THE

ENCYCLOPÆDIA BRITANNICA

A

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

Vol 01 (A-Anatomy)

Britannica 9th

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NINTH EDITION VOLUME I

. GNOCA TES (RM EDINBURGH: ADAM AND CHARLES BLACK

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PREFATORY NOTICE.

HE Encycrorp#pia Brirannica has long deservedly held a foremost place amongst English Encyclopeedias. It secured this position by its plan and method of treatment, the plan being more comprehensive, and the treatment a happier blending of popular and scientific exposition than had previously been attempted in any undertaking of the kind. The distinctive feature of the work was that it gave a connected view of the more important subjects under a single heading, instead of breaking them up into a number of shorter articles. This method of arrangement had a twofold advantage. ‘The space afforded for extended exposition helped to secure the services of the more independent and productive minds who were engaged in advancing their own departments of scientific inquiry. As a natural result, the work, while surveying in outline the existing field of knowledge, was able at the same time to enlarge its boundaries by embodying, in special articles, the fruits of original observation and research. The Encyclopedia Britannica thus became, to some extent at least, an instrument as well as a register of scientific progress.

This characteristic feature of the work will be retained and made even more prominent in the New Hdition, as the list of contributors already published

sufficiently indicates. In some other respects, however, the plan will be modified, to meet the multiplied require- ments of advancing knowledge. In the first place, the rapid progress of science during the last quarter of a century necessitates many changes, as well as a considerable increase in the number of headings devoted to its exposition. In dealing with vast wholes, such as Physics and Biology, it is always a difficult problem how best to distribute the parts under an alphabetical arrangement, and perhaps impossible to make such a distribution perfectly consistent and complete. The difficulty of distribution is increased by the complexity of divisions and multiplication of details, which the progress of science involves, and which constitute indeed the most authentic note of advancing knowledge. This sign of progress is reflected in extensive changes of terminology and nomenclature, vague general headings once appropriate and sufficient, such as Animalcule, being of necessity abandoned for more precise and significant equivalents. |

But, since the publication of the last edition, science, in each of its main divisions, may

be said to have changed as much in substance as in form. The new conceptions introduced into the Biological Sciences have revolutionised their points of view, methods of procedure, and systems of classification. In the light of larger and more illuminating generalisations, sections of the subject, hitherto only partially explored, have acquired new prominence and value, and are cultivated with the keenest interest. It is enough to specify the researches into the ultimate structures, serial gradations, and progressive changes of organic forms, into the laws of their distribution in space and time, and into the causes by which these pheno- mena have been brought about. The results of persistent labour in these comparatively new fields of inquiry will largely determine the classifications of the future. Meanwhile the whole system of grouping, and many points of general doctrine, are in a transition state ; and what is said and done in these directions must be regarded, to a certain extent at least, as tentative and provisional.. In these circumstances, the really important thing is, that whatever may be said on such unsettled questions should be said with the authority of the fullest

knowledge and insight, and every effort has been made to secure this advantage for the New Edition of the Encyclopeedia. | |

The recent history of Physics is marked by changes both of conception and classifica- tion almost equally great. In advancing from the older dynamic to the newer potential and kinetic conceptions of power, this branch of science may be said to have entered on a fresh stage, in which, instead of regarding natural phenomena as the result of forces acting between one body and another, the energy of a material system is looked upon as deter- mined by its configuration and motion, and the ideas of configuration, motion, and force are generalised to the utmost extent warranted by their definitions. This altered point of view, combined with the far reaching doctrines of the correlation of forces and the conservation of energy, has produced extensive changes in the nomenclature and classifi- cation of the various sections of physics; while the fuller investigations into the ultimate constitution of matter, and into the phenomena and laws of light, heat, and electricity, have created virtually new sections, which must now find a place in any adequate survey of scientific progress. The application of the newer principles to the mechanical arts and industries has rapidly advanced during the same period, and will require extended illustra- tion in many freshi directions. Mechanical invention has, indeed, so kept pace with the progress of science, that in almost every department of physics improved machines and processes have to be described, as well as fresh discoveries and altered points of view. In. recent as in earlier times, invention and discovery have acted and reacted on each other to a marked extent, the instruments of finer measurement and analysis having directly contributed to the finding out of physical properties and laws. ‘The spectroscope is a signal instance of the extent to which in our day scientific discovery is indebted to appropriate instruments of observation and analysis.

These extensive changes in Physics and Biology involve corresponding changes in the method of their exposition. Much in what was written about each a generation ago is now of comparatively little value. Not only therefore does the system of grouping in these

selences require alteration and enlargement; the articles themselves must, in the majority of instances, be written afresh rather than simply revised. The scientific department of the work will thus be to a great extent new. In attempting to distribute the headings ‘for the new edition, so as fairly to cover the ground occupied by modern science, I have been largely indebted to Professor Huxley and Professor Clerk Maxwell, whose valuable help in the matter I am glad to have an opportunity of acknowledging,

Passing from Natural and Physical Science to Literature, History, and Philosophy, it may be noted that many sections of knowledge connected with these departments. display fresh tendencies, and are working towards new results, which, if faithfully reflected, will require a new style of treatment. Speaking generally, it may be said that human nature and human life are the great objects of Inquiry in these departments. Man, in his individual powers, complex relationships, associated activities, and collective progress, is dealt with alike in Literature, History, and Philosophy. In this wider aspect, the rudest and most fragmentary records of savage and barbarous races, the earliest stories and traditions of every lettered people, no less than their developed literatures, mythologies, and religions, are found to have a meaning and value of their own. As yet the rich materials thus supplied for throwing light on the central problems of human life and history have only been very partially turned to account. It may be said, indeed, that their real significance is perceived and appreciated, almost for the first time, in our own day. But under the influence of the modern spirit, they are now being dealt with in a strictly scientific manner. The available facts of human history, collected over the widest areas, are carefully co-ordi- nated and grouped together, in the hope of ultimately evolving the laws of progress, moral and material, which underlie them, and which, when evolved, will help to connect and interpret the whole onward movement of the race, Already the critical use of the com- parative method has produced very striking results in this new and stimulating field of research. Illustrations of this are scen in the rise and rapid development of the compara- tively modern science of Anthropology, and the successful cultivation of the assistant sciences, such as Archeology, Ethnography, and Philology, which directly contribute materials for its use. The activity of geographical research in both hemispheres, and the large addi- tions recently made to our knowledge of older and newer continents by the

discoveries of eminent travellers and explorers, afford the anthropologist additional materials for his work. Many branches of mental philosophy, again, such as Ethics, Psychology, and Aisthetics, while supplying important elements to the new science, are at the same time very largely interested in its results, and all may be regarded as subservient to the wider problems raised by the philosophy of history. In the new edition of the Encyclopzedia full justice will, it is hoped, be done to the progress made in these various directions, ,

It may be well, perhaps, to state at the outset the position taken by the Encyclopedia Britannica in relation to the active controversies of the time—Scientific, Religious, and Philosophical. This is the more necessary, as the prolific activity of modern science has naturally stimulated speculation, and given birth to a number of somewhat crude conjec-

tures and hypotheses. The air is full of novel and extreme opinions, arising often from a hasty or one-sided interpretation of the newer aspects and results of modern inquiry. The higher problems of philosophy and religion, too, are being investigated afresh from opposite sides in a thoroughly earnest spirit, as well as with a directness and intellectual power, which is certainly one of the most striking signs of the times. This fresh outbreak of the inevitable contest between the old and the new is a fruitful source of exaggerated hopes and fears, and of excited denunciation and appeal. In this conflict a work like the Encyclopeedia is not called upon to take any direct part. It has to do with knowledge rather than opinion, and to deal with all subjects from a critical and historical, rather than a dogmatic, point of view. It cannot be the organ of any sect or party in Science, Religion, or Philosophy. Its main duty is to give an accurate account of the facts and an impartial summary of results in every department of inquiry and research. This duty will, I hope, be faithfully performed.

T. S. BAYNES. Sr Anprews, lst January 1875.

A

THE first symbol of every Indo-European alphabet,

denotes also the primary vowel sound. This coin- The alphabets of were of Semitic origin,

A,

cideice is probably only accidental. Europe, and perhaps of India also, and in all the Semitic alphabets except one, this same symbol (in modified forms) holds the first place 3 but it represents a peculiar breathing, not the vowel a,—the vowels in the Semitie languages occupying a subordinate place, and having originally no special symbols. When the Greeks, with whom the vowel sounds were much more important, borrowed the al phabet of Phcenicia, they re- quired symbols to express those vowels, and used for this purpose the signs of breathings which were strange to them, and therefore needed not to be preserved ; thus the Pheenician equivalent of the Hebrew aleph became alpha; it denoted, however, no more a guttural breathing, but the purest vowel sound. Still, it would be too much to assume that the Greeks of that day were so skilled in phonetics that they assigned the first symbol of their bor- rowed alphabet to the a-sound, because they knew that sound to be the most essential vowel. This primary vowel-sound (the sound of a in Sather) is produced by keeping the passage through which the air is vocalised between the glottis and the hips in the most open position possible. In sounding all other vowels, the air- channel is narrowed by the action either of the tongue or the lips. But here neither the back of the tongue is raised (as it is in sounding o and other vowels), so that a free space is left between the tongue and the uvula, nor is the front of the tongue raised (as in sounding e), so that the space is clear between the tongue and the palate. Again, no other vowel is pronounced with a wider opening of the lips; whereas the aperture is sensibly reduced at each side when we sound 0, and still more when we sound w (that. is, yoo). The whole channel, therefore, from the glottis, where the breath first issues forth to be modi- fied in the oral cavity, to the lips, where it finally escapes, is thoroughly open. Hence arises the great importance of the sound, by reason of its thoroughly non-consonantal character. All vowels may be defined as open positions

of the speech-organs, in which the breath escapes without any stoppage, friction, or sibilation arising from the con- tact of those organs, whereas consonants are heard when the organs open after such contact more or less complete. Now, all vowels except @ are pronounced with a certain contraction of the organs; thus, in sounding the ¢ (the English e-sound), the tongue is raised so as almost to touch the palate, the passage Icft being so elose, that if the tongue were suffered for a second to rest on the palate, there would be heard not ¢ but y; and a similar relation exists between w and w. This is commonly expressed by calling y and w semi-vowels, We might more exactly call ¢ and w consonantal-vowels; and as an historic fact, 7 does constantly pass into y, and % into w, and vice versa. But no consonant has this relation to the a-sound ; it has abso- lutely no affinity to any consonant ; it is, as we have called it, the one primary essential vowel.

The importance of this sound may be shown by histori- cal as well as by physiological evidence. We find by tracing the process of phonetic change in different lan- guages, that when one vowel passes into another, it is the pure a-sound which thus assumes other forms, whereas other vowels do not pass into the a-sound, though some- times the new sound may have this symbol. Roughly speaking, we might express the gene- Pm ral character of vowel change by draw- ing two lines from a common point, at which a is placed. One of these lines marks the progress of an original a (ak-sound) through ¢ (a-sound), till it sinks finally to ¢ (e-sound); the other marks a similar degradation, through o to w (oo-sound). This figure omits many minor modifications, and is sub- : ject to some exceptions in particular languages. But it represents fairly in the main the general process of vowel-change. Now, we do not assert that there ever was a time when a was the only existing vowel, but we do main- tain that in numberless cases an original a has passed into other sounds, whereas the reverse process is janine

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Ae

2 A—AAR

rare. Consequently, the farther we trace back the history of language, the more instances of this vowel do we find; the more nearly, if not entirely, does it beeome the one starting point from which all vowel-sound is derived.

It is principally to the effort required to keep this sound pure that we must attribute the great corruption of it in all languages, and in none more than our own. In- deed, in English, the short a-sound is never heard pure ; it is heard in Seotland, e.g., in man, whieh is quite different from the same word on English lips. We have it, how- ever, long in father, &e., though it is not eommon. It has passed into a great many other sounds, all of whieh are denoted in a most confusing way by the original symbol, and some by other symbols as well. Thus a denotes—(1.) The English vowel-sound in man, perhaps the most common of all the substitutes, dating from the 17th eentury. (2.) It appears in want; for this sound o is also employed, as in on. (3.) A more open sound is heard in ail (also denoted

by au in auk, and aw in awl). (4.) Very commonly it re-.

presents the continental ¢, as in ale (here also we have the symbol ai in ail). (5.) It is found in dere and many similar words, where the sound is really the e of den, pro- longed in the utterance; here also at is sometimes an equivalent, as in avr, Then (6) there is a sound whieh is not that of a either in man or in father, but something between the two. It is heard in such words as ask, pass, grant, &e. All these may be, and often are, pronounced

with the sound either of man or of father ; still, we do often |

hear in them a elearly distinguishable intermediate sound, whieh ought to have a special symbol. Lastly (7), there is the dull sound heard in final unaeeentuated syllables, ¢.9., in the word final itself. It is that to which all unaeeen- tuated syllables tend ; but it is also often heard even in monosyllables, where it is represented by every other vowel- symbol in the language, ¢.9., in her, sir, son, sun. This Protean sound is commonly ealled the neutral vowel ; it occurs in all languages, but perhaps in none so frequently as in English. This great variety of sounds, whieh are all

denoted among us by one symbol, clearly shows the in-.

sufficieney of our written alphabet.

As in English, so in Sanskrit, the short ah-sound was lost, and was replaced regularly by the neutral sound. This was regarded by the grammarians as inherent in every consonant, and therefore was only written at the beginning of a word; in faet, it is the smallest amount of vowel- sound requisite to float a consonant. Long a, however, kept its sound pure, and does so still in the vernaeulars of India. In Latin the sound was probably pure, both short and long, and it has been preserved so in the Romance languages down to the present day. In Greek there was considerable variation, proved in one ease at least by a variation of symbol; in Ionie a eommonly passed into 7, @ symbol whieh probably denoted the modern Italian open e; but possibly the elose e, that is, the English a in ale. On the other hand, it is probable that the Dorie « approximated to an 0, being sounded as a in our word want; and it is likely that this variation was the Aare:ac- pos which the grammarians attribute to the Dorians. This is eommonly supposed to have been the retention of a where the Ionie had 7; but that was not peculiar to the Dorians, being eommon to all the Greeks exeept the Ionians. In the north of Europe we find a similar tendency to give to a an o-sound; thus in Norse, aa is sounded as an open o. By a further extension in the north of England, at least in such parts as have been specially exposed to Norwegian influence, aw has the sound of 0 ; ¢.g., daw is pronouneed lo.

A is frequently used as a prefix in lieu of some fuller form in old English. Thus it stands for the preposition on (O.E. an) in away, again, afoot, asleep ; for of in adown (O.K. of-dune) ; and seems to be intensive in atherst (O.E.

of-thirst). Sometimes, especially with verbs, it represents the old English d@, which in old High German appears as ur or er, and in modern German as er, which signifies the eompletion of an action, as in erwachen, to which awake corresponds. Frequently no special force seems to be added by the prefix, as in abide, arise, &e. Sometimes a appears as the representative of the prefix eommonly used in past participles, which has the form ge in German, and ge and y in old English, e.g., in ago or agone; compare aware (O.E, gewaere), among (O.E. gemang), &e. A also stood for the preposition an (om) in such expressions (now obsolete) as a-doing, a-making, where

doing and making are verbal nouns. Lastly, it represents the prepositions on or of in the phrases now-a-days, Jack-a-lantern, and others.

The place that A oceupies in the alphabet aceounts for its being mueh employed as a mark or symbol. It is used, for instance, to name the sixth note of the gamut in musie ; in some systems of notation it is a numeral (see Arrri- mEric); and in Logic it denotes a universal affirmative proposition (sec Logic). In algebra, a and the first letters of the alphabet are employed to represent known quanti- ties. Al marks the best elass of vessels in Lloyd's Re- gister of British and Foreign Shipping. In the old poets, " A per se" is.found, meaning the highest degree of exeel- lenee; as when Chauecr calls Creseide " the floure and A per se of Troye and Greee."

A was the first of the cight litere nundinales at Rome, and on this analogy it stands as the first of the seven Domini- eal letters. .

Tt is often used as an abbreviation, as in A.D. for anno domint, A.M. for ante meridiem, A.B. and A.M. for artium baccalaureus and artiwm magister. In commeree A stands for accepted. (u.-P.)

AA, the name of about forty small European rivers. The word is derived from the old German aha, eognate to the Latin aqua, water. The following are the more important streams of this name :—a river of Holland, in North Brabant, which jos the Dommel at Bois-le-Duc ; two rivers in the west of Russia, both falling into the Gulf of Livonia, near Riga, whieh is situated between them; a river in the north of Franee, falling into the sea at Gravelines, and navigable as far as St Omer; and a river of Switzerland, in the eantons of Lueerne and Aargau, whieh carries the waters of Lakes Baldeker and Hallwyler into the Aar.

AACHEN. See Arx-LA-CHAPELLE.

AALBORG, a city and seaport of Denmark, is situated on the Liimfiord, about 15 miles from its junetion with the Cattegat. It is the eapital of the district of the same name, one of the subdivisions of the provinee of Jiitland. The city is a place of considerable commercial importance, and coutains a eathedral and a school of navigation. Soap, tobaeco, and leather are manufaetured ; there are several distilleries ; and the herring fishery is

extensively proseeuted. Grain and herring are largely exported, as are also to a smaller extent wool, eattle, skins, tallow, salt provisions, and spirits. The harbour, which is good and safe, though diffieult of aecess, is entered by about 800 vessels annually, and there is direet steam eommunieation with Copenhagen. The distriet is celebrated for its breed of horses. Population (1870), 11,953.

AALEN, a walled town of Wiirtemberg, pleasantly situated on the Koeher, at the foot of the Swabian Alps, about 50 miles E. of Stuttgart. Woollen and linen goods are manufaetured, and there are ribbon looms and tanneries in the town, and large iron works in the neighbourhood.

Aalen was a free imperial city from 1360 till 1863, when it was annexed to Wiirtemberg. Population (1871), 5552.

AAR, or Aarx, the most considerable river in Switzer-

land, after the Rhine and Rhone. It rises in the glaciers

AAR+=AAR 3

of the Finster-aarhorn, Schrcekhorn, and Grimsel, in the eanton of Bern; and at the Handeek in the valley of Hasli

forms a magnificent water-fall of above 150 feet in height. It then falls suceessively into the lakes Brienz and Thun,

and, emerging from the latter, flows through the eantons of

Bern, Soleure, and Aargau, emptying itself into the Rhine, opposite Waldshut, after a course of about 170 miles.

Its prineipal tributary streams are the Kander, Saane, and Thiele on the left, and the Emmen, Surin, Aa, Reuss, and

Limmat, on theright. On its banks are situated Unterseen, Thun, Bern, Soleure or Solothurn, Aarburg, and Aarau.

The Aar is a beautiful silvery river, abounding in fish, and

is navigable from the Rhine as far as the Lake of Thun. Several small rivers in Germany have the same name.

AARAU, the ehief town of the eanton of Aargau in

Switzerland, is situated at the foot of the Jura mountains, on the right bank of the river Aar, 41 miles N.E. of Bern.

It is well built, and eontains a town-hall, barraeks, several small museums, and a library rich in histories of Switzer- land. ‘There is a eannon foundry at Aarau, and among the prineipal manufactures are silk, cotton, and leather; also cutlery and mathematical instruments, which are held in The slopes of the neighbouring mountains are partially covered with vines, and the vicinity of the About ten miles distant along the

great repute.

town is attraetive. right bank of the Aar are the famous baths of Sehinznaeh. Population, 5449,

AARD-VARK (earth-pig), an animal very eommon in

South Afriea, measuring upwards of three feet in length, and having a general resemblance to a short-legged pig. It feeds on ants, and is of nocturnal habits, and very timid and harmless. Its flesh is used as food, and when suitably preserved is considered a delieaey. The animal is the only known species of its genus (Orycteropus), and belongs to the order Hdentata of the mammalia. The same prefix Aard appears in the name of the Aarp-wour (Protetes Lalandit), a rare animal found in Caffraria, whieh is said to partake of the eharaeters of the dog and civet. See MAMMALIA.

AARGAU (Freneh, Arcovir), one of the eantons, of Switzerland, derives its name from the river which flows through it, Aar-gau being the provinee or district of the Aar. It is bounded on the north by the Rhine, which divides it from the duchy of Baden, on the east by Zurich and Zug, on the south by Lucerne, and on the west by Bern, Soleure or Solothurn, and Basel. It has an area of 5024 square miles. By the census of 1870, the number of inhabitants was 198,873, showing an increase during the preceeding ten

years of 4665. Aargau stands sixth among the Swiss cantons in density of population, having 395 inhabitants to the square nile. The statisties of 1870 show that of the inhabitants 107,703 were Protestants, 89,180 Catholics, and 1541 Jews. German is the language almost universally spoken.

Aargau is the least mountainous canton of Switzerland. It forms part of a great table-land to the north of the Alps and the east of the Jura, having a general elevation of from 1200 to 1500 feet. The hills do not rise to any greater height than 1800 feet above this table-land, or 3000 feet above the level of the sea. The surface of the country is beautifully diversified, undulating tracts and well-wooded hills alternating with fertile valleys watered by the Aar and its numerous tributaries, and by the rivu- lets whieh flow northward into the Rhine. Although moist and variable, the elimate is milder than in most parts of Switzerland.

The minerals of Aargau are unimportant, but remarkable paleontological remains are found in its rocks. The soil to the left of the Aar is a stiff elay, but to the right it is light and productive. Agriculture is in an advaneed state, and great attention is given to the rearing of cattle. There

are many vineyards, and mueh fruit is grown. The can- ton is distinguished by its industry and its generally diffused prosperity. Many of the inhabitants are employed im the fishings on the Aar, and in the navigation of the river. In the villages and towns there are considerable manufactures of eotton goods, silk, and linen. The chief exports are eattle, hides, cheese, timber, raw eotton, yarn, eotton cloths, silk, maehinery, and wooden wares: and the imports inelude wheat, wine, salt, leather, and iron. The most important towns are Aarau, Baden, Zofingen, and Laufenburg, and there are mineral springs at Baden, Schinz- nach, Leerau, and Niederweil. The Swiss Junetion Railway crosses the Rhine near Waldshut, and runs south through the eanton to Turgi, whenee one line proceeds S.E. to Zurich, and another 8.W. to Aarau and Olben.

Until 1798, Aargau formed part of the eanton of Bern, but when the Helvetic Republie was proclaimed, it was erected into a separate eanton. In 1803 it received a eonsiderable accession of territory, in virtue of the arrange- ment under whieh the French evacuated Switzerland. Aceording to the law whereby the cantons are represented in the National Council by onc

member for every 20,000 inhabitants, Aargau returns ten representatives to that assembly. The internal government is vested in a legis- lative couneil elected by the body of the people, while a smaller eouneil of seven members is chosen by the larger body for the general administration of affairs. The re- sources of Aargau are stated to amount to about a million sterling; its revenue in 1867 was nearly £82,000, and the expenditure slightly greater. There is a publie debt of about £40,000. The canton is divided into eleven distriets, and these again are subdivided into forty-eight eireles. There is a court of law for eaeh district, and a superior court for the whole canton, to which cases involving sums above 160 franes ean be appealed. Edueation is eompulsory ; but in the Roman Catholie districts the law is not strietly enforeed. By improved schools and other appliances great progress has been made in education within the last thirty or forty years.

AARHUUS, a city and seaport of Denmark, situated on the Cattegat, in lat. 56° 9’ N., long. 10° 12’E. It is the chief town of a fertile district of the same name, one of the subdivisions of Jutland. The eathedral of Aarhuus is a Gothic strueture, and the largest church in Denmark. The town also contains a lyeeum, museum, and library. Aarhuus is a place of extensive trade. It has a good and safe harbour, has regular steam’ eommunieation with Copenhagen, and is eonnected by rail with Viborg and the interior of the eountry. Agricultural produce, spirits, leather, and gloves are exported, and there are sugar re- fineries, and manufactures of wool, cotton, and tobaeco. Population (1870), 15,020.

AARON, the first high-priest of the Jews, eldest son of Amram and Joehebed, of the tribe of Levi, aud brother of Moses and Miriam. When Moses was commissioned to eonduct the Israelites from Egypt to Canaan, Aaron was appointed to assist him, prineipally, it wonld appear, on aecount of his possessing, in a high degree, persuasive readiness of speech. On the oeeasion of Moses’ absenee in Mount Sinai (to which he had gone up to receive the tables of the law), the Israelites, regarding Aaron as their leader, elamorously demanded that he should provide them with a visible symbolic image of their God for worship. He weakly complied with the demand, and out of the ornaments of gold contributed for the purpose cast the figure of a ealf, this form being doubtless chosen in recol- leetion of the idols of Egypt. In ebedience to instructions given by God to Moses, Aaron was appointed

high-priest ; his sons and deseendants, priests ; and his tribe was set apart as the sacerdotal caste. The offiee of high-priest was held by Aaron for nearly forty years, till the time of his

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death, which took place on Mount Hor, when he was 123 years old.

AARSSENS, Francis Van (1572-1641), one of the greatest diplomatists of the United Provinces. He re-

presented the States-General at the Court. of France for many years, and was also engaged in embassies to Venice, Germany, and England. His great diplomatic ability appears from the memoirs he wrote of his negotiations im 1624 with Richelieu, who ranked him among the three greatest politicians of his time. A deep stain rests on the memory of Aarssens from the share he had in the death of Barneveldt, who was put to death by the States-General, aftcr the semblance of a trial, in 1619.

ABABDE, an African tribe occupying the country be-

tween the Red Sea and the Nile, to the S. of Kosseir, nearly as far as the latitude of Derr. Many of the race have settled on the eastern bank of the Nile, but the greater part still live like Bedouins. They are a distinct race from the Arabs, and are treacherous and faithless in their dealings. They have few horses ; when at war with other tribes, they fight from camels, their breed of which is famed. They possess considerable property, and trade in senna, aud in charcoal made from acacia wood, which they send as far as Cairo.

ABACA or ABAKA, a name given to the Musa textilis, the plant that produces the fibre called Manilla Hemp, and also to the fibre itself.

ABAOQUS, an architectural term (from the Gr. afag, a

tray or flat board) applied to the upper part of the capital of a column, pier, &c. The early form of an abacus Is

Forms of the Abacus.

simply a square flat stone, probably derived from the Tuscan order. In Saxon work it is frequently simply chamfered, but sometimes grooved, as in the crypt at Repton (fig. 1), and in the arcade of the refectory at West-minster. The abacus in Norman work is square where the columus are small; but on larger piers it is sometimes octagonal, as at Waltham Abbey. The square of the abacus is often sculptured, as at the White Tower and at Alton (fig. 2). In early English work the abacus is generally circular, and in larger work a continuation of circles (fig. 4), sometimes octagonal, and occasionally square. The mouldings are

generally rounds, which overhang deep hollows. The

abacus in early French work is generally square, as

txlccconedos co «oC OX «T esd

9

Fig. 5.—Roman Abacus.

at Blois (fig. 3). 4 The term is ap-

plied in its diminu- 2 tive form (Abacis- } cus) to the chequers

or squares of a tes-

sellated pavement.

Axpacus also signifies an instrument employed by the ancients for arithmetical calculations; pebbles, bits of bone, or coins, being used as counters. The accompanying figure (5) of a Roman abacus is taken from an ancient monn- ment. +t contains seven jong and scven shorter rods or

bars, the former having four perforated beads running on >

them, and the latter one. The bar marked I indicates units, X tens, and so on up to millions. The beads on the shorter bars denote fives,—five units, five tens, &c. The rod @ and correspond- ing short rod are for marking ounces; and the short quar- ter rods for fractions of an ounce.

The Swan-Pan of the Chinese (fig. 6) : closely resembles the C850 92 11-1 £ Aa Roman abacus in its Fig. 6.—Chinese Swan-Pan. construction aud use. Computations are made with it by means of balls of bone or ivory running on slender bam- boo rods similar to the simpler board, fitted up with beads strung on wires, which is employed in teaching the rndi- ments of arithmetic in elementary schools.

AB, a town of ancient Greece in the E. of Phocis, famons for a temple and oracle of Apollo. The temple was plundered and burned by the Persians (B.c. 480), and again by the Beeotians (B.c. 346), and was restored on a smaller scale by Hadrian. Remains of the temple and town may still be traced on a peaked hill near Exarkho. See Leake's Northern G'reece.

ABAKANSK, a fortified town of Siberia, in the govern- ment of Yeniseisk, on the river Abakan, near its confluence with the Yenisei. Lat. 54° N.; long. 91° 14' E. This is considered the mildest and most salubrious place in Siberia, and is remarkable for the tumuli in its neighbourhood, and for some statues of men from seven to nine feet high, covered with hieroglyphics. Population about 1000.

ABANA and Puarpar, "rivers of Damascus" (2 Kings v. 12), are now generally identified with the Barada and the Awaj respectively. The former flows through the city of Damascus; the Awaj, a smaller stream, passes eight miles to the south. Both run from west to east across the plain of Damascus, which owes to them much of its fertility,

| and lose themselves in marshes, or lakes, as they are called,

on the borders of the great Arabian desert. Mr Macgregor, who gives an interesting description of these rivers in his Rob Roy on the Jordan, affirms that "as a work of hydraulic engineering, the system and construction of the canals by which the Abana and Pharpar are used for irrigation, may be still considered as the most complete and extensive in the world."

ABANCAY, a town of Peru, in the department of Cuzco, 65 miles W.S.W. of the town of that name. — It lies on the river Abancay, which is here spanned by one of the finest bridges in Peru. Rich crops of sugar-cane are pro- duced in the district, and the town has extensive sugar refineries. Hemp is also cultivated, and silver is found in the mountains. Population, 20,000.

ABANDONMENT, in Marine Assurance, is the surren- dering of the ship or goods insured to the insurers, in the case of a constructive total loss of the thing insured. There is an absolute total loss entitling the assured to recover the full amount of his insurance wherever the thing insured has ceased to exist to any useful purpose,—and in such a case abandonment is not required. Where the thing assured continues to exist in specie, yet is so damaged that there is no reasonable hope of repair, or it is not worth the expense of bringing it, or what remains of it, to its destina- tion, the insured may treat the case as one of a total loss (in this case called constructive total loss), and demand the full sum insured. But, as the contract of insurance is one of indemnity, the insured must, in such a case, make an express cession of all his right to the recovery of the subject insured to the underwriter by abandonment. The insured must intimate his intention to abandon, within a

reasonable time after recciving correct information as to the loss; any unnecessary delay being held as an indica- tion of his intention not to abandon. An abandonment when onee accepted is irrevocable; but in no circumstances is the insured obliged, to abandon. After abandonment, the captain and crew are still bound to do all in their power to save the property for the underwriter, without prejudice to the right of abandonment; for which they are entitled to wages and remuneration from the insurers, at least so far as what is saved will allow. See Arnould, Marshall, and Park, on the Law of Insurance, and the judgment of Lord Abinger in Roux v. Salvador, 3 Bing. N.C. 266, Tudor’s Leading Cases, 139.

ABANDONMENT has also a legal signification in the law of railways. Under the Aets 13 and 14 Vict. c. 83, 14 and 15 Vict. c. 64, 30 and 31 Vict. c. 126, and 32 and 33 Vict. c. 114, the Board of Trade may, on the application of a railway company, made by the authority and with the eonsent of the holders of three-fifths of its shares or stock,

and on eertain conditions specified in the Acts, grant a war- rant authorising the abandonment of the railway or a por-

tion of it. After due publication of this warrant, the company is released from all liability to make, maintain, or work the railway, or portion of the railway, authorised

to be abandoned, or to complete any contracts relating to

it, subject to certain provisions and exceptions. ABANDONING a young child under two years of age, so

that its life shall be endangered, or its health permanently

injured, or likely to be so, is in England a misdemeanour, punishable by penal servitude or imprisonment, 24 and 25 Vict. c. 100, § 273. In Scotland abandoning or exposing an infant is an offence at common law, although no evil eousequences should happen to the child.

ABANO, a town of Northern Italy, 6 miles S.W. of Padua. There are thermal springs in the neighbourhood, which have been much resorted to by invalids for bathing, both in ancient and modern times. They were called by the Romans Aponi Fons, and also Aquce Patavine. Popu- lation of Abano, 3000.

ABANO, Pietro v’, known also as Petrus de Apono or Aponensis, a distinguished physician and philosopher, was born at the Italian town from which he takes his name in 1250, or, according to others, in 1246. After visiting the east in order to acquire the Greek language, he went to study at Paris, where he became a doctor of medicine and philosophy. In Padua, to which he returned when his studies were completed, he speedily gained a great reputa- tion as a physician, and availed himself of it to gratify his avarice by refusing to visit patients except for an exorbitant fee. Perhaps this as well as his meddling with astrology caused the charge to be brought against him of practising magic, the particular accusations being that he brought back into his purse, by the aid of the devil, all the money he paid away, and that he possessed the philosopher’s stone. He was twice brought to trial by the Inquisition ; on the first occasion he was acquitted, and he

died (1316) before the second trial was completed. He was found guilty, however, and his body was ordered to be exhumed and burned; but a friend had secretly removed it, and the Inquisition had, therefore, to eontent itself with the public proclamation of its sentence and the burning of Abano in effigy. In his writings he expounds and advocates the medical and philosophical systems of Averrhoes and other Arabian writers. His best known works are the Con- culvator differentiarum quce inter philosophos et medicos versantur (Mantua, 1472, Venice, 1476), and De venenis eorumgque remedits (1472), of which a French translation was published at Lyons in 1593.

ABARIS, the Hyperborean, a eelebrated sage of anti- quity, who visited Greece about 570 B.c., or, according to

others, a century or two earlier. The particulars of his history are differently related by different authors, but all accounts are more or less mythical. He is said to have travelled over sea and land, riding on an arrow given him by Apollo, to have lived without food, to have delivered the whole earth from a plague, &c. Various works in prose and verse are attributed to Abaris by Suidas and others, but of these we have no certain information.

ABATEMENT, Axats, from the French abattre, abater, to throw down, demolish. The original meaning of the word is preserved in various legal phrases. The abatement of a nuisaucc is the remedy allowed by law to a person injured by a public nuisance of destroying or removing it by his own act, provided he commit no breach of the peace in doing so. In the case of private nuisances abatement is also allowed, provided there be no breach of the peace, and no damage be occasioned beyond what the removal of the nuisance requires.

Abatement of freehold takes place where, after the death of the person last seised, a stranger enters upon lands before the entry of the heir or devisee, and keeps the latter out of possession. It differs from intrusion, which is a similar entry by a stranger on the death of a tenant for life, to the prejudice of the reversioner, or remainder man ; and from disseisin, which is the forcible or fraudulent ex- pulsion of a person seised of the freehold.

Abatement among legatees (defulcatis) is a proportionate deduction which their legacies suffer when the funds out of whieh they are payable are not sufficient to pay them in full.

Abatement in pleading is the defeating or quashing of a particular action by some matter of faet, such as a defect in form or personal incompetency of the parties suing, pleaded by the defendant. Such a plea is called a plea in abatement ; and as it does not involve the merits of the cause, it leaves the right of action subsisting. Since 1852 it has becn competent to obviate the effect of such pleas by amendment, so as to allow the real question in contro- versy between the parties to be tried in the same suit.

In litigation an action is said to abate or cease on the death of one of the parties.

ABATEMENT, or Repate, is a discount allowed for prompt payment; it also mcans a deduction sometimes made at the custom-house from the fixed duties on certain kinds of goods, on account of damage or loss sustained in warehouses. The rate and conditions of such deductions are regulated by Act 16 and 17 Viet. c. 107.

ABATI, or Dett'Appato, Niccoto, a celebrated fresco- painter of Modena, born in 1512. His best works are at Modena and Bologna, and have been highly praised by Zanotti, Algarotti, and Lanzi. He accompanied Primaticcio to France, and assisted in decorating the palace at Fontain- bleau (1552-1571). His pictures exhibit a combination of skill in drawing, grace, and natural colouring. Some of his easel pieces in oil are in different collections 3 one of the finest, now in the Dresden Gallery, represents the martyr- cs of St Peter and St Paul. Abati died at Paris in

1571.

ABATTOIR, from abattre, primarily signifies a slaughter- house proper, or place where animals are killed as distin- guished from boucheries and étaux publics, places where the dead meat is offered for sale. But the term is also employed to designate a complete meat market, of which the abattoir proper is merely part.

Perhaps the first indication of the existence of abattoirs may be found in the system which prevailed under the Emperors in aneient Rome. A corporation or guild of butchers undoubtedly existed there, which delegated to its offieers the duty of slaughtering the beasts required to supply the city with meat. ‘he establishments requisite

for this purpose were at first scattered about the various streets, but were eventually confined to one quarter, and formed the public meat market. This market, in the time of Nero, was one of the most. imposing structures in the city, and some idea of its magnificence has been transmitted to us by a delineation of it preserved on an ancient coin. As the policy and customs of the Romans made themselves felt in Gaul, the Roman system of abattoirs, if it may be so called, was introduced there in an imperfect form. A clique of families in Paris long exercised the special func- tion of catering for the public wants in respect of meat. But. as the city increased in magnitude and population, the necessity of keeping slaughter-houses as much as possible apart from dwelling-houses became apparent. As early as the time of Charles IX., the attention of the French author- ities was directed to the subject, as is testified by a decree passed on the 25th of February 1567. But although the importance of the question was frequently recognised, no definite or decided step seems to have been taken to effect the contemplated reform until the time of Napoleon E The evil had then reached a terribly aggravated form. Slaughter-houses abutted on many of the principal thorough- fares ; the traffic was impeded by the constant arrival of foot-sore beasts, whose piteous cries pained the ear; and rivulets of blood were to be seen in the gutters of the public streets. The constant accumulation of putrid offal tainted the atmosphere, and the Seine was polluted by being used as a common receptacle for slaughter-house refuse. This condition of things could not be allowed to continue, and on the 9th of February 1810, a decree was passed authoris- ing the construction of abattoirs in the outskirts of Paris, and appointing a Commission, to which was committed the consideration of the entire question.

The result of the appointment of this Commission was the construction of the five existing abattoirs, which were formally opened for business on the

15th of September 1818. The Montmartre abattoir occupies 8 English acres ;

METRES.

1, Menilmontant Abattoir.

A. Residenee of Officials. G. Steam Engine,

B. Sheep and Cattle Sheds. H. Stable with Water Tanks. C. Slaughter-Houses. above.

D. Yards to do. I, Dung Pits.

- Stores. L. Privies.

. Tallow-melting Houses. M. Layers for Cattle.

Ménilmontant, 104 acres; Grenelle, 77; Du Roule, 53; and Villejuif, 54. The first two contain each 64 slaughter- houses aud the same number of cattle-sheds; the third, 48 ; and each of the others 32. The dimensions of each of the

arrangement of the abattoirs will be understood from the preceding plan of that of Ménilmontant.

The component parts of a French abattoir are—l. Echaudoirs, which is the name given by the Paris butcher to the particular division allotted to him for the purpose of knocking down his beasts ; 2. Bouverves et Bergerves, the places set apart for the animals waiting to be slaughtered, where the animals, instead of being killed at once, after a long and distressing journey, when their blood is heated and their flesh inflamed, are allowed to cool and rest till the body is restored to its normal healthy condition ; 3. Fon- deurs, or boiling-down establishments; and, 4. Triperies, which are buildings set apart for the cleaning of the tripe of bullocks, and the fat, heads, and tripe of sheep and calves. Besides these, a Paris abattoir contains Logements des agens, Magasins, Réservoirs, Voiries, Lieux d aisance, Votites, Remises et écuries, Parcs aux Beufs, &c., and is provided with an abundant supply of

water. All the abat- toirs are under the control of the municipal authorities, and frequent inspections are’ made by persons regularly appointed for that purpose.

The abattoirs are situated within the barricrs, each at a distance of about a mile and three-quarters from the heart of the city, in districts where human habitations are still comparatively few. There are two principal markets from which the abattoirs at Paris are supplied,—the one at Poissy, about 13 miles to the north-west, and the other at Sceaux, about 5 miles and a quarter to the south of the city. There are also two markets for cows and calves, namely, La Chapelle and Les Bernadins.

The Paris abattoirs were until recently the most perfect specimens of their class ; and even now, although in some of their details they have been surpassed by the new Islington meat market, for their complete and compact arrangement they remain unrivalled.

The example set by Paris in this matter has been fol- lowed in a more or less modified form by most of the prin- cipal Continental towns, and the system of abattoirs has

| become almost universal in France.

The condition of London in this important sanitary respect was for a long period little more endurable than that of Paris before the adoption of its reformed system. Smithfield market, situated in a very populous neighbour- hood, continued till 1852 to be an abomination to the town and a standing reproach to its authorities. No fewer than 243,537 cattle and 1,455,249 sheep were sold there in 1852, to be afterwards slaughtered in the crowded courts and thoroughfares of the metropolis. But public opinion at length forced the Legislature to interfere, and the corpora- tion was compelled to abandon Smithfield market and to provide a substitute for it elsewhere.

The site selected was in the suburb of Islington, and the designs for the work were prepared by Mr Bunning. The first stone was laid March 24, 1854, and the market was opened by Prince Albert, June 15, 1855. The Islington market is undoubtedly the most perfect of its kind. It occu- pies a space of some 20.acres on the high land near the Pen- tonville prison, and is

open to both native and foreign cattle, excepting beasts from foreign countries under quarantine.

In connection with the Islington cattle market are a few slaughter-houses, half of which were originally public, and half rented to private individuals ; but at present they are all practically private, and the majority of the cattle sold are driven away and killed at private slaughter-houses. In this respect the London system differs from that of Paris ; and it may be said for the former that the meat is less liable to be spoiled by being carted to a distance, and is therefore probably delivered in better condition ; but the latter secures that great desideratum, the practical extine-

slaughter-houses is about 29} feet by 13. The general | tion of isolated slaughter-houses.

ABA—

than by the tedious and troublesome method of land- cleaning.

The Edinburgh abattoir, erected in 1851 by the corpora- tiou, from designs prepared by Mr David Cousin, the city architect, is the best as regards both construction and management in the United Kingdom. It occupies an area of four acres and a quarter, surrounded by a screen-wall, from which, aloug the greater part of its length, the build- ings are separated by a considerable open space. Opposite

2. Edinburgh Slaughter-Houses.

A. Central Roadway. G Raised Water Tank. B. Slaughtcring Buoths, HM. Tripery.

C. Cattle Sheds, 1. Pig-slaughtering Iouse. D. Enclosed Yards. K. Court for Cattle. E, Well. L. Sheds.

F, Steam-Engine. M. mS now Albumen Factory.

the principal gateway is a double roW of buildings, extend- ing in a straight line to about 376 feet in length, with a central roadway (marked AA in the

annexed plan), 25 feet wide. There are three separate blocks of building on each side of the roadway, the central one being 140 feet in length, and the others 100 feet each—cross-roads 18 feet wide separating the blocks. These ranges of building, as well as two sinaller blocks that are placed transversely behind the eastern central block, are divided into compart- ments, numbering 42 in all, and all arranged on the same plan. Next the roadway is the slaughtering-booth (BB), 18 feet by 24, and 20 feet in height, and behind this is a shed (CC) 18 feet by 22, where the cattle are kept before being slaughtered. All the cattle are driven into these sheds by a back-entrance, through the small enclosed yards (DD). The large doors of the booths are hung by balance weights, and slide up and down, so as to present no obstruction cither within the booth or outside. By a series of large ventilators along the roof, and-by other contrivances, the slaughtering-booths are thoroughly ventilated. Great pre- cautions have been used to keep rats out of the buildings. To effect this, the booths are laid with thick well-dressed pavement, resting on a stratum of concrete 12 inches thick, and the walls, to the height of 7 fect, are formed of solid ashlar; the roadways, too, are laid with concrete, and causewayed with dressed whinstone pavement; and the drainage consists entirely of glazed carthenware tubes. The ground on which the abattoir is built was previously connected with a distillery, and contains a well 100 feet deep (E), which, with the extensive system of tunnels attached to it, provides the establishment with an abundant supply of pure water. By means of a steam-engine (F), introduced in 1872, the water is pumped up into a raised tank (G), whence it is distributed to the different booths and sheds, as well as for scouring the roadways aud drains.

The steam from the engine is utilised in heating water for

the numerous cast-iron tanks required in the operations of cleansing and dressing the tripery (H) and pig slaugh- tering-house (1). Y an ingenious arrangement of rotary brushes driven by the steam-engine,—the inven- tion of Mr Rutherford, the superintendent,—the tripe is dressed in a superior manner, and at greatly less cost

,

management is vested in the city authorities.

ABA 7

By the Edinburgh Slaughter-Houses Act of 1850, the Booths are let at a statutory rent of £8 each per annum, and, in

addition to this, gate-dues are payable for every beast

entering the establishment. The present rates for tenants of booths are 13d. for an ox or cow, 2d. for a calf or pig, and 4d. for a sheep. Common booths are provided for butchers who are not tenants, on payment of double gate-dues, The city claims the blood, gut, and manure. The tripe and feet are dressed for the trade without extra charge.

The blood was formerly collected in large casks, and dis- posed of for manufacturing purposes. This necessitated the storage of it for several days, causing in warm weather a very offensive effluvium. It even happened at times, when there was little demand for the commodity, that the blood had to be sent down the drains. All nuisance is now avoided, and the amount received annually for the blood has risen from between £200 and £450 to from £800 to £1200, by a contract into which Messrs Smith and Forrest of Manchester have entered with the city authoritics, to take over the whole blood at a fixed price per beast, They have erected extensive premises and apparatus at their own cost, for extracting from the blood the albumen, for which there is great demand in calico-printing, and for converting the clot into inauure,

In connection with the establishment is a boiling-house, where all meat unfit for human food is boiled down and destroyed. The number of carcases seized by the inspec- tor, and sent to the boiling-house, during the 51 years ending with the close of 1872, amounted to 1449, giving a weight of upwards of 400,000 pounds.

Before the erection of these buildings, private slaughter- houses were scattered all over the city, often in the most populous districts, where, through want of drainage and imperfect ventilation, they contaminated the whole neigh- bourhood. Since the opening of the public abattoir, all private slaughtering, in the city or within a miile of it, is strictly prohibited.

Few of the provincial towns in Great Britain have as yet followed the example of London and Edinburgh, In some instances improvements on the old system have been adopted, but Great Britain is still not only far behind her foreign neighbours in respect of abattoirs, but has even been excelled by some of her own dependencies, In America abattoirs are numerous, and at Calcutta and other towns in British India, the meat markets present a very creditable appearance from their cleanliness and systematic arrangement, (c. N. B.)

ABAUZIT, Fremin, a learned Frenchman, was born of Protestant parents at Uzts, in Languedoc, in 1679, His father, who was of Arabian descent, died when he was but two years of age; and when, on the revocation of the Edict of Nantes in 1685, the authorities took stcps to have him educated in the Roman Catholic faith, his mother contrived his escape. For two years his brother and he lived as fugitives in the mountains of the Cevenues, but they at last reached Geneva, where their mother after- wards joined them on escaping from the imprisonment in which she was held from the time of their flight, Abauzit's youth was spent in diligent study, and at an early age he acquired great proficiency in languages, physics, and theology. In 1698 he travelled into Holland, and there became acquainted with Bayle, Jurieu, and Basnage. Proceeding to England, he was introduced to Sir Isaac Newton, who found in him one of the earliest defenders of the great truths his discoveries disclosed to the world,

Sir Isaae eorrected in the second edition of his Principia an error pointed out by Abauzit. The high estimate Newton

entertained of his merits appears from the eompliment

he paid to Abauzit, when, sending him the Commercium Epistolicum, he said, "You are well worthy to judge between Leibnitz and me." The reputation of Abauzit indueed William III. to request him to settle in England, but he did not aecept the king's offer, preferring to return to Geneva. There from 1715 he rendered valuable assistanee to a society that had been formed for translating the New Testament into French. He deelined the offer of the chair of philosophy in the University in 1723, but

ac- ecpted, in 1727, the sinecure office of librarian to the city of his adoption. Here he dicd at a good old age, in 1767. Abauzit was a man of great learning and of wonderful versatility. The varied knowledge he possessed was so well digested and arranged in his retentive mind as to be always within his reach for immediate use. Whatever chaneed to be discussed, it used to be said of Abauzit, as of Professor Whewell of our own times, that he seemed to have made it a subject of particular study. Rousseau, who was jealously sparing of his praises, addressed to him, in his Nouvelle Hélotse, a fine panegyric ; and when a stranger flatteringly told Voltaire he had come to see a great man, the philosopher asked him if he had seen Abauzit. Little remains of the labours of this intellectual giant, his heirs having, it is said, destroyed the papers that came into their possession, because their religious opinions differed from those of Abauzit. A few theological, archeological, and astronomical articles from his pen appeared in the Journal Helvétique and elsewhere, and he contributed several papers to Rousseau's Ductionary of Music. A work he wrote throwing doubt on the eanonieal authority of the Apoealypse was answered—eonelusively, as Abauzit himself allowed—by Dr Leonard Twells. He edited, and made valuable additions to Spon's History of Geneva. A eolleection of his writings was published at Geneva in 1770, and another at London in 1773. Some of them

were translated into English by Dr Harwood (1770, 1774). –

Information regarding Abauzit will be found in Senebier's Histoire Littéraire de Genéve, Harwood's Aiscellanies, and Orme's Bibliotheca Biblica, 1834.

ABB, a town of Yemen in Arabia, situated on a moun- tain in the midst of a very fertile country, 73 miles N.E. of Mocha. Lat. 13° 58' N., long. 44° 15' E. It eontains about 800 houses, and is surrounded by a strong wall ; the streets are well paved ; and an aqueduet from a neigh- bouring mountain supplies it with water, whieh is reeeived in a reservoir in front of the prineipal mosque. The population is about 5000.

ABBADIE, James, an eminent Protestant divine, was born at Nay in Bern about 1657. His parents were poor, but through the kindness of diseerning friends, he received an exeellent education. He prosecuted his studies with

sueh success, that on completing his eourse at Sedan, though only seventcen years of age, he had eon- ferred on him the degree of doetor in theology. After spending some years in Berlin as minister of a French Protestant ehureh, he aecompanied Marshal Sehomberg, in 1688, to England, and became minister of the French ehurch in the Savoy, London. His strong attachment to the eause of King William appears in his elaborate defenee of the Revolution, as well as in his history of the conspiracy of 1696, the materials of which were furnished, it is said, by the secretaries of state. The king promoted him to the deanery of Killaloe in Ireland. He died in London in 1727. Abbadie was a man of great ability and an eloquent preacher, but is best known by his religious treatises, several of which were translated

wide cireulation all over Europe. The inmost important of these are Traité de la Vérité de la Religion Chrétienne ; its continuation, Zraité de la Divinité de Jésus-Christ ; and LZ' Art de se connaitre Soi-méme. .

ABBAS I., surnamed THE Great, one of the most eelebrated of the sovereigns of Persia, was the youngest gon of Shah Mohammed Khodabendeh. After heading a sueeessful rebellion against his father, and causing one of his brothers (or, as some say, both) to be assassinated, he obtained possession of the throne at the early age of eighteen (1585). Determined to raise the fallen fortunes of his eountry, he first direeted his efforts against the predatory Uzbeks, who oecupied and harassed Khorasan.

"After a long and severe struggle, he defeated them in a

great battle near Herat (1597), and drove them out of his dominions. In the wars he earricd on with the Turks during nearly the whole of his reign, his successes were numerous, and he acquired or regained a large extent of territory. By the victory he gained at Bassorah (1605), he extended his cmpire beyond the Euphrates ; Achmed I. was foreed to eede Shirwan and Kurdistan in 1611; the united armies of the Turks and Tartars were completely defeated near Sultanieh in 1618, and Abbas made peace on very favourable terms; and on the Turks renewing the war, Baghdad fell into his hands after a year's siege (1623). In the same year he took the island of Ormuz from the Portuguese, by the assistance of the British. When he died in 1628, his dominions reaehed from the Tigris to the Indus. Abbas distinguished himself, not only by his suecesses in arms, and by the

magnificence of his court, but also by his reforms in the administration of his kingdom. He eneouraged eommeree, and, by constructing highways and building bridges, did much to facilitate it. To foreigners, especially Christians, he showed a spirit of toleranee ; two Englishmen, Sir Anthony and Sir Robert Shirley, were admitted to his confidenee, and seem to have had much influence over him. His fame is tarnished, however, by numerous deeds of tyranny and eruelty. His own family, cspeeially, suffered from his fits of jealousy ; his eldest son was slain, and the eyes of his other children were put out, by his orders.

ABBAS MIRZA (0. 1785, d. 1833), Prinee of Persia, third son of the Shah Feth Ali, was destined by his father to sueeeed him in the govermnent, beeause of his mother's conneetion with the royal tribe of the Khadjars. He led various expeditions against the Russians, but generally without suceess (1803, 1813, 1826). By a treaty made between Russia and Persia in 1828, the right of Abbas to the sueeession was recogniscd. When the Russian deputies were murdered by the Persian populace in 1829, Abbas was sent to St Petersburg, where he received a hearty weleome from the Czar, and made himself a favourite by his eourtesy and literary taste. He formed a design against Herat, but died shortly after the sicge had been opened by his son, who sueceeded Feth Ali as the Shah Mohammed Mirza. He was truthful—a rare quality in an Eastern—plain in dress and style of living, and fond of literature.

ABBASSIDES, the ealiphs of Baghdad, the most famous dynasty of the sovereigns of the Mahometan or Saracen empire. They derived their name and deseent from Abbas (0. 566, d. 652 a.p.), the unele and adviser of Mahomet, and sueeeeded the dynasty of the Ommiads, the ealiphs of Damaseus. Early in the 8th ecntury the family of Abbas had aequired great influenee from their near relationship to the Prophet ; and Ibrahim, the fourth in deseent from Abbas, supported by the province of Khorasan, obtained several suceesses over the Ommiad armies, but was eaptured and put to death by the Caliph

from the original French into other languages, and had a ; Merwan (747). Ibrahim's brother, Abul-Abbas, whom he

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had named his heir, assumed the title of caliph, and, by a decisive victory near the river Zab (750), effected the over- throw of the Ommiad dynasty. Merwan fled to Egypt, but was pursued and put to death, and the vanquished fainily was treated with a severity which gained for Abul-Abbas the surname of Al-Saffah, the Blood-shedder. From this time the house of Abbas was fully established in the government, but the Spanish provinces were lost to the empire by the erection of an independent caliphate of Cordova, under Abderrahman. .

On the death of Abul-Abbas, ALMaNsuR succeeded to the throne, and founded Baghdad as the seat of empire. He and his son Mohdi waged war successfully against the Turkomans and Greeks of Asia Minor; but from this time the rule of the Abbassides is marked rather by the development of the liberal arts than by extension of territory. The strictness of the Mohammedan religion was relaxed, and the faithful yielded to the seductions of luxury. The caliphs Harun Al-Rashid (786-809) and Al-Mamun (813-833) attained a world-wide celebrity by their gorgeous palaces, their vast treasures, and their brilliant and nume- rous equipages, in all which their splendour contrasted strikingly with the poverty of European sovereigns. The former is known as one of the heroes of the Arabian Nights ; the latter more worthily still as a liberal patron of literature and science. It is a mistake, however, to look in the rule of these caliphs for the lenity of modern civilisation. ‘No -Christian government,” says Hallam, “except perhaps that of Constantinople, exhibits such a series of tyrants as the caliphs of Baghdad, if deeds of blood, wrought through unbridled passion or jealous policy, may challenge the name of tyranny.”

The territory of the Abbassides soon suffered dismem- berment, and their power began to decay. Rival sove- reignties (Ashlabites, Edrisites, &c.) arose in Africa, and an independent government was constituted in Khorasan (820), under the Taherites. In the West, again, the Greeks encroached upon the possessions of the Saracens in Asia Minor. Ruin, however, came from a less civilised race. The caliphs had continually been waging war with the Tartar hordes of Turkestan, and many captives taken in these wars were dispersed throughout the empire. Attracted by their bravery

and fearing rebellion among his subjects, Motassem (833-842), the founder of Samarah, and successful oppo- uent of the Grecian forces under Theophilus, formed body- guards of the Turkish prisoners, who became from that time the real governors of the Saracen empire. Mota- wakkel, son of Motassem, was assassinated by them in the palace (861) ; and succeeding caliphs became mere puppets in their hands. Radhi (934-941) was compelled by the disorganised condition of his kingdom to delegate to Mohammed ben Rayek (936 a.p.), under the title of Lmir- al-Omara, commander of the commanders, the government of the army and the other functions of the caliphate. Province after province proclaimed itself independent ; the caliph's rule became narrowed to Baghdad and its vicinity ; and the house of Abbas lost its power in the East for ever, when Hulagu, prince of the Mongols, set Baghdad on fire, and slew Motassem, the reigning caliph (20th Feb. 1258). The Abbassides continued to hold a semblance of power in: the merely nominal caliphate of Egypt, and feebly attempted to recovery their ancient seat. The last of them, Motawakkel III., was taken by Sultan Selim I., the conqueror of Egypt, to Constantinople, and detained there for some time as a prisoner. He afterwards returned to Egypt, and died at Cairo a pensionary of the Ottoman government, in 1538.

ABBE is the French word corresponding to ABzot, but, from the middle of the sixteenth century to the time of the French Revolution, the term had a wider application.

The assumption by a numerous class of the name and style of abbé appears to have originated in the right con- ceded to the King of France, by a concordat between Pope Leo X. and Francis I., to appoint abbés commendataires to 225 abbeys, that is, to most of the abbeys in France. This kind of appointment, whereby the living was com- mended to some one till a proper election could take place, though ostensibly provisional, really put the nomi- nee in full and permanent possession of the benefice. He received about one-third of the revenues of the abbey, but had no share in its goverument, the charge of the house being intrusted to a resident officer, the prieur claustral. The abbés commendataires were not necessarily priests ; the papal bull required indeed that they should take orders within a stated time after their appointment, but there seems to have been no difficulty in procuring relief from that obligation. The expectation of

obtaining these sinecures drew young men towards the Church in considerable numbers, and the class of abbés so formed— abbés de cour they were sometimes called, and sometimes (ironically) abbés de sainte espérance, abbés of St Hope— came to hold a recognised position, that perhaps proved as great an attraction as the hope of preferment. The connection many of them had with the Church was of the slenderest kind, consisting mainly in adopting the name of abbé, after a remarkably moderate course of theo- – logical study ; practising celibacy ; and wearing a distinc- tive dress—a short dark-violet coat with narrow collar. Being men of presumed learning and undoubted leisure, many of the class found admission to the houses of the French nobility as tutors or advisers. Nearly every great family had its abbé. As might be imagined from the objectless sort of life the class led, mauy of the abbés were of indifferent character ; but there are not a few instanccs of abbés attaining eminence, both in political life and in the walks of literature and science. The Abbé Sieyés may be taken as a prominent example of the latter type.

ABBEOKUTA, or AzsEokuTa, a town of West Africa in the Yoruba Country, situated in N. lat. 7° 8’, and E. long. 3° 25’, on the Ogun River, about 50 miles north. of Lagos, in a direct line, or 81 miles by water. It lies in a beautiful and fertile country, the surface of which is broken by masses of grey granite. Like most African towns, Abbeokuta is spread over an extensive area, being surrounded by mud walls, 18 miles in extent. The houses are also of mud, and the streets mostly narrow and filthy. There are numerous markets in which native pro- ducts and articles of European manufacture are exposed for sale. Palm-oil and shea-butter are the chief articles of export, and it is expected that the cotton of the country will become a valuable article of commerce. The slave trade and human sacrifices have been abolished ; but not- withstanding the efforts of English and American mission- aries, the natives are still idle and degraded. The State, called Egbaland, of which Abbeokuta is the capital, has an area of about 3000 square miles. Its progress has been much hindered by frequent wars with the king of Dahomey. Population of the town, about 150,000; of the state or adjacent territory, 50,000. (See Burton’s Abbeo- kuta and the Cameroon Mountains, 2 vols.)

ABBESS, the female superior of an abbey or convent of nuns. The mode of election, position, rights; and authority of an abbess, correspond generally with those of an abbot. The office was elective, the choice being by the secret votes of the sisters from their own body. The abbess was solemnly admitted to her office by episcopal benediction, together with the conferring of a staff and pectoral, and held it for life, though liable to be deprived for misconduct. The Council of Trent fixes the qualifying age at forty, with eight years of profession. Abbesses had

a right to demand absolute obedience of thcir nuns, over whom they exerciscd disciplinc, extending cven to the power of expulsion, subject, however, to the bishop. As a female an abbess was incapable of performing the spiritual functions of the pmesthood belonging to an abbot. She could not ordain, confer the veil, nor excom- municate. In the eighth century abbesses were censured for usurping priestly powers by presuming to give the veil to virgins, and to confer benediction and imposition of hands to men. In England thcy attended ecclesiastical councils, e.g. that of Becanfield in 694, where they signed before the presbyters.

By Celtic usage abbesses presided over joint- houses of monks and nuns. This custom accompanied Celtic mon- astic missions to France and Spain, and even to Rome itself. Ata later period, a.p. 1115, Robert, the founder of Fontevraud, committed the government of the whole order, men as well as women, to a female superior.

Martene asserts that abbesses formerly confessed nuns, but that their undue inquisitiveness rendered it necessary to forbid the practice.

The dress of an English abbess of the 12th century consisted of a long white tunic with close slecves, and a black overcoat as long as the tunic, with large and loose sleeves, the. hood covering the head completely. The abbesses of the 14th and 15th centuries had adopted secular habits, and there was little to distinguish them from their lay sisters. (E. V.)

ABBEVILLE, a city of France, in the department of the Somm,, is situated on the River Somme, 12 miles from its mouth in the English Channel, and 25 miles N.W. of Amiens. It lies in a pleasant and fertile valley, and is built partly on an island, and partly on both sides of the river. Thc streets are narrow, and the houses are mostly picturesque old structures, built of wood, with many quaint decaying gables and dark archways. The town is strongly fortified on Vauban's system. It has a tribunal and chamber of commerce. The most remarkable edifice is the Church of St Wolfran, which was erected in the time of Louis XII. Although the original design was not completed, cnough was built to give a good idea of the splendid structure it was intended to erect. The facade is a magnificent specimen of the flamboyant Gothic style, and is adorned by rich tracery, while the western front is flanked by two Gothic towers. A cloth manufac- tory was established here by Van Robais, a Dutchman, under the patronage of the minister Colbert, as early as 1669; and since that time Abbeville has continued to be one of the most thriving manufacturing towns in France. Besides black cloths of the best quality, there are produced velvets, cottons, linens, serges, sackings, hosiery, pack- thread, jewellery, soap, and glass-wares. It has also establishments for spinning wool, print-works, bleaching-works, tanneries, a paper manufactory, &c.; and being situated in the centre of a populous district, it has a con- siderable trade with the surrounding country. Vessels of from 200 to 300 tons come up to the town at high-water. Abbeville is a station on the Northern Railway, and is also connected with Paris and Belgium by canals. Fossil remains of gigantic mammalia now extinct, as well as the rude flint weapons of pre-historic man, have been dis-covcred in the geological deposits of the neighbourhood. A treaty was concluded here in 1259 between Henry III. of England and Louis IX. of France, by which the province of Guienne was ceded to the English. Popula- tion, 20,058.

ABBEY, a monastery, or conventual establishment, under the government of an ABBOT or an ABBESS. A priory only differed from an abbey in that the superior bore the name of prior instead of abbot. This was the

case in all the English conventual cathedrals, e.g., Canter- Abbey. bury, Ely, Norwich, &c., where the archbishop or bishop occupied the abbot's place, the superior of the monastery being termed prior. Other priories were originally off- shoots from the larger abbeys, to the abbots of which they continued subordinate ; but in latcr times the actual dis- tinction betwecn abbeys and priorics was lost.

Reserving for the article Monasticism the history of the rise and progress of the monastic system, its objects, benefits, evils, its decline and fall, we propose in this article to con- fine onrselves to the structural plan and arrangement of conventual establishments, and a description of the various buildings of which these vast piles were composed.

The earliest Christian monastic communities with which Cells. we are acquainted consisted of groups of cclls or huts collected about a common centre, which was usually the abode of some anchorite cclebrated for superior holiness or singular asceticism, but without any attempt at orderly arrangement. The formation of such communities in the East does not date from the introduction of Christianity. The example had been already set by the Essenes in Judea and the Therapeutz in Egypt, who may be considered the prototypes of the industrial and meditative communities of monks.

In the earliest age of Christian monasticism the ascetics were accustomed to live singly, independent of one another, at no great distance from some village, supporting them- selves by the labour of their own hands, and distributing the surplus after the supply of their own scanty wants to the poor. Increasing religious fervour, aided by persecu- tion, drove them further and further away from the abodes

of men into mountain solitudes or lonely deserts. The deserts of Egypt swarmed with the cells or huts of thesc anchorites. Antony, who had retired to the Egyptian Thebaid during the persecution of Maximin, A.D. 312, was the most celebrated among them for his austerities, his sanctity, and his power as an exorcist. His fame collected round him a host of followers, cmulous of his sanctity. The deeper he withdrew into the wilderness, the more numerous his disciples became. They refused to be sepa- rated from him, and built their cells round that of their spiritual father. Thus arose the first monastic community, consisting of anchorites living each in his own

little dwell- ing, united together under one superior. Antony, as Neander remarks (Church History, vol. iii. p. 316, Clark's Trans.), "without any conscious design of his own, had become the founder of a new mode of living in common, Coenobitism." By degrees order was introduced in the groups of huts. They were arranged in lines like the tents in an encampment, or the houses in a street. From this arrangement these lines of single cells came to be known as Laure, Aatpa:, ' streets" or ' lanes."

The real founder of coenobian monasteries in the modern Ccenobia. sense was Pachomius, an Egyptian of the beginning of the 4th century. The first community established by him was at Tabenne, an island of the Nile in Upper Egypt. Eight others were founded in his lifetime, numbering 3000 monks. Within 50 years from his death his societies could reckon 50,000 members. These ccenobia resembled villages, peopled by a hard-working religious community, all of one sex. The buildings were detached, small, and of the humblest character. ach cell or hut, according to Sozomen (H. E. iii. 14), contained three monks. They took their chief meal in a common refectory at 3 P.M., up to which hour they usually fasted. They ate in silence, with hoods so drawn over their faces that they could see nothing but what was on the table before them. The monks spent all the time, not devoted to religious services or study, in manual labour. Palladius, who visited the Egyptian monasteries about the close of the 4th century, found among the 300

members of the Ccenobium of Panopolis, under the Pachomian rule, 15 tailors, 7 smiths, 4 carpenters, 12 camel-drivers, and 15 tanners. Each separate community had its own wconomus, or steward, who was subject to a chief wconomus stationed at the head establishment. All the produce of the monks' labour was committed to him, and by him shipped to Alexandria. The money raised by the sale was expended in the purchase of stores for the support of the communities, and what was over was devoted to charity. Twice in the year the superiors of the several ceenobia met at the chief monastery, under the presidency of an Archimandrite ("the chief of the fold," from puvdpa, a fold), and at the last meeting gave in reports of their administration for the year.

The ceenobia of Syria belonged to the Pachomian institu- tion. We learn many details concerning those in the vicinity of Antioch from Chrysostom’s writings. The monks lived in separate huts, xéAvBar, forming a religious hamlet on the mountain side. They were subject to an abbot, and observed a common rule. (They had no refec- tory, but ate their common meal, of bread and water only, when the day’s labour was over, reclining on strewn grass, sometimes out of doors.) Four times in the day they joined in prayers and psalms.

The necessity for defence from hostile attacks, economy of space, and convenience of access from one part of the community to another, by degrees dictated a more compact and orderly arrangement of the buildings of a monastic ccenobiuin. Large piles of building were erected, with strong outside walls, capable of resisting the assaults of an enemy, within which all the necessary edifices were ranged round one or more open courts, usually surrounded with cloisters. The usual Hastern arrangement is exemplified in the plan of the convent of Santa Laura at Athens (Laura, the designation of a monastery generally, being converted into a female saint).

nc

. Gateway.

. Chapels.

i

. Guest-house. . Church.

» Cloister,

*. Fountain,

. Refectory.

- Kitchen.

. Cells.

. Storehouses.

. Postern Gate.

. Tower,

Monastery of Santa Laura, Mount Athos (Lenoir).

This monastery, like the Oriental monasteries generally is surrounded by a strong and lofty blank stone wall, enclosing an area of between 3 and 4 acres. The longer side extends to a length of about 500 feet. There is only one main entrance, on the north side (A), defended by three separate iron doors. Near the entrance is a large tower (M), a constant feature in the monasteries of the Levant. There is a small postern gate at (L.) The

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enceinte comprises two large open courts, surrounded with buildings connected with cloister galleries of wood or stone. The outer court, which is much the larger, contains the granaries and storehouses (K), and the kitchen (H), and other offices connected with the refectory (G). Imme- diately adjacent to the gateway is a two-storeyed guest- house, opening from a cloister ©. The inner court is surrounded by a cloister (EE), from which open the monks' cells (II). In the centre of this court stands the catholicon or conventual church, a square building with an apse of the cruciform domical Byzantine type, approached by a domed narthex. In front of the church stands a marble fountain (F), covered by a dome supported on columns. Opening from the western side of the cloister, but actually standing in the outer court, is the refectory (G), a large cruciform building, about 100 feet each way, decorated within with frescoes of saints. At the upper end is a semi- circular recess, recalling the Triclinium of the Lateran Palace at Rome, in which is placed the scat of the Hegu- menos or abbot. This apartment is chicfly used as a hall of meeting, the Oriental monks usually taking their meals in their separate cells, St Laura is exceeded in magnitude by the Convent of Vatopede, also on Mount Athos. enormous establishment covers at least 4 acres of ground, and contains so many separate buildings within its massive walls that it resembles a fortified town. It lodges above 300 monks, and the establishment of the Hegumenos

is described as resembling the court of a petty sovereign prince. The immense refectory, of the same cruciform shape as that of St Laura, will accommodate 500 guests at its 24 marble tables.

The annexed plan of a Coptic monastery, from Lenoir, shows us a church of three aisles, with cellular apses, and two ranges of cells on either side of an oblong gallery.

Monasticism in the West owes its extension and de- velopment to Benedict of Nursia (born a.p. 480). His rule was diffused with miracul- ous rapidity from the parent foundation on Monte Cassino through the whole of Western Europe, and every country wit- nessed the erection of monas- teries far exceeding anything that had yet been seen in spaci- ousness and splendour. Few

Plan of Coptic Monastery.

A. Narthex.

B. Church.

C. Corridor, with cells on each side. D. Staircase.

great towns in Italy were without their Benedictine convent, penedic- and they quickly rose in all the great centres of population in tine.

England, France, and Spain. The number of these monas- teries founded between a.p. 520 and 700 is amazing.

- Before the Council of Constance, a.p. 1005, no fewer than

15,070 abbeys had been established of this order alone. The Benedictine rule, spreading with the vigour of a young and powerful life, absorbed into itself the older monastic foundations, whose discipline had too usually become dis- gracefully relaxed. In the words of Milman (Latin Christianity, vol. i. p. 425, note x.), ‘The Benedictine rule was universally received, even in the older monas- teries of Gaul, Britain, Spain, and throughout the West, not as that of a rival order (all rivalry was of later date), but as a more full

and perfect rule of the monas- tic life.” Not only, therefore, were new monasteries founded, but those already existing were pulled down, and rebuilt to adapt them to the requirements of the new rule.

The buildings of a Benedictine abbey were uniformly arranged after one plan, modified where necessary (as at

This Vatopede.

St Gall,

12

Durham and Worcester, where the monasteries stand close to the steep bank of a river), to accommodate the arrange- ment to local circumstances.

We have no existing examples of the earlier monasteries of the Benedictine order. They have all yielded to the ravages of time and the violence of man. But we have fortunately preserved to us an elaborate plan of the great Swiss monastery of St Gall, erected about a.p. 820, which puts us in possession of the whole arrangements of a monastery of the first class towards the early part. of the 9th century. This curious and interesting plan has been made the subject of a memoir both by Keller (Zurich, 1844) and by Professor Willis (Arch. Journal, 1848, vol. v. pp. 86-117). To the latter we are indebted for the

a a a 8 Da a a A a 1a} 1} io] i) 1] io)

ie z& 5 hv xy} |L™i} Je Ground-plan of St Gall. CuurRcH. U. House for blood-letting.

V. Sehool. W. Sehoolmaster’s Lodgings. X,X,. Guest-house for those of

A. High Altar. L. Altar of St Pant. C. Altar of St Peter.

D. Nave. superior rank. E. Paradise, X_X-. Guest-house for the poor. FF. Towers. Y. Guest-chamber for strange monks. MENIAL DEPARTMENT. Monastic BUILDINGS, z. Factory. G. Cloister.

a. Threshing-floor. 6. Workshops. ¢,c. Mills.

d. Kiln.

H. Calefactory, with Dormitory over. L Neeessary. J. Abbot’s house.

K. Refeetory. e. Stables.

L. Kitehen. J. Cowsheds.

M. Bakehouse and Brewhouse. g. Goatsheds,

N. Cellar. h. Pig-sties. #. Sheep-folds.

0. Parlour.

P,. Seriptorium, with Library over,

P,. Sacristy and Vestry.

Q. House of Noviees—1l. Chapel; 2. Refeetory; 3. Calefaetory; 4. Dormitory; 5. Master’s Room; 6. Chambers.

R. Infirmary—1-6 as above in the House of Noviees.

8. Doetor’s House.

T. Physie Garden.

k, k, k Servants’ and workmen’s sleeping chambers.

1, Gardener’s house.

m,m. Hen and Duck house.

n. Poultry-keeper’s house.

o. Garden.

Cemetery.

q. Bakehouse for Saeramental Bread.

r. Unnamed in Plan.

5, 8,5. Kitehens.

t,t, ¢. Baths.

substance of the following description, as well as for the above woodcut, reduced from his elucidated transcript of

ABBEY

[BENEDICTINE.

the original preserved in the archives of the convent. The general appearance of the convent is that of a town of isolated houses with streets running between them. It is evidently planned in compliance with the Benedictine rule, which enjoined that, if possible, the monastery should contain within itself every necessary of life, as well as the build- ings more intimately connected with the religious and social life of its inmates. It should comprise a mill, a bakehouse, stables and cow-houses, together with accom- modation for carrying on all necessary mechanical arts within the walls, so as to obviate the necessity of the monks going outside its limits. The general distribution of the buildings may be thus described :—The church, with its cloister to the south, occupies the centre of a quadrangular area, about 430 feet square. The build- ings, as in all great monasteries, are distributed into groups. The church forms the nucleus, as the centre of the religious life of the community. In closest connec- tion with the church is the group of buildings appropriated to the monastic life and its daily requirements—the refec- tory for eating, the dormitory for sleeping, the common room for social intercourse, the chapter-house for religious and disciplinary conference. These essential elements of monastic life are ranged about a cloister court, surrounded by a covered arcade, affording communication sheltered from the elements, between the various buildings. The infirmary for sick monks, with the physician’s house and physic gar- den, lies to the east. In the same group with the infirmary is the school for the novices. The outer school, with its head-master’s house against the

opposite wall of the church, stands outside the convent enclosure, in close proximity to the abbot's house, that he might have a constant eye over them. The buildings devoted to hospitality are divided into three groups,—one for the reception of distinguished guests, another for monks visiting the monastery, a third for poor travellers and pilgrims. The first and third are placed to the right and left of the common entrance of the monastery,—the hospitium for distinguished guests being placed on the north side of the church, not far from the ab- bot's house; that for the poor on the south side next to the farm buildings. The monks are lodged in a guest-house built against the north wall of the church. The group of buildings connected with the material wants of the esta- blishment is placed to the south and west of the church, and is distinctly separated from the monastic buildings. The kitchen, buttery, and offices, are reached by a passage from the west end of the refectory, and are connected with the bakehouse and brewhouse, which are placed still fur- ther away. The whole of the southern and western sides is devoted to workshops, stables, and farm-buildings. The buildings, with some exceptions, seem to have been of one story only, and all but the church were probably erected of wood. The whole includes thirty-three separate blocks. The church (D) is cruciform, with a nave of nine bays, and a semicircular apse at either extremity. That to the west is surrounded by a semicircular colonnade, leaving an open "Paradise" (E) between it and the wall of the church. The whole area is divided by screens into various chapels. The high altar (A) stands immediately to the east of the transept, or ritual choir; the altar of St Paul (B) in the eastern, and that of St Peter © in the western apse. A cylindrical campanile stands detached from the church on either side of the western apse (FF).

The "cloister court" (G) on the south side of the nave of the church has on its east side the " pisalis" or '" calefac- tory" (H),the common sitting-room of the brethren, warmed by flues beneath the floor. On this side in later monas- teries we invariably find the chapter-house, the absence of which in this plan is somewhat surprising. It appears, however, from the inscriptions on the plan itself, that the

Se ee

BENEDICTINE. |

north walk of the cloisters served for the purposes of a chap- ter-house, and was fitted up with benches on the long sides. Above the calefactory is the “dormitory” opening into the south transept of the church, to enable the monks to attend the nocturnal services with readiness. A passage at the other end leads to the “necessarium” (I), a portion of the monastic buildings always planned with extreme care. The southern side is occupied by the “‘refectory” (K), from the west end of which by a vestibule the kitchen (L) is reached. This is separated from the main buildings of the monastery, and is connected bya long passage with a building containing the bakehouse and brewhouse (M), and the sleeping-rooms of the servants. The upper story of the refectory is the “ves- tiarium,” where the ordinary clothes of the brethren were kept. On the western side of the cloister is another two story building (N). The cellar is below, and the larder and store-room above. Between this building and the church, opening by one door into the cloisters, and by another to the outer part of the monastery area, is the “ parlour” for inter- views with visitors from the external world (O). On the eastern side of the north transept is the “ scriptorium” or writing-room (P,), with the library above.

To the east of the church stands a group of buildings comprising two miniature conventual establishments, each complete in itself. Each has a covered cloister surrounded by the usual buildings, z.e., refectory, dormitory, &c., and a church or chapel on one side, placed back to back. A detached building belonging to each contains a bath and a kitchen. One of these diminutive convents is appropriated to the “ oblati” or novices (Q), the other to the sick monks as an “infirmary” (I).

The “residence of the physicians” (8) stands contiguous to the infirmary, and the physic garden (T) at the north-east corner of the monastery. Besides other rooms, it contains a drug store, and a chamber for those who are dangerously ill. The “house for blood-letting and purging” adjoins it on the west (U).

The “outer school,” to the north of the convent area, cou- tains a large school-room divided across the middle by a screen or partition, and surrounded by fourteen little rooms, termed the dwellings of the scholars. The head-master’s house (W) is opposite, built against the side wall of the

church. The two “hospitia” or ‘“ guest-houses” for the entertainment of strangers of different degrees (X, X,) comprise a large common chamber or refectory in the centre, surrounded by sleeping apartments. ach is pro- vided with its own brewhouse and bakehouse, and that for travellers of a superior order has a kitchen and store-room, with bed-rooms for their servants, and stables for their horses. There is also an “ hospitium” for strange monks, abutting on the north wall of the church (Y).

Beyond the cloister, at the extreme verge of the con- vent area to the south, stands the “ factory” (Z), contain- ing workshops for shoemakers, saddlers (or shoemakers, sellariz), cutlers and grinders, trencher-makers, tanners, cur- riers, fullers, smiths, and goldsmiths, with their dwellings in the rear. On this side we also find the farm-buildings, the large granary and threshing-floor (a), mills ©, malt- house (d). Facing the west are the stables (e), ox-sheds (f), goat-stables (g), piggeries (A), sheep-folds (2), together with the servants’ and labourers’ quarters (&). At the south- east corner we find the hen and duck house, and poultry- yard (m), and the dwelling of the keeper (m). Hard by is the kitchen garden (0), the beds bearing the names of the vegetables growing in them, onions, garlic, celery, lettuces, poppy, carrots, cabbages, &c., eighteen in all. In the same way the physic garden presents the names of the medicinal herbs, and the cemetery (p) those of the trees, apple, pear, plum, quince, &c., planted there.

It is evident, from this most curious and valuable docu-

ment, that by the 9th century monastic establishinents had become wealthy, and had acquired considerable import-

ance, and were occupying a leading place in education, agriculture, and the industrial arts. The influence such an institution would diffuse through a wide district would be no less beneficial than powerful.

The curious bird’s eye view of Canterbury Cathedral and Canter- its annexed conventual buildings, taken about 1165, pre- bury.

served in the Great Psalter in the library of Trinity College, Cambridge, as elucidated by Professor Willis with such admirable skill and accurate acquaintance with the existing remains,! exhibits the plan of a great Benedictine monas- tery in the 12th century, and enables us to compare it with that of the 9th, as seen at St Gall. We see in both the same general principles of arrangement, whicli indeed be- long to all Benedictine monasteries, enabling us to deter- mine with precision the disposition of the various build- ings, when little more than fragments of the walls exist. From some local reasons, however, the cloister and monastic buildings are placed on the north, instead, as is far more commonly the case, on the south of the church. There is also a separate chapter-house, which is wanting at St Gall.

The buildings at Canterbury, as at St Gall, form separate groups. The church forms the nucleus. In immediate con- tact with this, on the north side, lie the cloister and the group of buildings devoted to the monastic life. Outside of these, to the west and east, are the “halls and chambers devoted to the exercise of hospitality, with which every monastery was provided, for the purpose of receiving as guests persons who visited it, whether clergy or laity, tra- vellers, pilgrims, or paupers.” To the north a large open court divides the monastic from the menial buildings, in- tentionally placed as remote as possible from the conven- tual buildings proper, the stables, granaries, barn, bakc- house, brewhouse, laundries, &c., inhabited by the lay ser- vants of the establishment. At the greatest possible distance from the church, beyond the precinct of the convent, is the eleemosynary department. The almonry for the relief of the poor, with a great hall annexed, forms the pauper’s. hospitium.

The most important group of buildings is naturally that devoted to mouastic life. This includes two cloisters, the great cloister surrounded by the buildings essentially con- nected with the daily life of the monks,—the church to the south, the refectory or frater-house here as always on the side opposite to the church, and furthest removed from it, that no sound or smell of eating might penetrate its sacred precincts, to the east the dormitory, raised on a vaultcd undercroft, and the chapter-house adjacent, and the lodg- ings of the cellarer to the west. To this officer was com- mitted the provision of the monks’ daily food, as well as that of the guests. He was, therefore, appropriately lodged in the immediate vicinity of the refectory

and kitchen, and close to the guest-hall. A passage under the dormitory leads eastwards to the smaller or infirmary cloister, appro- priated to the sick and infirm monks. Eastward of this cloister extend the hall and chapel of the infirmary, resem- bling in form and arrangement the nave and chancel of an aisled church. Beneath the dormitory, looking out into the green court or herbarium, lies the “ pisalis” or “ cale- factory,” the common room of the monks. At its north- east corner access was given from the dormitory to the necessarvum, a portentous edifice in the form of a Norman hall, 145 feet long by 25 broad, containing fifty-five seats. It was, in common with all such offices in ancient monasteries, constructed with the most careful regard to cleanliness and

1 The Architectural History of the Conventual Buildings of the Monastery of Christ Church in Canterbury. By the Rev. Robert Willis. Printed for the Kent Archzxological Society, 1869.

West- minster.

‘York.

health, a stream of water running through it from end to end. A second smaller dormitory runs from east to west for the accommodation of the conventual officers, who were bound to sleep in the dormitory. Close to the refectory, but outside the cloisters, are the domestic offices connected with it; to the north, the kitchen, 47 feet square, sur- mounted by a lofty pyramidal roof, and the kitchen court; to the west, the butteries, pantries, &c. The infirmary had a small kitchen of its own. Opposite the refectory door in the cloister are two lavatories, an invariable adjunct to a monastic dining-hall, at which the monks washed before and after taking food.

The buildings devoted to hospitality were divided into three groups. The prior’s group “‘ entered at the south-east angle of the green court, placed near the most sacred part of the cathedral, as befitting the distinguished ecclesiastics or nobility who were assigned to him.” The cellarer’s buildings, were near the west end of the nave, in which ordinary visitors of the middle class were hospitably entertained. The inferior pilgrims and

paupers were relegated to the north hall oralmonry, just within the gate, as far as possible from the other two.

Westminster Abbey is another example of a great Bene- dictine abbey, identical in its general arrangements, so far as they can be traced, with those described above. The clois- ter and monastic buildings lie to the south side of the church. Parallel to the nave, on the south side of the cloister, was the refectory, with its lavatory at the door. On the eastern side we find the remains of the dormitory, raised on a vaulted substructure, and communicating with the south transept. The chapter-house opens out of the same alley of the cloister. The small cloister lies to the south-east of the larger cloister, and still farther to the east we have the remains of the infirmary, with the table hall, the refectory of those who were able to leave their chambers. The abbot's house formed a small court-yard at the west entrance, close to the inner gateway. Considerable por-

tions of this remain, including the abbot's parlour, cele- |

brated as "the Jerusalem Chamber," his hall, now used for the Westminster King's scholars, and the kitchen and butteries beyond.

St Mary's Abbey, York, of which the ground-plan is annexed, exhibits the usual Benedictine arrangements. The precincts are surrounded by a strong fortified wall on three sides, the river Ouse being sufficient protection on the fourth side. The entrance was by a strong gateway (U) to the north. Close to the entrance was a chapel, where is now the church of St Olaf (W), in which the new comers paid their devotions immediately on their arrival. Near the gate to the south was the guest's-hall or hospitium (T). The buildings are completely ruined, but enough remains to enable us to identify the grand cruciform church (A), the cloister-court with the chapter-house (B), the refectory (1), the kitchen-court with its offices (K, O, O), and the other principal apartments. The infirmary has perished completely.

Some Benedictine houses display exceptional arrange- ments, dependent upon local circumstances, e.g., the dormi- tory of Worcester runs from east to west, from the west walk of the cloister, and that of Durham is built over the west, instead of as usual, over the east walk; but, as a general rule, the

arrangements deduced from the examples described may be regarded as invariable.

The history of Monasticism is one of alternate periods of decay and revival. With growth in popular esteem came increase in material wealth, leading to luxury and worldliness. The first religious ardour cooled, the strict- ness of the rule was relaxed, until by the 10th century the decay of discipline was so complete in France that the monks are said to have been frequently unacquainted with

the rule of St Benedict, and even ignorant that they were bound by any rule at all. (Robertson’s Church History, ii. p. 538.) These alternations are reflected in the monastic buildings and the arrangements of the establishment.

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PALACE OF THE STUARTS ON THE SITE_OF THE ABBOTS HOUSE

THE ABBEY WALLS Tue GiTY WALLS

MOLTANCULAR TOWER

MARY CATE

THE ABBEY CLOSE CONTAINING ABOUT 15 ACRES

St Mary’s Abbey, York (Benedictine).—Churton’s Monastic Ruins.

A. Church. O. Offices.

B. Chapter-house, P. Cellars.

C. Vestibule to do. Q. Uncertain.

E. Library or Scrivtorium. R. Passage to Abbot’s House. F. Calefactory. 8. Passage to Common House. G. Necessary. T. Hospitium.

H. Parlour. U. Great Gate.

I. Refectory. VY. Porter’s Lodge.

K. Great Kitchen and Court. W.Church of St Olaf.

L. Cellarer’s Office. X. Tower.

M. Cellars. Y. Entrance from Bootham N. Passage to Cloister.

The reformation of these prevaient abuses generally took the form of the establishment of new monastic orders, with new and more stringent rules, requiring a modification of the architectural arrangements. One of the earliest of these reformed orders was the Cluniac. its name from the little village of Clugny, 12 miles N.W. of Macon, near which, about a.p. 909, a reformed Bene- dictine abbey was founded by William, Duke of Auvergne, under Berno, abbot of Beaume. He was succeeded by Odo, who is often regarded as the founder of the order. The fame of Clugny spread far and wide. Its rigid rule was adopted by a vast number of the old Bencdictine ab- beys, who placed themselves in affiliation to the mother society, while new foundations sprang up in large num- bers, all owing allegiance to the “archabbot,” established at Clugny. By the end of the 12th century the numbe1 of monasteries affiliated to Clugny in the various coun- tries of Western Europe amounted to 2000. The monas- tic establishment of Clugny was one of the most extensive and magnificent in France. We may form some idea of its enormous dimensions from the fact recorded, that when, A.D. 1245, Pope Innocent IV., accompanied by twelve

This order took Clugny.

CLUNIAC. |

cardinals, a patriarch, three archbishops, the two generals of the Carthusians and Cistercians, the king (St Louis), und three of his sons, the queen mother, Baldwin, Count of Flanders and Emperor of Constantinople, the

Duke of Burgundy, and six lords, visited the abbey, the whole party, with their attendants, were lodged within the monastery without disarranging the monks, 400 in num- ber. Nearly the whole of the abbey buildings, including the magnificent church, were swept away at the close of the last century. When the annexed ground-plan was taken, shortly before its destruction, nearly all the monastery, with the exception of the church, had been rebuilt. The church, the ground-plan of which bears a remarkable resemblance to that of Lincoln Cathedral, was of vast dimensions. It was 656 feet by 130 feet wide. The nave was 102 feet, and the aisles 60 feet high. The nave (G) had double

Abbey of Clugny, from Viollet le Duc.

A. Gateway. F. Tomb of St Hugh. M. Bakehouse.

B. Narthex. G. Nave. N. Abbey Buildings. C. Choir. H. Cloister. O. Garden.

PD, High-Altar. K. Abbot’s House. P. Refeetory.

E. Retro-Altar. L. Guest-House,

vaulted aisles on either side. Like Lincoln, it had an eastern as well as a western transept, each furnished with apsidal chapels to the east. The western transept was 213 feet long, and the eastern 123 feet. The choir terminated in a semicircular apse (F), surrounded by five chapels, also semicircular. The western entrance was approached by an ante-church, or narthex (B), itself an aisled church of no mean dimensions, flanked by two towers, rising from a stately flight of steps bearing a large stone cross. To the south of the church lay the cloister-court (H), of immense size, placed much further to the west than is usually the case. On the south side of the cloister stood the refectory (P), an immense building, 100 feet long and 60 feet wide, accommo- dating six longitudinal and three transverse rows of tables. It was adorned with the portraits of the chief benefactors of the abbey, and with Scriptural subjects. The end wall displayed the Last Judgment. Weare unhappily unable to identify any other of the principal buildings(N). The abbot’s residence (K), still partly standing, adjoined the entrance- gate. The guest-house (L) was close by. The bakehouse

‘| met the eye.

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(M), also remaining, is a detached building of immense

size. The first English house of the Cluniac order was that English of Lewes, founded by the Earl of Warren, cir. A.D. 1077, Cluniac.

Of this only a few fragments of the domestic buildings exist. The best preserved Cluniac houses in England are Castle Acre, Norfolk, and Wenlock, in Shropshire. Ground-plans of both are given in Britton’s Architectural Antiquities. They show several departures from the Benedictine arrange- ment. In each the prior’s house is remarkably perfect. All Cluniac houses in England were French colonies, go- verned by priors of that nation. They did not secure their independence nor become ‘‘ abbeys” till the reign of Henry VI. The Cluniac revival, with all its brilliancy, was but short lived. The celebrity of this, as of other orders, worked its moral: ruin. With their growth in wealth and dignity the Cluniac foundations became as worldly in life and as relaxed in discipline as their predecessors, and a fresh reform was needed. The next great monastic re- vival, the Cistercian, arising in the last years of the 11th century, had a wider diffusion, and a longer and more honourable existence. Owing its real origin, as a distinct foundation of reformed Benedictines, in the year 1098, to a countryman of our own, Stephen Harding (a native of Dorsetshire, educated in the monastery of Sherborne), and deriving its name from Citeaux (Cisterciwm), a desolate and almost inaccessible forest solitude, on the borders of Champagne and Burgundy, the rapid growth and wide celebrity of the order is undoubtedly to be attributed to the enthusiastic piety of St Bernard, abbot of the first of the monastic colonies, subsequently sent forth in such quick succession by the first Cistercian houses, the far- famed abbey of Clairvaux (de Clara Valle), a.p. 1116.

The rigid self-abnegation, which was the ruling principle Cistercian.

of this reformed congregation of the Benedictine order, extended itself to the churches and other buildings erected by them. The characteristic of the Cistercian abbeys was the extremest simplicity and a studied plainness. Only one tower—a central one—was permitted, and that was to be very low. Unnecessary pinnacles and turrets were prohibited. The triforium was omitted. The windows were to be plain and undivided, and it was forbidden to decorate them with stained glass. All needless ornament was proscribed. The crosses must be of wood; the candlesticks of iron. The renunciation of the world was to be evidenced in all that The same spirit manifested itself in the choice of the sites of their monasteries. The more dismal, the more savage, the more hopeless a spot appeared, the more did it please their rigid mood. But they came not merely as ascetics, but as improvers. The Cistercian monasteries are, as a rule, found placed in deep well- watered valleys. They always stand on the border of a stream; not rarely, as at Fountains, the buildings extend over it. These valleys, now so rich and productive, wore a very different aspect when the brethren first chose them as the place of their retirement. Wide swamps, deep mo- rasses, tangled thickets, wild impassable forests, were their prevailing features. The " Bright Valley," Clara Vallis of St Bernard, was known as the " Valley of Wormwood," infamous as a den of robbers. "It was a savage dreary solitude, so utterly barren that at first Bernard and his companions were reduced to live on beech leaves."—(Mil- man's Lat. Christ. vol. iii. p. 335.)

All Cistercian monasteries, unless the circumstances of the locality forbade it, were arranged according to one plan. The general arrangement and distribution of the various buildings, which went to make up one of these vast esta- blishments, may be gathered from that of St Bernard's own Abbey of Clairvaux, which is here given.

It will be observed that the abbey precincts aresurrounded by a strong wall, furnished at intervals with watch-

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towers and other defensive works. The wall is nearly encircled by a stream of water, artificially diverted from the small rivulets which flow through the

precincts, furnishing the establishment with an abundant supply in every part, for the irrigation of the gardens and orchards, the sanitary requirements ofthe brotherhood, and for the use of the offices and workshops. The precincts are divided across the centre by a wall, running from N. to S., into an outer and inner ward,—the former containing the menial, the latter the monastic buildings. The precincts are entered by a gateway (P), at the extreme western ex- tremity, giving admission to the lower ward. Here the barns, granaries, stables, shambles, workshops, and work- men's lodgings were placed, without any regard to sym-

Clairvaux, No. 1 (Cistercian), General Plan.

A. Cloisters. ! HI. Stables. O. Publie Presses,

B, Ovens, and Cornand | I. Wine-press and Hay- | P. Gateway. Oil-mills. ehamber. R. Remains of Old

C. St Bernard's Cell. K. Parlour. Monastery.

D. Chief Entranee. L. Workshopsand work- | S. Oratory.

E. Tanks for Fish. men's Lodgings. V. Tile-works.

F. Guest House. {, Slaughter-house. X, Tile-kiln.

G. Abbot's House. N. Barns and Stables. Y. Water-eourses.

metry, convenience being the only consideration. Ad- vancing eastwards, we have before us the wall separating the outer and inner ward, and the gatehouse (D) affording communication between the two. On passing through the gateway, the outer court of the inner ward was entered, with the western facade of the monastic church in front. Immediately on the right of entrance' was the abbot's house (G), in close proximity to the guest-house (F). On the other side of the court were the stables, for the accommo- dation of the horses of the guests and their attendants (H). The church occupied a central position. To the south were the great cloister (A), surrounded by the chief monas- tic buildings, and further to the east the smaller cloister, opening out of which were the infirmary, novices' lodgings, and quarters

for the aged monks. Still further to the east, divided from the monastic buildings by a wall, were the vegetable gardens and orchards, and tank for fish. The

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[CISTERCTAN.

large fish-ponds, an indispensable adjunct to any ecclesias- Clairvaux

tical foundation, on the formation of which the monks lavished extreme care and pains, and which often remain as almost the only visible traces of these vast establish- ments, were placed outside the abbey walls.

The Plan No. 2 furnishes the ichnography of the dis- tinctly monastic buildings on a larger scale. The usually unvarying arrangement of the Cistercian houses allows us to accept this as a type of the monasteries of this order. The church (A) is the chief feature. It consists of a vast nave of eleven bays, entered by a narthex, with a transept and short apsidal choir. (Itmay beremarked that the eastern limb in all unaltered Cistercian churches is remarkably short, and usually square.) To the cast of each limb of

Clairvaux, No. 2 (Cistercian), Monastic Buildings.

Chureh. K. Infirmary. S. Cellars and Store- – Cloister. L, Lodgings of Noviees houses. Chapter-House. M. Old Guest-House. | T, Water-course. Monks’ Parlour. N. Old Abbot’sLodgings. , U. Saw-mill and Oil-mill. Calefaetory. O. Cloister of Supernu- | V. Currier’s Workshops.

Promo >

Kitchen and Court. merary Monks, X. Sacristry.

. Refeetory. P. Abbot’s Hall. Y. Little Library.

. Cemetery. Q. Cell of St Bernard. Z. Undercroft of Dor- Little Cloister. R. Stables, mitory.

the transept are two square chapels, divided according to Cistercian rule by solid walls. Nine radiating chapels, similarly divided, surround the apse. The stalls of the monks, forming the ritual choir, occupy the four eastern bays of the nave. There was a second range of stalls in the extreme western bays of the nave for the fratres conversi, or lay brothers. To the south of the church, so as to secure as much sun as possible, the cloister was invariably placed, except when local reasons forbade it. Round the cloister (B) were ranged the buildings connected with the monks' daily life. The chapter-house © always opened out of the east walk of the cloister in a line with the

south transept. In. Cistercian houses this was quadran- gular, and was divided by pillars and arches into two or three aisles. Between it and the transept we find the sacristry (X), and a small book room (Y), armariolum, where the brothers deposited the volumes borrowed from the library. On the other side of the chapter-house, to the south, is a passage (D) communicating with the courts and buildings beyond. This was sometimes known as the parlour, colloqui locus, the monks having the privilege of conversation here. Here also, when discipline became relaxed, traders, who had the liberty of admission, were allowed to display their goods. Beyond this we often find the calefactorium or day-room—an apartment warmed _ by flues beneath the pavement, where the brethren, half- frozen during the night offices, betook themselves after the conclusion of lands, to gain a little warmth, grease their sandals, and get themselves ready for the work of the day. In the plan before us this apartment (EK) opens from the south cloister walk, adjoining the refectory. The placc usually assigned to it is occupied by the vaulted substruc- ture of the dormitory (Z). The dormitory, as a rule, was placed on the cast side of the cloister, running over the calefactory aud chapter-house, and joined the south transept, where a flight of steps admitted the brethren into the church for nocturnal services. Opening out of the dor- mitory was always the necessarium, planned with the greatest regard to health and cleanliness, a water-course invariably running from cnd to end. The refectory opens out of the south cloister at (G). The position of the refec- tory is usually a marked point of difference between Bene- dictine and Cistercian abbeys. In the former, as at Can- terbury, the refectory ran cast and west parallel to the nave of the church, on the side of the cloister

furthest removed from it. In the Cistercian monasteries, to keep the noise aud sound of dinner still further away from the sacred building, the refectory was built north and south, at right angles to the axis of the church. It was often divided, sometimes into two, sometimes, as here, into three aisles. Outside the refectory door, in the cloister, was the lavatory, where the monks washed their hands at dinner time. The buildings belonging to the material life of the monks lay near the refectory, as far as possible from the church, to the 8.W. With a distinct entrance from the outer court was the kitchen court (F), with its buttery, scullery, and larder, and the important adjunct of a stream of running water. Further to the west, projecting beyond the line of the west front of the church, were vast vaulted apartments (SS), serving as ccllarsand storehouses, above which was the dormitory of the converst. Detached from these, and sepa- rated entirely from the monastic buildings, were various workshops, which convenience required to be banished to the outer precincts, a saw-mill and oil-mill (UU) turned by water, and a currier's shop (V), where the sandals and leathern girdles of the monks were made and repaired. Returning to the cloister, a vaulted passage admitted to the small cloister (I), opening from the north side of which were eight small cells, assigned to the scribes employed in copying works for the library, which was placed in the upper story, accessible by a turret staircase. To the south of the small cloister a long hall will be noticed. This was a lecture-hall, or rather a hall for the religious disputations customary among the Cistercians. Froin this cloister opened the ifirmary (K), with its hall, chapel, cells, blood-letting house, and other dependencies. At the eastern verge of the vast group of buildings we find the novices lodgings (LL), with a third cloister near the novices' quarters and the original guest-house (M). De- tached from the great mass of the monastic edifices was the original abbot's house (N), with its dining-hall (P). Closely adjoining to this, so that the eye of the father of

the whole establishment should be constantly over those who stood the most in need of his watchful care,—those who were training for the monastic life, and those who had worn themselves out in its dutics,—was a fourth cloister (O), with annexed buildings, devoted to the aged and infirm

members of the establishment. The cemctery, the last resting-place of the brethren, lay to the north side of the nave of the church (H).

It will be seen that the arrangement of a Cistercian monastery was in accordance with a clearly-defined system, and admirably adapted to its purpose.

The base court nearest to the outer wall contained the buildings belonging to the functions of the body as agri- culturalists and employers of labour. Advancing into the inner court, the buildings devoted to hospitality are found close to the entrance; while those connected with the supply of the material wants of the brethren,—the kitchen, cellars, &c.,—form a court of themselves outside the cloister, and quite detached from the church. The church refec- tory, dormitory, aud other buildings belonging to the professional life of the brethren, surround the great cloister. The small cloister beyond, with its scribes' cells, library, hall for disputations, &c., is the centre of the literary life of the community. The requirements of sick- ness and old age are carefully provided for in the infirmary cloister, and that for the aged and infirm members of the establishment. The same group contains the quarters of the novices.

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Bird's eye View of Citeaux.

A. Cross. | H. Abbot's House. R. Infirmary.

L. Gate-House. I. Kitchen. | 8. Door to the Church, C. Almonry. K. Refectory. for the Lay Brothers. D. Chapel. L. StaircasetoDormitory. | T. Base Court.

E. Inner Gate-House. M. Dornitory. Vv. Great Cloister.

F, Stable. N. Church. W. Small Cloister.

G. Dormitory of Lay P. Library. X. Boundary Wall

Brethren.

ment of Citeaux. A cross (A), planted on the high-road. lL — 3

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Citeaux.

England.

Kirkstall.

directs travellers to the gate of the monastery, reached by an avenue of trees. On one side of the gate-house (B) is a long building ©, probably the almonry, with a dormitory above for the lower class of guests. On the other side isa chapel (D). «As soon as the porter heard a stranger knock at the gate, he rose, saying, Deo gratvas, the oppor- tunity for the exercise of hospitality being regarded as a eause for thankfulness. On opening the door he weleomed the new arrival with a blessing—Benedicite. He fell on his knees before him, and then ‘went to inform the abbot. However important the abbot’s occupations might be, he at once hastened to receive him whom heaven had sent. He also threw himself at his guest’s feet, and eonducted him to the chapel (D) purposely built close to the gate. After a short prayer, the abbot committed the guest tu the care of the brother hospitaller, whose duty it was to provide for his wants, and conduct the beast on which he might be riding to the stable (F), built adjacent to the inner gate-house (E). This inner gate conducted into the base court (T), round whieh were placed the barns, stables, cow-sheds, &e. On the eastern side stood the dormitory of the lay brothers, fratres conversi (G), detached from the cloister, with cellars and storehouses below. At (H), also outside the monastic buildings

proper, was the abbot’s house, and annexed to it the guest-house. For these buildings there was a separate door of entrance into the church (S). The large cloister, with its surrounding arcades, is seen at V. On the south end projects the refectory (K), with its kitchen at (I), accessible from the base court. The long gabled building on the east side of the cloister contained on the ground floor the chapter- house and calefactory, with the monks’ dormitory above (M), communicating with the south transept of the church. At (L) was the staircase to the dormitory. The small eloister is at (W), where were the carols or cells of the scribes, with the library (P) over, reached by a turret staircase. At ® we see a portion of the infirmary. The whole pre- cinct is surrounded by a strong buttressed wall (XXX), pierced with arches, through which streams of water are introduced. It will be noticed that the choir of the church is short, and has a square end instead of the usual apse. The tower, in accordance with the Cistercian rule, is very low. The windows throughout accord with the studied simplicity of the order.

The English Cistercian houses, of which there are such extensive and beautiful remains at Fountains, Rievaulx, Kirkstall, Tintern, Netley, &c., were mainly arranged after the same plan, with slight local variations. As an example, we give the ground-plan of Kirkstall Abbey, which is one of the best preserved and least altered. The church here is of the Cistereian type, with a short chancel of two squares, and transepts with three eastward chapels to each, divided by solid walls (222). The whole is of the most studied plainness. The windows are unornamented, and the nave has no triforium. The cloister to the south (4) occupies the whole length of the nave. On the east side stands the two-aisled chapter house (5), between which and the south transept is a small saeristy (sy and on the other side two small apartments, one of which was probably the parlour (6). Beyond this stretches southward the ealefactory or day-room of the monks (14). Above this whole range of building runs the monks’ dormitory, opening by stairs into the south transept of the church. At the other end were the necessaries. On the south side of the eloister we have the remains of the old refeetory (11), running, as in Benedictine houses, from east to west, and the new refeetory (12), which, with the increase of the inmates of the house, superseded it, stretching, as is usual in Cistercian houses, from north to south. Adjacent to this apartment are the remains of the kitchen, pantry, and

buttery. The arches of the lavatory are to be seen near the refectory entrance. ‘The western side of the cloister is, as usual, oceupied by vaulted cellars, supporting on the upper story the dormitory of the lay brothers (8). Ex- tending from the south-east angle of the main group of buildings are the walls and foundations of a secondary group of considerable extent. These have been identified either with the hospitium or with the abbot’s house, but they oeeupy the position in which the infirmary is more usually found. The hall was a very spacious apartment, measuring 83 feet in length by 48 feet 9 inches in breadth,

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Kirkstall Abbey, Yorkshire (Cistercian).

Church. 10. Common Room, Chapels. 11. Old Refectory.

. Saeristy. 12, New Refectory. Cloister. 13. Kitehen Court. Chapter-House. 14, Calefaetory or Day-Room. Parlour. 15. Kitchen and Offices,

. Punishment Cell (?)

. Cellars, with Dormitories for con- versi Over,

. Guest-House.

16-19. Uneertain; perhaps Offiees con- neeted with the Infirmary. 20. Infirmary or Abbot’s House.

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and was divided by two rows of columns. The fish-ponds lay between the monastery and the river to the south. The abbey mill was situated about 80

yards to the north-west. The mill-pool may be distinctly traced, together with the gowt or mill stream.

Fountains Abbey, first founded a.p. 1132, deserves Fountains.

special notice, as one of the largest and best preserved Cistercian houses in England. But the earlier buildings received considerable additions and alterations in the later period of the order, causing deviations from the strict Cistercian type. The church stands a short distance to the north of the river Skell, the buildings of the abbey stretching down to and even across the stream. We have the cloister (H) to the south, with the three-aisled chapter-house (I) and ealefactory (L) opening from its eastern walk, and the refectory (S), with the kitchen (Q) and buttery (T) attached, at right angles to its southern walk. Parallel with the western walk is an immense vaulted substructure (U), incorreetly styled the cloisters, serving as cellars and store-rooms, and supporting the dormitory of the conversi above. This building extended across the river. At its

S.W. corner were the necessaries (V), also built, as usual, above the swiftly flowing stream. The monks' dormitory was in its usual position above the chapter-house, to the south of the transept. As peculiarities of arrangement may be noticed the position of the kitchen (Q), between the refectory and calefactory, and of the infirmary (W) (unless there is some crror in its designation) above the river to

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eastern transept, the work of Abbot John of Kent, 1220- 1247, and to the tower (D), added not long before the dis- solution by Abbot Huby, 1494-1526, in a very unusual position at the northern end of the north transept.

The abbot’s house, the largest and most remarkable example of this class of buildings in the kingdom, stands south to the east of the church and cloister, from which it is divided bythe kitchen court(K), surrounded by the ordinary domestic offices. A considerable portion of this house was erected on arches over the Skell. The size and character of this house, probably, at the time of its erection, the most spacious house of a subject in the kingdom, not a castle, bespeaks the wide departure of the Cistercian order from the stern simplicity of the original foundation. The hall (2) was one of the most spacious and magnificent apart- ments in medizxval times, measuring 170 feet by 70 fect. Like the hall in the castle at Winchester, and Westminster Hall, as originally built, it was divided by 18 pillars and arches, with 3 aisles. Among other apartments, for the designation of which we must refer to the ground-plan, was a domestic oratory or chapel, 464 feet by 23 fect, and a kitchen (7), 50 feet by 38 feet. The whole arrangements and character of the building bespeak the rich and powerful feudal lord, not the humble father of a body of hard- working brethren, bound by vows to a life of poverty and self-denying toil. In the words of Dean Milman, “the superior, once a man bowed to the earth with humility, care-worn, pale, emaciated, with a coarse habit bound with a cord, with naked feet, had become an abbot on his curvetting palfrey, in rich attire, with his silver cross before him, travelling to take his place amid the lordliest of the realm.”—(Lat. Christ., vol. iii. p. 330.)

The buildings of the Austin Canons or Black Canons Black (so called from the colour of their habit) present few Austin distinctive peculiarities. This order had its first seat in Canons England at Colchester, where a house for Austin Canons was founded about a.p. 1105, and it very soon spread widely. As an order of regular clergy, holding a middle position between monks and secular canons, almost resem- bling a community of parish priests living under rule, they adopted naves of great length to accommodate large congregations. The choir is usually long, and is some- times, as at Llanthony and Christ Church (Twynham), shut off from the aisles, or, as at Bolton, Kirkham, &c., is destitute of aisles altogether. The nave in the northern houses, not unfrequently, had only a north aisle, as at Bolton, Brinkburn, and Lanercost. The arrangement of the monastic buildings followed the ordinary type. The prior’s lodge was almost

invariably attached to the S.W. angle of the nave. The annexed plan of the Abbey of St Augustine’s at Bristol, now the cathedral church of Bristol.

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Ground Plan of Fountains Abbey, Yorkshire.

A. Nave of the Church. ; N. Cellar. Z. Gate-House; Abbot’s B. Transept, O. Brew House. House. C. Chapels P. Prisons. 1. Passage. D. Tower. Q. Kitchen. 2. Great Hall. E. Sacristy. R.. Offices, 3. Refectory. F. Choir. 8. Refectory. 4, Buttery. G. Chapel of Nine T. Buttery 5. Storehouse. Pp — Altars. U. Cellars and Store- 6. Chapel. Ease wo — H. Cloister, houses. 7. Kitchen a) R 1. Chapter-House. V. Necessary. 8. Ashpit. a ol a K. Base Court. W. Infirmary (?) 9. Yard. L. Calefactory. X. Guest-Houses. 10, Kitchen Tank.

M. Water Course. Y. Mill Bridge. St Augustine’s Abbey, Bristol (Bristol Cathedral), Church. H. Kitchen. 1 8. . Great Cloister. 1. Kitchen Court. as – Little Cloister. K. Cellars.

. Chapter-House. L. Abbot’s Hall. Calefactory. P. Abbot’s Gateway. Refectory. R. Infirmary. Parlour.

Friars’ Lodging. King’s Hall

V. Guest-House.

W. Abbey Gateway. X. Barns, Stables, &c. Y. Lavatory.

the west, adjoining the guest-houses (XX). We mayalso call attention to the greatly lengthened choir, commenced by Abbot John of York, 1203-1211,

and carried on by his successor, terminating, like Durham Cathedral, in an

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Premons- tratensian.

Carthusian.

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that city, shows the arrangement of the buildings, which departs very little from the ordinary Benedictine type. The Austin Canons' house at Thornton, in Lincolnshire, is remarkable for the size and magnifieence of its gate-house, the upper floors of which formed the guest-house of the establishment, and for possessing an octagonal chapter- house of Decorated date.

The Premonstratensian regular canons, or White Canons, had as many as 35 houses in England, of whieh the most perfect remaining are those of Easby, Yorkshire, aud Bayham, Sussex. The head house of the order in England was Welbeek. This order was a reformed branch of the Austin canons, founded, a.p. 1119, by Norbert (born at Xanten, on the Lower Rhine, e. 1080) at Prémontré, a secluded marshy valley in the forest of Coucy, in the diocese of Laon. The order spread widely. Even in the founder's lifetime it possessed houses in Syria and Pales- tine. It long maintained its rigid austerity, till in the course of years wealth impaired its diseipline, and its members sank into indolenee and luxury. The Premon- stratensians were brought to England shortly after a.p. 1140, and were first settled at Newhouse, in Lincolnshire, near the Humber. The ground-plan of Easby Abbey, owing to its situation on the edge of the steeply-sloping banks of a river, is singularly irregular. The cloister is duly placed on the south side of the church, and the chief buildings occupy their usual positions round it. But the cloister garth, as at Chichester, is not rectangu- lar, and all the surrounding buildings are thus made to sprawl in a very awkward fashion. The church follows the plan adopted by the Austin canons in their northern abbeys, and has only one aisle to the nave—that to the north ; while the choir is long, narrow, and _aisleless. Each transept has an aisle to the east, forming three chapels.

The church at Bayham was destitute of aisle either to nave or choir. ‘The latter terminated in a three-sided apse. This church is remarkable for its exceeding narrowness in. proportion to its length. Extending in longitudinal dimen- sions 257 feet, it is not more than 25 feet broad. To adopt the words of Mr Beresford Hope—“ Stern Premon- stratensian canons wanted™n0~ congregations, and cared for no processions ; therefore they built their church like a long room.” an?

The Carthusian order, on its establishment by St Bruno,

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the plan of that of Clermont, from Viollet le Due. whole establishment is surrounded with a wall, furnished at intervals with wateh towers ®. The enclosure is divided into two courts, of which the eastern court, sur- rounded by a cloister, from which the cottages of the monks (I) open, is much the larger. The two courts are

A. Chureh. B. Monks’ Choir. C. Prior’s Garden, D. Great Cloister. E. Chapter-House. F. Passage.

G. Prior’s Lodg- ings.

H. Doveeot. I. Cells.

K. Chapel of Pont- gibaud.

L. Saeristy. M. Chapel. N. Stables. O. Gateway.

P. Guest-Cham- bers.

Q. Barns and Granaries.

R. Watch Towers. S. Little Cloister T. Bakehouse.

VY. Kitehen.

X. Refectory.

Y. Cemetery.

Z, Prison.

a.Cell of Sub-prior 6. Garden of do.

Carthusian Monastery of Clermont.

divided by the main buildings of the monastery, including the church, the sanctuary (A), divided from (B), the monks' choir, by a screen with two altars, the smaller eloister to the south (S) surrounded by the chapter-house (EH), the refectory (X)—these buildings occupying their normal position—and the chapel of Pontgibaud (K). The kitchen

about A.D. 1084, developed a greatly modified form and : with its offices (V) lies behind the refectory, accessible

arrangement of a monastic institution. this order, which combined the ccenobitic with the solitary life, demanded the erection of buildings on a novel plan. This plan, which was first adopted by St Bruno and his twelve companions at the original institution at Chartreux, near Grenoble, was maintained in all the Carthusian establishments throughout Europe, even after the aseetic severity of the order had been to some extent relaxed, and the primitive simplicity of their buildings had been ex- changed for the magnificence of decoration which charac- terises such foundations as the Certosas of Pavia and Florence. According to the rule of St Bruno, all the members of a Carthusian brotherhood lived in the most absolute solitude and silence. Each occupied a small detached eottage, standing by itself in a small garden surrounded by high walls and connected by a common corridor or cloister. In these cottages or cells a Carthusian monk passed his time in the strictest asceticism, only leaving his solitary dwelling to attend the services of the Chureh, exeept on certain days when the brotherhood assembled in the refeetory.

The peculiarity of the arrangements of a Carthusian monastery, or charter-house, as it was called in England, from a corruption of the French

chartreuz, is exhibited in

The principle of | from the outer court without entering the cloister.

To the north of the church, beyond the saeristy (L), and the side chapels (M), we find the cell of the sub-prior (a), with its garden. The lodgings of the prior (G) occupy the centre of the outer court, immediately in front of the west door of the church, and face the gateway of the convent (O). A small raised court with a fountain © is before it. This outer court also contains the guest-chambers (P), the stables, and lodgings of the lay brothers (N), the barns and granaries (Q), the doveeot (H), and the bakehouse (T). At (Z) is the prison. (In this outer court, in all the earlier foundations, as at Witham, there was a smaller church in addition to the larger church of the monks.) The outer and inner court are connected by a long passage (F), wide enough to admit a cart laden with wood to supply the cells of the brethren with fuel. The number of cells sur- rounding the great cloister is 18. They are all arranged on a uniform plan. Each little dwelling contains three rooms : a sitting-room ©, warmed with a stove in winter; a sleeping-room (D), furnished with a bed, a table, a bench, and a bookease; and a closet (). Between the cell and the cloister gallery (A) is a passage or corridor (B), cutting off the inmate of the cell from all sound or movement which might interrupt his meditations. The superior had

The Clermont

Clermont.

Witham.

CARTHUSIAN. |

free access to this corridor, and through open niches was able to inspect the garden without being seen. At (I) is the hatch or turn-table, in which the daily allowance of food was deposited by a brother appointed for that purpose, afford- ing no view either inwards or outwards. (H) is the garden,

A. Cloister Gallery B. Corridor.

C. Living Room. D. Sleeping Room. E. Closets.

F, Covered Walk. G. Necessary

Ii. Garden.

I. Hatch.

K. Wood-house.

Carthusian Cell, Clermont.

cultivated by the occupant of the cell. At (K) is the wood-house. (F) is a covered walk, with the necessary at the end. These arrangements are found with scarcely any variation in all the charter-houses of Western Europe. The Yorkshire Charter-house of Mount Grace, founded by Thomas Holland the young Duke of Surrey, nephew of Richard II., and Marshal of England, during the revival of the popularity of the order, about a.p. 1397, is the most

perfect and best preserved English example. It is charac- terised by all the simplicity of the order. The church isa modest building, long, narrow, and aisleless. Within the

wall of enclosure are two courts. The smaller of the two, the south, presents the usual arrangement of church, refec- tory, &c., opening out of a cloister. The buildings are plain and solid. The northern court contains the cells, 14 in number. It is surrounded by a double stone wall, the two walls being about 30 feet or 40 feet apart. Between these, each in its own garden, stand the cells; low-built two-storied cottages, of two or three rooms on the ground- floor, lighted with a larger and a smaller window to the side, and provided with a doorway to the court, and one at the back, opposite to one in the outer wall, through which the monk may have conveyed the sweepings of his cell and the refuse of his garden to the “eremus” beyond. By the side of the door to the court is a little hatch, through which the daily pittance of food was supplied, so contrived by turning at an angle in the wall that no one could either look in or look out. A very perfect example of this hatch —an arrangement belonging to all Carthusian houses— exists at Miraflores, near Burgos, which remains nearly as it was completed in 1480.

There were only nine Carthusian houses in England. The earliest was that at Witham in Somersetshire, founded by Henry IL, by whom the order was first brought into England. The wealthiest and most magnificent was that of Shene or Richmond .in Surrey, founded by Henry V. about A.D. 1414. The dimensions of the buildings at Shene: are stated to have been remarkably large. The great court measured 300 feet by 250 feet; the cloisters were a square of 500 feet ; the hall was 110 feet in length by 60 feet in breadth. The most celebrated historically is the Charter-house of London, founded by Sir Walter Manny A.D, 1371, the name of which is preserved by the famous

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public school established on the site by Thomas Sutton A.D. 1611. An article on monastic arrangements would be incom-

plete without some account of the convents of the Mendi- Mendicant cant or Preaching Friars, including the Black Friars or Friars.

Dominicans, the Grey or Franciscans, the White or Carmel- ites, the Eremite or Austin Friars. These orders arose at the beginning of the 13th century, when the Benedictines, together with their various reformed branches, had termi- nated their active mission, and Christian Europe was ready for a new religious revival, Planting themselves, as a rule, in large towns, and by preference in the poorest and most densely populated districts, the Preaching Friars were obliged to adapt their buildings to the requirements of the site. Regularity of arrangement, therefore, was not pos- sible, even if they had studied it. Their churches, built for the reception of large congregations of hearers rather than worshippers, form a class by themselves, totally unlike those of the elder orders in ground-plan and character. They were usually long parallelograms unbroken by tran- septs. The nave very usually consisted of two equal bodies, one containing the stalls of the brotherhood, the other left entirely free for the congregation. The constructional choir is often wanting, the whole church forming one unin- terrupted structure, with a continuous range of windows. The east end was usually square, but the Friars Church at Winchelsea had a polygonal

apse. We not unfrequently find a single transept, sometimes of great size, rivalling or exceeding the nave. This arrangement is frequent in Ireland, where the numerous small friaries afford admirable exemplifications of these peculiarities of ground-plan. Tho friars' churches were at first destitute of towers; but in the 14th and 15th centuries, tall, slender towers were com- monly inserted between the nave and the choir. The Grey Friars at Lynn, where the tower is hexagonal, is a good example. The arrangement of the monastic buildings is equally peculiar and characteristic. We miss entirely the regularity of the buildings of the earlier orders. At the Jacobins at Paris, a cloister lay to the north of the long narrow church of two parallel aisles, while the refectory— a room of immense length, quite detached from the cloister —stretched across the area before the west front of the church, At Toulouse the nave also has two parallel aisles, but the choir is apsidal, with radiating chapels. The refec- tory stretches northwards at right anglestothe cloister, which lies to the north of the church, having the chapter-house and sacristy on the east. As examples of English friaries,

the Dominican house at Norwich, and those of the Domini- Norwich. cans and Franciscans at Gloucester, may be mentioned. The Gloucester,

church of the Black Friars of Norwich departs from the original type in the nave (now St Andrew's Hall), in having regular aisles. In this it resembles the earlier examples of the Grey Friars at Reading. The choir is long and aisle- less ; an hexagonal tower between the two, like that exist- ing at Lynn, has perished. The cloister and monastic buildings remain tolerably perfect to the north. The Dominican convent at Gloucester still exhibits the cloister- court, on the north side of which is the desecrated church. The refectory is on the west side, and on the south the dormitory of the 13th century. This is a remarkably good example. There were 18 cells or cubicles on each side, divided by partitions, the bases of which remain. On the east side was the prior's house, a building of later date. At the Grey or Franciscan Friars, the church followed the ordinary type in having two equal bodies, each gabled, with a continuous range of windows. There was a slender tower between the nave and choir. Of the convents of the Carmelite or White Friars we have a good example in the

Abbey of Hulme, near Alnwick, the first of the order in Hulme.

England, founded a.p. 1240. The church is a narrow

Friars.

Cells.

Mendicant oblong, destitute of aisles, 123 feet long by only 26 feet

wide. The cloisters are to the south, with the chapter- house, &c., to the east, with the dormitory over. The priors lodge is placed to the west of the cloister. The guest-houses adjoin the entrance gateway, to which a chapel was annexed on the south side of the conventual area. The nave of the church of the Austin Friars or Eremites in London is still standing. It is of Decorated date, and has wide centre and side aisles, divided by a very light and graceful arcade. Some fragments of the south walk of the cloister of the Grey Friars exist among the buildings of Christ's Hospital or the Blue-Coat School. Of the Black Friars all has perished but the name. Taken as a whole, the remains of the establishments of the friars afford little warrant for the bitter invective of the Bencdictine of St Alban's, Matthew Paris :—" The friars who have been founded hardly 40 years have built residences as the palaces of kings. 'These are they who, enlarging day by day their sumptuous edifices, encircling them with lofty walls, lay up in them their incalculable treasures, impru- dently transgressing the bounds of poverty, and violating the very fundamental rules of their profession." Allowance must here be nade for jealousy of a rival order just rising in popularity.

Every large monastery had depending upon it one or more sinaller establishments known as cells. These cells were monastic colonies, sent forth by the parent house, and planted on some outlying estate. As an example, we may refer to the small religious house of St Mary Magdalene's, a cell of the great Benedictine house of St Mary's, York, in the valley of the Witham, to the south-east of the city of Lincoln. This consists of one long narrow range of build- ing, of which the eastcrn part formed the chapel, and the western contained the apartments of the handful of monks of which it was the home. To the east may he traced the site of the abbey mill, with its dam and mill- lead. These cells, when belonging to a Cluniac house, were called Obedientie.

The plan given by Viollet le Duc of the Priory of St Jean des Bons Hommes, a Cluniac cell, situated between the town of Avallon and the village of Savigny, shows that these diminutive establishments comprised every essential feature of a imonastery,—chapel, cloister, chapter-room, refectory, dormitory, all grouped according to the recog- nised arrangement.

These Cluniac obedientie differed from the ordinary Rencdictine cells in being also places of punishment, to which monks who had been guilty of any grave infringe- ment of the rules were relegated as to a kind of penitentiary. Here they were placed under the authority of a prior, and were condemned to severe manual labour, ful- filling the dutics usually executed by the lay brothers, who acted as farm-servants.

The outlying farming establishments belonging to the monastic foundations were known as ville or granges. They gave employment to a body of conversi and labourers under the management of a monk, who bore the title of Brother Hospitaller—the granges, like their parent in- stitutions, affording shelter and hospitality to belated travellers,

Authorities:—Dugdale, Monasticon; Fosbrooke, British Monachism; Helyot, Dictionnaire des Ordres Religicux; Lenoir, Architecture Monastique; Viollet le Duc, Diction- naire Raisonnée de Architecture Francaise; Walcott, Conventual Arrangement ; Willis, Abbey of St Gall; Archeo- logical Journal, vol. v., Conventual Buildings of Canter- bury ; Curzon, Monasteries of the Levant. (E. V.)

ABBIATE GRASSO, a town in the north of Italy, near the Ticino, 14 miles W.S.W. of Milan. It has silk manu- factures, and contains about 5000 inhabitants.

ABBON or Fievury. or ABBo FLORIACENSIS, a learned Frenchman, born near Orleans in 945. He distinguished himself in the schools of Paris and Rheims, and was a profi- cient in science, as known in his tine. After spending two years in England, assisting Archbishop Oswald of York in restoring the monastic system, he returned to France, and was made Abbot of Fleury (970). He was twice sent to Rome by Robert the Wise (986, 996), and on each occa- sion succeeded in warding off a threatened papal interdict. He was killed in 1004, in endeavouring to quell a monkish revolt. He wrote an epitome of the Lives of the Roman Pontiffs, besides controversial treatises, letters, &c.

ABBOT, the head and chief governor of a community of monks, called also in the East Archimandrita, from mandra, “a fold,” or Hegumenos. The name abbot is derived from the Hebrew 38, Ad, or father, through the Syriac Abba. It had its origin in the monasteries of Syria, whence it spread through the East, and soon became accepted generally in all languages as the designation of the head of a monastery. At first it was employed as a respectful title for any monk, as we learn from St Jerome (in Epist. ad Gal. iv. 6, in Matt. xxiii. 9), but it was soon restricted to the Superior.

The name abbot, though general in the West, was not universal. Among the Dominicians, Carmelites, Augus- tines, &c., the superior was called Prepositus, “ Provost,” and Prior ; among the Franciscans, Custos, ‘‘ Guardian ;” and by the monks of Camaldoli, Major.

Monks, as a rule, were laymen, nor at the outset was the abbot any exception. All orders of clergy, therefore, even the ‘ doorkeeper,” took precedence of him. For the reception of the sacraments, and for other religious offices, the abbot and his monks were commanded to attend the nearest church.—(Novelle, 133, c. ii.) This rule naturally proved inconvenient when a monastery was situated in a desert, or at a distance from a city, and necessity compelled the ordination of abbots. This innova- tion was not introduced without a struggle, ecclesiastical dignity being regarded as inconsistent with the higher spiritual life, but, before the close

of the 5th century, at least in the East, abbots seem almost universally to have become deacons, if not presbyters. The change spread more slowly in the West, where the office of abbot was commonly filled by laymen till the end of the 7th century, and partially so up to the 11th. Ecclesiastical Councils were, however, attended by abbots. Thus, at that held at Constautinople, A.D. 448, for the condemnation of Eutyches, 23 archimandrites or abbots sign, with 30 bishops, and, cw. A.D. 690, Archbishop Theodore promulgated a canon, inhibiting bishops from compelling abbots to attend councils. Examples are not uncommon in Spain and in England in Saxon times. Abbots were permitted by the Second Council of Niczea, a.p. 787, to ordain their monks to the inferior orders. This rule was adopted in the West, and the strong prejudice against clerical monks having gradually broken down, eventually monks, almost without exception, belonged to some grade of the ministry.

Originally no abbot was permitted to rule over more than one monastic community, though, in some exceptional cases, Gregory the Great allowed the rule to be broken. As time went on, violations of the rule became increasingly frequent, as is proved by repeated enactments against it. The cases of Wilfrid of York, civ. A.p. 675, who held the abbacy of the monasteries he had founded at Hexham and Ripon, and of Aldhelm, who, at the same date, stood in the same double relation to those of Malmesbury, Frome, and Bradford, are only apparent transgressions of the rule. We find more decided instances of plurality in Hugh of the royal Carlovingian house, cr. 720, who was at the same

time Bishop of Rouen, Paris, Bayeux, and Abbot of Fonte- nelle and Jumiéges; and Sidonius, Bishop of Constance, who, being already Abbot of Reichenau, took the abbacy of St Gall also. Hatto of Mentz, cer. 912, annexed to his see no less than 12 abbacies.

In Egypt, the first home of monasticism, we find abbots in chief or archimandrites exercising jurisdiction over a large number of communities, each of which had its own abbot. Thus, Cassian speaks of an abbot in the Thebaid who had 500 monks under him, a number exceeded in other cases. In later times also, general jurisdiction was exercised over the houses of

their order by the abbots of Monte Cassino, St Dalmatius, Clugny, &c. The abbot of Cassino was styled Abbas Abbatum. The chiefs of other orders had the titles of Abbas Generalis, or Magister, or Minister Generalis.

Abbots were originally subject to episcopal jurisdiction, and continued generally so, in fact, in the West till the llth century. The Codex of Justinian (lib. i. tit. i, de Ep. leg. xl.), expressly subordinates the abbot to epis- copal oversight. The first case recorded of the partial exemption of an abbot from episcopal control is that of Faustus, Abbot of Lerins, at the Council of Arles, a.p. 456; but the oppressive conduct, and exorbitant claims and exactions of bishops, to which this repugnance to episcopal control is to be traced, far more than to the arrogance of abbots, rendered it increasingly frequent, and, in the 6th century, the practice of exempting religious houses partly or altogether from episcopal control, and making them responsible to the Pope alone, received an impulse from Gregory the Great. These exceptions, though introduced with a good object, had grown into a wide-spread and crying evil by the 12th century, virtually creating an imperium in imperio, and entirely depriving the bishop of all authority over the chief centres of power and influence in his diocese. In the 12th century the abbots of Fulda claimed precedence of the Archbishop of Cologne. Abbots more and more aped episcopal state, and in defiance of the express prohibition of early councils, and the protests of St Bernard and others, adopted the episcopal insignia of mitre, ring, gloves, and sandals. XVIII, a.p. 1004-1009; but the first undoubted grant is said to be that to the Abbot of St Maximinian at Treves, by Gregory VII. (Hildebrand), a.p. 1073-1085. The mitred abbots in England were those of Abingdon, St Alban’s, Bardney, Battle, Bury St Edmund’s, St Augus- tine’s Canterbury, Colchester, Croyland, Evesham, Glas- tonbury, Gloucester, St Benet’s Hulme, Hyde, Malmes- bury, Peterborough, Ramsey, Reading, Selby, Shrewsbury, Tavistock, Thorney, Westminster, Winchcombe, St Mary’s York. Of these the precedeuce was originally yielded to the Abbot of Glastonbury, until in a.p. 1154 Adrian IV. (Nicholas Breakspear) granted it to the Abbot of St Alban’s, in which monastery he had been brought up. Next after the Abbot of St Alban’s ranked the Abbot of Westminster.

To distinguish abbots from bishops, it was ordained that their mitre should be made of less costly materials, and should not be ornamented with gold, a

rule which was soon entirely disregarded, and that the crook of their pastoral staff should turn inwards instead of outwards, indicating that their jurisdiction was limited to their own house. The adoption of episcopal insignia by abbots was followed by an encroachment on episcopal functions, which had to be specially but ineffectually guarded against by the Lateran Council, a.p. 1123. In the East, abbots,

subdiaconate and diaconate.

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if in priests' orders, with the consent of the bishop, were, as we have seen, permitted by the Second Nicene Council, A.D. 787, to confer the tonsure and admit to the order of reader; but they gradually advanced higher claims, until we find them authorised by Bellarmine to be associated with a single bishop in episcopal consecrations, and per- mitted by Innocent IV., a.p. 1489, to confer both the Of course, they always and everywhere had the power of admitting their own monks, and vesting them with the religious habit. In the first instance, when a vacauicy occurred, the bishop of the diocese chose the abbot out of the monks of the convent, but the right of election was transferred by jurisdiction to the monks themselves, reserving to the bishop the con- firmation of the election .and the benediction of the new abbot. In abbeys exempt from episcopal jurisdiction, the confirmation and benediction had to be conferred by the Pope in person, the house being taxed with the expenses of the new abbot's journey to Rome. By the rule of St Benedict, the consent of the laity was in some unde- fined way required ; but this seems never to have been practically enforced. It was necessary that an abbot should be at least 25 years of age, of legitimate birth, a monk of the house, uuless it furnished no suitable can- didate, when a liberty was allowed of electing from another convent, well instructed himself, and able to instruct others, one also who had learned how to command by having prac- tised obedience. In some exceptional cases an abbot was allowed to name his own successor. Cassian speaks of an abbot in Egypt doing this; and in later times we have another example in the case of St Bruno. Popes and sovereigns gradually encroached on the rights of the monks, until in Italy the Pope had usurped the nomina- tion of all abbots, and the king in France, with the ex- ception of Clugny, Prémontré, and other houses, chiefs

of their order. The election was for life, unless the abbot was canonically deprived by the chiefs of his order, or, when he was directly subject to them, by the Pope or the bishop.

The ceremony of the formal admission of a Benedictine abbot in medizval times is thus prescribed by the consuetu- dinary of Abingdon. The newly elected abbot was to put off his shoes at the door of the church, and proceed barefoot to meet the members of the house advancing in a procession. After proceeding up the nave, he was to kneel and pray at the topmost step of the entrance of the choir, into which he was to be introduced by the bishop or his commissary, and placed in his stall. The monks, then kneeling, gave him the kiss of peace on the hand, and rising, on the mouth, the abbot holding his staff of office. He then put on his shoes in the vestry, and a chapter was held, and the bishop or his commissary preached a suitable sermon.

The power of the abbot was paternal but absolute, limited, however, by the canons of the church, and, until the general establishment of exemptions, by episcopal control. As a rule, however, implicit obedience was en- forced ; to act without his orders was culpable ; while it was a sacred duty to execute his orders, however unrea- sonable, until they were withdrawn. Examples among the Egyptian monks of this blind submission to the commands of the superiors, exalted into a virtue by those who re- garded the entire crushing of the individual will as the highest excellence, are detailed by Cassian and others,—e.@., a monk watering a dry stick, day after day, for months, or endeavouring to remove a huge rock immensely exceeding his powers. St Jerome, indeed, lays down, as the principle of the compact between the abbot and his monks, that they should obey their superiors in all things, and perform what- ever they commanded.—({Ep. 2, ad Eustoch. de custod.

virgin.) So despotic did the tyranny become in the West, that in the time of Charlemagne it was neccssary to re- strain abbots by legal enactments from mutilating their monks, and putting out their eyes; while the rule of St Columba ordained 100 lashes as the punishment for very slight offences. An abbot also had the power of excom- municating refractory nuns, which he might use if desired by their abbess.

The abbot was treated with the utmost submission and reverence by the brethren of his house. When he appeared either in church or chapter all present rose and bowed. His letters were received kneeling, like those of the Pope and the king. If he gave a command, the monk receiving it was also to kneel. No monk might sit in his presence, or leave it without his permission. The highest place was naturally assigned to him, both in ehurch and at table. In the Hast he was commanded to eat with the other monks. In the West the rule of St Benedict appointed him a sepa- rate table, at which he might entertain guests and strangers. This permission opening the door to luxurious living, the Council of Aix, a.p. 817, decreed that the abbot should dine in the refectory, and be content with the ordinary fare of the monks, unless he had to entertain a guest. These ordinances proved, however, generally ineffectual to secure strictness of diet, and contemporancous literature «bounds with satirical remarks and complaints concerning the inordinate extravagance of the tables of the abbots. When the abbot condescended to dine in the refectory, his chaplains waited upon him with the dishes, a servant, if necessary, assisting them. At St Alban's the abbot took the lord's seat, in the centre of the high table, and was served on silver plate, and sumptuously entertained noble- men, ambassadors, and strangers of quality. When abbots dined in their own private hall, the rule of St Benedict charged them to invite their monks to their table, provided there was room, on which occasions the guests were to ab- stain from quarrels, slanderous talk, and idle gossipping.

The complaint, however, was sometimes made (as by Matt. .

Parisof Wulsig, the third abbot of St Alban's), that they invited ladies of rank to dine with them instead of theirmonks. The ordinary attire of the abbot was according to rule to be the same as that of the monks. But by the 10th century the rule was commonly set aside, and we find frequent com- plaints of abbots dressing in silk, and adopting great sumptuousness of attire. Nay, they sometimes laid aside the monastic habit altogether, and assumed a secular dress.} This wasa necessary consequence of their following the chase, which was quite usual, and indeed at that time only natural. With the increase of wealth and power, abbots had lost much of their special religious character, and become great lords, chiefly distinguished from lay lords by celibacy. Thus we hear of abbots going out

to sport, with their men carrying bows and arrows; keeping horses, dogs, and huntsmen ; and special mention is made of an abbot of Leicester, civ. 1360, who was the most skilled of all the nobility in hare-hunting. In magnificence of equipage and retinue the abbots vied with the first nobles of the realm. They rode on mules with gilded bridles, rich saddles and housings, carrying hawks on their wrist, attended by an immense train of attendants. The bells of the churches were rung as they passed. They associated on equal terms with laymen of the highest distinction, and shared all their pleasures and pursuits. This rauk and power was, how- ever, often used most beneficially. For instance, we read of Whiting, the last Abbot of Glastonbury, judicially mur- dered by Henry VIII., that his house was a kind of well- ordered court, where as many as 300 sons of noblemen and

1 Walworth, the fourth abbot of St Alban's, circa 980, is charged by Matthew Paris with adopting the attire of a sportsman.

gentlemen, who had been sent to him for virtuous educa tion, had been brought up, besides others of a meaner rank, whom he fitted for the universities. His table, attendance, and officers were an honour to the nation. He would entertain as many as 500 persons of rank at one time, besides relieving the poor of the vicinity twice a-week. He had his country houses and fisheries, and when he travelled to attend Parliament his retinue amounted to upwards of 100 persons, The abbots of Clugny and Vendome were, by virtue of their office, cardinals of the Romish Church.

In process of time the title abbot was improperly trans- ferred to clerics who had no connection with the monastic system, as to the principal of a body of parochial clergy; and under the Carlovingians to the chief chaplain of the king, Abbas Curve, or military chaplain of the em- peror, Abbas Castrensis, It even came to be adopted by purely secular officials. Thus the chief magistrate of the republic at Genoa was called Abbas Populi. Ducange, in his Glossary, also gives us Abbas Campanilis, Clocherii, Palatu, Scholaris, é&c.

Lay abbots, so called, had their origin in the system of commendation, in the 8th century. By this, to meet any great necessity of the state, such as an

inroad of the Sara- cens, the revenues of monasteries were temporarily com- mended, 7.¢., handed over to some layman, a noble, or even the king himself, who for the time became titular abbot. Enough was reserved to maintain the monastic brether- hood, and when the occasion passed away the revenues were to be restored to their rightful owners. The estates, however, had a habit of lingering in lay hands, so that in the 9th and 10th centuries most of the sovereigns and nobles among the Franks and Burgundians were titular abbots of some great monastery, the revenues of which they applied te their own purposes. These lay-abbots were styled Abbacomites or Abbates Milites. Hugh Capct, before his elevation to the throne, as an Abbacomes held the abbeys of St Denis and St Germain in commendam. Bishop Hatto, of Mentz, s.p. 891-912, is said to have held 12 abbeys in commendam at once. In England, as we see from the Acts of the Council of Cloveshoe, in the 8th century, monasteries were often invaded and occupied by laymen. ‘This occurred sometimes from the monastery having voluntarily placed itself under the protection of a powerful layman, who, from its protector, became its op- pressor. Sometimes there were two lines of abbots, one of laymen enjoying the lion’s share of the revenues, another of clerics fulfilling the proper duties of an abbot on a small fraction of the income. ‘The gross abuse of lay commen- dation which had sprung up during the corruption of the monastic system passed away with its reformation in the 10th century, either voluntarily or by compulsion. The like abuse prevailed in the East at a later period. John, Patriarch of Antioch, at the beginning of the 12th century, informs us that in his time most monasteries had been handed over to laymen, beneficiarti, for life, or for part of their lives, by the emperors,

In conventual cathedrals, where the bishop oceupied the place of the abbot, the functions usually devolving on the superior of the monastery were performed by a prior. In other convents the prior was the second officer next to the abbot, representing him in his absence, and fulfilling his duties. The. superiors of the cells, or small monastic establishments dependent on the larger monasteries, were also called priors. They were appointed by the abbots, and held office at their pleasure.

Authorities :—Bingham, Origines ; Ducange, Glossary ; Herzog, Realwérterbuch ; Robertson, Ch. Hist. ; Martene, De Antig. Monust.

Ritibus ; Montalembert, Monks of the West. (z. Vv.)

ABBOT

ABBOT, Craruzs, speaker of the House of Commons from 1802 to 1817, afterwards created Lord Colchester. See CoLCHESTER.

ABBOT, Guorcs, Archbishop of Canterbury, was born October 19, 1562, at Guildford in Surrey, where his father was a cloth-worker. He studied at Balliol College, Oxford, and was chosen Master of University College in 1597. He was three times appointed to the office of Vice-Chan- cellor of the University. When in 1604 the version of the Bible now in use was ordered to be prepared, Dr Abbot's name stood second on the list of the eight Oxford divines to whom was intrusted the translation of the New Testa- ment, excepting the Epistles. In 1608 he went to Scotland with the Earl of Dunbar to arrange for a union between the Churches of England and Scotland, and his conduct in that negotiation laid the foundation of his preferment, by attracting to him the notice and favour of the king. With- out having held any parochial charge, he was appointed Bishop of Lichfield and Coventry in 1609, was translated to the see of London a month afterwards, and in less than a year was made Archbishop of Canterbury. This rapid preferment was due as much perhaps to his flat- tering his royal master as to his legitimate merits. After his elevation he showed on several occasions firmness and courage in resisting the king. In the scandalous divorce suit of the Lady Frances Howard against the Earl of Essex, the archbishop persistently opposed the dissolu- tion of the marriage, though the influence of the king and court was strongly and successfully exerted in the opposite direction. In 1618, when a declaration was published by the king, and ordered to be read in all the churches, per- mitting sports and pastimes on the Sabbath, Abbot had the courage to forbid its being read at Croydon, where he happened to be at the time. As may be inferred from the incident just mentioned, Abbot was of the Protestant or Puritan party in the Church. He was naturally, therefore, a promoter of the match between the Elector Palatine and the Princess Elizabeth, and a firm opponent of the projected marriage of the Prince of Wales with the Infanta of Spain. This policy brought upon him the hatred of Laud and the court. The king, indeed, never forsook him; but Buck- ingham was his avowed enemy, and he was

regarded with dislike by the Prince of Wales, afterwards Charles I. In 1622 a sad misfortune befell the archbishop while hunting in Lord Zouch's park at Bramzill. A bolt from his cross-brow aimed at a deer happened to strike one of the keepers, who died within an hour, and Abbot was so greatly distressed by the event that he fell into a state of settled melancholy. His enemies maintained that the fatal issue of this accident disqualified him for his office, and argued that, though the homicide was involuntary, the sport of hunting which had led to it was one in which no clerical person could lawfully indulge. The king had to refer the matter to a commission of ten, though he said that "an angel might have miscarried after this sort." A decision was given in the archbishop's favour;. but to pre- vent disputes, it was recommended that the king should formally absolve him, and confer his office upon him anew. After this the archbishop seldom appeared at the council, chiefly on account of his infirmities. He attended the king constantly, however, in his last illness, and performed the ceremony of the coronation of Charles I. A pretext was soon found by his enemies for depriving him of all his functions as primate, which were put in commission by the king. This high-handed procedure was the result of Abbot's refusal to license a sermon preached by Dr Sibthorp, in which the king's prerogative was stretched beyond con- stitutional limits. The archbishop had his powers restored to him shortly afterwards, however, when the king found it absolutely necessary to summon a Parliament. His pre-

sence being unwelcome at court, he lived from that time in retirement, leaving Laud and his party in undisputed ascendency. He died at Croydon on the 5th August 1633, and was buried at Guildford, his native place, where he had endowed an hospital with lands to the value of £300 a year. Abbot wrote a large number of works; but, with the excep- tion of his Hxposition on the Prophet Jonah (1600), which was reprinted in 1845, they are now little known. His Geography, or a Brief Description of the Whole World, passed through numerous editions.

ABBOT, Gzrorct, known as "The Puritan," has been oddly and persistently mistaken for others, He has been described as a clergyman, which he never was, and as son of Sir Morris Abbot, and his writings accordingly entered

|in the bibliographical authorities as by the nephew of ‘ the Archbishop of Canterbury.

One of the sons of Sir Morris Abbot was, indeed, named George, and he was a man of mark, but the more famous George Abbot was of a different family altogether. He was son or grandson (it is not clear which) of Sir Thomas Abbot, knight of Easington, East Yorkshire, having been born there in 1603-4, his mother (or grandmother) being of the ancient house of Pickering. He married a daughter of Colonel Purefoy of Caldecote, Warwickshire, and as his monument, which may still be seen in the church there, tells, he bravely held it against Prince Rupert and Maurice during the civil war. He was a member of the Long Parliament for Tamworth. As a layman, and nevertheless a theologian and scholar of rare ripeness and critical ability, he holds an almost unique place in the literature of the period. His Whole Booke of Job Paraphrased, or made easy for any to under- stand (1640, 4to), is in striking contrast, in its concinnity and terseness, with the prolixity of too many of the Puritan expositors and commentators. His Vindiciw Sabbathi(1641, 8vo) had a profound and lasting influence in the long Sabbatic controversy. His Brief Notes upon the Whole Book of Psalms (1651, 4to), as its date shows, was posthumous, He died February 2, 1648. (MS. collections at Abbey- ville for history of all of the name of Abbot, by J. ‘T. Abbot, Esq., F.S.A., Darlington; Dugdale’s Antiquities of Warwickshire, 1656, p. 791; Wood’s Athenee (Bliss), s. v.; Cox’s Interature of the Sabbath; Dr James Gilfillan on The Sabbath; Lowndes, Bodlean, B. Museum Catal. 8. V.) (4,3: Gace ABBOT, Rozert. Noted as this Puritan divine was in his own time, and representative in various ways, he has hitherto been confounded with others, as Robert Abbot, Bishop of Salisbury, and his personality distributed over a Robert Abbot of Cranbrook; another of Southwick, Hants; a third of St Austin’s, London ; while these succes- sive places were only the successive livings of the one Robert Abbot. He is also described as of the Archbishop’s or Guildford Abbots, whereas he was in no way related, albeit he acknowledges very gratefully, in the first of his epistles-dedicatory of A Hand of Fellowship to Helpe Keepe out Sinne and Antichrist (1623, 4to), that it was from the archbishop he had “received all” his “worldly mainte- nance,” as well as “best earthly countenance” and “fatherly incouragements.” The worldly maintenance was the pre- sentation to the

vicarage of Cranbrook in Kent, of which the archbishop was patron. This was in 1616. He had received his education at Cambridge, where he proceeded M.A., and was afterwards incorporated at Oxford. In 1639, in the epistle to the reader of his most noticeable book historically, his Zriall of our Church-Forsakers, he tells us, “I have lived now, by God’s gratious dispensation, above fifty years, and in the place of my allotment two and twenty full.” The former date carries us back to 1588-89, or perhaps 1587-88—the I.— 4

“ Armada” year—as his birth-time; the latter to 1616-17 “ supra). In his Bee Thankfull London and her Sisters 1626), le describes himself as formerly “ assistant to a reverend divine… . now with God,” and the name on the margin is “ Master Haiward of Wool Church.” This was doubtless previous to his going to Cranbrook. Very remarkable and effective was Abbot’s ministry at Cran- brook, where the father of Phineas and Giles Fletcher was the first “Reformation” pastor, and which, relatively small as it is, is transfigured by being the birth-place of the poet of the “ Locust” and “The Purple Island.” His parish- ioncrs were as his own “sons and daughters” to him, and by day and night he thought and felt, wept and prayed, for them and with them. He isa noble specimen of the rural clergyman of hisage. Puritan though he was in his deepest convictions, he was a thorough Churchman as toward Non- conformists, ¢.g., the Brownists, with whom he waged stern warfare. He remained until 1643 at Cranbrook, and then chose the very inferior living of Southwick, Hants, as be- tween the one and the other, the Parliament deciding against pluralitics of ecclesiastical offices. Succeeding the extruded” Udall of St Austine’s, Abbot continued there until a good old age. In 1657, in the Warning-prece, he is described as still “ pastor of Austine’s in London.” He disappears silently between 1657-8 and 1662. Robert Abbot’s books are distinguished from many of the Puritans by their terscness and varicty. (Brook’s Puritans, iii. 182, 3; Walker’s Sufferings; Wood’s Athenee (Bliss); Cata- logus Impressorum Labrorum wn Bibliotheca Bodlewana, 8.v.; Palmer’s Vonconf. Mem., ii. 218.) (A. B. G.) ABBOTSFORD, the celebrated residence of Sir Walter Scott, situated on the south bank of the river Tweed, about three miles above Melrose. The nucleus of the property was a small farm of 100 acres, with the ‘“

inharmonious designation” of Clarty Hole, acquired by Scott on the lapse of his lease (1811) of the neighbouring house of Ashestiel. It was gradually increascd by various acquisitions, the last and principal being that of Toftfield (afterwards named Huntlyburn), purchased in1817. The present new house was then commenced, and was completed in 1824, The general ground-plan is a parallelogram, with irregular outlines— one side overlooking the Tweed, and the other facing a courtyard; and the general style of the building is the Scottish baronial. Scott had only enjoyed his new resi- dence one year when (1825) he met with that reverse of fortune (connected with the failure of Ballantyne and Constable), which involved the estate in debt. In 1830, the library! and museum were presented as a frec gift by the creditors; and after Scott’s death, which took place at Abbotsford in September 1832, a committee of friends subscribed a further sum of about £8000 towards the same object. The property was wholly disencumbered in 1847, by Mr Cadell, the publisher, accepting the remaining claims of the family over Sir Walter Scott’s writings in requital of his obligation to obliterate the heritable bond on the property. The result of this transaction was, that not only was the estate redeemed by the fruit of Scott’s brain, but a handsome residue fell to the publisher. Scott’s only son Walter (Lieutenant-Colonel 15th Hussars) did not live to enjoy the property, having died on his way from India in 1847. Its subsequent possessors have been Scott’s son-in-law, J. G. Lockhart, and the latter’s son-in-law, J. R. Hope Scott, Q.C., whose daughter (Scott’s great- granddaughter) is the present proprietor. Mr Lockhart died at Abbotsford in 1854.—See Life of Scott, by J. G. Lockhart; Abbotsford and Newstead Abbey, by Washing- ton Irving; Abbotsford Notanda in Gentleman’s Mag.,

1 The Catalogue of the Library at Abbotsford forms vol. Ixi. of the Bannatyne Club publications.

April and May 1869; The Lands of Scott, by James F.

Hunnewell, cr. 8vo, 1871; Scott Loan Hauhibition Cata- logue, 4to, 1871.

ABBOTSFORD CLUB, one of the principal printing clubs, was founded in 1834 by Mr W. B. D. D. Turnbull, and named in honour of Sir Walter Scott. Taking a wider range than its predecessors, the Bannatyne and Maitland Clubs, it did not confine its printing (as remarked by Mr Lockhart) to works

connected with Scotland, but admitted all materials that threw light on the ancicnt history of literature of any country, anywhere described or discussed by the Author of Waverley. The club, now dissolved, con- sisted of fifty members; and the publications extend to 34 vols. quarto, issued during the years 1835-1864.

ABBREVIATION, a letter or group of letters, taken from a word or words, and employed to represent them for the sake of brevity. Abbreviations, both of single words and of phrases, having a meaning more or less fixed and recognised, are common in ancient writings and inscrip- tions, and very many are in use at the present time. A distinction is to be observed between abbreviations and the contractions that are frequently to be met with in old manuscripts, and even in early printed books, whereby letters are dropped out here and there, or particular collo- cations of letters represented by somewhat arbitrary symbols. The commonest form of abbreviation is the substitution for a word of its initial lettcr; but, with a view to prevent ambiguity, one or more of the other letters arc frequently added. Letters arc often doubled to indicate a plural ora superlative.

J. Cuassican ABBREVIATIONS.—The following list con- tains a selection from the abbreviations that occur in the writings and inscriptions of the Romans :—

A. A. Absolvo, Aidilis, Ais, Ager, Ago, Aio, Amicus, Annus, Antiquo, Auctor, Auditor, Augustus, Aulus, Aurum, Aut.

A.A. Ais alienum, Ante audita, Apud agrum, Aurum argentum. AA. Augusti. AAA. Augusti tres.

A.A.A.F.F. Auro argento wre flando feriundo.?

A.A.V. Alter ambove.

A.C, Acta causa, Alius civis.

A.D. Ante diem; eg., A.D.V. Ante diem quintum.

A.D.A. Ad dandos agros.

ZED. Aides, Aidilis, Aidilitas.

JEM. and AIM. Aimilins, Amilia.

ZER. Airarium. AiR.P. Aire publico.

A.F. Actum fide, Auli filius.

AG. Ager, Ago, Agrippa.

A.G. Animo grato, Aulus Gellins.

A.L.A. and A.L.E. Arbitrium litis estimande.

A.M. and A.MILL. Ad milliarium.

AN. Aniensis, Annus, Ante.

ANN. Annales, Anni, Annona.

ANT. Ante, Antonius.

A.O0. Alii omnes, Amico optimo.

INE, Appius, Apud.

Re Ad pedes, Aidilitia potestate.

P.F. Auro (or argento) publico feriundo.

P.M. Amico posuit monumentum, Annorum plus minus. P.2.C. Anno post Romam conditam.

G. Argentum.

_V.V.D.D. Aram votam volens dedicavit, Arma votiva dono dedit. a A tergo. Also A TE. and A TER.

.T.M.D.O. Aio te mihi dare opertere.

Y. Augur, Augustus, Aurelius.

aio Annos vixit.

A.V.C. Ab urbe condita.

AVG. Augur, Augustus.

AVGG. Augusti (generally of two). AVGGG. Augusti tres. AVT.PR.R. Auctoritas provincize Romanorum.

Dp bb > > b> Bo ES

B. Balbius, Balbus, Beatus, Bene, Beneficiarius, Beneficium, Bonus, Brutus, Bustum.

B. for V. Berna, Bivus, Bixit.

B.A. Bixit annos, Bonis auguriis, Bonus ainabilis.

1 Deseribing the function of the triumvirt monetales.

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ABBREVIATION 27

BB. or B.B. Bene bene, ¢.¢., optime, Optimus. B.D. Bonz dex, Bonum datum. B.DD. Bonis deabus. B.D.S.M. Bene de se merenti. BF. Bona femina, Bona fides, Bona fortuna, Bonum factum. Bona femina, Bona filia. Bona hereditaria, Bonorum heres. Bonum judicium. B. 1.1. Boni judicis judicium. Beatee memorize, Bene merenti. Bona nostra, Bonum nomen. . Bona hic invenies. Bona paterna, Bonorum potestas, Bonum publicum. : Bene quicscat, Bona queesita. P.N. Bono reipublice- natus. Britannicus. Bonorum tutor, Brevi tempore. Bene vale, Bene vixit, Bonus vir. Balnea vina Venus. Bixit, for vixit.

i oe

WO wy aia

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Madd oon

C.

Cesar, Caius, Caput, Causa, Censor, Civis, Cohors, Colonia, Comitialis (dics), Condemno, Consul, Cum, Curo, Custos.

Caia, Centuria, Cum, the prefix Con.

Civis bonus, Commune bonum, Conjugi benemerenti, Cui bono.

Calumniz causa, Causa cognita, Conjugi carissime, Con- silium ccpit, Curie consulto.

Calumniz cavende causa.

Cesar (or Caius) curavit faciendum, Caius Caii filius.

. Olarissimi viri.

Ceesaris decreto, Caius Decius, Comitialibus dicbus.

Censor, Censores. CHESS. Censorcs

Causa fiducie, Conjugi fecit, Curavit faciendum.

Custos heredum, Custos hortorum.

Caius Julius, Consul jussit, Curavit judex.

Clarissimus, Claudius, Clodius, Colonia.

Clarissimus vir, Clypeum vovit.

Caius Marius, Causa mortis.

Cneeus.

Coheres, Cohors.

Collega, Collegium, Colonia, Colunina.

Collega, Coloni, Coloniz.

Comes, Comitium, Comparatum.

Conjux, Consensus, Consiliarius, Consul, Consularis.

Cornclia (tribus), Cornelius, Corona, Corpus.

Consiliarius, Consul, Consulares. COSS. Consules.

Carissimus or Clarissimus puer, Civis publicus, Curavit ponendum.

Caius Rufus, Civis Romanus, Curavit reficiendum.

Cesar, Communis, Consul.

Clarissimus or consularis vir.

Cura, Curator, Curavit, Curia.

D.

Dat, Dedit, &c., De, Decimus, Decius, Decretum, Decurio, Deus, Dicit, &., Dies, Divus, Dominus, Domus, Donum.

Decurio colonize, Diebus comitialibus, Divus Cesar.

Dea Dia, Decurionum decreto, Dedicavit, Deo dedit, Dono dedit.

. Datum decreto decurionum, Dono dedit dedicavit. °

De ea re.

Designatus.

Dedit imperator, Diis immortalibus, Diis inferis.

Deo invicto Mithr, Diis inferis Manibus.

Deo Magno, Dignus memoria, Diis Manibus, Dolo malo.

. Deo Optimo Maximo.

Dedit proprio sumptu, Deo perpetuo sacrum, De pecunia sua.

E

E. Ejus, Eques, Erexit, Ergo, Est, Et, Etiam, Ex. EG. Aiger, Egit, Egregius.
E. M. Egregie memorice, Ejusmodi, Erexit monumentum.

OQ SPREE Pon

SoG OZ

a29geneAe a aD SHO Sess

Fe bt ind By

gee Ad

CxeKs: =e REPS

Q is) Se

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Ris

EQ.M. Equitum magistcr. E.R.A. Ea res agitur. F.

F. Fabius, Facere, Fecit, &c., Familia, Fastus (dies), Felix, Femina, Fides, Filius, Flamen, Fortuna, Frater, Fuit, Functus.

F.C. Faciendum curavit, Fidei commissum, Fiducie causa.

18,10) Fidem dedit, Flamen Dialis, Fraude donavit.

F.F.F. Ferro flamma fame, Fortior fortuna fato.

FL. Filius, Flamen, Flaminius, Flavius.

FLL. Favete linguis, Fecit libens, Felix liber.

FR. Forum, Fronte, Frumentarins.

F.R. Forum Romanum.

__ °

BuAsolar er

Teall wall wal an tan! -anlt-nl onl pall anya en!

K.

Sivek.

Gaius (=Caius), Gallia, Gaudium, Gellius, Gemina, Gens, Gesta, Gratia.

Gemina fidelis (applied to a legion). SoG.P.F. Gemina pia fidelis.

Gloria.

Genius, Gens, Genus, Gnxus (=Cneus).

Genio populi Romani.

Ele

Habct, Ileres, Hic, Homo, Honor, Hora.

Heres, Herennius. HER. and HERC. Hercules.

Hac lege, Hoc loco, Honesto loco.

Hoe monumentum, Honesta mulier, Hora mala.

Hic sepultus est, Hic situs cst.

Hee urbs, Hic vivit, Honeste vixit, Honestus vir.

Immortalis, Imperator, In, Infra, Inter, Invictus, Ipse, Isis, Judex, Julius, Junius, Jupiter, Justus.

Jam, Intra.

Julius Cesar, Juris Consultum, Jus civile.

Idem, Idus, Interdum.

Inferis diis, Jovi dedicatum, Jus dicendum, Jussu Dci.

Jovi deo magno.

In foro, In fronte.

Jacet hic, In honestatem, Justus homo.

Imago, Immortalis, Immunis, Impcusa.

Imperator, Imperium. :

Jovi optimo maximo.

In publico, Intra provinciam, Justa persona.

Impensa sua vivus posuit.

K. Keso, Caia, Calumnia, Caput, Carus, Castra.

K., KAL., and KL. Kalende.

L. LB.

L. Lelius, Legio, Lex, Libens, Liber, Libra, Locus, Lollius, Lucius, Ludus. Libens, Liberi, Libertus.

L.D.D.D. Locus datus deercto decurionum.

LEG.

M.1I

Legatus, Legio.

Liber, Liberalitas, Libertas, Libertus, Librarius. Leges, Libentissime, Liberti.

Libens merito, Locus monumenti.

Laribus sacrum, Libens solvit, Locus saccr. Ludus.

>.F, Ludos publicos fecit.

Magister, Magistratus, Magnus, Mancs, Marcus, Marius, Marti, Mater, Memoria, Mensis, Miles, Monumentum, Mortuus, Mucius, Mulicr.

Manius.

Magno Deo, Manibus diis, Matri deum, Merenti dedit.

Mensis. MESS. Menses.

Mala fides, Marci filius, Monumentum fecit.

Matri Idaex, Matri Isidi, Maximo Jovi.

MNT. and MON. Moneta.

ila) ep M.S. MVN.

M.V.S.

ojolole) mar TA ay

aden iss)

be Sa)

P.C.

piehisk

Male positus, Monumentum posuit.

Manibus sacrum, Memoriee sacrum, Manu scriptum.

Municeps, or municipium; so also MN., MV., and MVNIC.

Marti ultori sacrum, Mcrito votum solvit.

N.

Natio, Natus, Nefastus (dics), Nepos, Neptunus, Nero, Nomen, Non, None, Noster, Novus, Numen, Nuime- rius, Numerus, Nummus.

Nepos, Neptunus.

Nostre fidei commissum.

Non licet, Non liquet, Non longe.

. Nobilis memorize vir.

Nostri. NN., NNO., and NNR. Nostrorum. Nobilis. NOB., NOBR., and NOV. Novembris. Nefastus primo (7.¢., priore parte dici), Non potest.

O. Ob, Officium, Omnis, Oportet, Optimus, Opus, Ossa. Obiit, Obiter, Orbis. Ob cives servatos. Omnibus honoribus functus. Ossa hic sita sunt. Hora, Ordo, Ornamentum.

.Q. Ossa tua bene quiescant.

Pars, Passus, Pater, Patronus, Pax, Perpetuus, Pes, Pius, Plebs, Pondo, Populus, Post, Posuit, Preescs, Practor, Primus, Pro, Provincia, Publicus, Publius, Puer.

Pactum conventum, Patres conscripti, Pecunia constituta, Ponendum curavit, Postconsulatum, Potestate censoria,

ho CO.

PE Pia fidelis, Pius felix, Promissa fides, Publii filius. which they occur. There is no occasion to explain here P.M. Piz memoria, Plus minus, Pontifex maximus. : the common abbreviations used for Christian names, books bo ae ie a Pecunia publica, Prepositus, | 5F Scripture, months of the year, points of the compass, PR. Pies oe Pridie, Deeps. grammatical and mathematical terms, or familiar titles, P.R. —_- Permissu reipublies, Populus Romanus. like “ Mr,” &c. ; en Hey Roel OO aes ‘ The ordinary abbreviations, now or recently in use, may »PK. refeetus preetorul, Fropreetor. ; i i i —— P.S. Peeunia a, Piet, Proprio sumptu, Publiee saluti. be conveniently classified under the following headings : P.V. Pia vietrix, Preefeetus urbi, Preestantissimus vir. 1. ABBREVIATED TITLES AND DESIGNATIONS. . ; ; _ | A.A. Associate of Arts. ; Q. Questor, Quando, Quantus, Que, Qui, Quinquennalis, | 4, B. Able-bodied seaman. Quintus, Quirites. A.M. (Artium Magister), Master of Arts. Q.D.R. Qua de re. A.R.A. Associate of the Royal Academy. Q.1.8.8. Que infra scripta sunt ; so Q. S. S. S. Que supra, &e. A.R.S.A. Associate of the Royal Scottish Academy. QQ. Queeunque, Quinquennalis, Quoque. B.A. Bachelor of Arts. Q.R. Questor reipublice. B.C.L. Bachelor of Civil Law. : . B.D. Bachelor of Divinity. R. Recte, Res, Respubliea, Retro, Rex, Ripa, Roma, Romanus, | B.L]I.. Bachelor of Laws. Rufus, Rursus. B.Se. Baehelor of Science.

R.C. Romana eivitas, Romanus vivis. RESP. and. RP. Respublica.

8.E.‘T.L. Sit ei terra levis.

Cc: C.A. RET. P. and RP. Retro pedes. ‘ C.B. : C.E. 8. Sacrum, Seriptus, Semis, Senatus, Sepultus, Servius, | OM. Servus, Sextus, Sibi, Sine, Situs, Solus, Solvit, Sub, | ¢.M.G. Suus. Csi. SAC. Sacerdos, Sacrificium, Saerum. ees: 8.C. Senatus consultum. DD. 8.D. Sacrum diis, Salutem dicit, Senatus decreto, Sententiam |), Lit, dedit. D.M. S.D.M. Sacrum diis Manibus, Sine dolo malo. D.Se. SER. Servius, Servus. Who mgecs F.C.8. SN. Senatus, Sententia, Sine. ED. 8.P. Sacerdos perpetua, Sine peeunia, Sua pecunia. F.F.P. §.P.Q.R. Senatus populusque Romanus. ¥.G.S. 5.8. Sanetissimus senatus, Supra seriptum. F.K.Q S.V.B.E.E.Q.V. Si vales bene est, ego quidem valeo. : L. T. Terminus, Testamentum, Titus, Tribunus, Tu, Turma, {

Tutor.

be a a ff a bd bd by

ABBREVIATION

Chairman.

Chartered Accountant.

Companion of the Bath.

Civil Engineer.

(Chirurgie Magister), Master in Surgery. Companion of St Michael and St George. Companion of the Star of India.

Doctor of Civil Law.

Doctor of Divinity.

Doctor of Literature.

Doetor of Medicine [Oxford].

Doetor of Seienee.

(Eboracensis), of York.}

Fellow of the Chemical Soeiety.

(Fidei Defensor), Defender of the Faith. . Fellow of the Faeulty of Physicians & Surgeons [Glasgow.] Fellow of the Geological Soeiety.

Ss .Q.C.P.1. Fellow of King and Queen’s College of Physicians

in Ireland. Fellow of the Linnean Society. Field Marshal.

S. s. TB., TI., and TIB. Tiberius. .A.S. Fellow of the Royal Astronomical Soeiety. TB., TR., and TRB. Tribunus. .R.C.P. Fellow of the Royal College of Physicians. T.F. Testamentum fecit, Titi filius, Titulum fecit, Titus | F.B.C.P.E. ime of the Royal College of Physicians of Edin- Flavius. urgh, TM. Terminus, Testamentum, Therme. F.R.C.S. Fellow of the Royal College of Surgeons. T.P. | Terminum posuit, Tribunicia potestate, Tribunus plebis. F.R.G.S. Fellow of the Royal Geographical Society. TVL. Tullius, Tullus. F.R.S. Fellow of the Royal Society. Ve F.R.8.E., Fellow of the Royal Soeiety of Edinburgh. Vi Urbs, Usus, Uxor, Vale, Verba, Vestalis, Vester, Vir, | F.R.S.L. Fellow of the Royal Society of Literature. Vivus, Vixit, Volo, Votum. F.8.A. Fellow of the Society of Antiquaries. V.A. Veterano assignatus, Vixit annos. F.S.8. Fellow of the Statistical Society. V.C. Vale conjux, ‘Vir clarissimus, Vir consularis. ¥.Z.8. Fellow of the Zoological Society. V.E. Verum etiam, Vir egregius, Visum est. G.C.B. Knight Grand Cross of the Bath, VE, Usus fruetus, Verba feeit, Vivus fecit. G.C.H. Knight Grand Cross of Hanover. NEP. Urbis prefeetus, Vir perfeetissimus, Vivus posuit. G.C.M.G. Knight Grand Cross of St Michael and St George. V.R. Urbs Roma, Uti rogas, Votum reddidit. ee 1. yee ee ee of the Star of India. IL. Mepiavan AppREviations.—Of the different kinds | J.p. ee) of abbreviations in use in the middle ages, the following | J.U.D. (Juris utriusque Doctor), Doctor of Civil and Canon Law. are examples :— ~ | K.C.S.1. Knight Commander of the Star of India. AM ine has | K.C.B. Knight Commander of the Bath. ‘Dp: ag K.G. Knight of the Garter. B.P. Beatus Paulus, Beatus Petrus. : : CC Carissimus (also plur. Carissimi), Clarissi Cir i es D DL. Dea er K.T, _ Knight of the Thistle. ‘ ie eg ea L.A.II.

Licentiate of the Apothecaries’ Hall. D.N.PP. Dominus noster Papa. TeGJ. Tend Oieedastice a pel ee ae Pandectze (prob. for Gr. Ti). LL.B. (Legum Baccalaureus), Bachelor of Laws. LDN. Deon. LL.D. (Legum Doctor), Doctor of Laws. mic arenes (or -mi). LL.M. (Legum Magister), Master of Laws. – MM. Magistri, Martyres, Matrimonium, Meritissimus. : is a a centile, offtie Royal CT se yams OSB. MOnine Gavel Benedict: -R.C.S. Licentiate of the Royal College of Surgeons. PP. Papa, Patres, Piissimus L.S.A. Licentiate of the Apothecaries Society. R.F. Rex Weameocum. d M.A. Master of Arts. ; Pa oO BavcrendiatmuseRaleaeianuane: M.B. (Afedicine Baccalawreus), Bachelor of Medicine. S.C.M. Saera Cesarea Majestas. M.C. Member of Congress. ae S.M.E. Sancta Mater Ecclesia. M.D. (Medicine Doctor), Doctor of Medicine. S.M.M. Saneta Mater Maria. M.P. Member of Parliament, – S.R.I. Sanctum Romanum Imperium M.R.C.P. Member of the Royal College of Physicians. S.V. Sanctitas Vestra, Sancta Virg a M.R.I.A. Member of the Royal Irish Academy. i. Venerabilis, Venerandus. Mus. B, Bachelor of Musie. V.R.P. Vestra Reverendissima Paternitas.

III. ABBREVIATIONS NOW IN UsE.—The import of these will often be readily understood from the connection in

1 An arehbishop or bishop, in writing his signature, substitutes for his surname the name of his see ; thus the prelates of Canterbury, York, Oxford, London, &e., subseribe themselves A. C. Cantuar., W. Ebor., J. F. Oxon., J. London, &e.

Sobek Vita TION

Mus. D. Doctor of Music.

N.P. Notary Public.

P.C, Privy Councillor. ;

Ph.D. (Philosophie Doctor), Doctor of Philosophy.

BP: Parish Priest.

P.R.A. President of the Royal Academy.

Q.C. Queen’s Counsel.

R. (Rex, Regina), King, Quecn. |

R.A. Royal Academician. Royal Artillery.

R.A.M. Royal Academy of Music.

R.E. – Royal Engineers.

Reg. Prof. Regius Professor.

R.M. Royal Marines.

R.N. Royal Navy.

S. or St. Saint.

§.S.C. Solicitor before the Supreme Courts [of Scotland].

§.T.P. (Sacrosanctee Theologie Professor), Professor of Sacred Theology.

V.C. Vice-Chancellor. Victoria Cross.

V.G. Vicar-General.

V.S. ‘Veterinary Surgeon.

W.S. Writer to the Signet [in Scotland]. Equivalent to Attorney.

bo

. ABBREVIATIONS DENOTING MoniEs, WEIGHTS, AND MEASURES :—!

ac. acre. L.,7 2 or 7. (Mbra)) pound bar. barrel. (money). bus. bushel. lb. or Ib. (ébra), pound (weight). c. cent. m. or mi. mile; minute. c. (or cub.) ft.

&c. cubic foot, | Mm. minim. &e. mo. month. ewt. lhundredweight. na. nail. d. (denarius), penny. oz. ounce. deg. degree. pk. peck. dr. drachm or dram. po. pole. dwt. pennyweight. pt. — pint. it franc. q. (quadrans), farthing. fl. florin. qr. quarter. ft. foot. qt. quart. fur. furlong. ro. — *rood. gal. gallon. Rs.?* rupees. gr. grain. s. or / (solidus), shilling. h. or hr. hour. S. or sec. second. hhd. hogshead. se. or scr. scruple. in. inch. sq. ft. &c. square foot, &c. kilo. kilometre. st. — stone.

yd. yard.

3. MIscELLANEOUS ABBREVIATIONS. A. Accepted. A.C. (Ante Christum), Before Christ. acc., a/e., or acct. Account. A.D. (Anno Domini), In the year of our Lord. A.E.1.0.U. Austrie est imperare orbi universo,3 or Alles Erdreich Ist Oesterreich Unterthan. Ait. or Mtat. (détatis [anno)), In the ycar of his age. A.H. (Anno Hegire), In the year of the Hegira (the Mohammedan

era). A.M. (Anno Mundi), In the year of the world. A.M. (Ante meridiem), Forenoon. Anon. Anonymous. A.U.C. (Anno urbis condite), In the year from the building of the city (i.e, Rome.) B.C. Before Christ. C. or Cap. (Caput), Chapter. Centigrade (or Celsius's) Thermometer. cent.* (Centum), A hundred, frequently £100, Cf. (Confer), Compare. Ch. or Chap. Chapter. Co. Company. County. Cr. Creditor. curt. Current, the present month. D.G. (Dei gratia), By the grace of God. Do. Ditto, the same. D.O.M. (Deo Optime Maxime), To God the Best and Greatest. Dr. Debtor. D.V. (Deo volente), God willing.

re

1 Characters, not properly abbreviations, are used in the same way ; e.g. °'" for "degrees, minutes, seconds," (circular measure); %, 3, 9 for "ounces, drachms, scruples." 3 is probably to be traced to the written form of the z in "oz."

2 These forms (as well as 8, the symbol for the American dollar) are placed before their amounts.

3 Jt is given to Austria to rule the whole earth. The device of Austria, first adopted by Frederick III.

*“ Per cent.” is often signified by °/,, a form traceable to « 100.”

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e.g. (Hxempli gratia), For example. etc. or &c. (Ht cetera), And the rest ; and so forth. Ex. Example.

F. or Fahr. Fahrenheit’s Thermometer. Fec. (Fecit), He made (or did) it.

fl. Flourished.

Fo. or Fol. Folio.

f.o.b. Free on board.

G.P.O. General Post Office.

H.M.S. Her Majesty’s Ship. ;

Ib. or Ibid. (Jbidem), In the same place. Id. (Jdem), The same.

ie. ie est), That, is.

1.H.S. (Jesus Hominum Salvator), Jcsus the Saviour of men. Inf. (nfra), Below. inst. Instant, the present month.

I.0.U.1 owe you.

ig. (Idem quod), The same as.

K.T.A. (xed re Aore), Et cetera, and the rest. L. or Lib. (Liber), Book.

Lat. Latitude.

lc. (Loeo citato), In the place cited.

Lon. or Long. Longitude.

I,.8. (Locus sigiili), The place of the seal. Mem. (Afemento), Remember, Memorandum. MS. Manuscript. MSS. Manuscripts. N.B. (Nota bene), Mark well; take notice. N.B. North Britain (.e., Scotland).

N.D. No date.

nem. con. (Nemine contradicente), No one contradicting. No. (Numero), Number.

N.S. New Style.

N.T. New Testament.

ob. (Obiit), Died.

Obs. Obsolete.

O.H.M.S. On Her Majesty’s Service. 0.8. Old Style.

0.T. Old Testament.

J Page. Pp. Pages.

e. (Per), For ; ¢.g., # lb., For one pound.

Pinx. (Pinxit), He painted it.

P.M. (Post meridiem), Afternoon.

P.O. Post Office. P.0.0. Post Office Order.

P.P.C. (Pour prendre congé), To take leave.

P.R. Prizc-ring.

prox. (Proximo [mense]), Next month.

P.S. Postscript.

Bt Bart

p.t. or pro. tem. (Pro tempore), For the time.

.T.O. Please turn over.

, Qu., or Qy. Query ; Question.

d. (Quast dicat), As if he should say ; as much as to say. .E.D. (Quod erat demonstrandum), which was to be demonstrated. ELF. (Quod erat faciendum), which was to be done.

. or quant. suff. (Quantum sufficit), As much as is sufficicnt. Quod vide), Which see.

R. or B. (Recipe), Take.

Vv (=r. for radix), the sign of the square root.

R.I.P. (Requiescat in pace /), May he rest in peace !

se. Seer Namely ; that is to say.

Se. or Sculp. (Seulpsit), He engraved it.

8.D.U.K. Society for the Diffusion of Useful Kuowledge. seq. or sq., seqq. or sqq. (Sequens, sequentia), The following. s.p. (Ste prole), Without offspring.

S.P.G. Society for the Propagation of the Gospel.

Sup. ee Above.

s.v. (Sub voce), Under the word (or heading).

T.C.D. Trinity College, Dublin.

COOL On

pO nO

ult. (Ultimo [mense}), Last month. U.S. United States.

v. (Versus), Against.

v. or vid. (Vide), See.

viz. (Videlicet), Namely.

V. R. (Victoria Regina), Victoria the Quecn. Xmas. Christmas [This X ts a Greek letter, corresponding to Ch}.

(See Greevius's Thesaurus Antiquitatum, 1694, sqq.; Nicolai's Tractatus de Siglis Veterum ; Mommsen's Corpus Inseriptionum Latinarum, 1863, sqgq.; Natalis de Wailly's Paléographie, Paris, 1838; Alph. Chassant's Paléographie, 1854, and Dictionnaire des Abréviations, 3d ed., 1866. A manual of the abbreviations in current use is a desideratum.)

ABBREVIATORS, a body of writers in the Papal Chancery, whose business is to sketch out and prepare in due form the Pope's bulls, briefs, and consistorial decrees.

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They are first mentioned in a bull of Benedict XII, early in the 14th century. Their number is fixed at seventy- two, of whom twelve, distinguished as de parco majort, hold prelatic rank; twenty-two, de parco minort, are clergymen of lower rank; and the remainder, examinatores, may be laymen.

ABDALLATIF, or App-uL-Lattr, a celebrated physician and traveller, and one of the most voluminous writers of the East, was born at Baghdad in 1162. An interesting memoir of Abdallatif, written by himself, has been pre-

served with additions by Ibn-Abu-Osaiba, a contemporary.

From that work we learn that the higher education of the youth of Baghdad consisted principally in a minute and careful study of the rules and principles of grammar, and in their committing to memory the whole of the Koran, a treatise or two on philology and jurisprudence, and the choicest Arabian poetry. After attainig to great pro- ficiency in that kind of learning, Abdallatif applied him- self to natural philosophy and medicine. To enjoy the society of the learned, he went first to Mosul (1189), and afterwards to Damascus, the great resort of the eminent men of that age. The chemical fooleries that engrossed the attention of some of these had no attraction for him, but he entered with eagerness into speculative discussions. With letters of recommendation from Saladin's vizier, he visited Egypt, where the wish he had long cherished to converse with Maimonides, "the Eagle of the Doctors," was gratified. He afterwards formed one of the circle of learned nen whom Saladin gathered around him at Jeru- salem, and shared in the great sultan's favours. He taught medicine and philosophy at Cairo and at Damascus for a uumber of years, and afterwards, for a shorter period, at Aleppo. His love of travel led him in his old age to visit different parts of Armenia and Asia Minor, and he was setting out on a pilgrimage to Mecca when he died at Baghdad in 1231. Abdallatif was undoubtedly a man of great knowledge and of an inquisitive and penetrating mind, but is said to have been somewhat vain of his attain- ments. Of the numerous works—most of them on medi- cine—which Osaiba ascribes to him, one only, the Account of Egypt, appears to be known in Europe. The manuscript of this work, which was discovered by Pococke the Orien- talist, is preserved in the Bodleian Library. It was trans- lated into Latin by Professor White of Oxford in 1800, and into French, with very valuable notes, by De Sacy in 1810. It consists of two parts: the first gives a general view of Egypt; the second treats of the Nile, and contains a vivid description of a famine caused, during the author's residence in Egypt, by the river failing to overflow its banks. The work gives an authentic detailed account of the state of Egypt during the middle ages.

ABD-EL-KADER, celebrated for his brave resistance to the advance of the French in Algeria, was born near Mascara, in the early part of the year 1807. His father was a man of great influence among his countrymen from his high rank and learning, and Abd-el-Kader himself at an early age acquired a wide reputation for wisdom and piety, as well as for skill in

horsemanship and other manly exercises. In 1831 he was chosen Emir of Mascara, and leader of the combined tribes in their attempt to check the growing power of the French in Africa. His efforts were at first successful, and in 1834 he concluded a treaty with the French general, which was very favourable to his cause. This treaty was broken in the succeeding year; but as the war that followed was mainly in favour of the Arabs, peace was renewed in 1837. War again broke out in 1839, and for more than a year was carried on in a very desultory manner. In 1841, however, Marshal Bugeaud assumed the chief command of the French force, which numbered nearly 100,000 men. The war was now carried on with great vigour, and Abd-el-Kader, after a

most determined resistance, surrendcred himself to the Duc d'Aumale, on the 22d December 1847. The promise, that he would be allowed to retire to Alexandria or St Jean d'Acre, upon the faith of which Abd-el-Kader had given himself up, was broken by the French government. He was taken to France, and was imprisoned first in the castle of Pau, and afterwards in that of Amboise. In 1852 Louis Napoleon gave him his liberty on condition of his not returning to Algeria. Since then he resided successively at Broussa, Constantinople, and Damascus. He is reported to have died at Mecca in October 1873. See ALGERIA.

ABDERA (1.), in Ancient Geography, a maritime town of Thrace, eastward from the mouth of the river Nestus. Mythology assigns the founding of the town to Hercules ; but Herodotus states that it was first colonised by Timesias of Clazomenz, whom the Thracians in a short time expelled. Rather more than a century later (B.c. 541), the people of Seos recolonised Abdera. The town soon became one of considerable importance, and in B.c. 408, when it was re- duced by Thrasybulus the Athenian, it is described as in a very flourishing condition. Its prosperity was greatly mm- paired by its disastrous war with the Triballi (cerca B.o. 376), and very little is heard of it thereafter. The Abderite, or Abderitani, were proverbial for their want of wit and judgment; yet their city gave birth to several eminent persons, as Protagoras, Democritus, and Anaxarchus the philosophers, Hecatzeus the historian, Niczenetus the poet, and others.

ABDERA (2.), a town in Hispania Beetica, founded by the Carthaginians, on the south coast, between Malaca and Prom. Charidemi. It is probably represented by the modern Adra.

ABDICATION, the act whereby a person in office renounces and gives up the same before the expiry of the time for which it is held. The word is seldom used except in the sense of surrendering the supreme power in a state. Despotic sovereigns are at liberty to divest themselves of their powers at any time, but it is otherwise with a limited monarchy. The throne of Great Britain cannot be lawfully abdicated unless with the consent of the two Houses of Par- liament. When James IL, after throwing the Great Seal into the Thames, fled to France in 1688, he did not formally resign the crown, and the question was discussed in Parlia- ment whether he had forfeited the throne or had abdicated. The latter designation was agreed on, for in a full assembly of the Lords and Commons, met in convention, it was re- solved, in spite of James's protest, "that King James II. having endeavoured to subvert the constitution of the king- dom, by breaking the original contract between king and people, and, by the advice of Jesuits and other wicked persons, having violated the fundamental laws, and having with- drawn himself out of this kingdom, has abdicated the government, and that the throne is thereby vacant." The Scotch Parliament pronounced a decree of forfeiture and deposition. Among the most memorable abdications of antiquity may be mentioned that of Sulla the dictator, B.c. 79,and that of the Emperor Diocletian, A.D. 305. The follow- ing is a list of the more important abdications of later times :—

A.D. Benedict IX., Pope, _ 1048 Stephen II. of Hungary, : ; 1131 Albert (the Bear) of Brandenburg, 1169 Ladislaus IIJ., Duke of Poland, 1207 John Balliol of Scotland, ; é ; 1296 John Cantacuzene, Emperor of the East, 1355 John XXIII., Pope, : é : ; ‘ : 1415 Erie VII. of Denmark and XIII. of Sweden, . : : 14389 Amurath II., Ottoman Emperor, A a 1444 and 1445 Charles V., Emperor,. : : é 1556 Christina of Sweden, : 1654 John Casimir of Poland, 1668 James II. of England, . : 1688 Frederick Augustus of Poland, 1706

A BD—

A.D,

1724 1730 1730 1759

Philip V. of Spain, :

Victor Amadeus II. of Sardinia,

Achmet III., Ottoman Emperor, . 0 ae Charles of Naples (on accession to throne of Spain),

Stanislaus II. of Poland, : F : 1795 Charles Emanuel IV. of Sardinia, June 4, 1802 Charles IV. of Spain, .. é Mar. 19, 1808 Joseph Bonaparte of Naples, . June 6, 1808 Gustavus IV. of Sweden, ; Mar. 29, 1809 Louis Bonaparte of Holland, . ae ‘ July 2, 1810 Napoleon of France, April 4, 1814, and June 22, 1815 Victor Emanuel of Sardinia, ; : : Mar. 13, 1821 Charles X. of France, Aug. 2, 1830 Pedro of Brazil,? . é April 7, 1831 Don Miguel of Portugal, May 26, 1834 William I. of Holland, Oct. 7, 1840 Louis Philippe of France, Feb, 24, 1848 Louis Charles of Bavaria, Mar. 21, 1848 Ferdinand of Austria, : : : F Dec. 2, 1848 Charles Albert of Sardinia, . : : : Mar. 23, 1849 Leopold If. of Tuscany, ¢ : 0 i July 21, 1859 Isabella II. of Spain, June 25, 1870 Amadeus I. of Spain, Hebs) slleetsis

ABDOMEN, in Anatomy, the lower part of the trunk of the body, situated between the thorax and the pelvis. See ANATOMY.

ABDOMINALES, or Appomrnat FisHEs, a sub-division of the Malacoptcrygious Order, whose ventral fins are placed behind the pectorals, under the abdomen. The typical abdominals are carp, salmon, herring, silures, and pike.

ABDUCTION, a law term denoting the forcible or fraudulent removal of a person, linited by custom to the case where a woman is the victim. In the case of men or children, it has been usual to substitute the term Kup-NAPPING (¢.v.) The old severc laws against abduction, generally contemplating its object as the possession of an heiress and her fortune, have bcen repealed by 24 and 25 Vict. c. 100, s. 53, which makes it felony for any one from motives of lucre to take away or detain against her will, with intent to marry or carnally know her, &c., any woman of any age who has any interest in any real or personal estate, or is an heiress presumptive,

or co-heiress, or pre- sumptive next of kin to any one having such an interest ; or for any one to cause such a woman to be married or carnally known by any other person; or for any one with such intent to allure, take away, or detain any such woman under the age of twenty-one, out of the possession and against the will of her parents or guardians. Bys. 54, forcible taking away or detention against her will of any woman of any age with like intent is felony. Even without such intent, abduc- tion of any unmarried girl under the age of sixteen is a misdemeanour, In Scotland, where there is no statutory adjustment, abduction is similarly dealt with by practice.

ABDUL MEDJID, Sultan of Turkcy, the thirty-first sovereign of the house of Othman, was born April 23, 1823, and succeeded his father Mahmoud II. on the 2d of July 1839. Mahmoud appears to have becn unable to effect the reforms he desired in the mode of educating his children, so that his son received no better education than that given, according to use and wont, to Turkish princes in the harem. When Abdul Medjid succecded to the throne, the affairs of Turkey were in an extremely critical state. At the very time his father died, the news was on its way to Constantinople that the Turkish army had been signally defeated at Nisib by that of the rebel Ligyptian viceroy, Mehemet Ali; and the Turkish fleet was at the same time on its way to Egypt, to be surrendered perfidiously by its commander to the same enemy. But through the intervention of the great European powers, Mehemet Ali was obliged to come to terms, and the Otto- man empire was saved. In compliance with his father’s

a eee 1 Pedro had sueceeded to the throne of Portugal in 1826, but abdi- cated it at once in favour of his daughter.

express instructions, Abdul Medjid set at once about carry- ing out the extensive refurms to which Mahmoud had so energetically devoted himself. In November 1839. was proclaimed an edict, known as the Hatti-sherif of Gulhané, consolidating and enforcing these reforms, which was supplemented, at the close of the Crimean war, by a similar statute, issucd in February 1856. By thesc enact- ments it was provided that all classes of the sultan’s sub- jects should have security for their lives and property ; that taxes should be fairly imposed and justice impartially administered ; and

that all should have full religious liberty and equal civil rights. The scheme was regarded as so revolutionary by the aristocracy and the educated classes (the Ulema) that it met with keen opposition, and was in consequence but partially put in force, especially in the remoter parts of the empire; and more than one con- spiracy was formed against the sultan's life on account of it. Of the other mcasures of reform promoted by Abdul Medjid the more important were—the reorganisation of the army (1843-4), the institution of a council of public in- struction (1846), the abolition of an odious and unfairly imposed capitation tax, the repression of slave trading, and various provisions for the better administration of the public service and for the advancement of commerce. The public history of his times—the disturbances and insurrections in different parts of his dominions throughout his reign, and the great war successfully carried on against Russia by Turkey, and by England, France, and Sardinia, in the interest of Turkey (1853-56)—can be mercly alluded to in this personal notice. When Kossuth and others sought refuge in Turkey, after the failure of the Hungarian rising in 1849, the sultan was called on by Austria and Russia to surrender them, but boldly and determinedly refused. It is to his credit, too, that he would not allow the con- spirators against his own life to be put to death. He bore the character of being a kind and honourable man. Against this, however, must be set down his excessive extravagance, especially towards the end of his life. He died on the 25th of Junc 1861, and was succeeded, not by one of his sons, but by his brother, Abdul Aziz, the present sultan, as the oldest survivor of the family of Othman.

A BECKET, Tnomas, Archbishop of Cantcrbury and Chancellor of England in the 12th century, was born in London on the 21st of December 1118. His father, Gilbert Beckct, and his mother Roesa or Matilda, were both, there can be little doubt, of Norman extraction, if indeed they themselves were not immigrants from Normandy to England. Gilbert Becket, a merchant, and at one time Sheriff of London, a man of generous impulses and some- what lavish hospitality, provided for his only child Thomas all the attainable advantages of influential society and a good education. At ten years of age Thomas was placed under the tuition of the canons regular of Merton on the Wandle in Surrey. From Merton he procceded to study in the London schools, then in high repute. At Pevensey Castle, the seat of his father's friend Richer de l'Aigle, one of the great

barons of England, he subsequently became a proficient in all the feats and graccs of chivalry. From Pevensey he betook himself to the study of theology in the University of Paris. He never became a scholar, mucli less a theologian, like Wolsey, or even like some of the learned ecclesiastics of his own day; but his intellect was vigorous and original, and his manners captivating to his associates and popular with the multitude. His father's failure in business recalled him to London, and for three years he acted as a clerk in a lawyer's office. But a man so variously accomplished could not fail to stumble on preferment sooner or later. Accordingly, about 1142, Archdeacon Baldwin, a learned civilian, a friend of the elder Becket, introduced him to Theobald, Archbishop of

Canterbury, who at once appointed him to an office in the Archiepiscopal Court. His talents speedily raised him to the archdeaconry of the see. Beckct's tact in assisting to thwart an attempt to intercst the Pope in favour of the coronation of Stephen's son Eustace, paved the way to the archdeacon's elevation to the Chancellorship of England under Henry IL, a dignity to which he was raised in 1155. As he had scrved Theobald the archbishop, so he served Henry the king faithfully and well. It was his nature to be loyal. Enthusiastic partisanship is, in fact, the key to much that is otherwise inexplicable in his subsequent con- duct towards Henry. When ata later period A Becket was raised to the primacy of England, a dignity not of his own seeking, he must needs quarrel with Henry in the interest of the Pope and "for the honour of God." As Chancellor of England he appeared in the war of Toulouse at the head of the chivalry of England, and '" who can recount," says his attendant and panegyrist Grim, 'the carnage, the desolation he made at the head of a strong body of soldiers? He attacked castles, and razed towns and cities to the ground ; he burned down houses and farms, and never showed the slightest touch of pity to any one who rose in insurrection against his master." In single combat he vanquished and made prisoner the valiant Knight Engelram de Trie. Nor did A Becket the chancellor seek to quell Henry's secular foes alone. He was the able mouthpiece of the Crown in its contention with the Bishop of Chichester, who had alleged that the permission of the Pope was necessary to the con- ferring or taking away of ecclesiastical benefices; and he rigorously exacted

scutage, a military tax in lieu of personal service in the field, from the clergy, who accused him of “plunging a sword into the bosom of his mother the church.” His pomp and munificence as chancellor were beyond precedent. In 1159 he undertook, at Henry’s request, an embassy to the French Court for the purpose of affiancing the king’s eldest son to the daughter of the king of France. His progress through the country was like a triumphal procession. “How wonderful must be the king of England himself whose chancellor travels in such state!” was on every one’s lips. In 1162 he was elected Archbishop of Canterbury, Gilbert Foliot, Bishop of Herford, alone dissenting, and remarking sarcastically, at the termination of the ceremony, that “the king had worked a miracle in having that day turned a layman into an archbishop and a soldier into a saint.” Hitherto A Becket had only been in deacon’s orders, and had made no profession of sanctity of life. At the same time, there is nothing to show that his character was stained by the gross licentiousness of the times. Now, however, he devoted himself body and soul to the service of the church. The fastidious courtier was at once transformed into the squalid penitent, who wore hair-cloth next his skin, fed on roots, drank nauseous water, and daily washed the fcet of thirteen beggars. Henry, who had expected to see the archbishop completely sunk in the chancellor, was amazed to receive the following laconic message from A Becket :—“ I desire that you will provide yourself with another chancellor, as I find myself hardly sufficient for the duties of one office, much less of two.” From that moment there was strife between A Becket and Henry, A Becket straining every nerve to extend the authority of the Pope, and Henry doing his utmost to subject the church to his own will. Throughout the bitter struggle for supremacy which ensued between A Becket and the king, A Becket was backed by the sympathy of the Saxon populace, Henry by the support of the Norman barons and by the greater dignitaries of the church. At the outset A Becket was worsted. He was constrained to take an oath, ‘‘ with good faith and without fraud or reserve, to observe the Constitutions of Claren- don,” which subjected clerks guilty of crime to the ordinary

civil tribunals, put ecclesiastical dignities at the royal dis- posal, prevented all appeals to Rome, and made Henry the virtual ‘head of the church.” For

his guilty compliance with these anti-papal constitutions he received the special pardon and absolution of his holiness, and proceeded to anathematise them with the energy of a genuinc remorse. The king resolved on his ruin. He was summoned before a great council at Northampton, and in defiance of justice was called on to account for the sum of 44,000 marks declared to have been misappropriated by him during his chancellorship. “For what happened before my consecra- tion,” said A Becket, “I ought not to answer, nor will I. Know, moreover, that ye are my children in God ; neither law nor reason allows you to judge your father. I refermy quarrel to the decision of the Pope. To him IJ appeal, and shall now, under the protection of the Catholic Church and the Apostolic See, depart.” He effected his escape to France, and took refuge in the Cistercian monastery of Pontigny, whence he repeatedly anathematised his cnemies in England, and hesitated not to speak of Henry as a “ mali- cious tyrant.” Pope Alexander IIL, though at heart a warm supporter of Becket, was guarded in his conduct towards Henry, who had shown a disposition to support the anti-pope Pascal III., and it was not till the Archbishop of York, in defiance of a papal bull, had usurped the functions of the exiled primate by officiating at the coronation of Henry’s son, that Alexander became really formidable.

Becket was now resolute for martyrdom or victory. Henry began to tremble, and an interview between him and Becket was arranged to take place at Fereitville in 1170. It was agreed that A Becket should return to his see, and that the king should discharge his debts and defray the expenses of his journey. A Becket proceeded to the coast, but the king, who had promised to meet him, broke his engagement in every particular. A Becket, in retaliation, excommunicated the Archbishop of York and the Bishops of London and Salisbury for officiating at the coronation of the king’s son. The terrified prelates took refuge in Normandy with Henry, who, on hearing their tale, accompanied by an account of A Becket’s splendid reception at Canterbury, exclaimed in ungovernable fury, ‘‘ Of the cowards who eat my bread, is there not one who will free me from this turbulent priest ?” Four knights, Fitzurse, Tracy, Morville, and Brito, resolved to avenge their sovereign, who it appears was ignorant of their intention. They arrived in Canterbury, and finding the archbishop, threatened him with death if he would not absolve the excommunicated bishops. ‘In vain,” replied A

Becket, ‘you threaten me. If all the swords in England were brandishing over my head, your terrors could not move me. Foot to foot you will find nie fighting the battle of the Lord.” He was barbarously murdered in the great cathedral, at the foot of the altar of St Benedict, on the 29th December 1170. Two years thereafter he was canonised by the Pope; and down to the Reformation innumerable pilgrim- ages were made to the shrine of St Thomas of Canterbury by devotees from every corner of Christendom. So numerous were the miracles wrought at his tomb, that Gervase of Canterbury tells us two large volumes kept in the cathedral were filled with accounts of them. Every fiftieth year a jubilee was celebrated in his honour, which lasted fifteen days ; plenary indulgences were then granted to all who visited his tomb; and as many as 100,000 pilgrims were registered at a time in Canterbury. The worship of St Thomas superseded the adoration of God, and even that of the Virgin. In one year thcre was offered at God’s altar nothing; at that of the Virgin £4, 1s. 8d.; while St Thomas received for his share £954, 6s. 3d.—an enormous sum, if the purchasing power of money in those times be considered. Henry VIII., with a just if somewhat ludicrous appreciation of the issue which A Becket had raiscd

with his royal predecessor Henry IL., not only pillaged the rich shrine dedicated to St Thomas, but caused the saint himself to be cited to appear in court, and to be tried and condemned as a traitor, at the same time ordering his name to be struck out of the calendar, and his bones to be burned and the ashes thrown in the air. A Becket’s character and aims have been the subject of the keenest ecclesiastical and historic controversy down to the present time, but it is im- possible to doubt the fundamental sincerity of the one or the disinterestedness of the other, however inconsistent his actions may sometimes appear. If the fruit of the Spirit be “love, joy, peace, long-suffering, gentleness, goodness, faith, meekness, and temperance,” A Becket was assuredly not a saint, for he indulged to the last in the bitterest invectives against his foes; but that he fought with admirable courage and devotion the “battle of the Lord,” according to the warlike idcas of an age with which he was in intense sympathy, is beyond dispute. He was the leading Ultramontane of his day, hesitating not to reprove the Pope himself for lukewarmness in the cause of the “‘church’s liberty.” He was the last of

the great ecclesiastics of the type of Lanfranc and Anselm, who struggled for supremacy with the civil power in England on almost equal terms. In his day'the secular stream was running very strong, and he might as chancellor have floated down the current pleasantly enough, governing England in Henry's name. He nevertheless perished in a chivalrous effort to stem the torrent. The tendency of his principles was to supersede a civil by a spiritual despotism ; " but, in point of fact," says Hook, in his valuable Life, "he was a high-principled, high-spirited demagogue, who taught the people to struggle for their liberties," a struggle soon to commence, and of which he was by no means an impotent if an unconscious precursor.—See Dr Giles's Vita et Epistole S. Thome Cantuariensis ; Canon Morris's Lafe of St Thomas Becket ; Canon Robertson's Life of Becket ; Canon Stanley's Historical Memorials of Canter- bury; J. G. Nichols Pilgrimages of Walsingham and Canterbury ; Hook's Lives of the Archbishops of Canter- bury; and Lord Campbell's Lives of the Chancellors of Tingland.

A'BECKETT, Gitzert Axgort, a successful cultivator of light literature, was born in London in 1811, and educated at Westminster School. He wrote burlesque dramas with success from his boyhood, took an active share in the establishment of different comic periodicals, particularly Igaro in London and Punch, and was a constant contributor to the columns of the latter from its commencement till the time of his death. His principal publications, all over- flowing with kindly humour, and rich in quaint fancies, are his parodies of living dramatists (himsclf included), reprinted from Punch (1844); The Small Debts Act, with Annotations and Explanations (1845); The Quizziology of the British Drama and The Comic Blackstone (1846); A Comic History of England (1847); and A Comic History of tome (1852). He contributed occasionally, too, to the Times and other metropolitan papers. A'Beckett was called to the bar in 1841, and from 1849 discharged with great efficiency the duties of a metropolitan police magis- ee He died at Boulogne on the 30th of August

ABEL (°3%, breath, vanity, transitoriness), the second son of Adam, slain by Cain his eldcr brother (Gen. iv. 1-16). The narrative in Genesis, which tells us that "the Lord had respect unto Abel and to his offering, but unto Cain and to his offering he had not respect," is supplemented by the statement of the New Testament, that "by faith Abel offered unto God a

more excellent sacrifice than Cain," (Heb. xi. 4), and that Cain slew Abel "because his own works were evil and his brother's righteous " (1 John iii, £2),

'marvellous.

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In patristic theology the striking contrast between the brothers was mystically explained and typically applied in various ways. Augustine, for example, regards Abel as the representative of the regenerate or spiritual man, and Cain as the representative of the natural or corrupt man. Augustine in his treatise De Heresibus, c. 86, mentions a sect of Abelitae or Abelians, who seem to have lived in North Africa, and chiefly in the neighbourhood of Hippo- Regius, According to their tradition, Abel, though married, lived in continence, and they followed his practice in this respect, so as to avoid the guilt of bringing sinful creatures into the world.

ABEL, Karu Friepricu (1726-1787), a celebrated Ger- man musician. His adagio compositions have becn highly praised, but he attained greater distinction as a performer than as a composer, his instrument being the Viola di gamba, which from his time has given place to the violoncello. He studied under Sebastian Bach, played for ten years (1748-58) in the band formed at Dresden by the Elector of Saxony, under Hasse, and then, procecding to England, became (1759) chamber-musician to the queen of George ITI. His life was shortened by habits of intemperance.

ABEL, Niets Henrik, one of the ablest and acutest mathematicians of modern times, was born at, Findde in Norway in 1802, and died near Arendal in 1829. Con- sidering the shortness of his life, the extent and thorough- ness of his mathematical investigations and analyses are His great powers of generalisation were dis- played in a remarkable degree in his development of the theory of elliptic functions. Legendre's eulogy of Abel, "Quelle téte celle du jeune Norvegien !" is the more forcible, that the French mathematician had occupied himself with those functions for most of his lifetime. Abel's works, edited by M. Holmboe, the professor under whom he studied at Christiania, were published by the Swedish government in 1839,

ABEL, THomas, a Roman Catholic divine during the reign of Henry VIII., was an Englishman, but when or where born does not appear. He was educated at Oxford, where he passed B.A. on 4th July 1513, M.A. on 27th June 1516, and proceeded D.D. On 23d June 1530 he was presented by Queen Catherine to the rectory of Brad- well in Essex, on the sea-coast. He had been introduced to the court through the report of his learning in classical and living languages, and accomplishments in music ; and he was appointed domestic chaplain to Queen Catherine. It speaks well both for the chaplain and his royal mistress, that to the last he defended the outraged queen against "bluff King Hal." The Defence, "Invicta Veritas," was printed at Luneberge in 1532. This pungent little book was replied to, but never answered, and remains the defence on Queen Catherine's part. Abel was ensnared, as greater men were, in the prophetic delusions and ravings of Elizabeth Barton, called the "' Holy Maid of Kent." As belonging to the Church of Rome, he inevitably opposed Henry VIII.'s assumption of supremacy in the church. Ultimately he was tried and condemned for " misprision of treason," and perished in the usual cruel and ignoble way. The execution, as described, took place at Smith- field on July 30, 1540. If we may not concede the vene- rable and holy name of martyr to Abel—and John Foxe is passionate in his refusal of it—yet we must hold that he at least fell a victim to his unsparing defence of his queen aud friend, the "misprision of treason" having been a foregone conclusion. In stat. 25, Henry VIIL, c. 12, he is described as having "caused to be printed and set forth in this realme diverse books against the divorce and separation." Neither the Z'ractatus nor the "diverse books" are known.—Dodd, Church History, Brussels, 1737, folio, vol. i. p. 208; eee. Mist, Ecel,

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de Martyr. Fratr. minor. (Ingolst. 1583); Pitts, De illustr. Angl. Scrip. ; Tanner's Bibliotheca Hibernico-Britan- nica, p. i.; Zurich, Original Letters relative to the English Reformation (Parker Society, pt. ii. pp. 209-211, 1846) ; Foxe's Acts and Monuments (Cattley's, vol. v. pp. 438-440) ; Burnet, Soames, Biog. Brit.; Wood's Athen (Bliss), s. v. ; Stow, Chron. p. 581. (A. BG.)

ABELARD, Perer, born at Pallet (Palais), not far from Nantes, in 1079, was the eldest son of a noble Breton house. The name Abwlardus (also written Abailardus, Abaielardus, and in many other ways) is said to be a cor- ruption of Habelardus, substituted by himself for a nick- name Bajolardus given to him when a student. As a boy, he showed an extraordinary quickness of apprehcn- sion, and, choosing a learned life instead of the active career natural to a youth of his birth, carly became an adept in the art of dialectic, under which name philosophy, meaning at that time chiefly the logic of Aristotle trans- initted through Latin channels, was the great subject of liberal study in the episcopal schools. Roscellin, the famous canon of Compitgne, is mentioned by himself as his teacher; but whcther he heard this champion of extreme Nominalism in early youth, when he wandercd about from school to school for instruction and exercise, or some years latcr, after he had already begun to teach for himself, remains uncertain. His wanderings finally brought him to Paris, still under the age of twenty. There, in the great cathedral school of Notre-Dame, he sat for a while under the teaching of William of Champeaux, the disciple of St Anselm and most advanced of Realists, but, presently stepping forward, he overcame the master in discussion, and thus began a long duel that issued in the downfall of the philosophic theory of Realism, till then dominant in the early Middle Age. First, in the teeth of opposition from the metropolitan teacher, he proceeded to set up a school of his own at Melun, whence, for more direct competition, he removed to Corbeil, nearcr Paris. The success of his teaching was signal, though for a time he had to quit the ficld, the strain proving too great for his physical strength. On his return, after 1108, he found William lecturing no longer at Notre-Dame, but in a monastic retreat outside the city, and there battle was again joined between them. Forcing upon the Realist a material change of doctrine, he was once more victorious, and thenceforth he stood supreme. His discomfited rival still had power to keep him from lecturing in Paris, but soon failed in this last effort also. From Melun, where he had resumed teaching, Abelard passed to the capital, and set up his school on the heights of St Geneviéve, looking over Notre-Dame. When he had increased his distine- tion still further by winning reputation in the theological school of Anselm of Laon, no other conquest remained for him. He stepped into the chair at Notre-Dame, being also nominated canon, about the year 1115.

Hew teachers ever held such sway as Abelard now did for a time. Distinguished in figure and manners, he was seen surrounded by crowds—it is said thousands—of students, drawn from all countries by the fame of his tcaching, in which acuteness of thought was relicved by simplicity and grace of exposition. Enriched by the offer- ings of his pupils, and feasted with universal admiration, he came, as he says, to think himself the only philosopher standing in the world. But a change in his fortunes was at hand. In his devotion to science, he had hitherto lived a very regular life, varied only by the excitement of conflict: now, at the height of his fame, other passions began to stir within him. There lived at that time, within the precincts of Notre-Dame, under the care of her uncle, the canon Fulbert, a young girl named Heloise, of noble extraction and born about 1101.

Fair, but still |

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more remarkable for her knowledge, which extended beyond Latin, it is said, to Greek and Hebrew, she awoke a fecl- ing of love in the breast of Abelard; and with intent to win her, he sought and gained a footing in Fulbert's house as a regular inmate. Becoming also tutor to the maiden, he used the unlimited power which he thus obtained over her for the purpose of seduction, though not without cherishing a real affection which she returned in unparalleled devotion. Their relation interfering with his public work, and being, moreover, ostentatiously sung by himself, soon became known to all the world except the too-confiding Fulbert; and, when at last it could not escape even his vision, they were separated only to meet in secret. There- upon Heloise found herself pregnant, and was carried off by her lover to Brittany, where she gave birth to a son. To appease her furious uncle, Abclard now proposed a marriage, under the condition that it should be kept secret, in order not to mar his prospects of advancement in the church; but of marriage, whether public or secret, Heloise would hear nothing. She appealed to him not to sacrifice for her the independence of his life, nor did she finally yield to the arrangement without the darkest fore- bodings, only too soon to be realised. The secret of the marriage was not kept by Fulbert; and when Heloise, true to her singular purpose, boldly then denied it, life was made so unsupportable to her that she sought refuge

in the convent of Argenteuil. Immediately Fulbert, believing that her husband, who aided in the flight, designed to be rid of her, conceived a dire revenge. He and some others broke into Abelard's chamber by night, and, taking him dcfenceless, perpetrated on him the most brutal mutilation. Thus cast down from his pinnacle of greatness into au abyss of shame and misery, there was left to the brilliant master only the life of a monk. Heloise, not yet twenty, consummated her work of self-sacrifice at the call of his jealous love, and took the veil.

It was in the Abbey of St Denis that Abelard, now aged forty, sought to bury himself with his wocs out of sight. Finding, however, in the cloister neither calm nor solitude, and having gradually turned again to study, he yielded after a ycar to urgent entreaties from without and within, and went forth to reopen his school at the Priory of Maisoncelle (1120). His lectures, now framed in a devotional spirit, were heard again by crowds of students, and all his old influence seemed to have returned ; but old enmities were revived also, against which he was no longer able as before to make head. No sooner had he put in writing his theological lectures (apparently the Jntroductio ad Theologiam that has come down to us), than his adver- saries fell foul of his rationalistic interpretation of the Trinitarian dogma. Charging him with the heresy of Sabellius in a provincial synod held at Soissons in 1121, they procured by irregular practices a condemnation of his teaching, whereby hc was made to throw his book into the flames, and then was shut up in the convent of St Médard. After the other, it was the bitterest possible experience that could befall him, nor, in the state of mental desola- tion into which it plunged him, could he find any comfort from being soon again set frec. The life in his own monastery proving no more congenial than formerly, he fled from it in secret, and only waited for permission to live away from St Denis before he chose the one lot that suited his present mood. In a desert place near Nogent- sur-Seine, he built himself a cabin of stubble and reeds, and turned hermit. But there fortune came back to him with a new surprise. His retreat becoming known, students flocked from Paris, and covered the wilderness around him with their tents and huts. When he began to teach again, he found consolation, and in gratitude he consecrated the new oratory they built for him by the uname of the Paraclete,

Upon the return of new dangers, or at least of fears, Abelard left the Paraclete to make trial of another refuge, accepting an invitation to preside over the Abbey of St Gildas-de-Rhuys, on the far-off shore of Lower Brittany. It proved a wretched exchange. The region was inhospit- able, the domain a prey to lawless exaction, the house itself savage and disorderly. Yet for nearly ten years he con- tinued to struggle with fate before he fled from his charge, yielding in the end only under peril of violent death. The misery of those years was not, however, unrelieved ; for he had been able, on the breaking-up of Heloise's convent at Argenteuil, to establish her as head of a new religious house at the deserted Paraclete, and in the capacity of spiritual director he often was called to revisit the spot thus made doubly dear to him. All this time Heloise had lived amid universal esteem for her knowledge and character, uttering no word under the doom that had fallen upon her youth; but now, at last, the occasion came for expressing all the pent-up emotions of her soul. Living on for some time in Brittany after his flight from St Gildas, Abclard wrote, among other things, his famous Historia Calamitatum, and thus moved her to pen her first Letter, which remains an uusurpassed utterance of human passion and womanly devotion ; the first being followed by the two other Leéters, in which she finally accepted the part of resignation which, uow as a brother to a sister, Abelard commended to her. He not long after was seen once more upon the field of his early triumphs, lecturing on Mount St Geneviéve in 1136 (when he was heard by John of Salisbury), but it was only for a brief space: no new triumph, but a last great trial, awaited him in the few years to come of his chequered life. As far back as the Paraclete days, he had counted as chief among his foes Bernard of Clairvaux, in whom was incarnated the principle of fervent and unhesitating faith, from which rational inquiry like his was sheer revolt, and now this uncompromising spirit was moving, at the instance of others, to crush the growing evil in the person of the boldest offender. After preliminary negotiations, in which Bernard was roused by Abelard's steadfastness to put forth all his strength, a council met at Sens, before which Abelard, formally arraigned upon a number of heretical charges, was prepared to plead his cause. When, however, Bernard, not without foregone terror in the prospect of meeting the redoubtable dialec- tician, had opened the case, suddenly Abelard appealed to Rome. The

stroke availed him nothing; for Bernard, who had power, notwithstanding, to get a condemnation passed at the council, did not rest a moment till a second condemnation was procured at Rome in the following year. Meanwhile, on his way thither to urge his plea in person, Abelard had broken down at the Abbey of Cluni, and there, an utterly fallen man, with spirit of the humblest, and only not bereft of his intellectual force, he lingered but a few months before the approach of death. Removed by friendly hands, for the relief of his sufferings, to the Priory of St Marcel, he died on the 21st of April 1142. First buried at St Marcel, his remains soon after were carried off in secrecy to the Paraclete, and given over to the loving care of Heloise, who in time came herself to rest beside them. The bones of the pair were shifted more than once afterwards, but they were marvellously preserved even through the vicissitudes of the French Revolution, and now they lie united in the well-known tomb at Pére-Lachaise.

Great as was the influence exerted by Abelard on the minds of his contemporaries and the course of medieval thought, he has been little known in modern times but for his connection with Heloise. Indeed, it was uot till the present century, when Cousin in 1836 issued the collection entitled Owvrages inédits d'Abélard, that his

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philosophical performance could be judged at first hand; of his strictly philosophical works only one, the ethical treatise Scito te wpsum, having been published earlier, namely, in 1721. Cousin's collection, besides giving ex- tracts from the theological work Stc et Non (an assemblage of opposite opinions on doctrinal points, culled from the Fathers as a basis for discussion), includes the Dialectica, commentaries on logical works of Aristotle, Porphyry, and Boéthius, and a fragment, De Generibus et Speciebus. The last-named work, and also the psychological treatise De Intellectibus, published apart by Cousin (in Fragmens Phalosophiques, vol. ii.), are now considered upon internal evidence not to be by Abelard himself, but only to have sprung out of his school. A genuine work, the Glossule super Porphyrium, from which M. de Rémusat, in his classical monograph Abvélard (1845), has given extracts, remains in manuscript.

The general importance of Abelard lies in his having fixed more decisively than any one before him the scholastic manner of philosophising, with its object of giving a formally rational expression to the received ecclesiastical doctrine. However his own particular inter- pretations may have been condemned, they were conceived in essentially the same spirit as the general scheme of thought afterwards elaborated in the 13th century with approval from the heads of the church. Through hin was prepared in the Middle Age the asccndency of the philosophical authority of Aristotle, which became firmly established in the half-century after his death, when first the completed Organon, and gradually all the other works of the Greek thinker, came to be known in the schools: before his time it was rather upon the authority of Plato that the prevailing Realism sought to lean. As regards the central question of Universals, without having suffi- cient knowledge of Aristotle's views, Abelard yet, in taking middle ground between the extravagant Realism of his master, William of Champeaux, or of St Anselm, and the not less extravagant Nominalism (as we have it reported) of his othcr master, Roscellin, touched at moro than one point the Aristotclian position. Along with Aristotle, also with Nominalists generally, he ascribed full reality only to the particular concretes ; while, in opposi- tion to the "insana sententia" of Roscellin, he declared the Universal to be no mere word (vox), but to consist, or (perhaps we may say) emerge, in the fact of predication (sermo). Lying in the middle between Realism and (extreme) Nominalism, this doctrine has often been spoken of as' Conceptualism, but ignorantly so. Abelard, pre- eminently a logician, did not concern himself with the psychological question which the Conceptualist aims at deciding as to the mental subsistence of the Universal. Outside of his dialectic, it was in ethics that Abelard showed greatest activity of philosophical thought ; laying very particular stress upon the subjective intention as determining, if not the moral character, at least the moral value, of human action. His thought in this direction, wherein he anticipated something of modern speculation, is the more remarkable because his scholastic successors accomplished least in the field of morals, hardly venturing to bring the principles and rules of conduct under pure philo- sophical discussion, even after the great ethical inquries of Aristotle became fully known to them, (G. Cc. RB.)

ABENCERRAGES, a family or faction that is said to have held a prominent position in the Moorish kingdom of Granada in the 15th century. The name appears to have been derived from the Yussuf ben-Serragh, the head of the tribe in the time of Mahommed VII., who did that sovereign good service in his struggles to retain the crown of which he was three times deprived. Nothing is known of the family with certainty; but the name is

familiar from the interesting romance of Gines Perez de Hita, Guerras civiles de Granada, which celebrates the feuds of the Abencerrages and the rival family of the Zegris, and the cruel treatment to which the former were subjected. Florian's Gonsalvo of Cordova, and Chateau- briand's Last of the Abencerrages, are imitations of Perez de Hita's work. The hall of the Abencerrages in the Alhambra takes its name from being the reputed scene of the massacre of the family. :

ABENEZBA, or Isw Ezra, is the name ordinarily given to ABRAHAM BEN Murr BEN Ezra (called also Abenare or Evenare), one of the most eminent of the Jewish literati of the Middle Ages. He was born at Toledo about 1090; left Spain for Rome about 1140; resided afterwards at Mantua (1145), at Lucca (1154), at Rhodes (1155 and 1166), and in England (1159) ; and died probably in 1168. He was distinguished as a philosopher, astronomer, physician, and poet, but especially as a grammarian and commentator. The works by which he is best known form a series of Com- mentaries on the books of the Old Testament, which have nearly all been printed in the great Rabbinic Bibles of Bomberg (1525-6), Buxtorf (1618-9), and Frankfurter (1724-7). Abenezra's commentaries are acknowledged to be of very great value ; he was the first who raised biblical exegesis to the rank of a science, interpreting the text according to its literal sense, and illustrating it from cognate languages. His style is elegant, but is so concise as to be sometimes obscure ; and he occasionally indulges in epigram. In addition to the commentaries, he wrote several treatises on astronomy or astrology, and a number of grammatical works.

ABENSBERG, a small town of Bavaria, 18 miles S.W. of Regensburg, containing 1300 inhabitants. Here Napo- leon gained an important victory

over the Austrians on the 20th of April 1809. The town is the Abusina of the Romans, and ancient ruins exist in its neighbourhood.

ABERAVON, a parliamentary and municipal borough of Wales, in the county of Glamorgan, beautifully situated on the Avon, near its mouth, 8 miles east of Swansea. The town and adjacent villages have increased rapidly in recent years, from the extension of the mines of coal and iron in the vicinity, and the establishment of extensive works for the smelting of tin, copper, and zinc. The harbour, Port Talbot, has been much improved, and has good docks; and there is regular steam communication with Bristol. Ores for the smelting furnaces are imported from Cornwall, and copper, tin, and coal are exported. Aberavon unites with Swansea, Kenfigg, Loughor, and Neath, in returning a member to Parliament. In 1871 the population of the parish was 3396, of the parliamentary borough, 11,906.

ABERCONWAY. See Conway.

ABERCROMBIE, Joun, an eminent physician of Kdin- burgh, was the son of the Rev. George Abercrombie of Aberdeen, in which city he was born in 1781. After attending the Grammar School and Marischal College, Aberdeen, he commenced his medical studies at Edinburgh in 1800, and obtained his degree of M.D. there in 1803. Soon afterwards he went to London, and for about a year gave diligent attention to the medical practice and lectures in St George's Hospital. In 1804 he returned to Edin- burgh, became a Fellow of the College of Surgeons, and commenced as general practitioner in that city; where, in dispensary and private practice, he laid the foundation of that character for sagacity as an observer of disease, and judgment in its treatment, that eventually elevated him to the head of his profession. In 1823, be became a Licen- tiate of the College of Physicians; in 1824, a Fellow of that body; and from the death of Dr Gregory in 1822, he was considered the first physician in Scotland. Aber-

crombie early began the laudable practice of preserving accurate notes of the cases that fell under his care ; and at a period when pathological anatomy was far too little regarded by practitioners in this country, he had the merit of sedulously pursuing it, and collecting a mass of most important

information regarding the changes pro-: duced by disease on different organs; so that, before the year 1824, he had more extended experience, and more correct views in this interesting field, than most of his contemporaries engaged in extensive practice. From 1816 he occasionally enriched the pages of the Hdinburgh Medical and Surgical Journal with essays, that display originality and industry, particularly those " on the diseases of the spinal cord and brain," and "on diseases of the intestinal canal, of the pancreas, and spleen." The first of these formed the basis of his great and very original work, Pathological and Practical Researches on Diseases

of the Brain and Spinal Cord, which appeared at Edin-

burgh in 1828. In the same year he published also another very valuable work, his Researches on the Diseases of the Intestinal Canal, Liver, and other Viscera of the Abdomen. Though his professional practice was very extensive and lucrative, he found time for other specula- tions and occupations. In 1830 he published his Inquiries concerning the Intellectual Powers of Man and the Investi- gation of Truth, a work which, though less original and profound than his medical speculations, contains a popular view of an interesting subject, expressed in simple language. It was followed in 1833 by a sequel, The Philosophy of the Moral Feelings, the object of which, as stated in the preface, was "to divest the subject of all improbable speculations," and to show "the important relation which subsists between the science of mind and the doctrines of revealed religion." Both works have been very extensively read, reaching the 18th and 14th editions respectively in 1869. Soon after the publication of Moral Feelings, the University of Oxford conferred on the author the honorary degree of Doctor of Medicine, and in 1835 he was elected Lord Rector of Marischal College, Aberdeen. Dr Aber- crombie was much beloved by his numerous friends for the suavity and kindness of his manners, and was uni- versally esteemed for his benevolence and unaffected piety. He died on the 14th of November 1844 of a very uncom- mon disease, the bursting (from softening of the muscular substance) of the coronary vessels of the heart. ABERCROMBY, Davin, M.D. This Scottish physi- cian was sufficiently noteworthy half a century after his (probable) decease to have his Nova Medicine Praxis reprinted at Paris in 1740; while during his lifetime his Tuta ac efficax luis venerece seepe absque mercurio ac semper absque

salivatione mercuriali curando methodus (1684, 8vo) was translated into German and published at Dresden in 1702 (8vo). In 1685 were published De Pulsus Varia- tione (London; Paris, 1688, 12mo), and Ars explorandi medicas facultates plantarum ex solo sap. (London). His Opuscula were collected in 1687. These professional writings gave him a place and memorial in Haller's Biblzo- theca Medicine Pract. (4 vols. 8vo, 1779, tom. iii. p. 619); but he claims passing remembrance rather as a meta- physician by his remarkable controversial books in theo- logy and philosophy. Formerly a Roman Catholic and Jesuit, he abjured Popery, and published Protestancy proved Safer than Popery (London, 1686). But by far the most noticeable of his productions is A Dvscourse of Wit (London, 1685). This treatise somehow has fallen out of sight—much as old coined gold gets hidden away —so that bibliographers do not seem to have met with it, and assign it at hap-hazard to Patrick Abercromby, M.D. Notwithstanding, the most cursory examination of it proves that in this Discourse of Wit are contained

some of the most characteristic and most definitely-put metaphysical opinions of the Scottish philosophy of com- mon sense. Of this early metaphysician nothing biographi- cally has come down save that he was a Scotchman ("'Scotus")—born at Seaton. He was living early in the 18th century. (Haller, as supra; Lawrence Charteris's M.S., s. v.) So recently as 1833 was printed A Short Account of Scots Divines by him, edited by James Maidment, Edinburgh. (A. B. G.) ABERCROMBY, James, Lorp DUNFERMLINE, third son of the celebrated Sir Ralph Abercromby, was born on the 7th Nov. 1776. Educated for the profession of the law, he was called to the bar at Lincoln's Inn in 1801, but he was prevented from engaging to any considerable extent in general practice by accepting appointments, first as commis- sioner in bankruptcy, and subsequently, as steward of the estates of the Duke of Devonshire. He commenced his political career in 1807, when he was elected member of Parliament for the borough of Midhurst. His sympathies with the small and struggling Opposition had already been declared, and he at once attached himself to the Whig party, with which he consistently acted throughout life. In 1812 he was returned for Calne, which he continued to represent until his elevation

to the Scotch bench in 1830. During this lengthened period he rendered conspicuous and valuable services to his party and the country. In Scotch affairs he took, as was natural, a deep interest; and, by introducing, on two separate occasions, a motion for the redress of a special glaring abuse, he undoubtedly -gave a strong impulse to the growing desire for a general reform. In 1824, and again in 1826, he presented a petition from the inhabitants of Edinburgh, and followed it up by a motion “for leave to bring in a Bill for the more effectual representation of the city of Edinburgh in the Commons House of Parliament.” The motion was twice rejected, but by such narrow majorities as showed that the monopoly of the self-elected Council of thirty-three was doomed. In 1827, on the accession of the Whigs to power under Mr Canning, Abercromby received the appointment of Judge- Advocate-General and Privy Counsellor. In 1830 he was raised to the judicial bench as Chief Baron of the Exche- quer in Scotland. The office was abolished in 1832; and almost contemporaneously, Edinburgh, newly enfranchised, was called to return two members to the first reformed Parliament. As the election marked the commencement of a new political era, the honour to be conferred possessed a peculiar value, and the choice of the citizens fell most appropriately on Francis Jeffrey and James Abercromby, two of the foremost of those to whom they were indebted for their hard-won privileges. In 1834 Mr Abercromby obtained a seat in the cabinet of Lord Grey as Master of the Mint. On the assembling of the new Parliament in 1835, the election of a speaker gave occasion for the first trial of strength between the Reform party and the followers of Sir Robert Peel. After a memorable division, in which more members voted than had ever before been known, Abercromby was elected by 316 votes, to 310 recorded for Manners-Sutton. The choice was amply justified, not only by the urbanity, impartiality, and firmness with which Abercromby discharged the public duties of the chair, but also by the important reforms he introduced in regard to the conduct of private business. In 1830 he resigned the office, and received the customary honour of a peerage, with the title of Lord Dunfermline. The evening of his life was passed in retirement at Colinton, near Edinburgh, where he died on the 17th April 1858. The courage and sagacity which marked his entire conduct as a Liberal were never more conspicuous than when, towards the close of his life, he availed himself of an opportunity of practically asserting his cherished doctrine of absolute religious equality. The

important part he took in originating and supporting the’ United Industrial School in Edinburgh for ragged children, irrespective of their religious belief, deserves to be grate- fully acknowledged and remembered, even by those who took the opposite side in the controversy which arose with regard to it.

ABERCROMBY, Patrick, M.D., was the third son of Alexander Abercromby of Fetterneir in Aberdeenshire, and brother of Francis Abercromby, who was created by James II. Lord Glasford. He was born at Forfar in 1656. As throughout Scotland, he could have had there the benefits of a good parish school; but it would seem from after events that his family was Roman Catholic, and hence, in all pro- bability, his education was private. This, and not the un- proved charge of perversion from Protestantism in subser- viency to James II., explains his Roman Catholicism and adhesion to the fortunes of that king. But, intending to become a doctor of medicine, he entered the University of St Andrews, where he took his degree of M.D. in 1689. From a statement in one of his preface-epistles to his mag- num opus, the Martial Achievements of the Scots Nation, he must have spent most of his youthful years abroad. It has been stated that he attended the University of Paris. The Discourse of Wit (1685), assigned to him, belongs to Dr David Abercromby, a contemporary. On his return to Scotland, he is found practising as a physician in Edinburgh, where, besides his professional duties, he gave himself with characteristic zeal to the study of antiquities, a study to which he owes it that his name still lives, fer he finds no place in either Haller or Hutchison’s Medical Biographies. He was out-and-out a Scot of the old patriotic. type, and, living as he did during the agitations for the union of England and Scotland, he took part in the war of pamphlets inaugurated and sustained by prominent men on both sides of the Border. He crossed swords with no less redoubtable a foe than Daniel Defoe in his Advantages of the Act of Security, compared with those of the intended Union (Edinburgh, 1707), and A Vindication of the Same against Mr De Foe (ibid.) The logic and reason were with Defoe, but there was a sentiment in the advocates of independence which was not sufficiently allowed for in the clamour of debate; and, besides, the disadvantages of union were near, hard, and actual,

the advantages remote, and contingent on many things and persons. Union wore the look to men like Abercromby and Lord Belhaven of absorption, if not extinction. Aber- cromby was appointed physician to James II., but the Re- volution deprived him of the post. Crawford (in his Peer- age, 1716) ascribes the title of Lord Glasford to an intended recognition of ancestral loyalty; its bestowment in 1685 corresponding with the younger brother's graduation as M.D., may perhaps explain his appointment. A minor literary work of Abercromby's was a translation of M. Beague's partizan History (so called) of the War carried on by the Popish Government of Cardinal Beaton, aided by the French, against the English under the Protector Somerset, which appeared in 1707. The work with which Aber- cromby's name is permanently associated is his already noticed Martial Achievements of the Scots Nation, issued in two noble folios, vol. i. 1711, vol. iu. 1716. In the title- page and preface to vol. i. he disclaims the ambition of being an historian, but in vol. ii., in title-page and preface alike, he is no longer a simple biographer, but an historian. That Dr Abercromby did not use the word "genwine history" in his title-page without warrant is clear on every page of his large work. Granted that, read in the light of after researches, much of the first volume must necessarily be relegated to the region of the mythical, none the less was the historian a laborious and accomplished reader and inves- tigator of all available authorities, as well manuscript as

printed; while the roll of names of those who aided him includes every man of note in Scotland at the time, from Sir Thomas Craig and Sir George Mackenzie to Mr Alex- ander Nisbet and Mr Thomas Ruddiman. The Martzal Achievements has not been reprinted, though practically the first example of Scottish typography in any way noticeable, vol. ii. having been printed under the scholarly supervision of Thomas Ruddiman. The date of his death is uncertain. It has been variously assigned to 1715, 1716, 1720, and 1726, and it is usually added that he left a widow in great poverty. That he was living in 1716 is certain, as Crawford speaks of him (in his Peerage, 1716) as "my worthy friend." Probably he died about 1716. Memoirs of the Abercrombys, commonly given to him, does not appear to have been published. (Chambers's Eminent Scotsmen, s. v.; Anderson's Scottish

Nation, s. v.; Chalmers's Biog. Dict., s. v.; Chalmers's Infe of Ruddiman ; Haller's Bibliotheca Medicine Pract., 4 vols. 4to, 1779; Hutchin- son's Biog. Medical, 2 vols. 8vo, 1799; Lee's Defoe, 3 vols. 8vo.) (A. B. G.)

ABERCROMBY, Sir Ratpu, K.B., Lieutenant-General in the British army, was the eldest son of George Aber- cromby of Tullibody, Clackmannanshire, and was born in October 1734. After passing some time at an excellent school at Alloa, he went to Rugby, and in 1752-53 he attended classes in Edinburgh University. In 1754 he was sent to Leipsic to study civil law, with a view to his pro- ceding to the Scotch bar, of which it is worthy of notice that both his grandfather and his father lived to be the oldest members. On returning from the Continent he expressed a strong preference for the military profession, and a cornet's commission was accordingly obtained for him (March 1756) in the 3d Dragoon Guards. He rose through the intermediate gradations to the rank of lieu- tenant-colonel of the regiment (1773), and in 1781 he became colonel of the 103d infantry. When that regiment was disbanded in 1783 he retired upon half-pay. That up to this time he had scarcely been engaged in active service, was owing mainly to his disapproval of the policy of the Government, and especially to his sympathies with the American colonists in their struggles for independence ; and his retirement is no doubt to be ascribed to similar feelings. But on France declaring war against England in 1793, he hastened to resume his professional duties; and, being esteemed one of the ablest and most intrepid officers in the whole British forces, he was appointed to the command of a brigade under the Duke of York, for service in Holland. He commanded the advanced guard in the action on the heights of Cateau, and was wounded at Nimeguen. The duty fell to him of protecting the British army in its disastrous retreat out of Holland, in the winter of 1794-5. In 1795 he received the honour of knighthood, the Order of the Bath being conferred on him in acknowledgment of his services. The same year he was appointed to succeed Sir Charles Grey, as commander- in-chief of the British forces in the West Indies. In 1796, Grenada was suddenly attacked and taken by a detach- ment of the army under his orders. He afterwards obtained possession of the settlements of Demerara and Essequibo, in South America, and of the islands of St Lucia, St Vincent, and Trinidad. He returned in 1797 to Europe, and, in reward for his important services, was appointed to the command of the regiment of Scots Greys, intrusted with the governments of the Isle of Wight, Fort George, and Fort Augustus, and

raised to the rank of lieu- tenant-general. He held, in 1797-8, the chief command of the forces in Ireland. There he laboured to maintain the discipline of the army, to suppress the rising rebellion, and to protect the people from military oppression, with a care worthy alike of a great general and an enlightened

and beneficent statesman. When he was appointed to the command in Ireland, an invasion of that country by the French was confidently anticipated by the English Government. He used his utmost efforts to restore the discipline of an army that was utterly disorganised ; and, as a first step, he anxiously endeavoured to protect the people, by re-establishing the supremacy of the civil power, and not allowing the military to be called out, except when it was indispensably necessary for the enforcement of the law and the maintenance of order. Finding that he received no adequate support from the head of the Irish Govern- ment, and that all his efforts were opposed and thwarted by those who presided in the councils of Ireland, he resigned the command. His departure from Ireland was deeply lamented by the reflecting portion of the pcople, and was speedily followed by those disastrous results which he had anticipated, and which he so ardently desired and had so wisely endeavoured to prevent. After holding for a short period the office of Commander-in-Chief in Scotland, Sir Ralph, when the enterprise against Holland was resolved upon in 1799, was again called to command under the Duke of York. The difficulties of the ground, the incle- mency of the season, unavoidable delays, the disorderly movements of the Russians, and the timid duplicity of the Dutch, defeated the objects of that expedition. But it was confessed by the Dutch, the French, and the British alike, that even victory the most decisive could not have more conspicuously proved the talents of this distin- guished officer. His country applauded the choice, when, in 1801, he was sent with an army to dispossess the French of Egypt. His experience in Holland and the West Indies particularly fitted him for this new command, as was proved by his carrying his army in health, in spirits, and with the requisite supplies, in spite of very great diffi- culties, to the destined scene of action. The debarkation of the troops at Aboukir, in the face of an opposing force, is justly ranked among the most daring and brilliant exploits of the English

army. A battle in the neighbour- hood of Alexandria (March 21, 1801) was the sequel of this successful landing, and it was Sir R. Abercromby's fate to fall in the moment of victory. He was struck by a spent ball, which could not be extracted, and died seven days after the. battle. The Duke of York paid a just tribute to the great soldier's memory in the general order issued on the occasion of his death :—" His steady observ- ance of discipline, his ever-watchful attention to the health and wants of his troops, the persevering and un- conquerable spirit which marked his military career, the splendour of his actions in the field, and the heroism of his death, are worthy the imitation of all who desire, like him, a life of heroism and a death of glory." By a vote of the House of Commons, a monument was erected in honour of Sir Ralph Abercromby in St Paul's Cathedral. His widow was created a peeress, and a pension of £2000 a year was settled on her and her two successors in the title. It may be mentioned that Abercromby was returned, after a keen contest, as member of Parliament for his native county of Clackmannanshire in 1773; but a parlia- mentary life had no attractions for him, and he did not seek re-election. A memoir of the later years of his life (1793-1801), by his son, Lord Dunfermline, was published in 1861.

ABERDARE, a town of Wales, in the county of Glamorgan, on the right bank of the river Cynon, four miles S.W. of Merthyr-Tydvil. The district around is rich in valuable mineral products, and coal and iron mining are very extensively carried on in the neighbour- hood. Important tin-works, too, have been recently opened. Part of the coal is used at the iron-works, and large quantities are sent to Cardiff for exportation. Aber-

city and received gifts from the authorities. In 1497 a blockhouse was built at the harbour mouth as a protection against the English. During the religious struggle in the 17th century between the Royalists and Covenanters the city was plundered by both parties. In 1715 Earl Marischal proclaimed the Pretender at Aberdeen. In 1745 the Duke of Cumberland resided a short time in the city. In the middle of the 18th century boys were kidnapped in Aberdeen, and sent as slaves to America. In 1817 the city became insolvent, with a debt of £225,710, contracted by public

improvements, but the debt was soon paid off. The motto on the city arms is Bon-Accord. It formed the watchword of the Aberdonians while aiding King Robert the Bruce in his battles with the English.

Of eminent men connected with Aberdeen, New and Old, may be mentioned—John Barbour, Hector Boece or Boethius, Bishop Elphinstone, the Earls Marischal ; George Jamesone, the famous portrait painter ; Edward Raban, the first printer in Aberdeen, 1622; Rev. Andrew Cant, the Covenanter ; David Anderson (Davie do a' thing), a mechanic; James Gregory, inventor of the reflecting telescope ; Dr Thomas Reid, the metaphysician; Dr George Campbell, Principal of Marishal College, author of several important works, and best known by his Philosophy of Ethetoric ; Dr James Beattie; Lord Byron; Sir James Mackintosh; Robert Hall; Dr R. Hamilton, who wrote on the National Debt.

Till 1800 the city stood on a few eminences, and had steep, narrow, and crooked streets, but, since the Improve- ment Act of that year, the whole aspect of the place has been altered by the formation of two new spacious and nearly level streets (Union Street and King Street, meet- ing in Castle Street), and by the subsequent laying out of many others, besides squares, terraces, &c., on nearly flat ground. The city is above eight miles in circuit, and is built on sand, gravel, and boulder clay. The highest parts are from 90 to 170 feet above the sea. The chief thorough- fare is Union Street, nearly a mile long and 70 feet broad. It runs W.S.W. from Castle Street, and crosses the Den- burn, now the railway valley, by a noble granite arch 132 feet in span and 50 feet high, which cost, with a hidden arch on each side, £13,000.

Aberdeen is now a capacious, elegant, and well-built Public town, and from the material employed, consisting chiefly of Buildings. light grey native granite, is called the " granite city." It contains many fine public buildings. The principal of these is Marischal College or University Buildings, which stands on the site of a pre-Reformation Franciscan Convent, and was rebuilt, 1836-1841, at a cost of about £30,000. It forms three sides of a court, which is 117 by 105 feet, and has a back wing, and a tower 100 feet high, The accommodation consists of twenty-five large class-rooms and laboratories, a hall, library, museums, &e.

The University of Aberdeen was formed by the union and incorporation, in 1860, by Act of Parliament, of the University and King’s College of Aberdeen, founded in Old Aberdeen, in 1494, by William Elphinstone, Bishop of Aberdeen, under the authority of a Papal bull obtained by James IV., and of the Marischal College and University of Aberdeen, founded in New Aberdeen, in 1593, by George Keith, Earl Marischal, by a charter ratified by Act of Par- liament. The officials consist of a chancellor, with rector and principal; there are 21 professors and 8 assistants, Arts and divinity are taught in King’s College, and medicine, natural history, and law in Marischal College. The arts session lasts from the end of October to the beginning of April. The arts curriculum of four years, with gradua- tion, costs £36, 1ls. There are 214 arts bursaries, 29 divinity, and 1 medical, of the aggregate annual value of £3646, £650, and £26, respectively, About 60 arts

dare is counected with the coast by canal and railway. Owing to the great development of the coal and iron trade, it has rapidly increased from a mere village to a large and flourishing town. Handsome churches, banks, and hotels have been erected, a good supply of water has been introduced, and a public park has been opened. Two markets are held weekly. The whole parish falls within the parliamentary borough of Merthyr-Tydvil. The rapid growth of its population is seen by the fol- lowing figures: in 1841 the number of inhabitants was 6471; in 1851, 14,999; in 1861, 32,299; and in 1871,

37,774.

ABERDEEN, a royal burgh and city, the chief part of a parliamentary burgh, the capital of the county of Aberdeen, the chief seaport in the north of Scotland, and the fourth Scottish towu in population, industry, and wealth. It lies in lat. 57° 9’ N. and long. 2° 6’ W., on the German Ocean, near the mouth of the river Dee, and is 542 miles north of London, and 111 mules north of Edinburgh, by the shortest railway routes.

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distory. Aberdeen, probably the Devana on the Diva of Ptolemy, was an important place in the 12th century. William the Lion had a residence in the city, to which he gave a char- ter in 1179, confirming the corporate rights granted by David I. The city received many subsequent royal charters. It was burned by Edward III. in 1336, but it was soon rebuilt and extended, and called New Aber- deen. The houses were of timber and thatched, and many such existed till 1741. The burgh records are the oldest of any Scottish burgh. They begin in 1398, and are complete to the present time, with only a short break. Extracts from them, extending from 1398 to 1570, have been published by the Spalding Club. For many centuries the city was subject to attacks by the barons of the sur- rounding districts, and its avenues and six ports had to be guarded. The ports had all been removed by 1770. Several monasteries existed in Aberdeen before the Re- formation. Most of the Scottish sovereigns visited the

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Churches and Schools.

bursaries, mostly from £10 to £35 in value, are given ycarly by competition, or by presentation and examination. ‘Two-thirds of the arts students are bursars. Seventeen annual scholarships and prizes of the yearly value of £158 are given at the end of the arts curriculum. The average yearly number of arts students, in the thirteen years since the union of the arts classes of the two colleges in 1860, has been 342, while in the separate colleges together for the nine years before the union, it was 431. In winter session

1872-73 there were 623 matriculated students in all the faculties. In 1872, 32 graduated in arts, 68 in medicine, 5 in divinity, and 1 in law. The library has above 80,000 volumes. The General Council in 1873 had 2075 registered members, who, with those of Glasgow Uni- versity, return one member to Parliament.

The Free Church Divinity College was built in 1850, at the cost of £2025, in the Tudor-Gothic style. It has a large hall, a library of 12,000 volumes, and 15 bursaries of the yearly value of from £10 to £25.

‘At the east end of Union Street, and partly in Castle Street, on the north side, are the new County and Muni cipal buildings, an imposing Franco-Scottish Gothic pile, 925 feet long, 109 feet broad, and 64 feet high, of four stories, built 1867-1873 at the cost of £80,000, including £25,000 for the site. Its chief feature is a tower 200 feet high. It contains a great hall, 74 feet long, 35 feet broad, and 50 feet high, with an open timber ceiling: a Justiciary Court-House, 50 feet long, 37 feet broad, and 31 feet high; a Town Hall, 41 feet long, 25 feet broad, and 15 feet high, and a main entrance corridor 60 feet long, 16 feet broad, and 24 feet high. A little to the west is the Town and County Bank, a highly ornamented building inside and outside, in the Italian style, costing about £24,000.

A very complete closed public market of two floors was built in 1842, at a cost of £28,000, by a company incor- porated by Act of Parliament. The upper floor or great hall is 315 feet long, 106 feet broad, and 45 feet high, with galleries all round. The lower floor is not so high. The floors contain numerous small shops for the sale of meat, fowls, fish, &c., besides stalls and seats for the sale of vegetables, butter, eggs, &c. The gallerics contain small shops for the sale of drapery, hardware, fancy goods, and books. On the upper floor is a fountain of polished Peter-

head granite, costing £200, with a basin 7} feet diameter,

cut out of one block of stone. Connected with this under- taking was the laying out of Market Street from Union Street to the quay. At the foot of this street is being built in the Italian style the new post and telegraph office, at a cost of £16,000, including £4000, the cost of the site. It is to form a block of about 100 feet square and 40 feet high.

‘Aberdeen has about 60 places of worship, with nearly 48,000 sittings. There are 10 Established churches; 20 Free, 6 Episcopalian, 6 United Presbyterian, 5 Congre- gational, 2 Baptist, 2 Methodist, 2 Evangelical Union, 1 Unitarian, | of Roman Catholic, 1 of Friends, and 1 of Origi- nal Seceders. There arc also several mission chapels. In 1843 all the Established ministers seceded, with 10,000 lay members. ‘The Established and Free Church denomina- tions have each about 11,000 members in communion. The Established West and East churches, in the centre of ‘the city, within St Nicholas churchyard, form a continuous building 220 feet long, including an intervening aisle, over ‘which is a tower and spire 140 feet high. The West was built in 1775 in the Italian style, and the East in 1834 in the Gothic, each costing about £5000. They occupy the

site of the original cruciform church of St Nicholas, erected

‘in the 13th, 14th, and 15th centuries. One of the ninc

bells in the tower bears the date of 1352, and is 4 feet

diameter at the mouth, 34 feet high, and very thick. The Union Street front of the churchyard is occupied by a very elegant granite fagade, built in 1830, at the cost of £1460. Itis 1474 feet long, with a central arched gateway and entablature 324 feet high, with two attached Ionic columns on each side. Each of the two wings has six Ionic columns (of single granite blocks, 15 feet 2 inches long), with basement and entablature, the whole being 234 feet high. The following are the style, cost, and date of erection of the other principal Aberdeen churches—St An- drew’s, Episcopal, Gothic, £6000, 1817; North Church,

Established, Greek, £10,000, 1831; three churches in a

cruciform group, Frec, simple Lancet Gothic, with a fine brick spire 174 feet high, £5000, 1844; Roman Catholic, Gothic, £12,000, 1859; Free West, Gothic, £12,856, 1869, with a spire 175 feet high.

In 1873 there were in Aberdeen about 110 schools, with from 10,000 to 11,000 pupils in attendance. About 2500 students attend the University, Mechanics' Institution, and private schools for special branches.

Five miles south-west of Aberdeen, on the south side of the Dee, in Kincardineshire, is St Mary's Roman Catholic College of Blairs, with a president and three professors.

The Aberdeen Grammar School, dating from about 1268, is a preparatory school for the university. It has a. rector and four regular masters, who teach classics, English, arithmetic, and mathematics, for the annual fee of £4, 10s. for each pupil. Writing, drawing, &c., are also taught. Nearly 200 pupils attend, who enter about the age of twelve. Like the Edinburgh High School, it has no elementary department. There are 30 bursaries. A new granite building for the school was erected, 1861-1863, in the Scotch baronial style, at the cost of £16,000, in- cluding site. It is 215 feet long and 60 feet high, and has three towers.

The Mechanics' Institution, founded 1824, and re- organised 1834, has a hall, class-rooms, and a library of 14,000 volumes, in a building erected in 1846, at a cost of £3500. During the year 1872-73, there were at the School of Science and Art 385 pupils; and at other evening classes,

538.

Aberdeen has two native banks, besides branch banks, and a National Security Savings Bank ; three insurance companies, four shipping companies, three railway com- panies, and a good many miscellaneous companies. 'There are ten licensed pawnbroking establishments, with about 440,000 pledges in the year for £96,000, and with a capital of £27,000. There are seven incorporated trades, originating between 1398 and 1527, and having charitable funds for decayed members, widows, and orphans, They have a hall, built in 1847 for £8300, in the Tudor Gothic style. The hall, 60 feet long, 29 wide, and 42 high, con- tains curious old chairs, and curious inscriptions on the shields of the crafts.

Banks, &¢

Among the charitable institutions is Gordon’s Hospital, Charities

founded in 1729 by a miser, Robert Gordon, a Dantzic merchant, of the Straloch family, and farther endowed by Alexander Simpson of Collyhill in 1816. It is managed by the Town Council and four of the Established ministers of Aberdcen, incorporated by royal charters of 1772 and 1792. The central part of the house was built in 1739, and the wings in 1830-1834, the whole costing £17,300, and being within a garden of above four acres. It now (1873) maintains and educates (in English, writing, arithmetic, physics, mathematics, drawing, music, French, &c.) 180 boys of the age 9 to 15, the sons and grandsons of decayed burgesses of guild and trade of the city; and next those of decayed inhabitants (not paupers). Expendi- ture for year to 31st October 1872, £4353 for 164 boys. It has a head-master, three regular, and several visiting

Music Hall.

| Theatre.

ABERDEEN

masters. The Boys’ and Girls’ Hospital, lately built for £10,000, maintains and educates 50 boys and 50 girls.

The Female Orphan Asylum, founded by Mrs Elmslie, in 1840, and managed by trustees, maintains and educates, chiefly as domestic servants, 46 girls betwcen the ages of 4 and 16, at the yearly cost for each of about £23, 13s. Those admitted must be legitimate orphan daughters of respectable parents, who have lived three years imme- diately before death in Aberdeen or in the adjoining parishes of Old Machar and Nigg. The Hospital for Orphan and Female Destitute Children, endowed by John Carnegic and the trustees of the Murtle Fund, maintains and educates 50 girls, chiefly for domestic service. The Asylum for the Blind, established in 1843, on a foundation by Miss Cruickshank, maintains and educates about 10 blind children, and gives industrial employment to blind adults. There is a boys’ and girls’ school for 150 boys and 150 girls on Dr Bell’s foundation. The Industrial Schools, begun by Sheriff Watson in 1841, and the Re- formatory Schools, begun in 1857, having some 600 pupils on the

roll, have greatly diminished juvenile crime in the district. The Murtle or John Gordon's Charitable Fund, founded in 1815, has an annual revenue from land of about £2400, applicable to all kinds of charity, in sums from £5 to £300. The Midbeltie Fund, founded by a bequest of £20,000, in 1848, by James Allan of Midbeltie, gives yearly pensions ranging from £5 to £15 to respectable decayed widows in the parishes of St Nicholas and Old Machar.

The two parishes in which Aberdeen is situated, viz., St Nicholas and Old Machar, have cach a, large poor-house. The poor of both parishes cost about £20,000 a year.

The Royal Infirmary, instituted in 1740, was rebuilt 1833-1840, in the Grecian style, at the cost of £17,000. It is a well-situated, large, commodious, and imposing building. It has three stories, the front being 166 feet long and 50 feet high, with a dome. A detached fever- house was built in 1872 for about £2500. The managers were incorporated by royal charter in 1773, and much increased in number in 1852. The institution is sup- ported by land rents, feu-duties, legacies, donations, sub- scriptions, church collections, &c. Each bed has on an average 1200 cubic feet of space. There are on the average 130 resident patients, costing each on the average a shilling daily, and the number of patients treated may be stated at

_ 1700 annually, besides outdoor patients receiving advice and

medicine. The recent annual expenditure has been about £4300. There is a staff of a dozen medical officers.

The Royal Lunatic Asylum, opened in 1800, consists of two separate houses, valued in 1870 at £40,000, in an enclosure of 40 acres. It is under the same management asthe Infirmary. The recent daily average of patients has been about 420, at an annual cost of £13,000. The annual vate for each pauper is £25, 10s. The General Dispensary, Vaccine, and Lying-in Institution, founded in 1823, has had as many as 6781 cases in one year. The Hospital for Incurables has a daily average of 26 patients, and the Oph- thalmic and Auric Institution has had 671 cases in a year.

The Music Hall, built in 1821 and 1859 at the cost of £16,500, has a front 90 feet long, with a portico of 6 Ionic pillars 30 feet high; large, highly-decorated lobbies and rooms; and a hall 150 feet long, 68 broad, and 50 high, with a flat ceiling, and galleries, The hall holds 2000 persons seated, and has a fine organ and an orchestra for 300. Here H.R.H. Prince Albert opened the British Association, as president, 14th September 1859. A new Theatre and Opera House was built in 1872, in the mixed Gothic style, for £8400, with the stage 524 feet by 29, and the auditorium for 1700 to 1800 persons. The front wall is of bluish granite and red and yellow freestone, with

some polished Peterhcad granite pillars, the rest being built of concrete.

In Castle Street, the City Place and Old Market Stance, market is the Market Cross, a beautiful, open-arched, hexagonal Cross.

structure of freestone, 21 feet diameter, and 18 feet high. It has Ionic columns and pilasters, and an entablature of twelve panels. On ten of the panels are medallions, cut in stone, in high relief, of the Scottish sovereigns from James I, to James VII. From the centre rises a com- posite column 124 feet high, with a Corinthian capital, on which is the royal unicorn rampant. This cross was planned and erected about 1682 by John Montgomery, a native architect, for £100 sterling. On the north side of the same street, adjoining the municipal buildings, is the North of Scotland Bank, a Grecian building in granite, with a portico of Corinthian columns, having most elabo- rately carved capitals. On an eminence east of Castle Street are the military barracks for 600 men, built in 1796 for £16,000. .

The principal statues in the city are those of the last Duke of Gordon—died 1836—in grey granite, 10 feet high ; Queen Victoria, in white Sicilian marble, 84 feet high; Prince Albert, bronze, natural-size, sitting posture; and a curious rough stone figure, of unknown date, supposed to be Sir William Wallace.

The Dee to the south of the city is crossed by three Bridges,

bridges, the old bridge of Dee, an iron suspension bridge, and the Caledonian Railway bridge. The first, till 1832 the only access to the city from the south, consists of seven semicircular ribbed arches, is about 30 feet high, and was built early in the 16th century by Bishops Elphin- stone and Dunbar. It was nearly all rebuilt 1718-1723, and from being 144 feet wide, it was in 1842 made 26 feet wide. From Castle Strect, King Street leads in the direction of the new bridge of Don (a little east of the old " Brig o' Balgownie"), of five granite arches, each 75 feet span, built for nearly £13,000 in 1827-1832.

A defective harbour, and a shallow sand and gravel bar at Harbour, its entrance, long retarded the trade of Aberdcen, but, under &c.

various Acts since 1773, they have been greatly deepened. The north pier, built partly by Smeaton, 1775-1781, and partly by Telford, 1810-1815, extends 2000 feet into the German Ocean. It is 30 feet broad, and, with the parapet, rises 15 feet above high water. It consists of large granite blocks. It has increased the depth of water on the bar from a few feet to 22 or 24 feet at spring tides, and to 17 or 18 feet at neap. The wet dock, of 29 acres, and with 6000 feet of quay, was completed in 1848, and called Victoria Dock, in honour of Her Majesty's visit to the city in that year. These and other improvements of the harbour and its entrance cost £325,000 down to 1848. By the Harbour Act of 1868, the Dee near the harbour has been diverted to the south, ac the cost of £80,000, and 90 acres of new ground (in addition to 25 acres formerly made up) for harbour works are being made up on the city or north side of the river; £80,000 has been laid out in forming in the sea, at the south side of the river, a new breakwater of conerete, 1050 feet long, against south and south-east storms. The navigation channel is being widened and deepened, and the old pier or break- water on the north side of the river mouth is to be lengthened at least 500 feet seaward. A body of 31 com- missioners manage the harbour affairs.

Aberdeen Bay affords safe anchorage with off-shore winds, but not with those from the N.E., E., and S.E. On the Girdleness, the south point of the bay, a lighthouse was built in 1833, in lat. 57° 8' N., and long. 2° 3' W., with two fixed lights, one vertically below the other, and re- spectively 115

and 185 feet above mean tide. There are also fixed leading lights to direct ships entering the harbour

Water.

Manufac- tures, &c.

at night. In fogs, a steam whistle near the lighthouse is sounded ten seconds every minute. Near the harbour mouth are three batteries mounting nineteen guns.

The water supplied to the city contains only 3} grains solid matter in a gallon, with a hardness of about 2 degrees. It is brought by gravitation, in a close brick culvert, from the Dee, 21 miles W.S.W. of the city, to a reservoir, which supplies nine-tenths of the city. The other tenth, or higher part of the city, is supplied by a separate reser- voir, to which part of the water from the culvert is forced up by a hydraulic engine. Nearly 40 gallons water per head of the population are consumed daily for all purposes. The new water works cost £160,000, and were opened by Her Majesty, 16th October 1866.

The gas is made of cannel coal, and is sent through 71 miles of main pipes, which extend 5 miles from the works.

The manufactures, arts, and trade of Aberdeen and vicinity are large and flourishing. Woollens were made as early as 1703, and knitting of stockings was a great industry in the 18th century. There are two large firms in the woollen trade, with 1550 hands, at £1000 weekly wages, and making above 1560 tons wool in the year into yarns, carpets, hand-knit hosiery, cloths, and tweeds. The linen trade, much carried on since 1749, is now confined to one firm, with 2600 hands, at £1200 wages weekly, who spin, weave, and bleach 50 tons flax and 60 tons tow weekly, and produce yarns, floorcloths, sheetings, dowlas, ducks, towels, sail-canvas, &c. The cotton manufacture, introduced in 1779, employs only one firm, with 550 hands, at £220 weekly wages, who spin 5000 bales of cotton a-year into mule yarn. The wincey trade, begun in 1839, employs 400 hands, at £200 weekly wages, who make

2,100,000 yards cloth, 27 to 36 inches broad, in the year. Paper, first made here in 1696, is now manufactured by three firms in the vicinity. The largest has 2000 hands, at £1250 weekly wages, and makes weekly 75 to 80 tons of writing paper, and 6} millions of envelopes, besides much cardboard and stamped paper; another firm makes weekly 77 tons coarse and card paper; and a third, 20 tons print- ing and other paper. The comb works of Messrs Stewart & Co., begun in 1827, are the largest in the world, em- ploying 900 hands, at £500 weekly wages, who yearly convert 1100 tons horns, hoofs, india-rubber, and tortoise- shells into 11 millions of combs, besides spoons, cups, scoops, paper-knives, &. Seven iron foundries and many engineering works employ 1000 men, at £925 weekly wages, and convert 6000 tons of iron a-year into marine and land steam engines and boilers, corn mills, wood-preparing machinery, machinery to grind and pre- pare artificial manures, besides sugar mills and frames and coffee machinery for the colonies.

The Sandilands Chemical Works, begun in 1848, cover five acres, and employ over 100 men and boys, at £90 to £100 weekly wages. Here are prepared naphtha, benzole, creosote oil, pitch, asphalt, sulphate of ammonia, sulphuric acid, and artificial manures. Paraffin wax and ozokerite are refined. An Artesian well within the works, 421 feet deep, gives a constant supply of good water, always at 51° Fahr. Of several provision- curing works, the largest employs 300 hands, chiefly females, in preserving meats, soups, sauces, jams, jellies, pickles, &c., and has in con- nection with it, near the city, above 230 acres of fruit, vege- table, and farm ground, and a large piggery. The products of the breweries and distilleries are mostly comsumed at home. A large agricultural implement work employs 70 or 80 men and boys. Nearly 200 acres of ground, within three miles of the city, are laid out in rearing shrub and forest-tree seedlings. In 1872 about 145 acres of straw- berries were reared within three miles of Aberdeen, and 80 tons of this fruit are said to have been exported.

ABERDEEN

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Very durable grey granite has been quarried near Aber- Granit deen for 300 years, and blocked and dressed paving, kerb, and building granite stones

have long been exported from the district. In 1764, Aberdeen granite pavement was first used in London. About the year 1795, large granite blocks were sent for the Portsmouth docks. The chief stones of the New Thames Embankment, London, are from Kemnay granite quarries, 16 miles north-west of the city. Aber- deen is almost entirely built of granite, and large quantities of the stone are exported to build bridges, wharfs, docks, lighthouses, &c., elsewhere. Aberdeen is famed for its polishing-works of granite, especially grey and red. They employ about 1500 hands in polishing vases, tables, chimney-picces, fountains, monuments, columns, &c., for British and foreign demand. Mr Alexander Macdonald, in 1818, was the first to begin the granite polishing trade, and the works of the same firm, the only ones of the kind till about 1850, are still the largest in the kingdom.

In 1820, 15 vessels from Aberdeen were engaged in the Fishing: northern whale and seal fishing ; in 1860, one vessel, but none since. The white fishing at Aberdeen employs some 40 boats, each with a crew of 5 men. Of the 900 tons wet fish estimated to be brought to market yearly, above a third are sent fresh by rail to England. The salmon caught in the Dee, Don, and sea are nearly all sent to London fresh in ice. The herring fishing has been pro- secuted since 1836, and from 200 to 350 boats are engaged in it.

Aberdeen has been famed for shipbuilding, especially shipbuil for its fast clippers. Since 1855 nearly a score of vessels ing. have been built of above 1000 tons each. The largest vessel (a sailing one) ever built here was one in 1855, of 2400 tons. In 1872 there were built 11 iron vessels of 9450 tons, and 6 wooden of 2980 tons, consuming 5900 tons iron, and costing £252,700, including £70,700 for engines and other machinery. 1400 hands were employed in shipbuilding in that year, at the weekly wages of about £1230.

In 1872, there belonged to the port of Aberdeen 236 Shipping.

vessels, of 101,188 tons, twenty-four of the vessels, of 7483 tons, being steamers. They trade with most British and Trish ports, the Baltic and Mediterranean ports, and many more distant regions. In 1872, 434,108 tons shipping arrived at the port, and the custom duties were £112,414. The export trade, exclusive of coasting, is insignificant. The shore or harbour

dues were £126 in 1765, and £1300 in 1800. In the year ending 30th September 1872, they were £25,520; while the ordinary harbour revenue was £37,765, expenditure £28,598, and debt £324,614. The introduction of steamers in 1821 greatly promoted in- dustry and traffic, and especially the cattle trade of Aberdeenshire with London. These benefits have been much increased by the extension of railways. Commodious steamers ply regularly between Aberdeen and London, Hull, Newcastle, Leith, Wick, Kirkwall, and Lerwick.

The joint railway station for the Caledonian, Great Railway North of Scotland, and Deeside lines, was opened 1867, Station and is a very handsome erection, costing about £26,000.

It is 500 feet long, and 102 feet broad, with the side walls 32 feet high. The arched roof of curved lattice-iron ribs, covered with slate, zinc, and glass, is all in one span, rising 72 feet high, and is very light and airy. a

The Medico-Chirurgical Society of Aberdeen was founded Societies. in 1789. The hall was built in 1820 at a cost of £4000, and is adorned with an Ionic portico of four granite columns,

27 feet high. It has 42 members, and a library of 5000 | volumes. The legal practitioners of Aberdeen have been | styled advocates since 1633, and received royal charters in 1774, 1779, and 1862. They form a society, called the Society of Advocates, of 127 members in 1873, with a

ABERDEEN

The chief structure in Old Aberdeen is the statcly fabric King’s It forms College.

hall built in 1871 for £5075, a library of nearly 6000 volumes, and a fund to support decayed and indigent members, and their nearest relatives. The revenue in 1872 was £2880.

Aberdeen has one daily and three weekly newspapers. The Aberdeen Journal, established in 1748, is the oldest newspaper north of the Forth.

The places of out-door recreation and amusement are chiefly the following: —The Links, a grassy, benty, and sandy tract, 2 miles long and } to 4 mile broad, along the shore betwcen the mouths of the Dee and the Don. It is mostly only a few feet above the sea, but the Broad Hill rises to 94 feet. Cattle shows, reviews, &c., are held on the Links. To the north-west of the town, a Public Recreation Park of 13 acres was laid out in 1872, at the cost of £3000, with walks, grass, trees, shrubs, and flowers.

Daily observations from 1857 to 1872 show the mean temperature of Aberdeen for the year to be 45°°8 Fahr., for the three summer months 56° Fahr., and for the thrce winter months 37°°3. The average ycarly rainfall is 30°57 inches. Aberdeen is the healthiest of the large Scottish towns. East winds prevail in spring.

Since 1867 £50,000 has been spent in constructing main sewers throughout the city. A few acres of farm land have been irrigated by part of the sewage.

The city is governed by a corporation, the magistrates and town council, consisting of twenty-five councillors, including a provost, six bailies, a dean of guild, a trea- surer, &c. The corporation revenue in the year 1871-72 was £11,498. The police, water, and gas are managed by the council, The municipal and police burgh has an arca of nearly three square miles, with 12,514 municipal electors, and with assessable property valued at £230,000 in 1873. The Parliamentary burgh has an area of nine square miles, including Old Aberdecn and Woodside, with 14,253 Par- liamentary electors, and real property to the value of £309,328 in 1873, It returns one member to Parliament. The population of Aberdcen in 1396 was about 3000; in 1643, 8750; in 1708, 5556; in 1801, 26,992; in 1841, 63,262; and in 1871, 88,125; with 6718 inhabited houses, 292 uninhabited, and 77 building.

ABERDEEN, OLD, is a small, quiet, ancient town, a

- burgh of barony and regality, a mile north of Aberdeen,

and as far south-west of the mouth of the Don. It mostly forms one long street, 45 to 80 feet above the sea. The Don, to the north of the town, runs through a narrow, wooded, rocky ravine, and is spanned by a single Gothic arch, the “ Brig o’ Balgownie” of Lord Byron. The bridge rests on gneiss, and is 67 feet wide and 344 feet high above the surface of the river, which at ebb tide is here 19 feet deep. The bridge is the oldest in the north of Scotland, and is said to have been built about 1305. The funds belonging to the bridge amount to £24,000.

The town was formerly the see of a bishop, and had a large cathedral dedicated to St Machar. In 1137 David I. translated to Old Aberdeen the bishopric, founded at Mortlach in Banffshire in 1004 by Malcolm IL. in memory of his signal victory there over the Danes. In 1153 Malcolm IV. gave the bishop a new charter.

The cathedral of St Machar, begun about 1357, occupied nearly 170 years in building, and did not remain entire fifty years. What is still left is the oldest part, viz., the nave and side aisles, 126 feet long and 624 feet broad, now used as the parish church. It is chiefly built of outlayer granite stones, and while the plainest Scottish cathedral, is the only one of granite in the kingdom. On the flat pannelled ceiling of the nave are 48 heraldic shields of the princes, nobles, and bishops who aided in its ercction. It has been latcly repaired, and some painted windows inserted, at the cost of £4280.

of King’s College near the middle of the town. a quadrangle, with interior court 108 feet square, two sides of which have been rebuilt, and a projecting wing for a library added since 1860. The oldest parts, the Crown Tower and Chapel, date from about 1500. The former is 30 feet square and 60 feet high, and is surmounted by a structure about 40 feet high, consisting of a six-sided lantern and a royal crown, both sculptured, and resting on the intersections of two arched ornamented slips rising from the four corners of the top of the towcr. The chapel, 120 feet long, 28 fect broad, and 37 fcet high, still retains in the choir the original oak canopied stalls, misererc scat, and lofty open screen. These fittings are 300 years old, in the French flamboyant style, and are unsurpassed, in tastc- ful design and delicate

execution, by the oak carving of any other old church in Europe. This carved woodwork owes its preservation to the Principal of Reformation times, who armed his people, and protected it from the fury of the barons of the Mearns after they had robbed the cathedral of its bells and lead. The chapcl is still used for public worship during the University session. Connected with Old Aberdeen is a brewery in the town, and a brick and coarse pottery work in the vicinity. Therc are also a Free church, two secondary schools, and two primary schools. Old Aberdeen has its own municipal officers, consisting of a provost, 4 bailies, and 13 councillors. The town is drained, lighted, supplied with water, and is within the Parliamentary boundary of New Aberdcen. There are several charitable institutions. Population in 1871, 1857 ; inhabited houses, 233. (A. @.)

ABERDEENSHIRE, a maritime county in the north- east of Scotland, between 56° 52’ and 57° 42’ N. lat. and between 1° 49’ and 3° 48’ long. W. of Greenwich. It is bounded on the north and east by the German Ocean; on the south by the counties of Kincardine, Forfar, and Perth ; and on the west by those of Inverness and Banff. Its greatest length is 102 miles, and breadth 50 milcs. Its circuit with sinuosities is about 300 miles, 60 being sea- coast. It is the fifth of Scotch countics in size, and is one- sixteenth of the extent of Scotland. Its arca is 1970 square miles, or 1,260,625 acres, of which, in 1872, 36-6 per cent.,or 585,299 acres, were cultivated, 93,339 in woods (mostly Scotch fir and larch), and 6400 in lakes. It con- tains 85 civil parishes and parts of 6 others, or 101 parishes, including civil and guoad sacra. The county is gencrally hilly, and mountainous in the south-west, whence, ncar the centre of Scotland, the Grampians scnd out various branches, mostly to the north-east, through the county. The run of the rivers and the general slope of the county is to the north-east and east. It is popularly divided into five

districts :—First, Mar, mostly between the Dee and Don, pjstricts

and forming nearly the south half of the county. It is mountainous, especially Braemar, its west and Highland part, which contains the greatest mass of elevatcd land in the British Isles. Here the Dee rises amid the grandeur and wildness of lofty mountains, much visited by tourists, and composed chiefly of granite and gneiss, forming many high precipices, and showing patches of snow throughout every summer. Here rises Ben

Muichdhui, the second highest mountain in Scotland and in the British Isles, 4296 fect ; Braeriach, 4225 ; Cairntoul, 4245 ; Cairngorm (famed for " Cairngorm stones," a peculiar kind of rock crystal), 4090 ; Ben-a-Buird, 3860 ; Ben Avon, 3826; and Byron's " dark Lochnagar," 3786. The soil on the Dce is sandy, and on the Don loamy. The city of Aberdcen is in Mar. Second, Formartin, between the lower Don and Ythan, with a sandy coast, succeeded by a claycy, fertile, tilled tract, and then by low hills, moors, mosses, and tilled land. Third, Buchan, north of the Ythan, and next in size to

Rivers.

Climate.

Geology.

Plants and Animals.

Agricul- ture.

Mar, with parts of the coast bold and roeky, and with the interior bare, low, flat, undulating, and in parts peaty. On the coast, six miles south of Peterhead, are the Bullers of Buchan,—a basin in which the sea, entering by a natural arch, boils up violently in stormy weather. Buchan Ness is the eastmost point of Scotland. Fourth, Garioch, a beautiful, undulating, loamy, fertile valley, formerly ealled the granary of Aberdeen, with the prominent hill Benaehie, 1676 feet, on the south. Fifth, Strathbogie, mostly eon-sisting of hills (The Buek, 2211 feet; Noath, 1830 feet), moors, and mosses. The eounty as a whole, exeept the low grounds of Buchan, and the Highlands of Braemar, eonsists mainly of nearly level or undulating traets, often naked and infertile, but interspersed with many rieh and highly eultivated spots.

The chief rivers are the Dee, 96 miles long; Don, 78; Ythan, 37, with mussel beds at its mouth; Ugie, 20; and Deveron, 58, partly on the boundary of Banffshire. The pearl mussel oceurs in the Ythan and Don. A

valuable pearl in the Scottish erown is said to be from the Ythan. Loch Muick, the largest of the few lakes in the eounty, 1310 feet above the sea, is only 2} miles long and 3 to $ mile broad. The rivers have plenty of salmon and trout. There are noted chalybeate springs at Peterhead, Fraser- burgh, and Pananieh near Ballater. ;

The climate of Aberdeenshire, exeept in the mountainous districts, is comparatively mild, from the sea being on two sides, ‘The mean annual temperature at Braemar is 43°°6 Fahr., and at Aberdeen 45°°8. The mean yearly rainfall varies from about 30 to 37 inches. The summer climate of the Upper Dee and Don valleys is the driest and most bracing in the British Isles, and grain is eultivated up to 1600 feet above the sea, or 400 to 500 feet higher than elsewhere in North Britain. All the erops cultivated in Seotland ripen, and the people often live to a great age.

The roeks are mostly granite, gueiss, with small tracts of syenite, mica slate, quartz rock, clay slate, grauwaeke, primary limestone, old red sandstone, serpentine, and trap. Lias, greensand, and ehalk flints oeeur. The roeks are mueh covered with boulder elay, gravel, sand, and allu- vium. Briek clay occurs near the coast. The surface of the granite under the boulder elay often presents glacial smoothings, grooves, and roundings. Cairngorm stone, beryl, and amethyst are found in the granite of Braemar.

The tops of the highest mountains have an aretie flora. At Her Majesty’s Lodge, Loch Muiek, 1350 feet above the sea, grow larehes, vegetables, eurrants, laurels, roses, &e. Some ash trees, 4 or 5 feet in girth, are growing at 1300 feet above the sea. The mole oeeurs at 1800 feet above the sea, and the squirrel at 1400. Trees, especially Seoteh fir and lareh, grow well in the eounty, and Braemar abounds in natural timber, said to surpass any in the north of Europe. Stumps of Seoteh fir and oak found in peat in the eounty are often far larger than any now growing. Grouse, partridges, and hares abound in the county, and rabbits are often too numerous. Red deer abound in Braemar, the deer forest being there valued at £5000 a year, and estimated at 500,000 aeres, or one-fourth the area of deer forests in Seotland.

Poor, gravelly, elayey, and peaty soils prevail mueh more in Aberdeenshire than good rich loams, but tile draining, bones, and guano, and the best

modes of modern tillage, have greatly inereased the produce. Farm-houses and steadings have greatly improved, and the best agrieultural implements and machines are in general use. About two- thirds of the population depend eutirely on agriculture, and oatmeal in various forms, with milk, is the chief food of farm-servants. Farms are generally small, eomparcd with those in the south-east counties. The fields are separated by dry-stone dykes, and also by wooden and wire fenees.

ABERDEENSHIBE

Leases of 19 or 21 years prevail, and the five, six, or seven shift rotation is im gencraluse. In 1872 there were 11,642 oceupiers of land, with an average of 50 acres eaeh, and paying about £536,000 in rent. Of the 585,299 acres of the county in erop in 1872, 191,880 acres were in oats, 18,930 in barley and bere, 1633 in rye, 1357 in wheat, 95,091 in turnips (being one-fifth of the turnips grown in Scotland), 8414 in potatoes, 232,178 in grasses and clover. In 1872 the eounty had 23,117 horses, 157,960 cattle (being above one-seventh of all the cattle in Scotland), 128,308 sheep, and 13,579 pigs. The eounty is unsur- passed in breeding, and unrivalled in feeding eattle, aud this is more attended to than the eultivation of graiu-erops. About 40,000 fat eattle are reared, and above £1,000,000 value of eattle and dead meat is sent from the county to London yearly. The eapital invested in agrieulture within the county is estimated at about £5,133,000.

The great mineral wealth in Aberdeenshire is its long- famed durable granite, whieh is largely quarried for build- ing, paving, eausewaying, and polishing. An aere of land on being reclaimed has yielded £40 to £50 worth of eause- waying stones. Gneiss is also quarried, as also primary limestone, old red sandstone, conglomerate millstone, grau- waeke, elay slate, syenite, and hornblende roek. Iron ore, manganese, and plumbago oeeur in the county.

A large fishing population in villages along the eoast Fisheries. engage in the white and herring fishery. Haddocks are salted and roek-dried (speldings), or smoked (finnans). The rivers and eoasts yield many salmon. Pcterhead was long the chief British port for the north whale and seal fishery, but Dundee now vies with it in this industry.

The manufactures and arts of the eounty are mainly Manufae. prosecuted in or near the town of Aberdeen, but throughout tures. the rural distriets there are mueh milling of eorn, brick and tile making, stone-quarrying, smith-work, brewing and distilling, cart and farm implement making, easting and drying of peat, timber felling, especially on Deeside and Donside, for pit-props, railway sleepers, lath, barrel staves,

&e. The chief imports into the eounty are, eoals, lime, Trade. timber, iron, slates, raw materials of textile manufae- tures, wheat, eattle-feeding stuffs, bones, guano, sugar, aleoholie liquors, fruits, &e. The ehief exports are granite (rough, dressed, and polished), flax, woollen, and eotton goods, paper, combs, preserved provisions, oats, barley,

live and dead eattle, &e. In the eounty there are about

520 fairs in the year for eattle, horses, sheep, hiring ser- vants, &e.

Aberdeenshire communicates with the south by the Railways.

Caledonian Railway, and five maeadamised roads aeross the east Grampians, the highest rising 2200 feet above the sea. About 188 miles of railway (the Great North of Seotland, Formartin and Buchan, and Deeside lines), and 2359 miles of publie roads, ramify through the eounty. Tolls over the eounty were abolished in 1865, and the roads are kept up by assessment. The railway lines in the eounty have eost on the average about £13,500 a mile. Several maeadamised roads and the Great North of Scot- land Railway form the main exits from the eounty to the north-west.

The chief antiquities in Aberdeenshire are Piets' houses Anti- or weems; stone foundations of eireular dwellings; mono- qities. liths, some being sculptured; the so-called Druid circles ; stone eists; stone and earthen enelosures; the vitrified forts of Dunnideer and Noath; eairns; erannoges; earthen mounds, as the Bass; flint arrow-heads; elay funeral urns; stone celts and hammers. Remains of Roman eamps oceur at Peterculter, Kintore, and Auehterless, respectively 1074,

100, and 115 acres. Roman arms have been found. Ruins of ancient edifiees oeeur. Ou the top of a conical hill ealled Dunnideer, in the Garioeh district,

are the remains of a

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Native features.

Courts and Police.

Churches.

ABERDEENSHIRE

castle, supposed to be 700 ycars old, and surrounded by a vitrified wall, which must be still older. The foundations ot two buildings still remain, the one in Braemar, and the other in the Loch of Cannor (the latter with the remains of a wooden bridge between it and the land), which are supposed to have belonged to Malcolm Canmore, King of Scotland. The most extensive ruins are the grand ones of Kildrummy Castle, evidently once a princely seat, and still covering nearly an acre of ground. It belonged to David Harl of Huntingdon in 1150, and was the seat of the Earls of Marr attainted in 1716. The Abbey of Deer, now in ruins, was begun by Cumyn Earl of Buchan about 1219.

In Roman times, Aberdeenshire formed part of Ves- pasiana in Caledonia, and was occupied by the Taixali, a warlike tribe. The local names are mostly Gaelic. St Columba and his pupil Drostan visited Buchan in the 6th century. In 1052 Macbeth fell near the Peel Bog in Lumphanan, and a cairn which marks the spot is still shown. In 1309 Bruce defeated Comyn, Earl of Buchan, near Inverurie, and annihilated a powerful Norman family. In 1411 the Earl of Marr defeated Donald of the Isles in the battle of Harlaw, near Inverurie, when Sir Robert Davidson, Provost of Aberdeen, was killed. In 1562 occurred the battle of Corrichie on the Hill of Fare, when the Earl of Murray defeated the Marquis of Huntly. In 1715 the Earl of Marr proclaimed the Pretender in Braemar. In 1746 the Duke of Cumberland with his army marched through Aberdeenshire to Culloden. In 1817 a base line of verification, 5 miles 100 feet long, was measured in con- nection with the Trigonometrical Survey of the British Isles, on the Belhelvie Links 5 to 10 miles north of Aberdecn.

Among eminent men connected with Aberdeenshire are, Robert Gordon of Straloch, who in 1648 published the first atlas of Scotland from actual survey ; the Earls Marischal, whose chief seat was Inverugie Castle; Ficld-Marshal Keith, born at Inverugie Castle, 1696 ; Dr Thomas Reid, the metaphysician, minister of New Machar 1737 to 1752; Lord Pitsligo, attainted 1745; Sir Archibald Grant of Monymusk, who introduced turnips into the county 1756, and was the first to plant wood on a great scale; Peter Garden, Auchterless, said to have died at the age of 132, about 1780; Rev. John Skinner, author of some popular Scottish songs ; Morrison the hygeist ; the Earl of Aberdeen, Prime Minister during the Crimean war.

The native Scotch population of Aberdeenshire are long- headed, shrewd, careful, canny, active, persistent, but reserved and blunt, and without demonstrative enthusiasm. They have a physiognomy distinct from the rest of the Scottish people, and have a quick, sharp, rather angry accent. ‘The local Scotch dialect is broad, and rich in diminutives, and is noted for the use of ¢ for o or xu, f for wh, d for th, &e. In 1830 Gaelic was the fireside language of almost every family in Braemar, but now it is little used.

Aberdeenshire has a Lord-Lieutenant and 3 Vice and 60 Deputy-Lieutenants. The Supreme Court of Justiciary sits in Aberdeen twice a-year

to try cases from the counties of Aberdeen, Banff, and Kincardine. The counties of Aberdeen and Kincardine are under a Sheriff and two Sheriffs-Substi- tute. The Sheriff Courts are held in Aberdeen and Peter- head. Sheriff Small-Debt and Circuit Courts are held at seven places in the county. There are Burgh or Bailie Courts in Aberdeen and the other royal burghs in the county. Justice of the Peace and Police Courts are held in Aberdeen, &c. The Sheriff Courts take cognisance of Commissary business. During 1871, 994 persons were confined in the Aberdeenshire prisons. In the year 1870-71, 74 parishes in the county were assessed £53,703 for 7702 poor on the roll and 1847 casual poor.

Aberdeenshire contains 105 Established churches, 99 Free, 31 Episcopal, 15 United Presbyterian, 9 Roman

Catholic, and 31 of other denominations. This includes

detached parts of the two adjacent counties.

By the census of 1871, 84°83 per cent. of the children Equcation,

in the county, of the ages 5 to 13, were receiving education. Those formerly called the parochial schoolmasters of Aberdecnshire participate in the Dick and Milne Bequests, which contributed more salary to the schoolmasters in some cases than did the heritors. Most of the schoolmasters arc Masters of Arts, and many are preachers. Of 114 parochial schools in the county before the operation of the new Education Act, 89 received the Milne Bequest of £20 a year, and 91 the Dick Bequest, averaging £30 a year, and a schoolmaster with both bequests would have a yearly income of £145 to £150, and in a few cases £250. The higher branches of education have been morc taught in the schools of the shires of Averdeen and Banff than in the other Scotch counties, and pupils have been long in the habit of going direct from the schools of these two counties to the University.

The value of property, or real rental of the lands and Property.

heritages in the county (including the burghs, except that of Aberdeen), for the year 1872-73, was £769,191. The railway and the water works in the city and county were for the same year valued at £11,133. For general county purposes for the year ending 15th May 1872, there was assessed £14,803 to maintain police, prisons, militia, county and municipal buildings, &c., and £19,320 to maintain 2359 miles of public county roads.

The chief seats on the proprietary cstates are—Balmoral Proprietors,

Castle, the Queen; Mar Lodge and Skene House, Earl of Fife; Aboyne Castle, Marquis of Huntly; Dunecht House, Earl of Crawford and Balcarres ; Keith Hall, Earl of Kintore ; Slains Castle, Earl of Errol; Haddo House, Earl of Aberdeen ; Castle Forbes, Lord Forbes; Philorth House, Lord Saltoun; Huntly Lodge, the Duke of Rich- mond. Other noted seats are—Drum, Irvine; Invercauld, Farquharson ; Newe Castlc, Forbes ; Castle Fraser, Fraser ; Cluny Castle, Gordon ; Meldrum House, Urquhart ; Craigs- ton Castle, Urquhat; Pitfour, Ferguson; Ellon Castle, Gordon; Fyvie Castle,Gordon. Ten baronets and knights have residences in the county. Of the proprietors many live permanently on their estatcs. Their prevailing names are Gordon, Forbes, Grant, Fraser, Duff, and Farquharson.

Aberdeenshire has one city, Aberdeen, a royal parlia- Burghs.

mentary burgh; three other royal parliamentary burghs, Inverurie, Kintore, and Peterhead; and seven burghs of barony, Old Aberdeen, Charleston of Aboyne, Frascrburgh, Huntly, Old Meldrum, Rosehearty, and Turriff.

The county sends two members to Parliament—one for Parliamen- East Aberdeenshire, with 4341 electors, and the other for tary repre-

West Aberdeenshire, with 3942 electors. The county has also four parliamentary burghs, which, with their respective populations in 1871, are —Aberdeen, 88,125; Peterhead, 8535 ; Inverurie, 2856; and Kintore, 659. The first sends one member to Parliament, and the other threc unite with Elgin, Cullen, and Banff, in sending another.

By the census 1801 the county had 121,065 inhabitants, Population.

and by that of 1871, 244,603, with 53,576 families, 111 females to 100 males, 34,589 inhabited houses, 1052 unin- habited houses, and 256 building. In 1871 there were in eight towns (Aberdeen, Peterhead, Fraserburgh, Huntly, Inverurie, Old Meldrum, Turriff, and New Pitsligo), 111,978 inhabitants ; in 32 villages, 19,561; and in rural districts, 113,064.

(New Statistical Account of Scotland, vol. xii. ; the charters of the burgh; extracts from the Council Register down to 1625, and selections from the letters, guildry, and trea- surer's accounts, forniing 3 volumes of the Spalding Club; Collections for a History of the Shires of A. and Banff, edited by Joseph Robertson, Esq., 4to, Spalding Club ;

Registrum Episcopatus Aberdonensis, vols. i. and ii., by Prof. Cosmo Innes, 4to, Spalding Club ; Zhe Listory of A., by Walter Thom, 2 vols. 12mo, 1811; Buchan, by the Rev. John B. Pratt, 12mo, 1859; Mistorical Account and Delinea- tion of A., by Robert Wilson, 1822; First Report of Royal Com. on Hist. MSS., 1869; The Annals of A., by William Kennedy, 1818; Orem's Description of the Chanonry, Cathe- dral, and King's College of Old A., 1724-25, 1830; The Castellated Architecture of A., by Sir Andrew Leith Hay of Rannes, imp. 4to; Specimens of Old Castellated Houses of A., with drawings by Giles, folio, 1838 ; Lives of Hminent Men of A., by James Bruce, 12mo, 1841). (A. ©.) ABERDEEN, Georczk Hamintton Gorpon, Fourtru Earn or, was born at Edinburgh on the 28th January 1784. He was educated at Harrow School, and at St John's College, Cambridge, where he graduated in 1804. He succeeded his grandfather in the earldom in 1801, and in the same year he made an extended tour through Europe, visiting France, Italy, and Greece. On his return he founded the Athenian Club, the membership of which was eonfined to those who had travelled in Greece. This explains Lord Byron's reference in the English Bards and Scotch Reviewers to "the travelled Thane, Athenian Aberdeen." Soon after his return he contributed a very able article to the Ldinburgh Review (vol. vi.), on Gell's Zopography of Troy. Another literary result of his tour was the publication in 1822 of An Inquiry into the Principles of Beauty in Grecian Archa- tecture, the substance of which had appeared some years before in the form of an introduetion to a translation of Vitruvius' Civil

Architecture. In 1806, having been elected one of the representative peers for Scotland, he took his seat in the House of Lords on the Tory side. He was already on terms of intimacy with the leading members of the then predominant party, and in particular with Pitt, through the influence of his relative, the cele- brated Duchess of Gordon. In 1813 he was intrusted with a delicate and diffieult speeial mission to Vienna, the object being to induce the Emperor of Austria to join the alliance against his son-in-law Napoleon. His diplomacy was completely successful ; the desired alliance was secured by the treaty of Toplttz, which the Earl signed as repre- sentative of Great Britain in September 1813. On his return at the conclusion of the war, he was raised to a British peerage, with the title of Viscount Gordon. Lord Aberdeen was a member of the Cabinet formed by the Duke of Wellington in 1828, fora short time as Chancellor of the Duchy of Lancaster, and then as Foreign Secretary. He was Colonial Secretary in the Tory Cabinet of 1834-5, and again received the seals of the Foreign Office under Sir Robert: Peel's administration of 1841. The policy of non- intervention, to which he stedfastly adhered in his conduct of foreign affairs, was at onee his strength and his weakness. According to the popular idea, he failed to see the limita- tions and exceptions to a line of policy which nearly all admitted to be as a general rule both wise and just. On the whole, his administration was perhaps more esteemed abroad than at home. It has been questioned whether any English minister ever was on terms of greater intimacy with foreign courts, but there is no substantial warrant for the charge of want of patriotism whieh was sometimes brought against him. On the two ehief ques- tions of home polities which were finally settled during his tenure of office, he was in advanee of most of his party. While the other members of the Government yielded Catholic Emancipation and the repeal of the Corn Laws as unavoidable concessions, Lord Aberdeen spoke and voted for both measures from convietion of their justice. On the 13th June 1843, he moved the second reading of his bill "to remove doubts respecting the

admission of ministers to benefices in Scotland," and it was passed into law in that session, though a similar measure had been rejected in 1840. As the first proposal did not prevent, so the passing of the Act had no effect in healing, the. breach in the Established Church of Scotland which oceurred in 1843. On the defeat of Lord Derby's government in 1852, the state of parties was such as to neeessitate a eoalition government, of which Lord

Aber- deen, in consequenee of the moderation of his views, was the natural ehief. He had been regarded as the leader of the Peel party from the time of Sir Robert's death, but his views on the two great questions of home poliey above mentioned rendered him more aceeptable to the Liberals, and a more suitable leader of a coalition government than any other member of that party could have been. His administration will chiefly be remembered in conneetion with the Crimean war, which, it is now generally believed, night have been altogether prevented by a more vigorous policy. The incompetence of various departments at home, and the gross mismanagement of the commissariat in the terrible winter of 1854, caused a growing dissatis- faction with the government, which at length found emphatic expression in the House of Commons, when a motion submitted by Mr Roebuck, calling for inquiry, was carried by an overwhelming majority. Lord Aberdeen regarded the vote as one of no-confidence, and at once resigned. From this period Lord Aberdeen took little part in public business. In recognition of his services he received, soon after his resignation, the decoration of the Order of the Garter. He died December 13, 1860. Lord Aberdeen was twice married,—first in 1805, to a daughter of the first Marquis of Abercorn, who died in 1812, and then to the widow of Viscount Hamilton. He was suc- ceeded in the title and estates by Lord Haddo, his son by the second marriage.

ABERDOUR, a village in the county of Fife, in Scot- land, pleasantly situated on the north shore of the Firth of Forth, and mueh resorted to for sea-bathing. It is 10 miles N.W. of Edinburgh, with which there is a frequent communication by steamer.

ABERFELDY, a village in Perthshire, celebrated in Scottish song for its "birks" and for the neighbouring falls of Moness. It is the terminus of a branch of the Highland Railway.

ABERGAVENNY, a market town in Monmouthshire, 14 miles west of Monmouth, situated at the junction of a small stream called the Gavenny, with the river Usk. It is supposed to have been the Gobannium of the Romans, so named from Gobannio, the Gavenny. The town was formerly walled, and has the remains of a castle built soon after the Conquest, and also of a Bencdictine monas tery. The river Usk is here spanned by a noble

stone bridge of fifteen arches. Two markets are held weekly, and elegant market buildings have recently been erected. There is a free grammar school, with a fellowship and exhibitions at Jesus College, Oxford. No extensive manufacture is carried on except that of shoes ; the town owes its prosperity mainly to the large coal and iron works in the neighbourhood. Abergavenny is a polling place for the county. Population of parish (1871), 6318.

ABERNETHY, a town in Perthshire, situated in the parish of the same name, on the right bank of the Tay, 7 miles below Perth. ‘The earliest of the Culdee houses was founded there, and it is said to have been the capital of the Pictish kings. It was long the chief seat of the Epis- copaey in the country, till, in the 9th eentury, the bishopric was transferred to St Andrews. There still remains at Aber- nethy a curious circular tower, 74 feet high and 48 feet in circumference, consisting of sixty-four courses of hewn stonc. A number of similar towers, though uot so well

built, are to be met with in Ireland, but there is only one other in Scotland, viz., that at Brechin. Petrie argues, in his Round Towers of Ireland, that these structures have been used as belfries, and also as keeps.

ABERNETHY, Joun,—a Protestant dissenting divine of Treland, was born at Coleraine, county Londonderry, Ulster, where his father was ministcr (Nonconformist), on the 19th October 1680. In his thirteenth year he entered a student at the University of Glasgow. On concluding his course at Glasgow he went to Edinburgh University, where his many brilliant gifts and quick and ready wit— thought-born, not verbal merely—struck the most eminent of his contemporaries and even his professors. Returning home, he received licence to preach from his Presbytery before he was twenty-one. In 1701 he was urgently invited to accept the ministerial charge of an important congregation in Antrim; and after an interval of two years, he was ordained there on 8th August 1703. His admiring biographer tells of an amount and kind of work done there, such as only a man of fecund brain, of large heart, of healthful frame, aud of resolute will, could have achieved. In 1717 he was invited to the congrega- tion of Usher’s Quay, Dublin, as colleague with Rev. Mr Arbuckle, and contemporaneously, to what was

called the Old Congregation of Belfast. The Synod assigned him to Dublin. He refused to accedc, and remained at Antrim. This refusal was regarded then as ecclesiastical high- treason; and a controversy of the most intense and dis- proportionate character followed. The controversy and quarrel bears the name of the two camps in the con- flict, the ‘‘ Subscribers” and the “‘ Non-subscribers.” Out- and-out evangelical as John Abernethy was, there can be no question that he and his associates sowed the seeds of that after-struggle in which, under the leadership of Dr Henry Cooke, the Arian and Socinian elements of the Irish Presbyterian Church were thrown out. Much of what he contended for, and which the “Subscribers” opposed bitterly, has been silently granted in the lapse of time. In 1726 the “Non-subscribers,” spite of an almost wofully pathetic pleading against scparation by Abernethy, were cut off, with due ban and solemnity, from the Irish Presbyterian Church. In 1730, spite of being a “ Non-subscriber,” he was called by his early friends of Wood Street, Dublin, whither he removed. In 1731 came on the greatest controversy in which Abernethy engaged, viz., in relation to the Test Act nominally, but practically on the entire question of tests and disabilities. His stand was “against all laws that, upon account of mere differences of religious opinions and forms of worship, excluded men of integrity and ability from serving their country.” He was nearly a century in advance of his century. He had to reason with those who denied that a Roman Catholic or Dissentcr could be a ‘“‘man of integrity and ability.” His Zracts—afterwards collected—did fresh servicc, generations later. And so John Abernethy through life was ever foremost where un- popular truth and right were to be maintained; nor did he, for sake of an ignoble expediency, spare to smite the highest- seated wrongdoers any more than the hoariest errors (as he belicved). He died in 1740, having been twice married. (Kippis’ Biog. Brit., s. v.; Dr Duchal’s Life, prefixed to Sermons; Diary in MS., 6 vols. 4to; History of Irish Pres- bytervan Church). (A. B. G.)

ABERNETHY, Joun, grandson of the preceding, an eminent surgcon, was born in London on the 3d of April 1764, His father was a London merchant. Educated at Wolverhampton Grammar School, he was apprenticed in 1779 to Sir Charles Blicke, a surgeon in extensive practice in the metropolis. He attended Sir William Blizzard’s anatomical lectures at the London Hospital, and was carly employed to assist Sir William as “de-

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monstrator ;” he also attended Pott’s surgical lectures at St Bartholomew’s Hospital, as well as the lectures of the celebrated John Hunter. On Pott’s resignation of the office of surgeon of St Bartholomew’s, Sir Charles Blicke, who was assistant-surgeon, succecded him, and Abernethy was elected assistant-surgeon in 1787. In this capacity he began to give lectures in Bartholomew Close, which were so well attcnded that the governors of the hospital built a regular theatre (1790-91), and Abernethy thus became the founder of the distinguished School of St Bartholomew’s. He held the office of assistant-surgeon of the hospital for the long period of twenty-eight years, till, in 1815, he was elected principal surgeon. He had before that time been appointed surgeon of Christ’s Hospital (1813), and Professor of Anatomy and Surgery to the Royal College of Surgeons (1814). Abernethy had great fame both as a practitioncr and as a lecturer, his reputation in both respects resting on the efforts he made to promote the practical improvement of surgery. His Surgical Ob- servations on the Constitutional Origin and Treatment of Local Diseases (1809)—known as “ My Book,” from the great frequency with which he referred his patients to it, and to page 72 of it in particular, under that name—was onc of the earliest popular works on medical science. The views he expounds in it are based on physiological considerations, and are the more important that the con- nection of surgery with physiology had scarcely becn recognised before the time he wrote. The leading prin- ciples on which he insists in ‘“‘ My Book ” are chicfly these two :—lst, That topical diseases are often mere symptoms of constitutional maladies, and then can only be removed by gencral remedies ; and 2d, That the disordered state of the constitution very often originates in, or is closely allied to deranged states of the stomach and bowels, and can only be remedied by mcaus that benefically affect the functions of those organs. His profession owed him much for his able advocacy of the extension in this way of the province of surgery. He had grcat success as a teacher from the thorough knowledge he had of his science, and the persuasiveness with which he cnunciated his views. It has been said, however, that the influence he excrted on those who attended his lectures was not beneficial in this respect, that his opinions were delivercd so dogmatically, and all who differed from him were dis- paraged and denounced so contemptuously, as to repress instead of stimulating inquiry.

It ought to be mentioned, that he was the first to suggest and to perform the daring operation of securing by ligature the carotid and the exter- nal iliac arteries. The celebrity Abernethy attained in his practice was due not only to his great professional skill, but also in part to the singularity of his manners. He used great plainness of speech in his intercourse with his patients, treating them often brusquely, and sometimes even rudely. In the circle of his family and friends he was courteous and affectionate ; and in all his dealings he was strictly just and honourable. He resigned his surgery at St Bartholomew's Hospital in 1827, and his professor- ship at the College of Surgeons two years later, on account of failing health, and died at his residence at Enfield on the 20th of April 1831. ABERRATION, or (more correctly) THE ABERRATION or Licut, is a remarkable phenomenon, by which stars "appear to deviate a little, in the course of a year, from their true places in the heavens. It results from the eye of the observer being carried onwards by the motion of the earth on its orbit, during the time that light takes to

travel from the star to the earth. The effect of this com- bination of motions may be best explained by a familiar illus- tration. Suppose a rain-drop falling vertically is received in a tube that has a lateral motion. In order that the drop may fall freely down

the axis of the tube, the A E

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latter must be inclined at such an angle as to move from the position AD to BE, G

and again to CF, in the times the drop moves from D to G, and from G to C. The drop in this case, since it moves down the axis all the way, must strike the bottom of the tube at C in the direction FC. The light proceeding from a star is not seen in its true direc- tion, but strikes the eye obliquely, for a precisely similar reason. If lines be taken to represent the motions, so that

the eye is carried from A to C during the time that light moves from D to C, the light will appear to the eye at C to come, not from D, but from F. The angle DCF, con- tained by the true and apparent directions of the star, is the aberration. It is greatest when the two motions are at right angles to each other, t.¢., when the star's longitude is 90° in advance of, or behind, the heliocentric longitude of the earth, or (which amounts to the same thing) 90° behind, or in advance of, the geocentric longitude of the sun. (See Astronomy.) Now, in the right-angled triangle

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ACD, tan ADC (i.e., DCF) = a ; whence it appears that

the tangent of the angle of aberration (or, since the angle is very small, the aberration itself) is equal to the ratio, velocity of earth in orbit ~ velocity of light being to the velocity of light in the proportion of 1 to 10,000 nearly, the maximum aberration is small, amount- ing to about 20-4 seconds of arc, —a quantity, however, which is very appreciable in astronomical observations.

Aberration always takes place in the, direction of the earth's motion; that is, it causes the stars to appear nearer than they really are to the point towards which the earth is at the moment moving. That point is necessarily on the ecliptic, and 90° in advance of the earth in longitude. The effect is to make a star at the pole of the ecliptic appear to move in a plane parallel to the ecliptic, so as to form a sinall ellipse, similar to the earth's orbit, but having its major axis parallel to the minor axis of that orbit, and vice versa. As we proceed from the pole, the apparent orbits the stars describe become more and more elliptical, till in the plane of the ecliptic the apparent motion is in a straight line. The length of this line, as well as of the major axes of the different ellipses, amounts, in angular measure, to about 40'°8. The stars thus appear to oscil- late, in the course of the year, 20'°4 on each side of their true position, in a direction parallel to the plane of the ecliptic, and the quantity 20':4 is therefore called the constant of aberration.

For the discovery of the aberration of light, one of the finest in modern astronomy, we are indebted to the dis- tinguished astronomer Dr Bradley. He was led to it, in 1727, by the result of observations he made with the

view of determining the annual parallax of some of the stars; that is, the angle subtended at these stars by the diameter of the earth’s orbit. He observed certain changes in the positions of the stars that he could not account for. The deviations were not in the direction of the apparent motion that parallax would give rise to; and he had no better

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The rate of the earth’s motion

success in attempting to explain the phenomenon by the nutation of the earth’s axis, radiation, errors of observa- tion, &c. At last the true solution of the difficulty occurred to him, suggested, it is said, by the movements of a vane on the top of a boat’s mast. Roemer had discovered, a quarter of a century before, that light has a velocity which admits of measurement; and Bradley perceived that the earth’s motion, having a perceptible relation to that of light, must affect the direction of the visual rays, and with this the apparent positions of the stars. He calculated the aberration from the known relative velocities of the earth and of light, and the results agreed entirely with his observations.

The observed effects of aberration are of importance as supplying an independent method of measuring the velocity of light, but more particularly as presenting one of the few direct proofs that can be given of the earth’s motion round the sun. It is indeed the most satisfactory proof of this that astronomy furnishes, the phenomenon being quite in- explicable on any other hypvthesis.

ABERYSTWITH, a municipal and parliamentary bo- rough, market town, and seaport of Wales, in the county of Cardigan, is situated at the western end of the Vale of Rheidol, near the confluence of the rivers Ystwith and Rheidol, and about the centre of Cardigan Bay. It is the terminal station of the Cambrian Railway, and a line to the south affords direct communication with South Wales, Bristol, &c. The borough unites with Cardigan, Lampeter, &c., in electing a member of Parliament. Coal, timber, and lime are imported, and the exports are lead, oak bark, flannel, and corn. The

harbour has of late been much improved ; and the pier, completed in 1865, forms an excellent promenade. There are many elegant build- ings, and it has been proposed to establish here a Uni- versity College of Wales. On a promontory to the S.W. of the town are the ruins of its ancient castle, erected in 1277, by Edward L., on the site of a fortress of great strength, built by Gilbert de Strongbow, and destroyed by Owen Gwynedd. From its picturesque situation and healthy climate, and the suitableness of the beach for bathing, Aberystwith has risen into great repute as a watering-place, and attracts many visitors. Much of the finest scenery in Wales, such as the Devil's Bridge, &c., lies within easy reach. Population (1871), 6898.

ABETTOR, a law term implying one who instigates, encourages, or assists another to perform some criminal action. See ACCESSORY.

ABEYANCE, a law term denoting the expectancy of au estate. Thus, if lands be leased to one person for life, with reversion to another for years, the remainder for years is in abeyance till the death of the lessee.

ABGAR, the name or title of a line of kings of Edessa in Mesopotamia. One of them is known from a corre- spondence he is said to have had with Jesus Christ. The letter of Abgar, entreating Jesus to visit him and heal him of a disease, and offering Him an asylum from the wrath of the Jews, and the answer of Jesus promising to send a disciple to heal Abgar after His ascension, are given by Eusebius, who believed the documents to be genuine. The same belief has been held by a few moderns, but there can be no doubt whatever that the letter of Jesus at least is apocryphal. It has also been alleged that Abgar possessed a picture of Jesus, which the credulous may see either at Rome or at Genoa. Some make him the possessor of the handkerchief a woman gave Jesus, as He bore the cross, to wipe the sweat from His face with, on which, it is fabled, His features remained miraculously imprinted.

ABIAD, Baur-E1-, a name given to the western branch of the Nile, above Khartoum. It is better known as the White Nile. See NILE.

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ABIES. See Fir.

ABILA, a city of ancient Syria, the capital of the tetrarchy of Abilene, a territory whose limits and extent it is impossible now to define. The site of Abila is indi- cated by some ruins and inscriptions on the banks of the river Barada, between Baalbec and Damascus, about twelve miles from the latter city. Though the names Abel and Abila differ in derivation and in meaning, their similarity has given rise to the tradition that this was the scene of Abel's death.

ABILDGAARD, Nixotas, called "the Father of Danish Painting," was born in 1744. He formed his style on that of Claude and of Nicolas Poussin, and was a cold theorist, inspired not by nature but by art. As a technical painter he attained remarkable success, his tone being very harmonious and even, but the effect, to a foreigner's eye, is rarely interesting. His works are scarcely known out of Copenhagen, where he won an immense fame in his own generation, and where he died in 1809. He was the founder of the Danish school of painting, and the master of Thorwaldsen and Eckersberg. (E. W. G.)

ABIMELECH (722738, father of the king, or rather perhaps king-father), occurs first in the Bible as the name of certain kings of the Philistines at Gerar (Gen. xx. 2, xxi, 22, xxvi. 1). From the fact that the name is applied in the inscription of the thirty-fourth psalm to Achish, it has been inferred with considerable probability that it was used as the official designation of the Philistinian kings. The name was also borne by a son of Gideon, judge of Israel, by his Shechemite concubine (Judges viii. 31). On the death of Gideon, who had refused the title of king both for himself and his children, Abimelech set himself to obtain the sovereignty through the influence of his mother's relatives. In pursuance of his plan he slew seventy of his brethren "upon one stone" at Ophrah, Jotham, the youngest of them, alone contriving to escape, This is one of the earliest recorded instances of a practice exceedingly common on the accession of Oriental despots. Abimelech was eventually made king, although his election was opposed by Jotham, who boldly appeared on Mount Gerizim and told the assembled Shechemites the fable of the trees desiring a king. At the end of the third year of his reign the Shechemites revolted, and under the leadership of Gaal made an

unsuccessful attempt to throw off the authority of Abimelech. In Judges ix. there is an account of this insurrection, which is specially interest- ing owing to the full details it gives of the nature of the military operations. After totally destroying Shechem, Abimelech proceeded against Thebez, which had also re- volted. Here, while storming the citadel, he was struck on the head by the fragment of a millstone thrown from the wall by a woman. To avoid the disgrace of perishing by a woman's hand, he requested his armour-bearer to run him through the body. Though the immediate cause of his death was thus a sword-thrust, his memory was not saved from the ignominy he dreaded (2 Sam. xi. 21). It has been usual to regard Abimelech's reign as the first attempt to establish a monarchy in Israel. The facts, however, seem rather to support the theory of Ewald (Gesch. ii. 444), that Shechem had asserted its independ- ence of Israel, when it chose Abimelech as its king,

ABINGDON, a parliamentary and municipal borough and market town of England, in Berkshire, on a branch of the Thames, 7 miles south of Oxford, and 51 miles W.N.W. of London. It is a place of great antiquity, and was an important town in the time of the Heptarchy. Its name is derived from an ancient abbey. The strects, which are well paved, converge to a spacious area, In which the market is held. In the centre of this area stands the mnarket-house, supported on lofty pillars, with a large hall

above, appropriated to the summer assizes for the couuty, and the transaction of other public business. The town contains two churches, which are said to have been erected by the abbots of Abingdon, one dedicated to St Nicholas and the other to St Helena ; several charitable institutions, and a free grammar school, with scholarships at Pembroke College, Oxford. In 1864 a memorial of Prince Albert was erected at Abingdon, a richly ornamented structure, surmounted by a statue of the Prince. Abingdon was incorporated by Queen Mary. It sends one member to Parliament, and is governed by a mayor, four aldermen, and twelve councillors. In the beginning of the century it manufactured much sail-cloth and sacking; but its chief trade now is in corn and malt, carpets, and coarse

linen. It is a station on a branch of the Great Western Railway. Population (1871), 6571.

ABIOGENESIS, as a name for the production of living by not-living matter, has of late been superseding the less accurate phrase ‘Spontaneous Generation.” Professor Huxley, who made usc of the word in his presidential address to the British Association in 1870, distinguished Abiogenesis from “ Xenogenesis” or “ Heterogenesis,” which occurs, or is supposed to occur, not when dead matter produces living matter, but when a living parent gives rise to offspring which passes through a totally different series of states from those exhibited by the parent, and does not return into the parent’s cycle of changes. When a “living parent gives rise to offspring which passes through the same cycle of changes as itself,” there occurs “ Homogenesis.” “ Biogenesis” includes both of these. Other names for Abiogenesis are Generatio Aiquivoca, Generatio Primaria, Archigenesis (Urzeugung), Archebiosis, &c. The question of Abiogenesis—whether under certain conditions living matter is produced by not- living matter—as it is one of the most fundamental, is per- haps also the oldest in Biology; but within recent years— partly because the means of accurate experimentation have been increased and the microscope improved, and partly because the question has been recognised in its impor- tant bearings on evolution, the correlation of forces, and the theory of infectious diseases—naturalists have been led to bestow more attention upon it than at any previous period. While, therefore, the doctrine of Abiogenesis cannot be said to be either finally established or refuted, it is at least reasonable to believe that we are gradually advancing to a solution. Among the older observers of phenomena bearing on the question may be named Aristotle, who, with the ancients generally, favoured Abiogenesis ; Redi, the founder of the opposite view ; Vallisnieri ; Buffon ; Needham; and Spallanzani ; among later observers, Schwann and Sehulze, Schroeder and Dusch, Pasteur, Pouchet, Haeckel, Huxley, Bastian, and many others. The experiments and observations made by these naturalists, and their results—the ingenious ex- pedients employed to prevent inaccuracy—the interesting and often marvellous transformations which microscopists declare they have witnessed—will be discussed in the article Htstotocy ; here it will be enough to note the gencral nature of the reasonings with which the opponents and defenders of Abiogenesis support their views. The

opponents maintain that all trustworthy observations have hitherto shown living matter to have sprung from pre-existing living matter ; and that the further we scarch and examine, the smaller becomes the number of those organisms which we cannot demonstrate to have arisen from living parents. They hold that seeming instances of spontaneous generation are usually to be explained by the germ-theory—the presence of invisible germs in the air; and they call to their aid such high authoritics as Pasteur and Tyndall. The defenders of Abiogenesis, on the other

hand, while interpreting the results of past observation and experiment in their own favour, are yet less disposed to rest on these, rather preferring to argue from those wide analogies of evolution and correlation which seem to support their doctrine. Thus Hacekel expressly embraces Abiogenesis as a necessary and integral part of the theory of universal evolution ; and Huxley, in the same spirit, though from the opposite camp, confesses that if it were given him to look beyond the abyss of geologically recorded time to the still more remote period when the earth was passing through physical and chemical con- ditions, he should expect to be a witness of the evolution of living protoplasm from not-living matter. (Critiques and Addresses, p. 239.) From this point of view, of course, any microscopie observations that have been made seem very limited and comparatively unimportant. The Abiogenists, indeed, are not without arguments to oppose the results of past observation that seem unfavourable to their views; they argue that, as yet, all the forms observed and shown to be produced by Biogenesis are forms possessing a certain degree of organisation, which in their case makes Abiogenesis unlikely, from the first ; whereas it has not been shown that the simplest struc- tures—the dfonera—do not arise by Abiogenesis. But it is not so mueh on grounds of fact and experiment the defenders of the Abiogenesis theory are convinced of its truth, as because it seems to gain confirmation from reasonings of much wider scope; because Abiogenesis aids the theory of evolution by tracing the organic into the inorganic ; beeause it fosters the inereasing unpopularity of the hypothesis of a special

“ vital foree;” and because, if this theory of the “ perpetual origination of low forms of life, now, as in all past epochs,” were established, it would agree well with the principle of uniformity, and by diselosing the existence of unknown worlds of material for development, would relieve natural selection with its assist- ing causes from what many consider the too Herculean labour of evolving all species from one or a very few primary forms. The fullest discussion of the subject of Abiogenesis, from the Abiogenist’s point of view, is to be found in Dr Bastian’s Beginnings of Life. Professor TIuxley’s address, already referred to, contains an interest- ing historical survey, as well as a masterly summary of facts and arguments in favour of Biogenesis. For many interesting experiments, see Vature, 1870-73. ABIPONES, a tribe of South American Indians, inhabit- ing the territory lying between Santa Fé and St Iago. They originally oecupied the Chaco district of Paraguay, but were driven thence by the hostility of the Spaniards. According to M. Dobrizhoffer, who, towards the end of last century, lived among them for a period of seven years, they have many singular customs and eharacteristics. They seldom marry before the age of thirty, are chaste and otherwise virtuous in their lives, though they practise infanticide, and are without the idea of God. ‘ With the Abipones,” says Darwin, “when a man chooses a wife, he bargains with the parents about tke price. But it fre- quently happens that the girl rescinds what has been agreed upon between the parents and bridegroom, obsti- nately rejecting the very mention of marriage. She often runs away and hides herself, and thus eludes the bride- groom.” The Abiponian women suckle those infants that are spared for the space of two years,—an onerous habit, whieh is believed to have led to infanticide as a means of escape. The men are brave in war, and pre-eminently expert in swimming and horsemanship. N umerically the tribe is insignifieant. M. Dobrizhoffer’s account of the Abiponians was translated into English by Sara Coleridge, at the suggestion of Mr Southey, in 1822. ABJURATION. See Atieciance, OatH or.

ABKHASIA, or AzBasia, a tract of Asiatic Russia, on the border of the Black Sea, comprehending between lat. 42° 30’ and 44° 45’ N. and between long. 37° 3’ and 40° 36’ E. The high mountains of the Caucasus on the N. and N.E. divide it from Circassia; on the §.E. it is bounded by Mingrelia; and on the 8.W. by the Black Sea. Though the country is generally mountainous, there are some deep well-watered valleys, and the climate is

mild. The soil is fertile, producing grain, grapes, and other fruits. Some of the inhabitants devote themselves to agriculture, some to the rearing of cattle and horses, and not a few support themselves by piracy and robbery. Honey is largely produced, and is exported to Turkey; and excellent arms are made. Both in ancient and in modern times there has been considerable traffic in slaves. This country was early known to the ancients, and was subdued by the Emperor Justinian, who introduced civilisation and Christianity. Afterwards the Persians, then the Georgians, and more recently the Turks, ruled over the land. Under the Turks Christianity gradually disappeared, and Moham- medanism was introduced in its stead. By the treaties of Akerman and Adrianople, Russia obtained possession of the fortresses of this territory; but till the insurrection of 1866, the chiefs had almost unlimited power. The prin- cipal town is Sukumkaleh, The population of Abkhasia is variously stated at from 50,000 to 250,000. See Pal- grave's Hssays on Eastern Questions, 1872.

ABLUTION, a ceremonial purification, practised in nearly every age and nation. It consisted in washing the body in whole or part, so as to cleanse it symbolically

from defilement, and to prepare it for religious observances.

Among the Jews we find no trace of the éeremony in patri- archal times, but it was repeatedly enjoined and strictly enforced under the Mosaic economy. It denoted either— (1.) Cleansing from the taint of an inferior and less pure condition, and initiation into a higher and purer state, as in the case of Aaron and his sons on their being set apart to the priesthood; or (2.) Cleansing. from the soil cf common life, in preparation for special acts of worship, as in the case of the priests who were commanded, upon pain of death, to wash their hands and feet before approaching the altar; or (3.) Cleansing from the pollution occasioned by particular acts and cireumstances, as in the case of the eleven species of uncleanness mentioned in the Mosaic law; or (4.) The absolving or purifying one's self from the guilt of some particular criminal act, as in the case of Pilate at the trial of the Saviour. The sanitary reasons which, in a warm climate and with a dry sandy soil, ren- dered frequent ablution an imperative necessity, must not be allowed to empty the act of its symbolic meaning. In the Hebrew

different words are used for the washing of the hands before meals, which was done for the sake of cleanliness and comfort, and for the washing or plunging enjoined by the ceremonial law. At the same time it is impossible to doubt that the considerations which made the law so suitable in a physical point of view were present to the mind of the Lawgiver when the rite was enjoined. Traces of the practice are to be found in the history of nearly every nation. The customs of the Mohammedans, in this as in other matters, are closely analogous to those of the Jews. With them ablution must in every case pre- eede the exercise of prayer, and their law provides that in the desert, where water is not to be found, the Arabs may perform the rite with sand. Various forms of ablution practised by different nations are mentioned in the sixth book of the Aineid, and we are told that Aineas washed his ensanguined hands after the battle before touching his Penates. Symbolic ablution finds a place under the New Testament dispensation in the rite of baptism, which is observed, though with some variety of form and circuni-

stances, throughout the whole Christian Church. By Roman Catholics and Ritualists, the term ablution is applied to the cleansing of the chalice and the fingers of the celebrating priest after the administration of the Lord’s Supper. ,

ABNER (7228, futher of light), first cousin of Saul (1 Sam. xiv. 50) and commander-in-chief of his army. The chief references to him during the lifetime of Saul are found in 1 Sam. xvii. 55, and xxvi. 5. It was only after that monarch’s death, however, that Abner was brought into a position of the first political importance. David, who had some time before been designated to the throne, was accepted as king by Judah alone, and was crowned at Hebron. The other tribes were actuated by a feeling hostile to Judah, and, as soon as they had thrown off the Philistinian yoke, were induced by Abner to recognise Ishbosheth, the surviving son of Saul, as their king. One cngagement between the rival factions under Joab and Abner respectively (2 Sam. ii. 12) is noteworthy, inasmuch as it was preceded by an encounter between twelve chosen men from each side, in which the whole twenty-four seem to have perished. In the general

engagement which fol- lowed, Abner was defeated and put to flight. He was closely pursued by Asahel, brother of Joab, who is said to have been “light of foot as a wild roe.” As Asahel would not desist from the pursuit, though warned, Abner was compelled to slay him in self-defence. This originated a deadly feud between the leaders of the opposite parties, for Joab, as next of kin to Asahel, was by the law and custom of the country the avenger of his blood. For some time afterwards the war was carried on, the advantage being invariably on the side of David. At length Ishbosheth lost the main prop of his tottering cause by remonstrating with Abner for marrying Rizpah, one of Saul’s concubines, im alliance which, according to Qriental notions, implied pretensions to the throne. Abner was indignant at the rebuke, and immediately transferred his allegiance to David, who not only welcomed him, but promised to give him the command of the combined armies on the re-union of the kingdoms. Almost immediately after, however, Abner was slain by Joab and his brother Abishai at the gate of Hebron. The ostensible motive for the assassina- tion was a desire to avenge Asahel, and this would be a sufficient justification for the deed according to the moral standard of the time. There can be little doubt, however, that Joab was actuated in great part by jealousy of a new and formidable rival, who seemed not unlikely to usurp his place in the king’s favour. The conduct of David after the event was such as to show that he had no com- plicity in the act, though he could not venture to punish its perpetrators. The dirge which he repeated over the grave of Abner (2 Sam. iii, 33-4) has been thus trans- lated :—

Should Abner die as a villain dies ?— Thy hands—not bound,

Thy feet—not brought into fetters: As one falls before the sons of wickedness, fellest thou.

ABO, a city and seaport, and chief town of the district of the same name in the Russian province of Finland, is situated in N. lat. 60° 26’, E. long. 22° 19’, on the Aura- joki, about 3 miles from where it falls into the Gulf of Bothnia. It was a place of importance when Finland formed part of the kingdom of Sweden, and the inhabi- tants of the city and district are mostly of Swedish descent. By the treaty of peace concluded here between Russia and Sweden on 17th August 1743, a great part of Finland was ceded to the

former. Abo continued to be the capital of Finland till 1819. In November 1827, nearly the whole city was burnt down, the university and its valuable library

being entirely destroyed. Before this calamity Abo con- tamed 1100 houses, and 13,000 inhabitants; and its university had 40 professors, more than 500 students, and a library of upwards of 30,000 volumes, together with a botanical garden, an observatory, and a chemical laboratory. The university has since been removed to Helsingfors. Abo is the seat of an archbishop, and of the supreme court of justice for South Finland; and it has a cathedral, a town-hall, and a custom-house. Sail-cloth, linen, leather, and tobacco are manufactured ; shipbuilding is carried on, and there are extensive saw-mills. There is also a large trade in timber, pitch, and tar. Vessels drawing 9 or 10 feet come up to the town, but ships of greater draught are laden and discharged at the mouth of the river, which forms an excellent harbour and is protected. Population in 1867, 18,109.

ABOLITIONIST. See Stavery.

ABOMASUM, caillette, the fourth or rennct stomach of Ruminantia. From the omasum the food is finally depo- sited in the abomasum, a cavity considerably larger than either the second or third stomach, although less than the first. The base of the abomasum is turned to the omaswm. It is of an irregular conical form. It is that part of the digestive apparatus which is analogous to the single stomach of other Mammalia, as the food there undergoes the process of chymification, after being macerated and ground down in the three first stomachs.

ABOMEY, the capital of Dahomey, in West Africa, is situated in N. lat. 7°, E. long. 2° 4’, about 60 miles N. of Whydah, the port of the kingdom. It is a clay- built town, surrounded by a moat and mud walls, and occupies a large area, part of which is cultivated. Tho’ houses stand apart; there are no regular streets; and the place is very dirty. It has four larger market-placcs, and trade is carried on in palm-oil, ivory, and gold, Moham- medan traders from the interior resorting to its markets. The town contains the principal palace of the king of Dahomey. It is the scene of frequent human sacrificcs,

a “custom” being hold annually, at which many criminals and captives are slain; while on the death of a king a “grand custom” is held, at which sometimes as many as 2000 victims have perished. The slave-trade is also pro- secutcd, and the cfforts of the British Government to induce the king to abolish it and the “customs” have proved un- successful. Population, about 30,000. See Danomry.

ABORIGINES, originally a proper name given to an Italian people who inhabited the ancient Latium, or country now called Campagna di Roma. Various deriva- tions of this name have been suggested; but there can bo scarcely any doubt that the usual derivation (ab origine) is correct, and that the word simply indicated a settled tribe, whose origin and earlier history were unknown. It is thus the equivalent of the Greck autochthones. It is thercforo, strictly speaking, not a proper name at all, although, from being applied to one tribe (or group of tribes), it came to be regarded as such. Who the Aborigines were, or whence they came, is uncertain; but various traditions that arc recorded seem to indicate that they were an Oscan or Opican tribe that descended from the Apennines into Latium, and united with some Pelasgic tribe to form tho Latins, The storics about Atneas’s landing in Italy repre- sent the Aborigines as at first opposing and then coalescing with the Trojans, and state that the united people then assumed the name of Latins, from their king Latinus. These traditions clearly point to the fact that the Latins were a mixed race, a circumstance which is proved by the structure of their language, in which we find numerous words closely connected with tlie Greek, and also numerous words that arc of an entirely different origin. These uon- Greek words are mostly related to the dialects of the

Opican tribes. In modern times the term Aborigines has been extended in signification, and is used to indicate the inhabitants found in a country at its first discovery, in contradistinction to colonies or new races, the time of whose introduction into the country is known. ABORTION, in Midwifery (from aborior, I perish), the premature separation and expulsion of the contents of the pregnant uterus. When occurring before the eighth lunar month of gestation, abortion is the term ordinarily employed, but

subsequent to this period it is designated premature labour, The present notice includes both these terms. As an accident of pregnancy, abortion is far from uncommon, although its relative frequency, as compared with that of completed gestation, has been very differently estimated by accoucheurs. It is more liable to occur in the earlier than in the later months of pregnancy, and it would also appear to occur more readily at the periods corresponding to those of the menstrual discharge. Abor- tion may be induced by numerous causes, both of a local and general nature. Malformations of the pelvis, acci- dental injuries, and the diseases and displacemeuts to which the uterus is liable, on the one hand; and, on the other, various morbid conditions of the ovum or placenta leading to the death of the foetus, are among the direct local causes of abortion. The general causes embrace certain states of the system which are apt to exercise a more or less direct influence upon the progress of utero- gestation. A deteriorated condition of health, whether hereditary or as the result of habits of life, certainly pre- disposes to the occurrence of abortion. Syphilis is known to be a frequent cause of the death of the foetus. Many diseases arising in the course of pregnancy act as direct exciting causes of abortion, more particularly the eruptive fevers and acute inflammatory affections. Prolonged irritation in other organs may, by reflex action, excite the uterus to expel its contents. Strong impressions made upon the nervous system, as by sudden shocks and mental emotions, occasionally have a similar effect. Further, certain medicinal substances, particularly ergot of rye, borax, savin, tansy, and cantharides, are commonly be- lieved to be capable of exciting uterine action, but the effects, as regards at least early pregnancy, are very un- certain, while the strong purgative medicines sometimes employed with the view of procuring abortion have no effect whatever upon the uterus, and can only act remotely and indirectly, if they act at all, by irritating the alimen- tary canal. In cases of poisoning with carbonic acid, abortion has been observed to take place, and the experi- ments of Dr Brown Sequard show that anything inter- fering with the normal oxygenation of the blood may cause the uterus to contract and expel its contents. Many cases of abortion occur without apparent cause, but in such instances the probability is that some morbid condition of the interior of the uterus exists, and the same may be said of many of those cases where the disposition to abort has become habitual. The tendency, however, to the recurrence of abortion in persons who have previously miscarried is well known, and should ever be

borne in mind with the view of avoiding any cause likely to lead to a repetition of the accident. Abortion resembles ordi- nary labour in its general phenomena, excepting that in the former hemorrhage often to a large extent forms one of the leading symptoms. The treatment of abortion embraces the means to be used by rest, astringents, and sedatives, to prevent the occurrence when it merely threatens ; or when, on the contrary, it is inevitable, to accomplish as speedily as possible the complete removal of the entire contents of the uterus. The artificial induc- tion of premature labour is occasionally resorted to by accoucheurs under certain conditions involving the safety

of the mother or the.foetus. For Criminal Abortion, see MEDICAL JURISPRUDENCE.

ABOUKIR, a small village on the coast of Egypt, 13 miles N.E. of Alexandria, containing a castle which was used as a state prison by Mehemet Ali. Near the village, and connected with the shore by a chain of rocks, is a small island remarkable for remains of ancient buildings. Stretching to the eastward as far as the Rosetta mouth of the Nile is the spacious bay of Aboukir, where Nelson fought “the Battle of the Nile,” defeating and almost destroying the French fleet that had conveyed Napoleon to Egypt. It was near Aboukir that the expedition to Egypt, under Sir Ralph Abercromby, in 1801, effected a landing in the face of an opposing force.

ABRABANEL, Isaac (called also Abravanel, Abarbanel, Barbanella, and Ravanella),a celebrated Jewish statesman, philosopher, theologian, and commentator, was born at Lisbon in 1437, He belonged to an ancient family that claimed descent from the royal house of David, and his parents gave him an education becoming so renowned a lineage. He held a high place in the favour of King Alphonso V., who intrusted him with the management of important state affairs, On the death of Alphonso in 1481, his counsellors and favourites were harshly treated by his successor John; and Abrabauel was, in consequence, compelled to flee to Spain, where he held for eight years (1484-1492), the post of a minister of state under Ferdi- nand and Isabella. When the Jews were banished from Spain in 1492, no exception was made in Abrabanel’s favour. He afterwards resided at Naples, Corfu,

and Monopoli, and in 1503 removed to Venice, where he held office as a minister of state till his death in 1508. Abra- banel was one of the most learned of the rabbis. His writings are chiefly exegetical and polemical ; he displays in them an intense antipathy to Christianity, though he lived on terms of friendship with Christians. He wrote commentaries on the greater part of the Old Testament, in a clear but somewhat diffuse style, anticipating much that has been advanced as new by modern theologians.

ABRACADABRA, a meaningless word once supposed to have a magical efficacy as an antidote against agues and other fevers. Ridiculously minute directions for the proper use of the charm are given in the Precepta de Medicina of Serenus Sammonicus. The paper on which the word was written had to be folded in the form of a cross, suspended from the neck by a strip of linen so as to rest on the pit of the stomach, worn in this way for nine days, and then, before sunrise, cast behind the wearer into a stream running to the east. The letters of this word were usually arranged to form a triangle in one or other of the following ways :—

ABRACADABRA ABRACADABRA ABRACADABR BRACADABR
ABRACADAB RACADAB ABRACADA ACADA ABRACAD CAD
ABRACA A ABRAC ABRA ABR AB

A ABRAHAM or ABRAM, father of the Israelite race, was the first-born son of Terah, a Shemite, who left Ur of the Chaldees, in the north-east of Mesopotamia, along with Abram, Sarai, and Lot, and turned westwards in the direction of Canaan. Abram had married his half-sister Sarai, who was ten years younger than himself 3 and though such relationship was afterwards forbidden by the law, it was common in aucient times, both among other

peoples, and among the Hebrews themselves at least before Moses. ‘The cause of Tcrah’s removing from his native country is not given. Having come to Haran, he abode there till his death, at the age of 205. According to Genesis xii., Abram left Haran when he was 75 years of age, that is, before the death of his father, in consequence of a divine command, to which was annexed a gracious

romise, “ And J will make of thee a great nation, and J will bless thee, and make thy name great; and thou shalt be a blessing. And IJ will bless them that bless thee, and curse him that curseth thee; and in thee shall all families of the earth be blessed” (xii. 2, 3). Another tradition makes him leave Haran only after Terah’s decease (Acts vii. 4), The later account is that Abram’s departure was the result of religious considerations, because he had already become emancipated from surrounding idolatry. Perhaps the desire of a nomadic life, the love of migration natural to au Oriental, had more to do with his pilgrimage than a spiritual impulse from within ; but it is likely that his culture advanced in the course of his sojournings, and that he gradually attained to purer conceptions of duty and life. Traditions subsequent to the Jehovistic represent him as driven forth by the idolatrous Chaldeans (Judith v. 6, &c.) on account of his monotheistic doctrines, and then dwelling in Damascus as its king (Josephus’s Antz- quities, i. 7). The true cause of departure may be sug- gested by Nicolaus of Damascus saying that he came out of Chaldea with an army. The leader of a horde, worsted in some encounter or insurrection, he emigratcd at the head of his adhercnts in quest of better fortunes. The word redeemed, in Isaiah xxix. 22, out of which Ewald conjectures so much, as if Abram had been rescued from great bodily dangers and battles, does not help the portrait, because it means no more than the patriarch’s migration from heathen Mesopotamia into the Holy Land. Journey- ing south-west to Canaan with his wife and nephew, he arrived at Sichem, at the oak of the seer or prophet, where Jehovah appeared to him, assuring him for the first time that his seed should possess the land he had come to. He travelled thence southward, pitching his tent east of Bethel. Still proceeding in the same direction, he arrived at the Negeb, or most southern district of Palestine, whence a famine forced him down to Egypt. His plea that Sarai was his sister did not save her from Pharaoh ; for she was taken into the royal harem, but restored to her husband in consequence of divine chastisments inflicted upon the lawless possessor of her person, leading to the discovery of her true relationship. The king was glad to send the patriarch away under the escort and protection of his men. A similar thing is said to have subsequently happened to Sarai at Gerar with the Philistine king Abimelech (Genesis xx.), as also to Rebekah, Isaac’s wife (xxvi.) The three narratives describe one and the same event in different shapes. But the more original (the junior Elohistic)1 is that of the 20th chapter, so that Gerar was the scene, and

Abimelech the offender; while the later Jehovistic narrative (xii.) deviates still more from veri- similitude. Though this occurrence, however, belongs to the southern borders of Palestine, we need not doubt the fact of Abram's sojourn in Egypt, especially as he had an Egyptian slave (Genesis xvi.) How long the patriarch remained there is not related; nor are the influences which the religion, science, and learning of that civilised land had upon him alluded to. That they acted beneficially upon his mind, enlightening and enlarging it, can scarcely be doubted. His religious conceptions were transformed. ne ee ee ee

1 Three documents at least are traceable in the Pentateuch ; the Elohistic, the junior Elohistic, and the Jehovistic. These were put together by a redactor. Nearly the whole of the fifth book was added by the Deuteronomist,

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The manifold wisdom of Egypt impresscd him. Inter- course with men far advanccd in civilisation taught him much, Later tradition speaks of his communicating to the Egyptians the sciences of arithmetic aud astronomy (Josephus i. 7); but this is founded upon the notion entertained at the time of the civilised Chaldeans of Babylon, whereas Ur of the Chaldees was a district remote from the subsequent centre of reconditc knowledge. Abram received more than he imparted, for the Egyptians were doubtless his superiors in science. He found the rite of circumcision in use. There, too, he acquired great substance—flocks and herds, male and female slaves. After returning to Canaan, to his former locality, Abram and Lot separated, because of disputes between thcir herdsmen, there not being sufficicnt room for all their cattle in common. Aftcr this separation the possession of Canaan was again assured to Abram and to his seed, who should be exceedingly numerous. This is the third theocratic promise he received. He is also commanded by Jehovah to walk through it in its length and breadth as a token of inheritance,—a later Jehovistic tradition that must be judged according to its inherent verisimilitude. Abram settled again at the oak of Mamre near Hebron. This was his headquarters. After Lot had been taken prisoner in the expedition of the kings of Shinar, Ellasar, Elam, and Goyim, against the old inhabitants of Basan, Ammonitis, Moabitis, Edomitis, and

others besides, Abram gave chase to the enemy, accompanied by his 318 slaves and friendly ueighbours, rescuing his. nephew at Hobah, near Damascus. On his return, the royal priest Melchizedek of Salem came forth to meet him with refreshments, blesscd the patriarch, and received from him the tithe of the spoils. The king acted generously towards the victor, and was still morc generously treated in return.

Jehovah again promised to Abram a numerous offspring, with the possession of Canaan. He also concluded a covenant with him in a solemn form, and revealcd the fortunes of his posterity in Egypt, with their deliverance from bondage. In consequence of the barrenness of Sarai, she gave her handmaid Hagar to Abram, who, becoming pregnant by him, was haughtily treated by her mistress, and ficd towards Egypt. But an angel met her in the desert and sent her back, telling of a numcrous racc that should spring from her. Having returned, she gave birth to Ishmacl, in the 86th ycar of Abram's age.

Again did Jehovah appear to the patriarch, promising as before a multitudinous seed, and changing his name in conformity with such promise. He assured him and his posterity of the possession of Canaan, and concluded a covenant with him for all time. At: the institution of circumcision on this occasion, Sarai's name was also changed, because she was to be the maternal progenitor of the covenant people through Isaac her son. Abram, and all the males belonging to him, were then circumcised. He had become acquainted with the rite in Egypt, and trans- ferred it to his household, making it a badge of distinction between the worshippers of the true God and the idolatrous Canaanites—the symbol of the flesh's subjection to the spirit. Its introduction into the worship of the colony at Mamre indicated a decided advance in Abram's religious conceptions. He had got beyond the cruel practice of human sacrifice. The gross worship of the Canaanites was left behind ; and the small remnant of it which he retained com- ported with a faith approaching monotheism. Amid pre- vailing idolatry this institution was a protection to his family and servants—a magic circle drawn around them. But, though powerful and respected wherever his name was known, he confincd the rite to his own dumestics, without attempting to force it on the inhabitants of the land where he sojourned. The punishment of death

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for neglecting it, because the uncircumcised person was thought to be a breaker of the covenaut and a despiser of its Author, seems a harsh measure on the part of Abram; yet it can hardly be counted an arbitrary traus- ference of the later Levitical severities to the progenitor of the race, since it is in the Elohist.

Accompanied by two angels, Jehovah appeared again to

Abram at the oak of Mamre, accepted his proposed hospi- tality, and promised him a son by Sarai within a year. Though she laughed incredulously, the promise was definitely repeated. When the angels lIcft, Jehovah communicated to Abram the divine purpose of destroying the dwellers in Siddim because of their wickedness, but acceded to the patriarch's intercession, that the citics of the plain should be spared if ten righteous men could be found in them. The two angels, who had gone before, arrived at Sodom in the evening, and were cntertained by Lot, but threatened with shameful treatment by the depraved inhabitants. Seeing that the veugcance of Heaven was deserved, they proceeded to exccute it, saving Lot with his wife and two daughters, and sparing Zoar as a place of refuge for them. Jehovah rained down fire and brimstone from heaven, turning all the Jordan district to desolation, so that when Abram looked next morning from the spot where Jehovah and himself had parted, he saw a thick smoke ascend from the ruins. Abram then journeyed from Hebron to the Negeb, settled between' Kadesh and Shur in Gerar, where Sarai is said to have been treated asa prior account makes her to have been in Egypt. At the patriarch's prayer the plague inflicted on the king and his wives was removed. 'Thisisa duplicate of the other story. Whatever historical truth the preseut nar- rative has belongs to an earlier period of Abram's life. His second removal to Gerar originated in the former journeying through it into Egypt. He must have remained in the neigh- bourhood of Hebron, his first settlement, where Isaac was born according to the Elohistic account. After the birth of the legitimate heir, succceding events were the expulsion of Hagar and Ishmael from the paternal home, and the making of a covenant between Abimclech and Abram at Beersheba. Here Abram "called on the

name of the Lord," and is said to have planted a noted tamarisk in commemoration of the event.

Abram was now commanded by God to offer up Isaac in the land of Moriah. Proceeding to obey, he was prevented by an angel just as he was about to slay his son, and sacrificed a ram that presented itself at the time. In reward of his obedience he received the promise of a numer- ous seed and abundant prosperity. Thence he returned to Beersheba.

Sarai died and was buried in the cave of Machpelah near Hebron, which Abram purchased, with the adjoining field, from Ephron the Hittite. The measures taken by the patriarch for the marriage of Isaac are circumstantially described. His steward Eliezer was sent to the country and kindred of Abram to find a suitable bride, which he did in Haran, whither he was divinely conducted. Rebckah appeared as the intended one; she parted from Bethuel and her family with their full approbation, was brought to Isaac, and became a maternal ancestor of the chosen people.

It is curious that, after Sarah's death, Abram should have contracted a second marriage with Keturah, and begotten six sons. The Chronicles, however, make her his concubine (1 Chron. i. 32), so that these children may have been born earlier. Probably the narrative intends to account for the diffusion of Abram's posterity in Arabia. Keturah's sons were sent away with gifts from their home into Arabia, and all the father's substance was given to Isaac. The patriarch died At the age of 175 years,

and was buried by Isaac and Ishmacl beside Sarai in Machpclah. The book of Genesis gives two lists of Arab tribes, descended partly from Abram and Keturah, partly from him and Hagar or Ishmael. These dwelt in Arabia Deserta and Petra, as also in the northeru half of Arabia Felix.

1. We cannot adopt the opinion of Von Bohlen and Dozy that Abram is a mythical person. He must be regarded as a historical character, though the accounts of his life have mythical elements intermingled with much that is tradi- tional or legendary. The difficulty of separating the historic from the merely traditional, hinders the presentation of a natural portrait. Later legends have invested him with ex- traordinary excellence. They have made him a worshipper of Jehovah, a prophet, the friend of God, favoured with

visible manifestations of. His presence, and receiving repeated promises of the most far-reaching character. He is the typical ancestor of the chosen race, living under the constant guidance of God, prospering in worldly goods, delivered from imminent perils. A superhuman halo surrounds him. It is the Jehovist in particular who invests him with the marvellous and improbable, con- necting him with altars and sacrifices—a cultus posterior to both his time and mental development—making him the subject of theophanies, talking familiarly to Jehovah himself, and fecding angels with flesh. The Elohist's descriptions are simpler. His patriarchs are usually colour- less men, upright and plain. 'They have neither char- acteristic features nor distinct outline. Abram stands out an honest, peaceable, generous, high-minded patriarch ; a prince, rich, powerful, and honoured, fitted for rule, and exercising it with prudence. We need not expect a full history of the man from writers long posterior, the representatives of popular traditions. Only fragments of the life are given, designed to show his greatness, Legend assigned ideal lineaments to the progenitor whon1 a remote antiquity shrouded with its hoary mantle, and thus he became a model worthy of imitation.

2. The biblical sources of his biography are three at least; and sometimes all appear in a single chapter, as in Gen. xxii., which describes the severest trial of faith. The oldest or Elohim-document is seen in verses 20-24, which link on to chap. xxi. 2-5, from the same. 'The rest of the chapter belongs to the junior Elohist, except verses 14-18, added by the Jehovist to connect Abram's sacrifice with Jerusalem. These different documents, out of which the general narrative was finally put together by a redactor, create diversities and contradictions. Thus the Elohist makes Abram laugh at the announcement of a son by Sarai (xvii. 17); the Jehovist, jealous for the patriarch's honour, assigns the laughter to the woman as a sign of incredulity (xviii. 12).

3. The account of the change of names given to Abram and Sarai when circumcision was instituted, cannot be regarded as historical. The Elohist says that Abram became Abraham, the latter meaning father of much people. But the Hebrew tongue has no word rahdm, and no root with the three letters pmax. Hence the Jews found the etymo- logy a puzzle.1 The old reading was undoubtedly Abram and Sarat, though the later Jews

expressly forbade Abram either in speaking or writing. The difference is one of mere orthography. The forms pmn and ny are cognate ones, as are mw and maw. The etymologising propensity of the Elohist is well known. The names signify father of height and princess respectively.

4. The religion of Abram was not pure Jehovism.

1 See Beer's Leben Abraham's, pp. 150, 151.

before the prophets. It was a late development, the creed of the most spiritual teaehers, uot of the people generally. Abram was a distinguished Oriental sheikh, who laid aside the grossness of idolatry, and rose by degrees, through eon- tact with many peoples and his own reflection, to the con- ception of a Being higher than the visible world, the God of the light and the sun. He was a civilised nomad, having wider and more spiritual aspirations than the peoples with whom he lived. As a worshipper of God, his faith was magnified by later ages throwing back their more advanced ideas into his time, because he was the founder of a favoured race, the type of Israel as they were or should be.

5. The leading idea forming the essence of the story re- specting Abram's sacrifice of Isaac, presents some difficulty of explanation, The ehapter did not proceed from the earliest writer, but from one acquainted with the institu- tion of animal saerifices. That the patriarch was familiar with human sacrifices among the peoples round about is beyond a doubt. Was he tempted from within to comply, on one oecasion, with the prevailing custom; or did the disaffected Canaanites call upon him to give sueh proof of devotion to his God? Perhaps there was a struggle in his mind between the better ideas which led to the habitual renunciation of the barbarous rite, and scruples of the uni- versal impropriety attaching to it. The persuasion that it could never be allowed may have been shaken at times. The general purport of the narrative is to place in a strong light the faith of one prepared to make the most eostly sacrifice in obedieuce to the divine command, as well as God's aversion to human offerings.

6. It is impossible to get chronological exactness in Abram's biography, because it is composed of different tra- ditions incorporated with one another, the product of dif- ferent times, and all passing through the hands of a later redactor for whom the true succession of events was not of primary importance. 'The writers themselves did not know the aecurate chronology, having to do with legends as well as facts impregnated with the legendary, which the redactor afterwards altered or adapted. The Elohist is much more chronological than the other writers. It is even impossible to tell the time when Abram lived. Ac- cording to Lepsius, he entered Palestine 1700-1730 z.c. ; according to Bunsen, 2886 ; while Schenkel gives 2130-2140 BC, In Beer's Leben Abraham's his birth is given 1948 A.M, 2.¢., 2040 B.c.

7. The Midrashim contain a good deal about Abram which is either founded on biblical accounts or spun out of the fancy. Nimrod was king of Babylon at the time. The patriarch's early announcement of the doctrine of one God, his zeal in destroying idols, including those worshipped by his father, his miraculous escape from Nimrod's wrath, his persuading Terah to leave the king's service and go with him to Canaan, are minutely told. During his life he had no fewer than ten temptations. Satan tried to ruin him, after the fiend had appeared at the great feast given when Isaac was weaned, in the form of a poor bent old man, who had been negleeted. We can only refer to one speci- men of rabbinic dialogue-making. God appeared to Abram by night, saying to him, " Take thy son"—(Abram interrupting), "Which? I have two of them." The voice of God—* Him who is esteemed by you as your only son." Abram—'" Each of them is the only son of his mother." God's voiee —" Him whom thou lovest." Abram—"T love both." God's voiee—" Him whom thou espeeially lovest." Abram—"T eherish my children with like love." God's voice—" Now, then, take Isaac." Abram—" And what shall I begin with in him?' God's voice—* Go to the land where at my call mountains will rise up out of valleys

—.. 0 Moriah, and offer thy son Isaac as a holocaust,"

1 uses more refined and dignified language.

Abram—"Is it a sacrifice I shall offer, Lord? Where is the priest to prepare it?" 'Be thou invested with that dig- nity as Shem was formerly." Abram—"

But that land eounts several mountains, which shall I ascend?" "The top of the mountain where thou shalt sce my glory veiled in the clouds," &c. (Beer, pp. 59, 60.)

The Arabic legends about Ibrahim are mostly taken from the Jewish fountain, very few being independent and pre- Islamite. Mohammed collected all that were current, and presented them in forms best suited to his purpose. His sources were the biblical aecounts and latcr Jewish legends. Those about the patriarch building the Kaaba along with Ishmael, his giving this son the house and all the country in which it was, his going as a pilgrim to Mecca every year, seeing Ishmael, and then returning to his own land, Syria, his foot-print on the black stone of the temple, and similar stories, are of genuine Arabic origin. 'The rest are Jewish, with certain alterations. The eollected narratives of the Arabic historians are given by Tabari, constituting a confused mass of legends drawn from the Old Testament, the Koran, and the Rabbins. (See Ewald's Geschichte des Volkes Israel, vol. i. pp. 440-484, third edition; Bertheau's Zur Geschichte der Israeliten, p. 206, et seg.; Tuch's Kommentar weber die Genesis, 1838; Knobel's Die Genesis, 1852; Dozy's Die Israeliten zu Mekka, p. 16, e seg.; B. Beer's Leben. Abraham's nach Auffassung der jiidischen Sage, 1859; Chronique @ Abou Djafar Mohammed Tabari, par L. Dubeux, tome premier, chapters 47-60; Chwolson's Ssabier und der Ssabismus, vol. ii.) (s. D.)

ABRAHAM-A-SANCTA-CLARA, was born at Kriheun- heimstetten, a village in Suabia, on the 4th of June 1642. His family name was Ulrich Megerle. In 1662 he joined the order of Barefooted Augustinians, and assumed the name by which alone he is now known. In this order he rose step by step until he became prior provincialis and definitor of his province. Having early gained a great reputation for pulpit eloquence, he was appointed court preacher at Vienna in 1669. There the people floeked in erowds to hear him, attracted by the force and homeliness of his langnage, the grotesqueness of his humour, and the impartial severity with which he lashed the follies of all classes of socicty. The vices of courtiers and eourt-life in particular were exposed with an admirable intrepidity. In general he spoke as a man of the people in the lan- guage of the people, the predominating quality of his style, which was altogether unique, being an

overflowing and often coarse wit. There are, however, many passages in his sermons in which he rises to loftier thought, and He died at Vienna on the lst December 1709. In his published writings Abraham-a-Sancta-Clara displayed much the same qualities as in the pulpit. Perhaps the most favourable specimen of his style is furnished in Judas der Erzschelm. His works have been several times reproduced in whole or part, though with many spurious interpolations, within the last thirty years, and have been very extensively read by both Protestants and Catholics. A selection was issued at Heilbroun in 1845, and a complete edition in 21 vols. appeared at Passau and Lindau, in 1835-54.

ABRANTES, a town of Portugal, Estremadura province, on the Tagus, about 70 miles N.E. of Lisbon, delightfully situated on the brow of a hill, of which the slopes are covered with olive trees, gardens, aud vineyards. It has considerable trade with Lisbon, particularly in fruit, corn, and oil. The town is strongly fortified, and is an important military position. At the convention of Cintra it was surrendered to the British. Junot derived from it his title of Duke of Abrantes. Population about

6000.

-ABRANTES, Duke anp Ducusss or. See Junot.

ABRAXAS, or Aprasax, a word engraved on certain antique stones, which were called on that aceount Abrazas stones, and were used as amulets or charms. ‘The Basili- dians, a Gnostie sect, attached importance to the word, if, indeed, they did not bring it into use. The letters of a8pagéas, in the Greek notation, make up the number 365, and the Basilidians gave the name to the 365 orders of spirits, which, as they conceived, emanated in succession from the Supreme Being. These orders were supposed to oecupy as many heavens, each fashioned like, but inferior to that above it; and the lowest of the heavens was thought to be the abode of the spirits who formed the earth and its inhabitants, and to whom was committed the administration of its affairs. The Abraxas stones, which are frequently to be met with in the cabinets of the eurious, are of very little value. In addition to the word Abraxas and other mystical characters, they have often engraved

on them cabalistic figures. The com- monest of these have the head of a fowl, and the arms and bust of a man, and terminate in the body and tail of a serpent.

ABRUZZO, originally one of the four provinces of the continental part of the kingdom of the two Sicilies, after- ward subdivided into Abruzzo Ulteriore I., Abruzzo Ulte- riore IJ., and Abruzzo Citeriore, which were so named from their position relative to Naples, and now form three of the provinces of the kingdom of Italy. The district, which was the most northerly part of the kingdom of the two Sicilies, is bounded by the Adriatic on the E., and by the provinces of Ascoli Piceno on the N., Umbria and Rome on the W., and Terra di Lavoro, Molise, and Capi- tanata on the S. The Abruzzi provinces have an area of nearly 4900 English square miles, and extend from N. lat. 41°40’ to 42°55’. Though presenting to the Adriatic a coast of about 80 miles in length, they have not a single good port. This territory is mostly rugged, mountainous, and covered with extensive forests, but contains also many fertile and well-watered valleys. The Apennines traverse its whole extent, running generally from N.W. to S.E., and here attaining their greatest elevation. Near Aquila is Monte Corno, the loftiest peak of that chain, called 7d gran Sasso d’Italia, or the great rock of Italy, which rises to the height of 9813 feet. Monte Majella and Monte Velino attain the height of 9500 and 8792 feet respectively. From the main range of the Apennines a number of smaller branches run off towards the west. The country is watered by numerous small rivers, most of which fall into the Adriatic. They are often suddenly swollen by the rains, especially in the spring, and thus cause considerable damage to the lands through which they pass. The principal rivers are the Tronto, Trentino, Pescara, and Sangro. In Abruzzo Ulteriore IL. is lake Celano or Lago di Fucino, the Lacus Fucinus of the Romans, now reduced to about one-third of its former extent. The elimate varies with the elevation, but, generally speaking, is temperate and healthy. Agriculture is but little understood or attended to, although in many of the lower parts of the eountry the land is fertile. The rivers are not embanked, nor is irrigation practised; so that the best of the land is frequently flooded during the rainy season, and parched in the heat of summer. The principal productions are corn, hemp, flax, almonds, olives, figs, grapes, and chestnuts. In the neighbourhood of Aquila saffron is extensively cultivated, although uot to such an extent as formerly. The

rearing and tending of sheep is the chief occupation of the inhabitants of the highlands; and the wool, which is of a superior quality, is an important article of com- merce, while the skins are sent in large quantities to the Levant. Bears, wolves, and wild boars inhabit the moun-

tain fastnesses ; and in the extensive oak forests numerous herds of swine are fed, the hams of which are in high repute. The manufactures are very inconsiderable, being ehiefly woollen, linen, and silk stuffs, and earthen and wood wares. Abruzzo was of great importance to the kingdom of Naples, being its chief defence to the north, and presenting almost insurmountable difficulties to the advanee of an enemy. The country is now free of the daring brigands by whom it was long infested. The inhabitants are a stout, well-built, brave, and industrious race. Their houses are generally miserable huts; their food principally maize, and their drink bad wine. The railway from Ancona to Brindisi passes through Abruzzo Ulteriore I. and Abruzzo Citeriore, skirting the coast; and a line has been projected from Pescara, by Popoli, the Lago di Fucino, and the valley of the Liris, to join the railway from Rome to Naples, and thus open up the interior of the country. The line is open for traffic betwecn Pescara and Popoli.

Azsruzzo UtrerioreE I. is the most northerly of the three provinces, and has an area of 1283 square miles, with a population in 1871 of 245,684. The western part of the province is very mountainous, the highest crest of the Apen- nines dividing it from Abruzzo Ulteriore II. The valleys possess a rich soil, well watered by rivulcts and brooks in the winter and spring, but these are generally dried up in the summer months. The streams run mostly into the Pescara, which bounds the province towards Abruzzo Citeriore, or into the Tronto, which is the northern boundary. The city of Teramo is the capital of the province,

Axsruzzo UuteriorE II. is an inland district, nearly covered with mountains of various heights, one of which is the Gran Sasso, There are no plains; but among the mountains are some beautiful and fruitful valleys, watered by the various streams that run through them. None of the rivers are navigable.

The province has an area of 2510 square milés, and in 1871 contained 332,782 inhabitants. Its chief town is Aquila.

Asruzzo CrTEeRIokE lics to the south and east of the other two provinces. It is the least hilly of the three, but the Apennines extend through the south-west part. They, however, gradually decline in height, and stretch away into plains of sand and pebbles. The rivers all run to the Adriatic, and are very low during the summer months. The soil is not very productive, and agriculture is in a very backward state; the inhabitants prefer the chase and fishing. The province contains 1104 square miles, with a population of 340,299 in 1871. Its chief town is Chieti.

ABSALOM (53x, father of peace), the third son of David, king of Israel. He was deemed the handsomest man in the kingdom. His sister Tamar having been violated by Amnon, David's eldest son, Absalom caused his servants to murder Amnon at a feast, to which he had invited all the king's sons. After this deed he fled to the kingdom of his maternal grandfather, where he remained three years; and it was not till two years after his return that he was fully reinstated in his father's favour. Absalom seems to have been by this time the eldest surviving son of David, but he was not the destined heir of his father's throne. The suspicion of this excited the impulsive Absalom to rebellion. For a time the tide of public opinion ran so strong in his favour, that David found it ex- pedient to retire beyond the Jordan, But, instead of adopt- ing the prompt measures which his sagacious counsellor Ahithophel advised, Absalom loitered at Jerusalem till a large force was raised against him, and when he took the field his army was completely routed. The battle was fought in the forest of Ephraim; and Absalom, caught in

the boughs of a trec by the superb hair in which he gloried, was run through the body by Joab. The king's grief for his worthless son vented itself in the touching lamentation —"Q my sou Absalom, my son, my son Absalom ! would God I had died for thee, O Absalom, my son, my son!"

ABSALON, Archbishop of Lund, in Denmark, was born in 1128, near Soroe in Zealand, his family name being Axel. In 1148 he went to study at Paris, where a college for Danes had been established. He afterwards travelled extensively in different countries; and returning to Den- mark in 1157, was the year after chosen Bishop of Roes- kilde or Rothschild.

Eloquent, learned, endowed with uncommon physical strength, and possessing the confidence of the king, Waldemar I., known as the Great, Absalon held a position of great influence both in the church and state. In that age warlike pursuits were not deemed in- consistent with the clerical office, and Absalon was a renowned warrior by sea and land, as well as a zealous ecclesiastic, his avowed principle being that “both swords, the spiritual and the temporal, were entrusted to the clergy.” To his exertions as statesman and soldier Wal- demar was largely indebted for the independence and con- solidation of his kingdom. In 1177 he was chosen by the chapter Archbishop of Lund and Primate of the church, but he declared himself unwilling to accept the appoint- meut; and when an attempt was made to install him by force, he resisted, and appealed to Rome. The Pope de- cided that the choice of the chapter must be respected, and cominanded Absalon to accept the Primacy on pain of excommunication. He was consecrated accordingly by the papal legate Galandius in 1178. He set the Cistercian monks of Soroe the task of preparing a history of the country, the most valuable result being the Danish Chronicle of Saxo Grammaticus, who was secretary to Absalon and his companion in an expedition against the Wendish pirates. A tower or castle which the archbishop caused to be built as a defence against these pirates, was the commencement of the present capital, Copenhagen, which from this circumstance is sometimes known in his- tory as Axelstadt. The archbishop died in 1201, in the monastcry at Soroe, and was buried in the parish church, where his grave may still be seen.

ABSCESS, in Surgery (from abscedo, to separate), a collection of pus among the tissues of the body, the result of inflammation. Abscesses are divided into acute and chronic. See SuRGERY.

ABSINTHE, a liqueur or aromatised spirit, prepared by pounding the leaves and flowering tops of various species of wormwood, chiefly Artemisia Absinthium, along with angelica root (Archangelica officinalis), sweet flag root (Acorus Calamus), the leaves of dittany of Crete (Origanum Dictamnus), star-anise fruit (Illiciwm anisatum), and other aromatics, and macerating these in alcohol. After soaking for about eight days the compound is distilled, yielding an emerald-coloured liquor, to which a proportion of an essential-oil, usually that of anise, is added. The liqueur

thus prepared constitutes the genuine Hxtrait d’ Absinthe of the French; but much of an inferior quality is made with other herbs and essential oils, while the adulterations practised in the manufacture of absinthe are very numerous and deleterious. In the adulterated liqueur the green colour is usually produced by turmeric and indigo, but the presence of even cupric sulphate (blue vitriol) as a colour- ing ingredient has been frequently detected. In com- merce two varieties of absinthe are recognised—common and Swiss absinthe—the latter of which is prepared with highly concentrated spirit; and when really of Swiss manu- facture, is of most trustworthy quality as regards the herbs used in its preparation. The chief seat of the manufac- ture is in the canton of Neufchatcl in Switzerland, although

absinthe distilleries are scattered generally throughout Switzerland and France. The liqueur is chiefly consumed in France, but there is also a considerable export trade to the United States of America. In addition to the quan- tity distilled for home consumption in France, the amount imported from Switzerland in recent years has not been less than 2,000,000 gallons yearly. The introduction of this beverage into general use in France is curious. Dur- ing the Algerian war (1844-47) the soldiers were adviscd to mix absinthe with their wine as a febrifuge. On their return they brought with them the habit of drinking it, which is now so widely disseminated in French society, and with such disastrous consequences, that the custom is justly esteemed a grave national evil. A French physician, M. Legrand, who has studied the physiological effects of absinthe drinking, distinguishes two trains of results accord- ing as the victim indulges in violent excesses of drinking or only in continuous steady tippling. In the case of excessive drinkers there is first the feeling of exaltation peculiar to a state of intoxication. The increasing dose necessary to produce this state quickly deranges the diges- tive organs, and destroys the appetite. An unappeasable thirst takes possession of the victim, with giddiness, tingling in the ears, and hallucinations of sight and hearing, followed by a constant mental oppression and anxiety, loss of brain power, and, eventually, idiocy. The symptoms in the case of the tippler commence with muscular quivcrings and decrease of physical strength ; the hair begins to drop off, the face

assumes a melancholy aspect, and he becomes ema- ciated, wrinkled, and sallow. Lesion of the brain follows, horrible dreams and delusions haunt the victim, and gradu- ally paralysis overtakes him and lands him in his grave. It has been denied by a French authority, M. Moreau, that these symptoms are due to wormwood or any of the essen- tial oils contained in absinthe, and he maintains that the strong spirit and such adulterations as salts of copper are sufficient to account for the effects of the liqueur. There is, however, no doubt that proportionately the consumption of absinthe is much more deletcrious to the human frame than the drinking of brandy or other strong spirits. The use of absinthe has becn prohibited in both the army and navy of France.

ABSOLUTE (from the Latin absolvere), having the gcneral meaning of loosened from, or unrestricted, in which sense it is popularly used to qualify such words as “imon- archy” or “ power,” has been variously employed in philo- sophy. Logicians use it to mark certain classes of names, Thus a term has been called absolute in opposition to attri- butwe, when it signifies something that has or is viewed as having independent existence ; most commonly, however, the opposition conveyed is to relative.

relation to its contradictory (as not man) within the universe of being; the correlatives, under less gencral notions, being then generally expressed positively as con- traries (woman, boy, master, brute, and so forth, for man). If there is thus no name or notion that can strictly be called absolute, all knowledge may be said to be relative, or of the relative. But the knowledge of an absolute has also been held impossible, on the ground that kuowing 1s itself a relation between a subject and an object; what is known only in relation to a mind cannot be known as absolute. This doctrinc, now commonly spoken of under the name of the Relativity of Knowledge, may, indced, be brought under the former view, in which subject-object marks the relation of highest philosophical significance within the whole universe of things. Kecping, however, the two views apart, we may say with double

force that of the absolute there is no knowledge,—(1), because, to be known, a thing must be consciously discriminated from other things; and (2), because it can be known only in relation with a knowing mind. Notwithstanding, there have been thinkers from the earliest times, who, in dif- ferent ways, and more or less explicitly, allow of no such restriction upon knowledge, or at least consciousness, but, on the contrary, starting from a notion, by the latter among them called the absolute, which includes within it the opposition of subject and object, pass therefrom to the explanation of all the phenomena of nature and of niind. In earlier days the Eleatics, Plato, and Plotinus, in modern times Spinoza, Leibnitz, Fichte, Schelling, Hegel, and Cousin, all have joined, under whatever dif- ferent forms, in maintaining this view. Kant, whilc denying the absolute or unconditioned as an object of knowledge, leaves it conceivable, as an idea regulative of the mind's intellectual experience. It is against any such absolute, whether as real or conceivable, that Hamilton and Mansel have taken ground, the former in his famous review of Cousin's philosophy, reprinted in his Discussions, the lattcr in his Bampton Lectures on Zhe Limits of Religious Thought, basing their arguments indifferently on the positions as to the Relativity of Knowledge indicated above. . For absolute in its more strictly metaphysical use, sce METAPHYSICS. (c. c. BR.)

ABSOLUTION, a term used in civil and ecclesiastical law, denotes the act of setting free or acquitting. In a criminal process it signifies the acquittal of an accused person on the ground that the evidence has either dis- proved or failed to prove the charge brought against him. It is now little used cxcept in Scotch law, in the forms assoilzie and absolvitor. The ecclesiastical usage of the word is essentially different from the civil. It refers to sin actually committed, and denotes the setting of a person free from its guilt, or from its penal consequences, or from both. It is invariably connected with penitence, and some form of coufession, the Scripture authority, to which the Roman Catholics, the Greek Church, and Protestants equally appeal, being found in John xx. 23, James v. 16, &e. In the primitive church the injunction of James was

literally obeyed, and confession was made before the

whole congregation, whose presence and concurrence were reckoned necessary to the validity of the absolution pro- nounced by the presbyter. In

the 4th century the bishops began to cxercise the power of absolution in their own right, without recognising the congregations. In conse- quence of this the practice of private confession (confessio auricularis) was established, and became more and more common, until it was rendered imperative once a year by a decree of the fourth Lateran Council (1215). A dis- tinction, indeed, was made for a time between peccata venralia, which might be confessed to a layman, and peccata mortalia, which could only be confessed to a priest;

but this was ultimately abolished, and the Roman Canon Law now stands, Nec venralia nec mortalia possumus confiteri sacramentaliter, nist sacerdott. A change in the form of absolution was almost a logical sequence of the change in the nature of the confession. At first the priest acted ministerially as an intercessory, using the formula absolutionis precativa or deprecativa, which consisted of the words: Dominus absolvat te— Misereatur tut omnipotens Deus et dimittat tibt omnia peccata tua. This is still the only form in the Greek Church, and it finds a place in the Roman Catholic service, though it is no longer used in the act of absolution. The Romish form was altered in the 13th century, and the Council of Trent decreed the use of the formula absolutionis indicativa, where the priest acts judicially, as himself possessed of the power of bind- ing and loosing, and says, L'go absolvo te. Where a form of absolution is used in Protestant Churches, it is simply declarative, the state being only indicated, and in no sense or degree assumcd to be caused by the declaration.

ABSORPTION, in the animal economy, the function possessed by the absorbent system of vessels of taking up nutritive and other fluids. See PHysioLocy.

ABSTEMII, a name formerly given to such persons as could not partake of the cup of the eucharist on account of their natural aversion to wine. Calvinists allowed these to communicate in the species of bread only, touching the cup with their lip; which was by the Lutherans deemed a profanation. Among scveral Protestant sects, both in Great Britain and America, abstemii on a some- what different principle have recently appeared. These are total abstainers, who maintain that the use of stimu- lants is essentially sinful, and allege that the wine used by Christ and his

disciples at the supper was unfermented. They accordingly communicate in the unfermented “ juice of the grape.” The difference of opinion on this point has led to a good dcal of controversy in many congrega- tions, the solution generally arrived at being to allow both wine and the pure juice of the grape to be served at the communion table.

ABSTRACTION, in Psychology and Logic, is a word used in several distinguishable but closely allied senses. First, in a comprehensive sense, it is often applied to that process by which we fix the attention upon one part of what is present to the mind, to the exclusion of another part; abstraction thus conceived being merely the nega- tive of ATTENTION (q. v.) In this sense we are able in thought to abstract one object from another, or an attribute from an object, or an attribute perceived by one sense from those perceived by other senses. Even in cases when thoughts or images have become inseparably associated, we possess something of this power of abstract- ing or turning the attention upon one rather than another. Secondly, the word is used, with a more special significa- tion, to describe that concentration of attention upon the resemblances of a number of objects, which constitutes classification. And thirdly, not to mention other less important changes of meaning, the whole process of generalisation, by which the mind forms the notions expressed by common terms, is frequently, through a curious transposition of names, spoken of as abstraction. Especially when understood in its less comprehensive connection, the process of abstraction possesses a peculiar interest. To the psychologist it is interesting, because there is nothing he is more desirous to understand than the mode of formation and true nature of what are called general notions. And fortunately, with regard to the abstractive process by which these are formed, at least in its initial stages, there is little disagreement ; since every one describes it as a process of comparison, by which the

| mind is enabled to consider the objects confusedly pre-

sented to it in intuition, to recognise and attend exclusively to their points of agreement, and so to classify them in accordance with their perceived resemblances. Further, this process is admitted without much dispute to

belong to the discursive or elaborative action of the intellect ; although, perhaps— should the view of some modern psychologists be correct, that all intelligence proceeds by the establishment of relations of (keness and unlikeness —abstraction will be better conceived as thus related to intelligence in general and typical of all its processes, than as the action merely of a special and somewhat indefinite faculty. No such harmony, however, exists regarding the nature of the product of abstraction ; for that is the subject- matter of Nominalism and Realism, which has produced more controversy, and stimulated to more subtlety of thought, than any other subject ever debated in philo- sophy. The concept or abstract idea has been represented in a multitude of ways: sometimes as an idea possessing an objective existence independent of particulars, even more real and permanent than theirs; sometimes as an idea composed of all the circumstances in which the par- ticulars agree, and of no others ; again, as the idea of an individual, retaining its individualising qualities, but with the accompanying knowledge that these are not the pro- perties of the class; and yet again, as the idea of a miscellaneous assemblage of individuals belonging to a class. It is still impossible to say that the many-sided controversy is at an end. The only conclusion generally admitted seems to be, that there exists between the con- cept and the particular objects of intuition some very intimate relation of thought, so that it is necessary, for all purposes of reasoning, that the general and particular go hand in hand, that the idea of the class—if such exists —be capable of being applied, in every completed act of thought, to the objects comprised within the class.

To the student of ontology, also, abstraction is of special interest, since, according to many distinguished thinkers, the recognition of abstraction as a powerful and universal mental process is to explain all ontology away, and give the ontologist his eternal quietus. The thorough- going nominalist professes to discover in the mind an inveterate tendency to abstraction, and a proneness to ascribe separate existence to abstractions, amply sufficient to account for all those forms of independent reality which inetaphysics defend, and to exhibit them all in their true colours as fictitious assumptions. In reply, the ontologist, strengthened by the instinct of self-preservation, commonly contends that the analogy between general notions and metaphysical principles does not hold good, and that the latter are

always more than simple abstractions or mere names. Only after abstraction is understood can the question be settled.

In like manner to logic, whether regarded as the science of the formal laws of thought, or, more widely, as the science of scientific methods, a true understanding of abstraction is.of the greatest importance. It is important in pure logic, because, as we have seen, every act of judgment and reasoning postulates a concept or concepts, and so pre- supposes abstraction. Abstraction, determining the possi- bility alike of reason and speech, creates those notions that bear common names; it is indispensable to the formation of classes, great or small; and just according as it ascends, increasing the extension and diminishing the intension of classes, the horizon visible to reason and to logic gradually recedes and widens. And to logic as the science of the sciences a true doctrine of abstraction is not less necessary ; because the process of extending know- ledge is, in all its developments, essentially the same as the first rudimentary effort to form a concept and think of particulars as members of a class; a “natural law,” at

least in its subjective aspect, is invariably an abstraction made by comparing phenomena—an abstraction under which phenomena are classed in order to the extension of knowledge, just as under a concept are grouped the par- ticulars presented in intuition. As proof of this identity it is found that the same differences exist regarding the objective or subjective nature of the “natural law” as regarding that of the concept. Some affirm that the law is brought ready-made by the mind and superinduced on the facts ; others, that it is never in any sense more than a mere mental conception, got by observing the facts; while there are yet others who maintain it to be such a sub- jective conception, but one corresponding at the same tine to an external relation which is real though unknowable.

ABSURDUM, Repuctio ab, a mode of demonstrating the truth of a proposition, by showing that its contra- dictory leads to an absurdity. It is much employed by Euclid.

ABU, a celebrated mountain of Western India, between 5000 and 6000 feet in height, situated in 42° 40’ N. lat., and 72° 48’ E. long., within the

Rajputénd State of Siroht, It is celebrated as the site of the most ancient Jain temples in India, and attracts pilgrims from all parts of the country. The Jains are the modern Indian representatives of the Buddhists, and profess the ancient theistic doctrines of that sect, modified by saint worship and incarnations. The elevations and platforms of the mountain are covered with elaborately sculptured shrines, temples, and tombs. On the top of the hill is a small round platform containing a cavern, with a block of granite, bearing the impression of the feet of Data-Bhrigu, an incarnation of Vishnu. This is the chief great place of pilgrimage for the Jains, Shrawaks, and Banians. The two principal temples are situated at Deulward, about the middle of the mountain, and five miles south-west of Guru Sikra, the highest summit. They are built of white marble, and are pre-eminent alike for their beauty and as typical specimens of Jain architecture in India. The following description is condensed from Mr Fergusson's History of Architecture, vol. ii. pp. 623 to 625 :—The more modern of the two was built by two brothers, rich merchants, between the years 1197 and 1247, and for delicacy of carving and minute beauty of detail stands almost unrivalled, even in this land of patient and lavish labour. The other was built by another merchant prince, Bimald Shah, apparently about 1032 a.p., and although simpler and bolder in style, is as elaborate as good taste would allow in a purely architectural object. It is one of the oldest as well as one of the most complete examples of Jain architecture known. The principal object within the temple is a cell lighted only from the door, con- taining a cross-legged seated figure of the god Paresnath. The portico is composed of forty-eight pillars, the whole enclosed in an oblong court-yard about 140 feet by 90 feet, surrounded by a double colonnade of smaller pillars, forming porticos to a range of fifty-five cells, which enclose it on all sides, exactly as they do in a Buddhist monastery (vthdra). In this temple, however, each cell, instead of being the residence of a monk, is occupied by an image of Paresnath, and over the door, or on the jambs of each, are sculptured scenes from the life of the deity. The whole interior is magnificently ornamented. The Emperor Akbar, by a farman dated in the month of Rabi-ul-dul, in the 37th year of his reign, corresponding with 1593, made a grant of the hill and temples of Abu, as well as of the other hills and places of Jain pilgrimage in the empire, to Harbijai Sur, a celebrated preceptor of the Setambart sect of the Jain religion. He also prohibited the slaughter of animals at these places.

The farmdn of this enlightened monarch declared that “it is the rule of the worshippers of God to preserve all religions.”

ABU-BEKR (father of the virgin), was originally called Abd-el-Caaba (servant of the temple), and received the name by which he is known historically in consequence of the marriage of his virgin daughter Ayesha to Mohammed. He was born at Mccca in the ycar 573 a.p., a Koreishite of the tribe of Benn-Taim. Possesscd of immense wealth, which he had himself acquired in commerce, and held in high esteem as a judge, an interpreter of dreams, and a depositary of the traditions of his race, his early accession to Islamism was a fact of great importance. On his con- version he assumed the name of Abd-Alla (servant of God). lis own belief in Mohammed and his doctrines was so thorough as to procure for him the title El Siddik (the faithful), and his success in gaining converts was corre- spondingly great. In his personal relationship to the prophet he showed the deepest veneration and most un- swerving devotion. When Mohammed fled from Mecca, Abu-Bekr was his sole companion, and shared both his hardships and his triumphs, remaining constantly with him until the day of his death. During his last illness the prophet indicated Abu-Bekr as his successor, by desir- ing him to offer up prayer for the people. The choice was ratified by the chiefs of the army, and ultimately con- firmed, though Ali, Mohammed’s son-in-law, disputed it, asserting his own title to the dignity. After a time Ali submitted, but the difference of opinion as to his claims gave rise to a controversy which still divides the followers of the prophet into the rival factions of Sunnites and Shiites. Abu-Bekr had scarcely assumed his new position under the title Khalifet-Resul-Allah (successor ofthe prophet of God), when he was called to suppress the revolt of the tribes Hedjaz and Nedjd, of which the former rejected Islamism, and the latter refused to pay tribute. He en- countered formidable opposition from different quarters, but in every case he was successful, the severest struggle being that with the impostor Mosailima, who was finally defeated by Khaled at the battle of Akraba. Abu-Bekr’s zeal for the spread of the new faith was as conspicuous as that of its founder had been. When the internal disorders had been repressed and Arabia completely subdued, he directed his generals to foreign conquest. The Irak of Persia was overcome by Khaled in a single

campaign, and there was also a successful expedition into Syria. After the hard-won victory over Mosailima, Omar, fearing that the sayings of the prophet would be entirely forgotten when those who had listened to them had all been re- moved by death, induced Abu-Bekr to see to their preservation in a written form. The record, when completed, was deposited with Hafsu, daughter of Omar, and one of the wives of Mohammed. It was held in great reverence by all Moslems, though it did not possess canonical authority, and furnished most of the materials out of which the Koran, as it now exists, was prepared. When the authori- tative version was completed, all copies of Hafsu's record were destroyed, in order to prevent possible disputes and divisions. Abu-Bekr died on the 23d of August 634, having reigned as Khalif fully two years. Shortly before his death, which one tradition ascribes to poison, another to natural causes, he indicated Omar as his successor, after the manner Mohammed had observed in his own case.

ABULFARAGIUS, Grecor ABuLFARAJ (called also Barnesravs, from his Jewish parentage), was born at Malatia, in Armenia, in 1226. His father Aaron was a physician, and Abulfaragius, after studying under him, also practised medicine with great success. His command of the Arabic, Syriac, and Greek languages, aud his know- ledge of philosophy aud theology, gained for him a very high reputation. In 1244 he removed to Antioch, and shortly after to Tripoli, where he was consecrated Bishop of Guba, when only twenty years of age. Ie was subsc-

quently transferred to the see of Aleppo, and was elected in 1266 Maphrian or Primate of the eastern section of the Jacobite Christians. This dignity he held till his death, which occurred at Maragha, in Azerbijan, in 1286. Abulfaragius wrote a large number of works on various subjects, but his fame as an author rests chiefly on his History of the World, from the creation to his own day. It was written first in Syriac, and then, after a considerable interval, an abridged version in Arabic was published by the author at the request of friends. The latter is divided into ten sections, each of which con- tained the account of a separate dynasty. The historic value of the work lies entirely in the portions that treat of eastern nations, especially in those relating to the Saracens, the Tartar Mongols, and the conquests of Genghis Khan. The other sections are full of mistakes, arising partly no doubt from the author's comparative ignorance of classical languages. A

Latin translation of the Arabic abridgement was published by Dr Pococke at Oxford in 1663. A por- tion of the original text, with Latin translation, edited, by no means carefully or accurately, by Bruns and F. W. Kirsch, appeared at Leipsic in 1788.

ABULFAZL, vizier and historiographer of the great Mongol emperor, Akbar, was born about the middle of the 16th century, the precise date being uncertain. His career as a minister of state, brilliant though it was, would probably have been by this time forgotten but for the record he himself has left of it in his celebrated history. The Akbar Nameh, or Book of Akbar, as Abulfazl's chief literary work is called, consists of two parts,—the first being a complete history of Akbar's reign, and the second, entitled Ayin-i-Akbari, or Institutes of Akbar, being au account of the religious and political constitution and administration of the empire. The style is singularly elegant, and the contents of the second part posscss a unique and lasting interest. An excellent translation of that part by Mr Francis Gladwin was published in Cal- cutta, 1783-6. It was reprinted in London very in- accurately, and copies of the original edition are now exceedingly rare and correspondingly valuable. Abulfazl died by the hand of an assassin, while returning from a mission to the Deccan in 1602. Some writers say that the murderer was instigated by the heir-apparent, who had become jealous of the minister's influence.

ABULFEDA, Ismart BEN-ALI, EMAD-EDDIN, the cele- brated Arabian historian and geographer, born at Damascus in the year 672 of the Hegira (1273 a.p.), was directly descended from Ayub, the father of the emperor Saladin. In his boyhood he devoted himself to the study of the Koran and the sciences, but from his twelfth year he was almost constantly engaged in military expeditions, chiefly against the crusaders. In 1285 he was present at the assault of a stronghold of the Knights of St John, and he took part in the sieges of Tripoli, Acre, and Roum. In 1298 the princedom of Hamah and other honours, origin- ally conferred by Saladin upon Omar, passed by inherit- ance to Abulfeda; but the succession was violently dis- puted by his two brothers, and the Court availed itself of the opportunity to supersede all the three, and to abolish the principality. The sultan Melik-el-Nassir ultimately (1310) restored the dignity to Abulfeda, with additional honours, as an acknowledgment of his military serviccs against the Tartars and

Bibars, the sultan’s rival. He received an independent sovereignty, with the right of coining money, &c., and had the title Melik Mowayyad (victorious prince) conferred upon him. For twenty years, till his death in October 1331, he reigned in tranquillity and splendour, devoting himsclf to the duties of govern- ment and to the composition of the works to which he is chiefly indebted for his fame. He was a munificent patron

of men of Ictters, who repaired in large numbers to his court. Abulfeda’s chief historical work is An Abridgement of the History of the IIuman Race, in the form of annals, extending from the creation of the world to the year 1328. A great part of it is compiled from the works of previous writers, and it is difficult to determine accurately what is the author’s and what is not. Up to the time of the birth of Mohammed, the narrative is very succinct; it becomes wore full and valuable the nearer the historian approaches his own day. It is the only source of information on many facts connected with the Saracen empire, and alto- gether is by far the most important Arabian history we now possess. Various translations of parts of it exist, the earliest being a Latin rendering of the section relating to the Arabian conquests in Sicily, by Dobelius, Arabic professor at Palermo, in 1610. This is preserved in Muratori’s Rerum Italicarum Scriptores, vol. i. The his- tory from the time of Mohammed was published with a Latin translation by Reiske, under the title Annales Mos- lemici (5 vols., Copenhagen, 1789-94), and a similar edition of the earlier part was published by Fleischer at Leipsic in 1831, under the title Abulfede Historia Ante- Islamitica. His Geography is chiefly valuable in the his- torical and descriptive parts relating to the Moslem empire. From his necessarily imperfect acquaintance with astro- nomy, his notation of latitude and longitude, though fuller than that of any geographer who preceded him, can in no case be depended on, and many of the places whose posi- tion he gives with the utmost apparent precision cannot be now identified. A complete edition was published by MM. Reinaud and De Slane at Paris in 1840; and Reinaud published a French translation, with notes and illustrations, in 1848. MSS. of both Abulfeda’s great works are pre- served in the Bodleian Library and in the National Library of France.

ABULGHAZI-BAHADUR (1605-1663), a khan of Khiva, of the race of Genghis-Khan, who, after abdicating in favour of his son, employed his leisure in writing a history of the Mongols and Tartars. He produced a valuable work, which has been translated into German, French, and Russian.

ABUNA, the title given to the archbishop or metropoli- tan of Abyssinia.

ABUSHEHR. See Busutre.

ABU-SIMBEL, or IpsamBux, the ancient Aboccis or Abuncis, a place in Nubia, on the left bank of the Nile,

about 50 miles 8.W. of Derr, remarkable for its ancient Egyptian temples and colossal figures hewn out of the solid rock. For a description of these see NUBIA.

ABU-TEMAN, one of the most highly esteemed of Arabian poets, was born at Djacem in the year 190 of the Hegira (806 a.p.) In the little that is told of his life it is difficult to distinguish between truth and fable. He seems to have lived in Egypt in his youth, and to have been engaged in servile employment, but his rare poetic talent speedily raised him to a distinguished position at the court of the caliphs of Bagdad. Arabian historians assert that a single poem frequently gained for him many thousand pieces of gold, and the rate at which his cou- temporaries estimated his genius may be understood from the saying, that ‘no one could ever die whose name had been praised in the verses of Abu-Teman.” Besides writing original poetry, he made three collections of sclect pieces from the poetry of the East, of the most important of which, called Hamasa, Sir William Jones speaks highly. Professor Carlyle quoted this collection largely in his Speci- mens of Arabic Poetry (1796). An edition of the text, with Latin translation, was published by Freytag at Bonn (1828-51), and a meritorious translation in German verse by Rickert appeared in 1846. Abu-Teman died 845 A.D.

ABYDOS (1.), in Ancient Geography, a city of Mysia, in Asia Minor, situated on the Hellespont, which is here scarcely a mile broad. It probably

was originally a Thracian town, but was aftcrwards colonised by Milesians. Nearly opposite, on the European side of the Hellespont, stood Sestos; and it was here that Xerxes crossed the strait on his celebrated bridge of boats when he invaded Greece. Abydos was celebrated for the vigorous resistance it made when besieged by Philip II. of Macedon; and is famed in story for the loves of Hero and Leander. The old castle of the Dardanelles, built by the Turks, lies a little southward of Sestos and Abydos.

ABYDOS (2.), in Ancient Geography, a town of Upper

Egypt, a little to the west of the Nile, between Ptolemais

and Diospolis Parva, famous for the palace of Memnon and the temple of Osiris. Remains of these two edifices are still in existence. In the temple of Osiris Mr Bankes discovered in 1818 the tablct of Abydos, containing a double series of twenty-six shields of the predecessors of Rameses the Great. This tablet is now deposited in the British Museum,

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ae is an extensive country of Eastern Africa,

the limits of which are not well defined, and authorities are by no means agreed respecting them. It may, however, be regarded as lying between 7° 30’ and 15° 40’ N. lat., and 35° and 40° 30’ E. long., having, N. and N.W., Nubia; E., the territory of the Danakils ; 8., the country of the Gallas; and W., the regions of the Upper Nile.1 It has an area of

1 It is usual to include in Abyssinia the flat country which lies between it and the Red Sea, and to regard the latter as forming its boundary on the east. This, however, is not strictly correct. Abyssinia proper com- prises only the mountainous portion of this territory, the low lying por- tion being inhabited by distinct and hostile tribes, and claimed by the Viceroy of Egypt as part of his dominions. The low country is very unhealthy, the soil dry and arid, and with few exceptions uncultivated, whereas the highlands are generally salubrious, well watered, and in many parts very fertile. This arid track of country is only a few miles broad at Massowah, in the north, but widens out to 200 or 300 miles at Tajurrah, in the south. It is, in a great

measure, owing to Abyssinia being thus cut off from intercourse with the civilised world by this in- hospitable region, which has for three centuries been in the hands of enemies, that it is at present so far sunk in ignorance and barbarism.

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about 200,000 square miles, and a population of from 3,000,000 to 4,000,000.

The name Abyssinia, or more properly Habessinia, is derived from the Arabic word Iabesch, which signifies mixture or confusion, and was applied to this country by the Arabs on account of the mixed character of the people. This was subsequently Latinised by the Portuguese into Abassia and Abassinos, and hence the present name. The Abyssinians call themselves Ztiopyavan, and their country Itopia, or Manghesta Itiopia, the kingdom of Ethiopia.

The country of Abyssinia rises rather abruptly from the low arid district on the borders of the Red Sea in lofty ranges of mountains, and slopes away more gradually to the westward, where the tributaries of the Nile have formed numerous deep valleys. It consists for the most part of extensive and elevated table-lands, with mountain ranges extending in different directions, and intersected by numerous valleys. The table-lands are generally from 6000 to 9000 fect above the level of the sea, but in the south there are

some of considerable extent, which attain a height of more than 10,000 feet. The mountains in various parts of the country rise to 12,000 and 13,000 feet above the sea, and some of the peaks of Samen are said to reach to 15,000 fcet, and to be always covered with snow. The average height of the range which divides the streams flowing to the east from those that flow westward is about 8000 feet, rising to 10,000 or 11,000 in the south, and sinking in the north. The whole country presents the appearance of having been broken up and tossed about in a remarkable manner, the mountains assuming wild and fantastic forms, with sides frequently abrupt and precipitous, and only accessible by very difficult passes. The Samen range

of mountains are the highest in Abyssinia, and together with the Lamalmon and Lasta mountains form a long but not continuous chain, running from north to south.

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Sketch Chart of Abyssinia,

The principal rivers of Abyssinia are tributaries of the Nile. The western portion of the country may be divided into three regions, drained respectively by the Mareb, the Atbara, and the Abai. The most northern of these rivers is the Mareb, which rises in the mountains of Taranta, flows first south, then west, and afterwards turns to the north, where it is at length, after a course of upwards of 500 miles, lost in the sand, but in the rainy season it falls into the Atbara. The Atbara, or Takazza, rises in the mountains of Lasta, and flowing first north, then west, and again turning to the north, at length falls into the Nile, after a course of about 800 miles. The Abai, Bahr-el-Azrek or Blue River, the eastern branch of the Nile, and considered by Bruce to be the main stream of that river, rises from two mountains near Geesh, in lat. 10° 59’ 25” N., long. 36° 55’ 30” E., about 10,000 feet above the level of the sea. It flows first north to the Lake of Dembea or Tzana, then takes a long semicircular sweep round the province of Godjam, and afterwards flows northward to about the 15th degree of N. lat., where it unites with the Bahr-el-Abiad, which has now been ascertained to be the true Nile. The Hawash, the principal river of eastern Abyssinia,

rises about lat. 9° 30’ N., long. 38° E., and, flowing in a north-easterly direction towards the Red Sea, is lost in Lake Aussa, lat.

11° 25’N., long. 41°40’ E. The principal lake of Abyssinia is the Dembea, which lies between 11° 30’ and 12° 30’ N. lat., and 37° and 37° 35’ E. long., being about 60 miles in length by 40 in width, and containing a number of small islands. It is fed by numerous small streams. The lake of Ashangi, in lat. 12° 35’ N., long. 39° 40’ E., is about 4 miles long by 3 broad, and upwards of 8000 feet above the sea.

The fundamental rocks of Tigré, and probably of all Abyssinia, are metamorphic. They compose the mass of the table-land, and while they occupy no inconsiderable portion of its surface, they are exposed, in Tigré at least, in every deep valley. The metamorphics vary greatly in mineral character, “every intermediate grade being found between the most coarsely crystalline granite and a slaty rock so little altered that the lines of the original bedding are still apparent. Perhaps the most prevalent form of rock is a rather finely crystalline gneiss. Hornblende-schist and miica-schist are met with, but neither of the minerals from which they are named appears to be so abundant as in some metamorphic tracts. On the other hand, a compact felspathic rock, approaching felsite in composition, is pre- valent in places, as in the Suru defile, between Komayli and Senafé.” There are a few exceptions, but as a general rule it may be asserted that in the neighbourhood of the route followed by the British army, so much of the country as is more than 8000 feet above the sea consists of bedded traps, and this is probably the case in general over Abys- sinia. “ Between the traps and the metamorphics a series of sandstones and limestones intervene, one group of the former underlying the latter. The limestone alone is fossiliferous, and is of Jurassic age.” ‘On the route to Magdala volcanic rocks were first met with at Senafé, where several hills consist of trachyte, passing into claystone and basalt. Trap hills, chiefly of trachyte, are dotted over the country to the southward as far as Fokada, a distance of nearly 30 miles. Here a great range of bedded traps com- mences, and extends for about 25 miles to the south, pass- ing to the west of Adigerat.” At Meshek, two marches south of Antalo, “the route entered high ranges entirely composed of trap, and thence no other rocks were seen as far as Magdala.” “The trappean rocks belong to two dis- tinct and unconformable groups.

The lower of these is much inclined, while the higher rests on its upturned and denuded edges.” Denudation has evidently been going on to a great extent in this country. One of its most striking features are the deep ravines which have been worked out by the action of the streams, sometimes to the depth of 3000 or 4000 feet. ‘How much of the Abyssinian high- lands has been removed by these great torrents, and spread as an alluvial deposit over the basin of the Nile?” ‘Probably over the whole of northern Abyssinia there existed at least 4000 feet of bedded traps, of which now only a few vestiges remain.” —W. 7. Blanford.

Abyssinia is said to enjoy “probably as salubrious a climate as any country on the face of the globe.”— Parkyns. The heat is by no means oppressive, a fine light air counteracting the power of the sun; and during the rainy season, the sky being cloudy, the weather is always agreeable and cool, while the rain itself is not very severe. In certain of the low valleys, however, malarious influences prevail before and after the rainy season, and bring on dangerous fevers, On the higher parts the cold is sometimes intense, particularly at night. The natural division of the scasons is into a cold, a hot, and a rainy season. The cold season may be said to extend from October to February, the hot from the beginning of March to the middle of June, and the wet or monsoon period from this time to the end of September. The rainy season is of importance, not only in equalising the temperature, increasing

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the fertility, and keeping up the water supply of the country, but, as Sir S. Baker has shown, it plays a most important part in the annual overflow of the Nile. — ,

On the summits and slopes of the highest mountains the vegetation is of a thoroughly temperate and even English character ; the plateaux have a flora of the same character ; while on the lower slopes of the hills and in the ravines occur many trees and shrubs of warmer climes. “The general

appearance of the plateaux and plains is that of a comparatively bare country, with trees and bushes thinly scattered over it, and clumps and groves only occur- ring round villages and churches. But the glens and ravines in the plateau sides, each with its little bright spring, are often thickly wooded, and offer a delicious contrast to the open country.””—Markham. This refers more particularly to the northern portion of the country, that drained by the Mareb; the central and southern parts are much more fertile and productive. Here the fertility is so great that in some parts three crops are raised annually. Agriculture receives considerable attention, and large quantities of maize, wheat, barley, peas, beans, &c., are grown. Very extensively cultivated is tef (Poa abyssinica), a herbaceous plant with grains not larger than the head of a pin, of which is made the bread in general use throughout the country. The low grounds produce also a kind of corn called tocussa, of which a black bread is made, which constitutes the food of the lower classes. Coffee grows wild on the western mountains, and the vine and sugar-cane are cultivated in favourable localities. Cotton is also grown to a consider- able extent. Among the fruit-trees are the date, orange, lemon, pomegranate, and banana. Myrrh, balsam, and various kinds of valuable medicinal plants are common.

Most of the domestic animals of Europe are found here. The cattle are in general small, and the oxen belong to the humped race. The famous Galla oxen have horns some- times four feet long. The sheep belong to the short and fat-tailed race, and are covered with wool. Goats are very common, and have sometimes horns two feet in length. The horses are strong and active. Of wild animals the spotted hyzena is among the most numerous, as well as the fiercest and most destructive, not only roaming in immense numbers over the country, but frequently entering the towns, and even the houses of the inhabitants. The elephant and rhinoceros are numerous in the low grounds. The Abyssinian rhinoceros has two horns; its skin, which has no folds, is used for shields, and for lining drinking vessels, being regarded as an antidote to poison. Crocodiles and hippopotami are plentiful in the rivers ; lions, panthers, and leopards are seen occasionally, and buffaloes frequently. Among other animals may be mentioncd as common various species of antelopes, wild swine, monkeys, hares, squirrels, several species of hyrax, jackals, dc.

The birds of Abyssinia are very numerous, and many of them remarkable for the beauty of their plumage. Great numbers of eagles, vultures, hawks, and other birds of prey are met with; and partridges, snipes, pigeons, parrots, thrushes, and swallows are very plentiful. Aiong insects the most numerous and useful is the bee, honey everywhere constituting an important part of the food of the inhabi- tants, and several of the provinces paying a large proportion of their tribute in this article. Of an opposite class is the locust, the ravages of which here, as in other parts of Northern Africa, are terrible. Serpents are not numerous, but several species are poisonous.

The inhabitants of Abyssinia form a number of different tribes, and evidently belong to several distinct races. The majority are of the Caucasian race, and are in general well- formed and handsome, with straight and regular features, lively eyes, hair long and straight or somewhat curled, and colour dark olive, approaching to black. Riippell regards

them as identical in features with the Bedouin Arabs, The tribes inhabiting Tigré, Amhara, Agow, é&c., belong to this race. ‘The Galla race, who came originally from the south, have now overrun the greater part of the country, consti- tuting a large portion of the soldiery, and, indeed, there are few of the chiefs who have not an intermixture of Galla blood in their veins. They are fierce and turbulent in character, and addicted to cruelty. Many of them are still idolaters, but most of them have now adopted the Moham- medan faith, and not a few of them the Christianity of the Abyssinians. They are generally large and well-built, of a brown complexion, with regular features, small deeply-sunk but very bright eyes, and long black hair. A race of Jews, known by the name of Falashas, inhabit the district of Samen. They affirm that their forefathers came into the country in the days of Rehoboam, but it seems more probable that they arrived about the time of the destruction of Jerusalem. From the 10th century they enjoyed their own constitutional rights, and were subject to their own kings, who, they pretend, were descended from King David, until the year 1800, when the royal race became extinct, and they then became subject to Tigré.

The prevailing religion of Abyssinia is a very corrupted form of Christianity. his is professed by the majority of the people, as well as by the

reigning princes of the different states. There are also scattered over the country many Mohammedans, and some Falashas or Jews. Christianity was introduced into this country about the year 330, but since that time it has been so corrupted by errors of various kinds as to have become little more than a dead formality mixed up with much superstition and Judaism. Feasts and fast-days are very frequent, and baptism and the Lord's supper are dispensed after the manner of the Greek Church. The children are circumcised, and the Mosaic command- ments with respect to food and purification are observed. The eating of animals which do not chew the cud and which have not cloven hoofs is prohibited. The ecclesiastical body is very numerous, consisting of priests of various kinds, with monks and nuns, and is looked upon with great awe and reverence. If a priest be married previous to his ordination, he is allowed to remain so; but no one can marry after having entered the priesthood. The primate or chief bishop is called Abuna (i.e., our father), and is nominated by the patriarch of Cairo, whom they acknow- ledge as their spiritual father. The churches are rude edifices, chiefly of a circular form, with thatched roofs, the interior being divided into three compartments,—an outer one for the laity, one within for the priests, and in the centre the Holy of Holies, exactly after the manner of a Jewish temple. The worship consists merely in reading passages of Scripture and dispensing the Lord's supper, without any preaching. Like the Greek Church, they have no images of any kind in their places of worship, but paint- ings of the saints are very common—their faces always in full, whatever may be the position of their bodies. They have innumerable saints, but above all is the Virgin, whom they regard as queen of heaven and earth, and the great intercessor for the sins of mankind. 'Their reverence for a saint is often greater than for the Almighty, and a man who would not hesitate to invoke the name of his Maker in witness to a falsehood may decline so to use the name of St Michael or St George. Legends of saints and works of religious controversy form almost their entire literature. "At present," says Bishop Gobat, "the Christians of Abyssinia are divided into three parties, so inimical to each other that they curse one another, and will no longer par- take of the sacrament together. It is one single point of theology that disunites them—the unceasing dispute con- cerning the unction of Jesus Christ."

In manners the Abyssinians are rude and barbarous.

Engaged as they are in continual wars, and accustomed to bluodshed, human life is little regarded among them. Murders and exccutions are frequent, and yet cruclty is said not to be a marked feature of their character ; and in war they seldom kill their prisoners. _When one is con- victed of murder, he is handed over to the relatives of the deceased, who may either put him to death or accept a ransom. When the murdered person has no relatives, the pricsts take upon themselves the officc of avengers. The Abyssinians are irritable, but easily appeased ; and are a gay people, fond of festive indulgences. On every festive occasion, as a saint's day, birth, marriage, &ec., it 1s customary for a rich man to collect his friends and neigh- bours, and kill a cow and one or two sheep. The principal parts of the cow are caten raw while yet warm and quiver- ing, the remainder being cut into small pieces, and eooked with the favourite sauce of butter and red pepper paste. The raw meat in this way is considered to be very superior in taste and much tenderer than when cold. "I can readily believe," says Mr Parkyns," that raw meat would be preferred to cooked meat by a man who from childhood had bcen accustomed to it." The statement by Bruce respecting the cutting of stcaks from a live cow has fre- quently been called in question, but there can be no doubt that Bruce actually saw what he narrates, though it would appear to have been a very exceptional case. Mr Parkyns was told by a soldier, "that such a practice was not un- common among the Gallas, and even occasionally oecurred among themselves, when, as in the case Bruce relates, a cow had been stolen or taken in foray." The principal drinks are mése,a kind of mead, and bousa, a sort of beer made from fermented cakes. Thcir dress consists of a large folding mantle and close-fitting drawers ; and their houses are very rude structures of a conical form, covered with thatch. Marriage is a very slight eonnection among them, dissolvable at any time by either of the parties ; and poly- gainy is by no means uncommon. Hence there is little family affection, and what cxists is only among children of the same father and mother. Children of the same father, but of different mothers, are said to be "always enemies to each other."—Gobat.

Abyssinia is one of the most ancient monarchies in the world, and has been governed from time immemorial by an emperor. For many years, however, until the accession of the late Emperor Theodore, he had been a mere puppet in the hands of one or other of his chiefs. Each chief is entire master of all sources of revenue within his territory, and has practically full power of life and death. His sub- jection consists in an obligation to send from time to time presents to his superior, and to follow him to war with as large a force as he can muster. For several generations the emperor had been little better than a prisoner in his palace at Gondar, his sole revenue consisting of a small stipend and the tolls of the weekly markets of that city, the real power being in the hands of the ras or vizier of the empire, who was always the most powerful chief for the time. If at any time a chief "has found himself strong enough to march upon the capital, he has done so, placed upon the throne another puppet emperor, and been by hin appointed ras or vizier, till a rival stronger than himself could turn him out and take his place."—-Dr Beke.

The three principal provinces of Abyssinia are Tigré in the north, Amhara (in which Gondar the capital is situated) in the centre, and Shoa in the south. The governors of these have all at different times assumed the title of Ras. Three other provinces of some importance are Lasta and Waag, whose capital is Sokota ; Godjam, to the south of Lake Dembea; and Kivara, to the west of that lake, the birth-place of the Emperor Theodore. The two provinces of Tigré and Shoa have generally becn in a state of rebellion

from or acknowledged independence of the central power at Gondar. The geographical position of Tigré enhances its political importance, as it lies between Gondar and the sea at Massowah, and thus holds as it were the gate of the capital. The province of Shoa is almost scparated from that of Amhara by the Wolla Gallas, a Mohammedan tribe, and for a long time the former had been virtually indepen- dent, and governed by a hereditary line of princes, to onc of whom the Indian government sent a special embassy under Major Harris in 1841.

The principal towns are Gondar in Amhara, the former capital of the kingdom, and containing abont 7000 inhabit- ants. Debra Tabor in Amhara, formerly a small village, but which rose to be a place of considerable size in

eonse- quence of the Emperor Theodore having fixed upon it as his residence, and near it was Gaffat, where the European workmen resided. It was burned by the emperor when he set out on his fatal march to Magdala. Adowa is the capital of Tigré, and the second city in the empire, having about 6000 inhabitants. Antalo is also one of the principal. towns of Tigré, and the capital of Enderta. Near Antalo is Chelicut. Sokota, the capital of Lasta Waag, is a town of considerable size. The capital of Shoa is Ankobar, and near it is Angolala, also a place of considerable size. The capital of Agamé is Adigerat.

The language of the religion and literature of the country is the Geez, which belongs to the Ethiopic class of languages, and is the ancient language of Tigré; of this the modern Tigré is a dialect. The Amharic, the language of Amhara, is that of the court, the army, and the merchants, and is that too which travellers who penetrate beyond Tigré have ordinarily occasion to use. But the Agow in its various dialects is the language of the people in some provinces almost exclusively, and in others, where it has been superseded by the language of the dominant race, it still exists among the lowest classes. This last is belicved to be the original language of the people; and from the affinity of the Geez, Amharic, and cognate dialects, to the Arabie, it seems probable that they were introduced by conquerors or settlers from the opposite shores of the Red Sea. The Gallas, who have overrun a great part of Abyssinia, have introduced their own language into various parts of the country, but in many cases they have adopted the language of the people among whom they have come. The literature

of Abyssinia is very poor, and contains nothing of much

value. During the late war the libraries in eunnection with the religious communities were found to eontain only modern works of little interest. On the eapture of Magdala, a large number of MSS. were found there, which had been brought by Theodore from Gondar and other parts. Of these 359 were brought home for examination, and are now deposited in the British Museum. The oldest among them belong to the 15th and 16th centuries, but the great bulk of them are of the 17th and 18th, and some are of the present century. ‘They are mostly copies of the Holy Scriptures, canonical and

apocryphal, including the Book of Enoch, prayer and hymn books, missals, lives of saints, and translations of various of the Greek fathers.

The trade and manufactures of Abyssinia are insignificant, the people being chiefly engaged in agriculture and pastoral pursuits. Cotton cloths, the universal dress of the country, are made in large quantities. ‘The preparation of leather and parchinent is also carried on to some extent, and manu- factures of iron and brass. ‘The Abyssinians are, I think,” says Mr Markham, “ capable of eivilisation. Their agriculture is good, their manufactures are not to be despised ; but the combined effects of isolation, Galla inroads, and internal anarchy, have thrown them back for centuries.” The foreign trade of Abyssinia is carried on entirely through Massowah. Its principal imports are lead,

tin, copper, silk, gunpowder, glass wares, Persian carpets, and coloured cloths. The chief exports are gold, ivory, slaves, coffee, butter, honey, and wax. Abyssinia, or at least the northern portion of it, was included in the ancient kingdom of Ethiopia. The connec- tion between Egypt and Ethiopia was in early times very intimate, and occasionally the two countries were under the same ruler, so that the arts and civilisation of the one naturally found their way into the other. In early times, too, the Hebrews had commercial intercourse with the Ethiopians ; and according to the Abyssinians, the Queen of Sheba, who visited Solomon, was a monarch of their country, and from her son Menilek the kings of Abyssinia are descended. During the captivity many of the Jews settled here, and brought with them a knowledge of the Jewish religion. Under the Ptolemies, the arts as well as the enterprise of the Greeks entered Ethiopia, and led to the establishment of Greck colonies. A Greek inscription at Adulis, no longer extant, but copied by Cosmos, and preserved in his Zopographia Christiana, records that Ptolemy Euergetes, the third of the Greek dynasty in Egypt, invaded the countries on both sides of the Red Sea, and, having reduced most of the provinces of Tigré to subjection, returned to the port of Adulis, and there offered sacrifices to Jupiter, Mars, and Neptune. Another inscription, not so aneient, found at Axum, and copied by Salt and others, states that Aeizanas, king of the Axomites, the Home- rites, &c., conquered

the nation of the Bogos, and returned thanks to his father, the god Mars, for his victory. The ancient kingdom of Auxume flourished in the first or second century of our era, and was at one time nearly coextensive with the modern Abyssinia. The capital Auxume and the seaport Adulis were then the chief centres of the trade with the interior of Africa in gold dust, ivory, leather, aromatics, &c. At Axum, the site of the ancient capital, many vestiges of its former greatness still exist; and the ruins of Adulis, which was once a seaport on the Bay of Annesley, are now about 4 miles from the shore. Christianity was introduced into the country by Frumentius, who was consecrated first bishop of Abyssinia by St Athanasius of Alexandria about a.p. 330. Subse- quently the monastic system was introduced, and between 470 and 480 a great company of monks appear to have entered and established themselves in the country. Since that time Monachism has been a power among the people, aud not without its influence on the course of events. In 522 the king of the Homerites, on the opposite coast of the Red Sea, having persecuted the Christians, the Emperor Justinian requested the king of Abyssinia, Caleb or Elesbaan, to avenge their cause. He accordingly collected an army, crossed over into Arabia, and conquered Yemen, whieh remained subject to Abyssinia for 67 years. This was the most flourishing period in the annals of the country. The Ethiopians possessed the richest part of Arabia, carried on a large trade, which extended as far as India and Ceylon, and were in constant communication with the Greek empire. Their expulsion from Arabia, followed by the conquest of Egypt by the Mohammedans in the middle of the 7th century, changed this state of affairs, and the continued ad- vances of the followers of the Prophet at length cut them off from almost every means of communication with the civilised world ; so that, as Gibbon says, “ encompassed by the enemies of their religion, the Ethiopians slept for near a thousand years, forgetful of the world by whom they were forgotten.” About a.p. 960, a Jewish princess, Judith, conceived the bloody design of murdering all the members of the royal family, and of establishing herself in their stead. During the execution of this project, the infant king was carried off by some faithful adherents, and conveyed to Shoa, where his authority was acknowledged, while Judith reigned

for 40 years over the rest of the kingdom, and transmitted the crown to her descendants. In 1268 the kingdom was restored to the royal house in the person of Icon Imlac. Towards the close of the 15th century the Portuguese missions into Abyssinia commenced. A belief had long prevailed in Europe of the existence of a Christian kingdoin in the far east, whose monarch was known as Prester John, and various expeditions had been sent in quest of it. Among others who had engaged in this search was Pedro de Covilham, who arrived in Abyssinia in 1490, and, believing that he had at length reached the far-famed king- dom, presented to the Negus, or emperor of the country, a letter from his master the king of Portugal, addressed to Prester John. Covilham remained in the country, but in 1507 an Armenian named Matthew was sent by the Negus to the king of Portugal to request his aid against the Turks. In 1520 a Portuguese fleet, with Matthew on board, entered the Red Sea in compliance with this request, and an embassy from the fleet visited the country of the Negus, and remained there for about six years. One of this embassy was Father Alvarez, from whom we have the earliest and not the least interesting account of the country. Between 1528 and 1540 armies of Mohammedans, under the renowned general Mohammed Gragn, entered Abyssinia from the low country, and overran the kingdom, obliging the emperor to take refuge in the mountain fastnesscs. In this extremity recourse was again had to the Portuguese, and Bermudez, who had remained in the country after the departure of the embassy, was ordained successor to the Abuna, and scent on this mission. In consequence a Portuguese fleet, under the command of Stcphen de Gama, was sent from India and arrived at Massowah. A force of 450 musqueteers, under the command of Christopher de Gama, younger brother of the admiral, marched into the interior, and being joined by native troops werc at first successful against the Turks, but were subsequently defeated, and their commander taken prisoner and put to death. Soon afterwards, however, Mohammed Gragn was shot in an engagement, and his forces totally routed. After this, quarrels arose between the Negus and the Catholic primate Bermudez, who wished the former publicly to profess him- self a convert to Rome. This the Negus refused to do, and at length Bermudez was obliged to make his way out of the country. The Jesuits who had accompanied or followed Bermudez into Abyssinia, and fixed thcir head-quarters at Fremona, were oppressed and neglected, but not actually expelled. In the beginning of the following century Father Paez arrived at

Fremona, a man of great tact and judgment, who soon rose into high favour at court, and gained over the emperor to his faith. He directed the erection of churches, palaces, and bridges in different parts of the country, and carried out many useful works. His successor Mendez was a man of much less conciliatory manners, and the feelings of the people became more strongly excited against the intruders, till at length, on the death of the Negus, and the accession of his son Facilidas in 1633, they were all sent out of the country, after having had a footing there for nearly a century and a half. The French physician Poncet, who went there in 1698, was the only European that afterwards visited the country before Bruce in 1769. It was about the middle of the 16th century that the Galla tribes first entered Abyssinia from the south; and notwithstanding frequent efforts to dislodge them, they gradually extended and strengthcned their positions till they had overrun the greater part of the country. The power of the emperor was thus weakened, independent chiefs set themselves up in different parts, until at length he became little better than a puppet in the hands of the most powerful of his chiefs. In 1805 the country was visited by Lord Valentia and Mr Salt, and again by Salt in 1810. In

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1829 Messrs Gobat and Kugler were sent out as missionarics by the Church Missionary Society, and were well reecived by the Ras of Tigré. Mr Kugler died soon after his arrival, and his place was subsequently supplied by Mr Isenberg, who was followed by Messrs Blumhardt and Krapf. In 1830 Mr Gobat proceeded to Gondar, where he also met with a favourable reception. In 1833 he returned to Europe, and published a journal of his residence here. In the following year he went back to Tigré, but in 1836 he was compelled to leave from ill health. In 1838 other missionaries were obliged to leave the country, owing to the opposition of the native priests. Messrs Isenberg and Krapf went south, and cstablished themselves at Shoa. The former soon after returned to England, and Mr Krapf remained in Shoa till Mareh 1842. Dr Rtippel, the German naturalist, visited the country in 1831, and remained nearly two years. MM. Combes and Tamisier arrived at

Massowah in 1835, and visited distriets which had not been traversed by Europeans since the time of the Portuguese. In 1839 the French Government sent out a scientific com- mission under M. Lefebvre. Its labours extended over five years, and have thrown great light on the condition and productions of the country. In 1841 a political mission was sent by the Governor-Gencral of India to Shoa, under the direction of Major Harris, who subsequently published an account of his travels. One who has done much to ex- tend our geographical knowledge of this country is Dr Beke, who was there from 1840 to 1843. Mr Mansfield Parkyns was there from 1843 to 1846, and has written the most interesting book on the country since the time of Bruce. Bishop Gobat having conccived the idea of sending lay missionaries into the country, who would engage in secular occupations as well as carry on missionary work, Dr Krapf and Mr Flad arrived in 1855 as pioneers of that mission. Six came out at first, and they were subscquently joined by others. Their work, however, was more valuable to Theodore than their preaching, so that he employed them as work- men to himself, and established them at Gaffat, near his eapital. Mr Stern arrived in Abyssinia in 1860, but re- turned to Europe, and came back in 1863, accompanied by Mr and Mrs Rosenthal.

Lij Kassa, who came subsequently to be known as the Emperor Theodore, was born in Kuara, a western province of Abyssinia, about the year 1818. His father was of noble family, and his uncle was governor of the provinccs of Dembea, Kuara, and Chelga. He was educated in a con- vent, but, preferring a wandering life, he became leader of a band of malcontents. On the death of his uncle he was made governor of Kuara, but, not satisfied with this, he seized upon Dembea, and having defeated several generals sent against him, peace was restored on his receiving Tavayitch, daughter of Ras Ali, in marriage. This lady is said to have been his good genius and counsellor, and during her life his conduet was most exemplary. He next turned his arms against the Turks, but was defeated ; and the mother of Ras Ali having insulted him in his fallen condition, he proclaimed his independence. The troops sent against him were successively defeated, and eventually the whole of the possessions of Ras Ali fell into his hands. He next de- feated the chief of Godjam, and then turned his arms against the governor of Tigré, whom he totally defeated in February 1855. In March of the same ycar he took the title of Theodore III., and caused himself to be

crowned king of Ethiopia by the Abuna. Theodore was now in the zenith of his career. He is described as being generous to excess, free from cupidity, merciful to his vanquished enemies, and strictly continent, but subject to violent bursts of anger, and possessed of unyielding pride and fanatieal religious zeal. He was also a man of edueation and intelli- gence, superior to those among whom he lived, with natural

talents for governing, and gaining the esteem of others. He had further a noble bearing and majestic walk, a frame eapable of enduring any amount of fatigue, and is said to have been “the best shot, the best spearman, the best runner, and the best horseman in Abyssinia.” Had he contented himself with what he now possessed, the sove- reignty of Amhara and Tigré, he might have maintained his position ; but he was led to exhaust his strength against the Gallas, whieh was probably one of the chief causes of his ruin. He obtained scveral victorics over that people, ravaged their country, took possession of Magdala, which he afterwards made his principal stronghold, and enlisted many of the chicfs and their followers in his own ranks. He shortly afterwards reduced the kingdom of Shoa, and took Ankobar, the capital; but in the meantime his own people were groaning under his heavy exactions, rebellions were breaking out in various parts of his pro- vinces, and his good qucen was now dead. He lavished vast sums of money upon his army, which at one time amounted to 100,000 or 150,000 fighting men; and in order to mect this expenditure, he was forced to exact exorbitant tributes from his people. The British consul, Plowden, who was strongly attached to Theodore, having been ordered by his Government in 1860 to return to Massowah, was attacked on his way by a rebel named Garred, mortally wounded, and taken prisoncr. Theodore attaeked the rebels, and in the action the murderer of Mr Plowden was slain by his friend and companion Mr Bell, but the latter lost his life in preserving that of Theodore. The deaths of the two Englishmen were terribly avenged by the slaughter or mutilation of nearly 2000 rebels. Theodore soon after marricd his sccond wife Terunish, the proud daughter of the late governor of Tigré, who felt neither affection nor respect for the upstart who had dethroned her father, and the union was by no means a happy one. In 1862 he madc a second expedition against the Gallas, whieh was stained with atrocious crueltics. Theodore had now given himself up to intoxication and lust. When the news of Mr Plowden’s death reached England, Captain Cameron

was appointed to succeed him as consul, and arrived at Massowah in February 1862. He proceeded to the camp of the king, to whom he presented a rifle, a pair of pistols, and a lettcr in the Quecn's name. In October Captain Cameron was dismissed by Theodore, with a letter to the Queen of England, which reached the Forcign Office on the 12th of February 1863. For some reason or other this letter was put aside and no answer returned, and to this in no small degree is to be attributed the difficulties that subsequently arose with that country. After forward- ing the letter, Captain Cameron, hearing that the Christians of Bogos had been attacked by the Shangallas and other tribes under Egyptian rule, proceeded to that district, and afterwards went to Kassala, the seat of the Egyptian ad- ministration in that quarter. Thence he went to Metemeh, where he was taken ill, and in order to recruit his health he returned to Abyssinia, and reached Jenda in August 1863. In November despatehes were received from England, but no answer to the emperor's letter, and this, together with the consul's visit to Kassala, greatly offended him, and in January 1864 Captain Cameron and his suite, with Messrs Stern and Rosenthal, were cast into prison. When the news of this reachcd England, the Government resolved, when too late, to send an answer to the emperor's letter, and selected Mr Hormuzd Rassam to be its bearer. He arrived at Massowah in July 1864, and immediately despatched a messenger requesting permission to present himself before the empcror. Ncither to this nor a subsequent application was any answer returned till August 1865, when a curt note was received, stating that Consul Cameron had been relcased, and if Mr Rassam still

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desired to visit the king, he was to proceed by the route of Metemeh. They reached Metemeh on 21st November, and five weeks nmiore were lost before they heard from the emperor, whose reply was now courteous, informing them that the governors of all the districts through which they had to march had received orders to furnish them with every necessary. They left Metemeh on the 28th December, and on 25th January following arrived at Theodore's camp in Damot. They were received with all honour, and were afterwards sent to Kuarata, on Lake Dembea, there to await the arrival of the captives. The latter reached this on 12th March, and everything appeared to proceed very favourably. A month later they started

for the coast, but had not pro- ceeded far when they were all brought back and put into confinement. Theodore then wrote a letter to the Queen, requesting European workmen and machinery to be sent to him, and despatched it by Mr Flad. The Europeans, although detained as prisoners, were not at first unkindly treated ; but in the end of June they were sent to Magdala, where they were soon afterwards put in chains. They suffered hunger, cold, and misery, and were in constant fear of death, till the spring of 1868, when they were relieved by the British troops. In the meantime the power of Theodore in the country was rapidly waning. In order to support his vast standing army, the country was drained of its resources: the peasantry abandoned the fertile plains, and took refuge in the fastnesses, and large fertile tracts remained uncultivated. Rebellions broke out in various parts of the country, and desertions took place among his troops, till his army became little more than a shadow of what it once was. Shoa had already shaken off his yoke ; Godjam was virtually independent; Walkeit and Samen were under a rebel chief; and Lasta Waag and the country about Lake Ashangi had submitted to Wagsham Gobaze, who had also overrun Tigré, and appointed Dejach Kassai his governor. The latter, however, in 1867 rebelled against his master, and assumed the suprenre power of that province. This was the state of matters when the English troops made their appearance in the country. With a view if possible to effect the release of the prisoners by con- ciliatory measures, Mr Flad was sent back, with some artisans and machinery, and a letter from the Queen, stating that these would be handed over to his Majesty on the release of the prisoners and their return to Massowah. This, however, failed to influence the emperor, and the English Government at length saw that they must havé recourse to arms. In July 1867, therefore, it was resolved to send an army into Abyssinia to enforce the release of the captives, and Sir Robert Napier was appointed com- mander-in-chief. A reconnoitring party was despatched beforehand, under Colonel Merewether, to select the landing- place and anchorage, and explore the passes leading into the interior. They also entered into friendly relations with the different chiefs in order to secure their co-operation. The landing-place selected was Mulkutto, on Annesley Bay, the point of the coast nearest to the site of the ancient Adulis, and we are told that “the pioneers of the English expedition followed to some extent in the footsteps of the adventurous soldiers of Ptolemy, and met with a few faint traces of this old world enterprise.””—C. R. Markham. The

force amounted to upwards of 16,000 men, besides 12,640 belonging to the transport service, and followers, making in all upwards of 32,000 men. The task to be accomplished was to march over 400 miles of a mountainous and little-known country, inhabited by savage tribes, to the camp or fortress of Theodore, and compel him to deliver up his captives. The commander-in-chief landed on 7th January 1868, and soon after the troops began to move forward through the pass of Senafé, and southward through the districts of Agamé, Tera, Endarta, Wojerat, Lasta, and

Wadela. In the meantime Theodore had been reduced to great straits. His army was rapidly deserting him, and he could hardly obtain food for his followers. He resolved to quit his capital Debra Tabor, which he burned, and set out with the remains of his army for Magdala. During this march he displayed an amount of engineering skill in the construction of roads, of military talent, and fertility of resource, that excited the admiration and astonishment of his enemies. On the afternoon of the 10th of April a force of about 3000 men suddenly poured down upon the English in the plain of Arogié, a few miles from Magdala. They advanced again and again to the charge, but were each time driven back, and finally retired in good order. Early next morning Theodore sent Lieut. Prideaux, one of the captives, and Mr Flad, accompanied by a native chief, to the English camp to sue for peace. Answer was returned, that if he would deliver up all the Europeans in his hands, and submit to the Queen of England, he would reccive honourable treatment. The captives were liberated and sent away, and along with a letter to the English gencral was a present of 1000 cows and 500 sheep, the acceptance of which would, according to Eastern custom, imply that peace was granted, Through some misunderstanding, word was sent to Theodore that the present would be accepted, and he felt that he was now safe; but in the evening he learned that it had not been received, and despair again seized him. Early next morning he attempted to escape with a few of his followers, but subsequently returned. The same day (13th April) Magdala was stormed and taken, and within they found the dead body of the emperor, who had fallen by his own hand, The inhabitants and troops were subsequently sent away, the fortifications destroyed, and the town burned. The queen Terunish having expressed her wish to go back to her

own country, accompanied the British army, but died during the march, and her son Alam-ayahu, the only legitimate son of the emperor, was brought to England, as this was the desire of his father. The success of the expedition was in no small degree owing to the aid afforded by the several native chiefs through whose country it passed, and no one did more in this way than Prince Kassai of Tigré. In acknow- ledgment of this several pieces of ordnance, small ams, and ammunition, with much of the surplus stores, were handed over to him, and the English troops left the country in May 1868. Soon after this Prince Kassai declared his independence; and in a war which broke out between him and Wagsham Gobaze, the latter was defeated, and his territory taken possession of by the conqueror. In 1872 Kassai was crowned king of Abyssinia with great ceremony at Axam, under the title of King Johannes, In that ycar the governor of Massowah, Munzinger Bey, a Swiss, by com- mand of the Viceroy of Egypt, marched an armed force against the Bogos country. The king solicited the aid of England, Germany, and Russia against the Egyptians, whose troops, however, were after a time withdrawn. Sir Bartle Frere, in the blue-book published respecting his mission to Zanzibar, is of the opinion that England, having regard to the passage to India by the Red Sea, should not have wholly abandoned Abyssinia. (D. K.) (See Travels of Bruce, 1768-73; Lord Valentia , Salt, 1809-10; Combes et Tamisier, 1835-37 ; Ferret et Galinier, 1839-43; Riippell, 1831-33; MM. Th. Lefebvre, A. Petit, et Quartin-Dillon, 1839-43; Major Harris; Gobat ; Dr C, Beke; Isenberg and Krapf, 1839-42; Mansfield Parkyns; Von Heuglin, 1861-62; H. A. Stern, 1860 and 1868; Dr Blane, 1868; A. Rassam, 1869; C. R. Markham, 1869; W. T. Blanford, 1870; Record of the Expedition to Abyssinia, compiled by order of the Secretary of State for War, by Major T. J. Holland and Captain H. Hozier, 2 vols. 4to, and plates, 1870; various Parliamentary Papers, 1867—68.)

ACACIA, a genus of shrubs and trees belonging to the natural family Leguminose and the section Mimosez. The flowers are small, arranged in rounded or elongated clusters. The leaves are compound pinnate in gencral. In some instances, how- ever, more especially in the Australian species, the leaf-stalks become flattened, and serve the purpose of leaves; the plants are hence call ed leafless Acacias, and as the leaf-stalks are often placed with

their edges towards the sky and earth, they do not Leaf of Acacia heterophylla. intercept light so fully , as ordinary trees. There are about 420 species of Acacias widely scattered over the warmer regions of the globe. They abound in Australia and Africa. Various species, such as Acacia vera, arabica, Ehrenbergu, and tortilis, yield gum arabic ; while Acacia Verek, Seyal, and Adansonti furnish a similar gum, called gum Senegal. These species are for the most part natives of Arabia, the north- eastern part of Africa, and the East Indies. The wattles

of Australia are species of Acacia with astringent barks. Acacia dealbata is used for tanning. An astringent medicine, called catechu or cutch, is procured from several species, but more especially from Acacia Catechu, by boiling down the wood and evaporating the solution so as to get an extract. The bark of Acacia arabica, under the name of Babul or Babool, is used in Scinde for tanning. Acacia formosa supplies the valuable Cuba timber called sabicu. Acacia Seyal is the plant which is supposed to be the shittah tree of the Bible, which supplied shittim-wood. The pods of Acacia nilotica, under the name of neb-neb, are used by tanners. The seeds of Acacia Niopo are roasted and used as snuff in South Ameriea. The seeds of all the varieties of Acacia in South Australia to the west, called Nundo, are used as food after being roasted. Acacia melanoxylon, black wood of Australia, sometimes called light wood, attains a great size; its wood is used for furniture, and receives a high polish. Acacia homalophylla, myall wood, yields a fragrant timber, used for ornamental purposes. A kind of Acacia is called in Australia Bricklow. In common language the term Acacra is often applied to species of the genus Robinia, which belongs also to the Leguminous family, but is placed in a different section. Robinia Pseudo-acacia, or false Acacia, is cultivated in the milder parts of Britain, and forms a large tree, with beautiful pink pea-like blossoms. The tree is sometimes called the Locust tree.

ACADEMY

CADEMY, dxad%e1a,! a suburb of Athens to the north, forming part of the Ceramicus, about a mile beyond the gate named Dypilum. It was said to have belonged to the hero Academus, but the derivation of the word is unknown. It was surrounded with a wall by Hipparchus, and adorned with

walks, groves, and fountains by Cimon, the son of Miltiades, who at his death bequeathed it as a public pleasure-ground to his fellow-citizens. The Academy was the resort of Plato, who possessed a small estate in the neighbourhood. Here he taught for nearly fifty years, till his death in 348 B.c.; and from these “groves of the Academy where Plato taught the truth,” ? his school, as distinguished from the Peripatetics, received the name of the Academics.

The same name (Academia) was in after times given by Cicero to his villa or country-house near Puteoli. There was composed his famous dialogue, Zhe Academic Ques- tions.

Of the academic school of philosophy, in so far as it diverged from the doctrines of its great master (see PLATO), we must treat very briefly, referring the reader for parti- culars to the founders of the various schools, whose names we shall have occasion to mention. ;

The Academy lasted from the days of Plato to those of Cicero. As to the number of successive schools, the critics are not agreed. Cicero himself and Varro recognised only two, the old and the new; Sextus Empiricus adds a third, the middle; others a fourth, that of Philo and Charmidas ; and some even a fifth, the Academy of Antiochus.

Of the old Academy, the principal leaders were Speusip- pus, Plato’s sister’s son, and his immediate successor; Xenocrates of Chalcedon, who with Speusippus accompanied Plato in his journey to Sicily; Polemo, a dissolute young

» The bye-form ixaJnuix, which occurs in Diogenes Laertius, is pro- bably a rationalistic attempt to interpret the word, such as we com- monly meet with in the writings of Plato.

2 Horace, Hp. ii. 2, 45.

Athenian, who came to laugh at Xenocrates, and remained to listen (Horace, Sat., 11. 3, 253); Crates, and Crantor, the latter of whom wrote a treatise, rept révOovs, praised by Cicero. Speusippus, like the Pythagoreans, with whom Aristotle compares him, denied that the Platonic

Good could be the first principle of things, for (he said) the Good is not like the germ which gives birth to plants and animals, but is only to be found in already existing things. He therefore derived the universe from a primeval indeter- minate unit, distinct from the Good; from this unit he deduced three principles—one for numbers, one for magni- tude, and one for the soul. The Deity he conceived as that living force which rules all and resides everywhere. Xenocrates, though like Speusippus infected with Pytha- goreanism, was the most faithful of Plato's successors. He distinguished three essences: the sensible, the intelligible, and a third, compounded of the other two. The sphere of the first is all below the heavens, of the second all beyond the heavens, of the third heaven itself. To each of these three spheres one of our faculties corresponds. To the sen- sible, sense; to the intelligible, intellect or reason; to the mixed sphere, opinion (ddga). So far he closely follows the psychology and cosmogeny of his master; but Cicero notes as the characteristic of both Spensippus and Xeno- crates, the abandonment of the Socratic principle of hesitancy.

Of the remaining three, the same writer (who is our prin- cipal authority for the history of the Academic school) tells us that they preserved the Platonic doctrine, but emphasised the moral part. On the old Academy he pronounces the following eulogium (De Fin. v. 3); "Their writings and method contain all liberal learning, all history, all polite discourse ; and besides, they embrace such a variety of arts, that no one can undertake any noble career without their aid….. In a word, the Academy is, as it were, the workshop of every artist." Modern criticism has not en- dorsed this high estimate. They preserved, it is true, and

elaborated many details of the Platonic teaching, which we could ill have spared; but of Plato's originality and specu- lative power, of his poetry and enthusiasm, they inherited nothing; "nor amid all the learning whieh has been pro- fusely lavished upon investigating their tenets, is there a single deduetion calculated to elueidate distinctly the eharacter of their progress or regression." } There is a saying of Polemo's, whieh will illustrate their virtual abandonment of philosophy proper: '" We should exercise ourselves in business, not in dialectieal speculation."

Areesilaus, the successor of Crates, the disciple of Theo- phrastus and Polemo, was the founder of the second or middle Aeademy. He professed himself the strict fol- lower of Plato, and seems to have been sincerely of opinion that his was nothing but a legitimate development of the true Platonic system. He followed the Socratic method of teaehing in dialogues; and, like Socrates, left no writ- ings,—at least the ancients were not acquainted with any. But we have no evidence that he maintained the ideal theory of Plato, and from the general tendeney of his teaehing it is probable that he overlooked it. He affinned that neither our senses nor our mind can attain to any certainty; in all we must suspend our judgment; proba- bility is the guide of life. Cicero tells us that he was more oecupied in disputing the opinions of othcrs than in advancing any of his own. Arcesilaus is, in fact, the founder of that academic seepticism whieh was developed and systematised by Carneades, the founder of the third or new Academy. He was the chief opponent of the Stoics and their doctrine of certitude. This is attested by a well-known saying of his: “If there had been no Chry- sippus, there would have been no Carneades.” To the Stoical theory of perception, the ¢avracia xatadyrrucy, by which they expressed a conviction of certainty arising from impressions so strong as to amount to science, he opposed the doctrine of dxaraAynwia, which denied any necessary eorrespondence between perceptions and the objects perceived. But while denying the possibility of any knowledge of things in themselves, he saved himself from absolute sceptieism by the doctrine of probability or verisimilitude, which may serve as a practical guide in life. Thus he announced as his criterion of truth an imagination or impression (fayracia) at once credible, irrefragable, and attested by comparison with other impressions. The wise man might be permitted to hold an opinion, though he allowed that that opinion might be false. In ethics, how- ever, he appeared as the pure seeptic. On his visit to Rome as an ambassador from Athens, he alternately main- tained and denied in his publie disputations the existence of justice, to the great scandal of Cato and all honest citizens,

On the fourth and fifth Academies, we need not dwell long. Philo and Antioehus both taught Cicero, and with- out doubt communicated to him that mild scepticism, that electicism compounded of almost equal sympathy with Plato and Zeno, which is the characteristic of his philo- sophical writings. The Academy exactly corresponded to the moral and political

wants of Rome. With no genius for speculation, the better Romans of that day were con- tent to embraee a system which, though resting on no philosophieal basis, and compounded of heterogeneous dogmas, offered notwithstanding a secure retreat from religious scepticism and political troubles, '* My words," says Cicero, speaking as a true Academician, "do not proclaim the truth, like a Pythian priestess 3 but I conjec- ture what is probable, like a plain man; and where, I ask, am I to search for anything more than verisimilitude 2" And again: "The characteristic of the Academy is never to

ee ee eee 1 Archer Butler, Lect. on Anc. Phil. ii. 315.

interpose one's judgmeut, to approve what seems most pro- bable, to compare together different opinions, to see what may be advanced on either side, and to leave oue's listencrs free to judge without pretending to dogmatise."

ACADEMY, in its modern acceptation, signifies a socicty or eorporate body of learned men, established for the ad- vancement of seienee, literature, or the arts.

The first institution of this sort we read of in history was that founded at Alexandria by Ptolemy Soter, whieh he named the Museum, povoetov. After completing his eonquest of Egypt, he turned his attention to the cultiva- tion of letters and science, and gathered about him a large body of literary men, whom he employed in collecting books and treasures of art. This was the origin of the library of Alexandria, the most famous of the ancient world. Passing by the academies which were founded by the Moors at Grenada, Corduba, and as far east as Samarcand, the next instance of an aeademy is that founded by Charle- magne at the instigation of the celebrated Alcuin, for promoting the study of grammar, orthography, rhetoric, poetry, history, and mathematics. In order to equalise all ranks, each member took the pseudonym of some ancient author or celebrated person of antiquity. For instance, Charlemagne himself was David, Alcuin became Flaccus Albinus. Though none of the labours of this academy have

eome down to us, it undoubtedly exerted considerable influence in modelling the language and reducing it to rules.

In the following century Alfred founded an academy at Oxford. This was rather a grammar school than a soeiety of learned men, and from it the University of Oxford originated.

But the academy whieh may be more justly considered as the mother of modern Europcan academies is that of Floral Games, founded at Toulouse in the year 1325, by Clemens Isaurus. Its object was to distribute prizes and rewards to the troubadours. The prizes consisted of flowers of gold and silver. It was first recognised by the state in 1694, and confirmed by letters-patent from the king, and its numbers limited to thirty-six. It has, except during a few years of the republic, continued to the present day, and distributes annually the following prizes :—An amaranth of gold for the best ode, a silver violet for a poem of sixty to one hundred Alexandrine lines, a silver eglantine for the best prose composition, a silver marigold for an elegy, and a silver lily presented in the last century by M. de Malpeyre for a hymn to the Virgin.

It was the Renaissance which was par excellence the era of academies, and as the Italians may be said to have dis- covered anew the buried world of literature, so it was in Italy that the first and by far the most numerous academics arose. The carliest of these was the Platonic Academy, founded at Florence by Cosmo de Mediei for the study of the works of Plato, though subsequently they added the explanation of Dante and other Italian authors,

Marsilius Ficinus, its principal ornament, in his Theologica Platonica, developed a system, chiefly borrowed from the later Platonists of the Alexandrian sehool, which, as it seemed to coincide with some of the leading doctrines of Christianity, was allowed by the church. His Latin trans- lation of Plato is at once literal, pcrspicuous, and correct; and as he had access to MSS. of Plato now lost, it has in several places enabled us to recover the original reading, After the expulsion of the Medici from Florence, the Platonic Academy was dissolved.

In giving some account of the principal academies of Europe, which is all that this article professes to do, we shall, as far as possible, arrange them

under different heads, according to—Is¢, The object which they were designed to promote; 2d, The countries to which they belong. This classification, though, perhaps, the best available, is

necessarily imperfect, inasmuch as several of those we shall mention were at once literary and scientific, and many associations for similar objects were known by some other name. Thus, with the doubtful exception of the Royal Academy of Arts, England has no academies in the proper sense of the word. For those institutions in England which answer to Italian academies, we must refer the reader to the article SocIEry.

L Screntiric Acapemres.—ZJtaly.—The first society for the prosccution of physical science was that established at Naples, 1560, under the presidency of Baptista Porta. It was called Academia Secretorum Nature or de Secreti. It arose from a meeting of some scientific friends, who assembled at Porta's house, and called themselves the Ofzos?. No member was admitted who had not made some useful discovery in medicine or natural philosophy. The name suggested to an ignorant public the prosecution of magic and the black arts. Porta went to Rome to justify himself before Paul III. He was acquitted by the Pope, but the academy was dissolved, and he was ordered to abstain for the future from the practice of all illicit arts.

'At Rome he was admitted to the Zcncer, an academy founded by Federigo Cesi, the Marcese di Monticelli. The device of the Lincei was a lynx with its eyes turned towards heaven tearing a Cerberus with its claws, intimating that they were prepared to do battle with error and falsehood. Their motto was the verse of Lucretius describing rain dropping from a cloud—* Redit agmine dulci." Besides Porta, Galileo and Colonna were enrolled among its mem- bers. The society devoted itself exclusively to physical science. Porta, under its auspices, published his great work, Magie Naturalis libri am., 1589, in fol.; his Phytogno- monica, or, the occult virtue of plants ; his De Humana Phy- siognomia, from which Lavater largely borrowed ; alsovarious works on optics and pneumatics, in which he approached the true theory of vision. He is cven said by some to have anticipated Galileo in the invention of the telescope.

But the principal monument still remaining of the zeal and industry of Cesi and his academy is the Phytobasanos, a compendium of the natural history of Mexico, written by a Spaniard, Hernendez. During fifty years the MS. had been neglected, when Cesi discovered it, and employed Terentio, Fabro, and Colonna, all Lynceans, to edit it and enrich it with notes and emendations. Cesi's own great work, Theatrum Nature, was never published. The MS. still exists in the Albani Library at Rome. After Cesi's death, 1630, the academy languished for some years under the patronage of Urban VIII. An academy of the same name was inaugurated at Rome 1784, and still flourishes. It numbers among its members some of our English philo- sophers. But the fame of the Lincet was far outstripped by that of the Accademia del Crmento, established in Florence 1657, under the patronage of the Grand Duke Ferdinand IL., at the instigation of his brother Leopold, acting under the advice of Viviani, one of the greatest geometers of Europe. The object of this academy was (as the name implies) to make experiments aud relate them, abjuring all preconceived notions. Unfortunately for science, it flourished for only ten years. Leopold in 1667 was made a cardinal, and the society languished without its head. It has, however, left a record of its labours in a volume containing an account of the experiments, pub- lished by the secretary in 1667. It is in the form of a beautifully priuted folio, with numerous full print pages of illustrations. It contains, among others, those on the supposed incompressibility of water, on the pressure of the air, and on the universal gravity of bodies. Torricelli, the inventor of the barometer, was one of its members.

Passing by numerous other Italian Academies of Science, we conc to those of modern times,

The Royal Academy of Sciences at Turin originated in 1757 as a private society ; in 1759 it published a volume of Miscellanea Philosophico-Mathematica Socretatis private Taurinensis ; shortly after it was constituted a Royal Society by Charles Emanuel III., and in 1783 Victor Amadeus III. made it a Royal Academy of Sciences. It consists of 40 members, residents of Turin, 20 non- resident, and 20 foreign members. It publishes each year a quarto volume of proceedings, and has crowned and awarded prizes to many learned works.

France.—The Old Academy of Sciences originated in much the same way as the French Academy. A private society of scicntific men had for some thirty years been accustomed to meet first at the house of Montmort, the maitre des requétes, afterwards at that of Thevenot, a great traveller aud man of universal genius, in order to converse on their studies, and communicate their discoveries. To this society belonged, among others, Descartes, Gassendi, Blaise Pascal, and his father. Hobbes, the philosopher of Malmesbury, was presented to it during his visit to Paris in 1640. Colbert, just as Richelieu in the case of the French Academy, conceived the idea of giving an official status to this body of learned men. Seven eminent mathematicians, among whom were Huyghens and De Bessy, the author of a famous treatise on magic squares, were chosen to form the nucleus of the uew society. A certain number of chemists, physicians, and anatomists were subsequently added. Pensions were granted by Louis XIV. to each of the members, and a fund for instruments and experimentations placed at their disposal. They commenced their session the 22d December 1666 in the Royal Library. They met twice a week—the mathematicians on the Wednesdays, the physicists (as the uaturalists and physiologists were then called) on the Saturdays. Duhamel was appointed secretary by the king. This post he owed more to his polished Latinity than to his scientific attainments, all the proceedings of the society being recorded in Latin. A treasurer was also nominated, who, notwithstanding his pretentious title, was nothing more than conservator of the scientitic instruments, &c. At first the academy was rather a laboratory and observatory than an academy proper. Experiments were undertaken in common and results discussed. Several foreign savants, in particular the Danish astronomer Reemer, joined the society, attracted by the liberality of the Grand Monarque; and the German physician and geometer Tschirnhausen and Sir Isaac Newton were made foreign associates. The death of Colbert, who was succeeded by Louvois, exercised a disas- trous effect on the fortunes of the academy. The labours of the academicians were diverted from the pursuit of pure science to such works as the construction of fountains and cascades at Versailles, and the mathematicians were employed to calculate the odds of the games of lansquenet and bassett. In 1699 the academy was reconstituted by M. de Pontchartrain, under whose department as secretary of state the academies came. By its new con- stitution it consisted of ten honorary members, men of high rank, who interested themselves in science, fifteen pensionaries,

who were the working members, viz., three geometricians, and the same number of astronomers, mechanicians, anatomists, and chemists. Each section of three had two associates attached to it, and besides, each pensionary had the power of naming a pupil. There were eight foreign and four free associates. The officers were, a president and a vice-president, named by the king from among the honorary members, and a secretary and treasurer chosen from the pensionaries, who held their offices for life. Fontenelle, a man of wit, and rather a populariscr of sciences than an original investigator, succceded Duhamel as

sccretary. The constitution, as is evident, was purely aristo- cratical, and unlike that of the French Academy, in which the principle of equality among the members was never violated. Science was not yet strong enough to dispense with the patronage of the great. The two leading spirits of the academy at this period were Clairaut and Réaumur. Clairaut was the first to explain capillary attraction, and predicted within a few days of the correct time the return of Halley's comet. His theory on the figure of the earth was only superseded by Laplace's Afécanique Céleste. Réaumur was principally distinguished by his practical discoveries, and a thermometer in common use at the present day bears his name.

To trace the subsequent fortunes of this academy would far exceed our limits, being equivalent to writing the history of the rise and progress of science in France. It has reckoned among its members Laplace, Buffon, Lagrange, D'Alembert, Lavoisier, and Jussieu, the father of modern botany. Those of our readers who wish for further informa- tion we would refer to M. Alfred Maury's excellent history.

On 21st December 1792, the old Academy of Sciences met for the last time. Many of the members fell by the guillotine, many were imprisoned, more reduced to indi- gence. The aristocracy of talent was almost as much detested and persecuted by the Revolution as that of rank.

In 1795 the Convention decided on founding an Insti- tute, which was to replace all the academies. The first class of the Institute corresponded closely to the old academy. See INSTITUTE.

In 1816 the Academy was reconstituted as a branch of the Institute. The new academy has reckoned among its members, besides many other brilliant names, Carnot the engineer, the physicians Fresnel, Ampére, Arago, Biot, the chemists Gay-Lussac and Thénard, the zoologists G. Cuvier and the two Geoffroy Saint-Hilaires.

The French had also considerable academies in most of their large towns. Montpellier, for example, had a Royal Academy of Sciences, founded in 1706 by Louis XIV., on nearly the same footing as that at Paris, of which, indeed, it was in some measure the counterpart. It was recon- stituted in 1847, and organised under three sections— medicine, science, and letters. It has continued to publish annual reports of considerable value. Toulouse also had an academy under the denomination of Lanternists; and there were analogous institutions at Nimes, Arles, Lyons, Dijon, Bordeaux, and other places. Of these several, we believe, are still in existence, if not in activity.

Before passing on to German academies, we may here notice a private scientific and philosophical society, the precursor of the French Academy of Sciences. It does not appear to have had any distinguishing name; but the pro- moter of it was Eusebius Renaudot, Counsellor and Phy- sician in Ordinary to the King of France, and Doctor Regent of the Faculty of Physic at Paris, by whom a full account of its conferences was published, translated into English by G. Havers, 1664. In the preface it is said to be “a production of an assembly of the choicest wits of France.” We will quote a few of the subjects of these discussions in order to show the character of the society :— “Why the loadstone draws iron;” “Whether the soul’s immortality is demonstrable by natural reason 3 40 OF tive little hairy girl lately seen in this city.” On subjects of popular superstition their views were far in advance of the time. Of judicial astrology it is said, “Why should we seek in heaven the causes of accidents which befall us if we can find them on earth?” Of the philosopher’s stone— “This most extravagant conceit, that it is the panacea, joined to the other absurdities of that chimerical art, makes us believe that it is good for nothing but to serve for imaginary consolation to the iniserable,”

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Germany.—The Collegium Curiosum was a scientific society, founded by J. C. Sturm, professor of mathematics and natural philosophy in the University of Altorff, in Franconia, in 1672, on the plan of the Accademia del Cimento. It originally consisted of 20 members, and con- tinued to flourish long after the death of its founder. The early labours of the society were devoted to the repetition (under varied conditions) of the most notable experiments of the day, or to the discussion of the results. Two volumes of proceedings were published by Sturm in 1676 and 1685 respectively. The Programma Invitatorium is dated June 3, 1672; and Sturm therein urges that, as the day of dis- putatious philosophy had given way to that of experi- mental philosophy, and as, moreover, seientific societies had been founded at Florence, London, and Rome, it would therefore seem desirable to found one in Germany, for the attainment of which end he requests the co-operation of the learned.

The work of 1676, entitled Collegium Eaperimentale sive Curiosum, commences with an account of the diving-bell, “a new invention ;” next follow chapters on the camera obscura, the Torricellian experiment, the air-pump, micro- scope, telescope, &e. The two works have been pronounced by a competent authority! to constitute a nearer approach to a text-book of the physics of the period than any pre- ecding work.

The Royal Academy of Sciences at Berlin was founded in 1700 by Frederic I. after Leibnitz’ comprehensive plan, but was not opened till 1711. Leibnitz was the first presi- dent. Under Maupertuis, who succeeded him, it did good service. Its present constitution dates from January 24, 1812. It is divided into four sections—physical, mathe- matical, philosophical, and historical. Each section is under a paid secretary elccted for life; each secretary presides in turn for a quarter of a year. The members are—lst, Re- gular members who are paid; these hold general meetings every Thursday, and scctional meetings every Monday. 2d, Foreign members, not to exceed 24 in nuinber. 3d, Hon- orary members and eorrespondents. Since 1811 it has published yearly, Mémoires del Académie Royale des Sciences et Belles Lettres d Berlin. For its scientific and philoso- phical attainments the names of W. and A. vy. Humboldt, Ideles, Savigny, Schleiermacher, Bopp, and Ranke, will sufficiently vouch.

The Academy of Sciences at Mannheim was established by Charles Theodore, Elector Palatine, in the year 1755. The plan of this institution was furnished by Schzpflin, according to which it was divided into two classes, the his- torical and physical. In 1780 a sub-division of the latter took place into the physical, properly so-called, and the meteorological. The meteorological obscrvations are pub- lished separately, under the title of Ephemerides Societatis Meteorologice Palatine, The historical and physical me- moirs are published under the title of Acta Academia Theodoro-Palatine.

The Electoral Bavarian Academy of Sciences at Munich was established iu 1759, and publishes its memoirs under the title of Abhandlungen der Baierischen Akademie. Soon after the Elector of Bavaria was raised to the rank of king, the Bavarian government, by his orders, directed its atten- tion to a new organisation of the Academy of Sciences of Munich. The design of the king was, to render its labours more extensive than those of any similar institution in Europe, by giving to it, under the direction of the ministry, the immediate superintendence over all the establishments

for public instruction in the kingdom of Bavaria. The Privy-

Councillor Jacobi, a man of most excellent character, and of

| considerable scientific attainments, was appointed president,

ee 1 Mr G. F. Rodwell, in the Chemical News, Junie 21, 1867,

The Electoral Academy at Erfurt was established by the Elector of Mentz, in the year 1754. It consists of a pro- tector, president, director, assessors, adjuncts, and asso- ciates. Its object is to promote the useful sciences. The memoirs were originally published in Latin, but afterwards in German. The Hessian Academy of Sciences at Giessen publish their transactions under the title of Acta Philo- sophico-Medica Academia Scientiarum Principalis Hessiace. In the Netherlands there are scientific academies at Flush- ing and Brussels, both of which have published their transactions.

Russia. —The Imperial Academy of Sciences at St Petersburg was projected by the Czar Peter the Great. Having in the course of his travels observed the advan- tage of public societies for the encouragement and promo- tion of literature, he formed the design of founding an academy of sciences at St Petersburg. By the advice of Wolff and Leibnitz, whom he consulted on this occasion, the society was accordingly regulated, and several learned foreigners were invited to become members. Peter him- self drew the plan, and signed it on the 10th of February 1724; but he was prevented, by the suddenness of his death, from carrying it into execution. His decease, how- ever, did not prevent its completion; for on the 21st of December 1725, Catharine I. established it according to Peter's plan, and on the 27th of the same month the society assembled for the first time. On the lst of August 1726, Catharine honoured the meeting with her presence, when Professor Bulfinger, a German naturalist of great eminence, pronounced an oration upon the advances made in the theory of magnetic variations, and also on the progress of research in so far as regarded the discovery of the longi- tude, A short time afterwards the empress settled a fund of £4982 per annum for the support of the academy; and 15 members, all eminent for their learning and talents, were admitted and pensioned, under the title of professors in the various branches of science and literature. The most distinguished of these professors were Nicholas and Daniel Bernouilli, the two De Lisles, Bulfinger, and Wolff.

During the short reign of Peter IL. the salaries of the raembers were discontinued, and the academy utterly neglected by the Court; but it was again patronised by the Empress Anne, who even added a seminary for the educa- tion of youth under the superintendence of the professors. Both institutions flourished for some time under the direction of Baron Korf; but upon his death, towards the end of Anne's reign, an ignorant person being appointed president, many of the most able members quitted Russia. At the accession of Elizabeth, however, new life and vigour were infused into the academy. The original plan was enlarged and improved ; some of the most learned foreigners were again drawn to St Petersburg ; and, what was considered as a good omen for the literature of Russia, two natives, Lomonosof and Rumovsky, men of genius and abilities, who had prosecuted their studies in foreign universities, were enrolled among its

members. Lastly, the annual income was increased to £10,659, and sundry other advan- tages were conferred upon the institution.

The Empress Catharine IL, with her usual zeal for promoting the diffusion of knowledge, took this useful society under her immediate protection. She altered the court of directors greatly to the advantage of the whole body, corrected many of its abuses, and infused a new vigour and spirit into their researches. By Catharine's particular recommendation the most ingenious professors visited the various provinces of her vast dominions; and as the funds of the academy were not sufficient to defray the whole expense of these expeditions, the empress supplied the deficiency by a grant of £2000, which was renewed as occasion required.

The purpose and object of these travels will appear from the instructions given by the academy to the several per- sons who engaged in them. They were ordered to institute inquiries respecting the different sorts of earths and waters; the best methods of cultivating barren and desert spots; the local disorders incident to men and animals, together with the most efficacious means of relieving them; the breeding of cattle, particularly of sheep; the rearing of bees and silk-worms; the different places and objects for fishing and hunting; minerals of all kinds; the arts and trades; and the formation of a Flora Russica, or collection of indi- genous plants. They were particularly instructed to rectify the longitude and latitude of the principal towns; to make astronomical, geographical, and meteorological observa- tions; to trace the courses of rivers; to construct the most exact charts; and to be very distinct and accurate in re- marking and describing the manners and customs of the different races of people, their dresses, languages, anti- quities, traditions, history, religion; in a word, to gain every information which might tend to illustrate the real state of the whole Russian empire. More ample instruc- tions cannot well be conceived; and they appear to have been very zealously and faithfully executed. The conse- quence was that, at that time, no country could boast, within the space of so few years, such a number of excellent publications on its internal state, its natural productions, its topography, geography, and history, and on the manners, customs, and languages of the different tribes who inhabit it, as issued from the press of this academy. In its researches in Asiatic

languages, and general knowledge of Oriental customs and religions, it proved itself the worthy rival of our own Royal Asiatic Socicty.

The first transactions of this society were published in

1728, and entitled Commentarti Academie Scientiarum Imperialis Petropolitanee ad annum 1726, with a dedica- tion to Peter II. The publication was continued under this form until the year 1747, when the transactions were called Novi Commentarit Academie, &c.; and in 1777, the academy again changed the title into Acta Academie Scien- tiarum Imperialis Petropolitane, and likewise made some alteration in the arrangements and plan of the work. The papers, which had been hitherto published in the Latin language only, were now written indifferently either in that language or in French, and a preface added, entitled Partie Historique, which contains an account of its pro- ceedings, meetings, the admission of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were published: the first of the Mew Commen- taries made its appearance in 1750, and the twentieth in 1776. Under the new title of Acta Academic, a number of volumes have been given to the public; and two are printed every year. These transactions abound with ingenious and elaborate disquisitions upon various parts of science and natural history; and it may not be an exaggeration to assert, that no society in Europe has more distinguished itself for the excellence of its publications, particularly in the more abstruse parts of pure and mixed mathematics. The academy is still composed, as at first, of 15 pro- fessors, besides the president and director. Each of these professors has a house and an annual stipend of from £200 to £600. Besides the professors, there are four adjuncts, with pensions, who are present at the sittings of the society, and succeed to the first vacancies. The direction of the academy is generally entrusted to a person of distinction.

The buildings and apparatus of this academy are on vast scale. There is a fine library, consisting of 36,000 curious books and manuscripts ; together with an extensive museum, in which the various branches of natural history, &c., are distributed in different apartments. The latter 1s extremely rich in native productions, having been consi-

derably augmented by the collections made by Pallas, Gmelin, Guldenstaedt, and other professors, during their expeditions through the various parts of the Russian em- pire. The stuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c., contain innumerable articles of the highest curiosity and value. The motto of the society is exceedingly modest; it consists of only one word, Paulatim.

Sweden.—The Academy of Sciences at Stockholm, or the Royal Swedish Academy, owes its institution to six persons of distinguished learning, among whom was the celebrated Linneus. They originally met on the 2d of June 1739, when they formed a private society, in which some dis- sertations were read; and in the end of the same year their first publication madc its appearance. As the meet- ings continued and the members increased, the society attracted the notice of the king; and, accordingly, on the 31st of March 1741, it was incorporated under the name of the Royal Swedish Academy. Not receiving any pen- sion from the crown, it is merely under the protection of the king, being directed, like our Royal Society, by its own members. It has now, however, a large fund, which has chiefly arisen from legacies and other donations; but a pro- fessor of experimental philosopliy, and two secretaries, are still the only persons who receive any salaries. Each of the members resident at Stockholm becomes president by rotation, and continues in office during three months. There are two kinds of members, native and foreign; the election of the former take places in April, that of the latter in July; and no money is paid at the time of admission. The dissertations read at each meeting are collected and published four times in the year: they are written in the Swedish language, and printed in octavo, and the annual publications make a volume. The first 40 volumes, which were completed in 1779, are called the Old Transactions. Denmark.—The Royal Academy of Sciences at Copen- hagen owes its institution to the zeal of six individuals, whom Christian VI., in 1742, ordered to arrange his cabinet of medals. These persons were John Gram, Joachim Fre- deric Ramus, Christian Louis Scheid, Mark Woldickey, Eric Pontopidan, and Bernard Moelman, who, occasionally mecting for this purpose, extended their designs; assoeiated with them others who were eminent in several branches of science; and forming a kind of literary society, employed themselves in searching into, and explaining the history and antiquities of their country. The Count of Holstein, the first president,

warmly patronised this society, and reconi- mended it so strongly to Christian VI. that, in 1743, his Danish majesty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former pursuits natural history, physics, and mathematics. In consequence of the royal favour the members engaged with fresh zeal in their pursuits; and the aeademy has published 15 volumes in the Danish language, some of which have been translated into Latin.

Lingland.—In 1616 a scheme for founding a Royal Academy was started by Edmund Bolton, an eminent scholar and antiquary. Bolton, in his petition to King James, which was supported by George Villicrs, Marquis of Buckingham, proposed that the title of the academy should be “King James, his Academe or College of honour.” In the list of members occurs the name of Sir Kenelm Digby, oue of the original members of the Royal Society. The death of the king proved fatal to the undertaking, In 1635 a second attempt was made to found an academy, under the patronage of Charles I., with the title of “ Minerva’s Muszeumi,” for the instruction of young noble-men in the liberal arts and sciences, but the project was soon dropped. About 1645some of the more ardent followers

of Bacon used to meet, some in London, some at Oxford, for the discussion of subjects counected with experimental science, This was the origin of the Royal Society, which received its charter in 1662. See Royan Soctery.

Lreland.—The Royal Irish Academy arose out of a society established at Dublin about the year 1782, and consisting of a number of gentlemen, most of whom belonged to the university. They held weekly meetings, and read essays in turn on various subjects. The nicmbers of this society afterwards formed a more extensive plan, and, admitting only such names as might add dignity to their new institution, became the founders of the Royal Irish Academy. They professed to unite the advancement of science with the history of mankind and polite literature. The first volume of their transactions (for 1787) appeared in 1788, and seven volumes were afterwards published. A society was formed in Dublin, similar to the Royal Society in London, as early as the year 1683; but the distracted state of the country proved unpropitious to the cultivation of philosophy and literature.

Holland.—The Royal Academy of Sciences at Amsterdam, erected by a royal ordinance 1852, succeeded the Royal Institute of the Low Countries, founded by Louis Napoleon, King of Holland, 1808. In 1855 it had published 192 volumes of proceedings, and reccived an annual subsidy of 14,000 florins from the state.

Spain.—The Academy of Sciences at Madrid, founded 1774, after the model of the French Aeademy.

Portugal.—The Academy of Sciences at Lishon is divided into three classes —natural history, mathematics, and national literature. It consists of 24 ordinary and 36 extraordinary members. Since 1779 it has published Memorias de Letteratura Portugueza ; Memorias Economicas ; Collecgao de Livros ineditos di [Historia Portugueza.

II. AcapEmiEs oF Betts Lerrres.—Jtaly.—Italy in the 16th century was remarkable for the number of its literary academies. Tiraboschi, in his //istory of [talian Literature, has given a list of 171; and Jarkius, in his Specimen ITistorie Academiarum Conditarum, enumerates nearly 700. Many of these, with a sort of Socractic irony, gave theniselves names expressive of ignorance or simply ludi- crous. Such were the Lunatici of Naples, the Estravaganti, the Fulminales, the Trapessati, the Drowsy, the Sleepers, the Anxious, the Confused, the Unstable, the Fantastic, the Transformed, the ditherial. ‘The first academies of Italy chiefly directed their attention to classical literature ; they compared manuscripts ; they suggested new readings, or new interpretations; they deciphered inscriptions or coins; they sat in judgment on a Latin ode, or debated the pro- pricty of a phrase. Their own poetry had, perhaps, never been neglected ; but it was not till the writings of Bembo furnished a new code of criticism in the Italian language, that they began to study it with the same minuteness as modern Latin.” ‘They were encouragers of a numis- matic and lapidary erudition, clegant in itself, and throw- ing for ever little specks of light on the still occan of the past, but not very favourable to comprehensive observation, and tending to bestow on an unprofitable pedantry the honours of real learning.”! The Italian nobility, excluded as they mostly were from politics, and living in eities, found in literature a consolation and a career. Such academies were oligarchical in their

eonstitution; they encouraged culture, but tended to hamper genius and extinguish originality. Of their academies, by far the most cclebrated was the Accademia della Crusca or Fur- furatorum; that is, of Bran, or of the Sifted. The title was borrowed from a previous society at Perugia, the Accademia degli Scosst, of the Well-shaken. Its device

1 Hallam's Int. to Lit. of Europe, vol. i. 654, and vol. ii. 502. I, — 10

was a sieve; its motto, "fl pil bel fior ne coglie," it collects the finest flour of it ; its principal object the puri- fication of the language. Its great work was the Vocabu- lurio della Crrusca, the first edition of which was published 1613. It was composed avowedly on Tuscan principles, and regarded the 14th century as the Augustan period of the language. Beni assailed it in his Anti-Crusca, and this exclusive Tuscan spirit has disappeared in subsequent editions. The Accademia della Crusca is now incorporated with two older societies—the Accademia degli Apatici (the Impartials) and the Accademia Fiorentina.

Among the numerous other literary academies of Italy we may mention the Academy of Naples, founded about 1440 by Alfonso, the king; the Academy of Mlorence, founded 1540, to illustrate and perfect the Tuscan tongue, especially by a close study of Petrarch ; the Zntronati of Siena, 1525; the Infiammati of Padua, 1534; the Rozzi of Siena, sup- pressed by Cosmo, 1568. ' _

The Academy of Humourists, Umoristi, had its origin at Rome in the marriage of Lorenzo Marcini, a Roman gentle- man, at which several persons of rank were guests. It was carnival time, and so to give the ladies some diversion, they betook themselves to the reciting of verses, sonnets, speeches, first extempore, and afterwards premeditately, which gave them the denomination of Belli Humori. After some expericnce, and coming more and more into the taste of these exercises, they resolved to form an academy of belles lettres, and changed the title of Belli Humori for that of umoristt.

In 1690 the Academy or Society of Arcadians was established at Rome, for the purpose of reviving the study of poetry, The founder Crescimbeni is the author of a well-known history of Italian poetry. It numbered among its members many princes, cardinals, and other ecclesias- tics; and, to avoid disputes about pre-eminence, all appeared masked after the manner of Arcadian shepherds. Within ten years from its first establishment the number of academicians amounted to 600.

The Royal Academy of Savoy dates from 1719, and was made a royal academy by Charles Felix in 1848. Its emblem is a gold orange tree full of flowers and fruit; its motto “Flores fructusque perennes,” being the same as those of the famous /lorimentane Academy, founded at Annecy by St Francis de Sales. It has published valuable memoirs on the history and antiquities of Savoy.

Germany. — Of the German literary academies, the most celebrated was Die Kruchtbringende Cresellschaft, the Fruitful Society, established at Weimar 1617. Five princes enrolled their names among the original members. The object was to purify the mother tongue. The German academies copied those of Italy in their quaint titles and petty ceremonials, and exercised little permanent influence on the language or literature of the country.

France.—The French Academy was established by order of the king in the year 1635, but in its original form it came into existence some four or five ycars earlier. About the year 1629 certain literary friends in Paris agreed to meet weekly at the house of one of their number. These meet- ings were quite informal, but the conversation turned mostly on litcrary topics; and when, as was often the case, one of the number had composed some work, he read it to the rest, and they gave their opinions upon it. The place of meeting was the house of M. Conrard, which was chosen as being the most central. The fame of these meetings, though the members were bound over to secrecy, reached at length the ears of Cardinal Richelieu, who conceived so high an opinion of them, that he at once promised them his protection, and offered to incorporate them by letters patent. Nearly all the members would have preferred the charms of privacy, but, considering the risk they would run in

incurring the cardinal’s displeasure, and that by the letter of the law all meetings of any sort or kind were prohibited, they expressed their gratitude for the high honour the cardinal thought fit to confer on them. They procecded at once to organise their body, settle their laws and constitu- tion, appoint officers, and choose their name. Thcir officers consisted of a director and a chancellor, both chosen by lot, and a permanent secretary, chosen by votes. They elected besides a publisher, not a member of the body, The director presided at the mectings, being considered as primus inter pares, and performing much the same part as the speaker in the English House of Commons. The chancellor kept the seals, and scaled all the official docu- ments of the academy. The office of the secretary explains itself. The cardinal was ex officio protector. The meet- ings were weckly as before.

The letters patent were at once grantcd by the king, but it was only after violent opposition and long delay that the president, who was jealous of the cardinal’s authority, con- sented to grant the verification required by the old con- stitution of France.

The object for which the academy was founded, as set forth in its statutes, was the purification of the French language. “The principal function of the academy shall be to labour with all care and diligence to give certain rules to our language, and to rendcr it pure, eloquent, and capable of treating the arts and sciences” (Art. 24). They proposed “to cleanse the language from the impurities it has con- tracted in the mouths of the common people, from the jargon of the lawyers, from the misusages of ignorant courtiers, and the abuscs of the pulpit.”—Letter of Academy to Cardinal Richelieu.

Their numbers were fixed at forty. The original members who formed the nucleus of the body were eight, and it was not till 1639 that the full number was completed. Their first undertaking consisted of essays written by all the members in rotation. To judge by the titles and spcci- mens which have come down to us, these possessed no special originality or merit, but resembled the émdetgers of the Greek rhetoricians. They next, at the instance of Cardinal Richelieu, undertook a criticism of Corneille’s Cid, the most popular work of the day. It was a rule of the academy that no work could be criticised except at the author’s request. It was only the fear of

incurring the cardinal’s displeasure which wrung from Corneille an un- willing consent. The critique of the academy was re- written several times before it met with the cardinal’s approbation. After six months of elaboration, it was pub- lished under the title, Sentiments de l Académie Frangoise sur le Cid. This judgment did not satisfy Corneille, as a saying attributed to him on the occasion shows. “ Hora- tius,” he said, referring to his last play, “‘ was condemned by the Duumviri, but he was absolved by the people.” But the crowning labour of the academy, commenced in 1639, was a dictionary of the French language. By the twenty-sixth article of their statutes, they were pledged to compose a dictionary, a grammar, a treatise on rhetoric, and one on poetry. M. Chapelain, one of the original members and leading spirits of the academy, pointed out that the dictionary would naturally be the first of these works to be undertaken, and drew up a plan of the work, which was to a great cxtent carried out. A catalogue was to be made of all the most approved authors, prose and verse: these were to be distributed among the members, and all words and phrases of which they approved to be marked by them in order to be incorporated in the dictionary. For this they resolved themselves into two committccs, which sat on other than the regular days. M. de Vaugelas+

1 A bon mot of his is worth recording. When returning thanks for

was appointed editor in chief. To remunerate him for his labours, he received from the cardinal a pension of 2000 francs. ‘The first edition of this dictionary appeared in 1694, the last Complément in 1854.

Instead of following the history of the French Academy,— which, like its two younger sisters, the Academy of Sciences and the Academy of Inscriptions, was suppressed in 1793, and reconstituted in 1795, as a class of the Insti- tute,—a history which it would be impossible to treat adequately in the limit of an article, we will attempt briefly to estimate its influence on French literature and language, and point out its principal merits and defects. To begin with its merits, it may justly boast that there is hardly a single name of the first rank among French littérateurs that it has not eurolled among its members. Moliére, it is true, was rejected as a player; but we can hardly blanie the academy for a social prejudice which it

shared with the age; and it is well known that it has, as far as was in its power, made the amende honorable. In the Salle des Séances is placed the bust of the greatest of modern comedians, with the inscription, “Rien ne manque a sa gloire ; il manquait 4 la notre.” Descartes was excluded from the fact of his residing in Holland. Scarron was confined by paralysis to his own house. Pascal is the only remaining exception, and Pascal was better known to his contemporaries as a mathematician than a writer. His Lettres Provinciales were published anonymously; and just when his fame was rising he retired to Port-Royal, where he lived the life of a recluse. On the other hand, it cannot be denied that the fauteuils have often been occupied by men of no mark in literature. Nor is the academy wholly exonerated by M. Livet’s in- genious defence, that there are but eight marshals in the Freuch army, and yet the number has never appeared too restricted ; for its most ardent admirers will not assert that it has, as a rule, chosen the forty most distinguished living authors. Court intrigue, rank, and finesse have too often prevailed over real merit and honesty. Though his facts are incorrect, there is much truth in Courier’s caustic satire :—“ Dans une companie de gens faisant profession desprit ou de savoir, nul ne veut prés de soi un plus habile que soi, mais bien un plus noble, un plus riche: un duc et pair honore l’Académie Francaise, qui ne veut point de Boileau,! refuse la Bruyére, fait attendre Voltaire, mais recoit tout d’abord Chapelain et Conrart.”

We have next to consider the influence of the French Academy on the language and literature, a subject on which the most opposite opinions have been advanced. On the one hand, it has been asserted that it has corrected the judgment, purified the taste, and formed the language of French writers, and that to it we owe the most striking characteristics of French literature, its purity, delicacy, and flexibility. Thus Mr Matthew Arnold, in his well-known Lissay on the Literary Influence of Academies, has pro- nounced a glowing panegyric on the French Academy as a high court of letters, and rallying point for educated opinion, as asserting the authority of a master in matters of tonc and taste. To it he attributes in a great measure that thoroughness, that openness of mind, that absence of vulgarity which he finds everywhere in French literature 3 and to the want of a similar institution in England he traces that eccentricity, that provincial spirit, that coarse- ness, which, as he thinks, is barely compensated by English genius. Thus, too, M. Renan, one of its most distinguished living members, says

that it is owing to the academy “qu’on ee ee ee his pension, the cardinal remarked, “ Well, Monsieur, you will not forget the word pension in your dictionary.” “No, Monseigneur,”

replied Vaugelas, “and still less the word gratitude.”

; ; a was elected to the French Academy 1684, La Bruyére in :

(6)

peut tout dire sans apparcil scholastique avec la langue des gens du monde.” “Ah ne dites,” he exclaims, “ qu’ils n’ont rien fait, ces obscures beaux esprits dont la vie se passe & instruire le procés des mots, a peser les syllables. Ils ont fait un chef-d’ceuvre—la langue frangaise.” On the other hand, its inherent defects have been so well summed up by M. Lanfrey, that we cannot do better than quote from his recent LHistory of Napoleon. “This institution,” he says, speaking of the French Academy, “had never shown itself the enemy of despotism. Founded by the monarchy and for the monarchy, eminently favourable to the spirit of intrigue and favouritism, incapable of any sustained or combined labour, a stranger to those great works pursued in common which legitimise and glorify the existence of scientific bodies, occupicd exclusively with learned trifles, fatal to emulation, which it pretends to stimulate, by the compromises and calculations to which it subjects it, directed in everything by petty considerations, and wasting all its energy in childish tournaments, in which the flatteries that it showers on others are only the foretaste of the compliments it expects in return for itself, the French Academy seems to have received from its founders the special mission to transform genius into bel esprit, and it would be hard to produce a man of talent whom it has not demoralised. Drawn in spite of itself towards politics, it alternately pursues and avoids them; but it is specially attracted by the gossip of politics, and whenever it has so far emancipated itself as to go into opposition, it does so as the champion of ancient prejudices. If we examine its influence on the national genius, we shall see that it has given it a ficxibility, a brilliancy, a polish, which it never possessed before; but it has done so at the expense of its masculine qualities, its originality, its spontaneity, its vigour, its natural grace. It has dis- ciplined it, but it has emasculated, impoverished, and rigidified it. It sees in taste, not a sense of the beautiful, but a certain type of

correctness, an elegant form of medio- erity. It has substituted pomp for grandeur, school routine for individual inspiration, elaborateness for simplicity, fadewr and the monotony of literary orthodoxy for variety, the source and spring of intellectual life; and in the works produced under its auspices we discover the rhetorician and the writer, never the man. By all its traditions the academy was made to be the natural orma- nient of a monarchical society. Richelieu conceived and created it as a sort of superior centralisation applied to intellect, as a high literary court to maintain intellectual unity, and protest against innovation. Bonaparte, aware of all this, had thought of re-establishing its ancient privileges ; but it had in his eyes one fatal defect—esprit. Kings of France could condone a witticism even against themselves, a parvenu could not."

In conclusion, we would bricfly state our own opinion. The influence of the Freneh Academy has been conservative rather than creative. While it has raised the general standard of writing, it has tended to hamper and crush originality. It has done much by its example for style, but its attempts to impose its laws on language have, from the nature of the case, failed. For, however perfectly a dictionary or a grammar may represent the existing language of a nation, an original genius is certain to arise—a Victor Hugo, or an Alfred de Musset, who will set at de- fiance all dictionaries and academic rules.

Spain.—The Royal Spanish Academy at Madrid held its first meeting in July 1713, in the palace of its founder, the Duke d'Escalona. It consisted at first of 8 academicians, including the duke; to which number 14 others were afterwards added, the founder being chosen president or director. In 1714 the king granted them the royal con- firmation and protection. Their device is a crucible in

the middle of the fire, with this motto, Limpia, fixa, y da esplendor—*"It purifies, fixes, and gives brightness." The number of its members was limited to 24; the Duke d'Escalona was chosen director for life, but his successors were elected yearly, and the secretary for life. Their object, as marked out by the royal declaration, was to cultivate and improve the national language. They were to begin with choosing carefully such words

and phrases as have been used by the best Spanish writers ; noting the low, barbarous, or obsolete ones; and composing a dictionary wherein these might be distinguished from the former. ;

Sweden.—The Royal Swedish Academy was founded in the year 1786, for the purpose of purifying and perfecting the Swedish language. A medal is struck by its direction every ycar in honour of some illustrious Swede. This academy does not publish its transactions.

Belyium.—Belgium has always been famous for its literary societics. The little town of Diest boasts that it possessed a society of poets in 1302, and the Catherinists of Alost date from 1107. Whether or not there is any foundation for these claims, it is certain that numerous Chambers of Ehetoric (so academies were then called) existed in the first years of the rule of the house of Bur- gundy.

The present Royal Academy of Belgium was founded by the Count of Coblenzl at Brussels, 1769. Count Stahren- berg obtained for it in 1772 letters patent from Maria Theresa, who also granted pensions to all the members, and a fund for printing their works. All academicians were ¢pso facto ennobled. It was reorganised, and a class of finc arts added in 1845 through the agency of M. Van de Weyer, the learned Belgian ambassador at London. It has devoted itsclf principally to national history and anti- quities.

III. AcApEmMIEs or ARCHZOLOGY AND History.— Italy.—Under this class the Academy of Herculaneum pro- perly ranks. It was established at Naples about 1755, at which period a museum was formed of the antiquities found at Herculaneum, Pompeii, and other places, by the Marquis Tanucci, who was then minister of state. Its ob- ject was to explain the paintings, &c., which were discovered at those places; and for this purpose the members met every fortnight, and at each meeting three paintings werc submitted to three academicians, who made their report on them at their next sitting. The first volume of their labours appeared in 1775, and they have been continued under the title of Antichita dv Ercolano. They contain engravings of the principal paintings, statues, bronzes, marble figures, medals, utensils, &c., with explanations. In the year 1807, an Academy of History and Antiquities, on a new plan, was established at Naples by Joseph Bona- parte. Thc number of members was limited to forty; twenty of whom

were to be appointed by the king, and these twenty were to present to him, for his choice, three names for each of those wanted to complete the full num- ber. Hight thousand ducats were to be annually allotted for the current expenses, and two thousand for prizes to the authors of four works which should be deemed by the academy most deserving of sucha reward. A grand meet- ing was to be held every year, when the prizes were to be distributed, and analyses of the works read. The first meeting took place on the 25th of April 1807; but the subsequent changes in the political state of Naples pre- vented the full and permanent establishment of this insti- tution. In the same year an academy was established at Florence for the illustration of Tuscan antiquities, which published some volumes of memoirs.

France.—The old Academy of Inscriptions and Belles Lettres was an off- shoot from the French Academy, which

then at least contained the élite of French learning. Louis XIV. was of all French kings the one most occupied with his own aggrandisement. Literature, and even science, he only encouraged so far as they redounded to his own glory. Nor werc literary men inclined to assert their independence, Boileau well represented the spirit of the age when, in dedicating his tragedy of Berenice to Colbert, he wrote— “The least things become important if in any degree they can serve the glory and pleasure of the king.” Thus it was that the Academy of Inscriptions arose. At the suggestion of Colbert, a company (a committee we should now call it) had been appointed by the king, chosen from the French Academy, charged with the office of furnishing inscriptions, devices, and legends for medals. It consisted of four academicians: Chapelain, then considered the poet laureate of France, one of the authors of the critique on the Cid (see above); Vabbé de Bourzeis; Francois Car- pentier, an antiquary of high repute among his contem- poraries ; and l’abbé de Capagnes, who owed his appoint- nent more to the fulsome flattery of his odes than his really learned translations of Cicero and Sallust. This company used to meet in Colbert’s library in the winter, at his country-house at Sceaux in the summer, generally on Wednesdays, to serve the convenience of the minister, who was constantly present. Their meetings were princi- pally occupied with

discussing the inscriptions, statues, and pictures intended for the decoration of Versailles; but M. Colbert, a really learned man and an enthusiastic collector of manuscripts, was often pleased to converse with them on matters of art, history, and antiquities. Their first published work was a collection of engravings, accom- panied by descriptions, designed for some of the tapestries at Versailles. Louvois, who succeeded Colbert as a superintendent of buildings, revived the company, which had begun to relax its labours. Félibien, the learned architect, and the two great poets Racine and Boileau, were added to their number.

But it was to M. de Portchartrain, comptroller-general of finance and secretary of state, that the academy owed its institution. He added to the company Renaudot and Tourreil, both men of vast learning, the latter tutor to his son, and put at its head his nephew, l'abbé Bignon, librarian to the king. By a new regulation, dated the 16th July 1701, the Royal Academy of Inscriptions and Medals was instituted, 'being composed of ten honorary members, ten pensioners, ten associates, and ten pupils. On its constitution we need not dwell, as it was an almost exact copy of that of the Academy of Science. Among the regulations we find the following, which indicates clearly the transition from a staff of learned officials to a learned body :—"' The academy shall concern itself with all that can contribute to the perfection of inscriptions and legends, of designs for such monuments and decorations as may be submitted to its judgment; also with the description of all artistic works, present and future, and the historical ex- planation of the subject of such works; and as the know- ledge of Greek and Latin antiquities, and of these two languages, is the best guarantee for success in labours of this class, the academicians shall apply themselves to all that this division of learning includes, as one of the most worthy objects of their pursuit."

Among the first honorary members we find the indefa- tigable Mabillon (excluded from the pensioners by reason of his orders), Pere La Chaise, the king's confessor, and Cardinal Rohan; among the associates Fontenelle, and Rollin, whose Ancient History was submitted to the academy for revision. In 1711 they completed L'L/istocre Meétallique du Roi, of which Saint-Simon was asked to

write the preface. In 1716 the regent changed its title to that of the Academy of Inscriptions and Belles Lettres, a title which better suited its new character.

In the great battle between the Ancients and the Moderns which divided the learned world in the first half of the 18th century, the Academy of Inscriptions naturally espoused the cause of the Ancients, as the Academy of Sciences did that of the Moderns. During the earlier years of the French Revolution the academy continued its labours uninterruptedly; and on the 22d of January 1793, the day after the death of Louis XVI., we find in the Proceedings that M. Bréquigny read a paper on the projects of marriage between Queen Elizabeth and the Dukes of Anjou aud Alencon. In the same year were published the 45th and 46th vols. of the Mémoires de V Académie. On the 2d of August of the same year the last séance of the old academy was held. More fortunate than its sister Academy of Sciences, it lost only three of its members by the guillotine. One of these was the astronomer Sylvain. Bailly. Three others sat as members of the Convention ; but for the honour of the academy, we must add that all three were distinguished by their mode- ration.

In the first draught of the new Institute, October 25, 1795, no class corresponded exactly to the old Academy of Inscriptions ; but most of the members who survived found themselves re-elected either in the 2d class of moral and political science, under which history and geography were included as scctions, or more generally under the 3d class of literature and fine arts, which embraced ancient languages, antiquities, and monuments.

In 1816 the academy reccived again its old name. The Proceedings of the Society embrace a vast field, and are of very various merits. Perhaps the subjects on which it has shown most originality are comparative mythology, the history of science among the ancients, and the geo- graphy and antiquities of France. The old academy has reckoned among its-members De Sacy the Orientalist, Dansse de Villoison the philologist, Du Perron the traveller, Sainte-Croix and Du Theil the antiquarians, and Le Beau, who has been named the last of the Romans, The new academy has already inscribed

on its lists the well-known names of Champollion, A. Rémusat, Raynouard, Burnouf, and Augustin Thierry.

Celtic Academy.—In consequence of the attention of several literary men in Paris having been directed to Celtic antiquitics, a Celtic Academy was established in that city in the year 1800. Its objects were, first, the elucidation of the history, customs, antiquities, manners, and monuments of the Celts, particularly in France; secondly, the etymology of all the European languages, by the aid of the Celto- British, Welsh, and Erse ; and, thirdly, researches relating to Druidism. The attention of the members was also parti- cularly called to the history and settlements of the Galatz in Asia. Lenoir, the keeper of the museum of French monuments, was appointed president. The academy still exists as La Société Royale des Antiquaires de France.

TV. ACADEMIES OF MEDICINE AND SURGERY.—Germany. —The Academy of Nature Curiosi, called also the Leo- poldine Academy, was founded in 1662, by J. L. Bausch, a physician of Leipsic, who, imitating the example of the English, published a general invitation to medical men to communicate all extraordinary cases that occurred in the course of their practice. The works of the Mature Curiasi were at first published separately ; but this being attended with considerable inconvenience, a new arrangement was formed, in 1770, for publishing a volume of observations annually. From some cause, however, the first volume did not make its appearance until 1784, when it came forth under the title of Zphemerides. In 1687, the Emperor

Leopold took the society under his protection, and estab- lished it at Vienna; hence the title of Zeopoldine which it in consequence assumed. But though it thus acquired a name, it had no fixed place of meeting, and no regular assemblies ; instead of which there was a kind of bureau or office, first established at Breslau, aud afterwards re- moved to Nuremberg, where communications from corre- spondents were received, and persons properly qualified admitted as members. By its constitution the Leopoldine Academy consists of a president, two adjuncts or secretaries, and colleagues or members, without any limitation as to numbers. At their admission the last come under a two- fold obligation—first, to choose some subject for

discussiou out of the animal, vegetable, or mincral kingdom, provided it has not been previously treated of by any colleague of the academy; and, secondly, to apply themselves to furnish materials for the annual Hphemerides. Each member also bears about with him the symbol of the academy, consist- ing of a gold ring, whereon is represented a book open, with an eye on one side, and on the other the academical motto of Vunquam otiosus.

The Academy of Surgery at Vienna was instituted by the present emperor, under the direction of the celebrated Brambella. In it there were at first only two professors ; and to their charge the instruction of a hundred and thirty young men was committed, thirty of whom had formerly been surgeons in the army. But latterly the number both of teachers and pupils was considerably increased. Gab- rielli was appointed to teach pathology and practice ; Boecking, anatomy, physiology, aud physics; Streit, medical aud pharmaceutical surgery; Hunczowsky, surgical ope- rations, midwifery, and chirurgia forensis; and Plenk, chemistry and botany. To these was also added Beindel, as prosecutor and extraordinary professor of surgery and anatomy. Besides this, the emperor provided a large and splendid edifice in Vienna, which affords accommodation both for the teachers, the students, pregnant women, patients for clinical lectures, and servants. For the use of this academy the emperor also purchased a medical library, which is open every day ; a complete set of chirur- gical instruments; an apparatus for experunents in natural philosophy ; a collection of natural history; a number cf anatomical and pathological preparations; a collection of preparations in wax, brought from Florence; and a variety of other useful articles. Adjoining the building there is also a good botanical garden. With a view to encourage emulation among the studeuts of this institution, three prize medals, each of the value of 40 florins, are annually bestowed on those who return the best answers to questions proposed the year before. These prizes, however, are not entirely founded by the emperor, but are in part owing to the liberality of Brendellius, formerly protochirurgus at Vienna.

France.—Royal Academy of Medicine.—Medicine is a science which has always engaged the attention of the kings of France. Charleniagne established a school of medicine in the Louvre, and various societies have been founded, and privileges granted to the faculty by his suc- cessors. The

Royal Academy of Medicine succeeded to the old Royal Society of Medicine and the Academy of Sur- gery. It was erected by a royal ordinance, dated December 20, 1820. It was divided into three sections—medicine, surgery, and pharmacy. In its constitution it closely resembled the Academy of Sciences (vid. sup.) Its function was to prescrve or propagate vaccine mattcr, and answer inquiries addressed to it by the Government on the subject of epidemics, sanitary reform, and public health generally. It has maintained an enormous correspondence in all quarters of the globe, and published extensive minutes.

VY. ACADEMIES OF THE Ting Ants.—ussia.—The

academy at St Petersburg was establislied by the Empress Elizabeth, at the suggestion of Count Shuvaloff, and annexed to the Academy of Sciences. The fund for its support was £4000 per annum, and the foundation adinitted forty scholars. Catharine II. formed it into a separate institution, augmented the annual revenue to £12,000, and increased the number of scholars to three hundred ; she also constructed, for the use and accommo- dation of the members, a large circular building, which fronts the Neva. The scholars are admitted at the age of six, and continue until they have attained that of eighteen. ‘They are clothed, fed, and lodged at the expense of the crown; and are all instructed in reading and writing, arithmetic, the French and German languages, and draw- ing. At the age of fourteen they are at liberty to choose any of the following arts, divided into four classes, viz., first, painting in all its branches of history portraits, war- pieces, and landscapes, architecture, mosaic, enamelling, dsc. ; secondly, engraving on copperplates, seal-cutting, &c. ; thirdly, carving on wood, ivory, and amber; fourthly, watch- making, turning, instrument making, casting statues in bronze and other metals, imitating gems and medals in paste and other compositions, gilding, and varnishing. Prizes are annually distributcd to those who excel in any particular art; and, from those who have obtained four prizes, twelve are selected, who are sent abroad at the charge of the crown. A certain sum is paid to defray their travelling expenses; and when they are settled in any town, they receive an annual salary of £60, which is continued during four years, There is a small assortment of paintings for the

use of the scholars; and those who have made great progress are permitted to copy the pictures in the imperial collection. For the purpose of design, there are models in plaster, all done at Rome, of the best antique statues in Italy, and of the same size with the originals, which the artists of the academy were employed to cast in bronze.

France.—The Academy of Painting and Sculpture at Paris was founded by Louis XTV. in 1648, under the title of Académie Royale des Beaux Arts, to which was afterwards united the Academy of Architecture, erected 1671. The academy is composed of painters, sculptors, architects, engravers, and musical composers. From among the members of the society, who are painters, is chosen the director of the French Académie des Beaux Arts at Berne, also instituted by Louis XIV. in 1677. The director's pro- vince is to superintend the studies of the painters, sculptors, &c., who, having been chosen by competition, are sent to Italy at the cxpense of the Government, to complete their studies in that country. Most of the celebrated French painters have begun their career in this way.

The Royal Academy of Music is the name which, by a strange perversion of language, is given in France to the grand opera. In 1571 the poet Baif established in his house an academy or school of music, at which ballets and masquerades were given. In 1645 Mazarin brought from Italy a troupe of actors, and established them in the Rue du Petit Bourbon, where they executed Jules Strozzi's " Achille in Sciro," the first opera performed in France. After Moliére's death in 1673, his theatre in the Palais Royal was given to Sulli, and there were performed all Gluck's great operas ; there Vestris danced, and there was produced Jean Jacques Rousseau's " Devin du Village."

Italy—In 1778 an Academy of Painting and Sculp- ture was established at Turin. The meetings were held in the palace of the king, who distributed prizes among the most successful members. In Milan an Academy of Architecture was established so early as the year 1380, by Galeas Visconti. About the middle of the last century an Academy of the Arts was established there, after the

example of those at Paris and Rome. The pupils were furnished with originals and models, and prizes were dis- tributed annually. The prize for

painting was a gold medal, and no prize was bestowed till all the competing pieces had been subjected to the examination and criticism of competent judges. Before the effects of the French Revolution reached Italy this was one of the best establish- ments of the kind in that kingdom. In the hall of the academy were some admirable pieces of Correggio, as well as several ancient paintings and statues of great merit,— particularly a small bust of Vitellius, and a statue of Agrippina, of most exquisite beauty, though it wants the head and arms. The Academy of the Arts, which had been long established at Florence, fell into decay, but was restored in the end of last century. In it there are halls for nude and plaster figures, for the use of the sculptor and the painter. The hall for plaster figures had models of all the finest statues in Italy, arranged in two lines; but the treasures of this and the other institutions for the fine arts were greatly diminished during the occupancy of Italy by the French. In the saloon of the Academy of the Arts at Modena there are many casts of antique statues; but after being plundered by the French it dwindled into a petty school for drawings from living models; it contains the skull of Correggio. There is also an Academy of the Fine Arts in Mantua, and another at Veuice,

Spain.—In Madrid an Academy for Painting, Sculp- ture, and Architecture, was founded by Philip V. The minister for foreign affairs is president. Prizes are dis- tributed every three years. In Cadiz a few students are supplied by Government with the means of drawing and modelling from figures; and such as are not able to purchase the requisite instruments are provided with them.

Sweden.—An Academy of the Fine Arts was founded at Stockholm in the year 1733 by Count Tessin. In its hall are the ancient figures of plaster presented by Louis XIV. to Charles XI. The works of the students are publicly exhibited, and prizes are distributed annually. Such of them as display distinguished ability obtain pensions from Government, to enable them to reside in Italy for some years, for the purposes of investigation and improvement. In this academy there are nine professors, and generally about four hundred students. In the year 1705 an Academy of Pajnting, Sculpture, and Architecture was established at Vienna, with the view of encouraging and promoting the fine arts.

England.—The Royal Academy of Arts in London was instituted for the encouragement of designing, painting, sculpture, &c., in the year 1768, with Sir J. Reynolds for its president. This academy is under the immediate patronage of the queen, and under the direction of forty artists of the first rank in their several professions. It furnishes, in winter, living models of different characters to draw after; and in summer, models of the same kind to paint after. Nine of the ablest academicians are annually elected out of the forty, whose business it is to attend by rotation, to set the figures, to examine the performance of the students, and to give them necessary instructions. There are likewise professors of painting, sculpture, architecture, anatomy, and chemistry, who annually read public lectures on the subjects of their several departments ; besides a president, a council, and other officers. The admission to this academy is free to all students properly qualified to reap advantage from the studies cultivated in it; and there is an annual cxhibition at Burlington House of paintings, sculptures, and designs, open to all artists of distinguished merit.

The Academy of Ancient Music was established in Lon- don in 1710, by several persons of distinction, and other

amateurs, in conjunction with the most eminent masters of _ the time, with the view of promoting the study and practice of vocal and instrumental harmony. This institution, which had the advantage of a library, eonsisting of the most celebrated compositions, both foreign and domestic, in manuscript and in print, and which was aided by the per- – formances of the gentlemen of the chapel royal, and the ehoir of St Paul’s, with the boys belonging to each, con- tinued to flourish for many years. In 1731 a charge of plagiarism brought against Bononcini, a member of the academy, for claiming a madrigal of Lotti of Venice as his own, threatened the existence of the institution. Dr Greene, who had introduced the madrigal into the aea- demy, took part with Bononcini, and withdrew from the society, taking with him the boys of St Paul’s. In 1734 Mr Gates, another member of the society, and master of the children of the royal chapel, also retired in disgust ; so that the institution was thus deprived of the assistance which the boys afforded it in singing the soprano parts. From this time the academy beeame

a seminary for the instruction of youth in the principles of music and the laws of harmony. Dr Pepusch, who was one of its foun- ders, was aetive in accomplishing this measure; and by the expedient of edueating boys for their purpose, and admitting auditor members, the subsistence of the aca- demy was continued. The Royal Academy of Music

ACADIE, or Acapra, the name borne by Nova Scotia while it remained a Freneh settlement.

ACALEPH& (from dxadyjpy, a nettle), a name given to the animals commonly known as jelly-fish, sea-bludder, Medusce, sea-nettles, &e.

ACANTHOCEPHALA (from dxav6a, a thorn, and xepahy, the head), a group of parasitic worms, having the heads armed with spines or hooks,

ACANTHOPTERYGII (from dxavOa, a thorn, and mrépvé, a Wing), an order of fishes, having bony skeletons with priekly spinous processes in the dorsal fins.

ACANTHUS, a genus of plants belonging to the natural order Acanthacesx. The species are natives of the southern parts of Europe. The most common speeies is the Acan- thus mollis or Brankursine. It has large, deeply-cut, hairy, spiny leaves, whieh are supposed to have suggested the deeoration of the Corinthian column. Another species, Acanthus spinosus, is so called from its spiny leaves.

ACAPULCO, a town and port in Mexico, on a bay of the Pacifie Ocean, about 190 miles §.8.W. of Mexico, in N. lat. 16° 50’, W. long. 99° 46’. The harbour, whieh is the best on the Paeifie coast, is almost completely land- locked. It is easy of aecess, and the anchorage is so secure that heavily- laden ships can lie elose to the rocks whieh surround it. The town lies N.W. of the harbour, and is defended by the castle of San Diego, which stands on an eminence. During a part of the dry season the air is infected with the putrid effluvia of a morass eastward of the town. This, together with the heat of the climate, aggravated by the reflection of the sun’s rays from the granite rocks that environ the town, renders it very un- healthy, especially to Europeans, though a passage cut through the rocks, to let in the sea breeze, has tended to unprove its salubrity. Acapulco was in former times the great

depdt of the trade of Spain with the East Indies. A galleon sailed from this port to Manilla in the Philippine Islands, and another returned once a year laden with the treasures and luxuries of the East. On the arrival of this galleon a great fair was held, to which merchants resorted from all parts of Mexico. The trade between Acapulco

was formed by the principal nobility and gentry of the kingdom, for the performance of operas, composed by Handel, and conducted by him at the theatre in the Hay- market. The subscription amounted to £50,000, and the king, besides subscribing £1000, allowed the society to assume the title of Royal Academy. It consisted of a governor, deputy-governor, and twenty directors. A con- test between Handel and Senesino, one of the performers, in which the directors took the part of the latter, occa- sioned the dissolution of the academy, after it had subsisted with reputation for more than nine years. The present Royal Academy of Music dates from 1822, and was incor- porated in 1830 under the patronage of the queen. It instructs pupils of both sexes in music, charging 33 guineas per annum; but many reeeive instruction free. It also gives public concerts. In this institution the leading instrumentalists and vocalists of England have received their education. (See Afusical Directory published by Rudall, Carte, and Co.)

ACADEMY is a term also applied to thosc royal collegiate seminaries in which young men are educated for the navy and army. In our country there are three colleges of this description—the Royal Naval College at Portsmouth, the Royal Military Academy at Woolwich, and the Royal Military College, Sandhurst.

and Manilla was annihilated when Mexico became inde- pendent; and, from this cause, and also on account of the frequeut earthquakes by which the town has been visited, it had sunk to comparative insignificanee, when the dis- eovery of gold in California gave its trade a fresh impetus. It is now the most important seaport in Mexico, and is regularly touched at by the Pacific mail steamers. Besides having a large transit trade, it exports wool, skins,

cocoa, cochineal, and indigo; and the imports include cottons, silks, and hardware. Population about 5000.

ACARNANTA, a province of aneient Greece, now called Carnia. It was bounded on the N. by the Ambracian gulf, on the N.E. by Amphilochia, on the W. and S.W. by the Ionian Sea, and on the EK by tolia. It was a hilly country, with numerous lakes and traets of rich pasture, and its hills are to the present day crowned with thick wood. It was celebrated for its cxeellent breed of horses, The Acarnanians, aeeording to Mr Grote, though admitted as Greeks to the Pan-Hellenie games, were more akin in character and manners to their barbarian neighbours of Epirus. Up to the time of the Peloponnesian war, they are mentioned only as a raee of rude shepherds, divided into numerous petty tribes, and engaged in continual strife and rapine. They were, however, favourably distinguished from their Aitolian neighbours by the fidelity and stead- fastness of their character. They were good soldiers, and excelled as slingers. At the date above mentioned they begin, as the allies of the Athenians, to make a more pro- minent figure in the history of Greece. The chief town was Stratos, and subsequently Leueas.

ACARUS (from dxapi, a mite), a genus of Arachnides, represented by the cheese mite and other forms.

ACCELERATION is a term employed to denote gene- rally the rate at which the velocity of a body, whose motion is not uniform, either increases or deereases. As the velocity is continually changing, and cannot therefore be estimated, as in uniform motion, by the space actually passed over in a certain time, its value at any instant has to be measured by the space the body would describe in the unit of time, supposing that at and from the instant in

question the motion became and continued uniform. If the motion is such that the velocity, thus measured, in- creases or decreases by equal amounts in equal intervals of time, it is said to be uniformly accelerated or retarded. In that case, if f denote the amount of increase or decrease of velocity corresponding to the unit of time, the whole of such increase or decrease in

¢ units of time will evidently be jt, and therefore if w be the initial and v the final velocity for that interval, v =u + ft,—the upper sign apply- ing to accelerated, the lower to retarded, motion. — To find the distance or space, s, gone over in ¢ units of time, let ¢ be divided into n equal intervals. The velocities at the

Ps : ot 2t end of the successive intervals will be u + / a? & £7 a7

we f a , &c. Let it now be supposed that during each

17

of these small intervals the body has moved uniformly with its velocity at the end of the interval, then (since a body moving uniformly for « seconds with a velocity of y feet per second will move through xy feet) the spaces described in the successive intervals would be the product

‘ t : of the velocities given above by a? and the whole space in

the time ¢ would be the sum of these spaces; 1..,

2

s=u-(1 +1…. repeated n times) “p51 +243….. +7)

i Ree 1

It is evident, however, that as the increase or decrease of velocity takes place continuously, this sum will be too large; but the greater n is taken, or (which is the same thing) the smaller the intervals are during which the velocity is supposed to be uniform, the nearer will the result be to the truth. Hence making n as large as pos-

2 n(n+1 sigh ae fh * (as) =

: 1 ; : :

sible, or 38 small as possible, ¢.¢.,=0, we obtain as the

P 1 3 correct expression s = ui * 5 fe. In the case of motion from rest, u=0, and the above formule become v=/,

l 5a $= 3 jt .

We have a familiar instance of uniformly accelerated and uniformly retarded motion in the case of bodies fall- ing and rising vertically near the earth's surface, where, if the resistance of the air be neglected, the velocity of the body is increased or diminished, in consequence of the earth's attraction, by a uniform amount in each second of time. To this amount is given the name of the accelera- tion of gravity (usually denoted by the letter g), the value of which, in our latitudes and at the surface of the sea, is very nearly 32} feet per second. Hence the space a body falls from rest in any number of seconds is readily found by multiplying 161, feet by the square of the number of seconds. For a fuller account of accelerating force,—ex- pressed in the notation of the Differential Calculus by

dv d?. , f= = or f= + "a ,—the reader is referred to the article DYNAMICS.

ACCENT, in reading or speaking, is the stress or pressure of the voice upon a syllable of a word. The deriva- tion of the term (Lat. accentus, quasi adcantus) clearly shows that it was employed by the classical grammarians to express the production of a musical effect. Its origin is therefore to be sought in the natural desire of man to gratify the ear by modulated sound, and probably no language exists in which it does not play a more or less important part. '' Only a machine," says Professor Blackie (Place and Power of Accent in Language, in the T'ransac- tions of the Royal Society of Edinburgh, 1871), " could

AGCC{=ACCO

produce a continuous scries of sounds in undistinguished monotonous repetitions like the tam, tum, tum, of a drum; a rational being using words for a rational purpose to manifest his thoughts and feelings, necessarily accents both words and sentences in some way or other." That the accentuation of some languages is more distinct, various, and effective than that of others is beyond question, but there are none, so far as we know, in which its power is not felt. The statement sometimes made, that the French

have no accent in their words, can only mean that their accent is less emphatic or less variously so than that of certain other nations. If it means more, it is not merely an error, but an absurdity. From this conception of the subject, it is obvious that accent must be funda- mentally the same thing in all languages, and must aim more or less successfully at the same results, however diverse the rules by which it is governed. But there are, nevertheless, important differences between the conditions under which accent operated in the classical, and those in which it operates in modern tongues. It did not wholly determine the rhythm, nor in the least affect the metre of classical verse ; it did not fix the quantity or length of classical syllables. It was a musical element superadded to the measured structure of prose and verse.

Passing over the consideration of the accentual system of the Hebrews with the single remark, that it exhibits, though with more elaborate and complicated expression, most of the characteristics both of Greck and English accent, we find that the Greeks employed three grammatical accents, viz., the acute accent (‘), which shows when the tone of the voice is to be raised ; the grave accent (‘), when it is to be depressed ; and the circumylex accent (~), composed of both the acute and the grave, and pointing out a kind of undula- tion of the voice. The Latins have made the same use as the Greeks of these three accents, and various modern nations, French, English, &c., have also adopted them. As to the Greck accents, now seen both in manuscripts and printed books, there has been great dispute about their antiquity and use. But the following things seem to be undoubtedly taught by the ancient grammarians and rhetoricians :—(1.) That by accent (rpocwdta, rdvos) the Greeks understood the elevation or falling of the voice on a particular syllable of a word, either absolutely, or in relation to its position in a sentence, accompanied with an intension or remission of the vocal utterance on that syllable (extracts, dvects), occasioning a marked predominance of that syllable over the other syllables of the word. The predominance thus given, however, had no effect whatever on the quantity —long or short—of the accented syllable. The accented syllable in Greek as in English, might be long or it might be short ; elevation and emphasis of utterance being one thing, and prolongation of the vocal sound quite another thing, as any one acquainted with the first elements of music will at once perceive. The difficulty which many modern

scholars have experienced in conceiving how a syllable could be accented and not lengthened, has arisen partly from a complete want of distinct ideas on the nature of the elements of which human speech is composed, and partly also from a vicious practice which has long pre- vailed in the English schools, of reading Greek, not accord- ing to the laws of its own accentuation, but according to the accent of Latin handed down to us through the Roman Catholic Church. For the rules of Latin accentuation are, as Quintilian and Cicero and the grammarians expressly mention, very different from the Greek ; and the long syllable of a word has the accent in Latin in a hundred cases, where the musical habit of the Greek ear placed it upon the short. There is, besides, a vast number of words in Greek accented on the last syllable (like voluntee'r, ambusca'de, in English), of which not a single instance occurs in the Latin lan-

guage. Partly, however, from ignorance, partly from care- lessness, and partly perhaps from stupidity, our scholars transferred the pronunciation of the more popular learned language to that which was less known; and with the help of time and constant usage, so habituated themselves to identify the accented with the long syllable, according to the analogy of the Latin, that they began seriously to doubt the possibility of pronouncing otherwise. Eng- lish scholars have long ceased to recognise its existence, and persist in reading Greek as if the accentual marks meant nothing at all. Even those who allow (like Mr W. G. Clark and Professor Munro) that ancient Greek accent denoted an elevation of voice or tone, are still of opinion that it is impossible to reproduce it in modern times. "Here and therc," says the former (Cambridge Journal of Philology, vol. i. 1868), "a person may be found with such an exquisite ear, and such plastic organs of speech, as to be able to reproduce the ancient distinction between the length and tone of syllables accented and unaccented, and many not so gifted may fancy that they reproduce it when they do nothing of the kind. For the mass of boys and men, pupils as well as teachers, the dis- tinction is practically impossible." But, in spite of such pessimist views, it may, on the whole, be safely asserted that since the appearance of a more philosophical spirit in philology, under the guidance of Hermann, Boeckh, and other master-minds among the Germans, the best gram- marians have come to recognise the

importance of this element of ancient Hellenic enunciation, while not a few carry out their principles into a consistent practice. The only circumstance, indeed, that prevents our English scholars from practically recognising the element of accent in classical teaching, is the apprehension that this would interfere seriously with the practical inculcation of quantity ; an apprehension in which they are certainly justified by the practice of the modern Greeks, who have given such a predominance to accent, as altogether to subordinate, and in many cases completely overwhelm quantity; and who also, in public token of this departure from the classical habit of pronunciation, regularly compose their verses with a reference to the spoken accent only, leaving the quantity —as in modern language generally—altogether to the dis- cretion of the poet. But, as experiment will teach any oue that there is no necessity whatever in the nature of the human voice for this confusion of two essentially different elements, it is not unlikely that English scholars will soon follow the example of the Germans, and read Greek prose at least systematically according to the laws of classical speech, as handed down to us by the gram- marians of Alexandria and Byzantium. In the recitation of classical verse, of course, as it was not constructed on accentual principles, the skilful reader will naturally allow the musical accent, or the emphasis of the rhythm to over- bear, to a great extent, or altogether to overwhelm, the accent of the individual word; though with regard to the recitation of verse, it will always remain a problem how far the ancients themselves did not achieve an “ accentwum cum quantitate apta conciliatio,” such as that which Her- mann (De emendandu ratione, &c.) describes as the per- fection of a polished classical enunciation. A historic survey of the course of learned opinion on the subject of accent, from the age of Erasmus down to the present day, forms an interesting and important part of Professor Blackie’s essay quoted above. See Pennington’s work on Greek Pronunciation, Cambridge, 1844 ; the German work on Greek Accent by Guttling (English), London, 1831; and Blackie’s essay on the Place und Power of Accent, in the Lransactions of the Royal Society of Edinburgh, 1870-71.

If there is any perplexity regarding the nature or influ- ence of classical accent, there is none about English. J¢

does not conflict or combine with the modulations of quan- tity. It is the sole determining element in our metrical system. Almost the very earliest of our authors, the Venerable Bede, notices this. In defining rhythm he says —“It is a modulated composition of words, not according to the laws of metre, but adapted in the number of its syllables to the judgment of the ear, as are the verses of our vulgar poets” (Bede, Op. vol. i. p. 57, ed. 1553). We have, of course, long vowels and short, like the Greeks and the Romans, but we do not regulate our verse by them; and our mode of accentuation is sufficiently despotic to occasionally almost change their character, so that a long vowel shall seem short, and vice versa. In reality this is uot so. The long vowel remains long, but then its length gives it no privilege of place in a verse. It may modify the enunciation, it may increase the roll of sound, but a short vowel could take its place without a violation of metre. Take the word far, for example; there the vowel a is long, yet in the line

**O Moon, far-spooming Ocean bows to thee,”

it is uot necessary that the a in far should be long; a short vowel would do as well for metrical purposes, and would even bring out more distinctly the accentuation of the syllable spoom.

Originally English accent was upon the root, and not upon inflectional syllables. Gdttling finds the same prin- ciple operating in Greek, but in that language it certainly never exercised the universal sway it does in the earlier forms of English. In the following passage from Beowulf, the oldest monument of English literature, belonging, in its first form, to a period even anterior to the invasion of Britain by the Angles and Saxons, we shall put the accented or emphatic syllables in italics :-—

Strdet waes stén-fah stig wisode

gumam act-gaedere gud-byrne sean . heard, hond-locen . hring-iren scir .

song in searwum

pa hic té sele furdum in hyra gr¢re-geatwum gangan ewomon

The strect was of variegated stone, the path directed

the men together ;

the war-corselet shone

hard, hand-locked ;

the ring-iron bright

sang in their trappings,

when they to the hall forward

in their terrible armour

came to go.

It will be observed that in these verses the accent (not to be confounded with the mark which is used in Anglo-Saxon to show that the vowel over which it is placed is long) is invariably on a monosyllable, or on the root part of a word of more than one syllable. The passage is also a good illustration of what has previously been stated, that the metre or rhythm in English is determined not by the vowel-quantity of a syllable, but by the stress of the voice on particular syllables, whether the vowels are long or short. In the older forms of English verse the accent is somewhat irregular; or, to put it more accurately, the number of syllables intervening between the recurrent accents is not definitely fixed. Sometimes two or more intervene, sometimes none at all. Take, for example, the opening lines of Langland's pocm, entitled the Vision of Prers the Plowman :—

**TIn a somer seson

Whan soft was the sone, I shope me in shroudes, As la shepe were,

In habit as an heremite Unholy of workes,

Went wide in this world Wonders to here.

Ac on a May mornynge On Maluerne hulles,

Me byfel a ferly,

Of fairy, me thoughte ; I was wery forwandred, And went me to reste Under a brode banke

By a bornes side.

And as | day and dened, And loked in the watcrs, I slombred in a slepyng, It sweywed so merye.”

But no matter how irregular the time elapsing between the I. — 11

recurrence of the accents, they are always on the root- syllables.

The Normau Conquest, however, introduced a different system, which gradually modified the rigid uniformity of the native English accentuation. The change is visible as early as the end of the 12th century. By the middle of the 14th, that is to say, in the age of Chaucer, it is in full operation. Its origin is thus explained by Mr Marsh, in his Origin and History of the English Language (Lond., 1862) :—“ The vocabulary of the French language is de- rived, to a great extent, from Latin words deprived of their terminal inflections. The French adjectives mortal and

fatal are formed from the Latin mortalis and fatalis, by

dropping the inflected syllable; the French nouns nation and condition from the Latin accusatives nationem, condi- tionem, by rejecting the em final. In most cases, the last syllable retained in the French derivatives was prosodically long in the Latin original; and either because 1t was also accented, or because the slight accent which is perceivable in the French articulation represents temporal length, the stress of the voice was laid on the jinal syllable of all these words. When we borrowed such words from the French we took them with their native accentuation ; and as ac- cent is much stronger in English than in French, the final syllable was doubtless more forcibly enunciated in the former than in the latter language.” The new mode of ac- centuation soon began to affect even words of pure

English origin—e.g., in Robert of Gloucester we find falshede instead of falshede, tidinge instead of tidinge, trewehede instead of trewehede, gladdore instead of gladdore, wisliche instead of wisliche, begynnyng instead of begynnyng, endyng in- stead of endyng. In the Proverbs of Hendyng we have no- thyng for nothing, habben for habben, fomon for fomon ; in Robert of Brunne, halydom for halydom, clothyng for cloth- ing, gretand for gretand. Chaucer furnishes numerous in- stances of the same foreign influence revolutionising the native accent; fredom for fredom, hethenesse for hethenesse, worthinesse for worthinesse, lowly for lowly, wynnynge for wynnynge, weddynge for weddynge, comynge for comynge ; and it is traceable even in Spenser. On the other hand, a contrary tendency must not be overlooked. We see an effort, probably unconscious, to compel words of French origin to submit to the rule of English accentuation. It is noticeable in the century before Chaucer: in Chaucer him- self it begins to work strongly ; mortal becomes mortal ; tempest, tempest ; substance, substance ; amyable, amyable ; morsel, morsel; servise, servise ; duchesse, duchesse ; cosyn, cosyn, &c.; while a multitude of words oscillate between the rival modes of accentuation, now following the Frencli and now the English. Before and during the Elizabethan period, the latter began to prove the stronger, aud for the last 300 years it may be said to have, for the most part, Anglicised the accent and the nature of the foreign additions to our vocabulary. Nevertheless, many French words still retain their own accent. Morris (Z/istorical Outlines of English Accidence, p. 75) thus classifies these :—

‘*(1.) Nouns in -ade, -ter (-eer), -e’, -ee, or -oon, -ine, (~~in), as cas~~ cade’, crusade’, &c.; cavalier’, chandelier’, &c. ; gazetteer’, pioneer’, &c. (in conformity with these we say harpooneer’, mountaineer’,) ; legatee’, payee’, &c.; balloon’, cartoon’, &c. ; chagrin’, violin’, &c. ; routine, marine’, &c.

‘* Also the following words :—cadet’, brunette’, gazette’, cravat’, canal’, control’, gazelle’, amateur’, fatigue’, antique’, police’, &c.

- Adjectives (a) from Lat. adj. in ws, as august’, benign’, ro- bust, &c.; (6) in -ose,as morose’, verbose’, &c.; (c) ~~esque, as bur~~ lesque, grotesque’, &c.

‘*(3.) Some verbs, as baptize’, cajole’, caress’, carouse’, chastise’, escape’, esteem’, &c.”

To these may be added the Greek and Latin words which have been introduced into English for scientific and other learned purposes, and which, not having been altered in form, retain their original accentuation—as auro’ra,

coro’na, colos’sus, wde’a, hypoth’esis, ceesu’ra, dic’resis, diag- no’sis, dilu’vium, diplo’ma, eflu’vium, elys’iwm, &e. ; besides the still larger number that have suffered a slight modifi- cation of form, but no change of accent, as dzalec’tic, diag- nos’tic, efflores’cent, ellip’tic, emer’sion, emol’lrent, &c. The Italian contributions to our tongue retain their original accent when the form is untouched, as mulat’to, sona’ta, vol- ca’no, but lose it when the form is shortened, as ban‘dit (It. bandi’to).

A change in the position of the accent serves a variety of purposes in English. It distinguishes (1.) a nown from a verb, as ac’cent, accent’; aug’ment, augment’; tor’ment, torment’; com’ment, comment’; con’sort, consort’; con’test, contest’; con’trast, contrast’; di’gest, digest’; dis’count, dis- count’; in’sult, insult’, &c.; (2.) an adjective from a verb, as ab’sent, absent’; fre’quent, frequent’; pre’sent, present’ ; com’pound, compound’, &c.; (3.) an adjective from a noun, as expert, expert’; com’pact, compact’. It also denotes a difference of meaning, ¢.g., con’jure, conjure’; in’cense, incense’; au’gust, august’; su’pine, supine’.

Accent has exercised a powerful influence in changing the forms of words. The unaccented syllables in the course of time frequently dropped off. This process was necessarily more rapid and thorough in English than in many other languages which were not subjected to equal strain. The Norman Conquest made havoc of the English tongue for a time. It was expelled from the court, the schools, the church, and the tribunals of justice ; it ceased to be spoken by priests, lawyers, and nobles; its only guardians were churls, ignorant, illiterate, indifferent to grammar, and careless of diction. Who can wonder if, in circumstances like these, it suffered disastrous eclipse 4 The latter part of the Anglo-Saxon Chronicle furnishes melancholy evidence of the chaos into which it had fallen, yet out of this chaos it rose again into newness of life, reforming and re-accenting its half-

ruined vocabulary, and drawing from the very agent of its destruction the elements of a richer and more plastic expression. For it cannot be doubted that the irregularities now existing in English accent, though perplexing to a foreigner, copiously vary the modulation, and so increase the flexibility and power of the language. The older forins of English, those in use before the Conquest, and down to the period of Chaucer, are stiff, monotonous, and unmusical. A hard strength is in the verse, but no liquid sweetness or nimble grace. Now, it is possible, in spite of our deficiency in vowel endings, to produce the noblest melody in accent words known to the modern world. Almost every kind of metre, swift or slow, airy or majestic, has been successfully attempted since the age of the Canterbury Tales. When we compare the drone of Caedmon with the aerial melody of the Skylark, the Cloud, and the Arethusa of Shelley, we see what an infinite progress has bcen made by the development of accent in the rhythm of our native tongue.

See Lectures on the English Language, by G. P. Marsh (Lond. 1861); the Origin and History of the English Language, &c., by G. P. Marsh (Lond. 1862); LHistorische Grammatik der Englische Sprache, von. C. Friedrich Koch (1863-69); Lhe English Language, by R. G. Latham (1855); Philological Essays, by the Rev. Richard Garnett (Lond. 1859); On Early English Pronunciation, with especial reference to Shakspere and Chaucer, by A. J. Ellis (Lond. 1867-71) ; Historical Outlines of English Accidence, by Dr R. Morris (Lond. 1872). (3. M. RB.)

ACCEPTANCE is the act by which a person binds hinself to comply with the request contained in a bill of exchange addressed to him by the drawer. In all cases it is understood to be a promise to pay the bill in money, the law not recognising an acceptance in which the promise is

to pay in some other way, as, for example, partly in money and partly by another bill. Acceptance may be absolute, conditional, or partial. Adsolute acceptance is an engage- ment to pay the bill strictly according to its tenor, and is made by the drawee subscribing his name, with or without the word “accepted,” at the bottom of the bill, or across the face of it. Conditional acceptance is a promise to pay on a contingency occurring, as, for example,

on the sale of certain goods consigned by the drawer to the acceptor. No contingency is allowed to be mentioned in the body of the bill, but a contingent acceptance is quite legal, and equally binding with an absolute acccptance upon the acceptor when the contingency has occurred. Partial acceptance is where the promise is to pay only part of the sum mentioned in the bill, or to pay at a different time or place from those specified. In all cases acceptance involves the signature of the acceptor either by himself or by some person duly authorised on his behalf. A bill can be accepted in the first instance only by the person or persons to whom it is addressed ; but if he or they fail to do so, it may, after being protested for non-acceptance, be accepted by another " supra protest," for the sake of the honour of one or more of the parties concerned in it.

ACCESSION is applied, in a historical or constitutional sense, to the coming to the throne of a dynasty or line of sovereigns, as the accession of the House of Hanover. The corresponding term, when a single sovereign is spoken of, is "succession." In law, accession is a method of acquiring property, by which, in things that have a close connection with or dependence on one another, the property of the principal draws after it the property of the accessory, according to the principle, accessio cedet principali, or accessorium sequitur principale. Thus, the owner of a cow becomes likewise the owner of the calf, and a landowner becomes proprietor of what is added to his estate by alluvion. Accession produced by the art or industry of man has been called industrial accession, and may be by specification, as when wine is made out of grapes, or by confusion or commixture. Accession sometimes likewise signifies consent or acquiescence. Thus, in the bankrupt law of Scotland, when there is a settlement by a trust-deed, it is accepted on the part of each creditor by a deed of accession.

ACCESSORY, a person guilty of a felonious offence, not as principal, but by participation ; as by advice, command, aid, or concealment. In treason, accessories are excluded, every individual concerned being considered as a principal. In crimes under the degree of felony, also, all persons concerned, if guilty at all, are regarded as principals. (See 24 and 25 Vict. c. 94. s. 8.) There are two kinds of accessories—bejore the fact, and ajfter it. The first is he who commands or procures another to commit felony, and is not present

himself ; for if he be present, he is a principal. The second is he who receives, assists, or comforts any man that has done murder or felony, whereof he has knowledge. An accessory before the fact is liable to the same punishment as the principal ; and there is now indeed no practical difference between such an acccssory and a principal in regard either to indictment, trial, or punishment (24 and 25 Vict. c. 94). Accessories after the fact are in general punishable with imprisonment for a period not exceeding two years (ib. s. 4). The law of Scotland makes no distinction between the accessory to any crime (called art and part) and the principal. Except in the case of treason, accession after the fact is not noticed by the law of Scotland, unless as an element of evidence to prove previous accession.

ACCIAJUOLI, Donato, was born at Florence in 1428. He was famous for his learning, especially in Greek and mathematics, and for his serviccs to his native state. Having previously been intrusted with several important

embassies, he became Gonfalonier of Florence in 1473. He died at Milan in 1478, when on his way to Paris to ask the aid of Louis XI. on behalf of the Florentines against Pope Sixtus IV. His body was taken back to Florence, and buried in the church of the Carthusians at the public expense, and his daughters were portioned by his fellow- citizens, the fortune he left being, owing to his probity and disinterestedness, very small. He wrote a Latin transla- tion of some of Plutarch’s Lives (Florence, 1478); Com- mentaries on Aristotle’s Ethics and Politics ; and the lives of Hannibal, Scipio, and Charlemagne. In the work on Aristotle he had the co-operation of his master Argyropylus.

ACCIDENT. An attribute of a thing or class of things, which neither belongs to, nor is in any way deducible from, the essence of that thing or class, is termed its accident. An accident may be either inseparable or separable: the former, when we can conceive it to be abscnt from that with which it is found, although it is always, as far as we know, present, 7.¢., when it is not necessarily but is uni- versally present ; the latter, when it is neither necessarily nor universally present. It is often difficult to determine whether a particular attribute is essential or accidental to the object we are

investigating, subsequent research frequently proving that what we have described as accidental ought to be classed as essential, and vice versa. Practically, and for the time being, an attribute, which neither directly nor indirectly forms part of the signification of the term used to designate the object, may be considered an accident; and many philosophers look upon this as the only intelligible ground for the distinction. Propositions expressing the relation between a thing or class and an accident, and also between a thing or class and its property (é.¢,, something deducible from, but not strictly forming part of, its essence), are variously styled "accidental," '"synthetical," "real," "ampliative," in contradistinction to "essential," "analy- tical," "verbal," and " explicative" propositions. Thc former give us information that we could not have dis- covered from an analysis of the subject notion—e.g., "man is found in New Zealand ;" the latter merely state what we already know, if we understand the meaning of the language employed, e.g., "man is rational."

ACCIUS, a poet of the 16th century, to whom is attributed A Paraphrase of sop's Fables, of which Julius Scaliger speaks with great praise.

ACCIUS (or Arius), Lucius, a Latin tragic poet, was the son of a freedman, born, according to St Jerome, in the year of Rome 583, though this appears somewhat uncertain. He made himself known before the death of Pacuvius by a dramatic piece, which he exhibited the same year that Pacuvius brought one on the stage, the latter being then cighty years of age, and Accius only thirty. We do not know the name of this piece of Accius's, but the titles of several of his tragedies are mentioned by various authors. He wrote on the most celebrated storics which had been represented on the Athenian stage; but he did not always take his subject from Grecian story; for he composed at least one dramatic piece wholly Roman, entitled Brutus, and referring to the expulsion of the Tarquins. Only fragments of his tragedies remain. He did not confine himself to dramatic writing, having left ather productions, particularly his Annals, mentioned by Macrobius, Priscian, Festus, and Nonnius Marcellus. He has been censured for the harshness of his style, but in other respects he has been estecmed a great poet. He died at an advanced age ; and Cicero, who evidently attaches considerable weight to his opinions, speaks of having conversed with him in his youth.

ACCLAMATION, the expression of the opinion, favour- able or unfavourable, of any assembly by means of the voice. Applause denotes strictly a similar expression by

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clapping of hands, but this distinction in the usage of the words is by no means uniformly maintained. Among the Romans acclamation was varied both in form and purpose. At marriages it was usual for the spectators to shout Jo Hymen, Iymencee, or Talassio ; a victorious army or general was greeted with Jo triumphe ; in the theatre acclamation was called for at the close of the play by the last actor, who said, Plaudite ; in the senate opinions were expressed and votes passed by acclamation in such forms as Omnes, omnes, Aiquum est, Justum est, &e ; and the praises of the emperor were celebrated im certain pre-arranged sentences, which seem to have becn chanted by the whole body of senators. The acclamations which authors and poets who recited their works in public received were at first spon- taneous aud genuine, but in time became very largely mercenary, it being customary for men of fortune who affected literary tastes to keep applauders in their service and lend them to their friends. When Nero performed in the theatre his praises were chanted, at a given signal, by five thousand soldiers, who were called Augustals. The whole was conducted by a music-master, mesochorus or pausarius. It was this case of Nero which, occurring to the recollection of the French poet Dorat, may be said to have originated the well-known Paris clague. Buying up a number of the tickets for a performance of one of his plays, he distributed them gratuitously to those who pro- inised to express approbation. From that time the claque, or organised body of professional applauders, has been a recognised institution in conncction with the theatres of Paris. In the early ages of the Christian church it was by no means uncommon for an audience to express their appro- bation of a favourite preacher during the course of his sermon. Chrysostom especially was very frequently inter- rupted both by applause and by acclamations. In eccle- siastical councils vote by acclamation is very common, the question being usually put in the form, placet or non placet.

This differs from the acclamation with which in other assemblies a motion is said to be carried, when, no amend- ment being proposed, approval is expressed by shouting such words as Aye or Agreed.

ACCLIMATISATION is the process of adaptation by which animals and plants are gradually rendered capable of surviving and flourishing in countries remote from their original habitats, or under meteorological conditions dif- ferent from those which they have usually to endure, and which are at first injurious to them.

The subject of acclimatisation is very little understood, and some writers have even denied that it can ever take place. It is often confounded with domestication or with naturalisation ; but these are both very different pheno- inena.

appeared westwards ; while in New Zealand there are, according to Mr T. Kirk (Transactions of the New Zealand Institute, vol. ii: p. 131), no less than 250 specics of naturalised plants, more than 100 of which spread widely over the country, and often displace the native vegetation. Among animals, the European rat, goat, and pig, are uaturalised in New Zealand, where they multiply to such an exteut as to injure and probably extcrminate many native productions. In neither of these cases is there any indication that acclimatisation was necessary or ever took place.

On the other hand, the fact that an animal or plant cannot be naturalised is no proof that it is not acclimatised. It has been shown by Mr Darwin that, in the case of most animals and plants in a state of uature, the competition of other organisms is a far more efficient agency in limiting their distribution than the mere influence of climate. We have a proof of this in the fact that so few, comparatively, of our perfectly hardy garden plants ever run wild; and even the most persevering attempts to naturalise them usually fail. Alphonse de Candolle (@éographie Botanique, p. 798) informs us that several botanists of Paris, Geneva, and especially of Montpellier, have sown the seeds of many hundreds of species of exotic hardy plants, in what appeared to be the most favourable situations, but that in hardly a single case has any one of them become naturalised. Attempts have also been made to naturalise continental insects in this country, in places where the proper food- plants abound and the conditions seem generally favour- able,

but in no case do they seem to have succeeded. Even a plant like the potato, so largely cultivated and so perfectly hardy, has not established itself in a wild state in any part of Europe.

Different Degrees of Climatal Adaptation in Animals and Plants.—Plants differ greatly from animals in the closeness of their adaptation to meteorological conditions. Not only will most tropical plants refuse to live in a temperate climate, but many species are seriously injured by removal a few degrees of latitude beyond their natural limits. ‘This is probably due to the fact, established by the experiments of M. Becquerel, that plants possess no proper temperature, but are wholly dependent on that of the surrounding medium.

Animals, especially the higher forms, are much less sensitive to change of temperature, as shown by the exten- sive range from north to south of many species. Thus, the tiger ranges from the equator to northern Asia as far as the river Amour, and to the isothermal of 32° Fahr. The mountain sparrow (Passer montana) is abundant in Java and Singapore in a uniform equatorial climate, and also inhabits this country and a considerable portion of northern Europe. It is true that most terrestrial animals are restricted to countries not possessing a great range of temperature or very diversified climates, but there is reason to believe that this is due to quite a different set of causcs, such as the presence of enemies or deficiency of appropriate food. When supplied with food and partially protected from enemies, they often show a wonderful capacity of enduring climates very different from that in which they originally flourished. Thus, the horse and the domestic fowl, both natives of very warm countries, flourish without special protection in almost every inhabited portion of the globe. The parrot tribe form one of the most pre-eminently tropical groups of birds, only a few species extending into the warmer temperate regions; yet even the most exclu- sively tropical genera are by no means delicate birds as regards climate. In the Annals and Magazine of Natural Iistory for 1868 (p. 381) is a most interesting account, by Mr Charles Buxton, M.P., of the naturalisation of parrots at Northreps Hall, Norfolk. A considerable number of

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African and Amazonian parrots, Bengal parroquets, four species of white and rose crested cockatoos, and two species of crimson lories, have been at large for many years. Several of these birds have bred, and they almost all live in the woods the whole year through, refusing to take shelter in a house constructed for their use. the thermometer fell 6° below zero, all appeared in good spirits and vigorous health. Some of these birds have lived thus exposed for nearly twenty years, enduring our cold easterly winds, rain, hail, and snow, all through the winter,—a niarvellous contrast to the equable equatorial temperature (hardly ever less than 70°) which many of them had been accustomed to for the first year or years of their existence.

Mr Jenner Weir records somewhat similar facts in the Zoologist for 1865 (p. 9411). He keeps many small birds in an open aviary in his garden at Blackheath, and among these are the Java rice bird (Padda oryzivora), two West African weaver birds (Hyphantornis textor and Huplectes sanguinirostris), and the blue bird of the southern United States (Spiza cyanea). These denizens of the tropics prove quite as hardy as our native birds, having lived during the severest winters without the slightest protection against the cold, even when their drinking water had to be repeatedly meltcd.

Hardly any group of Mammalia is more exclusively tropical than the Quadrumana, yet there is reason to believe that, if other conditions are favourable, some of them can withstand a considerable degree of cold. The Semnopithecus schistaceus was found by Captain Hutton at an elevation of 11,000 feet in the Himalayas, leaping actively among fir- trees whose branches were laden with snow-wreaths. In Abyssinia a troop of dog-faced baboons were obscrved by Mr Blandford at 9000 feet above the sea. We may there- fore conclude that the restriction of the monkey tribe to warm latitudes is probably determined by other causes than temperature alone.

Similar indications are given by the fact of closely allied species inhabiting very extreme climates. The recently extinct Siberian mammoth and woolly rhinoceros were closely allied to species now inhabiting tropical regions exclusively. Wolves and foxes are found alike in the coldest and hottest

parts of the earth, as are closely allied species of falcons, owls, sparrows, and numerous genera of waders and aquatic birds.

A consideration of these and many analogous facts might induce us to suppose that, among the higher animals at least, there is little constitutional adaptation to climate, and that in their case acclimatisation is not required. But there are numerous examples of domestic animals which show that such adaptation does exist in other cases. The yak of Thibet cannot long survive in the plains of India, or even on the hills below a certain altitude ; and that this is due to climate, and not to the increased density of the atmosphere, is shown by the fact that the same animal appears to thrive well in Europe, and even breeds there readily. The Newfoundland dog will not live in India, and the Spanish breed of fowls in this country suffer more from frost than most others. When we get lower in the scale the adaptation is often more marked. Snakes, which are so abundant in warm countries, diminish rapidly as we go north, and wholly cease at lat. 62°. Most insects are also very susceptible to cold, and seem to be adapted to very narrow limits of temperature.

From the foregoing facts and observations we may con- clude, firstly, that some plants and many animals are not constitutionally adapted to the climate of their native country only, but are capable of enduring and flourishing under a more or less extensive range of temperature and other climatic conditions; and, secondly, that most plants

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and some animals are, more or less closely, adapted to climates similar to those of their native habitats. In order to domesticate or naturalise the former class in countries not extremely differing from that from which the species was brought, it will not be necessary to acclimatise, in the strict sense of the word. In the case of the latter class, however, acclimatisation is a necessary preliminary to naturalisation, and in many cases to useful domestica- tion, and we have therefore to inquire whether it is possible.

Acclimatisation by Individual Adaptation.—lIt is evi- dent that acclimatisation may occur (if it occurs at all) in two ways, either by modifying the constitution of the individual submitted to the new conditions, or by the production of offspring which may be better adapted to those conditions than their parents. The alteration of the constitution of individuals in this direction is not easy to detect, and its possibility has been denied by many writers. Mr Darwin believes, however, that there are indications that it occasionally occurs in plants, where it can be best observed, owing to the circumstance that so many plants are propagated by cuttings or buds, which really continue the existence of the same individual almost indefinitely. He adduces the example of vines taken to the West Indies from Madeira, which have been found to succeed better than those taken directly from France. But in most cases habit, however prolonged, appears to have little effect on the constitution of the individual, and the fact has no doubt led to the opinion that acclimatisation is impossible. There is indeed little or no evidence to show that any animal to which a new climate is at first prejudicial can be so acclimatised by habit that, after subjection to it for a few or many seasons, it may live as healthily and with as little care as in its native country ; yet we may, on general principles, believe that under proper conditions such accli- matisation would take place. In his Principles of Biology (chap. v.), Mr Herbert Spencer has shown that every organ and every function of living beings undergoes modification to a limited extent under the stimulus of any new con- ditions, and that the modification is almost always such as to produce an adaptation to those conditions. We may feel pretty sure, therefore, that if robust and healthy individuals are chosen for the experiment, and if the change they are subjected to is not too great, a real individual adaptation to the new conditions—that is, a more or less complete acclimatisation—will be brought about. If now animals thus modified are bred from, we know that their descendants will inherit the modification. They will thus start more favourably, and being subject to the influence of the same or a slightly more extreme climate during their whole lives, the acclimatisation will be carried a step further; and there seems no reason to doubt that, by this process alone, if cautiously and patiently carried out, most animals which breed freely in confinement could in time be acclimatised in almost any inhabited country. There is, however, a much more potent agent, which renders the process of adaptation almost a certainty.

Acclimatisation by Variation.—A mass of evidence exists showing that variations of every conceivable kind oceur among the offspring of all plants and animals, and that, in particular, constitutional variations are by no means un- common. Among cultivated plants, for example, hardier and more tender varieties often arise. The following cases are given by Mr Darwin :—Among the numerous fruit-trees raised in North America, some are well adapted to the climate of the Northern States and Canada, while others only succeed well in the Southern States. Adaptation of this kind is sometimes very close, so that, for example, few English varieties of wheat will thrive in Scotland. Seed- wheat from India produced a miserable crop when planted

by the Rev. M. J. Berkeley on land which would have produced a good crop of English wheat. Conversely, French wheat taken to the West Indies produced only barren spikes, while native wheat by its side yielded an enormous harvest. Tobacco in Sweden, raised from home- grown seed, ripens its seeds a month earlier than plants grown from foreign seed. In Italy, as long as orange trees were propagated by grafts, they were tender ; but after many of the trees were destroyed by the severe frosts of 1709 and 1763, plants were raised from seed, and these were found to be hardier and more productive than the former kinds. Where plants are raised from seed in large quantities, varieties always occur differing in constitution, ag well as others differing in form or colour; but the former cannot be perceived by us unless marked out by their behaviour under exceptional conditions, as in the following cases. After the severe winter of 1860-61, it was observed that in a large bed of araucarias some plants stood quite unhurt among numbers killed around them. In Mr Darwin’s garden two rows of scarlet runners were entirely killed by frost, except three plants, which had not even the tips of their leaves browned. A very excellent example is to be found in Chinese history, according to M. Huc, who, in his L’Empire Chinois (tom. ii. p. 359), gives the following extract from the Memoirs of the Emperor Khang :-—“On the Ist day of the 6th moon I was walking in some fields where rice had been sown to be ready for the harvest in the 9th moon. I observed by chance a stalk of rice which was already in ear. It was higher than all the rest, and was ripe enough to be gathered. I ordered it to

be brought to me. The grain was very fine and well grown, which gave me the idea to keep it for a trial, and see if the following year it would preserve its precocity. It did so. All the stalks which came from it showed ear before the usual time, and were ripe in the 6th moon. Each year has multiplied the produce of the preceding, and for thirty years it is this rice which has been served at my table. The grain is elongate, and of a reddish colour, but it has a sweet smell and very pleasant taste. It is called Yw-m, Imperial rice, because it was first cultivated in my gardens. It is the only sort which can ripen north of the great wall, where the winter ends late and begins very early; but in the southern provinces, where the climate is milder and the land more fertile, two harvests a year may be easily ob- tained, and it is for me a sweet reflection to have procured this advantage for my people." M. Huc adds his testimony that this kind of rice flourishes in Mandtchuria, where no other will grow. We have here, therefore, a perfect example of acclimatisation by means of a spontaneous con- stitutional variation.

That this kind of adaptation may be carried on step by step to more and more extreme climates is illustrated by the following examples. Sweet-peas raised in Calcutta from seed imported from England rarely blossom, and never yield seed ; plants from French seed flower better, but are still sterile; but those raised from Darjeeling seed (originally imported from England) both flower and seed profusely. The peach is believed to have been tender, and to have ripened its fruit with difficulty, when first introduced into Greece; so that (as Darwin observes) in travelling northward during two thousand years it must have become much hardier. Dr Hooker ascertained the average vertical range of flowering plants in the Himalayas to be 4000 feet, while in some cases it extended to 8000 feet. The same species can thus endure a great difference of temperature; but the important fact is, that the individuals have become accli- inatised to the altitude at which they grow, so that seeds gathered near the upper limit of the range of a species will be more hardy than those gathered near the lower limit. This was proved by Dr Hooker to be the case with

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Himalayan conifers and rhododendrons, raised in thig country from seed gathered at different altitudes.

Among animals exactly analogous facts occur. M. Roulin states that when geese were first introduced into Bogota they laid few eggs at long intervals, and few of the young survived. By degrees the fecundity improved, and in about twenty years became equal to what it is in Europe, The same author tells us that, according to Garcilaso, when fowls were first introduced into Peru they were not fertile, whereas now they are as much so as in Europe. Mr Darwin adduces the following examples. Merino sheep bred at the Cape of Good Hope have been found far better adapted for India than those imported from England ; and while the Chinese variety of the Ailanthus silk-moth is quite hardy, the variety found in Bengal will only flourish in warm latitudes. Mr Darwin also calls attention to the circumstance that writers of agricultural works generally recommend that animals should be removed from one district to another as little as possible. This advice occurs even in classical and Chinese agricultural books as well as in those of our own day, and proves that the close adaptation of each variety or breed to the country in which it originated has always been recognised.

Constitutional Adaptation often accompanied by External Modification.—Although in some cases no perceptible altera- tion of form or structure occurs when constitutional adapta- tion to climate has taken place, in others it is very marked. Mr Darwin hascollectedalarge number of cases inhis Animals and Plants under Domestication (vol. ii. p. 277), of which the following are a few of the most remarkable. Dr Falconer observed that several trees, natives of cooler climates, assumed a pyramidal or fastigiate form when grown in the plains of India; cabbages rarely produce heads in hot climates ; the quality of the wood, the medicinal products, the‘odour and colour of the flowers, all change in many cases when plants of one country are grown in another. One of the most curious observations is that of Mr Meehan, who “compared twenty-nine kinds of American trees belonging to various orders, with their nearest European allies, all grown in close proximity in the same garden, and under as nearly as possible the same conditions. In the American species Mr Meehan finds, with the rarest excep- tions, that the leaves fall earlier in the season, and assume before falling a brighter tint; that they are less deeply toothed or serrated; that the buds are smaller; that the trees are more diffuse in growth, and have fewer branchlets; and, lastly, that the seeds are smaller ;—all in comparisou with the European species.” Mr Darwin concludes that there is no way of

accounting for these uniform differences in the two series of trees than by the long-continued action of the differeut climates of the two continents.

In animals equally remarkable changes occur. In Angora, not only goats, but shepherd-dogs and cats, have fine fleecy hair; the wool of sheep changes its character in the West Indies in three generations; M. Costa states that young oysters, taken from the coast of England, and placed in the Mediterranean, at once altered their manner of growth aud formed prominent diverging rays, like those on the shells of the proper Mediterranean oyster.

Iu his Contributions to the Theory of Natural Selection

(p. 167), Mr Wallace has recorded cases of simultaneous

variation among insects, apparently due to climate or other strictly local causes. He finds that the butterflies of the family Papilionide, and some others, become similarly modified in different islands and groups of islands. Thus, the species inhabiting Sumatra, Java, and Borneo, are almost always much smaller than the closely allied species of Celebes and the Moiuccas; the species or varieties of the small island of Amboyna are larger than tlie sane

species or closely allied forms inhabiting the surrounding | the influence of natural agencies, which render existence

islands; the species found in Celebes possess a peculiar form of wing, quite distinct from that of the same or closely allied species of adjacent islands; and, lastly, numerous species which have tailed wings in India and the western islands of the Archipelago, gradually lose the tail as we proceed eastward to New Guinea and the Pacific.

Many of these curious modifications may, it is true, be due to other causes than climate only, but they serve to show how powerfully and mysteriously

local conditions affect the form and structure of both plants and animals ; and they render it probable that changes of constitution are also continually produced, although we have, in the majority of cases, no means of detecting them. It is also impossible to determine how far the effects described are produced by spontaneous favourable variations or by the direct action of local conditions; but it is probable that in every case both causes are concerned, although in constantly varying proportions.

The Influence of Heredity.—Adaptation by variation would, however, be a slow and uncertain process, and might for considerable periods of time cease to act, did not heredity come into play. This is the tendency of every organism to produce its like, or more exactly, to produce a set of newforms varying slightly from it in many directions—a group of which the parent form is the centre. If now one of the most ex- treme of these variations is taken, it is found to become the centre of a new set of variations ; and by continually taking the extreme in the same direction, an increasing variation in that direction can be effected, until checked by becoming so great that it interferes with the healthy action of the organism, or is in any other way prejudicial. It is also found that acquired constitutional peculiarities are equally hereditary ; so that by a combination of those two modes of variation any desired adaptation may be effected with greater rapidity. The manner in which the form or constitution of an organism can be made to change con- tinuously in one direction, by means of variations which are indefinite and in a// directions, is often misunderstood. It may perhaps be illustrated by showing how a tree or grove of trees might, by natural causes, be caused to travel during successive generations in a definite course. The tree has branches radiating out from its stem to perhaps twenty feet on every side. Seeds are produced on the extremities of all these branches, drop to the ground, and produce seedlings, which, if untouched, would form a ring of young trees around the parent. But cattle crop off every seedling as soon as it rises above the ground, and none can ever arrive at maturity. If, however, one side is protected from the cattle, young trees will grow up on that side only. This protection may exist in the case of a grove of trees which we may suppose to occupy the whole space between two deep ravines, the cattle existing on the lower side of the wood only. In this case young trees would reach maturity on the upper side of the wood, while on the lower side the trees would successively die, fall, and rot away, no young

ones taking their place. If this state of things continued unchanged for some centuries, the wood night march regularly up the side of the mountain till it occupied a position many miles away from where it once stood ; and this would have taken place, not because more seed was produced on one side than the other (there might even be very mucli less), nor because soil or climate were better on the upper side (they might be worse), nor because any intelligent being chose which trees should be allowed to live and which should be destroyed ;—but simply because, for a series of generations, the conditions permitted the existence of young trees on one side, and wholly prevented it on the other. Just in an analogous way animals or plants are caused to vary in definite directions, cither by

impossible for those that vary in any other direction, or by the action of the judicious breeder, who carefully selects favourable variations to be the parents of his future stock ; and in either case the rejected variations may far outnumber those which are preserved.

Evidence has been adduced by Mr Darwin to show that the tendency to vary is itself hereditary; so that, so far from variations coming to an end, as some persons imagine, the more extensively variation has occurred in any species in the past, the more likely it is to occur in the future. There is also reason to believe that individuals which have varied largely from their parents in a special direction will have a greater tendency to produce offspring varying in that direction than in any other; so that the facilities for adaptation, that is, for the production and increase of favourable variations in certain definite directions, are far greater than the facilities for locomotion in one direction in the hypothetical illustration just given.

Selection and Survival of the Fittest as Agents in Natura- lisation.—We may now take it as an established fact, that varieties of animals and plants occur, both in domesticity and in a state of nature, which are better or worse adapted to special climates. There is no positive evidence that the influence of new climatal conditions on the parents has any tendency to produce variations in the offspring better adapted to such conditions, although some of the facts mentioned in the preceding sections render it probable that such may be the case. Neither does it appear that this class of variations are very frequent. It is, however, certain that whenever any anual or plant is largely

propagated con- stitutional variations will arise, and some of these will be better adapted than others to the climatal and other conditions of the locality. In a state of nature, every recurring severe winter or otherwise unfavourable season, weeds out those individuals of tender constitution or imperfect structure which may have got on very well during favourable years, and it is thus that the adaptation of the species to the climate in which it has to exist is kept up. Under domestication the same thing occurs by what Mr Darwin has termed “unconscious selection.” Each culti- vator seeks out the kinds of plants best suited to his soil and climate, and rejects those which are tender or otherwise unsuitable. The farmer breeds from such of his stock as he finds to thrive best with him, and gets rid of those which suffer from cold, damp, or disease. A more or less close adaptation to local conditious is thus brought about, and breeds or races are produced which are sometimes liable to deterioration on removal even to a short distance in the same country, as in numerous cases quoted by Mr Darwin (Animals and Plants under Domestication, vol. ii. p. 273).

The Method of Acclimatisation.—Taking into considera- tion the foregoing facts and illustrations, it may be con- sidered as proved—lst, That habit has little (though it appears to have some) definite effect in adapting the constitution of animals to a new climate ; but that it has a decided, though still slight, influence in plants when, hy the process of propagation by buds, shoots, or grafts, the individual can be kept under its influence for long periods ; 2d, That the offspring of both plants and animals vary in their constitutional adaptation to climate, and that this adaptation may be kept up aud increased by means of heredity; and, 3d, That great and sudden changes of clinate often check reproduction even when the health of the individuals does not appear to suffer. In order, therefore, to have the best chance of acclimatising any animal or plant in a climate very dissimilar from that of its native country, and in which it has been proved that the species in question cannot live and mnintain itself

without acclimatisation, we must adopt some such plan as the following :—

1. We must transport as large a number as possible of adult healthy individuals to some intermediate station, and increase them as much as

possible for some years. Favourable variations of constitution will soon show them- selvcs, and these should be carefully selected to brecd from, the tender and unhealthy individuals being rigidly elimi- nated.

2. As soon as the stock has becn kept a sufficient time to pass through all the ordinary extremes of climate, a number of the hardiest may be removed to the more remotc station, and the same process gone through, giving protection if necessary while the stock is being increased, but as soon as a large number of healthy individuals are produced, sub- jecting them to all the vicissitudes of the climate.

It can hardly be doubted that in most cases this plan would succeed. It has been recommended by Mr Darwin, and at one of the early meetings of the Société Zoologique d'Acclim- atisation, at Paris, M. Geoffroy St Hilaire insisted that it was the only method by which acclimatisation was possible. But in looking through the long series of volumes of Reports published by this Society, there is no sign that any systematic attempt at acclimatisation has even once been made. A number of foreign animals have been introduced, and more or less domesticated, and sone useful exotics have been culti- vated for the purpose of testing their applicability to French agriculture or horticulture; but neither in the case of animals nor of plants has there been any systematic effort to modify the constitution of the specics, by breeding largely and selecting the favourable variations that appeared.

Take the case of the Hucalyptus globulus as an example. This is a Tasmanian gum-tree of very rapid growth and great beauty, which will thrive in the extreme south of France. In the Bulletin of the Society a large number of attempts to introduce this tree into general cultivation in other parts of France are recorded in detail, with the failure of almost all of them. But no precautions such as those above indicated appear to have been taken in any of these experiments ; and we have no intimation that either the Society or any of its members are making systematic efforts to acclimatise the tree. The first step would be, to obtain seed from healthy trees growing in the coldest climate and at the greatest altitude in its native country, sowing these very largely, and in a variety of soils and situations, in a part of France where the climate is some- what but not much more extreme. It is

almost a certainty that a number of trees would be found to be quite hardy. Ag soon as these produced sced, it should be sown in the same district and farther north in a climate a little more severe. After an exceptionally cold season, sced should be collected from the trees that suffcred least, and should be sown in various districts all over France. By such a process there can be hardly any doubt that the tree would be thoroughly acclimatised in any part of France, and in many other countries of central Europe ; and more good would be effected by one well-directed effort of this kind than by hundreds of experiments with individual animals and plants, which only serve to show us which are the species that do not require to be acclimatised.

Acclimatisation of Man.—On this subject we have, un- fortunately, very little direct or accurate information. The general laws of heredity and variation have been proved to apply to man as well as to animals and plants; and nume- rous facts in the distribution of races show that man must, in remote ages at least, have been capable of constitutional adaptation to climate. Ifthe human race constitutes a single species, then the mere fact that man now inhabits every region, and is in each case constitutionally adapted to the climate, proves that acclimatisation has occurred. But we

have the same phenomenon in singlevarieties of man, such ag the American, which inhabits alike the frozen wastes of Hudson’s Bay and Terra del Fuego, and the hottest regions of the tropics,—the low equatorial valleys and the lofty plateaux of the Andes. No doubt a sudden transference to an extreme climate is often prejudicial to man, as it is to most animals and plants; but there is every reason to believe that, if the migration occurs step by step, man can be acclimatiscd to almost any part of the earth’s surface in comparatively few gencrations. Some eminent writers have denied this. Sir Ranald Martin, from a consideration of the effects of the climate of India on Europeans and their offspring, believes that there is no such thing as acclimatisation. Dr Hunt, in a report to the British Association in 1861, argues that “time is no agent,” and —“if there is no sign of acclimatisation in one generation, there is no such process.” But he entirely

ignores the effect of favourable variations, as well as the direct in- fluence of climate acting on the organisation from infancy.

Professor Waitz, in his Introduction to Anthropology, adduces many examples of the comparatively rapid con- stitutional adaptation of man to new climatic conditions. Negroes, for example, who have been for three or four generations acclimatised in North America, on returning tu Africa become subject to the same local diseases as other unacclimatised individuals. He well remarks, that the debility and sickening of Europeans in many tropical countries are wrongly ascribed to the climate, but are rather the consequences of indolence, sensual gratification, and an irregular mode of life. Thus the English, who cannot give up animal food and spirituous liquors, are less able to sustain the heat of the tropics than the more sober Spaniards and Portuguese. The excessive mortality of European troops in India, and the delicacy of the children of European parents, do not affect the real question of acclimatisation under proper conditions. They only show that acclimatisation is in most cases necessary, not that it cannot take place. The best examples of partial or com- plete acclimatisation are to be found where European races have permanently settled in the tropics, and have maintained themselves for several generations. There are, however, two sources of inaccuracy to be guarded against, and these are made the most of by the writers above referred to, and are supposed altogether to invalidate results which are otherwise opposed to their views. In the first place, we have the possibility of a mixture of native blood having occurred ; in the second, there have almost always been a succession of immigrants from the parent country, who continually intermingle with the families of the early settlers. It is maintained that one or other of these mixtures is absolutely necessary to enable Europeans to continue long to flourish in the tropics.

There are, however, certain cases in which the sources of error above mentioned are reduced to a minimum, and cannot seriously affect the results; such as those of the Jews, the Dutch at the Cape of Good Hope and in the Moluccas, and the Spaniards in South America.

The Jews are a good example of acclimatisation, because they have been established for many centuries in climates very different from that of their

native land; they keep themselves almost wholly free from intermixture with the people around them ; and they are often so populous in a country that the intermixture with Jewish immigrants from other lands cannot seriously affect the local purity of the race. They have, for instance, attained a population of near two millions in such severe climates as Poland and Russia ; and according to Mr Brace (Races of the Old World, p. 185), “their inercase in Sweden is said to be greater than that of the Christian population ; in the towns of Algeria they are the only race able to maintain its numbers; and ia

Cochin China and Aden they succeed in rearing children and forming permanent communities.”

In. some of the hottest parts of South America Europeans are perfectly acclimatised, and where the race is kept pure it seems to be even improved. Some very valuable notes on this subject have been furnished to the present writer by the well-known botanist Dr Richard Spruce, who resided many years in South America, but who has hitherto been prevented by ill health from giving to the world the results of his researches. As a careful, judicious, and accurate observer, both of man and nature, he has few superiors. He says—

“The white inhabitants of Guayaquil (lat. 2° 13’ S.) are kept pure by careful selection. The slightest tincture of red or black blood bars entry into any of the old families who are descendants of Spaniards from the Provincias Vascongadas, or those bordering the Bay of Biscay, where the morals are perhaps the purest (as regards the intercourse of the sexes) of any in Europe, and where for a girl, even of the poorest class, to have a child before marriage is the rarest thing possible. The consequence of this careful breeding is, that the women of Guayaquil are considered (aud justly) the finest along the whole Pacific coast. They are often tall, sometimes very handsome, decidedly healthy, although pale, and assuredly prolific enough. Their sons are big, stout men, but when they lead inactive lives are apt to become fat and sluggish. Those of them, however, who have farms in the savannahs, and are accustomed to take long rides in all weathers, and those whose trade obliges them to take frequent journeys in the mountainous

interior, or even to Europe and North America, are often as active and as little burdened with superfluous flesh as a Scotch farmer.

“The oldest Christian town in Peru is Piura (lat. 5° S.), which was founded by Pizarro himself. The climate is very hot, especially in the three or four months following the southern solstice. In March 1843 the temperature only once fell as Jow as 83°, during the whole month, the usual lowest night temperature being 85°. Yet people of all colours find it very healthy, and the whites are very prolific. I resided in the town itself nine months, and in the neighbourhood seven months more. The population (in 1863-4) was about 10,000, of which not only a considerable proportion was white, but was mostly descended from the first emigrants after the conquest. Purity of descent was not, however, quite so strictly maintained as at Guayaquil. The military adventurers, who have often risen to high or even supreme rank in Peru, have not seldom been of mixed race, and fear or favour has often availed to procure them an alliance with the oldest and purest-blooded families.”

These instances, so well stated by Dr Spruce, seem to demonstrate the complete acclimatisation of Spaniards in some of the hottest parts of South America. Although we have here nothing to do with mixed races, yet the want of fertility in these has been often taken to be a fact inherent in the mongrel race, and has been also sometimes held to prove that neither the European uor his half-bred offspring can maintain themselves in the tropics. The following observation is therefore of interest :—

“At Guayaquil for a lady of good family—married or unmarried—to be of loose morals is so uncommon, that when it does happen it is felt as a calamity by the whole community. But here, and perhaps in most other towns in South America, a poor girl of mixed race—especially if good-looking---rarely thinks of marrying one of her own class until she has—as the Brazilians say—‘approveitada de sua mocidade’ (made the most of her youth) in receiving presents from gentlemen. If she thus bring a good dowry to her husband, he does not care to inquire, or is not

sensitive, about the mode in which it was acquired. The consequences of this indiscriminate sexual intercourse, espe- cially if much prolonged, is to diminish, in some cases to paralyse, the fertility of the female. And as among people of mixed race it is almost universal, the population of these must fall off both in numbers and quality."

The following example of divergent acclimatisation of the same race to hot and cold zones is very interesting, and will conclude our extracts from Dr Spruce's valuable notes :—

"One of the most singular cases connected with this subject that have fallen under my own observation, is the difticulty, or apparent impossibility, of acclimatising the Red Indian in a certain zone of the Andes. Any person who has compared the physical characters of the native races of South America must be convinced that these have all originated in a common stirps. Many local differences exist, but none capable of invalidating this conclusion. The warmth yet shade-loving Indian of the Amazon; the Indian of the hot, dry, and treeless coasts of Peru and Guayaquil, who exposes his bare head to the sun with as much zest as an African negro; the Indian of the Andes, for whom no cold seems too great, who goes constantly bare-legged and often bare-headed, through whose rude straw hut the piercing wind of the paramos sweeps, and chills the white man to the very bones ;—all these, in the colour and texture of the skin, the hair, and other important features, are plainly of one and the same race.

"Now there is a zone of the equatorial Andes, ranging between about 4000 and 6000 feet altitude, where the very best flavoured coffee is grown, where cane is less luxuriant but more saccharine than in the plains, and which is therefore very desirable to cultivate, but where the red ian sickens and dies. Indians taken down from the sierra get ague and dysentery. Those of the plains find the temperature chilly, and are stricken down with influenza and pains in the limbs. I have seen the difficulty experienced in getting farms cultivated in this zone, on both sides of the Cordillera. The permanent residents are generally limited to the major domo and his family; and in the dry season labourers are hired, of any colour that can be obtained—some from the low country, others from the highlands—for three, four, or five months, who gather in and grind the cane, and plant for the harvest of the

following year; but a staff of resident Indian labourers, such as exists in the farms of the sierra, cannot be kept up in the Yungas, as these half-warm valleys are called. White men, who take proper precautions, and are not chronically soaked with cane-spirit, stand the climate perfectly, but the creole whites are still too much caballeros to devote themselves to agricultural work.

“In what is now the republic of Ecuador, the only peopled portions are the central valley, between the two ridges of the Andes—height 7000 to 12,000 feet—and the hot plain at their western base ; nor do the wooded slopes appear to have been inhabited, except by scattered savage hordes, even in the time of the Incas. The Indians of the highlands are the descendants of others who have inhabited that region exclusively for untold ages; and a similar affirmation may be made of the Indians of the plain. Now, there is little doubt that the progenitors of both these sections came from a temperate region (in North America) ; so that here we have one moiety acclimatised to endure ex- treme heat, and the other extreme cold; and at this day exposure of either to the opposite extreme (or even, as we have seen, to the climate of an intermediate zone) is always pernicious and often fatal. But if this great difference has been brought about in the red man, might not the same have happened to the white man? Plainly it might, time being given ; for one cannot doubt that the inherent adapta-

bility is the same in both, or (if not) that the white man possesses it in a higher degree.”

The observations of Dr Spruce are of themselves almost eonclusive as to the possibility of Europcans becoming ac- climatised in the tropics; and if it is objected that this evidence applies only to the dark-haired southern races, we arc fortunately able to point to facts, almost equally well authenticated and conclusive, in the case of one of the typ- cal Germanic races. At the Cape of Good Hope the Dutch have been settled and nearly isolated for

about 200 years, and have kept themselves alinost or quitc free from native intermixture. They are described as being still perfectly fair in complexion, while physically they are the finest body of men in the colony, being very tall and strong. They marry young, and have large families. The population, according to a census taken in 1798, was under 22,000. In 1865 it was near 182,000, the majority being (according to the Statesman's Year Book for 1873) of " Dutch, German, or French origin, mostly descendants of original settlers." We have here a population which has doubled itself every twenty-two years ; and the greater part of this rapid in- erease mnust certainly be due to the old European immi- grants. In the Moluceas, where the Dutch have had settle- ments for nearly 250 years, some of the inhabitants trace their descent to early immigrants; and these, as well as most of the people of Dutch descent in the East, are quite as fair as their European ancestors, enjoy excellent health, and are very prolific. But the Dutch accommodate them- selves admirably to a tropical climate, doing much of their work early in the morning, dressing very lightly, and living a quiet, temperate, and checrful life. They also pay great attention to drainage and general cleanliness. In addition to these examples, it may be maintained that the rapid in- crease of English-speaking populations in the United States aud in Australia, ouly a comparatively small portion of which can be due to direct immigration, is far from support- ing the view of Dr Knox, that Europeans cannot per- manently maintain themselves in those countries. Mr Brace expressly denies that the American physique has degenerated from the English type. He asserts that manu- facturers and others find that "for labours requiring the utmost physical endurance and inuscular power, such as iron-puddling and lumbering in the forests and on the streams, and pioneer work, foreigners are never so suitable as native Americans. The reports of the examining sur- geons for voluntcers—such as that of Dr W. H. Thomson to the Surgeon-General in 1862, who examined 9000 men — show a far higher average of physique in the Americans examined than in the English, Germans, or Irish. It is a fact well known to our life insurance companies, that the average length of life here is greater than that of the English tables._—TZhe Races of the Old World, p. 375. Although the comparisons here instituted may not be quite fair or conclusive, they furnish good arguments against those who maintain that the Americans are physically deteriorat- ing. On the whole, we seem justified in concluding that, under favourable conditions, and with a proper adaptation of means to

the end in view, man may become acclimatised with at least as much eertainty and rapidity (counting by generations rather than by years) as any of the lower animals. (a. R. w.)

ACCOLADE (from collum, the neck), a ccremony an- ciently used in conferring knighthood ; but whether it was an embrace (according to the use of the modern French word, accolade), or a slight blow on the neck or cheek, is not agreed. Both these customs appear to be of great antiquity. Gregory of Tours writes that the early kings of France, in eonferring the gilt shoulder-belt, kissed the knights on the left cheek; and William the Conqueror is said to have made use of the blow in conferring the honour of knight-

hood on his son Henry. At first it was given with the naked fist, a veritable box on the ear, but for this wag substituted a gentle stroke on the shoulder with the flat of the sword.

ACCOLTI, Benepict, was born in 1415 at Arezzo, in Tuscany, of a noble family, several members of which were distinguished like himself for their attainments in law. He was for some time professor of jurisprudence in the University of Florence, and on the death of the celebrated Poggio in 1459 became chancellor of the Florentine re- public. Hediedin 1466. In conjunction with his brother Leonard, he wrote in Latin a history of the first crusade, entitled De Bello a Christianis contra Barbaros, pro Christi Sepulchro et Judea recuperandis, libri tres, which, though itself of little interest, furnished Tasso with the historic basis for his Jerusalem Delivered. This work appeared at Venice in 1432, and was translated into Italian in 1543, and into French in 1620. Another work of Accolti's—De Prestantia Virorum sui Afvi—was published at Parma in

1689.

ACCOLTI, Bernarp (1465-1535), son of the preced- ing, known in his own day as l'Unico Aretino, acquired great fame as a reciter of impromptu verse. He was listened to by large crowds, composed of the most learned men and the most distinguished prelates of the age. Among others, Cardinal Bembo has left on record a testimony to his extraordinary talent. His high reputation with his contemporaries seems scarcely justified by the poems he

published, though they give evidence of brilliant fancy. It is probable that he sueceeded better in his extemporary productions than in those which were the fruit of deliberation. His works, under the title Virginia, Comedia, Cagitoli e Strambotti di Messer Bernardo Accolti Aretino, were published at Florence in 1513, and have been several times reprinted.

ACCOLTI, Pierro, brother of the preceding, was born at Florence in 1455, and died there in 1549. He was abbreviator under Leo X., and in that capacity drew up in 1520 the famous bull against Luther. In 1527 he was made a cardinal by Clement VII., who had employed him as his secretary.

ACCOMMODATION, a term used in Biblical interpre- tation to denote the presentation of a truth not absolutely as it is in itself, but relatively or under some modification, with the view of suiting it either to some other truth or to the persons addressed. It is generally distinguished into formal and material,—the aceommodation in the one case being confined to the method uf teaching, and in the other being extended to the matter taught. To the former head may be referred teaching by symbols or parables, by pro- gressive stages graduated according to the capacity of the learner, by the application of prophecy to secondary fulfil- ments, &c. To the latter head are to be refcrred the alle- gations of the anti-supranaturalistic school, that Christ and the writers of Scripture modified or perverted the truth itself in order to secure wider acceptance and speedicr success, by speaking in accordance with contemporary ideas rather than with absolute and eternal truth.

ACCOMMODATION, in commerce, denotes generally temporary pecuniary aid given by one trader to another, or by a banker to his customers, but it is used more par- ticularly to describe that class of bills of exchange which represents no actual exchange of real value between the parties.

ACCORAMBONI, Virroria, an Italian lady remark- able for her extraordinary beauty and her tragic history. Her contemporaries regarded her as the most captivating woman that had ever becn scen in Italy. She was songlit in marriage by Paolo Giordano Orsini, Duke of Bracciano, who, it was generally believed, had murdcred his wife,

Isabella de Medici, with his own hand; but her father gave her in preference to Francesco Peretti, nephew of Cardinal Montalto. Perctti was assassinated (1581), and a few days afterwards Vittoria fled from the house of the Cardinal, where she had resided, to that of the Duke of Bracciano. The opposition of Pope Gregory XITI., who even went so far as to confine Vittoria to Fort St Angelo for nearly a ycar, did not prevent her marriage with the duke. On the accession of Montalto to the papal throne as Sixtus V. (1585), the duke thought it prudent to take refuge with his wife in the territory of the Venctian republic. After a few months' residence at Sald, on the Lake of Garda, he died, bequeathing nearly the whole of his large fortune to his widow. This excited the anger of Ludovico Orsini, a relative, who caused Vittoria to be murdered in her residence at Padau (Dec. 22,1585). The history of this beautiful and accomplished but unfortunate woman has been written by Adry (1800), and recently by Count Gnoli, and forms the basis of Webster's tragedy, The White Devil, and of Tieck's romance, Vittoria Accorambont.

ACCORDION (from the French accord), a small musical instrument in the shape of a bellows, which produces sounds by the action of wind on metallic reeds of various sizes. It is played by being held in both hands and pulled back- wards and forwards, the fingers being left free to touch the keys, which are ranged along each side. The instru- nent is akin to the concertina, but differs from it in having the chords fixed by a mechanical arrangement. It is manu- factured chiefly in Paris.

ACCORSO (in Latin Accursius), FRANCIS, an eminent lawyer, born at Florence about 1182. After practising for some time in his native city, he was appointed professor at Bologna, where he had great success asa teacher. He undcrtook the great work of arranging into one body the almost innumerable comments aud remarks upon the Code, the Institutes, and Digests, the confused dispersion of which among the works of different writers caused much obscurity and contradiction. When he was employed in this work, it is said that, hearing of a similar one proposed and begun by Odofred, another lawyer of Bologna, he feigned indis- position, interrupted his public lectures, and shut himself up, till he had, with the utmost

expedition, accomplished his design. His work has the vague title of the Great Gloss, and, though written in barbarous Latin, has more method than that of any preceding writer on the subject. The best edition of it is that of Godefroi, published at Lyons in 1589, in 6 vols. folio. Accursius was greatly extolled by the lawyers of his own and the immediately succeeding age, and he was even called the Zdol of Jurisconsults, but those of later times formed a much lower estimate of his merits. There can be no doubt that he has disentangled with much skill the sense of many laws; but it is equally un- deniable that his ignorance of history and antiquities has often led him into absurdities, and becn the cause of many defects in his explanations and commentaries. He died at Bologna in 1260. His eldest son Francis, who filled the chair of law at Bologna with great reputation, was invited to Oxford by King Edward I, and in 1275 or 1276 read lectures on law in that university. In 1280 he returned to Bologna, where he died in 1293.

ACCORSO (or Accurstus), MARIANGELO, a learned and ingenious critic, was born at Aquila, in the kingdom of Naples, about 1490. He was a great favourite with Charles V., at whose court he resided for thirty-three years, and by whom he was employed on various forcign missions. To a perfect knowledge of Greck and Latin he added an intimate acquaintance with several modern languages. In discovering and collating ancient manuscripts, for which his travels abroad gave him special opportunities, he displayed uncommon diligence. His work eutitled Diatribe’ tn

Ausonium, Solinum, et Ovidium, printed at Rome, in folio, in 1524, is a singular monument of erudition and critical skill. He bestowed, it is said, unusual pains on Claudian, and made, from different manuscripts, above seven hundred corrections on the works of that poet. Unfortunately these criticisms were never published. He was the first editor of the Letters of Cassiodorus, with his Treatise on the Soul ; and his edition of Ammianus Marcellinus (1533) contains five books more than any former one. The affected use of antiquated terms, introduced by some of the Latin writers of that age, is humorously ridiculed by him, in a dialogue published in 1531 (republished, with his name, in 1574), entitled Osco, Volsco, Romanaque

Eloquentia Interlocu- toribus, Dialogus Ludis Romanis actus. Accorso was accused of plagiarism in his notes on Ausonius; and the determined manner in which he repelled, by a most solemn. oath, this charge of litcrary theft, presents us with a singular instance of anxiety and care to preserve a litcrary reputa- tion unstained.

ACCOUNT, a Stock Exchange term: eg., “Zo Buy or Sell for the Account,” &c. The word has different, though kindred, significations, all derived from the making up and settling of accounts on particular days, in which stricter sensc the word “Settlement” is more specially used.

The financial importance of the Account may be gathered from the Clearing House returns. Confining ourselves to the six years, from the 30th of April 1867 to the 30th of April 1873, we have the following figures, furnished by the Clearing House to Sir John Lubbock, and communi- cated by him to the 7%mes:-—

On fourths On Stock Exchange On Consols April April of the Month. Account Days. Settling Days. 1867 to 1868 £147,113,000 £444,443,000 £132,293,000 1868 to 1869 161,861,000 550,622,000 142,270,000 1869 to 1870 168,523,000 594,763,000 148, 822,000 1870 to 1871 186, 517,000 635, 946, 000 169,141,000

1871 to 1872 229,629,000 942, 446, 000 233,843,000 1872 to 1873 265,965,000 1,032,474,000 243,561,000

During the year ending April 30, 1878, the total amount of bills, cheeks, &c., paid at the Clearing House showed an inerease of £643,613,000 during the same period ending April 1872, and of £2,745,924,000 over 1868. The amounts passing through on the Aths of the month amounted to £265,965,000, showing an increase of £36,336,000 over 1872. The payments on Stock KHachange Account Days formed a sum of £1,032,474,600, being an increase of £90,028,000 over 1872. The payments on Consols Account Days for the same period amounted to £243,561,000, giving an inerease of £9,718,000 over 1872.

In English and Indian Government Securities, the settle- ments are monthly, and for foreign, railway, and other securities, generally speaking, they are

fortnightly. It follows therefore that in 1867-1868, an ordinary Stock Exchange Account Day involved payments, on Stock Exchange accounts only, averaging about £10,000,000 sterling, and in 1872-3 something like £25,000,000 ster- ling; and these sums again, enormous as they are, repre- sent for the most part ouly the balance of much larger transactions, The London Account is, in fact, probably the greatest and most important periodical event in the financial world. The great European ceutres have their own Accouut Days and methods of settlement, but the amounts dealt in are very much less than on the London market. The leading cities in the United Kingdom have also their Stock Exchanges, but their practice follows more or less that of London, where the bulk of their business is transacted by means of post and telegraph.

The Account in Consols or other English Goverument Securities, or in the securities of the Government of India, or in Bank of England Stock, or other Stocks transferable at the Bank of England, extends over a month, the settle- ments being monthly, and in them the committee of the Stock Exchange does not take cognisance of any bargain for a future account, if it shall have been effected more

than eight days previously to the close of the existing account. :

The Account in Securities to Bearer, and, with the above exceptions, in Registered Securities also, extends over a period of from twelve to nineteen days. This period is in each case terminated by the “settlement,” which occurs twice in each month (generally about the middle and end), on days fixed by the committee for general purposes of the Stock Exchange in the preceding month. ;

This “settlement” occupies three continuous days, which are all termed Account days, but the third day 1s the true Account, Settling, or Pay Day.

Continuation or Carrying-over is the operation by which the settlement of a bargain transaeted for money, or for a given account, may for a consideration (ealled either a “ Contango” or a ‘‘ Back- wardation”) be deferred for the period of another account. Such a continuation is equivalent

to a sale “* for the day,” and a repur- chase for the suceeeding account, or to a purchase ‘‘ for the day, a; and a re-sale for the sueceeding aceount. ‘The price at which such transactions are adjusted is the “* Making-Up” price of the day. _

Contango is a technical term which expresses the rate of in- terest charged for the loan of money upon the security of stock

transferred for the period of an aceount or otherwise, or the rate of

interest paid by the buyer to the seller to be allowed to defer paying for the stock purchased, until the next settlement day.

Backwardation, or, as it is more often called, Back (for brevity), in contradistinction to contango, is the amount charged for the loan of stock from one account to the other, and it is paid to the purchaser by the seller in order to allow the seller to defer the deli- very of the stock.

A Bull Account is one in which cither the purchases have pre- dominated over the sales, or the disposition to purchase has been inore marked than the disposition to sell.

‘A Bear Account is one in which either the sales have preponderated over the purchases, or in which the disposition to sell has been more strongly displayed than the disposition to buy.

Sometimes the Bull or the Bear disposition extends to the great

majority of securities, as when there are general falls or general rises. Sometimes a Bull Account in one set of securities 1s con- temporaneous with a Bear Account in another.— Vide Cracroft’s Stock Exchange Manual.

ACCOUNTANT, earlier form AccompTant, in the most-general sense, is a person skilled in accounts. It is applied to the person who has the charge of the accounts in a public office or in the counting-house of a large private business. It is also the designation of a distinct profession, which deals in any required way with mercantile accounts.

ACCOUNTANT-GENERAL, an officer in the English Court of Chancery, who reccives all monies lodged in court, and by whom they are deposited in bank and disbursed.

ACCRA or AcrA, a town, or rather a collection of forts, in a territory of the same name, on the Gold Coast of Africa, about 75 miles east of Cape Coast Castle. Of the forts, Fort St James is a British settlement, Creveccour was established by the Dutch, and Christianborg by the Danes ; but the two last have since been ceded to Britain— Christianborg in 1850, and Crévecceur in 1871. Accra is considered to be one of the healthiest stations on the west coast of Africa, and has some trade in the productions of the interior,— ivory, gold dust, and palm-oil ; while cotton goods, tobacco, rum, and beads are imported in exchange. Tt is the residence of a British civil commandant.

ACCRINGTON, an important manufacturing town of England, in Lancashire, lies on the banks of a stream called the Hindburn, in a dcep valley, 19 miles N. from Man- chestcr and 5 miles E. of Blackburn. It has increased rapidly in recent years, and is the centre of the Manchester cotton-printing trade. There are large cotton factories and print- works, besides bleach-fields, &c., employing many hands. Coal is extensively wrought in the neighbourhood. The town has a good appearance, and among the more handsome buildings are a fine church, in the Gothic style, erected in 1838, and the Peel Institution, an Italian structure, contain- ing an assembly room, a lecture room, &c., The sanitary arrangements generally are good, and a reservoir capable

of containing 140,000,000 gallons has been constructed for the water supply of the town. Accrington is a station on the Lancashire and Yorkshire Railway. The population of the two townships of Old and New Accrington was in 1861, 17,688 ; and in 1871, 21,788.

ACCUM, Freperick, chemist, born at Biickeburg in 1769, came to London in 1793, and was appointed teacher of chemistry and mineralogy at the Surrey Institution in 1801. While occupying this position he published several scientific manuals (Chemistry, 1803; Mineralogy, 1808; Crystallography, 1813), but his name will be chiefly re- membered in connection with gas-lighting, the introduction of which was mainly due to him and to the enterprising printseller, Ackermann. His excellent Practical

Treatise on Gaslight appeared in 1815; and he rendered another valuable service to society by his Z'reatise on Adulterations of Food and Culinary Poisons (1820), which attracted much notice at the time it appeared. Both works, as well as a number of his smaller publications, were translated into German. In consequence of charges affecting his honesty, Accum left London for Germany, and in 1822 was appointed professor in the Industrial Institute and Academy of Architecture at Berlin. He died there in 1838.

ACCUMULATOR, a term applied frequently to a powerful electrical machinc, which generates or accumu- lates, by means of friction, electric currents of high ten- sion,—manifested by sparks of considerable length. Accumulators have been employed in many places for exploding torpedoes and mines, for blasting, &. An exceedingly powerful apparatus of this kind was employed by the Confederate authorities during the civil war m America for discharging submarine and river torpedoes. Whatever the nature of the materials employed in the con- struction of the accumulator, or the form which it may assume mechanically, it is simply a modification of, or aul improvement upon, the ordinary cylindrical or the plate- glass frictional electrical machine, — the fundamental scientific principles being the same in nearly every case. The exciting body consists generally of a large disc or circular plate of vulcanite, —more frequently termed by electricians " ebonite," in consequence of its resemblance, in point of hardness and of polish, to polished ebony,—the vulcauite disc taking the place of the ordinary circular plate of thick glass.

ACE, the received name for the single point on cards or dice—the unit. Mr Fox Talbot has a speculation (Lnglish Etymologies, p. 262) that the Latins invented, if not the game of dice, at least the name for the single point, which they called unus. The Greeks corrupted this into dvos, and at length the Germanic races, learning the game from the Greeks, translated the word into ass, which has now become ace. The fact, however, is, that the root of the word lies in the Latin as, the monetary unit, which is to be identified with the Greek efs; Doric, ais or ds. ACEPHALA, a name sometimes given to a section of the molluscous animals, which are divided into encephala and acephala, according as they have or want a distinctly differentiated head. The Acephala, or Lamellibranchiata, as they are also called, are commonly known as bivalve shell-fish.

ACEPHALI (from 4 privative, and xepady, a head), a term applied to several sects as having no head or leader; and in particular to a sect that separated itself, in the end of the 5th century, from the rule of the patriarchs of Alex- andria, and remained without king or bishop for more than 300 years (Gibbon, c. xlvii.)

ACEPHALI was also the name given to the levellers in the reign of Henry I., who are said to have been so poor as to have no tenements, in virtue of which they might acknowledge a superior lord.

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AcepHati, or Acephalous Persons, fabulous monsters, described by some ancient naturalists and geographers as having no heads.

ACER. See MAPLE.

ACERBIL, Gruserre (JosEPH), au Italian traveller, born at Castel-Goffredo, near Mantua, on the 3d May 1778, studied at Mantua, and devoted himself specially to natural science. In 1798 he undertook a journey through Den- mark, Sweden, Finland, and Lapland; and in the follow- ing year he reached the North Cape, which no Italian had previously visited. He was accompanied in the latter part of the journey by the Swedish colonel Skidldebrand, an excellent landscape-painter. On his return Acerbi stayed for some time in England, and published his Z'ravels through Sweden, &c. (London, 1802), which was translated into German (Weimar, 1803), and, under the author's per- sonal superintendence, into French (Paris, 1804). The French translation received numerous corrections, but even in this amended form the work contains many mistakcs. Acerbi rendered a great service to Italian litcrature by starting the Biblioteca Italiana (1816), in which he opposed the pretensions of the Academy della Crusca. Xeing appointed Austrian consul-general to Egypt in 1826, he entrusted the management of the Brblioteca to Gironi, contributing to it afterwards a series of valuable articles on Egypt. While in the East he obtained for the

museums of Vienna, Padua, Milan, and Pavia many objects of interest. He returned from Egypt in 1836, and took up his residence in his native place, where he occupicd himself with his favourite study till his death in August 1846.

ACERNUS, the Latinised name by which SEBASTIAN Fasran Kionowtcz, a celebrated Polish poet, is generally known, was born at Sulmierzyce in 1551, and died at Lublin in 1608. He was for some time burgomaster and president of the Jews' civil tribunal in the latter town, where he had taken up his residence after studying at Cracow. Though himself of an amiable disposition, his domestic life was very unhappy, the extravagance and misconduct of his wife driving him at last to the public hospital of Lublin, where he ended his days. He wrote both Latin and Polish poems, and the genius they dis- played won for him the name of the Sarmatian Ovid. The titles of fourteen of his works are known; but a number of these were totally destroyed by the Jesuits and a section of the Polish nobility, and copies of the others are for the same reason exceedingly rare. The Victoria Deorum ubi continetur Vert Herois Educatio, a poem in forty- four cantos, cost the poet ten years' labour.

ACERRA, in Antiquity, a little box or pot, wherein were put the incense and perfumes to be burned on the altars of the gods, and before the dead. It appears to have been the same with what was otherwise called thuribulum and pyxis. The censers of the Jews were acerre; and the Romanists still retain the use of acerre, under the name of incense pots.

The name acerra was also applied to an altar erected among the Romans, near the bed of a person recently de- ceased, on which his friends offered incense daily till his

burial. The real intention probably was to fumigate the apartment. The Chinese have still a somewhat similar custom.

ACERRA, a town of Italy, in the province of Terra di Lavoro, situated on the river Agno, 7 miles N.E. of Naples, with which it is connected by rail. It is the an- cient Acerrae, the inhabitants of which were admitted to the privileges of Roman citizenship so early as 332 3.c., and which was plundered and burnt by Hannibal during the second Punic war. A few

inscriptions are the only traces time has left of the ancient city. The town stands

in a fertile district, but is rendered very unhcalthy by the malaria rising from the artificial water-courses of the sur- rounding Campagna. It is the seat of a bishop, and has a cathedral and seminary. Flax is grown in the neighbour- hood. Population, 11,717.

ACETIC ACID, one of the most important organic acids. It occurs naturally in the juice of many plants, and in cer- tain animal secretions; but is generally obtained, on the large scale, from the oxidation of spoiled wines, or from the destructive distillation of wood. In the former process it is obtained in the form of a dilute aqueous solution, in which also the colouring matters of the wine, salts, &., are dis- solved ; and this impure acetic acid is what we ordinarily term vinegar. The strongest vinegar sold in commerce contains 5 per cent. of real acetic acid. It is used as a mordaut in calico-printing, as a local irritant in medicine, as a condiment, and in the preparation of various acctates, varnishes, &c. Pure acetic acid is got from the distillation of wood, by neutralising with lime, separating the tarry inatters from the solution of acetate of lime, evaporating off the water, and treating the dry residue with sulphuric acid. On applying heat, pure acetic acid distills over as a clear liquid, which, after a short time, if the weather is cold, becomes a crystalline mass known by the name of Glacial Acetic Acid. For synthesis, properties, &c., see CHEMISTRY.

ACHAIA, in Ancient Geography, a name differently applied at different periods. In the earliest times the name was borne by a small district in the south of Thessaly, and was the first residence of the Achzans. At a later period Achaia Propria was a narrow tract of country in the north of the Peloponnesus, running 65 miles along the Gulf of Corinth, and bounded by the Ionian Sea on the W., by Elis and Arcadia on the S., and by Sicyonia on the E. On the south it is separated from Arcadia by lofty moun- tains, but the plains between the mountains and the sea are very fertile. Its chief town was Patre. The name of Achaia was afterwards employed to denote collectively the states that joined the Achean League. When Greece was subdued by the Romans, Achaia was the name given to the most southerly

of the provinces into which they divided the country, and included the Peloponnesus, the greater part of Greece Proper, and the islands.

Achowans and the Achcean League.—The early inhabitants of Achaia were called Acheans. The name was given also in those times to some of the tribes occupying the eastern portions of the Peloponnesus, particularly Argos and Sparta. Afterwards the inhabitants of Achaia Propria appropriated the name. This republicwas not considerable, in early times, as regards either the number of its troops, its wealth, or the extent of its territory, but was famed for its heroic virtues. The Crotonians and Sybarites, to re-establish order in their towns, adopted the laws and customs of the Acheans. After the famous battle of Leuctra, a dif- ference arose betwixt the Lacedzmonians and Thebans, who held the virtue of this people in such veneration, that they terminated the dispute by their decision. The govern- ment of the Acheans was democratical. They preserved their liberty till the time of Philip and Alexander; but in the reign of these princes, and afterwards, they were either subjected to the Macedonians, who had made themselves masters of Greece, or oppressed by domestic tyrants. The Achzan commonwealth consisted of twelve inconsiderable towns in Peloponnesus. About 280 years before Christ the republic of the Achzeans recovered its old institutions and unanimity. This was the renewal of the ancicnt confede- ration, which subsequently became so famous under the name of the AcHZAN LEAGUE—having for its object, not as formerly a common worship, but a substantial political union. ‘Though dating from the year B.c. 280, its import-

ance may be referred to its connection with Aratus of Sicyon, about 30 years later, as it was further augmented by the splendid abilities of Philopeemen. Thus did this people, so celebrated in the heroic age, once more emerge from com- parative obscurity, and become the greatest among the states of Greece in the last days of its national independence. The habitants of Patrse and of Dyme were the first assertors of ancient liberty. The tyrants were banished, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were discussed and deter- mincd; and a registcr was provided for recording the

trans- actions of the council. This assembly had two presidents, who were nominated altcrnatcly by the different towns. But instcad of two presidents, they soon elected but one. Many neighbouring towns, which admired the constitution of this republic, founded on equality, liberty, the love of justice, and of the public good, were incorporated with the Achzans, and admitted to the full enjoyment of their Jaws and privileges. The Achean League affords the most perfect example in antiquity of the federal form of govern- nent; and, allowing for difference of time and place, its resemblance to that of the United States government is very remarkable. (See Arts. AMPHIcTYony and FEDERAL GoVvERNMENT; also Freeman's Federal Government, 2 vols. 8vo. 1863, and Comparative Politics, 8vo. 1873; Droysen, Geschichte des Hellenismus, 2 vols.; Helwing, Geschichte des Achaischen Bundes.)

ACHAN, the son of Carmi, of the tribe of Judah, at the taking of Jericho concealed two hundred shckcls of silver, a Babylonish garment, and a wedge of gold, con- trary to the express command of God, This sin proved fatal to the Israelites, who were repulsed at the siege of Ai. In this emergency Joshua prostrated himself before the Lord, and begged that he would have mercy upon his people. Achan was discovered by casting lots, and he and his children were stoned to death. This expiation being made, Ai was taken by stratagem. (Josh. vil. viii.)

ACHARD, Franz Cart, a Prussian chemist, born at Berlin on the 28th April 1753, was the first to turn Marggrafi's discovery of the presence of sugar in bect-root to commercial account. He erectcd a factory on an estate in Silesia, granted to him about 1800 by the king of Prussia, and produced there large quantities of sugar to meet the scarcity occasioned by the closing of the West Indian ports to continental traders. In 1812 a similar establish- ment was erected by Napoleon at Rambouillet, although the Institute of France in 1800, while honouring Achard for his researches, had declared his process to have little practical value. At the close of the war the manufacture of beet-root sugar was protected by duties on other sugars that were almost prohibitive, so that the real worth of Achard's discoveries could not be tested. Achard was a frequent contributor to the Memoirs of the Academy of Berlin, and published in 1780 Chymisch-Physische Schriften, con- taining descriptions and results of his very numerous and

carefully conducted experiments on the adhesion of bodies. He died in 1821.

ACHARIUS, Enix, a Swedish physician and botanist, born at Gefle in 1757. The son of a comptroller of customs, he studied first in his native town, and then in 1773 at the University of Upsal, where Linneus was one of his teachers. In 1782 he took the degree of M.D. at the University of Lund, and practised thereafter in various districts of Sweden. But the direction of his studies had becn determined by his contact with Linnzus, and he found his appropriate sphere when he was appointed Professor of Botany at the Wadstena Academy in 1801. Five years before he had been admitted a member of the Academy at Stockholm. He devotcd himself to the study of the cryptogamic ordcrs of plants, and especially of the

family of lichens. All his publications were connected with this subject, the Lichenographia Universalis (Got- tingen, 1804) being the most important. Acharius died of apoplexy in 1819. His name has been given by botanists to more than one species of plants.

ACHATES, the faithful friend and companion of Aineas, celebrated in Virgil’s #neid as fidus Achates.

ACHEEN. See Acuin.

ACHELOUS, the largest river in Greece, rises in Mount Pindus, and dividing Attolia from Acarnania, falls into the Ionian Seca. In the lower part of its course the river winds in an extraordinary manner through very fertile but marshy plains. Its water descends from the mountains, heavily charged with fine mud, which is deposited along its bauks and in the sca at its mouth, where a number of small islands have gradually been formed. It was formerly called Thoas, from its impetuosity in its upper portion, and Homer gave it the name of king of rwers. It has a course of 130 miles. The epithet Acheloiws is used for aqueus (Virgil), the ancients calling all water Achelous, according to Ephorus. The river is now called Aspro Potamo.

ACHENWALL, Gortrriep, a German writer, ccle- brated as having formulated and developed the science (Wissenschaft der Staaten), to which he was the first to apply the name scientea statrstica, or statistics. Born at

Eilbing, in East Prussia, in October 1719, he studicd at Jena, Halle, and Leipsic, and took a degree at the last- named university. He removed to Marburg in 1746, where for two ycars he read Icctures on history, and on the law of nature and of nations. Here, too, he commenced those inquirics in statistics by which his name became known. In 1748, having been invited by Miinchhausen, the Hanoverian minister, to occupy a chair at the university, he removed to Gottingen, where he resided till his death in 1772. His chicf works were connected with statistics. The Staatsverfassungen der europarschen Reiche appeared first in 1752, and revised cditions—corrected from information which he travelled through England, France, and other countries to collect—were published in 1762 and 1768. He was marricd in 1752 to a lady named Walther, who obtained some celebrity by a volume of poems published in 1750, and by other writings.

ACHERON, in Classical Mythology, the son of Ceres, who, for supplying the Titans with drink when they were in contest with Jupiter, was turned into a river of Hades, over which departed souls were ferried on thcir way to Elysium. The name eventually was uscd to designate the whole of the lower world.

ACHILL, or " Eagle" Island, off the west coast of Irc- land, forms part'of the county of Mayo. It is of triangular shape, and extends 15 miles from east to west, and 12 from north to south, its total area being 51,521 acres. The island is very mountainous; its extreme western point, Achill Head, is a bold and rugged promontory rising to a height of 2222 feet above the sea. Large bogs, incapable of cultivation, alternate with the hills of this desolate isle, of whose extensive surface not more than 500 acres have been reclaimed. The inhabitants earn a scanty subsistence by fishing and tillage; their dwellings are miserable hovels. There is a mission-station on the island, and remains of ancient churches are still extant.

ACHILLES ('AyAdevs). When first taken up by the legendary history of Greece, the ancestors of Achilles were settled in Phthia and in Augina. That their original seat, however, was in the neighbourhood of Dodona and the Achelous is made out from a combination of the following facts: That in the Iliad (xvi. 233) Achilles prays to Zeus of Dodona; that this district was the

first to bear the name of Hellas; that the followers of Achilles at Troy were the only persons named Hellenes in the time of Homer

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Thueyd. i. 3; cf. liad, ii. 684, where the moro usual name a Be aidace also oceurs) ; that in /Hgina Zeus was styled “ Hellanios ;” and that the name of Selloi, applied to the priesthood at Dodona, is apparently identical with the name Hellenes. Whether from this local eonneetion the derivation of the name of Aehilles from the same root as ’AyeAdos should be preferred to the other derivations, such as ’Axt-hevs =“ExéAaos, “ruler,” or ’Ay-tAc’s, = “the bane of the Iliaus,” remains undecided. But this is gained, that we see in what manner the legend of Achilles had its root in the earlier Pelasgie religion, his adherenee to which in the prayer just cited would otherwise appear very strange on the part of a hero who, through the influence of Homer and his successors, is completely identified with the Olympian system of gods. According to the genealogy, /Haeus had two sons, Peleus and Telamon, of whom the former became the father of Aehilles—the latter, of Ajax; but of this relationship between Achilles and Ajax there is no sign in the Jad. Peleus ruled in Phthia ; and the gods remark- ing his piety, rewarded him with, ainong other presents, a wife in the person of the beautiful nereid Thetis. After her son was born, Thetis appears to have returned to her life in the sea. The boy was placed under his father’s friend, the centaur Cheiron. When six years old he slew lions and boars, and eould run down a stag. When nine, he was removed from his instructor to the island of Scyrus, where, dressed as a girl, he was to be brought up among the daughters of Lycomedes, his mother preferring for him a long inglorious life to a brief but splendid career. The same desire for his safety is apparent in other legends, which describe her as trying to make him invulnerable when a child by placing him in boiling water or in a fire, and then salving him with ambrosia; or again, in later story, by dipping him in the river Styx, from which he came out, all but the heel whieh she held, proof against

wounds. When the aid of Aehilles was found indispensable to the expedition against Troy, Odysseus set out for Scyrus as a pedlar, spread his wares, ineluding a shield and spear, before the king's daugliters, among whom was Achilles in disguise. Then he eaused an alarm of danger to be sounded, upon which, while the girls fled, Achilles seized the arms, and thus revealed himself. Provided with a eontingent of 50 ships, and aecompanied by the aged Phoenix and Patroelus, he joined the expedition, which after oecupying nine years in raids upon the towns in the neighbourhood of Troy and in Mysia, as detailed in the epie poem entitled the Cypria, culminated in the regular siege of Troy, as deseribed in the Jliad, the grand object of which is the glorification of our hero. Estranged from his comrades, because his eaptive Briseis had been taken from him, Achilles remained inexorable in his tent, while defeat attended the Greeks. At length, at their greatest need, he yielded so far as to allow Patroclus to take his chariot and to assume his armour. Patroclus fell, and the news of his death roused Achilles, who, now equipped with new armour fashioned by Hephestus, drove back the Trojans, slew Hector, and after dragging his body thrico round the Trojan walls, restored it to Priam. With the funeral rites of Patroclus the JZiad eoneludes, and the story is taken up by the Athiopis, a poem by Arctinus of Miletus, in which is deseribed the combat of Achilles first with the unazon Penthesilea, and next with Memnon. When the latter fell, Achilles drove back the Trojans, and, impelled by fate, himself advanced to the Seaan gate, where an arrow from the bow of Paris struek his vulnerable heel, and he fell, bewailed through the whole camp. (A. 8. M.) ACHILLES TATIUS, a Greek writer, born at Alexan- dria. The precise time when he flourished is uncertain, but if cannot have been earlier than the 5th century, as in his principal work he evidently imitates Heliodorus. Suidas,

from conjecture. plored. It is believed to be inhabited by tribes kindred

who calls him Achilles Statius, says that he was converted from heathenism and became a Christian bishop, but this is doubtful, the more so that Suidas also attributes to him a work on the sphere (epi ogaipas) whieh is referred to by Firmicus (330-50), and must, therefore, have beeu written by another

person. The erotic romance of Achilles Tatius, entitled Zhe Loves of Clitophon and Leucippe, is almost certainly the work of a heathen writer. The style of the work is ornate and rhetorieal, while the story is often unnatural, and sometimes coarse, and the develop- ment of the plot irregular and frequently interrupted. Its popularity at the time it appeared is proved by the many manuscripts of it which still exist, and the value attached to it by modern scholars and crities is seen in the frequency with which it has been reprinted and translated. A Latin translation by Annibal Crucceius was published, first in part at Leyden in 1544, and then complete at Basel in 1554, The Greek text was first printed by Commelin, at Heidelberg, in 1601. Other editions by Salmasius (Leyden, 18214 Mitscherlich (Biponti, 1792), and Jacobs (Leipsic, 1821), have been superseded by the editions of Hirschig (Paris, 1856), and Hercher (Leipsie, 1857). An English translation by A. H. (Anthony Hodges) appeared at Oxford in 1638.

ACHILLINI, Atexanper (1463-1512), a native of Bologna, was celebrated as a lecturer both in medicine and in philosophy, and was styled the second Aristotle. Heand Mundinus wero the first at Bologna to avail themselves of the permission given by Frederick II. to dissect dead bodies. His philosophical works were printed in one volume folio, at Venice, in 1508, and reprinted with con- siderable additions in 1545, 1551, and 1568. He also wrote several medical works, chiefly on anatomy.

ACHIN (pronounced Atchcen), a town and alsoa state of Northern Sumatra; the one state of that island which has been powerful at any time since the discovery of the Cape route to the East, and the only one that still remains indepen- dent of the Dutch, though that independence is now menaced.

De Barros names Achin among the twenty-nine states that divided the sea-board of Sumatra when the Portuguese took Malacca. Northern Sumatra had been visited by several European travellers in the Middle Ages, such as Mareo Polo, Friar Odorico, aud Nicolo Conti. Some of these as well as Asiatic writers mention Lambri, a state which must have nearly oceupied the position of Achin, But the first voyager to visit Achin, by that name, was Alvaro Tellez, a captain of Tristan d’Acunhia’s fleet, in 1506. It was then a mere dependency of the adjoining state of Pedir; and the latter, with Pasei, formed the only states on the coast whose chiefs claimed the title of

Sultan. Yet before twenty years had passed Aeh{n had not only gained independence, but had swallowed up all other states of Northern Sumatra. It attained its climax of power in the time of Sultan Iskandar Muda (1607-1636), under whom the subject coast extended from Aru opposite Malaeca round by the north to Padang on the west coast, a sea-board of not less than 1100 miles ; and besides this, the king's supremacy was owned by the large island of Nydas, and by the continental Malay states of Johor, Pahang, Quedah, and Perdk.

The present limits of Achin supremacy in Sumatra are reckoned to be, on the east coast the River Tamiang, in about 4° 25' N. lat., which forms the frontier of territories tributary to Sidk; and on the west coast a line in about 2° 48' N., the frontier of Trumon, a small modern state lying between Achin and the Dutch government of Padang. Even within these limits the actual power of Aehin is pre- carious, and the interior boundary can be laid down only This interior country is totally unex-

to the Battas, that remarkable race of anthropophagi who adjoin on the south. The whole area of Achin territory, defined to the best of our ability, will contain about 16,400 English square miles. A rate of 20 per square mile, per- haps somewhat too large an average, gives a probable population of 328,000. ;

The production of rice and pepper forms the chicf industry of the Achin territory. From Pedir and other ports on the north coast large quantities of betel-nut are exported to continental India, to Burmah, and to Penang for China. Some pepper is got from Pedir, but the chief export is from a number of sinall ports and anchorages on the west coast, where vessels go from port to port making up a cargo. Achin ponies are of good repute, and. are exported. Minor articles of cxport are sulphur, iron, sappan-wood, gutta-percha, dammer, rattans, bamboos, benzoin, and camphor from the intcrior forests. The camphor is that from the Dryabalanops camphora, for which so high a price is paid in China, and the whole goes thither, the bulk of that whole being, however, extremely small. Very little silk is now produced, but in the 16th century the quantity seems to have been considerable. What

is now wanted for the local textures, which are in some esteem, is imported from China.

The chief attraction to the considcrable trade that cxisted at Achin two centuries ago must have been gold. No place in the East, unless Japan, was so abundantly sup- plied with gold. We can form no estimate of the annual export, for it is impossible to accept Valentyn's statement that it sometimes reached 80 bahars (512,000 ounces !). Crawford (1820), who always reckoned low, calculated the whole export of Sumatra at 35,530 ounces, and that of Achin at 10,450; whilst Anderson (1826), who tends to put figures too high, reckoned the whole Achin cxport alone at 32,000 ounces. The chief imports to Achin are opium (largely consumed), rice (the indigenous supply being inadequate), salt, iron ware, picce-goods, arms and amunuuition, vessels of copper and pottery, China goods of sorts, and a certain kind of dried fish.

The great repute of Achin at one time as a place of trade is shown by the fact, that to this port the first Dutch (1599) and first English (1602) commercial ventures to the Indics were dirccted. Lancaster, the English com- modore, carried letters from Queen Elizabeth to the king of Achin, and was well received by the prince then reign- ing, Alauddin Shah. Another exchange of lctters took place between King James I. and Iskandar Muda in 1613. But native caprice and natural jealousy at the growing force of the European nations in those scas, the reckless rivalries of the latter and their fierce desire for monopoly, were alike destructive of sound trade; and the English factory, though several times sct up, was never long main- tained. The French made one great effort under Beaulieu (1621) to establish relations with Achin, but nothing came of it.

Still the forcign trade of Achin, though subject to spas- modic interruptions, was important. Dampier and others speak of the number of foreign merchants scttled there,— English, Dutch, Danes, Portuguese, Chinese, Banyans from Guzerat, &c. Dampier says the roads were rarcly without ten or fifteen sail of different nations, bringing vast quantities of rice, as well as silks, chintzes, muslins, and opium. Besides the Chinese merchants settled at Achin, others used to come annually with the junks, ten or twelve in number, which arrived in June. A regular fair was then established, which

lasted two months, and was known as the China camp,—a lively scene, and great resort of foreigners.

The Achinese are not identical with the Malays proper either in aspect or language. They are said to be taller,

handsomer, and darker, as if with a mixture of blood from India proper. Their language is little known; but though it has now absorbed much Malay, the original part of it ig said to have characteristics connecting it both with the Batta and with the Indo-Chinese tongues. The Achin literature, however, is entirely Malay; it embraces poctry, a good deal of theology, and several chronicles.

The name of the state is properly Acheh. This the Portuguese made into Achem; whilst we, with the Dutch, Icarned to call it Achin. The last appears to have becn a Persian or Indian form, suggested by jingling analogy with Machin (China).

The town itself lics very near the north-west extremity of Sumatra, known in charts as Achin Head. Here a girdle of ten or twelve small islands affords protection to the anchorage. This fails in N.W. winds, but it is said that vessels may find safe riding at all seasons by shifting their berths. The town lies between two and three miles from the sca, chiefly on the left bank of a river of no great size. This forms a swampy delta, and discharges by three mouths. The central and chief mouth is about 100 yards wide, and has a depth of 20 to 30 feet within the bar. Bunt the latter has barcly 4 feet at low tide; at high tide it admits native craft of 20 or 30 tons, and larger craft in the rainy season. The town, like most Malay towns, con- sists of detached houses of timber and thatch, clustered in enclosed groups called kampongs, and buried in a forest of fruit-trecs. The chief feature is the palace of the Sultan, which communicates with the river by a canal, and is enclosed, at least partially, by a wall of cut stone.

The valley or alluvial plain in which Achin lics is low, and subject to partial inundation; but it is shut in at a short distance from the town, on the three landward sides, by hills) It is highly cultivated, and abounds in small

villages and kampongs, with white mosques interspersed. The hills to the eastward are the spurs of a great volcanic mountain, upwards of 6000 feet in height, called by natives Yamuria, by mariners “the Golden Mountain.”1 Of the town population we find no modern estimate.

The real original territory of the Ach{nese, called by them Great Achin (in the sense of Achin proper), consists of threc districts immediately round the city, distinguished respectively as the 26, the 25, and the 22 mukims? (or hundreds, to use the nearest English term).

Each of these three districts has two heads, called pang- lumas; and these, according to some modern accounts, constitute the council of state, who are the chief adminis- — trators, and in whose hands it lies to depose the sovereign or to sanction his choice of a successor. Late notices speak of a chief minister, apparently distinct from thesc; and another important member of the government is the Shabandar, who is over all matters of customs, shipping, and commerce.

The court of Achin, in the 17th century, maintained a good deal of pomp; and, according to Beaulieu, the king had always 900 elephants. These animals, though found throughout Sumatra, are now no longer tamed or kept.

Hostilities with the Portuguese began from the time of the first independent king of Achin; and they had little remission till the power of Portugal fell with the loss of Malacca (1641). Not less than ten times before that event were armaments despatched from Achin to reduce Malacca, and more than once its garrison was very hard pressed. One of these armadas, equipped by Iskandar Muda in 1615, gives an idea of the king’s resources. * It consisted of 500 sail, of which 250 were galleys, and

1 Several other great volcanic cones exist in the Achin territory, and two visible from seaward rise to a height of 11,000 feet or more in the unexplored interior.

? A mikim is said properly to embrace 44 households.

among these a hundred were greater than any then used in Europe. 60,000 men were embarked, with the king and his women.

On the death of Iskandar's successor in 1641, the widow was placed on the throne; and as a female reign favoured the oligarchical tendencies of the Malay chiefs, three more queens were allowed to reign successively. Though this series of female sovereigns lasted only fifty-eight years altogether, so dense is apt to be the ignorance of recent history, that long before the end of that period it had become an accepted belief among foreign residents at Achin that there never had been any sovereigns in Achin except females; and hence, by an easy inference, that the Queen of Sheba had been Queen of Achtn !

In 1699 the Arab or fanatical party suppressed female government, and put a chief of Arab blood on the throne, The remaining history of Achin is one of rapid decay. Thirty sovereigns in all have reigned from the beginning of the 16th century to the present day.

After the restoration of Java to the Netherlands in 1816, a good deal of weight was attached by the neighbouring English colonies to the maintenance of our influence in Achin; and in 1819 a treaty of friendship was concluded with the Calcutta Government, which excluded other European nationalities from fixed residence in Achin. When the home Government, in 1824, made a treaty with the Netherlands, surrendering our remaining settlements in Sumatra in exchange for certain possessions on the con- tinent of Asia, no reference was made in the articles to the Indian treaty of 1819; but an understanding was exchanged that it should be modified by us, whilst no proceedings hostile to Achin should be attempted by the Dutch.

This reservation was formally abandoned by our Govern- ment in a convention signed at the Hague, November 2, 1871; and little more than a year elapsed before the government of Batavia declared war upon Achin. Doubt- less there was provocation, as there always will be between such neighbours; but the necessity for war has been greatly doubted, even in Holland. A Dutch force landed at Achin in April 1873, and attacked the palace. It was defeated with considerable loss, including that of the general (Kohler). The approach of the south-west mon- soon was considered to

preclude the immediate renewal of the attempt ; but hostilities were resumed, and Achin fell in January 1874.

(De Barros; Faria y Souza; Valentyn, vol. v.; Beaulieu (in Thévenot's Collection); Dampier; Marsden; Crawfurd's Mist. and Decl. of the Ind. Archip.; J. of Ind. Archip.; Dulaurier in J. Astatique, 3d s. vol. viii; Anderson's Acheen, 1840; Veth, Atchin, &c. Leyden, 1873, &c.) (H. Y.)

ACHMET, or AnMzp, the name of three emperors or sultans of Turkey, the first of the name reigning from 1603 to 1617, the second from 1691 to 1695. Achmet IIT. succeeded his brother Mustapha II., whom the Janissarieg deposed in 1703. After the battle of Pultowa in 1709, Charles XII. of Sweden took refuge with him, and incited him to war with Peter the Great, Czar of Russia. Achmet recovered the Morea from the Venetians (1715); but his expedition into Hungary was less fortunate, his army being defeated at Peterwardein by Prince Eugene in 1716, and again near Belgrade the year after. The empire was dis- tracted during his reign by political disturbances, which were occasioned, in part at least, by his misgovernment; and the discontent of his soldiers at last (1730) drove him from the throne. He died in prison in 1736.

"ACHRAY, a small picturesque lake in Perthshire, near Loch Katrine, 20 miles W. of Stirling, which has obtained notoriety from Scott's allusion to it in the Lady of the Lake.

ACHROMATIC GLASSES are so named from being specially constructed with a view to prevent the confusion

of colours and distortion of images that result from the use of lenses in optical instruments. When white light passes through a lens, the different-coloured rays that con- stitute it are refracted or bent aside at different angles, and so converge at different foci, producing a blurred and coloured image. To remedy this compound lenses have been devised, which present a well-defined image, unsur- rounded by coloured bands of light. To instruments fitted

with lenses of this kind has been given the name achromatic, from 4 privative, and ypépea, colour.

The celebrated opti- cian, John Dollond, was the first to surmount this practical difficulty, about the year 1757, by the use of a combination of crown and flint glass. See Oprics, Microscors, é&c.

ACI REALE, a city and seaport of Sicily, in the Italian province of Catania, near the base of Mount Etna. It stands on solidified lava, which has here been deposited by different streams to a depth of 560 feet. The town, which has been almost entirely re-erected since the earth- quake of 1693, is built of lava, contains many handsome edifices, and is defended by a fortress. Linen, silks, and cutlery are manufactured, and the trade in cotton, flax, grain, and wines is considerable. The place is celebrated for its cold sulphurous mineral waters. Near Aci Reale is the reputed scene of the mythical adventures of Acis and Galatea; and on this account several small towns in the neighbourhood also bear the name of Aci, such as Aci Castello, Aci Terra, &c. Aci Reale has a population of

24,151.

ACID, a general term in chemistry, applied to a group of compound substances, possessing certain very distinctive characteristics. All acids have one essential property, viz., that of combining chemically with an alkali or base, forming a new compound that has neither acid nor alkaline characters. The new bodies formed in this way are termed salts. Every acid is therefore capable of producing as many salts as there are basic substances to be neutralised; and this salt-forming power is the best de- finition of an acid substance.

The majority of acids possess the following contingent properties :—

1, When applied to the tongue, they excite that sensation which is called sour or acid.

2. They change the blue colours of vegetables to a red. The vegetable blues employed for this purpose are generally tincture of litmus and syrup of violets or of radishes, which have obtained the name of re-agents or tests. If

these colours have been previously converted to a green by alkalies, the acids restore them.

All these secondary properties are variable; and if we attempted to base a definition on any one of them, many important acids would be excluded. Take the case of a body like silica, so widely diffused in nature. Is pure silicious sand or flint an acid or a neutral substance? When it is examined, it is found to be insoluble in water, to be devoid of taste, and to possess no action on vegetable colour- ing matters; yet this substance is a true acid, because when it is heated along with soda or lime, it forms the new body commonly called glass, which is chemically a salt of silicic acid. Many other acids resemble silica in properties, and would be mistaken for neutral bodies if the salt-forming power was overlooked.

Another method of regarding an acid, which is found of great importance in discussing chemical reactions, is to say an acid is a salt whose base is water. This definition is very apparent if we regard what takes place in separating the acid from a salt. In this decomposition the acid would appear to be left without having any substitute for the removed alkali. This is not however the case, as water is found to enter into union instead of the base. Thus every true acid must contain hydrogen; and if this is displaced I. — 13

by a metal, salts are formed directly. An acid is there- fore a salt, whose metal is hydrogen. The full importance of the definition of an acid will be learned under the head- ing CHEMISTRY. ;

ACIDALIUS, Vatens, a very distinguished scholar and critic, born in 1567 at Wittstock, in Brandenburg. After studying at Rostock and Helmstaedt, and. residing about three years in Italy, he took up his residence at Breslau, where he professed the Roman Catholic religion. His excessive application to study was supposed to have caused his untimely death, which occurred in 1595, when he had just completed his twenty-eighth year. He wrote notes on Tacitus and Curtius, a commentary on Plautus, and a number of poems, which are inserted in the Delicrvee of the German poets. Baillet gave him a place among his Enfans Célebres, and tells that he wrote the commentary

on Plautus and several of the Latin pocms when he was only seventeen or eighteen years of age.

ACINAGES, an ancient Persian sword, short and straight, and worn, contrary to the Roman fashion, on the right side, or sometimes in front of the body, as shown in the bas-reliefs found at Persepolis. Among the Persian nobility they were frequently made of gold, being,worn as a badge of distinction, The acinaces was an object of religious worship with the Scythians and others (Herod. iv. 62).

Acts, in Mythology, the son of Faunus and the nymph Symethis, was a beautiful shepherd of Sicily, who being beloved by Galatea, Polyphemus the giant was so enraged that he crushed his rival with a rock, and his blood gush- ing forth from under the rock, was metamorphosed into the river bearing his name (Ovid, Met. xiii. 750; Sil. Ital. xiv. 221). This river, now Miume di Jact, or Acque Grandi, rises under a bed of lava on the eastern base of Etna, and passing Aci Reale, after a rapid course of one mile, falls into the sea. The waters of the stream, once celebrated for their purity, are now sulphureous.

ACKERMANN, Joun Curistian Gortiies, a learned physician and professor of medicine, born at Zeulenroda, in Upper Saxony, in 1756. At the early age of fifteen he became a student of medicine at Jena, where he soon attracted the favourable notice of Baldinger, who undertook the direction of his studies. When Baldinger was trans- ferred to Gottingen in 1773, Ackermann went with him, and afterwards studied for two years at Halle.

ACCEMET (dxotunros, sleepless), an order of monks instituted by Alexander, a Syrian, about the middle of the 5th century. Founding on the precept, Pray without ceasing, they celebrated divine service uninterruptedly night and day, for which purpose they divided themselves into three sections, that relieved each other in turn. The chief seat of the Accemetze was the cloister Studium at Constantinople, whence they were sometimes called Studites. Having adopted the monophysite heresy, they were put under the Papal ban about the year 536.

ACOLYTE (from dxdAovfos, an attendant), one of a minor order of clergy in the ancient church, ranking next to the sub-deacon, We learn from the

canons of the

heb 2 OO

fourth Council of Carthage that the archdeacon, at their ordination, put into their hands a candlestick with a taper and an empty pitcher, to imply that they were appointed to light the candles of the church and to furnish wine for the eucharist. Their dress was the cassock and sur- plice. The name and office still exist in the church.

ACONCAGUA, a province of Chile, South America, is about 100 miles long by 40 miles wide, and lies between 31° 30’ and 33° 20’S. lat., and 70° and 71° 30’ W. long., between the provinces of Valparaiso and Santiago on the N. and Coquimbo on the 8. A large part of the province ig mountainous, but it contains several rich and fertile valleys, which yield wheat, maize, sugar-cane, fruits, and garden produce in abundance. In the agricultural dis- tricts there are raised from 50 to 60 fanegas of wheat for every quadra, equal to about 35 bushels per English acre. The province has also mineral resources, but not to such extent as Coquimbo or Atacama. Its chief town is San Felipe. The mountain Aconcagua, one of the loftiest peaks of the Andes, rises to the height of 23,910 feet above the sea on the frontier between this province and Mendoza, a department of the Argentine Republic. A river of the same name rises on the south side of the mountain, and after a course of 230 miles falls into the Pacific 12 miles N. of Valparaiso. Population (1870),

134,178.

ACONITE, Aconitum, a genus of plants commonly known as Aconite, Monkshood, Friar’s Cap, or Helmet flower, and embracing about 18 species, chiefly natives of the mountainous parts of the northern hemisphere. They are distinguished by having one of the five blue or yellow coloured sepals in the form of a helmet; hence the English name. Two of the petals placed under the hood of the calyx are supported on long stalks, and have a hollow spur at their apex. The genus belongs to the natural order Ranunculacee, or the Buttercup family. Aconitum Napellus, common monkshood, is a doubtful native of Britain. It is an energetic irritant and narcotic poison, It causes death by a depressing effect on the nervous

system, by producing palsy of the muscles concerned in breathing, and by fainting. A tincture prepared by the action of spirit on the roots is used medicinally to allay pain, especially in cases of tic. Its roots have occasionally been mistaken for horse-radish. The Aconite has a short underground stem, from which dark-coloured tapering roots descend, The crown or upper portion of the root gives rise to new plants. When put to the lip, the juice of the Aconite root pro- duces a fecling of numbness and tingling. The horse- radish root, which belongs to the natural order Cruci- feree, is much longer than that of the Aconite, and it is not tapering; its colour is yellowish, and the top of the root has the remains of the leaves on it. It has a pun- gent taste. Many species of Aconite are cultivated in gardens, some having blue and others yellow flowers. Aconitum Lycoctonum, Wolfsbane, is a yellow-flowered species common on the Alps of Switzerland. One species, Aconitum heterophyllum, found in the East Indies, and called Butees, has tonic properties in its roots. The roots of Aconitum ferox supply the famous Indian (Nipal) poison called Bikh, Bish, or Nabee. This species is con- sidered by Hooker and Thomson as a variety of Aconitum Napellus. Aconitum palmatum yields another of the celebrated Bikh poisons. Aconitum luridum, of the Hima- layas, also furnishes a poison.

ACONTIUS, the Latinised form of the name of G1acomo Aconcro, a philosopher, jurisconsult, engineer, and theolo- gian, born at Trent on the 7th September 1492. He em- braced the reformed religion; and after having taken refuge for a time in Switzerland and Strasburg, he came to Eng- land about 1558. He was very favourably received by

Quecn Elizabeth, at whosc court, it is said, though on doubtful authority, that he resided for a considerable period. With the sanction of Parliament, he carried on for several years extensive works for the embankment of the Thamcs, and so reclaimed a large quantity of waste land, part of which was bestowed upon him by way of recompense. His gratitude to Queen Elizabeth was expressed in the dedica- tion to her of his eclebrated Collection of the Stratagems of Satan, which has been often translated, and has passed through many editions. Various opinions have been given of this

work, which advocated toleration to an extent that many considered indifference. The nature of its doctrine may perhaps be best gathered from the fact that it gained for the author the praise of Arminius, and the strong con- demnation of the Calvinists. Acontius also wrote a treatise, De Methodo, which was published at Basel in 1558. He died in London about the year 1566.

ACORUS, a genus of monocotyledonous plants belonging to the natural order Aroidez, and the sub-order Orontiaceze. Acorus Calamus, sweet-scdge or sweet-flag, is a native of Britain. It has an agreeable odour, and has been used as a strengthening remedy, as well as to allay spasms. The starchy matter contained in its running stem or rhizome is associated with a fragrant oil, and it is used as hair- powder. Confectioners form a candy from the rhizomes of the plant, and it is also used by perfumers in preparing aromatic vinegar.

ACOSTA, Curistovat b', a Portuguese naturalist, born at Mozambique in the early part of the 16th century. On a voyage to Asia he was taken captive by pirates, who exacted from him a very large ransom, After spending some years in India, chiefly at Goa, a Portuguese colony, he returned home, and settled as a surgeon at Burgos. Here he published his Zratado de las drogas y medecinas de las Indias orientales (1578). This work was translated into Latin, Italian, and French, became well known through- out Europe, and is still consulted as an authority. Acosta also wrote an account of his travels, a book in praise of women, and other works, He died in 1580,

ACOSTA, JosEPH p', a celebrated Spanish author, was born at Medina del Campo about the year 1539. In 1571 he went to Peru as a provincial of the J esuits ; and, after remaining there for seventeen years, he returned to his native country, where he became in succession visitor for his order of Aragon.and Andalusia, superior of Valladolid, and rector of the university of Salamanca, in which city he died in February 1600. About ten years before his death he published at Seville his valuable Historia Natural y Moral de las Indias, part of which had previously appeared in Latin, with the title De Natura Novi Orbis, libri duo. This work, which has been translated into all the principal languages of Europe, gives exceedingly valuable informa- tion regarding the condition of South America at the

time. On the subject of climate Acosta was the first to propound the theory, afterwards advocated by Buffon, which attri- buted the different degrees of heat in the old and new con- tinents to the agency of the winds. He also contradicted, from his own experience, the statement of Aristotle, that the middle zone of the earth was so scorched by the stn as to be destitute of moisture, and totally uninhabitable. Even after the discovery of America this Aristotelian dogma was an article of faith, and its denial was one ground of the charge of. scepticism and atheism brought against Sir Walter Raleigh. Acosta, however, boldly declared that what he had seen was so different from what he had expected, that he could not but “laugh at Aristotle’s meteors and his philosophy.” In speaking of the conduct of his country- men, and the means they employed for the propagation of their faith, Acosta is in no respect superior to the other prejudiced writers of his country and age. Though he

acknowledges that the career of Spanish conquest was marked by the most savage cruelty and oppression, he yet represents this people as chosen by God to spread the gospel among the nations of America, and recounts a variety of miracles as a proof of the constant interposition of Heaven in favour of the merciless and rapacious invaders. Besides his History, Acosta wrote the following works :—1l. De Pro- mulgatione Evangelit apud Barbaros ; 2. De Christo Reve- lato; 3. De Temporibus Novissimis, lib. vi.; 4. Concionum toma wt.

ACOSTA, Unter p’, a Portuguese of noble family, was born at Oporto towards the close of the 16th century. His father being a Jewish convert to Christianity, hc was brought up in the Roman Catholic faith, and strictly ob- served the rites of the church till the course of his inquiries led him, after much painful doubt, to abandon the religion of his youth for Judaism. Passing over to Amsterdam, he was received into the synagogue, having his name changed from Gabriel to Uriel. He soon discovered, however, that those who sat in Moses’ seat were shameful perverters of the law ; and his bold protests served only to exasperate the rabhis, who finally punished his contumacy with the greater excommunication. Persecution seemed only to stimulate his temerity, and he soon after published a de- fence, Hxamen das

tradigoens Phariseas, é&c., in which he not merely exposed the departures of the Jewish teachers from the law, but combated the doctrine of a future life, holding himself supported in this position by the silence of the Mosaic Books. For this he was imprisoned and fined, besides incurring public odium as a blasphemer and atheist. Nothing deterred, he pursued his speculations, which ended in his repudiating the divine authority of the law of Moses. Wearied, however, by his melancholy isolation, and longing for the benefits of society, he was driven, in the inconsis- tency of despairing scepticism, to seek a return to the Jewish communion. Having recanted his heresies, he was re- admitted after an excommunication of fifteen years, but Was soon excommunicated a second time. After seven years of miserable exclusion, he once more sought admis- sion, and, on passing through a humiliating penance, was again received. These notices of his singular and unhappy life are taken from his autobiography, Exemplar Humane Vite, published, with a “refutation,” by Limborch, and republished in 1847, It has been said that he died by his own hand, but this is, to say the least, doubtful. His eventful history forms the subject of a tale and of a tragedy by Gutzkow.

ACOTYLEDONES, the name given to one of the Classes of the Natural System of Botany, embracing flowerless plants, such as ferns, lycopods, horse-tails, mosses, liverworts, lichens, sea-weeds, and mushrooms. The name is dcrived from the character of the embryo, which has no cotyledon. Flowering plants have usually one or two cotyledons, that is, seed-leaves or seed-lobes connected with their embryo ; while in flowerless plants the body representing the embryo consists of a cell, called a spore, without any leaves. The plants have no flowers, and their organs of reproduction are inconspicuous, hence they are called by Linnzus crypto- gamous. Some flowering plants, such as dodders, have no cotyledons; and some have the cotyledons divided into more than two, as in conifers. Some acotyledonous spores, when sprouting, produce a leaf-like expansion called a pro- thallus, on which the organs of reproduction, consisting of antheridia and archegonia, are produced. ‘This is well seen in the case of ferns, In the interior of the antheri- dian cells, moving filamentous bodies, called spermatozoids, have been observed. These fertilise the archegonial cells, whence new plants are produced. In the article Botany these plants will be noticed under Class III. of the Natural System.

Definition.

Sound is due to vibrations,

Sound is propagated to the ear by vibra- tions of air,

&c.

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ACOUSTICS:

LF COUSTICS (from dxovw, to hear) is that branch of

A Natural Philosophy which treats of the nature of sound, and the laws of its production and propagation, in so far as these depend on physical principles. _The description of the mechanism of the organ of voice and of the ear, and the difficult questions connected with the processes by which, when sound reaches the drum of the ear, it 1s trans- mitted to the brain, must be dealt with in separate articles of this work. Itis to the physical part of the science of acoustics that the present article is restricted.

Part I. General notions as to Vibrations, Waves, &c.

2. We may easily satisfy ourselves that, in every in- stance in which the sensation of sound is excited, the body, whence the sound proceeds, must have been thrown, by a blow or other means, into a state of agitation or tremor, implying the existence of a vibratory motion, or motion to and fro, of the particles of which it consists.

Thus, if a common glass-jar be struck so as to yield an audible sound, the existence of a motion of this kind may be felt by the finger lightly applied to the edge of the glass ; and, on increasing the pressure so as to destroy this motion, the sound forthwith ceases. Small pieces of cork put in the jar will be found to dance about during the con- tinuance of the sound ; water or spirits of wine poured into the glass will, under the same circumstances, exhibit a ruffled surface. The experiment is usually performed, in a more striking manner, with a bell-jar and a number of small light wooden balls

suspended by silk strings to a fixed frame above the jar, so as to be just in contact with the widest part of the glass. On drawing a violin bow across the edge, the pendulums are thrown off to a con- siderable distance, and falling back are again repelled, &e.

It is also in many cases possible to follow with the eye the motions of the particles of the sounding body, as, for instance, in the case of a violin string or any string fixed at both ends, when the string will appear, by a law of optics, to occupy at once all the positions which it suc- cessively assumes during its vibratory motion.

3. It is, moreover, essential, in order that the ear may be affected by a sounding body, that there be interposed between it and the ear one or more intermediate bodies (media), themselves capable of molecular vibration, which Shall receive such motion from the source of sound, and transmit it to the external parts of the ear, and especially to the membrana tympani or drum of the ear. This state- ment is confirmed by the well-known effect of stopping the ear with soft cotton, or other substance possessing little elasticity.

The air around us forms the most important medium of communication of sound to our organs of hearing ; in fact, were air devoid of this property, we should practically be without the sense of hearing. In illustration of the part thus assigned to the atmosphere in acoustics, an apparatus has been constructed, consisting of a glass receiver, in which is a bell and a hammer connected with clock-work, by which it can be made to strike the bell when required. The receiver is closed air-tight by a metal plate, through which passes, also air-tight, into the interior, a brass rod. By properly moving this rod with the hand, a detent is released, which checks the motion of the wheel-work, and the hammer strikes the bell continuously, till the detent is pushed into its original position. As long as the air in

the receiver is of the usual atmospheric density, the sound is perfectly audible. But on rarefying the air by means of an air-pump (the clock-work apparatus having been separated from the plate of the pump by means of a pad- ding of soft cotton), the sound grows gradually fainter, and at last becomes inaudible when the rarefaction of the air has reached a very low point. If, however, at this stage of the experiment, the metal rod be brought

into contact with the bell, the sound will again be heard clearly, because now there is the necessary communication with the ear. On readmitting the air, the sound recovers its original intensity. This experiment was first performed by Hawksbee in 1705.

4, Inasmuch, then, as sound necessarily implies the Lawsof — existence in the sounding body, in the air, &c., and (we Vibratory

may add) in the ear itself, of vibratory motion of the par- ticles of the various media concerned in the phenomenon, a general reference to the laws of such motion is essential to a right understanding of the principles of acoustics.

The most familiar instance of this kind of motion is afforded by the pendulum, a small heavy ball, for instance, attached to a fine string, which is fixed at its other end. There is but one position in which the ball will remain at rest, viz., when the string is vertical, there being then equilibrium between the two forces acting on the body, the tension of the string and the earth's attractive force or gravity. Thus, in the adjoining fig., if C is the point of suspension, and CA the vertical through that point of length 7, equal to the string, A is the equilibrium position of the particle.

Let now the ball be removed from A to P, the string being kept tight, so that P describes the arc AP of a circle of radius 3 equal to /, and let the ball be there dropped. The tension of the string not being now directly opposite in direction to gravity (g), motion will ensue, and the body will retrace the arc PA.

In doing so, it will continually

increase its velocity until it @ a =

reaches the point A, where its A oo

velocity will be a maximum, and Fig. 1.

will consequently pass to the other side of A towards Q. But now gravity tends to draw it back towards A, and hence the motion becomes a retarded

one; the velocity continually diminishes, and is ultimately destroyed at some point Q, which would be at a distance from A equal to that of P, but for the existence of friction, resistance of the air, &c., which make that distance less. From Q it will next move down with accelerated motion towards A, where it will have its greatest velocity in the direction from left to right, and whence it will pass onwards towards P, and so on. Thus the body will vibrate to and fro on either side of A, its amplitude of vibration or distance between its extreme positions gradually diminishing in consequence of the resistances before men- tioned, and at last being sensibly reduced to nothing, the body then resuming its equilibrium-position A.

If the amplitude of vibration is restricted within incon- siderable limits, it is easy to prove that the motion takes place just as if the string were removed, the ball deprived altogether of weight and urged by a force directed to the point A, and proportional to the distance from that point. For then, if m be any position of the ball, the chord mA may be regarded as coincident with the tangent to the

circle at m, and therefore as being perpendicular to Cm. Hence g, acting parallel to CA, being resolved along Cm and mA, the former component is counteracted by the tension of the string, and there remains as the only effec- tive acceleration, the tangential component along mA,

‘ : Am g which, by the triangle of forces, is equal to g- Gm oO p Am,

is therefore proportional to Am. ae this Giicoatiion of indefinitely small vibrations, the pendulum is isochronous; that is, the time occupied in passing from one extreme position to the other is the same, for a given length / of the pendulum, whatever the extent of vibration.

We conclude from this that, whatever may be the nature of the forces by which a particle is urged, if the resultant of those forces is directed towards a fixed point, and is proportional to the distance from that point, the particle will oscillate to and fro about that poiut in times which are independent of the amplitudes of the vibrations, pro- vided these are very small.

5. The particle, whose vibratory motion we have been . considering, is a solitary particle acted:on by external forces. But, in acoustics, we have to do with the motion of particles forming a connected system or medium, in which the forces to be considered arise from the mutual actions of the particles. These forces are in equilibrium with each other when the particles occupy certain relative positions. But, if any new or disturbing force act for a short time on any one or more of the particles, so as to cause a mutual approach or a mutual recession, on the removal of the disturbing force, the disturbed particles will, if the body be elastic, forthwith move towards thcir respective positions of equilibrium. Hence arises a vibra- tory motion to and fro of each about a given point, analogous to that of a pendulum, the velocity at that point being always a maximum, alternately in opposite directions. Thus, for example, if to one extremity of a pipe contain- ing air were applied a piston, of section equal to that of the pipe, by pushing in the piston slightly and then remov- ing it, we should cause particles of air, forming a thin section at the extremity of the pipe, to vibrate in directions parallel to its axis.

posed, a transmission from @ to x, y, &c., 7.¢., in the opposite direction.

Confining our attention to propagation in the direction abe .. ., we have next to remark that each particle in that line will be affected by the disturbance always later than the particle immediately preceding it, so as to be found in the same stage of vibration a certain interval of time after the preceding particle.

7. Two particles which are in the same stage of vibra- Phase.

tion, that is, are equally displaced from their equilibrium- positions, and are moving in the same direction and with equal velocities, are said to be in the same phase. Hence we may express the preceding statement more briefly thus: Two particles of a disturbed medium at different distances from the centre of disturbance, are in the same phase at different times, the one whose distance from that centre is the greater being later than the other.

8. Let us in the meantime assume that, the intervals ab, be, cd …. being equal, the intervals of time which elapse between the like phases of 6 and a, of cand b…. are also equal to each other, and let us consider what at any given instant are the appearances presented by the different particles in the row.

T being the time of a complete vibration of each particle,

let i be the interval of time requisite for any phase of a

to pass ou to 6. If then at a certain instant a is displaced to its greatest extent to the right, b will be somewhat short of, but moving towards, its corresponding position, c still further short, and so on. Proceeding in this way, we shall come at length to a particle p, for which the distance ap =p.ab, which therefore lags in its vibrations behind a

by a time =px u =T, and is consequently preciscly in

the same phase as a. And between these two particles a, p, we shall evidently have particles in all the possible phases of the vibratory motion. At h, which is at distance from a=4ap, the difference of phase, compared with a, will be 31, that is, A will, at the given instant, be dis- placed to the greatest extent on the opposite side of its equilibrium-position from that in which @ is displaced; in other words, / is in the exactly opposite phase to a.

In order that a medium may be capable of molecular vibrations, it must, as we have mentioned, possess elasticity, that is, a tendency always to return to its original condi- tion when slightly disturbed out of it.

6. We now proceed to show how the disturbance where-

9. In the case we have just been considering, the vibra- Longitu- tions of the particles have been supposed to take place in ‘inal and a direction coincident with that in which the disturbance eel ein passes from one particle to another. The vibrations are : then termed longitudinal.

by certain particles of an elastic medium are displaced from * their equilibrium-positions, is successively transmitted to the remaining particles

of the medium, so as to cause these also to vibrate to and fro.

Let us consider a line of such particles y, x, a, b, dc.

But it need scarcely be observed that the vibrations may take place in any direction whatever, and may even be curvilinear. If they take place in directions at right angles to the line of progress of the disturbance, they are said to be transversal.

10. Now the reasoning employed in the preceding case Wave of will evidently admit of general application, and will, in transversal particular, hold for transversal vibrations. Hence if we ‘isplace- mark (as is done in fig. 2) the positions a, b, ¢,. . ., occupied rt

yuanaabcdefghtikimno>p

equidistant from each other, as above; and suppose one of

them, say a, to be displaced, by any means, to a, As we have seen, this particle will swing from a, to a, and back again, occupying a certain time T, to complete its double vibration. But it is obvious that, the distance between a and the next particle } to the right being diminished by the displacement of the former to a,, a tendency is gene- rated in 6 to move towards a,, the mutual forces being no longer in equilibrium, but having a resultant in the direction ba, The particle 6 will therefore also suffer displacement, and be compelled to swing to and fro about the point 6. For similar reasons the particles c,d… will all likewise be thrown iuto vibration. Thus it is, then, that the disturbance propagates itself in the direction under consideration. There is evidently also, in the case sup-

by the various particles, when swinging transversely, at the instant at which a has its maximum displacement above its equilibrium-position, and trace a zontinuous line runing through the points so found, that line will by its ordinates indicate to the eye the state of motion at the given instant.

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Fig. 2. Thus @ and p are in the same phase, as are also } and

q,cand 7, &c. a@ and hare in opposite phases, as are also d and 2, c and k, &e.

Wave of velocities.

Waves for longitu- dinal vibra- tions.

Propaga- tion of waves.

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Distances ap, bq, &e., separating particles in the same phase, and each of which, as we have seen, is passed over by the disturbance in the time T of a complete vibra- tion, include within them all the possible phases of the motion.

Beyond this distance, the curve repeats itself exactly, that is, the phases recur in the same order as before.

Now the figure so traced offers an obvious resemblance to the undulating surface of a lake or other body of water, after it has been disturbed by wind, exhibiting a wave with its trough A,B, and its crest Bp,C. Hence have been introduced into Acoustics, as also into Optics, the terms wave and undulation. The distance ap, or baie. or A ©, which separates two particles in same phase, or which includes both a wave-crest and a wave-trough, is termed the length of the wave, and is usually denoted by A.

vai the curve repeats itself at intervals each =A, it follows that particles are in the same phase at any given moment, when the distances between them in the direction of transmission of the disturbance =, 2d, 3A… and gene- rally =nd, where n is any whole number.

Particles such as a and A, 6 and 2, &c., which are at

distances = sa , being in opposite phases, 80 will also be

: : 1 ‘ : particles separated by distance, ae A= A, or, in general,

by sa + md = (2m + 1) , that is, by any odd multiple of ; ;

11. A like construction to the one just adopted for the displacements of the particles at any given instant, may be also applied for exhibiting graphically their velocities at the same instant. Erect at the various points a, b, ¢, &e., perpendiculars to the line joining them, of lengths pro- portional to and in the direction of their velocities, and draw a line through the extreme points of these perpendi- culars; this line will answer the purpose required. It is indicated by dots in the previous figure, and manifestly forms a wave of the same length as the wave of displace- ments, but the highest and lowest points of the one wave correspond to the points in which the other wave crosses the line of equilibrium.

12. In order to a graphic representation of the displace- ments and velocities of particles vibrating longitudinally, ++ is convenient to draw the lines which represent those quantities, not in the actual direction in which the motion takes place and which coincides with the line abc…, but at right angles to it, ordinates drawn upwards indicating displacements or velocities to the right (i.¢., in the direc- tion of transmission of the disturbance), and ordinates drawn downwards indicating displacements or velocities in the opposite direction. When this is done, waves of dis- placement and velocity are figured identically with those for transversal vibrations, and are therefore subject to the same resulting laws.

13. But. not only will the above waves enable us to see at a glance the circumstances of the vibratory motion at the instant of time for which it has been constructed, but also for any subsequent moment. Thus, if we desire to

consider what is going on after an interval a , we have

simply to conceive the whole wave (whether of displace- ment or velocity) to be moved to the right through a dis- tance

fig. refers,

any point, suchas /, good, because now the displacements are to the left, but are in excess on the right side of the point 7 From a to h, therefore,

particles on either side are

both directed towards A. At

In short, the whole circumstances –

ACOUS TTCS

and of velocity) advancing continuously inthelinea bc… with a velocity V which will take it over the distance ab in the time a being therefore 7 = 7. =o OF ye a ; Pp

This is termed the velocity of propagation of the wave, and, as we see, is equal to the length of the wave divided by the time of a complete vibration of each particle.

If, as is usually more convenient, we express T in terms of the number z of complete vibrations performed im a

given time, say in the unit of time, we shall have 7 =,

and hence Wee

14. There is one very important distinction between the Variations two cases of longitudinal and of transversal vibrations which of density

now claims our attention, viz., that whereas vibrations of

the latter kind, when propagated from particle to particle vibrations

in an elastic medium, do not alter the relative distances of the particles, or, in other words, cause no change of density throughout the medium; longitudinal vibrations, on the other hand, by bringing the particles nearer to or further from one another than they are when undisturbed, are necessarily accompanied by alternate condensations and

rarefactions.

Thus, in fig. 2, we see that at the instant to which that the displacements of the particles immediately adjoining a are equal and in the same direction; hence at

that moment the density of the medium at a is equal to that of the undisturbed medium. ‘The same applies to the

points h, p, &e., in which the displacements are at their

maxima and the velocities of vibration = 0.

At any point, such as c, between a and A, the displace-

ments of the two adjoining particles on either side are both to the right, but that of the preceding particle is now the

greater of the two, and hence the density of the medium throughout aA exceeds the undisturbed density. So at between A and h, the same result holds

the medium is condensed. k, the displacements of the two both to the /eft, that of the pre- ceding particle beg, however, the greater. The medium, therefore, is here in a state of rarefaction. And in like manner it may be shown that there is rarefaction from B to p; so that the medium is rarefied from h to p. ‘At A the condensation is a maximum, because the dis- lacements on the two sides i

From h to B, as at

of that point are equal and B, on the other hand, it is the rarefaction which is a maximum, the displacements on the right and left of that point being again equal, but directed outwards from B.

It clearly follows from all this that, if we trace a curve of which any ordinate shall be proportional to the differ- ence between the density of the corresponding point of the disturbed medium and the density of the undisturbed medium—ordinates drawn upwardsindicating condensation,

and ordinates drawn downwards rarefaction—that curve will cross the line of rest of the particles adc… in the same points as does the curve of velocities, and will there- fore be of the same length A, and will also rise above that line and dip below it at the same parts. But the connec- tion between the wave of condensation and rarefaction and the wave of velocity, is still more intimate, when the extent to which the particles are displaced is very small, as is always the case in acoustics. For it may be shown that then the degree of condensation or rarefaction at any point of the medium is proportional to the velocity of vibration at that point. The same ordinates, therefore, will repre-

1 wave.

\elocity of

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sent the degrees of condensation, which represent the velocities, or, in other words, the wave of condensation and rarefaction may be regarded as coincident with the velocity

wave. Part II.

Velocity of propagation of waves of longitudinal disturbance

through any elastic medium.

15. Sir Isaac Newton was the first who attempted to de- termine, on theorctical grounds, the velocity of sound in The formula obtained by him gives, however, a numerical value, as regards air, falling far short of the result derived from actual experiment; and it was not till long afterwards, when Laplace took up the ques- tion, that complete coincidence was arrived at between We are indebted to the late Pro- fessor Rankine, of Glasgow (Phil. Trans. 1870, p. 277), for a very simple and elegant investigation of the question,

air and other fluids.

theory and observation.

which we will here reproduce in an abridged form.

Let us conceive the longitudinal disturbance to be pro- pagated through a medium contained in a straight tube having a transverse section equal to unity, but of indefinite

length.

Let two transverse planes A, A, (fig. 3) be conceived

as moving along the in- terior of the tube in the same direction and with the same velocity V as the disturbance-wave itself,

AS ee ee

B——> V

Fig. 3.

Let wu, u, be the velocities of displacement of the particles of the medium at A, A, respectively, at any given instant, estimated in the same direction as V; and p, p, the corre-

sponding densities of the medium.

The disturbances under consideration, being such as preserve a permanent type throughout their propagation, it follows that the quantity of matter between A, and x, remains constant during the motion of these planes, or that as much must pass into the intervening spacc through one Now at A, the velocity of the particles relatively to A, itself is V — Uy mwards, and consequently there flows into the space A, A,

of them as issues from it through the other.

through A, a mass (V —~,)p, in the unit of time.

Forming a similar expression as regards A,, putting m for the invariable mass through which the disturbance is pro-

pagated in the unit of time, and considering that if p de- note the density of the undisturbed medium, m is evidently equal to Vp, we have—

V—u,)p,=(V — u,)p,= Vp=m : (1.) Now, p,p, being the pressures at A,, A, respectively, and therefore p,—p, the force generating the acceleration

u, —%,, in unit of time, on the mass m of the medium, by the second law of motion,

Py — P= MU, — U;) . : ‘ (2.) : ep cating u,, u, from these equations, and putting for

1

a = – the symbols s,,,,s (which therefore denote the volumes of the unit of mass of the disturbed medium at A,, A,, and of the undisturbed medium), we get:

m= 227 Pi ang you ge Pea P 2) % a aa

Now, if (as is generally the case in sound) the changes of Pressure and volume occurring during the disturbance of the medium are very small, we may assume that these changes are proportional one to the other. Hence, denot- ing the ratio which any increase of pressure bears to the diminution of the unit of volume of the substance, and

1 See also Maxwell, Theory of Heat, p. 203.

which is termed the elasticity of the substance, by e, we shall obtain for the velocity of a wave of longitudinal dis- placements, supposed small, the equation:

V= Jes rea ; : : ’

p

16. In applying this formula to the determination of Laplace’s the velocity of sound in any particular medium, it is correction, requisite, as was shown by Laplace, to take into account the thermic effects produced by the condensations and rarefactions which, as we have seen, take place in the sub- stance. The heat generated during the sudden compres- sion, not being conveyed away, raises the value of the elasticity above that which otherwise it would have, and which was assigned to it by Sir Isaac Newton.

Thus, in a perfect gas, it is demonstrable by the prin- ciples of THERMODYNAMICS, that the elasticity e, which, in the undisturbed state of the medium, would be simply equal to the pressure p, is to be made equal to yp, where y is a number exceeding unity and represents the ratio of the specific heat of the gas under constant pressure to its specific heat at constant volume.

Hence, as air and most other gases may be practically regarded as perfect gases, we have for them:

V= min J@ ee . «=

17. From this the following inference may be drawn:— Velocity of The velocity of sound in a given gas is unaffected by sound in

change of pressure if unattended by change of temperature. ae iE

For, by Boyle’s law, the ratio ~ is constant at a given ee temperature. The accuracy of this inference has been con- firmed by recent experiments of Regnault.

18. To ascertain the influence of change of temperature Effect of on the velocity of sound in a gas, we remark that, by Gay change of Lussac’s law, the pressure of a gas at different tempcra- tempera- tures varies proportionally both to its density p and to 1+at, where ¢ is the number of degrees of temperature above freezing point of water (32° Fahr.), and ais the expan- sion of unit of volume of the gas for every degree above 32°.

If, therefore, p, 2, p, p) denote the pressures and densities corresponding to temperatures 32°+¢° and 32°, we have:.

(I.)

Po Po and hence, denoting the corresponding velocitics of sound by V, V,, we get:

77 J +a?)

whence, a being always a very small fraction, is obtained very nearly:

Vv a at

vi, 1 att and V—V,=5..Vy. The velocity increases, therefore, by = V, for every de-

gree of rise of temperature above 32°.

19. The general expression for V given in (II.) may be Another put in a different form : if we introduce a height H of the expression gas, regarded as having the same density p throughout and pe exerting the pressure p, then p=gpH, where g is the acceleration of gravity, and there results:

ve VyvgH . . Now /gH or wg 2g. is the velocity U which would

(III.)

be acquired by a body falling im vacuo from a height > : Hence V=U ,/y.

Numerical value of V in air.

V in diffe- rent gases.

Experi- ments for

- determin- ing V in air.

V depends

If y were equal to 1, V=U, which is the result obtained by Newton, and would indicate that the velocity of sound in a gas equals the velocity of a body falling from a height equal to half of that of a homogeneous atmosphere of the gas.

20. In common the mercurial barometer 30 ins. air is to that of mercury as 10,458°6 × 2°5 ft. = 26,214 ft.

Also y = 1-408 Hence V,= 4/1408 × 32,2 × 26,214 = 1090 ft. and, by § 18, the increase of velocity for each degree of rise

545g,

dry air at 32° Fahr., g being 32:2 ft., and or 2°5 ft., the density of 1: 10,485°6; hence H=

or –

: Vee 1090 of temperature (a being Gay) 8 gga

ls ft: very nearly. 91. If the value of y were the same for different gases,

—-

it is obvious from formula V = y= that, at a given

temperature, the velocities of sound inthose gases would be to each other inversely as the square roots of their densities. Regnault has found that this is so for common air, carbonic acid, nitrous oxide, hydrogen and ammoniacal gas (though less so as regards the two last).

22. The experimental determination of the velocity of sound in air has been carried out by ascertaining accurately the time intervening between the flash and report of a gun as observed at a given distance, and dividing the distance by the time. A discussion of the many experiments con- ducted on this principle in various countries and at various periods, by Van Der Kolk (Lond. and Edin. Phal. Mag., July 1865), assigns to the velocity of sound in

dry air at 39° Fahr., 1091 ft. 8 in. per second, with a probable error of + 3°7 ft.; and still more recently (in 1871) Mr Stone, the Astronomer Royal at the Cape of Good Hope, has found 1090°6 as the result of careful experiments by him- self there. The coincidence of these numbers with that we have already obtained theoretically sufficiently estab- lishes the general accuracy of the theory.

93. Still it cannot be overlooked that the formula for

onintensity V ig founded on assumptions which, though approximately,

of sound.

V depends on the pitch of sound.

are not strictly correct. Thus, the air is not a perfect gas, nor is the variation of elastic force, caused by the passage through it of a wave of disturbance always very small in comparison with the elastic force of the undisturbed air. Earnshaw (1858) first drew attention to these points, and came to the conclusion that the velocity of sound increases with its loudness, that is, with the violence of the disturb- ance. In confirmation of this statement, he appeals to a singular fact, viz. that, during experiments made by Captain Parry, in the North Polar Regions, for determin- ing the velocity of sound, it was invariably found that the report of the discharge of cannon was heard, at a distance of 24 miles, perceptibly earlier than the sound of the word fire, which, of course, preceded the discharge.

As, in the course of propagation in unlimited air, there is a gradual decay in the intensity of sound, it would fol- low that the velocity must also gradually decrease as the sound proceeds onwards. This curious inference has been verified experimentally by Regnault, who found the velocity of sound to have decreased by 2°2 ft. per second in passing from a distance of 4000 to one of 7500 feet.

94, Among other interesting results, derived by the accurate methods adopted by Regnault, but which want of space forbids us to describe, may be mentioned the de- pendence of the velocity of sound on its pitch, lower

notes being, cet. par., transmitted at a more rapid rate than higher ones. ‘Thus, the fundamental note of a trumpet travels faster than its harmonies.

APCTO U SYPngtr

of a column of the substance produced by its own weight

3 w w, then e beng =~ or

that would be increased 1 foot by the weight of 1 cubic foot) by Z,

pressure equal to one atmosphere, or to that of a column

tained, whether by direct experiment, as by Colladon and water of the

the length of an iron bar be

by our definition of /, must be the weight of a cubic foot

95. The velocity of sound in liquids and solids (the dis- V in tignias

placements being longitudinal), may be obtained by formula and solidy, (1), neglecting the thermic effects of the compressions and expansions as being comparatively inconsiderable, and may be put in other forms:

Thus, if we denote by s the change in length of one foot

9p

e an We have = and hence: €

v=,/! (IV.)

or, replacing : (which is the length in feet of a column

V= Jgt (V.)

which shows that the velocity is that due to a fall through

Or, again, in the case of a liquid, if » denote the change of volume, which would be produced by an increase of

H of the liquid, since ¢ is the change of volume due to

weight of a column 1 of the liquid, and .*. : = – and : Bs , we get q v= J . ; . (VE)

Ex. 1, For water, = = 20,000 very nearly; H=34 ft. V in wate :

and hence V = 4680 feet. This number coincides very closely with the value ob-

Sturm on the Lake of Geneva in 1826, who found 4708, or by indirect means which assign to the velocity in the River Seine at 59° Fahr. a velocity of 4714 ft. (Wertheim).

Ex. 2. For iron. Let the weight necessary to double V in iro, 4260 millions of Ibs. on the

square foot. Then a length / will be extended to /+ 1 by

a a force of 4260 mito = on the sq. ft. This, therefore,

of the iron, Assuming the density of iron to be 7°8, and 62°32 Ibs. as the weight of a cubic foot of water, we get 7-8 × 62°32 or 486 lbs. as the weight of an equal bulk of

illi 42 aay Hence ae =486 and/=“2 millions,

which gives V= gre, [22 millions

486

= [82 × 1000 = 1000 284 or V=17,000 feet per second nearly.

As in the case of water and iron, so, i general, it may be stated that sound travels faster in liquids than in air,

: nie Bie : and still faster in solids, the ratio 4 being least in gases

iron.

and greatest in solids.

26. Biot, about 50 years ago, availed himself of the Exper great difference in the velocity of the propagation of sound ed through metals and through air, to determine the ratio of Hon ot the one velocity to the other. A bell placed near one €X- jp solids | tremity of a train of iron pipes forming a joint length of upwards of 3000 feet, being struck at the same instant as the same extremity of the pipe, a person placed at the other extremity heard first the sound of the blow on the pipe, conveyed through the iron, and then, after an interval

=2 EE See

f locity of

i 0 paga-

na of ‘hnsversal vrations,

I

sound of the bell transmitted through the air.

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of time, which was noted as accurately as possible, og

e result was a velocity for the iron of 10°5 times that in air. Similar experiments on iron telegraph wire, made more recently near Paris by Wertheim and Brequet, have led to an almost identical number. Unfortunately, owing to the metal in those experiments not forming a continuous whole, and to other causes, the results obtained, which fall short of those otherwise found, cannot be accepted as correct.

Other means therefore, of an indirect character, to which we will refer hereafter, have been resorted to for deter-

_ mining the velocity of sound in solids. Thus Wertheim,

from the pitch of the lowest notes produced by longitudinal friction of wires or rods, has been led to assign to that velocity values ranging, in different metals, from 16,822 feet for iron, to 4030 for lead, at temperature 68° Fahr., and which agree most remarkably with those calculated by

means of the formula V=. /=. He points out, however,

that these values refer only to solids whose cross dimensions are small in comparison with their length, and that in order to obtain the velocity of sound in an unlimited solid mass, it is requisite to multiply the value as above found by /$or £nearly. For while, in a solid bar, the extensions and contractions due to any disturbance take place laterally as well as longitudinally ; in an extended solid, they can only occur in the latter direction, thus increasing the value of e.

27. To complete the discussion of the velocity of the propagation of sound, we have still to consider the case of transversal vibrations, such as are executed by the points of a stretched wire or cord when drawn out of its position of rest by a blow, or by the friction of a violin-bow.

Fig. 4.

Let om (fig. 4) be the position of the string when undis- turbed, mnp when displaced. We will suppose the amount of displacement to be very small, so that we may regard the distance between any two given points of it as remain- ing the same, and also that the tension P of the string is not changed in its amount, but only in its direction, which is that of the string.

Take any origin o in oa, and ab=be = dr (a very small quantity), then the perpendiculars am, bn, cp, are the dis- placements of abc. Let k, l be the middle points of mn, np; then kl (which=mn or ab very nearly) may be re- garded as a very small part of the string acted on by two forces each = P, and acting at n in the directions np, nm. These give a component parallel to

ac, which on our sup- position is negligible, and another F along nb, such that:

F =P (sin 6— sin 6) =P. (H-F)ap

mn oa Now if c=a length of string of weight equal to P, and the string be supposed of uniform thickness and density,

the weight of k= 4 kl ==. 5x, and the mass m of kl =

FP. = Ot, ge

Hence the acceleration J in direction nb is—

*FF ng—pr Jaa =I daz **

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If we denote ma by y, oa by a, and the time by ¢, we shall readily see that this equation becomes ultimately, ey pt dea I aes which is satisfied by putting

Y= (e+ Joe. t+ (x— J/g. t) where ¢ and y indicate any functions. : Now we know that if for a given value of ¢, x be in-

creased by the length A of the wave, the value of y remains unchanged; hence,

$ (t+ Joc. th+ d= (w@+ArA+ A/ Ge. t) &e. But this condition is equally satisfied for a given value of

= A x, by increasing ,/gec. t. by A, w.e., increasing ¢ by Tigo: This therefore must = T (the time of a complete vibration of any point of the string). But V= z Hence,

V = Jy (VIL) is the expression for the velocity of sound when due to very small transversal vibrations of a thin wire or chord, which velocity is consequently the same as would be acquired by a body falling through a

height equal to one half of a length of the chord such as to have a weight equal to the tension.

The above may also be put in the form—-

Vv = ge ? w where P is the tension, and w the weight of the unit of length of the chord.

28. It appears then that while sound is propagated by Compari- longitudinal vibrations through a given substance with the son of V same velocity under all circumstances, the rate of its trans- °° < mission by transversal vibrations through the same sub-.o

= ‘ for longi- | stance depends on the tension and on the thickness. The tudinal former velocity bears to the latter the ratio of J: fc, Vibrations.

(where / is the length of the substance, which would be lengthened one foot by the weight of one foot, if we take

ail, that is, of the square

root of the length which would be extended one foot by the weight of ¢ feet, or by the tension, to 1. This, for ordinary tensions, results in the velocity for longitudinal vibrations being very much in excess of that for transversal vibrations.

29. It is a well known fact that, in all but very excep- Law of tional cases, the loudness of any sound is less as the dis- decay of tance increases between the source of sound and the ear. ered of The law according to which this decay takes place is the is “tn same as obtains in other natural phenomena, viz., that in creased dis an unlimited and uniform medium the loudness or intensity tance. of the sound proceeding from a very small sounding body (strictly speaking, a point) varies inversely as the square of the distance. This follows from considering that the ear AC receives only the conical portion OAC of the whole volume of sound emanating from O, and that in order that an ear BD, placed at a greater distance from O, a may admit the same ; quantity, itsarea must be g =e oo to that of AC: as OB?: A OA*. But if A’=AC be situated at same dis- Fig. 5. tance as BD, the*

amount of sound received by it and by BD (and therefore by AC) will be as the area of A! or AC to that of BD. Hence, the intensities of the sound as

I — 14

the foot as our unit) or of

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heard by the same ear at the distances OA and OB are to each other as OB? to OA? Influenceof 30. In order to verify the above law when the atmo- diminished gphere forms the intervening medium, it would be necessary density of +5 test it at a considerable elevation above the earth's ehegiadt surface, the ear and the source of sound being separated sound. by air of constant density. As the density of the air diminishes, we should then find that the loudness of the sound at a given distance would decrease, as 18 the case In the air-pump experiment previously described. This arises from the decrease of the quantity of matter impinging on the ear, and the consequent diminution of its ws-wva. The decay of sound due to this cause is observable in the rarefied air of high mountainous regions. De Saussure, the celebrated Alpine traveller, mentions that the report of a pistol at a great elevation appeared no louder than would a small cracker at a lower level.

But it is to be remarked that, according to Poisson, when air-strata of different densities are interposed between the source of sound and the ear placed at a given distance, the intensity depends only on the density of the air at the source itself; whence it follows that sounds proceeding from the surface of the earth may be heard at equal dis- tances as distinctly by a person in a floating balloon as by one situated on the surface itself; whereas any noise origi- nating in the balloon would be heard at the surface as faintly as if the ear were placed in the rarcfied air on a level with the balloon. This was exemplified during a balloon ascent by Glaisher and Coxwell, who, when at an elevation of 20,000 feet, heard with great distinctness the whistle of a locomotive passing beneath them.

Part IIT. Reflexion and Refraction of Sound.

31. When a wave of sound travelling through one medium meets a second medium of a different kind, the vibrations of its own particles arc communicated to the particles of the new medium, so that a wave is excited in the latter, and is propagated through it with a velocity de- pendent on the density and elasticity of the second medium, and therefore differing in general from the previous velocity. The direction, too, in which the new wave travels is dif- ferent from the previous one. This change of direction is termed refraction, and takes placc according to the same laws as does the refraction of light, viz., (1.) The new direction or refracted ray lies always in the plane of incidence, or plane which contains the incident ray (i.e. the direction of the wave in the first medium), and the normal to the surface scparating the two media, at the point in which the incident ray meets it; (2.) The sine of the angle between the normal and the incident ray bears to the sine of the angle between the normal and the refracted ray, a ratio which is constant for the same pair of media.

For a theoretical demonstration of these laws, we must refer to the art. Oprics, where it will be shown that the ratio involved in the second law is always equal to the ratio of the velocity of the wave in the first medium to the velocity in the second; in other words, the sines of the angles in question are directly proportional to the velocities.

32. Hence sonorous rays, in passing from one medium into another, are bent in towards the normal, or the reverse, according as the velocity of propagation in the former exceeds or falls short of that in the latter. Thus, for instance, sound is refracted towards the perpendicular when passing into air from water, or into carbonic acid gas from air; the converse is the case when the passage takes place the opposite way.

Laws of refraction.

Refraction is to or from the normal ac- cording to relative values of the velo- cities.

Limiting angle and total re- flection.

Fig. 6. 33. It further follows, as in the analogous casc of light,

that there is a certain angle termed the limiting angle, whose sine is found by dividing the less by the greater | velocity, such that all rays of sound meeting the surface separating two different bodies will not pass onward, } but suffer total reflexion back into the first body, if I the velocity in that body is less than that in the other | body, and if the angle of incidence excecds the limiting | angle. 'The velocities in air and water being respectively 1090 | and 4700 feet, the limiting angle for these media may be easily shown to be slightly above 155°. Hence, rays of | sound proceeding from a distant source, and therefore | nearly parallel to each other, and to PO (fig. 6), the angle POM being greater than 154°, will not pass into the water at all, but suffer total reflexion. Under such circumstances, the report of a gun, however powerful, would be inaudible by an ear placed in the water. 34, As light is concentrated into a focus by a convex Acoustic: glass lens (for which the velocity of light is less than for lenses. the air), so sound ought to be made to converge by passing T, through a convex lens formed of carbonic acid gas. On

the other hand, to produce convergence with water or hydrogen gas, in both which the velocity of sound exceeds | its rate in air, the lens ought to be concave. These results | have been confirmed experimentally by Sondhaus and | Hajech, who also succeeded in verifying the law of the equality of the index of refraction to the ratio of the velocities of sound.

35. When a wave of sound falls on a surface separating Laws of | two media, in addition to the refracted wave transmitted reflexion) into the new medium, which we have just been consider- ing, there is also a fresh wave formed in the new medium, and travelling in it in a different direction, but, of course, with the same velocity. This reflected wave is subject to the same laws as regulate the reflexion of light, viz. (1.) the coincidence of the planes of incidence and of reflexion, and (2.) the equality of the angles of incidence and reflexion, that is, of the angles made by the incident and reflected rays with the normal.

36. As in an ellipse (fig. 7), the normal PG at any point Reflexior bisects the angle SPH (8, H by asphi being the foci), rays of sound diverging from 8, and falling on the spheroidal surface formed by the revolution of the ellipse

about the longest diameter AB, will be . reflected to H. Also, since SP Fig. 7.

+ PH is always = AB, the times in which the different rays will reach H will all be equal to each other, and hence a crash at S will be heard as a crash at H.

37. At any point P of'a parabola (fig. 8) of which S is Reflexio the focus, and AX the axis, the normal PG bisects the PY pata, angle SPX, PX being bie a | drawn parallel to AX. a

Hence rays of sound diverging from §, and falling on the paraboloid , formed by the revolution of the parabola about its axis, will all be reflected in directions parallel to the axis. And vice versa rays of sound XP, XQ,

Q

Fig. 8.

d&c., from a very distant source, and parallel to the axis of

a paraboloid, will be reflected into the focus. Con- sequently, if two reflecting paraboloids be placed at a considerable distance from and opposite to each other, with their axis coincident in direction (fig. 9), the tick of a watch placed at the focus S of one will be heard dis- tinctly by an ear at S', the focus of the other.

Echoes.

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38. As a luminous object may give a succession of images when placed between two or more reflecting sur-

faces, so also in like circum- stances may a sound suffer repetition.

To these principles are easily: traceable all the pecu- liarities of echoes. A wall or steep cliff may thus send back, somewhat reduced in intensity, a shout, the report of a pistol, &c. The time . which elapses between the sound

and its echo may be easily deduced from the known velocity of sound in air, if the distance of the wall be given. Thus, for a distance of 37 yards, the interval will be found by dividing the double of that or 74 yards by 370 yards, the velocity of sound at 50° Fahr., to amount to } of a second. Hence, if we assume that the rate at which syllables can be distinctly uttered is five per second, the wall must be at a distance exceeding 37 yards to allow of the echo of a word of one syllable reaching the ear after the word has been uttered, 74 yards for a word of two syllables, and so on.

If the reflecting surface consists of one or more walls, cliffs, &c., forming together a near approach in shape to that of a prolate spheroid or of a double parabolic surface, then two points may be found, at one of which if a source of sound be placed, there will be produced, by eonver- gence, a distinct echo at the other. As examples of this may be mentioned the whispering gallery in St Paul's, London, and the still more remarkable case of the Cathedral of Girgenti in Sicily mentioned by Sir John Herschel.

i ——> aA,

Fig. 9.

"Sound con- 39, On similar principles of repeated reflexion may be _ veyed over explained the well-known fact that sounds may be con-

water, &.

H

Thunder.

veyed to great distances with remarkably slight loss of intensity, on a level piece of ground or smooth sheet of water or ice, and still more so in pipes, chimneys, tunnels, &e. Thus, in one of Captain Parry's Polar expedi- tions, a conversation was on one occasion carried on, at a distance of 14 mile, between two individuals sepa- rated by a frozen sheet of water. M. Biot heard distinctly from one end of the train of pipes 2 of a mile long, previously referred to, a low whisper proceeding from the opposite end.

Practical illustrations are afforded by the system of communication by means of tubing now so extensively adopted in public and private buildings, and by the speak- ing trumpet and the ear trumpet.

40. The prolonged roll of thunder, with its manifold varieties, is partly to be ascribed to reflexion by moun- tains, clouds, ésc.; but is mainly accounted for on a diffe- tent acoustic principle, viz., the comparatively low rate of transmission of sound through air, as was first shown by Dr Hooke at the close of the 17th century. The ex- planation will be more easily understood by adverting to the case of a volley fired by a long line of troops. A person situated at a point in that line produced, will first it is evident hear the report of the nearest musket, fol- lowed by that of the one following, and so down to the last one in the line, which will close the prolonged roll thus reaching his ear; and as each single report will appear to him less intense according as it proceeds from a greater distance, the roll of musketry thus heard will be one of gradually decreasing loudness. But if he were to place himself at a relatively great distance right opposite to the centre of the line, the separate reports from each of the two wings would reach him nearly at the same moment, and hence the sound of the volley would now approach more nearly to that of a single loud erash. If the line of

soldiers formed an arc of a cirele having its centre in his position, then the distances gone over by tho separate reports being equal, they would reach his ear at the same absolute instant of time, and with exactly equal intensi- ties; and the effect produced would be strictly the same as that of a single explosion, equal in violence to the sum of all the separate discharges, occurring at the same dis- tance. It is easy to see that, by varying the form of the line of troops and the position of the observer, the sonorous effect will be diversified to any extent desired. If then we keep in view the great diversity of form exhibited by lightning-flashes, which may be regarded as being lines, at the points of which are generated explosions at the samo instant of time, and the variety of distance and relative position at which the observer may be placed, we shall feel no difficulty in accounting for all those acoustic pheno- mena of thunder to which Hooke's theory is applicable.

Part IV. The Principles of Musical Harmony.

41. A few words on the subject of musical harmony must be introduced here for the immediate purposes of this article, further details being reserved for the special article on that subject.

Sounds in general exhibit three different qualities, so far as their effect on the ear is concerned, viz, loudness, prtch, and timbre.

Loudness depends, cet. par., on the violence with which Loudness the vibrating portions of the ear are excited; and there- depends on fore on the extent or amplitude of the vibrations of the Bat Ai body whence the sound proceeds. Hence, after a bell has ; been struck, its effect on the ear gradually diminishes as its vibration becomes less and less extensive. By the theory of vibrations, loudness or intensity is measured by the visewa of the vibrating particles, and is consequently proportional to the square of their maximum velocity or to the square of their maximum displacement, Helm- holtz, however, in his remarkable work on the perception of tone, observes that notes differing in pitch differ also in loudness, where their vis viva is the same, the higher note always exhibiting the greater intensity.

42. Difference of pitch is that which finds expression in Pitch de- the common terms applied to notes: Acute, shrill, hagh, pends on sharp, grave, deep, low, flat. We will point out presently in ™pidity of what manuer it is established that this quality of sound de- Y>™tio»- pends on the rapidity of vibration of the particles of air in contact with the external parts of the ear. The pitch of –

a note is higher in proportion to the number of vibrations of the air corresponding to it, in a given time, such as one

second. If ~ denote this number, then, by § 13, 2 =~,

and hence, V being constant, the pitch is higher the less the length A of the wave.

43. Timbre, or, as it is termed by German authors, klang-farbe, rendered by Tyndall into clang-colour or clang- tint, but for which we would substitute the expression acoustic colour, denotes that peculiarity of impression produced on the ear by sounds otherwise, in pitch, loudness, &c., alike, whereby they are recognisable as different from each other. Thus human voices are readily interdistinguishable 3 80 are notes of the same pitch and intensity, produced by different instruments. The question whence arises this dis- tinction must be deferred for the present.

44. Besides the three qualities above mentioned, there Distinction exists another point in which sounds may be distinguished between among each other, and which, though perhaps reducible to Pines an

j ¢ : : i usical difference of timbre, requires some special remarks, viz., notes, that by which sounds are characterised, either as noises or as musical notes. A musical note is the result of regular,

Timbre.

Laws of musical harrnony.:

Ratios of vibrations.

Unison.

Octave.

Twelfth and Fifth.

Major third.

Major sixth.

Minor third.

Fourth,

Second.

Seventh.

Diatonic scale.

periodic vibrations of the air-particles acting on the ear, and therefore also of the body whence they proceed, each particle passing through the same phase at stated intervals of time. On the other hand, the motion to which noise is due is irregular and flitting, alternately fast and slow, and creating in the mind a bewildering and confusing effect of a more or less unpleasant character. Noise may also be produced by combining in an arbitrary manner several musical notes, as when one leans with the fore-arm against the keys of a piano. In fact, the composition of regular periodic motions, thus effected, is equivalent to an irregular motion.

45, We now proceed to state the laws of musical har- mony, and to describe certain instruments by means of which they admit of being experimentally established. The chief of these laws are as follow :—

(1.) The notes employed in music always correspond to certain definite and invariable ratios between the num- bers of vibrations performed in a given time by the air when conveying these notes to the ear, and these ratios are of a very simple kind, being restricted to the various permutations of the first four prime numbers l, 2, 3, 5, and their powers.

(2.) Two notes are in unison whose corresponding vibra- tions are executed exactly at the same rate, or for which

(denoting by n, m, the numbers per second) =! =1. This ratio or interval (as it is termed) is the simplest possible. (3.) The next interval is that in which = = 2, and is termed the octave. (4.) The interval “ = 3 is termed the twelfth, and if

we reduce the higher note of the pair by an 8”, z.e., divide its number of vibrations by 2, we obtain the interval

=: = 4 designated as the interval of the Jifth.

(5.) The interval = = 5 has no particular name at- tached to it, but if we lower the higher note by two gor divide nm, by 4, we get the interval "®=2, or the interval of the major third.

(6.) The interval oS =: is termed the major sixth.

: ie me Ore : (7.) The interval " = — = 5 is termed the minor third. ' 2 ' (8.) The interval = = a = ; is termed the fourth.

(9.) The interval ° which, being =; ,

2

garded as formed by taking in the first place a note one-

fifth higher than the key-note or fundamental, 7.¢., higher

may be re-

than the latter by the interval Z thence ascending by

another fifth, which gives us – x sand lowering this by

an octave, which results in : , which is called the second.

: 15 3. 5

(10.) The interval gg 5X p may be regarded as the

: : 5

major third. i) of the fifth (5),and is called the interval of the seventh.

46. If the key-note or fundamental be denoted by C, and the notes, whose intervals above C are those just enumerated, by D, E, F, G, A, B, C, we form what is

_of twelve notes forms the chromatic scale. The note inter-

known in music as the natural or diatonic scale, in which therefore the intervals reckoned from C are successively :

9543 5 15

3° wv 3? 9? 3? 8? and therefore the intervals between each note and the

one following are :

9 10 16 9 10 9 16

g' 9' 15' 8' 9' 8 15° Of these last intervals the first, fourth, and sixth are Majort

2,

9 ; : ,

each = 5 which is termed a major tone. The second and Minort

by

10 9 : : :

jifth are each = ry which is a ratio slightly less than the former, and hence is called a minor tone. The third Semito 16 {aaa and seventh are each = Te? to which is given the name of semt-tone.

By interposing an additional note between each pair of Chrom: notes whose interval isa major or a minor tone, the result- Scale. ing series of notes may be made to exhibit a nearer ap- proach to equality in the intervals successively separating them, which will be very nearly semi-tones. This sequence

posed between C and D is either C sharp (C@) or D flat (Db), according as it is formed by ravsing C a semi-tone or lowering D by the same amount. .

47, Various kinds of apparatus have been contrived with a view of confirming experimentally the truth of the laws of musical harmony as

above stated.

Savart's toothed wheel apparatus consists of a brass Savart' wheel, whose edge is divided into a number of equal pro- toothed jecting teeth distributed uniformly over the circumference, ies and which is capable of rapid rotation about an axis per- "—_ pendicular to its plane and passing through its centre, by means of a series of multiplying wheels, the last of which is turned round by the hand. The toothed wheel being set in motion, the edge of a card or of a funnel-shaped piece of common note paper is held against the teeth, when a note will be heard arising from the rapidly suc ceeding displacements of the air in its vicinity. The pitch of this note will, agreeably to the theory, rise as the rate of rotation increases, and becomes steady when that rota- tion is maintained uniform. It may thus be brought into unison with any sound of which it may be required to determine the corresponding number of vibrations per second, as for instance the note A;, three 8°" higher than the A which is indicated musically by a small circle placed between the second and third lines of the G clef, which A is the note of the tuning-fork usually employed for regulating concert-pitch. A; may be given by a piano. Now, suppose that the note produced with Savart's appa- ratus is in unison with A 3, when the experimenter turns round the first wheel at the rate of 60 turns per minute or one per second, and that the circumferences of the various multiplying wheels are such that the rate of revolution of the toothed wheel is thereby increased 44 times, then the latter wheel will perform 44 revolutions in a second, and hence, if the number of its teeth be 80, the number of taps imparted to the card every second will amount to 44 × 80 or 3520. This, therefore, is the number of vibra- tions corresponding to the note A;. If we divide this by 23 or 8, we obtain 440 as the number of vibrations answer- ing to the note A. This, however, tacitly assumes that the bands by which motion is transmitted from wheel to wheel do not slip during the experiment. If, as is always more or less the case, slipping occurs, a different mode for determining the rate at which the toothed wheel revolves, such as is employed in the syren of De la Tour (vide below), must be adopted.

» Seebeck's 1 pyrell.

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If, for the single toothed wheel, be substituted a set of four with a common axis, in which the teeth are in the ratios 4:5: 6:8, and if the card be rapidly passed along their edges, we shall hear distinctly produced the fundamental chord C, E, G, C, and shall thus satisfy our- selves that the intervals C, E; C, G, and C C, are (as they

nN : ought to be) > and 2 respectively.

48. The syren of Seebeck is the simplest form of appa- ratus thus designated, and consists of a large circular disc of pasteboard mounted on a central axis, about which it may be made to revolve with moderate rapidity. This disc is perforated with small round holes arranged in circles about the centre of the disc. In the first series of circles, reckoning from the centre, the openings are so made as to divide the respective circumferences, on which they are found, in aliquot parts bearing to each other the ratios of the numbers 2, 4, 5, 6, 8, 10, 12, 16, 20, 24, 32, 40, 48, 64, The second series consists of circles each of which is formed of two sets of perforations, in the first circle arranged as 4:5, in the next as 3:4, then as 2:3,3:5,4: 7. In the outer series is a circle divided by perforations into four sets, the numbers of aliquot parts being as 3:4 :5 : 6, followed by others which we need not further refer to.

The disc being started, then by means of a tube held at

one end between the lips, and applied near to the disc at.

the other, or more easily with a common bellows, a blast of air is made to fall on the part of the disc which con- tains any one of the above circles. The current being alternately transmitted and shut off, as a hole passes on and off the aperture of the tube or bellows, causes a vibra- tory motion of the air, whose rapidity depends on the number of times per second that a perforation passes the mouth of the tube. Hence the note produced with any given circle of holes rises in pitch as the disc revolves more rapidly; and if, the revolution of the disc being kept as steady as possible, the tube be passed rapidly across the circles of the first series, the notes heard are found to pro- duce on the ear, as required by theory, the exact impres- sion corresponding to the ratios 2 : 4 : &c., 7.¢., of a series of notes, which, if the lowest be denoted by C, form the sequence C CO, E, G, C, &c., &c. In

like manner, the first circle in which we have two sets of holes dividing the circum- ference, the one into say 8 parts, and the other into 10, or in ratio 4 : 5, the note produced is a compound one, such as would be obtained by striking on the piano two' notes

separated by the interval of a major third ia} Similar

results, all agreeing with the theory, are obtainable by means of the remaining perforations.

A still simpler form of syren may be constituted with a good spinning top, a perforated card disc, and a tube for blowing with.

49. The syren of Cagnard de la Tour is founded on the same principle as the preceding. It consists of a cylindrical chest of brass, the base of which is pierced at its centre with an opening in which is fixed a brass tube projecting outwards, and intended for supplying the cavity of the cylinder with compressed air or other gas, or even liquid. The top of the cylinder is formed of a plate perforated near its edge by holes distributed uniformly in a circle concen- tric with the plate, and which are cut obliquely through the thickness of the plate. Immediately above this fixed plate, and almost in contact with it, is

another of the same dimensions, and > furnished with the same number, n, of aN openings similarly placed, but passing

obliquely through in an opposite direction Fig. 10

from those in the fixed plate, the one set being inclined to the left, the other to the right.

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This second plate is capable of rotation about a steel axis perpendicular to its plane and passing through its centre. Now, let the movable plate be at any time ina position such that its holes are immediately above those in the fixed plate, and let the bellows by which air is forced into the cylinder (air, for simplicity, being supposed to be the fluid employed) be put in action;

then the air in its passage will strike the side of each opening in the mov- able plate in an oblique direction (as shown in fig. 10), and will therefore urge the latter to rotation round its centre.

After “th of a revolution, the two sets of perforations will

again coincide, the lateral impulse of the air repeated, and hence the rapidity of rotation increased. This will go on continually as long as air is supplied to the cylinder, and the velocity of rotation of the upper plate will be accelerated up to a certain maximum, at which it may be maintained by keeping the force of the current constant.

Now, it is evident that each coincidence of the perfora- tions in the two plates is followed by a non-coincidence, during which the air-current is shut off, and that con- sequently, during each revolution of the upper plate, there occur n alternate passages and interceptions of the current. Hence arises the same number of successive impulses of the external air immediately in contact with the movable plate, which is thus thrown into a state of vibration at the rate of n for every revolution of the plate. The result is a note whose pitch rises as the velocity of rotation increases, and becomes steady when that velocity reaches its constant value. If, then, we can determine the number m of revolu- tions performed by the plate in every second, we shall at once have the number of vibrations per second correspond- ing to the audible note by multiplying m by n.

For this purpose the steel axis is furnished at its upper part with a screw working into a toothed wheel, and driv- ing it round, during each revolution of the plate, through a space equal to the interval between two teeth. An index resembling the hand of a watch partakes of this motion, and points successively to the divisions of a graduated dial. On the completion of each revolution of this toothed wheel (which, if the number of its teeth be 100, will comprise 100 revolutions of the movable plate), a projecting pin fixed to it catches a tooth of another toothed wheel and turns it round, and with it a correspond- ing index which thus records the number of turns of the first toothed wheel. As an example of the application of this syren, suppose that the number of revolutions of the plate, as shown by the indices, amounts to 5400 in a minute of time, that is, to 90 per second, then the number of

vibrations per second of the note heard amounts to 90n, or (if number of holes in each plate =8) to 720.

50. Dove, of Berlin, has produced a modification of the syren by which the relations of different musical notes may be more readily ascertained. In it the fixed and movable plates are each furnished with four concentric series of perforations, dividing the circumferences into different aliquot parts, as p. ex., 8, 10, 12,16. Beneath the lower or fixed plate are four metallic rings furnished with holes corresponding to those in the plates, and which may be pushed round by projecting pins, so as to admit the air-current through any one or more of the series of perforations in the fixed plate. Thus, may be obtained, either separately or in various combinations, the four notes whose vibrations are in the ratios of the above numbers, and which therefore form the fundamental chord (CEGC,). The inventor has given to this instrument the name of the many-vowed syren.

51. Helmholtz has further adapted the syren for more extensive use, by the addition to Dove's instrument of another chest containing its own fixed and movable per-

Dove's syren,

Helm- holtz's double syren.

Vibro- graphs,

The Phon- auto-

graph.

forated plates and perforated rings, both the moveable plates being driven by the same current and revolving about a com- mon axis. Annexed is a figure of this instrument (fig. 11).

52. The relation between the pitch of a note and the frequency of the correspond- ing vibrations has also been studied by graphic methods. Thus,

if an elastic metal slip or a pig's bristle be attached to one prong of a tuning- fork, and if the fork, while in vibration, is moved rapidly over a glass plate coated with lamp black, the attached slip touching the plate lightly, a wavy line will be traced on the plate answering to the vibrations to and fro of the fork. The same result will be obtained with a stationary fork and a movable glass plate; and, if the time oc- cupied by the plate in moving through a given distance can be ascertained, and the number of complete undulations ex- hibited on the plate for that distance, which is evidently the number of vibrations of the fork in that time, is reckoned, we shall have determined the numerical vibra- tion-value of the note yielded by the fork. Or, if the same plate be moved in contact with two tuning-forks, we shall, by comparing the number of sinuosities in the one trace with that in the other, be enabled to assign the ratio of the corresponding numbers of vibrations per second. Thus, if the one note be an octave higher than the other, it will give double the number of waves in the same distance. The motion of the plate may be simply produced by dropping it between two vertical grooves, the tuning-forks being properly fixed to a frame above.

53. Greater accuracy may be attained with the so-called Vibrograph or Phonautograph (Duhamel's or Keenig's), consisting of a glass cylinder coated with lamp-black, or, better still, a metallic cylinder round which a blackened sheet of paper is wrapped. The cylinder is mounted on a horizontal axis and turned round, while the pointer attached to the vibrating body is in light contact with it, and traces therefore a wavy circle, which, on taking off the paper and flattening it, becomes a wavy straight line. The superiority of this arrangement arises from the comparative facility with which the number of revolutions of the cylinder in a given time may be ascertained. In Keenig's phonauto- graph, the axis of the cylinder is fashioned as a screw, which works in fixed nuts at the ends, causing a sliding as well as a rotatory motion of the cylinder. The lines traced out by the vibrating pointer are thus prevented from over- lapping when more than one turn is given to the cylinder.

Any sound whatever may be made to record its trace on the paper by means of a large parabolic cavity resembling a speaking-trumpet, which is freely open at the wider ex- tremity, but is closed at the other end by a thin stretched membrane. To the centre of this membrane is attached a small

feather-fibre, which, when the reflector is suitably placed, touches lightly the surface of the revolving cylinder. Any sound (such as that of the human voice) transmitting its rays into the reflector, and communicating vibratory motion to the membrane, will cause the feather to trace a sinuous line on the paper. If, at the same time, a tuning- fork of known number of vibrations per second be made to trace its own line close to the other, a comparison of the two lines gives the number corresponding to the sound under consideration.

Fig. 11.

Part V. Stationary Waves.

54. We have hitherto, in treating of the propagation of Station, waves of sound, assumed that the medium through which W@ves p; it took place was unlimited in all directions, and that the fa by source of sound was single. In order, however, to under- posite p | stand the principles of the production of sound by musical gressive _ instruments, we must now direct our attention to the case waves. of two waves from different sources travelling through the same medium in opposite directions. Any particle of the medium being then affected by two different vibrations at the same instant will necessarily exhibit a different state of motion from that due to either wave acting separately from the other, and we have to inquire what is the result of this mutual interference (as it is termed) of the two given waves. Supposing, as sufficient for our purpose, that the given waves are of equal lengths and of equal amplitudes, in other words, that the corresponding notes are of the same pitch and equally loud; and supposing, further, that they are advancing in exactly opposite directions, we shall now show that the result of the mutual interference of two such waves is the production of a stationary wave, that is, taking any line of particles of the medium along the direction of motion of the component waves, cer- ——~——_+ 443 tain of them, such as a, ¢,

é… at intervals each Fig. 12.

— : : ‘ P : at will remain constantly in their usual undisturbed posi-

tions. All the particles situated between a and c will vibrate (transversely or longitudinally, as the case may be) to and fro in the same direction as they would if affected by only one of the interfering waves, but with different amplitudes of vibration, ranging from zero at a to a maximum at 6 and thence to zeroatc. Those between c and e will vibrate in like manner, but always in an opposite direction to the similarly placed particles in ac, and so on alternately.

The annexed figures will represent to the eye the states of motion at intervals of time =} of the time T of a complete vibration of the particles. In fig. 13, 1, the particles in

4.

Sp ts a b Cc ad € Fig. 13.

ac are at their greatest distances from their undisturbed positions (above or to the right, according as the motion is transversal or longitudinal). In fig. 13, 2, they are all in their undisturbed positions. In fig. 13, 3, the displacements are all reversed relatively to fig. 13, 1. In fig. 13, 4, the particles are again passing through their equilibrium positions, resuming the positions indicated in fig. 13, 1, after the time T.

The points ace, &c., which remain stationary are termed Nodes ax nodes, and the vibrating parts between them ventral ventral segments, as

54a. Proof. In fig. 14, 1, the full curved line represents Proof. the two interfering waves at an instant of time such that,

a

i

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in their progress towards each other, they are then coinci- dent. It is obvious that the particles of the medium will at the moment in question be displaced to double the ex- tent of the displacement producible by either wave alone,

so that the resultant wave may be represented by the dotted curve. In fig. 14, 2, the two interfering waves, repre- sented by the full and dotted curves respectively, have each

Fig. 14.

passed over a distance = 4 A, the one to the right, the other to the left, and it is manifest that any disturbance of the medium, producible by the one wave, is completely neutra- lised by the equal and opposite action of the other. Hence, the particles of the medium are now in their undisturbed positions. In fig. 14, 3, a further advance of the two waves, each in its own direction, over a space=}A, has again brought them into coincidence, and the result is the

__Wave represented by the dotted line, which, it will be re-

marked, has its crests, where, in fig. 1, are found troughs. In fig. 14, 4, after a further advance = } d, we have a repeti- tion of the case of fig. 14, 2, the particles are now again un- affected by the waves. A still further advance of } A, or of A reckoned from the commencement, brings us back to the same state of things as subsisted in fig. 14,1. An in- spection and inter-comparison of the dotted lines in these figures are now sufficient to establish the accuracy of the laws, before mentioned, of stationary waves,

Part VI. Musical Strings.

55. We have in musical strings an instance of the occurrence of stationary waves. Let AB (fig. 15) be a wire or

string, supposed meanwhile to at be fixed only at one extremity B, Ypscaig ante ge and let the wire be, at any part, y

excited (whether by passing a :

violin bow across or by friction Fig. 16.

along it), so that a wave (whether of transversal or longi- tudinal vibrations) is propagated thence towards B. On teaching this point, which is

fixed, reflexion will occur, in consequence of which the particles there will suffer a complete reversal of velocity, just as when a perfectly elastic ball strikes against a smooth surface perpendi- cularly, it rebounds with a velocity equal and opposite to that it previously had. Hence, the displacement due to

the incident wave being BM, the displacement after re- flexion will be BN equal and opposite to BM, and a reflected wave will result, represented by the faint line in the fig., which will travel with the same velocity, but in the opposite direction to the incident wave fully lined in the fig. The interference of these two oppositely pro- gressing waves will consequently give rise to a stationary wave (fig. 16), and if we

take on the wire distances 4g pS BC, CD, DE, &.=4 A, Fig. 16,

the points B, C, D, E,... will be nodes, each of which separate portions of the wire vibrating in opposite direc- tions, %.¢., ventral segments.

56. Now, it is obvious that, inasmuch as a node is a point which remains always at rest while other parts of the medium to which it belongs are vibrating, such point may be absolutely fixed without thereby interfering with the oscillatory motion of the medium. If, therefore, a length

AB of wire be taken equal to any multiple of ; , A may be

fixed as well as B, the motion remaining the same ag before, and thus we shall have the usual case of a musical string. The two extremities being now both fixed, there will be repeated reflexions at both, and a consequent persistence of two progressive waves advancing in opposite directions and producing together the stationary wave above figured.

57. We learn from this that a musical string is suscep- tible of an infinite variety of modes of vibration corre- sponding to different numbers of subdivision into ventral

| segments. |

Thus, it may have but one ventral segment (fig. 17), or but two nodes formed by its fixed extremities. In this case, << the note emitted by itis the ~ B lowest which can possibly be Fig. 17. obtained from it, or, as it is called, its fundamental note. If J denote the length of the wire, by what has been already

proved, J= > and therefore the length of the wave A=

2l. Hence, V being the velocity of propagation of the wave through the wire, the number , of vibrations ae ie in the unit of time with the fundamental note is yk

The next possible sub-division of the wire is into two ventral segments, the three nodes being the two fixed ~— ~~ .c ends A, B, and the middle 4 '8 point C (fig. 18). Hence, /=A, Fig. 18. and the number of vibrations n, ot or double of those of the fundamental. The note, therefore, now is an 8" higher.

Reasoning in a like manner for the cases of three, four, &c., ventral segments, we obtain the following general law, which is applicable alike to transversely and to longi- tudinally vibrating wires:

A wire or string fixed at both ends ts capable of yielding, sn addition to its fundamental note, any one of a series of notes corresponding to 2, 3, 4 times, &c., the number of vibrations per second of the fundamental, viz., the octave, twelfth, double octave, de.

These higher notes are termed the harmonics or (by the Germans) the overtones of the string.

It is to be remarked that the overtones are in general fainter the higher they are in the series, because, as the number of ventral segments or independently vibrating parts of the string increases, the extent or amplitude of the vibrations diminishes. nein

58. Not only may the fundamental and its harmonics

Funda—

mental and harmonics,

May be heard tu gether.

-e 7 se rr

be obtained independently of each other, but they are also to be heard simultancously, particularly, for the reason just given, those that are lower in the scale. A practised ear easily discerns the coexistence of these various tones when a pianoforte or violin string is thrown into vibration. It is evident that, in such case, the string, while vibrating as a whole between its fixed extremities, is at the same time executing subsidiary oscil- 4 lations about its middle point, its points of trisection, &c., as shown in fig. 19, for the fundamental and the first har- monic.

Harmonics, 59. The easiest means for bringing out the harmonics of

how best g string consists in drawing a violin-bow across it near to

obtained. Gne end, while the feathered end of a quill or a hair-pencil is held lightly against the string at the point which it is intended shall form a node, and is removed just after the bow is withdrawu. Thus, if a node is made in this way, at 3 of AB from A, the note heard will be the twelfth. If light paper rings be strung on the cord, they will be driven by the vibrations to the nodes or points of rest, which will thus be clearly indicated to the eye.

Compari-

60. The formula x, ~~% shows that the pitch of the funda~~ son of fun-

damentals mental note of a wire of given length rises with the velocity

of strings of propagation of sound through it. Now we have learned

vibrating (§ 28) that this velocity, in ordinary circumstances, is

transverse- : : : P a

yard lot enormously greater for a wire vibrating longitudinally than

gitudinally. for the same wire vibrating transversely. The fundamental note, therefore, is far higher in pitch in the former than in the latter case.

As, however, the quantity V depends, for longitudinal vibrations, solely on the nature of the medium, the pitch of the fundamental note of a wire rubbed along its length depends—the material being the same, brass for instance—on its length, not at all on its thickness, &c.

But as regards strings vibrating transversely, such as are met with in our instrumental music, V, as we have seen (§ 27), depends not only on the nature of the sub- stance used, but also on its thickness and tension, and hence the pitch of the fundamental, even with the same length of string, will depend on all those various circumstances.

Fig. 19.

Transverse- 61. If we put for V its equivalent expressions before eee given, we have for the fundamental note of transversely o

vibrating strings: no y ae ‘ A*

*= NI me fd n (OT t= J**

l w?

whence the following inferences may be easily drawn:

If a string, its tension being kept invariable, have its length altered, the fundamental note will rise in pitch in exact proportion with its diminished length, that is, 2 varies then inversely as J. :

Hence, on the violin, by placing a finger successively on

% 843 23

pus one of the strings at 9’ 5 a’ 5B =, ., we shall ob- tain notes corresponding to numbers of vibrations bearing to ei a the ratios to unity of

the following, Viz., 3 4 3 9B? 2, which notes form, therefore, with

the fundamental, the complete scale. nx 62. By tuhtening a musical string, its length remaining V'Tension. unchanged, its fundamental is rendered higher. In fact, then, ~ is proportional to the square root of the tension. Thus, by quadrupling the tension, the note is raised an octave. Hence, the use of keys in tuning the violin, the

=e pianoforte, &c.

1 63. Equal lengths of strings of the same density and thickness. equally stretched, but of different thicknesses, give funda-

mentals which are higher in pitch in proportion to dimi- | nution of thickness (7.¢., » varies inversely as the thickness), | Thus, of two strings of same kind of gut, same length and same tension, if one be twice as thick as the other, its fundamental will be an octave lower. Hence, three of the | strings of the violin, though all of gut, have different | fundamentals, because unequally thick.

64. Equally long and equally stretched strings or wiresna | of different thickness and different material, have funda- 1 | mentals higher in pitch the less the weights of the strings ; WV weightt n here varies inversely as the square root of the weight w F™ of a given length of the string. onge |

65. If, in last case, the thicknesses of the stringsnq | which are to be compared together are equal, then n varies inversely as the square root of the density. N density)

Hence, in the violin and in the pianoforte, the lower notes are obtained from wires formed of denser material.

Thus, the fourth string of the violin is formed of gut covered with silver wire.

66. A highly ingenious and instructive method for Melde's 3 illustrating the above laws of musical strings, has been pertmem) recently contrived by M. Melde, and consists simply in a attaching to the ventral segment of a

vibrating body, ~ such as a tuning-fork ora bell-glass, a silk or cotton thread, the other extremity being either fixed or passing over a pulley and supporting weights by which the thread may be stretched to any degree required. The vibrations of the larger mass are communicated to the thread which, by proper adjustment of its length and tension, vibrates in unison and divides itself into one or more ventral segments easily discernible by a spectator. If the length of the thread be kept invariable, a certain tension will give but one ventral segment; the fundamental note of the thread is then of same pitch as the note of the body to which it is attached. By reducing the tension to } of its previous amount, the number of ventral segments will be seen to be increased to two, indicating that the first harmonic of the thread is now in unison with the solid, and consequently that its fundamental is an octave lower than it was with the former tension; thus confirming the law that » varies as ,/P. In like manner, on further lowering the tension to 1, three ventral segments will be formed, and so on.

The law that, cat. par., n varies inversely as the thick- ness may be tested by forming a string of four lengths of the single thread used before, and consequently of double the thickness of the latter, when, for the same length and tension, the compound thread will exhibit double the num- ber of ventral segments presented by the single thread.

The other laws admit of similar illustration.

Part VII. Stif Rods, Plates, de.

67. If, instead of a string or thin wire, we make use of Rod, fx a rod or narrow plate, sufficiently stiff to resist flexure, we ee may cause it to vibrate }

1 2. 3. trans transversely when fixed ; B B versely. at one end only. In this ¢ eer Cc D case the number of vi- brations corresponding to ¥ LE

the fundamental note varies as the thickness directly, and.as the square of the length inversely. i The annexed figures re- | \ u present the modes of vi- bration corresponding to the fundamental and the A A A first two overtones, the Fig. 20.

rod passing to and fro

between the positions AGKC and AHLD. In all eases A

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being fixed is necessarily a node, and B being free is the middle of a ventral segment. We have thus a succession of cases in which the rod contains 4, 3, §, &c. ventral seg- ments. The numbers of vibrations per second are as the squares of these, or, as 1 : 9 : 25 : &c. The reason of this is, that (taking the case of 'fig. 20, 3) the part FB, which may be regarded as an independent rod fixed at the end F, is evidently } of the length of AB, and consequently,

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at the same time, one or more other nodal points ought to be touched with the fingers while the bow is being applied. In this way, any of the possible configurations may be easily produced.

71. By similar methods, a circular plate may be made Circular to exhibit nodal lines dividing the surface by diametral Plates. lines into four or a greater, but always even, number of sectors, an odd number being incompatible with the general law of stationary waves that the parts of a body adjoining a nodal line on either side must always vibrate oppositely

to each other,

Another class of figures consists of Fig. 23.

since nx z has a proper note of 5? or 25 times the

rapidity of vibration in fig. 20, 1.

By attaching, with a little bees' wax, stiff hog's bristles to one prong of a tuning-fork, or to the edge of a bell- glass, or even a common jar, and clipping them on trial to suitable lengths, we shall find that, on drawing a note in the usual way from the tuning-fork or glass, the bristles will divide into one or more separately vibrating segments, as in the above figs.

68. The tuning-fork itself may be re- a; garded as belonging to the class of stiff ; rods. When emitting its fundamental { note, it vibrates, as in fig. 21, with nodes at 6 and d and extreme positions abcde and fbgdh. .

69. The transversal vibrations of thin square, circular, and other plates of metal or glass, are interesting, because, if these are kept ina horizontal position, light dry sand or powder sifted over the upper surface, will be thrown off the ventral segments to the nodal lines, which will thus be rendered manifest to the eye, forming what are termed Chladni's figures. As in the case of a musical string, so here we find that the pitch of the note is higher for a given plate the greater the number of ventral segments into which it is divided; but the converse of this does not hold good, two different notes being obtainable with the same number of such segments, the position of the nodal lines being, however, different.

_ 70. The upper line of annexed figures shows how the sand arranges itself in three cases, when the plates are square. The lower line gives the same in a sort of

FU EE

circular nodal lines along with dia- metral (fig. 23).

Circular nodal lines unaccompanied by intersecting lines cannot be pro- duced in the manner described ; but may be got either by drilling a small hole through the centre, and draw- ing a horse-hair along its edge to bring out the note, or by attaching a long thin elastic rod ta the centre of the plate, at right angles to it, holding the rod by the middle and rubbing it lengthwise with a bit of cloth powdered with resin, till the rod gives a distinct note; the vibra- tions are communicated to the plate, which consequently vibrates transversely, and causes the sand to heap itsclf into one or more concentric rings.

72. The theory of the vibrations of plates has not yet Theory been put on a quite satisfactory basis, The following law ofChladni's may, however, be regarded as confirmed by experiment, figures. viz., that when two different plates of the same substance present the same nodal configuration, the

numbers of vibrations are to each other directly as the thicknesses, and inversely as the superficial areas.

73. Paper, parchment, or any other thin membrane Vibrations stretched over a square, circular, &c., frame, when in the of mem- vicinity of a sufficiently powerful vibrating body, will, ‘™™°* through the medium of the air, be itself made to vibrate in unison, and, by using sand, as in previous instances, the nodal lines will be depicted to the eye, and seen to vary in form, number, and position with the tension of the plate and the pitch of the originating sound. The mem- brana tympani or drum of the ear has, in like manner and on the same principles, the property of repeating the vibrations of the external air which it communicates to the internal parts of the ear.*

74. Rods vibrating longitudinally are, as we have already Longitu- remarked, subject to the laws of stationary waves. If, for dinal vibra- instance, a wooden rod fixed at one end, be rubbed near ae ia the top between the finger and thumb previously coated”

Fig. 21.

; 3

Fig. 22.

idealised form, and as usually to be found in acoustical works. Fig. 22, 1 corresponds to the lowest possible note of the particular plate used; Fig. 22, 2 to the jifth higher; Fig. 22, 3 to the tenth or octave of the third, the numbers of vibration in the same time being as 2 to 3 to 5,

If the plate be small, it is sufficient, in order to bring out the simpler sand- figures, to hold the plate firmly between two fingers of the same hand placed at any point where at least two nodal lines meet, for instance the centre in (1) and (2), and to draw a violin bow downwards across the edge near the middle of a ventral segment. But with

larger plates, which alone will furnish the more complicated figures, a clamp-screw must be used for fixing the plate, and, |

with powdered resin, it will yield a fundamental note when it so vibrates as to have only one node (at the fixed extremity) and half a ventral segment reaching from that extremity to the other, that is, when the length / of the

rod is } A, or A = 4/, and therefore n "eri

*4l° also give overtones corresponding to 2, 3, &. nodes, the free end being always the middle of a ventral segment, and for which therefore the lengths of waves are = *, &c. (as will be easily seen by referring to figs. in § 67, which may equally represent transversal and longitudinal displacements). Hence, the fundamental and harmonies of a rod such as we are now considering, have vibrations whose rates are as the successive odd numbers.*

A series of like rods, each fixed at one end into a block of wood, and of lengths bearing to each other, the ratios 1: $: &c. (as in § 61), will give the common scale when rubbed in the manner already mentioned. This follows

from the fundamental having n= ' and therefore nx I. — 15

But it may

i

Air is the essential souree of sound in pipes.

Principles of Ber- nouilli's theory.

Pipe stopped at both ends.

Open pipe.

Pipe stopped at one end only.

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Glass rods or tubes may also be made to vibrate longi- tudinally by means of a moist piece of cloth; but it is advisable to clamp them firmly at the centre, when each half will vibrate according to the same laws as the

wooden rods above. The existence of a motion of the particles of glass to and fro in the direction of its length may be well exhibited, by allowing a small ball of stone or metal suspended by a string to rest against one extremity of the rod, when, as soon as the latter is made to sing by friction, the ball will be thrown off with considerable violence.

Part VIII. Theory of Pipes.

75. The longitudinal vibrations of air enclosed in pipes arc of greater practical importance than those of other bodies, because made available to a very great extent for musical purposes. In the flute, horn, trumpet, and other wind instruments, it is the contained air that forms the essential medium for the production of sound, the wood or metal enclosing it having no other effect but to modify the timbre or acoustic colour of the note.

76. In dealing with the theory of pipes, we must treat the air precisely in the same manner as we have dealt with elastic rods vibrating lengthwise, a pipe stopped at both ends being regarded as equivalent to a rod fixed at both ends, a pipe open at both ends to a rod free at both ends, and a pipe stopped at one end and open at the other to a rod fixed at one end and free at the other. When there- fore the air within the pipe is anywhere displaced along the length of the pipe, two waves travel thence in opposite directions, and being reflected at the extremities of the pipe, there results a stationary wave with one or more fixed nodal sections, on one side of which the air is at any moment being displaced in one direction, while on the other side it is displaced in the opposite. Hence, when the air on both sides of the node is moving in towards it, there is condensation going on at the node, followed by rarefaction on the reversal of the motion of the air. The full lines in annexed figs. are curves of displacements, the dotted lines curves of velocity and density (wd. § 10 and 14).

As a stopped end prevents any motion of the air, a nedal section is always found there, And as, at the open end, we may conceive the internal air to be mnaintained at the same density as the external air, we may assume that such end coincides with the middle of a ven- tral segment.

From these assumptions, which form the basis of Bernouilli's Theory of Pipes, we infer ; |

77. That in a pipe stopped at both ends, as in a rod fixed at both ends, the fundamental : note (fig. 25, 1), corresponds to A = 2/, and therefore to n=s,, the velocity of sound in air, and the overtones to numbers of vibrations = 2n, 3n, and so on. Fig. 25, 2, represents the octave. Fig. 25.

78. That in a pipe open at both ends the same holds good as‘in the previous case. For (fig. 26, 1) AC=4,. .A=4 AC = 2/, and in fig. 26, 2, AD = 4, and also

=}1/.:. A\=1, or } its value for the fundamental 3 and similarly for the other harmonics.

79. That in a pipe open at one end and stopped at

Fig. 24,

Vv denoting

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| 4 of value of A in previous

, assumed by Bernouilli are such as do not fully occur in

the other (or, as it is usually termed, a stopped pipe, case § 77, being purely imaginary),

the fundamental note hasn= a ‘ – and the overtones corres- 1——~ ——~ pond to 3n, 5n….*

For, in fig. 27, 1, AB or

1=4A, and in fig. 27, 2, CB 4 or $d is evidently=} AB or 22 ?™ m s

11, whence A = $/, which being

case, shows that the number a

of vibrations is three times greater. other overtones.

80. It follows from the above, that a given pipe Harmonie (whether open or stopped) may . is in Pipes, be made to emit, in addition , to or in combination with its fundamental, a series of over- tones, which, in an open pipe, follow the natural numbers, and hence are the octave, twelfth, &c., but, in a stopped pipe, follow the odd numbers, so as to want the octave and other notes represented by the even numbers. The succession of overtones may be practically obtained by properly regulating the force of the blast of air by which the air-column is put into vibration.

81. If the fundamental notes of two pipes of equal Notes of lengths, but of which one is open, the other stopped, be open and compared together, they will be found to differ in pitch by ae an octave, the stopped being the lower. This fact is in oa keeping with the theory, for the numbers of vibrations lengths.

Similarly for the

Fig. 27.

ue are in the ratio of 2 to 1.

82. By altering the length of the same pipe, we can no i vary the pitch of the fundamental at pleasure, since n varies inversely as 7. This is effected in the flute and some other wind instruments by means of openings along part of the pipe, which, being closed or opened by means

of keys and of the fingers, increase or diminish the length

of the vibrating air-column. In this manner the successive notes of the scale are usually obtained within the range of

an octave. The scale is further extended by bringing into play the higher harmonics.

being respectively x and

83. Since in an open pipe n= x and therefore 7= ~ , Length of

if for V we put 1090 ft., and for » 264, which is the number of vibrations per second usually assigned to the note C, we get / = 2 ft. very nearly. This, accordingly, is the length of the so-called C open pipe. The C stopped pipe must, by what has been stated above, be 4 feet in length.

*84, Conversely it is obvious that the velocity V of sound Velocity i in air, and generally in any gas, may be deduced from the 29Y * . equation V = 2n/, and that if two pipes of equal length oma contain respectively air and any other gas, the velocities in the two media being to each other directly as the number of vibrations of the notes they respectively emit, we may, from the well-ascertained value of the velocity in air, determine in this way the velocities in other gases, and thence the values of thcir coefficients y (wd. § 21).*

85. While the inferences drawn by means of Bernouilli's Defects of theory agree, to a certain extent, with actual observation, Bemow™ there are discrepancies between the two which point to a the existence of some flaw in one or both of the hypotheses on which the theory rests. In truth, the conditions

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practice. The stopped extremity of a pipe is always to some extent of a yielding nature, and does not therefore exactly coincide with a nodal surface; nor can the internal air immediately adjoining the open end be perfectly free from variation of density during the vibrations of the whole mass, particularly so at the embouchure, where the blast is introduced by which the tone is originated. It would appear from recent experiments that the pitch of a pipe is somewhat lower than the above theory would indicate.

86. The reed-pipe differs in many respects from the simple pipe which we have been considering. A small elastic strip of metal, fixed at one extremity (the reed), lies over a slit of the same shape, and is set in transverse vibration by a current of air acting underneath. If, as is the case in the accordion and harmonium, the reed is un- provided with a pipe, the pitch of its note is regulated altogether by the dimensions of the reed, in conformity with the law of tranversely vibrating plates ; although, it is to be remarked, the note is really due to the vibrations of the air which alternately escapes through the slit of the reed, and is prevented doing so exactly as often as the reed executes a movement to and fro. The proper note of the reed itself is very poor and faint.

87. In the reed-pipe there is added above the recd a pipe the air in which partakes of the vibratory motion, and im- proves the quality of the sound. The pitch is, however, not affected by this pipe, unless it exceed a certain length 1, when the pitch begins to fall, and continues to do so as / is increased, till, when the length of pipe is 2/, the note is again restored to its original pitch, &c.

88. M. Weber, to whom we are indebted for these and other curious facts respecting reed pipes, has explained them thus:—If the reed be exactly at that part of the vibrating air-column where the air-displacements. are at their maximum, and where consequently the air suffers no variation of density during the vibratory motion of the column, the oscillations of the reed are not at all affected by the air-vibrations, and consequently the pitch of the reed-pipe is the same as that of the reed itself. But if the reed be

situated at any other part of the air-column, and especially at a nodal section, where the air is undergoing alternate condensation and rarefaction, then, when the air- blast from the wind chest pushes in the reed, the air in the pipe is in the act of rarefaction, and consequently tends to accelerate the reed inwards, whereas the elasticity of the reed tends in an opposite direction. When, again, the reed is passing to the other extreme of its vibration, the air in the pipe is in the act of condensation, and tends to accelerate the reed outwards or in the opposite direction to the elasticity of the reed. Hence the reed is affected just as if its elasticity, and therefore the rapidity of its vibra- tions, were diminished, and thus the pitch is lowered.

Part IX, Singing Flames.

89. The chemical or gas harmonicon, which consists of a small flame of hydrogen or of coal gas, burning at the lower part of the interior of a glass tube, and giving out a very distinct note, exhibits considerable analogy with the reed-pipe. For, as Sondhaus seems to have established, the primary cause of the note lies in the oscillations of the gas within the burner and the feeding-pipe, which there- fore play exactly the same part as does the reed portion of the reed-pipe. The air in the glass tube being heated by the flame ascends, and the pressure above the flame being thence diminished, the flame is forced upwards by the gas beneath, until an influx of atmospheric air at the top of the tube forces the flame back. Thus a periodic agitation

which communicate by caoutchouc tubes with a

of the flame ensues, accompanied by a corresponding dis- turbance of the air-column in the glass tube. The size of the flame and its position within the tube must be so regulated as to bring out the best possible note, which will then be found to be the same as the air in the tube would itself emit, according to the laws of pipes, allowance being made made for the high temperature of the air. A series of tubes may thus be arranged of suitable lengths to give the common scale. It sometimes happens, particularly with short tubes, that the note will not come out spontane- ously, all that is required, then, is either by blowing gently at the top of the tube, or by

singing in unison with the expected note, to give to the air the requisite initial move- ment.

The flame, which burns steadily with a yellowish light before the tube sounds, will, as soon as the note is heard, be seen to flicker up and down, changing rapidly from yellow to blue and blue to yellow, its intensity also chang- ing periodically. These fluctuations are best seen by view- ing the image of the flame reflected by a small plane mirror, held in the hand and moved to and fro. Before the note is heard, the image of the then quiescent flame, being im- pressed on different points of the retina, appears as a con- tinuous luminous strip; but, when the harmonicon speaks, the various images become quite detached from one another, showing that the portion of the retina over which the reflected light passes is sensibly affected only at certain points of it, which evidently correspond to the instants of time at which the flame, in its periodical fluctuations, is at its brightest.

90. Naked flames, that is, flames unaccompanied by tubes, Naked may also give out musical notes, and many singular in- flames.

stances are mentioncd by Tyndall and others of their

*sensitiveness to external sounds. 91. Koenig of Paris has constructed an apparatus in- Flame tended to indicate the modes of vibration of the different manometer. parts of vibrating bodies, such as columns of air, &c., by means of flames, and to which he has given the name of the Flame Manometer. We will here describe its applica- tion to the case of organ- pipes. apertures along one side, one at the middle, o (fig. 28), ze., at a node of the fundamental tone, and the two others, a, d, half way betweén pipe, and coinciding therefore with the nodes of | { the first overtone or octave. *

An open pipe has three

o and the extremities of the

—.

These openings are closed by thin flexible membranes forming the ends of small boxes or capswles, the spaces within

coal-gas reservoir, and also by separate tubes with small gas burners arranged on a vertical stand. The gas being introduced, and the three flames kindled and adjusted to equal heights of about # of an inch; if the pipe be made now to utter its first over- tone, the flame connected with o will remain stationary and of the same brightness as before, but those communi- cating with a and 6 will become longer and thinner, and assume a bluish and faint Imminosity. But, if the fnnda- mental be brought out of the pipe, then it is o's flame that is violently affected, while those of a and 6 are scarcely affected at all. If the flames be originally made less in height (say + inch), those of a and 6 in the former case, and of o in the latter, will be extinguished. These results are fue to the condensations and rarefactions of the air in the pipe which are at their maximum at a node, causing the membrane placed there to vibrate outwards and inwards, and hence to force more or less of the gas into the burner.

In order to compare together the notes of different pipes, four plane reflecting surfaces are connected together in the form of a cube, which is mounted on a vertical axis about which it is capable of being turned round. Each pipe is

Fig. 28.

furnished with one opening, a membrane, &c. (as above), at its middle. As pointed out (§ 87), if any of the pipes be made to sound, the reflector being at the same time put in motion, a series of separate images will be seen. On sounding another pipe, whose fundamental ts an octave higher, we shall have a second line of images separated from each other by half the interval of those in the former series. This is best observed when the two flames are placed in the same vertical linc. If the note of the second pipe is a fifth higher than the first, and consequently its vibra- tions to those of the first as 3 to 2, then the same space which contains two images of the lower note will contain three of the higher, and so on, for other combinations. When more complicated ratios are to be tested, it 1s pre- fcrable to connect both capsules with the same burner, either with or without the reflector.

Part X.

Communication of Vibrations

Communi- 92, The communication of sonorous vibrations from one cation be- body to another plays so essential a part in acoustics that

eee a few words must here be given to the subject. It appears solids, and to be well established that while the vibrations of a solid liquids. arc in general most readily communicated to other solids

in contact with it, they are not so to liquids, and still less so to air and other aeriform fluids. Thus, a tuning-fork is inaudible at any moderate distance unless applied to a table, by whose extended surface the air can be more intensely affected. So likewise a musical string sounds very poorly unless connected with a resonant cavity or wooden chest, to the wood of which it first imparts its vibratory motion, which then produces stationary waves in the continued air. Kundt'sex- 93. A few years ago M. Kundt made known a method periments. founded on the communicability of vibration, by which the velocities of sound in different media may be compared together with great facility. Take a glass tube 3 feet or up- wards in length, drop into it a small quantity of the fine powder of the club-moss or lycopodium, and turn the tube round so as to spread the powder over the internal surface of the tube. Stop both ends of the tube with corks, clamp it at its centre, and rub one of its halves lengthwise with a moist cloth, so as to cause the glass to sound a note. It will then be found that, the air within the tube taking up the motion, and a stationary wave being fornied in it, the powder is driven off from the ventral segments and forms little heaps at the nodes. The dust-heaps are, by the laws of stationary waves, separated therefore from each other by intervals each equal to half the length of an air-wave, or A If, then, the number of heaps =m, and the length of the tube =/; ==. But, by the laws of longitudinal vibrations of rods, the length 2' of the glass-wave -4(5) =2l. Hence ~ =m,

that is, the number of dust-hcaps is equal to the ratio of the lengths of a wave of sound in glass and in air, and consequently to the ratio of the velocities of sound in those media. (For the vibrations being in unison, their number in a given time must be the same for the glass and the

air, 4.6, == 373 VY, V' being the velocities),

Kundt found 16 to be the number of heaps; prior experiments of a different kind had, as we have before mentioned, given this as the number of times that the velocity of sound in glass exceeds its velocity in air.

Instead of producing the air-vibrations by friction of the tube containing the air, it is preferable to make usc of a smaller tube or rod, furnished with a cork at one end, which

fits like a piston into the tube, and projecting at its outer end through an opening in the cork which closes the air- tube. The rod thus inserted is the one which is rubbed longitudinally and communicates its vibrations to the air in the enclosing tube. By means of an apparatus of this kind, Kundt determined the ratio to the velocity of sound in air of its velocity in various solids, and also (replacing the air in the tube by differcnt gases) of its velocity in these gases. Part XI.

Interference of Sound.

94, When two or more sonorous waves travel through the same medium, each particle of the air being simultanc- ously affected by the disturbances due to the diffcrent waves, moves in a different manner than it would if only acted on by each wave singly. The waves are said mutually to interfere. We shall exemplify this subject by consider- ing the case of two waves travelling in the same direction through the air. We shall then obviously be led to the following results :—

95. If the two waves are of equal length X, and are in the same phase (that is, each producing at any given moment the same state of motion in the air-particles), their combined effect is equivalent to that of a wave of the same length A, but by which the excursions of the particles are increased, being the sum of those due to the two com- ponent waves rc- spectively.

If the two inter- fering waves, being still of same length A, be in opposite phases, or so that

owen,

Fig. 29.

she rN one is in advance of the other by 9° and consequently one

produces in the air the opposite state of motion to the other, then the resultant wave is one of the same length A, but by which the excursions of the particles are de- creased, being the difference between those due to the component waves. If the amplitudes of vibration which thus mutually interfere are moreover equal, the effect is the total mutual destruction of the vibratory motion. Thus we learn that two musical notes, of the same pitch, conveyed to the ear through the air, will produce the effect of a single note of the same pitch, but of increased loudness, if they are in the same phase, but affect the ear very slightly, if at all, when in opposite phases. If the differ-

ence of phase be varied gradually from zero to ay the result-

ing sound will gradually decrease from a maximum to a minimum.

96. Among the many experimental confirmations which may be adduced of these proportions, we will mention the following -—

Take a circular plate, such as is available for the production of Chladni's

figures (§ 71), and cut out of a sheet " of pasteboard a piece of the shape ABOCD (fig. 30), consisting of two circular quadrants of the same diameter as the plate. Let, now, the plate be made in the usual manner to vibrate so as to exhibit two nodal lines coinciding with two rectangular diameters. If the ear be placed right above the centre of the plate, the sound will be scarcely audible. But, if the pastcboard be interposed so as to intercept the vibrating scgments AOB, DOC, the note becomes much more distinct. The reason

Meaning of _ interfer- ence,

Two waves of equal lengths,

Experi- mental il-

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other will be in the same phase, that is, the length of the resultant wave will be mA or m" X', and if N denoto the

/

corresponding number of vibrations N = = or –

of this is, that the segments of the plate AOD, BOC always vibrate in the same direction, but oppositely to the segments AOB, DOC. Hence, when the pasteboard is in its place, there are two waves of same phase starting from the two former segments, and reaching the ear after equal distances of transmission through the air, are again in the same phase, and produce on the ear a conjunct im- pression. But when the pasteboard is removed, then there is at the ear opposition of phase between the first and the second pair of waves, and consequentlya minimum of sound.

and Funda- mental and octave.

' n Thus, for the fundamental and its octave i 3,

therefore N=n or =A that is, the note of interference

is of the same pitch as the fundamental.

| ne Senet 4 For the fundamental and its major third, . a Hence Funda-

Fag =

lokpin's 97. A tubular piece of wood shaped as in fig. 31, and ; nv vicntelenatl vent 4 ge o 2 a mere a sa . N= 70 = that is, the resulting sound is two octaves major third. i e opening ' :

strewn over the membrane, is so placed over a lower than the fundametal.

i

h

came /Anometer,

be set in violent movement. But if the same ends A, B, be placed over oppositely vibrating segments (such as AOD, COD), the sand will be scarcely, if at all, affected.

98, If a tuning-fork in vibration be turned round before the ear, four positions will be found in which it will be inaudible, owing to the mutual interference of the oppo- sitely vibrating prongs of the fork. On interposing the hand between tho ear and either prong of the fork when in one of those positions, the sound becomes audible, be- cause then one of the two interfering waves is cut off from the ear. This experiment may be varied by holding the fork over a glass jar into which water is poured to such a depth that the air-column within reinforces the note of the fork when suitably placed and then turning the fork round.

99, Helmholtz' double syren (§ 51) is well calculated for the investigation of the laws of interference of sound. For this purpose a simple mechanism is found in the in- strument, by means of which the fixed upper plate can be turned round and placed in any position relatively to the lower one. If, now, the apparatus be so set that the notes from the upper and lower chest are in unison, the upper fixed plate may be placed in four positions, such as to cause the air-current to be cut off in the one chest at the exact instant when it is freely passing through the other, and vice versa. The two waves, therefore, being in opposite phases, neutralise one another, and the result is a faint sound. On turning round the upper chest into any inter- mediate position, the intensity of the sound will increase up to a maximum, which occurs when the air in both chests is being admitted and cut off contemporaneously.

100. If two pipes, in exact unison, and furnished with flame manometers, are in communication with the same wind-chest, and the two flames be placed in the same vertical line, on introducing the current from the bellows, we shall find that the two lines of reflected images will be so related that each image in one lies between two images in the other. This shows that the air-vibrations in one pipe are always in an opposite phase to

the other, or that condensation is taking place in the one when rarefaction occurs in the other. This arises from the current from the bellows passing alternately into the one and the other pipe. There will also be a remarkable collapse of the sound When both pipes communicate with the wind-chest com- pared with that produced from ono pipe alone.

101. If the two interfering waves are such as produce vibrations whose numbers per second are n, n' respectively, these being to each other in the ratio of two integers m, m' when expressed in its lowest terms, then the lengths of the waves A, A' being inversely as n ton', will be to each other as m':m, and consequently mA=m'N'. Particles therefore of the air separated by this distance from each

; i i 4 ' : n 3

circular or rectangular vibrating plate, that the B For the fundamental and its major sixth, "~ ="; N Funda.

ends A, B lie over the segments of the plate, Fig. 31 an) pont anal I such as AOD, COB in the previous fig., which hats _ 2 nv salt d is a twelfth ™" MPT eine fate of motion. The sand at C will therefore = 5 or = and the resulting sound is a tw

below the lower of the two interfering notes. If m and m' differ by 1, then N=n-7n'; for m—m' fe es. @ or l=>- x: of two interfering sounds is expressible in its lowest terms by numbers whose difference is unity, the resulting note has a number of vibrations simply equal to the difference of those of the interfering notes.

The results stated in this section may be tested on a har- monium. Thus, if the notes B, C, at the extreme right of the instrument be struck together, there will be heard an interference note four octaves lower in pitch than the above C, because the interval in question being a semi- tone, is +, and, consequently, by.last case, the interference note is lower than the C by interval 4g.

Other notes may be heard resulting from the mutual interference of the overtones.

102. When two notes are not quite in tune, the resulting Beats,

sound is found to alternate between a maximum and mini- mum of loudness recurring periodically. To these perivdical alternations has been given the name of Beats. Their origin is easily explicable. Suppose the two notes to cor- respond to 200 and 203 vibrations per second; at some instant of time, the air-particles, through which the waves are passing, will be similarly displaced by both, and con- sequently the joint effect will be a sound of some intensity. But, after this, the first or less rapidly vibrating note will fall behind the other, and cause a diminution in the joint displacements of the particles, till, after the lapse of 3 of a second, it will have fallen behind the other by } a vibra- tion, At this moment, therefore, opposite displacements will be produced of the air-particles by the two notes, and the sound dne to them will be at a minimum. This will be followed by an increase of intensity until the lapse of another sixth of a second, when the less rapidly vibrating note will have lost another half-vibration relatively to the other, or one vibration reckoning from the original period of time, and the two component vibrations will again con- spire and reproduce a maximum effect. Thus, an inter. val of 3 of a second elapses between two successive maxima or beats, and there are produced three beats per second. By similar reasoning it may be shown that the number of beats per second is always equal to the difference between the numbers of vibrations in the same time corresponding to the two interfering notes. The more, therefore, these are out of tune, the more rapidly will the beats follow each other.

Beats are also heard, though less distinctly, when other concords such as thirds, fifths, &c., are not perfectly in tune ; thus, 200 vibrations and 303 vibrations per second, which form, in combination, an imperfect fifth, produce beats occurring at the rate of three per second.

Hence, if the ratio of the vibrations Case of

Examples of beats.

118 eC OUST ICS

103. The phenomena of beats may be easily observed with two orgau-pipes put slightly out of tune by placing the hand near the open end of one of

them, with two nuusical strings on a resonant chest, or with two tuning-forks of same pitch held over a resonant cavity (such as a glass jar, vid. § 97), one of the forks being put out of tune by loading one prong with a small lump of bees'-wax. In the last instance, if the forks are fixed on one solid piece of wood which can be grasped with the hand, the beats will be actually felt by the hand. If one prong of each fork be furnished with a small plain mirror, and a beam of light from a luminous point be reflected successively by the two mirrors, 80 ag to form. an image on a distant screen, when one fork alone is put in vibration, the image will move on the screen and be seen as a line of a certain length. If both forks are in vibration, and are perfectly in tune, this line may either be increased or diminished permanently in length, according to the difference of phase between the two sets of vibrations. But if the forks be not quite in tune, then the length of the image will be found to fluc-

'tuate between a maximum and a minimum, thus making the

The num- ber of vi- brations of a note found by beats.

Tuning by beats.

Irritating ~

effect of rapid beats.

beats sensible to the eye. The vibrograph (§ 52, 53) is also well suited for the same purpose, and so in an especial manner is Helmholtz' double syren (§ 51), in which, by continually turning round the upper box, a note is produced by it more or less out of tune with the note formed by the lower chest, according as the handle is moved more or less rapidly, and most audible beats ensue. The gas harmonica and the flame manometer also afford excellent illustrations of the laws of beats.

104. Advantage has been taken of these laws for the purpose of determining the absolute number of vibrations per second corresponding to any given note in music, whence may be derived the number for all the other notes (§ 45). The human ear may be regarded as most correctly appreciating two notes differing by an octave. Two tuning- forks then are taken, giving

respectively the note A and its lower octave, and a number of other forks are prepared intermediate in pitch to these, say 54, and by means ef bees'-wax these are so tuned, that the first gives four beats with the A fork, the second four beats with the fourth, and so on up to the last, which also gives four beats with the A_, fork. Now, if x =the unknown number of vibrations for the note A, n-4, n-8 …n—55×4, will be the numbers for all the successive forks down to the A_, fork, n—55xX4 ————- = fand consequently = 440.

105. Beats also afford an excellent practical guide in th tuning of instruments, but more so for the higher notes of the register, inasmuch as the same number of beats, that is, the same difference between the numbers of vibrations, for two notes of high pitch, indicates greater deviation from perfect unison, than it does for two notes of low pitch. Thus, two low notcs of 32 and 30 vibrations

which being an octave below A, we have:

respectively, whose interval is therefore ie or = 2.€., & Semi-

15

tone, give two beats per second, while the same number of beats are given by notes of 32×16 (four octaves higher than the first of the preceding) or 512 and 514 vibrations, which are only slightly out of tune.

106. As the interval between two notes, and con- sequently the number of beats increases, the effect on the car becomes more and more unpleasant, and degenerates at last into an irritating rattle. With the middle notes of the musical register, this result occurs when the number of beats comes up to 20 or 30 per second, the musical interval between the two interfering notes being then between half and a whole tone. Helmholtz attributes the disagreeable im- pression of beats on the ear, to the same physiological cause

to which is due the painful effect on the eye of a faint flickering light, as, for instance, the light streaming through a wooden paling with intervening openings when the individual affected is passing alongside. In this case, the

retina, which, when continuously receiving the same amount of light, thereby loses its sensitiveness in a great degree, is unable to do so.

It is, however, remarked by the above-mentioned author that the same number of beats, which has so irritating an effect when due to two notes in the middle of the register, is not attended by the same result when due to notes of much lower pitch. Thus, the notes C, D forming a tone give togethcr 33 beats per second, while a note two octaves lower than C also gives 33 beats with its fifth; yet the former combination forms a discord, the latter a most pleasing concord.

107. When the number of beats reaches to 132 or Difference. upwards per second, the result is a continuous and not tones unpleasing impression on the ear, and it was formerly held that the effect was always equivalent to that of a note having that number of vibrations. Helmholtz has shown that this opinion is inaccurate, except when the interfering tones are very loud, and consequently accompanicd by very considerable displacements of the particles of the vibrating medium. 'These resultant tones being, as to their vibration-number, equal to the difference between the numbers corresponding to the two primaries, are termed difference-tones, and may be best observed with the double syren. The same author was led also, on theoretical grounds, to surmise the formation of swmmation-tones by gumma- the interference of two loud primaries, the number of tion-tones | resultant vibrations being then equal to the sum of the numbers for the two components, and appealed for experi- mental proof to his syren. But, at the last meeting of the British Association (1872), Koenig, the celebrated Parisian acoustician, maintained that the notes of the syren, thus held to be summation-tones, were in reality the difference- tones of the harmonics.

108. By reference to the laws of the interference of Helm

vibrations, Helmholtz has been enabled to offer a highly holtz's er satisfactory explanation of the cause whence arises dif- re ference of quality or timbre or acoustic colour between coleme : different sounds. He has shown conclusively that there are but few sounds which are of a perfectly simple character, that is, in which the fundamental is not accompanied by one or more overtones. Now, when a note is simple, there can be no jarring on the ear, because there is no room for interference of sound. Hence, the

softness of the tuning- fork when its fundamental is reinforced by a resonant cavity, and also of the flute. The same character of soft- ness belongs also to those instruments in which the powerful harmonics are limited to the vibration ratios 2, 3… 6 (§ 57, 80); because the mutual interference of the funda- mental and their harmonics give rise to concords only. The piano, the open organ pipe, the violin, and the softer tones of the human voice, are of this class. But if the odd harmonics alone are prescnt, as in the narrow stopped organ pipe, and in the clarionet, then the sound is poor, and even nasal; and if the higher harmonics beyond the sixth or seventh are very marked, the result is very harsh (as in recd-pipes)

109. The human voice (for a description of the organ in Voice. which it originates, we refer to Art. Physiology— Voice and Speech)is regarded by the best authorities as being analogous to a rced-pipe, the vocal chords forming the reed, and the cavity of the mouth the pipe, and, like the reed, is rich in harmonics, as many as sixteen having been detected in a bass voice. But their number and relative intensities differ much in different individuals, or even in the same person at dif- ferent times ; and it is on this variety that, agreeably to Helm-

holtz's theory of timbre, the peculiarities depend by which any one voice may be unmistakably distinguished from every other. Voices in which overtones abound are shar P, and even rough; those in which they are few or faint, are soft and sweet. In every voice, however, the aacaaioer, and relative intensity of the overtones depend on the form assumed by the cavity of the mouth, which acts relatively to the vocal chords precisely as a resonator does to a tuning-fork, or a pipe to a reed. This may be easily tested by holding a tuning-fork before the open mouth, when, by giving to the cavity a suitable form, the Faia Madani or some overtone of the fork may be heard distinctly reverberated from the interior of the mouth. Each vowel sound, as Helmholtz has shown, is simply the result of the reinforcements by the air in the cavity of the mouth, and its prolongation towards the larynx, of one or in some cases two overtones of determinate pitch, contained in the

sound which proceeds from the vocal chords. Koenig assigns the following notes as characteristic of the

simpler vowel sounds (adopting the foreign pro- A-—— nunciation):—To U, the note Bb below the line —r

in the G clef, corresponding to 225 vibrations per second; to O, the next higher octave, consequently of

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double the number of vibrations, and thence ascending by octaves for A, E, and I, the last of which is therefore characterised by a note of 3600 vibrations per second.

The above theory of vowel sounds may be satisfactorily confirmed by means of tuning-forks, vibrating in front of resonant cavities, which can, ~ by suitable combination, be made to utter any vowel sound.

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Lon-

ALPHABETICAL INDEX.

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ACQUI, a town of Northern Italy, in the province of Alessandria, 18 miles 8.S.W. of the city of that name, on the left bank of the Bormida. It is a place of great antiquity; and its hot sulphur baths, which are still much frequented, were known to the Romans, who gave the place the name of Aquc Statielle. 'There are still to be found uumerovs ancient inscriptions, and the remains of a Roman aqueduct. The town is the seat of a bishop, and has a fine cathedral, several convents, and a royal college. Good wine is produced in the vineyards of the district, and great attention is given to the rearing of silk-worms. There are also considerable silk manufactures. Population, 8600.

AGRE, a measure of surface, being the principal deno- mination of land-measure used in Great Britain. The word (akin to the Saxon acer, the German acker, and the Latin ager, a field) did not originally signify a determinate quantity of land, but any open ground. The English standard or imperial acre contains 4840 square yards, or 10 square chains, and is also divided into roods, of which it contains 4, the rood again being divided in

40 perches. The imperial acre has, by the Act 5 Geo. IV. «. 74, super- seded the acres, of very different extent, that were in use in different parts of the country. The old Scottish acre was equal to 1:26118345 imperial acres. The Irish acre eontains 7840 square yards. 'The acre is equivalent to -40467, t.e., about 2ths, of the French hectare (now the basis of superficial measurement in Germany, Italy, and Spain, as well as in France), '7 of the Austrian joch, '37 of the Russian desitine, and 1°62 ancient Roman jugera. The hectare corresponds to 2 acres 1 rood 35°38 perches.

ACRE, AxKa, or St Jean D'Acrz, a town and seaport of Syria, and in ancient times a celebrated city. No town has experienced greater changes from political revolutions and the calamities of war. According to some this was the Accho of the Scriptures; and its great antiquity is proved by fragments of houses that have been found, consisting of that highly sun-burnt brick, with a mixture of cement and sand, which was only used in erections of the remotest ages. It was known among the ancients by the name of Ace, butit is only from the period when it was taken posses- sion of by Ptolemy Soter, king of Egypt, and received from him the name of Ptolemais, that history gives any eertain account of it. When the empire of the Romans began to extend over Asia, Ptolemais came into their pos-session. It is mentioned by Strabo as a city of great importance; and fine granite and marble pillars, monu- nents of its ancient grandeur, are still to be seen. During the Middle Ages Ptolemais passed into the hands of the Saracens. They were expelled from it in 1110 by the Crusaders, who made it their principal port, and retained it until 1187, when it was recovered by Saladin. In 1191 it was retaken by Richard I. of England and Philip of France, who purchased this conquest by the sacrifice of 100,000 troops. They gave the town to the knights of St John of Jerusalem, from whom it received the name of St Jean D'Acre. In their possession it remained for a century, though subject to eontinual assaults from the Saracens. It was at this time a large and extensive city, populous and wealthy, and contained numerous churches, convents, and hospitals, of which no traces now remain. Acre was finally lost to the Crusaders in 1291, when it was taken by the Saracens after a bloody siege, during which it suffered severely. From this time its prosperity rapidly declined. In 1517 it fell into the hands of the Turkish sultan, Selim J.; and in the beginning of the 18th century, with the exception of the residences of the French factors, a mosque, and a few poor

cottages, it presented a vast scene of ruin. Towards the end of that century Acre was much strength- ened and improved by the Turks, particularly by Djezzar Pacha, and again rose to some importance. It is memor-

able in modern history for the gallantry with which it was defended in 1799 by the Turks, assisted by Sir Sydney Smith, against Bonaparte, who, after spending sixty-one days before it, was obliged to retreat. It continued to enjoy an increasing degree of prosperity till 1832. Though fettered by imposts and monopolies, it earried on a eon- siderable foreign trade, and had resident consuls from most of the great states of Europe. On the revolt of Mehemet Ali, the pacha of Egypt, Acre was besieged by his son, [brahim Pacha, in the winter of 1831-32. The siege lasted five months and twenty-one days, and, before the city was taken, its public and private buildings were mostly destroyed. Its fortifications were subsequently repaired and improved by the Egyptians, in whose hands it remained until 3d Nov. 1840, when the town was reduced to ruins by a three hours' bombardment from the British fleet, acting as the allies of the sultan. The Turks were again put in possession of it in 1841.

Acre is situated on a low promontory, at the northern extremity of the Bay of Acre. The bay affords no shelter in bad weather; and the port is scarcely capable of contain- ing'a dozen boats. Vessels coming to this coast, therefore, generally frequent the anchorage of Caiffa, on the south side of the bay. Acre is 80 miles N.N.W. of Jerusalem, and 27 8. of Tyre. Population, 10,000.

ACROBAT (from dxpoBaréw, to walk on tiptoe), a rope- dancer. Evidence exists that there were very skilful per- formers on the tight-rope (fwnambuli) among the ancient Romans. Modern acrobats generally nse a long pole, loaded at the ends, and by shifting this are enabled to maintain, or readily to recover, their equilibrium. By an extension of the meaning of the term, acrobatic feats now include trapéze leaping and similar performances.

ACROCERAUNIA, in Ancient Geography, a promon- tory in the N.W. of Epirus, which terminates the Montes Ceraunii, a rauge that runs 8.E. from the promontory along the coast fora number of miles, and is supposed to have derived its name from being often struck with light- ning. The cape (now called Glossa by the Greeks, and Lin- guetta by the Italians) is in lat. 40° 25’ N.

ACROGEN 4 is the name applied to a division of acoty- ledonous or cryptogamous plants, in which leaves are pre- sent along with vascular tissue. In the higher divisions of Acrogens, as ferns and lycopods, the tissue cousists of scalari- form vessels, while in the lower divisions spiral cells are observed, which take the place of vessels. The term Acro- gen means summit-grower, that is, a plant in which the stem increases specially by the summit. This is not, how- ever, strictly accurate. .

ACROLITH (éxpodAr6or), statues of a transition period in the history of plastic art, in which the trunk of the figure was of wood, and the head, hands, and feet of marble. The wood was concealed either by gilding or, more commonly, by drapery, and the marble parts alone were exposed. Acroliths are frequently mentioned by Pausanias, the best known specimen being the Minerva Areia of the Plateans.

ACRON, a celebrated physician, born at Agrigentum in Sicily, who was contemporary with Empedocles, and must therefore have lived in the 5th century before Christ. The successful measure of lighting large fires, and purify- ing the air with perfumes, to pnt a stop to the pestilence that raged in Athens (430 B.c.), is said to have originated with him; but this has been questioned on chronological grounds. Pliny is mistaken in saying that Acron was the founder of the sect of the Empirici, which did not exist until the 3d century before Christ. The error probably arose from a desire on the part of the sect to establish for itself a greater antiquity than that of the Dogmatici. Suidas gives the titles of several works written by Acron,

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on medical subjects, in the Doric dialect, but none of these now exist.

ACROPOLIS (’Axpérodus), a word signifying the upper town, or chief place of a city, a citadel, usually on the summit of a rock or hill. Such buildings were common in Greek cities; and they are also found elsewhere, as in the case of the Capitol at Rome, and the Antonia at Jerusalem ; but the most celebrated was that at Athens, the remains of which still delight and astonish travellers. It was enclosed by walls, portions of which show traces of extreme antiquity. It had nine gates; the principal one was a splendid struc- ture of Pentelican. marble, in noble Doric architecture, which bore the name of Propylaia. Besides other beauti- ful edifices, it contains the IlapOeviv, or temple of the virgin goddess Athene, the most glorious monument of ancient Grecian architecture.

a, Pedestal of Rome and Augustus.

b, c, d, Sites of temples of Minerva, Diana, and Venus.

e, Erectheium.

f, Dionysiac theatre.

g, Odeon of Herodes,

h and 0, Grottoes,

#, Ruined mosque.

k, 1, Gate and portico.

m, Choragic monument of Thrasyeles, now church of our lady of the grotto.

n, mn, Remains of Pelasgic wall.

Pp, u, Walls of outworks, &c.

8, Gate to Propylea.

qg, 7, t, Forts,

u, v, Ancient walls.

ACROSTIC (from dxpos and orixos, meaning literally the extremity of a verse), is a species of poetical composi- tion, so constructed that the initial letters of the lines, taken consecutively, form certain names or other particular words. This fancy is of considerable antiquity, one of the most remarkable examples of it being the verses cited by Lactantius and Eusebius in the 4th century, and attri- buted to the Erythrean sibyl, the initial letters of which form the words "Incots Xpiords cod vids cwryp: "Jesus Christ, the Son of God, the Saviour," with the addition, according to some, of oravpds, "the cross." The initials of the shorter form of this again make up the word ixOus, 1o which a mystical meaning has been attached (Augustine, De Civitate Dei, 18, 23), thus constituting another kind of acrostic. The arguments of the comedies of Plautus, with acrostics on the names of the respective plays, are probably of still earlier date. Sir John Davies (1570- 1626) wrote twenty-six elegant Hymns to Astrea, each an acrostic on " Elizabetha Regina;" and Mistress Mary Fage, in Fame's Roule, 1637, commemorated 420 celebrities of her time in acrostic verses. The same form of composition is often to be met with in the writings of more recent versifiers. Sometimes the lines are so combined that the final letters as well as the initials are significant. Edgar Allan Poe, with characteristic ingenuity, worked two hames—one of them that of Frances Sargent Osgood —into verses in such a way that the letters of the names corre- sponded to the first letter of the first line, the second letter of the second, the third letter of the third, and so on.

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Generally speaking, acrostic verse is not of much value, and is held in slight estimation. Dr Samuel Butler says, in his "Character of a Small Poet," "He uses to lay the outsides of his verses even, like a bricklayer, by a line of rhyme and acrostic, and fill the middle with rubbish." Addison (Spectator, No. 60) found it impossible to decide whether the inventor of the anagram or the acrostic were the greater blockhead; and, in describing the latter, says, 'T have seen some of them where the verses have not only been edged by a name at each extremity, but have had the same name running

down like a seam through the middle of the poem." And Dryden, in Mac Flecknoe, scornfully assigned Shadwell the rule of

'¢ Some peaceful province in acrostic land." pe

The name acrostic is also applicd to alphabetical or "abecedarian" verses. Of these we have instances in some of the Hebrew psalms (e.g., Ps. xxv. and xxxiv.), the successive verses of which begin with the letters of the alphabet in their order. The structure of Ps. cxix. is still more claborate, each of the verses of each of the twenty- two parts commencing with the letter which stands at the head of the part in our English translation. Alphabetical verses have been constructed with every word of the suc- cessive lines beginning with the successive letters of the alphabet.

By an extended use of the term acrostic, it is applied to the formation of words from the initial letters of other words. "Iy@vs, referred to above, is an illustration of this. So also is the word "Cabal," which, though it was in use before, with a similar meaning, has, from the time of Charles II, been associated with a particular ministry, from the accident of its being composed of Clifford, Ashley, Buckingham, Arlington, and Lauderdale. Akin to this are the names by which the Jews designated their Rabbis; thus Rabbi Moses ben Maimon (better known as Maimonides), was styled "'Rambam," from the initials R.M.B.M.; Rabbi David Kimchi (R. D.K.), " Radak," &c.

A species of puzzle, scarcely known twenty years ago, but very common now (see Lnglish Catalogue, 1863-71, s. v. Acrostics), is a combination of enigma and double acrostic, in which words are to be guessed whose initial and final letters form other words that are also to be guessed. Thus Sleep and Dream may have to be discovered from the first and last letters of Sound, Lover, Europe, Elia, and Palm, all expressed enigmatically.

ACT, in Dramatic Literature, signifies one of those parts into which a play is divided to mark the change of of time or place, and to give a respite to the actors and to the audience. In Greek plays there are no separate acts, the unities being strictly observed, and the action being continuous from beginning toend. If the principal actors left the stage the chorus took up the argument, and con- tributed an integral part of the play, though chiefly in the form of comment upon the action. When necessary, another drama,

which is etymologically the same as an act, carried on the history to a later time or in a different place, and thus we have the Greek trilogies or groups of three dramas, in which the same characters reappear. The Roman poets first adopted the division into acts, and sus- pended the stage business in the intervals between them. Their number was usually five, and the rule was at last laid down by Horace in the Ars Poetica—

‘ Neve minor, neu sit quinto productior actu Fabula, que posci vult, et spectata reponi.”*

“ [f you would have your play deserve success, Give it five acts complete, nor more nor less.” ° — Francis. On the revival of letters this rule was almost universally observed by dramatists, and that there is an inherent con-*

venience and fitness in the number five is evident from the fact that Shakespeare, who refused to be trammelled by merely arbitrary rules, adopts it in all his plays. Some critics have laid down rules as to the part each act should sustain in the development of the plot, but these are not essential, and are by no incans universally recogniscd. In comedy the rule as to the number of acts has not been so strictly adhered to as in tragedy, a division into two acts or three acts being quite usual since the time of Molicre, who first introduced it.

It may be well to mention here Milton’s Samson Agonistes ag a specimen in English literature of a dramatic work founded on a purely Greck model, in which, consequently, there is no division into acts.

AQT, in Law, is an instrument in writing for declaring or justifying the truth of anything; in which sense records, decrees, sentences, reports, ccrtificates, &c., are called acts. The origin of the legal usc of the word Act is in the acta of the Roman magistrates or people, of their courts of law, or of the senate, mcaning (1) what was done before the magistrates, the people, or the scnate; (2) the records of such public proceedings.

ACT OF PARLIAMENT. An Act of Parliament may be regarded as a declaration of the Legislature, enforcing certain rules of conduct, or defining rights and conferring them upon or withholding them from certain persons or classes of persons. The collective body of such declara- tions constitutes the statutes of the realm or written law of the nation, in the widest sense, from Anglo-Saxon times to the present day. It is not, however, till Magna Charta that, in a more limited constitutional sense, the statute-book is generally held to open, and the Parliamentary records only begin to assume distinct outlines late in the reign of Edward I. The maladministration of the common law by the royal judges had gradually taught the people the necessity of obtaining written declarations of their rights—often acknowledged, still oftener violated. Insen- sibly almost, the Commons, whose chief function it origin- ally was to vote supplies to the crown, began to couple their grants with petitions for the redress of grievances. The substance of these petitions and of the royal responses was in time made the groundwork of Acts which, as framed by court redactors, and appearing annexed to proclamation- writs after the dissolution of Parliament, were frequently found seriously to misrepresent its will. To check this evil an Act was passed (8 Henry IV.), authorising the Commons to be represented at the engrossing of the Par- liament roll; but even this surveillance was not enough, for in the beginning of the reign of Henry V. it was enacted, at the instance of the Commons, that in regard to their petitions the royal prerogative should in future be limited to granting or refusing them simpliciter. In this way it became a fixcd constitutional principle that an Act of Par- liament, to be valid, must express concurrently the will of the entire Legislature. It was not, however, till the reign of Henry VI. that it became customary, as now, to intro- duce bills into Parliament in the form of finished Acts; and the enacting clause, regarded by constitutionalists as the first perfect assertion, in words, of popular right, came into general use as late as the reign of Charles I. It is thus expressed :—" Be it enacted by the King's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal and Commons in this present Par- liament assembled, and by the authority of the same." The use of the preamble with which Acts arc usually pre- faced, is thus quaintly set forth by Lord Coke,—" The rehcarsal or preamble of the statute is a good meane to find out the meaning of the statute, and, as it were, a key to

open the understanding thereof." Originally, the col- lective Acts of each scssion formed but one statute, to

which a general title was attached, and for this reason an Act of Parliament is always cited as the chapter of a par- ticular statute—e.g., 24 and 25 Vict. c. 101. Titles were, however, prefixed to individual Acts as early as 1488, Since 33 Geo. IIL c. 13, an Act of Parliament is com- plete whenever it receives the royal assent, and takes effect from that date, unless the Act itself fix some other. British Acts require no formal promulgation, for it is presumed that every subject of the realm is cognisant of the resolutions of Parliament, either by himself or his representative

therein.

Modern Acts of Parliament are—1l. Public. These are binding on all citizens, and are ea officio cognisable by the judges. Since 1850 every Act is held to be public unless the contrary be expressly declared. 9. Private Acts. These rclate to particular classes, persons, or places. Private Acts are (1.) Personal, viz., those which relate to name, naturalisation, estate, &c., of particular persons. (2.) Local, affect- ing bridges, canals, docks, turn ikes, railways, &c. To prevent such Acts from being unduly passed, the promoters of private bills are required to comply with the standing orders of the two Houses, by which private bill procedure is regulated. Acts of Parliament, for convenience of reference, are classified as Public General Acts, Local and Personal Acts declared Public, Private Acts printed, and Private Acts not printed. Public General Acts (if no exception be expressed), extend to Great Britain and Ireland, exclusively only of the Channel Islands and the Isle of Man.

The first complete edition of English Acts of Parliament published by state authority appeared between the ycars 1810 and 1824. It includes the early charters, and ends with the reign of Quecn Anne. Many private editions of the statutes had appeared previous to that of the Record Commissioners. The practice of printing Acts of Par- liament commenced in the reign of Richard III. The charters and Acts were written in Latin till the Statutwm de Scaccario, 51 Henry Ill. (1266), which is in French. The Acts of Edward I.

are indis- criminately in Latin or French ; but from the fourth year of Uenry VII. Acts are exclusively in English.

Scotch Acts.—The earliest attempts at a written record of the pro- ceedings of the Parliament of Scotland consisted of detached instru- ments or indentures, and the next step was the entering of these detached instruments on a roll for more permanent preservation. No such record, however, is preserved before the disputed succes- sion, which commenced in 1289. The earliest roll of placita in parliamento is dated 1292; but the Blak Buik, containing a series of proceedings in Parliament from 1357 to 1402, is the most im- portant of the earliest records of Parliament. The original beoks of Parliament of the reigns of James I. and James II. are not preserved, but from the year 1466 down to the Union a voluminous, but not unbroken, series has been preserved. Down to the reign of James V., scarcely any Act in the original registers is distinguished by a title or rubric; and even after that period the practice has not in this respect been uniform. In like manner there is no numeration of the Acts of Parliament during this period. The language of the earliest Scotch records is in Latin; but as early as 1398 some of the proceedings of Parliament or the Council-General were written in Scots, and subsequently to 1424 always in that language. Unlike the English Acts, French was never used in Scotch legislation. In 1541 a selection of the Acts of James V. was printed. 'The first edition of the Acts was published in 1566, the second in 1597, the third in 1681; and the great national work, the complete record of Parlia- ment, has just been completed, with a general index to the whole 'Acts from 1124 to 1707, which forms the great repertory of the legal, constitutional, and political history of Scotland. In 1540 an Act was passed requiring all the Acts of Parliament to be pronounced in presence of the king and the estates,—the assent of the king being indicated by his touching them with the sceptre; and in 1641 it was ordained that the Acts passed in 1640 be published in the king's name, and with the consent of the estates. But during the civil war the Acts of Parliament were passed in name of thc estates alone. These Acts, however, were rescinded after the restoration of Charles Il. by Act 1661, c. 126, because "the power of making laws is an essential privilege of the royal prerogative." In 1457 an Act was passed for proclaiming the Acts of Parliament in the shires and burghs, that none be ignorant; and in 1581 it was ordained that Acts need not be proclaimed at the market-cross of the

head burgh of each shire, but at the market-cross of Edinburgh only, the lieges obeying them forty days thereafter. The clerk of register was always bound to give extracts of Acts to the lieges in their parti- cular affairs. In 1425 a committee, consisting of an equal number of cach estate, was appointed to amend the books of law; and in 1567 a commission was issued to codify the laws, civil and muni- cipal, dividing them into heads like the Roman law,—the heads as they are ready to be brought to Parliament to be confirmed. Lord Bacon recommended the Scotch Acts for their 'excellent brevity." His lordship's praise applics very properly to the Acts down to the

reign of Queen Mary and the early part of the reign of James VI.; at the Pah of subsequent legislation is intolerable to the

nsulter. : i Trish Acts may be said to eommence A.D. 1310, in the reign of

Edward II., and to elose with the union with the British Parlia- ment in 1801. From the former date, however, there is a break till 1429. In 1495 Poyning's Law provided that no bill should be introdueed into the Irish Parliament whieh has not pre- viously reeeived the royal assentin England; and till 1782 the Parliament of Ireland remained in tutelage to that of England. Sinee 1801 it has been incorporated with the Parliament of Great

Britain.

ACT OF SEDERUNT, in Scotch Law, an ordinance for regulating the forms of procedure before the Court of Session, passed by the judges in virtue of a power con- ferred by an Act of the Scotch Parliament, 1540, c. 93. In former times this power was in several instanees clearly exceeded, and such Acts of Sederunt required to be rati- fied by the Scotch Parliament; but for more than a century and a half Acts of Sederunt have been almost exclusively confined to matters relating to the regulation of judicial procedure. Many recent statutes contain a clause empower- ing the court to make the necessary Acts of Sederunt. A quorum of nine judges is required to pass an Act of Sederunt.

ACTS OF THE APOSTLES, the fifth among the canonical books of the New Testament. What has to be said on this book will naturally fall under the following heads: The state of the text; the authorship; the object of the work; the date and the place of its composition,

The State of the Text.—The Acts is found in two MSS.

generally assigned to the 4th century, the Codex Sinai- ticus, in St Petersburg, and the Codex Vaticanus, in Rome; in one MS. assigned to the 5th century, the Codex Alex- andrinus, in the British Museum ; in two MSS. belonging to the 6th century, the Codex Deze, in Cambridge, and the Codex Laudianus, in Oxford; and in one of the 9th century, the Codex Palimpsestus Porfirtanus, in St Peters- burg, with the exception of chapter first and eight verses of chapter second. Large fragments are contained in a MS. of the 5th century, the Codex Ephremi, in Paris. Fragments are contained in five other MSS., none of which is later than the 9th century. These are all the uncial MSS. containing the Acts or portions of it. The MSS. in Oxford and Cambridge differ widely from the others. This is especially the case with the Cambridge MS., the Codex Bezw, which is said to contain no less thau six hundred interpolations. Scrivener, who has edited this MS. with great care, says, " While the general course of the history and the spirit of the work remain the same as in our commonly received text, we perpetually encounter long passages in Codex Deze which resemble that text only as a loose and explanatory paraphrase recalls the original form from which it sprung; save that there is no difference in the language in this instance, it is hardly an exaggeration of the facts to assert that Codex D [ie, Codex Beze| reproduces the textus receptus of the Acts much in the same way that one of the best Chaldee Targums does the Hebrew of the Old Testament, so wide are the variations in the diction, so constant and inveterate the practice of expanding the narrative by means of inter- polations." Scrivener here assumes that the additions of the Code Beze are interpolations, and this is the opinion of nearly all critics. There is one, however, Bornemann, who thinks that the Codex Beze contains the original text, and that the others are mutilated. But even sup- posing that we were quite sure that the additions were interpolations, the Codex Bezw makes it more difficult to determine what the real text was. Scrivener, with

good reason, supposes that the Codex Beze is derived from an original which would most likely belong to the third cen- tury at the latest.

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Authorship of the Work.—In treating this subject we begin with the external evidence.

The first mention of the authorship of the Acts in a well- authenticated book occurs in the treatise of Irenzeus against heresies, written between the years 182 and 188 a.p. Trenzeus names St Luke as the author, as if the fact were well known and undoubted. He attributes the third Gospel to him, and calls him "a follower and disciple of apostles " (I. iii. 10, 1). He states that "he was inseparable from Paul, and was his fellow-worker in the gospel" (Z. iii. 14, ey: The next mention occurs in the Stromata of Clemens Alexandrinus, written about 195 A.p., where part of St Paul's speech to the Athenians is quoted with the words, "Even as Luke also, in the Acts of the Apostles, records Paul as saying" (Strom. v. xii. 82, p. 696, Pott). The Acts of the Apostles is quoted by Tertullian as Scripture, and assigned to St Luke (Adv. Mar. v. 2 and 3). Origen speaks of 'Luke who wrote the Gospel and the Acts" (Eus. H. 2. vi. 25); and Eusebius includes the Acts of the Apostles in his summary of the books of the New Testament (Hist. Eccl. iii, 25). The Muratorian canon, generally assigned to the end of the second or beginning of the third ceutury, includes the Acts of the Apostles, assigns it to St Luke, and says that he was an eye-witness of the facts recorded. There is thus unanimous testimony up to the time of Eusebius that St Luke was the author of the Acts. This unanimity is not disturbed by the circum- stance that some heretics rejected the work, for they did not deny the authorship of the book, but refused to acknowledge it as a source of dogmatic truth.

After the time of Eusebius we find statements to the effect that the Acts was little known. "The existence of this book," Chrysostom says, "is not known to many, nor the person who wrote and composed it." And Photius, in the ninth century, says, "Some maintain that it was Clement of Rome that was the writer of the Acts, others that it was Barnabas, and others that it was Luke the Evangelist."

Treneus makes such copious quotations from the Acts that we can feel sure that he had before him substantially our Acts. We cannot go further back than Irenzus with certainty. If, as we shall see, the writer of the Acts was also the writer of the third Gospel, we have Justin Martyr's testimony (about 150 a.p.) for the existence of the third Gospel in his day, and therefore a likelihood that the Acts existed also. But we have no satisfactory evidence that Justin used the Acts, and there is nothing in the Apostolic Fathers, nor in any work anterior to the Letter of the Churches of Vienne and Lyons, written probably soon after 177 a.D., to prove the existence of the Acts.

The weight of external evidence therefore goes entirely for St Luke as the author of the Acts. But it has to be noticed, that the earliest testimony is more than a hundred years later than the events described in the Acts. We have also to take into account that Ireneus was not critical, We find him calling the Pastor of Wermas Scrip- ture; Clemens Alexandrinus also calls the Pastor inspired; and Origen not merely attributes inspiration to the work, but makes the author of it thc Hermas mentioned in the Epistle to the Romans. All scholars reject the testimony of Irenzus, Clemens Alexandrinus, and Origen in this matter. The question arises, How far are we to trust them in others of a similar nature ?

We turn to the internal evidence. And in the very commencement we find the author giving himself out as the person who wrote the third Gospel. This claim has been almost universally acknowledged. There is a remark- able similarity of style in both. 'The same peculiar modes of expression continually occur in both; and throughout both there exist continual references backward and for-

ward, which imply the same authorship. There are some difficulties in the way of this conclusion. Two of these deserve special notice. If we turn to the last chapter of the Gospel, we find it stated there (ver. 13) that two dis- ciples met Jesus on the day of the resurrection, as they were going to Emmaus. Towards nightfall (ver. 29) he entered the village with them; and as he reclincd with them, he became known to them, and disappeared. Whereupon "at that very hour" (ver. 33) they rose up and returned to

Jerusalem. They found the eleven assembled, and told them what had happened to them. " While they were saying these things, he himself stood in the midst of them" (ver. 36). The apostles gave him a piece of fish, and he ate it. 'But he said to them" (ver. 44), so the narrative goes on, and it then relates his speech; and at ver. 50 it says, "He led them out to Bethany," and then disappeared from them. This disappearance was final ; and if the words used in the Gospel make us hesitate in determining it to be his asccnsion, such hesitation is removed by the opening words of the Acts. According to the Gospel, therefore, all the events now related took place, or seem to have taken place, on the day of the resurrection, or they may possibly have extended into the next morning, but certainly not later. The Acts, on the contrary, states that Jesus was seen by the disciples for forty days, and makes him deliver the speech addressed to his disciples and ascend into heaven forty days after the resurrection. The other instance is perhaps still more sin- gular. Inthe Acts we have three accounts of the conversion of St Paul—the first by the writer himself, the other two by St Paul in his speeches. The writer states that (ix. 4, 7) when the light shone round Paul, he fell to the ground, "but the men who were journeying with him stood dumb." St Paul himself says (xxvi. 14) that they all fell to the ground. The writer says (ix. 7) that St Paul's com- panions heard the voice, but saw no one. St Paul himself says (xxii. 9) that his companions saw the light, but did not hear the voice of him who spake to him. And finally, all these accounts differ in their report of what was said on the occasion. Notwithstanding these differences, even these very accounts contain evidence in them that they were written by the same writer, and they do not destroy the force of the rest of the evidence. The case would be quite different – if Baur, Schwegler, and Wittichen were right in supposing that the Gospel of Luke contained documents of opposite tendencies. It would then be necessary to assume different authors for the different parts of the Gospel, and still an- other for the Acts. But this theory falls to the ground if the Tiibingen theory of tendencies is rejected.

The Acts itself claims to be written by a companion of St Paul. In chap. xvi. 10, the writer, without any previous warning, passes from the third person to the first. St Paul had reached the Troad. There he saw a vision inviting him to go to Macedonia, 'But when he saw the vision, straightway we sought to go out into Macedonia." The use of the "we" continues until Paul

leaves Philippi. In chap. xx. Paul returns to Philippi, and the "we" is resumed, and is kept up till the end of the work. Irenzeus (77. iii. 14, 1) quotes these passages as proof that Luke, the author, was a companion of the apostle. The minute character of the narrative, the accurate description of the various journeyings, the unimportance of some of the details, and the impossibility of contriving all the inci- dents of the shipwreck without experiencing them, are strong reasons for believing that we have the narrative of an eye-witness. And if we allow this much, we can scarcely help coming to the conclusion that this eye-witness was the author of the work; for the style of this eye-witness is exactly the style of the writer who composed the previous portions. Some have supposed that we have here the per-

sonal narrative of Timothy or of Silas; but this swpposition would compel us to believe that the writer of the Acts was so careless as to tack documents together without remem- bering to alter their form. Such a procedure on the part of the skilful writer of the Acts is unlikely in the highest degree. The "we" is introduced intentionally, and can be accounted for only in two ways: either by supposing that the writer was an eye-witness, or that he wished to be thought an eye-witness, and borrowed the narrative of an eye-witness to facilitate the deception. Zeller has adopted this latter alternative; and this latter alternative is the only possible one for those who assign a very late date to the Acts.

We may test the writer's claim to be regarded as a com- panion of St Paul by comparing his statements with those of the other books of the New Testament. As might be expected, the great facts recorded in the Gospels are repro- duced accurately in the Acts. There is only one marked difference. St Matthew says (xxvii. 5, 7) that Judas cast the traitor's money into the temple, and the priests bought with it a field for the burial of strangers. St Peter in Acts (i. 18) says, that Judas himself purchascd a field with the , reward of his iniquity. St Matthew says that he went and hanged himself, St Peter that he fell headlong and burst in the middle. St Matthew says, or rather seems to say, that the field was called the field of blood, because it

was pur- chased with blood-money; St Peter secms to attribute the name to the circumstance that Judas died in it.

The Acts is divided into two distinct parts. The first deals with the church in Jerusalem, and especially narrates the actions of St Peter. We have no external means of testing this portion of the narrative. The Acts is the only work from which information is got in regard to these events. The second part pursues the history of the apostle Paul; and here we can compare the statements made in the Acts with those made in the Epistles. Now here again we have a general harmony. St Paul travels in the regions where his Epistles show that he founded churches. The friends of St Paul mentioned in the Acts are also the friends acknowledged in the Epistles. And there are many minute coincidences. At the same time, we learn from this comparison that St Luke is not anxious to give minute details, Timothy probably visited Athens while St Paul was there. This we learn from 1 Thess. iii. 1, but no mention is made of this visit in the Acts. Again, we gather from the Epistles to the Corinthians that St Paul paid a visit to Corinth, which is not recorded in the Acts. Moreover, no mention is made of Titus in the Acts. These, however, are slight matters; and it must be allowed that there is a general agreement. But attention has been drawn to two remarkable exceptions. These are the ac- count given by St Paul of his visits to Jerusalem in the Epistle to the Galatians and that given by St Luke; and the character and mission of the apostle Paul, as they appear in his letters and as they appear in the Acts.

In regard to the first point, St Paul himself says in the Epistle to the Galatians, that after his conversion straight- way he held no counsel with flesh and blood, nor did he go up to Jerusalem to the apostles who were before him; but he went away to Arabia and returned to Damascus; that then after three years he went up to Jerusalem to seek for Cephas, and he remained with him fourteen days. He at that time saw only two apostles,—Peter, and James the brother of the Lord. He then went away to Syria and Cilicia, and was unknown by face to the churches of Judea. He says that fourteen years after this he went up to Jeru- salem with Barnabas, taking Titus with him. On this occasion he went up by revelation. St Paul introduces these facts for a purpose, and this purpose is that he might prove his independence as an apostle. He had acted

solely on the revelation given to himself. He had neither required nor obtained sanction from the other apostles. He was an apostle, not sent forth from men nor through nen, but through Jesus and God. When we turn to the Acts, we find that no mention is made of the journey to Arabia. He stays some days at Damascus, and then begins to preach the gospel. He continues at this work a considerable time; and then, in consequence of the plots of the Jews, he secretly withdraws from Damascus and proceeds to Jerusalem. 'The brethren there are suspicious in regard to him, and their fears are not quieted until Barnabas takes him to the apostles; and after this intro- duction he gocs in and out amongst them, and holds dis- cussions wlth the Hellcnists. Finally, when the Hellenists attempt to kill him, the brethren send him to Tarsus. In the Epistle to the Galatians St Paul does everything for him- self, instigated by his inward feelings. In the Acts he is forced out of Antioch, and sent by the brethren to Tarsus. In the Galatians St Paul stays only a fortnight, and sces only St Peter and St James of the apostles, and was unknown by face to the churches of Judea. In the Acts Barnabas takes . him to the apostles, and he continues evidently for a period inuch longer than a fortnight, going in and out amongst them. 'Then in chap. xi. 30, he goes up a second time to Jerusalem,—a visit which scems inconsistent with the narra- tive in the Epistle to the Galatians. And finally, when he goes up to Jcrusalem, the Acts does not represent him going up by an independent revelation, but as being sent up; and it says nothing of his taking an independent part, but represents him as submitting to the apostles.

This, however, leads us to the treatment of the character of St Paul by the writer of the Acts. Some of the Tiibingen critics assert that the writer shows ill-will to St Paul, but they are evidently wrong. On the contrary, the character of the apostle as given in the Acts is full of grand and noble traits. Yet still there are some singular pheno- mena in the Acts. St Paul claimed to be an apostle by the will of God. He had as good a right to be an apostle as St Peter or St James. Yet the writer of the Acts never calls him an apostle in the strict sense of the term. He is twice called an apostle, namely, in Acts xiv. 4 and 14. On both occasions his fellow-apostle is Barnabas; but Barnabas was not one of the twelve, and not an apostle in the strict sense of

the term. And even in these verses the reading is doubtful. The Codex Beze omits the word apostle in the 14th verse, and makes the 4th liable to suspicion by inserting an addition to it. St Luke also brings prominently forward as the proper mark of an apostle, that he should have companied with the Lord from his baptism to his ascension, and describes the filling up of the number of the twelve by the election of Matthias. And if St Luke's narrative of St Paul's conversion be minutely examined, it will be perceived that not only does he not mention that St Paul saw Jesus, but the circumstances as related scarcely permitted St Paul to see Jesus. He was at once dazzled by the light, and fell to the ground. In this prostrate condition, with his eyes shut, he heard the voice; but at first he did not know whose it was. And when he opened his eyes, he found that he was blind. The words of Ananias imply that St Paul really did see Jesus, but St Luke abstains from any such statement. And St Paul is not treated by the Jewish Christians in the Acts as an independent apostle. He is evidently under submission to the apostles at Jerusalem.

_ Furthermore, the point on which St Paul specially insists in the Epistle to the Galatians is, that he was appointed the apostle to the Gentiles as St Peter was to the circumcision, and that circumcision and the observance of the Jewish law were of no importance to the Christian. St Paul's words on this point in all his letters are strong and decided. But in

the Acts it is St Peter that opens up the way for the Gentiles. In St Peter's mouth occurs the strongest language in regard to the intolerable nature of the law. Not a word is said of the quarrel between St Peter and St Paul. The brethren in Antioch send St Paul and Barnabas up to Jerusalem to ask the opinion of the apostles and elders. St Paul awaits the decision of the apostles, and St Paul and Barnabas carry back the decision to Antioch. And throughout the whole of the Acts St Paul never stands forth as the champion of the Gentiles. He seems continually anxious to reconcile the Jewish Christians to himself, by observing the law of Moses. He circumcises Timothy, and he performs his vows in the temple. And he is particularly careful in his speeches to show how deep his respect for the law of Moses is. In this regard the letters of St Paul are very different from his speeches as

given in the Acts. In the Epistle to the Galatians he claims perfect freedom for him- self and the Gentiles from the observance of the law; and neither in it nor in the Epistle to the Corinthians docs he take any notice of the decision to which the apostles are said to have come in their meeting at Jerusalem. And yet the narrative of St Luke implies a different state of affairs from that which it actually states in words; for why should the Jews hate St Paul so much more than the other apostles if there was nothing special in his attitude to- wards them 3

We may add to this, that while St Luke gives a rather minute account of the sufferings of St Peter and the church in Jerusalem, he has not brought prominently forward the perils of St Paul. St Paul enumerates some of his suffer- ings in the second Epistle to the Corinthians (chap. xi. 23-28). St Luke has omitted a great number of these. Thus, for instance, St Paul mentions that he was thrice shipwrecked. St Luke does not notice one of these ship- wrecks, that recorded in the Acts having taken place after the Epistles to the Corinthians were written. Some also think that St Luke dctails several occurrences which are scarcely in harmony with the character of St Paul. They say that the dismissal of John Mark, as recorded in the Acts, is a harsh act. St Paul's remark, "I wist not that he is the high pricst" (xxiii. 5), they regard as doubtful in point of honesty. And the way by which he gained the Pharisecs to his side, in opposition to the Sadducees, they describe as an expedient unworthy the character of this fearless apostle (xxiii. 6).

St Luke occasionally alludes, in the Acts, to events which took place outside of the church. We can test his accu- racy in recording these events by comparing his narrative with the narratives of historians who treat of the same period. These historians are Josephus, Tacitus, and Suetonius. Now, here again we find that the accounts in the Acts generally agree. Indeed, Holtzmann has noticed that all the external events mentioned in the Acts are also to be found in Josephus. We may therefore omit Tacitus and Suetonius, and confine ourselvcs to Josephus. Three narratives deserve minute examination. The first is the death of Herod Agrippa. Josephus says (Ant. xix. 8, 2) that Herod was at Czsarea celebrating a festival in honour of the Cesar. On the second day of the spectacle, the king put on a robe made entirely of silver, and entered the theatre early in the day. The sun's rays fell

upon the silver, and a strong impression was produced on the people, so that his flatterers called out that he was a god. He did not check their impiety, but soon, on looking up he saw an owl perched above his head on a rope. He at once recognised in the bird the harbinger of evil. Imme- diately he was attacked by violent pains in the bowels, and after five days' illness died. The Acts says that Herod was addressing a deputation of Tyrians and Sidonians in Ceesarea, seated on the tribunal and arrayed in a royal

robe. The people called out, " The voice of a god, aud not of aman." " Immediately an angel of the Lord struck him because he gave not God the glory, and becoming worm- eaten, he died" (xii. 21-23). Both accounts agree in representing Herod as suddenly struck with disease be- cause he did not check the impiety of his flatterers, but they agree in almost nothing else; and it is difficult to conceive that the one writer knew the account of the other. Which account is most to be trusted, depends upon the answer given to the question which is the more credible his- torian. :

The second case relates to the Egyptian mentioned in the question of the tribune to St Paul, in Acts xxi. 38, "You are not then the Egyptian who, some time ago, made a disturbance, and led into the wilderness the four thousand of the sicarii?" Josephus mentions this Egyptian, both in his Antiquities (xx. 8,6) and in the Jewish War (ii. 13, 5). In the Jewish War (ii. 13, 3), Josephus describes the sicar, and then passes on, after a short section, to the Egyptian. He states that he collected thirty thousand people, led them out of the wilderness "to the mount called the Mount of Olives, which," he says (Ant. xx. 8, 6) in words similar to those in Acts i. 12, "lies opposite to the city five furlongs distant." On this Felix attacked him, killed some, cap- tured others, and scattered the band. The Egyptian, however, escaped with some followers. Hence the question in the Acts. There are some striking resemblances between the words used by both writers. The numbers differ; but St Luke gives the numbers of the sicarii, Josephus the numbers of the entire multitude led astray.

The third case is the one which has attracted most attention. In the speech which Gamaliel delivers, in Acts v. 35-39, it is said, 'Some time before this, Theudas rose up, saying that he was some one, to whom a number of about

four hundred men attached themselves, who was cut off, and all who followed him were broken up and came to nought. After him rose up Judas the Galilean, in the days of the registration, and he took away people after him; and he also perished, and all that followed him were scat- tered:" On turning to Josephus we find that both Theudas and Judas the Galilean are mentioned. The circumstances related of both are the same as in the Acts, but the dates are different. According to' Josephus, Theudas gave himself out as a prophet, in the reign of Claudius, more than ten years after the speech of Gamalicl had been 'delivered, while Judas appeared at the period of the registration, and therefore a considerable time before Theudas. To explain this difficulty, some have supposed that there may have been another Theudas not men- tioned by Josephus, or that Josephus is wrong in his chronology. Others suppose that St Luke made a mis- take in regard to Theudas, and is right in regard to Judas. Keim maintains that St Luke has made the mis- take, and suggests that possibly it may be based upon the passage of Joscphus; and Holtzmann has gone more minutely into this argument. Holtzmann draws attention to the nature of the sections of Josephus which contain the references to Theudas and Judas (Ant. xx. 5,1, 2). He says that nearly all the principal statements made in these short sections emerge somewhere in the Acts: the census of Quirinus, the great famine, Alexander as a member of a noble Jewish family, and Ananias as high priest, More- over, St Luke has preserved the order of Josephus in men- tioning Theudas and Judas; but Josephus says " the sons of Judas," whereas St Luke says "Judas." "Is it not likely," Holtzmann argues, "that St Luke had before his mind this passage of Josephus, but forgot that it was the sons of Judas that were after Theudas, and not the father?" He adds also, that in the short passage in the Acts there are five peculiar expressions, identical or nearly identical

with the expressions used by Josephus, and comes to the conclusion that St Luke knew the works of Josephus. He finds further traces of this knowledge in the circumstance that, in Acts xiii. 20-21, St Luke agrees in his statements with Josephus where both differ from the Old Testament. He also adduces certain Greek words which he supposes St Luke derived from his reading of Josephus. Max Krenkel, in making an addition to this argument, tries to

show, from a comparison of passages, that St Luke had Josephus before his mind in the narrative of the childhood of Christ; and he supposes that the expedieut attributed to the apostle Paul, of setting the Pharisees against the Sadducees (Acts xxiii. 6), is based upon a similar narrative given in Josephus (Bell. Jud. ii. 21, 3, and Veta, 26 ff), The importance of this investigation is great; for if Holtz- mann and Krenkel were to prove their point, a likelihood would be established that the Acts of the Apostles, or at least a portion of it, was written after 93 a.D., the year in which the Antiquities of Josephus was published, accord- ing to a passage occurring in the work itself. Meanwhile, the fact' that important portions of the narrative must have been written by an eye-witness of the events recorded, combined with the unity of style and purpose in the book, are cogent arguments on the other side.

The speeches in the Acts deserve special notice. The question occurs here, Did St Luke follow the plan adopted by all historians of his age, or is he a singular exception? The historians of his age claimed the liberty of working up, in their own language, the speeches recorded by them. They did not dream of verbal accuracy; even when they had the exact words of the speakers before them, they preferred to mould the thoughts of the speakers into their own methods of presentation. Besides this, historians do not hesitate to give to the characters of their history specches which they never uttered. The method of direct speech is useful in producing a vivid idea of what was supposed to pass through the mind of the speaker, and therefore is used continually to make the narrative lively. Now it is generally believed that St Luke has followed the practice of his contemporaries. There are some of his speeches that are evidently the summaries of thoughts that passed through the minds of individuals or of multitudes. Others unquestionably claim to be reports of speeches really delivered. But all these speeches have, to a large extent, the same style as that of the narrative. They have passed to a large extent through the writer's mind, and are given in his words. They are, moreover, all of them the merest abstracts. The speech of St Paul at Athens, as given by St Luke, would not occupy more than a minute and a half in delivery. The longest speech in the Acts, that of the martyr Stephen, would not take more than ten minutes to deliver. It is not likely that either speech lasted so short a time. But this circumstance, while destroying their verbal accuracy, does not destroy their

authenticity; and it must strike all that, in most of the speeches, there is a singular appropriateness, there is an exact fitting-in of the thoughts to the character, and there are occasionally allusions of an obscure nature, which point very clearly to their authenticity. The one strong objection urged against this inference, is that the speeches of St Peter and St Paul show no doctrinal differences, such as are said to appear in the Epistles; but the argument has no force, unless it be proved that St Paul's doctrine of justification is different from the creed of St Peter or St James.

Not the least important of the questions which influence critics in determining the authorship of the Acts is that of miracles. Most of those who think that miracles are im- possible, come to the conclusion that the narratives con- taining them are legendary, and accordingly they maintain that the first portion of the Acts, relating to the carly

church in Jcrusalen: and to St Peter, is in the highest degree untrustworthy. The writer, it is maintained, had no personal knowledge of those early days, and received the stories after they had gone through a long process of transmutation. They appeal, for instance, to the account of the Pentecost, where the miracle of spcaking with tongues is described. They say that it is plain, on a eomparison of the Epistle to the Corinthians with the Acts, that St Paul meant one thing by the gift of tongues, and the writer of the Acts another. And the inference is at hand that, if the writer had known St Paul, he would have known what the gift of tongues was; and the possibility of such a niistake, it is said, implies a considerable distance from the time of the apostles and the primitive church. They point also to the curious parallelism between the miracles of St Peter and those of St Paul. St Peter begins his series of miracles by healing a lame man (iii. 2); so does St Paul (xiv. 8). St Peter exorcises evil spirits (v. 16; viii. 7); so docs St Paul (xix. 15; xvi. 18). If St Peter deals with the magician Simon, St Paul encounters Elymas. If St Peter punishes with death (v. 1ff.), St Paul punishes with blindness (xii. 6 ff.). If St Peter works miracles by his shadow (v. 15), not less powerful are the aprons and nap- kins of St Paul (xix. 12). And, finally, if St Peter can raise Tabitha from the dead (ix. 36), St Paul is equally successful in the case of Eutychus (xx. 9). It is easy to see, also, that since

there is no contemporary history with which to compare the statements in the Acts, and since many of the statements are of a summary nature, and very few dates are given, a critic who believes the narratives legendary will have no difficulty in finding many elements in the narratives confirmatory of his belief. But to those who believe in miracles the rest of the narrative seems plam and unvarnished. The parallelism between the miracles of St Peter and St Paul is accounted for by the fact that they acted in similar circumstances, and that actual events were at hand on which to base the paral- lelism. At the same time, some who believe in the possi- bility of miracles think that the Acts presents peculiar difficulties in this matter. They say that the healing by means of shadows and aprons is of a magical nature; that the death of Ananias and Sapphira, and the other destruc- tive miracles, are out of harmony with the rest of the miracles of the New Testament; and that the earthquakes that release St Peter and St Paul seem purposeless. The difficulties on this head, though real, are not however of great importance, nor do they tell very seriously against the received opinion that St Luke is the author of the work.

We have thus given a general summary of the questions which come up in investigating the authorship of the Acts, and of the arguments used in settling this point. The conclusions based upon this evidence are very different. Some join the traditional opinion of the chureh to the modern idea of inspiration, and maintain that St Luke was the author of the work, that every diserepancy is Inerely apparent, and that every speech contains the real and genuine words of the speaker. Others maintain that St Luke is the writer, and that the book is justly placed in the canon; that the narrative is, on the whole, thoroughly trustworthy, and that neither its canonicity nor eredibility is affected by the existence of real discrepancies in the narrative. Others hold that St Luke is the author, but that we have got in the book an ordinary narrative, with portions eredible and portions incredible; that for the early portions of the work he had to trust mainly to his memory, dulled by distance from the scene of action and by lapse of time, and that he has given what he knew with the uncritical indifference to minute accuracy in time, circumstance, and word, which characterises all his con. temporaries, Others maintain that St Luke is the author,

but that, being a credulous and unscientific Christian, he recorded indeed in honesty all that he knew, but that he was deluded in his belief of miracles, and is often inaccu- rate in his statement of facts. Others think that St Luke was not the author of the work. He may have been the original author of the diary of the Apostle Paul's travels in which the "we" occurs; but the author of the Acts did not write the diary, but inserted it into his narrative after altering it for a special purpose, and the narrative was written long after St Paul and St Luke were dead. Others think that in the Acts we have the work of Timothy or of Silas, or of some one else. A considerable number imagine that St Luke had different written doeuments before him while composing, and a very few think that the work is the work of more than one writer. But as we have intimated, the weight of testimony is in favour of St Luke's authorship.

Purpose.—We have seen that the Acts of the Apostles is the work of one author possessed of no inconsiderable skill. This author evidently omits many things that he knew; he gives a short account of others of which he could have supplied accurate details, and, as in the ease of St Paul, he has brought forward one side of the character prominently, and thrown the other into the shade. What motive could have led him to act thus? What object had he in inserting what he has inserted, and omitting what he has omitted? Most of the answers given to these questions have no important bearing on the question of the author- ship of the Acts, But the ease is different with the answer of the Tiibingen school. The Titbingen school maintains that St Paul taught that the law was of no avail to Jew and Gentile, and that, therefore, the observance of it was unnecessary ; that St Peter and the other apostles taught that the observance of the law was necessary, and that they separated from St Paul on this point; and that the early Christians were divided into two great elasses—those who held with St Paul, or the Gentile Christians, and those who held with St Peter, or the Jewish Christians. They further maintain that there prevailed a violent con- troversy between these two parties in the church, until a fusion took place towards the middle of the second half of the second eentury, and the Catholie Church arose. At what. stage of this controversy was the Acts written 7 is the ques- tion they put. St Peter, we have seen, is represented in the Acts as opening the church to the Gentiles. St Peter and the rest of the apostles at Jerusalem admit tho Gentiles on certain gentle conditions of

refraining from things offered to idols, from animals suffocated, from blood, and from fornication. What could be the object of such statements but to convinee the Jewish Christians that they were wrong in pertinaciously adhering to their entire exelusion of the Gentiles, or insisting on their observance of the entire law? But St Paul is represented as observ- ing the law, as sent forth by St Peter and the other apostles, as going continually to the Jews first, and as appearing in the temple and coming up with collections for the Jerusalem ehureh. Was not this also intended to reconcile the Jewish Christians to St Paul? Then the great doctrines of St Paul all but vanish—free grace, justi- fication by faith alone, redemption through the blood of Christ,—all thatis characteristic of St Paul disappears, except his universalism, and that is modified by the decree of the apostles, the circumcision of Timothy, and St Paul's observ- ance of the law. The object of all this, they affirm, must be to reconcile the Jewish party by concessions. But there is said to be also another object, of minor importance indeed, but still quite evident and falling in with the other. Throughout the Aets St Paul is often accused of turning the world upside down and causing disturbances, The Jewish Christians may have thought that St Paul was to

blame in this matter, and that St Paul's opinions were peculiarly calculated to stir up persecution against the Christians. The stories in the Acts were devised to con- vince them that they were mistaken in this supposition. On every occasion in which St Paul is accused before magistrates, and especially Roman magistrates, he is ac- quitted. Grallio, the town-clerk of Ephesus, Lysias, Felix, and Festus, all declare that St Paul has done nothing con- trary to the law. And while the Romans thus free him from all blame, it is the Jews who are always accusing him.

We have here reproduced the argument of Zeller, who has given the most thorough exposition of an opinion held also by Baur, Schwegler, and others. The argument fails to have effect if the assumption that St Paul and St Peter differed radically is rejected. It also suffers from the cir- cumstance, that there is no historical authentication of the church being in such a state in the first half of the second century, that this attempt at reconciliation could take place within it. Moreover, the writing of a fictitious production seems

an extraordinary means for any one to employ in order to effect reconciliation, especially if, as Zeller imagines, the church in Rome was specially con- templated. The church in Rome and the other Christian churches had St Paul's Epistles to the Romans, Corinthians, and Galatians before them. They could be in no doubt as to what were his sentiments. They must also have had some history of his career ; and no object could be effected by attempting to palin upon them a decree of apostles which never existed, or a history of St Peter and St Paul contradicted by what they knew of both.

Overbeck, finding this solution of Zeller unsatisfactory, thinks that the object of the Acts is to help the Gentile- Christian Church of the first half of the second century, now far removed from Paulinism and strongly influenced by Judaism, to form a clear idea of its own past, especially of its own origin and of its founder St Paul. It is thus, he maintains, an historical novel, somewhat like the Clemen- tines, devised to realise the state of the church at an earlier period.

It would be tedious to enumerate all the other objects which have been set forth as the special aim of the Acts. Some think that it was a work written for the private use of Theophilus, and aimed, therefore, at giving him the special information which he required. Others think that it is intended to describe the spread of the gospel from Jerusalem to Rome. Others believe that the writer wished to defend the character of the Apostle Paul. Some of the more recent members of the Tiibingen school think that it was intended to distort the character of St Paul, and that the image of him given in the Acts is an intermediate stage between the real Paul and the caricature supposed by them to be made of him under the name of Simon in the Clementines.

Date.—There are no sure data for determining the date. Appeal used to be made to Acts viii. 26, "Unto the way which goeth down from Jerusalem to Gaza, which is desert." But most probably it is the way which is here said to be desert or lonely. But even if the word " desert " or "lonely" be applied to Gaza, we get nothing out of it. Accordingly, in the absence of data very various dates have been assigned. Some think that it was written at the time mentioned in the last chapter of Acts, when St Paul had been two

ycars in Rome. Some think that it must have been written after the fall of Jerusalem, as they believe that the gospel was written after that event. Trenzeus thought that it was written after the death of St Peter and St Paul (Z/. iii. 1). Others think that St Luke must have written it at a late period of his life, about the year 80 A.D. The Tiibingen school think that it was written some time in the second century, most of them agree-

ing on the second or third decade of that century, about 125 a.p. They argue that a late date is proved by the nature of the purpose which oeeasioned the work, by the representation which it gives of the relation of the Christians to the Roman state, and by the traces of Gnosticism (xx, 29), and of a hierarchical constitution of the church (i. 17,20 ; wail ayetf. jieay. 28; xx. 17, 28} to be found in the Acts.

Place.—There is no satisfactory evidence by which to settle the place of composition. later fathers of the church and the subscriptions of late MSS. mention Achaia, Attica, Alexandria, Macedonia, and Rome. And these placcs have all had their supporters in modern times, Some have also tried to show that it was written in Asia Minor, probably at Ephesus. The most likely supposition is that it was written at Rome; Zeller has argued with great plausibility for this conclusion.

There is a large literature on the subject of this article, but the most important treatises are those of Sechwanbeck, Schneckenburger, Lekebusch, Zeller, Trip, Klostermann, and CErtel. Zeller's work deserves special praise for its thoroughness. Various other writers have discussed the sub- ject in works dealing with this among others; as Baur in his Paulus ; Schwegler in his Nachapostolisches Zeitalter ; Ewald in his History of Israel ; Renan in his Apostles; Hausrath in his Vew Testament History; and, in a more conservative manner, Neander, Baumgarten, Lechlcr, Thiersch, and Lange. Of commentaries, the best on the Tiibingen side is that of De Wette, remodelled by Overbeck, and that of the more conservative Meyer is especially good. In English we have an able treatment of the subject in Dr Davidson's Introduction to the Study of the New Testament ; we have com- mentaries by Biscoe, Humphry, Hackett, Cook, Words- worth, Alford, and Gloag; and dissertations by Paley, Birks, Lewin, Conybeare, and Howson.

There are various other treatises claiming to be Acts of Apostles. One or two of these must have existed at an early date, though, no doubt, they have since received large interpolations. But most of them belong to a late period, and all of them are acknowledged to be apocryphal. They are edited by Tischendorf in his Acta Apostolorum Apocrypha (Lipsie, 1851), and have been translated, with an introduction giving information as to their origin and dates, by Mr Walker, in vol. xvi. of the Amnte-Nicene Lnbrary. (3. Day

ACTA CONSISTORII, the edicts of the consistory or council of state of the Roman emperors. These edicts were generally expressed in such terms as these: 'The august emperors, Diocletian and Maaimian, in council declare, That the children of decurions shall not be exposed to wild beasts in the amphitheatre."—The senate and soldiers often swore, either through flattery or on compulsion, upon the edicts of the emperor. The name of a

senator was erased by Nero out of the register, because he refused to swear upon the edicts of Augustus.

ACTA DIURNA, called also Acta Populi, Acta Publica, and simply Acta or Diurna, was a sort of Roman gazette, containing an authorised narrative of the transactions worthy of notice which happened at Rome—as assemblies, edicts of the magistrates, trials, executions, buildings, births, marriages, deaths, accidents, prodigies, &c. Petronius has given us an imitation specimen of the Acta Diurna, one or two extracts from which may be made to show their style and contents. 'I'he book-keeper of Trimalchio pretends to read from the Acta Urbis:—' On the 30th of July, on the Cuman farm, belonging to Trimalchio, were born 30 boys and 40 girls; there were brought into the barn from the threshing-floor 125,000 bushels of wheat; 500 oxen were broken in.—On the same day the slave Mithridates was crucified for having slandered the tutclar deity of our

friend Gaius.—On the same day 100,000 sesterces, that could not be invested, were put into the money-box.—On the same day a fire broke out in the gardens of Pompey, which arose in the steward's house," &c. The Acta diffcred from the Annals (which were discontinued in B.C. 133) in this respect, among others, that only the greater and more important matters were given in the latter, while in the former things of less note also were recorded. The origin of the Acta is attributed to Julius Cesar, who first ordered the keeping and publishing of the acts of the people by public officers. Some trace them back as far as Servius Tullius, who it was believed ordered that the next of kin, on occa- sion of a birth, should register the event in the temple of Venus, and on occasion of a death, should register it in the temple of Libitina. The Acta were drawn up from day to day, and exposed in a public place to be read or copied by all who chose to do so. After remaining there for a reasonable time they were taken down and preserved with other public documents.

ACTA SENATUS, among the Romans, were minutes of the discussions and decisions of the senate. These were also called Commentartt Senatus, and, by a Greek name, iropvnpata. Before the consulship of Julius Casar, minutes of the proceedings of the senate were written and occasionally published, but unofficially. ordered the minutes to be recorded and

published autho- ritatively. The keeping of them was continued by Augustus, but the publication was forbidden. Some pro- minent senator was usually chosen to draw up these Acta.

ACTON, in Fabulous History, son of Aristeeus and Autonoé, a famous hunter. He was torn to pieces by his own dogs. Various accounts are given of this occurrence; but the best known story is that told by Ovid, who re- presents him as accidentally seeing Diana as she was bathing, when she changed him into a stag, and he was pursued and killed by his dogs.

ACTIAN GAMES, in Roman Antiquity, solemn games instituted by Augustus, in wnemory of his victory over Antony at Actium. See Actium.

ACTINIA, a genus of ccelenterate animals, of which the sea-anemone is the type. See AcTINozoa.

ACTINISM (from dxris, a ray), that property of the solar rays whereby they produce chemical effects, as in photography. The actinic force is greatest in the blue and violet rays of the spectrum.

ACTINOMETER (measurer of solar rays), a thermo- meter with a large bulb, filled with a dark-blue fluid, and enclosed in a box, the sides of which are blackened, and the whole covered with a thick plate of glass. It was the invention of the late Sir John Herschel, and was first described in the Hdinburgh Journal of Science for 1825. It is used for measuring the heating power of the sun's rays, the amount of which is ascertained by exposing the bulb for equal intervals of time in sunshine and shade alternately.

ACTINOZOA, a group of animals, of which the most familiar examples are the sea-anemones and " coral insects" of the older writers. The term was first employed by de Blainville, to denote a division of the Animal Kingdom having somewhat different limits from that to which its application is restricted in the present article; in which it is applied to one of the two great divisions of the Ca@Lun- TERATA, the other being the Hydrozoa.

The Actinozoa agree with the Zydrozoa in the primitive and fundamental constitution of the body of two membranes, an ectoderm and an endoderm, —between which a middle layer or mesoderm may subsequently arise,—in

the absence of a completely differentiated alimentary canal, and in possessing thread cells, or nematocysts; but they present a somewhat greater complexity of structure.

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This is manifest, in the first place, in their visceral tube, or "stomach," as it is often called, which is continued from the margins of the mouth, for a certain distance, into the interior cavity of the body, but which is always open at its fundus into that cavity. And, secondly, in the position of the reproductive elements, which, in the Hydrozoa, are always developed in parts of the body wall which are in immediate relation with the external surface, and generally form outward projections; while, in the Actinozoa, they are as constantly situated in the lateral walls of the chambers into which the body cavity is divided. In consequence of this arrangement, the ova, or sexually generated embryos, of the Actinozoa are detached into the interior of the body, and usually escape from it by the oral aperture; while those of the IZydrozoa are at once set free on the exterior surface of that part of the body in which they are formed.

The Actinozoa comprise two groups, which are very diffcrent in general appearance and habit, though really similar in fundamental structure. These are—

1, The Coralligena or sea-anemones, coral animals, and sea-pens; and 2. The Ctenophora.

(1.) The Coralligena.—A common sea-anemone presents a subcylindrical body, terminated at each end by a disk. The one of these discoidal ends serves to attach the ordinarily sedentary animal; the other exhibits in the centre a mouth, which is usually elongated in one direction, and, at each end, presents folds extending down into the gastric cavity. This circumstance greatly diminishes the otherwise generally radial symmetry of the disk, and of the series of flexible conical tentacles which start from it;

and, taken together with some other circumstances, raises a doubt whether even these animals arc not rather bilater- ally, than radially, symmetrical. Each tentacle is hollow, and its base communicates with one of the chambers into which the cavity of the body is divided, by thin membranous lamelle, the so-called mesenterics, which radiate from the oral disk and the lateral walls of the body. to the parietes of the visceral tube. The inferior edges of the mesenterics are free, and arcuatcd in such a manner as to leave a central common chamber, into the circumference of which all the intermescnteric spaces open, while above, it communicates with the visceral tube. The tentacles may be perforated at their extremi- ties, and, in some cases, the body wall itsclf exhibits aper- tures leading into the intermesenteric spaccs. The free edges of the mesenteries present thickenings, like the hem of a piece of linen, each of which is much longer than the distance between the gastric and the parictal attachment of the mesentery, and hence is much folded on itself. It is full of thread cells. The mesoderm, or middle layer of the body, which lies between the ectoderm and the endoderm, consists of a fibrillated connective tissue, containing fusi- form orstellate nucleated cells, and possesses longitudinal and circular muscularfibres. These areprolonged into the mesen- teries, and attain a great development in the disk of attach- ment, which serves as a sort of foot like that of a limpet.

The question whether the Coralligena possess a nervous system and organs of sense, hardly admits of a definite answer at present. It is only in the Actinide that the existence of such organs has been asserted ; and the nervous circlet of Actinia, described by Spix, has been seen by no later investigator, and may be safely assumed to be non- existent. But Professor P. M. Duncan, F.R.S., in a paper "On the Nervous System of Actinia," recently communi- cated to the Royal Society, has affirmed the existence of a nervous apparatus, consisting of fusiform ganglionic cclls, united by nerve fibres, which resemble the sympathetic nerve fibrils of the Vertebrata, and form a plexus, which appears to extend throughout the pedal disk, and very probably into other parts of the body. In some of

the Actinides (e.g., Actua mesembryanthemum), brightly coloured bead-like bodies are situated on the oral disk out- side the tentacles. The structure of these "chromato- phores," or " bourses calicinales," has been carefully investi- gated by Schneider and Rottekem, and by Professor Duncan. They are diverticula of the body wall, the sur- face of which is composed of close-set "bacilli," beneath which lies a layer of strongly-refracting sphcrules, followed by another layer of no less strongly refracting cones. Sub- jacent to these Professor Duncan finds ganglion cells and nerve plexuses. It would seem, therefore, that these bodies are rudimentary eyes.

At the breeding season the ova or spermatozoa are evolved in the thickness of the mesenteries, and are dis- charged into the intermesenteric spaces, the ova undergo- ing their development within the body of the parent. The yelk, usually, if not always, enclosed in a vitelline membrane, undergoes complete division, and the outer wall of the ciliated blastodermic mass which results becomes invagi- nated, the embryo being thercby converted into a double wallcd sac—the external aperture of which is the future mouth, while the contained cavity represents the body cavity. In this stage the larval Actinia represents the Gastrula con- dition of sponges and Hydrozoa. The edges of the oral aperture grow inwards, giving rise to a circular fold, which is the rudiment of the visceral tube. This is at first con- nected with the body wall by only two mesenteries, which are seated at opposite ends of one of the transverse diameters of the body. As the mesenteries increase in number, the ten- tacles grow out as diverticula of the intermesenteric spaces.

In all the Coralligena, the development of which has been observed, the embryo is converted into a simple actinozoon in a similar manner; but from this point they diverge in two directions. In one great group, the mesen- teries, and the tentacles which arise from the intermesen- teric chambers, increase in number to six; and then, in the great majority of cases, the intermcsenteric spaces undergo subdivision by the development of new mesenteries, accord- ing to curious and somewhat complicated numerical laws, until their number is increased to some multiple of five or six. In these /Zexacoralla (as they have been termed by Hacckel) the tentacles also usually remain rounded and conical. In the other group, the Octocoralla, the mesen- terics and the tentacles increase to cight, but do not sur- pass

that number; and the tentacles become flattened and serrated at the edges, or take on a more or less pennatifid character.

There are no Octocoralla which retain the simple indivi- duality of the young actinozoon throughout life; but all in- crease by gemmation, and give rise to compound organisms, which may be arborescent, and fixed by the root end of the common stem, as in the Alcyonide and Gorgonide ; or may possess a central stem which is not fixed, and gives off lateral branches which undergo comparatively little sub- division, as in the Pennatulide.

The body cavities of the zodids of these compound Octocoralla are in free communication with a set of canals which ramify through the cenosarc, or common fabric of the stem and branches by which they are borne, and which play the part of a vascular system.

Except in the case of Tubipora, the zodids and the super- ficial coenosare give rise to no continuous skeleton; but the deep or inner substance of the ccenosare may be converted into a solid rod-like or branching stem.

In the Hexacoralia, on the other hand, one large group, that of the Actinide, consists entirely of simple organisms,—organisms that is, in which the primitive actinozoon attains its adult condition without budding or fission; or if it bud or divide, the products of the operation separate from one another. No true skelcton is formed,

ACTENOTZOa

all are to some extent locomotive, and some (Jfinyas) float frecly by the help of their contractile pedal region. The most remarkable form of this group is the genus Cereanthus, which has two circlets, each composed of numerous tentacles, one immediately around the oral aperture, the other at the margin of the disk. The foot is elongated, subconical, and generally presents a pore at its apex. Of the diametral folds of the oral aperture, one pair is much longer than the other, and is produced as far as the pedal pore. The larva is curiously like a young hydrozoon with free tentacles, and at first possesses four mesenteries, whence it may be doubted whether Cereanthus does not rather belong to the Octocoralla.

The Zoanthide differ from the Actenide in little more than their multiplication by buds, which remain adherent, either by a common connecting mass or ccenosare or by stolons; and in the possession of a rudimentary, spicular skeleton.

On the other hand, the proper stone-corals (as contra- distinguished from the red coral) are essentially Actinia, which become converted into compound organisms by gemmation or fission, and develope a coutinuous skeleton.

The skcletal parts! of the Actinozoa, to which reference has been made, consist cither of a substance of a horny character; or of an organic basis impregnated with earthy salts (chiefly of lime and magnesia), but which can be isolated by the action of dilute acids; or finally, of cal- careous salts in an almost crystalline state, forming rods or corpuscles, which, when treated with acids, leave only an inappreciable and structureless film of organic matter. The hard parts of all the Aporosa, Perforata, and Tabu- lata of Milne Edwards are in the last-mentioned condition; while, in the Octocoralla (except T'ubipora) the Antipathide, and Zoanthide, the skeleton is either horny, or consists, at any rate, to begin with, of definitely formed spicula, which contain an organic basis, and frequently present a laminated structure. In the organ coral (Zubipora), however, the skeleton has the character of that of the ordinary stone- corals, except that it is perforated by numerous minute canals,

The skeleton appears, in all cases, to be deposited within the mesoderm, and in the intercellular substance of that layer of the body. Even the definitely shaped spicula of the Octocoralla are not the result of the metamorphosis of cells. In the simple aporose corals the calcification of the base and side walls of the body gives rise to the cup or théca; from this the calcification radiates in- wards, in correspondence with the mesenteries, and gives rise to as many vertical septa, the spaces between which are termed loculc; while, in the centre, either by union of the septa or independently, a pillar, the columella, grows up. From the sides of adjacent septa scattered processes of calcified substance, or synapticule, may grow out toward one another, as in the Yungidw,; or the interrup- tion of the cavities of the loculi may be more complete by the formation of shelves

stretching from septum to septum, but lying at different heights in adjacent loculi. These are interseptal dissepiments. Finally, in the T'abulata, horizontal plates, which stretch completely across the cavity of the theca, are formed one above the other and constitute tabular dissepuments,

In the Aporosa the theca and septa are almost invariably imperforate; but in the Perforata they present apertures, and in some madrepores the whole skeleton is reduced to a mere network of dense calcareous substance. When the Hexacoralla multiply by gemmation or fission, and thus give rise to compound massive or aborescent aggre- gations, each newly-formed coral polype developes a skeleton

- *See Kolliker's Icones Histologica, 1866.*

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of its own, which is either confluent with that of the others, or is united with them by calcification of the con- necting substance of the common body. This intermediate skeletal layer is then termed canenchyma.

The Octocoralla (excepting Tubipora) give rise to no thece and their dependencies, the skeleton of each polype, and of the superficial portion of the polyparium, being always composed of loose and independent spicula. But in many, as the Gorgonide, Pennatulide (and in the Antipathide among the Hexacoralla), the central part of the common stem of the compound organism becomes hardened, either by conversion into a mere horny axis (which may be more or less impregnated with calcareous salts) without spicula; or the cornification may be accompanied by a massive development of spicula, either continuously or at intervals; or the main feature of the skelcton may, from the first, be the development of spicula, which become soldered together by a subcrystalline intermediate deposit, as in the red coral of commerce (Corallium rubrum).

It has seemed advisable to say thus much concerning the hard parts of the Actznozoa in this place, but the details of the structure and development of

the skeleton of the Coralligena will be discussed under Corats and CoraL REEFS.

The Tabuata, or Millepores, and the Rugosa, an extinct and almost exclusively Paleozoic group of stone-coral form- ing animals, are usually referred to the Coralligena. Judg- ing by the figures given by Agassiz! of living Millepores, the polypes which cover its surface are undoubtedly much more similar to coryinform fydrozoa than they are to any Actinozoon. But it is to be observed, firstly, that we have no sufficient knowledge of the intimate structure of the polypes thus figured; and, secondly, that the figures show not the least indication of the external reproductive organs which are so conspicuous in the Zydrozoa, and which surely must have been present in some one or other of the Millepores examined, were they really Hydrozoa. As re- gards the Lugosa, the presence of septa is a strong argument against their belonging to any group but the Actimozoa, though it is not to be forgotten that a tendency to the development of septiform prominence is visible in the walls of the gastric passages of certain calcareous sponges,

Phenomena analogous to the "alternation of generations," which is so common among the Hydrozoa, are unknown among the great majority of the Actinozoa. But Semper? has recently described a process of sexual multiplication in two species of Fungi, which he ranks under this head. The Fungie bud out from a branched stem, and then become detached and free, as is the habit of the genus. To make the parallel with the production of a Afedusa from a Scyphistoma complete, however, the stem should be nourished by an asexual polype of a different character from the forms of Fungice which are produced by gemmation. And this does not appear to be the case.

Dimorphism has been observed by Kolliker to occur extensively among the Pennatulide. Each polypary pre- sents at least two different sets of zodids, some being fully developed, and provided with sexual organs, while the others have neither tentacles nor generative organs, and exhibit some other peculiarities? These abortive zodids are either scattered irregularly among the others (€.9.5 Sarcophyton, Veretillum), or may occupy a definite position (¢.9., Virgularia).

(2.) The Ctenophora.—These are all freely swimming,

_, Contributions to the Natural History af the United States. Vol. il. Plate xv.
2 Ueber Generations-Wechsel bet Steinkorallen. Leipzig, 1872.

3 Abhandlungen der Senkenbergischen Naturforschenden Gesell- schaft, bd. vii. viii.

actively locomotive, marine animals, which do not multiply by gemmation, nor form compound organisms such as the polyparies of the Coralligena. Like the latter they are composed of a cellular ectoderm and endoderm, between which a mesoderm, containing stellate connective tissue corpuscles and muscular fibres, is interposed. But, in most parts of the organisin, the mesoderm acquires a great thick- ness and a gelatinous consistency; so that the body of one of these animals differs in this respect from that of an Actinia in the same way as the body of a Cyanea differs from that of a Hydra. The bilateral symmetry, which is obscure in most of the Coralligena, becomes obvious in the Ctenophora, in which the parts are disposed symmetri-

cally on each side of a vertical plane passing through

the longitudinal axis of the body. The oral aperture is situated at one end of this axis (or its oral pole), while at the opposite extremity (or aboral pole) there is very generally situated a sac containing solid mineral particles—the lithocyst.

The oral aperture leads into a visceral tube, which undoubtedly performs the functions of a stomach. Never- theless, as in the Coralligena, it is open at its aboral end, and its cavity is thus placed in direct communication with a chamber, whence canals are given off which penetrate the gelatinous mesoderm. Of these canals, one continues the direction of the axis of the body, and usually ends by two apertures at the aboral pole. The others take a direction in a plane more or less at right angles with the axis; and after branching out, terminate in longitudinal canals, which lie beneath the series of locomotive paddles, or come into relation with the tentacles when such organs are developed. In addition to these, two canals frequently extend along the sides of the stomach towards the oral pole. The paddle-like

locomotive plates are disposed in eight longi- tudinal series (ctenophores) on the outer surface of the body. They are thick at the base; thin and, as it were, frayed out into separate filaments, at their free edges; and each plate is set transversely to the long axis of the series of which it forms a part. The ovaria and testes are developed in the side walls of the longitudinal canals. It is clear, therefore, that these canals answer to the intermesentcric spaces of an Actinia; that the common cavity into which they and the stomach open answers to the common cavity of the body of the Actinia; that the apertures at the aboral pole answer to the terminal aperture of Cereanthus; and that the wide interspaces between the longitudinal canals repre- sent the mesoderm of the Actinian mesenteries immensely thickened.

In their development the Ctenophora resemble the Coralligena in all essential respects, though they differ from them in some details. Thus the process of yelk division goes on at a different rate in the two moicties of the egg, so that the vitellus becomes divided into one set of small and another set of large cells, whereof the latter become overlaid by the former, and give rise to a large- celled hypoblast, enclosed within a small-celled epiblast. But in the manner in which the body cavity is formed, and the visceral tube (which becomes the stomach) is developed, the Ctenophora resemble the Actinic. The paddles make their appearance at four points of the circumference of the body, in the form of elevations beset with short cilia; but each of these divides into two, and thus the eight defini- tive series are constituted.

There is a general agrcement among anatomists respect- ing the structure of the Ctenophora thus far; but the question whether they possess a nervous system and sensory organs or not, is, as in the case of the Coralligena, one upon which there exists great diversity of opinion. Grant originally described a nervous ganglionated ring, whence longitudinal cords proceed in Cydippe (Pleurobrachia);

but his observation has not been verified by subsequent investigations. According to Milne Edwards, followed by others (among whom I must include myself), the nervous system consists of a ganglion, situated at the aboral pole of the body, whence nerves radiate, the most conspicuous of

which are eight cords which run down the correspond- ing series of paddles; and a sensory organ, having the characters of an otolithic sac, is seated upon the ganglion. Agassiz and Kolliker, on the other hand, have denied that the appearauces described (though they really exist) are justly interpreted. And again, though the body, described as an otolithic sac, undoubtedly exists in the position indi- cated in all, or most, of the Ctenophora, the question has been raised whether it is an auditory or a visual organ.

These problems have been recently reinvestigated with great care, and by the aid of the refined methods of modern histology, by Dr Eimer,! who describes a ner- vous system, consisting of extremely delicate varicose ulti- mate nerve fibrils, which traverse the mesoderm in all directions, and are connectcd here and there with gan- glionic corpuscles. These nerves are only discernible with high magnifying powers, as they are for the most part isolated, and arc collected into bundles ouly beneath the longitudinal canals. The mass which lies beneath the lithocyst is composed of cells, but these have none of the special characters of nerve cells. Eimer states that he has traced the filaments, which he considers to be nerves, into direct continuity with muscular fibres; and, around the mouth, into subepidermal bodies, which he regards as rudimentary forms of tactile corpuscles. The lithocyst is recognised as an auditory organ, and, in addition, eye-spots are described.

With a fundamental similarity of organisation, the form of the body varies extraordinarily in the Ctenophora. Onc of the gencra which is commonest on our coasts—Cydippe (Pleeobrachia)—is spheroidal ; others (Beroé) are more ovate ; others are provided with large lobular processes (Hucharvs), while an extreme modification, in which the body is ribbon shaped, is secn in Cestum.

The Ctenophora are divisible into two very unequal groups : I. Hurystomata, in which the large oral aperture occupies the trun- cated extremity of the oval body. 1. Beroide. IJ. Stenostomata, in which the oral aperture and the gastric sac are small relatively to the size of the body. 2. Saceatee. 8. Lobate. 4. Teniate.*

1. Beroide.

The body is ovate, truncated at the oral pole, the aboral being more or less acuminate and mobile. The digestive cavity occupies a large portion of the body. The oral margin is simple in Beroé and Idyia; butin Rangia the interradial spaccs are notched, and in each a short process projects. cireumoral canal. No tentacles are present. The ctenophores of Pandora do not extend over more than half the body, as in the embryos of Cydippe. The development of the Beroide is unac- companied by metamorphosis.

2. Saccate,

The circumoral canal is absent. The oral aperture is laterally compressed, its long axis being at right angles to the plane of the tentacles, which are present in all the genera, and which are either simple (Cydippe), or furnished with lamellar and filamentous appendages (Hormiphora). The ctenophores are equal in length, or the lateral ones are fully developed, while the intermediate are shorter.

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e oral and aboral pole, or the oral only, bear lobate appendages. Bolind has a pair of oral lappets, into wine ie radial cals Se at. longed. The ctenophores corresponding to these lobes are the longest, while the middle ones are much shorter, and are prolonged on to an auricle or finger-like lobe. The tentacles are represented by a tuft of short processes on either side of the mouth. The young Bolind has the form of Cydippe, and like it bears a pair of loug-fringed

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1 Zoologische Studien auf Capri. 1873. ® Haeckel, " Generelle Morphologie," ii. Ixi.

The radial canals are connected by a'

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tentacles. The aboral region, bearing the lateral ctenophores, grows more rapidly than the oral, so as ultimately to project in two principal lobes, by

which the similar outgrowth of the median aboral regions with its ctenophores is arrested, the auricles being the dwarfed representatives of these regious. These auricles in Eucharis are longer, so that the ctenophores are all of equal length. The tentacles of this genus are placed at the oral pole; the oral lobes are equivalent to the median etenophores of Cydippe. Hurhamphwa has the oral lobes small, the body elongated, terminated by two conical projections, on which the median ctenophores are prolonged.

4. Toniate.

The body of Cestwm is laterally compressed and elongated in a direction which corresponds to one of the transverse diameters of Cydippe, the ribbon-like band thus formed being sometimes threc or even four feet long. The tentacles are near the oral pole ; the canals are ten in number; the medio-lateral canals terminate in trunks which follow the oral margin of the ribbon, and thus correspond to the circular canal of Beroé.

Many Actinozoa (Pennatulide, Ctenophora) are phos- phorescent; but the conditions which determine the evolu- tion of light have not been determined.

All Actinozoa are marine animals, and the distribution of many of the families (Actinide, Turbinolidw, Pennatu- lide, Beroidce) is extremely wide, and bears no ascertain- able relation to climate. (T. EH. m)

ACTION, in Law, is the process by which redress is sought in a court of justice for the violation of a legal right. The word is used by jurists in three different senses. Sometimes it is spoken of as a right—the right, namely, of instituting the legal process; sometimes, and more pro- perly, it means the legal process itself ; and sometimes the particular form which it assumes. The most universally recognised division of actions is the division established by the Roman lawyers into actions in rem and in personam. An action im vem asserts a right to a particular thing as against all the world; an action i personam asserts a right only as against a particular person. For the sake of con- venience, the law relating to actions ought to form a separate section by itself in a properly constructed code.

In Roman law the action passed through three historical stages—

In the first period, which was brought to an end by the Lex Abutia, about 578 A.U.c., the system of legis actiones prevailed. These were five in number,—the actio sacramenti, per judicts postula- tionem, per condictionem, per manus injectionem, per pignorts cap- tionem. The first was the primitive and characteristic action of the Roman law, and the others were little more than modes of applying

it to cases not contemplated in the original form, or of carrying the result of it into execution when the action had been decided.

Action, in English Law, means the form of civil pro- cess hitherto observed in the Courts of Common Law. The procedure in the Court of Chancery is totally distinct, but some account of the former may be desirable in order to explain the new form of action introduced for all the civil courts by the Judicature Act of 1873:—

Actions at law are divided by Blackstone into three classes, according to the relief which they are respectively intended to obtain. Real actions are those " whereby the plaintiff claims title to have any lands or tenements, rents, commons, or other heredita- ments." In personal actions the claim is " for debt or personal duty, or damages in lieu thereof," or for "satisfaction in damages for some injury done to person or property." Alixed actions were sup- posed to partake of the nature of both of these; that is to say, there was a demand both for real property and for personal damages, asin the case of an action for waste. The distinction has long ceased te be of any value. Blackstone speaks of real actions as being in his time pretty generally laid aside, and successive enactments have oblite- rated the distinctions altogether. The statute 3 & 4 Will. IV. ¢. 27, abolished all the real and mixed actions, except three real acticns, and ejectment, which was a mixed action. The Common Law Pro- cedure Act of 1860 has assimliated the procedure in the former to an ordinary action, and the Common Law Procedure Act of 1852 now regulates the proceedings in ejcctment. In these and other respects the three Common Law Procedure Acts of 1852, 1854, and 1860, very greatly simplified the proceedings in an action at law. The first of these rendered it unnecessary any longer to select a form of action in prosecuting a claim, and abolished many of the technicalities which had accompanicd the older forms. The divi-

sions now observed may be regarded as indicating, not so much forms of action in the old sense, as the character of the injury sus- tained and the relief sought.

Action (under the Supreme Court of Judicature Act, 1873). By this Act, which establishes one supreme court in place of the Superior Courts of Common Law and the High Court of Chancery, action is the name given to the proceeding in the High Court of Justice, which takes the place of the old actions at common law, suits insti- tuted by bill or information in the Court of Chancery, causes iz rem in the Court of Admiralty, or by citation in the Court of Probate. For these various modes of obtain- ing redress the Act substitutes one uniform proceeding, which retains most of the essential features of the common law action. The form of action established by the Act is in some measure a compromise between the old action at law and Chancery suit. It may be described as putting an end to the unintelligible and even misleading formule of the one and reducing the prolixity and redundance of the other. (E. BR.)

ACTIUM, in Ancient Geography, a promontory in the north of Acarnania, at the mouth of the Sinus Ambracius, opposite the town of Nicopolis, built by Augustus on the north side of the strait. Eastwards from the promontory the strait widens out and forms a safe harbour. On the promontory was an ancient temple of Apollo (who is hence called by Virgil Actews), which was enlarged by Augustus. Actium became famous on account of Augustus's victory over Antony and Cleopatra (z.c. 31), and for the quin- quennial games he instituted there, called Actia or Ludi Actiact. Actiaca Ara was a computation of time from the battle of Actium. There was on the promontory a small town, or rather village, also called Actiwm.

ACTON, a large village in Middlesex, about eight miles west of St Paul's. It was once much frequented because of its saline springs, but these have long lost their repute. Acton being near the metropolis and easily accessible by the Great Western Railway, and the price of building land being low, numerous villas have been erected in the neigh- bourhood. The population of the parish increased from 3151 in 1861 to 8306 in 1871.

ACTON, Sir Joun Francis Epwarp, son of Edward Acton, who practised as a physician at Besangon, was born there in 1736, and succeeded to the title and estates in 1791, on the death of his cousin in the third degree, Sir Richard Acton. He served in the navy of France, and afterwards in that of Tuscany, and commanded a frigate in the joint expedition of Spain and Tuscany against Algiers in 1774. His gallantry in rescuing three or four thousand Spanish soldiers from slavery led to his advancement. Entering the Neapolitan service, he gained the favour of Queen Mary Caroline, became commander-in-chief of the land and sea forces, then minister of finance, and ultimately prime minister. His policy was devised in concert with the English ambassador Hamilton, and, of course, was hostile to France and to the French party in Italy. He has been held responsible for the arbitrary and despotic measures which, in 1798-99, filled the prisons of Naples with poli- tical prisoners, and even brought some of them to the scaffold. In 1803 Acton was for a short time deprived of the reins of government at the demand of France; but he was speedily restored to his former position, which he held till, in Feb. 1806, on the entry of the French into Naples, he had to flee with the royal family into Sicily. He died at Palermo on the 12th Aug. 1811, leaving by his wife (eldest daughter of his brother, General J oseph Edward Acton, whom he had married by papal dispensation) three children, of whom the second, Charles Januarius Edward, was made Cardinal Santa Maria dclla Pace in 1842. It may be well to state that Sir John has very frequently

been confounded with his above-mentioned brother, born in 1737, who was also employed in the Neapolitan service.

ACTUARY, in ancient Rome, was the name given to the clerks who recorded the Acta Publica of the Senate, and also to the officers who kept the military accounts and enforced the due fulfilment of contracts for military supplies. In its English usage the word has undergone a gradual limitation of meaning. At first it scems to have denoted any clerk or registrar; then more particularly the secretary and adviser of any joint-stock company, but especially of an insurance company; and it is now applied specifically to one who makes those calculations as to the probabilities of human life, on

which the practice of life assurance and the valuation of reversionary interests, deferred annuities, &c., are based. The first mention of the word in law is in the Friendly Societies Act of 1819, where it is used in the vague sense, "' actuarics, or persons skilled in calculation." The word has been used with precision since the establishment of the "Institute of Actuaries of Great Britain and Ire- land" in 1848. The "Faculty of Actuaries in Scotland" was formed at Edinburgh in 1856, and incorporated by royal charter in 1868. The registrar in the Lower House of Convocation is also called the actuary.

ACUNA, CuristovaL pv', a Spanish Jesuit, born at Burgosin 1597. He was admitted into the society in 1612, and, after some years spent in study, was sent as a mis- sionary to Chih and Peru, where he became rector of the College of Cuenga. In 1639 he was appointed by the Jesuits to accompany Pedro Texeira in his second explora- tion of the Amazon, in order to take scientific obscrvations, and draw up a report that might be sent to Spain. The journey lasted for ten months; and, on their arrival at Peru, no ship being ready to convey the explorer to Spain, Acuiia employed himself in the preparation of a narrative of his journey. This was published at Madrid in 1641, under the title Vuevo Descubrimiento del Gran Rio de las Amazonas, &ce. The King of Spain received Acuiia coldly, and, it is said, even tried to suppress his book, fearing that the Portuguese, who had revolted from Spain, would avail themsclves of the information which it contained. A translation into French was published by Gomberville in 1682; and a translation from the French into English appeared in 1698. After occupying the positions of procu- rator of the Jesuits at Rome, and calificador (censor) of the Inquisition at Madrid, Acuiia returned to South Amcrica, where he died, probably soon after the ycar 1675.

ACUPRESSURE, in Surgery (acus, a necdle, premo, I press), a method of restraining hemorrhage, introduced in 1869 by the late Sir J. Y. Simpson. The closure of the vessel near the bleeding point is attained by the direct pressure of a metallic needle, either alone or assisted by a loop of wire. The advantages claimed by the originator of this method over the old silk ligaturc were, that the needles can be removed within forty-eight hours after introduction, allowing the wound to heal rapidly ; and that, being metallic and non-porous, they do not cause irritation and suppura- tion like the silk

ligature. The catgut ligature, which is rapidly absorbed, is gradually superseding both the silk ligature and the acupressure needle. A volume entitled Acupressure, by Sir J. ¥. Simpson, was published in 1864.

ACUPUNCTURE, the name of a surgical operation among the Chinese and Japanese, which is performed by pricking the part affccted with a silver needle. 'They employ this operation in headaches, lethargies, convulsions, colics, &c.; and it has more lately been introduced into British practice for the cure of some forms of neuralgia.

ADAFUDIA, a large town of Western Africa, in the country of the Felattahs, in 13° 6' N. lat., 1° 3' E. long., about 400 miles 8.E. of Timbuctoo. It is surrounded by a mud wall. The neighbouring country is rich and

fertile. The trade in native merchandise is said to be as great as that of Abomey, the capital of Dahomey; and there is also a considerable traffic in slaves. Population, about 24,000.

ADAL, a region in Eastern Africa, with a coast line extending, between 11° 30' and 15° 40' N. lat., from the Gulf of Tajurrah to the neighbourhood of Massowah. For about 300 miles it borders on the Red Sea, the coast of which is composed of coral rock. It stretches inland to the mountain terraces, to the west of which lie the Abys- sinian tablelands of Shoa and Tigré, with a breadth near Massowah of only a few miles, but widening towards the south to 200 or 300 miles. The northern portion of this region, known as the Afar country, is traversed by two routes to Abyssinia—the one from Zulla near Massowah, and the other from Amphilla Bay. The former of these was selected for the British Abyssinian expedition of 1868, Annesley Bay being the place of debarkation and base of operations. There is a third route to Abyssinia through Adal, that from Tajurrah to Ankobar, the capital of Shoa, said to be preferred for trading purposes, as being less steep than the others. The river Hawash flows through the southern district of Adal in a N.E. direction, but is lost in Lakes Abbebad and Aussa. Near this river is Aussa, the chief town of the country. Volcanic rocks occur in various parts of this district; and two mountains, 4000 feet high, are mentioned, which have sent down streains of lava on all sides to the distance of 30 miles. The

country contains two great salt plains or basins,—that of Asali in its northern portion, and Aussa in the south. The remarkable salt lake of Bahr Assal, near Tajurrah, is 570 feet below the level of the sea. The country as a whole is barren and uncultivated. A little barley is reared on the higher terraces, and some districts afford pasturage for domestic animals, large quantities of butter being annually sent to Massowah. In some parts of Adal the elephant is not uncommon. The salt of Asali and Aussa is a valuable article of commerce. There is no fixed government, the country being inhabited by various independent tribes, all speaking the Afar language and professing the Mahometan religion, and most of them of nomadic habits.

ADALBERT, Sarnt, one of the founders of Christianity in Germany, known as the Apostle of the Prussians, was born of a noble family in Slavonia, about 955; was educated at the monastery of Magdeburg; and, in 983, was chosen Bishop of Prague. The restraints which he tried to impose on the newly-converted Bohemians by prohibiting poly- gamy, clerical incontinency, and similar sins, raised against him so strong a feeling of hatred, that he was forced, in 988, to retire to Rome, where he resided at the monasteries of Monte Basino and St Alexis. In 993 he returned to his flock, in obedience to the command of the Pope. Find- ing little amendment, however, in their course of living, he soon afterwards went again to Rome, and obtained permis- sion from the Pope to devote himself to missionary labours, which he carried on chiefly in North Germany and Poland. While preaching in Pomerania (997), he was thrust through the heart by a heathen priest.

ADALBERT, Archbishop of Bremen and Hamburg, born of the noble Saxon family of the Counts of Wettin, was oue of the most remarkable ecclesiastics of the 11th century. Through the friendship of the emperor Henry IIf. he was elevated in 1043, when only about thirty years old, to the see of Bremen and Hamburg, which included the whole of Scandinavia, and he accompanied the monarch in his journey to Rome (1046). Here it is said that he was offered and that he refused the papal throne. The refusal certainly cannot have arisen from lack of ambition; for on his return in 1050, with a com-

mission as legate to the northern eourts from Pope Leo IX., he immediately set about carrying out the emperor's wishes by establishing himself in an independent patri- archate of the north. For this purpose he sought by every means to augment his already great influence, he adorned his two cathedrals, and enlarged and fortified the town of Bremen so that it might rival Rome. There was much in his favour, and he might even have succeeded in entirely separating the church of the north from the see of Rome, had it not been for the death of Henry ITI., and the oppo- sition of Cardinal Hildebrand. Henry IV. being a minor at the time of his father's death, Adalbert was associated with Archbishop Hanno of Cologne as guardian and regent; and during the absence of the latter on a mission to Rome, he sought, by granting every indulgence, to gain the favour of the young prince, and so to be able to exercise an absolute power in the state (1062-65). The Archbishops of Mayence and Cologne secured his banishment from court after the government had been assumed by Henry in person (1066); and about the same time his diocese was invaded by the "natural enemies" of Bremen, the Saxon nobles. In 1069, however, he was recalled, and reinstated in his former position. He died at Goslar in 1072, having done much during his last years to inflame the Saxons' hatred of Henry, which resulted soon afterwards in their revolt.

ADAM, ®78, an appellative noun, meaning the first man. In Genesis ii. 7, 25, iii. 8, 20, iv. 1, &c., it assumes the nature of a proper name, and has the article, the man, the only one of his kind; yet it is appellative, correctly speaking. In Genesis i. 26, 27, v. 2, it is simply appellative, being applied to both progenitors of the human race; not to the first man alone as in the second, third, and fourth chapters. The etymology of the word is uncertain, but it is probably connected with a root signifying red, so that the idea is one red or ruddy.

The early part of Genesis contains two accounts of man's creation. These narratives need not be examined at present farther than man's origin is concerned, In Genesis i. 26, 27, we read, " And God said, Let us make man in our image, after our likeness ; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth. So God created man in his own image; in the image of God created he him; male

and female ereated he them." At the end of the sixth day of creation man appears, the noblest of earth's inhabitants. In Genesis ii. 7, 8, we also read, "And the Lorp formed man of the dust of the ground, and breathed into his nostrils the breath of life ; and man became a living soul. And the Lorp God planted a garden eastward in Eden; and there he put the man he had formed." The woman's creation is thus narrated in subsequent verses of the same chapter—20, 21, 22, 23, "And Adam gave names to all cattle, and to the fowl of the air, and to every beast of the field: but for Adam there was not found an help meet for him. And the Lorp God caused a deep sleep to fall upon Adam, and he slept: and he took one of his ribs, and closed up the flesh instead thereof. And the rib, which the Lorp God had taken from man, made he a woman, and brought her unto the man, And Adam said, This 7s now bone of my bones, and flesh of my flesh: she shall be called Woman, because she was taken out of man," Between these accounts some discrepancy exists. The first repre- sents the man and woman to have been created together, after the various creatures which the earth sustains on its surface; the second makes Adam to have been created first, then the various animals, with the woman last of all. The creation of animals separates the origin of the man and the woman. The first narrator states that man was

made in the image and form of God, without explaining his meaning more particularly. Hence interpreters differ in attempting to define it. The language need not be restricted either to man's spit or to his body, but may refer to his united whole, including spiritual qualities and bodily form. The ancient Hebrew did not think of God without a certain form, but transferred the human one to him, divesting it of grossness, and giving it an ethereal luminousness of surpassing glory. The image of God, therefore, in which Adam is said to have been created, includes the whole man, with special reference to the spiritual nature within him. We cannot tell whether the writer thought of immortality as involved in the God- likeness. He may have done so. But the second account teaches that man was only mortal at first, because he is sent out of Paradise lest he should become immortal by eating of the tree of life. —

The narrative in the first chapter is arranged according toa definite plan. Six days are allotted to the creation of the heavens and earth, with all their furniture animate and inanimate. After due preparation had been made by the formation of light, atmosphere, and land separated from water, life is called into existence, first vegetable, then animal, terminating in man the lord of this lower world. The narrative in chapters ii—iv. does not present such orderly progress. In it man is the central figure, to whom all is subordinated. He is created first. For him plants and trees are made to spring up. He is placed in a delightful garden. The Lord God perceiving his solitary condition creates the beasts of the field and the fowls of the air; but when brought to the protoplast, they were insufficient to supply his mental void, so that woman was made, in whom he found a suitable partner. A number of questions connected with the first pair, not necessarily entering into the writer's main purpose in describing man's origin, but complementary and new, are, the means by which the ground yielded vegetable pro- ductions, the materials from which the man and the woman were formed, the cause of their intimate union, the place of their abode, the simplicity of their condition, and the way in which animals first received their names. By these traits preparation is made for the history of what befell the protoplasts in their primitive abode.

According to the second narrative, Jehovah planted a garden in Eden, eastward, and put the first man there. A spring or stream rising in Eden, and flowing through the garden, supplied it with water. In issuing from the garden it divided itself into four rivers, each having its own course. The writer gives their names, and the countries washed by three of them. This garden, usually termed Paradise after the Septuagint and Vulgate, has been eagerly sought for; but it has baffled curiosity. Though two of the rivers, the Euphrates and Tigris, are well known, the other two, Pison and Gihon, can only be identified with difficulty. They seem to be rivers of Northern India. The Tigris and Euphrates took their rise in the high land of Northern Armenia ; the Pison, z.e., Indus, rises in the Himalayas; and the Gihon, 7.e., Oxus, 18 connected with Ethiopia or Cush. The writer appears to have considered them all as having their source in the northern highlands of Asia, and flowing south, and there- fore he placed Eden somewhere in the north of Asia. The names of two rivers belonging to a foreign tradition, and little known to the Hebrews because intercourse with India was then

remote, were associated with those of two known ones incorporated in the national tradition. If the interpreter had to do with pure history, it might not be anuss to search for Eden in some definite locality; but, as the case stands, the examination would probably be fruitless.

The garden has two remarkable productions—the tree

of life, and the tree of knowledge of good and evil The former derives its name from the virtue of its fruit to impart perpetual life or immortality. The fruit of the latter communicates the knowledge of good and evil. It awakens moral consciousness. The one had to do with physical, the other with spiritual life. Such were the miraculous powers of the two trees in the midst of the garden.

The third chapter gives an account of the first pair falling away from the state in which they were created. What that state was may be clearly gathered from the words. It was one of innocent simplicity. The protoplasts had a child- like unconsciousness of evil; no knowledge of right and wrong, virtue and vice. They were in the happy condition of infancy. Their moral existence had not begun. Perfec- tion, uprightness, righteousness, could not be predicated of them. But the world presents vice and its concomitant misery in strong colours. Misery and evil abound. The eyes of an Oriental especially must have been vividly struck with the phenomena of toilsome work, the pains of child-bearing, the slavery of woman, and the inevitable necessity of death. The Hebrews, accordingly, meditated onthe cause. The writer seeks to connect with the problem incidental phenomena, as the love of man and wife, the form of the serpent different from that of other animals, the mutual hatred of man and serpents, &e. It is an old question, the introduction of evil into the world. As all the posterity of the first pair participate in sin and suffer- ing, the cause must be looked for in connection with these. Yet it must not proceed from themselves. God had made them innocent and happy. The origin of evil must come from without. A serpent becomes the instru- ment of their temptation. That cunning and mischievous animal seduces them. The writer thought of nothing but the creature itself. Those who suppose that the devil employed the serpent as his instrument, or that the devil alone is spoken of, are confronted by the fact that the idea of

Satan was of later introduction among the Hebrews than the age of the writer. The curse pronounced on the tempter sufficiently shows that none but the agent expressly named was thought of.

Are these narratives of the creation, primal abode, and fall of man, literal history? So some have always believed, with Augustine and the Reformers. The difficulties in the way of this interpretation are great. As it cannot be carried out consistently, its advocates resort to various expedients. They forsake the literal for the figurative wherever necessity demands. Thus they put a figurative construction on the language of the curse, because they allege that a literal one would be frigid, utterly unworthy of the solemn occasion, highly inconsistent with the dignity of the speaker and the condition of the parties addressed. Sometimes they even incline to regard the narrative as a sort of poem, or give it a poetical character. The atmosphere in which the accounts move is different from the literal one. Instead of assuming that God created the world and all it contains in a moment of time, and in harmonious arrangement, the first writer attributes creation to six successive days, represents the Almighty as addressing the newly-formed existences, look- ing upon them with satisfaction, pronouncing them good, and resting on the seventh day. He naturally chose the six days of the Hebrew week, with which he was familiar, for successive gradations of the creative power. In the second account we find a speaking serpent, God walking in a human way in the cool of the day through the garden, his jealousy of the aspiring Adam who had attained a higher knowledge, his cursing the serpent, and cherubim with a flaming sword. To explain all this as literal history, were to attribute other perfections to the

Deity than infinite power, spirituality, and wisdom. Hence the Church of England, according to Horsley, does not demand the literal understanding of the document con- tained in the sccond and third chapters, as a point of faith.

Are the narratives. allegorical ?

them, followed by the Greek fathers of Alexandria, Clement and Origen,? as well as by Ambrose. In modern times Coleridge read the whole as an

allegory.2 So did Donaldson in his Jashar. There is no indication, how- ever, that allegories were intended. Had this been the case, the truths meant to be conveyed would have been easily discovered. The embarrassment and capriciousness of the allegorical interpreters prove that they have followed a wrong method. The outward form is set aside, and an idea discovered beneath it with which the envelope has no necessary connection. Both should be retained ; the shell suggesting the kernel, and the kernel showing itself to be the necessary evolution of eentral ideas. _ According to another interpretation, more commonly ac- ecpted among scholars at the present day, both accounts are supposed to be, like the early records of other nations, tradi- tional and mythical. This does not imply that theyare fables or fictions; far from it. It is true that the oldest traditions of peoples are mainly subjective, the result of the national mind; but they arc nevertheless rcal. Variable, developed in different forms, influenced by the characteristics of the people and by their intercourse with others, they are all that constitutes the earlicst history of nations, the shapings of oral tradition before written records appeared. A mythologi- eal age stands at the head of all national histories ; and that of the Hebrews seems to be no exception. The two narra- tives present philosophical mythi ina historical form. They represent the best ideas of the Hebrews at a certain stage of their history in explanation of the creation of man, his primeval abode and state, and the causc of his degeneracy. The first account is plain and simple. It assigns a high dignity to man, and traces all human beings to a single pair, in harmony with the best evidence of modern science that points to unity of origin, rather than to dif- ferent centres of creation. There is a naturalness in the narrative that cannot be mistaken, while the writer adhercs to generalities. (Sec Gabler's Hinleitung to Huchhorn's Urgeschichte, vol. i. p. 11, &c.; and Gesenius's article " Adam," in Ersch und Gruber's Encyklopoedie, vol. i.)

On the othcr hand, the narrator in the second, third, and fourth chapters manifests a more reflective spirit, seeking to explain causes, and to trace connections. Supplying particu- lars wanting in the older narrative, and correcting others, he enters into details, and though more anthropomorphic, has a finer perception of eircumstances associated with the protoplasts. Tholuck himself admits his narrative to bea mythus. It is usual to designate the first writer the Elohist ; the second, the Jehovist ; beeause the one com-

monly uses Elohim as the name of God; the other Jehovah, or Jehovah Elohim in the second and third chapters.

The Adam in the second and third chapters, according to this view, is the progenitor and representative of humanity, who brought misery into the world by self-will. He is ideal man, becoming historical in every individual who, as soon as his moral nature is awakened, feels the power and the possibility of rising higher through reason and _per- ception. Adam's procedure repeats itself in each indivi- dual, who has his paradise, eats of the tree of knowledge, and feels within him the roots of apostasy from God. On

So Philo! interprets

1 De mundi Opificio, p. 37, vol. i. ed. Mangey. 2 Philocalia, cap. 1, and contra Cels. 3 Aids to Reflection, p. 241, note (Burlington edition of 1840).

the other hand, his restoration and happiness are supposed to be in his own power. His salvation is practicable through the victory of reason over instinct, of faith over sense.4

The traditions of ancient nations present analogies to the creation of man given in the first chapter of Genesis, The Etrurian comes nearest to the Hebrew. There creation takes place in six periods of a thousand years each, and men appear in the last, after the earth, sun, moon, and stars, with all living things on the surface of the globe, had been brought into existence by God. The Persian mythology, in like manner, makes Ormuzd, the god of light, ereate by his word JZZonover the visible world in six periods of a thousand years each, and man is formed last. The name of the first man is Kaiomorts.6 The Chaldee myth, given by Berosus, presents little resemblance to the Hebrew narra- — tive. Bel, the highest god, divided the darkness, and cut the woman, who ruled over the monstrous ereatures found at first in the all, into two halves, out of which heaven and earth were formed. After that he cut off hisown head. The blood trickling down was taken by other gods and mixed with earth, from which men were formed, who are therefore wise, and partakers of the divine intelligence.' The

Phenician myth is still more unlike the Hebrew aceount.® But Ovid's teaching is that man was made in the image of the gods, and was intended to be ruler of the earth.° The Egyptian theology has no point of contact with the Hebrew.!° The Indian accounts arc very numerous, but often discrepant. Their likeness to the Hebrew narrative is remote; for the play of imagination appears in them to excess and absur- dity. Among those myths in which the formation of men is described without allusion to any primordial distinction of castes, we may quote two. Prajapati, 7.¢., the universe which was soul and only one, formed animals from his breaths, a man from his soul. The soul is the first of the breaths. Since he formed a man from his soul, therefore they say, "man is the first of the animals, and the strongest." The soul is all the breaths; for all the breaths depend upon the soul. Since he formed man from his soul, therefore they say, " man is all the animals;" for all these are man's." Manw's account of the creation is that men of the four castes proceeded separately from different parts of Brahma's body prior to the division of that body into two parts. The doctrine of emanation appears in the Indian cosmogonies, as also that of absorption. Thus Brahma is reabsorbed into the supreme spirit, according to Manu." According to the Bamians in India, God having made the world and the ereatures belonging to it, created man, who came forth from the earth at the divine voice, his head appearing first, then his whole body, into whom life was eonveyed. God gave him for companion a woman, and the two lived together as man and wife, feeding on the fruits of the ground. They had four sons of different temperaments, for whom God made four women, and the four quarters of the earth were peopled by their progeny."

The paradisiacal state of the first pair, and their loss of it as described in the second and third chapters of Genesis, have their parallels in the myths of ancient nations. Ac- cording to the Persian traditions, Meschia and Meschiane, the progenitors of mankind, were created for happiness in

4 See Tuch's Kommentar weber die Genesis, p. 50.

5 Suidas, s. v. Tuppnvia, vol. ii. pp. 1248-9, ed. Bernhardy.

6 Kleuker, i. 19, 20; iii. 59, &c.

7 Eusebius's Chron. Bipartitwm, vol. i. p. 24, ed. Aucher.

8 See Sanchoniatho, translated by Cory, in the Phenix, p. 185, &e., ed. New York.

9 Metamorphos. i. 76, &c.; Opera ed. Burmann, tom. ii. p. 20.

10 Rocth's Geschichte der Philos. i. p. 181, &e.

Nl Muir's Sanskrit Texts, vol. i. p. 24, 2d od.

12 Tid. p. 53, &e.

13 See Lord's Display of two Foreign Sects in the East Indies, chap- ten Dellweccy

this world and the next, on condition that they were good, and did not worship Dews. At first they acted according to their original nature, acknowledging that all beings were derived from Ormuzd. But they were seduced by an evil spirit, and clothed themselves in black for thirty days. After that they went out to hunt, and found a white goat, of whose milk they drank. In this they sinned against their body, and were punished. The evil spirit or Dew presented himself to them again, giving them fruits to eat, by which they forfeited a hundred enjoyments. At first they covered themselves with the skins of dogs, and ate the flesh of these animals. They hunted and made them- sclves clothing of the skins of deer.!

Abriman is represented as a poisonous serpent, and springs in this form from heaven to earth.2 Dews often take the same form.®

*The tree Hom among them is similar to the tree of life. It imparts immortality, and is called the king of trees.**

The holy mountain or paradise of Persian tradition is Aibordj, the abode of Ormuzd and the good spirits, which sends forth great rivers. This means the Hindu Koosh mountains where was Avrjana vecdjo, the first seat of the Aryan race. Here we have mention of a district Heden ; and Zoroaster is said to have been born in Ledenesch, but elsewhere in Airjana veedjo.§

According to the religion of Lama or the Calmucks, men lived in the first age of the world 80,000 years. They were holy and happy. But their happiness came to an end. A plant, sweet as honey, sprang out of the earth, of which a greedy man tasted, and made others acquainted with it. A sense of shame was awakened, and therefore they began to make themselves coverings of the leaves of trees. Their age and size decreased. Virtue fled, and all manner of vice prevailed.' The paradisiacal state of Thibetan mythology is one of perfection and spirituality. But the desire to eat of a sweet herb, schima, put an end to that condition. Shame sprang up within the fallen; the need of clothing was felt. They were driven to agriculture by necessity. Virtue fled, murder, adultery, and all other vices suc- ceeded.®

Among the Indians, the holy mountain of the north, the seat of the gods, and the source of the great rivers, was Meru.® The tree Parijata, brought from heaven to earth by Krishna, with its heavenly flower and fruit, scares away hunger, thirst, disease, old age, c&c.1°

The Greek myths are remotely parallel. Hesiod describes the primitive state as one frec from toil, sickness, and all kinds of evil. Mortals were contented with easily obtained, though poor, sustenance. But cunning Prometheus de- ceived Zeus, and stole fire from heaven. The latter, by way of punishment, sent a beautiful woman, Pandora, whom Epimetheus accepted as a gift. Having with her a vessel into which all sorts of misery had been put, she opened it out of curiosity, and evils flew forth in abundance, filling the earth. Hope alone remained at the bottom.

The story is supplemented and modified in the Theogony. There Prometheus is twice punished, and woman becomes the source of man's evils, merely as the original mother of the race, There is also a reconciliation between Zeus and Prometheus.12

In Aischylus mankind are presented in the ignorance of

1 Kleuker's Zend-Avesta, part iii. pp. 84, 85.

2 Thid. iii. 62. 3 Ibid. ii. 192.

4 Tbid. iii. p. 105.

> Ibid. iii. 70, 91. § Tbid. ii. 277, 299; iii. 118.

” Staudlin in Archiv. fur Kirchengeschichte, i. 8, pela

8 See Stiudlin’s Archiv. i. 8, p. 15.

® Von Bohlen’s Das alte Indien, i. 12; ii. 210.

1° Wilson’s Vishnu Purana, pp. 586, 613; and Langlois’s translation of the Harivansa, tome ii. p. 3

U Opera et Dies, 40-105.

12 Toid. 506-616.

infancy till Prometheus implantcd in them the power of intellect, and the capability of knowledge. The fire from heaven is not the cause of the evils that broke in upon them; rather is it the teacher of every art, and the opencr up of infinite resources; but Prometheus himself must endure fearful punishment for his self-will, in paying too much regard to mortals. Still there is an intimation of future reconciliation between the opposing powers, Zeus and Prometheus.

The points of similarity between the Old Testament and this Greek representative of man’s fall are tolcrably plain. In both there is an original state marked by freedom from sorrow, by complete earthly cnjoyment and undisturbed peace with God. Both attach the origin of evil to the act of a free being putting himself in opposition to God— evil being the punishment of that act, arising by means of a woman. As the Old Testament narrative implies that the step taken by man was not a mere degeneracy, so Adschylus’s description admits that it was for humanity the beginning of a richer and higher life, since man’s proper destiny could not be worked out in a condition of childlike incapacity. Pandora reminds us of Eve ; Epi-metheus of Adam. Prometheus and the serpent both wish to make men like God in knowledge and happiness.‘3 The tragic poet seems to regard Prometheus as the archetype of man, so that his fate is theirs. Like every

strong-willed mortal, Prometheus floundcrs on the rock of presumption. He persists in acting contrary to the commands of Deity, and endures torture till he submits to a higher will, accept- ing the symbols of repentance and restraint within certain limits. Thus, like Adam, he is the representative of humanity.

The fundamental difference between the Hebrew and Greek narratives is, that the distinction between God and the world, spirit and nature, maintained with all sharpness in the one, is not carried out in the other. On the con- trary, the Greek myth mixes the two spheres, so that the world appears as the original, independent element, of which spirit and deity are mere products. In the Hebrew narrative the spiritual features are presented clearly and simply; in the Greek they are indistinct, because transferred to the sensuous world and covered with a luxuriant growth of outer nature.14

Ovid paints the golden age in the manner of Hesiod, but with more details. It was pervaded by innocent simplicity, and the successive ages became still worse, till moral corrup- tion reached such a height in the last or iron age that Jupiter sent a flood to destroy all mankind.

Plato in his Symposiwm!® explains the sexual and ama- tory inclination of the man and the woman by the fact that there were at first androgynous beings, whom Zeus separated into men and women. The two sexes were originally united.

In Corrodi's Bettrdge (xviii. p. 14), the Indian Zzour Vedam is quoted, in which the first man is called Adimo, from whose body came Brahma, Vishnu, and Schiva. This statement is repeated by Knobel and othcrs. But the Ezour Vedam (a corrupt pronunciation of Yajur Veda) is a spurious Veda from the pen of some Jesuit missionary.!" Though it mentions Adimo (which simply means the first) in vol. i p. 195, &c., and vol. ii. 205, genuine Indian mythology recognises no such name of the first man.

The second narrative, in some of its ideas, seems de-

13 See Buttmann's Mythologus, Band i. p. 48, &c.

14 See G. Baur in the Studien und Kritiken for 1848, p. 820, et seq.

15 Metamorphos. i. 89, &c.; vol. ii. p. 14, &., ed. Burmann.

16 Cap. xv. ed. Stallbaum, 1827.

7 The Ezour Vedam was printed at Parisin1778. See Mr Ellis, in the Astatick Researches, vol. xiv. p. 2, &c., and Dr Muir in the Transactions of the Royal Society of Edinburgh, vol. xxiii. part 2, p. 255, &e. 78

rived from Eastern Asia. Several features disclose this ; such as the covering of fig leaves, the springing of four rivers from a common source, and the names of two of them which point to India. The tree of life and the seducing spirit have their place in the Persian and Indian religions. But its essence is adapted to the Hebrew theology, and contains genuine Hebrew traits ; though it stands tolerably isolated in the circle of ideas which the Old Testament presents. Not till the Book of Wisdom do we find express reference to it (chap. ii. 28, 24), though the tree of life is spoken of in the Proverbs. Yet there is diversity amid similarity. As elaborated by the Hebrew mind, the narrative isa profound theory, with noble features worthy of the subject. Its verisimilitude is apparent. It shows a thoughtful contemplation of human nature, a fine sense of its capacities and weakness, of its aspirations and needs, Its lines are drawn with great dis- cernment. The problem need expect no better solution in this life ; for its depths cannot be fathomed by the sound- ing-line of a finite understanding. Here is the one philo- sophy of the subject that has taken the deepest hold of the human mind, engrafting itself on the religious systems of very different races, and enlisting the sympathies of the most civilised nations. Originating in the East, it has been transferred to the West, where it lives in pristine vigour. It is the essence of the best ideas and traditions of Eastern Asia, improved and enlarged by the Hebrew mind at a certain period. The more the narrative is examined, the more clearly will it appear the result of enlightened reason. It embodies national traditions of Hebrew reflec- tiveness. Free from the pantheism and dualism inherent in the mythologies of other peoples, the monotheism which distinguished the Hebrews as the depositaries of a divine truth pervades it. The tradition has two sides. It repre- sents the transition of man to freedom and humanity, as Schiller describes it; his elevation by the awakening exercise of reason; his advance

from nature's cradling- season to a consciousness of the divine within him ; but it represents at the same time the inclination to follow his own will, to aspire to the forbidden contrary to his better conviction, to push reason beyond the limits within which alone it can be legitimately used ; in short, to break away from the will of God in self-sufficient independence. While the fact was one of the most fortunate in man's history, it was also one of the saddest. When moral good was made possible, moral evil was introduced. A knowledge of the one brings that of the other.!

After Adam fell, God drove him from paradise, whose gates were guarded by cherubim to prevent access to the tree of life. The protoplasts had first three sons—Cain, Abel, Seth; then other sons and daughters. Adam died at the age of 930. According to the Elohist, the later race of men descended from Seth, the first born (Genesis v.) ; according to the Jehovist from Cain, who was the first born (Genesis iv.) A Jewish tradition represents him as buried in Hebron with the patriarchs; a Christian one makes Golgotha his resting-place.

A number of absurd fables, the fancies of Jewish writers, have gathered round the simple narratives of the Old Testament, and are incorporated in the Talmud. In these Adam is said to have been made as a man-woman out of dust collected from every part of the earth; his head reached to heaven, and the splendour of his face surpassed the sun, The very angcls feared him, and all creatures hastened to pay him devotion. The Lord, in order to display his power before the angels, caused a sleep to fall upon him, took away something from all his members, and

1 See Schelling's Magisterdissertation in vol. i. of his Sdmmdlic/ Werke, p-3, &e. AMM Ureclre

when he awoke commanded the parts that had been re- moved to be dispersed over the globe, that the whole earth might be inhabited by his seed. Thus Adam lost his size, but not his completeness. His first wife was Lilith, mother of the demous. But she flew away through the air; and then

the Lord created Eve from his rib, brought her to Adam in the most beautiful dress, and angels descend- ing from heaven played on heavenly instruments; sun, moon, and stars dancing. He blessed the pair, and gave them a feast upon a table of precious stone. Angels prepared the most costly viands. But Adam's glory was envied by the angels; and the scraph Sammael succeeded in seducing him. The pair were driven out of paradise into the place of darkness, and wandered through the earth.?

According to the Koran, God created man of dried clay like an earthen vessel, animating the figure, and enduing it with an intelligent soul. When he had placed him in paradise, he formed Eve out of his left side. AU the angels worshipped the new man except Eblis, who refused and became an unbeliever. Satan caused them to forfeit paradise, and turned them out of their state of happiness. On Adam's repentance, God pitied him, and had him taught the divine commandments by the arch- angel Gabriel; whercupon he was conducted to Avafat, a mountain near Mecca, and found Eve after a separation of 200 years. He was buried on Mount Abukais, near Mecca.? Many other fables of the later Jews respecting Adam are collected by Eisenmenger, and those of the Mahometans

by Herbelot.

In the emanation systems of the Christian Gnostics and Manicheans, as well as in the gnosis of the Mandeans, Adam is represented as one of the first and holiest sons. Both catholic and heretical literature indulged in fictions respecting Adam. A Life of Adam was translated from the Ethiopic into German by Dillmann, in Ewald's Jahrbuch, vy. The Testament of Adam, current in Syriac and Arabic, was published by Renan in the Journal Asiatique, série v. tom. 2. Both these seem to be derived from the Spelunca Thesaurorum, which exists in MS. in the Syriac tongue. The Sethites, a Gnostic sect, had Apocalypses of Adam; other Gnostics had a Gospel of Eve. A Book of the Repent- ance of Adam and A Book concerning the Daughters of Adam, are condemned in the decree of Gelasius. George Syncellus cites a Greek Life of Adam; and a fragment from Zhe Greek Book of Adam, in a Florentine M6., is given in the Literaturblatt des Orients for 1850. Thus the Adam-literature is copious. The Book of Adam, pub- lished by Norberg in 1816, is improperly so termed. It is a Mandeean or Sabian

work, Szdra Rabba, which is now better known, since Petermann's critical edition of 1867, and Noldeke's researches into the language. (s. D.)

ADAM or Bremen, ecclesiastical historian, was born in Upper Saxony, and in 1067, probably on the invitation of Archbishop Adalbert, came to Bremen, where he was appointed canon and magister scholarum. He died in 1076. His Gesta Hammaburgensis Keclesoee Pontificum, containing a history of the diocese of Hamburg and Bremen from 788 till the death of Adalbert in 1072, is of great importance as the chief source of information in regard to the state of the northern kingdoms during the period of which it treats. Itis supposed to have been com- piled partly from written documents and partly from the oral communications of the Danish king, Svend Estrithson. Its statements are generally trustworthy, though the chrono- logy is sometimes confused, and the geographical informa-

z Eisenmenger's Entdektes Judenthum, Amsterdam, 1700, 4to.

3 D'Herbelot's Bibliotheque Orientale, s. v. ' Adam," p. 58, &¢., ed. 1697, Paris.*

1. See Dillmann in Herzog's Encyklopadie, xii. p. 319.

tion often erroneous. The style is clear and interesting, though somewhat prolix. It was first published from MSS. at Copenhagen in 1579. The best edition is that of Lappenberg in Pertz's Monumenta Germanie. A supple- ment to the Gesta, a geographical work of considerable value, entitled De Situ Danie et Reliquarum que trans Daniam sunt Regionum Natura, was published at Stock- holm in 1615, and at Leyden in 1629.

ADAM, ALEXANDER, Rector of the High School, Edin- burgh, was born on the 24th of June 1741, near Forres, in Morayshire. From his earliest years hc showed uncommon diligence and perscverence in classical studies, notwith- standing many difficulties aud privations. In 1757 he went to Edinburgh, where he studicd at the University with such success that in eighteen months he was appointed head-master of Watson's Hospital, being at the time only nineteen. He was confirmed in the office of Rector of the

*High School on the 8th of June 1768, on the retirement of Mr Matheson, whose substitute he had been for some time before. From this period he devoted himself entirely to the duties of his office, and to the preparation of the numerous works he published in classical literature. His popularity and success asa teacher are strikingly illustrated in the facts that his class increased more than fourfold dur- mg his incumbency, and that an unusually large proportion of his pupils attained to eminence, among them being Sir Walter Scott, Lord Brougham, and Jcffrey. He succeeded in introducing the study of Greek into the curriculum of the school, notwithstanding the opposition of the University headed by Principal Robertson. In 1780 the University of Edinburgh conferred upon Mr Adam the honorary degree of Doctor of Laws. He died on the 18th December 1809, after an illness of five days, during which he occasionally imagined himself still at work, his last words being,— * But it grows dark; you may go." Dr Adam's first pub- lication was his Principles of Latin and English Grammar (1772). This was followed by his Roman Antiquities (1791), his Summary of Geography and History (1794), and his Latin Dictionary (1805). The MS. of a projected larger Latin dictionary, which he did not live to complete, lies in the library of the High School.*

ADAM, Mxrtcutor, German divine and biographer, was born at Grottkaw in Silesia after 1550, and educated in the college of Brieg, where he became a Protestant. He was enabled to pursue his studies there by the liberality of a person of quality, who had lIcft several exhibitions for young students. In 1598 he went to Heidelberg, where, after holding various scholastic appointments, he becamc conrector of the gymnasium. In1615 he published the first volume of his Vite Germanorum Philosophorum, &c. This volume was followed by three others; that which treated of divines was printed in 1619; his lives of lawyers and of physicians were published in 1620. All the learned men whose history is contained in these four volumes lived in the 16th or beginning of the 17th century, and are either Germans or Flemings; but he published in 1618 the lives of twenty divines of other countries in a separate volume, entitled Decades duce continentes Vitas Theologorum Exterorum Principum. All his divines are Protestants. His industry as a biographer is commended by Baylc, who acknowledges his obligations to Adam's labours. Lutherans and Catholics accuse him of unfairness, but the charge is at least exaggerated. He died in 1622.

ADAM, Ropert, architect, the second son of William Adam of Maryburgh, in Fife, was born in 1728. He studied at the University of Edinburgh, and probably received his first instruction in architecture from his father, who, whether a professional architect or not, gave proofs of his skill and taste in the designs of Hopetoun House and the Edinburgh Royal Infirmary. In 1754 young Adam

visited the Continent, and spent three years in Italy for the purpose of examining the ruins of Roman architecture. The magnificence of the public baths erected at Rome in the time of Diocletian having impressed him with the idca that therc had been a marked revival of architectural art during that emperor's reign, he resolved to visit the ruins of the private palace Diocletian had erected at Spalatro in Dalmatia. In company with Clcrisseau, a French architect, he sailed from Venice in July 1754, and in a few weeks, with the help of two experienced draughtsmen, had com- pleted plans and views of the fragments, from which he was afterwards able to exccute a design of the entire build- ing. The results were published in the Ruins of the Palace of Diocletian, &c. (1764). After his return to England he rose to the highest eminence in his profession, and was appointed architect to the king in 1762. Six years later he entered Parliament as representative of the county of Kinross, but he still continued to devote himself to the duties of his profession, resigning only his court appoint- ment. In 1773-78 he and his brothcr James, also an architect of considerable note, published from time to time large folio cngravings with Ictterpress description of their designs, the most important being,—Lord Mansfield's house at Caenwood; Luton House, Bedfordshire; the Register House, Edinburgh, &c. Among their later works may be mentioned the buildings erected in London by the two brothers, and hence called the Adelphi (d8eAgo/), which proved an unsuccessful speculation ; Portland Place, London ; and the Infirmary of Glasgow. The leading characteristics of all these designs are lightness and elegance; and, though grave faults may be found with his style, it cannot be denied that English architecture, especially that of the streets of London, owes very much to Robert Adam. He continued actively engaged in his profession until his death in 1792. James, his brother and associate in labour, died in 1794. ADAM, Ricut

Hon. Writt1am, nephew of the preced- ing, eldest son of John Adam, Esq. of Blair-Adam, Kin- ross-shire, was born on the 2d August 1751, studicd at the Universities of Edinburgh and Glasgow, and passed at the Scotch barin 1773. Soon after he removed to England, where he entered Parliament in 1774, and in 1782 was called to the Common-law bar. He withdrew from Parlia- ment in 1795, entered it again in 1806 as representative of the united counties of Clackmannan and Kinross, and continued a member, though with some intcrraptions, till 1811. A popular though not an eloquent spcaker, Mr Adam soon took a prominent place in thc House, making himself of importance by his sound judgment and firm general adherence to the Whig party. A duel in 1779 between him and Mr Fox, in which the latter was slightly wounded, did not interrupt their close and steady friend- ship. They both belonged to the small but noble band that opposed the encroachments of the Government on the Constitution during the period of the French Revolution. One of Mr Adam's most valuable parliamentary efforts was the agitation which he successfully raised, in March 1794, against the sevcre punishment awarded in the Scotch criminal court to certain persons who had becn convicted of sedition. At the English bar he was as successful as any one can be who does not devote himself entirely to the profession. Though known to be much cngaged in Parlia- ment, and with the management of the pecuniary affairs of the Prince of Wales and the Duke of York, he obtained a very considerable practice. He was successively Attorney and Solicitor General to the Prince of Wales, onc of the managers of the impeachment of Warren Hastings, and one of the counsel who defended the first Lord Melville when impeached (as Mr Dundas). During his party's brief tenure of office in 1806 he was Chancellor of the Duchy of Cornwall, and was aftcrwards a privy councillor

and lord-lieutenant of Kinross-shire. In 1814 he became a baron of Exchequer in Scotland, and in the following year was appointed chief commissioner of the newly- established Jury-Court for the trial of civil causes, over which he presided with much ability and acceptance till 1830, when it ccascd to exist as a separate court, and became merged in the permancnt supremc tribunal. Though little versed in the technicalities of

law, he was in all practical matters an able manager; he was a shrewd observer of all that passcd around him, and a most agree- able companion. He died at Edinburgh on the 17th February 1839. ;

ADAM'S BRIDGE, or Rama's Bridge, a chain of sand- banks, extending from the island of Manaar, near the N. W. coast of Ceylon to the island of Rameseram, off the Indian coast, and lying between the Gulf of Manaar on the 8.W. and Palk Strait on the N.E. It is more than 30 miles long, and offers a serious impediment to navigation. Some of the sandbanks arc dry; and no part of the shoal has a greater depth than 3 or 4 feet at high water, except three tortuous and intricate channels, a few fcet deep, which in calm weather permit the passage of boats and small vessels.

ADAM'S PEAK, a lofty mountain in Ceylon, about 45 miles E. from Colombo, in N. lat. 6° 55', E. long. 80° 30'. It rises steeply to a height of 7240 feet, and commands a magnificent prospect. Its conical summit terminates in an oblong platform, 74 feet by 24, on which there is a hollow, resembling the form of a human foot, 5 fcet 4 inches by 2 feet 6 inches; and this has been consecrated as the foot- print of Buddha. The margin of this supposed footprint is ornamented with gems, and a wooden canopy protects it from the weather. It is held in high veneration by the Cingalesc, and numerous pilgrims ascend to the sacred spot, where a priest resides to receive thcir offerings, and bless them on their departure. By the Mahometans the impression is regarded as that of the foot of Adam, who here, according to their tradition, fulfilled a penance of one thousand years, while the Hindoos claim it as that of their god Siva.

ADAMAWA, a country of Central Africa, lies between 7° and 11° N. lat., and 11° and 16° E. long., about mid- way on the map between the Bight of Biafra and Lake Chad. Its boundarics cannot be strictly defined; but it stretches from 8.W. to N.E. a distance of 200 miles, with a width of from 70 to 80 miles. This region is watcred by the Benuwe and the Faro. The former, which ulti- mately unites with the Niger, flows through Adamawa, first in a northerly, then in a westerly direction; and is joined by the Faro, which rises in t'1e south, 22 miles from Yolla, the capital of the country. Near their confluence the Benuwe is 800 yards wide, with a depth of about 11 feet; the Faro has a breadth of 600 yards, but is generally very shallow. Both rivers

are subject to extraordinary floods, beginning in the end of September, and lasting forty days, during which the swamps of the adjacent country arc 'covered for a great distance on both sides, and the Benuwe rises at least 30 feet. The most fertile parts of the country are the plains near the Benuwe, about 800 feet above the level of the sea. Further from that river the land rises to an elevation of 1500 feet, and is diversified by numerous hills and groups of mountains. Mount Alantika, about 25 miles §.S.E. of Yolla, is the loftiest mountain in Adamawa, and rises from the plain, an isolated mass, to the height of 9000 feet. The country, which is execedingly rich, and is covered with luxuriant herbage, has many villages, and a considerable. population. The grain known as Zolcus sorghum or durra, ground-nuts, yams, and cotton are the prineipal products; and the palm and banana abound. Elephants are very numerous, and ivory is largely ex- ported. In the eastern part of the country the rhino-

ceros is met with, and the rivers swarm with crocodiles, and with a curious mammal called the ayu, bearing some resemblance to the seal. Yolla, the capital of Adamawa, is situated, in N. lat. 9° 28', E. long. 12° 13', in the fertile plain between the Benuwe and the Faro. The liouses are built of clay, and surrounded by court-yards, in which grain is grown; so that the town, though containing only about 12,000 inhabitants, is spread over a large extent of ground, and is 3 miles long from east to west. Turkedi (a dark-coloured cotton cloth), beads, salt, and calico are the principal articles exposed in the markets. Here and throughout Adamawa cotton is gencrally used as a medium of barter. A very large proportion of the population are slaves, many private individuals holding as many as 1000, while the governor is said to receive annually about 5000 in tribute. The government of Adamawa is in the hands of a Mahometan ruler, who owns a nominal allegiance to the Sultan of Sokoto, but is in reality an independent sovereign. Formerly the country was called Fumbina, and was possesscd by various African tribes, until it was over- run by the Fulbe, a Mahometan people. It has not been entirely subjected by them, but they have detached settle- ments at various places; and numerous governors, as well of the Fulbe as of outlying pagan tribes, are in subjection to the ruler of Yolla. (See Barth's Travels in Central Africa, vol. ii.)

ADAMITES, or Apamians, a sect of heretics that flourished in North Africa in the 2d and 3d centurics. Basing itself probably on a union of certain gnostic and ascetic doctrines, this sect pretended that its members were re-cstablished in Adam's state of original innocency. They accordingly rejected the form of marriage, which, they said, would never have existed but for sin, and lived in absolute lawlessness, holding that, whatever they did, their actions could be neither good nor bad. During the Middle Ages the doctrines of this obscure sect, which did not at first exist long, were revived in Europe by the Brethren and Sisters of the Free Spirit, who in the 14th century were better known throughout Germany as Beghards. This name was originally borne by a religious party that was formed in the Netherlands a century earlicr. The two sects came into contact on the Rhine frontier, associated with each other, gradually approximated in doctrine, and were at last identified by the application to both of the one name; though a distinct sect of Beghards, free from the excesses of the brethren, continued to exist in the Nether- lands. Prcard is simply another form which Beghard assumed in the harsh pronunciation of the Bohemians, and the common method of accounting for it by supposing a leader Picard has no sufficient warrant. The principal seat of the Picards in Bohemia was a small island in the river Luschnitz, where they lived in a state of nature, and had wives in common. In 1421 they were almost exter- minated by Ziska, the leader of the Hussites, who com- mitted many of them to the flames. In 1849 it appeared that the sect existed in a district of Austria, though small in number, and not ostentatious of its peculiar practices. (Riidinger de Hecl. Frat. in Bohem., &c.; Bossuet's Varia- toons of Protestant Churches.)

ADAMNAN or Apomnan, Sarnt, born in Ireland about the ycar 624, was elected Abbot of Iona in 679, on the death of Failbhe. While on a mission to the court of King Aldfrid of Northumberland (700-1), he was led to adopt the Roman rule in regard to the time for the observance of Easter; and on his return to Iona he tried to enforce the change upon the monks, but without success. It is said that the disappointment caused his death, which occurred in 703 or 704. Adamnan wrote a LInfe of St Columba, which, though abounding in fabulous matter, is of great interest and value. The best edition is that of Reeves,

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published by the Irish Archeological and Celtic Society in 1857. Adamnan's other well-known work, De Situ Terre Sanctwe, was based, according to Bede, on information received from Arculf, a French bishop, who, on his return from the Holy Land, was wrecked on the west coast of Britain, and was entertained for a time at Jona. This was first published by Gretser at Ingolstadt in 1619. (Kalen- dars of the Scottesh Saints, by Bishop Forbes, 1872.)

ADAMS, Joun, a distinguished statesman of the United States of North America. He was born on thé 19th or (new style) 30th of October 1736, in that part of the township of Braintree, in Massachusetts, which on a subsequent division was called Quincy. His parents were of that class, then abounding in New England, who united the profession of agriculture with that of some one of the mechanic arts. His ancestor Henry had emigrated from Devonshire in the year 1632, and had established himself at Braintree with six sons, all of whom married: from one descended the subject of this memoir, and from another that Samuel Adams who, with John Hancock, was by name proscribed by an Act of the British Parliament, for the conspicuous part he acted in the early stages of the opposition to the measures of the mother country. When about fifteen years of age, his father proposed to his son John either to follow the family pursuits, and to receive in due time, as his portion, a part of the estate which they had cultivated, or to have the ex- pense of a learned education bestowed upon him, with which, instead of any fortune, he was to make his way in future life. The son chose the latter alternative; and having received some preparatory instruction, was admitted a student at Harvard College in the year 1751. After graduating in 1755, he removed to the town of Worcester, where, according to the economical practice of that day in New England, he became a tutor in a grammar school, and at the same time was initiated into the practice of the law in the office of Mr Putnam, then an attorney and a colonel of militia, and subsequently a general of some celebrity in the revolutionary war. A letter he wrote at the early age of ninetecn, shows a degree of foresight which, like many other predictions, may have led to its own accomplishment. It is dated 12th October 1775, and says— Soon after the Reformation, a few people came over to this New World for conscience'

sake. Perhaps this apparently trivial incident may transfer the great seat of empire to America. It looks likely to me; for if we can remove the turbulent Clallic (the French in Canada), our people, according to the exactest computation, will in another century become more numerous than England itself. Should this be the case, since we have, I may say, all the naval stores of the nation in our hands, it will be easy to obtain the mastery of the seas, and then the united force of all Europe will not be able to subdue us. The only way to keep us from setting up for ourselves is to disunite us."

He was admitted to practice in the year 1758, and gradually rose to the degree of eminence which a local court can confer; and obtained distinction by some essays on the subject of the canon and feudal law, which were directed to point to the rising difference which commenced between the mother country and the colonies, soon after the peace of 1763 had delivered the latter from all disquietude re- specting the establishments of France in the adj olning pro- vince of Canada. His character rose, both as a lawyer and @ patriot, so as to induce Governor Barnard, who wished to gain him over to the royal party, to offer him the office of advocate-general in the Admiralty Court, which was deemed a sure step to the highest honours of the bench. Two years after, he was chosen one of the representatives of his native town to the congress of the province. His first prominent interference in political affairs was at a meeting at Braintree in 1765, to oppose the Stamp Act.

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The resolutions he proposed were not only carried unani- mously, but were afterwards adopted verbatim by more than forty other towns. In 1768 he found it neccssary to remove to Boston, owing to the increase of his legal practice.

His professional integrity was soon after exhibited in the defence of Captain Preston and some soldiers, who were tried before a Boston jury on a charge of murder, April 1770. In this case Adams was counsel for the defence; and being cousidered by the people, then in an inflamed state against the troops,

as a determined friend of liberty, his eloquence obtained a verdict of acquittal without lessen- ing his popularity.

When it was determined, in 1774, to assemble a general congress from the several colonies, Mr Adams was one of those solicited for the purpose by the people of Massa- chusetts. Before departing for Philadelphia to join the congress, he parted with the friend of his youth, his fellow- student and associate at the bar, Jonathan Sewall, who had attained the rank of attorney-general, and was necessarily opposed to his political views. Sewall made a powerful effort to change his determination, and to deter him from going to the congress. He urged, that Britain was dcter- mined on her system, and was irresistible, and would be destructive to him and all those who should persevere in opposition to her designs. To this Adams replied: "I know that Great Britain has determined on her system, and that very fact determines me on mine. You know I have been constant and uniform in opposition to her mea- sures; the die is now cast; I have passed the Rubicon 3 to swim or sink, live or die, survive or perish with my country, is my unalterable determination." The conversation was then terminated by Adams saying to his friend, "I see we must part; and with a bleeding heart, I say, I fear for ever. But you may depend upon it, this adieu is the sharpest thorn on which I ever set my foot."

When the continental congress was assembled Mr Adams became one of its most active and energetic leaders. He was a member of that committec which framed the Declara- tion of Independence, and one of the most powerful advo- cates for its adoption by the general body; and by his clo- quence obtained the unanimous suffrages of that assembly. Though he was appointed chief-justice in 1776, he declined the office, in order to dedicate his talents to the general purpose of the defence of the country.

In 1777 he, with three other members, was appointed a commissioner to France. He remained in Paris about a year and a half, when, in consequence of disagrcements among themselves, in which Adams was not implicated, all but Franklin were recalled. In the end of 1779 he was charged with two commissions,—one as a plenipotentiary to treat for peace, the other empowering him to form a commer- cial treaty with Great Britain. When he arrived in Paris, the French Government viewed with jealousy the

purpose of the second commission; and Count de Vergennes advised him to keep it secret, with a view to prevail on the congress to revoke it. Mr Adams refused to communicate to the count his instructions on that subject; and an altercation arose, from a claim made by France for a discrimination in favour of French holders of American paper money in the liquidation of it. The count complained to Congress, trans- mitted copies of Mr Adams's letters, and instructed the French minister at Philadelphia to demand his recall. The demand was rejected, but afterwards four others were Joined with him in the commission. Whilst these negotiations were in progress he went to Holland, and there, in oppo- sition to the influence and talents of the British ministcr, Sir Joseph Yorke, succeeded both in negotiating a loan, and in procuring the assistance of that country in the defence against Great Britain, He formed a commercial treaty with

that republic, and joined in the ephemeral association called "the armed neutrality."

In 1785 Mr Adams was appointed ambassador to the court of his former sovereign, where his conduct was such as to secure the approbation of his own country, and the respect of that to which he was commissioned. Whilst in London, he published his work entitled Defence of the American Constitution, in which he combated ably the opinions of Turgot, Mably, and Price, in favour of a single legislative assembly; and thus perhaps contributed to the division of power and the checks on its exercise, which became established in the United States. At the close of 1787 he returned, after ten years devoted to the public service, to America. He received the thanks of Congress, and was elected soon after, undcr the presidency of Wash- ington, to the office of Vice-President. In 1790 Mr Adams gave to the public his Discourses on Davila, in which he exposed the revolutionary doctrines propagated by France and her emissaries in other countries. On the retirement of Washington, the choice of President fell on Mr Adams, who entered on that office in May 1797. At that time the Government was entangled by the insolent pretensions of the French demagogues, and by their partisans in many of the states. Great differences of opinion arose

between the individuals at the head of affairs: one party, with Mr Hamilton at their head, was disposed to resist the preten-

sions of France by open hostilitics; whilst Mr Adams was .

disinclined to war, so long as there was a possibility of avoiding it with honour. Owing to this division of his own friends, rather than to a want of public confidence, at the conclusion of the four years for which the President is chosen, Mr Adams was not re-elected. Perhaps this was in some measure owing to the preponderance of the slave states, in which Mr Jefferson, his rival, and a proprietor of slaves, had a fellow-feeling among the chief of the people.

He retired with dignity, at 68 years of age, to his native place, formed no political factions against those in power, but publicly expressed his approbation of the measures which were pursued by him who had been his rival, who had become his successor in power, but had never ccased to be his firmly-attached friend.

The last public occasion on which Mr Adams appeared, was as a member of the convention for the revision of the constitution of Massachusetts, in which some slight altera- tions were requisite, in consequence of the province of Maine being separated from it.

He scems to have enjoyed his mental faculties to the

close of his protracted life; and even on the last day of it, two hours only before its final close, on the 4th July 1825, the fiftieth anniversary of the Act of Independence, he dictated to a friend, as a sentiment to be given at the public dinner of the day, " Independence for ever." By a very singular coincidence Jefferson, his rival and friend, died a few hours earlier on the same day. ; Mr Adams was considered a sound scholar, well versed in the ancient languages, and in many branches of general literature. His style in writing was forcible and perspicu- ous, and, in the latter years of his life, remarkably elegant. In person he was of middling stature; his manners spoke the courtesy of the old school; and his address, at least when he was in England, was dignified and manly.

ADAMS, Jonn Quincy, eldest son of the preceding, was born at Braintree on the 11th July 1767. The greater part of his education was received in Europe, which he visited in company with his father in 1778, and again in 1780, when he attended for a time the university of Ley- den. When only fifteen years old he went, as secretary, with Francis Dana on his unsuccessful mission to St

Petersburg. Returning home after an interval spent in Holland, London, and Paris, he graduated at Harvard in

was admitted to the bar in 1791. of letters, on political subjects, contributed to a Boston newspaper, attracted much attention, and Washington appointed him ambassador to the Hague in 1794. An appointment to a similar post in Portugal, made just before the expiry of Washington's presidency, was set aside by

1788; and, after spending three ycars in a lawyer's office, Three successive series

his father, who sent hin instead to Prussia, giving him the promotion by the express advice of Washington. During his residence as ambassador at Berlin, he succceded in nego- tiating a commercial treaty with Prussia. On Jcfferson becoming President (1801), Adams was recalled, and resumed the practice of law in Boston. In 1802 Suffolk county returned him a member of the Massachusetts Senatc, and in the following year he was electcd to Con- gress. Indebted for his position to the Federal party, Adams supported their views for four years, but separated from them by voting for Jefferson's proposed embargo. This course involved him in much controversy, and cost him his scat in the Senate. During his retirement he added to the employment arising from his profession the duties of the professorship of rhetoric and belles lettres at Harvard University, which he held for three ycars (1806-9). His lectures—the first ever read in an American university —were published in 1810, and were much thought of at the time, though now almost forgotten. In the winter following the resignation of his professorship, he visited Washington; and, in an interview with Jefferson, brought a charge against some of the Federal leaders of a design to

dissolve the union, and form a separate confedera- tion for the north. The charge was afterwards repeated in the newspapers; and, though resting on slender grounds, greatly affected the coufidence of the other states in the New England representatives. In 1809 Madison, having obtained after some delay the concurrence of the Senate, entrusted Adams with the embassy to St Petersburg,—an appointment which the latter accepted against the wishes of his father, and continued to hold, though offered a seat on the judicial bench of New England some time after his arrival in Russia. When war broke out between England and the United States, Adams induced the Czar to make an offer of intervention, which, however, the English Government declined to accept. Independent negotiations were thereupon carried on for six months at Ghent (the representatives of America being Adams, Russell, and Clay), and resulted in the treaty of peace which was signed 24th December 1814. After serving for two years (1815-17) as minister in London, he again entered the arena of home politics as secretary of state under Monroe. In this office he distinguished himself specially by his arrangement of the treaty with Spain, which defined the boundaries of the ceded territories of Florida and Louisiana. An claborate report on weights and mea- sures gained for him also a name for scientific acquirements. In 1825 the election of a President fell, according to the constitution of the States, to the House of Representatives, since no one of the candidates had secured an absolute majority of the electors chosen by the States, and Adams, who had stood second to Jackson in the electoral vote, was chosen in preference to Jackson, Clay, and Crawford. The administration of Adams was marked by the imposition of a high tariff on forcign goods, with the view of promoting internal industry, and by the unsucccssful attempt to pur- chase Cuba from Spain. Notwithstanding the efforts of Clay, and the special claim he himself made on the voters of Virginia on account of his discovery of the so-called New England "plot" twenty years before, Adams failed to secure his re-election in 1829. Defeated by Jackson, who had 178 votes to his 83, he retired to Quincy, where his father's fortune, increased by his own efforts, afforded

him an ample competency. Two years later he was re- turned to Congress by the district in which he lived, and which he continued to represent until his

death. Having been chosen mercly on account of his determined resistance to secret societies, his position was independent of party politics, and correspondingly strong. He stood for the office of governor, and then for that of senator, of Massa- chusetts, but was on both occasions defeated by Davis. As chairman of the committee on manufactures, he strove to devise a middle policy in regard to tariffs, but his greatest effort at this period—perhaps the greatest service of his whole political life—was in connection with the abolition of slavery. In every form which the question took, he was the bold and determined advocate of abolition, gradually gathering an influential party around him, and so preparing for the triumphs, most of which have been won since his death. He himself witnessed, in 1845, the abolition of the " gag-rule," restricting the right of petition to Congress on the subject of slavery, which he had persistently opposed during the nine ycars it was in force. He died of paralysis on 23d February 1848, having been seized two days pre- viously while attending the debates of Congress. Adams wrote 2 number of works, which are now of little import- ance. The style is fluent, but has none of the vigour and elegance of his father's. During his whole lifetime he kept a very voluminous journal, some portions of which have been published.

ADAMS, Ricuarp, M.A., divine. Two contemporaries of the same name are frequently confounded with each other. The more eminent was son of the Rev. Richard Adams, rector of Worrall, in Cheshire. The family records seven clergymen of the Church of England in succession. The present worthy was born at Worrall, but the loss of the registers leaves the date uncertain. It is usually, but erro- neously, stated, that he studied at Cambridge University. He was admitted a student of Brazenose College, Oxford, March 24, 1646, and became a fellow, having proceeded through the usual degrees, It was at Brazenose he formed his life-long friendship with John Howe, who had a pro- found veneration for Adams. In 1655 he was appointed to the rectory of St Mildred's, Bread Street, London—John Milton being a parishioner. From this he was ejected by the Act of Uniformity of 1662. Thereupon he continued his ministry as opportunity offered, and at length was settled as pastor of a congregation in Southwark. This Richard Adams is a typical example of the consistent and meek labourers of the early and struggling period of Non- conformity. His holy and beautiful life inspired Howe's noblest eloquence in his funeral sermon.

He died in a ripe old age, on 7th Feb. 1698. His principal literary work is his contribution of annotations on Philippians and Colossians to Pool's celebrated Annotations. Along with Veal he edited the works of Charnock. (4.2. G.)

ADAMS, Samuzt, American statesman, born at Boston, Sept. 27, 1722, was second cousin to John Adams. He studied at Harvard, but, owing to his father's misfortunes in business in connection with a banking speculation,—the "tmanufactory scheme,"—he had to leave before complet- ing his course, and to relinquish his intention of becoming a Congregational clergyman. He received his degree, however, and it is worthy of note, as showing the tendency of his political opinions, that his thesis was a defence of the affirmative reply to the question, 'Whether it be law- ful to resist the supreme magistrate, if the commonwealth cannot otherwise be preserved?" The failure of the bank- ing scheme above referred to, in consequence of the limita- tions imposed by English law, made Adams still more decided in his assertion of the rights of American citizens, and in his opposition to Parliament. He gave up his business, in which he had little success, and became tax-

collector for the city of Boston, whence he was called by his political opponents, " Samuel the publican." In all the proceedings which issued at last in the declaration of independence Adams was a conspictious actor. He took part in the numerous town meetings, drafted the protest which was sent up by Boston against the taxation scheme of Grenville (May 1764); and, being chosen next year a member of the general court of Massachusetts, soon became one of the leaders in debate. Upon his entry into the House he was appointed clerk, and had thus much influ- ence in arranging the order of business and in drawing up papers. Attempts were more than once made by the English governor to win him over by the offer of a place, but Adams proved inflexible. His uncompromising resist- ance to the British Government continued; he was a prominent member of the continental Congress at Phila- delphia, and was one of those who signed the Declaration of Independence in 1776. He was a member of the con- vention which settled the constitution of Massachusetts, and became president of its

Senate. From 1789 to 1794 he was lieutenant-governor of the State, and governor from 1794 to 1797, retiring in the latter year partly on account of age, but partly also because the Federalists were then in the ascendant, and he himself was inclined to the Jefferson or Republican party. He dicd on the 3d Oct. 1803. In an oration on American independence, delivered in Philadelphia, 1st Aug. 1776, Adams characterises the English as "a nation of shopkeepers." The oration was translated into French, and published at Paris; and it is therefore not unlikely that Napoleon's use of this phrase was not original.

ADAMS, Tuomas—" the prose Shakspeare of Puritan theologvans,"as Southey named him—has left as few personal memorials behind him as the poet himself. The only facts regarding the commonplaces of his biography are furnished by epistles-dedicatory and epistles to the reader, and title-pages. From these we learn that he was, in 1612, "a preacher of the gospel at Willington," in Bedfordshire, where he is found on to 1614,. and whence issued his Heaven and Earth Reconciled, The Devil's Banquet, and other works; that in 1614-15 he was at Wingrave, in Buckinghamshire, probably as vicar, and whence a number of his works went forth in quick succession; that, in 1618 he held the preachership at St Gregory's, undor St Paul's Cathedral, and was "observant chaplain" to Sir Henrie Montague, the Lord Chief-Justice of England ; that during these years his epistles show him to have been on the most friendly terms with some of the foremost men in state and church; and that he must have died before the Restoration of 1660. His " occasionally" printed sermons, in small quartos, when collected in 1630, placed him beyond all comparison in the van of the preachers of England. Jeremy Taylor does not surpass him in brilliance of fancies, nor Thomas Fuller in wit. His numerous works display great learning, classical and patristic, and are unique in their abundance of stories, anecdotes, aphorisms, and puns. He was a Puritan in the church, in distinction from the Nonconformist Puritans, and is evangelically, not dry-doctrinally, Calvinistic in his theology. His works have been recently collected by Drs Joseph Angus and Thomas Smith (3 vols. 8vo, 1862). (A. B. G.

ADAMSON, Parrick, a Scottish prelate, Archbishop of St Andrews, was born in the year 1543, in the town of Perth, where he received the rudiments

of his education. He afterwards studied philosophy, and took his degree of master of arts at the University of St Andrews. In 1564 he set out for Paris as tutor to the eldest son of Sir Wil- liam Macgill In the month of June of the same year, Mary Queen of Scots being delivered of a son, afterwards James VI. of Scotland and J. of England, Mr Adamson

wrote a Latin poem, in which he gave the prince the title of king of Francc and England. This proof of his loyalty involved him in difficulties. The French court was offended, and ordered him to be arrested; and he was confined for six months. He was released only through the intercession of Qucen Mary and some of the principal nobility, who intc- rested themselves in his behalf. As soon as he recovered his liberty, he retired with his pupil to Bourges. He was in this city during the massacre at Paris; and the same perse- cuting spirit prevailing among the Catholics at Bourges as at the metropolis, he lived concealed for seven months in a public-house, the aged master of which, in reward for his charity to heretics, was thrown from the roof, and had his brains dashed out. Whilst Mr Adamson lay thus in his sepulchre, as he called it, he wrote his Latin poetical version of the book of Job, and his tragedy of Herod in the same language. In the year 1573 he returned to Scotland, and, having entered into holy orders, became minister of Paisley. In the year 1575 he was appointed one of the commis- sioners, by the General Assembly, to settle the jurisdiction and policy of the church; and the following year he was named, with Mr David Lindsay, to report their proceedings to the Earl of Morton, then regent. About this time the earl appointed him one of his chaplains; and, on the death of Archbishop Douglas, promoted him to the archiepiscopal see of St Andrews. 'This gave rise to a protracted con- flict with the Presbyterian party in the Assembly. Soon after his promotion, he published a catechism in Latin verse, dedicated to the king, a work highly approved even by his enemies, who' nevertheless still continued to persecute him with great violence. In 1578 he submitted himself to the General Assembly, which procured him peace but for a very little time; for, the year following, fresh accusations were brought against him. A Provincial Synod was held at St Andrews in April 1586; the archbishop was here accused and excommunicated. He appealed to the king and the states, but this availed him little. At the next General Assembly, a

paper being produced containing the arch- bishop's submission, he was absolved from the excommuni- cation. In 1588 fresh accusations were brought against him. 'The year following he published the Lamentations of the prophet Jeremiah in Latin verse, which he dedicated to the king, complaining of his hard usage. Towards the end of the same ycar he published a translation of the Apocalypse in Latin verse, and a copy of Latin verses. The king was unmoved by his application, and granted the revenue of his see to the Duke of Lennox, so that the prelate and his family were literally reduced to the want of bread. During the remaining part of his unfortunate life he was supported by charitable contributions, and died in 1592. He had previously made a written recantation of his alleged errors in regard to Episcopacy, though the genuineness of this is doubted by Spottiswoode. (See Cunningham's Church History of Scotland, vol. i.) The character of this prelate has been variously represented, according to the sentiments of religion and politics which prevailed. But there is little doubt that he encouraged and supported, under the authority of the king, oppressive and injurious measures. The panegyric of the editor of his works, Mr Wilson, is extravagant and absurd. He says that "he was a miracle of nature, and rathcr seemed to be the immediate production of God Almighty than born of a woman."

_ADANA, a city of Asia Minor, the capital of the pro- vince of the same name, on the right bank of the Sihun, about 30 miles from the sea, in N. lat. 37° 1', E. long. 35° 18'. It is built on the site of the ancient Antiochia ad Sarum. Its position, commanding the passage of the mountains to the north of Syria, rendered it important as a military station in the contest between the Egyptians and

'and the relationship was considered more remote in pro-

the Turks in 1832. After the defeat of the Turkish army at Konieh, it was taken possession of by Ibrahim Pacha, and continued to be held by the Egyptians till the treaty of July 1840 restored it to the Porte. In the streets of the town there are numerous beautiful fountains, supplied with water from

the river, which is here spanned by a stately bridge of fifteen arches, said to have been erected by Justinian. In winter the climate is mild and healthy, but in summer the heat is so great that the principal inhabitauts betake themselves to various cool retreats in the neighbouring mountains. The adjoining plain of Adana is rich and fertile. The chief productions of the province are cotton, corn, sesame, and wool, which are largely exported. The population of the town is 20,000.

ADANSON, Micuet, a celebrated French naturalist, descended from a Scottish family which had at the Revolu- tion attached itsclf to the fortunes of the house of Stuart, was born the 7th of April 1727, at Aix, in Provence, where his father was in the service of M. de Vintimille, arch- bishop of that province. On the translation of this prelate — to the archbishopric of Paris, about the year 1730, the elder Adanson repaired thither with his five children, who were all provided for by their father's patron. A small canonry fell to the lot of Michcl, the revenue of which defrayed the expenses of his education at the college of Plessis. While there he was distinguished for great quick- ness of apprehension, strength of memory, and mental ardour; but his genius took no particular bent, until he received a microscope from the celebrated Tuberville Need- ham, who was struck with admiration of the talents and acquirements he displayed at a public examination. From that time to the last hour of his life he persevered with a zeal almost unexampled in the observation and study of nature. On leaving college, his youthful ardour was well employed in the cabinets of Reaumur and Bernard de Jussieu, as well as in the Jardin des Plantes. Such was his zeal, that he repeated the instructions of the professors to his less apt fellow-students; and before completing his nineteenth year he had actually described (for his own improvement) 4000 species of the three kingdoms of nature. In this way he soon exhausted the rich stores of accumulated knowledge in Europe; and having obtained a small appointment in the colony of Senegal, he resigned his canonry, and embarked on the 20th of December 1748 for Africa. Senegal, from the unhealthiness of its climate, was a terra incognita to naturalists; and this determined his choice of that country asa ficld for exploration. His ardour remained unabated during the five years of his residence in Africa. He collected and described, in greater or less detail, an immense number of animals and _ plants; collected specimens of every object of commerce ; delineated maps of the country;

made systematic meteorological and astronomical observations; and prepared grammars and dictionaries of the languages spoken on the banks of the Senegal. On his return to Paris in February 1754 he found himself without resources, but fortunately secured the patronage of M. de Bombarde, who encouraged him in the publication of the scientific results of his travels. In his Histoire Naturelle du Sénégal (Paris, 1757) he made use of a small portion of the materials at his disposal; and the work has a special interest from the essay on Shells, printed at the end of it, where Adanson proposed his universal method, a system of classification distinct from those of Buffon and Jinneus. He founded his classifica tion of all organised beings on the consideration of each individual organ. As each organ gave birth to new rela- tions, so he established a corresponding number of arbitrary arrangements. Those beings possessing the greatest num- ber of similar organs were referred to one great division,

portion to the dissimilarity of organs. The chief defect of this method consists in presupposing a knowledge of specics and their organisation altogether beyond the existing stage of knowledge. It gives, however, distinct ideas of the degree of affinity subsisting between organised beings, independent of all physiological science. Until the appear- ance of this work, the Testacea had scarcely been made the subject of serious study. Adanson's methodical distribu- tion, founded on not less than twenty of the partial classi- fications already alluded to, is decidedly superior to that of any of his predecessors. For the first time there was pre- sented in this department of natural history a classification of the animals themselves, and not merely of the shells which contain them. Like every first attempt, however, it had its imperfections, which arose chiefly from ignorance of the anatomical structure of the animals. It was owing to this that he omitted, in his arrangement of the Mollusca, all molluscous animals without shells. He abandoned his original plan of publishing his Senegal observations in eight volumes, and applied himself entirely to his Familles des Plantes, which he published in 1763: Here he developed the principle of arrangement above mentioned, which, in its adherence to natural botanical relations, was based on the system of Tournefort, and had been anticipated to some extent nearly a century before by Ray. The success of this work was hindered by its

innovations in the use of terms, which were ridiculed by the defenders of the popular sexual system of Linnzus; but it did much to open the way for the establishment, by means principally of Jussieu's Genera Plantarum (1789), of the natural method of the classification of plants. In 1774 Adanson submittcd to the consideration of the Academy of Sciences an immense work, containing what may be called the universal application of his universal method ; for it extended to all known beings aud substances, This work consisted of 27 large volumes of mauuscript, employed in displaying the general relations of all these matters, and their distribution; 150 volumes more, occupied with the alphabetical arrangement of 40,000 species; a vocabulary, containing 200,000 words, with their explanations; and a number of detached memoirs, 40,000 figures, and 30,000 specimens of the thrce king- doms of nature. The committee to which the inspection of this enormous mass was intrusted strongly recommended Adanson to separate and publish all that was peculiarly his own, leaving out what was merely compilation. He obsti- nately rejected this advice; and the huge work, at which he continued to labour, was never published. He had been elected a member of the Academy of Sciences in 1759, and he latterly subsisted on a small pension it had conferred on him. Of this he was deprived on the dissolution of the Academy by the Constituent Assembly, and was consequently reduced to such a depth of poverty as to be unable to appear before the French Institute when it invited him to take his place among its members. Government afterwards conferred upon him a pension sufficient to relieve the simple wants of the great naturalist. He died, after months of severe suffering, on the 3d of August 1806, requesting, as the only decoration of his grave, a garland of flowers gathered from the 58 families he had differentiated" a touching though transitory image," says Cuvier, "of the more durable monument which he has erected to himself in his works." His zeal for science, his unwearied industry, and his talents as a philosophical observer, are conspicuous in all his writ- ings. The serenity of his temper, and the unaffected good- ness of his heart, endeared him to the few who knew him intimately. On his return from Africa in 1754, he laid before the French Indian Company a scheme for the settle- ment of a colony in Senegal, where articles of African produce might be cultivated by free negroes. His proposi- tions were unheeded by his countrymen, and by a@ mis-

directed patriotism he refused to prescnt them to the Abolitionists of England. A similar feeling led him to refuse to settle in Austria, Russia, or Spain, on the invita- tion of the sovereigns of those countries. His most im- portant works are his Vatural Listory of Senegal and his Families of Plants. He contributed a number of papers to the Memoirs of the Academy of Sciences, on the Ship-worm, the Baobab tree (the largest tree known, to which, in hon- our of Adanson, Linnzeus gave the name Adansonia digitata), the origin of the varieties of cultivated plants, guin-producing trees, and the Osczllatoria Adansonia, au animal regarded by him as a spontaneously moving plant. Besides these essays, he contributed several valuable articles in natural history to the earlier part of the Supplement to the first Encyclopédie ; and he is also the reputed author of an essay on the Electricity of the Tourmaline (Paris, 1757), which bears the name of the Duke of Noya Caraffa.

ADAPTATION, in Biology, is the process by which an organism or species of organisms becomes modified to suit the conditions of its life. Every change in a living organ- ism involves adaptation; for in all cases life consists in a continuous adjustment of internal to external relations. The term is usually restricted, however, to imply such modifications as arise during the life of an individual, when an external change directly gencrates some change of func- tion and structure. Thus, since the adjustments of organ- isms arise partly in direct response to causes acting on the individual, and partly in response to causes acting not directly on the individual but on the species as a whole, adaptation is to be regarded as the complement of natural selection. While natural selection acts primarily on the species, adaptation acts only indirectly, through the in- heritance of modifications directly generated in the indi- vidual. All adaptation is limited, since an organ can only vary to a certain limited extent from its congenital struc- ture. Adaptations are sometimes distinguished as indirect (for instance, by Haeckel, Generelle Morphologie, vol. ii.); which are directly generated in an organism, but only become apparent in its offspring. These form an im- portant class, and seem to suggest that the phenomena of adaptation, thoroughly understood, would go far to explain all the difficult cases of so-called spontaneous variation.

ADDA, the ancient Addua, a river of Northern Italy, formed by the union of several small streams, near the town of Bormio, in the Rhzetian Alps, flows westward through the Valtellina into the Lake of Como, near its northern extremity. Issuing from the Lecco arm of the lake, it crosses the plain of Lombardy, and finally, after a course of about 150 miles, joins the Po, 8 miles above Cremona. The Adda was formerly the boundary between the terri- tories of Venice and Milan; and on its banks several im. portant battles have been fought, notably that of Lodi, where Napoleon defeated the Austrians in 1796.

ADDER, the common viper (Vipera communis). The death adder (Acanthopis tortor) of Australia, and the puff adder (Clotho arietans) of South Africa, are both highly poisonous.

ADDINGTON, Henry, Viscount Sipmours, primc minister of England, eldest son of Dr Anthony Addington, was born at Reading on the 30th May 1757. He was educated at Winchester and at Brazenose College, Oxford. In 1784 he was called to the bar at Lincoln's Inn, but being elected about the same time member of Parliament for Devizes, he did not enter on legal practice. He was already on terms of intimacy with the younger Pitt, his father having been Lord Chatham's medical adviser (a circumstance that secured for young Addington the nick- name in Parliament of "the Doctor"); and he attached himself, as was natural, to the party of the great commoner.

His fidclity to Pitt received a specdy and ample acknow- ledgment when he was elected, in May 1789, speaker of the House, in suceession to Grenville. For a period of twelve years he discharged the duties of the ehair to the general satisfaction of all parties, if with no very marked ability. In 1801, when Pitt resigned on the question of Catholic emancipation, Addington succeeded him in the offices of prime minister and chancellor of the exchequer. He was head of the party that had come to be known as "the king's friends," and took office, it is said, on the urgent personal solicitation of his majesty. The most memorable event of his brief administration was the nego- tiation of the peace of Amiens, whieh was concluded on terms that

were considered very favourable. It proved, however, but a short-lived truce, the ambition of the First Consul necessitating a renewal of hostilities in May 1803. From this period Pitt assumed a critical attitude towards the ministry, and at length he joined Fox and the opposi- tion in demanding more vigorous measures for the defence of the country. 'The result was that Addington was com- pelled to resign, and Pitt was restored to power in May 1804. Addington abstained from all factious opposition, and indeed gave a general support to the Government. In January 1805 he joincd the cabinet as president of the eouneil, accepting at the same time the dignity of a peer- age, which he had previously declined. He resigned office, however, in July of the same year, in consequence of the share he took in the prosecution of Lord Melville having estranged him from Pitt. After the death of the latter in 1806, he beeame lord privy seal, and subsequently lord president in the cabinet of Fox and Grenville, but resigned office in 1807. He became a third time lord president under Mr Pereeval in 1812, and in June of the same year received the seals of the Home Office under the adminis- tration of Lord Liverpool. He held this position for ten eventful years, during which he received his full share of the hostile criticism to which home secretaries are pecu- liarly exposed. His administration had the merit of being vigorous, fearless, and consistent; but it frequently occa- sioned great irritation, and all but provoked rebellion. The poliey of repression which he pursued in regard to the reform meeting at Manchester in 1819, was not justifiable even according to the limited ideas of liberty prevalent at that time. Lord Sidmouth resigned office in 1822, retain- ing his seat in the cabinet, however, until 1824. He died on the 15th Feb. 1844, at the advanced age of 87. (Life and Correspondence of Lord Sidmouth, by Dean Pellew, 3 vols. 8vo, 1847; Life of Wuliam Pitt, by Lord Stan- hope, 4 vols. p. 8vo, 1867.)

ADDISON, JosrrH, was the eldest son of Lancelot Addison, Dean of Lichfield, and was born at his father's rectory of Milston in Wiltshire, on the Ist day of May 1672. After having passed through several schools, the last of which was the Charter-house, he went to Oxford when he was about fifteen years old. He was first entered of Queen's College, but after two years was elected a scholar of Magdalen College, having, it is said, been reeommended by his skill in Latin versification. He took his master's degree in 1693, and held a fellowship from 1699 till 1711.

The eleven years extending from 1693, or his twenty-first year, to 1704, when he was in his thirty-second, may be set down as the first stage of his life as a man of letters, During this period, embracing no profession, and not as yet entangled in official business, he was a student, an observer, and an author; and though the literary works which he then produced are not those on which his permanent cele- brity rests, they gained for him in his own day a high reputation. He had at first intended to become a clergy-man ; but his talents having attracted the attention of leading statesmen belonging to the Whig party, he was

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speedily diverted from his earlicr views by the countenance which these men bestowed on him. His first patron (to whom he seems to have been introduced by Congreve) was Charles Montague, afterwards Earl of Halifax, who was himself a dabbler in literature, and a protector of literary men; and he became known afterwards to the accomplished and excellent Somers. While both of them were quite able to estimate justly his literary merits, they had regard mainly to the services which they believed him capable of render ing to the nation or the party; and accordingly they encouraged him to regulate his pursuits with a view to public and official employment. For a considerable time, however, he was left to his own resources, which cannot have been otherwise than scanty.

His first literary efforts were poetical. In 1693 a short poem of his, addressed to Dryden, was inserted in the third volume of that veteran writer's Miscellanies. 'The next volume of this collection contained his translation, in toler- able heroic couplets, of "all Virgil's Fourth Georgic, execpt the story of Aristzus." Two and a half books of Ovid were afterwards attempted; and to his years of early man- hood belonged also his prose Hssay on Virgil's Georgics, a performance which hardly deserved, either for its style or for its critical excellence, the compliment paid it by Dryden, in prefixing it to his own translation of the poem. The most ambitious of those poetical assay-pieces is the Account of the Greatest English Poets, dated April 1694, and addressed affectionately to Sacheverell, the poet's fellow-collegian, who afterwards became so notorious in the party-quarrels of the time. This piece, spirited both in language and in versi- fication, is chiefly

noticeable as showing that ignoranee of old English poetry which was then universal. Addison next, in 1695, published one of those compositions, celebrat- ing contemporary events, and lauding contemporary great men, on which, during the half-century that succeeded the Revolution, there was wasted so much of good writing and of fair poetical ability. His piece, not very meritorious even in its own class, was addressed "To the King," and eom- memorates the campaign which was distinguished by Wil- liam's taking of Namur. Much better than the poem itself: are the introductory verses to Somers, then lord keeper. This production, perhaps intended as a remembrancer to the writer's patrons, did not at onee produce any obvious effect: and we are left in considerable uncertainty as to the manner in which about this timc Addison contrived to support himself. He corresponded with Tonson the book- scller about projected works, one of these being a Trans- lation of Herodotus. It was probably at some later time that he purposed compiling a Dictionary of the English Language. In 1699 a considerable collection of his Latin verses was published at Oxford, in the d/usce Anglicane. These appear to have interested some foreign scholars; and several of them show curious symptoms of his charac- teristic humour.

In the same year, his patrons, either having still no office to spare for him, or desiring him to gain peculiarly high qualifications for diplomatic or other important business, provided for him temporarily by a grant, which, though bestowed on a man of great merit and promise, would not pass unquestioned in the present ceutury. He obtained, on the recommendation of Lord Somers, a pension of £300 a year, designed (as Addison himself afterwards said in a memorial addressed to the crown) to enable him " to travel, and qualify himself to serve His Majesty." In the summer of 1699 he crossed into France, where, chiefly for the pur- pose of learning the language, he remained till the end of 1700; and after this he spent a ycar in Italy. In Switz erland, on his way home, he was stopped by receiving notice that he was to be appointed envoy to Prinee Engene, then engaged in the war in Italy. But his Whig friends

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were already tottering in their places; and,in March 1702, the death of King William at once drove them from power and put an end to the pension.

Indeed Addison asserted that he never received but one year's payment of it, and that all the other expenses of his travels were defrayed by himself. He was able, however, to visit a great part of Germany, and did not reach Holland till the spring of 1703. His prospects were now sufficiently gloomy: he entered into treaty, oftener than once, for an engagement as a travelling tutor; and the correspondence in one of these negotiations has been preserved. Tonsou had recom- mendcd him as the best person to attend in this character the son of the Duke of Somerset, commonly called "The Proud." The duke, a profuse man in matters of pomp, was economical in questions of cducation. He wished Addison to name the salary he expected; this being declined, he announced, with great dignity, that he would give a hundred guineas a year; Addison accepted the munificent offer, saying, however, that he could not find his account in it otherwise than by relying on his Grace's future patronage; and his Grace immediately intimated that he would look out for some one else. Towards the end of 1703 Addison returned to England.

Works which he composed during his residence on the Continent were the earliest that showed him to have attained maturity of skill and genius. There is good reason for be- lieving that his tragedy of Cato, whatever changes it may afterwards have suffered, was in great part written while he lived in France, that is, when he was about twenty-eight years of age. Jn the winter of 1701, amidst the stoppages aud discomforts of a journey across the Mount Cenis, he composed, wholly or partly, his Letter from Italy, which is by far the best of his poems, if it is not rather the only one among them that at all justifies his claim to the poetical character. It contains some fine touches of description, and is animated by a noble tone of classical enthusiasm. While in Germany he wrote his Dialogues on Medals, which, however, were not published till after his death. These have much liveliness of style, and something of the gay humour which the author was afterwards to exhibit more strongly; but they show little cither of antiquarian learning or of critical ingenuity. In tracing out parallels between passages of the Roman poets and figures or scenes which appear in ancient sculptures, Addison opened the easy course of inquiry which was afterwards prosecuted by Spence; and this, with the apparatus of spirited metrical translations from the classics, gave the work a likeness to his account of his travels. This account, entitled Remarks on Several Parts of Italy, &c., he

sent home for publication before his own return. It wants altogether the interest of personal narra- tive: the author hardly ever appears. The task in which he chiefly busies himself is that of exhibiting the illustra- tions which the writings of the Latin poets, and the anti- quities and scenery of Italy, mutually give and receive. Many of the landscapes are sketched with great liveliness, and there are not a few strokes of arch humour. The statistical information is very meagre; nor are therc many observations on society; and politics are no further meddled with than to show the moderate liberality of the writer's own opinions.

With the year 1704 begins a second era in Addison's life, which extends to the summer of 1710, when his age was thirty-eight. This was the first term of his official career; and, though very barren of litcrary performance, it not only raised him from indigence, but settled definitively his posi- tion asa publicman. His correspondence shows that, while on the Continent, he had been admitted to confidential inti- macy by diplomatists and men of rank; immediately on his return he was enrolled in the Kitcat Club, and brought thus and otherwise into communication with the gentry of the

Whig party. Although all accounts agree in representing him as a shy man, he was at least saved from all risk of making himself disagreeable in society, by his unassuming manners, his extreme caution, and that sedulous desire to oblige, which his satirist Pope exaggerated into a positive fault. His knowledge and ability were esteemed so highly, as to confirm the expectations formerly entcrtained of his usefulness in public business; and the literary fame he had already acquired soon furnished an occasion for recommend- ing him to public employment. Though the Whigs were out of office, the administration which succeeded them was, in all its earlier changes, of a complexion so mixed and un- certain, that the influence of their leaders was not entirely. lost. Not long after Marlborough's great victory at Blen- heim, it is said that Godolphin, the lord treasurer, expressed to Lord Halifax a desire to have the great duke's fame extended by a poetical tribute. Halifax seized the oppor- tunity of recommending Addison as the fittest man for the duty; stipulating, we are told, that the service should not be unrewarded, and doubtless satisfying the minister that his protegé possessed other qualifications for office besides dexterity in framing heroic verse. Zhe Campaign, the poem thus written to order, was received with extraordinary applause; and it is probably as good as any that ever was prompted by no more worthy inspiration. It has, indeed, neither the fiery spirit which Dryden threw into occasional pieces of the sort, nor the exquisite polish that would have been given by Pope, if he had stooped to make such uses of his genius; but many of the details are pleasing; and in the famous passage of the Angel, as well as in several others, there is even something of force and imagination.

The consideration covenanted for by the poet's friends was faithfully paid. A vacancy occurred by the death of another celebrated man, John Locke; and in November 1704, Addison was appointed one of the five commissioners of appeal in Excise. The duties of the placc must have been as light for him as they had been for his predecessor ; for he continued to hold it with all the appointments he subse- quently received from the same ministry. But there is no reason for believing that he was more careless than other public servants in his time; and the charge of incompetency as a man of business,

which has been brought so positively against him, cannot possibly be true as to this first period of his official career. Indeed, the specific allegations refer exclusively to the last years of his life; and, if he had not really shown practical ability in the period now in question, it is not easy to see how he, a man destitute alike of wealth, of social or fashionable liveliness, and of family interest, could have been promoted, for several years, from office to office, as he was, till the fall of the administration to which he was attached. In 1706 he became one of the under- secretaries of state, serving first under Hedges, who belonged to the Tory section of the Government, and afterwards under Lord Sunderland, Marlborough's son-in-law, and a zealous follower of Addison's early patron, Somers. The work of this office, however, like that of the commissionership, must often have admitted of performance by deputy. For in 1707, the Whigs having become stronger, Lord Halifax was sent on a mission to the Elector of Hanover; and, besides taking Vanbrugh the dramatist with him as king- at-arms, he selected Addison as his secretary. In 1708 he entered Parliament, sitting at first for Lostwithiel, but afterwards for Malmesbury, which, being six times elected, he represented from 1710 till his death. Here unquestion- ably he did fail. What part he may have taken in the details of business we are not informed; but he was always a silent member, unless it be true that he once attempted to speak and sat down in confusion. In 1709 Lord Wharton, the father of the notorious duke, having been named lord-lieutenant of Ireland, Addison becaine his

secretary, receiving also an appointment as keeper of records. This event happened only about a ycar and a half before the dismissal of the ministry; and the Irish secretary would seem to have transacted the business of his office chiefly in London. But there are letters showing him to have made himself acceptable to some of the best and most distin- guished persons in Dublin; and he escaped without having any quarrel with Swift, his acquaintance with whom had begun some time before. In the literary history of Addison those seven years of official service are almost a blank, till we approach their close. He defended the Government in an anonymous pamphlet on Zhe Present State of the War; he united compliments to the all-powerful Marlborough with indifferent attempts at lyrical poetry in his

opera of Rosamond; and, besides furnishing a prologue to Steele's comedy of The Tender IMusband, he perhaps gave some assistance in the composition of the play. Trish administration, however, allowed it would seem more leisure than might have been expected. During the last few months of his tenure of office Addison contributed largely to the Zutler. But his entrance on this new field does nearly coincide with the beginning of a new section in his history.

Even the coalition-ministry of Godolphin was too Whig- gish for the taste of Queen Anne; and the Tories, the favourites of the court, gained, both in parliamentary power and in popularity out of doors, by a combination of lucky accidents, dexterous management, and divisions and double- dealing among their adversaries. The real failure of the prosecution of Addison's old friend Sacheverell, completed the ruin of the Whigs; and in August 1710 an entire revolution in the ministry had been completcd. The Tory administration which succeeded kept its place till the queen's death in 1714, and Addison was thus left to devote four of the best years of his life, from his thirty-ninth year to his forty-third, to occupations less lucrative than those in which lis time had recently been frittered away, but much more conducive to the extension of his own fame, and to the bencfit of English literature. Although our information as to his pecuniary affairs is very scanty, we are entitled to believe that he was now independent of literary labour. He speaks, in an extant paper, of having had (but lost) property in the West Indies; and he is understood to have inherited several thousand pounds from a younger brother, who was governor of Madras. In 1711 he purchased, for £10,000, the estate of Bilton, near Rugby,—the place which after- wards became the residence of Mr Apperley, better known by his assumed name of " Nimrod."

During those four years he produced a few political writings. Soon after the fall of the ministry, he con- tributed five numbers to the Whig Examiner, a paper set up in opposition to the Tory periodical of the same name, which was then conducted by the poet Prior, and after- wards became the vehicle of Swift's most vehement invec- tives against the party he had once belonged to. These are certainly the most ill-natured of Addison's writings, but they are neither lively nor vigorous. There is more spirit in his allegorical pamphlet, the Trial and Conviction of Count Tariff. ;

But from the autumn of 1710 till the end of 1714 his principal employment was the composition of his celebrated Periodical Essays. The honour of inventing the plan of such compositions, as well as that of first carrying the idea into execution, belongs to Richard Steele, who had been a school-fellow of Addison at the Charter-house, continued to be on intimate terms with him afterwards, and attached himself with his characteristic ardour to the same political party. When, in April 1709, Steele published the first number of the Z'atler, Addison was in Dublin, and knew nothing of the design. He is said to have detected his

friend's authorship only by recognising, in one of the early papers, a critical remark which he remembered having him- self communicated to Steele. He began to furnish essays in a few weeks, assisted occasionally while he held office, and afterwards wrote oftener than Steele himsclf. He thus contributed in all, if his literary executor selected his con- tributions correctly, more than 60 of the 271 essays which the work contains. The Zatler exhibited, in more ways than one, symptoms of being an experiment. The pro- jector, imitating the news-sheets in form, thought it prudent to give, in each number, news in addition to the essay; and there was a want, both of unity and of correct finishing, in the putting together of the literary materials. Addison's contributions, in particular, are in many places as lively ag anything he ever wrote; and his style, in its more familiar moods at least, had been fully formed before he returned from the Continent. But, as compared with his later pieces, these are only what the painter's loose studies and sketches are to the landscapes which he afterwards constructs out of them. In his invention of incidents and characters, one thought after another is hastily used and hastily dismissed, as if he were putting his own powers to the test, or trying the cffect of various kinds of objects on his readers; his most ambitious flights, in the shape of allegories and the like, are stiff and inanimate; and his favourite field of literary criti- cism is touched so slightly, as to show that he still wanted confidence in the taste and knowledge of the public.

The Tatler was dropped at the beginning of 1711, but only to be followed by the Spectator, which was begun on the 1st day of March, and appeared

every week-day till the 6th day of December 1712. It had then completed the 555 numbers usually collected in its first seven volumes, Addison, now in London and unemployed, co-operated with Steele constantly from the very opening of the series; and the two, contributing almost equally, seem together to have written not very much lcss than five hundred of the papers. Emboldened by the success of their former adventure, they devoted thcir whole space to the essays. They relied, with a confidence which the extraordinary popularity of the work fully justified, on their power of exciting the interest of a wide audience by pictures and reflections drawn from a field which embraccd the whole compass of ordinary life and ordinary knowledge, no kind of practical themes being positively excluded except such as were political, and all literary topics being held admissible, for which it seemed possible to command attention from persons of average taste and information. A seeming unity was given to the undertaking, and curiosity and interest awakened on behalf of the conductors, by the happy invention of the Spectator's Club, in which Steele is believed to have drawn all the characters. The figure of Sir Roger de Coverley, however, the best even in the opening group, is the only one that was afterwards elaborately depicted; and Addison was the author of all the papers in which his oddities and amia- bilities are so admirably delineated. To him, also, the Spectator owed a very large share of its highest excellences. His were many, and these the most natural and elegant, if not the most original, of its humorous sketches of human character and social eccentricities, its good-humoured satires on ridiculous features in manners, and on corrupt symptoms in public taste; these topics, however, making up a depart- ment in which Steele was fairly on a level with his more famous coadjutor. But Steele had neither learning, nor taste, nor critical acuteness sufficient to qualify him for enriching the series with such literary disquisitions as those which Addison insinuated so often into the lighter matter of his essays, and of which he gave an elaborate specimen in his celebrated and agreeable criticism on Paradise Lost. Still further beyond the powers of Stcele were those specu- lations on the theory of literature and of the processes of

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thought analogous to it, which, in the essays " On the Plea- sures of the Imagination," Addison prosecuted, not, indeed, with much of philosophical

depth, but with a sagacity and comprehensivencss which we shall undervalue much unless we remember how little of philosophy was to be found in any critical views previously propounded in England. To Addison, further, belong those essays which (most fre- quently introduced in regular alternation in the papers of Saturday) rise into the region of moral and religious medi- tation, and tread the elevated ground with a step so grace- ful as to allure the reader irresistibly to follow; sometimes, as in the " Walk through Westminster Abbey," enlivening solemn thought by gentle sportiveness; sometimes flowing on with an unintcrrupted sedateness of didactic eloquence; and sometimes shrouding sacred truths in the veil of in- genious allegory, as in the majestic " Vision of Mirza." While, in a word, the Spectator, if Addison had not taken part in it, would probably have been as lively and humorous as it was, and not less popular in its own day, it would have wanted some of its strongest claims on the respect of pos- terity, by being at once lower in its moral tone, far less abundant in literary knowledge, and much less vigorous and expanded in thinking. In point of style, again, the two friends resemble each other so closely as to be hardly distinguishable, when both are dealing with familiar objects, and writing in a key not rising above that of conversation. But in the higher tones of thought and composition, Addi- son showed a mastery of language raising him very de- cisively, not above Steele only, but above all his contem- poraries. Indeed, it may safely be said, that no one, in any age of our literature, has united, so strikingly as he did, the colloquial grace and ease which mark the style of an accomplished gentleman, with the power of soaring into a strain of expression nobly and eloquently dignified.

On the cessation of the Spectator, Steele set on foot the Guardian, which, started in March 1713, came to an end in October, with its 175th number. To this series Addison gave 53 papers, being a very frequent writer during the latter half of its progress. None of his essays here aim so high as the best of those in the Spectator; but he often exhibits both his cheerful and well-balanced humour, and his earnest desire to inculcate sound principles of literary judgment. In the last six months of the year 1714, the Spectator received its eighth and last volume; for which Steele appears not to have written at all, and Addison to have contributed 24 of the 80 papers. Most of these form, in the unbroken seriousness both of their topics and of their manner, a contrast to the majority of his essays in the earlier volumes; but

several of them, both in this vein and in one less lofty, are among the best known, if not the finest, of all his essays. Such are the " Mountain of Miseries ;" the antediluvian novel of ' Shallum and Hilpa ;" the " Reflections by Moonlight on the Divine Perfections."

In April 1713 Addison brought on the stage, very reluc- tantly, as we are assured, and can easily believe, his tragedy of Cato. Its success was dazzling; but this issue was mainly owing to the concern which the politicians took in the exhibition. The Whigs hailed it as a brilliant mani- festo in favour of constitutional freedom. The Tories echoed the applause, to show themselves enemies of despot- ism, and professed to find in Julius Cesar a parallel to the formidable Marlborough. Even with such extrinsic aids, and the advantage derived from the established fame of the author, Cato could never have been esteemed a good dramatic work, unless in an age in which dramatic power and insight were almost extinct. It is poor even in its poetical elements, and is rcdeemed only by the finely solemn tone of its moral reflections, and the singular refine- ment and equable smoothness of its diction.

The literary career of Addison might almost be held as

closed soon after the death of Queen Anne, which occurred in August 1714, when he had latcly completed his 42d year. His own life extended only five years longer; and this closing portion of it offers little that is pleasing or instructive. We see him attaining the summit of his ambition, only to totter for a little and sink into an early grave. We are reminded of his more vigorous days by nothing but a few happy inventions interspersed in political pamphiets, and the gay fancy of a trifling poem on Kneller's portrait of George I.

The lord justices who, previously chosen secretly by the Elector of Hanover, assumed the government on the Queen's demise, were, as a matter of course, the leading Whigs. They appointed Addison to act as their secretary. He next held, for a very short time, his former office under the Irish lord- lieutenant; and, early in 1715, he was made one of the lords of trade. In the course of the same year occurred the first of the only two quarrels with

friends, into which the prudent, good-tempered, and modest Addison is said to have ever been betrayed. His adversary on this occasion was Pope, who, only three years before, had received, with an appearance of humble thankfulness, Addison's friendly remarks on his Essay on Criticism; but who, though still very young, was already very famous, and beginning to show incessantly his literary jealousies, and his personal and party hatreds. Several little mis- understandings had paved the way for a breach, when, at the same time with the first volume of Pope's Iliad, there appeared a translation of the first book of the poem, bear- ing the name of Thomas Tickell. Tickell, in his preface, disclaimed all rivalry with Pope, and declared that he wished only to bespeak favourable attention for his contemplated version of the Odyssey. But the simultaneous publication was awkward; and Tickell, though not so good a versifier as Pope, was a dangerous rival, as being a good Greek scholar. Further, he was Addison's under-secretary and confidential friend; and Addison, cautious though he was, does appear to have said (quite truly) that Tickell's trans- lation was more faithful than the other. Pope's anger could not be restrained. He wrote those famous lines in which he describes Addison under the name of Atticus; and, as if to make reconciliation impossible, he not only circulated these among his friends, but sent a copy to Addison himself. Afterwards, he went so far as to profess a belief that the rival translation was really Addison's own. It is pleasant to observe that, after the insult had been perpetrated, Addison was at the pains, in his P'recholder, to express hearty approbation of the Jicad of Pope; who, on the contrary, after Addison's death, deliberately printed the striking but malignant lines in the Epistle to Dr Arbuthnot. In 1715 there was acted, with little success, the comedy of The Drummer, or the Haunted House, which, though it appeared under the name of Steele, was certainly not his, and was probably written in whole or chiefly by Addison. It contributes very little to his fame. From September 1715 to June 1716, he defended the Hano- verian succession, and the proceedings of the Government in regard to the rebellion, in a paper called the Freeholder, which he wrote entirely himself, dropping it with the fifty-fifth number. Itis much better tempered, not less spirited, and much more able in thinking, than his Examiner. The finical man of taste does indeed show himself to be some- times weary of discussing constitutional questions; but he aims many enlivening thrusts at weak points of social life and manners; and the charactcr of the Fox-hunting Squire, who is

introduced as the representative of the Jacobites, is drawn with so much humour and force that we regret not being allowed to see more of him.

In August 1716, when he had completed his 44th year, Addison married the Countess-Dowager of Warwick, a

widow of fifteen years' standing. She seems to have for- feited her.jointure by the marriage, and to have brought her husband uothing but the occupancy of Holland House at Kensington. We know hardly anything positively in regard to the affair, or as to the origin or duration of his acquaintance with the lady or her family. But the current assertion that the courtship was a long one is very probably erroneous. There are better grounds for believing the assertion, transmitted from Addison's own time, that the marriage was unhappy. The countess is said to have been proud as well as violent, and to have supposed that, in con- tracting the alliance, she conferred honour instead of receiv- ing it. To the uneasiness caused by domestic discomfort, the most friendly critics of Addison's character have attri- buted those habits of intemperance, which are said to have grown on him in his later years to such an extent as to have broken his health and accelerated his death. His bio- grapher, Miss Aikin, who disbelieves his alleged want of matrimonial quiet, has called in question, with much il- genuity, the whole story of his sottishness ; and it must at any rate be allowed that all the assertions which tend to fix such charges on him in the earlier parts of his life, rest on no evidence that is worthy of credit, and are in themselves highly improbable. i day; and the constant frequenting of coffce-houses, which figures so often in the Spectator and elsewhere, and which was really practised among literary men as well as others, cannot have had good effects. Addison, however, really appears to have had no genuine relish for this mode of life ; and there are curious notices, especially in Steele's corre- spondence, of his having lodgings out of town, to which he retired for study and composition. But, whatever the cause nay have been, his health was shattered before he took that which was the last, and cortainly the most unwise step, in his ascent to political power.

For a considerable time dissensions had existed in the ministry; and these came to a crisis in April 1717, when those who had been the real chiefs

passed into the ranks of the opposition. 'Townshend was dismissed, and Walpole anticipated dismissal by resignation. There was now formed, under the leadership of General Stanhope and Lord Sunderland, an administration which, as resting on court- influence, was nicknamed the "German ministry." Sun- derland, Addison's former superior, became one of the two principal secretaries of state; and Addison himself was appointed as the other. His elevation to such a post had been contemplated on the accession of George I., and pre- vented, we are told, by his own refusal; and it is asserted, on the authority of Pope, that his acceptance now was owing only to the influence of his wife. Even if there is no ground, as there probably is not, for the allegation of Addison's inefficiency in the details of business, his unfit- ness for such an office in such circumstances was undeni- able and glaring. It was impossible that a Government, whose secretary of state could not open his lips in debate, should long face an opposition headed by Robert Walpole. The decay of Addison's health, too, was going on rapidly, being, we may readily conjecture, precipitated by anxiety, if no worse causes were at work. II] health was the reason assigned for retirement, in the letter of resignation which he laid before the king in March 1718, eleven months after his appointment. He received a pension of £1500 a year.

Not long afterwards the divisions in the Whig party alienated him from his oldest friend. The Peerage Bill, introduced in February 1719, was attacked, on behalf of the opposition, in a weekly paper, which was called the Plebeian, and written by Steele. Addison answered it temperately enough in the Old Whig; provocation from the Leberan brought forth angry retort from the Whig;

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Steele charged Addison with being so old a Whig as to have forgotten his principles; and Addison sneered at Grub Street, and called his friend " Little Dicky."! How Addi- son felt after this painful quarrel we are not told directly; but the Old Whig was excluded from that posthumous collection of his works for which his executor Tickell had received from him authority and directions. In that collec- tion was inserted a treatise on the evidences

of the faith, entitled Of the Christian Religion. Its theological value is very small; but it is pleasant to regard it as the last effort of one who, amidst all weaknesscs, was a man of real good- ness as well as of eminent genius.

The disease under which Addison laboured appears to have been asthma. It became more violent after his retire- ment from office, and was now accompanied by dropsy. His deathbed was placid and resigned, and comforted by those religious hopes which he had so often suggested to others, and the value of which he is said, in an anecdote of doubtful authority, to have now inculcated in a parting interview with his stepson. He died at Holland House on the 17th day of June 1719, six wecks after having com- pleted his 47th year. His body, after lying in state, was interred in the Poets' Corner of Westminster Abbey.

The Biographia Britannica gives an elaborate memoir of him; particulars are well collected in the article under his name in the Biographical Dictionary of the Society for the Diffusion of Useful Knowledge; and a good many new materials, especially letters, will be found in Zhe Life of Joseph Addison, by Lucy Aikin, 1843. (W. 8.)

An edition of Addison's works, in four volumes quarto, was pub- lished by Baskerville at Birmingham in 1761. Dibdin characterises this as a 'glorious performanee."' A eomplete edition in six volumes, with notes, by Kichard Hurd, appeared in 1811. An American edition (New York, 1854), in six volumes, with notes, by G. W. Greene, contains several pieces eolleeted for the first time. An edi- He al Spectator, with valuable notes by Henry Morley, appeared in °

ADEL or SoMAUvLI, an extensive tract of country, stretch- ing eastward from the neighbourhood of Tajurrah to Cape Guardafui, between 43° and 51° E. long., with a breadth not accurately ascertained. Zeila and Berbera are the chief ports on the coast, and have some trade with the opposite shores of Arabia, exporting spices, ivory, gold dust, cattle, and horses, and receiving Indian commodities in exchange. The country, which is marshy and unhealthy, is inhabited by the Somauli, who are governed by an Iman, and are Mahometans.

ADELAAR, Cort SrvaRtsENn, surnamed the Eagle, a famous naval commander, was born at Brevig in Norway in 1622. At the age of fifteen he became a cadet ih the Dutch fleet under Van Tromp, and after a few years entered the service of the Venetian Republic, which was engaged at the time in a war with Turkey. In 1645 he had risen to the rank of captain; and after sharing in various victories as commander of a squadron, he achieved his most brilliant success at the Dardanelles, on the 13th May 1654, when, with his own vessel alone, he broke through a line of 37 Turkish ships, sank 15 of them, and burned others, causing a loss to the enemy of 5000 men. The following day he entered Tenedos, and compelled the complete surrender of the Turks. On returning to Venice he was crowned with honours, and became admiral-lien- tenant in 1660. Numerous tempting offers were made to him by other naval powers, and in 1661 he left Venice to return to the Netherlands. Next year he was induced, by the offer of a title and an enormous salary, to accept the command of the Danish fleet from Frederick III. Under Christian V. he took the command of the combined Danish fleets against Sweden, but died suddenly (5th November

1 On this point, however, see Macaulay's Essay on Zhe Life and Writings of Addison.

1675) at Copenhagen, before the expedition set out. When in the Venetian service, Adelaar was known by the name of Curzio Suffrido Adelborst.

ADELAIDH, the capital of the British colony of South Australia and of the county of the same name, situated on the Torrens, seven miles from Port Adelaide, with which it is connected by railway. 'The river, which is spanned at this point by several bridges, divides the city into two parts — North Adelaide, the smaller of the two, but containing the chief private houses, occupying a gentle slope on the right bank; and South Adelaide, the commercial centre of the town, lying on a very level plain on the left. The streets of Adelaide are broad, and regularly laid out. Among its public buildings are the Government offices and the governor's house, the post office, the jail, five banks, the railway station, and a theatre. It is the seat of a Protestant Episcopal and also of a Roman Catholic bishop, and contains places of worship belonging to these bodies, as well as to the Presbyterians,

the Methodists, the Uni- tarians, the Baptists, and other denominations. Adelaide possesses a botanical garden, and is surrounded by exten- sive public grounds, known as the " Park Lands," contain- ing over 1900 acres. It is lighted with gas, and is sup- plied with water froin a reservoir some miles up the Torrens. The corporation consists of a mayor and cight councillors, two from each of the four wards; and there are also two auditors, a town clerk, and other officials. The chief manufactures are woollen, starch, soap, beer, flour, leather, earthenware, and iron goods. There is a good retail trade in European produce; and in the vicinity are iron and copper mines. Adelaide was founded in 1836, and incor- porated in 1842. It received its name in honour of Queen Adelaide. Population, 27,208.

Port ADELAIDE is situated in a low marshy position, on a small inlet of the Gulf of St Vincent. Its harbour is safe and commodious; but a bar at the mouth, where the depth of water varics with the tide from 8 to 16 feet, pre- vents large vessels from entering. It isa free port, and has good wharfs and warehouse accommodation. In 1867, 364 vessels of 119,654 tons arrived at, and 376 of 125,559 tons departed from, Port Adelaide. The chief imports were drapery, iron goods and machinery, beer, wine, spirits, and paper; and the exports, grain, copper and lead ores, wool, tallow, and other native products. Population, 2482.

ADELSBERG, a market town of Austria, in the pro- vince of Carniola, 26 miles SW. of Laibach, and about the same distance E. of Trieste. About a mile from the town is the entrance to the famous stalactite cavern of Adelsberg, the largest and most magnificent in Europe. The cavern is divided into four grottoes, with two lateral ramifications which reach to the distance of about a mile and a half from the entrance. The river Poik enters the cavern 60 feet below its mouth, and is heard murmuring in its recesses. In the Kaiser-Ferdinand grotto, the third of the chain, a great ball is annually held on Whitmonday, when the chamber is brilliantly illuminated. The Franz-J oseph- Elisabeth grotto, the largest of the four, and the farthest from the entrance, is 665 feet in length, 640 feet in breadth, and more than 100 feet high. Besides the imposing pro- portions of its chambers, the cavern is remarkable for the variegated beauty of its stalactite formations, some resem- bling transparent drapery, others waterfalls, trees, animals, or

human beings, the more grotesque being called by various fanciful appellations, These subterranean wonders were known in the Middle Ages, but the cavern remained undiscovered in modern times until 1816, and it is only in still more recent times that its vast extent has been fully ascertained and explored.

ADELUNG, Friepricn von, a distinguished philo- logist, nephew of John Christoph Adelung, was born at

Stettin on the 25th February 1768. After studying philo- sophy and jurisprudence at Leipsic he accompanied a family to Italy, where he remained for several years. At Rome he obtained access to the Vatican library, a privilege which he utilised by collating and editing some valuable old German MSS. that had been taken from Heidelberg. On his return he became private secretary to Count Pahlen, whom he accompanied from Riga to St Petersburg. In 1803 he became instructor to the younger brothers of the Czar, the arch-dukes Nicholas and Michael, and gave such satisfaction to the empress-mother that she entrusted him with the care of her private library. In 1824 he became director of the Oriental Institute in connection with the foreign office, and in the year following president of the Academy of Sciences. He died on the 30th January 1843. Adelung's chief literary works were—a Biography of Baron Herberstein (St Petersburg, 1817), a Biography of Baron de Meyerberg (1827), a treatise on the Relations between the Sanscrit and the Russian Languages (1815), and an Essay on Sanscrit Interature (1830), a second edition of which appeared in 1837, under the title Bibliotheca Sanscrita. ADELUNG, JoHann CuristTorn, a very eminent Ger- man grammarian, philologist, and general scholar, was born at Spantekow, in Pomerania, on the 8th August 1732, and educated at the public schools of Anclam and Closter- bergen, and the university of Halle. In the year 1759 he was appointed professor at the gymnasium of Erfurt, but relinquished this situation two years after, and went to reside in a private capacity at Leipsic, where he continued to devote himself for a long period to the cultivation of letters, and particularly to those extensive and laborious philological researches which proved so useful to the language and literature of his native country. In 1787 he

received the appointment of principal librarian to the elector of Saxony at Dresden, with the honorary title of – Aulic Counsellor. Here he continued to reside during the remainder of his life, discharging with diligence and in- tegrity the duties of his situation, and prosecuting his laborious studies to the last with indefatigable industry and unabated zeal. Possessing a naturally robust consti- tution, he was able to devote, it has been said, fourteen hours daily to literary toil, down even to the period of his death. He died at Dresden on the 10th of September 1806. The life of a mere scholar is generally destitute of interest ; and that of Adelung, which was spent entirely in literary seclusion, presents no variety of incident to the pen of the biographer. Of his private character and habits few memorials have been preserved, but in these few he is represented as the man of an amiable disposition. He was a lover of good cheer, and spared neither pains nor expense in procuring a variety of foreign wines, of which his cellar, which he facetiously denominated his Bibliotheca Selectissima,is said to have contained no less than forty different kinds. His manners were easy and affable, and the habitual cheerfulness of his disposition rendered his society most acceptable to a numerous circle of friends. The writings of Adelung are very voluminous, and there is not one of them, perhaps, which does not exhibit some preofs of the genius, industry, and erudition of the author. But although his pen was usefully employed upon a variety of subjects in different departments of literature and science, it is to his philological labours that he is principally indebted for his great reputation ; and no man ever devoted himself with more zeal and assiduity, or with greater success, to the improvement of his native language. In a country subdivided into so many distinct sovereign states, possessing no common political centre, and no national institution whose authority could command de- ference in matters of taste,—in a country whose indigenous literature was but of recent growth, and where the dialect

of the people was held in contempt at the sevcral courts, it was no easy task for a single writer to undertake to fix the standard of a language which had branched out into a variety of idioms, depending in a great measure upon prin- eiples altogether arbitrary. Adelung effected as much in this respect as could well be accomplished by the persever- ing labours of an individual.

By means of his excellent grammars, dictionary, and various works on German style, he contributed greatly towards rectifying the orthography, refining the idiom, and fixing the standard of his native tongue.! Of all the different dialects he gave a decided preference to that of the margraviate of Misnia, in Upper Saxony, and positively rejected everything that was contrary to the phraseology in use among the best society of that province, and in the writings of those authors whom it had produced. In adopting this narrow principle he is generally thought to have 'been too fastidious. The dialect of Misnia was undoubtedly the richest, as it was the earliest cultivated of any in Germany; but Adelung pro- bably went too far in restraining the language within the limits of this single idiom, to the exclusion of others from which it might have, and really has, acquired additional richness, flexibility, and force. His German dictionary has been generally regarded as superior to the English one of Johnson, and certainly far surpasses it in etymology. In- decd, the patient spirit of investigation which Adelung pos- sessed in so remarkable a degree, together with his intimate knowledge of the ancient history and progressive revolutions of the different dialects on which the modern German is based, peculiarly qualified him for the duties of a lexico- grapher. No man before Jacob Grimm did so much for the language of Germany. Shortly before his death he issued the very learned work, at which he had been labouring quictly for years, entitled Mithridates ; or, a General History of Languages, with the Lord's Prayer, as a specimen, in nearly five hundred languages and dialects. – The hint of this work appears to have been taken from a publication, with a similar title, published by the celebrated Conrad Gesner in 1555; but the plan of Adelung is much more extensive. Unfortunately he did not live to finish what he had undertaken. 'The first volume, which contains the Asiatic languages, was published immediately after his 'death ; the other three were issued under the superin- tendence of Professor Vater (1809-17). Of the very numerous works by Adelung, in addition to translations, the following are of greatest importance :-—

Geschichte der Streitigketten zwischen Dinemark und den Herzogen von Holstein-CGottorp. Frankf., Leipsic, 1762, 4to.—Pragmatisehe Staatsgesehiehte Europens von dem Ableben Kaiser Karls des 6'" an. Vols, i-ix. Gotha, 1762-9, 4to.—Jlineralogische Belustigungen. Vols. i-vi. Copenhagen and Leipsic, 1767-71, 8vo.—Glossarium Manwale ad

Seriptores medice et infime Latinitatis, ex magnis Glos- sariis Caroli du Fresne Domini Ducange ct Carpentarti, in eom- pendium redaectwm. Tomi vi. Halle, 1772-84.—Versueh eines vollstindigen grammatiseh-kritischen Worterbuchs der Hoch Tvut- sehen Mundart. 1774-86, 5 vols. 4to.—Ueber die Geschichte der Tcutschen Sprache, tiber Teutsche Mundarten und Teutsche Sprach- Ichre. Leipsic, 1781, 8vo.—-Ucber den Ursprung der Sprache und den Bau der Worter. Ibid. 1781, 8vo.— Teutsche Sprachlehre, zum Gebroatch der Sehulen in den Kénigl. Preuss. Landen. Berlin, 1781. —Lchrgchéude der Teutschen Sprache.—Versuch einer. Geschichte der Cultur des Menschliehen Geschicchts. 1782, 8v0.—Beytrige zur Birgerlichen Geschichte, zur Geschichte der Cultur, zur Natur- geschiehte, Naturichre, und dem Feldbaue. Leipsic, 1783, 8vo.— Forisctzung und Erginzungen eu Christ. Gottl. Jéchers allgemeinem Gelchrien Lewico, Leipsic, 1784, 2 vols. 4to.—Ucher den Teutsehen Styl. Berlin, 1785, 3 vols. 8vo.—Vollstindige Anweisung zur Leutschen Orthographie. Leipsic, 1786, 2 vols. —Auszug aus dem Grammuatiseh-kritischen Worterbuch der Hohen Teutschen Mundart.

Leipsic, 1793, 1 vol. ; 1795, 2 vols. 8vo.—Mithridates, oder Allae- meine Sprachenkunde. 3 vols. Berlin, 1806-1812. i s

u nae period in which High German as a written language ap- proached nearest perfection is, according to him, the short interval between 1740 and 1760. 7 , —

ADE—ADE

ADEN, a town and seaport of Yemen in Arabia, belong- ing to Britain, situated on a peninsula of the same name, 100 miles east of the strait of Bab-el-Mandeb. The penin- sula of Aden consists chiefly of a mass of barren and dego- late volcanic rocks, extending five miles from east to west, and three from its northern shore to Ras Sanailah or Cape Aden, its most southerly point; it is connected with the mainland by a neck of flat sandy ground only a few fect high; and its greatest elevation is Jebel Shamshan, 1776 feet above the level of the sea. The town is built on the eastern eoast, In what is probably the crater of an extinct volcano, and is surrounded by precipitous rocks that form an admirable natural defence. There are two harbours, an outer, facing the town, protected by the island of Sirah, but

now partially ehoked with mud; and an inner, called Aden Back-bay, or, by the Arabs, Bander Tuwayyi, on the western side of the peninsula, which, at all periods of the year, admits vessels drawing less than 20 feet. On thewhole, Aden is a healthy place, although it suffers considerably from the want of good water, and the heat is often very intense, From its admirable commercial and military position, Aden early became the chief entrepdt of the trade between Europe and Asia. It was known to the Romans as Arabia Feliz and Attanw, and was captured by them, probably in the year 243.c. At the commencement of the 16th century it fell into the hands of the Portuguese, who, however, were expelled by the Turks in 1538. In the following century the Turks themselves relinquished their conquests in Yemen, and the Sultan of Senna established a supremacy over Aden, which was maintained until the year 1730, when the Shcik of Lahej, throwing off his allegiance, founded a line of independent sultans. In 1837 a ship under British colours was wrecked near Aden, and the crew and passengers grievously maltreated by the Arabs. An explanation of the outrage being demanded by the Bombay Government, the Sultan undertook to make compensation for the plunder of the vessel, and also agreed to sell his town and port to the English. Captain Haines of the Indian navy was sent to complete these arrangements, but the Sultan's son, who now exercised the powers of government, refused to fulfil the promises that his father had made. A combined naval and military force was thereupon despatched, and the place was captured on the 16th January 1839, It became an outlying portion of the Presidency of Bombay. The withdrawal of the trade between Europe and the East, caused by the discovery of the passage round the Cape of Good Hope, and the misgovernment of the native rulers, had gradually reduced Aden to a state of compara- tive insignificance; but about the time of its capture by the British, the Red Sca route to India was re-opened, and eommerce soon began to flow in its former channcl. Aden was made a free port, and was chosen as one of the coaling stations of the Peninsular and Oriental Steamship Company; and at present its most valuable import is eoal for the use of the steamers. It has, however, a considerable trade in the products of Arabia—coffee, gum, feathers, dyes, pearls, and ivory; and in return receives silk and eotton goods, grain, and provisions. In 1871-72 the value of its im- ports was £1,404,169; and of its exports, £885,919. In the same year 535 steamers (643,982 tons), 94 sailing vessels (90,516 tons), and 898 native craft visited the port. The town has

been fortified and garrisoned by the British; and its magnificent water-tanks, which had been permitted to fall into ruins, have been partially restored. It contams nearly 30,000 inhabitants, as compared with less than 1000 in 1839. ;

ADERNO, a city of Sicily, in the province of Catania, near the foot of Mount Etna, 17 miles N.W. of Catamia. It is built on the site of the ancient Adranum, portions of the massive walls of which are still visible, and numerous

Roman sepulchres have been found in the vicinity. The modern city has a clean appearance, but the situation is unhealthy. It is remarkable for the number of its con- vents and nunneries, and has several churches, the chief of which is supported by beautiful pillars of polished lava. On the river Simeto, near the town, there is a series of beautiful cascades. Population, 12,999.

ADERSBACH ROCKS, a remarkable group of isolated columnar rocks in a valley of the Riesengebirge, on the frontier of Bohemia and Prussian Silesia, 9 miles W.N.W. of Braunau. The mountain, for several miles, appears divided into detached masses by perpendicular gaps, varying in depth from 600 to 1200 feet. These masses are from a few feet to several hundred yards in diameter. The part called the labyrinth consists of smaller masses of columnar form, confusedly piled on one another, and rising to heights of from 100 to 200 feet. From their fantastic shapes the rocks have received various fanciful appellations. Some geologists have supposed that their remarkable structure is the result of subterranean commotion; but the generally- received opinion is, that the whole area had once been a tabular mass of sandstone of unequal hardness, and that the soft parts, which formed perpendicular seams, have been worn away by water and atmospheric changes, leaving the harder portions in their natural position. The recesses of this wild region frequently afforded a place of refuge to the distressed inhabitants of the district during the Thirty Years' War.

ADHESION, a term used to denote the physical force in virtue of which one body or substance remains attached to the surface of another with which it

has been brought into contact. It is to be distinguished from cohesion, which is the mutual attraction that the particles of the same body exert on each other; and it differs from chemical attraction or affinity, since. the properties of the substances it affects remain unchanged after it takes place. It is a force that the molecules of the adhering bodies exert on each other, and must not be confounded with a contact which is due to mere mechanical pressure, such as that which a piece of caoutchouc tubing exerts by its elasticity on a body that. distends it. A very familiar instance of adhesion occurs in the wetting of solid bodies. It often, indeed generally, happens that, when a solid and a liquid touch each other, a film of the latter adheres to the former, and neither falls nor can be shaken off. This arises from the adhesion of the liquid to the solid being a stronger force than the cohesion of the particles of the liquid. It is also stronger than the force of gravitation; and the liquid can only be removed by being forcibly rubbed off, or by the process of evaporation. The force of adhesion may be determined by poising a plate of metal on a balance, and afterwards ascertaining what additional force will be required to detach it from the surface of a liquid. But this can only be done in the few cases in which the liquid does not wet the solid (otherwise the measurement would be that of the cohesive force of the liquid), and does not act on it chemically. The phenomena of Capmnuary ATTRACTION (q.v.) depend on adhesion. Sometimes, when a solid and a liquid are brought into contact, the adhesive force overcomes the cohesion of the particles of the solid, so that it loses its solid form, and is dissolved or held in solution. Solid bodies, too, as well as liquids, adhere to solids. Smooth surfaces (of lead, for instance, or of dissimilar metals) will adhere; and if two plates of polished glass be laid together, it will scarcely be possible to separate them without breaking them. If the solids are pressed together, the adhesive force is generally greater; but it has been shown to be dependent to a very shght extent only on the pressure of the atmosphere. To a looser kind of adhesion, whereby one body is prevented

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from moving smoothly ou the surface of another, we give the name of friction. The force of this increases with pressure, which may be the effect of gravitation or the result of mechanical appliances. If it be desired that

solids should adhere permanently, this is commonly effected by the intervention of other substances—the cements, mortars, and solders—in a liquid or viscid state, which, when they "set" or become solid, adhere closely to the bodies united by means of them. The principle of the processes of plating, gilding, &c., is similar to this. The adhesive force of cements, &c., is sometimes very great. The common experiment of splitting a thin sheet of paper into two is an illustration of it. The paper is pasted carcfully between two pieces of cloth, which are pulled asunder after the paste has dried. The adhesion of the paste to the paper and to the cloth is so strong that the paper is thus separated into two sheets, which can casily be de- tached from the cloth by wetting it. Again, air and other gases adhere to solids. A dry ueedle, placed carefully on the surface of still water, will float, resting on a cushion of air; and when thermometers are filled with mercury, the liquid has to be boiled in them to expel the air that adheres to the glass.

ADIAPHORISTS (adidopos, indifferent), a name ap- plied to Melancthon and his supporters in a controversy which drose out of the so-called Leipsic Interim (1548), and raged until 1555. In 1547 Charles V. had drawn up the Augsburg Interim, with a view to provide for the tem- porary government of the Church until a general council could be called. This gave great dissatisfaction both to the more advanced and to the more moderate reformers; and the object of Melancthon's Leipsic Interim was to reconcile all parties, if possible, by declaring that certain rites and observances of the Roman Catholic Church and the jurisdiction of the Roman Catholic bishops being adiaphora (things indifferent), might be lawfully recognised. On the other hand, the Catholics were required to accept the Protestant formula of the doctrine of justification, leaving out the words sola fide, which, it was said, might belong to the adiaphora. In the controversy that fol- lowed, Melancthon's chief opponent was his former col- league, Matth. Flacius, on whosc removal from Wittenburg to Magdeburg the latter place became the head-quarters of the extreme Lutherans,

ADIGE (German, ésch), the ancient Athesis, a large river of Italy, formed by several rivulets which rise in the Rhetian Alps, and unite near Glarus. After flowing eastward to the neighbourhood of Botzen, it receives the Eisach, and becomes navigable. It then turns to the south, and leaving the Tyrol, enters Lombardy 13 miles S. of Roveredo. After traversing Northeru

Italy in a course first southerly, but then easterly, it falls into the Adriatic at Porto-Fossone, a few miles N. of the Po. The most considerable towns on its banks are Treut and Roveredo in the Tyrol, and Verona and Legnago in Italy. It is navigable from the heart of the Tyrol to the sea, and has in Lombardy a breadth of 200 yards and a depth of from 10 to 16 feet, but the strength of the current renders its navi- gation very difficult, and lessens its value as a means of transit between Germany and Northern Italy. The Adige has a course of about 220 miles.

ADIPOCERE (from adeps, fat, and cera, wax), a sub- stance into which animal matter is sometimes converted, deriving its name from the resemblance it bears to both fat and wax. When the Cemetery of the Innocents at Paris was removed in 1786-87, great masses of this substance were found where the coffins containing the dead bodics had been placed very closely together. At the bottom of the coffin, in these cases, there appeared, loosely cnveloped in linen, a shapeless mass, of a dingy white colour,

flattened as though it had undergone great pressure. The whole body had been converted into this fatty matter, exeept the bones, which remained, but were extremely brittle. Foureroy, who had observed the substance before, and had given it the name of adipocere, read a paper on the subject before the Aeademy of Seienees in 1789. Chemically, adipocere is found to eonsist prineipally of margarate of ammonia. A similar substance, found in peat, is known as bog-butter. , ipahdeeree

ADIPOSE (adeps, fat), a term in Anatomy, signifying fatty; as adipose tissue, adipose cell, é&c.

ADIRONDACK MOUNTAINS, a group of mountains in the N. of the state of New York, North America, lying between Lakes Champlain and Ontario. They rise from an extensive plateau about 2000 feet above the level of the sea, and are chiefly of granite formation. Mount Marcy, the highest summit, has an altitude of 5337 feet, and others of the group are from 4000 to 5000

feet high. The two principal streams which take their rise in this region—the Hudson flowing south, and the Richelieu flowing northwards from Lake Champlain—afford abundant means of convey- ing from the mountains the valuable timber, chiefly pine, with which they are eovered. Extensive deposits of mag- netic iron ore, of great value, have been discovered; and a village, called Adirondack, has recently sprung up, where smelting is extensively proseeuted. Emerson, in his poem Adirondacks, has familiarised the literary world with the seenery of these mountains.

ADIT (from adire, to go to), a passage or door. The doors of porticoes in aneient theatres were called adits. In mines the name is given to a gallery or passage, nearly hori- zontal, by which water is earried off. Ores also are sometimes removed by the adit. Some works of this kind are of great magnitude. The great Cornish adit at Gwennap, near Falmouth, extends, with its branches, to from 30 to 40 miles in length, and drains a traet of 5500 acres.

ADJUDICATION, in Scottish Law, the name of that aetion by whieh a ereditor attaehes the heritable, z.¢., the real, estate of his debtor, or his debtor's heir, in order to appropriate it to himself either in payment or security of his debt. The term is also applied to a proceeding of the same nature by which the holder of an heritable right, labouring under any defect in point of form, gets that defeet supplied by deeree of a court.

ADJUDICATION in Bankruptcy, in English Law, is equi- valent to the Seotch award of sequestration.

ADJUSTMENT, in Commerce, the settlement of a loss ineurred at sea on insured goods. If the poliey be what is ealled an open one, and the loss of the goods be total, the insurer must pay for them at the value of prime cost, whieh ineludes not only the invoice price of the goods, but all duties paid, the premium of insurance, and all expenses ineurred on them when put ou board. If the poliey be a valued one, and a total loss be incurred, then they are settled for at the valuation fixed at the time of the insur- anee, unless the insurers can prove that the insured had not a real interest in the goods, or that they were over- valued. In ease of a partial loss, the value of the goods must be proved. (See Arnould On Marine Insurance.)

ADJ UTAGE, a short tube or nozzle, inserted in an orifice, by means of which liquids flow from a vessel more freely.

ADJUTANT, a military officer whose duty it is to assist the eommanding officer of a regiment or battalion. Every battalion of infantry, regiment of cavalry, and brigade of artillery, has an adjutant, who keeps the regimental books, reeords, and correspondence; aets as the commanding officer's representative in matters of regimental detail ; superintends the drill of reeruits ; keeps the roster (ie, register of order of service) for all duties; details the guards,

piquets, detachments, &c., that are furnished by the regi- ment; and is responsible for the reeeipt of the daily divi- sional or brigade order from the superior staff-officer, and the preparation and issue of regimental orders. The Adju- tant-General is the staff-officer specially charged with all matters relating to the diseipline and drill of the army. ADJUTANT, the Ciconia Argala, or Leptoptilos Argala, a species of stork found in tropical India. It is of great size, sometimes six or even seven feet in height, the body and legs bearing nearly the same proportion as in the common stork. The bill is long and large; while the head, neck, and pouch are bare, or covered only with a few scattered hairs. At the back of its neek there is a second poueh-like

appendage, which the bird inflates during flight. The

general colour of the body is an ashen gray above and white below. The adjutant is extremely vora- cious, and, feeding on offal, reptiles, and other vermin, acts the part of a seaven- ger. It is often to be seen in camps and parade-grounds; henee its name.

ADJYGURH, a town and fort of India, in the presi- dency of Bengal, 130 miles S.W. of Allahabad. The fort is situated on a very steep hill, more than 800 feet above the town; and contains the ruins of temples adorned with elaborately-carved seulptures. It was captured by the British in 1809, 'The town is a neatly-built place, but subject to malaria. Population, 5000. .

ADMINISTRATOR, in English Law, he to whom the ordinary or judge of the ecclesiastical eourt, now the Court of Probate, aeting in the queen's name, commits the administration of the goods of a person deceased, in default of an executor. The origin of administrators is derived from the civil law. 'Their establishment in England is owing to a statute made in the 3lst year of Edward III. Till then no office of this kind was known besides that of exeeutor; in default of whom, the ordinary had the dis- posal of goods of persons intestate, de.

ADMINISTRATOR, in Scottish Law, a person legally em- powered to act for another whom the law presumes ineap- able of acting for himself, as a father for a pupil ehild.

ADMIRAL, a great offieer or magistrate, who has the government of a navy and the hearing of all maritime causes,

There can be little doubt of the Asiatic origin of the name given to this officer, which does not appear to have been known in the languages of Europe before the time of the Holy Wars. Amir, in Arabic, is a chief or com- mander of forces; it is the same word as the ameer of the peninsula of India (as ameer al omrah, the chief of lords or prinees), and the emir of the Turks or Saracens, who had and still have their emir or ameer'l dureea, commander

of the sea, amir'l asker dureea, commander of the naval armament. The incorporation of the article with the noun appears, we believe, for the first time in the Annals of Eutyehius, patriareh of Alexandria, in the 10th eentury, who ealls the Caliph Omar. Amirol munumim, ie., Im- perator fidelium. Spelman says, "In regno Saraeenorum 'quatuor preetores statuit, qui admirall: vocabantur." The d is evidently superfluous, and is omitted by the French, who say Amiral. .The Spanish write Almirante; the Portuguese the same. Milton would seem to have been aware of the origin of the word when he speaks of "the mast of some great ammiral," It is obvious, then, that the supposed derivations of éAyvpos from the Greek, awmer from the French, and aen mereal from the Saxon, are faneiful and unauthorised etymologies.

Anciently there were three or four admirals appointed for the English seas,.all of them holding the office durante beneplacito, and eaeh of: them having particular limits under his charge and government, as admiral of the fleet of ships from the mouth of the Thames, northward, south- ward, or westward.. Besides these, there were admirals of the Cinque Ports: We sometimes find that one person had been admiral of all the' fleets—Sir John de Beau- champ, 34 Edw, ITI., being the first who held the post; but the title of Admiralis Anglie does not oeeur till the reign of Henry IV., when the king's half-brother, Sir

Thomas Beaufort (created Earl of Dorset 5th July 1411), –

a natural son of John of Gaunt, was made admiral of the fleet for life, and admiral of England, Ireland, and Aqui- taine for life. It may be observed that there was a title above that of admiral of England, which was locum tenens regis super mare, thé king's lieutenant-general of the sea. This title is first mentioned in the reign of Richard II. Before the use of the word admiral was known, the title of custos maris was made use of.

Of the rank of admiral there are three degrees—admiral, viee-admiral, rear-adntiral. Each of these degrees formerly eomprised three grades, distinguished by red, white, and blue flags—the red being the highest degree in each rank of admiral, viee-admiral, and rear-admiral.

It may be remarked that for nearly a century there was no admiral of the red squadron. Aceording to a vulgar error, that flag had been taken from us by the Dutch in one of those arduous struggles for naval superiority which that nation was onee able to maintain against the naval power of England. But the faet is, the red flag was laid aside on

the union of the two erowns of England and Seotland, when |

the union flag was adopted in its place, and was usually hoisted by the admiral eommanding in chief. The red flag was revived on the oceasion of the promotion of naval officers

in November 1805, in consequence of the memorable viec- |

tory off Trafalgar. The three degrees of red, white, and blue flag-officers were abolished by order in council on 5th August 1864, and the white ensign was theneeforward adopted as the sole flag for the ships of the royal navy proper. Captains are now promoted to be rear-admirals, rear-admirals to be vice-admirals, and viee-admirals to be admirals svmpliciter—the numbers of each rank being regulated by orders in council passed on and subsequently to 22d February 1870.

tionary, 8vo, 1849.

ADMIRAL OF THE FLEET is a mere honorary distinction, |

which gives no command, but merely an inerease of half-pay, | The |

his being £3, 7s. a-day, and that of an admiral £2, 2s. title has been sometimes eonferred on the senior admiral

on the list of naval officers, and was a short time held by – the Duke of Clarenee, afterwards William IV. In 1851 | were appointed, for the first time, two admirals of the fleet, |

(See Navy.) For biographical . information, see Campbell's Lives of the British Admirals, | 8 vols. 8vo, 1817; O'Byrne's Naval Biographical Dic- :

| opportunity which so able and warlike a prinee would not neglect,

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Sir Thomas Byam Martin, G.C.B., and Sir George Coek- burn, G.C.B., the last having been appointed for his long and highly-distinguished services. The number of admirals of the fleet now (1874) authorised to be borne is three. If the admiral of the fleet should happen to serve afloat, he is authorised to carry the union flag at the main-top-gallant- mast head, which was the case when the Duke of Clarence escorted Louis XVIII. across the Channel to take posses- sion of the throne of France.

The comparative rank of flag-officers and officers in the army has been settled as follows by his Majesty's order in eouncil, in the reign of George

IV :-—

The admiral and eommander-in-chief of the fleet has the rank of a field-marshal in the army ; admirals with flags at the main take rank with generals of horse and foot; vice- admirals with lieutenant-generals ; rear-admirals with major- generals; commodores of the first and second elass with broad pendants with brigadier-generals.

On the aetive list of admirals there were in 1873 three admirals of the fleet, thirteen admirals, fifteen vice-admirals, and twenty-five rear-admirals.

Yn addition to these, there were on the reserved list forty admirals and thirty-four vice-admirals; on the retired list forty-three admirals, fifty-five viec-admirals, and sixty-two rear-admirals. As to the numbers to be borne permanently on these lists, and the regulations aceording to which admirals are retired and reserved, under Mr Childers' retire- ment seheme, see Navy.

ADMIRAL (THE Lorp Hien) or ENGLAND, an ancient officer of high rank in the state, who not only is vested with the government of the navy, but who, long before any regular navy existed in England, presided over a sovereign eourt, with authority to hear and determine all causes relating to the sea, and to take cognizance of all offenecs eommitted thereon.

The period about which this officer first makes his appearanee in the governments of European nations eorroborates the supposition of the offiee having been adopted in imitation of the Mediterranean powers at the return of the Christian heroes from the Holy Wars. Aceording to Moreri, Florent de Varenne, in the year 1270, was the first admiral known in Franee ; but by the most approved writers of that nation the title was unknown till, in 1284, Enguerand de Coussy was constituted admiral. The first admiral by name that we know of in England was W. de Leybourne, who was appointed to that offiee by Edward I. in the year 1286, under the title of Admiral de la mer du Roy @ Angleterre. Mariana, in his History of Spain, says that Don Saneho, having resolved to make war on the barbarians (Moors), prepared a great fleet; and as the Genoese were at that time very powerful by sea, and experienced and dex- terous sailors, he sent to Genoa to invite, with great offers, Benito Zacharias into his service ; that he aeeepted those offers, and brought with him twelve ships; that the king named him his

admiral (almirante), and eonferred on him the offiee for a limited time. This happened in the year 1284. Several Portuguese authors ob- serve that their offiee of almirante was derived from the Genoese, who had it from the Sieilians; and these from the Saracens; and it appears from Souza's Historia Gencalogica da Caza Real, that in 1322 Mieer Manuel Pigagow was invited from Genoa into Portugal, and appointed to the office of almirante, witha salary of 3000 pounds (livras) a year, and eertain lands, &e., on condition that he should furnish on his part twenty men of Genoa, all experieneed in sea affairs, and qualified to be alcaidis (eaptains) and arraiscs (masters) of ships: all of whieh terms, almirante, aleaidi, and arrais, are obviously of Arabie derivation.

Edward I., who began his reign in 1272, went to the Holy Land, and visited Sieily on his return. He must therefore have had an opportunity of informing himself coneerning the military and naval seienee of the various eountries bordering on the Mediterrancan—an

but whether the title and office of admiral existed in England before his time, as some are inelined to think, or whether W. de Ley- bourne was first ereated to that offiee in 1286, as before mentioned, we believe there is no authentie reeord to enable us to decide. Sup- posing him, however, to be the first, Edward may either have adopted the offiee and title from the Genoese, or the Sieilians, or the Spaniards, or the Freneh; or even had it direetly from the Saraeens, against whom he had fought, and with whom he had afterwards mueh amicable intereourse. It would seem, however,

that the office was in Edward's time to some extent honorary; for that monarch, in 1307, orders the lord mayor of London, at his peril and without delay, to provide a good ship, well equipped, to carry his pavilions and tents; and in the same year another order is addressed to the Vieccomes Kantiw to provide for immediate passage across the seas tot ct tales pontes et claias, as the constable of Dover Castle should demand, without one word being mentioned of the admiral. (Rymer, vol. iii. p. 82.) It is to be observed, how- ever, that at this time the royal fleets were made up of royal and private ships, and that the admiral would not be charged with the

transport of such things as those mentioned unless the flect was intended to co-operate with the land forces. ;

From the 34th Edward II. we have a regular and uninterrupted succession of admirals. In that year Edward Charles was appointed admiral of the north, from the mouth of the river Thames north- ward, and Gervase Allard admiral of the west, from the mouth of the Thames westward; and these two admirals of the north and the west were continued down to the 34th Edward III., when Sir John de Beauchamp, lord warden of the Cinque Ports, constable of the Tower of London and of the Castle of Dover, was constituted High Admiral of England. Nine years afterwards the office was again divided into north and west, and so continued until the 10th Richard II., when Richard, son of Alain, Earl of Arundel, was appointed Admiral of England. Two years after this it was again divided as before; and in the 15th year of the same reign, Edward, Earl of Rutland and Cork, afterwards Duke of Albemarle, was constituted High Admiral of the North and West ; and after him the Marquis of Dorset and Earl of Somerset, son of John of Gaunt, Duke of Lancaster. Percy, Earl of Winchester, next sueceeded to the same title, which once more was dropped in the 2d of Henry IV., and divided as before. Sir Thomas Beaufort was twice appointed by Henry IV. admiral of England ; and on the accession of Henry V. he was reappointed by letters patent dated 3d June 1413, In the 14th Henry VI., John Holland, Duke of Exeter, was created admiral of England, Ireland, and Aquitaine, for life; and in the third year of' Edward-VI., John Dudley, Earl of Warwick, was constituted high admiral of England, Treland, Wales, Calais, Boulogne, the marchcs of the same, Normandy, Gascony, and Aquitaine, also captain-general of the navy and seas of the king, &e. In the 27th Elizabeth, Charles, Lord Howard, had all the aforesaid titles, with the addition of captain-gencral of the navy and scas of the said kingdoms.

On the 20th November 1632 the office of high admiral was for the first time put in commission, all the great officers of state being the commissioners. During the Commonwealth a committee of Parliament managed the affairs of the Admiralty. At the Restoration, in 1660, the Duke of York was constituted Lord High Admiral of Eng- land. ° The commission was revoked in 1673, and King Charles IT. held the Admiralty in his own hands, and managed it by the great officers of his privy council till 1684, when the

Duke of York was re-instated. Charles took this occa- sion of reserving for his own use all the droits and per- quisites claimed by the lord high admiral.

Annexed is a list of lord high admirals and _ first lords of the Admiralty from the time of Charles the Second to the year 1874 :—

FIRST LORDS OF THE ADMIRALTY FROM 1660.

*Date of Appointment. James Duke of York, * . dune 6, 1660. King Charles the Second, . June 14, 1678. PrincesRupert, 1 Me 6 nes . July 9, 1678. Sir Henry Capcll, Kt., . c : ; . May 14, 1679. Daniel Finch, Esq., . é c . Feb. 14, 1680. Danicl Lord Finch, . 0 i A . Jan. 20, 1681. Daniel Earl of Nottingham, . ; : April 17, 1684. James Duke of York (and as James II.),+ . May 17, 1684. Arthur Herbert, Esq., ; : : ; March 8, 1689. Thomas Earl of Pembroke and Montgomery, Jan. 20, 1690. Charles Lord Cornwallis, aca March 10, 1692, Anthony Viscount Falkland, April 15, 1693. Edward Russell, Esq., May 2, 1694 Edward Earl of Oxford, : é . June 5, 1697. John Earl of Bridgewater, . c : : . May 31, 1699. Thomas Earl of Pembroke and Montgomery, . April 4, 1701 George Prince of Denmark,t c c . May 20, 1702. Thomas Earl of Pembroke and Montgomery,t . Nov. 29, 1708, Edward Earl of Oxford, : ; ; Nov. 8, 1709. Sir John Leake, Kt., Oct. 4, 1710. Thomas Earl of Strafford, . Sept. 30, 1712. Edward Earl of Oxford, Oct. 14, 1714, James Earl of Berkeley, March 19, 1717. Lord Viscount Torrington, . Ang. 2, 1727.*

ADMIRAL

Date of Appointment, . dune 21, 17338. March 19, 1741, Dee. 27, 1744,

16, 1748.

Sir Charles Wager, Kt., . ; ; é Daniel Karl of Winchelsea and Nottingham, John Duke of Bedford, : : A John Karl of Sandwich,

George Lord Anson, . : . dune 22, 1751. Richard Earl Temple, : : ; ; Noy. 17, 1756. Danicl Earl of Winchelsea and Nottingham, April 6, 1757. George Lord Anson, . .. 7 5 6 July 2, 1757, George Dank Earl of Halifax,

June 17, 1762. George Grenville, Esq., Oct. 18, 1762, John Earl of Sandwich, April 20, 1763. John Earl of Egmont, : Sept. 16, 1763. Sir Charles Saunders, K.B., Sept. 15, 1766. Sir Edward Hawke, K.B., Dee. 11, 1766. John Earl of Sandwich, Jan. 12,1771. Hon. Augustus Keppel, April 1, 1782. Augustus Viscount Keppel, July 18, 1782. Richard Viscount Howe, Jan. 30, 1788. Augustus Viscount Keppel, April 10, 1783. Richard Viscount Howe, Dec. 31, 17838. John Earl of Chatham, : : : . duly 16, 1788. George John Earl Spencer, é 3 : . Dec. 19, 1794, John Earl of St Vincent, K.B., . : ; . Feb. 19, 1801. Henry Lord Viscount Melville, . ; t . May 15, 1804, Charles Lord Bartram, : ; : . May 2, 1805. Charles Grey, Esq., . 9 ; ‘ Feb. 10, 1806. Thomas Grenville, Esq., . j Sept. 29, 1806.

Henry Lord Mulgrave, .

‘ ; April 6, 1807, Right Hon. Charles Yorke, : é

Noy. 24, 1869.

Right Hon. Robert Viscount Melville, March 25, 1812. H. R. H. William Henry Duke of Clarence, t May 2, 1827. Right Hon. Robert Viscount Melville, K.T., Sept. 19, 1828. Right Hon. Sir James R. G. Graham, Bart., Nov. 25, 1830, Right Hon. George Baron Auckland, . June 11, 1834, Thomas Philip Earl de Grey, . é Dec. 28, 1834, Right Hon. George Baron Auckland, . April 25, 1885. Gilbert Earl of Minto, G.C.B., . : ; Sept. 19, 1885. Thomas Earl of Loge 5 ; : . Sept. 8, 1841. Right Hon. Edward Earl of Ellenborough, . Jan. 18, 1846, Right Hon. George Earl of Auckland (died Ist

January 1849), . ; ‘ . ; . duly 24, 1846. Right Hon. Sir Francis T. Baring, Bart., . . dan. 18, 1849, Algernon Percy Duke of Northumberland, K.G., Feb. 28, 1852. Right Hon. Sir James R. G. Graham, Bart., Jan. 5, 1853,

Right Hon. Sir Charles Wood, Bart, . Right Hon. Sir John Pakington, Bart., . Z Edward A. St Maur Duke of Somerset, K.G.,_.

March 8, 1855, March 9, 1858, June 28, 1859.

Right Hon. Sir J. 8. Pakington, Bart., G.C.B., July 18, 1886. Right Hon. Henry Thomas Lowry Corry, . . March 8, 1867. Right Hon. Hugh Culling Eardley Childers, . Dec. 18, 1868.

Right Hon. George Joachim Gosehen,

- *Lord High Admiral of England. + Lord High Admiral and Lord General. $ Lord High Admirals of Great Brituin.*

Prince George of Denmark, when lord high admiral, having surrendered, by a formal instrument, all the rights, profits, perquisites, and advantages whatsoever, appertaining to the office, for the benefit and use of the public, with the exception of the sum of £2500 a-year, to be disposed of in such manner and for such particular uses as her Majesty, under her sign manual, should direct; and the salary of the lord high admiral, which had hitherto been no more than 300 marks, was now fixed, by warrant under privy seal, at £7000 a-year. This sum, by lst George IJ., was divided equally among seven commissioners, an arrangement which continued from that time, except that the pay of the com- missioner who stood first in the patent was made up from other funds to £3000 a-year, and in the year 1806 was further increased to £5000 a-year. Since the surrender above mentioned, all the droits of admiralty, as they are called, with all the fees, emoluments, and perquisites what- soever, have been taken from the admiral and applied to public purposes.

These droits and perquisites are by no means inconsider- able. As enumerated in the patent, they consist of flotsam, jetsam, ligan, treasure, deodands, derelicts, found within the admiral's jurisdiction; all goods picked up at sea; all fines, forfeitures, ransoms, recognisances, and pecuniary punish- ments; all sturgeons, whales, porpoises, dolphins, and

grampuses, and all such large fishes; all ships and goods of the enemy coming into any creek, road, or port, by stress of weather, mistake, or ignorance of the war; all ships seized at sea, salvage, &c., together with his

shares of prizes; which shares were afterwards called tenths, in imitation probably of the French, who gave theiradmiral, for supporting the dignity of his office, son droit de dixiéme. All prizes are now wholly given up by the crown to the captors, and such share of the droits as from circumstances may be thought proper The lord high admiral also claimed and enjoyed as his due the cast ships; and the subordinate officers of the navy, as their perquisites, all other decayed and unserviceable stores.

Though by Act of 2 William and Mary, stat. 2, c. 2 (extended by the 1 Geo. IV. c. 90, and 7 and 8 Geo. IV. c. 65), the lords commissioners of the admiralty are vested with all and singular authorities, jurisdictions, and powers which have been and are vested, settled, and placed in the lord high admiral of England for the time being, to all intents and purposes as if the said commis- sioners were lord high admiral of England, yet there is this remarkable difference in the two patents by which they are constituted, that the patent of the lord high admiral mentions very little of the military part of his office, but chiefly details his judicial duties as a magistratc ; whilst, on the contrary, the patent to the lords commis- sioners of the admiralty is very particular in directing them to govern the affairs of the navy, and is almost wholly silent as to their judicial powers.

These powers, as sct forth in the patent to the Earl of Pembroke in 1701, are, the power to act by deputy; to take cognisance of all causes, civil and maritime, within his juris- diction ; to arrest goods and persons; to preserve public

streams, ports, rivers, fresh waters, and creeks whatsoever

within his jurisdiction, as well for the preservation of the ships as of the fishes; to reform too strait nets and unlawful engines, and punish offenders; to arrest ships, mariners, pilots, masters, gunners, bombardiers, and any other persons whatsoever able and fit for the service of the ships, as often as occasion shall require, and wheresocver they shall be met with; to appoint vicc-admirals, judges, and other officers, durante beneplacito; to remove, suspend, or expel them, and put others in their placcs, as he shall see occasion; to take cognisance of civil and maritime laws, and of death, murder, and mayhem.

It was by no means necessary that the lord high admiral should be a professional man. Henry VIII. made his natural son, the Duke of Richmond, lord high admiral of England when he was but six years old. When the high admiral, however, went to sca in person, he had usually a commission under the great seal appointing him admiral and captain-general of the fleet, sometimes with powers to confer knighthood, and generally to punish with life and limb. Such a commission was granted by Henry VIII. to Sir Edward Howard, who executed indenture with the king to furnish 3000 men, 18 captains, 1750 soldiers, 1232 Mariners and gunners; his own pay to be 10s. and that of a captain ls. 6d. a-day. The rest had 5s. per mensem as wages, and 5s. for victuals each man, together with certain dead shares.

It appears, from Mr Pepys' Naval Collections, that the lord high admiral did anciently wear, on solemn occasions, a gold whistle, set with precious stones, hanging at the end of a gold chain.

The salary of the first lord commissioner is £4500 a-ycar, and of each of the naval lords £1500, in addition to the half-pay of their rank. The civil lord gets £1000, and the parliamentary secretary £2000 a-year.

The opening paragraph of the Black Book of the Admiralty has the following noteworthy instruction as regards the depu- ties and officers to be chosen by the lord high admiral :-—

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' When one is made admirall, hee must first ordaine and substi- tute for his lieutenants, deputies, and other officers under him, some of the most loyall, wise, and disereete persons in the maritime law and auncient customes of the seas whieh hee can any where find, to the end that by the helpe of God and their good and just government, the office may be executed to the honour and good of the realme."*

Had this precept been always acted on, there would probably have been less occasion than has presented itsclf for the many reorganisations which the administration of the lord high admiral's administrative office has under- gone. As it has been, the necessity for periodical changes has been urgent and unavoidable. From the time of which Macaulay wrotc, that the king

(James II.) was the only honest man in his dockyards, down to the present date, the need has been incumbent on successive first lords and high admirals to lay the axe to the root of a tree which, in some shape or other, has not ceased to bring forth evil fruit. The soil favoured corruption, and no efficient means were employed to prevent its growth. A root and branch reformation was urgently needed, though it was not applied except in particular instances. Till the great French war of 1793-1815 led to the formation of a navy board of commissioners to superintend the work and management of the dockyards; of a victualling board, to sce to the provisioning of the fleet; and of sick and hurt commissioners, to look after the sick and wounded —the administrative departments of the navy were left to nominecs of the lord high admiral or first lord, the said nominecs deriving "no small advantage" from the arrangement. Under the departmental boards things ccrtainly improved from what they were in the time of Charles II.; but they fell far short of what was desirable, and, by the vagueness of their administra- tive principle, opened a door for irresponsible wrong- doing, which in the end made them exceedingly bad instruments of government. These boards continued till 1832, when Sir James Graham, then first lord of the admiralty, introduced sweeping changes. He abolished the several intangible boards which administered undcr the shelter of the board of admiralty, and appointed in their stead five principal officers of the navy, who were afterwards included in the admiralty patent. These officers were—a surveyor or architect and constructor of the navy; a storekeeper-general, charged with oversight and purchase of the material for dockyards and ships; an accountant- general, charged with the duty of seeing that all wages and cash paid were duly brought to account; a comp- troller of victualling and transport services, charged with the maintenance of the victualling establishments of the navy, and of sufficient supplies of provisions and clothing for the fleet, and with the oversight of the transport arrangements for men and stores; and a physician of the navy, afterwards called medical director-general, charged with the oversight of all hospitals and of all sanitary arrangements of the navy. Lach of these officcrs adminis- tered the department entrusted to him in every particular, not only in respect of stock, but of replenishment and account of stock. A lord of the admiralty was told off to supervise the permanent head and to represent his department at the board. These alterations were in many respects very beneficial. Altered circumstances

required some modification of the original scheme of dutics; and the addition of threc principal officers—the director of works, the director of transports (who, after the Crimean war, relieved the comptroller of victualling of his trans- port duties), and the registrar of contracts. In 1860 the office of surveyor of the navy was abolished, and that of controller of the navy, with larger powers over dock- yard management, was revived. In 1869, Mr Childers, first lord of the adiniralty, made changes which tended

to subordinate the members of the board of admiralty more effectually to the first lord, constituting him in effect ntinister of marine; and to render departmental officers at once more individually responsible and more intimate with the controlling members of the board. He increased the power and functions of the controller of the navy, giving him a seat at the board, and charging him with the stock-keeping attributes of the storekeeper-general, whose purchasing functions were transferred to a new officer—the superintendent of contracts, the head of the contract and purchase department, and his accounting functions to the accountant-general. The office of store- keeper-general was abolished. The office of comptroller of victualling was also abolished—the storekeeping func- tions being transferred to a new officer, the superin- tendent of victualling—the purchasing function to the head of the purchase department, the accounts to the accountant-general. The other officers remained ; but in the case of each this modification of business ensued, viz., that all stores whatever required by any of them were to be obtained through the agency of one supply or purchase department; that all accounts whatever were to be rendered to the accountant-gencral. The departmental officers of the admiralty at the present time (1874) are— the controller of the navy, without a seat at the board (who has on his staff a chief naval architect, a chief engineer, a surveyor of dockyards, a superintendent of naval stores, and a director of ordnance)—the director- general of the medical department, the director of works, the director of transports, the hydrographer, the superintendent of contracts, the superintendent of victualling. The department of the two permanent secre- taries of the admiralty (one a naval officer, the other a civilian) undertakes the conduct

of all business relating to the personnel of the navy and the ordering of the fleets.

To control the departmental officers, and to advise the responsible first lord, there are the following members of the board of admiralty, viz., the parliamentary or finan- cial sccretary, who has oversight of all business relating to finance, estimates, expenditure, and accounts, and who is the alter ego of the first lord in Parliament; the first naval lord, who, assisted by two other naval "lords," takes oversight of the personnel and of all executive func- tions of the fleet; and a civilian lord, who assists the financial secretary, and has particular oversight also of naval civil establishments and of the works department.

A list of secretaries of the admiralty from 1684 to the present time is given below :—

FIRST SECRETARIES TO THE ADMIRALTY.

From To Samuel Pepys, Esq., May 1684 Feb. 1689. Phineas Bowles, Esq., March 1689 Dec. 1689, James Sotherne, Esq., . Dec. 25, 1689 Sept. 24, 1694. Josiah Barchett, Esq., . Sept. 25,1694 Oct. 10, 1741. Thomas Corbet, Esq., Oct. 10, 1741 ach

John Cleveland, Esq., _.. Philip Stevens, Esq. (then one |

of the Board), 1 "OP Jume 18, 1768 March 8, 1796,

Evan Nepean, Esq., March 38,1795 Jan. 21, 1804. William Marsden, Esq., Jan. 21,1804 Jnne 24, 1807. Hon. W. W. Pole, f June 24, 1807 Oct. 8, 1809. John Wilson Croker, Esq., Oct. 9,1809 Nov. 29, 1830. Captain the Hon. George Elliott, Nov. 29,1830 Dec. 24, 1834. Right Hon. George R. Dawson, Dec. 24, 1834 April 27, 1835. Charles Wood, Esq., M.P., April 27,1885 Oct. 4, 1839. R. More O'Ferrall, Esq., Oct. 4,1839 June 9, 1841. John Parker, Esq., M.P., June 9, 1841 Sept. 10, 1841. Hon. Sidney Herbert, . Sept. 10,1841 Feb. 1845. Right Hon. H.T. L. Corry, M.P., Feb. 1845 July 18, 1846. Henry G. Ward, Esq., M.P.,. July 18, 1846 May =_'1, 1849. John Parker, Esq., M.P., May 21, 1849 March 38, 1852. Augustus Stafford, Esq., __. March 38, 1852 Jan. 6, 1853. | Bernal Osborne, Esq., M.P., . Jan. 6,

1853 March 8, 1858. Right Hon. H. T. L. Corry, M.P., March 9, 1858 June 30, 1859.

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From To RNs et | June 90, 1859 April 29, 1866, Hon. Thomas G. Baring, M.P., April 30, 1866 July 15, 1866, Lord Henry G. Lennox, M.P., July 16, 1866 Dec. 17, 1868, W. E. Baxter, Esq., M.P., Dee. 18, 1868

March 16, 1871, Geo. J. Shaw Lefevre, Esq., M.P., March 17, 1871 —_

As regards the navies of foreign countries, their govern- ment is in the hands of ministers or departments variously constituted. The Russian Admiralty is a highly-organised bureau, divided into departments after the English nianner, and under the supreme control of a high admiral, usually a Grand Duke of the Imperial House. The German Admiralty was, till 1872, a branch of the War Office, though governed by a vice-admiral under a naval prince of the reigning family. In 1872 it was severed from the War Office, though remaining an appanage thereof, and a general of the army was placed at its head. The French minister of marine, assisted by a permanent staff, controls the navy of France on a highly centralised system of administration; but the departments are well organised, and work well. The Italian fleet is governed on principles analogous to the French, but with a large admixture of the English representative element. The American navy is governed by a secretary of the navy, a cabinet minister, to whom the departmental heads are responsible, and under whose orders they work. (F. W. RB.)

ADMIRALTY, Hieu Courror. This is a court of law, in which the authority of the lord high admiiral is exercised in his judicial capacity. Very little has been left on record of the ancient prerogative of the admirals of England. For some time after the first institution of the office they judged all matters relating to merchants and mariners, which happened on the main sea, in a summary way, according to the laws of Oleron (so called because pro- mulgated by Richard I. at that place). These laws, which were little more than a transcript of the Rhodian laws, became the universally-received

customs of the western part of the world. 'All the seafaring nations," says Sir Leoline Jenkins, "soon after their promulgation, received and entertained these laws from the English, by way of deference to the sovercignty of our kings in the British ocean, and to the judgment of our countrymen in sea affairs."

In the patents granted to the early admirals between the latter years of the rcign of Henry Il]. and the close of that of Edward II1., no mention is made of marine perquisites or of civil power, nor does it appear that the admirals enjoyed either; but after the death of the latter, new and extraordinary powers were grantcd to them, and it would appear that they usurped others. The preamble to the 18 Richard J]. stat. 1, c. 5, sets forth that "a great and common clamour and complaint hath been oftentimes made before this time, and yet is, for that the admirals and their deputies hold their sessions within divers places of this realm, as well within the franchise as without, accroaching to them greater authority than belongeth to their office, in prejudice of our lord the king and the common law of the realm, and in diminishing of divers franchises, and in destruction and impoverishing of the common people;" and the statute therefore directs that the admirals and their deputies shall not meddle from henceforth of any thing done within the realm, but only of a thing done upon the sea. Two years afterwards (15 Rich. II. c. 38), im consequence, ag stated in the preamble of the statute, "of the great and grievous complaint of all the commons," it was ordained that the admiral's court should have no cognisance of any contracts, pleas, or quarrels, or of any thing done or arising within the bodies of counties, whether by land or by watcr, nor of wreck of the sea; but that the admiral should have cognisance of the death of a man, and of mayhem done in great ships being and hovering in the main stream of great rivers, yet only beneath the bridges of the same rivers nigh to the sca. He may also arrest ships in the great flotes for the great voyages of the king and of the realin, saving always to the king all manner of forfcitures and profits thereof coming, and have jurisdic- tion over the said flotes, but during the said voyages only. But if the admiral or his lieutenant exceed that jurisdiction, then, by 2 Henry IV. c. 11, the statute and the common law may be holden against them; and if a man pursues wrongfully in the admiralty

| court, his adversary may recover double damages at common law,

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and the pursuant, if attainted, shall incur the penalty of £10 to the

ing. . : The place which, according to Spelman, is absolutely subject to the jurisdiction of the admiral is the sea; which, however, compre- hends public rivers, fresh waters, creeks, and all places whatsoever, within the cbbing and flowing of the sea, at the highest water, the shores or banks adjoining, from all the first bridges to the seaward ; and in these, he observes, the admiralty hath full jurisdiction in all causes, criminal and civil, except treasons and the right of wreck. Lord Coke observes (5 Rep. 107), that between the high-water mark and the low-water mark the admiral hath jurisdiction super aquam, ad plenitudinem maris, and as long as it flows, though the land be infra corpus comitatus at the reflow, so as of one place there is divisum imperium interchangeably .

But though the statute restraineth the lord high admiral that he shall not hold plea of a thing rising in the body of a county, he is not restrained from making execution upon the land, but is cm- powered to take cither body or goods upon the land; otherwise his jurisdiction would often prove a dead Ictter. He also can and does hold his court in the body of a county. So, likewise, the civil power may apprehend and try persons who may have been guilty of offences cognisable at common law, though committed in the fleet, in any port or harbour of Great Britain, or at sea, provided such persons have not already been tried for such offences cither by court-martial or in the admiralty court; and in all ports, harbours, creeks, &c., lying in any county, the high admiral and the sheriff, or eoroner, as the case may be, have concurrent jurisdiction.

By the 6 and 7 Will. IV. c. 53 the admiralty jurisdiction is extended to Prince of Wales' Island, Singapore, and Malacca; and under the 3 and 4 Vict. c. 65, the court has jurisdiction in the following cases : —

Whenever a vessel is arrested by process issuing from the said court, or the proceeds of any vessel are brought into the registry, to take cognisance of all claims in respect of any mortgage of such vessel.

To decide all questions as to the title to, or ownership of, such vessel, or the proceeds thereof remaining in the registry, arising in any eause of possession, salvage, damage, wages, or bottomry, insti- tuted in the said court.

To decide all claims and demands whatsoever in the nature of salvage, or in the nature of towage, or for necessaries supplied to any foreign vessel, and enforce the payment of the same, whether such vessel may have been in the body of the county or upon the high seas at the time when the service was rendered, or damage received, or necessaries furnished, in respect of which claim is made.

To decide all mattcrs and questions concerning booty of war on shore, or the distribution thereof, which it shall please her Majesty, by the advice of the privy council, to refer to the judgment of the said court, who shall proceed therein as in cases of prize of war.

And under § 40 of the 9 and 10 Vict. c. 99, to decide on all elaims and demands whatsoever in the nature of salvage for services performed, whether on sea or land.

The high court of Admiralty has jurisdiction upon the high seas all over the world. It has an instance jurisdic- tion which is civil, and a prize jurisdiction in time of war. The latter jurisdiction does not extend to the admiralty courts of Ireland or Scotland, which never had prize com- missions sent to them. It is of the highest importance in war time, when questions of seizure or detention of neutral ships arise, to have but one court of which to inquire concerning all causes, so as to expedite the action of the Foreign Office in dealing with representations from neutral powers. 'The causes which arise in time of peace are causes of collisions, of seamen's wages, bottomry, wearing unlawful colours, salvage, and causes of possession, where one part owner or minor claims to have security from those other owners who are going to send the ship on a foreign voyage that the ship shall return again. Causes under the Slave Act treaties are also cognisable here. The evidence is all documentary. In 1803 there were 1125 prize cases before the court; in 1804, 1144; in 1806, 2286; in 1807, 2789; a. on, above 1000 causes each year, down to the year

The criminal jurisdiction, which formerly comprehended all crimes whatever committed at sea, from larceny to homicide, which were triable at common law at the assizes if committed on shore, was much modified upon the report of the select committee on the high court of admiralty in 1833. Such offences are now triable at common law on surrender to the jurisdiction; but the judge of the admi-

ralty eourt may still sit with other commissioners of oyer and terminer. He has no longer any independent criminal jurisdiction.

The instance jurisdiction is permanent; the prize juris- diction is by virtue of a special commission, pro re natd. Its issue is one of the first acts done on the outbreak of war. Appeals formerly lay from the civil decisions to the high court of delegates or specially-appointed commis- sioners; from the prize decisions to the prize commissioners. By the Aets 2 and 3 Will. IV. c. 92, and 3 and 4 Will. IV. ce. 41, all appeals from admiralty court decisions of any kind lie to the sovereign, who is authorised to refer them to the judicial committee of the privy couneil.

The lord high admiral was assisted in his judicial functions by the following principal officers:—1. The vice- admiral; 2. The judge; 3. The registrar; 4. The advocate- general; 5. The eounsel and judge-advocate; 6. The soli- citor; 7. The procurator; 8. The marshal,—which officers are continued,

1. Lhe.Vice-Admiral. This officer is the admiral's deputy or lieutenant mentioned in the statutes of 13th and 15th Richard IL, and was the person, most probably, who pre- sided in the court. At present the office of vice admiral of England is a perfect sinecure, generally conferred on some naval officer of high rank and distinguished character in the service. The salary of £434, 1s. 9d. per annum, attached to it in addition to half-pay, was abolished by order in council, "22d February 1870. The salary and office of rear-admiral of England were abolished by the same order in council, The salary was £342, 9s..per annum. Each county of England has its vice-admiral, which is little more than' an honorary distinction, though the patent gives to the holder all the powers vested in the admiral himself. Similar powers were also granted to the-judges of the admiralty county

courts; but this was found so inconvenient and prejudicial to those' who had suits to commence or defend before them, that the Duko of York, when lord high admiral, in 1663 caused instructions to be drawn up in order to assign to each his province, whereby the whole judicial power remained with the judge, and the upholding of the rights of the admiral, and levy- ing and receiving the perquisites, &c., appertained to the vice-admiral.

Each of the four provinces of Ireland has its vice-admiral. There is one vice-admiral for all Scotland, and one for the Shetland and Orkney Islands. The governor of most of our colonies had a eommission of vice-admiral granted to him by the lord high admiral or lords commissioners of the admiralty, and generally a commission from the king under the great seal, grounded on the 11 and 12 William IIL. c. 7, and further confirmed by 46 Geo. III. c. 54, by which he was authorised to try all treasons, piracies, felonies, robberies, murders, conspiracies, and other offences, of what nature or kind soever, committed on the seas, where the parties were taken into custody in places remote from England. The court eonsisted of seven persons at the least, of whom the governor, the lieutenant-governor, the vice- admiral, the flag-officer, or commander-in-chief of the squa- dron, the members of the council, the chief-justice, judge of the vice-admiralty court, captains of men-of-war, and secretary of the colony, were specially named in the com- mission; but any three of these, with four others selected from known merchants, factors, or planters, captains, lieu- tenants, or warrant officers of men-of-war, or eaptains, masters, or mates of merchant ships, constituted a legal court of piracy. By the 12 and 13 Vict. c. 96, all per- sons charged in any eolony with offences committed on the sea may be dealt with in the same manner as if the offences had been committed on waters within the local jurisdiction of the eourts of the colony.

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The vice-admiralty courts in the colouics are of two de- scriptions. 'The one has power to inquire into the causes of detention of enemies or neutral vessels, to try and con- demn the same for the benefit of the captors, as well as to take cognisance of all matters relating to the office of the lord high admiral. The other has only power to institute inquiries into misdemeanours committed in merchant ves- sels, and to determine petty suits, &c., and to

guard the privileges of the admiral. The former are usually known by the name of prize courts, the latter by that of wmstance courts. Appeals from vice-admiralty courts abroad lay formerly to the high court of admiralty in England, and from that, if nced were, to the high court of delegates, or in prize cases to the prize commissioners. By an Act of her present Majesty, all such appeals lie direct to the sovereign, who refers them to the judicial committee of the privy council. a

The following are the colonies and forcign possessions in which vice-admiralty courts are now (1874) established. Others are constituted as occasion may require, in case of war :—

Aden. (Stave trade juris- Malta.

diction only.) Mauritius, Antigua, Montserrat, and Montserrat.

Barbuda. Natal. Australia, South. Nevis. Australia, West. New Brunswick. Bahamas. Newfoundland. Barbadoes. New South Wales. Bermuda. New Zealand. Bombay. Prince Edward's Island. British Columbia. Quebec. British Guiana. Quecnsland. Calcutta. St Christopher. Canada. St Helena. Cape of Good Hope. St Lucia. Ceylon. St Vincent. Dominica. Sierra Leone. Falkland Islands. The Straits Settlements. Gambia. (Prince of Wales' Island, Gibraltar. Singapore, and Malacca.) Gold Coast. Tasmania. Grenada. Tobago. Halifax, Nova Scotia. Tortola and Virgin Islands. Honduras, Trinidad. Hong Kong. Vancouver's Island. Jamaica, Victoria, Labuan. Zanzibar. (Limited slave Lagos. trade jurisdiction only.) Madras.

By the provisions of the Vice-admiralty Courts Act of 1863, The governor of a colony is ex officio vicc-admiral, and the chief-justice cx officio judge of the vice-admiralty court.

In none of the patents to the lord high admiral, vice- admiral, or judge, is any mention made of prize jurisdiction. Lord Mansfield had occasion to search into the records of the court of admiralty in Doctors' Commons, to ascertain on what foundation this jurisdiction was exercised by the judge of the admiralty; but he could not discover any prize-act books farther back than 1643; no sentences far- ther back than 1648. The registrar could go no farther back than 1690. 'The prior records," says his lordship, "are in

confusion, illegible, and without index." Tho prize jurisdiction may therefore be considered as of modern authority, and distinct altogether from the ancient powers given to the admiral. To constitute the authority for trying prize causes, a commission under the great seal issues to the lord high admiral at the commencement of every war, to will and require the court of admiralty, and the lieu- tenant and judge of the said court, his surrogate or surro- gates, to proceed upon all manner of captures, seizures, and reprisals, of all ships and goods that are or shall be taken; and to hear and determine according to the course of the admiralty, or the law of nations; and a warraut issues to the judge of the admiralty accordingly.

The adiniralty court being in this respect a court in

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which foreigners of all nations may become suitors, an appeal may be had from its decisions to a committee of the lords of the privy council, who hear and determine according to the established laws of nations.

At the breaking out of a war, the lord high admiral also receives a special comniission from the crown, under the great scal, to empower him to grant letters of marque and reprisals against the enemy, he having no such power by his patent. These letters are either general or special; general, when granted to private men to fit out ships at their own charge to annoy the enemy; special, when in the case of any of our merchants being robbed of their estates or property by foreigners, the king grants them letters of reprisal against that nation, though we may be in amity with it. Before the latter can be sued for, the complainant must have gone through the prosecution of his suit in the courts of the state whose subjects have wronged him; where, if justice be denied, or vexatiously delayed, he must first make proof of his loses and charges in the admiralty court here; whereupon, if the Crown is satisfied he has pursued all lawful means to obtain redress, and his own interceding should produce no better effect, special letters of reprisal are granted; not, however, as must be evident, until a very strong case has been made out. This custom, which we may now consider as obsolete, seems to be a remnant of the law of ancient Greece, called androlepsia, by which, if a man was slain, the friends and relations of the deceased might seize on any three citizens of the place where the

murderer took refuge, and make them slaves, unless he was delivered up. Both Oliver Cromwell and King Charles II. granted lettcrs of reprisal. In 1638 the Duc d'Epernon seized on the ship " Amity" of London, for the service of the French king against the Spaniards, promising full satis- faction; but none being made, the owners obtained letters of reprisal from the Protector, and aftcrwards, in 1665, from Charles II. In 1666 Captain Butler Barnes had letters of reprisal against the Danes. 'The Dutch having burnt six English merchant vessels in the Elbe, within the territories of Hamburg, which city, instead of giving any assistance or protection, hindered the English from defending them- selves, letters of reprisal were granted to the sufferers against that city. Lastly, one Justiniani, a noble Genoese, being indebted in a large sum to Joseph Como, a merchant in London, which he had several years solicited for with- out obtaining satisfaction, Captain Scott, commander of his Majesty's ship the " Dragon," stationed at that time in the Mediterranean, received orders to make reprisals upon the ships of that republic; upon which the debt was paid.

2. The Judge.—The patents to the judge of the admiralty and vice-admiralty courts run pretty nearly in the same manner as those of the lord high admiral, and point out the several matters of which he can take cognisance. The Par- liament of 1640 established the office of judge of the admi- ralty court in three persons, with a salary of £500 a-year to cach. At the Restoration there were two judges of the high court of admiralty, which sometimes proved incon venient; for when they differed in opinion, no judgment could be had. These judges, before the Revolution, held their appointment only during pleasure. At that period, and under the provisions of the Bill of Rights, Sir Charles Hedges was constituted judge under the great seal of England, guamdiu se bene gesserit, with a salary of £400 a-year, and an additional £400 out of the proceeds of prizes and perquisites of the admiralty; but in the year 1725 the latter sum was diminished from the ordinary estimate by the House of Commons. The salary of Sir James Marriott, from 1778 to 1782, during the American war, was £800 a year, and £3700 added for fees. From 1794 to 1798, the salary was £1780, and £2500 for fees. During the six- teen years that Sir William Scott (Lord Stowell) was judge,

from 1798 to 1814, the salary was £2500, and the fees averaged £2800 a-year. Under the 3 and 4 Vict. c. 66, § 1, the salary is fixed at £4000 per annum. All fees of whatever kind, formerly payable to the judge, are now paid to the consolidated fund.

The court of admiralty is at present (1873), and pend- ing the erection of the uew law courts, held in Westminster. In the time of Henry IV. it was held in Southwark, either at a quay on the south side of the Thames, or in the erc- while church of St Margaret-on-Hill, most likely the former. Stow, in his Survey (A.D. 1598), says—"VIII., Horton's Quay, near London Bridge, is mentioned in the records of the high court of admiralty (3d Nov. 1541) as its usual place of sitting.

The judges of the vice-admiralty courts in certain of the colonies, limited by 41 George III. c. 96, are allowed a salary not exceeding to each the sum of £2000 a-year, to be paid out of the consolidated fund of Great Britain; to- gether with profits and emoluments not exceeding to each the further sum of £2000 per annum, out of the fecs to be taken by the said judges, of which a table is directed to be hung up in some conspicuous place in the court; and no judge is to take any fee beyond those specified, directly or indirectly, on pain of forfeiture of his office, and being pro- ceeded against for extortion; and on his retirement from office after six years' service, or from some permanent infir- mnity, the Crown may, by authority of the Act above men- tioned, grant unto such judge an annuity for the term of his life not exceeding £1000 per annum. This liberal provi- sion puts the judges of the colonial courts of vice-admiralty above all suspicion of their decisions being influenced by unworthy motives—a suspicion they were not entirely free from when their emoluments depended mainly on their fees.

During the war of 1793-1815 a session of oyer and ter- miner to try admiralty causes was held at the Old Bailey, now the central criminal court, twice a-year. The commis- sion for this purpose was of the same nature with those which are granted to the judges when they go on circuit; that is to say, to determine and punish all crimes, offences, and mis- demeanours, and abuses; the end of both being the same, their /¢mzts different; the one relating to things done upon the land, the other to things

done upon the water. The lords commissioners of the admiralty, all the members of the privy council, the chancellor and all the judges, the lords of the treasury, the secretary of the admiralty, the treasurer and commissioners of the navy, some of the aldermen of London, and several doctors of the civil law, were the mem- bers of this commission ; any four of whom made a court.

The proceedings of the court, now probably obsolete, were continued de die in diem, or, as the style of the court was, from tide to tide. .

3. The Registrar of the Admiralty formerly held his place by patent from the Crown. The patent was issued under the great seal of the court of admiralty, and the appointment was afterwards confirmed by patent under the great seal of the United Kingdom. The appointment was for life, and was often granted in reversion. The registrar

had no salary, the amount of his emoluments depending on the captures, droits, &c, condemned by the court, which during the war of 1793-1815 were so enormous that in 1810 an Act was passed for regulating the offices of registrars of admiralty and prize courts, by which it is enacted "that no office of registrar of the high court of admiralty, or of the high court of appeals for prizes, or high court of delegates in Great Britain, shall, after the expira- tion of the interest now vested in possession or reversion therein, be granted for a longer term than during pleasure, nor be executed by deputy; that an account be kept in the said offices respectively of all the fees, dues, perquisites, emoluments, and profits received by and on account of the said registrars, out of which all the expeuses of their offices are to be paid; that one-third of the surplus shall belong to the registrar and to his assistant (if an assistant should be necessary), and the remaining two-thirds to the consoli- dated fund of Great Britain, to be paid quarterly into the exchequer; the account of such surplus to be presented to the court at least fourteen days before each quarter-day, and verified on oath." Under the 3 and 4 Vict. « 66, § 2, a yearly salary of £1400 is substituted for "all fecs, dues, perquisites, emoluments, and profits," and which may be increased in time of war to £2000. The duties of the registrar are—l. To keep a public registry, to give attend- ance therein, and to preserve in a regular manner

the registers, acts, records, and documents belonging to the office; 2. To attend all sittings of the court of admiralty, and to attend the judge at chambers; 3. To draw and sign all warrants, monitions, commissions, é&c., issuing from the court; to attend other courts with minutes, &c., of the admiralty court when required; 4. To have the custody of all moneys paid into court or paid out of court.

4. The Advocate-General.—This officer is appointed by warrant of the lords commissioners of the admiralty. His duties are—to appear for the lord high admiral in his court of admiralty, court of delegates, and other courts; to move and debate in all causes wherein the rights of the admiral are concerned; for which he had anciently a salary of 20 marks (£13, 6s. 8d.) a-year. In May 1803, Dr William Battine, who was appointed in 1791, had an addition of £200 to his salary, "for his extraordinary trouble and attendance during the present hostilities." His salary was coutinued to him and his successor, Dr Arnold, till 1816; since that time the allowance has been reduced to its original amount of £13, 6s. 8d. Formerly the admiral's advocate was always retained as leading counsel, but after the droits were transferred to the crown, he was gradually supplanted by the king's advocate, who was generally retained in all cases, the admiralty advocate acting only as junior counsel; and while the former during the war made sometimes from £15,000 to £20,000 a-year, the latter rarely reccived from his professional duties more than from £1500 to £2000 a-year.

5. The Counsel and Judge-Advocate for the affairs of the Admiralty and Navy is the law officer who is chiefly con- sulted on matters connected with the military duties of the lord high admiral. He advises also on all legal questions. His salary is £100 a-year, besides his fees, which in time of war may be reckoned to amount to from £1200 to £1800 a-year. Till the present reign the offices of counsel of the admiralty and judge-advocate of the fleet were sepa- rate and distinct, the latter being a sinecure appointment, with a, salary of £182, 10s. attached to it. The salary is now abolished. The duties are very light, the veritable work of the office being discharged by deputy judges- advocate appointed on cach occasion of a court-martial, and by resident law agents at Portsmouth and Plymouth, who receive salaries in lieu of all fees and charges.

6. The Solicitor to the Admiralty is a au officer ap-

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pointed during pleasure by the lords of the admiralty. He is the general legal adviser, in the first instance, of the lords commissioners; and since 1869 there have been added to his other functions those of registrar of public securities and custodian of all public securitics and bonds belonging to the admiralty. His salary is £1600 a-year in lieu of all fees, bills, and disbursements, with an allow- ance of £1300 a-year for assistance of clerks, His office is provided for him.

7. The Procurator.—The admiralty's proctor stands pre- cisely in the same situation to the queen's proctor that his advocate docs to that of the queen, though there 1s not quite so great a difference in their cmoluments. They act as the attorneys or solicitors in all causes concerning the queen's and the lord high admiral's affairs in the high court of admiralty and other courts. All prize causes are conducted by the queen's proctor. It is supposed that in some years of war, in the early part of the century, the proctor did not reccive less than £20,000 a-year.

8. The Marshal.—This officer receives his appointment from the lord high admiral or lords commissioners of the achniralty. His appointment is under the seal of the high court of admiralty during pleasure, and is confirmed by letters patent from the Crown. His duties are to arrest ships and persons; to execute all processes or orders issuing from the court; to attend, in person or by deputy, the judge with the silver oar (the ancient emblem of maritime jurisdic- tion); and formerly also to attend executions. It is also the duty of the marshal or his deputy to arrest, under warrant from the admiralty, any officer not beneath the rank of post captain who may be ordered for trial by court- martial; and to see to the delivery of sentenced prisoners to their place of punishment. His emoluments formerly de- pended on the number of prizes brought into port for con- dcmnation, and the number of ships embargoed, and might probably be reckoned in time of war, communibus annis, from £1500 to £2000 a-year, out of which he had to pay about £400 a-year toa deputy. He had no salary. The office can, however, be no longer

performed by deputy, except in case of illness, $9 of the 3 and 4 Vict. c. 66. The marshal is now paid by a salary of £500, in addition to his travelling expenses.

(See Orders in Council since February 1870; Camp- bell's Lives of the British Admirals; O'Byrne's Naval Biographical Dictionary; Rymer's Kadera; Pepys' Naval Collections, and Pepys' Diary; The Black Book of the Admiralty (republished by the Master of the Rolls); Stephen's Commentaries on the Laws of England; Stow's Survey of London; Rolls of Parliament; Report of Com- mittee appointed by the Treasury in 1836 to inquire into the fees and emoluments of public offices; Sir Harris Nicolas's [listory of British Navy). (F. W. RB.)

ADMIRALTY, IRELAND. — For all executive functions Ireland is subject to the jurisdiction and orders of the lord high admiral, or lords commissioners for executing the office, of Great Britain. For judicial purposes, however, an admiralty court sits in the Four Courts, Dublin, having a judge, a registrar, a marshal, and other officers. In peace time and war time alike it exercises only an instance juris- diction. No prize commission has ever issued to it.

ADMIRALTY, ScoTnanp. At the Union, while the national functions of the lord high admiral were merged in the English office, there remained a scparate court of admiralty, with subsidiary local courts, having civil and criminal jurisdictions in maritime questions. The separate courts were abolished in 1831, and their powers merged in the courts of session and justiciary, and the local courts,

ADMIRALTY CHARTS. These useful aids to naviga- tion are constructed in the hydrographic department of the British Adiniralty, by specially-appointed surveyors and

draughtsmen, and they are issued to the public by order of the lords commissioners of the adntiralty. They are divided into various sections as follows:—1l. English and Irish Channels aud coasts of the United Kingdom; 2. North Sca and adjacent coasts; 3. Baltic Sea; 4. North and

west coasts of France, Spain, and Portugal; 5. Mediterranean, Black Sea, and Sea of Azov; 6. Atlantic Ocean and Islands ; 7. Arctic Sea and north and east coasts of America; 8, West Indies, Gulf of Mexico, &c.; 9. South America, east coast; 10. West coasts of South and North Ame- rica; 11. Africa, Madagascar, Mauritius, Red Sea, &e.; 12. East Indies, Arabian coast, &c.; 13. Indian Archi- pelago, China Sea, Japan, &ec.; 14. Australia, New Zealand, &c.; 15. Pacific Ocean islands. They are about 3000 in number, of various sizes and scales, and the prices vary from 6d. to 10s. Accompanying the charts there are books of sailing directions, tables, and lists of lights. Similar charts as those of the British Admiralty are issued by the United States Coast Survey, as well as by the Russian and French governments. The superintendent of the United States Coast Survey issues an annual report, showing the progress of the survey, and containing much valuable information. .

ADMIRALTY ISLAND, an island belonging to the United States, about 90 miles long from N. to S., and 25 miles broad, lying between King George III. Archipelago and the mainland, in 58° N. lat., 134° W. long. Its coasts, which are generally steep and rocky, are indented with several accessible and commodious bays. The island has abundance of good water, and ig covered with pines, which grow there to a very large size.

ADMIRALTY ISLANDS, a group of about forty islands lying to the N.E. of New Guinea, between 2° and 3° S. lat., and 146° 18' and 147° 46' E. long. The largest is about 50 miles in length; the others are very small, and all rise but little above the sea-level. Their exuberant vegetation, and in particular the groves of cocoa-nut trees, give them a very beautiful appearance. The islands were discovered by the Dutch in 1616, but have seldom been visited, access being difficult on account of the surrounding reefs. The natives are tall, and of a tawny colour. ;

ADOLPHUS, Jouy, historian and barrister, was born in London on the 7th August 1768. He was educated undcr the care of a grand-uncle, and after making a voyage to the West Indies was enrolled as an attorney about the year 1790. Called to the bar in 1807, he devoted him- self to practice in criminal causes, and in a few years attained a leading position among Old Bailey counsel. His masterly defence of Thistlewood and the Cato Street

con- spirators, for which he had been retained only a few hours before the trial, did much to extend his reputation, He was very skilful in the management of his cases, but his hastiness of temper frequently led to unseemly altercations with other counsel. He held a good position in society, and was on terms of intimacy with the leading literary men of the day. The History of England from the Acces- sion of George III, to 1783, which he published in 1802, was favourably noticed in the Edinburgh Review for its impartiality and accuracy. A new and enlarged edition of this work, in eight volumes, was in preparation, but only seven volumes were complcted when the author died, 16th July 1845. His other literary works were—Bio- graphical Memoirs of the French Revolution (1799); The British Cabinct (1799); Mistory of France from 1790 to 1802 (18038) ; Afemoirs of John Bannaster.

ADOLPHUS, Joun Leycuster, son of the above, also a distinguished barrister (dicd 1862), was the first to picrce the mask of the author of Waverley, in a series of critical letters addressed to Richard Heber, which he pub- lished in 1821.

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ADONIS, according to some authors, the son of Theias, king of Assyria, and his daughter Smyrna [Myrrha], was the favourite of Venus. He was fond of hunting; and Venus often warned him not to attack the larger wild beasts; but neglecting the advice, he was killed by a wild boar he had rashly wounded. Venus was incon- solable, and turned him into a flower of a blood colour, supposed by soine to be an anemone. Adonis had to spend half the year in the lower regions, but during the other half he was permitted to revisit the upper world, and pass the time with Venus. No grief was ever more celebrated than that of Venus for Adonis, most nations round the Mediterranean having perpetuated the memory of it by anniversary ceremonies. 'The tale of Adonis (Keightley's Mythology) is evidently an eastern myth. His own name and those of his parents refer to that part of the world. He appears to be the same with the Thammuz ieutioned by the

prophet Ezekiel (viii. 14), and to be a Phoenician personification of the sun, who during part of the year is absent, or, as the legend expresses it, with the goddess of the under world; during the remaindcr with Astarte, the regent of heaven." Among the Egyptians, Adonis is supposed to have been adored under the name of Osiris, the husband of Isis ; but he was sometimes called by the name of Ammuz or Thammuz, the concealed, to denote probably his death or burial. It has been thought it is he the Hebrews call the dead (Ps. evi. 28, and Lev. xix. 28), because his worshippers wept for him, and represented him as one dead; and at other times they call him the tmage of jealousy (Ezek. viii. 3, 5), because he was an object of jealousy to other gods. The Syrians, Phoenicians, and Cyprians worshipped Adonis; and Calmet was of opinion that this worship may be identified with that of the Moabitish Baal-peor. Modern critics plausibly

-connect the divine honours paid to Adonis with the

mysterious rites of phallic worship, which, in some shape or other, prevailed so extensively in the ancient world.

ADONIS, in Ancient Geography, a small river rising in Mount Lebanon, and falling into the sea at Byblus. When in flood its waters exhibit a deep red tinge; hence the legend that connects it with the wound of Adonis.

' While smooth Adonis from his native rock, Ran purple to the sea, suppos'd with blood Of Thammuz yearly wounded."—MitTon.*

ADONIS, a genus of ranunculaceous plants, known commonly by the names of Pheasant's Eye and Flos Adonis. There are ten or twelve species given by authors, but they may be probably reduced to three or four. There are two indigenous species, Adonis autumnalis and Adonis estivalts. They are commonly cultivated. An early flower- ing species, Adonis vernalis, is well worthy of cultivation.

ADOPTIAN CONTROVERSY, a controversy relating to the sonship of Christ, raised in Spain by Elipandus, archbishop of Toledo, and Felix, bishop of Urgel, towards the close of the 8th century. By a modification of the doctrine of Nestorius they maintained that Christ was really the Son of God in his divine nature alone, and that in his human nature he was only

the Son of God by adop- tion. It was hoped that this view would prove more acceptable to the Mahometans than the orthodox doc- trine, and Elipandus especially was very diligent in pro- pagating it. Felix was instrumental in introducing it into that part of Spain which belonged to the Franks, and Charlemagne thought it necessary to assemble a synod at Ratisbon (792), before which the bishop was summoned to explain and justify the new doctrine. Instead of this he renounced it, and confirmed his renunciation by a solemn oath to Pope Adrian, to whom the synod sent him. The recantation was probably insincere, for on returning to his diocese he taught adoptianism as before. Anothcr synod

was held at Frankfort in 794, by which the new doctrine was again formally condemued, though neither Felix nor any of his followers appeared. A friendly letter from Alcuin, and a controversial pamphlet, to which Felix re- plied, were followed by the sending of several commissions of clergy to Spain to endeavour to put down the heresy. Archbishop Leidrad of Lyous being on one of these com- missions, persuaded Felix to appear before a synod at Aix-la-Chapelle in 799. There, after six days' disputing with Alcuin, he again recanted his heresy. The rest of his life was spent under the supervision of the archbishop at Lyons, where he died in 816. Elipandus, secure in his see at Toledo, never swerved from the adoptian views, which, however, were almost universally abandoned after the two leaders died. The coutroversy was revived by solitary advo- cates of the heretical opinions more than once during the Middle Ages, and the questions on which it turns have, in one form or another, been the subject of frequent discussion.

ADOPTION, the act by which the relations of paternity and filiation are recognised as legally existing between persons not so related by nature. Cases of adoption were very frequent among the Greeks and Romans, and the custom was accordingly very strictly regulated in their laws. In Athens the power of adoption was allowed to all citizens who were of sound mind, and who possessed no male off- spring of their own, and it could be exercised either during lifetime or by testament. The person adopted, who re- quired to be himself a citizen, was enrolled in the family and demus of the adoptive father, whose name, however, he did not necessarily assume. In

the interest of the next of kin, whose rights were affected by a case of adoption, it was provided that the registration should be attended with certain formalities, and that it should take place at a fixed time—the festival of the Zhargelia. The rights and duties of adopted children were almost identical with those of natural offspring, and could not be renounced except in the case of one who had begotten children to take his place in the family of his adoptive father. Adoptcd into another family, children ceased to have any claim of kindred or inheritance through their natural father, though any rights they might have through their mother were not similarly affected. Among the Romans the existence of the patria potestus gave a peculiar significance to the custom of adop- tion. The motive to the act was not so generally child- lessness, or the gratification of affection, as the desire to acquire those civil and agnate rights which were founded on the patria potestas. It was necessary, however, that the adopter should have no children of his own, and that he should be of such an age as to preclude reasonable expec- tation of any being born to him. Another limitation as to age was imposed by the maxim adoptio imitatur naturam, which required the adoptive father to be at least eighteen years older than the adopted children. According to the same maxim eunuchs were not permitted to adopt, as being impotent to beget children for themselves. Adoption was of two kinds according to the state of the person adopted, who might be either still under the patria potestas (aliens Juris), or his own master (swt juris). In the former case the act was one of adoption proper, in the latter case it was styled adrogation, though the term adoption was also used in a general sense to describe both species. In adoption proper the natural father publicly sold his child to the adoptive father, and the sale being thrice repeated, the maxim of the Twelve Tables took effect, S¢ pater filium ter venunduit, filius a patre liber esto. The process was rati- fied and completed by a fictitious action of recovery brought by the adoptive father against the natural parent, which the latter did uot defend, and which was therefore knowu as the cessio tn jure. Adrogation could be accomplished origin- ally only by the authority of the people assembled in the

Comitia, but from the time of Diocletian it was effected by an imperial rescript. Females could not be adrogated, and, as they did not possess the

patria potestas, they could not exercise the right of adoption in ecithcr kind. The whole Roman law on the subject of adoption will be found in Justinian's Institutes, lib. i. tit. 11. In Hindoo law, as in nearly cvery ancicnt system, wills are almost un- known, and adoptions take their place. The strict law of adoption in India has becn relaxcd to the extent that a Hindoo widow may adopt when her deceased husband has not done so. Adoption is not recognised in the laws of England and Scotland, though there are legal means by which one may be enabled to assume the name and arms and to inherit the property of a stranger. In France and Germany, which may be said to have cmbodied the Roman law in their jurispru- dence, adoption is regulated according to the principles of Justinian, though with sevcral more or less important modifications, rendcred necessary by the usages of these countries respectively. The part played by the legal fiction of adoption in the constitution of primitive society and the civilisation of the racc is so important, that Sir Henry 8. Mainc, in his valuable work on Ancient Lan, expresses the opinion that, had it never existed, the primi- tive groups of mankind could not have coalesced except on terms of absolute superiority on the one side, and absolute subjection on the other. With the institution of adoption, however, one people might feign itself as descended from the same stock as the people to whose sacra gentilicra it was ad- mitted ; and amicable relations were thus established between stocks which, but for this expedient, must have submitted to the arbitrament of the sword with all its consequences.

Aportion, as a Biblical term, occurs only in the Vew Testament. In Old Testament history the practice was unknown, though cascs approximating to it have been pointed out. In the New Testament viofecia occurs in several passages, on which is founded onc of the leading doctrines of theology.

ADORATION, an act of homage or worship which, among the Romans, was performed by raising the hand to the mouth, kissing it, and then waving it in the direction of the adored object. The devotee had his head covered, and after the act turned himself round from left to right. Sometimes he kissed the feet or knecs of the images of the gods themselves, and Saturn and Hercules were adored with the head bare. By a natural transition the homage that was at first paid to divine beings alone came to be paid to men in token of extraordinary respect. Those who approached the Greek and Roman

emperors adored by bowing or kneeling, laying hold of the imperial robe, and prescntly withdrawing the hand and pressing it to the lips. In eastern countries adoration was performed in an attitude still more lowly. The Persian method, introduced by Cyrus, was to bend the knee and fall on the face at the prince's feet, striking the earth with the forehead, and kissing the ground. Homage in this form was refused by Conon to Artaxerxes, and by Callisthenes to Alexander the Great. In England the ceremony of kissing the king's or queen's hand, and some other acts which are performed kneeling, may be described as forms of adoration. Adora- tion 1s applied in the court of Rome to the ceremony of kissing the Pope's foot, a custom which is said to have been introduced by the popes after the example of the Emperor Diocletian. In the Romish Church a distinction is made between Latria, a worship due to God alone, and Dulia or Hyperdulia, the adoration paid to the Virgin, saints, martyrs, crucifixes, the host, d&ec.

_ ADOUR, the ancient Aturus, a river of France which rises near Barége, in the department of Upper Pyrenees,

Apo Av

and, flowing first northwards, then with a circuit to the west, passes through the departments of Gers and Landes, and falls into the Bay of Biscay 3 miles below Bayonne, Its length is about 180 miles, and it is navigable for about 70 miles, as far as St Séver. Bagnéres-de-Ligorre, Tarbes, and Dax are the other important towns on its banks. ADOWA, the capital of Tigré, in Abyssinia, is situated

in 14° 12' N. lat., 39° 3' E. long., on the left bank ag:

the River Hasam, 145 miles N.E. of Gondar. It is built on the castern declivity of a hill overlooking a small plain, and has regular streets, ornamented with trees and gardens. The town derives its chicf importance from its situation on the route between Massowah and Gondar, which has caused it to become the great entrepdt of traffic between the ex- tensive table-land of Tigré and the coast. Gold and ivory are included in its transit trade, and hardware is manu-

factured, as well as the coarse cotton cloth which circulates

in Abyssinia as the medium of exchange in place of money.

Population about 6000.

ADRA, the ancient Abdera, a seaport of Spain on the Mediterranean, in the province of Almeria, 60 miles 8.1. of Grenada. Lead is extensively wrought in the neigh- bourhood, and exported to Marseilles. The other exports include wheat and sugar. Population, 7400.

ADRASTUS, in Legendary History, was the son of Talaus, king of Argos, and Lysianassa, daughter of Polybus, king of Sicyon. Being driven from Argos by Amphiaraus, Adrastus repaired to Sicyon, where he became king on the death of Polybus. After a time he was reconciled to Amphiaraus, to whom he gave his sister in marriage, returned to Argos, and occupied the throne. He acquired great honour in the famous war against Thebes, which he undertook for the restoration of his son-in-law Polynices, who had been deprived of his rights by his brother Eteocles, notwithstanding the agreement between them. Adrastus, followed by Polynices and Lydeus, his two sons-in-law, Amphiaraus, his brother-in-law, Capancus, Hippomcdon, and Parthenopzeus, marched against the city of Thebes, and on his way is said to have founded the Nemcan games. This is the expedition of the Seven Worthies against Thebes which the poets have made nearly as famous as the siege of Troy. As Amphiaraus had foretold, they all lost their lives in this war except Adrastus, who was saved by the speed of his horse Arion. Ten years after, at the insti- gation of Adrastus, the war was renewed by the sons of the chiefs that had fallen. This expedition was called the War of the Epigoni, and ended in the taking and destruction of Thebes. None of the followers of Adrastus perished in it except his son Agialeus. The death of this son affected Adrastus so much that he died of grief at Megara, as he was leading back his victorious army.

ADRIA, a city of Italy, in the province of Rovigo, between the rivers Po and Adige. It is a place of great antiquity, and was at an early period a seaport of such importance and celebrity as to give name to the sea on which it stood. Originally an Etruscan colony, it enjoyed for a time remarkable prosperity; but under the Romans it appears never to have been of much importance, and after the fall of the Western Empire it rapidly declined. The dykes which protected the surrounding country from inundation were

neglected, the canals became choked, and the mud and other deposits brought down by the waters of the Po and Adige caused a gradual extension of the land into the Adriatic, so that Adria ceased to be a seaport, and is now 16 miles from the sca, on whose shores it formerly stood. By the draining of the neighbouring lands, the modern town has been much improved. It has some trade in grain, cattle, fish, wine, and earthenware, is the seat of a bishopric, and has a muscum of Greek and Roman anti-quities. A little to the south, extensive remains of the

| was born before 1100 a.p. at Langley, ncar St Albans, in.

ancient city have been discovered deeply imbedded in the accumulated soil. The population of Adria is 10,000.

ADRIA (6 'Adpias—Acts xxvii. 27) in St Paul's time meant all that part of the Mediterranean between Crete and Sicily. This fact is of importance, as it relieves us from the necessity of finding the island of Melita, on which Paul was shipwrecked, in the present Adriatic Gulf.

ADRIAN, a town of the United States, capital of Lenawee co., Michigan, situated on a branch of the Raisin river, and on the Michigan Southern Railway, 73 miles W.S.W. of Detroit. Adrian is the centre of trade for the surrounding district, which is chiefly grain-producing. Its extensive water-power is employed in mills of various kinds. Tt has several fine churches and other public buildings. Population in 1870, 8438.

ADRIAN, Pusuius uius, Roman emperor. Haprian and Roman History.

ADRIAN (sometimes written Haprtan) was. the name of six popes :—

ApvriaNn I., son of Theodore, a Roman nobleman, occupied the pontifical chair from 772 to 795. Soon after his accession the territory that had been bestowed on the popes by Pcpin was invaded by Desiderius, king of the Longobards, and Adrian found it necessary to invoke the aid of Charlemagne, who entered Italy with a large army, and repelled the enemy. The pope acknowledged the obligation by conferring upon the emperor the

title of Patrician of Rome, and Charlemagne made a fresh grant of the territories orginally bestowed by his father, with the addition of Ancona and Benevento. The friendly relations thus established between pope and emperor continued unbroken, though a serious difference arose between them ou the question of the worship of images, to which Charle- magne and the Gallican Church were strongly opposed, while Adrian favoured the views of the Eastern Church, and approved the decree of the Council of Nicaea (787), confirming the practice and excommunicating the icono- clasts. It was in connection with this controversy that Charlemagne wrote the so-called Libri Carolint, to which Adrian replied by letter, anathematising all who refused to worship the images of Christ, or the Virgin, or saints. Notwithstanding this, a synod, held at Frankfort in 794, anew condemned the practice, and the dispute remained unsettled at Adrian's death. An epitaph written by Charlemagne in verse, in which he styles Adrian " father," proves that his friendship with the pontiff was not dis- turbed by the controversy in which they were so long engaged.

Appian II, born at Rome, became pope in 867, at the age of seventy-six. He faithfully adhered to the ambi- tious policy of his immediate predecessor, Nicholas I., and used every means to extend his authority. His persistent endeavours to induce Charles the Bald #> resigir tHe kirig- dom of Lorraine to the empéror were unsuccessful. Hinemar, archbishop of Rheims, who had crowned Charles, denied the pope's right to interfere in the matter, and maintained that the threatened excommunication of the king's adherents would have no validity. Adrian was for the time more successful in his contest with the patriarch of Constantinople—the sentence of deposition he passed upon Photius being confirmed by a council of the Eastern Church held in 869-70. His arrogant measures were, however, the immediate occasion of the schism between the Greek and Latin churches. Adrian had himself been

| Married, but put away his wife on ascending the papal

throne, and a council called by him at Worms in 868 decreed the celibacy of the clergy. He died in 872. Appian III., born at Rome, succeeded Martin II. in

_ 884, and dicd in 885 on a journey to Worms.

Aprian IV., whose name was Nicholas Breakspeare,

See

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Hertfordshire, and is the only Englishman who has occupied

the papal chair. His request to be allowed to take tho – habit of the monastcry of St Albans having been refused | by Abbot Richard, he procceded to Paris, where he studied

with diligence, and soon attained great proficiency, espe- cially in theology. Being admitted, after a period of pro-

bation, a regular clerk in the monastery of St Rufus, in

Provence, he distinguished himself so much by his learning and strict observance of the monastic discipline that he was chosen abbot when the office fell vacant. His merit became known to Pope Eugenius III., who created him cardinal- bishop of Alba in 1146, and sent him two years later as his legate to Denmark and Norway. On this mission he con- verted many of the inhabitants to Christianity, and erected

- Upsal into an archiepiscopal see. Soon after his return to | Rome, Anastasius, successor of Eugenius, died, and Nicholas | Was unanimously chosen pope, against his own inclination, }in Nov. 1154. On hearing of the election, Henry II. of _ England sent the abbot of St Albans and three bishops to _ Rome with his congratulations, which Adrian acknowledged ‘ by granting considerable privileges to the monastery of St Albans, including exemption from all episcopal juris- . diction except that of Rome. _ the sovereignty of Ireland upon the English monarch was

The bestowal by Adrian of

a practical assertion of the papal claim to dispose of king- doms. The act, besides facilitating and hastening the subjection of Ireland to England, was also the means of inducing Henry to yield the long-contested point of lay investiture to ecclesiastical offices. The beginning of Adrian’s pontificate was signalised by the energetic attempts of the Roman people to recover their ancient liberty under the consuls, but the pope took strong measures to maintain his authority, compelling the magis- trates to abdicate, laying the city undcr an interdict, and procuring the execution of Arnold of Brescia (1155). In the same year he excommunicated William, king of Sicily, who had ravaged the territories of the church, but the ban was removed and the

title of King of the Two Sicilies conferred on William in the following year, on the promise of a yearly tribute to the Holy See. With Adrian com-

-menced the long and bitter conflict between the papal

power and the house of Hohenstaufen which ended in tho humiliation of the latter. Frederick Barbarossa having entered Italy at the head of a large army for the purposo of obtaining the crown of Germany from the hands of the pope, Adrian met him at Sutri. The demand that he should hold the pope's stirrup as a mark of respect was at first refused by Frederick, whereupon the pope on his part with- held from the emperor the osculwm pacis, and the cardinals ran away in terror. After two days' negotiation, Frederick was induced to yield the desired homage, on the representa- tion that the same thing had been done by his predecessors. His holiness then conducted the emperor to Rome, where the ceremony of coronation took place in the Church of St

Peter's. It was in these transactions that the quarrel

originated. A letter addressed by the pope to Frederick

and the German bishops in 1157 asserted, on the ground

of the ceremonies that had taken place, that the emperor

held his dominions as a beneficium. The expression, being 'interpreted as denoting feudal tenure, stirred up the fiercest

indignation of Frederick and the Germans, and though

explanations were afterwards given with the view of show- ing that the word had not been used in an offensivo sense, 'the breach could not be healed. Adrian was about to

pronounce the sentence of excommunication upon Frederick when he died at Anagni on the Ist Sept. 1159.

AprIAN V., a Genoese, whose name was Ottoboni Fiesci, occupied the papal throne for only five weeks in 1276.

When congratulated on his accession he replied in the

well-known words, “I wish you had found me a healthy cardinal rather than a dying pope.” ‘

Aprian VI., born of humble parentage at Utrecht in 1459, studied at the university of Louvain, of which he became vice-chancellor. He was chosen by the Emperor Maximilian to be tutor to his grandson, the Archduke Charles, through whose interest as Charles V. he was after- wards raised to the papal throne. In 1517 he received the cardinal’s hat from Leo X., and in 1519 he was made bishop of Tortosa. After the death of Ferdinand he was for a time regent of Spain. He was chosen pope Jan. 9, 1522; but the election was very displeasing to the people of Rome, as the new pope, in contrast with his predecessor Leo, was known to be very rigid in discipline and frugal in his mode of living. On his accession, contrary to the usual custom, he did not change his name, and he showed his dislike to ostentation in many other ways. In regard to the great fact with which he had to deal—the Reformation—Adrian’s conduct showed that he did not fully estimate the gravity of the crisis. Acknowledging the corruptions of the church, he did his utmost to reform certain external abuses; but when his proposed measures failed to win back Luther and the other reformers, he immediately sought to suppress their doctrines by force. He died on the 14th September 1523. So little did the people care to conceal their joy at the event that they wrote ou the door of his physician’s house the words “the saviour of his country.”

ADRIAN, Carvrnat, was born at Corneto, in Tuscany, and studied at Rome. He was sent by Innocent VIII. as nuncio to Britain, to endeavour to reconcile James III. of Scotland and his subjects. That king having died, Adrian remained in England, where Henry VII. presented him to the bishopric of Hereford, and afterwards to that of Bath and Wells; but he never resided in either of these dioceses. On his return to Rome he became secretary to Pope Alexander VI., who employed him in various missions, and subsequently invested him with the purple. It was Adrian in particular that Alexander is said to have meant to poison in order that he might seize on his great wealth, when, as is generally reported, he fell a victim to his

own wicked- ness. Not long after the elevation of Leo X. to the papal chair he was implicated in the conspiracy of Cardinal Petrucci against that pontiff. He confessed his guilt; and pardon being offered only on condition of his payment of a fine of 25,000 ducats, he resolved to fly from Rome. It is supposed that he was murdered by a domestic who coveted his wealth. Adrian was one of the first who sought to restore the Latin tongue from its medizval corruptions to classical purity. He wrote De Vera Philosophia, a re- ligious treatise, printed at Cologne in 1548; De Sermone Latino, a learned work, published at Rome in 1515, and re- peatedly since; a treatise, De Venatione; and some Latin verses,

ADRIANI, Grovannt Battista, born of a patrician family of Florence about 1511, was secretary to the republic of Florence, and for thirty years professor of rhetoric at the university. He wrote a history of his own times, from 1536 to 1574, in Italian, which is generally, but according to Brunet erroneously, considered a continuation of Guic- ciardini. De Thou acknowledges himself greatly indebted to this history, praising it especiallyfor its accuracy. Adriani composed funeral orations on the Empcror Charles V. and other noble personages, and was the author of a long letter on ancient painters and sculptors prefixed to the third volume of Vasari. He died at Florence in 1579.

ADRIANOPLE (called by the Turks Eprenen), a city of European Turkey, in the province of Rumelia, 137 miles W.N.W. of Constautinople; 41° 41' N. lat., 26° 35' E. long. It is pleasantly situated partly on a hill and partly on the banks of the Tundja, near its confluence

with the Maritza. Next to Constantinople, Adrianople is the most important city of the empire. It is the seat of a bishop of the Greek Church. The streets are narrow, crooked, and filthy; its ancient citadel, and the walls which formerly surrounded the town, are now in ruins. Of its public buildings the most distinguished are the Liski-Serat, the ancient palace of the sultans, now in a state of decay; the famous bazaar of Ali Pacha; and the mosque of the Sultan Selim IL, a magnificent specimen of Turkish archi- tecture, which

ranks ainong the finest Mahometan temples, The city has numerous baths, caravanseries, and bazaars; and considerable manufactures of silk, leather, tapestry, woollens, linen, and cotton, and an active general trade. Besides fruits and agricultural produce, its exports include raw silk, cotton, opium, rose-water, attar of roses, wax, and the famous dye known as Turkey red. The surrounding country is extremely fertile, and its wines are the best produced in Turkey. The city is supplied with fresh water by means of a noble aqueduct carried by arches over an extensive valley. There is also a fine stone bridge here over the Tundja. During winter and spring the Maritza is navigable up to the town, but Enos, at the mouth of that river, is properly its seaport. Adrianople was called Uskadama previous to the time of the Emperor Hadrian, who improved and embellished the town, and changed its name to Hadrianopolis. In 1360 it was taken by the Turks, who, from 1366 till 1453, when they got possession of Constantinople, made it the seat of their government. In the campaign of 1829 Adrianople surrendered to the Russians without making any resistance, but was restored after the treaty of peace signed the same year. Population,

140,000.

ADRIATIC SEA, the Adriaticum Aare of the ancients, is an arm of the Mediterranean which separates Italy from Triest, Croatia, Dalmatia, and Albania. It extends from 40° to 45° 50' N. lat. in a N.W. direction. Its extreme north-west portion forms the Gulf of Venice, and on the east side are the gulfs of Triest, Fiume, Cattaro, and Drino. Its greatest length is 450 miles, its mean breadth 90 miles, and its depth varies from 12 to 22 fathoms. The western or Italian coasts are generally low and marshy; but the eastern shores are steep and rocky, and the abounding creeks and inlets, with the numerous islands, afford to mariners many safe natural harbours. The ebbs and flows of the tide in the Adriatic are inconsiderable, though more observable than in the Mediterranean generally; and its saltness is a little greater than that of the ocean. The prevalence of sudden squalls from the N.E. and 8.E. renders its navigation hazardous, especially in winter. Except the Po and Adige, no considerable rivers flow into the Adriatic. Its chief emporia of trade are Venice, Triest, and Ancona. The port of Brindisi, on the Italian coast, near the southern extremity of the Adriatic, is rapidly rising in importance as the point of arrival and departure of the Peninsular

and Oriental Company's steamers conveying the overland mails between England and the East. The name Adriatic is derived from Adria, between the mouths of the Po and the Adige, and not from Adria in Picenum. (See Mighlands and Islands of the Adriatic, by A. A. Paton, 2 vols. 8vo, 1849; Shores of the Adriatic, by Viscountess Strangford, 1864.)

ADULE or Aputis, atown on the Red Sea. See ZULLA.

ADULLAM, in Scripture Geography, a city in the plain country of the tribe of Judah. The cave Adullam, m which David took refuge after escaping from Gath (1 Sam. xxii. 1), was probably situated among the mountains to the east of Judah, near the Dead Sea. From its being described as the resort of "every one that was in distress," or "in debt," or "discontented," it has often been humor- ously alluded to, as by the Baron of Bradwardine im Waverley, chap. 57.

Loe

ADULTERATION

DULTERATION, the act of debasing a pure or A genuine commodity for pecuniary profit, by adding to it an inferior or spurious article, or by taking from it one or more of its constituents. The term is derived from the Latin adultero, which in its various inflections signifies to defile, to debase, to corrupt, to sophisticate, to falsify, to counterfeit, &c. The objects of adulteration are fourfold, namely, to increase the bulk or weight of the article, to improve its appearance, to give it a false strength, or to rob it of its most valuable constituents. All these adul- terations are manifestly of a designedly fraudulent character, and arc therefore properly the subjects of judicial inquiry ; but there may be accidental corruptions and adulterations of a commodity, arising from natural or unavoidable causes, as when darnel or ergot become mixed with grain in the fields of the slovenly farmer, or when an article becomes changed and deteriorated from spontaneous decay, or when inineral matters and otherimpurities are accidentally derived from the machinery or vessels in which the thing is prepared orkept. The recognition of such impurities, and the tracing of them to their source, is of prime importance in pursuing a charge of adulteration. Few articles of commerce, however, are excmpt from fraudulent adulteration, and the

practice of it has grown with the competition of trade, and the removal of those wholesome restrictions which in former times were so energetically opposed to all kinds of dishonest dealing ; for the guilds and companies of all large cities had their corporate regulations for supervising and governing every description of trade and manufacture. The excise, too, including the customs, had until recently control over the quality of all exciseable articles; and although the prime object of this was to protect the revenue of the country, yet it also served to prevent adulteration. In addition to this there were in ancient times ordinances of assize for regulating the price and quality of the common necessaries of life. As far back as the reign of John (1203) there was a proclamation throughout the kingdom for enforcing the legal obligations of assize as regards bread ; and in the following reign the statute (51 Hen. III. stat. 6), entitled the Pillory and Tumbrel, was framed for the express purpose of protecting the public from the dishonest dealings of bakers, vintners, brewers, butchers, and others. This statute is deserving of notice as the first in which the adulteration of human food is specially noticed and prohi- bited ; and it seems to have been enforced with more or less of rigour until the time of Anne, when it was repealed (8 Anne, c. 19). According to Liber Albus, it was strictly observed in the days of Edward I,, for it states that 'if any default shall be found in the bread of a baker in the city, the first time, let him be drawn upon a hurdle from the Guildhall to his own house through the great street where there be most people assembled, and through the great streets which are most dirty, with the faulty loaf hanging from his neck ; if a second time he shall be found committing the same offence, lct him be drawn from the Guildhall through the great street of Cheepe, in the manner aforesaid, to the pillory, and let him be put upon the pillory, and remain there at least onc hour in the day ; and the third time that such default shall be found, he shall be drawn, and the oven shall be pulled down, and the baker made to forswear the trade in the city for ever." Vintners, Spicers, groccrs, butchers, regrators, and others, were subject to the like punishment for dishonesty in their commercial dealings—it being thought that the pillory, by appealing _ to the sense of shame, was far more deterrent of such

' aud the Inland Revenue.

crimes than fine or imprisonment. But all this has given way to the force of free trade, and now the practice of adultcration has become an art, in which the knowledge of science and the ingenuity of trade are freely exercised. Fifty years ago it attracted the attention of one of the most expert chemists of the day, Mr Accum, who, in his Treatise on Adulterations of Food, and Culinary Poisons, declared it to be an "'art and mystery." Subsequently to that, in 1851 and the three following years, articles on the adultera- tion of food appeared in the Zancet, and the effect of those articles was to call for a Parliamentary inquiry, which resulted in the Adulteration of Food Act of 1860. That Act of Parliament gave power to certain local authoritics in England, Scotland, and Ireland to appoint analysts, having competent medical, chemical, and microscopical knowledge. The penalty for selling an adulterated article, knowing it to be so adulterated, was five pounds, and the costs of the proceedings. But as the statute was permissive, only a few analysts were appointed, and it soon became a dead letter. Attempts were subsequently made to improve the law, and to make it compulsory on local authorities to appoint analysts. One of these was the Bill of 1869, and another was that of 1871—both of which were abandoned by their promoters. In the year 1872, however, an Act was passed, entitled An Act to amend the Laws for the Prevention of Adulteration of Food, Drink, and Drugs. The main features of this Act are the following :—Local authorities in England, Scotland, and Ireland are bound to appoint analysts with competent medical, chemical, and microscopical know- ledge. They must also appoint officers or inspectors to purchase articles of food, drink, and drugs within their respective districts, and take them to the analyst for examination. Other purchasers of such articles are per mitted, under proper restrictions, to have suspected articles analysed. On receiving a certificate from the analyst, stating that anyarticle is adulterated, the inspector must take the necessary legal procecdings for the purpose of bringing the offender to justice. The penalty on conviction of mixing anything whatever with a drug, with the view of adulterating it, or of mixing any injurious or poisonous ingredient with any article of food or drink, is a sum not exceeding fifty pounds, together with the costs ; and for the second offence he shall be guilty of a misdemeanour, and be imprisoned for a period not exceeding six calendar months with hard labour. The penalty for selling an adulterated article with a guilty knowledge is a sum not exceeding twenty pounds, together with the costs; and for a second

offence, the justice may order the offender's name, place of abode, and offence to be published in a newspaper, or in any manner he thinks fit, at the expense of the offender. Although the meaning of the term adulteration is not strictly defined in the Act, yet it is declared that the admixture of anything whatever with an article of food, drink, or drug, for the purpose of fraudulently increasing its weight or bulk, is an adulteration within the provisions of the Act. The adulteration of intoxicating liquors is provided for by the Licensing Act 1872 (35 and 36 Vict. c. 94); and in this Act there is a schedule of substances, called " Dele- tertous Ingredients," which are considered to be adultera- tions: they are Cocculus indicus, chloride of sodium or common salt, copperas, opium, Indian hemp, strychnine, tobacco, darnel seed, extract of logwood, salts of zine or lead, alum, and any extract or compound of any of these. The execution of this Act rests with the police authorities The penalties for adulteration

are very severe, leaving it tc the magistrate either to inflict a heavy fine or to send the offender to prison. In the year 1869 an Act was passed to prevent the adulteration of seeds, in fraud of Her Majesty's subjects, and to the great detriment of agriculture (32 and 33 Vict. ¢. 112), wherein it is declared that the killing of seeds, the dying of them, and the selling of such killed or dyed secds, with intent to defraud, is punishable with a penalty not exceeding five pounds for the first offence, nor exceeding fifty pounds for a sccond or subsequent offence, together with the publication of the offender's name, place of abode, and offence in any manner that the justice thinks fit. x

Adulteration in other countries is strictly prohibited under penal obligations. The Prussian penal code provides that any person selling adulterated or spoiled goods shall be liable to a penalty up to fifty dollars, or imprisonment for six weeks, with confiscation of goods; and it 18 not necessary to prove that the seller was aware of the adultera- tion. In Holland, the Dutch law is very similar to the code Napoleon, and inflicts a punishment of imprisonment for from six days to two years, with a fine of from 16 to G00 francs. The adulteration of bread with copperas or sulphate of zinc is dealt with by imprisonment of from two to five years, and a fine of

from 200 to 500 florins. In Paris, malpractices connected with the adulteration of food are investigated by the Conseil de Salubrité and punished. Much valuable information concerning the adulteration of food, drink, and drugs in foreign countries has lately been obtained from the various British legations and consulates abroad, through @ circular addressed to them from the Foreign Office. These investigations were commenced by the late Earl of Clarendon, and have been continued by Earl Granville. The results have becn published in the Food Journal for 1870 and 1871; and they are epitomised at page 193 of the journal of the last mentioned date.

Among the adulterations which are practised for the purpose of fraudulently increasing the weight or bulk of an article are the following :—

1. Adulterations of Afitk.—This is commonly effected by the addition of water—technically termed Simpson ; and it is known by the appearance of the milk, the specific gravity of it, the quantity of cream which rises, and the chemical composition of the milk. Good milk has a rich appearance, and a full pleasant taste. Its specific gravity ranges from 1029 (water being 1000) to 1032—the average being 1030. If, therefore, the density of milk is above 1030, other conditions corresponding, the inference is that the sample is unusually good. Between 1028 and 1030 it is most probably genuine. At from 1026 to 1028 it is of doubtful quality, and below that, unless the amount of cream is enormously large, the sample is not genuine. An instrument, called a galactometer, has becn constructed to show the specific gravity of milk at a glance; but it must always be remembered that while the addition of water tends to lower the gravity of milk, so also does the presence of much cream, and therefore a sample of skimmed milk may show a high gravity even when diluted with water. The per- centage quantity of cream is ascertained by means of an instrument called a lactometer. It is a glass tube about 10 or 11 inches long and half an inch in diameter, graduated into 100 parts. Having shaken a sample of milk so as to diffuse the cream throughout its bulk, it is poured into the lactometer to the topmost division; and after standing for 12 hours, to allow the cream to rise, the proportion of it is read off from the divisions on the tube. Good milk shows a range of from 8 to 12 divisions. Conjoined with the preceding test, this affords reliable indication of the quality of the sample. After removing the

crcam, the gravity should be again taken, and this should not be lower than 1030. The chemical composition of milk varies to some

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extent with the breed of the cow, its age, the diet upon which it is fed, the time of calving, and the time of milking ; for afternoon milk is generally richer than morning, and the last drawn than the first. But taking the results of a large number of analyses by different chemists, it may be said that the avcrage percentage composition of milk is as follows :—-Casein or cheese matter, 3°64; butter, 3°55; milk, sugar or lactose, 4-70; saline matter, 0°81; and water, 87°30. If, therefore, 1000 grains of milk be treated with a few drops of acetic acid, and then heatcd in a flask to about 120° Fahr., the cascin of the milk will curdle, and enclose within it all the butter. When itis quite cold, it can easily be filtered, and when dry, the curd and butter should weigh from 75 to 85 grains ; and the serum or whey should have a density of about 1029. The addition of mineral matter, as common salt or carbonate of soda, to milk is easily recognised by an examination of the ash or saline constitutents. 1000 grains of good milk evaporated to dryness will produce from 120 to 130 grains of solid matter, of which about 8 grains are mineral ; and these are left in the platinum capsule, when the solid matter is incinerated or burnt to an ash. Of this ash about half is phosphate of lime, and 2°7 are alkaline chlorides, the rest being phosphates of magnesia and iron, with a little carbonate of soda. Any notable increase, therefore, in the proportion of ash, or any large diminution of it, will show adulteration. Colouring matter, as annatto, &c., is known by the peculiar tint of the milk; and starchy matters boiled to an emulsion will give their characteristic reactions with iodine, and will furnish a sediment which the micro- scope will reveal. Fatty emulsions, in imitation of milk, were used during the sicge of Paris, on the recommendation of M. Dubrunfaut, who claims to have made a very perfect substitute by emulsifying fatty matter with an artificial whey or serum. This he did by dissolving from 40 to 50 grammes of saccharine matter (lactose, glucose, or cane sugar), and from 20 to 30 grammes of albumen (dried white of egg), and from 1 to 2 grammes of the crystals of carbonate of soda, in half a litre of water, and then emulsifying with from 50 to 60 grammes of olive oil or other fatty substance. This is best done at a temperature of from 120° to 140° Fahr.; and the liquid so

prepared has the appearance of cream, and requires to be mixed with twice its volume of water to acquire the consistence of milk. Gelatine may be used instead of albumen, the mixture being cven more nearly like rich cream than the former. M. Gaudin says that any kind of fat may be used for this purpose, provided it is purified with superheated steam; and M. Fan states that even horse grease may be so employed. M. Dumas, however, is of opinion that none of these substitutes can take the place of milk for any time as dietetical agents. Milk from diseased animals, especially those affected with pleuropneumonia, and the foot-and-mouth disease, is very unwholesome, and ought not to be drunk. The diseased product is recognised by the presence of abnormal inflam- matory globules of the nature of pus, and by a large amount of epithelium cells. Preserved condensed milk is now 80 commonly used for food, that its properties when good should be known. 100 parts of the specimens at present m the market consist of from 14 to 18 parts of casein, from 12 to 14 of butter, from 44 to 52 of sugar, and from 2°4to 2-7 of saline matter—making in all from 77 to 81 parts of solid matter—the rest, namely, from 23 to 19 parts, bemg water. It appears, therefore, that the concentration of the milk has been carried to about one-third of its original bulk, and that sugar has then been added, so that when diluted with twice its volume of water, it makes a sweet-tasting milk of ordinary strength. Good cream should contain rom 25 to 34 parts of butter, about 5 of casein, 2 of sugay, 2 of saline matter, and from 62 to 56 parts of water.

ADULTE

- 9. Coffee has from very early times been the subject of sophistication. As far back as 1725, the Act 2 Geo. I. c. 30, took cognizance. of the practice, and rendered it penal. In 1803 it was the object of very decisive ineasures, for by 43 Geo. III. c. 129, the officers of excise were empowered to search for, and to seize any burnt, scorched, or roasted peas, beans, or other grains or vegetable substance prepared in imitation of coffee ; and any person manufacturing or selling the same was liable to a penalty of £100; gradually, however, it was found that use of torrefied vegetables in lieu of coffee, was becoming general in spite of these restrictions, and, therefore, in 1822, the Legislature (3 Geo. IV. c. 53) thought it expedient to allow the manufacture and sale of scorched or roasted corn, peas, beans, or turnips,

by persons who were not dealers or sellers of coffee or cocoa, provided the same was sold under license in a whole or unground condition, and in its proper name.' The penalty for infraction of the law was £100 in the case of a dealer in coffee or cocoa, and £50 in that of a licensed dealer. At that time the use of chicory was not generally known in England, although it had long before been introduced into France as a substitute for coffee; and its use was encouraged by the first Napoleon, who thought thus to strike a blow at English commerce. It was also used in Belgium and the Nether-lands, so that travellers who visited Paris, Brussels, or Amsterdam, became acquainted with the substitute, and gradually acquired a taste for it. About the year 1820 the first parcels of chicory were imported into this country, and it would seem that the public demand for it gradually increased ; for in 1832 there was a minute of the Treasury nullifying the Acts of George III. and George IV., by allowing grocers and other dealers in coffee and cocoa to sell chicory, provided they did not mix it with coffee. At a later period even this restriction was withdrawn ; for by the Treasury minute of 1840, dealers in coffee were per- mitted to sell a mixture of chicory and coffee, provided a duty of 6d. per lb. was paid on all the chicory imported for home consumption. The use of it being thus legalised, it rapidly came into favour, and English farmers found it profitable to cultivate the root, and to send it into commerce duty free. – This roused the attention of the Government, for the duties on chicory and coffce began seriously to fall off. ven the quality of the coffce imported undcrwent a change; for instead of demanding the fine flavoured varieties, orders were given for a coarse and strong descrip-tion of plantation coffee, which would stand a good deal of chicory, as the grocers phrased it. All this was brought to the notice of the Lords of the Treasury, and in 1852 they revoked the order of 1840. Butso strong was the influence of the trade upon Government, that in the following year the offensive minute was withdrawn, and grocers were again permitted to sell mixtures of coffee and chicory, provided the packet was distinctly labelled "' mixture of chicory and coffee." Thc Treasury even went so far in 1858 as to direct the Commissioners of Inland Revenue, not to object to licensed dealers in coffce keeping and selling mangcl- wurzcl or beet-root mixed with coffee, provided they observed the same conditions as those laid down in the Treasury minute of 1853 as to chicoryand coffee. Up to this time the duty on chicory had been merely nominal; but it was gradually increased until, in 1863, it was equivalent to that levied on coffee, and thus the

revenue was protected, while adulteration was encouraged. The extent to which this was practised may be gathered from the Annual Reports of Mr Phillips, the principal chemist of the Inland Revenue Laboratory. During the years 1856 to 1862 inclusive, when the dealers in coffee and chicory were visited by the officers of Excise, the average number of samples of coffee annually examined was 3053, and of these

90, or nearly 3 per cent. were adulterated—the range being from 51 per cent. in 1856, to 1°8 per cent. in 1862; and the quantity of chicory in the mixture averaged 24 per cent. In 1860 it was 29 per cent. Now, in all these cascs the coffee was sold as pure coffee, with no label upon the package ; but when the mixtures of chicory and coffee were asked for, 7:3 per cent. were improperly labelled, and the average proportions of chicory ranged from 39°8 per cent. in 1859, to 22°3 per cent. in 1862—+the average for the seven years, before the duties were equalised, being 30-7 per cent. In some cases, however, it reached to nearly 90 per cent.—40 to 50 per cent. being common propor- tions ; and to neutralise the peculiar sweetness, and the earthy flavours which such quantities of chicory induced, it was, and still is the practice, to add more or less of the bitter material called " finings," which is a preparation of burnt sugar or caramel. Even chicory itself is now the subject of adulteration with roasted corn, beans, lupin seeds, acorns, horse-chesnuts, peas, pulse (called "' Hambro' pow- der"), mustard husks, coffee husks (called " flights"), and even spent coffee, besides various roots, as carrots, parsuips, mangel-wurzel, beet-root, dandelion, &c. It is even said that spent tan and dried bullocks' livers have been employed for the purpose. The tests for these adulterations arc the appearances presented by the tissucs of the various vegetables when examined under the microscope, and by the fact that infusion of chicory does not become discoloured when it is treated with iodine, as it contains no starchy matters. Ground coffee, also, is of such a greasy nature, from the presence of volatile oil, that when it is thrown upon watcr, it floats, and does not readily discolour the water; whereas, all the adulterating agents quickly sink in water, and give it a brown porter-like appearance. It is not difficult indeed to separate, in a rough way, the coffee from its adulterating matters by merely stirring a given weight of the mixture in a tumbler of cold

water ; after a few minutes, the coffce will be found upon the surface of the water, and the other things at the bottom of it. Chemical analysis also readily discovers the fraud. It might be thought that there was safety in purchasing the coffee-berrics entire, but a very ingenious machine has been patented for the manufacture of spurious berries out of common vegetable substances.

3. Tea.—Formerly, when the supply of tea to this country was entirely under the control of the East India Company, the adulteration of it in China was rarcly practised, as every shipment of it was carcfully examincd by experienced officers at Canton, who rejected all teas of spurious or doubtful character. At that time, therefore, the adultcration of tca was carried on after it was imported into this country, and there were many legislative enactments prohibiting the practice. By the Act 2 Geo. I. c« 3, every tea dealer was subject to a penalty of £100, if he was convicted of counterfeiting, altering, fabricating, or manufacturing tea, or mixing it with other leaves. Later still, the statutes of 4 Geo. II. c. 14, and 17 Geo. III. c. 29, and 4 Geo. IV. c. 14, dealt more precisely with the subject, and imposed other penalties. At that time the adulterations of tea were effected in a wholesale manncr ; for according to Mr Phillips, of the Inland Revenue Office, there were in London alonc, in 1843, as many as eight manufactories in which the exhausted leaves, obtained from hotels, coffee-houses, and elsewhere, were redricd, and faccd with rosc-pink and blacklead, in imitation of genuine tea. More recently, however, the adulteration of tea has becn practised by the Chinese, who find no difficulty in disposing of any kind of spurious tea to English merchants at Canton and Shanghai, who ship it to this country, and lodge it in the bonded warehouses with all the formalities of an honourable transaction, knowing that the difficulties of convicting them under the Adultcration of Food Acts and

Nuisances Removal Acts are almost insurmountable ; for, in the first place, the local sanitary authorities have no means of obtaining direct information of the existence of unsound or spurious tea, or other article of food or drink

in bonded warehouses; and secondly, if such information reaches them indirectly, they have no legal right of entry for the purpose of cxamining the tea and taking samples. But supposing both of these difficulties have been sur- mounted, and the tea has been found on analysis to be spurious, there yet remain the difficulties of obtaining a ‘ justice’s order for its condemnation, an order from the customs for its removal, and an order which will satisfy the requirements of the wharfinger in whose custody it has been placed. But besides these, there are the difficulties of proving the ownership of the article, and the guilty knowledge of the broker who sells it. In illustration of this, we may refer to the proceedings of the sanitary authorities of the city of London in their endeavour to suppress the importation and sale of spurious tea. In the mouth of March 1870, Dr Letheby, the food analyst for the city, reported that a large quantity of spurious tea had arrived in London from China, and was lodged in the bonded warehouses of the city. It was described as “ Fine Moning Congou” from Shanghai; and it consisted of the redried leaves of exhausted tea, much of which had become putrid before drying. It appears to have been called in China “ Ma-loo mixture”——-Maloo being the name of the street where it was prepared, and along the sides of which heaps of this trash might often be seen drying in the sun, with dogs and pigs walking over it. Proceedings were taken under the Nuisance Removal Amendment Act (26 and 27 Vict. c. 117), for the purpose of obtaining an order for the condemnation and destruction of the tea ; but it was argued for the defencc —ls¢, That “‘tea” was not named in the Act of Parliament; 2d, That it was not included under the term “vegetable ;” 3d, That it was not “food ;’ and 4th, That being in a bonded warehouse, it was not “exposed for sale.” The case, however, was so glaring that, after two days’ hearing, an order was given by the justice for its destruction ; but as a case was granted for the opinion of the Court of Queen’s Bench, the order was suspended ; and as the application to the Court was never made, the order is still in abeyance. In another case, where many chests of spurious “scented orange Pckoe siftings” were in bond, the order for its condemnation was refuted on the ground that there was not sufficient evidence of the so-called tea being unwholesome, notwith- standing that it was not above one-sixth its proper strength ; that it had little or none of the active principles of tea; that it had an unpleasant odour and an acrid taste ; that a great portion of it was not tea at all, and that the rest of it was composed of exhausted tea leaves, with

just enough good tea to give it a flavour. A like failure of justice occurred in the cityin 1866, when measures were taken by the sanitary authoritics to prevent the sale of about 350,000 Ibs. of rotten and charred tea which had been saved from a fire at Beal's wharf. The adulterations practised by the Chincse are numerous ; exhausted tea is redried and glazed in a very deceptive manner. Millions of pounds of leaves of different plants, other than tea, are gathered and mixed with it. Mineral matter too, in the form of china clay, fine sand, and iron filings, are ingeniously incorporated with the leaf before curling, so that as much as from 20 to 40 per cent. of impurity is thus mixed with it. The tests, however, for these adulterations are very simple. In the

first place, there is the usual trade test of infusion: a |

quantity of tea, amounting to the weight of a sixpence, is put into a small covered cup, and infused with about four ounces of boiling water for ten minutes. The infusion is then poured off from the lcaves, and is examined for colour,

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taste, and odour—all of which are characteristic. 'The leaves, too, are examined for soundness, for colour, for size, and for special botanical properties. Impurities like iron filings, sand, or dirt, are easily seen among the leaves, or at the bottom of the cup; and when these are placed upon a coarse sieve and washed with water, the impurities pass through, and may be collected for examination. The leaves, too, betray by their coarseness and botanical characters, the nature and quality of the tea; for although the leaves of genuine tea differ much in size and form, yet their venation and general structure are very distinctive. Very young leaves are narrow, convoluted, and downy ; those next in size and age have their edges delicately serrated, aud the venation is scarcely perceptible; while those of larger size have the venation well marked, there being a series of loops along each side of the leaf extending from the mid-rib to the edge: the serrations also are stronger aud deeper, beginning a short distance from the stem and running up the side of the leaf to the apex. In addition to this, the microscopic characters of the surface of the leaf are very characteristic. Further investigations of a chemical nature are sometimes needed to

determine the question of adulteration ; and these depend on the well-known com- position of good tea. In different cases, according to the age of the leaf and its mode of treatment, the proportions of its chief constituents may vary; but in a general way it may be said that the average composition of tea is as follows :—Moisture from 6 to 10 per cent.; astringent matter (tannin), from 25 to 35; gum, from 6 to 7; albuminous matters, from 2 to 3; thein, from 2 to 3; mineral matters (ash), from 5 to 6; and ligneous or woody tissue, from 50 to 60 per cent. Green tea, which is generally made out of young leaves, contains the largest quantity of soluble matters; and these, when fully exhausted from the leaves by successive boiling in water, amount to from 25 to 35 per cent. of the weight of the tea. In ordinary cases, when the tea is merely infused in boiling water, it does not yield above 25 per cent. of extractive, Again, the ash of tea is very characteristic of its quality— old and spurious leaves, as well as tea adulterated with mineral matter, yielding more than 6 per cent. of ash. The chief constituents of the ash of good tea are potash and phosphoric acid, with a little lime, silica, and oxide of iron —there being but a trace of chlorine and sulphuric acid; whereas the ash of old and exhausted leaves contains but little potash and phosphoric acid, in proportion to the lime and silica; and in those cases where tea has been damaged by sea water, the amount of chloride is considerable. Iron filings in tea are easily discovered by means of a magnet, there being in some cases as much as 20 or 30 per cent. of this impurity. Even when incorporated with the leaf before rolling and glazing, the fraud is detected by the attraction of the tea to the magnet.

4, Cocoa in its natural state contains so much fatty matter (amounting to rather more than half its weight), that it has long been the practice to reduce it by means of sugar or farinaceous substances. The first of these pre- parations is called chocolate, and the latter is known by such names as granulated, flake, rock, soluble cocoa, &c. In some cases the mixture is adulterated with mineral matters, as oxide of iron, to give colour. These adulterations are recognised by the appearance and taste of the preparation, by its microscopic characters, by the colour and reaction of its solution, and by the proportions of fat and mineral matters in it.

5. Bread.—Fspecial care has been taken at all times to protect the public from the dishonest dealing of bakers. The assize of bread, for example, is a

very ancient institu- tion ; for it was the subject of a proclamation in 1202, and it was the chief matter referred to in the notable statute of

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the Pillory and Tumbrel (51 Henry III. stat. 16) already | a tough elastic gluten, which, when baked in an oven,

mentioned. In the city of London, according to ‘ Liber Albus,” the assize of bread was an important institution. It was always made immediately after the feast of St Michael in each year, and very specific instructions were given for the guidance of the four discreet men who were to perform it; for their decision regulated the business of the baker in respect of the price and quality of bread, &c., for the current year; and woe to him if he disregarded it— there being numerous instances in ‘ Liber Albus” of the pillory aud the thew in cases where bread had been found adulterated or of short weight. In the time of Anne, the assize of bread was still further regulated (8 Anne, c. 19), and in the year 1815 it was abolished by the statute 55 Geo. III. c. 99. Especial provision, however, was made to guard against the frauds of adultcration, for several Acts of Parliament, especially 31 Geo. I]. c. 29 and 1 and 2 Geo. IV. c. 50, prohibited the use of alum and other spurious articles in bread under severe penalties. At the present time, the chicf adulterations of bread are with alum or sulphate of copper for the purpose of giving solidity to the gluten of damaged or inferior flour, or with chalk or carbonate of soda to correct the acidity of such flour, or with boiled rice or potatocs to enable the bread to carry more water, and thus to produce a large number of loaves per sack of flour. In practice 100 Ibs. of flour will make from 133 to 137 lbs. of bread, a good average being 136 Ibs. ; so that a sack of flour of 280 lbs. should yield 95 four-pound loaves. But the art of the baker is exercised to increase the number, and thisis accomplished by harden- ing the gluten in the way already mentioned, or by means of a gummy mess of boiled rice, three or four pounds of which, when boiled for two or three hours in as many gallons of water, will make a sack of flour yield at least 100 four-pound loaves. Such bread, however, is always dropsical, and gets soft and sodden at the base on standing, and quickly becomes mouldy. A good loaf should have kindness of structure, being

neither chaffy, nor flaky, nor crummy, nor sodden. It should also be sweet and agreeable to the palate and the nose, being neither sour nor mouldy. It should keep well, and be easily restored to freshness by heating it in a closed vessel. And a slice of it, subjected to a-temperature of from 260° to 280° Fahr. should hardly:be discoloured, and should not lose more than 37 or 38 per cent. of its weight. When stecped in water, it should give a milky sweet solution, and not a ropy acid liquid. The recognition of alum and sulphate of copper in bread requires practice and skilful manipulation, it being surrounded with difficulties. The most easily applied process is that described by Mr Horsley. He makes a tincture of logwood, by digesting a quarter of an ounce of the freshly cut chips in five ounces of methylated spirit for eight hours, and filters. A teaspoonful of this tincture is put with a like quantity of a saturated solution of carbonate of ammonia into a wine-glassful of water ; and the mixed solutions, which are of a pink colour, are then poured into a white-ware plate or dish. A slice of the suspected bread is allowed to soak in it for five minutes, after which it is placed upon a clear plate to drain, and, if alum be present, it will, in the course of an hour or two, acquire a blue colour ; if the tint be greenish, it is a sign of sulphate of copper ; whereas pure bread gradually loses its pink colour, but never becomes blue or green. The ash of bread will also furnish evidences of the presence of mineral impurities.

6. Flour and other Farinaceous Matters—-The tests for good flour are its sweetness and freedom from acidity and inusty flavour. A given weight of the flour, say 500 grains, made into a stiff dough with watcr, and then carefully kneaded under a small stream of water, will yield

expands into a clean-looking ball of a rich brown colour, that weighs, when perfectly dry, not less than 50 grains. Bad flour makes a ropy-looking gluten, which is very difficult of manipulation, and is of a dirty brown colour when baked. The ash of flour should not exceed 2 per cent, Other farinaceous matters are recognised under the microscope by the peculiar form, and size, and marking of the individual granules. In this way, the adultcrations of oat-meal with barley-meal, and of arrow-root with inferior starches, may be easily detected.

7. Fatty Matters and Oils are the subjects of frequent adulteration, Butter and lard, for example, are mixed with inferior fats, and with water, salt, and farina. Most of these impurities are seen when the sample of butter or lard is melted in a glass, and allowed to stand in a warin place for a few hours, when the pure fat will float as a transparent oil, while the water, salt, farina, &c., will subside to the bottom of the glass. Fresh butter generally contains a notable quantity of water, as from 12 to 13 per cent., and sometimes a little salt, and a trace of curd; but these should never excced two per cent. in the aggregate. Foreign fats are recognised by the granular look of the butter, by its gritty feel, by its taste, and by its odour when warmed. Other tests for these impurities are the melting-point of the sample, and its solubility in a fixed quantity of ether at a temperature of 65° Fahr. 20 grains of the sample, treated with a fluid drachm of ether, in a closed test tube, will look slighty flocculent, and bealmost entirely dissolved in the case of good butter ; but it will be mealy and liniment-like with lard, granular with dripping, and almost solid with mutton fat. The melting point of different fats is as follows :—Horse grease, 140°; calf fat, 136°; mutton fat, 130°; beef fat, 99°; hog's lard, 81°; and butter, 80°.

Oils are adultcrated with inferior kinds, and the fraud is detected by means of the specific gravity of the oil, and its chemical reactions when tested upon a white plate with a drop of concentrated sulphuric acid—the colour and its time of developmeut being the indications of the quality of the oil. The specific gravity of the animal oils are as follows :—Neat's-foot oil, 880 ; tallow oil, 900 ; dolphin oil, 918; cod-liver oil, 921 to 926; whale oil, 927; seal oil, 934; porpoise oil, 937. Among the vegetable oils the following are the most important :—Rape or colza oil, 913 to 916; olive oil, 918; filbert oil, 916; becch-nut, 922 ; walnut, 923 ; cotton-secd, 923 to 928; poppy, 924; sweet almond, 918 to 922; hazel-nut and hemp-seed, 926; and linseed, 634 to 936.

8. Isinglass is often adulterated with gelatine, the fraud being ingeniously contrived so as to retain to a large extent the well-known characters of genuine isinglass ; but it may be recognised in the following way: immersed in cold water, the shreds of genuine isinglass become white and opaque like cotton threads, and they swell equally in all directions, whereas those of gelatine become transparent and ribbon- like. Isinglass dissolves

completely in boiling watcr, and makes a slightly turbid solution, which has a faint fishy smell, and is without action on litmus paper; whereas gelatine leaves a quantity of insoluble matter, and the solution smells of glue, and has an acid reaction. Strong acetic acid swells up the shreds of isinglass, aud renders them soft and gelatinous; but it hardens gelatine. And, lastly, the ash of genuine isinglass is very small in quantity, and has a reddish colour ; whereas that of gelatine is bulky (weighing from 2 to 3 per cent.), and has a perfectly white appearance from the presence of calcareous salts. Genuine isinglass is produced from the swimming-bladder or sound of the sturgeon, but gclatine is a sort of clarified glue obtained from bones, clippings of hides, &c. Boussingault states that the Bouxwiller glue, which is prepared from the

bones of horscs slaughtered at that establishment, is trans- parent, and nearly colourless, and is on that account much sought after by restaurateurs for making jellies. It enters largcly, too, into the composition of French gelatine.

9. Sugar—During the last ten or twelve years the manufacture of sugar from starch has been an important branch of industry. The product is sent into commerce under the names of glucose, saccharum, and British sugar ; and although it is chiefly used for brewing purposes, it is also employed for adulterating brown sugar, and for making confectionary, jams, marmalades, and fruit jellies. In the year 1870, as much as 25,737 cwt. of this sugar was manufactured for home consumption, and since then the quantity has been increasing. It is produced from rice or other starch, by submitting it to the action of very dilute sulphuric acid at a boiling temperature—the acid being afterwards neutralised with lime, and the solution evapo- rated to the setting point. The crystals of grape sugar arc very small, and are entirely without that sparkling character which distinguishes cane sugar. They are less soluble in water, but more so in alcohol, than cane sugar, and they have only about one-third the sweetening power. Boiled with a solution of caustic potash, they quickly produce a deep brown liquid, and they have the power of reducing the hydrated oxide of copper, when heated therewith in an

alkaline solution. hese characters are distinctive of it, and will serve to recognise it in the brown sugars of commerce.

10. Mustard is generally so acrid and powerful in its flavour that it is commonly diluted with flour, or other farinaceous matter, turmeric being added to improve its appearance. he mixture is recognised by means of the microscope, when the granules of starch and the colouring matters of turmeric are easily seen. Genuine mustard does not contain starch, and therefore does not become blue when it is treated with a solution of iodine.

11. Spices, as pepper, cinnamon, curry powder, ginger, cayenne, &c., are more or less the subjects of fraudulent adulteration, which can readily be detected by the micro- scope, and by an examination of the mineral constituents. Formerly, pepper was ground by the retail dealer, and then there was uo excuse for the presence of adulterating agents ; but in 1856, the wholesale dealer undertook the business of grinding, and from that time adulteration has been on the increase. In some cases, the article does not contain a trace of pepper, but is made up of gypsum, mustard husk, and a little starch. In the Ninth Report of the Commissioners of Inland Revenue, there is a statement by Mr Phillips, the chief chemist of the Excise, that he found a sample of so-called pepper containing 25 per cent. gypsum, the rest being mustard husks and a little cereal starch, without a trace of pepper. Another sample con- sisted of 16 per cent. gypsum, 44 mustard husks, a little cereal starch, and the rest pepper. our other samples, closcly resembling pepper, so as to deceive an inexperienced eyc, were found to contain about 22 per cent. of gypsum, with sand, starch, and mustard husk. Linseed meal and powdered capsicums are likewise used for adulterating pepper. The chief sophistications of ginger powder are sago-meal, ground rice, and turmeric ; while the colouring agents of curry powders and cayenne arc ferruginous earths, brick dust, and even vermilion and _ red-lead. Spices, too, are sometimes exhausted of their active pro- perties before they are ground and sold to the public.

. 12. Beer, Ale, and Porter.—The assize of ale is con- temporaneous with that of bread, being described as the "Assisee Panis et Cervesie," in old documents. In the statute 51 Henry III. c. 16 (1266), they are spoken of as

ancient and well-known institutions, the object of them being to regulate the quality and pricc of these articles,

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The officers appointed to determine the goodness of alc were called "ale conners," or 'ale tasters" (gustatores cervisiv), and were elected annually in the court-lect of each manor, and in the city of London at the ward-mote, according to the advice and assent of the alderman and other reputable men of the ward. Very specific instructions are given in Liber Albus of the business of the brewer, and of the penalities for any default thereof—it being ordained that no ale should be sold without having been tasted and approved by the ale conncrs of the district. Even now these officcrs are elected in the city of London with the old formalities, but the real duty of examining the quality of ale, beer, and porter has for many years becn in the hands of the Excise. As far back as the time of Anne there was a law prohibiting the use of Cocculus imdicus or any unwholcsome ingredient in the brewing of becr, under severe penaltics, the brewer being restricted to the use of malt and hops alone; but gradually, as the taste for porter came into, fashion (since 1730), and during the French war, when the price of malt was very high, certain colouring matters prepared from burnt sugar were allowed to be used, and this at last became so necessary to the trade, that it was legalised by the Act 51 Geo. III. c. 51. Five years after, however, it was prohibited by the statute 56 Geo. III. c. 58, which declared that after the 5th of July 1817, no brewer, or dealer, or retailer of beer, shall receive, or use, or have in his possession or custody, any liquor, extract, or other material or preparation, for- the purpose of darkening the colour of worts or beer, other than brown malt. He was also prohibited from using molasses, honey, liquorice, vitriol, quassia, Cocculus indicus, grains of paradise, guinea pepper, or opium, or any extract or preparation of the same, or any substitute for malt or hops, under a penalty of £200; and no chemist or vendor of drugs was permitted to sell, send, or deliver any such things to a brewer or retailer of beer under a penalty ot £500. Later still, in 1830, the Act for permitting the general sale of beer and cider by retail in England (1 Will. IV. c. 64), declares that if any person so licensed shall knowingly sell any beer, ale, or porter, made otherwise than from malt and hops, or shall mix, or cause to be admixed, any drugs or other peruicious

ingredients with any beer sold in his house or premises, or shall fraudulently dilute or in any way adulterate any such beer, &c., shall for the first offence forfeit and pay a sum of from £10 to £20, and for the second offence shall be adjudged disqualified from selling beer, ale, or porter for two years, or forfcit asum of from £20 to £50; and the same regulations applied to cider and perry. The execution of these acts rested with the Excise, and it would seem that three classes of adulterations were practised, namely, lsf, Those which gave fictitious strength to the beer, as Cocculus indicus, tobacco, opium, &c.; 2d, Those which improved the flavour and body of the beer, as grains of paradise, capsicum pods, ground ginger, coriander seeds, carraway seeds, sweet flag, liquorice, molasses, and salt; and, 3d, Those which gave bitterness, as quassia, chiretta, horehound, gentian, &c. In London the publicans were not in the habit of practising the first kind of adulteration, but confined themselves to the second and third. In the country, however, according to Mr Phillips, it was quite otherwise, especially with brewers who retailed their own beer; for he found that they fre- quently uscd tobacco and Cocculus indicus. He even thinks that the cases of brutal and purposeless violence which were so often recorded were referable to the madden- ing influence of these ingredients. By the Act 24 and 25 Vict. c, 22 (1863), when the duty on hops was relieved, these bitters and substitutes were permitted, and so also was sugar, provided the full duty of 12s. 8d. per cwt. was paid upon it. Later still, by the Licensing Act 1872 (35

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and 36 Vict. c. 94), provision is made to protect the public from the adultcration of beer; for it prohibits the possession, sale, or use of beer adulterated with Cocculus indicus, chloride of sodium (otherwise common salt), cop- peras, opium, Indian hemp, strychnine, tobacco, darnel- sced, extract of logwood, salts of zinc or lead, alum, and any cxtract or compound thereof, under a penalty of £20 for the first offence, and £100 for .the second offence, together with disqualification of both the dealer and the house for a certain period. The police and the officcrs of Inland Revenue are empowered to search for and obtain samples of such beer, and the analyst is a person appointed by the Excise. The tests for the adulteration of beer, ale, and porter, are not easily applied except by a skilled chemist ; but

it may be said that the chief qualities of good beer are its density, sweetness, spirituosity, piquancy, flavour, and frothiness. The density of ale and beer ranges from 1008 to 1020 (water being 1000)—the average being 1015 ; and in the case of porter it ranges from 1015 to 1020. The amount of alcohol in these beverages ranges from 5 to 9 per cent., the average being about 7. .The solid extract is from 4 to 6 per cent., and the ash or mineral matter is from 0°2 to 0°3 per cent. very little of which should be common salt. '

13. Malt.—The Excise do not permit malt to be adul- terated with ungerminated grain ; but it is very difficult to determine whether the presence of these grains is accidental or otherwise, as in some wet seasons when barley is badly stacked it will heat or become mouldy, and the grains will lose their vitality. Evenif the grain is dried artificially at a temperature of from 140° to 150° Fahr., the vitality of the sced will be destroyed. In some seasons as much as from 34 to 70 per cent. of the grain will be killed. Roasted unmalted grain, instead of the malted, is prohibited by 19 and 20 Vict. c. 34, but there is no doubt that the substitution is largely practised.

14. Wine and Spirits.—The denunciations in the Scripture against the use of mixed wine has reference, in all probability, to wines which were fortified or adulterated with stimulating and intoxicating herbs. In this country measures werc taken at a very early period to prevent the sale of unsound and unwholesome wine. The Vintners' Company, for example, which was incorporated in the reign of Edward the Third, under the name of the " Wine Tonners," had control over the price and purity of the article, there being chosen every year "persons of the most sufficient, most true, and most cunning of the craft (that hold no taverns)," who were to see to the condition of all wines sold by retail, and who were to govern the taverners in all their proceedings. Bad or adulterated wine was thrown into the gutters, and the possessors thereof were set in the pillory. It would seem that the wince which was most adulterated was that called Gascoign ; for in the tenth ycar of the reign of Henry the Sixth (1432), there was a petition to the king on the subject, praying him to amend the same. Stowe, in fact, says "that in the 6th of Henry VI, the Lombardes currupting their sweete wines, when the knowledge thercof came to John Ranwell, maior of London, he, in divers places of the citic, commanded the heades of the buts and other

vesscls in the open streetes to be broken, to the number of fifty, so that the liquor running forth passed through the citie like a stream of raine water, in the sight of all the people, from whence there issucd a most loathsome savour." In modern times the art of adulterating wine has been brought to great perfection ; for it consists not merely in the blending of wines of different countries and vintages, but in the use of materials which are entirely foreign to the grape. Port wine, for cxample, is manufactured from Beni Carlos, Figueras, and red Cape, with a touch of Mountain to soften the mixture and give it richness—

the body and flavour being produced by gum-dragon, and the colour by " berry-dye," which is a preparation of German bilberries. To this is added the washings of brandy casks ('brandy cowe"') and a little salt of tartar to form a crust. Sherry of the brown kind and of low price is mingled with Cape and cheap brandy, and is flavoured with " brandy- cowc," sugar-candy, and bitter almonds. If the colour be too high it is lowered by means of blood, and softness is imparted to it by gum-benzoiu. Pale sherries are produced by means of plaster of Paris or gypsum, by a process called "plastering," and the effect of it is to reniove the natural acids (tartaric and malic), as well as the colour of the winc. In this way a pale, dry, bitter, and sub-acid winc is produced, charged with the sulphates of lime and potash. Large quantitics of what are called clarets are manufactured in this country from inferior French wine and rough cidcr, the colour being imparted to it by turnsol or cochineal. Madeira is . produced from Vidonia with a little Mountain and Cape, to which are added bitter almonds and .sugar. Even Vidonia and Cape are adulterated with cider and runi —carbonate of soda being used to correct the acidity. Common Sicilian wine is transformed into Tokay, Malaga, and Lachryma Christi. Champagne is produced from rhubarb stalks, gooseberries, and sugar, the product being largely, consumed at balls, races, masqucrades, and public dinners. Of late, too, since the investigations of Petiot, Thenard, Gall, Hussman, and others, the manufacture of wine from sugar and the refuse husk or mark of the grape has been largely practised, insomuch that a great part of the wine of France and Germany has ceased to be the juice of the grape at all. In point of fact, the processes of blending, softening, fortifying, sweetening, plastering,

é&c., &c., are carried on to such an extent that it is hardly possible to obtain a sample of genuine wine, even at first hand; and books are written on the subject, in which the plainest directions are given for the fabrication of every kind of wine, there being druggists called '" brewers' druggists," who supply the agents of adulteration. Thesc are as follow:—Elderberry, logwood, brazil-wood, red saunders-wood, cudbear, red beet-root, &c., for colour; litharge, lime or carbonate of lime, carbonate of soda, and carbonate of potash, to correct acidity ; catechu, logwood, sloe-leaves, and oak-bark, for astringency; sulphate of lime, gypsum, or Spanish earth, and alum for removing colour ; cane sugar for giving sweetness and body; glucose or starch sugar for artificial wine ; alcohol for fortifying ; and ether, especially acetic ethcr, for giving bouquet and flavour. The tests for these agents are not readily applied, except: by the professional chemist; but they are promptly recognised by the stomach and the brain, for good wine, though it may intoxicate, rarely leaves a disagreeable impression. In a general way, it may be said that the specific gravity of genuine wine ranges from 991 to 997; and the amount of alcohol in it never exceeds 20 per cent. by volume. The solid residue in it, when evaporated to perfect dryness, amounts to from 1:33 to 2:15 per cent. in Rhine wines, and in the light wines of France; to from 2°85 to 3°73 per cent. in Teneriffe and Cape; to from 3°49 to 4°54 per cent. in sherry and Madeira; and to from 3°75 to 5:24 in port. Sweet wines, as Lachryma Christi, Muscat, Malaga, Tokay, Bergerac, champagne, and the wines of the Palatinate, contain a much larger percentage of solid matter in them. The ash, or involatile constituents of wine, should range between 0°19 and 0°5 per cent. It should be strongly alkaline, and should consist of carbonatc, sulphate, and phosphate of potash, chloride of sodium, carbonate of lime, and a little alumina. As a distinctive mark of genuinc wine, the ash is of the greatest value. Again, pure winc gives but slight precipitates with oxalate of ammonia, with acid nitrate of silver, and acid nitrate of baryta. The

colouring matters of wine may be separated and analysed by the process of Mulder, which is too elaborate for description in this place, and so also are the tests for recognising spurious colours, as the test of Vogel, Jacob, and others (solutions of acetate of lead), that of Pelouze and Frenny (basic

acetate of cad); of Ness von Esenbeck solutions of alum and of carbonate of potash) ; of Batilhat Co of Filhol (ammonia and sulphide of ammonium); and others. At present, the spectroscope has not furnished, as was expectcd, any very reliable indications of the nature of the colouring matters of wine. In fact, the whole subject requires fuller investigation. The adulteration of spirits consists mostly in the addition of water and in the use of inferior spirit, recipes being given in the Dublican's Guade, and other such books, for what is called making up spirits for sale. The recognition of these frauds rests with the Excise, under the Act 35 and 36 Vict. c. 94.

15. Tobacco and Snuff.—The adulteration of these articles is prohibited and otherwise provided for by the statutes 5 and 6 Vict. c. 98, and 25 and 26 Vict. c. 7, and 30 and 31 Vict. c. 90, manufacturers of tobacco and snuff being prohibited from using or having in their possession sugar, honey, molasses, treacle, leaves, herbs, or plants, powdered wood, moss, weeds, sea-weeds, or any ground or unground roasted grain, chicory, lime, sand, umbre, ochre, or other earths, nor anything capable of being used to increase the weight of tobacco or snuff, under a penalty of £200—watcr alone being allowed in the inanufacture of tobacco; and water, salt, and alkaline salts, as well as lime in the manufacture of snuffs, under a penalty of £300. But it appears from the reports of the Commissioners of Inland Revenue, that the adulteration of tobacco and snuff is still largely practised. Tobacco is adulterated with molasses, sugar, aloes, liquorice, gum, eatechu, oil and lamp-black, alum, tannic acid and iron, log- wood, and such leaves as rhubarb, chicory, cabbage, bur- dock, colts-foot, and excess of salt and water. In the year 1862 it was discovered that certain Irish manufacturers were adultcrating their Cavendish and roll-tobacco with liquorice, in imitation of the sweetened Cavendish of North America, and therefore in 1863 the practice was legalised in the case of Cavendish and negro-head by the Manufactured Tobacco Act, 1863. Snuffs are adulterated with excess of alkaline salts, lime, sand, ferruginous earths, fustic, torrefied oat- meal, peat-moss, ground velonia cups, bichromate of potash, and chromate of lead. Mr Phillips states, in the Yourth Lteport of the Commissioners of Inland Revenue, that up to 1856 the praotice of adulterating snuff was very prevalent, particularly in Ireland—52 per cent. of the samples analysed being found to be illicit; in 1858 and subsequently, however, the proportion has been much less, These adulterations are recognised by drying the

sample, and noting the loss of weight, and by the amount and nature of the ash left on incineration. Foreign leaves, é&c., are discovered by the aid of the microscope.

16. Among the adulterations which are practised for the purpose of improving the appearance of the article, and giving it a false strength, are the following :—The addition of alum or sulphate of copper to bread ; the facing of black tea with black lead, and of green with a mixture of endugo or Prussian blue with turmeric and china clay; the treat- ment of pickles and preserved fruits with a salt of copper, which has the property of mordanting and brightening the green colouring matter of vegetables. In some cases the quantity of copper has been so large as to give a coppery appearance to a steel knife or fork kept in the pickle; but at all times the metal may be discovered by the pink colour of the ash, and by its becoming blue when treated with a little strong ammonia. Jerruginous earths are added to sauces, anchovies, potted meats, and the preparations of

cocoa. This also is recognised by the amount and colour oftheash. Jfineral pigments, as ycllow and orange chromate of lead, green arsenite of copper, &c., are frequently used in colouring confectionery, and have produced serious results to those who have eaten it. Lastly, with a view of giving falsc strength to the article, sulphuric acid has been added to vinegar and lime-juice ; black jack or burnt sugar to coffee and chicory ; catechu or terra japonica to exhausted tea; Cocculus indicus to beer and porter; cayenne and mustard husks to pepper, &e.

17. Adultcrations are also practised for the purpose of debasing the article, as when the cream is taken from milk by the process of skimming; or when the active principles of spices, &c., have been removed by distillation.

18. Accidental adulterations may occur from the admix- ture of darnel or ergot with flour; siliceous and earthy matters with substances that are ground in a mill; mould or acari with flour, sugar, cheese, &c.; and copper, zine, or lead may be accidentally derived from the vessels in which any acid substance or liquid has been prepared or kept. In this manner cider and

winc have become tainted with lead; sour milk with zinc; and jellies, jams, and preserves with copper.

19. Adulteration of Cattle Foods.—In a recent trial, where the question of adultcration was raised, a linseed- cake maker stated in evidence that his ordinary oil-cake consisted of 50 parts ground sesamé cake, 20 parts of bran, and 30 of linseed and linseed siftings. To prevent the detection of this fraud by an examination of the cake with the naked eye, it is customary to powder the materials very fine by means of a machine called a " Buffein machine," after which they are thoroughly mixed together and pressed into a cake. It would seem, indeed, that pure linseed cake is not saleable, except in a few localities, as in the neigh- bourhood of Gainsborough, and in the agricultural centres of Lincolnshire and Norfolk, where the genuine cake is appreciated. Elsewhere the adulterated article commands a ready sale, on account of its low price; and thus encouragement is given to the use of all sorts of adulterating agents, as earth-nut, cotton, beech, and sesamé bran, rice- husks, oat-dust, and other such worthless matter. Very recently this important subject has been treated by Dr Voelcker in a paper " On the Characters of Pure and Mixed Linseed Cakes," which was published in the Journal of the Royal Agricultural Society of England (vol. ix. part 1). Some of the impurities of linseed cake may be due to the accidental presence of the secds of various weeds and wild plants, which the careless farmer has allowed to grow upon his land. Most of these, however, are easily removed by one or two siftings, as in the case with clean linseed ; but the siftings are not thrown away; they are used for adulterating other samples of linseed—making the second, third, and even fourth qualities of Riga and St Petersburg seed. Occasionally the siftings are sent out to sea in barges to meet the vessels coming from the north with linseed on board; there the mixture is made; and when the vessels reach the port for which they are destined, the cargo is sold for genuine linseed "as imported." But besides these impurities, the linseed cake of commerce contains a large proportion of other cakes, as rape, earth- nut, decorticated and undecorticated cotton seed, beech-nut, hemp-seed, cocoa-nut, cocoa, palm-nut, palm-kerncls, niger seed, sesamé or teal seed, poppy, castor oil, bassia, curcas, indigo seed, olive, &c., besides bran, acorns, careb-beans, and the husks or shades of earth-nut, oats, barley, rice,and other refuse. Some of these things are actually poisonous to cattle, as in the case of castor-oil cake, curcas bean,

purging flax, wild mustard, wild radish, &c.; others are of doubtful quality, as corn cockle, darnel, indigo seed, earth-nut, &c.; and many are disagrecable to the taste, om

account of rancidity and other properties, as cocoa-nut cake, palin-nut cake, bassia cake, &e. ; while many are so charged with woody matters as to be indigestible and irritating in their action, as cotton, olive, palm-nut, husks of rice, cocoa-nut fibre, saw-dust, &c. These impurities are sometimes easily recognised by the naked eye, or by a lens of low power. At other times the colour of the cake is an indication of itsimpurity. The taste of it also is frequently characteristic ; for while linseed has a sweet mucilaginous taste, rape sced is turnipy, mustard acrid, dodder like garlic, bassia bitter, &c. Then, again, the action of a little warm water will develope the flavour of impurities—rape giving off a strong odour of turnip, mustard its well-known acrid flavour, wild radish and other impurities their characteristic smells. When examined chemically it is found that adulterated and dirty cakes show a deficiency of oil and albuminous matter, and a large excess of woody fibre and mineral substance. In good cake the moisture ranges from 10 to 14 per cent., the oil from 10 to 15, the albuminous matter from 25 to 35, the mucilage, sugar, and digestible fibre to from 20 to 30 per eent., the woody fibre to from 9 to 14, and the mineral matter or ash to from 6 to 8 per cent. Cake that has been shipped too fresh is apt to heat and become mouldy; in which case it will lose its fine aroma, and be of inferior quality: it may even be injurious to animals feeding on it.

20. Lhe Adulteration of Seeds, in fraud of her Majesty's subjects, and to the great detriment of agriculture, has been provided for by the Act 32 and 33 Vict. c. 112, wherein it is prohibited to kill, dye, or to sulphur seeds, or any way to give them a false appearance, under a penalty of £5 for the first offence, and £50 for the second. But for all this extensive frauds are practised : turnip sced is adulterated with rape, wild mustard or charlock, the vitality of which has been destroyed by kiln-drying at a high temperature ; old turnip seed (kiln-dried) is also used for diluting fresh seed ; and it is notorious that such seed can be obtained in commerce by the ton. Again, clover seed is often killed and dyed—one of the commonest frauds

being to dye trefoil, and to sell it for red clover ; the pinkish or yellowish-brown tint and metallic look being given with a weak solution of logwood and alum, or with a strong solution of logwood alone, and then it is shaken up with a little black lead. Another trick is to dye white clover seed with a weak solution of indigo, and thus to make it look like hybrid clover which has a bluish-green colour. When trefoil and white clover secd have become changed by age and have lost their yellowish colour, they are dyed with infusion of turmeric, and then toned down with the fumes of burning sulphur; in fact, these fumes are used to brighten up all sorts of seeds that have become brown by keeping, but they destroy the vitality of the sced.

21. Adulteration of Drugs.—This at all times has been considered a serious offence. In the city of London, the president and censors of the College of Physicians have power to scarch for apothecaries' wares, drugs, and stuffs, and on finding them defective, corrupted, and not meet nor convenient to be ministered in any medicines for the health of man's body, they are to destroy them, and are to correct and punish the offenders by committing them to prison, aud amercing them in a penalty not exeeeding £20. These wholesome powers were granted to the college by the Acts 14 and 15 Hen. VIII. c. 5, and 32 Hen. VIII. c. 40, and 2 Mary, « 9; but although they are still in force, and might be advantageously exercised, yet they have long since fallen into disuse ; and if it had not been for the laudable efforts of the Pharmaceutical Society of Great Britain, there would have been no practical remedy for thé adulteration of drugs. The Society was founded in 1841, for the purpose of advancing

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the status and education of those who were engaged in the preparation and sale of medicines, and it was incorporated by Royal Charter in 1843. A few years after, in 1852, the qualifications of pharmaceutical chemists were regu- lated by Act of Parliament (15 and 16 Vict. c. 56), and in 1868 it was further provided, by the 31 and 32 Vict. ce. 121, that no person should be permitted to engage in the sale or dispensing of medicines, or to use the title of chemist and druggist, or dispensing chemist, or pharmaceutist, without being duly qualified, and registered as a pharma- ceutical chemist.

The adulteration of medicine was also prohibited by the incorporation of the Adulteration of Food and Drink Act 1860 (23 and 24 Vict. c. 84), it being declared that such adulteration should be deemed an ad- mixture injurious to health. More recently, in 1872, the Act 35 and 36 Vict. c. 74, renders it penal for any one to adulterate a drug for sale, or to sell such drug. In the first case the penalty is a sum not exceeding £50, to- gether with the costs of the conviction; and for a second offence he shall be guilty of a misdemeanour, and be im- prisoned for a period not exceeding six calendar months, with hard labour. In the second case, the seller of an adulterated drug is subject to a penalty not exceeding £20, together with eosts; and for a second offence he shall have his name, place of abode, and offence pub- lished in any manner that the justice thinks fit. The chief adulterations and debasing of drugs are the follow- ing :—In the case of vegetable substances, as jalap, opium, rhubarb, cinchona bark, &e., foreign substances are added to make up for the loss of weight in drying and powdering, there being in many cases a trade allowance of only four per cent. for such loss, whereas in almost all eases it ex- eeeds this. Roots, seeds, and barks, for example, lose from 6 to 9 per eent., sceammony 7 per cent., aloes 9, sarsaparilla 10, squills 12, and opium from 15 to 25 per cent. At other times foreign substances are added to assist the grinding, or to improve the appearance of, the article. Occasionally the active principles are removed, or the medicine has become worthless from keeping or from faulty preparation. In the case of the alkaloids, inert substances, as sugar, starch, gum, &c., are mixcd with them to increase their weight and bulk. Lastly, the activity of a vegetable drug may greatly depend on its mode and place of culture. With respect to mineral preparations, there is even a still larger field for adulteration, insomuch that the purity of the article is entirely regulated by the wholesale price of it. Again, directly after the Act of 1856 (18 and 19 Vict. e. 38), which permitted the sale of methylated spirit —that is, inferior spirit mixed with wood-naphtha, duty free for manufacturing purposes—advantage was taken of it by many chemists and druggists, and the eheap spirit was used for making tinctures and other medicinal preparations. This, however, came at last to be so serious and dangerous a practice, and was withal so great a fraud on the revenue, that means were taken to suppress it by the Act 29 and 30 Vict. « 64, wherein it is provided that such spirit shall not be used in any medicinal preparation, except in the manufacture of chloro- form, ether, and the vegetable

alkaloids, or in the preparation of other things whereby the spirit was afterwards entirely: dissipated. But Mr Phillips remarks, in the Vinth Report of the Commissioners of Inland Revenue, that a few instances have been discovered of the sale of drinks under the names of " Indianna brandee," "medicated whiskce," "pure Islay mountain," "Indian tincture," é&c., the exciting principle of all of which was found to be hyponitrous ether prepared from methylated spirit. In the case of a drink called "Hollands whiskee," it was produced by distilling the methylated spirit with a little nitrie acid, and then sweeten- ing with treacle, and flavouring with rhubarb, ehloroform,

fenugreek, &c., so as to conceal its real character ; and notwithstanding its disagreeable flavour, it got into public favour in some districts, éspecially in Ireland, and was largely sold as a cheap means of producing intoxication.

92. The Adulteration of Textile Fabrics.—Woollen goods have for years past been largely adulterated with refuse fibres called "shoddy" or "mingo." The practice was denounced by Latimer in one of his sermons at Paul's Cross, preached before king Edward in 1635, wherein he spoke of it as the devil's artifice, saying that they were wont to make beds of flock, but now they had turned it into dust, which he aptly called 'Devil's dust," and that the cloth worker did so incorporate it to the cloth that it was wonderful to see. The practice is still in vogue, for there is hardly a piece of cheap cloth without it. Shoddy as originally used was merely the fluff or waste from the looms, but now it consists of any kind of woollen rubbish, as old blankets, stockings, &c., pulled to pieces in a machine called the "Devil." Mingo is even a shorter description of fibre, and is made in the same way from old rags. No less than forty millions of pounds of these are made annually in Yorkshire, at an estimated value of eight millions sterling, and all of it is used for adulterating woollen cloth. There is even another kind of refuse called "extract," which is employed for the same purpose. It consists of the wool obtained from the rags of mixed goods; that is, goods which have a cotton or linen warp blended with wool. The cotton is destroyed by chemical agency, chiefly by means of dilute sulphuric acid, and the wool is left intact.

The cotton fabrics and gray goods of Lancashire and Yorkshire are largely adulterated with size and china clay, the object being to give them increased weight and sub- stance. Up to about twenty years ago the sizing of cotton goods was effected with a mixture of fermented flour, paste, and tallow, by which means the tenacity of the warp was increased and the friction of weaving was lessened. To effect this about 20 per cent. of size was used; but in 1854, when tallow became dear in consequence of the Russian war, a substitute was found in china clay. Later still in 1862, when the cotton famine began to be felt, and the long-fibred American cotton grew scarce, it was found necessary to give tenacity to the twist made from shorter fibre by using more size. In this manner as much as from 50 to 90 per cent. of size has got to be used, the greater part of it being china clay, with a certain proportion of hygroscopic matter, such as chloride of magnesium, to keep the material damp and supple. The impurity is easily detected by washing the cloth, and ascertaining the loss of weight before and after the operation. Cheap calicoes are also largely impregnated with lime, which has been used in the process of bleaching, and left in them. A cloud of dust flies out of such fabrics when they are torn. Silk also is made heavier and stouter by the incorporation of dye stuffs used expressly for the purpose. This is generally the case with dark-coloured silks, black and brown, as lighter shades will hardly admit of it; as much indeed as half the weight of the silk may be thus incorporated with it. DA

23. Falsification of Coin and Precious Metals.—In Anglo- Saxon times the debasing or counterfeiting of coin was punished by the loss of the hand. In later times it has been criminal in the highest degree. By the statute 24 and 25 Vict. c. 99, the counterfeiting of gold or silver coin is felony, and in Scotland is a high crime and offence. Hardly less severe is the punishment for debasing, diminishing, lightening, or impairing the value of the current coin of the realm; and very effectual means are taken to secure their standard value when put into circulation. In the first place, an officer is appointed by the Crown to super-

(See Minr and Cornacer.) In the second place, the coin is tested, as to its weight and fineness, by persons skilled in the goldsmith's craft. (See Assay.)

But notwithstanding this, the coins of the realm, as issued from the mint, have often been debased to a considerable extent ; for, according to Lord Liverpool, the total debasement of the silver money of this country, from the time of the Conquest to the reign of Elizabeth, was not less than 65 per cent. It is notorious that in Spain, Austria, and Turkey the degradation of the silver coin, even at the present time, is carried to a serious extent. By the Coinage Act 1870 (33 and 34 Vict. ¢ 10) the composition and weight of all the coins of this country are strictly provided for; and in the case of gold coin, the limits or "'remedy" of fineness and weight are exceedingly narrow. The composition of the coin is fixed at eleven-twelfths fine gold, and one-twelfth alloy (copper); so that in 1000 parts of our gold coin there are 916°66 parts of fine gold. This is called its millesimal fineness, and the allowance for error in composition is limited to 0°002 per 1000 parts. The weight of the sovereign is fixed at 123°27447 grains, and the limit of error in weight is the 0-2 of a grain; and in proportion with all other gold coins, Tn the case of silver coins, the composition is thirty-seven fortieths of fine silver, and three-fortieths of alloy (copper) —the millesimal fineness being therefore 925 parts of silver ; the remedy or allowance of fineness is just twice that of gold—namely, 0-004 per 1000 parts. The weight of the silver coin is at the rate of 87:27272 grains per shilling of value; and the remedy or allowance of error is confined to 0°36363 of a grain per shilling. Lastly, the bronze coinage of the country consists of 95 parts copper, 4 tin, and | zinc: the weight of a penny being 145°83333 grains; and the allowance for error is 2°91666 grains per penny. The specific gravity of the several descriptions of coin is 17°53 for gold, 10°35 for silver, and 8°89 for bronze. So accurate are the composition and weight of the coins issued from the mint at the present time, that at the last trial of the '" Pyx" in July 1871, the jury reported that every piece separately examined (representing many millions sterling) was found to be accurately coined in regard to weight and fineness. In the case of the gold coin, the fineness ranged from 916°2 to 917 parts per 1000. These, indeed, were the extremes of only 2°66 per cent. of the coins examined, the great bulk of them, namely 72°65 per cent. having a fineness of from 916°5 to 9167 per 1000. Now, when it is considered that the composition of an alloy of gold and copper can be ascertained to the one-ten thousandth part, and that the delicacy of a balance is to the thousandth part of a grain, it must be evident that the accuracy and perfection of coining in this country are remarkably precise. As, however,

the weight of gold and silver coin must become less by continual wear, the Acts 22 and 25 Vict. c. 99, and 33 and 34 Vict. « 10 provide for it. It does not appear that the practice of debasing coin is carried on to any great extent in this country ; for in the second Annual Report of the Deputy-Master of the Mint (1871), the chemist of the Mint (Mr W. Chandler Roberts) says that only two sovereigns were submitted to him, the weight of which had been fraudulently reduced by means of a solvent, aided by electricity. In former times, however, the process of "sweating" was very frequently employed.

The adulteration of precious metals was prohibited and provided for by the rules and regulations of the various guilds and corporations which took cognizance of the goldsmiths' craft. As early as the 26th of Henry IL (1180) the Goldsmiths' Company of London was founded, and in 1327, when it was incorporated, it was invested with the privilege and power of inspecting, trying, and

intend the coinage, and to be answerable for its gooduess. | tegulating all gold and silver wares throughout the king-

dom, and of punishing all offenders who were found guilty of working adulterated gold or silver. The chief offenders appear to have been the cutlers, who were charged with covering base metal in such a manner that it could not easily be detected. It was therefore provided that all waanner of vessels of gold and silver should be of " good and true alloy ;" and power was given to the company to "eo from shop to shop to assay if the gold was good," and finding that it was not of the mght touch, it was to be seized and forfeited for the king. Subsequently, by the statute of 2 Henry VI. (1424), it was provided that none – should work gold unless it be as. good as the alloy of the "mystery," and that silver wares should be as good or better than the king's coin. It was further provided, that when the goods were finished they should be brought to the Hall to be assayed; and when found of the right touch it should be stamped with the owner's and assayer's marks, as well as with the " Liberdshede crowned." These powers have been confirmed in numerous Acts of Parliament, the most important of which are the following :—12 Geo. IL ec. 26 (1739), which provides that no goldsmith, silver smith,

or other trader shall work or make any vessel of gold of less than 22-carat fineness (that is, 22 parts of fine gold to 2 parts of alloy), nor any silver vessel. or plate of less than eleven ounces and two pennyweights of finc silver, and 18 pennyweights of alloy, in a pound troy, under a penalty of £10. But this does not extend to jewelry, earrings, gold springs, lockets, &c. It also pro- vides for the proper assaying and stamping of the same. In 1784, the Act 24 Geo. IIT. c. 53, made provision for imposing a duty on the article assayed and stamped,

ADULTERY (from the Latin adulterium) is the sexual intercourse of a married person with another than the offender's husband or wife. Among the Greeks, and in the earher period of Roman law, it was not adultery unless a married woman was the offender. The foundation of the later Roman law with regard to adultery was the lex Julia de adultervis coercendis passed by Augustus about B.c. 17, (See Dig. 48, 5; Paull. Rec. Sent. ii. 26; Brisson, Ad Leg. Jul. de Adult.) In Britain it has been reckoned a spiritual offence, that is, cognisable by the spiritual courts only. The common law took no farther notice of it than to allow the party aggrieved an action of damages. In England, however, the action for "criminal conversation," as it was ealled, is nominally abolished by 20 and 21 Vict. c. 85, § 59; but by the 33d section of the same Act, the husband may claim damages from one who has committed adultery with his wife in a petition for dissolution of the marriage, or for judicial separation, or in a special petition for the purpose in the Divorce Court. In Scotland damages may be recovered against an adulterer in an ordinary action of damages in the civil court, and the latter may be found liable for the expenses of an action of divorce if joined with the guilty spouse as a co-defender.

Adultery is, both in England and Scotland, a ground of divorce. In England, a complete divorce or dissolution of the marriage could, until the creation of the Court of Probate and Divorce by 20 and 21 Vict. c. 85, be obtained only by an Act of Parliament. In Scotland a complete divorce may be effected by proceedings in the Court of Session, as succeeding to the old ecclesiastical jurisdiction of the commissioners. A person divorced for adultery is, by the law of Scotland, prohibited from intermarrying with the paramour. See Divorce.

ADVENT, in the calendar, the period of the approach of the nativity, lasting, in the Greek Church, from St Martin's Day (Nov. 11), and, in other churches, from St

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lw and from that time the king's or queen's head has ap- peared as a mark. In 1798, the Act 38 Geo. IIT. c. 69, gave permission for a lower standard of gold, namely 18-carat gold (that is, 18 parts of fine gold to 6 of alloy); and by the Act 7 and 8 Vict. c. 22 (1844), the penalty for using false stamps, &c., was ameliorated. Lastly, by the Act 17 and 18 Vict. c. 96, three still lower standards of gold were permitted, namely 15-carat gold, 12-carat gold, and 9-carat gold, each of which was to be designated by the number and the decimal. At pre- sent, therefore, all gold and silver plate, as well as wedding and mourning rings, must be assayed and stamped before their sale ; and other articles may be assayed and stamped in like manner at the option of the maker or dealer. The stamps or marks impressed on gold are the following, namely,—1s¢, The initials of the maker's name; 2d, The duty mark (a king's or queen's head); 3d, The crown and standard number, indicating the quality of the gold; 4th, The assayer's stamp (a leopard's head for Goldsmiths' Hall) ; and 5th, The letter denoting the year of assay. In the case of silver, the stamps are—1s¢, The initial letters of the maker; 2d, A lion; 3d, The assayer's stamp (in London, a leopard's head); 4th, The letter indicating the year of assay; and 5th, The duty mark (a king's or queen's head). Silver goods of higher value, that is, with a mixture of 11 ounces and 10 pennyweights of fine silver, instead of 11 ounces and 2 pennyweights, is called new sterling, and is, as for- merly, marked with a figure of Britannia, and a lion's head erased. As in olden times, the Goldsmiths' Company have still power to break, cut, or otherwise destroy all gold and silver plate which is below the legal standard. = (u. L.)

Andrew's Day (Nov. 30) till Christmas, The observance of it dates from the 4th century, and it has been recognised since the 6th century as the commencement of the ecclesias- tical year. With the view of directing the thoughts of Christians to the coming of Christ as Saviour, and to his second coming as Judge, special lessons are prescribed for the four Sundays in Advent. At one time Advent was observed almost as strictly as Lent, but the

rule is now relaxed, and in the Church of England fasting is confined to the week in which Ember Day (13th Dec.) occurs. The phrase second advent is commonly used to denote our Lord's "appearing the second time, without sin, unto sal- vation," which is so often spoken of in the New Testament. Various opinions have been held as to the time and manner of this event. In the apostolic churches it was commonly regarded as imminent, though this was not the opinion of the apostle Paul, as may be gathered from 2 Thess. ii. 3, 4, The discussion in later times has centred itself chiefly round the question whether the second advent is pre- millennial or post-millennial.

ADVERTISEMENT (from the French avertissement, a giving notice, or announcement) denotes in a general sense any information publicly communicated through the press or otherwise. It is the profit derived from advertisements that supports the larger number of newspapers. While some of these drag out a sickly existence, others derive a large revenue from this source. The duty upon advertise- ments (which existed in Britain! previous to 1853) was not unjustly branded as a tax upon knowledge. It was certainly very unequal and oppressive, being the same upon the sale of an estate worth £100,000 as on a servant's notice wanting a place, upon an advertisement of a sixpenny

1 There is no duty on advertisements in the United States, Germany, or France. In France, however, there is a duty of 10 per cent. on the raw paper, and a further duty of 20 per cent. on all newspapers printed.

pamphlet and an expensive book. Previous to 1833 the duty on each advertisement was 3s. 6d. in Great Britain, and 2s. 6d. in Ireland; in that year it was reduced to ls. 6d. in Great Britain, and 1s. in Ireland. In 1832 (the last year of the high duty) the total number of newspaper advertisements in the U. K. was 921,943: viz, 787,649 in England, 108,914 in Scotland, and 125,380 in Ireland; the amount of duty paid in that year being £172,570. In 1841 the number of advertisements had increased to 1,778,957: viz., 1,386,625 for England, 188,189 for Scotland, and 204,143 for Ireland; and the total duty paid amounted to £128,318. In 1851 the

amount of duty rose to £175,094, 10s. 8d.; being for England £142,365, 3s. 6d.; Scotland, £19,940, 11s.; Ireland, £12,788, 16s. 2d. In compliance with the all but unanimous voice of the public, this duty was abolished in 1853; since which time the system of advertising has increased to an unprecedented extent, in consequence of the low rate at which short advertisements are now inserted. To advertise advantageously requircs both experience and judgment; without a knowledge of the character aud circulation of the public journals, much expenditure may be wasted by advertising in papers that have either a limited or inappropriate circulation. The sale of some commodities (such as quack medicines) depends almost wholly on advertising, of which it has been said that if the vender has the courage to continue advertising to the extent of £20,000, he will make his fortune by a drug thoroughly worthless. Advertising often falls dispro- portionately on books, as it is necessary that new publica- tions should be freely advertised. On small low-priced books the expense is particularly heavy, an advertisement of a one shilling book costing as much as one selling at twenty shillings. From this, and their generally ephe- ineral character, it may be said that ninety-nine out of a hundred pamphlets are published at a loss.

Interesting information on the subject of advertisements will be found in an article in the Hdinburgh Review for Ist Feb. 1843, 'On the Advertising System," and in the Quarterly Review for June 1855, "On the Rise and Pro- gress of Advertisements, from the estabhshment of the Newspaper Press of this Country till the Present Time." In the latter article it is stated that the first advertisement occurs in the Afercurius Politicus for Jan. 1652, the sub- ject of the advertisement being a heroic poem of congratula- tion on Cromwell's victories in Ireland. A writer in Wotes and Queries for July 6, 1872, has found two examples of advertisements previous to that date, which occur in the Mercurius Elencticus of Oct. 1648. See also The News- paper Press, by James Grant (2 vols., 1871), and the article NEWSPAPERS.

ADVOCATE (from the Latin advocatus), a lawyer author- ised to plead the causes of litigants in courts of law. The word is used technically in Scotland in a sense virtually equivalent to the English term barrister; and a deriva- tive from the same Latin source is so used in most of the countries of Europe where the civil law is in force. The advo- catus of the Romans meant, as the

word implies, a person whose assistance was called in or invoked. The word is not often used among the earlier jurists, and appears not to have had a strict meaning. It is not always associated with legal proceedings, and might apparently be applied to a supporter or coadjutor in the pursuit of any desired ob- ject. When it came to be applied with a more specific Inmtation to legal services, the position of the advocatus was still uncertain. It was different from, and evidently inferior to, that of the juris-consultus, who gave his opinion and advice in questions of law, and may be identified with the consulting counsel of the present day. Nor is the merely professional advocate to be confounded with the more distinguished orator, or patronus, who came forward

in the guise of the disinterested vindicator of justice. This distinction, however, appears to have arisen in later times, when the profession became mercenary. By the lew Cincia, passed about two centurics before Christ, and subsequently renewed, the acceptance of remuneration for professional assistance in lawsuits was prohibited. This law, like all others of the kind, was evaded. The skilful debater was propitiated with a present ; and though he could not sue for the value of his services, it was ruled that any honor- artum so given could not be demanded back, even though he dicd before the anticipated service was performed. The traces of this evasion of a law may be found in the existing practice of rewarding counsel by fces in anticipation of serviccs. In the Justinian collection we find that legal provision had been made for the remuneration of advo- cates. (Dig. lib. 50, tit. 12, § 10-13; Brissonius, De Sig. Verb. ; Heineccius ad Pand. lib. iii, tit. 1.) The advocatus fisci, or fiscal advocate, was an officer whose function, like that of a solicitor of taxes at the present day, was connected with the collection of the revenue. (Sce generally on this subject Forsyth's Hortensius, London, 1849.) The term advocate is of frequent use in the chron- icles, capitulanes, chartularies, and other records of eccle- siastical matters, during the Middle Ages. (See Du Cange, s.v. Advocati Ecclestarum, who affords a profuse supply of references to authorities.) The term was applied in the primitive church to those who defended the Christians against malignants or persecutors. As the church waxed rich and powerful, its temporal supporters assumed a more important position. The advocate,

defender, or patron, was of a temporal rank, corresponding to the power of the ec- clesiastical body who sought his advocacy. Princes sought the distinction from Rome; and it was as a relic of the practice of propitiating temporal sovereigns by desiring their protection that Henry VIII. received his title of " Defender of the Faith." The office of advocate to any of the great religious houses, possessed of vast wealth, was one of dig- nity and emolument, generally held by some feudal lord of power and influence. This kind of protection, however, was sometimes oppressive. In the authorities quoted by Du Cange we find that, so early as the 12th century, the advo- cates were accused of rapine and extortion ; and by a capi- tulary of the popedom of Innocent ITI. they are prohibited from taking and usurping rewards and privileges beyond use and wont. The office at length assumed a fixed character in its powers and emoluments ; and it became the practice for the founders of churches and other ecclesiastical endow- ments to reserve the office of advocate to themselves and their representatives. The term advocate was subsequently superseded by the word patron ; but a relic of it still exists in the term advowson, and the word advowee, which is the form in which the Latin advocatus found its way into the technicalities of English law. Until lately, advocate was the proper designation of legal practitioners in the Pro- bate and Admiralty courts, and still is the name given to those who practise in what remains of ecclesiastical courts. In France, corporations or faculties of avocats were at- tached to the parliaments and other tribunals. They formed, before the revolution, a part of the extensive and powerful body commonly called the nobility of the robe. It was not necessary that the avocat should be born noble, and his professional rank was little respected by the hereditary aristocracy ; but as a middle rank, possessed of great powers and privileges, which it jealously guarded, the profession acquired greatinfluence. In the Encyclopédie Methodique, the avocat is called " the tutelary genius of the repose of families, the friend of man, his guide and protector." The avocats, as a body, were reorganised under the empire by a decree of 15th December 1810. (See Camus, Lettres sur la Profession d'Advocat ; A. Young, The French Bar.) In

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France there is a distinction between avocats and avoudés. The latter, whose number is limited, act as procurators or agents, representing the parties before the tribunals, draft and prepare for them all formal acts and writings, and prepare their lawsuits for the oral debatcs. 'The office of the avocat, on the other hand, consists in giving advice as to the law, and conducting the causes of his clients by written and oral pleadings. The number of avocats is not limited; every licentiate of law being entitled to apply to the corporation of avocats attached to each court, and after presentation to the court, taking the oath of office, and passing three years in attendauce on some older advocate, to have himself recognised as an advocate. The Faculty of Advocates is the collective term by which the members of the bar are known in Scotland. They professionally attend the supreme courts in Edinburgh; but they are privileged to plead in any cause before the inferior courts, where counsel are not excluded by statute. They may act in cases of appeal before the House of Lords ; and in some of the British colonies, where the civil law is in force, it is customary for those who practise as barristers to pass as advocates in Scotland. This body has existed by imme- morial custom. Its privileges are constitutional, and are founded on no statute or charter of incorporation. The body formed itself gradually, from time to time, on the model of the French corporations of avocats, appointing like them a dean. or doyen, who is their principal officer. No curriculum of study, residence, or professional training was, until 1856, required on entering this profession ; but the faculty have always had the power, believed to be liable to control by the Court of Session, of rejecting any candidate for admission. The candidate undergoes two private ex- aminations—the one in general scholarship, in lieu of which, however, he may produce evidence of his having graduated as master of arts in a Scottish university, or ob- tained an equivalent degree in an English or foreign univer- sity ; and the other, at the interval of a year, in Roman, private international, and Scots law. He must, before the latter examination, produce evidence of attendance at classes of Scots law and conveyancing in a Scottish univer- sity, and at classes of civil law, public or international law, constitutional law, and medical jurisprudence in a Scottish or other approved university. He has then to undergo the old academic form of the public impugnment of a thesis on some title of the pandects ; but this cere- mony, called the public examination, has degenerated into amere form. A large proportion of the candidate's

entrance fees (amounting to £339) is devoted to the magnificent library belonging to the faculty, which literary investigators in Edinburgh find so eminently useful.

Lorp ApvocaTs, or Kine's ApvocarE, is the principal law-officer of the crown in Scotland. His business is to act as a public prosecutor, and to plead in all causes that concern the crown. He is at the head of the system of public prosecutions by which criminal justice is administered in Scotland, and thus his functions are of a far more ex- tensive character than those of the English law-officers of the crown. He is aided by a solicitor-general and subor- dinate assistants called advocates-depute. The office of king's advocate seems to have been established about the beginning of the 6th century. Originally he had no power to prosecute crimes without the concurrence of a private party; but in the year 1597 he was empowered to prose- cute crimes at his own instance. He has the privilege of pleading in court with his hat on.

ADVOCATION, in Scottish Law, was amode of appeal from certain inferior courts to the supreme court. It was abolished in 1868, a simple " appeal" being substituted.

ADVOWSON, or ApvowzEN (advocatio), in English Common Law, the right of presentation to a vacant eccle-

siastical beueficc, is so called because the patron defends or advocates the claims of the person whom he presents. Originally all appointments within a diocese lay with the bishop; but when a landowner founded a church on his estate and endowed it, his right to nominate the incumbent was usually recognised. Where the right of presentation remains attached to the manor, it is called an advowson appendant, and passes with the cstate by inheritance or sale without any special conveyance. But where, as is often the case, the right of presentation has been sold by itself, and so separated from the manor, it is called an advowson 7m gross. Advowsons arc further distinguished into presentative, collative, and donative. In a presentative advowson, the patron presents a clergyman to the bishop, with the petition that he be instituted into the vacant living. The bishop is bound to induct if

he find the clergyman canonically qualified, and a refusal on his part is subject to an appeal to an ecclesiastical court either by patron or by presentee. In a codlative advowson the bishop is himself the patron, either in his own right or in the right of the proper patron, which has lapsed to him through not being exercised within the statutory period of six months aftcr the vacancy occurred. No petition is necessary in this case, and the bishop is said to collate to the benefice. In a donative advowson, the sovereign, or any subject by special licence from the sovereign, confers a benefice by a simple letter of gift, without any reference to the bishop, and without presentation and institution. The incumbent of such a living is to a great extent free from the jurisdic- tion of the bishop, who can only reach him through the action of an ecclesiastical court. When an ecclesiastical body owned an advowson, it very frequently, by appropria- tion, exercised the right in its own favour, the corporation becoming the incumbent of the living, the actual duties of which were discharged by a vicar or perpetual curate. An advowson, being property, may be sold, or mortgaged, or seized by the creditors on a bankrupt estate, under certain restrictions intended to prevent simony. A sale is abso- lutely prohibited during the mortal sickness of the incum- bent, or during the existence of a vacancy. There are upwards of 13,000 benefices in the Church of England, the advowsons being distributed as shown in the following list, which may be taken as approximately correct :— Under the patronage of the crown there are 1144 livings; bishops, 2324; deans and chapters, 938; the universities, 770; parochial clergy, 931; and private persons, 7000.

ADYTUM, the most retired and sacred place of ancient temples, into which none but the officiating priests were allowed to enter. The Most Holy Place of the temple of Solomon was of the nature of the pagan adytum; none but the high priest being admitted into it,and he but once a year.

AK, or AE, a diphthong, compounded of a and x, of fre- quent occurrence in Latin and in Anglo-Saxon. In the best editions of the classics the form now preferred is ae. In English words derived from Latin the diphthong is gene- rally converted into the simple e, but it is not unfrequently retained, as in Molian, medieval, &c. In some words it represents the Greek a, to which the Latin @ corresponds, as in esthetics (arcOyria).

JEACUS, in ALythology, the son of Jupiter by Agina. When the isle of /Agina was depopulated by a plague, his father, in compassion to his grief, changed all the ants upon it into men and women, who were called Afyrmidones, from pipyng, an ant. The foundation of the fable is said to be, that when the country had been depopulated by pirates, who forced the few that remained to take shelter in caves, Alacus encouraged them to come out, and by commerce and industry to recover what they had lost. His character for justice and piety was such that, in a time of universal drought, he was nominated by the Delphic oracle

to intercede for Greece, and his prayer was answered. The ancients also imagined that /Zacus, on account of his 1m- partial justice, was chosen by Pluto one of the three judges of the dead, and that it was his province to judge the Europeans. ; ;

ZEDILE (cdilis), in Roman Antiquity, a magistrate whose chief business was to superintend buildings of all kinds, but more especially public ones, as temples, aque- ducts, bridges, &c. To the ediles likewise belonged the care of the highways, public places, weights and measures, &c. They also superintended the markets, fixed the prices of provisions, took cognisance of breaches of decency and public order, and took charge of police matters generally. The custody of the plebiscita, or decrees of the people, and senatus consulta, or decrees of the senate, was likewise committed to them. 'They had the inspection of theatres and plays, and were obliged to exhibit magnificent games to the people, usually at their own expense, whereby many of them were ruined. They had the power, on certain oc- casions, of issuing edicts, and by degrees they procured to themselves a considerable jurisdiction. At first there were only two zdiles, viz., the sediles of the people, cediles plebei, or minores. They were first created in the same year as the tribunes, p.c. 494; for the tribunes, finding themselves oppressed with the multiplicity of affairs, demanded of the senate to have officers to whom they might entrust matters of less importance; and accordingly two zediles were created ; and henceforward the zdiles were elected every year at the same assembly as the tribunes. But these plebeian ediles having refused, on a signal occasion, to continue the great games for four days instead of

three, on account of the expensc, the patricians made an offer to do it, provided they were admitted to the honours of the edileship. Ac- cordingly two new ediles were created, from the order of the patricians, in the year of Rome 388. They were called ediles curules, or majores, aS having a right to sit on a curule chair when they gave audience; whereas the plebeian ediles only sat on benches. The curule ediles alone had the right to issue edicts. Othcrwise they shared all the ordinary functions of the plebeian eediles; they had to procure the celebration of the grand Roman games, and to exhibit comedies, shows of gladiators, &c., to the people; and they were also appointed judges in all cases relating to the selling or exchanging of estates. To assist these first four ediles, Cesar (B.c. 45) created a new kind, called wdiles cereales, so named from their being deputed chiefly to take care of the supply of corn, which was called donum Cereris. These sediles cereales were also taken out of the order of patricians. In the municipal cities and colonies there were xdiles having much the same authority as at Rome. We also read of an wdilis alimentarius, expressed in abbreviature by adil. alim., whose business seems to have been to provide diet for those who were maintained at the public charge, though others assign him a different office. In an ancient inscription we also meet with edile of the camp, edilis castrorum.

JEGADES, or cates, a group of islands off the west- ern coast of Sicily, between Trapani and Marsala, consisting of Maretimo, Levanzo, and Favignana. These islands are rendered historically famous by the great naval victory gained. there by the Romans over the Carthaginians in B.¢. 241, which put an end to the first Punic war.

JEGEAN SEA, a part of the Mediterranean, now more usually called the Archipelago or Grecian Archipelago, bounded on the north by Thrace and Macedonia, on the west by Grecce, and on the east. by Asia Minor. The origin of the name is uncertain. Various derivations are given by the ancient grammarians—one from the town of Mig ; another from Aigea, queen of the amazons, who

. . . ° ? perished in this sea; and a third from Ageus, the father

of Theseus, who threw himself headlong into it. See ARCHIPELAGO.

JEGEUS, in Fabulous History, the son of Pandion, was king of Athens, and the father of Theseus. He was one of the Athenian heroes, but is notable chicfly for the man- ner of his death. The Athenians having killed Androgeus, the son of Minos, king of Crete, for carrying away the prize for wrestling from them, Minos made war upon them; and being victorious, imposed this severe condition on Aigeus, that he should annually send into Crete seven of the noblest of the Athenian youths and as many maidens, chosen by lot, to be devoured by the Minotaur, On the fourth year of this tribute the choice fell on Theseus, or, as others say, he himself entreated to be sent. The king at his son's departure gave orders that, as the ship sailed with black sails, it should return with the same in case he perished; but if he came back victorious he should change them for white. When Theseus rcturned from Crete after killing the Minotaur, he forgot to change the sails in token of his victory, according to the agree- ment; and his father, who sat on a rock watching the return of the vessel, imagining from the black sails that his son was dead, cast himself headlong into the sea, which was supposed in consequence to have obtained the name of the digean Sea. The Athenians decreed divine honours to Aigeus, and sacrificed to him as a marine deity and an adopted son of Neptune.

ALGINA, in Fabulous History, the daughter of Asopus, king of Boeotia, was beloved by Jupiter, who carried her from Epidaurus to a desert island called Q@none or QZnopia, which was afterwards called by her name. See Alacus.

AEGINA, or Eeina, or Eneta, an island in the Saronic gulf, 20 miles distant from the Pirseus, formerly vying with Athens in naval power, and at the sea-fight of Salamis disputing the palm of victory with the Athenians. It was the native country and kingdom of Alacus, who called it 4igina, from his mother's name. (Ovid.) The inhabitants were called Zginete and Aiginenses. Aigina is triangular in shape, and is about 8 miles long from N.W. to8.E., and about 6 broad, with an area of about 41 square miles. Strabo states its circumference at 180 stadia, or about 224 English miles. Its western side consists of stony but fertile plains, which are well cultivated, and produce luxuriant crops of grain, with some cotton, vines, almonds, and figs. The

rest of the island is mountainous, and rather barren. The southern end rises in the conical Mount Oros, and the Panhellenian ridge stretches to the north, from which fertile narrow valleys descend on either hand. From the absence of marshes, and its insularity, the climate is mild, and the most salubrious of Greece. The ruins of the ancient Adgina extend along two small ports, still protected by well-built ancient moles, and the shores of an open bay, defended by an ancient breakwater, near the N.W. cape of the island. On the land side the city walls are still distinctly traceable, 10 feet in thickness, strengthened by towers at unequal distances, and pierced by three gates. They abutted on those of the ports, which were thus included within the line of fortifications, as at Athens and elsewhere in ancient Greece. Two elegant Doric columns and substructures are all that remain of the buildings noticed by Pausanias within the precincts of a city that was long the greatest and most opulent mari- time power of Greece; but the ruins of seventeen Christian churches, still visible, prove that after the glories of the proud city had passed away—after what it suffered from the jcalousy of its rival Athens, and from an carthquake about the beginning of our era—a considerable modern town had occupied its site. Some of these may perhaps only date from the time that Adgina remained under its Venetian masters, as does a tower erected at the entrance

MGI AGI

of the largest port. The Venetians resigned posscssion of the island to the Turks in 1715, under whom it became the prey of Mainote and other pirates, until the emancipa- tion of Greece made it, in 1828-29, the seat of the Greek government. On a hill near the N.E. corner of the island stands the modern little town of Adgina (as it is pronounced by the modern Greeks). It is separated by a ravine from the hill, on which rise in lonely majesty the ruins of a noble temple, supposed to be that of Jupiter Panhellenius, though the point has been disputed. The temple occupies the rocky summit of a hill, in the midst of a forest of pines, at the extremity of the Panhellenian ridge. It was a ruin in the days of Cicero, as mentioned in one of his Ictters, and seems to have been thrown down by an earth- quake at an unknown epoch. This temple is conspicuous from a distance, and was visited by Chandler in the last century; but has been chiefly known to us by the success- ful excavations of our countrymen Cockerell and Foster,

assisted by Baron Hallcr and M. Linckh of Stuttgard, in 1811. These gentlemen unitcd in clearing away the rub- bish which the lapse of 2000 years had accumulated on the basement and floor of the cella; and after twenty days' exertion they were rewarded by the discovery not only of many interesting details relating to Grecian architecture, but also of many statues, in wonderfully energetic atti- tudes, that had once adorned the fallen pediments of this celebrated temple. These consist of the eleven figures of the eastern and five statues of the western pediment, almost entire, besides fragments of the rest, and two statuettes, and other ornaments of the acroteria. These sculptures supply an important link in the history of ancient art, and connect the schools of early Greece with that of Etruscan sculpture. The efforts of Messrs Cockerell and Foster to secure those treasures to their country are well known, as well as their failure through an unlucky mistake of the agent sent out to purchase them for the British Museum. They now form one of the most intcrest- ing acquisitions of the magnificent Glyptothek of Munich. The temple stands on a stylobate of 94 feet by 45 feet. The original number of columns in the peristyle was thirty-two, of which twelve were ranged on each side, and six in each front, 17 feet 2 inches high, including the wide spreading ovolo of the capital, and a diameter of 3 feet 3 inches at the base. Two other columns, of 3 fect 2 inches between antze, are in the pronaos, and two similar in the opisthodomos or posticum. The cella had a door at each end; a double row of smaller columns, 2 feet 4 inches in diameter, were within the cella to support its partial roof; but the greatest portion of the cella was open, as this temple was hypethral, There still remain twenty-one columns of the peristyle, with their architraves; six of the eastern front, and continuously with them are five columns of the north side; the four columns of the pronaos and opisthodomos, and the lower part of the shafts of five within the cella. The tympana had been painted of a bright azure, to give relief to the statues; and the drapery of Minerva, the middle figure of each group, had been painted red and blue. The whole of the ornaments on the cornices and upper mouldings of the pediment had been painted in encaustic, not carved. The subject of the groups of statuary appears to be the contest for the body of Patroclus, one of the acide (or royal progeny of AZgina of old), as described by Horner. (Cockerell On the Zgina Marbles; Brand's Journal.) This magnificent structure was erected most probably in the 6th century B.c., but, at all events, un- doubtedly belongs to the brilliant period of

Aiginetan power, when its navy and its commerce were the pride of Greecc, and carried its citizens to the remotest shores of the Mediterranean and the Euxine. Silver money is said to have been struck at Aigina long before it was coined

even at Athens. The victory of Salamis was in a great measure owing to the thirty ships of Augina, and the voice of grateful Greece assigned to her warriors on that event- ful day the prize of valour. Yet not long after, the rivalry of Athens began to cloud the prosperity of the haughty islanders, whose fleet she had before defeated; and Aégina at length sunk under the enmity of a relentless commercial rival, that banished her citizens aud supplied their place with Attic colonists. After the close of the Peloponnesian war Lysander restored the banished inhabitants, but /figina never recovcred its ancient prosperity.

ANGINETA, Pauuus, a celebrated surgeon of the island of Aigina, whence he derived his name. According to Le Clerc's calculation, he lived in the 4th century; but Abulfaragius the Arabian places him with more probability in the 7th. His knowledge in surgery was very great, and his works are deservedly famous. The title of the most important of them, as given by Suidas, is "Ezcropis 'latpujs BiBdia "Era (Synopsis of Medicine in Seven Looks). The sixth book, which treats of surgery, is par- ticularly interesting. 'The whole work in the original Greek was published at Venice in 1528, and auother edition appeared at Basle in 1538. Several Latin trans- lations have been published, that of J. Cornarius (Basle, 1556) being accompanied by a commentary. Agineta is the first writer who takes notice of the cathartic property of rhubarb, and, according to Dr Milward, is the first in all antiquity who deserves the title of accoucheur.

EGIS, in Classical Mythology, a name given to the shield or buckler of Jupiter. The goat Amalthza, which had suckled that god, being dead, he is said to have covered his buckler with the skin, or used the skin as a buckler; whence the appellation aegis, from aug, dvyds, goat. Jupiter afterwards restored the animal to life, covered it with a new skin, and placed it among the stars. A full description of the xgis of Jupiter is given by Homer, JI. v. 738, sgq. Apollo is also represented as bearing the wgis, and Minerva still

more frequently. After Perscus killed Medusa, Minerva nailed her head in the middle of the wgis, which thence- forth had the faculty Medusa herself had during her life of converting all who looked on it into stone. Later writers regard the «gis sometimes as a buckler, but oftener as a cuirass or breastplate. The gis of Pallas, described by Virgil (dn. lib. viii. v. 435), must have becn a cuirass, since the poet says expressly that Medusa's head was on the breast of the goddess. But the wgis of Jupitcr, mentioned a little before (v. 354), seems from the description to have been a buckler. The wxgis appears to have been really the goat's skin used, as well as the skins of other animals, as a belt to support the shield. When so used it would usually be fastened on the right shoulder, and would partially envelope the chest as it passed obliquely round in front and behind to be attached to the shield under the left arm. Hence, by transference, it would be employed to denote at times the shield which it supported, and at other times a lorica or cutrass, the purpose of which it in part served. Illustrations of the assumption of the aegis by the Roman emperors nay be seen in ancient statues and cameos.

ZEGISTHUS, in Ancient History, was the son of Thy- estes by his own daughter Pelopea, who to conceal her shame exposed him in the woods. Some say he was taken up by a shepherd and suckled by a goat; whence he was called 4igesthus, After he grew up he was recognised by his father, and on the death of the latter he became king of Mycenz. He did not join the expedition against Troy; and after the departure of the expedition he scduced Clytemnestra, the wife of Agamemnon, and lived with her during the siege of Troy. Afterwards, with her assistance, he slew her husband, and reigned seven years in Mycene. He was slain, together with Clytemnestra, by Orestes.

ZEGOSPOTAMI, in Ancient Geography, a small river in the Thracian Chersonesus, running south-east, and falling into the Hellespont to the north of Sestos,—with a town of the same name, and a station or road for ships, at its mouth. Here the Athenians under Conon, through the fault of his colleague Philocles, received a signal overthrow from the Laccdemonians under Lysander (B.c. 405), which involved the taking of

Athens, and put an end to the Peloponnesian war. The town does not appear to have existed till after the date of the battle.

ZELFRIC, "'the Grammarian," as he has been called, is one of the most voluminous of our old English writers before the Conquest. He flourished at the latter end of the 10th century and the beginning of the 11th. — Of his personal history little can be learned, and his birth and death are alike involved in obscurity. We know that he was a pupil of Ethelwold, the friend of Dunstan, at Abing- don. On Ethelwold's advancement to the see of Win-chester, AElfric accompanied him, and filled the office of chief instructor in the diocese. For the use of his scholars he wrote his Latin and English Grammar and G'lossary and his Colloquium. The last of these is in Latin, with an old English interlinear translation, in which the Latin is rendered word for word. It is interesting for its account of ancient manners, and shows that Alfric made use of the conversational method in his teaching. The words in his Glossary are not arranged alphabetically, but grouped together into classes. Ailfric afterwards removed to Cerne Abbey, in Dorsetshire, where he composed his Homilies, the work on which his fame as an author chiefly depends. They are 80 in number, and were edited by Thorpe in 1844-46 for the Alfric Society. In composing them, fflfric drew largely from the fathers. Their style is very simple and pleasing, and obscure words are carefully avoided in order to adapt them to the capacity even of the most ignorant. Subsequent writers made great use of them, and not a few are to be found unabridged in the transition (semi-Saxon) English of the succeeding centuries. They excited great attention about the time of the Refor- mation, and were appealed to—especially the '" Paschal Homily "—to prove that the doctrines of the English Church before the Conquest were at variance with those held by the Church of Rome. Among 'lfric's other works may be mentioned his Z'reatise on the Old and New Testaments, and his Abridgment of the Pentateuch and the Book of Job. Of the rest of his life we have little on which we can rely. He attained to the dignity of abbot, but he seems to be a different person from tlfric, archbishop of Canterbury (995-1006), with whom he is sometimes confounded.

fELIA CAPITOLINA, a name given to the city built by the Emperor Hadrian, a.p. 134, near the spot where the ancient Jerusalem stood, which

he found in ruins when he visited the eastern parts of the Roman empire. A Roman colony was settled here, and a temple was dedicated to Jupiter Capitolinus. Hence the name Capitolina, to which Hadrian prefixed that of his own family.

ZELIANUS, Crauptvus, born at Preeneste, in Italy. He taught rhetoric at Rome, under the Emperor Alexander Severus, according to Perizonius, but more probably under Hadrian. Hewassurnamed MeAtyhwocos,“ Honey-tongued,” on account of the ease and accuracy with which he spoke and wrote Greek ; and he was also named “the Sophist,” from his being a teacher of rhetoric. He loved retirement, and devoted himself to study. He greatly admired and studied Plato, Aristotle, Isocrates, Plutarch, Homer, Anacreon, Archilochus, &c. ; and, though a Roman, gives preference to the writers of the Greek nation, and employs the Greek language in his works. His curious and entertaining work entitled Varia Historia has been frequently republished, as

well as his treatise De Vatura Animalium.

/EMILIUS, Pautus, the name of a celebrated family of the Aumilia Gens. See PAULUS.

ZEMILIUS, Pavtus, or Paoto Emi11o, a celebrated histo- rian, born at Verona, who obtained such reputation in Italy that he was invited into France by the cardinal of Bourbon, in the reign of Charles VIII., in order to write the history of the kings of France in Latin, and was presented toa canonry in Notre Dame. He enjoyed the patronage and support of Louis XII. He died at Paris on the 5th of May 1529. His work entitled De Rebus gestis Francorum was translated into French by Renard in 1581, and hag also been translated into Italian and German.

ZENEAS, in Fabulous History, a Trojan prince, the son of Venus and Anchises. He plays a conspicuous part in the Iliad, and is represented, along with Hector, as the chief bulwark of the Trojans. Homer always speaks of f®neas and his descendants as destined to reign at Troy after the destruction of Priam and his house. Virgil has chosen him as the hero of his

great epic, and the story of the Aneid, though not only at variance with other tradi- tions, but inconsistent with itself, can never lose its place as a biography of the mythical founder of the Latin power, fineas is described in the dneid as escaping from the destruction of Troy, bearing his aged father on his shoulders, carrying in one hand his household gods, while with the other he leads his little son Ascanius or Iiilus, His wife Creiisa is separated from them and lost in the tumult. After a perilous voyage he lands in Africa, and is kindly received by Dido, queen of Carthage; who, on his forsaking her to seek a new home, destroys herself. Again escaping the dangers of the sea, he arrives in Italy, where he lands in Latium, and forms an alliance with Latinus, the king of the country, marries his daughter Lavinia, and founds a city which he calls, after her, Lavinium. Turnus, king of the Rutuli, a rejected suitor of Lavinia, makes war on Latinus, and both are slain in battle. The story of the dineid ends with the death of Turnus. According to Livy, on the death of Latinus, Aineas assumes the sove- reignty of Latium, and the Trojan and Latin powers are united in one nation. After a reign of three years, Auneas falls in a battle with the Rutuli, assisted by Mezentius, king of Etruria, and is supposed to be carried up into heaven, because his body cannot be found. After his death or disappearance he receives divine honours.

fENEAS SYLVIUS, Porr. See Pius II.

JEOLIZZ INSULA, the modern Lipari IsLanps, 2 group of islands between Italy and Sicily. They are so called from Aolus, the god of the winds, who was supposed to rule over them; but they are also frequently termed Insule Vulcanice, or Hephestie, from their volcanic erup- tions, and Insulee Lipareorum, from Jipara (modern Lipari), the chief of the group. According to Pliny, the other islands are Hiera, now Vulcano,; Strongyle, now Stromboli ; Didyme, now Salina ; Phoenicusa, now Felicudi ; Huonymus, probably Panaria; and Fricusa,now Alicudi. Besides these there are several small islets. Homer mentions only one /Kolian island (Od. x. 1).

JEOLIAN HARP, named from olus, god of the wind, a musical instrument consisting of cat-gut strings stretched over a wooden sound-box. When exposed to a current of air, the strings produce a variety of pleasing harmonic sounds in strange succession and combination.

ALOLIS, or Mota, in Ancient Geography, a country of Asia Minor, settled by colonies of /Zolian Greeks. The

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name in its limited sense was applied to the coast ex- tending from the river Hermus to the promontory of Lectum, on the north side of the entrance to the Gulf of Adramyttium, and lying between Ionia to the S. and Troas to the N. In its wider acceptation it comprehended Troas and the coasts of the Hellespont to the Propontis, where there were likewise several Aolian colonies. AHOLUS, in Heathen Mythology, the god and father of the winds, was variously represented as the son of Hip- potes, or of Neptune by a daughter of Hippotes, or of Jupiter. In the Odyssey he is mentioned as the king of the AZolian isle to whom Jupiter had given the super- intendence and distribution of the winds. Later poets make him the god and father of the winds, who dwelt in one of the Aolian islands—according to some in Strom- boli, according to others in Lipari, while others place his residence at Rhegium in Italy. He is represented as having authority over the winds, which he confined in a vast cavern. Strabo and some other writers consider him to have had a real existence; and derive the fable of his power over the winds from his skill in meteorology and the management of ships. Hic vasto rex Molus antro,

Luctantes ventos tempestatesque sonoras

Imperio premit, ac vinclis et carcere frenat.

Illi indignantes magno cum murmure montis

Circum claustra fremunt; ccls4 sedet Holus arce

Sceptra tenens, mollitque animos, et temperat iras:

Ni faciat, maria ac terras celumque profundum

Quippe ferant rapidi secum, verrantque per auras. Ainetd, lib. i. 52. Here olus, in cavern vast, With bolt and barrier fetters fast Rebellious storm and howling blast. They with the rock's reverberant roar Chafe blustering round

their prison door : He, throned on high, the sceptre sways, Controls their moods, their wrath allays. Break but that sceptre, sea and land, And heaven's etherial deep, Before them they would whirl like sand, And through the void air sweep. Conington's Translation.

Through Hippotes, olus is usually represented as de- scended from /Zolus, one of the sons of Hellen, and the inythological ancestor of the Aolian tribes.

JEON (aidv), a space of time, was often used in Greek to denote indefinite or infinite duration; and hence, by metonymy, for a being that exists for ever. In the latter sense it was chiefly used by the Gnostic sects to denote those eternal beings or manifestations which emanated from the one incomprehensible and ineffable God. See GNostIcIsM.

AEPINUS, Franz Maria Unricu THEODOR, a distin- guished German natural philosopher, was born at Rostock in Saxony in 1724, and died at Dorpat in August 1802. He was descended from John pinus (6. 1499—d. 1553), the first to adopt the Greek form (airevds) of the family name, a leading theolugian and controversialist at the time of the Reformation. After studying medicine for a time, Francis Apinus devoted himself to the physical and mathematical sciences, in which he soon gained such distinction that he was admitted a member of the Berlin Academy of Sciences. In 1757 he settled in St Peters- burg as member of the Imperial Academy of Sciences and professor of physics, labouring there and pursuing his favourite studies with great success till his death. He enjoyed the special favour of the Empress Catharine IL, who appointed him tutor to her son Paul, and endeavoured, Without success, to establish normal schools throughout the empire under his direction. Epinus is best known by his researches, theoretical and experimental, in electricity and magnetism. His principal work, Tentamen Theorie Elec-

tricitatis et Magnetismi, published at St Petersburg in 1759, may be regarded as the first systematic and suc- cessful attempt to apply mathematical reasoning to these subjects. Adopting Franklin's theory of positive and negative electricities, or electric forces, he investigated the

relations of these fully, and especially the conditions of their equilibrium; and many of the conclusions he arrived at do not depend for their value and importance on the theory of Franklin. pinus himsclf extended the theory, holding that the particles of the electric fluid repel each other, attract the particles of all bodies, and are attracted by them, with a force inversely proportional to the dis- tance; that the fluid resides in the pores of the surfaces of bodies, moving readily through some, called conductors or non-electrics, and with difficulty through others; and that electric phenomena are produced either by the approach of bodies unequally charged, or by the unequal distribution of the fluid in the same body. He propounded a kindred theory of magnetism, a magnetic fluid being supposed to exist corresponding to the electric fluid, but acting on, aud acted on by, the particles of iron only. It is to be added that Zpinus was the first to perceive and define, with any measure of clearness, the affinity between elec- tricity and magnetism. There is a remarkable similarity between portions of the work above named and a paper by Cavendish—the result of independent investigations— given in the Philosophical Transactions for 1771. In 1787 the Abbé Haiiy published an exposition of ASpinus's theories. Apinus did not confine himself to one or two departments of natural science. He published a treatise, in 1762, On the Distribution of Heat at the Surface of the arth; aud he was also the author of valuable memoirs on different subjects in astronomy, mechanics, optics, metcor- ology, and pure mathematics, contained in the journals of the learned societies of St Petersburg and Berlin. His discussion of the effects of parallax in the transit of a planet over the sun's disc excited great interest, having appeared (in 1764) between the dates of the two transits of Venus that took place during last century.

EQUI, an ancient and warlike people of Italy, inhabit- ing the upper valley of the Anio, who, in confederacy with the Volsci, carried on a long series of hostilities with the early Romans, but were finally subdued in the year 302 Bc.

JERARIANS, a class in ancient Rome, composed of citizens who had suffered the severest kind of degradation the censors could inflict, but concerning whose exact. posi- tion we have no precise information. Though heavily taxed, they did not enjoy the rights of citizenship beyond their

liberty and the general protection of the state. They could not vote in assemblies or serve in the army, and were deprived of and excluded from all posts of honour and profit. Romans of the higher classes, as well as the plebeians, were liable to become AMrarians. The name may be derived from ws, wris, money, since they were mere tax-payers; or, which is more probable, it may refer to the list of them which the censors gave in to the wrarium or public treasury.

ZERARIUM, the public treasury at ancient Rome. It contained the money and accounts of the state, and also the standards of the legions, the public laws engraven on brass, the decrees of the senate, and other papers and registers of importance. The place where these public treasures were deposited, from the time of the establish- ment of the republic, was the temple of Saturn, on the eastern slope of the Capitoline hill. In addition to the common treasury, supported by the general. taxes and charged with the ordinary expenditure, there was.a reserve treasury, also in the temple of Saturn, the wrarium sanc- tum (or sanctius), maintained chiefly by a tax of 5 per cent, on the value of all manumitted slaves, which was not to

be had recourse to, or even entered, except in the extreme necessity of the state. Under the emperors the senate continued to have at least the nominal management of the erarium, while the emperor had a separate exchequer, called the fiscus. But after a time, as the power of the emperors increased aud their jurisdiction extended till the senate existed but in form and name, this distinction vir- tually ceased. Besides creating the jiscws, Augustus also established a military treasury (@rarium militare), con- taining all money raised for and appropriated to the main- tenance of the army. The later emperors had a separate erarium privatum, containing the monies allotted for their own use, distinct from the jiscws, which they ad- ministered in the interests of the empire.

AERATED WATERS. Waters impregnated with an unusually large proportion of carbonic acid, or other gaseous substances, occur abundantly in springs throughout the world; and, in addition to their gaseous constituents,

generally hold in solution a large percentage of different

salts. The manufacture of aerated waters arose out of the attempt to imitate these by artificial means, but till about the beginning of the present century such efforts did not meet with great success. The earliest method of producing acidulated water was that which still obtains in the pre- paration of effervescing draughts, such as are made from "'Seidlitz" powders. These powders consist of separate portions of sodium bicarbonate and tartaric acid, which, on being dissolved together in water, form sodium tartrate and liberate carbonic acid, which bubbles up through the water. In recent years "granular" effervescent pre- parations have been introduced, in which the acid and salt are mixed in a dry state, and produce their reaction on being dissolved. The popular preparation termed effer- vescent citrate of magnesia, and several others under a variety of names, consist essentially of sodium bicarbonate and tartaric acid, to which a little citric acid is sometimes added. A limit, however, is set to the use of waters so aerated on account of the purgative action of the alkaline earths they necessarily contain.

In the manufacture of common aerated waters the car- bonic acid is prepared apart from the pure water in which it is to be dissolved. There are essentially only two inethods on which the manufacture is conducted, although there is an endless variety in the apparatus used. In the first process, which may be distinguished as the method of chemical pressure, the carbonic acid gas saturates the water by its own pressure, passing directly from the chamber in which it is produced and purified into the cylinder or cylinders containing the water to be aerated. The small apparatus frequently used in private houses and hospitals may be taken as an illustration of this method. The most common form consists of two strong glass globes A and B, protected by netting in case of breakage. Into the globe A are placed the materials for generating carbonic acid, usually in this case tartaric acid and sodium bi- carbonate. When charged with these materials, a metal tube C, accurately fitted to the aperture in the globe, is inserted. The globe PB is inverted and filled with water, and in this position the globe A is screwed tightly up by the joint D, the metal tube reaching to near the top of globe B. On placing the apparatus upright, a proportion of water escapes through the metal tube into globe A, acts on the charge it

con- tains, and evolves carbonic acid, which passes up the tube and saturates the water in B, As the pressure of the gas

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augments, the quantity absorbed increases, and when fully saturated the aerated water may be drawn off by the cock E. In manufacturing on a large scale, a combination of globes or cylinders is used for producing continuous action, and less expensive sources of carbonic acid than sodium bicarbonate and tartaric acid are employed. The second or mechanical pressure process is that generally followed in the manufacture in this country. In this process the gas is prepared in a lead chamber by the action of sulphuric acid on chalk, and is washed by pass- ing through water into the gas-holder in which it is col- lected. By the action of a force-pump, water, filtered when necessary, and carbonic acid, are pressed, in due proportions, into a very strong copper cylinder, tinned internally, termed a receiver or saturator, in which an agitator is kept revolving. A pressure gauge is attached to the receiver, and when the index indicates from 120 to 140 tb pressure per square inch, what is termed aerated water, and very frequently does duty for soda- water, is ready for drawing off at the bottling apparatus. Real soda-water is best prepared by adding to the water before aeration a proportion of sodium bicarbonate equal to about 30 or 36 grains per pint of water. Potash-water, Seltzer, lithia, Carrara, bromide of potassium, and a host of other waters, are similarly prepared, the various salts being used in different proportions, according to the taste and experience of manufacturers. Lemonade, and other aerated drinks flavoured with fruit syrups, have the pro- portion of syrup placed in the bottle to which simple aerated water taken from a receiver, indicating a pressure of 80 to 100 ib per square inch, is added. From a syrup composed of 14 ib of sugar, 25 oz. of tartaric acid, 34 oz. of citric acid, and 44 drachms of essence of lemon, dissolved in 24 gallons of water, 30 dozen bottles of an excellent quality of lemonade can be prepared. On ac- count of the rapidity with which the gas escapes on the removal of pressure, special arrangements are required for the bottling and corking processes, and the frequent ex- plosion of bottles necessitates guards to protect the bottler. A

dexterous bottler will fill and cork 5000 bottles in ten hours. The consumption of aerated waters, especially in hot climates, is very great.

AEROE, or ARKO, an island of Denmark, in the Little Belt, lying 74 miles 8. of Funen, between Alsen and Langeland. It is of an irregular triangular shape, about 15 miles long and 8 broad at the widest points, with a hilly surface, but a fertile and well-cultivated soil. Popu- lation, 10,200; chief town, Aeroeskjobing, on the east coast.

AEROLITE (anp, air, and diGos, a stone), a stony or metallic body, which, falling through the atmosphere, reaches the earth's surface. These meteoric stones gene- rally contain a considerable proportion of iron ; indeed, the iron in some of these substances exceeds the siliceous matter, and some have then given them the name of mete- oric irons. A remarkable aerolite that fell at AUgospotami, in 467 B.c., was, according to Pliny, to be seen in his day, and was then as large as a waggon. In 1492 one fell at Ensisheim, in Alsace, that weighed 270 tb.; and, not to mention others, one of 12 tb weight is reported to have fallen in California in August 1873, which penetrated the earth to the depth of 8 feet, and when dug up was so hot that it could not be handled. Aerolites often reach the earth in groups or showers, as at L'Aigle, in Normandy, in 1803; at New Concord, Ohio, in May 1860; and at Dhurmsala, in the Punjaub, in July the same year. The area on which a shower of aerolites falls is usually ellipti- cal, the largest stones being near one end of the ellipse, the major axis of which extends in some cases to a length of eighteen or twenty miles. See METEOR.

| | | I that if ever the air is navigated, it will be by ships pre- senting little resemblance to those that traverse the ocean.

The subject of aerostation is scarcely ever alluded to by Acrostatic the classical writers, and the fable of Daedalus and Icarus, attempts of and the dove of Archytas, form almost all we have to re- pa os cord in relation to flying previous to the dark ages. De- Teens dalus, an Athenian, killed his nephew Talus through Dedalus

jealousy of his talents, and fled with his son Icarus to Crete, and Iearus.

yadual N every stage of society men have sought, by the combi- ; scovery | nation of superior skill and ingenuity, to attain those "navig?- distinct and obvious advantages which nature has conferred "- on the different tribes of animals, by endowing them with a peculiar structure and a peculiar force of organs. The rudest savage learns from his very infancy to imitate the swimming of a fish, and plays on the surface of the water with agility and perseverance. But an art so confined in

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its exercise, and requiring such a degree of bodily exertion, could not be considered of much avail. It must have been soon perceived (even if the discoveries of the arts of nata- tion and navigation were not absolutely simultaneous), that the fatigue of impulsion through the water could be greatly diminished by the support and floating of some light sub- stance. The trunk of a tree would bear its rude proprietor along the stream; or, hollowed out into a canoe and fur- nished with paddles, it might enable him even to traverse ariver. From this simple fabric the step was not great to the construction of a boat or barge, impelled by the force of oars. But it wasa great advance to fix masts and apply sails to the vessel, and thus substitute the power of wind for that of human labour. The adventurous sailor, instead of plying on the narrow seas or creeping timidly along the shore, could now launch with confidence into the wide ocean. Navigation, in its most cultivated form, may be fairly regarded as one of the sublimest triumphs of human genius, industry, courage, and perseverance. Having by his skill achieved the conquest of the waters that encompass the habitable globe, it was natural for man to desire likewise the: mastery of the air in which we breathe. In all ages, therefore, great ingenuity has been expended in efforts at flying, all of which have as yet re- sulted in failure. But the analogy between sailing on the water and sailing in the air is not so close as many enthu- siasts have supposed it to be. There is a general resem- blance, inasmuch as in hoth cases the propulsion must be made by means of a fluid. But in the one case the fluid is inelastic, in the other elastic ; and the physicist or mathe- matician knows how vastly different are the properties of liquids, even in fundamental points, from those of aeriform or gaseous

bodies. Again, in the one case the vessel floats on the surface of the water, in the other it must float totally immersed in the aerial fluid. A ship, while sailing, is acted on by two fluids—the water supports it and the air propels it; but a ship sailing in the air would be only under the action of the one fluid that surrounds it on all sides. These few considerations—and many more might be added—indicate the essential distinctions between the two cases ; and a very little thought shows that it is not so remarkable as it at first sight appears, that the invention of the art of sailing ou the water should be lost in prehis- toric antiquity, while that of sailing in the air is not a century old; and that while navigation is one of the most perfect of the arts, the power of directing a body floating in the air still remains unattained. Many have argued, that because navigation is an accomplished fact, therefore the navigation of the air must be possible; and without denying the truth of the conclusion, it is worth while at the outset of this article to point out the fallacy of the reasoning. It is true that there is no reason to despair of

where he built the celebrated labyrinth for Minos, the king. But having offended Minos, so that he was im- prisoned by him, he made wings of feathers, cemented with wax, for himself and his son, so that they might escape by flight. He gave his son directions to fly neither too low nor too high, but to follow him. Icarus, however, be- coming excited, forgot his father's advice, and rose so high that the heat of the sun melted the wax of his wings, and he fell into the sea near Samos, the island of Icaria and the Icarian sea being named after him. Dzedalus accom- plished his flight in safety. (Ovid, fet. lib. viii. Fab. iii.) The explanation of the myth may be, as has been supposed, that Dedalus used sails, which, till then, according to Pausanius and Palephatus, were unknown, and so was enabled to escape from Minos' galleys, which were only provided with oars; and that Icarus was drowned near the island Icaria. But the whole story of Deedalus is so fan- ciful a romance, that it is scarcely worth while even to speculate upon what the infinitesimal fragment of truth that lay at the bottom of it may have been.

Archytas of Tarentum was a well-known geometer and Archytas,

astronomer, and he is apostrophised by Horace (Ode 28, lib. i.) The account of his flying pigeon or dove we owe to Aulus Gellius (Woctes Attica), who says " that it was the model of a dove or a pigeon formed in wood, and so con- trived as by a certain mechanical art and power to fly: so nicely was it balanced by weights, and put in motion by hidden and enclosed air." Gellius gives as his authorities "many men of eminence among the Greeks," whom he does not mention by name, and Favorinus the philosopher.

Archytas thus has been regarded as holding to aeronau- tics much about the same position as Archimedes does to the mechanical sciences ; but while the claim of the latter rests on real discoveries and great contributions to know- ledge, the former owes his position merely to an unsup- ported and untrustworthy tradition. When the fire-balloon was invented, it was only natural that many should see in the "hidden and enclosed air" of Archytas' dove a pre- vious discovery of the hot-air balloon. It is quite possible that Archytas may have rarefied the air in his dove by heat, and so made it ascend; but in this case it certainly could not have been made of wood. But if the dove ever was made to appear to fly, it is much the more probable that this effect was produced, as in the scenes at theatres, by means of fine strings or wires invisible to the spectators.

The ancients seem to have been convinced of the im- possibility of men being able to fly, and they appear to have made no attempts in this direction at all. The power of flying was attributed only to the most powerful of the divinities ; and it was regarded as only secondary to Jupi- ter's prerogative of flashing the lightning and hurling the thunderbolt.

The history of aerostatics in the Middle Ages, like that of Aerostaties

the attainment of aerial navigation, as the history of inven- d every other subject relating even remotely to science or ™ the dark

tion and science records many victories as great and at one ss al te) e

time apparently as far off; still, it is as well to notice how little assistance the old discovery affords towards the solution of the new: it may, indeed,

even be that progress has been retarded by the false analogy, for we may feel pretty certain

knowledge of any kind, is little better than a record of the

falsehoods or chimeras circulated by impostors or enthu-

siasts. Truth was completely obscured by ignorance and

fanaticism, and every person of superior talents aud acquire- I. — 24

Attempts at flying.

ments was believed to deal in magic, and to perform his feats of skill chiefly through the secret aid granted him by the prince of darkness; and in a later and comparatively recent period, those wretched creatures whom the unfeeling credulity of our ancestors, particularly during the prevalence of religious fanaticism, stigmatised and murdered under the denomination of witches, were supposed to work all their enchantments, to change their shapes at will, and to transport themselves through the air with the swiftness of thought, by a power derived from their infernal master, to whom was thus assigned the privilege of conferring the gift of acrial navigation upon his servants.

During the darkness of the Middle Ages every one at all distinguished for his knowledge in physics was gene- rally reputed to have obtained the power of flying in the air. Friar Bacon did not scruple to claim the invention ; and the credulity and indulgent admiration of some authors have lent to these pretensions more credit than they really deserved. Any one who takes the trouble to examine the passages of Bacon's obscure and ponderous works will find that the propositions advanced by him are seldom founded on reality, but ought rather to be considered as the illu- sions of a lively fancy. Albertus Magnus, who flourished in the first half of the 13th century, was reputed to have discovered the art; and to give an idea of the state of the physical sciences at that time, it is worth while to quote the following recipes from his De Mirabilibus Nature :— "Take one pound of sulphur, two

pounds of willow-carbon, six pounds of rock-salt ground very fine in a marble mortar; place, when you please, in a covering made of flying papy- rus to produce thunder. The covering, in order to ascend and float away, should be long, graceful, well filled with this fine powder; but to produce thunder, the covering should be short, thick, and half full." (Quoted in Astra Castra, p. 25.) Regiomontanus, the first real mathema- tician after the partial revival of learning, is said, like Archytas, to have formed an artificial dove, which flew before the Emperor Charles V. at his public entry into Nuremberg; but the date of Regiomontanus' death shows this to have been impossible.

Attempts at flying have, as a rule, been made by a some- what low class of projectors, who have generally united some little share of ingenuity to a smattering of mechanics. At the beginning of the 16th century an Italian alchemist visited Scotland, and was collated by James IV. to the abbacy of Tungland, in Galloway. Having constructed a set of wings, composed of various plumage, he undertook from the walls of Stirling Castle to fly through the air to France. This feat he actually attempted, but he soon came to the ground, and broke his thigh-bone by the violence of the fall—an accident he explained by asserting that the feathers of some fowls were employed in his wings, and that these had an affinity for the dunghill, whereas, if composed solely of eagles' feathers, they would have been attracted to the air. This anecdote has furnished to Dunbar, the Scottish poet, the subject of one of his rude satires. In 1617, Fleyder, rector of the grammar school at Tiitbingen, delivered a lecture on flying, which he published eleven years afterwards. A poor monk, however, ambitious to reduce the theory to practice, provided himself with wings; but his machinery broke down, and falling to the ground, he broke his legs and perished. Bishop Wilkins (Mathematical Magick, 1648) says it was related that "a certain English monk called Elmerus, about the Confessor's time," flew by means of wings from a tower a distance of more than a furlong; that another person flew from St Mark's steeple at Venice; and another, at Nuremberg. He also quotes Busbequius to the effect that a Turk also attempted something of the kind at Constantinople. It would probably not be very difficult to make a long list of

such narrations, in some of which the experimenter is related to have been successful, and in others to have failed; but the evidence is in no case very good, and we may feel certain that all the traditions of attempts with a successful issue are false.

In Borelli's posthumous work, De Motu Animalium, pub- Borelii lished at Rome in 1680-81, he calculated the enormous shows tho strength of the pectoral muscles in birds; and his proposition re ceiv. (vol. i. pp. 322-326) is entitled " Est impossibile, ut mane homines propriis viribus artificiosé volare possint," in which by ee he clearly points out the impossibility of man being able by of wings, his muscular strength to give motion to wings of sufficient extent to keep him suspended in the air. But Borelli did not, of course, as has sometimes been stated, demonstrate the impossibility of man's flying otherwise than merely by means of his own muscular power.

A very slight consideration of the matter shows that, Sailing in although the muscles of man may not be of sufficient the air, strength to enable him to use wings, this objection does not apply against the possibility of making a flying chariot in which the motive power should be produced mechanically as in a watch, or a boat to float in the atmosphere. Both these projects have therefore always engaged the attention of abler men than has the art of flying, and it was only the ignorance of the nature and force of the atmosphere, as well as of the properties of all aeriform bodies, that caused so long a time to elapse before the invention of the balloon.

Albert of Saxony, a monk of the order of St Augustine, Albert of and a commentator on the physical works of Aristotle, 54xony. seems first to have comprehended (though in a very vague and erroneous manner) the principles on which a body might be made to float in the atmosphere. Adopting, of course, Aristotelian views with regard to the nature of the elements, he considered that, as fire is more attenuated, and floats above our atmosphere, therefore a small portion of this ethereal substance, enclosed in a light hollow globe, would raise it to a certain height and keep it suspended in the air; and that, if more air were introduced, the globe would sink like a ship when water enters by a leak.

Long afterwards Francis Mendoza, a Portuguese Jesuit, Francis who died in 1626, at the age of forty-six, embraced this Mendoza theory, and he held that the combustible nature of fire was

no real obstacle, as its extreme levity and the extension of

the air would prevent it from supporting inflammation. Casper Schott, also a Jesuit, adopted the same specula- Casper tion, only that he replaced the fire by the thin ethereal Schott. substance which he believed floated above our atmosphere;

but, of course, the difficulty of procuring any of this ether

was a sufficient obstacle.

Similar notions have been revived at different times.

They were likewise often blended with the alchemical tenets Alchemical so generally received in the course of the 15th, 16th, and notions. part of the 17th centuries. Thus Schott quotes Lauretus Lauretus Laurus to the effect that if swans' eggs or leather balls be Laurus. filled with nitre, sulphur, or quicksilver, and be exposed to

the sun, they will ascend. It was also believed that dew

was of celestial origin, being shed by the stars, and that it

was drawn up again in the course of the day to heaven by

the heat of the sun. Thus Laurus states that hens' eggs

filled with dew and exposed to the solar heat will rise.

He was so grossly ignorant, however, of the principles of motion, that it is not worth while even to allude to his

other assertions.

Cyrano de Bergerac (born 1620) wrote a philosophical Romance romance entitled Histoire Comique des Estats et Empire de of Cyrano la Lune, and Les Estats et Empire du Soleil (from-which Pa Swift is supposed to have derived the idea of writing . portions of Gulliver's Travels). To equip himself for per- forming the journey to the moon, the French traveller fastens round his body a multitude of very thin flasks

filled with the morning's dew; the heat of the sun, by its attractive power on the dew, raised him up to the middle region of the atmosphere, whence, some of the flasks being broken, the adventurer sank again to the ground. Other aeronautical ideas occur in the romance.

Cardan proposed that ascensional power might be applied a3 in a rocket; and one Honoratus Fabry has described a huge apparatus, consisting of long tin pipes, worked by air compressed by the action of fire.

The most noted scheme for navigating the air promul- gated previously to the successful ex- periments of the Montgolfiers,is due to a Jesuit, Francis Lana, and was pro- posed by him in a work entitled Pro- dromo dell'Arte Maestra, Brescia, 1670. His idea, though useless and unpractical in so far that it could never be carried out, is yet deserv- ing of notice, as the principles in- – volved are sound; and this can be said of no earlier attempt. His pro- ject: was to procure four copper balls of very large dimensions, yet so extremely thin that after the air was exhausted from them they would be lighter than the air displaced, and so would rise ; and to those four balls he proposed to attach a boat, with sails, &c., and which would carry up a man. He submitted the whole matter to calculation, and proposed that the globes should be about 25 feet in diameter and y4,th of an inch in thickness; this would give from all four balls a total ascensional force of about 1200 ib, which would be quite enough to raise the boat, sails, passengers, &c. But the obvious objection to the whole scheme is, that it would be quite impossible to construct a globe of so large a size and of such small thickness which would even support its own weight without falling to pieces if placed on the ground, much less bear the external atmospheric pressure when the internal air was removed. Lana himself noticed the latter objection, but he thought that the spherical form of the copper shell would,

notwithstanding its extreme thinness, enable it, after the exhaustion was effected, to sustain the enormous pressure, which, acting equally on every point of the surface, would tend to consolidate rather than to break the metal. Of course this assumed the ball to be absolutely spherical, a state of affairs as impossible as indifferent equi- librium actually is. He proposed to exhaust the air from the globes by attaching each to a tube 36 feet long, fitted with a stopcock, and so produce a Torricellian vacuum. He was thus apparently ignorant of the invention of the air- pump by Otto Guericke about 1650; and though his pro- Ject is noteworthy as the hydrostatics of it is correct, still Lana displays his ignorance of philosophical facts known in his day, quite as much as his originality; and his pro- position has, since Montgolfier's discovery, received a greater share of notice than it deserves.

So late as 1755, and not long before the invention of balloons, a very fanciful scheme was proposed by Joseph

Galien, a Dominican friar, and professor of philosophy and

Lana's Aeronautical Machine,

theology in the papal university of Avignon. This vision- ary proposed to collect the diffuse air of the wpper regions, and to enclose it in a huge vessel extending more than a mile every way, and intended to carry fifty-four times as much weight as did Noah's ark. It is unnecessary to notice at greater length this absurd chimera, which is merely mentioned here at all because it is sometimes re- ferred to, though only on account of the magnitude of the fantastic scheme.

It is proper here to remark, that nearly all the early pro-

False ideas

jectors imagined that the atmosphere was of no great with regard

height, and that it covered the earth like a shallow ocean, having a well-defined boundary; and the aerial vessels which they proposed were intended to float on the surface of this ocean, exactly as ships do on the sea, with their upper portions in the ether or diffuse air, or whatever the fluid might be, that lay above. And these ideas were, of course, not dispelled till after the invention of the barometer and the discovery of the law of the decrease of atmospheric pressure with elevation.

to the at-

mosphere,

Some writers have stated that Francis Bacon first pub- Confused

lished the true principles of aeronautics.

This assertion we ideas of

*cannot help noticing, because it has really no foundation ee es except in the propensity, fostered by indolence, which *™ ;*

would gladly refer all the discoveries ever made to a few great names. They mistake, indeed, the character of Bacon who seek to represent him as an inventor. His claim to immortality rests chiefly on the profound and comprehensive views which he took of the bearings of the different parts of human knowlege; for it would be difficult to point out a single fact or observation with which he enriched the store of physical science. On the contrary, being very deficient in mathematical learning, he disregarded or rejected some of the noblest discoveries made in his own time.

We can find only two passages in Bacon's works which can be considered as referring to aeronautics, and they both occur in that collection of loose facts and inconclusive reasonings which he has entitled Natural History. The first is styled Haperiment Solitary, touching Flying in the Air, and runs thus—" Certainly many birds of good wing (as kites and the like) would bear up a good weight as they fly; and spreading feathers thin and close, and in great breadth, will likewise bear up a great weight, being even laid, without tilting up on the sides. he farther ex- tension of this experiment

might be thought upon." The second passage is more diffuse, but less intelligible; it is styled Experiment Solitary, touching the Flying of unequal Bodies in the Air:—"Let there be a body of unequal weight (as of wool and lead or bone and lead); if you throw it from you with the light end forward, it will turn, and the weightier end will recover to be forwards, unless the body be over long. The cause is, for that the more dense body hath a more violent pressure of the parts from the first impulsion, which is the cause (though heretofore not found out, as hath been often said) of all violent motions; and when the hinder part moveth swifter (for that it less endureth pressure of parts) than the forward part can make way for it, it must needs be that the body turn over; for (turned) it can more easily draw forward the lighter part." The fact here alluded to is the resistance that bodies experience in moving through the air, which, depending on the quan- tity of surface merely, must exert a proportionally greater effect on rare substances. The passage itself, however, after making every allowance for the period in which it was written, must be deemed confused, obscure, and un- philosophical.

We now come to the discovery of the balloon, which Discovery

- was due to Stephen and Joseph Montgolfier, sons of Peter of the

Montgolfier, a large and celebrated papermaker at Annonay, P#!0%-

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The bros thers Mont- golfier.

Ascent of of the first air-balloon.

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188 RER ON AW T ICs [DISCOVERY OF a town about 40 miles from Lyons. The brothers had | earth in no way checked its progress; and the excitement observed the suspension of clouds in the atmosphere, and | was so great, that thousands of well-dressed spectators, it occurred to them that if they could enclose any vapour | many of them ladies, stood exposed, watching it intently the of the nature of a cloud in a large and very light bag, it | whole time it was In sight, and were drenched to the skin. might rise and carry the bag with it into the air. They | The balloon, after remaining in the air for about three- accordingly made experiments, inflating bags with smoke quarters of an hour, fell in a field near Gonesse, about from a fire placed underneath, and found either that the | 15 miles off, and terrified the peasantry so much that smoke or some vapour emitted from the fire did ascend it was torn into shreds by them. Hydrogen gas was at and carry the bag with it. Being thus assured of the cor- | this time known by the name of inflammable air; and rectness of their views, they determined to have a public | balloons inflated with gas have ever since been called by ascent of a balloon on a large scale. They accordingly | the people air-balloons, the kind invented by the Mont- invited the States of Vivarais, then assembled at Annonay, | golfiers being designated fire-balloons. French writers have to witness their aerostatic experiment, and on June 5, | also very frequently styled them after their inventors, 1783, in the presence of a considerable concourse of spec- | Charlitres and Montgolficres.

tators, a linen globe of 105 feet in circumference was |, On the 19th of September 1783 Joseph Montgolfier inflated over a fire fed with small bundles of chopped | repeated the Annonay experiment at Versailles, in the pre- straw, and when released rapidly rose to a great height, | sence of the king, the queen, the court, and an immense and descended, at the expiration of ten minutes, at | number of spectators. The inflation was commenced at the distance of about 14 mile. This was the dis- covery of the balloon. The brothers Montgolfier imagined that the bag rose because of the levity of the smoke or other' vapour given forth by the burning straw; and it was not till some time later that it was recognised that the ascending power was due merely to the lightness of heated air compared to an equal volume of air at a lower temperature. Air, like all other fluids, expands by heat, and thereby becomes rarefied, so that any volume of hot air weighs less than the corresponding volume of air at a lower temperature. If, then, the air inside the balloon be so heated that it, together with the balloon, weighs less than the air displaced, the balloon will rise till it arrives at such a height that it and the enclosed air are equal in weight to that of the displaced air, when equilibrium will be ob-

balloon rose to the height of about 1500 feet, and descended after eight minutes, at a distance of about. two miles, in the wood of Vaucresson. Suspended below the balloon, in a cage, had been placed a sheep, a eock, and a duck, which were thus the first aerial travellers. They were quite un-injured, except the cock, which had its right wing hurt in consequence of a kick it had received from the sheep; but this took place before the ascent. The balloon, which was painted with ornaments in oil colours, had a very showy appearance.

The first human being who ascended in a balloon was M. Francois Pilitre de Rozier, a young naturalist, who, two years afterwards, was killed in an attempt to cross the English Channel in a balloon.

Ascent of a sheep, a cock, and a

one o'clock, and completed in eleven minutes, when the:

See Plate I,

Ascent of M. Pilitre de Rozier

tained. In Montgolfier's first balloon, no source of heat was taken up with it, so that the air inside rapidly cooled, and the balloon soon descended.

The news of the experiment at Annonay rapidly spread over Europe, and at Paris attracted so much attention that M. Faujas de Saint-Fond, a naturalist, set on foot a sub- scription for paying the expense of repeating the experi- ment. The balloon was constructed by two brothers of the name of Robert, under the superintendence of M. Charles, professor of natural philosophy in Paris, and afterwards a member of the Academy of Sciences. It had at first been suggested to copy the process of Montgolfier, but Charles proposed the application of hydrogen gas, which was adopted. The filling of the balloon, which was made of thin silk varnished with a solution of elastic gum, and was about 13 feet in diameter, was commenced on August 23, 1783, in the Place des Victoires. The hydrogen gas was obtained by the action of dilute sulphuric acid upon iron filings, and was introduced through leaden pipes; but as the gas was not passed through cold water, great difficulty was experi- enced in filling the balloon completely; and altogether about 500 tb of sulphuric acid and twice that amount of iron filings were used. Bulletins were issued daily of the progress of the inflation; and the crowd was so great that on the 26th the balloon was moved to the Champ de Mars, a distance of 2 miles. This was done secretly, in the middle of the night, to avoid the crowd; and the appearance of the balloon being thus removed, preceded by lighted torches and escorted by a detachment of soldiers, is described as having been very remarkable. On the next day, August 27, an immense concourse of people covered the Champ de Mars, and every spot from which a view could be obtained was crowded. About five o'clock a cannon was discharged as the signal for the ascent, and the balloon when liberated rose to the height of about 3000 feet with great rapidity. A shower of rain which began to fall directly after the balloon had left the

and following days, he made several ascents (generally @ Arlandes, alone, but once with a companion, in a captive balloon (i¢., one attached by ropes to the ground), taking up fuel and feeding the fire, which was kindled in a

and th

On October 15, 1783, Marque M. Girond de Villette), and demonstrated that there was no difficulty in

brazier suspended under the balloon, when in the air. The way being thus prepared for aerial navigation, on November 21, 1783, M. Pildtre de Rozier and the Marquis d'Arlandes first trusted themselves to a free fire-balloon. The experi- ment was made from the Jardin du Chateau de la Muette, in the Bois de Boulogne. The machine employed, which was a large fire-balloon, was inflated at about two o'clock, and leaving the earth at this time, it rose to a height of about 500 feet, and passing over the Invalides and the Ecole Militaire, descended beyond the Boulevards, about 9000 yards from the place of ascent, having been between twenty and twenty-five minutes in the air. The result was completely successful; and it is scarcely necessary to add, the excite- ment in Paris was very great.

Only ten days later, viz., on December 1, 1783, Charles and Robert ascended from Paris in a balloon in- fe flated with hydrogen gas. The balloon, as in the case of andl Be the small one of the same kind previously launched from jn a ballom the Champ de Mars, was constructed by the brothers inflated Robert. It was 27 feet in diameter, and the ear was sus- with hyd pended from a hoop surrounding the middle of the ae er balloon, and fastened to a net which covered the upper hemisphere. The balloon "ascended very gently from the Tuileries at a quarter to two o'clock, and after remaining for some time at an elevation of about 2000 feet, it de- scended in about two hours at Nesle, a small town about 27 miles from Paris, when M. Robert left the car, and M. Charles made a second ascent by himself. He had intended to have replaced the weight of his companion by a nearly equivalent quantity of ballast; but not having any suitable means of obtaining such ready at the place of descent, and it being just upon sunset, he gave the word

MM. Ascent

THE BALLOON. |

to let go, and the balloon being thus so greatly lightened, ascended very rapidly to a height of about 2 miles. After staying in the air about half-an- hour, he descended 3 miles from the place of ascent, although he believed

the distance traversed, owing to different currents, to have been about 9 miles. In this second journey M. Charles experienced a violent pain in his right ear and jaw, no doubt produced by the rapidity of the ascent. He also witnessed the phenomenon of a double sunset on the same day; for when he ascended, the sun had set in the valleys, and as he mounted he saw it rise again, and set a second time as he descended.

All the features of the modern balloon as now used are more or less due to Charles, who invented the valve at the top, suspended the car from a hoop, which was itself at- tached to the balloon by netting, &c. The M. Robert who accompanied him in the ascent was one of the brothers who had constructed it.

On January 19, 1784, the largest balloon on record

- (if the contemporary accounts are correct) ascended from

Lyons. It was more than 100 feet in diameter, about 130 fect in height, and when distended had a capacity, it is said, of over half-a-nillion cubic feet. It was called the lesselles (from the name of its proprietor or owner,

and thought that if they could imprison it in a bag, the bag might ascend too; and the observation and reasoning were both such as might occur to anybody. This does not detract from their merit; it, on the contrary, adds to it. The fact that millions of persons must have observed the same thing, and had noé derived anything practical there- from, only enhances the glory of those who in such well- worn tracts did make a discovery; but the simplicity of the invention shows that it is needless to inquire whence the brothers were led to make it, and how far any part of the credit is due to their predecessors. It is scarcely pos- sible to imagine anything more remarkable than that the fact that a light bag held over a fire would ascend into the air was not discovered till 1783, notwithstanding that men in all ages had seen smoke ascend from fire (though, of course, the fire-balloon does not ascend for exactly the same reason that smoke does). It might be supposed that the

connec- tion of the Montgolfiers with a paper manufactory gave them facilities for constructing their experimental balloons of thin paper; and perhaps such was the case, although we can find no evidence of it. With regard to Charles's substitution of hydrogen gas, there are anticipations that must be noticed. As early as 1766 Cavendish showed that this gas was at least seven times lighter than ordinary

air, and it immediately occurred to Dr Black, of Edinburglt, Dr Black's well known as the discoverer of latent heat, that a thin bag experi- filled with hydrogen gas would rise to the ceiling of a room, ™@™*-

we believe), and after having been inflated from a straw fire in seventeen minutes, it rose with seven persons in the car, viz., Joseph Montgolfier, Pilatre de Rozier,

Count de Laurencin, Count de Dampierre, Prince Charles de Ligne, Count de Laport d'Anglefort, and M. Fontaine, the last gentleman having leaped into the car just as the

He provided, accordingly, the allantois of a calf, with the view of showing at a public lecture such a curious experi- ment; but for some reason it seems to have failed, and

machine had started. The fire was fed with trusses of straw, and the balloon rose majestically to the height of about 3000 feet, but descended again after the lapse of about a quarter of an hour from the time of starting, in consequence of a rent in the upper part.

erica «It is proper here to state that researches on the use of static gas for inflating balloons seem to have been carried on at jeriment Philadelphia nearly simultaneously with the experiments

Black did not repeat it, thus allowing a great discovery,

almost within his reach, to escape him. Several. years afterwards a similar idea occurred to Tiberius Cavallo, Cavallo who found that bladders, even when carefully scraped, are inflated too heavy, and that China paper is permeable to the gas. ae st But in 1782, the year before the invention of the

Mont- Rcfraeeen golfiers, he succeeded in elevating soap-bubbles by in- gas in flating them with hydrogen gas. The discovery of 1782.

mearks n he dis- ry of i halloon.

of the Montgolfiers; and when the news of the latter reached America, Messrs Rittenhouse and Hopkins, mem- bers of the Philosophical Academy of Philadelphia, con- structed a machine consisting of forty-seven small hydrogen gas-balloons attached to a car or cage. After several pre- liminary experiments, in which animals were let up to a certam height by a rope, a carpenter, one James Wilcox, was induced to enter the car for a small sum of money ; the ropes were cut, and he remained in the air about ten minutes, and only then effected his descent by making in- cisions in a number of the balloons, through fear of falling into the river, which he was approaching.

The improvements that have been made in the manage- ment and inflation of balloons in the last ninety years have only had reference to details, so that as far as essential principles are concerned the subject is now in pretty much the same state as it was in 1783. We have therefore ar- rived at a point in the history of the balloon where it is well to consider how much the Montgolfiers and Charles owed to their predecessors; and it is proper here to state that, although we have assigned the invention to the two brothers, Stephen aud Joseph—as no doubt they both conducted the early experiments together—still there is reason to believe that the share of the latter was very small. Stephen, however, although the originator of balloons, does not appear ever to have ascended himself, and Joseph did not repeat the ascent just mentioned in the

fire-balloons might have taken place almost at any time in the world's history, but the substitution of hydrogen gas for heated air could not have been made previously to the latter half of the last century; and although all the honour of an independent discovery belongs to the Mont- golfiers, Charles, by his substitution of "inflammable air" for heated air, merely showed himself acquainted with the state of chemical science of his day. Charles never again ascended after his double expedition on the Ist of December 1783.

We now return to the history of aerial navigation, and commence with an account of the first ascents of balloons in this country. Although the news of the Annonay and subsequent experiments in France rapidly spread all over Europe, and formed a topic of general discussion, still it was not till five months after the Montgolfiers had first publicly sent a balloon into the air that any aerostatic experiment was made in England. In November 1783 Count Zambeccari, an Italian, who happened to be in London, made a balloon of oil-silk, 10 feet in diameter, and weighing 11 ib. It was publicly shown for several days, and on the 25th it was three-quarters filled witlr hydrogen gas, and launched from the Artillery ground at one o'clock. It descended after two hours and a half near Petworth, in Sussex, 48 miles from London. This was the first balloon that ascended from English ground. On February 22, 1784, a hydrogen gas balloon, 5 feet in

Flesselles, The Montgolfiers had studied Priestley's Hx- | diameter, was let up from Sandwich, in Kent, and de periments relating to different kinds of Air, whence they | scended at Warneton, in French Flanders, 75 miles first conceived the possibility of navigating the atmosphere; | distance. This was the first balloon that crossed the but their experiment was so simple as to require scarcely any | Channel. The difficulties and dangers of aerial navi-

philosophical knowledge. They had scen smoke ascend,

gation having been surmounted by the end of the year

Andreani.

Blanchard.

Tytler.

Lunardi.

See Plate [.

1783, the ascents of balloons were now multiplied in all quarters. It will therefore be sufficient to notice very briefly only the more remarkable of the succeeding ascents.

The Chevalier Paul Andreani, of Milan, constructed a fire- balloon 68 feet in diameter, and on February 25, 1784, ascended from Milan with two brothers of the name of Gerli, and remained in the air for about twenty minutes. This is usually regarded as the first ascent in Italy (but see Monck Mason's Aeronautica, p. 247). Andreani ascended again on March 13, with two other persons.

On the 2d of March M. Jean Picrre Blanchard, who had becn for some years before occupicd with projects for flying, made his first voyage from Paris in a balloon 27 feet in diamcter, and descended at Billancourt, near Sévres. Just as the balloon was about to ascend, a young man jumped into the car, and, drawing his sword, de- clared his determination to ascend with Blanchard. He was ultimately removed by force. The episode is worth noting, as it has sometimes been stated that the young man was Napoleon Bonaparte, but this is untrue; his name was Dupont de Chambon. Blanchard made sub- sequently, it is said, more than thirty aerial voyages, and he is one of thc most celebratcd of the earlier aeronauts. He also crossed the English Channel, as noticed further on.

On July 15, 1784, the Duc de Chartres and the two brothers Robert ascended from St Cloud; but the neck of the balloon becoming choked up with an interior balloon filled with common air, intended to regulate the ascending and descending power, they were obliged to make a hole in the balloon, in ordcr to allow of the escape of the gas, but they descended in safety.

The first person who rose into the air from British ground appears to have been Mr J. Tytler,! who ascended from the Comely Gardens, Edinburgh, on August 27, 1784, in a fire-balloon of his own construction. He descended on the road to Restalrig, about half-a-mile from the place where he rose. A brief account appeared in a letter, under date August 27, in the London Chronicle, and we have seen a picture of the balloon copied in some journal from a " ticket in the British Museum." Mr Tytler's claims were for a long time entirely overlooked, the honour being invariably assigned to Lunardi,

till attention was called to them by Mr Monck Mason in 1838. After Lunardi's successful ascents in 1785, Mr Tytler addressed a set of verses to him (quoted in Astra Castra, p. 108), in a note, to which he gives a modest account of his own " mis- fortunes," describing his two "leaps." This is, perhaps, the most correct name for them, as his apparatus having been damaged at different times, he merely heatcd the air in the balloon, and went up without any furnace, being seated in an ordinary basket for carrying earthenware. He reached a height of from 350 to 500 feet.

Although by a few days Tytler has the precedence, still his attempts and partial success were all but totally un- known; whereas Lunardi's experiments excited an enormous amount of enthusiasm in London, and it was he that practically introduced aerostation into this country in the face of very great disadvantages. We have already referred to the extraordinary apathy displayed in England with regard to aerostatic experiments, one consequence of which was that their introduction was due to a foreigner. Vincent Lunardi was secretary to Prince Caramanico, the Neapoli- tan ambassador, and his published letters to his guardian, the Chevalier Compagni, written while he was carrying out his project, and detailing all the difficulties, &c., he met with as they occurred, are very interesting, and give a vivid account of the whole mattcr. His balloon was 33

1 Mr Tytler contributed largely to, and, indeed, appears to have been virtually editor of, the second edition (1778-83) of the Encyclo- pedia Britannica.

feet in circumference, and was exposed to the public vicw at the Lyceum in the Strand, where it was visited by upwards of 20,000 people. It was his original inten- tion to have ascended from Chelsea Hospital, but the con- duct of a crowd at a garden at Chelsea, which destroyed the fire-balloon of a Frenchman named De Moret, who announced an ascent on August 11, but was unable to keep his word, led to the withdrawal of the lcave that had been granted. Ultimately, after some difficulties had been arranged, he was permitted to ascend from the Artil- lery ground, and on September 15, 1784,

the inflation with hydrogen gas took place. It was intended that Mr Biggin, an English gentleman, should accompany Lunardi; but the crowd becoming impatient, the latter judged it prudent to ascend with the balloon only partially full rather than risk a longer delay, and accordingly Mr Biggin was obliged to leave the car. Lunardi therefore ascended alone, in presence of the Prince of Wales and an enormous crowd of spectators. He took up with him a pigeon, a dog, and a cat, and the balloon was provided with oars, by means of which he hoped to raise or lower it at pleasure. Shortly after starting, the pigeon escaped, and one of the oars became broken and fell to the ground. In about an hour and a half he descended at South Mimms, in Hertfordshire, and landed the cat, which had suffered from the cold: he then ascended again, and de- scended, after the lapse of about three-quarters of an hour, at Standon, near Ware, where he had great difficulty in inducing the peasants to come to his assistance; but at length a young woman, taking hold of one of the cords, urged the men to follow her example, which they then did. The excitement caused by this ascent was immense, and Lunardi at once became the star of the hour. He was presented to the king, and was courted and flattered on all sides. To show the enthusiasm displayed by the people during his ascent, he tells himself, in his sixth letter, how a lady, mistaking the oar which fell for himself, was so affected by his supposed destruction that she died in a few days; but, on the other hand, he says he was told by the judges "that he had certainly saved the life of a young man who might possibly be reformed, and be to the public a compensation for the death of the lady;" for the jury were deliberating on the fate of a criminal, whom they must ultimately have condemned, when the balloon appeared, and every one became inattentive, and to save time they gave a verdict of acquittal, and the whole court came out to view the balloon. The king also was in con- ference with his ministers; but on hearing that the balloon was passing, he broke up the discussion, remarking that they might resume their deliberations, but that perhaps they might not see Lunardi again; upon which he, Mr Pitt, and the other ministers viewed the balloon through telescopes. The balloon was afterwards exhibited in the Pantheon. In the latter part of the following year (1785) Lunardi made several very successful ascents from Kelso, Edinburgh, and Glasgow (in one of which he traversed a distance of 110 miles): these he has described in a second series of letters. He subsequently returned to Italy, where we believe he still followed the practice of

aerostation, and made many ascents. He died on July 31, 1806, at Lisbon, according to the Gentleman's Magazine, but a con- temporary newspaper gives Genoa as the place, and adds that he died in a state of very great indigence.

Lunardi's example was soon followed by others, and on October 16, 1784, Blanchard ascended from Little Chelsea with Mr Sheldon, and having deposited the latter at Sun- bury, rose again alone, and descended at Romney Marshes. On November 12, Mr James Sadler, sen., ascended from Oxford, and there is every reason to believe that he made a previous ascent from the same place on October 12, four

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AHRONAUTICS

days previous to Blanchard's (sce Monck Mason, p- 274, where it is stated that he attempted to ascend in a fire- balloon on September 12, but that the balloon was burnt). On November 30, 1784, Blanchard again ascended, accom – panied this time by Dr J. Jeffries, an American physi- On January 4, 1785, Mr Harper ascended from

REMARKABLE ASCENTS. |

191

accompanied by two Bostangis, early in the year 1786, who, crossing the sea which divides Europe from Asia, descended about 30 leagues from the coast.

We have now given a brief account of all the noteworthy Most of the voyages that took place within the first two or three years subsequent

clan. after the discovery of the balloon by Montgolfier. Ascents ead i nehard Birmingham; and on January 7, Blanchard and Dr Jeffries | were multiplied from this time onwards, aud it is impos- ease hee 4 achieved the feat of crossing the Channel from Dover to | sible to give even a list of the many hundreds that have for plea-

Calais. At seven minutes past one the balloon left Dover

taken place since: this omission is, however, of slight sure, and Castle, aud in their passage they had a most magnificent view

importance, as henceforth the balloon became little better ee

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of tede voyage from Boulogne.

of both shores. When about one-third across they found themselves descending, and threw out every available thing from the boat or car. When about three-quarters across they were descending again, and had to throw out not only the anchor and cords, but.also to strip and throw away part of their clothing, after which they found they were rising, and their last resource, viz., to cut away the car, was rendered unnecessary. As they approached the shore the balloon rose, describing a magnificent arch high over the land. They descended in the forest of Guinnes,

On March 23, 1785, Count Zambeccari, who had, as we

ubecearl. have seen, launched the first balloon from English ground,

ascended for the first time with Admiral Vernon from London. Shortly afterwards he returned to his own country, and there applied himself assiduously to the prac- tice of aerial navigation. He twice, in 1803 and 1804, descended into the Adriatic, and both times only escaped after undergoing much danger. Descending in a fire- balloon on September 21, 1812, after a voyage from Bologna, the shock of the grapnel catching in a tree caused the balloon to catch fire; and to save themselves from being burnt, Zambeccari and his companion, Signor Bonaga, leaped from the car. The former was killed on the spot, but the latter, though fearfully injured, escaped with his life.

On June 15, 1785, Pilétre de Rozier made his last fatal It was his intention to have repeated the exploit of Blanchard and Jeffries in the reverse direction, and have crossed from Boulogne to Eng- land. For this purpose he had contrived a double balloon, which he expected would combine the advantages of both kinds—a fire-balloon, 10 feet in diameter, being placed underneath a gas-balloon of 37 feet in diameter, so that by increasing or diminishing the fire in the former it might be possible to ascend or descend without waste of gas.

than a toy, let up to amuse people at fétes or other public occasions. When the first ascents were made in France, the glow of national vanity was lighted up, and the most brilliant expectations were felt with regard to aerostation, and the glory to the nation that would accrue therefrom. These anticipations have not been realised, and the balloon at this moment has received no great improvement since the time of Charles, except the substitution of ordinary coal-gas for hydrogen, which has rendered the inflation of a balloon at any gas-works a comparatively simple matter, bearing in mind the elaborate contrivances required for the generation of hydrogen in sufficient quantities. But in one respect the balloon has been of real service, viz., to science, in rendering the attainment of observations in the higher strata of the atmosphere not only possible but practicable. In regard to such matters the balloon is unique, as the atmosphere is the great laboratory of nature, in which are produced all the phenomena of weather, the results of which we perceive on the earth; and no observa- tions made on mountain-sides can take the place of those made in the balloon, as what is required is the knowledge of the state of the upper atmosphere itself, free from the disturbing effects of the contiguity of the land. Althongh, therefore, in what follows, we shall notice any particularly remarkable ascents, we shall chiefly confine ourselves to the few that have been undertaken for the sake of advancing science, and which alone are of permanent value. It will be necessary to make one exception to this rule, however, in the case of the parachute, the experiments with which require some notice, although they have been put to no useful purpose. The balloon has also been used in warfare as a@ means of observing the movements of the enemy; and the applications of it to this purpose deserve notice, although we think not so much use has been made of the balloon in this direction as might have been.

Rozier was accompanied by M. P. A. Romain, and for rather less than half-an-hour after the aerostat ascended all seemed to be going on well, when suddenly the whole apparatus was seen in flames, and the unfortunate adven- turers came to the ground from the supposed height of more than 3000 feet. Rozier was killed on the spot, and } Romain only survived about ten minutes. A monument was erected on the place where they fell, which was near the sea-shore, about four miles from the starting-point. The Marquis de la Maisonfort had accompanied Rozier to Boulogne, intending to ascend with him, but M. Romain

there insisted on a prior promise. Either the upper bal-

loon must have been reached by the flames, and the gas _ taken fire, or the gas must have poured down into the lower balloon, and so have caused the explosion.

The substitution of coal-gas for hydrogen is due to Mr Substitu- Charles Green, the veteran aeronaut, who made several tion of coal- hundred ascents, the first of which took place on July 19, oe = = e 1821, the coronation day of George IV. In this ascent Sg oe ordinary coal-gas was first used; and every balloon, with very few exceptions, that has ascended since this date has been so inflated. Pall Mall was first lighted by gas in 1807, and at the end of 1814 the general lighting of London by gas commenced; so that coal-gas could not have been available for filling balloons long before it was actually used.

Leaving out of consideration the ascents undertaken for Subsequent scientific objects (very many of which were remarkable for famous the height attained or the distance traversed, and which Pte will be specially noticed further on), we proceed to men-

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We must not omit to mention that on June 4, 1784, Madame Thible ascended from Lyons in a fire-balloon with M. Fleurand, in the presence of King Gustavus of Sweden, then travelling under the name of Count Haga. Madame Thible is very likely the only woman who ever ascended in a fire-balloon, The first Englishwoman who ever ascended into the air was Mrs Sage, who accompanied Mr Biggin in his voyage from London on June 29, 1785. Accounts are given of an ascent at Constantinople, made

in the presence of the Sultau, by a Persian physician,

tion the most noteworthy ascents that have taken place and that have not ended fatally (these latter will be re- ferred to separately). Mr Crosbie, a gentleman who was the first to ascend from Ireland (January 19, 1785), on the 19th July 1785 attempted to cross St George's Channel to England, but fell into the sea; he was saved by some vessels that came to his rescue. Lunardi also fell into the sea, about a mile and a half from the shore, after an ascent from Edinburgh in December 1785; he was rescued by a fishing-boat. Richard Maguire was the second person

Everything passed off satisfactorily, the balloon descending safely at Beckenham; the pony showed no alarm, but quietly ate some beans with which its rider supplied it in the air. Equestrian ascents have since been repeated. In 1852, Madame Poitevin, who had made several such jour- neys in Paris, ascended from Cremorne Gardens, London, on horseback (as "' Europa on a bull"); but after the first journey its repetition was stopped in England by applica- tion to the police courts, as the exhibition outraged public feeling. Lieutenant Gale was killed at Bordeaux on Sept. 8, 1850, in descending after an equestrian ascent, through mismanagement in landing of the horse. M. Poitevin, de- scending in 1858, after an equestrian ascent from Paris, was nearly drowned in the sea near Malaga. Among remarkable balloon ascents must also be noticed that of Mr Wise, from St Louis, on June 23, 1859, in which a distance of 1120 miles was traversed.

In 1863, Nadar, a well-known photographer at Paris, Nadar's constructed an enormous balloon, which he called " Le balloon, Géant." It was the largest gas-balloon ever constructed, containing over 200,000 cubic feet of gas. Underneath it was placed a smaller balloon, called a compensator, the object of which was to prevent loss of gas during the voyage. The car had two stories, and was, in fact, a model of a cottage in wicker-work, 8 feet in height by 13 feet in length, containing a small printing-office, a photographic department, a refreshment-room, a lavatory, &c. The first ascent took place at five o'clock on Sunday, October 4, 1863, from the Champ de Mars. There were thirteen per- sons in the car, including one lady, the Princess de la Tour d'Auvergne, and the two aeronauts Louis and Jules Godard. In spite of the elaborate preparations that had becn made and the stores of provisions that were taken up, the balloon descended at nine o'clock, at Meaux, the early descent being rendered necessary, it was said, by an accident to the valve-line. A second ascent was made a fortnight later, viz., on October 18; there were nine passengers, including Madame Nadar. The balloon descended at the expiration of scventeen hours, near Nienburg in Hanover, a distance of about 400 miles. A strong wind was blowing, and the balloon was dragged over the ground a distance of 7 or 8 miles. All the passengers were bruised, and some more seriously hurt. The balloon and car were then brought to England, and exhibited for some time at the Crystal Palace at the end of 1863 and beginning of 1864. The two ascents of Nadar's balloon excited an extraordinary amount of enthusiasm and interest, vastly out of pro- portion to what they were entitled to. The balloon was larger than any of the same kind that had previously ascended; but this was scarcely more than just appreci- able to the eye, as the doubling the contents of a balloon makes comparatively slight addition to its diameter. M., Nadar's idea was to obtain sufficient money, by the ex- hibition of his balloon, to carry out a plan of aerial locomotion he had conceived possible by means of the principle of the screw; in fact, he spoke of " Le Géant" as "the last balloon." He also started L'Aeronaute, a newspaper devoted to aerostation, and published a small book, which was translated into English under the title The Right to Fly. Nadar's ascents had not the remotest connection with science, although he claimed that they had; nor was his knowledge, as shown in his writings, sufficient to have enabled him to advance it in any way. |

Directly after Nadar's two balloon ascents, M. Eugene Eugene Godard constructed what was perhaps the largest aerial Gol" machine that has ever been made. It was a Montgolfier or fire-balloon, of nearly half-a-million cubic feet capacity (more than double the capacity of Nadar's), The balloon Flesselles, 1783, is said to have slightly exceeded this size. 'The air was heated by an 18 fect stove, weigh-

who ascended from Ireland. Mr Crosbie had inflated his balloon on May 12, 1785, but it was unable to take him up, when Mr Maguire, a student at the university, who was present, offered to ascend. His offer was accepted, and he made the ascent. For this he was knighted by the Lord-Lieutenant (Monck Mason, p. 266). On July 22, 1785, Major Money ascended from Norwich. The balloon was blown out to sea, and he was obliged to descend into the water. After remaining there seven hours hewas rescued by a revenue cutter which had been despatched to his assistance, Mr James Sadler attempted to cross St Gcorge's Channel on the lst of October 1812, and had nearly suc- ceeded, when, in consequence of a change in the wind, he was forced to descend into the sea off Liverpool. After remaining in the water some time, he was rescued by a fishing-boat. But onJuly 22, 1817, Mr Windham Sadler, his second son, succeeded in crossing the Channel from Dublin to Holyhead. On May 24, 1837, Mr Sneath ascended from near Mansfield in a fire-balloon, and descended safely. At half-past one o'clock on November 7, 1836, Mr Robert Hollond, Mr Monck Mason, and Mr Charles Green ascended from Vauxhall Gardens, and descended at about two leagues from Weilburg, in the duchy of Nassau, at half-past seven the next morning, having thus traversed a distance of about 500 miles in 18 hours; Liége was passed in the course of the night, and Coblentz in the early morning. A full account of this trip is given by Mr Monck Mason in his Aeronautica (1838). The balloon in which the journey was performed (a very large one, containing about 85,000 cubic feet of gas), was subsequently called the Nassau Balloon, and under that name became famous, and ascended frequently.

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The Great Nassau Balloon.

Reewes We ought also, perhaps, to notice a curious ascent made sd i: by Mr Green on July 29, 1828, from the Eagle Tavern, City Road, on the back of a favourite pony. Underneath the balloon was a platform (in place of a car) containing places for the pony's fect, and some straps went loosely under his body, to prevent his lying down or moving about.

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CELEBRATED AERONAUTS. |

ing, with the chimney, 980 fb. This furnace was fed by straw; and the "car" consisted of a gallery sur- rounding it. Two ascents of this balloon were made from Cremorne Gardens, on July 20 and July 28, 1864. After the first journey the balloon descended at Greenwich, and after the second at Walthamstow, where it was in- jured by being blown against a tree. Notwithstanding the enormous size of the balloon, M. Godard asserted that it could be inflated in half an hour, and the inflation at Cremorne did not occupy more than an hour. The ascent of the balloon was a very striking sight, the flames roaring up the chimney of the furnace into the enormous globe above. The trusses of straw were suspended by ropes from the gallery below the car, and were drawn up and placed in the furnace as required. This was the first fire-balloon seen by the inhabitants of London, and it was the second ascent of this kind that had been made in this country, Mr Sneath's ascent at Mansfield having been the first, as Mr Tytler's

experiment at Edinburgh in 1784 was a leap, not an ascent, as no source of heat was taken up. In spite of the rapidity with which the inflation was effected, few who saw the ascent could fail to receive an impression most favourable to the gas-balloon in the matter of safety, as a rough descent, with a heated furnace as it were in the car, could not be other than most dangerous.

In the summer of 1873 the proprietors of the New York Daily Graphic, an illustrated paper, determined to con- struct a very large balloon, and enable Mr Wise, the well- known American aeronaut, to realise his favourite scheme of crossing the Atlantic Ocean to Europe. It was believed by many that a current from west to east existed con- stantly at heights above 10,000 fcet, but this seems very uncertain. Mr Green having stated that he had met with such a current, Mr Glaisher nade a point of investigating the directions of the wind at different heights in his ascents, but found that they were as capricious as near the ground. The same result was found by others, and a comparison of the courses of the balloons sent up from Paris during the siege will show that no constant current exists. The American project came to nothing through the badness of the material of which the balloon was made. The size of the balloon was said to be such as to contain 400,000 cubic feet, so that it would lift 14,000 tb. On September 12, 1873, during its inflation, Mr Wise declared the material of which it was made was so bad that he could not ascend in it, though the other two persons who were to accompany him agreed to go. When, however, 325,000 feet of gas had been put into the balloon, a rent was ob- served, and the whole rapidly collapsed. It seems that a most niggardly spirit was shown by the proprietors of the Daily Graphic, so that an inferior material was used, the whole cost being not in excess of 5000 dollars. The bona fides of Mr Wise was not questioned. On October 6, 1873, Mr Donaldson and two others ascended from New York in the balloon after it had been repaired, and effected a perilous descent in Connecticut. During the autumn of 1873 a great amount of discussion took place both in Eng- land and America about the existence of the westerly current and the subject of aerostation. In September 1873 Mr Barnum, the well-known American showman, visited Eng- land with the view of eliciting whether, in the opinion of those best qualified, there was sufficient probability of a successful result to induce him to undertake the construction of a suitable balloon.

By aeronauts (omitting the pioneers Lunardi, Zambec- cari, and others who have been already spoken of) we mean persons who have followed ballooning as a business or trade. Of these, perhaps the best known and most successful have been Blanchard, Garnerin, the Sadlers, Mr Charles Green, Mr Wise, Mr Coxwell, and the brothers

Godard. Blanchard made, it is said, thirty-six ascents, his first having taken place on March 2, 1784. His wife also made many ascents; she was killed on July 7, 1819. Garnerin is said to have ascended more than fifty times; he introduced night ascents with fireworks, &c., the first of which took place on August 4, 1807. We shall have occasion to refer to him again when we treat of parachutes. Mr James Sadler made about sixty ascents, the first of which took place on October 12, 1784. His two sons, John and Windham, both followed in their father's steps; the latter was killed in 1817. In the minds of most Englishmen the practice of ballooning will, for a long time, be associated with the name of Mr Charles Green, the most celebrated of English aeronauts, who, having made his first ascent on July 19, 1821, only died in the year 1870, ata very advanced age. He is credited with 526 ascents by Mr Turnor; and from advertisements, é&e., we see that in 1838 he had made 249. Mr Green may be said to have reduced ballooning to routine, and he made more ascents than any other person has ever accomplished. He accompanied Mr Welsh in his scientific ascents, and to him is also due the invention of the guide rope, which he used in many of his voyages with success. It inerely con- sisted of a rope not less than 1000 feet in length, which was attached to the ring of the balloon (from which the car is suspended), and hung down so that the end of it was allowed to trail along the surface of the ground, the object being to prevent the continual waste of gas and ballast that takes place in an ordinary balloon journey, as such an expenditure is otherwise always going on, owing to the necessity of keeping the balloon from getting either too high or too low. If a balloon provided with a guide rope sinks so low that a good deal of the rope rests on the earth, it is relieved of so much weight and rises again; if, on the contrary, it rises so high that but a little is supported by the earth, a greater

weight is borne by the balloon, and equilibrium is thus produced. Mr Green frequently used the guide rope, and found that its action was satisfactory, and that it did not, as might be supposed, become entangled in trees, &c. It was used in the Nassau journey, but more recent aeronauts have dispensed with it. Still, in crossing the sea or making a very long journey, where the preser- vation of the gas was of great importance, it could not fail to be valuable. Mr Green had, in his time, morc experience in the management than has fallen to the lot of any one else, and he brought to bear on the subject a great amount of skill and practical knowledge. There is also a plain matter-of-fact style about his accounts of his ascents that contrasts very favourably with the writings of some other aeronauts. Mr Coxwell, who has made several hundred ascents, first ascended in 1844, under the name of Wells. He it was who, as aeronaut, accompanied Mr Glaisher in most of his scientific ascents, 1862-65. The Godard family have made very many ascents in France, and are well known in all countries in connection with acronautics. It was to two of the Godards that the management of the military balloons in the Italian campaign was entrusted; it was M. Jules Godard who succeeded in opening the valve in the dangerous descent of Nadar's balloon in Hanover in 18638, and it was Kugene Godard who constructed perhaps the largest Montgolfier ever made, an account of the ascen- sions of which has been given above. M. Dupuis Delcourt was also a well-known aeronaut; he has written on the sub- ject of aerostation, and his balloons were employed by MM. Bixio and Barral in their scientific ascents. In America Mr Wise is par excellence the aeronaut; he has made several hundred ascents, and many of them are distin- guished for much skill and daring. He also appears to have pursucd his profession with more energy and capacity than has any other aeronaut in recent times, and his //story I. — 25

Balloon accidents that have terminated fatally.

The num- ber of per- sons who have ~ ascended in balloons.

Scientific ascents.

of Aerostation shows him to possess much higher scientific attainments than balloonists usually have. In fact, Mr Wise stands alone in this respect, as nearly all professional aeronauts are destitute of scientific knowledge.

The number of fatal accidents that have occurred in the history of balloons is not very great, and nearly all have resulted either from the use of the fire-balloon, or from want of knowledge, or carelessness on the part of the aeronauts themselves. We have already referred to the accidents that closed the carecrs of Pildtre de Rozier and Zambeccari. On November 25, 1802, Signor Olivari, at Orleans, and on July 17, 1812, Herr Bittorff, at Mannheim, perished in consequence of the accidental combustion of their Mfontgolfiéres. On April 7, 1806, M. Mosment ascended from Lille upon a platform, from which he acci- dentally fell and was killed. On July 7, 1819, Madame Blanchard ascended from Paris at night with fireworks attached to the car, a spark from one of which ignited the gas in the balloon, and she was precipitated to the ground and killed. Lieut. Harris ascended from London on May 25, 1824, but, through mismanagement of the valve-line, he allowed all the gas to escape suddenly from the balloon, which descended with terrible velocity. He was killed by the fall, but his companion, Miss Stocks, escaped almost uninjured. In an ascent from Blackburn on September 29, 1824, by Mr Windham Sadler, the balloon, in rising, struck against a chimney, and the aeronaut fell over the side of the car and was killed. On July 24, 1837, Mr Cocking descended from a balloon in a parachute, which struck the ground with such violence that he was killed on the spot. In descending with a horse on September 8, 1850, Lieut. Gale was killed; and in 1863 Mr Chambers was killed at Nottingham, his death arising from suffocation by the gas that poured out at the neck of the balloon, which was not separated from the car by a sufficient interval.

The number of accidents that have occurred bears but a very small proportion to the number of successful ascents that have been made. Mr Monck Mason, in his Aeronautica, gives a list of the names, with the dates and places of their ascent, of all persons who, as far as he could find, had ascended previously to 1838. His list contains 471 names, which are distributed among the inhabitants of the different countries as follows:—England, 313; France, 104; Italy, 18; Germany and the German States, 17; Turkey, 5; Prussia, 3; Russia, 2; Poland, 2; Hungary, 2; Denmark, 1;

Switzerland, 1; and the United States, 3. Among these are the names of 49 women, of whom 28 are English, 17 French, 3 German, and 1 Italian. Some of the persons had ascended a great number of times; thus Mr Charles Green's ascents alone amounted to more than 249; and those of the members of the same family to 535. Mr Mason calculated that the whole number of ascents executed by Englishmen was 752. Of the 471 adventurers only nine were killed, and of these six owed their fate to the dangers attendant on the use of the fire-balloon, and one to bravado. The great number of our own countrymen that appear in the above list is no doubt partially duc to the fact that it was compiled by an Englishman, to whom English news- papers and other records were more accessible; still there is no reason to doubt that a much greater number of Englishmen have ascended than inhabitants of any other country, as balloons as an amusement at fétes, &c., have been more common here. The number of Englishmen who have ascended might now be estimated at from 1500 to 2000.

We can call to mind but three fatal casualties that have taken place since Mr Mason compiled his list, viz, Mr Cocking's parachute accident, Mr Gale's death in 1850, and Mr Chambers' death in 1863.

We come now to an account of the use to which the balloon has been applied for the advancement of science.

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The ascents that have been made are by Sacharof, Biot, and Gay-Lussac in 1804, by Bixio and Barral in 1850, by Mr Welsh in 1852, by Mr Glaisher in 1862-66, and MM. [Flammarion and De Fonvielle in 1867-68. We shall give a brief account of these ascents, because, as has been remarked, with a few exceptions, they form the only useful purpose to which the balloon has been applied. The gene- ral description of the phenomena, &c., met with in a high ascent, and the general results found, are referred to in the account of Mr Glaisher's experiments, as not only are his accounts more detailed, but the number of ascents made by him is much in excess of that of all the others put together.

*The Academy of Sciences at St Petersburg, entertaining Ascent of the opinion that the experiments made on mountain-sides M-Sacharof by De Luc, De Saussure, Humboldt, and others must give * 2 results different from those made in free air at the same bined | heights, resolved in 1803 that a balloon ascent should be January made for the purpose of making scientificresearches. Accord- 30, 1804, dingly, on January 30, 1804, M. Sacharof, a member of the academy, ascended, with M. Robertson as aeronaut, in a balloon belonging to the latter, which was inflated with hydrogen gas. The ascent was made at a quarter past seven, and the descent effected at a quarter to eleven. No great height was reached, as the barometer never sank below 23 in., corresponding to less than 14 mile. The experiments were not very systematically made, and the chief results were the filling and bringing ~down several flasks of air collected at different elevations, and the supposed observation that the magnetic dip was altered. A tele- scope was fixed in the bottom of the car pointing vertically downwards, so that the travellers might be able to: ascer- tain exactly the spot over which they were floating at any momeut. M. Sacharof found that, on shouting downwards through his speaking-trumpet, the echo from the earth was quite distinct, and at his height was audible after an interval of about ten seconds. M. Sacharof's account is given in the Philosophical Magazine (Tilloch's), vol. xxi. pp. 193-200 (1805).*

At the commencement of 1804 Laplace proposed to the members of the French Academy of Sciences that balloons should be employcd for the purpose of solving certain physical problems, adding that, as the government had placed funds at their disposal for the prosecution of use- ful experiments, he thought they might be well applied to this kind of research. The proposition was supported by Chaptal the chemist, who was then minister of the interior, and accordingly the necessary arrangements were speedily effected, the charge of the experiments being given to MM. Gay-Lussac and Biot.

The principal object of this ascent was to determine if Ascent of the magnetic force experienced any appreciable diminution 6ay-s at heights above the earth's surface, De Saussure having ped found that such was the case upon the Col du Géant. On Anon 9: August 24, 1804, MM. Gay-Lussac and Biot (the former 1804, eminent as a chemist and the latter as a natural

philo- sopher) ascended from the Conservatoire des Arts at ten o'clock in the morning. Their magnetic experiments were incommoded by the rotation of the balloon, but they found that, up to the height of 13,000 feet, the time of vibration of a magnet was appreciably the same as on the earth's surface. They found also that the air became drier as they ascended. The height reached was about 13,000 feet, and the temperature declined from 63° Fahr. to 51°. The descent was effected about half-past one, at Meriville, 18 leagues from Paris. .

In a second experiment, which was made on September Ascentot 16, 1804, M. Gay-Lussac ascended aloue. The balloon bas left the Conservatoire des Arts at 9.40 a.m., and descended Septembet at 3.45 p.m. between Rouen and Dieppe. The chief result 16, 1804. obtained was that the magnetic force, like gravitation, did

io ascents in balloons having been undertaken.

ASCENTS. |

not experience any sensible variation at hcights from the earth's surface which we can attain to. Gay-Lussac also brought down air collected at the height of nearly 23,000 fect, and on analysis it appeared that its constitu- tion was the same as that of air collected at the earth's surface. At the time of leaving the carth the thermometer stood at 82° Fahr., and at the highest point reached (23,000 feet) it was 14°°9 Fahr. Gay-Lussac remarked that at his highest point there were still clouds above him.

From 1804 to 1850 there is no record of any scientific In the latter year MM. Bixio and Barral made two ascents for this pur- pose. They ascended from the Paris Observatory on June

" 29, 1850, at 10.27 a.m., the balloon being inflated with

hydrogen gas. The day was a rough one, and the ascent took place suddenly, without any previous attempt having been made to test the ascensional force of the balloon. When liberated, it rose with great rapidity, and becoming

balloon. In 1861, at Manchester, the committce was reap- pointed, and it then consisted of Colonel Sykes (chairman), Mr Airy, Sir David Brewster, Mr Fairbairn, Admiral Fitzroy, Mr Gassiot, Mr James Glaisher, Sir J. Herschel, Dr Lee, Dr Lloyd, Dr W. A. Miller, Dr Robinson, and Dr Tyndall. Some unsuccessful experiments were made with a balloon of Mr Green's, and also with one hired from the proprietors of Cremorne Gardens, which turned out to be in a hopelessly leaky condition; the trained observers also, on whom the committee had relied, failed to perform their duties, In this state of affairs, Mr Coxwell, an acronaut who had made a good many ascents, was communicated with, and he agrced to construct a new balloon, of 90,000 cubic feet capacity, on the condition that the committee would undertake to use it, and pay £25 for each high ascent made especially for the committee, the latter dcfraying also the cost of gas, &c., so that the expensc of each high ascent amounted to nearly £50. An observer being still wanted,

fully inflated it pressed upon the network, bulging out at the top and bottom. As the ropes by which the car was suspended were too short, the balloon soon covered the

*Mr Glaisher, a member of the committee, offered himself to Mr take the observations, and accordingly the first ascent was Glaisher's made on July 17, 1862, from the gas-works at Wolverhamp- ®5¢¢"*ts.*

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travellers like an immense hood. In endeavouring to secure the valve-rope, a rent was made in the balloon, and the gas escaped so close to the faces of

the voyagers as almost to suffocate them. Finding that they were descending then too rapidly, they threw overboard everything available, including their coats, and only excepting the instruments. The ground was reached at 10h. 45m., near Lagny. Of course no observations were made.

MM. Bixio and Barral determined to ascend again with- out delay, and accordingly, on July 27, 1850, they repeated the experiment. The ascent was remarkable on account of the extreme cold met with. At about 20,000 feet the temperature was 15° Fahr., the balloon being enveloped in cloud; but on cmerging from the cloud, at 23,000 feet, the temperature sank to—38° Fahr., no less than 53° Fahr. below that experienced by Gay-Lussac at the same eleva- tion. The existence of these very cold clouds served to explain certain meteorological phenomena that were ob- served on the earth both the day before and the day after the ascent. Some pigeons were taken up in this, as in most other high ascents, and liberated; they showed a reluctance to leave the car, and then fell heavily downwards.

In July 1852 the committee of the Kew Observatory resolved to institute a series of balloon ascents, with the view of investigating such meteorological and physical phenomena as require the presence of an observer at a great height in the atmosphere. Mr Welsh, of the Kew Observatory, was the observer, and Mr Green's great Nassau balloon was employed, Mr Green himself being the aeronaut. Four ascents were made in 1852, viz., on August 17, August 26, October 31, and November 10, when the respective heights of 19,510, 19,100, 12,640, and 22,930 feet were attained. A siphon barometer, dry and wet bulb thermometers, aspirated and free, and a Regnault's hygrometer were taken up. Some air collected at a considerable height was found on analysis not to differ appre- ciably in its composition from air collected near the ground. The original observations are printed in eatenso in the Philo- sophical Transactions for 1853, pp. 311-346. The lowest temperatures met with in the four ascents were respectively 8°-7 Fahr. (19,380 feet); 12°4 Fahr. (18,370); 16°-4 Fahr. (12,640); —10°-5 Fahr. (22,370); the decline of tem- perature being very regular.

At the meeting of the British Association for the Ad- vancement of Science held at Abcrdeen in 1859, a com- Inittee was appointed for the purpose of making observations

. in the higher strata of the atmosphere by means of the

balloon. For the first two years nothing was cffectcd, owing to the want both of an observer and of a suitable

ton, this town being chosen on account of its central position inthecountry. Altogether, Mr Glaisher made twenty-eight ascents, the last having taken place on May 26, 1866. Of these only seven were specially high ascents, although six others were undertaken for the objects of the committee alone. On the other occasions Mr Glaisher availed himself of public ascents from the Crystal Palace and other places of entertainment, merely taking his place like the other passengers. In the last six ascents another aeronaut, Mr Orton, and a smaller balloon, were employed. The dates, places of ascent, and greatest heights (in feet) attained in the twenty-eight ascents were— 1862: July 17, Wolver- hampton, 26,177; July 30, Crystal Palace, 6937; August 18, Wolverhampton, 23,377; August 20, Crystal Palace, 5900; August 21, Hendon, 14,355; Scptember 1, Crystal Palace, 4190; September 5, Wolverhampton, 37 ,000; September 8, Crystal Palace, 5428. 1863: March 31, Crystal Palace, 22,884; April 18, Crystal Palace, 24,163; June 26, Wolverton, 23,200; July 11, Crystal Palace, 6623; July 21, Crystal Palace, 3298; August 31, New- castle-upon-Tyne, 8033; September 29, Wolverhampton, 16,590; October 9, Crystal Palace, 7310. 1864: January 12, Woolwich, 11,897; April 6, Woolwich, 11,075; June 13, Crystal Palace, 3543; June 20, Derby, 4280; June 27, Crystal Palace, 4898; August 29, Crystal Palace, 14,581; December 1, Woolwich, 5431; December 30, Woolwich, 3735. 1865: February 27, Woolwich, 4865; October 2, Woolwich, 1949; December 2, Woolwich, 4628. 1866: May 26, Windsor, 6325. Of these, all the ascents from Wolverhampton (four in number) and from Woolwich (seven in number) were undertaken wholly for the committee, and Mr Glaisher was mcrely accompanied by the aeronaut, whose business it was to manage thc balloon. The expense of the special high ascents (about £50 for each, as stated above) rendcred it desirable, when possible, to take advantage of the desire felt by many to accompany Mr Glaisher in his journey, and admit one or two other travellers; and of this kind werc one or two of the ascents from the Crystal Palace, though the majority, in which the clevation attained frequently fell short of a mile, were the ordinary public ascents advertised beforc- hand. It is not possible here

to give any complete account of the results obtained, and it would be superfluous, as the observations, both as made and aftcr reduction, are printed in the British Association Reports, 1862-66. It will be enough, after cxplaining the objects of the experiments, &c., to describe briefly one or two of the most remarkable ascents, and then statc the kind of conclusions that follow from them as a whole.

Objects of

The primary object was to determine the tempcrature of

the experi- the air, and its hygrometrical state at different elevations

ments.

Tnstrn- ments and apparatus.

Ohserving arrange- mcnts.

Mr Glaisher's ascent on July 17,

1862.

to as great a height as could be reached ; and the secondary objects were—(1) to determine the temperature of the dew- point by Daniell's and Regnault's hygrometers, as well as by the dry and wet bulb thermometers, and to compare the results; (2) to compare the readings of an aneroid barometer with those of a mercurial barometer up to the height of 5 miles; (3) to determine the elcctrical state of the air, (4) the oxygenic condition of the atmosphere, and (5) the time of vibration of a magnet; (6) to collect air at different elevations; (7) to note the height and kind of clouds, their density and thickness; (8) to determine the rate and direc- tion of different currents in the atmospherc; and (9) to make observations on sound.

The instruments used were mercurial and aneroid baro- meters, dry and wet bulb thermometers, Daniell's dew- point hygrometer, Regnault's condensing hygrometer, maximum and minimum thermometers, a magnet for hori-

zontal vibration, hermetically sealed glass tubes exhausted. of air, and an electrometer. In one or two of the ascents a camera was taken up.

One end of the car was occupied by the aeronaut; near the other, in front of Mr Glaisher, was placed a board or table, the extremities of which rested on the sides of the car; upon this board was placed suitable framework to carry the several thermometers, hygrometers, magnet, aneroid barometer, &c.; a perforation through it admitted the lower branch of the mercurial barometer to descend below, leaving the upper branch at a convenient height for observing. A watch was placed directly opposite to Mr Glaisher, the central space being occupied by his note- book. The aspirator (for Regnault's hygrometer) was fixed undcrneath the centre of the board, so as to be con- veniently workable by either feet or hands. Holes were cut in the board to admit the passage of the flexible tubes required for Regnault's hygrometer and the dry and wet bulb thermometers.

The first ascent was made, as has been stated, from Wolverhampton on July 17, 1862, and the journey was remarkable on account of a warm current that was met with at a great elevation. The weather, previous to the ascent, had been bad for a long time, and it had been delayed in consequence. The wind was still blowing from the west, and considerable difficulty was experienced in the preliminary arrangements, so that no instrument was fixed before starting. The balloon left at 9.43 a.m., and a height of 3800 feet was reached before an observation could be taken. At 4000 feet clouds were entered, and left at 8000 feet. The temperature of the air at starting was 59° Fahr., at 4000 feet it was 45°, and it descended to 26° at 10,000 feet, from which height to that of 13,000 feet there was no diminution. While passing through this space Mr Glaisher put on additional clothing, feeling certain that a temperature below zero would be attained before the height of 5 miles was reached; but at the elevation of 15,500 feet the temperature was 31°, and at each successive rcading, up to 19,500, it increased, and was there 42°. The temperature then decreased rapidly, and was 16° at 26,000 feet. On descending it increased regularly to 37°°8 at 10,000 feet. A very rough descent, in which nearly £50 worth of instruments were broken, was effected near Oakham, in Rutlandshire, Mr Coxwell having judged it prudent to descend on account of the proximity, as he supposed, of the Wash. In coming down, a cloud was entered at an elevation of 12,400 feet,

and proved to be more than 8000 feet in thickness. The rise of temperature met with in this ascent was most remarkable.

The weather on the day (Aug. 18, 1862) of the third as- cent was favourable, and there was but little wind. All the

instruments were fixed before leaving the earth. A height Ascent of more than 4 miles was attained, and the balloon remained from Wol- in the air about two hours. When at its highest point verhanip- there were no clouds between the balloon and the earth, Te and the streets of Birmingham were distinctly visible. ; ; The descent was effected at Solihull, 7 miles from Bir- mingham. On the earth the temperature of the air was 67°°8, aud that of the dew-point 54°6; and they steadily decreased to 39°°5 and 22°-2 respectively at 11,500 fect.

The balloon was then made to descend to the height of about 3000 feet, when both increased to 56°°0 and 47°5 respectively. On throwing out ballast the balloon rose again, and the temperature declined pretty steadily to 24°-0, and that of the dew-point to—10°-0, at the height

of 23,000 feet. During this ascent Mr Glaisher's hands became quite blue, and he experienced a qualmish sensa-

tion in the brain and stomach, resembling the approach of sea-sickness; but no further inconvenience, besides such

as resulted from the cold and the difficulty of breathing,

was experienced, This feeling of sickness never occurred again to Mr Glaisher in any subsequent ascent.

The ascent from the Crystal Palace on August 20, 1862, Ascent was merely an ordinary one for the public amusement, in fom Crys. which Mr Glaisher took a place in the car. In these low tal Palace, ascents from places of entertainment, in which other per- ang from sons also were passengers, the large board stretching right Hendon, across the car could not be used. A smaller frame August 21, was therefore made, which could be screwed on to the 186. edge of the car, to carry the watch, siphon barometer, aneroid

barometer, dry and wet bulb thermometers, grid- iron thermometer,! and Daniell's and Regnault's hygro- ' meters, which comprised all the instruments usually taken up in these low ascents. In the first low ascent, July 30, this framework was fixed inside the car; but as it seemed possible that the warmth proceeding from the voyagers might influence the readings of the instruments, it was always afterwards fixed outside, and projected beyond the car, 80 that all the instruments were freely exposed to the surrounding air. The ascent on August 20 was a low one, and presented no remarkable feature except that the balloon was nearly becalmed over London. The earth was left at 6.26 p.m., aud the air was so quiet that at the height of three-quarters of a mile the balloon was still over the Crystal Palace. At 7h. 47m. it was over London, and moving so slowly that it was thought desirable to ascend. above the clouds in hopes of meeting with a more rapid current of air. At 8h. 5m. the voyagers were above the clouds, and it became quite light again, darkness having come on whilst hovering over London, at which time the gradual illumination by the lights in the streets formed a most wonderful sight, and one never to be forgotten. The roar, or rather loud hum, proceeding from the great city was also most remarkable. After having been above the clouds some time, the lowing of cattle and other agri- cultural sounds were heard. Accordingly, the valve-line was pulled, and the balloon descended below the clouds, when the light of London was seen in the distance asa misty glare. The darkness increased as the balloon descended very slowly, and it at length touched the ground so gently in the middle of a field at Mill Hill, near Hendon, that those in the car were scarcely aware of the contact. There were twelve voyagers altogether, and when with some trouble sufficient countrymen were collected to take their places and enable

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1 This was a thermometer with a bulb shaped like a gridiron, S0 28 to have a very great surface exposed to the air. It was thought that the ordinary pea-sized bulb would not permit of the thermometer being sufficiently delicate to register the rapid changes of temperature dne to the quick motion of the balloon, as it requires some little time for such a thermometer to take up the temperature of the surrounding medium.

them to leave the car, it was resolved to anchor the balloon for the night and to make an ascent in the early morning. Accordingly, at 4.30 a.m, on August 21, the earth was left, there being altogether five persons in the car. It was a dull, warm, cloudy morning, with the sky overcast. In about an hour the height of 3 miles was attained, and the temperature had fallen to 23°, having been 58° on the carth before leaving. The aspect of the clouds under for- mation before and during the rising of the sun was mar- vellous in the extreme, and baffled description. There were scen shining masses of cloud in mountain chains, rising perpendicularly from the plain, with summits of dazzling whiteness, forming vast ravines, down which the balloon appeared to glide, or pass through their sides, into other valleys, until, as the balloon rose far above, all appeared a mighty sea of white cloud. The descent was effected about a quarter past seven, and the transition from the magnificent scene above the clouds to the ugly prospect of the dreary earth as seen early on a dull morning, with a uniform leaden sky, was most depressing. The place of descent was near Biggleswade.

The most noteworthy fact in connection with the ascent, September 1, 1862, was, that from the balloon the clouds were observed to be forming below, and secn to be follow- ing the whole course of the Thames from the Nore to Richmond. The clouds were above the river following all its windings, and extending neither to the right nor to the left. It was about the time of high water at London Bridge, and the phenomenon was no doubt connected with the warm watcr from the sea.

As in the ascent, September 5, 1862, the greatest – height ever reached was attained, it is desirable to give

the account of it in some detail, and in Mr Glaisher's own

"words. It is only necessary to premise that it was intended on this occasion to ascend as high as possible. The fol- – lowing is an extract from Mr Glaisher's account (British Association Report, 1862, pp. 383-385) :—

This ascent had been delayed owing to the unfavourable state of the weather. 'lhe balloon left at lh. 8m. p.m. The tempcrature of the air was 59°,

and the dew-point 50°. At the height of 1 mile it was 41°, dew-point 88°; and shortly afterwards we entered a cloud of about 1100 feet in thickness, in which the temperature of the air fell to 364°, the dew-point being the same, thus indicating that the air was here saturated with moisture. On emerging from the cloud at 1h. 17m. we came upon a flood of strong sunlight, with a beautiful blue sky, without a cloud above us, and a magni- fieent sea of cloud below, its surface being varied with endless hills, hillocks, mountain chains, and many snow-white masses rising from it. I here tried to take a view with the camera; but we were rising with too great rapidity, and going round and round too quickly, to enable me to do so. The flood of light, however, was so great that all I should have needed would have been a momentary exposure, as Dr Hill Norris had kindly furnished me with extremcly sensitive dry plates for the purpose. We reached 2 miles in height at Ih. 21m. The temperature had fallen to the freezing-point, and the dew-point to 26°. We were 8 miles high at 1h. 28m., with a tem- perature of 18°, and dew-point 13°. At lh. 39m. we had reached 4 miles, and the temperature was 8°, and dew-point— 15°; in ten minutes more we had reaclied the fifth mile, and the temperature had passed below zero, and then read— 2°, and at this point no dew was observed on Kegnault's hygrometer when cooled down to – 80°; but a dew-point obtained from the readings of dry and wet gave— 36°. Up to this time I had taken observations with comfort. Thad experienced no difficulty in breathing, whilst Mr Coxwell, in consequence of the necessary exertions he had to make, had breathed with difficulty for some time. At 1h. 51m. the barometer reading was 11°05 inches, but this requires a subtractive correction of 0°25 inch, as found by comparison with Lord Wrottesley's standard barometer just before starting. I afterwards read the dry thermo- meter as—5°; this must have been about Ih. 52m. or later; I could not see the column of mercury in the wet bulb thermometer; nor afterwards the hands of the watch, nor the fine divisions on any mstrument. I asked Mr Coxwell to help me to read the instru- ments, as I experienced a difficulty in seeing. In consequence, however, of the rotatory motion of the balloon, which had continued without ceasing since the earth had been left, the valve-line had become twisted, and he had to leave the car and moupt into the

ring above to adjust it. At this time I looked at the baromcter, and found it to be 10 inches, still decreasing fast ; its true reading therefore was 93 inches, implying a height of 29,000 feet. Shortly afterwards I laid my arm upon the table, possessed of its full vigour, and on being desirous of using it, I found it powerless—it must have lost its power momentarily. I tricd to move the other arm, and found it powerless also. I then tried to shake myself, and succeeded in shaking ny body. I seemed to have no limbs. I then looked at the barometer, and whilst doing so my head fell on my left shoulder. I struggled and shook my body again, but could not move my arms. I got my head upright, but for an instant. only, when it fell on my right shoulder, and then I fell backwards, my back resting against the side of the car, and my head on its edge; in this position my eyes were directcd towards Mr Coxwell in the ring. When I shook my body I seemed to have full power over the muscles of the back, and considerable power over those of the neck, but none over eithcr my arins or my legs; in fact, I seemed to have none. As in the case of the arms, all muscular power was lost in an instant from my back and neck. I dimly saw Mr Coxwell in the ring, and endeavoured to speak, but could not ; when in an instant intense black darkness came : the optic nerve finally lost power suddenly. I was still conscious, with as active a brain as at the present moment whilst writing this. I thought I had been seized with asphyxia, and that I should experience no more, as death would come unless we speedily descended : other thoughts were actively entering my mind, when I suddenly became unconscious as on going to sleep. [I cannot tell anything of the sense of hearing; the perfect stillness and silence of the regions 6 miles from the earth (and at this time we were between 6 and 7 miles high) is such that no sound reaches the ear.

My last observation was made at 1h. 54m. at 29,000 feet. I suppose two or three minutes fully were occupied between my eyes becoming insensible to seeing fine divisions and Jh. 54m., and then that two or three minutes more passed till I was insensible ; therc- fore I think this took place at about 1h. 56m. or 1h. 57m. Whilst powerless I heard the words ‘temperature’ and ‘ observation,’ and I knew Mr Coxwell was in the car speaking to me, and endeavour- ing to arouse me; therefore consciousness and hearing had returned. I then heard him speak more emphatically, but I could not see,

speak, or move. I heard him again say, ‘ Do try—now do.’ Then I saw the instruments dimly, then Mr Coxwell, and very shortly saw clearly, I rose in my seat and looked round, as though wak- ing from sleep, though not refreshed by sleep, and said to Mr Coxwell, ‘I have been insensible.’ He said, ‘ You have ; and I too, very nearly.” I then drew up my legs, which had been extended before me, and took a pencil in my hand to begin observations. Mr Coxwell told me that he had lost the use of his hands, which were black, and I poured brandy over them.

‘I resumed my observations at 2h. 7m., recording the barometer reading at 11°53 inches and temperature — 2°. I suppose that three or four minutes were occupied from the time of my hearing the words ‘temperature’ and ‘observation’ till I began to observe. If so, then returning consciousness came at 2h. 4m., and this gives seven minutes for total insensibility. I found the water in the vessel supplying the wet bulb thermometer, which I had by fre- quent disturbances kept from freezing, was one solid mass of ice ; and it did not all melt until after we had been on the ground some time.

“ Mr Coxwell told me that whilst in the ring he felt it piercingly cold ; that hoar-frost was all round the neck of the balloon ; on at- tempting to leave the ring he found his hands frozen, and he had to place his arms on the ring and drop down ; that he thought for a moment I had lain back to rest mysclf; that he spoke to me without eliciting a reply ; that he then noticed my legs projected and my arms hung down by my side; that my countcnance was serene and placid, without the earnestness and anxiety he had’ noticed before going into the ring, and then it struck him I was insensible. He wished to approach me, but could not, and he felt. insensibility coming over himself; that he became anxious to open the valve, but in consequence of his having lost the use of his hands he could not, and ultimately did so by seizing the cord with his teeth, and dipping his head two or three times, until the balloon took a decided turn downwards,

‘No inconvenience followed this insensibility, and when we dropped it was in a country where no conveyance of any kind could be obtained, so that I had to walk between 7 and 8 miles.

‘The descent was at first very rapid ; we passed downwards 3 miles in nine minutes ; the balloon’s career was then checked, and it finally descended in

the centre of a large grass field at Cold Wes- ton, 74 miles from Ludlow.

‘In this ascent six pigeons were taken up. One was thrown out at the height of 3 miles, when it extended its wigs and dropped as a piece of paper ; a second, at 4 miles, flew vigorously round and. round, apparently taking a dip each time; a third was thrown out between 4 and 5 miles, and it fell downwards as a stone ; a fourth was thrown out at 4 miles on descending ; it flew in a circle, and shortly alighted on the top of the balloon. The two remaining,

Ascent from the Crystal Palace on April 18,

1862.

Ascent from Wol- verton, June 26,

1863.

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pigeons were brought down to the ground. One was found to be dead, and the other, a earrier, was still living, but would not leave the hand when I attempted to throw it off, till, after a quarter of an hour, it began to peek a pieee of ribbon whieh eneireled its neek, and was then jerked off the finger, and flew with some vigour to- wards Wolverhampton. One of the pm returned to Wolver- hampton on Sunday, the 7th, and this is the only one that has been heard of.”

Mr Glaisher found from his observation-book that the last observation was made at 29,000 feet, and that at this time the balloon was ascending at the rate of 1000 fect per minute; and that when he resumed his observations, it was descending at the rate of 2000 fect per minute, the interval being thirteen minutes. This gives 36,000 or 37,000 feet for the greatest height attained. Two other series of con- siderations led to the latter height, and there can be no doubt that the altitude of 37,000 feet, or 7 miles, was attained on this occasion.

In the ascent, April 18, 1863, 24,000 feet of elevation was reached. It was remarkable for the rapidity of the de- scent. At 2h. 44m., the balloon being then at a height of 10,000 feet, Mr Coxwell suddenly caught sight of Beachy Head, and Mr Glaisher, looking over the edge of the car, saw the sca, apparently immediately underneath. There was no time to be lost, and Mr Coxwell hung on to the valve- line, telling Mr Glaisher to leave his instruments and do the same. The earth was reached at 2h. 48m., the two miles of descent having been effected in four minutes. The balloon struck the ground near Newhaven with a terrible crash, but, from the free use of the valve-line, it was so crippled that it did not move afterwards. All the instru- iments, of the value of more than £25, including some that were unreplaceable, were broken, and Mr Glaisher was hurt. In the descent, after the first high ascent on July 17, 1862, the earth was struck with so much violence that most of the instruments were broken, and Mr Glaisher (who was closed in by his observing-board) was a good deal hurt then. In subsequent ascents, therefore, boxes were used filled with small mattresses, in which the instru- ments could be hurriedly placed, and the board was so arranged that it could be turned over and hung outside the car. These improvements had the effect of diminish- ing the danger to himself and the chance of breakage of the instruments, but in the Newhaven descent there was not sufficient time to put them in practice.

The circumstances met with in the ascent, Junc 26, 1863, were so remarkable that a short account cannot be omitted. The morning was at first very bright and fine, but between 11 and 12 o'clock a change took place; the sky became covered with clouds, and the wind rose and blew strongly, so that great difficulty was experienced in com- pleting the inflation. At lh. 3m. the balloon left; in four minutes, at 4000 feet high, cloud was entered. Mr Glaisher expected soon to break through it, and enter into bright sunshine as usual, but nothing of the sort took place, as, on emergence, clouds were seen both above and below. At 9000 feet the sighing and moaning of the wind were heard, and Mr Glaisher satisfied himself that this was due, not to the cordage of the balloon, but to opposing currents. At this time the sun was seen faintly, but instead of its brilliance increasing, although the balloon was then two miles high, a fog was entered, and the sight of the sun lost. The balloon next passed through a dry

fog, which was left at 12,000 feet, and after the sun had been seen faintly for a little time, a wetting fog was entered.

- *At 15,000 feet," Mr Glaisher proceeds, "we were still in fog, but it was not so wetting. At 16,000 fcet we entered a dry fog ; at 17,000 feet saw faint gleams of the sun, and heard a train. We were now about 3 miles high; at this time we were not in eloud, but elouds were below us ; others were on our level at a dis-*

tanee, and yet more above us. We looked with astonishment at each other, and said as we were rising steadily we surely must soon

pass through them. At 17,500 feet we were again enveloped in fog, which beeame wetting at 18,500 feet ; we left this cloud below at 19,600 fect. At 20,000 fect the sun was just visible. We were now approaching 4 miles high ; dense elouds were still above us; for a space of 2000 to 3000 feet we met with no fog, but on passin above 4 miles our attention was first attraeted to a dark mass o cloud, and then to another on our level; both these elouds had fringed edges—they were both nimbi. Without the slightest doubt both these elouds were regular rain-elouds. Whilst looking at them we again lost sight of everything, being enveloped in fog whilst passing upwards through 1000 feet. At 22,000 feet we again emerged, aud were above elouds on passing above 23,000 feet. At six minutes to 2 o'eloek we heard a railway train ; the temperature here was 18°. I wished still to aseend to find the limits of this vapour, but Mr Coxwell said, ' We are too short of sand ; I eannot

o higher ; we must not even stop here.' I was therefore most reluetantly compelled to abandon the wish, and looked searehingly around, At this highest point, in elose proximity to us, were rain-clouds ; below us dense fog. I was again reminded that we must not stop. With a hasty glance everywhere, above, below, around, I saw the sky nearly eovered with dark clouds of a stratus eharaeter, with eirri still higher, and small spaees of blue sky be- tween them. The blue was not the blue of 4 or 5 miles high as | had

always before scen it, but a faint blue, as seen from the earth when the air is charged with moisture."

In the downward journey an even more remarkable series of circumstances was met with; for a fall of rain was passed through, and then below it a snow-storm, the flakes being entirely composed of spiculze of ice and innumerable snow- crystals. On reaching the ground near Ely the lower atmosphere was found to be thick, misty, and murky. At Wolverton the afternoon was cold, raw, and disagreeable for a summer's day. The fact of rain-clouds extending layer above layer to a height of 4 miles, was one never hitherto regarded as possible; and the occurrence of rain and snow, and the latter underneath the former, and all happen- ing on a day in the very middle of summer, formed a series of most curious and unexpected phenomena.

Mr Glaisher having, in one of his descents, which took Night place near sunset, observed that the temperature was the Ascauts

same through a very considerable height, it occurred to him that after dark it was quite possible that, for some ele- vation above the earth's surface, the temperature might even increase with increase of height; and to determine this he arranged for some ascents to be made after sunset, so that the temperature during the night might be observed. For this purpose he procured a couple of Davy lamps, which answered their object satisfactorily. Accordingly, on October 2, 1865, an ascent was made from Wool- wich Arsenal, the time of starting being about three- quarters of an hour after the sun had set. The temperature on the earth was 56°, and it steadily increased to 59°6 at the height of 1900 feet. This was established con- clusively by repeated ups and downs, the temperature falling as the balloon descended. The view of London lighted up, as seen from the balloon in this ascent, the night being clear, was most wonderful. A second night ascent was made from the same place on December 2, 1865, and the balloon left the earth 2? hours after sunset. On this occasion the temperature did not rise, but the decrease, though steady, was small. In an ascent from Windsor on May 29, 1866, the balloon was kept up till half-past eight o'clock, and the temperature was found to decrease as the earth was approached during the last 900 feet. In this last ascent no paid aeronaut

was employed, as Mr Westcar, of the Royal Horse Guards, undertook the management of the balloon. In the preceding five ascents Mr Orton, of Blackwall, was employed as aeronaut.

It has been found necessary in the present notice to Results”

allude merely to the more striking points noticed in Mr ex Glaisher’s twenty-eight ascents. The number of observa- tions made by him was of course great, and it is only neces- sary here to repeat that they are to be found in the Reports of the British Association for the Advancement of Scvence,

peri: ments.

ASCENTS. |

1862-66. It appeared as one of the results of the eXx- periments that the rate of the decline of temperature with elevation near the earth was very different when the sky was clear from what was the case when it was cloudy ; and the equality of temperature at sunset and Increase with height after sunset were very remarkable facts which were not anticipated, and which have an important bearing on the theory of refraction, as astronomical observations are usually made at night. Even at the height of 5 miles, cirrus clouds were seen high in the air, apparently as far above as they seem when viewed from the earth, and the air must there be so exceedingly dry that it is hard to believe that their presence can be due to moisture at all. The results of the observations differed very much, and no doubt the atmospheric conditions depended not only on the time of day, but also on the season of the year, and were such that a vast number of ascents would be requisite to determine the true laws with anything approaching to certainty and completeness. It is also clear that England is a most unfit country for the pursuit of such investiga- tions, as, from whatever place the balloon started, it was never safe to be more than an hour above the clouds for fear of reaching the sea. It appeared from the observations that an aneroid barometer could be trusted to read as accu- rately as a mercurial barometer to the heights reached. The time of vibration of a horizontal magnet was taken in very many of the ascents, and the results of ten different sets of observations proved undoubtedly that the time of vibration was longer than

on the earth. In almost all the ascents the balloon was under the influence of currents of

The majority of Mr Glaisher's experiments were made in the summer, partly because public ascents took place at this time of the year, and partly because the weather was more settled. But some special ascents were made in the winter; these were found to be very troublesome and costly, owing to the time that was wasted before a suitable day occurred, and to the boisterous weather, which damaged the balloon. Altogether the number of ascents bore but a small ratio to the number of days spent over them. Sometimes it was necessary to wait at Wolverhampton a whole week after the day fixed for the ascent, owing to the unfavourable state of the weather and the necessity of keeping the light gas re- quired for the balloon in a separate gasometer (as the lightest gas is the worst in illuminating power), added to the cost and difficulty. When balloons ascend as public exhibitions from places of entertainment it is very rarely that a height of a mile is reached, although, in the absence of instruments, it is not unusual for the acronaut to ex- aggerate the elevation, as the passengers have no reason for disputing what is told them. This must be borne in mind when physiological or other phenomena are described by voyagers unprovided with instruments. We have noticed the observations made in Mr Glaisher's ascents at greater length, because they are almost the only ones that have been made in which the height and other matters are determined with certainty. A quantity of air was collected in two large bags at the height of 12,000 fect in the ascent on J anuary 12, 1864, and submitted to Professor Tyndall, but he has never made public the analysis of it.

air in different directions. The thickness of these currents was found to vary greatly: The direction of the wind on the earth was sometimes that of the whole mass of air up to 20,000 feet, whilst at other times the direction changed within 500 feet of the earth. Sometimes directly opposite currents were met with at different heights in the same ascent, and three or four streams of air were encountered moving in different directions. Ignoring the different cur- rents of air which caused the balloon to change its direction,

and at times to move in entirely opposite directions, and simply taking into account the places of ascent and descent, the distances so measured were always very much greater

In the years 1867 and 1868 M. Flammarion made eight Ascents of or nine ascents from Paris for scientific purposes. 'The M. Flam- heights reached were not great, but the general result of 1867-68 the observations was to confirm those made by Mr Glaisher. : See M. Flammarion in Voyages Aériens, Paris, 1870, or Travels in the Air, London, 1871. Observations were also made in some balloon ascents by M. de Fonvielle, which are noticed in the works just referred to.

*The balloon had not been discovered very long before it Use of bal- received a military status, and soon after the commence- loons for ment of the French revolutionary war an aeronautic school eee ae was founded at Meudon; Guyton de Morveau, the chemist, P"“P°****

than the horizontal movement of the air as measured by anemometers. For example, on January 12, 1862, the balloon left Woolwich at 2h. 8m. p.m., and descended at Lakenheath, 70 miles distant from the place of ascent,

and Colonel Coutelle being the persons in charge. Four balloons were constructed for the armies of the north, of the Sambre and Meuse, of the Rhine and Moselle, and of Egypt. In June 1794 Coutelle ascended with the adju-

at 4h. 19m. p.m. At the Greenwich Observatory, by Robinson's anemometer, during this time the motion of the air was 6 miles only. With regard to physiological ob- servations, Mr Glaisher found that the number of pulsations

tant and general to reconnoitre the hostile army just before Reconnais- the battle of Fleurus, and two reconnaissances were made, pe Ag each occupying four hours. It is generally stated that it fore the

: : : : battle of was to the information so gained that the French victory Dial oe

increased with elevation, as also the number of inspirations. The number of his pulsations was generally 76 per minute before starting, about 90 at 10,000 feet, 100 at 20,000 feet, and 110 at higher elevations But a good deal depended on the temperament of the individual. This was also the case in respect to colour ; at 10,000 feet the faces of some would be a glowing purple, whilst others would be scarcely affected; at 4 miles high Mr Glaisher found the pulsations of his heart distinctly audible, and his breathing Was very much affected, so that panting was produced by the very slightest exertion; at 29,000 feet he became in- sensible. In reference to the propagation of sound, it was at all times found that sounds from the earth were more or less audible according to the amount of moisture in the air. When in clouds at 4 miles high, a railway train was heard; but when clouds were far below, no sound ever reached the ear at this elevation. The discharge of a gun was heard at 10,000 feet. The barking of a dog was heard at the height of 2 miles, while the shouting of a multitude of people was not audible at heights exceeding 4000 feet.

was due. The balloon corps was in constant requisition during the campaign, but it does not appear that, with the exception of the reconnaissances just mentioned, any great advantages resulted, except in a moral point of view. But even this was of importance, as the enemy were much dis- concerted at having their movements so completely watched, while the French were correspondingly elated at the supe- rior information it was believed they were gaining. An attempt was made to revive the use of balloons in the African campaign of 1830, but no opportunity occurred in which they could be employed. It is said that in 1849 a reconnoitring balloon was sent up from before Venice, and that the Russians used one at Sebastopol. In the French campaign against Italy in 1859 the French had recourse to the use of balloons, but this time there was not any aerostatic corps, and their management was entrusted to the brothers Godard. Several reconnaissances were

made, and one of especial interest the day before the battle At Sol- of Solferino. No information of much importance seems, ferino,

however, to have been gained thereby. The Fleurus re-

used in the hy the Federals.

American war.

Use of bal- loons in the siege of Paris,

1870-71.

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connaissalice was made in a balloon inflated with hydrogen gas, while at Solferino a fire-balloon was employed. ach system has its advantages and disadvantages; the gas- balloon requires several hours for inflation, but then it can remain in the air any length of time; the fire-balloon can be inflated rapidly, but it will not stay in the air more than five or ten minutes unless a furnace is taken up, the use of which is impracticable in even a moderate wind; besides, the firc-balloon must be of very large dimensions, and only one person could,as a rule, ascend ata time,and he would have to be occupied with the fire: the use of fire-balloons also is always attended with some danger. M. Eugene Godard, who was engaged in the management of the balloons in the Italian campaign, wrote to the Zunes, in August 1864, ex- pressing his opinion of the superiority of fire-balloons for war purposes, as they are so easily inflated and are not destroyed or compelled to descend even if pierced by several balls; and this was also, we believe, the opinion of the Austrians who made experiments with war balloons.

In the late American war balloons were a good deal used There was a regular balloon staff attached to M'Clcllan's army, with a captain, an assistant-captain, and about 50 non-commissioned officers and privates. The appa- ratus consisted of two generators, drawn by four horses each; two balloons, drawn by four horses éach, and an acid-cart, drawn by two horses. The two balloons used contained about 13,000 and 26,000 feet of gas, and the inflation usually occupied about three hours. (See Captain Beaumont's Account, vol. xii. of the Royal Engineers' Papers.) We are not aware of the value set by the officers in command on the information obtained by this means; but as we believe balloons were employed till the conclusion of the war, it is clear that some importance was attached to their

use. In 1862 or 1863 one or two experiments to test the use of balloons in making reconnaissances were made at Alder- shot, but nothing came of them.

When the Montgolfiers first discovered the balloon, its great use in military operations was at once prophe- sied; but these anticipations have not been realised. On the other hand, however, there can be no doubt that the balloon has never had a fair trial, being viewed coldly by officers enamoured of routine, and when used, being often left unsupplicd with suitable appointments. It is probable that a future still remains for the balloon in this direction.

The paramount value of the balloon during the recent siege of Paris must be fresh in the minds of all. It was by it alone that communication was kept up between the besieged city and the external world, as the balloons carried away from Paris the pigeons which afterwards brought back to it the news of the provinces. 'The total number of balloons that ascended from Paris during the siege, conveying persons and de- spatches, was sixty-four—the first having started on September 23, 1870, and the last on January 28, 1871. Gambetta effected his escape from Paris, on October 7, in the balloon Armand-Barbés, an event which doubtless led to the prolongation of the war. Of the sixty-four balloons only two were never heard of; they were blown out to sea. One of the most remarkable voyages was that of the Ville d'Orléans, which, leaving Paris at eleven o'clock on November 21, descended fifteen hours afterwards near Christiania, having crossed the North Sea. Several of the balloons on their descent were taken by the Prussians, and a good many were fired at while in the air; but we do not hear of any being injured from this cause. The average size of the balloons was from 2000 to 2050 metres, or from 70,000 to 72,000 cubic fect. The above facts we have extracted from Les Ballons du Siege de Paris, a sheet pub- lished by Bulla & Sons, Paris; compiled by the brothers Tissandier, well-known French aeronauts, and giving the

ARONA DO TACS

name, size, and times of ascent and descent of every balloon that left Paris, with the names of the aeronaut and gene- rally also those of the passengers,

the weight of despatches, the number of pigeons, &c. Ouly those balloons, however, are

sixty-two balloons is given by Mr Glaisher in the introduc- tion to the second edition of Zravels in the Air (1871). It was, however, published too soon after the conclusion of the siege to be quite so complete as the sheet of the MM.

[PARACHUTES,

noticed in which some person ascended. A similar list of

Tissandier.

It is perhaps worth stating that the balloons were manu- factured and despatched (generally from the platforms of the Orleans or the Northern Railway) under the direction of the Post-Office. The aeronauts employed were mostly sailors, who did their work very well. No use whatever was made in the war of balloons for purposes of reconnaissance. The exccedingly important part played by the balloon in the siege of Paris would alone, if it had been of no other utility, render it one of the most valuable inventions of the last century.

The principle of the parachute is so simple that the idea Para. must have occurred to persons in all ages. Father Loubere, chutes. in his History of Siam, published two centuries ago, tells of a person who frequently diverted the court by the pro- digious leaps he used to take, having two parachutes or umbrellas fastened to his girdle. In 1783 a certain M. le Normand practically demonstrated the efficiency of a parachute by descending from a high house at Lyons; but he merely regarded it as a uscful means whereby to escape from fire. To Blanchard is due the idea of using it as an Blanchanl adjunct to the balloon. As early as 1785 he had con- structed a parachute, to which was attached a basket. In this he placed a dog, which descended safely to the ground when the parachute was released from a balloon at a con- siderable elevation. Jt is stated that he descended himself from a balloon in a parachute in 1793; but, owing to some defectin its construction, he fell toorapidly, and broke his leg.

André Jaques Garnerin was the first person who success- Gamera, fully descended from a balloon in a parachute, and he repeated this experiment so often that he may be said to have first demonstrated the practicability of using the machine; and, in fact, that he invented it in a practical and suitable form. Jn 1793 Garnerin had been taken prisoner at Marchiennes, and he was confined for between two and three years in the fortress of Bude, in Hungary. While in captivity he elaborated in his mind the means of descending from a balloon by means of a parachute; and on October 22, 1797, he made his first public expen- ment. He ascended from the park of Monceau at Panis, and when at the height of about 1} mile he released the parachute, which was attached to the balloon in place of a car; the balloon, relieved suddenly of so great a weight, rose very rapidly till it burst, while the parachute de- scended very fast, making violent, oscillations all the way. Garnerin, however, reached the earth in safety upon the plain of Monceau. In 1802 Garner came to England and made a good many ascents in all parts of the country, many of which excited much enthusiasm, as can be seen from the contemporary accounts; and on September 21, 1802, he repeated his parachute experiment in England.

The parachute was dome-shaped, and bore a resemblance Gamerit to a large umbrella. The case or dome was made of white ee canvas, and was 23 feet in diameter. At the top was `anted truck or round piece of wood 10 inches in diameter, with` *ppgland. hole in its centre, fastened to the canvas by 32 short pieces See Plate of tape. The parachute was suspended from a hoop at- tached to the netting of the balloon, and below the para- chute was placed a cylindrical basket, 4 feet high and 24 feet in diameter, which contained the aeronaut. The ascent took | place at about six o'clock from North Audley Street, London;*

and, at a height of about (it is believed) 8000 feet, Garnerin separated the parachute from the balloon. For a few seconds his fate seemed certain, as the parachute retained the collapsed state in which it had originally ascended, and fell very rapidly. It suddenly, however, expanded, and the rapidity of its descent was at once checked, but the oscil- lations were so violent that the car, which was suspended 920 feet below, was sometimes on a level with the rest . of the apparatus. Some accounts state that these oscilla- i tions increased, others that they decreased as the parachute | descended, and the latter seems most probable. It came | to the ground in a field at the back of St Pancras Church, | the descent having occupied rather more than ten minutes. | Garnerin was hurt a little by the violence with which the | basket containing him struck the earth; but a few cuts and

a sight nausea represented all the ill effects of his fall. He made, certainly, one other descent in a similar way (as that just described is stated to have been his third), and we believe several others on the Continent, but this was the only one he effected in England. _rdaki Jordaki Kuparento, a Polish aeronaut, is the only person "aparento. who ever made any real use of a parachute. He ascended] from Warsaw on July 24, 1808, in a fire-balloon, which, at a considerable elevation, took fire; but being provided with a parachute, he was enabled to effect his descent in safety. tal parae The next experiment made with a parachute was that atede- which resulted in the unfortunate death of Mr Robert i Mr Qocking. So early as 1814 this gentleman had lectured ens on the subject before the City Philosophical Society, and also before the Society of Arts. He always retained an interest in ballooning, and made two ascents—one with Mr Sadler, and the other on September 27, 1836, with Mr Green. The success of the balloon trip of Messrs Hollond, Mason, and Green, seems to have incited Mr Cocking to demonstrate practically the truth of his views. He accord- ingly constructed a suitable parachute on his principles, and having succeeded in obtaining the consent of Messrs Hughes and Gye, the proprietors of Vauxhall Gardens, to permit the ascent to be made there, he prevailed on Mr Green to ascend in his great Nassau balloon with the parachute attached. The great defect of Garnerin's umbrella-shaped parachute was its violent oscillation during descent, and Mr Cocking considered that if the parachute were made of a conical form (vertex downwards), the whole of this

oscillation would be avoided; and if it were made of sufficient size, there would be resistance enough to check too rapid a descent. He there- fore constructed a parachute on this principle, the radius of which at its widest part was about 17 feet. It was stated in the public an- nouncements previ- ous to the experi- ment that the whole weighed 223 ib; but from the evidence at the inquest it: appeared that the 8 weight must have Cocking's Parachute. been over 400 tb. Mr Cocking's weight was 177 Ib, which was so much additional. On July 24, 1837, the trial took place; and the Nassau balloon, with Mr Green and Mr Spencer, a solicitor, in the car, and having suspended below it the parachute, in the car of which was Mr Cocking, rose from the ground at twenty-five minutes to eight in

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rising to a suitable height, partly in consequence of the re- sistance to the air offered by the expanded parachute, and partly owing to its weight. Mr Cocking wished the height to be 8000 feet; but when the balloon reached the height of 5000 feet, it being then nearly over Greenwich, Mr Green called out to Mr Cocking that he should be unable to ascend to the requisite height if the parachute was to descend in daylight. Mr Cocking accordingly let slip the catch which was to liberate him from the balloon. The parachute for a few seconds descended very rapidly but still evenly, until suddenly the upper rim seemed to give way, and the whole apparatus collapsed (taking a form resembling an umbrella turned inside out, and nearly closed), and the machine descended with great rapidity, oscillating very much. When about two or three hundred feet from the ground, the basket became disengaged from the remnant of the parachute, and Mr Cocking was found in a field at Lee, literally dashed to pieces.

Mr Green and Mr Spencer, who were in the car of the balloon, had also a narrow escape. At the moment the parachute was disengaged they crouched down in the car, and Mr Green clung to the valve-line, to permit the escape of the gas. The balloon shot upwards, plunging and rolling, and the gas pouring from both the upper and lower valves, but chiefly from the latter, as the great resistance of the air checked its egress from the former. Mr Green and Mr Spencer applied their mouths to tubes communicating with an air-bag with which they had had the foresight to provide themselves, otherwise

they would certainly have been suffocated by the gas. Notwith- standing this precaution, however, the gas almost totally deprived them of sight for four or five minutes. When they came to themselves they found they were at a height of about four miles, and descending rapidly. They effected, however, a safe descent near Maidstone.

Many objections were made, after the result, to the form of Mr Cocking's parachute; but there is little doubt that had it been constructed of sufficient strength, and perhaps of somewhat larger size, it would have answered its pur- pose, As it was, the upper rim was made of tin, which soon gave way. Mr Wise, the American aecronaut, made some experiments on parachutes of both forms (Garnerin's and Cocking's), and found that the latter always were much more steady, descending generally in a spiral curve,

In 1839 Mr Hampton made three descents in a para- chute, on Garnerin's pattern, from his pal- loon, the ' Albion." He followed Gar- 4 nerin's example in Jae attaching the para- chute to the netting of the balloon, so that when the con- nection between the two was severed the latter was left to its own devices. Mr Hampton took mea- S sures, however, that Hampton's Parachute. it should descend soon after the parachute, and it was generally found no great distance off, and returned to him All his parachute descents were safely performed, although in one he was a good deal shaken.

We may remark that a descending balloon half-full of gas either does rise, or can with a little management be made to rise, to the top of the netting and take the form of a parachute, thus materially lessening the rapidity of descent. Mr Wise, in fact, having noticed this, once purposcly

the evening. A good deal of difficulty was experienced in | exploded his balloon when at a considerable altitude, and

I, — 26

Mr Hamp- ton's para- chute descents,

Descending balloon takes the parachute form,

Flying machines and navi- gable bal- loons.

M. Dupuy de Léme's navigable balloon.

the resistance offered to the air by the envelope of the balloon was sufficient to enable him to reach the ground without injury. And a similar thing took place in one of Mr Glaisher's high scientific ascents (April 18, 1863), when, at a height of about 2 miles, the sea appeared directly underneath; the gas was let out of the balloon as quickly as possible, and the velocity of descent was so great, that the 2 miles of vertical height were passed through in four minutes. On the balloon reaching the ground at Newhaven, close to the shore, it was found to be nearly empty. The balloon had, in fact, for the last mile or more, merely acted as a parachute; the shock was a severe one, and all the instruments were broken, but nothing serious resulted to the occupants of the car. Numerous attempts have been made both to direct balloons and contrive independent flying machines. After the invention of the balloon by the brothers Montgolfier, it was at once thought that no very great difficulty would be found in devising a suitable steering apparatus ; in fact, it was supposed that to rise into the air and remain there was the chief difficulty, and that, this being accomplished, the power of directing the aerostat would be a secondary achievement that must follow before long. Accordingly, in most of the early balloons the voyagers took up oars, sails, or paddles, which they diligently worked while in the air; sometimes they thought an effect was produced, and sometimes not. If we consider the number of different currents in the atmosphere, it is no wonder that some should have announced with confidence that their course was changed from that of the wind by means of the sails or oars that they used; in fact, it is not very often that the whole atmosphere up to a considerable height is moving en masse in the same direction, so that generally the course taken by the balloon, as determined merely by joining the places of ascent and descent, is not identical with the direction of the wind, even when it is the same at both places. Although there is no reason why balloons should not be so guided by means of mechanical appliances attached to them as to move in a direction making a small angle with that of the wind, still it must have been evident to any one who has observed a balloon during inflation on a windy day, that any motion in which it would be exposed to the action of a strong current of air must result in its destruction. It has therefore gradually

become recognised that the balloon is scarcely a step at all towards a system of aerial navigation; and many have thought that the principles involved in the construction of a flying machine must be very different from the simple statical equilibrium that subsists when a balloon is floating inthe air. " To navigate the air the machine must be heavier than the air," has frequently been regarded as an axiom; and there can be nodoubt that an apparatus constructed of such light material as is necessary for a balloon must either be destroyed or become ungovernable in a high wind. Recently, however, M. Dupuy de Léme, an eminent French engineer, has con- structed and made expcriments with a balloon which he considers satisfies some of the conditions. The balloon is spindle-shaped, the longer axis being horizontal, and it contains about 120,000 cubic feet. The car is suspended below the middle of the balloon, and there are provided a rudder and a screw. The rudder consists of a triangular sail placed beneath the balloon and near the rear, and is kept in position by a horizontal yard, about 20 feet long, turning round a pivot in its forward extremity ; the height of the sail is 16 feet, and its surface 160 square feet. Two ropes for working the rudder extend forward to the seat of the steerer, who has before him a compass fixed to the car, the central part of which will coutain fourteen men. The screw is carried by the car, and is driven by four or eight men working at a capstan. A trial was made with the

machine on February 2, 1872, on a windy day, and M. de Léme considered that he had been enabled by his screw and rudder to alter his course about 12°. (See Report of the Aeronautical Society, 1872).

Whatever difficulties may present themselves in regu- lating the horizontal movement of the balloon, there can be no doubt that the vertical motion could be obtained by means of a screw or other mechanical means; and the power of being able to ascend or descend without loss of ballast would be a considerable gain. In the opinion of many, however, the balloon is not worth improvement ; and as ballooning is now generally practised merely as a spectacle by which the aeronaut or showman gains his living, it is not likely that any advancement will be made.

Of flying machines, in which both buoyancy and motion were proposed to be obtained by purely mechanical means, the number has been very great.

Most of the projects have been chimerical, and were due to persons possessed of an insufficient knowledge of the principles of natural philosophy, both theoretically and practically. They serve, however, to show how great a number of individuals must have paid attention to the matter, and even at the present time several patents are taken out annually on the subject.

We do not propose here to give an account of any of these projects, for but few have ever passed beyond projects, but

will merely refer to Mr Henson's aerial carriage, which in Henson's 1843 attracted some attention. The apparatus was an 2erial car elaborate one, and its principal feature was the great ™6® expanse of the sustaining planes. The machine was to advance with its front edge a little raised, the effect of which would be to present its under surface to the air over which

it was passing; the resistance of this air, acting on it like the strong wind on the sails of a windmill, would, it was thought, prevent the descent of the machine. Mr Henson invented a steam-engine of great lightness, but he proposed that the machine should be started down an inclined plane, so that

the steam-engine would only have to make up for the velocity lost by the resistance of the air, The scheme never came to anything.

In the still air of a room it is, of course, not difficult to attach an apparatus to a balloon so as to direct its motion, and even models of flying machines have been made which, when tried in a room, seemed moderately successful. Some instruments which would very nearly support themselves in the air were shown at the Aeronautical Society's exhi- bition at the Crystal Palace. A good deal would be accomplished if an accurate knowledge of the exact motion of a bird's wing could be obtained ; in fact, until this is known, or until sufficient experiments on the resistance experienced by different-shaped laminze with different motions are made, there seems little chance of the con- struction of a satisfactory flying machine, unless means can be found to make a steam-engine of much less weight than is at present necessary.

In 1865 the Aeronautical Society of Great Britain was Aeronauti founded, the officers being—President, the Duke of Argyle; We Treasurer, Mr J. Glaisher; and Secretary, Mr Brearey. It Bens has published an annual report every year since [1873], con- taining selections from the papers read to the society, and abstracts of the discussions that took place thercon at the meetings. The numerous papers submitted to this society bear witness to the great number of minds that are engaged on the solution of the problem of aerial navigation. Of course, not a few of the methods proposed are the fanciful projects of ignorant men, but some show the careful thought and elaborate experiment of trained engineers and other qualified persons. In 1868 the society held an exhibition of flying machines, &c., at the Crystal Palace, which was | visited by many persons. A fire-balloon of a M. de la Marne, which should have ascended during this exhibition,

caught fire and was burnt. In 1871 a series of experi- ments was made at Penn's factory (Greenwich) on the resistance of different shaped planes placed at different angles, in a current of air produced by a rotary fan. In- vestigations of this kind not only form the first step towards obtaining data for a true knowledge of the exact nature of flying, but are also independently of high scientific interest. The chief object of the society is to bring together those persons who are interested in the subject of aero- nautics (except balloonists by trade, who are ineligible), and to encourage those who, possessing suitable acquire- ments, are devoting their time to the investigation of the question.

Aerostatic societies have also been founded in other countries; but although they have been inaugurated with considerable éclat, more than one have already terminated a short-lived career. The Vienna society seems, however, to have been unusually active during the recent exhibi- tion of 1873.

The principle in virtue of which a balloon ascends is

ili- exactly the same as that which causes a piece of wood or

other material to float partially immersed in water, and 'may be stated as follows, viz., that if any body float in equilibrium in a fluid, the weight of the

body is equal to the weight of the fluid displaced. By the "fluid dis- placed" is meant the fluid which would occupy the space actually occupied in the fluid by the body if the body were removed. When the fluid is inelastic and incompressible, i.¢., a liquid, as water, its density is the same throughout, and bodies placed in it either rise to the surface and float there partially immersed, or sink to the bottom. Thus, suppose a body only one-third as heavy as water (in other words, whose specific gravity is one-third) was floating on the surface of water, then, as the weight of the body must be equal to that of the water it displaces, it is clear that one- third of the body must be immersed. In the case, however, of an elastic or gaseous fluid, such as air, the density gradu- ally decreases as we recede from the surface of the earth, for each layer has to support the weight of all above it, and as air is elastic or compressible, the layers near the earth are more pressed upon, and therefore denser than those above. Thus, if a body lighter than the air it displaces be set free in the atmosphere, it rises to such a height that the air there is so attenuated that the weight of it displaced is equal to that of the body, when equilibrium takes place, and the body ascends no higher. In all cases, therefore, a body floating in the air is totally immersed, and it can never get beyond the atmosphere, and float, as it were, upon its surface.

To find, therefore, how high any body (lighter than the air it displaces), such as a balloon, of given capacity and weight, will rise, it is only necessary to calculate at what height the volume of a quantity of air equal to the given capacity will be equal in weight to the given weight. Leaving temperature out of the question, the law of the decrease of density in the atmosphere is such that the

density at a height xis equal to e # x the density at the earth's surface, g being the measure of gravity, and & also*

a constant; the value of E is called the height of the homo-

geneous atmosphere, viz., it is equal to what would be the height of the atmosphere if it were homogeneous through- out, and of the same density as at the earth's surface. Its value may be taken at about 26,000 feet. Thus, let V be the volume of a balloon and its appurtenances, car, ropes, é&c. (viz., the number of cubic feet, or whatever the unit of solidity may be, that it

displaces), and let W be its weight (including that of the gas), then it will rise to a height 2 such that

W = Vg x density of air,

= Vyoye ’ g being the value of the force of gravity, and o, being the density of the air at the surface of the earth. This equa- tion is not quite accurate, for several reasons—(1) because the decrease of temperature that results from increase of elevation has not been taken into account; (2) because g has been taken to measure the force of gravity on the earth’s surface, whereas it should represent this force at a height x; this is easily corrected by replacing g by g’, a?

(aa)? as a@ is about 4000 miles, and z is never likely in any ordi- nary question to exceed 10 miles, we can replace g’ by g without introducing sensible error, for the correction due to this cause would be much less than other uncertainties that must arise; and (3) because W and V could not both remain constant. If the balloon be not fully inflated on leaving, so that the gas contained in it can expand, then V, the volume of air displaced, will increase; while, if the balloon be full at starting, the envelope must either be strong enough to resist the increased pressure of the gas inside, due to the removal of some of the pressure outside (owing to the diminished density of the air), or some of the gas must be allowed to escape. The former alternative of the second case could not be complied with, as the balloon would burst; some of the gas must therefore escape, and so W is diminished. The weight of gas of which the balloon is thus eased cannot properly be omitted from the calculation, if x be considerable; but a good approximation is obtained without it, as the weight of the gas that escapes will generally bear a small proportion to the weight of balloon, car, grapnel, passengers, &c. The true equation (except as regards temperature) is therefore, for a balloon full at starting—

where g’=g a being the radius of the earth, but

yy _ 92eapd(l – 6 F) — ga®Vyoye7#* (a+)? (a+*

?

Y denoting the volume actually occupied by the gas, g'

' a . . ' : denoting Tara? viz., gravity at height x, and p, being the density of the gas on the ground. It will generally be sufficient, especially when temperature is omitted, to take the formula in the approximate form written previously. As the volume of air displaced by the car, ropes, passengers, &c., is usually trifling compared to that displaced by the balloon itself, no great error can arise from taking v, = V,. As an example, let us find how high a balloon of 100,000 cubic feet capacity would rise if inflated with pure hydrogen gas, carrying with it a weight of 3000 Ib (this including the weight of the balloon itself and appurtenances). A cubic foot of air, at temperature 32° Fahr., and under a pressure of 29°922 in., weighs '080728 tb, and a cubic foot of hydrogen weighs :005592 ib, so that (supposing the barometer reading on the earth to be 29-922 in., and the temperature of the air to be 32°) at the surface of the earth the balloon, &c., weighs 3559 ib, and the weight of the air displaced is 8073 tb. The balloon will therefore approximately rise to such a height x that 100,000 cubic feet of air shall there weigh 3559 ib; and x is given in feet by the equation

rig — 3299 ee S078 or % = 26,000 (log 8073 — log 3559),

the logarithms being hyperbolic; if common or Briggian logarithms be used, the result must be multiplied by 2°30258 . . . (the reciprocal of the modulus). In the above

Mathema-

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case we find = about 21,000 feet, and as at this height rather more than half the gas will have escaped (it having been supposed that the balloon was full at starting). This only reduces the value 3559 by about 300, and the result of taking it into account is only to increase the height just found by about 200 feet. If 2000 ib out of the 3000 were thrown away during the

ascent, the balloon would reach a height of about 10 miles; the weight of the gas that escapes is here important, as, if it be not taken into account, the height given by the formula is only about 8 miles. :

In actual aerostation, as at present practised, ordinary coal gas is used, which is many times heavier than hydrogen, being, in fact, usually not less than half the specific gravity of air. Even when balloons are inflated with hydrogen, generated by the action of sulphuric acid on zine filings, the gas is very far from pure, and its density 1s often double that of pure hydrogen, and even greater.

The hydrostatic laws relating to the equilibrium of float- ing bodies were known long previous to the invention of the balloon in 1783, but it was only in the latter half of the 18th century that the nature of gases was sufficiently understood to enable these principles to have been acted on. As we have seen, both Black and Cavallo did make usc of them on a small scale, and if they had thought it possible to make a varnish impervious to the passage of hydrogen gas they could have easily anticipated the Montgolfiers. As it was, no sooner was the fire-balloon invented, than Charles at once suggested and practically carried out the idea of the hydrogen or inflammable air balloon.

The mathematical theory of the rate of ascent of a

tical theory balloon possesses remarkable historic interest, from the

of the motion of a balloon ; the last problem that en- gaged the attention of Euler.

Motion of a balloon.

fact that it was the last problem that engaged the attention of the greatest mathematician of the last century, Euler. The news of the experiment of the Montgolfiers at Annonay on June 5, 1783, reached the aged mathematician (he was in his 77th year) at St Petersburg, and with an energy that was characteristic of him he at once proceeded to investi- gate the motion of a globe lighter than the air it displaced. For many years he had been all but totally blind, and was in the habit of performing his calculations with chalk

upou a black board. It was after his death, on September 7, 1783, that this board was found covered with the analytical investigation of the motion of an aerostat. This investi- gation is printed under the title, Caleuls sur les Ballons Aérostatiques faits par feu M. Léonard Euler, tels qu'on les a trouvés sur son ardoise, aprés sa mort arrivée le 7 Septembre 1783, in the Memoirs of the French Academy for 1781 (pp. 264-268). The explanation of the earlier date is that the volume of memoirs for 1781 was not published till 1784. The peculiarity of Euler's memoir is that it deals with the motion of a closed globe filled with a gas lighter than air, whereas the experiments of the Mont- golfiers were made with balloons inflated with heated air. The explanation of this must be that either an imperfect account reached Euler, and that he supplied the details himself as seemed to him most probable, or that he, like the Montgolfiers themselves, attributed the rising of the balloon to the generation of a special gas given off by the chopped straw with which the fire was fed. The treatment of the question by Euler presents no particular point of importance—indeed, it could not; but the fact of its having given rise to the closing work of so long and distinguished a life, and having occupied the last thoughts of so great a mind, confers on the problem of the balloon's motion a peculiar interest.

We now proceed to the investigation of the vertical motion of a balloon inflated with gas, the horizontal motion, of course, being always equal to that of the current in

which it is placed. In supposing, therefore, the balloon to be ascending vertically into a perfectly calm atmosphere, there is no loss of generality. There are two cases of the problem, viz., when the balloon is only partially filled with gas at starting, and when it is quite filled. The motion in the former case we shall investigate first, as the balloon will ascend till it becomes completely full, and then the subsequent motion will belong to the second case. Wemay remark that it is usual in investigations relating to the motions of a balloon to regard it in the way that Euler did, viz., as a closed inextensible bag, capable of bearing any amount of pressure. In point of fact, the neck or lower orifice of the balloon is invariably open while it is in

the air, so that the pressure inside and outside is practically always the same, and when the balloon continues ascending after it has become quite full, the gas pours out of the neck or is allowed to escape by opening the upper valve. It is to be noticed that we have not thought it necessary to trans- form the formulz obtained in such wise that they may be readily adapted to numerical calculations as they stand, as our object is rather to exhibit the nature of the motion, and clearly express the conditions that are fulfilled in the case of a balloon, than deduce a serics of formule for practical use. We shall, however, indicate the simplifications allow- able in practical applications. The effect of temperature, though important, is neglected, as the connection between it and height is still unknown. It was chiefly to determine this relation that Mr Glaisher's ascents were undertaken, and at the conclusion of the first eight he deduced an empirical law which seemed to accord pretty well with the observations ; the succeeding twenty ascents, however, failed to confirm thislaw. In fact, it is evident, even without ob- servation, that the rate of the decline of temperature when the sky is clear must differ from what it is when cloudy, and that, being influenced to a great amount by radiation of heat from the earth's surface, it will vary from hour to hour. Under these circumstances, as our object is not to deduce a series of practical rules for calculating heights, &c., we have supposed the temperature to remain constant throughout the atmosphere. The assumption of any law of decrease would considerably complicate the equations. Per- haps the simplest law, mathematically considered, would be to assume the curve of descent of temperature to be y=e—, The curve Mr Glaisher deduced from his eight ascents was a portion of a hyperbola, the constants being determined empirically.

Let M=the mass of the balloon, car, netting, gas, pas- sengers, &c., on starting. V,=the capacity of the envelope of the balloon when full.

% =the volume of gas at the pressure of the air intro- duced into the balloon before starting.

v=the volume (supposed less than V,) occupied by the gas at the height x.

9== density of the gas in the balloon on the earth.

See . : at the height x.

6) =density of the air on the earth.

i » at the height «.

w=the initial upward velocity of the balloon (which is introduced for the sake of complete generality, but is always zero).

u,y=the velocity (vertically upwards, as all horizontal motion is ignored) at height x.

Then the equation of motion at any time previous to the balloon becoming completely filled is

: du _ = tapes 2 —Le Mu my OG Mg' — ates the last term being due to the resistance of the air, which is assumed to vary directly as the square of the velocity and as the density of the air. In very slow motions the

Motion of a, balloon only par- tially full at starting.

INVESTIGATIONS. |

resistance appears from experiments to vary pretty nearly as the velocity; and when the motion is very swift, as in the case of a rifle-bullet, as the cube of the velocity; but when the motion is neither very rapid nor very slow, the law of the square of the velocity probably represents the truth very fairly. By g' is denoted the value of gravity

at the height x, so that

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, a I= Vara a being, as above, the radius of the earth. In the exponen- tial term, we shall replace g' by g, as no sensible error can result therefrom. The value of ov is constant, as by Boyle's and Marriotte's law it always=o,vy,. Writing, therefore, for brevity—

2a 2 “uO ie =, . oa? the equation of motion takes the form ee ae yA — B – dx (a+«)?’

whence, following the usual rule for the integration of linear differential equations of the first order, and writing X for e~, for convenience of printing,*

ada 2p— mk — 2 oY; ec ve =f (a+2x)2

ea mx e—mX—nXJor Sap — 2 2 7 ml: ata ews dx m? ; = Ra? an — lp na One 4 pp Sar Ba’ sea Shara me a coal mX =pa°| – Tat a{enBi(—na ne)

*— menEi(— 2na — 2nx) Lig + ** Ei (Bra — Bn2) – 4 Ge Herein put x=0, so that w= %, and we have*

*Ute ™ = Ba? [~ — +af{er9]i(— na) — me?*Bi(— 2na)*

TO ay Ei) C +79 i(~~8na~~)...} | al S

whence, by subtraction, e-™ = g—mX

a A+z

*Ue~ ™X — 4 .2¢— ™ = Ba? +af{er*hi(—na—na)*

*— me**Bi(— 2na- 2nx) +... — e**Bi(— na) + me*Bi(— 2na)- ... a*

therefore e—m(1— X) ik ay aa — Xe) al i eae U?=Ure- ee [é we

+ ae™ {enaRi(— na— nx) — e**Ei(— na) — mem«Hi(— 2na— 2na)*

2

*+me”*Bi(— 2na) + a 5" Ei(— 8na— ne) – 5 enahi(— 3na)+...}]*

in which Ei x is used to denote the exponential integral of

: ee aoe 4 : . a, Viz. af da, according to a recognised notation. The

values of the integral Eiz, which may be regarded as a known function, have been tabulated (see Philosophical Transactions for 1870, pp. 367-388).

We thus have, except for temperature, the complete solution of the problem of the motion of the balloon so far as velocity and height are concerned; it would not be possible to connect the time and the height except by the

ee O Ney Tuc &

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performance of another integration, for the practicability of which it would be necessary to submit to some loss of generality, viz., we should have to regard x ag small ag compared to a, and take A as small, and so on. . The equa- tion last written gives the motion until the height (say h) is attained at which the balloon becomes quite full, after which the gas begins to escape, and we have the second case of the problem.

Before proceeding, however, to the discussion of this second case, it is worth while to examine the solution more carefully, leaving out of consideration quantities that make no very great difference in the practical result, for the sake of simplicity. Supposing, then, gravity to be constant at all heights, and A to be zero, the equation of motion takes the simple form

d.u dz @ whence u? — Ww? = Re;*

and we see, what is pretty evident from general reasoning, that if a balloon, partially filled, rises at all, it will at least rise to such a height that it will become completely full. The letters meaning the same as before, the equation of Motion of

motion of a balloon completely filled at starting is : bie i du a ula { M— V4(%— } u zs "Gray { Vor — M+ Vo(p9— p) i starting.

— Aue" , or substituting for p and o their values

du a? { M —Vop)(1—e-") \ uo Iara*

*+ Vopo(1 — e—**) *

{ Vome—” — M —awe-™ ,*

The integral of this differential equation could be obtained in series as before, only that the resulting equations would be more complicated. As we do not propose to discuss the formule obtained, it will be sufficient for our purpose to deduce an approximate solution by neglecting V.po(1 — e~”) compared to M, viz., neglecting the mass of the gas that has escaped during the ascent compared to the mass of the whole balloon and appurtenances. It must be borne in mind, however, that when coal gas is used, and the ascent is to a great height, the mass of gas that escapes is by no means insensible. The equation thus becomes*

ga

du? — nays? — gM TF +e Us = (a +a)%

*| Voape—”? —M *

dur _ ya? il -:) m+ é Crt V ore nz — M }

y being a This is an equation which can be integrated.

in exactly the same way as that previously considered, viz., by multiplying by a factor e~”, and integrating at once; thus,*

IADR Cn dee 2o— mX — V 22 17 [cate Nae as

—n2—mX

3 . da

e7 mx eo MX — az dp

aru k a+a \ +o —na—mX

é = Vie ae lo —_— – oF a+a

FL oases, ane |

tiga { =

*—n{em Ei (—na—nz) —me*Ei (—2na—2Qnz) +... }*

*o {e‘“Hi (—2na — 2nzx) — me**Ei (— 8na — 3nz)- — |*

Principle of the fire- balloon.

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—mx

-Mya? is te | ereBi (-na—na)

— mei (—2na—2nx)+..- \ ]+c,

and C is determined as before by putting « = 0, when we have u = u,.

In this case ~, is not zero, except when the balloon starts from the earth quite full, The general case is, when the balloon is only partially filled on leaving; the previous equations then hold until a height 2, at which it becomes quite full, when the motion changes, and is as just investi- gated. Then w, becomes the velocity at the height h, and everything is measured from this height as if from the sur- face of the earth, a being then the radius of the earth + h, Po» % the densities at height h, and p, o at height x + h, dsc. We have therefore, except as regards time, completely determined the motion of a balloon inflated with gas in an atmosphere of constant temperature. The introduction of temperature would modify the motion considerably, but in the present state of science it cannot be taken into account.

The general principle of the equilibrium of a fire-balloon is, of course, identical with that of a gas-balloon ; but the motion is different, as the degree of buoyancy at each moment varies with the temperature of the air within the balloon, and therefore with the heat of the furnace by which the air is warmed. Dry air expands 5},d part of its volume for every increase of temperature of 1° centigrade, or z}yth of its volume for every increase of temperature of 1° Fahr. If, therefore, the air in an envelope or bag be

heated 60° Fahr. more than the surrounding air, the air within the bag will expand 79th of its volume, and this air must therefore escape. The air within the bag weighs less, therefore, than the air it displaces by the ¥exth part of the latter; and if the weight of this be greater than the weight of the bag and appurtenances, the latter will ascend. It is, therefore, always easy to calcu- late approximately the ascensional power of a fire-balloon if the temperature of the surrounding air be known, and also the mean temperature of the air within the balloon. Thus, let the balloon contain V cubic feet of hot air at the temperature ¢ (Fahr.), and let the temperature of the surrounding air be ¢ (Fahr.) Also, suppose the weight of the balloon, car, &c., is W tb, and let the barometer reading be 2 inches, then the ascensional power is equal to the weight of the air displaced — weight of the heated air -—W hb, viz.,

h _ § Vx-080728 V x 080728 eal 14223 > 14/732 \n-wn,

491 +491

°080728 Ib being the weight of a cubic foot of air at tem- perature 32°, under the pressure of one atmosphere, viz., when the reading of the barometer is 29°922in. Of course, the motion depends upon the temperature of the air in the balloon as due to the furnace, if the latter istaken up with the balloon ; but if the air in the balloon is merely warmed, and the balloon then set free by itself, the problem is an easy one, as the rate of cooling can be determined approxi- mately; but it is destitute of interest. We have said that dry air increases its volume by z},th part for every in- crease of 1° (Fahr.), but the air is generally more or less saturated with moisture. This second atmosphere, formed of the vapour of water, is superposed over that of the air, as it were, and, in a very careful consideration of the question, should be taken into account. Even, however, when the air is completely saturated with moisture but little difference is produced ; so that for all practical pur- poses the presence of the vapour of water in the air may be ignored. Of course the amount of vapour depends on

the dew-point, and tables of the pressure of the vapour of water at different temperatures are given in most modern works on heat; but, as has been

stated, the matter, in an aeronautical point of view, is of very little importance, At first it was supposed that the cause of the ascent of the balloon of the Montgolfiers was traceable to the generation of gas and smoke from the damp straw which was set light to; but the advance of science showed that the fire-balloon owed its levity merely to the rarefaction of the air produced by the heat generated.

A formula giving the height, in terms of the readings of Height o¢ the barometer and thermometer, on the surface of the the balloon, earth, and at the place the height of which is required, is "termined

easily obtained from the principles of hydrostatics. The faa" formula given by Laplace, reduced to English units, is— mete, aa i thermo- |

*om Z =loe(;) * eos +a +°002837 cos 2 L) meter.*

(at ay

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Z being the height required in feet, A, h' the heights of the barometer in inches at the lower and upper stations, ¢, ¢' the temperatures (Fahr.) of the air at the lower and upper stations, L the latitude, z the approximate altitude, and 20,886,900 the earth's mean radius in feet. This was the formula used by Mr Glaisher for the reduction of his observations. It is open to the obvious defect that the temperature is assumed uniform, and equal to the mean of the temperatures at the upper and lower stations ; but till the law of decline of temperature is better determined, perhaps this is as good an approximation to the truth as we can have without introducing needless complication in the formula.

A sphere is not a developable surface—z.e., it cannot be Shape ofa divided in any manner so as to admit of its being spread gore of a out flat upon a plane, so that no spherical balloon could be lou made of stif plane material. However, the silk or cotton of which balloons are manufactured is sufficiently flexible to prevent any deviation from the sphere being noticeable. Balloons are made in gores, a gore being what, in spherical trigonometry, is called a dune, viz., the surface enclosed between two

meridians. The approximate shape of these gores is very easy to calculate. A Thus, let ABEC be a gore, . then the sides ABE, ACH, . are not arcs of circles, but curves of sines, viz., PQ bears] to DB the ratio that sin AP does to sin AD, or, which | comes to the same thing, sup- posing AD=90°, and AP & =2x°, then PQ=BD sin 2".

It is thus easy, by means of a

table of natural sines, to form , ¥ c

a pattern gore, whatever the 3

required number of gores may

be. Thus, supposing there are

to be n gores, then B C must

ber of points can be found

on the curve ABE in the

manner indicated above. A z slight knowledge of spherical Balloon Gore. trigonometry shows the reason for the above rule. Bal- loons, as usually constructed, are spherical, except for the neck, which is made to slope down, so that the whole

be "th of the circumference—

*viz.; * ths of AE; and BD n*

and A D being given, any num-

shape resembles rather that of a pear. The pattern gore should originally be made as if for a spherical balloon, and afterwards the slight modification necessary for the forma- tion of the neck should be applied.

The gores are sewn together, and a small portion of the upper end of each is cut away, so as to leave an aperture at the top of the balloon of from 1 to 3 feet in diameter. This space is occupied by the valve, which is generally made of strong wood, and consists of two semicircular shutters hinged to a diameter of the circular frame, and kept closed bya spring. The valve is opened by pulling a string, technically called the valve-line, which passes down through the balloon and out at the lower orifice in which the neck terminates. The net-work which, like the gores, is attached to the circumferences of the valve, passes over the surface of the balloon, and supports the ring or hoop from which the car is suspended by half a dozen strong ropes, of perhaps 4 or 5 feet in length. The net- work is thus stretched between the valve and the ring. It is very important that all the ropes by which the car hangs from the ring should be so adjusted that each may bear pretty nearly the same weight, as otherwise the whole net- ting and balloon will be strained, and perhaps to a serious extent. 'The car is usually merely a large basket made of wicker-work. The neck of the balloon should be 7 or 8 fect above the car, so that the aeronaut can easily reach it by mounting into the ring. The best material for the envelope is silk; but on account of the expense cotton or alpaca is generally used: in all cases it must be varnished, in order to render it more impervious to the gas. The grapnel or anchor is a large five-pronged hook attached to the ring by a rope 100 or 120 feet long. The first care of the aeronaut on leaving the earth is to lower the grapnel gently to the full extent that the rope will permit. Thus, when the balloon is in the air, the grapnel hangs down below it, and when the descent is

the velocity is sometimes very great. It is also convenient, if the district upon which the balloon is descending appear unsuitable for landing, to be able to rise again. The ballast consists of fine baked sand, which becomes so scat- tered as to be inappreciable before it has fallen far below the balloon. It is taken up in bags containing about a cwt. each. The balloon at starting is liberated by a spring catch which the aeronaut releases, and the ballast should be so adjusted that there is nearly equilibrium before leaving, else the rapidity of ascent is too great, and has to be checked by parting with gas. It is almost im- possible to liberate the balloon in such a way as to

avoid giving it a rotary motion about a vertical axis, which con- tinues during the whole time it is in theair. This rotation makes it difficult for those in the car to discover in what direction they are moving; and it is only by looking down along the rope to which the grapnel is suspended that the motion of the balloon over the country below can be traced. We may mention that the upward and downward motion at any instant is at once known by merely dropping over the side of the car a small piece of paper: if the paper ascends or remains on the same level or stationary, the balloon is descending; while, if it descends, the balloon is ascending. This test is so delicate that it sometimes showed the motion at a particular instant with more pre- cision than did Mr Glaisher's very delicate instruments.

Contrivances are often proposed by which the valve might be opened in less crude ways than by merely pulling a string attached to it; by which the jerks produced by the catching of the grapnel might be diminished, &c. These im- provements are not adopted, because simplicity is requisite before everything. Any mechanical contrivance might be broken and rendered useless by the first blow of the car on the earth; whereas the primitive arrangements in use are such.that scarcely any rough treatment can impair their efficiency.

being effected, is the first thing to touch the ground. If

The most important works that have appeared on the Works on the descent is well managed, and the balloon is moving

subject of aerostation are— ae

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be of

downwards slowly, the weight of which it is relieved when the grapnel is supported by the earth checks any further descent, and the wind carries the balloon along horizontally, the grapnel trailing over the ground until it catches in some obstruction and is held fast. The balloon is then in much about the same position asa kite held by a string, and if the wind be strong, plunges about wildly, striking the ground and rebounding, until the

aeronaut, by continued use of the valve-line, has allowed sufficient gas to escape to deprive it of all buoyancy and prevent its rising again.

The chief danger attending ballooning lies in the descent; for if a strong wind be blowing, the grapnel will some- times trail for miles over the ground at the rate of ten or twenty miles an hour, catching now and then in hedges, ditches, roots of trees, &c. ; and, after giving the balloon a terrible jerk, breaking loose again, till at length some obstruction, such as the wooded bank of a stream, affords a firm hold. If the balloon has lost all its buoyant power by the escape of the gas, the car also drags over the ground. But even a very rough descent is usually not productive of any very serious consequences; as, although the occupants of the car generally receive many bruises, and are perhaps cut by the ropes, it rarely happens that anything worse occurs. On a day when the wind is light (supposing that there is no want of ballast) nothing can be easier than the descent, and the aeronaut can decide several miles off on the field in which he will alight. It is very important to have a good supply of ballast, so as to be able to check the rapidity of the descent, as in passing downwards through a wet cloud the weight of the balloon is enormously in- creased by the water deposited on it; and if there is no ballast to throw out to compensate this accession of mass,

Deadalus, or Mechanical Motions, by Bishop Wilkins, London, 1648 ; A Treatise on the Nature and Properties of Air and other Permanently Elastie Fluids, by Tiberius Cavallo, London, 1781 ; Account of the First Acrial Voyage in England, in a Series of Letters to his Guardian, by Vincent Lunardi, London, 1784 ; History and Practice of Aerostation, by Tiberius Cavallo, London, 1785; Annals of some Remarkable Aerial and Alpine Voyages, including those of the author, by T. Forster, London, 1832 ; Aeronautica, by Monck Mason, London, 1838 ; 4 System of Aero- nautics, comprehending its Earliest Investigations, by John Wise, Philadelphia, 1850 ; Astra Castra, Experiments and Adventures in the Atmosphere, by Hatton Turnor, London, 1865 ; V% oyages Aériens, par J. Glaisher, C. Flammarion, W. de Fonvielle, et G. Tissandier, Paris, 1870; the same translated into English and published, edited by James Glaisher, under the title, Travels in the Air, London, 1871.

All the above books we have seen ourselves, and used in the preparation of the present article. Astra Castra is a work of 530 pp. large quarto; it consists chiefly of extracts from other works and writings, and it is useful as affording data for a history rather than as a history itself. On pp. 463-465 is a list of books and papers on aeronautics, which seems fairly complete up to the date 1864. In the list are also included memoirs and papers which we have not noted in the last paragraph, as the most important of them are referred to under their special sub- jects in the course of this article. We should advise any one desirous of studying the history of aeronautics to consult Mr Turnor's list in Astra Castra, which is the most perfect we have met with. He has marked with an asterisk those works that may be consulted by the public in the library of the Patent Office, which contains, besides books, a valuable collection of prints and broadsheets on the subject of aerostation. (3. G.)

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ZERTSZEN, Prerer, called "Long Peter" on account of his height, an historical painter of great merit as regards both drawing and colouring, was born at Amsterdam In 1520, and dicd in 1573. When a youth he distinguished himsclf by painting homely scenes, in which he reproduced articles of furniture, cooking utensils, &c., with marvellous fidelity, but he afterwards cultivated historical painting. Several of his best works—altar-pieces in various churches —were destroyed in the religious wars of the Netherlands. An excellent specimen of his style on a small scale, a picture of the crucifixion, may be seen in the Antwerp Museum. Ertszen was a member of the Academy of St Luke, in whose books he is entered as Langhe Peter, schilder. Three of his sons attained to some note as painters.

ZES is commonly translated brass, but the 2s of the Romans, like the yadxés of the Greeks, was used to signify not only pure copper, but also a bronze, or alloy of copper and tin. Brass, in the modern acceptation of an alloy of copper aid zinc, was unknown to the ancients. The cutting instruments of the ancient Greeks, Romans, and Egyptians were originally of bronze. The Romans borrowed their arms, as well as their money, from the Etruscans. Analysis of the bronzes of these nations shows that they contained about 12 per cent. of tin, which gave them hard- ness and the capability of receiving

a good edge. As the ost ancient coined money of the Romans was of copper or bronze, ws came to be used for money in general, even after the introduction of silver and gold coinage; and as alienum was used to signify borrowed money, debt. dis equestre, Es hordearium, dis militare, were terms for the pay of Roman soldiers (previous to the introduction of the regular stipendium), which was furnished, it would appear, not from the public treasury, but by certain private persons as decreed by the state. The first, which amounted to 10,000 asses, was the purchase-money of the horse of an eques. The second, amounting to 2000 asses, was the pay of an cques, and was furnished by unmarried women, widows, and orphans, if possessed of a certain amount of property. The cs militare, reckoned. by Niebuhr at 1000 asses a year, was the pay of a foot soldier.

ZESCHINES, an Athenian philosopher, said to have been the son of a sausage-maker. He was continually with Socrates; which occasioned that philosopher to say that the sausage-maker's son was the only person who knew how to pay a due regard to him. It is alleged that poverty obliged him to go to Sicily to the court of Dionysius; and that he met with great contempt from Plato, but was ex- tremely well received by Aristippus, to whom he showed some of his dialogues, receiving from him a handsome sum of money. He did not venture to profess philosophy at Athens, Plato and Aristippus being in such high esteem ; but he opened a school, in which he taught philosophy to yuaintain himsclf. He afterwards wrote orations for the forum. Phrynicus, in Photius, ranks him amongst the best orators, and mentions his orations as the standard of the pure Attic style. Hermogenes has also spoken very highly of him. He wrote, besides, several dialogues :— 1. Concerning virtue, whether it can be taught; 2. Eryxias, or Erasistratus: concerning riches, whether they are good ; 3. Axiochus: concerning death, whether it is to be feared,— but those extant on the several subjects are not genuine remains. M. le Clerc has given a Latin translation of them, with notes and several dissertations, entitled Silue Phalologice.

AESCHINES, a celebrated Grecian orator, was born in Attica 389 years before the Christian era. According to his own account, he was of distinguished birth; according to that of Demosthenes, he was the son of a courtesan, and a humble performer in a company of comedians. But whatever was the true history of his birth and early life,

his services as 2 soldier, and his talents, which were con- siderable, procured him great applause; and, as a public speaker, he became a formidable rival to Demosthenes himself. The two orators, inspired probably with mutual jealousy and animosity, became at last the strenuous leaders of opposing parties. Auschines had almost from the first advocated peace with Philip of Macedon, and having been sent on several embassies to negotiate with the king, had been treated with much respect. He was, in conse- quence, accused by Demosthenes of having received money as a bribe when he was employed on one of these embassies. He indirectly retaliated by bringing an accn- sation against Ctesiphon, the friend of Demosthenes, for having moved a decree, contrary to the laws, to confer on Demosthenes a golden crown as a mark of public appro- bation. A numerous assembly of judges and citizens met to hear and decide the question. Each orator employed all his powers of eloquence; but Demosthenes, with superior talents, and with more justice on his side, was victorious; whereupon Aéschines went into exile. According to Plutarch, the resentment of Demosthenes was now softened into generous kindness; for when Alschines was going into banishment, he requested him to accept of a sum of moncy; which made him exclaim, "How do I regret leaving a country where I have found an enemy so generous, that I must despair of ever meeting with a friend who shall be like him!" But this story seems more than doubtful. ZXschines, after staying some years in Asia Minor, opened a school of eloquence at Rhodes. He is said to have com- menced his lectures by reading to his audience the two oratious which had been the cause of his banishment. His own oration received great praise, but that of Demosthenes was heard with boundless applause. In so trying a moment, when vanity must be supposed to have been deeply wounded, he is reported to have said, with a noble gene- rosity of sentiment, "What would you have thought if you had heard him thunder out the words himself!" ischines afterwards removed to Samos, where he died in the 75th year of his age. Three only of his orations are extant. His eloquence is of a very high order, and as an orator he is second only to Demosthenes.

AESCHYLUS, the father of the Greek tragic drama, was born in the year 525 B.c., in the Attic demos of Eleusis The period of his youth and manhood

coincides, therefore, with that great uprising of the national spirit of the Greeks, caused by the successive attempts of Darius, king of Persia, and his son Xerxes, to enslave their European neighbours on the north and west shores of the Aigean; and it was no doubt as much for the advantage of his poetical faculty as for the development of his manhood, that he took an active part in those famous military achievements by which the march of the insolent Asiatic hosts was repelled. The father of Attic tragedy helped, in the year 490, to drive the captains of Darius into the marshes of Marathon, and, ten years later, encompassed with ruin the multitudinous armament of Xerxes within the narrow strait of Salamis. The glories of this naval achievement, the bard who had helped to win it with his sword afterwards lived to cele- brate with the lyre, and left to the world the play of the Persians, as a great national record of combined poetry and patriotism almost unique in history. Of his subse- quent career at Athens only a few scanty notices remain, and those chiefly connected with the representation of his plays. We know that he composed seventy plays, and that he gained the prize for dramatic excellence thirteen times ; further, that the Athenians esteemed his works so highly as to allow some of them to be represented after his death, —a privilege, in their dramatic practice, altogether anoma lous. We know, also, that in the course of his life he paid one or two visits to Sicily, to which country he was attracted,

no doubt, by the same literary influence in the person of its ruler Hiero, that drew thither Bacchylides, Simonides, and other notable men of that rich epoch. There can, at the same time, be little doubt that one cause of his visits to that island may have been a want of sympathy as to political matters between him and the Athenian public; for while the Athenians, from the time of Cleisthenes (4.c. 510), had been advancing by rapid and decided steps to the full expansion of the democratic principle, it is evident, from some passages in his plays, especially from the whole tone and tendency of the Hwmenides, that the political Icanings of the poet of the Prometheus were towards aris- tocracy, and that, in the days of Pericles, he foresaw, with a sorrowful fear, the ripeness of those democratic evils which within so short a period led Xenophon to seek a new fatherland in Sparta, and opened to the Macedonian a plain path to the sovereignty of Greece. But

whatever may have have been his motives for retiring from the scene of so many literary triumphs (and the gossipers of ancient times have of course transmitted to us their pleasant in- ventions on this point), it is certain that, in the year A.o. 456, two years after the representation of his great trilogy, the Orestiad, he died at Gela, in Sicily, in the sixty-ninth year of his age; and the people of Gela, rejoicing in his bones, as Ravenna does in those of the banished Dante, inscribed the following memorial on his tomb :— ' Here Aischylus lies, from his Athenian home*

Remote, 'neath Gela's wheat-producing loam ;

How brave in battle was Euphorion's son,

The long-haired Mede can tell who fell at Marathon." And thus he lives among posterity, celebrated more as a patriot than as a poet; as if to witness to all times that the great world of books, with all its power, is but a small thing unless it be the reflection of a greater world of action. Of the seventy plays which an old biographer reports him to have composed, only seven remain, with a few fragments of little significance save to the keen eye of the professed philologist. These fragments, however, are sufficient to justify the high esteem in which he was held by the Athenian public, and by that greatest of all the great wits of a witty age and a witty people, Aristophanes. In the grand trilogy which exhibits, in three consecutive tragedies, the story of the murder of Agamemnon, and its moral sequences, we have a perfeet specimen of what the Greek tragedy was to the Greeks, as at once a complex artistic machinery for the exhibition of national legend, and a grave pulpit for the preaching of important moral truths; nor could a more worthy founder than Aischylus of such a "sacred opera" be imagined. His imagination dwells habitually in the loftiest region of the stern old religious mythology of primeval Greece; his moral tone is pure, his character earnest and manly, and his strictly dramatic power (not-withstanding the very imperfect form of the drama in his day), as exhibited more especially in the Agamemnon, in the Humenides, and in some parts of the Prometheus, is such as none of his famous successors, least of all Euripides, could surpass. Of his other plays, the Seven against Thebes is a drama, as Aristophanes expressed it, "full of war," and breathes in every line the spirit of the age and of the people that saved Europe from the grasp

of oriental despotism; the Persians, though weak in some parts, con- tains some fine choral poetry, and a description of the battle of Salamis, that will belong to the poetry of the world so long as the world lasts; while the Suppliants presents much in a tasteful translation that makes us lament the loss of the missing piece of the trilogy to which it belonged, no less than the blundering of the thoughtless copyists of the middle ages, by whose pen it has been so egregiously defaced. For in ancient times the. flowing rhetorical Euripides was found a more useful model for the schools

of eloquence than the lofty, stern, and sometimes harsh, and occasionally it may be obscure, Aschylus: therefore the text of the latter has been comparatively neglectcd, and much work was left for the tasteful philologist before many parts of his noblest choruses could be ren- dered legible. Of the editions of A%schylus, the most notable in the earlier times of modern scholarship is that of Stanley; in more recent times, that of Schiitz, who undertook the work of restoration with much learning and great boldness. The impulse given by this scholar was moderated by Wellauer, who, in his edition, along with some happy emendations, principally endeavoured to vin- dicate the authority of the manuscript readings from the large license of conjectural critics; and now from the remains of the great Hermann has been published a text that should present the just medium between the timidity of Wellauer and the rashness of mere conjectural criticism, though it is much to be feared that the learned German has been not scldom led astray by the itch of emendation, which is the old besetting sin of eritical scholarship. Of English poetical translations there are the old one by Potter, and recent ones by Blackie, Plumptre, and Swanick. There is also a translation in literal prose by Buckley. (g. s. B.) JESCULAPIUS, in the Leathen Mythology, the god of medicine, was the son of Apollo and the nymph Coronis. He was educated by the centaur Chiron, who taught him the art of healing; and his skill enabled him to cure the most desperate diseases. But Jupiter, enraged at his restoring to life Hippolytus, who had been torn in pieces by his own horses, killed him with a thunderbolt. According to Cicero, there were three deities of this name: the first,

the son of Apollo, worshipped in Arcadia, who invented

the probe and bandages for wounds; the second, the brother of Mereury, who was killed by lightning; and the third, the son of Arsippus and Arsinoe, who was the first to teach tooth-drawing and purging. At Epidaurus, sculapius's statue was of gold and ivory, with a long beard, the head surrounded with rays, a knotty stick in one hand, and the other entwined with a serpent: the figure was seated on a throne of the same materials as the statue, and had a dog lying at its feet. The Romans crowned him with laurel, to represent his descent from Apollo; and the Phliasians represented him as beardless. The cock, the raven, and the goat were sacred to this deity. His chicf temples were at Pergamos, Smyrna, Tricca, a city in Thessaly, and the isle of Coos; in all which places votive tablets were hung up, showing the names of those eured and the diseases of which they were healed by his assistance. But his most famous shrine was at Epidaurus, where, every five years, games were celebrated in his honour, nine days after the Isthmian games at Corinth.

JESIR (plural of As, or Ass, god), the gods of the Northmen of Scandinavia and Iceland. There were twelve chief gods or AMsir besides Odin (the

from the fragmentary remains of aneient Seandinavian songs, first colleeted in Jeeland in the 11th eentury, and embodied in the 13th eentury with numerous other prose and poetie myths in a eompilation now known to us as the Eddas. From these highly interesting but frequently obscure sourees we are able to reproduee to a eertain extent the image and eoneeption of each of the Aisir, as they presented themselves to the imagination of their early northern worshippers. ;

In Thor, who seems to have been a god of that earlier Pheenician form of nature-worship which was superseded in Seandinavia and Northern Germany by the faith of Odin, we have the impersonation of the disturbing and destruetive ageneies in the universe. He is the son of heaven and earth —of Odin, the All-father, and of Frigg or Fidrgvin, the vivifying—and is the strongest of the sir. From his hammer flashed the lightning, and his chariot wheels sent thunder rolling through the elouds as he went on his way,

eleaving mountains, loosening the pent-up streams and fires, and slaying all giants and misshapen monsters. Ever busily engaged in these labours, he seldom tarried in Asgard with the other Asir, but dwelt in his mansion, Bilskirnir, in the densest gloom of the elouds. With his mallet he eonseerated the newly- wedded, and henee the sign of the mallet or hammer was made by the Northmen when they took an oath and bound themselves by vows, whether of marriage or any other obligation. The early Christian missionaries of Norway, finding the faith in Thor too strong to be suddenly up- rooted, tried to transfer many of his eharaeteristies to their zealous royal eonvert, St Olaf, who was said to have re- sembled the old northern god in his eomeliness of person, his bright red beard, hot, angry temper, and personal strength; while some of the monks of a later period en- deavoured to persuade the Northmen that in Thor their forefathers had worshipped the Christ, the strong and mighty Saviour of the oppressed, and that his mallet was the rude image of the eross. Slaves and all thralls killed in battle were believed to be under the protection of Thor, who, as god of the Finns before the spread of the As religion, was honoured as their speeial guardian against the tyranny of their new masters.

In Baldur the Northmen honoured all that was beauti- ful, eloquent, wise, and good, and he was the spirit of aetivity, joy, and light; but his name signifies the strong in mind, and the earliest eoneeption of Baldur is that of mental rather than physieal or material perfeetion. His wife, Nanna, reflected these attributes in a less degree. On his life depended the activity and happiness of all the Aisir, exeepting only Loki, the earthly fire or inearnation of evil, and henee this As, from envy of the beauty and innoeénee of Baldur, brought about his death, and hindered his release from the power of Hel, the goddess of death.

According to the myth, the sir, distressed at Baldur's presenti- ment of his own approaching end, joined his mother, Frigg, in exacting an oath from animals, plants, and minerals, not to injure him. The mistletoe alone among plants had been forgotten, and when this was discovered by Loki he pulled a wand of it, and hastening to the assembly of the Asir, where all were engaged in the sport of shooting at Baldur, as he was supposed to be invulner- able, he gave it to Hod, the blind god of brute strength, and directed him how to aim it. The mistletoe pierced Baldur through, and he

fell dead to the ground in the presence of the Hsir, who, foreseeing the evil that would betall them, since light and purity had been taken from them, gave way to sorrow and fear. When all their efforts to release Baldur from Hel had been thwarted by the machinations of Loki, they resolved to avenge themselves. Having eaptured their foe, they confined him within a mountain- cave, and hung above his head a venomous snake, to drop its poison on his face; but his wife, Sigyn, stood by him, and caught the drops in a cup, and it was only while she emptied the goblet that the venom touched him, when he shrank aside, and caused the earth to be shaken as with an earthquake. There Loki will remain till Ragnaréck, the twilight of the world, when the Asir, the earth, and

all dwellers therein, will be destroyed by the powers of evil, the rescuers and companions of Loki. Only Odin, the All-father, will survive, and gather around him on Ida's plain, where Asgard had once stood, the Aésir, regenerate and purified by Surt's black fire, and then a new and better world will arise, in which Baldur will again come with his unconscious slayer, Hod, and all evil will cease, and light and darkness will dwell together in unity.

Under one form of the myth of Baldur's death he is the bright god of day or summer, and Héd, the blind and the strong, is dark night or fiereely-raging winter, his pre- ordained foe and destroyer. After that final purification by suffering or fire, and the regeneration to whieh the Northmen looked as the means of the ultimate adjustment of the disturbed balanee between evil and good, and from whieh they did not exempt their gods, the influenee of good was to prevail. Baldur would reappear, and Loki, the eonsuming power of evil, be no more heard of.

Loki, in the beginning of time, under the name of Lodthur, flame, and as the foster-brother of the All-father, had united with him in imparting blessings to the universe, and had given blood and a fair colour to Ask and Embla, from whieh the first men were created. Afterwards he left the eouneil of the sir, and like a fallen angel wan- dered away into regions of spaee, desolating and eonsuming all things that came in eontact with his fierce flame. Deseending into the bowels of the earth, where his presenee is made

manifest by voleanic fires, he eonsorted with evil giantesses, by whom he beeame the father of Hel, pallid death ; of Augurboda, the announcer of sorrow ; and of the wolf Fenrir, and the serpent of Midgard, which are ever threatening the destruction of the world and the peaee of the Atsir.

Loki can assume all forms. As sensuality he courses through the veins of men, and as heat and fire he pervades nature, causing death and destruction. After the introduction of Christianity, the attributes and mystic deeds of Loki were transferred to Satan by the people of Scandinavia, amongst whose descendants his name still retains its evil reputation. In Iccland an ignis fatwus is known as Loki's burning; and in Jutland, when there is a dazzling light or a waving motion in the air which impedes the sight of distant objects, the peasants say, " Loki is sowing his oats."

Nord, supposed to be the Nerthus known to the Romans, and his ehildren Frey or Frieeo and Freyia, appear to have been honoured in the north before the time of Odin, and to have been worshipped by peoples powerful enough to have been admitted into friendly allianee with his followers. Niord is said to have lived in Vanaheim, and to have ruled over the Vanir, or light elves, long before he beeame one of the Asir, He is god of the ocean, the ruler of winds and stiller of waves, and to him the seafarer and fisherman raise altars and make prayers. His attributes and powers seem to point to the existenee of a superior knowledge of navigation among those aneient raees of Seandinavia who have been idealised in the imagination of the Northmen as good, bright, and agile elves and water-sprites—the Lids Alfjar—or Vanir of their mythology. Nidrd's son Frey is the god of rain, plenty, and fruitfulness; and his worship, according to the early northern ehronieler, Adam of Bremen, was aeeompanied with phallic rites. His sister and wife, Freyia, who holds a high plaee among the Aisi, is the goddess of love; but her influence, unlike her hus- band's, is not always beneficent, and varies with the form which she assumes in operating on the minds of men. Her ehariot is drawn by cats, as emblematie of fondness and passion, and a hog attends upon her and upon Frey, whose name, like her own, implies fructifieation or enjoy- ment.

The Swedes paid especial honour to Frey, while the Norwegians worshipped Thor (who was in all respects his opposite) as their chief As.

The latter must also have received divine honours amongst the Germans, as his name is included in the form of objurgation used by the early Saxon missionaries; but this fact and the German name of the fifth day of the week —Donners-tag, the Thunderer's day—are

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the only evidences stil] extant of the early worship of Thor in Germany. '

By their alliance with Nidrd and his children the Asir secured fertility to the earth and mankind, and the intervention of mild gentle agencies in nature to counteract the destructive influence of Thor's powcr.

In 77 or Tyr we have the Mars of the Northmen. It is he who gives victory, and although he is as wise as he is brave, it is he who stirs men to strife, and not to peace. His name, which signifies honour, is found in the namcs of the days of the week in O. Nor., Dan., A.-S., and in our own "Tuesday;" and shows that, like Thor and Frey or Freyia, whose memory is perpetuated in our Thursday and Friday, the worship of this bravest of the sir was widely spread among peoples of Northern origin.

In Bragi the Northmen honoured the originator of their Skaldic poetry, the god of eloquence and wise utterances. At guilds and at grave-feasts the Bragi-cup was drunk; and at the funeral of kings or jarls the heir was not permitted to take his father's scat till the " Bragarfull" was brought in, when, rising to receive it, he drank the contents of the cup, and was led to the high seat of honour. At guild feasts the Bragi-cup was signed with Thor's mallet, and was drunk after the company had drained Odin's cup for victory, and Nidrd's and Frey's cup for a bountiful year.

The peculiarity of Bragi's cup was that, on drinking it, a vow —held to be inviolable—was made to perform some deed worthy of a skald's song. Bragi's wife, Idun, as the guardian of the casket which contained apples that gave to those who ate them perpetual youth, was specially cherished by the other Asir. In her abduction by the giant Thiassi, and her removal to the nether world through Loki's craft, her mute grief, and her release in the spring, we have an analogy with the myth of Proserpine; and like her she presides over fresh verdure.

Heimdal, whose attribute is the rainbow, is the god of watchfulness, the doorkeeper of the Msir; while Vidar, the strongest of the gods after Thor, is the impersonation of silence and caution; Uli decides the issue of single com- bats, and Jorsetti settles all quarrels.

In the goddesses Lofn and Vor lovers find protectors; the former unites the faithful, the latter punishes the faithless. Gefion, to whom the Danes owe the formation of the island Seeland, watches over maidens, and knows the decrees of fate. Hin guards those whom Frigg, the quecn and mother of heaven, is desirous of freeing from peril; Frigg herself, as Odin's wife and the mother of the Asir, knows the destinies of men, but is silent in regard to them. As goddess of the earth, she is known as Frygga, the fertile summer earth, and Rinda the frost-hardened surface, and is attended by Fulla, the full, Hur, the young goddess of healing, and many other goddesses.

Saga, whose name is derived from Segja, to narrate, is the goddess of history and narration. Odin and she pledge each other daily in golden cups filled from the copious ever-flowing streams of her abode, Sockquabek (from Sokk, abyss, in allusion, to the abundant streams of narrative). Snotra is the goddess of sagacity and elegance, from whom men and women seek good sense and refinement of manners. The Norns and the Valkyriur, if not actually goddesses, are closely connected with the sir. The threc principal Norns or Nornir are Urd, past time; Verdandi, present time; and Skulld, future time. They and the Valkyriur, who are known under many names, twist and spin the threads of destiny, and make known what has been decreed from the beginning of time.

From this brief outline it may be seen that in their Aisir the Northmen recognised the creators, sustainers, and regulators of the world as it now is, from whom eman- ated the thought and life that pervade and animate all nature, and the efforts to subject it to the spiritual will. With Odin and the AMsir thc intellectual life of the northern people began; and although they ascribed to them

human forms and acts, these were seldom without some- thing higher and nobler than what pertains to mortals; and while they recognised the

existence of a state of chaos and darkness before this world began with the creation of the Aisir, they anticipated the advent of another statc, in which gods, like men, would receive their award at the hands of a supreme All-father. (E. C. 0.)

AHSOP, the fabulist, is supposed to have been born about the year 620 B.c., but the place of his birth is uncertain, that honour being claimed alike by Samos, Sardis, Mcscm- bria in Thrace, and Cotizum in Phrygia. He was brought, while young, to Athens as a slave, and having served several masters, was eventually enfranchised by Iadmon the Samian. He thereupon visited Croesus, king of Lydia, at whose court he is represented by Plutarch as reproving Solon for his discourteous manner towards the king. During the usurpa- tion of Pisistratus he is said to have visited Athens, and composed the fable of Jupiter and the Frogs for the instruc- tion of the citizens (Phadrus, i. 2). As the ambassador of Croesus at Delphi he was charged with the payment of the large sum of four mine to each of the citizens; but in consequetice of some dispute, he declined to distribute the money. The Delphians, incensed at his conduct, accused him of sacrilege, and threw him headlong from a precipice, about 564 B.c. A pestilence which ensued being attri- buted to this crime, the people declared their willingness to make compensation for his death; which, in default of a nearer connection, was claimed and reccived by Iadmon, the grandson of his old master (Plut. de sera Num. Vind., p. 556, Herodot. ii. 134). None of Ausop's works are extant. The popular storics regarding him are derived from a life prefixed to a book of fables purporting to be his, collected by Maximus Planudes, a monk of the 14th century, in which he is represented as a monstcr of ugliness and de- formity, a notion utterly without foundation, and doubtless intended to heighten his wit by the contrast. That this life, however, was in existence a century before Planudes's time, appears by a manuscript of it found at Florence, and published in 1809. In Plutarch's Convivium, where sop is a guest, though there are many jests on his original ser- vile condition, there are none on his appearance; and it would secin that the ancients were not usually restrained by delicacy in this point, since the personal defects of Socrates, and his resemblance to old Silenus, afford ample matter for merriment and raillery in the Symposium of Plato. We are told, besides, that the Athenians erected in honour of Adsop a noble statue by the famous sculptor Lysippus, a circumstance which alone

would be sufficient to confute the absurd fiction of his deformity; but more to the point is the statement of Pliny (xxxvi. 12), that he was the Contubernalis of Rhodopis, his fellow-slave, whose extraordinary beauty passed into a proverb:

"Arav@ 8uoia, kad 'Podams h Kart:

The obscurity in which the history of A'sop is involved has induced some to deny his existence altogether; and Giambattista Vico, in his Scienza Nuova, chooscs rather to consider him as an abstraction, an excess of scepticism which is quite unreasonable. Whether Alsop left any written fables has been more justly disputcd, and Bentley inclines to the negative. Thus Aristophanes (Vespe, v. 1259) represents Philocleon as learning his fables in conversation, and not from a book; and Socrates essayed to versify such as he remembered (Plat. Phad. p. 61). Others, again, are of opinion that a collection had been made of them before the time of Socrates (Mus. Crit. i. 408). It is, however, certain that fables bearing AEsop's name were popular at Athens during the most brilliant period of its literary history; though the discrepancies of authors in quoting the same fables seem in favour of Bentley's hypothesis. (Compare Aristot. De Part. Anim.

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iii. 2; and Lucian, Vigr. 82). The original fables were in prose, and were turned into verse by several writers ; the first, after the example of Socrates, being Demetrius Phalereus. Next appeared an edition in elegiac verse, often cited by Suidas, but the author's name 1s unknown; then Babrius, an excellent Greek poet, turned them into choliambics (ie. limping iambics); but of ten books, a few fables only are preserved entire. Of the Latin writers of sopean fables, Phsedrus is the most celebrated. '« Esopus auctor quam materiam reperit, Hance ego polivi versibus senarlls. PHED.

The fables now extant in prose under Aisop's name are en- tirely spurious, as is proved by Bentley in his Dissertation on the Fables of Aisop, and have been assigned an oriental origin. The identification of sop with the Arabian philosopher and fabulist Lokman (who is made by some traditions the contemporary of the psalmist David) has frequently becn attempted; and the Persian accounts of Lokman, which among other things describe hun as an

ugly black slave, appear to have been blended by the author of the Life, published by Planudes, with the classical stories respecting Ausop. The similarity of the fables ascribed to each renders it probable that they were derived from the same Indo-Persian source, or from the Chinese, who appear to have possessed such fables in very remote antiquity. A complete collection of the A'sopean fables, 231 in number, was published at Breslau by J. G. Schneider in 1810.

ZESOP, a Greek historian, whose life of Alexander the Great is preserved in a Latin translation by Julius Valerius. It is a work of no credit, abounding in errors.

ZESOP, Cuoprus, a celebrated actor, who flourished about the 670th year of Rome. He and Roscius were con- temporaries, and the best performers who ever appeared upon the Roman stage; the former excelling in tragedy, the latter in comedy. Cicero was on intimate terms with both actors, and put himself under their direction to per- fect his action. /®sop performed many friendly services to Cicero, especially during the period of his banishment. He appears to have spared no pains to improve himself in his art, and to have always studied his part with the greatest care. On the stage his declamation was emphatic and his action vchement, and he became entirely absorbed in his part. Plutarch mentions it as reported of him, that while he was representing Atreus deliberating how he should revenge himself on Thyestes, he forgot himself so far in the heat of action that with his truncheon he struck and killed one of the servants crossing the stage. His age and the time of his death are uncertain; but he made his last appearance on the stage in B.c. 55, at the dedication of Pompey's theatre, on which occasion his voice failed him. ZEsop lived in a somewhat expensive manner; but he nevertheless contrived to leave an ample fortune to his spendthrift son. This is the son of AZsop mentioned by Horace (Saé. ili. 3, 239) as taking a pearl from the ear- drop of Cecilia Metella, and dissolving it in vinegar, that he might have the satisfaction of swallowing eight thousand pounds' worth at a draught.

JESTHETICS is the term now employed to designate the theory of the Fine Arts—the science of the Beautiful, with its allied conceptions and emotions. The province of the science is not, however, very definitely fixed, and there

is still some ambiguity about the meaning of the term, arising from its etymology and various usc. The word esthetic, in its original Greek form (aic@yrixds), means anything that has to do with perception by the senses, and this wider eonnotation was retained by Kant, who, under the title Transcendental Aisthetic, treats of the a priori principles of all sensuous knowledge. The limitation of the term to

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the comparatively narrow elass of sensations and perecp- tions oceupied with the Beautiful and its allied properties is due to the Germans, and primarily to Baumgarten, who started from the supposition that, just as truth is the end and perfection of pure knowledge or the understanding, and good that of the will, so beauty must be the supreme aim of all sensuous knowledge. Yet, spite of these sources of vagueness in the subject and its name, some considerable part of the theory can be looked upon as pretty clearly defined, and it may be possible, by means of careful reflec- tion on this ascertainable quantity, to indicate, rouglily at, least, the extent and boundaries of a complete system of esthetic doctrine.

A very brief survey of what has been written under the name esthetics is sufficient to show that it includes, as its first and foremost problem, the determination of the nature and laws of Beauty, including along with the Beau- tiful, in its narrower signification, its kindred subjects, the Sublime and the Ludicrous. To discover what it is in things which makes them beautiful or ugly, sublime or ludicrous, is one eonstant factor in the esthetic problem. Intimately connected with this objective question is the subjective and psyehological inquiry into the nature of the feelings and ideas that have beauty for their object. Further, it will be found that all attempts to construct a complete esthetic theory aim at determining the highest ends of the Fine Arts (which obviously eoncern them-. selves largely, if not exclusively, with the Beautiful), and at marking out the distinctions and tracing the depen- dencies of natural and artistic beauty. All this part of the field of sesthetic inquiry seems fairly agreed on, and it is only when we approach other sides of the Fine Aris that the precise scope of the scienee appears obscure. But while there is this measure of agreement as to the

proper subject matter of sesthetics, we find two diametrically opposed methods of approaching it, which distinctly colour all parts of the doctrine arrived at, and impose different limitations to the boundaries of the subject. The first is the metaphysical or a@ priori method; the second the scientific or empirical method. The one reasons deduc- tively from ultra-scientific conceptions respecting the ulti mate nature of the universe and human intelligence, and seeks to explain the phenomena of beauty and art by help of these. The other proceeds inductively from the consideration of these phenomena, as facts capable of being compared, classified, and brought under certain uni- formities. At the same time, it must not be supposed that either method is customarily pursued' in complete inde- pendence of the other. The most subtle exponent of transcendentalism in art appeals to generalisations drawn from the facts of art; nor have the professedly scientific critics often abstained from introducing conceptions and hypotheses of a metaphysical character.

(A.) MerapHysicaL PROBLEMS.

Metaphysical speculation in esthetics centres about the objective nature of beauty, and arises somewhat in the following manner :—The appreciation of the Beautiful is a mode of perception. In estimating a beautiful lindscape or a beautiful statue, the mind perceives the beauty as a pro- perty of the object. It is, moreover, a single property; the name beautiful always denoting the same essential thing, whatever this may be. Now we find that it is not a simple property of matter known through one particular class of sensations, as colour; and the question arises, what it really is in itself, whcther inherent in and inseparable from matter, or something superior to it, and if so, how revealed through it. The directions of this inquiry have beet almost as numerous as the systems of metaphysical thought. On the supposition of a real substance, matter, independent

of all intelligence, human or divine, writers have attempted to discover the essential principle which beautifies it. It has been universally considered by metaphysicians that matter in itself is devoid of beauty, if not positively ugly, and the only question arises as to the extraneous principle which imparts beauty to it. This has been conceived either as a simple force

distinct from matter, yet setting it in motion, vivifying it, and reducing it to forms, as by Lévéque; or as a divine being, whose volition directly invests material objects with all their beautiful aspects, as by Reid; or, lastly, as self-existent forms or ideas superin- duced upon matter, which are in truth the beauty of objects, as by Plato and his modern followers.

In the prevailing German systems of zsthetics, which are based on an ontological idealism, the independent existence of matter has been denied. These writers con- ceive an absolute Thought or Idea as the ultimate reality, of which matter and consciousness are but the two sides. Matter is conceived as the negative or limiting principle in the action or self-movement of the Absolute. The problem of objective beauty becomes on this hypothesis the deter- mination of the particular mode in which the Beautiful is a manifestation of the supreme thought; for the Good and the True are cqually revelations of the Unconditioned, and it is necessary to mark off beauty from these. Various definitions of the Beautiful, based on this mode of concep- tion, may be found in the systems of Hegel, Weisse, and the Hegelians. The second great problem in the meta- physics of esthetics is to co-ordinate the species of the wsthetic genus, nainely, the Beautiful (in its narrow sense), the vel the Sublime, and the Ridiculous. This has been undertaken by the Hegclians, and their attempts to construct what they call the dialectics of esthetics are among the most curious products of metaphysical thought. It being assumed that thcre is some one ontological process running through every manifestation of the xsthetic Idea, these writers have sought to determine how each of the subaltern notions is related to this process. The last problem in the scheme of metaphysical esthetics relates to the nature and functions of Art, looked at on one side as a reproduction in altered form of the beauty of Naturc, and, on the other, as the conscious product of esthetic intuition in the human mind, First of all, the arts are appreciated and classi- fied according to the several modes in which they body forth the Idea to our minds. Secondly, since the Absolute may be spoken of as revealing itself to human intelligence, so human intelligence may be looked on as groping through long ages after the Absolute, and thus the historical evolu- tion of art finds its place in a complete metaphysic of esthetics. In concluding this preliminary sketch of the metaphysical systems, it should be added that they can be adequately estimated and criticised only in connection with the whole systems of

thought of which they are organic parts. Within the scope of a purely scientific criticism it is only possible to point out any inconsistencies in the application of these ideas to beauty and art, and to show how much or how little they cffect, as hypothetical instruments, in helping us more clearly to understand the phenomena.

(B.) Screntiric ProBLeMs.

In the scicntific discussion of esthetic subjects, the anti- thesis of subject and object in human cognition is accepted as a phenomenal distinction, without any inquiry into its ontological meaning. Inquirers no longer discuss the essence of beauty, looked on as a transcendental conception above all experience, but seek to determine in what the Beautiful, as a series of phenomena, clearly and visibly -consists. ./lsthetic speculation becomes, accordingly, more purely psychological. First of all, the unity of beauty is questioned. It is asked whether all objects which appear

beautiful are so because of some one ultimate property, or combination of properties, running through all examples of beauty, or whether they are so called simply because they produce some cominon pleasurable feeling in the mind. This is a question of induction from facts and consequent definition, lying at the very threshold of ssthetic scicnce. It has been most vigorously disputed by British writers on the subject, and many of them have decided in favour of the plurality and diversity of elements in beauty. Again, it has been asked in which category of our experience, objective or subjective, beauty originates. By some it has been referred to an objective source, whether to sensation, as a direct result of physiological action, as by Burke, or to something distinctly perceived by means of sensation, as a certain relation of unity, symmetry, &., among tlio parts of an object, its colours, forms, and so on, as pro- bably by Aristotle, Didcrot, Hogarth, and most writers. By others the source of beauty has been sought in the inner life of the mind itself, in certain ideas and emotions which have become reflected on external objects by asso- ciation. This is the doctrine of Alison. A third class recognise both of these sources, attributing the effects of beauty partly to the pleasurable effects of external stimu- lation, partly to the activities of perception, and partly to multitudinous associations of

ideas and feelings from past expericnce. This class includes Dugald Stewart, Professor Bain, and Mr Herbert Spencer. A third question in the general scientific theory of beauty which is closely related to the last and largely determined by it, is the precise nature of the mental faculty or activity conccrned in the perception and appreciation of the Beautiful. This, too, has been widely discussed by English writers,—answers to the other two questions frequently appearing as the necessary implications of the solution of this one. By those who affirm that beauty is a simple property or conjunction of properties in external objects, the subjective perception of this property has been regarded either as a unique faculty (the internal sense), or as the rational principle acting in a certain way. By the school of Alison, who find the source of beauty in a certain flow of ideas suggested by an object, the perception of the same, as a property of the object, would be explained as the result of inseparable association, producing a kind of momentary delusion. And this same effect of association, in producing an apparent intuition of one simple property, would be made use of by those later writers who resolve the nature of beauty into both objective and subjective elements. It is noticeable, too, that while some writers have treated the appreciation of beauty as purely intellectual, others have confined themselves to the emotional element of pleasure. With respect to the Ludi- crous and the Sublime, as distinguished from the Beautiful, there seems to have bcen a tacit agrecment that both of these are unique and single properties, whether originally in the object of sense, or reflected on it from the mind; and various theories have been suggested in explanation of the charactcristic effects of these propertics on human sensibility and thought.

What strikes one most, perhaps, in these discussions is the vagueness due to the great diversity of conception as to the real extent of the Beautiful—the number of objects it may be supposed to denote. While one class of writers appears to limit the term to the highest and most refined examples of beauty in nature and art, others have looked on it as properly including the lower and more vulgarly recognised instances. There is certainly a great want of definiteness as to the legitimate scope of esthetic theory. It will be seen, too, how closely this point bears on the question of the relativity of ssthetic impressions, whether there is any form of beauty which pleascs universally and necessarily, as Kant affirms. The true method of resolving

this difficulty would appear to be to look on esthetic impressions more as a growth, rising, with the advance of intellectual culture, from the crude enjoyments of sensation to the more refined and subtle delights of the cultivated mind. The problem of the universal and necessary would then resolve itsclf into an inquiry into a general tendency. It would be asked what kinds of objects, and what ele- ments of sensation, idea, and emotion, tend to become con- spicuous in esthetic pleasures, in proportion as the mind advances in general cmotional and intellectual culture. Another defect in nearly all the theories of the Beautiful that have been proposed, refers to the precise relation of the intellectual element in the zxsthetic impression. In opposing the narrow view, that the appreciation of beauty is a purely intellectual act, a cold intuition of reason, writers have fallen sometimes into another narrowness, 1n resolving the whole of the effect into emotional elements, or certain species of pleasure. Unless beauty is, as Hutcheson affirmed, a simple property of objects like colour, the per- ception of it as objective, which all must allow to be a mental fact, can only be explained by means of certain intel- lectual activities, by force of which the pleasurable cffccts come to be referred to such a seemingly simple property. The solution of this point would doubtless be found in a more complete discussion of the perceptive or discrimi- native and assimilative activities of the intellect which are invariably called into play by complex objects, and which correspond to the attributes of proportion, unity in variety, &c., on which so much stress has been laid by the intui- tivists. Not only so, but any theory of esthetic operations ust be incomplete which docs not give prominence to those more subtle and exalted intellectual activities that are involved in the imaginative side of zsthetic apprecia- tion, as in detecting the curious half-hidden implications which make up the essence of a refined humour, in con- structing those vague yet impressive ideas which enter into our intuition of sublimity and infinity, and even in appreciat- ing such seemingly simple qualitics as purity of colour and tone, or the perfectly graduated blending of two adjacent colours. Such activities of the mind constitute, among other things, the symbolic aspect of the Beautiful, and give, as Mr Mill suggests, a basis of truth to such scem- ingly fanciful notions respecting the meaning of beautiful qualities as one finds in the works of Mr Ruskin.

But comparatively little has been done in a purely scientific manner to determine the nature and functions of Art so as to fix the relations of the different arts to simple or natural beauty. Aristotle supplied a few valuable doctrines, which have been rendered still more precise by Lessing and others. Yet there seems even now no consensus of opinion as to the precise aims of art, how far it has simply to reproduce and constructively vary the beauties of nature, or how far to seek modes of pleasurable effect wider than those supplied by natural objects. A theory of art at all comparable in scientific precision to existing theories of morals has yet to be constructed. The few attempts to establish a basis for art of a non-mctaphysical kind are characterised by great one-sidedness. Thus, for example, the theory that the function of art is to imitate nature, has been broached again and again with scarcely any referenee to music, merely, as it seems, out of an impatience for some one defining property. Without attempting to sketch a complete doctrine of art, a suggestion may be offered as to the right direction of inquiry. First of all, then, the widest possible generalisations on the various emotional susceptibilities to which art can appeal must be collected, from a study both of mental phenomena as a whole, and of all varieties of pleasurable feeling actually ministered by the several forms of art. 'This would fix the end of the fine arts in the widest sense, marking it off from the ends

of utility and morality. Secondly, the highest aims of art, or the ideal of art, would have to be determined by a con- sideration of the laws of compatibility and incompatibility among these various orders of gratification, the requirements of quantity, variety, and harmony, in any lofty esthetic impression, and the relative value of the sensational, intellectual, and emotional elements in esthetic effeet. This part of the subject would include the discussion of the value and universal necessity of the real and the ideal in art, truth to nature and imaginative transformation. These conclusions would require verification by means of the widest and most accurate study of the development of the arts, in which could be traced the gradual tentative progress of the artistic mind towards the highest achieve- ments of art, as well as the permanent superiority of all those forms of art which most clearly embody this tendency. This part of the

theory of art would clearly connect itself with the problem of the general law or tendency in esthetic development already referred to. The proper determina- tion of these two ideas, the whole range of possible zsthetic delight, and the direction of the highest, purest, and most permanent delight of cultivated minds, would at once dis- pose of many narrow conceptions of art, by recognising the need of the widest possible diversity and grades of artistic value, if only as experiments requisite to the discovery of its highest function. At the same time the meaning and limits of the universal and necessary in art would be defined, and the unsuggestive and dreary conflicts between an unbending absolutism and a lawless individualism shown to be irrelevant. The validity of canons of art, and their limitations, would in this manner be fixed, and the impatient exaltation of certain schools and directions of taste reduced to a modest assertion of a purely relative truth. The aims of art as a whole being thus determined, the next thing would be to define and classify the individual arts of painting, music, poetry, é&c., according to their respective powers of embodying these aims. 'This would require a careful consideration of the material or medium of expression employed by cach art, and the limitations im- posed by it as to the mode of representation. The deter- mination of this part of zesthetic theory, which Lessing com- menced, would require not only technical but considerable psychological knowledge. Similarly, any conclusion arrived at on this subject would need to be verified by a reference to the history of the arts, as exemplifying both the successes of aright conception of the scope and possibilities of the. particular art, and the failures resulting from a mistaken conception. Many other points, such as the nature of genius, the function and bounds of criticism, the relation of esthetic culture to intellectual, moral, and social pro-

gress, would be included in a complete scheme of art

doctrine.

(C.) History or SYSTEMS.

In the following brief account of the most important contributions to esthetic doctrine, only such writings will be recognised as aim at some general conception of Art and the Beautiful. Much that passes in current literature for esthetic speculation, namely, a certain thoughtful way of

criticising special works of art, is simply the application of recognised principles to new cases. Sometimes, how- ever, in the hands of a philosophic critic the mere appre- ciation of a single poem or the works of a particular artist may become a luminous discussion of some general prin- ciple, and this method of constructing zsthetic theory from the criticism of a single work or series of works was ren- dered very productive by Lessing.

I. Greek Speculations.—Ancient Greece supplies us with the first speculations on the Beautiful and the aims of the fine arts. Nor is it surprising that among a people

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so productive of noble artistic creations, and at the same time so speculative, numerous attempts to theorise on these subjects should have been made. We have in classic writings many allusions to works of an esthetic character now lost, such as a series on poetry, harmony, and even painting, by Democritus. It is to be gathered, too, from Plato’s Dialogues that the Sophists made the principles of beauty a special department in their teaching. The first Greek thinker, however, whose views on these subjects are at all known is Socrates. Accepting Xenophon’s account of his views in the Memorabilia and the Symposton, we find that he regarded the Beautiful as coincident with the Good, and both of them as resolvable into the Useful. Every beautiful object is so called because it serves some rational end, whether the security or gratification of man. It looks as though Socrates rather disparaged the immediate grati- fication which a beautiful object affords to perception and contemplation, and emphasised rather its power of further- ing the more necessary ends of life. Thus he said that pictures and other purposeless works of art, when used to adorn a house, hindered rather than furthered enjoyment, because of the space they took from useful objects. This mode of estimating the value of beauty is, however, no necessary consequence of the theory that the whole nature of beauty is to minister pleasure. It arises from undue attention to mere material comfort as a condition of happi- uess. The really valuable point which Socrates

distinctly brought to light is the relativity of beauty. Unlike his illustrious disciple, he recognised no self-beauty (atvréd 76 xaAdv) existing absolutely and out of all relation to a per- cipient mind.

Of the precise views of Plato on this subject, even if they were really formed, it is very difficult to gain a just conception from the Dialogues. In some of these, called by Mr Grote the Dialogues of Research, as the Hippias Major, he ventures on no dogmatic theory of Beauty, and several definitions of the Beautiful proposed are rejected as inadequate by the Platonic Socrates. At the same tiie we may conclude that Plato's mind leaned decidedly to a theory of an absolute Beauty, this, indeed, being but one side of his remarkable scheme of Ideas or self-existing Forms. In the Symposion he describes how love (Eros) produces aspiration towards the pure idea of beauty. It is only this absolute beauty, he tells us, which deserves the name of beauty; and this is beautiful in every manner, and the ground of beauty in all things. It is nothing discoverable as an attribute in another thing, whether living being, earth, or heaven; for these are only beautiful things, not the Beautiful itself. It is the eternal and perfect existence contrasted with the oscillations between existence and non-existence inthe phenomenal world. In the Phedrus, again, he treats the soul's intuition of the self-beautiful as a reminiscence of its prae-natal existence, undefiled by union With respect to the precise forms in which the idea of beauty reveals itself, Plato is very un- decided. Of course his theory of an absolute Beauty is incompatible with the notion of its ministering simply a variety of sensuous pleasure, to which he appears to lean in the Gorgias and even the Hippias Major. Further, his peculiar system of ideas naturally led him to confuse the self-beautiful with other general conceptions of the true and the good, and so arose the Platonic formula xadoxdyabia, expressive of the intimate union of the two principles. So far as his writings embody the notion of any dis- tinguishing element in beautiful objects, it is proportion, harmony, or unity among the parts of an object. The superior beauty of proportion is taught in the Philebus, and In the Phedon it is applied to virtue. As a closely-related view, we see him emphasising unity in its simplest aspect of evenness and purity, the need of variety being over-

looked. Thus in the Philebus he states his preference for regular and mathematical forms, as the straight line and the circle. So he selected among colours pure white, among tones the pure and equal, and among impressions of touch the smooth. At the same time the Dialogues evince many other tentative distinctions in the Beautiful, as, for example, the recognition in the Politics of two opposed classes of beautiful things, those characterised by force and velocity, and those by a certain slowness and softness; which points to a contrast between the stimula- tive and the restful in sensation, since enlarged upon by English psychologists. Elsewhere he descants on the beauty of the mind, and seems to think, in the Republic, that the highest beauty of proportion is seen in the union of a beautiful mind with a beautiful body. In spite of his lofty theory of the origin and nature of beauty, Plato seems to have imperfectly appreciated the worth of art as an independent end in human life and culture. He found the end of art in imitation (yipyors), but esti- mated the creative activity of art as a clever knack, little higher in intellectual value than the tricks of a juggler. He tended to regard the effects of art as devoid of all serious value, and as promoting indolence and the supremacy of the sensual elements of human nature. (See the Sophistes, Gorgias, and Jepublic.) Accordingly, in his scheme for an ideal republic, he provided for the most inexorable censorship on poets, &c., so as to make art as far as possible a mere instrument of moral and political training. As to particular arts, Plato appears to have allowed a certain ethical value to music, in combination with dance and song, if of a certain character, as expressing either the worthy and manly, or the quiet and orderly. With respect to poetry, his views, as expressed in the Republic and else- where, were very uncertain. Thus at times he condemns tragedy and comedy i toto ; at other times he admits the claims of a lofty dramatic poetry. He seems not to have fully considered the aims and influences of painting and sculpture, which he constantly disparages.

A loftier conception of the aims of poetry was afforded Aristotle,

by the strictures of Aristophanes in the Wrogs and else- where. But the one Greek who, as far as we know, fully appreciated and clearly set forth the ends of the fine arts, considered, independently of ethical and political aims, as the vehicles to the mind of the ideas and delights of beauty, was

Aristotle. Unlike Plato, he proceeded less metaphysically and more scientifically to investigate the phenomena of beauty by a carcful analysis of the principles of art. In his treatises on poetry and rhetoric, he gives us, along with a theory of these arts, certain principles of beauty in general ; and scattered among his other writings we find many valuable suggestions on the same subject. First of all, Aristotle ignores all conceptions of an absolute Beauty, and at the same time seeks to distinguish the Beautiful from the Good. Thus, although in the more popular exposition, the Rhetoric, he somewhat incorrectly makes praiseworthi- ness a distinguishing mark of the Beautiful, regarded as a species of the Agreeable or Desirable, he seeks in the Jfeta- physics to distinguish the Good and the Beautiful thus: the Good is always in action (év zpdéet); the Beautiful, however, may exist in motionless things as well (év dxwyrots). Else- where he distinctly teaches that the Good and the Beautiful are different (€repov), although the Good, under certain con- ditions, can be called beautiful. He thus looked on the two spheres as co-ordinate species, having a certain area in common. It should be noticed that the habit of the Greek mind, in estimating the value of moral nobleness and eleva- tion of character by their power of gratifying and impress- ing a spectator, gave rise to a certain ambiguity in the meaning of 76 xaAdv, which accounts for the prominence the Greek thinkers gave to the connection between the

Beautiful and the Good or morally Worthy. Aristotle further distinguished the Beautiful from the Fit, and in a passage of the Politics set Beauty above the Useful and Necessary. Another characteristic of the Beautiful fixed by this thinker in the Rhetoric is thc absence of all lust or desire in the pleasure it bestows. This is an important point, as suggesting the disinterested and unmonopolising side of ssthetic pleasure. The universal elements of beauty, again, Aristotle finds in the Afetaphysics to be order (rdgis), symmetry, and definitencss or determinateness (76 épurpevov). In the Poetics he adds another essential, namely, a certain magnitude, it being desirable, for a synoptic and single view of the parts, that the object, whether a natural body or a work of art, should not be too large, while clear- ness of perception requires that it should not be too small. At the same time he seems to think that, provided the whole be visible as such, the

greater magnitude of an object is itself an element of beauty. This is probably to be understood by help of a passage in the Polztics, which lays down the need of a number of beautiful parts or aspects in a highly beautiful object, as the human body. With respect to art, Aristotle's views are au immense advance on those of Plato. He distinctly recognised, in the Politics and elsewhere, that its aim is simply to give imme- diate pleasure, and so it does not need to seek the useful like the mechanical arts. The essence of art, considered as an activity, Aristotle found in imitation, which, unlike Plato, he considers not as an unworthy trick, but as in- cluding knowledge and discovery. The celebrated passage in the Poetics where he declares poctry to be more philo- sophic and serious a matter (orovdaidrepov) than philo- sophy, best shows the contrast between Plato and Aristotle in their estimates of the dignity of artistic labour. In the Poetics he tclls us that the objects to be imitated by the poet are of three kinds—(1.) Those things or events which have been or still are; (2.) The things which are said to be and seem probable; (3.) The things which necessarily are (ctvac 52). The last points, as Schasler supposes, to the ideal character of imitation as opposed to mere copying of individual objects or events, and accounts for the lofty value assigned to it by Aristotle. More particularly the objects of imitation in poetry and music, if not in all art, are dispositions (70y), passions, and actions. Aristotle gives us some interesting spcculations on the nature of the artist's mind, and distinguishes two varieties of the poetic imagination—the easy and versatile conceptive power of a man of natural genius (évuzjs), and the more emotional and lively temperament of an inspired man (uavixds). He gives us no complete classification of the fine arts, and it is doubtful how far his principles are to be taken as applicable to other than the poetic art. He scoms, however, to distinguish poetry, music, and dancing — all of which are supposed to imitate some element of human nature, some feeling or action—by the means they employ, namely, rhythm, harmony,melody,and vocal sound. Paint- ing and sculpture are spoken of as imitative arts, but their special aims are not defined. Architecture seems ignored by Aristotle as non-imitative. His peculiar theory of poetry can only be just glanced at here. Its aim, he says, is to imitate dispositions and actions, Metrical form is hardly looked on as an essential. Poetic imitation, as in- cluding the selection of the universal in human nature and history, is ably treated; and from this part of Aristotle's theory all modern ideas of poetic truth are more

or less deriv- able. He distinguishes, somewhat superficially, the epic poem, the drama, and a third variety not named, but appa- rently lyric poetry, by the manner in which the poet speaks in each variety, whether in his own person, or in that of another, or in bothalternately. The epicand the dramatic pocm require unity of action, a certain magnitudc, with

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beginning, middle, and cnd, and also those changes of for- tune and recognitions that make up the thrilling character of plot. The end of tragedy Aristotle defines as the effecting, by means of pity and fear, of a purification of these passions; and this is perhaps the point of greatest interest for zesthctics in the whole of his theory of poetry. Whether he is refcrring to any moral influence of tragedy on the emo- tions, bringing both fear and pity in the spectator's mind to their proper ethical mean, as Lessing and others conccive; whether he simply means the elimination of all painful ingredients in these feelings, either by the recognition of the imaginary nature of the evil represented, or by the simul- taneous satisfaction of other and dceper feelings as moral approval or wide human sympathy; or, finally, whether by "purification " we are to understand the grateful relief by artificial means of a recurring emotion needing periodic vent, as Ueberweg argues,—this subtle point may be left to the student to decide. It would be interesting to know how far Aristotle attributed something analogous to this xafapors to the other arts. In the Politics he certainly speaks of a purifying effect in certain kinds of music in quieting the wilder forms of excitement. Finally, it might perhaps be conjectured from his definition of the Ludicrous, as something faulty and disgraceful, yet free from pain, and not destructive, that he would find in the laughter of comedy something analogous to this purification, namely, the gradual resolution of the more painful feelings of con- tempt or disgust into the genial moods of pure hilarity.

Omitting to notice the few valuable remarks on &s- Plotinns

thetic subjects of the later Greeks and their Roman contemporaries, one may briefly refer to the views of the Alexandrian mystic and Neo-Platonist Plotinus, not only because of their intrinsic interest, but on account of their resemblance to certain modern systems. His theory is to be found in an essay on the Beautiful in the series of dis- courses called Hnneades. His philosophy differs from the Platonic in the recognition of an objective voids, the dircet einanation from the absolute Good, in which the ideas or notions (Adyox), which are the prototypes of real things, are immanent. This Reason, as self-moving, becomes the for- mative influcnce reducing matter, which in itself is dead, to form. Matter thus formed becomes a notion (Aédyos), and this form is beauty. Objects are ugly so far as they arc unacted upon by Reason, and so remain formless. The creative vovs is absolute Beauty, and is called the more than beautiful (75 Srépxaddov). There are three degrees or stages of the Beautiful in manifestation, namely, the beauty of subjective vods, or human reason, which is the highest ; that of the human soul, which is less perfect through the connection of the soul with a material body; and that of real objects, which is the lowest manifestation of all. As to the characteristic form of beauty, he sup- posed, in opposition to Aristotle, that a single thing not divisible into parts might be beautiful through its unity and simplicity. He attached special worth to the beauty of colours in which material darkness is overpowered by light and warmth. In reference to artistic beauty, he said that when the artist has Aoyo. as models for his creations, these may become more beautiful than natural objects. This is a very curious divergence of opinion from the Platonic.

After Plotinus there is little speculation on esthetic St Augus tine.

subjects till we come to modern writers. St Augustine © wrote a treatise on the Beautiful, now lost, in which he,

en appears to have reproduced Platonic ideas under a Christian systems.

guise. He taught that unity is the form of all beauty ("omnis porro pulchritudinis forma unitas est"). Infinite goodness, truth, and beauty are

the attributes of the Deity, and communicated by him to things. But passing from these fragmentary utterances, we may consider more fully

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the modern theories, beginning with the German systems, as being the most metaphysical, and having most affinity with ancient speculation. In German literature the two divisions of metaphysical deduction and critical construc- tion of ssthetic principles are very sharply contrasted, and nearly every writer on the subject is easily referred to one or other of the classes, On the one hand, we have the laborious systematic philosophers, as Kant and Hegel; and on the other, men who entered upon esthetic specula- tion either as connoisseurs of some special department, as Winckelmann and Lessing, or even as productive artists— for example, Schiller and Goethe.

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is the form of adaptation (Zweckmiissigkeit) without any end being conceived. Finally, in modality it is a necessary satisfaction, pleasing not by a universal rule, this being unassignable, but by a sensus communis, or agrcement of taste. Kant is not very consistent in carrying out these distinctions. Thus, for example, he recognises in fitness a particular species of beauty, namely, "adhering" as dis- tinguished from "free" or intrinsic beauty, without re- cognising that this implies the presence of a notion. So, in discussing the objective validity of our esthetic im- pressions, he decides that the highest meaning of beauty is to symbolise moral good; and, in even a more fanciful

stematic Il. German Writers—The first of the Germans who ratisess— attempted to fit a theory of the Beautiful and of Art umgar- into a complete system of philosophy was Baumgarten.

manner than that of Mr Ruskin, he attaches moral ideas, as modesty, frankness, courage, &c., to the seven primary colours of the Newtonian system. Yet he does not admit

; Adopting the Wolffian principles of knowledge, as modi-

fied by Leibnitz, he thonght he was completing that system by setting over against logical knowledge, whose object is truth, xsthetic knowledge, which has to do with beauty. The former is conceptive knowledge (be- greifendes Lrkennen), the act of the understanding, and its result as the science of clear conceptions is embodied in logic. Adsthetic has to do, not with clear, but con- fused conceptions (verworrene Vorstellungen), namely, sen- suous knowledge. The beautiful is defined by Baumgarten as the perfection of sensuous knowledge, and the ugly is that which struggles against this perfection; and, con- sistently with this view, he first employed the term esthetic (esthetica) to denote a theory of the Beautiful. He held that perfection, as harmony of object with its con- ception or notion (Begrif'), presents itself under threc as- pects:—(1.) As truth for pure knowledge; (2.) As beauty for obscure perception ; (3.) As goodness for the capacitics of desire or will. It will be seen at once by the thoughtful student that this mode of dealing with impressions of beauty, &c., simply as intellectual elements (confused con- ceptions), must fail to account for their emotional aspects— feeling, which is the very soul of the esthetic impression, being radically distinct from conception and knowledge. Still Baumgarten did service in separating so sharply the provinces of logic, ethics, and sesthetics, and in connecting the latter with the impressions of the senses. The details of his zsthetics are mostly unimportant. 'From Leibnitz's theory of a pre-established harmony, and its conscquence that the world is the best possible, Baumgarten concluded that nature is the highest embodiment of beauty, and that art must seek as its highest function the strictest possible imita- tionof nature. Baumgarten had several disciples in this con- ception of zesthetics, as Sulzer and Moses Mendelssohn. The next original philosophical scheme of esthetics is that of Kant. His system of knowledge falls into three branches—the critique of pure reason, which has to determine what are the a priori elements in the know- ledge of objects; the critique of practical reason, which inquires into the a priori determinations of the will; and the critique of judgment, which he regards as a connecting link between the other two, and which has to do with any @ priori principles of emotion (pleasure and pain), as the middle term between cognition and volition. This judgment Kant divides into the xsthetic, when pleasure or pain is felt immediately on presentation of an object; and the teleological, which implies a pre-existing notion, to which the object is expected to conform. He attempts, in a somewhat strained manner, to define

the Beautiful by help of his four categories. In quality beauty is that which pleases without interest or pleasure in the existence of the object. This distinguishes it from the simply Agree- able and the Good, the former stimulating desire, and the latter giving motive to the will. In quantity it is a uni- versal pleasure. Under the aspect of relation, the Beautiful

that the perception of this symbolic function involves any notion. Once more, he attributes beauty to a single colour or tone by reason of its purity. But such a definition of the form of the Beautiful clearly involves some notion in the percipicnt mind. Kant further applies his four cate- gories, with still less of fruitful suggestion, to the Sublime. The satisfaction of the Sublime is a kind of negative plea- sure created through the feeling of a momentary restraint (Hemmung) of vital force, and of a subsequent outpouring of the same in greater intensity. The feeling of the in- adequacy of the imagination is succeeded by a consciousness of the superiority of reason to imagination. The sentiment is thus a kind of wonder or awe. Sublimity is either mathe- matical, that of magnitude, or dynamical, that of nature's might. He allows no sublimity to passions, as rage or revenge. Kant has, too, a theory of the Ridiculous, the effect of which he lays, oddly enough in respect to the rest of his doctrine, in a grateful action of the body, the muscles of the diaphragm, &c., giving a sense of health. This action takes place on the sudden relaxation of the under- standing when kept in a state of tension by expectation. The cause of laughter, or the Ridiculous, may hence be defined as "the sudden transformation of a tense expecta- tion into nothing." He placed the beauty of nature above that of art, which can be of value only mediately, not as an end in itself. He classifies the arts according as they express the ssthetic idea—whatever this may mean after his exclusion of all definite conception from the per- ception of beauty. Just as expression in speech consists of articulation, gesticulation, and modulation, answering to thought, intuition (Anschauung), and feeling, so we have three kinds of art—(1.) Those proceeding orally (redende), oratory and poetry; (2.) Those of visible image (bi/dende), plastic art and painting; and (3.) "the art of the play of feelings," namely, music and "colour art," which last is not defined. Kant's system is very defective, and some of its inconsistencies were pointed out by Herder in his Kalligone, who lacked, however, philosophic accuracy. Herder denied Kant's distinctions between the Beautiful, the Good, and the Agrceable, saying that the first must be

desired as well as satisfying, and the second be loved as well as prized. Yet herein Kant is decidedly superior to his critic. Herder held, in opposition to Kant, that all beauty includes significance (Bedeutsamkeit), and cannot affect us apart from a notion of perfection. But here, too, Kant is to be preferred, since his theory does not assume all beautiful objects to contain some one element or form capable of being detected. Kant's real additions to esthetic theory consist in the better separation of the Beautiful from the Good and Agreeable, in the prominence given to the emotional side of esthetic impressions, and in the partial recognition of the relativity of ssthetic judgment, more especially in the case of the Sublime.

After Kant the next philosopher to discuss the meta- Schelling.

physics of the Beautiful and art is Schelling. He sought I. — 28

Hegel.

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to engraft art upon his curious system of transccudental idealism in a manner which can only be faintly indicated here. In Schelling's metaphysical system the relation of subject and object is conceived as identity. Each exists, yet not independently of the other, but identified:in a higher, the absolute. They may be conceived as two poles representing different directions, but yet inseparably joined. All knowledge rests on this agreement. Either nature, the object, may be conceived as the prius, and the subject con- structed out of it; or the subject may be taken as the prius, and the object constructed from it. These are the two poles of knowledge, and constitute the philosophy of nature and the transcendental philosophy. The latter, like Kant's philosophy of mind, is bascd on a threefold conception of the powers of human nature. It consists of—(1.) Theoretic philosophy, dealing with perception; (2.) Practical philo- sophy, discussing the will and freedom ; and (3.) The philo- sophy of art. The aim of the last is thus expressed: The ego must succeed in actually perceiving the concord of sub- ject and object, which is half disguised in perception and volition. This concord is scen within the hmits of the ego in artistic perception only. Just as the product of nature is an mucouscious product like a conscious one, in its de- signfulness, so the product of art is a conscious product like an

unconscious one. Only in the work of art does intelligence reach a perfect perception of its real self. This is accompanied by a feeling of infinite satisfaction, all mystery being solved. Through the creative activity of the artist the absolute reveals itself in the perfect identity of subject and object. Art is therefore higher than philo- sophy. Schelling thus sets the beauty of art far above that of nature. As to the form of the beautiful he is very vague, leaning now to a conception of harmony in the totality of the world (Weltall), and now to a Platonic conception of primitive forms (Urbilder) of perfection. He has a very intricate classification of the arts, based on his antithesis of object and subject, reality and ideality. A curious feature of Schelling's theory is his application of his one fundamental idea to tragedy. The essence of tragedy is, he thinks, an actual conflict of liberty in the subject with objective necessity, in which both being conquered and conquering, appear at once in the perfect indifference. Antique tragedy he holds, accordingly, to be the most per- fect composition of all arts.

Passing over Solger, whose esthetic doctrine is little more than a revival of Platonism, we come to Hegel. His system of philosophy falls into three parts, all based on the self-movement of the idea or absolute :—(1.) The logic discussing the pure universal notions which are the logical evolution of the absolute, as pure thought; (2.) Philosophy of nature—the disruption of thought, the idea, into the particular and external; (3.) Philosophy of the spirit—the return of thought or the absolute from this self-alienation to itself in self-cognisant thought. Just as the absolute, so has spirit a series of three grades to traverse—(a.) Subjective spirit or intelligence, relating itself to the rational object as something given; (b.) Ob- jective spirit or will, which converts the subjectivised theoretical matter (truth) into objectivity; (c.) Absolute spirit, which is the return of the spirit from objectivity to the ideality of cognition, to the perception of the absolute idea. This again has three stages—(1.) Art, in which the absolute is immediately present to scnsuous perception; (2.) Religion, which embodies certainty of the idea as above all immediate reality; and (3.) Philosophy, the unity of these. According to this conception, the beautiful is defined as the shining of the idea through a sensuous medium (as colour or tone). It is said to have its life in shining or appearance (Schein), and so differs from the true, which is not real sensuous existence, but the universal idea

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contained in it for thought. He defines the form of the Beautiful as unity of the manifold. The notion (Begrif) gives necessity in mutual dependence of parts (unity), while the reality demands the appcarance or semblance (Schein) of liberty in the parts. He discusses very fully the beauty of nature as immediate unity of notion and reality, and lays great emphasis on the beauty of organic life. But.it is in art that, like Schelling, he finds the highest revelation of the Beautiful. Art makes up the deficiencies of natural beauty by bringing the idca into clearcr light, by showing the external in its life and spirit- ual animation. ‘The various forms of art depend on the various combinations of matter and form. In Oricntal or symbolical art matter is predominant, and the thought is struggling through with pain so as to reveal the ideal. In the classical form the ideal has attained an adequate existence, form and matter being absolutely commensurate. Lastly, in the romantic form, the matter is reduced to a mere show, and the ideal is supreme. Hegel classifies the individual arts according to this same principle of the rcla- tive supremacy of form and matter—(1.) The beginning of art is architecture, in which as a symbolic art the sensuous material is in excess. (2.) Sculpture is less subjected to matter, and, as representing the living body, is a step to- wards a higher ideality. (3.) Painting, which is the romantic art kar’ égoyyv, expresses the full life of the soul. By the elimination of the third dimension of space, and the

employment of a coloured plane, painting rids itself of the

coarse material substrate of sculpture, and produces only a semblance of materiality. (4.) In music, which employs pure tone, all the elements of space are suppressed, and hence its content is the inner emotional nature (Gemiith). Music is the most subjective of the arts. (5.) Poetry has the privilege of universal expression. It contains all the other arts in itself, namely, the plastic art in the epos, music in the ode, and the unity of both in the drama.

Several systems of zsthetics, more or less Hegelian in Dialectic

Weisse of the a Hegelians,

character, can only be referred to in passing. defined zesthctics as the science of the idea of beauty, an explained the Beautiful as the entrance of the universal or of the essence into the limited and finite, that is, the cancelling or annulling of truth (die aufgehobene Wahrheit). By thus recognising an internal contradiction in all beauty, he sought to develope, by a curious dialectical process, the ideas of the Ugly, the Sublime, and the Ludicrous. He treats each of these three in immediate contrast to beauty. Uegliness is the immediate existence of beauty. It appears as the negative moment in the Sublime, and in the Ludicrous this negativity is again cancelled and resolved into affirmation so as to con- stitute a return to the Beautiful. A like attempt to deter- mine the relations of the Ugly, Comic, &c., as moments of the self-revealing idea was made by several Hegelians. Thus Ruge, in his Abhandlung tiber das Komusche, teaches that sublimity is the zsthetic idea striving to find itself, together with the satisfaction of this striving. If, how- ever, the idea lose itself, sinking away in a kind of swoon, we have the Ugly. Finally, when the idea recovers from the swoon, its new birth is attended with a feeling of amusement (Hrheiterung), and then we have the effect of the Ludicrous. Rosenkranz, in his dsthettk des Hass- lichen, conceives the Ugly as the negation of the Beautiful, or as the middle between the Beautiful and the Ludicrous, aud seeks to trace out its various manifestations im form- lessness in nature, incorrectness in artistic representation, and deformity or the disorganisation of the Beautiful in caricature. Schasler, again, seems to hold that the Ugly 1s co-ordinate with the Beautiful, being the motor principle that drives the Beautiful from the unconditioned rest of the Platonic idea, from the sphere of empty abstractness to actuality. This fundamental contradiction reveals itself

complete systems are too numerous to be fully represented Incomplete here. Only a few of the most valuable contributions to the German theory will be alluded to. Winckelmann's services to the °¥St°™-*

: ; Winckel- development of plastic art do not directly concern us. ee

as the contrast of matter and spirit, rigid motioulessness and motion, and appears in art as the autithesis of the sublime and graceful (das

Anmuthige), the latter containing the Naif, the Pretty, and the Ridiculous. Finally, Theodor

Vischer seeks to settle these subtle relationships in this manner: He supposes the Sublime to be the sundering of the sesthetic idea and its sensuous image (G'ebild) from the state of unity constituting the Beautiful, the idea reaching as the infinite over against the finite of the image. The image now resists the sudden rupture, and in asserting itself as a totality in defiance of the idea becomes the Ugly. The Comic, again, is the result of some partial and appa- rently involuntary recognition of the mghts of the idea by the rebellious image. Schasler says, in criticising the views of Vischer, that it is difficult not to be satirical in describing the dialectic artifices to which the idea is here compelled, little suspecting how easily any similar attempt to adjust relations between these ideas, looked at objectively as movements of the supreme idea, may appear equally naif and funny to a mind uot already oppressed with the resist- ing burden of its own abstractions.

Theodor Vischer, the last of the Hegelians named here, has produced the largest and most laborious system of metaphysical ssthetics, and a brief account of its scope must be given to complete our history of the German systems. He defines sesthetics as the science of the Beau- tiful. His system falls into three parts: (1.) Metaphysic of the Beautiful; (2.) The Beautiful as one-sided existence —beauty of nature and the human imagination; (3.) The subjective-objective actuality of the Beautiful—Art. The metaphysic again falls into two parts—the theory of simple beauty, and that of the Beautiful in the resistance of its moments (the Sublime and Ridiculous). He defines the Beautiful as "the idea in the form of limited appearance." His discussions of the various beauties of nature, the organic and inorganic world, are very full and suggestive, and his elaboration of the principles of art (excepting those of music, which he left another to elucidate), is marked by a wide and accurate knowledge. He divides the arts into—(1.) The objective, or eye arts (architecture, sculpture, and painting); (2.) Subjective, or ear arts (music); (3.) Subjective-objective arts, or those of sensuous conception (poetry). He subdivides the first into those of measuring sight (architecture), touching sight (sculpture), and sight proper (painting). Vischer's style is very laboured. His propositions fall into the form of mathematical theorems,

and are made exceedingly incomprehensible by the ex- cessive subtleties of his metaphysical nomenclature.

There are several other systems of sesthetics which deserve mention here, but space does not allow of a full account of them. Of these the most important are the theories of Herbart, Schopenhauer, and von Kirchmann. Herbart's views are based on his curious psychological conceptions. He ignores any function in the Beautiful as expressive of the idea, and seeks simply to determine the simplest forms or the elementary judgments of beauty. Schopenhauer's discussions, connecting beauty with his peculiar conception of the universe as volition, are a curious contribution to the subject. As a specimen of his specula- tions, one may give his definition of tragedy as the repre- sentation of the horrible side of life, the scornful dominion of accident, and the inevitable fall of the just and inno- cent, this containing a significant glimpse into the nature of the world and existence. Von Kirchmann has written a two-volume work on esthetics, which is interesting as a reaction against the Hegelian method. It professes to be an attempt to base the science on a realistic foundation, and to apply the principles of observation and induction long acted upon in natural science.

The German esthetic speculations not elaborated into

Of his theory of plastic beauty, based exclusively on the principles of Greek sculpture, little requires to be said. He first pointed to the real sources of superiority in antique creations, by emphasising the distinction between natural and ideal beauty, the esthetic value of contour as an ideal element, the beauty of expression as the manifestation of an elevated soul, and consisting of a noble simplicity and a quiet grandeur. But by too exclusive an attention to Greek art, and indeed to sculpture, his theory, as an attempt to generalise on art, lacks completeness, making little room for the many-sidedness of art, and narrowing it down to one, though an exalted, ideal.

Lessing's services to the scientific theory of art are far Lessing.

greater than those of Winckelmann. He is the first modern who has sought to deduce the special function of an art from a consideration of the means at its disposal. In his Laokoon he defines the boundaries of poetry and painting in a manner which has scarcely been improved on since. In slight

divergence from Winckelmann, who had said that the representation of crying was excluded from sculpture by the ancients as unworthy of a great soul, Lessing sought to prove that it was prohibited by reason of its incom- patibility with the conditions of plastic beauty. He reasoned from the example of the celebrated group, the Laokoon. Visible beauty was, he said, the first law of ancient sculpture and painting. These arts, as employing the co-existent and permanent in space, are much more limited than poetry, which employs the transitory and suc- cessive impressions of sound. Hence, expression is to poetry what corporeal beauty is to the arts of visible form and colour. The former has to do with actions, the latter with bodies,—that is, objects whose parts co-exist. Poetry ean only suggest material objects and visible scenery by means of actions; as for example, when Homer pictures Juno's chariot by a description of its formation piece by piece. Painting and sculpture, again, can only suggest actions by means of bodies. From this it follows that the range of expression in poetry is far greater than in visible art. Just as corporeal beauty loses much of its charm, so the visible Ugly loses much of its repulsiveness by the suc- cessive and transient character of the poetic medium. Hence poetry may introduce it, while painting is forbidden to represent it. Even the Disgusting may be skilfully employed in poetry to strengthen the impression of the Horrible or Ridiculous; while painting can only attempt this at its peril, asin Pordenone's Intcrmeut of Christ, in which a figure is represented as holding its nose. Visible imita- tion being immediate and permanent, the painful element cannot be softened and disguised by other and pleasing ingredients (the Laughable, é&c.), as in poetry. As Schasler says, Lessing's theory hardly makes room for the effects of individuality of character as one aim of pictorial as well as of poetic art. Yet as a broad distinction between the two heterogeneous arts, limiting, on the one hand, pictorial de- scription in poetry, and the representation of the painful, low, and revolting in the arts of vision, it is unassailable, and constitutes a real discovery in esthetics. Lessing's principles of the drama, as scattered through the critiques of the Hamburg Dramaturgy, are for the most part a fur- ther elucidation of Aristotelian principles, of great value to the progress of art, but adding comparatively little to the theory. Its conspicuous points are the determination of poetic truth as shadowed forth by Aristotle, and the dif- ference between tragedy and comedy in respect to liberty of invention both

of fable and of character; secondly, the reassertion that both fear and pity, and not simply one of

Goethe.

Schiller.

Jean Paul.

Other writers.

Attempts to deter- mine the instinctive or sensa- tional ele- ment in beauty.

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these, are the effects of every tragedy, and that it is false dramatic art to attempt to represent either the sufferings of a perfect martyr, or the actions of some monstrous horror of wickedness, as Corneille and the French school had urged ; lastly, the interpretation of Aristotle's purifica- tion of the passions as referring to this very fear and pity, and pointing to a certain desirable mean between excessive sensibility and excessive callousness. Schasler says that if Lessing had had an Aristotle to lean on in the Laokoon as in the Dramaturgy, it would have been more valuable. Others might be disposed to say that if he had been as free from the traditions of authority in the Dramaturgy as he was in the Laokoon, the former might have contained as much in the way of real discovery as the latter. :

The partial contributions to ssthetics after Lessing need not long detain us. Goethe wrote several tracts on sesthetic topics, as well as many aphorisms. He attempts to mediate between the claims of ideal beauty, as taught by Winckelmann, and the aims of individualisation. Schiller discusses, in a number of disconnected essays and letters, some of the principal questions in the philosophy of art. He looks at art as a side of culture and the forces of human nature, and finds in an esthetically cultivated soul the reconciliation of the sensual and rational. His letters on esthetic education (Ueber die wsthetische Erzie- hung des Menschen) are very valuable, and bring out the connection between esthetic activity and the universal im- pulse to play (Spieltrieb). This impulse is formed from the union of two other impulses—

the material (Stoftrieb) and the formal (¥ormtrieb)—the former of which seeks to make real the inner thought, the latter to form or fashion this reality. Schiller's thoughts on this topic are cast in a highly metaphysical mould, and he makes no attempt to trace the gradual development of the first crude play of children into the ssthetic pleasures of a cultivated maturity. He fixes as the two conditions of esthetic growth, moral freedom of the individual and sociability. The philosophic basis of Schiller's speculation is the system of Kant. Another example of this kind of reflective discus- sion of art by literary men is afforded us in the Vorschule der Atsthetik of Jean Paul Richter. This is a rather am- bitious discussion of the Sublime and the Ludicrous, and contains much valuable matter on the nature of humour in romantic poetry. Jean Paul is by no means exact or systematic, and his language is highly poetic. His defini- tions strike one as hasty and inadequate: for example, that the Sublime is the applied Infinite, or that the Ludi- crous is the infinitely Small. Other writers of this class, as Wilhelm von Humboldt, the two Schlegels, Gervinus, though they have helped to form juster views of the several kinds of poetry, &c., have contributed little to the general theory of art. FF. Schlegel's determination of the principle of romantic poetry as the Interesting, in opposi- tion to the objectivity of antique poetry, may be cited as a good example of this group of speculations.

No account of German esthetics can be complete with- out some reference to the attempts recently made by one or two naturalists to determine experimentally the physical conditions and the net sensational element of artistic im- pression. Of these, the most imposing is the development by Helmholtz of a large part of the laws of musical com- position, harmony, tone, modulation, &c., from a simple physical hypothesis as to the complex character of what appear to us as elementary tones. Another interesting experimental inquiry has been instituted by Fechner into the alleged superiority of 'the golden section " as a visible proportion. Zeising, the author of this theory, asserts that the most pleasing division of a line, say in a cross, is the golden section, where the smaller division is to the larger as the latter to the sum. Fechner describes in his

contribution Zur experimentalen disthetik a serics of experiments on a large number of different persons, in which he supposes he eliminated all effects of individual association, and decides in favour of the hypothesis. He, however, assumes that this visible form must please pri- marily, and does not recognise that any constant association growing up in all minds alike would give precisely the same results. Finally, allusion may be made to some ingenious but very forced attempts of Unger and others to discover harmonic and melodious relations among the elementary colours.

Ill. French writers on Aisthetics.—In passing from German Partig} to French writers on sesthetical topics we find, as might be ex- discussions pected, much less of metaphysical assumption and a clearer of the pro. perception of the scientific character of the problem. At the i. game time, the authors are but few, and their works mostly of a fragmentary character. Passing by the Jesuit André, who sought to rehabilitate Augustin's theory of the Beauti- ful, we first light on the name of Batteux. In his Cowrs Batteus, de Belles Lettres(1765) he seeks to determine the aims of art by elucidating the meaning and value of the imitation of nature. He classifies the arts according to the forms of space and time, those of either division being capable of combining among themselves, but not with those of the other. Thus architecture, sculpture, and painting may co-operate in one visible effect; also music, poetry, and the dance. Diderot, again, in the Hncyclopédie, sought to Diderct, define beauty by making it to consist in the perception of relations. In his Hssais sur la Peinture he follows Bat- teux in extolling naturalness, or fidelity to nature. Another very inadequate theory of beauty was propounded by Pére Buffier. He said it is the type of a species which gives Buffer, the measure of beauty.

The only elaborated systems of xsthetics in French The sys. literature are those constructed by the spiritwalistes, that tems of tha is, the philosophic followers of Reid and D, Stewart on spiritual: the one hand, and the German idealists on the other, who a constituted a reaction against the crude sensationalism of the 18th century. They aim at elucidating what they call the higher and spiritual element in sesthctic impressions, and wholly ignore any capability in material substance or external sensation of affording the peculiar delights of beauty. The lectures of Cousin, entitled Du Vrai, du Beau, et du Bien, the Cours d'Esthétique of Jouffroy, and the

systematic treatise of Lévéque, La Science du Beau, are the principal works of this school. The last, as the most Léyéque. elaborate, will afford the student the best insight into this mode of speculation. The system of Lévéque falls into four parts—(1.) The psychological observation and classifi- cation of the effects of the Beautiful on human intelligence and sensibility; (2.) The metaphysic of beauty, which determines whether it has a real objective existence, and if so, what is the internal principle or substance of this objective entity; and further seeks to adjust the relations of the Beautiful, the Sublime, the Ugly, and the Ridiculous in relation to this principle; (3.) The application of these psychological and metaphysical principles to the beauty of nature, animate and inanimate, and to that of the Deity;

(4.) Their application to the arts. The influence of the

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Germans in this mode of systematising is apparent. All the characters of beauty in external objects, as a flower, of which the principal are size, unity and variety of parts,

beauty. His views are highly metaphysical and Platonic The intui- in character. The Beautiful and the Good are combined in tivists. one ideal conception, much as with Plato. Matter in itself eoeiige is ugly. The order of the world, wherein all beauty really UBM

intensity of colour, grace or flexibility, and correspondence to environment, may be summed up as the ideal grandeur and order of the species. These are perceived by reason to be the manifestations of an invisible vital force. Simi- larly the beauties of inorganic nature are translatable as the grand and orderly displays of an immaterial physical force. Thus all beauty is in its objective essence either spirit or unconscious force acting with fulness and in order. It is curious that Lévéque in this way modifies the strictly spiritual theory of beauty by the admission of an unconscious physical force, equally with spirit or mind, as an objective substratum of the

Beautiful. He seeks, however, to assimilate this as nearly as possible to cou- scious energy, a8 immaterial and indivisible. The aim of art is to reproduce this beauty of nature in a beautiful manner, and the individual arts may be classified according to the degree of beautiful force or spirit expressed, and the degree of power with which this is interpreted. Accord- ingly, they are arranged by Lévéque in the same order as by Hegel.

IV. Ltalian and Dutch Writers.—There are a few writers on esthetic subjects to be found in Italian and Dutch literature, but they have little of original speculation. The Italian, as Pagano and Muratori, follow French and English writers. One Dutch writer, Franz Hemsterhuis (18th century), is worth naming. His philosophic views are an attempt at reconciliation between the sensational and the intuitive systems of knowledge. The only faculty of true knowledge is an internal sense, nevertheless all true knowledge comes through the senscs. The soul, desiring immediate and complete knowledge, and being limited by its union with the senses, which are incapable of perfectly simultaneous action, strives to gain the greatcst number of the clements of cognition or ideas in the shortest pos- sible time. In proportion as this effort is successful, the knowledge is attended with enjoyment. The highest measure of this delight is given by beauty, wherefore it may be defined as that which affords the largest number of ideas in the shortest time.

V. English Writers—In the esthetic speculations of English writers, we find still less of metaphysical construc- tion and systematisation than in those of French thinkers. Indeed, it may be said that there is nothing answering to the German conception of ssthetic in our literature. The inquiries of English and Scotch thinkers have been directed for the most part to very definite and strictly scientific pro- blems, such as the psychological processes in the perception of the Beautiful. The more moderate metaphysical impulses of our countrymen have never reached beyond the bare asser- tion of an objective and independent beauty. Hence we find that the German historians regard these special and limited discussions as so many empirical reflections, wholly devoid of the rational element in true philosophy. Schasler speaks of these essays as "empiristic esthetics," tending in one direction to raw materialism, in the other, by want of method, never lifting itself above the plane of "an zsthe- ticising dilettanteism."

English writers are easily divisible into two groups—(1.) Those who lean to the conception of a primitive objective beauty, not resolvable into any simpler ingredients of sensation or simple emotion, which is perceived intuitively cither by reason or by some special faculty, an internal sense; (2.) Those who, tracing the genesis of beauty to the union of simple impressions, have been chiefly concerned with a psychological discussion of the origin and growth of our esthetic perceptions and emotions.

Lord Shaftesbury is the first of the intuitive writers on

resides, is a spiritual principle, all motion and life being the product of spirit. The principle of beauty is perceived not with the outer senses, but with an internal—that is, the moral—sense (which perceives the Good as well). This perception affords the only true delight, namely, spiritual enjoyment. Shaftesbury distinguishes three grades of the Beautiful, namely, (1.) Inanimate objects, including works of art; (2.) Living forms, which reveal the spiritual forma- tive force; and (3.) The source from which these forms spring, God. r

In his Inquiry into the Original of our Ideas of Beauty Hutcheson.

and Virtue, Hutcheson follows many of Shaftesbury's ideas. Yet he distinctly disclaims any independent self-existing beauty in objects apart from percipient minds. "All beauty," he says, "is relative to the seuse of some mind perceiving it." The cause of beauty is not any simple sensation from an object, as colour, tone, but a certain order among the parts, or "uniformity amidst variety." The faculty by which this principle is known is an internal sense which is defined as "a passive power of receiving ideas of beauty from all objects in which there is uniformity in variety." Thus Hutcheson seems to have supposed that beauty, though always residing in uniformity in variety as its form, was still something distinct from this, and so in need of a peculiar sense distinct from reason for the appreciation of it. But his meaning on this point is not clear. This faculty is called a sense, because it resembles the external senses in the immediateness of the pleasure it experiences. The perception of beauty, and the delight attending it, are quite as independent of considerations of principles, causes, or usefulness in the object, as the plea- surable sensation of a sweet taste. Further, the effect of a beautiful object is like the impression of our senses

in its necessity; a beautiful thing being always, whether we will or no, beautiful. In the second placc, this sense is called internal, because the appreciation of beauty is clearly dis- tinct from the ordinary sensibility of the eye and ear, whether emotional or intellectual and discriminative, many persons who posscss the latter intact being totally destitute of the former. Another reason is, that in some affairs which have little to do with the external senses, beauty is perceived, as in theorems, universal truths, and general causes. Hutcheson discusses two kinds of beauty—abso- lute or original, and relative or coniparative. The former is independent of all comparison of the beautiful object with another object of which it may be an imitation. The latter is perceived in an object considered as an imitation or resemblance of something else. He distinctly states that "an exact imitation may still be beautiful though the original were entirely devoid of it;' but, curiously enough, will uot allow that this proves his previous definition of beauty as "uniformity amidst variety" to be too narrow. He secnis to conceive that the original sense of beauty may be "varied and overbalanced" with the secondary and subor- dinate kind, Hutcheson spends a good deal of time in proving the universality of this sense of beauty, by show- ing that all men, in proportion to the enlargement of their intellectual capacity, are more delighted with uniformity than the contrary. He argues against the supposition that custom and education are sources of our perception of beauty, though he admits that they may enlarge the capa- city of our minds to retain and compare, and so may add to the delight of beauty.

The next writer of conscquence on the intuitive side is Reid.

Reid. In the eighth of his Essays on the Intellectual Powers he discusses the faculty of taste. He held, on the

Sir W. Hamilton.

Ruskin.

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ground of conimon sense, that beauty inust exist in objects independently of our minds. As to the nature of the Beautiful, he taught that all beauty

resides primarily in the faculties of the mind, intellectual and moral. The beauty which is spread over the face of visible nature is an emana- tion from this spiritual beauty, and is beautiful because it symbolises and expresses it. Thus the beauty of a plant resides in its perfection for its cnd, as an expression of the wisdom of its Creator. Reid's theory of beauty is thus purely spiritual.

The celebrated Lectures on Metaphysics of Sir W. Hamilton do not, unfortunately, contain more than a slight prelimin- ary sketch of the writer's theory of the emotional activities. He defines pleasure, following very closely the theory of Aristotle, as "a reflex of the spontaneous and unimpeded exertion of a power of whose energy we arc conscious" (vol. ii. p. 440). And, in perfect agreement with this con- ception, he divides the various feelings according to the faculties or powers, bodily or mental, of which they are the concomitants. In the scheme thus faintly shadowed forth, the sentiments of Taste are regarded as subserving both the subsidiary and the elaborative faculties in cognition, in other words, the Imagination and the Understanding. The

activity of the former corresponds to the element of variety

in the beautiful object, while that of the latter is concerned with its unity. A beautiful thing is accordingly defined "ag one whose form occupies the Imagination and Under- standing in a free and full, and, consequently, in an agree- able activity" (p. 512). In this way, the writer conceives, he comprehends all pre-existing definitions of beauty. He explicitly excludes all other varieties of pleasure, such as the sensuous, from the proper gratification of beauty. The sesthetic sentiment is thus regarded as unique and not resolvable into simpler feelings. Similarly, he denies any proper attribute of beauty to fitness. The essence of the sentiment of sublimity he finds, much in the same way as Kant, in a mingled pleasure and pain; "of pleasure in the consciousness of the strong energy, of pain in the conscious- ness that this energy is vain." He recognises three forms of Sublimity: those of Extension or space, of Protension or time, and of Intension or power. Finally, he thinks that the Picturesque differs fron the Beautiful iu appealing simply to the imagination. A picturesque object is one whose parts are so

palpably unconnected that the under- standing is not stimulated to the perception of unity.

A very like interpretation of beauty, as spiritual and typical of divine attributes, has been given by Mr Ruskin in the second volume of his Modern Painters. This part of his work, bearing the title " Of Ideas of Beauty," has a very systematic appearance, but is in fact a singularly desultory series of westhetic ideas put into a very charming language, and coloured by strong emotion. Mr Ruskin distinguishes between the theoretic faculty concerned in the moral per- ception and appreciation of ideas of beauty and the imaginative or artistic faculty, which is employed in re- garding in a certain way and combining the ideas received from external nature. The former, he thinks, is wrongly named the csthetie faculty, as though it were a mere operation of sense. The object of the faculty is beauty, which Mr Ruskin divides into typical and vital beauty. The former is the external quality of bodies that typifies somedivine attribute. The latter consists in "the appearance of felicitous fulfilment of function in living things." The forms of typical beauty are—(1.) Infinity, the type of the divine incomprehensibility; (2.) Unity, the type of the divine comprehensiveness ; (3.) Repose, the type of the divine permanence; (4.) Symmetry, the type of the divine

justice; (5.) Purity, the type of the divine energy; and (6.) Moderation, the type of government by law. Vital beauty, again, is regarded as relative when the degree of

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exaltation of the function is estimated, or generic if only the degree of conformity of an individual to the appointed functions of the species is taken into account. Mr Ruskin's wide knowledge and fine esthetic perccption make his works replete with valuable suggestions, though he appears wanting in scientific accuracy, and lacks, as Mr Mill has pointed out, all appreciation of the explanatory power of association with respect to the ideal elements of typical beauty.

Of the more analytic writcrs on the effects of the Beautiful, The analy. Addison deserves a passing mention, less, however, for the tical theor.

scientific precision of his definitions, than for the charm ists, of his style. His Essays on the Imagination, contri- Aaeion. buted to the Spectator, are admirable specimens of popular sesthctic reflection. Addison means by the pleasures of im- agination those which arise originally from sight, and he divides them into two classes—(1.) Primary pleasures, which entirely proceed from objects before our eyes; and (2.) Secondary pleasures, flowing from ideas of visible objects.

The original sources of pleasure in visible objccts are great- ness, novelty, and beauty. This, it may be said, is a valu- able distinction, as pointing to the plurality of sources in ~ the «esthetic impression, but the threefold division is only a very rough tentative, and destitute of all logical value, novelty of impression being always a condition of beauty. The secondary pleasures, he rightly remarks, are rendered far more extended than the original by the addition of the proper enjoyment of resemblance, which is at the basis of all mimicry and wit. Addison recognises, too, the effects of association in the suggestion of whole scenes, and their accompaniments by some single circumstance. He has some curious hiuts as to the physiological seat of these mental processes, and seeks, somewhat naively, to connect these pleasures with teleological considerations.

In the Elements of Criticism of Lord Kaimes, another Lord

attempt is made to affiliate esthetic phenomena to simpler Kaimes. pleasures of experience. Beauty and ugliness are simply the pleasant and the unpleasant in the higher senses of sight and hearing. By "higher" he means more intel- lectual, and he conceives these two senses to be placed midway between the lower senses and the understanding. He appears to admit no more general feature in beautiful objects than this pleasurable quality. Like Hutcheson, he divides beauty into intrinsic and relative, but understands by the latter ideas of fitness and utility, which were excluded from the Beautiful by Hutcheson. He illustrates the English tendency to connect meutal processes with physiological conditions, by referring the main elements of the feeling of sublimity to the effect of height in objects in compelling the spectator to stand on tiptoe, by which the chest is expanded and muscular movements produced which give rise to the peculiar emotion.

Passing by the name of Sir Joshua Reynolds, whose Hogarth. theory of beauty closely resembles that of Pere Buffier, we come to the speculations of another artist and painter, Hogarth. He discusses in his Analysis of Beauty all the elements of visible beauty, both form and colour, often manifesting great speculative skill, and always showing a wide and accurate knowledge of art. He finds altogether six elements in beauty, namely—(1.) Fitness of the parts to some design, as of the limbs for support and movement ; (2.) Variety in as many ways as possible, thus in form, length, and direction of line, shape, and magnitude of figure, &c.; (3.) Uniformity, regularity, or syinmetry, which is only beautiful when it helps to preserve the character of fitness; (4.) Simplicity or distinctness, which gives pleasure not in itself, but through its enabling the eye to enjoy variety with ease; (5.) Intricacy, which provides employment for our active energies, ever eager for pursuit,

and leads the eye "a wanton kind of chase"; (6.) Quantity

or magnitude, which draws our attention, and produees acniration and awe. The beauty of proportion he very acutely resolves into the needs of fitness. Hogarth applies these prineiples to the determination of degrees of beauty in lines, and figures, and compositions of forms. Among lines he singles out for speeial honour the serpentine (formed by drawing a line once round from the base to the apex of a long slender eone) as the line of grace or beauty par excellence. Its superiority he places in its many varieties of direction or eurvature, though he adds that more suddenly eurving lines displease by their grossness, while straighter lines appear lean and poor. In this last remark Hogarth tacitly allows another principle in graceful line, namely, gentleness, as opposed to suddenness, of ehange in direction, though he does not give it distinct recognition in his theory, as Burke did. Hogarth's opinions are of great value as a set off against the extreme views of Alison and the association school, sinee he distinctly attributes a great part of the effects of beauty in form, as in eolour, to the satisfaction of primitive susceptibilities of the mind, though he had not the requisite psychological knowledge to reduce them to their simplest expression. In his remarks on intricacy he shows clearly enough that he

understood the pleasures of movement to be involved in all visual perception of form.

Burke's speculations on the Beautiful, in his Philosophical Inquiry into the Origin of our Ideas of the Sublime and Beautiful, are curious as introducing physiological con- siderations into the explanation of the feelings of beauty. They illustrate, moreover, the tendeney of English writers to treat the problem as a psychological one. He finds the elements of beauty to be—(1.) Smallness of size;. (2.) Smoothness of surface; (3.) Gradual variation of direction of outline, by which he means gentle curves; (4.) Delicacy, or the appearance of fragility; (5.) Brightness, purity, and softness of colour. The Sublime he resolves, not very carefully, into astonishment, which he thinks always con- tains an element of terror. Thus "infinity has a ten- deney to fill the mind with a delightful horror." Burke seeks what he calls " efficient causes" for these phenomena in certain affections of the nerves of sight, which he comn- pares with the operations of taste, smell, and touch, Terror produces "an unnatural tension and certain violent emotions of the nerves," hence any objects of sight whieh pro- duce this tension awaken the feeling of the Sublime, which isa kind of terror. Beautiful objects affect the nerves of sight just as smooth surfaces the nerves of touch, sweet tastes and odours the corresponding nerve fibres, namely, by relaxing them, and so producing a soothing effeet on the mind. The arbitrariness and narrowness of this theory, looked at as a complete explanation of beauty, cannot well escape the reader's attention.

Alison, in his well-known Essays on the Nature and Principles of Tuste, proceeds on an exactly opposite method to that of Hogarth and Burke. He considers aud seeks to analyse the mental process which goes on when we experience the emotion of beauty or sublimity. He finds that this consists in a peculiar operation of the imagination, namely, the flow of a train of ideas through the mind, which ideas are not arbitrarily determined, but always correspond to some simple affection or emotion (as eheerfulness, sadness, awe), awakened by the object. He thus makes association the sole source of the Beautiful, and denies any such attribute to the simple impressions of the Senses. His exposition, whieh is very extensive, contains many ingenious and valuable contributions to the ideal or assoeiation side of esthetic effects, both of nature and of art; but his total exelusion of delight (hy which

name lhe dis- tinguishes zsthetic pleasure) from the immediate effects of colour, visible form, and tone, makes his theory appear very

ineomplete. This is especially applicable to music, where the delight of mere sensation is perhaps most conspicuous, He fails, too, to see that in the emotional harmony of the ideas, which, according to his view, make up an impression of beauty, there is a distinct source of pleasure over and above that supplied by the simple feeling and by the ideas themselves.

Jefirey's Lssay on Beauty is little more than a modifica- Jefiey.

tion of Alison's views. He defines the sense of beanty as consisting in the suggestion of agreeable and interesting sensations previously experienced by means of our various pleasurable sensibilities. He thus retains the necessity of ideal suggestion, but at the same time discards the sup- posed requirement of a train of ideas. Jeffrey distinctly saw that this theory excludes the hypothesis of an inde- pendent beauty inherent in objects. He fails as completely as Alison to disprove the existence of a sensuous or organic beautiful, and, like him, is avowedly concerned to show the presence of some one, and only one, determining prin- ciple in all forms of the Beautiful.

D. Stewart's chief merit in the esthetic discussions, con- Dugald tained in his Philosophical Essays, consists in pointing out Stewart.

this unwarranted assumption of some single quality (other than that of producing a certain refined pleasure) running through all beautiful objects, and constituting the essence of beauty. He shows very ingeniously how the successive transitions and generalisations in the meaning of the term beauty may have arisen. He thinks it must originally have connoted the pleasure of colour, which he recognises as primitive. His criticisms on the one-sided schemes of other writers, as Burke and Alison, are very able, though he himself hardly attempts any complete theory of beauty. His eonception of the Sublime, suggested by the etymology of the word, renders prominent the element of height in objects, whieh he coneeives as an upward direction of motion, and which operates on the mind as au exhibition of power, namely, triumph over gravity.

Of the association psyehologists James Mill did little Professor more towards the analysis of the sentiments of beauty than Baiu. ‘re-state Alison’s doctrine.

On the other hand, Professor Bain, in his treatise Zhe Hmotions and the Will, carries this examination considerably further. He asserts with Stewart that no one generalisation will comprehend all varieties of beautiful objects. He thinks, however, that the wsthetic emotions, those involved in the fine arts, may be roughly circumseribed and marked off from other modes of enjoyment by means of three eharacteristics—(1.) Their not serving to keep up existence, but being gratifications sought for themselves only; (2.) Their purity from all repulsive ingredients; (3.) Their eminently sympathetic or sharable nature in contrast to the exelusive pleasures of the individual in eating, &c. The pleasures of art are divided, according to Mr Bain’s general plan of the mind, into (1.) The elements of sensation—sights and sounds; (2.) The extension of these by intellectual revival—ideal sug- gestions of muscular impression, touch, odour, and other pleasurable sensations; (3.) The revival, in ideal form also, of pleasurable emotions, as tenderness and power, and in a softened measure of emotions painful in reality, as fear; (4.) The immediate gratification, that is in actual form, of certain wide emotional susceptibilities reaching beyond art, namely, the elating effect of all change of impression under the forms of artistic eontrast and variety; and, secondly, the peculiar delight springing from harmony among im- pressions and feclings, under its several sxsthetic aspects, . musical harmony and melody, proportion, &c. The details in Mr Bain’s exposition are rich and varied in relation to the psychology of the subject. He finds the effect of sublimity in the manifestation of superior power in its highest degrees, which manifestation excites a sympathetic

elation in the beholder. The Ludicrous, again, is defined by Mr Bain, improving on Aristotle and Hobbes, as the degradation of something possessing dignity in circum- stances that excite no other strong emotion. The pleasure accompanying the impression may be referred either to the elation of a sense of power or superiority ideally or sym- pathetically

excited, or to a sense of freedom from restraint, both of which have in common the clement of a joyous rebound from pressure. 'Thus it will be seen that Professor Bain recognises no new mental principle in wsthetic effects, but regards them as peculiar combinations and transforma- tions, according to known psychological laws, of other and simpler feelings.

An interesting turn has been given to the psychology of sesthetics by Mr Herbert Spencer. In some of his essays, as the one entitled "The Origin and Function of Music," and more fully in the concluding chapter of his Psychology (second edition), on the Esthetic Sentiments, he offers a new theory of the genesis of the pleasures of beauty and art, based on his doctrine of evolution, He takes up Schiller's idea of the connection between esthetic activity and play, only he deals with this latter not as an ideal tendency, but as a phenomenal reality, seeking to make it the actual starting-point in the order of evolution of sesthetic action. Play or sport is defined as the superfluous and useless exercise of faculties that have been quiescent for a time, and have in this way become so ready to dis- charge as to relieve themselves by simulated actions. Asthetic activities yield to the higher powers of percep- tion and emotion the substituted exercise which play yields to the lower impulses, agrecing with play in not directly subserving any processes conducive to life, but being gratifications sought for themselves only. This point of affinity between the two classes of pleasures is a valuable addition to «esthetic theory, and helps one to understand how the artistic impulse first arose. At the same time it is doubtful how far all present esthetic pleasures, as the passive enjoyments of colour and tone, can be interpreted as substituted activities in Mr Spencer's sense. They scem rather to be original and instinctive modes of gratification not dependent on any previous exer- cises of life-function, except so far as the structure and functions of the senses as a whole may be viewed as the product of multitudinous life-processes in animal evolu- tion. Mr Spencer, moreover, forms a hierarchy of zsthetic pleasures, the standard of height being either the number of powers duly exercised, or what comes to the same thing, the degree of complexity of the emotional faculty thus exercised. The first, and lowest class of pleasures, are those of simple sensation, as tone and colour, which are partly organic and partly the results of association. The second class are the pleasures of perception, as em- ployed upon the combination of colours, &ce. The highest order of pleasures are

those of the zsthctic sentiments proper, consisting of the multitudinous emotions ideally excited by zsthetic objects, natural and artistic. Among these vaguely and partially revived emotions Mr Spencer reckons not only those of the individual, but also many of the constant feelings of the race. Thus he would attri- bute the vagueness and apparent depth of musical emotion to associations with vocal tones, built up during the course of vast ages. This graduated scheme is evidently dictated by the assumption that the higher the stage of evolution, the higher the pleasure. Yet Mr Spencer adinits that this measure of esthetic value will not suffice alone, and he adds, that the most perfect form of esthetic gratification is realised when sensation, perception, and emotion, are present in fullest and most pleasurable action. Mr Spen- cer's supposition, that much of the pleasure of esthetic emotion is refcrrible to transmitted experience, offers a

very ingenious, even if not very definite, mode of explain- ing many of the mysterious effects of tone, and even of colour.

Among works on the history of esthetic doctrines, the student may be referred to the following :—

In German literature, which contains the most complete histories, Max Schasler's Kritische Geschichte der Aisthettk, forming the first two volumes of an esthetic system, is the fullest. Still he hardly does justice to English writers, there being no mention of Alison and recent thinkers. His stand-point is only definable as a new modification of Hegelianism. Zimmermann's Geschichte der Aisthetik is also to be recommended. Lotze's Gesehichte der isthetik Deutsch- land isa highly eritieal réswmé of German systems, characterised by a good deal of caution, and a desire to mediate between opposing views, and if not very definite in its result, very appreciative and suggestive of the many-sidedness of the subject. In French, Lévéque's work, La Science dw Beau, contains a very falr account of the most conspicuous systems, ancient and modern. In our own literature, numerous references to other systems are to be found in the essays of Alison ; and Jeffrey attempts a brief historical survey of the doctrines of beauty in his article on the subject. Dugald Stewart's essays mostly fall into eritical examination of the chicf theories of beauty. Finally, Professor Bain, in his

Compendiwm of Mental and Moral Science, supplies a brief but careful account of most of the known theories of the Beautiful. (J. 8.)

AETION, a painter, whose famous picture of the mar- riage of Roxana and Alexander was exhibited at the Olympic games, and gained Aétion so much reputation that the president of the games gave him his daughter in marriage. The picture is minutely described by Lucian. Aétion appears from that author to have flourished in the times of Hadrian and the Antonines.

AETIUS, a Roman general of the closing period of the western empire, born at Dorostolus in Meesia, late in the 4th century. While detained for some time as a hostage in the camp of Rhuas, king of the Huns, he acquired an influence with the barbarians that was afterwards of much advantage to himself, though the same cannot be said of it as 'regards the empire. He led into Italy an army of 60,000 Huns, which he employed first to support the usurp- ing Emperor John, and, on the death of the latter, to enforce his claim to the supreme command of the army in Gaul upon Placidia, the empress-mother and regent for Valen- tinian III. Afterwards, when he incurred the disfavour of Placidia for the death of his rival Boniface, he again employed an army of Huns to compel her to reinstate him in his former position. In Gaul he won his military repu- tation, upholding for nearly twenty years, by combined policy and daring, the falling fortunes of the western empire. His greatest victory was that of Chalons-sur-Marne (20th Sept. 451), in which he utterly routed Attila and the Huns—the number slain on both sides being, according to one computation, 300,000, though this is obviously an exaggeration, This was the last triumph of the empire. Three years later (454) Aétius presented himself at court to claim the emperor's daughter in marriage for his son Gaudentius; but Valentinian, suspecting him of designs upon the crown, slew him with his own hand.

AETIUS, surnamed "the Atheist," founder of an ex- treme sect of the Arians, was a native of Ccele-Syria. After working for some time as a coppersmith, he became a travelling doctor, and displayed great skill in disputatious on medical subjects; but his controversial power soou. found a wider field for its exercise in the great theological question of the time. He studied successively under the Arians, Paulinus, bishop of Antioch,

Athanasius, bishop of Anazarbus, and the presbyter Antonius of Tarsus. In 350 he was ordained a deacon by Leontius of Antioch, but was shortly afterwards forced by the orthodox party to leave that town. At the first synod of Sirmium, he won 4 dialectic victory over the homoiousian bishops Basilius and Eustathius, who sought in consequence to stir up against him the enmity of Czsar Gallus. In 356 he went

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Alexandria with Eunomius in order to advocate Arianism, but he was banished by Constantius. Julian the apostate recalled him from exile, bestowed upon him an estate in Lesbos, and retaiued him for a time at his court in Con- stantinople. Being consecrated a bishop, he used his office in the interests of Arianisin by creating other bishops of that party. At the accession of Valens (364) he retired to his estate at Lesbos, but soon returned to Constantinople, where he died in 367. The Anomeean sect of the Arians, of whom he was the leader, are sometimes called after him Aétians. His work De Jide has been preserved in connec- tion with a refutation written by Epiphanius.

AETIUS, a Greek physician, born at Amida in Meso- potamia, who lived at the end of the 5th or the beginning of the 6th century. Of his personal history little is known, except that he studied at Alexandria, and was physician to the court at Coustantinople with the title comes obsequit. He wrote a work entitled BuBAla larpuxa "Exxaidexa, which is mainly a compilation from the works of previous authors. Hight books of this were issued from the Aldine press at Venice in 1534; various other parts have beeu frequently published ; and a Latin translation of the whole, by Cor- narius, appeared at Basle in 1542.

ZETNA. See Erna.

AETOLIA, a country of ancient Greece, bounded on the N. by Epirus and Thessaly, on the E. by the provinces of Doris and Locris, on the S. by the Gulf of Corinth, and separated on the W. from Acarnania by the river Achelous. The part which lay westward of the river Evenus, and south of a line joining Thermum and Stratus in Acar- nania, was called old Attolia, the rest of the country new or acquired Aftolia. The country is in general

mountainous and woody, but along the coast from the Achelous to the Evenus, and northward to Mount Aracynthus, is a plain of great fertility; while another extensive and fertile plain stretches north from this mountain along the east bank of the Achelous as far as the northern limit of old Atolia. The Aitolians were a restless and turbulent people, Strangers to friendship or principles of honour, aud they were cousequently regarded by the other states of Greece as outlaws and public robbers. On the other hand, they were bold and enterprising in war, undaunted in the greatest dangers, and jealous defenders of their liberties, They distinguished themselves above all the other nations of Greece in opposing the ambitious designs of the Mace- donian princes, who, after having reduced most of the other states, were forced to grant them a peace upon very honourable terms. The constitution of the A®tolian league was copied from that of the Achawans, and with a view to form, as it were, a counter alliance. The Cleomenic war, and that of the allies, called the Social War, were kindled by the tolians with the express purpose of humbling the Achzans. In the latter they held out, with the assistance only of the Eleans and Lacedemonians, for the space of three years, against the united forces of Achaia and Macedon, but were obliged at last to purchase a peace by yielding up to Philip all Acarnania. In order to regain this province they entered into an alliance with Rome against Philip, and proved of great service to the Romans in their war with him; but being dissatisfied with the terms of peace granted by Flaminius, they made war upon the Romans themselves. They were speedily over- come, and only obtained peace ou very humiliating terms. After the conquest of Macedon by Aumilius Paullus the AKtolians were reduced to a much worse condition; for not only those among them who had openly declared for Perseus, but those who were only suspected to have secretly favoured him, were sent to Rome to clear themselves before the senate. There they were detained, and never afterwards permitted to return to their native country.

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Five hundred aud fifty of the chief men were barbarously assassinated by the partisans of Rome solely on the sus- picion of favouring the designs of Perseus. The Atolians appeared before Aimilius Paullus in mourning habits, and made loud complaints of such inhuman treatment, but could obtain no

redress; on the contrary, ten commis- sioners, who had been sent by the senate to settle the affairs of Greece, enacted a decree, declariug that those who were killed had suffered justly, since it appeared to them that they had favoured the Macedonian party. From this time those only were raised to the chief honours and employments in the Aitolian republic who were known to prefer the interest of Rome to that of their country, and thus all the magistrates of A®tolia became the creatures and mere tools of the Roman senate. In this state of servile subjection they continued till the destruction of Corinth and the dissolution of the Achwan league, when 4Etolia, with the other free states of Greece, was reduced to a Roman province, commonly called the province of Achaia, In this state, with little alteration, Atolia continued under the emperors till the reign of Constantine the Great, who, in his new partition of the provinces of the empire, divided the western parts of Greece from the rest, calling them New Lpirus, aud subjecting the whole country to the preefectus pretorio for Ilyricum. Under the succes- sors of Constantine Greece was parcelled out into several principalities, especially after the taking of Constantinople by the western princes. About the beginning of the 13th century Theodorus Angelus, a uoble Grecian of the im- perial family, seized on AXtolia and Epirus. The former he left to Michael his son, who maintained it against Michael Paleologus, the first emperor of the Greeks, after the expulsion of the Latins. Charles, the last prince of this family, dying in 1430 without lawful issue, bequeathed AMtolia to his brother's son, named also Charles; and Acarnania to his natural sons Memuon, Turnus, and Her- cules. But great disputes arising about this division, Amurath II., after the reduction of Thessalonica, laid hold of so favourable an opportunity, and expelled all the cou- tending heirs in 1432, The Mahometans were after- wards dispossessed of this country by the famous prince of Epirus, George Castriot, commonly called Scanderbeg, who with a small army opposed the whole power of the Ottoman empire, and was victorious in twenty-two pitched battles. That hero at his death left great part of Aitolia to the Venetians; but they not being able to make head against such a mighty power, the whole country was soon reduced by Mahommed IT. It is now included in the kingdom of Greece.

AFANASIEF, Atexsanpr NikoLaEvicu, a Russian scholar, distinguished for his researches in Slavonic litera- ture and archzology, was born about

1825. He contri- buted many valuable articles to the serial literature of his country, but his reputation rests chiefly on two works of more permanent interest. The first was au extensive collection, in eight parts, of Russian Popular Stories ; the other a treatise, in three volumes, on the Poetical Views of the Old Slavonians about Nature, completed just before the author's death, which occurred in the autumn of 1871.

AFER, Domrrivs, orator, born at Nismes, flourished under Tiberius and the three succeeding emperors. Quin- tilian makes frequent mention of him, and commends his pleadings. But he disgraced his talents by acting as public accuser in behalf of the emperors against some of the most distinguished personages in Rome. Quintilian, in his youth, assiduously cultivated the friendship of Domitius. He tells us that his pleadings were superior in point of eloquence to any he had ever heard, and that there were public collections of his witty sayings (dicta), some of which he quotes. He also mentions two al of his, Ov

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Witnesses. Domitius crected a statue in honour of Cali- gula, on which there was an inscription to the effect that this prince was a second time consul at the age of 27. This he intended as an encomium; but Caligula regarding it as a sarcasm upon his youth and his infringement of the laws, raised a process against him, and pleaded himself in person. Domitius, instcad of making a defence, repeated part of the emperor's speech with the highest marks of admiration; after which he fell upon his knees, begged pardon, and dcclared that he dreaded Caligula's eloquence more than his imperial power. This piece of flattery succceded so well, that the emperor not only pardoned him, but raised him to the consulship. Afer died in the reign of Nero, a.D. 60.

AFFIDAVIT means a solemn assurance of a matter of fact known to the person who states it, and attested as his statement by some person in authority. Evidence is chiefly taken by means of affidavits in the practice of the Court of Chancery in England. By 3 and 4 Will. TV. c. 42, s. 42, provision is made for appointing commissioners in Scotland and Ireland to

take affidavits. The term is generally applied to a statement certified by a justice of peace or other magistrate. Affidavits are sometimes neces- sary as certificates that certain formalities have been duly and legally performed. They are extensively used in the practice of bankruptcy, and in the administration of the revenue. At onc time thcy were invariably taken on oath, but this practice has been much narrowed. Quakers, Mora- vians, and Separatists have long been privileged in all cases to make a solemn declaration or affirmation ; and now, if any persons called as witnesses, or required or desiring to make an affidavit or deposition, shall refuse or be unwilling from alleged conscientious motives to be sworn, the court or justice may, on being satisfied of the sincerity of such objection, allow such person to make a solemn affirmation or dcclaration—by 17 and 18 Vict. c. 125, s. 20, extended to all counties in England, Ireland, and Scotland by sub- sequent statutes. An Act of 1835 (5 and 6 Will. IV. c. 62) substituted declarations for oaths in certain cases; and this statute is extensively observed. The same Act prohibited justices of peace from administering oaths in any matter in which they had not jurisdiction as Judges, except when an oath was specially authorised by statute, as in the bankrupt law, and excepting criminal inquiries, Parliamen- tary proceedings, and instances where oaths are required to give validity to documents abroad. But justices are per- mitted to take affidavits in any matter by declaration, and a person making a false affidavit in this way is lable to punishment. Affidavits may be made abroad before any British ambassador, envoy, minister, chargé d'affairs, secre- tary of embassy or legation, consul, or consular agent (18 aud 19 Vict. c. 42, s. 1).

AFFINITY, in Zaw, as distinguished from consan- guinity, is applied to the relation which each party toa marriage, the husband and the wife, bears to the kindred of the other. The marriage having made them one person, the blood relations of each are held as related by affinity in the same degree to the one spouse as by consanguinity to the other. But the relation is only with the married parties themselves, and does not bring those in affinity with them in affinity with cach other; so a wife's sister has no affinity to her husband's brother. The subject is chiefly important from the matrimonial prohibitions by which the canon law has restricted relations by affinity. Taking the table of degrees within which marriage is prohibited on account of consanguinity, the rule has been thus extendcd to affinity, so that

wherever relationship to a man himself would be a bar to marriage, relationship to his deceased wife will be the same bar, and vice versa on the husband's decease. This rule has been founded chiefly on interpretations of the

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eightecnth chapter of Leviticus. Formerly by law in Eng. land, marriages within the degrees of affinity were not absolutely null, but they were liable to be annulled by ecclesiastical process during the lives of both parties; in other words, the incapacity was only a canonical, not a civil, disability. By an Act passed in 1835 (5 and 6 Will. LV. c. 54), all marriages of this kind not disputed before the passing of the Act are declared absolutely valid, while all subsequent to it are declared null. in England, and not merely voidable, a marriage with a deceased wife's sister or niece. to Scotland; but it was made quite clear by a leading decision in 1861 (Fenton v. Livingston) that, as "the degrees forbidden in consanguinity are also forbidden in affinity," the marriage of a sister-in-law with a brother-in- law is absolutely null in that country. Nor can a man contract a marriage with his wife's sister so as to be valid in Great Britain, by celebrating his marriage with her in a country where such marriages are lawful (Brook v. Brook,

This renders null

The Act does not extend

9 H. L. Cases, 193).

AFFINITY, Cuemicat, the property or relation in virtue of which dissimilar substances are capable of entering into chemical combination with each other. Substances that are so related combine always in fixed and definite propor- tions; the resulting compound differs from its components in its physical properties, with the exception that its weight is exactly the sum of their weights; and the combination is always accompanied with the evolution of heat. In these respects it differs from.a mere mechanical mixture; in the latter there is contact without combination, and its pro- perties are a mean or average of those of the substances that compose it. That effect may be given to chemical affinity, the substances must be placed

in contact; but mere contact is often insufficient, and combination only takes place on the application of heat, light, electric agency, &c., or through the interposition of some foreign substance. Generally speaking, the affinity is less between substances that closely resemble cach other than between those whose properties are altogether dissimilar. The term elective affinity, now generally disused, has been employed to indi- cate the greater affinity which a substance, when brought into contact with other substances, often has for one in preference to another. Advantage is frequently taken of this greater affinity to decompose compound substances. For a full treatment of chemical affinity and combination, see CHEMISTRY.

AFFIRMATION. See AFFIDAVIT.

AFFRE, Denis Avcusts, Archbishop of Paris, was born at St Rome, in the department of Tarn, on the 27th Sept. 1793. When fourteen years of age, having ex- pressed his desire to enter the church, he became a student at the seminary of St Sulpice, of which his maternal uncle, Denis Boyer, was director. His studies being completed before he had reached the age necessary for ordination, he was occupied for some time as professor of philosophy in the seminary at Nantes. He was ordained a priest in 1818, and held his first charge in connection with the church of St Sulpice. After filling a number of ecclesiastical offices, he was elevated to the Archbishoprie of Paris in 1840. His tenure of this office, though it was marked by great zeal and faithfulness, will be chiefly remembered by its tragic close. During the insurrection of 1848 the arch- bishop was led to believe that by his personal interference peace might be restored between the soldiery and the insurgents. He accordingly applied to General Cavaignac, who warned him of the risk he incurred. " My life," the archbishop answered, "is of little importance." Soon afterwards, the firing having ceased at his request, he appeared on the barricade at the entrance to the Faubourg St Antoine, accompanicd by M. Albert, of the national guard,

bearing a green branch as a sign of peace, and by Sellier, an attached servant. His reception was not very favour- able, and he had spoken only a few words, when the insur- gents, hcaring some shots, and fancying they

were betrayed, opened fire upon the national guard, and the archbishop fell. He was rcmoved to his palace, where he died on the

27th June 1848. Next day the National Assembly issued a decree expressing their great sorrow on account of his death; and the public funeral on the 7th July was one of the most striking spectacles of its kind. The archbishop wrote several treatises of considerable value, including one on Egyptian hieroglyphics.

AFGHANISTAN

HIS is the name applied, originally in Persian, to that mountainous region between N.W. India and Eastern Persia, of which the Afghans are the most nume- rous and the predominant inhabitants. Afghans, under that and other names, have played no small part in Asiatic history. But the present extensive application of the name Afghdnistdn is scarcely older than the shortlived empire founded by Ahmed Khan in the middle of last ceutury. The Afghans themselves are not in the habit of using the term.

In treating of this country we include a part of the Hazara mountain region, but not that part of the Oxus basin which is now under Afghan rule, for which see AFGHAN TURKESTAN.

Afghanistan generally may be regarded as a great quad- rilateral plateau, —using that term in the technical sense of a region whose lowest tracts even are considerably elevated above the sea-level,—extending from about 62° to 70° E. long., and from 30° to 35° N. lat. This territory cor- responds fairly to the aggregate of the ancient provinces of Aria (Herat), Drangiana (Seistan), the region of the Paropamisade (Kabul), and Arachosia (Kandahar), with Gandaritis (Peshiwar and Yazufzai). Though the last territory belongs ethnically to Afghanistan, an important part of it now forms the British district of Peshawar, whilst the remainder acknowledges no master.

The boundaries of Afghanistan can be stated here only roughly; and, from the area thus broadly defined, many portions will have to be deducted as

occupied by indepen- dent or semi-independent tribes. But, so understood, they may be thus stated :—

On the north: beginning from east, the great range of Hindu Kush, a western offshoot of the Himalya, parting the Oxus basin from the Afghan basins of the Kabul river and Helmand. From long. 68° this boundary continues westward in the prolongation of Hindu Kush called Koh-i- Baba. This breaks into several almost parallel branches, enclosing the valleys of the river of Herat and the Murghab or river of Mery. The half-independent Hazara tribes stretch across these branches and down into the Oxus basin, so that it is difficult here to assign a boundary. We assume it to continue along the range called Safed Koh or "White Mountain," which parts the Herat river valley from the Murghab.!

On the east: the eastern base of the spurs of the Suli- mani and other mountains which limit the plains on the west bank of Indus, and the lower valleys opening into these, which plains (the "Derajat") and lower valleys belong to British India. North of Peshdwar district the boundary will be, for a space, the Indus, and then the limit, lying in unknown country, between the Afghan and Dard tribes,

On the south: the eastern part of the boundary, occu- pied by practically independent tribes, Afghan and Biltich, is hard to define, having no marked natural indication. But from the Shal territory (long. 67°), belonging to the Bilfich state of Kenat, westward, the southern limits of 0 EE ee

1 Not to be confounded with the more easterly Safed Koh of the Kabul basin,

the valleys of the Lora river, and then of the Helmand, as far as the Lake of Scistan in lat. 30°, will complete the southern boundary. Thus the whole breadth of Bilfichistan, the ancient Gedrosia, a dry region occupying 5° of lati- tude, intervenes between Afghanistan and the sea.

The western boundary runs from the intersection of the Lake of Seistan with lat. 30°, bending eastward, so as to exclude a part of the plain of Scistan on the eastern bank of the lake, and then crosses the lake to near the meridian of 61°. Thence it runs nearly due north, near this meri- dian, to a point on

the Hari-Riid, or river of Herat, about 70 miles below that city, where it encounters the spurs of the Safed Koh, which has been given as the northern boundary.

But if we take the limits of the entire Afghan dominions, as they at present exist, the western boundary will con- tinuc north along the Hari-Riid to lat. 36°, and the northern boundary will run from this point along the borders of the Turkinan desert, so as to include Andkhoi, to Khoja Saleh ferry on the Oxus. The Oxus, to its source in Great Pamir, forms the rest of the northern boundary. These enlarged limits would embrace the remainder of the Hazara mountain tracts, and the whole of what is now called AFGHAN TURKESTAN, as well as BADAKHSHAN with its dependencies, now tributary to the Afghan Amir.

The extreme dimensions of Afghanistan, as at first defined, will be about 600 milcs from east to west, and 450 miles from north to south; and, if we take the whole Afghan dominion, the extent from north to south will be increased to 600 miles. Within both the areas so defined, however, we have included some territory over which the Afghan government has no control whatever, and much over which its authority is respected only when backed by a special exertion of force. Under the former head come the valleys of the Yusufzai clan north of Peshawar, the Momands, Afridis, Vaziris, &., adjoining that district on the west and south-west, the high-lying valleys of Chitral or Kashk&r, and of the independent Pagans or KAfirs, among the loftier spurs of Hindu Kush. Under the latter head come the eastern districts of Khost and (partially) of Kwrram, the Kakar country in the extreme south-east, much of the country of the tribes called Eim&k and Hazara in the north-west, and probably Badakh- shin with its dependencies.

If we suppose the sea to rise 4000 feet above its existing level, no part of the quadrilateral plateau that we have defined would be covered, except portions of the lower valley of the Kabul river, small tracts towards the Indus, and a triangle, of which the apex should be at the Lake of Seistan in the extreme south-west, and the base should just include Herat and Kandahar, passing beyond those cities to intersect the western and southern boundaries respectively. Isolated points and ridges within this tri- angle would emerge.

Further, let us suppose the sea to rise 7000 feet above its existing level. We should still have a tract emerging so large that a straight line of 200 miles could be drawn, from the Kfshan Pass of Hindu Kush, passing about 35 miles west of Kabul, to Rangak on the road between Ghazni and Kandahar, which nowhere should touch the submerged portion. And we believe it is certain that a line under

like conditions, but 250 miles in length, could be drawn at right angles to the former, passing about 25 miles south of Ghazni. The greater part of this latter line, however, would lie in the Hazara country, in which we have no observations.

'In the triangular tract that would be submerged accord- ing to our first supposition, the lowest level is the Lake of Seistan, 1280 feet above the sea. Herat is 2650; Kan- dahar, 3490.

The Afghans themselves make a broad distinction between Kabul, meaning thereby the whole basin of the Kabul river, and the rest of their country, excluding the former from the large and vague term Kuorasan, under which they con- sider the rest to be comprehended. There is reason for such a distinction in history as well as nature. For the Kabul basin was in old times much more intimately con- nected with India, and to the beginning of the 11th cen- tury was regarded as Indian territory.

Narurat Drvistons.—Of these, this Kabul basin (1) forms the first. As others we may discriminate—(2.) The lofty central part of the table-land on which stand Ghazni and Kala't-i-Ghilzai, embracing the upper valleys of ancient Arachosia ; (3.) The upper Helmand basin ; (4.) The lower Helmand basin, embracing Girishk, Kandahar, and the Afghan portion of Seistan; (5.) The basin of the Herat river; and (6.) The eastern part of the table-land, draining by streams, chiefly occasional torrents, towards the Indus.

Kabul Basin.—Its northern limit is the range of Hindu Kush, a name which properly applies to the lofty, snow- clad crest due north of Kabul, and perhaps especially to one pass and peak. But it has been conveniently extended to the whole line of alpine watershed, stretching west- ward from

the southern end of Pamir, and represents the Caucasus of Alexander's historians. Its peaks throughout probably rise to the region of perpetual snow, and even on most of the passes beds of snow occur at all seasons, and, on some, glaciers. We find no precise height stated for any of its peaks, but the highest probably attain to at least 20,000 or 21,000 feet. The height of the Kushan Pass is estimated by Lord at 15,000 feet.

The Kabul river (the ancient Kophes) is the most im- portant river of Afghanistan. It may be considered as fully formed about 30 miles east of Kabul, by the junction there- abouts (the confluence does not seem to have been fixed by any traveller) of the following streams :—(a.) The Kabul stream, rising in the Unai pass towards the Helmand, which, after passing through the city, has been joined by the Logar river flowing north from the skirts of the Ghilzai plateau ; (b.) A river bringing down from the valleys Ghorband, Parwain, and Panjshir, a large part of the drainage of Hindu Kush, and watering the fruitful plain of Daman-i- Koh (the " Hill-skirt "), intersected by innumerable brooks, and studded with vineyards, gardens, and fortalices. This river was formerly called Bdrdn, a name apparently obsolete, but desirable to maintain ; (c.) The river of Zagao, coming down from the spurs of Hindu Kush on the Kafir borders.

Some 30 miles further east, the Alishang enters on the left bank, from Laghman, above which this river and its confluents drain western Kariristan. Twenty miles fur- ther, and not far beyond Jalalabad, the Kabul river receives from the same side a confluent entitled, as regards length, to count as main stream. In some older maps this bears the name of Kama, from a place near the confluence, and in more recent ones Atiner, from a district on its lower course. Higher it is called the river of Kashkar, and the Beilam. It seems to be the Choaspes, and perhaps the MMalamantus of the ancients. It rises in a small lake near the borders of Pamir, and flows in a south-west direction through the length of Kashkar or Chitral, an independent valley-state, whose soil lies at a height of 6000 to 11,000

feet. the Kabul river cannot be less than 250 miles, 7.¢., about 80 miles longer than that regarded as the main stream, measured to its most remote source.

[NATURAL DIVISIONS.

The whole length of the river to its confluence with

The basin of the Kabul river is enclosed at the head by

the Paghman range, an offshoot of Hindu Kush, which divides the Kabul valleys from the Helmand. Up the head-waters of the stream that passes Kabul, leads the chief road to Turkestan, crossing for a brief space into the Helmand basin by the easy pass of Unai (11,320 feet), and then over the Koh-i-Baba, or western extension of Hindu Kush, by the Hajjigak passes (12,190 and 12,480 feet), to

Bamian.

The most conspicuous southern limit of the Kabul basin

is the Safed Koh, Spin-gar of the Afghans (" White Moun-

tain," not to be confounded with the western Safed Koh already named), an alpine chain, reaching, in its highest summit, Sita Ram, to a height of 15,622 feet, and the eastern ramifications of which extend to the Indus at and

below Attok, Among the spurs of this range are those

formidable passes between Kabul and Jalalabad, in which the disasters of 1841-42 culminated, as well as the famous Khybar passes between Jalalabad and Peshawar. This southern watershed formed by the Safed Koh is so much nearer the Kabul river than that on the north, that the tributaries from this side, though numerous, are indi- vidually insignificant.

After flowing 60 miles (in direct measurement) eastward from the Kuner confluence, the Kabul river issues from the mountains which have hemmed it in, and enters the plain of Peshdwar, receiving, soon after, the combined rivers of Swat (Soastus) and Panjkora (Gurcus), two of the great valleys of the Yusufzai. This combined river is called by the Afghans Landai Sin or Little river, in dis- tinction from the Abba Sin or Indus, and the name seems

often to adhere to the lower course of the Kabul river. Both rivers on entering the plain ramify, in delta fashion, into many natural channels, increased in number by arti- ficial cuts for irrigation. Finally the river enters the Indus immediately above the gorge at Attok.

The lowest ford on the Kabul river is a bad one, near Jalalabad, only passable in the dry season. Below the Kuner confluence the river is deep and copious, crossed by ferries only, except at Naoshera, below Peshawar, where there is usually a bridge of boats. The rapid current is unfavourable to navigation, but from Jalalabad downwards the river can float boats of 50 tons, and is often descended by rafts on blown skins. The whole course of the river, measured by a five-mile opening of the compasses, is as follows :—From source of Kabul stream in Unai pass to Attok, 250 miles ; from source either of Logar or of Panj- shir to the same, 290 miles; from source of Kashkar river to the same, 370 miles.

A marked natural division of the Kabul basin occurs near Gandimak, above Jalalabad, where a sudden descent takes effect from a minimum elevation of 5000 feet to one of only 2000. The Emperor Baber says of this :—‘ The moment you descend, you see quite another world. The timber is different; its grains are of another sort; its animals are of a different species; and the manners and customs of its inhabitants are of a different kind.” Burnes, on his first journey, left the wheat harvest in progress at Jalalabad, and found the crop at Gandamak, only 25 miles distant, but 3 inches above ground. Here, in truth, nature has planted the gates of India. The valleys of the upper basin, though still in the height of summer affected by a sun of fierce power, recall the climate and products of the finest part of temperate Europe ; the region below is a chain of narrow, low, and hot plains, with climate and vegetation of an Indian character.

Accounts of Kabul strike us by apparent contradiction. Some give scarcely any impression but that of extreme ruggedness and desolation, awful defiles, and bare black crags; others dwell on the abounding orchards, green sward, charming dells, and purling streams. But both aspects are characteristic. The higher spurs, both of Hindu Kush and Safed Koh, are often clad with grand forests of pine, oak, and other alpine trees, and

resemble the wooded ranges of Himalya. But the lower hills generally are utterly woodless, and almost entirely naked. In the bot- toms, often watered by clear and copious streams, we have those beauties of verdure and fertility on which some writers dwell, and which derive new charms from contrast with the excessive sterility of the hills that frame them.

We cannot speak at equal length of the other natural divisions of Afghanistan, but some chief points will be noticed with the rivers. In general the remainder of the country, regarded by the Afghans as included in Khorasan, exhibits neither the savage sublimity of the defiles of the Kabul region, the alpine forests of its higher ranges, nor its nests of rich vegetation in the valleys, save in the north-east part adjoining Safed Koh, where these characters still adhere, and in some exceptional localities, such as the valley of Herat, which is matchless in richness of cultiva- tion. Generally the characteristics of this country are elevated plateaux of sandy or gravelly surface, broken by ranges of rocky hills, and often expanding in wide spaces

of arid waste, which terminate to the south-west in a regular

desert of shifting sand. Even in cultivated parts there is a singular absence of trees, and when the crops are not visible this imparts an aspect of great desolation and emptiness to the landscape. Natural wood, however, is found in some parts of West Afghanistan, as in the almost tropical delta of the Helmand, in the Ghiir territory, and on the Herat river below Herat. Generally, indeed, in such cases the trees appear to be mimosas, tamarisks, and the like, with little body of foliage.

Rivers.—Next to the Kabul river in importance, and probably much exceeding it in volume as it certainly does in length, is the Helmand (Htymander), the only considerable river in its latitude from the Tigris to the Indus. The Helmand has its highest sources in the Koh-i-Baba and Paghman hills, between Kabul and Bamian. Its succeed- ing course is through the least known tract of Afghanistan, chiefly occupied by Hazaras ; indeed, for a length of nearly 300 miles no European has seen the river. This unvisited space terminates at Girishk, where the river is crossed by the principal route from Herat to Kandahar. Till about 40 miles above Girishk the character of the Helmand is said to be that of a mountain river, flowing

between scarped rocks, and obstructed by enormous boulders. At that point it enters on a flat country, and extends over a gravelly bed. Here, also, it begins to be used in irrigation. Forty-five miles below Girishk the Helmand receives its greatest tributary, the Arghand-4b, coming past Kandahar from the high Ghilzai country. It here becomes a very considerable river, said to have a width of 300 or 400 yards, and a depth of 9 to 12 feet. But this cannot be at all seasons, as there are fords at long intervals as far down as Pfilalik, 100 miles from the mouth. The desert draws near the left bank in the lower course, and for the last 150 miles the moving sands approach within 1} mile. The vegetation on the banks is here of luxuriant tropical character. The whole of the lower valley seems to have been once the seat of a prosperous population, and there is still a good deal of cultivation for 100 miles below Girishk. Even this, however, is much fallen off, and lower down still more so, owing to disorders and excessive insecurity.

The course of the river is more or less south-west from its source till in Seistan it approaches meridian 62°, when

it turns nearly north, and so flows on for 70 or 80 miles, till it falls into the lake of Seistan by various mouths. The whole length of the river, nieasured as before, is about 615 miles. Ferrier considers that it has water enough for navi- gation at all seasons, from Girishk downwards. At present boats are rarely seen, and those in use are most clumsy ; rafts are employed for crossing.

Arghand-6b.—Of this tributary of the Helmand little is known except in its lower course. It rises in the Hazara county, N.W. of Ghazni. It is said to be shallow, and to run nearly dry in height of summer; but when its depth exceeds 3 feet its great rapidity makes it a serious obstacle to travellers. In its lower course it is much used for irrigation, and the vallcy is cultivated and populous ; yet the water is said to be somewhat brackish. Its course may be reckoned about 235 miles.

It is doubtful whether the ancicnt Arachotus is to be identified with the Arghand-ab or with its chief confluent the Tarnak, which joins it on the left about 30 miles S.W. of Kandahar. The two rivers run nearly parallel, inclosing the backbone of the Ghilzai plateau. The Tarnak is much the shorter (length about 197 miles) and less copious. The ruins at Ulan Robat,

supposed to represent the city Arachosia, are in its basin; and the lake known as Ab-i- Istada, the most probable representative of Lake Arachotus, is ucar the head of the Tarnak, though not communicating with it. The Tarnak is dammed for irrigation at intervals, and in the hot season almost exhausted. There is a good deal of cultivation along the river, but few villages. The high road from Kabul to Kandahar passes this way (another reason for supposing the Tarnak to be Arachotus), and the people live off the road to eschew the onerous duties of hospitality.

The Zora is the most southerly river of Afghanistan, and may be regarded as belonging to the Helmand basin, though it is not known that its waters ever reach that river. It rises near the Kand and Joba peaks in a branch of the Sulimani, and flows nearly cast, pass- ing through the large valley of Pishin, but lying too dcep for irrigation. The river has a course of nearly 200 miles, and con- siderable breadth, but is never for a week together unfordable. In the Shorawak district (long. 65°-66°) a good deal of irrigation is drawn from it. The river is said to terminate in a lake, on the verge of the sandy desert.

Rivers belonging to the basin of Scistan and the Lower Helmand are the Khash-Rud, the Farrah-Rud, and the Harut.

The AKhdsh-rad rises in or near the southern slopes of Siah-Koh (Black Mountain), which forms the southern wall of the valley of Herat, and flows south, in flood reaching the Lake of Scistan, but pauaely, exhausted in irrigation. It is named from Khash, a vil-

age in the Scistan plain. In the dry season it is everywhere fordable, but in floods caravans may be detained by it scveral days.

The Farrah river flows from the same quarter, and has the same eharacter in floods. It isa larger stream, and at Farrah is said to have a width of 150 yards, with 2 fect of watcr, and a clear, swift stream. In flood, Khanikoff was struek with the resemblance of this river, rolling its yellow waves violently between steep banks of clay, to the Cyrus at 'Tiflis.

The Hardt rises in the mountains S.E. of Herat, and has a course of about 245 miles to the Lake of Seistan. Canals from it supply abundant irrigation

to the plains of Sabzvar and Anardarah. The river forms a true delta with fifteen branches, giving rise to marsh and much vegetation, especially tamarisk, willow, and poplar. The Harut receives in the plain a considerable affluent, the Khushkck river.

It is possible that confusion of the name of this river with the Hari-Rud, or river of Herat, led to the long prevalent mistake that the latter river flowed south into the Seistan Lake—a mistake as old as Ptolemy, if his Aria Lacus be (as it seems) that of Seistan.

The Hari-rad is formed by two chief confluents in the lofty Hazara country, not far from the sourees of the river of Balkh. Its early course is, for more than 100 miles and as far as the village of Jaor, westward, at a height of many thousand feet above the sca. It then descends rapidly (it is said with cataracts), but continues in the same direction, receiving numerous streams, to Obeh, where much water begins to be drawn off. Sixty-five miles further it flows past Herat, 3 miles to the south of the city. Hercabouts the Kandahar road crosses the river by a masonry bridge of 26 arches. Near this fiftcen deep canals are drawn off. A few miles below Herat the river begins to turn N.W.; and after passing for many miles through a woody tract, abounding in game, in which are the preserves of the Herat princes, at the ancient and now nearly deserted town of Kassan, 70 miles from Herat, it turns due north. Though the drainage brought down by this river must be large, so much is drawn off that, below Herat, reaches of it are at times quite dry. Below Kassan it receives fresh supplies, and eventually the Meshed stream. It flows on towards Sarakhs, and dwindles away; but accurate information regarding it is still wanting. The channel is shown, in a map lately publishcd, as passing Sarakhs for some 250

miles, and ending in a swamp adjoining the Daman-i-Koh, on the border of the Turkman desert.

Of the rivers that run towards the Indus, south of the Kabul river, the chief are the Kurram and the Gomal.

The Kurram drains the southern flanks of Safed Koh. The middle valley of Kurram, forming the distriet so ealled, is highly irrigated, well peopled, and erowded with small fortified villages, orchards, and groves, to which a fine background is afforded by the dark pine forests and alpine snows of Safed Koh. The beauty and climate of the valley attracted some of the Mogul emperors of Delhi, and the remains exist of a garden of Shah Jahian's. The river passes the British frontier, and enters the plain country a few miles above Banu, spreading into a wide bed of sand and boulders, till it joins the Indus near Isa-Khel, after a course of more than 200 miles. By the Kurram valley is one of the best routes from India into Afgha- nistan, It was travelled by Major Lumsden's party in 1857-58.

he Gomal, rising in the Sulimani mountains, though in length equal to the Kurram, and draining, with its tributaries, a much larger area, is little more than a winter torrent, diminishing to a mere rivulet, till December, when it begins to swell. At its exit into the plain of the Derajat a local chief threw a dam aeross its channel; and it is now only in very wet seasons that its waters reach the Indus, near Dera Ismael Khan. Not long before leaving the hills it receives from the S. W. a tributary, the Zhob, of nearly equal lencth and size, coming from the vicinity of the Kand and Joba peaks, in long. 68°.

Laxes.—As we know nothing of the lake in which the Lora is said to end, and the greater part of the lake of Surstan (see that article) is excluded from Afghanistan, there remains only the Ad-i-Jstada, on the Ghilzai plateau. This is about 65 miles S.S.W. of Ghazni, and stands at a height of about 7000 feet, in a site of most barren and dreary aspect, with no tree or blade of grass, and hardly a habitation in sight. It is about 44 miles in circuit, and very shallow; not more than 12 fect deep in the middle. The chief feeder is the Ghazni river. The Afghans speak of a stream draining the lake, but this seems to be un- founded, and the saltness and bitterness of the lake is against it. Fish entering the salt water from the Ghazni river sicken and die.

Provinces AND Towns.—The chief political divisions of Afghanistan in recent times are stated to be Kabul, Jalalabad, Ghazni, Kandahar, Herat, and Arcuan Tur- KESTAN (q.v.), to which are sometimes added the command of the Ghilzais and of the Hazaras. This list seems to omit the unruly districts of the eastern table-land, such as Kurram, Khost, &c. But

we must not look for the pre- cision of European administration in such a case.

In addition to Kasun, GHazni, KaAnpAnAR, HERAT, described under those articles, there are not many places in Afghanistan to be called towns. We notice the follow- ing :—

Jalalabad lies, at a height of 1946 feet, in a plain on the south of the Kabul river. It is by road 100 miles from Kabul, and 91 from Peshawar. Between it and Peshawar intervene the Khybar and other adjoining passes; between it and Kabul the passes of Jagdalak, Khurd-Kabul, &c. The place has been visited by no known European since Sir G. Pollock's expedition in 1842. As it then existed, the town, though its walls had an extent of 2100 yards, contained ouly 300 houses, and a permanent population of 2000. The walls formed an irregular quadrilateral in a ruinous state, surrounded on all sides by buildings, gardens, the remains of the ancient walls, &c., affording cover to an assailant. The town walls were destroyed by Pollock, but have probably been restored.

The highly-cultivated plain is, according to Wood, 25 miles in length by 3 or 4 miles in breadth; the central part covered with villages, castles, and gardens. It is abund- antly watered.

The province under Jalalabad is about 80 miles in length by 35 in width, and includes the large district of Laghman, north of the Kabul river, as well as that on the south, which is called Nangnihar. The former name, properly

derived by the Mahommedans from the patriarch Lamech whose tomb they profess to show; the latter name is inter. preted (in mixed Pushtu and Arabic) to mean " nine rivers," an etymology supported by the numerous streams. The word is, however, really a distortion of the ancient Indian name Nagarahdra, borne by a city in this plain long before Islam, and believed to have been the Vagara or Dionyso- polis of Ptolemy. Many topes and other Buddhist traces exist in the valley, but there are no unruined

buildings of any moment. Baber laid out fine gardens here; and his grandson (Jalaluddin) Akbar built Jalalabad. Hindus form a considerable part of the town population, and have a large temple. The most notable point in the history of Jalalabad is the stout and famous defence made there, from November 1841 till April 1842, by Sir Robert Sale.

Istélif is a town in the Koh Daman, 20 miles N.N.W. of Kabul, which was stormed and destroyed, 29th Sep- tember 1842, by a force under General M'Caskill, to punish the towns-people for the massacre of the garrison at Charikar, and for harbouring the murderers of Burnes. The place is singularly picturesque and beautiful. The rude houses rise in terrace over terrace on the mountain-side, forming a pyramid, crowned by a shrine embosomed in a fine clump of planes. The dell below, traversed by a clear rapid stream, both sides of which are clothed with vineyards and orcliards, opens out to the great plain of the Daman-i-Koh, rich with trees and cultivation, and dotted with turreted castles; beyond these are rocky ridges, and over all the eternal snows of Hindu Kush, Nearly every householder has his garden with a tower, to which the families repair in the fruit season, closing their houses in the town. The town is estimated, with seven villages depending on it, to contain about 18,000 souls.

Charikdr (population 5000) lies about 20 miles north of Istalif, at the north end of Koh Daman, and watered by a canal from the Ghorband branch of the Baran river. Hereabouts must have been the Z7riodon, or meeting of the three roads from Bactria, spoken of by Strabo and Phny. It is still the seat of the customs levied on trade with Turkestan, and also of the governor of the Kohistan or hill country of Kabul, and is a place of considerable trade with the regions to the north. During the British occupa- tion a political agent (Major Eldred Pottinger, famous in the defence of Herat) was posted here with a Gtirkha corps under Captain Codrington and Lieutenant Haughton. In the revolt of 1841, after severe fighting, they attempted to make their way to Kabul, and a great part was cut off. Pottinger, Haughton (with the loss of an arm), and one sepoy only, reached the city then; though many were after- wards recovered.

Kale't-t-Ghilzai has no town, but is a fortress of some importance on the right bank of the Tarnak, on the road between Ghazni and Kandahar, 89

miles from the latter, and at a height of 5773 fect. The repulse of the Afghans in 1842 by a sepoy garrison under Captain Craigie, was one of the most brilliant feats of that war.

Girishk is also a fort rather than a town, the latter being insignificant. It is important for its position on the high road between Kandahar and Herat, commanding the ordin- ary passage and summer ford of the Helmand. It was held by the British from 1839 till August 1842, but during the latter nine months, amid great difficulties, by a native garrison only, under a gallant Indian soldier, Balwant Singh.

Farrah belongs to the Seistan basin, and stands on the river that bears its name, and on one of the main routes from Herat to Kandahar, 164 miles from the former, 236 miles from the latter. The place is enclosed by a huge earthen rampart, crowned with towers, and surrounded by a wide and deep ditch, which can be flooded, and with a covered

Lamghin, the seat of the ancient Zampage, is absurdly | way. It has the form of a parallelogram, running north

CLIMATE. |

and south, and only two gates. Asa military position it is of great importance, but it is excessively unhealthy. Though the place would easily contain 4500 houses, there were but 60 habitable when Ferrier was there in 1845, nor was there much change for the better when Colonel Pelly passed in 1858. Farrah is a place of great antiquity; certainly, it would seem, the Phra of Isidore of Charax (1st century), and possibly Prophthasia, though this is more probably to be sought in the great ruins of Pcshawaran, farther south, near Lash. According to Ferrier, who alludes to " ancient chronicles and traditions," the city on the present site within the great rampart was sacked by the armies of Chinghiz, and the survivors transported to another position, one hour further north, where there are now many ruins and bricks of immense size (a yard square), with cunciform Ictters, showing that site again to be vastly older than Chinghiz. The population came back to the southern site after the destruction of the medizval city by Shah Abbas, and the city prospered again till its bloody siege by Nadir Shah. Since then, under constant attacks, it has declined, and in 1837 the remaining

population, amounting to 6000, was carried off to Kandahar. Such are the vicissitudes of a city on this unhappy frontier.

Sabzvar, the name of which is a corruption of old Persian, Isphizar, " horse-pastures," is another important strategic point, 93 miles from Herat and 71 miles north of Farrah, in similar decay to the latter. The present fort, which in 1845 contained a small bazar and 100 houses, must once have been the citadel of a large city, now represented by extensive suburbs, partly in ruins. Water is conducted from the Harut by numerous canals, which also protect the approaches.

Zarni is a town in the famous but little known country of Ghur, to the east of Herat, the cradle of a monarchy (the Ghurid dynasty) which supplanted the Ghaznevides, and ruled over an extensive dominion, including all Afghanistan, for several generations. Zarni, according to Ferrier, was the old capital of Ghur. Ruins abound; the town itself is small, and enclosed by a wall in decay. It lies in a pleasant valley, through which fine streams wind, said to abound with trout. The hills around are covered with trees, luxuriantly festooned with vines. The population in 1845 was about 1200, among whom Ferrier noticed (a remarkable circum- stance)someGheber families. The bulk of the peopleare Sims and Taimtinis, apparently both very old Persian tribes.

Ciimatz.—The variety of climate is immense, as might be expected. At Kabul, and over all the northern part of the country to the descent at Gandamak, winter is rigorous, but especially so on the high Arachosian plateau. In Kabul the snow lies for two or three months; the people seldom leave their houses, and sleep close to stoves. At Ghazni the snow has been known to lie long beyond the vernal equinox; the thermometer sinks to 10° and 15° be- low zero (Fahr.) ; and tradition relates the entire destruction of the population of Ghazni by snow-storms more than once.

At Jalalabad the winter and the climate generally assume an Indian character, and the hot weather sometimes brings the fatal simeim. The summer heat is great every- where in Afghanistan, but most of all in the districts bordering on the Indus, especially Sewi, on the lower Helmand, and in Seistan. All over Kandahar province the summer heat is intense, and the simum is not unknown. The hot season throughout the '" Khorasan"

part of the country is rendered more trying by frequent dust-storms and _ fiery winds; whilst the bare rocky ridges that traverse the country, absorbing heat by day and radiating it by night, render the summer nights most oppressive. At Girishk, Ferrier records the thermometer in August to have reached 118°to120° (Fahr.) in the shade. At Kabul the summer sun has much of its Indian power, though the heat is tempered

occasionally by breezes from Hindu Kush, and the nights are usually cool. Baber says that, even in summer, one could not sleep at Kabul without a sheepskin, but this seems exaggerated. At Kandahar snow seldom falls on the plains or lower hills; when it does, it melts at once.

At Herat, though 800 feet lower than Kandahar, the summer climate appears to be more temperate ; and, in fact, the climate altogether is one of the most agreeable in Asia. In July, Ferrier says he found the heat never to pass 98°, and rarely 91° to 93° (Fahr.) These are not low figures, but niust be compared with his register at Girishk, just given. From May to September the wind blows from the N.W. with great violence, and this extends across the country to Kandahar. The winter is tolerably mild; snow melts as it falls, and even on the mountains does not lie long. Three years out of four at Herat it does not freeze hard enough for the people to store ice; yet it was not very far from Herat, and could not have been at a greatly higher level (at Kafir Kala', near Kassan) that, in 1750, Ahmed Shah's army, retreating from Persia, is said to have lost 18,000 men from cold in a single night.

The summer rains that accompany the S.W. monsoon in India, beating along the southern slopes of the Himalya, travel up the Kabul valley, at least to Laghman, though they are more clearly felt in Bajaur and Panjkora, under the high spurs of the Hindu Kush, and in the eastern branches of Safed Koh. Rain also falls at this season at the head of Kurram valley. South of this the Sulimani mountains may be taken as the western limit of the monsoon's action. It is quite unfelt in the rest of Afghan- istan, in which, as in all the west of Asia, the winter rains are the most considerable. The

spring rain, though less copious, is more important to agriculture than the winter rain, unless where the latter falls in the form of snow. Speaking generally, the Afghanistan climate is a dry one. The sun shines with splendour for three-fourths of the year, and the nights are even more beautiful than the days. Marked characteristics are the great differences of summer and winter temperature and of day and night temperature, as well as the extent to which change of climate can be attained by slight change of place. As Baber again says of Kabul, at one day's journey from it you may find a place where snow never falls, and at two hours' journey, a place where snow almost never melts!

The Afghans vaunt the salubrity and charm of some local climates, as of the Tobah hills above the Kakar country, and of some of the high valleys of the Safed Koh.

The people have by no means that immunity from disease which the bright dry character of the climate and the fine physical aspect of a large proportion of them might lead us to expect. Intermittent and remittent fevers are very prevalent: bowel complaints are common, and often fatal in the autumn. The universal custom of sleeping on the house-top in summer promotes rheumatic and neuralgic affections; and in the Koh Daman of Kabul, which the natives regard as having the finest of climates, the mortality from fever and bowel complaint, between July and October, is great; the immoderate use of fruit predisposing to such ailments. Stone is frequent; eye discase is very common, as are hemorrhoidal affections and syphilitic diseases in repul- sive forms. A peculiar skin disease of syphilitic origin prevails at Kandahar, and native physicians there are said by Bellew to admit that hardly one person in twenty is free from the taint in some form.

NaturaL Propvucrions—Minerals.— Afghanistan is believed to be rich in minerals, but few are wrought. Some small quantity of gold is taken from the streams in Lagh- man and the adjoining districts. Famous silver mines were formerly wrought near the head of the Panjshir valley, in Hindu Kush. Iron of excellent quality is pro-

duced in the (independent) territory of Bajaur, north-west of Peshawar, from magnetic iron sand, and is exported. Kabul is chiefly supplied from the Permdli (or Farmtili) district, between the Upper Kurram and Gomal, where it is said to be abundant. Iron ore is most abundant near the passes leading to Bamian, and in other parts of Hindu Kush. Copper ore from various parts of Afghanistan has been seen, but it is nowhere worked. a:

Lead is found, ¢.g., in Upper Bangash (Kurram district), and in the Shinwari country (also among the branches of Safed Koh), and in the Kakar country. There are reported to be rich lead mines near Herat scarcely worked. Lead, with antimony, is found near the Arghand-ab, 32 miles north-west of Kala't-i-Ghilzai; in the Wardak hills, 24 miles north of Ghazni; in the Ghorband valley, north of Kabul; and in the Afridi country, near our frontier. Most of the lead used, however, comes from the Hazara country, where the ore is described as being gathered on the surface. An ancient mine of great extent and elabo- rate character exists at Fcringal, in the Ghorband valley. Antimony is obtained in considerable quantities at Shah-Maksud, about 30 miles north of Kandahar.

Silicate of zinc in nodular fragments comes from the Zhob district of the Kakar country. It is chiefly used by cutlers for polishing.

Sulphur is said to be found at Herat, dug from the soil in small fragments, but the chief supply comes from the Hazara country, and from Pirkisri, on the confines of Seistan, where there would seem to be a crater, or fuma-role. Sal-ammoniac is brought from the same place. Gypsum is found in large quantities in the plain of Kan- dahar, being dug out in fragile coralline masses from near the surface.

Coal (perhaps lignite) is said to be found in Zurmat (between the Upper Kurram and the Gomal) and near Ghazni.

Nitre abounds in the soil over all the south-west of Afghanistan, aud often affects the water of the kdrez, or subterranean canals.

VrcETABLE Kincpom.\—The characteristic distribution of vegetation on the mountains of Afghanistan is worthy of attention. The great mass of it is confined to the main ranges and their immediate offshoots, whilst on the

more distant and terminal prolongations it is almost entirely absent ; in fact, these are naked rock and stone.

Take, for example, the Safed Koh. On the alpine range itself and its immediate branches, at a height of 6000 to 10,000 feet, we have abundant growth of large forest trees, among which eonifers are the most noble and prominent, such as Cedrus Deodara, Abies excelsa, Pinus longifolia, P. Pinaster, P. Pinea (the edible pine), and the larch. We have also the yew, the hazel, juniper, walnut, wild peach, and almond. Growing under the shade of these are several varieties of rose, honeysuekle, currant, gooseberry, haw-thorn, rhododendron, and a luxuriant herbage, among which the ranuneulus family is important for frequeney and number of genera. The lemon and wild vine are also here met with, but are more common on the northern mountains. The walnut and oak (ever- green, holly-leaved, and kermes) descend to the seeondary heights, where they become mixed with alder, ash, khinjak, Arbor-vite, juniper, with species of Astragalus, &e. Here also are Indigoferw and dwarf laburnum.

Lower again, and down to 3000 feet, we have wild olive, species of roek-rose, wild privet, aeacias and mimosas, barberry, and Zizy- phus; and in the eastern ramifications of the ehain, Chamcrops humilis (which is applied to a variety of useful purposes), Begnonia or trumpet flower, sissu, Salvadora persica, verbena, acanthus, varieties of Gesnerc.

The lowest terminal ridges, especially towards the west, are, as has been said, naked in aspeet. Their scanty vegetation is almost wholly herbal; shrubs are only oceasional; trees almost non- existent. Labiate, eomposite, and umbelliferous plants are most

eommon. Ferns and mosses are almost confined to the higher ranges. fo)

1 Chiefly from Bellew.

AP Ca eNITSa AN

[porany,

In the low brushwood seattered over portions of the dreary plaing of the " Khorasan" table-lands, we find leguminous thorny plants of the papilionaceous sub-order, sueh as camel-thorn (Hedysarum Alhagi), Astragalus in several varieties, spiny rest-harrow (Ononis spinosa), the fibrous roots of whieh often serve as a tooth-brush;

lants of the sub-order Afimosee, as the sensitive mimosa ; a plant of the Rue family, ealled by the natives lipdd ; the eommon worm- wood; also eertain orchids, and several species of Salsola. The rue and wormwood are in general use as domestie medicines—the former for rheumatism and neuralgia; the latter in fever, debility and dyspepsia, as well as for a vermifuge. The lipad, owing to its heavy nauscous odour, is believed to keep off evil spirits. In some places, oecupying the sides and hollows of ravines, are found the rose bay (Neriwm Oleander), ealled in Persian khar-zarah, or ass bane, the wild laburnum, and various Indzgofere.

In eultivated districts the ehief trees seen are mulberry, willow. poplar, ash, and oceasionally the plane ; but these are due to man's planting.

Uncultivated Products of Valwe.—One of the most important of these is the gum-resin of Narthex assafetida, which grows abun- dantly in the high and dry plains of Western Afghanistan, espe- cially between Kandahar and Herat. The depot for it is Kandahar, whenee it finds its way to India, where it is much used as a eondi- ment. It is not so used in Afghanistan, but the Seistan people eat the green stalks of the plant preserved in brine. The eolleetion of.the gum-resin is almost entirely in the hands of the Kakar elan of Afghans.

In the highlands of Kabul edible rhubarb is an important local luxury. The plants grow wild in the mountains. The bleached rhubarb, whieh has a very delieate flavour, is altered by eovering the young leaves, as they sprout from the soil, with loose stones or an empty jar. The leaf-stalks are gathered by the neighbourin hill people, and earried down for sale. Bleaehed and unbleache rhubarb are both largely consumed, both raw and cooked.

The walnut and edible pine-nut are both wild growths, which are exported.

The sanjtt (Elecagnus orientalis), common on the banks of water- courses, furnishes an edible fruit. An orehis found in the moun- tains yields the dried tuber which affords the nutritious mueilage called salep; a good deal of this goes to India.

Pistacia khingak affords a mastie. The fruit, mixed with its resin, ig used for food by the Achakzais in Southern Afghanistan. The true pistachio is found only on the northern frontier ; the nuts are imported from Badakhshan and Kunduz.

Mushrooms and other fungi are largely used as food, especially — by the Hindus of the towns, to whom they supply a substitute for meat.

Manna, of at least two kinds, is sold in the bazaars. One, ealled turanjbin, appears to exude, in small round tears, from the eamel- thorn, and also from the dwarf tamarisk; the other, sir-kasht, in large grains and irregular masses, or cakes, with bits of twig im- bedded, is obtained from a tree which the natives eall siah chob (black wood), thought by Bellew to be a Fraxinus or Ornus.

AcricuLTurE.—In most parts of the country there are two harvests, as generally in India. One of these, called by the Afghans bahdrak, or the spring crop, is sown in the end of autumn, and reaped in summer. It consists of wheat, barley, and a variety of lentils. The other, called paizah or tirmdi, the autumnal, is sown in the end of spring, and reaped in autumn. It consists of rice, varieties of millet and sorghum, of maize, Phaseolus Mungo, tobacco, beet, turnips, &c. The lofticr regions have but one har- vest.

Wheat is the staple food over the greater part of the country. Rice is largely distributed, but is most abundant in Swat (independent), and best in Peshawar (British). It is also the chief crop in Kurram. In much of the eastern mountainous country bdjra (Holcus spicatus) is the chief grain. Most English and Indian garden-stuffs are culti- vated; turnips in some places very largely, as cattle food.

The growth of melons, water-melons, and other cucurbi- taceous plants is reckoned very important, especially near towns; and this crop counts for a

distinct harvest.

Sugar-cane is grown only in the rich plains; and though cotton is grown in the warmer tracts, most of the cotton cloth is imported. .

Madder is an important item of the spring crop ™ Ghazni and Kandahar districts, and generally over the west, and supplies the Indian demand. It is said to be very profitable, though it takes three years to mature.

ZOOLOGY. }

Saffron is grown and exported. The castor-oil plant is everyWhere common, and furnishes most of the oil of the country. Tobacco is grown very generally; that of Kan- dahar has much repute, and is exported to India and Bokhara. 'Two crops of leaves are taken.

Lucerne and a trefoil called shaftal form important fodder crops in the western parts of the country, and, when irrigated, are said to afford ten or eleven cuttings in the season. The komal (Prangos pabularia) is abundant in the hill country of Ghazni, and is said to extend through the Hazara country to Herat. It is stored for winter use, and forms an excellent fodder. Others are derived from the Holcus sorghum, and from two kinds of panick. It is common to cut down the green wheat and barley before the ear forms, for fodder, and the repetition of this, with barley at least, is said not to injure the grain crop. Bellew gives the following statement of the manner in which the soil is sometimes worked in the Kandahar district:— Barley is sown in November; in March and April it is twice cut for fodder; in June the grain is reaped, the ground is ploughed and manured, and sown with tobacco, which yields two cuttings. The ground is then prepared for carrots and turnips, which are gathered in November or December.

Of great moment are the fruit crops. All European fruits are produced profusely, in many varieties, and of excellent quality. Fresh or preserved, they form a prin- cipal food of a large class of the people, and the dry fruit is largely exported. In the valleys of Kabul, mulberries are dried, and packed in skins for winter use. This mul- berry cake is often reduced to flour, and used as such, forming in some valleys the main food of the people.

Grapes are grown very extensively, and the varieties are very numerous. 'The vines are sometimes trained on trellises, but most frequently over ridges of earth 8 or 10 feet high. The principal part of the garden lands in vil- lages round Kandahar is vineyard, and the produce must be enormous.

Open canals are usual in the Kabul valley, and in eastern Afghanistan generally; but over all the western parts of the country much use is made of the karez, which is a subterranean aqueduct uniting the waters of several 'springs, and conducting their combined volume to the surface at a lower level, Elphinstone had heard of such conduits 36 miles in length.

ANIMAL Kinepom.—As regards vertebrate zoology, Afghanistan lies on the frontier of three regions, viz. , the Eurasian, the Ethiopian (to which region Biluchestan seems to belong), and the Indo-Malayan. Hence it natu- rally partakes somewhat of the forms of each, but is in the main Hurasian.

MAMMALS.—Monkeys are stated by Mr Bellew to exist in Yusuf- zai, and perhaps extend to some other districts north of the Kabul river; but no species has been named.

Felide.—F. catus, F. chaus (both Eurasian); F. caracal (Eur., Ind., Ethiop.), about Kandahar; a small leopard, stated to be found almost all over the country, perhaps rather the cheeta (F. Jjubatus, Ind. and Eth.); F. pardus, the common leopard (Eth. and Ind.) The tiger is said to exist in the north-eastern hill country, which is quasi-Indian.

Canide.—The jackal (C. aureus, Euras., Ind., Eth.) abounds on the Helmand and Argand-ab, and probably elsewhere. Wolves (C. Bengalensis) are formidable in the wilder tracts, and assemble in troops on the snow, destroying cattle, and sometimes attacking single horsemen. The hyxna (H. striata, Africa to India) is com- mon. These do not hunt in packs, but will sometimes singly attack a bullock: they and the wolves make havoc among sheep. A favourite feat of the boldest of the young men of southern Afghanistan is to enter the hyzna's den, single-handed, muffie and tie him. There are wild dogs, according to Elphinstone and Conolly. The small Indian fox (Vulpes Bengalensis) is found ; also V. flavescens, common to India and Persia, the skin of which is much used as a fur.

Mustelide.—Species of Mungoose (Herpestes), species of otter,

Mustela crminea, and two ferrets, one of them with tortoise-shell marks, tamed by the Afghans to keep down vermin; a marten (iM. Jflavigula, Indian).

Bears are two: a black one, probably Ursus torquatus; and one of a dirty yellow, U. Isabcllinus, both Himalyan species.

Ruminants.—Capra cegagrus and C. megaceros; a wild (Ovis cycloceros or Vignet); Gazella subgutturosa—these are netted in batches when they descend to drink at a Stream; G. dorcas, perhaps; Cervus Wallichii, the Indian barasingha, and probably some other Indian deer, in the north-eastern mountains.

The wild hog (Sus scrofa) is found on the Lower Helmand. The wild ass, Gorkhar of Persia (Equus onager), is frequent on the sandy tracts in the south-west. Neither elephant nor rhinoccros now exists within many hundred miles of Afghanistan; but there is ample evidence that the latter was hunted in the Peshawar plain down to the middle of the 16th century.

LTalpide.—A mole, probably 7: Europea; Sorex Indicus 5 Erinaceus collaris (Indian), and Er. auritus (Eurasian).

Bats, believed to be Phyllorhinus cineraccus (Panjab species), Scotophilus Bellii (W. India), Vesp. auritus and V. barbastellus, both found from England to India.

Rodentia.—A squirrel (Sciurus Syriacus?); Mus Indicus and M. Gerbellinus; a gerboa (Dipus telwm ?); Alactaga Bactriana; Gerbil lus Indieus, and G. crythrinus (Persian and Indian); Lagomys Nepal- ensis, a central Asian species. A hare, probably L. ruficaudatus.

Brrps.—The largest list of Afghan birds that we know of is given by Captain Hutton in the J. As. Soc. Bengal, vol. xvi. p. 775, seqq.; but it is confessedly far from complete. Of 124 species in that list, 95 are pronounced to be Eurasian, 17 Indian, 10 both Eurasian and Indian, 1 (Turtur risorius) Eur., Ind., and Eth.; and 1 only, Carpodacus (Bucanetes) crassirostris, peculiar to the 'country. Afghanistan appears to be, during the breeding season, the retreat of a variety of Indian and some African (desert) forms, whilst in winter the avifawna becomes overwhelmingly Eurasian.

REPTILEs.—The following particulars are from Gray :—Lizards—Pscudopus gracilis (Eur.), Argyrophis Horsfieldit, Salea Horsfieldii, Calotcs Maria, C. versicolor, C. minor, C. Emma, Phrynocephalus Tickelii —all Indian forms. A tortoise (7. Horsjfieldii) appears to be peculiar to Kabul. There are apparently no salamanders or tailed Amphibia. The frogs are partly Eurasian, partly Indian. And the same may be said of the fish ; but they are as yet most imperfectly known.

Domestic ANIMALS.—The camel is of a more robust and compact breed than the tall beast used in India, and is more carefully tended. The two-humped Bactrian camel is sometimes seen, but is not a native.

Horses form a staple export to India. The best of these, however, are brought from Maimana and other places on the Khorasan and Turkman frontier. The indigenous horse is the ydbi, a stout, heavy-shouldered animal, of about 14 hands high, used chiefly for burden, but also for riding. It gets over incredible distances at an ambling shuffle; but is unfit for fast work, and cannot stand exces- sive heat. The breed of horses was improving much under the Amir Dost Mahommed, who took much interest in it. Generally, colts are sold and worked too young.

The cows of Kandahar and Seistan give very large quan- tities of milk. They seem to be of the humped variety, but with the hump evanescent. Dairy produce is important in Afghan diet, especially the pressed and dried curd called krit (an article and name perhaps introduced by the Mongols).

There are two varieties of sheep, both having the fat tail. One bears a white fleece, the other a russet or black one. Much of the white wool is exported to Persia, and now largely to Europe by Bombay. Flocks of sheep are the main wealth of the nomad population, and mutton is the chief animal food of the nation. In autumn large numbers are slaughtered, their carcases cut up, rubbed 'with salt, and dried in the sun. The same is done with beef and camel's flesh.

The goats, generally black or parti-coloured, seem to be a degenerate variety of the shawl-goat.

The climate is found to be favourable to dog-breeding. Pointers are bred in the Kohistan of Kabul and above Jalalabad —large, heavy, slow-hunting, but fine-nosed and staunch; very like the old double-nosed Spanish pointer. There are greyhounds also, but inferior in speed

sheep often

to second-rate English dogs. The khandi is another sporting dog, most useful, but of complex breed. He is often used for turning up quail and

partridge to the hawk.

INDUSTRIAL Propucts.—These are not important. Silk is produced in Kabul, J alalabad, Kandahar, and Herat, and chiefly consumed in domestic manufactures, though the best qualities are carried to the Panjab and Bombay.

Excellent carpets—soft, brilliant, and durable in colour— are made at Herat. They are usually sold in India as Persian. Excellent felts and a variety of woven goods are made from the wool of the sheep, goat, and Bactrian camel. A manufacture, of which there is now a con- siderable export to the Panjab for the winter clothing of our irregular troops, besides a large domestic use, is that of the postin, or sheepskin pelisse. The long wool remains on, and the skin is tanned yellow, with admirable softness and suppleness. Pomegranate rind is a chief material in the preparation.

Rosaries are extensively made at Kandahar from a soft crystallised silicate of magnesia (chrysolite). The best are of a semi-transparent straw colour, like amber. They are largely exported, especially to Mecca.

TRapp.—Practically, there are no navigable rivers in Afghanistan, nor does there exist any wheeled carriage. Hence goods are carried on beasts of burden, chiefly camels, along roads which often lie through close and craggy defiles, and narrow stony valleys among bare mountains, or over waste plains. Though from time immemorial the larger part of the products of India destined for western Asia and Europe has been exported by sea, yet at one time valuable caravans of these products, with the same destination, used to traverse these rugged Afghan roads.

The great trade routes are the following :—

1. From Persia by Mesh'hed to Herat.

2. From Bokhara by Merv to Herat.

3. From the same quarter by Karshi, Kabul.

4, From the Panjab by Peshawar and the Tatara or Abkhanah Passes to Kabul.

5. From the Panjab by the Ghawalari Pass towards Ghazni.

6. From Sind by the Bolan Pass to Kandahar.

There is also a route from eastern Turkistan by Chitral to Jala- labad, or to Peshawar by Dir; but it is doubtful how far there is any present traffic by it.

Balkh, and Khulm, to

Towards Sind the chief exports from or through Afghanistan are wool, horses, silk, fruit, madder, and assa- foetida. The staple of local production exported from Kandahar is dried fruit. The horse trade in this direction is chiefly carried on by the Syads of Pishin, Kakars, Bakh- tiyaris, and Biluchis. The Syads also do, or did, dabble largely in slave-dealing. The Hazaras furnished the largest part of the victims.

Burnes's early anticipation of a large traffic in wool from the regions west of the Indus has been amply verified, for the trade has for many years been of growing importance; and in 1871-72 2,000,000 ib were shipped from Karachi. The importation to Sind is chiefly in the hands of Shikar- ptr merchants. Indeed, nearly all the trade from southern Afghanistan is managed by Hindus. That between Mesh'hed, Herat, and Kandahar is carried on by Persians, who bring down silk, arms, turquoises, horses, carpets, &c., and take back wool, skins, and woollen fabrics.

The chief imports by Peshawar from India into Afghanis- tan are cotton, woollen, and silk goods; from England, coarse country cloths, sugar and indigo, Benares brocades gold thread and lace, scarves, leather, groceries, and drugs. The exports are raw silk and silk fabrics of Bokhara, gold and silver wire (Russian), horses, almonds and raisins and fruits generally, furs (including dressed fox skins and sheep skins), and bullion.

ARGHANISTAN

[TRADE,

The trade with India was thus estimated in 1862 :—

Imports from

Exports to India. Tadin' Totals. By Peshawar…..+++++ £156,513 £120,643 £277,156 By Ghawalari Pass….. 130,000 164,000 294,000 By Bolan Pass.. .....- 31,870 18,892 50,762 £318,383 £303, 535 £621,918

But this omits some passes, and the Bolan exports do not in- clude the large item of wool which enters Sind further south.

A relic of the old times of Asiatic trade has come down

to our day in the habits of the class of Lohani Afghan traders, commonly called Powindahs, who spend their lives in carrying on traftic between India, Khorasan, and Bok. hara, by means of their strings of camels and ponies, banded in large armed caravans, in order to restrict those recurring exactions that would render trade impossible.

Bullying, fighting, evading, or bribing, they battle their way twice a year between Bokhara and the Indus. Their sum-

mer pastures are in the highlands of Ghazni and Kala't-

Ghilzai. In the autumn they descend the Sulimani passes. At the Indus, in these days, they have to deposit all weapons ; but once across that, they are in security. They leave their families and their camels in the Panjab plains, and take their goods by rail to all the Gangetic cities, or by boat and steamer to Karachi and Bombay. Even in Asam or in distant Rangoon the Povindah is to be seen, pre-eminent by stature and by lofty air, not less than by rough locks and filthy clothes. In March they rejoin their families, and move up again to the Ghilzai highlands, sending on caravans anew to Kabul, Bokhara, Kandahar, and Herat, the whole returning in time to accompany the tribe down the passes in the autumn. The Povindah trade by all the passes is now estimated to reach £1,500,000 in value annually.

INHABITANTS oF AFGHANISTAN.—These may first be divided into Afghan and non-Afghan, of whom the Afghan people are predominant in

numbers, power, and character.

The Afghans themselves do not recognise as entitled to that name all to whom we give it. According to Bellew they exclude certain large tribes, who seem, nevertheless, to be essentially of the same stock, speaking the same language, observing the same customs, and possessing the same moral and physical characteristics. These are recog- nised as Pathdns, but not as Afghans, and are all located in the vicinity of the Sulimani mountains and their off- shoots towards the east. We do not attempt to name them, because the information on the subject seems con- tradictory. There are tribes of somewhat similar character elsewhere, such as the Wardaks, to the south of Kabul; and there are again some tribes, in contact with these and with Afghan tribes, who speak the Afghan language, and have many Afghan customs, but are different in aspect, and seem not to be regarded as Pathan at all. Such are the Tfris and Jajis of Kurram.

Of the Afghans proper there are about a dozen great clans, with numerous subdivisions. Ofthe great clans the following are the most important :—

The Durrdnis, originally called Abdalis, received the former name from a famous clansman, Ahmed Shah. Their country may be regarded as the whole of the south and south-west of the Afghan plateau.

The Ghilzais are the strongest of the Afghan clans, and perhaps the bravest. 'They were supreme in Afghanistan in the beginning of last century, and for a time possessed the throne of Ispahan. They occupy the high plateau north of Kandahar, and extend, roughly speaking, east- ward to the Sulimani mountains, and north to the Kabul river (though in places passing these limits), and they extend down the Kabul river to Jalalabad. On the British

to have been gone into.

The Yusufzais occupy an extensive tract of hills and valleys north of Peshawar, including part of the Peshawar plain. Except those within our Peshawar district, they are independent; they are noted even among Afghans for

their turbulence.

The Kakars, still retaining in great measure their inde-

pendence, occupy a wide extent of elevated country in the south-east of Afghanistan, among the spurs of the Toba and Sulimani mountains, bordering on the Biluch tribes. But the region is still very imperfectly known.

Of the non-Afghan population associated with the Af- ghans, the 7djiks come first in importance and numbers, They are intermingled with the Afghans over the country, though their chief localities are in the west. They are regarded as descendants of the original occupants of that part of the country, of the old Iranian race; they call themselves Parsiwin, and speak a dialect of Persian. They are a fine athletic people, generally fair in com- plexion, and assimilate in aspect, in dress, and much in manners to the Afghans. But they are never nomadic. They are mostly agriculturists, whilst those in towns follow mechanical trades and the like, a thing which the Afghan never does, They are generally devoid of the turbulence of the Afghans, whom they are content to regard as masters or superiors, and lead a frugal, industrious life, without aspirmg to a share in the government of the country.

Many, however, become soldiers in the Amir's army. and | Y> ')

many enlist in our local Panjab regiments. They are zealous Sunnis. The Tajiks of the Daman-i-Koh of Kabul are said to be exceptional in turbulent and vindictive character.

The Kizilbdshes may be regarded as modern Persians, but more strictly they are Persianised Turks, like the present royal race and predominant class in Persia. They speak pure Persian. Their immigration dates only from the time of Nadir Shah (1737). They are chiefly to be found in towns as merchants, physicians, scribes, petty traders, &c., and are justly looked on as the more educated and superior class of the population. At Kabul they con- stitute the bulk of the Amir's cavalry and artillery. Many serve in our Indian regiments of irregular cavalry, and bear a character for smartness

and intelligence, as well as good riding. They are Shiahs, and heretics in Afghan eyes.

It is to the industry of the Parsiwans and Kizilbashes that the country is indebted for whatever wealth it pos- sesses, but few of them ever attain a position which is not in some degree subservient to the Afghan,

The Hazdras have their stronghold and proper home in the wild mountainous country on the north-west of Afghanistan proper, including those western extensions of Hindu Kush, to which modern geographers have often applied the ancient name of Paropamisus. In these their habitations range generally from a height of 5000 feet to 10,000 feet above the sea.

The Hazaras generally have features of Mongol type, often to a degree that we might call exaggerated, and there can be no doubt that they are mainly descended from fragments of Mongol tribes who came from the east with the armies of Chinghiz Khan and his family, though other races may be represented among the tribes called Hazaras. The Hazaras generally are said by Major Leech

invasion the Ghilzais showed a rooted hostility to the foreigner, and great fidelity to Dost Mahommed, though of a rival clan. It is remarkable that the old Arab geo- graphers of the 10th and 11th centuries place in the Ghilzai country a people called Khilijis, whom they call a tribe of Z'urks, to which belonged a famous family of Dehli kings. The probability of the identity of Khilijis and Ghilzais is obvious, and the question touches others regarding the origin of the Afghans, but it does not seem

to be called Moghals by the Ghilzais ; and one tribe, still bearing the specific name of Mongol, and speaking a Mongol dialect, is found near the head waters of the Murghab, and also further south on the skirts of the Ghur mountains, But it is remarkable that the Hazaras generally speak a purely Persian dialect. The Mongols of the host of Chinghiz were divided into tomans (ten thousands) and hazaras (thousands), and it is probably in this use of the word that the origin of its present application is to be sought.

The oldest occurrence of this application that M. de Khanikoff has met with is in a rescript of Ghazan Khan of Persia, regarding the security of roads in Khorasan, dated a.H. 694 (a.p. 1294-95).

Though the Hazaras pay tribute to the Afghan chiefs, they never do so unless payment is enforced by arms. The country which they occupy is very extensive, embracing the upper valleys of the Arghand-ab and the Helmand, both sides of the main range of Hindu Kush, nearly as far east as the longitude of Andarab, the hill country of Bamian, and that at the head waters of the Balkh river, the Murghab, and the Hari-Rud; altogether an area of something like 30,000 square miles. The Hazaras are accused of very loose domestic morals, like the ancient Massagete, and the charge seems to be credited, at least of certain tribes. They make good powder, are good shots, and, in spite of the nature of their country, are good riders, riding at speed down very steep declivities. They are said to have a yodel like the Swiss. They are often sold as slaves, and as such are prized. During the winter many spread over Afghanistan, and even into the Panjab, in search of work. Excepting near Ghazni, where they hold some lands and villages, the position of the Hazaras found in the proper Afghan country is a menial one. They are Shiahs in religion, with the exccption of one fine tribe called the Zeidnat Hazaras, oceupying the old territory of Badghis, north of Herat.

Limdk is a term for a sept or section of a tribe. It has come to be applied, much as hazara,-to certain nomadic or semi-nomadic tribes west of the Hazaras of whom we have been speaking, and immediately north of Herat. These tribes, it is said, were originally termed "the four Kimaks." It is difficult in the present state of information regarding them, sometimes contradictory, to discern what is the broad distinction between the Eimaks and the Hazaras, unless it be that the Eimaks are predominantly of Iranian or quasi-Iranian blood, the Hazaras Turanian. The Eimaks are also Sunnis. Part of them are subject to Persia.

Hindkis.—This is the name given to people of Hindu descent scattered over Afghanistan. They are said to be of the Kshatri or military caste. They are occupied in trade ; they are found in most of the large villages, and in the towns form an important part of the population, doing all the banking

business of the country, and holding its chief trade in their hands. They pay a high poll-tax, and are denied many privileges, but thrive notwithstanding. The Jats of Afghanistan doubtless belong to the same vast race as the Jats and Jats who form so large a part of the population of the territories now governed from Lahore and Karachi, and whose origin is so obscure. They are a fine athletic, dark, handsome race, considerable in numbers, but poor, and usually gaining a livelihood as farm-ser- vants, barbers, sweepers, musicians, &c.

Biltichis.—Many of these squat among the abandoned tracts on the lower Helmand; a fierce and savage people, professing Islam, but not observing its precepts, and hold- ing the grossest superstitions; vendetta their most stringent law; insensible to privation, and singularly tolerant of heat ; camel-like in capacity to do without drink 3 superior to the Afghans in daring and address, which are displayed in robber raids carried into the very heart of Persia.

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There remain a variety of tribes in the hill country north of the Kabul river, speaking various languages, seemingly of Prakritic character, and known as Kohistanis, Laghmanis, Pashais, &c. ; apparently converted remnants of the aboriginal tribes of the Kabul basin, and more or less kindred to the still unconverted tribes of Kafiristan, to the Chitral people, and perhaps to the Dard tribes who lie to the north of the Afghan country on the Indus.

An able officer of the staff in India (Col. Macgregor) has lately made a diligent attempt to estimate the population of Afghanistan, which he brings to 4,901,000 souls. This includes the estimated population of Afghan Turkestan, the people of Chitral, the Kafirs, and the independent Yusufzais.

We shall deduct the three first:—

4,901,000

Afghan Turkestan …...~~ssessse20+0+ ora Chitralis and Kafirs~~
*~~……..~~2++++ i * 792,000*

4,109, 000

which may be thus roughly divided— Fimaks and Hazaras…....csscseesseseeeessrereeees 400,000 Tajiks …...ccsseserecesconserececes cesenceceecorsceonees 500,000 Kizilbashes…....ssccsesceseeseeeenecssecereesceonss 150,000 Hindkis and Jats. .....cccsseesecersrsetereeseoeers 500,000 Kohistanis, &c. Mee cery hy 200,000 Afghans and Pathans, including 400 in- dependent Yusufzais, &c…....-. Ss 2,359,000 Motaleeererretesesesce es 4,109,000

The Afghans, in government and general manners, have a likeness to other Mahommedan nations; but they have also many peculiarities.

Besides their division into clans and tribes, the whole Afghan people may be divided into dwellers in tents and. dwellers in houses; and this division is apparently not coincident with tribal divisions, for of several of the great clans, at least a part is nomad and a part settled. Such, e.g., is the case with the Durrani and with the Ghilzai.

Nomad Afghans exist in the Kabul basin, but their proper field is that part of their territory which the Afghans include in Khorasan, with its wide plains. These people subsist on the produce of their flocks, and rarely cultivate. They may, perhaps, pay something to the Kabul govern- ment through their chief, and they contribute soldiers to the regular army, besides forming the bulk of the militia; but they have little relation to the government, and seldom enter towns unless to sell their produce. They are under some indefinite control by their chiefs, to whom serious disputes are referred. Petty matters are settled by the " greybeards" of the community, guided by the Afghan traditional code. Many of the nomad tribes are professed and incorrigible thieves. Among certain tribes the cere- mony of naming a male child is accompanied by the sym- bolical act of passing him through a hole made in the wall of a house, whilst a volley of musketry is fired overhead.1

The settled Afghans form the village communities, and in part the population of the few towns. Their chief occupation is with the soil. They form the core of the nation and the main part of the army. Nearly all own the land on which they live, and which they cultivate with their own hands

or by hired labour. Roundly speaking, agriculture and soldiering are their sole occupations. No Afghan will pursue a handicraft or keep a shop, though, as we have seen, certain pastoral tribes engage largely in travelling trade and transport of goods.

As a race, the Afghans are very handsome and athletic, often with fair complexion and flowing beard, generally black or brown, sometimes, though rarely, red; the features

1 Of one tribe, at least, of which this is told, the Afghan blood is doubtful.

highly aquiline. The hair is shaved off from the forehead to the top of the head, the remainder at the sides being allowed to fall in large curls over the shoulders. Their step is full of resolution; their bearing proud and apt to be rough.

The women have handsome features of Jewish cast (the last trait often true also of the men); fair complexions, sometimes rosy, though usually a pale sallow; hair braided and plaited behind in two long tresses terminating in silken tassels. They are rigidly secluded, but intrigue is frequent. In some parts of the country the engaged lover is admitted to visits of courtship, analogous to old Welsh customs.

The Afghans, inured to bloodshed from childhood, are familiar with death, and are audacious in attack, but easily discouraged by failure; excessively turbulent and unsub- missive to law or discipline; apparently frank and affable in manner, especially when they hope to gain some object, but capable of the grossest brutality when that hope ceases. They are unscrupulous in perjury, treacherous, vain, and in- satiable, passionate in vindictiveness, which they will satisfy at the cost of their own lives and in the most cruel manner. Nowhere is crime committed on such trifling grounds, or with such general impunity, though when it is punished the punishment is atrocious. Among themselves the Afghans are quarrelsome, intriguing, and distrustful; estrangements and affrays are of constant

occurrence; the traveller con- ceals and misrepresents the time and direction of his journey. The Afghan is by breed and nature a bird of prey. If from habit and tradition he respects a stranger within his threshold, he yet considers it legitimate to warn a neighbour of the prey that is afoot, or even to overtake and plunder his guest after he has quitted his roof. The repression of crime and the demand of taxation he regards alike as tyranny. The Afghans are eternally boasting of their lineage, their independence, and their prowess. They look on the Afghans as the first of nations, and each man looks on himself as the equal of any Afghan, if not as the superior of all others. Yet when they hear of some atro- cious deed they will exclaim —" An Afghan job that!" They are capable of enduring great privation, but when abund- ance comes their powers of eating astonish an European. Still, sobriety and hardiness characterise the bulk of the people, though the higher classes are too often stained with deep and degrading debauchery.

The first impression made by the Afghans is favourable. The European, especially if he come from India, is charmed by their apparently frank, open-hearted, hospitable, and manly manners; but the charm is not of long duration, and he finds that under this frank demeanour there is craft as inveterate, if not as accomplished, as in any Hindu.

Such is the character of the Afghans as drawn by Ferrier and other recent writers, and undoubtedly founded on their experience, though perhaps the dark colour is laid. on too universally. The impression is very different from that left by the accounts of Elphinstone and Burnes. Yet most of the individual features can be traced in Elphinstone, though drawn certainly under less temptation to look on the darker side, owing to the favourable circumstances of his intercourse with the Afghans, and touched with a more delicate and friendly hand, perhaps lightened by wider sympathies. Sir H. Edwardes, who had intimate dealings with the Afghans for many years, takes special exception to Elphinstone's high estimate of their character, and appeals to the experience of every officer who had served in the country. "Nothing," he sums up, "is finer than their physique, or worse than their morale."

Many things in Afghan character point to a nation in decadence—the frank manners and joyous temper, the hospitable traditions, the martial and

independent spirit, the love of field sports, the nobility of aspect, suggest @

INSTITUTIONS. |

time when these were more than superficial and deceptive indications of character, and were not marred by greed and treacherous cruelty.

Po.it1caL InstituTIons.—The political institutions of the Afghans present the rude and disjointed materials of a free constitution. The nation is theoretically divided into four great stocks, supposed to spring from four brothers. But these four divisions are practically obsolete, and only come up in genealogies. ach tribe has split into several branches, and in the more numerous and scattered tribes these branches have separated, and each has its own chief. They retain, however, the common name, and an idea of community in blood and interests.

The type of the Afghan institutions is perhaps best seen in some of the independent tribes near the British frontier. These cling most closely to the democratic traditions. Their rude state of society is held together by a code as rude, which is acknowledged, however, and understood by every one, and enforced by the community, every member of which considers its infringement as an act committed against his own privileges. The JAfaliks or chiefs are the representatives of the tribe, division, or family to which they each belong, but they possess no independent power of action, and before they can speak in council, they must have collected the wishes of the bodies which they represent.

The men of the section (Land?) of a village, having come to a decision, send their representative to a council of the whole village, and these again to that of the sept (Lhaz/), and the appointed chiefs of the septs finally assemble as the council of the dds or tribe. These meetings, in all their stages, are apt to be stormy. If persuasion and argument fail to produce unanimity, no further steps can be taken, unless one party be much the weaker, when sometimes the stronger side will forcibly extort assent. When once a council has decided, implicit compliance is incumbent on the tribe under heavy penalties, and the maliks have the power of enforcing these.

Justice is administered in the towns, more or less defect- ively, according to Mahommedan law, by a k4zi and muftis. But the unwritten code by which Afghan communities in their typical state are guided, and the maxims of which

enetrate the whole nation, is the Pukhtéinwali, or usage of the Pathans, a rude system of customary law, founded on principles such as one might suppose to have prevailed before the institution of civil government.

A prominent law in this code is that called Vanawatai, or "entering in." By this law the Pathan is bound to grant any boon claimed by the person who passes his threshold and invokes its sanctions, even at the sacrifice of his own life and property. So also the Pathan is bound to feed and shelter any traveller claiming hospitality. Re- taliation must be exacted by the Pathan for every injury or insult, and for the life of a kinsman. If immediate opportunity fail, a man will dodge his foe for years, with the cruel purpose ever uppermost, using every treacherous artifice to entrap him. To omit such obligations, above all the vendetta, exposes the Pathan to scorn. The injuries of one generation may be avenged in the next, or even by remoter posterity. The relatives of a murdered man may, however, before the tribal council, accept a blood-price.

Crimes punished by the Pathan code are such as murder without cause, refusal to go to battle, contravention of the decision of a tribal council, adultery.

The Afghans are Mahommedans of the Sunni or ortho- dox body, with the exception of a few tribes, perhaps not truly Pathan, who are Shiahs. They are much under the influence of their Mullahs, especially for evil; and have a stronger feeling against the Shiah heretic than against the I

1 Elphinstone.

unbeliever; their aversion to the Persians being aggravated thereby. But to those of another faith they are more tolerant than most Mahommedans, unless when creed be- comes a war-cry. They are very superstitious in regard to charms, omens, astrology, and so forth; and greatly ad- dicted to the worship of local saints, whose shrines (2¢ydrat) are found on every hill-top. The shrine, a domed tomb, or mayhap a heap of stones within.a wall, sometimes marks the saint's grave, but is often a cenotaph. The saint may have been unknown in life for his virtues, but becomes after death an object of veneration, for reasons often hard to discern. In the immediate environs of Ghazni there are no less than 197 of these shrines.

A very marked feature in Afghan character is the pas- sionate love of field sports, especially hawking. Deer- stalking in the open plains, the driving of game to well- known points by a host of beaters, and wild-fowl shooting with decoys, are others of their sports. They are capital horsemen, and unerring marksmen with the native rifle (jezail). :

Among themselves the people are convivial and humorous. Festive gatherings are frequent, where they come together, not to buy or'sell, or even to quarrel, but to make a noise and be happy. Tilting, shooting, racing, and wild music vary the amusements.

They have a wild dance called the dtan, in which the men work themselves into great excitement. Among some Kakar tribes it is said the atan is sometimes danced by both sexes together. '

GovVERNMENT.—Afghanistan is now, and has been be- fore, under one prince, but it is hardly a monarchy as we are used to understand the term. It is rather the govern- ment of a dictator for life over a military aristocracy, and within this a congeries of small democracies. Elphinstone compares it with Scotland in the middle ages; some things suggest a comparison with Poland, in spite of differ- ence of physical geography; but in neither was there the democratic constitution of the Afghan ulus. The sirdars govern in their respective districts, each after his own fashion; jealous, ambitious, turbulent, the sovereign can restrain them only by their divisions. There is no unity nor permanence; everything depends on the pleasure of a number of chiefs bound by no law, always at variance, and always ready to revolt when they have the slightest interest in doing so—almost always ready to

plunge into strife with a wild delight in it for its own sake. In war, as in peace, chiefs and soldiers are ready to pass from one service to another without scruple. It is a matter of speculation, and no disgrace.

The spirit of Afghan character and institutions was tersely expressed by an old man to Elphinstone, who had urged the advantages of quiet and security under a strong king: " We are content with discord, we are content with alarms, we are content with blood; but we will never be content with a master."

REVENUES.—The revenues of Dost Mahommed Khan were estimated in 1857 at 4,000,000 rupees, or about £400,000. This included Afghan Turkestan, but not Herat, which he did not hold. The Herat revenue was estimated some years before (probably too low) at £80,000. In the later years of Dost Mahommed the net revenue is stated to have amounted to £710,000, of which the army cost £430,000.1 Information on this subject is very im- perfect, and not always consistent. There seems to be a tax on the produce of the soil, both in kind and in money, and a special tax on garden ground. A house-tax of about 5 rupees is paid by all who are not Pathans. The latter pay a much lighter tax under another name; and

1 See Hdin. Review, July 1878, p. 273.

the Hindus pay the separate poll-tax (jazeya). Taxes arc paid on horses, &c., kept, and on the sale of animals in the public market.

The aggregate of taxation is not great, but the smallest exaction seems a tyrannical violence to an Afghan. Nor does payment guarantee the cultivator from further squeez- ing. In many parts of the country collections are only made spasmodically by military force. The people are let alone for years, till need and opportunity arise, when a force is marched in, and arrears extorted.

Customs dues at Kabul and Kandahar are only 2} per cent. nominally, but this is increased a good deal by exactions. There is a considerable tax on

horses cx- ported for sale, and a toll on beasts of burden exporting inerchandise, from 6 rupees on a loaded camel to 1 rupee on a donkey.

Minirary Force.—According to the old system the Afghan forces were entirely composed of the ulus, or tribesmen of the chiefs, who were supposed to hold their lands on a condition of service, but who, as frequently as not, went over to the enemy in the day of need. Asa counterpoise, the late Amir Dost Mahommed began to form a regular army. In 1858 this contained 16 infantry regiments of (nominally) 800 men, 3 of cavalry of 300 men, and about 80 field-pieces, besides a few heavy guns. The pay was bad, and extremely irregular, and punish- ments were severe. The men were fine, but recruited in the worst manner, viz., the arbitrary and forcible seizure of able-bodied men. There were also Jezailchi (riflemen), irregulars, some in the Amir's pay, others levies of the local chiefs; and a considerable number of irregular cavalry. We have failed to obtain recent data on this subject.

Lancuacs anp Lrrerature.—Persian is the vernacular of a large part of the non-Afghan population, and is fami- liar to all educated Afghans. But the proper language of the Afghans is Pushti, or Pukhti (these are dialectic variations), Currency has been given to the notion that this language has a Semitic character, but this appears to be quite erroneous, and is entirely rejected by competent authorities, the majority of whom class Pushtu positively as an Aryan or Indo-Persian language. The Pushtu vocabulary preserves a number of ancient forms and con- nections with words that remain isolated in other Aryan languages. Interesting illustrations of this and other points connected with Pushtu will be found in a paper by Tsidor Léwenthal in the J. of the As. Soc. of Bengal, vol. xix;

Pushtu does not seem to be spoken in Herat, or (roughly speaking) west of the Helmand.

There is a respectable amount of Afghan literature. The oldest work in Pushtu as yet mentioned is a history of the conquest of Swat by Shaikh MAli, a chief of the Yusufzais, and leader in the conquest (A.D. 1413-24). In 1494 Kaji Khan became chief of the same clan; during his rule Buner and Panjkora were completely con- quered, and he wrote a history of the events. But these works have not been met with. In the reign of Akbar, Bayazid

Ansari, called Pir-i-Roshan, "' The Saint of Light," the founder of an heretical sect, wrote in Pushtu; as did his chief antagonist, a famous Afghan saint called Akhund Darweza.

The literature is richest in poetry. Abdarrahman (17th century) is the best known poet. Another very popular poet is Khushal Khan, the warlike chief of the Khattaks in the time of Aurangzib. Many other members of his family were poets also. Ahmed Shah, the founder of the monarchy, likewise wrote poetry. Ballads are numerous.

History.—The Afghan chroniclers call their people Bani-Israil (Arab. for Children of Israel), and claim descent from King Saul (whom they call by the Mahommedan cor-

ruption Talét) through a son whom they ascribe to him, called Jeremiah, who again had a son called Afghéna, The numerous stock of Afghana were removed by Nebu- chadnezzar, and found their way to the mountains of Ghur and Feroza (east and north of Herat). Only nine years after Mahommed's announcement of his mission they heard of the new prophet, and sent to Medina a deputation headed by a wise and holy man called Kais, to make inquiry. The deputation became zealous converts, and on their return converted their countrymen. From Kais and his three sons the whole of the genuine Afghans claim descent.

This story is repeated in great and varying detail in sundry books by Afghans, the oldest of which appears to be of the 16th century ; nor do we know that any trace of the legend is found of older date. In the version given by Major Raverty (Introd. to Afghan Grammar), Afghanah is settled by King Solomon himself in the Sulimant moun- tains; there is nothing about Nebuchadnezzar or Ghur. The historian Firishta says he had read that the Afghans were descended from Copts of the race of Pharaoh. And one of the Afghan histories, quoted by Mr Bellew, relates "a current tradition" that previous to the time of Kais, Bilo the father of the Biluchis, Uzbak (cvidently the father of the Uzbegs), and Afghana were considered as

brethren. As Mahommed Uzbeg Khan, the eponymus of the medley of Tartar tribes called Uzbegs, reigned in the 14th century A.D., this gives some possible light on the valuc of these so-called traditions.

We have analogous stories in the literature of almost all nations that derive their religion or their civilisation from a foreign source. To say nothing of the farce of the Book of Mormon, there is in our own age and in our own country a considerable number of persons who seriously hold and propagate the doctrine that the English people are descended from the tribes of Israel, and the literature of this whimsi- cal theory would fill a much larger shelf than the Afghan histories. But the Hebrew ancestry of the Afghans is more worthy at least of consideration, for a respectable number of intelligent officers, well acquainted with the Afghans, have been strong in their belief of it; and though the customs alleged in proof will not bear the stress laid on them, undoubtedly a prevailing type of the Afghan physi- ognomy has a character strongly Jewish. This characteristic is certainly a remarkable one; but it is shared, to a considerable extent, by the Kashmiris (a circumstance which led Bernier to speculate on the Kashmiris represent- ing the lost tribes of Israel), and, we believe, by the Tajik people of Badakhshan.

In the time of Darius Hystaspes (B.C. 500) we find the region now called Afghanistan embrace in the Achenienian satrapies, and various parts of it occupied by Sarangians (in Seistan), Arians (in Herat), Sattagydians (supposed in highlands of upper Helmand and the platcau of Ghazni), Dadicw (suggested to be Tajiks), Aparyte (mountaineers, perhaps of Safed Koh, where lay the Paryetee of Ptolemy), Gandarit (in Lower Kabul basin), and Pak- tyes, on or near the Indus. In the last name it has been plausibly suggested that we have the Pukhiun, as the eastern Afghans pro- nounce their name. Indeed, Pusht, Pasht, or Pakht, would seem to be the oldest name of the country of the Afghans in their tradi- tions.

Alexander's march led him to Artacoana (Herat ?), the capital of Aria, and thence to the country of the Zarange (Seistan), to that of the Ewergete, upon the Etymander (Helmand river), to Arachosia, thence to the Indians dwelling among snows in a barren country, probably the highlands between Ghazni and Kabul. Thence he marched to the foot of Caucasus, and spent

the winter among the Paropamisade, founding a city, Alexandria, supposed to be Hupian, near Charikar. On his return from Bactria he prosecuted his march to India by the north side of the Kabul river. s

The Ariana of Strabo corresponds generally with the exis dominions of Kabul, but overpasses their limits on the west ani south.

'About 310 B.c. Seleucus is said by Strabo to have given to the Indian Sandrocottus (Chandragupta), in consequence of a marriage

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eontract, some part of the country west of the Indus, oceupied by an Indian population, and no doubt embracin a part of the Kabul basin. Some 60 years later oceurred the esta lishment of an inde- pendent Greek dynasty in Bactria. Of the details of their history and extent of their dominion in different reigns we know almost nothing, and conjecture is often dependent on such vague data as are afforded by the collation of the localities in which the coins of independent princes have been found. But their power extended eertainly over the Kabul basin, and probably, at times, over the whole of Afghanistan. The ancient architecture of Kashmir, the tope of Manikyala in the Panjab, and many sculptures found in the Peshawar valley, show unmistakable Greek influence. Deme- trius (circa B.C. 190) is supposed to have reigned in Arachosia after being expelled from Baetria, much as, at a later date, Baber reigned. in Kabul after his expulsion from Samarkand. LEucratides (181 B.C.) is alleged by Justin to have warred in India. With his coins, found abundantly in the Kabul basin, commences the use of an Arianian inseription, in addition to the Greek, supposed to imply the transfer of rule to the south of the mountains, over a people whom the Greek dynasty sought to conciliate. Under Heliocles (147 B.c. ?), the Parthians, who had already encroached on Ariana, pressed their conquests into India. Menander (126 B.c.) invaded India at least to the Jumna, and perhaps also to the Indus delta, The eoinage of a succeeding king, Hermeus, indicates a barbaric ruption. There is a general correspondence between classical and Chinese accounts of the time when Bactria was overrun by Seythian invaders. The chief nation among these, ealled by the Chinese Yucchi, about 126 3B.c. established themselves in Sogdiana and on the Oxus in five hordes. Near the Christian era the chief of one of these,

which was called Kushan, subdued the rest, and extended his conquests over the countries south of Hindu Kush, including Sind as well as Afghanistan, thus establishing a great dominion, of whieh we hear from Greek writers as Indo-Scythia.

Buddhism had already acquired influence over the people of the Kabul basin, and some of the barbaric invaders adopted that system. Its traces are extensive, especially in the plains of Jalalabad and Peshawar, but also in the vicinity of Kabul.

Various barbarie dynasties suceceded cach other, among which a notable monarch was Kanishka or Kanerkes, who reigned and con- quered apparently about the time of Our Lord, and whose power extended over the upper Oxus basin, Kabul, Peshawar, Kashmir, and probably far into India. His name and legends still filled the land, or at least the Buddhist portion of it, 600 years later, when the Chinese pilgrin Hwen Thsang travelled in India ; they had even reached the great Mahommedan philosopher, traveller, and geographer, Abu Rihan Al-Birfni, in the 11th century ; and they are still celebrated in the Mongol versions of Buddhist ecclesiastical story.

in the time of Hwen Thsang (630-45 a. D.) there were both Indian and Turk prinees in the Kabul valley, and in the suceeeding cen- turies both these raees seem to have predominated in succession. The first Mahommedan attempts at the conquest of Kabul were un- successful, though Seistan and Arachosia were permanently held from an early date. It was not till the end of the 10th century that a Hindu prince ceased to reign in Kabul, and it fell into the hands of the dark Sabaktegin, who had established his eapital at Ghazni. There, too, reigned his famous son Mahmfid, and a scries of descendants, till the middle of the 12th eentury, rendering the eity one of the most splendid in Asia. We then have a powerful dynasty, commonly believed to have been of Afghan race ; and if so, the first. But the historians give them a legendary descent from Zohak, which is no Afghan genealogy. The founder of the dynasty

was Alauddin, chief of Ghur, whose vengeance for the cruel death of his brother at the hands of Bahram the Ghaznevide was wreaked in devastating the great city. His nephew Shahabuddin Mahommed repeatedly invaded India, eonquering as far as Benares. His empire in India indced—ruled by

his freedmen who after his death became independent—may be regarded as the origin of that great Mahom- ™medan monarchy which endured nominally till 1857. For a brief period the Afghan countries were subject to the king of Kharizm, and it was here chiefly that oecurred the gallant attempts of Jala- luddin of Kharizm to withstand the progress of Chinghiz Khan.

A passage in Firishta seems to imply that the Afghans in the Sulimani mountains were already known by that name in the first eentury of the Hegira, but it is uncertain how far this may be built on. The name Afghans is very distinetly mentioned in 'Utbi's History of Sultan Mahmud, written about A.D. 1030, eoupled with that of the Khiljis. It also appears frequently in connection with the history of India in the 13th and 14th centuries. The suecessive dynasties of Dehli are generally ealled Pathan, but were really so only In part. Of the Khiljis (1288-1321) we have already spoken. The Tughlaks (1321-1 421) were originally Tartars of the Karauna tribe. The Lodis (1450-1 526) were pure Pathans. Fora eentury and more after the Mongol invasion the whole of the Afghan countries were under Mongol rule; but in the middle of the 14th eentury a native dynasty sprang up in western Afghanistan, that of the Kuris, which extended its rule over Ghur, Herat, and Kandahar. The

history of the Afghan countries under the Mongols is obseure; but that régime must have left its mark upon the country if we judgo from the oecurrence of frequent Mongol names of places, and even of Mongol expressions adopted into familiar language.

All these countries were included in Timur's conquests, and Kabul at least had remained in the possession of one of his descendants till 1501, only three years before it fcll into the hands of another and more illustrious one, Sultan Baber. It was not till 1522 that Baber succeeded in permanently wresting Kandahar from the Arghuns, a family of Mongol descent, who had long held it. From the time of his conquest of Hindustan (victory at Panipat, April 21, 1526), Kabul and Kandahar may be regarded as part of the

empire of Dehli under the (so-called) Moghul dynasty which Baber founded. Kabul so continued till the invasion of Nadir (1738). Kandahar often changed hands between the Moghuls and the rising Safavis (or Sofis) of Persia, Under the latter it had remained from 1642 till 1708, when in the reign of Husain, the last of them, the Ghilzais, provoked by the oppressive Persian governor ShahnawAz Khan (a Georgian prince of the Bagratid house) revolted under Mir Wais, and expelled the Persians. Mir Wais was acknowledged sovereign of Kandahar, and eventually defeated the Persian armies sent against him, but did not long survive (d. 1715).

Mahmud, the son of Mir Wais, a man of great courage and energy, carried out a project of his father's, the con- quest of Persia itself. After a long siege, Shah Husain came forth from Ispahan with all his court, and surrendered the sword and diadem of the Sofis into the hands of the Ghilzai (Oct. 1722). Two years later Mahmud died mad, and a few years saw the end of Ghilzai rule in Persia.

Nadir Shah (1737-38) both recovered Kandahar and took Kabul. But he gained the goodwill of the Afghans, and enrolled many in his army. Among these was a noble young soldier, Ahmed Khan, of the Saddozai family of the Abdali clan, who after the assassination of Nadir (1747) was chosen by the Afghan chiefs at Kandahar to be their leader, and assumed kingly authority over the eastern part of Nadir's empire, with the style of Dur-i-Durrdn, " Pearl of the Age," bestowing that of Durrani upon his clan, the Abdalis. With Ahmed Shah, Afghanistan, as such, first took a place among the kingdoms of the earth. During the twenty-six years of his reign he carried his warlike expeditions far and wide. Westward they extended nearly to the shores of the Caspian; eastward he repeatedly entered India as a conqueror. At his great battle of Panipat (Jan. 6, 1761), with vastly inferior numbers, he gave the Mahrattas, then at the zenith of power, a tremendous defeat, almost annihilating their vast army; but the suc- cess had for him no important result. Having long suf- fered from a terrible disease, he died in 1773, bequeathing to his son Timfir a dominion which embraced not only Afghanistan to its utmost limits, but the Panjab, Kashmir, and Turkestan to the Oxus, with Sind, Biluchistan, and Khorasan as tributary governments.

Timur transferred his residence from Kandahar to Kabul, and continued during a reign of twenty years to stave off the anarchy which followed close on his death. He left twenty-three sons, of whom the fifth, Zaman Mirza, by help of Payindah Khan, head of the Barakzai family of the Abdalis, succeeded in grasping the royal power. For many years barbarous wars raged between the brothers, during which Zaman Shah, Shuja-ul-Mulk, and Mahmid, successively held the throne. The last owed success to Fatteh Khan, son of Payindah, a man of masterly ability in war and politics, the eldest of twenty-one brothers, a family of notable intelligence and force of character, and many of these he placed over the provinces. The malig- nity of Kamran, the worthless son of Mahmud, succceded

in making the king jealous of his minister; and with match- less treachery, ingratitude, and cruelty, the latter was first blinded, and afterwards murdered with prolonged torture, the brutal Kamran striking the first blow.

The Barakzai brothers unitcd to avenge Fatteh Jhan. The Saddozais were driven from Kabul, Ghazni, and Kan- dahar, and with difficulty reached Herat (1818). Herat remained thus till Kamran's death (1842), and after that was held by his able and wicked minister Yar Mahom- med. The rest of the country was divided among the Barakzais—Dost Mahommed, the ablest, getting Kabul. Peshawar and the right bank of the Tndus fell to the Sikhs after their victory at Naoshera in 1823. The last Afghan hold of the Panjab had been lost long before—Kashmir 1n 1819; Sind had cast off all allegiance since 1808; the Turkestan provinces had been practically independent since the death of Timur Shah.

In 1809, in consequence of the intrigues of Napoleon in Persia, the Hon. Mountstewart Elphinstone had been sent as envoy to Shah Shuja, then in power, and had been well received by him at Peshawar. This was the first time the Afghans made any acquaintance with Englishmen. Lieut. Alex. Burnes visited Kabul on his way to Bokhara '1 1832. In 1837 the Persian siege of Herat and the proceedings of Russia created uneasiness, and Burnes was sent by the Governor-General as resident to the Amir's court at Kabul. But the terms which the Dost sought were not conceded by the government, and the rash reso- lution was taken of re-establishing Shah

Shuja, long a refugee in British territory. Ranjit Singh, king of the Panjab, bound himself to co-operate, but eventually declined to let the expedition cross his territories. The " Army of the Indus," amounting to 21,000 men, therefore assembled in Upper Sind (March 1838), and advanced through the Bolan Pass under the command of Sir John Keane. There was hardship, but scarcely any opposition. Kohandil Khan of Kandahar fled to Persia. That city was occupied in April 1839, and Shah Shuja was crowned in his grandfather's mosque. Ghazni was reached 21st July; a gate of the city was blown open by the engineers (the match was fired by Lieut. afterwards Sir Henry Durand); and the place was taken by storm. Dost Mahommed, finding his troops deserting, passed the Hindu Kush, and Shah Shuja entered the capital (7th August). The war was thought at an end, and Sir John Keane (made a peer) returned to India with a' considerable part of the force, leaving behind 8000 men, besides the Shah's force, with Sir W. Macnaghten as envoy, and Sir A. Burnes as his colleague.

During the two following years Shah Shuja and his allies remained in possession of Kabul and Kandahar. The British outposts extended to Saighan, in the Oxus basin, and to Mullah Khan, in the plain of Seistan. Dost Mahommed surrendered (Nov. 3, 1840), and was sent to India, where he was honourably treated. From the begin- ning, insurrection against the new government had been rife. The political authorities were over-confident, and neglected warnings. On the 2d November 1841 the revolt broke out violently at Kabul, with the massacre of Burnes and other officers. The position of the British camp, its communications with the citadel, and the location of the stores were the worst possible; and the general (Elphinstone) was shattered in constitution. Disaster after disaster occurred, not without misconduct. At a confer- ence (23d December) with the Dost's son, Akbar Khan, who had taken the lead of the Afghans, Sir W. Macnaghten was murdered by that chief's own hand. On 6th January 1842, after a convention to evacuate the country had been signed, the British garrison, still numbering 4500 soldiers (of whom 690 were Europeans), with some 12,000 followers,

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marched out of the camp. The winter was severe, the troops demoralised, the march a mass of confusion and massacre ; for there was hardly a pretence of keeping the terms. On the 13th the last survivors mustered at Gan- damak only twenty muskets. Of those who left Kabul, Dr Brydone only reached J alalabad, wounded and half dead. Ninety-five prisoners were afterwards recovered. The garrison of Ghazni had already been forced to sur- render (10th December). But General Nott held Kan- dahar with a stern hand, and General Sale, who had reached Jalalabad from Kabul at the beginning of the out- break, maintained that important point gallantly.

To avenge these disasters and recover the prisoners preparations were made in India on a fitting scale; but it was the 16th April 1842 before General Pollock could relieve Jalalabad, after forcing the Khybar Pass. After a long halt there, he advanced (20th August), and gaining rapid successes, occupied Kabul (15th September), where Nott, after retaking and dismantling Ghazni, joined him two days later. The prisoners were happily recovered from Bamian. The citadel and central bazaar of Kabul were destroyed, and the army finally evacuated Afghanistan December 1842.

Shah Shuja had been assassinated soon after the depar- ture of the ill-fated garrison. Dost Mahommed, released, was able to resume his position at Kabul, which he retained till his death in 1863. Akbar Khan was made vazir, but died in 1848.

The most notable facts in later history must be briefly stated. In 1848, when the Sikh revolt broke out, Dost Mahommed, stimulated by popular outery and by the Sikh offer to restore Peshawar, crossed the frontier and took Attok. A cavalry force of Afghans was sent to join Sher Singh against the British, and was present at the battle of Gujerat (21st Feb. 1849). The pursuit of the Afghans by Sir Walter Raleigh Gilbert, right up to the passes, was so hot that the Dost owed his escape to a fleet horse.

In 1850 the Afghans re-conquered Balkh.

Jn January 1855, friendly intercourse, which had been renewed between the Dost and the British government, led to the conclusion of a treaty at

Peshawar.

In November 1855, after the death of his half-brother, Kohandil Khan of Kandahar, the Dost made himself master of that province. In 1856 came the new Persian advance to Herat, ending in its capture, and the English expedition to the Persian Gulf. In January 1857 the Dost had an interview at Peshawar with Sir J. Lawrence, at which the former was promised' arms and a subsidy for protection against Persia. In consequence of this treaty a British mission under Major Lumsden proceeded to Kandahar. The Indian mutiny followed, and the Afghan excitement strongly tried the Dost's fidelity, but he maintained it. Lumsden's party held their ground, and returned in May

1858.

In 1863, Dost Mahommed, after a ten months' siege, captured Herat; but he died there thirteen days later (9th June), and was succeeded by his son Sher Ali Khan.

Since then the latter has passed through many vicissi- tudes in rivalry with his brothers and nephews, and at one time (1867) his fortunes were so low that he held only Balkh and Herat. By the autumn of 1868, however, he was again established on the throne of Kabul, and his competitors were beaten and dispersed. In Apmil 1869 Sher Ali Khan was honourably and splendidly received at Amballa by the Earl of Mayo, who had shortly before replaced Sir J. Lawrence. Friendly relations were con firmed, though the Amir's expectations were not fulfilled. He received the balance of a donation of £1 20,000 which had been promised and partly paid by Sir John Lawrence. A considerable present of artillery and arms was made {0

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him; since then some small additional aid in money and arms has been sent, but no periodical subsidy.

Sher Ali Khan now reigns over all Afghanistan and Afghan Turkestan, whilst Badakhshan is tributary to him. In the latter part of 1872 a correspoudence which had gone on between the Governments of Russia and

England resulted in a declaration by the former that Afghanistan was beyond the field of Russian influence; whilst the Oxus, from its source in Lake Sirikol to the western limit of Balkh, was recognised as the frontier of Afghan dominion.

ANTIQUITIES.—We can afford space for only the briefest indication on this subject. The basin of the Kabul river especially abounds in remains of the period when Buddhism flourished, beginning with the Inscribed Rock of Shah- bazgarhi, or Kapur-di-girl, in the Peshawar plain, which bears one of the rvepliche of the famous edicts of Asoka (not later than B.c. 250). In the Koh-Daman, north of Kabul, are the sites of several ancient cities, the greatest of which, called Beghram, has furnished coins in scores of thousands, and has been supposed to represent Alexander's Nicwa. Nearer Kabul, and especially on the hills some miles south of the city, are numerous topes. In the valley of Jalalabad are many remains of the same character. In the Peshawar plain and on the adjoining heights are numerous ancient cities and walled villages, in many cases presenting ruins of much interest, besides the remains of topes, monasteries, cave temples, dc. ; and frequently sculp- tures have been found on those sites, exhibiting evident traces of the influence of Greek art. The Mahdban moun-

AFGHAN TURKESTAN is a convenient name applied of late years to those provinces in the basin of the Oxus which are subject to the Amir of Kabul. BapaKHsHAN and its dependencies, now tributary to the Amir, are sometimes included under the name, but will not be so included here. The whole of the Afghan dominions consist of AFGHANISTAN as defined under that heading, ArGHaNn TURKESTAN, and BADAKHSHAN with its dependencies.

The territories included here will be, beginning from the east, the khanates or principalities of Kunduz, Khulm, Balkh with Akcha; and the western khanates of Sir-i-pul, Shibrghin, Andkhfi, and Maimana, sometimes classed together as the Chihdr Vildyat, or "Four Domains 3" and besides these, such part of the Hazara tribes as lie north of the Hindu Kush and its prolongation, defined in the article AYGHANISTAN. The tract thus includes the whole southern moiety of the Oxus basin, from the frontier of Badakhshan on the east to the upper Murghab river on the west. The Oxus

itself forms the northern boundary, from the confluence of the Kokcha or river of Badakhshan, in 694° E. long., to Khoja Salih ferry, in 65° E. long. nearly. Here the boundary quits the river and skirts the Turkman desert to the point where the Murghab issues upon it. Along the whole southern boundary we have a tract of lofty mountain country. Thus, in the east, above Kunduz, we have the Hindu Kush rising far into the region of perpetual snow, and with passes ranging from 12,000 to 13,000 feet and upwards. Above Khulm and Balkh is the prolongation of Hindu Kush, called Koh-i-baba, in which the elevation of the cols or passes seems to be nearly as high, though the general height of the crest is lower. The mountains then fork in three branches westward, viz., Koh-i-Siah, "The Black Mountain," to the south of the Herat river ; Koh—Safed, " The White Mountain," between the Herat river and the Murghab, and a third ridge north of the latter river. The second branch (Safed-Koh) has been assumed in the article AFGHANISTAN as the boundary of

tain, near the Indus, which has been plausibly identified with the Aornos of the Greeks, and the hills more imme- diately compassing the Peshawar valley, abound in the ruins of very ancient fortresses. At Talash, on the Panjkora river, are extensive ruins of massive fortifications 3 and in Swat there are said to be remains of several ancient cities,

In the valley of the Tarnak are the ruins of a great city (Ulan Robat), supposed to be ancient Arachosia. About Girishk, on the Helmand, are extensive mounds and other traces of buildings; and the remains of several great cities exist in the plain of Seistan, as at Pulki, Peshawaran, and Lakh, relics of ancient Drangiana, as yet unexamined. An ancient stone vessel, preserved in a mosque at Kandahar, is almost certainly the same that was treasured at Peshawar in the 5th century as the begging-pot of Sakya-Muni. Of the city of Ghazni, the vast capital of Mahmud and his race, no substantial relics survive, except the tomb of Mahmud and two remarkable brick minarets.

To the vast and fruitful harvest of coins that has been gathered in Afghanistan and the adjoining regions, we can here but make an allusion.

(Elphinstone's Caubool; various papers in J. As. Soc. Bengal; Ferrier's Journeys, and Hist. of the Afghans; Bellew's Journal, Report on the Yi usufzais, and Notes on flora of Afgh.; James's Report on Peshawar District ; Raverty's Afghan Grammar; Panjab Trade Report ; Baber's Memoirs; Kaye's History ; papers by Major Lums- den, and by Lieut.~~Col. C. M. Macgregor, &. The para~~ graph on the Animal Kingdom has been revised by Prof. Henry Giglioli of Florence.) (H. y.)

that region. We know almost nothing of these mountains, except from the journey of Ferrier, who crossed all three watersheds in four days of July 1845. He describes the middle range as very lofty, with a good deal of snow on the pass; the southern range not so high, the northern one not nearly so high.

Rivers.—We shall first describe the rivers of this region in succession.

For the Oxus itself, see that article.

Beginning from the eastward, its first tributary within our limits is the river of Kunduz, known also as the river of Aksarai, the Surkhab, and what not. As the principal source of this river we may regard the stream of Bamian, fed close under the Koh-i-Baba by a variety of torrents which join from the pass of Akrobat and other gorges of the Hazara country, adjoining that famous site (8496 feet above sea level). The names of some of these seem to preserve a tradition of the ancient population ; such are the 'Cutlers' Vale," "the Smiths' Vale," the " Valley of Kye-paint." At the eastern end of the valley the Bamian stream reecives another of nearly equal bulk, descending from the pass of Hajjigak, the most important crossing of the mountains between Kabul and the Oxus, and from which the road descends upon Bamian, and thence by Saigh4n, Khurram, and Haibak, to Khulm, in the Oxus valley. On the volcanic rock which parts the streams stand extensive ruins, the name of which, Zohak, connects them with the most ancient legends of Persian history.

From this the river turns nearly north, passing the country of the Sheikh 'Alis, one of the most famous Hazara elans, and closely skirting the great range of Hindu Kush. About 40 miles N.N.E. of Zohak it receives from the left two confluents, of size probably almost equal to its own—the rivers of

Saighan and of Kamard, both rising to the westward of Bamian, and crossing the highway from Bamian to Khulm. Hereabouts the river seems to take the name of Surkhab. The first considerable confluent on the right is the Andarab river, draining the valley of that name, and joining at Doshi, about 85 miles in a direct line N.E. of Zohak. About Ghori, still a place of some note, the valley widens out greatly, and becomes in places swampy, with expanses of tall grass, a character which it thenceforth retains. The river is, or has been, bridged at Thomri, a few miles beyond Ghori, a work ascribed to Aurangzib. It then receives from the right the Baghlan river, coming from Narin and the hills of Khost. The only remaining confluent is the important one which joins immediately below the town of Kunduz, sometimes called the Khanabad river, sometimes by the names of its chief contributarics, the Farokhar and Bangi.

The Farokhar, or river of Talikan, is the most easterly, coming out of Badakhshan, the boundary of which runs along the watershed on its left bank. The Bangi flows through Khost from the highlands of Badakhshan, east of Andarab. A third tributary, the Shorab, salt, as its name implics, drains the high range called Esk-mushk, above Narin. '

The Surkhab or Kunduz river enters the Oxus at a point approxi- nately (no traveller has visited the confluence) 32 miles N.W. of Kunduz, its whole length, exclusive of minor windings, being about 220 miles.

From Ghori downwards, the hills which bound the valley on either side appear to be of no great elevation, and to be tolerably clothed with grass, and occasionally with fir trees; the aspect of the country gradually approximating to that of Badakhshan, in contrast to the cnore sterile offshoots of Koh-i-Baba to the westward.

Kunduz itself lies very low, scarcely 500 feet above sea level, and the roads approaching the town have to pass over piles amid the swampy vegetation. The adjacent plain is In the main richly cultivated and thickly peopled, but it is interspersed with extensive tracts of jungly grass, and is extremely and

proverbially unhealthy. The plains, which extend, though not unbroken, from Kunduz to the Oxus, are free from the bare and repulsive character of those further west, and are described as covered in part with rich cultiva- tion, thick with groves and hamlets, and in part with splendid pasture. ; -:

Procecding westward, the next tributary to the Oxus basin is the Khulm river. The traveller from Bamian northward first touches the Khulm river, on descending from the Kara-Kotal, at a spot called Dodb Shahpasand, probably 5000 feet above the sea, where 'ts {wo main sources join, and the main road to Turkestan keeps on or near the river till its exit on the Oxus plain. The character of the mass of mountains which extends from the Koh-i-Baba to Khulm is utter rocky aridity, but broken sometimes in the sudden trench-like valleys by an exuberant vigour of vegetation. Along a chain of these trench-like gorges, walled by stupendous cliffs scem- ing sometimes almost to close overhead, the traveller descends to- wards Khulm. At Haibak the valley opens out, but closes in again before Khulm is reached. Here he emerges from a narrow gorge upon the plain of the Oxus, some 20 miles from the great river, and leaves the mountains suddenly, as onc leaves the gate of a fortress, still rising behind in a bold rampart to the height of 2500 feet. The river is belicved to be spent in irrigation before reaching the Oxus.

'As far north at least as Khurram, half-way from Bamian to Khulm, the offshoots of Koh-i-Baba, west of the Khulm defile, must reach a height of 11,000 or 12,000 feet; for here Ferrier found bitter cold and snow ou thc top on the 7th of July (latitude nearly 36°).

The next river westward is the Balkh river, sometimes called Dehés. It rises not far from some of the tributaries of the Surkhab, nor from the sources of the Herat river, at a remarkable spot which, under the name of the Band-i-Barbar, or Barbar dam, is the subject of various legends, though we have no distinct account of it. The valley of Yekalang, on the upper waters of this river, at a height of 7000 fect above the sea, was visited by A. Conolly, and is described by him as fertile, well-watered, and populous, about 15 miles in length by } to 4 mile in width. Ferrier is the only traveller who has crossed the mature stream, and he merely mentions that he forded it, and that it was rather rapid. We thus know almost nothing of the river. In length

it cannot come far short of the Surkhab. Beyond the lofty mountains recently spoken of, some of the hills towards the Balkh-ab have a thin clothing of wood, and the valleys opening on the river are wide and not unfertile. The main valley expands into level tracts of pasture, covered by long grass and intersected by artificial watcr-courses; but (as with the

hulm river) the gorge from which the stream issues on the Oxus

lain is narrow, and walled in by very high hills on either side.

he ruins and gardens of ancient Balkh stand about 6 miles from the hills, but no part of the river appears to reach the site in its natural bed, nor does any part of its waters reach the Oxus in a running stream.

The plains that slope from the gardens of Balkh to the Oxus are naturally white hard steppes, destitute of spontaneous verdure save sparse brush of tamarisk and other meagre growths; but the soil responds richly to irrigation whenever this is bestowed.

_ The next stream that we meet with, and the last that can be con- sidered even as an indirect tributary of the Oxus, is that which fer- tiliscs the small khanates of Shibrghan and Andkhui, on the verge of the Turkman desert; whilst the two confluents that contribute to form it have previously watered the territories of Siripul and Maimana. The river, or whatever survives of its water after irri- gating Andkhui, is lost in the desert. The taste of the water is abominable, and, though the inhabitants are accustomed to it strangers suffer from its usc. '

The last river that we have to notice is the Murghab, which rises between the two northern branches of the Koh-i-Baba or Paro- pamisus. Ferrier is the only traveller who has been on the upper waters of the Murghab. He takes no notice of the river itself, but describes a remarkable plain or basin, about 120 miles in circuit,

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entirely surrounded by mountains, well-watered, and rich in vege- tation. idolaters. Their country is a part of the old territory of Garjistan. 'At Shah

Mashad, about half-way between this and the plains, the river was crossed by Major Eldred Pottinger, but we have no access to his report. Further down, as the river approaches the foot of Murghab Bala, on the road from Maimana to Herat, it runs with great 35 to 40 miles below Murghab, it begins to flow through a valley of clay soil, bounded by sandy heights, and gradually opening into the plain of Merv. the boundary does not seem as yet to have been precisely fixed. About 100 miles merly there was a great dam, securing the fertility of that oasis, the nucleus of ancient Margiana. This was destroyed by the Amir Maasum (otherwise Shah Murad) of Bokhara, about 1785, when he carried off the whole population into slavery. Beyond Merv the river is lost in the desert.

[AFGHAN The people are Mongol Hazaras, and, according to Ferrier, violence, and the valley narrows to a defile. At Panjdeh,

Hereabouts, too, it quits the Afghan terntory, but

from Panjdeh the river reaches Merv, where fer-

PROVINCES AND Piaces of Notse.—We do not know

the precise divisions maintained under the Afghans, but they coincide generally with the old principalities or khanates, the hereditary rulers of which, in several cases, continue in authority under the Afghan governor of Turke- stan. Bamian, Saighan, and the higher valleys belong, it is understood, to a special command over the Hazara tribes.

L Kunduz.—Beginning again.from the east, the first

province is Kunduz, having on the east Badakhshan, on the west Khulm, on the north the Oxus, and on the south Hindu Kush, The districts of Kunduz are approximately as follows:—(1.) Kunduz, with the chief town of the province, a wretched place, as described by Wood, of some 500 or 600 mud huts, intermingled with straw sheds, Uzbek tents, gardens, and corn-fields, and overlooked by a mud fort on an extensive mound. (2.) Hazrat Imdm, on the irrigated and fertile Oxus plain. The town, known in the

Middle Ages as Arhang, is described as about the same size as Kunduz, with a better fort, protected by a wet ditch. (3.) Baghidn, and (4.) Ghort, in the swampy valley of the Surkhab. (5.) Doshe, further up the same valley, at the confluence of the Andarab stream. (6.) A7llagae and Khinjén, near the lower part of the Andarab stream. (7.) Andarab, at the foot of the Tul and Khawak passes over Hindu Kush, often supposed to be the Adrapsa of Alexander's historians. This secluded town was a favourite minting place of the Samanid sovereigns of Persia and Turkestan, in the 10th century, probably owing to the vicinity of silver mines at Paryan. (8.) Khost les between Andarab and Kunduz. The name often occurs in the history of Baber and his successors. (9.) Varin and Ish- kimish Vie to the east of Baghlan, at the sources of the Baghlan stream and of the Shorab branch of the Kunduz river. The second name appears to be the same as Lshk- mushk, which Wood applies to a high mountain in this quarter. (10.) Farhang and Chal lie on the borders of Badakhshan, and are utterly unknown. (11.) Zalikan also lies on the borders of Badakhshan, but is pretty well known, being on the main road between Kunduz and Faizabad, the capital of Badakhshan. It is now a poor place, but'is ancient, and was once famous. A fortress here stood a long siege from Chinghiz Khan, and the place is mentioned by Marco Polo as Zaican. During the rule of Murad Beg of Kunduz this was the seat of a government that included Badakhshan. (12.) Khanabad, on the river of that name, pleasantly elevated above the swampy level of Kunduz, is, or was, the usual summer residence of the chiefs of that territory.

Il. Khulm was the next of the khanates, lying between Kunduz and Balkh. The districts, as far as we know them, are the following :—(1.) Tdshkurghin. The old town of Khulm stood in the Oxus plain, surrounded by watered orchards of famous productiveness; but it lay so exposed to the raids of the Kunduz Uzbeks that the chief, Killich Ali, in the beginning of this century, transferred

his residence to Tashkurghan, 4 miles further south, aud just at the mouth of the defile—a cheerless group of villages, consisting of mud houses with domed roofs, con- nected by gardens and enclosed by a inud wall 3 it is

sup- posed to contain at least 15,000 souls, and is a place of considerable trade. (2.) Haibak. The town presents rather an imposing aspect, clustering round a castle of some strength on an isolated eminence; the domed houses, however, are compared to large brown bee-hives. The Khulm river valley here opens out, and is very fertile; the banks are shaded by luxuriant fruit trees. The site is a very ancient one, and, under the name of Samangdn, was famous in Persian legend. One traveller describes there a remarkable relic of antiquity called the Takht or Throne of Rustam. This, from the account, would seem to have been a Buddhist dagoba.' (3.) Khurram Sarbdgh, so called from two villages in the upper defiles of the Khulm river.

III. Balkh. Balkk proper is the populous and well- watered territory upon the eighteen canals which draw off the waters of the Balkh-ab, and on which there are said to be 360 villages.

No trace has been recovered of the ancient splendours of Bactra, nor do the best judges appear to accept Ferrier's belief that he saw cuneiform inscriptions upon bricks dug up there. A late Indian report by an intelligent Mahom- medan speaks of a stone throne in the citadel, to which traditional antiquity is ascribed, but of this we know no more. The remains that exist are scattered over some 20 miles of circuit, but they consist mainly of mosques and tombs of sun-dried brick, and show nothing even of early Mahommedan date. The inner city, surrounded by a ruined wall of 4 or 5 miles in compass, is now entirely deserted; a scanty population still occupies a part of the outer city. In 1858 Mahommed Afzal Khan, ruling the districts of Turkestan on behalf of his father, Dost Mahommed, transferred the seat of the Afghan govern- ment and the bulk of the population to Takhtapul, a position which he fortified, some 8 miles east of the old city; and this remains the capital of the Afghan territories on the Oxus.

The only other place of note in the district is Mazdr-t- Sharif, or the "Noble Shrine," on the road to Khulm, where a whimsical fiction has located the body of 'Ali, the son-in-law of Mahommed. It is the object of pilgrimages, and the scene of a great annual fair. Vambéry speaks of the roses, matchless for colour and fragrance, that grow on the pretended tomb.

Of the districts lying on the Balkh river within the hills we know nothing.

Akcha, some 40 to 45 miles westward from Balkh, was an Uzbek khanate before the last Afghan conquest. It is small, but well-watered and populous. The town is forti- fied, and has a citadel. Accounts differ as to the popula- tion; one writer calls them Uzbeks, another Sarak Turk- mans,

IV. The provinces known as the Four Domains are :-— (1.) Shibrghan, some 20 miles west of Akcha. This was another small Uzbek khanate. The town, which contains about 12,000 Uzbeks and Parsiwans, has a citadel, but is not otherwise fortified. It is surrounded by good gardens, and excellent cultivation, but its water supply is dependent upon Siripul, and, in the frequent case of hostility between the two, is liable to be cut off. Ferrier speaks highly of the climate and the repute of the inhabitants for valour. f Shibrghan (Sapurgan) and its fine melons are mentioned by Marco Polo. (2.) Andkhui, about 20 miles north-west of Shibrghan, forms an oasis in the desert, watered by the

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1 Burslem, A Peep into Turkestan, p. 125.

united streams from Siripul and from Maimana., It was once a flourishing city, and the oasis was reckoned to con- tain 50,000 inhabitants, but the place has scarcely recovered from the destruction it endured at the hands of Yar Mahommed of Herat in 1840. It was at Andkhui that Moorcroft died in 1825 ; but his grave is at Balkh. Tre. beck, the last survivor of his party, died and was buried at Mazar. (3.) Maimana, 105 miles from Balkh, and some 50 south-west of Andkhui, contains some ten or twelve villages or townships, besides the capital, anda population estimated at 100,000 souls. It is a district of considerable produc- tiveness, industry, and trade, and the Uzbek inhabitants have a high reputation as soldiers. The chief was formerly a notorious slave-dealer. (4.) Siripul. This khanate lying within the limits of the undulating country south-west of Balkh and east of Maimana, is of about the same calibre as the latter, but somewhat lower in estimated population. Two-thirds of the people are Uzbeks, the rest Hazaras, From the last a tribute of slaves is, or used to be, exacted; and Hazara widows, it is said, were claimed as govern- ment property, and sold by auction. The town of Siripul is an irregular mass of houses clustered on the slope of a

hill crowned by a fort. Many tents gather round it also,

and Ferrier estimates the population of town and tents as

high as 18,000. The valley below is abundantly watered, and the breadth of orchards and tillage is considerable.

PopuLaTIon.—In the estimate of population cited under AFGHANISTAN, that of Afghan Turkestan is reckoned at 642,000. This includes 55,000 for Badakhshan (no doubt too low an estimate) ; and the remainder, for the provinces included under our present article, excluding Hazaras, will be 587,000. Anything but a round' number is entirely

"Inappropriate to such an estimate 3 but we shall probably

not be far wrong if we reckon the population at 600,000.

The Tajiks, or people of Iranian blood, are probably the representatives of the oldest surviving race of this region, They are found in some districts of Balkh and valleys of Kunduz. Khost, for instance, is said to be chiefly occupied by them. Uzbeks seem to be the most numerous race ; and there are some other Turk tribes not classed as Uzbeks.? There seem to be a good many families claiming Arab descent; Afghans, especially about Balkh and Khulm; and in the towns some Hindus and Jews.

Propucts anp InpustRY.—We have no means of giv- ing any systematic account of the products of these pro- vinces, either in natural history or industry. Rock-salt is worked at Chal, near the Badakhshan frontier, as well as beyond that frontier. Pistachio nuts are grown largely in the hill country of Kunduz, as well as the adjoining districts of Badakhshan, and the whole supply of India, Central Asia, and Russia is said to be derived from this region, Fruit is abundant and excellent, especially in Khulm and Balkh. Andkhui, before its decay, was famous for the black sheepskins and lambskins which we call astrakhan 4 and also for a breed of camels in great demand. Kunduz produces a breed of horses, highly valued in the Kabul market under the name of Kataghan. Maimana also is famous for horses, which are often exported to India ; and is a mart for carpets and textures of wool and.camels' hair, the work of Turkman and Jamshidi women. Slave-

dealing and man-stealing have long been the curse of this region, but late changes have tended to restrict these, and the Russian conquest of Khiva will probably have a most beneficial effect in this respect at least.

Mistory.—Ancient Balkh, or Bactra, was probably one of the oldest capitals in Central Asia. There Persian tra- dition places the teaching of Zoroaster. Bactriana was a

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? The Uzbeks were, however, a confederation of many Turk and Tartar tribes, not one race.

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province of the Achzmenian empire, and probably was occupied in great measure by a race of Tranian blood. About B.c. 250, Theodotus, governor of Bactria under the Seleucidse, declared his independence, and commenced the history, so dark to us, of the Greco-Bactrian dynasties, whose dominions at one time or another—though probably never simultaneously—touched the Jaxartes and the Gulf of Cutch. Parthian rivalry first, and then a series of nomad movements from inner Asia, overwhelmed the isolated dominion of the Greeks (circa B.c. 126). Powers rose on the Oxus, known to the Chinese as Yuechi, Kweish- wang, Yetha, Tukharas, and what not; dimly to western Asia and Europe as Kushans, Haidthala, Hphthalite or White Huns, and Zochari. Buddhism, with its monas- teries, colossi, and gilded pagodas, spread over the valley of the Oxus. We do not know what further traces of that time may yet be revealed ; but we see some in the gigantic sculptures of Bamian. The old Arab historians of the Mahommedan conquest celebrate a heathen temple at Balkh, which they call 1 aobihadr, which Sir H. Rawlinson has pointed out to have been certainly a Buddhist monas- tery (Nava-Vihdra). The name Naobihar still attaches to a village on one of the Balkh canals, thus preserving, through so many centuries, the memory of the ancient Indian religion. The memoirs of the Chinese pilgrim Hwen Thsang, in the first part of the 7th century, give many particulars of the prevalence of his religion in the numerous principalities into which the empire of the Tukharas had broken up; and it is remarkable how many of these states and their names

are identical with those which still exist. This is not confined to what were great cities like Balkh and Bamian ; it applies to Khulm, Khost, Baghlan, Andarab, and many more.

As Haiathalah, or Tokhdristén, the country long con- tinued to be known to Mahommedans ; its political destiny generally followed that of Khorasan. It bore the brunt of all the fury of Chinghiz, and the region seems never to have effectually recovered from the devastations and mas-

sacres which he began, and which were repeatcd in degree in succeeding generations. For about a century these Oxus provinces were attached to the empire of the Dehli Moguls, and then fell into Uzbek hands. In the last century they formed a part of the dominion of Ahmed Khan Durrani (see AFGHANISTAN), and so remained under his son Timur. But during the fratricidal wars of Timur's sons they fell back under the independent rule of various Uzbek chiefs. Among these, the Kataghans of Kunduz were long predominant ; and their chief, Murad Beg (1815 to about 1842), for some time ruled Kilab beyond the Oxus, and all south of it from near Balkh to Pamir.

In 1850 the Afghans recovered Balkh and Khulm; by 1855 they had also gained Akcha and the four western khanates; Kunduz in 1859. They were proceeding to

extend their conquests to Badakhshan, when the Amir of |

that country agreed to pay homage and tribute.

We have noticed, in the conclusion of the article AFGHAN- ISTAN, the correspondence which recently took place (1872- 73) with Russia regarding the recognition of the Oxus as the boundary of Afghan Turkestan.

Antiquities.—These are known but very imperfectly. The best known, and probably the most remarkable, are the famous colossi at Bamian, with the adjoining innumer- able caves. In the same locality are the ruins of the medieval city destroyed by Chinghiz, the great fort called Sayadabad, and

the ruins of Zohak. At Haibak are numerous caves like those of Bamian. have little or nothing to show, though probably excavation would be rewarded. The little known or unknown valleys of Badakhshan probably contain remains of interest, but our only notices of them are so highly spiced with imagina- tion as to be worthless. General Ferrier saw remarkable rock sculptures in a defile in the Hazara country, south of Siripul, and curious rock excavations a little further south.

(Wood's Journey, 2d ed., 1873, with Introductory Essay ; Ferrier's Caravan Journeys; Burnes's Travels ; Indian official documents; Vambéry's Zravels; &c., &c.) (H. ¥.)

AFIUM-KARA-HISSAR, a city of Asiatic Turkey, in the pashalic of Anatolia, nearly 200 miles E. of Smyrna, and 50 miles S.S.E. of Kutaiah. It stands partly on level ground, partly on a declivity, and above it rises a precipitous trachytic rock 400 feet in height, on the sum- mit of which are the ruins of an ancient castle. From its situation on the route of the caravans between Smyrna and western Asia on the one hand, and Armenia, Georgia, &c., on the other, the city is a place of extensive trade, and its bazaars are well stocked with the merchandise both of Europe and the East. Opium in large quantities is pro- duced in its vicinity, and forms the staple article of its commerce; and there are, besides, manufactures of black felts, carpets, arms, and saddlery. Afium contains several mosques (one of them a very handsome building), and it is the seat of an Armenian bishop. The population is estimated at about 60,000.

AFRAGOLA, a town of Italy, in the province of Napoli, 6 miles N.N.E. of Naples. It has extensive manufac- sais ee straw bonnets. Population of commune (1865),

493.

AFRANIUS, Lucius, a Latin poet who lived about a century before Christ. He wrote comedies in imitation of Menander, and was commended by Cicero and Quintilian for his acute genius and fluent style. The fragments of his works which are extant have been collected by Bothe in his Poete Scenict Latini, and by Neukirch in his De Fabula Togata Romanorum.

AFRANIUS, Luctus, whose early history is unknown, was a devoted friend and adherent of Pompey, whom he served with distinction as one of his lieutenants in the Sertorian and Mithridatic wars. In the year 60 B.c., and chiefly by Pompey's support, he was raised to the consul- ship, but in performing the duties of that office he showed, like many other soldiers both before and since, an utter incapacity to manage civil affairs. In the following year, while governor of Cisalpine Gaul, he had the good fortune to obtain the honour of a triumph, and on the allotment of Spain to Pompey, 55 3.c., Afranius and Petreius were sent to take charge of the government of that country. On the rupture between Czsar and Pompey, they were

compelled, after a short campaign in which they were at

first successful, to surrender to Cesar at Ilerda, 49 B.c., and were dismissed on promising not to serve again in the war. Afranius, regardless of his promise, joined Pompey at Dyrrhachium, and at the battle of Pharsalia, 48 B.c., he had charge of Pompey's camp. On the complete defeat of Pompey, Afranius, despairing of pardon from Ceesar, re- paired to Africa, and was present at the battle of Thapsus, 46 8.c., which ruined the hopes of the Pompeians in that part of the world. Escaping from the field with a strong body of cavalry, he was afterwards taken prisoner, along with Faustus Sulla, by the troops of Sittius, and handed over to Cresar, whose veterans, disappointed at their not being led to immediate execution, rose in tumult and put them to death.

Balkh seems to.

geography of Africa.

Ancient Egypt.

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AFRICA

HIS vast continent, though associated from the dawn

of civilisation with traditions and mysteries of the

most stimulating kind, has remained until recently one of the least known, and, both commercially and politically, one of the least important of the great divisions of the globe. The knowledge of Africa possessed by the ancients was very limited, owing principally to its physical construc- tion. The great desert, which in a broad belt stretches quite across the continent, forbade every attempt to pass it until the introduction of the camel by the Arabs. The want of any known great river, except the Nile, that might

- conduct into the interior, contributed to confine the Greek

and Roman colonists to the habitable belt along the north- ern coast. 'The Phoenicians are known to have formed establishments on the northern coast of Africa at a very early period of history, probably not less than 3000 years ago; and the conquest of Egypt by Cambyses dates as far back as the year B.c. 525. We may consider, therefore, the coasts of Egypt, of the Red Sea, and of the Mediter- ranean, to have been settled and well known to the ancient Asiatics, who were constantly passing the narrow isthmus which divided their country from Africa and led them im- mediately from parched deserts into a fertile valley, watered by a magnificent river. But whether they were much or little acquainted with the western coast, which bounds the Atlantic, and the eastern coast, washed by the Indian Occan, is a question that has exercised the research and ingenuity of the ablest scholars and geographers, and has not yet been satisfactorily answered.

This question being one of curiosity rather than utility, we shall only state the case, and the results of the several inquiries, without eutering into the merits of the arguments advanced by the different parties. We are told by Hero- dotus, that Necho, king of Egypt, sent out an expedition under the command of certain Phoenician seamen, for the purpose of circumnavigating Africa ; and that, on their re- turn, they asserted that they had accomplished this under- taking. Few of the ancient writers give credit to the story; but, among the moderns, the Abbé Paris and Montesquieu have contended that this voyage was actually performed. Isaac Vossius and D'Anville have strong doubts ; and Dr Vincent and M. Gosselin maintain that such an expedition,

at such a period, exceeds all the means and resources of

navigation, then in its infancy. Last of all comes Major Rennel, who, in his elucidation of the geography of Hero- dotus, has done more than all the rest in clearing away the doubts of history ; and he argues the possibility of such a voyage, from the construction of their ships, with flat bot- toms and low masts, enabling them to keep close to the land, and to discover and enter into all the creeks and har- bours which any part of the coast might present. At all events, one thing is evident: if such an expedition ever circumnavigated the African continent, the fruits of it have nearly, if not entirely, perished.

About half a century after this supposed expedition, the

account of another voyage, down the western coast, is con-

tained in the Periplus of Hanno, which has also called forth many learned and elaborate discussions among modern geo- graphers, some of whom would carry Hanno to the Bight of Benin, others only to Sherbro Sound or the river Nun in lat. 28° N.

The extent to which ancient discovery proceeded along the eastern coast of Africa, has divided the opinion of the learned nearly as much as its progress on the western coast. Delisle, Huet, and Bochart, made the discovery of the coast to extend as far south as Mozambique and Madagascar.

D'Anville could trace such discovery no farther than to Cape Delgado; and M. Gosselin contends that the ancients never proceeded down the coast beyond Brava. But Dr Vincent, who has entered more profoundly into the subject than any of his predecessors, and brought a great fund of learning to bear on the question, in his Periplus of the Erythrean Sea, has with great plausibility extended these boundaries to Mozambique and to the island of Madagascar.

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Sketch Map of Africa.

Egypt, under the Ptolemies, the great patrons of scicnce and promoters of discovery, possessing the advantage of the only great river which falls from

the African continent into the Mediterranean, made no progress beyond its au- cient boundaries ; and though the Romans, who subse- quently possessed Egypt, penctrated beyond the limits of their own dependencies, they extended their discoveries no further than Fezzan in one direction, and, at a later period, beyond Nubia as far as Abyssinia, and the regions of the Upper Nile. We know nothing of the progress made by

the Carthaginians in the discovery of Interior Africa; but The Car- although it has been asserted that their merchants had thaginians.

reached the banks of the interior river, which we call the Kawara or Niger, they have left nothing on record that will warrant such a supposition. The story told by Hero- dotus, of some Nasamonians crossing the desert, and arriv- ing at a large river, can only be applicable to some western arm of the Nile. first information concerning the interior of Northern Africa are the Arabs, who, by means of the camel, were able to penetrate across the great desert to the very centre of the continent, and along the two coasts as far as the Senegal and the Gambia on the west, and to Sofala on the east. On this latter coast they not only explored to an extent far beyond any supposed limits of ancient discovery, but planted colonies at Sofala, Mombas, Melinda, and at various other places.

The 15th century produced a new era in maritime dis- Portu- covery. The voyages of the Portuguese were the first to guese.

give anything like an accurate outline of the two coasts,

The people from whom we derive the The Arabs,

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and to complete the cireumnavigation of Africa. The dis- eovery of America and the West India islands gave rise to that horrid traffic in African negroes, which has since been suppressed ; but this traffic has becn the mcans of acquiring a more extended and accurate knowledge of that part of the coast which lies betwcen the rivers Senegal and the Cameroons, as well as of the manners and character of the

The Eng- people who inhabit this extended line of coast. With the lish and English and French scttlements in Africa began a systematic French. —_ survey of the coast, and portions of the interior. African The uncertainty and confusion that prevailed in the geo- Associa- graphy of the interior of Africa induced a few learned and Hon. scientific individuals to form themselves into an association for promoting the exploration of Inner Africa. This society was formed in London in 1788, and under its auspices 1m- portant additions were made to the geography of Africa by Houghton, Mungo Park, Hornemann, and Burckhardt. Repeated failures, however, at length discouraged the asso- ciation from engaging other missionaries, and it subse- quently merged in the Royal Geographical Society in 1831. Discoveries During the last sixty years more has been done to make

in the 19th us acquainted with the geography of Africa than during century. the whole of the 1700 previous years, since Ptolemy, taken together. With Mungo Park, strictly speaking, commences the era of unccasing endeavours to explore the interior.

Mungo Park proceeded in 1795 from the river Gambia on the west coast, to the Joliba (commonly ealled Niger), traced this river as far as the town of Silla, explored the intervening countrics, determined the southern confines of the Sahara, and returned in 1797. In 1805 this adven- turous traveller embarked on a second journey in the same regions, for the purpose of descending down the river Joliba to its mouth. This journey added little to the discoveries already made, and cost the traveller his life. He is ascer- tained to have passed Timbuktu, and to have reached Boussa, where he was killed by the natives. In 1798 Dr Lacerda, a scientific Portuguese traveller, who had already acquired fame through his journeys in Brazil, made the first great journey in South-Eastern Africa, inland from Mozambique, and reached the capital of the African king, known as the Cazembe, in whose country he died.

Hornemann, in 1796-98, penetrated from Cairo to Mur- zuk, and transmitted from that place valuable information respecting the countries to the south, especially Bornu. He then proceeded in that direction, but it is supposed that he soon afterwards perished, as no accounts of his fur- ther progress have ever reached Europe. The first actual crossing of the

continent that has been recorded was ac- complished between the years 1802 and 1806, by two Pom- beiros or mercantile traders in the employment of the Por- tuguese, who passed from Angola eastward through the territories of the Muata Hianvo and the Cazembe, to the possessions on the Zambeze. In 1816 an expedition was sent out by the English Government, under the eommand of Captain Tuckey, to the river Congo, which was at that time believed to be the lower course of the Joliba. This was a disastrous undertaking, and the geographical addi- tions were but slight, the river having been ascended a distance of only 280 miles.

In 1819 Lyon and Ritchie penetrated from Tripoli to Murzuk, and a little distance beyond that place.

In 1822 Denham, Clapperton, and Oudney, set forth from Tripoli in the same direction, crossed the Great De- sert, and reached, on the 4th February 1823, the great lake Tsad or Chad. The surrounding countries were explored as far as Sakatu in the west, and Mandara in the south. This journey was altogether one of the most successful and im- portant into the interior. Oudney died in Bornu, but Clap- perton undertook a second journey from the coast of Guinea, crossed the Kawara, and arrived at Sakatu, at which place he

Park.

Lacerda.

Horne- mauin.

Tuckey.

Lyon and Ritchie.

Denham, Clapper- ton, and Oudney.

also died. His servant, Richard Lander, returned to Eng- land, after having explored a part of the adjoining regions,

Major Laing succeeded in reaching Timbuktu from Tri- Laing poli, but was murdered on his return in the desert.

In 1827 and 1828 Caillié set out from the Rio Nunez caja on the western coast, reached Timbuktu, and returned from that place through the Great Desert to Maroeco. A second Portugucse journey was undertaken in 1830 from Mozam- bique to the Cazembe's dominions, and Major Monteiro, the leader of the expedition, more fortunate than his pre- decessor Dr Lacerda, was enabled to complete a map of the country traversed, and to bring back a complete account of this portion of the interior.

The termination of the Joliba, Kawara, or Niger, remained Landers, _ in obscurity till 1830, when it was ascertained by Lander and his brother, who succeeded in tracing the river from Yaouri down to its mouth. They embarked on a second expedition, which sailed in 1832, for the purpose of ascend- ing the Kawara as far as Timbuktu. But only Rabba was reached, and the general results of the expedition were most disastrous.

The great Niger expedition, similar to the foregoing, Niger ex. | consisted of three steam-vessels, and was despatched by the pedition. | Government in 1841, under Captain Trotter. It proved a failure, and resulted in a melancholy loss of life.

In the region between the Kawara and the coast, Mr Duncan, | Duncan, one of the survivors of the Niger expedition, made some additions to our geographical knowledge by his journey to Adafoodia, in 1845-46. This enterprising traveller met with an untimely death in a second attempt in the same region for the purpose of reaching Timbuktu.

The: preceding journeys were confined chiefly to the East northern and western portions of the continent. A much Afniean greater number of travellers explored the regions drained Travellers, by the Nile, the salubrity of which, particularly of Abyssinia, is so infinitely greater than that of Western Africa, that among the many explorers of the former, a very small proportion have died as compared with the im- mense loss of life in Western Africa. Among the most distinguished of the earlier Hast African travellers are Bruce (1768-73), Browne (1793), who reached Darfur, Burckhardt

(1814), Cailliaud (1819), and more recently Riippel (1824-25), Russegger (1837), D'Abbadie (1838—

44), Beke (1840-44), D'Arnaud and Werne on the White Nile (1840-42), and Brun Rollet (1845). .

Though the Duteh settlement in South Africa was South founded as early as 1650, not much information of the Africa interior of that portion of the continent was gained till the pa end of the 18th century, when a series of journeys was com- menced by Sparrmann, and followed up by Vaillant, Barrow, Trotter, Somerville, Lichtenstein, Burchell (1812), Camp- bell, Thomson, Smith, Alexander (1836-37), and Harms.

A station of the Church Missionary Society was estab- Mombas lished near Mombas, in about 4° S. lat. on the east coast Mission of Africa, in 1845, and the zealous missionaries in charge of it began to make exploring journeys into the interior. Thus, early in 1849, the Rev. Mr Rebmann discovered the great snow-clad mountain of Kilima-njaro, rising on the edge of the inland plateau ; and his companion, Dr Krapf, taking a more northerly route, came in sight of a second huge mountain named Kenia, also snow-clad, though directly beneath the equator. Frequent reports reached these mis- sionaries of vast lakes in the interior beyond the mountains they had discovered, and their information awakened. a great interest in this region at home.

About this time an embassy, for the purpose of conclud- ing commercial treaties with the chiefs of Northern Africa, as far as Lake Chad, by which the legitimate trade of these countries should be extended and the system of slavery Richart-| abolished, was originated by Mr James Richardson, who 8

DISCOVERIES. |

Barth and Overweg.

| Barth.

part of our knowledge of the central negro states.

- Living- – stone

present time, and have given to him the first African discoverers.

was the great discovery of the first year.

slope, reaching the Portuguese coast at Loanda in 1854.

fisch Bay to a point in lat. 17° 58'S., and long. 21° E

the river Limpopo.

explored by Livingstone), coast-land to the mouth of the Rovuma river,

was executed by Livingstone, who in returning (1855-56)

in going westward to Loanda, descended the Zambeze to its mouth at Quilimane, discovering the wonderful Victoria Falls of the river on his way.

In 1856 an important addition was made to the more exact geography of Africa, in a survey of the greater part of the course of the Orange river, by Mr Moffat, a son of the veteran South African missionary.

The following year was one of great activity in African exploration. Damara Land, in the south-west, was tra- versed by Messrs Hahn and Rath as far as the southern limit of the Portuguese territory at the Cunene river ; Dr Bastian was exploring the interior of Congo and Angola,

-and Du Chaillu had begun his first journey in the forest Country of the Fan tribes on the equatorial west coast. Under the auspices of the Royal Geographical Society, si 224 Captains Burton and Speke, already distinguished by their Perilous journey to Harar, a trading centre in the Somali and Galla country of the east African promontory, set out from Zanzibar, to ascertain the truth about the great inland

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left England for this purpose in 1849, accompanied by Drs The expedition had already almost | reached the scene of its labours when Richardson

died; Overweg also fell a victim to his exertions, but Dr Barth continued his explorations till 1856. During this time he traversed in many directions almost the whole of the northern Soudan, completing a series of journeys which must always remain most conspicuous in North African travel, and upon which we are still dependent for the greater

In the summer of 1849, Dr Livingstone, who, as an agent of the London Missionary Society, had laboured and travelled in the countries immediately north of the Cape Colony since 1840, began those remarkable journeys in the _(L.Ngami). interior of Southern Africa, which have continued until the place among The finding of Lake Ngami, the central point of the continental drainage of South Africa,

Two journeys from the west coast now claim attention. In 1846 a Portuguese trader named Graga succeeded in again reaching the country of the South African potentate, named the Muata Yanvo, from Angola; he was followed by a Hungarian named Ladislaus Magyar, who explored the central country in various directions from 1847 to 1851. Between 1851 and 1853 Livingstone made two journeys northward from his station in the land of the Bechuanas, and was the first European to embark upon the upper course of the Zambeze. From the Makololo country, in – the central part of the river basin, he now led a party of

natives westwards up-stream to the water-parting of the

continent at the little Lake Dilolo, and thence to the western

During 1851 Galton explored a part of the south-western country inhabited by the Damaras and Ovampo, from Wal- ” determining accurately a number of positions in this region. On the south-east, also, Gassiot made an interesting journey from Port Natal north-westward through the mountains to

Two most remarkable journeys across the whole continent |vaPorto. now follow in order ; the one, made by Silva Porto, a Por- tuguese trader, who leaving Benguela in 1853, took an eastward route, parallel to but considerably northward of the Zambeze, over perfectly unknown country. He then rounded the southern end of the Lake Nyassa (afterwards and made

his way across the east having spent a year and two months in his tedious march. The other

by a somewhat more northerly route than that travelled over

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lakes which had been reported by the Mombas missionaries. Their most successful journey (1857-59) resulted in the discovery of Lake Tanganyika, in a deep basin, between 3° and 8°§. lat., and of the southern portion of a perhaps greater lake northward, supposed by Speke, its discoverer, to be the head reservoir of the Nile.

In a new journey in the Zambeze region in 1859, Dr Living- Livingstone, accompanied by Dr Kirk, traced the Shire stone and river, a northern tributary of the Zambeze, to its outflow a from the Nyassa, the most southerly of the great African ; chain of fresh lakes.

About this time also several travellers (Petherick (1858), Explorers Lejean, Miani, the Poncets, Antinori, Debono, Peney) of the were adding much to the existing knowledge of the Upper petite White Nile from the Egyptian side ; and in the north the Duveyricr. Algerian Sahara was being explored by the French scien- tific traveller Duveyrier.

In 1860 Captain Speke, anxious to extend knowledge of the great inland reservoirs which had been discovered in his former journey, and to connect them with the known countries to northward, accompanied by Captain Grant, Speke and again left Zanzibar. Reaching a point on the north-vestern Grant. Shores of the great lake which he had previously made . known, and which he now named the Victoria N yanza, the traveller thence traced the outflowing river to the White Nile at Gondokoro, thus completing a great link in the chain of African discoveries, which binds the country known from the east coast to that explored from the side of Egypt.

Meanwhile Dr Livingstone had endeavoured to find a way to his newly-discovered Lake Nyassa from the mouth Living- of the Rovuma, a large river which flows to the Indian stone (L. Ocean near Cape Delgado, and which was also reported to Nyassa). take its rise in this lake, but the river

proved to be un- navigable beyond a point not far from the sea. He returned then (in 1861) to the Shire river ; and, carrying a boat past its rapids, launched out to explore the whole length of Lake Nyassa.

A series of important journeys by Gerhard Rohlfs had Rohlfs now (1861) begun in Marocco and in the Maroccan Sahara 3 (Marocco). and on the equatorial east coast region, Baron von der Von Decken had extended Rebmann's information in the region Decken, of the snowy mountain, Kilima-njaro.

In the south the artist Baines had crossed the Kalahari Baines. Desert from Damara Land to the falls of the Zambeze.

In 1862 Petherick made an important journey of explora- tion in the Nile region west of Gondokoro.

The year 1864 was marked by the discovery of a second great reservoir lake of the Nile, near the latitude of the Victoria Nyanza, by Baker, pushing southward from Gon- Baker dokoro. This lake the discovercr named the Albert N yanza, (Albert During this year also, Rohlfs extended his travels from ke). Marocco to the oasis of Tuat, thence making his way to Ghadames and Tripoli; in Western Africa, the officers of the French marine stationed at the Gaboon explored the delta region of the great Ogowai river 3 and Du Chaillu, Du Chaillu. in a second journey (1864-65), entered the gorilla country of Ashango, south of this river; whilst, on the east coast,

Baron von der Decken attempted the navigation of the von Juba, but was destined to fall a martyr to the jealousies of Decken. the Galla and Somali tribes, whose territories the river divides.

After a short stay at Tripoli, the traveller Rohlfs again Rohlfs turned southward, and in a journey which lasted from (across N. 1865 to 1867, crossed the whole northern continent—first 4'). reaching Lake Chad by almost the same route as that for- merly taken by Barth, and thence striking south-westward by a new path to the Bight of Benin,

In 1866 some progress was made in discovery in the west, by the navigation of the Ogowai river by Walker, for Walker. 200 miles from its mouth. Hahn

and Rath also extended

their exploration of Damara Land. On the eastern side Messrs Wakefield and New, the successors of Krapf and Rebmann in the Mombas Mission, made numerous short journeys in the Galla country, and the former collected very valuable native information respecting the countries lying between this coast-land and the great lakes of the Nile basin. In this year also Dr Livingstone had again entered the Rovuma river, beginning that greatest of all his journeys from which he has not yet (1873) returned, and the outline of which we shall notice further on.

Still farther south, in 1866-67, the discovery of gold in the mountains between the Zambeze and Limpopo rivers, by the pioneer Mauch, gave great impetus to exploration in this part of the continent. The years 1867-68 brought Abyssinian the memorable Abyssinian campaign, and the accurate re- Expedi- cords kept of the line of march on the high land from tion. Massowah to Magdala formed a most valuable contribution to African geography.

Most important in the following years (1869-71) were the researches of the botanist, Dr Schweinfurth, in the region of the complicated network of tributaries received by the White Nile west of Gondokoro, during which he passed the water-parting of the Nile basin in this direction, and came into a new area of drainage, possibly belonging to the system of Lake Chad ; and the outsetting of a great Egyptian military expedition (1869) by Sir Samuel Baker, for the purpose of exploration of the Upper Nile and of the extermination of slave traffic on the river, and to plant Egyptian military posts in the regions visited.

The letters received from time to time in this country from Dr Livingstone enable us to trace roughly his move- ments from 1866 to the present time as follows :—Arriving from Bombay, on the East African coast, near the mouth of the Rovuma, he passed up the course of this river to the conflueuce of its main tributary branches, one coming from the north-west, the other from south-west. Following the latter arm, the traveller appears to have gone round the southern end of the Lake Nyassa, and, marching then in a north-

westerly direction, he crossed the head waters of the Aruangoa tributary of the Zambeze, near the track of Lacerda, in the previous century; ascending a high land, he came upon a portion of the Chambeze river, belonging to a different basin, and continuing in a north- westerly direction, discovered Lake Liemba, a southern extension of Lake Tanganyika, in April 1867. Thence he turned to the Cazembe's town, and in journeys northward and southward from this point, made known the two great (Lakes lakes, Moero (Sept. 1867), aud Bangweolo or Bemba (July Moero and 1868), which form part of a new system, connected by the Bangweolo) Chambeze (also named the Luapula and Lualaba) river in a basin south and west of that of the Tanganyika. In 1869 Livingstone had made his way to Ujiji, Burton's halting- place, on the eastern shore of the Tanganyika. Hence, crossing the lake, he penetrated the dense tropical forests and swamps of Manyuema country, in the heart of the southern portion of the continent, and during 1870-71 traced the vast river (Lualaba) flowing out of the Lake Moero, in its north and westerly course, to a second, and then a third great expansion —Lake Kamalondo the one, and the other a still unvisited body of water lying in about 3° S. lat., and 25° or 26° E. long; also learning, by native report, that the Lualaba (which is in all probability the upper course of the mighty Congo river) received a great tributary from south-westward. This south-western arm also expands into a vast lake, which Livingstone has named, in anticipation, Lake Lincoln.

Though the untruth of a report of Livingstone's death, near the Nyassa, had been proved by an expedition sent out on his track by the Geographical Society of London in 1867, yet, at the time of his Manyuema journey, the pro-

Wakefield and New.

Living- stone.

Mauch.

Schwein- furth.

Baker's Egyptian Expedi- tion.

Living- stone.

(Lake Liemba.)

(Manyue- ma).

(The Lualaba).

AG RM C A

[PROGRESSIVE

bable fate of the great traveller, from whom no news had come out of Africa for more than two years, became a mat- ter of the greatest anxiety among all classes in Europe aud America. 'This led to a special mission for Dr Livingstone's aid, gencrously fitted out at the cost of the proprietor of an American newspaper. Stanley, the leader of this expedi- Stanley, tion, made a bold march from Zanzibar to Ujyji, on Lake Tanganyika, and was fortunate in meeting the great travel-

ler there, returning from Manyuema, broken down by the severity of the task which he had accomplished, and in need of everything. A boat voyage round the northern

end of Tanganyika, undertaken in the latter part of 1871

by Livingstone and Stanley together, proved that this great

lake has no apparent outlet in a northerly direction, and leaves the question of its drainage in considerable doubt.

Recruited in health, and supplied with stores and fol- lowers, Livingstone is believed to have started afresh from Unyanyembe, a point midway in the route from Zanzibar to Ujiji, where he parted with Stanley, in autumn of 1872, to carry out a projected journey, in which he will clear up all doubts respecting the ultimate direction of the great Lualaba river.

Of the expeditions which have been progressing in Africa contemporaneously with these later journeys of Dr Living- stone, that of Sir

Samuel Baker is perhaps the most im- portant, though its story has until now been one of almost continuous hardship and disaster. Up to the middle of the year 1870, at which time the expedition, consisting of up- wards of 1500 men, with numerous vessels, had safely Baker, reached a point on the Nile in 9° 26'N. lat., all appears to have gone well; but beyond this the passages of the river had become choked with overgrowth of vegetation, and each yard of advance had to be cut through this living bar- rier ; disease broke out among the troops, and the expedi- tion was reduced to the greatest straits. In the end, how- ever, it appears to have been completely successful, and before Sir Samuel Baker's return to Egypt in 1873, the whole country, as far south as the equator, had been taken possession of in the name of Egypt, and several garrisons had been planted to maintain the hold.

Knowledge of the rich country between the Transvaal Republic and the Zambeze has extended with wonderful rapidity, through the exertions of the pioneers Mauch, Mohr, Recent Baines, Elton, and St Vincent Erskine, so that this region South has now almost passed out of the category of lands in which eee

. . . . esearcne: geographical discoveries can be made. A point of great interest in the progress of the exploration of this country was the discovery by Mauch, in 1871, of the ruins of an ancient city or fortress, named Zimbaoe, certainly not of African construction, about 200 miles due west from Sofala, in lat. 20° 15'S., long. 30° 45' E., through which it has been sought to identify this region with the Ophir of Scripture. The finding, in 1869, of rich diamond fields in the upper valley of the Orange river, and in that of its tributary the Vaal, caused a rush of emigration to these districts, and tended still further to develop this portion of Africa.

North African exploration is also vigorously progressing. In the west, during 1869, Winwood Reade made a journey Winwoo! from Sierra Leone to the head of the Niger, and from 1867 Reade onwards M. Munzinger, consul at Massowa, has greatly Munaings extended our knowledge of Northern Abyssinia. A notable journey of exploration in the Sahara remains to be men- tioncd. In 1869 Dr Nachtigal was appointed to carry Dr Nacli presents from the King of Prussia to the Sultan of Bornu, tigal. on Lake

Chad, in acknowledgment of that potentate's aid to former travellers. Besides accomplishing this mission, this explorer hasadded very considerably to our knowledge of the Eastern Sahara by investigating the central mountainous country of Tibesti, hitherto only known by report; and in

more recent journeys, still being continued, he has proved the existence of an outflowing river from Lake Chad, which has hitherto been believed to be a terminal lake, the fresh- ness of its waters having on this account appeared an

anomaly in physical geography. With the double purpose of affording support to Dr Livingstone, and of adding to the geography of Equatorial Tho Royal Africa, two expeditions were fitted out by the Royal Geo- Geographi- graphical Society in 1872. One of these, led by Lieut. w ty's Cameron, was planned to follow the footsteps of Living- n Stone in his present journey from the eastern side, entering the country by the ordinary trade route from Zanzibar to- wards the Tanganyika. This expedition started from Zan- zibar early in 1873, under the auspices of Sir Bartle Frere's mission, and has now made considerable progress towards the interior. The other, named the " Livingstone Congo Expedition," under Lieuts. Grandy, is to pass from the west coast to the interior, by following the river Congo, which is almost without doubt the lower course of the great Lualaba river, about to be further explored by Dr Living- stone coming to it from the eastern side. The latest accounts from this expedition are also in the highest degree favourable, and an advance of upwards of 150 miles has already been made from Loanda. A new expedition, under the leadership of the indefatigable traveller Rohlfs, is now in preparation, and is destined to explore the unknown

portions of the Libyan desert.

Thus the exploration of the great continent is slowly advancing year by year, but with earnest and unceasing progress. As yet the only portions of Africa of which we possess any approach to an accurate topographical know- ledge are, the Cape Colony and Natal under British rule in the south,

the French colony of Algeria, the Portuguese possession of Angola, and Egypt and Tunis, dependent on the Turkish Empire, in the north.

Throughout the rest of the continent, a network of routes accomplished by travellers gives in most parts the great out- line of its features; where these lines interlace more closely, as in the South African Republics, and in Abyssinia, the general aspect of the land is now so well known as to pre- clude the possibility of any important geographical dis- covery there ; elsewhere, however, the gaps between the tracks are wider. In the vast inhospitable region of the Sahara there are great areas still unknown to civilised man, and the equatorial region of dense forests in Central Africa is still one of the greatest terre incognite of the globe.

The origin and meaning of the name of this great con- tinent has been a fertile subject for conjecture among philologists and antiquaries. By the Greeks it was called Libya, A:8vn, and by the Romans Africa. Varro believed he had found the etymology of the former in Lnbs, the Greek name of the south wind ; and Servius, the scholiast on Virgil, proposed to derive the other from the Latin word aprica (sunny), or the Greek word a-phriké (without cold). It is more probable that the name Libya was derived by the Greeks from the name of the people whom they found in possession of the country to the westward of Egypt, and who are believed to have been those that are called in the Hebrew Scriptures Lehabim or Lubim. With respect to the word Africa, Suidas tells us that it was the proper name of that great city which the Romans called Carthago, and the Greeks, Karchedon. It is certain, at least, that it was applied originally to the country in the immediate neighbourhood of Carthage, that part of the continent first known to the Romaus, and that it was subsequently ex- tended with their increasing knowledge, till it came at last to include the whole continent. Of the meaning of the name, the language of Carthage itself supplies a simple and natural explanation ; the word Afrygah, signifying a Separate establishment, or in other words a colony, as

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Carthage was of Tyre. So that thc Pheenicians of old, at home, may have spoken of their Afrygah, just as we speak of our colonies. Be that as it may, the Arabs of the present day still give the name of Afrygah or Afrikiyah to the territory of Tunis. It may also be remarked, that the name seems not to have been used by the Romans till after the time of the first Punic war, when they became first acquainted with what they afterwards called A frica Propria.

Africa lies between the latitudes of 38° N. and 35° S., Position

and is of all the continents the most truly tropical. It ig, and extent. strictly speaking, an enormous peninsula attached to Asia by the isthmus of Suez. The most northern point is the Cape, situated a little to the west of Cabo Blanco, and opposite Sicily, which lies in lat. 37° 20' 40' N., long. 9° 41' E. Its southernmost point is Cabo d'Agulhas, in 34° 49' 15" S.; the distance between these two points being 4330 geographical, or about 5000 English miles. The westernmost point is Cabo Verde, in long. 17° 33' W., its easternmost Cape Jerdaffun, in long. 51° 21' E., lat. 10° 25' N., the distance between the two points being about the same as its length. The western coasts are washed by the Atlantic, the northern by the Mediterranean, and the eastern by the Indian Ocean.

The form has been likened to a triangle, or to an oval, Form. but such a comparison is scarcely warranted, it being of an irregular shape, the northern half rounding off, the southern one contracting and terminating in a point.

The superficial extent of Africa has never been accurately Superficial determined, but may be taken at 9,858,000 geographical extent. square miles, exclusive of the islands. It is larger than either Europe or Australia, but smaller than Asia and the New World.

The coast line of Africa is very regular and unbroken, Coast line presenting few bays and peninsulas. The chief indentation 4 inden- is formed by the Gulf of Guinea, with its two secondary divisions, the Bight of Benin and the Bight of Biafra. On the northern coast, the Gulf of Sidra and the Gulf of Kabes must be mentioned, and on the eastern coast the Gulf of Arabia.

The physical configuration may be considered under two Physical heads, the great lower-lands and plains of Northern Africa, configura- and the great table-lands, with their mountain ranges and 4“ groups, of Central and Southern Africa. The great northern lower-land comprises the Sahara, the Lake Chad region, and the valley of the Lower Nile. The Sahara is by no means a plain throughout, but for the greater part it rises into table-lands, interspersed with mountain groups of 6000 feet elevation, and probably more, and the term lower-lands can only be applied to it in a general way, to distinguish it from the more elevated region to the south.

The Sahara has often been pictured as a monotonous and immense expanse of sand; but nothing could be more erroneous, as the greatest variety exists in the physical configuration of its surface, as well as in its geological features. Our knowledge is as yet too scanty to enable us to trace its features in every part. On the north, this great The desert is fringed with extensive table-lands, which in some northern places rise abruptly from the Mediterranean, as the great oe plateau of Barbary, extending through Marocco, Algeria, ; and Tunis, and the table-land of Barca, elevated 1500 feet, and gradually descending towards the Delta of the Nile.

This elevated ground is succeeded to the south by a depressed region, which extends from the Great Syrtis or Gulf of Sidra, in a general direction as far as Middle Egypt, and comprises the oascs of Augila and Siwah. So greatly depressed is this region, that the level of the oasis of Siwah is 100 feet, and in one place (Bahrein) even 167 feet below the level of the sea. The western portions of this country, between the oases of Augila and Siwah, explored in I. — 32

The great South African plateau,

1869 by the traveller Rohlfs, were found to be everywhere from 100 to 150 feet beneath the level of the Mediterrancan ; and M. de Lesseps, in conducting a survey from the Egyptian side, found the eastern part to be much beneath the level of the Nile. Herc then must be one of the grcatest arcas of depression in the land of the globe, com- parable with that which surrounds the Caspian Sea. This depressed region is again followed by a

table-land of con- siderable extcnt and width, extending from the Gulf of Kabes in a southerly direction, along the Tripoline shores, and probably traversing, in the same dircction, the Libyan Desert, and reaching as far as the Nile, near the first cataract. Its north-western part, as far as Sokna, consists of the Hamadah, a stony, drcary, and extensive table-land, of from 1500 to 2000 feet high, "' which seems to be like a broad belt intercepting the progress of commerce, eivili- sation, and conquest, from the shores of the Mediterrancan to Central Africa." Near Sokna this plateau breaks up and forms what are called the J ebel-es-Soda, or Black Mountains, a most picturesque group of cliffs ; and again, on the route from Murzuk to Egypt, it also breaks into huge cliffs, and bears the name of El-Harouj. The whole of the central portion of the Northern Sahara, as far south as the plateau of Air or Asben, is occupied by similar bare table-lands, with lower areas of sand dunes between. Numerous wadys, the ouly inhabited parts of the country, intersect the slopes of these plateaux. The country of Ahaggar, between 23° and 29° N. lat., and 5° E. long., appears to form the central elevation from which the greater of these dry water-courses radiate ; from it a series of long wadys—one of them, the wady Rharis or Igharghar, being about 600 miles in length—run northward towards a depressed country which lies inland from the Gulf of Cabes, and contains several salt lagoons, covered with a few feet of water in winter, but dried up in summer, and lying considerably below the Mediterranean level. Other wadys radiate west and south-west from Ahaggar to the unknown region of the Sahara, which lies between this and the northern bend of thc Niger. The most truly desert region of the Sahara is an irregular belt of shifting sand dunes, the "Erg" or " Areg," which stretches from the lagoons above referred to near the Mediterranean coast south-westward to near the river Senegal and the Atlantic, in an unbroken chain for upwards of 2000 miles, and hav- ing an average width of perhaps 200 miles. In this sand belt the wadys of the inward slope of the plateau of Barbary terminate, excepting the Wady Saura, which crosses the Erg to the important oasis of Tuat, near the centre of its southern border, and the Wady Draa, which turns to the Atlantic coast. From Wady Draa a great plain extends alont the western shore as far as the river Senegal, and probably continues as such to the east towards Timbuktu, and thence to Lake Chad. Thus it appears that the western half of the Sahara is surrounded by a broad belt of plains and depressions, the central parts being formed by extensive table-lands, with occasional

mountain knots, such as that which forms the fertile kingdom of Air and Asben, the culminating points of which are from 4000 to 5000 feet high.

The eastern portion of the Sahara appears to have nearly the sane general elevation as the western half, and near its centre several fcrtile mountain regions, comparable with that of Asben, are known. Such is the mountainous country of Borgu, north-east of the kingdoms which surround Lake Chad, and Tibesti, north of it, in the centre of the Tibbu district, recently explored by Dr Nachtigal, who found rich vegctation and abundant animal life in the valleys of this mountain group.

To the south and east of the region just described Africa may be considered as one connected mass of elevated

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land, comprising the most extensive table-lands, as well as high mountain groups and chains.

The great mass of the African platcau land is to south- ward of the 10th parallel of N. latitude, but it is pro- longed on the eastern side almost to the north coast of the continent by the wedge-shaped table-land of Abys- sinia, the highest surface in Africa, and by the moun- tains which extend from it between the lower course of the Nile and the Red Sca. The terminal point of the high land in this direction may be said to be Jebel Attaka, which rises immediatcly west of Suez to a height of 2640 From this point to the southern extremity of the Eastem continent the eastern, and generally higher edge, of the edge of ti great plateau runs in an almost unbroken line. Passing Plateau, southwards along its margin, the most prominent heights before the table-land of Abyssinia is reached are Mounts Elba, 6900, and Soturba, 6000 feet in elevation, near the middle of the African coast of the Red Sea. Thcre may, however, be greater heights in the little known region of Nubia, which lies between these mountains and the Nile.

The eastern slope of the Abyssinian plateau begins im- mediately south of the port of Massowah, and is a uni- form line of steep descent, unbroken by any river, falling abruptly from an average hcight of 7000 feet to the depressed plain which here skirts the coast of the Red Sea. This edge, which

extends southward for at least 800 miles, forms the watcr-parting of the rivers which have furrowed deeply into the opposite slopes of the plateau, and appears to be higher than the general surface of the country; yet several lofty groups of mountaius rising from the level of the high land attain a much greater elevation, and Mouut Abba Jared, the highest known point, is esti- mated at 15,000 feet above the sea. Between the most southern part of Abyssinia which is known and_ the equator, where the edge of the plateau has again been partly explored, a long space of unknown country inter- venes; but there is every reason to believe that the slope is continuous. Mount Kenia, 18,000 feet, and Kilima- njaro, 18,715 feet, the highest points in all Africa, mark the eastern edge under the equator; further south on the inland route from Zanzibar to the Tanganyika, the edge is known as the Rubeho Mountains, with a height of 5700 feet at the pass by which they are crossed on the caravan route. Still further, the edge is again known where it forms a rampart, called the Njesa, walling in the Nyassa Lake. From this point Mount Zomba, 7000 feet high, near Lake Shirwa, Mount Milanje, 8000 fect, and Mount Clarendon, 6000 feet, carry it south to where the Zambeze river makes the first break in its uniform line. The narrows and rapids of Lupata, below the town of Tete, mark the point at which the river breaks through the plateau land to the coast slope beneath it. Passing the river, the eastern edge is again followed in the Mashona and Matoppo Mountains (7200 feet) of Mosilikatse's kingdom, from which heights the chief tributaries of the Limpopo river flow. At the head- waters of that river the plateau edge forms the Hooge Veldt of the Transvaal Republic, which joins with the Kathlamba or Drakenberg. The portion of the edge which bears this name is specially prominent: it runs southward in a huge wall of rocky crags which support the table-land behind for 500 miles, almost parallel with the coast, and at a dis- tance of 150 miles from it, having Zulu Land, Natal, and Caffraria on the slopes of the spurs which it throws down to the coast. In the Transvaal Republic, where the Drakenberg joins the Hooge Veldt, the edge attains @ height of 8725 feet in the summit named after the explorer Mauch, but it is highcst where it forms the intcrior limit of Natal, and where Cathkin Peak riscs to 10,357 feet above the sea.

As in Abyssinia, so here, this part of the eastern plateau

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edge is the great watcr-parting of the continent, and

the streams which form the Orange river flow down its

inward slope. There is uo break in the continuance of the

edge where it passes round from the Drakenberg to form

the inmost and highest of the alternate ridges and terraces

of the Cape Colony. It is now named in successive parts 'Southern from east to west the Storm Berge, the Zuur Berg, Schnee edge of the Berge, Nieuwe-veld, and Rogge-veld, the last-named _por- plateat. tion of the edge turning northward with the bend of the western coast. Its greatest height within the Cape Colony is in Compass Berg, the summit of the Schnee Berge, 8500 feet above the sea.

The outer terraces of the Cape Colony, in which two chief ridges may be traced, lie closer together, and much nearer the coast; between these and the inmost or chief edge is the dry elevated region known as the Great Karroo. Their elevation is also very considerable, though they are broken through by lines of drainage sloping from the chief edge; the part of the middle ridge, which is named the Little Zwarte Berge, attains 7628 feet, and several points in both are upwards of 6000 feet above the sea. Table Mountain, a well-known and flat-topped mass of granite overhanging Cape Town, 3550 feet high, is the nucleus of the peninsula which extcnds south to form the Cape of Good Hope, but is altogether separated from the mountain ridges of the colony. Testern The western edge of the great African plateau is generally 'ige of the lower than the eastern, since the whole slope of the continent ateal. is more or less from the great heights on its eastern side, towards the west, but it is also clearly traceable, and of great height throughout. Rounding the western side of the Cape Colony, the threc ridges above noticed run togcther, and decrease somewhat in elevation as the mouth of the Orange river isapproached. 'Their elevation at the point of

union in Little Namaqua Land is still very considerable; and here Mount Welcome attains 5130 feet, and Vogelklip, to north of it, 4343 feet above the sea. Beyond the Orange river in Namaqua and Damara Lands, the western edge continues in one or more terraces parallel to the coast. Mount Omatako, in the latter country, rises to 8800 fect. Northward, through Benguela and Angola, a more broken serics of ridges and terraces mark the descent from the interior plateau, and the great Congo river breaks through to the coast-land at the place whcre it forms the cataracts of the narrow gorge of Yellala. Sierra Complida is the name given by the Portuguese to that part of the western edge which runs between the Congo and the rapids of the lower Ogowai river on the equator. On the plateau edge at the southern side of this river, Du Chaillu has made known a mountain of 12,000 feet in elevation; and the furthest point which has been reached on the Ogowai was in the vicinity of high mountains. Passing the Ogowai, and following the coast of the Bight of Biafra, the edge is now known as the Sierra do Crystal. The Camaroon mountains, at the head of the gulf, form a high peninsula of volcanic mountains, rising to 13,700 feet; but are isolated from the plateau lands, and belong rather to the remarkable line of volcanic heights which shows itself in the islands of Fernando Po, Prince's Island, St Thomas, and Annobon, stretching away into the ocean in the direction of St Helena. From the Sierra do Crystal the plateau edge inclincs towards the lower course of the river Niger to a point above its delta, and below the confluence of the Benue, aud then turns abruptly to the east.

The heights which skirt the northern coast-land of the Gulf of Guinea, and which stretch as far as the head-waters of the Senegal and Gambia, and in the inner slope of which the Niger also has its sources, may be considered as an extension from the great plateau. But they are of smaller general elevation; and that best known part of the ridge, which has the name of the Kong Mountains, is apparently not higher than from 2000 to 3000 feet.

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The northern edge of the great African platcau is almost Northern

unknown; but there are evidences that it runs eastward edge of the between the 4th and 8th parallels of N. latitude, to a point Plateau. at which it is well known, and where the Nile falls over its slope, forming the succession of rapids above Gondokoro. The character of the upper Benue river is that of a mountain- born river; and Mounts Alantika, 10,000 feet high, and Mindif, 6000 feet, which rise to southward of Lake Chad, seem to be the outliers of the plateau edge in which the Benue has its sources. Beyond the Nile the margin of the plateau curves northward, to form the inner slope of the Abyssinian table-land.

The general clevation of the surface of the great African plateau, the limits of which have now been traced, may be taken at from 3000 to 4000 feet above the sea; but its surface presents very great undulations, from the depressions which arc occupied by some of the great lakes, to the high mountains which rise above its average level.

The most prominent of these interior masses yet known Heights are the Blue Mountains, discovered by Baker, rising from in the in- the western shore of the Albcrt Lake to a height of per- tetior of the haps 10,000 feet, and which are believed to extend south- ae ward to unite with the Balegga Mountains, made known

by Livingstone in his journey of 1871, north-west of Lake Tanganyika; these again are believed to join with the mountains which rise midway bctwecn the Victoria, the

Albert Nyanza, and the Tanganyika, dividing the drainage

to these vast lakes, and rising here in Mount M'fumbiro to upwards of 10,000 feet. Another great central line of

heights which also had an important part in directing the water-shed of the interior of South Africa, runs from the

north of the Nyassa Lake, where it is named the Lobisa plateau, through the Muchinga Mountains, which separate

the drainage of the Lualaba and its lakes from that of the Zambeze basin, westward to the heights in the far interior

of Angola, known as the Mossamba Mountains, and from

which rivers flow in all dircctions.

The plateau of Barbary, in the north of the continent, Plateau of

beyond the lower land of the Sahara, is a distinct and Barbary. separate high land, stretching from Cape Bon, on the Medi- terranean coast opposite Sicily, in a south-westerly direction to the Atlantic coast, through Tunis, Algeria, and Marocco. The eastcrn portion of it in Algeria and Tunis riscs in a broad plateau from 2000 to 3000 feet in general height, with outer heights, enclosing an elevated steppe, at a distance of about 100 miles apart. On the west, where it enters Marocco, these outer ridges draw together and form the high ranges of the Atlas Mountains, rising to a much greater elevation, and attaining 11,400 feet in the summit named Mount Miltsin.

The African continent, as far as it has yet been explored, seems to be the portion of the globe least disturbed by volcanic action. The known active volcanoes in the con- tinent are those of the Camaroon Mountains, on the coast of the Gulf of Guinea in the west, and the Artali volcano in the depressed region of the salt desert which lies be- tween the Abyssinian plateau and the Red Sea. This latter volcano is probably a part of the system with which the volcanic island of Jebel Tur, in the Red Sea, ncar the same latitude, is connected. One other active volcano only Gyeater is known by report,—the Njemsi volcano, in the country geological between Mount Kenia and the Victoria Lake. Shocks features. of earthquake appear to be almost unknown in any part of the continent. It has been pointed out by the late Sir Roderick Murchison that the older rocks which are known to circle round the continent, unquestionably in- cluded an interior marshy or lacustrine country, and that the present centre zone of waters, whether lakes, rivers, or marshes, extending from Lake Chad to Lake Ngami, are but the great modern residual phenomena of those

Minerals and metals.

General nature of the surface of Africa.

Equatorial forests.

of a mesozoic age. The surface of the South African continent has not been diversified in recent times by the outpouring of lava streams, or broken up by the efforts of subterranean heat to escape. Nor has it been sub- jected to those great oscillations by which the surfaces of many other countries have becn so placed under the waters of the ocean as to have been strewed over with erratic blocks and marine exuvie. The interior of South Africa may therefore be viewed as a country of very ancient conservative terrestrial character. Knowledge of the special geology of Africa is yet confined to the few parts of the continent in which Europeans have perma- nently settled. In this respect the southern region of the Cape Colony and Natal have advanced furthest, and their geological features have been mapped out with some accuracy. Elsewhere in the continent, excepting In Algeria and Angola, light has only been thrown along the line followed by the few explorcrs who have given attention to this subject.

Among the minerals of Africa, salt is widely distributed, though in some districts wholly wanting. Thus in the Abyssinian high land the salt, which is brought up in small blocks from the depressed salt plain on the Red Sea coast beneath, is so valued as to be used as a money currency ; and. in the native kingdoms of South Central Africa, the salt districts are royal possessions strictly guarded. Metals seem nowhere very abundant. Gold is perhaps the most generally distributed. The gold-fields of the Transvaal Republic and of the country which extends thence to the Zambeze, are numerous; but no yield has as yet been dis- covered of sufficient quantity to overcome the difficulties of working, and of transport to the distant sea-ports, to which no navigable rivers lead from this region. Copper is known to exist in large quantities in the mountains of native kingdoms of the centre of South Africa ; and one of the objects of Dr Livingstone's present journey is to visit the famed copper country of Katanga south-west of the Tanganyika Lake. The diamond-fields in the districts of the Vaal and Orange rivers north of the Cape Colony are now steadily worked, and give good returns.

Africa is the only one of the continents of the globe which lies equally to north and south of the equator, and the portions of it which cxtend beyond the tropics do not advance far into the temperate zones. From this it results that Africa, besides being the warmest of all the continents, has also the most equal distribution of the sun's heat during the seasons over the parts which lie north and south of the central line. Winds and rain, depending on the distribution of heat, are also correspondingly developed in these two great divisions of the continent, and the broad landscape zones, passing from humid forest to arid sandy desert, also agree exactly with onc another north and south of Equatorial Africa.

Between 10° N. and 10°S. of the equator, but especially in that portion of it the outskirts of which have only as yet been reached by travellers, Africa appears to be a land of dense tropical forest. Wherever it has been penetrated, travellers speak of an exccssively rank vegetation; passage has to be forced through thick underwood and creeping plants, between giant trees, whose foliage shuts out the sun's rays; and the land tecms with animal and insect life of every form and colour. Describing the forests of Manyuema country, west of the Tanganyika Lake, Living- stone says— Into these [primzeval forests] the sun, though vertical, cannot penetrate, excepting by sending down at midday thin pencils of rays into the gloom. The rain watcr stands for months in stagnant pools made by the feet of elephants. The climbing plants, from the size of a whipcord to that of a man-of-war's hawser, are so numerous, that the ancient path is the only passage. When one

of the giant trees falls across the road, it forms a wall breast high to be climbed over, and the mass of tangled ropes brought down makes cutting a path round it a work of time which travellers never undertake." Herc there is a double rainy season, and the rainfall is excessive. To

north and south of this central belt, where the rainfall

diminishes, and a dry and wet season divides the year, the forests gradually open into a park-like country, and then merge into pastoral grass-lands. pastoral belt is occupied by the native states of the Soudan, from Abyssinia westward, in the parallel of Lake

sponding to this in the south, are the grass-lands stretching across the continent from the Zambeze to southern Angola and Benguela. The pastoral belts again gradually pass into the dry, almost rainless desert zones of the Sahara in the north, and the Kalahari desert in the south, which present many features of similarity.

The extremities of the continent, to which moisture is carried from the neighbouring oceans, again pass into a second belt of pastoral or agricultural land, in the north- ward slopes of -the plateaus of Barbary, Marocco, Algeria, and Tunis, corresponding with the seaward terraces of cultivated land in the Cape Colony in the south.

Taking a broad view of the hydrography of Africa, there are two great areas of continental drainage, one in the north, the other in the south, from which no water escapes directly to the ocean. These correspond almost exactly with the two desert belts of the Sahara and the Kalahari above described. The whole of the remaining portions of the continent, its forcsts and pastoral districts, in which the greater rainfall gives greater power to the rivers, are drained by streams which find their way to the ocean on one side or other, generally forcing a passage through some natural or waterworn gorge in the higher circle of mountains which run round the outer edges of the great plateau.

By far the larger portion of the oceanic drainage of the continent is to the Atlantic and its branch the Mediter- ranean, to which the Nile, Niger, Ogowai, Congo, and Orange rivers flow. The great rivers which drain on the opposite side, to the Indian Ocean, are the Juba, Zambeze, and Limpopo; whilst the northern continental basin, by far more extensive than the southern, has only one grcat river, the Shari, which supplies Lake Chad.

Tt must be noticed that the capabilities of the African rivers, as highways of approach to the interior of the con- tinent, are exceedingly small in comparison with those of the other great continents of the globe, most of

them being either barred at their mouths, or by rapids at no great distance from the coast. It is owing to this physical cause mainly that the African continent has remained for so many centuries a sealed book to the civilised world. On the other hand, it must be observed, that when these outer barriers have becn passed, the great interior of the land, in its most productive regions, possesses a network of vast rivers and lakes, unsurpassed in extent by those of any country of the world, by means of which the resources of Central Africa may in future be thoroughly developed.

The Nile is the oldest of historical rivers, and afforded the only means of subsistence to the earliest civilised 'people on earth, and yet the origin of this river remained an enigma almost to the present day. Though it drains a larger area than any other river of Africa, upwards of 1,000,000 square miles, and in this respect is one of the largest rivers of the globe, the Nile, passing for a great portion of its lower course through the desert belt of North Africa, and receiving no tributaries there, loses much of its volume by evaporation, and is far surpassed in the quantity of water conveyed to the ocean by the Congo, in the moist cquatorial zone. The great labours of Dr

In North Africa this Norther

and

southern Chad, to the Gambia on the Atlantic coast; and corre- },

Deserts,

Rivers,

Nile.

FEATURES. |

Livingstone, in the lake region of Central Afriea, have so narrowed the spaee within whieh the sources of the Nile can exist, that, though no traveller has yet reached the ultimate feeders of the great river, their position can now The limit of the Nile basin on the south is formed by the

high mountains which rise to westward of the Albert Lake, and which divide between this great reservoir and the Tanganyika, extend-

be predicated almost with certainty.

ing eastward to the plateau of Unyamuezi, on the northern side of whieh the Vietoria Nyanza lies. The ultimate

sourees must then be the feeders of these great equatorial

lakes, the Victoria and Albert. The river issuing from the former lake, at the Ripon Falls, 3300 feet above the sea, to join the northern end of the Albert Nyanza, may be considered as the first appearance of the Nile as a river. At the Ripon Falls the overflow is from 400 to 500 feet in breadth, and the descent of 12 feet is broken in three places by rocks. Further down, where the river turns westward to join the Albert Lake, it forms the Karuma and Murchison Falls, the latter being 120 feet in height. Irom the Albert Lake, the Nile, called the Kir in this part, begins its almost due northward 'course to the Mediterranean, and has no further lake expansion. Be- tween the Albert and Gondokoro, in 5° N. lat., which lies at 2000 feet above the sea, the Nile descends at least 500 feet in a series of rapids and eataracts. Beyond Gondokoro, up to which point it is navigable, it enters the northern lower land of Africa, which is here a region of swamps and, forests, and several tributaries join it from the west. The. largest of these, named the Bahr-el-Ghazal, unites with the main stream below the 10th parallel; and, not much further on, a main tributary, the Sobat river, joins the Nile from the unknown region whieh lies to the south- east. Hence, onward, the Nile is known as the Bahr-el- Abiad or White River. The two remaining great tribu-

tary rivers descend from the high land of Abyssinia on the.

east. The first of these, the Bahr-el-Azrek or Blue River, its waters being pure in comparison with those of the N ile, has its source near Lake Dembea or Tzana, through which it flows, in the western side of the Abyssinian plateau, 6000 feet above the sea ; forming a semicircular eurve in the plateau, the Blue Nile runs north-westward to the eonfluence at Khartum, 1345 feet above the sea. Between this point and the union of the next tributary, the Nile forms the eataract which is known as the sixth from

its mouth. In about 18° N. it is joined by the Atbara or Black River, the head stream of which is the Takkazze, flowing in a deep cut valley of the high land. This tribu- tary is named from the dark mud which it carries from the high land, brought down to it by streams which swell into rushing torrents in the rainy season. It is to these rivers that the fertility of Lower Egypt is mainly due, for each year a vast quantity of Abyssinian mud is borne down to be spread over the delta. Hence the Nile pursues its way in a single line through the dry belt of desert to the Mediterranean without a single tributary, descending by five cataracts, at considerable distances apart. The delta of the Nile, in which the river divides into two main branehes, from which a multitude of eanals are drawn off, is a wide low plain, occupying an area of about 9000 square miles. The most remarkable circumstance connected with the delta is the annual rise and overflow of the river, which takes place with the greatest regularity in time and equality in amount, beginning at the end of June, and subsiding completely before the end of November, leaving over the whole delta a layer of rich fertilising slime.

The Sheliff in Algeria, and the Muluya in Eastern Marocco, are the chief streanis flowing to the Mediterranean

y, irom the high land of Barbary.

Passing round to the Atlantie system, the Sebu, the

Ummer Rebia, and the Tensift, from the Atlas range, are permanent rivers flowing aeross the fertile plain of Western Marocco, which they serve to irrigate. Next is the Wady Draa, a water-course which has its rise on the inner slope of the high land in Maroceo, and which bends round through the Maroccan Sahara to the Atlantic, near the 28th parallel. Its channel, of not less than 500 miles in length, forms a long oasis in the partly desert country through which it flows, and water remains iu its bed nearly throughout the year.

A streteh of 1100 miles of waterless coast, where the desert belt touehes on the Atlantic, intervenes between the Draa and the Senegal river, at the beginning of the pastoral belt in lat. 15° N.

The Senegal rises in the northern portion of the belt of Senegal.

mountains which skirt the Gninea coast, and has a north- westerly course to the sea. During the rainy season it is navigable for 500 miles, from its mouth to the cataract of Feloo, for vessels drawing 12 feet of water, but at other times it is not passable for more than a third part of this distanee. Senegal, and flows westward in a tortuous bed over the plain country, giving a navigable channel of 400 miles, up to the Falls of Barra Kunda. The Rio Grande, from the same heights, is also a considerable river. The Niger is the third African river in of drainage and volume; it is formed by the union of two great tributaries, the Quorra and Benue,—the former from the west, the latter from the country in the east of

ethe river basin. The Quorra, called the Joliba in its upper

course, has its springs in the inner slope of the mountains which give rise to the Senegal and Gambia, not far from the Atlantic coast. At first its course is north-eastward to as far as the city of Timbuctu, on the border of the desert zone; then it turns due east, and afterwards south-east to its confluence with the Benue, at a point 200 miles north from the coast of the Gulf of Guinea. The chief tributary of the Quorra is the Sokoto river, coming from the elevated country which forms the water-parting between the N iger basin and that of Lake Chad on the east, and its confluence is near the middle of the portion of the channel of the Quorra whieh bends to south-east.

At a distance of about 100 miles from its sources, the traveller Park, the first European who reached the J oliba, found it flowing in a wide fertile valley, and navigated by canoes which kept up a constant traffic. Above Timbuc- tu the eommerce of the river is busily carried on in barges of 60 to 80 tons burden; further on, where the river touches upon the desert belt in the most northerly portion of its course, its fertile banks form the most marked con- trast to the arid desert lands beyond. From the confluence of the Sokoto to the union with the Benue, the river course is only navigable

after the rainy season, since at other times rocks and shoals interrupt the passage. The sources of the Benue are unknown as yet, but it is believed to have its rise in the northern edge of the great plateau of Southern Africa, almost due south of Lake Chad ; Its known course is westward, and at the furthest point to which it was easily navigated by the traveller Baikie, nearly 400 miles from its eonfiuence with the Kawara or Quorra, it was still half a mile in width and about 10 feet in average depth, flow- ing through rich plains. From the confluence of the Quorra and Benue the Niger has a due south course to its delta, and the united river has an average width of about a mile. At a distanee of 100 miles from the sea, minor branches which enclose the delta separate from the main stream on each side. The delta is much more extensive than that of the Nile, and measures about 14,000 Square miles of low alluvial plain, covered with forest and jungle, and com- pletely intersected by branches from the main river, the outmost of which reach the sea not less than 200 miles

The Gambia has its sourees ncar those of the Gambia.

poiut of area Niger.

Gaboon.

Ogowai.

Congo.

Coanza.

apart. Unlike the Nile, the Niger possesses one main channel through the centre of the delta, called at its mouth tho Nun river.

Old Calabar river, the Camaroon river, and the Gaboon, are the best known of a number of wide inlets or estuaries of the sea, which occur on the west coast immediately north of the equator; but these are merely the receptacles of a number of minor streams, not the mouths of great rivers, as at one time supposed. ;

The Ogowai (pron. Ogowee) river, the delta of which forms Cape Lopez, immedaitely S. of the equator, isa great stream which is believed to drain a large area of the forest zoue between the Niger and the Congo; as yet, its lower coast is only known to a distance of 200 miles from the sea. Above the delta the main stream of the river, named the Okanda, breaks through the edge of the plateau, and is joined by the Onango, a tributary from the coast range of the Sierra Complida. Below this confluence the river is a mile and a half in average width, its depth varying from 15 to 50 feet. The deltais formed by the two main branches into which the Ogowai divides at about 30 miles from the coast, and is a swampy flat, covered with mangroves.

The Congo or Zaire must be considered the second river of Africa in point of area of drainage, and it is the first in respect of the volume of water which it discharges to the ocean. There remains but little doubt that the head streams of this vast river are those which supply the great lacustrine system discovered by Dr Livingstone in his recent journeys south and west of Lake Tanganyika. Through these lakes the river, which rises in the upland north of Lake Nyassa, named in different parts of its course the Chambeze, Lua- pula, or Lualaba, flows in great bends to west and north- ward, to where it passes into the unknown country still to be explored in the heart of the continent. The Lualaba has a great tributary named the Lufira, from the south; and it is almost certain that the Kassabi river, which springs in the Mossamba Mountains, in the interior borders of Angola, is also one of the feeders of this great river. The Guango river, rising in the same mountains, nearer Angola, must also join the Congo lower down in its valley. At the furthest point on the Lualaba reached by Living- stone, in about lat. 6° S. and long. 25° E., the great river had a breadth of from 2000 to 6000 yards, and could not be forded at any season of the year. Every circum- stance connected with this river—its direction, the time of its annual rising, and the volume of its water which could be discharged by the Congo mouth alone—point to its identity with this river. The explorer Tuckey, who, in 1816, followed up the Congo from its mouth on the west coast further than any one, found it, above the cataracts which it forms in breaking through the coast range, to have a width of from 2 to 4 English miles, and with a current of from 2 to 3 miles an hour; and his statement that at the lowest stage of its waters it discharges 2,000,000 of cubic feet of water per second, has been confirmed by more recent surveys. Forty miles out from its mouth

its waters are only partially mingled with that of the sea, and some nine miles from the coast they are still perfectly fresh. The Congo is the only one of the large African rivers which has any approach to an estuary, contrasting in this respect with those which have delta mouths.

The Coanza, the most important river of Angola, in respect of its affording a navigable channel for 140 miles from its mouth, rises in a broad valley formed by the Mossamba Mountains in the interior of Benguela, and curves north-westward to the ocean. Its upper course is rapid, and its navigation only begins after the last of its cataracts has been passed; the mouth is closed by a bar. The Cunene river has its rise in the opposite watershed of the mountains, its springs being close to those of the

Coanza, aud its course is south-eastward, forming the southern limit of the territory of Mossamedes. It is the most southerly river of the central fertile zones of Africa on this side of the continent, and appears to be suitable for navigation throughout the greater part of its length—rising from 15 to 20 feet at times of flood, but having such a depth, at its lowest stage, as to be only passable by canocs.

From the Cunene, in lat. 17° S., to the Orange river in 29°S., the dry belt of the South African desert zone intervenes, and there are no permanent rivers on the land sloping to the sea. The coast lands from the edge of the plateau are, however, furrowed by numerous water-courses, which are filled only after the occasional rainfalls.

The Orange river also belongs for the greater part of its lower course to the water-courses of the arid belt, but it receives such a constant supply from its head streams, which descend from the high lands near the east coast of the continent, as to be able to maintain a perennial flow in its channel, which, however, is so shallow as to be of no value for navigation. Its main head streams are the Vaal and Nu Gariep or Orange, which rise on the opposite slopes of one of the summits of the Drakenberg range, called the Mont aux Sources. After encircling the Orange River Free State, these rivers unite

near the centre of this part of the continent to form the Orange, which continues west- ward to the Atlantic, but without receiving any permanent tributary. The chief water channels which periodically carry supplies to it from the south are Brak and the Great Hartebeeste; from the Kalahari region in the north come the Molopo and Nosob channels. Midway between the union of the head streams and the ocean the river forms a great fall of 150 feet in height.

The rivers which flow down from the terraces of the Cape Colony are numerous, but have little permanent depth of water, shrinking almost to dryness excepting after rains, when they become impetuous torrents; some have cut deep channels, much beneath the level of the country, and the banks of these cafions are choked with dense vegetation. Passing round to Natal and Zulu Land, the coast country is well watered by frequent streams which descend from the base of the cliff-wall of the Drakenberg ; these have gene- rally the character of mountain torrents, with rapid flow between high banks and changing volume, and are almost without exception closed at their mouths by sand bars, which in most instances shut in considerable lagoons. One of these, the lake of Santa Lucia, is more than 40 miles in length.

Orange,

Drainage to the Indian Ocean,

The first large river of the Indian Ocean system is the Limpopo.

Limpopo or Crocodile river, so named from the great nuni- ber of these animals found in its bed. Its basin lies centrally in the southern tropic, also in the desert belt, and on this account it barely maintains a shallow flow of water throughout the year. Its sources are in that part of the plateau edge in the Transvaal Republic which is known as the Hooge Veldt and Magalies Berg ; from this it forms a wide semicircular sweep to north-east and south, reaching the ocean not far north of Delagoa Bay, in 25°S. _ Its chief tributary, the Olifant or Lepalule, has its rise in a part of the Hooge Veldt which is nearer the coast. Many of its minor tributaries in its lower course are periodical streams known as sand rivers, only filled after heavy rains.

The Zambeze is the great river of the pastoral belt of Zambere.

South Africa, and the fourth in point of size in the con- tinent, draining nearly 600,000 square miles. As far as its basin has yet been explored, the Zambeze has three head streams from the great water-parting ridge which extends from the Mossamba Mountains of inner Angola to the high lands north of Nyassa Lake, about the 12th parallel of S. latitude. There are the Lungebungo river from the Mossamba Mountains, the Leeba river from Lake Dilolo, on the water-parting which separates be-

tween the Zambeze and the Kassabi river, and the Lce- ambye or Jambaji, probably the main-source stream, coming from the unknown lands south-west of the Cazembe's territory. From the union of these streams the general course of the Zambeze is in two wide curves eastward, through the plateau and over its edge to the Indian Ocean, in about 19° S. lat. From the north its main tributaries are the Kafue and Loangwa or Aruangoa rivers, and the Shire river, flowing out of Lake Nyassa. Above this point, on its middle course, where it forms the great Victoria Falls, the Zambeze receives the Chobe from the north-west; and from southward numerous minor tribu- taries join its lower channel. The Zambeze forms a delta with many mouths, the outmost of which are nearly 100 miles apart, and their entrances are generally barred by sand banks; but if these be passed, the main river is continuously navigable for 320 miles to the town of Teté, and its tribu- tary the Shire may also be followed up for nearly 150 miles, to where its cataracts stop navigation. At the Victoria Falls the great river contracts from its general width of nearly a mile, to 60 or 80 feet, and plunges over a height of 100 feet, into a remarkable zig-zag gorge rent in the hard basalt rocks.

The Rovuma, which has its chief tributaries from the plateau edge on the eastern side of Lake Nyassa, is the next great river of the drainage to the Indian Ocean. It has been navigated by Livingstone for 150 miles from the coast, and formed part of his route in entering the con- tinent on the journey from which he has not yet returned, but its basin has not yet been explored.

Still farther north the mouths of a great river named the Rufiji are known, on the coast opposite the island of Monfia, south of Zanzibar; but no part of its course has yet been traced by any European.

The Kingani and the Wami are two streams from the plateau edge, in the country of Usagara, and reach the sea in the channel formed by Zanzibar island. The Pangani river, further north, rises in the snowy mountain Kilima- njaro. The Sabaki and Dana, which embouch on the opposite side of Formosa Bay, in 3°S., flow over the same coast plains, having their head springs in the spurs of Mount Kenia. The latter river might be navigated during the rainy season for 100 miles from the coast.

The Juba river is the most considerable on the eastern side north of the equator. Jt is believed to have its rise in the high lands immediately south of Abyssinia, and its general direction is south-eastward to the Indian Ocean ; but nothing is known of its higher course except by report. The ill-fated expedition under Baron von der Decken explored this river for about 180 miles upwards from its mouth, but as yet no traffic is carried on by its means. The Webbe or Haines river flows down from the high lands in a direction nearly parallel to the Juba, a little farther north, but its outlet on the coast is completely barred by sand dunes of from 400 to 500 feet in height, behind which it forms a lagoon of varying extent. The desert zone is now again reached, and the water supply fails. No permanent rivers reach the Red Sea from the Abyssinian highlands or from the heights of Nubia which continue these northward; the largest water-course is that of the Barca, which is periodically filled by its tributaries in the northern part of the Abyssinian plateau.

Turning now to the great areas of continental drainage, it is observed that in North Africa there is a vast space of upwards of four millions of square miles, extending from the Nile valley westward to the Atlantic coast, and from the plateau of Barbary in the north to the extremities of the basin of Lake Chad in the south, from which no single river finds its way to the sea. The whole of this space, however, appears to be furrowed by water channels in the

most varied directions. From the inner slopes of the plateau of Barbary numerous wadys take a direction to- wards the great sand-belt of the Erg, in

which they ter- minate; a great serics of channels appears to radiate from the higher portion of the Sahara, which lies immediately north of the tropic of Cancer and in about 5° E. of Green- wich ; another cluster radiates from the Mountains of Tibesti, in the eastern Sahara.

Lake Chad, on the margin of the pastoral belt, is sup- plied by a large river named the Shari, coming from the moist forest country which lies nearer the equator; and the lake, which till recently was believed to have no outlet, overflows to north-eastward, fertilising a great wady, in which the waters become lost by evaporation as they are led towards the more arid country of the Sahara.

The southern area of continental drainage is of much smaller extent, and occupies the space of the desert zone which lies between the middle of the Zambeze basin and Damara Land. It centres in Lake Ngami, to which the Tioge river flows from the pastoral belt on the south- west. Several water-courses from the high Damara Land also take a direction toward this lake. The river Zuga carries off the overflow of Lake Ngami towards a series of salt lagoons which lie eastward near the edge of the plateau; but it becomes narrower and less in volume as it approaches these, and in some seasons scarcely reaches their bed.

Smaller spaces of continental drainage exist at various points near the eastern side of the continent. One of these occupies the depressed area between the base of the Abyssinian highland and the Red Sea, and is properly a continuation of the Sahara desert belt beyond the inter- vening plateau. In this space the Hawash river, descend- ing from the plateau, terminates before reaching the sea. Another interior basin lies in the plateau between the edge on which mountains Kenia and Kilima-njaro rise and the country east of the Victoria Lake, and includes several salt lakes. It is probable that the great Tanganyika Lake is the centre of a third basin of no outflow on this side of the great plateau; and Lake Shirwa, south-east of the Nyassa, constitutes a fourth.

The great lakes, which form such a prominent feature in Lakes.

African hydrography, are found chiefly in the southern and eastern regions of the continent, but they are distributed over all the systems of drainage.

The Victoria and Albert Lakes of the Nile basin are great seas of fresh water; and if their extent should ultimately prove to be nearly that which is at present believed, they rival the great Ame-

rican lakes for the place of the greatest expanse of fresh Nile lakes.

water on the globe. The former, the Victoria Lake, is at an elevation of about 3300 feet above the sea; and its outline, as at present sketched on our maps, occupies an area of not less than 30,000 square miles. The Albert Lake, 2500 feet above the sea, is believed to have an extent not far short of this. Lake Baringo, north-west of the Victoria, is reported to be a great fresh lake, discharg- ing towards the Nile by a river which is possibly the Sobat tributary. Lake Tzana or Dembea, 60 miles in length, at a level of 6000 feet above the sea, on the Abyssinian plateau, is the only remaining great lake of the Nile basin.

The great expansions of the Chambeze-Lualaba river, Congo presumably belonging to the river Congo, are the only lakes.

other considerable lakes of the Atlantic drainage. The highest of them, Lake Bangweolo or Bemba, is described as being 150 miles in length from east to west, and at an elevation of 4000 fect; Lake Moero, the next, extends through 60 miles; Lakes Kamalondo or Ulenge, and the yet unvisited lakes of the same drainage, are described as of vast extent, and lie at an clevation of about 2000 feet above the sea.

| | |

Zambeze Lake.

Continen- tal lakes.

Salt lakes.

Climate.

Belonging to the drainage system of the Indian Ocean are, Lake Nyassa, 1500 fect above the sca, and stretching meridionally over an arca of nearly 9000 square miles in the basin of the Zambeze;.and Lake Samburu, a reported lake of great extent, lying in the plateau edge north of Mount Kenia, and probably belonging to the basin of the Jubariver. The great Lake Tanganyika, upwards of 10,000 square miles in area, and united by a broad channel with Lake Licntba in the south, occupies a deep longitudinal basin, girt with mountains ; it is 2800 feet above the sea level. As yet no outlet has been discovered for this vast lake, and the question whether it has or has not an over- flowing river, is still undecided ; but its waters are not perfectly fresh, the drainage to it is small, and the proba- bility is that the Tanganyika is a continental lake. Lake Shirwa, enclosed by mountains on the plateau edge south- east of Lake Nyassa, and 2000 feet above the sea, has brackish water, and no outlet.

Lake Chad, the greatest lake of the continental system of North Africa, is a shallow lagoon of very variable extent, with numerous islands: it lics at about 1100 fect above the sea; its waters are fresh and clear, and its over-flow is carried off to north-castward by the wady named Bahr-el-Ghazal.

Lake Ngami, the corresponding lake in the southern continental system, at an elevation of about 2900 feet, is also a shallow recdy lagoon, varying in extent according tothe season. The Zuga river carries off its surplus water to eastward. Salt lakes are of frequent occurrence in the areas of continental drainage; perhaps the most remarkable of these is the Assal lake, which lics in a depression east of Abyssinia comparable with that of the Dead Sca, 600 feet beneath the level of the Red Sea; the Sebka-el-Faroon or Schott Kebir, south of Tunis, is a great salt lagoon, 100 miles in length, dried up in summer, when its bed is found to be thickly encrusted with salt, and in winter covered with water to a depth of two or three feet. It lies several feet beneath the level of the Mediterranean.

Africa lies almost entirely in the torrid zone, and is the hottest continent of all. The greatest heat, however, is not found under the equator, since the whole of the central belt of the continent is protected by a dense covering of forest vegetation, supported by the heavy rainfall, and has in consequence a more equable climate, but in the dry, bare exposed desert belts, which lie on

the margins of the tropics, the Sahara in the north and the Kalahari in the south, where the climate is extreme. The highest tempera- ture is found throughout the Sahara, particularly in its eastern portions towards the Red Sea. In Upper Egypt and Nubia eggs may be baked in the hot sands; and the saying of the Arabs is, "in Nubia the soil is like fire and the wind like a flame." The regions along the Mediterranean and Atlantic coasts are rendered more tem- perate by the influence of the sea. To the south of the Great Desert the temperature decreases, chiefly on account of the increasing moisture and protection of the land sur- face from extreme heating by its trec growth, but also because of the greater elevation of the land as the great southern plateau is approached. Both on account of its elevation and its narrower form, which gives greater acccss to the equalising influence of the surrounding ocean, the southern half of the African continent has a less high temperature than the northern, though the same gradations of climate outward from the centre belt are clearly marked in each division. Regular snowfall does not occur even in the most southern or northern regions; and this pheno- menon is only known in the most elevated points of the continent, as in the Atlas Mountains in the north, the summits of which retain patches of snow even in summer, in the Abyssinian peaks, in the highest points of the

mountains of the Cape Colony, and most remarkably in the lofty summits of Mounts Kenia aud Kilima-njaro, which rise on the plateau directly beneath the equator. The intensity of radiation and its influence upon the tempera- ture are very great in Northern Africa; while in the day time the soil of the Sahara rapidly absorbs the solar rays, during the night it cools so rapidly that the formation of ice has often been known to occur.

The observed average temperatures of the extreme months of the year at various points of Africa, from N. to S., are given in the following table :-—

Jan. ; July. Jan. | July. Las Palmas, Can- } | g1-9 | 73-6 Kobbé, Darfur, . | 67°1 | 87°8 ary Islands, Ankobar, Abyssinia,| 52°0 | 58°1 Santa Cruz, Tene- } | g3.7 | 77-9 || Elmina, Gold Coast, | 79°7 | 76°7 Tite Ne ue Christiansborg, ,, | 81°0 | 76°5 Funchal, Madeira, | 68°5 | 72°5 || Niger Mouth (5°) | g¢-9 | 39-9 Casa Blanca, Ma- } | 57.4 | 77-9 SONA) emer ees ROSCO, BMF SL) Leone, . . . Cape Town (34°S.), | 74°3 | 57°6 Kuka, Bornu 756 | 83:8 Stellenbosch, . 77°0 | 57°0 Ger N.), « Swellendam, . 72°7 | 59°9

ee ee ee Africa is not much under the influence of the regular Winds |

winds, except the monsoons of the Indian Ocean, the great movement of the atmosphere depending chiefly on the oscillation of the continent beneath the sun during the sea- sons, as will be afterwards explained. The wind currents over the whole continent have a prevailing direction from the east. There are the trade winds, modified by inter- ruptions of changing heat and elevation of the land sur- face. In the northern part of the Indian Ocean the year is divided betwcen the south-west monsoon, blowing from March till September, away from Africa, towards the then heated continent of Asia; and the north-east monsoon, or rather the normal trade wind, blowing towards the African coasts, from October till February. It will be seen in the next paragraph, that the monsoons, although they extend only to about a third portion of the East African shores, have an extremely important bearing upon the physical economy of the whole African continent. From hurricanes Africa is nearly exempt, except in its south-eastern extremity, to which at times the Mauritius hurricanes extend. At rare intervals these have visited the east coast as far as Zanzibar. Northern Africa is much exposed to the hot winds and storms from the Sahara, which are called in Egypt Khamsin, in the Mediterranean Scirocco, Shume or Asshume in Marocco, and Harmattan on the east coasts of the Sahara and in the countries bordering on the Gulf of Guinea. These always blow directly across the coast from the interior, and scem to move round the compass during the year, beginning in Egypt in April, in Algeria in July, in Marocco in August, in Senegambia in November. Similar dry electrical winds are experienced in

the Kalahari desert in the south. Whirlwinds, frequently carrying sand up into the atmosphere, are of frequent occurrence in these deserts, and are also known in the dry region of Unyamuezi, between Zanzibar and the Tanganyika, and i the Limpopo basin farther south. Extreme heat and dry-ness are the characteristics of these winds, which, raising the sand, filling the air with dust, and prodigiously favour-

in September and October. Whilst the north-east mon- In the

FEATURES. |

ing the powers of evaporation, are often fatal to the vege- In interior.

Rains within the tropics.

table and animal creation in the regions visited by them.

In Africa the dependence of the winds and rains upon the movement of the land beneath the sun is more clearly marked than in any other intertropical region of the globe. The high temperature caused by the vertical heat of the sun over a particular area induces an indraught of air to that place, an ascending current is produced which carries up with it the warm and moist air; condensed in the higher regions of the atmosphere, the moisture falls as rain, and the condensation makes way for a further in- draught. It is thus that in Africa the winds and rains follow as a rule the pendulating movement of the continent beneath the sun, and the rainy season of any space begins almost immediately after the sun has reached its zenith. Between the tropics and the equator the sun comes twice to the zenith of each belt during the year, at the tropical lines the sun is only once in the zenith ; thus it follows that a double rainy season is observed in all places lying in the central belt of the tropics, and a single rainy season in those which are nearer the skirts of the zone. These wet and dry seasons correspond to the cooler and hotter periods of the year, and take the place of the summer and winter of the temperate regions. Various circumstances tend to interfere with and modify the working of this general rule of the rotation of seasons. In Southern Africa that rainy season which follows the

apparent move- ment of the sun northward, is greater than that which ensues after his passage south, since in the former case the winds are drawn inwards from the ocean and carry greater quantities of moisture, whereas in the latter the winds are drawn from the land north of the equator, and their mois- ture is already in great part spent. In the northern and eastern regions of Africa the winds and rains are governed as much by the heating and cooling of the Asiatic con- tinent as by that of Africa itself, but in the central and western portions of the continent the rule is well exem- plified. Thus in Damara Land, bordering on the southern tropic, there is one short rainy season from February till April, beginning only with the northing sun; at Loanda in Angola the greater rains last from February till May, the lesser rainy season, when the sun has passed this place going south, occurs in November only. At Annobon island, surrounded by wide sea, April and May are the rainy mouths of the northing sun, October and November of the southing. The Guinea coast, facing the sea to southward, has its greater rainy season from March to June, when the northing sun draws the ocean winds on to the coast; and its lesser rains occur in October and November, when the sun has passed southward from the land. Nearing the northern tropical line, the coast-land from Sierra Leone to the Senegal river has a simple wet and dry season during the year.

On the eastern coast-land the rains are more dependant on the direction of the monsoon winds; about the mouths of the Zambeze and on the Mozambique coast the rains begin in November, after the north-east monsoon wind has set in over the northern part of the Indian Ocean, bringing with it the vapours drawn from the sea to condense on the coast slopes. The rains continue here till March, when the south-west Monsoon begins to blow away from the land towards the then heated surface of Asia. At Zanzibar there is a double fainy season, a stronger in the months of March, April, and May, with the northing sun, beginning immediately after the south-west monsoon has set in, and a weaker in September and October with the southing sun. Under the equator on the east coast the rains begin in April with the south-west monsoon, continuing till June, and during this period the sky is obscured by heavy clouds. The second rainy season here is only marked by a few showers

soon is blowing the sky remains of a cloudless blue. the interior of the continent, between these tropical coasts, the rainy seasons appear rather to precede than follow the advancing sun. In the region of the central Zambeze the greater rains last through February, March, and April, the lesser occurring in October and November. The worst droughts are experienced in December and J anuary. Nearer the centre of the continent the two rainy seasons become so lengthened as almost to merge into one period of rains, extending over about eight months of the year. In the newly-explored country south-west of the Tanganyika, Dr Livingstone found that the rains began in October, and that the last showers fell in May; but there is probably a drier period between these limits. At the Tanganyika Lake the rainy season begins in September, lasting till May, and the same rainy reason has been observed in the interior country of the west coast immediatcly north of the equator. Between these points, in Manuyema country, Dr Livingstone found that the rains continued till July, or almost through the year. Northward in the interior the rainy seasons are again clearly divided into a greater aud lesser, and in the regions west of the Upper Nile between 5° and 10° N. lat., the stronger rains occur from August till October, the weaker come with the northing sun in April and May. The plateau of Abyssinia, rising high above the general level of the north of Africa, and inter- cepting and condensing the moist winds, has also a double rainy season,—a greater from June to September, when the sun is passing southward; a lesser in February and April, with the northing sun. The rainy seasons in Central Africa are ushered in and accompanied by violent thunderstorms and by occasional falls of hail. The quantity of the rain- fall, which is excessive in the regions near the equator, diminishes rapidly to north and south of this belt as the dry regions on the borders of the tropics are approached.

The Sahara, and also the Kalahari of Southern Africa, are almost rainless regions, but wherever a sufficient elevation occurs to intercept a cooler stratum of the atmosphere, rain is not wanting, even in the midst of the Great Desert. A striking instance of this is related by Mr Richardson. That traveller relates that when on the borders of the mountain knot of " Air, in about latitude 19° N., on the 30th Sept. 1850, there was a cry in the encampment, 'The wady is coming.' Going out to look, I saw a broad white sheet of foam advancing from the south between the trees of the valley. In

ten minutes after a river of water came pouring along, and spread all around us, converting the place of our encainpment into an isle of the valley. The current in its deepest part was very powerful, capable of carrying away Sheep and cattle, and of uprooting trees. This is one of the most interesting phenomena J have witnessed during my present tour in Africa. The scene, indeed, was per- fectly African. Rain had been observed falling in the south ; black clouds and darkness covered that zone of the heavens, and an hour afterwards came pouring down this river of water into the dry parched-up valley."

The causes of want of rainfall in the vast region of the Dry re- Sahara appear to be mainly these—that the winds advanc- gions.

ing towards it come from a cooler and moister to a warmer and drier region, indeed to the hottest and driest of all, and so are constantly losing in moisture and gaining in temperature as they approach; the high plateau of Abyssinia forms an effective screen from the winds of the Indian Ocean, wringing out their moisture before the Sahara is reached, and on the Atlantic side the north-east trade wind constantly blows away from the land ; a barrier of mountains also deprives the Sahara of rain from the south-west. Another cause of dryness is the low level of great areas of the Sahara. We have seen that wherever

I. — 33

Extratropi- cal rains.

Plants,

Quadiu- mana,

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there is a considcrable elevation, even in its midst there is a periodical rainfall. The Kalahari region is almost rain- less, on account of the great heat to which it is subjected 5 but specially because the winds coming towards it from the eastward, the prevailing winds, expend their moisture on the high slopes of the plateau which face the Indian Ocean. Hcavy dews,

consequent on the rapid changes of day and night temperature in these bare regions, partly compensate the deficiency of rain.

The portions of the continent which lie beyond the tropics north and south, the outer slopes of the plateau of Barbary and of the Cape Colony, have no marked rainy season, and the times of the occurrence of rain are altered, the summers of both being drier, the showers more frequent in winter. In Natal, and on the slopes of the plateau in its neighbourhood, rain may be expected in any month; but the greatest falls occur from October to March. The absolute quantity of rain which falls in Africa has as yet been measured at so few points, that no definite conclusions can be arrived at respecting it.

Although Africa belongs almost entirely to the torrid and warm zones, its vegetable productions are essentially different in different parts. Thus, in the extreme north, groves of oranges and olives, plains covcred with wheat and barlcy, thick woods of evergreen oaks, cork-trees, and sea-pines, intermixed with cypresses, myrtles, arbutus, and fragrant tree-heaths, form the principal features of the landscape. On this northern coast the date-palm is first found ; but its fruit does not arrive at perfection, and it is chiefly valued as an ornamental object in gardens. Various kinds of grain are cultivated. Beyond this region of the coast and the Atlas chain, with the borders of the Sahara, commences a new scene. It is in this region, extending to the borders of Soudan, that the date-tree forms the charac-teristic feature. Being peculiarly adapted to excessive dry- ness and high tempcrature, it flourishes where few other plants can maintain an existence. Were it not for the fruit of the invaluable date-tree, the inhabitants of the desert would almost entirely depend on the productsof other regions for their subsistence. With the southern boundary of the Sahara, the date-tree disappears, the baobab or monkey bread-tree takes its place, and, under the influence of the tropical rains, a new, rich, and highly-developed flora pre-sents itself. These trees, together with huge cotton-trees, oil-palms, sago-palmns, and others of the same majestic tribe, determine the aspect of the landscape. The laburnum ex- pands its branches of golden flower, and replaces the senna of the northern regions, and the swamps are often covered

N. Africa, Distri- Marocco, buted over

Africa.

ORDERS. Egypt, (te and the

Sanna, District. Quadrumana,

Carnivora,

Ungulata,

Multungulata,

Edentata,

Insectivora, .

Ikosneey 6 6 6 6

Marsupialia and Monotre- mata,

Total,

The order Quadrumana is well represented, more particu- larly within the tropics, whence they decrease northwards and southwards. The most important members of this family are the anthropoid monkeys, the chimpanzee and gorilla, in Tropical and Western Africa. Baboons and mandrils, with few exceptions, are peculiar to Africa. Only a few species

APWRAC A

Abyssinia | Senegam- | Somali Land, bia to Upper Nilej/Lake Chad| Mozambique, District.

[BOTANY.

with immense quantities of the papyrus plant. Instead of waving fields of corn, the cassava, yam, pigeon-pea, and the ground-nut, form the farinaceous plants. The papaw, the tamarind, the Senegal custard-apple, and others, replace the vine and the fig. In Southern Africa, again, the tro-

pical forms disappear, and in the inland desert-like plains, the fleshy, leafless, contorted, singular tribes of kapsias, of mesembryanthemums, euphorbias, crassulas, aloes, and other succulent plants, make their appearance. Endless species of heaths are therefound in great beauty, and the hills androcks are scattered over with a remarkable tribe of plants called Cycadacece. Plants of the protca tribe also add to the extra-ordinary variety in the vegetable physiognomy of that region.

Of the characteristic African plants, the date-trec is one Date-palm, of the most important, as it is likewise among the nearly one thousand different species of palms. It furnishes, as it were, the bread of the desert, beyond which it occurs only in Western Asia, wherever a similar dry and hot climate prevails. This tree requires a sandy soil, and springs must not be absent. The dates furnish food not only for man, but for the camel and the horse. For the latter purpose the stones are used in many parts, and are said to be more nourishing than the fruit itself. The Arabs make a great variety of dishes of which dates form the chief part. Of the sap of the tree palm-wine is prepared, and the young leaves are eaten like cabbage.

In Southern Africa are the extensive miniature woods of Heaths, heaths, as characteristic as the groves of date-palms in the north. No less than five hundred species have already been discovered. These plants, of which some reach the height of 12 to 15 feet (Erica urceolaris), are covered throughout the greater part of the year with innumerable flowers of beautiful colours, the red being prevalent.

*The papyrus is an aquatic plant, having a stem from 3 Papyms. to 6 feet high. It inhabits both stagnant waters andrun- – ning streams, and is common in the countries of the Nile, particularly Egypt and Abyssinia. Its soft, smooth flower- stem afforded the most ancient material from which paper was prepared, and for this reason it is one of the noticeable African plants. It has, however, also been used for other purposes ; its flowering stems and leaves are twisted into ropes ; and the roots, which are sweet, are used as food.**

The following table, compiled from the "synonymic lists Animals of species of mammals" given by Mr Andrew Murray,? affords a general view of the distribution of terrestrial mammals in the different parts of Africa,—the

figures denot- ing the number of species found in each of the divisions, those in the last column being the number peculiar to Africa :—

East Africa,

S. Africa, – Natal | W- Africa) Total Species

to Damara see Species in | peculiar to Land and! guinea Africa. Africa. C. Colony. i

Zanzibar, | Madagas- car. and

Zambczia.

of the genus Macacus, which is East Indian, are found in Africa. The only short-tailed species (AMacacus Innwus)

1 See Flora of Tropical Africa, by Daniel Oliver, F.R.S., F.L.S, London, 1868.

2 The Geographical Distribution of Mammals, by Andrew Murray. London, 1866.

Carnivora.

Ungulata (Hoofed fammalia,

|

Ruminan- ‘ia, and achyder- nata).

ctivora,

ZOOLOGY. |

coast at the Rock of Gibraltar. true Lemurs or makis.

represented in Africa by the chimpanzee. entirely wanting.

Of the larger Carnivora the bear is almost entirely wanting, and occurs only sparely in the Atlas Mountains in Barbary. The true martens are unknown, but otters occur. Of the Canis family the jackal is characteristic, and roams over the whole of Africa; it differs from the Asiatic species in its paler skin, which approaches the colour of the prevailing deserts. The wolf and fox do not extend beyond the northern margin of Africa. Hyzenas are true African tenants; the striped hyzena extending from Asia over North Africa, the spotted hysena over the remainder of the con- tinent; in the southmost part of the continent the brown hyena is also found, and with it the aardwolf, or earth wolf of the Cape colonists, allied to this genus. Africa is the chief home of the lion, which there remains undisturbed as king over the lower animal creation, though it has been driven inwards from the more settled portions of the coast- land; while in the extreme south-western parts of Asia, to which it is now confined, its power is divided with that of the tiger. The leopard, serval, caracal, chaus, and civet cat (the locality of the true civet being North Africa), are the other principal representatives of the cat tribe. The herpestes or ichneumons have the same distribution as the civets; the species which destroys the eggs of the crocodile is found in Egypt and the North of Africa.

Of wild horses the asinine group is characteristic of Asia, and the hippotigrine of Africa. The quagga, exclu- sively African, inhabits the most southern parts of the continent, and is scarcely found north of the Orange river, but occurs in great herds, associated with the white-tailed gnu; the zebra (Hquus Burchellit), or zebra of the plains, is widely distributed over Africa, from the limit of the quagga to Abyssinia and the west coast; the zebra of the inountains (Zquus zebra), more completely striped than the rest, is only known in South Africa. The true onager or aboriginal wild ass is indigenous to North-East Africa and the island of Socotra. A species inhabiting the high land of Abyssinia is distinct from these. The horse, domesti- cated in other parts of Africa, excepting the region of forests, is not found in the eastern intertropical region; and, for some cause not yet clearly ascertained, it appears to be impossible to acclimatise it there. The single humped camel or dromedary is used over the whole of North Africa, as far south and west as the river Niger and Lake Chad. The Indian buffalo has spread by introduc- tion to North Africa; the Cape buffalo, a Species peculiar to Africa, reaches as far north as a line from Guinea to Abyssinia;

the Bos Brachycerus is a species peculiar to West Africa, from Senegal to the Gaboon. Of sheep, the Ovis Tragelaphus is peculiar to North Africa ; the Ibex goat extends into Abyssinia. The family of the antelopes is essentially African, five-sixths of the species composing it being natives of that country, and chiefly of the portion lying south of the Sahara, occurring in dense herds. Lastly, the giraffe, one of the most celebrated and characteristic of African quadrupeds, ranges from the limits of the Cape Colony as far as the Sahara and Nubia.

Of Edentata the seven species known to occur in Africa are also peculiar to it. The aardwark (Orycteropus capensis) is essentially burrowing in its habits; and the burrows formed by these animals are the source of frequent danger to the waggons and horses of the Cape colonists.

A genus of moles is met with in South Africa, but is

The gibbons are

AFRICA

is North African, and is also found wild on the opposite In Madagascar the place of the true monkeys is supplicd by the peculiar tribe of the Many species have close affinities with those of Asia; thus the orang-outang of Borneo is

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not found in the tropical regions. The Cape or gilded mole, chryso-chlore, is so called from its iridescent glossy fur; two or three species of hedgehog occur in the continent, and Madagascar has a peculiar family resembling these in appearance, but without the power of rolling up into a ball for defence. Bats are numerous in Africa, but few are peculiar to it.

Of Rodents the burrowing kinds prevail. The African Rodentia.

species of porcupine are known in the northern and western coast-lands and in South-Eastern Africa. The hyrax ex- tends over Eastern Africa and a portion of the west coast. Hares are only known in the countries north of the

Sahara and in the Cape colony. Among squirrels, those with bristles or spines in their fur are peculiar to the southern regions of the continent.

The ornithology of Africa presents a close analogy in Birds, many of its species to those of Europe and South Asia. Thus, on its northern coasts, there is scarcely a single species to be found which does not also occur in the other countries bordering on the Mediterranean. The ornitho- logy of the region of the Nile and the northern coasts is identified with that of Arabia, Persia, and Spain. The deserts are inhabited by species adapted to its solitudes 3 while Southern Africa presents different species.

The ostrich, the hugest of birds, which has been described as the feathered camel, or the giraffe among birds, is found in almost every part of Africa. But its chief home is the desert and the open plains; mountainous districts it avoids, unless pressed by hunger. The beautiful white feathers, so highly prized by the ladies of Europe, are found in the tail only of the male bird. The chase is not without its difficulties, and it requires the greatest care to get within musket-shot of the bird, owing to its constant vigilance and the great distance to which it can see. The flectest horse, too, will not overtake it unless stratagem be adopted to tire it out. If followed up too eagerly, the chase of the ostrich is not destitute of danger; for the huntsman has sometimes had his thigh-bone broken by a single stroke from the leg of a wounded bird.

The large messenger or secretary-bird, which preys upon serpents and other reptiles, is one of the most remarkable African birds. It is common near the Cape, aud is not seldom domesticated. Of gallinaceous fowls, adapted to the poultry-yard, Africa possesses but a single genus, tle guinea-hens, which, however, are found in no other part of the world. These birds, of which there are three or four dis- tinct species, go in large flocks of 400 or 500, and are most frequently found among underwood in the vicinity of ponds and rivers. ‘There are, besides, many species of partridges and quails in different parts of Africa. Water fowl of various species are also abundant on thé lakes, and rivers, as are likewise various species of owls, falcons, and vul- tures, the latter of which are highly useful in consuming the offal and carrion, which might otherwise taint the air and produce disease.

Among the smaller birds of Africa are many species re- markable for the gaudincss and brilliancy of their plumage, or the singularity of their manners and economy. Of the former kind may be mentioned the sunbirds, the lainpro- tornis, the bee-eaters, the rollers, the plantain-eaters, the parrots, the haleyons, and numerous smaller birds that swarm in the forests. Of the latter kind it will be suffi- cient to mention the honey-cuckoo (Cuculus indicator).

Though Africa is not exempt from the scourge of veno- Reptiles. mous or dangerous reptiles, still it has comparatively fewer than other tropical countries, owing to the dryness of the climate. The reptiles harboured by the desert regions consist chiefly of harmless lizards and serpents of a small size, though often venomous. The frog and tortoise tribes are. represented in but few species and numbers, ;

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Fishes.

Insects,

Zoophytes.

Man,

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The most important among the reptiles is the crocodile, which inhabits nearly all the large rivers and lakes within the tropics, and is still abundant in the Nile below the first cataract.

The chameleon is common in Africa. Among the veno- mous species of snakes are the purple naja, the ccrastes or horned viper, the ringed naja, and the darting viper. _

Edible fish are found almost everywhere in great variety and quantity. The fresh waters of Egypt produce the gigantic bishir, the coffres, and numerous specics of the pimelodes. Many varieties of fish exist in the great inte- rior

lakes; five large species found in the Tanganyika are described by Burton. The greater number of the fish of the Red Sea resemble the saxatiles of the warm seas of Asia. On the west coasts are found the fish belonging to equatorial latitudes, while the shores of the Mediterranean produce those of France and Spain. The seas of the southern extremity possess the species common to the latitudes of the antarctic, south of the three great capes. The fish of the east coast are the same as those of the Indian Sea.

Of the insect tribes Africa also contains many thousand different kinds. The locust has becu, from time imme- morial, the proverbial scourge of the whole continent ; scor- pions, scarcely less to be dreaded than noxious serpents, are everywhere abundant; and the zebub, or fly, one of the instruments employed by the Almighty to punish the Egyptians of old, is still the plague of the low and cultivated districts. In the interior of Africa a venomous fly occurs in certain regions of the south and east, which is fatal to nearly all domestic animals. It is called tsetse (Glossina morsitans), and its size is almost that of the common blue fly which settles on meat; but the wings are larger. On the absence of this insect greatly depended the success of recent explorers in that quarter, as, where it appeared, their cattle infallibly fell victims to its bite. There are large tribes which cannot kecp either cattle or sheep, because the tsetse abounds in their country. Its bite is not, however, dangerous to man; wild animals likewise are undisturbed by it. The termites or white ants are likewise a scourge to the country where they occur in great numbers. This destructive creature devours everything in the shape of wood, leather, cloth, &c., that falls in its way; and they march together in such swarms, that the devastation they commit is almost incredible.

Of the class of zoophytes, the brilliant polypi of every variety, and madrepores, abound on the coasts of Africa. The shores of the Mediterranean produce the finest coral, and those of the Red Sea bristle with extensive reefs of the same mollusca.

From the shores of the Mediterranean to about the lati- tude of 20° N., the population of Africa consists largely of tribes not originally native to the soil, but of Arabs and Turks, planted by conquest, with a considerable number of Jews, the children of dispersion; and the more recently

introduced French. The Berbers of the Atlas region, the Tuaricks and Tibbus of the Sahara, and the Copts of Egypt, may be viewed as the descendants of the primitive stock, while those to whom the general name of Moors is applied, are perhaps of mixed descent, native and foreign. From the latitude stated to the Cape Colony, tribes com- monly classed together under the title of the Ethiopic or Negro family are found, though many depart very widely from the peculiar physiognomy of the Negro, which is most apparent in the natives of the Guinea coast. In the Cape Colony, and on its borders, the Hottentots form a distinct variety in the population of Africa, most closely resembling the Mongolian races of Asia.

The Copts, or as they are correctly pronounced, either Ckoobt or Ckibt, are considered to be the descendants of

the ancient Egyptians. They do not now compose more than one sixteenth part of the population of Egypt, their number not 'exceeding 145,000, about 10,000 of whom reside at Cairo. Conversions to the Mohammedan faith, and intermarriages with the Moslems, have occasioned this decrease in their numbers; to which may be added the persecutions which they endured from their Arabic invaders and subsequent rulers. They were forced to adopt distine- tions of dress, and they still wear a turban of a black or blue, or a grayish or light brown colour, in contradistinction to the red or white turban. In some parts of Upper Egypt there are villages exclusively inhabited by the Copts. Their complexion is somewhat darker than that of the Arabs, their foreheads flat, and their hair of a soft and woolly character; their noses short, but not flat; mouths wide, and lips thick ; the eyes large, and bent upwards in an angle like those of the Mongols; their cheek-bones high, and their beardsthin. They are not an unmixed race, their ancestors in the earlier ages of Christianity having intermarried with Greeks, Nubians, and Abyssinians. With the exception of a small proportion, the Copts are Christians of the sect called Jacobites, Eutychians, Monophysites, and Monothelites, whose creed was condemned by the Council of Chalcedon, A.D. 451. They are extremely bigoted, and bear a bitter hatred to all ofher Christians; they are of a sullen temper, extremely

avaricious, great dissemblers, ignorant, and faith- less. They frequently indulge in excessive drinking; but in their meals, their mode of eating, and the manner in which they pass their hours of leisure, which is chiefly in smoking their pipes and drinking coffec, they resemble the other in- habitants of the country. Most of the Copts in Cairo are employed as secretaries and accountants, or tradesmen; they are chiefly engaged in the government offices; and as merchants, goldsmiths, silversmiths, jewellers, architects, builders, and carpenters, they are generally considered more skilful than the Moslems. The Coptic language is now understood by few persons, and the Arabic being employed in its stead, it may be considered as a dead language.

The countries above Egypt are inhabited by two tribes Nubians.

of people resembling each other in physical characters, but of distinct language and origin. One is, perhaps, the aboriginal or native, the other a foreign tribe. Dr Prichard terms them Eastern Nubians, or Nubians of the Red Sea, and Nubians of the Nile, or Berberines. All these tribes are people of a red-brown complexion, their colour in some instances approaching to black, but still different from the ebony hue of the Eastern negroes. Their hair is often frizzled and thick, and is described as even woolly; yet it is not precisely similar to the hair of the negroes of Guinea. The Eastern Nubians are tribes of roving people who inhabit the country between the Nile and the Red Sea; the northern division of this race are the Ababdeh, who reach northward in the eastern desert as far as Kosseir, and, towards the parallel of Deir, border on the Bishari. The Bishari reach thence towards the confines of Abyssinia, The latter are extremely savage and inhospitable; they are said to drink the warm blood of living animals; they are for the most part nomadic, and live on flesh and milk.

They are described as a handsome people, with beautiful,

features, fine expressive eyes, of slender and elegant forms; their complexion is said to be a dark brown, or a dark chocolate colour. The Bardbra or Berberines are a people well known in Egypt, whither they resort as labourers from the higher country of the Nile. They inhabit the valley of that name from the southern limit of Egypt to Sennaar. They are a people distinct from the Arabs and all the surrounding nations. They live on

the banks of the Nile ; and wherever there is any soil, they plant date- trees, set up wheels for irrigation, and sow durra and some

Tibbus.

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leguminous plants. At Cairo, whither many of this race resort, they are esteemed for their honesty. They profess

Islam. The Barabra are divided into three sections by

their dialects, which are those of the Nuba, the Kenous,

and the Dongolawi. According to Dr Prichard, it is pro-

bable that the Berberines may be an offset from the original stock which first peopled Egypt and Nubia.

The country of the Nubians is limited on the west by

that of the Tibbus, who are spread over the eastern por-

tions of the Sahara, as far as Fezzan and Lake Chad. Dr

Latham considers it probable that their langnage belongs to the Nubian class. They inhabit the locality of the ancient Libyans or Zibyes. Their colour is not uniform. In some it is quite black, but many have copper-coloured faces. They are slim and well made, have high cheek- bones, the nose sometimes flat like that of the negro, and sometimes aquiline. Their mouth is in general large, but their teeth fine. Their lips are frequently formed like those of Europeans ; their eyes are expressive, and tlicir hair, though curled, not woolly. The females are especially

distinguished by a light and elegant form, and in their

walk and erect manner of carrying themselves are very striking. Their feet and ankles are delicately formed, and not loaded with a mass of brass or iron, as is the practice in other countries of Northern Africa, but have

merely a light anklet of polished silver or copper, sufficient to show their jetty skin to more advantage; and they also wear neat red slippers. The Tibbus are chiefly a pastoral people. They keep horses, cattle, sheep, and goats, but camels constitute their principal riches. The villages of the Tibbus are very regularly built in a square, with a spacc left on the north and south faces of the quadrangle for the use of the cattle. The huts are entirely of mats, which exclude the sun, yet admit both the light and the air. The interior of these habitations is singularly neat: clean wooden bowls for the preservation of milk, each with a cover of basket-work, are hung against their walls. They are greatly exposed to predatory incursions into their country by the enemies who surround them. The Tibbus of Tibesti are described by Dr N achtigal as of medium stature, well made, of elegant though muscular frame ; in colour they vary between a clear bronze and black: the greater number are dark bronze-coloured, yet without the slightest trace of what is generally recognised as the negro physiognomy. They carry on a considerable traffic in slaves between Sudan, Fezzan, and Tripoli.

"All that is not Arabic in the kingdom of Marocco," says Dr Latham, "all that is not Arabic in the French provinces of Algeria, and all that is not Arabic in Tunis, Tripoli, and Fezzan, is Berber. The language, also, of the ancient Cyrenaica, indeed the whole country bordering the Mediterranean, between Tripoli and Egypt, is Berber. The extinct language of the Canary Isles was Berber ; and, finally, the language of the Sahara is Berber. The Berber languages, in their present geographical localities, are essen- tially inland languages. As a general rule, the Arabic is the language for the whole of the sea-coast from the Delta of the Nile to the Straits of Gibraltar, and from the Straits of Gibraltar to the mouth of the Senegal." The Berber nation is one of great antiquity, and from the times of the earliest history has been spread over the same extent of country as at present; the ancient Numidian and Mauritanian names of Sallust, and other writers, have a meaning in the modern Berber. It has affinities with the Semitic languages. In the northern parts of Atlas these people are called Berbers ; in the southern tracts they are the Shuluh or Shelhas. In the hilly country belonging to Tunis, the Kabyles; in Mount Auress, the Showiah; and in the Desert, the Tuarick,—all belong to the same group. The mountains of Atlas are said to be inhabited by more

than twenty different tribes, carrying on perpetual warfare against each other. Thcy are very poor, and make plun- dering excursions in quest of the means of supporting life. They are described as an athletic, strong-featured people, accustomed to hardships and fatigue. Their only covering is a woollen garment without sleeves, fastened round the waist by a belt.

The Shuluh, who are the mountaineers of the N orthern Atlas, live in villages of houses made of stone and mud, with slate roofs, occasionally in tents, and even in caves, They are chiefly huntsmen, but cultivate the ground and rear bees. They are described as lively, intelligent, well- formed, athletic men, not tall, without marked features, and with light complexions, The Kabyles, or Kabaily, of the Algerian and Tunisian territories, are the most indus- trious inhabitants of the Barbary States, and, besides till- age, work the mines contained in their mountains, and obtain lead, iron, and copper. They live in huts made of the branches of trees and covered with clay, which resemble the magalia of the old Numidians, spread in little groups over the sides of the mountains, and preserve the grain, the legumes, and other fruits, which are the produce of their husbandry, in mattoures, or conical excavations in the ground. They are of middle stature 3 their complexion is brown, and sometimes nearly black.

The Tuarick are a people spread in various tribes through the greater portion of the Sahara, The expedition under Richardson, Barth, and Overweg, who traversed and ex- plored a great portion of the Tuarick territories, has greatly added to our knowledge of these people. The following are the names and localities of the principal tribes :—

1, Tanelkum, located in Fezzan.

Ouraghen, family of Shafou, Vacated 2. Azghers, Emanghasatan, oul Hateetah, at Ch t Amana, ,, of Jabour, =

3. Aheethanaran, the tribe of Janet.

4. Hagar (Ahagar), pure Hagars and M aghatah. They occupy the tract between Ghat, Tuat, and Timbuktu.

5. Sagamaram, located on the route from Aisou to Tuat.

6. Kailouees, including the Kailouecs proper, the Kaltadak, and the Kalfadai.

7. Kilgris, including the Kilgris proper, the Itecsan, and

the Ashraf. These and the tribes under the preceding

head inhabit the kingdom of Ahir. 8. Oulimad, tribes surrounding Timbuktu in great num- bers. This, probably identical with the Sorghou, is the

largest and most powerful tribe, while the Tanelkums are

the smallest and weakest.

The various tribes are very different in their characters, but they are all fine men, tall, straight, and handsome. They exact a tribute from all the caravans traversing their country, which chiefly furnishes them with the means of subsistence. They are most abstemious, their food consist- ing principally of coarse brown bread, dates, olives, and water. Even on the heated desert, where the thermometcr generally is from 90° to 120°, they are clothed from head to foot, and cover the face up to the eyes with a black or coloured handkerchief.

The Moors who inhabit large portions of the empire of Moors. Marocco, and are spread all along the Mediterranean coast, are a mixed race, grafted upon the ancient Mauritanian stock; whence their name. After the conquest of Africa by the Arabs they became mixed with Arabs; and having conquered Spain in their turn, they intermarried with the natives of that country, whence, after a possession of seven centuries, they were driven back to Mauritania. They are a handsome race, having much more resemblance to Europeans and western Asiatics than to Arabs or Berbers, although their language is Arabic, that is, the Mogrebin, dialect, which differs considerably from the Arabic in,

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Jews.

Arabia, and even in Egypt. people, and not altogether unlettered; but they are cruel, revengeful, and blood-thirsty, exhibiting but very few traces of that nobility of mind and delicacy of feeling and taste which graced their ancestors in Spain. 'The history of the throne of Marocco, of the dynastic revolutions at Algiers, Tunis, and Tripoli, is written with blood ; aud among the pirates who infested the Mediterranean they were the worst. Their religion is the Mohammedan. They are temperate in their dict and simple in their dress, except the richer classes in the principal towns, where the ladies literally cover themselves with silk, gold, and jewels, while the men indulge to excess their love of fine horses and splendid arms. They generally lead a settled life as mer- chants, nechanics, or agriculturists, but there are also many wandering tribes. They exhibit considerable skill and taste in dyeing, and in the manufacture of swords, saddlery, leathernware, gold and silver ornaments. At the Great Exhibition in London in 1851, the Moorish department contained several articles which were greatly admired. The Moors along the coast of Marocco still carry on piracy by ineans of armed boats.

At two different periods, separated from each other by perhaps a thousand years, Afriea was invaded by Arabic tribes, which took a lasting possession of the districts they conquered, and whose descendants form no inconsiderable portion of the population of North and Central Africa, while their language has superseded all others as that of civilisation and religion." Of the first invasion more has been said under the head " Abyssinians." The second was that effected by the first successors of Mahoinet, who con- quered Egypt, and subsequently the whole north of Africa ag far as the shores of the Atlantic, in the course of the first century of the Hegira, or the seventh of the Christian era. As regards language, Egypt is now an entirely Arabic country, although in many other respects the Fellahs are totally different from the peasants in Arabia. But there are also several tribes of true Arabic descent scattered about from the high lands of Abyssinia down over Nubia and Egypt, and westward over the central provinces of Kordofan, Darfur, Waday, and Bornu. Others wander

in the Libyan deserts and the Great Sahara, as well as in the states of Tripoli, Tunis, and Algiers, leading a similar life with the Kabyles, but constituting a totally distinct race. Others, again, dwell in the empire of Marocco, among whom those along the shores of the Atlantic are notorious for their predatory habits and ferocious character. In many places Arabic adventurers have succeeded in subduing native tribes of every nationality, over which they rule as sovercign lords; and on the coast of Zanzibar resides an Arabic royal dynasty. Many of the smaller islands to the north of Madagascar are inhabited by Arabs, and traces of them have been discovered in Madagascar itself. The African Arabs are not all alike in features aud colour of skin, the differences being attributable to some of them having intermarried with natives, while others preserved the purity of their blood.

The early settlements of the Jews in Egypt are facts universally known. Under the Ptolemies, large numbers of them settled at Alexandria and in Cyrenaica, and after the destruction of Jerusalem they rapidly spread over the whole of the Roman possessions in Africa; many also took refuge in Abyssinia. King Philip IL. having driven them out of Spain, many thousands of families took refuge on the opposite coast of Africa. They are now numerous in all the larger towns in the north, where they carry on the occupation of merchants, brokers, &c., the trade with Kurope being mostly in-their hands. They live in a state of great degradation, except in Algiers, where the French restored them to freedom and independence. They have

They are an intellectual ,

acquired much wealth, and although compelled to hide their riches from the eupidity of their rulers, they lose no opportunity of showing them whenever they can do so without risk of being plundered, fear and vanity being characteristic features of their character. ‘The Jewesses in Maroceo and Algiers are of remarkable beauty.

Ever since the conquest of Egypt by Sultan Selim, and Turks.

the establishinent of ‘Turkish pashalies in Tripoli, Tunis, and Algiers, Turks have settled in the north of Africa; and as they were the rulers of the country, whose numbers were

always on the increase on account of the incessant arrivals .

of Turkish soldiers and officials, the Turkish became, and still is, the language of the different governments. Properly speak- ing, however, they are not scttled, but only eneamped in Africa, aud hardly deservea place amoung the African nations,

Not all the inhabitants of the country called Abyssinia Abys- are Abyssinians; nor are the real Abyssinians all of the siniane.

saine origin, being a mixed race, to the formation of which several distinct nations have contributed. The primitive stock is of Etliopian origin, but, as their language clearly shows, was at an early period mixed with a tribe of the Himyarites from the opposite coast of Arabia, who, in their turn, were ethnologically much more closely con- nected with the Hebrews than with the Joctanides, or the Arabs properly speaking. In the age of the Egyptian Ptolemies, and after the destruction of Jerusalem, Jews settled in Abyssinia in such nuinbers, that not only their religion spread among the inhabitants, but the Hebrew language became mixed with the Abyssinian as it then was. Hence the surprising analogy between the principal Abyssinian languages, viz., the Gheez in Tigré, and the Amharic in Amhara, with the Hebrew. The uninterrupted intercourse with Arabia, and the immigration of several Arabic tribes, also contributed towards the apparently Semitic aspect of the present Abyssinian language. A large portion uf Abyssinia having been occupied by Galla and other tribes, we shall here only dwell on the original Abyssinians. They inhabit a large tract, extending from the upper course of the Blue River, north as far as the Red Sea, and some isolated districts in the south and south-east. To the west of them are the Agau Abyssinians, a different tribe, whose idiom, however, is the common language of the lower classes in Tigré and Amhara also, Abyssinia was once a large and powerful kingdom, but the Galla having conquered the whole south of it, it gradually declined until the king or emperor became a mere shadow, in whose naine several vassal princes exercise an unlimited power each in his own territory. Owing to their jealousy and niutual fears, war seldom ceases

amoung the inhabitants. The Christian religion was introduced into Abyssinia in the first centuries after Christ ; but whatever its condition night have been in former times, it now presents a de- graded mixture of Christian dogmas and rites, Jewish observances, and heathenish superstition. Yet of Judaism, which was once so powerful, but feeble traces are extant, while the Mohammedan religion is visibly on the increase. European missionaries have been, and still are very active among them, but their efforts have been crowned only with partial suceess. The Abyssinians, the Gallas being excluded from that denomination, are a fine strong race, of a copper hue, more or less dark, and altogether dif- ferent from the Negroes, with whom, however, they have frequently bcen confounded, because they were called a black people. Their noses are nearly straight, their eyes beautifully clear, yet languishing, and their hair is black and crisp, but not woolly. They are on the whole a bar- barous people, addicted to the grossest sensual pleasures ; aud their priests, amoung whom marriage is customary, are little better than the common herd of the people. They live in huts, a large assemblage of which forms a so-called

town; and although they possess some solid constructions of stone, such as churches and bridges, it appears that these were built by the Portuguese, the ruins at Axum and other places belonging to a much earlier period, when the country undoubtedly enjoyed a higher civilisation than at present. Owing to the influence exercised upon them during the last thirty years by European missionaries and travellers, their conduct towards strangers is less rude than it used to be at the time of Bruce. It is a remarkable fact that, not- withstanding the low state of their religion, the Christians in Abyssinia are not allowed to keep slaves, although they may purchase them for the purpose of selling them again.

This extensive race comprehends by far the greater num- ber of African nations, extending over the whole of Middle and South Africa, except its southernmost projecticn to- wards the Cape of Good Hope. A line drawn from the mouth of the Senegal in the west to Cape Jerdaffun in the east, forms its northern lnnits almost with gcometrical accuracy, few Ethiopic

tribes being found to the north of it. All the members of this race, however, are not Negroes. The latter are only one of its numerous offshoots; but between the receding forehead, the projecting cheek-bones, the thick lips of the Negro of Guinea, and the more straight configuration of the head of a Galla in Abyssinia, there are still many striking analogies; and modern philology hav- ing traced still greater analogies, denoting a common origin, among the only apparently disconnected languages of so many thousands of tribes, whose colour presents all the hues between the deepest black and the yellow brown, it is no longer doubtful that the Negro, the Galla, the Somali, and the Kaffre, all belong to the same ethnological stock.

The principal Negro nations, as we know them, are the Mandingoes, who are numerous, powerful, and not uncivi- lised, in Senegambia, and farther inland, around the head waters of the Quorra, where they have established a great number of kingdoms and smaller sovereignties. The inland trade is chiefly in their hands. They are black, with a mix- ture of yellow, and their hair is completely woolly. The Wolofs or Yolofs, whose language is totally different froin those of their neighbours, are the handsomest and blackest of all Negroes, although they live at a greater distance from the equator than most of the other black tribes, their prin- cipal dwelling-places being between the Senegal and the Gambia, along the coast of the Atlantic. They are a mild and social people. The Moulahs or Fellatahs occupy the central parts of Soudan, situated in the crescent formed by the course of the Quorra, and also large tracts to the south- east, as far as the equator west to the Senegal, and east till beyond Lake Chad. Their colour, as a rule, is black, inter- mixed, however, with a striking copper hue, some of them being hardly more dark than gipsies. They are onc of the most remarkable nations in Africa, very industrious, live in commodious and clean habitations, and are mostly Moham- medans. A distinction was formerly made between the Foulahs of Senegambia and the Fellatahs of Central Africa, but it has since been ascertained that they belong to the same stock, and speak the same language. The hair of the Foulahs is much less woolly than that of other Negroes. Of the prin- cipal nations in Guinea, among whom the true Negro type is particularly distinct, especially around the Bight of Benin, are the Feloops, near the Casamanga, very black, yet hand- some; and the Ashanti, of the Amina race, who surpass all their neighbours in civilisation, and the cast of whose features differs so much from the Negro type that they are

said to be more like Indians than Africans ; although this is perhaps only true of the higher orders. They are still in possession of a powerful kingdom. The country behind the

Slave Coast is occupied by tribes akin to the Dahomeh on

the coast. In South Guinea we meet three principal races, nainely, the Congo, the Abunda, and the Benguela Ne-

groes, who are divided into a variety of smaller tribes, with whom we are much less acquainted than with the northern Negroes, although the Portuguese have occupied this coast for upwards of three centuries. The Wamasat and Wak- wavt, possibly of Abyssinian stock, are a remarkable race of wild nomad hunters, who occupy the high plateau which rises between the coast-land and the Victoria Nyanza, extend- ing from the equator southward to the route which leads from Zanzibar to the Tanganyika Lake. They are the terror of the more settled inhabitants of the surrounding countries, and occasionally make raids down cven to the coast-land behind Mombas. The next great branch of the Ethiopic race comprchends the Galla, who occupy an immense tract in Eastern Africa, from Abyssinia as far as the fourth degree of S. latitude, on the coast inward from Mombas. Our knowledge of them is chiefly confined to those Gallas who conquered Abyssinia. With regard to their physical con- formation, they stand between the Negro of Guinea and the Arab and Berber. Their countenances are rounder than those of the Arabs, their noses are almost straight, and their hair, though strongly frizzled, is not so woolly as that of the Negro, nor are their lips quite sothick. Their eyes are smal] (in which they again differ from the Abyssinians), deeply set, but very lively. They are a strong, large, almost bulky people, whose colour varies between black and brownish, some of their women being remarkably fair, considering the race they belong to. An interesting tribe of them has lately been brought to the knowledge of Europeans, the Somali, originally Arabs, who have advanced from the southern shores of the Gulf of Aden since the 15th century, and now occupy the greater portion of the East African pro-

montory wedging into the Galla region, and almost dividing that country into two distinct portions. For the most part they pursue a wandcring and pastoral life.

In the central regions of the continent the negroid tribes, which are classed under the general name of Wanyamwezi, occupying the plateau south of the Vic- toria and east of the Tanganyika Lakes, have been made known by Burton and subsequent travellers; round the west and north of the Victoria are several distinct king- doms, the chief being those of Karague and Uganda, traversed by Speke and Grant; iu the region west of the Upper Nile the countries of the Jur, Dor, and Bongo tribes have been explored by Dr Schweinfurth, and he has passed beyond the watershed of the Nile into a new basin, where he found the Niamniam and Monbuttu tribes. Dr Livingstone, in his latest journey, has entered tho country of the Manyuema tribes, west of Tanganyika, in the heart of the continent; these he describes as a fine, tall handsome race, superior alike to the slaves seen at Zanzibar and the typical negro of the west coast; exceedingly numerous, and living in a primitive condition, utterly igno- rant of the outer world. 'The Balunda race of Negroes occupy a great area of South Central Africa, and have two ancient and powerful kingdoms of Muropua and Lunda, the former ruled over by the hereditary '" Muata" or chief Hianvo, who has his capital near the Cassabi tributary of the Congo, and the latter by the Hianvo's vassal, the Cazembe, whose palace is near the Luapula river, south-west of Lake Tanganyika. Kibakoe or Quiboque and Lobal, south-west of the kingdom of Hianvo, are the chief states on the borders of Angola and Benguela; towards the Nyassa lake, south- east from the Cazembe's dominions, the Maravi tribe is per haps the most powerful, and beyond the Nyassa that of the Wahiao is the chief. The Makololo tribe, occupying the cen- tral portion of the Zambeze basin, is of southern origin, and forms an intermediate stage between the Negro and Kaffre.

The Kaffres, who, together with the tribes most akin to Kaffres.

them, occupy the greater portion of South Africa, especially the eastern portions, have some analogy with Europeans in

Wamasai and Wak-

wavi.

Galla,

Somali.

Negroid Tribes,

Hottentots.

plains. It is not known even whence the name of Hotten- Pp eee i a oe 9 vie A tot procecds, as it is none of their own. It has been con- Cape Caliny, ; oe 221,310 “682,600 | 38 jectured that hot and tot frequently occurring in their singu- Natalee i woe; 17,800 269,362 | 15 lar language, in which the monosyllables are enunciated Orange R. Free State, . 42,500 37,000 | 0°8 with a palatic clacking with the tongue, like that of a hen, Transvaal Republic, « pee hes 20a may have given rise to the name, and that the early Dutch EQuaToRIAL REGIONS, – 1,522,200 } 48,000,000 | 29 settlers named them hot-en-tot. They call themselves gzwz- | | IsLanps in the ATLANTIC 2 720 99.145 | 37 que, pronounced with a clack. They are a lively, cheerful, OCEAN, . – + + + : ; good-humoured people, and by no means wanting in intel- oe A Ngee eae ey to! ri lect ; but they have met with nothing but harsh treatment 2 ee, ae ane 488 5590 | if since their first connection with Europeans. Neither Bar- Ascension, . — 38 “400 | 10 tholomew Diaz, who first discovered, nor Vasco de Gama, St Helena,. . – 47 6,860 | 145 who first doubled, the Cape of Good Hope, nor any of the Tristan da Cunha, ve 3 subsequent Portuguese navigators, down to 1509, had much Isuanpsin the INDIAN OCEAN 233,870 | 6,000,000 | 25 communication with the natives of this southern angle of ecg oi 5,000) Africa; but in the year above mentioned, Francisco d’Al- pie Bboy, re rs 100" | aa

‘ : A z anzibar, 616 380,000 | 616 meyda, viceroy of India, having landed on his return at Madagascar, . . + – 228,575 | 5,C00,000 | 22 Saldanha (now Table) Bay, was killed, with about twenty Comoro Islands (with 1,062 64,600 | 64 of his people, in a scuffle wtih the natives. To avenge his Mayotta), . – - : | s death, a Portuguese captain, about three years afterwards, ae pe coplelnle > « 6 209,737 | 216 is said to have landed a

piece of ordnance loaded with grape Mauritius and Wb de. » – shot, as a pretended present to the Hottentots. Two ropes pendencies, . } ae 322,924 | 456 were attached to this fatal engine; the Hottentots poured | | Dxserr of KALAHARI and down in swarms. Men, women, and children flocked round the GREAT INLAND 783, 600 the deadly machine, as the Trojans did round the wooden LakEs, . horse, "' funemque manu contingere gaudent." The brutal AFRICA, ; 11,556,600. T92, 520,000 | 16

264 A F R I C A [eruwonoey,

brandy and tobacco, at the expense of their herds of cattle, on which they subsisted. Under the British sway they have received protection, aud shown themselves not unworthy of it. They now possess property, and enjoy it in security. One of the most beautiful villages, and the neatest and best-cultivated gardens, belong to a large community of Hottentots, under the instruction and guidance of a few Moravian missionaries,

These forlorn people are of Hottentot origin. Of them Bushmen also several tribes have been discovered much farther north, and intelligence has lately reached Europe, that between the Portuguese possessions, in the very centre of South Africa, there is a nation of dwarfish appearance who possess large herds, and who seem to belong to the original Bushmen stock.

The island of Madagascar is inhabited by a race of Malay origin, exhibiting traces of Negro and Arabic mixture.

The area and population of Africa and its divisions are Populatj thus estimated :— 4

their featurcs; but they are woolly haired, and while some are almost black, others arc comparatively fair, although some of their tribes might have been mixed with the East- ern Negroes:» They have been very wrongly classed with the Negroes. Thcy are a strong, muscular, active people, addicted to plunder and warfare. The Eastern Kaffres, among whom the Amakosah and Amazulah are best known to us, on account of their frequent invasions of the Cape Colony, are much more savage than the western and north- ern, or the Bechuana and Sichuana tribes. All Kaffres arc pastoral, keeping large herds of cattle ; but the last-named tribes inhabit large towns, well-built

houses, cultivate the ground carefully, and exhibit every appearance of being capable of entire civilisation. The word Kaffre, or Kafir, as it ought to be written, is Arabic, and was first applied by the Europeans to the inhabitants of the coast of Mozam- bique, because they were so called by the Mohammedans, in whose eyes they were Kafirs, that is infidels. »

*We conclude this sketch with the Hottentot race, which Average ° . ° Ee DIVISIONS. Area in English Population. Density, is entirely different from all the other races of Africa. square miles. P * |No.toa*

8q. mile.

Where they originally came from, and how they happened to be hemmed in and confined entirely to this remote corner of the earth, is a problem not likely to be ever satisfactorily golved. The only people to whom the Hottentot has been

4,008,600 | 20,420,000] 5 259,600 | 2,750,000 | 10 258,300 | 2,921,146 | 11

NortuH AFRICA, Marocco, . Algeria, «

thought to bear a resemblance, are the Chinese or Malays, feck Sanaa ae 45,700 | 2,000,000 | 48 or their original stock the Mongols. Like these pcople Tet, ial 344,400 750,000 | 2

659,100 8,000,000 | 12

they have the broad forehead, the high cheek-bones, the

2,436,500 4,000,000 16

oblique eye, the thin beard, and the dull yellow tint of complexion, resembling the colour of a dried tobacco leaf ; but there is a difference with regard to the hair, which grows in small tufts, harsh, and rather wiry, covering the scalp somewhat like the hard pellets of a shoe-brush. The women, too, have a peculiarity in their physical conforma- tion, which, though occasionally to be met with in other

Egyptian territory, . . Shyla go Oo Oo omc

The MouHAMMEDAN STATES }

of CENTRAL SOUDAN, . 631,000 | 38,800,000 | 61

Western Soupan, from the Senegal to the Lower Niger, including Upper Guinea, and. .. .«

818,600 | 388,500,000 | 47

: : : : French Senegambia,. . 96,530 209,162 nations, is not universal, as among the Hottentots. Their Liberia, – Gia. aa 9,580 eiae a constitutional "bustles" sometimes grow to threc times the Dahomeh, . – + + 8,880 180,000 | 47 size of those artificial stuffings with which our fashionable British possessions, . 17,100 577,318 | 34 Portuguese possessions, . 35,880 8,500 0:2

ladies have disfigured themselves. Even the females of the diminutive Bosjesmen Hottentots, who frequently perish of hunger in the barren mountains, and are reduced to skele- tons, have the same protuberances as the Hottentots of the

1,595,000 | 29,700,000 | 18 158,400 | 3,000,000 | 19

1,966,000 | 16,000,000 8

BASTOABRICA, . . 3 Abyssinia,. . . –

Soutu AFRICA,

Portuguese fired off the piecc, and viewéd with savage

delight the mangled a of the deluded people. The 1 Compiled from the Tables in Behm and Wagner's Bevilkerung der Dutch effected their ruin by gratifying their propensity for | Erde. Gotha, 1872.

sTATEs. |

In the central forest regions of Africa, wherever com- munications with the coast-land have been opened up, hunting the elephant for its tusks to barter

with the traders appears to be the characteristic occupation, if any, beyond that of mere attention to the daily wants of life, is engaged in; and here the population may be considered as a settled one, living in villages in the more open spaces of the woods. A rudely agricultural state seems to mark the outer belt of negro land on each side of the equatorial zone, where the population is also more or less stationary. The arid regions of the Sahara and the Kalahari beyond have, on the other hand, a thinly scattered nomadic population, though here also the fertile wadys form lines of more permanent habita- tion, and contain permanent towns and villages. Except- ing in the immediate neighbourhood of the Mediterranean in Abyssinia, on a narrow margin of the coasts of the Atlantic and the Indian Ocean, and in those parts which have been colonised by Europeans, or which came directly under their influence, society has remained in a barbarian state, and there remain great areas the inhabitants of which have as yet no knowledge of the outer world.

Agriculture is conducted with little art. The natural fertility of the soil in the well-watered districts supersedes the need of skill, while the production of the simplest manufactures is alone requisite, where the range of personal wants embraces few objects, and those of the humblest class,

Wars, cruel and incessant, waged not for the sake of territory, but for the capture of slaves, form one of the most marked and deplorable features in the social condition of the African races. This practice, though not of foreign introduction, has been largely promoted by the cupidity of the Europeans and Transatlantic nations; and, unhappily, the efforts of private philanthropy, and the political arrangements of various governments, have not yet availed to terminate the hideous traffic in mankind, or abate the suffering entailed upon its victims.

In Religion, Christianity is professed in Abyssinia, and in Egypt by the Copts, but its doctrines and precepts are little understood and obeyed. Mohammedanism prevails in all Northern Africa, excepting Abyssinia, as far as a line passing through the Soudan, from the Gambia on the west to the confluence of the Quorra and Benue, and thence eastward, generally following the 10th parallel of N. lat. to the Nile below the junction of the Ghazal; thence south- east, leaving the coast-land in the Mohammedan

region, to Cape Delgado. In Marocco, Algeria, and Egypt, there is an admixture of Jews. Heathen N egroes and Caffre tribes extend southward over the continent from the line described above to the colonies in the southern extremity of the continent; and over this vast area the native mind is surrendered to superstitions of infinite number and character. In the Cape Colony Protestantism again pre- vails, but with a strong intermixture of heathenism. The labours of Christian missionaries have, however, done much, especially in South Africa, towards turning the benighted Africans from idols to the living God.

In describing the political divisions of Africa, we shall proceed from north to south.

The country included under the general name of Barbary extends from the borders of Egypt on the east to the Atlantic on the west, and is bounded by the Mediterranean on the north, and by the Sahara on the south. It com- prises the states of Marocco, Algeria, Tunis, and Tripoli.

Marocco, the most westerly state of Barbary, is thus named by the Europeans, but by the Arabs themselves Mogr'-eb-el-Aksa, or "the extreme west." The eastern boundary was determined in the treaty with the French of 18th March 1845, by a line which, in the south, com- mences east of the oasis Figueg, intersecting the desert of Angad, and reaching the Mediterranean at a point about

30 miles west of the French port Nemours. In the south Marocco einbraces the oasis of Tuat and the Wady Draa. The power of the government of Marocco, which is despotic and cruel, as well as the population of the country, appear to have diminished greatly. Two-thirds of the country are independent of the Sultan's authority, and are held by mountain chiefs who defy his power. The trade of the coast is maintained by European merchants. See Marocco.

Algeria extends from Marocco in the west, to Tunis in Algeria, the east, and closely answers in its limits to the ancient kingdom of Numidia. The' southern boundaries are not very definite, falling, as they do, within the boundless plains of the desert. See ALGrers.

Tunis is the smallest of the Barbary states. The con- Tunis. figuration of the surface is similar to that of Algeria, in three divisions, the "Tell," or fertile coast slopes, the steppes on the high lands, and the low-lying Sahara beyond. The highest peaks range between 4000 and 5000 feet. The southern plains comprise the land of dates (Belad- el-Jerid), and several extensive salt lakes. Tunis possesses but few rivers and streams, and springs are plentiful only in the mountainous regions.

The climate is, upon the whole, salubrious, and is not of the same excessive character as that of Algeria; regular sea-breezes exercise an ameliorating influence both in sum- mer and winter; frost is almost unknown, and snow never falls. During summer occasional winds from the south render the atmosphere exceedingly dry and hot.

The natural productions of the country are somewhat similar to those of the other Barbary states, but dates of the finest quality are more largely produced. The horses and dromedaries are of excellent breed, and the former are eagerly sought for the French army in Algeria. Bees are reared in great quantity, and coral fisheries are carried on. Of minerals lead, salt, and saltpetre are the most noticeable.

The population consists chiefly of Mohammedan Moors and Arabs; the number of Jews is estimated at 45,000, and of Roman Catholics 25,000. The former have attained a higher degree of industry and civilisation than their brethren elsewhere; those of the latter who inhabit the central mountainous regions are nearly independent.

The government is vested in a hereditary bey, and has been conducted in peace and security for a number of years. From the year 1575 onwards, Tunis has been under the rule of Turkey; but by a firman of October 1871 the Sultan renounced the ancient tribute, The bey, who is styled " Possessor of the kingdom of Tunis," is confirmed in his position at Constantinople, and may neither. enter into a war, nor conclude a treaty of peace, nor cede

any part of his territory without the sanction of the Sultan. The Tunisian coinage bears the name of the Sultan, and the troops (3900 infantry and artillery, and 100 cavalry, form the regular army) are at the disposal of the Sublime Porte in time of war. In the interior of the country the bey has absolute power. The slave trade was abolished in 1849.

The commerce of Tunis is considerable, but agriculture is in a backward state. The exports consist chiefly of wool, olive-oil, wax, honey, hides, dates, grain, coral, dc.

The principal town is Tunis, situated on a shallow lake on the north coast. It is the most important commercial place on the southern shores of the Mediterranean after Alexandria, and has a population of about 125,000. The site of the ancient Carthage is 13 miles from Tunis in the direction of Cape Bon.

Tripoli, a regency of the Turkish empire, extends from Tripoli. Tunis along the shores of the Mediterranean to the table- land of Barca, which forms a separate province. Politically, it includes the' pashalic of Fezzan, a country which, in a physical point of view, belongs to the Sahara.

Tripoli is the least favoured by nature of the Barbary

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Egypt.

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states, possessing a great extent of sterile surface. Mr Richardson graphically describes the physiognomy of the country between the towns of Tripoli and Murzuk in eight zones:—1. The plain along the sea-shore, with the date- palm plantations and the sandhills; 2. The Gharian moun- tains, with their olive and fig plantations, more favourcd with rains than the other regions; 3. The limestone hills and broad valleys between the town of Kalubah and Gharecah, gradually assuming the aridity of the Sahara as you procecd southward ; 4. The Hamadah,an immense descrt plateau, separating Tripoli from Fezzan; 5. The sandy valleys and limestone rocks

between El-Hessi and Es-Shaty, where herbage and trees are found; 6..The sand between Shiaty and El-Wady, piled in masses or heaps, and extending in undulating plains; 7. The sandy valleys of El-Wady, covered with forests of date-palms; 8. The plateau of Murzuk, consisting of shallow valleys, ridges of low sand- stone hills, and naked plains. These zones extend parallel with the Mediterranean shores through the greater portion of the country. A summit of the Jebel-es-Soda, or Black Mountains, midway between Tripoli and Murzuk, almost 2800 feet high, is supposed to be the culminating point of the regency. Rivers exist only periodically, and springs are exceedingly scarce.

The climate is somewhat more subject to extremes than that of Tunis, especially in the interior, where burning heat is followed by excessive cold. As far south as Sokna snow occasionally falls. The climate of Murzuk is very unhealthy, and frequently fatal to Europeans.

The natural products are very much like those of Tunis. Oxen and horses are small, but of good quality; the mules are of excellent breed. Locusts and scorpions are among the most noxious animals. Salt and sulphur are the chicf minerals. ;

The population is very thin, Arabs are the prominent race, besides which are Turks, Berbers, Jews, Tibbus, and Negroes. The country is governed by a pasha, subject to the Ottoman empire. The military force by which the Turks hold possession of this vast but thinly-peopled terri- tory amounts to 4500 men.

The commerce is not inconsiderable, and the inhabitants of Tripoli trade with almost every part of the Sahara, as well as the Soudan. At Murzuk there is a large annual market, which lasts from October to January. The ex- ports of Tripoli are wheat, wax, ivory, ostrich feathers, madder, esparto grass, cattle, salt, and dates.

Tripoli is the capital of the regency, and the largest town; it lies on the Mediterranean, surrounded by a fertile plain; the number of inhabitants is about 30,000. Murzuk, the capital of Fezzan, has a mixed population of about 11,000 souls. The town of Ghadamis has about 7000 inhabitants.

In 1869 the maritime plateau of Barca and the depressed region inland from it, which contains the oases of Aujila and Jalo, was formed into a separate government, depend- ent directly upon Constantinople. This country is the seat of the ancient Greek Pentapolis of Bernice, Arsinee, Barca, Apollonia, and Cyrene. Bengazi, the only place of importance, occupies the site of the first of these on the Mediterranean, and has from 6000 to 7000 inhabitants.

Egypt occupies the north-eastern corner of Africa, and is remarkable for its ancient and sacred associations, and its wonderful monuments of human art.

Egypt is a vast desert, the fertile portions susceptible of cultivation being confined to the Delta of the Nile and its narrow valley, a region celebrated in the most ancient historic documents for its singular fertility, and still pouring an annual surplus of grain into the markets of Europe. By the annual inundation of the Nile this region is laid under water, and upon its retirement the grain crops are sown in the layer

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of mud left behind it. Barren ranges of hills and elevated tracts occupy the land on both sides of the Nile, which is the only river of the country. The amount of its rise is a matter of extreme solicitude to the people, for should it pass its customary bounds a few feet, cattle are drowned, houses are swept away, and immense injury ensues; a falling short of the ordinary height, on the other hand, causes dearth and famine, according to its extent. The water of the Nile is renowned for its agreeable taste and wholesome quality. In connection with the Nile is the Birket-el- Kerun, a salt lake.

The climate is very hot and dry. Rain falls but seldom along the coasts, but the dews are very copious. The hot and oppressive winds, called khamsin and simooms, are a frequent scourge to the country; but the climate is, upon the whole, more salubrious than that of many other tropical countries.

The natural products are not of great variety. The wild plants are but few and scanty, while those cultivated include all the more important kinds

adapted to tropical countries; rice, wheat, sugar, cotton, indigo, are cultivated for export; dates, figs, pomegranates, lemons, and olives, are likewise grown. The doum-palm, which appears in Upper Egypt, is characteristic, as also the papyrus. The fauna is cha- racterised by an immense number of waterfowl, flamingoes, pelicans, &c. The hippopotamus and crocodile, the two primeval inhabitants of the Nile, seem to be banished from the Delta, the latter being still seen in Upper Egypt. The cattle are of excellent breed. Large beasts of prey are wanting; but the ichneumon of the ancients still exists. Bees, silkworms, and corals are noticeable. Minerals are scarce, natron, salt, and sulphur being the principal.

The native Egyptians of Arab descent compose the great bulk of the people, the peasant and labouring class, and are termed Fellahs. Next in number, though compara- tively few (145,000), are the Copts, descended from the old inhabitants of the country, the ancient Egyptians, but far from being an unmixed race. tribes, Negroes, European Christians (Greeks, Italians, French, Austrian, English), the Jews, and the dominant Turks, compose the remainder of the population.

Egypt is formally a Turkish pashalic, but the hereditary pasha, by whom the government is conducted, and whose authority is absolute, is practically an independent prince. The government of Nubia and Kordofan is also conducted by the Pasha of Egypt, and recently the whole of the Nile valley, as far south as the equator, has been annexed by the Egyptian government. An army of about 14,000 men

| ig maintained.

The agriculture of Egypt has always been considerable, there being three harvests in the year. The industry is limited: one peculiar branch is the artificial hatching of eggs in ovens heated to the requisite temperature, a pro- cess which has been handed down from antiquity, and is now chiefly carried on by the Copts. Floating bee-hives are also peculiar to the Nile. Thc commerce is extensive and important: the exports to Europe consist chiefly of cotton, flax, indigo, gum-arabic, ostrich feathers, ivory, senna, and gold. The country forms part of the great highway of traffic between Europe and Southern Asia. Railways, from the ports of Alexandria and Damietta in the Mediterranean, and from Suez on the Red Sea, unite at

Cairo; and a railway now extends thence up the bank of the Nile to near the first cataract of the river at Assouan, in lat. 24° N.

The Suez canal, uniting the Red Sea and the Medi- Suez cana

terranean, was begun in April 1859, and was opened for traffic ten years later, in November 1869. The cutting runs from the artificial harbour of Port Said on the Medi- terranean, through the shallow lagoon of Menzaleh, and

through two smaller lakes with low sandhills between; nearer Suez a depressed area, in which several salt lakes formerly existed, has been filled up by water let in by the canal, and now forms a wide expanse of water. In length the canal is nearly 100 miles, and has a depth throughout of 26 feet, with a general width of 200 to 300 feet at the top of the banks and 72 feet at the bottom. Vessels are able to steam or be towed through the canal in sixteen hours from sea to sea. Extensive harbours and docks have beeu constructed both on the Mediterranean side and at Suez. The number of vessels which entered Purt Said in 1871 was 1215, of 928,000 tons, exclusive of 87 war-ships.

Egypt proper is divided into three sub-pashalics—Bahari or Lower Egypt, Vostani or Middle Egypt, and Said or Upper Egypt. Cairo, on the east bank of the Nile, is the capital of Egypt, and is the largest town of Africa, containing 354,000 inhabitants: it has 400 mosques, and upwards of 130 minarets, some of them of rich and graceful architec- ture, presenting at a distance an appearance singularly imposing. Alexandria, on the coast, is the emporium of the cominerce with Europe, and has 220,000 inhabitants, among whom are 54,000 Europeans. Damiectta has a population of 37,100; Rosetta of 18,300. Suez, on the northern extremity of the Red Sea, is a small, ill-built town, but has assumed importance as a good port since the establishment of the overland route to India and the completion of the maritime canal. It has now nearly 14,000 inhabitants, of whom about 2500

are Europeans. Port Said has 8800 inhabitauts, of whom one-half are foreigners.

Nubia extends along the Red Sea, from Egypt to Abys- sinia, comprising the middle course of the Nile.

The natural features of the country are varied; the northern portion consisting of a burning sterile wilderness, while the southern, lying within the range of the tropical rains, and watered by the Abyssinian affluents of the N ile, exhibits vegetation in its tropical glory, forests of arborescent grasses, timber-trees, and parasitical plants largely clothing the country. This latter territory, which may be called Upper Nubia, includes the region of ancient Meroe, situated in the peninsula formed by the Nile proper, the Blue River, and the Atbara, and comprises, further south, the recently extinguished modern kingdom of Sennaar.

Nubia forms the link between the plain of Egypt and the high table-lands of Abyssinia; its general physical character is that of a slightly ascending region. The lowest parts in Upper Nubia scarcely exceed an altitude of 1300 feet; Khartum, at the confluence of the Blue and White Rivers, being 1345 feet above the level of the sea. A chain of mountains and elevated land rises abruptly along the shores of the Red Sea, gradually slopmg down to the valley of the Nile; the intermediate region being intersected by smaller ranges, groups of hills, and numerous wadys filled with sand. The spurs of the Abyssinian tableland, extending within the southern confines of Nubia, reach a height of 3000 feet. Besides the N ile, the country is watered by two other large rivers, its tributaries, the Bhar-el-Azrek or Blue River, and the Atbara or Takkazze, both being much alike in magnitude, and having their head-streams in the Abyssinian table-land.

The climate of Nubia is tropical throughout, and the heat in the deserts of its central portions is not exceeded by that of any other part of the globe. The southern half of the country is within the influence of the tropical rains, the northern partakes the character of the almost rainless Sahara; and while the latter is generally very salubrious, the former is a land of dangerous fevers, particularly in the plains subject to inundations. Such is the Kolla, a marshy and swampy region of great extent, situated along the foot

of the Abyssinian Mountains, between the Blue River and the Takkazze.

The northern region is poor in natural productions, but in the south the vegetation is most luxuriant ; palms form & prominent feature, and the monkey bread-tree attains its most colossal dimensions. The date-tree, dourra, cotton, and indigo are cultivated. The date-palm does not ex- tend beyond the south of Abou-Egli, in lat. 18° 36'

The elephant occasionally wanders as far as Sennaar : the rhinoceros, lion, giraffe, and buffalo are more common, The waters are inhabited by crocodiles more ferocious than those of Egypt, and by huge hippopotami. The young hippopotamus brought to the Zoological Gardens of London in 1850, was captured in Nubia, in an island of the N ile, about 1800 miles above Cairo: no living specimen had been seen in Europe since the period when they were exhibited by the third Gordian in the Colosseum at Rome. Monkeys and antelopes are found in great numbers. The camel does not extend beyond the twelfth degree of latitude to the south. Ostriches roam over the deserts ; and among the reptiles, besides the crocodile, are large serpents of the python species, and tortoises. Of the numerous insects the most remarkable is the scarabeus of the ancient Egyp- tians, still found in Sennaar. Of minerals Nubia possesses gold, silver, copper, iron, salt.

In the inhabitants two principal varietics are recognised, the pure original population, and their descendants, mixed with other nations. The Berberines inhabit the northern part, and the Bisharis the desert regions; the latter are the genuine Nubians, finely moulded and dark complexioned, supposed by some to agree more closely with the ancient Egyptians than the Copts, usually deemed their represen- tatives. In the south-eastern part the true Negro element appears.

Nubia, now a province under the pashalic of Egypt, con- sisted formerly of a number of sinall' and independent king- doms. The Turkish conquest lasted from 1813 to 1822; in the latter years it was invaded and mercilessly ravaged by the army of Mahomet Ali, under his second son Ismayl, whose

dreadful atrocities entailed a fearful fate wpon him- self, having been surprised when attending a nocturnal banquet, at some distance from his camp, and burned to death.

The country is favourable for agriculture, which, how- ever, is only carried on to a limited extent, by the women. Cattle are abundant, and the camels of the Bisharin and Ababde are famous for their enduring powers. Salt is largely exported from the shores of the Red Sea to India, and ivory, with other products of tropical Africa, forms a principal article of trade.

Khartum, the capital of Nubia, the headquarters of the Egyptian government, and the chief seat of commerce, con- tains a population variously estimated at from 20,000 to 50,000. It is a modern town, having been founded in 1821, and les in a dry, flat, and unhealthy country, near the confluence of the two main branches of the Nile. It is in telegraphic communication with Cairo.

Kordofan, on the western side of Nubia, lies between the Kordofan,

parallels of 12° and 16°, and between the meridians 29° and 32°, containing about 30,000 square miles. It is a flat country, interspersed with a few hills, presenting in the dry season a desert with little appearance of vegetation, and in the rainy season a prairie, covered with luxuriant grass and other plants. The general elevation of the country is 2000 feet, and some of the hills attain a height of 3000. The altitude of El Obeid is 2150 feet. There are no permanent rivers in the country, and the natural products are similar to those of the adjoining regions of Nubia.

The population consists of Negroes. This country was, simultaneously with Nubia, made tributary to Egypt. The

commerce consists of gum-arabic, ivory, and gold, and is not inconsiderable. El Obeid, the chicf town, is composed of several villages of mud-built houses, thatched with straw, containing about 12,000 inhabitants.

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large and fine variety of the ass is valuable to the inhabitants. Of minerals, salt is the chief production, which occurs chiefly near Bilma.

The habitable portions of the Sahara are possessed by

Abyssinia. The boundaries of Abyssinia are somewhat uncertain ; | three different nations. In the extreme western portion but confining it to the provinces actually under the govern- | are Moors and Arabs. They live in tents, which they re- ment of Christian or Mohammedan princes, it may be de- } move from one place to another ; and their residences con- scribed as extending from about 9° to 16° N. lat., and from | sist of similar encampments, formed of from twenty to a 35° to 40° E. long. See ABYSSINIA. hundred of such tents, where they are governed by a sheik

Saharan The Saharan countries extend from the Atlantic in the | of their own body; each encampment constituting, as it

countries. west, to the Nilotic countries in the east, from the Barbary | were, a particular tribe. They are a daring set of people,

States in the north, to the basins of the Rivers Senegal and Kawara, and Lake Chad in the south. The area of this large space amounts to at least 2,000,000 square miles, or upwards of one-half of that of the whole of Europe. It is very scantily populated, but from our present defective knowledge of that region, the number of its inhabitants can be but roughly estimated.

The physical configuration of the Sahara has already been indicated. Notwithstanding the proverbial heat, which is almost insupportable by day, there is often great cold at night, owing to the excessive radiation, promoted by the clearness of the sky. Rain is nearly, though not entirely absent, in this desolate region. It appears that when nature has poured her bounty over the adjoining regions in the south, and has little more left to bestow, she sends a few smart showers of rain to the desert, parched by the long prevalence of the perpendicular rays of the sun. The prevail- ing winds blow during three months from the west, and nine months from the east. When the wind

increases, into a storm, it frequently raises the loose sand in such quantities that alayer of nearly equal portions of sand and air, and ris- ing about 20 feet above the surface of the ground, divides the purer atmosphere from the solid earth. This sand, when agitated by whirlwinds, sometimes overwhelms caravans with destruction, and, even when not fatal, involves them in the greatest confusion and danger.

The natural products correspond with the physical fea- tures of the country. Vegetation and animal life exist

and not restrained by any scruple in plundering, ill-treating, and even killing persons who are not of their own faith ; but to such as are, they are hospitable and benevolent. The boldest of these children of the desert are the Tuaricks, who occupy the middle of the wilderness, where it is widest. The form of their bodies, and their language, prove that they belong to the aboriginal inhabitants of Northern Africa, who are known by the name of Berbers. They are a fine race of men, tall, straight, and handsome, with an air of independence which is very imposing. They live chiefly upon the tribute they exact from all caravans traversing their country. They render themselves formidable to all their neighbours, with whom they are nearly always in a state of enmity, making predatory incursions into the neighbouring countrics. The third division of Saharan people are the Tibbus, who inhabit the eastern portion, comprising one of the best parts of the desert. In some of their features they resemble the Negroes. They: are an agricultural and pastoral nation, live mostly in fixed abodes, and are in this respect greatly different from their western neighbours. Their country is as yet little explored by Europeans. The Tibbus are in part Pagans, while the other inhabitants of the Sahara are Mohammedans.

The commerce of the Sahara consists chiefly of gold, ostrich feathers, slaves, ivory, iron, and salt, exchanged for manufactured goods, and transported across the desert by great caravans, which follow lines uniting the greater cities and oases of the southern and northern borders.

only sparingly in the oases or valleys where springs occur, and where the soil is not utterly unfit to nourish certain plants. Amongst the few trees the most important is the date-palm, which is peculiarly suited to the dryness of the climate. This useful tree flourishes best in the eastern part of the desert,

inhabited by the Tibbus. The doum- palm is likewise a native of the same part, and seems

Western Africa comprehends the west coast of Africa, Westem from the borders of the Sahara, in about lat. 17° N. to Africa. Nourse River, in about the same latitude south, with a con- siderable space of inland territory, varying in its extent from the shores, and, in fact, completely undefined in its interior limits.

Senegambia, the country of the Senegal and Gambia, Senegam- | extends from the Sahara in the north to lat. 10° in the Pi

entirely absent in the western Sahara; its northernmost limit is on the southern borders of Fezzan and Tegerry, in lat. 24°. N. Acacias are found in the extreme west towards Senegambia, furnishing the so-called gum-arabic. In many parts of the desert a thorny evergreen plant occurs, about 18 inches high. It is eagerly eaten by the camels, and is almost the only plant which supplies them with food while thus traversing the desert. The cultivation of grains to a small extent is limited to the western oases of Tuat and others, a little barley, rice, and beans, being there grown. In the kingdom of Air there are some fields of maize and other grains; but upon the whole, the population depend for these products on Soudan and other regions. There are but a few specimens of wild animals in these wildernesses ; lions and panthers are found only on its bor- ders. Gazelles and antelopes are abundant, hares and foxes but scarce. Ostriches are very numerous, and vultures and ravens are also met with. In approaching Soudan, animal and vegetable life becomes more varied and abundant. Of reptiles, only the smaller kinds are found, mostly harmless lizards and a few species of snakes. Of domestic animals, the most important is the camel, but horses and goats are not wanting, and in the country of the Tuaricks an excel- lent breed of sheep is found, while in that of the Tibbus a

south, and may be considered as extending inland to the sources of the waters which flow through it to the Atlantic.*

The western portion is very flat, and its contiguity to the great desert is frequently evidenced by dry hot winds, an atmosphere loaded with fine sand, and clouds of locusts. The eastern portion is occupied with hills and

elevated land. Under the 10th parallel the hills approach quite close to the coast. The country possesses a great number of rivers, among which the Senegal, Gambia, and Rio Grande are the most important. Senegambia ranges, in point of heat, with the Sahara and Nubia. The atmosphere is most oppressive in the rainy season, which lasts from June to November, when an enormous amount of rain drenches the country. The prevailing winds in that period are south-west, whereas in the dry season they are from the east. The climate is, upon the whole, most unhealthy, and too gene- rally proves fatal to Europeans.

The vegetation is most luxuriant and vigorous. The baobab (monkey bread-tree), the most enormous tree on the face of the globe, is eminently characteristic of Senegambia. It attains to no great height, but the circumference of the trunk is frequently 60 to 75 feet, and has been found to measure 112 feet; its fruit, the monkey-bread, is a princi-

pal article of food with the natives. Bombacez (cotton- trees) are likewise numerous, and they are among the loftiest in the world. Acacias, which furnish the gum-arabic, are most abundant, while the shores are lined with mangrove trees. The flora and fauna are similar to those of Nubia. Gold and iron are the chief metals.

The inhabitants consist of various Negro nations, the chief of which are the Wolof.

_ The gum trade is the most important traffic on the Sene- gal; bees-wax, ivory, bark, and hides, forming the chief exports from the Gambia.

Of European settlements are: The French possessions on the Senegal ; the capital of which is St Louis, built about the year 1626, on an island at the mouth of the river. The total population of the settlement amounts to about 210,000.

The British settlement on the Gambia has about 7000 inhabitants. Bathurst is the chief town.

The Portuguese settlement consists of small factories south of the Gambia, at the Bissagos Islands, Bissao, Cacheo, and some other points.

The west coast of Africa, from Senegambia to the Nourse River, is commonly comprised by the general denomination Guinea Coast, a term of Portuguese origin.

The coast is generally so very low, as to be visible to navi- gators only within a very short distance, the trees being their only sailing marks. North of the equator, in the Bight of Benin, the coast forms an exception, being. high and bold, with the Cameroon Mountains behind ; as also at Sierra Leone, which has received its name (Lion Moun- tain) in consequence. The coast presents a dead level often for thirty to fifty miles inland. It has numerous rivers, some of which extend to the furthest recesses of Inner Africa.

The climate, notoriously fatal to European life, is ren- dered pestilential by the muddy creeks and inlets, the putrid swamps, and the mangrove jungles that cover the banks of the rivers. There are two seasons in the year, the rainy and the dry season. The former commences in the southern portion in March, but at Sierra Leone and other northern parts, a month later.

Vegetation is exceedingly luxuriant and varied. One of the most important trees is the Elais guineensis, a species of palm, from the covering of whose seed or nut is ex- tracted the palm-oil, so well known to English commerce and manufacture; several thousand tons are annually brought into the ports of Liverpool, London, and Bristol. The palm-oil tree is indigenous and abundant from the river Gambia to the Congo; but the oil is manufactured in large – quantities chiefly in the country of the Gold and Slave

Coasts. The former comprises nearly all the more remark- able of African animals: particularly abundant are elephants, hippopotami, monkeys, lions, leopards, crocodiles, serpents, parrots. The domestic animals are mostly of an inferior quality. The principal minerals are gold and iron. The population consists, besides a few European colonists, of a vast variety of Negro nations, similar in their physical qualities and prevailing customs, but differing considerably in their dispositions and morals.

The chief ‘articles of commerce are palm-oil, ivory, gold, wax, various kinds of timber, spices, gums, and rice.

The divisions of Northern or Upper Guinea are mostly founded on the productions characteristic of the different parts, and are still popularly retained.

The British colony of Sierra Leone extends from Rokelle river in the north, to Kater river in the south, and about twenty miles inland. The chief portion of the settlement is a rugged peninsula of mountains with a barren soul, but surrounded by a belt of rich coast-land, with a moist and pestilential climate. The colony was founded in 17 oT,

The Guinea Coast.

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and has been maintained with a view to the suppression of the West African slave trade. The population, consisting chiefly of liberated slaves, amounted, in 1869, to 55,374, of which number 129 were white men. Freetown, the capital is, after St Louis, the most considerable European town on the western coast of Africa.

The Malaghetta or Grain Coast extends from Sierra Grain Leone to Cape Palmas. Malaghetta is a species of pepper Coast. yielded by a parasitical plant of this region. It is some- times styled the Windy or Windward Coast, from the fre- quency of short but furious tornadoes throughout the year.

The republic of Liberia, a settlement of the American Liberia. Colonisation Society, founded in 1822, for the purpose of removing free people of colour from the United States, occupies a considerable extent of the coast, and has for its capital Monrovia, a town named after the president, Mr Monro.

The Ivory Coast extends from Cape Palmas 3° W. long., Ivory and obtained its name from the quantity of the article Coast. supplied by its numerous elephants. The French settle- ments of Grand Bassam, Assinic, and Dabou were aban- doned in 1871.

The Gold Coast stretches from west of Cape Three Points Gold to the river Volta, and has long been frequented for gold- Coast. dust and other products. By a treaty of February 1871, the whole of the Dutch possessions on the Gold Coast were made over to Britain, and the Danish settlements of Chris- tiansburg and Friedensburg were ceded to the English in 1849; so that the British coast now extends from the mouth of the Tenda river, in long 2° 40' W., to that of the Ewe, in long. 1°10' E. of Greenwich. The protected territory extends inland from this coast strip to an average distance of 50 miles. Cape Coast Castle and Fort James, founded by the British, and Elmina (population about 10,000) the most important of the former Dutch stations, with Accra, are the chief settlements.

The Slave Coast extends from the river Volta to the Slave Calabar river, and is, as its name implies, the chief scene Coast of the most disgraceful traffic that blots the history of man- kind. Eko or Lagos, one of the chief towns of the coast, was destroyed by the British in 1852, and was proclaimed a British possession in 1861. Palma and Badagry are also British settlements.

The kingdonis of Ashantee, Dahomey, Yoruba, and others, occupy the interior country of the Guinea coast. Ashantee, the most powerful Negro state of Upper Guinea, is an exceedingly fertile and productive country. Its inhabitants, though skilled in some manufactures and of a higher intel- ligence than is usually found in this region, are of an exceedingly sanguinary disposition, and have frequently been involved in war with the British. The capital city, Kumassi, is believed to have a population of about 100,000.

The coast from the Old Calabar river to the Portuguese possessions is inhabited by various tribes. Duke Town, on the former river, is a town of 4000 inhabitants, with considerable trade in palm-oil, ivory, and timber.

On the Gaboon river, close to the equator, are a French settlement (in 1871 the French retained only a coaling station), and American missionary

stations. At the equa- tor Southern or Lower Guinea begins, where the only European settlements are those of the Portuguese.

Loango is reckoned from the equator to the Zaire or Loango, Congo river. Its chief town is Boally, called Loango by the Europeans.

Congo extends south of the Zaire, comprising a very Congo. fertile region, with veins of copper and iron. Banza Congo or St Salvador is the capital.

Angola comprises the districts of Angola proper, Ben- Angola and

guela, and Mossamedes. In these regions the Portuguese Benguela, settlements extend farther inland than the two preceding

districts, namely, about 200 miles. The capital, St Paulo de Loando, contains 12,300 inhabitants, aud has a fine har- bour. St Felipe de Benguela is situated in a picturesque but very marshy and most unhealthy spot.

The coast from Benguela to the Cape Colony may, in a general arrangement like this, be included either within West Africa or South Africa. The whole coast is little visited or known, being of a most barren and desolate description, and possessing few harbours. Ichabo island and Angra Peguena Bay are visited for their guano deposits, and are claimed as British possessions.

Under South Africa the Cape Colony only is generally comprised. It takes its name from the Cape of Good Hope, and extends from thence to the Orange river in the north, and to the Kai river in the east. A large proportion of the territory included within these limits, especially in the north, is either unoccupied, or, excepting missionary stations, entirely in the hands of the aborigines.

Apart from the shores, the country consists of high lands, forming parallel mountainous ridges, with elevated plains or terraces of varying extent between. The loftiest range, styled in different parts of its course Sneuw-bergen, Winter- hergen, Nieuveld-bergen, and Roggenveld-bergen, names originated by the Dutch, is the third and last encountered on proceeding into the interior from the south coast. This and the other chains are deeply cut by the transverse valleys called kloofs, which serve as passes across them, and appear as if produced by some sudden convulsion of nature, subse- quently widened by the action of the atmosphere and run- ning water.

The high plains or terraces are reniarkable for their extraordinary change of aspect in the succession of the seasons. During the summer heats they are perfect deserts, answering to the term applied to them, karroos, signifying, in the Hottentot language, '"'dry" or "arid." But the sandy soil being pervaded with the roots and fibres of various plants, is spontaneously clothed with the richest verdurc after the rains, and becomes transformed for a time into a vast garden of gorgeous flowers, yielding the most fragrant odours. Adapted thus to the support of gramini- vorous animals, the karroos are the resort of antelopes, zebras, quaggas, and gnus in countless herds, and of the carnivorous beasts that prey upon them, the lion, hyzena, leopard, and panther. These quadrupeds, however, with the elephant, rhinoceros, hippopotamus, giraffe, buffalo, and ostrich, have been largely banished from their old haunts by the advancing footsteps of civilised man, and are only found in the more secluded parts of the interior. The country has a singular and superb flora, but it comprises few native plants useful to man: many such have been now introduced. Heaths of varied species and great beauty abound; and geraniums are treated as common weeds. Many highly productive districts occur; corn, wines, and fruit being the chief objects of cultivation in the neighbour- hood of the Cape, while the more inland settlements are grazing farms. Some fine natural forests clothe the sides of the mountains; but in general the colony is deficient in timber trees, as well as in navigable streams, perennial springs, and regular rain. A great deposit of rich copper ore occurs near the mouth of the Orange; and salt is ob- tained for consumption and sale frota salt lakes.

The climate is exceedingly fine and salubrious. There are two seasons, characterised by the prevalence of certain winds. During the summer, which lasts from September to April, the winds blow from south-east, coldand dry; during the winter, namely from May to September, north-west winds prevail, In the most elevated regions the winters are occa- sionally severe, and snow and ice occur.

The chief native tribes within the British territory are the Hottentots, Bechuanas, and Kaffres. No manufacture

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is conducted at the Cape except the making of wine, of which from 10,000 to 40,000 gallons are annually exported to England. Various articles of provision are supplied to ships sailing between Europe and the East Indies.

Cape Town is the capital of the colony, and contains 28,460 inhabitants, of whom 15,120 are Europeans. Its commerce is considerable, and the port is frequented by 500 to 600 vessels every year.

The Orange river sovercignty, added to the British tervi- tories in 1848, but subsequently given up and constituted a free republic, extends north of the Orange river as far as the Ky Gariep or Vaal river. In consequence of the dis- covery of rich diamond fields on the lower Vaal river and in the neighbouring territory of the Griqua chief Water- boer, who also petitioned to have his lands subjected to British rule, a wide country surrounding the diamond- fields was incorporated with the Cape Colony in October

1871, under the name of Griqua Land West, divided into Griqua The Land West.

the districts of Pneil, Griqua Town, and Klipdrift. population of this new tcrritory was estimated at 50,000 in 1872, concentrated in camps round the chief diamond-

fields. In 1869, Bassuto Land, a mountainous territory at Bassuto the head waters of the Nu Gariep branch of the Orange river, Land.

and on the inward slope of the Drakenberg range, was incorporated as a British possession.

Natal or Victoria, a district on the east. coast, and sepa- Natal.

rated from the Cape Colony by Kaffraria, is a recently formed British settlement, which was created into a colony in 1856. It is highly favoured in those respects in which the Cape is most deficient, having abundance of wood and water, with coal and various metallic ores, a fine alluvial soil, and a climate adapted to the cultivation of the products for which the home demand is large and constant——cotton, silk, and indigo. Pietermaritzburg, the capital of the settle- ment, lies 50 miles from the coast. Port Natal, now D'Urban, seated on a fine lake-like bay, is the only harbour.

The Transvaal Republic is an inland state, between the Vaal on the south and the Limpopo river on the north, having the Drakenberg edge on the east, and the Bechuana tribes, which occupy the region bordering on the Kalahira desert, on the west, founded by the Dutch boers emigrating from the Cape Colony. Its surface is an elevated plateau, thinly wooded in some parts, but generally affording excel- lent pasture. The chief town is Potchefstroom, on a tribu- tary of the Vaal; but the seat of government is at Pretoria, in the region of the head streams of the Limpopo.

East Africa extends from Natal northwards to the Red Sea, comprising Sofala, Mozambique, Zanzibar, and the Somali country. But little is known of that region beyond the shores. Bay to the Zambeze river, is flat, sandy, and marshy, gradually ascending towards the interior. It abounds with rivers, which are the source of yearly inundations. The soil is very fertile, and produces chiefly rice. In the interior, gold and other metals, as well as precious stones, are found. The Portuguese have settlements at Sofala, in an unhealthy spot, abounding with salt marshes; it consists of only huts, a church, and a fort in ruins. Inhambane, near the tropic of Capricorn, has an excellent harbour.

Mozambique extends from the Zambeze to Cape Delgado, Mozam- and is similar, in its natural features, to the Sofala Coast. Piaue

The greatest river is the Zambeze. The principal settle- ment of the Portuguese is at Quillimane, which is situated in a very unhealthy position on the northern arm of the delta of the Zambeze, surrounded with mangrove trees.

The Zanzibar or Sawahili Coast extends from Cape Del- Zanaba.

gado to the river Jub, near the equator. The coast is generally low, and has but few bays or harbours: its northern . portion is rendered dangerous by a line of coral reefs ex- tending along it. 'The region possesses a great number of

The Sofala Coast, extending from Delagoa Sofala.

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rivers, but none of them attain a first-rate magnitude. The principal are the Rovuma, the Lufiji, Ruvu, Pangani, and Dana; the two latter rising in the snowy mountains of Kilima-njaro and Kenia, The climate is similar to that of other tropical coasts of Africa, hot and unhealthy in gelle- ral: in some portions, however, the elevated ground, and with it a more temperate and healthy climate, approaches the shores to within a short distance. The vegetation is juxuriant, aud cocoa-nut, palms, maize, rice, and olives are the chief articles of cultivation. The fauna comprises all the more characteristic African species.

The chief inhabitants are the Sawahili, of mixed Arab and Negro descent, but the coasts are under the Arab do- uninion of the Imaum of Muscat, by whose efforts commerce with the nations of the interior has greatly increased.

The island of Zanzibar (Unguja of the Sawahili) is the residence of a Sultan, tributary to the Imaum of Muscat, and the seat of extensive commerce. Mombas, on a sniall island close to the main shore, possesses the finest

harbour on that coast, and has recently become famous as the seat of an important missionary station.

The Somali country comprises the eastern horn of Africa, from the equator northward to the Bay of Tadjurra, near the entrance into the Red Sea. The coast is generally bold and rocky, in some places covered with sand; and the ex- tensive region it encloses presents a shghtly ascending plain, traversed by large valleys of great fertility, among which the Wady Nogal is prominent. This country is not so well watered as the region to the south, and some of its rivers are periodical.

The Somali country is famous for its aromatic produc- tions and gums of various kinds ; and it is supposed that the spices and incense consumed in such large quantities by the ancient peoples of Egypt, Greece, Syria, and Rome, were derived from this part of Africa, and not from Arabia.

Zeila and Berbera, on the northern coast, are the chief trading ports: the permanent population of the former is about 3000, while the latter may be said to exist only dur- ing the winter, when no less than 20,000 strangers, at an average, arrive to pitch their tents, and thus create a great market-place. Harrar, in the Galla country, is the chief place in the interior, with 8000 inhabitants, who are Mohammedans, One-third of the population is Somali, one-third Arab.

Central Africa comprises the regions which extend from the southern borders of the Sahara in the north to Cape Colony in the south, and from Senegambia in the west to the territory of the Egyptian pashalic on thé east. It com- prehends the central basins of the great lakes from Lake Chad to the Nyassa, and the greater part of the basins of the Niger, Congo, Nile, and Zambeze. Even the Sahara may well be included in this general denomination. So httle is yet known of this vast region that the general fea- tures of some portions only can be indicated. The greater portion seems to be densely peopled with numerous tribes, and to possess inexhaustible natural resources. The portion north of the equator, under the name Soudan or N igritia, comprises a great number of states, among which the prin- cipal are Bambarra, Timbuktu, and Houssa, in the west : Bornu, Baghermi, and Waday, around Lake Chad ; Darfur in the east ; and Adamaua in the

south. The inhabitants are of Negro race, with many Arabs, Moors, and Berbers.

Bambarra occupies part of the basin of the J oliba, or upper Source of the Quorra. The dominant inhabitants are the Mandingoes and Foulahs, who have embraced Islamism, and are much more advanced in civilisation than the other Negro tribes. The country comprises extensive and excel- lent pastures, with abundance of domestic animals, as horued cattle, sheep, goats, and horses of a fine breed. Among the vegetable products the most remarkable is the butter-tree,

which furnishes an important article of agricultural industry and trade,

Sego, the capital, is situated on the J oliba, and contains 30,000 inhabitants. It was here that Mungo Park first

caught sight of the long-sought river, Timbuktu, or Jennie, comprises the basin of the J oliba Timbuktu. below Bambarra, and lies partly within the Great Sahara.

Timbuktu, a few miles from the banks of the Joliba, and situated amid sands and deserts, is a celebrated centre of the North African caravan trade. It contains from 12,000 to 15,000 inhabitants. Houssa is an extensive country extending to the Sahara Houss:. in the north, to the Joliba or Kawara on the west, to Bornu on the east, and to about 10° N. lat. on the south. The dominant race are the Foulahs, but the mass of the popu- lation are Negroes. It is a very fertile and beautiful coun- try, but the climate is insalubrious, and in many parts fatal to Europeans. The inhabitants are engaged in pastoral, as well as in agricultural and commercial pursuits. The capital, Sakatu, is one of the largest cities in Negro- land; it is situated in a fertile but marshy plain. Kano, another large town, containing 30,000 to 40,000 inhabitants, is the great emporium of trade in Houssa ; there the English merchandise coming from the north through the Sahara, meets with American goods coming from the Bight of Benin. The manufactures of Kano

consist chiefly of cloth, for the dyeing of which that town is famed all over Central Africa, Bornu is one of the most powerful states of N egroland ; Bornu. extending on the west to the 10th degree of long., on the east to Lake Chad and the kingdom of Baghermi, and on the south as far as Mandara and Adamaua, in about 11°N, lat. Kanem, ou the northern side of Lake Chad, has recently been conquered and brought under Bornuese sovereignty. The general character of Bornu is that of a plain, subject to inundations, particularly near Lake Chad. Tt is very fertile, and cotton and indigo attain a high degree of excel- lence. The original Bornuese are an agricultural people. . Kuka, the capital and residence of the Sheik of Bornu, had in 1866 about 60,000 inhabitants.

Baghermi, another powerful kingdom, is situated east of Baghermi: 2

Bornu. The boundaries, according to Dr Barth, who first visited this country and penetrated as far as Masefia, the capital, are on the west the river Loggeme, a tributary of the Shary or Asu, by which it is divided from Bornu and Adamaua; on the north its limits are in about L2g° N: lat. and on the east 193° E. long., both lines dividing it from Waday; the southern boundary is in about 84° N. lat. Baghermi is an extensive plain or valley formed by the river Shary or Asu and its tributaries. The inhabitants are very warlike, and frequently engage in slave marauding expeditions into the neighbouring states to the south. Masetia, the capital, hes in 11° 40' N. lat., and 17° 20' E. long. Waday, or Dar Saley, lies east of Baghermi, and reaches Walay. as far as Darfur. It comprises an extensive region, stretching as far as the basin of the Nile. Lake Fittri, situated in the western portiou, forms a basin, unconnected with that of Lake Chad, and by which the country as far as Darfur is drained. It has never been explored by Europeans. The population. comprises a great variety of tribes and different lan- guages, Wara, the capital, is placed by Dr Barth in 14° N. lat., and 22° KE. long. . Darfur, east of Waday, extends as far as Kordofan. The Darfur. country rises towards the west into a range of hills called Jebel Marrah, It is drained into the Nile. A great portion of the country is Saharan in its character, while other parts are fertile and diversified. Browne, in 1703, estimated the Whole population at 200,000. It hasan extensive trade with Egypt.

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Cobbeih, the capital, is a merchant town, and contains about 6000 inhabitants.

Fumbina or Adamaua is an extensive country south of Houssa and Bornu, under Foulah dominion. It consists of a large, fertile, and highly-cultivated valley, formed by the River Benue. Near Yola, the capital, the Benue receives the Faro, a large tributary coming from the south-west. This country was first visited by Dr Barth in 1851.

Yola, the capital, lies in 8° 50' N. lat., and 13° 30' E. longitude. ; :

South of the belt of Negro states of the Soudan lies the great unknown region of Central Africa. On the east the unexplored area is bounded by the numerous states of the lake region made known by Burton, Speke, and Livingstone. Of these the chief are Unyamwesi, occupying the plateau south of the Victoria Lake, and east of Lake Tanganyika, with the capital town of Kaseh or Tabora, frequented by Arab traders from Zanzibar ; Karague on the western side of the Victoria Nyanza; and Uganda, stretching round its north-western shores. In the interior, beyond Lake Tanganyika, Livingstone has recently made known the peoples of Manyuema land, where " there is no political cohesion ; not one king or kingdom. Each man is independent of every other." To the south of the unknown region are the powerful Negro kingdoms of the Muata Yanvo and of the Cazembe, occupying the whole of the interior between 6° and 12° S. lat. Kabebe, the capital of the former state, is believed to be in about lat. 8° S., long. 23° 30' E. of Greenwich; and Lunda, the chief town of the latter potentate, is in the Luapula valley, south-west of the Tanganyika Lake, and was visited by Livingstone in 1867-68. The Makololo kingdom, occupying the central basin of the Zambeze river, with the chief town of Linyanti, west of the Victoria Falls; and that of Mosilikatse in the south-east, between the Zambeze and the Limpopo rivers, are the great remaining divisions of Central Africa. Besides these, however,

innumerable petty kingdoms, chiefships, and tribes subdivide the vast populations of Negroland.

To Africa belong a considerable number of islands. The Madeiras, belonging to Portugal, lie off the north-west coast of Africa, at a distance of about 360 miles. Madeira, the chief island, is about 100 miles in circuit, and has long been famed for its picturesque beauty, rich fruits, and fine climate, which renders it a favourite resort of invalids. Wine is the staple produce. Funchal, the chicf town, with 18,000 inhabitants, is a regular station for the West India mail steam-packets from Southampton, and the Brazilian sailing-packets from Falmouth.

The Canaries, belonging to Spain, the supposed Fortunate Islands of the ancients, are situated about 300 miles south of Madeira. They are 13 in number, all of volcanic origin, Teneriffe being the largest. The latter is remarkable for its peak, which rises as a vast pyramidal mass to the height of 12,173 feet.

The Cape Verde Islands, subject to Portugal, are a numerous group about 80 miles from Cape Verde. They obtained their name from the profusion of sea-weed found by the discoverers in the neighbouring ocean, giving it the appearance of a grcen meadow. . They are also of volcanic origin.

Fernando Po, a very mountainous forest-covered island, is in the Bight of Biafra.) The British settlement of Clarence Town was established in 1827, but afterwards abandoned. 'The island now belongs to Spain.

St Thomas, immediately under the equator, is a Portu- guese settlement; as is also Prince's Island, in 2° N. lat.

Annobon in 2° §. lat., belongs to the Spaniards.

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Ascension, a small, arid, volcanic islet, was made a British port on the arrival of Napoleon Bonaparte at St Helena, and since rctaincd as a station, at which ships may touch for stores. Green Hill, the summit of the island, rises to the height of 2840 feet.

St Helena is a huge dark mass of rock, rising abruptly from the ocean to the height of 2692 feet. James' Town is the only town and port.

Madagascar, the largest island of Africa, and one of the largest in the world, is separated from the Mozambique coast by a channel of that name, about 250 miles wide. The area exceeds that of France.

The high interior of the island is generally very fertile, with magnificent forests and fine pastures watered by numerous rivers, but a belt of hot swamp land with a deadly climate surrounds the coast.

The inhabitants are diverse races of Negro, Arab, and Malay origin. The Ovahs, a people of the central provinces, are now dominant. The principal town, Antananarivo, has about 80,000 inhabitants.

The French possess the islands of Sante Marie and Nos- sibe on the coast of Madagascar, and Mayotta island in the Comoro group.

The Comoro isles, four in number, are in the north part of the Mozambique Channel, and inhabited by Arab tribes.

Réunion or Bourbon, 400 miles east of Madagascar, is a colony of France, producing for export, coffee, sugar, cocoa, spices, and timber.

Mauritius, ceded to the British by the French in 1814, is 90 miles north-east of Bourbon. The sugar-cane is chiefly cultivated. Port Louis, the capital, beautifully situated, has 75,000 inhabitants. Within the jurisdiction of the Governor of the Mauritius are the islands of Rodri- guez, the Seychelles, and the Amarante islands.

Socotra, a large island, east of Cape Jerdaffun, with an Arab and Negro population, has been known from early times; it belongs to the Imaum of Muscat. This island was long celebrated as producing the finest aloetic drug ; it is found still to produce a fine kind of aloe, though much of what passed as Socotrine aloes really came from India. Guins, tobacco, and dates are also exported. (K. J.)

Note.—The above article was completed before it was known with certainty that the saddest event in the history of African exploration had occurred. Dr Livingstone, to whom the article justly assigns "the first place among African discoverers," died of dysentery near Lake Bang- weolo on the 4th of May 1873. The story of his latest discoveries, and of the rare devotion with which his native attendants carried his remains with them during an eight months' march to the coast, belongs to a biographical notice. It is more fitting in this place to note, as some consolation for an almost irreparable loss, that Living- stone's death seems to have given a powerful stimulus to the prosecution of the task he had so nearly completed. The expedition of Lieutenant Cameron, above referred to, is being carried out with a vigour and intelligence that give ample promise of a further limitation of the region of the unknown, if not of the complete solution of all out- standing problems. In the spring of 1874 he had commenced a thorough exploration of Lake Tanganyika, which, from his professional experience as a hydrographical surveyor, is expected to lead to very valuable results. And the complete success of Stanley's first memorable mission in search of Livingstone warrants confident hopes in regard to a second expedition, also admirably organised and equipped, which has started under his direction.

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AFRICANUS, Juutus, called also Sextus by Suidas, a Christian historian of the 3d century, born, according to some, in Africa, and, according to others, in Palestine, of African parents. Little is known of his personal his- tory, except that he lived at Emmaus, and that he went on au embassy to the emperor Heliogabalus to ask the restoration of that town, which had fallen into ruins. His mission succeeded, and Emmaus was henceforward known as Nicopolis. It is by no means certain that he was a bishop or even a priest, though the latter is probable. He wrote a history of the world (IHevra@i@diov Xpovodoyixdv) from the creation to the year 221 a.D., a period, according to his computation, of 5723 years. He calculated the period between the creation and the birth of Christ as 5499 years, and antedated the latter event by three years. This method of reckoning became

known as the Alexandrian era, and was adopted by almost all the eastern churches. The history is no longer extant, but copious extracts from it are to be found in the Chronicon of Eusebius, besides fragments in Syncellus, Cedrenus, and the Paschale Chront- con. Kusebius has also given some extracts from his letter to Aristides, reconciling the apparent discrepancy between St Matthew and St Luke in the genealogy of Christ by a reference to the Jewish law, which compelled a man to marry the widow of his deceased brother, if the latter died without issue. His letter to Origen, impugning the authority of the apocryphal book of Susanna, and Origen's answer, are both extant, the former having been printed at Basle, 1674. The ascription to Africanus of a work entitled Keoroi, treating of agriculture, natural history, inilitary science, &c., has been disputed on account of the inconsistency between it and the author's other writings. Neander suggests that it was probably written by Afri- canus before he had devoted himself to religious subjects.

AFZELIUS, Apam, an eminent Swedish naturalist, born at Larf, West Gothland, in 1750. Having studied at Upsala under Linnzus, he became teacher of oriental literature in that university in 1777, and demonstrator of botany in 1785. For two years (17 92-94) he resided on the west coast of Africa as botanist to the Sierra Leone Company. After acting for some time as secretary to the Swedish embassy in London, he returned home, became again a teacher in the university of Upsala, and was ap- pointed professor of materia medica in 1812. He edited the autobiography of Linnus (Upsala, 1823), a German translation of which appeared at Berlin in 1826. His literary work included also a large number of botanical papers contributed to the Linnean Society of London and the Royal Academy of Stockholm, as well as treatises on certain plants of Guinea and Sweden. He died at Upsala in 1836, having bequeathed his botanical collection to the university. Several species of plants, known as Afzelia, are named after this distinguished botanist.

AFZELIUS, Arwip Aveust, the Swedish historian, poet, and comparative mythologist, was born at Fjellaker in 1785. For a while he was a schoolmaster in Stock- holm, but afterwards entered the church, and became parish priest of Enköping, where he worked for just half-a- century, till his death in 1871. His poetical career began in 1811 and closed in 1848,

when he wrote his Farewell to the Swedish Harp. One great work of his life was to col- lect and publish, in conjunction with the eminent Geijer, three volumes of Swedish F olk-songs; but he will be best remembered by his History of the Swedish People, which has won him a European reputation. He did not live to bring this history lower down than 1709. (E. W. G.)

AGA, or Acua, a word, said to be of Tatar origin, signifying a dignitary or lord. Among the Turks it is ap-

plied to the chief of the janissaries, to the commanders of

the artillery, cavalry, and infantry, and to the eunuchs in

charge of the seraglio. It is also employed generally as a

term of respect in addressing wealthy men of leisure, land- owners, «ec. usage in Tartary, Persia, and Algiers.

The word is found with a somewhat similar

AGADES, the capital of the kingdom of Air, or Asben,

in Central Africa, situated in 17° 2’ N. lat., 8° 5’ E, long.

The town is built on the edge of a plateau, 2500 feet above

the level of the sea, and is supposed to have been founded

by the Berbers to serve as a secure magazine for their ex- tensive trade with the Songhay empire. The language of the people is a dialect of Songhay. In former times Agades was a place of great traffic, and had a population of about 50,000. Its importance may be estimated by the fact that the king of Agades paid a tribute of 150,000 ducats to the king of Songhay. Since the beginning of the 16th century the prosperity of the place has gradually declined. Extensive quarters of the town, which has a circuit of 34 miles, are deserted and ruinous. The occu- pied houses number only 600 or 7 00, and the population does not exceed 7000. The houses, which are built of

clay, are low and flat-roofed ; and the only building of im- portance is the chief mosque, which is surmounted by a tower 95 feet high. There is little traffic in the markets F no money is used, and the usual medium of exchange is millet. The chief trade is in grain. Agades derives its main importance from its situation on the direct route from the countries to the north-east to Sokoto and other important towns in the Hansa states. The great salt caravans pass through it, as well as pilgrims on their way to Mecca. From its healthy climate and advantageous posi- tion, the place might prove to be a good station for a Euro- pean agent. (See Barth's Zravels in Central A frica, vol. i.)

AGAMEMNON. The stern obligations of a king and the majesty of his office, as compared with his humane desires and occasional frailty, give the keynote to the character of Agamemnon. But the kingly office, like the Sceptre which was the symbol of it, had come to him from Pelops (Ziad, ii. 100) through the stained hands of Atreus and Thyestes, and had brought with it a certain fatality, by which his misfortunes, and especially the catas- trophe at the close of his life, were explained. As his title of Atrides implies, Agamemnon was a son of Atreus, his mother being Aérope. In a later account he is a son of Pleisthenes. But, apart from this difference, it is agreed that he succeeded to the sovereignty of Atreus over Argolis, Corinth, Achaia, and many islands, his seat being at Mycenz, not, as Aischylus for political reasons asserts, at Argos. The succession had been usurped by Thyestes and Atgisthus. During the usurpation Agamemnon and his brother Mene- laus visited Tyndareus, the king of Sparta, and obtained in marriage his two daughters—the former Clytzemnestra, the latter Helena: with his help Agamemnon was re- instated in his rights. Menelaus succeeded Tyndareus, The children born by Clytzemnestra were Chrysothemis, Iphigenia, Electra, and one son, Orestes. Elsewhere are mentioned also Iphianassa and Laodice; but the latter was the original name of Electra, it appears, and it has been suggested that Iphianassa stood in the same relation to Iphigenia. Agamemnon was then the most powerful prince in Greece; and to him of right, as well as naturally, his brother Menelaus turned for aid to compel the Trojans to give up his wife Helena, whom Paris had carried off. The various princes of Greece having been brought to unite in an expedition for this purpose, Agamemnon was chosen leader, he himself furnishing 100 ships and lending also 60 more to the Arcadians. It

was not perhaps his fault that the Greeks landed by mistake on the coast of Mysia, from which, after plundering it, they took ship and were scattered in a storm; but it was owing to him (and this is the beginning of his ill-fate) that after again assembling in

Aulis, whence they had set out, the fleet was storm-bound. He had slain a deer sacred to Artemis, and boasted himself a better hunter than the goddess. This, as Calchas the seer read the divine will, could only be atoned for by his offering up his daughter Iphigenia in sacrifice. Compelled by his duty to the expedition, he allowed her to be sent for, the pretext given to Clyteemnestra being that she was to be married to Achilles. But when the moment of sacri- fice came, the goddess substituted a stag, carried her off to the Tauri, and made her immortal. The fleet now sailed; and except the quarrel between him and Achilles at Tenedus or Lemnus, there was no incident in which Agamemnon figured particularly, until, in one of the raids on the towns round Troy, Briseis and Chryseis were brought captives, and assigned, the former to Achilles, the latter to Aga- memnon,—who, having to yield up his captive to appease Apollo, claimed and took the other. Upon this Achilles withdrew from the war, and Agamemnon endeavoured at first to maintain it without him. In the face of disaster he repented, and offered reparation—sending costly presents by the hands of Pheenix, Ajax, and Ulysses. His offer rejected, he took the field himself, and did marvels of bravery, but was wounded and defeated. When Troy was finally taken and the captives distributed, he obtained Cassandra, and with her returned home; but before sailing the shade of Achilles appeared to him, foretold what would happen, and sought to restrain him. In his absence Clyteemnestra had yielded to the temptations of Adgisthus, and, to cover her shame, planned with him the death of her husband. 'The approach of Agamemnon being an- nounced by a spy, a feast and an affected welcome were prepared for him and his followers. At the feast they were fallen upon by hired murderers, assisted by Aigisthus and Clytemnestra, the latter herself slaying Cassandra (Odyssey, iv. 512-537; x1. 385-461). According to

Zéschylus, Agamemnon was slain in his bath, his wife first.

throwing a piece of cloth over him to prevent resistance. For his death vengeance was taken by his son Orestes. In the legends of the Peloponnesus, Agamemnon was re- garded as the highest type of a powertul monarch, and in Sparta he was worshipped under the title of Zeus Agamem- non. His tomb was pointed out among the ruins of Mycenz (Pausanias ii. 16. 5). (A. S. M.) AGAPE, plur. AcAPa, the love-feast, or feast of charity, which among the primitive Christians usually accompanied the Eucharist. The word (dydzry, love) is first employed in this sense in the Epistle of Jude, verse 12. The sug- gestion of a connection between Christian love-feasts and the Zpavor and éroupiar of Greece and Rome is both im- probable and unnecessary. The feelings of love and brotherhood fostered by the new faith, strengthened as these must have been by the complete isolation of the little Christian community, are quite sufficient to account for the existence of the Agape, without referring them to other more or less similar institutions. According to Chrysostom, the Agape was a common feast, symbolising the community of goods when it no longer really existed, to which the rich brought provisions, and the poor, who brought nothing, were invited. At first it was observed probably every evening in immediate connection with the celebration of the Lord's Supper, though whether before or after is a point that has been much disputed. It closed with the holy kiss (#iAjpa aytov, piAnpa aydays). The Corinthian church was the first to pervert the Agape by destroying the community between rich and poor (1 Cor. xi. 21). Partly perhaps on account of such irregularities extending, and partly to escape the notice of persecutors, it became usual about the middle of the 2d century to separate the Lord's Supper from the Agape by celebrating the former at the close of morning service on Sunday,

and the latter by itself after a considerable interval. Abuses becoming more frequent, love-feasts were gradually put under greater restrictions. The rich began habitually to absent themselves from the Agapze, which caime thus to be regarded as a provision for the poor alone; and the Council of Gangra (360), to correct the abuse, pronounced an anathema upon any who should despise the Agape. A number of synods and councils in succession

condemned the holding of these feasts in churches, as well as the participation of the clergy in them, and at length the observ- ance altogether died out. In modern times it has been revived in one form or other by the Moravian Brethren, the Wesleyan Methodists, and, in Scotland, by the followers of Robert Sandeman.

AGAPETUS, deacon of the St Sophia Church at Con- stantinople, presented to the Emperor Justinian a work entitled Charta Regia, composed in 527, which con- tained advice on the duties of a Christian prince. It is highly valued, and has been several times reprinted. The best edition is that contained in Bandauri's Imperium Orientale (Paris, 1711). There is an English translation by Thomas Paynell (1550); and a French translation, executed from a Latin version by Louis XITI., with the assistance of his tutor, David Rivault.

AGARDE, Artur, a learned English antiquary, born at Foston, in Derbyshire, about 1540. He was trained a lawyer; but entering the exchequer as a clerk, he became deputy-chamberlain in 1570. This office, which he held for forty-five years, gave him unrivalled opportunities for carrying on his favourite study. Along with his intimate friends, Sir Robert Cotton and Camden, he was one of the original members of the Society of Antiquaries. He made a special study of the Domesday Book, and prepared an explanation of its more obscure terms, which is of little worth. Hearne, in his Collection of Curious Discourses written by Eminent Antiquaries (Oxford, 1720), includes six by Agarde on such subjects as the origin of parliament, the antiquity of shires, the authority and privileges of heralds, &c. Agarde died in 1615, and was buried in the cloister of Westminster Abbey. He bequeathed to the exchequer all his papers relating to that court, and to his friend Sir Robert Cotton his other manuscripts, amounting to twenty volumes.

AGASIAS, son of Dositheus, a famous sculptor of Ephesus, who is supposed to have lived about the 4th century. His celebrated work, known erroneously as the Borghese Gladiator, was discovered at the commencement of the 13th century in the ruins of an imperial palace at Antium, where the Apollo Belvidere was also found. It represents a figure in action, with the head uplifted as if to meet the attack of a horseman.

According to Winckel- mann, the representation of the figure is intensely real, without a touch of imagination. The statue forms part of the Louvre collection.

AGASSIZ, Louis Jon Rupoipn, was the son of a Swiss Protestant clergyman. His father was the pastor of the parish of Motiers, a small town situated near the north- eastern angle of the Little Murtensee, and not far from the eastern extremity of the Lake of Neuchatel. Agassiz was born at this retired place on May 28, 1807. Educated first at home, then spending four years at the gymnasium of Bienne, he completed his elementary studies at the academy of Lausanne. Whilst at this latter place he already be- came conspicuous amongst his fellow-students, not only for his love of the natural sciences, but for the manifest talent he displayed in pursuing them. The close alliance between these subjects and the science of medicine led him to adopt the latter as his profession, for which he studied successively at the universities of Zurich, Heidelberg, and Munich; at the same time availing himself of the advantages afforded

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The Ganoids were the most remarkable as well as the most widely diffused of primeval fishes 3 we find them equally in the fresh-water deposits of the weald, in the marine deposits of the oolites, the chalk, and the magnesian lime- Stone, and in the more mixed and dubious deposits of the coal measures. Agassiz, therefore, was fully justified in attaching very great importance to this hitherto unrecog- nised class. Indeed, later ichthyologists—e.g., J. Miiller and Professor Owen—have found it necessary to retain the class in their recent classifications, though in a modified form. The remaining portions of Agassiz' system have not been adopted by them; but though they do not accept the terms Placoids, Cycloids, and Ctenoids as representing classes, all zoologists employ them as new and convenient adjectives, of the utmost value to students of systematic ichthyology. One reason for the rejection of Agassiz' system by modern ichthyologists is the obvious one that he draws the characteristics of his classes from a single organ—the skin—and that not the most important. At the same time, it must be admitted that the Placoids, like the

Ganoids, also constituted a natural group closely corre- sponding with the Pisces cartilaginet of Cuvier and others. The distinction between Cycloids and Ctenoids was a much more trivial one, and needlessly separated closely-allied forms. It is only those who are familiar with the magnitude and difficulties of the task thus undertaken that can appreciate the daring courage of the youth who grappled with it. Under twenty-five years of age, and, as already observed, with limited financial resources, he nevertheless seems to have known no fear. He soon announced to geologists several important generalisations, the correctness of which has been confirmed by all sub- Sequent research. In particular, he pointed out that no examples of Cycloids and Ctenoids, comprehending the bulk of the fishes now seen in our markets, were to be found in rocks of older date than the cretaceous age.

As the work proceeded it became obvious that it would over-tax the resources of the intrepid young zoologist, un- less some additional assistance could be afforded to him. The British Association for the Advancement of Science wisely came to his aid, and the late Earl of Ellesmere— better known in his youth as Lord Francis Egerton—gave him yet more efficient help. The original drawings made for the work, chiefly by Dinkel, amounted to 1290 in number, These were purchased by the earl; but, with princely liberality, he left all that were necessary for the further prosecution of his labours in the hands of Agassiz.

It was whilst he was thus engaged that Agassiz paid his first visit to England, for the purpose of studying the rich stores of fossil fishes with which this country abounds. He was then in his youthful prime—a model of manly vigour and scientific enthusiasm ; but amongst his many qualities none were more remarkable than the quickness with which he detected the peculiarities of any new fossil, and the retentiveness of hig memory, which enabled him to make ready use of his newly-acquired knowledge. The consciousness that he possessed these powers led him occa- sionally— though, it must be allowed, but rarely—to trust unduly to them, and made him sometimes hasty and off- hand in his conclusions.

But fossil ichthyology, though a very large subject, was insufficient to occupy his energetic mind. In 1837 we find him issuing the "Prodrome" of

a monograph on the recent and fossil Echinodermata, the first part of which appeared in 1838 ; and in 1839-40 he published, in addi- tion, two quarto volumes on the fossil Echinoderms of Switzerland. This division of the invertebrate animals was evidently a favourite one with him, since we find it the subject of numerous memoirs which appeared from time to time during his later life.

by these universities for extending his knowledge of natural history, especially of botany. Having completed his academi- cal course, he took his degree of doctor of medicine at Munich.

Up to this time he had no particular inclination for the study of ichthyology, which soon afterwards became the great occupation of his life. Agassiz always declared that he was led into ichthyological pursuits through the follow- ing circumstances :—In 1819-20, Spix and Martius were engaged in their celebrated Brazilian tour, and on their return to Europe, amongst other collections of natural objects, they brought home an important one of the fresh- water fishes of Brazil, and especially of the Amazon river. Unfortunately Spix did not live long enough to work out the history of these fishes 3 hence it became necessary that some other naturalist should undertake the task of describ- ing them. It is no insignificant proof of the reputation which Agassiz had already won, that, though little more than a youth just liberated from his academic studies, he was selected for this purpose. His attention being thus directed to the special subject of ichthyology, he at once threw himself into the work with that earnestness of spirit which characterised him to the end of his busy life. Thus, in 1828 we find him, after describing a new Species of Cynocephalus, publishing a description of a new cyprinoid fish. This was followed by a yet more elaborate research into the history of the cyprinoid aud other fishes found in the lake of Neuchatel, Rapidly enlarging his plans, the publication of the last-named work was succeeded by the issue, in 1830, of a prospectus of a History of the Fresh- water Fishes of Central Lurope. It was only in 1839, however, that the first part of this important publication appeared. The task of describing and figurin g the Brazilian fishes of Spix and Martius was completed and the work published in 1829,

Acquiring fresh confidence through these labours, he now contemplated a yet greater task, Having become a pro- fessed ichthyologist, it was impossible that the fossil fishes with which the stratified rocks of his native mountains abound should fail to attract his attention. The rich stores furnished by the slates of Glarus and the limestones of Monte Bolca were already well known; but very little had been accomplished in the way of the scientific study of them. Agassiz at once threw himself into this new field of labour with his wonted enthusiasm, and began the publication of the work which, more than any other, made him known to foreign naturalists, and laid the foundation of his world- wide fame. Five volumes of his Recherches sur les Poissons Fossiles appeared at intervals between the years 1833 and 1844. They were magnificently illustrated, chiefly through the labours of Dinkel, an artist of remarkable power in delineating natural objects.

Agassiz soon found that his palzeontological labours rendered a new basis of ichthyological classification ab- solutely necessary. The fossils rarely exhibited any traces of the soft tissues of fishes, They chiefly consisted of the teeth, scales, and fins, even the bones being perfectly preserved in but comparatively few instances. Hence the classifications of Cuvier and other naturalists were of little use to him in determining the mutual relations of the fossil forms. He therefore adopted his well-known Classification, which divided fishes into four groups—viz., Ganoids, Placoids, Cycloids, and Ctenoids. The first of these groups was chiefly represented amongst living fishes by the Lepidosteus or bony pike of the great American rivers; by the Polypterus or Bischir of the Nile 3 and by the sturgeon. The last fish has a wide geographical Tange; but the other two, which best display the characters on which Agassiz based his Ganoid class, are limited to the fresh-water rivers of local geographical areas. But in the Paleozoic and Mesozoic ages it was strikingly otherwise.

It was by these great undertakings that he chiefly won his distinguished position as one of the greatest leaders in scientific research; but his observant faculties were by no means concentrated upon them exclusively. His intellec- tual tentacula expanded in every direction. The history of the Belemnites, the muscular system of recent and fossil shells, the principles of

classification of the animal king- dom, the embryology of the salmon, and critical studies of special genera of fossil Mollusca—all engaged his attention. During his travels in England in 1834 he was ever on the alert for new specimens for the museum at Neuchatel. One characteristic incident of this kind may be referred to here. A fine porpoise had been caught by the Scarborough fishermen. Agassiz was weary with travel, and had but a few'hours to remain in the town, but the chance could not be allowed to escape ; the creature was purchased, and midnight saw Agassiz and the writer of this sketch working by the dim light of two tallow candles dissecting the animal, and shipping off its half-cleaned bones to Neuchatel, before he ventured to take the much- needed rest.

Subsequently to his first visit to England the labours of Hugh Miller, Dr Malcolmson, and other geologists brought to light the marvellous ichthyal fauna of the Devonian beds of the north-east of Scotland. Murchison and Sedgwick had some time previously directed attention to the existence of fishes of this geological age, especially amongst the bituminous shales of Caithness; but the more recent discoveries were of far greater interest than the earlier ones, because of the strange forms of the Pterich- thys, the Coccosteus, and other species then made known to geologists for the first time. The supposition of Hugh Miller, that some of these fishes had vertical instead of horizontal mouths, suggestive of a transition from the crustacean to the ichthyal type, added fresh interest to the subject in the eyes of a philosophic inquirer like Agassiz. These fossils were reported upon by him more than once, and were finally made the subjects of a special monograph, which was published in 1844. Miller's inter- pretation of the structure of the mouth Agassiz soon demonstrated to be erroneous.

The year 1840 witnessed the inauguration of a new movement, which has proved to be of the utmost import- ance to geological science. Previously to this date De Saussure, Venetz, Charpentier, and others had made the glaciers of the Alps the subjects of special study, and Charpentier had even arrived at the important conclusion that the well-known erratic blocks of alpine rocks scattered so abundantly over the slopes and summits of the Jura mountains, had been conveyed thither by glaciers. The question having attracted the attention of Agassiz, he at once grappled with it in his wontedly enthusiastic manner. He not only made successive journeys to the

alpine glaciers in company with Charpentier, but he had a rude hut constructed upon one of the Aar glaciers, which for a time he made his comfortless home, in order that he might the more thoroughly investigate the structure and movements of the ice. 'These labours resulted in the publication of his magnificent illustrated folio entitled Etudes sur les Glaciers, In this important work the movements of the glaciers, their moraines, their influence in grooving and rounding off the rocks over which they travelled, producing the striations and roches moutonnés with which we are now so familiar, were treated with a comprehensiveness which threw into the shade all the writings of previous labourers in this field. He not only accepted Charpentier's idea that some of the alpine glaciers had extended across the wide plains and valleys drained by the Aar and the Rhone, and thus landed parts of their remains upon the uplands of the Jura, but he went still further in the same direction. He

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concluded that, at a period geologically recent, Switzerland had been another Greenland; that instead of a few glaciers stretching their restricted lines across the areas referred to, one vast sheet of ice, originating in the higher Alps, had extended over the entire valley of north-western Switzerland until it reached the southern slopes of the Jura, which, though they checked and deflected its further extension, did not prevent the ice from reaching in many places the summit of the range. holding a similar view in the case of the vast plains spread out between the Andes and the eastern coast' of South America. The publication of this work gave a fresh impetus to the study of glacial phenomena in all parts of the world. In 1841 Agassiz spent many weeks in his hut on the Lower Aar glacier, where he received as his guest the late Professor James Forbes, who was also engaged upon the

At a later period we shall find him

study of glacial phenomena. The latter philosopher, in

his work on Norway and its Glaciers, recognised in the fullest manner his indebtedness to Agassiz for much new light respecting the details of glacial action.

Thus familiarised with the phenomena attendant on the

movements of recent glaciers, Agassiz was prepared for a new and most unexpected discovery which he made in

1846, in conjunction with the late Professor Buckland. These two savants visited the mountains of Scotland together, and found in six different localities clear evi- dence of some ancient glacial action. The discovery was

announced to the Geological Society of London in a joint communication from the two distinguished observers.

Similar discoveries were subsequently made by Buckland, Lyell, Ramsay, and others in various parts of Scotland, Westmoreland, Cumberland, and North Wales. The for- mer existence of glaciers in each of these mountainous districts is a fact that no one now presumes to doubt any more than that these glaciers, either directly, or indirectly in the shape of icebergs, have at least contributed largely to the accumulation of those wide-spread deposits with which geologists are familiar under the name of drift and boulder formations.

But we must now follow Agassiz to a new sphere of labour. In 1838 he was appointed to the professorship of natural history at Neuchatel, with a very limited income. In the autumn of 1846 he crossed the Atlantic, with the two-fold design of investigating the natural history and geology of the United States, and delivering a course of lectures on zoology at the Lowell Institute; and the tempting advantages, pecuniary and scientific, presented to him in the New World, induced him to settle in the United States, where he remained to the end of his life. He was appointed professor of zoology and_geology in the university of Cambridge, U.S., in 1847. He left that post in 1851 for a medical professorship of comparative anatomy at Charlestown, but returned in 1853 to Cambridge.

This transfer to a new field, and the association with fresh objects of high interest to him, gave his energies a new stimulus) Volume after volume now proceeded from his pen: some of his writings were popular, and ad- dressed to the multitude, but most of them dealt with the higher departments of scientific research. His work on Lake Superior, and his four volumes of

Contributions to the Natural History of the United States, were of this latter character. But whilst thus working earnestly at American zoology, he still kept in view more generalised inquiries, the fruits of which appeared in 1854, with the title of Zoologie Générale et Esquisses Générales de Zoologie con- tenant la Structure, le Développement, la Classification, &e., de tous les Types d'Animaua vivants et détruts. Before leaving these literary labours, we must not overlook the valuable service he rendered to science by the formation, for his own use, of a catalogue of scientific memoirs—an

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extraordinary work for a man whose hands were already so full, This catalogue, edited and materially enlarged by the late Hugh Strickland, was published by the Ray Society under the title of Lrbliographia Zoologia et Geo- logue. Nor must we forget that he was building up another magnificent monument of his industry in the Museum of Natural History, which rose under his foster- ing care, at Cambridge. But at length the great strain on his physical powers began to tell. He then sought to restore his waning health by a southern voyage. His early labours among the fishes of Brazil had often caused him to cast a longing glance towards that country; and he now resolved to combine the pursuit of health with the gratification of his long-cherished desires. In April 1865 he started for Brazil, along with his admirable wife and an excellent class of assistants. Even on shipboard he could not be idle. In his outward voyage he delivered a course of lectures, open to all his fellow-passengers, but especially addressed to his assistants, and intended to instruct them in the nature and bearings of the great problems upon which they might hope to throw light during their stay in Brazil. An interesting account of this journey, to the success of which the emperor of Brazil contributed in every possible way, was published by Mrs Agassiz when they returned home, laden with the natural treasures of the Brazilian rivers.

In 1871 he made a second excursion, visiting the southern shores of the North American continent, both on its Atlantic and its Pacific seaboards. He had for many years yearned aftcr the establishment of some permanent school where zoological science could be studied, not in class-rooms or museums of dead specimens, but amidst the living haunts of the subjects of

study. Like all truly great teachers, he had little faith in any school but that of nature, The last, and possibly the most permanently in- fluential, of the labours of his long and successful life was the establishment of such an institution, which he was enabled to effect through the liberality of Mr John Anderson, a citizen of New York. That gentleman not only handed over to Agassiz the island of Penikese, on the east coast, but also presented him with $50,000 wherewith per- manently to endow it as a practical school of natural science, especially devoted to the study of marine zoology. Another American friend gave him a fine yacht, of 80 tons burden, to be employed in marine dredging in the sur- rounding seas. Had Agassiz lived long enough to bring all this machinery into working order, it is difficult to ex. aggerate the practical advantages which American science would have reaped from it when guided by such experi- enced hands. But it was otherwise ordained. The disease with which he had struggled for some years proved fatal on Dec. 14, 1873.

A letter to his old friend, Sir Philip M. de Grey Eger- ton, Bart., written but a few days before his death, and doubtless one of the last that he penned, showed that his spirit was still as indomitable and his designs as large as ever; and one of his latest expressed wishes was that he might be spared for four more years in order that the work he had contemplated might be eompleted.

Our available space will not allow us to give a de- tailed sketch of the opinions of this remarkable man on even the more important of the great subjects which he studied so long. From first to last he steadily rejected the doctrine of evolution, and affirmed his belief in inde- pendent creations. In like manner he retained his confi- dence in the former existence and agency of vast continental ice-sheets, rather than in the combined action of more limited glaciers and icebergs, which nearly all modern geologists recognise as the producers of the drifts and boulder-clays. When studying the superficial deposits of

the Brazilian plains in 1865, his vivid imagination covered even that wide tropical area, as it had covered Switzerland before, with one vast glacier, extending from the Andes to the sea. His daring conceptions were only

equalled by the unwearied industry and genuine enthusiasm with which he worked them out; and if in details his labours were some- what defective, it was only because he had the courage to attempt what was too much for any one man to accom- plish. (w. ©. w.)

AGATE (from Achates, a river in Sicily, on the banks of which it is said to have been found), a name applied by mineralogists to a stone of the quartz family, generally occurring in rounded nodules or in veins in trap rocks. The number of agate balls in the rock often give it the character of amygdaloid; and when such a rock is decom- posed by the elements, the agates drop out, and are found in the beds of streams that descend from it ; or they may be obtained in quarrying. Great quauntitics are obtained from Oberstein and Idar, in Germany, where there are large mauufactories for colouring and polishing the stones; and many are brought from India and Brazil. Agate occurs in considerable quantity in Scotland, whence the stone is familiarly known to lapidaries as Scotch pebble; and very large masses of calcedony, a variety of it, are brought from Iceland, the Faroe Islands, aud Brazil. Agate chicfly con- sists of calcedony, with mixtures of common quartz and occasional patches of jasper and opal. The colour markings are often in concentric rings of varying forms and iuten- sity, or in straight parallel layers or bands. The colours are chiefly gray, white, yellow, or brownish-red. The com- position of agate is not uniform; but it usually contains from 70 to 96 per cent. of silica, with varying proportions of alumina, coloured by oxide of iron or manganese. The principal varieties are—

1, Calcedony. In this the colours are in parallel bands. The porosity of this stone, and the presence of iron in it, have given rise to a beautiful artificial process for height- ening its natural colours, which has been long practised at Oberstein, and probably long known in India. The stones best suited for this purpose are such as when recently frac- tured imbibe moisture most readily. The stones are first dried without heat, then immersed in a mixture of honey and water, and afterwards placed in a heated oven, where they remain for two or three weeks, constantly covered with the liquid. They are then washed, dried, and put into an earthenware vessel containing sufficient sulphuric acid to cover them; this vessel is closed and placed in the oven for a space varying from one to twelve hours, according to the hardness of

the stone. The agates are now reioved, washed, and thoroughly dried; and after being kept in oil for twenty- four hours, are cleaned, cut, and polished. In the best specimens the gray streaks are increased in intensity; some exhibit brown streaks approaching to black, while white impenetrable parts assume a brighter hue by the contrast. This is the process employed to convert the veined calce- dony or agate into onyx, especially for the production of cameos and intaglios, in imitation of the antique sculptured gems, of which admirable specimens are found in the cabincts of the curious, and especially in the Florentine Museum. Jn those minute but exquisite works the ancient Greeks espe- cially excelled; and remarkable specimens of the art have been found in the tombs of Egypt, Assyria, and Etruria, In such works the figures, whether in relief or intaglio, appear of a different colour from the ground.

2. Carnelian, or red calcedony, when found, is almost always brownish or muddy. The following process is employed at Oberstein to convert both this sort aud the yellowish-brown varieties into a rich red, so as to rival the Indian carnelian, which probably also has its colour heightened artificially :—After being thoroughly dried, the

stones are dipped in sulphuric acid, and immediately exposed in a covered earthenware crucible to a red heat: the whole is allowed to cool slowly, and when cold the stones are removed and washed.

3. Mocha stones, originally brought from the East, are clear grayish calcedonies, with clouds and dashes of rich brown of various shades. They probably owe their colour chiefly to art.

4, Moss agates are such as contain arborisations or den- drites of oxide of iron, some of which seem to be petrifac- tions of real vegetable forms.

5. Bloodstone is a dark-green agate containing bright red spots like blood-drops. —-s

6. Plasma, a grass-green stone, found engraved in ruins at Rome, on the Schwartzwald, and on Mount Olympus, appears to be calcedony coloured

by chlorite.

7. Chrysoprase, found in Silesia, is an agate coloured apple-green by oxide of nickel. ‘

The agate can be cut or sawed easily, and is used for making cups, rings, seals, handles for knives and forks, sword-hilts, rosary beads, aud a great variety of trinkets. Many stones of this kind are marked with representations of men, animals, or inanimate natural objects; but there can be no question that a very large proportion of these are to be regarded as productions of art.

AGATHARCHIDES, a celebrated Greek grammarian and geographer who flourished about 140 years B.c., was born at Cnidos. His works are lost, except those passages quoted by Diodorus Siculus and other authors, in which he describes the gold mines of Upper Egypt, and gives the first philosophical explanation of the inundations of the Nile, which he ascribed to the rains on the mountains of Ethiopia. (Hudson’s Greek Geographers.)

AGATHARCHUS, a Greek painter, commemorated by Vitruvius for having first applied the laws of perspective to architectural painting, which he used successfully in prepar- ing scenery for the plays of Auschylus. He flourished about 480 years B.C.

AGATHIAS, a Greek historian and poet, born at Myrina in Asia Minor, about 536 a.p. He was educated at Alex- andria, and in 554 went to Constantinople, where, after studying Roman law for some years, he practised as an advo- cate. /The title “Scholasticus,” generally given to Agathias, was fiat by which advocates were known in Coustanti- nople. Of the poetry by Agathias but little remains; his Daphniaca (Aadviaxd), a collection of erotic poems, being entirely lost, and only the introduction to his KvxAos, or anthology from earlier and contemporary writers, being extant. A number of his epigrams may be found in the Anthologia Greca. His principal work is his history, which begins, where Procopius ends, with the 26th year of the reign of Justinian (553), and carries on the narrative of events until 558. It is valuable as a chronicle, but the style is turgid, and great ignorance is shown of the history and geography of western Europe. It was printed in Greek, with a Latin translation by Bonaventura Vulcanius,

at Leyden in 1594. The best edition is that of Niebuhr (Bonn, 1828). A French translation is included in the second volume of Louis Cousin's J/istory of Constantinople.

AGATHO, an Athenian tragic poet, the disciple of Pro- dicus and Socrates, celebrated by Plato in his Protagoras for his virtue and his beauty. A tragedy of his obtained the prize in the fourth year of the 90th Olympiad, and he was crowned, in the presence of upwards of 30,000 persons, when a little over thirty years of age. There are no remains of his works, except a few quotations in Aristotle, Athenzeus, and others.

AGATHOCLES, a famous tyrant of Sicily, was the son of a potter at Rhegium. By his singular vigour and abilities he raised himself through various gradations of

rank till he finally made himself tyrant of Syracuse, and then of nearly all Sicily. He defeated the armies of the Carthaginians several times, both in Sicily and Africa; but at length he met with a reverse, and his soldiers' pay being in arrears, they mutinied, forced him to fly his camp, and murdered his sons. Recovering himself, he relieved Corcyra, which was besieged by Cassander; burnt the Macedonian fleet; and revenged the death of his children by putting the murderers, with their wives and fami- lies, to the sword. After ravaging the sea-coast of Italy he took the city of Hipponium. The last years of his life were greatly harassed with ill-health and the turbulence of his grandson Archagathus. He died in the seventy-second year of his agé, B.c. 290, after a reign of twenty-eight years.

AGDE, a town of France, in the department of Hérault, on the left bank of the river of that name, 30 miles S.W. of Montpellier. It isa place of great antiquity, and is said to have been founded, under the name of Agathe, by the Greeks. In the neighbourhood there is an extinct volcano, and the town is built of black volcanic basalt, which gives it a grim and forbidding aspect. It has a fine old Gothic cathedral, a college, and a school of navigation. The Canal du Midi, or Languedoc canal, uniting the Garonne with the Mediterranean Sea, passes under the walls of the town, and the mouth of the Hérault forms a convenient harbour, which is protected bya fort. Thus advantageously situated, the place commands an extensive coasting trade, more than 400 vessels annually entering the port. Soap and

verdigris are manufactured, and the staple productions of southern France are largely exported. Population,

9747.

AGE, a term denoting generally any fixed period of time, is used more definitely in a variety of senses, Classi- cal mythology divided the whole history of the earth into a number of periods. Hesiod, for example, in his poem Works and Days, describes minutely five successive ages, during each of which the earth was peopled by an entirely distinct race. The first or golden race lived in perfect happiness on the fruits of the untilled earth, suffered from no bodily infirmity, passed away in a gentle sleep, and became after death guardian demons of this world. The second or silver race was degenerate, and refusing to worship the immortal gods, was buried by Jove in the earth. The third or brazen race, still more degraded, was warlike and cruel, and perished at last by internal violence. The fourth or heroic race was a marked advance upon the preceding, its members being the heroes or demi-gods who fought at Troy and Thebes, and who were rewarded after

| death by being permitted to reap thrice a-year the free

produce of the earth. The fifth or cron race, to which the poet supposes himself to belong, is the most degenerate of all, sunk so low in every vice that any new change must be for the better. Ovid, in his Metamorphoses, follows Hesiod exactly as to nomenclature and very closely as to substance. He makes the degeneracy coutinuous, however, by omitting the heroic race or age, which, as Grote points out, was probably introduced by Hesiod, not as part of his didactic plan, but from a desire to conciliate popular feeling by including in his poem the chief myths that were already current among the Greeks.

A definite period in history distinguished by some special characteristic, such as great literary activity, is generally styled, with some appropriate epithet, an age. It is usual, for example, to speak of the age of Pericles, the Augustan age, the Elizabethan age; of the age of the crusades, the dark ages, the middle ages, the age of steam. Such isolated periods, with no

continuity or necessary con- nection of any kind, are obviously quite distinct from the ages or organically-related periods into which certain

capax, capable of discerning between right and wrong, the principle in that case being that malitia supplet actatem. At twenty-one both males and females obtain their full legal rights, and become liable to all legal obligations. A Seat in the British Parliament may be taken at twenty-one,

eminent modern philosophers have divided the whole course of human history. According to Fichte's scheme there are five ages, distinguished by the relative predomi- nance which instinct, external authority, and reason have in them respectively, instinct being supreme in the first and reason in the last. Comte's scheme distinguishes three ages according to the state of knowledge in each, and he supposes that we are now entering upon the third of these. In the first age of his scheme knowledge is super- natural or fictitious; in the second it is metaphysical or abstract; in the third it is positive or scientific. Schemes somewhat similar have been proposed by other philosophers, chiefly of France and Germany, and seem to be regarded by them as essential to any complete science of history.

In relation to individual as well as to social life, age is used with a considerable variety of application. It frequently denotes the total duration of life in man, animals, or plants, aud in this sense belongs to the subject of LoncEvrry (q.v.) It also denotes in man the various periods into which his life may be divided, either from a physiological or from a legal point of view. In the former aspect perhaps the most common division is into the four ages of infancy, youth, manhood, and old age. These again have been increased to six or seven by some physiologists—infancy, childhood, boyhood or girlhood, adolescence, manhood or womanhood, age, and old age or second childhood. While both schemes have a sufficient basis of scientific accuracy, they have also each attracted the fancy of the poet. Ovid in his Metamor- phoses (xv. 198-213) makes a beautiful comparison between the four ages of a man's life and the four seasons of the year, in a passage which has been frequently imitated ; and the sevenfold division has been exquisitely cast into poetic form by Shakespeare in As You Like It, act ii scene 7. The division of human life into periods for legal purposes is

naturally more sharp and definite than the foregoing. It would be unscientific in the physiologist to name any pre- cise year for the transition from one of his stages to another, inasmuch as that differs very considerably among different nations, and even to some extent among different indi- viduals of the same nation. But the law must necessarily be fixed and uniform, and even where it professes to pro- ceed according to nature, must be more precise than nature. The Roman law divided human life for its purposes into four chief periods, which had their subdivisions—(1.) Infantia, lasting till the close of the seventh year; (2.) The period between infantia and pubertas, males becoming puberes at fourteen and females at twelve 3 (3.) Adolescentia, the period between puberty and majority ; and(4.)The period after the twenty-fifth year, when males become majores. The first period was one of total legal incapacity; in the second period a person could lawfully do certain specified acts, but only with the sanction of his tutor or guardian; in the third the restrictions were fewer, males being permitted to manage their own property, contract marriage, and make a will; but majority was not reached until the age of twenty- five. By English law there are two great periods into which life is divided—infancy, which lasts in both sexes until the twenty-first year, and manhood or womanhood. The period of infancy, again, is divided into several stages, marked by the growing development both of rights and obligations. Thus at twelve years of age a male may take the oath of allegiance; at fourteen both sexes are held to have arrived at years of discretion, and may therefore choose guardians, give evidence, and consent or disagree to a marriage. A female has the last privilege from the twelfth year, but the marriage cannot be celebrated until the majority of the parties without the consent of parents or guardians. At fourteen, too, both sexes are fully re- sponsible to the criminal law. Between Seven and fourteen there is responsibility only if the accused be proved doli

his infancy, property, make contracts, carry on trade, and, as a neces- Sary consequence, is liable to be declared a bankrupt.

In the United States is thirty-five, for a senator thirty, and for a representative twenty-five.

instructor of the three and Polycletus. ments of the date when he flourished. Thiersch meets the

the monastery at Glastonbury,

influence over Canute in

ano

Certain professions, however, demand as a qualification in

entrants a more advanced age than that of legal manhood. In the church a candidate for deacon's orders must be twenty-three, and for priest's orders age; and no clergyman is eligible for a bishopric under thirty. In Scotland infancy is not time previous to majority, which, as in England, is reached by both sexes at twenty-one, is divided into two stages: pupilage lasts until the attamment of puberty, which the law fixes at fourteen in males and twelve in females; minority lasts from these ages respectively until twenty-one. Minority obviously corresponds in some degree to the English years of discretion, buta Scotch. minor has more

twenty-four years of

a legal term. The

personal rights than an English infant in the last stage of ég., he may dispose by will of moveable

Among foreign nations the law on this matter is somewhat

varied. In France the year of majority is twenty-one, and

the nubile age, according to the Code Napoleon, eighteen

for males and fifteen for females, with a restriction as to the consent of guardians.

In Germany majority is usually reached at twenty-four, though in some states (Bavaria, Saxony, Wiirtemburg, and Baden) the age is twenty-one. the age qualification for a president

AGELADAS, an eminent statuary of Argos, and the great sculptors, Phidias, Myron, There is considerable difference in the state.

difficulty by supposing that there was another artist of the

Same name.

AGELNOTH, JETHELNOTH, or Eruetnoru, known

also as Achelnotus, son of Hgelmaer the Earl, Archbishop

Canute, was trained in for which he afterwards obtamed new privileges from the king. According to William of Malmesbury, he exercised a great and salutary the way both of encouragement and restraint. He was appointed dean of Canterbury and chaplain to the king, and was raised to the archbishopric on the death of Living in 1020. He wisely counselled Canute to that course of policy which ultimately led to the fusion of Danes and Saxons, and their united resistance to the invasion of the Normans; and similar pacific counsels in the church brought about a temporary cessation of the mutual persecution on the part of the Benedictine and secular clergy. It being necessary that the archbishop should visit Rome in person to receive the pall, he repaired thither in 1022, and was received by Pope Benedictine VIII. with every mark of honour, At Pavia, on his way home, he purchased a relic, which was said to be the right arm of St Augustine of Hippo, at the cost of 100 talents of silver and 1 of gold. This he sent.aS a present to Leofric, the young Earl of Mercia. With his own wealth and liberal grants from Canute he restored and adorned his cathedral. When Canute died, he made the archbishop promise to be faithful to his sons by Emma, and the pro- mise was so truly kept that Harold, the usurper, remained unconsecrated until after the death of Agelnoth (1038). AGEN, the chief town of the department of Lot-et- Garonne in France, is situated on the right bank of the Garonne, 73 miles S.E. of Bordeaux. 'Through its ex- cellent water communication it affords an outlet for the

of Canterbury in the reign of

agricultural produce of the district, and forms an entrepot of trade between Bordeaux and Toulouse. Its chief manu- factures are sail-cloth, cotton, linen, leather, and starch. It has a college and several literary institutions, and is the seat of a bishop and a high court of justice. There 1s a fine bridge of eleven arches over the Garonne. In 1872 the population was 18,887.
AGENT, in Diplomacy, Commerce, and Jurisprudence, is a name applied generally to any person who acts for another. It has probably been adopted from France, as its function in modern civil law was otherwise expressed in Roman jurisprudence. Ducange (s.v. Agentes) tells us that in the later Roman empire the officers who collected the grain in the provinces for the troops and the household, and afterwards extended their functions so as to include those of government postmasters or spies, came to be called agentes in rebus, their earlier name having been frumentarit. In Diplomacy, a class of semi-ambassadors termed agents have been employed generally between states of unequal power. The small community might send an agent to propitiate some powerful government, and secure its protec- tion. A great power would, on the other hand, distribute its agents among the petty states which it kept in clientage, to see that no counteracting influence was at work among them. In this shape our Indian government keep agencies in the protected and other neighbouring states. Similarly, though this class does not fall within the scope of public international law, the self-governing British colonies now employ agents to attend to their interests and represent them in the mother country. The status of diplomatic agents, not of the classes of ambassadors, envoys, ministers, or chargés d'affaires, is extremely ill-defined and uncer-

tain. (Phillimore's International Law, it. 246; Heffter Europdisches Vélkerrecht, § 222.) See AMBASSADOR; DIPLoMAcy.

The law of PRINCIPAL AND AGENT has its origin in the law of mandate among the Romans, and fortunately even in England the spirit of that system of jurisprudence pervades this branch of the law. The law of agency is thus almost alike throughout the whole British empire, and a branch of the British commercial code, in which it is of great importance that different nations should under- stand each other's system, differs only slightly from the law of the rest of Europe.

In a general view of the law of agency it is necessary to have regard to the rights and duties of the principal, the agent, and the public. The agent should not do what he has no authority for; yet if he be seen to have authority, those with whom he deals should not be injured by secret and unusual conditions. The employer is bound by what his agent does in his name, but the public are not entitled to take advantage of obligations which are known to be unauthorised and unusual. The agent is entitled to demand performance by the principal of the obligations undertaken by him within the bounds of his commission, but he is not entitled to pledge him with a recklessness which he would certainly avoid in the management of his own affairs. It is in the regulation of these powers and corresponding checks in such a manner that the legal principle shall apply to daily practice, that the niceties of this branch of the law consist.

Agents are of different kinds, according to their stipu- lated or consuetudinary powers. The main restraint in the possible powers of an agent is in the old maxim, delegatus non potest delegare, designed to check the complexity that might be created by inquiries into repeatedly-deputed responsibility. The agent cannot delegate his commission or put another in his place; but in practice this principle is sometimes modified, for it so may arise from the nature of his office that he is to employ other persons for the

accomplishment of certain objects. Thus, there is nothing to prevent a commercial agent from sending a portion of the goods entrusted by him to his own agent for disposal.

In the general case agency is constituted by the acceptance of the mandate or authority to act for the principal, and the evidence of this may be either verbal or in writing. The English statute of frauds requires an agent to have authority in writing for the purposes of its Ist, 2d, and 3d clauses relating to leases. 'And it is a general rule, that an agent who has to execute a deed, or to take or give livery or seisin, must be appointed by deed for that purpose. Moreover, as a corporation aggre- gate can in general act only by decd, its agcnt must be so appointed, though it would seem that some trifling agencies, even for corporations, may be appointed without one." (Smith's Mercantile Law, B. I. chap. iv.) It is a general rule that those obligations

which can only be undertaken by solemn formalities cannot be entered on by a delegate who has not received his authority in writing. But it is often constituted, at the same time that its extent is defined, by mere appointment to some known and recog- nised function—as where one is appointed agent for a banking establishment, factor for a merchant, broker, supercargo, traveller, or attorney. In these cases, usage defines the powers granted to the agent; and the employer will not readily be subjected to obligations going beyond the usual functions of the office; nor will the public dealing with the agent be bound by private instructions inconsist- ent with its usual character. While, however, the public, ignorant of such secret limitations, are not bound to respect them, the agent himself is liable for the consequences of transgressing them. Agency may also be either created or enlarged by implication. What the agent has done with his principal's consent the public are justified in believing him authorised to continue doing. Thus, as a familiar instance, the servant who has continued to purchase goods for his master at a particular shop on credit is presumed to retain authority and trust, and pledges his master's credit in farther purchases, though he should, without the knowledge of the shopkeeper, apply the articles to his own uses. 'The law is ever jealous in admitting as acces- sories of a general appointment to any particular agency the power to borrow money in the principal's name, to give his name to bill transactions, and to pledge him to guaranties; but all these acts may be authorised by implication, or by being the continuation of a series of transactions, of the same kind and in the same line of business, to which the principal has given his sanction. Thus an employer may, by the previous sanction of such operations, be liable for the bills or notes drawn, indorsed, and accepted by his clerk or other mandatary; nay, may be responsible for the obligations thus incurred after the mandatary's dismissal, if the party dealing with him knew that he was countenanced in such transactions, and had no reason to suppose that he was dismissed. In ques- tions of this kind the distinction between a general and a special agent is important. A general agent is employed to transact all his principal's business of a particular kind, at a certain place,—as a factor to buy and sell; a broker to negotiate contracts of a particular kind; an attorney to transact his legal business; a shipmaster to do all things relating to the employment of a ship. Such an agent's power to do everything usual in the line of business 10 which he is employed is not limited by any private restric- tion or order

unknown to the party with whom he is deal- ing. On the contrary, it is incumbent on the party dealing with a particular agent, i.e., one specially employed in a single transaction, to ascertain the extent of his autho- rity. The law applicable to a mercantile agent's power to pledge or otherwise dispose of the goods entrusted to him

being in an unsatisfactory state, a statutory remedy was apphed to it by an Act of 1825 (6 Geo. IV. c. sa which required amendment in 1842 (5 and 6 Vict. c. 39).

The general object of these measures, which appear to extend to Scotland, is to make transactions with an agent in possession of goods as safe as dealing with the owner, to all who treat with him, as purchasers or other- wise, in good faith, and in ignorance of his want of owner- ship. Thus, when an agent ships goods in his own name, the consignee is entitled to a lien on them for any advances to the agent, or liabilities on bills or notes, if he has not notice by the bill of lading or otherwise at or before the time of the advance or receipt that such person is not the actual and bond fide owner. The presumption in such cases 18 ownership; and the burden of disproving it, as well as of showing that the consignee was aware of the mere agency, falls on the person questioning the validity. By the statutes, the person entrusted with and in possession of a bill of lading, dock warrant, warehouse-keeper's certi- ficate, wharfinger's certificate, or other delivery warrant, is held the owner of the goods it represents, so as to render valid any transaction for their sale or disposition of the goods, or the deposit or pledge therevf, or of any part thereof, to parties ignorant of the limited ownership. Be- sides their effect in rendering valid, in this more compre- hensive manner, operations conducted under the appearance and supposition of absolute ownership, the acts have separate provisions for the security of those who deal with agents, knowing them to be such. The acts, how- ever, must be studied in their very words, which are not remarkable for clearness. The following brief descrip- tion of their general effect, taken from Chitty's Collec- tion of Statutes, may be useful :—« First, where goods or documents for the delivery of goods are pledged as a security for present or future advances, with the knowledge that they are not the*

property of the factor, but without notice that he is acting without authority, in such a cage the pledgee acquires an absolute lien. Secondly, where goods are pledged by a factor without notice to the pledgee that they are the property of another, as a security for a pre-existing debt, in that case the pledgee acquires the same right as the factor had. Thirdly, where a contract to pledge is made in consideration of the delivery of other goods or documents of title, upon which the person deliver- ing them up had a lien for a previous advance (which is deemed to be a contract for a present advance), in that case the pledgee acquires an absolute lien to the extent of the value of the goods given up." The statutes are applicable only to proper mercantile transactions, and not, for example, to advances upon the security of furniture in a furnished house to the apparent owner. (See Smith's Leading Cases, vol. i. p. 759 sqq., 6th ed.)

The obligations of the principal are—to pay the agent's remuneration, or, as it is often called, commission, the amount of which is fixed by contract or the usage of trade; to pay all advances made by the agent in the regular course of his employment; and to honour the obligations lawfully undertaken for him. The agent is responsible for the possession of the proper skill and means for carrying out the functions which he undertakes, He must devote to the interests of his employer such care and attention as a man of ordinary prudence bestows on his own—a duty capable of no more certain definition, the application of it as a fixed rule being the function of a jury. He is bound to observe the strictest good faith; and in some instances the law interposes to remove him from temptation to sacrifice his employer's interests to his own: thus, when he is employed to buy, he must not be the seller ; and when employed to sell, he must not be the purchaser. He ought only to deal with persons in good credit, but he

is not responsible for their absolute solvency. unless he guarantee them. A mercantile agent guaranteeing the pay- ments he treats for is said to hold a del credere commission,

In Scotland the procurators or solicitors who act in the preparation of cases in the various law-courts, and all who take out the attorney licence, are called agents. See ATTORNEY.

In France, the Agents de Change were formerly the class generally licensed for conducting all negotiations, as they were termed, whether in commerce or the money market, Of late the term has been practically limited to those who conduct, like our stockbrokers, transactions in public stock ; and it is understood that it is rather as speculators than as agents that the majority of them adopt the profession, The laws and regulations as to courtiers, or those whose functions were more distinctly confined to transactions in merchandise, have been mixed up with those applicable to agents de change. Down to the year 1572 both functions were free; but at that period, partly for financial reasons, a system of licensing was adopted at the suggestion of the Chancellor 'Hépital. Among the other revolutionary measures of the year 1791, the professions of agent and courtier were again opened to the public. Many of the financial convulsions of the ensuing years, which were due to more serious causes, were attributed to this indiscrimi- nate removal of restrictions, and they were reimposed in 1801. From that period regulations have been made from time to time as to the qualifications of agents, the security to be found by them, and the like. They are now regarded as public officers, appointed, with certain privileges and duties, by the government, to act as intermediaries in negotiating transfers of public funds and commercial stocks, and for dealing in metallic currency.

AGESILAUS, king of the Lacedemonians, the second of the name, son of Archidamus Il., was, through the influence of Lysander, raised to the throne in 398 nC, in opposition to the superior claim of his nephew Leoty- chides. Immediately on his accession he advised the Lacedeemonians to anticipate the king of Persia, who was making great preparations for war, and attack him in his own dominions. He was himself chosen for this expedition, and gained so many advantages over the enemy that, if the league which the Athenians and the Thebans formed against the Lacedemonians had not obliged him to return home, it seems probable that he would have carried his victorious arms into the very heart of the Persian empire, But he readily gave up all these triumphs to come to the succour of his country, which he happily relieved by his victory over the allies at Cheronea, in Beeotia, 394 B.c. He obtained another near Corinth ; but, to his great mor- tification, the Thebans afterwards gained several victories over the Lacedemonians. This at first raised a clamour against him. He had been ill when the course of victory turned in favour of the enemy; but as soon as he was able to act in

person his valour and prudence prevented the Thebans from reaping the advantages of their successes : so that it was generally believed that, had he been in health at the beginning, the Lacedemonians would have sustained no losses, and that without him all would have been lost. It cannot be denied, however, that his fond- ness for war occasioned many losses to his countrymen, and led them into enterprises which in the end con- tributed much to weaken their power. He died in the third year of the 103d Olympiad, being the 84th year of his age and 38th of his reign, and was succeeded by his son Archidamus. Agesilaus, though a vigorous ruler and great general, was of small stature, and lame from his birth. His accession to the throne was, indeed, opposed on this ground, an oracle having foretold evils to Sparta under a lame sovereignty. As we have seen, the oracle was

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so far fulfilled that many troubles befell the state during his reign, Few of these, however, are traceable to the policy of the king, whose public life was illustrated by a series of brilliant victories over the enemies of his country. In character, Agesilaus seems to have possessed the Spartan virtues of courage, tenrperance, and fortitude, without the Spartan vices of hardness, cupidity, and injustice. is life aud merits have been commemorated by Xenophon, Plutarch, Diodorus Siculus, and Cornelius Nepos. : AGGREGATION, Srares oF, the three states—solid, liquid, and gaseous—in which matter occurs, depending on the degree of cohesion that subsists between the molecules or atoms of material bodies. In the solid state, the mole- cules cohere so firmly that their relative positions cannot be changed without the application of force, and the body retains a definite form; in the liquid state, they move freely and readily on each other, the cohesion that exists being so slight that the body has itself no form; in the gaseous state, they are affected by an elastic force that amounts to repulsion, tending to separate them, and so diffuse them through an increased space. The metals, glass, wood, &c., are solids ; water and atmospheric air are the most familiar types of liquid and gaseous bodies. The name fluid is sometimes

used to denote both gases and liquids, which are designated elastic and non-elastic fluids respectively. These states of aggregation are not in every case—many now believe they are not in any case—per- manent and unchangeable. Mctals can be melted and vaporised ; the liquid water is convertible into ice and into steam; and a number of what were formerly reckoned fixed or permanent gases have been liquified and solidified. Solids are reduced to liquid, and liquids to gaseous forms, princi- pally by heat ; pressure effects changes of the opposite kind. AGHRIM, or AveHri™, a small village in Galway, 4 miles W. of Ballinasloe, is rendered memorable by the de- cisive victory gained there, on 12th July 1691, by the forces of William III., under General Ginkell, over those of James IL, under the French general St Ruth. The Inish, numbering 25,000, and strongly posted behind marshy ground, at first maintained a vigorous resistance ; but Ginkell, having penetrated their line of defence, and their general being struck down by a cannon-ball at this critical moment, they were at length overcome and routed with ter- rible slaughter. The loss of the English did not exceed 700 killed and 1000 wounded ; while the Irish, in their disastrous flight, lost about 7000 men, besides the whole material of the army. This defeat rendered the adherents of James in Ireland incapable of farther efforts, and was speedily fol- lowed by the complete submission of the country. AGINCOURT, or Azincourt, a French village, in the department of Pas de Calais, situated in 50° 35 JNealat,, 2° 10' E. long., famous on account of the victory obtained there by Henry V. of England over the French, Follow- ing the example of several of his predecessors, the young king crossed over to France in the third year of his reign on a military expedition. Having landed at the mouth of the Seine, he took and sacked Harfleur after a siege of thirty-six days, but the army was so much reduced in strength, especially by disease, that some of Henry's ad- visers counselled a return home without following up the advantage. The proud spirit of the young king, however, would not submit to this, and he resolved on a march through the country to what was then the English forti- fied town of Calais, though he knew that a force vastly superior to his own was in the field to oppose him. On the morning of Friday, the 25th of October, 1415 a.p., St Crispin's day, the English and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on both wings. The Constable d'Albert, who commanded the French army, fell into the snare that was

laid for him, by drawing up his army im a narrow plain between two woods. This deprived him in a great mea- sure of the advantage he should have derived from the prodigious superiority of his numbers, by obliging him to make his lines unnecessarily deep, and to crowd his troops, particularly his cavalry, so close together that they could hardly move or use their arms. The numbers of the French are differently estimated at from 50,000 to 150,000 men, but the latter number is a gross exaggeration. The first line was commanded by the Constable d'Albert, the dukes of Orleans and Bourbon, and many other nobles ; the dukes of Alencon, Brabant, and Barre conducted the second line; and the earls of Marle, Damartine, Faucon-

berg, é&c., were at the head of the third line. The king of

England placed 200 of his best archers in ambush in a low meadow on the flank of the first line of the French. His own first line consisted wholly of archers, each of

whom, besides his bow and arrows, had a battle-axe, a

sword, and a stake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from cavalry. This was a new invention, and had a happy effect. That he might not be encum-

bered, Henry dismissed all his prisoners on their word

of honour to surrender themselves at Calais if he obtained the victory, and lodged all his baggage near the village of Maisoncelles, in his rear, under a slender guard. The

main body of the English army, consisting of men-at-arms, was commanded by Henry in person ; the vanguard, com-

mitted to Edward Duke of York at his particular request, was posted as a wing to the right; and the rearguard, commanded by Lord Camois, as a wing on the left. The archers were placed between the wings, in the form of a wedge. The lines being formed, the king, in shining armour, mounted on a fine white horse, rode along them, and addressed each corps with a cheerful countenance and in encouraging language. To inflame their resentment against their enemies, he spoke of the cruelty practised by the French against their prisoners; and to rouse their love of honour, he declared that every soldier in the army who behaved well should thenceforth be deemed a gentleman, and entitled to bear coat armour. The two armies, drawn up in this manner, stood a considerable time gazing at one another in silence. But the English king, dreading that the French would discover the danger of their situation and decline a battle, commanded the charge to be sounded, about ten o'clock in the forenoon. At that instant the first line of the English kneeled down and kissed the ground; and then starting up, discharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, upon a signal being given, the archers in ambush arose, and, discharg- ing their arrows on the flank of the French line, threw it into some disorder. The battle now became general, and raged with great fury. The English archers, having expended all their arrows, threw away their bows, and rushing forward, made dreadful havoc with their swords and battle-axes. The first line of the enemy was by these means defeated, its leaders being either killed or taken prisoners. The second line, commanded by the Duke d'Alengon (who had made a vow either to kill or take the king of England, or to perish in the attempt), now ad- vanced, and was met by the second line of the English, led by the king. The duke forced his way to the king, and assaulted him with great fury; but Henry brought him to the ground, where he was instantly despatched by the surrounding soldiers, receiving innumerable wounds. Dis- couraged by this disaster, the second line made no more resistance, and the third fled without striking a blow; yielding a complete and glorious victory to the English, after a violent struggle of three hours' duration. In the

circumstances, the victory could not be followed up. Henry | of lands, the measure was lost by a minority of one. The

and his army returned at once by Calais to England, and

entered London with a pageant of unprecedented splendour.

The number slain in the battle is variously stated. The

loss to the conquerors is generally reckoned at 1600 men, and the French are said to have left 10,000 slain on the field, including the constable, three dukes, five counts, and ninety barons. (See the Histories of Britain; and Battle of Agincourt, by Sir Harris Nicolas.)

AGIO (Ital. aggio, exchange, discount), a term used in commerce to denote the difference between the real and the nominal value of money. In some states the coinage is so debased, owing to the wear of circulation, that the real is greatly reduced below the nominal value. Where this reduction amounts, e.g., to 5 per cent., if 100 sove- reigns were offered as payment of a debt in England while such sovereigns were current there at their nominal value, they would be received as just payment ; but if they were offered as payment of the same amount of debt in a foreign state, they would be received only at their intrinsic value of £95, the additional £5 constituting the agio. Where the state keeps its coinage up to a standard value, no agio is required. The same principle is applied to the paper currency of a country when reduced below the bullion value which it professes to represent. According as there is more demand for gold or for paper money for the pur- poses of commerce, it often becomes necessary, in order to procure the one of the higher current value, to pay a premium for it, which is called the agio. In countries where silver coinage is the legal tender, agio is sometimes allowed for payment in the more convenient form of gold.

AGIS. Four kings of this name reigned at different periods in Sparta. 'The first of the name was the son of Kurysthenes, and is supposed to have reigned about 1032 B.C. The designation of Helots is said to have had its rise in his time, from the unsuccessful revolt of the inhabitants of Helos, and their final enthralment by the Spartans,

Acts II. succeeded his father Archidamus, and reigned from 427 to 399 B.c. He distinguished himself during the Peloponnesian war as an able and successful general, and headed the Spartans at the great and decisive battle of Mantinea.

Aats IIT. succeeded his father Archidamus TIT., 338 zc. He took an active part in the league of the Grecian states against Alexander the Great, and at the head of their forces defeated a Macedonian army under Corragus. He was slain, about 331 B.c., in a battle with Antipater, under the walls of Megalopolis.

Acis IV., son of Eudamidas IT., and lineally descended from Agesilaus II., succeeded his father 244 B.c., and reigned four years. He was more distinguished for the social reforms he attempted to introduce at Sparta than for his success as a general. The degenerate state of the Spartan commonwealth led him to attempt a reformation by restoring the institutions of Lycurgus, and, in the spirit of a true reformer, he set the example in his own person and household. His excellent intentions were seconded by all the younger and poorer portion of the community ; but the rich and luxurious were vehemently opposed to measures which threatened to interfere so seriously with their influence and pleasures. His colleague, Leonidas, headed the opposition, and busily propagated the suspicion that Agis aspired to tyranny, by obliterating: the distinc- tions of society and increasing the power of the multi- tude. Agis was supported by the influence of his uncle Agesilats, who, being deeply in debt, was highly favour- able to the proposed changes. Lysander and Mandroc- lides, two of the ephori, were also strenuous promoters of the reform. When the time came for Agis to propose in the senate a general discharge of debts and a new division

triumph of Leonidas, however, was short. Being accused by Lysander of having violated the laws, he took refuge in the temple of Minerva, and refusing to appear in his own defence, was degraded from his dignity and banished to Tegza. His son-in-law, Cleombrotus, was elected in his stead. The next election of ephori proved unfavourable to the party of Agis. Lysander and Mandroclides were tried for innovation, but succeeded in persuading the two kings to eject the new magistrates from office, which was effected in the midst of much tumult. The reformation might uow have

been established but for the intrigues of Agesi- laus, whose selfish schemes counteracted the good inten- tions of the two kings. At this time the Achzans sent to Sparta for assistance in the war with the Attolians, which was granted. Agis received the command of the troops, and though he gained no advantage over the cau- tious Aratus, the Achzan general, he conducted the campaign with considerable credit from the good discipline he maintained in his army. On his return he found that the misconduct of Argesilaus had resulted in a revolution and the recall of Leonidas. He took refuge in the temple of Minerva, Cleombrotus in that of Neptune. Leonidas contented himself with banishing his son-in-law, but re- solved on the ruin of Agis. The unfortunate king was accordingly seized and cast into prison, where, after a mock trial, he was sentenced to be strangled. His mother and grandmother in vain entreated to gain him a public hearing : they were insidiously permitted to visit him in prison, where they shared his fate.

AGISTMENT (from the old French gésir or grr, to lie ; see Hdin. Rev., vol. exxviii. p. 79), the profit arising from taking in cattle to lie and pasture in one's lands, applied more particularly, in the first instance, to the proceeds of pasturage in the king's forests. The tithe of agistment, or "tithe of cattle and other produce of grass lands," was formally abolished by the Act of Union, on a motion sub- mitted with a view to defeat that measure. (See Hdin. Rev., vol. xxxiv. p. 73.)

AGNANO, Laco p', a small circular lake near Naples, about two miles in circumference, and evidently situated in the crater of an extinct volcano. On its banks are the stufe, or natural vapour-baths of San Germano, beneficial in cases of rheumatic disease; and on its opposite shore is the famous Grotta del Cane, from the floor of which car- bonic acid is continually evolved, rising to a height of about 18 inches, in such quantity as to kill dogs that enter it, while a man, on account of his erect posture, wholly escapes the effects of the gas. (See Spallanzani's Travels.) The grotto is a small artificial excavation, 12 feet long by 4 or 5 wide and 6 feet high, seemingly made for obtaining puzzolano, or earthy volcanic tufa,

AGNATES (Agnati), in Roman Law, are persons related through males only, as opposed to cognates. Relationship by agnation was founded on the idea

of the family held together by the patria potestas; cognatio involves simply the modern idea of kindred.

AGNESI, Maria Gazrana, an _ Italian lady _pre- eminently distinguished for her scientific attainments, was born at Milan on the 16th of May 1718, her father being professor of mathematics in the university of Bologna. When only nine years old, she had such command of Latin as to be able to publish an elaborate address in that language, maintaining that the pursuit of liberal studies was not improper for her sex. By her thirteenth year she had acquired Greek, Hebrew, French, Spanish, Ger- man, and other languages. She was in consequence gene- rally known as " the Walking Polyglot." Two years later her father began to assemble in his house at stated in- tervals a circle of the most learned men in Bologna, before

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whom she read and maintained a series of theses on the most abstruse philosophical questions. President De Brosses has given an interesting account of one of those meetings, at which he was present, in his Lettres sur UItalie (tom. i, p. 243); and a permanent record of Agnesi's share in them has been preserved in the Propost- tiones Philosophicce, which her father caused to be published in 1738. 'These displays, being probably not altogether congenial to Maria, who was of a retiring disposition, ceased in her twentieth year, and it is even said that she had at that age a strong desire to enter a convent. Though the wish was not gratified, she lived from that time in a retirement almost conventual, avoiding all society, and devoting herself entirely to the study of matheinatics. The most valuable result of her labours was the Jnstetuzeone Analitiche ad Uso della Gioventu Italiana, which was pub- lished at Milan in 1748. The first volume treats of the analysis of finite quantities, and the second of the analysis of infinitesimals. A French translation of the second volume, by D'Antelmy, with additions by Bossut, appeared at Paris in 1775; and an English translation of the whole work by Colson, the Lucasian professor of mathematics at Cambridge, was published after his death at the expense of Baron Maséres. The great merit of the work was universally recognised at the time of its publication; and though in the long interval that elapsed

before the English translation appeared the methods of analysis had been greatly improved, it was recognised by a writer in the Edinburgh Review (1803) as still the best introduction to the works of Euler and other mathematicians of the con- tinent. Madame Agnesi also wrote a commentary on the Conic Sections of the Marquis de Hopital, which, though highly praised by those who saw it in manuscript, was never published. In 1750, on the illness of her father, she was appointed by Pope Benedict XIV. to occupy the chair of mathematics and natural philosophy at Bologna. After the death of her father, in 1752, she carried out a long-cherished purpose by giving herself to the study of theology, and especially of the fathers. Another purpose, which seems also to have been long cherished, was now also fulfilled. After holding for some years the office of directress of the Hospice Trivulzio for Blue Nuns at Milan, she herself joined the sisterhood, and in this austere order ended her days (1799).

AGNESI, Maria Teresa, sister of the above (died 1780), was well known as a musician, having composed a number of cantatas, besides three operas—Sophonisbe, Curo in Armenia, and Nitocre.

AGNOET AI (from éyvoéw, to be ignorant of), in Church ITistory, a sect of ancient heretics who maintained that Christ's human nature did not become omniscient by its union with His divinity. Its founder was Themistius, a deacon of the Monophysites in Alexandria in the 6th cen- tury. The sect was anathematised by Gregory the Great.

AGNOLO, Baccto p', wood-carver, sculptor, and archi- tect, was born at Florence in 1460. The first was his original calling, and he attained considerable distinction in it before he turned his attention to architecture, which he went to Rome to study in 1530. He still carried on wood-carving, and his studio was the resort of the most celebrated artists of the day—Michael Angelo, Sansovius, the brothers Sangallo, and others. On his return to Florence he devoted himself chiefly to architecture, and planned many of the finest palaces and villas of that city, such as the Villa Borghese and the Palais Bartolini. The latter was the first dwelling-house which had what had previously been confined to churches—frontispieces of columns to the doors and windows. For introducing this fashion Agnolo incurred the

ridicule of the Florentines: but it nevertheless established itself firmly. Anoentee

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much-admired work of this architect is the campanile or bell-tower of the church Di Santo Spirito in Florence. He was also engaged to complete the drum of the cupola in the metropolitan church Di Santa Maria del Fiore; but Michael Angelo found fault with his plans, and the work remains unexecuted to this day. He died in 1543, leaving three sons, architects, one of whom, Giuliano, completed his father's unfinished works.

AGNONE, a town of South Italy, at the foot of Monte Capraro, 20 miles N.W. of Campobasso. It has 10,230 in- habitants, chiefly employed in the manufacture of copper wares, for the excellence of which it is celebrated.

AGNUS DEI, the figure of a lamb bearing a cross, symbolical of the Saviour as the "Lamb of God." The device occurs in medieval sculptures, but the name is especially given in the Church of Rome to a small cake made of the wax of the Easter candles, and impressed with this figure. Since the 9th century it has been custo- mary for the popes to bless these cakes, and distribute them, on the Sunday after Easter, among the faithful, by whom they are highly prized as having the power to avert evil. In modern times the distribution has been limited to persons of distinction, and is madc by the pope on his accession, and every seven years thereafter.

Aenus Det is also the popular name for the anthem beginning with these words, which is said to have been introduced into the missal by Pope Sergius I. (687-701). Based upon John i. 29, the Latin form is Agnus Det, qua tollas peccata mundi, miserere nobis. In the celebration of the mass it is repeated three times before the communion, and it is also appended to many of the litanies.

AGOBARD, a Frank, born in 779, became coadjutor to Leidrad, archbishop of Lyons, in 813, and on the death of the latter succeeded him in the see (816). He was one of the chief supporters of Lothaire and Pepin in

their con- spiracy against their father, Louis le Debonnaire, and was in consequence deposed by the council of Thionville (835). On making an apology for his conduct, and becoming reconciled to the emperor, he was reinstated in 837. Agobard's works, which were edited by Baluze in 1665 (2 vols. 8vo), show him to have been a man of clear intellect, strongly opposed to the superstitious notions of the time. He wrote against image-worship, the belief in witchcraft, the ascription of tempests to the influence of sorcerers, and trial by the ordeal of fire and water. In the adoptionist controversy Agobard took a prominent part on the orthodox side. He died at Saintonge in 840.

AGONALIA, in Roman Antiquity, festivals celebrated on the 9th January, 21st May, and 11th December in each year, in honour of Janus, whom the Romans invoked before undertaking any affair of importance. Ovid, in his Fastt, i. 319-332, mentions various etymologies of the word.

AGONIC LINES (from 4 privative, and ywvia, an angle), the imaginary lines on the earth's surface where the magnetic needle indicates no declination or deviation from the terrestrial meridian—that is, points to the true north and south. There are two great primary agonic lines, varying from time to time, the courses of which for the epochs 1787 (from Hansteen's Magnetismus der Erde) and 1840 (by General Sir E. Sabine) are figured in Keith Johnston's Physical Atlas.

AGONOTHETA, or AGoNOTHETES (dyév and riOype), in Grecian Antiquity, was the president or superintendent of the sacred games. At first the person who instituted the games and defrayed the expenses was the Agonothetes; but in the great public games, such as the Olympic, Pythian, &c., these presidents were the representatives of ditferent states, or were chosen from the people in whose country the games were celebrated. They received the several titles of aiovpvyra, BpaBevrai, ayovapxat, drywvobiKcl,

dOdoberat, They were also called pafSotxor or faBSovdpor, from the rod or sceptre emblematic of their authority. AGORA (dyeipw, to congregate), the place used among the ancient Greeks as a public market, and

corresponding in general with the Roman forum. From its convenience as a meeting-place, it became in most of the cities of Greece the general resort for social and political purposes. In Thessaly, however, the market-place was kept apart. from "the field of freedom," where the commons met; and at Sparta a similar provision was made by the institutions of Lycurgus, that nothing might distract the attention of 'the auditors. At Athens, with the increase of commerce and political interest, it was found advisable to call public meetings at the Pnyx or the temple of Bacchus; but the important assemblies there, such as mectings for ostracism, were held in the agora. In the best days of Greece the agora was the place where nearly all public traffic was con- ducted. To frequent it, therefore, was equivalent to being actively engaged in business; and "he has forsaken the agora," indicated that a man was a suspicious character. The agora was most frequented in the forenoon, and then only by men. Slaves did the greater part of the purchasing, though even the noblest citizens of Athens did not scruple to buy and sell there. The name dyopé was also given (and this is perhaps the primary use of the word) to the assemblies of the people in the Grecian states. These assemblies were convened by proclamation by order of the sovereign power, a herald inviting all concerned to the agora. The right of speech and of vote in these assemblies appears to have been restricted to the nobles, all that was allowed to the populace being the indication of their sentiments on the topics brought before them by signs of applause or disapproval, At Atheus the old agora lay to the west of the citadel. It was adorned with trees planted by Cimon the conqueror of the Persians; and around it numerous public buildings were erected, such as the senate hall and the law courts. The new agora lay to the north of the Acropolis, in the Eretrian quarter. Pausanias is the great architectural authority on the agoree of Megalopolis, Corinth, Elia, Messina, Sparta, &e. Palladius and Vitruvius also give details. The remains of different agorée are described in the-works of Texier, Newton, Barth, and other travellers, AGORANOMOI, magistrates in the republics of Greece, whose position and duties were similar to those of the eediles of Rome. In Athens there were ten, chosen annu- ally by lot, five of whom took charge of the city, and five of the harbour. The former saw to the maintenance of order and decency in the markets, took cognisance of the purity of the articles exposed for sale and of all weights and measures, and collected the dues ; the latter received the harbour dues and enforced the shipping regulations. AGORDO, a town in

North Italy, 12 miles N.W. of Belluno. The valley of Imperina, in its vicinity, contains the richest copper mines in Italy. Population, 3000. AGOSTA, or Aucusra, a city of Sicily, 14 miles N. of Syracuse, and in the province of that name. It is built on a peninsula, and is united to the mainland by a narrow causeway. By some writers it is supposed to occupy the site of ancient Megara Hyblea. The modern city, which was founded by the emperor Frederick II. in 1229-33, suf- fered severely during the wars of succeeding centuries, and was several times sacked. It had, however, attained consider- able opulence when, in 1693, it was overthrown by an earth- quake, the effects of which were aggravated by the explosion of the powder magazine of the citadel. One-third of the inhabitants perished in this disaster. When the city was rebuilt, the streets were laid out in parallel lines, and the houses were constructed with low roofs, so as to nitigate the results of any recurrence of the calamity. Agosta is forti- fied towards both sea and land; and the harbour, though

rather difficult of access, is commodious and well sheltered. The chief trade of the town is in salt ; and the other exports include wine, cheese, oil, honey, and sardines. Near Agosta the Dutch were defeated by the French in a naval engage- meut in 1676, and their famous admiral, De Ruyter, was mortally wounded. Population (1865), 9735. AGOSTINI, Lzonarpo, an eminent antiquary of the 17th century, born at Siena. After being employed for some time by Cardinal Barberini to collect works of art for the Barberini palace, he was appointed by Pope Alexander VII. superintendent of antiquities in the Roman states, He issued a new edition of Paruta's Sicilian Medals, with engravings of 400 additional specimens ; but a promised volume of letterpress explanation never appeared. In con-

Junction with Bellori he also published a work on antique

sculptured gems, which was translated into Latin by Gro- novius (Amsterdam, 1685).

AGOSTINO and AGNOLO (or ANcrLo) DA SIENA, two brothers, architects and sculptors, who flourished in the first half of the 14th century.

Della Valle and other com- mentators deny that they were brothers, They certainly studied together under Giovanni Pisano, and in 1317 were

jointly appointed architects of their native town, for which

they designed the Porta Romana, the church and convent of St Francis, and other buildings. On the recommenda: tion of the celebrated Giotto, who styled them the best sculptors of the time, they were chosen to execute the tomb of Guido, bishop of Arezzo, which that artist had designed. It was esteemed one of the finest artistic works of the 14th century, but unfortunately was destroyed by the French under the Duke of Anjou.

AGOSTINO, Paoxo, an eminent Italian musician, born at Valerano in 1593. He studied under N anini, and suc- ceeded Ugolini as conductor of the Pope's orchestra in St Peter's. His musical compositions are numerous and of great merit, an Agnus Det for eight voices being specially admired. He died in 1629.

AGOUTI, a genus of mammals (the Dusyprocta) found in South America and in some of the West Indian islands, belonging to the same family as the guinea-pig, viz., that of Cavide in the order Rodentia. The largest and com- monest species is the D. Aguti, somewhat resembling a rabbit, but about the size of a hare, whence it is sometimes called the rabbit or hare of South America. The feet have large and strong claws, but the animal does not burrow; the hind legs are very long, and when eating it squats on them, feeding itself with its fore-paws; and the tail is, except in one species, a very short naked stump. The agoutis are gregarious, live chiefly in woods, and feed on vegetables exclusively, especially on roots and nuts. They commit great havoc in sugar plantations by gnawing the roots of the canes, and in sugar-growing localities are there- fore destroyed as vermin. The flesh, which is tender and well-flavoured, is a common article of diet in Guiana and Brazil. When the Autilles and Bahamas were discovered they are said to have been overrun with these animals, which were the largest quadrupeds then found in the islands.

AGRA, a division, district, and city of British India, under the jurisdiction of the lieutenant-governor of tho North-Western Provinces. Tux AcRra Division comprises the six districts of Agra, Etaéwah, Mainpurt,

Farrakhabad, Etah, and Mathura. It is bounded on the N. by the Aligarh district; on the W. by the Bhartpur, Dholpur, and Gwalior states; on the §. by the Jalaun and Cawn- pur districts; and on the E. by the Ganges. Agra division contains, according to the census of 187 2, @ population of 5,038,136 souls; of whom 4,607,946 arc Hindus, 427,834 Mahometans, and 2356 Christians and others.

Acra Disrrrcr lies between 26° 43’ 45” and 27° 24° 15" N. lat, and between 77° 28’ and 78° 53’ E. long.

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It is bounded on the N. by the district of Mathuré; on the E. by the Maiupurf and Et4wah districts; on the S. by the Gwalior territory and the Dholpur state; and on the W. by the Bhartpur territory. Its area in 1872 was returned at 1873 square miles, and its population at 1,094,184 souls. The general appearance of the district is that com- mon to the Doab, a level plain intersected by watercourses (ndlis) and ravines. The only hills are the sandstone eleva- tions in the west and south-west of the district. The prin- cipal rivers are the Jamna, Chambal, Uttangan, and Khart. The Jamnd intersects the district, cutting off the sub- divisions of Itmadpur and Firozbad ; and a branch of the Aligarh division of the Ganges Canal passes through its northern parts. The general elevation of the district is estimated at from 650 to 700 feet above the level of the sea. ‘The soil is sandy; many of the wells are brackish, and the local water supply is scanty. The failure of the periodical rains during the monsoon suffices to produce great scarcity, sometimes reaching the famine point. Only five towns are returned by the census as containing up- wards of 5000 inhabitants, viz., Agra city (the capital of the district), population 149,008; Fathipur Sikri, the site of Akbar’s famous mosque and palace, 6878; Firozabad, 14,255; Pindhat, 6571; and Saimr4é, 5704. There are three municipalities, viz., Agra city, Firozibad, and Fathi- pur Sikri. These muncipalities derive their local revenue from octroi and from property within the municipal limits. The total municipal income and its incidence per head of the population are as follows :—Agra city, municipal income, £15,441, incidence per head, 2s. Ofd.; Firozibad, £724— 1s. per head; Fathipur Sikri, £366—1s. per head. The land revenue of the whole district was stated in 1871 at £162,882, and

the gross revenue at £660,526. Ascheme of rural instruction by means of indigenous schools was introduced in 1848. In 1871-72 there were 431 schools in the district, attended by 10,823 pupils, of whom 8820 were Hindus, 1293 Mahometans, and 710 of other deno- minations. The educational establisliments within the city will be described below. The police force consisted of 1358 regular police in 1871, equal to one man to every 1°37 square miles of area, or one to every 805 inhabitants; and a village watch or rural constabulary of 1921 men, being one man to every 0:97 square miles of area, or one to every 570 inhabitants. The chief crimes of the district, in common with the rest of the Doab, are burglary and theft.

Aara City, situated on the banks of the Jamna river, in 27° 10' N. lat., and 78° 5' E. long., is the head-quarters of the division and capital of the district. Formerly it was the provincial capital also, but since the mutiny the seat of government has been removed from Agra to Allahabad. The city, which is about 4 miles in length by 3 in breadth, sweeps along the banks of the river in a semicircle. The principal thoroughfares are a fine broad street intersecting the town from north to south; and the Strand, which runs along the banks of the river for a distance of 2 miles. This road measures 80 feet in width, and is said to have been constructed by the destitute poor during the famine of 1838. In 1846 the population of the city was esti- mated at 66,000; in 1872 it was ascertained to be 149,000. The conservancy and improvement of the town are in the hands of a municipal committee, which derives its funds principally from octroi duties. In 1871-72, the municipal income was returned as follows:—Octroi duties, £13,587 ; miscellaneous receipts, such as rent from land belonging to the municipality, &c., £1854—total, £15,441. The details of municipal expenditure were as follow:—LEstablishment and cost of collection, £1667, 12s.; police, £4041, 12s.; conservancy, £1749, 12s.; lighting, £672, 14s.; watering, £255, 10s. ; original works, £3561, 16s. ; repairs, £1429, 2s.; education, £120; vaccination, £36, 6s.; dispensary, £360 ;

charities, £240; grants to cantonments, museum, &c., £1465, 28.—total, £15,599, 6s. The principal educational establishment in Agra is the Government College, a hand- some building, situated in the civil lines a

short distance from the town. It was established in 1820; in 1872 it contained 385 pupils. The other chief schools are the St John's College, established by the Church Missionary Society in 1854; the Victoria College, established in 1862; and St Peter's Catholic College. These three colleges in 1872 had 643 pupils on their rolls. There is also a medical college, founded in 1853. The total number of students admitted into it during the sixteen years from 1855 to 1870 inclusive, was 1168, of whom 235 passed the pre- scribed examination and received appointments in the government medical service. The Agra fort has a very imposing appearance, but is of no great strength. It occu- pies a large space of ground on the banks of the river, enclosed by high walls and towers of red stone. The fortress was constructed by the Emperor Akbar in the latter part of the 16th century, and exceeds a mile in circuit. In 1803 the place was held by the Marhattas; but being invested by Lord Lake's army, it surrendered after a day's bombardment. During the mutiny of 1857 it formed a place of refuge for the European and Christian community of Agra, and was threatened by the insurgent sepoys. The buildings of most note within the walls of the fort are the palace and hall of audience of Shah Jahan, and the Mott Masjid, or " Pearl Mosque."

'In the centre of the palace," says Mr Fergusson in his History of Architecture, vol. ii., pp. 699-700, 'fis a great court 500 feet by 370, surrounded by arcades, and approached at the opposite ends through a succession of beautiful courts opening into one another by gateways of great magnificence. On one side of this court is the great hall of the palace, the Diwani-Khas, 208 feet by 76, supported by three ranges of arcades of exquisite beauty. It is open on three sides, and with a niche for the throne at the back. This hall is now used as an arsenal, Behind it are two smaller courts, the one containing the Diwani-Am or hall of private audience, the other the harem. The hall in the former is one of the most elegant of Shah Jahan's buildings, being wholly of white marble

inlaid with precious stones, and the design of the whole being in the best style of his reign."

The Moti Masjid or Pearl Mosque is the most elegant mosque of Indian-Mahometan architecture. Mr Fergus- son describes it as follows :—

“Tts dimensions are considerable, being externally 235 feet east and west, by 190 fcet north and south, and the courtyard 155 feet square. ‘he mass is also considerable, as the whole is raised on a terrace of artificial construction, by the aid of which it stands well out from the surrounding buildings of the fort. Its chief beauty consists in its courtyard, which is wholly of white marble from the pavement to the summit of its domes. In design it somewhat resembles the great Dehli mosque, except that the minarets are omitted, and the side gateways are only recesses. The western part, or mosque properly so called, is of white marble inside and out; and, except an inscription from the Kuran inlaid with black marble as a frieze, has no ornament whatever beyond the lines of its own graceful architecture.”

Agra, however, is even more famous for the T4j-Mahal, a splendid mausoleum built by the Emperor Shah Jahan for the remains of his favourite wife, Mumt4z4 Mahal, and where he himself is also buried. The building is of white marble, with four tall minarets of the same material, one at each corner. The whole rises from an elevated marble terrace. The following account is extracted from Mr Fergusson’s History of Architecture, pp. 692-694 :—

‘The enclosure, including the gardens and outer court, is a parallelogram of 1860 feet by more than 1000 feet. The outer court, surrounded by arcades and adorned by four gateways, forms au oblong, occupying in length the whole breadth of the inclosure, by about 450 feet in depth. The principal gateway, measuring 110 feet by 140, leads from the court to the gardens, which, with their marble canals and fountains and cypress trees, are almost as beautl- ful as the tomb itself. The tomb stands on a raised platform 18 feet high, faced with white marble, and is exactly 313 feet square.

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At each corncr of this terrace stands a minaret 133 feet in height, and of the most exquisite pe ortions—more beautiful, perhaps, than any other in India. In the centre of the marble platform

stands the mausoleum, a square of 186 fect, with the corners cut off

to the extent of 33 feet 9 inches. The centre of this is occupied by the principal dome, 58 feet in diameter and 80 fect in height, under which is an inclosure formed by a screen of trellis-work of white marble, a chef-d'ewore of elegance in Indian art. Within this stand the two tombs. These, however, as is usual in Indian sepulchres, are not the true tombs; the bodies rest in a vault level with the surface of the ground, beneath plainer tombstones placed exactly underneath those in the hall above. In each angle of the building is a smaller dome of two storeys in height, 26 feet 8 inches in diameter, and connected by various passages and halls. The light to the central apartment is admitted only through double screens of white marble trellis-work of the most exquisite design, one on the outer and one on the inner face of the walls. In our climate this would produce nearly complete darkness; but in India, and in a building wholly composed of white marble, this was required to temper the glare, which otherwise would have been intolerable. As it is, no words can express the chastened beauty of that central chamber, seen in the soft gloom of the subdued light which reaches it through the distant and half-closed openings that surround it. When used as a pleasure palace, it must have been the coolest and the loveliest of garden retreats; and now that it is sacred to the dead, it is the most graceful and most impressive of the sepulchres of the world. This 'falas is an early example of that system of inlaying with precious stones which became the great characteristic of the style of the Mughuls after the death of Akbar. All the span- drils of the Taj, all the angles and more important architectural details, are heightened by being inlaid with precious stones, such as agates, bloodstones, jaspers, and the like. These are combincd in wreaths, scrolls, and frets, as exquisite in design as they are beautiful in colour; and, relieved by the pure white marble in which they are inlaid, they form the most beautiful and precious style of ornament ever adopted in architecture. It is lavishly bestowed on the tombs themselves and the screens that surround them, but more sparingly introduced on the mosque that forms one wing of the Taj, and on the fountains and surrounding buildings. The judgment, in- deed, with which this style of ornament is apportioned to the various aa is almost as remarkable as the ornament itself, and conveys a

igh idea of the taste and skill of the Indian architects of this age."

Tavernier, in his Travels (vol. iii., p. 94), mentions that 20,000 workmen were incessantly employed on this work during a period of twenty-two years. The tomb of the Emperor Akbar is contained in a splendid mausoleum at Sikandré, a suburb of Agra city.

AGRAM, or Zacras, the capital of the Austrian pro- vince of Croatia, is finely situated on a hill near the banks of the Save, in 45° 49' N. lat. and 16° 1' E, long., 160 miles south of Vienna. It is the seat of the governor of Slavonia and Croatia, of a bishop, of the courts of justice, and of the meetings of the provincial diet. Agram is divided into three parts, called the upper and lower towns, and the town of the bishop. It has a lyceum, library, museum, gymnasium, an ancient cathedral, and a large library. Some silk and porcelain are manufactured, and a brisk trade is carried on in grain, potash, tobacco, and honey. Population in 1869, 19,857.

AGRARIAN LAWS (Leges Agrarie), when used in the most extended signification of the term, are laws for the distribution and regulation of property in land. The his- tory of these enactments is not only important as explana- tory of the constitution of the ancient republics, but is rendered highly interesting by the conflicting opinions which have been entertained respecting their object and operation. It seems to have been a notion generally entertained in the ancient world that every citizen of a country should be a landholder; and that the territory of a state, so far as it was not left uninclosed or reserved for public purposes, should be divided in equal portions among the citizens, Such a distribution of public land seems to have been acted upon as a recognised principle from the earliest period to which existing historical records extend. Hence we find the Almighty giving express instructions to Moses as to the Imanner in which the land of Canaan was to be portioned

out among the Hebrews (Num. xxxiii. 54), and naming the'

persons to whom the division was to be entrusted (Num.

xxxiv. 16-18), A division of the land was accordingly made, and the portion assigned to each man became his inalienable property, and descended in

perpetuity to his heirs and successors. By the law of J ubilee, all lands were restored free of encumbrances on the recurrence of the "year of release ;" so that, though a man's estate might, in the interval, have been repeatedly sold or alienated, yet on the return of the fiftieth year it reverted to the heirs of the original possessor (Levit. xxv. 10). In the republics of ancient Greece, and also in the Grecian colonies, a similar principle of division of land prevailed (Thue. v. 4, Herod, iv. 159). Lycurgus is represented by Plutarch (Lycur.) as redividing the whole territory of Laconia into 39,000 parcels, of which 9000 were assigned in equal lots to as many Spartan families, and 30,000, also in equal lots, to their free subjects ; and although this statement is not borne out by any of the early Greek historians, and is even incon- sistent with the assertion of Aristotle (Polit. ii. 4), yet it is valuable as recognising the principle of the division of the public lands. (See Thirlwall's ist. of Greece, chap. viii., and Grote's Hist. of Greece, part ii. chap. vi., with the authorities there quoted.)

Tt was long a prevalent and undisputed opinion that the territories of the Hebrews, and of the republics of ancient Greece, were divided into equal portions, and that the object of such a distribution was to maintain a state of equality among all the members of the community. This, however, does not appear to be consistent with the dis. tinctions of rank which we find admitted in Scripture (Josh. ix. 15; xxii. 14; 1 Sam. ix. 21, &c., &e.); and from a remark of Thucydides (i. 6), taken in connection with the statement of Aristotle (Polit. ii. 9), it may be legitimately inferred that property did not continue to be equally dtis- tributed at Lacedemon. Distinctions of rank are clearly recognised in the legislation of Solon. Aristotle, in the Second Book of his Politics (chap. vi, &c.), explains the constitutions of several of the ancient republics, and endea- vours to show how the population is to be accommodated to this equal division of land; but it would be foreign to our object to review his arguments. It may be sufficient to remark that such an attempt to arrest the progress of enterprise is altogether inconsistent with the spirit of liberty which gave life and energy to the ancient republics; and that, though it might have been carried into effect under the despotism of Persia or the predominant rule of the kings of Macedonia, it was entirely at variance with the freedom of opinion which prevailed in Greece, and the stubborn resistance to control which animated the Romans after the expulsion of the kings. But granting that such a policy had been

practicable, it would have been highly inexpedient. The ignorant Hindu might remain satisfied with the caste which nature had transmitted to him through successive generations, because his progenitors had been prevented from emerging from their obscurity; but the citizens of Greece and Italy, being themselves constituent members of the body politic, and not ignorant of the power thereby conferred on them, could not have been kept in check by the same principle of fear. Such an attempt, moreover, to prevent the acquisition of property would have obstructed the advancement of the arts of civilised life, would have extinguished those feelings of patriotism which led the Greeks so often to hazard their lives in defence of their country, and, by engendering discontent and exciting internal commotions, would have made them an easy prey to their enemies,

The expression Agrarian Laws, however, is more com- monly applied to the enactments among the Romans for the management of the public domains (ager publicus); and to an account of these the remainder of our space must be devoted. It isa singular fact that, while almost every other

subject connected with the Roman constitution had been successfully investigated and explained, the object and in- tention of the agrarian laws were entirely misunderstood by scholars for many centuries after the revival of letters. They were invariably represented as intended to prohibit Roman citizens from holding property in land above a certain fixed amount; and as authorising the division among the poorer citizens of the estates of private indi- viduals when these exceeded the prescribed limit; thus legalising a system of plunder which would have been subversive of all social order. No such doctrine had, indeed, been admitted in any well-regulated state, ancient or modern; nor did anything analogous to it appear in the principles or practice of the Roman constitution; yet the expressions used by the ancient authors in reference to these enactments, and the disturbances to which they invariably gave rise, seemed to justify an unfavourable interpretation ; and the opinion, when once propounded, was uncondition- ally received by successive generations of lcarned men, notwithstanding the many embarrassments and contradic- tions to which it led.

Romulus is represented as dividing his small territory among the members of his infant community at the rate of two jugera (each extending to two-thirds of an English acre) a-piece, as inheritable property. The whole district, however, was not thus assigned; one portion was set apart for the service of the gods and for the royal domains; and another was reserved as common land for pasture. The stock kept on the common land served to eke out a main- tenance which two jugera could not otherwise have furnished to a family, and an agistment was paid to the common- wealth for the pasturage. It is probable that the same principle prevailed under the regal government, and that successive adjustments of the territory were made. Such a law existed among those of Servius Tullius. The equality of property thus established seems to have been considered as a fundamental principle of the Roman constitution ; and the agrarian laws were regarded as the necessary means of wresting from the large proprietors the possessions which they had illegally acquired. Machiavelli and Montesquieu both participate in this mistake, and are far from condemn- ing the agrarian laws, even when taken in the common meaning. The former alleges that the interest of every republic requires that the state should be rich and the citizens poor, and thus justifies the assumed spoliation ; while Montesquieu receives it as an historical fact that Romulus adopted the principle of equality in his original distribution of the territory of Rome as the future ground of her strength, and that the tribunitian contests were but attempts to restore the original constitution. Adam Smith (Wealth of Nations, b. iv. chap. vii. part i.) assents to the same interpretation, without, however, any expression of approval.

The correct interpretation of the agrarian laws must thus be considered as of modern date. Amidst the violence of the French Revolution a scheme for the equal division of the national property was advocated, with great popular favour, by some of the frantic leaders, who sought a sanc- tion for their extravagances in precedents drawn from the ancient republics, and particularly from the agrarian laws of the Romans. The subject was thus invested with a new interest, and engaged the attention of Professor Heyne of Gottingen, who in 1793 (Opus. Acad. iv. 350-373) ad- dressed to the members of his university a paper in which he successfully combated the opinions which, up till that time, had been entertained respecting them, and showed that their object had been entirely misunderstood. Other writers, as

Heeren and Hegewisch, embraced and illustrated his views; but it was reserved for the acuteness and learn- ing of Niebuhr fully to develop the theory which had been

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suggested, and to demonstrate the fact "that the agrarian laws of the Romans were in no case intended to interfere with or affect private property in land, but related exclu- sively to the public domain." The theory of Niebuhr was too startling to meet with universal approval. It has accordingly been assailed by Rudorff, Dureau de la Malle (Econ. Polit. des Romaines), Puchta, and others, who have ingeniously and plausibly supported the opinions formerly maintained ; but their arguments fail to produce conviction. (Class. Mus., vol. ii.) The language of Livy passim, when referring to the agrarian laws, is inexplicable unless the interpretation of Niebuhr be adopted : —

"Tf," says Dr Arnold, " amongst Niebuhr's countless services to Roman history, any single one may claim our gratitude beyond the rest, it is his explanation of the true nature and character of the agracian laws. 'I'wenty-four years have not yet elapsed since he first published it, but it has already overthrown the deeply-rooted false impressions which prevailed universally on the subject; and its truth, like Newton's discoveries in natural science, is not now to be proved, but to be taken as the very corner-stone of all our re-searches into the internal state of the Roman people" (Hist. of Rome, vol. ii.)

In almost all countries the legal property of the land has been originally vested in the sovereign, whether we are to understand under that name a single chief, a particular portion of the nation, or the people at large. In the same manner, the property of all the land in a conquered country was held to be transferred to the sovereign power in the conquering state, and was assumed with more or less rigour as circumstances seemed to require. From the earliest times a portion of the Roman territory was thus regarded as the property of the state, and the profits arising from it were applied to the public service. The public domain (ager publicus) was at first small, but was gradually extended by the right of conquest till it embraced a large portion of the whole peninsula. In this process of extension the sub- jugated

communities were frequently mulcted of a propor- tion of their lands, varying according to the alleged offence or the resistance which they had offered to the arms of the conquerors. 'Thus the Boii were deprived of one-half of their territory; the Hernici forfeited two-thirds; and the whole of the ager Campanus, the richest district in Italy, was taken from the inhabitants of Capua on the capture of their city after its revolt to Hannibal.

The lands thus acquired were disposed of in various ways. A portion of them was frequently sold by auction to meet the immediate necessities of the state, and was thus con- veyed in perpetuity to the purchasers. The disposal of the remainder depended on the nature and condition of the land, and its position in reference to the bulk of the com- munity. If in good condition and at no great distance from the city, it was frequently assigned, in small allot- ments of seven jugera (between 4 and 5 acres), to those of the poorer citizens, whose services in war gave them a claim upon the state; while in hostile districts and on exposed frontiers military colonies were planted, each colonist receiving a fixed quantity of land. In both these cases the land so assigned ceased to form part of the public domain, and became the property of the recipients. In some cases the land, after having been assumed as public property, was allowed to remain in the hands of the former owners, who became the tenants of the state for a fixed period, and paid a certain rent to the Roman exchequer.

The preceding remarks refer only to arable or meadow land, vineyards, or olive-gardens, which could be turned to immediate advantage. It is obvious, however, that in a country the greater part of which was acquired by conquest, large districts must have been laid waste, the inhabitants with their houses destroyed, and neither cultivators nor the means of cultivation left. Arrangements of a differ- ent description were therefore necessary for lands in this

41, Dionys. viii. 76), but respecting the provisions of this we have no precise information. Cassius was himself a patrician, and we may therefore infer that the law did not eneroach upon the just rights of the dominant class to which he belonged. It is not the object of this article to trace in detail the various measures which were pro- posed, and the agitations with which

they were severally attended. Three such are recorded during the 4th century B.c. (Liv. iv. 36

position. Wide ranges of country, fit only for pasture, had to be disposed of, and were available to those alone who were able to stock them with flocks and herds, and to provide slaves to attend to and protect their property. Hence it was usual for the state to invite persons possessed of the necessary means to enter upon the occupation of such lands on advantageous terms; an invitation with which the patricians, as being the wealthy class, could alone comply. The ordinary conditions were, that after the land was again brought into cultivation, the occupants should pay as rent one-tenth of the produce of the corn-lands, and one-fifth of the vines and fruit-trees, with a moderate rate per head for sheep and cattle grazing on the public pastures, The lands were not assigned for any definite period; the occupants were merely tenants at will, liable to extrusion whenever the state found it necessary to employ the land for any other purpose. It was a fundamental principle of Roman law that prescription could not be pleaded against the state; and consequently, though the right of occupancy might not only be transmitted from heir to heir, but might also be sold, no length of time could alter the precarious nature of the tenure by which the lands were held, The state always reserved to itself the power of resuming pos- session when it thought fit ; and though such resumption might in many cases be attended by individual hardship, it was nevertheless justified by the original contract.

Much of the obscurity connected with the Roman agrarian laws has arisen from a misapprehension of the meaning of the words possidere, possessor, and possessio. These terms, when used in a strictly legal sense, denote merely occupancy by a tenant, and never imply an absolute right of property. The act of occupancy was termed usus, and the benefit derived by the state fructus.

‘“The ager publicus,” says Professor Ramsay, “ having been ae- quired and occupicd as explained above, numerous abuses arose in process of time, especially among the tenants belonging to the second class. These being, as we have said, in the earlier ages, ex- elusively patricians, who at the same time monopolised the admin- istration of public affairs, they were in the habit of defrauding the state, either by neglecting altogether to pay

the stipulated propor- tion of the produce, or by paying less than was due ; or, finally, by claiming, what was in reality ager publicus, as their own private property ; 1t being easy, of coursc, in the absence of all strict super- intendence and of scientific surveys, to shift the land-marks which separated public from private property. Meanwhile the deficiencies in the public treasury were made up by heavier taxes; and the plebeians complained that they were impoverished by new imposts, while the lands belonging to the community, which they had ac- quired by their blood, if fairly managed, would yield a sufficient return to meet all demands upon the exchequer ; or, if portioned out in allotments among themselves, afford them the means of sup- porting the increased burdens. These complaints, unquestionably founded in justice, were soon vehemently expressed, and were revived from time to time more or less loudly, and enforced more or less earnestly, according to the state of public feeling and the energy of the popular champions. It is true that the wealthier plebeians soon became tenants of the ager publicus as well as the patricians ; but although this circumstance materially strengthened the hands of the occupiers, it did not improve the condition of the poor, or make them less keenly alive to the injustice of the system against which they protested." (Manual of Rom. Antig. p. 228.)

Assuming, then, that the agrarian laws had for their sole object the distribution and management of the public lands (ager publicus), their effect must have been felt in two ways :—{1.) In enforcing the regular payment of rent from the occupants, preventing them from exceeding the limits assigned to them, and compelling the surrender of portions for division among the poorer citizens 5 and (2) In insisting upon the immediate application of newly- acquired territories to the establishment of colonies, or its assignment to individuals. It is obvious that the laws first referred to, as involving long-established interests, would necessarily lead to violent contests.

eople, in 367 B.c. (Liv. vi. 42). The provisions of this law were ; {15 That no one should occupy more than 500 jugera (about 333 acres) of the public land ; (2.) That none should have more than 100 large and 500 small cattle grazing on the public pastures ; and (8.) That every occupant of the public lands should einploy a certain proportion of free labourers in cultivating it.

Niebuhr (vol. ili. p. 11, &. Eng. transl.) has endeavoured to supply the other details; but these can be received merely as ingenious, and it may be successful, conjectures. For an able controversy as to

law had subsided, two centuries were allowed to pass with only a single interference (Valer. Max. y. 4, 55; Polyb. ii. 21) with the occupants of the public lands; and during that time large additions had been made to the possessions of the state by the confiscations consequent upon the sccond Punie war. In the meantime the

not necessary to enumerate. It may be mentioned, in conclusion, as a significant fact, that the prominent advocates of the agrarian laws, Cassius, Licinius, and the Gracchi, all belonged to the class which would have been injured by their operation had they led to an undue interference with private property. (G. F.)

AGREDA, a town of Spain, in the province of Old Castile, 23 miles N.E. of Soria. It is the chief town of the mountainous district of the same name, and is built on the skirts of the Sierra Moncayo. At Agreda the river Queiles is crossed by a fine stone bridge of one arch. Population, 3120.

AGRICOLA, Cyaus J ULIUS, was born at Forum Julii, now frejus, in Provence, 37 A.D., and was in Vespasian's time made lieutenant to Vettius Bolanus in Britain. Upon his return he was ranked by that emperor among the patri- clans, and made governor of Aquitania. This post he held for thrce years ; he then was recalled to Rome, and chosen consul, Britain being assigned to him as his pro- vince (78 4.p.) Here he reformed many abuses created by his predecessors, put a stop to extortion, and caused justice to be impartially administered. In the spring of 79 he marched towards the north, where he made new conquests, and ordered forts to be built for the Romans to winter in. He spent the following winter in concerting schemes to bring the Britons to conform to the Roman customs. He thought the best way of diverting them from their warlike propensities was to soften their rough manners by proposing to them new kinds of pleasure, and inspiring them with a desire of imitating the Roman man- ners. He encouraged the erection of maguificent temples, porticoes, baths, and other fine buildings, The British nobles at length had their sons educated ; and they who before had the utmost aversion to the Roman

language now began to study it with great assiduity. They likewise adopted the Roman dress ; and, as Tacitus observes, they were brought to consider those things as marks of polite- ness which were only so many badges of slavery. Agri- cola, in his third campaign, advanced as far as the Solway ; and in his fourth he subdued the nations betwixt the Sol- way and the friths of Forth and Clyde, into which the rivers Bodotria and Glotta discharged themselves; and here he built a chain of fortresses to check the nations yet

I. — 37

The first agrarian law, properly so called, was proposed and passed by Sp. Cassius Viscclinus, when consul, 486 B.C. (Liv. ii.

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unconquered, In his fifth he fixed garrisons along the western coasts, over against Ireland. In his sixth cam- paign he passed the river Bodotria ; ordering his fleet, the first which the Romans cver had in those parts, to row along the coasts aud take a view of the northern parts. The fleet sailed round by the northern and westcrn coasts, and first proved Britain to be an island. In the following spring, the Britons raised an army of 30,000 men, under the command of Galgacus, to oppose the invaders. _ In the engagement that ensucd at the foot of the Grampians the Romans gained the victory, and 10,000 of the Britons are said to have been killed. This happened in the reign of the emperor Domitian, who, growing jealous of the glory of Agricola, recalled him, under pretence of making him governor of Syria. Agricola was in Britain fully seven years, from 78 to 85 A.D. ; and he died on the 23d August, 93 a.p., when. he had attained the age of 55. Agricola was aman of great integrity ; he possessed high military talents, together with administrative abilities of the first rank. The Life of Agricola, written by his son-in-law, the historian Tacitus, is a model of simple and dignified biography.

AGRICOLA, CuristopH Lupwic, landscape-painter, was born at Regensburg on the 5th Nov. 1667, and dicd at the same place in 1719. He spent a great part of his life in travel, visiting England, Holland, and France, and residing for a considerable period at Naples. His numer- ous landscapes, chiefly cabinet pictures, are remarkable for fidelity to nature,

and especially for their skilful repre- sentation of varied phases of climate. In composition his style shows the influence of Caspar Poussin, while in light and colour he imitates Claude Lorraine. His pictures are to be found in Dresden, Brunswick, Vienna, Florence, Naples, and many other towns of both Germany and Italy.

AGRICOLA (originally LanpMAnNn), GEORG, a famous mineralogist, born at Glauchau in Saxony, on the 24th March 1494. After studying at Leipsic and in Italy, he practised for some time as a physician at Joachimsthal in Bohemia. In 1531 he was enabled to gratify his natural inclination towards the study of geology aud mineralogy by removing to the mining district of Chemnitz in Saxony, where he had been appointed professor of chemistry. The results of his laborious investigations are chiefly to be found in his great work De Re Metallica (Basle, 1546), which describes minutely the various methods of mining, of rais- ing and dressing the ore, and of smelting, and contains a number of curious woodcuts. It has been several times reprinted, and a German translation by Lehmann appeared at Freyberg in 1806-10. He also wrote De Ortu et Causis Subterraneorum, De Animantibus Subterraneorum, De Natura Fossilium, besides other works. Agricola was the first to raise mineralogy to the dignity of a scicnce, aud he developed it to such an extent that no substantial advance was made upon his results until the middle of the 18th century. He died at Chemnitz on the 21st Novem- ber 1555.

AGRICOLA, JoHaNN FRIEDRICH, musician, was born at Dobitschen in Saxe-Altenburg, on the 4th Jan. 1720, and died in 1774. While a student of law at Leipsic he studied music under John Sebastian Bach. In 1741 he went. to Berlin, where he placed himself under Quanz for instruction in musical composition. He was soon gene- rally recognised as one of the most skilful organists of his time. In 1759, on the death of Graun, he was appointed kapellmeister to Frederick IJ. He composed several operas of great merit, as well as instrumental pieces and church music. His reputation chiefly rests, how- ever, on his theoretical and critical writings on musical subjects.

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AGRICOLA (originally ScunirrerR or ScHNEIDER),

Jouanwnzs, one of the foremost of the German reformers, was born ou the 20th April 1492, at Hisleben, whence he ig sometimes called Jagister Islebius. Wittenberg, where he soon gained the friendship of Luther. In 1519 he accompanied Luther to the great assembly of German divines at Leipsic, and acted as recording secre- tary. After teaching for some time in Wittenberg, he went to Frankfort in 1525 to establish the worship according to the reformed religion. month when he was induced to go to Eisleben, where he remained till 1526 as teacher in the school of St Andrew, and preacher in the Nicolai church, enjoying great popu- larity in the latter capacity. In 1536 he was recalled to

He studied at

He had resided there only a

Wittenberg to fill a professorial chair, and was welcomed Almost immediately afterwards, however, a controversy, which had been begun ten years before and been temporarily silenced, broke out afresh with greater violence. Agricola was the first to teach the views which Luther was the first to stigmatise by the now well-known name Antinomian. He held that while the unregenerate were still under the law, Christians were entirely free from it, being under the gospel alone. He denied that Chris- tians owed subjection to any part of the law, even the Decalogue, as a rule of life. Luther conducted the argu- ment with his usual velhhemence, and there was in the heat of controversy probably a good deal of misrepresentation on both sides. In 1540 Agricola left Wittenberg secretly for Berlin, where he published a letter addressed to the elector of Saxony, which was generally interpreted as a re- cantation of his obnoxious views. Luther, however, seems not to have so accepted it, and Agricola remained at Ber- lin. The elector Joachim II. of Brandenburg having taken him into his favour, appointed him court preacher and general superintcndent. He held both offices until his death in 1566, and his career in Brandenburg was one of great activity and great influence. Along with the Catholic bishops Von Pflug and Michael Halding he pre- pared the Augsburg Interim of 1548. 'Agricola wrote a number of theological works which are now of little in- terest. He was the first to make a collection of German proverbs, which he

illustrated with an appropriate com- mentary. The most complete edition is that published at Wittenberg in 1592.

AGRICOLA, RopotpHus (originally Roztor Hvys- MANN), a distinguished scholar, born at Bafflo, near Grén- ingen, in 1443. He was educated at Louvain, where he graduated as master of arts. After residing for some time in Paris, he went in 1476 to Ferrara in Italy, and attended the lectures of the celebrated Theodore Gaza on the Greek language. Having visited Pavia and Rome, he returned to his native country about 1479, and was soon afterwards appointed syndic of Groningen. In 1482, on the invita- tion of Dalberg, bishop of Worms, whose friendship he had gaincd in Italy, he accepted a professorship at Heidel- berg, and for three years delivered lectures in that univer- sity and at Worms on the literature of Greece and Rome. By his personal influence much more than by his writings he did a great deal for the promotion of learning in Ger- many. Hallam says that "no German wrote so pure a style, or possessed so large a portion of classical learning ;" and the praiscs of Erasmus and other critics of the genera- tion immediately succeeding Agricola's are unstinted. In his opposition to the scholastic philosophy he seems to have in some degree anticipated the coming of that great revolu- tion in which many of his pupils were conspicuous actorg.. He died at Heidelberg in 1485. His principal work is

the De Inventione Dialectica, in which he attempts to change the scholastic philosophy of the day.

(See Vita et Merita Rudolphi Agricole, by T. F. Tresling, Gréningen, 1830).

Historical Summary.

Egypt.

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AGRICULTURE

CHAPTER I.

[would be interesting to know how the nations of

antiquity tilled, and sowed, and reaped ; what crops they cultivated, and by what methods they converted them into food and raiment. But it is to be regretted, that the records which have come down to us are all but silent upon these homely topics.

In Mr Hoskyn's admirable treatise! we have an excellent specimen of what may yet be done to recover and construct an authentic history of the Agriculture of the ancients, from: the casual allusions and accidental notices of rural affairs which lie thinly scattered through the body of general literature ; and, more especially, from those myste- rious records of the past, which are now being rescued from their long burial under the ruins of some of the most famous cities of antiquity. Although comparatively little has been found in such records bearing directly upon the subject, we must not despair of the learned industry and masterly skill of an advancing and searching criticism, gathering together these gleams of light, and making them happily converge upon the darkness which has hitherto interposed between us and a circumstantial knowledge of the methods and details of ancient husbandry.

Every reader of the Bible is familiar with its frequent references to Egypt as a land so rich in corn, that it not only produced abundance for its own dense population, but yielded supplies for exportation to neighbouring coun- tries. Profane history corroborates these statements. Diodorus Siculus bears explicit testimony to the skill of the farmers of ancient Egypt. He informs us that they were acquainted with the benefits of a rotation of crops, and were skilful in adapting these to the soil and to the seasons. The ordinary annual supply of corn furnished to Rome has been estimated at 20,000,000 bushels. From the same author we also learn that they fed their cattle with hay during the annual inundation, and at other times tethered them in the meadows on green clover. Their flocks were shorn twice annually (a practice common in several Asiatic countries), and their ewes yeaned twice a year. For religious as well as economical reasons, they Were great rearers of poultry, and practised artificial hatching, as at the present day. The abundance or scarcity of the harvests in Egypt depended chiefly upon the height of the annual inundation. If too low, much of the land could

not be sown, and scarcity or famine ensued. On the other hand, great calamities befell the country when the Nile rose much above the average level. Cattle were drowned, villages destroyed, and the crops necessarily much diminished, as in such cases many of the fields were still under water at the proper seed time. In 1818 a calamity of this kind took place, when the river rapidly attained a height of 34 feet above the proper level.

It is from the paintings and inscriptions with which the ancient Egyptians decorated their tombs that we get the fullest insight into the state of agriculture amongst this remarkable people. Many of these paintings, after the lapse of two or three thousand years, retain the distinctness of outline and brilliancy of colour of recent productions. The acquaintance which these give us with their occupations, attainments, and habits is truly marvellous, and fills the

1 Short Inquiry into the History of Agriculture, by Chandos Wren Hoskyn, Esq.

reader of such works as Wilkinson's Egypt with perfect amazement. livery fresh detail seems to give confirmation to that ancient saying, "There is nothing new under the sun." The pictures referring to rural affairs disclose a State of advancement at that early date which may well lead us to speak modestly of our own attainments. An Egyptian villa comprised all the conveniences of a European one of the present day. Besides a mansion with numerous apartments, there were gardens, orchards, fish- ponds, and preserves for game. Attached to it was a farm-yard, with sheds for cattle and stables for carriage horses. A steward directed the tillage operations, super- intended the labourers, and kept account of the produce and expenditure. The grain was stored in vaulted chambers furnished with an opening at the top, reached by steps, into which it was emptied from sacks, and with an aperture below for removing it when required. Hand-querns, similar to our own, were used for grinding corn ; but they had also a larger kind worked by oxen. In one painting, in which the sowing of the grain is represented, a plough drawn by a pair of oxen goes first; next comes the sower scattering the seed from a basket; he is followed by another plough; whilst a roller, drawn by two horses yoked abreast, completes the operation. The steward stands by super- intending the whole. Nothing, however,

conveys to us so full an impression of the advanced state of civilisation amongst the ancient Egyptians as the value which they attached to land, and the formalities which they observed in the transfer of it. In the time of the Ptolemies, their written deeds of conveyance began with the mention of the reign in which they were executed, the name of the president of the court, and of the clerk who drew them. The name of the scller, with a description of his personal appearance, his parentage, profession, and residence, was engrossed. The nature of the land, its extent, situation, and boundaries ; the name and appearance of the purchaser were also included. A clause of warrandice and an explicit acceptance by the purchaser followed, and finally the deed was attested by numerous witnesses (so many as sixteen occur to a trifling bargain), and by the president of the court.

The nomades of the patriarchal ages, like the Tartar, Judea: and perhaps some of the Moorish tribes of our own, whilst Patriarchal mainly dependent upon their flocks and herds, practised A8¢-

also agriculture proper. The vast tracts over which they roamed were in ordinary circumstances common to all shepherds alike. During the summer they frequented the mountainous districts and retired to the valleys to winter. Vast flocks of sheep and of goats constituted the chief wealth of the nomades, although they also possessed animals of the ox kind. When these last were possessed. in abundance, it seems to be an indication that tillage was practised. We learn that Job, besides immense possessions in flocks and herds, had 500 yoke of oxen, which he employed in ploughing, and a " very great husbandry." Isaac, too, conjoined tillage with pastoral husbandry, and that with success, for we read that he sowed in the land Gerar, and reaped an hundred-fold —a return which, it would appear, in some favoured regions, occasionally rewarded the labour of the husbandman. In the parable of the sower, our Lord (grafting his instructions upon the habits, scenery, and productions of Palestine), mentions an increase of thirty, sixty, and an

hundred fold. Such increase, although far above the average rate, Was somctimes even greatly excceded, if we take the authority of Herodotus, Strabo, and Pliny.

Along with the Babylonians, Egyptians, and Romans, the Israelites are classed as one of the great agricultural nations of antiquity. The sojourn of the Israelites in Egypt trained them for the more purely agricultural life that awaited them on their return to take posses- sion of Canaan. Nearly the whole population were virtually husbandmen, and personally engaged m its pur- suits. Upon their entrance into Canaan, they found the country occupied by a dense population possessed of walled cities and innumerable villages, masters of great accumulated wealth, and subsisting on the produce of their highly cultivated soil, which abounded with vineyards and oliveyards. It was so rich in grain, that the invading army, numbering 601,730 able-bodied men, with their wives and children, and a mixed multitude of camp-followers, found "old corn" in the land sufficient to maintain them from the day that they passed the Jordan. The Mosaic Institute contained an agrarian law, based upon an equal division of the soil amongst the adult males, a census of whom was taken just before their entrance into Canaan. Provision was thus made for 600,000 yeomen, assign- ing (according to different calculations) from sixteen to twenty-five acres of land to each. This land, held in direct tenure from Jehovah, their sovereign, was strictly inalienable. 'The accumulation of debt upon it was pre- vented by the prohibition of interest, the release of debts every seventh year, and the reversion of the land to the proprietor, or his heirs, at each return of the year of jubilee. The owners of these small farms cultivated them with much care, and rendered them highly productive. They were favoured with a soil extremely fertile, and one which their skill and diligence kept in good condition. The stones were carefully cleared from the fields, which were also watered from canals and conduits, communicating with the brooks and streams with which the country "was well watered everywhere," and enriched by the application of manures. The seventh year's fallow prevented the exhaustion of the soil, which was further enriched by the burning of the weeds and spontaneous growth of the Sabbatical year. The crops chiefly cultivated were wheat, millet, barley, beans, and lentiles; to which it is supposed, on grounds not improbable, may be added rice and cotton, The ox and the ass were used for labour. The word "oxen," which occurs in our version of the Scriptures, as well as in the Septuagint and Vulgate, denotes the species, rather than the sex. As the Hebrews did not mutilate any of their animals, bulls were in common use. The quantity of land ploughed by a yoke of oxen in one day was called a

yoke or acre. Towards the end of October, with which month the rainy season begins, seedtime commenced, and of course does so still. The seedtime, begun in October, extends, for wheat and some other white crops, through November and December ; and barley continues to be sown until about the middle of February. The seed appears to have been sometimes ploughed in, and at other times to have been covered by harrowing. The cold winds which prevail in January and February frequently injured the crops in the more exposed and higher districts. The rainy season extends from October to April, during which time refreshing showers fall, chiefly during the night, and gene- rally at intervals of a few days. The harvest was earlier or later as the rains towards the end of the season were more or less copious. It, however, generally commenced in April, and continued through May for the different crops in succession. In the south, and in the plains, the harvest, as might be expected, commenced some weeks earlier than in the northern and mountainous districts. The slopes of

the hills were carefully terraced and irrigated whercver practicable, and on these slopes the vine and olive were cultivated with great success. At the same time the hill districts and neighbouring deserts afforded pasturage for numerous flocks and herds, and thus admitted of the benefits of a mixed husbandry. With such political and social arrangements, and under the peculiarly felicitous climate of Judea, the country as a whole, and at the more prosperous periods of the commonwealth, must have ex- hibited such an example of high cultivation, rich and varied produce, and wide-spread plenty and contentment, as the world has never yet elsewhere produced on an equally extensive scale. Not by a figure of speech but literally, every Israelite sat under the shadow of his own vine and fig-tree ; whilst the country as a whole is described (2 Kings xviii. 32) as "a land of corn and wine, a land of bread and vineyards, a land of oil-olive and of honey." An interesting illustration of the advanced state of agri- culture in these ancient times is afforded by the fact, that, making allowance for climatic differences, the numerous allusions to it with which the Scriptures abound seem natural and appropriate to the British farmer of the present day.

The unrivalled literature of Greece affords us little infor- Greece.

mation regarding the practical details of her husbandry. The people who by what remains to us of their poetry, philosophy, history, and fine arts, still exert such an in- fluence in guiding our intellectual efforts, in regulating taste, and in moulding our institutions, were originally the invaders and conquerors of the territory which they have rendered so famous. Having reduced the aboriginal tribes to bondage, they imposed upon them the labour of cultivat- ing the soil, and hence both the occupation, and those engaged in it, were regarded contemptuously by the domi- nant race, who addicted themselves to what they regarded as nobler pursuits. With the exception of certain districts, such as Beeotia, the country was naturally unfavourable to agriculture. When we find, however, that valleys were freed from lakes and morasses by drainage, that rocky surfaces were sometimes covered with transported soil, and that they possessed excellent breeds of the domesticated animals, which were reared in vast numbers, we infer that agriculture was better understood, and more carefully practised, than the allusions to it in their literature would seem to warrant.

Amongst the ancient Romans agriculture was highly Rome.

esteemed, and pursued with earnest love and devoted atten- tion. 'In all their foreign enterprises, even in earliest times," as Schlegel remarks, "'they were exceedingly covetous of gain, or rather of land; for it was in land, and in the produce of the soil, that their principal and almost only wealth consisted. They were a thoroughly agricultural people, and it was only at a later period that commerce, trades, and arts, were introduced among them, and even then they occupied but a subordinate place."1 Their passion for agriculture survived very long ; and when at length their boundless conquests introduced an unheard-of luxury and corruption of morals, the noblest minds amongst them were strongly attracted towards the ancient virtue of the purer and simpler agricultural times. Several facts in Roman history afford convincing proof, if it were required, of the devotion of this ancient people to agricul- ture, in their best and happiest times. Whilst their arts and sciences, and general literature, were borrowed from the Greeks, they created an original literature of their own, of which rural

affairs formed the substance and inspiration, Schlegel and Mr Hoskyn notice also the striking fact, that

1 The Philosophy of History, by Frederick Von Schlegel.

London, 1846, p. 253.

whilst among the Greeks the names of their illustrious families are borrowed from the heroes and gods of their mythology, the most famous houses amongst the ancient Romans, such as the Pisones, Fabii, Lentuli, &c., have taken their names from their favourite crops and vegetables. Perhaps it is not too much to assert, that many of those qualities which fitted them for conquering the world, and perfecting their so celebrated jurisprudence, were acquired, or at all events nourished and matured, by the skill, fore- sight, and persevering industry, so needful for the intelligent and successful cultivation of the soil. The words which Cicero puts into the mouth of Cato give a fine picture of the ancient Roman enthusiasm in agriculture. "I come now to the pleasures of husbandry, in which I vastly delight. They are not interrupted by old age, and they seem to me to be pursuits in which a wise man's life should be spent. The earth does not rebel against authority ; it never gives back but with usury what it receives. The gains of hus- bandry are not what exclusively commend it. Iam charmed with the nature and productive virtues of the soil. Can those old men be called unhappy who delight in the culti- vation of the soil? In my opinion there can be no happier life, not only because the tillage of the earth is salutary to all, but from the pleasure it yields. The whole establish- ment of a good and assiduous husbandman is stored with wealth ; it abounds in pigs, in kids, in lambs, in poultry, in milk, in cheese, in honey. N othing can be more profitable, nothing more beautiful, than a well-cultivated farm."

In ancient Rome each citizen received, at first, an allot- After the expulsion of

ment of about two English acres.

the kings this allotment was increased to about six acres.

These small inheritances must, of course, have been culti-

vated by hard labour. On the increase of the Roman territory the allotment was increased to fifty, and afterwards even to five hundred acres. Many glimpses into their methods of cultivation are found in those works of Roman authors which have survived the ravages of time. Cato speaks of irrigation, frequent tillage, and manuring, as means of fertilising the soil. Mr Hoskyn, from whose valuable contribution to the History of Agriculture we have drawn freely in this historic summar , quotes the following interesting passage from Pliny, commenting on Virgil :!1— "Our poet is of opinion that alternate fallows should be made, and that the land should rest entirely every second year. And this is, indeed, both true and profitable, provided a man have land enough to give the soil this repose. But how, if his extent be not sufficient? Let him, in that case, help himself thus. Let him sow next year's wheat-crop on the field where he has just gathered his beans, vetches, or lupines, or such other crop as enriches the ground. For, indeed, it is worth notice that some crops are sown for no other purpose but as food for others, a poor practice in my estimation." In another place he tells us, " Wheat, the later it is reaped, the better it casts ; but the sooner it is reaped, the fairer the sample. The best rule is to cut it down before the grain is got hard, when the ear begins to have a reddish-brown appearance. 'Better two days too soon than as many too late,' is a good old maxim, and might pass for an oracle." The following quotation from the same author is excellent: —Cato would have this point especially to be considered, that the soil of a farm be good and fertile; also, that near it there be plenty of labourers, and that it be not far from a large town: moreover, that it have sufficient means for transporting its produce, either by water or land. Also, that the house be well built, and the land about it as well managed. But I observe a great

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1 Short Inquiry into the History of Agriculture, pp. 49-51, by Chandos Wren Hoskyn, Esq.

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error and self-deception which many men commit, who hold opinion that the negligence and ill-husbandry of the former owner is good for his

successor or after-purchaser. I say, there is nothing more dangerous and disadvantageous to the buyer than land so left waste and out of heart therefore Cato counsels well to purchase land of one who has managed it well, and not rashly and hand-over-head to despise and make li another. He says, too, that as well land as men, which are of great charge and expense, how gainful soever they may seem to be, yicld little profit in the end, when all reckonings are made. was the most assured profit rising out of land? made this

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The same Cato being asked, what

answer,—‘ To feed stock well.’ Being asked again, ‘ What was the next?’ he answered, ‘To feed with moderation” By which answer he would seem to conclude that the most certain and sure revenue was a low cost of production. To the same point is to be referred another speech of his, ‘That a good husbandman ought to be a seller rather than a buyer ;’ also, ‘that a man should stock his ground early and well, but take long time and leisure before he be a builder ? for it is the best thing in the world, according to the proverb, ‘to make use, and derive profit, from other men’s follies.’ Still when there is a good and convenient house on the farm, the master will be the closer occupicr, and take the more pleasure in it; and truly it is a good saying, that ‘the master’s eye is better than his heel.’”

“It is curious,” says Mr Hoskyn, “to read such passages as these, and to find the very same subjects still handled, week after week, in fresh and eager controversy in the agricultural writings and periodicals of the present day, eighteen centuries after those opinions were written.”

In the later ages of the empire agriculture was neglected, and those engaged in it regarded with contempt. Many fair regions once carefully

cultivated, and highly productive, were abandoned to nature, and became a scene of desolation, the supplies of overgrown Rome being drawn from Egypt, Sicily, and other provinces, which became notable as the granaries of the empire.

Under the Goths, Vandals, and other barbarian con- Middle querors, agriculture in Europe, during the middle ages, Ages.

seems to have sunk into the lowest condition of neglect and contempt. We owe its revival, like that of other arts and

sciences, to the Saracens of Spain, who devoted themselves Spain.

to the cultivation of that conquered territory, with heredi- tary love for the occupation, and with the skilful application of the experience which they had gathered in other lands in which they had established their power. By them, and their successors, the Moors, agriculture was carried in Spain to a height which perhaps has not yet been surpassed in Europe. It is said, that so early as the tenth century the revenue of Saracenic Spain alone amounted to £6,000,000 sterling,—probably as much as that of all the rest of Kurope at that time. The ruins of their noble works for the irrigation of the soil still attest their skill and industry, and put to shame the ignorance and indolence of their successors. The same remark applies to the Spanish dominions in South America. In the ancicnt empire of Peru agriculture seems to have reached a high degree of perfection. The ruins of basins and canals, frequently carricd through tunnels, prove their industry and skill in irrigation. One of their aqueducts is said by Mr Prescott? to have been traced by its ruins for nearly 500 miles. They cultivated the sides of mountains, by means of terraces, which retained forced soil, and were skilled in the application of manure. That on which they chiefly de- pended was guano, and their Incas protected the penguins, by which it was deposited, by strict laws, which made it

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highly penal to kill one of these birds, or to set foot on the islands at breeding time. The Spaniards thus obtained possession of two good patrimonies, and have wasted them both.

The influence of the crusades upon the agriculture of this period is not to be overlooked. The dreadful oppression of the feudal system received at that time a shock most favourable to the liberties of man, and, with increasing liberty, more enlightened ideas began to be entertained, and greater attcntion to be paid to the cultivation of the soil.

But, during this long interval, the population of Europe was divided into two great classes, of which by far the larger one was composed of bondmen, without property, or the power of acquiring it, and small tenants, very little superior to bondmen ; and the other class, consisting chiefly of the great barons aud their retainers, was more frequently employed in laying waste the fields of their rivals than in improving their own. The superstition of the times, which destined a large portion of the land to the support of the church, and which, in some measure, secured it from predatory incursions, was the principal source of what little skill and industry were then displayed in the cultivation of the soil. 'If we consider the ancient state of Europe," says Mr Hume,} "we shall find that the far greater part of society were everywhere bereaved of thcir personal liberty, and lived entirely at the will of their masters. Every one that was not noble was a slave ; the peasants were not in a better condition ; even the gentry themsclves were sub- jected to a long train of subordination under the greater barons, or chief vassals of the crown, who, though seemingly placed in a high state of splendour, yet, having but a slender protection from law, were exposed to every tempest of the state, and by the precarious condition on which they lived, paid dearly for the power of oppressing and tyrannis- ing over their inferiors."—' The villains were entirely occupied in the cultivation of their master's land, and paid their rents either in corn or cattle, and other produce of the farm, or in servile offices, which they performed about the

baron's family, and upon farms which he retained in his own possession. In proportion as agriculture improved and money increased, it was found that these services, though extremely burdensome to the villain, were of little advantage to the master ; and that the produce of a large estate could be much more conveniently disposed of by the peasants themselves who raised it, than by the landlord or his bailiff, who were formerly accustomed to receive it. A commutation was therefore made of rents for services, and of money-rents for those in kind; and as men in a subse- quent age discovered that farms were better cultivated where the farmer enjoyed security in his possession, the practice of granting leases to the peasant began to prevail, which entirely broke the bonds of servitude, already much relaxed from the former practices. The latest laws which we find in England for enforcing or regulating this species of servitude were enacted in the reign of Henry VII. And though the ancient statutes on this subject remain still unrepealed by Parliament, it appears that before the end of Elizabeth the distinction between villain and freeman was totally, though insensibly, abolished, and that no person remained in the state to whom the former laws could be applied."

But long before the 15th century, it is certain that there was a class of tenants holding on leases for lives, or for a term of years, and paying a rent in land produce, in services, or in moncy. Whether they gradually sprung up from the class of bondmen, according to Lord Kames,? or

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» History of England, chap, xxiii. 2 Kames's Law Tracts.

existed from the earliest period of the feudal constitution, Middle according to other writers,' theirnumber cannot be supposed Ages. to have been considerable during the middle ages. The stock which these tenants employed in cultivation com- monly belonged to the proprietor, who received a proportion of the produce as rent,—a system which still exists in France and in other parts of the Continent, where such tenants are called metayers, and some vestiges of which may yet be traced in the steel-bow of the law of Scotland. Leases of the 13th century still remain, and both the laws and chartularies® clearly prove the existence in Scotland of a class of cultivators distinct from the serfs or boudmen. Yet the condition of these*

tenants seems to have been very different from that of the tenants of the preseut day; and the lease approached nearer in its form to a feu-charter than to the mutual agreement now in use. It was of the nature of a beneficiary grant by the proprietor, under certain conditions, and for a limited period ; the consent of the tenant seems never to have been doubted. In the common expression "granting a lease," we have retained an idea of the original character of the deed, even to the present time.

The corn crops cultivated during this period seem to have Crops. been of the same species, though all of them probably much inferior in quality to what they are in the present day. Wheat, the most valuable grain, must have borne a small proportion, at least in Britain, to that of other crops; the remarkable fluctuation of price, its extreme scarcity, indi- cated by the extravagant rate at which it was sometimes sold, as well as the preparatory cultivation required, may convince us that its consumption was confined to the higher orders, and that its growth was by no means extensive. : Rye and oats furnished the bread and drink of the great body of the people of Europe. Cultivated herbage and roots were then unknown in the agriculture of Britain. It was not till the end of the reign of Henry VIII. that any salads, carrots, or other edible roots were produced in England. The little of these vegetables that was used was formerly imported from Holland and Flanders. Queen Catherine, when she wanted a salad, was obliged to despatch a messenger thither on purpose.®

The ignorance and insecurity of those ages, which neces- sarily confined the cultivation of corn to a comparatively small portion of country, left all the rest of it in a state of nature, to be depastured by the inferior animals, then only occasionally subjected to the care and control of man, Cultivators were crowded together in miserable hamlets ; the ground contiguous was kept continually under tillage ; and beyond this, wastes and woodlands of a much greater extent were appropriated to the maintenance of their flocks and herds, which pastured indiscriminately, with little attention from their owners.

The low price of butcher-meat, though it was then the food of the common people, when compared with the price of corn, has been justly noticed by

several writers as a decisive proof of the small progress of civilisation and industry.

One of the earliest and greatest agricultural grievances Purvey- was the levying of Purveyance. This originally compre- 41% hended the necessary provisions, carriages, &c., which the nearest farmers were obliged to furnish at the current prices to the king's armies, houses, and castles, in time of war. It was called the great purveyance, and the officers who collected those necessaries were called purveyors. The smaller purveyance included the necessary provisions for the household of the king when travellizg through the a a Re

3 Bell's Treatise on Leases.

4 Sir John Cullum's History and Antiquities of Mawsted (Suffolk). 5 Chalmers' Caledonia, book iv. ec. 6.

6 Hume's History of England, chap. xxiii.

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kingdom, and these the tenants on the king's demesne lands were obliged to furnish gratis, a practice that came to be adopted by the barons and great men in every tour which they thought proper to make in the country. These exactions were so grievous, and levied in so high-handed a manner, that the farmers, when they heard of the court's approach, often deserted their houses, as if the country had been invaded by an enemy. "' Purveyance," says Dirom,! "was perhaps for many centuries the chief obstruc- tion to the agriculture and improvement of Great Britain. Many laws were made for the reformation and regulation of purveyance, but without effect ; and the practice continued down to so late a period as the reign of James the First."

By statute 1449, the tenant was for the first time secured in possession, during the term of his lease, against a purchaser of the land; and in 1469 he was protected from having his property carried off for the landlord's debts, beyond the amount of rent actually due; an enact- ment which proves his miserable condition before that time.

Soon after the beginning of the 16th century agriculture partook of the general improvement which followed the invention of printing, the revival of learning, and the more settled authority of government; and instead of the occa. sional notices of historians, we can now refer to regular treatises, written by men who engaged eagerly in this neglected and hitherto degraded occupation. We shall therefore give a short account of the principal works, as well as of the laws and general policy of Britain, in regard to agriculture, from the early part of the 16th century to the Revolution in 1688, when a new era commenced in the legislation of corn, and soon after in the practice of the cultivator.?

Earty Works on AGRICULTURE.

of -The first and by far the best of our early works is the andry, Book of Husbandry, printed in 1534, commonly ascribed

F to Fitzherbert, a judge of the Common Pleas in the reign

of Henry VIII. This was followed, in 1539, by the Book of Surveying and Improvements, by the same author. In the former treatise we have a clear and minute description of the rural practices of that period, and from the latter may be learned a good deal of the economy of the feudal system in its decline. The Book of Husbandry has scarcely been excelled by any later production, in as far as concerns the subjects of which it treats ; for at that time cultivated herbage and edible roots were still unknown in England. The author writes from his own experience of more than forty years ; and, with the exception of passages denoting his belief in the superstition of the Roman writers, there is very little of this valuable work, in so far as regards the culture of corn, that should be omitted, and not a great deal that need be added, even in a manual of husbandry adapted to the present time. Fitzherbert touches on almost every department of the art, and in about a hundred octavo pages has contrived to condense more practical

information than will be found scattered through as many volumes of later times ; and yet he is minute even to the extreme on points of real utility. There is no reason to say, with Mr Harte, that he had revived the husbandry of the Romans 3 he merely describes the practices of the age in which he lived ; and from his commentary on the old statute extenta manerit, in his Book of Surveying, in which he does not allude to any recent improvements, it is probable that the manage- ment which he details had been long established. But it may surprise some of the agriculturists of the present day to be told, that, after the lapse of almost three centuries, Fitzherbert's practice, in some material particulars, has not a

1 Inquiry into the Corn Laws, &e., p. 9. 2 The account of the Writers on Agriculture taken from Mr Cleg- horn's Treatise in the former edition of the Encylopedia Britannica.

been improved upon ; and that in several districts abuses until recently existed, which were as clearly pointed out by him at that early period as by any writer of the present age,

The Book of Husbandry begins with the plough and other instruments, which are concisely and yet minutely described; and then about a third part of it is occupied with the several operations as they succeed one another throughout the year. Among other things in this part of the work, the following deserve notice :-—

"Somme (ploughs) wyll tourn the sheld bredith at every landsende, and plowe all one way ;" the same kind of plough that is now found so useful on hilly grounds. Of wheel-ploughs he observes, that "they be good on even grounde that lyetl lyghte;" and on such lands they are still most commonly employed. Cart-wheels were soinctimes bound with iron, of which he greatly approves. On the much agitated question about the employment of horses or oxen in labour, the most important arguments are distinctly stated.

"In some places," he says, 'fa horse plough is better," and in others an oxen plough, to which, upon the whole, he gives the pre- ference, and to

this, considering the practices of that period, they were probably entitled. Beans and peas seem to have been common crops. He mentions the different kinds of wheat, barley, and oats ; and after describing the method of harrowing 'all maner of cornnes," we find the roller employed. "They used to role their barley grounde after a showr of rayne, to make the grounde even to mowe."" Under the article "To falowe," he observes, 'the greater clottes (clods) the better wheate, for the clottes kepe the wheat warme all wynter ; and at March they will melte and breake and fal in manye small peces, the whiche is a new dongynge and refreshynge of the corne." This ig agreeable to the present practice, founded on the very same reasons. 'In Ma , the shepe folde is to be set out ;" but Fitzherbert does not muc approve of folding, and points out its disadvantages in a very judicious manner, « In the latter end of May and the begynnynge of June, is tyme to wede the corne;" and then we have an' accurate description of the different weeds, and the instruments and mode of weeding. Next comes a second ploughing of the fallow; and afterwards, in the latter end of June, the mowing of the meadows begins. Of this operation, and of the forks and rakes, and the haymaking, there is a very good account. The corn harvest naturally follows : rye and wheat were usually shorn, and barley and oats cut with the scythe. This intelligent writer docs not approve of the practice, which still prevails in some places, of cutting wheat high, and then mowing the stubbles. " In Somersetshire," he says, "'they do shere theyr wheat very lowe ; and the wheate strawe that they purpose to make thacke of, they do not threshe it, but cut off the ears, and bynd it in sheves, and call it rede, and therewith they thacke theyr houses." He recommends the practice of setting up corn in shocks, with two sheaves to cover cight, instead of ten sheaves as at present; probably owing to the straw being then shorter. The corn was commonly housed; but if there be a want of room, he advises that the ricks be built on a scaffold, and not upon the ground. Corn- stacks are now beginning to be built on pillars and frames. The fallow reccived a third ploughing in September, and was sown about Michaelmas. " Wheat is moost commonlye sowne under the forowe, that is to say, cast it uppon the falowe, and then plowe it under ;" and this branch of his subject is concluded with directions about threshing, Winnowing, and other kinds of barn-work,

Fitzherbert next proceeds to live stock. ‘An housbande,”’ he says, “‘can not well thryue by his corne without he have other cattell, nor by his cattell without corne. And bycause that shepe, in myne opynyon, is the mooste profytablest cattell that any man can haue, therefore I pourpose to speake fyrst of shepe.” Hig remarks on this subject are so accurate, that one might imagine they came from a storemaster of the present day ; and the minutix which he details are exactly what the writer of this article has seen practised in the hilly parts of this country. In some places at present, “they neuer seuer their lambes from their dammes ;” ‘and the poore of the pecke (high) countreye, and such other places, where, as they vse to mylke theyr ewes, they vse to wayne theyr lambes at 12 weekes olde, and to mylke their ewes fiue or syxe weckes ;” but that, he observes, “is greate hurte to the ewes, and wyll cause them that they wyll not take the ramme at the

tyme of the yere for pouertye, but goo barreyne.” ‘In June ig ’

tyme to shere shepe ; and ere they be shorne, they must be verye well washen, the which shall be to the owner greate profyte in the sale of his wool, and also to the clothe-maker.” It appears that hand washing was then a common practice ; and yct in the west and north of Scotland its introduction is of comparatively recent date. His remarks on horses, cattle, &¢c., are not less interesting ; and there is a very good account of the diseases of each species, and some just observations on the advantage of mixing different kinds on bs same pasture. Swine and bees conclude this branch of the work.

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Early Works.

Book of Surveying.

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The author then points out the great advantages of inclosure ; recommends “quycksettynge, dychynge, and hedgeyng;’ and gives particular directions about settcs, and the method of training a hedge, as well as concerning the planting and management of trees. We have then a short information “for a

yonge gentylman that intendeth to thryue," and "a prolouge for the wiues occu- pation," in some instances rather too homely for the present time. Among other things, she is to "make her husband and herself somme clothes ;" and "she maye haue the lockes of the shepe eyther to make blankettes and courlettes, or bothe." This is not so much amiss; but what follows will bring the learned judge into disrepute eve with our most industrious housewives. "It is a wyues occu- pation," he says, "to wynowe all maner of cornes, to make malte, to washe and wrynge, to make heye, shere corne, and, in time of nede, to helpe her husbande to fyll the mucke wayne or dounge carte, dryue the ploughe, to loode heye, corne, and suche other ; and to go or ride to the market to sel butter, chese, mylke, egges, chekyns, capons, hennes, pygges, gese, and all maner of cornes." The rest of the book contains some useful advices about diligence and economy ; and concludes, after the manner of the age, with many pious exhortations.

Such is Fitzherbert's Book of Husbandry, and such was the state of agriculture in England in the early part of the 16th eentury, and probably for a long time before; for he nowhere speaks of the praetices which he deseribes or reeommends as of reeent introduetion.

The Book of Surveying adds considerably to our knowledge of the rural eeonomy of that age. 'Four maner of eom- mens" are deseribed; several kinds of mills for eorn and other purposes, and also "quernes that goo with hand ;" different orders of tenants, down to the " boundmen," who 'in some places eontynue as yet ;' "and many tymes, by colour thereof, there be many freemen taken as boundmen, and their lands and goods is taken from them." Lime and marl are mentioned as common manures; and the former was sometimes spread on the surfaee to destroy heath. Both draining and irrigation are notieed, though the latter but slightly. And the work eoneludes with an inquiry " how to make a township that is worth XX. marke a yere, wortl XX. li. a year;" from whieh we shall give a specimen of the author's manner, as well as of the economy of the age.

'It is undoubted, that to every townshyppe that standeth in tyllage in the playne countrey, there be errable landes to plowe and sowe, and leyse to tye or tedder theyr horses and mares upon, and common pasture to kepe and pasture their catell, beestes, and shepe upon; and also they have medowe

grounde to get theyr hey upon. Than to let it be known how many acres of crrable lande euery man hath in tyllage, and of the same acres in euery felde to chaunge with his neyghbours, and to leye them toguyther, and to make hym one seuerall close in euery felde for his crrable lands; and his leyse in euery felde to leve them togyther in one felde, and to make one seuerall close for them all. And also another seuerall close for his portion of his common pasture, and also his porcion of his medowe in a seuerall close by itselfe, and al kept in seuerall both in wynter and somer; and euery cottage shall haue his portion assigned hym accordynge to his rent, and than shall nat the ryche man ouerpresse the poore man with his cattell ; and euery man may eate his oun close at his pleasure. And vndoubted, that hay and strawe that will find one beest in the house wyll finde two beestes in the close, and better they shall lyke. For those beestis in the house have short heare and thynne, and towards March they will pylle and be bare; and therefore they may nat abyde in the fylde before the heerdmen in winter tyme for colde. And those that lye in a elose under a hedge haue longe heare and thyck, and they will neuer pylle nor be bare; and by this reason the husbande maye kepe twyse so many catell as he did before.

'This is the cause of this approwment. Nowe euery husbande hath sixe seuerall closes, whereof iii. be for corne, the fourthe for his leyse, the fyfte for his commen pastures, and the sixte for his haye ; and in wynter time there is but one occupied with corne, and than hath the husbande other fyue to occupy tyll lente come, and that he hath his falowe felde, his ley felde, and his pasture felde al sommer. And when he hath mowen his medowe, then he hath his medowe grounde, soo that if he hath any weyke catell that wold be amended, or dyvers maner of catell, he may put them in any close he wyll, the which is a great advantage ; and if all shulde lye commen, than wolde the edyche of the eorne feldes and the aftermath of all the medowes be eaten in X. or XII. dayes. And the rych men that hath moche catell wold have the advantage, and the poore man can have no helpe nor relefe in wynter when he hath moste nede ; and if an acre of lande be worthe sixe pens, or it

be enclosed, it will be worth VIII. pens, when it is enclosed by reason of the compostying and dongyng of the catell that shall go and lye upon it both day and nighte; and if any of his thre closes that he hath for his corne be

worne or ware bare, than he may breke and plowe up his close that he hadde for his layse, or the close that he hadde for his commen pasture, or bothe, and sowe them with corne, and let the other lye for a time, and so shall he have alway reist grounde, the which will bear moche corne with lytel donge ; and also he shall have a great profyte of the wod in the hedges whan it is growen; and not only these profytes and advantages beforesaid, but he shall save moche more than al these, for by reason of these closes he shall save mcate, drinke, and wages of a shepherde, the wages of the heerdmen, and the wages of the swine herde, the which may fortune to be as chargeable as all his holle rent ; and also his corne shall be better saved from eatinge ov destroyeng with catel. For dout ye nat but heerdemen with their catell, shepeherdes with their shepe, and tieng of horses and mares, destroyeth moch corne, the which the hedges wold save. Paraduenture some men would say, that this shuld be against the common weale, bicause the shepeherdes, heerdmen, and swyne- herdes, shuld than be put out of wages. To that it may be answered, though these occupations be not used, there be as many newe occupations that were not used before ; as getting of quicke-settes, diching, hedging, and plashing, the which the same men may use and occupye."

The next author who writes professedly on agriculture Tusser, is Tusser, whose Mive Hundred Points of Husbandry, 1562. published in 1562, was formerly in sueh high repute as to be reeommended by Lord Molesworth to be taught in schools.1 The edition of 1604 isthe one we make use of here. In it the book of husbandry eonsists of 118 pages, and then follows the Points of ITousewifrie, oceupying 42 pages more. It is written in verse. Amidst a vast heap of rubbish, there are some useful notices eoneerning the state of agrieulture at the time in different parts of England. Hops, which had been introdueed in the early part of the 16th century, and on the eulture of whieh a treatise was published in 1574 by Reynolde Seott, are mentioned as a well-known erop. Buekwheat was sown after barley. Hemp and flax are mentioned as eommon erops. Inelosures must have been numerous in several eounties ; and there is a very good eomparison between "ehampion (open fields) eountry, and several," which Blythe afterwards transcribed into his Jmprover Improved. Carrots, eabbages, turnips, | and rape, are mentioned among the herbs and roots for the kitehen. There is nothing to be found in Tusser about serfs or bondmen, as in Fitzherbert's works. This

author's division of the erop is rather eurious, though probably quite inaeeurate, if he means that the whole reut might be paid by a tenth of the eorn.

"One part cast forth for rent due out of hand. One other part for seed to sow thy land. Another part leave parson for his tith. Another part for harvest, sickle and sith. One part for ploughwrite, cartwrite, knacker, and smith. One part to uphold thy teemes that draw therewith. Another part for servant and workman's wages laie. One part likewise for filbellie daie by daie. One part thy wife for needful things doth crave. Thyself and thy child the last part would have."

The next writer is Barnaby Googe, whose Whole Art of Googe, Husbandry was printed in 1578, and again by Markham 1978. in 1614. The first edition is merely a translation of a German work ; and very little is said of English husbandry in the seeond, though Markham made some trifling inter- polations, in order, as it is alleged, to adapt the German husbandry to the English climate. It is for the most part made up of gleanings from the aneient writers of Greeee and Rome, whose errors are faithfully retained, with here and there some deseription of the practices of the age, in whieh there is little of novelty or importanee. Googe mentions a number of English writers who lived about the time of Fitzherbert, whose works have not been preserved.

1 Some Considerations for the promoting of Agriculture and employ- ing the Poor. Dublin, 1723.

Plat, 1594.

Norden,

1618.

Butler on Bees, 1609.

SUMMARY. |

For more than fifty years after this, or till near the middle of the 17th century, there are no systematic works on husbandry, though several treatises on particular departments of it. From these it is evident that all the different operations of the farmer were performed with more care and correctness than formerly; that the fallows were bettcr worked, the fields kept freer from weeds, and much more attention paid to manures of every kind.

Sir Hugh Plat, in his Jewel House of Art and Nature, printed in 1594 (which Weston in his catalogue erroneously ascribes to Gabriel Plattes), makes some useful observations on manures, but chiefly collected from other writers. His censure of the practice of leaving farm dung lying scattered about is among the most valuable.

Sir John Norden's Surveyor's Dialogue, printed in 1607, and reprinted with additions in 1618, is a work of con- siderable merit. The first three books of it relate to the rights of the lord of the manor and the various tenures by which landed property was then held, with the obligations which they imposed. Among others, we find the singular custom, so humorously described in the Spectator, of the incontinent widow riding upon a ram. In the fifth book there are a good many judicious observations on the "different natures of grounds, how they may be employed, how they may be bettered, reformed, and amended." The famous meadows near Salisbury are mentioned ; and when cattle have fed their fill, hogs, it is pretended, "are made fat with the remnant—namely, with the knots and sappe of the grasse." " Clouer grasse, or the grasse honey suckle" (white clover), is directed to be sown with other hay seeds. "Carrot rootes" were then raised in several partsof England, and sometimes by farmers. London street and stable dung was carried to a distance by water, though it appears from later writers to have been got for the trouble of removing. And leases of 21 years are recommended for persons of smaH capital, as better than employing it in purchasing land,—an opinion that prevails very generally among our present farmers.

Bees seem to have been great favourites with these early writers ; and among others, there is a treatise by Butler, a gentleman of Oxford, called

the Feminine Monarchie, or the History of Bees, printed in 1609, full of all manner of quaintness and pedantry.

We shall pass over Markham, Mascall, Gabriel Plattes, and several other authors of this period, the best part of their writings being preserved by Blythe and Hartlib, of whom we shall say a little immediately. In Sir Richard Weston's Discourse on the Husbandry of Brabant and Flanders, published by Hartlib in 1645, we may mark the dawn of the vast improvements which have since been effected in Britain. This gentleman was ambassador from England to the elector palatine and king of Bohemia in 1619, and had the merit of being the first who introduced the great clover, as it was then called, into English agriculture, about 1645, and probably tumips also. His directions for the cultivation of clover are better than was to be expected. It thrives best, he says, when you sow it on the worst and barrenest ground, such as our worst heath ground is in England. The ground is to be pared and burnt, and unslacked lime must be addcd to the ashes. It is next to be well ploughed and harrowed; and about ten pounds of clover seed must be sown on an acre in April or the end of March. If you intend to preserve seed, then the second crop must be let stand till it come to a full and dead ripeness, and you shall have at the least five bushels per acre. Being once sown, it will last five years ; and then being ploughed, it will yield, three or four years together, rich crops of wheat, and after that a crop of oats, with which clover seed is to be sown again. It is in itself

an excellent manure, Sir Richard adds; and so it should Early

be, to enable land to bear this treatment. In less than ten years after its introduction, that is, before 1655, the cul- ture of clover, exactly according to the present method, seems to have been well known in England, and it had also made its way to Ireland.

A great many works on agriculture appeared during the time of the Commonwealth, of which Blythe's ZJmprover Improved and Hartlib's Legacy are the most valuable. The first edition of the former was published in 1649, and of the latter in 1650; and both of them were enlarged in

subsequent editions. In the first edition of the Zmprover Improved, no mention is made of clover, nor in the second of turnips, but in the third, published in 1662, clover is treated of at some length, and turnips are recommended as an excellent cattle crop, the culture of which should be extended from the kitchen garden to the field. Sir Richard Weston must have cultivated turnips before this; for Blythe says, that Sir Richard affirmed to himself he did feed his swine with them. They were first given boiled, but afterwards the swine came to eat them raw, and would run after the carts, and pull them forth as they gathered them,—an expression which conveys an idea of their being cultivated in the fields.

Blythe's book is the first systematic work in which there are some traces of the alternate husbandry so beneficially established since, by interposing clover and turnip betwecn culmiferous crops. He is a great enemy to commons and common fields, and to retaining land in old pasture, unless it be of the best quality. His description of the different kinds of ploughs is interesting ; and he justly recommends such as were drawn by two horses (some even by one horse), in preference to the weighty and clumsy machines which required four or more horses or oxen. Almost all the manures now used seem to have been then well known, and he brought lime himself from a distance of 20 miles. He speaks of an instrument which ploughed, sowed, and harrowed at the same time; and the setting of corn was then a subject of much discussion. 'It was not many years," says Blythe, " since the famous city of London petitioned the Parliament of England against two anusancies or offensive commodities, which were likely to come into great use and esteem; and that was Newcastle coal, in regard of their stench, &c., and hops, in regard they would spoyle the taste of drink, and endanger the people."

Hartlib's Legacy is a very heterogeneous performance, containing, among some very judicious dircctions, a great deal of rash speculation. Several of the deficiencies which the writer complains of in English agriculture must be placed to the account of our climate, and never have been or can be supplied. Some of his recommen- dations are quite unsuitable to the state of the country, and display more of general knowledge and good inten- tion than of either the theory or practice of agriculture. Among the subjects deserving notice may be mentioned the practice of steeping and liming seed

corn as a preven- tive of smut; changing every year the species of grain, and bringing seed corn from a distance ; ploughing down green crops as manure; and feeding horses with broken oats and chaff. This writer seems to differ a good deal from Blythe about the advantage of interchanging tillage and pasture. "Tt were no losse to this island," he says, "if that we should not plough at all, if so be that we could certainly have corn at a reasonable rate, and likewise vent for all our manufactures of wool ;" and one reason for this is, that pasture employeth more hands than tillage, instead of dc- populating the country, as was commonly imagined. The grout, which he mentions "as coming over to us in Hol- land ships," about which he desires information, was pro- bably the same with our present shelled barley ; and mills

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Works.

Blythe,

1649.

Hartlib,

1650.

Ray and Kvelyn.

Tillage,

1488.

Vagabonds.

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for manufacturing it were introduccd into Scotland from Holland towards the beginning of the last century.

To the third edition, published in 1655, are subjoined Dr Beatie's Annotations with the writer of the Legacy's answers, both of them ingenious, and sometimes instruc- tive. But this cannot be said of Gabriel Plattes's Mercu- rius Letificans, also added to this edition, which is a most extravagant production. There are also several communl- cations from Hartlib's different correspondents, of which the most intercsting arc those on the early cultivation and great value of clover. Hartlib himself does not appcar much in this collection; but he seems to have been a very useful person in editing the works of others, and as a collector of miscellaneous information on rural subjects. It is strange that neither Blythe nor Hartlib, nor any of Hartlib's correspondents, seem ever to have heard of Fitzherbert's works.

Among the other writers previous to the Revolution, we shall only mention Ray the botanist, and Evelyn, both men of great talent and rescarch, whose works are still in high estimation. A new edition of Evelyn's Silva and Terra was published in 1777 by Dr Hunter, with large notes and elegant engravings, and reprinted in 1812.

The preceding revicw commences with a period of feudal anarchy and despotism, and comes down to the time when the exertions of individual intcrest were protected and en- couraged by the firm administration of equal laws; when the prosperity of Great Britain was no longer retarded by in- ternal commotions, nor cndangered by hostile invasion.

Laws,

The laws of this period, in so far as they relate to agri- culture and rural economy, display a similar progress in improvement.

From the beginning of the reign of Henry VII. to the end of Elizabeth's, a number of statutes were made for the encouragement of tillage, though probably to little purpose. The great grievance of those days was the practice of laying arable land to pasture, and suffering the farm-houses to fall to ruin. ' Where in some towns," says the statute 4th Henry VII. (1488), 'two hundred persons were occupied and lived of their lawful labours, now there are occupied two or three herdsmen, and the residue fall into idleness ;" therefore it is ordained, that houses which within threc years have been

Ict for farms, with twenty acres of land lying in tillage or husbandry, shall be upheld, undcr the penalty of half the profits, to be forfeited to the king or the lord of the fee. Almost half a century after- wards, the practice had become still more alarming ; and in 1534 a new Act was tried, apparently with as little suc- cess. "Some have 24,000 sheep, some 20,000 sheep, some 10,000, some 6000, some 4000, and some more and some less ;" and yet it is alleged the price of wool had nearly doubled, "shccp being come to a few persons' hands." A penalty was therefore imposed on all who kept above 2000 sheep; and no person was to take in farm morc than two tencments of husbandry. By the 39th Elizabcth (1597), arable land made pasture since the lst Elizabcth shall be again converted into tillage, and what is arable shall not be converted into pasture.

Many laws werc enacted during this period against va- gabonds, as they were called ; and persons who could not find employment secm to have been sometimes confounded with thosc who really preferred idleness and plunder. The dissolution of the feudal system, and the suppression of thc monasteries, deprived a great part of the rural population of the mcans of support. They could not be employed in cultivating the soil, for there was no middle class of farmers possessed of capital to be vested in iunprovements ; and what little disposable capital was in the

hands of great proprictors could not, in those rude times, be so advantageously embarked in the expensive and pre- carious labours of growing corn, as in pasturage, which required much less skill and superintendence. Besides, there was a constant demand for wool on the Continent ; while the corn market was not only confincd by laws against exportation, but fettered by restrictions on the internal trade. The laws regarding the wages of labour and the price of provisions are a further proof of the ignorance of the age in regard to the proper subject of legislation.

By the statute 1552 it is declared, that any person that Forestal- shall buy merchandise, victual, &c., coming to market, ling, 1582, or make any

bargain for buying the same, before they:shall be in the market ready to be sold, or shall make any motion for enhancing the pricc, or dissuade any person from coming to market, or forbear to bring any of the things to market, &c., shall be deemed a forestaller. Any person who buys and sells again in the same market, or within four miles thereof, shall be reputed a regrater. Any person buying corn growing in the fields, or any other corn, with intent to sell again, shall be reputed an unlaw- ful ingrosser. It was also declared, that no person shall sell cattle within five weeks after hc had bought them. Licenses, indeed, were to be granted in certain cases, and particularly when the price of wheat was at or under 6s. 8d.

a quarter, and other kinds of grain in that proportion.

The laws regarding the exportation and importation of ComTrade. corn during this period could have had little effect in encouraging agriculture, though towards the latter part of it they gradually approached that system which was finally established at and soon after the Revolution. From the time of the above-mentioned statute against forestallers, which effectually preventcd exportation, as well as the freedom of the home trade, when corn was above thc price therein spccified, down to 1688, there are at least twelve statutes on this subject; and some of them are so nearly the same, that it is probable they were not very carefully observed. The price at which wheat was allowed to be exported was raised from 6s. 8d. a quarter, the price fixed by the 1st and 2d of Philip and Mary (1553), to 10s. in 1562; to 20s. in 1593; to 26s. 8d. in 1604; to 32s. in 1623; to 40s. in 1660; to 48s. in 1663; and at last, in 1670, exportation was virtually permitted without limita- tion. Certain duties, however, were payable, which in some cases seem to have amounted to a prohibition ; and until 1660 importation was not restrained even in years of plenty and cheapness. In permitting exportation, the object appears to have been revenue rather than the encouragement of production.

The first statute for levying tolls at turnpikes, to make Tolls,1662 or repair roads in England, passed in 1662.

Of the state of agriculture in Scotland in the 16th and Scotland, the greater part of the 17th century very little is known ; 16th and no professed treatise on the subject appeared till after the a Revolution. The south-castern

counties were the earliest improved, and yet in 1660 their condition scems to have becn very wretched. Ray, who made a tour along the eastern coast in that year, says, "We observed little or no. fallow ground in Scotland ; some ley ground we saw, which they manured with sca wreck. The men seemed to be very lazy, and may be frequently observed to plough in their cloaks. It is the fashion of them to wear cloaks when they go abroad, but especially on Sundays. They have neither good bread, cheese, nor drink. They cannot make them, nor will they learn, Their butter is very indifferent, and one would wonder how they could contrive to make it so bad. They use much pottage made of coal- wort, which they call Laz, sometimes broth of decorticated barley. The ordinary country-houses are pitiful cots, built of stone and covered with turfs, having in them but one

Houghton,

1681.

SUMMARY. |

room, many of them no chimneys, the windows very small holes, and not glazed. The ground in the valleys and plains bears very good corn, but especially bears barley or bigge, and oats, but rarely wheat and rye."

It is probable that no great change had taken place in Scotland from the end of the 15th century, except that tenants gradually became possessed of a little stock of their own, instead of having their farm stocked by the landlord, 'The minority of James V., the reign of Mary Stuart, the infancy of her son, and the civil wars of her grandson Charles I., were all periods of lasting waste. The very laws which were made during successive reigns for protecting the tillers of the soil from spoil, are the best proofs of the deplorable state of the husbandman."2

Yet in the 17th century were those laws made which paved the way for the present improved system of agri- culture in Scotland. By statute 1633, landholders were enabled to have their tithes valued, and to buy them either at nine or six years' purchase, according to the nature of the property. The statute 1685, conferring on landlords a power to entail their estates, was indeed of a very dif- ferent tendency in regard to its effects on agriculture.

But the two Acts in 1695, for the division of commons, and separation of intermixed properties, have facilitated in an eminent degree the progress of improvement.

Procress oF AGRICULTURE FROM 1688 To 1760.

From the Revolution to the accession of George IIT. the progress of agriculture was by no means so considerable as we should be led to imagine from the great exportation of corn, It is the opinion of well-informed writers,? that very little improvement had taken place, either in the cultivation of the soil or in the management of live stock, from the Restoration down to the middle of last century. Even clover and turnips, the great support of the present

'improved system of agriculture, were confined to a few

districts, and at the latter period were scarcely cultivated at all by common farmers in the northern part of the island, Of the writers of this period, therefore, we shall notice only such as describe some improvement in the modes of culture, or some extension of the practices that were formerly little known.

In Houghton's Collections on Husbandry and Trade, a periodical work begun in 1681, we have the first notice of turnips being eaten by sheep : —"Some in Essex have their fallow after turnips, which feed their sheep in winter, by which means the turnips are scooped, and so made capable to hold dews and rain water, which, by corrupting, imbibes the uitre of the air, and when the shell breaks it runs about and fertilises. By feeding the sheep, the land is dunged as if it had been folded; and those turnips, though few or none be carried off for human use, are a very excellent improvement, nay, some reckon it so though they only plough the turnips in without feeding."4 This was written in February 1694; but ten years before, Wor- lidge, one of his correspondents, observes, "Sheep fatten very well on turnips, which prove an excellent nourish- ment for them in hard winters when fodder is scarce ; for they will not only eat the greens, but feed on the roots in the ground, and scoop them hollow even to the very skin. Ten acres (he adds) sown with clover, turnips, &c., will feed as many sheep as one hundred acres thereof would before have done."5 ee hLhCLULULUtt —"CSCsCSCSSC'(RB

1 Select Remains of John Ray. ond. 1760.

- *Chalmers's Caledonia, vol. ii. p. 732.*

® Annals of Agriculture, No. 270. Harte's Essays. Comber on National Subsistence, Polel. j

ele ep a Collections on Husbandry and Trade, vol. i. p. 218,

5 Ibid. vol, iv. pp. 142-144,

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At this time potatoes were beginning to attract notice.

"The potato," says Houghton, 'is a bacciferous herb, with esculent roots, bearing winged leaves and a bell flower.

'This, I have been informed, was brought first out of Virginia by Sir Walter Raleigh ; and he stopping at Ireland, some was planted there, where it thrived very well, and to good purpose ; for in their succeeding wars, when all the corn above the ground was destroyed, this supported them; for the soldiers, unless they had dug up all the ground where they grew, and almost sifted it, could not extirpate them; from whence they were brought to Lancashire, where they are very numerous, and now they begin to spread all the kingdom over. They are a pleasant food boiled or roasted, and caten with butter and sugar. There is a sort brought from Spain, that are of a longer form, and are more luscious than ours ; they are much set by, and sold for sixpence or eightpence the pound.,"6

The next writer is Mortimer, whose Whole Art of Hus- Mortimer, bandry was published in 1706, and has since run through 1706.

several editions. It is a regular, systematic work, of con- siderable merit; and will even now repay perusal by the practical agriculturist. From the third edition of Hartlib's Legacy, we learn that clover was cut green, and given to cattle; and it appears that this practice of soiling, as it is now called, had become very common about the beginning of last century, wherever clover was cultivated. Rye-grass was now sown along with it.

Turnips were hand-hoed, and extensively employed in feeding sheep and cattle, in the same manner as at present.

The first considerable improvement in the practice of that Tull, 1731.

period was introduced by Jethro Tull, a gentleman of Berk- shire, who began to drill wheat and other crops about the year 1701, and whose Lorse-hoeing Husbandry, published in 1731, exhibits the first decided stepin advance upon the prin- ciples and practices of his predecessors. Not contented with acareful attention to details, Tull set himself, with admirable skill and perseverance, to investigate the growth of plants, and thus to arrive at a knowledge of the principles by which the cultivation of field-crops should be regulated. Having arrived at the conclusion that the food of plants consists of minute particles of earth taken up by their rootlets, it fol- lowed, that the more thoroughly the soil in which they grew was disintegrated, the more abundant would be the "pasture" (as he called it), to which their fibres would have access. He was thus led to adopt that system of sowing his crops in rows or drills, so wide apart as to admit of tillage of the intervals, both by ploughing and hoeing, being continued until they had well-nigh arrived at maturity.

As the distance between his rows appeared much greater than was necessary for the range of the roots of the plants, he begins by showing that these roots extend much far- ther than is commonly believed, and then proceeds to inquire into the nature of theirfood. After examining several hypo- theses, he decides this to be fine particles of earth. The chief, and almost the only use of dung, he thinks, is to divide the earth, to dissolve " this terrestrial matter, which affords nutriment to the mouths of vegetable roots;" and this can be done more completely by tillage. It is therefore ne- cessary not only to pulverise the soil by repeated ploughings before it be seeded, but, as it becomes gradually more and more compressed afterwards, recourse must be had to tillage while the plants are growing ; and this is hoeing, which also destroys the weeds that would deprive the plants of their nourishment.

The leading features of Tull's husbandry are his practice of laying the land into narrow ridges of five or six feet, and upon the middle of these drilling

one, two, or three rows, distant from one another about seven inches when there were three, and ten when only two. The distance of the

e Houghton's Collections on Husbandry and Trade, vol. ii. p. 468,

Tull, con- tinued.

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plants on one ridge from those on the contiguous one he called an interval ; the distance between the rows on the same ridge, a space or partition ; the former was stirred repeatedly by the horse-hoe, the latter by the hand-hoe.

The extraordinary attention this Ingenious person gave to his mode of culture is perhaps without a parallel :—

'1 formerly was at mueh pains," he says, "'and at some eharge in improving my drills for planting the rows at very near distances, and had brought them to such perfection, that one horse would draw a drill with eleven shares, making the rows at three inches and a half distance from one another ; and at the same time sow in them three very different sorts of seeds, whieh did not mix ; and these, too, at different depths. As the barley-rows were seven inches asunder, the barley lay four inches deep. A little more thau three inches above that, in the same channels, was elover ; betwixt every two of these rows was a row of St Foin, covered half an ineh deep.

"T had a good erop of barley the first year; the next year two crops of broad elover, where that was sown ; and where hop-clover was sown, a mixed erop of that and St Foin; but I am sinee, by experience, so fully eonvineed of the folly of these, or any other mixed erops, and more espeeially of narrow spaces, that I have demolished these instruments, in their full perfection, as a vain curiosity, the drift and use of them being contrary to the true principles and practice of horse-hoeing."' !

In the culture of wheat, he began with ridges six fect broad, or eleven on a breadth of 66 feet; but on this he afterwards had fourtecn ridges. After trying different num- bers of rows on a ridge, he at last preferred two, with

au intervening space of about 10 inches. He allowed only three pecks of seed for an acre. The first hoeing was per- formed by turning a furrow from the row, as soon as the plant had put forth four or five leaves; so that it was done before or at the beginning of winter. The next hoeing was in spring, by which the earth was returned to the plants. The subsequent operations depended upon the circunistances and condition of the land and the state of the weather. The next year's crop of wheat was sown upon the intervals which had been unoccupied the former year; but this he does not seem to think was a matter of much consequence.

" My field," he observes, "whereon is now the thirteenth crop of wheat, has shown that the rows may successfully stand upon any part of the ground. The ridges of this field were, for the twelfth erop, changed from six feet to four feet six inelies. In order for this alteration the ridges were ploughed down, and then the next ridges were laid out the same way as the former, but one foot six inehes narrower, and the double rows drilled ou their tops ; whereby, of eonsequence, there must be some rows standing on every part of the ground, both on the former partitions and on every part of the intervals. Notwithstanding this, there was no manner of difference in the goodness of the rows ; and the whole field was in every part of it equal, and the best, I believe, that ever grew on it. It is now the thirteenth erop, likely to be good, though the land was not ploughed crossways."?

It follows, from this singular management, that Tull thought a succession of crops of different species altogether unnecessary; and he labours hard to prove against Dr Woodward, that the advantages of such a change under his plan of tillage were quite chimcrical, though he seems to admit the benefit of a change of the seed itself.

In cultivating turnips he made the ridges of the same breadth as for wheat, but only one row was drilled on each. His management, while the crop was growing, differs very little from the present practice. When drilled on the level, it is impossible, he observes, to hoe-plough them so well aswhen they are planted upon ridges. But the seed was deposited at different depths, the half about four inches deep, and the other half exactly over that, at the depth of half an inch.

“Thus planted, let the weather be never so dry, the deepest seed will come up, but if it raineth immediatcly aftcr planting, the shallow will come up first. We also make it eome up at four times, by mixing our seed half new and half old, the new eoming up a day quicker than the old. These four comings up give it so

1 Horse-hoeing Husbandry, p. 62. Lond. 1762. ? Ibid. p. 424.

many ehanees for cseaping the fly ; it being often secn that the seed sown over night will be destroyed by the fly, when that sown the next morning will escape, and vice versa: or you may hoe-plough them when the fly is like to devour them ; this will bury the greatest part of these enemies : or clse you may drill in another row without new-ploughing the land.”

Drilling and horse and hand hoeing seem to have been in use before the publication of Tull’s book. “Hoeing,” he says, “may be divided into deep, which is our horse-hoeing ; and shallow, which is the English hand-hoeing; and also the shallow horse-hoeing used in some places betwixt rows, where the intervals are very narrow; as 16 or 18 inches. This is but an imitation of the hand-hoe, or a succedaneum to it, and can neither supply the use of dung nor fallow, and may be properly called scratch-hoeing.” But in his mode of forming ridges his practice seems to have beeu original ; his implements display much ingenuity ; and his claim to the title of father of the present horse-hoeing husbandry of Great Britain seems indisputable. A trans- lation of Tull’s book was undertaken at one and the same time in France, by three different persons of consideration, without the privity of each other. Two of them afterwards put their papers into the hands of the third, M. du Hamel du Monceau, of the Royal Academy of Sciences at Paris, who published a treatise on husbandry, on the principles of Mr Tull, a few years after. But Tull seems to have had very few followers in England for more than thirty years. The present method of drilling and horse-hoeing turnips was not introduced into Northumberland till about the year 1780 ;? and it was then borrowed from Scotland, the farmers of which had the merit of first adopting Tull’s management in the culture of this root about 1760.

From Scotland it made its way, but slowly, into the southern parts of the island.

Tull's doctrines and practices being quite in advance of his own times, were, as is usual in such cases, vehemently opposed by his contemporaries. He was, in consequence, involved in frequent controversy, in conducting which he occasionally showed an aspcrity of temper which excites our regret, but which is not to be wondered at, when we consider the trials of patience which he encountered from the unreasonable opposition of the agricultural community to his improvements; the thwarting of his experiments by his own labourers, who, in their ignorant zeal against inno- vations, wilfully broke his machines, and disregarded his orders; and from acute and protracted bodily disease. The soundness of his views and practice, as regards turnip culture, came by-and-by to be acknowledged, and have since been gencrally adopted. But it was only some twenty-five years ago that his full merit began to be under stood. The Rev. Mr Smith, in his Word in Season, about that time recalled attention to Tull's peculiar system of wheat culture in a way that startled the whole community ; while Professor Way, in a series of eloquent lectures delivered before the Royal Agricultural Socicty, showed that his science was true in the main, and even more strik- ingly ahead of his times than his practice.

Among the English writers of this period may be men- tioned Bradley, Lawrence, Hales, Miller, Ellis, Smith, Hill, Hitt, Lisle, and Home. Most of their works went through several editions in a few ycars,—at once a proof of the estimation in which they were held, and of the direction of the public mind towards investigating the principles and practice of agriculture.

Of the progress of the art in Scotland, till towards the Scotland: end of the 17th century, we are almost entirely ignorant. Progra ¥

The first work, written by Donaldson, was printed in 1697, under the title of L/usbandry Anatomized; or, an Inquiry into the Present Manner of Teiling and Manuring the

3 Northumberland Survey, p. 100.

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Donaldson,

1697.

SUMMARY. |

Ground in Scotland. It appears from this treatise, that the state of the art was not more advanced at that time in North Britain than it had been in England in the time of Fitzherbert. Farms were divided into infield and outfield ; corn crops followed one another without the intervention of fallow, cultivated herbage, or turnips, though something is said about fallowing the outfield; inclosures were very rare; the tenantry had not begun to emerge from a state of great poverty and depression ; and the wages of labour, compared with the price of corn, were much lower than at present ; though that price, at least in ordinary years, must appear extremely moderate in our times. Leases for a term of years, however, were not uncommon; but the want of capital rendered it impossible for the tenantry to attempt any spirited improvements.

Donaldson first points out the common management of that period, which he shows to have been very unproduc- tive, and afterwards recommends what he thinks would be a more profitable course.

"Of the dale ground," he says, "that is, such lands as are partly hills and partly valleys, of which sorts may be comprehended the greatest part of arable ground in this kingdom, I shall suppose a farmer to have a lease or tack of three score acres, at three hundred merks of rent per annum (£16, 18s. 4d. sterling). Perhaps some who are not acquainted with rural affairs may think this cheap; but those who are the possessors thereof think otherwise, and find difficulty enough to get the same paid, according to their prescnt way of manuring thereof. But that I may proceed to the comparison, I shall show how commonly this farm-room is managed. It is com- mouly divided into two parts, viz., one-third croft, and two-thirds outfield, as it is termed. The croft is usually divided into three parts: to wit, one-third barley, which is always dunged that year barley is sown thereon; another third oats; and the last third

eas. The outside field is divided into two parts, to wit, the one alf oats, and the other half grass, two years successively. The roduct which may be supposed to be on cach acre of croft, four Pails (three Winchester quarters), and that of the outfield, three (2} quarters); the quota is seven score bolls, which we shall also reckon at five pounds (8s. 4d.) per boll, cheap year and dcar year one with another. This, in all, is worth £700 (£58, 6s. 8d. sterling).

‘Then let us see what profit hc can make of his cattle. Accord- ing to the division of his lands there is 20 acres of grass, which cannot be expected to be very good, because it gets not leave to lie above two years, and therefore cannot be well swarded. How- ever, usually, besides four horses, which are kept for ploughing the said land, ten or twelve nolt are also kept upon a farm-room of the above-mentioned bounds; but, in respect of the badness of the grass, as said is, little profit is had of them. Perhaps two or threc stone of butter is the most that can be made of the milk of his kine the whole summer, and not above two heffers brought up each year. As to what profit may be made by bringing up young horses, I shall say nothing, supposing he keeps his stock good, by those of his own upbringing. The whole product, then, of his cattle cannot be reckoned above fifty merks (£2, 15s. 6d.) For, in respect his beasts arc in a manner half-starved, they are generally small; so that scarce may a heffer be sold at above twelve pounds (£1 sterling). The whole product of his farm-room, therefore, exceeds not the value of £733 (£61, 1s. 8d. sterling), or thereabout.”

The labourers employed on this farm were two men and one woman, besides a herd in suinmer, and other servants in harvest.

Donaldson then proceeds to point out a different mode of management, which he calculates to be more profit- able ; but no notice is taken of either clover or turnips as crops to be raised in his new course, though they are incidentally noticed in other parts of the work.

“I also recommend potatoes as a very profitable root for husband- men and others that have numerous families. And because there 1s a peculiar way of planting this root, not commonly known in this country, I shall here show what way it is ordinary planted or set. The ground must be dry; and so much the better it is if it have a good soard of grass. The beds or riggs are

made about eight foot broad, good store of dung being laid upon your ground; horse or sheep dung is the proper manure for them. "Throw each potatoe or sett (for they were sometimes cut into setts) into a knot of dung, and afterwards dig earth out of the furrows, and cover them all over, about some three or four inches deep ; the furrows lcft between your riggs must be about two foot broad, and little less will they

be in depth before your potatoes be covered. You nced not plant this root in your garden ; they are commonly set in the fields, and wildest of ground, for enriching of it." As to their consumption, they were sometimes " boiled and broken, and stirred with butter and new milk; also roasted, and eaten with butter; yea, some make bread of them, by mixing them with oat or barley meal; others parboil them and bake with them apples, after the manner of tarts."

There is a good deal in this little treatise about sheep, and other branches of husbandry; and, if the writer was well informed, as in most instances he appears to have been, his account of prices, of wages, and generally of the practices of that period, is very interesting.

The next work on the husbandry of Scotland is, Zhe Belhaven, Countryman's Rudiments, or an advice to the Farmers 1723.

in East Lothian, how to labour and improve thetr grounds, said to have been written by Lord Belhaven about the time of the Union, and reprinted in 1723. In this we have a deplorable picturc of the state of agriculture in what is now the most highly improved county in Scot- land. His lordship begins with a very high encomium on his own performance. "I dare be bold to say, there was never such a good easy method of husbandry as this, so succinct, extensive, and methodical in all its parts, published before." And he bespeaks the favour of those to whom he addresses himself, by adding, "neither shall I affright you with hedging, ditching, marling, chalking, paring, and burning, draining, watering, and such like, which arc all very good improvements indeed, and very agreeable with the soil and situation of East Lothian ; but I know ye cannot bear as yet a crowd of improvements, this being only intended to initiate you in the true method and principles of

husbandry." The farm- rooms in East Lothian, as in other districts, were divided into infield and outfield.

"The infield (where wheat is sown) is gencrally divided by the tenant into four divisions or breaks, as they call them, viz, ono of wheat, one of barley, one of pease, and one of oats, so that the wheat is sowd after the pease, the barley after the wheat, and tho oats after the barley. The outfield land is ordinarily made usc ot promiscuously for feeding of their cows, horse, sheep, and oxen; tis also dunged by their sheep who lay in earthen folds ; and some- times, when they have much of it, they fauch or fallow a part of it yearly."

Under this management the produce seems to have been three times the seed; and yet, says his lordship, "if in East Lothian they did not leave a higher stubble than in other places of the kingdom, their grounds would be in a much worse condition than at present they are, though bad enough."—" A good crop of corn makes a good stubble, and a good stubble is the equalest mucking that is." Among the advantages of inclosures, he obscrves, "you will gain much more labour from your servants, a great part of whose time was taken up in gathering thistles and other garbage for their horses to feed upon in their stables ; and thereby the great trampling and pulling up, and other destruction of the corns, while they are yet tender, will be prevented." Potatoes and turnips are recommended to bo sown in the yard (kitchen-garden). Clover does not seem to have been in usc. Rents were paid in corn; and, for the largest farm, which he thinks should employ no more than two ploughs, the rent was about six chalders of victual "when the ground is very good, and four in that which is not so good. But I am most fully convinced they should take long leases or tacks, that they may nat be straitened with time in the improvement of their rooms; and this is profitable both for master and tenant."

Such was the state of the husbandry of Scotland in the Society of early part of last century. The first attempts at improvement !™Provers.

cannot be traced farther back than 1723, when a number of land-holders formed themselves into a society, under the title of the Soceety of Improvers in the Knowledge of Agriculture

Maxwell,

1748.

First Threshing- Machine.

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im Scotland. The Earl of Stair, one of their most active members, is said to have been the first who cultivated turnips in that country. The Select Transactions of this society were collected and published in 1743 by Mr Maxwell, who took a large part in its proceedings. It is evident from this book that the society had exerted itself in a very laudable manner, and apparently with considerable success, in introducing cultivated herbage and turnips, as well as in improving the former methods of culture. But there is reason to believe that the influence of the example of its numerous members did not extend to the common tenantry, who are always unwilling to adopt the practices of those who are placed in a higher rank, and supposed to cultivate land for pleasure rather than profit. Though this society, the earliest probably in the United Kingdom, soon counted upwards of 300 members, it existed little more than 20 ycars. Maxwell delivered lectures on agriculture for one or two scssions at Edinburgh, which, from the specimen he has left, ought to have been encouraged.

In the introductory paper in Maxwell's collection, we are told, that—

"The practice of draining, inelosing, summer fallowing, sowing flax, hemp, rape, ee and grass seeds, planting eabbages after, and potatoes with, the plough, in fields of great extent, is introduced ; and that, according to the general opinion, more corn grows now yearly where it was never known to grow before, these twenty years last past, than perhaps a sixth of all that the kingdom was in use to prodnee at any time before."

In this work we find the first notice of a threshing- machine: it was invented by Mr Michael Menzies, advo- cate, who obtained a patent for it. Upon a representation made to the society that it was to be scen working in several places, they appointed two of their number to in- spect it; and in their report they say, that one man would be sufficient to manage a machine

which would do the work of six. One of the machines was "moved by a great water-wheel and triddles," and another "by a little wheel of three feet diameter, moved by a small quantity of water." This machine the society recommended to all gentlemen aud farmers.

The next work is by the same Mr Maxwell, printed in 1757, and entitled the Practical Husbandman; being a collection of miscellaneous papers on Husbandry, &e. In this book the greater part of the Select Transactions is re- published, with a number of new papers, among which, an Essay on the Husbandry of Scotland, with a proposal for the improvement of it, is the most valuable. In this he lays it down asa rulc, that it is bad husbandry to take two crops of grain successively, which marks a consider- able progress in the knowledge of modern husbandry ; though he adds, that in Scotland the best husbandmen after a fallow take a crop of wheat ; after the wheat, peas ; then barley, and then oats; and after that they fallow again. The want of inclosures was still a matter of complaint. The ground continued to be cropped so long as it produced two seeds; the best farmers werc contented with four seeds, which was more than the general produce.

The first Act of Parliament for collecting tolls on the highway in Scotland was passed in 1750, for repairing the road from Dunglass bridge to Haddington. In ten years after, several Acts followed for the counties of Edin- burgh and Lanark, and for making the roads between Edinburgh and Glasgow. The benefit which agriculture has derived from good roads it would not be easy to esti- mate. The want of them was one great cause of the slow progress of the art in former times.

The Revolution in 1688 was the epoch of that system of corn laws to which very great influence has been ascribed, both on the practice of agriculture and the general pro-

sperity of the country. But for an account of these and later statutes on the subject, we must refer to the article Corn Laws.

The exportation of wool was prohibited in 1647, in 1660, and in 1688; and the prohibition strictly enforced by subsequent statutes. The effect of this on its price, and the state of the wool trade, from the earliest period to the middle of last century, are distinctly exhibited by the learned and laborious author of Memoirs on Wool, printed in 1747,

CHAPTER II. RECENT BRITISH AGRICULTURE. Section 1.—Progress during the Eighteenth Century.

Before entering upon a description of the agriculture of Great Britain at the present day, it may help to set matters in a clearer light if we take just so much of a retrospect as will serve as a back-ground to our picture.

At the beginning of the 18th century the agriculture of our country was still of the rudest kind. With the exception of certain parts of England, the land was still for the most part unenclosed, the live stock of each township grazing together, and the arable land being occupied in common field or run-rig. The practice of fallowing annually a portion of the arable land, and of interposing a crop of peas betwixt the cereal crops, was becoming a common practice, and was a great improvement upon the previous and yet common usage of growing successive corps of white-corn until the land was utterly exhausted, when it was left to recruit itself by resting in a state of nature, while other portions were undergoing the same process. Clover and turnips had been introduced before this date, and were coming gradually into cultivation as field crops in the more advanccd parts of England. Potatoes were commonly grown in gardens, but had not yet found their way to the fields. /

The gradual advance in the price of farm produce soon after the year 1760, occasioned by the increase of population and of wealth derived from manufactures and commerce, gave a powerful stimulus to rural industry, augmented agricultural capital, and called forth a more skilful and enterprising race of farmers. The arable lands of the country, which, under the operation of the feudal system, had been split up into minute portions, cultivated by the tenants and their families without hired labour, began now to be consolidated into larger holdings, and let to those tenants who possessed most energy and substance. This enlargement of farms, and in Scotland the letting of them under leases for a considerable term of years,

continued to be a marked feature in the agricultural progress of the country until the end of the century, and is to be regarded both as a cause and a consequence of that progress. The passing of more than 3000 inclosure bills during the reign of Geo. III., before which the whole number was but 244, shows how rapidly the cultivation of new land now proceeded. The disastrous American war for a time interfered with the national prosperity; but with the return of peace in 1783, the cultivation of the country made more rapid progress. The quarter of a century immediately following 1760, is memorable in our agricultural annals for the introduction of various important improvements. It

was during this period that the genius of Bakewell produced Bakewell.

such an extraordinary change in the character of our more important breeds of live stock; but especially by the perfecting of a new race of sheep —the well-known Leicesters —which have ever since proved such a boon to the country, and have added so much to its wealth. Bakewell's fame as a breeder was for a time cnhanced by the improvement which he effected on the long-horned cattle, then the

PROGRESS. |

prevailing breed of the midland counties of England. These, however, were ere long rivalled, and have now been entirely superseded by the shorthorn or Durham breed, which the brothers Colling obtained from the useful race of cattle that had long existed in the valley of the Tees, by applying to them the principle of breeding which Bakewell had already established. A more rational system of cropping now began very generally to supersede the thriftless and barbarous practice just referred to of sowing successive crops of corn until the land was utterly exhausted, and then leaving it foul with weeds, to recover its power by ap indefinite period of rest. Green crops, such as turnips, clover, and ryegrass, began to be alternated with grain crops, and hence the name alternate husbandry, by which this improved system is generally known. The land was now also generally rendered clean and mellow by a summer fallow before being sown with clover or grasses.

Hitherto the husbandry of England had been very superior in every respect to that of Scotland. Improvements now, however, made rapid progress in the

latter. Mr Dawson, at Frogden, in Roxburghshire, is believed to have been the first who grew turnips as a field crop to any extent. This enterprising farmer having heard of the success with which this crop was cultivated in certain parts of England, took the precaution of seeing for himsclf the most approved mode of doing so before attempting to introduce it on his own farm. He accordingly went to Leicestershire, and presenting himself to the celebrated Bakewell in the garb of a Scotch ploughman, hired himself to him for six months in that capacity. Having in this thoroughly practical way acquired the knowledge he was in quest of, he told his employer (who would fain have retained him longer) that it was full time for him to be home to his own large farm. The season was too advanced to admit of his doing more that year than sow a few experimental drills, but the very next year he is said to have sown 70 acres. We have been unable to ascertain the exact date of this occurrence, but it is on record that as early as 1764 Mr Dawson had 100 acres of drilled turnips on his farm in one year.

A few years after this the Messrs Culley—one of them also a pupil of Bakewell—left their paternal property on the banks of the Tees, and settled on the Northumbrian side of the Tweed, bringing with them the valuable breeds of live stock and improved husbandry of their native district. The improvements introduced by these energetic and skilful farmers spread rapidly, and exerted a most beneficial influence upon the border counties. An Act passed in 1770, which relaxed the rigour of strict entails, and afforded power to landlords to grant leases and other- wise improve their estates, had a beneficial effect on Scottish agriculture. From 1784 to 1795 improvements advanced with steady steps. This period was distinguished for the gencral adoption and industrious working out of ascertained improvements. Small's swing plough, and Meikle's thrash- ing-machine, although invented some years before this, were now perfected and brought into general use, to the great furtherance of agriculture. Two important additions were about this time made to the field crops, viz., the Swedish turnip and potato oat. The latter was accidentally discovered in 1788, and both soon came into general cultivation. In the same year Merino sheep were intro- duced by his Majesty, George III., who was a zealous farmer. For a time this breed attracted much attention, and sanguine expectations were entertained that it would prove of national importance. Its unfitness

for the pro- duction of mutton, and increasing supplies of fine clothing wool from other countries, soon led to its total rejection.

In Scotland, the opening up of the country by the construction of practicable roads, and the enclosing and

subdividing of farms by hedge and ditch, was now in active progress. The former adfnitted of the gencral use of wheel-carriages, of the réady conveyance of produce to markets, and in particular, of the extended use of lime, the application of which was immediately followed by a great increase of produce. The latter, besides its more obvious advantages, speedily freed large tracts of country from stagnant water, and their inhabitants from ague, and prepared the way for the under-ground draining which soon after began to be practised.

Section 2.—Remarkable progress from 1795 to 1815.

The agriculture of the country was thus steadily improv- ing, when suddenly the whole of Europe became involved in the wars of the French Revolution. In 1795, under the joint operation of a deficient harvest, and the cutting off of foreign supplies of grain by the policy of Napoleon, the price of wheat, which, for the twenty preceding ycars, had been under 50s. a quarter, suddenly rose to 81s. 6d., and in the following year reached to 96s. In 1797 the fear of foreign invasion led to a panic and run upon the banks, in which emergency the Bank Restriction Act, suspending cash payment, was passed, and ushered in a system of unlimited credit transactions. Under the un- natural stimulus of these extraordinary events, every branch of industry extended with unexampled rapidity. But in nothing was this so apparent as in agriculture ; the high prices of produce holding out a great inducement to improve lands then arable, to reclaim others that had previously lain waste, and to bring much pasture-land under the plough. Nor did this increased tillage interfere with the increase of live stock, as the green crops of the alternate husbandry more than compensated for the dimi- nished pasturage. This extraordinary state of matters lasted from 1795 to 1814; the

prices of produce even increasing towards the close of that period. The average price of wheat for the whole period was 89s. 7d. per quarter ; but for the last five years it was 107s., and in 1812 it reached to 126s. 6d. The agriculture of Great Britain, as a whole, advanced with rapid strides during this period ; but nowhere was the change so great as in Scotland. Indeed, its progress there, during these twenty years, is probably without parallel in the history of any other country. This is accounted for by a concurrence of circumstances. Previous to this period, the husbandry of Scotland was still in a backward state as compared with the best districts of England, where many practices, only of recent introduction in the north, had been in general uso for generations. This disparity made the subsequent contrast the more striking. The land in Scotland was now, with trifling exceptions, let on leases for terms varying from twenty to thirty years, and in farms of sufficient size to employ at the least two or three ploughs. The unlimited issues of Government paper, and the security afforded by these leases, induced the Seotch banks to afford every facility to landlords and tenants to embark capital in the improvement of the land. The substantial cducation supplied by the parish schools, of which nearly the whole population could then avail themselves, had diffused through all ranks such a measure of intelligence as enabled them promptly to discern, and skilfully and energetically to take advantage of this spring-tide of prosperity, and to profit by the agricultural information now plentifully furnished by means of the Bath and West of England Society, established in 1777, the Highland Society, instituted in 1784, and the National Board of Agriculture, in 1793-— of which, however, more anon. As one proof of the astonishing progress of Scottish husbandry during this period, we may mention that the rental of land, which in 1795 amounted to £2,000,000, had in 1815 risen to

£5,278,685, or considcrably more than double in twenty years.

But of the causes which have influenced the agriculture of the period under review, none have been so powerful as the extraordinary increase of our population, which, in round numbers, has twice doubled during the past seventy years. Not only are there four times as many people requiring to be fed and clad now as there were then, but from the increased wealth and

altered habits of the people, the individual rate of consumption is greater now than formerly. This is particularly apparent in the caseof butcher-meat, the consumption of which has increased out of all proportion to that of bread-corn. To meet this demand, there behoved to be more green crops and more live stock ; and from that has resulted more wool, more manure, and more corn. While this ever-growing demand for farm- produce has stimulated agricultural improvement, it has also operated in another way. The productiveness of the soil has been greatly increased, and will no doubt be still more so in future; but the area of the country cannot be increased. Land—the raw material from which food is produced—being thus limited in amount and in increasing demand, has necessarily risen in price. So much is this the case, that whereas the average price of wheat for the five years preceding 1872 was £2, 15s. per quarter, or £2, 7s. 6d. less than during the five years preceding 1815, the rent of Jand is much higher now than it was then. The raw material of the food-grower having thus risen in price, his only resource has been to fall upon plans for lowering the cost of producing his crops and for increasing their amount. To such an extent has he succeeded, that the produce market has been kept full, and prices have decreased. The business of farming has in the main been a less prosperous one than most other branches of national industry, and yet agriculture, as an art and as a science, has made steady progress. We believe it is only in this way that the contemporaneous existence of two things apparently so incompatible as a steady rise in the rent of land, and a steady decrease in the price of its produce, can be satisfactorily accounted for.

PROGRESS SINCE 1816. Section 3.—Laws affecting Agriculture.

The abundant crop of 1813, and restored communication with the continent of Europe in the same year, gave the first check to these unnaturally exorbitant prices and rents. The restoration of peace to Europe, and the re-enactment of the Corn Laws in 1815, mark the commencement of another era in the history of our national agriculture. It was ushered in with a time of severe depression and suffering to the agricultural community. The immense fall in the price of farm-produce which then took place was aggravated, first, by the unpropitious weather and deficient harvest of the years 1816, 1817; and still more by the passing in 1819 of the Bill restoring cash payments, which, coming into operation in 1821, caused serious

embarrassment to all persons who had entered into engage- ments at a depreciated currency, which had now to be met with the lower prices of an enhanced one. The much- debated Corn Laws, after undergoing various modifications, and proving the fruitful source of business uncertainty, social discontent, and angry partizanship, were finally abolished in 1846, although the Act was not consummated until three years later. Several other Acts of the Legis- lature, passed during this period, have exerted an important influence on agriculture. Of these, the first in date and importance is the Tithe Commutation Act of 1836. All writers on agriculture had long concurred in pointing out the injurious effects on agriculture of the tithe system as it then stood. The results of the change have amply

verified the anticipations of those who were instrumental in procuring it. Since the removal of this formidable hindrance, improvement has been stimulated by those Acts under which the Government has been empowcred to advance money on certain conditions for the draining of estates. An important feature in these advances is, that the 64 per cent. of interest charged upon them provides a sinking fund by which the debt is extinguished in twenty- two years. Additional facilities have also been granted by the Act passed in 1848 for disentailing estates, and for burdening such as are entailed with a share of the cost of certain specified improvements.

Section 4.—Cattle Murrain and Potato Disease.

Another class of outward events, which has had an important influence upon agriculture, requires our notice. We refer to those mysterious diseases affecting both the animal and vegetable kingdoms, the causes and remedies for which have alike baffled discovery. The murrain, or "vesicular epizootic," appeared first in 1841, having been introduced, as is supposed, by foreign cattle. It spread rapidly over the country, affecting all our domesticated animals, except horses, and causing everywhere great alarm and loss, although seldom attended by fatal results. It has prevailed ever since, in a greater or less degree, and has been more widely diffused as well

as more virulent in 1871 and 1872 than ever before. It was soon followed by the more terrible lung-disease, or pleuro-pneumonia, which continues to cause serious mortality among our herds. In 1865 the rinderpest, or steppe murrain, origi- nating amongst the vast herds of the Russian steppes, where it would appear to be never altogether wanting, had spread westward over Europe, until it was brought to London by foreign cattle. Several weeks elapsed before the true character of the disease was known, and in this brief space it had already been carried by animals purchased in Smithfield market to all parts of the country. After causing the most frightful losses, it was at last stamped out by the resolute slaughter of all affected animals and of all that had been in contact with them. In the autumn of 1872 this cattle plague was again detected in several cargoes of foreign cattle brought to our ports. Happily the stringent provisions of the Contagious Diseases (Animals) Act had the effect of preventing its entrance, except in the case of one cargo brought to Hull, from which the plague was conveyed to several herds in the adjacent parts of Yorkshire, and caused considerable losses before it was again stamped out. Severe as have been the losses in our flocks and herds from these imported diseases, they have been as nothing in comparison with the cffects of the mysterious potato blight, which, first appearing in 1845, has since pervaded the whole of Europe, and in Ireland especially proved the sad precursor of famine and pestilence. This seemingly insignificant blight for a time well-nigh withdrew from cultivation one of our most esteemed field crops ; it influences the business of farming in a way that baffles the shrewdest calculators, and is producing social changes of which no man can predict the issue.

Section 5.——Leading Improvements.

We can here do little more than enumerate some of the more prominent improvements in practical agriculture which have taken place during the period under review. Before the close of the past century, and during the first quarter of the present one, a good deal had been done in the way of draining the land, either by open ditches, or by Elking- ton's system of deep covered drains. This system has now been superseded by one altogether superior to it both in principle and practice. In 1835, James Smith of Deanston (honour to his memory !) promulgated his now well-known

system of thorough draining and deep ploughing. It has been carried out already to such an extent as to alter the very appearance and character of whole districts of our country, and has prepared the way for all other improvements. The words " Portable Manures" indicate at once another prominent feature in the agriculture of the times. arly in the present century, ground bones began to be used as a manure for turnips in the eastern counties of England, whence the practice spread, at first slowly, and then very rapidly, over the whole country. It was about 1825 that bones began to be generally used in Scotland. In 1841 the still more potent guano was introduced into Great Britain ; and about the same time, bones, under the new form of superphosphate of lime. By means of these invaluable fertilisers, a stimulus has been given to agri- culture which can scarcely be over-rated.

The labour of agriculture has been greatly lightened, and its cost curtailed, by means of improved implements and machines. 'The steam-engine has taken the place of the jaded horses as a thrashing power. This was first done in East Lothian by Mr Aitchison of Drumore, who about 1803 had his thrashing-machinery, at his distillery and farm of Clement's Wells, attached to a steam-engine, which was erected for him a few years previously by Bolton and Watt, for the works of the distillery. About 1818-20 several steam-engines on the condensing principle were erected in East Lothian, solely for the propelling of thrashing-machinery. One of these, put up by Mr Reid of Drem, at a cost of £600, is still doing its work there, and, strange to say, after the lapse of fifty-five years, looks as well and is as efficient as when first erected. It would be tedious to particularise other instances in this department, as it will be treated of fully in its proper place. It is especially in this department that the influence of the ever- memorable Exhibition of the Industry of all Nations in 1851 has told upon agriculture. Reaping by machinery may virtually be regarded as one of the fruits of that great gathering.

The railways, by which the country is now intersected in all directions, have proved of great service to farmers, by conveying their bulky produce to distant markets cheaply and quickly, and by making lime and other manures

available to the occupiers of many inland and remote districts. In nothing has this benefit been more apparent than in the case of fatted live stock, which is now invariably transported by this means, with manifest economy to all concerned.

During the whole of this period there has been going on great improvement in all our breeds of domesticated animals. This has been manifested not so much in the production of individual specimens of high merit—in which respect the Leicesters of Bakewell, or the short-horns of Colling, have perhaps not yet been excelled—as in the diffusion of these and other good breeds over the country, and in the improved quality of our live stock as a whole. The fattening of animals is now conducted on more scientific principles. Inereased attention has also been successfully bestowed on the improvement of our field crops. Improved varieties, obtained by cross-impregnation, either naturally or arti- ficially brought about, have been carefully propagated, and generally adopted. Increased attention is now bestowed on the cultivation of the natural grasses. The most important additions to our list of field crops during this period have been Italian rye-grass, winter beans, white Belgian carrot, sugar beet, and alsike clover.

Section 6.—Increase and Diffusion of Agricultural Knowledge.

Let us look now at the means by which, during this period, agricultural knowledge has at once been increased

and diffused. Notice has already been taken of the institution of the Highland Society and the National Board of Agriculture. These patriotic societies were the means of collecting a vast amount of statistical and general informa- tion connected with agriculture, and by their publications and premiums made known the practices of the best-farmed districts of the country, and encouraged their adoption elsewhere. These national associations were soon aided in their important labours by numerous local societies which sprang up in all parts of the kingdom. After a highly useful career, under the zealous presidency of Sir John Sinclair, the Board of Agriculture was dissolved, but has left in its Statistical Account, county surveys, and other documents, much interesting and valuable information

regarding the agriculture of that period. In 1800 the original Farmers' Magazine entered upon its useful career under the editorship of Robert Brown of Markle, the author of the well-known treatise on Rural Affairs. The Highland Society having early extended its operations to the whole of Scotland, by-and-by made a corresponding addition to its title, and as the Highland and Agricultural Society of Scotland continues to occupy its important sphere with a steadily increasing membership, popularity, and usefulness. As its revenue and experience increased, it gradually extended its operations. In 1828, shortly after the discontinuance of the Farmers' Magazine, its Prize Essays and Transactions began to be issued statedly in connection with the Quarterly Journal of Agriculture, a periodical which until recently occupied a prominent place in our professional literature. This society early began to hold a great annual show of live stock, implements, &c., the popularity of which continues unabated. In 1842, Mr. John Finnie at Swanstone, near Edinburgh, having sng- gested to some of his neighbours the desirableness of obtaining the aid of chemistry to guide farmers in many departments of their business, the hint was promptly acted upon, and these Mid-Lothian tenant-farmers had the merit of originating an Agricultural Chemistry Association (the first of its kind), by which funds were raised, and an eminent chemist engaged, for the express purpose of con- ducting such investigations as the title of the society implies. After a successful trial of a few years this association was dissolved, transferring its functions to the Highland and Agricultural Society, which has ever since devoted much of its attention to this subject. The nature and impor- tance of the services which labourers in this department of science have rendered to agriculture may be gathered from the society's Transactions, and numerous other pub- lications of a similar kind. The Highland Society has of late years established itself on a broader basis, and imparted new energy to its operations by lowering its admission- fee in behalf of tenant-farmers, who have in consequence joined it in great numbers, and now take an important part in the conduct of its business. The practice adopted by it, about the same time, of holding periodical meetings for the discussion of important practical questions, by means of essays, prepared by carefully selected writers, did good service, too, to the cause of agricultural progress.

The adoption by Government of a proposal made by this society, to collect the agricultural statistics of Scotland, showed at once how thoroughly it

enjoyed the confidence of the tenantry, and how easily, and by what simple and inexpensive machinery, this most important and interesting inquiry could be conducted. Through an unfortunate misunderstanding between the Government and the socicty on a mere technical point, this most useful inquiry came to an abrupt termination, after having been conducted for five years. This brief experiment had, however, proved so conclusively the value of such statistics, and the ease with which they could be collected, that the Government soon

after took the matter in hand, and has ever since, through the agency of the officers of Inland Revenue, obtained annual returns of cropping and live stock for the whole of Great Britain.

The obvious success of this National Scottish Society has led to the formation of similar ones in England and in Treland. The former, instituted in 1838, and shortly afterwards incorporated by royal charter, at once centered upon a carcer of usefulness, the extent of which cannot well be over-rated. Its membership—comprising the most influential persons in the kingdom—and its revenues are iow so large as to enable it to conduct its proceedings on a scale befitting its position and objects. These are of a varicd character, but its efforts are concentrated upon its journal and annual show. The former, published twice a-year, is chiefly composed of the essays and reports to which the liberal prizes of the society have been awarded, and undoubtedly stands at the head of our present agri- cultural periodicals. At the annual shows of the society, a prominent place is assigned to implements and machines. Such as admit of it, are subjected to comparative trials, which are conducted with such skill and pains that the awards command the entire confidence of exhibitors and their customers. The extent and rapidity of the im- provement in agricultural machinery which the society has been mainly instrumental in effecting are altogether extraordinary.

There are few market towns of any importance that have not their organised club or occasional gathering of the farmers in their neighbourhood, for the discussion of professional topics. We have now also a goodly list of agricultural periodicals, both weekly and monthly, most of them ably conducted, which are extensively read, and are the means of collecting and diffusing much valuable know- ledge, which, but for them, would often, as in former times, perish with its authors, or be confined to corners. The facilities now afforded by railways for cheap and expeditious travelling, induce most farmers to take an occasional peep at what is going on beyond their own neighbourhood. This, more than anything, deals death-blows to prejudices, and extends good husbandry.

The literature of agriculture has been enriched by the contributions of many able writers, Some deserve to be particularly mentioned. The volumes of the late David Low, Esq., ou Practical Agriculture, Landed Property and Economy of Landed Estates, and Domesticated Animals, must ever be of standard authority on their respective subjects. Mr Henry Stephens' Book of the Farm, and Mr J. ©. Morton's Cyclopedia of Agriculture, are invaluable to the agricultural student for their fulness, and for the minuteness of their details. Mr Caird's Lnglish Agriculture supplies the mcans for a most interesting comparison with the descriptions left tous by Arthur Young. Mr Hoskyn's History of Agriculture and Chrontcles of a Clay Farm are the very gems of our professional literature. In a series of essays on our Farm Crops by Professor John Wilson of Edinburgh, the scientific and the practical are most happily combined. Among the more recent publications of value may be mentioned Loudon's Hncyclopedia ; How Crops Grow, by Mr Johnson; M'Combie's Cattle and Cattle-Breeders ; Mechi's How to Farm Profitably; Hozier's Practical Remarks on Agricultural Drainage; Todd's American Wheat Culturist, &c. Johnston, Anderson, Way, and Voelcker, have done admirable service in expound- ing the chemistry of agriculture; Youatt, Spooner, and Vasey, its zoology; and Smith, Parkes, Webster, Bailey, Denton, Scott Burn, and Starforth, its engineering, mechanics, and architecture.

In reviewing the history of our national agriculture for the past sixty years, it is pleasing to note the growing

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intelligence displayed by our agriculturists in the prose- cution of their calling. It is curious, also, to observe the analogy between the order of that progress, and that which is usually observed in individual minds. For a long time

we see agricultural societies and writers occupying them-

selves chiefly about the practical details and statistics of

husbandry, and attaching much importancetoempirical rules.

Gradually, however, we observe, along with a zealous collecting of facts, a growing disposition to investigate the causes of things, and desire to know the reason why one practice is preferable to another. When, therefore, the Royal Agricultural Society adopted as its motto, ‘ Practice with Science,” it expressed not more the objects to be aimed at in its own proceedings, than the characteristic feature. of our present stage of agricultural progress.

CHAPTER III. PRACTICE OF BRITISH AGRICULTURE.

We shall now endeavour to present a picture of British agriculture in its present state. In doing this, we shall take much the same course which we should pursue, if we were asked to conduct a visitor over our own farm, and to give him a detailed account of its cultivation and manage- ment. In the case supposed, we should, first of all, explain to him that the farm comprises a great diversity of sodls ; that its fields are very variously circumstanced as regards climate, altitude, exposure, and distance from the home- stead; and that in its ¢tdlage, cropping, and general management, regard must be had to these diversities, whether natural or artificial We should then conduct him through the homestead, pointing out the position and uses of the various farm buildings and of the machinery and implements contained in them. From thence we should proceed to the fields to examine their fences and the tillage operations. With some observations about the succession of crops, and the manures applied to them, there

would follow an examination of the cultivated crops, pastures, and meadows, of the live stock of the farm, and of the measures adopted in reclaiming certain waste lands belong- ing to it. This survey being completed, there would naturally follow some discussion about the tenure of land, the capital required for its profitable cultivation, the con- dition of farm labourers, the necessity for devoting more attention to the education of the agricultural community, and the duty of the Legislature to remove certain obstruc- tions to agricultural improvement.

Section 1.—Soils.

The soil constituting the subject-matter on which the husbandman operates, its character necessarily regulates to a large extent the nature of his proceedings. The soil or surface covering of the earth in which plants are produced is exceedingly varied in its qualities. Being derived from the disintegration and decomposition of the rocks which constitute the solid crust of the globe, with a mixture of vegetable and animal remains, soils take their character from that of the rocks from which they have chiefly been derived. There is thus a generally prevailing resemblance between the soils of a district and the rocks over which they lie, so that a knowledge of the composition of the one affords a key to the character of the other. But this connection is modified by so many circumstances, that it is altogether impossible by the mere study of geology to acquire an easy and certain rule for determining the agricultural character of the soil of any particular district or field, as it has been the fashion with some writers of late years to assert. 'When, indeed, we regard a considerable tract of land, we can for the most part trace a connection between the subjacent deposits and the subsoil, and consequently the soil. Thus, in a country of

sandstone and arenaceous beds, we shall find the soil sandy; in one of limestone, more or less calcareous; in one of schistose rocks, more or less clayey. But even in tracts of the same geological formation, there exist great differences in the upper stratum, arising from the prevalence of one or other member of the series, or from the greater or less inclination of the strata, by which the debris of the different beds are more or less mixed together on the surface. The action of water, too, in denuding the surface at one part, and

carrying the debris in greater or smaller quantity to anothcr, exercises everywhere an important influence on the character of soils. Thus the fertility of a soil on the higher ground, from which the earthy particles are washed, is found to be very different from that of the valley to which these particles are carried. It is seen accordingly, that within the limits of the same geological formation, soils are greatly varied, and that the mere knowledge of the formation will not enable us to predicate the character of the soil of any given tract, either with respect to its texture, its composition, or its productiveness."! Even a very limited acquaintance with the geology of Great Britain serves, however, to account for the exceed- ingly diversified character of its soils. The popular defini- tions of soils—aud to these it is safest for practical farmers to adhere—have respect to their most obvious qualities. Thus they are designated from their composition, as clays, loams, sands, gravels, chalks, or peats; or from their texture, in which respect those in which clay predominates are called heavy, stif', or impervious; and the others light, Friable, or porous. From the tendency of the former to retain moisture they are often spoken of as wet and cold, and the latter, for the opposite reason, as dry and warm. According to their measure of fertility, they are also described as rich or poor. The particular crops for the production of which they are respectively considered to be best adapted have also Jed to clays being spoken of as wheat or bean soils, and the friable ones as barley and turnip souls, This latter mode of discriminating soils is, however, becoming every day less appropriate; as those of the lighter class, when sufficiently enriched by suitable manuring, are found the most suitable of all for the growth of wheat; while the efforts of agriculturists are now successfully directed to the production of root crops on soils so strong as heretofore to have been reckoned unfit for the purpose. But still, such extreme diversities as we everywhere meet with in our soils must necessarily lead to a corresponding diversity in their agricultural treatment, and hence the necessity for keeping this fact prominently in view in every reference to British agriculture as a whole.

Section 2.—Injluence of Climate.

But if diversity of soil necessarily modifies the practice of the husbandman, that of climate does so far more powerfully. The soils of the different parts of the globe do not very materially differ from each other, and yet their

vegetable products vary in the extreme. This is chiefly owing to difference of temperature, which decreases more or less regularly as we recede from the equator, or ascend from the sea-level. Places in the same latitude and at the same elevation are found, however, to vary exceedingly in temperature, according to their aspect, the prevailing winds to which they are exposed, their proximity to seas or mountains, and the condition of their surface. The different parts of Great Britain are accordingly found to possess very different climates. In passing from south to north, its mean temperature may be taken to decrease one degrce Fahrenheit for every 80 miles of latitude, and the same

1 Low's Practical Agriculture, p. 42.

for every 300 feet of elevation. The temperature of the west side of our island also differs materially from that of the east, being more equal throughout the year. This is owing to the prevalence of mild westerly winds charged with moisture, which, while they equalise the tempcrature, cause the average fall of rain on the west side of Britain to be in many cases double, and in some nearly three times that on the opposite side. In the central parts of England cultivation is carried on at 1000 feet of elevation, but 800 may be taken as the ordinary limit. In Scotland the various crops are usually from two to three weeks later in coming to maturity than in England. In both divisions of the island the western counties, owing to their mild and humid climate, are chiefly devoted to pasturage, and the eastern, or dry ones, to tillage. As compared with the continent of Europe, our summers are neither so hot, our winters so cold, nor our weather so steady. We want, therefore, many of its rich products, but, on the other hand, our milder winter and moister climate are eminently favourable to the production of pasturage and other cattle crops, and admit of agricultural operations being carried on more regularly throughout the year. Indeed, looking to the immense varieties of the products of our soil, there is probably no other country so favourably circumstanced for a varied and succcssful agti- culture.

Section 3.—Influence of Population, dc.

Besides those variations in the agricultural practice of this country which arise from diversities of soil and climate, there are others which are due to the distribution of the population. The proximity of cities and towns, or of populous villages, inhabited by a manufacturing or mining population, implies a demand for dairy produce and vege- tables, as well as for provender and litter, and at the same time affords an ample supply of manure to aid in their reproduction. Such commodities, from their bulk or perish- able nature, do not admit of long carriage. The supplies of these must therefore be drawn from comparatively limited areas, and the character of the husbandry pursued there is determined apart from those general influences previously referred to. From these and other causes there is a diversity in the practice of British agriculture which increases the difficulty of describing it accurately. Indeed, it is so well known that there are peculiarities of cha- racter attaching to almost every individual field and farm, and still more to every different district or county, which demand corresponding modifications of treatment in order to their successful cultivation, that a prudent man, if required to take the management of a farm in some district greatly inferior in its general system of farming to that which he may have left, will yet be very cautious in innovating upon specific practices of the natives.

To such peculiarities it is obviously impracticable to refer in such a treatise as the present. They are referred to now because they suggest an explanation of some of those discrepancies in the practice and opinions of farmers, equally successful in their respective localities, which we constantly meet with ; and because, in proceeding to deli- neate the practice of Berwickshire, where our personal experience has been gained by upwards of forty years of actual farming, we would deprecate the idea of claiming for its modes a superiority over those of other districts. Its geographical position, and the mixed husbandry pur- sued in it, would justify, in some measure, its being referred to as a fair sample of the national agriculture. But it is on the specific ground that it is best to speak from actual experience as far as that will serve, that we vindicate this selection.

CHAPTER IV. FARM-BUILDINGS. Section 1.—General Requisttes.

In pursuance of the plan already indicated, let us now refer for a little to Farm-Buildings. We have spoken of the soil as the raw material upon which the farmer operates: his homestead may, in like manner, be regarded as his manufactory. That it may serve this purpose in any good measure, it is indispensable that the accommodation afforded by it be adequate to the extent of the farm, and adapted to the kind of husbandry pursued upon it. It should be placed upon a dry, sunny, sheltered site, have a good supply of water, and be as near as possible to the centre of the farm. 'The buildings should be so arranged as to economise labour to the utmost. It should be con- structed of substantial materials, so as to be easily kept in repair, and to diminish, to the utmost, risk from fire.

The most cursory examination of existing homesteads will suffice to show that in their construction these obvious conditions have been sadly neglected. For one farm really well equipped in this respect, hundreds are to be met with in all parts of the kingdom, and more especially in England, most wretchedly deficient. Wherever this is the case, it is impossible that the farmer, however skilful or industrious, can make the most of his materials, or compete on equal terms with his better furnished neigh- bours. As the agricultural community becomes more generally alive to the importance of economising labour by a judicious arraugement of buildings, and of reducing the cost of the production of beef (and adding to the amount and fertilising power of the home-made manure) by the manner in which the live stock is housed, we may hope that improvement in this department will make rapid progress. Tenants will refuse to embark their capital, and waste their skill and labour, on farms unprovided with suitable apparatus for cultivating them to the best advan- tage. Landlords and their agents will by-and-by find that until this is done, they must put up with an inferior tenantry, an antiquated husbandry, and with lower and worse-paid rents.

Section 2.—Plans.

In erecting new homesteads, or in making considerable additions to or alterations upon existing ones, it is of much importance to callin the aid of

an architect of ascer- tained experience in this department of his art, and then to have the work performed by contracts founded upon the plans and specifications which he has furnished. A reasonable sum thus expended will be amply returned in the cost, trouble, and disappointment, which it usually saves to both landlord and tenant. It is to be hoped that in future a greater number of thoroughly qualified architects will devote themselves to this department of their profession, and that they will meet with adequate encouragement. It is not, therefore, with the view of superseding their services, but simply to illustrate our references to existing practices, that we subjoin a plan of farm-buildings.

While protesting against the utter rudeness and inade- quacy of the great majority of homesteads, we must also deprecate the hurtful expenditure sometimes lavished in erecting buildings of an extent and style altogether disproportionate to the size of the farm, and out of keep- ing with its homely purposes. When royalty or nobility, with equal benefit to themselves and their country, make agriculture their recreation, it is altogether befitting that in such cases the farm-yard should be of such a style as to adorn the park in which it is situated. And even those intended for plain, everyday farming need not be un- sightly ; for ugliness is sometimes more costly than

elegance. Let utility, economy, and comfort, first be secured, and, along with these, as much as possible of

that pleasing effect which arises from just proportions, harmonious arrangement, and manifest adaptation to the use the buildings are designed for.

Section 3.—Principles of Arrangement.

The barn, with its thrashing-machinery, and other appurtenances, naturally forms the nucleus of the home- stead, and regulates the distribution of the other buildings. The command of water-power will often determine the exact site of the barn, and indeed of the whole buildings. The cheapness and

safety of this motive-power render it well worth while to make considerable sacrifices to secure it, when a really sufficient and regular supply of it can be had. But the difficulty of securing this when the adjoining lands are thoroughly drained, and the great efficiency and facility of application of steam-power, are good reasons why precarious supplies of water-power should now be rated very differently than they were when a horse-wheel or windmill were the only alternatives. A very usual and suitable arrangement is to have the whole buildings, forming a lengthened parallelogram, facing south or south- east; the barn being placed in the centre of the north range, with the engine-house behind it, and the straw- house at right angles in front, with doors on both sides for the ready conveyance of litter and fodder to the yards, &c. It is always advantageous to have the barn of sufficient height to afford ample accommodation to the thrashing and winnowing machinery. When the disposition of the ground admits, it is a great convenience to have the stackyard on a level with the upper barn, so that the unthrashed corn may be wheeled into it on barrows, or on a low-wheeled truck drawn by a horse. Failing this, the sheaves are usually pitched in ata wide opening from a framed cart. The space on which the cart stands while this is going on is usually paved, that loose ears and scattered grain may be gathered up without being soiled ; and it is a further improvement to have it covered by some simple roof, to protect the sheaves from sudden rain.

It isa good arrangement to have the straw-barn fitted up with a loft, on the level of the opening at which the straw is discharged from the thrashing-mill, so as to admit of fodder being stored above and litter below. A sparred trap-door in front of the shaker retains the straw above, or lets it fall to the ground as required. This upper floor of the straw-barn is the most convenient place for fixing a chaff-cutter to be driven by the thrashing-power. The granary should communicate with the upper barn, that the dressed grain may be raised to it by machinery. °

A loft over the engine-room, communicating with the upper barn and granary, forms a suitable place for fixing a grinding-mill, bruising rollers, and cake-breakers, as it affords opportunity for having these machines easily connected with the steam-power. It suits well to have the house in which cattle food is cooked attached to and under the same roof as the

engine-house. One coal store and chimney thus serves for both. Over this cooking-house, and communi- cating with the grinding-loft, may advantageously be placed a kiln, to be heated by the waste steam from the engine. An open shed outside the barn, for the accommodation of a circular saw, is also a desideratum. By the aid of the latter machine and a handy labourer, the timber required for ordi- nary repairs on the farm may be cut out at trifling expense.

The cattle-housing, of whatever description, where there are the largest and most frequent demands for straw, is placed nearest to the straw-house, and in communication with the turnip-stores, and the house (if any) in which food is cooked or otherwise prepared. Where cattle are bred, the cow-house and calf-house are kept together. A roomy

Water.

Cottages,

Farm- house.

BUILDINGS. |

working court is always a great convenience, and it suits well to have the stable opening to it, and the cart-shed and tool-house occupying another side. Costly machines, such as corn-drills and reaping machines, require to be kept in a locked place, to preserve them from the collisions, and the loss or derangement of their minute parts, to which they are exposed in an open cart-shed.

An abundant supply of good water is a most important matter. The best source is from springs, at such an elevation as to admit of its being brought in a pipe, with a continuous flow. Failing this a well and pump is the usual alternative, although it is sometimes necessary to collect the rain-water from the roofs, and preserve it in a capacious and carefully-made tank. In every case it is desirable to have a regulating cistern, from which it is distributed by pipe to every part of the homestead where it is required. It is, in every case, of importance to have the eaves of the whole buildings spouted, and the rain- water carried where it can do no mischief. Where

fattening cattle are kept in open yards with sheds, by spouting the eaves, and slightly hollowing the yards towards their centres, the urine to a large extent is absorbed by the litter, and retained in the manure. The effectual way, however, is to have the whole of the yards roofed over. The waste of food and litter, and the damage sustained alike by cattle and manure, from the excessive rainfall of winter 1872-3, has probably done more than any amount of argument could do to convince farmers of this. If stall feeding is practised, a pitis required, into which the solid dung is wheeled and the liquid conveyed by drains. Liquid manure tanks are at present in universal repute, but we shall endeavour to show, when treating of manures, that they are not such an indispensable appendage to a farm-yard as is generally asserted. In Scotland it is customary to carry the dung from the byres into a yard in which young cattle are kept, where it is daily spread about and subjected to further treading, along with such quantities of fresh litter as are deemed necessary. That from the stables is carried into the adjoining feeding-yard, and it is usually remarked that the cattle occupying it make more rapid progress than their neighbours.

An important part of the buildings of a farm are the cottages for its labourers. It is in all cases expedient to have the people required for the ordinary working of a farm resident upon it; and it is always much better to have families, each in its own cottage, than a number of young people boarded in the farm-kitchen, or with the farm- overseer. These cottages are usually a little removed from the other farm-buildings, and it is, on various accounts, better to have them so. There is, however, an advantage in having the cottages of the farm-steward and cattleman either within the courtyard, or close to its entrance, that these responsible functionaries may at all times be near their charge, and especially that they may be at hand when any of the live stock require night attendance. As there are manifold advantages in having but one main entrance to the homestead, and that closed by a gate which can be locked at night, it will be obviously necessary to have the keeper of the key close at hand to open the gate by night if required. Much more attention than formerly is now paid to the construction of cottages. The apartments are better floored, higher in the roof, and so arranged as to secure comfort and decency. Besides a small garden, each cottage is usually provided with a pig- sty and ash-pit, and in some cases with a coal-place and privy besides.

The position and style of the farmer's dwelling also claims a remark here. The approved mode used to be, to place it either directly in front or rear of the farm-yard, on the ground that the farmer would thus have his premises

and cattle under his eye even when in his parlour or bed- room. As has been well remarked, 'The advautages of this parlour-farming are not very apparent, the attendant evils glaringly so. Ifthe condition of ready communication be obtained, the farm-house should be placed where the amenities of a country residence can be best enjoyed."! On all hands we now hear it urged, that it is only by men possessed of capital and intelligence that the business of farming can be rendered remunerative. Those who desire to have such men for tenants will be more likely to succeed by providing a commodious and comfortable farmery, pleasantly placed among trees and shrubs, than by setting it down in the precincts of the dung-heap.

CHAPTER V. FENCES.

Section 1.—Benefit of Fences.

The fences by which farms are generally enclosed and subdivided form another part of what may be termed their fixtures, and may therefore be suitably noticed here. When lands are let to a tenant, the buildings and fences are usually put into sufficient repair, and he is taken bound to keep and leave them so at the issue of his occupancy. Although there are some persons who advocate the total removal of subdivision fences, it is admitted on all hands that the farm as a whole, and the sides of public thorough-fares which may intersect it, should be guarded by sufficient fences of some kind. The general belief has hitherto been, that there is a farther advantage in having the land subdivided by permanent fences into enclosures of moderate size. The use of such partition fences is not only to confine the live stock to particular fields, or restrain them from trespassing on the other crops, but to afford shelter from cutting winds. It is now frequently urged, that the heavier cattle should never be turned to pasture at all, but kept on

roots and green forage the whole year round, and that sheep can be managed satisfactorily by incans of movable hurdles. It is highly probable that the practice of soiling will become more general, as it undoubtedly deserves to do. Still, this does not necessarily call for the total removal of subdivision fences, which we cannot but regard as an imprudent proceeding. It is probable that those who have adopted it have done so very much owing to the prevalence of the opposite extreme. There are large portions of the finest land in England so encumbered with hedges and hedgerow trees, as to be utterly incapable of profitable cultivation. In many cases the fields are so small and the trees so large that their roots actually meet from the opposite sides, and pervade the entire surface soil of the area enclosed by them. Wheu manure is applied to such fields, it is monopolised by these freebooters from the hedges, and the crops of grain or hay, such as they are, are so screened from the sun and wind that there is great risk of their being spoiled in the harvesting. If drains are made in such fields, they are speedily filled up by the rootlets, and thus rendered useless. It has been computed that not less than one and a quarter million acres are occupied by hedgerows in England and Wales, and that if the land overshaded and plundered by roots be included, the amount is three millions. In Devonshire one-fourth of the en- closures in many parishes are under two acres; more than one-third under three acres; and nearly two-thirds under four acres. 'Two millions, at least, of these acres might be redeemed, and what a margin is here available for increased production! The land thus wasted would probably yield a sum equal to county and poor rates, and perhaps malt-tax

1 For further information on Farm Buildings, see also Aforton's Cyclopedia of Agriculture, article "Farm Buildings," and The Book of Farm Buildings, by Henry Stephens and' R. Scott Burn, Edin- burgh, 1861.

too! In such circumstances, it is no wonder that zealous agricultural improvers should look upon hedgerows much as American settlers do upon their forests, and, like them, be sometimes indiscriminate in their clearings. We believe that there is an advantage in having land, whether for pasture or

tillage, ‘subdivided into parallel-sided fields of from ten to forty acres each, according to the size of the farm, by means of permanent fences of a kind adapted to the locality. Section 2.—Varteties of Fences.

When the soil and climate are favourable to the growth of the common white thorn, hedges formed of it combine efficiency, economy, and ornament, in a greater degree than any other fence. But to have a really efficient thorn hedge, much attention must be paid to its planting, rearing, and after management. In proceeding to rum a new line of thorn hedge, care must be taken that the soil is clean and in good heart, and that the subsoil is porous and dry. When these conditions do not obtain, they must be secured by fallowing, manuring, draining, and trenching. The young quicks should be stout and well rooted; not taken indiscriminately as they stand in the nurserymen’s beds, but of uniform stoutness. Such selected plants are always to be had for a small additional price, which will be found to be well repaid in the superior progress of such plants, when contrasted with that of others taken as they chance to come to hand. The embryo fence must be kept free of weeds, and secured from the encroachments of cattle by a line of rails on both sides. “Some persons advise that the young hedge should from the first be trimmed into line by using the pruning-hook after each year’s growth. It is certainly better not to touch it with the knife, or, at least, only to restrain an occasional shoot that unduly overtops its neighbours, until the centre stems are at least a couple of inches in diameter. If the plants are then headed over fence-high, and the lateral shoots pruned to a straight line, a close fence with a substantial backbone in it is secured; whereas by pruning annually from the first, a fence is obtained that pleases the eye, but which, consisting only of a mass of spray, presents no effectual barrier to cattle. When a thorn hedge has reached the stage just referred to, the protecting rails may be removed, and the hedge kept in a neat and efficient state by annual pruning. On good, deep soil, thorns will stand this constant removal of the annual growth of spray for many years without injury, especially if the pruning is delayed until the leaf has fallen. In less favourable circumstances, it is found necessary from time to time to withhold the pruning-knife for a few years together. When the hedge has been reinvigorated by such periods of unrestrained growth, it can again be cut back to the centre stems, and subjected anew to a course of annual pruning. To insure a close fence, the

bottom of the hedge must at all times be kept clear of tall weeds. The constant use of the weeding-iron is, however, objectionable ; for, besides being expensive, it injures the bark of the thorns and thereby impairs their health. It is quite sufficient to cut the weeds close to the surface twice a year by means of a reaping-hook or short scythe.

In arable lands, by this plan of keeping hedges about four feet high, and cutting down the weeds as required, an efficient and ornamental fence is maintained at com- paratively small cost, and with little injury to the ad-joining crops from shading, or the harbouring of weeds and vermin.

Although the white thorn forms a better hedge than any shrub yet tried for the purpose in this country, there are many upland situations where the beech and hornbeam grow more freely, and are to be preferred either alone or in

1 See Furmer's Magazine for March 1852, p. 253.

mixture with it. These plants, and also crab or sloe, are sometimes useful in filling a gap occasioned by the removal of a hedgerow tree or the death of a portion of thorn hedge.

In exposed situations, where thorns do not thrive, Stone

drystone walls are the most usual substitute. When carefully constructed, of stones suitable for the purpose, they last a long time, and form an excellent fence. Their durability is much enhanced by having the cope-stones set in lime-mortar. A layer along the centre of the wall, and an external pointing, of lime-mortar will also repay the additional first cost thus incurred. A wall of this kind four feet high, exclusive of the cope, while quite sufficient to restrain cattle and the heavier kinds of sheep, is no barrier to the mountain breeds, which can easily clear a six-foot wall.

A simple and very effective fence has, however, come Wira

much into use of late years. It is composed of iron wire (No. 8 being the size most commonly used), which is attached by small staples to common stakes, such as are used for wooden railings, driven firmly into the ground about five feet apart. The wire is drawn out of the coil, and the ends of the various lengths or threads are neatly joined by first heating them, and then twisting the one into the other, until the quantity required for the stretch of fence is run out. It is then attached to every third or fourth stake by a staple, which must not be driven home. The other lines of wire are then treated in the same manner, each being attached to the stakes at such width apart as has been determined upon, and marked upon the stakes. A ready way of doing this is by stretching along the stakes a common gardener's line which has been previously rubbed with chalk, or a charred stick, and striking it against the stakes at the required heights, in the way that sawyers mark aplank. When the requisite number of wires has thus been loosely attached, they are pulled as tight as possible by the hands of the workmen, after which a screw orlever is applied to each in turn until it is made perfectly tight. As the efficiency of this kind of fence is wholly dependent on perfect tightness being obtained, a stoutstraining-post must be fixed securely in the ground at the end of each line of fence. This serves the double purpose of furnishing a fulcrum for the stretching instrument, and a secure attachment for the ends of the wires. When the straining is accomplished, each wire is stapled to each stake. The gates are usually hung upon these straining-posts. Although wooden strain- ing-posts are commonly used, some persons prefer iron ones, fixed into large blocks of stone. Five wires thus stretched, at an average width of six inches, form an effectual fence for the wildest sheep. They could, indeed, easily clear it so far as height is concerned, but they are afraid to leap at an object which they cannot see until they are close upon it. They may be seen at first walking along the line anxiously looking for an opening, and if one more bold than the others makes a run at it, he is sure to catch such a fall as effectually deters him from repeating the attempt. With these cheap and portable materials, which any labourer of ordinary in- telligence can easily put together, a fence admirably adapted for enclosing or subdividing mountain pastures is now quite attainable by every sheep-farmer, and will well repay its cost. It is equally available for protecting young thorn hedges, and generally for all purposes for which wooden railing 1s used. Asa fence for cattle or horses, it is advisable to add a single rail of wood nailed flat along the top of the stakes, which must be

sawn off evenly for this purpose. As com- pared with wooden railing, wire is much cheaper and more durable, and more easily kept in repair. It is cheaper also than stone walls, available in many situations where they are not, and a more certain barrier to agile sheep ; but it is less durable, and affords no shelter.

The latter defect can in some situations be remedied by

Mainten- ance.

MACHINES. |

raising a low mound of turf, running the wire-fence along the top of this mound, and sowing on it the seeds of the common whin.

We have already noticed that the fences of a farm are usually erected by the landlord and kept in repair by the tenant. The latter is at least usually taken bound in his lease to keep and leave them in good order; but as this ubligation is often very indifferently performed, and much damage and vexation occasioned in consequence, it is always expedient that a person should be appointed by the landlord to attend to the fences, and the half of his wages charged against the tenant. By such a course, dilapidation and dis- putes are effectually guarded against, and the eyesore of defective, ill-kept fences is wholly removed.

CHAPTER VL MACHINES AND IMPLEMENTS OF HUSBANDRY.
Section 1.—Recent Improvements.

That the cultivation of the soil may be carried on to the best advantage, it is necessary that the farmer be provided with a sufficient stock of machines and implements of the best construction. Very great improvement has of late years taken place in this department of mechanics. The great agricultural societies of the kingdom have devoted much of their attention to it ; and under their auspices, and stimulated by their premiums, exhibitions, and competitive trials, manu- facturers of skill and capital have embarked largely in the business. In many instances the quality of the article has been improved and its cost reduced, There has hitherto been a tendency to produce imple- ments needlessly cumbrous and elaborate, and to in-

troduce variations in form which are not improvements. The inventors of several valuable implements, the exclusive manufacture of which they have secured to themselves by patent, appear to have retarded their sale, and marred their own profits by the exorbitant prices which they have put upon them. Some, however, have become alive to the advan- tages of looking rather to large sales with a moderate profit on each article, and of lowering prices to secure this, A most salutary practice has now become common of inventors of implements of ascertained usefulness granting licence to other parties to use their patent-right on reasonable terms, and thus removing the temptation to evade it by introducing some alteration which is trumpeted as an improvement, although really the reverse.

The extended use of iron and steel in the construction of agricultural implements is materially adding to their durability, and generally to their efficiency, and is thus a source of considerable saving. While great improvement has taken place in this department, it too commonly happens that the village mechanics, by whom a large portion of this class of implements is made and repaired, are exceedingly unskilled, and lamentably ignorant of the principles of their art. They usually furnish good materials and substantial workmanship, but by their unconscious violation of mecha- nical laws, enormous waste of motive power is continually incurred, and poor results are attained. This can probably be remedied only by the construction of the more costly and complex machines being carried on in extensive factories, where, under the combined operation of scientific superin- tendence, ample capital, and skilled labour, aided by steam- power, the work can be so performed as to combine the maximum of excellence with the minimum of cost.

Section 2.—Ploughs.

_We begin our brief notice of the implements of the farm with those used for the tillage of the soil. Of these the first place is unquestionably due to the plough. A history of this implement, tracing its gradual progress from the

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ancient Sarcle to its most improved form at the present day, is necessarily a history of agriculture. So much is this the case, that a tolerably correct estimate of the progress of the art in any country, whether in ancient or modern times, may be formed by ascertaining the structure of the plough. Much attention has been paid to its construction in Britain for the last hundred years, and never more than at the present day. After all that has been done, it is still, however, an unsettled point which is the best plough for different soils and kinds of work ; and accordingly, many varying forms of it are in use in those parts of the kingdom which have the reputation of being mostskilfullycultivated. Eversince the introduction of Small's improved swing-plough, the universal belief in Scotland, and to a cousiderable extent in England, has been that this is the best form of the imple- ment. Wheel-ploughs have accordingly been spoken of by Scottish agriculturists in the most depreciatory terms, and yet it turns out that this has been nothing better than an unfounded prejudice ; for when subjected to careful com- parative trial, as has been frequently done of late, the

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Howard's Champion Plough.

balance of excellence is undoubtedly in favour of the plough with wheels, Its advantages are, that it is easier of draught ; that the quality of its work is better and greatly more uniform than can be produced by a swing plough ; that in land rendered hard by drought, or other causes, it will enter and turn over even furrows where its rival either cannot work at all, or at best with great irregularity and severe exertion to the ploughman; and, lastly, that its efficiency is independent of skill in the ploughman. This last quality has indeed been usually urged as an objection to wheel-ploughs, as their tendency is said to be to produce an inferior class of workmen. Those who know the difii- culty of getting a field ploughed uniformly, and especially of getting the depth of furrow specified by the master adhered to over a field, and by all the ploughmen, can best appreciate the value of an implement that, when once properlyadjusted, will cut every furrow of an equal width and depth, and lay them all over at exactly the same angle. The diversity in the quality of the work at those ploughing competitions, to which only the

picked men of a neighbourhood are sent, and where each may be supposed to do his very best, shows conclusively how much greater it must be on individual farms, even under the most vigilant superintendence. In every other art the effect of improved machinery is to supersede manual dexterity; and it does seem absurd to count that an objection in agriculture which is an advantage in everything else. There is more force in the objection that wheel-ploughs are inferior to swing ones in ploughing cloddy ground, or in crossing steep ridges, and that they cannot be used for forming drills for turnip or other crops. This objection vanishes when it is known that in the most improved wheel-ploughs, the wheels can be laid aside at pleasure, and that they can then be used in all respects as swing-ploughs. A mould-board, somewhat higher and wider behind than that best adapted for ordinary work, is required for forming turnip-drills. This, however, is easily managed by having two distinct mould-boards for each plough, or, better still, by using only the double mould-board

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or bulking plough for drilling. An important feature in the English ploughs is, that they are fitted with cast-iron shares, which, being case-hardened on their under surface, wear unequally, and so preserve a sharp edge. The necessity for daily recourse to the smithy is thus removed, and along with it that irregularity in the quality of the work and draught of the plough, which so often arises from witting or unwitting alterations being made in the set of the share in the course of its unceasing journeys thither. These cast-iron shares are slightly more brittle than those made of malleable iron with steel points ; but it is of importance in determining their comparative merits to bear in mind that the prime cost of the former—10d. to 1s. each—is so small as to render them at the year's end the least expensive of the two. When it is desired to turn a very deep furrow, a plough is used differing from the common one only in being somewhat larger and stronger in all its parts, with four horses to draw it.

Ploughs which break and stirthe subsoil, without bringing it to the surface, by following in the wake of the common plough, are now much used. The first of the kind—the invention of the late Mr Smith of Deanston—is a ponderous implement, requiring at least four good horses to draw it. It is

well adapted for displacing and aiding in the removal of earth-fast stones. The inventor has happily described its operation by terming ita " horse pick." Read's subsoil- plough is a much lighter implement, which can usually be drawn by two horses. Since the introduction of thorough draining, it. is found beneficial to loosen the soil to a much greater depth than was formerly practicable, and this class of implements is well fitted for the work. It is always ad- visable to use this implement, and to mark and dig out the large stones encountered by it, before introducing steam cultivation.

Broadshare or paring-ploughs are much used in various parts of England in the autumn cleaning of stubble. A broad-cutting edge is made to penetrate the soil to the depth of three or four inches, so as to cut up the root-weeds which at that season lie for the most part near the surface. These, as well as the stubble, being thus detached from the firm soil, are removed by harrowing and raking ; after which the land is worked by the common plough. An implement of this kind is frequently used in carrying out the operation of paring aud burning. Bentall's Broadshare has the reputation of being the best of its class; but we can con- fidently recommend the common plough, stripped of its mould-board and fitted with a share twelve inches broad, as not only the cheapest, but decidedly the most efficient scarifier that has yet been used.

An ingenions Aberdeenshire mechanic, Mr Pirie of Kinmundy, has recently invented a double-furrow plough, on an entirely new principle, which has met with general approval, and has already been adopted by all the great plough makers. By carrying the plough on three wheels, one on the land and two bevelled ones in the angle of the furrow, Mr Pirie dispenses with both soles and side plates, and thereby lessens the friction, and avoids that hurtful glazing and hardening of the bottom of the furrow which attends the use of other ploughs. So much is the draught lessened by this improvement, that three horses and one man with this double-plough can perform as much work in a day as four horses and two men with two ordinary ploughs. For a seed-furrow or level field of free soil, two horses are quite able to work the double- plough.

Various implements of the plough type, so modified as to adapt them for particular processes, have from time to time been offered to public notice,

but have failed to meet with general favour. We limit our notice to those of ascertained utility, and refer the reader who desires fuller

information to Ransome's Implements of Agriculture, and the more recent work by Messrs Stephens and Scott Burn, where he will find descriptions of the most interest- ing of them.

Section 3.—Grubbers, &c.

Next in importance to the plough is the class of imple- ments variously called grubbers, cultivators, drags, or scari- fiers. To prepare the soil for the crops of the husbandman, it is necessary to pulverise it to a sufficient depth, and to rid it of weeds. The appropriate function of the plough is to penetrate, break up, and reverse the firm surface of the field. This, however, is only the first step in the process, and does but prepare for the more thorough disintegration which has usually been accomplished by harrowing, rolling, and repeated ploughings. Now, however excellent in its own place, the plough is a cumbrous and tedious pul- veriser, besides needlessly exposing a fresh surface at each operation, and cutting the weeds into minute portions, which renders their removal more difficult. These defects were long felt, and suggested the desirableness of having some implement of intermediate character betwixt the plough and harrow, which should stir the soil deeply and expeditiously without reversing it, and bring the weeds unbroken to the surface. The whole tribe of grubbers, &c., has arisen to meet this demand, and we shall now consider the comparative merits of the more prominent of the group. The first notice is due to Finlayson's harrow, which, as improved by Scoular, was, until recently, the best implement of its kind. Its faults—and they attach equally to Kirkwood's and Wilkie's—are, that it is seyere work for two horses, is liable to choke in turfy or foul ground, aud that it consolidates the bottom of the furrow, while producing a fine tilth on the surface. Finlayson's grubber, in its improved form, weighs about five cwt., and costs as many pounds.

Another useful implement of this class which enjoys a large reputation in England is Biddle's scarifier. It is

mounted on four wheels—two small ones in front and two much larger behind. The frame and tines are of cast- iron, and can be raised and depressed at pleasure by means of two levers which regulate the depth to which the tines shall penetrate. The tines are prepared to receive case-hardened cast-iron points of different widths, or steel hoes of nine inches width, so that the implement can be used for breaking up and paring the surface, or for grubbing out weeds and pulverising the soil, as may be required. An important feature in this scarifier is, that it keeps its hold of a hard surface much better than a plough. It weighs half a ton, is drawn by four or six horses, and costs about £18. ines ee IL a. 1 The Implements of Agriculture, by J. Allen Ransome, Lond.

1843. The Book of Farm Implements and Machines, by Henry Stephens and R. Scott Burn, Edin.

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The Ducte or Uley cultivator has many features in common with Biddle's, and although brought forward as an improvement upon it, has not established its title to be so regarded. The great weight, high price, and amount of horse-power required to work them, are serious objec- tions to all these implements.

Of more recent notoriety than these, and contrasting with them favourably in these respects, is an implement invented by the late Mr John Tennant, at Shields, near Ayr, and now popularly known as Tennant's grubber. Its

construction, as the annexed cut will show, is simple in the Its weight is about two cwt., its price £4, 10s.,

extreme.

Tennant's Grubber, as improved by T. Brown, Edington.

and its draught easily overcome by two horses. The depth at which it works is regulated by raising or lowering the shank which supports its wheels in front. Its tines can be easily moved on their supporting bars, and it may be worked with five or seven as desired. By substituting a shorter hind bar, and setting the tines more closely to- gether, it makes a most efficient drill-grubber. We shall have occasion to refer to this implement frequently in

treating of tillage operations The improvement which | Mr T. Brown has made on Tennant's grubber consists mainly in the mode of attaching the tines to the bars, This attachment, which the cut explains, has the merit of being at once very simple and very effectual. The tines when thus fixed are as rigid as if welded to the bars, and yet, by merely slackening the screws and driving out the wedges, they can with ease and rapidity be either adjusted at varying w:dths apart, or detached for repair.

A, Tine ; B, Keeper; C, Wedge, } Actual Size.

Section 4.—Steam-Power Tillage Implements.

Such are the most important of those implements by which the tilling of the soil has hitherto been accomplished, and upon which the farmer must continue to rely so long as he uses the muscular force of animals as his motive power.

Fowler's Locomotive Engine, with Clip Drum.

But the progress of invention has at last made the steam- engine practically available for this purpose, and accordingly we here introduce some notice of what has now been accom- a in applying steam power to the cultivation of the so

After many abortive attempts to do this by moving the engine itself over the land to be operated upon, it is now admitted on all hands that the only available method is to

communicate the power from the engine to the implements by means of steel wire-ropes and windlasses. This is done in a variety of ways, some of the most prominent of which we shall now describe. The systems actually in operation fall under two general classes, which are known severally as the " Direct" and the " Roundabout." The first of these is the system introduced by Messrs John Fowler & Co. of Cornhill, London, and now so well known in connection with I. — 4o

their name. The late Mr John Fowler's first efforts were directed to the production of a draining apparatus, and it was after succeeding in this apparently more arduous effort that he adapted his tackle to the hauling of tillage imple- ments. After various tentative changes, Mr Fowler settled | on the form which is still in extensive use. It consists of a single locomotive engine, usually of 12 or 14 horse-power, with a windlass attached to it under the boiler. Around this windlass an endless steel wire-rope passes with a single turn in a groove, which, by means of hinged clips, lays hold of nearly the entire circumference of the rope, and that with a force proportioned to the strain upon the rope, which thus obtains sufficient grip to convey the necessary hauling power without risk of slipping upon the drum. This wire- rope, which requires to be just twice as long as the field to be tilled is wide, passes round a sheave upon a self-acting anchor placed at the farther side of the field opposite to the engine. This anchor is a prominent feature in Mr Fowler's apparatus. It consists of a low truck on four wheels, with sharp disc edges, which cut deeply into the soil, and thus obtain a hold sufficient to resist the strain of the wire rope. A box, loaded with stones, is fixed on the outer side of this truck to hinder it from canting over. The sheave mounted upon this truck, besides serving its primary use, gives motion when required to a drum, which winds up a rope, the other end of which is fixed well a-head in the direction in which the truck is required to move. Thus the apparatus warps itself along the headland as the ploughing progresses, and is keptalways vis-d-vis tothe engine, which moves itself forward by its own locomotive power at every bout of the ploughs,

and keeps abreast of them. That the rope may not drag upon the ground, friction rollers or rope-porters, as they are called, are placedatsuitableintervals. These beingmounted on wheels and strung upon the rope, are now in a good measure self-acting, as the tautness of the rope keeps them in its own line. The ploughs are fixed to a balance frame carried on two wheels, and are in duplicate, pointing to each other, so that when the set at one end of the frame is in work, the opposite set is carried aloft intheair. The plough frame is thus hauled to and fro across the field, between the engine and movable anchor, by reversing the action of the windlass; and it is adapted for taking from two to eight furrows at once, according to the power of the engine em- ployed, or the nature of the soil that is operated upon,

Messrs Fowler have made this form of their apparatus more generally available by adapting it for attachment to the ordinary 8-horse power thrashing-engine. When thus used the clip-drum is mounted on a separate frame and connected with the engine, which being stationed in a corner of the field to be ploughed, the rope is carried to two self- acting anchors, one at each side of the field, and thus encloses a triangle. The plough is drawn to and fro betwixt these anchors, and as it gradually approaches the engine at each successive bout, the gearing on the plough-frame tightens up the rope and accommodates it to the diminishing length required.

To work Fowler's apparatus there is required one engine- driver, one ploughman, a stout lad to attend to the anchor, two boys to shift the rope-porters, and a horse and boy to supply the engine with water and fuel.

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Fowler's Steam-Plough as at work.

About 1865 Messrs Fowler made an important addition to their apparatus by substituting a second engine for their movable anchor. In this arrangement, now well known as the " Double Engine system," a pair of locomotive engines, each having a plain winding drum instead of the clip-drum, are placed opposite to each other at the ends of the field to be operated upon ; the rope of each of the engines is attached to the plough, or other tillage implement, which is drawn to and fro betwixt them by each working in turn. While the engine in gear is coiling in its rope and drawing the plough towards itself, the rope of the other engine is paid out with merely somuch drag on it as to keep it from kinking or getting ravelled on the drum. The advantages claimed for this system are, economy of power from the direct pull of the engines on the implement ; the facility and rapidity

with which the engines move themselves and the whole apparatus from field to field, or farm to farm, and take up their positions and get to work without the aid of horses ; and the few hands required to work it. Its drawbacks are the large first cost, and corresponding charge for wear and tear, depreciation, and interest; its unsuitableness for working in small and irregularly shaped fields ; and the injury done to headlands in wet weather. Its special adaptation is for large farms, and for working for hire; and for these it is undoubtedly without a rival.

Mr William Smith of Woolston, Bedfordshire, may fairly be regarded as the pioneer of cultivation by steam power. At the meeting of the Royal Agricultural Society of England at Carlisle in 1855, he witnessed the performance of the late John Fowler's steam draining-plough, and then contracted

with him to construct for him a windlass and other tilling apparatus, with which he got to work on his own farm in the autumn of that year. These two leaders in stcam- cultivation did not long work together. They had decided and diverse opinions as to the best road to success, and accordingly each for the future took his own course. Mr Smith's merit is not largely that of an

original inventor of machinery, but rather that of a zealous, persevering, and successful applier of the inventions of others. But by his own example and his vigorous writings, he has contributed very largely indeed to the success of steam cultivation. He makes use of the ordinary portable engine, such as is em- ployed as a thrashing power, which gives motion to a detached windlass with two drums, from which a wire-rope is carried round the area to be operated upon, and hence the name " Roundabout" applied to this system. This rope being attached by a turning bow to a powerful grubber, the implement is drawn to and fro across the field by reversing as required the action of the windlass, the slack half of the rope being uncoiled from the one drum as the part in work is wound up upon the other. His mode of working is to break up the ground by using a three-tined grubber, and then to go over it again with a seven-tined one, working at right angles to the first. Mr Smith zealously advocates the supe-

riority of grubbing to ploughing, being of opinion that if the soil is thoroughly broken up to a sufficient depth, it is better not to reverse the surface, as weeds are thus kept on the top, and the removal of them thereby greatly facilitated.

Mr Smith soon made an important addition to his system of tillage by means of an implement which he calls a Ridger and Subsoiler. By means of it the soil, after being thoroughly smashed up by the steam-grubber, is thrown into 36-inch ridges, the tine at the same time penctrating and loosening the subsoil in each furrow several inches deeper. His clay soil treated thus immediately after harvest is put into the best possible condition for benefiting by the alternations of wintry weather, for allowing rain-water to pass readily and beneficially to the drains, and for yielding a friable seed-bed in spring. It has enabled him altogether to dispense with dead fallows; to grow abundant crops of wheat and beans alternately for a number of successive years, at an average annual cost of 8s. 6d. per acre for tillage ; and to keep his land perfectly clean under this constant cropping. He has the high merit not only of being the first man who successfully used steam power for the cultiva- tion of a farm, but of demonstrating that this can be done with manifest economy even by the occupiers of small farms,

Smith's Steam Cultivator as at work.

secing that his own farm extends to but 180 acres of arable land. After the lapse of eighteen years there is probably no one who yet practises steam cultivation with as great success and economy. At the end of this period he reports that his engine and tackle are in excellent condition.

Mr Smith's apparatus was for a time manufactured by

the well-known firm of J. & F. Howard of Bedford, and | opposite to each other on two sides of the field, occupying

Since 1860 the Messrs Howard have sent out a tackle of |

more recently by Barford & Perkins of Peterborough.

their own, in which the main features of Smith's system are retained, but to these they have themselves added from time to time various improvements. By means of a self-acting windlass and self-moving anchors, their tackle can now be worked by one engineman (who also attends to the windlass), one ploughman, and two portcr-boys. Although the earliest in date of invention, the most recent in actual operation is the tackle of Messrs Fisken,

which has features peculiar to itself. A single traction engine is stationed at any convenient point on the margin of or near to the field to be operated upon, the preference always being given to a site where there is water, whence it can supply itself either by pumping or by the patent injector. The other parts of the apparatus are two self-moving anchor windlasses, which are placed

the place and doing the work of the two engines in the double-engine system. These windlasses are mounted on four disc wheels, and have also a spud which cuts into the soil to give the necessary resistance to the side pull. They each carry a winding-drum with the necessary length of wire-rope, and these windlass-drums wind up and pay out alternately in precisely the same way as in Fowlcr's double engines. They also have each a winding-forward drum with wire-rope and anchor fixed a-head, by means of

have been ploughed during the time for neighbours at a charge, including everything, of 12s. an acre. The engine is also used for thrashing purposes, and 220 acres at home and 250 acres elsewhere are thus thrashed out for hire.

which they warp themselves forward and keep abreast as the work progresses. Power is communicated from the engine to these windlasses by means of a light hemp rope, travelling at the speed of the fly-wheel, which is carried all round the field, and takes a double turn round a grooved pulley ou each windlass. A set of anchor pulleys on wheels carry this rope round the corners of the field ; another set of pulleys, on stakes driven into the ground at suitable points, carry it off the ground; and a tension anchor mounted on four wheels, and having, like the windlasses, an apparatus by which it warps itsclf forward, and keeps the hemp-rope taut as the length out varies with the progress of the work. The windlasses have each a self-acting clutch, which stops the implement when any obstruction is encountered, and by which the attendants stop it at the turnings, or when otherwise necessary, with- out in any case requiring to stop the engine. By these arrangements the engine-driver does not require to have the implement in sight, his duty being merely to drive his engine at a uniform speed, as neither stopping nor revers- ing are required. The advantages claimed for Fisken's tackle are those which it has in common with the other Roundabout systems, and, in addition, the use of a light hemp rope to convey power from engine to implement with less friction and cost than in other systems; great adapta- bility to fields of any size, or shape, or inequality of surface ; and a capacity in certain circumstances of being worked by a fixed steam-engine or water powcr.

The Royal Agricultural Society of England has from the first devoted much attention and large funds to the promo- tion of steam cultivation, by the prizes offered at its annual shows, and by the reports published in its Journal from year to year. In the prolonged trial of steam-ploughs which took place at Leeds in July 1861 under its auspices, the competi- tion was mainly betwixt Fowler's and the modification, by Howard, of what is popularly known as Smith's system. The award of the judges was as follows:

—"The £100 prize offered for the most economical application of steam power to the cultivation of the soil, was awarded to Mr Fowler for his 12-horse power enginc, moving anchor- age, and plough; and of the £100 offered for the most economical application of the ordinary thrashing-engine of the farm to steam cultivation, £75 was given to Mr Fowler, and £25 to Mr Howard. Besides these a silver medal is given to Mr Hayes, for his clever windlass for the same purpose ; and the same to Mr Roby for his combined engine and windlass."

During the summer and autumn of 1861, Mr J. C. Morton, editor of the Agricultural Gazette, personally in- spected the farms of many of these parties, and published from time to time in that paper detailed accounts of his own observations and of the information supplied to him in regard to each case. In his New Farmer's Almanac for 1862, he condensed these reports, and from it we give the following extracts :—

"Tittle Woodcote Farm lies—a tract of open country and light calcareous soil of various depth—upon the chalk, about a mile from the Carshalton station on the London and Epsom railway. Mr Arnot has had Fowler's 10-horse power steam-engine and ploughing apparatus since the harvest of 1859. His apparatus, rope, and enginecost £700. He works a three-furrow plough. The work done each year by the steam-plough on his 400 acre farm has thus been 393 acres in 1859-60, and 389 acres in 1860-61. It has been done at the rate of six or scven acres a day for ordinary ploughing, and three acres a day (one acre per furrow) when at the 10 and 12-inch deep work. It may average on the whole five acres a day, including all stoppages and removals, and has thus taken close upon eighty days for its accomplishment. Besides this, however, 150 acres

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"The cost of repairs has been uncommonly small—in-

cluding a new cog-wheel, repacking cylinders, and athorough

overhaul and cleaning of the whole apparatus at the end of

two years—besides the replacement of shares and sharpening

of coulters for the plough, and the gradual wearing of the

rope-porters. In all it has not nearly reached £10 a year,

at which, nevertheless, we put it. The tear and wear of rope is reported as follows :—A new 400-yard rope, lately bought, costing £35, has made the stock stronger and better than it was at the beginning. This charge may therefore be put against more than two years' work, and is equal to about £15 a year. The weekly cost of labour when at work is as follows :— Engineer, 18s. ; ploughman, 14s. ; anchor lad, 9s. ; two porter lads, 6s. each; horse and water cart, about 24s. weekly—in all, £3, 17s. weekly, or as nearly as possible 12s. a day. The cost for oil is 1s. a day, and for fuel, at nine or ten cwt. a day, it may be put at 10s. daily. The charge for depreciation at 10 per cent is £70 a year, and for interest of capital £35 a year. The whole annual cost may thus be estimated :—

Labour, 80 days . : 3 ; £48 Fuel and oil é a 0 c 44 Repairs and rope ; : . 25 Depreciation and interest of capital : 105

Total £222

"But 500 acres of thrashing, and 70 or 80 acres perannum of steam ploughing for hire, equal in all to at least forty days' work per annum, are also done by this engine. And the profits of this work should be deducted from this sum before Mr Arnot's experience of his investment can be accurately described. The sum of £222, at which, if there had been no other use for engine and apparatus, his cost must have been estimated, is equal to 11s. per acre over the work accomplished, much of which, however, was 12 inches deep. Butif the proper shareof the interest and depreciation of capital be charged upon its work elsewhere for hire, the cost of steam ploughing will not exceed £190, or 10s. 6d. an acre. But Mr Arnot would contend that the engino is not £30 worse than when he purchased it two years ago ; and one-half of this, with interest of capital, will amount to £50, two-thirds only of which should be charged against the plough-work ; and £150 would thus appear to be the annual cost of ploughing 400 acres, or 7s. 6d. anacre. In fact, he might very well claim that this sum should be still further reduced by all the profit of his hire elsewhere, which can hardly be put at less than 20s. a day, and this on forty days per annum will amount to £40 or more; so

that the net cost to him of his machinery has not been more than £110 a year, or 5s. 6d. an acre over his ploughing.

“What did it use to cost him when he worked thirteen horses on his farm? He now works six horses. His horses get 24 bushels of oats, and 24 trusses of hay weekly each, during seven months :—

30 weeks at 11s. amount to £16 10 0 22 weeks on elover, &e., at 5s. 5 10 0 The annual food per horse costs £22 0 0

‘The annual charge for depreciation, farrier, blacksmith, saddler, and implements, is at least £5 per horse, and for interest of capital in horse and implements at least £2 more. This makes the annual cost of each horse £29. The wages paid, in cash and cottage, to ploughmen is at least £32 per pair, or £16 per horse, and the whole cost is thus equal to £45 per horse per annum ; which over seven horses amounts to £315 per annum—one-half more than the expenditure, even on the highest estimate, upon the

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engine which has displaced them, and nearly double what Mr Arnot has actually incurred when he deducts his profits on its hire.

“A clay land farm near Bedford (the Woolston or Bed- ford apparatus), the Tithe Farm of Stevington, occupied by Mr William Pike, is a tract naturally of poor clay soil. The extent farmed by Mr Pike has till lately been about 475 acres, of which 357 were arable; and fifteen horses were employed in five 3-horse teams upon this extent. Now, about 600 acres are farmed, of which 420 acres are arable; and the whole is managed with ten horses and an 8-horse power engine, working grubbers on the Wool- ston system. If the additional land requires the same horse-power per 100 acres as was needcd on the original farm, then, in place of ten horses, seventeen or eighteen must have been nceded, and probably Mr Pike’s mere saving by the use of his 8-horse engine and cultivating apparatus does not fall short of £300 a year.

“The present cropping of the land is as follows :—125 acres are in wheat, of which 105 were partly after beans, cross-grubbed by steam-puwer before

sowing, and partly after clover, having been cross-grubbed also by steam-power more than once before the previqus harvest time, and then horse scarified and harrowed. The remainder was after horse cultivation. 'There are 60 acres of beans after wheat, its stubble having been dressed with farm-yard dung, and then ploughed by horse power. 'There are 60 acres of grass and clover; 20 acres now in vetches have been cross- grubbed after a mauuring; 25 acres in mangolds and turnips have been cross-grubbed in autumn, and again steam-scarified and crossed in spring; 50 acres in barley, and 25 acres in oats, make up the extent of the farm, and were got in after steam cultivation. By 'cross-grubbing' it is meant that the operation was repeated.

"More horse cultivation than usual was done in 1860. Clay land was fit only on rare ocasions, and both horse and steam power were then used to the utmost. Mr Pike has had Mr Smith's grubber worked by an ordinary thrashing-engine since July 1858. Since that time 731 acres have been cross-grubbed, 7.¢., doubly-worked. In addition to this Mr Pike informs me that he has also cross-grubbed for hire 300 acres of land. For this he charges 25s. an acre, the coals being supplied to the employer.

"Excluding this item from our consideration in the meantime, and assuming that 730 acres—double cultivated between July 1858 and June 1861—correspond to 250 acres annually, the average performance of the engine, in- cluding all stoppages except removals, has been six acres daily once cultivated. To do 250 acres twice would there- fore occupy at least eighty-three days; adding three days for removals, there are eighty-six days' work of the steam- engine to be charged upon the steam cultivation of the farm. The following is the labour and its cost per week :—l engineer, 16s.; 1 ploughman, 11s.; 2 men shift- ing anchors, 22s.; 1 man at windlass, 12s.; 1 porter-boy, 6s.; 1 boy and horse with water cart, 24s: the whole amounts to £3, 19s., or 13s. 2d. daily. In addition to this we add the cost of coals, 10 cwts. at 19s. a ton on the ground, or 9s. 6d. daily. The oil at 5s. a gallon costs about 1s, a day.

_"The daily cost thus comes to 23s. 6d., and this over eighty-six days amounts to about £100. Against the engine and apparatus, costing about £510, we must put 10 per cent., or £51, for depreciation, and 5 per cent., or

£25, 10s., for interest of capital. The cost of repairs may perhaps be satisfied by an annual charge of £15; and for tear and wear of rope we have the following items: 1400 yards of iron wire-rope originally purchased, £50; steel ropes, 1400 yards, since purchased, £60. Probably the

annual charge needed to maintain this may be made on the theory that the rope will last three years, and £25 a year may suffice for this particular. Adding up these items, we have a sum total of £216, 10s. to be charged against the farm for steam cultivation. Putting £216 against 500 acres once grubbed in the course of the year, we have a charge of about 8s. 7d. an acre for the grubbing. Mr Pike informed me that, during the three years of his steam cultivation, on several of the ten fields already specified, he has not used the plough at all. Even the mixing of manure with the soil is done by the grubber. No plough is used to bury it. It is laid upon the land, and grubbed to and fro, and thereby mixed sufficiently. The cleanness of the land, too, is a fair testimony to the quality of cultivation by implements which stir, but do not overturn the soil.

"Mr Pike has till lately used the grubber invented by Mr Smith of Woolston, with the turnbow apparatus for turning the tool at the land's end. Latterly he has used the cultivator of Messrs Howard, cach tine of which is double, pointing both fore and aft, so that no turning at all is needed, the claw which follows in the wake of the working tooth as it goes coming into operation in its turn as it comes back again."

Mr Pike thus writes to Messrs Howard, of date December 2, 1861 :—

' GENTLEMEN,—I have cultivated my farm by stcam-power for the last four years, and therefore feel myself in a position to speak positively of the merits of the system.*

***My farm, belonging to the Duke of Bedford, consists principally of poor, strong, hilly, clay land, which, before I entered upon it, was laid up in three yard ridges, with water gutters drawn across the ridges to take off the*

water. Since I have steam cultivated it, I have done away with ridges and furrows entircly ; my fields of 40 and 50 acres each, which are steep in places, are all laid on the flat, and during the wettest season I have never secn any water stand upon them. I am convinced if land is broken up a good depth by the cultivator, and under drained, there is no nced of any furrows, if it is ever so strong.

**‘T am enabled to manage my farm with about half the number of horses. I do it with less trouble to mysclf. I am always more forward with my work, and the horses I do keep cost much less per head than formerly, as all the hard work is done by steam.*

*‘*The effect of deep stirring this soil is very apparent in the crops ; my land is naturally very poor, so that very large yiclds are out of the question ; but I am convineed I can grow much more corn by steam than by horse cultivation, and I can also grow a larger breadth of root crops. I also find that by constant deep tillage my land moves easier every year, consequently it is less expense to cultivate. I seldom use the plough, except my horscs have got nothing else to do.*

‘I break up my clover lays before harvest, and make a bastard fallow of them. I am convinced this is the surest way of getting a good wheat crop on strong soil ; and, besides cleaning the land, it has this advantage, it does not leave so much work to do at Michaelmas. I also break up my tare land before harvest, so that after harvest I have nothing to do but cultivate my bean and wheat stubbles.

***I put away my tackle as soon as possible after we have heavy rains, the latter part of October or beginning of November, and do not bring it out again until the turnip land is ready to break up for barley. My object is to make the best usc of the summer and the early autumn.*

***When I commenced cultivating by steam, I uscd to set down to little pieces, but I found ¢hat too much trouble, therefore inereased the length of my ropes, as I found it made very little difference to my 8-horse engine whether I had out a long or short length of rope. I have now suflicient to do a 50 acre field, without moving either engine or windlass; this is my largest field; I dug a pond at one end, and I do the whole without moving from the*

pond. When I can, I sct my engine and windlass in an adjoining field, so as to finish headlands and all complete, without going into it. Water carting is a great expensc, and in a wet season a great nuisance. I therefore have dug some ponds, and sometimes I dam up a ditch or master drain to obtain a supply.

"'T am particularly pleased with the new apparatus you made for me last spring. The windlass is much easier moved about, and is very simple to manage. The cultivator takes less time at land's end, there is no danger of overturning, it does not jump so much in work, and the hind shares cause the land to lay looscr. No matter

how hard the ground, it will break it up, and on sidehills it goes mueh steadier and better than my old one.

"The first steel rope I had did above 2000 aeres, andI have a small portion of itat work yet. If people mean to have their ropes last, they must keep them off the ground, and attend well to the coiling on the windlass drums. I like your new rollers, whieh carry the rope further from the ground.—I am, Gentlemen, yours very truly,

'¢ Messrs J. & F. Howard, Bedford. Wui.1AM Pike."

It is due to Messrs Howard to state that their numerous other customers concur in testifying to the general efficiency of their tackle, its little liability to breakage or derange- ment, and to the readiness with which their ordinary farm labourers have learned to work it efficiently.

By this time cultivation by steam-power had been adopted by enterprising individuals in nearly every county in England, and was making steady progress in the face of many hindrances. In every instance the purchaser and his servants had to learn the use of novel and somewhat complicated machinery ; much of which, as first sent out, proved to be defective both in structure and in material. The fields also, through lack of preparation, often presented obstacles which, as experience was gained, were seen and remedied. In a few instances, where the purchaser of steam tackle was

either unable to give his personal super- intendence, or lacked the necded energy and perseverance to cope with the difficulties of a new enterprise, it proved a failure. But with rare exceptions, easily accounted for, it was everywhere demonstrated that by steam-power and appropriate implements, the tillage of the soil can be per- formed with a rapidity, efficiency, and economy far excelling what is practicable by animal power and the old implements.

In the autumn of 1866, by which date steam tillage had greatly extended, the Royal Agricultural Society of England sent out three scts of commissioners to inspect and report on the position of steam cultivation at that time. The reports obtained were published in the Society's Journal for 1867, and present a mass of most interesting and instructive in- formation on the whole subject. The commissioners visited about 150 farms situatcd in nearly 40 different counties of England, and a few in East Lothian, containing an aggregate area of 66,000 acres, which they estimate to be about a third of the whole area then under stcam cultiva- tion, They amply confirm what has already been stated as to the success of this new system of tillage, and make it plain that the changes thus brought about are of such im- portance as really to amount to a revolution in modern agriculture.

At its annual show in 1871, at Wolverhampton, the English Socicty again provided for a careful competitive trial of steam-tillage machinery, when the following awards were made :—

GLass I.—For the best combination of machinery for the cultiva- tion of the soil by steam-power—

1st Prize, £100—Awarded to Messrs J. Fowler & Co., Leeds.

2d Prize, £50— do. do. do.

Ciass I1.—For the best combination of machinery for the eultiva- tion of the soil by steam-power, the weight of the steam-engine not to exeeed 10 tons—

1st Prize, £50—Awarded to Messts Fowler, Leeds.

2d Prize, £25—Awarded to the Ravensthorpe Engineering Co.

(Fisken system).

Crass IL].—For the best eombination of machinery for the cultiva- tion of the soil by an ordinary agricultural engine, whether self-propelling or portable.

1st Prize, £50—Awarded to Messrs Fowler, Leeds. 2d Prize, £25—Awarded to Messrs Howard, Bedford.

A Silver Cup, value £100, offered by the Right Hon. Lord Vernon, president, for the best combination of machinery for the culti- vation of the soil by steam-power, the cost of whieh shall not exeeed £700. The engine to be locomotive, and adapted for threshing and other farm purposes.—Awarded to Messrs Fowler & Co., Leeds.

Steam cultivation has now ceased to be a novelty, and is

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making rapid progress in all parts of Great Britain and in foreign countries. In March 1873, at an agricultural mect- ing, it was stated by Messrs Fowler & Co. of Leeds, that they are turning out annually from their works about 100 sets of their tackle for the home markct,and from 50 to 60 for foreign countries. Of their home sales about half are to private individuals, and half to persons who work them for hire. In a district around Magdeburgh fifty sets of their tackle are employed in cultivating the soil for the growth of sugar-beet. The other leading makers are also doing a large business, with the certainty of its becoming larger every year. The expiry of several patents applicable to steam cultivating tackle is giving an additional stimulus to the manufacture of such machines. Partly in this way, and also by contrivances of their own, the Messrs Howard of Bedford have recently (1873) made very considerable changes and progress with their tackle. Their self-acting anchors, and their turning cultivator, which is constructed on an entirely new principle, are said to be respectively the best of their kind. Section 5.—Harrows.

When a field has been broken up by the plough, it is usually next operated upon by the harrow, whether the object be to prepare it for and to cover in

seeds, or to bring clods and roots to the surface. This is virtually a rake dragged by horses. In its most ordinary form, the framework is of wood with iron tines, of which each harrow contains twenty. Formerly each horse dragged a single harrow, although two or more were worked abreast. Under this arrangement the harrows had too much independent motion, and were liable to get foul of each other. This has been remedied, first, partially, by coupling them loosely by riders, and then more effectually by a hinge-like joining, which allows a separate vertical motion, but only a combined horizontal one. A rhomboidal form is also given to this paw of harrows— usually called brakes—so that when properly yoked, no two tines run in the same track. 'This description of harrow is now frequently made entirely of iron.

Howard's patent harrows are a further improvement on this implement. The zig-zag form given to each section en-

Howard's Patent Harrow.

ables the whole so to fit in, that the working parts are equally distributed over the space operated upon. The number of times is 75, instead of 40, as in the form last noticed, and yet, from the form of frame and manner of coupling, the tines are well apart, and have each a separate line of action. Practical farmers speak very highly of the effective working of this implement. By an excecdingly simple contrivance, the centre part when turned on its back forms a sledge on which its fellows can be piled and drawn along from one ficld to another. A light description of harrows, with smaller and more numerous tines, is some- times used for covering in grass-seeds. If a harrow is to be used at all for this purpose, Howard's is a very suitable

kind, but a much better implement is Cartwright's chain- harrow, which abrades the surface over which it is drawn to a degree that could not be anticipated from a mere

inspection of the implement. It is formed by attaching @oee—

to a draught-bar pairs of square-linked chains, each 7 4 feet long, connecting them by cross links, and keeping the whole expanded by two movable stretchers. The old-fashioned ponderous break harrow is now entirely discarded, and the more efficient cultivator used in its stead. A form of the latter, from its close resemblance to harrows, is noticed now rather than before. It is a very strong iron harrow, with the tines made longer, and very considerably curved forwards. An iron rod with a loop handle is fixed to the hind bar, by means of which the driver can easily hitch it up and get rid of

weeds, &c. Two such harrows aré coupled together and drawn by four horses. Its pulverising power is very considerable. But when clods have been brought to the surface, they are most effectually reduced by various kinds of rollers.

Section 6.—Rollers.

Those formerly used were solid cylinders of timber or stone attached to a frame and shafts, for which hollow ones of cast-iron' are now generally substituted. The simplest form of these has a smooth surface, and is cast in sections to admit of more easy turning. They are made of diverse weights, so as to be adapted for the draught of one or two horses as required. Those of the former description, weigh-

Smooth Cast-Iron Field Roller.

ing in all 6 ewt., and costing as many pounds sterling, are exceedingly useful for all purposes where expedition rather than heavy pressure is wanted. From their greater dura- bility, smoother surface, and less liability to clog, the readi- ness with which they can be cast of any weight that is re- quired, and their moderate price, it is probable that cast-iron cylinders will speedily supersede all others.

Several important variations on the common smooth roller have been introduced of late years. Of these the first notice is due to Crosskill's clod-crusher, on the ground both of its intrinsic merit and the date of its introduction. It consists of cast-iron dises 24 feet in diameter, with serrated edge and a series of sideway-projecting teeth. Twenty-three of these dises

are strung loosely upon a round axle, so as to revolve independently of each other. The free motion thus given to each disc, and which has latterly been increased by cast- ing each alternate one of greater diameter in the eye, adds at once to the pulverising and self-cleaning power of the roller. Three horses yoked abreast are required to work it. The axle is prolonged at each end sufficiently to receive travelling wheels, on which it is transported from place to place. Although primarily designed and actually much used for breaking clods, it is even more in request for consolidating loose soils, checking the ravages of wire-worm, and covering in clover and grass seeds. For the latter purpose, its action 18 perfected by attaching a few bushes to it, which fill up the indentations, and leave a surface so beautifully even as to rival the accuracy and neatness of a well-raked border.

It is now to be had on a smaller scale adapted to the draught of two horses.

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Cambridge's roller possesses several features in common with Crosskill's, and is used for similar purposes. In tho

Cambridge's Press-Wheel Roller.

form in which it was first brought out it consisted of dises, fitting close to each other, with fluted instead of serrated edges, In its recently improved form the discs are not made of uniform diameter as formerly, but each alternate one in the set is raised about two inches, and has the centre hole, not circular and close fitting to the axle, but triangular and wide. The result is that while the discs press uniformly on the surface over which they are rolled, the larger ones rise above their fellows with a jerking motion, which gives a most efficient self-cleaning power to the implement, and thus admits of its being used when other rollers would be clogged. The eccentric discs are now made either with serrated or smooth edges as customers prefer. After careful trial we have come to the conclusion that it is the most useful roller for general purposes which we yet possess,

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Disc of Cambridge's Roller, showing Self-cleaning Action.

Under this head may be noticed press drills, which, by means of a series of narrow cylinders with conical edges, form corresponding grooves in loose soil. Seeds sown broad- cast over a surface thus treated come up in rows. The

Land-Presser.

land-presser is a modification of the press-roller. It is made with two or three conical edged cylinders to fit into the seams of as many plough furrows, the other end

of the axle on which they are fixcd being supported by a plain carriage-wheel. It is drawn by one horse, and follows in the wake of two or three ploughs, according to the number of its cylinders. When wheat is sown after clover lea, this implement is found exceedingly useful in closing the seams and forming a uniform seed-bed.

The Norwegian, or, as it should rather be called, the Swedish harrow is strictlya clod-crushing implement. From its radiating spikes penetrating the surface over which it 1s drawn, it has been called a harrow; but its revolving motion entitles it rather to be classed with rollers. In its usual form it consists of three rows of cast-iron rowels arranged upon parallel axles fixed in an iron frame, which is supported on three wheels,—one in front and two behind. The out- line and arrangements are in fact the same as in Finlayson's grubber, only substituting parallel rows of rowels for tines. There is also the same leverage for raising and depressing the frame. But this implement has recently been con- structed on a much simpler and cheaper plan, in which the wheels and lever apparatus are discarded altogether. It thus consists of a simple wrought-iron frame with four rows of rowels. A few boards are laid across the frame, forming a platform over the rowels, on which the driver stands when it is wished to increase the weight and efficiency of the im- plement. On the upper side at either end is fixed a piece of wheel-tire, on which the implement, when turned on its back, can slide along, sledge-fashion, when it is wished to move it from place to place.

As thus constructed it can be made for about £5. This is the best implement yet in- troduced for breaking mozst clods.

Section 7.—Breast-Plough and Trenching-Pork.

Before leaving the implements of tillage, it may be proper to notice two, which have been a good deal brought under notice of late years, viz., the breast-plough and trenching- fork. The former is extensively used in carrying out the process of paring and burning. It is the implement known in Scotland as the flaughter (or thin turf) spade. In using it the workman guards his thighs with a piece of board, fastened on apron-wise, and with this presses against the cross-head of the implement, and urges forward its cutting edge. When a thin turf has thus been severed from the surface, he turns it over by a jerk of his arms. The fork is used in giving a deep autumn digging to land in preparation for root crops. Both operations can ordinarily be more economically performed by using horse-power with suitable implements. But for clearing out corners of fields, hedge sides, and similar places, manual labour with these tools can frequently be made to supplement the plough to good purpose.

Section 8.—Implements for Sowing.

A large portion of the grain annually sown in Great Britain is still distributed by hand from the primitive sowing-shcet.

"The sower stalks

With measured step, and liberal throws the grain Into the faithful bosom of the ground."

Jn Scotland a decided preference is still given to broadcast.

sowing, for which purpose a machine is used that covers from 15 to 18 feet, according to the width of ridge adopted. It consists of a long seed-box, carried on a frame mounted on two wheels. From these motion is com- municated to a spindle which revolves in the seed-box, and expels the seed by means of cogs or brushes, through openings which can be graduated to suit the required rate of seeding. It is drawn by a single horse, is attended

by one man, and can get over 30 acres a day. It is peculiarly adapted for the regular distribution of clover and grass seeds. Now that reaping by machinery has become so

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general, there is an obvious advantage in having the fields as level and with as few open forms as possible, and hence of having a marker attached to the sowing-machine. In one made by Sheriff at West Barns, by an ingenious apparatus on the principle of the odometer, the machine itself is made to register the space which it travels over, and thus to indicate the ratc per acre at which it is distributing the seed. Excellent results have been, and still are, obtained from broadcast sowing. But as tillage becomes more perfect, there arises a demand for greater accuracy in the depth at which seeds are deposited in the soil, for greater precision in the rate and regularity of their distribution, and for greater facilities for removing weeds from amongst the growing crop. These considerations led, at a comparatively early period, to the system of sowing crops in rows or drills, and hence the demand for machines to do this expeditiously and accurately. We accordingly find, in our best cultivated districts, the sowing and after-culture of the crops now conducted with a precision which reminds the spectator of the processes of some well-arranged factory. This is accomplished by means of a variety of drilling- machines, the most prominent of which we shall now notice.

The Suffolk drill is the kind in most general use. It is a complicated and costly machine by which manure and seeds can be simultaneously deposited. That called the "general purpose drill" can sow ten rows of corn, with or without manure, at any width between the rows from 44 to 10 inches, and at any rate per acre between two pecks and six bushels. It can be arranged also to sow clover and grass seeds,—the heavier seeds of clover being thrown out by minute cups,—and the lighter grass seeds brushed out from a separate compartment. It is further fitted for sowing beans and turnips—the latter either two drills at a time on the ridge, or three on the flat. This drill, as most recently improved by Messrs Hornsby of Grantham and Garrett of Leiston, has an apparatus for preserving the machine in a level position when working on sloping ground. As a main

object in drilling crops at all is to admit of the use of the hoe, it becomes an important point to accomplish the drilling with undeviating straightness, and exact parallelism in each successive course of the drill. This is now obtained by means of a fore-carriage, which an assistant walking alongside so controls by a lever as easily to keep the wheel in the same rut down which it had previously passed. Messrs Hornsby have also introduced India-rubber tubes for conducting the seed, in place of the tin funnels hitherto used. These drills cost about £42.

The Woburn drill of the Messrs Hensman is simpler in its construction than those already noticed. "In all other drills, the coulters, which distribute the manure or seed, hang from the carriage. In this drill the carriage rests upon the coulters, which are like the iron of skates; it may be said, indeed, to run on four pairs of skates. Hence this drill's power of penetrating hard ground, and of giving a firm bed to the wheat-seed in soft ground. Each drill coulter, however, preserves its independence as when suspended. This self-adjustment is required by the in- equality of tilled ground, and is thus obtained : each pair of coulters is fixed to the end of a balance beam, these again to others, and they to a central one. Thus each coulter, in well-poised rank, gives its independent share of support. It varics from the generality of drills, as it is drawn from the centre by whipple-trees instead of shafts ; and the drill-man behind can steer or direct the drill with the greatest nicety. The corn-box of the drill is entirely self-acting, and delivers the seed equally well going either up or down hill. It is also capable of horse-hoeing, by attaching hoes to the levers instead of the coulter-shares.

It is drawn by a pair of horses, and the price from £18 to £20."

Turnip drill_—tiIn Scotland, and in the north and west of England, turnips are usually sown on the ridge by a machine which sows two rows at atime. In the south- eastern parts of England, which are hotter and drier, it is found better to sow them on the flat, for which purpose machines are constructed which sow four rows together, depositing manure at the same time. Both kinds are adapted for sowing either turnips or mangold-wurzel seeds as required. With the view of economising seed and manure, what are called drop-drills have recently been introduced, which deposit both—not in

continuous streams —but in jets, at such intervals apart in the rows as the farmer wishes the plants to stand. What promises to be a more useful machine is a water-drill invented by a Wilt- shire farmer—Mr Chandler of Market Lavington. "His water-drill pours down each manure-coulter the requisite amount of fluid, mixed with powdered manure, and thus brings up the plant from a mere bed of dust. Having used it largely during three years, I may testify to its excellence. Only last July, when my bailiff had ceased turnip sowing on account of the drought, by directing the use of the water-drill, I obtained from this latter sowing

an earlier and a better show of young plants than from |

the former one with the dust-drill. Nor is there any increase of expense if water be within a moderate distanee, for we do not use powder-manures alone. They must be mixed with ashes, that they may be diffused in the soil. Now, the expense and labour of supplying these ashes are equal to the cost of fetching mere water; and apart from any want of rain, it is found that this method of moist diffusion, dissolving, instead of mingling only, the super-phosphate, quickens its action even upon damp ground, and makes a little of it go further."?

Section 9.—Manure-Distributors.

The practice of top-dressing: wheat, vetches, clover, or meadows, with guano and various light manures, has now so much increased, and the inconvenience of scattering them over the surface by hand is so great, that various machines have recently been invented for distributing them, which can also be used for sowing such manures over turnip drills, covering three at once. Such machines will probably be used in future for distributing lime, which can thus be done much more regularly than by cart and shovel, espeeially when it is wished to apply small quan- tities for the destruction of slugs or for other purposes. It seems quite practicable to have this or a similar machine so constructed as that it could be readily hooked on to the tail of a cart containing the lime or other substance which it is desired to distribute by it. The top-dressing material could by such an arrangement be drawn into the hopper of the distributor as it and its tender move along, and the cart when emptied be replaced by a full one with little loss of time.

A cheap and effective machine, capable of being in a similar manner attached to a dung-cart, which eould tear asunder fold-yard manure, and distribute it evenly in the bottoms of turnip drills, would be a great boon to farmers, and seems a fitting object to be aimed at by those possessed of the inventive faculty.

Section 10. —Horse-Hoes.

It has already been remarked that the great inducement to sow grain and green crops in rows is that hoeing may be resorted to, for the double purpose of ridding them of

Ee a u See Mr Pusey's Report on Implements, in the Journal of the Royal Agricultural Society of England, vol. xii. p. 604. 2 Thid., p. 607.

weeds and stimulating their growth by frequent stirring of the soil Jt is now upwards of a century sinee Jethro Tull demonstrated, in his books and on his fields, the facility with which horse-power could be thus employed. His system was early adopted in regard to turnips, and led, as we have seen, to a complete revolution in the practiee of agrieulture. The peculiar manner in which he applied his system to grain crops, and the principles on which he grounded his practice, have hitherto been for the most part repudiated by agriculturists, who have thought it indispens- able to drill their grain at intervals so narrow as to admit, as was supposed, of the use of the hand-hoe only. But the accuracy with which corn-drills perform their work has been skilfully taken advantage of, and we now have horse-hoes, covering the same breadth as the drill, which can be worked with perfect safety in intervals of but seven inches' width. By such a machine, and the labour of a pair of horses, two men, and a boy, ten acres of corn can be hoed in as many hours. Not only is the work done at a fifth of the expense of hand-hoeing, and far more effectually, but it is practicable in loealities and at seasons in which hand-labour cannot be obtained.

Garrett's horse-hoe is admitted to be the best implement of its kind. It can be used for hoeing either beans, tur- nips, or eorn, as the hoes can be adapted to suit any width betwixt rows, and the axle-tree being movable at both ends, the wheels, too, can be shifted so as to be kept between the rows of plants. The shafts can be attached to any part of the frame to avoid injury

to the crop by the treading of the horses. Each hoe works on a lever independent of the others, and can be loaded with different weights, on the same principle as the coulters of the corn- drill, to accommodate it to uneven surfaces and varying degrees of hardness in the soil.

A great variety of implements, under the general names of horse-hoes, scufflers, scrapers, or drill-grubbers, fitted for the draught of one horse, and to operate on one drill at a time, is in use in those parts of the eountry where root crops are chiefly sown on ridgelets from 24 to 30 inches apart. With considerable diversity of form and efficiency, they in general have these features in common, viz., provision for being set so as to work at varying widths and depths, and for being armed either with hoes or tines, according as it is wished to pare the surface or stir the soil more deeply. A miniature Norwegian harrow is sometimes attached to drill-grubbers, by which weeds are detached from the soil, and the surface levelled and pulverised more thoroughly. Tennant's grubber, with its tines set close together, and two horses yoked to it abreast by a tree long enough to allow them to walk in the drills on either' side of that operated upon, is the most effective implement for cultivating between the rows of beans, potatoes, turnips, or mangolds, that we have yet seen used for this purpose.

Section 11.—Turnip-Thinners.

It sometimes happens, as when drought prevails while the earlier sowings of turnips or mangold are made, and this is followed by copious rains and forcing weather, that the farmer finds it impracticable to get the thinuing-out of the seedlings overtaken as fast as is needful. To aid him in such emergencies, a class of machines has been brought out, of which Huckvale's turnip-thinner may be named as a type. They are very favourably reported of by those who have used them. Such machines, drawn by one horse, and made to operate upon either one or two rows of young turnip plants, have first a paring apparatus, which clears off weeds from the sides of the rows, and along with this a set of revolving hoes by which gaps are cut in the rows of turnip plants, and tufts of them are left standing at any

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required distance apart. This does not dispense with the after use of the hand-hoe or fingers to effect a perfect singling of the plants; but as a large space can be gone over in a day at small cost, it enables the farmer to save his crop from getting overgrown and choked until he can overtake the more perfect thinning of it. The next class that claims attention is

Section 12.—Harvesting Implements.

These, till little more than twenty years ago, comprised only the reaping-hook and scythe. An implement by means of which horse-power could be made available for this important operation has long been eagerly desired by farmers. Repeatedly during the first half of the present century their hopes had been excited, only to be disappointed, by the announcement of successful inventions of this kind. These hopes were revived, and raised to a higher pitch than ever, by the appearance, in the Great Exhibition of the Industry of all Nations, of two reaping-machines, known as M'Cormick's and Hussey's, from the United States of America, where for several years they had been used extensively and successfully. These implements were subjected to repeated trials in different parts of England, on crop 1851, but never in circumstances which admitted of their capabilities being tested in a thoroughly satisfac- tory manner.

At the first of these trials, made under the auspices of the Royal Agricultural Society, the preference was given to M'Cormick's, to which the Exhibition Medal was in consequence awarded. It turned out, however, that at this trial Hussey's machine had not a fair chance, being attended by a person who had never before seen it at work, for, when a further trial took place before the Cleveland Agricultural Society, with Mr Hussey himself super- intending his own machine, an all but unanimous decision was given in his favour. Hussey's machine was in conse- quence adopted by the leading implement makers, such as Messrs Garrett, Crosskill, &c.

Early in 1852, a very important, communication from the pen of the late Mr James Slight, curator of the museum of the Highland and Agricultural Society, appeared in the Transactions of the Society, by which the attention of the public was recalled to a reaping-machine of home production, viz., that invented by the Rev. Patrick Bell, minister of the parish of Carmylie in Forfarshire, and for which a premium of £50 had been awarded to him by the Highland Society. This machine attracted much attention at that time. Considerable numbers were made and partially used, but from various causes the invention was lost sight of, until, by the arrival of these American machines, and the notoriety given to them by the Great Exhibition, with concurring causes about to be noticed, an intense interest was again excited regarding reaping by machinery. From Mr Slight's report, the public lcarned that the identical Bell's machine, to which the prize was awarded, had for the previous fourteen years been statedly employed on the farm of Inch-Michael in the Carse of Gowrie, oceupied by Mr George Bell, a brother of the inventor, who, during all that period, had succeeded in reaping, on the average, four-fifths of his crop by means of it every year. Mr Slight further stated, that at least Sour specimens of it had been carried to Aimerica, and that from the identity in principle between them and those now brought thence, with other corroborating circumstances, there is little doubt that the so-called American inventions are after all but imitations of this Scottish machine. When it became known that Bell's machine was to be exhibited and, if possible, subjected to public trial, at the meeting of the Highland and Agricultural Society at Perth, in August 1852, the event was looked forward to by Scottish farmers

with eager interest. On that occasion it was accordingly again brought forward, with several important improve- ments made upon it, by Mr George Bell, already referred to, and was fully tested in competition with Hussey's, as made by Crosskill. To the disappointment of many, Mr M'Cormick did not think fit to enter the lists at this or at some subsequent opportunities.

The success of Bell's machine on this occasion, and at some subsequent public trials, gave it a high place in public estimation, and accordingly

many of the implements manu- factured by Mr Crosskill of Beverly, were sold to farmers in all parts of Great Britain, and especially in Scotland. After a hopeful start the success of this machine has not been so decided as was at first anticipated. In common with other reaping-machines, it had of course to contend with the disadvantages of unprepared fields and unskilful guides ; but in addition to this, it was found to be too heavy in draught, too liable to derangement, and (in the first issues of it) too easily broken in some of its parts to be fitted for general use. These drawbacks were, to a greater or less extent, obviated by subsequent improvements, and the machine continued for a few years to receive a fair measure of public patronage. By-and-by it was in a great measure superseded by other self-delivery machines, such as Burgess & Key's M'Cormick, with its Archimedean screw, which, like Bell's, lays off the reaped grain in a continuous swathe, and by others which, by means of revolving rakes, lay it off in quantities suitable to form a sheaf. In crops of moderate bulk and standing erect, these self-delivery machines make rapid and satisfactory work, but when the crop is lodged and twisted they are nearly useless. The consequence is that for several years, and especially in those districts where reaping by machinery is most practised, the preference is given to manual-delivery machines, on the ground that they are lighter of draught, less liable to derange- ment, less costly, more easily managed, and thus more to be depended upon for the regular performance of a fair amount of daily work, than their heavier rivals. And, accordingly, light machines on Hussey's principle, but with endless variations, are at present most in demand.

Before leaving this subject, a remark is due in connection with the strange neglect of Bell's machine for twenty-five years, and the enthusiasm with which it was hailed on its reappearance. 'The first is so far accounted for by the fact noticed by Mr George Bell, that such specimens of his brother's machine as formerly got into the hands of farmers were so imperfectly constructed that they did not work satisfactorily, and thus brought discredit on his invention. Thetrueexplanation seemsto be, that at that date the country was not ready for such a machine. Not only was manual labour then abundant and cheap, from the number of Irish labourers, who annually, as harvest drew near, flocked into the arable districts of Great Britain, but thorough draining had made little progress, and the land was

everywhere laid into high ridges, presenting a surface peculiarly unfavourable for the successful working of a reaping-machine. Now, however, the conditions are reversed. Emigration to the colonies, and the ever-growing demand for labourers in connection with factories, mines, docks, and railways, have to a very great extent withdrawn the class of people that used to be available for harvest work, and have so largely raised the rate of wages to those who still remain as to render reapiug-machines indispensable to the farmer. The pro- gress of thorough draining has at the same time enabled him to dispense with the old-fashioned ridges and furrows, and to lay his corn lands in the level state so favourable for reap- ing and other operations of husbandry. In these altered conditions lies the true explanation of the former apathy and subsequent enthusiasm manifested by our farmers to- wards this invention.

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Section 13.—Mowing-Machines.

Another class of labour-saving machines, closely allied to those we have just described, for which we are indebted to our American cousins, is mowing-machines. Several different forms of these were introduced and brought into somewhat general use during the years 1858 and 1859. Having used such machines for the past fourteen years we can testify to their thorough efficiency, and to the very great saving of labour, and still more of time, which can be secured by means of them. In one instance 30 acres of clover—a very full crop, and partially lodged—were mown in 32 hours, and this under all the disadvantages of a first start. This machine being of very light draught, a pair of horses can work it at a smart pace without difficulty. By employing two pairs of horses, and working them by relay, it can, in the long days of June and July, be kept going sixteen hours a day, and will easily mow from 16 to 18 acres of seeds or meadow in that time, making, moreover, better work than can ordinarily be obtained by using the scythe. These mowing-machines, which cost from £16 to £25 each, have proved a most seasonable and truly important addition to our list of agricultural implements. That they may be used to advantage, it is

absolutely necessary to have the land well rolled and carefully freed from stones.

Section 14.—Haymakers.

Haymakers are valuable implements, and well deserving of more general use. They do their work thoroughly, and enable the farmer to get through a great amount of it in snatches of favourable weather. Where manual labour is scarce, or when, as in Scotland, haymaking and turnip- thinning usually come on hand together, the mower and haymaker render the horse-power of the farm available for an important process which cannot be done well unless it is done rapidly and in season.

Section 15.—Horse-Rakes.

Horse-rakes are in frequent use for gathering together the stalks of corn which are scattered during the process of reaping, for facilitating the process of haymaking, and also for collecting weeds from fallows. By an ingenious contrivance in the most improved form of this implement, the teeth are disengaged from the material which they have gathered without interrupting the progress of the horse.

We seem to be verging on the time when, by means of machines worked by horse-power, farmers will be enabled to cut and carry their grass and grain with little more than the ordinary forces of their farms.

Section 16.—Wheel-Carriages.

The cartage of crops, manure, &¢., upon an arable farm, is such an important part of the whole labour performed upon it (equal, as shown by a recent estimate, to one-half), that it is a matter of the utmost consequence to have the work performed by carriages of the most suitable kind. It was for a long time keenly debated by agriculturists, whether waggons or carts are most economical. This question is now undoubtedly settled. Mr Pusey says, "It is proved beyond question that the Scotch and Northumbrian farmers, by using one-horse carts, save one-half of the horses which south country farmers still string on to their three-horse waggons and three-horse dung-carts, or dung-pots, as they are called. The said three-horse waggons and

dung-pots would also cost nearly three times as much original outlay. Few, I suppose, if any, farmers buy these expensive luxuries now, though it is wonderful they should keep them; for last year at Grantham, in a public trial, five horses with five carts were matched against five waggons with ten horses, and the five

1 See Morton's Cyclopedia of Agriculture. Article " Carriages."

horses beat the ten by two loads."2 The one-horse carts here referred to are usually so constructed as to be easily adapted to the different purposes for which wheel-carriages are needed upon a farm. For each pair of wheels and axle there is provided a close-bodied cart, and another with sparred sides and broad shelvings, called a long-cart, or harvest-cart, either of which can easily be attached to the wheels, according to the nature of the commodities to be carried. Sometimes a simple movable frame is attached to the close-body to fit it for carrying hay or straw; but although one or two such frames are useful for casual pur- poses throughout the year, they are inferior for harvest work to the regular sparred cart with its own shafts. In some distriets the whole of the close-bodied carts used on the farm are made to tip. For many purposes this is a great convenience; but for the conveyance of grain to market, and generally for all road work, a firm frame is much easier for the horse, and less liable to decay and de- rangement. The Berwickshire practice is to have one pair of tip-carts on each farm, and all the rest firm or dormant- bodied, as they are sometimes called.

Many farms are now provided with a water or tank cart, for conveying and distributing liquid manure.

Section 17.—Road-Engines.

Although many attempts have been made to adapt the loco- motive steam-engine for the conveyance both of passengers aud goods on common roads, the results hitherto have not been altogether satisfactory. Progress is,

however, undoubt- edly being made in this effort ; and in not a few instances such enginesareactuallyin usefor the carriage of heavy goods. If beet sugar factories should increase in Great Britain, the carriage of the roots from the farms to the factories will probably be performed by traction engines; for the inex- pediency of withdrawing the horse-power of the farm from its other urgent work at the season most suitable for deliver- ing these roots to the sugar-maker presents at present a serious hindrance to the cultivation of this crop.

MACHINES FOR PREPARING CROPS FOR MARKET. (Sections 18, 19, 20.) Section 18.—Steam-Fngunes.

The extent to which steam-power is now employed for the purposes of the farm is another marked feature in the recent

(Clayton, Shuttleworth, & Co.)

We have already referred to the value of water-power for propelling agricultural machinery

Portable Steam-Engine, progress of agriculture.

- *Mr Pusey's Report, in the Journal of the Royal Agricultural Society of England vol. xii, p. 617.*

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when it can be had in sufficient and regular supply. As it is only in exceptional cases that farms are thus favoured, the steam-engine is the power that must generally be reckoned upon, and accordingly its use is now so common that a tall chimney has become, over extended districts, the prominent feature of nearly every homestead. It has been satisfactorily shown that grain can be thrashed and dressed by well-constructed, steam-propelled machinery, at one- fourth the cost of thrashing by horse-power and dressing by hand-fanners. So great, indeed, is the improvement in steam-engines, and so readily can the amount of power be accommodated to the work to be done, that we find them everywhere superseding the onc-horse gin, and even manual labour, for pumping, churning, coffee-grinding,

&e. Wherever, then, a thrashing-mill is used at all, it may be safely asserted that, next to water, steam 1s the cheapest power by which it can be propelled. The portable engine is the form which has hitherto found most favour in the southern parts of the kingdom. Mr Pusey thus states the reason for which he regards them as preferable to fixed engines :—" If a farm be a large one, and especially if, as is often the case, it be of an irregular shape, there is great waste of labour for horses and men in bringing home all the corn in the straw to one point, and in again carrying out the dung to a distance of perhaps two or three miles. Itis therefore common, and should be general, to have a second outlying yard. This accommodation cannot be reconciled with a fixed engine.

Portable Thrashing-Machine.

(Clayton, Shuttleworth, & Co.)

"Tf the farm be of a moderate size, it will hardly—and if small will certainly not—bear the expense of a fixed engine: there would be waste of capital in multiplying fixed engines to be worked but a few days in the year. It isnow common, therefore, in some counties for a man to invest a small capital in a movable engine, and earn his livelihood by letting it out to the farmer.

"But there is a further advantage in these movable engines, little, I believe, if at all known. Hitherto corn has been thrashed under cover in barns; but with these engines and the improved thrashing-machines we can thrash the rick in the open air at once as it stands. It will be said, How can you thrash out of doors on a wet day? The answer is simple. Neither can you move your rick into your barn on a wet day; and so rapid is the work of the new thrashing-machines, that it takes no more time to thrash the corn than to move it. Open-air thrashing is also far pleasanter and healthier for the labourers, their lungs not being choked with dust, as under cover they are; and there is, of course, a saving of labour to the tenant not inconsider- able. But when these movable steam-engines have spread generally, there will arise an equally important saving to the landlord in buildings. Instead of three or more barns

whose objects are obsolete.

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clustering round the homestead, one or other in constant waut of repair, a single building will suffice for dressing corn and for chaff-cutting. The very barn-floors saved will be no insignificant item. Now that buildings are required for new purposes, we must, if we can, retrench those buildings Open-air thrashing may appear visionary, but it is quite common with the new machinery ; nor would any one perform the tedious maneeuvre of setting horses and men to pull down a rick, place it on carts, and build it up again in the barn, who had once tried the simple plan of pitching the sheaves at once into the thrashing- machine." !

To us these reasons are inconclusive.. A fixed engine can be erected and kept in repair at greatly less cost than a portable one of the same power. It is much easier to keep the steam at working pressure in the common boiler than in the tubular one, which, from its compactness, is generally adopted in portable engines. It is, no doubt, very convenient to draw up engine and machinery alongside a rick and pitch the sheaves at once upon the feeding-board, and very pleasant to do this in the sunshine and "caller air ;" but we should think it neither convenient nor pleasant to have engine and thrashing-gear to transport and refix every time of thrashing, to have grain and chaff to cart to the barn, the thrashed straw to convey to the respective places of consumption, and all this in circumstances unfavourable to accurate and cleanly disposal of the products, and excessive exposure to risk of weather. Sudden rain will no doubt interrupt the carrying in of arick in the one case as the thrashing of it in the other ; but there is this vast difference in favour of the former, that the partially carried rick is easily re-covered; machinery, products of thrashing, and work-people, are safely under cover ; and the engine is ready by a slight change of gearing forother work, such as bruising, grinding, or chaff-cutting.

It is urged on behalf of the portable engine, that in districts where the farms are generally small, one may serve a good wany neighbours. Now, not to dwell on the expense and inconvenience to small occupiers of frequently transporting such heavy carriages, and of having as much of their crop thrashed in a day (there being manifest economy in having at least a day's

work when it is employed) as will meet their demands for fodder and litter for weeks to come, we are persuaded that on farms of even 80 or 100 acres, a compact fixcd engine of two or three horse-power will thrash, bruise grain, cut chaff, work a churn, and cook cattle food, &c., more economically than such work can be done in any other way. It is very usual to find on such farms, especially in dairy districts, an apparatus for cooking cattle food by steam, or by boiling in a large copper, where as much fuel is used every day, and as much steam generated, as would work such an engine as we have referred to, and do the cooking over and above. Evena small dairy implies a daily demand for boiling water to scrub vessels and cook food for cows. How manifestly economical, then, when the steam is up at any rate, to employ this untiring, obedient agent, so willing to turn the hand of anything, in performing the heavy work of the homestead with a power equal, perhaps, to that of all the men and horses employed upon the farin.

Whenever tillage by steam-power is fairly available, there will undoubtedly be an inducement to use the portable engine as a thrashing-power that has not hitherto existed, as there will be a manifest economy in having both opera- tions performed by the same engine. Even then, however, there is a high probability of its being found impracticable to withdraw the engine even once a week for the needful thrashing during the six or eight weeks immediately after

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1 Mr Pusey's Report on Implements.—Journal of the Royal Agvt- cultural Society of England, vol. xii. p. 621.

harvest, when it will be of such consequence to make diligent use of every available hour for pushing on the tillage.

The kind of fixed engine most approved for farm-work

in the north of England and south of Scotland is the over- head crank engine, attached by direct action to the spur- wheel, and sometimes even to

the drum shaft of the thrashing-machine. Their cheapness, simplicity of con- struction, easy management, and non-liability to derange-

nent, fit these engines in an eminent degree for farm-work.!

Section 19.—Thrashing-Machines.

It is now sixty-five years since an ingenious Scotch mechanist, Andrew Meikle, produced a thrashing-machine so perfect that its essential features are retained unaltered

to the present day. Indeed, it is frequently asserted that,

after all the modifications and supposed improvements of the thrashing-machine which have been introduced by various parties, the mills made by Meikle himself have not

yet been surpassed, so far as thorough and rapid separation of the grain from the straw is concerned. The unthrashed corn is fed evenly into a pair of slowly revolving fluted rollers of cast-iron, by which it is presented to the action

of a rapidly revolving cylinder or drum armed with four

beaters, which are square spars of wood faced with iron, fixed parallel to its axis, and projecting about four inches from its circumference. The drum is provided with a dome or cover, and the corn being partly held by the fiuted rollers as it passes betwixt the drum and its cover, the rapid strokes of the beaters detach the grain from the ears, and throw the straw forward upon slowly revolving rakes, in passing over which the loose grain is shaken out of the straw, and falls through a grating into the hopper of a winnowing and ridding machine, which rids it of dust and chaff, and separates the grain from the unthrashed ears and broken straw, called roughs or shorts. The grain and roughs are discharged by separate spouts into the apartment below the thrashing-loft, whence the corn is fed into the rollers, and the thrashed straw falls from the rakes into the straw barn beyond. Since Meikle's time further additions have been made to the machinery. In the most improved machines driven by steam or a sufficient water power, the

grain is raised by a series of buckets fixed on an endless web into the hopper of a double winnowing-machine, by which it is separated into clean corn, light, whites or capes, and small seeds and sand. The discharging spouts are sufficiently elevated to admit of sacks being hooked on to receive the different products as they fall. When barley is thrashed, it is first carried by a separate set of elevators, which can be detached at pleasure, into a "hummeller," in which it is freed from the awns, and then raised into the second fanners in the same manner as other grain. The hummeller is a hollow cylinder, in which a spindle fitted with transverse blunt knives revolves rapidly. The rough grain is poured in at the top, and, after being acted upon by the knives, is emitted at the bottom through an opening which is enlarged or diminished by a sliding shutter, according to the degree of trimming that is required. A large set of elevators is usually employed to carry up the roughs to the feeding-board, that they may again be subjected to the action of the drum. The roughs are emptied, not directly on the feeding-board, but into a riddle, from which the loose grain passes by a canvas funnel direct to the winnower in the apartment below, and only the unthrashed ears and short straw are allowed to fall upon the board.

The alterations that have been made upon the thrashing-

*1 See article on *'Comparative Advantages of Fixed and Portable Steam Power for the Purposes of a Farm," by Robert Ritchie, Esq., i in Transactions of Highland Society for March 1852, p. 281.*

machine since Meikle's time chiefly affect the drum. Meikle himself tried to improve upon his beaters by fixing a project- ing ledge of iron on their outer edges, so as to give them a scutching action similar to that of flax-mills. This strips off the grain from oats or barley very well when thinly fed in; but its tendency is to rub off the entire ears, especially of wheat, and also to miss a portion of the ears, whenever there is rapid feeding in. More recent trials of drums on the scutching principle show them to be on the whole inferior to the plain beater.

We have already referred to the general use of portable thrashing-machines in the eastern counties of England. These, for the most part, have drums

with six beaters upon a skeleton frame, which revolve with great rapidity (about 800 times per minute, hence often called high-speed drum), within a concave or screen, which encloses the drum for about one-third its circumference. This screen consists alternately of iron ribs and open wire-work, and is so placed that its inner surface can be brought into near contact with the edges of the revolving beaters, and admits of this space being increased or diminished by means of screws. No feeding-rollers are used with this drum, the unthrashed corn being introduced directly to it.

Another form of drum, acting on the same principle as that just referred to, but cased with plate-iron, and having for beaters eight strips of iron projecting about one-fourth of an inch from its surface, and which works within a concave which embraces it for three-fifths of its circum- ference, is in use when it is desired to preserve the straw as straight and unbroken as possible. These are made of sufficient width to admit of the corn being fed in sideways, and are called bolting machines, from the straw being delivered in a fit state for being at once made up into bolts or bundles for market. Although the term beaters isretained in describing these drums, it is evident that the process by which the grain is separated from the ears is rubbing rather than beating. This necessarily requires that only a narrow space intervene between drum and concave, and that the corn be fed in somewhat thinly. Such machines thrash clean, whether the ears are all at one end of the sheaf or not, and deliver the straw straight and uninjured ; but it is objected to these by some that they are slower in their operation than those with the beating drum, are liable to choke if the straw is at all damp, that the grain is sometimes broken by them, and that they require greater power to drive them.

A further and more recent modification is the peg-drum. In this case the drum is fitted with parallel rows of iron pegs, projecting about 24 inches from its surface, which in its revolutions pass within one-fourth of an inch of similar pegs fixed in the concave in rows running at right angles to the drum. Great things were at first anticipated from this invention, which, however, it has failed to realise. But iron pegs have more recently been added to the common beater-drum with apparent success. The beaters in this case are made one-half narrower than usual, and have stout iron pegs, formed of square rods, driven into their faces, angle foremost, and slightly

reflected at the points. These act by a combination of beating and rippling, and are said to thrash clean and to be easily driven.

There is thus a great variety of thrashing-machines to be found in different parts of the country, the comparative merits of which are frequently and keenly discussed by agriculturists. The extraordinary discrepancies in the amount and quality of the work performed by different machines, and in the power required to effect it, are due quite as much to the varying degrees of skill with which their parts are proportioned and put together, as to varying merit in the respective plans of construction.

In the best examples of 6-horse power stationary steam- engines and thrashing-machinery, as found in the Lothians,

fifty quarters of grain, taking the average of wheat, barley, and oats, are thrashed, dressed, and sacked up ready for market, in a day of ten hours, with a consumption of 74 ewt. of good coals, and a gross expenditure for wages, value of horse labour, fuel, and wear and tear of machinery, of 9d. per quarter.

The exigencies of the labour market are giving a power- ful stimulus to the use of labour-saving contrivances of all kinds; and hence the recent introduction of straw elevators, to be worked either by horse-power or by the same steam- engine that is driving the thrashing-machinery. The latter plan finds most favour in England, where it has already been adopted to a considerable extent.

The Royal Agricultural Society of England has done much towards ascertaining the real merits of the various thrashing-machines now in use, by the carefully conducted comparative trials to which it has subjected those which have been presented in competition for its liberal prizes. The accuracy of these trials, and the value of the recorded

results, have been much enhanced by the use of an:

ingenious apparatus invented by Mr C. E. Amos, consulting engineer to the Society, which is figured and described at

_p. 479 of vol. xi. of the Society's Journal. A pencil

connected with this apparatus traces a diagram upon a sheet of paper, recording every variation of the power employed during the experiment to work the machine under trial. For reasons already stated, we regard it as unfor- tunate that the patronage of this great Society has hitherto been so exclusively bestowed upon portable machines.

Section 20.— Winnowing-Machines.

We have already referred to the fanners, which, except in portable machines, are almost invariably found in com- bination with thrashing-machinery, so as to deliver the grain into the corn-chamber in a comparatively clean state ; and we have also noticed the further contrivances by which, when there is a sufficient motive power at command, the complete dressing of the grain goes on simultaneously with the thrashing. The winnowers used in such cases do not differ in construction from those worked by hand. In- deed, it is usual to have one at least that can be used in either way at pleasure. In these machines the separa- tion of the clean from the light grain, and of both from dust, sand, and seeds of weeds, or other rubbish, is effected by directing an artificial blast of wind upon a stream of grain as it falls upon a riddle. There is thus a combination of fanning and sifting, which is used in different degrees according to the views of the mechanist. In some forms of this machine the benefit of the artificial blast is in a great measure lost through an injudicious application of it.

Section 21.—Corn-Bruiser and Grinding-Mill.

The now frequent use of various kinds of grain in the fattening of live stock creates a necessity for machines to prepare it for this purpose, either by breaking, bruising, or grinding. A profusion of these, to be worked by hand, is everywhere to be met with. Such machines are always most economically worked by steam or water power. When that can be had, a set of rollers for

bruising oats or linseed, and millstones to grind the inferior grain of the farm, form a most valuable addition to barn machinery.

Section 22.—Cake-Crushers.

Machines for breaking linseed-cake into large pieces for cattle, or smaller ones for sheep, are now in general use. The breaking is performed by passing the cakes between serrated rollers, by which it is nipt into morsels. These are usually driven by hand ; but it is always expedient to have a pulley attached to them, and to take advantage of mechanical power when available.

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Section 23.—Chaff-Cutters.

The use of this class of machines has increased very much of late years. Fodder when cut into lengths of from half-an-inch to an inch is somewhat more easily masticated than when given to animals in its natural state; but the – chief advantages of this practice are, that it prevents waste, and admits of different qualities—as of hay and straw, straw and green forage, or chaff and pulped roots—being so mixed that animals cannot pick out the one from amongst the other, but must eat the mixture as it is presented to them. Such cut fodder also forms an excellent vehicle in which to give meal or bruised grain, either cooked or raw, to live stock. This applies particularly to sheep feeding on turnips, as they then require a portion of dry food, but waste it grievously when it is not thus prepared. Chaff-cutters are constructed on a variety of plans; but the principle most frequently adopted is that of radial knives bolted to the arm of a fly-wheel, which work across the end of a feeding-box fitted with rollers, which draw forward the straw or hay and present it in a compressed state to the action of the knives. A machine on this principle, made by Cornes of Barbridge, has gained the first premium in its class at recent meetings of the Royal Agricultural Society of England. Gillets' guillotine chaff-cutter is an exceedingly ingenious and efficient machine, performing its work with great accuracy, and without frequent sharpening of its one double-edged knife. These machines are most economically worked by the power used for thrashing. The most convenient site for them is in the upper loft of the straw-barn,

where the straw can be supplied with little labour, and the chaff either shoved aside, or allowed to fall as it is cut through an opening in the floor into the apartment below, and at once conveyed to other parts of the homestead. The practice on some farms where there is a fixed steam-enginc, is to thrash a stack of oats in the forenoon, and to cut up the straw, and bruise or grind the grain simultaneously, in the afternoon.

Section 24.—Turnip-Cutters.

Cattle and sheep which have arrived at maturity are able to scoop turnips rapidly with their sharp, gouge-like front teeth, and so can be fattened on this kind of food without an absolute necessity of slicing it for them. Even for adult animals there is, however, an advantage in reducing turnips to pieces which they can easily take into their mouths, and at once get between their grinders with- out any preliminary scooping ; but for young stock, during the period of dentition, it is indispensable to their bare subsistence. It is largely through the use of slicing- machines that certain breeds of sheep are fattened on turnips, and got ready for the butcher at fourteen months old. It seems to be admitted on all hands that Gardener's patent turnip-cutter is the best that has yet been produced for slicing roots for sheep. It is now made entirely of iron, and is an exceedingly useful machine.

In cattle feeding it is not usually thought necessary to divide the roots given to them so minutely as for sheep. A simple machine, fashioned much on the principle of nut-crackers, by which, at each depression of the lever handle, one turnip is forced through a set of knives which divide it into slices each an inch thick, is very generally used in Berwickshire for this purpose. Many persons, however, prefer to have the turnips put into the cattle-troughs whole, and then to have them cut by a simple cross-bladed hand-chopper, which at each blow quarters the piece struck by it. The mode of housing fattening cattle largely determines whether roots can be most conveniently sliced before or after being put into the feeding-trouglis.

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Section 25.—Turnip-Pulpers.

An opinion now obtains, and is on the increase, that it is advantageous to rasp roots into minute fragments and mix them with chaff before giving them to cattle, as this not only facilitates mastication, but in wintry weather prevents the chilling effects of a bellyful of such watery food as turnips are when eatenalone. This system is peculiarly appropriate when it is desired to give a few roots to store cattle which are being fed mainly upon straw or coarse hay. When a few turnips or mangolds are put down in their natural state there is a scramble for the better food, in which the stronger cattle get more than their share, and the weaker are knocked about. But by pulping the roots and mixing them with a full allowance of cha, every animal gets its fill, and there is nothing to quarrel about.*

At the Carlisle meeting of the Royal Agricultural Society a premium was offered for machines to perform this kind of work, under the somewhat inappropriate designation of "pulping-machines." The prize was awarded to Mr Philips for his machine, which reduces roots to minute fragments by means of a series of circular saws. We learn from parties who have made trial of most of the machines of this class yet brought out, that they give the preference to that made by Bentall of Maldon in Sussex.

Section 26.—Steaming Apparatus for Cooking Cattle Food.

We have several times alluded to the cooking of food for cattle. This is performed either by boiling in a common pot, by steaming in a close vessel, or by infusion in boiling water. Varieties of apparatus are in use for these purposes. A convenient one is a close boiler, with a cistern over it, from which it supplies itself with cold water by a self- acting stop-cock. 'his is alike suitable for cooking either by steaming or infusing,

Section 27.—Weighing-Machines.

It is of course indispensable for every farm to be provided with beam and scales, or other apparatus, for ascertaining the weight of grain, wool, and other com- modities, in quantities varying from 1 lb. to 3 ewt. But, besides this, it is very desirable to have a machine by which not only turnips, hay, manures, &c., can be weighed in cart-loads, but by which also the live weight of pigs, sheep, and bullocks can be ascertained. Such a machine, conveniently placed in the homestead, enables the farmer to check the

weighing of purchased manure, linseed-cake, coal, and similar commodities, with great facility. It affords the means of conducting various experiments for ascertaining the comparative productiveness of crops, the quantities of food consumed by cattle, and their periodic Progress, with readiness and precision. To persons unable to estimate the weight of cattle by the eye readily and accurately, such a machine is invaluable.

Section 28.—Concluding Remarks on Implements.

We have thus enumerated, and briefly described, those machines and implements of agriculture which may be held to be indispensable, if the soil is to be cultivated to the best advantage. The list does not profess to be complete ; but enough is given to indicate the progress which has recently taken place in this department. We have already referred to this department of the proceedings of the Royal Agricultural Society of England, and would earnestly recommend to all engaged in agriculture the careful study of the reports on implements contained in the ninth and subsequent volumes of their Journal. The care with which they have selected their Judges, and the skilful manner in which those entrusted with the difficult and responsible office have discharged their duties, are truly admirable. A few extracts from these reports will serve to show the

| extent and value of this department of the Society's labours.

In the report for 1849, Mr Thomson of Moat-Hall says— "The Society's early shows of implements must be vicwed chiefly in the light of bazaars or expositions. Neither stewards nor judges had yet acquired the experience requisite for the adequate discharge of their office, so that such men as Messrs Garrett, Hornsby, Ransome, and a few others, would have laughed in their sleeves had they been told that they could learn anything in the Society's show- yard. In spite, however, of a creditable display on the part of a few leading firms, the majority of the implements exhibited at these early shows were of inferior construction and workmanship, and the general appearance of the exhibitions meagre and unsatisfactory.

“The attention of some of the leading members of the Society (especially of the late lamented Mr Handley) was earnestly directed to the improvement of this department, and they soon perceived that little was gained by collecting implements in a show-yard for people to gaze at, unless an adequate trial could be made of thcir respective merits. To attain this end great exertions were made, and every improvement in the mode of trial was followed by so marked an increase in the number and merit of the imple- ments brought forward at subsequent shows, as to prove the strongest incentive to further effort.*

“At the Cambridge and Liverpool meetings, when these trials were in their infancy, their main attraction consisted of ploughing-matches on a large scale, which gratified sight- seers, but gave no results that could be depended upon, and therefore disappointed all practical men. It would occupy time unnecessarily to trace the gradual changes which have led to the discontinuance of these showy exhi- bitions, and the substitution in their place of quiet, business-like trials, in the presence of stewards and judges alone. Suffice it to say, that what they have lost in dis- play, they have gained in efficiency, and consequently in

favour with those classes for whose benefit they were de-

signed. At the York meeting, the improved mode of trying the thrashing-machines supplied a deficicncy which, until that time, had been much felt, viz., the absence of any means of ascertaining the amount of power expended in working the machines under trial; and it may now be asserted, with some confidence, that, with the exception of an occasional error or accident, the best implements are uniformly selected for prizes.

“Tt now remains to answer the question proposed for consideration, viz., to what extent the great improvement made of late in agricultural implements is due to the exertions of this Society; and with this view a tabular statement is subjoined, which shows the relative extent and importance of the Society’s two first and two last shows of implements :— —_

No. of Awards. Exhibitors. Money. Medals, 1830 Oxford . : 23 ao 4 1840 Cambridge : 36 0 7 1848 York 5 » 146 230 mil 1849 Norwich . » 145 364 13

“From this it will be seen that at Cambridge, where the trial of implements was confined to one day, and was, in other respects, so immature as to be of little practical value, the number of exhibitors was only thirty-six, and the judges, in whom a certain discretionary power was vested, awarded no money and but seven medals, in consequence of the scarcity of objects deserving of reward ; whilst at York, eight years after, when trials lasted several days, and had attained a considerable degree of perfection, the number of exhibitors had increased four-fold. The additional amount offered in prizes at the later meetings has undoubtedly assisted in creating this great increase of competition, but it cannot be considered the principal cause, since the imple-

ment-makers are unanimous in declaring that, even when most successful, the prizes they receive do not reimburse them for their expenses and loss of time. How, then, are the increased exertions of the machine-makers to be ac- counted for? Simply by the fact that the trials of imple- ments have gradually won the confidence of the farmer, so that, when selecting implements for purchase, he gives the preference to those which have received the Society’s mark of approval. This inference is corroborated by the makers themselves, who readily admit that the winner of a prize, for any implement of general utility, is sure to receive an ample amount of orders, and that the award of a medal is worth on an average £50.”

In reporting upon the agricultural implement department of the Great Exhibition, Mr Pusey says—‘ The yearly shows and trials of the Royal Agricultural Society have certainly done more in England for agricultural machines within the last ten years, than had been attempted anywhere in all former time… . It seems proved that since annual country shows were established by Lord Spencer, Mr Handley, and others yet living, old implements have been improved, and new ones devised, whose performances stand the necessary inquiry as to the amount of saving they can effect. To ascertain that amount precisely is difficult ; but, looking through the successive stages of management, and seeing that the owner of a stock-farm is enabled, in the preparation of his land, by using lighter ploughs, to cast off one horse in three, and by adopting other simple tools to

dispense altogether with a great part of his ploughing,— that in the culture of crops by the various drills, horse labour can be partly reduced, the seed otherwise wanted partly saved, or the use of manures greatly economised, while the horse-hoe replaces the hoe at one-half the expense,—that in harvest the American reapers can effect thirty men's work, whilst the Scotch cart replaces the old English waggon with exactly half the number of horses,—that in preparing corn for man's food, the steam thrashing-machine saves two-thirds of our former expense,—and in preparing food for stock, the turnip-cutter, at an outlay of Is., adds 8s. a-head in one winter to the value of sheep ; lastly, that in the indispensable but costly operation of draining, the materials have been reduced from 80s. to 15s.—to one-fifth, namely, of their former cost,—it seems to be proved that the efforts of agri-cultural mechanists have been so far successful, as in all these main branches of farming labour, taken together, to effect a saving, on outgoings, of little less than one-half."

Since these reports were made, the demand for improved agricultural implements and machinery has increased enormously, so much so that the manufacture of them is now a most important and a rapidly increasing branch of our national industry, and we quite anticipate that in a short time there will be such a general appreciation of the benefits of cultivation by steam power, and such a demand for engines and tackle to carry it out, as the makers and manufacturers will find it difficult to satisfy.

Scottish agriculturists, in reading these reports, will pro- bably note with self-gratulation, that some of the improve- ments referred to as of recent introduction in England, viz., two-horse ploughs and one-horse carts, have long been estab- lished among themselves. Indeed, they will find graceful acknowledgment of the fact in these reports. Unless alto- gether blinded by prejudice, they will, however, see that our brethren south of the Tweed have already outstripped us in many particulars, and that unless our national Society, our mechanists, and farmers, exert themselves with correspond- ing judgment and zeal, we must henceforth be fain to follow, where we at least fancy that we have hitherto been leading. But we have more important motives and encouragements to exertion than mere national emulation. The extent to which the cost of production of farm produce has been

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lessened by recent improvements in the implements of husbandry, and in the details of farm management, is greater than many are aware of. It seems to be in this direction mainly that the farmer must look for a set-off against the steadily increasing cost of land and labour. If by further improvementsin his machinery and implements he is enabled to keep fewer horses, to get his deep tillage performed by steam power, and his mowing and reaping accomplished by the ordinary forces which he requires throughout the year, the reduction upon the prime cost of his produce will be really important. A hopeful element in this anticipated progress is that it tends directly to elevate the condition of the rural labourer. Every addition to the steam power and labour-saving machines used upon the farm implies an increased demand for cultured minds to guide them, a lessening of the drudgery heretofore imposed upon human thews and sinews, an equalising of employment throughout the year, and a better and steadier rate of wages. Believing, as we do, that on every farm enormous waste of motive power—mechanical, animal, and manual—is continuously going on through the imperfection of the implements and machines now in use, we would urge upon all concerned to look well to this; for, with all our improvements, there is undoubtedly yet a large margin for retrenchment here.

Besides the bulky and costly implements now enumerated, every farm must be provided with a considerable assortment of hand-implements and tools, all of which it is of conse- quence to have good of their kind. Although not individu- ally costly, they absorb a considerable capital in the aggre- gate. When not in use, they require to be kept under lock, and at all times need to be well looked after. Without waiting to describe these in detail, let us now see how the work of the farm is conducted.

CHAPTER VII. PREPARATION OF THE LAND FOR TILLAGE OPERATIONS. Section 1.—When Required.

Before those simple tillage operations which are necessary in every instance of committing seeds to the earth can be gone about, there are more costly and elaborate processes of preparation which must be encountered in certain circum- stances, in order to fit the soil for bearing cultivated crops. It is now only in exceptional cases that the British agri- culturist has to

reclaim land from a state of nature. The low-country farmer does occasionally meet with a patch of woodland, or a bank covered with gorse or brushwood, which he sets about converting into arable land. It is in the higher districts that, from the facilities now afforded for readily enriching poor soils by portable manures, the plough still frequently invades new portions of muir and bog, and transforms them into fields. The occupiers of land in these upland districts are accordingly still familiar with the processes of paring and burning, trenching, removing earth- fast stones, and levelling inequalities of surface. In break- ing up land that has been for a course of years under pasturage, paring and burning are also frequently resorted to in all parts of the country. The grand improvement of all, thorough underground drainage, is common to every district and class of soils.

Section 2.—Draiming.

From the moist climate of Britain, drainingis undoubtedly the all-important preliminary operation in setting about the improvement of the soil.

To drain land is to rid it of its superfluous moisture. The rivers of a country with their tributary brooks and rills are the natural provision for removing the rain water which either flows directly from its surface, or which, after percolating through porous strata to an indefinite depth, is again discharged at the surface by springs. The latter may

thus be regarded as the outlets of a natural underground drainage. This provision for disposing of the water that falls from the clouds is usually so irregular in its distribu- tion, and so imperfect in its operation, that it leaves much to be accomplished by human labour and ingenuity. The art of the drainer accordingly consists—

lst, In improving the natural outfalls by deepening, straightening, or embanking rivers; and by supplementing these, when necessary, by artificial canals and ditches: and

2d, In freeing the soil and subsoil from stagnant water, by means of artificial underground channels.

The first of these operations, called trunk drainage, is the most needful; for until it be accomplished there are exten- sive tracts of land, and that usually of the most valuable kind, to which the secondary process either cannot be applied at all, or only with the most partial and inefficient results. Very many of our British rivers and streams flow with a sluggish and tortuous course through valleys of flat alluvial soil, which, as the coast is approached, expand into extensive plains, but little elevated above the level of the sea. Here the course of the river is obstructed by shifting shoals and sand-banks, and by the periodic influx of the tides. The consequence is, that immense tracts of valuable land are at all times in a water-logged and comparatively worthless state, and on every recurrence of a flood are laid entirely under water. In a subsequent chapter on " Waste Lands" some account shall be given of the extent of this evil, and of the efforts that have been successfully devoted to its remedy. Some of these fen-land and estuary drain- age works have been accomplished in the face of natural obstacles of the most formidable character, and constitute trophies of engineering talent of which the country may well be proud. Great as the natural difficulties are which have to be encountered in such cases, there are others of a differ- ent: kind which have often proved more impracticable. It has been found easier to exclude the sea and restrain land- floods, than to overcome the prejudices and reconcile the conflicting interests of navigation companies, commissioners of sewers, ownersof mills, andlanded proprietors. Although all these classes suffer the most serious losses and incon- veniences from the defective state of many of our rivers, it is found extremely difficult to reconcile their conflict- ing claims, and to allocate to each his proper share of the cost of improvements by which all are to benefit. A most interesting and instructive illustration of the urgent necessity for improving the state of our rivers, of the difficulties to he encountered in doing so, and of the incalculable benefits thus to be obtained, has been given in an essay on Trunk Drainage, by John Algernon Clarke, Esq., published in vol. xv. (part first) of the Journal of the Royal Agricultural Society of England. Mr Clarke, after some most important observations on trunk drainage, describes in detail works projected under powers granted in an Act of

Parlia- ment, passed in 1852, “constituting commissioners for the improvement of the river Nene and the navigation thereof.”

There is not a district of the kingdom in which works similar in kind are not absolutely indispensable, before extensive tracts of valuable land can be rendered available for profitable cultivation by means of underground drainage. Itis interesting to know that thenecessity for trunk drainage, and the means of accomplishing it, were distinctly set before the public 200 years ago by a practical draining engineer, to whose writings the attention of the agricultural com- munity has been frequently directed of late by Mr Parkes, Mr Gisborne, and others. From the third edition (1652) of The Improver Improved, by Walter Blithe, the author referred to, in which the true principles of land drainage are stated as distinctly, and urged as earnestly, as

by any of our modern writers, we here quote the following remarks :—

*‘*A strait water-course, eut a considerable depth, in a thousand parts of this nation, would be more advantageous than we are aware of, or I will task myself here to dispute further. And though many persons are interested therein, and some will agree, and others will oppose; one ereek lyeth on one side of the river, in one lord’s manor, and another lyeth on the other side, and divers men own the same; why may not one neighbour change with another, when both are gainers? If not, why may they not be compelled for their own good, and the commonwealth’s advantage? J daresay thousands of aeres of very rich land may hereby be gained, and possibly as many more much amended, that are almost destroyed; but a law is want- ing herein for the present, which I hope will be supplied if it may appear advancement to the public; for to private interests it is not possible to be the least prejudice, when every man hath benefit, and each man may also have an equall allowance if the least prejudiced.*

*‘*But a word or two more, and so shall conclude this chapter— and it is a little to further this improvement through a great destruction (as some may say); it is the removing or the destroying of all such mills, and none else, as drown and corrupt more lands than themselves are worth to the eommonwealth, and they are such as are kept up or dammed so high as that they bogeyfie all the lands that lye under their mill-head. Such mills as are of little worth, or are by constant great charges maintained, I advise to be pulled down; the advance of the land, when the water is let run his course, and not impounded, will be of far greater value many times. _ But in ease the mills should be so necessary and profitable too, and far more than the lands they spoil, I shall then advise, that under thy mill-dam, so many yards wide from it as may prevent breaking through, thou make a very deep trench all along so far as thy lands are putrefied, and thereinto receive all the issuing, spew- ing water, and thereby stop or cut off the feeding of it upon thy meadow, and carry it away back into thy back-water or false course, by as deep a trench, cut through the most low and convenient part of thy meads. But put case that thou shouldst have no convenient fall on that side thy mill-dam, then thou must make some course, or plant some trough under thy mill-dam, and so carry it under into some lower course that may preserve it from soaking thy meadows or pastures under it; and by this*

means thou maist in a good measure reducc thy land to good soundness, and probably wholly cure it, and preserve thy mill also.”

It is painful to reflect that after the lapse of two cen- turies, we should still see, as Blithe did, much “ gallant land” ruined for want of those draining operations which he so happily describes.

A clear outfall of sufficient depth being secured, the way Subsoil

is open for the application of underground draining. And here it may be proper to state, that there is very little of the land of Great Britain naturally so dry as not to be susceptible of improvement by artificial draining ; for land is not in a perfect condition with respect to drainage, unless all the rain that falls upon it can sink down to the minimum depth required for the healthy development of the roots of cultivated crops, and thence find vent, either through a naturally porous subsoil or by artificial channels. Much controversy has taken place as to what this minimum depth is. Suffice it to say, that opinion is now decidedly in favour of a greater depth than was considered necessary even a few years ago, and that the best authorities concur in stating it at from three to four feet. There are persons who doubt whether the roots of our ordinary grain or green crops ever penetrate to such a depth as has now been specified. A careful examination will satisfy any one who makes it, that minute filamentary rootlets are sent down to extraordinary depths, wherever they are not arrested by stagnant water. It has also been questioned whether any benefit accrues to crops from this deep descent of their roots. Some persons have even asserted that it is only when they do not find food near at hand that they thus wander. But it must be borne in mind that plants obtain moisture as well as nourishment by means of their roots, and the fact is well known that plants growing in a deep soil resting on a porous subsoil seldom or never suffer from drought. It is instructive, too, on this point, to observe the practice of the most skilful gardeners, and see the importance which they attach to trenching, the great depth .— 42

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at which they often deposit manure, and the stress which they lay upon thorough drainage. On the other hand, it is well known that soils which soonest become saturated, and run from the surface in wet weather, are precisely those which parch and get chapped the soonest in drought. The effectual way to secure our crops at once from drown- ing and parching, is to put the land in a right condition with respect to drainage. k

All soils possess more or less the power of absorbing and retaining water. Pure clays have it in the greatest degree, and gritty siliceous ones in the smallest. In dry weather this power of attracting moisture 1s constantly operating to supply from below the loss taking place by evaporation at the surface. In heavy rains, as soon as the entire mass has drunk its fill, the excess begins to flow off below; and therefore a deep stratum, through which water can percolate, but in which it can never stagnate—that is, never exceed the point of saturation—is precisely that in which plants are most secure from the extremes of drought and drowning.

If a perfect condition of the soil with respect to drainage is of importance for its influence in preserving it in a right condition as respects moisture, it is still more so for its effects upon its temperature. All who are conversant with rural affairs are familiar with that popular classification of soils in virtue of which such as are naturally dry are also invariably spoken of as warm and early ; and conversely, that wet soils are invariably described as being cold and late. This classification is strictly accurate, and the explana- tion of it is simple, An excess of water in soil keeps. down its temperature in various ways. In passing into the state of vapour it rapidly carries off the heat which the soil has obtained from the sun's rays. Water possesses also a high radiating power ; so that, when present in the soil in excess, and in a stagnant state, it is constantly carrying off heat by evaporation and radiation. On the other hand, stagnant water conveys no heat downwards ; for although the surface is warmed, the portion of water thus heated being lightest, remains floating on the surface, and will give back its heat to the atmosphere, but conveys none downwards. When the surface of stagnant water becomes colder than the general mass, the very opposite effect immediately ensues ; for as water cools its density increases, and thus causes an instant sinking of the portion that has been cooled, and a rising of a warm portion from below to take its place—this movement continuing

until the whole has been lowered to 40°, at which point water reaches its maximum density, while, if the temperature be reduced a few degrees more, water will begin to freeze. It is thus that soil surcharged with water is kept at a lower temperature than similar soil that has a sufficient natural or artificial drainage.

But while the presence of stagnant water in a soil has this injurious power of lowering its temperature, a very different effect ensues when rain water can sink freely into it to a depth of several feet, and then find a ready exit by drainage ; for in this case the rain water carries down with it the heat which it has acquired from the atmosphere and from the sun-heated surface, and imparts it to the subsoil. There is as yet a lack of published experiments to show the ordinary increase of temperature at various depths and in different soils, as the result of draining wet land. Those conducted by Mr Parkes, in a Lancashire bog in June 1837, showed, as the mean of thirty-five observations, that the drained and cultivated soil at seven inches from the surface was 10° warmer than the adjoining undrained bog in its natural state at the same depth. It is understood that later experiments conducted by the same gentleman on an extended scale fully establish the fact, that an increased temperature of the soil is an unfailing accompaniment of thorough draining. The importance of this result caunot

are injured by draining.

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well be over-rated. The temperature and other conditions of the atmosphere, which we call climate, are placed beyond human control; but this power of raising the temperature of all wet, and consequently cold soils, becomes tantamount in some of its results to a power of improving the climate. There are, accordingly, good grounds for stating that in numerous cases grain crops have ripened sooner by ten or twelve days than they would have done but for the draining of the land on which they grew.

The points which we have thus briefly touched upon are so essential to an intelligent appreciation of the subject, that we have felt constrained to notice them, however meagrely. But our space forbids more thana mere enumera- tion of some of the many evils inscparable from the presence of

stagnant water in the soil, and of the benefits that flow from its removal. Wet land, if in grass, produces only the coarser grasses, and many sub-aquatic plants and mosses, which are of little or no value for pasturage; its herbage is late of coming in spring, and fails early in autumn; the animals grazed upon it are unduly liable to disease, and sheep, especially, to the fatal rot. When land is used as arable, tillage operations are easily interrupted by rain, and the period always much limited in which they can be prosecuted at all; the compactness and toughness of such land renders each operation more arduous, and more of them necessary, than in the case of dry land. The surface must necessarily be thrown into ridges, and the furrows and cross-cuts duly cleared out after each process of tillage, on which surface expedients as much labour has probably been expended in each thirty years as would now suffice to make drains enough to lay it permanently dry. With all these precautions the best seed-time is often muissed, and this usually proves the prelude to a scanty crop, or to a late and disastrous harvest. The cultivation of the turnip and other root crops, which require the soil to be wrought to a deep and free tilth, either becomes altogether impracticable, and must be abandoned for the safe but costly bare fallow, or is carried out with great labour and hazard; and the crop, when grown, can neither be removed from the ground, nor consumed upon it by sheep without damage by poaching. The dung, lime, and other manure, that is applied to such land is in a great measure wasted; and the breaking of the subsoil and general deep tillage, so beneficial in other circumstances, is here positively mischievous, as it does but increase its power of retaining water. Taking into account the excessive labour, cost, and risk, inseparable from the cultivation of wet land, and the scanty and precarious character of the crops so obtained, it would in many cases be wiser to keep such lands in grass, than to prosecute arable husbandry under such adverse circumstances. These very serious evils can either be entirely removed, or, at the least, very greatly lessened by thorough draining. It often happens that naturally porous soils are so soaked by springs, or so water-logged by resting upon an impervious subsoil, or, it may be, so drowned for want of an outfall in some neighbouriug river or stream, that draining at once effects a perfect cure, and places them on a par with the best naturally dry soils. In the case of clay soils, the improve- ment effected by draining is in some respects greater than in any other class, but still it cannot change the inherent properties of clay. This has sometimes been overlooked by

sanguine improvers, who, hastily assuming that their strong land, when drained, would henceforward be as friable and sound as the more porous kinds, have proceeded to treat it on this assumption, and have found to their cost that clay, however well drained, will still get into mortar and clods, if it is tilled or trodden on too soon after rain. It is entirely owing to such rash and unskilful management that au opinion has sometimes got abroad, that clay lands They merely retain the qualities

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peculiar to clay, and when they are treated judiciously, show as good a comparative benefit from draining as other soils. The only instances in which even temporary injury arises from draining is in the case of some peaty and fen lands, which are so loose that they suffer from drought in protracted dry weather. As such lands are usually level and have water-courscs near them, this inconvenience admits of an easy remedy by shutting up the main outlets, and then admitting water into the ditches. The drains in this way become ready channels for applying the necded moisture by a kind of subterraneous irrigation.

The beneficial effects of thorough draining are of a very decisive and striking kind. The removal of stagnant water from a stratum of 4 fcet in depth, and the establishing of a free passage for rain water and air from the surface to the level of the drains, specdily effects most important changes in the condition of the soil and subsoil. Plough- ing and other tillage operations are performed more easily than before in consequence of a more friable state of the soil. Moderate rains which formerly would have sufficed to arrest these operations do so no longer, and heavy falls of rain cause a

much shorter interruption of these labours than they did when the land was in its natural state. Deep tillage, whether by the common or subsoil plough (which formerly did harm), now aids the drainage, and is every way beneficial. Ridges and surface furrows being no longer needed the land can be kept flat, with great benefit to crops and furtherance to field operations. An earlier seed-time and harvest, better crops, a healthier live stock, and an improved style of husbandry, are the usual and well known sequents of judiciously conducted drainage operations. In short, the most experienced and skilful agriculturists now declare with one consent that good drainage is an indispens- able preliminary to good cultivation.

Although it has been reserved to the present times to see land draining reduced to a system bascd on scientific prin- ciples, or very great improvement effected in its details, it is by no means a modern discovery. The Romans were careful to keep their arable lands dry by means of open trenches, and there are even some grounds for surmising that they used covered drains for the same purpose. In- dubitable proof exists that they constructed underground channels by means of tubes of burned earthenware; but it seems more probable that these were designed to carry water to their dwellings, &c., than that they were used simply as drains. Recent inquiries and discoveries have also shown that it is at least several centuries, since covered channels of various kinds were in use by British husbandmen for drying their land. It is, at all events, two centuries since Captain Walter Blithe wrote as follows :—

"Superfluous and venomous water which lyeth in the earth and much occasioneth bogginesse, mirinesse, rushes, flags, and other filth, is indeed the chief cause of barrenesse in any land of this nature… . . Drayning is an excellent and chiefest means for their reducement ; and for the depth of such draynes, I cannot possibly bound, because I have not time and opportunity to take in all circumstances. . . . .

with clay, under which thou must goe halfe one spades graft deepe at least; yea, suppose this corruption that feeds and nourisheth the rush or flagg should lie a yard or foure foot deepe, to the bottome of it thou must goe, if ever thou wilt drayne it to purpose… . . And for the drayning trench

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| be sure thou indeavour to carry it as neare upon a straight

line as possible… . . To the bottome where the spewing spring lyeth thou must goe, and one spades depth or graft beneath, how deep so ever it be, if thou wilt drayne thy land to purpose. I am forced to use repetitions of some things, because of the suitableness of the things to which they are applyed ; as also because of the slownesse of peoples apprehensions of them, as appears by the non-practice of them, the which wherever you see drayning and trenching you shall rarely find few or none of them wrought to the bottome….. Go to the bottome of the bog, and there make a trench in the sound ground, or else in some old ditch, so low as thou verily conceivest thy sclfe assuredly under the level of the spring or spewing water, and then carry up thy trench into thy bogg straight through the middle of it, one foot under that spring; .... but for these common and many trenches, oft times crooked too, that men usually make in their boggy grounds, some one foot, some two, never having respect to the cause or matter that maketh the bogg to take that way, I say away with them as a great piece of folly, lost labour and spoyle…. . After thou has brought a trench to the bottom of the bog, then cut a good substantial trench about thy bog; and when thou hast so done make one work or two just over- thwart it, upwards and downwards, all under the matter of the bog. Then thou must take good green faggots, willow, aldcr, elme, or thorne, and lay in the bottome of thy works, and then take thy turfe thou tookest up in the top of thy trench, and plant upon them with the green sward down- wards; or take great pebbles, stones, or flint stones, and so jill up the bottome of thy trench about fifteen inches high, and take thy turfe and plant it as aforesaid, being cut very fit for the trench, as it may join close as it is layd downe, and then having covered it all over with earth, and made it even as thy other ground, waite and expect a wonderfull effect through the blessing of God."

These sagacious arguments and instructions were doubt- Elkington

less acted upon by some persons in his own times and since ; but still they had never attained to general adoption, and were ultimately forgotten. Towards the close of last century, Mr Elkington, a Warwickshire farmer, discovered and promulgated a plan of laying dry sloping land that is

drowned by the outbursting of springs. When the higher lying portion of such land is porous, rain falling upon it sinks down until it is arrested by clay or other impervious matter, which causes it again to issue at the surface and wet the lower-lying ground. Elkington showed that by cutting a deep drain through the clay, aided when necessary by wells or augur holes, the subjacent bed of sand or gravel in which a body of water is pent up by the clay, as in a vessel, might be tapped, and the water conveyed harmlessly in the covered drain to the nearest ditch or stream. In the circumstances to which it is applicable, and in the hands of skilful drainers, Elkington's plan, by bringing into play the natural drainage furnished by porous strata, is often eminently successful. His system was given to the public in a quarto volume, edited by a Mr John Johnston of Edinburgh, who does not secm to have shared the engineer- ing talents of the man whose discoveries he professes to ex- pound. During the thirty or forty years subsequent to the publication of this volume, most of the draining that took place was on this system, and an immense capital was expended in such works with very varying results. Things continued in this position until about the ycar 1823, when

the late James Smith of Deanston, having discovered ancw Smith of those principles of draining so long before indicated by Deanston,

Blithe, proceeded to exemplify them in his own practice, and to expound them to the public in a way that speedily effected a complete revolution in the art of draining, and marked an era in our agricultural progress. Instead of

td

'Smith of

Deanston.

Modern system,

Outfall.

persisting in fruitless attempts to dry extensive areas by a few dexterous cuts, he insisted on the necessity of pro- viding every field that needcd draining at all with a complete system of parallel underground channels, running in the line of the greatest slope of the ground, and so near to each other that the whole rain falling at any time upon the surface should sink down and be carried off by the drains. The distances between drains he showed must be regulated by the greater or less retentiveness of the ground operated upon, and gave 10 feet as the minimum, and 40 feet as the maximum of these distances. The depth which he pre- scribed for his parallel drains was 30 inches, and these were to be filled with 12 inches of stones small enough to pass through a 3-inch ring—in short, a new edition of Blithe's drain. A main receiving-drain was to be carried along the lowest part of the ground, with sub-mains in every subordinate hollow that the ground presented. These receiving drains were directed to be formed with a culvert of stone work, or of tiles, of waterway sufficient to contain the greatest volume of water at any time requiring to be passed from the area to which they respectively supplied the outlet. The whole cultivated lands of Britain being disposed in ridges which usually lie in the line of greatest ascent, it became customary to form the drains in each furrow, or in each altcrnate, or third, or fourth one, as the case might require or views of economy dictate, and hence the system soon came to be popularly called furrow drawing. From the number and arrangement of the drains, the terms frequent and parallel were also applied to it. Mr Smith himself more appropriately named it, from its effects, thorough draining. The sound principles thus promulgated by him were speedily adopted and extensively carried into practice. The great labour and cost incurred in procuring stones in adequate quantities, and the difficulty of carting them in wet seasons, soon led to the substitution of tiles and soles of burned earthenware. The limited supply and high price of these tiles for a time impeded the progress of the new system of draining ; but the invention of tile-making machines by the Marquis of Tweeddale and others, removed this impediment, and gave a mighty stimulus to this fundamental agricultural improvement. The substitution of cylindrical pipes for the original horse-shoe tiles has still further lowered the cost and increased the efficiency and permanency of drainage works.

The system introduced and so ably expounded by Smith of Deanston has now been virtually adopted by all drainers. Variations in matters of detail (having respect chiefly to the depth and distance apart of the parallel drains) have indeed been introduced ; but the distinctive features of his system are now recognised and acted upon by all scientific drainers.

In setting about the draining of a field, or farm, or estate, the first point is to secure, at whatever cost, a proper outfall. The lines of the receiving drains must next be determined, and then the direction of the parallel drains. The former must occupy the lowest part of the natural hollows, and the latter must run in the line of the greatest ascent of the ground. In the case of flat land, where a fall is obtained chiefly by increasing the depth of the drains at their lower ends, these lines may be disposed in any direction that is found convenient; but in undu- lating ground a single field may require several distinct sets of drains lying at different angles, so as to suit its several slopes. When a field is ridged in the line of the greatest ascent of the ground, there is an obvious convenience in adopting the furrows as the site of the drains; but wherever this 1s not the case the drains must be laid off to suit the contour of the ground, irrespective of the furrows altogether. When parts of a field are flat, and other parts have a con- siderable acclivity, it is expedient to cut a receiving drain near to the bottom of the slopes, and to give the flat ground

an independent sct of drains. In laying off receiving drains it is essential to give hedge-rows and trees a good offing, lest the conduit should be obstructed by roots. When a drain must of necessity pass near to trees, we have found it practicable to exclude their roots from it by the use of coal-tar. In our own practice, a drain carried through the corner of a plantation has by this expedient remained free from obstruction for now fourteen years. In this instance the tar was applied in the following manner :— Sawdust and coal-tar being mixed together to the consis- tency of ordinary mortar, a layer of this was laid in the bottom of the trench; the drain-pipes were then laid, and completely coated over withthe same mixture to thethickness of an inch, and the earth carefully replaced in the ordinary

way. When a main drain is so placed that parallel ones empty into it from both sides, care should be taken that the inlets of the latter are not made exactly opposite to each other. Indeed, we have found it expedient in such cases to have two receiving drains parallel to each other, each to receive the subordinate drains from its own side only. As these receiving drains act also as ordinary drains to the land through which they pass, no additional cost is incurred by having two instead of one, provided they are as far apart as the other drains in the field. Much of the success of draining depends on the skilful planning of these main drains, and in making them large enough to discharge the greatest flow of water to which they may be exposed. Very long main drains are to be avoided. Numerous outlets are also objectionable, from their liability to obstruction, An outlet to an area of from ten to fifteen acres is a good arrangement. 'These outlets should be faced with mason- work, and guarded by iron gratings.

The depths of the parallel drains must next be deter- Depths,

mined. In order to obtain proper data for doing so, the subsoil must be carefully examined by digging test-holes in various places, and also by taking advantage of any quarries, deep ditches, or other cuttings in the proximity, that afford a good section of the ground. We have already expressed an opinion that the drains should not be less than four feet deep; but it is quite possible that the discovery at a greater depth than four feet of a seam of gravel, or other very porous material charged with water, underlying considerable portions of the ground, may render it expedient to carry the drains so deep as to reach this seam. Such a seam, when furnished with sufficient outlets, supplies a natural drain to the whole area under which it extends. When such exceptional cases are met with, they are precisely those in which deep drains, at wide intervals, can be trusted to dry the whole area. When the subsoil consists of a tenacious clay of considerable depth, it is considered by many persons that a greater depth than three feet is unnecessary. The greater depth is, however, always to be preferred ; for a drain of four feet, if it works at all, not only does all that a shallower one can do, but frees from stagnant water a body of subsoil on which the other has no effect at all. It has indecd been alleged that such deep drains may get so closed over by the clay that water will stand above them. If the surface of clay soil is wrought into puddle by improper usage,

water can undoubt- edly be made to stand for a time over the shallowest drains as easily as over the deepest. But the contraction which takes place in summer in good alluvial clays gradually estab- lishes fissures, by which water reaches the drains. . In such soils it is usually a few years before the full effect of draining is attained. This is chiefly due to the contraction and con- sequent cracking of clay soils in summer just referred to, and partly, as Mr Parkes thinks, to the mining operations of the common earth-worm. Both of these natural aids to drainage operate with greater force with drains fourfeetdeepthan when they are shallower. The tardy percolation of water through

clay soils seems also a reason why in such cases it should get the benefit of a greater fall, by making the drain deep. Draining is always a costly operation, and it is therefore peculiarly needful to have it executed in such a way that it shall be effectual and permanent. We advocate a minimum depth of four feet, because of our strong conviction that such drains carefully made will be found to have both these qualities. And this opinion is the result of dear-bought experience, for we have found it necessary in our own case to re-open a very considerable extent of 30-inch drains in consequence of their having totally failed to lay the land dry, and to replace them by four fcet ones, which have proved perfectly efficacious. In doing this we have seen a 30-inch drain opened up and found to be perfectly dry, and yet when the same trench was dcepened to four feet therc was quite a run of water from it. Now also that steam power has become available for the tillage of the soul, and is certain, at no distant day, to be in general requisition for that purpose, it is peculiarly expedient to have the drains laid at such a depth as to admit of that potent agency being uscd for loosening the subsoil to depths hitherto unattain- able, not only without hazard to the drains, but with the certainty of greatly augmenting their efficiency. Therefore we earnestly dissuade all parties who are about to undertake drainage works from giving ear to representations about the sufficiency and economy of shallow drains. These, doubtless, cost somewhat less to begin with, but in thousands of cases they fail to accomplish the desired end, and the unfortunate owners, after all their outlay, are left to the miserable alternative of seeing their land imperfectly drained, or of exccuting the

works anew, and thus losing the whole cost of the first and inefficient ones. The extreme reluctance with which the latter alternative is necessarily regarded will undoubtedly operate for a long time in keeping much land that has been hastily and imperfectly drained from partici- pating in the benefits of thorough drainage. The distance apart at which the drains should be cut must be determined by the nature of the subsoil. In the most retentive clays it need not be less than 18 feet. On the other hand, this distance cannot safely be exceeded in the case of any sub- soil in which clay predominates, although it should not be of the most retentive kind. In all parts of the country instances abound in which drains cut in such subsoils, from 24 to 30 feet apart, have totally failed to lay the land dry. When ground is once pre-occupicd by drains too far apart, there is no remedy but to form a supplementary one betwixt each pair of the first set ; and thus, by exceeding the proper width at first, the space betwixt the drains is unavoidably reduced to 12 or 15 fect, although 18 feet would originally have sufficed. It is only with a decided porosity in the subsoil, and in proportion to the degree of that porosity, that the space between drains can safely be increased to 24, or 30, or 36 feet. In those exceptional cases in which drains more than 36 feet apart prove effectual, their success is due to the principle on which Elkington's system is founded. A few years ago an opinion obtained currency, that as the depth of drains was increased their width apart might with safety be increased in a corresponding ratio. And hence it came to be confidently asserted, that with a depth of 5 or 6 feet a width of from 40 to 60 feet might be adopted with a certainty of success, even in the case of retentive soils. We believe that experience has already demonstrated the unsoundness of this opinion. At all events, in recommending a minimum depth of 4 feet, we do so on the ground that (other things being equal) the whole benefits of drainage are more fully and cecrtainly secured by drains of this depth than by those of 24 or 3 feet. In ordinary cases an increase of depth does not compensate for an Increase of the width apart of the drains. Draining can be carried on at all seasous, but is usually best done in

summer or autumn. The digging is usually paid for by task work, and the setting of the pipes by day's wages. A thoroughly trustworthy and

expericnced workman is selected for the latter work, with instructions to set no pipes until he is satisfied that the depth of the drains and level of the bottoms are correct. When the soil is returned into the drains all defects are of course buried, and it therefore be- loves the landlord, or his substitute, whether tenant or bailiff, to exercise a vigilant oversight of draining operations. Unless carefully executed they cannot be efficient ; and with- out efficient drainage all other agricultural opcrations must be carried on under grievous disadvantages. The extent of land in Great Britain naturally so dry as not to necd artificial drainage is very much less than even practical farmers, who have not studied the subject, are at all aware of.

Cylindrical pipes with collars are undoubtedly the best Pipes.

draining material that has yet been discovered. The collars referred to are simply short pieces of pipe, just so wide in the bore as to admit of the smaller pipes which form the drain passing freely through them. In use, one of these collars is so placed as to encase the ends of each contiguous pair of tubes, and thus forms a loose fillet around each joining. The ends of these pipes being by this means securely kept in contact, a continuous canal for the free passage of water is infallibly insured, the joinings are guarded against the entrance of mud or vermin, and yet sufficient space is left for the admission of water. Pipes of all diameters, from 1 inch to 16 inches, are now to be had; those from 1 to 2 inches in the bore are used for subordinate drains ; the larger sizes for sub-main and main receiving drains. Collarsarcused with the smaller sizes only, large pipes not being so liable to shift their position as small ones. In constructing a drain, it is of much importance that the bottom be cut out just wide enough to admit the pipes and no more. Pipes, when thus accurately fitted in, are much less liable to derangement than when laid in the bottom of a trench several times their width, and into which a mass of loose carth must necessarily be re- turned. This accurate fitting is now quite practicable in the case of soils tolerably free from stones, from the excellence of the draining tools that have lately been introduced. The following cut represents the most import- ant of these tools,

c and e¢ are long tapering spades for digging out the mid- f dle and bottom spits, | a, d, and f recurved scoops for clearing out the debris, and 6b a

pipelayer, by means of which a workman standing at the margin of a drain hooks up a pipe and collar, and deposits them easily and accurately in the deep narrow trench,

If a quicksand is cncountered in constructing a drain, it will be found expedient to put a layer of straw in the bottom of the trench, and then, instead of the ordinary pipe and collar, to use at such a place a double set of plpes—one within the other—taking care that the joinings of the inner set are covered by the centres of the outer ones. By such precautions the water gets vent, and the running sand is excluded from the drain. When a brook has been diverted from its natural course for mill-power or irrigating purposes, it often happens that portions of land are thereby deprived of the outfall required to admit of their being drained to

Draining Tools.

Cost.

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a proper depth. In such cases it is frequently practicable to obtain the needed outlet by carrying a main drain through below the water-course, by using at that point a few yards of cast-iron pipe, and carefully filling up the trench with clay puddle, so that there may be no leakage from the water-course intothedrain. Whilethisis being done the water must either be turned off or carried over the temporary gapina wooden trough.

The cost of draining is so much influenced by the ever- varying price of labour and materials, and by the still more varying character of the land to be operated upon, that it is impossible to give an estimate of the cost that will admit of general application. The following tabular data, taken chiefly from Mr Bailey Denton's valuable treatise, are pre- sented to aid those who wish to form such an estimate :— TABLE I.—Showing the number of rods of drain per acre at given

distances apart, and the number of pipes of given lengths required per acre.

Intervals between | Rods per | 12-inch 18-ineh 14-inch 15-inch the drains acre. pipes, pipes. pipes. pipes. in fect. jy «pil 1462 | 240 | 2284 | 2074 | 1936

21 125 2074 1915 1778 1659 24 110 1815 1676 1555 1452 27 975 1613 1489 1383 1290 80 88 1452 1340 1244 1161

TABLE II.—Showing the cost of draining per acre at different intervals between the drains,

21 feet | 24 feet | 27 feet | 30 fect | apart. | apart. | apart. | apart.

Labour, cutting and filling |£ 8. d.|£ s.d.|£ 8, d.\£ 8. d.\£ s. d. in at 6s, per rod…..... 318 43 210215 0/2 8112 4 0 Material, pipes for minor | drains, 18s. per 1000….. 26 | 19 2114 3110 61 7 5

18 feet apart.

Haulage, two miles, and de- livery in fields at 2s. 6d.

per 1000 0.2… eeeee ee es 0640 5 50 4 90 4 80 38 9

Pipe-laying and finishing, jt is eee ee 012 2/010 60 9 2:0 8 20 7 4 Superintendence, foreman.. [0 5 010 5 00 5 00 5 00 5 0 Extra for mains…....0. 0 200 2 00 2 01/0 2 00 2 0

Iron-outlet pipes, and ma- sonry, and extra labour… |(0 1 6/0 1 6/0 1 60 1 60 1 6 Capwasisasiet's 7 6 16 6 5/511 85 0 4411 0

Total Add for collars, if used….. 1 210019 7/017 1015 3018 8

8 81117 6 06 8 9515 75 4 8

Various attempts have from time to time been made to lower the cost of draining land by the direct application of animal or steam power to the work of excavation. The

Steam Draining Plough,

A Engine.

a Large drum. a! Small drum.

B B! Snatch blocks,

C Anchor.

J Large rope.

S$ Pullcy attached toplough.

P Draining-plough.

G Small rope.

I Anchor and sheave for small rope.

most successful of these attempts is the steam-draining apparatus invented by Mr John Fowler of Bristol, usually

called Fowler's draining plough. A six-horse portable steam-engine is anchored in one corner of the field to be drained. It gives motion to two drunis, to each of which a rope 500 yards long is attached, the one uncoiling as the other is wound up. These ropes pass round blocks which are anchored at each end of the intended line of drain, and are attached one to the front and the other to the hinder end of the draining apparatus. This consists of a framework, in which is fixed, at any required depth not exceeding 3} feet, a strong coulter terminating in a short horizontal bar of cylindrical iron, with a piece of rope attached to it, on which a convenient number of drain pipes are strung. This frame being pulled along by the engine, the coulter is forced through the soil at a regulated depth, and deposits its string of pipes with unerring accuracy, thus forming, as it proceeds, a perfect drain. The supply of pipes is kept up by means of holes previously dug in the line of the drain, at distances corresponding to the

length of the rope on which they are strung. This machine was subjected to a very thorough trial at the meeting of the Royal Agricultural Society of England at Lincoln in 1854, on which occasion a silver medal and very high commendation were awarded to it. In March 1855 it was publicly stated that five of these im- plements are now at work in different parts of England, and that already 10,000 acres of land have been drained by means of them. At the Lincoln trial it was satisfactorily proved that this implement could work at a depth of 34 feet. As it moved along, the soil on each side, to the width of 2 or 3 feet, seemed to be loosened. It is therefore probable that this implement, or at least one propelled on the same principle, may yet be used as a subsoil disiti- tegrator.

A great stimulus has recently been given to the improve- Drainage

ment of land by the passing of a series of Acts of Parlia- Acts

ment, which have removed certain obstacles that effectually hindered the investment of capital in works of drainage and kindred ameliorations. By the first of these Acts, passed in 1846, a sum of £4,000,000 of the public money was authorised to be advanced to landowners to be expended in draining their lands. The Enclosure Commissioners were charged with the allocation of this money and the superintendence of its outlay. The most important pro- visions of this Act are that it enables the possessors of entailed estates (equally with others) to share in the benefits of this fund ; that it provides, on terms very favourable to the borrower, for the repayment of the money so advanced by twenty-two annual instalments ; that before sanctioning the expenditure of these funds on drainage works, the com- missioners must have a report from a qualified inspector, to the effect that they are likely to prove remunerative ; and, finally, that the works must be performed according to specifications prepared by the inspector, and approved by the commissioners, who have seldom allowed of a less depth of drain than 34 feet. By the end of the year 1854 the whole of this money was allocated, and more than half of it actually expended. Scottish landowners were so prompt to discern, and so eager to avail themselves of this public fund, that more than half of it fell to their share. The great success of this measure, and the rapid absorption of the fund provided by it, soon led to further legislative Acts, by which private capital has been rendered

available for the improvement of land, by draining and otherwise, on conditions similar to those just enumerated. These Acts are—

1st, The Private Moneys Drainage Act (12 and 13 Vict. c. 100), limited to draining. ‘

2d, The West of England, or South-West Land Draining Company’s Act (11 and 12 Vict., c. 142), for the purpose of draining, irrigation and warping, embanking, reclaiming and enclosing, and road-making.

3d, The General Land-Drainage aud Improvement Com- pany’s Act (12 and 13 Vict. c. 91), for the purposes of draining, irrigating and warping, embanking, reclaiming and enclosing, road-making and erecting farni- buildings.

4th, The Lands Improvement Company’s Act (16 and 17 Vict. c. 154), for the same purposes as the above, with the addition of planting for shelter. This company’s powers extend to Scotland.

By these Acts ample provision is made for rendering the dormant capital of the country available for the improvement of its soil. To the owners of entailed estates they are peculiarly valuable, from the power which they give to them of charging the cost of draining, &c., upon the inheritance. If such owners apply their own private funds in effecting improvements of this kind, they are enabled, through the medium of these companies, to take a rent-charge on their estates for repayment of the money they so expend, over which they retain personal control, so that they can be- queath as they choose the rent-charge payable by their suc- cessor. Besides their direct benefits, these Drainage Acts have already produced some very important indirect fruits. They have led to many improvements in the manner of accomplishing the works to which they relate, to the wide and rapid dissemination of improved modes of draining, &e., and, in particular, they have had the effect of creating, or at least of greatly multiplying and accrediting, a staff of skilful aud experienced draining engineers, of whose services all who are about to engage in draining and similar works will do well to avail themselves.

Section 3.—Removal of Harthfast Stones.

Newly reclaimed lands, and even those that have long been under tillage, are frequently much encumbered with earth- fast stones. This is particularly the case in many parts of Scotland. Their removal is always desirable, though neces- sarily accompanied with much trouble and expense. In our personal practice we have proceeded in this way. In giving the autumn furrow preparatory to a fallow crop, each ploughman carries with him a few branches of fir or beech, oue of which he sticks in above each stone encoun- tered by his plough. If the stones are numerous, particu- larly at certain places, two labourers, provided with a pick, a spade, and a long wooden lever shod with iron, attend upon the ploughs, and remove as many of the stones as they can, while yet partially uncovered by the recent furrow. Those thus dug up are rolled aside upon the ploughed land. When the land gets dry enough in spring, those not got out at the time of ploughing are discovered by means of the twigs, and are then dug up. Such as can be lifted by one man are carted off as they are, but those of the larger class must first be reduced by a sledge hammer. They yield to the hammer more easily after a few days' exposure to drought than when attacked as soon as dug up. Before attempting to break very large boulders a brisk fire of dried gorse or brushwood is kept up over them until they are heated, after which a few smart blows from the hammer shiver them completely. Portions of otherwise good land arc sometimes 80 full of these boulders, that to render it available, the Stones must be got rid of by trenching the whole to a con- siderable depth. When ploughing by steam-power becomes general, a preliminary trenching of this kind will in many cases be requisite before tillage instruments thus propelled can be used with safety.

Section 4.—Paring and Burning.

Paring and burning have, from an early period, been re- sorted to for the more speedy subduing of a rough uncultured surface. This is still the most approved method of dealing With such cases, as well as with any tough old sward which 18 again to be subjected to tillage. In setting about the

operation, which is usually done in March or April, a turf, not exceeding an inch in thickness, is first peeled off in successive stripes by a paring-plough drawn by two horses, or by the breast-plough already described. These turfs

are first set on edge and partially dried, after which they are collected into heaps, and burned, or rather charred. The ashes are immediately spread over the surface, and ploughed in with a light furrow. By this process the matted roots of the pasture plants, the seeds of weeds, and the eggs and larvee of innumerable insects, are at once got rid of, and a highly stimulating top-dressing is supplied to the land. A crop of turnips or rape is then drilled on the flat, and fed off by sheep, after which the land is usually in prime con- dition for bearing a crop of grain. This practice is unsuit- able for sandy soils, which it only renders more sterile ; but when clay or peat prevails, its beneficial effects are indisput- able. We shall, in the sequel, give an example of its recent successful application.

Section 5.—Levelling,

Land, when subjected to the plough for the first time, abounds not unfrequently with abrupt hollows and pro- tuberances, which impede tillage operations. These can be readily levelled by means of a box shaped like a huge dust-pan, the front part being shod with iron, and a pair of handles attached behind. This levelling-box is drawn by a pair of horses. Being directed against a promi- nent part, it scoops up its fill of soil, with which it slides along sledge-fashion to the place where it is to discharge its load, which it does by canting over, on the ploughman disengaging the handles.

In all parts of Great Britain, abundance of pasture land, and often tillage land also, is to be met with lying in broad, highly raised, serpentine ridges. These seem to have originated when teams of six or eight bullocks were used in ploughing ; and it has been suggested that this curvature of the ridges at first arose from its being easier to turn these long teams at the end of each land by sweeping round in a curve than by driving straight out. he very broad head- lands found in connection with these curved ridges point to the same fact. A theory still lingers among our peasantry, that "water runs better in a crooked furrow than in a straight one," and has probably been handed down since the discovered awkwardness of curved ridges was first seen to need some plausible apology. These immense, wave- like ridges are certainly a great annoyance to the modern cultivator ; but still the sudden levelling of them is accom- panied with so much risk, that it is usually better to cut drains in the intervening hollows, and plough aslant

them in straight lines, by which means a gradual approximation to a level surface is made. A field in our own occupation, which was levelled, by cleaving down the old crooked ridges, fifty years ago, still shows, by alternate curving bands of greater and less luxuriance, the exact site of the crowns and furrows of the ancient ridges.

Section 6.—Trenching.

But for its tediousness and costliness, trenching two or three spits deep by spade or forkis certainly the most effectual nieans for at onceremoving obstructions, levelling the surface, and perfecting the drainage by thoroughly loosening the subsoil. For the reasons mentioned, it is seldom resorted to on a large scale. But it is becoming a common practice, with careful farmers, to have those patches of ground in the corncrs, and by the fences of fields, which are missed in ploughing, gone over with the trenching-fork. The additional crop thus obtained may fail to compensate for this hand-tillage, but it is vindicated on the ground that these corners and margins are the nurscries of weeds which it is profitable to destroy.

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CHAPTER VIII. TILLAGE OPERATIONS. Section 1.—Ploughing.

When the natural green sward, or ground that has been cleared of a cultivated crop, is to be prepared for the sowing or planting of further crops, the plough leads the way in breaking up the compact surface, by cutting from it succes- sive slices, averaging about ten inches in breadth by seven in depth, which it turns half over upon each other to the right-hand side. This turning of the slices or furrows to one side only renders it necessary to square off the space to be ploughed into parallelograms, half the slices of which are laid the one way and the other half the other, by the going and returning of the plough. These parallel spaces are variously termed ridges, stetches, lands, or feirings, which in practice vary in width from a few furrows to 30 yards. When very narrow spaces are used, a waste of labour ensues, from the necessity of opening out and then reclosing an extra number of index or guiding furrows ; while very wide ones involve a

similar waste from the distance which the plough must go empty in traversing atthe ends. The spaccs thus formed by equal numbers of furrow-slices turned from opposite sides have necessarily a rounded outline, and are separated by open channels. Ina moist climate and im- pervious soil, this ridging of the surface causes rain-water to pass off more rapidly, and keeps the soil drier than would be the case if it was kept flat. Hence the cultivated lands of Great Britain alinost invariably exhibit this ridged form of surface. Until the art of under-ground draining was discovered, this was indeed the only mode of keeping cultivated ground tolerably dry. But it is at best a very defective mcthod, and attended by many disadvantages. When land is naturally dry, or has been made so by thorough drainage, the flatter its surface is kept the better for the crops grown upon it. We are not forgetful that there arc, in various parts of Great Britain, clays so impervious that probably no amount of draining or disintegration of the subsoil will render it safe to dispense with ridging. These, however, are exceptional cases, and, as a rulc, such a con- dition of soil and subsoil should be aimed at as will admit of this rude expedient of ridging being altogethcr dispensed with. Unless land can absorb the whole rain which falls upon it, its full range of fertility cannot be developed ; for the same showers which aggravate the coldness and sterility of impervious and already saturated soils carry down with them, and impart to those that are pervious, ever fresh sup- plies of genial influences. Instead, then, of this perennial source of fertility being encouraged to run off by surface channels, or to stagnate in the soil and become its bane, let provision be made for its free percolation through an open stratum several feet in thickness, and then for its escape by drains of such depth and frequency as each particular case requires. When this is attained, a flat surface will generally be preserved, as alike conducive to the welfare of the crops and to the successful employment of machinery for sowing, weeding, and reaping them.

Tn all treatises on British agriculture of a date anterior to the first quarter of the present century, we find great stress laid on the proper formation of the ridges, careful cleaning out of the separating channels or water-furrows, and drawing and spading out of cross-cuts in all hollows, so that no water may stagnatc on the surface of the field. As thorough under-draining makes progress, such directions are becoming obsolete. But

whether ridging or flat work is used, the one-sided action of the plough renders it necessary, in setting about the ploughing of a field, to mark it off into parallel spaces by a series of equi-distant straight lines. Supposing the line of fence, at the side at which he begins, to be straight, the ploughman takes this as his base line;

and measuring from it, erects his three or more feiring poles perfectly in line, at a distance from the fence equal to half the width of the ridges or spaces in which it is proposed to plough the field. This operation—called in Scotland fering the land—is usually entrusted to the most skilful ploughman on each farm, and is regarded as a post of honour. Having drawn a furrow in the exact linc of his poles, which practice enables him to do with an accuracy truly admirable, he proceeds, using always the last furrow as a fresh base from which to measure the next one, until the field is all marked off. When this is done, it presents the appearance of a neatly ruled sheet of paper. Besides the poles just referred to, the ploughman is frequently furnished with a cross staff, by means of which he first of all marks off two or more lines perpendicular to the straight side at which he commences, and along these he measures with his poles, which arc graduated for the purpose, in laying off his parallel lines. This feiring is only required when a process of fallowing, in preparation for green crop, has obliterated the former ridges. In breaking up clover lea or older sward, the ploughman begins at the open furrows, which afford him a sufficient guide.

In ploughing for a seed-bed the furrow-slice is usually cut about five inches deep. In the case of lea, it should be turned over unbroken, of uniform thickness, and laid quite close upon the preceding one, so as to hide all green sward. The improved wheel-plough already referred to does this work very beautifully, cutting out the slice perfectly square from the bottom of the furrow. The perfect uniform- ity in the width and depth of the slices cut by it permits the harrows to act equally upon the whole surface. When the slice is cut unevenly, they draw the loosened soil from the prominences into the hollows, so that one part is scraped bare, and the other remains untouched and unbroken. This must necessarily yield a poor seed-bed, and contrasts un- favourably with the uniform tilth produced by harrowing after such

work as these wheel-ploughs invariably produce. In the Lothians and west of Scotland, a form of plough is much used for ploughing lea, which cuts out the slice with an acute angle at the land side. This, when turned over, stands up with a sharp ridge, which looks particularly well, and offers a good subject for harrows to work upon. But if a few of these furrow-slices are removed, the firm earth below exhibits the same ribbed appearance as the newly ploughed surface, instead of the clear level sole on which the right-angled slice cut by the wheel-plough is laid over so as to rest upon its lower angle. This ribbing of the unstirred subsoil is exceedingly objectionable in all kinds of ploughing.

In the autumn ploughing of stubble-ground in preparation for the root-crops of the following season, a much deeper furrow is turned over than for a seed-furrow. In ordinary cases it should not be less than nine inches, while in very many, if ten or twelve can be attained, so much the better. In all deep soils this bringing up and mixing with the sur- face of fresh material from below is highly beneficial. It must not, however, be practised indiscriminately. Siliceous and peaty soils need compactness, and to have the soil that has been artificially enriched kept a-top. For such deep work as we have noticed above, three or even four horses are frequently yoked to the plough. When a field slopes considerably one way, it is good practice to work the plough down the slope only, and return without a furrow. pair of horses working in this way will turn as deep a furrow, and get over as much ground, as three will do taking a furrow both ways, and with less fatigue to themselves and to the ploughman. After bringing a heavy furrow downhill, they get recruited in stepping briskly back with only the plough to draw. This mode of ploughing one furrow down the slope tends less to gather the soil to-

ward the bottom than by using a turn-wrest plough across the slope. It is while giving this decp autumn furrow that the subsoil plough is used. It follows in the wake of the common plough, and breaks and stirs the subsoil, but without raising it to the surface. This is a laborious operation, and engrosses too much of the horse-power of the farm to admit of large breadths being overtaken in any one season. In all indurated subsoils,

however, it repays its cost; for when once thoroughly done, it diminishes the labour of ordinary ploughings for several succeeding rota- tions, aids the drainage, and adds to the fertility of the soil. It is in the performance of this deep autumn tillage and breaking up of the subsoil, that the steam-engine, with appropriate tackle, has begun to play an important part, and for which it will probably one day supersede all other means. Section 2.—Harrowing, kc.

The harrow, cultivator, and roller, are all more simple in their action and more easily managed than the plough. Har- rowing is most effective when thc horscs step briskly along. The tines are tlien not merely drawn through the soil, but, in their combined swinging and forward movement, strike into it with considerable force. It is with reference to this that a single application of this implement is called a stroke of the harrows. Rollers are used to aid in pulveris- ing and cleaning the soil, by bruising clods and lumps of tangled roots and earth which the othcr implements have brought a-top; in smoothing the surface for the reception of small seeds, or the better operation of the scythe and other implements ; and for consolidating soil that is too loose in its texture. Except for the latter purpose, light rollers are much superior to heavy ones. When itis wanted, for example, to bruise clots of quickens, that the after harrowing may more thoroughly free the roots from the adhering earth, a light cast-iron roller, say of 5 ewt., drawn by one horse, effects this purpose as thoroughly as one double the weight drawn by a pair,—and does it, moreover, in much less time, at less than half tle expensc, and without in- juriously consolidating the free soil. These light rollers are conveniently worked in pairs, the ploughman driving one horse and leading the other. With a pair of active horses, and such rollers, a:good deal more than double the space can be rolled in a day, than by yoking them both to one heavy one of the same length of cylinder. For mere clod-crushing, provided the clods are moist, the Norwegian harrow is superior to any roller; and for compressing a loose surface or checking wire-worm, serrated or smooth- edged discs, such as Crosskill's or Cambridge's, are better than smooth cylindcrs of the same weight, so that the heavy smooth roller, requiring two or more horses to draw it, is superseded by better implements for all purposcs where rollers are used at all, unless it be for the rolling of the grass-lands.

As a general rule, none of these tillage operations can be performed to advantage when the soil is wet. When rain falls inopportunely there is a strong temptation to push on the field operations, before the soil has recovered the proper state of dryness. When this is done the farmer almost invariably finds in the issue that the more haste he makes the worse he speeds. Soils with a good deal of clay in their composition are peculiarly susceptible of injury in this way. Nice discrimination is necdcd to handle them aright. They require, morcover, a full stock of well-conditioned horses, that the work may be pushed rapidly through in favourable weather. To manage such soils success- fully, especially when root crops are grown, tries the skill of the farmer to the utmost. So at least it has hitherto been; but with steam-power to aid him, there is now a probability that the clay land farmer, by being able to break up his soil without treading it, and to get through

with a large extent of tillage when his land is in trim for it, may find it practicable to grow root crops on equal terms with the occupier of freer soil.

Section 3.—Fallowing.

When, by such operations as have now been described, land has been reclaimed from its natural state, and rendered fit for the purposes of the husbandman, it is everywhere so charged with the germs of weeds, most of which possess in a remarkable degree the power of reproduction and multiplication, that it is only by the most incessant and vigorous efforts he can restrain them from encroaching upon his cultivated crops, and regaining entire possession of the soil. He can do much towards this by ordinary tillage, and by sowiug his crops in rows, and hoeing in the inter- vals during the early stages of their growth. But if his efforts are restricted to such measures only, the battle will soon go against him. Lesides this, all arable soils in which clay predominates, particularly when undrained, havo such a determined tendency to become compact and soured, that under ordinary efforts they fail to yield a genial seed- bed. There is a necessity, therefore, for having recourse, from time to time, to that ameliorating process of lengthened tillage called fallowing. This process begins in autumn, immediately after the removal from the ground of the cereal crop,

which had bcen sown upon the land newly broken up from clover lea or natural sward, and extends either to the time for sowing turnips and analogous crops in the following spring, or is continued during the entire summer in preparation for autumn-sown wheat. We shall first describe that modification of the fallowing process by which the soil is prepared for the sowing of drilled grecn crops, and then the more prolonged form of it usually called summer or naked fallow.

Green Crop Fallow.

The object aimed at being the thorough disintcgration and cleaning of the soil, the usual practice is to begin by ploughing as deeply as is found practicable. This first or autumn furrow is accordingly turned over to a depth of 8 or 9 inches; or by using a stronger plough drawn by three or four horses, it is carried to 12 inches in depth; and in some cases, by following with a subsoil plough in the wake of the common one, the soil is stirred to the depth of 14 or 16 inches. All cultivators are agreed as to the importance of thus decply and effectually disintcgrating all soils that arc naturally dry or thoroughly drained. In the case of undrained lands, and even of very unctuous clays, although well drained, such deep stirring of the soil in autumn does but increase its capacity of rctaining the rains of winter, and of being thcreby more effectually soured, and is therefore to be avoided. Assuming, however, that we have to do with soil thoroughly draincd and modcrately friable, it is undoubtedly beneficial to loosen it deeply and thoroughly at this stage. But beforo this decp ploughing is set about, it will be worth while to considcr well its bearing upon the cleaning part of the process. On carefully examining the fields at the time of reaping the grain-crops, and from week to weck thereafter, the roots of the couch- grass are found at first lying close to the surface ; but in- stantly, on their gctting the ground to themselves, they begin to send out fresh fibres, and to push their shoots deeply into the soil. In thesc circumstances, to proceed at once, according to the customary practice, to plough dceply, allows these wecds much time to increase, while this laborious and tcdious operation is going on; and although, when performed, it gives some prescnt check to their progress, by burying them under a mass of loosencd soil, it not only incrcases the difficulty of their after removal, but places them out of the reach of frost, and in the best

possible position for pervading the entire soil, on the first reeurrence of mild weather. The consequence is, that fallows so treated arc invariably found in spring more fully stocked with quickens than they were at the time of the autumn ploughing. The observation of this suggested the practice, now very common in England, of cleaning fallows in autumn before guwing the Jirst deep furrow. For this purpose, such implements as Biddle's scarifier, the broad-share paring-ploughs, or better still, the common plough, divested of its mould-board and fitted with a share a foot broad, are set to work as fast as the grain-crops are reaped, and the whole surface is rapidly pared at a depth of three or four inches. This completely loosens the yet shallow-lying roots of the couch-grass, which are then freed from the adhering earth by the Norwegian and chain- harrow, raked together and burned, or carted off. This pulverising of the surface soil in early autumn is usually followed by the springing up of an abundant crop of annual wecds and of shaken grain, which are thus got rid of by the subsequent ploughing. So great and manifold are the advantages of this modern practice, that in those districts where it is most in use, other autumn work, even wheat-sowing, is comparatively neglected until it is accomplished. When the wecds have been got rid of in this summary and inexpensive manner, dcep ploughing is then resorted to with unalloyed bencfit. Whenever steam-power becomes fully available for tillage operations, this autumn cleaning and deep stirring of fallows will be accomplished rapidly and effectually, and the teams will meanwhile be set at liberty for root-storing, wheat-sowing, and other necdful work, which can be well done only when accomplished during the brief season of good weather, which usually intervenes betwixt the close of harvest and beginning of winter.

Tn the case of farms that have for a lengthened period been carefully cultivated, the stubble may be found so clean as not to require the whole area to be scarified in the manner now described. Instead of this, it may suffice to have the ground carefully examined, and such patches or stray plants of couch-grass, or other perennial weeds, as are met with, forked out.

By this means the fallows are kept clean at little cxpense, and when spring arrives, those repeated ploughings, and other tedious and costly operations, arc wholly avoided, in performing which the condition of the soil is marred and the best seed-time often missed. When fallows are thus cleaned in autumn, it is highly advantageous to cart on to them at once, and cover in with a deep furrow, all the farm-yard dung that is on hand up to the completion of their first ploughing. From the length of time which must elapse before the land can again be touched, it is quite safe, or rather it is highly advantageous, to apply all the recently made dung, although in a very rough state. In doing this, it is necessary that a person precede each plough, and trim the rank litter into the previous furrow, that it may be properly covered up and regularly distributed. Unlcss this precaution is observed, the ploughs are constantly choked and impeded, the manure is drawn together into unsightly hassocks, and the whole operation is imperfectly performed. The recommendations to this practice are— First, Au important saving of labour; for the manure being carted direct from the yards, é&c., on to the land, and evenly spread over it, there is no forming, covering up, and turning of dunghills, or refilling and carting in spring, This heavy work is accomplished at a season when time is less pressing than in spring, and the sowing of the crop can be procecded with morc rapidly when the time for it arrives, and while weather favours. Second, There is a saving of manure by burying it at once in its rough state, instead of first fermenting it in large heaps; and a large portion of the fallow-break can thus be dressed with home-made manure.

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Third, The rough dung thus ploughed in decomposes slowly, its virtues are absorbed and retained by the soil, with the whole mass of which it is thoroughly incorporated by the spring tillage, and which, in consequence, is found, after such treatment, in a peculiarly mellow and favourable condition for recciving the seed.

The advantages of autumn cleaning and manuring of land in preparation for green crops are so great that the utmost exertions should be made to secure them. Over a large portion of England the harvest is usually so early

as to leave ample time for accomplishing the cleaning process before being arrested by bad weather. From the later harvest season and more humid climate of Scotland, it is there more difficult to carry it out to the whole extent of the fallow-break ; but still, with promptitude and energy, much can be done. One of her shrewd and intelligent sons, Mr Tennant, the inventor of the grubber which bears his name, has, however, introduced a system of autumn tillage, founded upon the same principle, and accomplishing virtually the same end, but less expensive and better adapted to the climate of Scotland than that just described. So soon as the grain crops are harvested, Mr Tennant sets his light grubbers agoing, and by working them over the whole field several times and in opposite directions, stirs the whole surface soil to the depth of six or eight inches, tears up and brings to the surface all root-weeds, where, after being knocked about and freed from adhering soil by repeated harrowings and a final grubbing, they are left for the winter. In our own practice we have latterly improved, as we imagine, on Mr Tennant's plan by broadsharing the land before using the grubbers, and also by employing the Norwegian harrow instead of the common one. The broadsharing ensures that the whole of the couch-grass and other weeds are thoroughly loosened without being buried, and the Norwegian harrow shakes out the roots from the adhering earth better than the common harrow. When it is intended to treat a field in this way, care should be taken at harvest time to reap the crop as close to the ground as possible, as rank stubble seriously encumbers the tillage implements. In setting about the grubbing of a field it is expedient also to begin with the headlands, and to work them thoroughly all round twice over, before they are trodden down by the frequent turning of the horses upon them. Tf this is omitted it will be found nearly impossible to have the margins of the field as well cultivated as the rest of it. A field thus treated presents for a time a singularly untidy and unpromising appearance ; but the ultimate effccts of the practice, as well in the cleaning as the disintegrating of the soil, are very remarkable. When roots of couch-grass, &c., are freed from the soil, and fully exposed to the vicissitudes of the weather at a season when their vital force is at the lowest point, they are unable to resist its effects, and gra- dually die. If placed in similar circumstances in spring, with their vital energy in full play, the merest point of a root embedded in, or even in contact with, pulverised soil, enables them to push down fresh fibres, to re-establish their connection with the soil, and to grow as lustily as ever. But so completely is

the destruction of these pests secured by this simple process of winter exposure, that on the return of spring they may be ploughed in with impunity. Mr Tennant assures us, that ever since he adopted this practice he has been enabled to dispense with the removal of these weeds. Having had an opportunity of inspecting his farm, we are enabled to testify to its cleanness and high state of fertility. On this plan, then, the elcaning of fallows is accomplished by tillage operations alone, without any outlay for raking or hand-picking, burning, or carting off. Nor is this done at the expense of the pulverising part of the pro- cess. On the contrary, Mr Tennant asserts, and we have so far verificd his assertion by actual experiment, that by dis-

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integrating the soilin autumn, as is done by this broadshar- ing, grubbing, and harrowing, it receives far more benefit from the alternation of frost and thaw, rain and drought, than when merely ploughed and left lying during winter in compact furrow-slices. This plan affords the same facilities as the other for autumu manuring, if the weeds are raked off at once from so much of the fallow-break as it is wished to manure before winter. When the remainder is ploughed in April following, more of it may then have the farm-yard dung applied to it in the same way. Agriculturists owe a large debt of gratitude to Mr Tennant for the invention of his beautifully simple and efficient grubber, and for this scientific application of it to the fallowing process. Those who have been pursuing this system of tillage will be much interested in observing that it has been adopted by Mr Smith of Woolston, who is carrying it out to perfection by means of his steam-drawn implements.

The autumn tillage of the fallows having been accom- plished in one or other of the ways described, the land is left untouched till the return of spring. If it is infested by annual weeds, it is expedient, as soon as itis dry

enough to bear treading with impunity, to level and stir the surface by a turn of the harrows. This slight moving of the mellowed surface-soil induces the seeds of weeds to germinate more quickly than they would otherwise do, and thus a crop of them is got rid of by the next tilling. This pre- liminary harrowing is useful also in affording a level course for the tillage implements. By the time that the labour connected with the sowing of spring crops is over, the fallows are usually dry enough to be stirred with safety. This point, must, however, be well seen to, as irreparable mischief is often done by going upon them too soon. And now it is, that, instead of rigidly following any customary routine of so many ploughings, harrowings, and rollings, the skilful cultivator will regulate his procedure by the actual circum- stances of his soil, and the object which he has in view. What is needed for the successful growth of drilled green crops is to have the soil free from weeds, thoroughly disin- tegrated to the depth of six or eight inches, and yet moist enough to ensure the ready germination of seeds deposited init, Where such autumn cleaning and manuring as we have described have been successfully carried out, all that is needed, in order to obtain a proper tilth, is to go to work with light grubbers, first in the line of the previous furrows and then across them, and then to harrow, roll, and remove any weeds that have beeu missed in autumn, after which the soil will be in the best possible condition for drilling. On friable soils, this method of performing the spring tillage by means of the grubber instead of the plough is perfectly practicable, and has manifold advantages to recommend it. The saving of labour is very great, as a man and _ pair of horses will more easily grub four acres than plough one acre. Weeds are more easily removed, as the grubber pulls them out unbroken, whereas the plough cuts them in pieces. The soil that has becn all winter subjected to the mellowing in- fluences of the weather, and which, in consequence, is in the best possible condition to yield a genial seed-bed, is retained a-top, whereas ploughing buries it and brings up clods in its stead. And, lastly, the soil being merely stirred, without having its surface reversed, its natural moisture (or winter sap) is retained, whereby the germinating of seeds sown in it becomes almost a certainty. The importance of this last point in the cultivation of such crops as the turnip, whose secds must usually be sown during hot and dry weather, can scarcely be overrated. This practice is peculiarly appropriate for soils of loose texture, which are invariably injured by repeated ploughings. But it is also resorted to successfully on

soils of the opposite extreme. Many farmers in the Lothians now grow abundant and ex-

tensive crops of turnips on strong clay soils by spreading a liberal dressing of dung on the stubble in autumn, ploughing it in with a deep furrow, leaving the land untouched until sowing-time has fully arrived, and then stirring the mellowed surface soil by the grubbers, removing weeds, and drilling aud sowing at once without any ploughing. When this system is adopted on tenacious soils, itis prudent to operate upon portions of the field in detail, taking in only so much at a time as can be grubbed and drilled the same day ; for if rain should intervene betwixt the grubbing and the drilling, the soil would set like mortar and the tide be lost. When once the ridgelets are made up in good condition, they can withstand a fall of rain with comparative impunity ; and hence the occurrence of a course of finc weather, when the season is yet too early for sowing, is sometimes taken advantage of by preparing the land and making it up into ridgelets, although it should require to remain in this state weeks, or even months, before sowing takes place. In such a case, immediatcly before sowing, the ridgelets are first partially levelled by harrowing length-wisc, in ordcr to loosen the soil and destroy annual weeds, and then again made up by using a double-breasted plough. We must here, however, insist upon the importance of having the grubbing thoroughly performed, which it cannot be unless the tines penetrate the soil as deeply as the plough has done at the autumn ploughing. It is owing to the neglect of this that the system has failed in the hands of many farmers, who first mismanage the operation, and then throw the blame upon the grubbers. 'To ensure success, the implement must be set so as to work at its full depth, sufficient motive power being applied by yoking three horses, if necessary, to each grubber at the first and also at the sccond going over, and there must be vigilant superintendence exercised lest the ploughman do the work slightly. It is sometimes objected to this system of spring tillage, that it fails to rid the land of thistles and other tap-rooted weeds; but it is surely easier to fork these out as they appear, than to plough a whole field merely to destroy as many thistles as a man, it may be, would dig up ina day. By taking advantage of the tilth obtained by the action of the elements, instead of first

ploughing down the mellowed surface, and then attempting laboriously to reduce the obdurate furrows by mechanical means, skilful and energetic farmers now succeed in preparing even tenacious soils for drilled green-crops, at little expense, and with a good measure of certainty.

On these opposite classes of soils, then—the very loose, and the tenacious—spring tillage, in preparation for root- crops, 1s performed to better purpose by means of the grubber than the plough. Betwixt these extremcs, however, lies the most valuable class of soils—the strong fertile loams —on which the heaviest crops and best quality of Swedes are grown. With these it is usually expedient to have recourse to at least one spring ploughing, as soon, but only as soon, as the soil is dry enough to crumble freely to the very bottom of the furrow. As this usually occurs from four to six weeks before the time of sowing the crop, it is advisable to plough the entire field, and leave it so until rain falls, when a moderate use of the grubber, harrows, and light roller, usually suffices to produce a good tilth for ridging. When opcrations are not thus facilitated by a seasonable fall of rain, it is necessary to proceed somewhat differently. The field is lying as it was left by the plough, with a rough dried surface. If harrowed while in this state, an abundant crop of clods is brought to the surface, which quickly harden when thus fully exposed to drought. To avoid this inconvenience, the field is first rolled with a heavy roller, and then grubbed across the direction in which it was last ploughed. By this means the clods, being partially crushed and pressed down amongst the loose earth, resist the grubber, and are crumbled by it, instead of being

merely raked out and left entire on the surface, as would happen but for this preliminary rolling. The grubbcrs are followed closely by harrows and a light roller, and these again by the grubbers; but this time with seven tines on instead of five, after which a sufficient tilth is usually obtained. All this is on the supposition that the land is clean when these spring opcrations are commenced ; for should it be otherwise, it is usually better to begin with the grubber on the stale winter furrow, and to get rid of the weeds, before using the plough. If it is found necessary to plough near to the time of sowing, then the harrow and roller must keep pace with the ploughs in order to

retain moisture and prevent the formation of clods. The Nor- wegian harrow is the proper implement to use in such cases. Let it ever be borne in mind that if the soil is cleaned and sufficiently disintegrated, the less working it gets at this stage the better.

It may be well indeed to remind the reader that although the fallowing process can most conveniently be gone about during the period which intervenes betwixt the removal of a grain-crop from the ground and the sowing of the succeed- ing root-crop, and on this account is often spoken of ina loose way as being performed "in preparation for the root- crop," it is a fallacy to regard this laborious and costly process of tillage and cleaning as undertaken solely or mainly for the benefit of the turnip or other root-crop, then about to be sown. The other crops of the rotation benefit by it in a far greater degree, and it would be re- quired on their account although turnips were not grown at all, as may be seen in the case of clay lands with their periodic naked fallows. It is the overlooking of this fact which has led people to charge the whole cost of this fallow- ing process, and ofall the manure then applied to the land, against the turnip-crop, and then to represent this crop as the most costly one which the farmer grows,—one which often yields him less than it cost to produce it. Undoubt- edly the cost of the fallow must be charged equally against all the crops of the rotation.

Summer or Naked Fallow.

Having thus described at length that modification of the fallowing process by which the soil is prepared for the sowing of green crops, we shall now, as proposed, speak of that prolonged form of it called a swmmer or naked fallow. From the facilities now afforded, by means of tile-draining and portable manures, for an extended culture of green crops, this laborious and costly process, which im its day was justly regarded as the very kcy to good and profitable farming, is now restricted to the more obdurate clay soils, or to cases where draining and other modern improve- ments are neglected. The manifold advantages of having abundant crops of turnips, or mangel-wurzel, instead of naked fallow, sometimes tempt the occupiers of clay soils to push the cultivation of these crops beyond due bounds. We know of cases where, after large expenditure in draining, the cultivation of turnips has been carried to such an extent, and conducted so injudiciously,

that the land has got foul and soured, and its gross produce has been reduced below what it was while the land was undrained, and under a regular system of all but exclusive naked fallows. However thoroughly drained, clay soils retain their ticklish temper, and are so easily disconcerted by interference during un- favourable weather, that the preparing of them for the cultivation of root-crops, and still more the removing of these crops when grown, is at best a hazardous business, and requires to be conducted with peculiar tact. Judicious farmers, who know by cxperience the difficulties that have to be overcome in cultivating such soils, are of opinion that all that can yet be ventured upon with safety is to prolong the period of the naked fallow's recurrence, rather than

entirely to dispense with it. After a series of altcrnate grain and cattle crops, it is accordingly still their practice to wind up with a summer fallow, by which they rectify unavoidable defects in the tillage of preceding years, and put their land in good humour for entcring again upon a fresh course of cropping.

This process is begun by a deep ploughing in autumn, in performing which the land is gathered into ridges, that it may be kept as dry as possible during winter. When the more urgent labours of the following spring are so far dis- posed of as to afford leisure for it, a second ploughing is given to the fallow, usually by reversing the furrows of autumn. This is followed at intervals by two cross-plough- ings, which are made to reverse each other, in order to keep the land level. As it is the nature of these soils to break into lumps, under the action of the plough, rather than to crumble down, the clods thus produced get so thoroughly parched in dry weather, that root-weeds encloscd in them are killed by shecr desiccation. To further this cheap mode of getting rid of them, the land is not rolled, but stirred by the grubber and harrow as frequently as possible, so as to expose the clods freely to the drought. We know by ex- perience that fallows can be cleaned effectually by thus taking advantage of the tendency in clay soils to bake excessively under exposure to the hot dry weather which usually prevails in June aud July. Should the scason happen to be a showcry onc, this linc of

tactics must nceds be abandoned, and recourse had to the judicious use of the grubber, Norwegian and common harrow, in order to free the weeds from the soil, and then clear them off by raking or hand-picking. This is more costly, and, as we believe, less beneficial to the soil than the simple method first noticed, which should therefore be attempted in the first place. As in hay-making, much can here be done in a few favourable days, by keeping grubbers and harrows at work, and turning the clods frequently. When farm-yard dung is to be applied to such fallows, it is desirable that it should be carted on and ploughed in before July expires. In applying it, two methods are followed. That usually adopted is, after marking off the ridges, to put down the dung in small heaps, at regular distances, and forthwith to spread it and plough it in. In the other, the land is formed into ridgelets, running diagonally across the intended line of the ridges, and the dung is enclosed in them in the manner to be hercaftcr described in treating of turnip culture. In either way, after the lapse of several weeks, the surfacc is levelled by harrowing, and the land is gathered into ridges by the last of this series of ploughings, hence called the seed-furrow. When lime is to be applicd to such land, this is the stage of the rotation which is usually chosen for doing so. It is spread evenly over the surface, imme- diately before the last ploughing. In finishing off this fallowing process, it is necessary, on undrained lands, to be carcful to clean out the ridge-furrows and cross-cuts, in anticipation of winter rains. But if such land is worth cultivating at all, it is surcly worth draining, and this operation once thoroughly performed, puts an end to all further solicitude about furrows.

CHAPTER IX. SUCCESSION OF CROPS. Section 1.—Rotation necessary.

There are few agricultural facts more fullyascertained than this, that the growth, year after ycar, on the same soil, of one kind of plants, or family of plants, and the removal from it, either of the entire produce, or at least of the ripened seeds of such plants, rapidly impairs the gencral fertility of that soil, and, in particular cases, unfits it for bearing further crops of the kind by which it has been ex- hausted. The explanation of the causes of this phenomenon

belongs to the agricultural chemist or vegetable physiologist, to whom we willingly leave the task. What we have to do with is the fact itself, and its important bearing on agri- cultural practice. There is no natural tendency in the soil to deterioration. If at any time, therefore, the earth fails to yield its increase for the use of man, it is owing to his own ignorance and cupidity, and not to any defect in the beneficent arrangements of the Creator. The aim, then, of the agriculturist, and the test of his skill, is to obtain from his farm abundant crops at a remunerative cost, and without impairing its future productiveness. In order to this, two conditions are indispensable,—first, that the elements of fertility abstracted from the soil by the crops removed from it be duly and adequately restored ; and, second, that it be kept free from weeds. The cereal grains, whose seeds constitute the staple food of the human family, are neces- sarily the most important and valuable of our ordinary crops. 'The stated removal from a farm of the grain pro- duced on it, aud its consumption elsewhere, is too severe a drain upon its productive powers to admit of these crops being grown every year on the whole, or greater part of it, without speedily impairing its fertility. Supposing, how- ever, that this waste could be at once repaired by the annual return to the soil of manure equivalent in constituent clements to the produce removed, the length of time which grain-crops occupy the soil, and their habit of growth, inter- pose peculiar difficulties in the way of cleaning it thoroughly, either before they are sown, or while they occupy the ground. Again, although bread-coru is the most important product of our soil, other commodities, such as butcher-meat, dairy produce, vegetables, wool, and flax, are indispensably re- quired. The economical culture of the soil demands the employment of animal power, which, to be profitably used, must be so distributed as to fill up the year. The mainten- ance of the working cattle, and of other live stock, implies the stated culture of a large amount of herbage and forage. Now, these varied conditions are duly met by cultivating grain and cattle crops alternately, and in about equal pro- portions. In carrying out these general principles, much discrimination is required in selecting the particular plants best adapted to the soil, climate, and other circumstances, of each farm, and in arranging them in the most profitable sequences; for not only is it necessary duly to alternatc grain aud green crops, but, in general, there is a necessity, or at least a high expedicncy, in so varying the species or varieties of the latter class as to prolong, as much as possible, the periodic recurrence of any one of them on

the same field. In settling upon a scheme of cropping for any particular farm, regard must be had to its capabilities, to the markets available for the disposal of its products, and to the command of manure. When these things have been maturely considered, it is always beneficial to conduct the cropping of a farm upon a settled scheme. The number of men and horses required to work it is regulated chiefly by the extent of the fallow-break, which it is therefore desirable to keep as near to an average annual breadth as possible. When the lands of a farm vary much—as regards fertility, fitness for particular crops, and proximity to the homestead,—they must be so apportioned as to make the divisions alloted to each class of crops as equal as possible in all respects, taking one year with another. Unless this 1s done, those fluctuations in the gross produce of farms which arise from varying seasons are needlessly, it may happen ruinously, aggravated ; or such an accumulation of labour is thrown on certain years which may prove un- favourable ones as to weather, that the work is neither done well nor in due season.

No better rotation has yet been devised for friable soils of fair quality than the well-known four-field or Norfolk system. By this course half the arable lands are in grain-

crops, and half in cattle-crops, annually. It is indeed true that, in the way in which this course has hitherto been usually worked, both turnips and clover have recurred so frequently (every fourth year) on the same fields, that they have become subject to disease, and their produce excessively precarious. But the excellence of this course is, that its main features can be retained, and yet endless variation be introduced in its details. For example, instead of a rigid one-fourth of the land being each year under turnips, barley, clover, and wheat or oats, respectively, half only of the barley division is frequently in practice now sown with clover seeds, and the other half cropped in the following year with beans, peas, potatoes, or vetches. On the same sct of fields, coming round again to the same point, the treat- ment is reversed by the beans, &c., and clover, being made to change places. An interval of eight years is thus sub- stituted for one of fowr, so far as these two crops are con- cerned. Italian rye-grass, unmixed with any other plant, is now frequently taken in lieu of clover on part of the division usually allocated: to it, and proves a grateful change both to the land and to the

animals which consume it. In like manner, instead of sowing turnips unvaryingly every fourth year on each field, a portion of the annual division allotted to this crop can advantageously be cropped with mangel-wurzel, carrots, or cabbages, care being taken to change the site occupied by each when the same fields again come in turn. The same end is even so far gained by alternating Swedish with yellow or globe turnips. It is also found expedient, either systematically or occasionally, to sow a field with clover and pasture grasses immediately after turnips, without a grain crop, and to allow it to remain in pasture for four years. A corresponding extent of the other land is meanwhile kept in tillage, and two grain crops in succession are taken on a requisite portion to equalise the main divisions, both as respects amount of labour and the different staple products. A closer cover of grasses and a better pasture is obtained in this way than by first taking the customary grain crop after turnips; the land is rested and invigorated for future tillage, the outlay on clover and grass-seeds somewhat diminished, and the land bettcr ma- naged for the interests of all concerned than by a rigid adherence to the customary rotation.

Section 2.—Lestrictive Clauses in Leases Hurtful.

Jt is common enough for landlords, or their agents, to tie down the tenantry over large estates to the rigid observ- ance of some pet rotation of their own. In an unimproved state of agriculture, and for a tenantry deficient both in capital and intelligence, such trammels, kindly enforced, may be as beneficial to them as to their landlord. But when the culture of the soil is undertaken by men of good education, who bring to the business ample capital, and skill to use it to the best advantage, such restrictions are much more likely to do harm than good to both parties. It is to be observed in regard to those restrictive clauses usually inserted in farm-leases,—such as, that two grain- crops shall never be taken in immediate succession ; that no hay, straw, or turnips, shall be sold from the farm ; that only certain limited quantities of potatoes or flax shall be grown ; that land shall be two or more years in grass, &c.,— that they all proceed on the supposition that the farm is to maintain its own fertility. They obviously do not con- template the stated purchase of large quantities of guano, bones, and similar extraneous manures, or the consumption by live stock of linseed-cake, grain, or other auxiliarics to the green crops produced on the farm. Now, not only are such

clauses incompatible with such a system of farming as we have just now indicated, but their direct tendency, if enforced, is to hinder a tenant from adopting it even when disposed to do so. We hear now-a-days of tenants who are

annual purchasers of these extraneous fertilising substances to the extent of 20s. to 30s. worth for every acre occupied by them. To enforce the same restriction on such men as on others who buy none at all is obviously neither just nor politic ; and we believe that any practical farmer, if he had his choicc, would rather be the successor of a liberal manurer, however he may have cropped, than of one who has farmed by rulc on the starving system. We are quite aware that, in regard to the first-mentioned of these restric- tions (viz., that which forbids taking two grain-crops in immediate succession), the contrary practice 1s still asserted by agricultural authorities to be necessarily bad farming. Now, we do not concur with this opinion, but believe, on the contrary, that when land is kept clean, and is as highly manured and well tilled as it must be to grow cattle-crops in perfection, the sccond successive crop of grain will usually be better than the first, its production nowise injurious to the land, and the practice, in such circumstances, not only not faulty, but an evidence of the skill and good manage- ment of the farmer. A frequent encomium applied to a particularly well-cultivated farm is, that "it is like a garden." The practice of market-gardeners is also frequently referred to as a model for farmers. Now, the point with them is to have every inch of their ground under crop of some kind at all seasons, and to carry everything to market. Under such incessant cropping, the fertility of the soil is maintained only by ample manuring and constant tillage. By these means, however, it is maintained, and the practice is extolled as the perfection of management. Such a system must therefore be as true in farming as in gardening, when the like conditions are observed. Undoubtedly he is a good farmer, who, while keeping his land clean and in good heart, obtains the greatest produce from it at the least proportion- ate outlay ; and itis no valid objection to his practice merely to say that he is violating orthodox rotations.

Section 3.—Haperiments at Rothamstead and Lois Weedon.

Some curious information has been obtained regarding the effects of growing successive crops of one kind of plant on the same field, from two examples of it that attracted much attention. We refer to the experiments of Mr Lawes at Rothamstead, and of the Rev. Mr Smith at Lois Weedon. It is well known that Mr Lawes for a number of years devoted a considerable extent of land to the prosecution of a series of interesting experiments, one field being allotted to experiments with wheat, another to turnips, and another to beans. One acre in the wheat-field bore upwards of twenty successive crops of wheat without any manure whatever. The land was annually scarified and thoroughly cleaned as soon as the crop was removed; it was then ploughed and again drilled with wheat, which was duly hoed in spring. Now, with occasional variation, due to the character of particular seasons, Mr Lawes found that the average annual produce of this acre was 16 bushels of grain and 16 cwt. of straw, below which he failed to reduce it by these successive crops. His soil was a strong clay loam, resting at a depth of five or six feet upon chalk. In the case of turnips, he found that, when treated in the same way, they cease after a few years to grow larger than radishes, nor could he, by the application of any amount or variety of manure which he tried, obtain a second successive crop equal to the first. With the wheat, on the contrary, the addition of four cwt. of Peruvian guano at once doubled the produce. Mr Smith's experiments, as is well known, were a revival of Jethro Tull's system of growing wheat continually on the same field, by a plan of alternate strips of wheat and bare fallow, made to change places an- nually. He improved in so far upon Tull's practice, inasmuch as he thoroughly drained his land, and his fallow spaces were deeply trenched every autumn, as well as ploughed

and hocd during the growing season. The result was that his land thus treated yielded an average annual produce of 34 bushels per acre for eleven or twelve successive crops. Now, it is not our intention to offer any opinion on this as a system 'of wheat growing. We refer to it along with Mr Lawes's, for the purpose of showing that, notwithstand- ing the prevalent opinion that grain-crops exhaust the fertility of soils more rapidly than green crops, this is true only in a very restricted sense. Grcen crops judiciously interposed do undoubtedly serve a most important purpose in the means

which they furnish for maintaining the fertility of a farm; but it is worthy of note, that whereas, by the addition of suitable manure, thorough tillage, and diligent removal of weeds, clay soil at least will stand an indefinite succession of grain crops, the same means entircly fail to yield the same results with our most popular green crops. Our personal experience quite accords with this; for we suppose it will be admitted that the corn crops of the country are at the present day superior, both in quality and quantity, to those of any preceding period ; whereas potatoes, turnips, and clover, which we have so long regarded as our sheet- anchor, have become increasingly precarious, and threaten to fail us altogether. We offer these facts for the consider- ation of those who out-and-out condemn the practice of sowing two white crops in immediate succession. In stating this opinion, we must, however, guard against misappre- hension. Unless the land is highly manured and kept thoroughly clean, we are just as much opposed to the practice as any one can be; but when mischief is done by it, we believe that it is duc rather to the presence of weeds than to the second grain-crop. Neither do we plead for the absolute removal of restrictive clauscs from farm leases. Human nature being what it is, men who do not see it to be for their own advantage to farm well, will, through ignorance or greed, impoverish their land unless they are restrained. Clauscs as to cropping should, however, be pro- hibitory rather than prescriptive—have reference rather to what is removed from the farm than to what is grown upon it—and they should be contingent upon the other practices of the tenant. So long as he continues, by ample manuring and careful tillage, to maintain the fertility and general good condition of the farm rented by him, it can be no ad- vantage to his landlord to hinder him from cropping it at his own discretion. It will be seen from these remarks, that we attach more importance to those general principles which should regulate the succession of crops, than to the laying down of formulze to meet supposed cascs. The man who cultivates by mere routine isunpreparedfor emergencies, and is sure to lag in the race of improvement; while he who studies principles is still guided by them, while altering his practice to suit changing circumstances.

CHAPTER X. MANURES, Section 1.—Farm-yard Dung.

In our remarks on tillage operations and on the succession of crops, we have seen how much the practice of the husband- man is modified by the kinds and amount of manures at his disposal. In describing the crops of the farm and their culture, frequent reference will also necessarily be made to the use of various fertilising substances ; and we shall, there- fore, before proceeding to that department of our subject, enumerate and briefly remark on the most important of them. In such an enumeration, the first notice is un- questionably duc to farm-yard dung.

This consists of the excrements of cattle, their litter, and the refuse of their fodder; usually first trodden down in successive layers, and partially fermented in the farm-yard, and then removed to some convenient place and thrown together in heaps, where, by further fermentation and decay,

it is reduced to a dark-coloured, moist, homogeneous mass, in which state it is usually applied to the land. It is thus the residuum of the whole products of the farm, minus the exported grain, and that portion of the other crops which, being first assimilated in the bodies of the live stock, is sold in the form of butcher-meat, dairy-produce, or wool. In applying farm-yard dung to land there is thus a returning to it of what it had previously produced, less the above exceptious, and such waste as may occur during the process of decay by gaseous exhalation or liquid drainage. It is obvious that the value of such dung as a fertilising agent must depend much on two circumstances, viz., lst, The nature of the food consumed by the animals whose excre- ments are mingled with it; and, 2d, The success with which waste from drainage and exhalation has been prevented. When cattle used during the winter months to be barely kept alive on straw and water, and were confined in an open yard, which, in addition to its own share of rain, re- ceived also the drip from the eaves of the surrounding build- ings—which, after percolating the litter, flowed unchecked into the neighbouring ditch—it is needless to say that the dung resulting from such a process was all but worthless. It is much to be regretted that, from the faulty construction of farm-buildings, farmers still find it impossible to guard their dung-stores from injury and waste. When catile- yards are slightly hollowed towards their centre, and the surrounding eaves are spouted, the litter

absorbs the whole of the urine and the rain which falls upon the uncovered area, while the treading of the cattle goes far to prevent undue fermentation and escape of gases, The same remark applies still more strongly to covered boxes, the dung re- sulting from this mode of housing fattening cattle being of the best quality. In the case of byres and stables it is certainly desirable to have a covered depét, into which the litter and solid excrements may be wheeled daily, and to have the urine conveyed by proper drains and distributed over this mass of solid matter. As there is usually more liquid than these can at once absorb, it is well to have a tank at the lowest part of this depdt in which to store the surplus, that it may from time to time be returned upon the adjoining mass, or conveyed to heaps in the fields. Advantage is usually taken of frosty weather to cart out to the fallow division of the farm the dung that has accumulated in yards and boxes. It is formed into large square heaps about four feet deep, in situations most convenient for ready application to the land when the season for sowing the crops arrives. It is desirable to prepare a site for these heaps by carting together and spreading down a quantity of earth (or peat, when that can be got), for the purpose of absorbing the ooze from the fermenting mass laid upon it. At the beginning of winter, the loaded dung-carts are driven on to the heaps, and their contents are spread evenly over it, layer above layer, both to equalise the quality of the dung- heap as a whole, and, by the compression thus applied, to prevent a too rapid fermentation. When the heap has attained the requisite bulk, a covering of earth or peat is spread over it to keep it moist and to prevent the escape of its ammonia. When this home-made manure was the only kind statedly at the command of the farmer, it was con- sidered necessary, and we believe truly, to have it in an advancedstate of decomposition before applying it to a turnip crop. There was a waste of manure by this practice, but unless it was in a state to supply instant nourishment and stimulus to the young turnip plants, the crop was certain to be a deficient one. The application, along with farm-yard dung, of guano, superphosphate of lime, and other portable manures, quite does away with the necessity of having the former much rotted. These concentrated manures stimulate the growth of the plants during their early stage, and put them in the best condition for making gradual use of the

slowly dissolving dung. Excessive decomposition of farm- yard dung is now therefore avoided, and pains rather be- stowed to improve its quality by protecting it from the weather, and retaining its ammonia and natural juice. The cheapest, and perhaps also the best, way of doing this is to cart the dung direct from the cattle-yard to the fields, and at once to plough it in.

Section 2.—Liquid Manures.

We have spoken of the importance of carefully retaining the urine of the housed live stock, by having it absorbed in the solid matter of the dung-heap, and of collecting the surplus into a suitable tank, where it may be available for moistening the heap from time to time, and especially when about to be applied to the land. A system has, however, lately attracted much notice, by which pains are taken not only to preserve every drop of urine and ooze from dung- heaps, but, as far as practicable, to apply the whole manure produced on the farm in a liquid form. It is in Ayrshire, and especially on the farm of Myremill, that this system has been carried out most fully. Our reference will be best explained by quoting at length from the Minutes of Infor- mation issued by the General Board of Health regarding sewage manure.

'The next farm visited was in the immediate vicinity of Glas- gow, where the supply of liquid manure is derived from another source, and distributed in a different manner. The supply is from a dairy of 700 cows, attached to a large distillery ; the entire drain- age from the former flows in a full continuous stream into a tank containing 80,000 or 40,000 gallons, whence it is pumped up immediately by a 12-horse power engine, and foreed through 4-inch iron pipes, laid about 18 inehes under ground, into large vats or eisterns placed on the highest points of the land to he irrigated. From these it descends by gravitation through another system of pipes laid along the ridges of the hills, finding an outlet through stand-coeks placed at intervals, from which it is distributed through movable iron pipes fitting into each other, and laid along the surface in whatever direetion the supply is required. The land thus irrigated consists of three farms lying at some distance apart, the farthest point to whieh the liquid is eonveyed being about two miles, and the highest elevation 80 fect above the site of the tank and engine. The principal use to which the irrigation has been applied has

been to preserve the fertility of the pastures, the general appearance of which was at first rather disappointing, but this was explained by the fact that they are fully stocked, and that the cows rush with avidity to those parts that have been last irrigated, and eat them down quite bare. Asis the case in other instanees, however, by far the most profitable application has been found to be Italian rye- grass, of which 15 (Scotch) acres were under cultivation, some with seed supplicd by Mr Dickinson, whose successful cultivation of it by similar means near London has long been known. 'The first cut- ting of this had yielded about ten tons the acre, the second nine, and the third, which was ready for cutting, was estimated at eight or nine more. Some crops of turnips and eabbages were pointed out to us in a state of vigorous growth, and with more than eommon promise of abundance; these were raised by a dressing of ashes and refuse (of little fertilising value, having been purchased at 2s. 6d. a ton), eonjoined with four doses of liquid, one after the preceding crop of oats had been carried, one prior to sowing, and two more at different stages of growth. The enterprising gentleman who has carried out these works at his own expense, and in spite of the dis- couragement arising from partial failure in his earlier attempts, though speaking eautiously, as was natural in a tenant on a nine- teen years' lease, of the pecuniary results of this undertaking, imparted some facts which leave little doubt that it must have been largely remunerative. Besides maintaining, if not increasing, the fertility of the pastures, to which the solid manure from the byres was formerly devoted, at a heavy expense of cartage (thc whole of which is now saved), he is enabled to sell all this manure, of which we cstimated the quantity at about 3000 tons a year, at 6s. a load. For a good deal of the Italian rye-grass not required for his own con- sumption, he obtained upwards of 18s. a ton, the profit on which, taking into aeeount the yield before stated, may casily be imagined. Thirteen carts, cach containing six barrels of ten gallons each, are used to eonvey the milk to market, where it is sold at 5d. the Seotch pint, equal to six pints imperial measure. The ineome from milk would, therefore, be not less than £43, 6s. 8d. per day, or £15,816, 18s. 4d. per annum.

- *The next place visited was the farm of Myremill, near Maybole, in Ayrshire, the property of Mr Kennedy, who adopted and improved on the method of distribution just deseribed. On this*

farm, about 400 imperial acres of which are laid down with pipes, some of the solid as well as the liquid manure has been applied by these means, guano and superphosphate of lime having been thus transmitted in solution, whereby their value is considerably enchanced. This is especially the case with guano, the use of which is thus rendered in great measure independent of the uncertainties of climate, and it is made capable of being applied with equal advantage in dry as in wet weather. In some respects the farm labours under peculiar disadvantages, as water for the purpose of diluting the liquid has to be raised from a depth of 70 feet and from a distance of more than 400 yards from the tanks where it is mixed with the drainage from the byres. These tanks are four in number, of the following dimensions res ectively :~~—48 × 14 × 12; 48 × 14× 15; 72 × 14 × 12; 72× 17 × 12. They have each a _ separate communication with the well from which their contents are pumped up; which are used in different degrees of 'ripeness,' a certain amount of fermentation induced by the addition of rape~~ dust being considered desirable. 'The liquid is diluted, according to circumstances, with three or four times its bulk of water, and delivered at the rate of about 4000 gallons an hour, that being the usual proportion to an acre. The quantity to be applied is determined by a float-gauge in the tank, which warns the engineer, whose business it is to watch it, when to cut off the supply, and this is a signal to the man distributing it in the field to add another length of hose, and to commence manuring a fresh portion of land. The pumps are worked by a 12-horse power steam-engine, which performs all the usual work on the farm, thrashing, cutting chaif and turnips, crushing oil-cake, grinding, &c., and pumping. The pipes are of iron; mains, submains, and service pipes, five, three, and two inches in diameter respectively, laid eighteen inches or two feet below the surface. At certain points are hydrants to which gutta-percha hose is attached in lengths of twenty yards, at the end of which is a sharp nozzle with an orifice ranging from one to one aud a half inch, according to the pressure laid on, from which the liquid makes its exit with a jet of from twelve to fifteen yards. All the labour required is that of a man and a boy to adjust the hose and direct the distribution of the manure, and eight or ten acres may thus be watered ina day. There are now 70 acres of Italian rye- grass and 130 of root crops on the farm. The quantity they would deliver by a jet from a pump worked

by a 12-horsepower steam- engine would be 40,000 gallons, or 178 tons, per diem, and the expense per ton about 2d., but a double set of men would reduce the cost. 'The extreme length of pipe is three quarters of a mile, and with the hose the total extent of delivery is about 1,900,000 yards, or 400 acres. To deliver the same quantity per diem by water-carts, to the game extreme distance, would be impracticable. One field of rye- grass, sown in April, had been cut once, fed off twice with sheep, and was ready (August 20th) to be fed off again. In another, after yielding four cuttings within the year, each estimated at 9 or 10 tons per acre, the value of the aftermath for the keep of sheep was stated at 25s. an acre. Of the turnips, one lot of swedes, dressed with 10 tous of solid farm manure, and about 2000 gallons of the liquid, having six bushels of dissolved bones along with it, was ready for hoeing 10 or 12 days earlier than another lot dressed with double the amount of solid manure without the liquid application, and were fully equal to those in a neighbour's field which had received 30 loads of farm-yard dung, together with 3 ewt. guano and 16 bushels bones per acre; the yield was estimated at 40 tons the Scotch acre, and their great luxuriance seemed to me to justify the expectation. From one field of white globe turnips sown later, and manured solely with liquid, from 40 to 50 tons to the Scotch acre was expected. _ A field of carrots, treated in the same manner as the swedes, to which a second application of liquid was given just before thinning, promise from 20 to 25 tons the acre. Similarly favourable results have been obtained with cabbages ; and that the limit of fertility by these means has not yet been reached, was clearly shown in one part of the Italian rye-grass which had acci- dentally received more than its allowance of liquid, and which showed a marked increase of luxuriance over that around it. The exact increase of produce has not been accurately determined, but the number of cattle on the farm has increased very largely, and by means of the Italian rye-grass at least fowr times as many beasts as before can be kept now on the same extent of land, the fertility of the land being at the same time increased. This plant, of all others, appears to receive its nourishment in this form with most gratitude, and to make the most ample returns for it; and great as are the results hitherto obtained, I believe that the maximum of productive- ness is not yet reached, and that the present experiment must be carried yet further before we know the full capabilities of this manure. Of one important fact connected with this crop, | am assured, that notwithstanding the rank luxuriance of its growth,

animals fed upon it not only are not scoured, but thrive more than on any other kind of grass in cultivation.

«Taking into the irrigation account the whole cost of the engine, and the whole of the fuel and wages—although half of these might have been deducted—the following appears to be the capital account and working expenses for fertilising Myremill farm :—

AGRICULTVEeE

[MANURES.

‘Tanks complete £300 0 0 Steam engine . it Om Omen) Pumps . : : : – 80 0 0 Iron pipes, laying, and hydrants – 000800 Gutta-percha distributing pipes, &c. : 56 0 0 £1586 0

«« Annual interest on £1586, and wear and : tear, at 7§ percent. . poe : : oe Annual wages : 3 : : : 104 0 0 Fuel : : c : : : 58 0 0 Zant 19 0

This amount, divided by the number of acres, is equal to the annual sum of 14s. per acre.

“‘T now come to the practical results of so cheap a mode of fer- tilising land.

“Mr Young informed me that in one of the fields he had him- self measured the growth of Italian rye-grass, and had found it to be two inches in twenty-four hours ; and that within seven months, Mr Kennedy had cut from a field we were passing at the time 70 tons of grass per acre. Where the whole is cut, four or five heavy crops are thus taken; but upon some of the land during the last two years 20 sheep to the acre have been penned in hurdles, and moved about the same field from time to time; after each remove the fluid has been applied, and immediately followed by an abun- dant growth of food. There is not the slightest appearance of exhaustion in the land,—its fertility appears to increase. I was informed that, before the liquid manure was used, the land would not keep more than a bullock or five sheep to the acre; now it will maintain, if the crops are cut and carried in, five bullocks or twenty sheep to the acre. Some beans, bran, and oil-cake are bought for

the stock; but, on the other hand, one-third or more of the farm is kept in grain, notwithstanding the great number of live stock.

“ Canning Park.—My Telfer’s farm, near Ayr. This is a small dairy farm of 40 acres, near the level of the sea, and about a mile and a half west of the town of Ayr. The subsoil is beach gravel with a slight admixture of clay. Water is too abundant. It lies dead within about 20 inches of the surface, and in winter nearer than that.

“‘ No bedding or litter is used here. The cows lie on cocoa-nut mats. The ventilation is perfect ; and the air sweeter than in the majority of the dwelling-houses of human beings.

‘The following appears to be the cost of carrying out the system of Mr Telfer’s farm :—

cad Kar. : : , £30 0 0 Engine : ; ; 60 0 0 Iron pipes and hydrants 100 0 0 Distributing hose-pipe, &c. 20 0 0

£210 Dig

ag Annual interest on £210, and wear and tear, £15 15 0

at 74 per cent. : : : : : Wages and fuel . il © £26 15 0

‘In summer the cows have a quantity of oil-cake, as well as yrass; and in winter they have turnips or mangel-wurzel, bean or barley meal, and cut hay or grass; the whole mess being steamed together. Miss Bell, the cousin of Mr Telfer, manages the dairy, and said that last year the hay bought would amount to from £30 to £40, and she should think the grain to not less than £200. In general terms, the other food is produced upon the farm. | As to the produce of grass, which is the chief article, the first cutting during the present year was in the latter end of March about 18 inches thick. The second was from 18 inches to 2 feet thick. The third was from 3 feet to 4 feet 6 inches thick. The fourth nearly the same. The fifth was 2 feet thick; and the sixth, in process of cutting at the time I was there, we measured at 18 inches thick. Taking the mean, where two dimensions are given for the same crop, I find the aggregate depth of grass, grown and cut off this farm within

seven months, to be not less than 14 feet 3 inches. All this is, however, eaten upon the premises, and the whole marketable produce of the farm is represented by the milk and butter.

'As to the quantity and value of these, Miss Bell stated that the previous week the butter was 114 tb and 120 tbh—together 234 Ib, sold at 1s. per pound. This, she stated, was about the average quantity and price. The amount for butter would therefore be £11, 14s. per week, or per annum £608, 8s. She informed me far- ther, that during about eight months in the year, the cold milk rea- lises about the same amount as the butter. In the summer months, during hot weather, the market value of the milk is only about half that of the butter. From these data, the amount for milk sold per annuni is £507. : :

"The total receipts for the two articles of milk and butter amount to £1115, 8s. per annuni.

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*"*T only necd toadd that, previously to the adoption of the present system of farming, these 40 acres of land were barely sufficient to support eight or nine cows, and would have been well let at a rental of 30s. an acre.'*

The attention now so generally directed to this subject, and the importance attached to it in many quarters, justify this lengthened quotation, and call for some remarks upon it. We have carefully examined two of the instances re- ferred to in this report, viz, Port-Dundas and Myremill ; and some smaller experiments more cursorily. After doing so we are sorry to say that we have arrived at a very different estimate of this system of manuring from that expressed in the above quotations. We at once, and with pleasure, acknowledge that in so far as concerns the storing up and preparing of the liquid manure, its application to the land, and the production, by means of it, of crops of Italian rye-grass almost surpassing belief in their luxuriance and weight of. produce, Mr Kennedy's experiments have been crowned with complete success. The excellence of this grass as food for live stock, and their relish for it, is also indisputable. Neither do we dispute the statements of those who tell us that manure, when largely diluted with water, and properly applied in the liquid form, is more

beneficial to plants than in any other way in which it can be presented to them. Admitting all this, the question remains, Has it yet been shown that this system can be economically applied to ordinary farms? Data are still wanting from which to answer this question conclusively, but we shall state some of the reasons which constrain us, with our present information, to do so in the negative. Supposing an adequate motive power already to exist, and to be partly employed for other purposes, the capital that must be invested in providing the tanks and other apparatus necessary for carrying out this system amounts to about £4 per acre over a farm of average extent. If the system be a sound one, the great amount of this outlay can- not fairly be urged as an objection to it. The addition of @ permanent rent charge of 5s. per acre to an entire farm, for a benefit which in any one year can be available to but a limited portion of it, is however a serious matter. In each case referred to in the Minutes of Information, the whole annual charge, whether arising from interest on capital, wear and tear of machinery, or working expenses, is divided by the whole acreage of the farm. In the first seven cases given in the tabular statement, this mode of calculation is correct, as the whole areas do actually benefit

TABLE III.—Showing Cost, &c., of the Application of Sewerage Waters and Liquid Manures.

Berkshire. Catchmeadow. eeation, Pusey Meadows. 100 and open gu tiers, , z 445

Steam-engine, pumps, Glasgow. underground iron main

Land not previously worth more than 6s. per acre, welsing six heavy crops of grass per annum.

10 feet thick of grass cut from

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0 0} 88 7 6 38718 4/014

b Total of Cost of Works a Annual Agipal Name of Place. Eng- Mode of Application. an rir » Cy) Working | Charge per Observations. lish

Apparatus. | ® 3 per Expenses. | English acres. Geni acre. : Fe STAC Se Soma con Se Mane 6. es Edinburgh. g : : : team-engine, pumps, and Average rental upwards of Craigentinny Meadows, | 63 | { Steam. Serubd tes, |p OO Og TOON a iy Wa ofa a 11 | ge oo el Bigp. level ee) Aeron onen. gations) || «799° g Gl apo™4| 19°17 Bl 118 1 Tm a pails Sea Meadows. and panes, . . ; – nn a i Old Meadows. 228 Do. do. 2700 0 0| 20210 0119 5 O11 8 2% (a eenion £25 per TI oat Portia d Wort! ds of £12 ; le Duke of Portland. orth upwards o pre- Clipstone Meadows. 300 PE ee a 86,000 0 0/2700 0 0 150 0 0] 9 10 0 viously worth from 3s. to ips Wiltshire. Beadwork of ridge and a ae eect ™ Wiley Meadows, 150 furrow, gravitation and 8000 0 0] 225 0 0} 5210 0/117 o | feat, DASnOEE Ne VOR open gutters, The Duke of Bedford Beadwork and catch- Land more than quadrupled a oo 90 eee be ein 1183 0 0} 8814 6) 6710 0/114 83 a ane gen only 4 years Nae

Mr Har ove farm. 508 1450

pipes and iron distribut- gee pipes, . Steam-engine pumps, M il cn, 508 underground iron mains,

y gutta-percha a and

jet pipe Canning Park farm. 50

Cem aaibe oe

0 0} 108 15 0) 240 10 0) 0 18

an acre in six months,

on al { 70 tons of grass cut from an

0 0) 118 19 0) 16210 0 acre in six months,

0 0| 1515 of 11 0 01010 8 | Ext of anaemic Salas

80. stacks per annum; in

Leg or Dunduff farm. 50 iron mains, gutta- a 191 0 0} 14 6 6 310 00 7 13 { place of 19, as praviousl hose, and jet pipe, . P me Staffordshire. ae pure af peeenand. Steam- a pumps, wee ee cc waned anchurch farm near underground iron mains anks constructed sufficien Trentham. i > gutta- Mette ee and ee ee al for 300 acres. Jet pipe, Lancashire. = se apa! of liquid equal Talewood farm. 120 52112 0| 39 2 5| 1915 2)0 9 93 25 or 30 tons of farmn- aid manure per acre. A fourth crop of grass bein: Cheshire. weighed, was found equa Lescard farm. 150 Do. do. 672 110) 50 8 O 1711 00 9 to 10 tons per acre. It was the lightest crop cut off the same land. Glamorganshire. Gravitation, underground {or constructed sufficient Porth Kerry Farm, 50 iron mains, gutta- perc | 300 0 0 2210 0 010 0/018 0 for 300 acres. Between 9 hose and jet pipe . ‘ and 10 feet of.grass cut.

| Ee

each year by the irrigating process. But when we come to those irrigated by machinery, we find that a half or two- fifths only of the land receives the benefits of it in any one

year. If the annual charge in this latter class of cases is

divided by the acreage actually irrigated, it becomes evident

that the expense is double that of the Pusey meadows, and I. —= 44

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equal to that of the old meadows near Edinburgh, instead of being less, as itis made to appear. Again, in estimating the profits an opposite course is followed. While the charges are made to appear less by spreading them over the whole area of the farm, the enormous produce of grass from the irrigated parts is put prominently forward, and little is said about its produce as a whole. In the dairy cases, too, we are told of enormous gross profits, without being pointedly reminded that the larger portion of the keep of the cows, such as distillery offal, bean-meal, hay, and even straw and turnips, is actually purchased ; that in this way a quantity of extraneous manure becomes available for the associated farm, sufficient (however applied) to maintain it im a state of fertility ; and that there would be

handsome profits from the dairy, irrespective of the farm altogether. In fact, town dairies usually have no land attached to them. The cows are maintained solely by purchased food, and the sale of manure, liquid and solid, forms one of the stated items of income. In Mr Harvey's and similar cases, two separate businesses are in fact mixed up, and yet the whole is spoken of in such a way as if the profit was mainly due to the use of liquid manure. Information issued by the General Board of Health have an air of special pleading about them, which to us seriously detracts from their value.

The entire annual cost of applying manure in this manner iz stated to amount to from 10s. to 14s. per acre for the whole extent of the farm. Now this would suffice to provide annually from 1 to 14 cwt. of Peruvian guano (even at its present high price) for every acre of the farm, or from 2 to 3 cwt. per acre, if applied, as the liquid is, to the portion under green crop only. The stated application of such a dressing of guano, in separate portions, and during showery weather, will be found to yield results little inferior to those obtained by the use of liquid manure. To do this requires no costly apparatus or permanent sinking of capital, and its application can be desisted from at any time when found unremunerative. The adoption of this plan of applying the liquid manure of the farm necessarily demands that the whole system of management be accommodated to it. In order to furnish this liquid manure, the whole green crops must, summer and winter, be conveyed to the homestead, and there consumed in such a manner as that the urine and dung of the animals fed upon it may be scoured into the tanks. It is no such easy matter to replenish these tanks as some persons seem to think. When cattle are housed in boxes or properly protected yards, the whole of the urine is absorbed by the litter, and goes to the field in the dung- cart. This is certainly a more cxpensive way of conveying it to the ficlds than by pipes. But then, as in the new system, the urinc, &c., is diluted with at least three times its volume of water, there are four tons of manure to con- vey on the one plan for one on the other. Even where pipes are used, all the litter, and a portion at least of the dung, has still to be carted out, so that no claim of a saving of carriage can validly be put forward on behalf of this system ; but its merits must be grounded solely on the superior efficacy of manure, when applied in a liquid instead of a solid form.

In the case of dry and loose soils, the consuming of the turnip crop, by folding sheep upon it, has hitherto bcen regarded as at once the cheapest way in which it can be converted into wool and mutton, and the land consolidated and enriched, so as to fit it for producing grain and other crops. On tenacious soils, and in a moist climate, which is quite the case at Myremill, it is certainly impracticable to pursue this system in winter. It is perhaps also the case that shcep are healthier, fatten more rapidly, and yicld more wool, when fed under cover, than when folded on the open turnip field. Admitting all this, however, we are disposed

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Indeed, the whole of these Minutes of

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to think that these benefits are better secured by Mr Randell of Chadbury's plan of littering the pens with burnt clay, which kecps the sheep clean, and their feet in good order, and, when mingled with their urine and dung, forms a most valuable manure for any kind of land. Were this carried out by means of movable covered pens, which could be erected and easily shifted from place to place in the turnip ficld, the carriage of the turnips and manure would be greatly reduced, especially if accomplished by means of the portable railway.

In the case of dairies near towns, where the cows are largely fed on brewery or distillery offal and other purchased food, the circumstances are totally different from those of ordinary farms, depending solely on their own resources. The liquid manure that would otherwise run to waste, when thus applied, is so much clear gain, in so far as the value of the increased produce exceeds the cost of application. It may form a wholesome caution to some persons to men- tion here that, notwithstanding all that has been written about the success of the spirited operations at Port-Dundas, wo were told by Mr Harvey, that so dubious is he still about it, that if the thing were to do again, he would rather keep his money in his pocket, and let the urine run into the canal as formerly. If there is doubt even in such a case, how much more when the manure must virtually be purchased. And this lcads us to remark that we have better hopes of the ultimate success of this

plan of manuring, when it is restricted to the application of the surplus liquid manure of the homestead to some picce of meadow near at hand, supplementing this supply, when necessary, by dissolving guano in water, and sending it through the pipes. These remarks apply even more strongly to the sewage from towns. The liquid, in this casc, is highly charged with fertilising ingredients of the most valuable kind, sccing that it con- sists largely of night-soil from a population consuming much animal food. With few exceptions, this valuable liquid, which flows in such quantities from all our towns, is not only utterly lost, but is a grievous nuisance, by polluting our streams and gencrating discase. In applying it as manure, the expense lies entirely in providing and working the necessary apparatus. In such cases, then, with an un- failing supply of highly fertilising liquid, costing nothing to begin with, there is every inducement to put into opera- tion any plan by which it can be economically applied to field crops. The enhanced value of green forage in the vicinity of towns is an additional motive for attempting this. The profitable disposal of town sewage in a way neither injurious to the health nor offensive to the senses of the community, is, however, a problem yct remaining to be solved.

The ingenuity and enterprise displayed by Mr Kennedy and others, in their endeavours to cheapen by this means the cost of farm produce, and the frankness and untiring patience with which they have shown and explained their proceedings to the unceasing stream of visitors, which the novelty of the operations attracted from all parts of the kingdom, and even from forcign countries, arc altogether so admirable and praiseworthy that it requires no slight effort to speak of them otherwise than approvingly. The con- fidence with which various influential parties have proclaimed the complete success of this scheme of irrigation, and recom- mended it for gencral adoption, scems, however, to require that those who have examined it, and arrived at an opposite conclusion, should publicly say so.

It is unreasonable to expect that private parties are to divulge their whole business affairs ; and yet, without a full Dr. and Cr. account for some ordinary arable farm treated on this system, it is impossible to arrive at a sound judgment on its merits. Until this can be done, it would be better to abstain from publishing partial statements, which tend only

to mislead the public mind. We offer these remarks in no spirit of hostility to this new system of farming. We shall rejoice unfeignedly to find that our opinion of it is erroneous, and that it really warrants the sanguine expectations which some parties entertain regarding it. We simply maintain that as yet the case is " not proven," and our counsel to those who are disposed to try it is, not to embark in it to an extent that would embarrass them, if, as we fear, it should prove a failure. Section 3.—Guano.

Next to farm-yard manure, which must ever be looked to as the chief means of maintaining the fertility of a farm, guano claims our notice. This substance is the dung of seafowl, and is found on rocky islets in parts of the world where rain seldom falls. The droppings of the myriads of birds by which such places are frequented have in many cases been permitted to accumulate during untold ages, and are now found in enormous deposits. The principal supply, both for quantity and quality, has hitherto come from the Chincha Islands, on the coast of Peru. The introduction of this powerful and exceedingly portable manure gave a prodigious impetus to agricultural improvement. It is about thirty years since a few casks of this article were brought to Liverpool from Peru, where it has been known and prized asa valuable manure from the remotest periods. No sooner had its value been discovered by our British agriculturists than the demand for it became so keen, that the quantity imported rose from 2881 tons in 1841 to 283,300 tons in 1845. The price at which it was sold at first was £20 per ton, from which, with increased supplies, it fell to £11, when the discovery in 1844 of a considerable deposit on the island of Ichaboe, on the coast of Africa, at once reduced the price to £9.

Discoveries have from time to time been made of other deposits on the African coast and in Australia. The quality of both is much inferior to that from Peru. It is in a more advanced state of decay, and contains more moisture and sand. Great as was the deposit of this valu- able fertiliser on the Chincha Islands, it rapidly diminished under the excessive demand for it from Great Britain and other countries. Gradually the quality became very in- ferior, and in 1871 it was announced that this deposit was entirely exhausted. Considerable supplies are still obtained from other parts of the

Peruvian coast; but unfortunately the quality is very inferior to that formerly obtained from the Chinchas. This circumstance would not be of much consequence if the guano was offered for sale on fair terms ; but as the agents of the Peruvian Government sell it only at one uniform price per ton, although different cargoes, and even different portions of any one cargo, vary excessively in quality, it is now an unsafe article for farmers to purchase.

We give here, from the Board of Trade returns, a table of the quantities of guano imported yearly, with the com- puted real value, from 1854 to 1872.

Table showing the Imports of Guano from 1854 to 1872.

Year. | Tons, Value. Year. Tons. Value,

1854 | 235,111 | £2,530,272 || 1864 | 131,358 | £1,457,088 1855 | 305,061 | 3,137,160 || 1865 | 237,398 | 2,675,995 1856 | 191,501 | 2,136,431 || 1866 | 135,697 | 1,439,679 1857 | 288,362 | 3,613,074 |] 1867 | 192,308 | 2,109,506 1858 | 353,541 | 4,084,170 || 1868 | 182,343 | 2,039,478 1859 | 84,122 769,333 || 1869 | 210,010 | 2,640,983 1860 | 141,435 | 1,557,895 |] 1870 | 280,311 | 3,476,680 1861 | 178,423 | 2,022,283 || 1871 | 178,678 | 1,994,145 1862 | 141,636 | 1,635,322 |} 1872 | 118,704 | 1,201,042 1863 | 233,574 | 2,658,856

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The dung of birds, from its including both liquid and solid excrements, is superior as a manure to that of quadru-

peds. Pigeons' dung has long been in high repute as an excellent fertiliser, and brought a high price in days when portable manures were scarcely to be had. It is now little heard of, guano, the excrement of fowls which feed upon fish, being superior, weight for weight. The dung of domestic poultry is usually mixed with the general dung- heap, but it could be turned to better account if kept by itself. It has been recommended to strew the floors

of poul- try-houses daily with sawdust or sand, and to rake this with the droppings into a heap to be kept under cover and used like guano.

Section 4.—Bones.

It is now about sixty years since ground bones began to be used by farmers in the east side of England as a manure for turnips. At first bones were roughly smashed by ham- mers and applied in great quantities. By and by mills were constructed for grinding them to a coarse powder, in which state they continued to be used as a dressing for turnips, at the rate of sixteen to twenty bushels per acre, in all parts of the kingdom and to a very great extent, until the ad- mirable discovery by Baron Liebig of the mode of preparing superphosphate of lime by dissolving bones in sulphuric acid. We shall not attempt to explain on chemical princi- ples the wonderful superiority of this substance over simple bone-dust in promoting the growth of the turnip plant. What we should do indifferently, by borrowing from others, will be found well done by various accomplished chemists who write specially on these subjects. We can, however, testify from experience to the important fact, that one bushel of bone-dust dissolved by a third of its weight of sulphuric acid is as a manure superior in value to four bushels of simple bone-dust. It is not merely, or even chiefly, in the lessened cost at which an acre of turnips can be manured that this superiority lies, but especially in this, that from the extraordinary stimulus given by superphosphate of lime to newly germinated turnip plants, they usually arrive at the stage when they are fit for thinning in from ten to fifteen days earlier than when sown over farm-yard dung or simple bone-dust, or both combined. This shortening of the critical period during which the attacks of the insignifi- cant but dreaded turnip-beetle so often baulk the hopes of the husbandman is an advantage not easily estimated, and one well fitted to inspire him with confidence in the science to which he owes the discovery, and with grateful respect for the eminent discoverer. This powerful effect in quicken- ing the growth of the young turnip plants is possessed in nearly as great a degree by Peruvian guano, when it is supplied with sufficient moisture. In climates and seasons which may be characterised a8 moist and cool, guano will show best results, whereas in those which are rather hot and dry superphosphate has the advantage. Accordingly we find guano the

comparative favourite in Scotland, and its rival in the drier counties of England.

Guano is believed to encourage a great expanse of foliage, and to be more especially suited for early sowings; and superphosphate to influence development of bulb, and to deserve the preference for a later seed-time. The obvious inference is that, for the turnip crop at least, these valu- able fertilisers should be used: in combination ; and actual experiment has verified its soundness. The use of them is universal and ever on the increase. They constitute also the standard by which farmers estimate the cost and effects of other purchased manures. The extent to which they are used, their high price, and the facility with which they can be adulterated with comparatively worthless ingredients, have led to almost unparalleled frauds. The adulteration of manures has, in fact, become a regular trade. Had farmers only their bodily senses to aid them, the detection of this fraud would be difficult—perhaps impossible. Here,

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however, they can call the chemist to their aid, with the certainty of ascertaining the real character of the articles which they are invited to purchase. If purchasers of ma- nures would but insist in every instance on getting from the seller an analysis by some competent chemist, and along with it a written warrandicc that the stock is of the quality therein indicated, detection and punishment of fraud would be easy. In regard to superphosphate of lime, the farmer can purchase bone-dust and sulphuric acid and prepare it himself. We conducted this process for several years in the following way:—A trough was provided 7 feet x 3°4 x 9-10, made of 24-inch deal, strongly jointed, and secured at the corners by wooden pegs, as iron nails would be corroded by the acid. This holds conveniently 48 bushels of bones. The heap of bone-dust is then gone over with a barley riddle, and the small dust which passes through this is laid aside to be used as a drying material for the other portion, after it is subjected to the acid. We find that a third part of the boneé-dust passes through the riddle. Three bottles, or carboys as they are called, of concentrated acid, averaging 180 ib. each, are then emptied into the trough and mixed with cold water at the

rate of 14 of water, by measure, to 1 of acid. In practice, the water is poured in first and then the acid. Into this mixture 48 bushels of bones, previously measured and laid close to the trough, are rapidly shovelled by two labourers, who will do well to be attired in clothes and shoes past spoiling. So soon as the bones begin to be thrown in, violent ebullition commences. By the time that the whole of the bones are thrown in, there will be barely liquid enough to moisten the last of them. The labourers therefore dig down at one end of the trough till they reach the bottom, and then carefully turn back and mix the whole quantity until they reach the othcr end. The surface is then levelled and covered with a layer of the dry riddlings two inches thick. In this state it is allowed to remain for two days, when the trough is empticd, and the same process is repeated until the whole quantity is gone over. When shovelled out of the trough the bones are found to have become a dark-coloured paste, still very warm, and emitting a sweetish smell, While one person throws it out, another adds to it its proportion of dry riddlings, and mixes them carefully. This mass is heaped up in the corner of a shed, and augmented at each emptying of the trough, until the requisite quantity is obtained. After this the mass is care- fully turned over several times, at intervals of five or six days, and is then dry enough for sowing either by hand or machine. Some prefer moistening the bones with boiling water, and then adding pure acid as they are shovelled into the trough ; but by first mixing the acid and water there is greater certainty of all the bones being equally acted upon. There is also great convenience in using the finest portion of the bone-dust for drying the other, as suitable material for this purpose is sometimes difficult to procure. The homely process now described is quite inferior to, and more costly than, that pursued in factories, and should only be resorted to when a genuine article cannot otherwise be obtained.

We have referred to superphosphate of lime prepared from bones. A new source of supply has, however, been discovered of late years, the extent and importance of which is becoming more apparent as investigation proceeds. We allude to those phosphoric deposits found in such abundance in the crag, and upper and lower green-sand formations in the south of England. The existence of these fossil animal remains was first pointed out by Drs Mantel and Buckland though it is to Professor Henslow that we are indebted for having called attention to their eminent agricultural value, and

described the localities whence they may be most readily obtained. These remains consist of the fractured and rolled bones of sharks, gigantic sea-lizards, and whales, which at

one period of our earth's history must have existed in myriads in our oceans and seas. Mixed with these bones are found many fish-teeth and shells of different specics, and likewise immense numbers of rolled, water-worn pebbles, which at one period were imagined to be the fossilised ex-crements of the animals themselves, and were on this account called coprolites by Professor Henslow and others. Although this has since been proved a mistake, the name has been adopted, and will probably be continued. 'These fossil bones, and so-called coprolites of the crag, are found in enormous quantities on the coast of Suffolk, Norfolk, and Essex, whence Mr Lawes of Rothamstead obtained nearly the whole of the material which he employed in the preparation of his well-known " coprolite manure," or " Lawes' super- phosphate." Already, it is belicved, several thousands of tons of these fossils in one form or other are annually sold for manure, with a rapidly increasing demand. Those found in the crag formation are exceedingly hard, and require to be ground by powerful machinery, and dissolved in sul- phuric acid, to render the phosphate of lime available as manure. Fossils, though less abundant in the green-sand, can be reduced to the requisite fineness by simple machinery, and are then fit for agricultural purposes without any chemi- cal preparation. They are found plentifully in the parish of Farnham, so long celebrated for the excellence and abun- dance of its hops, which are now discovered to be due to the presence in the soil of these fossil remains. The discovery of these mines of manure in various parts of our country was made most seasonably, and has proved of immense national importance. When Liebig predicted that, "in the remains of an extinct animal world England is to find the means of increasing her wealth in agricultural produce, as she has already found the great support of her manufactur- ing industry in fossil fuel," he was regarded by many as merely indulging a fine philosophic fancy ; but enough has already been realised to convince the most sceptical of the importance of the data on which he founded his opinion.1

On mixing a quantity of bone-dust with its own bulk of mould or sand, and wetting the whole with the liquid which oozes from the dung-heap, violent fermentation immedi- ately ensues, dissolving the bones, and making them more readily available for the nourishment of the turnip crop. Many farmers are so satisfied with this preparation, that they dispense with the acid. This is not judicious, as the superphosphate of lime is a more valuable manure than bones dissolved by simple fermentation.

Bones are sometimes applied as a top-dressing to grass land with singular success. 'This Cheshire practice con- sists in applying an extraordinary dose of bones to pasture- land. 'For pasture land, especially the poorer kind,' says Mr Palin, 'there is nothing equal to bone manure, either as regards the permanency of its effects, or the production of a sweet luxurious herbage, of which all cattle are fond. Many thousand acres of the poor clay soils have been covered with this manure during the last eight or ten years.' The average quantity used is about a ton anda half to the acre; it is therefore a landlord's improvement, on which seven or eight per cent. is gencrally paid. Boiled bones act as long as unboiled bones, retaining the phosphorus, though not so quickly, having lost the animal matter. Boiled bones (1845) cost £3, 10s. per ton; the outlay then was five guineas per acre, sometimes £7 or £8. 'I have known,' says a correspondent, 'many instances where the annual value of our poorest clay lands has been increased by an outlay of from £7 to £8 an acre, at least 300 per cent. ; or, in other words, that the land has been much cheaper after this outlay at 30s., than in its native state at 10s. per acre; with the satisfaction of seeing a miserable covering

1 Journal of the Royal Agricultural Society of England, vol. ix. p. 56, and vol. xii. p. 91.

of pink-grass, rushes, hen-gorse, and other noxious wecds, exchanged for a most luxuriant herbage of wild clover, trefoil, and other succulent grasses.' Though much of the clover and trefoil may disappear in five or ten years (some times they last fifteen years), an excellent herbage reniains. 'Draining,' the writer adds, 'may be carried too far where bones are used, for boned lands suffer by a dry summer. The land should be kept cool.' I have found the same thing on water meadows. The freer the grass is growing, the more it-suffcrs from drought; and this is natural, for a larger supply of sap is required. This writer adds, 'I have known many a poor, honest, but half-broken man, raised from poverty to comparative independence, and many a sinking family saved from inevitable ruin, by the help of this wonderful manure.' Indeed, I believe, land after boning will keep three cows where two fed before. As to this practice, however, caution

is necessary. It seems to belong to cold clays for grass in Cheshire, though on such soil it would hardly answer elsewhcre, even for turnips. A Cheshire landlord told me that he had tried it vainly for grass in Suffolk. I know no case of its success ont of Che- shire, unless in the bordering counties, and have heard some eases of its failure even in those. It will not do, therefore, at all to adopt it hastily. We only know it to have succeeded about Cheshire, which is on the red marls geo- logically, and on the rainy side of the country, and must remember that it is a costly proceeding, striking in its success, but as yet circumscribed in its practice, and thcre- fore in the proof of its efficacy."

Section 5.—Rape-Cake, de.

Rape-cake reduced to powder forms an excellent manure for wheat and other crops. It is usually applied at the rate of from tour to eight cwt. per acre. The cakes result- ing after oil has been expressed from camelina, hemp, and cotton seeds, and from pistachio and castor-oil nuts, from beech and other mast, all possess considerable value as manure, and were at one time available for that purpose. Most of them now command a price for cattle feeding that forbids their use as manure unless when in a damaged state.

Section 6.—Blood, ke.

All parts of the carcases of animals form valuable manure, and are now carefully used in that way whenever they are unfit for more important uses. The blood and other refuse from shambles and from fish-curers' yards, when mixed with earth and decomposed, make a valuable manure, and are eagerly sought after by farmers to whom such supplies are accessible. In London a company has been formed by whom the blood from the shambles is purchased, and em- ployed instead of water in preparing superphosphate of lime, which, when thus manufactured, contains an amount of ammonia which adds considerably to its efficacy as a manure. In Australia and South America it has long been the practice to slaughter immense numbers of sheep and cattle for the sake of their hides and tallow only, there being no market for them as beef and mutton. To obtain the whole tallow, the carcases are subjected to a process of boiling by steam and afterwards to pressure, and are then thrown aside in great piles. This dried residuum is

afterwards used as fuel in the furnaces of the steaming apparatus, and the resulting ashes constitute the bone-ash of commerce, which 1s now an important raw matcrial in our manure factories.

After many abortive attempts to convey Australian beef and mutton to the British market, the difficulty has at last been overcome by enclosing the meat in a par-boiled state im tin cases, hermetically sealed. This has already grown

1 Article by Mr Pusey. See Journal of Royal Society of England,

vol. xi. p. 409.

to a large trade, with every likelihood of its increasing rapidly. As the meat in these cases is sent free from bone, a plan has been found for rendering the bones also a pro- fitable article of export. For this purpose they are crushed into compact cakes 6 inches square by 3 inches thick, in which form they can be stowed in comparatively small space.

The refuse from glue-works ; the blubber and dregs from fish-oil ; animal charcoal that has been used in the process of sugar-refining ; the shavings and filings of horn and bones from various manufactures, and woollen rags, are all made available for manure.

Section 7.—Night-Sotl.

Night-Soil is a powerful manure; but owing to its offensive odour it has never been systematically used in Britain. Various plans are tried for obviating this objec- tion, that most in repute at present being its mixture with charred peat. From the universal use of water-closets in private dwellings, the great mass of this valuable fertilising matter now passes into sewers, and is carricd off by streams and rivers, and is for the most part totally lost asa manure. When sewage water is used for irrigation, as in the neighbourhood of Edinburgh, it is to the night-soil dissolved in it that its

astonishing effects in promoting the growth of grass arc chiefly due. We have already expressed our views in regard to the use of it in this diluted form of sewage water. That mode of applying it is necessarily restricted to lands in the vicinity of towns. Hitherto the numerous and costly attempts that have been made to separate the fertilising matter from the water in which it is contained have proved utter failures. The most feasible plan for the utilisation of night-soil that we have hitherto heard of is that brought forward by the Rev. Henry Moule, Fordington Vicarage, Devon. In a tract addressed to cot- tagers he says,—‘“‘ Now, my discovery is this: The earth of your garden, if dried—or dried and powdcred clay—will suck up the liquid part of the privy soil; and, if applicd at once and carefully mixed, will destroy all bad smell and all nasty appearance in the solid part, and will keep all the value of the manure. Three half pints of earth, or even one pint, will be enough for cach timc. And earth thus mixed even onceis very good manure. Butif, after mixing, you throw it into a shed and dry it, you may use it again and again; and the oftener you use it the stronger the manure will be. I have used some seven and cven eight times ; and yet, even after being so often mixed, there is no bad smell with the substance ; and no one, if not told, would know what it is.” To adapt a privy for using dried earth in this way, he says,—“ Let the seat be made in the com- mon way, only without any vault beneath. Under the seat place a bucket or box, or, if you have nothing else, an old washing-pan. A bucket is the best, because it is more easily handled ; only let it have a good-sized bail or handle. By the side of the seat have a box that will hold (say) a bushel of dried earth, and a scoop or old basin that will take up a pint or a pint and a half, and let that quantity of earth be thrown into the bucket or pan every time it is used. The bucket may be put in or taken out from above by having the whole cover moved with hinges; or elsc, through a door in front or at the back.” He has also in- vented and patented an earth-closet, as a substitute for the ordinary water-closet, which he describes thus :—“The back contains dried and sifted earth, which enters the pan through a hole at the back of it, and covers the bottom. The bottom is moved by the handle and lever; the side of the pan acts as a scraper ; and all that is upon the bottom is pushed off, falling into the bucket or shaft below. The earth thus applied at once prevents fermentation. and almost all exhalation and offensive smell. The bottom returns to

its place by means of a spring, and a fresh supply of the earth falls upon it from the box.”

This scheme has now been tested for a sufficient length of time, and on a wide enough scale, to show that in the case of privatc houses in rural districts, as well as in prisons, asylums, hospitals, public schools, military camps, and fac- tories, it is entirely successful as regards the sanitary results of its use, and the value of the manure when applied to gardens attached to the premises from which it is obtained. But the cost and annoyance of moving so bulky a substance, and the small percentage of fertilising matter contained in it, forbid the expectation of its being adopted in towns.

Section 8.—Sea-Weed.

Along our sea-board large supplies of useful manure are obtained in the shape of drifted sea-weed. This is either applied as a top-dressing to grass and clover, ploughed in with a light furrow, for various crops, or mixed in dung- heaps. It requires to be used in large quantities per acre —from 40 to 60 loads—and is evanescent in its effects. Grain grown on land manured with sea-weed is generally of fine quality, and is in repute as seed corn.

Section 9.—Manure Crops.

Crops of Buckwheat, Rape, Vetches, and Mustard are some- times ploughed in, while in a green, succulent state, to enrich the land. It is, however, more usual to fold sheep on such crops, and so to get the benefit of them as forage, as well as manure to the land. The leaves of turnips are frequently ploughed in after removing the bulbs, and have a powerful fertilising effect.

Section 10.—Lame.

Besides manurcs of an animal and vegetable origin, vari- ous mineral substances are used for this purpose. The most important and extensively used of these is lime. In the dricr parts of England it is not held in much esteem, whereas in the western and northern counties, and in Scot- land, its

usc is considercd indispensable to good farming. Experienced farmers in Berwickshire consider it desirable to lime the land every twelve years, at the rate of from 120 to 200 bushels of the unslacked lime per acre. It is found especially beneficial in the reclaiming of moory and boggy lands, on which ncither green nor grain crops thrive until it has been applied to them. Its use is found to improve the quality of grain, and to cause it in some cases to ripen earlier. It facilitates the cleaning of land, certain weeds disappearing altogether for a time after a dressing of lime. It is the only known specific for the disease in turnips called " fingers-and-toes," on which account alone it is frequently used in circumstances which would otherwisc render such an outlay unwarrantable. The practice, still frequent, of tenants at the beginning of a nineteen years' lease, liming their whole farm at a cost per acre of from £3 to £5, proves conclusively the high estimation in which this manure is held. The belief—in which we fully concur —is however gaining ground, that moderate and frequent applications are preferable to these heavy doses at length- ened intervals.

When bare fallowing was in use, it was commonly to- wards the close of that process that lime was applied. Having been carted home and laid down in large heaps, it was, when slaked, spread evenly upon the surface and covered in by a light furrow. It is now frequently spread upon the autumn furrow preparatory to root crops, and worked in by harrowing or grubbing, and sometimes by throwing the land into shallow ridgelets. Another method

1 Manure for the Million, by Rey. Henry Moule, price 1d. Mr Moule has also published a pamphlet on the same subject, entitled National Health and Wealth.

much used is to form it into compost with decayed quickens, parings from road-sides and margins of fields, &c., which, after thorough intermixture by frequent turnings, is spread evenly upon the land when in grass. A cheap and effectual way of getting a dressing of such compost thoroughly com- minuted and incorporated with the surface soil, is to fold sheep upon it, and feed them there with turnips for a few days. The value of such compost is much enhanced by mixing common salt with the lime and earth, at the rate of one part of salt by measure to two parts of lime. A mixture of these two substances in these proportions prepared under cover, and applied in a

powdery state, is much approved as a spring top-dressing for corn crops on light soils. In whatever way lime is applied, it is important to remember that the carbonic acid which has been expelled from it by subjecting it in the kiln to a red heat, is quickly regained from the atmosphere, to which therefore it should be as little exposed as possible before applying it to the land. A drenching from heavy rain after it is slaked is also fatal to its usefulness. Careful farmers therefore guard against these evils by laying on lime as soon as it is slaked; or when delay is unavoidable, by coating these heaps with earth, or thatching them with straw. In order to reap the full benefit of a dressing of lime it must be so applied as, while thoroughly incorporated with the soil, to be kept near the surface. This is more particularly to be attended to in laying down land to pasture. This fact is so well illustrated by an example quoted in the article " Agriculture" in the 7th edition of the present work that we here repeat it.

'¢ A few years after 1754," says Mr Dawson, 'having a consider- able extent of outfield land in fallow, which I wished to lime previous to its bape laid down to pasture, and finding that I could not obtain a sufficient quantity of lime for the whole in proper time, I was induced, from observing the effects of fine loam upon the surface of similar soil, even when covered with bent, to whe small quantity of lime on the surface of this fallow, instead of a larger quantity ploughed down in the usual manner. Accordingly, in the autumn, about twenty acres of it were well harrowed in, and then about fifty- six Winchester bushels only, of unslakcd lime, were, after being slaked, carefully spread upon each English acre, and immediately well harrowed in. As many pees of the lime, which had not been fully slaked at first, were gradually reduced to powder by the dews and moisture of the earth,—to mix these with the soil, the land was again well harrowed in three or four days thereafter. This land was sown in the spring with oats, with white and red clover and rye-grass seeds, and wall harrowed without being ploughed again. The crop of oats was good, the plants of grass sufficiently numerous and healthy ; and they formed a very fine pasture, which continucd good until ploughed some years after for corn.

"« About twelve years afterwards I took a lease of the hilly farm of Grubbet, many parts of which, though of an earthy mould toler- ably deep, were too steep and elevated to be keptin tillage. As these lands had been

much exhausted by cropping, and were full of couch- grass, to destroy that and procure a cover of fine grass, I fallowed them, and laid on the same quantity of lime per acre, then harrowed and sowed oats and grass-seeds in the spring, exactly as in the last- mentioned experiment. The oats were a full crop, and the plants of grass abundant. Several of these fields have been now above thirty years in pasture, and are still producing white clover and other fine grasses ; no bent or fog has yet appeared upon them. It deserves particular notice, that morc than ¢reble the quantity of lime was laid upon fields adjoining of a similar soil, but which being fitter for occasional tillage, upon them the lime was ploughed in. These fields were also sown with oats and grass seeds. The latter throve well, and gave a fine pasture the first ycar; but afterwards the bent spread so fast, that in three years there was more of it than of the finer grasses."

The conclusions which Mr Dawson draws from his ex- tensive practice in the use of lime and dung deserve the attention of all cultivators of similar land :-—

*'*1, That animal dung dropped upon coarse benty pasture pro- duces little or no improvement upon them; and that, even when sheep or cattle are confined to a small space, as in the case of folding, their dung ceases to produce any beneficial effects after a few years, whether the land is continued in pasture or brought under the plough.*

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"9, That even when land of this description is well fallowed and dunged, but not limed, though the dung augments the produce of the subscquent crop of grain, and of grass also for two or three years, its effects thereafter are no longer discernible either upon the onc or the other.

«3, That when this land is limed, if the lime is kept upon the surface of the soil, or well mixed with it, and then laid down to pasture, the finer grasses continue in possession of the soil, even in elevated and exposed situations, for a grcat many years, to the exclusion of bent and fog. In the ease of Grubbet-hills, it was observed, that more than thirty years have now elapsed. Besides this, the dung of the animals pastured upon such land adds every year to the luxuriance, and improves the quality of the pasture, and

augments the productive powers of the soil when afterwards ploughed for grain; thus producing upon a benty outfield soil effects similar to what are expericnced when rich infield lands have been long in pasture, and which are thereby more and more enriched. ;

“4, That when a large quantity of lime is laid on such land, and ploughed down deep, the same effects will not be produced, whether in respect to the permanent fineness of the pasture, its gradual amelioration by the dung of the animals depastured on it, or its fertility when afterwards in tillage. On the contrary, unless the surface is fully mixed with lime, the coarse grasses will in a few years regain possession of the soil, and the dung thereafter deposited by cattle will not enrich the land for subsequent tillage.

“ Lastly, It also appears from what has been stated, that the four-shift husbandry is only proper for very rich land, or in situa- tions where there is a full command of dung; that by far the greatest part of the land of this country requires to be continued in grass two, three, four, or more years, according to its natural poverty; that the objection made to this, viz., that the coarse grasses In a few years usurp possession of the soil, must be owing to the surface soil not being sufficiently mixed with lime, the lime having been covered too deep by the plough.” —Farmers’ Magazine, vol. xiii. p. 69.

Section 11.—Marl.

Our remarks hitherto have had reference to carbonate of lime in that form of it to which the term lime is exclusively applied by farmers. But there are other substances fre- quently applied to land which owe their value chiefly to the presence of this mineral. The most important of these is marl, which is a mixture of carbonate of lime with clay, or with clay and sand, and other compounds. When this substance is found in the proximity of, or lying under, sandy or peaty soils, its application in considerable doses is attended with the very best effects. The fen lands of England, the mosses of Lancashire, and sandy soils in Norfolk and elsewhere, have been immensely improved in this way. In Lancashire, marl is carried on the mosses by means of portable railways at the rate of 150 tons, and at a cost of about £3 per acre. In the fens long trenches are dug, and the subjacent marl is thrown out and spread on either side at an expense of 54s. per aere. By this

process, often repeated, of claying or marling, as it is variously called, the appearance and character of the fen lands have been totally changed, excellent wheat being now raised where formerly only very inferior oats were produced. As the composition both of peat and of clay marl varics exceed- ingly, it is always prudent, either by limited experiment or chemical analysis of both substances, to ascertain the effect of their admixture. Lime is always present in those cases which prove most successful ; but an overdose does harm.

Section 12.—Shell-Marl.

Under some mosses and fresh-water lakes extensive de- posits of shell-marl are frequently found. It contains a larger percentage of lime than clay marl, and must be applied more sparingly.

Section 13.—Chalk.

Throughout the extensive chalk districts of England, the practice of spreading this substance over the surface of the land has prevailed from the remotest times. In the case of the Lincolnshire Wolds, once as celebrated for desolate barrenness as they now are for high culture and

smiling fertility, chalking was one important means of bring- ing about this wonderful improvement, as it still is in maintaining it. “The soil being but a few inches in depth, and often containing a large proportion of flints, naturally possesses very little fertility—often being a light sand, not strong enough naturally to grow turnips—so that the farmers were at first obliged to make a soil, and must now maintain its new-born productivencss. The three principal means by which this is done are the processes of chalking, and boning, and manuring with sheep. A dressing of 80 or 100 cubic yards per acre of chalk is spread upon the land, and then a crop of barley is obtained if possible, being sown with seeds for grazing. The fields are grazed with sheep two years, the sheep being at the same time fed with oil-cake ; and then the land will be capable of producing a fine crop of oats.

Bones are also used frequently for the barley crop, and when they first came into use were thrown upon the land in a chopped state, neither broken nor crushed, and as much as 40 or cven 50 bushels per acre. The boning and sheep-feeding are in constant operation, but chalking is required only at intervals of a few years. On the western side of the Wold district, wherever the chalk adjoins the white or blue marl, an extensive application of it is made to the surface. Thus immense quantities of earth and stone have been added by manual labour and horse-carriage to the thin covering of original soil; and, besides this, the soil is being continually deepencd by deep ploughing, the chalk fragments thus brought to the surface crumbling into mould."?!

In Dorsetshire "it is usual to chalk the land once in twenty years, the sour description of soil being that to which it is found most advantageous to apply it. The chalk is dug out of pits in the field to which it is applied, and it is laid on sometimes with barrows, but chiefly with the aid of donkeys. The first method costs 40s. an acre, the last 35s. when hire donkeys are used; 20s. to 25s. where the donkeys are the property of the farmer. The chalk is laid on in large lumps, which soon break down by the action of frost and exposure to the weather. Chalk is occasionally burned and applied as lime, in which state it is preferred by many farmers, notwithstanding the additional cost of the burning."?

Section 14.—Shell-Sand and Inmestone Gravel.

On the western shores of Great Britain and Ireland are found great quantities of sand mixed with sea-shells in minute fragments. This calcareous sand is carried inland considerable distances, and applied to the land as lime is elsewhere. Limestone gravel is also found in various places and used in the same way.

Section 15.—Gypsum.

Sulphate of lime or gypsum is considered an excellent top-dressing for clover and kindred plants. It is thought by some that the failure of red clover is to be accounted for by the repeated crops of that plant having exhausted the gypsum in the soil. Its application has been followed by favourable results in some cases, but has yet quite failed in others. It is applied in a

powdered state at the rate of two or three cwt. per acre when the plants are moist with rain or dew.

Section 16.—Burnt Clay.

About fifty years ago burnt clay was brought much into notice as a manure, and tried in various parts of the country, but again fell into disuse. It is now, however, more extcn- sively and systematically practised than ever.
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1 "Farming of Lincolnshire," by John Algernon Clarke ; Journal

*of Royal Agricultural Society, xii. 331. * Sec Caird's English Agriculture, 1850 and IGF L, jo, (ile*

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reference to the practice is to be found in the volumes of the Journal of the Royal Agricultural Society of England. This burning of clay is accomplished in sevcral ways. Sometimes it is burned in large heaps or clamps containing from 80 to 100 cart-loads. A fire being kindled with some faggots or brushwood, which is covered up with the clay, taking care not to let the fire break out at any point, more fuel of the kind mentioned, or dross of coals, is added as required, and more clay heaped on. A fierce fire must be avoided, as that would make the clay into brickbats. A low, smothered combustion is what is required ; and to maintain this a good deal of skill and close watching on the part of the workman is necessary. A rude kiln is sometimes used for the same purpose. Either of these plans is suitable where the ashes are wanted at a homestead for absorbing liquid manure, &ec.; but for merely spreading over the land, that called clod-burning is preferable, and is thus described in volume viii. page 78, of the Royal Agricultural Soctety's Journal ~~—' Roll and harrow, in dry weather, till the majority of clods are about the size of a large walnut; no~~ thing so good as the clod-crusher to forward this operation : when perfectly dry, collect them into rows about six yards apart, with iron-teethed rakes; take a quarter of a whin faggot, or less, according to size, previously cut into lengths by a man with an axe; place these pieces about four yards wpart in the rows, cover them with clods, putting the finest mould upon the top of the heap, to

prevent the fire too quickly escaping ; observe the wind, and leave an opening accordingly ; having set fire to a long branch of whin, run from opening to opening till two or three rows are lighted, seeure these, and then put fire to others, keeping a man or two behind to attend to the fires and earthing up till the quantity desired may be burned, which will generally take four or five hours, say from 25 to 35 loads per acre of 30 bushels per load.

"This work is often put out to a gang of men at about 10s. per acre for labour, and the whins cost 4s. 6d. per acre, not including the carting.

'When the heaps are cold, spread and plough in. The great advantage of burning clods in these small heaps, in preference to a large one, is the saving of expense in collect- ing and spreading ; there is much less red brick earth and more black and charred ; no horses or carts moving on the land whilst burning ; and a large field may be all burned in a day or two, therefore less liable to be delayed by wet weather. In the heavy land part of Suffolk, the farmers purchase whins from the light land occupiers, and often cart them a distance of fourteen or sixteen miles, when there is no work pressing on the farm. These are stacked up and secured by thatching with straw, that they may be dry and fit for use when required. Bean straw is the next best fuel to whins or furze, and it is astonishing to see how small a quantity will burn the clods if they are of the proper size and dry. Observe, if the soil is at all inclined to sand, it will not burn so well. I will here mention, that I often sift and store up a few loads of the best blackened earth to drill with my turnips, instead of buying artificial manure, and find it answers remarkably well, and assists in maintaining the position that a heavy land farm in Suffolk can be farmed in the first-rate style without foreign ingredients."

Burnt clay is an admirable vehicle for absorbing liquid manurc. A layer of it in the bottom of cattle-boxes does good service, at once in economising manure, and in yielding to the cattle a drier bed than they would otherwise have until the litter has accumulated to some depth. Valuable results have also been obtained by using it for strewing over the floors of poultry-houses, and especially of pens in which sheep are fed under cover. In the

latter case it is mixed with the excrements of the sheep as they patter over it, and

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forms a substance not unlike guano, nor much inferior to it asa manure. As anapplication to sandy or chalky soils it is invaluable. It is mainly by this use of burnt clay, in combination with fattening of shcep under cover, that Mr Randell of Chadbury has so astonishingly increased the productiveness of his naturally poor clay soil. A Berwick- shire proprietor, himself a practical farmer, who visited Mr Randell's farm in the summer of 1852, thus writes :—"I have visited most of the best managed farms in England, at least those that have so much of late been brought under general notice ; but without exception, I never saw land in the splendid condition his is in. The beauty of the system lies in the cheap method by which he has imparted to it this fertility, and in the manner in which he keeps it up. A large part of the farm consisted, fourteen years ago, of poor clay, and was valued to him at his entry at 7s. 6d. per acre. It is now bearing magnificent crops of all kinds, the wheat being estimated to yield from 6 to 7 quarters per acre.

" Mechi has enriched Tiptree-heath, it is true; but then it is effected at a cost that will make it impossible for him to be repaid. Mr Randell, on the other hand, has adopted a course that is nearly self-supporting, his only cost being

the preparation of the clay. The great secret of his success

lies in his mode of using it; and as I never heard of a similar process, I will briefly explain to you how it is done : —His heavy land not permitting him to consume the turnip and mangold crops on the ground, he carts them home, and

feeds his sheep in large sheds. They do not stand on boards

or straw, but on the burnt clay, which affords them a

beautiful dry bed; and whenever it gets the least damp or

dirty, a fresh coating is put underthem. The mound rises in height ; and in February, when the shearlings are sold (for the sheep are only then twelve mouths old), the mass

is from 7 to 8 feet deep. He was shearing his lambs when

I was there, as he considers they thrive much better in the sheds without their fleeces. They are half-bred Shropshire downs; and at the age I mention, attain the great weight of 24 lbs. per quarter.

"TJ walked through the sheds, but of course they were

then empty. I saw the enormous quantity of what he

called his 'home-made guano ;' the smell from it strongly indicated the ammonia it contained. He had sown his tur- nips and other green crops with it; and what remained he used for the wheat in autumn. He assured me he had often tested it with other manures, and always found 10 tons of the compound quite outstrip 4 cwt. of guano, when they were applied to an acre of land separately."

Section 17.—Charred Peat.

Charred peat has been excessively extolled for its value as a manure, both when applied alone, and still more in combination with night-soil, sewage water, and similar matters, which it dries and deodorises. So great were the expectations of an enormous demand for it, and of the benefits to result to Ireland by thus disposing of her bogs, that a royal charter was granted to a company by whom its manufacture was commenced on an imposing scale. This charcoal is doubtless a useful substance ; but, as Dr Anderson has proved, peat, merely dried, is a better absorber and retainer of ammonia than after it is charred.

Section 18.—Soot.

Soot has long been in estimation as an excellent top- dressing for cereal crops in the early stage of their growth, and for grasses and forage plants. It is applied at the rate of 15 to 30 bushels per acre. On light soils the addition of 8 or 10 bushels of salt to the above quantity of soot is said to increase materially its good effect. This mixture trenched, or deeply ploughed in, is also re-

commended as one of the most powerful of all manures for carrots.

In London Labour and the London Poor we find the following statistics as to metropolitan soot :-—

Bush. of Soot per annum.

- *53,840 houses, at a yearly rental above £50, producing*

six bushels of soot each per annum 4 , – 828,040 90,002 houses, at a yearly rental above £30 and below £50, producing five bushels of soot each perannum 450,010 168,880 houses, at a yearly rental below £30, producing two bushels of soot each per annum ‘ = 827,760 Total number of bushels of soot annually pro- duced throughout London c : C 2,100,810

The price of soot per bushel is but 5d., and sometimes 43d., but 5d. may be taken as an average. Now, 1,000,000 bushels of soot at 5d. will be found to yield £20,833, 6s. 8d. per annum.”

Section 19.—WSalt.

Common salt has often been eommended as a valuable manure, but has never been used in this way with such uni- form success as to induce a general reeourse to it. We have already spoken of it as forming a useful compound with lime and earth. It can also be used beneficially for the destruction of slugs, for which purpose it must be sown over the surface, at therate of four or five bushels per acre, early in the morning, or on mild, moist days, when they are seen to be abroad. It is used also to destroy grubs and wireworm, for which purpose it is sown in considerable quantity on

grass land some time before it is ploughed up. It can be used safely on light soils, but when clay pre- dominates, it causes a hurtful wetness, and subsequent incrustation of the surface. Its application in its unmixed state as a manure is at best of doubtful benefit; but in combination with lime, soot, nitrate of soda, and perhaps also superphosphate of lime, it appears to exert a beneficial influence.

Section 20.—itrate of Soda.

Cubie saltpetre, or nitrate of soda, has now become one of our staple manures. The fertilising power of common saltpetre or nitrate of potass has been known from the earliest times, but its high price has hitherto hindered its use as a manure, except in the form in which it is obtained as refuse from the gunpowder mills. The cubic nitre is brought from Peru, where there are inexhaustible supplies of it. The principal deposits of nitrate of soda are in the plain of Tamarugal, at a distance of 18 miles from the coast. The beds are sometimes 7 or 8 feet in thickness, and from these it is quarried with ease. It is not found in a perfectly pure state, but contains a mixture of several sub- stances, chiefly common salt. To fit it for certain uses in the arts, it is subjected to a process of purification by boiling and evaporation. But for its use as a manure this is altogether unnecessary, and the cost would be greatly lessened if the nitrate were imported as quarried. As eubic nitre and guano contain very nearly the same per- centage of nitrogen (the element to which the fertilising power of all manures is mainly due), it may seem sur- prising that the former should ever be used in preference to the latter. In practice, however, it is found that when applied as a top-dressing in spring, the former frequently yields a better profit than the latter ; and hence the importance to farmers of getting it at a more reason- able price. Nitrate of soda is used as a manure for grain and forage crops. It is now extensively used as a top- dressing for wheat. For this purpose it is applied at the rate of 84 tb per acre, in combination with 2 cwt. of salt. The nitre and salt are thoroughly mixed, and carefully sown, 4. en ae

1 Farmers' Magazine for March 1852, p. 254.

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by hand, in two or three equal portions, at intervals of several weeks, beginning early in March, and finishing by the third week in April. If nitre alone is used, it has a tendency to produce over-luxuriance, and to render the erop liable to lodging and mildew. But the salt is found to correct this over-luxuriance, and a profitable increase of grain is thus obtained. Mr Pusey? informs us that an application of 42 Ib of nitrate of soda and 84 bb of salt per acre, applied by him to ten acres of barley that had been injured by frost, had sueh an effect upon the erop, that he had seven bushels more grain per acre, and of better quality, than on part that was left undressed for comparison. These seven bushels per acre were attained by an outlay of 6s. 4d. only. This nitre is also applied with advantage to forage crops. Mr Hope, Fenton Barns, East Lothian, states that he finds the use of it as a top-dressing to clover, at the rate of one cwt. of nitrate and two of guano per acre, profit- able. Its beneficial effects are most apparent when it is applied to light and sterile soils, or to such as have been exhausted by excessive cropping.

Section 21.—Potash.

Crude potash, or kainite, has of recent years been largely imported from Germany, and has been somewhat exten- sively used in combination with other manures for potatoes and other root crops—two cwt. per acre being a common rate for the potash.

Section 22.—Artijicial Manures.

Besides those substances, the most important of which we have now enumerated, which are available as manure in their natural state, there are various chemical products, such as salts of ammonia, potash, and soda, copperas, sul- phuric and muriatic acid, &c., which, in combination with lime, guano, night-soil, and other substances, are employed in the preparation of manures, with a special view to the requirements of particular crops. In some cases these pre- parations have been eminently successful, in others but doubtfully so. Many failures are probably due to the spuriousness of the article made use of ; as it is known that enormous quantities of worthless rubbish have, of late years, been sold to farmers, under high sounding names, and at high prices, as special manures. We would recom- mend those who desire information regarding the pre-

paration and use of such compounds to study the article on Agricultural Chemistry, by Mr Lawes of Rothamstead, in the Journal of the Royal Agricultural Society of England (vol. viii. p. 226); the accounts of experiments with special manures in the Zransactions of the Highland and Agri- cultural Society of Scotland ; and the articles relating to Agricultural Chemistry in Morton's Cyclopedia. Those who purchase manures of this kind ought to be very care- ful to insist in every instance upon the seller producing an analysis by some chemist of established character, and granting a written warranty that the article sold to them is at least equal to the value indicated by the analysis. Were all farmers to insist upon this mode of buying their manures, they would at once put an end to that wholesale system of fraud by which they have been so enormously cheated of late years.

In applying these concentrated manures, those only of a slowly operating character should be used in autumn or winter, and at that season should invariably be mixed with the soil. Those in which ammonia abounds should in spring also be mixed with the soil when crops to which they are applied are sown. When used for top-dressing growing crops they should be applied only in wet weather.

- *Journal of Royal Agricultural Society, vol. xiii. p. 349.*

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CHAPTER XI. CULTIVATED CROPS—GRAIN CROPS.

[GRAIN CROPS.

less per quarter than white wheats of similar quality, they are less grown than heretofore. But being more hardy and less liable to mildew and sprouting than the finer white wheats, a recurrence of unfavourable seasons always leads to an increased cultivation of them. Some of these red wheats are, however, so productive that they are preferred

Pursuing the plan announced at the outset, we have now to speak of field crops, and shall begin with the cereal

grasses, or white-corn crops, as they are usually called by es Section 1.—Wheat.

It is unnecessary to dwell upon the value of this grain to the farmer and to the community. It constitutes emphati- cally our bread-corn—our staff of life. While its increased. consumption is, on the one hand, an indication of an improved style of living among the general population, its extended culture points, on the other, to an Improving agriculture, as it is only on soils naturally fertile, or that have been made so by good farming, that. it can be grown with success. Wheat is sown both in autumn and spring, from which circumstance attempts have been made to classify its varieties by ranging them under these two general heads. This distinction can only serve to mislead ; for while it is true that there are varicties best adapted for autumn and for spring sowing respectively, it is also true that a majority of the kinds most esteemed in Britain admit of being sown at cither season, and in practice are actually so treated. It is not our intention to present a list of the varieties of wheat cultivated in this country. These arc very numerous already, and are constantly being augmented by the accidental discovery of new varieties, or by cross- impregnation artificially brought about for this purpose. The kinds at present in greatest repute in Scotland are the hardier white wheats, among which Hunter's white still retains the first place. There are many kinds which, in favourable seasons, produce a finer sample ; but its hardi- ness, productiveness, and excellent milling qualities, render it a general favourite both with farmers and millers. Its most marked characteristic is, that in rubbing out a single ear, part of the grains are found to be opaque and white, and others flinty and reddish coloured, as if two kinds of wheat had been mixed together. Selections from Hunter's wheat have been made from time to time, and have obtained a measure of cclebrity under various local names. The most esteemed of these is the Hopeton wheat. On very rich soils both these varieties have the fault of producing too much straw, and of being thereby liable to lodge. Hence, several new kinds with stiffer straw, and consequent lessened liability to this disaster, are now in request in situations where this evil is apprehended. Fenton wheat, possessing this quality in an eminent degree, and being at

the same time very productive, and of fair quality, is at present extensively cultivated. It has the peculiarity of producing stems of unequal height from the same root, which gives a crop of it an unpromising appearance, but has perhaps to do with its productiveness. The red-straw white and Piper's thick-set have properties similar to the Fenton. Piper's had the repute of being the shortest and stiffest strawed wheat in cultivation, but after a brief popularity is now never heard of. The red-chaf' white is productive, and yields grain of beautiful quality, but it requires good seasons, as it sheds its seeds easily and sprouts quickly in damp weather. The Chiddam, Trump, whate Kent, and Talavera, have each their admirers, and are all good sorts in favourable seasons; but, in Scotland at least, their culture is attcnded with greater risk than the kinds previously named; they require frequent change of seed from a sunnier climate, and are only adapted for dry and fertile soils with a good exposure.

in the best cultivated districts of England. Spalding's prolific holds a first place among these, being truly prolific, and producing grain of good quality. shows a tendcncy to produce a rough quality of grain. The Northumberland red and the golden creeping are there in estimation; the former being well adapted for spring

In Scotland it

sowing, and the latter for poor soils and exposed situations. Several new varieties of wheat have recently been intro- duced by Mr Patrick Sheriff of Haddington, formerly of Mungoswells. One is a large-grained red wheat, another somewhat resembles Hunter's in colour, and the third has grain of a pearly whiteness. They have all the peculiarity of being bearded. They are all true autumn wheats ; but

they seem also well adapted for spring sowing, as they ripen

early. A red bearded variety, usually called April wheat,

from its prospering most when sown in that month, and

which indeed is a true summer wheat, is sometimes grown with advantage after turnips, when the season is too advanced for other sorts. But except

upon poorish clay soils, it seems only doubtfully entitled to a preference over barley in such circumstances. The list now given could easily be extended ; but it comprises the best varieties at present in use, and such as are suited to the most diversified soils, seasons, and situations in which wheat can be grown in this country. In regard to all of them it is reckoned advantageous to have recourse to frequent change of seed, and in doing this to give the preference to that which comes from a soil and climate better and earlier than those of the locality in which it is to be sown. Every farmer will find it worth his while to be at pains to find out fron whence he can obtain a change of seed that takes well with his own farm, and having done so, to hold to that, and even to induce his correspondent to grow such sorts as he prefers, although he should have to pay him an extra price for doing so. An experienced farmer once remarked to the writer, that by changing his seed he got it for nothing ; that is, his crop was more abundant by at least the quantity sown, from the single circumstance of a suitable change of seed. It is proper, however, to state, that this practice of changing the seed is founded more upon mere opinion than upon well-ascertained facts, and that in those instances where it has been followed by beneficial results nothing is known of the causes to which such success is due, It is much to be desired that our agricultural societies should address themselves to the thorough investigation of a question of such vital importance. In fixing upon the kind of whcat which he is to sow, the farmer will do well to look rather to productiveness than to fine quality. For however it may gratify his ambition to show the heaviest and prettiest sample in the market, and to obtain the highest price of the day, no excellence of quality can compensate for a deficiency of even a few bushels per acre in the yield. It is of importance, too, to have seed-corn free from the seeds of weeds and from other grains, and to see that it be true of its kind. Farmers who are systematically careful in these respects frequently obtain an extra price for their produce, by selling it for seed-corn to others; and even millers give a preference to such clean samples.

But there are seeds which no amount of care or accuracy in dressing can remove from seed-corn—viz., those of certain parasitical fungi, which must be got rid of by a different process. The havoc caused to wheat crops by bunt, blackball, or pepper-brand (Uredo caries or Tilletia caries), before the discovery of the mode of preventing it

by steeping the seed-corn in some acrid or caustic bath, was often rumous. The plan at first most usually adopted was to immerse the secd-wheat in stale chamber-lie, and afterwards to dry it by mixture with quick-lime. This pickle, as it is called, is usually cflicacious; but the lime vexes the cyes and excoriates the hands and face of the sower, or clogs the hopper of the sowing-machine, and has therefore been superseded by othcr substances. Blue vitriol (sulphate of copper) is as good as anything for this purpose, and is used in the following manner. A solution is prepared by dissolving powdcred sulphate of copper in water, at the rate of two ounces to a pint for each bushel of wheat. The grain is emptied upon a floor; a little of it is shovelled to one side by onc person, while another sprinkles the solution over it, and this process is continued until the whole quantity is gone over. The heap is then turned repeatedly by two persons working with shovels opposite to each other. After lying for a few minutes, the grain absorbs the moisture, and is ready for sowing either by hand or machine.

The season for wheat-sowing extends from September to April, but ordinarily that succeeds best which is committed to the ground during October and November. When summer-fallows exist the first sowings are usually made onthem. It is desirable that the land neither be wet nor very dry when this takes place, so that the precise time of sowing is determined by the weather; but it is well to proceed as soon after Ist October, as the land is moist enough to insure a regular germination of the seed.

Over a large portion of England wheat is the crop usually sown after clover or one year's "seeds." In such cases the land is ploughed in the end of September, imme- diately harrowed, and wheat sown upon it by a drilling machine. On loose soils the land-presser is frequently used to consolidate the soil and to form a channel for the seed, which in such cases comes up in rows, although sown broad- cast. It is more usual, however, first to level the pressed furrows by harrowing, and then to use the drill, by means of which various portable manures are frequently deposited along with the seed-corn. The sowing of wheat after clover or "seeds," as now described, is rarely practiscd in Scotland, where it so invariably fails as to show that it is

unsuited to our northern climate. It is here not unusual, however, to plough up such land in July or August, and to preparc it for wheat-sowing by what is called rag-fallowing. After the first ploughing the land is harrowed lengthwise, so as to break and level the surface of the furrows and close the interstices without tearing up or exposing any green sward. It is then allowed to lie for ten or fourteen days to allow the herbage to die, which it soon does at this season when light is thus excluded from it. A cross ploughing is next given, followed by repeated grubbings, harrowing, and eae after which it is treated in all respects as a summer-

ow.

The fallow and clover leas being disposed of, the land from which potatoes, beans, pease, or vetches have been cleared off will next demand attention. When these crops have been carefully horse and hand hoed, all that is required is to clear off the haulm to plough and sow. If the land is not clean, recourse must be had to a short fallowing process before sowing wheat. For this purpose the surface is loosencd by the broadshare and grubber, the weeds harrowed out and raked off, aftcr which the land is ploughed and sown. On soils well adapted for the growth of beans and wheat, viz., those in which clay predominates, any lengthened process of autumn cultivation is necessarily attended with great hazard of being interrupted by rain, to the loss of seed-time altogether. Every pains should there- fore be taken to have the land so cleaned beforehand that these unseasonable efforts may be dispensed with ; and to have

the sowing and harrowing to follow so closely upon the ploughing as to diminish to the utmost the risk of hindrance from wet weather. As the crops of mangolds, carrots, or turnips arrive at maturity, and are either removed to the store-heap or consumed by sheep where they grow, succcs- sive sowings of whcat can be made as the ploughing is accomplished and as the weather permits. It is to be noted, however, that it is only on soils naturally dry, or made so by thorough draining, and which are also clean and in a high state of fertility, that wheat-sowing can be continued with advantage

during the months of December and January. If the whole of these conditions do not obtain, it is wiser to refrain until February or March. When these late winter sowings are made, it is of especial importance to sow close up to the ploughs daily, as a very slight fall of rain will, at this season, unfit the land for bearing the harrows. This sowing and harrowing, in dc- tail, is the more easily managed, that in the circumstances cross-harrowing is neither necessary nor expedient. Under the most favourable conditions as to weathcr and drainage, soils with even a slight admixture of clay in their composi- tion will at this season plough up somewhat clammy, so that cross-harrowing pulls the furrows too much about, and exposes the seed, instead of covering it more perfectly. Two double turns of the harrows lengthwise is as much as should be attempted at this season.

The sowing of spring-wheat is only expedient on dry and fertile soils with a good exposure. Unless the whole con- ditions are favourable, there is much risk of spring-sown wheat being too late to be properly ripened or well har- vested. On the dry and fertile soils in the valley of the Tweed, where the entire fallow-break is sown with turnips, and where consequently it is difficult to gct a large breadth clearcd in time for sowing wheat in autumn, it is the practice to sow it largely in February and March, and frequently with good success. Many judicious farmers are, however, of opinion that, taking the average of a twenty years' lease, barley is a more remunerative crop than spring-sown wheat, even under circumstances most favour- able to the latter. When it is resolved to try it, a very full allowance of seed should be given—not less than three bushels per acre, and 34 will often be better. If the plants have room they will tiller; and thus the ripening of the crop is retarded, the risk of mildew increased, and the quality of the grain deteriorated. As much seed should therefore be sown as will yield plants cnough to occupy the ground fully from the first, and thus remove the tendency to tillering. By such full seeding a fortnight is frequently gained in the ripening of the crop, and this frequently makes all the difference between a remuncrative crop and a losing one.

Much controversy has taken place about the quantitics of seed-wheat which should be used per acre. The advo- cates of thin seeding have been so unguarded and extra- vagant in their encomiums of their favourite method, — some of them insisting that anything more than a few quarts per acre

does but waste seed and lessen the produce, —that many persons have been induced to depart from their usual practice to their serious cost. It is true that with land in a high state of fertility, and kept scrupulously clean by frequent hoeings, a full crop of wheat may be obtained from half a bushel of seed per acre, provided that it is sown in September, and deposited rcgularly over the surface. But what beyond a trifling saving of seed is gained by this practice? And at what cost and hazard is even this secured? It is a mere fallacy to tell us, as the advocates of excessively thin seeding so often do, that they obtain an increase of so many hundred-fold, whereas thick seeders cannot cxcecd from twelve to twenty fold, when after all the gross produce of the latter may exceed that of

the former by more than the quantity of seed saved, with less expense in eulture, less risk from aceidents and disease, an earlier harvest, and a better quality of grain. Sueh a crowding of the ground with plants as prevents the proper development of the ear is of course to be avoided ; but the most experienced growers of whcat are eonvineed of the benefit of having the ground fully oecupicd at the time when active spring growth begins. This is secured by using two bushels per acre for the sowing made early in October, and by inercasing this quantity at the rate of half a peck per week until three bushels is reached, which may be held as the maximum. Less than this should not be used from thc middle of November to the end of the season. These are the quantities to be used in broad-cast sowing ; when drilling or dibbling is resorted to, two-fifths less seed will suffice. In Seotland, at least, often repeated

trials have shown that larger crops are obtained by broad-

easting than by drilling. The latter mode is, however, to be preferred wherever the land is infested by annual weeds, which can then be got rid of by hoeing. When clover and grass-seeds are sown with the grain erop, it is believed also that they thrive better from the grain being sown in rows, probably beeause in this ease light and air are less excluded from them. It is believed also that in highly-manured soils of a loose texture, grain deposited somewhat deeply in rows is less liable to lodge than when sown broad-east and shallower. When drilling and hoeing are resorted to, the

latter is effected most cheaply and effectively by using Garret's horse-hoe. The mere stirring of the soil is eon- sidered by many farmers to be so beneficial to the wheat crop that they use the horsc-hoe irrespective of the presence of wecds. Others are of opinion that, apart from the destruction of weeds, hoeing is injurious to grain crops, alleging that the cutting of their surface roots weakens the stems and inercascs their liability to fall over. Carefully conducted experiments are required to settle this point. We have no personal experience bearing upon it beyond this, that we have repeatedly seen a wheat crop much benefited by mere harrowing in spring. It is always use- ful to roll wheat, and indeed all cereal crops, in order to facilitate the reaping process, although no other benefit should result from it. When the plants have been loosened by severe frosts, or are suffering from the attacks of the wire-worm, the use of Crosskill's roller is usually of great benefit to the crop.

A plan of growing wheat year after year on the same field without the use of manure was praetised for a number of years by the late Rev. Mr Smith of Lois Wecdon, North- amptonshire, and detailed by him in the pages of the Royal Agricultural Society's Journal, and in a pamphlet which has passed through many editions and had a very extensive eirculation. His plan is to a eertain extent a revival of that of Jethro Tull, but with this important differenee, that whereas Tull occupied his ground with alternate double rows of wheat a foot apart, and vacant spaces, five feet wide, which were carefully cultivated by ploughings and horse-hoeings repeated at intervals from the springing of the whcat until midsummer, Mr Smith intro- dueed two important elements in addition, viz., thorough draining, and trenching the vacant spaces in autumn, so as to bring portions of subsoil to the surfaee. A field treated on this system eonsists of alternate strips of wheat and bare fallow, which are made to exchange places year by year, so that each successive crop oceupics a different site from its immediate predecessor. It has also the benefit of the fresh soil brought up by the previous autumn's double- digging, which is subsequently mellowed and pulverised by lengthened exposure to the atmosphere, and by frequent stirrings. The produce obtained by Mr Smith from his acre thus treated was very nearly 34 bushcls each year for

the first five years ; but as his erups steadily improved, his

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average at the end of fourteen years was fully 36 bushels. Writing in July 1861, he said, “The growing crop for 1861, notwithstanding the frost, looks strong and well, with searcely a gap. Thus year after year gives growing confidence in the scheme.” On steam-power being intro- duced, Mr Smith became convinced of the practicability of earrying out his system with advantage on an eutire farm. At first he restrieted himself to the employment of manual labour, but he subsequently invented a set of implements for sowing, eovering in, rolling, and hoeing his crops by horse labour. We give in his own words his directions for earrying out this system, what he believed to be the advantages of it, and the eost of thus cultivating an aere :—

‘I suppose, at the outset, the land intended for whcat to he wheat land; having besides a fair depth of staple, and a subsoil, as will gencrally, though not universally be the case, of the same chemical composition with the surface. I suppose it dry, or drained three feet deep at least ; well cleaned of weeds; the lands cast; and the whole tolerably level.

‘©. First of all, then, plough the whole land, when dry, one inch deeper than the used staple. If it turn up cloddy, bring the clods down with the roller or the crusher. Let this be done, if possible, in August. Harrow deep, so as to get five or six inches of loose mould to admit the presser. Before sowing wait for rain. After the rain wait for a fine day or two to dry the surface. With

this early commencement a week or two is of no material import-

ance compared with that of ploughing dry and sowing wet. ‘ As early as eal, however, in September, get in your seed with the presser-drill, or with some implement which forms a firm-*

bedded channel in which to deposit the seed, grain by grain, a few

inches apart. Cover over with the crusher or rough roller. ‘©. When the lines of wheat appear above ground, guard against

the rook, the lark, and the slug—a trite suggestion, but ever needful, especially here. watch for the weeds, and wage constant warfare against them. The battle may last for a year or two, or in some foul cases even more; but, in the end, the mastery, and its fruits, without fail, will be

And now, and at spring, and all through summer,

yours.

“3, The plant being now distinctly visible, dig the intervals two spits deep, increasing the depth, year after year, till they come to twenty or twenty-four inches. Bring up at first only four, or five, or six inches, according to the nature of the subsoil, whether tena- cious, or loamy, or light. To bring up more at the outset would be a wasteful and injurious expense.

‘The digging is donc thus :—Becfore proceeding with the work, a few cuts are made within three inches of the wheat, the back of the spade being towards the rows. A few double spits, first of all, at the required depth, are then thrown out on the headland, and there left for the present. Aftcr this, as the digging proceeds, the staple is cast to the bottom, and the subsoil thrown gently on the top. This process is carried on throughout the whole interval ; at the end of which interval, just so much space is left vacant as was occupied by the soil thrown out at the beginning of it. In commencing the second interval at that finished end, the earth is thrown out as at first, not on the headland, however, but into the vacant spacc of the first interval. And so on all over the acre.

‘<4, Late in winter, and early in spring, watch your opportunity, in dry weather, before the roots of the plant are laid bare, to press them with the crusher.

‘©5, In the spring and early summer stir the spaces between the rows as oftcn as the surface becomes crusted over; and move the settled intervals four or five inches deep with the common scarifier, set first of all about twenty-eight inches wide, reducing the width till it come by degrees to

twenty-four and eighteen inches. Continue the process, if possible, at the last-namcd width, up to the time of flowering in June.

“These operations are indispensable to full success, and happily can be carried on at little cost; for, while the intervals of each acre can be scarified in fifty minutes, the horse-hoe implement, covering two lands at once, can stir between the rows in twenty-five.

‘<6. Immediately the crop is carried, clean the intervals, and move them with the scarifier in order to sow, without delay, the shed grains. When these vegctate and come up into plant, move the intervals again five or six inches dcep, and so destroy them. Aftcr that, level with the harrow implement, and the land is ready for the drill.

“Tf anything occur to prevent the sowing early in Septeinber, and to drive you to the end of October, set the drill for a thicker crop. But, if possible, sow early—for this reason. Tillered wheat has a bad name. But that has reference only to wheat which has tillered late in the spring. And certainly, in that case, there is the fear of danger to the crop, and danger to the sunple. For

supposing no mildew to fall ou it, cven then the plant ripens unevenly ; the early stems being ready for the sickle, while the late-grown shoots have scarcely lost their verdure. But if mildew

eome when the stem is soft, and sueculent, and porous, instead of

being, as it should be at that time, glazed and case-hardened against its attacks, the cnemy enters in and checks the circulating sap ; and the end is, blackened straw, light ears, and shrivellcd grain. Therefore, sow early. Let the plant tiller before winter. Give every stem an equal start at spring; and then, with a strict adherence to rule, there need be no alarm as to the result, subject only to those visitations from which no wheat, on any system, in the

same description of svil, and under the same climate, is secure." —(See pamphlet, Word in Season, p. 36.)

'The advantages of the system of corn-growing which I have described are principally these :—First, while one crop of wheat is growing, the unsown intervals of the acre are being fallowed and prepared for another. This the farmer well knows to be of infinite momeut, meeting, as it does, one of the greatest difficulties he has to contend with. Next, upon this half-portion of the acre, tilled as I describe, there is a yicld equal to average crops on a whole acre. Then, for half the portion of an acre, there is, of eoutrse, only half the labour and half the expense of an entire acre required for cultivation. And, lastly, the hand-labour required finds constant employment for the poor." —(Jbid., p. 17.)

"After harrowing, and cleaning, and levelling the whole, I marked out the channels for the seed with my presser implement, which is drawn with one horse, and presses two lands at once. M y scheme of implements, to be complete, embraced a drill, which was to act immediately behind the presser-wheels, and to drop seed by sced into the hard channels. The spindle of the presser was to turn the drill-wheels, and the boxes were to be made removable. Being unable to accomplish this in time for this year's sowing, I had the seed, as heretofore, dropped by hands, and covered over by rollers.

"These rollers form the roller implement in the same frame, and are managed thus: the three-whceled pressers are removed from their sockets, and in their place two rough rollers, formed of several wheels on the self-cleaning principle, are introduced, and cover over two lands at once.

"The portion of the field thus seeded will lie in this firm but rough state till spring time. Then, when the rollers have been sielita again to keep the roots of the plant well in their place, they too will be removed from the frame, and light wheels and hoes will. be attached, forming the horse-hoe implement, for hoeing and stirring between the wheat.

"There is yet one other use for the implement frame. The .intervals of the wheat having been trenched in autumn, and well and frequently stirred by the common scarifier at spring, arc shut out by the wide-spreading wheat-

plant in June from all further processes till the crop is cut and carried. They are then to be moved and levelled by the common one-horse scarifier for sced- time. After this will follow the harrow. Tho hoes will be removed from the frame, and two small harrows will be attached, to cover two lands at once ; and with this implement the horse will walk on the stubble-land, between what before were the intervals ; and the cycle of operations is now complete.

"In all these operations (excepting in that of scarifying) the sown lands, and lands about to be made ready for sowing, are untouched by the foot of man or horse.

"The tinie occupied in scarifying the land is about an hour the acre ; in heavily pressing the channels for the seed, half an hour ; in the other operations about 20 or 25 minutes. (Pp. 25, 26.)

"The presser-drill, spoken of in p. 25, is completed, and I now sow the four acres in 90 minutes, timed by watch ; being at the tate of 18 or 20 acres a day in a day of 8 hours, with a horse of average power and speed.

"It has been thought advisable to keep the drill in its own frame, —devoting another frame to the roller-whcels or crusher, the hoes, the scarifiers, and harrows, all of which are made removable, and which, with the exception of the spade, the hand-hoe, and the common scarifier for stirring the intervals, perform the whole cycle of operations for eultivating the land for wheat." —(Pp. 33, 34.)

"T have only to show now, by my fresh balancc-sheet, how with suitable implements, on wheat-land, the whole scheme I propose is economical, as well as easy and expeditious,

"One double digging in autumn : : 5 eel 0 © Three stirrings with scarifier at spring (6d.) 6 2 U One ditto with scarifier and harrow implement,

before sowing oe, 0 1 0 Two pecks of seed (5s. the bushel) 2 6 Pressing and drilling : _ oi 0 Rough rolling 6 ; : ¢ : : 0 0 6 Four hoeings between wheat with horse-shoe im-

plement (6d.) : : F ‘ 0 2 0 Bird-keeping 6 0 2 0

Carried forward £2 2 0

AGnHTOUL TW RE

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Brought forward e227 710

All the operations from reaping to marketing 1 a) Rates, taxes, and interest . : 010 0 Total amount of outlay £3 14 0

“‘The produce, supposing it equal to that of former years, in round numbers, would be :—

“Four quarters and two bushels of wheat (at 40s.). £810 0 One ton and 12 cwt. of straw (at £2 the ton) 3 4 0 £11 14 0

Deduct outlay 3 14 0 Total amount of profit 5 283 (Or

—(Ibid., p. 30.)

Particular attention was directed to this system of wheat culture by a lecture on Tull’s husbandry, delivered by Professor Way, at a council meeting of the Royal Agri- cultural Society of England, and by the animated discus- sion which followed; when several gentlemen who had visited Mr Smith’s farm bore testimony to the continued excellence of his crops, and intimated that they and others had begun to test the system upon their own farms. If such a practice can indeed be pursued on the generality of clay-soils, then the puzzling problem of how to cultivate them with a profit is solved at once. It is not to be thought that practical farmers would regard otherwise than with incredulity a system which so flatly contradicts all existing theory and practice. The facts submitted to them by Mr Smith being beyond challenge, they would naturally imagine there must be some peculiarity in the soil at Lois Weedon which enabled it to sustain such hea

and continued demands on its fertility; and that the issue,

there and elsewhere, must eventually be utter sterility. For our own part, believing that we have exceeding much to learn in every department of agriculture, we cannot thus summarily dispose of these facts. We simply accept them as true, and leave the exposition of them to expervence, whose verdict we await with much interest.

But Mr Smith is not the only person who has furnished us with information regarding the continuous growth of wheat for a series of years on the same soil. Mr Lawes, at Rothamstead, in Herts, so well known by his interesting papers on agricultural chemistry in the Royal Agricultural Society's Journal, has furnished some facts in connection with the culture of wheat on clay soils to which farmers were little prepared to give credence. Mr Caird, who visited Rothamstead early in 1851, thus refers to the sub- ject in his valuable work :—

"On a soil of heavy loam, on which sheep cannot be fed on tur- nips, 4, 5, and 6 feet above the chalk, and therefore uninfluenced by it, except in so far as it is thereby naturally drained, fen crops of wheat have been taken in succession, one portion always without any manure whatever, and the rest with a variety of manure, the effects of which have been carefully obscrved. The seed is of tho red cluster variety, drilled uniformly in rows at 8 inches apart, and two bushels to the acre, hand-hoed twice in spring, and kept perfectly free from weeds. When the crop is removed the land is scarified with Bentall's skimmer, all weeds are removed, it is ploughed once, and the seed for the next crop is then drilled in, During the ten years, the land, in a natural state, without manure, has produced a uniform average of 16 bushels of wheat an acre, with 100 Ib. of straw per bushel of wheat, the actual quantity varying with the change of seasons between 14 and 20 bushels. The repetition of the erop has made no diminution or change in the uniformity of the average, and the conclusion seems to be established, that if the land is kept clean, and worked at proper scasons, it is impossible to exhaust this soil below the power of producing 16 bushels of wheat every year.

"But this natural produce may be doubled by the application of certain manures. Of these, Mr Lawes's experiments led him to conclude that ammonia is the essential requisite. His conclusions are almost uniform, that

no organie matter affects the produce of wheat, except in so far as it yields ammonia; and that the whole of the organie matter of the corn crop is taken from the atmosphere by the medium of ammonia. There is a constant loss of amunonia going on by expiration, so that a larger quantity must be supplicd than is contained in the crop. For practical purposes, 5 Ib. of

ammonia is found to produce a bushel of wheat, and the cheapest form of ammonia at present being Peruvian guano, 1 cwt. of that substance may be calculated to give 4 bushels of wheat. The natural produce of 16 bushels an acre may therefore be doubled by an application of 4 ewt. of Peruvian guano. To this, however, there is a limit—elimatc. Ammonia gives growth, but it depends on climate whether that produce is straw or corn. In a wet, eold summer a heavy application of ammonia produees an undue de- velopment of the circulating condition of the plant, the erop is laid, and the farmer's hopes are disappointed. Seven of corn to ten of straw is usually the most produetive erop; five to ten seldom yields well, The prudent farmer will therefore regulate his application of ammonia with a referenee to the average charaeter of the climate in whieh his farm is situated. Tas ? 'The practical conclusion at which we arrive is this, that in the cultivation of a clay-land farm, of similar quality of soil to that of Mr Lawes, there is no other restrietion necessary than to keep the land clean ; that while it is very possible to reduce the land by weeds, it is impossible to exhaust it (to a certain point it may be reduced) by cleanly cultivated corn corps ; that it is an ascertained fact that wheat may be taken on soils of this deseription (provided they are manured) year after year, with no other limit than the neces- sity for cleaning the land, and that may best be accomplished by an occasional green crop—turnip or mangold, as best suits—at great intervals, the straw being brought to the most rotten state, and applied in the greatest possible quantity to insure a good crop, whieh will clean the land well. If these conclusions are satisfac- torily proved, the present mode of cultivating heavy clays may be greatly changed, and the owners and occupiers of such soils be better eompensated in their cultivation than they have of late had reason

to anticipate.'"—(Caird's English Agriculture, in 1850 and 1851, pp. 460-462.) }

It is certainly curious to observe, that the addition of four cwt. of guano brings up the produce of Mr Lawes's acre from its average annual rate of sixteen bushels, under its reduced normal state, to very nearly the same as Rev. Mr Smith's acre under his system of alternate strips of corn and summer fallow.

From information carefully gathered, Mr Caird gives it as his opinion, that the average produce of wheat per acre in 26 of the 32 counties of England visited by him is 263 bushels, or 14 per cent. higher than it was estimated at in the same counties by Arthur Young 80 years before. Were the country generally anything like as well cultivated as particular farms that are to be met with in all parts of it, we should have the present average increased by at least eight bushels per acre. 63 tb per bushel is a weight indi- cating a good quality of grain. A good crop of wheat will yield a ton of grain and about two tons of straw per acre.

Besides its uses on the farm, wheat straw, in certain limited districts in the south of England, is an article of some value, as the raw material of a not unimportant native manufacture, namely, Straw-Plait. The first straws used for this purpose in this country were grown in the neigh- bourhood of Luton in Bedfordshire. This town is still the principal seat of the straw trade and straw bonnet manufac- ture, and the district around still produces the finest quality of straws; but straw-growing is now also carried on in parts of Hertfordshire, Buckinghamshire, Oxfordshire, and Berkshire. Light, rich soils are best adapted for this pur- pose. The kinds of wheat grown with this view are the Red Lammas and the Chiddam. A bright, clean, tough straw being required, it is necessary to begin reaping before the flag of the straw falls. If the straw is exposed to rain, it becomes rusted or spotted; if to very hot and dry weather, it gets sunburnt and brittle. The utmost care and energy must, therefore, be used to get the crop dried, carried, and stacked as quickly as possible. In favourable seasons an acre of wheat will yield (besides the grain) from 15 ewt. to a ton of cut straws, of the value of £6 to £8 per ton, clear of all expenses. The farmer sells his straw to a class of men called straw-factors, who draw and

1 Mr Lawes continues these experiments of growing sueeessive erops of wheat year after year on the same site, with no material change in the results after a trial of thirty years.

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cut the straws in his barn. The drawing and cutting-off of the ears being there performed, the factors remove the straw to their own premises. There it undergoes a farther cutting, is exposed to the fumes of sulphur, assorted into proper lengths, and made up into marketable bunches of various sizes and qualities. plaiters at the various markets of the district.

daily bread of the peasantry.

[GRAIN CROPS.

These bunches are disposed of to the About 50,000 females and boys are engaged in plaiting. No plait

is made in factories, the work being performed by the wives

and children of agricultural labourers in their own cottages,

where it is carried on all the year except in harvest. The

straw trade, in its various departments, is of considerable

importance and is steadily increasing. The gross returns

are supposed not to fall short of £1,250,000 per annum. There is now also a small demand for wheat straw for the manufacture of paper.

Section~2.—Barley.

In Great Britain barley is the grain crop which ranks next in importance to wheat, both in an agricultural and commercial point of view. Its use as bread-corn is confined to portions of the lowlands of Scotland, where unleavened cakes, or "bannocks o' barley meal," still constitute the It is

more largely used in preparing the “ barley broth” so much relished by all classes

in Scotland. To fit the grain for this purpose, it is pre-

pared bya peculiar kind of mill, originally introduced from Holland by Fletcher of Saltoun, in which a thick cylinder of gritty sandstone is made to revolve rapidly within a case of perforated sheet-iron. The barley is introduced betwixt the stone and its case, and there subjected to violent rubbing, until first its husk and then its outer coatings are removed. It is, however, in the production of malt hquor and ardent spirits, and in the fattening of live stock, that our barley crops are chiefly consumed. We have no doubt that it would be better for the whole community if this grain were more largely used in the form of butcher-meat and greatly less in that of beer or whisky. It has been customary for farmers to look upon distillation as beneficial to them from the ready market which it affords for barley, and more especially for the lighter qualities of this and other grain crops. But this is a very short-sighted view of the matter; for careful calculation shows that when the labouring man spends a shilling in the dram-shop, not more than a penny of it goes for the agricultural produce (barley) from which the gin or whisky is made ; whereas, when he spends the same sum with the butcher or baker, nearly the whole amount goes for the raw material, and only a frac- tion for the tradesman’s profits. And not only so, but the man who spends a part of his wages upon strong drink diminishes, both directly and indirectly, his ability to buy wholesome food and good clothing; so that, apart from the moral and social bearings of this question, it can abundantly be shown that whisky or beer is the very worst form for the farmer in which his grain can be consumed. Were the £50,000,000 at present amnually spent in Great Britain upon ardent spirits (not to speak of beer), em- ployed in purchasing bread, meat, dairy produce, vege- tables, woollen and linen clothing, farmers would, on the one hand, be relieved from oppressive rates, and, on the other, have such an increased demand for their staple pro- ducts as would far more than compensate for the closing of what is at present the chief outlet for their barley.

There are many varieties of barley in cultivation, and some of them are known by different names in different districts. Those most esteemed at

present in Berwickshire and neighbouring counties are the Chevalier, the Anndat, and the common-early long-eared. The chevalier produces the finest and heaviest grain, weighing usually from 54 ib to 56 ib per bushel, and is in high estimation with maltsters.

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) :

GRAIN CROPS. |

It is also tall and stout in the straw, which is less liable to lodge than that of the common barley; and when this accident does happen, it has the valuable property of not producing aftershoots or greens. It requires about fourteen days longer than the common-early to reach maturity, but as it admits of being sown earlier than the latter sort, this is in practice no drawback to it. The Annat barley resembles the chevalier in its leading features, but is yellower in its complexion, and not quite so round in the grain. It ripens a few days earlier than the chevalier, and in our own experience is more productive. The common- early is more liable than those just noticed to suffer from over-luxuriance. It is generally used for the latest sowings on those portions of land from which the turnip crop has been longest in being removed.

In the elevated or northern parts of the kingdom, four- rowed barley, usually called bere or bigg, is cultivated, as it is more hardy, and ripens earlier than the two-rowed varieties. A new variety, called Victoria bere, is said to be so productive, and to yield such a heavy sample, as to be worthy of cultivation even in lowland districts.

Barley delights in a warm, friable soil, and thrives best when the seed is deposited rather dceply in a tilthy bed. Being the grain crop best adapted for succeeding turnips that have been consumed by sheep-folding, advantage must be taken of favouring weather to plough up the land in successive portions as the sheep-fold is shifted. So much of it as is ploughed before 1st February will usually get so mcllowed by the weather as to be easily brought into suitable condition for receiving the seed. In Scotland the usual practice is to sow broadcast on this stale furrow, and to cover the

seed by simple harrowing. A better way is first to level the surface by a stroke of the harrows, and then to form it into ribs twelve inches apart by such an implement as has been described when speaking of Tennant's grubber. Over this corrugated surface the seed is sown broadcast, and covered by another turn of the harrows. The ribbing loosens the soil, gives the seed a uniform and sufficient covering, and deposits it in rows. The only advantage of such ribbing over drilling is, that the soil is better stirred, and the seed deposited more deeply, and less crowded than is done by the ordinary drills. It is certainly of great advantage to have the sced- corn deposited in narrow lines, so far as the working of the horse-hoe is concerned; but we are convinced that stiffer stems, larger ears, a more abundant yield, and a brighter sample, are likely to be obtained when the seed is loosely scattered in a channel three or four inches wide than when crowded into a narrow line. This grain is now sown considerably earlier than heretofore. When the soil is enriched by plentiful manuring, its temperature raised by thorongh draining, and the climate and exposure favour- able, it should be sown as early in March as possible, and will often do remarkably well although sown in February. This early sowing counteracts that tendency to over- luxuriance by which the crop is so often ruined in fertile soils, It is chiefly owing to this early sowing (although aided by the use of hummelling machinery) that the average weight of barley is so much greater now than it was thirty years ago. From 54 tb to 56 Ib per bushel is now about the average weight in well-cultivated districts ; while 57 Tb and 58 tb is by no meansrare. The produce per acre ranges from 30 to 60 bushels, 36 bushels being about the average. The quantity of seed used per acre is from 24 to 3 bushels for broadcast sowing, and about a third less when drilled. As already remarked in regard to wheat, it is well, as the season advances, to avoid, by a fuller allowance of seed, the temptation to excessive tillering, and consequent unequal and later ripening. A good crop of barley yields about 1 ton each per acre of grain and straw.

Section 3.—Oats.

Over a large portion of England oats are grown only as provendcr for horses, for which purpose they are fully ascertained to be superior to all other grains. Except, therefore, on fen-lands and recently-reclaimed muiry soils, the cultivation of oats in South Britain bears a small proportion to the other cereals. It is in Scotland, "the land o' cakes," that this grain is most esteemed and most extensively cultivated. Considerably more than half of the annual grain crops of Scotland consists, in fact, of oats. The important item which oatmeal porridge forms in the diet of her peasantry, and of the children of her other classes, has something to do with this extensive culture of the oat ; but it arises mainly from its peculiar adaptation to her humid climate. As with the other cereals, there are very numerous varieties of the oat in cultivation. In Messrs Lawson's Synopsis of the Vegetable Products of Scotland, it is said (Div. i p. 80), "Our collection comprises nearly sixty varieties, about thirty of which are grown in Scotland; but of these not more than twelve are in general cultivation. These twelve varieties, enumerated in the order of their general cultivation, are, the Potato, Hopetoun, Sandy, Early-Angus, Late-Angus, Grey-Angus, Blainslie, Berlie, Dun, Friesland, Black Tartarian, and Barbachlaw." The first four kinds in this list are those chiefly cultivated on the best class of soils. It is to the produce of these that the highest market prices usually have reference. The weight per bushel of these sorts usually runs from 42 ib to 46 tb. From 50 to 60 bushels per acre is a usual yield of oats. The two last named kinds are chiefly esteemed for their large produce, and adaptation to inferior soils; but being of coarse quality, they are chiefly used for provender. A variety which stands the winter is now frequently grown in England, for the double purpose of first yielding a sea- sonable supply of green food to ewes and lambs in early spring, and afterwards producing a crop of grain. It has already been stated that in Scotland wheat does not prosper when sown after clover or pasture; but with the oat it is quite the reverse, as it never grows better than on land newly broken up from grass. It is, accordingly, almost invariably sown at this stage of the rotation. The land is ploughed in December or January, beginning with the strongest soil, or that which has lain longest in grass, that it may have the longest exposure to the mellowing influences of wintry weather. In March or April the oats are sown broadcast on this first ploughing, and covered in by repeated harrowings. These are given

lengthwise until the furrows are well broken down, for if the harrows arc worked across the ridges before this is effected, they catch hold of the edges of the slices, and, partially lifting them, permit the seed-corn to fall to the bottom, where it is lost altogether. As it is only when a free tilth is obtained that the crop can be expected to prosper, care must be taken to plough early and somewhat deeply, laying the furrows over with a rectangular shoulder, to sow when the land is in that state of dryness that admits of its crumbling readily when trode upon, and then to use the harrows until they move smoothly and freely in the loose soil, two or three inches deep. The Norwegian harrow is an important auxiliary to the common ones in obtaining this result. When wild mustard and other annual weeds abound, it is advisable to drill the crop and to use the horse-hoe. When the land is clean, the general belief in Scotland is that the largest crops are obtained by sowing broadcast. When the latter plan of sowing is adopted, from 4 to 6 bushels per acre is the quantity of seed used. The latter quantity is required in the case of the Hopetoun and other large- grained varieties. The condition of the soil as to richness and friability must also be taken into account in deter-

*mining the quantity of seed to be used. When it is in high heart and likely to harrow kindly, a less quantity will suffice than uuder opposite conditions. In breaking up a tough old sward, even 6 bushels per acre may be too little to sow. The following very interesting experiment bearing on this point was made in the county of Fife -—*M Gullaud, Wemyss, offered a sweepstakes in 1890, that 4 bushels of oats, sown per Scotch acre, in poor land, would yield a better produce than 8 bushels sown under similar conditions. The late Mr Hill, maintaining the contrary, accepted the sweepstakes, and a number of others took up the same. Experiments were made by Mr Dingwall, Ramornie, and Mr Buist, Hattonhill. . .. . —*

In Mr Buist's experiments, '¢4 bush. sown yielded 28 bush. per acre, 34 Ib per bush. 8 bush. sown yielded 36 ,, 3 34} Ib

‘In Mr Dingwall’s experiments, “ 4 bush. sown yielded 45 bush. per acre, 384 tb per bush, 8 bush. sown yielded 49 ,, Sa BON it TAs “1

The advocates for thin seeding will of course regard even the least of these quantities as foolishly redundant. It is quite true, that if the land is in good heart, the crop will ultimately stand close on the ground from a very small seeding ; but it will take two or three weeks longer to do this than if the land had been fully stocked with plants from the first, by giving it seed enough. In our precarious climate, where a late harvest and bad crops usually go together, it is of the utmost importance to secure early, uniform, and perfect ripening ; and as liberal seeding tends directly to promote such a result, practical farmers will do well to take care how they omit such a simple means of attaining so important an end. We believe that it 1s on the principle now indicated that the superior result, both as respects quantity and quality of produce, in the double- seeded lots in the experiments now cited, is to be explained.

As with wheat, the vigour and productiveness of the oat is much enhanced by frequent change of seed. Our agricultural authorities usually assert that the change should, if possible, always be from an earlier climate and better soil. This is undoubtcdly true as regards high-lying districts ; but with a good soil and climate we have always seen the best results with secd from a later district. A homely old couplet tersely expresses the experience of our ancestors in this matter of the changing of seed-corn by directing us to procure—

‘Oats from the hills, bere from the sea, Gude wheat and pease wherever they be.”

On poor hard soils it is usually remunerative to apply a cwt. of guano per acre to the oat crop, sowing it broad- cast, and harrowing it in along with the seed. As much additional produce is thus ordinarily obtained as more than pays for the manure, and the land is, in all respects, left in better condition for the succeeding green crop. In the case both of very light and strong clay soils, we have obtained excellent results by applying a liberal dressing of farm yard dung in autumn to grass-land about to be broken up for oats. By using in this way the dung produced during the summer months, we have obtained abundant crops of oats from portions of land

which, but for this, would have yielded poorly; and, at the same time, by applying the bulky manure at this stage of the rotation, instead of directly for the succeeding green crop, an important saving of time and labour has been effected, as we shall have occasion to notice when treating of turnip-culture.

When the young oat plants have pushed their second leaf, it is always beneficial to use the roller, as it helps to protect the crop from the evil effects of drought, and

1 Agricultural Gazette, 20th November 1852.

facilitates the reaping of it. The oat frequently suffers much from a disease called "'segging" or "tulip root," which appears to be caused by the presence of a maggot in the pith of the stems close to the ground. On land which is subject to this disease it is advisable not to sow early. A. dressing of lime is also believed to be scrviceable as a preventative. On muiry soils this crop is also not unfre- quently lost by what is called "slaying." This seems to result from the occurrence of frosty nights late in spring, when the crop is in its young stage, which, when grown on such soils, it cannot withstand. The application of large dressings of lime to light muiry soils greatly aggravates this tendency to slaying in the oat crop. The only cffectual remedy is to improve the texture of the soil by a good coat- ing of clay. Oats yield about 1 ton of grain and 14 ton of straw per acre.

Section 4.—LRye.

The extensive cultivation of this grain in any country being alike indicative of a low state of agriculture, and of a poor style of living among its peasantry, it must be regarded as a happy circumstance that it has become nearly obsolete in Great Britain. It is still occasionally met with in some of our poorest sandy soils, and patches are occa- sionally grown elsewhere for the sake of the straw, which is in estimation for thatching, for making bee-

hives, and for stuffing horse-collars. Its cultivation as a catch crop, to furnish early food for sheep in spring, is on the increase.

Section 5.—LEeGuMINoUS Crops—Zeans.

The only members of this family statedly cultivated for their grain are beans and pease. Before the introduction of clover and turnips these legumes occupied a more important place in the estimation of the husbandman than they have done since. Indeed, in many districts naturally well adapted for the culture of turnips, that of beans and pease was fora time all but abandoned. Recently, however, increasing precariousness in the growth of clover, and even of turnips, where they have been sown on the same ground every fourth year for a lengthened period, has compelled farmers to return to the culture of beans and pease for the mere purpose of prolonging the intervals in the periodic recurrence of the former crops. But it is found, in regard to the bean itself, in districts where it has long occupied a stated place in rotations of six or seven years, that its average produce gradually diminishes. We have thus an additional illustration of the importance of introducing as great a variety of crops as possible into our field culture. It is on this principle that beans and pease are now again extensively cultivated on dry friable soils. Wintcr beans, or pease of some early variety, are generally preferred in such cases. The grain of these legumes, though partially used for human food, is chiefly consumed by horses and by fattening cattle and sheep. Being highly nutritious, they are well adapted for this purpose. By growing beans on a limited portion of the land assigned to cattle crops, a larger weight of beef and mutton can be produced from a given number of acres, than by occupying them wholly with roots, forage, and pasturage. Several varieties of field beans are cultivated in Great Britian, such as the common horse bean, the tick, the Heligoland, and the winter bean. The latter was introduced into England about the year 1825, and there rises steadily in estimation. It has been tried in many parts of Scotland, and proves quite hardy, but is objected to from the exceeding shortness of its straw. But for this, it is a valuable acquisition, as it ripens so much earlier than the spring-sown varieties. Beans should never be sown on land that is foul. By diligent horse and hand hoeing, land that is clean to begin with can be kept so under beans, and left in fine condition for carrying a white

crops.] wGikkreUunrT U’R E 361

corn crop; but in opposite circumstances it is sure to get into utter confusion. It is found advisable, therefore, to take beans after the white crop that has succeeded roots or a bare fallow. In Berwickshire, where a five-years’ course, consisting of turnips, wheat, or barley, two years’ seeds, and oats, has long prevailed, beans are now not unfre- quently introduced by substituting them for the second year’s grass. A four-years’ course with beans instead of a portion of the seeds is certainly preferable. In cultivating this crop the land is ploughed with a deep furrow in autumn, a dressing of dung being first spread over the surface and turned in by the plough. As early in March as the state of the soil admits, it is stirred by the grubber and harrowed. The seeds are then deposited either in narrow rows 14 inches, or in wider rows 27 inches apart. The latter width has long been preferred in Scotland, because of its admitting of the free use of the plough and the drill-grubber, in addition to the hoe, during the early stages of the plant’s growth, and also from a belief that the free entrance of light and air, of which the wide rows admits, increases the productiveness of the crop. We shall describe both modes of culture, and then state the grounds upon which, after long sharing in the opinion just noted, and following that practice, we now give a decided preference to sowing in narrow rows. In sowing at the wider intervals, the soil, having been prepared as already stated, is formed, by a single turn of the common plough, into shallow drills 27 inches apart. Ten or twelve such drills being formed to begin with, the seed is scattered broadcast, at the rate of 3 bushels per acre, by a sower who takes in six of these drills at a time, and gives them a double cast, or by a drilling-machine, which sows three rows at once. The beans either roll into the hollows as they fall, or are turned in by the ploughs, which now proceed to open each a fresh drill, in going down the one side of the working interval, and to cover in a seeded one in returning on the other side. If tares are cultivated on the farm, it is usual to sow a small quantity (say a peck per acre) amongst the beans, on which they are borne up, and so ripen their seeds better, and yield more abundantly, than when trailing on the ground. When the crop comes to be thrashed the tares are easily separated from the beans by sifting. Ten days or so after sowing, the drills are partially levelled by a turn of the chain harrow; and if the land is cloddy, it is smoothed by a light roller. If showers occur when the bean

plants are appearing above ground, or shortly after, the common harrows may be used again with the best effect in pulverising the soil and destroying newly-sprung weeds. A horse and hand hoeing is then given, and is repeated if weeds again appear. When the plants have got about 6 inches high it is beneficial to stir the soil deeply betwixt the rows by using Tennant's grubber, drawn by a pair of horses. For this purpose the tines are set so close together as to clear the rows of beans, and the horses are yoked to it by a main tree, long enough to allow the horses to work abreast in the rows on either side of the one operated upon. The soil is thus worked thoroughly to the depth of 6 or 8 inches, without reversing the surface and exposing it to drought, or risk of throwing it upon the plants. Just before the blooms appear some farmers pass a bulking- plough betwixt the rows, working it very shallow, and so as merely to move the surface soil towards the plants. This may do good, but a deep earthing up is hurtful. When the blooms open all operations should cease, as otherwise much mischief may be done. Such an amount of culture as has now been described may be thought needlessly costly and laborious, but unless a bean crop is kept clean, it had better not be sown. And it is to be remembered that the benefit of this careful tillage is not

confined to it, but will be equally shared in by the wheat crop that follows. The culture of winter beans differs only in this, that they require to be sown as early in autumn as the removal of the preceding grain crop admits of. When it is determined to sow in 14-inch rows, the seeds are deposited by any of the corn drilling-machines in common use, set for the specified width of rows, or (which we prefer) the soil is formed into narrow ribs or drills by means of the one-horse plough, the seeds are scattered broadcast by hand or machine over this corrugated surface, and they are covered by a double turn of the common harrows, and rolled by a light roller. As soon as the bean plants appear, care must be taken to keep down weeds by diligent hoeing. Two good hoeings will usually suffice, for by the time that the second is accomplished, the crop will speedily so close in as to render any further hoeing impracticable and unnecessary. After repeated trials of these two modes of cultivation, made alongside of cach other, we have found that the produce from the narrow rows has been at the rate of from 4 to 6 bushels more per acre than that from the wide rows, and that the soil has been left decidedly cleaner after the former than after the latter mode. It is

certainly somewhat startling to find results so opposed as these are to preconceived opinion and approved practice. And yet, when the matter is well considered, it becomes obvious enough why it should be so. The wide rows admit of a most effective process of tillage and hoeing up to the time when the beans come into bloom, when, however, it must wholly cease. But when farther culture is precluded, the need for it by no means ceases, seeing that the rows of bean plants usually remain suffi- ciently apart to admit of the continued growth of weeds during the long period which intervenes betwixt the blooming and the ripening of the crop. And hence it happens—especially if the spring prove cold and parching —that although the wide-rowed beans have been kept scrupulously clean up to the time of blooming, their upright habit of growth renders it impossible that they can so close in upon the wide space betwixt the rows, as to preoccupy and overshadow the ground sufficiently to keep it clean during the long period that the crop must neces- sarily be left to its own resources. By sowing in narrow rows the crop is soon in a condition to defend itself against weeds and drought, and hence the saving of labour, the more bulky crops, and the cleaner stubble, which result from sowing beans at 14 rather than 27 inch intervals.

In Scotland the haulm of beans is esteemed au excellent fodder for horses and other live stock, whereas in England it is thought unfit for such a use. The reason of this appears to be, that in the southern counties beans are allowed to stand until the leaf is gone and the stems blackened before reaping; whereas in Scotland they are reaped so soon as the eye of the grain gets black. When well got, the juices of the plant are thus, to some extent, retained in the haulm, which in consequence is much relished by live stock, and yields a wholesome and nutritious fodder. A good crop of beans yields about 1 ton of grain and 14 ton of straw per acre.

Section 6.—Pease.

Pease are sown in circumstances similar to those just detailed, but they are better adapted than beans to light soils. They too are best cultivated in rows of such a width as to admit of horse-hoeing. The early stage at which they fall over, and forbid further culture, renders it even more needful than in the case of beans to sow them only on land already clean. If annual weeds can

be kept in check until the pease once get a close cover, they then occupy the ground so completely that nothing else can live under them ; and the ground, after their removal, is found

in the choicest condition. A thin crop of pease should never be allowed to stand, as the land is sure to get perfectly wild. The difficulty of getting this crop well harvested renders it peculiarly advisable to sow only the early varieties.

Section ‘7.—Other Crops.

The cereals and legumes now enumerated constitute the staple grain-crops of Great Britain. Others are grown occasionally, but more for curiosity than profit. Zealous attempts were made by thc late William Cobbet to introduce maize or Indian corn as one of our regular crops. It has been conclusively proved that none of its varieties yet tried can be ripened in the ordinary seasons of this eountry. It has indeed been suggested that it might form a useful addition to our garden vegetables,—using it, as it is done in America, by cooking the unripe cobs, and also that we might grow it beneficially as a forage crop. Lentiles have recently been grown in different parts of the country; but both of these grains can be imported of better quality, and at less cost, than they can be grown at home.

There is great inducement to agriculturists to endeavour more earnestly to obtain improved varieties of grain by cross-impregnation of existing ones. Something has already been accomplished in this direction, but only enough to show what encouragement there is to persevere. Whenever the same skill and perseverance are directed to the improve- ment of field crops that our gardeners are constantly excrting, with such astonishing results, on fruits, flowers, and vegetables, we may anticipate a great increase of produce, not only from the discovery of more fruitful varieties, but of such as possess a special adaptation to every diversity in the soil and climate of our territory.

Section 8.—Harvesting of Grain Crops, and preparing them for Market.

Several distinct modes of reaping grain are in use. The most ancient, and still the most common, is by the sickle or reaping-hook, which is used either with a smooth or serrated edge. The latter was at one time preferred, as by it the work was performed most accurately. The smooth- edged instrument is, however, now the favourite, as it requires less exertion to use it, and the reaper ean, in consequence, get through more work in a day; and also because in using it the stalks are less compressed, and consequently dry faster when made into sheaves. In some 'parts of England the crops are reaped in a method called tagging or bagging. The cutting instrument used is heavier, straighter, and broader in the blade than the common reaping-hook. The workman uses it with a slashing stroke, and gathers the cut corn as he proceeds by means of a hooked stick held in his left hand. It is a similar process to the mode of reaping with the Hainault scythe—an instrument which has been tried in this country, but never adopted to any extent. The common scythe, especially with that form of handle known as the Aberdeen handle or sned, is very extensively used for reaping grain in all parts of the kingdom. Indeed, the practice of mowing grain has been increasing of late years, and would extend more rapidly but for the greater difficulty of finding good mowers than good reapers. A greater amount of dexterity is required to cut grain well by the scythe than by the sickle. The difficulty lies not in making smooth and clean stubble, but in so laying the swathe as to admit of the corn being sheaved accurately. When the mower lays his swathe at right angles to his line of progress, and the gatherer is skilful and careful, corn may be handled as neatly in reaping by the scythe as by the sickle. When the crops are not much laid or twisted, mowing is somewhat the cheapest of these modes of reaping. Its ehief recom-

mendation, however, is that mown sheaves dry most quickly, and suffer least from a drenching rain. This arises from the stalks being less handled, and so forming an open sheaf, through which the wind penetrates freely. Tightly bound sheaves are always difficult to dry.

In Berwickshire and adjoining counties the reaping of the crops has hitherto been accomplished by employing, at day's wages, such a number of reapers

as suffices to cut down the crops on each farm in from twelve to twenty days. The rate of wages paid to reapers for a number of years has ranged from 2s. 6d. to 3s. 6d. each per diem, with victuals in addition, costing about ewghtpence for each person. In marshalling the band, two rcapers are placed on each ridge of 15 or 18 feet in breadth, with a binder to each four reapers, and a steward, or the farmer in person, to superintend the whole. When the crop is of average bulk, and lies favourably for reaping, each bandwin, or set of four reapers and a binder, clear two acres in a day of ten hours, but 14 to 14 acre only, if it is bulky and lodged. The cost of reaping by this method is therefore from 10s. to 15s. per acre. With a reaping-machine cutting say six acres per diem, and requiring in all ten persons (five men and five women or stout lads) to attend to and clear up after it, at an average wage, including victuals, of 3s. each, and allowing 3s. per diem to cover tear and wear, and interest on its prime cost, there seems a reasonable prospect of a goodly portion of our future crops being reaped for about 6s. per acre. The labour of the horses employed in working the reaper is not included in this estimate, as at this season they would otherwise be idle, and yet eating nearly as much food as when at work. There would thus be a saving in actual outlay of about 5s. per acre. But this is the least important view of the matter. On a Berwickshire farm producing 200 acres of crop, there are usually at least six pairs of horses kept, with a resident population sufficient to yield about thirty persons (including women and youths) available for harvest labour. The stated forces of such a farm will therefore suffice to man three reaping-machines, which, if the weather is favourable, and the crops standing erect or lying in one direction, will cut down the crop in about ten days. When portions of the crop are much lodged and twisted, it becomes necessary to employ part of the labourers in clearing out such portions by the scythe or sickle. It is often possible to manage these awkward-lying portions by setting one or more men, each with a stout staff, to raise up the crop and lay it towards the machine. When two or more machines are used on the same farm, it is best to work them together by cutting the whole length or width of the field in whichever direction the general lay of the crop admits of them working to most advantage. As each machine completes its cut, it returns empty to the side from which it started; and they follow each other at such an interval as gives time to the lifters and binders, who are placed equidistant along the whole line, to keep the course clear. In such cases a man is usually

employed to sharpen the spare knives, to assist in changing them from time to time, and to attend to the oiling and trimming of the whole machinery. It is good economy to have a spare machine at hand ready to put in the place of one that may be disabled by some breakage, and thus avoid interruption to the urgent work of reaping while the damage is being repaired. Great progress has been made in recent years in working these machines skilfully and systematically; they are in general use in all well-cultivated districts, and the time appears to be at hand when the whole grain crops of the country will be reaped by means of them.

It is now agreed on all hands that grain should be reaped before it becomes what is called dead ripe. In the case of wheat and oats, when the grains have ceased to yield a

milky fluid on being pressed under the thumb-nail, and when the ears and a few inches of the stem immediately under them have become yellow, the sooner they are reaped the better. Barley requires to be somewhat more matured. Unless the pink stripes on the husk have disappeared, and the grain has acquired a firm substance, it will shrink in drying, and be deficient both in weight and colour. When allowed to stand till it gets curved in the neck, the straw of barley becomes so brittle that many ears break short off in the reaping, and it then suffers even more than other grain crops under a shaking wind.

Tt is of great consequence to see that corn is dry when it is tied up in sheaves, that these are not too tightly bound, and that every sheaf is kept constantly on foot. . From the increased demand for harvest labourers, and the rapidity with which operations must be carried forward, stooking is not now performed with the same accuracy that it was wont to be. There is therefore the greater need for employing a person to review the stooks daily, and keep every sheaf

erect. It was formerly the practice in Scotland to set up oats and barley in full stooks of twelve sheaves each, viz., five pairs and two hood-sheaves. These hood-sheaves are an excellent defence when wet weather sets in, but they retard the drying of the corn in fine weather, and there are now few

binders who.can set them up so as to stand securely. It is better, therefore, to aim at rapid drying, and for this purpose to have the sheaves small individually, and to set but fowr or six of them together. Large sheaves the worse to dry than small ones, not only from their greater bulk, but from their being almost inevitably tighter bound. The utmost vigilance is required on the part of farmers to avoid this fault. Beans and pease are reaped by the sickle. The former are usually not bound into sheaves at once, but left prostrate in handfuls for a few days until they have withered a little. But it is on the whole safer to stook them as they are reaped. They are then sheaved and bound with ties of twisted straw, which must be provided beforehand. In stacking beans, the tops of the sheaves are kept outwards, as by this means fewer pods are exposed to the weather, or to the depredations of fowls, &c., than when the butts are to the outside. Pease are rolled into wisps as they are reaped, and afterwards turned daily until they are fit to carry. When stacked, they must instantly be thatched, as they take in wet like a sponge. It requires no little discrimination to know when sheaves are dry enough to keep in a stack. The farmer finds it for his profit to consult his most intelligent and experienced labourers on this point. On thrusting the hand into a sheaf sufficiently dried, there is a lightness and kindliness to the touch not easily mistaken when once understood. Whenever this is ascertained, the crop is carried with the utmost possible dispatch. This is best accomplished by using one-horse carts, and by building the sheaves into round stacks of ten or twelve loads each. Very large stacks are for ostentation, not for profit. The labour of pitching up the sheaves to them is needlessly great; corn is much sooner ina state to keep in small stacks than in large ones, and sooner gets into condition for market ; the crop is more accessible for thrashing in ten load quantities than in huge ricks; and the crop of different fields and kinds of grain more easily kept separate. While naming ten or twelve loads as a convenient quantity to put together in each stack, let it be observed that this assumes the sheaves to be in a thoroughly dry condition ; for in wet seasons it frequently happens that the sheaves have a sufficient degree of dryness to keep safely in stacks of five or six loads each, although they will certainly heat if double these quantitics arc put together. Judicious farmers therefore accommodate the size of their stacks to the condition of the sheaves, and are more concerned to

get their crops secured rapidly and safely than to have their stacks of uniform size. For the same reasons, it is often expedient to stack portions of the crop either in the field where it grew or at some convenient site nearer than the homestead, but on the way towards it, and where two carts will suffice to keep each stacker in work. An incidental benefit from having the stacks in detached groups is, that it lessens the risk from fire.

It is always desirable to have the stacks built upon frames or stools elevated 18 or 20 inches from the ground. Besides the security from vermin thus attained, there is a free admission of air to every part, particularly when aided by a triangle of rough timber in the centre, which specdily insures thorough dryness in the whole stack. When stacks are built upon the ground with a mere bedding of straw under them, the grain from the basement tiers of sheaves is often lighter by several pounds per bushel than that from the rest of it. A farmer who has his rick-yard fully furnished with these frames can often carry his crop without risk—when, if built on the ground, it would inevitably heat—and have the grain in condition for market earlier by months than in the latter case. As the stacks are built,

Young's Stack-Stool.

they are thatched without delay. For this purpose, careful farmers provide beforehand ample stores of thatch and straw ropes. The thatch is not elaborately drawn, but merely straightened a little as it falls from the thrashing- mill, tied into large bundles, and built up into stacks, where it gets compressed, and so lies more evenly than if used direct from the mill. A good coating of such thatch secured by straw ropes, interlacing each other in chequers, forms a secure and cheap covering, easily put on by ordinary farm labourers, and possesses, with all its rough- ness, an air of unpretending rustic neatness which har- monises well with surrounding objects, and which we greatly prefer to the elaborate ricks of the southern counties with their shaved sides, combed thatch, and weather-cock a-peak. Apart from its cost, the shaving of stacks is

objectionable, as they then suffer more from a beating rain or snow-drift than when the natural roughness is left upon them, on the same principle

that a coarse, shaggy topcoat shoots off wet better than a smooth broadcloth. A stout two-ply cord made of cocoa-nut fibre, or coir, is coming into use as a substitute for straw ropes in the thatching of stacks,

With proper machinery propelled by steam or water, the

thrashing and dressing of grain is a simple and inexpensive process. to its weight per bushel, its relative value depends much upon its dryness and thorough freedom from chaff, dust, light grain, and seeds of weeds.

As grain is now universally sold with a reference

Farmers who are syste- matically careful in the cultivation, harvesting, thrashing, and dressing of their crops, can always command the best prices of the day. In preparing a parcel of grain for market, it is a good plan to measure a few sacks very carefully, ascertain the average weight of these, and then fill every remaining sack to that weight exactly.

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CHAPTER XII. CULTIVATED CROPS—ROOT CROPS.

Section 1.—Potato.

The events of late years rendcr it necessary to regard this root somewhat differently than was warranted by its previous history. Its value as an article of food, relished alike by prince and peasant, its easy culture, its adaptation to a very wide diversity of soil and climate, and the largeness of its produce, justly entitled it to the high esteem in which it was universally held. Like many other good gifts, it was, however, grossly abused, and diverted from its legitimate use ; and advantage was taken of its amazing productive powers to elevate it from the place of an agreeable, wholesome addition to the daily food of the community to that of “the staff of life.” In Ireland and the Highlands of Scotland, the people, already in a pain- fully degraded

condition, and contented with the potato as their sole food all the year round, took occasion, from its very productiveness, under the rudest culture, to sub- divide their lands, and marry prematurely, with reckless improvidence, and amid an ever-deepening degradation. We know now, from the utter prostration and helplessness into which this wretched population was at once thrown by the memorable potato disease, the terrible penalty which this abuse of "a good gift" has brought directly on the miserable sufferers, and indirectly on the whole com- munity. It will be well if the stern lesson, enforced by famine and pestilence, have the effect of leading to a better social condition. Viewed in this light, the potato disease may yet prove a blessing to the nation. Its continued prevalence, although in a mitigated form, cannot well be regarded otherwise, when we remember the frantic eagerness with which the Irish peasantry replanted their favourite root on the first indication of its returning vigour, and the desperate energy with which they cling to it under repeated disappointments. Apart from this speciality, the precarious health of this important esculent is much to he regretted. It seems contrary to analogy to suppose that it is likely either to be entirely lost or to manifest a permanent lability to disease. It seems more natural to suppose that by-and- by the disease will disappear, or that some efficient remedy for it will be discovercd. Railways afford great facilities for transporting this bulky commodity at little expense to great distances, and thus render the market for it available to a wider district. Apart from disease, this facility of transport would naturally insure its more extended cultiva- tion. This cnlarged cultivation of a crop which, to be grown successfully, requires a soil rich in fertilising matters, has moreover been rendered practicable by the facilities which the farmer now has of obtaining guano and other portable manures.

The varieties of the potato, whether for garden or field culture, are exceedingly numerous, and admit of endless increase by propagating from seeds. It would serve no useful purpose to enumerate here even a selection from the sorts in use in different parts of the country. In Messrs Lawson's Synopsis of the Vegetable Products of Scotland a description of 175 kinds is given, to which the reader is referred for particulars. When the crop is grown for cattle food, bulk of produce will be the primary consideration; but for sale or family use, flavour, keeping quality, and handsome

appearance, will be particularly attended to. Exemption from disease is now a momentous consideration, whatever the use for which it is grown. There is this difficulty, however, connected with selections on the score of healthiness, that while in each season since the disease broke out certain varieties have escaped, it is observed from year to year that the exempted list varies, certain kinds that had been previously healthy becoming as

obnoxious to disease as any, and others in a great measure escaping that had suffered much before. Indeed, certain parties, from observing that diseased tubers left in the ground have produced healthy plants in the following season, have been induced purposely to plant diseased potatoes, and with good results. This, however, is probably due to the mere fact of their being kept in the earth.

In field culture the potato is frequently grown on a portion of the fallow break; but its appropriate place in the rotation is that usually assigned to beans, with which, in an agricultural point of view, it has many features in common, and in lieu of which it may with advantage be cultivated. As the potato requires to be planted as early in spring as the weather will admit of, thus leaving little opportunity for cleaning the land, and as its mode of growth forbids any effective removal of root-weeds by after culture, it is peculiarly necessary to have the land devoted to this crop cleaned in autumn. Winter dunging facilitates the planting, and is otherwise beneficial to the crop by producing that loose and mellow condition of the soil in which the potato delights. The quality of the crop is also believed to be better when the dung is thoroughly incor- porated with the soil, than when it is applied in the drill at the time of planting. A liberal application of manure is necessary if a full crop is expected. The rank growth thus induced renders it, however, more obnoxious to the blight, and hence at present it is more prudent to aim rather at a sound crop than an abundant one, and for this purpose to stint the manure. When it is applied at the time of planting, the mode of procedure is the same as that which will presently be described in the section on turnip culture. The potato sets are prepared a few days before they are expected to be needed. Tubers about the size of an egg do well to be planted whole; and itus a good plan to select these when harvesting the crop, and to store them by themselves, that they may be ready for use without further labour. The larger tubers are cut into pieces having

at least one sound eye in each, although two are better. Itis of great consequence to have seed-potatoes stored in a cool and dry pit, so that if possible they may be prepared for planting before they have begun to shoot. If there has been any heating in the pit, the potatoes are found to be covered by a rank crop of shoots, which are necessarily rubbed off, and thus the most vigorous eyes are lost, and much of the substance which should have nourished the young plant is utterly wasted. A sufficient number of dormant eyes are no doubt left, but from the comparatively exhausted state of the tubers, these produce stems of a weaker and more watery character, and more liable to disease than those first protruded. To avoid these evils, gardeners are at pains to invigorate their seed potatoes and husband their whole powers for early and vigorous growth by greening them in autumn, storing them in a cool place with a current of air passing through it, and then in early spring exposing them to light on a floor, whence they are carefully removed and planted with their short green shoots unbroken. Neither the greening nor the sprouting under cover and in the light can ordinarily be practised on the scale on which the field culture of the potato is conducted. But the important feature in it, viz., so treating potatoes intended for seed that the crop shall be produced from the first and most vigorous shoots, and that these shall obtain the full benefit of the natural pabulum stored up for their use in the parent tuber, should be care- fully considered and imitated if possible in field culture.

The report of the meeting of the Edinburgh Botanical Society, on 8th January 1852, bears that " Professor Simpson communicated the results of some experiments made by himself and Mr Stewart relative to the growth of alpine plants after having been kept artificially covered

with snow in an ice-house for many months. Seeds and plants when kept in this way during winter, and then brought into the warm air of summer, germinate and grow with great rapidity. Mr Stewart had also made experi- ments with animals, and. he found that the chrysalis so treated produced a

moth in eleven days after being brought into the atmosphere, while another chrysalis of the same moth did not do so for three or four months after. In arctic regions the rapid growth of plants during the short summer was well known. Professor Simpson alluded to the importance of similar experiments being made on the different kinds of grain. He referred to the rapidity of harvest in Canada and other countries where the cold lasted for many months, and he was disposed to think that if grain was kept in ice-houses during the winter, and sown in spring, there might be an acceleration of the harvest."

The suggestion for the treatment of seed corn ig cer- tainly deserving of trial; but the known difficulty of hinder- ing the premature germination of potato sets in the ordi- nary method of storing them seems to point to them as the peculiarly appropriate subjects of such an experiment.

Potato drills should not be less than 30 inches wide, nor the sets less than 10 or 12 inches apart in the rows. The usual practice is to take the sets to the field in sacks, which are set down at convenient distances for replenishing the baskets or aprons of the planters. When a large breadth is to be planted, a better way is to have the sets in carts, one of which is moved slowly along in front of the planters. A person is seated in the cart, who has by him several spare baskets which he keeps ready filled, and which are handed to the planters in exchange for empty ones as often as required. 'This greatly economises the time of the planters, and admits of a greater amount of work being accomplished by them ina day. Single-bout drills are quite sufficient, so far as the success of the crop is concerned. So soon as the young potato plants are fairly above ground, the drill- grubber should be set to work and followed up without delay by hand-hoeing. Mr Wallace, North Berwick Mains, a most successful cultivator of potatoes, has for many years taken off all the shoots, save one, from the potato sets as they appear above ground, and the prunings are used in filling up blanks; the result has been that the produce of the sohtary stem is both larger and of more equal size and quality than when the shoots are all left. A turn of the horse-hoe and another hand-hoeing after a short interval are usually required, after which the common practice is to earth up the rows by the double mould-board ploughs. There is reason to believe that this latter practice usually does harm rather than good. It no doubt prevents the

uppermost tubers from getting greened by exposure to the light, but it is believed that the injury inflicted on the roots which spread into the intervals betwixt the rows far more than counterbalances any benefits that result, or have been supposed to result, from this earthing up. After the plants are a foot high, a slight stirring of the surface to keep down weeds is all the culture that is admissible con- sistently with the well-doing of the crop.

When the crop is matured, which is known by the decay of the tops and the firmness of the epidermis when the tubers are forcibly rubbed by the thumb, advantage is taken of every dry day in harvesting the crop. With small plots, the fork is certainly the most efficient implement for raising the tubers; but on the large scale, when expedition 1s of great consequence, they are always unearthed by the double mould-board plough. Alternate rows are split open In the first instance, and then the intervening ones, as the produce of the first is gathered. When a convenient breadth has thus been cleared, a turn of the harrows. is given to uncover such tubers as have been hid from the gleaners at the first going over. This work is now very

generally accomplished by means of a bulking-plough divested of its wings, and having attached to its sole a piece of iron terminating in radiating prongs. This being worked directly under the row of potato plants, unearths the tubers, and spreads them on the surface by one opera- tion. The potatoes are gathcred into baskets, from which they are emptied into carts and conveyed at once to some dry piece of ground, where they are piled up in long narrow heaps and immediately thatched with straw. The base of the heaps should not exceed a yard in width, and should be raised above the surface level rather than sunk below it, as is very usually done. As the dangers to be guarded against are heating and frost, measures must be taken with an eye to both. The crop being put together in as dry and clean a state as possible, a good covering of straw is put on, and coated over two or three inches thick with earth, care being taken to leave a chimney every two yards along the ridge. By thus keeping the heaps dry and secure from frost, it is usually possible, even yet, to preserve potatoes in good condition till spring. Such diseased ones as have been picked out at the gathering of the

crop can be used for feeding cattle or pigs. The fact that pigs fatten apparently as well on diseased potatoes when cooked by steaming or boiling, as on sound ones, is certainly a very important mitigation of this dreaded calamity. There are several varieties of the potato, such as "yams," " lumpers," "mangel-wurzel potato," &c., which, although unfit for human food, are much relished by cattle, and which, from their abundant produce, healthiness, and great fattening quahty, are well deserving of being more generally cultivated for the purpose of being used in combination with turnips and other substances in the fattening of cattle. The turnip crop of recent years has been nearly as much diseased as the potato crop, and as one remedy against " fingers-and- toes" in the former is to let longer intervals of time inter- vene before their recurrence in the same field, and as it has been ascertained that an acre each of beans, potatoes, and turnips will produce more beef than three acres of turnips alone, it is worthy the consideration of those con- cerned whether it would not be prudent to substitute a crop of these coarser potatoes for a portion of their turnip crop on fields or parts of fields that have borne diseased turnips in previous rotations. Eight tons per acre is a good crop of potatoes.

Section 2.—Turnips.

The introduction of turnips as a field crop constitutes one of the most marked epochs in British agriculture. To the present day no better critcrion exists by which to estimate its state in any district, or the skill of individual farmers, than the measure of success with which this or other root crops are cultivated. We have already, in our section upon fallowing, described in detail the process of preparing the soil for drilled green crops. Referring the readcr to what is there said, we now proceed with our description of turnip culture.

Previous to the introduction of bone-dust and guano, farm-yard dung formed, in the majority of cases, the ouly available manure for the turnip crop. It was almost in- variably formed into heaps in the field to which it was to be applied, and repeatedly turned, as great stress was laid on having it well rotted. The introduction of these invalu- able portable manures has, however, not only immensely extended the culture of the turnip, but has materially modified the course of procedure. On the first introduc- tion of

bone-dust the practice was to use the fold-yard dung as far as it would go, and to apply bone-dust alone, in quantities of from sixteen to twenty bushels per acre, to the remainder of the crop. Guano, too, for a time was used to some cxtent on the same principle; but now it is

most satisfactorily proved that whereas very good crops of turnips can be obtaincd by manuring either with dung alone, at the rate of from fifteen to twenty tons per acre, or bones alone, at the rate of sixteen to twenty bushels, or guano alone, at the rate of three or four cwt., much better crops can be obtained by applying to each acre its propor- tion of each of these kinds and quantities of manures. A portion of the bones is now usually applied in the form of superphosphate of lime; and as this substance, and also guano, have a remarkable power of stimulating the growth of the turnip in its earliest stage, forcing it to the state fit for thinning from ten to fourteen days earlier than hereto- fore, there is now no occasion for the dung being in the advanced state of decomposition that was formerly found necessary. When farm-yard dung alone was used, it behoved to be in a soluble state, ready to furnish nourish- ment to the plant from the beginning. But in bringing it to that state a considerable loss is sustained by fermentation, and its bulk is so much reduced that it becomes difficult to distribute evenly the allowance which would be available for each acre, in order to give the whole crop a share of it. This, however, it is most desirable to do, as good farm- yard manure contains in itself the whole elements required by the crop; and hence an additional reason for the plans of applying farm-yard dung which have already been noticed. If that made during the previous summer has been applied in autumn to the lea before ploughing for oats, as far as it will go, and another portion of the con- templated turnip break dunged before the winter furrow, with all that has been made up to that time, and the future accumulations up to April formed into heaps, to be applied in the drills for the latest sowings, the manures produced on the farm may be made to go over nearly the whole breadth under root crops.

In procecding to sow those portions that were dunged before the oat crop and on the stubble, all that is required is to form the drills, and apply the

guano or bones, or mixture of both, by hand. In doing this, ten or twelve drills are set out the evening before, that all may be ready for a good start. The light manure is taken to the ficld in carts, which are unyoked at convenient distances for replenishing the aprons of the young persons (one for each plough) or the machine by which it is distributed along the drills. The sowers of the manure being started on the outside drills, the ploughmen proceed to open fresh ones inside in going, and to cover in the manure by reversing the first formed ridgelets as they return. The seed machine, sowing two rows at a time, follows close up to the ploughs, and thus the work goes rapidly on, each plough getting over from 24 to 3 acres a-day. When farm-yard dung is applied at the time of sowing, the process is the same, except that the drills must be opened somewhat deeper, and that the dung-carts, followed by an adequate number of spreaders, precede the sowers of the light manures. In filling the dung-carts, one able-bodied labourer is required for each plough employed in drilling; and where these amount to three, six spreaders are required to distribute it evenly along the drills. In some districts the double- breasted plough is used in forming the drills and covering in the dung. In the hands of a skilful ploughman that implement does certainly make neater work to look at; but so far as the success of the crop is concerned, the common swing-plough is preferable, for in covering in with it the earth is made to run over the top of the ridgelet, by which means the clods fall into the hollow, and the finest of the mould is left on the top, where the seed is to be deposited. With the double mould-board this cannot so well be done, and the consequence is, that a groove is formed on the top of the ridgelet, in which the small dry clods, carried up by the tail of the mould-board, are left, forming the worst

possible bed for the seed. In parching weather it is usual to pass a light roller over the drills immediately after sowing, to retain the moisture and insure germination. The seed is deposited near the surface, half an inch of mould being a sufficient covering. The quantity sown is 2 Ib per acre of globe or yellow turnip seeds, and 3 to 4 Ib of swedes. Care must be taken that the seed is fresh, so as to have a vigorous and thick plant. Thick sowing

increases the difficulty of thinning out the plants, but it hastens their growth, and diminishes the risk of failure from the depredations of the turnip beetle. The time of sowing in the south of Scotland extends from the begin- ning to the end of May for swedes, and thence to the middle of June for yellows and globes. A partial sowing of yellow or globe is, however, made by careful stock- masters before sowing the swedes, to be ready for use by the end of August or beginning of September, when pasturage fails. Sowings of early varieties, such as the stubble turnip and certain yellow kinds, are also made after winter tares or other catch crops, until the middle of July; but in Scot- land they cannot be sown later than this with advantage, unless for the production of a crop of seed. The average weight per acre of swedes may be stated at 18 tons, and of turnips at 22 tons, but double these rates have occasionally been obtained. Recent experiments go to show that with liberal manuring and early sowing, the weight of the crop is considerably increased by thinning

‘out the plants at wider intervals than has hitherto been

customary. The usual practice in Scotland has been to sow in ridgelets 27 inches apart, with 9 or 10 inches be- twixt the plants. Recent experiments establish the fact that, with 15 inches from plant to plant, much larger bulbs and a greater acreable produce are obtained. As it is ascertained that in the case of swedes the largest bulbs are also the best in quality, it is of the greater consequence to allow them ample room.

The thinning is commenced as soon as the rough leaf is fairly developed. Previous to this operation the horse-hoe is worked betwixt the rows for the double purpose of destroying weeds and facilitating the operation of thinning. This operation is sometimes still farther facilitated by using Huckvale’s machine, which slaps out the rows so as to leave tufts of plants at regular distances apart. The singling of the plants is performed by the hand-hoe. The young persons by whom this work is usually performed advance in echelon with their backs to the untouched work, the steadiest and most expert worker leading the band. This arrangement insures a uniform rate of progress, saves the finished work from being trodden upon, and keeps the workers closely under the eye of the steward. This thin- ning of the rows, so as to leave single plants at regular intervals of 12 to 15

inches apart, is accomplished by an alternate thrusting and drawing motion of the hoe, which a little practice enables the workers to perform with such precision that very rarely do they either make a gap or leave double plants, and still more rarely do they require to stoop down to disentangle them with their fingers. Three of these workers can usually thin an acre in a day. With ordinary care on the part of the overseer, there is no great difficulty in getting the plants left single at proper intervals ; but it is very difficult to get the hoers trained to select and leave only the stoutest plants. And yet so important is this, that, all other things being equal, a difference of two to three tons per acre in the rate of pro- duce has been ascertained to result on comparing rows that had been thinned by a person who took pains to select and leave the best plants, with others on which they had been left indiscriminately. When the plants have rallied after the thinning, and begun to grow rapidly, the usual practice has been to turn a furrow from either side

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a

of them into the middle of the interval by a one-horse plough, and then to level this down by a turn, of the horse- hoc. A great improvement on this practice 1s to use Tennant's grubber instead, adjusted for drill work in the manner already described. By thus using a strong imple- ment drawn by two horses, the soil in the intervals betwixt the rows can be stirred a foot deep if required, without any risk of hurting the young plants, and this, too, is accomplished by a single operation. A second hand-hocing is then given, which usually completes the after culture.

The nature of the soil will generally determine the mode of consuming the crop. On all loose, dry soils, fecding off by sheep is the most profitable plan; whereas on deep, strong loams, it is advisable to withdraw the whole produce, and have it eaten by cattle, as, unless in very favourable weather, when even a fourth is fed off by shecp, the extra manuring does not compensate to the after crops for the injury which they usually sustain from the treading and poaching. On the poorest class of light soils the whole

crop should, if possible, be consumed where it grows by sheep; but on those of a better description, a third, a half, or two-thirds may be withdrawn for the feeding of cattle, according to circumstances. Whatever the proportion left on the ground, care is to be taken to regulate the intervals so as to distribute the treading and droppings of the sheep as equally as possible over the field.

The management of the turnip crop so as that it may be supplied to the live stock in the best possible condition during the entire season, is a point of the greatest import- ance. The portion that is to be used as cattle food is removed from the ground as soon as the crop is suffi- ciently matured, and before the time when drenching rains and severe frosts may ordinarily be looked for. The best way of prescrving turnips is by storing in broad flat heaps, not exceeding 20 inches deep, on some dry and sheltered situation, open to the sun, and covering them with a good coating of straw. It takes less labour to put them together in this way, and less straw to cover them; and being less exposed to frost and parching winds, they retain their juices much better than when stored in long narrow heaps. The pulling of swedes preparatory to stor- ing is much facilitated by passing under them a sharp share, and so cutting across the tap-roots without displacing the bulbs. The thatch of the corn-stacks that are thrashed in autumn is usually reserved for covering turnip heaps. After 1st November it is well to make diligent use of every favourable hour in thus securing the turnip crop.

The portion to be fed off by sheep must necessarily be treated in a different manner. What is to be used after Christmas can be very readily defended against frost by earthing up in the drills with the common plough. But as what is to be consumed by the young sheep must be pulled and trimmed at any rate, in order to be sliced, the best way is to throw the turnips into heaps at regular distances, and cover them with a thin coating of earth. By this means the turnips are kept from running to stems, and the sheep get them clean and fresh, whatever the state of the weather! The same end is secured by opening a trench by a bout of the common plough, into which the turnips from two drills on either side are laid in regular order with their tops uppermost, and the earth turned over upon them by reversing the course of the plough. When wanted for use they are again unearthed by

means of the plough. The feeding qualities of turnips are so seriously impaired by exposure to frost, even when they

u During the unusually wet winter of 1852-53 a large quantity of turnips and swedes intended for cattle food was stored in this way. The trimming and storing was carried on every dry day, and the carting postponed until the occurrence of frost or drought admitted of its being done without injury to the land.

escape actual destruction, that the expense of sccuring them by one or other of these methods is always amply repaid. In very mild winters, again, storing is equally effective in preventing the virtues both of the turnips and the soil from being wasted by the pushing of the sced stems,

The turnip is lable in the early stages of its growth to the attacks of various insects. The most formidable of these enemies is the turnip beetle, which frequently settles upon the plants as soon as they appear above ground in such numbers as totally to destroy the whole of them. The best way of guarding against these nimble adversaries is to endeavour, by careful preparation of the soil, liberal manuring, and thick seeding, to secure a thick plant and rapid growth; for whenever the rough leaf is expanded the risk from this quarter is over. From time to time the young turnip plants are assailed by the larve of certain butterflies and moths, which sometimes appear in such num- bers as to cause serious alarm, but ordinarily their attacks occasion but a slight check to the growth of the crop.

A far more formidable evil is the disease called " fingers and toes," which, although long known, seems to be steadily extending, and has been wider spread and more virulent since 1851 than in previous years. This truly formidable disease sometimes shows itself by the time that the plants are ready for thinning, but more usually it is about the stage when the second hoeing is given that unmistakable indications of its presence are observed. The crop appears in high health, and is making rapid growth, when suddenly, under hot sunshine, numbers of the plants are seen to droop with

flaccid leaves; and examination being made, it is found that the disease has already made serious progress. In some cases it is chiefly confined to the tap-root, which is distorted with knobby excrescences. In others, the roots present a thickened, palmated appearance, giving risc to the popular name for the disease, "fingers and toes;" while in others the lateral roots expand into glandular-looking tubers, which frequently appear partially above ground at distances of several inches from the central stem. For a time all these forms of the excrescences present a smooth healthy looking skin, yielding no trace of the presence of insccts of any kind, either externally or internally. By-and-by the skin cracks over the excrescences, which speedily assume a gangrenous appearance. Indeed, the whole symptoms pre- sent a striking analogy to cancer in the animal system. By the time that the healthy plants are approaching near to maturity, the most diseased ones have usually lost all resemblance to turnips, and there remains on the land a substance like rotten fungus. In very bad cases whole acres together are found in this state, with here and there a sickly distorted turnip still showing a few green leaves. At other times a few only of the plants are wholly destroyed ; the field, to a casual observer, looking not much amiss, though a closer inspection proves that the general crop is of stunted growth, with few plants entirely free from the disease. Such partially diseased roots are not absolutely rejected by sheep, but they are evidently unpalatable and innutritious, while the crop as a whole is more speedily consumed than its general appearance would lead one to expect. When this disease appears on farms that have previously been exempt from it, it is usually confined for a year or two to small patches, which, however, in the absence of remedial measures, steadily and rapidly extend, not only on the recurrence of a turnip crop on the same fields, but over the other parts of the farm. Indced, there are not wanting indications of its being propagated by contagion; as, for instance, when tainted roots are carted into pastures, and the disease shows itself most in those places where they have been consumed, when, in course of rotation, the field comes afterwards to bear a turnip crop. When they are consumed by cattle in fold-yards, the dung

may be the medium of contamination, on the supposition that this conjecture is well-founded. Ploughing land in a wet state evidently

aggravates the disease. We know of one instance where a strip down the middle of a field was ploughed in autumn while soaked by rain, on which wet ploughed portion the turnips were evidently more diseased than over the rest of the field. In another instance which came under our personal observation, a ditch running along part of the top of a field of upwards of 50 acres, was scoured in spring, and the mud spread back over the head-land. The whole ficld was, in the same season, sown with turnips, which proved an excellent crop, entirely free from "fingers and toes," with the exception of that portion of headland on which the mud was spread, where every plant was diseased. Although wholly in the dark as to the nature and propagation of this disease, it is well to know that the judicious application of lime is a certain remedy. In order, however, to its efficacy, it must be applied in a powdery state after the autumn ploughing, and immediately incorporated with the soil by harrowing; or else, as a com- post with earth, spread on the lea before breaking up for oats. We know from experience that a very moderate dose (say four tons of unslaked shells to the acre) applied in this way will suffice to prevent the disease. It is on light soils that its ravages are most frequently experienced, and to these heavy doses of lime are unsuitable. Indeed, whether for promoting the general fertility of soils, or for warding off the attacks of this disease, moderate applications of lime every twelve years or so seem preferable to heavier dressings at longer intervals. The name "fingers and toes" is not unfrequently applied to a distinct disease to which the turnip, in common with the cabbage and other coleworts, is liable—namely anbury or club root. When the knobby excrescence which is found on plants affected by anbury is broken up, it is found to encase a white maggot, whose presence is the obvious cause of the mis- chief. We have seen young cabbages which had begun to droop from clubbing, when pulled up, freed from the parasite, and replanted, regain healthy growth and come to prosperous maturity. In the case of the " finger and toe," the most careful investigation, aided by the microscope, has hitherto failed to detect any insect cause for this disastrous malady.

Section 3.—Mangel-Wurzel.

This root has been steadily rising in estimation of late years. It is peculiarly adapted for those southern parts of England where the climate is too hot and dry for the suc- cessful cultivation of the turnip. A competent authority

declares that it is there easier to obtain 30 tons of mangold than 20 tons of swedes, and that it is not at all unusual to find individual roots upwards of 20 tb in weight. In Scotland it is just the reverse, it being comparatively easy to grow a good crop of swedes, but very difficult to obtain 20 tons of mangold. This plant is very susceptible of injury from frost, and hence in the short summer of Scot- land it can neither be sown so early nor left in the ground so late as would be requisite for its mature growth. These difficulties may possibly be got over either by the selection of hardier varieties or by more skilful cultivation. Its feeding quality is said to be nearly equal to that of the swede; it is much relished by live stock—pigs especially doing remarkably well upon it; and it has the very im- portant property of keeping in good condition till mid- summer if required. Indeed, it is only after it has been some months in the store heap that it becomes a palatable and safe food for cattle. It is, moreover, exempt from the attacks of the turnip beetle. On all these accounts, there- fore, it is peculiarly valuable in those parts of Great Britain where the summer is usually hot and dry—conditions of

climate which are favourable to the mangold and peculiarly unfavourable tothe turnip.

Up to the act of depositing the seed, the processes of pre- paration for mangold are identical with those described for the turnip; winter dunging being even more appropriate for the former than for the latter. The ridgelets being formed 28 inches apart, and charged with a liberal allowance of dung and guano, the seeds are deposited along the top, at the rate of about 4 Ib per acre. The common drilling machines are easily fitted for sowing its large rough seeds, which should be sown from the 10th to the 25th April. The after culture is also identical with that of the turnip. The plants are thinned out at distances of not less than 15 inches apart. Tyansplanting can be used for filling up of gaps with more certainty of success than in the case of swedes. But we find it much more economical to avoid such gaps by sowing a little swede seed along with the mangold. Several varieties of the plant are cultivated-— those in best repute being the orange globe, the long yellow, and the long red. This crop requires a heavier dressing of manure than the turnip to grow it im perfection, and is much benefited by having salt mixed with the manure at the rate of 2 or 3 ewt. per acre. The crop requires to be secured in store heaps as early in autumn as possible, as it is

easily injured by frost. The following graphic descrip- tion of this process is by Mr Morton of Whitfield :—

‘The mode of harvesting our root crop which we have adopted for several years is this: We let the lifting, cutting off the leayes and the roots, and putting the roots into the cart—at so much per acre, according to the weight of the erop—to one man, who gets other men to Join with him in the work and share in the profits; and the arrangement I require to be adopted is, that the one-horse carts, which I employ to haul the roots, shall be constantly employed, and I require from 16 to 20 loads or tons of roots to be filed hourly. The number of earts required is according to the distance of the field from the store; thus the distance from the middle of the field to the store being 15 chains, four carts are required ; 22 chains require five carts ; and 30 ehains require seven carts.

“ The mode of lifting the roots,—Five men are employed to pull up the roots ; each man pulls up two rows; standing between the rows, he takes with his left hand a root from the row on his left side, and with his right hand a root from the row on his right side, and pulling both up at the same time, places them side by side, across the row where he pulled up the roots with his right hand, so as to have the tops lying in the space between the two rows he has pulled up ; the next man takes the two rows at the right hand of the last two rows we have just described, and he, with each of his hands, pulls up a row, and places them on the line of the row whieh he has pulled up with his left hand, with the root end lying towards the rovt end of the first row, so that we have now four rows of roots lying close together in two rows, side by side, with their leaves on the outside of each of these rows, and the roots of each row nearly touching each other ; and every four rows, when growing, are thus, when pulled, laid in two rows, root to root, occupying not more than 27 inches. Now, as the next four rows are lifted in the same way, and placed in like manner, we have a space unoccupied of three times 27 inches, or 6 feet 9 inches between each double row of roots, for the eart to go between them (viz., this double row of bulbs after they have had the leaves and roots eut off), to carry off the bulbs to the store. After the five men who are pulling the roots there follow ten women or boys, with knives made of pieces of old scythes, who, with repeated blows, eut off the leaves and roots without ever moving one. of them with their hands ;*

this is constant but not hard work, and it requires ten active women or boys to keep up with the five men pulling.

“‘Immediately on the heels of the cutters follow the carts between the two double rows of bulbs as they lie, having their leaves and roots cut off; and a man, one of the principals of the gang, and nine young active boys and girls, throw up the bulbs as fast as they can into the cart, the man speaking to the horse to move forward or stop as they clear the ground ; when one cart is full, an empty one has been brought by one of the boys who drive the earts, and plaeed immediately behind the full one ; so that, as he moves off with the full cart, the man calls the horse with the empty cart to move forward, and they proceed to throw the roots into the eart as fast as they did into the one that has just gone off the field.

“The pulling of the roots and the filling of the earts being the principal work, one of the leaders is in each of these departments of

the work ; so that, by his example, he shows those with him how he wishes them to work, and thus the work. proceeds with the utmost regularity and despatch; 20,cart-loads are hourly filled in the fields and delivered in the store ; 180 to 182 loads of 22 cwt. and 23 cwt. each in a day of nine hours; thus a cart-load is filled every three minutes by 10 pairs of hands, which are pulled by five pairs of hands, and the leaves and roots cut off by 10 pairs of hands —in all 25 pairs of hands, men, women, and boys. This has been repeatedly done in a day. ;

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The heaps are carefully thatched, and the spaces betwixt them filled with straw to keep out frost.

It is believed that in many cases crops of turnip and mangold could be more cheaply stored by means of the portable railway than by carts, and with less injury to the land. This is especially the case with clay soils and in wet seasons. In using it, eight drills of roots are trimmed and laid in two rows, as Mr Morton describes; the rails are shifted between the pairs of rows in

succession; and the roots are pitched into light trucks, which a man pushes before him to the headland, where the contents are discharged by tipping. Being there heaped up and thatched, the roots are carted to the homestead as required.

Section 4.—Carrot.

This root, though so deservedly esteemed and univer- sally grown in gardens, has not hitherto attained to general cultivation as a field crop. This is owing chiefly to certain practical difficulties attending its culture on a larger scale. Its light feathery seeds cannot easily be-sown so as to secure their regular germination; the tardy growth of the young plants, and the difficulty of discriminating between them and weeds makes the thinning a troublesome affair; the harvesting of the crop is comparatively expensive; and it is only on sandy and light loamy soils, or those of a peaty character, that it can be grown successfully. The Increasing precariousness in the growth of potatoes, turnips, and clover, and the consequent necessity for a greater variety of green crops, entitle the carrot to increased atten- tion asa field crop. Its intrinsic qualities are, however, very valuable, especially since the introduction of the white Belgian variety. On light soils it is alleged that larger crops of carrots can be obtained than of turnips, and with less exhaustion of their fertility, which is explained as arising from the greater depth to which the carrots descend for their nourishment. This root is eaten with avidity by all kinds of farm stock. Horses, in particular, are very fond of it, and can be kept in working condition with a considerably smaller ration of oats when 20 lb of carrots are given to them daily. It can also be readily kept to an advanced period of spring when stored with ordinary care.

The mode of culture is very similar to that already de- scribed for mangel-wurzel. A usual practice is to prepare the seed for sowing by mixing it with moist sand, and turning the mass repeatedly for several days until germina- tion begins, when it is sown by hand at the rate of 6 tb per acre of the dry seeds, in a seam opened by the coulters of the corn or turnip drill, according as it is wished to have it on the flat or on ridgelets. Some prefer merely to rub the mixture of seeds and sand or mould betwixt the palms, until the seeds are thoroughly separated from each other, and so divested of

their hairs as, when mixed with sand, to run from a drilling machine. It is of the utmost importance to secure seeds of the previous year's growth, as if older their germination cannot be depended upon. Much care is also needed in saving the seed only from selected roots, as

carrots have a decided tendency to degenerate. The white Belgian variety is certainly the best for farm use, not only from the weight of crop, but from its growing more rapidly in its earliest stage than other approved sorts, and showing a broader and deeper coloured leaf, which can more easily be discriminated from weeds, and thus admitting of the earlier use of the hoe. When the sowing and first hoeing and thinning of the crop are got over successfully, the after culture of the crop is very simple; all that is needed being the occasional use of the horse and hand hoe to keep down weeds. The fork must be used in lifting the crop. The greens are then cut off and given to young stock or cows, and the roots stored in long narrow heaps, exactly as mangold. Fifteen tons per acre is an average crop, although on suit- able soils, with liberal manuring and skilful cultivation, double the weight is sometimes obtained. Those who in- tend to cultivate this crop statedly will do well to raise their own seeds from carefully-selected roots. Unless genuine and fresh seed is sown, failure and disappointment can scarcely be avoided.

Section 5.—Parsnip.

This plant bears so close a resemblance to the carrot, and its culture and uses are so similar, that they need not be repeated. It can, however, be cultivated successfully over a much wider range of soils than the carrot, and, unlike it, rather prefers those in which clay predominates. It is grown extensively and with great success in the Channel Islands. The cows there, fed on parsnips and hay, yield butter little inferior, either in colour or flavour, to that produced from pasture. About 10 ib of seed are required per acre. It requires, like that of the carrot, to be steeped before sowing, to hasten germination, and the same care is needed to have it fresh and genuine. It should be sown in April. The roots, when matured, are stored like carrots.

Section 6.—Jerusalem Artichoke.

This root, although decidedly inferior to the potato in flavour, is yet deserving of cultivation. It grows freely in inferior soils, is easily propagated from the tubers, and requires little attention in its cultivation. When once established in the soil, it will produce abundant crops for successive years on the same spot. It is sometimes planted in woods to yield shelter for game, for which purpose it is admirably fitted, as it grows freely under the shade of trees, and yields both food and covert. In properly-fenced woods it might yield abundant and suitable food for hogs, which could there root it at their pleasure, without damage to anything. Where they had mast along with these juicy tubers, they would undoubtedly thrive apace. After they had grubbed up what they could get, enough would be left to reproduce a crop for successive seasons. Such a use of this esculent seems well deserving of careful trial.

CROPS ANALOGOUS TO DRILLED ROOT CROPS. (Sections 7, 8, 9.)

There are several crops which, under a strict classifica- tion, should be noticed among forage crops rather than here, but which, in an agricultural point of view, are so closely analogous to drilled root crops that we regard this as the suitable place in which to notice them.

Section 7.—Cabbage.

On strong rich soils large crops of very nutritious food for sheep or cattle, and of a kind very acceptable to them, are obtained from the field culture of the Drumhead cab- bage. A seed-bed is prepared in a garden, orchard, or other sheltered situation, about the second week in August, either by sowing in rows 12 inches apart, and thinning the plants

about 3 inches in the rows, or broadcast in beds. As early in spring as the land on which the crop is to be grown is dry enough for being worked, let it be thoroughly and deeply stirred by one or more turns of the grubber.

Assuming that a liberal dressing of dung has been put into it at the autumn ploughing, 3 or 4 cwt. of guano are now scattered evenly over the surface and ploughed in by a deep square furrow. A lot of plants being brought from the seed-bed, a band of planters, each provided with a dibble and a piece of rod 27 inches long, proceed to Insert a row of plants the length of the rods apart in each third plough-seam, the result of which is that the plants stand in regular rows 27 inches apart every way, and can afterwards be kept clean by horse and hand hoeing hike any other drilled green crop. Cabbages are much in repute with breeders of rams and prize sheep, which fatten rapidly on this food. Cabbages are usually drawn off and given to sheep on their pastures, or to cattle in byres and yards ; but they are also-fed off, whcre they grow, by sheep, in the same way as turnips. It is an exhausting crop when wholly drawn off, and on this account is sometimes grown with advantage on spots greatly enriched by irrigation with sewage or otherwise, and where the succeeding grain crop is expected to suffer from over-luxuriance, the cabbages being grown, as the phrase goes, to ‘ take the shine out of it.” In favourable circumstances, from 30 to 40 tons per acre of this nutritious crop may be obtained. From what has been said it is evidently not adapted for extensive field culture ; but on most farms a few acres might be grown annually with great advantage. It is a peculiarly suitable food for either sheep or cattle during the autumnal tran- sition from grass to turnips.

Section 8.—Rape.

This plant is peculiarly adapted for peaty soils, and is accordingly a favourite crop in the fen lands of England, and on recently reclaimed mosses and moors elsewhere. Its growth is greatly stimulated by the ashes resulting from the practice of paring and burning. In these cases it is sown broadcast ; but when such soils are brought into a regular course of tillage, it is drilled, and otherwise treated in the same manner as turnips. As we shall consider its culture under the head of ‘ Oil-producing Plants” (chap. xiv. sec. 5), we shall only say further here, that its highly nutritious leaves and stems are usually consumed by folding sheep upon it where it grows, and that there is no green food upon which they fatten faster. Occasionally it is carried to the homestead, and used with other forage in carrying out the system of soiling cattle.

Section 9.—Kohl-Rabi.

This plant has been frequently recommended to the notice of farmers of late years. Like mangold, it is better adapted than the turnip for strong soils and dry and warm climates. It may be either sown on drills in the same manner as the turnip, or sown in a seed-bed and afterwards transplanted. The latter plan is expensive, if it is desired to cultivate the crops to any extent; but is commendable for providing a supply of plants to make good deficiencies in the rows of other crops, or when a small quantity only is wanted. By sowing a plot of ground in March in some sheltered corner, and transplanting the crop early in May, it is more likely to prosper than in any other way. Cattle and sheep are fond of it, and it is said not to impart any unpleasant flavour to milk. We have seen a few trials of it in Scotland as a field crop; but, from whatever cause, the weight of food produced per acre was greatly less than from the mangolds and swedes growing alongside of it. For further information about this plant, the reader is referred to the Book of the Farm, vol. ii. p. 87; Hewlett Davis's

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Farming Essays, p. 90 ; Lawson's Synopsis of the Vegetable Products of Scotland, div. ii. p. 109. Lawson says that the pulp or flesh of kohl has the same taste as the leaves of the cabbage, and hence its adaptation as food for milch cows.

CHAPTER XIII

CULTIVATED CROPS.—HERBAGE AND FORAGE CROPS.

Section 1.—Grasses, dc.

Under this general heading we propose to include what we have to say concerning the grasses, whether natural or cultivated, and those other crops which are grown expressly for the sake of the cattle food yielded by their leaves and stems. This kind of farm produce is either consumed where it grows by depasturing with live stock, or mown and given to them in a

green state under cover, or dried and stored for after use. It thus embraces the cultivation of these crops, and their disposal, whether by grazing, soiling, or haymaking. Following this method, we shall first of all briefly describe the cultivation of those pasture and forage crops which are of best repute in British husbandry.

Tillage lands are now everywhere cropped according to some settled rotation, in which the well-recognised principles of the alternate husbandry are carried out accord- ing to the actual circumstances of each locality. With rare exceptions, such lands at stated intervals bear a crop of the clovers or cultivated grasses. As these are usually sown in mixture, especially when intended for pasturage, the resulting crop is technically called "seeds." Ag it is of importance to have the land clean and in good heart when such crops are sown, they usually follow the grain crop which immediately succeeds the fallowing process. Being for the most part of a lower habit of growth, these can be sown and grown along with white corn crops without injury to either. When the latter are harvested, the former, being already established in the soil, at once occupy it, and grow apace. By this arrangement there is therefore secured an important saving both of time and til- lage. Barley being the crop amongst which the seeds of the clovers and grasses are most frequently sown, and amongst which, upon the whole, they thrive best, it is customary to sow these small seeds at the same time as the barley, and to cover them in with a single stroke of the common harrows. 'This is erroneous practice, both as regards the time and manner of sowing these small seeds. We have already mentioned, in the proper place, that barley should be sown as early in March as possible. Now, if the clovers, &c., are sown as early as this, they are almost certain to get so forward as both to rob the barley of its due share of nourishment, and, when it is reaped, to bulk so largely in the sheaves as to retard their drying, and aggravate the risk of their being ill harvested. It is found, too, that if there be plants enough, the clovers stand the winter better, and ultimately yield a better crop, when, at the reaping of the grain crop, they are puny-looking than when they are very strong. It is better, therefore, to delay the sowing of the small seeds till the end of April or beginning of May. As to the manner of covering them in, we have to remark that the smallness of these seeds and their mode of germinating alike require that they receive only the very slightest covering of soil. This important fact is so well illustrated in the

following table, which exhibits the results of some carefully-conducted experiments, reported to the Highland Society by Mr Stirling of Gleubervie, that we shall here quote it :—

‘ Column I. contains the scientific names. Column IT. contains the average weight of the seeds per bushel in pounds.*

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Column III. contains the average number of seeds in one ounee. Column IV. shows, in inehes, the depth of eover at whieh the reatest number of seeds brairded. Column VY. shows, in inehes, the depth of eover at which only about half the number of seeds brairded. Column VI. shows, in inehes, the least depth of eover at whieh none of the seeds brairded.

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oa 21,000]... = ZS Lotus cornieulatus, 62 28,000}0 to 4] 4to 4] 13 major, . . . 64 51,000 a — i Medieago lupulina, 63 16,000/0 to 41) tol | 14 sativa, as 60 12,600 ni fon An Onobryehis sativa, . 26 1,280} #tol |2 to2}} 4} Petrosalinum sativum, 41 12,800 ae ae ane Bens ee 52 15,600 | tto 4)1}to14] 24 ine, angmusorba }! os | 3.s20| ato #|i4to1g| 4 Trifolium filiforme, 65 54,000}0 to 4) 3$to 4] 1} hybridum, 63 | 45,000}0 to 4] 4to #] 14 pratense, . -| 64 | 16,000]}0 to 4/14 t014| 2 pratense perenne, .| 64 16,000} 0 to 4} 14to14} 2 repens, : 65 32,000} 0 to 4| dto ¢| 13

"The results in the three last columns of the preceding table were obtained by sowing the seed in finely-sifted dark loam, whieh was kept moist throughout the proeess of germination, to which is attributable the eireumstanee of so many of the sorts vegetating best (as shown in Column IV.) without eovering, and under full exposure to the light. The eombination of such fayourable eireumstances of soil and moisture ean, however, seldom be ealeulated upon in field sowing, therefore a eovering of mould for the seeds, however slight, is always advisable. But it will be seen, by the results in Column VI., that a great number of seeds must. be inevitably lost from over-depth of covering, unless the ground be in all eases care-

fully prepared and pulverised before sowing either the natural or artificial grasses,"

From this it is evident that to scatter these tiny seeds over a cloddy surface, and then to harrow it, may more i

' C.D oe 1 Morton's Cyclopedia of Agriculture—article "Grasses," vol. i. p. 999.

aptly be called burying than sowing them. The following is a more rational mode of proceeding :—When these seeds are to be sown among winter wheat, it is expcdient to begin by using the horse-hoe (supposing the wheat to have been drilled), as well to loosen the surface and produce a kindly bed for the seeds as to destroy weeds. In the case of broadcasted wheat, a turn of the harrows secures the same end. In the case of the more recently sown barley all that is needed is to smooth the surface with the one- horse

roller, Over the ground thus prepared the small seeds are distributed by a broadcast sowing-machine, which covers at once a space of 15 or 18 fect in width. The covering is then effected by simply rolling with the smooth roller, or by dragging over the surface the chain- harrow, which may either be attached to the sowing-machine or to a separate frame ; or by using Cambridge's or Crosskill's roller, with a very light chain harrow attached to it. On clay soils the chain-web is to be preferred; but on loose soils Crosskill's roller imparts a beneficial firmness, and, With its tail-piece of chain-web to fill up the indentations, gives an accuracy of finish which rivals the neatness of a newly-raked garden plot. We have long regarded this covering in of grass seeds as the most important use to which Crosskill's valuable implement is put. The only drawback to it is, that it makes a heavy demand on the horse-power of the farm at a pressing season. As it can only be worked in dry weather, it is advisable, when the land is in trim, to work it double tides by means of a relay of horses. This mode of procedure is alike applicable to the sowing of mixed clovers and grasses, and to that of the clovers alone, and is the course usually pursued in sowing for one or two years' " seeds."

When it is intended to lay down arable land to grass for several years, or to restore it to permanent pasture or meadow, it is always advisable to sow the seeds without a corn crop. This doubtless involves an additional cost at the outset, but it is usually more than repaid by the en- hanced value of the pasture thus obtained. To grow the grasses well, the soil should be pulverised to the depth of 3 or 4 inches only, and be full of manure near the surface. There is no better way of securing these conditions than by first consuming a crop of turnips on the ground by sheep folding, and then pulverising the surface by means of the grubber, harrow, and roller, without ploughing it.

Much diversity of practice exists in regard to the kinds and quantities of seeds used in sowing down with a grain crop. In Scotland from 2 to 4 pecks of ryegrass seeds, with from 10 to 14 tb of those of red, white, alsike, and yellow clovers, in about equal proportions, is a common allowance for an acre. A pound or two of field parsley is occasionally added, or rather is substituted for an equal weight of clover seeds. The natural grasses are seldom sown, and only when the land is to be laid to permanent pasture. In

England ryegrass is in much less repute than in Scotland, the clovers being there very generally sown unmixed, and always in larger quantities than we have just named—20 Ib per acre being a common allowance. There can be little doubt that both these plans are faulty.

When a good natural pasture is carefully examined, it is found to consist of an amazing number of different grasscs and other plants. Not only does a natural pasture contain a great variety of herbage at any one time, but it has its plants which replace each other at different seasons; and some also which are prominent only in wet years and others in dry ones. The provision thus made for affording at all times such a variety of food as is at once grateful and whole- some to the animals which browse on it, and for keeping the ground fully occupied under every diversity of seasons and weather, is truly admirable, and the study of it well

fitted to interest and instruct the husbandman. The importance of this subject is beginning to be appreciated by agriculturists; as one proof of which we now sce our leading seedsmen regularly advertising for sale an extensive list of grasses and other pasture plants. Most of them also, for the guidance of their customers, point out the kinds and quantities per acre which are appropriate for diversity of soils and other circumstances. We refer, as an example of this, to the manual of Messrs Lawson of Edin-burgh, who have devoted much attention to this subject. The following Tables will be found useful :—

"J.-For ALTERNATE HUSBANDRY. For 1 year's Hay Forl nears Hay an

For 1 year's Hay. an

lyear's Pasture. 2 years' Pasture. Tb Tb Lolium italicum…..... 9 9 9 PETENNE «....-e esse ees 18 18 18 Dactylis glomerata …..... — 2 2 Phleum pratense …....++ + 1 2 2 Medicago lupulina…..... —_— 1 1 Trifolium hybridum…..... 1 2 2 pratense …..... 8 4 2 pratense perenne — 2 4 TEPENS 00000040000 4 4

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“ For sheep pastures it will often be found advantageous to add from 2 to 4 Ib per acre of parsley seed to the above mixtures; and for pastures in certain upland districts established practice will jus- tify the introduction of an additional pound or two of yellow clover (Medicago lupulina), together with from 2 to 8 tb of ribgrass (Plantago lanceolata). And for very heavy as well as for peaty soils, 1 to 14 tb of Phlewm pratense may be added advantageously, both for hay and pasture.

‘©JJ,—For PERMANENT Pasture, No. I.

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Alopecurus pratensis…….....csscseeeeeeeeeee see eeerteerneerees 2 Dactylis glomerata …….....:scseceeereseceeeeseeeseneneeeenn ees 6 Festuca duriuscula …....0…ccscscssssrssneeseeeeseesnecnenseers 2 GIACION. ... 0+ sostesesinprent enmasindaiciaee terete ta em 2 PTALCMSIS 00… seeeceeeeeceneet ee eeee see eeeeeeanneeeaea ees 2 Wolrumlitalicuties, ..-.c.cssoeceee nese deere tear ee en cee 6 PCTENNC.....cccsss veceeenecceerneet ees eesenees seueeees 8 Phleum pratense. .....cscccseeseceseeeeenseeseeeeeaerseeeea ees 2 Poa nemoralis SemMpervirens…..... 6… eevee ceeeeeee eee aeeees 2 Wu) US eqeteb Ose onnGseGN0 on00 no» sub ongGauAcacEnvODsboononHdAoC 3 Medicago lupulina…. .....:.eeeseeecee eee eeeeertneeteee neces 1 Trifolium pratense…....-sesceeeseeeeceeeeet nnn eeeeeenen erence il PCTENMC ores veces ceeeeeceeaeeeneeeeeeeeeee se eee ree 3

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‘“‘In certain cases the following additions to Table IJ. may be made—namely, 1 to 2 tb each of Festuca rubra and Poa pratensis on dry sandy soils; 1 Tb of Achillea Millefolium, and 1 to 2 Tb of Petrosalinum sativum in sheep pastures; 2 Ib chicory (Cichorium Intybus) in cattle pastures, 6 or 10 tb of Onobrychis sativa and 4 to 6 tb of Poteriwm Sanguisorba (burnet) in dry calcareous soils. When a crop of hay is taken the first year, both the ryegrasses (Loliwm) may be increased by a third; and 2 tb of Trifolium pra-

tense added. Also $ to 1 tb per acre of Anthonanthwm odoratum when occasional crops of hay are to be taken.” +

When land has been thus sown for a permanent pasture, care should be taken not to allow a sheep to set foot upon it for the first two years, for if these industrious nibblers are allowed to crop the tender clover seedlings before they are fully established in the soil, they are certain to remove the crown from most of them, and thus ruin the pasture at the very outset. Innumerable instances of failure in the attempt to obtain good permanent pastures are entirely owing to this premature grazing by sheep. The first growth should therefore be mown, care being taken to do so before

any of the grasses have flowered. Then roll repeatedly,

and stock with young cattle only until the second season is over.

Having described the means to be used for obtaining

wee Cyclopedia of Agriculture—article “ Grasses,’ vol. i. p. :

good pastures, let us now consider how to use them pro- fitably. The art of grazing embraces the practical solution of two important problems, viz., 1st, How to obtain the greatest amount and best quality of herbage from any given pasture; and 2d, How to consume this herbage by live stock so as to make the most of it. The grazier has ever to keep in view what is best for his land and what is best for his stock; and must take his measures throughout the entire season with an eye to both these objects. As regards the first of them, experience yields the following maxims for his guidance :—

Never to stock his pastures in spring until genial weather is fairly established.

Never to allow the grasses to run to seed, nor parts of a field to be eaten bare, and others to get rank and coarse.

Duly to spread about the droppings of the cattle, to remove stagnant water, and to extirpate tall weeds.

Some time about midsummer to make a point of having the pasture eaten so close that no dead herbage or " fog- gage" shall be left on any part of it.

In what more immediately concerns the welfare of the live stock he is in like manner taught in stocking his pastures—

To adapt the stock, as regards breed, size, condition, and numbers, to the actual capabilities of the pasturage.

To secure to the stock at all times a full bite of clean, fresh-grown, succulent herbage.

In moving stock from field to field to take care that it be a change to better fare—not to worse.

Pasturage consists either of natural herbage or of "seeds." In the south-eastern counties of Scotland there is little good old grass; all the really fertile soils being employed in arable husbandry, with the exception of small portions around the mansions of landowners. The pasturage consists, therefore, for the most part of the cultivated clovers and grasses. Comparatively few cattle are there fattened on grass; the object of graziers being rather to stock their pastures with young and growing animals, and to get them into forward condition for bemg afterwards fattened upon turnips. The grazing season is there also much shorter than in England, old grass seldom affording a full bite for a well-conditioned bullock before the middle of May, or later than the middle of September. It is quite otherwise in England, various parts of which abound with old grass lands of the very richest description, on which oxen of the largest size can be fattened rapidly. These, in many cases, admit of being stocked towards the end of April, and under judicious management continue to yield excellent pasturage for half the year. When stocked with cattle in fresh condition, two sets or "'runs" are not unfrequently fattened in such pastures in the same season. These grass-fed cattle begin to come to market early in July, and for four or five months thereafter constitute the chief supplies of beef in our markets.

Cattle already well-fleshed are alone suitable for turning into these rich old pastures. When this is attended to, and care taken not to over-stock the pastures until they yield a full bite, the progress of the oxen will usually be very rapid. It is now customary to hasten this progress by giving about 4 ib of oilcake to each beast daily. The dust and crumbs being sifted out, the bits of cake are strewn upon the clean sward, from whence they are quickly and carefully gleaned by the cattle. This is usually a profitable practice. It brings the beasts forward rapidly, improves their appearance and handling, and, besides enriching the land, admits of about twelve per cent. more numbers being fed upon a given acreage. These choice old pastures are usually occupied in combination with others of inferior quality. The most forward lot of cattle having been fattened and sold off from the former,

they are ready to receive a fresh stock. If it is con- templated to get them also fattened before the expiry of the season, they are not put on the best land instantly on the first lot being sold; but a crowd of sheep or store-

beasts being turned upon it for a few days, the existing

herbage is cleared off, and the pasture (Anglice) "laid in " or (Scottice) "hained," until a fresh clean growth fits it for receiving a suitable number of the best cattle from the other pastures. It is inexpedient to graze sheep promis- cuously with cattle on these best lands, as they pick out the sweetest of the herbage, and so retard the fattening of the oxen. Neither do we approve of having horses among such cattle ; not so much from their interfering with their pasturage as from the disturbance which they usually cause by galloping about. This does not apply to the draught- horses of a farm, which are usually too tired and hungry when turned out from the yoke to mind anything but food and rest, but it is better thrift to soil them ; and frolic- some, mischievous colts are unsuitable companions for sedate, portly oxen. In favourable seasons, the grass often grows more rapidly than an ordinary stocking of cattle can consume it, in which case they select the best places, and allow the herbage on some parts to get rank and coarse. If these rank places are neglected until the herbage gets dry and withered, the finer plants die out, the coarser-growing grasses usurp the ground, and the pasturage is injured for future years. 'To check this evil in time, these

neglected places should be mown, and the grass either brought to the homestead for soiling, or left to dry where it grew; in which statc the cattle will eat up most of it, and be the better for it, especially if their bowels are unduly relaxed by the succulence of the growing herbage. The remarks now made apply equally to all old pastures employed for the fattening of cattle, although not of the first quality. All that is required is, to observe a due proportion between the capabilities of the pasturage and the breed and size of the cattle. A pasture that will fatten a fifty-stone ox may be quite inadequate for one of seventy, and the hardy Galloway or West Highlander will thrive apace where the heavier and daintier shorthorn could barely subsist.

With the exception of the best class of rich old pastures, grass is usually consumed to greater profit by a mixed stock of sheep and store cattle than by one kind of animals only. This holds true both as regards the natural herbage of pastures or water meadows, and cultivated grasses, clovers, or sainfoin. When old pastures and mixed "seeds" are grazed chiefly by sheep, the same rules apply that have already been noticed in connection with cattle. The herbage should if possible be fully established in a growing state, and so far advanced as to afford a full bite, before the pasture is stocked in spring. If the sheep are turned into it prematurely, their close nibbling hinders the plants from ever getting into a state of rapid growth and productiveness, and the necessity imposed upon the stock of roaming over the whole field, and keeping long afoot before they can glean enough to appease their appetite, is prejudicial alike to them and to their pasture. The prudent grazier endeavours to avoid these evils by having stores of swedes or mangolds to last until the full time at which he may reckon on having good pasturage. In distributing the flocks to different fields, the best pasturage is allotted to those that are in most forward condition. It is advan- tageous to have the pastures so subdivided that one portion may be double stocked while another is rested. By fre- quently removing the stock from the one portion to the other the herbage of each by turns gets time to grow and freshen, and is more relished by the sheep, and more whole- some than when the whole is tainted by their uninterrupted occupation of it. In the case of clover, trefoil, sainfoin, and water-meadows, this principle is yet more fully carried

out by folding the flock and giving them a fresh piece daily. The crop is thus eaten close off at once in daily portions, and the plants being immediately thereafter left undisturbed, and receiving over the whole area their due share of the excrements of the flock, grow again more rapidly than when subjected to constant browsing under a system of promiscuous grazing. This plan of folding sheep upon such crops has the same advantages to recommend it as soiling, only that it is cheaper to shift the fold daily than to mow and cart home the forage and carry back the manure. In the case of water-meadows it is the practice to irrigate them afresh as each crop of grass is fed off. This is attended with considerable risk of the sheep getting tainted with rot, which must be guarded against as much as possible. In the first place, it is well to give them a daily allowance of bran, beans, or cake, and salt; and besides this, to put on this land only such sheep as are nearly ready for the butcher. They will thus fatten very rapidly, and be slaughtered before there is time for harm to ensue.

The modes of grazing which we have now described are appropriate for sheep in forward condition. The poorer pastures are usually stocked with nursing ewes and lean sheep bought in from higher grazings. Lambs, both before and after weaning, require clean pastures, and of course frequent changes. If kept on tainted pastures, they are certain to become subject to diarrhoea, to be stinted in their growth, and to have their constitution so weakened that many of them will die when afterwards put upon turnips. To avoid these evils, they must be frequently moved from field to field. A sufficient number of store cattle must be grazed along with them, to eat up the tall herbage and rank patches avoided by the shcep. After the lambs are weaned, the ewes require to fare rather poorly for a time, and can thus be made use of to eat up the worst pasturage, and the leavings of the young and fattening sheep. When the latter, with the approach of autumn, are put upon aftermath, clover stubbles, rape, cabbages, or turnips, their previous pastures should in succession be thickly stocked by the ewes and other store stock, so as to be eaten bare and then left to freshen and get ready for the ewes by rutting-time, when they require better food. In depasturing sheep on poor soils it is usually highly advantageous to give them a daily allowance of grain or cake in troughs, which must be shifted daily, so as to distribute the manure regularly over the land. By means of this auxiliary food shcep can be fattened on land the herbage of which would not alone

suffice for the purpose. It admits also of a larger number of sheep being kept per acre, and of the pasturage being fed off more closely than could otherwise be done. The produce of poor siliceous soils, both in grass and after crops, is much increased by the additional manuring and treading which the con- sumption of such extraneous food upon them occasions.

It is always advantageous to have pastures provided with a shed, under which the stock can find shelter from sudden storms, or from the attacks of insects and the scorching rays of the summer's sun. When such sheds are regularly strewed with dried peat or burnt clay, much valuable compost for top-dressing the pasture can be obtained. The dung of the cattle, thus secured and applied, benefits the pastures more than that which is dropped upon it by the animals. Such clots require to be spread about from time to time.

The temperate climate of Britain is so peculiarly favour- able to the growth of the grasses and other pasture plants, and to the keeping of live stock with safety in the open fields for a large part of the year, that the practice of con- suming these crops by depasturing, as already described, has hitherto been decidedly preferred to soiling. One con-

sequence of this is, that forage crops have been compara- tively neglected. 'There is now, however, a growing conviction among agriculturists that it is more convenient to keep neat cattle and horses, during summer, in yards or loose boxes, and to feed them with succulent forage, mown and brought to them daily as it is needed, than to turn them adrift to browse in the fields. The pasturing plan is preferred by many because it involves the least labour, and is alleged to be more healthful to the amimals. In behalf of the soiling plan it is urged that a given space of ground under green crop keeps nearly twice as much stock, when its produce is mown and consumed elsewhere, than when it is constantly nibbled and trodden upon ; that housed cattle being exempted from the vicissitudes of the weather, the attacks of insects, mutual disturbance, and the labour of gathering their food, eat less and yet fatten more rapidly than they do at pasture; that more good is gotten of their excrements when mixed with litter and trodden down under cover, than when dropped about in the open fields; and that land from

which a green crop has been mown, when ploughed up, is freer of weeds and (other things being equal) bears a better corn-crop than that which has been pastured. It is a further recommend- ation to the soiling plan that it admits of oilcake or meal being administered along with green food with a precision and economy that is unattainable in the pasture fields. There being so many and such cogent reasons in favour of the practice of soiling, we may warrantably anticipate that it will in future be much more generally adopted. It is proper, however, to notice that the success of this system is absolutely dependent on the following conditions:—The green food must be mown and brought home at least ¢wice a-day, owing to the rapidity with which it ferments when put together ; it must be given to the stock not less than four times daily, and only in such quantity at each feed as they can eat clean up in the interval betwixt meals; they must have constant and ample supplies of pure water and of fresh litter ; and, in particular, matters must be so arranged that there shall be an unfailing supply of green forage of the best quality through the entire season. This is accomplished either by successive cuttings of one kind of crop from the same ground—as of irrigated meadow or Italian ryegrass—or by a combination of such crops as naturally come to maturity in succession, or are made to do so by asequence of sowings. rom what has been said it is obvious that soiling can only be carried out successfully with a moderately good soil and climate, a liberal use of manure, and skill and foresight on the part of the farmer. With these, however, its results will usually be highly satis- factory. It is peculiarly adapted for clay soils, on which the culture of root crops is attended with much difficulty, and where there is, therefore, abundance of litter for use in summer, and much need for the soiling system to get it converted into good manure.

Section 2.—Natural Meadow Grass.

In proceeding to notice the crops most usually cultivated in Britain for green forage we shall begin with natural meadow grass. In the south-western parts of England abundant crops of grass are obtained by irrigation with water alone. Our remarks will here, however, be re- stricted to those situations where sewage from towns or villages is available. Wherever a few scores of human families are congregated together, and have their dwellings properly drained and supplied with water, there is an

opportunity for manuring a considerable extent of meadow with the sewage-water accruing from them throughout the year. 'The celebrated meadows in the environs of Edin- burgh are interesting illustrations of the value of such water for irrigating purposes, and of the astonishing bulk

of rich herbage which can be obtained in the course of a year from an acre of land thus treated. From the thick- ness of the crop in these meadows, and the rank luxuriance of its growth, the grass must be cut before it exceeds ten inches in height, as otherwise the bottom gets blanched and the grass rots out. The mowing begins usually in April and continues till November, so that by fitly pro- portioning the head of stock to the extent of meadow, and having the latter arranged in plots to be mown in regular succession, soiling can be practised throughout the season by the produce of the meadow alone. This practice is necessarily limited to situations where sewage-water is available. The following excerpts from a paper read before the Royal Scottish Society of Arts in January 1867 On the Collection, Removal, and Disposal of the Refuse of the City of Edinburgh, by Charles Macpherson, C.E., burgh engineer, to which the society's silver medal was awarded, will explain this system and exhibit its results :—

"The waters of the Craigentinny Burn, the Lochrin Burn, the Jordan Burn, and the Broughton Burn, are used in irrigating part of the lands adjoining the course of the respective streams. 'The waters of the Craigentinny Burn are used for irrigating about 250 acres; Lochrin Burn, about 70 acres; Jordan Burn, about 11 acres; and Broughton Burn, about 5 acres—being 336 acres in all irrigated by the water flowing in these four natural outlets for the drainage of Edinburgh.

"The area within the city draining towards the Craigentinny Burn —to the meadows irrigated by the waters of which I shall confine these remarks—is about one square mile and a half in extent. From this district there flows about 20 cubic feet of spring-water pcr minute; the surplus rainfall being the a portion of 24 inches per annum; and the sewage from a population of 95,589 persons, according to the census of 1861, with a water supply of say

25 gallons per head. Of this population about 60,000 have the use of water-closets ; and excrementitious matter from about 15,000 or 20,000 of the remainder finds its way to the sewers connected with the burn at the rate of about 265 feet per minute of sewage.

“ Various kinds of soil are oy Se The subsoil of the part of the meadows nearest the city is peat, with loam over it near the course of the burn; while to the northward it is naturally sand, but the sand has becn taken away, and the ground made up with rubbish of buildings, &c., dressed off with soil. Further down the course of the stream the soil is reddish clay, or loamy clay, or sandy clay ; while at the part of the Figgate Whins adjoining the sea-shore it is pure sand, with a coating of rich loam, varying from 1 inch to 4 or 5 inches deep, entirely derived from repeated applications of the sewage, no soil having been ever spread over the sand. The deeper soil is nearest the channels for conveying the sewage to the land. The meadows on the farm of Lochend, at Restalrig, and at Craigen- tinny, have a slope transversely to the course of the stream, varying from the steepest part, 1 in 25, which is of small extent, to about 1 in 50, which is the slope of the greatest part of these meadows. The Figgate Whins were artificially levelled to allow of irrigation.

“It is importaut to remark that the land (except the sand at the Figgate Whins) has been drained thoroughly to a depth of 4 feet below the surface. It was found that with shallower drains the sewage was drawn off by the drain, leaving the lower part of the

ound without irrigation. At the Figgate Whins the sewage soaks into the sand, and oozes out upon the sea-shore.

“The kinds of grasses grown are Italian ryegrass and meadow grass. The ryegrass requires to be resown every third year; but the meadow grass has not required resowing, not even on the Figgate Whins, which were sown about forty years ago, when the ground was first irrigated. Opinions differ as to which grass is best adapted for the purpose; but ryegrass seems to produce the heavier crops. The irrigated ground is let off in small plots or squares for the season to the highest bidder. The grass is cut by the tenant as required, so that the annual yield of any particular plot has never been accurately ascertained ; but an average crop is considered to be from 80 to

40 tons per acre, in four cuttings. The first cutting takes place at the beginning of April, and the last at the end of September, the let of the ground expiring at 1st October. The time of cutting the intermediate crops depends upon the wants of the tenant.

“The whole grass iseaten by about 3100 cows—the number previous to the cattle plague—in Edinburgh, Newhaven, Leith, and Portobello ; but after the fourth crop is cut, sheep are turned on some parts of the ground about the beginning of November, and remain for about a fortnight, should the weather be favourable. The sheep do not seem to thrive, however, although the food is plentiful. The grass has been found most suitable for feeding cows—the attempts to use it for feeding other animals having been found not to answer, and

the cost of converting it into hay being proved to be such as to render the process unprofitable.

“‘The price paid for the plots varies considerably, the best being

nown to bring £40 per acre, while others are as low as £15 or £20. Tast scason, nae ci the cattle plague, the former high prices could not be obtained. The best land produces the heaviest crop ; but on the Figgate Whins, mere irrigated sand, the first crop is earlier in the season—a matter of such consequence that, although the annual yield is less, the rent paid for these plots is about as high as for the plots producing the heavier crop. ‘he rental of the Figgate Whins previous to the irrigation was, I have been informed, about 20s. per

acre; while, when irrigated, parts have been let for some years at

£40 per acre. The only works having becn the levelling of the

sandy hillocks and formation of channels for the sewage—neither

of them very costly operations—and the annual outlay being small, the increased annual value of that land may be stated at not much less than the

difference between the two sums.

‘Jt might be an interesting speculation to consider how far the cost of the works necessary for collecting and removing the sewage

from the district of the city draining towards Craigentinny might

have been defrayed by the advance of rent obtained by the disposal of the sewage in irrigating the land along the course of the stream. The cost of the whole sewerage works (including many of the branch drains) constructed within the district in the city which is drained

to the Craigentinny Burn, may be stated at £96,000. Assuming

that the annual rent of the 250 acres irrigated was £5 per acre on

an average previous to being laid out for irrigation, while the rent

was raised to £25, then the difference, £20 per acre, is the annual value of the irrigation. There being 250 acres, gives £5000 as the return, or upwards of 5 per cent. on the cost of the sewers. ;

‘The produce of the various irrigated meadows round Edinburgh is sufficient to supply the present demand for grass; necessitating any further application of the sewage to some other kind of crop, unless a more extensive market is obtained for the grass produced.”

Section 3.—Italian Ryegrass.

Italian ryegrass can be cultivated over as wide a range of soils and climate as any forage crop which we possess, and its value for soiling is every day getting to be more generally appreciated. When first introduced, and indeed until very recently, it was chiefly sown in mixture with other grasses and clovers for pasturage, a purpose to which it is well adapted from its early and rapid growth in spring. Its true function, however, is to produce green food for soiling, for which purpose it is probably unrivalled. It is in connection with the system of irrigation with liquid manure that its astonishing powers have been most fully developed. When grown for this

purpose it is sown in April, on land that has borne a grain crop after turnips or summer fallow. If sown with a grain crop as thickly as is requisite, it grows to nearly the height of the grain, and both are injured. A liberal dressing of farm-yard dung is spread upon the stubble in autumn, and immediately ploughed in. In the end of March or beginning of April the land is prepared for the seed by being stirred with the grubber and then well harrowed. The seed, at the rate of 4 bushels per acre, is then sown in the way already described for clover and grass seeds. When the liquid manure system is practised, the crop is watered as soon ag the young plants are about an inch high, and so rapid is its growth in favourable circumstances that a cutting of 10 tons per acre has in some cases been obtained six weeks after sowing. When there is no provision for supplying liquid manure, a top-dressing of guano, nitrate of soda, soot, or the first two articles mixed, is applied by hand-sowing, carc being taken to give this dressing when rain seems at hand or has just fallen. A similar top-dressing is repeated after each cutting, by which means three cuttings are ordinarily obtained from the same Space in one season. A very great quantity of stock can thus be supported from a very

mited extent of ground. This grass is also found to be very grateful to the palates of horses, cattle, and sheep, which all thrive upon it. Though so very succulent, it does not produce purging in the animals fed upon it. It 1s peculiarly suitable feeding for milch cows, as appears from the published account at Canning Park. Such results

as those obtained by Mr Kennedy and others are not to be expected unless under similar conditions; but on good loams, clean and in good heart, and under such treatment as is described at the beginning of this section, as large crops of this grass as of red clover may be reckoned on, with at least equal feeding powers, and with a degrce of certainty which the farmer cannot now entertain in regard to the latter crop. If it is regularly mown when the ear begins to show, and care taken never to allow the seed to form, it is fully ascertained that this grass will grow abundantly for a second year, with the advantage of being ready for use very much earlier than in its first season. It is sometimes sown in autumn, but those who have had the fullest experience in its cultivation give a decided preference to spring sowing, either after a grain crop which has followed a green crop or

fallow, or at once after turnips. It is of great import- ance to get fresh and genuine seed. That directly imported from Italy yields the best crop when otherwise good. As a proof of the fondness of sheep for this grass, it has been observed that when it had been sown in mixture with red clover and cut for hay, sheep, on being turned into the aftermath, eat down the Italian ryegrass in preference to the clover.

Section 4.—Crimson Clover.

Crimson clover, though not hardy enough to withstand the climate of Scotland in ordinary winters, is a most valuable forage crop in England. It is sown as quickly as possible after the removal of a grain crop at the rate of 18 ib to 20 tb per acre. It is found to succeed better when only the surface of the soil is stirred by the scarifier and harrow than when a ploughing is given. It grows rapidly in spring, and yields an abundant crop of green food, peculiarly palatable to live stock. It is also suitable for making into hay. Only one cutting, however, can be obtained, as it does not shoot again after being mown.

Section 5.—Red Clover.

This plant, either sown alone or in mixture with ryegrass, has for a long time formed the staple crop for soiling ; and so long as it grew freely, its power of shooting up again after repeated mowings, the bulk of crop thus obtained, its palatableness to stock and fecding qualities, the great range of soils and climate in which it grows, and its fitness either for pasturage or soiling, well entitled it to this pre- ference. Except on certain rich calcareous clay soils, it has now, however, become an exceedingly precarious crop. The seed, when genuine, which unfortunately is very often not the case, germinates as freely as ever, and no greater difficulty than heretofore is experienced in having a full plant during autumn and the greater part of winter 3 but over most part of the country, the farmer, after having his hopes raised by seeing a thick cover of vigorous-looking clover plants over his field, finds to his dismay, by March or April, that they have either entirely disappeared, or are found only in capricious patches here and there over the field. No satisfactory explanation of this clover failure has yet been given, nor any certain remedy, of a kind to be applied to the soil, discovered. One important fact is, however, now well established, viz.,

that when the crop- ping of the land is so managed that clover does not recur at shorter intervals than eight years, it grows with much of its pristine vigour. The knowledge of this fact now determines many farmers in varying their rotation so as to secure this important end. At one time there was a somewhat prevalent belief that the introduction of beans into the rotation had a specific influence of a beneficial kind on the clover when it came next to be sown ; but the true explanation seems to be, that the beans operate favour-

ably only by the incidental circumstance of almost neces-

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sarily lengthening the interval betwixt the recurrences of clover.

When the four-course rotation is followed, no better plan of managing this proccss has been yet snggested than to sow beans, pease, potatoes, or tares, instead of clover, for one round, making the rotation one of eight years instead of four. The mechanical condition of the soil seems to have something to do with the success or failure of the clover crop. We have often noticed that head-lands, or the converging line of wheel tracks near a gateway at which the preceding root crop had been carted from a field, have had a good take of clover, when on the field generally it had failed. In the same way a field that has been much poached by sheep while consuming turnips upon it, and which has afterwards been ploughed up in an unkindly state, will have the clover prosper upon it, when it fails in other cases where the soil appears in far better condition. If red clover can be again made a safe crop, it will be a boon indeed to agriculture. Its seeds are usually sown along with a grain crop, any time from Ist February to May, at the rate of 12 tb to 20 ib per acre when not com- bined with other clovers or grasses.

Italian ryegrass and red clover are now frequently sown in mixture for soiling, and succeed admirably. It is, how- ever, a wiser course to sow them separately, as by substi- tuting the Italian ryegrass for clover, for a single rotation, the farmer not only gets a crop of forage as valuable in all respects, but is enabled, if he choose, to prolong the in- terval betwixt the

sowings of clover to twelve years, by sowing, as already recommended, pulse the first round, Italian ryegrass the second, and clover the third.

These two crops, then, are those on which the arable- land farmer mainly relies for green forage. To have them good, he must be prepared to make a liberal application of manure. Good farm-yard dung may be applied with advantage either in autumn or spring, taking care to cart it upon the land only when it is dry enough to admit of this being done without injury. It must also be spread very evenly so soon as emptied from the carts. But it is

usually more expedient to use either guano, nitrate of soda,

or soot, for this purpose, at the rates respectively of 2 cwt., 1 cwt., and 20 bushels. If two or more of these substances are used, the quantities of each will be altered in proportion. They are best also to be applied in two or three: portions at intervals of fourteen to twenty days, beginning towards the end of December, and only when rain seems imminent or has just fallen.

When manure is broadcast over a young clover field, and presently after washed in by rain, the effect is identical with that of first dissolving it in water, and then distribut- ing the dilution over the surface, with this difference, namely, that the first plan costs only the price of the guano, d&c., and is available at any time and to every one, whereas the latter implies the construction of tanks and costly machinery.

Section 6.— Vetches.

Vetches are another very valuable forage crop. Being indigenous to Britain, and not fastidious in regard to soil, they can be cultivated successfully under a great diversity of circumstances, and are well adapted for poor soils. By combining the winter and spring varieties, and making several sowings of each in its season at intervals of two or three weeks, it is practicable to have them fit for use from May till October, and thus to carry out a system of soiling by means of vetches alone. But it is usually more expedient to use them in combination with grass and clover, beginning with the first cutting of the latter in May, taking the winter vetches in June, recurring to the Italian ryegrass or clover as the second cutting is ready, and

afterwards bringing the spring vetches into use. . Each crop can thus be used when in its best state for cattle food, and so as gratefully to vary their dietary.

Winter Vetches.—There is no botanical difference between winter and spring vetches, and the seeds being identical in appearance, caution is required in purchasing seed to get it of the right sort. Seed grown in England is found the most suitable for sowing in Scotland, as it vegetates more quickly, and produces a more vigorous plant than that which is home-grown. As the great inducement to cultivate this crop is the obtaining of a supply of nutritious green food which shall be ready for use about the Ist May, and so as to fill up the gap which is apt to occur betwixt the root crops of the previous autumn and the ordinary summer food, whether for grazing or soiling, it is of the utmost importance to treat it in such a way that it may be ready for use by the time mentioned. To secure this, winter tares should be sown in August if possible, but always as soon as the land can be cleared of the preceding crop. 'They may yield a good crop though sown in October, but in this case will probably be very little in advance of early-sown spring vetches, and possess little, if any, advan- tage over them in any respect. The land on which they are sown should be dry and well sheltered, clean, and in good heart, and be further enriched by ploughing into it from 12 to 15 loads of farm-yard manure. Not less than 34 bushels of sced per acre should be sown, to which some think it beneficial to add half a bushel of wheat. Rye is frequently used for this purpose, but it gets reedy in the stems, and is rejected by the stock. Winter beans are better than either. The land having been ploughed rather deeply, and well harrowed, it is found advantageous to deposit the seed in rows, either by a drilling-machine or by ribbing. The latter is the best practice, and the ribs should be at least a foot apart and rather deep, that the roots may be well developed before top-growth takes place. As soon in spring as the state of the land and weather admits of it, the crop should be hocd betwixt the drills, a top-dressing at the rate of 40 bushels of soot or 2 cwt. of guano per acre applied by sowing broadcast, and the roller then uscd for the double purpose of smoothing the surface so

as to admit of the free use of the scythe, and of pressing down the plants which may have been loosened by frost. It is thus by early sowing, thick seeding, and liberal manuring, that this crop is to be forced to an early and abundant maturity. May and June are the months in which winter vetches are used to advantage. A second growth will be produced from the roots if the crop is allowed to stand; but it is much better practice to plough up the land as the crop is cleared, and to sow turnips upon it. After a full crop of vetches, land is usually in a good state for a succeeding crop. When the whole process has been well managed, the gross amount of cattle food yielded by a crop of winter vetches, and the turnip crop by which it is followed in the same summer, will be found consider- ably to exceed what could be obtained from the fullest crop of turnips alone, grown on similar soil, and with the same quantity of manure. It is vain to sow this crop where game abounds.

Spring Vetches, if sown about the Ist of March, will be ready for use by Ist July, when the winter vetches are just cleared off. To obtain the full benefit of this crop, the land on which it is sown must be clean, and to keep it so a much fuller allowance of seed is required than is usually given in Scotland. When the crop is as thick set as it should be, the tendrils interwine, and the ground is covered by a solid mass of herbage, under which no weed can live. To secure this, not less than 4 bushels of seed per acre should be used if sown broadcast, or 3 bushels if in drills. The latter plan, if followed by hoeing, is certainly

the best ; for if the weeds are kept in check until the crop is fairly established, they have no ehance of getting up afterwards. With a thin crop of vetches, on the other hand, the land is so certain to get foul, that they should at once be ploughed down, and something else put in their place. As vetches are in the best state for use when the seeds begin to form in the pods, repeated sowings are nade at intervals of three weeks, beginuing by the end of February, or as early in March as the season admits, and continuing till May. The usual practice in Scotland has been to sow vetches on part of the oat break, once ploughed from lea. Sometimes this does very well, but a far better plan is to omit sowing clover and grass seeds on part

of the land occupied by wheat or barley after turnips, and having ploughed that portion in the autumn to occupy it with vetches, putting them cnstead of "seeds" for one revolution of the course.

When vetches are grown on poor soils, the most pro- fitable way of using them is by folding sheep upon them, a practice very suitable also for clays, upon which a root erop cannot safely be consumed in this way. A different course must, however, be adopted from that followed when turnips are so disposed of. When sheep are turned in upon a piece of tares, a large portion of the food is trodden down and wasted. Cutting the vetches and putting them into racks does not much mend the matter, as much is still pulled out and wasted, and the manure unequally dis- tributed over the land. To avoid those evils, hurdles with vertical spars, betwixt which the sheep can reach with head and neck, are now used. These are set close up to the growing crop along a considerable stretch, and shifted for- ward as the sheep eat up what is within their reach. This requires the constant attention of the shepherd, but the labour is repaid by the saving of the food, which being always fresh and clean, does the sheep more good. A modification of this plan is to use the same kind of hurdles, but instead of shifting them as just described, to mow a swathe parallel to them, and fork this forward within reach of the sheep as required, repeating this as often during the day as is found necessary, and at night moving the sheep close up to the growing crop, so that they may lie for the next twenty-four hours on the space which has yielded food for the past day. During the night they have such pickings as have been left on the recently-mown space, and so much of the growing crop as they can get at through the spars. There is less labour by this last mode than the other, and having practised it for many years we know that it answers well. This folding upon vetches is suitable either for finishing off for market sheep that are in forward condition, or for recently-weaned lambs, which, after five or six weeks' folding on this clean, nutritious herbage, are found to take on more readily to eat turnips, and to thrive better upon them, than if they had been kept upon the pastures all the autumn. Sheep folded upon vetches must have water always at command, otherwise they will not prosper.

As spring-sown vetches are in perfection at the season when pastures usually get dry and scanty, a common practice is to cart them on to grass

land and spread them out in wisps, to be eaten by the sheep or cattle. It is, however, much better either to have them eaten by sheep where they grow, or to cart them to the homestead.

Section 7.—Beans.

_ The common field bean has not hitherto been recog- nised as an available forage plant. Mr Mechi has, we believe, the merit of first showing its great value for this purpose. In the hot dry summer of 1868, when pastures utterly failed, and men were at their wits' end how to keep their stock in life, he had recourse to his bean crop, then at

its full growth, and its green pods filled with soft pulse. His plan of using it was, to mow the needed quantity daily, pass it through a chaff-cutter, and then send it out in troughs to his sheep in their pastures, and to his cattle in their stalls. The quantity of green food per acre yielded by a full crop of beans when used in this way is very great, and probably exceeds that of any other crop we grow. As Mr Mechi observed, on first announcing his practice, "no farmer need to be at a loss for food for his live stock who has a crop of beans at command." We know that many farmers availed themselves of this seasonable hint with the very best results. That pre-eminently successful grazier, Mr William M'Combie, M.P., Tillyfour, has, in his instructive pamphlet, shown how useful it is to have a few acres of mixed beans, peas, and tares ready to give to cattle in forward condition in the month of August, by laying down to them daily on their pastures a supply of this very palatable and nourishing forage. By this ex- pedient they make rapid progress at a season when they would lose the condition they had already gained if left dependent on the then failing pasturage. We can testify from experience that we never have our cattle make such rapid progress on any kind of food as when thus supplied with green pulse on autumn pastures.

Section 8.—Mustard.

After a crop of vetches has been consumed, if the season is too far advanced to admit of turnips being sown, it is not unusual to take a crop of white mustard or crimson clover.

By means of the crops now enumerated, the practice of soiling can be carried out in all cases where it is practicable.

There are other valuable crops of this kind, several of which we shall now describe ; but their culture is either limited by their requirements in regard to soil and climate, or attended with too great expense to admit of their eom- peting with those already described.

Section 9.—Sainfoin.

This very important forage plant would be well entitled to a more prominent place in our list but for the circum- stance that it is only on dry calcareous soils that its excellences are fully developed ; and to these, accordingly, its culture may be said to be confined. In all the chalk districts of England sainfoin occupies an important place in the rotation of crops. Referring to the chalky downs round Isley in Berks, Mr Caird says :—" About a tenth part of the land is kept under sainfoin, in which it remains for four years, being each year cut for hay, of which it gives an excellent crop. A farmer having 40 acres of saiufoin sows out 10 acres and breaks up 10 acres annually. This goes regularly over the whole farm, the sainfoin not returning on the same field for considerable intervals, and when its turn comes round the field receives a rest of four years from the routine of cultivation. It is then ploughed up in spring, and sown with oats on one furrow, the crop of which is generally excellent, as much as 80 bushels an acre not being uncommon."! The seed, at the rate of 4 bushels per acre, is drilled in immediately after barley or oats has been sown, working the drill at right angles to its course when it deposited the grain. It is frequently pastured for one or more years before being mown either for green forage or for hay. It is sometimes allowed to stand for eight or ten years, but the plan described in the above quotation is the more approved one. A variety called giant sainfoin has been introduced by Mr Hart of Ashwell, Herts. As compared with the common sort it is more rapid in its growth in

1 Caird's English Agriculture, p. 114. I. — 48

spring, and still more so after the first and second cuttings. Three cuttings for hay, and one of these ripening the seed, have been yielded by it in one year, and a good eddish after all. 'The yield from it in the first year after sowing is large in comparison with the common sainfoin, from its attaining maturity much sooner ; but for the same reason it is thought judicious to break it up after three years, while still in vigour.

Section 10.—Lucerne.

Lucerne is much cultivated as a forage crop in France and other parts of the continent of Europe, but has never come into general use in Britain. It is, however, frequently met with in small patches in districts where the soil is very light, with a dry subsoil. Its thick tap-roots penetrate very deeply into the soil; and if a good cover 1s once obtained, the plants will continue to yield abundant cuttings of herbage for eight or ten years, provided they are statedly top-dressed and kept free from perennial weeds. In cultivating lucerne, the ground must first be thoroughly cleaned, and put into good heart by consuming a turnip crop upon it with sheep. In March or April, the surface- soil having first been brought to a fine tilth, the seed, at the rate of 10 tb per acre, is sown in rows 15 to 18 inches apart. As soon as the plants appear they must be freed from weeds by careful hoeing and hand-weeding, repeated as occasion requires. Little produce is obtained from them the first season, and not a very heavy cutting the second; but by the third year two or more abundant crops of herbage will be produced, peculiarly suitable for horse- feed. It is the slow growth of the plants at first, and the difficulty of keeping them free from weeds on those dry soils which alone are adapted for growing lucerne, that have deterred farmers from growing it more extensively than has hitherto been done. We have grown it success- fully in Berwickshire on a muiry soil resting on sandstone rock, in an exposed situation, at an elevation of 400 feet. The time to cut it is, as with clover and sainfoin, when it is in full flower.

Section 11.—Chicory, ke.

Chicory, burnet, cow-parsnip, and prickly comfrey, all known to be palatable to cattle and yielding a large bulk of produce, have probably been

less carefully experimented with than their merits deserve. Although they have long figured in such notices as the present, or in occasional paragraphs in agricultural periodicals, they have never yet, that we are aware of, been subjected to such a trial as either conclusively to establish their claim to more extended culture, or to justify the neglect which they have hitherto experienced.

Section 12.—Gorse or Whan.

Notwithstanding its formidable spines, the young shoots of this hardy evergreen yield a palatable and nutritious winter forage for horses and cattle. To fit it for this purpose it must be chopped and bruised to destroy the spines. This is sometimes done in a primitive and laborious way by laying the gorse upon a block of wood and beating it with a mallet, flat at one end and armed with crossed knife-edges at the other, by the alternate use of which it is bruised and chopped. There are now a variety of machines by which this is done rapidly and efficiently, and which are in use where this kind of forage is used to any extent. The agricultural value of this plant has often been over-rated by theoretical writers. In the case of very poor, dry soils, it does, however, yield much valuable food at a season when green forage is not otherwise to be had. It is on this account of importance to dairymen; and to them it has this further recommendation, that cows fed

upon it give much rich milk, which is free from any unpleasant flavour. To turn it to good account, it must be sown in drills, kept clean by hoeing, and treated as a regular green crop. If sown in March, on land fitly pre- pared and afterwards duly cared for, it is ready for use in the autumn of the following year. A succession of cuttings of proper age is obtained for several years from the same field. It is cut by a short stout scythe, and must be brought from the field daily ; for when put in a heap after being chopped and bruised it heats rapidly. It is given to horses and cows in combination with chopped hay or straw. An acre will produce about 2000 faggots of green two-year-old gorse, weighing 20 tb each.

This plant is invaluable in mountain sheep-walks. The rounded form of the furze bushes that are met with in such situations shows how diligently the annual growth, as far as it is accessible, is nibbled by the sheep. The food and shelter afforded to them in snow-storms by clusters of such bushes is of such importance that the wonder is our sheep farmers do not bestow more pains to have it in adequate quantity. Young plants of whin are so kept down by the sheep that they can seldom attain to a profitable size unless protected by a fence for a few years.

Section 13.—-Tussac G'rass.

The tussac grass of the Falkland Islands has of late years attracted considerable attention as a forage plant. From its gigantic growth, even in those ungenial regions, and the extraordinary relish manifested for it by horses and cattle, sanguine hopes were entertained that it was to prove a truly valuable addition to our present list of forage plants; but the attempts hitherto made to introduce it in Britain have not been of a very encouraging kind. The only successful cases have been in the Orkneys and in Lewis. Messrs Lawson of Edinburgh, who have given much attention to it, say—" Our own experience leads to the conclusion, that localities within influence of the sea spray, the soil being of a peaty nature, are without doubt the best adapted for the growth of the tussac; and in such places it is likely to be of great service, as few other nutritive grasses will exist there. In our own experi- mental grounds it does not thrive well; which may perhaps be accounted for by the nature of the soil, which is light and dry. Regarding its value as a forage plant, we have before us an analysis made, at our request, by Professor Johnston, the results of which show that 'the tugsac grass ought to be very nutritive.' Propagation, in the absence of seed, is easily effected, under favourable circumstances, by subdivision of the roots."

We have thus noticed all the more important of our forage crops of ascertained value. Additions will probably be made to them from time to time, especially from the increased attention now bestowed on green crops of all kinds. It has lately been suggested that maize and also lupins, although unfit for our climate as grain crops, might with advantage be tried as forage plants. Both are successfully grown for this purpose in Germany. Being unable to withstand frost, they should be sown not earlier than May. The maize requires a deep 'rich soil; the lupins again are said to do best on light siliceous soils. Both should be sown in rows 15 to 18 inches apart, and seeded at the rate of 2 bushels per acre. A trial which we made with lupins (both the blue and the yellow sorts) in 1858, on a light moorland, proved a total failure.

Section 14.—Haymaking.

Having spoken of the cultivation and use in a green state of herbage and forage crops, it remains to describe the process by which they are preserved for use in a dry state, or made into hay. On every farm a supply of good

hay, adequate to the wants of its own live stock, is, or at least ought to be, statedly provided. This is no doubt an expensive kind of food, but on the other hand it is highly nutritions, and conduces much to the healthfulness of the animals fed upon it. Many a valuable farm horse is annually sacrificed to a false economy in feeding him solely on innutritious straw or ill-gotten hay. The owners of such stock would do well to consider that the death of a horse yearly, and the impaired health and coudition of the whole stud, more than counterbalance any saving that can be effected by using bad fodder instead of good. . But the great consumption of hay is by the numerous horses constantly required in this country for other purposes than farm labour. In the vicinity of towns hay is therefore a staple agricultural product, and hay- making an important branch of rural economy. It is one in the practice of which English farmers generally excel their brethren north of the Tweed. In the counties near the metropolis, in particular, this process is conducted with admirable skill.

In converting the grasses and forage plants into hay, the object is to get quit of the water which they contain, amounting to nearly two-thirds of their weight, with the least possible loss of their nutritive qualities. In order to this the crops must be mown at that stage of their growth when the greatest weight of produce with the maximum of nutritive value can be obtained; and then it is necessary so to conduct the drying process that the inspissated juices shall not be washed out and lost by external wetting. A simple and sufficiently accurate rule for determining the first point is to mow when the plants are in full flower. If this stage is exceeded, both the quality of the hay and the amount of the foggage or aftermath are seriously impaired. It follows from this that mowing should be commenced somewhat earlier than the stage indicated, otherwise, before the whole can be cut the last portion will have exceeded the proper degree of ripeness. By cutting a part too soon a slight loss of weight is incurred, which, however, is compensated for by a better aftermath; whereas if part is allowed to mature the seeds, there is a loss of weight, quality,and aftermath. Haymaking, to be done well, must be done quickly, and in order to this a full supply of labourers is indispensable. As a good mower can cut on an average an acre in a day, as many must be engaged as can overtake the extent of crop while it is in the best state for cutting. It is of great importance, too, to have the grass cut close to the ground. A loss of from 5 to 10 per cent. on the gross

produce is frequently incurred by unskilful or careless mowers leaving the sward too high. Now that efficient mowing-machines can be had, this work can be performed with a celerity and accuracy hitherto unattainable. To admit of accurate and expeditious mow- iug, whether by scythe or machine, care must be taken, at the proper season, to remove all stones and other obstruc- tions, and to make the surface smooth by rolling.

Confining our attention, in the first place, to natural meadow grass, let us glance at the process as conducted by those who are most proficient in it. The mowers having commenced their work at sunrise, the haymakers, in the proportion of two men and three women to each mower, So soon as the dew is off, shake out the swathes evenly over the whole ground, until they have overtaken as much as they can get into cocks the same day. This quantity they how turn and toss about as frequently as possible, getting it, before evening, either into a compact windrow, or forming it into very small cocks. Next day these cocks are again opened out, and as much more of the grass in swathe as can be overtaken, all of which is anew subjected to the same repeated turnings, and again, aS evening approaches, secured from dew and rain by windrowing

and cocking ; that which is driest being put into larger cocks than on the previous day. If the weather is hot and parching, that which was first cut is by the fourth day ready for the stack, and is immediately carried. A large rick-cloth is drawn over the incipient stack until more hay is in condition to be added to it, and then, if weather favour, the whole process, from mowing to stacking, for a time goes on simultaneously, and is speedily completed. As the building of the stack proceeds, its sides are, by pulling, freed from loose hay, and straightened; and when completed it is thatched with the least possible delay. If the weather prove showery, the grass is left untouched in the swathe until it begins to get yellow on the under side, in which case it is usually turned over without opening out until weather again favour. 'To produce fine hay, care must be taken to secure from dew or rain by cocking before nightfall all that has been spread out during the day—never to touch it until dew or wet is off—to shake all out so thoroughly as that the whole may be dried alike —and never to suffer it, after being tedded out, to lie so long as to get scorched on one side. When these operations are conducted successfully, the hay is of a fine light-green

colour, delightfully fragrant, and retains its nutritious matter unimpaired. To accomplish this in our variable climate much skill and energy, and an ample command of labour, are necessary.

The cost and labour of this process are now, indeed, much reduced by the use of machinery, consisting of mower, tedder, and rake, by means of which a man and pair of horses can do the work of ten scythemen, and another man and horse can toss, turn, and draw into windrows as much grass as could be overtaken in the same time by fifteen people. The hay-tedder, moreover, shakes out the grass more thoroughly than it can be done byhand. After the hay is gathered into rows, horse labour is also sometimes employed to collect it into heaps by means of a sweep, that is, a piece of plank with a rope attached to each end of it, by which a horse draws it along on edge, while two lads hold it down, and the hay is thus pushed forward in successive portions, which are then by hand labour made into orderly cocks. The yield of meadow hay ranges from 1 to 2 tons per acre, and the cost of making it is about 10s. per ton. In London hay is brought to market in trusses, each weighing 56 ib, 36 of which are called a load. In cutting up a stack these trusses are removed from it in compact cubes, which are then neatly secured by bands of twisted hay.

In converting the cultivated forage crops, such as clover (either pure or mixed with ryegrass), sainfoin, lucerne, or vetches, into hay, the procedure varies considerably from that pursued with the natural grasses. A considerable part of these plants consists of broad tender leaves, which, when scorched by the sun, become so dry and brittle that, on the least rough handling, they fly into dust, aud are totally lost. These crops, therefore, do not admit of being shaken asunder and tossed about like the natural grasses, a circumstance which unfortunately forbids the use of the tedding-machine in getting them. The swathes are accordingly left untouched until they have got slightly withered on the upper side, after which they are turned several times with as little breaking up as possible ; made up first into small cocks, opened out again, gently turned, and made into larger cocks, which as speedily as possible are carried and stacked. These crops can be stacked with safety in a very green state by mixing with them frequent layers of clean dry straw, by which the redundant juices are absorbed, and injurious heating prevented. The straw thus impregnated

acquires a flavour which renders it palat- able to cattle; but it is advisable, when this practice is adopted, to cut the whole into chaff before using it as fodder.

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When it is desired to save the seeds of Italian or common ryegrass, the crop, after being mown, is allowed to lie for a day or two in swathe, and is then neatly gathered into sheaves, bound, and stookced, precisely like a crop of oats. When sufficiently dried, the seed is either thrashed out in the field, the straw stacked like other hay, and the seed spread thinly over a granary floor, and turned several times daily until it is dry enough to keep in a bin or in sacks ; or the sheaves are built into small round stacks, which stand until the seed is wanted, when it is thrashed out by machinery like grain.

Of late years we have frequently secured considerable quantities of useful hay by mowing seeds that had been pastured by sheep in the early part of the season. In July we run the mowing-machines over such fields, taking care to set the cutting-bar high enough to leave the fresh-grown herbage untouched, and to remove only that of older and taller growth. 'The mown stuff is left untouched for two or three days; is then drawn together by the horse rake, and put into cocks for a short time, or carted at once to the rick-yard as weather permits. In this way much herbage that would otherwise go to waste is converted into useful winter fodder, and a fresh-grown clean pasture secured for lambs or other stock.

CHAPTER XIV. CULTIVATED CROPS—OROPS OF LIMITED CULTIVATION.

Under this head we shall notice a variety of crops which, however valuable in themselves, and important to the farmers of particular localities, are, from one cause or other, not adapted for general cultivation.

Section 1.—lax.

Flax is probably the most important of these crops. In- deed, from the rapid growth of our linen trade, the growing demand for linseed and its products, and the fitness of the soil and climate for the successful growth of flax, it is

not without cause that its more extended cultivation has been so strenuously urged upon our farmers, and that influential societies have been organised for the express purpose of promoting this object. Viewed merely as an agricultural crop, the cultivation of flax is exceedingly simple, and could be practised as readily and extensively as that of the ccreal crops. 'The difficulty is, that before it can be disposed of to any advantage, it must undergo a process of partial manufacture; thus there is required not only an abundant supply of cheap labour, but such an amount of skill and personal superintendence on the part of the farmer as is incompatible with due attention to corn and cattle husbandry. If a ready and remunerative market were available for the fibre in its simple form of flax straw, this, in combination with the value of the seed for cattle feeding, would at once hold out sufficient motive to our farmers to grow it statedly and to any required extent. Until this is the case, its culture cannot extend in the corn-growing districts of Great Britain. In Ireland and parts of the Highlands of Scotland, where there is a redundant popula- tion much in want of such employment as the flax crop furnishes, and where the climate is suited for its growth, it is highly desirable that its culture should extend, and probable that it will do so. Flax prospers most when grown upon land of firm texture resting upon a moist subsoil. It does well to succeed oats or potatoes, as it requires the soil to be in fresh condition without being too rich. Lands newly broken up from pasture suit it well, as these are generally freer from weeds than those that have been long under tillage. It is usually inexpedient to apply manure directly to the flax crop, as the tendency of this is to produce over-luxuriance, aud thereby to mar the quality

of the fibre, on which its value chiefly depends. For the same reason it must be thickly seeded, the effect of this being to produce tall slender stems, free from branches. The land having been ploughed in autumn, is prepared for sowing by working it with the grubber, harrow, and roller, until a fine tilth is obtained. On the smooth surface the seed is sown broadcast by hand or machine, at the rate of 3 bushels per acre, and covered in the same manner as clover seeds. It is advisable immediately to hand-rake it with common

hay-rakes, and thus to remove all stones and clods, and to secure a uniform close cover of plants. When these are about 3 inches long the crop must be carefully hand-weeded. This is a tedious and expensive process, and hence the importance of sowing the crop on land as free as possible from weeds of all kinds. 'To obtain flax of the very finest quality the crop must be pulled as soon as the flowers fall, but in the improved modes of steeping, whether by Schenck's or Watt's patent, the value of the fibre is not diminished by allowing the seeds to mature. It must not, however, be allowed to become dead ripe, but should be pulled whenever the seeds appear, on opening the capsule, to be slightly brown-coloured. The pulling requires to be managed with much care. It is performed by men or women, who seize a small quantity with both hands and pull it by a slight jerking effort. The important point to be attended to is to keep the butts even as successive quantities are seized and twitched from the ground. When a convenient handful has been pulled it is laid on the ground, and the next parallel to it at a foot or so apart, The next handfuls are laid across these, and so on until a small pile is made, after which another is begun. After lying in this position for a few days, the seed-vessels or bolls are separated from the flax by lifting each handful separately and pulling the top through a ripple or iron comb fixed upon a piece of plank. As many of these handfuls as will make a small sheaf are then laid very evenly together, and bound near both ends with bands formed of a few stems of flax. These sheaves are set up in stooks, and when dry enough to keep without heating are stacked and thatched until an opportunity occurs of disposing of the flax straw. Sometimes the flax is bound into sheaves and stooked as it is pulled, and treated exactly like a grain crop. In this case the seed is separated from the straw by passing the head of each sheaf between iron rollers. The only objection to this plan is that the bolls of separate sheaves get so entangled in each other as to render it exceedingly difficult to handle them in carrying the crop, and in building and taking down the stacks, without dis- arranging the sheaves and wasting much straw and seed.

It would be tedious to enter here into a minute detail of the ordinary method of separating the flax fibre from the woody part of the stem. Suffice it to say that in the ordinary practice the sheaves or beets of flax straw are immersed in a pit or pool filled with clear soft water. The sheaves are kept under water by laying boards upon them loaded with stones to keep them down.

Here the flax undergoes a process of fermentation by which the parts are separated. About nine or ten days are usually required for this purpose, but this is much influenced by the temperature.. A good deal of skill and close watching is required to know exactly when it has been watered enough. 'The flax is now taken from the pit and evenly spread upon a smooth, clean, recently-mown meadow, where it lies for about ten days more, receiving several turnings the while. When the retting, as this is called, is perfected, the flax is carefully gathered up when perfectly dry, and again tied into sheaves, in which state it is stored under cover until the breaking and scutching can be overtaken.

All this necessarily requires much skilful watching and

| nice manipulation,—more, as we have already said, than is

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compatible with the other avocations of an extensive farmer. There are, however, improved modes of accomplishing this preliminary manufacture of flax which, wherever estab- lished, pave the way for the growth of flax as an ordinary field crop. For these see article Fiax.

The extent of flax cultivation in Ireland is considerable, but the acreage has been gradually diminishing during late years. In 1864 it reached the maximum, 301,693 acres; next year it fell to 251,433. Since 1869 it has steadily declined, there being 229,252 acres in flax crop that year, and only 122,003 in 1872.

Hemp, although at one time very generally grown in Great Britain, is now so rarely met with that it is unneces- sary to enter into details of its cultivation.

Section 2.—LLops.

The hop is an important crop in several of the southern counties of England. Although an indigenous plant, it was originally brought into England for cultivation from Flanders in 1525. It is cultivated to a considerable extent in Belgium, Bavaria, in the United States of America,

and more recently in Australia. Hops, as is well known, are chiefly used for preserving and imparting a peculiar flavour to beer. Probably the only parts of the hop flower which enter into the composition of the beer are the seeds, and the yellow glutinous matter which surrounds the outer in- teguments of the seed, and lies at the bottom of the petals. This yellow matter (technically termed the condition of the hop) has an intensely bitter taste, and emits a peculiar and very agreeable aroma, which, however, is extremely volatile ; and hence the necessity for close packing as soon as possible after the hops are dried. When kept over a year, much of this aroma flies off, and hence xew hops are indispensable in brewing the first kinds of beer. Several varieties of the hop are cultivated in England. Of these, the Farnham and Canterbury whitebines and goldings are esteemed the finest. These are tall varieties, requiring poles of from 14 to 20 feet. The grapes, so called from grow- ing in clusters, and of which there are several varieties of various quality, require poles from 10 to 14 feet long. Jones's, adapted for lighter and inferior land, requires these but 8 to 10 feet. The colegates are a hardy and late-ripening variety, which grow best on stiff soils; and the Flemish redbine, only cultivated from its less liability than the other to be attacked by the aphis or black blight.

The hop is a very exhausting crop for the land, requir- ing to be planted only on the most fertile soils, and to have them sustained by frequent and large dressings of manure rich in nitrogen. Hops are principally cultivated in the counties of Kent, Sussex, Surrey, Hants, Worcester, and Hereford, and to a more limited extent in Essex, Suffolk, and Nottingham. The best quality of hops are grown at Farnham in Kent, upon the outcrop of the upper greensand formation, from whence the phosphatic nodules or coprolites now so well known in the manure market are obtained. In 1871 the land under hop cultivation in Great Britain measured 60,030 acres; in 1872 it amounted to 61,927 acres, of which there were in Kent 37,927, in Sussex 9738, and in Hereford 6106 acres.

_ In forming a new plantation, the ground soon after Michaclmas Is trenehed to the depth of 18 inches, if it has previously been in meadow or old pasture, taking eare not to bury the surface-soil above half that depth. Subsoil-ploughing will suffice with land that is in tillage. If the land is wet, drains are made from 4 to 5 feet deep, laid with pipes, and a foot of broken

stones over them, to prevent the roots of the hops from obstrueting the pipes. The distanee between the drains is dctermined by the necessities of each case. Perfeet draining is essential to the suecess of the crop ; and the hops are planted in squares or triangles at equal distanees, varying from 6 to 7 feet, aceording to the fertility of the soil and the greater or less luxuriant habit of growth of the variety selectcd. The plants are raised by cutting off the layers or shoots of the pre-

ceding year, whieh are bedded out during the month of Mareh in ground previously prepared, and in the sueceeding autumn become what are ealled nursery plants or bedded sets. Early in November these are planted, one, two, or three being used for a hill aeeording to the strength of the plants. Care must be taken to introduce a sufficient number of male plants, six hills to the acre being deemed suffieient. The presence of these is found to induce earlier matu- rity, and to improve both the quality and weight of the erops. The ground must at all times be kept free from wecds and have a good depth of pulverised soil. From the first, a stick, 6 feet high or so, is placed to each hill, to whieh a// the young bines, as they shoot out during summer, must be tied. A liberal dressing of superphosphate of lime and guano is in June hoed in around each hill, whieh is repeated in July, undcr which treatment 2 or 3 ewt. of hops is obtained the first year, in addition to a crop of mangolds, turnips, or potatoes, grown in the intervals between the hills. On newly broken up ground lime is applied the following spring. When a plantation has been established, the annual routine of culture begins in autumn, as soon as the crop has been gathered, when the haulm is stripped from the poles, and stored away as a substitute for straw. The poles are staeked or piled in quantities of 400 or 500, at regular distanees on the ground. During winter they are sorted and repointed when required, and new ones substi- tuted for those that are broken or deeayed ; this work and the carrying on of manure being aecomplished in frosty weather. The ground is dug over by the fork at this season. In March the earth is removed from the plants by a beek or pronged hoe till the erown is exposed, that the plant may be pruned. Immediately after this the poles are set, the length and number of these for each hill depending upon the kind of hops and amount of growth anticipated. They are fixed into holes made for them by a hop-bar. As the season advanees, the ground is hoed. and again dug or stirred by a nidget or searificr drawn by a horse. Early in May the bines or young

shoots, as soon as long enough, are tied to the poles with tushes or bast. ‘This tying is repcated sevcral times as the bines get higher, and has even to be done by step-ladders. In June the hops are earthed up or killed, at whieh time weak plants gct a dressing of guano. Throughout the summer weeds are destroyed as they appear, and the soil kept loose by the nidget or the hand-hoc. If poles are blown over by high winds, they are imincdiately rcplaced.

The pieking of the hops usually begins about the seeond week in September, and furnishes ample employment for several weeks to the entire population of the distriets, and to a large influx of strangers ; men, women, and children all engaging in it. The hop-piekers are arranged into eompanies, and are supplied with baskets or bins, holding 7 or 8 bushels cach, which are gauged with blaek lines inside to save the trouble of measuring. Each eompany is under the superintendenee of a hop-bailiff, who keeps an aeeount of the earnings, &e. Under him are several men ealled pole-pullers, whose duty it is to supply the piekers with poles of hops, and to assist in earrying the pieked hops to the earts. They use an iron lever called a hop-dog in pulling up the poles. The hops are piekcd, one by one, into the bins, eare being taken that no bunehes, nor leaves, nor mouldy hops, are ineluded. The hops are dried in kilns or oast-houscs, on floors of haircloth. Great improve- ments have been made of late years in the construction of these oasts. Mueh niee diserimination is required in managing the drying so as to produce the best quality of hops. As soon as they are removed from the kiln they are packed into poekets, whieh during the process are suspended from a hole in the floor, and the hops trodden into them by a man, This is now done more aecurately by machines, in whieh a piston presses the hops into the pockets. Hop-growing is a hazardous speeulative business, the return at times being very great, and at other times not eovcring expenses. This ariscs from the liability of the hop to the attaeks of inseets, but more especially to blight and mould. The blight is eaused by innumer- able hordes of the Aphis humuli, which sometimes destroy the plants altogether. The mould is a parasitieal fungus. It is belicved that a means has at last been diseovered of checking the ravages of tlicse assailants, by enveloping each ‘plant separately in a light eovering, and subjceting it to the fumes of tobaeco in the case of blight, and to a eloud of powdered brimstone in the case of mildew. 1n blight years it usually happens that some grounds

altogether escape, in whieh ease the returns from them are enormous, owing to the enhaneed priee.

Section 3.—Sugar-Beet.

The Silesian white beet has long been cultivated in various states of continental Europe for the production of sugar, and in several of them is now a staple product of very great value and importance. After several abortive attempts to introduce this industry into our own country, it seems at last to have obtained a firm footing in England, through the enterprise and perseverance of Mr James

Duncan, sugar-refiner, of Mincing Lane, London, who five years ago erected the necessary buildings and machinery at Lavenham, in Suffolk, Through the kindness of Mr Duncan we are enabled to submit to our readers the follow- ing details regarding this most interesting enterprise.

The sugar factory at Lavenham was erected in 1868, although not completed until February 1869. Mr Duncan had first of all contracted with various farmers in that neighbourhood to grow beet for him at the price of 20s. per ton of clean roots, delivered at his factory, with the option to the growers of receiving back the resulting pulp at 12s, per ton, if removed as made. Mr Duncan also procured from the continent the necessary supplies of seed of the best sort, and furnished the growers with in- structions as to the proper mode of cultivation. In grow- ing mangolds farmers try to grow the largest possible weight per acre, and for this purpose they manure heavily, and give the individual plants ample space. This will not do in the case of sugar-beet, as it is found that small roots are richest in sugar, and that 24 ib each is the best size to aim at. The endeavour, therefore, must be to have the roots small individually, and yet to secure a good weight per acre. As the part of the bulb that grows above ground contains very little sugar, a further object is to have as little of it exposed to light as possible. All this is accom- plished by sowing the crop in rows about 16 inches apart, and lcaving the plants close to each other. If all is well managed, the crop should yield from 15 to 20 tons of cleaned roots per acre. The delivery of the roots at the factory begins about the end of September, when they are

carted direct from the field as they arc pulled. The exi- gences of wheat-sowing and other field labour at that season induce the growers to store a considerable part of their beet crop at home, and to deliver it at the factory from time to time as they can overtake this heavy cartage. The roots lose weight rapidly when kept in clamps, to cover which a little extra price is given as the season advances. The convenience of the growers is much fur-thered by this arrangement; but it sometimes results in irregular supplies, and consequent loss to the manufacturer.

Owing to the extreme drought of 1868 the beet was late in being sown, and the crop was small, amounting only to 1200 tons; but it was exceedingly rich in sugar. The following season was moist, and the yield per acre good, but the arca under crop was small, and the total quantity delivered at the factory about 3000 tons. The year 1870 was again an extremely hot and dry one, with a gross produce of 4500 tons, which yielded 12 per cent. of syrup. The produce in 1871 was 6000 tons, yielding 10 per cent. of syrup, and that of 1872 exceeded 7000 tons of very good roots ; but the wetness of the season and strikes among the labourers so protracted the factory work, that instead of being completed in December it was prolonged until March, and the percentage of sugar was smaller than it ought to have been. The particulars of this last crop are as follows. The total weight of clean roots from 571 acres was—

Delivered fresh from the fields, 2370 tons. Clamped by growers at their farms, 5485 ,,

7855,

Of the 571 acres, 89 by 2 growers averaged 17 tons per acre. a 115 by 2 ,, ie a 2 61 by 2 ” ” 15 ” ” 21) { 9» 14 ” lad 147 ” 13 ”» be) 10 | a9 12 be) 9 Bape 26 4,7 4G, 11 3 ” 18 | ” 10 ” 99 15 bed 9 23 99 62 L nde) 8 ×9

So that with a total average of 133 tons per acre, two-thirds

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[SUGARBEET.

of the crop averaged 15 tons, and the remaining third only 9} tons. The proportion of feeding pulp has been large in 1871 and 1872,—both having been moist seasons,—and has been 22 per cent. of the weight of the roots. In 1870 it was only 19 per cent. The details of the disposal of the pulp from crop 1872 are also interesting. Of 1235 tons of pulp purchased by nine farmers—

597 tons were taken by one,

326 Ay by another, 116 Fr by another, 95 re by another, not a grower of beet.

In addition to these quantities sold, about 500 tons were stored at the factory, where at the same time about 100 tons of crop 1871 were still on hand, and in excellent condition. To this latter fact we can add our own testi- mony, having been favoured by Mr Duncan with a sample of it after it had been eighteen months in store, when we found it perfectly sweet and good, retaining unimpaired the taste and smell of fresh beet-root. The mode of storing the pulp is very simple. Ona piece of dry ground a trench is dug out about 7 feet wide and 1 foot deep. Into this trench the pulp is firmly trodden by the fect of the labourers, and gradually drawn to a point, precisely as is done in storing roots. The whole is then covered with earth to the depth of 12 inches; and thus stored, the pulp keeps well for two or three years. In using it, a thin crust from the outsides is rejected. In Germany and Austria tanks of brick-work are used to economise space, but not in France or Belgium. Three tons of this pulp are esti- mated to be equal in feeding value to one ton of good hay. Hitherto farmers give the preference to fresh-made pulp ; but Mr Duncan regards this as quite a mistake, as in his own practice he finds that pulp a year old is a better feeding material than when newly made. In 1872 he fattened 50 cattle on pulp three years old, and in the summer of 1873 he had 60 cattle consuming the surplus of the previous season. These cattle (27 yearlings and 33 two-year-olds) consumed daily 35 ewt. of pulp and 4 ewt. of cut chaff (of hay and barley straw) mixed together. The older beasts received daily in addition 7 ib each of bean-meal, on which ration they made good progress. To meet the cart- age difficulty, Mr Duncan contracted that year (1873) with one grower to perform the

haulage of 2000 tons of beet roots a distance of 5 miles by a traction engine.

Several joint-stock companics have been formed for prosecuting this industry, but Mr Duncan's is the only factory as yet in actual operation. It is known also that Mr Lawes and Dr Gilbert have for several years been engaged in extensive experiments on sugar-beet, and with most successful results.

The manufacture of sugar from beet-root has attained to very great dimensions on the continent of Europe. It is known that from the crop of 1872 there has been produced 1,025,000 tons of sugar, worth £24 per ton, and 250,000 tons of molasses, worth £3 per ton, and that new factories, some of them on a gigantic scale, are now in course of erection. A most important fact connected with this rapidly-extending industry is that the erection of a sugar factory is immediately accompanied by an improvement in the agriculture, and an increase in the value of the land, of the surrounding district. In many places farmers gladly contract to supply beet-root at 18s. per ton for ten years, on condition that they receive back pulp in fair proportion to the quantity of root supplied by them. Russia pro- duces the finest quality of beet, instances being known in which the roots yielded 10 per cent. of loaf-sugar. There are good grounds for concluding that Russia will at no very distant date take a prominent place as a sugar-producing country.

There secms at present a reasonable prospect that the

cultivation of sugar-beet will be adopted in various parts of our own country. . It has already been proved that the beet grown in the south-eastern counties of England is richer in sugar thau that produced in the north of France. And it seems well worth while to ascertain, by careful cx-periment, whether in certain parts of Scotland, such as the Lothians, Fife, and the carses, sugar-beet could not with advantage be substituted for the precarious and exhausting potato crop. The repeal of the sugar-duty would give a great stimulus to this enterprise, and should be pressed for in the interest of our native agriculture.

‘Section 4.—Chicory (for its Roots).

The very extensive and constantly increasing consump- tion of the roots of chicory as a substitute for coffee, renders it now an agricultural crop of some importance. The soils best adapted for its growth are deep friable loams. The process of cultivation is very similar to that required for the carrot, excepting only that it is not sown earlier than the first week of May, lest the plants should run to seed. When this happens, such plants must be thrown aside when the crop is dug, else the quality of the whole will be injured. About 4 tb of seed is the quantity to sow per acre, eithcr broadcast or in rows. The latter is undoubtedly the best mode, as it admits of the land being kept clean, and yields roots of greater weight. The crop is ready for digging up in November. A long stout fork is the best implement for this purpose. In using it, care must be taken to get out the roots entire, not only for the sake of the roots, but to lessen an inconvenience attendant on the culture of this plant, namely, that the fragments left in the soil grow amongst the after crops, and are as trouble- some as weeds. The roots, when dry, are carefully washed, cut into thin slices, and kiln-dried, when they are fit for the coffee-grinder. From 1 to 1} tons per acre of the dried root is an average produce.

Section 5.—Oil-yielding Plants.

Various plants are occasionally cultivated in Britain for the sake of the oil which is expressed from their ripened seeds, We have already noticed the value of flax-seed for this purpose, although the fibre is the product which is chiefly had in view in cultivating it. The plants most commonly sown expressly as oil-yielding crops are—rape (Brassica Napus), colza (Brassica campestris oleifera), gold of pleasure (Camelina sativa), and the poppy (Papaver somniferum). Rape is the plant most frequently and ex- tensively grown for the production of oil. The colza is said to yield better crops of seed than the other species. This plant is much cultivated in Flanders for this purpose. In Great Britain it seems rather on the decline. It is chiefly on rich alluvial soils that this crop is grown. For a seed-crop rape is sown in June or J uly, precisely in the manner already described for turnips. The young plants are thinned out to a width of 6 or 8 inches apart, and afterwards kept clean by hoeing. The foliage may be eaten down by sheep

early in autumn, without injuring it for the production of a crop of seed. In spring the horse and hand hoe must be used, and the previous application of 1 or 2 ewt. of guano will add to the productiveness of the crop. It suits well to lay down land to clover or grass after a crop of rape or turnip seed, and for this pur- pose the seeds are sown at the time of giving this spring culture. The crop must be reaped as soon as the seeds are observed to acquire a light brown colour. The reaping is managed precisely as we have described in the case of beans. As the crop, after being reaped and deposited in separate handfuls on the ground, very soon gets dry enough for thrashing, and as the seed is very easily shed after this 1s the case, this process must be performed as rapidly as

possible. Sometimes it is conveyed to the thrashing-mill on harvest carts, on which a cloth is stretched to save the seeds knocked out in the loading and unloading, but more usually the flail is used on temporary thrashing-floors pro- vided in the field by spreading down large cloths. The crop is gently lifted from the ground and placed, heads innermost, on a blanket which two persons grasp by the corners, and carry to the thrashing-floors. A large number of people are required to push this process through rapidly, for unless the crop is quickly handled, a great loss of seed ensues. The seed is immediately spread thinly upon a granary floor, and frequently turned until dry enough to keep in sacks, when it is cleaned and disposed of. On good soil and in favourable seasons the yield sometimes reaches to 40 bushels per acre. The haulm and husks are either used for litter or burned, and the ashes spread upon the land. It makes good fuel for clay-burning.

Section 6.—Seeds of Agricultural Crops.

In the case of seed-corn it is customary for farmers either to select from the best of their own growth, to ex- change with or purchase from neighbours, or, if they wish a change from a different locality, to employ a commission-agent to buy for them. In all districts there are careful farmers who, by occupying land that produces grain of good appearance, and being at pains to have good and pure sorts, are stated sellers of seed-corn, and manage in

this way to get a few shillings more per quarter for a part of their produce. It is therefore only in the case of new and rare varieties that professional secdsmen ordinarily deal in seed-corn. There are, however, other field crops, such as clovers, grasses, turnip, mangold, carrots, winter vetches, &c., the seeds of which, to a large extent, pass through the hands of seedsmen, and the growing of which is restricted to particular districts, and is in the hands of a limitcd number of farmers. These seed crops are sometimes very remunerative to the grower; but are hazardous ones for farmers to attempt at their ownrisk. The only safe course is to grow them at a stipulated price, to the order of some thoroughly respectable seedsman, and to hold to the pro- duction of the particular kind or kinds which he requires. This applies in a less degree to the clovers, and to the more commonly cultivated grasses, than to the other seeds just referred to. Such an arrangement is beneficial to all concerned.

We have already described (chap. xiii. sec. 13) the mode of saving the seeds of Italian or common ryegrass ; and as other grasses are managed in the same way, it is unneces- sary to say more regarding them.

It is only in the southern parts of England that clover is grown for the sake of its seeds.) When it is mcant to take a crop of seed, the clover is fed off with sheep, or mown early in the season, aud then allowed to produce its flowers and ripen its seeds. This preliminary eating or cutting over causes the plants to throw up a greater number of seed-stems, and to yield a fuller and more equally ripelling crop. The crop is mown when the seeds are seen to be matured. In the case of white clover the cutting takes place while the dew is upon the crop, as working ainongst it when dry would cause a loss of seed. After mowing and turning the crop, the ground is raked with close-toothed iron rakes, to catch up loose heads. The thrashing is a twofold process—first the separation of the heads or cobs from the stem, called " cobbing," aud then of the seeds from the husks, called "drawing." This was formerly accomplished by a laborious and tedious process of thrashing with flails, but it is now done by machinery. In favourable seasons the yield is about 5 or 6 bushels (of 70 Ib each) per acre.

Turnip seed is the next most important crop of this kind.

From the strong tendency in the best varieties of turnips and swedes to degenerate, and the readiness with which they hybridise with each other, or with any member of the family Brassica, no small skill and pains are needed to raise seed that can be depended upon to yield roots of the best quality. Turnip seed is saved either from selected and transplanted roots, or from such as have been sown for the express purpose, and allowed to stand as they grow. The first plan, if the selection is made by a coinpetent judge, is undoubtedly that by which seed of the purest quality is obtained. But it is an expensive way, not only from the labour required in carrying it out, but from the yield of seed being generally much less than from plants that have not been disturbed. Professional seed-growers usually re- sort-to a compromise by which the benefit of both plans is secured, viz., by selecting with great care and transplant- ing a limited number of bulbs, and saving the seed obtained from them to raise the plants which are to stand for their main seed crop. The latter are carefully examined when they come into bloom, and all plants destroyed the colour of whose flower varies from the proper shade. Turnips that are to bear seed are purposely sown much later in the season than when intended to produce cattle food, as it is found that bulbs about 1 ib weight are less liable to be injured by frost or to rot before the seed is matured, than those of larger size. The management of a turnip-seed crop, both as regards culture and harvesting, is identical with that of rape for its seeds, which has already been described.

Mustard.—Both the white and brown mustard is culti- vated to some extent in various parts of Engiand. The former is to be found in every garden as a salad plant ; but it has of late been coming into increasing favour as a forage crop for sheep, and as a green manure, for which purpose it is ploughed down when about to come into flower. The brown mustard is grown solely for its seeds, which yield the well-known condiment. When white mus- tard is cultivated for its herbage, it is sown usually in July or August, after some early crop has been removed. The land being brought into a fine tilth, the seed, at the rate of 12 ib per acre, is sown broadcast, and covered in the way recommended for clover seeds. In about six weeks it is ready either for feeding off by sheep or for ploughing down as a preparative for wheat or barley. White mustard is not fastidious in regard to soil. When grown for a seed crop it is treated in the way about to be de- scribed for the other variety. For this purpose either kind requires a fertile

soil, as it is an exhausting crop. The seed is sown in April, is once hoed in May, and requires no further culture. As soon as the pods have assumed a brown colour the crop is reaped and laid down in handfuls, which lie until dry enough for thrashing or stacking. In removing it from the ground it must be handled with great care, and carried to the thrashing-floor or stack on cloths, to avoid the loss of seed. The price depends much on its being saved in dry weather, as the quality: suffers much from wet. The yield varies from 20 to 30 bushels per acre, and the price from 10s. to 20s. per bushel. It is chiefly grown on rich alluvial soils in the south-eastern counties of England. This great evil attends its growth, that the seeds which are unavoidably shed in harvesting the crop remain in the soil, and stock it permanently with what proves a pestilent weed amongst future crops.

Market Gardening.—In Essex and Kent no inconsider- able extent of land is annually occupied in growing the seeds of the staple crops of our kitchen and flower gardens. Wholesale seedsmen contract with farmers to grow these seeds for them at a stipulated price.

The growth of fruits and of culinary vegetables is in various parts of Great Britain an important department of

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farming—for the scale on which it is conducted allies it quite as much to agriculture as to horticulture. In the counties contiguous to London thousands of acres are occupied in growing vegetables and in producing fruit. Very large numbers of persons find employment in these market gardens. The system of cultivation pursued in them is admirable. The soil is trenched two spits deep for nearly every crop; it is heavily manured and kept scrupulously clean by incessant hoeing. Whenever a crop is removed, some other suited to the season is instantly put in its place, and not an inch of ground is suffered to be unproductive. A young farmer, bent on knowing his business thoroughly, could not occupy a few months to better purpose than by placing himself under one of these clever market gardeners,

Kent has long been peculiarly celebrated for its orchards, The best of them are on the borders of the greensand for- mation, or ragstone as it is provincially called. Apples, pears, plums, cherries, and nuts are produced in immense quantities. The filbert plantations alone are said to occupy 5000 acres. An abundant and cheap supply of fruit and vegetables for the inhabitants of our towns is undoubtedly an important object, and is likely to occupy increased attention wherever a suitable soil and exposure, with facility of carriage by railway, are combined. In Cornwall and in the Channel Islands the cultivation of brocoli and early potatoes is an important and growing industry.

CHAPTER XV. LIVE STOCK—HORSES.

The breeding and rearing of domesticated animals has ever been a favourite pursuit in Great Britain, and has been carried to greater perfection than any other department of rural affairs. In no other country of similar extent can so many distinct breeds of each class of these animals be found—most of them excellent of their kind, and admirably adapted to the particular use for which they are designed. Observing the usual order, we notice first Horses,

Section 1.—-Breeds.

Here we shall confine our attention to those breeds which are cultivated expressly for the labours of the farm ; for although the breeding of saddle-horses is chiefly carried on by farmers, and forms in some districts an important part of their business, it does not seem advisable to treat of it here. It isa department of husbandry requiring such a combination of fitness in the soil, climate, and enclosures of the farm, of access to first-class stallions, and of taste and judgment on the part of the farmer, that few indeed of the many who try it are really successful. The morale too of the society into which the breeding of this class of horses almost necessarily brings a man is so unwhole- some, that none can mingle in it freely without experienc- ing to their cost that "evil communications corrupt good manners." We have noted it as a fact of peculiar signifi- cance, in this connection, that of the few men who really make money by this business, scarcely one desires to see it prosecuted by his sons.

The immense size and portly presence of the Hnglish black horse entitle him to priority of notice. This breed is widely diffused throughout England, though found chiefly in the midland counties. It is in the fens and rich pastures of these counties that the celebrated dray horses of London are bred and reared. These horses are too slow and heavy for ordinary farm-work, and would not be bred but for the high prices obtained for them from the great London brewers, who pride themselves on the great size, majestic bearing, and fine condition of their team horses. The breeders of these horses employ brood mares and young

colts exclusively for their farm-work. The colts are highly fed, and worked very gently until four years old, when they are sold to the London brewers, often at very great prices. The same breed is largely used in England for ordinary farm labour, although not found of such gigantic proportions as in those districts where they are bred for the special destination just referred to. Although very docile, their short step, sluggish gait, large consumption of food, and liability to foot lameness, render them less pro- fitable for ordinary farm-work than the breeds about to be mentioned.

The Suffolk Punch is a well-marked breed which has long been cultivated in the county from which it takes its name. These horses are, for the most part, of a sorrel, bay, or chestnut colour, and are probably of Scandinavian origin. They are compact, as their name imports, hardy, very active, and exceedingly honest pullers. These horses at one time were very coarse in their form and rather slow ; but they have now been so much improved in form and action that we find them the chief prize-takers at recent exhibitions of the Royal Agricultural Society.

The Cleveland Bays are properly carriage-horses; but still in their native districts they are largely employed for field work. Mr Milburn says—“ The Cleveland, as a pure breed, is losing something of its distinctiveness. It is running into a proverb, that ‘a Cleveland horse is too stiff for a hunter, and too light for a coacher; but there are still remnants of the breed, though less carefully kept dis- tinctive than may be wished by advocates of purity. Still, the contour of the farm-horses of Cleveland has the light- ness, and hardiness, and steadiness of the breed; and it is singular that while the

lighter soils have horses more cal- culated for drays, the strong-land farmer has the compact and smaller, but comparatively more powerful animal."

In the north-eastern counties of England, and the ad- jacent Scottish borders, compact, clean-legged, active horses, of medium size, with a remote dash of blood in them, are generally preferred to those of a heavier and slower kind. One ueeds only to see how such horses get along at turnip-sowing, or with a heavy load in a one-horse cart, to be convinced of their fitness for the general work of a farm.

The Clydesdale Horses are not excelled by any cart breed in the kingdom for general usefulness. They belong to the larger class of cart-horses, sixteen hands being an average height. Brown and bay are now the prevailing colours. In the district whose name they bear the breeding of them for sale is extensively prosecuted, and is conducted with much care and success. Liberal premiums are offered by the local agricultural societies for good stallions. Horses of this breed are peculiarly distinguished for the free step with which they move along when exerting their strength in cart or plough. Their merits are now so generally appreciated that they are getting rapidly diffused over the country. Many small farmers in Clydesdale make a business of raising entire colts, which they either sell for stallions or send into distant counties to serve for hire in that capacity.

In the Highlands of Scotland, a breed of hardy and very serviceable ponies, or "garrons," as the natives call them, are found in great numbers. In their native glens they are employed in tillage, and although unfit for stated farm-work in the low country, are even there often used in light carts for work requiring despatch rather than great power. Similar ponies abound in Wales.

Section 2.—Breeding of Cart-Horses.

In breeding cart-horses regard must be had to the pur- pose for which they are designed. If the farmer contem- plates the raising of colts for sale, he must aim at a larger frame than if he simply wishes to keep up his own stock

of working cattle. These considerations will so far guide him as to the size of the mares and stallions which he selects to breed from ; but vigorous constitutions, perfect freedom from organic disease, symmetrical form, and good temper are qualities always indispensable. N othing is more common than to see mares used for breeding merely because, from lameness or age, they have ceased to be valuable for labour. Lameness from external injury is, of course, no disqualification: but it is mere folly to expect valuable progeny from unsound, mis-shapen, ill-tempered, or delicate dams, or even from really good ones, when their vigour has declined from age. A farmer may grudge to lose the labour of a first-rate mare for two or three months at his busiest season ; but if he cannot make arrangements for doing this, he had better let breeding alone altogether ; for it is only by producing horses of the best quality that it can be worth his while to breed them at all. It is always desirable that both sire and dam should have arrived at maturity before being put to breed.

The head of the cart-horse should not be large, at least not heavy in the bones of the face and jaws, nor loaded with flesh. Full development of brain is, indeed, of great importance, and hence a horse somewhat wide between the ears is to be preferred. Prick ears and narrow forehead have by some been reckoned excellences, but we have so invariably noticed such horses to be easily startled, given to shying, and wanting in courage and intelligence, that we regard such a form of head as a defect to be avoided. The eye should be bright, full, and somewhat prominent, the neck inclining to thickness, of medium length, and slightly arched, and the shoulders oblique. Upright shoulders have been commended as an advantage in a horse for draught, it being alleged that such a form enables him to throw his weight better into his collar. It should be remembered, however, that the horses which display the greatest power in drawing heavy loads are characterised by muscular vigour and nervous energy rather than mere weight of carcase; and these qualities are more usually found in connection with the oblique shoulder than the upright one—not to mention that this form is indispensable to that free and full step so necessary in a really useful farm-horse.

“The back should be straight and broad, the ribs well arched, and the false ribs of due length, so as to give the abdomen capacity and roundness. The

tail should he well set out, not too drooping, and the quarters should be full and muscular. The horse should girth well, and have his height in his body rather than in his legs, so as to look less than measurement proves him to be. The forelegs should be strong, and flat below the knee, and by no means round and gummy either before or behind, neither should they have white hair about them, nor much hair of any colour. The hocks should be broad in front, and neither too straight nor too crooked, nor yet cat-hammed. All diseases of this joint, whether curbs, spavins, or thoroughpins, are sufficient grounds for rejecting a horse. The feet are a matter of very much importance. The tendeney of many heavy horses is to have thin horn and flat feet. A stallion possess- ing sueh feet is exeeedingly objectionable. Plenty of horn is a recommendation, and the feet had better be too large than too small. The brood mare should possess as many of the points now enumerated as: possible. If the mare is small but symmetrical, we may very properly select a large stallion, provided he has good action. If, on the other hand, the mare is large and has a tendeney to coarseness, we should select a middle-sized horse of symmetrical appearance. " 1

Sixteen hands is a good height for a farm-horse. Except for very heavy land, we have always had more satisfaction from horses slightly below this standard than above it.

We have repeatedly put a well-bred saddle mare to a cart-horse, and have invariably found the produce to prove excellent farm-horses. The opposite cross, betwixt a cart- mare and blood stallion, is nearly as certain to prove un- gainly, vicious, and worthless. These horses are generally Sanne

1 Morton's Cyclopedia of Agriculture—article " Horse."

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much stronger than their appearance indicates, have great powers of endurance, and can be kept in prime working condition at much less cost than bulkier animals. It is on inuscular power and nervous energy that the strength of animals depends, and this, therefore, should be sought after in the farm-horse rather than-mere bulk.

Cart-mares should not foal earlicr than May. Provided they are not unduly pushed or put to draw heavy loads, they may be kept at work almost up to their time of foaling, and are thus available for the pressing labours of spring. It is of importance, too, that the pasture should be fresh and the weather mild ere their nursing duties begin. Mares seldom require assistance in bringing forth their young, and although it is. well to keep an eye upon them when this event is expected, they should be kept as quiet as possible, as they are.impatient of intrusion, and easily disturbed in such circumstances. A sheltered paddock with good grass, and where there are no other horses, is the most suitable quarters for a mare that has newly foaled. There must be no ditch or pond in it, as young foals have a peculiar fatality for getting drowned in such places. A mare, in ordinary condition, receives the stallion on the ninth or tenth day after foaling, and with a greater cer- tainty of conceiving than when it is delayed until she is again in heat. Jf the mare's labour can at all be dis- pensed with, it is desirable to have her with her foal for two months at least. She may then be put to easy work with perfect safety, so that she is not kept away from the foal longer than two or three hours at a time. When the foal has got strong enough, it may even be allowed to follow its dam at her work, and to get suck as often as it desires it. Towards the end of September foals are usually weaned, and are then put under cover at night, and receive a little corn, along with succulent food. Good hay, bran, carrots, or swedes, and a few oats, must be given regularly during the first winter, with a warm shed to lie in, and an open court for exercise. At weaning it is highly expedient to put a cavasin on colts, and lead them about for a few times. A few lessons at this early age, when they are easily controlled, saves a world of trouble afterwards. Before being turued to grass in spring, they should, on the same principle, be tied up in stalls for a week or so. It is customary to castrate colts at a year old. Some, indeed, advise its being done a few weeks after birth, when, of course, the pain to the animal and risk of death are less. It must, however, be borne in mind that this early emascu- lation will probably ensure a skranky neck, whereas a natural tendency to this defect can in good measure be remedied by deferring the operation. We have seen a puny colt much improved in figure by being left entire until he was two years old. By giving good pasture in summer, and a liberal allowance of hay, roots, and oats in winter, colts may with safety, and even benefit, be put to moderate work in their third spring. Some time before this is done they

should be put through a short course of training, to use them to the bit, and make them quiet and handy. Many good cart-horses are ruined for want of a little timely attention in this way. When they have got familiar with the harness, they should be yoked to a log of wvod, and made to draw that up and down the furrows of a fallow field, until they become accustomed to the restraint and exertion, after which they may with safety be put to plongh alongside a steady and good-tempered horse, and, what is of equal consequence, under the charge of a steady, good-tempered ploughman. As they should not have more than five hours' work a-day for the first summer, it is always an advantage to have a pair of them to yoke at the same time, in which case they take half-day about, and do a full horse's work betwixt them. With such moderate work and generous feeding their growth will be promoted.

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By midsummer, the press of field labour being over, it is advisable to turn the striplings adrift, and let them enjoy themselves in a good pasture until after harvest, when they can again be put to plough. Horses should not be required to draw heavy loaded carts until they are five years old. When put into the shafts earlier than this they frequently get strained and stiffened in their joints. On every farm requiring four or five pairs of horses it is highly expedient to have a pair of young ones coming in annually. This enables the farmer to be provided against contingencies, and to have his stable occupied at all times with horses in their full vigour, which go through their work with spirit, and never falter for a little extra pushing in emergencies.

Section 3.—Feeding and General Management of Farm-Horses.

As there is true economy in employing only the best quality of horses, and these in their prime, so also is there in feeding them uniformly well, and looking to their com- fort in all respects. The following quotation from the Transactions (for October 1850) of the Highland and Agri- cultural Society of Scotland, describes the practice of some of our most experienced farmers in this particular :—

"The system of feeding I adopt is as follows :—From the middle of October till the end of May my horses get one feed of steamed food and two feeds of

oats daily, with the best oat or wheat straw for fodder. I never give bean straw unless it has been secured in fine condition, having often seen the bad effects of it, partly owing, I think, to its long exposure to the weather. In our variable climate, and from the quantity of sand which adheres to it, I use it generally for litter. The steamed food used is well washed Swedish turnips and potatoes in equal proportions, mixed with sifted wheat-chaff. In those years when we had a total loss of potatoes Swedish turni alone was used, but not with the same good effect as when mixc with potatoes. This year, having plenty of diseased potatoes in a firm state, I give a larger proportion of potatoes than turnip, and never upon any occasion give oat husks, commonly called meal- seeds, having often seen their injurious effects. At five o'clock in the morning each horse gets 6 Ib weight of bruised oats, at noon the same ey of oats, and at half-past seven P.M. 47 tb weight of steamed food. I find that it takes 62 tb weight of unsteamed potatoes and turnip to produce 47 tb steamed; to each feed of steamed food, 4 oz. of common salt are added, and mixed up with one-fourth part of a bushel of wheat-chaff, weighing about 14 lb, a greater quantity of wheat-chaff than this having generally too laxa- tive an effect. ach horse eats from 14 tb to 18 Tb of fodder during the twenty-four hours, besides what is required forlitter. In spring I sometimes give a mixture of bruised beans and oats, instead of oats alone; from June to the middle of October those horses that are required for the working of the green crop, driving manure, and harvest-work, are fed with cut grass and tares in the house ; and about 7 tb of oats each day, given at twice, increasing or decreasing the quantity according to the work they have todo; and I turn out to pasture only those horses that are not required until the busy season. I disapprove of horses that are regularly worked being turned out to grass, and exposed to all the changes of our variable climate, as I believe it to be the origin of many diseases. By this mode of feeding the horses are always in fine sleek condition, and able for their work. I have acted upon this system for the last fifteen years, have always had from 16 to 20 horses, and during that period I have only lost 7 horses, 3 of them from accidental causes ; and I attribute this, in a great measure, to the mode of feeding, and in particular to the steamed food."

The treatment of horses differs somewhat in other places from that now detailed. In Berwickshire, for example, they are usually turned to pasture as

soon as the mildness of the weather and the forwardness of the pasture admit of it. While employed in carrying the crop, their fodder consists largely of tares, and afterwards till Martinmas they are fed on hay. From this date oat and bean straw, with 8 or 10 tb of raw swedes to each per diem, is substituted till the 1st of March, when, with the recurrence of harder labour, hay is again given till the return of the grazing season. During three-fourths of the year they receive about 16 tb of oats per diem, in three separate feeds. From the close of turnip-sowing until harvest, oats are either withheld or given only when a harder day's work occurs. The practice

of bruising the whole of the oats given to horses, and also of chopping their hay, is now very prevalent. By giving a few pounds of chopped hay with each feed of bruised oats, and oat-straw in the racks, during the whole of the winter half-year, horses are kept in better condition and at no more expense than by giving them straw alone for half the period, and hay alone the other half. We are persuaded, also, that unless horses are stripped of their shoes and turned adrift altogether for a summer's run, soiling in boxes or sheds, with an open yard, is preferable to grazing. Hay and oats ought undoubtedly to constitute the staple fare of farm-horses. Without a liberal allowance of suitable and nourishing food, it is impossible that they can perform the full amount of work of which they are capable, or be sustained for any length of time in robust health. When alleged very cheap plans of feeding horses are inquired into, it is usually found that the amount and quality of the work performed by them is in fitting pro- portion. In this, as in so many other things, cheapness and economy are not convertible terms. The true way to economise the horse-labour of a farm is to have only good and well-fed animals, and to get the greatest possible amount of work out of them.

CHAPTER XVI. LIVE STOCK—CATTLE. Section 1.—Breeds—lst, Heavy Breeds.

As our limits do not admit of even a brief notice of all those breeds of cattle for which Great Britain is so famous, we shall restrict our remarks to some of the most important of them. Without entering upon curious speculations as to the origin of these breeds, we proceed to notice them in the order

suggested by their relative importance in practical agriculture. The large lowland cattle thus claim our first attention, and amongst them we cannot hesitate in assign- ing the first place to the

Short-horns.—It appears that from an early date the valley of the Tees possessed a breed of cattle which, in appearance and general qualities, were probably not unlike those quasi short-horns which abound in various parts of the country at the present day. By the time that the Messrs Colling came upon the field it is evident that there were many herds around them in which considerable improvement had already been effected, and that they com- menced their memorable efforts in cattle-breeding with exceedingly hopeful materials to work upon. But in their masterly hands these materials seemed at once to acquire an unwonted plasticity; for in an incredibly short time their cattle exhibited, in a degree that has not yet been excelled, that combination of rapid and large growth with aptness to fatten, of which their symmetry, good temper, mellow handling, and gay colours are such pleasing indices and accompaniments, and for which they have now acquired a world-wide celebrity. It was by judicious selection in the first instance, and then by coupling animals of near affinity in blood, that they so developed and stereotyped these qualities in their cattle as to entitle them at once to take rank as the progenitors of a new and well-marked breed. These Durham, Teeswater, or Short-horn cattle, as they were variously called, were soon eagerly sought after, and spread over the whole country with amazing rapidity. For a time their merits were disputed by the eager ad- vocates of other and older breeds, some of which (such as the long-horns, once the most numerous breed in the kingdom) they have utterly supplanted, while others, such as the Herefords, Devons, and Scotch polled cattle, have each their zealous admirers, who still maintain their supe- riority to the younger race. But this controversy is mean- while getting practically decided in favour of the short-

horns, which constantly encroach upon their rivals even in their headquarters, and seldom lose ground which they once gain. Paradoxical as the statement appears, it is yet true that the very excellence of the short-horns has in many cases led to their discredit. For many persons desiring to possess these valuable cattle, and yet grudging the cost of pure-bred bulls, or being ignorant of the principles of breed- ing, have used worthless cross-

bred males, and so have filled the country with an inferior race of cattle, bearing indeed a general resemblance in colour, and partaking in some measure of the good qualities of short-horns, but utterly wanting in their peculiar excellences. By ignorant or pre- judiced persons the genuine race is nevertheless held answerable for the defects of the mongrels which usurp their name, and for the dainaging comparisons which are made betwixt them and choice specimens of other breeds. That the short-horn breed should spread as it does, in spite of this hinderance, is no small proof of its inherent ex- cellence, and warrants the inference that whenever justice is done to it, it will take its place as the one appropriate breed of the fertile and sheltered parts of Great Britain. This desirable consummation has hitherto been retarded by the scarcity and high price of pure-bred bulls. We are quite aware that bull-breeding, as hitherto conducted, is a hazardous and unremunerative business, notwithstanding the great prices sometimes obtained for first-class animals. We are of opinion, however, that it might be conducted in such a way as to be safer and more profitable to the breeder, and more beneficial to the country at large, than it has hitherto been. There is at present a large and growing demand for good yearling short-horn bulls, at prices ranging from £25 to £50. With a better supply both as to quality and numbers, this demand would steadily increase, for we have long observed that there is no want of customers for really good animals at such prices as we have named. When higher prices than these are demanded, farmers who breed only for the production of beef feel that they are beyond their reach, and are fain to content themselves with lower-priced and inferior animals. We are glad, therefore, that it is a steadily increasing practice for breeders of short- horns to dispose of their young bulls by an annual auction sale on their own premises ; or for a number of breeders to concur in offering their lots for sale on the same day at some central auction mart. The good effects of this in- creasing supply of well-bred bulls are becoming apparent in the improved quality of the cattle now brought to our markets.

A great stimulus has been given to the breeding of high- class short-horns by the extraordinary prices which of late have been obtained for animals of certain favourite and fashionable strains. To illustrate this we give the follow- ing particulars of the four principal sales of the year 1872 :-—

The late Mr Pawlet's . herd of 60 animals averaged £195 18 7 Mr G. Bowly's ' ; oe ol) re 158 1 9 Earl of Dunmore's . : oe! Fe 242 18 9 Messrs Harward & Downay's ,, 61 3 mise) (33 22)

It is said that the operations of one enterprising Canadian breeder—Mr Cochran of Hillhurst—have had a powerful effect in determining these extraordinary market rates for short-horns of the choicest type. One cargo, including forty short-horn bulls and heifers, and choice specimens of Cotswold sheep and Berkshire pigs, taken out by this gentleman in 1870, is said to have cost him £15,000. American breeders of short-horn cattle have now established a herd-book of their own, and have been so successful in their efforts that already they have made numerous sales to English breeders at long prices. While we write, accounts have come of the sale by auction, on 10th September 1873,

| of the herd of Mr Campbell of New York Mills, near

Utica, when 108 animals realised $380,000. Of these 10 were bought by British breeders, 6 of which, of the Duchess family, averaged $24,517, and one of them, " Highth Duchess of Geneva," was bought for Mr Pevan Davies of Gloucestershire at the unprecedented price of £8120. Choice specimens of these cattle are now also being sent in large numbers to our Australian colonies and to various parts of the continent of Europe. Indeed, it may be said of them, that, like our people, they are rapidly spreading over the world. ;

As already hinted, the Hereford is the breed which in England contests most closely with the short-horns for the palm of excellence. They are admirable grazier's cattle, and when of mature age and fully fattened, pre- sent exceedingly level, compact, and massive carcases of excellent beef. But the cows are poor milkers, and the oxen require to be at least two years old before being put up to fatten—defects which, in our view, are fatal to the claims which are put forward on their behalf. To the grazier who purchases them when their growth is somewhat matured they usually yield a good profit, and will generally excel short-horns of the same age. But the distinguishing characteristic of the latter is that, when properly treated,

they get sufficiently fat and attain to remunerative weights at, or even under, two years old. If they are kept lean until they have reached that age their peculiar excellence is lost. From the largeness of their frame they then cost more money, consume more food, and yet do not fatten more rapidly than bullocks of slower growing and more compactly formed breeds. It is thus that the grazier fre- quently gives his verdict in favour of Herefords as compared with short-horns. Even under this mode of management short-horns will usually yield at least as good a return as their rivals to the breeder and grazier conjointly. But if fully fed from their birth so as to bring into play their peculiar property of growing and fattening simultaneously, we feel warranted in saying that they will yield a quicker and better return for the food consumed by them than cattle of any other breed. Unless, therefore, similar qualities are developed in the Herefords, we may expect to see them more and more giving place to the short-horns. These remarks apply equally to another breed closely allied to the Herefords, viz., the

North Devons, so much admired for their pleasing colour, elegant form, sprightly gait, and gentle temper, qualities which fit them beyond all other cattle for the labour of the field, in which they are still partially employed in various parts of England. If it could be proved that ox-power is really more economical than horse-power for any stated part of the work of the farm, then the Devons, which form such admirable draught oxen, would be deserving of general cultivation. It is found, however, that when agriculture reaches a certain stage of progress, ox-labour is inadequate to the more rapid and varied operations that are called for, and has to be superseded by that of horses.

Scotland possesses several indigenous breeds of heavy cattle, which for the most part are black and hornless, such as those of Aberdeen, Angus, and Galloway. These are all valuable breeds, being characterised by good milking and grazing qualities, and by a hardiness which peculiarly adapts them for a bleak climate. Cattle of these breeds, when they have attained to three years old, fatten very rapidly, attain to great size and weight of carcase, and yield beef which is not surpassed in quality by that of any cattle in the kingdom.

The cows of these breeds, when coupled with a short- horn bull, produce an admirable cross-breed, which com- bines largely the good qualities of both parents. The great saving of time and food which is effected by the earlier maturity of the cross-breed has induced a very

extensive adoption of this practice in all the north-eastern counties of Scotland. Such a system is necessarily inimical to the improvement of the pure native breeds; but when cows of the cross-breed are continuously coupled with pure short-horn bulls, the progeny in a few generations become assimilated to the male parent, and are characterised by a peculiar vigour of constitution and excellent milking power in the cows. With such native breeds to work upon, and this aptitude to blend thoroughly with the short-horn breed, it is much more profitable to introduce the latter in this gradual way of continuous crossing than at once to substitute the one pure breed for the other. The cost of the former plan is much less, as there needs but the pur- chase from time to time of a good bull; and the risk is incomparably less, as the stock is acclimatised from the first, and there is no danger from a wrong selection. The greatest risk of miscarriage in this mode of changing the breed is from the temptation to which, from mistaken economy, the breeder is exposed of rearing a cross-bred bull himself, or purchasing a merely nominal short-horn bull from others.

From this hurried review of our heavy breeds of cattle it will be seen that we regard the short-horn as incom- parably the best of them all, and that we anticipate its ultimate recognition as the breed which most fully meets the requirements of all those parts of the country where grain and green crops are successfully cultivated,

2d.—Dairy Breeds.

The dairy breeds of cattle next claim our attention, for although cattle of all breeds are used for this purpose, there are several which are cultivated chiefly, if not exclusively, because of their fitness for it. Dairy husbandry is pro- secuted under two very different and well-defined classes of

circumstances. In or near towns, and in populous mining and manufacturing districts, it is carried on for the purpose of supplying families with new milk. In the western half of Great Britain, and in many upland districts, where the soil and climate are more favourable to the production of grass and other green crops than of corn, butter and cheese constitute the staple products of the husbandman. The town dairyman looks to quantity rather than quality of milk, and seeks for cows which are large milkers, which are long in going dry, and which can be readily fattened when their daily yield of milk falls below the remunerative measure. Large cows, such as short-horns and their crosses, are accordingly his favourites. In the rural dairy, again, the merits of a cow are estimated by the weight and quality of the cheese or butter which she yields, rather than by the mere quantity of her milk. The breeds that are cultivated expressly for this purpose are accordingly characterised by a less fleshy and robust build than is requisite in grazier's cattle. Of these we select for special notice the Ayrshire, the Suffolk dun, and the Jersey breeds.

The Ayrshires, by common consent, now occupy the very first rank as profitable dairy cattle. From the pains which have been taken to develop their milk-yielding power it is now of the highest order. Persons who have been conversant only with grazing cattle cannot but be surprised at the strange contrast between an Ayrshire cow in full milk and the forms of cattle which they have been used to regard as most perfect. Her wide pelvis, deep flank, and enor- mous udder, with its small wide-sct teats, seem out of all proportion to her fine bone and slender forequarters. As might be expected, the breed possesses little merit for grazing purposes. Very useful animals are, however, obtained by crossing these cows with a short- horn bull, and this practice is now rather extensively pursued in the west of Scotland by farmers who combine dairy husbandry with the fattening of cattle. The function of the Ayrshire cattle is, however, the dairy. For this they are unsurpassed, either as respects the amount of produce yielded by them in proportion to the food which they consume, or the faculty which they possess of converting the herbage of poor exposed soils, such as abound in their native district, into butter and cheese of the best quality.

The couuty of Suffolk has for centuries been cclebrated for its dairy produce, which is chiefly obtained from a polled breed of cattle, the prevailing colour of whieh is dun or pale red, from which they are known as the Sujjolk Duns. They have a strong general resem- blance to the Scotch polled cattle, but nevertheless seem to be indigenous to Suffolk. They are ungainly in their form and of little repute with the grazier, but possess an undoubted capacity of yielding a large quantity of milk in proportion to the food which they consume. They are now encroached upon by, and will pro- bably give place to, the short-horns, by which they are deeidedly excelled for the combined purposes of the dairy and the fattening

ll. we the breeds already referred to are those to which professional dairymen give the preference, but the cattle of the Channel Islands, of which ie Jersey may be regarded as the type, are so remarkable for the choice quality of the cream and butter obtained from their rather scanty yield of milk, that they are eagerly sought after for private dairies, in which quality of produce is more regarded than quantity. The rearing of heifers for the English market is of such importance to these islands that very stringent regulations have been adopted for insuring the purity of their peculiar breed. These cattle in general are utterly worthless for the purposes of the grazier. The choicer specimens of the Jerseys have a certain deer- like form which gives them a pleasing aspect. The race, as a whole, bears a striking resemblance to the Ayrshires, which are alleged to owe their peculiar excellences to an early admixture of Jersey blood.

3d.—Mountain Breeds.

The mountainous parts of Great Britain are.not less favoured than the lowlands in possessing breeds of cattle peculiarly adaptcd to the exigencies of the climate. F

The Kyloes or West Highland cattle are the most prominent of this group. They are widely diffused over the Highlands of Scotland, but are found in the greatest perfection in the larger Hebrides. Well- bred oxen of this breed, when of mature growth and in good con- dition, exhibit a symmetry of form and noble bearing which is unequalled by any cattle in the kingdom. Although somewhat slow in arriving at maturity, they are contented with the coarsest fare, and ultimately get fat where the daintier short-horns could

barely exist. Their hardy constitution, thick mellow hide, and shaggy coat, peculiarly adapt them for a cold humid climate and coarse pasturage. Fewer of these cattle are now reared in the Highlands than formerly, owing to the lessened number of cottars and small tenants, the extension of sheep husbandry, and latterly from the excessive multiplication of deer forests. Large herds of cows are, however, kept ou such portions of farms as are unsuited for sheep walks. The milk of these cows is very rich, but as they yield it in small quantity, and go soon dry, they are unsuited for the dairy, and are kept almost solely for the purpose of suckling each her own calf. The calves are generally housed during their first winter, but after that they shift for themselves out of doors all the year round. Vast droves of these cattle arc annually transferred to the lowlands, where they arc in request for their serviceablcness in consuming profitably the produce of coarse pastures and the leavings of daintier stock. Those of a dun or tawny colour are often selected for grazing in the parks of the aristocracy, where they look quite as picturesque as the deer with which they are associated. Indeed, they strikingly resemble the so-called wild cattle that are carefully preserved in the parks of several of our nobility, and like them are probably the descendants of the cattle of the ancient Britons. This a is confirmed by the strong family likeness borne to them by the

Welsh cattle, which is quite what might be expected from the many features, physical and historical, which the two provinces have in common. Although the cattle of Wales, as a whole, are obviously of common origin, they are yet ranged into several groups, which owe their distinctive features either to peculiarities of soil and climate or to intermixture with other breeds. The. Pembrokes may be taken as the type of the mountain groups. These are hardy cattle, which thrive on scanty pasturage and in a humid climate. They excel the West Highlanders in this respect, that they make good dairy cattle, the cows being peeuliarly adapted for cottagers' purposes. When fattened they yield beef of excellent quality. Their prevailing and most esteemed colour is black, with deep orange on the naked parts. The Anglesea cattle are larger and coarser than the Pembrokes, and those of Merioneth and the higher districts are smaller, and inferior to them in every respect. The county of Glamorgan possesses a peculiar breed, bearing its name, which has long been in estimation for combined grazing and dairy purposes. It has latterly been so much encroached upon by Herefords and short- hoins

that there seems some likelihood of its becoming extinct, which will be cause for Tegret, unless pains are taken to occupy its place with cattle not inferior to it in dairy qualities. We con- clude this rapid review of our native breeds by noticing the most singular of them all, viz.,

The Shetland cattle, which are the most diminutive in the world.

The carcase of a Shetland cow, when fully fattened, scarcely exceeds in weight that of a long-woolled wether. These little creatures are, however, excellent milkers in proportion to their size ; they are very hardy, are contented with the scantiest pasturage, come early to maturity, are easily fattened, and their beef surpasses that of all other brecds for tenderness and delicacy of flavour. The dintinutive cows of this breed are not unfrequently coupled with short-horn bulls, and the progeny from such apparently preposterous unions not only possess admirable fattening qualities, but approximate in bulk to their sires. These curious and handsome little ercatures, apparently of Scandinavian origin, are so peculiarly fitted to the circumstances of their bleak and stormy habitat, that the utmost pains ought to be taken to preserve the breed in purity, and to improve it by judicious treatment.

Section 2.—Farm Management of Cattle.

We shall now endeavour to describe the farm management of this valuable class of animals, under the heads of breeding, rearing, fattening, and dairy management. The proceedings of those engaged in the breeding and rearing of cattle for the production of beef are, however, largely determined by the character of the soil and climate of particular districts and farms. The occupiers of all comparatively fertile soils carry forward to maturity such animals as they breed, and dispose of them directly to the butcher. Those who are less fortunately circumstanced in this respect advance their young cattle to such a stage as the capabizities of their farms admit of, and then transfer them to others, by whom the fattening process is conducted. It cannot be too strongly impressed upon those who engage in this business that it never can be profitable to breed inferior cattle ; OF (however good their quality) to suffer their growth to be arrested by cold or hunger ; or to sell them in a lean state. In selecting a breeding stock of cattle, the qualities to be aimed at are a sound constitution and a symmetrical form, aptitude to

fatten, quict temper, and large milk-yielding power in the cows. As all these qualities are hereditary, cattle are valuable for breeding purposes not merely in pro- portion as they are developed in the individuals, but according to the measure in which they are known to have been possessed by their progenitors. A really good pedi- gree adds therefore greatly to the value of breeding-stock. It is doubtless important to have both parents good; but in the case of ruminants, the predominating influence of the male in determining the qualities of the progeny is so well ascertained, that the selection of the bull is a matter of prime importance. We are able to state, from ample personal experience, that by using a bull that is at once good himself and of good descent, a level and valuable lot of calves can be obtained from very indifferent cows. It is indeed miserable economy to grudge the price of a good bull. Coarse, mis-shapen, unthrifty cattle cost just as much for rearing and fattening as those of the best quality, and yet may not be worth so much by £3 or £4 a-head when they come ultimately to market. The loss which is annually sustained from breeding inferior cattle is far greater than those concerned seem to be aware of. It is impossible to estimate this loss accurately, but from careful observation and inquiry we are confident that it amounts to not less than 50s. a-head on one-half of the fat cattle annually slaughtered in Great Britain. If this be so, it follows that without expending a farthing more than is done at present on food, housing, and attendance, the profit which would accrue from using only the best class of bulls would be equivalent to an advance of 1s. per stone in the price of beef as regards half of the fat bullocks brought to market. This profit could, moreover, be secured by a very moderate outlay ; for if properly gone about, the best class of bulls might be employed without adding more than 3s. or 4s. a-head to the price of each calf reared. We may surely anticipate that such a palpable source of profit will not continue to be neglected by the breeders of cattle. There are many instances in which landlords would find it

much for their interest to aid their tenantry in at once procuring really good bulls. Cattle shows and prizes are useful in their way as a means of

improving the cattle of a district, but the introduction of an adequate number of bulls from herds already highly improved is the way to accomplish the desired end cheaply, certainly, and speedily. We must here protest against a practice by which short- horn bulls are very often prematurely unfitted for breeding. Their tendency to obesity is so remarkable that unless they are kept on short commons they become unwieldy and unserviceable by their third or fourth year. Instead, how- ever, of counteracting this tendency, the best animals are usually "made up," as it is called, for exhibition at cattle shows or for ostentatious display to visitors at home, and the consequence is, that they are ruined for breeding pur- poses. We rejoice to see that the directors of our national agricultural societies are resolutely setting their faces against this pernicious practice. It is needful certainly that all young animals, although intended for breeding stock, should be well fed, for without this they cannot attain to their full size and development of form. But when this is secured, care should be taken, in the case of all breeding animals, never to exceed that degree of flesh which is indispensable to perfect health and vigour. The frequent occurrence of abortion or barrenness in high- pedigreed herds seems chiefly attributable to overfeeding. The farmer who engages in cattle-breeding with the view of turning out a profitable lot of fat beasts annually, will take pains first of all to provide a useful lot of cows, such as will produce good calves, and if well fed while giving milk will yield enough of it to keep two or three calves a-piece. That he may be able to obtain a sufficient supply of good calves he will keep a really good bull, and allow the cottagers residing on the farm or in its neighbourhood to send their cows to him free of charge, stipulating only that when they have a calf for sale he shall have the first offer of it.

Cows are an expensive stock to keep, and it is therefore of importance to turn their milk to the best account. It is poor economy, however, to attempt to rear a greater number of calves than can be done justice to. Seeing that they are to be reared for the production of beef, the only pro- fitable course is to feed them well from birth to maturity. During the first weeks of calf-hood the only suitable diet is unadultered milk, warm from the cow, given three times a-day, and not less than two quarts of it at each meal. By three weeks old they may be taught to eat good hay, linseed cake, and sliced swedes. As the latter items of diet are relished and freely eaten, the allowance of milk is gradually diminished until about the twelfth week,

when it may be finally withdrawn. The linseed cake is then given more freely, and water put within their reach. For the first six weeks calves should be kept each in a separate crib; but after this they are the better of having room to frisk about. Their quarters, however, should be well sheltered, as a comfortable degree of warmth greatly promotes their growth. During their first summer they do best to be soiled on vetches, clover, or Italian ryegrass, with from 1 Tb to 2 tb of cake to each calf daily. When the green forage fails, white or yellow turnips are substi- tuted for it. A full allowance of these, with abundance of oat straw, and not less than 2 ib of cake daily, is the appropriate fare for them during their first winter. Swedes will be substituted for turnips during the months of spring, and these again will give place in due time to green forage or the best pasturage. The daily ration of cake should never be withdrawn. It greatly promotes growth, fattening, and general good health, and in particular is a specific against the disease called blackleg, which often proves so fatal to young cattle. Young cattle that have been skil-

fully managed upon the system which we have now sketched, are at 18 months old already of great size, with open horns, mellow hide, and all those other features which indicate to the experienced grazier that they will grow and fatten rapidly. 'This style of management is not only the best for those who fatten as well as rear, but is also the most profitable for those who rear only.

We have already stated that in Scotland comparatively few cattle are fattened on pasturage. An increasing number of fat beasts are now prepared for market during the summer months by soiling on green forage; but it is by nieans of the turnip crop, and during the winter months, that this branch of husbandry is all but exclusively con- ducted in the northern half of Great Britain. But a few years ago the fattening of cattle on Tweedside and in the Lothians was conducted almost exclusively in open courts, with sheds on one or more sides, in which from two to twenty animals were confined together, and fed on turnips and straw alone. Important changes have now been in- troduced, both as regards housing and feeding, by means of which

a great saving of food has been effected. Under the former practice the cattle received as many turnips as they could eat, which, for an average-sized two-year-old bullock, was not less than 220 ib daily. The consequence of this enormous consumption of watery food was, that for the first month or two after being thus fed the animals were kept in a state of habitual diarrhceea, Dry fodder was, indeed, always placed within their reach; but as long as they had the opportunity of taking their fill of turnips, the dry straw was all but neglected. By stinting them to about 100 th of turnips daity, they can be compelled to eat a large quantity of straw, and on this diet they thrive faster than on turnips at will,

SHEEP. |

and a cake is thus produced which in its raw state is poisonous to cattle, it has been ascertained that boiling deprives such spurious cake of its hurtful qualities and renders it safe and wholesome. As rape-cake possesses fattening elements equal to those of linseed-cake, and can usually be bought at half the price, it is well worth while to have recourse to a process by which it can so easily be rendered a palatable and nourishing food for cattle.

Fattening cattle are usually allowed to remain in the pastures to a later date in autumn than is profitable. The pressure of harvest work, or the immature state of his turnip crop, often induces the farmer to delay housing his bullocks until long after they have ceased to make progress on grass. They may still have a full bite on their pastures ; but the lengthening nights and lowering temperature lessen the nutritive quality of the herbage, and arrest the further accumulation of fat and flesh. The hair of the cattle begins also to grow rapidly as the nights get chilly, and causes them to be housed with rougher coats than are then ex- pedient. To avoid these evils the farmer should early in August begin to spread on the pasture a daily feed of green forage, consisting of vetches, peas, and beans grown in mixture in about equal proportions, which if well podded and full of soft pulse, supplies exactly the kind of food required to compensate for the deteriorating pasturage. Early in September cabbages and white globe turnips should be given on the pasture in lieu of the green forage. After ten days or so of this treatment they should be transferred to their winter quarters. For the first

two months after they go into winter quarters they make as good progress on yellow turnips as on any kind of roots; for the three following months well stored swedes are the best food for them ; and from the beginning of March until the end of the season, mangolds and potatoes, in the proportion of four parts of the former to one of the latter. The chaff of wheat, oats, or beans, if tolerably free from dust, is quite as suitable as cut straw for mixing with the pulped roots and cooked food. The addition of a small quantity of chopped hay, or of the husks of kiln-dried oats, to the other food, usually induces cattle to feed more eagerly. In short, the animals must be closely watched, and occasional variations made in the quantity and quality of the food given to particular individuals or of the general lot as their circumstances may require. Besides the food given in the manger it is desirable that each animal should receive a daily allowance of fresh oat straw in a rack to which he has access at pleasure.

A better appreciation of the effects of temperature on the animal economy has of late years exerted a beneficial influ- ence upon the treatment of fattening cattle. Observant farmers have long been aware that their cattle, when kept dry and moderately warm, eat less and thrive faster than under opposite conditions. They accounted for this in a vague way by attributing it to their greater comfort in such circumstances. Scientific men have now, however, showed us that a considerable portion of the food consumed by warm-blooded animals is expended in maintaining the natural heat of their bodies, and that the portion of food thus disposed of is dissipated by a process so closely an- alogous to combustion that it may fitly be regarded as so much fuel. The fat which, in favourable circumstances, is accumulated in their bodies, may in like manner be regarded as a store of this fuel laid up for future emer- gencies. The knowledge of this fact enables us to under- stand how largely the profit to be derived from the fattening of cattle is dependent upon the manner in which they are housed, and necessarily forms an important element in determining the question whether yards, stalls, or boxes are best adapted for this purpose. A really good system of housing must combine the following conditions :—

Ist, Facilities for supplying food and litter, and for re- moving dung with the utmost economy of time and labour;

2d, Complete freedom from disturbance ;

3d, A moderate and unvarying degree of warmth ;

4th, A constant supply of pure air ;

5th, Opportunity for the cattle having a slight degree of exercise ; and

6th, The production of manure of the best quality.

We have no hesitation in expressing our opinion that the whole of these conditions are attained most fully by means of well-arranged and well-ventilated boxes. Stalls are to be preferred where the saving of litter is an object, and yards for the rearing of young cattle, which require more exercise than is suitable for fattening stock. These yards are now, however, in the most improved modern homesteads, wholly roofed over, and thus combine the good qualities of both yard and box.

CHAPTER XVII. LIVE STOCK—SHEEP.

When Fitzherbert so long ago said, "Sheep is the most profitablest cattle that a man can have," he expressed an opinion in which agriculturists of the present day fully concur. But if this was true of the flocks of his time, how much more of the many admirable breeds which now cover the rich pastures, the grassy downs, and the heath- clad mountains of our country. Their flesh is in high estiniation with all classes of the community, and constitutes at least one-half of all the butcher meat consumed by them. Their fleeces supply the raw material for one of our most flourishing manufactures. They furnish to the farmer an important source of revenue, and the readiest means of maintaining the fertility of his fields.

Section 1.—Breeds.

The distinct breeds and sub-varieties of sheep found in Great Britain are very numerous. We have no intention of describing them in detail, but shall

confine our observa- tions to those breeds which by common consent are the most valuable for their respective appropriate habitats. They may be fitly classed under three heads —viz., the heavy breeds of the plains, those adapted for downs and similar localities, and the mountain breeds.

lst.—Heavy Breeds.

Of the first class, the improved Letcesters are still the most important to the country. They are more widely diffused in the kingdom than any of their congeners. Although, from the altered taste of the community, their mutton is less esteemed than formerly, they still constitute the staple breed of the midland counties of England. Leicester rams are also more in demand than ever for crossing with other breeds. It is now about a century since this breed was produced by the genius and persever- ence of Bakewell, in whose hands they attained a degree of excellence that has probably not yet been exceeded by the many who have cultivated them since his day. The characteristics of this breed are extreme docility, extra- ordinary aptitude to fatten, and the early age at which they come to maturity. The most marked feature in their structure is the smallness of their heads, and of their bones generally, as contrasted with their weight of carcase. They are clean in the jaws, with a full eye, thin ears, and placid countenance. Their backs are straight, broad, and flat, the ribs arched, the belly carried very light, so that they present nearly as straight a line below as above; the chest is wide, the skin very meilow, and covered with a beautiful fleece of long, soft wool, which weighs on the average from 6 to 7 Ib. On good soils and under careful treatment

these sheep are currently brought to weigh from 18 to 20 tb per quarter at 14 months old, at which age they are now usually slaughtered. At this age their flesh is tender and juicy ; but when feeding is carried on till they are older and heavier, fat accumulates so unduly as to detract from the palatableness and market value of the mutton.

Lineolns.—These were at onc time very large, ungainly animals, with an immeuse fleece of very long wool. By crossing them with the Leicesters the character of the breed has becn entirely changed, and very greatly for the

better. It is now, in fact, a sub-variety of the Leicester, with larger frame and heavier fleece than the pure brecd. Their wool, however, retains its distinctive characteristics— viz., great length of staple, an unctuous fecling, and, in particular, a brightness or lustre which adds largely to its value. Sheep of this kind are reared in immense numbers on the wolds and heaths of Lincolnshire, and are sold when about a year old in the wool, and in very forward condition, to the graziers of the fens and marshes, who ultimately bring them to very great weights.

Cotswolds, sometimes ealled Glo'sters or New Oxfords, are also large and long-woolled sheep, with good figure and portly gait. Great improvement has been effected in this breed during the last 30 years, in consequence of which they are rising rapidly in public estimation. The qualities for which they are prized are their hardi- ness, docility, rapid growth, aptitude to fatten, and the great weight to which they attain. .Their chief defect is that they yield mutton somewhat coarse in the grain and with an undue preponderance of fat. But in addition to their great merits as a pure breed they are especially valuable for the purpose of crossing with Downs and other short-woolled sheep. Of this we shall speak more particularly when we come to notice the Cross-breeds.

Teeswaters.—Vhis brecd, found formerly in the vale of the Tees, used to have the reputation of being one of the largest and heavicst of our native breeds. They had lighter flecces than the old Lincolns, but greater aptitude to fatten. Like them, however, they have becn so blended with Leicester blood as to have lost their former charac- teristics. As now met with, they constitute simply a sub-variety of the latter breed.

The Kents or Romney Marsh Sheep, arc another distinct long- woolled breed which have much in common with the old Lincolns, although they never equalled them either in the weight or quality of their fleece. They too have been much modified by a large infusion of Leicester blood ; but as their distinctive qualities fit them

well for a bleak and humid habitat, there is now an aversion to risk |

these by further crossing. As thcy now exist they are a great improvement upon the old breed of the Kentish marshes ; and this, in the first instance at

least, was the result of crossing rathcr than

selection. 2d.—Down and Forest Breeds.

The breeds peculiar to our chalky downs and other pastures of medium elevation next claim our notice.

Southdowns.— Not long after Robert Bakewell had begun, with admirable skill and perseverance, to bring to perfection his celebrated Leicesters, which, as we have scen, have either superseded or totally altered the character of all the heavy breeds of the country, another breeder, Mr John Ellman of Glynde, in Sussex, equal to Bakewell in judgment, perseverance, and zeal, and wholly devoid of his illiberal prejudice and narrow selfishness, addressed himself to the task of improving the native sheep of the downs, and succceded in bringing them to as great perfection, with respect to early maturity and fattening power, as they are perhaps susceptible of. Like Bakewell, he early began the practice of letting out rams for hire. These were soon eagerly sought after, and the qualities of his improved flock being rapidly communicated to others, the whole race of down shcep has more or less become assimilated to their standard. These improved Southdowns have, in fact, been to all the old forest and other fine-woolled breeds what the Leicesters have been to their congeners. Many of them have entirely disappeared, and others only survive in those modifications of the improved Southdown type which are to be found in particular localities. These down sheep possess certain well-marked features which distinguish them fiom all other breeds. They have a elose-set fleece of fine wool, weighing, when the animals are well fed, about 4 lb. ; their faces and legs are of a dusky brown colour, their neck slightly arched, their limbs short, their carcase broad and compact, their offal light, and their buttocks very thick and square behind. They are less impatient of folding, and suffer less from a pasture being thickly stocked with them than any other breed. It is in connection with this breed that the practice of folding as a means of inanuring the soil is so largely carried out in the chalk districts of England. Itis well ascertained that the injury done to a flock by this practice exceeds the benefit conferred on the crops. Now that portable manures are so abundant, it is to be hoped that this pernicious

practice of using sheep as mere muck machines will be everywhere abandoned.

AGRICULTUES

[LIVE STOCK—

These sheep are now usually classed as Sussex Downs and Hamp- shire Downs, the former being the most refined type of the class, both as regards wool and carcase, and the latter, as compared with them, having a heavier fleece, stronger bone, and somewhat coarser and larger frame.

The Shropshire sheep, while partaking of the general character- istics of the Southdown, is so much heavier both in fleece and earcase, and is altogether so much more robust an animal, that it now claims to be ranked as a separate breed. The qualities just referred to as distinguishing it from other downs seem, however, to be the result of selection rather than of crossing with other brecds, and thus the Shropshire sheep, while a pure down, is yet of so distinct a type from the high-bred " Southdown," that it is well entitled to be recognised as a distinct and very valuable brecd, as has been done by the Royal Society, which now assigns it a separate class at its annual mectings. Shropshire rams are eagerly sought aftcr, and many breeders of cminence in that conten! now their annual sales of these animals,

These breeds are peculiarly adapted for all those parts of England where low grassy hills occur, interspersed with, or in proximity to, arable land. In such situations they are prolific, hardy, and easily fattened at an early age. It is to their peculiar adaptation for cross- ing with the long-woolled breeds that they are indebted for their recent and rapid extension to other districts.

Dorsets.—This brecd has from time immemorial been naturalised in the county of Dorset and adjacent parts. They are a white-faced, horned breed, with fine wool, weighing about 4 tb per fleece. They are a hardy and docile race of sheep, of good size, and fair quality of mutton. But the property which distinguishes them from every other breed in Great Britain is the fecundity of the ewes, and their readiness to reccive the male at an early season. They have even been known to yean twice in the same year. Being, in addition to this, excellent nurses, they have long been in usc for rearing

house lamb for the Loudon market. For this purpose the rams are put to them early in June, so that the lambs are brought forth in October, and are ready for market by Christmas. But for this peculiarity, they would ere now have shared the fate of so many other native breeds, which have given place either to the Leicesters or Southdowns, according to the nature of the pastures. So long, however, as the rearing of carly house lambis found profitable, there is a sufficient inducement to preserve the Dorset breed in their purity, as they are unique in thcir property of early yeaning.

3d.—Mountain Breeds.

Cheviots.—As we approach and cross the Scottish border we find a range of hills covered with coarser herbage than the chalky downs of the south, and with a climate considerably more rigorous. Here the Southdown sheep have been tried with but indifferent success. This, however, is not to be regretted, seeing that the native Cheviot breed rivals them in most of their good qualities, and possesses in addition a hardihood equal to the necessities of the climate. This breed, besides occupying the grassy hills of the border counties, is now found in great force in the north and west Highlands of Scot- land. In the counties of Sutherland and Caithness, where they were introduced by the late Sir John Sinclair, they have thriven amazingly, and in the hands of some spirited breeders have attained to as great perfection asin their native district. During the last 30 years this breed has undergone very great improvement in size, figure, weight of fleece, and aptitude to fatten. In proof of this, it is enough to mention that Cheviot wether lambs are now in the border counties brought to market when weaned, and are transferred to the low country graziers, by whom they are sent fat to the butcher at sixteen months old, weighing then from 16 to 18 tb per quarter. This is particularly the case in Cumberland, where Cheviot lambs are preferred to all other breeds by the low-country farmers, by whom they are managed with grcat skill and success. It is not at all unusual with them to realise an increase of from 20s. to 25s. per head on the purchase price of these lambs, after a twelvemonth's keep. This fact is peculiarly interesting from the proof which it affords of a hitherto unsuspected capacity in Cheviots, and probably in other upland breeds, to attain to a profitable degree of fatness and weight of carcase at almost as early an age as the lowland breeds when the same attention and liberal feeding is bestowed

upon them. There is no breed equally well adapted for elevated pastures, con- sisting of the coarser grasses with a mixture of heath ; but when- ever, from the nature of the soil or greater elevation, the heaths un- mistakably predominate, a still hardier race is to be preferred, viz.—

The Blaekfaced or Heath Breed.—They are accordingly found on the mountainous parts of Yorkshire, Lancashire, Cumberland, and Westmoreland ; over the whole of the Lammermuir range, the upper part of Lanarkshire, and generally over the Highlands of Scotland. Both male and: female of this breed have horns, which in the former are very large and spirally twisted. The face and legs are black or specked with black, with an occasional tendency to this colour on the fleece ; but there is nothing of the brown or russet colour which distinguishes the down breeds. The ehoicest flocks of these sheep

are found in Lanarkshire and in the Lammermuirs, where consider- able pains are now bestowed on their improvement. Their chief defects are coarseness of fleece and slowness of fattening until their growth is matured. In most flocks the wool, besides being open and coarse in the staple, is mixed with emps or hairs, which detract from its value. Rams with this defect are now carefully avoided by the best breeders, who prefer those with black faces, a mealy mouth, a slight tuft of fine wool on the forehead, horns flat, not very large, and growing well out from the head, with a thickset fleece of long, wavy, white wool. Greater attention is now also bein paid to their improvement in regard to fattening tendency ; in whic respect we do not despair of seeing them brought nearer to a par with other improved breeds. Whenever this is accomplished we shall possess in the breeds now enumerated, and their crosses, the means of converting the produce of our fertile plains, grassy downs, rough upland pastures, and heath-clad mountains, into wool and mutton of the best quality, and with the utmost economy of which the circumstances admit. :

In the higher grounds of Cumberland, and also in Westmoreland, Lancashire, and parts of Yorkshire, two varicties of the heath breed of sheep are found, viz., Herdwicks and Lonks—which, witha general resemblance to the blackfaced Highland breed, differ from it in having a elose-set fleece of

fine soft wool. They are sometimes de- scribed by saying that they have " the fleece of a Cheviot on the car- ease of a Highlander ;"' but the Herdwicks are so small, and both breeds are so inferior to the blackfaced in aptitude to fatten, that they are losing ground in their native districts, where the blackfaces are spreading rapidly, being in great repute for breeding crosses to long-woolled rams.

4th. Cross-Breeds.

We have thus enumerated the most important of our pure breeds of sheep, but our list would be defective were we to omit those cross-breeds which are acquiring increased importance every day. With the extended cultivation of turnips and other green crops there has arisen an increased demand for sheep to consume them. Flockmasters in upland districts, stimulated by this demand, happily be- thought them of putting rams of the improved low-country breeds to their Cheviot ewes, when it was discovered that the lambs produced from this cross, if taken to the low country as soon as weaned, could be fattened nearly as quickly, and brought to nearly as good weights, as the pure low-country breeds. The comparatively low prime cost of these cross-bred lambs is a farther recommendation to the grazier, who finds also that their mutton, partaking at once of the fatness of the one parent and of the juiciness, high flavour, and larger proportion of lean flesh of the other, is more generally acceptable to consumers than any other kind, and can always be sold at the best price of the day. The wool, moreover, of these crosses, being at once long and fine in the staple, is peculiarly adapted for the manufacture of a class of fabrics now much in demand, and brings in consequence the best price of any British-grown wool. The individual fleeces, from being close set in the pile, weigh nearly as much as those of the pure Leicesters. On all these accounts, therefore, these sheep of mixed blood have risen rapidly in public estimation, and are produced in ever-increasing numbers. This is accomplished in several ways. 'The occupiers of uplying grazings in some cases keep part of their ewe flock pure, and breed crosses from another part. They sell the whole of their cross-bred lambs, and get as many females from the other portion as keeps up the number of their breeding flock. This system of crossing cannot be pursued on the most elevated farms, as ewes bearing these heavier crossed lambs require better fare than when coupled with rams of their own race. The

surplus ewe lambs from such high-lying grazings are an available source of supply to those of a lower range, and are eagerly sought after for this purpose. Others, however, take a bolder course. Selecting a few of the choicest pure Cheviot ewes which they can find, and putting these to a first-rate Leicester ram, they thus obtain a supply of cams of the first cross, and putting these to ewes, also of the first cross, inanage in this way to have their entire flock half- bred, and to go on continuously with their own stock

without advancing beyond a first cross. They, however, never keep rams from such crossed parentage, but always select them from the issue of parents each genuine of their respective races. We know several large farms on which flocks of crosses betwixt the Cheviot ewe and Leicester ram have been maintained in this way for many years with entire success ; and one at least in which a similar cross with Southdown ewes has equally prospered. Many, how- ever, prefer buying in females of this first cross, and coupling them again with pure Leicester rams. In one or other of these ways cross-bred flocks are increasing on every side. So much has the system spread in Berwick- shire, that whereas, in our memory, pure Leicesters were the prevailing breed of the county, they are now confined to a few ram-breeding flocks. The cross-breed in best estimation in England is that betwixt the Cotswold and Southdown, which is in such high repute that it is virtually established as a separate breed under the name of Oxford Downs. In Scotland the cross betwixt the Leicester ram and Cheviot ewe is that which seems best adapted to the climate and other conditions of the country, and is that accordingly which is most resorted to on farms a portion of which is in tillage. On higher grounds a cross betwixt the Cheviot ram and blackfaced ewe is in good estimation, and has been extending considerably in recent years. This cross-breed seems to equal the pure blackfaced in hardiness, and is of considerably greater value both in fleece and carcase. This cross-breed is known by the name of Halflangs. As in the case of the Leicester-Cheviot ewes, flocks are main- tained by using rams of the cross-breed.

Section 2.—Management of Lowland Sheep,

As the management of sheep is influenced mainly by the nature of the lands upon which they are kept, we shall first describe the practice of Lowland flockmasters, and afterwards that pursued on Highland sheep-walks.

On arable farms, where turnips are grown and a breeding stock of sheep regularly kept, it is usual to wean the lambs about the middle of July. When this has been done, the aged and faulty ewes are drafted out, and put upon good aftermath or other succulent food, that they may be got ready for market as soon as possible. In many districts it is the practice to take but three crops of lambs from each ewe. A third part of the breeding flock—viz., the four- year-old ewes—is thus drafted off every autumn, and their places supplied by the introduction of a corresponding number of the best of the ewe-lambs of the preceding year's crop. These cast or draft ewes are then sold to the occu- piers of richer soils in populous districts, who keep them for another season to feed fat lambs. Such parties buy in a fresh stock of ewes every autumn, and, as they phrase it, "feed lamb and dam." In other cases the ewes are kept as long as their teeth continue sound, and after that they are fattened and sold to the butcher directly from the farm on which they have been reared. When the ewes that are retained for breeding stock have been thus overhauled, they are put to the worst pasture on the farm, and run rather thickly upon it. Attention is necessary, for some days after weaning, to see that none of them suffer from gorging of the udder. When it appears very turgid in any of them, they are caught and partially milked by hand ; but usually the change to poorer pasturage, aided by their restlessness and bleating for want of their lambs, at once arrests the flow of milk. The time of admitting the ram is regulated by the purpose for which the flock is kept, and by the date at which fresh green food can be reckoned upon in spring. When the produce is to be disposed of as fat lambs, it is of course an object to have them early; but for a holding stock, to be reared and fattened at fourteen to sixteen

months old, from 20th September to 20th October, accord- ing to the climate of the particular locality, is a usual time for admitting rams to ewes. A few weeks before this takes place the ewes are removed from bare pasture, and

put on the freshest that the farm affords, or, better still, on rape; failing which one good feed of white turnips per diem is carted and spread on their pastures, or the ewes are folded for part of the day on growing turnips. The rams are turned in amongst them just when this better fare has begun to tell in their improving appearance, as it ig found that in such circumstances they come in heat more rapidly, and with a greatly increased likelihood of conceiving twins. On level ground, and with moderate- sized enclosures, one ram suffices for sixty ewes ; but it is bad economy to overtask the rams, and one to forty ewes is better practice. Sometimes a large lot of ewes are kept in one flock, and several rams, at the above proportion, turned among them promiscuously. It is better, however, when they can be placed in separate lots. The breasts of the rams are rubbed with ruddle, that the shepherd may know what they are about. Those who themselves breed rams, or others who hire in what they use at high prices, have recourse to a different plan for the purpose of getting more service from each male, and of knowing exactly when each ewe may be expected to lamb; and also of putting each ewe to the ram most suitable to her in point of size, figure, and quality of flesh and fleece. The rams in this case are kept in pens in asmall enclosure. What is techni- cally called a teaser is turned among the general flock of ewes, which, on being seen to be in heat, are brought up and put to the ram that is selected for them. They are then numbered, and a note kept of the date, or otherwise a common mark, varied for each successive week, is put on all as they come up. The more usual practice is to mark the breast of the ram with ruddle, as already described, for the first seventeen days that they are among tle ewes—- that being the time of the periodic recurrence of the heat —and then to use soot instead. When lambing-time draws near, the red-rumped ewes, or those that conceived from the first copulation, are brought into the fold, and the remainder after the lapse of the proper interval. If all goes on well, six weeks is long enough for the rams to remain with the flock. The ewes are then put to more moderate fare, taking care, however, not to pinch them, but to preserve the due medium betwixt fatness and poverty. Under the first-mentioned extreme there is great risk of losing both ewe and lamb at the time of parturition ; and under the second, of the ewe shedding her wool, and being unable to nourish her lamb properly either before its birth or after. Wheu there is a consider- able breadth of grass-land, the grit or in-lamb ewes are run thinly upon it so long as the weather continues moderate. As the pasturage fails or winter

weather sets in, they receive a daily feed of turnips or hay, or part of both. In districts where the four-course rotation is pursued, and wheat sown after seeds, there is a necessity for keeping the ewes wholly on turnips and chopped hay or straw. In this case they are made to follow the fattening sheep, and to eat up their scraps, an arrangement which is suitable for both lots. A recently-introduced practice is better still—namely, to feed the ewes at this season on a mixture of oue part by measure of pulped turnips or mangel-wurzel to two of chopped straw, which is served out to them in troughs set down in their pastures. From the large quantity of straw which ewes are thus induced to eat, they can be allowed to take their fill of this mixture, and be kept in a satisfied and thriving state with a very moderate allowance of roots. As their time to lamb draws near, the mess should be made more nourishing by adding to it ground rape-cake, bean-meal, and bran, at the rate of

from ith to 4d of a pound of each of these articles to each ewe daily.

The period of gestation in the ewe is twenty-one weeks. No lambs that are born more than twelve days short of this period survive. Before any lambs are expected to arrive a comfortable fold is provided, into which either the eutire flock of ewes, or those that by their markings are known to lamb first, are brought every night. This fold, which may either be a permanent erection or fitted up annually for the occasion, is provided all round with separate pens or cribs of size enough to accommodate, a single ewe with her lamb or pair. The pasture or turnip fold to which the flock is turned by day is also furnished with several temporary but well-sheltered cribs, for the reception of such ewes as lamb during the day. It is of especial consequence that ewes producing twins be at once consigned to a separate apartment, as, if left in the crowd, they frequently lose sight of one lamb, and may refuse to own it when restored to them, even after a very short separation. Some ewes will make a favourite of one lamb, and wholly repudiate the other, even when due care has been taken to keep them together from the first. In this case the favourite must either be separated from her or be muzzled with a piece of network, to prevent it from getting

more than its share of the milk in the shepherd's absence. Indeed the maternal affection seems much dependent on the flow of milk, as ewes with a well-filled udder seldom trouble the shepherd by such capricious partialities. As soon as the lambs have got fairly afoot, their dams are turned with them into the most forward piece of seeds, or to rape, rye, winter-oats, or water-meadow, the great point being to have abundance of succulent green food for the ewes as soon as they lamb. Without this they cannot yield milk abundantly, and without plenty of milk it is im- possible to have good lambs. It is sometimes necessary to aid a lamb that has a poor nurse with cow's milk. This is at best a poor alternative ; but if it must be resorted to, it is only the milk of a farrow cow, or at least of one that has been calved six months, that is at all fit for this pur- pose. To give the milk of a recently-calved cow to a young lamb is usually equivalent to knocking it on the head. Ewe milk is poor in butter, but very rich in curd, which is known to be also in a measure the character of that of cows that have been long calved and are not again pregnant. We have found the Aberdeen yellow bullock turnip the best for pregnant and nursing ewes. Mangel-wurzel is much approved of by the flockmasters of the southern counties for the same purpose. It is of impor- tance at this season to remove at once from the fold and pens all dead lambs, and filth of every kind, the presence of putrefying matter being most hurtful to the flock. Should a case of puerperal fever occur, the shepherd must scrupulously avoid touching the ewe so affected ; or if he has done so, some one should take his accoucheur duties for a few days, as this deadly malady is highly contagious, and is often unconsciously communicated to numbers of the flock by the shepherd's hands. Unnecessary inter- ference with ewes during parturition is much to be depre- cated. When the presentation is all right, it is best to leave them as much as possible to their natural efforts. When a false presentation does occur, the shepherd must endeavour to rectify it by gently introducing his hand after first lubricating it with fresh lard or olive-oil. The less dogging or disturbance of any kind that ewes receive during pregnancy the less risk is there of unnatural presentations. As soon as lambs are brought forth the shepherd must give them suck. When they have once got a bellyful, and are protected from wet or excessive cold for two or three days, there is no fear of their taking harm from ordinary weather, provided only that the ewes have plenty of suit-

able food. Lambs are castrated, docked, and ear-marked, with least risk when about ten days old. Ewes with lambs must have good and clean pasturage throughout the sum- mer. For this purpose they must either be run thinly among cattle or have two or more enclosures, one of which may always be getting clean and fresh for their reception as the other gets bare and soiled. We have not found any advantage in allowing lambs yeaned in March to run with their dams beyond 20th July. A clover eddish or other perfectly clean pasture is the most suitable for newly- weaned lambs. Such as abound in tath, as it is called in Scotland—that is, rank herbage growing above the drop- pings of sheep or other animals—are peculiarly noxious to them. Folding upon rape or vetches suits them admirably, so that fresh supplies are given regularly as required. Sheep, when folded on green rye or vetches, require a good deal of water, and will not thrive unless this is supplied to them.

- All sheep are liable to be infested with certain vermin, especially "fags" or "kaids" (ALelophagus ovinus) and lice. To rid them of these parasites various means are resorted to. Some farmers use mercurial ointment, which is applied by parting the wool, and then with the finger rubbing the ointment on the skin, in three or four longitudinal seams on each side, and a few shorter ones on the neck, belly, legs, &c. Those who use this salve dress their lambs with it immediately after shearing their ewes, and again just before putting them on turnips. More frequently the sheep are immersed, all but their heads, in a bath in which arsenic and other ingredients are dissolved. On being lifted out of the bath, the animal is laid on spars, over a shallow vessel so placed that the superfluous liquor, as it is wrung out of the fleece, flows back into the bath. If this is done when the ewes are newly shorn, the liquor goes farther than when the process is deferred until the lambs are larger and their wool longer. It is a good practice to souse the newly-shorn ewes, and indeed the whole flock at the same time, in a similar bath, so as to rid them all of vermin.!

As turnips constitute the staple winter fare of sheep, it is necessary to have a portion of these sown in time to be fit for use in September. Young sheep always show a reluctance to take to this very succulent food, and should

therefore be put upon it so early in autumn that they may get thoroughly reconciled to it while the weather is yet temperate. Rape or cabbage suits admirably as tran- sitionary food from grass to turnips. ference from summer to winter fare is well managed, they usually make rapid progress during October and November. Some farmers recommend giving the hoggets, as they are now called, a daily run off from the turnip-fold to a neigh- bouring pasture for the first few weeks after their being put to this diet. We have found it decidedly better to keep them steadily in the turnip-fold from the very first. When they are once taught to look for this daily enlarge- ment, they become impatient for it, and do not settle quietly to their food. If possible, not more than 200 should be kept in one lot. The youngest and weakest sheep should also have a separate berth and more generous: treatment. Turnips being a more watery food than sheep naturally feed upon, there is great advantage in giving them from the first, along with turnips, a liberal allowance of clover hay cut into half-inch chaff. When given in this form, in suitable troughs and in regular feeds, they will eat up the whole without waste, and be greatly the better for it. To

1 The mercurial and arsenical salves and washes commonly in use

are believed often to have a hurtful effect on the health of the flocks to which they are applied, and. have sometimes caused very serious losses. Having used Macdougall's dip (a preparation of carbolic acid) for many years, we can testify to its eflicacy and safety.

When this trans- |

economise the hay, equal parts of good oat straw may be cut up with it, and will be readily eaten by the flock. A liberal supply of this dry food corrects the injurious effects which are so often produced by feeding sheep on turnips alone, and at the same time lessens the consumption of the green food. We believe also that there is true economy in early beginning to give them a small daily allowance, say 4 Ib each, of cake or corn, This is more especially desir- able when sheep are folded on poor soil. The extraneous

food both supplies the lack of nutrition in the turnips and fertilises the soil for bearing succeeding crops. An im- mense improvement has been effected in the winter feeding of sheep by the introduction of machines for slicing turnips. Some careful farmers slice the whole of the turnips used by their fattening sheep, of whatever age; but usually the practice is restricted to hoggets, and only resorted to for them when their niilk-teeth begin to fail. In the latter case the economy of the practice does not admit of debate. When Mr Pusey states the difference in value between hoggets that have had their turnips sliced and others that have not, at 8s. per head in favour of the former from this cause alone, we do not think that he over-estimates the benefit. Those who slice turnips for older sheep, and for hoggets also as soon as ever they have taken to them, are, we suspect, acting upon a sound principle, and their ex- ample is therefore likely to be generally followed. There is no doubt of this at least, that hoggets frequently lose part of the flesh which they had already gained from the slicing of the turnips being unduly delayed. By 1st December their first teeth, although not actually gone, have become so inefficient that they require longer time and greater exertion to feed their fill than before; and this, concurring with shorter days and colder weather, operates much to their prejudice. When the slicing is begun, it is well to leave a portion of growing turnips in each day's fold, as there are always some timid sheep in a lot that never come freely to the troughs ; and they serve, moreover, to occupy the lot during moonlight nights, and at other times when the troughs cannot be instantly re-plenished. As the sheep have access to both sides of the troughs, each will accommodate nearly as many as it is feet in length. There should therefore be provided at least as many foot-lengths of trough as there are sheep in the fold. The troughs should be perpendicular at their outer edges, as the sheep are less apt to scatter the sliced turnips on the ground with this form than when they slope out- wards. It is expedient to have a separate set of similar troughs for the cake or grain and chopped fodder, which it is best to use mixed together.

As the season when frost and snow may be expected approaches it is necessary to provide in time for the flock having clean unfrozen turnips to eat in the hardest weather. To secure this, care must be taken to have always several weeks' supply put together in heaps and covered with earth to a sufficient thickness to exclude frost. The covering with earth is the only

extra cost incurred from using this precaution, for if slicing the roots is practised at all, it necessarily implies that the roots must be pulled, trimmed, and thrown together, and this again should be done in such a way as to insure that the dung and urine of the sheep shall be equally distributed over the whole field. This is secured by throwing together the produce of 18 or 20 drills into small heaps, of about a ton each, in a straight row and at equal distances apart. For a time it will suffice to cover these heaps with a few of the turnip leaves and a spadeful of earth here and there to prevent the leaves from being blown off. This arrangement necessitates the regular moving of the troughs over the whole ground. As the heaps are stript of their covering special care must be taken to scatter the tops well about, otherwise there

will be corresponding rank spots in the grain crop that follows.

On light dry soils it is usually most profitable to con- sume the whole turnip crop where it grows by sheep, and to convert the straw of the farm into dung by store cattle kept in suitable yards, to which a daily allowance of rape or cotton cake is given, with wholesome water con- stantly at their command. But it may at times be more profitable to use young sheep instead of cattle for this purpose, and it is quite practicable todoso. In the winter of 1865-66, in consequence of the prevalence of rinder- pest, we had recourse to this expedient with entire success. A lot of 200 hoggets was put into two contiguous yards, of a size which ordinarily had accommodated 15 cattle each; the hoggets were fed on hay cut into chaff, which was served to them in troughs so placed as to be protected from rain. Along with this chaff they received 2 ib each daily of mixed cakes and grain, and a constant supply of water. A covered passage by which the yards communicated was coated with quicklime, which was stirred up daily and added to twice a-week. Care was taken to drive the whole lot of sheep over this limed passage once every day, with liberty to them to pass and repass as much as they liked at all times. The yards were kept clean by being thinly covered over with fresh straw every day. By this means, and by an occasional paring of the hoofs when seen to be necessary, their feet were kept perfectly sound. In other respects they throve well, and the death-rate was unusually small.

To clear the ground in time for the succeeding grain crop a portion of the turnip crop is usually stored on some piece of grass or fallow, where the flock is folded until the pas- tures are ready to receive them. As the date of this varies exceedingly, it is well to lay in turnips for a late season, and rather to have some to spare than to be obliged to stock the pastures prematurely. If corn or cake has been given in the turnip field, it must be continued in the pasture. Hoggets that have been well managed will be ready for market as soon as they can be shorn, and may not require grass at all. 'They usually, however, grow very rapidly on the first flush of clovers and sown grasses, especially when aided by cake or corn. When the soil is of poor quality, it is expedient to continue the use of such extra food during summer. The best sheep are generally sent to market first, and the others as they attain to a proper degree of fatness. Store sheep or cattle are then purchased to occupy their places until the next crop of lambs is weaned.

Lowland flocks are for the most part shorn in May, although many fat sheep are sent to market out of their wool at a much earlier date. Indeed railway transit has made it practicable to forward newly-shorn sheep to market so quickly that there is now little risk of their suffering from exposure to bad weather, and accordingly few fat sheep are now sent to market rough after the 1st of April. But in the case of nursing ewes and store sheep of all kinds it is highly inexpedient to deprive them of their fleeces until summer weather has fairly set in. Accordingly, the latter half of May and the first half of June are, in average seasons, the best shearing time, beginning with the hoggets and ending with the ewes.

This practice of shearing a portion of the flock so early as April renders it necessary to make a change on that mode of sheep-washing so well described by the author of the Seasons. Artificial washing-pools are accordingly now pro- vided by damming up some small stream of clean water. The bottom is paved and three sides faced with bricks set in cement, with a sluice to let off the foul water when necessary. The most accessible side of the pool is formed of strong planks, securely jointed, behind which the men engaged in washing the sheep stand dry, and ac-

[tive stooK—

complish their work much in the way that a washer- woman does hers at her tub. A sloping passage at the upper end of the pool allows the sheep to walk out, one by one, as they are washed. One such pool is often made to accommodate several neighbouring farms.

Section 3.—Management of Mountain Sheep.

We have already taken notice of the extent to which Cheviot sheep have of late years been introduced in the Highlands of Scotland. Many of the immense grazings there are rented by farmers resident in the south of Scot- land, who only visit their Highland farms from time to time, and intrust the management of their flocks and shepherds, which rival in numbers those of the ancient patriarchs, to an overseer, whose duty it is to be constantly on the grounds, to attend in all respects to the interests of his employer, see his orders carried into effect, and give him stated information of how it fares with his charge.

The following pertinent remarks we quote from an extensive and experienced Highland sheep-farmer :—

'The management of flocks in the Highlands is much the same as on high and exposed farms in the higher districts of Roxburgh- shire, Dumfriesshire, and Sclkirkshire, as regards the ewe hirsels ; the ewe lambs either not being weaned, or that only for eight or ten days, so that they may continue to follow their mothers. The wether lambs are sent to the wether ground about the beginning of August, and herded on the part of it considered most adapted for their keep till about the middle of October, when they are sent to be mostly in Ross-shire, where they remain till the middle of March or beginning of April. This is one of the heaviest items of are in Highland farming, amounting to fully 4s. per head ; and thus, upon a farm equally stocked with ewes and wethers, adds just about one-third to the rental of the farm. On the return of the wether hogs they are put to particular parts of the wether ground, at large amongst the other ages of wether stock, where they remain until drawn out when three years old at the usual season to send to market ; with this exception, that the year follow- ing (when thcy are dinmonts), the smallest of them, those that are not considered capable of wintering at home, say to the extent of two or three to the score, arc again drawn out. and sent with the hogs to turnips.

“Mr Sellar, in his Report of the County of Sutherland, gives a very minute and detailed account of the mode of management as practised on his farms. This, however, does not apply to extensive West Highland farms, which have no arable farms attached, no fields to bring in the diseased or falling-off part of the stock to, nor is it ever practicable to shift any part of the stock to different parts of the farm from that on which they have been reared.”

Sheep Farming on the hills drained by the Tweed.

Until quite a recent date the grassy hills enclosing the upper valley of the Tweed and its numerous tributaries were stocked almost entirely with Cheviot sheep, and the highest and most heathery portions of the Lammermuir hills with the blackfaced breed. Since about the year 1850, under the stimulus of a growing demand and rapidly advancing price for cross-bred lambs, a great change of practice has been going steadily on. Formerly, on such hill-country farms, cultivation of the soil was restricted to a very small scale indeed, but latterly it has been extending up the valleys and hill-sides at a rapid rate. Large areas of rough natural pasture are yearly being converted into fields, which are well enclosed by substantial stone walls, and by draining, liming, and the liberal application of portable manures, are made to produce luxuriant crops of turnips, oats, and the cultivated clovers and grasses. As this pro- cess of reclamation goes on, half-bred sheep (Leicester- Cheviots) are substituted for pure Cheviots, the lambs of this cross breed being at weaning-time worth from 10s. to 15s. more per head than Cheviots, their fleeces heavier by 2 ib each as well as more valuable per Ib, and the draft ewes also more valuable in about the same proportion as the lambs. These half-bred sheep must be kept almost exclusively on the reclaimed lands, which, however, will keep about double the number of this more valuable breed of

sheep than they did of the less valuable when in their natural unreclaimed state. When the lowest-lying and kind- liest soils of such farms have thus been improved and devoted to the keeping of half-bred sheep, the higher and poorer parts are often unfit for keeping Cheviot sheep, and are stocked with the hardier blackfaced breed. Cheviots are in consequence rather at a discount at present as com- pared with a period still recent.

The general management of these hill-country half-bred flocks does not differ materially from those of the plains. They require generous feeding, and being prolific and good nurses, they pay well for it. The oats grown on such farms are disposed of most profitably when consumed by the flock.

We begin our description of the management of strictly hill flocks with autumn, and assume that the yearly cast of lambs and aged ewes has been disposed of, and only as many of the ewe lambs retained as are required to keep up the breeding stock. A former practice was to keep these ewe lambs or hoggets by themselves on the best portions of the respective walks, or rakes as they are called on the Borders. Now, however, they are kept apart from their dams only as long (eight or ten days) as suffices to let the milk dry up; whereupon they are returned to the flock or hirsel to which they belong, and at once associate again each with its own dam. The hoggets, under the guidance of the ewes, are thus led about over the ground, according to varying seasons, and under the promptings of an instinct which far surpasses the skill and care of the best shepherd. The latter, indeed, restricts his interference chiefly to keep- ing his flock upon their own beat, and allows them to dis- tribute themselves over it according to their own choice. When thus left to themselves each little squad usually selects its own ground, and may be found, the same individuals about the same neighbourhood day after day. This plan of grazing the hoggets and ewes together has been attended with the best results. There are far fewer deaths among the former than when kept separate, and being from the first used to the pasturage and acquainted with the ground, they get inured to its peculiarities, and grow up a healthy and shifty stock, more easily managed and better able to cope with trying seasons than if nursed elsewhere, and brought on to the ground at a more advanced age. Each hogget and its dam may be seen in couples all through the winter and spring, and with the return of summer it is a pretty sight to see these family groups grown into triplets by the addition to each of a little lamb.

As the autumn advances, the flockmaster makes his preparations for smearing or bathing. The smearing material is a salve composed of tar and butter, which is prepared in the following manner :—Six gallons of Arch-angel tar and 50 tb of grease-butter are thoroughly incor- porated, and as much milk added as makes the salve work freely. This quantity suffices for

100 sheep. This salve destroys vermin, and by matting the fléece is supposed to add to the comfort and healthiness of the sheep. It adds considerably to the weight of the fleece, but imparts to it an irremediable stain, which detracts seriously from its value per Ib. A white salve introduced by Mr Ballantyne of Holylee is now in repute on the borders. It is prepared as follows :—30 tb butter, 14 fb rough turpentine, and 3 tb soft soap are melted and mingled in a large pot; 2 i soda and } ib arsenic are then dissolved in a gallon of boiling water, and this, along with 12 gallons more of cold water, is intimately mixed with the other ingredients, and yields enough for dressing 100 sheep at the rate of a quart to each. Some persons, believing the arsenic an unsafe application, substitute for it half-a-gallon of tobacco juice. Instead of the rough turpentine, some also use half-a-gill of spirit of tar for each sheep; this

ingredient being mixed in each quart-potful at the time of application.

In applying these salves, the sheep are brought to the homestead in daily detachments, according to the number of men employed, each man getting over about sixty in a day. A sheep being caught and laid upon a stool, the wool is parted in lines running from head to tail, and the tar salve spread upon the skin by taking a little upon the fingers and drawing them along. In using the white salve each shepherd has a boy assistant who pours the liquid salve from a tin pot with a spout, while he holds the wool apart. This white salve destroys vermin, and is believed to nourish the wool and to promote its growth. Of late years the practice of dipping has largely been substituted for salving or pouring. It is practised as already described in the case of low-country flocks, save only that with large flocks it is expedient to have it performed at some central and other- wise convenient part of the grounds. Instead of a movable tub and dripping board of wood, it is better to have a fixed one built of concrete, or bricks set in cement, with a paved dripping pen large enough to hold 50 sheep in each of its two divisions. The other requisites are a boiler to supply hot water for dissolving the dipping stuff, a pipe to convey cold water to the bath, and a waste pipe to empty it for cleansing. This salving or dipping must all be accomplished before the 20th November, about which time the rams are admitted to the flock. Before this is done another pre- liminary is required. As the ewe hoggets graze with the flock, it is necessary to guard them from receiving the male, for

which purpose a piece of cloth is sewed firmly over their tails, and remains until the rams are withdrawn. This is called breeking them. On open hilly grounds about forty ewes are sufficient for each ram. To insure the vigour and good quality of the flock, it is necessary to have a frequent change of blood. To secure this by purchasing the whole rams required would be very costly, and therefore each flockmaster endeavours to rear a home supply. For this purpose he purchases every autumn, often at a high price, one or two choice rams from some flock of known ex- cellence, and to these he puts a lot of his best ewes, care- fully selected from his whole flock. These are kept in an enclosed field until the rutting season is over, and after receiving a distinctive mark are then returned to their respective hirsels. From the progeny of these selected ewes a sufficient number of the best male lambs is reserved to keep up the breeding stock of the farm. The rams are withdrawn from the flock about lst January, and are then kept in an enclosed field, where they receive a daily feed of turnips.

Except in heavy falls of snow and intense frosts, the flocks subsist during the entire season on the natural produce of their pastures. It is necessary, however, to be provided for such emergencies both .as regards food and shelter. For this purpose each shepherd has at suitable parts of his beat several sted/s or artificial shelters, such as are described at p. 402, and beside each of them a stack of hay from which to fodder the flock when required. So long as the sheep can get at heather or rushes by scraping away the snow with their feet they will not touch the hay, but when the whole surface gets buried and bound up, they are fain to take to it. The hay is laid out in handfuls over the snow, twice a day, if need be. The hay should, however, be administered with caution, and never to a greater extent than is absolutely necessary. Whenever there is a lull in the storm, the shepherd should use his utmost endeavour to move the flock out from their shelter to the nearest piece of rough heather or ground from which the wind has drifted off the snow, and where the sheep can by scraping with their feet get at their natural food. This should be done not merely to economise hay, but because

it is found that sheep invariably come through the hard- ships of winter in better condition when thus encouraged to shift as much as possible for themselves, than when fed to the full on hay, and allowed to keep to their shelter all the day. ;

Much vigilance, promptitude, and courage, are required on the part of shepherds in these wild and stormy districts in getting their flocks into places of safety on the breaking out of sudden snow-storms, and tending them skilfully there.

In spring advantage is taken of any dry weather that occurs to set fire to the roughest portions of the old heather andother coarse herbage, and this being thus cleared off, a fresh young growth comes up, which yields a sweeter pasture to the flocks for several succeeding years. Careful shepherds are at pains to manage the muir-burning so as to remove the dry effete herbage in long narrow strips, and thus to secure a regular intermixture of old and young heath.

The lambing season is one of much anxiety to the master; and to his shepherds and their faithful sagacious dogs it is one of incessant toil. They must be a-foot from "dawn till dewy eve," visiting every part of their wide range several times a-day, to see that all is right, and to give assistance when required. The ewes of these hardy mountain breeds seldom require man's assistance in the act of parturition, but still cross presentations and difficult cases occur even with them. Deaths occur also among the newly-dropt lambs, in which case the dam is takén to the nearest stell, and a twin-lamb (of which there are usually enough to serve this purpose) put in the dead one's place. The dead lamb's skin is stript off, and wrapt about the living one, which is then shut up beside the dam in a small crib or parik, by which means she is usually induced in a few hours (and always the sooner the more milk she has) to adopt the supposititious lamb. As the lambing season draws to a close, each shepherd collects the unlambed ewes of his flock into an inclosure near his cottage, and examines them one by one to ascertain which are pregnant. 'To the barren ones he affixes a particular mark, and at once turns them again to the hill, but the others are retained close at hand until they lamb, by which means he can attend to them closely with comparatively little labour. The lambs are castrated and docked at

from 10 to 20 days old. For this and for all sorting and drafting purposes an ample fold and suit of pens, formed of stout post and rail, are provided on some dry knoll con- venient for each main division of the flock. To this the flock is gently gathered, and penned off in successive lots of 10 or 12, taking care that each lamb has its own dam with it before it is penned, and to do this with as little dogging and running as possible. The male lambs of the pure blackfaced breed, when designed to be kept as wethers, are not castrated until they are eight or ten weeks old, partly because when this is done sooner their horns have a tendency to get so crumpled as to grow into their eyes, and partly because a bold horn is thought to improve the appearance of an aged wether.

On these elevated sheep-walks shearing does not take place until July. It cannot, in fact, be performed until the young wool has begun to grow or rise, and so admit of the shears working freely betwixt the skin and the old matted fleece. The sheep are previously washed by causing them to swim repeatedly across a pool with a gentle current flowing through it. They are made to plunge in from a bank raised, either naturally or artificially, several feet above the surface of the water. This sousing and swimming in pure water cleanses the fleece far more effect- ually than could be supposed by persons accustomed only to the mode pursued in arable districts. Shearing takes

place three or four days after washing, and in the interim much vigilance is required on the part of the shepherd to prevent the sheep from rubbing themselves under banks of moss or earth, and so undoing the washing. In the case of blackfaced flocks washing is now not unfrequently altogether dispensed with, because the greater weight of uuwashed wool more than counterbalances the difference in price betwixt washed and unwashed flecces. Each man usually shears about 60 sheep a-day. It is neither practicable nor expedient to shear these mountain sheep so closely as the fat denizens of lowland pastures. For this operation each shearer is provided with a low-legged sparred stool, having a seat at one end, or with a bench built of green turf. These are arranged in a row close in front of a

pen, in which the unshorn sheep aré placed. The shearers being seated, each astride his stool or bench, with their backs to the pen, a man in it catches and hands over a sheep to each of them. The sheep is first laid on its back upon the stool, and the wool shorn from the under parts, after which its legs are bound together with a soft woollen cord, and the fleece removed, first from the one side and theu from the other, by a succession of cuts running from head to tail. The fleeces are thrown upon a cloth and immediately carried to the wool-room, where, after being freed from clots, they are neatly wrapped up and stored away. Before the shorn sheep are released each receives a mark or buist by dipping the owner's cypher in melted pitch, and stamping it upon the skin of the animal. To discriminate different ages and hirsels, these marks vary in themselves or are affixed to different parts of the sheep. Once or twice a year all stray sheep found upon the farms of a well-defined district are brought to a fixed rendezvous, where their marks are examined by the assembled shep- herds, and each is restored to its proper owner.

Weaning takes place in August or early in September. A sufficient number of the best ewe lambs of the pure breeds are selected for maintaining the flock, and are treated in the way already noticed. With this exception, the whole of the lambs are sold either to low-country graziers or as fat lambs to the butcher. The wether lambs usually go to the former, and the ewe lambs of the cross betwixt blackfaced ewes and Leicester rams to the latter. These cwes being excellent nurses, make their lambs very fat in favourable seasons, in which case they are worth more to kill as lambs than to rear. Immediately after the weaning, the ewes which have attained mature age are disposed of, generally to low-country graziers, who keep them for another year, and fatten lamb and dam. To facilitate the culling out of these full-aged ewes, each successive crop of ewe lambs receives a distinctive ear- mark, by which all of any one age in the flock can be at once recognised.

Section 4.— Wool.

Wool is such an important part of the produce of our flocks that it seems proper to offer a few remarks upon it before leaving this subject, although it will fall to be considered under its proper heading. We here insert with

much pleasure the following communication received from the late John Barff, Esq., of Wakefield :—

“«] willingly give you a reply to your various inquiries regarding wool, as faras Iam able. As to the kinds grown in the various counties of the United Kingdom, this I cannot fully answer, as there are some counties’ wools which have not come much under my inspection ; but generally I may remark that wherever the turnip can be cultivated and has been introduced, the Leicester, Lincoln- shire, Cotswold, and the half-breds from Down and Cheviot, are to be found; and in the same counties, in several instances, you have several kinds, if we except Lincolnshire and Leicestershire, which have entirely the long-wool sheep. The great bulk also of York, Warwick, Oxford, Cambridge, Gloucester, Northampton, and Nottingham shires, have this description of shecp, but they

have also Downs and half-breds. Kent has its own sheep, ealled Kents ; the wool being much finer than the real long-wool sheep, running in quality and weight of fleece between the latter and the Down, something like your half-breds from Cheviot ewes by Leicester rams. ‘They have soniewhat of a similar sheep in Devon, Cornwall, Hereford, and Shropshire, but the quality in the two former counties scarcely so fine as the two latter, or the Kent wools. Norfolk has the origina! Down and the half-bred ; Surrey, Suffolk, Essex, Sussex, and Hampshire are nearly all Down wools, though in these counties, upon some of their best lands, where they ean cultivate the turnip, the half-bred are being introduced; and I need scarcely say to you, the Leicester sheep, as well as half-breds and Cheviots, are to be found in Durham, Northumberland, Berwickshire, Roxburghshire, Lothians, and other parts of Scotland where the turnip is eultivated; and in those parts where it is not, and on the hills, the Cheviot and blackfaced prevail. The blaek- faced are used for low padding cloths, carpets, and horse-rugs. The Down wools were formerly all used for cloths and flannels; but now, from the improvement in worsted machinery, one-third is used for worsted yarns and goods ; and. as the portion suitable for eomb- ing purposes is more valuable for this purpose than for eloths or flannels, the grower aims at getting it as deep-stapled as possible ; and. this Ret ied to a great increase

in the weight of the fleece, but at the same time a deterioration in the quality. The Leicester, Lincolnshire, and half-bred, and Cotswolds, as well as the Kents and Devons, are entirely used for worsted yarns aud goods; and a very small portion of the wools imported come in competition with them. The nearest approach is a little imported from Holland and Denmark ; but they partake more of your cross from a blackfaced ewe by a Leicester ram. The Irish wools are either the long- woolled sheep similar to the Leicester, the mountain sheep similar to your Cheviot, or the small Welsh sheep. The Irish wools are generally open-haired, and have not the richness of the Leicester or our English, and are not so much esteemed or valuable as English wool of apparently the same quality by $d. to 1d. per ib. Richness of handle is now very desirable, as there is a demand for what are called glossy yarns, which wools fed on pasture or good new seeds only can produce, and which eannot be obtained from the wools grown on chalk or hard lands, sueh as our midland counties—viz., Oxford, Bedford, and Northampton—generally produce.

"In every fleece of wool there are two or three qualities—not more than two or three in the blackfaeed, four or five in the long- woolled sheep, five or six in the half-bred, and seven or cight in a Down fleece ; aud I may say every fleece undergoes this sorting or separation before being put into any process of manufacture. Of course the more there is of the best quality in any fleece the more desirable and valuable the fleece is; in blaekfaced, to be free from dead hair or kemps ; and we find in all the other wools that the more close the staple and puwrly the wool, the more it yields of the finer qualities, whilst the open-haired makes more of the lower quality. The breeder should therefore, in selecting his tups with a view to good wool, choose them with a close purly staple. A great deal of the excellence, however, of wool depends upon the nature of the soil on which the sheep are fed. Upon the chalk and sandy hard lands we always find the worst qualities of wool of its kind, whilst the best eomes from the rich good lands, where there is plenty of old grass or seeds. Thus the wools of Roxburghshire, as a general tule, are better than Berwickshire or Lothian ; Leicester, Lincoln-shire, Nottingham, and Warwickshire, superior to Oxford, Cam- bridge, Bedford, or Northampton ; and in Downs, Sussex and Surrey, better than Essex and Norfolk, from their downs being more grassy and the land better. The principal quality required in wool is a rich soft handle, as such is

always found to improve in every pro- cess it is put through in the various stages of its manufacture, Whilst the wools grown on chalk or hard lands, and which have a hard bristly handle, get coarser as they progress in the manufacture.

"With regard to the salves or baths used for destroying vermin, we do not know what kinds are used in the different localities, but of those used with you we dislike the spirit of tar and tobaeco. Wilson of Coldstream's dip appears to answer, and one called Ballantyne's, used in Selkirkshire ; but in all these a great deal depends upon their being properly attended 10, and being put on at the proper season. If put on in the autumn, we don't perceive that they have been used, and whenever we have to make a complaint

on this head, we find it arises from the baths haying been used in ;

spring,"

CHAPTER XVIII. LIVE STOCK—GOATS, &C. Section 1.—Goats.

Goats hever occupied an important place among the domesticated animals of the British Islands, and, with the exception of Ireland, their numbers have been constautly

diminishing. By the statistical returns it appears that in 1871 there were 232,892 goats in Ireland, which in 1872 had increased to 242,319. The value of goat's milk, as a source of household economy, is much greater than is usually supposed. This is so well shown by Cuthbert W. Johnston, Esq., in an article in the Farmers' Magazine, that we shall quote from it at some length.

'The comfort derived by the inmates of a cottage from a regular supply of new milk need hardly be dwelt upon. Every cottager's wife over her tea, every poor parent of a family of children fed almost entirely on a vegetable diet, will agree with me that it is above all things desirable to be able to have new milk as a varia- tion to their daily food of bread and garden vegetables. The inhabitant of towns and of suburban districts, we all know, is at tho mercy of the milk dealer; the milk he proeures is rarcly of the best quality, and under the most favourable circumstances he receives it with suspicion, and his family consume it with sundry misgivings ag to its wholesomeness.

"TIaving personally experienced these difficulties, and having about three years sinee commenced the attempt to supply my family with goat's milk, and as our experience is cheering, I desire in this paper to advoeate the claims of the milch goat to the attention of the eottager, and the other dwellers in the suburban and rural districts.

'"' Few persons are perhaps aware of the gentleness and playful- ness of the female goat—how very cleanly are its habits, how readily it accommodates itself to any situation in which it is plaeed. Confined in an outhouse, turned on to a common or into a yard, tethered on a grass plat, it seems equally. content. I have found it readily accommodate itself to the tethering system, fastened by a leathern collar, rope, and iron swivel, secured by a staple to a heavy log of wood. 'The log is the best (and this with a smooth even surfaee at the bottom), because it can be readily moved about from one part of the grass plat to another. The goat, too, uscs the log as a resting-place in damp weather. The goat should be fur- nished with a dry sleeping-place, and this, in case of its inhabiting open yards, can be readily furnished ; anything that will serve for a dry dog-kennel will be comfortable enough for a goat.

‘The milk of the goat is only distinguishable from that of the cow by its superior richness, approaching, in fact, the thin cream of cow’s milk in quality. .The eream of goat’s milk, it ig true, separates from the milk with great tardiess, and never so com- pletely as in the ease of cow’s milk. This, however, is of little consequence, since the superior richness of goat’s milk renders the use of its cream almost needless. The comparative analysis of milk of the cow and goat will show my readers how much richer the latter is than that of the former; 100 parts of each, according to M. Regnault, gave on an average—

Cow Goat 1 cS Mn PRPRPRE RRS iocacts ane rian: ae Seen omc 84:7 826 OU SS ee NCR Me oC MMERARE A to. cantar eenconn 4:0 4°5 Sugar of milk and soluble salts.….....0005 5°0 4°5 Caseine (cheese), albumen, and insoluble salts, 3°6 9°0

So that, while the milk of the cow yields 12°6 per cent. of solid matters, that of the goat produces 17 per cent., goat’s milk yield- ing rather more butter, rather less sugar of milk, but considerably more caseine (cheese) than that of the cow.

“It must not be supposed that the taste of the milk of the goat differs in any degreé from that of the cow; it is, if anything, sweeter, but it is quite devoid of any taste which might very reasonably be supposed to be derivable from the high-flavoured shrubs and herbs upon which the animal delights to browse.

“The amount of the milk yielded by the goat varies from two quarts to one quart per day ; it is greatest soon after kidding time, and this gradually decreases to about a pint per day, a quantity whieh will continue for twelve months, This is not a large supply, it is true; but still it is one which is available for many very useful purposes ; and be it remembered that when mixed with more than its own bulk of lukewarm water, it is then in every respect superior to the milk supplied by the London dairymen.

“In regard to the best variety of goat to be kept, I would recom- mend the smooth-haired kind, which are quite devoid of beards or long hair. In this opinion I am confirmed by an experienced correspondent, Mr W. H. Place of Hound House, near Guildford, who remarked, in a recent obliging

communication—‘I found that the short-haired goats with very little beards were the best milkers ; but from these I seldom had more than four pints a-day at the best (I should say three pints were the (isa, and this quantity decreases as the time for kidding approaches (the goat carries her young 21 to 22 weeks). They should not be fed too well near the time of kidding, or you will lose the kids. In winter I gave them hay, together with mangel-wurzel, globe and Swedish turnips, earrots, and sometimes a few oats, and these kept up their milk as well as anything, but of course it was most abundant when

they could get fresh grass. The milk I always found excellent,

but I never had a sufficient quantity to induce me to attempt mak-

ing butter except once, as an experiment: my cook then made a

little, which was easily done in a little box-churn; the butter

ne very good. I found the flesh of the kids very tender and elicate.’

“I can add little to Mr Place’s information as to their food ; mine have generally fed out of the same rack as a Shetland pony, with whom they are on excellent terms. The pony throughout the summer is soiled with cut grass, and I notice that the goats pick out the sorrel, sow thistle, and all those weeds which the pony rejccts.

Me In the garden (if they are, by any chance, allowed to browse), I notice that they select the rose-trces, common laurels, arbutus, laurestinas, and the laburnum. Of culinary vegetables they prefer cabbages and lettuces ; they also bite picces out of the tubers of the potato. They carefully pick up the leaves, whcther green or autumnal, of timber trees; of these they prefer those of the oak and elm, and delight in acorns and oak-apples. We are accustomed to collect and store the acorns for them against winter ; spreading the acorns thinly on a dry floor, to avoid the mouldiness which follows the sweating of acorns laid ina heap. As I have before remarked, none of these astringent substances affcct the taste of their milk ; and I may

here observe that, with ordinary gentleness, there is no more difficulty, if so much, in milking a goat than a cow.

“The he-goat engenders at a yearold. The she-goat can produce when seven months old. She generally yeans two kids. The manure of the goat is perhaps the most powerful of all our domestic animals.

“Such are the chief facts which I have decmed likely to be useful in inducing the extended keeping of the milch goat. It is an animal that, I feel well assured, may be kept with equal ad- vantage by the cottager and the dwellers in larger houses. It is useless to compare it with the cow, or to suppose that the goat can supplant it in situations where the cow can be readily kept ; but in the absence of pastures, and in places where there is too little food for cows, I feel well convinced that, with ordinary care and atten- tion, and a moderate firmness in overcoming the prejudices of those unaccustomed to the goat (and unless these are found in the owner, live stock never are profitable), the value and the comfort of a milch goat are much greater than is commonly known.

‘“‘The waste produce of a garden is exceedingly useful in the kee ofa goat. By them almost every refuse weed, all the cuttings an clearings which are wheeled into the rubbish-yard, are carefully picked over and consumed. To them the trimmings of laurels and other evergrecns, pea-haulm, and cabbage stalks, &c., are all grate- ful variations of their food. In winter a little sainfoin, hay, or a few oats, keeps them in excclllent condition. In summer, the mowings of a small grass-plot, watered with either common or sewage water, will, with the aid of the refuse garden produce, keep a goat from the end of April until October.”

Section 2.—Hogs.

Although occupying a less prominent place in the estima- tion of the farmer than the ox and sheep, the hog is never- theless an animal of great value. He is easily reared, comes rapidly to maturity, is not very nice as to food, consuming offal of all kinds, and yields a larger amount of flesh in proportion to his live weight and to the food which he has consumed, than any other of our domesticated animals whose flesh is used for food. To the peasantry he is invaluable, enabling the labouring man to turn the scraps

even from his scanty kitchen, and from his garden or allotment, to the best account. On such fare, aided by a little barley or pollard, he can fatten a good pig, and supply his family with wholesome animal food at the cheapest possible rate.

_ The breeds of swine in Great Britain are numerous, and so exceed- ingly blended that it is often impossible to discriminate or classify them properly. The original breeds of the country seem to be two, viz., "' Lhe old English Hog," tall, gaunt, very long in the body, with pendent ears and a thick covering of bristles. The represen- tatives of this old breed are found chiefly in the western counties of England, especially in Lancashire, Yorkshire, and Cheshire, where hogs of immense size are still reared, but greatly improved as com- pared with their ancestry. Their bones are smaller, their hair finer and thinner set, their skin thinner and with a pink tint, the ears still pendulous but much thinner, the carcase much thicker, and their propensity to fatten greatly increased. This large breed is exceedingly prolific, and the sows are excellent nurses, it being quite common for them to farrow and rear from 12 to 18 pigs at

each litter. They are somewhat tardy in arriving at maturity, and do not fatten readily until that is the case. After sixteen months old they, however, lay on flesh very rapidly, grow to very great weights, and produce hams of excellent quality, with a large pro- portion of lean fleshin them. The Berkshire and Hampshire hog seems originally to have been from the same stock, but by some early cross acquired the thicker carcase, prick-ears, shorter limbs, and earlier maturity of growth, by which they are characterised. 'The other native breed is found in the Highlands and Islands of Scotland. They are very small, of a dusky brown colour, with coarse bristles along the spine, and prick-ears. They are exceed- ingly hardy, and subsist on the poorest fare, being often left to range about without shelter, and support themselves as they best can on the roots of plants, shell-fish, seaweed, and dead fish cast up by the tide.

The improved breeds now so abundant have been obtained by crossing these old races with foreign hogs, and chiefly with the Chinese and. Neapolitan. Our modern white breeds, with prick-ears, short limbs, fine bone, delicate white flesh, and remarkable pro- pensity to fatten at an early age, are indebted for these qualities to the Chinese stocks. The improved black breeds, of which the Essex may be selected as the type, and which possess the qualities just enumerated in even a greater degree, are a cross from the Neapolitan. They are characterised by their very small muzzle, fine bone, black colour, and soft skin nearly destitute of hair. They can be brought to profitable maturity at from eight to twelve months old, the white breeds at from twelve to sixteen months. Both kinds are peculiarly suitable for producing small pork to be used fresh, or for pickling. The flesh of these smaller breeds pro- duces, however, excellent bacon when used in that manner, and at less cost than that of the larger breeds, for this reason, that it is only from the flesh of a hog that has reached maturity that bacon of the first quality can be produced; and as these have reached that point at an age when the others are but ready for beginning the fattening process, it follows that the carcase of the former, in a state fit for curing, is produced at less cost than that of the latter. Sows of the Neapolitan breed and its crosses are better mothers and nurses than the Chinese. Both kinds require peculiar care to pre- vent the pregnant sow from becoming hurtfully fat. Unless kept on poor and scanty fare they inevitably become useless for the purpose of breeding. The Berkshire hog combines the good quali- ties of the larger and smaller breeds already referred to, so happily, that he deservedly enjoys the reputation of being as profitable a sort for the farmer‘as can be found. With proper treatment he arrives at maturity at about sixteen months old, yields a good weight of carcase for the food which he has consumed, and his flesh is well adapted for being uscd either as fresh meat, pickled pork, or bacon, according to the age at which he is slaughtered. A very profitable hog is also obtained by coupling sows of the larger breeds with males of some of the smaller races.

It too frequently happens that less care is bestowed on the breeding of pigs than of the other domesticated animals. ;

From the early age at which they begin to breed there is need for constant change of the male, to prevent the intermingling of blood too near akin.

These animals, too, are exceedingly sensitive to cold, and often suffer much from the want of comfortable quarters. Whether for fattening hogs, or sows with young pigs, there is no better plan than to lodge them in a roomy house with a somewhat lofty thatched roof, the floor being carefully paved with stone or brick, and the area partitioned off into separate pens, each furnished with a cast-iron feeding-trough at the side next the dividing alley, and with adequate drainage, so that the litter in them may be always dry. The period of gestation with the sow is sixteen weeks, and as her pigs may be weaned with safety at six weeks old, she usually farrows twice in the year. In this climate it is desirable that her accouchement should never occur in the winter months. It is a common arrangement to have a pig-shed so placed that the store pigs lodged in it can have access to the cattle-courts, where they grub amongst the litter, and pick up scattered grains that have escaped the thrashing-mill, and fraginents of turnips and other food dropped by the cattle. On such pickings, and the wash and offal from the farm kitchen, aided by a few raw potatoes, Swedes, or mangold, and in summer by green vetches, a moderate number of store pigs can be got into forward condition, and afterwards fattened very quickly, by putting them

into pens and improving their fare. There is no cheaper way of fattening hogs than by feeding them on boiled or steamed potatoes, mashed and mixed with a portion of barley or pease-meal. When barley-meal alone is used, it should be mixed with cold water, and allowed to soak for twelve hours before being given to the hogs. A few morsels of coal should be frequently thrown into their troughs. These are eaten with evident relish, and conduce to the health of the animals.

An interesting account of the most approved methods of cutting up, curing, and disposing of carcases of pork, is given in the Journal of the Royal Agricultural Society, vol. xi., p. 585.

Section 3.—Poultry,

is a class of stock deserving more attention than farmers generally give it. There are, indced, few farm-yards un- tenanted by fowls of some sort, and few homesteads with- out a poultry-house. It is rare, however, to meet with

an instance where the breeding and management of poultry is conducted with the care and intelligence so frequently bestowed on other kinds of live stock. Now, if poultry is kept at all, whether for pleasure or profit, it is surely worth while to use rational means for securing the object in view. To have good fowls, it is necessary to provide a dry, warm, well-ventilated house, in which they may roost and deposit their eggs. This house must be kept clean, and its tenants regularly supplied with abundance of suitable food. Constant and careful attention is also absolutely indispensable. On farms of the lesser sort, this duty is usually undertaken by the farmer's wife or daughters. It will, however, in most cases be better to entrust the entire charge of the poultry to some elderly female servant, who shall give her undivided attention to it.

The kinds of poultry most suitable for a farm-yard are the common fowls, geese, and ducks, Turkeys and guinea- fowl are difficult to rear, troublesome to manage, and less profitable than the other sorts. Of the common fowl there are now many excellent and distinct breeds. The Cochin China or Shanghae is the largest breed we have. They are hardy and very docile; their flesh is of good quality when young ; their eggs, of a buff colour, are comparatively small but excellent in flavour, and are produced in great abundance. The hens resume laying very soon after hatch- ing a brood ; sometimes so soon as three weeks. They are the more valuable from the circumstance that their principal laying season is from October to March, when other fowls are usually unproductive. The Dorkings, of which there are several varieties, as the speckled, the silver, and the white, are not excelled by any breed for general usefulness. The hens are peculiarly noted for their fidelity in brooding, and their care of their young. The Spanish fowls are very handsome in their plumage and form, have very white and excellent flesh, and lay larger eggs than any other breed. The Polish and Dutch every-day layers are peculiarly suitable where eggs rather than chickens are desired, as the hens of both these breeds continue® to lay for a long time before showing any desire to brood.

It is to be recommended that, except in situations where a good price can be got for chickens, the return should be sought for chiefly in eggs.

A suitable stock of fowls being selected, pains must be taken to preserve their health and other good qualities by breeding only from the best of both sexes, and these not too near akin. A very simple plan for securing this is to select a cock, and not more than six or eight hens, of the best that can be got, to entrust these to the care of some neighbouring cottager, whose dwelling is sufficiently apart to prevent intercourse with other fowls, and then to use

only the eggs from these selected fowls for the general hatching. There are many advantages in such a course. The whole stock of fowls can thus be had of uniform character and superior quality. If it suit the fancy or object of the owuer, his fowls may be of several distinct breeds without any risk of their intermingling ; the select breeding stocks can be kept up by merely changing the cock every second year, and not more than one cock to thirty hens need be kept for the general stock, as it is no consequence whether their eggs are impregnated or not. Besides having the run of the barn-door, cattle-courts, and stack-yard, fowls are greatly benefited by having free access to a pasture or roomy grass-plot. If the latter is interspersed with evergreen shrubs so much the better, as fowls delight to bask under the sunny side of a bush, besides seeking shelter under it from sudden rain. Their court should also be at all times provided with clean water, and a heap of dry sand or coal-ashes, in which they wallow, ancl free themselves from vermin. To keep them in pro- fitable condition, they require, besides scraps from the kitchen and refuse of garden stuffs, &c., a daily feed of barley or oats at the rate of a fistful to every three or four fowls. In cold weather they are the better of having some warm boiled potatoes thrown down to them, as also chopped liver or scraps of animal food of any kind. There is an advantage in having the poultry-house adjoining to that in which cattle-food is cooked in winter, as, by carry- ing the flue of the furnace up the partition-wall, the fowls get the benefit of the warmth thus imparted to their roost- ing-place. Saw-dust, dried peat, or burnt clay, are suitable materials for littering poultry-houses, and are preferable to straw. By strewing the floor with such substances two or three times a week, each time carefully removing the pre- vious application, and storing it with the mingled drop- pings of the fowls wnder cover, a valuable manure can be secured. When 100 common fowls, a score of geese, and a dozen or two of ducks are kept, the quantity and value of the manure produced by them, if

kept by itself and secured from the weather, will surprise those who have not made trial of such a plan.

Of late years the breeding of poultry has in various parts of the kingdom become quite a passion. Not only have many separate treatises been published entirely de- voted to this subject, but every agricultural periodical now bears evidence to the popularity of this pursuit.

Section 4.—Treatment of Live Stock under Disease.

Time was when every such treatise as the present was expected to contain a description of the diseases to which the domesticated animals are most subject, and instructions for their treatment under them. But now that farriery is discarded and veterinary medicine is taught in colleges, the handling of such a subject is obviously beyond the province of a practical farmer. A few general observations is all, therefore, that we offer regarding it. The province of the stockmaster obviously is to study how to prevent disease, rather than how to cure it. For this end let him exercise the utmost care, first, in selecting sound and vigorous animals of their respective kinds, and then in avoiding those errors in feeding and general treatment which are the most frequent causes of disease. When cases of serious disease occur, let the best professional aid that is available be instantly resorted to; but in all those cases which farmers usually consider themselves competent to treat we advise that they should trust rather to good nursing, and to the healing power of nature, than to that indiscriminate bleeding and purging which is so commonly resorted to, and which in the majority of cases does harm

CHAPTER XIX. IMPROVEMENT OF WASTE LANDS.

Notwithstanding the great progress which agriculture has made, and the immense amount of capital, energy, and skill which for generations has been brought to bear upon the improvement of our soil, there are still large portions of the surface of our country lying in their natural state, and

usually classed under the head of Waste Lands, in contradistinction to those which are under tillage, or have at some time been subjected to the plough. Of this (so called) waste land but a limited portion 1s absolutely unproductive. Much of it is capable of being converted into arable land, and doubtless will in course of time be so dealt with, but in the meantime this class of waste lands, and very much more that will never be tilled, is of great and steadily increasing value as sheep-walks. Even for this purpose most of it is susceptible of great im- provement, and would well repay it. These lands are comprised under the following descriptions :—1st, Those hilly and mountainous parts of Great Britain which, from their steep and rugged surface and ungenial climate, are unfit for tillage; 2d, Those which lie uncultivated owing to natural poverty of soil, its wetness, or the degree to which it is encumbered with stones ; 3d, Bogs and mosses ; 4th, Lands so near the sea-level as to be more or less liable to be submerged ; and 5th, Blowing sands.

Section 1.—Improvement of High-lying Sheep Pastures.

The lands referred to under the first of these heads are of very great extent, embracing the whole of the mountain- ous parts of Scotland and Wales, and much of the high grounds in the north of England and south of Scotland. These high grounds afford pasturage for innumerable flocks of sheep of our valuable mountain breeds. The business of sheep-farming has received a great stimulus of late years from the ever-growing demand for sheep to consume the green crops of arable districts. These upland sheep-walks are accordingly rising in value, and their improvement is becoming every day of increasing importance. The im- provement of these hill grazings embraces these leading features, viz., drainage, shelter, and enclosure. Until of Iate years our hill flocks were peculiarly liable to the rot and other diseases arising from the presence of stagnant and flood water upon their pastures. Many grazings that had at one time an evil reputation on this account now yield sound and healthy sheep, solely from the care with which they have been drained. To guard against the pernicious effects of flooding, the courses of brooks and runnels, which in heavy rains overflow their grassy margins, are straight- ened, deepened, and widened, to such an extent as is required to carry off all flood water without allowing it to overflow. Some grounds are naturally so dry that this is all that is required to render them

safe. But in general the slopes and hollows of hilly grounds abound with springs and deposits of peat, and with flats on which water stag- nates after rain. On well-managed grounds such places are covered with a network of open drains or shallow ditches, about 30 inches wide at top and half as many deep, by which superfluous water is rapidly carried off. The cutting of these drains costs from 8s. to 10s. per 100 rods (of six yards each). In pastoral districts there are labourers who are skilled in this kind of work, and to whom the laying out of the lines is frequently entrusted, as well as the exe- cution of the work. On very steep places they are careful to avoid a run directly down the declivity, as a strong current of water in such circumstances gutters the bottom of the drain, and chokes those below with the debris thus produced; but with this exception the drains are always run straight down the greatest slope of the ground.

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When such drains have been properly made, it is neces- sary to have them statedly overhauled and kept in good order.

Next in importance to drainage is good and sufficient shelter. This, in the absence of natural coppices of birch or hazel, is provided by means of clumps and belts of fir plantation. These should always be of such extent that the trees may shelter each other as well as the sheep. Trees planted in a mass always shoot up faster than in narrow strips, and restrain the snow-drift which passes through the latter. A shepherd who knows the ground well should always be consulted about the sites of sucli plantations. The conditions requisite are, that the soil be such as trees will grow in ; that it be so far removed from any brook, ravine, or bog, as to be accessible to the flock from all sides; that there be rough herbage, such as heather, gorse, or rushes, near at hand, which the sheep may be able to get at in deep snow ; that it be contiguous to the sheep-walk, and placed so as to afford defence against the most prevalent winds. A less costly shelter is formed by building what are called stel/s, which consist of a simple dry-stone wall enclosing a circular space twenty yards or so in diameter, with an opening on one side ; or forming a cross, in one angle of which the sheep find shelter from

whatever point the wind blows. A haystack is a necessary adjunct to such defences.

It is a further point of importance to have such grazings surrounded with a ring fence, consisting either of dry- stone walls, turf walls with wire a-top, or a simple wire fence. This prevents trespass; and the sheep having freedom to range, without watching, up to the boundary, more of them can be kept on the ground than when they are ever and anon turned back by the shepherd. These needful and inexpensive improvements are now generally attended to over the wide pastoral districts of the Scottish border counties. In the remote Highlands they are still much neglected. There are, however, few agricultural im- provements which yield so quick and certain a return.

Section 2.—Reclaiming of Moor Lands.

The improvement of the second class of these unre- claimed lands is now much facilitated by the readiness with which portable manures can be obtained for them. Drain- ing and enclosing here necessarily demand the first atten- tion. In some cases the land is so encumbered with stones that careful trenching of the whole surface is the only way of getting rid of them. In the north of Scotland many thousands of acres formerly useless have been converted into valuable arable land by this means.

In nearly all parts of the country there are extensive tracts of this muiry soil, producing only a scanty and coarse herbage, which are susceptible of remunerative im- provement. We are happy in being able to submit to the reader the following detailed account of a successful instance of this, kindly furnished to us by George A. Grey, Esq. of Millfield Hill, Northumberland : —

‘It is said that ‘necessity is the mother of invention.’ I was told by some of my friends that I had given too high a price for this estate, and that it would be a dearcr farm to me now than when I rented it from Lord Grey. To overcome this opinion or fact, I thought of several plans of making it more remunerative, and decided on that which I am now about to describe.

*‘*On the high part of the farm, at an elevation of from 400 to 500 feet above the sea, I had upwards of 100 acres of moorland ofa poor*

description, which had never been under the plough. This consisted of short heath, bilberry bushes, and dry white bent grass, and a soft dry deep moss, delightful as a Turkey carpet under foot, and excel-

lent excursive ground for old hunters, with a small portion of spratty

grass and rushes in the damp hollows. The soil is of a free turnip and barley loam on the rotten whinstone. By planting on the west side, and in some places suitable for shelter, I reduced the quantity to about 100 acres. This I divided into three fields of about 33 acres each.

WASTE LANDS. }

"« My great dread was the length of time which such @ rough dry surface would require to decompose sufficiently to allow of cultivation, having seen Hostihury moors in many parts of Scotland lying for two, three, and four years before crops could be obtained, owing to the great cover of coarse vegetation preventing the furrow from lying over, and keeping the land so open and dry through summer that if a braird of corn or green erop was obtained, it would wither away in dry weather. ; '

"'T had heard of paring and burning, but knew nothing of the

rocess. I, however, obtained the necessary information very much from Mr Langlands of Bewick, who had practised it to a consider- able extent. © With what I saw there J was so much pleased that I determined to proceed at once. –

"T also saw Mr Langlands's work done by a paring-plough, such as is used in the south of England, with a wide plate to cut a furrow of 10 or 12 inches in width. On the point of this is an upright piece of steel, which cuts and divides the heath,—the mould-bosrd turns the furrow over flat on its back, and from end to end of the landing the furrows lay side by side like planks from a saw-mill, and were about half an inch in thickness.

*'*T must, however, remark, as a caution to others against falling into the same error as I did, that this land had been in tillage at some former time, and was in ridges with a regular surface, so that when the plough was set, it*

cut the whole furrow at a uniform depth, and was drawn by two horses with ease, and at an expense of about eight shillings per acre. Sy

‘J got this plough, and gave it a fair trial, but from my land never having been laid smooth, it cut one part as thin as was wished, and the next yard perhaps six or twelve inches thick, which caused a great extra expense in drying, lifting, and burning, and wasted more soil than was necessary or desirable. Also my land having a great deal of small whinstone below the turf, the stecl plate frequently got injured and broken. It was therefore with great reluctance laid aside, and the ordinary method of paring by hand adopted, which is slower and much more expensive, but very perfect. It saves soil and cheapens the burning operation, the paring being so thin when the heath, &c., was divided, that light could be seen through the sod, which was only held together with the roots and fibres.

“T began with No. 1 field in July 1849. TI let the ae and burning to a company at 25s. per acre, but they made low wages, and after getting more than their work came to, gave up the job. I then got some experienced hands to pare, and paid them the usual wages, at that time 9s. per week, and gave them thcir food, say 18s. per week, the work being very hard. The total cost of this averaged me 24s. 9d. per acre. A portion of the top part of No. 1 was left undone owing to the lateness of the season. This was dry benty turf. It was ploughed in the common way, and grew no oats in 1850. It was again ploughed and much harrowed and rolled, and sown with the remainder of the field in 1851 with rape, and has grown only a few plants at wide distances. It is still in such a dry undecomposed state that although it is on the high part of the field where sheep draw to lie, I do not expect that it will grow a crop of corn next year; while a portion which was pared down the middle of it grew good corn and rape.

***A portion of No. 2 field was also ploughed in the ordinary way. This was moist land, growing shorter and sweeter grass than any other. It grew a very thin irregular crop of oats in 1850, not within three-quarters per acre of the pared land, but is now (1851) bearing a good crop of oats, that field being a second time in oat crop. To return :*

“T had a fair crop of rape in the autumn of 1849 on a consider- able portion of No, 1, where it was sown in tolerable scason during all August ;

after that it appeared to be too late. All was, however, ploughed up at once to secure the ashes, and was well harrowed and sown with oats in the spring of 1850. The pared land turned out to be much too thickly sown at four bushels per acre. Corn tillers so much on such land that in some parts it prevented it from coming to maturity. I have since sown much thinner, say three bushels per acre, and even in some degree I find the same fault, there being from five to eight stems from one root. My crop of 1850 turned out to be 30 bushels per acre, but it was on the point of being cut when the high wind in August devastated this district, and that lying high and fully exposed to the wind suffered most severely. I should say it was not below six quarters per acre, and the quality of the grain good.

_ In June and July 1850 I pared No. 3 by the same hands who finished my work the previous year. I let the burning of it to an Irishman at 2s. 6d. per acre, binding him to burn it closely piled up in good-sized heaps like hay-cocks, to prevent the escape of the ashes in the shape of smoke into the atmosphere.

**«This, with the paring, cost me on 36 acres 19s. 6d. peracre. I got 20 acres of it ploughed and sown with white turnips, broadcast in July and August. J had a close nice crop, though the roots were small, which kept a large flock of sheep for several weeks. This had the good effect of treading down the land and making it plough up better for oats.*

"“Nos. 1 and 2 were limed at the rate of 7 loads per acre. In

June 1851 No. 1 was sown broadcast with rape, by mixing 4 Ib. of rape seed with one bushel of oat shellings for an acre, and sowing them out of a grass-seed machine. The crop is very close and fine, ond has kept twenty scores of sheep from an early day in August to this date (September 27th).

" No. 2 in 1851 was again sown with oats, which proved a very fine crop, as also did No. 3. The produce was about nine quarters peracre. The oats are very thick and tall, and have very long, large heads, and the grain is plump and good; the stalks being strong, the crop is not lodged so as to*

injure the yield. I estimate it at cer- tainly 74 quarters per acre, but shall calculate it at 6 quarters.

*“*T sow on that land the sandy oat, being early, not liable to lodge nor to shake in moderately high winds, although it was not proof against that of 1850.*

“‘ Previously to breaking up I drained with pipes all the land which required drying, of which I shall give a statement, along with the expenses and profits of the whole.

“The result shows that if I had, some years ago, when prices of grain were good, done as a tenant what I have done now, I should have been amply repaid by the first or second crops, and have had my farm for the remainder of a twenty-one years’ lease worth fully £100 a year more than when I began.

“The result of my experience is, that I neither agrce with tho generality of Scotsmen nor with many Southerns. The former are of opinion that burning wastes the vegetable matter, which should be kept to decompose and enrich the soil, not considering that at once the land receives a rich dressing of ashes quite equal to two quarters of bones, or 4 or 5 ewt. of the best guano; and that, during the several years which such a slow proccss would require to take place, the land might be much more enriched by growing and having eaten upon it fine crops of rape and turnip, and by producing heavy corn crops, which would in a much shorter space be returned to it in the shape of manure ; and also that by the process of burn- ing the land is freed from the larve of insects, suchas grubs, slugs, wireworms, &c. &c., which are engendered among the rough grass, and fostered for a length of time under the rough, dry, undecomposed turf; to say nothing of the length of time which the speculator is kept out of a large amount of capital and interest, instead of having the former returned with the latter after the first or at most the second year.

‘The latter, again (the Englishmen), are too much in the habit of repeating the operation of burning, even after the land has lain in grass only for a few years, when it might as well be ploughed and cultivated without such

expense, thereby unnecessarily reducing the soil, there not being the same difficulties to be overcome nor the same advantage to be gained from it.

*‘*T should certainly burn all land with a rough harsh surface, and should as certainly plough and sow all land with a sweet grassy face upon it.*

“Tn my opinion there are few farms in this country which do not contain certain portions of land capable of remunerative improvement, and I have shown that such improvement is quite within the scope of a tenant with a lease, without which no man can farm well, at least in the Northumbrian system. Would it not be better, then, for landlords, tenants, and the country generally, were tenants to employ labourers on works so speedily remunerative to themselves, rather than run to their landlord whenever they feel the screw, and ask for abatement of rent, or to be allowed to plough out some piece of valuable old grass, or otherwise cross crop their land, with a view of obtaining some temporary advantage, but in the end to the inevitable injury of all concerned? (Signed) “G. A. Grey,

“Millfield Hill, Dee. 1, 1851.”

From a statement of outlay and returns appended to the above paper it appears that the profits on the three fields were respectively £50, 12s. 5d., £84, 19s. 3d., and £39, 2s. 9d., from which, however, there falls to be deducted the expense of fencing (£35), leaving a gross profit of £139, 14s. 5d.

Section 3.—Reclaiming of Bogs.

The reclamation of extensive bogs, or deposits of peat, is a more arduous undertaking, requiring a considerable expenditure of capital and longer time before a return is obtained from it. The extent of land of this description in Great Britain and Ireland is very great. Very exagge- rated statements of the profits to be derived from its improvement have often been published, and not a few persons have incurred serious loss by rashly undertaking this kind of work. On the other hand, when bogs are favourably situated with reference to a command of marl or other calcareous matter, to assist in their decomposition and consolidation, and of manure to enrich them, their

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reclamation has proved a very profitable speculation. The well-known instance of Chat Moss in Lancashire affords so interesting an example of this that we shall here quote a description of it.

‘Chat Moss, well known as that black barren swamp between Liverpool and Manchester, contains 6000 acres, one-half of which is in the township of Barton, and the remainder in the townships of Bedford, Astley, and Worsley. re me ;

‘The principal part of this moss, which lies in Barton township, belongs to the ‘Trafford family, and is entailed, but the ancestor of the present Sir Thomas de ‘I’rafford appears to have obtained, at the latter end of the last century, an Act of Parliament to grant a ninety-nine years’ lease of 2500 acres to a Mr Wakefield, who about the year 1805 disposed of his interest in it to the late William Roscoe, of literary celebrity, who spent a large sum in a fruitless endeavour to improve it, failing in which, the lease was sold in 1821 to other parties. J. A. Brown, Esq., of Woolden Hall, bought 1300 acres ; the late Edward Baines, M.P. for Leeds, purchased the remaining 1200 acres. The most extensive and successful efforts at improving this moss have been made on a part of the 1200 acres bought by Mr Baines, who, besides occupying the part operated upon by Mr Roscoe, improved a considerable breadth himself, and let several portions to other parties, who have made considerable progress in improving small portions. The most extensive opera- tions, however, upon the whole, have been carried out by a company to whom Mr Baines, in 1828, granted a lease of 550 acres for 68 years, the remainder of the original term, at a nominal rent for the first year, increasing gradually till at the end of five years the rent attained its maximum of £165 per annum for the 550 acres. This company, which was formed at the time the Liverpool and Man- chester Railway was in progress of being made on the property, consisted, amongst others, of some practical farmers, and originated with William Reed, who for the three first years was the manager, and resided on this farm, which they called Barton Moss farm.

During that period I had the pleasure of paying my friend Reed a visit, and of witnessing the skill and success attending his enterprise aud various experiments.

*‘*The first operation, that of draining, had been effected by open- ing side drains at intervals of fifty yards, into which were laid covered ones six yards apart, at right angles with and emptying into the open side drains.*

*‘*The moss being in a semi-fluid state, it was necessary to procced slowly with draining, taking out only one graft or depth at a time, allowing it to remain a week or a month, according to the state of the weather, before taking out the second graft ; this admitted of the sides becoming consolidated, and of the second graft being taken out without the moss closing in. It was again alowed to remain as before till sufficiently dry to admit of the third being removed.*

*‘*The open drains were made 8 feet wide and 3 fect 6 inches deep, and the covered drains 16 inches wide and 3 feet deep ; the last graft of the latter being only about 6 inches wide at the top, tapering to 4 inches at the bottom, and being taken out of the middle of the cut, left a shoulder on each side. ‘The sod or graft first taken out had by this time become tough and dry, and was placed, with the heath side downwards, in the shoulder, thus leaving the narrow spit at the bottom open fora depth of about 14 inches ; the other square sod being put on the top, completed the drain.”*

“The cost of this mode of draining, including the side drains, was about 38s. per acre. The drains first put in required to be renewed in a few years, in consequence of the moss becoming so much consolidated and reduced in height that the plough, as well as the horses’ feet, broke through the roof, although the horses were shod with ‘pattens,’ or boards of about 10 inches square, with the angles taken off. The second draining, however, was more perma- nent, and would probably not have required renewing for many years but for the nioles, which have been very troublesome in working down to the drains, and filling them up in various places ; so that the operation of draining has required to be partially renewed in every field, and in many of them entirely so ; and thus these little animals have been the cause of a very considerable increase in the cost of labour. It has subsequently been found advisable to put the under drains in at 4 yards, instead of 6 yards asunder,

and the advantage in one erop has been quite sufficient to pay the extra cost. A two-horse engine was erected, which drives the thrashing-machine, straw-cutter, and crushing-mill; and the escape-steam from it steams the horses' food.

*"*The buildings were erected principally of timber, covered with asphalted felt.*

" After draining, making roads, and burning off the heath plant, the land was scarified lengthwise of the fields by an implement with knives shaped like coulters, reversed, sharp on the convex side, fixed in two bars, and drawn by three horses yoked abreast.*

'The tough surface was by this means eut at every four inches ; the land was then ploughed across the scarifying ; a roller, sur- rounded with knives, was next passed across the plough ; after this the land was well harrowed till sufficiently reduced.

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'From 60 to 100 cubic yards of marl were put on an acre, and in the following summer the land was manured, also by means of the movable railway, at the rate of fifty tons of black Manchester manure per acre, and planted with potatoes, which were followed by wheat, sown with red clover and ryegrass, for mowing for one or two years ; then oats and potatoes, &c., as before. 'I'hese were all flourishing crops ; the wheat in particular looked bright and beautiful. The potatoes were sold for £25 and £30 per acre, which more than paid the whole cost of improvement. Mr John Bell, resident bailiff, has made many valuable experiments relative to the improvement of raw moss, one of which has resulted in a dis- eovery likely to be of considerable importance, which is, that a mixture of lime and salt applied a while before seeding, with the addition of a good dressing of guano, in the proportion of four tons of lime and five ewt. of salt per acre, qualifies it to produce a crop of potatoes or oats equal to that after the application of 60 yards of marl per acre. 1t is essential that the mixture should be spread while it is hot. Mr Evens (one of the proprietors) is con-

vinced that the peat on the surface ought never to be burned ; he has always found that, when the heath sod is turned down to decay, much better crops have been obtained than when it has been burnt off, or than when the top has been taken away either for fuel or other purposes. What are termed moss-fallows,—that is, parts which have had the moss taken off for fuel,—will never bear so good a crop as the upper surface, however deep the moss may be underneath." —(Notes on the Agriculture of Lancashire, with Suggestions for its Improvement, by Jonathan Binns.)

About a century ago, Lord Kames, on becoming pro- prietor of the estate of Blair-Drummond, in the county of Perth, began the improvement of a large tract of worth- less moss by a totally different process from that now detailed. In this case the moss had accumulated upon a good alluvial clay soil. Instead, therefore, of attempts being made to improve the moss itself, it was floated off piecemeal into the neighbouring Firth of Forth. The supply of water required for this purpose was obtained from the river Teith, from which it was raised to the requisite height by a powerful water-wheel. Being conveyed through the moss in channels, successive layers of peat were dug and thrown into these channels,which were shifted as occasion required, until the whole inert mass was removed. A thin stratum next the clay was burnt, and the ashes used as manure. An immense extent of moss has thus been got rid of on that estate and on others in the neighbourhood, and "an extensive tract of country, where formerly only a few snipes and muir-fowl could find subsistence, has been converted, as if by magic, into a rich and fertile carse of alluvial soil, worth from £3 to £5 per acre."

Section 4.—Reclaiming of Fen Lands.

We next notice the fen lands of England. " In popular language, the word fen designates all low wet lands, whether peat-bog, river alluvium, or salt marsh ; butin the great Bedford level, which, extending itself in Cambridge-shire and five adjoining counties, is the largest tract of fen land in the kingdom, the farmer always distinguishes, and it is thought conveniently and correctly, between fen land and marsh land. By the former they mean land partly alluvial and formed by river floods, and partly accumulated by the growth of peat. Such lands are almost invariably of a black colour, and contain a great percentage of carbon. By marsh lands they mean low tracts

gained from the sea, either by the gradual silting up of estuaries or by artificial embankments." Low-lying peat occurs in small patches in nearly every maritime county of Britain, being usually separated from the sea or from estuaries by salt marsh or alluvium. There is a large extent of such land in Somerset- shire yet but partially drained, and a still larger breadth in Lancashire, where its improvement makes steady pro- gress. In Kent, on the seaboard of Norfolk, on both shores of the Humber, and stretching along the sides of its tribu- taries, there are immense tracts of this description of land. But these are all exceeded in importance by the "great level of the fens, which occupies the south-eastern quarter of Lincolnshire, the northern half of Cambridgeshire, and

spreads also into the counties of Norfolk, Suffolk, Hunting- don, and Northampton. Its length is about 70 miles, its breadth from 3 or 4 to 30 or 40 miles, the whole area being upwards of 1060 square miles, or 680,000 acres. On the map the fens appear like an enlargement of the Wash, and in reality have the aspect of a sea of land, lying between that bay and the high lands in each of the above-named counties, which seem to form an irregular coast-line around it." This fen country has for centuries bcen the scene of drainage operations on a stupendous scale. The whole sur- face of the great basin of the fens is lower than the sea, the level varying from four to sixteen feet below high- water mark in the German Ocean. The difficulty of drain- ing this flat tract is increased from the circumstance that the ground is highest near the shore, and falls inland towards the foot of the slope. These inland and lowest grounds consist of spongy peat, which has a natural tendency to retain water. The rivers and streams which flow from the higher inlands discharge upon these level grounds, and originally found their way into the broad and shallow estuary of the Wash, obstructed in all direc- tions by bars and shifting sand-banks. These upland waters being now caught at thcir point of entrance upon the fens, are confined within strong artificial banks, and so guided straight seaward. They are thus restrained from flooding the low grounds, and by their concentration and momentum assist in scouring out the silt from the narrow channel to which they are confined. The tidal waters are at the same time fenced out by sea-banks, which are pro- vided at proper intervals with sluice doors, by which the

waters escape at ebb-tide. To show the extent of these operations, it may be mentioned that the whole sea-coast of Lincolnshire and part of Norfolk, a line of at least 130 miles, consists of marsh lands lower than the tides, and is protected by barrier banks, besides which there are hun- dreds of miles of river embankments. When this does not provide such a drainage as to admit of cultivation, the water is lifted mechanically by wind or steam mills into the maiu aqueducts.

The first use of steam-engines for the purpose of drain- ing was in Deeping fen, where, in 1824-5, two, of 80 and 60 horse-power respectively, were erected. By means of these two engines upwards of 20,000 acres have now a good drainage, whereas formerly forty-four wind-mills, with an aggregate power of 400 horses, failed to keep them sufficiently dry. The scoop-wheel of the larger engine is 28 feet in diameter, and the float-boards are 5 feet wide. It was intended to have a "dip" of 5 feet, but the land has subsided so much in consequence of the draining that it seldom has a dip of more than 2 feet 9 inches. The water is lifted on an average 7 feet high. When both engines are at work they raise 300 tons weight of water per minute.

The soil of the fens consists for the most part of dark- coloured peat, from 1 to 8 or 10 feet indepth. The surface in general is not pure peat, but is mixed with silt or other soil, Under this there is in general a stratum of brown spongy peat, which sometimes rests upon gravel, but for the most part upon clay, which usually contains a portion of calcareous matter. The removal of the water has of course been the primary improvement; but subsidiary to this the rapid amelioration and great fertility of the fen lands are largely due to this fortunate conjunction of clay and peat. The early practice of the fen farmers was to pare and burn the surface, grow repeated crops of rape, oats, wheat, &c., and burn again. The subsidence of the soil subsequent to the draining and repeated paring and burning, brought the surface nearer to the subjacent clay, which the cultivators by and by began to dig up and spread over the surface. This practice is now universal, and its

continued use, together with careful cultivation and liberal manuring, has changed a not very productive peat into one of the most fertile soils in the kingdom. Nowhere in our country has the industry and skill of man effected

greater changes than in the fens. What was once a dismal morass, presenting to the view in summer a wilderness of reeds, sedges, and pools of water, among which the cattle waded, and in winter almost an unbroken expanse of water, is now a fertile corn land. The fen men, who formerly lived upon the adjacent high lands, and occupied themselves with fishing, fowling, and attending to their cattle, have now erected homesteads upon the fen lands, divided them by thorn hedges, and brought them into the highest state of cultivation.

We referred at the outset to the distinction betwixt fen land and marsh land. 'The following pertinent observa- tions on the reclamation of marsh land are extracted from Mr David Stevenson's paper in the Highland and Agricul- tural Society's Transactions, vol. iii., 1871.

First, In order to insure success, the space to be reclaimed must be within the influence of water containing much alluvial matter, and not on the shores of an open sandy estuary.

Secondly, The spaces to be reclaimed should be allowed to receive the deposit left by the tide for as long a period as possible, and no attempt should be made entirely to exclude the water from them, until they have by gradual accretion attained the level of at Icast ordinary spring tides.

The first case to which I shall refer is Loch Foyle, a situation where the amount of salt water greatly prepondcrates over the fresh. Extensive reclamations have been made there, and I have received from Mr G. Henry Wiggins, of Londonderry, some notes regarding them, from which I extract the following interesting information: —

'« After the salt water had been excluded, shallow surface drains were made with spades or forks, and in about two years ryegrass grew pretty freely : exceptional spots reniained barren for some time. The grass was followed by oats, which improved as the salt left the soil, Deeper draining allowed the cultivation of flax and clover ; afterwards, on deeper draining, all ordinary crops began to grow well—wheat, beans, turnips, mangold, and carrots—but all requiring fully as much manure as any old upper land. These sloblands, says Mr Wiggins, yield a great return for manure, but must

have manure on the lower and damper portions. Feorin grass grows well without manure.

“ Whenever the ditches have so far drained the soil as to allow of its becoming cracked and open to the air, the crops begin to increase in produce, but the full value of the soil is never known until thoroughly under-drained with tile or stone ; it then mostly yields excellent crops of almost any produce, clover and ryegrass for hay being perhaps the most profitable. Grazing the land does not answer, except from the beginning of May to the end of September; after this the soil is too cold and damp for the beasts to lie down, and they begin to fail.”

The expense of these intakes on the Foyle may be taken at about £20 an acre to get them from the sea; the expense of bring- ing the land when got into cultivation will come to at least £10 more; making a total of £30 per acre. The best lands are worth 50s. to 40s. the Cunningham or Scotch acre, and the lowest and wettest parts perhaps not more than 10s.—say 30s. round as a fair average. To this has to be added the expense of keeping up the banks and pumping water; so that I believe Mr Wiggins is right when he says that no great profit can be expected, and that these matters are generally undertaken by hopeful and energetic enthu- siasts, who seldom realise their expectations, and afterwards fall into the hands of other parties, who are perhaps rather more successful.

The reclamations made by the Ulverston and Lancaster Railway in Morecambe Bay were rapidly formed by the embankment for carrying the railway, which was made in pretty deep water. Like the Foyle, there is also predominance of sea-water. Mr. Drewry, of Holker in Lancashire, has favoured me with the following informa- tion :—“‘ A portion of the land enclosed by the railway in 1856 was grassed over, and the remainder was sand without any vegetation on it. After it was levelled it was divided into fields by open ditches and wire fences ; the ditches had to be made very wide at the top, in order to get them to stand. The land was then drained with 3-inch pipes, each drain opening into the ditch at each side of the ficld, The tiles were all covered round with peat moss, to act as a filter to prevent the sand from running into them. The sand is so fine that without this precaution the drains would have filled up very quickly. The drainage is the

great difficulty, as they are very apt to fill up after every precaution has been taken.

“On the portion which was grassed over, two crops of oats were first taken, and then it was green-cropped. It grew for a few years

good crops of wheat, beans, and clover, as well as Swedish turnips and mangolds ; but though a great quantity of manure was used, the erops fell off, and at present it is nearly all in grass. The portion whieh was bare sand was treated in the same way, exeept as to the first two crops of oats. It was green-eropped after it had been enelosed about two years. After the railway was made there was no means of silting the land. The tide was entirely kept out ; had it been admitted, this land would have been mueh more valu- able and much higher—we would then have had a better drainage and a richer sand. That portion whieh was grassed over at the time it was enelosed is still mueh the best. :

“When land is reelaimed from the sea, the first thing to be looked to is a good outfall for the water, and, when it is possible, no doubt it is very desirable that the land should be silted up gradually. In our ease this could not be done, as the reelamation of the land was a very secondary affair.”

In the district called Marshland, in Norfolk, extending between the Ouse and the Nen; in that called South Holland, in Lincolnshire, stretching between the Nen and the Welland ; northward of Spalding, and also north-east of Boston, there is a considerable tract of marine clay soil. In Marshland this is chiefly arable land, producing large crops of wheat and beans; but in Lincolnshire it forms exceedingly fine grazing land. This tract lies within the old Roman embankment by which the district was first defended from the ocean. Outside this barrier are the proper marsh lands, which have been reclaimed in portions at successive periods, and are still intersected in all direc- tions by ranges of banks. The extraordinary feature of this tract is, that the surface outside the Roman bank is 3 or 4 feet higher than that in the inside, and the level of each new enclosure is more elevated than the pre- vious one. The land rises step by step as the coast is approached, so that the most recently reclaimed land is often 12 or even 18

feet higher than the lowest fen land in the interior, the drainage from which must nevertheless be conveyed through these more elevated marshes to the sea.

Lands such as some of those which we have just been describing are often greatly improved, or rather may be said to be made, by means of a peculiar mode of irrigation called "warping." It is practicable only in the case of land lying below the level of high tide in muddy rivers. It is little more than a century since it was first practised in England, the first instance of it being near Howden, on the banks of the Humber. But although the practice is comparatively new in Britain, it has long been in use on the continent of Europe, particularly in Italy, and is thus described hy Mr Cadell :—' In the Val de Chiana, fields that are too low are raised and fertilised by the process called colmata, which is done in the following manner :— The field is surrounded by an embankment to confine the water. The dike of the rivulet is broken down so as to admit the muddy water of the high floods. The Chiana itself is too powerful a body of water to be used for this purpose ; it is only the streams that flow into the Chiana that are thus used. This water is allowed to settle and deposit its mud upon the field. The water is then let off into the river at the lower end of the field by a discharg- ing course called scolo, and in French canal d'ecoulement. The water-course which conducts the water from a river, either to a field for irrigation or to a mill, is called yora. In this manner a field will be raised 54 and sometimes 7} feet in ten years. Ifthe dike is broken down to the bottom, the field may beraised to the same height in seven years; but then in this case gravel is also carried in along with the mud. In a field of 25 acres, which had been six years under the process of colmata, in which the dike was broken down to within 3 feet of the bottom, the process was seen to be so far advanced that only another year was requisite for its completion. The floods in this instance had been much charged with soil. The water which comes off cultivated land completes the process sooner than that which comes

off hill and woodland. Almost the whole of the Val di Chiana has been raised by the process of colmata." 1

Section 5.—Blowing Sands.

On many parts of our sea-coasts, and especially in the Hebrides, there occur extensive tracts of blowing sands, which are naturally not only sterile themselves, but a source of danger to better lands adjoining them, which in some instances have been quite ruined by the sand deposited upon them by the winds. This mischief is effectually pre- vented by a process beautifully simple and useful, namely, planting the sand-banks with sea bent-grass (Arundo arenaria), the matting fibres and stems of which not only bind the sand, but clothe it with a herbage which is relished by cattle, and which, being able to resist the severest winter weather, furnishes a valuable winter forage in those bleak situations. The bent-grass can be propagated by seed, but in exposed situations it is found better to transplant it. This operation is performed betwixt October and March, as it succeeds best when the sand is moist and evaporation slow.

CHAPTER XX. GENERAL OBSERVATIONS.

According to the method proposed at the outset, we now offer a few observations on several topics connected with our subject.

Section 1.—Of the Tenure of Land.

The extent of land in Great Britain occupied by its owners for agricultural purposes bears a very small pro- portion to the whole area. The yeoman class is still numerous in several parts of England, but must have diminished greatly from that continuous amalgamation of small estates into large ones which has formed a marked feature in our social history during the present century, This change, although to be regretted on public grounds, has had a favourable influence on the cultivation of the soil, for it almost invariably happens that a larger produce is obtained from land when it is occupied by a tenant than when it is cultivated by its proprietor. As a matter of fact, the land of the country is now, with trifling exceptions, let out to professional farmers in quantities varying from the rood-allotment of the village labourer to the square miles of the Highland grazier. Farms of all sizes are usually to be found in any district, and most important it is that this should be the case ; but the extent of farms is chiefly determined by the amount of hired labour employed upon them, and the measure of personal

superintendence on the part of the tenant which the kind of husbandry pursued upon them calls for. We accordingly find that in very fertile tracts, in the vicinity of towns, and in dairy districts, they seldom exceed 200 acres ; where the ordinary alternate husbandry is practised the average ranges from 300 to 400 ; in more elevated tracts, where a portion of natural sheep-walk is occupied along with arable land, it rises to 800 or 1000; while that of the sheep grazings of our hills and mountains is limited only by the capital of the tenant. About a century ago there occurred in various parts of Great Britain a similar amalgamation of small holdings into farms of the sizes which we have now re ferred to as is at present in progress in Ireland. This enlargement of farms, with the employment of increased capital in their cultivation, insures a more rapid reclama- tion of waste lands, and general progress of agriculture up to a certain point, than would otherwise take place. But as every step in advance beyond this point implies an

1 Journey in Carniola, Italy, and France, by W. A Cadell, Esq., F.R.S.

increase of outlay in proportion to the extent, and the need for closer superintendence, it seems likely that, in future, the size of arable farms will not further increase, but may rather be expected to approximate towards that which at present obtains in suburban districts.

Farms are held either by yearly tenancy or under leases for a specified number of years. The latter plan is that upon which nearly the whole lands of Scotland are let ; and it obtains also to a considerable extent in the northern counties of England, in West Norfolk, and in Lancashire. But with these and other exceptions, amounting altogether to about a tenth part, the farms of England are held by yearly tenancy, which can be terminated by either of the contracting parties giving the other six months' notice to that effect. 'This precarious tenure has been attended by far fewer changes than a stranger might suppose, owing to the highly honourable conduct for which English pro- prietors as a class have long been noted. On all the large estates it is quite common to find families occupying farms of which their ancestors have been tenants for generations, or even for centuries. The mutual esteem and confidence which usually subsist between such landlords and tenants are undoubtedly much to the credit of both, but not

the less has the system, as a whole, operated unfavourably for all concerned ; for however numerous and striking the excep- tions, it is yet the fact that under this system of tenancy- at-will less capital has been invested in the improvement of farms, less labour has been employed, and less enterprise displayed in their ordinary cultivation, less produce has been obtained from them by the occupiers, and less rent has been received for them by the owners, than in the case of similar lands let on leases for a term of years. These different results ensue, not because tenants with leases are abler men or better farmers than their neighbours who are without them, but solely beause the one system re- cognises certain important principles which the other ignores. It is contrary to human nature to expect that any body of men will as freely invest their capital, whether in the shape of money, skill, or labour, in a business yielding such slow returns as agriculture, with no better guarantee that they or their families shall reap the fruits of it than the continued good-will of existing proprietors or those who any day may succeed them, as they will do with the security which a lease for a term of years affords. It does therefore seem strange that a majority of the farmers of Great Britain should be tenants-at-will, and still more strange that they should be so of choice. Tt is nevertheless true that a considerable portion of the tenantry of England are even less disposed to accept of leases than their landlords are to grant them. The latter cling to the system because of the greater control which they thereby retain over their estates, and the greater political influence with which it invests them: the former do so because low rents are one of its accompaniments. Since the removal of restrictions on the importation of foreign agricultural produce, there are indications that neither landlords nor tenants are so well satisfied with this system of tenancy-at-will as they once were. Not only is the granting of leases becoming more common than it has hitherto been, but there is a growing desire on the part of tenants to obtain the benefit of that guarantce for the realising of their capital which tenant-right affords to en- terprising farmers who may have unexpectedly to quit their farms. In certain districts of England this claim, called tenant-right, has been recognised so long that, apart either {rom written stipulation or statutory enactment, it has, by mere usage, attained to something like a legal standing. In Lincolnshire an out-going tenant can, by virtue of this usage, claim from his landlord or successor 'Tepayment, in certain definite proportions, of the cost of such ameliora-

tions of a specified kind as he may have made during the last years of his occupancy, and the benefits of which his removal hinders him from realising in the natural way. Tenant-right is certainly a valuable adjunct to tenancy-at-will, but still it does not meet the real exigencies of the case. There are feelings inherent in man's nature which cause him to recoil from exertions the fruits of which are as likely to be enjoyed by a stranger as by himself or his family. This repugnance, and its paralysing influence, is not to be removed by a mere " right" to pecuniary com- pensation. It is certainty of tenure—so far at least as human arrangements can be certain—which will really induce a farmer to throw his whole heart into his business. It is accordingly to this principle that lcases owe their value, and by it also that the ouly weak point in them is to be accounted for. The first years of a lease are usually characterised by an energetic performance of various improvements, whereas towards its close there is usually such a withdrawing even of ordinary outlay as is unfavour- able to the interests of both landlord and tenant. There is at present a very generally entertained opinion that this inconvenience would be obviated by engrafting the system of tenant-right upon that of leases. So strongly has the current of opinion been running in this direction that a bill has been submitted to the legislature for the purpose of conferring on out-going tenants a legal claim to compensation for certain specified investments which may

have been made by them, but of which their removal hinders –

them from reaping the benefit. This bill further provided that in the event of a tenant having erected buildings for his own accomniodation without the sanction of his landlord, he should have a right to remove the materials if the landlord or incoming tenant declined to purchase them. Through accidental circumstances this bill was withdrawn without being discussed, but it is certain to be re-intro- duced, and sooner or later to be passed. It is now admitted on all hands that land cannot be cultivated to its full measure of productiveness without a large investment of capital, and that this outlay, when once incurred, cannot be recouped for several years at the least. It is in vain, therefore, to expect that these so much needed investments will be

made until those who should make them are secured against having their property confiscated by a six months' notice to quit.

It scems to be gencrally admitted that twenty-one years is the proper duration for an agricultural lease. Such a term suffices to give confidence to the tenant in embarking his capital, and secures to the landlord his legitimate control over his property, and due participation in its varying value. It is generally felt by tenants that the lease or document in which their agreement with their landlord is engrossed might with advantage be much shortened, as well as simplified in its terms. When treating of the succession of crops we have already expressed our views regarding those restrictive clauses which usually occupy a prominent place in such writings. Such restric- tions are of course introduced with the view of guarding the property of the landlord from deterioration ; but when he is so unfortunate as to meet with incompetent or dishonest tenants, they entirely fail to secure this object, and yet are a hindrance and discouragement to enterprising and con- scientious tenants. It is probable that the cxistence of the laws of distraint in England and hypothec in Scotland, which give to landlords a lien over the effects of their tenantry in security for the payment of the current year's rent, has had its influence in adding to the number and stringency of these clauses, and has encouraged the practice of letting lands by tender to the highest offerer. For the law in question, by rendering landlords to a considerable extent. independent of the personal character and pecuniary

circumstances of the occupiers of their land, has obviously a direct tendency to rendcr them less cautious than they would otherwise be, and to induce them, when tempted by the promise of high rents, to trust more to this legal security than to the moral character, business habits, pro- fessional skill, and pecuniary competency of candidates for their farms.

Section 2.—Capital required for working a Farm.

The amount of capital that is required in order that the business of farming may be conducted advantageously, is largely determined by the nature of the soil, &c., of each farm, the system of management appropriate to it, the

price of stock and of labour, and the terms at which its rents are payable. In the case of land of fair quality, on which the alternate husbandry is pursued, and when the rents are payable as the produce is realised, £10 per acre may be regarded as an amount of capital which will enable a tenant to prosecute his business with advantage and com- fort. In letting a farm, a landlord not only does a just and prudent thing for himself, but acts as a true friend to his proposed tenant, when he insists upon being shown that the latter is possessed of available funds to an amount adequate to its probable requirements.

The importance of the topics to which we have thus referred is happily expressed by Mr Pusey, when, after enumerating various agricultural desiderata, he says, " In some degree none of us carry out all that is in our power ; but want of capital and want of confidence in the tenure of farms are, I suppose, the two principal causes of this omission."

Section 3.—Education of Farmers.

But the mere possession of capital does not qualify a man for being a farmer, nor is there any virtue inherent in a lease to insure his success. To these must be added probity, knowledge of his business, and diligence in pro- secuting it. These qualifications are the fruits of good education (in the fullest sense of that term), and are no more to be looked for without it than good crops without good husbandry. Common school instruction will, of course, form the groundwork of a farmer's education ; but to this should be added, if possible, a classical curriculum. It has been the fashion to ask, "' Of what use are Greek and Latin to a farmer?" Now, apart from the benefit which it is to him, in common with other men, to know the structure of language, and to read with intelligence the literature of his profession, which more and more abounds in scientific terminology, we believe that no better discipline for the youthful mind has yet been devised than the classical course which is in use in our best public schools. Of this discipline we desire that every future farmer should have the advantage. But the great difficulty at present lies in finding appropriate occupation for such youths betwecn their fifteenth and twentieth years. In many cases the sons of farmers are during that period put to farm labour. If they are kept statedly at it, and are made proficient in every kind of work performed on a farm, it

is a good pro- fessional training as far as it goes. The more common one—at least as regards the sons of the larger class of farmers—which consists of loitering about without any stated occupation, attending fairs and markets, and pro- bably the race-course and hunting-field, is about the most absurd and pernicious that can well be imagined. Such youths are truly to be pitied, for they are neither inured to bodily labour nor afforded the benefits of a liberal educa- tion. It need not surprise any one that such hapless lads often prove incompetent for the struggles of life, and have to yield their places to more vigorous men who have enjoyed the benefit of 'bearing the yoke in their youth." Unless

young men are kept at labour, either of mind or of body, until continuous exertion during stated hours, confinement to one place, and prompt vbedience to their superiors have ceased to be irksome, there is little hope of thcir eithcr prospering in business or distinguishing themselves in their profession. Owing to the altered habits of society, there is now less likelihood than ever of such young persons as we are referring to being subjected to that arduous training to bodily labour which was once the universal practice; and hence the necessity for an appropriate course of study to take its place. Many Scottish farmers en- deavour to supply this want by placing their sons for several years in the chambers of an attorney, estate-agent, or land surveyor, partly in order that they may acquire a know- ledge of accounts, but especially for the sake of the whole- some discipline which is implied in continuous application and subjection to superiors. It is also common for such youths to be sent to Edinburgh for a winter or two to attend the class of agriculture in the University, and perhaps also that of chemistry, and the Veterinary College classes. This is well enough in its way; but there is wanting in it an adequate guarantee that there is real study—the actual performance of daily mental work. The agricultural college at Cirencester appears to come more fully up to our notion of what is needed for the professional training of farmers than any other institution which we yet possess. We shall rejoice to see such opportunities of instruction as it affords multiplied in Great Britain. After

enjoying the benefits of such a course of training as we have now indicated, young men would be in circumstances to derive real advantage from a residence with some ex- perienced practical farmer, or from a tour through the best- cultivated districts of the country. We are well aware that what we have now recommended will appear sufficiently absurd to the still numerous class of persons who believe that any one has wit enough to be a farmer. But those who are competent to judge in the case can well afford to smile at such ignorance. They know that agriculture is at once an art, a science, and a business ; that the researches of naturalists, chemists, geologists, and mechanicians are daily contributing to the elucidation of its principles and the guidance of its practice; and that while its pursuits afford scope for the acutest minds, they are relished by the most cultivated. As a business it shares to the full in the effects of that vehement competition which is experienced in every other branch of industry, and has besides many risks peculiar to itself. The easy routine of the olden time is gone for ever; and without a good measure of tact, energy, and industry, no man can now obtain a livelihood by farming. It is desirable that all this should be known, as nothing has been more common than for parents who have sons too dull to be scholars or too indolent for trade, to put them to farming; or for persons who have earned a competency in some other calling to covet the (supposed) easy life of a farmer, and find it to their sorrow a harassing and ill-requited one.

Section 4.—Farm Labourers.

The agriculture of a country must ever be largely affected by the condition and character of the peasantry by whom its labours are performed. An acute observer has shown that in England a poor style of farming and low wages—that good farming and high wages, usually go together ; and that a low rate of wages is significantly associated with a high poorrate. The worst paid and worst lodged labourers are also the most ignorant, the most prejudiced, the most reckless and insubordinate. The eminence of the agriculture of Scotland is due in large measure, to the moral worth and intelligence of her peasantry. For this she is indebted to the early establish-

went of her parochial schools, and to the sterling quality of the elementary education which the children of her tenantry and peasantry have for generations received in these schools together. These schools had unfortunately become inadequate to the increased population ; but still in the rural districts of the Scottish lowlands it is a rare thing to meet with a farm labourer who caunot both read and write. Apart from higher benefits, the facilities which the services of such a class of labourers have afforded for the intro- duction and development of improved agricultural practices, the use of intricate machinery, and the keeping of accurate accounts, cannot well be over-rated. It is an interesting testimony to the value of a sound system of national education that our Scottish peasantry should be in such request in other parts of the kingdom as bailiffs, gardeners, and overseers. Recent legislation warrants the expectation that this inestimable blessing will speedily be enjoyed by our entire population.

The pernicious influence of the present law of settlement and removal upon the English labourer is now attracting the attention which it so urgently demands. The pro- prietors and tenants of particular parishes in various parts of England at present combine to lessen their own share of the burden of the poor-rate by pulling down cottages and compelling their labourers to reside out of their bounds. The folly and cruelty of such short-sighted policy cannot be too strongly reprobated. These poor people are thus driven into towns, where their families are crowded into wretched apartments, for which they must pay exorbitant rents, and where they are constantly exposed to moral and physical contamination of every sort. From these com- fortless abodes the wearied and dispirited men must trudge in all weathers to the distant scene of their daily labours. One cannot conceive of a prosperous agriculture co-existing with such a system, nor feel any surprise that thieving, incendiarism, and burdensome rates should be its frequent accompaniments. It is pleasant to contrast with this close- parish policy the conduct of some of our English nobility, who are building comfortable cottages and providing good schools for the whole of the labourers upon their princely estates.

About the middle of the 18th century, when the old township system began to be broken up, and the land to be enclosed and arranged into compact farms of considerable size, it happily became the practice in the south-

eastern counties of Scotland, and a portion of the north of England, to provide each farm with its own homestead, set down as near its centre as possible, and with as many cottages as would accommodate all the people statedly required for the work of that farm. These cottages, always placed in con- venient proximity to the homestead, are let to the tenant along with the farm as a necessary part of its equipment. The farmer hires his servants by the year at stipulated wages, each family getting the use of a cottage and small garden rent free. The farmer has thus always at hand a staff of labourers on whose services he can depend ; and they, again, being engaged for a year, are never thrown out of work at slack seasons, nor are they liable to loss of wages from bad weather or casual sickness. This arrangement has the further advantage of the men being removed from the temptations of the village alehouse. So successfully has this system worked that the counties in which it pre- vails have long had, and still have, an agricultural popula- tion unequalled in Great Britain for intelligence, good conduct, and general well-being.

Over a very large portion of Scotland, and more especially in the counties lying betwixt the Forth and the Moray Frith, while the arrangement of farms and mode of management are substantially the same as those of the border counties, there is this marked difference, that the ploughmen as a rule

live by themselves in bothies. They are for the most part unmarried men, although not a few of them have wives and children living under the most unfavourable conditions in distant towns and villages ; and so it comes to pass, under this bothy system, that about two-thirds of all the meu statedly employed in farm labour are shut out from all the comforts and blessings of family life, and have become in consequence rude, reckless, and immoral. Until a quite recent date this system, because of its supposed economy, was stoutly defended both by landlords and farmers ; but its evil effects have become so manifest as to convince them at last that the system is wrong, and there is now in con- sequence a general demand for more cottages on farms.

The condition of the agricultural labourers in the southern counties of England has long been of a most unsatisfactory character. The discontent that had long existed among them has at last, in the summer of 1873, culminated in wide-spread combinations and strikes for higher wages and better terms. To a large extent the labourers have been able to make good their demands, although at the cost of much unhinging of old relations betwixt them and their employers, and a great deal of mutual grudging and jealousy. The thorough healing of chronic social maladies is always difficult, and usually demands the patient use of a variety of remedial measures. We venture to express the opinion that much benefit would ensue from the adoption in southern England of the essential parts of the border system, viz., cottages on each farm for all its regular labourers, yearly engagements, and a cow's keep as part of the wages of each family. }

Section 5.—What the Legislature should do for Agriculture.

The further progress of our national agriculture is un- doubtedly to be looked for from the independent exertions of those immediately engaged in it ; but important assist- ance might be, and ought to be, afforded to them by the legislature, chiefly in the way of removing obstructions. What we desiderate in this respect is the repeal, or at least the important modification, of the law of distraint and hypothec ; the commutation of the burdens attaching to copyhold lands ; the reformation of the law of settlement ; the removal of the risk and costs which at present interfere with the transference of land; the endowment of an adequate number of agricultural colleges, with suitable museums, apparatus, and illustrative farms ; and the com- pulsory adoption of a uniform standard of weights and measures. We desire also to see the arterial or trunk drainage of the country undertaken by government. Until this is done, vast tracts of the most fertile land in the kingdom cannot be cultivated with safety and economy, or attain to the productiveness of which they are capable, It is the opinion of Mr Bailey Denton, the eminent draining engineer, that not more than three millions of acres of the land of Great Britain have yet been drained. Our national interests surely require that its agriculture should be freed from such obstructions as these, and that it should receive the benefit of a fair share of public provision, such as is made for training youths for the learned professions and for the public service ; and of such grants as are

given in aid of scientific research for the encouragement of the fine arts, and for the furtherance of manufactures and commerce.

We cannot close this section without referring to another grievance which has long had a most depressing effect on the agriculture of particular districts of our country, and is now, we regret to say, spreading rapidly to all parts of it,

1 For confirmation and full illustration of the statements and opinions in the above section on agricultural labourers, the reader is referred to the reports of, and the evidence collected by, the " Com- mission on the Employment of Children, Young Persons, and Women

| in Agriculture," in 1870,

in the excessive preservation of game. This evil has been greatly aggravated since that mode of sporting called the battue has unhappily become the fashion. For this amuse- ment a very large head of game is reckoned to be indis- pensable, and proprietors who engage in it are naturally enough led to vie with each other as to who shall show the greatest quantity of game, and report the heaviest bag, at their respective shooting parties. All this necessarily implies a grievous waste of farm produce, and frightful loss to farmers whose crops are exposed to the incursions of the privileged vermin. Worst of all, these hordes of game present such irresistible temptation to poaching that the rural population is demoralised by it to an alarming extent. So long as field sports were in a great measure restricted to resident landowners and their personal friends, they were, with rare exceptions, careful not to allow their tenants to be injured by game. Now, however, there are multitudes of men who, having acquired wealth in business, are eager to engage in field sports, and ready to give almost any amount of money for the privilege of doing so. These game tenants are often utterly regardless of the interests of farmers, and cause them both lossand annoyance. All this is occasioning such an amount of heart-burning and aliena- tion of feeling between different classes of society as cannot failto

have disastrous consequences. A few years ago the removal of hares and rabbits from the list of animals pro- tected by the game-laws would, so far at least as landlords aud their tenants are concerned, have put an end to all this misery, The refusal of so moderate a concession has in all likelihood sealed the fate of these oppressive laws which have so long embittered society and disgraced our country.

Section 6.—Concluding Remarks.

On carcfully comparing the present condition of British agriculture with what it was forty years ago, the change for the better is found to be very great indeed. But on all hands there are many indications warranting the an- ticipation that the progress of discovery and improvement in future will be more steady, more rapid, and more general than it has hitherto been. There is not only a more general and more earnest spirit of inquiry, but practical men, instead of despising the aids of science, seek more and more to conduct their investigations under its guidance. Experi- ments are made on an ever-widening scale and upon well- concerted plans. Their results are so recorded and published that they at once become available to all, and each fresh investigator, instead of wasting his energies in re-discovering what (unknown to him) has been discovered before, now makes his start from a well-ascertained and ever-advancing frontier. Formerly the knowledge of the husbandman con- sisted very much of isolated facts, and his procedure was often little better than a groping in the dark. As the

rationale of his various processes is more clearly discovered,

he will be enabled to conduct them with greater economy and precision than he can do at present. A clearer know- ledge of what really constitutes the food of plants, and of the various influences which affect their growth, will necessarily lead to important improvements in all that relates to the collection, preparation, and use of manures.

What may truly be called a revolution in agriculture is now in the act of rapid development, in the application of steam-power to the tillage of the soil, which is spreading on every side. Enough has already been accomplished to show that, under the combined influence of drainage and steam tillage, the clay soils of England will speedily have their latent

fertility brought into play in a manner that will mightily augment our supplies of home-grown bread-

corn and butcher-meat. It may indeed now be reasonably anticipated that these hitherto impracticable soils will again take their place as our best corn-growing lands, and that those large portions of the country where for a long time our national agriculture presented its poorest aspect, may ere long exhibit its proudest achievements.

In closing this rapid review of British Agriculture, it is gratifying and cheering to reflect that never was this great branch of national industry in a healthier condition, and never were there such solid grounds for anticipating for it a steady and rapid progress. The time has hardly yet gone by when it was much the way with our manufacturing and trading men, and our civic population generally, to regard our farmers as a dull, plodding sort of people, greatly inferior to themselves in intelligence and cnergy. Many of them seem now, however, to be awakening to the fact that their rural brethren possess a full share of those qualities which so honourably distinguish the British race. Nay, some of them may have experienced no little surprise when they became aware that in a full competition of our

whole industrial products with those of other nations, as at —

Paris in 1855, and at similar and more recent international expositions, the one department in which Britain con- fessedly outstripped all her rivals was not in any of her great staple manufactures, but in the live stock of her farms, and in her agricultural implements and machinery.

List of Plates accompanying this Article.

No. IIT. Soe of Covered Homestead for a small Farm, by Mr J. jowile. IV. Ground Plan of Steading and Offices on the Home Farm of the Earl of Southesk. V. Shorthorn Bull and Cow. VI. Hereford Bull, and South Down Ewe and Lamb. VII. Cheviot Ewe and Blackfaced Heath Sheep. VIII.

Leicester Ram and Ewe. IX. Romsey Marsh Ewe, and Sow of the Large English Breed.

The following description has been supplied along with the plan given in Plate IV. :—"It represents the ground plan of a steading of offices recently built on the home farm of the Earl of Southesk, planned by Charles Lyall, Esq., his lordship's factor. It contains a powerful thrashing- mill, corn-bruiser, oil-crusher, chaff-cutter, and turnip- slicer, all driven by a portable steam-engine ; and is amply supplied with water for the troughs, and is lighted by gas. It may be regarded as a model, containing as it does all the conveniences and appliances necessary for the complete development of the stock and implement departments. It is calculated for an occupancy of 500 acres, and was built, including the steam-engine, at a cost of about £5000."

This plan may very well illustrate the present state of opinion as to whether or not cattle should be kept wholly under cover. It gives an affirmative answer to this ques- tion in the case of fattening cattle ; but for breeding stock of all ages it provides accommodation in open yards. This we consider the best arrangement ; for it is impossible in the case of breeding stock to retain that fine coat of hair which so enhances the good looks and value of high-class cattle without such an amount of exposure to the weather as is afforded by open yards with covered sheds. 'There is one feature in this plan which we cannot but regret, viz., its bothy. It is indeed one of the best of its kind, having a separate sleeping-place for each of its inmates, and suitable arrangements for their cleanliness and com- fort; but the meanest cottage in the country, inasmuch as it admits of family life, is to be preferred to the most perfect bothy. (3. We)

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CHAPTER XXI.

LARGE AND SMALL FARMING.

No treatise on agriculture will in these days be con- sidered complete which does not take note of some of the various modes in which the treatment of the soil may be affected by variations in the cultivating occupier's form of tenure. A farm may be the property of its occupier, or be held by him at will or on lease. According to its extent it will be the subject of grande or of petite culture, expressions which in the following pages will be Anglicised as large and small culture or farming. If a farm be of small size, and if its occupant be also its owner, peasant proprietorship comes into play. If it be let, its rent may consist of a payment of predetermined amount in money or in kind, or may, instead of a fixed portion, be a pre- determined proportion of the annual produce. It may be let to one individual, singly responsible for the rent and for all imposts, fiscal or other, and exclusively entitled to the whole of the remaining net produce; or it may be held in common by any number of coparceners, all co-operating in the cultivation, and jointly and severally responsible for the rent and other dues, and all participating in the net profits.

Each of these systems has its advocates, and of one of them, at least, the admirers are so much enamoured as to be unable to perceive merit in any of the rest. A judgment upon them that would be generally acceptable is therefore impossible, and need not be attempted here. Nothing more will be aimed at than such an impartial estimate of the advantages and disadvantages of each as may help an unbiassed reader to judge for himself.

I. In regard to tenancy at will and to leases, little need be added to the observations made in previous chapters of this article. For the consideration, how- ever, of those who insist on the undoubted fact that in Great Britain, where tenancy at will is still the rule, and leases as yet only the exception, the same families, although liable to be ousted at six months'

notice, are nevertheless often found occupying the same land from generation to generation, the following may be suggested as a not improbable explanation of the landlord's non- exercise of the power of eviction. It may perhaps be not so much that the farmers really confound past continuity with future permanency of tenure, as that their want of security for the future prevents their investing liberally in improvements, and thereby bringing the land into a con- dition calculated to attract higher bidders for its possession. Such increase as does take place in its lettable value is chiefly due to enhancement of the prices of produce; and to a rise of rent proportionate to such enhancement the old tenants readily submit rather than be removed. The principal loser here is the landlord, whose short-sighted policy deters his tenants from a species of enterprise the benefit of which would eventually become principally his own. If the tenants took the trouble to make the com- parison, they might, it is true, deliberately prefer the mere chance of a long series of years at a low rent to the cer- tainty of the same low rent for a limited term, coupled with the nearly equal certainty of a rise of rent at the end of the term. Their gains in the former case, they might argue, however meagre, might at least be easily earned; whereas materially to increase them in the latter case, although perhaps possible, would be possible only at the expense of much anxiety of mind as well as of much extra sweat of the brow.

Il. Of grande culture, or large farming, it may perhaps be thought almost superfluous here to enumerate the recom- mendations, which indeed on one condition are obvious and incontrovertible. Provided a large farmer be possessed of

capital duly proportioned to the extent of his holding, and of intelligence to employ his capital judiciously, his husbandry can scarcely fail to prove abundantly satisfactory. In a territory entirely parcelled out among farmers of this de- scription there would, from a purely agricultural point of view, seem little left to desire. The system certainly ap- proaches towards the realisation of the great object of all agriculture—that of the production of the greatest pos- sible quantity and the best possible quality of raw material for the use of man. The distinguishing characteristic of large culture is the scope it affords for the appli- cation to husbandry of the great principle of division of labour. A well-managed large farm is indeed a factory for the

production of vegetable and animal substance. The extensive scale on which operations are there carried on necessitates the employment of several persons, to each of whom some special occupation may be assigned, and constant practice naturally increases the labourer's skill. Time, too, is saved which would otherwise be lost in turning frequently from one occupation to another; and there is also a further saving in implements, large and small, and in draught cattle, fewer of which will suffice for the tillage of a given area held entire than would be needed if the same acreage were divided amongst numerous tenants. Some, again, of the more important of agricultural operations, and notably those of drainage and irrigation, are in many situations incapable of being efficiently performed except on a large scale ; and though they may be, and often are, most efficiently performed on the very largest scale by a combination of small land- holders, still every such combination must necessarily be preceded by negotiations involving indefinitely pro- longed delay, with which a single individual, occupying the entire tract, could at his option dispense. And a similar remark applies to the costlier implements and machines, in the adoption of which associations of small farmers may slowly follow the example of individual large farmers, but which they would not, without such example, have themselves adopted—which, indeed, unless _previ- ously patronised by large farmers, would never have been offered for their adoption. Probably no inventive genius, however disinterestedly ardent, would have been at the pains to devise a steam thrashing-machine or a steam plough, had there not been wealthy agriculturists, some of whom might readily be persuaded to risk, at their own cost and charges, an immediate trial of any promising invention. Farmers of limited means, even when living in the same neighbourhood, would have to be educated into faith in the novel apparatus before the inventor would get a single specimen taken off his hands.

Besides, wherever large farming prevails, large properties are its invariable concomitants; and wherever it is the fashion for pro- prietors to reside on their estates, many of them are sure to amuse themselves with farming. Very likely, if they were to count the cost, they might find the amusement an expensive one. Not im- possibly they often spend on the land as much as they get back from it, or even more, the expenditure in that case at best producing only its bare equivalent. But the same expenditure, unless so

applied, would as likely as not have remained utterly unproductive, being devoted to some other amusement, or to mere parade or luxury, from which no tangible return whatever would be possible; so that its application to agricultural extravagance is virtually a gain, in the sense, at all events, of preventing total loss. Nor in that sense only; for rich men who take to farming as a pastime are preciscly those most likely to be forward in putting new inventions and new processes to the test of experiment; while the experience thereby acquired, instead of being jealously concealed, is liberally published far and wide, so becoming the property of the whole body of farmers by profession, and serving them, according to circum-

stances, as a guide to follow or a beacon to avoid. Every one interested in such matters knows how inuch has been done in this way by successive Dukes of Bedford and Portland and Marquesses Townshend ; by the late Earls of Leicester and Scarborough and Earl Spencer ; and by the present Earl of Ducie and Earl Grey ; nor are there many ways in which a landed aristocracy can better rebut the reproach of inutility than by thus doing honour to agriculture, and having the honour reflected back on themselves. ;

As already hinted, however, it is only on condition of being con- ducted with adequate capital that large farming can succeed. True, with deficient capital small farming could succeed no better, per- haps indecd not so well ; but then there is much more danger of the necdful capital being wanting to a large farmer than a small one. Whatever, from £5 to £20, be the desirable proportion per acre, the number of persons possessing the £50 or £200 required for stocking a farm of ten acres is likely to be everywhere many times more than fifty-fold that of those possessing the £2500 or the £10,000 which a single farm of 500 acres would require. Besides, in coun- tries abounding with fortunate individuals able to count their pounds sterling by the thousand, promising modes of investing such considerable sums abound proportionally; and even in a country so exceptionally rich as our own, the number of capitalists prepared to invest their thousands in farming is sadly below the number of farms which would be all the better for having the

same thousands so invested. We are justified then by experience in saying, that wherever large farming is the rule, there will probably be very many farmcrs without adequate capital. Now, in agricul- ture, Inadequate capital means, among other things, insufficient live stock and insufficient manure, and, as an inevitable consequence, defective crops. It means, in short, imperfect cultivation.

III. From these premises it would apparently result that small farmers will generally be more nearly pro- vided with the capital required for their business than large ones; and such seems to be actually the fact where- ever peculiar circumstances have not been at work as pre- ventives. It is not indeed so in Ireland, where feudal oppression or anarchy, alternating with alien misrule, has in all generations made destitution the heritage of the peasantry. Neither is it so in France, where the swarms of petty landholders had little of either precept or example to teach them that to employ their spare napoleons in thoroughly cultivating the few acres they already possess, would be a much better investment of their money than the purchase with it of an additional acre or two to be as imperfectly cultivated as the rest. In England the system of small cultivation, strictly so called, has probably ceased to exist, now that amateur farming has come so much into fashion, and that the instances have become comparatively so numerous of men of considerable substance turning to farming for a livelihood. It will not, however, help us much, when endeavouring to ascertain the relative merits of two rival agricultural systems, to contrast good specimens of the one and bad specimens of the other. If we would accurately gauge their respective capabilities, we should take them both at their best, and the comparison here of large with small farming will accordingly be of the former as it presents itself in England, and of the latter as developed in Flanders. Now, in the territory first named the average capital of occupants of 100 acres and upwards would certainly not be understated, and would probably be materially overstated, at £6 per acre; yet M. de Laveleye, while giving £8 as the average for Flanders (where the medium size of farms is but 74 acres in the western, and no more than 5 acres in the eastern province), adds that good farmers, judging of others by themselves, would call that sum much too low even for an average; and further remarks that, although a small tenant may, on entering, have only £8 an acre, the additions he is con- tinvally making to his live stock, and his continually

increasing purchases of manure, commonly raise the £8 to £16 before the expiration of his lease. He also informs us that in other Belgian districts—in the Hesbayan portions of Brabant and Hainault, whereof one-sixth is occupied by farms of 100 acres and upwards, and in the Condrusian portion of the province of Namur, where farms of 250 acres and upwards are pretty numerous—a farmer's average

AGRICULTURE

[LARGE AND

capital is estimated at between £5, 12s. and £6, 8s., and between £3 and £4 per acre respectively. True, as already intimated, there are certain descriptions of stock on which the small farmer's expenditure must necessarily somewhat exceed his rival's—ten Flemish farmers of 10 acres each being probably obliged to keep ten horses, while an Eng- lish farmer of 100 acres might not perhaps have occasion for more than a pair, reducing also his number of carts, ploughs, and the like, in similar proportion. But after all reasonable deduction on this account, the balance of capital remaining for the purchase and maintenance of those animals and materials of which no farmer ever has too many or too much, is in general much greater in the Fleming's case than in the Englishman's, 'It would startle the English farmer of 400 acres of arable land," said Mr Rham forty years ago, 'to be told that he should constantly feed 100 head of cattle, yet this would not be too large a proportion if the Flemish system were strictly followed, a beast for every 3 acres being a common Flemish proportion, and on very small occupations, where spade husbandry is used, the pro- portion being still greater." 'That the occupier," he pro- ceeds, "of only 10 or 12 acres of light arable soil should be able to maintain four or five cows may appear astonish- ing, but the fact is notorious throughout the Waes country." These statements are of somewhat ancient date, but are still as applicable as ever. During a recent tour through Belgium; the present writer visited two farms near St Nicolas, in the Pays de Waes—the first two that came in his way. On one, of 10 acres, he found four cows, two calves, one horse, and two pigs, besides rabbits and poultry, On the other, of 38 acres, one bull, six cows, two heifers, one horse, and seventy-five sheep—these last, however, being allowed, in addition to what they got on their

owner's ground, the run of all the stubbles in the commune;. the whole commune, on the other hand, being allowed the use of the bull gratis. A few days later the writer went over a farm a few miles from Ypres. On this, of 32 acres in extent, he counted eight cows, six bullocks, a calf eight weeks old, and four pigs. To possess plenty of live stock is to possess in an equal abundance the first requisites of sustained fertility. 'No cattle, no dung; no dung, no crop," is a Flemish adage; and the wealthiest of English agriculturists are less prodigal of manure than the Flemish peasantry. Mr Caird, in his instructive and interesting treatise on Hnglish Agriculture, cites as something extra- ordinary that, for a farm six miles from Manchester, manure should have been bought at the rate of 12 or 13 tonsan acre; but this, which in England passes for lavishness, might seem more like niggardliness in Flanders; for there from 10 to 15 tons of good rotten dung and 10 hogsheads of liquid from the urine tank, per acre, are quite common sacrifices and libations to the Sterculine Saturn, and some 30s. worth of purchased fertilisers—bones, wood-ashes, linseed-cake, and guano—are not unfrequently superadded. Nay, when potatoes are the crop for whose increase the deity is invoked, 60 tons of manure per acre are no unusual quantity to lay on. The holder of the farm of 32 acres near Ypres, just alluded to, assured the writer, in his land- lord's presence, that, over and above what his own cattle supply, he purchases manure to the value of no less than £200 annually.

One of the respects in which small culture has been admitted to stand at some disadvantage in comparison with large is that of division of labour; but against whatever loss of time or even infe- riority of skill may result from the necessity there is for each of the labourers engaged in the former culture to occupy himsclf with a varicty of operations instead of confining himself to one, are to be set the additions voluntarily madc to the labour employed, and also its superior heartiness. The tillage of a small farm is executed often entirely, and always in great mcasure, by the farmer himself

and the members of his family; and when these have adcquate security that the entire increase of the soil, over and abovea specified

SMALL FARMING. |

quantity, will belong to themselves, they generally do their utmost t> make the increase as large as possible. Not, indeed, always. Industry, in common with other virtues, is greatly influenced by example; and small leaseholders, or even small freeholders, thinly interspersed among numerous tenants-at-will, are much more likely to accept as their standard of becoming exertion the habitual list- lessness of the latter than to set up an independent standard of their own. Where, however, small farmers are in a@ decided majority, they are, unless some extraordinary circumstances are in operation to depress thcir energy, sure to appear as models of dili- gence. Their activity is not then restricted within set hours of work. Whenever a thing requires to be done is with them the proper time for doing it, and early and late, consequently—long before the hired journeyman comes in the morning and long after he has gone home in the evening—they may be seen afield, doing, too, whatever they do, not only with all their might, but with all the heed which people usually bestow on their own affairs, cven though they bestow it on nothing else. In particular, they waste nothing—least of all anything that can be used as manure. Now, there are no crops which would not be the better for such special attention, and there are some to which it is an almost indispensable condition of excellence. Flax, hemp, hops, wine, oil, and tobacco furnish instances of culture in which the individual plants require, or at any rate abundantly repay, separate care. But such minute attention no supervision can ensure—no rate of hire can command. It is habitually rendered by those only who arc directly interested in rendering it, or otherwise directly stimulated—by the small farmer and the small farmer's wife and children all working with their own hands for their own behoof, and by his servants, if he have any ; for that must be a pitiful creature indeed who, with his employer working by his side, will let his employer work harder than himself. Herein, then—(in the greater quantity and better quality of work which the same number of persons will do in small as compared with large farming)—cousisting the distinctive excel- lence of the former system, how far does this counterbalance the superiority of large farming in regard to the saving of labour and implements? There can be no more conclusive mode of answering this question than by contrasting the substantial results of the two systems, adopting as tests the respective amounts both of gross and of net producc. Now, in England the average yield of wheat per acre was in 1837 only 21 bushels, the highest average for any single county being no more than 26 bushels. The highest

average since claimed for the whole of England is 32 bushels; but this is pro- nounced to be much too high by the best, perhaps, of all authori- ties, Mr Caird, who gives 26} bushels as "the average of figures furnished to him by competent judges in all parts of the kingdom," adding, as the result of his own observation, that 32 bushels, as an average produce, is to be met with "only on farms where both soil and management are superior to the present average of England." In Jersey, however, whcre the average size of farms is only 16 acres, the average produce of wheat for the five years ending with 1833 was, by official investigation, ascertained to be 40 bushels. In Guernsey, where farms are still smaller, 32 bushels per acre was, according to Inglis, considered, about the same time, "a good, but still a common, crop ;" and the light soil of the Channel Islands is naturally by no means particularly suitable for the growth of wheat. That of Flanders, originally a coarse silicious sand, is par- ticularly unsuitable, and accordingly little wheat is sown there, but of that little the average yield, at least in the Waes district, is, according to a very minute and careful observer, from 32 to 36 bushels. Of barley, a more congenial cereal, the average is in Flanders 41 bushels, and in good ground 60 bushels; while in England it is probably under 38, and would certainly be over- stated at 36 bushels. Of course the English averages are consider- ably exceeded in particular localities—on such farms, for instance, as those of Mr Paget, near Nottingham, and of Mr Stansfeld, in the West Riding of Yorkshire, wheat crops of 46 bushels per acre being not extraordinary, and of 56 bushels not unknown ; but these exceptional cases may be more than matched in Guernsey, where the largest yield of wheat per acre, in each of the three years ending with 1847, was proved to the satisfaction of the local agricultural society to have been not less than 76, 80, and 72 bushels respec- tively. Of potatoes, 10 tons per acre would anywhere in England, even on the rich "warp lands"' bordering the tidal affluents of the Humber, be considered a high average crop; but in Jersey the average is reckoned at 15 tons, and near Tamise, in eastern Flanders, Mr Rham found a cultivator of 8 acres of poor land rais- Ing nearly 12 tons from one of them. Clover, again, 'the glory of Flemish farming," "is nowhere else found in such perfect luxuri- ance" as in Flanders, where it exhibits "a vigour and weight of produce truly surprising," especially when it is discovered " that such prodigious crops are raised from 6 tb of seed per acre." Most of the other green crops, and also most of the root crops, grown in Flanders deserve to

be spoken of in similar terms; and to the extraordinary number of cattle fed upon these green and root crops reference has already been made. If any reliance may be placed on these statistics, it cannot, however startling at first hearing, be too

much to affirm that in the Channel Islands and in Flanders the average of gross produce is greater than in England by fully one- fourth, or say by the equivalent of 9 bushels of wheat per acre.

Gross produce, however, is not the only thing to be considered, for there is no doubt that on equal areas small farming employs more hands than large; and it might be that the entire produce of a small farm was not more than sufficient to feed the extra mouths. This would not necessarily be an evil, unless on the assump- tion that the condition of agricultural labourers is neces- sarily so wretched that an increase in their number is tantamount to an increase of wretchedness. Possibly, however, the extra produce might be less than sufficient to feed the extra mouths, so that the quantity of net pro- duce remaining available for sale to the non-agricultural portion of the community would be diminished ; and, if this were really the fact, it might be conclusively con- demnatory of small farming. Nor, to prove that it is not the fact, will it suffice to urge that land, when divided among numerous occupants, commonly fetches a much higher rent than when united into a few extensive hold- ings—that whereas, for example, 30s. an acre would in England be considered a fair and even a high rate for middling land, it must be very middling land indeed which in Guernsey will not let for at least £4, while in Switzerland, another territory of petite culture, the average rent is £6. For these higher rents might be the results of an incident, not of culture, but of tenure—of that excessive competition for land which is unhappily a too frequent accompaniment of small farming. Neither will it suffice to show that, although the agricultural popula- tion of a minutely-divided territory is always far denser than that of one of large farms, certain territories of the former description are nevertheless among those which maintain the largest manufacturing and commercial popu- lation-—Belgium, for instance, being second to England alone in that

respect, and Switzerland and Rhenish Prussia being likewise cases in point. For it may obvi- ously be replied that the non-agricultural classes of a community need not be entirely dependent for food on home produce, but may derive part of their supplies from abroad, and it may generally be impossible to ascertain what is the proportion imported. This objection does not, indeed, apply to the Channel Islands; and Mr W. T. Thornton has, in a new edition of his Plea for Peasant Proprietors, been at considerable pains to prove that in Guernsey two, and in Jersey four, non-agricultural inhabi- tants are maintained on the produce of every acre and a half of cultivated land, whereas in England only one such person is so fed. Be this as it may, a preferable, or at any rate more generally applicable, test is the propor- tion between the extra production of small farming and the consumption of the extra labourers therein employed. Now, in Flanders and in the two principal Channel Islands the agricultural population is about four times as dense as in England, being at the rate of about one person for every 4 acres, instead of one for every 17; but cause has also been shown for believing that in Flanders and in the same islands the average produce of the soil is greater than in England by the equivalent of 9 bushels of wheat per acre, or of 153 bushels for every 17 acres. But 153 bushels, or say 19 quarters, of wheat is much more than three persons—and these not all adult males, but, more likely, a man, a woman, and a child—would consume, even if it were supplied to them, and there were nothing else for them to eat, and is fully three times as much as three such persons of the farm labourers' class in any part of Europe have the means of procuring. After deduction, therefore, of their consumption, there would still remain available for sale to non-agriculturists, from the produce of

17 acres under small culture, the equivalent of nearly 100 bushels of wheat more than could be spared for the same purpose from an equal extent of land under a large farmer. These conclusions are not put forward as more than roughly approximate, nor, indeed, in the present disgrace- fully defective state of British agricultural statistics, are any but rough approximations on the subject possible. But, unless very wide indeed of the

truth, they must be acknowledged to furnish adequate reason why rural magnates should not engross all our praises, and why the honest agricultural muse should reserve a share of com- mendation for small leaseholding farmers also.

IV. And while so much can be said for small leaseholders, it is obvious that every one of the arguments adduced in favour of that class applies with redoubled force to small freeholders cultivating their own freeholds. A peasant proprietor, whose whole produce belongs to himself, is of course richer than he would be if he had to pay rent —can more easily bear the expenses of cultivation, of procuring proper implements and manure, of drainage and urigation, and of the keep of live stock. Small lease- holders, as a class, lay out more money on their land, in proportion to its extent, than large occupiers; but a small freeholder has more money to lay out than a leaseholder of the same degree, and has besides stronger motives for laying it out on improvements. "A small proprietor," says Adam Smith, "who knows every part of his little terri- tory, who views it with all the affection which property, especially small property, naturally inspires, and who, upon that account, takes pleasure not only in cultivating but in adorning it, is generally of all improvers the most indus- trious, the most intelligent, and the most successful." It might have been added, that he is likewise the most enter- prising. He need not carefully calculate whether his outlay will be fully recovered by him within a certain term of years; he has only to consider whether the increased value of his land will be equal to fair interest on the sum which the improve- ments will cost. He does not require that the principal should ever be returned. He is satisfied to sink it for ever in his own land, provided that, in that safest of all invest- ments, it promise to yield a perpetual annuity equal to what would be its annual increase in another employment.

Again, the peasant proprietor has the strongest possible incentives to diligence. A man never works so well as when paid by the piece; but even then, the more he is paid, the better he works. The small leaseholder, not less than the small proprietor, is paid in proportion to his labour; but the latter is paid at a higher rate, for he takes to himself the whole fruit of his labour, while the former must content himself with part. The proprietor, too, knows that, so long as his labour continues equally pro- ductive, his

remuneration will remain the same; while that of the tenant, though augmented solely by his own exertions, may be diminished at the expiration of his lease. Besides, many rural operations yield no profit until after a long lapse of time; and the annual profit of others is so small that the enjoyment of it in perpetuity is requisite to recompense the labour expended. Such operations are seldom undertaken except by proprietors. No tenant would think of planting an orchard such as Arthur Young saw near Sauve on a tract consisting "seemingly of nothing but bare rocks;" or, as in the mountains of Languedoc, would "carry earth in baskets on the back to form a garden where nature had denied it ;" or would enclose and till fields and gardens on a "wretched blowing sand naturally as white as snow." But, as Young exclaims, "give a man the secure possession of a bleak rock, and he will turn it into a garden!" There is "no way so sure of carrying tillage to a mountaintop as by permitting the neighbouring villagers to acquire it in property. The

magic of property turns sand to gold." It may perhaps be objected that the gold does not repay the cost of trans- mutation, and that therefore the labour expended upon it has been wasted; and no doubt a monied speculator, who should engage in such alchemy with hired labour, might never recover the amount of his outlay. But—and here comes a conclusive answer to those who, instead of admir- ing such achievements, condemn them as mere waste of power—the peasant who performs them on his own account performs them with labour which would otherwise be valueless at that particular time. When the hired journey- man has earned his day's wages, and gives himself up to rest or amusement, the little landowner is content to recreate himself by turning to some lighter work. It is sufficient amusement for him to weed or water his cabbages, or to train or prune his fruit-trees; and, in wet or wintry weather, when outdoor work is scarce worth paying for, and when the day-labourer must often remain idle because no one will employ him, then it is that the independent cottager builds up terraces on the steep hillside, or lays the site of a garden among rocks. It is, in short, one prime excellence of peasant proprietorship that it

stirs into activity labour which otherwise would not have been exerted—in other words, would not have existed, and the fruits of which, consequently, however insignificant, are at any rate all pure gain.

The pastoral tribes, by which most civilised countries were

originally occupicd, have almost invariably been followed, either immediately or after a certain interval, by a race of peasant pro-

prietors. The revolution has taken place at different stages of national progress, but scarcely an instance can be mentioned in which it has not occurred sooner or later. In territories of very

small extent, very barren or much intersected by mountains, rivers, or other natural barriers, it has commonly been coeval with the first appropriation of land by individuals. In such situations, the original tribes of nomad herdsmen must necessarily have been small for want of pasture ; and the same cause must have prevented any individual from acquiring very great numbers of cattle, and from very greatly surpassing his companions in wealth and power. All must have been nearly equal in rank; and, whenever a partition of their common territory was resolved upon, every one, no doubt, made good his claim toashare. On the other hand, in countries containing abundance of good pasture, separate tribes might expand indefinitely, and the cattle of single proprietors be counted by thousands and tens of thousands. Great wealth would then imply great disparity of rank, and rich herdsmen would have many poor retainers entirely indebted to their bounty, and consequently entirely devoted to their service. Such dependants, when the community passed from a migratory and pastoral to a stationary and agricultural condition, could put forward no pretensions on their own behalf. Their relation to their masters would remain the same as before, or rather would be exchanged for a more stringent form of bondage. From servants they would become serfs, and the duty assigned to them would be that of tilling their masters' fields, as they had previously tended his herds. In the course of ages, however, they would imperceptibly acquire some important privileges. Residing for many successive generations on the lands allotted to them for their own subsistence, and paying to their lord always the same, or nearly the same, portion of the produce, they would come at length to be regarded as conditional proprietors of their respective

holdings, or as perpetual lessees at a quit and almost nominal rent. Their proprietary title, although at first merely prescriptive, would be eventually legalised ; and thus it is that from villeins and serfs has descended a progeny no less respectable than English copy-holders and German bauers.

VY. In one or other of these ways almost every country Métayage

on the face of the globe which has passed regularly through the various stages that separate barbarism from. civilisa- tion, has been at some period, as many are still, occupied in great measure by peasant proprietors. In_ those countries, however, in which peasant proprietorship has been evolved from serfdom, there must have been, inter- mingled with the lands held by servile tenure, others, not less extensive, in the immediate occupation of a rural aristocracy. These seignorial domains would long con- tinue to be cultivated by the serfs or slaves of their re- spective owners, but as feudal and domestic slavery fell

into desuetude, the landlords, in order to get their lands tilled, would be reduced to the necessity of holding out inducements to free husbandmen to lend their assistance. In England, where, thanks to the comparative security enjoyed by industry, plebeians of some substance were already not rare, it might suffice to offer tenancies for terms of years or for lives; but, in those continental countries in which feudal misrule had given way, only to be replaced by monarchical tyranny, it was generally necessary for the landowner, who desired that his farms should be tolerably stocked, to stock them himself. Hence arose a system which, having never existed in England, has no English name, but which in certain provinces of Italy and France, where it was once almost universal, and is still very common, is called mezzeria and métayage, or halv- ing—the halving, that is, of the produce of the soil between landowner and landholder. These expressions are not, however, to be understood in a more precise sense than that in which we sometinies talk of a larger and a smaller half. They merely signify that the produce is divisible in certain definite proportions, which must obviously vary with the varying fertility of the soil and other circum- stances, and which do in practice vary so much that the landlord's share is sometimes as much as two-thirds, some- times as little as one-third. Sometimes the

landlord supplies all the stock, sometimes only part—the cattle and seed perhaps, while the farmer provides implements ; or perhaps only half the seed and half the cattle, the farmer finding the other halves—taxes too being paid wholly by one or the other, or jointly by both.

Now, with whatever virtue a system like this may be condition- ally credited, it plainly can have no virtue at all except on con- dition of its being believed to be permanent. The métayer must have full confidence that the landlord, although authorised by law, will be prevented by respect for custom, from increasing his exac- tions; but even on this condition the system is open to the serious objection, that the metayer will deem it his interest to lay out on the land as little as possible, if anything, of his own, except labour. If in England, previously to tithe commutation, a farmer was discouraged from spending money on improvements by the knowledge that the parson would claim one out of every ten ad- ditional sheaves of corn or pounds of butter produced in conse- quence, what chance is there of a metayer risking a similar expendi- ture, while knowing that the landlord's share of the consequent produce would be a moiety or more instead of a tenth? In this particular, mctayage closely resembles English tenancies at will, which practically render it almost equally incumbent on the land- lord to bear the entire expense of all costly improvements, and over which metayage, in another and nearly allied particular, possesses a marked advantage. Although the métayer may, for one very cogent Treason—a reason, however, likely to be somewhat counteracted by belief, whether well or ill founded, in the fixity of his tenure—be reluctant to use in his business any capital of his own, he will, for the converse of that same reason, be anxious to make the most of the capital entrusted to him by his landlord. He is his landlord's

artner, cntitled to a moiety or thereabout in his landlord's gains.

t is his interest, then, to get the most out of the land that can be brought out of it by means of the landlord's stock. Virtually, indeed, he is himself, in a qualified sense, a peasant proprietor, pos- sessing in a minor degree all the stimulants to diligence, heedful- ness, and thrift, incidental to that charactcr ; and there can scarcely, therefore, be inherent in his constitution any such incurable vice as would warrant his being condemned a priort. Equally with other people he is entitled to be judged by his behaviour. As to this the

testimony of cxperience is very conflicting. English writers who see nothing of métayage at home, and may be suspected of looking with not wholly unprejudiced eyes at what they see of it abroad, were, until Mr J. S. Mill adopted a different tone, unani- tous in condemning it. They judged it, however, by its appear- ance in France, where it has never worn a very attractive aspect. In that country every form of agriculture still retains many of the traditions of the ante-Revolutionary period, and métayage, in par- ticular, labours under great difficulties in consequence. Under the ancien régime not only were all direct taxes paid by the métayer, the noble landowner being exempt, but these taxes, being assessed accord- ing to the visible produce of the soil, operated as penalties upon all endeavours to augment its productiveness. No wonder, then, if the métayer fancied that his interest lay less in exerting himself to augment the total to be divided between himself and his landlord,

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than in studying how to defraud the latter of part of his rightful share ; nor any great wonder either if he has not yet got entirely rid of habits so acquired. Rather would it be strange if he had, especially when it is considered that he still is, as his predecessors were formerly, destitute of the virtual fixity of tenure without which métayage cannot reasonably be expected to prosper. French métayers, in Arthur Young's time, were 'removable at pleasure, and obliged to conform in all things to the will of their landlords," and so in general they are still. Yet even in France, according to M. de Lavergne, although "métayage and extreme rural poverty usually coincide," there is one province, Anjou, where the contrary is the fact, as it is also in Italy. Indeed, to every tourist who has ago through the plains of Lombardy with his eyes open, the

nowledge that métayage has for ages been there the prevailing form of tenure ought to suffice for the triumphant vindication of métayage in the abstract. Its perfect compatibility with the most flourishing agriculture must be clear to any one who, noting the number and populousness of the cities in the Lombard provinces, is at the same time aware how much of agricultural produce those provinces export and how little they import. An explanation of the contrasts presented by métayage in different regions is

not far to seek. Métayage, in order to be in any measure worthy of com- mendation, must be a genuine partnership, one in which there is no sleeping partner, but in the affairs of which the landlord, as well as the tenant, takes an active part. If he do this, he cannot be an absentee. He must be on the spot to judge when and what advances are required from him, and to watch over their proper application ; to that end conferring habitually with the metayer, and taking as well as giving counsel on the subject, as on one in which both are equally concerned. This exhibition of common interest on one side is sure to beget it, if previously wanting, on the other; feelings of mutual attachment insensibly spring up, and the spirit which governs the mutual relations becomes one of friendly and almost affectionate association. Such is, or at any rate used to be, the state of affairs in Piedmont, in Lombardy, and in Tuscany ; and wherever the same description applies, the results of métayage appear to be as eminently satisfactory, as they are de- cidedly the reverse wherever the landlord holds himself aloof, contenting himself, as it were, with putting out his stock to usury, and never intervening except to carp at the smallness of the returns. Instead of community, there is then conflict, of interests. Anta- gonism takes the place of association. The landlord grudges the scautiest advances, and even of those the farmer does his best to cheat the soil, which, starved by them who ought to feed it, leaves them to starve in return.

On the whole, and according to preponderance of testimony, métayage must perhaps be admitted to be everywhere showing a tendency to degenerate after the above fashion; yet even so, the worst that need be said of it is, that it is becoming an anachronism ; this, moreover, being perhaps a reproach less to itself than to the age in which we live. It is the present generation of mankind who are chiefly to blame if the ties which anciently linked together employers and employed in more or less kindly fellowship, are now- a-days, in agriculture as in other departments of industry, visibly. decaying, and if each section of the agrarian class, bidding the others keep their distance, prefers to perform its own functions separately, and without more of natural intercourse than business obligations, arranged beforehand, render indispensable. But whenever, from whatever cause, landowners have come to be regarded by landholders as mere receivers of rent, métayage cannot possibly thrive, and it is accordingly dying out, even in the quarters to which it has hitherto appeared most congenial. Even in the Milanese, where

the minute and assiduous attention to details which métayers, next after peasant proprietors, can best be depended on for bestowing, is in especial de- mand for sericulture and viticulture, métayage is undergoing changes which M. de Laveleye (Economie Rurale de la Lombardie) describes as follows :—

'The primitive conditions of contract which fixed, according to local and traditional usage, the cultivator's share, are daily more and more departed from. For a considerable time past, in the parts about Como and Milan, to the arrangement for sharing by halves, which now applies only to plantation crops, grasses, and cocoons, has been added a clause providing for the annual payment of a determinate quantity of corn; and, as this quantity is scttled no longer by local custom, but by the demands of the proprietors and the offers of intending tenants, it follows that métayage is losing its character of fixity, and falling under the law of increase which governs farming rent. The clause in question is continually be- coming more and more of a habit; and, even where it has not yet been adopted, the ancient contract has undergone other and not less regretable modifications. The high price of commodities, particu- larly of silk, having markedly augmented the profits of the méta. yers, the landlords have availed themselves of this circumstance to introduce new stipulations—sometimes taking more than half of the cocoons, sometimes claiming a quantity of mulberry leaves to sell for their own profit, sometimes taking tithes first and then halving the residue. All this is done with the same aim and the

same result, the aim being to secure to the landlord the whole benefit of continually rising prices, the result that of depriving the métayer of the security which the primitive sgreement gave him, and of subjecting him to all the disadvantages of a leaseholder without any of the latter's compensations."

VI. The plan of industrial partnerships, wherever it has had a fair trial, has invariably been attended by the hap- piest results; but it has hardly yet been fairly tried in farming, where, however, its application would in one respect

be comparatively easy. In most other kinds of business, to determine to the satisfaction of both parties concerned how much, if any, of extra profits had been due to extra zeal on the part of the employed, might be an operation of some difficulty ; but there need never be any doubt whether the crops of a given acreage were or were not above the average, or what, therefore, if any, was the surplus in which, according to the agreement, the employed were entitled to participate. That farmers would risk but little and only occasional loss, and in the long run would be sure to gain considerably, by permitting their labourers to share with them in a surplus which the labourers would have by voluntary exertion to create before they could share in it, may perhaps to an indifferent bystander seem a self-evident proposition. Farmers in general, however, may long be prevented from recognising its truth by an intervening haze of traditional prejudice, which must first be cleared away, and the removal may occupy so much time that not improbably another and more advanced form of agricultural co-operation, not needing the farmers' con- currence, may in the mean time come into vogue.

Intermingled with the multitudinous peasant proprietary of France are not only a much larger number of well-to-do country gentlemen than is commonly supposed, but also a not inconsiderable sprinkling of rural magnates, who, even beside English dukes, might well pass for extensive land- owners. Among these latter are representatives of some of the oldest and noblest French families—men rejoicing in the grand historic names of Rochefoucauld, Noailles, Luynes, Montemart, D'Usez, and the like—who having at the restoration been partially reinstated in the domains of which the first revolution had despoiled them, dis- appeared, on the second expulsion of the Bourbons, from court and office, and, returning to their country seats, be- took themselves, under the Orleanist dynasty and second empire, to the improvement of their estates. A difficulty which here confronted them was that of finding tenants possessed of capital enough for any but very small farms, and this they have latterly endeavoured to obviate by devising, under the name of métayage par groupes, an ex- panded modification of a discredited tenure. This consists in letting a considerable farm, not to one métayer, but to an association of several, who work together for the general good, under the supervision either of the landlord himself, or of a manager or bailiff of his appointment. This plan is by no

means the novelty it may perhaps appear, its near counterpart having within the present cen- tury existed in some singular patriarchal communities — Jaults, Guittards, and Garriotts (see Thornton On Labour, 2d edition, pp. 488-90), in Niveruais and Au- vergne, and still existing among the massari of the sub- alpine districts of northern Italy. Its merit consists in its tendency to excite among the associates the generous emulation and other healthy stimulating and controlling influences of co-operative fellowship; but as yet it has scarcely been long enough in operation to show very deci- sively how itis likely to work. In the event of its proving a marked success, it. may become the starting-point of much further progress. One easy and important step in advance would be for a body of métayers to persuade their landlord to let them have their farm on lease, and at a fixed

rent, thus raising themselves to that higher stage of agri- cultural co-operation of which an imperfect but encourag- ing example has been afforded among ourselves by Mr Gurdon's well-known experiment at Assington in Suffolk. Of the two or three scores of labourers who are there par- ties to the leases by which two farms—one of 130, the other of 212 acres—are held, not more than teu or a dozen have regular work in their own fields, the rest being therefore little more than passive capitalists, sleeping partners in the concern, while the active members receive, in addition to wages at the rates current in the neighbour- hood, no larger shares in the profits than the members who do not exert themselves to increase those profits. Never- theless, to sum up in a single phrase of especial significance for our present purpose the praises of the results achieved, Mr Gurdon declares that "he has no other land so well farmed" as that on which the co-operative principle is even thus partially applied. It would seem, therefore, that the adoption of the same principle in its integrity would result in better farming still, and it may be hoped that the ques- tion will, at Assington or elsewhere, be ere long put to the proof. In order, however, that the experiment should succeed, it must, in England at least, be made by picked men ouly, the circumstances by which British farm- labourers are usually surrounded being but ill calculated to call forth in them the conscientious public spirit and other cognate virtues which every species of industrial co- operation imperatively demands. However

important, therefore, the part which the co-operative principle may be destined to play hereafter in agriculture, its develop- ment in that direction will probably be very gradual, and the realisation of its services to British farming exceedingly slow.

From the foregoing review the moral to be drawn is two-fold: first, that all varieties of tenure, having appa- rently some natural affinity for the circumstances out of which they have arisen or by which they are surrounded, have presumably some special virtue which ought to secure them against unqualified condemnation a priori; and secondly, that landed tenure should be left absolutely free to adapt itself naturally, by gradual modification, to changing circumstances, without artificial coercion or restraint of any kind. Whatever be the conflicting pre- tensions of seignorial and peasant proprietorship, or of large and small farming, it must always be, in an agri- cultural sense, equally impolitic to seek by legal enact- ment, on the one hand, to bind or hold land together, or on the other to accelerate its subdivision. However patent the superiority of leases over tenancy at will, the statutory prohibition of these and the statutory prescription of those would involve an interference with freedom of contract equally unwarrantable in either case. Whatever be the virtue latent in industrial co-operation, all virtue goes out from it when, instead of being left to introduce itself spontaneously, it is forcibly obtruded or patronisingly led forward. The only assistance, apart from the organisation of some simple process for the verification of titles to land,

which agriculture requires or can safely accept from law, |

is removal of the artificial obstructions which law has placed in its way—of the legal sanction given to primo- geniture and entails in England, of the legal compulsion imposed upon testatorship in France, of all those legal im- pediments, in short, by which immovable is prevented from being utilised with the same facility as movable property. If in any conceivable circumstances it might be expedient legislatively to foster the growth or arrest the decay of @ peasant proprietary, or to promote co-operative farming, the considerations warranting measures of the kind must be social or political rather than agricultural, and, as such, do not fall within the scope of this paper. © (w. 7. T.)

AGRIGENTUM, in Ancient Geography, a city on the south coast of Sicily, part of the site of which is now occupied by a town called Girgent:, from the old name. (See GircENtr.) It was founded by a colony from Gela, 582 pc. An advantageous situation, a free govern- ment, and an active commercial spirit raised the city to a degree of wealth and importance unknown to the other Greek settlements, Syracuse alone excepted. The pro- sperity of Agrigentum was interrupted by the usurpation of Phalaris which lasted about fifteen years. He met with the common fate of tyrants, and after his death the Agri- gentines enjoyed their liberty for sixty years; at the expiration of which term Theron usurped the sovereign authority. The moderation, justice, and valour of this prince preserved him from opposition. He joined his son- in-law Gelon, king of Syracuse, in a victorious war against the Carthaginians. Soon after his decease, 472 B.c., his son Thrasydeus was deprived of the diadem, and Agri- gentum restored to her old democratical government, which she retained till the Carthaginian invasion in 406 no. During this interval of prosperity were executed most of those splendid public works which excited the admiration of succeeding ages, and causcd Empedocles to remark "that the Agrigentines built their dwellings as though they were to live for ever, and indulged in luxury as if they were to die on the morrow." The total number of the inhabitants at this period was estimated by Diodorus at 200,000. The power of the Agrigentines now ex- perienced a terrible reverse. They were attacked by the Carthaginians in 406 B.c., their armies routed, their city taken, and their race almost extirpated, scarcely a vestige of their material greatness being left. Although some of the fugitive inhabitants availed themselves of permission to return to the ruined city, and after a few years were even able to shake off the yoke of Carthage, Agrigentum never fully recovered from this fatal disaster. Such was the condition of the city 340 B.c. that Timoleon, after his triumph over the Carthaginians, found it necessary to re- colonise it with citizens from Velia in Italy. During the first Punic war Agrigentum was the headquarters of the Carthaginians, and was besieged by the Roman consuls, who, after eight months' blockade, took it by storm. It nevertheless changed masters several times during the contest, and in every instance suffered most cruel outrages. At the close of the war Agrigentum finally fell under the dominion of Rome.

The profuse luxury and display for which the Agrigen- tines are celebrated in history were supported by a fertile territory and an extensive commerce, by means of which the commonwealth was able to resist many shocks of adversity. It was, however, crushed in the-fall of the Eastern Empire, and the Saracens obtained possession of the city.

Agrigentum occupied a hill rising between the small rivers Agragas and Hypsas, and was remarkable for its Strength as a fortress. The whole space comprehended within the walls of the ancient city abounds with traces – of antiquity. Of its many celebrated edifices, the most magnificent was the temple of Olympian Jupiter. Of this vast structure nothing remains except the basement and a few fragments of the columns and entablature ; but these and many other monuments attest the ancient 'magnifi- cence of the Agrigentines.

AGRIONTA, festivals celebrated annually by the Beo- tians in honour of Dionysus, in which the women, after playfully pretending for some time to search for that god, desisted, saying that he had hidden himself among the Muses. They were solemnised at night by women and the priests only. The tradition is that the daughters of Minyas, having despised the rites of the god, were seized with

frenzy and ate the flesh of one of their children, and that the Agrionia were celebrated in expiation of the offence. AGRIPPA, Herop, the son of Aristobulus and Berenice, and grandson of Herod the Great, was born about 11 B.c. Josephus informs us that, after the death of his father, Herod, his grandfather, sent him to Rome to the court of Tiberius. The empcror conceived a great affection for Agrippa, and placed him near his son Drusus, whose favour he very soon won, as well as that of the empress Antonia. On the death of Drusus, Agrippa, who had been recklessly extravagant, was obliged to leave Rome, overwhelmed with debt, and retired to the castle of Malatha. After a brief seclusion, Herod the tetrarch, his uncle, who had married Herodias, his sister, made him principal magistrate of Tiberias, and presented him with a large sum of money; but his uncle grudging to con- tinue his support, and reproaching him with his bad economy, Agrippa left Judea, and soon after returned to Rome. There he was received with favour by Tiberius, and commanded to attend Tiberius

Nero, the son of Drusus. Agrippa, however, chose rather to attach himself to Caius, who at that time was universally beloved, and so far won upon this prince that he kept him continually about him. Agrippa being one day overheard by Euty- ches, a slave whom he had made free, to express his wishes for Tiberius's death and the advancement of Caius, was betrayed to the emperor and cast into prison. Tibe- rius soon after died, and Caius Caligula ascended the throne 37 a.p. The new emperor heaped wealth and favours upon Agrippa, changed his iron fetters into a chain of gold, set a royal diadem upon his head, and gave him the tetrarchy of Batanza and Trachonitis, which Philip, the son of Herod the Great, had formerly possessed. To this he added that held by Lysanias; and Agrippa returned very soon into Judea to take possession of his new kingdom. On the assassination of Caligula, Agrippa, who was then at Rome, contributed much by his advice to maintain Claudius in possession of the imperial dignity, to which he had been advanced by the army; and while he made a show of being in the interest of the senate, he secretly advised Claudius to maintain his position with firmness. The emperor, as an acknowledgment of his services, gave him the government of Judea; and the kingdom of Chalcis, at his request, was given to his brother Herod. Thus Agrippa became of a sudden one of the greatest princes of the East, the territory he possessed equalling in extent that held by Herod the Great, his grandfather. He returned to Judea, and governed it to the great satisfac- tion of the Jews. But the desire of pleasing them, and a mistaken zeal for their religion, impelled him to acts of cruelty, the memory of which is preserved in Scripture (Acts xii. 1, 2, &c.) About the feast of the Passover, 44 A.D., Janies the elder, the son of Zebedee and brother of John the evangelist, was seized by his order and put to death. He procceded also to lay hands on Peter, aud imprisoned him, delaying his execution till the close of the festival. But God having miraculously delivered Peter from prison, the designs of Agrippa were frustrated, After the Passover, he went from Jerusalem to Cvesarea, where he had games performed in honour of Claudius, and the inhabitants of Tyre and Sidon waited on him to sue for peace. Agrippa having come early in the morn- ing to the theatre to give them audience, seated himself on his throne, dressed in a robe of silver tissue, which reflected the rays of the rising sun with such lustre as to dazzle the eyes of the spectators. When the king had delivered his address, the parasites around him shouted out that it was not the voice of a man but of a

god. The vain Agrippa received the impious flattery with complacent satisfaction ; but in the midst of his elation, looking wpwards, he saw, IL — 53

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with superstitious alarm, an owl perched over his head. During his confinement by Tiberius he had been startled by a like omen, which had been interpreted as portending his speedy release, with the warning that whenever he should behold the same sight again, his death was to follow within the space of five days. Seized with terror, he was immediatcly smitten with disease, and after a few days of excruciating torment, died, according to the Scripture expression, "eaten of worms," 44 A.D.

AGRIPPA, Heron, II., son of the preceding, born about 27 a.D., was made king of Chalcis on the death of his uncle Herod, 48 a.p.; but three or four years after he was deprived of that kingdom by Claudius, who gave him other provinces instead of it. In the war which Vespasian carried on against the Jews Herod sent him a succour of 2000 men, by which it appears that, though a Jew in religion, hc was yet entircly devoted to the Romans, whose assistance indeed he required to secure the peace of his own kingdom. He died at Rome in the third year of Trajan, 100 a.p. He was the seventh and last king of the family of Herod the Great. It was before him and Berenicc, his sister, that St Paul pleaded his cause at Ozesarca (Acts xxvi.)

AGRIPPA, Marcus Vipsantus, according to Tacitus, was born of humble parents about 63 B.c, At the age of eighteen he was the chosen companion of Octavius (after- wards Octavianus), the nephew and successor of Julius Ceesar, many of whose successes were mainly due to the courage and military talents of Agrippa. On the assassina- tion of Cesar, 44 B.c., Agrippa accompanied his friend to Italy, and rendered essential service in the conduct of the first war against M. Antonius, which terminated in the capture of Perusia in 40 B.c, Three years after this Agrippa was made consul, and had the command in Gaul, when he defeated the Aquitani, and led the Roman eagles beyond the Rhine to punish the aggressions of the Cer- mans on his province. But Agrippa was soon summoned to Italy by the critical state of the affairs of Octavianus, the whole coast being commanded by the superior fleets of Sex. Pompcius. His first carc was the formation of a secure harbour for the ships of Octavianus, and this he accomplished by uniting the Lucrine lake with the sca. He made an inner haven also by joining the lake Avernus to the Lucrine. In these secure ports the fleet was equipped, and 20,000 manumitted slaves were scdulously trained in rowing and naval manceuvres until they were able to cope with the seamen of Pompcius. Agrippa was thus enabled in the following year to defeat Pompeius in the naval action of Myle; and soon after won a more signal victory near Naulochus. These victories gave Octa- vianus the empire of the Mediterranean, and secured to him Sicily, the granary of Rome, after an easy triumph over his feeble colleague Lepidus ; and they prepared the way for the overthrow of the power of M. Antonius, the other triumvir. The merit of all these successes was very much due to the skill, resolution, and sagacity of Agrippa,

Agrippa was chosen adile 33 3.c., and signalised his tenure of office by great improvements in the city of Rome, in the repair and construction of aqueducts and fountains neglected or injured during the civil wars, and in the enlargement and repair of the sewers. He appears also to have introduced an effectual mode of flushing the sewers by conducting into them the united waters of several different streams. From these useful labours Agrippa was again called away in 31 B.c. to com- mand the Roman fleet, which, by the victory at Actium, fixed the empire of the world on

Octavianus. The services of Agrippa made him a special favourite with Octavianus, who gave him his niece Marcella in marriage,

AGRIPPA

27 B.c., when he was consul for the third time. In the following year the servile senate bestowed on Octavianus the imperial title of Avaustus. Agrippa, in commemo- ration of the naval victory of Actium, dedicated to Jupiter and all the other gods the Pantheon, now called La Rotonda. The inscription on its portico still remains, M. Acrippa L. F. Cos. Tertium Fecir. In 25 z.c. we find this eminent man employed in Spain, where he re- duced the insurgent Cantabri, the ancestors of the present Biscayans.

The friendship of Augustus and Agrippa seems to have been clouded by the jealousy of Marcellus, which was probably fomented by the intrigues of Livia, the second wife of Augustus, in dread of his influence with her hus- band. The consequence was that Agrippa left Rome ; and though, to cloak his retirement, he was appointed proconsul of Syria, he went no farther than Mytilene. Marcellus dying within a year, Agrippa was recalled to Rome, and being divorced from Marcella, became the hus- band of the widowed Julia, who was no less distinguished by her beauty and abilities than afterwards by her shame- less profligacy.

In 19 3.c. Agrippa again led an army into Spain, where he subdued the Cantabri, who had becn for two years in insurrection against the Romans. While in Gaul, where he also pacified the insurgent inhabitants, he constructed four great public roads, and the splendid aqueduct at Nemausus (now Nismes), the ruins of which even yet excite admiration. On his return to Rome, 18 B.c., he was invested with the tribunician power, along with the emperor, for five years. After that he was a second time made governor of Syria, 17 B.c., where, by his just and wise administration, he obtained general commendation, especially from the Hebrew population of his province, of which Judea formed a part. This resulted from his having, at the request of Herod the Great, gone up to Jerusalem, and granted special privileges for their religious worship to the Jewish subjects of the empire. In this journey, too, he colonised Berytus (now Beyrout) as a military and com- mercial settlement.

The last military employment of Agrippa was in Pan- nonia, 13 B.c., where his character for equity was of itself sufficient to put down insurrection without bloodshed. Returning to Italy, he lived there in retirement, greatly honoured, and died at Campania, 12 B.c., two years before his imperial father-in-law, He was the greatest military commander of Rome since the days of Julius Cesar, and the most honest of Roman governors in any province.

Under the care of Agrippa, Julius Czesar's design of having a complete survey of the empire made was carried out. He had a chart of the entire empire drawn up, and projected a great work on the geography of its provinces. His materials were placed in the public archives, where Pliny consulted them (Nat. Hist., iii.) Agrippa also wrote an account, now lost, of the transactions in which he had taken part.

Agrippa left several children: byhis first wife he had Pom- ponia Vipsania, who became the first wife of Tiberius, and was the mother of Drusus; and by Julia he was the father of Caius and Lucius Cesar, who were adopted by Augustus ; of Julia, married to Lepidus; of Agrippina the elder; and of Agrippa Posthumus. (See Dio Cassius; Appianus ; Suetonius ; Velleius Paterculus ; Fergusson's Rom. Rep. ; Merivale's Romans under the Empire.)

AGRIPPA, Henry Cornetius (von NuErrTEsHEIM), knight, doctor, and by common reputation a magician, was born of a noble family at Cologne on the 14th Sept. 1486. Educated at the university of Cologne, he entered when still very young into the service of the Emperor Maximilian, who sent him on a diplomatic mission to Paris in 1506.

During the next three years he was engaged in a military expedition to Catalonia, and then in the formation of a secret society of theosophists, the first of those alternations betwecn the career of the knight and the career of the student in which his whole life was passed. In 1509 he went by invitation to the university of Déle in Burgundy, and read lectures on Reuchlin's De Verbo Airifico, which gained for him the degree of doctor of divinity and a stipend. It was these lectures that first stirred against him that

malignant hatred of the monks which embittered his life and blackened his memory. He was denounced as an impious and heretical cabalist by an obscure monk named Catilinet, in lectures delivered at Ghent (1510) before Margaret of Burgundy, and his hopes of securing the patronage of that princess were thus for the time dis- appointed. To win her favour, he had composed (1509) and dedicated to her a treatise, De Nobilitate et Procel- lentia Foeminei Sexus, the publication of which was delayed from motives of prudence until 1532. For the same reason the same course was followed in regard to his treatise De Occulta Philosophva, which, though completed in the spring of 1510, did not appear until 1531. In writing it he had the advice and assistance of the abbot Trithemius of Wiirzburg. Failing to receive encourage- ment as a man of letters, Agrippa was forced again to enter the diplomatic service. In 1510 the emperor sent him on a mission to London, where he became the guest of Dean Colet at Stepney. Soon after his return home he was summoned to follow his imperial master to the war in Italy, where he won his spurs—probably at the battle of Ravenna. In the autumn of 1511, on the invitation of the Cardinal de Santa Croce, he attended the schismatic council of Pisa as theologian, and by so doing still further provoked the hostility of the papal party. After a period spent in the service of the Marquis of Montferrat, during which he visited Switzerland, Agrippa was invited in 1515 to the university of Pavia, where he delivered lectures on the Pimander of Hermes Trismegistus, the first of which is preserved among his published works, and received a doctor's degree in law and medicine. He was still doomed, however, to a harassed, unsettled life. Three years were spent in the service of the Marquis of Montferrat and the Duke of Savoy. In 1518 he became syndic at Metz, where he was involved in disputes with the monks, and especially with the inquisitor Nicolas Savin, before whom he boldly and persistently defended a woman accused of witchcraft. He was, chiefly in consequence of this, com- pelled to resign his office, and quitted Metz for Cologne in January 1520. After two years spent in seclusion in his native city, he went to Geneva, where he practised medicine for a short time. In 1523 he removed to Friburg, having been appointed town physician. In the following year he was induced to go to Lyons as court physician to the queen-mother, Louisa of Savoy, but the change did not better his condition, since, though he re- ceived several empty honours, his salary remained unpaid. It was probably amid the privations of poverty that he composed, in 1526, his De Incertitudine et

Vanitate Screnrarum et Artium atque Excellentia Verbi Det Declamatio, which was first published in 1530. The work is remarkable for the keenness of its satire on the existing state of science and the pretensions of the learned, and when published furnished fresh occasion for the malicious misrepresentation of his enemies. A quarrel with the queen compelled Agrippa to leave Lyons and betake himself to the Netherlands. In 1529 he was appointed historiographer to the Emperor Charles V., and in that capacity wrote a history of the emperor's reign. The salary attached to the office was, however, left unpaid, and Agrippa was consequently imprisoned at Brussels, and afterwards

banished from Cologne, for debt. He died at Grenoble in 1535.

The character of Agrippa has been very variously reprcsented. The earlier accounts are grossly disfigured by the calumnies of the Dominicans, whose hatred, following him even to the grave, placed over it an inscription that is probably unique in its spiteful malignity. In later times full justice has been done to his memory. A Life of Agrippa by Henry Morley (London 1856) contains a detailed analysis of his more important works. A complete edition of his writings appeared in two volumes at Leyden in 1550, and has been several times republished.

AGRIPPINA (THE ELDER), the virtuous and heroic but unfortunate offspring of M. Agrippa by a very abandoned mother, and herself the parent of a still more profligate and guilty daughter of the same name. She was early married to Germanicus, the son of Drusus and Antonia, the niece of Augustus. On the death of Augustus she joined her husband in his German campaigns, where she had several opportunities of showing her intrepidity, sharing with Germanicus his toils and his triumphs. The love which the army showed for this leader was the cause of his recall from the Rhine by the suspicious Tiberius. He was soon afterwards sent into Syria, whcre he died at Antioch from the effects, as was believed, of poison administered to him by Piso, the governor of Syria.

On his deathbed Germanicus implored his wife, for the sake of their numerous children, to submit with resignation to the evil times on which they were fallen, and not to provoke the vengeance of the tyrant Tiberius. But, unhappily, this prudent advice was not followed by the high-spirited

woman, who, on landing at Brundusium, went straight to Rome, entered the city bearing the urn of her deceased husband in her arms, and was received amid the tears of the citizens and the soldiery, to whom Germanicus was dear. She boldly accused Piso of the murder of her husband; and he, to avoid public infamy, committed suicide. She continued to reside at Rome, watched and suspected by Tiberius, who for some time dreaded to glut his vengeance on the widow and family of so popular a prince as Germanicus. She soon had the temerity to upbraid the tyrant with his hypocrisy in pretending to worship at the tomb of Augustus. He began by putting to death both men and women who had shown attachment to the family of Germanicus ; and finally he arrested Agrippina and her two eldest sons, Nero and Drusus, and transported them to the isle of Pandataria, where her mother Julia had perished ; and there she was starved, or starved herself, to death in the 33d year of our era. Tiberius also ordered the execution of her two eldest sons; yet it is remarkable that by his will the emperor left her youngest son Caius, better known by the name of Caligula, as one of the heirs of the empire.

AGRIPPINA, daughter of Germanicus and Agrippina the elder, sister of Caligula, and mother of Nero, was born about 15 a.p., at Oppidum Ubiorum, which was at that time the headquarters of her father's legions, and which was after her named Colonia Agrippina Ubiorum (now Cologne). She wrote memoirs of her times, which Tacitus quotes and Pliny commends; but her life is notorious for intrigue and perfidy. In 28 a.p. she became the wife of Cn. Dom. Ahenobarbus, who died 40 a.p. Her next husband was Crispus Passienus, whom some years afterwards she was accused of poisoning. For flagitious conduct, Caligula banished her to the isle of Pontia; but on the accession of her uncle Claudius, 41 a.p., she was sct free, and began to succeed in her ambitious schemes. After Messalina had been put to death, 48 a.p., Agrippina was raised by Claudius to her place as his imperial consort, 49 a.p. She prevailed upon him to discard Britannicus,

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his own son, and to adopt her son Domitius in his stead. She removed from her path all whom she feared or envied, and in 54 A.D. poisoned Claudius at Sinuessa that she might reign as regent for her son. Nero in a short time grew tired of her interference, and when she first intrigued against and then frowned upon him, he ordered her to be slain at her villa on the Lucrine lake. After having been slightly wounded by Anicetus, she perished by the sword of a centurion, 60 A.D.

AGROTERAS THUSIA, an annual festival at Athens in honour of Artemis or Diana, in fulfilment of a vow made by the city before the battle of Marathon to offer in sacrifice a number of goats equal to that of the Persians slain in the conflict. The number was afterwards restricted to 500.

AGTELEK, a village of Hungary, in the county of Gomér, near the road from Pesth to Kaschau. In the neighbourhood is the celebrated stalactite grotto of Baradla, one of the most remarkable in Europe. The entrance is extremely narrow, but the interior spreads out into a labyrinth of caverns, the largest of which, called the Flower Garden, is 96 feet high and 90 feet wide, and extends nearly 900 feet in a straight line. In these caverns there are numerous stalactite structures, which, from their curious and fantastic shapes, have received such names as the Image of the Virgin, the Mosaic Altar, &c.

AGUA, VotcaNno DE, a huge mountain in Central America, 25 miles S.W. of Guatemala. It is of a conical shape, and rises to a height of 15,000 feet above the level of the sea. At the summit there is a crater, measuring about 140 yards by 120, from which stones and torrents of boiling water are occasionally discharged. In close proximity to Agua are the volcanoes of Pacaya, on the S.E., and Fuego on the W., and the three present together a sceue of great magnificence.

AGUADO, ALExanpER Marta, one of the most famous bankers of modern times, was born of Jewish parentage at Seville in 1784. He commenced life as a soldier, fight- ing with distinction in the Spanish war of independence on the side of Joseph. After the battle of Baylen (1808) he entered the French army, in which he had risen to be colonel and aide-de-camp to Marshal Soult, when he took his discharge in 1815. He immediately commenced busi- nes$ as a commission-agent in Paris, and chiefly through

his connection with Spain and the Spanish colonies, acquired in a few years wealth enough to enable him to undertake banking. The Spanish government gave him full powers to negotiate the loans of 1823, 1828, 1830, and 1831; and Ferdinand VII. rewarded him with the title of Marquis de las Marismas del Guadalquiver, and the decorations of several orders. Aguado also negotiated the Greek loan of 1834. In 1828, having become possessed of large estates in France, including the Chateau Margaux, famous for its wine, he was naturalised as a French citizen. He died in 1842, leaving a fortune computed at 60,000,000 francs. The designs of the leading pictures in an exten- sive and admirable art collection which he had formed were published by Gavard under the title Galerie Aguado

(1837-42).

AGUAS CALIENTES, a town in Mexico, capital of the state of the same name, situated 270 miles N.W. of the city of Mexico, in 22° N. lat., and 101° 45' W. long. It takes its name from the hot springs in its vicinity. The climate is fine, and the extensive and beautiful gardens surrounding the town produce an abundance of olives, figs, grapes, and pears. It has a large manufactory of woollen cloth, and the general trade is considerable. Population, 22,534.

AGUILAR, Grace (1816-47), an admired English authoress, was the daughter of a Jewish merchant in London. She was educated wholly by her parents, and

commenced her literary career at an early age. Her works, written in a pleasing, elegant, and impressive style, consist chiefly of religious fictions, such as The Martyr and Home Injiuence. She also wrote, in defence of her faith and its professors, The Spirit of Judaism, and other works. Her services in the latter direction were acknowledged grate- fully by the "women of Israel," in a testimonial which they presented shortly before her death. In 1835 she had a severe attack of measles, from the effects of which her constitution never wholly recovered. After a long struggle with increasing bodily infirmities, she died at Frankfort, on her way to Schwalbach, in the autumn of 1847.

AGUILAR pz 1a Fronrera, a town of Spain, stands near the river Cabra, 22 miles 8.S.E. of Cordova. The houses are well built, and distinguished by their cleanness and regularity. The town has three handsome public squares, and the principal buildings are the parish church, the chapter-house, a new town-hall, the prison, and the markets. Near the church are the ruins of a once magni- ficent Moorish castle. The district produces excellent wines, which go by the name of Montilla, and there is also some trade in corn and oil. Population, 12,000.

AGUILLON, Frangois pD', an eminent mathematician, born at Brussels in 1566. He entered the Society of Jesus in 1586, and was successively professor of philosophy at Douay and rector of the Jesuit College at Antwerp. Eminent for his skill in mathematics, he was the first to introduce the study of that science among the Jesuits in the Low Countries. He wrote a treatise on Optics in six books (Antwerp, 1613), and was employed in finishing another on Catoptrics and Dioptrics when he died, in 1617.

AGUIRRA, JosuF Ssunz pv', a distinguished Spanish ecclesiastic and theological writer, was born at Logrogno on the 24th March 1630. He belonged to the Benedictine order, and was abbot of St Vincent, professor of theology at the university of Salamanca, and afterwards secretary to the Spanish Inquisition. For a work (Defensio Cathedree S. Petri adversus Declarationes Cleri Gallici, 1682), which he wrote in support of the papal authority against the four propositions of the Gallican Church, he was promoted to the rank of cardinal by Pope Innocent XI. in 1686. Of his other works the chief are a Collection of the Councils of Spain (1693-4), and a Treatise on the Theology of Anselm, only three volumes of which appeared, the fourth and last being still incomplete when the author died, August 19th, 1699. To judge from a warm eulogium of Bossuet, his opponent in controversy, Aguirra had a very high reputation for piety.

AGULHAS, Carr, the most southern point of Africa, 100 miles E.S.E of the Cape of Good Hope, in 34° 51' 30" 8. lat., and 19° 56' 30" E. long. At a distance of a mile from the sea it rises to a height of 455 feet. In 1849 a lighthouse was opened on it nearer the shore, the light in which stands 128 feet above high-water mark. An im- mense bank, the Agulhas Bank, extends from the Cape of Good Hope along the coast to the great Fish River, a

distance of 560 miles, with a breadth, opposite to the Cape, of 200 miles. The great oceanic current from the Indian Ocean to the Atlantic sets along its outward edge, and has sharply defined it. This current has such velocity that ships are often carried far to the westward, and round the Cape of Good Hope, even against a smart breeze. The bank abounds with fish ; and the approach to it is denoted by the appearance of many whales, sharks, and seals, and innumerable sea-birds.

AHAB, king of Israel, was the son and successor of Omri. He ascended the throne in the 38th year of Asa, king of Judah, 2.¢., 918 B.c., and reigned over Samaria 22 years. Having married Jezebel, daughter of Ethbaal, king of the Sidonians, he was brought into closer connec-

tion with the neighbouring powers in the north, and strengthened himself considerably, so that he was able to consolidate the disunited kingdom, and render it powerful against Judah. Some notices out of Menander, preserved by Josephus, lead to the conclusion that Ethbaal, father of Jezebel, was identical with Ithobal, priest of Astarte, who usurped the throne of Tyre after murdering Pheles the king. It is not improbable that Ahab's marriage with such a princess was the means of procuring him great riches, which brought pomp and luxury in their train, along with the material and social influence that give a certain security to monarchy. We read of his building an ivory palace and founding new cities, the effect perhaps of a share in the flourishing commerce of Pheenicia. But his matrimonial connection with Tyre and Sidon, however

fruitful in wealth, was in many respects detrimental. His.

wife was a strong-minded, passionate devotee of idolatry, who exercised an injurious influence over him. Led by her, he gave a great impulse to the worship of Baal. and Astarte in his kingdom. For the former he built a temple with an altar; of the latter he made the well-known image which existed long after. Under the patronage of Jezebel, the Phoenician cultus assumed important dimensions, for Baal is said to have had 450, Astarte 400 priests and pro- phets. The infatuated queen was especially hostile to the prophets and priests of Jehovah, whom she tried to exter- minate ; but

the former in particular, though sore pressed, were not entirely cut off. They still held their ground; and Elijah, the most conspicuous of them, came off victor in the contest with Baal's ministers. Jehovism triumphed in the person of the intrepid Tishbite, whom the queen was unable to get into her power. Ahab was a public- spirited and courageous monarch. He defeated the Syrians twice, and concluded a peace with Benhadad on favourable terms. Mesha, king of Moab, paid him a large yearly tribute. In conjunction with Jehoshaphat, king of Judah, he went forth to battle a third time against the Syrians, and was slain at Ramoth-Gilead. It speaks favourably for his disposition that he repented of the cruel measures taken against Naboth, and that he humbled himself before the Lord. Though he feared Elijah and Micaiah, he was not insensible to their utterances ; nor could he have suffered so many as 400 prophets to live in his kingdom without some little regard for their office. The prophetic voice, held as it was in small esteem, must have had some influence upon his administration, especially when pohtical grounds coincided with it. His evil courses were due much more to the influence of Jezebel than to his own vicious impulses.

As the accounts of Ahab are fragmentary, it is not always easy to make out from them a clear or connected history of his reign. There is room for conjecture and misconception. Thus Ewald represents him as building a splendid temple, with an oracle- grove of Astarte near his favourite palace at Jezreel, on the basis of 1 Kings xvi. 32, xviii. 19; but this is imaginary, since the original does not speak of a grove but of Astarte (xvili, 19); nor is it pro- bable that a second structure of the kind mentioned existcd elsewhere in addition to Baal's temple in Samaria. Neither can it be held as likely that a large statue of Baal was set up in front of his temple, and small statues of him in the interior, merely because we read in 2 Kings x. 26, 27, first of bringing forth the zmages of Baal, and then of breaking the cnwige of the same sun-god. Rather were the smaller images in the porch and the chief one in the interior, so that the reading or punctuation of verse 26 should be slightly altered. Whether the 450 or 400 prophets were distinct from the priests is doubtful. Identifying them, we believe that the priests acted as prophets, procuring for themselves greater renown among the ignorant peopie by their arts of necromancy and magic.

_ Yor the biography of this monarch we are indebted almost exclu- sively to the books of Kings, where the writers consider him in a theocratic rather than a political aspect. Viewing him from their later prophetic standpoint, their portrait is somewhat one-sided, though correct in the main. It is observable that the portions of the Kings in which he is spoken of are somewhat different in char- acter and expression, betraying the use of different sources by the

compiler. 1 Kings xvi. 29-83, xxii. 39, 2 Kings x. 25-28, are more historical than the rest, which contain almost all that is related of Ahab, and were derived from tradition. It has been conjectured by Hitzig that the 45th psalm owes its origin to Ahab, being the joyous poetical expression of a matrimonial connection with 'Tyre, which augured unusual prosperity for the distracted kingdom, But the assumption is improbable, because, as De Wette observes, an event belonging to Ephraim was hardly a fitting subject for a poem included in the canon.

Another Ahab, a false prophet in the time of the Baby- lonian exile, is mentioned by Jeremiah (xxix. 21), and threatened with terrible punishment. %. Dy)

AHALA, a noble Roman family of the gens Servilia, which produced many distinguished men. Of these the most celebrated is C. Servilius Structus Ahala, master of the horse to the dictator Cincinnatus, s.c. 439. He sig- nalised himself by his boldness in slaying in the forum with his own hand the popular agitator Sp. Meelius, for refusing to appear before the dictator on a charge of con- spiracy against the state. For this act Ahala was brought to trial. He saved himself from condemnation by retiring into exile.

AHANTA, a territory on the Gold Coast of Africa, lying on the second parallel of W long. It is one of the richest and most fertile districts in that part of the con- tinent. Axim, the chief settlement, was founded by the Dutch, but now belongs to Britain.

AHASUERUS, the Latinised form of the Hebrew Ahashverosh, #77308 (in the LXX. 'Agcovnpos, once in Tobit '"Aov'npos), occurs as a royal Persian or Median name in three of the books of the canonical Scriptures, and in one of the books of the Apocrypha. In every case the identi- fication of the

person thus named with those found in profane history is matter of controversy. The hypothesis of Fiirst and others, that in all the passages one and the same person is meant, viz, the well-known Xerxes, may be set aside as quite inapplicable to the facts; and it becomes necessary to glance at the particular places.

In Dan. ix. 1, Ahasuerus appcars as the father of Darius the Mede, who "was made king over the realm of the Chaldeans " after the conquest of Babylon and death of Belshazzar. Whio this Darius was is one of the most difficult and disputed questions of ancient history. If, as is very generally supposed, he is Astyages, the grandfather of the great Cyrus, and the last independent king of Media, then Ahasuerus is to be identified with Cyaxares, the father of Astyages. The passage in Tobit where the name occurs (xiv. 15) lends confirmation to this view. It is there stated that Nineveh was captured and destroyed by " Nabuchodonosor aud Assuerus." Aecording to Herodotus (i. 106 ef. Rawlinson's Her., vol. i. 412), it was the Medes under Cyaxares who took Nineveh.

In Ezra iv. 6 Ahasuerus is mentioned as a king of Persia, to whom the enemies of the Jews sent representations opposing the re- building of the temple at Jerusalem. Here the sequence of the reigns in the sacred writer and in the profane historians—in the one, Cyrus, Ahasuerus, Artaxerxes, Darius; in the other, Cyrus, Cambyses, Smerdis, Darius—leads naturally to the identification of Ahasuerus with Cambyses. Other circumstances, especially the known policy of the usurper Smerdis, and its reversal by Darius (see Inscr. of Behistun, col. i. § 14), corroborate this conclusion.

In the Book of Esther, Ahasuerus is the name borne by that king of Persia, certain events of whose court and cmpire (which will be noticed elsewhere, see EstHER) form the subject of the whole nar- tative. (Throughout this book the LXX. render the name by 'Aprat- éptns.) The hypothesis of certain writers, that this Ahasuerus is the Cyaxares, king of Media, already referrcd to, may be at once dis- missed. That of others, identifying him with Artaxerxes Longi- manus, the son and successor of Xerxes, though countenanced by Josephus, deserves scarcely more consideration. Recent in- quirers arc all but universally of opinion that he must be a mon- arch of the Achemenian dynasty, carlier than this Artaxerxes ; and opinion is

divided between Darius Hystaspis and his son and suc- cessor Xerxes. In support of the former view it is alleged, among other things (see Tyrwhitt's Esther and Ahasuerus, p. 162), that Darius was the first Persian king of whom it could be said, as in Esther i. 1, that he "reigned from India even unto Ethiopia, over an hundred and seven and twenty provinces ;" and that it was also the distinction of Darius that (Esther x. 1) he "laid a tribute upon the land and upon the isles of the sea" (ef. Herod. iii. 89). In support of the latter view it is allegeed—(1.) That the Hebrew

Ahashverosh is the natural equivalent of the old Persian Khsha- yorsha, the true name of the monarch called by the Grecks Xerxes, as now read in his inscriptions ; (2.) That there is a striking sim1- larity of character between the Xerxes of Herodotus and the Ahasucrus of Esther ; (3.) That certain coincidences in datcs and events corroborate this identity, as, ¢.g., "In the third year of his reign Ahasucrus gave a grand feast to his nobles, lasting one hun- dred and cighty days (Hsther i. 3); and Xerxes in his third year also assembled his chief officers to deliberate on the invaston of Greece (Herod. vii. 8). Again, Ahasuerus married Esther at Shushan in the seventh ycar of his reign; in the same year of his reign Xerxes returned to Susa with the mortification of his defeat, and sought to forget himself in pleasure. Lastly, the tribute im- posed on the land and isles of the sea also accords with the state of his revenue, cxhausted by his insane attempt against Greece (Kitto's Cyclopedia, s.v. Ahasucrus). To this it may be added that the interval of four years betwccn the divorce of Vashti and the marriage of Esther is well accounted for by the intervention of an important serics of events fully occupying the monarchs thoughts, such as the invasion of Greece. It may be added that by the advocates of both views appeal is made, with more or less of confidence, to the namcs of the queens of the respective sovereigns ; Atossa, wife of Darius, answering to Hadassah, and Amestris, wife of Xerxcs, to Esther (Esther ii. 7); and also to the number of gene- rations. indicated in the genealogy of Mordecai from the deporta- tion of the Jews into Babylon (Esther ii. 5; of. Tyrwhitt, p. 95, with Rawlinson, Bampton Lect., p. 186). If, as seems gnc the name Ahasuerus is

the transcription of the Persian Khshayursha (written Hisiarsa in Babylonian) which, according to Sir H. Rawlin- son, means " venerable king" (see Rawlinson's Her. iii. 363), then this name may be reasonably supposed to have been originally an appellative. and its application, especially by foreigners like the Jews, to different royal persons, is explained.

AHAZ (literally Possessor), son of Jotham, and the eleventh king of Judah, reigned 16 years, from 741 to 725 B.c. He was the most weak-minded and corrupt of all the kings that had hitherto reigned over Judah. About the time of his accession, Pekah, king of Israel, and Rezin, king of Syria, had formed an alliance with the view of acquiring the kingdom of Judah by conquest. They in- vaded the country, laid siege to Jerusalem, and carried away an immense number of captives, though they failed to secure their ultimate object. At the same time incur- sions were made by the Edomites and Philistines, and Ahaz was fain to call in the aid of Tiglath-Pileser, king of Assyria, who destroyed the power of Syria, but took care to cxact heavy tribute for the service thus rendered. Ahaz was even compelled to appear as a vassal at Damascus, and so to bring his kingdom to the lowest point of political degradation. In religion Ahaz was a heathen. He broke in pieces the vessels of the temple of God, and at last ventured to close its gates altogether. He sacrificed to Syrian deities, erected altars on which incense was to be offered, and caused his son to pass through the fire to Moloch. He was succeeded by his son Hezekiah. In the inscriptions of Tiglath-Pileser II., king of Assyria, Yahu- khan Jahudai, that is, Joahaz or Ahaz of Israel, appears among the names of those who acknowledged his sovereignty and paid tribute. (Schrader's Die Ketlinschriften und das Alte Testament.)

AHAZIAH (lit. Whom the Lord sustains), son and successor of Ahab, and eighth king of Israel, reigned scarcely two years, from 897 to 896 Bc. He continued in the idolatrous practices of his father, worshipping Baal and Astarte. Upon his accession the Moabites revolted, and refused any longer to pay the tribute which had been exacted from them since the establishment of Israel as a separate kingdom. Before Ahaziah could take measures to subdue them, he was seriously injured by a fall from the lattice of an upper chamber in his palace. He immediately sent messengers to the oracle of the god Baalzebub at Ekron to inquire the issue of his ilness. While on their

way they were met by Elijah the prophet, who bade them return and tell the king that he would surely die.

AHAZIAH, son of Jehoram and Athaliah, daughter of Ahab, and sixth king of Judah, reigned onc year, 885 B.c.

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Under the evil influence of his mother, he walked in the ways of Ahab's house, and was an idolatrous and wicked king. He was slain by Jehu, the son of Nimshi.

AHENOBARBUS, the name of a plebeian Roman family of the gens Domitia, which rose in'the course of time to considerable distinction. The name was derived from the red beard and hair by which many of the family were dis- tinguished. The emperor Nero was of this family.

AHITHOPHEL (lit. Brother of Foolishness, i.e., foolish), the very singular name of one of the sagest politicians in Old Testament history. In regard to his family rela- tionships it is almost beyond doubt that he was the grand-father of Bathsheba, and it has been suggested as probable that he was first introduced at court through this connec- tion. He was one of David's most trusted counsellors, and his defection to the cause of Absalom was a severe blow to the king, who prayed that God would bring his counsel to ' foolishness," probably alluding to his name. David's grief at the desertion is expressed in Ps. xli. 9, lv. 12-14. Ahithophel's advice was at first acceptable to Absalom's party, and probably laid down the policy which alone was likely to be successful; but Hushai's counsel of delay, given in the secret intercst of David, was ultimately adopted. Ahithophel's political foresight enabled him to see that this resolution would prove fatal to the rebel cause, and he at once returned to his home at Giloh, "put his house-hold in order, and hanged himself." 'This is the only case of deliberate suicide that is mentioned in the Old Testament,

AHMADABAD, a district and city of British India, in the province of Gujrat, within the jurisdiction of the governor of Bombay. The pistrrict lies

between 21° 4’ and 23° 5’ N. lat., and between 71° 2’ and 73° 25’ E. long. Jt is bounded by the province of Katiwdr on the N, and W., by the Mahi Kanta on the N. and E., by the Kaira collectorate on the E. and S., and by the gulf of Cambay on the 8. The area of the district is returned at 3844 square miles. The river Sdbarmat{ and its tributaries, flowing from north-east to south-west into the gulf of Cambay, are the principal streams that water the district. The north-eastern portion is slightly elevated, and dotted with low hills, which gradually sink into a vast plain, sub- ject to inundation on its western extremity. With the exception of this latter portion, the soil is very fertile, and some parts of the district are beautifully wooded. The total population of Ahmadabdd is returned at 829,637 souls, the average density, as compared with the area, being 216 to the square mile, and the proportion of females 891 to every 1000 males. About 86 per cent. of the popu- lation are returned as Hindus, 10 per cent. as Mahome- tans, and 4 as Buddhists. The percentage of persons of other denominations is infinitesimal, their total number being only 1237 souls.

The hamlets for the most part consist of substantial houses of bricks and tiles, with only a small proportion of huts. Some of the larger villages contain houses with upper stories, and the general appearance of the inhabitants indicates dy ge The principal agricultural products are rice, wheat, bajra, and cotton, with a little sugar-cane, tobacco, and oil-seeds. Silk manufacture forms an important industry of the city. The total revenue of the district in 1872 amounted to £152,344, of which £147,283 was derived from the land ; the total net expenditure on civil administration in the same year amounted to £21,700. The fiscal system consists for the most part of settlements direct with the husbandman, technically known as rayatwari ; but some villages are “‘télwkddrt,” in which the “tdlukdér” or landholder collects the revenue, and pays 70 per cent. of it to Government, retaining the remaining 30 per cent. for himself. The excise revenue is generally farmed out, but a government distillery exists in the city. The land settlement 1s fixed for a period of thirty years, and expires in different parts of the district between the years 1884 and 1888. Seventy-five per cent. of the total area of the district is cultivable, of which 55 per cent. is actually under cultivation, the other 20 per cent. remaiming fallow. The principal marts in Ahmadébdd are Dhollera, Gogo, Dholké, and Viramgdon. Municipalities have becn established in

-the towns of Ahmadabad, Dholkd, Mandu, Gogo, Dhanduka, Printej, and Mordshd ; the rate of municipal taxation per head of population varies from 2s. 63d. in Ahmadabad to 43d. in Morasha, the average throughout the eight towns being 1s. 7gd. per head. The muuicipal ineome is chiefly derived from octroi duties, which in some of the towns are farmed. Thirteen towns are returned as eontaining a population exeeeding 5000 souls, namely, Ahmadabad, population 116,873 ; Dholka, 20,854; Viramgdon, 19, 661 : Dhollera, 12,468 ; Dhanduka, 9782; Gogo, 9571; Prantej, 8341; Morasha, 7436 ; Sanand, 7229; Mandu, 6774; Patri, 6320 ; Barwala, 5813 ; and Ranpur, 5796. The district eontains 145 sehools, in eight of which English is taught. The police force numbers 1189 men. he Kolis contribute most largely to the eriminal population.

AHMADABAD City, the capital of the district, is situated on the east or left bank of the river Sébarmati, in 23° N. lat., and 72° 36' E. long. It was formerly one of the largest towns in India, celcbrated for its commerce and manufactures of gold and silver, silk and cotton fabrics, articles of gold, silver, steel, enamel, mother of pearl, lacquered ware, and fine wood-work. Excellent paper was also manufactured, and a large trade carried on in indigo, cotton, and opium. With the rise of the Marhatta power, however, Ahmadabad became the scene of repeated struggles between the Marhattas and the Mussulmans, whose power was then on the wane, and from this period its pros- perity declined. It was captured by the Marhattds in 1755, and again by the British in 1780. The latter soon afterwards gave the town. back to the Marhattds, who held it till it finally came into the hands of the English in 1818. The present state of the city is flourishing. It contains a population of 116,873 souls, and is a large and important station on the Bombay, Baroda, and Central India Rail- way. It is the seat of important silk manufactures, and has two cotton-mills worked by steam-power.

The principal objects of architectural interest are the Jain temple of Seth Hathisinh and the Juma Masjid or Great Mosque. The Jain temple is a modern edifice, having been erected about twenty-five years ago by Hathi Sinh, a rich Jain merchant, who dedicated it to Dharmnath. This inodern style shows that the Jain style of architecture has hardly degenerated from

its ancient excellence. The ex- ternal porch, between two circular towers, is of great magni- ficence, most elaborately ornamented, and leads to an outer court, with sixtecn cells on either side. In the centre of this court is a domed porch of the usual form, with twenty pillars. The court leads to an inner porch of twenty-two pillars, two stories in height, with a roof of a shape very fashionable in modern Jain teinples, though by no means remarkable for beauty. This inner porch conducts to a triple sanctuary. The exterior of the temple expresses the interior more completely than even a Gothic design; and whether looked at from its courts or from the outside, it possesses variety without confusion, and an appropriateness of every part to the purpose for which it was intended. The Juma Masjid or Great Mosque of Ahinadabad, although not remarkable for its size, is one of the most beautiful mosques in the East, the Jain style of architecture being plainly visible in its construction. Its external dimensions are 382 feet by 258 feet.

AHMADNAGAR, a district and city in British India, in the province of Gujrat, within the jurisdiction of the Governor of the Presidency of Bombay. The coLLECTORATE extends from 18° 6' to 19° 50' N. lat., and from 73° 40' to 75° 37' KE. long., and contains the following eleven tilukés or sub-districts: Nagar, Jamkhair, Parnair, Srigonda, Karjat, Newasa, Koparg4m, Sangamnair, Rahuri, Siogim, and Ankol&

Godavari river; and on the N. by the Nasik district. The total area of the district is returned at 4,209,036 acres, or 6576°62 square miles. Of the total area, 3,068,162 acres, or 4794-00 square miles, are cultivated; 121,474 acres, or 189°80 square miles, are cultivable, but not actually under tillage; and 1,019,400 acres, or 1592°81 square miles, are uncultivable. The last portion includes (besides unarable lands) village sites, roads, tanks, rivers, &c. The population of the district, according to the census taken on the night of the 21st February 1872, numbered 773,938 souls, divided into the following five classes :~~— Hindus, 716,820, or 92°62 per cent. of the total popu~~ lation; Mahometans, 42,435, or 5°49 per cent.; Bud- dhists, 12,547, or 1°62 per cent.; Christians, 941, or 0-12 per cent.; and other denominations, 1195, or 0°15 per cent. The bulk of the population consists of Marhattds and Kunbis, the latter being the agriculturists.) On the north the district is watered by the Godavart and its tribu- taries the Prawara and

the Mula; on the north-east by the Dor, another tributary of the Godavari; on the east by the Séphani, which flows through the valley below the Bald Ghat range; and in the extreme south by the Bhimd and its tributary the Gor. The Sind river, another tributary of the Bhima, flows through the Nagar and Karjat talukas, The collectorate on the whole is fairly well watered, although in some villages among the hills and spurs of the Western Ghats the supply is insufficient. The district is intersected by the Bombay and Agra road; a second road connects Pund via Serur with the town of Ahmadnagar, and is con- tinued thence towards Malig4m; a third road leads from Pund to Ndrdyang4m, besides various cross-tracts and

minor roads connecting the different towns of the district. ”

The only important industry is weaving. The principal agri- cultural products are wheat, grain, bajra, jodr, and tur dal. The early or spring erop is bajra and tur dal; wheat, gram, and joar being sown later in the season. Several other food grains are also raised; and sugar-eane, betel leaves, a little cotton, and all descriptions of vegetables are sown on suitable soils. The staple food of the people is bajra and joar (coarse kinds of millet). The total revenue of the district is returned at nearly £170,000; about £140,000 being derived from the land revenue. The total annual expenditure is returned at £50,000. The present land settlement was introduced about 1844-45, and the thirty years’ leases are now beginning to fallin. In a few villages which were transferred to Ahmadnagar from the Nasik eollectorate the leases have already expired, and a revision of the settlement is in progress (1873). The following eight towns are returned as containing a population of upwards of 5000 souls :—Ahmadnagar, population 32,841; Sangam- nair, 9978; Pathardi, 7117; Khurda, 6889; Srigonda, 6175; Bhingar, 5752; Karjat, 5535; and Sonai, 5254. The municipal system has been introdueed into the towns of Ahmadnagar, San- gamnair, and Dhingar. In the two first named, the municipal revenue is derived from a house tax and octroi duties on goods and articles imported into the town for consumption. In Bhingar the municipal revenue is raised by the levy of a classified tax on pro- fessions and trades carried on within the town. The municipal revenue and expenditure in 1872, together with the incidence of municipal tax per head of the population in each of the three towns, was as follows:—Ahmadnagar, municipal income, £3611, 18s.; municipal

expenditure, £3557, 12s.; ineidenee per head of population, 2s. 2}d. Sangamnair, municipal ineome, £275, 4s.,~~— 62d. per head; expenditure, £217. Bhingar, municipal revenue, £259, 18s.—8#d. per head; expenditure, £259, 18s. Ahmadna~~ gar distriet eontains 1 high school, 1 first-grade Anglo-vernaeular school, 8 middle-class schools, 164 lower-elass schools, and 1 girls' sehool. Kdueation is making fair progress, and the number of schools is annually inereasing as funds beeome available. For the proteetion of person and property, a regular police force of 594 men of all grades is maintained, at a eost, during 1872-73, of £9869. A village police, numbering 2042 men, is also kept up, at a eost of £1978 per annum. There are no special criminal elasses in the distriet exeept a few Bhils, and they are now much less troublesome than formerly.

AHMADNAGAR City, the capital of the district of the same name, is situated in 19° 6' N. lat., and 74° 46' E, long. It is a town of considerable antiquity, having been founded, in 1494, by Ahmad Nizdm Shah, on the site of

a more ancient city, Bhingar. This Ahmad established a new monarchy, which lasted uutil its overthrow by Shah Jahdn in 1636. In 1759 the Peshwa obtained possession of the place by bribing the Mahometan commander; and in 1797 it was ceded by the Peshwd to the Marhatta chicf Daulat R4o Sindhi&. During our war with the Marhattés in 1803 Ahmadnagar was invested by a British force under General Wellesley, and captured, It was after- wards restored to the Marhattds, but again came into the possession of the British in 1817, according to the terms of the treaty of Puna. The town has rapidly advanced in prosperity under British rulc. It now contains a popula- tion of 32,841 souls, is an important station on the Great Indian Peninsular Railway, and has been created a muni- cipality, as is mentioned above.

AHMED SHAH, founder of the Durdni dynasty in Afghanistan, born about 1724, was the son of Sammaun- Khan, hereditary chief of the Abdali tribe. While still a boy Ahmed fell into the hands of the hostile tribe of Ghilzais, by whom he was kept prisoner at Kandahar. In March 1738 he was rescued by Nadir Shah, who soon afterwards gave him the command of a body of

cavalry composed chiefly of Abdalis. On the assassination of Nadir in 1747, Ahmed, having failed in an attempt to seize the Persian treasures, retreated to Afghanistan, where he easily persuaded the native tribes to assert their inde- pendence, and accept him as their sovereign. He was crowned at Kandahar in October 1747, and about the same time he changed the name of his tribe to Durani. Two things may be said to have contributed greatly to the con- solidation of his power. He interfered as little as possible with the independence of the different tribes, demanding from each only its due proportion of tribute and military service; and he kept his army constantly engaged in bril- liant schemes of foreign conquest. Being possessed of the Koh-i-noor diamond, and being fortunate enough to inter- cept a treasure on its way to the Shah of Persia, he had all the advantages which great wealth can give. He first crossed the Indus in 1748, when he took Lahore; and in 1751, after a feeble resistance on the part of the Mahome- tan viceroy, he became master of the entire Panjab. In 1750 he had taken Nishaptr, and in 1752 he subdued Kashmir. His great expedition to Dehli was undcrtaken in 1756 in order to avenge himself on the Great Mogul for the recapture of Lahore. Ahmed entered Dehli with his army in triumph, and for more than a month the city was given over to pillage. The Shah himself added to his wives a princess of the imperial family, and bestowed another upon his son Timur Shah, whom he made governor of the Panj4b and Sirhind, As his viceroy in Dehli he left a Rohilla chief in whom he had all confidence, but scarcely had he crossed the Indus when the Mahometan vizier drove the chief from the city, killed the Great Mogul, and set another prince of the family, a tool of his own, upon the throne. The Mahratta chiefs availed themselves of these circumstances to endeavour to possess themselves of the whole country, and Ahmed was compelled more than once to cross the Indus in order to protect his territory from them and the Sikhs, who were constantly attacking his garrisons. In 1758 the Mahrattas obtained possession of the Panjab, but on the 6th January 1761 they were totally routed by Ahmed in the great battle of PAnipat. In a later expedition he inflicted a severe defeat upon the Sikhs, but had to hasten westwards immediately afterwards in order to quell an insurrection in Afghanistan. Meanwhile the Sikhs again rose, and Ahmed was now forced to abandon all hope of retaining the command of the Panjab. After lengthened suffering from a terrible disease, said to have been cancer in the face, he died in 1773, leaving to his son Timur the kingdom he had founded.

AHM—

AID

AHRIMAN or ARIMANES (Angra-Mainyus, Hostile or Destroying Spirit), in the Zend-Avesta, the principle of evil, opposed to Ormuead, the principle of good, the one being symbolised by darkness and the other by light. Both were visible manifestations of the Zervan-Akerene (Infinite Time), and existed from all eternity, according to the doc- trine of the Magians. Zoroaster himself, however, seems to have taught that Ormuzd alone was eternal, while Ahriman was created. In the Avesta this world is repre- sented as the theatre of a ficrce conflict between the two spirits, which is to last for 12,000 years. In the end Ahriman is to acknowledge the supremacy of Ormuzd. (See ZOROASTER.)

AHWAZ, a town in Persia, on the left bank of the river Karoon, about 100 miles N.E. of Bassorah, Though now an insignificant place, it occupies the site of what was once an extensive and important city. Of this ancient city vast remains are left, extending 12 miles along the bank of the river. Among the most remarkable are the ruins of a bridge and a palace, besides vestiges of canals and water- mills, which tell of former commercial activity. There is also, in a ruined state, a bund or stone dyke of great strength thrown across the river for purposes of irrigation, It extends 100 feet in length, and many single blocks in it measure from 8 to 10 feet in thickness. Ahwaz reached the height of its prosperity in the time of the earliest Mahometan caliphs.

*AI (Sept. 'Ayyai, 'Ayyat, and Tot; Vulg. Haz), a royal city of the Canaanites, east of Bethel. It existed in the time of Abraham, who pitched his tent between the two cities (Gen. xii. 8; xiii. 3); but it is chiefly noted for its capture and destruction by Joshua (vii. 2-5; viii. 1-29), who made it "a heap for ever, even a desolation." At a later period Ai was, however, rebuilt, and is mentioned by Isaiah (x. 28), and also after the captivity. The site was known, and some scanty ruins still existed, in the time of Eusebius and Jerome (Onomast., s.v. *Ayyat). Dr Robin- son was unable to discover any certain traces of either. He remarks (Bib. Researches, ii. 313), however, that its situa- tion with regard to Bethel may be well determined by the facts recorded in Scripture. That Ai lay to the east of Bethel is distinctly stated;*

and the two cities were not so far distant from each other but that the men of Bethel mingled in the pursuit of the Israelites as they feigned to flee before the king of Ai, and thus both cities were left defenceless (Josh. viii. 17). A little to the south of a village called Deir Diwan, and one hour's journey from Bethel, the site of an ancient place is indicated by reservoirs hewn in the rock, excavated tombs, and foundations of hewn stone. This, Dr Robinson thinks, may mark the site of Ai, as it agrees with all the intimations as to its position. In this view more recent authorities generally coincide. Kiepert's map gives it a place near these ancient ruins. Stanley places it at the head of the Wady Harith.

AIDAN, a king of Scottish Dalriada, who reigned about the close of the 6th century. He usurped the succession from the son of Conall, and was crowned by Columba, who personally preferred another, and, it is said, was compelled to perform the ceremony by an interposition of divine power. During Aidan's reign the Scottish Dalriada was completely freed from subjection to the Irish monarchs. (See Adaninan, lib. iii., c. 5; and Bede.)

AIDAN, 8x, first bishop of Lindisfarne or Holy Island, embraced a religious life in the monastery of Iona. Oswald, king of Northumbria, having requested a mission of monks from Iona to labour for the conversion of his subjects, Aidan was chosen by the abbot as leader of the expedition, and was consecrated a bishop about 634-5 a.p. Bede speaks of the holiness of his life, of the influence of his preaching as scen in the conversion of multitudes, and also

of numerous miracles which he performed. Aidan died on the 3lst August 651.

AIDE-DE-CAMP, a confidential officer attached to the "»ersonal" or private staff of a general. In the field he is the bearer of his chief's written or verbal orders, and when employed as the gcneral's mouthpiece, must be implicitly obeyed. In garrison and quarters his duties are more of a social character—he superintends the general's household, writes and answers invitations, &c. To increase their state, colonial governors and the Lord-Lieutenant of Ireland have aides-de-camp with functions analogous to those

of equerries to royalty. Officers above the rank of captain are seldom taken as aides, and none of less than two years' service. The sovereign, as head of the army, may have an indefinite number of aides-de-camp. In 1874 there were thirty-three military aides-de-camp ; of these, twelve, taken from the militia, were honorary, the remainder, from the regular army and marines, were chosen for distinguished warservices. The appointment carries with it promotion to the army rank of "full" colonel. The Queen has also at present (1874) eleven naval aides-de-camp, in compliment to the sister service; but the appointment is more especially of a military character. An admiral's aide-de-camp is his flag-heutenant.

AIDIN, or Guzet-Hissar, a town of Turkey in Asia, in the pashalic of Anatolia, about 70 miles S.E. of Smyrna. It is beautifully situated near the river Meander, and is the residence of a pasha. Since 1866 it has been connected with Smyrna and Ephesus by rail. On a neigh- bouring height are to be seen the ruins of the ancient Tralles, Aidin is a place of very extensive trade, and is celebrated for its figs, which are grown in great abundance in the beautiful orchards between the town and the river, and form an important article of export. The streets of the town, overshadowed by trees, and having numerous well-frequented bazaars, present a very picturesque appear- ance. Among the inhabitants are considerable numbers of Greeks, Armenians, and Jews; and there are several churches and synagogues in addition to the fine Turkish mosques. Population, 30,000.

AIDS (Ausilia), a pecuniary tribute under the feudal system, paid by a vassal to his lord on particular occasions ; originally a voluntary grant which in process of time became exigible as a right. The aids of this kind were chiefly three, viz.:—ls, When the lord made his eldest son a knight; 2d, To provide a dower when he gave his eldest daughter in marriage; 3d, To ransom the person of the lord when taken prisoner. The amount of the first two was definitely fixed by 3 Ed. L, c. 36, but that of the last was of course uncertain. The right of levying aids was abolished by 12 Car. II., c. 24.

AIKIN, Joun, M.D. (1747-1822), was born at Kibworth- Harcourt, received his elementary education at the dissent- ing academy of Warrington, where his father was tutor, and prosecuted his medical studies in the university of Edinburgh, and in London under the celebrated Dr William Hunter. He

commenced his professional career as a surgeon at Chester; but being unsuccessful, he removed to Warring- ton. Finally, he went to Leyden, took the degree of M.D. in that university (1780), and attempted to establish him- self as a physician in London. His success in this new field does not scem to have been considerable; chiefly, no doubt, because he concerncd himself more with the advocacy of liberty of conscience than with his professional duties. He therefore began at an early period to devote himself to literary pursuits. Dr Aikin's reputation chiefly rests on his endeavour to popularise scientific inquiries. In conjunction with his sister, Mrs Barbauld, he com- menced the publication of a serics of volumes on this principle, entitled Evenings at Home (6 vols., 1792-5), a

popular and interesting work, chiefly commendable for the purity of the principles it inculcates, and the pleasing views it gives of human nature. It has been translated into almost every European language. His love of nature, and his power in delineating its features, are well illustrated in The Natural History of the Year, as well as in his mis- cellaneous Lssays. In 1798 Dr Aikin retired from pro- fessional life, and devoted himself with great industry to literary undertakings of numerous and varied kinds, among which his valuable Biographical Dictionary (10 vols. 1799-1815) holds a conspicuous place. Besides these, he published Biog. Memoirs of Medicine (1780); Lives of John Selden and Archbishop Usher; Memoirs of Huet, Bishop of Avranches; Geographical Delineations of All Nations, &c. He edited the Monthly Magazine from 1796 to 1807, and started the Atheneum in 1807. The latter was discon- tinued, however, in 1809.

AIKIN, Lucy, daughter of the preceding, a well-known historical writer, was born at Warrington on 6th Nov. 1781. After rendering valuable assistance to her father in several of his later works, she commenced her own career as an authoress by the publication of several books for the young, the most important of which were the Adventures of Rolando, a translation, and Lorimer, a tale. In 1818 she published her Afemoirs of the Court of Queen Llizabeth, the first and best of the series of historical works on which her reputation rests. It was very popular, and passed through several editions. The Jfemoirs of the Court of King James I. (1822) was highly commended

in the Edinburgh Review, which pronounced it "a work very nearly as entertaining as a novel, and far more instruc- tive than most histories." Her Memoirs of the Court of Charles I. (1833) showed a falling off; and her latest work, the Life of Addison (1843), was declared disappointing by Macaulay in the Ldinburgh Review, vol. lxxvili. Miss Aikin died at Hampstead, where she had resided for forty years, on the 29th Jan. 1864. A Life by P. H. le Breton appeared in a volume entitled JLemoirs, Miscellanies, and Letters of Incy Atkin (Lond. 1864).

AIKMAN, Wix11aM, a celebrated portrait-painter, born at Cairney, Aberdeenshire, on the 24th Oct. 1682. He was intended by his father for the bar, but followed his natural bent by becoming a pupil under Sir John Medina, the leading painter of the day in Scotland. In 1707 he went to Italy, resided in Rome for three years, after- wards travelled to Constantinople and Smyrna, and in 1712 returned home. In Edinburgh, where he practised as a portrait-painter for some years, he enjoyed the patron- age of the Duke of Argyll; and on his removal to London in 1723 he soon obtained many important commissions. Perhaps his most successful work was the portrait of the poet Gay. He also painted portraits of himself, Fletcher of Saltoun, William Carstairs, and Thomson the poet. The likenesses were generally truthful, and the style was modelled very closely upon that of Sir Godfrey Kneller. Aikman held a good position in literary society; and counted among his personal friends Swift, Pope, Thomson, Allan Ramsay, Somerville, and Mallet. He died in June 1731, leaving unfinished a large picture of the royal family.

AILRED, Eatrep, ETHeLReDus, ALUREDUS, an Eng- lish ecclesiastic and histerian, born at Hexham in 1109, He was educated at the Scotch court with Henry the son of King David. The king is said to have offered him a bishopric, which he refused, preferring to become a monk in the Cistercian abbey of Rievaulx, Yorkshire. In 1146 he was chosen abbot, and he held that position till his death in 1166,—the accounts which state that he was trans- ferred to Revesby in Lincolnshire being probably founded on a confusion of names. Leland says that he had seen his tomb at Rievaulx adorned with gold and silver ornaments.

Ailred was the author of a large number of historical and theological works. The former are of little value, owing to his credulity, except for the occasional glimpses they give of contemporary life and manners. His theological works, including a volume of homilies, a treatise on charity, and a treatise on fricndship, are somewhat in the style of St Bernard. (For a full account of the historical writings see Sir T. D. Hardy's Descriptive Catalogue.)

AILSA CRAIG, a remarkable island-rock at the mouth of the Firth of Clyde, off the coast of Ayrshire, Scotland. Tt is of a conoidal form, with an irregular elliptic base, and rises abruptly from the sea to the height of 1139 feet. The only side from which the rock can be ascended is the east; the other sides being for the most part perpendicular, and generally presenting lofty columnar forms, though not so regular as those of Staffa. The rock is a greenstone or syenite, with a basis of grayish compact felspar traversed by numerous trap veins. A columnar cave exists towards the north side, and on the castern are the remains of a tower, with several vaulted rooms. Two springs occur on the island, and some scanty grass affords subsistence to numerous rabbits. The precipitous parts of the rock are frequented by large flocks of solan geese and other aquatic wild fowl. It is situated in 55° 15' N. lat., 5° 7' W. long.

AIN, a department on the eastern frontier of France, bounded on the N. by the departments of Jura and Sadéne- et-Loirc, on the W. by Saéne-et-Loire and Rhéne, on the S. by Isére, and on the E. by the departments of Savoie and Haute Savoie and the Swiss cantons Geneva and Vaud. It extends at the widest points 52 miles from N. to S., and about the same distance from E. to W., with an area of 2241 square miles. The east of the depart- ment is very mountainous, being traversed by the southern portion of the Jura range, but in the north-west the surface is comparatively level, and in the south-west flat and marshy. Ain is wholly within the basin of the Rhéne, that river itself being the boundary on the east and south, while it receives the Ain, which passes southward through the centre, and the Sadnc, which forms the western boundary of the department. The climate is usually cold, but on the whole healthy, except in the damp marshy districts on the west. The soil in

the valleys and plains of the department is fertile, producing wheat, barley, maize, rye, and fruits of various kinds, as well as wine of excellent quality; the tops of many of the mountains are covcred with forests of fir and oak, and the lower slopes yield excellent pasture for sheep and cattle. The chief mineral product is asphalt, besides which potter's clay, iron, build- ing-stone, and the best lithographic stone in France, are produced in the department. There are many corn and saw mills on the mountain streams; and cotton, linen, and silk fabrics, coarse woollen cloth, paper, and clocks, are manufactured to a limited extent. Ain, which formed a part of the ancient province of Burgundy, is divided into five arrondissements—Bourg and Trevoux in the west, and Gex, Nantua, and Belley in the east; containing in all 36 cantons and 452 communes. Bourg is the capital, and Belley is the seat of a bishop. Population of Ain in 1872, 363,290, of whom 185,074 were males, and 178,216 were females. Of the total population, 115,407 could neither read nor write, and 46,450 more could not write.

AINAD, a town of Arabia, in the province of Hadra- maut, about 207 miles N.E. of Aden. Near it is the tomb of a Moslem prophet much frequented by pilgrims, at which a great annual fair is also held. The population 1s said to be about 10,000.

AINMULLER, Maximimran EMMANUEL, founder of a new school of glass- painting, was born at Munich on the 14th February 1807. He was induced, by the advice of Gartner, director of the royal porcelain manu-

factory, to devote himself to the study of glass-paint- ing, both as a mechanical process and as an art, and he made such progress that in 1828 he was appointed director of the newly-founded royal painted-glass manufactory at Munich. The method which he gradually perfected there was a development of the enamel process adopted in the Renaissance, and consisted in actually painting the design upon the glass, which was subjected, as each colour was laid on, to carefully-adjusted heating. The fault of this new style is its production of transparent pictures seen by transmitted and not by reflected light; but the popular verdict in its favour has been, notwithstanding, proved by the extent to which it has been adopted. The earliest specimens of Ainmiiller's work are to be found in the

cathedral of Ratisbon. With a few exceptions, all the windows in Glasgow cathedral are from his hand. Speci- mens may also be seen in St Paul's cathedral and St Peter's College, Cambridge. On the Continent it must suffice to mention Cologne cathedral as containing some of his finest productions. Ainmiiller had considerable skill as an oil- painter, especially in interiors; and his pictures of the Chapel Royal at Windsor and of Westminster Abbey have been much admired. He died 9th December 1870. AINOS, the name of a small but remarkable tribe in Japan, found chiefly in the island of Yesso. They are dif- ferent in race and character from the ordinary Japanese, and seem to have been the earliest inhabitants of the country. Since the invasion of the islands by the Japanese, however, the Ainos have been gradually supplanted by the invaders, and are now completely subject to them, although they still preserve the appearance of internal self-government, living in societies of from ten to twenty families, under a hereditary chief. Their language is quite distinct from the Japanese, and intercourse between the two peoples is carried on by a sort of mongrel dialect. The Ainos are not tall, averaging a little over 5 feet; but they are well- proportioned and strongly-built, with a type of counte- nance European rather than Asiatic. They are distin- guished by an exuberance of hair on the head and body, a circumstance which has given rise to their name of " Hairy Kuriles." The women are ugly, and are much addicted to tattooing. The dress of the Ainos consists of a robe of skin or cotton, reaching to the knees and secured by a girdle; their huts are small and uncomfortable, with little or no furniture ; and their food is mostly the produce of fishing and hunting, together with rice got by barter from the Japanese. They are probably less than 50,000 in number. AINSWORTH, Henry, divine and scholar, was born "about 1560" at Pleasington, near Blackburn, Lancashire, having been second son of Lawrence Ainsworth of Pleas- ington Hall, Young Henry Ainsworth is believed to have received his education at Queen Elizabeth's Grammar School in Blackburn, of which his father was an original founder. According to tradition, he was a Roman Catholic, and a younger brother, John, a Protestant; and the two brothers, entering into a written controversy, mutually con- verted each other—Henry having embraced Protestantism, and John, Popery. The subsequent earlier history of Ains- worth is still obscure. No record survives; but various authorities concur in stating that he passed from Blackburn to Cambridge. He associated with the Puritan party in the Church of England, and

eventually adopted the plat- form of the Independents as represented by the Brownists. He was driven from his native country by the state proscription of the sectaries before the year 1593. He is found residentin "ablind lane at Amsterdam" about 1595-6. His exile must have reduced him to extreme poverty. He is stated to have been a " porter" to a scholarly bookscller in Amsterdam, who, on discovering his skill in the Hebrew language, made him known to his countrymen. Roger

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Williams, in one of his fiery tractates, reproaches Ainsworth as "living upon ninepence a week and some boiled roots." When the Brownists erected a church in Amsterdam, Francis Johnson was chosen for their pastor, and Henry Ainsworth for their doctor or teacher. In 1596 these two divines drew up a confession of their faith (in Latin), which was reprinted in 1598, and dedicated to the various universities of Europe (including St Andrews, Scotland). The separations and controversies which ensued at Amsterdam and at Leyden belong to church history. Of Ainsworth it may be said, that while he never put himself forward or sought notoriety, he was beyond comparison the most steadfast and most resolute and most culturcd champion of those principles of civil and religious freedom represented by the now large and influential body of Non- conformists in Britain and America called Independents or Congregationalists. The personal squabbles and temporary animosities have long passed away; and it is recognised that in Henry Ainsworth Nonconformity had a man of saintly worth, of intellectual power, and of uncompromising intrepidity. Amid the strifes and clamours of controversy he pursued steadfastly his rabbinical studies. The com- bination was so unique that Moreri and Zedler, like others, made two Henry Ainsworths—one Dr Henry Ainsworth, a learned biblical commentator; the other H. Ainsworth, an arch-heretic, and "the ringleader of the Separatists at Amsterdam." Kindred mistakes are found regarding his writings in Hornbeck's Summa Controversiarum, and more recent bibliographical authorities. In 1608 our Ainsworth defended the Separation against Richard Bernard and William Crashaw (father of the poet). But his ablest and most arduous minor work in controversy was his crushing reply to the notorious Smyth, entitled A Defence of the Holy Scriptures, Worship, and Ministry, used in the Chris- tuan Church separated

from Antichrist, against the Chal- lenges, Cavils, and Contradictions of M. Smyth (1609). His memory abides through his rabbinical learning. The ripe fruit of many years' diligence appeared in his Notes on Genesis, 1616; Exodus, 1617; Leviticus, 1618; Num- bers, 1619; Deuteronomy, 1619; Psalms, 1612, 2d edition 1617; Song of Solomon, 1623. These were collected in folio in 1627, and again in 1639, and later in various forms. From the outset the Annotations have taken a commanding place, especially among Continental scholars, as witness Clement, Dornius, Voght, Lilienthal, and Simon, the last urging Catholics to study and value them. Perhaps nothing more clearly shows even his home repute than the praiseworthy zeal with which Vice-Chancellor Dr John Worthington endeavoured to recover certain posthumous MSS. of Ainsworth. These, it is to be feared, have irrecoverably disappeared. Moreri mentions a cur- rent report that the famous Lightfoot "pillaged the best of his observations" from Ainsworth. A comparison of the Exercitations with the Annotations shows, however, that – the two scholars worked independently. Moreri's groundless remark has been transmuted into an imputation as ground- less —that Lightfoot had got into his possession the MSS. of Ainsworth. The character and learning of the great rab- binist ought to have silenced such an unworthy suspicion. There is nothing more striking in the career of Ains- worth than the reported manner of his death, which took place at Amsterdam in 1622-3. It is stated that, having found a diamond of great value, he advertised it ; and when the owner, who was a Jew, came to demand it, he offered the finder any gratuity he sought. Ainsworth, though poor, requested only of the Jew that he would procure him a conference with some of his rabbis upon the prophecies of the Old Testament relating to the Messiah, which the Jew promised ; but not having interest to obtain such a con- ference, it is thought that he contrived to get Ainsworth

poisoned (Neal, Puritans, ii. 47). Another account says that he attended the conference, and so confounded the Jews that, from spite and malice, they in this manner put a period to his life (Brook, Puritans, ii. 302). There is an air of improbability about the uarrative; but it is cer- tain he was dead in 1623, for in that year was published his Seasonable Discourse, or a Censure upon a Dialogue of the Anabaptists, in which the editor speaks of him as a departed worthy. Fora pretty complete list of his writ- ings, lesser and larger, see Chalmers, Brook, and Hanbury. Many are now extremely

rare and high-priced. (Sec Wor- thington's Diary [Chetham Socicty], by Crossley, i. 263-6; Hanbury's Memorials, s.v.; Works of Robinson, iii., Appendix, and supra.) (A. BG.)

AINSWORTH, Rozert (1660-1743), author of a well- known Latin dictionary, was born at Woodvale, near Man- chester. After teaching for some time in Bolton, he removed to London, where he conducted a boarding-school, first at Bethnal Green, and then at Hackney. Ata com- paratively early period of his life he had realised a com- petency, and was able to retire. Proposals for the pre- paration of a Latin dictionary were made to him in 1714, but the work was not published till 1736. It was long extensively used in schools, and oftcn reprinted, the later editions being reviscd and enlarged by other hands. Ains- worth's Dictionary was, however, radically imperfect, con- taining a mere register of words, with no scientific classification or complete and exact definition of their various meanings, and necessarily wanting the results of modern philological research. Later works have now entirely superseded it.

AINTAB, a large garrison town on the northern frontier of Syria, 65 miles N.N.E. of Aleppo, in 36° 58' N. lat., 37° 13' E. long. It has a considerable trade, chiefly in hides and leather, and cotton of coarse quality is grown in the district. Population, about 20,000.

AIR was the name formerly given to all gaseous sub- stances. The gas now known as oxygen, for instance, was named by Priestley dephlogisticated air, in contradistinc- tion to nitrogen or azote, which was phlogisticated air. So hydrogen gas was known to the early chemists as inflam- mable air, carbonic acid gas as fixed air, &c. The name is now ordinarily restricted to what is more accurately called atmospheric air—the air we brcathe—the invisible elastic fluid which surrounds the earth, extending to an unknown height. The properties of this fluid will be fully considered under such headings as ATMOSPHERE, BaRro- METER, CHEMISTRY, VENTILATION, &c, Reference may be made here to the mechanical use of air as a moving power, or rather as a means for transferring power, just as it is transferred by a train of wheelwork. Compressed air can be employed in this way with great advantage in mincs, tunnels, and other confined situations, where the discharge of stcam would be attended with

inconvenience. The work is really done in these cases by a steam-engine or other prime mover in compressing the air. In the con- struction of the Mont Cenis tunnel the air was first com- pressed by water-power, and then carried through pipes into the heart of the mountain to work the boring machines. This use of compressed air in such situations is also of indirect advantage in serving not only to ventilate the place in which it is worked, but also to cool it; for it must be remembered that air falls in temperature during expansion, and therefore, as its temperature in the machines was only that of the atmosphere, it must, on being discharged from them, fall far below that temperature. This fall is so great that one of the most scrious practical difficulties in working machines by compressed air has been found to be the forma- tion of ice in the pipes by the freezing of the moisture in the air, which frequently chokes them entirely up.

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AIR-ENGINE. Engines which have for their working fluid heated air instead of steam are called " air-engines." The name "caloric engine" has also been applied to them, but is not to be commended, for they have no more right to that title than steam-engines—the useful effect of both machines being due to the transformation of heat into mechanical energy, the air in the one case and the steam in the other being merely convenient media through which to effect that transformation. ; ~

The utilisation of the expansion of heated air for driving an engine has for many years been @ subject which has exercised the ingenuity of inventors. The history of air- engines has, however, been little more hitherto than a history of failures, and they are as far now from super- seding steam-engines as they were fifty years ago. This is owing mostly to the fact that the inventors have too often worked empirically, without any real knowledge of the conditions under which, and under which only, the real advantages of the fluid could be attained, and have therefore continually violated these conditions. There are also certain constructive difficulties in the way of making a successful air-engine which have never been fully over- come. It should be distinctly understood that, regarded simply as a medium for transforming heat into work, air possesses zo advantage over steam or any

other fluid. Its advantage is, that it can be used with safety at much higher temperatures than steam (and therefore a larger propor- tion of the heat given to it can be transformed into work), and that by employing the gases of combustion in the cylinder much heat can be utilised which with steam-engines is necessarily wasted.

Of the air-engines which have actually worked we have— (1.) Those in which the changes of temperature take place at a pair of constant volumes; (2.) those in which the changes of temperature take place at a pair of constant pressures; and (3.) those in which heat is received and rejected at a pair of constant pressures. The first two classes, fitted with "' economisers," are in theory " perfect" engines; that is, they are theoretically capable of trans- forming into work the largest fraction the limits of tem- perature allow of the heat received from the fuel. The third class are not perfect engines, but possess certain practical advantages which will be afterwards mentioned.

The well-known engine invented by the Rev. Dr Stirling in 1816, and subsequently improved by him, in conjunction with his brother, Mr James Stirling, C.E., of Edinburgh, belongs to the first class. In this engine the same mass of air is used again and again, and is compressed at starting to a pressure of 7 to 10 atmospheres. A cylindrical air-receiver, in which a plunger can be moved up and down, is placed over the flue of the furnace. The annular space between the plunger and the sides of this receiver is occu- pied by an immense number of thin sheets of metal, which form the "economiser." In the upper part of the receiver, which com- municates freely with one end of a working cylinder of the usual construction, is a "refrigerator," consisting of a coil of tubing through which cold water continually circulates. The plunger is alternately raised and lowered by suitable mechanism, and in its motion causes the great body of air in the machine to occupy alter- nately the bottom or heating end and the top or cooling end of the receiver. It thus undergoes alternate expansion and contraction, and thereby gives motion to the piston of the working cylinder, and thence to a crank shaft in the usual way. The advantages of this engine were, that the air in the cylinder was always cool, and that the great pressure which could be used rendered the size of the machine for a given

power very moderate. doned because of the failure of the receiver to stand the destructive action of the heat.

The most familiar cxample of the second class of air-engines is that invented by Captain Ericsson. It differed from Stirling's in many respects, and does not seem in any one particular to have been an improvement on it. Fresh air was drawn from the atmo- sphere at every stroke, and a very low pressure used, and what was the receiver in Stirling's engine became the working cylinder of Ericsson's. It was thus excessively bulky in proportion to its power, and all the working parts were exposed to the destructive action of intense heat. It is chiefly interesting on account of the

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enormous scale on which its construction was actually carried out. The engines of the steamship "Ericsson" had four working cylinders, each 14 ft. in diameter, with other parts in proportion. The trials of this vessel were conducted in a manner which did not allow any confidence to be placed in the results said to be obtained, and steam- engines replaced those of Ericsson within two years.

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To the third class of air-engines belong those of Sir George Cayley and several of the older inventors. The best known modern ex- ample is, however, the engine of Mr Philander Shaw, which is shown in our engraving, and which was exhibited at the Paris Exhibition of 1867. The most important feature of this type of engine is the use of the products of combustion themselves, instead of merely the air heated by them, to drive the piston. The con- struction of the engine is very simple : the working

piston is fitted with a trunk on its upper side, which, thus reduced in area, serves as a compressing pump, and the products of combustion act directly upon its under side, which is protected by a large drum filled with non-conducting material from the heat. The furnace stands beside the cylinder, and is entirely closed up, means being provided for feeding it with fuel without allowing any air to enter. The air compressed by the pump is delivered into the furnace, where it com- bines with the fuel to form the gases of combustion, and in this way receiving additional heat, expands, and raises the piston of the working cylinder for a portion of its stroke. The admission-valve of the latter is then closed, and the gases expand, without addition of heat, until the piston has completed its stroke, and are then dis-charged into the atmosphere. By the addition of an " economiser," the efficiency of this type of engine may be very greatly increased ; but its principal advantage is that, by actually using the products of combustion inside the engine, much heat is saved which in other engines is unavoidably sent up the chimney and lost.

One of the principal features of all air-engines is the "economiser" (sometimes erroneously called the "regeue- rator"), an invention of Mr Stirling's. The object of this apparatus is to store up the heat rejected by the fluid when it falls in temperature, and subsequently to raise the tem-perature of the fluid by re-storing the same heat, so that the only heat which the furnace has to supply is the latent heat of expansion, together with the amount of sensible heat which maybe lost through the imperfection of the economiser.

(For a popular explanation of the theory of air-engines, see an admirable paper by the late Professor Rankine in the Edinburgh Philosophical Journal for January 1855; and for a complete account of the same, involving the use of the higher mathematics, see the same author's Steam- Engine, pp. 345, et seg. See also Prof. Clerk Maxwell's Theory of Heat, and a series of papers on the subject in Engineering, 1874.) (A. B. W. K.)

AIR-GUN, a weapon like a common gun in shape, in which the force employed to propel the bullet is the elas- ticity of condensed atmospheric air. It has attached to it, or constructed in it, a strong metal chamber, into which air is forced by a condensing syringe (see PNEUMATICS). In this

way a pressure may be obtained of several hundred atmospheres. When a trigger is touched, the condensed air rushes into a space behind the bullet with such force as to propel it from the barrel to a considerable distance. If only a little air be allowed to escape each time, a single charge will propel a number of bullets in succession, with

a constantly diminishing force. Sometimes the weapon is made in the form of a walking-stick, and is then called an air-cane. The air-gun is little else than a scientific toy, and has no practical value. The apparatus is costly, the process of condensation requires considerable labour, and the propulsive force of the air is, at its maximum, less than that of an ordinary charge of gunpowder. The only advantage it can be said to have in any way is the ques- tionable one of its use being unattended by the explosive noise that accompanies the discharge of a common gun. AIR-PUMP, an apparatus by means of which a closed vessel can have the air it contains removed from it. It con- sists essentially of two parts—a receiver, from which the air is to be exhausted ; and a pump, to perform the work of exhaustion. The receiver is in general made of glass, in order that the condition of objects placed within it for the purpose of experiment may be readily seen by the opera- tor. It is open at the bottom, and has its lower edge accurately ground ; when in its place in the air-pump it stands upon a smooth brass plate. The pump itself is a brass cylinder, having a piston in it, which can be moved backwards and forwards by means of a rod, in the usual way. At the end of the cylinder nearest the receiver is placed a small valve, in the piston itself is another (or some mechanism which serves the purpose of a valve), and there is frequently a third in the outer end of the cylinder. All these valves open outwards from the receiver. The action of the pump, when arranged in this way, is exactly similar to the action of an ordinary well-pump, with air as the fluid instead of water. The air-pump was invented about 1654 by Otto von Guericke, a magistrate of Magdeburg, and a man who devoted great attention to various pro- blems in pneumatics! The first description of his pump was published in 1657 in the Mechanica Hydraulico-

pneumatica of Gaspar Schottus, professor of mathematics

at Wurtemberg. He used a spherical glass receiver, with a pumping syringe attached, and kept the whole of the working parts under water to prevent leakage. His pump

was very imperfectly constructed, but he did eventually Succeed in getting a very good vacuum with it. The method of producing the Torricellian vacuum, by filling a vessel with liquid and then removing the liquid without permitting ingress of air, was previously known; but a vacuum produced in this way was obviously useless for experiments with any objects but those which could pre- viously be immersed in the liquid used. Guericke was, however, the first to recognise that, by virtue of its perfect

+ He was also the inventor of the ‘ Magdeburg hemispheres.”

elasticity, or tendency to expand indefinitely, air could be pumped out of a closed space as well as water; and this is the principle of his and all succeeding air-pumps. Al- though the invention of the air-pump is due to a German, almost all the improvements made in it from time to time have come from Englishmen. Dr Boyle contributed so much to its perfection that for a Jong time the state of the air in an exhausted receiver was called vacuum Boyleanum, and the air-pump itself machina Boyleana. Dr Hook, Ifawkesbee, John Smeaton, and others brought the air- pump externally to very much the same form as that in which it is commonly seen at present, and which is shown in the annexed woodcut. The pump here has two cylin- ders, which are worked by a winch handle, the pump rods having toothed racks on the upper part of their length. Professor Tate is the inventor of a double-action air-pump, now much used where a very perfect vacuum is required. It has two pistons in one barrel, the air being drawn from the receiver at the centre of the barrel, and discharged into the atmosphere at its extremities. Very complete air- pumps have two or three barrels, arranged as shown in the woodcut, for rapid exhaustion, until the pressure in the receiver is equal to (say) half-an-inch of mercury; and in addition to these a horizontal Tate’s barrel, which can then be put into action to bring the vacuum down to =), inch of mercury (1-600th of the pressure of the atmosphere), or even less at low temperatures. See PNEUMATICS.

Atr-Pump, in steam-engines, is the pump which draws the condensed steam, along with the air which is always mixed with it, and also the condensing water (except where a surface condenser is used), away from the con- denser, and discharges it into the hot well. See Srzam- ENGINE. (A. B. W. K.)

ATR, or ASBEN, a country of central Africa, lying be- tween 15° and 19° N. lat. and 6° and 10° E. long. The northern and best known portion of this region is of a very diversified character. It has numerous mountain ranges, some of which rise to a height of 5000 feet, with richly- wooded hollows and extensive plains interspersed. The mimosa, the dum-palm, and the date are abundant; and the valleys are covered with the exuberant vegetation of the tropics. Some of the plains afford good pasturage for camels, asses, goats, and cattle; others are desert table- lands. In the less frequented districts wild animals abound, notably the lion and the gazelle. The country generally is of sandstone or granite formation, with occasional trachyte and basaltic ranges. There are no permanent rivers; but during the rainy season, from August to October, very heavy floods convert the water-courses in the hollows of the mountains into broad and rapid streams. Numerous wells supply the wants of the people and their cattle. To the south of this variegated region lies a desert plateau, 2000 feet above the level of the sea, destitute of water, and tenanted only by the wild ox, the ostrich, and the giraffe. Still further south is the district of Damerghu, nominally tributary to Air, undulating and fertile, and yielding rich crops. Notwithstanding the fertility of the valleys in the northern portion of the country, there is little of the soil under cultivation except in the neighbourhood of the vil- lages, where slaves are employed in tillage. Millet, dates, indigo, and senna are the principal productions. The great bulk of the food supplies is brought from Damerghu, and the whole materials for clothing are also imported. Were it not for the traffic in salt between Bilma and the Hansa states of Soudan, the country could scarcely maintain its present limited number of inhabitants. A great caravan annually passes through Air, consisting of several thousand camels, carrying salt from Bilma to Sokoto. Air was called Asben by the native tribes until they were conquered by the Berbers. The present inhabitants are for the most

part of a mixed race, combining the finer personal traits of the Berbers with the characteristics of the negro. The king or sultan of Air occupies a very precarious position, being to a great extent dependent on the chiefs of the Tawarek tribes inhabiting a vast tract of the Sahara to the north-west, who are continually at war among them- selves. A large part of the revenue of the king is derived from tribute exacted from the salt caravan. His authority does not seem to be great in the outlying parts of his dominions. The chief town of Air is AGADEs (g.v.) (See Dr Barth's Travels in Central Africa, vol. i.) AIRAY, Henry, D.D. This celebrated Puritan presi- dent of Queen's College, Oxford, was born at Kentmere, near Windermere, but no record remains of the date of either birth or baptism. Anthony & Wood names West- moreland as his birthplace. In the well-known Life of Bernard Gilpin it is told that when he was making pre- parations for martyrdom, he " received the account with great composure ; and immediately after called up William Airay, a favourite domestic, who had long served him as his almoner and steward." From the great kindness shown to our Airay by Gilpin, and from the vicinity of Kentmere to the Rectory, it does not appear to be hazarding too much to assume that this William Airay was his father, and that the family tradition is right in assigning Kentmere, not Barton or Wilford, as his birth- place. The truly apostolic man's bounty showed itself in sending Henry and a (probable) brother Ewan or Evan to his own endowed school, where they were fully educated "in grammatical learning,' and were in attendance at Oxford when Gilpin lay a-dying. From the Athenee we glean the details of Airay's college attendance. He was "sent," says Wood, "to St Edmund's Hall in 1579, aged nineteen or thereabouts." "Soon after," he continues, "our author, Airay, was translated to Queen's College, where he became pauper puer serviens; that is, a poor serving child that waits on the fellows in the common hall at meals, and in their chambers, and do other servile work about the college." His transference to Queen's College is explained by its having been Gilpin's own college, and by his Westmoreland origin giving him a claim on Eaglesfield's foundation. He proceeded B.A. on June 19, 1583. On June 15, 1586, he passed M.A. ; B.D. in 1594; and D.D. on June 17, 1600—all in Queen's College. " About the time he was master" (1586), "he entered holy orders, and became a frequent and zealous preacher in the university." His Commentary on the

Epistle to the Philippians (1618), reprinted 1864, is a specimen of his preaching before his college, and of his fiery denunciation of Popery, and his fearless enunciation of that Calvinism which Oxford, in common with all England, prized then. In 1598 he was chosen provost of his college, and in 1606 was vice-chancellor of the uni- versity. In the discharge of his vice-chancellor's duties, he came into conflict with Laud, who even thus early was betraying his Romish tendencies. He was also rector of Otmore (or Otmoor), near Oxford, a living which involved him in a trying litigation, whereof present incumbents reap the benefit. He died on 6th October 1616. His character as a man, preacher, divine, and as an important ruler in the university, will be found portrayed in the Epistle by Potter, prefixed to the Commentary. He must have been a fine specimen of the more cultured Puritans— possessed of a robust common-sense in admirable contrast with some of his contemporaries. (Lectures on the whole Epistle of Paul to the Philippians, 1618, 1864 3; Wood's Athene, by Bliss, ii. 177, 178, &. ; Laud's Works; Wills (Surtees Society.) (A. B. G.) AIRDRIE, a parliamentary and municipal burgh and market-town of Scotland, in the parish of New Monkland,

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Lanarkshire, 11 miles E. of Glasgow and 32 W. of Edin- burgh. The high road between these cities passes through Airdrie, forming its principal street, from which others diverge at right angles. It is well built, paved, and lighted with gas, but it contains little that is beautiful or attrac- tive. It possesses a fine town-hall and a handsome edifice erected as the county buildings, as well as two places of worship belonging to the Church of Scotland, three to the Free Church, two to the United Presbyterians, and one each to the Reformed Presbyterians, the Congregationalists, the Baptists, the Wesleyan Methodists, and the Roman Catholics; five branch banks, with excellent places of business constructed or in course of construction; a me- chanies' institute, and several schools. The extensive coal and iron mines in the vicinity give employment to a large part of the population of Airdrie, and have been the means of raising it, since the commencement of the century, from the insignificance of a village to its present prosperity. In the town itself there are manufactories of cotton goods and iron wares, besides foundries, engineering shops, saw-mills, and

other branches of industry. A branch of the North British Railway from Glasgow, passing through Airdrie to Edinburgh, connects it by a direct line with both cities. It is also connected with Glasgow by the Monkland Canal, which comes within a mile of the town. By the Reform Act of 1832 Airdrie was created a parliamentary burgh, uniting with Falkirk, Hamilton, Lanark, and Linlithgow in send- ing one member to parliament. Its municipal corporation, which dates from 1821, consists of twelve councillors, in- cluding a provost and three bailies. There are weekly courts held by the magistrates, and courts are held twice a week by the sheriff-substitute and the justices of the peace respectively. The market-day is Tuesday, but the market is of little importance. By the census of .1871 the population of Airdrie was 13,488, the number of inhabited houses 1167, and the parliamentary constituency 1702, increased in 1873 to 1932. The annual value of real pro- perty in the burgh, not including railways, is £26,145; and the corporation revenue for 1873, £3401.

AIRE, an English river which rises in the West Riding of Yorkshire and pursues a south-easterly course through the populous " clothing district" of which Leeds is the capital. At Castleford, below Leeds, it receives a small tributary, the Calder, and it joins the Ouse shortly before that river's expansion into the estuary of the Humber above Hull. It is navigable to Leeds for small craft.

AIRE, a fortified town of France, on the river Lys, in the department of Pas-de-Calais, 10 miles S.E. of St Omer. Although its situation is low and marshy, the town is neat and well built. It possesses extensive barracks; and the Church of St Paul is a handsome Gothic structure. Its manufactures consist of hats, cotton and woollen goods, hardware, yarn, soap, and oil. Population, 8803.

AIRE, a town in the south of France, in the department of Landes, on the left bank of the Adour, 14 miles 8.8.E. of St Sever. At one time it was the capital of the Visi- goths, and since the fifth century it has been the seat of a bishopric. It has a college and cathedral ; and there are manufactories of leather and hats. Population, 5144.

AISLE, sometimes written Isuz, YLE, and ALLEY (Lat. and Ital. Ala, a wing ; Fr. Azle, Bas cété; Ger. Seitenschaf,, Sectenchor), in its primary sense, the

wing of a house, but generally used to describe the alleys or passages at the sides of the naves and choirs of churches. In reckon- ing their number, the nave is usually counted. ‘hus a nave with an aisle on each side is generally called a three- aisled church ; if with two aisles on each side, a five- aisled church. In England there are many churches with one side-aisle only ; but there is only one cathedral with five aisles, that at Chichester. There are, however, very

‘many such on the Continent, the most celebrated of which are at Milan and Amiens. Others have three aisles on each side, or seven aisles in all, as the cathedrals at Antwerp and Paris. The most extraordinary, however, is that at Cordova, originally erected fora mosque. It was first built with a nave and five aisles on each side, and eight others afterwards were added, making nineteen aisles in all. Old English writers frequently call the transepts “the cross isle, or yle,” and the nave the “ middle ile.”

AISNE, a frontier department in the north-east of France, bounded on the N. by the department of Nord and the kingdom of Belgium, on the E. by the department of Ardennes, on the 8.E. by that of Marne, on the S. by that of Seine-et-Marne, and on the W. by those of Oise and Somme; extending at the widest points 75 miles from N. to §., and 53 from E. to W., with an area of 2838 square miles. The surface of the department con- sists of fine undulating plains, diversified in the north by hilly ground which forms a part of the mountain system of the Ardennes. The chief rivers are the Somme, the Escaut, and the Sambre in the north ; the Oise, traversing the north-west, with its tributaries the Serre and the Aisne, the latter of which joins it beyond the limits of the depart- ment; and the Marne and the Ourcq in the south. The soil of Aisne is, as a whole, fertile, and in some parts very rich, yielding wheat, barley, rye, oats, hops, flax, fruit, beetroot, and potatoes ; there is good pasturage, and much attention is paid to the rearing of cattle, sheep, and horses. Wine is produced, but, except in the valley of the Marne, its quality is inferior. Large tracts of the department are under wood, the chief forests being those of Nouvion and St Michel in the north, Coucy and St Gobain in the centre, and Villers-Cotterets in the south. There are uo minerals of importance in the department, but good building-stonc

and slates of a fair quality are found. Aisne is an im- portant manufacturing department ; its chief industrial pro- ducts being shawls and muslin—as well as other cotton, linen, and woollen goods—glass, including the famous mirrors of St Gobain, iron wares, beetroot sugar, leather, and pottery. It has a good trade, which is much facilitated by railroads (the most important being those between Paris and Strasbourg, and Paris and Mons), canals, and the navigable portions of the rivers. Aisne, which is com- posed of parts of the ancient provinces of Picardy and the Isle of France, is divided into five arrondissements—St Quentin and Vervins in the north, Laon in the centre, and Soissons and Chateau Thierry in the south. It contains in all 37 cantons and 837 communes. Laon is the capital, and Soissons the seat of the bishop. The other towns of importance are Chauny, St Quentin, Vervins, Hirson, Suise, Villers-Cotterets, and Chateau Thierry. Population in 1872, 592,439, of whom 183,104 could neither read nor write, and 28,651 could read, but could not write.

AITON, Wittiam (1731-1793), an eminent botanist and gardener, was born near Hamilton in Scotland. Having been regularly trained to the profession of a gardener, he travelled to England in the year 1754, where he became assistant to Philip Miller, then superintendent of the physic garden at Chelsea. In 1759 he was appointed director of the newly-established botanical garden at Kew, in which office he continued till his death. The garden at Kew, under the auspices of King George III., was destined to be the grand repository of all the vegetable riches which could be accumulated by regal munificence, from researches through every quarter of the globe. Aiton's care and skill in cultivation, and intelligence in arrangement, gained for him high reputation among the lovers of the science, and the particular esteem of his royal patrons. Under his superintendence many improvenicnts took place in the plan and edifices of Kew gardens, which

rendered them the principal scene of botanical culture in the kingdom. In 1783 his merit was rewarded with the lucrative office of manager of the pleasure and kitchen gardens of Kew, which he was allowed to hold along with the botanical direction. In 1789 he published his //ortus Kewensvs, a catalogue of the plants cultivated in the Royal Botanical Garden at Kew, in 3 vols. 8vo, with 13 plates— a work which had been the labour of many years. The Hortus, in which the Linnzean system of arrangement, with some

modification, was adopted, was very favourably re- ceived by students of science, and a second edition was issued (1810-3) by W. T. Aiton, his eldest son and suc- cessor, He was for many years honoured with the friend- ship of Sir Joseph Banks, the president of the Royal Society, and was aided by the Swedish naturalists, Solander and Dryander, in the preparation of his Hortus Kewensis.

AITZEMA, Leon van, Dutch historian and statesman, was born at Doccum, in Friesland, on the 19th November 1600, and died at the Hague on the 23d February 1669. Tn his youth he published a volume of Latin poems under the title of Poemata Juvenilia. He subsequently devoted himself almost entirely to political life, and held for a lengthened period the position of resident at the Hague for the towns of the Hanseatic League. His most im- portant work was the //istorie oft Verhaal van Sadken van Staet in Oorlogh (14 vols 4to, 1657-71), embracing the period from 1621 to 1668, It contains a large number of state documents, and is an invaluable authority on one of the most eventful periods of Dutch history.

AIX, an ancient city of France, the chief town of the arrondissement of the same name, in the department of the Bouches-du-Rhone. It was the Aqua Sextiw of the Romans, and between this and Arelate (Arles) is the field on which Marius gained his great victory over the Teutons. Under the counts of Provence, Aix became celebrated as a seat of learning; and it still retains many relics of its former splendour, and is distinguished by the number and excellence of its literary institutions. It has a library of 100,000 volumes, an academy of law, scicnce, and thco- logy, a museum, and a chamber of commerce. 'The cathedral—the baptistry of which is said to have been constructed from the remains of a Roman temple—the "Palais," the town- hall, and the clock-tower, are fine speci- mens of ancient architecture, There are numerous public fountains, on one of which is sculptured a figure of King Réné by David. The hot springs, from which the city derives its name, are not now in much repute. Aix is the seat of a court of justice and an archbishopric. The chief manufactures are cotton, silk, thread, and hardware 3 and olives and almonds are cultivated on the surrounding hills. There is considerable commerce in corn, wine, and oil. The naturalists Adanson and Tournefort, and the painter Vanloo, were born at Aix. Population (1872), 29,020.

AIX, or Arx-LE-Barns, a town of France, in the depart- ment of Savoie, near Lake Bourget, 8 miles north of Chambéry. It was a celebrated bathing-place in the time of the Romans, and possesses numerous ancicnt remains. The hot springs, which are of sulphureous quality, and have a temperature of from 109° to 113° Fahr., are still much

frequented, attracting annually above 2000 visitors, They ,

are used for drinking as well as for bathing purposes. Population, 4430.

AIX-LA-CHAPELLE, the German Aacusn, the capital of a district of the same name in Rhenish Prussia, situated near the Wurm, a tributary of the Meusc, in a pleasant and fertile valley about 40 miles west of Cologne, with which it is connected by railway. It is well built, and is enclosed by ramparts that have been converted into pro- menades, and its appearance is rather that of a prosperous modern town than of an ancient city full of historical

associations. Its town-house, built in 1353 on the ruins of Charlemagne's palace, contains the magnificent corona- tion hall of the German emperors, 162 feet long by 60 fect wide. Near the town-house are two ancient towers, one of which, called the Granusthurm, is sometimes said to be of Roman origin; and a fountain, with a statue of Charle- magne, which was erected in 1620. The cathedral of Aix-la-Chapelle consists of two parts, distinct both as to the time of their erection and their style of architecture. The older portion may be said to date cither from 796 a.p., when it was erected by Charlemagne as the palace chapel, or from 983, when it was rebuilt on the old model by Otho IIL., after having been almost entirely destroyed by the Normans. It consists of an octagon, planned after that of St Vitale at Ravenna, surrounded by a sixteen- sided gallery, and terminating in a cupola. It contains the tomb of Charlemagne, which was opened in the year 1000, when the body of the emperor was found seated on a marble throne which was afterwards used in the imperial coronation ceremonics. The Gothic choir, which forms the more modern portion of the cathedral, was

added during the latter half of the 14th and the beginning of the 15th centuries. The cathedral possesses many relics, the most sacred of which are exhibited only once every seven years, when they attract large crowds of worshippers. Be- sides thesc buildings, almost the only other of any antiquity is the corn exchange, probably of the 12th century. Of modern edifices, Aix-la-Chapclle possesses a theatre, a public library, a gymnasium, and several churches and hospitals. The chief manufactures of Aix-la-Chapclle are woollen cloths, stockings, shawls, silks, leather, glass, necdles, pins, machines, gencral ironmongery, carriages, beer, brandy, tobacco, and chemicals. There is a good trade in these

articles, not only with Germany and other continental"

countries, but also, in the case of cloth especially, with the United States of America. The hot sulphur springs of Aix-la-Chapclle are another important source of revenue to the inhabitants. These springs were known to the Romans, and have long been celebrated for the cure of rhcumatism and gout. There are six in all, of which the Kaiscrguelleis the chief, with a temperature reaching as high as 136° Fahr. There are also two cold chalybcate springs. Aix-la-Chapelle is the Aguisgranum, or Civitas Aquensis, of the Romans. Charlemagne, who perhaps was born and certainly died in the town, made it the second city of his empire and the capital of his dominions north of the Alps. _ He conferred numerous privileges upon its citizens, exempt- ing them from military scrvice and from all taxes, even when they were living in other parts of the empire. From 813 to 1531 the cmpcrors of Germany were crowned at Aix-la- Chapcllc, which during that period became one of the most important free imperial cities, although it was ravaged by the Normans in 851, and again in 882. By the removal of the coronations to Frankfort, Aix-la-Chapelle lost its lead- ing position in Germany, and its internal prosperity was much injured by a disastrous fire in 1656. During the revolution it for a time belonged to France, but in 1815 it was ceded to Prussia, and has now become one of the chicf seats of commerce in that kingdom. Population of Aix-la- Chapelle (1871), 74,238.

AIX-LA-CHAPELLE, Congresses and Treaties of. The first congress of Aix-la-Chapelle concerned the succession of Maria Theresa to the empire. It

was held in 1748, and resulted in the treaty of Aix-la-Chapelle, signcd in the same year, by which Maria Theresa was left in possession of most of her hereditary dominions, the chief exception being Silesia, which was ceded to Prussia. The second congress, held in 1818, resulted in the convention of Aix- la-Chapelle. The object of this congress was the regulation of the affairs of Europe, especially of France, after the war.

A treaty of peace between France and Spain was also signed in this city in 1668, whereby Louis XIV. gave up his claim to the Spanish Netherlands, but was left in possession of much that he had already conquered.

AJACCIO, the chief town of Corsica, one of the depart- ments of France. It is a seaport, situated on the west coast of the island, in 41° 54' N. lat., and 8° 44' E. long. The harbour is commodious, and sheltered on all sides save the south-west. The town is well built, and its principal buildings are the cathedral, the town-house, and the citadel. It is the seat of a bishop and a court of justice, and has a commercial college, a school of hydrography, a large library, and a botanic garden. Wine, fruits, and olive oil are the chief articles of trade ; and anchovy and coral fisheries are extensively prosecuted along the coast. Ajaccio is cele- brated as the birthplace of Napoleon Bonaparte. The house where he was born (15th August 1769) is still standing in good preservation. A marble statue was erected to his honour in 1850, and the people still retain strong Bonapartist sympathies. Population (1872), 16,545.

AJAN (the ancient Azania), a tract which forms the eastern horn of Africa, with a coast-line of about 10° of latitude, from Cape Gardafui nearly to the equator. It extends inland to the territory of the Gallas, but its limits cannot be strictly defined, as this part of Africa has been little explored. The coast towards the south is low and sandy, but northward, near Cape D'Orfui, it becomes high and mountainous, with some fertile valleys inter- sperscd. Cape Gardafui, the most eastern point of Africa, is a bold promontory backed by lofty hills. There are no considerable rivers in Ajan, and the land for the most part is barren. The inhabitants, a tribe of the Somali, carry on a trade with the Arabs in ivory and gum, and the country possesses an excellent breed of horses.

AJAX (Aias), the son of Telamon. In Greek legend Ajax represents throughout only physical qualities, like Hercules, with whom, indeed, a likeness must have been recognised, or there would have been no sufficient basis for the belief that the child Ajax was born at the prayer of Hercules in behalf of his friend Telamon (the-name Atas —or Aas with digamma—being an allusion to the eagle, ateros, which appeared to announce the success of the prayer); and again, that Hercules was present at the birth of the infant, and by wrapping it in his lion's skin made it invulnerable, except in the armpit.. In respect of being open to a wound in only one small spot Ajax resembles Achilles, with whom in the usual genealogy he claims to be related as cousin. But of this relationship there is no evidence in the Jliad, where Ajax appears of colossal frame (zeddpros), in himself a tower of strength (wvpyos 'Ayauay), and, as the simile implies, prepared for defence, not to lead assaults, unmoved by the shafts of enemies as is an-ass in a corn-field by the pelting of boys (Iliad, xi. 556-566), while Achilles is no less clearly drawu as sensitive to finer passions and tastes, if equally bold in war. Unwarranted as it was by the liad, the identification of Ajax with the family of AZacus was chiefly a matter which concerned the Athenians, and that not until Salamis had come into their possession, on which occasion Solon inserted a line in the Iliad (ii. 557) for the purpose of supporting the Athenian claim to theisland. Ajax then became an Attic hero, his name being given to one of the tribes. In this way his deedscametobea favourite subject of the Atticdrama, though they are not always represented in a creditable manner—as, for example, when, contrary to his steady character In the Iliad of being respectful to the gods, he is charged with insult to Athena, to account for her having influenced the decision against him in his competition with Ulysses for the armour of Achilles. It was Athena, also, who made him insane then, and led him to take his own life. From his blood

sprang a flower, as at the death of Hyacinthus, which bore the initial letter of his name. In later times the people of Novum Ilium believed him to have been wronged by the decision, and told how, when Ulysses had been shipwrecked, the armour of Achilles was wafted by the tide upon the shore near the tomb of Ajax. (A. S. M.)

AJAX OILEUS, or the Lesser Asax, was a son of the King of Locri, whose subjects he led before Troy, contribut- ing a contingent of forty ships. In boldness he was in the first rank among the Greeks there, equal to make a stand against Hector, and swift of foot next toAchilles. But, com- pared with the other leaders, he is impatient and overbear- ing. Like the Telamonian Ajax, he appears as an enemy of Ulysses, and as the victim of Athena's vengeance. It was due to her influence that he, known for his speed, lost the race with Ulysses at the games in honour of Patroclus (Iliad, xxiii. 754-784); and again it was through her that on his return homeward his ship was wrecked upon the mythical Gyrzean rock (Odyssey, iv. 499). As it stands in later story, he had drawn down Athena's anger by his assault upon Cassandra at the image of the goddess. Ulysses charged him with this offence, and demanded that he should be stoned. But, according to another version of the legend, he had only carried her off to his tent without any harm, when Agamemnon took her from him, and spread a report that Athena would destroy the whole army unless Ajax were slain; upon which, thinking of the unjust verdict given against his namesake, he went to sea in a frail vessel and perished. The news was received in the camp with grief, a funeral pile was erected on the ship which had conveyed him to Troy, sacrifice was offered, and when the evening wind came on, the burning ship was cut adrift. (A. Ss. M.)

AJEHO, or A-SHE-HOH, also called ALCHUKU, a consider- able and rapidly increasing city of Manchnria, 30 miles south of the river Soongari, and about 120 north of Kirin. It is advantageously situated on the slopes of a gentle descent leading to the river. The country around is very fertile, producing in abundance various kinds of grain, besides pulse and opium. The population of the district consists entirely of Chinese immigrants, who are engaged in the reclamation and cultivation of the soil, which is given to them at a nominal price. A large trade is done in the town; and although the shops are of mean appearance, quantities of porcelain and other ornamental articles ex- posed for sale indicate its growing wealth. The population is about 40,000, and includes a considerable number of Mahometans.

AJMIR, a district and town of British India, in RAjpu- tani. The pistrict lies between 25° 43' and 26° 42' N. lat., and 74° 22' and 75° 33' E. long.,

measuring 80 miles in length from north to south, by 50 miles in breadth, and comprising an area of 2057 square miles. It is bounded on the E. by the states of Krishnagar and Jaipur, on the S. by Mewar, on the W. by the British district of Mairward, and on the N.W. by the state of Jodhpur. The population in 1865 was returned at 426,268; of whom 363,539, or 85 per cent., were Hindus, and the remainder chiefly Mahometans. The eastern portion of the district is generally flat, broken only by gentle undulations, but the north and north-western parts are intersected by the great ARAVALLI range (g.v.) Many of the valleys in this region are mere sandy deserts, with an occasional oasis of cultivation, but there are also some very fertile tracts ; among these is the plain on which lies the town of Ajmir. This valley, however, is not only fortunate in possessing a noble artificial lake, but is protected by the massive walls of the N4g-p4thar range or Serpent rock, which forms a barrier against the sand. The only hills in the district are the Aravalli range and its offshoots. Ajmir is almost totally devoid of rivers, the Bands being the only stream

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which can be dignified with that name, and it only touches the south-eastern boundary of the district so as to irrigate the Pargané of Samur. Four small streams—the Sdgar- mati, Saraswati, Khari, and Daf—also intersect the dis- trict. In the dry weather they are little more than brooks. The Sdgar-mati and Saraswati unite at Gobindgarh, the united waters flowing on under the name of the Lunt (or salt water) river. There are two first-class roads in Ajmir, viz., one from Ajmir city to Gangwana, and thence through the Krishnagarh and Jaipur states to Agra; and another from the city to the cantonment station of Nasirdbdd, a distance of 14 miles. There is also a second-class road from Ajmir to Naya Nagar, a distance of 36 miles, besides sixteen third-class tracks connecting the principal towns and villages with the city. The principal products of the district are wheat, barley, rice, sugar-cane, peas, bajrd, maize, til (oil-seed), tobacco, and cotton. With the excep- tion of woollen blankets, turbans, é&c., manufactures can be scarcely said to exist in Ajmir. Salt is made in a rude method at Ramsur, from the saline exudations of the soil, to the extent of 3000 cwt. per annum. After supplying local wants, the surplus is exported towards Malwa and Sagar. The principal trade is in wool, cotton, opium,

printed cloths, and tobacco. A large quantity of cotton is exported to Nayd Nagar, in Mairward district, whence it finds its way into the Bombay market. Oil is also a pro- fitable article of trade. The domestic animals are sheep, horses, bullocks, camels, and goats. Cattle, and especially bullocks, are much valued, but are very scarce, owing partly to the want of sufficient pasturage and partly to frequent droughts. When these occur, the cattle are sent away to the neighbouring states, where better pasture can be pro- cured, and very few find their way back. – The imperial revenue obtained from the district in 1867 amounted to £61,791, 8s., exclusive of local funds raised by a road, tank, and postal cess.

The tenures of the agricultural village communities in Ajmir are of a very simple and uniform kind. They all belong to the type known as "imperfect patidari," by which the better descriptions of land are held in severalty by each member of the proprictary body. Each member is responsible for the amount of revenue allotted on his holding; but in event of the default of any shareholder, the whole community is collectively liable for the total sum. The inferior and waste lands remain the property of the whole village, and the income derived from them is credited to the common account. The cultivators are nearly all proprietors of the land they till. A large portion of Ajmir district is parcelled out into estates, varying in size from a single village to a large pargand (or fiscal division). These estates are held by Rajput chiefs, some of whom descend from the original ruling families, while others owe their position to force or to the favour of the reigning power. They have all been confirmed in their estates by the British on payment of a fixed annual quit rent. Three towns are returned as containing a popu- lation of upwards of 5000 inhabitants in 1867—-viz., Ajmir city (the capital and the only municipality in the district), population 34,763 ; Kekri, 6357; and Pisangun, 5055. There is also a pee at cantonment at Nasirabad, the garrison of which in 1867 consiste of a battery of European artillery, a European infantry regiment, a squadron of native cavalry, and a regiment of native infantry. In 1867 there were eighteen government schools in the district, attended by 647 pupils, and a government college at Ajmir city attended by 3820 students. Besides these there were three mission schools for boys and one for girls in Ajmir city, and eight others in its neigh~ bourhood. The average attendance at the mission schools amounted to 347.

Asmfr Crry, the capital of Ajmir district, is situated in a picturesque and fertile valley surrounded by mountains, in 26° 29’ N. lat. and 74° 43’ E. long. The town is partly built on the lower slope of the Téragarh hill, and is surrounded by a stone wall with five handsome gates, To the north of the city is a large artificial lake called the Anasdgar, whence the water supply of the place is derived. The town is clean, and possesses several handsome streets, the dwellings of the better classes being large and well built. The population in 1867 numbered 34,763, about

two-thirds being Hindus, and the remainder Mahometans. The city trade chiefly consists of salt and opium. The former is imported in large quantities from the Sambar lake and Ramsur. Oilmaking is also a profitable branch of trade. Cotton cloths are manufactured to some extent, for the dyeing of which the city has attained a high repu- tation. A municipal income of about £2000 a-year 18 derived from octroi dutics levied on articles consumed in the town. Out of this the police and conservancy arrange- ments are paid, the balance being spent on roads and in the support of charitable institutions. The Ajmir college, affiliated to the Calcutta university, had 320 pupils in 1867. The college buildings being inadequate to this uumber of pupils, the foundation-stone of a new structure was laid on the 17th February 1868. The agent to the governor-general for Rajputand resides at Ajmir, which is also the headquarters of the commissioner of the Ajmir and Mairw4ré division. It is likewise a station of a Scotch Presbyterian mission.

The chief object of interest is the dargd, or tomb of a famous Mahometan saint named Mayud-ud-din. It is situated at the foot of the Téragarh mountain, and consists of a block of white marble buildings, without much pretension to architectural beauty. To this place the emperor Akbar, with his empress, performed a pilgrimage on foot from Agra, in accordance with the terms of a vow he had made when praying forason. The large pillars ereeted at intervals of two miles the whole way, to mark the daily halting-place of the imperial pilgrim, are still extant. An ancient Jain temple, now converted into a Mahometan mosque, is situated on the lower slope of the

Tardgarh hill. With the exeeption of that part used as 2 mosque, nearly the whole of the ancient temple has fallen into ruins, but the relies are not excelled in beauty of architeeture and sculpture by any remains of Hindu art. Forty columns sup- port the roof, but no two are alike, and great fertility of invention is manifested in the execution of the ornaments. The summit of Taragarh mountain, overhanging Ajinir, is crowned by a fort, the lofty thick battlements of which run along its brow and enclose the table-land. The walls are 2 miles in circumferenee, and the fort can only be approached by steep and very roughly-paved planes, com- manded by the fort and the outworks, and by the hill to the west. On coming into the hands of the English, the fort was dismantled by order of Lord William Bentinck, and is now eonverted into a sanitarium for the troops at Nasirabéd. Ajmir was founded about the year 145 a.p. by Aji, a Chohan, who established the dynasty which continued to rule the country (with many vicissi- tudes of fortune) while the repeated waves of Mahometan invasion swept over India, until it eventually became an appanage of the erown of Dehli in 1193. Its internal government, however, was handed over to its ancient rulers upon the payment of a heavy tribute to the conquerors. lt then remained feudatory to Dehli till 1365, when it was captured by the ruler of Mewar. In 1509 the place became a source of contention between the chiefs of Mewar and Marwar, aud was ultimately eonquered in 1532 by the latter prince, who in his turn in 1559 had to give way before the emperor Akbar. It continued in the hands of the Mughuls, with occasional revolts, till 1770, when it was ceded to the Marhattas, from which time up to 1818 the unhappy district was the scene of a continual struggle, being seized at different times by the Mewar and Marwar rajas, fram whom it was as often retaken by the Marhattas. In 1818 the latter eeded it to the British in return for a payment of 50,000 rupees. Since then the country has enjoyed unbroken peaee and a stable government.

AJURUOGCA, a town of Brazil, in the province of Minas Gcraes, 117 miles N. of Rio de Janeiro. It is situated on the Ajuruoca river, which is here crossed by a bridge. Gold was once found in the vicinity, but the soil has been long exhausted of the precious metals; and the people are chiefly engaged in agriculture, and in rearing animals for the markets of Rio. The land is fertile, and produces millet, mandioca, coffee, sugar-cane, and tobacco. The population of the town and district is 12,000.

AKABAH, Tue Gutr or, the Sinus Elanites of anti- quity, is the eastmost of the two divisions into which the Red Sea bifurcates near its northern extremity. It pene- trates into Arabia Petreea in a N.N.E. direction, from 28° to 29° 32' N. lat., a distance of 100 miles, and its breadth varies from 12 to 17 miles. The entrance is contracted by Tiran and other islands, so that the passage is

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rendered somewhat difficult; and its navigation is danger- ous on account of the numerous coral reefs, and the sudden squalls which sweep down from the adjacent mountains, many of which rise perpendicularly to a height of 2000 feet. The only well-sheltered harbour is that called the Golden Port, situated on its western shore about 33 miles from the entrance, and 29 miles E. of Mount Sinai. About 24 miles from the head of the gulf is the village of AKABAH, with a fortified castle, garrisoned by a few soldiers for the protection of the Moslem pilgrims on their way to Mecca. In the vicinity of the village there are extensive date groves; and there is abundance of good water, fruit, and vegetables. Akabah, though now of small importance, is not devoid of historical interest. It is supposed to occupy the site of the Elath of Scripture, which in remote ages carried on an extensive commerce; and some ruins in the sea a short distance southward are surmised to be the remains of Lziongeber.

AKBAR, AKHBAR, or AKBER, JELLALADIN MoHam- MED, one of the greatest and wisest of the Moghul emperors, was born at Amerkote in Sindh on the 14th October 1542, his father, Humayun, having been driven from the throne a short time before by the usurper Sher Khan. After more than twelve years' exile, Humayun regained his sovereignty, which, however, he had held only for a few months when he died. Akbar succeeded his father in 1556 under the regency of Bahram Khan, a Turkoman noble, whose energy in repelling pretenders to the throne, and severity in main- taining the discipline of the army, tended greatly to the consolidation of the newly-recovered empire. Bahram, however, was naturally despotic and cruel; and when order was somewhat restored, Akbar found it necessary to take the reins of government into his own hands, which he did by a proclamation

issued in March 1560. The discarded regent lived for some time in rebellion, endeavouring to establish an independent principality in Malwah, but at last he was forced to cast himself on Akbar's mercy. The emperor not only freely pardoned him, but magnanimously offered him the choice of a high place in the army or a suitable escort for a pilgrimage to Mecca, and Bahram preferred the latter alternative. When Akbar ascended the throne, only a small portion of what had formerly been comprised within the Moghul empire owned his authority, and he devoted himself with great determination and mar- vellous success to the recovery of the revolted provinces. Over each of these, as it was restored, he placed a governor, whom he superintended with great vigilance and wisdom. He tried by every means to develop and encourage com- merce; he had the land accurately measured for the purpose of rightly adjusting taxation ; he gave the strictest instruc- tions to prevent extortion on the part of the tax-gatherers, and in many other respects displayed an enlightened and equitable policy. Thus it happened that, in the fortieth year of Akbar's reign the empire had more than regained all that it had lost, the recovered provinces being reduced, not to subjection only as before, but to a great degree of peace, order, and contentment. Akbar's mcthod of dealing with what must always be the chief difficulty of one who has to rule widely diverse races, affords perhaps the crown- ing evidence of his wisdom and moderation. In religion he was at first a Mussulman, but the intolerant exclu- siveness of that creed was quite foreign to his character. Scepticism as to the divine origin of the Koran led him to seek the true religion in an eclectic system. He accord- ingly set himself to obtain information about other religions, sent to Goa, requesting that the Portuguese missionaries there would visit him, aud listened to them with intelligent attention when they came. As the result of these inquiries, he adopted the creed of pure deism and a ritual based upon the system of Zoroaster. The religion thus founded,

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however, having no vital force, never spread beyond the limits of the court, and died with Akbar himself. But though his eclectic system failed, the spirit of toleration which originated it produced in other ways many import- ant results; and, indeed, may be said to have done more to establish Akbar's power on a secure basis than all his economic and social reforms. He conciliated the Hindoos by giviag them freedom of worship; while at the same time he strictly prohibited certain barbarous Brahminical practices, such as trial by ordeal and the burning of widows against their will. He also abolished all taxes upon pil- grims as an interference with the liberty of worship, and the capitation tax upon Hindoos, probably upon similar

rounds. Measures like these gained for him during his life- time the title of "Guardian of Mankind," and caused him to be held upas a model to Indian princes of later times, who in the matter of religious toleration have only too seldom followed his example. Akbar was a munificent patron of literature. He established schools throughout his empire for the education of Hindoos as well as Moslems, and he gathered round him many men of literary talent, among whom may be mentioned the brothers Feizi and Abul-fazl. 'The former was commissioned by Akbar to trans- late a number of Sanscrit scientific works into Persian; and the latter (see ABULFAZL) has left, in the Akbar-Nameh, an enduring record of the emperor's reign. It is also said that Akbar employed Jerome Xavier, a Jesuit missionary, to translate the four Gospels into Persian. The closing years of Akbar's reign were rendered very unhappy by the misconduct of his sons. Two of them died in youth, the victims of intemperance; and the third, Selim, afterwards the emperor Jehanghir, was frequently in rebellion against his father. These calamities were keenly felt by Akbar, and may even have tended to hasten his death, which occurred at Agra on the 13th October 1605. His body was deposited in a magnificent mausoleum at Sicandra, near Agra.

AKEN, or AcKEN, a town in Prussian Saxony, situated on the Elbe, 25 miles E.S.E. of Magdeburg, close to the frontiers of Anhalt. It has manufactures of cloth, leather, chemicals, and optical instruments; large quantities of beetroot sugar are produced in the neighbourhood; and there is a considerable transit trade on the Elbe. Popula- tion (1871), 5273.

AKENSIDE, Marx. Like young Henry Kirke White, the poet of the Pleasures of Imaginution was the son of a butcher. He was born at Newcastle-on-Tyne on November 9th, 1721. His school was the free one founded by a former mayor of Newcastle, Thomas Horsley. Later, one of the ministers of the Presbyterians added to his school- acquired knowledge in private. In his sixteenth year he sent to the Gentleman's Magazine a copy of verses entitled "The Virtuoso." Sylvanus Urban graciously printed the poem; but the old man was not difficult to please. Other verse contributions succeeded—imitative, yet not without gleams of a true faculty. Some written in the Lake country, while on visits with friends at Morpeth, have Wordsworthian touches. The memories of these visits transfigure the Pleasures of Imagination. In his nineteenth year, being intended for the clerical profession, he pro- ceeded to the university of Edinburgh; but within one session, like many others, he changed his purpose, and transferred his name from the theological to the medical classes—although, indeed, then, as still, the opening years were occupied with the same studies for either. On his change he honourably returned certain moneys which his fellow Presbyterians had advanced towards his theological education. He attended the university for only two years. While there, in 1740, a medical society, which combined with it a debating club, gave him a fine field for the exercise of his oratorical powers. Dugald Stewart

states that Robertson the historian, then a student of divinity, used to attend the meetings in order to hear Akenside's speeches. Some of his minor poems belong to this period, such as his Ode " for the Winter Solstice," the elegy called "Love," and the verses "to Cordelia." He returned to his native town in 1741, and then his friendship with Jeremiah Dyson had commenced, "a name never to be mentioned by any lover of genius or noble deeds without affection and reverence" (Willmott). In the years 1741 to 1743 he must have been ardent in his wooing of the Muses. In the summer or autumn of 1743 Dodsley carried with him to Pope at Twickenham a MS. for which the writer asked £120. The oracle of Twicken- ham having read the poem, counselled the publisher to make no niggardly offer, because "this was no every-day writer." It was something for Pope to be thus prescient in the absence of rhyme—albeit Pope's insertions in 7'he Seasons remain to attest that, supreme artist as he was in rhyme, he could also manage blank verse with exquisite cunningness. The MS. was the Pleasures of Imagunation,

which Dodsley published in 1744. In his twenty-third year the author, like Byron, awoke to find himself famous. The assaults of Warburton and Hurd were scarcely a deduc- tion from the universal welcome. The poet's " Epistle" to Warburton was effective. He went to Leyden, and there pursued his medical studies with ardour. He obtained the degree of M.D., May 16th, 1744; his inaugural disserta- tion describing the formation and growth of the human foetus with original observation and acuteness. He now returned to England, advancing more and more in his friendship with the good and large-hearted Dyson. He chose Northampton as the place wherein he should com- mence practice. It was an unfortunate selection, as Sir James Stonehouse " possessed the confidence of the town," and it was deemed an intrusion. A not very creditable controversy arose; and we are at a loss whether most to admire the stinging rebuffs in honeyed courtesies or the mutual pretence of ultimate satisfaction and good-will. At Northampton Akenside was on friendly terms with Dr Doddridge. There, too, he wrote his "Epistle to Curio," which Lord Macaulay pronounced his best production, as "indicating powers of elevated satire, which, if diligently cultivated, might have disputed the pre-eminence of Dry- den." Willmott traces some of the most nervous lines of the Pleasures of Hope to this "Epistle to Curio." Not succeeding in his profession at Northampton, he removed to Hampstead in 1747. The Odes had then been published. Dr Akenside came to Hampstead under the xgis of the generous Dyson. Somehow, in Hampstead as at North- ampton, he manifested a vanity of self-display and hauteur of manner that made him many enemies. Within three years he had to leave Hampstead for London. He set up in Bloomsbury Square in a "fine house," and with an annuity of £300 from the still ungrudging Dyson. One is pleased to come on these words of a far greater poet a century later, "I am not unfrequently," wrote Wordsworth in 1837, "a visitor on Hampstead Heath, and I seldom pass by the entrance of Mr Dyson's villa at Goulder's Hill, close by, without thinking of the pleasure which Akenside often had there." The generous clerk of the House of Commons and secretary of the Treasury nobly earned his imperishable place in the (revised) Pleasures of Imagina- tion. Contemporaneous with his professional duties, the poet became an essayist and reviewer for Dodsley in the now forgotten Musewm. In 1753 the university of Cam- bridge bestowed on him the degree of doctor of medicine. In 1754 he was elected a fellow of the College of Physi- cians. In 1755 he read before the college the Gulstonian Lectures; and in 1756 the

Croonian Lectures. In 1759 he was chosen assistant, and two months later chief,

physician of St Thomas's Hospital. In this year he had removed to Craven Street. In 1762 he changed once more to Burlington Street. In 1760 was published the L/arvevan Oration by order of the College of Physicians. In 17 61, along with Dyson, he passed from a somewhat noisy Whiggery to the Tories, which added "renegade" to his name. In 1765-6 he was working upon the revised and enlarged copy of the Pleaswres of Imagimation. His fame was widening professionally and poetically, when a putrid fever carried him off suddenly on June 23d, 1770. He was buried at St James's Church on the 28th. As a man, the nearer one gets to Akenside the less is there lovable about him; there seem to have becn ineradicable mean- nesses in his nature. Lavish in his expenditure while practically dependent on Dyson, and remaining dependent after his professional income ought to have released his patron, we cannot think of him as high-minded. His personal vanity was constantly bringing him sorenesses. The "Doctor" in Peregrine Pickle was painted from the life, not a mere creation of Smollett's genius. As a poet, the place of Akenside is secure, but it is not very lofty. His imagination is rhetorical rather than subtle, consisting more of pomp of words than greatness of thought. His chief defect is lack of emotion, and especially pathos. The enlarged Pleasures of Imagination, notwithstanding some noble additions, was a blunder. Some of his minor pieces have a classical grace and charm of expression. (See the original editions of his writings; Bucke's Life, Writings, and Genius of Akenside, 1832; Dyce and Willmott's edition of his Poems; Cunningham's Johnson's Lives of the Poets, s.v.; Biog. Brit.; Medical Biog., s.v.) A. B. G.

AKERBLAD, Jan Davin (1760-1819), a learned Swede, distinguished for his researches in Runic, Coptic, Pheenician, and ancient Egyptian literature. He entered the diplomatic service as secretary to the Swedish embassy at Constantinople, and utilised the leisure which the situa- tion afforded by visiting Jerusalem (1792) and the Troad (1797). After an interval spent at Gottingen, he was appointed ambassador to Paris. His last years were passed at Rome, where he enjoyed a pension from the Duchess

of Devonshire. Akerblad was a diligent student of hiero- glyphics ; and though he failed to decipher the Rosetta stone, he arrived at certain conjectural conclusions with regard to the true method of interpretation, which were afterwards confirmed by Dr Young. His works inelude letters on the Coptish cursive writing and on the Rosetta inscription, both addressed to M. de Sacy ; and a number of pamphlets on the interpretation of various Runic and Pheenician inscriptions.

AKERMAN (perhaps the ancient Z'yras or Julia Alba), a town of Russia in Europe, in the province of Bessarabia, on a tongue of land projecting into the estuary of the Dniester. Its harbour is too shallow to admit vessels of large size; but the trade of the town is, notwithstand- ing, very considerable. Large quantities of salt are ob- tained from the saline lakes in the neighbourhood; and com, wine, wool, and leather are among the other exports. The town, which is ill-built, contains several mosques and Greek and Armenian churches; it is guarded by ramparts, and is commanded by a citadel placed on an eminence. Akerman derives some historical celebrity from the treaty concluded there in 1826 between Russia and the Porte, securing considerable advantages to the former. It was the non-observance of this treaty by Turkey that led to the war of 1828. Population (1867), 29,609.

AKERMAN, Joun Yoncz, an antiquarian, distinguished chiefly in the department of numismatics, was born in Wiltshire on the 12th June 1806. He became early known in connection with his favourite study, having initiated the Numismatic Journal in 1836. In the following year he

became the secretary of the newly-established Numismatic Society. In 1848 he was clected secretary to the Society of Antiquaries, an office which he was compelled to resign in 1860 on account of failing health. He died on 18th November 1873. Akerman published a considerable nuni- ber of works on his special subject, the more important being a Catalogue of Roman Coins (1839); a Numismatic Manual (1840); Roman Coins relating to Britain (1844), for which he received the medal of the French Institute; Ancient Coins—Iispania, Gallia, Britannia (1846); and Numismatic Illustrations of the New Testament (1846). He wrote also a Glossary of

Words used in Wiltshire (1842) ; Wiltshire Tales, illustrative of the Dialect (1853); and Remams of Pagan Saxondom (1855).

AKHALZIKH, a city of Georgia, in Asiatic Russia, on an affluent of the Kur, 110 miles west of Tiflis, in 41° 40' N. lat., 43° 1' E. long. It contains a strong castle, a college and library, and a fine mosque, and has a considerable trade in silk, honey, and wax. Population (1867), 15,977.

AKHISSAR, the ancient Thyatira, a town of Turkey in Asia, in Anatolia, 58 miles N.E. of Smyrna. The inha- bitants are Greeks, Armenians, and Turks. The houses are built of earth or turf dried in the sun, and are very low and ill-constructed; but there are six or seven mosques, which are all of marble. Remarkable inscriptions are to be seen in several parts of the town on portions of the ruins of the ancient city. Cotton of excellent quality is grown in the neighbourhood, and the place is celebrated for its scarlet dyes. Population, about 6000.

AKHTYRKA, a town of Russia in Europe, in the Ukraine, situated on a river of the same name, 45 niiles N.W. of Kharkov. It has eight churches, one of: which, containing an image of the Virgin, is held in great venera- tion. The town is enclosed by ditches; and the environs are fertile, the orchards producing excellent fruit. There are some manufactures of light woollen stuffs, and a great market is held annually in May. Population (1867), 17,411.

AKIBA, Ben JosEpu, a famous rabbi who flourished about the close of the first and the beginning of the second centuries. It is almost impossible to separate the true from the false in the numerous traditions respecting his life. He became the chief teacher in the rabbinical school of Jaffa, where, it is said, he had 24,000 scholars. What- ever their number, it seems certain that among them was the celebrated Rabbi Meir, and that through him and others Akiba exerted a great influence on the development of the doctrines embodied in the Talmud. He sided with Barchochebas in his revolt, recognised him as the Messiah, and acted as his sword-bearer. Being taken prisoner by the Romans under Julius Severus, he was flayed alive with circumstances of great cruelty, and met his fate, according to tradition, with marvellous steadfastness and composure. He is said to have been a hundred and twenty years old at the time of his death. The Jews were long

accustomed to pay visits to his tomb, and he is one of the ten Jewish martyrs whose names occur in a penitential prayer still used once a year in the synagogue service. A number of works commonly attributed to Akiba are of later origin; but the one entitled s27p2 “227 i992 (Doctrine of Rabbi Akiba) is probably genuine.

AKOLA, a district and city of British India, in the commissionership of West Berar, within the Haidardbad assigned districts. AKoLA DisTRIcT lies between 20° 23’ and 21° 10’ N. lat., and between 76° 25’ and 77° 19’ E. long.; its greatest length from N. to S. being 72 miles, and its greatest breadth from E. to W. 63 miles. It is bounded on the N. by the Satpur4 range; on the E. by Elichpur district ; on the S. by the Sdétmal and Ajanta hills; and on the W. by the Buldén4 and Khandesh districts. The total area of the district in 1869 was 26972 square miles,

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or 1,726,625 acres, of which 1,326,583 acres, or 2072°78 square miles were under cultivation; 127,003 acres, or 198-45 square miles, cultivable but not actually under tillage; 41,198 acres, or 64:37 square miles, alienated land held rent free; the remaining 231,842 acres, or 362°25 square miles, consisting chiefly of unarable land, but includ- ing river-beds, tanks, village sites, pasturage land, or land occupied for public uses, &c. The population of the dis- trict in 1869 numbered 487,558—viz., Hindus, 433,238 ; Mahometans, 39,030; aborigines, 15,157; Christians, 78; Parsis, 45; Jews, 10. The district is square in shape and almost of a dead level, with the exception of two conical-shaped hills which stand out quite apart from any other eminences, and rise straight up from the plain. The principal river of Akola, which, although not navigable, represents the main line of drainage, and into which the other streams discharge themselves, is the Purna, flowing east and west. The principal tributaries on its south bank are the Kata Purnd, Murna, Num, and Bord{; and on its north bank, the Shahnur, Idrupé, and Wun. None of these streams are navigable, and some of them almost dry up after the rainy season.

The extension line of the Great Indian Peninsular Railway from Bhosawal to Nagpur intersects the district, with stations at Jalam Shegaon, Paras, Akola, and Borgaon. Of eight main roads, three have been metalled. The first runs from Akold to Akot, a rising cotton mart, and is 28 miles in length, running north-north- east. It is metalled, and all the smaller water-courses are bridged. The Purna and Shahnur rivers, however, cross the line, and arc not bridged, a circumstance which impairs the usefulness of the road during the rainy season. The second road is known as the Basim road, and runs for 24 miles southwards through the district. The third road is 12 miles long, from Khamgdon to Nandura railway station, and is mctalled throughout. The other five lines of road are neither bridged nor metalled, but only marked out and levelled. The district imports piece goods from Bombay, and food grains from the adjoining districts. Its principal exports are cotton to Bombay, clarified butter, dyes (indigo and kusamba), and cattle. Internal trade is chiefly carried on at weekly markets and by annual fairs. The principal manufacture of the district is the weaving of cotton. Carpets and coarse cloths are woven in almost every village, with turbans at Balapur, and silk cloths for native women at Akola and in the larger towns. The principal agricultural products are as follows :—The wet weather or kharif crop consists of joar (eighteen varieties) ; bajra (two kinds); cotton (two kinds); tur, urid, and mug (three kinds of pulse) ; rice and kulkar (a smaller variety of rice); Indian corn ; rala; ganji; ajwdn ; indigo ; and til (oil-seeds of two kinds). The cold weather or rabi crop consists of—wheat (three kinds) ; gram ; linseed ; lakh (a pulse) ; peas ; musuri; tobacco ; and mustard. The principal articles of garden produce are the follow- ing -— Sugar-cane (two kinds); Indian corn (two kinds) ; ground nuts; onions; garlic ; coriander ; pan leaves; chillies ; opium ; sweet potatoes ; grapes ; plantains ; saffron ; and numerous kinds of vege- tables. A tenure peculiar to Akola is that known as metkart hold- ings. These consist of certain strips of land extending along the whole breadth of the district at the foot of the frontier range. They are now of considerable valuc, and were originally held as payment for the maintenance of a chain of outposts or watch-towers on elevated points in the ridge, with a view to giving warning of the approach of the Bhil or Gond banditti, and warding off their attacks. Seven towns are returned as containing a population excceding 5000 —viz., Akola (the capital of the district), population 12,236 ; Akot, one of the principal cotton marts of Berar, and also celebrated for its cotton manufacture,

14,006 ; Khamgéon, now the largest cotton mart In the province, but which has only sprung into importance within recent times, 9432; Balépur, one of the chicf military stations In the Berars during the Mahometan rule, 12,631 ; Jalgaon, an Important cotton market, 8763; Patur, 6011 ; Shegaon, a station on the Great Indian Peninsular Railway, and a cotton market, 7450. In 1869 there were 1 higher class, 10 middle class, and 63 lower schools for boys in Akola district ; besides 7 female schools and 1 normal school for training Hindustdn{ and Marhatt masters, making a total of 82 schools in all. For the protection of person and property there were in 1869 13 police stations and 12 outposts, with a regular police force of 536 officers and men, equal to one man

to every five miles of the district area, or one man to every 909 of the population.

Axotd Town, the headquarters of the district of the same name, and also of the west Berar division of the Haidarébdd assigned territory, is situated on the Nagpur

extension of the Great Indian Peninsular Railway, in 20° 6' N. lat., and 76° 2' E. long. The town contains three or four wealthy merchants; aud two markets are held each week—one on Sundays, the other on Wednesdays. The commissioner's and deputy-commissioner's court-houses, the central jail (capable of holding 500 prisoners), the post- office, and barracks or rest-houses for European troops, close to the station, are the principal public buildings, Besides these, there are a civil hospital, a charitable dispen- sary, an English high school, a town-hall, and an English church. A detachment of infantry is stationed at the town. Population in 1869, 12,236.

AKRON, a town of the United States, capital of Sum- mit county, Ohio, situated on the Atlantic and Great Western Railway, and on the Ohio and Erie Canal, at its junction with the Pennsylvania and Ohio Canal, 36 miles S. of Cleveland. By means of the canal and the Little Cuyahoga river the town is amply supplied with water- power, which is employed in a variety of manufactures ; and its mercantile business is extensive. It has several flour mills, woollen factories, and manufactories of iron goods. Mineral fire-

proof paint, immense beds of which are found in the vicinity, and wheat are important articles of export. Akron was founded in 1825, and was made the capital of the county in 1841. Population in 1870, 10,006.

AK-SU, a town of Chinese Turkestan, is situated in 41° 7’ N. lat., 79° E. long., 250 miles N.E. of Yarkand. It has a flourishing trade, and is resorted to for purposes of commerce by caravans from all parts of Central Asia. There are some cotton manufactures; and the place is celebrated for its richly-ornamented saddlery made from deer-skin. A Chinese garrison is stationed here, and copper and iron are wrought in the neighbourhood by exiled Chinese criminals. The district is well cultivated, and sheep and cattle are extensively reared, The popula- tion of the town is about 20,000; that of the town and district 100,000.

AKYAB, a district and city within the Ardk4n division of British Burmah, and under the jurisdiction of the chief commissioner of that province. The pisTRIcT lies along the north-eastern shores of the Bay of Bengal, between 20° and 214° N. lat., and 92° 12’ and 94° E. long. It forms the northernmost district of British Burmah, and the largest of the three districts of the Arékan division. It is bounded on the N. by the Chittagong district of Bengal; on the E. by the Sumadoung ranges, which separate it from Inde- pendent Burmah; on the S. by the Ardkdén districts of Raémri and Sandoway; and on the W. by the Bay of Bengal. In 1871 the frontier or hill tracts of the district were placed under a special administration, with a view to the better government of the wild tribes which inhabit them. The present area is returned at 4858 square miles, of which 521 square miles are cultivated, 913 cultivable but not actually under tillage, and 3424 square miles uncultivable and waste. The population of the district in 1872 amounted to 263,152, of whom 192,885 were Buddhists or Jains, 47,349 Mahometans, 8687 Hindus, 13,928 abori- gines, and 303 Christians. The central part of the district consists of three fertile valleys, watered by the Myu, Koladyne, and Lemyu. These rivers approach each other at their mouths, and form a vast network of tidal chan- nels, creeks, and islands. Their alluvial valleys yield inexhaustible supplies of rice, which the abundant water carriage brings down to the port of Akyab at a very cheap rate. The four chief towns are Khimgchut in the extreme north-east of the district; Koladyne in the centre; Ardkdn, further down the rivers; and Akyab

on the coast, where their mouths converge. This district passed into the hands of the British, together with the rest of Ar4kan division, at the close of the first Burmese war of 1825.

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AxyaB, Town and Port, situated at the point of con- vergence of the three large rivers Myu, Koladyne, aud Lemyu, 20° 9’ N. lat., and 92° 56’ E. long., is the chief town of the district of the same name, and the most flourish- ing city of the Arakan division. The town is regularly built, with broad streets running at right angles to each other. The port is commodious, is the seat of a large export trade in rice, and possesses steam communication direct with Calcutta once a fortnight, except during the south-west monsoon. The population in 1871-72 numbered 15,281. Akyab monopolises almost the whole sea-borne trade of the province of Ardkan, amounting in 1871-72 to £1 ,345,417 ; to which the export of rice contributed £105,894. During 1871-72, 256 vessels, of a total burden of 129,061 tons, entered the port; and 262 vessels, of a burden of 130,203 tons, cleared.

ALABAMA, one of the Southern States of the North American Union, lies between 30° 13’ and 35° N. lat., and between 85° and 88° 35’ W. long. It is bounded by Florida and the Gulf of Mexico on the §S., Mississippi on the W., Tennessee on the N., and Georgia on the E.

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Its length is 330 miles, average breadth 154, and area 50,722 square miles. The Alleghany range stretches into the northern portion of the state, but the elevation is nowhere great ; the centre is also hilly and broken; on the south, however, for nearly 60 miles inland, the country is very flat, and raised but little above the sea-level. The Alabama is the chief river of the state. It is formed by the junction of the Coosa and the Talapoosa, which unite about 10 miles above the city of Mont- gomery. Forty-five miles above Mobile the Alabama is joined by the Tombigbee, and from that point is known as the Mobile River. It is navigable from Mobile to Wetumpka, on the Coosa, some 460 miles. The Tombig- bee is navigable to Columbus, and the

Black Warrior, one of its chief tributaries, to Tuscaloosa. The Tennessee flows through the northern portion of the state, and the Chattahoochee forms part of its eastern boundary. The climate of Alabama is semi-tropical. The temperature ranges from 82° to 18° Fahr. in winter, and in summer

from 105° to 60°; the mean temperature for the year being a little over 60°. The average severity of the winter months is considered to have increased—a result due, it is said, mainly to the felling of the forests, which gives more unrestricted scope to the cold north-west winds from the Rocky Mountains. The uplands are healthy, but the in- habitants of the low-lying lands are subject to attacks of intermittent, bilious, and congestive fevers. The stratified rocks of the state belong to the silurian, carboniferous, cretaceous, and tertiary systems. The silurian strata throw up numerous mineral springs along the line of the anti- clinal axes, some of which, such as Blount Springs and the St Clair Springs, are much resorted to for their health- giving properties. There are also several noted springs arising from the tertiary beds, such as those of Tallahatta and Bladon. Alabama possesses extensive coal deposits. Mr Tait, the state commissioner for the industrial resources of Alabama, considers that the area of the coal-lands in the state amounts to 5500 square miles, of which 5000 belong to the Warrior, and the remaining 500 to the Cahaba and Coosa fields. Assuming that only one-half of this area can be worked to advantage, Mr Tait further esti- mates the aggregate possible yield at 52,250,000,000 tons. At present, however, the annual output probably does not exceed 12,000 tons. In regard to iron, the natural wealth of Alabama is also very great. Mr Tait asserts that a ridge of iron, of an average thickness of 15 feet, runs parallel to one of the principal railway lines for a distance of 100 miles ; and in other parts of the country there are large deposits of ore, both red hematite and blackband. The ores of Alabama are said to yield from 10 to 20 per cent. more iron than those of Britain. Granite, marble, flagstones, roofing-slate, lime, and porcelain clay, are among the other mineral products. A little gold has also been found in the state.

The soil of Alabama varies greatly in character, but is for the most part productive to a greater or lesser extent, except in the south, where there are considerable tracts of sandy, barren, and almost worthless soil. The forests are mainly in the central and northern parts of the state, and embrace oaks, poplars, cedars, chestnuts, pines, hickories, mulberries, elms, and cypresses. The following table exhibits the chief agricultural statistics of Alabama for 1870, as compared with 1860, the year before the war:—

1870. 1860.

Land in { Improved, acres | 5,062,204 | 6,385,724 Farms. | Uap proved, se: 36 9,898,974 12,718,821 Horses, ... : 80,770| 127,063

Live Stock | Mules and Asses, . 76,675| 111,687 on Cattle, 487,163 778,896 Farms. Sheep, 241,934] 370,156 Swine, . . ail 719,757 | 1,748,321

Indian Corn, bushels 16,977,948 |33, 226, 282 TORE, ce oc 55 1,055,068 | 1,218,444 |.

a, ie | 18,977| 72,457

DAB eon cas es 770,866| 682,179

Potatoes, . . . 2,033,872 | 5,931,568

Chief Pease and Beans, 319 156,574 | 1,482,036 Products. \ Butter, Tb 3,213,753 | 6,028,478 Cotton, . bales 429,482 989,955

Wool… a 33 381,253 775,117

Rice, . ‘ Tb 922,945 498,465

Tobacco, : 152,742 | 232,914

Molasses, gallons 433,281 | 140,768

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Alabama possesses comparatively few manufactures. It is estimated that in 1870 the capital invested amounted to £1,140,806, and the total products in the same year were valued at £2,608,124. There were in 1870 thirteen establishments for the manufacture of cotton goods, whose products amounted in all to 2,843,000 hb, including 4,518,403 yards of sheetings and shirtings, and 1,039,321

yards of ginghams and checks. In the same year 613 flour mills operated on 3,298,848 bushels of grain. There were 284 lumber mills, producing 1,115,000 laths, 97,192 feet of lumber, and 1,422,000 shingles. In the iron manufac- tures there has been a marked advance, which is the more noticeable because several other industries have experienced a serious decline. Thus, in 1850 the quantity of ore used for making pig-iron was only 1138 tons, in 1860 it had risen to 3720 tons, and in 1870 to 11,350; the value of the products being respectively £4500, £12,918, and £42,051. Alabama has also manufactories of rolled and cast iron; but the rise in the value of their products is not so marked. There are, besides, tanneries, carriage and waggon works, and machinery factories, in addition to industries of a local nature. Mobile is the chief mercantile city of the state. In the years ending June 30, 1871 and 1872, 688 and 369 vessels (gross burden, 558,525 and 272,853 tons) entered, and 711 and 369 (551,310 and 277,356 tons) cleared the port of Mobile. Cotton was the priucipal article of export—the amount in 1871 being 287,074 bales, and in 1872, 137,977; of which 240,660 and 123,522 bales went to Great Britain. Mobile is con- nected with the general network of railways of the United States. A line runs from the city through Montgomery and on to Atalanta in Georgia; another runs from Mobile to Meridan in Mississippi; a line crosses the state from Meridan through Cahawba to Montgomery; a loop-line runs from Montgomery to Troy, and proceeding round by Columbus in Georgia, rejoins the main line at Opelika; from Selma a line proceeds north-easterly, following the valley of the Coosa, and passing through Georgia and Tennessee; and another traverses the valley of the Tennessee, from which a branch strikes off to the north to join the Ten- nessee group of railways at Nashville. A line also con- nects Mobile with New Orleans. The part of the line from Mobile to Montgomery between Mobile and Tensas was completed

under considerable engineering difficulties. It crosses the Mobile river by a swing drawbridge 1000 feet in length, with a draw of 260 feet; while the Tensas river. bridge is built on cylindrical piers, each span measuring 152 feet, and its total length 2084 feet. There are at present 1602 miles of railway and 2135 of telegraph lines in operation in Alabama.

Alabama returns six members to Congress. The state government is vested in a governor, Senate, and House of Representatives. The Senate consists of 33 members elected for four years, one half retiring every two years. The House of Representatives consists of not more than 100 members, elected for two years, and apportioned among the counties according to population, each county, however, being entitled to at least one representative. The members of both houses receive 16s. 8d. each per diem, and the governor £520, 16s. 8d. perannum. The taxation in 1870 amounted to $2,982,932, and the public debt to $13,277,154. In 1860 the taxation was only $851,171. The state is divided into 65 counties, and Montgomery is the capital. The other principal towns are Mobile, Tus- caloosa (the former capital), Florence, Huntsville, Selma, and Wetumpka,

Alabama was first penetrated by the Spaniards in quest of gold in 1541, under the celebrated leader De Soto. The natives defended themselves stubbornly, and in their defence inflicted and sustained very severe losses. The present site of Mobile was first occupied by the French in 1711. In 1763 the French possessions east of the Missis- sippi, including Alabama, were ceded to England. Alabama was originally included in Georgia, but in 1802 became part of the territory of Mississippi. In 1813 the Creek Indians made a desperate effort to check the encroach- ments of the Anglo-Saxons, but were eventually crushed in

the battle of Horse Shoe Bend by General Jackson, who compelled them to surrender three-fourths of their terri- tory. In 1819 Alabama was admitted into the Union as an independent member of the confederation. It seceded in the year 1861, but since the close of the war has been again admitted into the Union.

The census of 1870 showed the following results :—Total population of Alabama, 996,992; coloured, 475,510; with 98 Indians. Of these, 987,030 were native born, and 9962 foreign. In 1860 the population was 964,201, of

whom 526,271 were whites and 437,770 (435,080 slaves) were coloured ; in 1820 (the year after Alabama had been admitted into the Union) the numbers were—total, 127,901; whites, 85,451; coloured, 42,450 (41,879 slaves). Of the total population in 1870, 488,738 were males (255,023 whites, 233,677 coloured, 38 Indians) and 508,254 females (respectively, 266,361, 241,833, 60). In regard to educa- tion, there were in the state between 5 and 18 years of age, 173,273 males (91,989 whites, 81,274 coloured, and 10 Indians) and 169,703 females (89,798, 79,882, and 23); of whom 77,139 have attended school (viz., 31,098 white and 7502 coloured males, and 30,226 white and 8313 coloured females). The returns give 2969 schools, with 2372 male and 992 female teachers. Of persons 10 years and upwards, there were 349,771 returned as unable to read, and 383,012 as unable to write.

ALABASTER (said to be derived from the Arabic al batstraton, the whitish stone), a name properly restricted to the fine massive variety of gypsum, or sulphate of lime, which is used in the manufacture of ornamental vases, statuettes, clock-frames, &c. When pure, it is of a brilliant pearly- white lustre, so very soft as to be easily scratched by the nail, and is soluble to a slight extent in water. It occurs in large and very pure masses at several localities in Tuscany, and is turned or chiselled into its various ornamental forms in Florence, which is the centre of the alabaster trade. At a time when the taste for alabaster work was more general than now, it was quarried at Lagny, near Paris. In Eng- land considerable deposits are found in various localities, but chiefly in Derbyshire and Staffordshire, where it is worked to form the plaster of Paris moulds used by potters ; hence it is termed " potters' stone." Fine blocks found in quarrying the potters' stone are reserved for the alabaster turners. A yellow variety of alabastcr, found at Sienna, is termed " alabastra agatato." When it presents a fibrous structure, it is known as "satin spar," which when cut has the opalescent appearance of "cat's eyes." Ori- ental alabaster is the name applied to the stalagmitic variety of carbonate of lime formed on the floors of lime- stone caves by the percolation of water, an entirely dif- ferent material from the above. It is usually clouded or banded in an agate-like manner, and hence is sometimes known as onyx marble, The alabaster yielded by celebrated quarries, known to the ancients and now again worked, in the province of Oran, Algeria, is of this kind. It is this oriental alabaster that is referred to

in the Bible, the dAaBactpirns of the Greeks. The stone was held in very high estimation among the civilised nations of antiquity, being then chiefly procured from quarries in the neighbour- hood of Thebes, which to this day remain unexhausted. At the present time it is procured from Oran (Algerian onyx), the Pyrenees, Chili, California, &c. In the Soanean Museum there is an Egyptian sarcophagus in oriental alabaster, covered with hieroglyphics, which was purchased by Sir John Soane for 2000 guineas.

ALABASTER, Wituiam, D.D., poet and scholar. If to have been commemorated with golden words by Ed- mund Spenser in his Colin Clouts come Home Againe, 11. 400-415, and by Herrick in his Hesperides ; and to have been reckoned "foeman worthy of his steel" by Bishop

Bedell ; and to have had his portrait painted by Cornelius Jansen, and engraved by Payne; and to have been pro- nouuced by Fuller "a most rare poet as any our age Or nation hath produced ;" and to have drawn from Samuel Johnson unequivocal eulogium, may be regarded as entit- ling to a claim on our interest at this later day, Dr William Alabaster unites in himself all these memorable tributes. Alabaster was his own spelling, as it was Bedell's and Fuller's ; but it is found contemporaneously " Arblastier." The name is derived from arcubalista (in arms of the family, a cross-bow bent in pale), and the same probably as Arblastier. He was born at Hadleigh, Suffolk, about 1567, was educated at Westminster School, and went thence to Trinity College, Cambridge. He was also in- corporated at Oxford in 1592. He became fellow of Trinity. Having been appointed chaplain to Robert, Earl of Esscx, he attended him in that expedition, designed to aid Henry IV. against the League in 1591, celebrated by Dr Donne in "The Storm" and "The Calm." While in France (in his twenty-fourth year), he was converted to Roman Catholicism, and a quaint English sonnet, " Of his Conversion," survives, wherein he defies the "frowne and scorne and purblind pittie" of the world, as having a vision of perdition if he yielded thercto. He did not long remain a Roman Catholic. In the preface to his work entitled Hece Sponsus Venit (1633), he relates that certain doctrines of his having become obnoxious to the court of Rome, he was enticed to that city and imprisoned there by authority of the Inquisition ;

and that on his liberation he was confined within the city walls, but escaped at the peril of his life, and returned to England. On his return he became prebendary of St Paul's and rector of Hatfield. Dr Alabaster was famous as a Hebraist; but his studies of Hebrew took a twist in the direction of the cabalistic learning, by which he luxuriated in discussions on_ the mystical meanings imagined to be hidden in the words of the Old Testament. The investigation and application of this supposed mystical meaning of Scripture was the main object of his Apparatus in Revelationem Jesu Christi (Antwerp, 1607); and, indeed, it runs through. all his critical writings, as in his singular Spiraculum Tubarum, sive Fons Spiritualium Expositionem ex equivocis Penta- glott? Significationibus (n.d., folio), his Lexicon Pentaglotton (1637, folio), and the Commentarius de Bestea Apoca- lyptica (1621). It was of these books Herrick wrote as making Alabaster 'the one, one onely glory of a million." A MS. of Alabaster's Hisets is among Emanuel College MSS.; a better one, with additional poems, entitled "Tnuenta Bellica" — recalling MHerbert's '" Triumphus Mortis," so headed—and '"'Inuenta Adespota," is in the Chetham Library, Manchester. The poem is unfinished, but has lines in it which account for Spenser's lofty praise and hopes. It has never been printed. His best known verse is a Latin tragedy called Roxana. This is praiscd by Fuller, stirred Anthony & Wood into enthusiasm, and is regarded by Dr Johnson as the only Latin verse in Eng- land worthy to be named previous to Milton. It was prepared for his college (Trinity), and never meant for publication. Having been surreptitiously published in 1632, the author thereupon reprinted it, with this on the title-page, "A plagiariis unguibus vindicata, aucta et agnita." It is a curious composition. The subject is an oriental tale which had previously been dramatised in the Dalida of Groto, an Italian. The scenes consist of con- versations between real and allegorical personages. The first act is entirely carried on between the ghost of one of the characters and personifications of Death and Suspicion. Hallam charges Alabaster with plagiarism from Dalida, but he cannot have really read the two. Alabaster died about 1640. (A. B. G.)

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ALACRANES, a group of coral reefs and islands in the Gulf of Mexico, 80 miles off the north coast of Yucatan, and extending 14 miles from north to south, and 11 from east to west. On the 12th February 1847 the mail steamer Twced was wrecked on the Alacranes ; and in January 1849 a similar disaster befell the Forth, belonging to the same company. On the south side, in 22° 23' 36" N. lat., and 89° 42' W. long., there is a secure harbour, well sheltered by dry reefs.

ALAGOAS, a maritime province of Brazil, formerly a district of Pernambuco, is situated between 9° and 10° 30' S. lat., and extends inland 150 miles. It is bounded on the N. and W. by Pernambuco, and is separated by the river San Francisco from the province of Sergipe on the S. It embraces an area of 15,036 square miles. The country, particularly in the north-west, is very moun- tainous, but at the same time richly wooded. On the eastern side of the mountains, hilly tracts, well suited for the cultivation of cotton, descend towards the coast, and nearer the sea there is a rich alluvial soil interspersed with swamps (lagoas), whence the province takes its name. The chief articles of produce and export are sugar-cane, rice, cotton, hides, and rosewood. 'Tropical fruits of all kinds are produced in abundance, and the forests, besides ad- mirable timber, yield various dyes and drugs. The people are chiefly engaged in agriculture, and there are no manu- factures of importance. The population of the province is 300,000. The town of ALaGoas, formerly the capital of the province, is situated on Lake Manguaba. It has declined considerably since the transfer of the local government to Maceio. Population, including district, 12,000.

ALAIN DE LILLE (Atanus az Insuuis), theologian and ecclesiastic, born at Lille or Ryssel about the year 1114. The facts of his life are involved in uncertainty, owing to his having been frequently confounded by bio- graphers with others, nearly contemporary, who bore the same name. Some have identified him with Alanus, bishop of Auxerres ; others confound him with an elder Alanus, also born at Lille. These, however, were probably three distinct persons. Of the theological writer known as the doctor universalis, all that can be said with certainty is that he was a Cistercian monk. It is probable that he passed a great part of his life in England, though he ended his days in the abbey of Citeaux. His works are very numerous, the most important of them being entitled Anti-Claudianus, sive

de Officio Viri Boni et Perfect. The title denotes that the work takes for its model Claudian's satire against Rufinus, the minister of Theodosius. It is written in verse, and partakes somewhat of the character of an encyclopedia. Alain's De Arte Catholice Fidei is remarkable for its endeavour to base dogmatic theology on the exact reasoning of mathematical demonstration, and for its admission that heresy was to be overcome by argu- ment and not by mere authority. His exposition of the prophecies of Merlin, in seven books, is of some importance in its bearing upon English history. A Life of St Bernard and a treatise against heretics, usually included among the works of this author, are, from internal evidence, to be attributed with more probability to the bishop of Auxerres. Alain died about 1202-3.

ALAIS, a flourishing town of France, in the department of the Gard, on the right bank of the Gardon, at the foot of the Cevennes, 25 miles north-north-west of Nimes, with which it is united by rail. In the 17th century it was a stronghold of the French Protestants, and was besieged and taken by Louis XIII. in 1629. It has a citadel, erected by Louis XIV., a fine Gothic church, and a mining school. The town itself has considerable manufactures of ribands, silk, earthenware, glass, and vitriol ; but its pros- perity is chiefly derived from the adjacent mineral field,

which was opened up in 1819, and yields great quantitics of coal and iron, as well as zinc, lead, and manganese. The numerous mines, blast furnaces, and iron foundries, afford employment to many workmen. 'There are cold miucral springs in the vicinity, which attract large num- bers of visitors during the summer months. Population in 1872, 19,230.

ALAJUELA, a city in the state of Costa Rica, Central America, 23 miles W.N.W. from Cartago, and midway between it and the west coast. It is a place of consider- able trade, and is connected by a mule road with the port of Puntas Arenas, the only good harbour possessed by Costa Rica on the Pacific Ocean. Some parts of the town are well built and beautifully situated ; and the detached houses in the environs are embowered by trees and flowering shrubs. The sugar-cane is cultivated in the neighbourhood. Population, 12,575.

ALAMANNI, or AtemManni, Luici, an Italian states- man and poet, was born at Florence in 1495. His father was a devoted adherent of the Medici party, but Luigi, smarting under a supposed injustice, joined with others in an unsuccessful conspiracy against Giulio de' Medici, after- wards Pope Clement VII. He was obliged in consequence to take refuge in Venice, and, on the accession of Clement, to flee to France. When Florence shook off the papal yoke, Alamanni returned, and took a prominent part in the management of the affairs of the republic. On the restora- tion of the Medici (1530), he had again to take refuge in France, where he composcd the greater part of his works. He was a favourite with Francis I., who sent him as ambas- sador to Charles V. after the pcace of Crespi in 1544. As an instance of his tact in this capacity, it is related that, when Charles interrupted a complimentary address by quoting from a satirical poem of Alamanni's the words—

***Vaquila grifagna,*

Che per piu devorar, duoi rostri porta,"

(Two crooked bills the ravenous eagle bears,

The better to devour,) the latter at once replied that he spoke then as a poet, who was permitted to use fictions, but that he spoke now as an ambassador, who was obliged to tell the truth. The ready reply pleased Charles, who added some compli- mentary words. After the death of Francis, Alamanni enjoyed the confidence of his successor Henry IL, and in 1551 was sent by him as his ambassador to Genoa. He died at Amboise in 1556. He wrote a large number of poems, distinguished by the purity and excellence of their style. The best is a didactic poem, La Coltivazione (1533), written in imitation of Virgil's Georgics. His Opere Toscane (1532) consists of satirical pieces written in blank verse. An unfinished poem, Arvarchide, in imitation of the I liad, was the work of his old age, and has little merit. It has been said by some that Alamanni was the first to use blank verse in Italian poetry, but the distinction belongs rather to his contemporary Trissino.

ALAMOS, Los, a town of Mexico, in the state of Sinaloa, situated on a barren plain 140 miles N.N.W. of Sinaloa. The houses of the town are mostly of stone or brick covered with stucco, and several of the streets are well paved; provisions are dear and water scarce. The surrounding district contains many rich silver mines. Of the population, amounting to about 10,000, a large propor- tion are employed in the mines.

ALAMOS DE BARRIENTOS, Don BALTHAZAR, & Spanish philologist, born at Medina del Campo, in Castile, about 1550. He was on terms of intimate friendship with Antonio Perez, secretary to Philip II. ; and when the latter fell into disgrace, Alamos was cast into prison, where he remained nearly twelve ycars. During this period he pre- pared the translation of Tacitus, with a commentary, which

gave him his reputation as a classical scholar. On the death of Philip I]. Alamos recovered his liberty, and afterwards received various important court appointments through the influence of the Duke de Lerma and the Count d'Olivarez. He died at the age of eighty-five.

ALAN, ALLEN, or ALLyN, Wintiam (1532-94), car- dinal, was born at Rossall in Lancashire. He studicd at Oriel College, Oxford, and was appointed principal of St Mary's Hall in 1556. Two years later he was made

a canon of York; but being opposed to the Reformation, was forced to flee to Louvain on the accession of Elizabeth. He returned to England after a time, and for some years resided chiefly at Oxford ; but his proselytising zeal being discovered, necessitated a second flight. At Donay he received a doctor's degree from the recently-founded univer- sity, and he himself established a college there for English Catholics. In 1587 he was made cardinal of St Martin de Montibus, and in 1589 archbishop of Mechlin. The great aim of his life seems to have been to restore the papal supremacy in England. For this purpose he founded the college at Douay, and scent over the Jesuit priests trained there to his native land. He was, of course, a bitter enemy of Elizabeth, who expelled his emissaries, aud even caused some of them to be put to death. One of his pamphlets, prepared for circulation among the English people, con- tained charges against the queen so foul and scurrilous that they can scarcely be repeated. It was only natural that he should be one of the chief intriguers in the Spanish plot which led to the fitting out of the Armada, especially as the pope had promised him the archbishopric of Canterbury in

the event of the expedition being successful. His letters –

to Philip were full of encouragement, and the failure of the entcrprise must have been a severe blow to him. When the fact became known, he lost favour at the papal court, and was refused permission to return to his diocese. ALAND ISLANDS, an archipelago at the entrance to the Gulf of Bothnia, about 25 miles from the coast of Sweden, and 15 from that of Finland. The group consists of nearly 300 islands, of which about 80 are inhabited, the remainder being desolate rocks. These islands form a continuation of a dangerous granite recf cxtending along the south coast of Finland. Thcy formerly belonged to Sweden; and in the neighbourhood the first victory of the Russian fleet over the Swedes was gained by Peter the Great in 1714. They finally passed into the possession of Russia in 1809. The inhabitants, amounting to about 16,000, are mostly of Swedish descent, and are hardy sea- men and fishermen. The surface of the islands is generally sandy, the soil is thin, and the climate is keen; yct Scotch fir, spruce, and birch are grown; and rye, barley, flax, and vegetables are produced in sufficient quantity for the wants of the people. Grcat numbers of cattle are reared; and cheesc, butter, and hides, as well as salted meat

and fish, are exported. The largest island, which gives its name to the group, is 18 miles long by 14 broad, and contains about two-thirds of the total population. Therc are several excel- lent harbours (notably that of Ytternees), which are of great importance to Russia from the fact that they are frozen up for a much briefer period than those on the coast of Finland. The fortress of Bomarsund, in onc of these islands, was attacked and destroyed by an Anglo-French force in 1854. ALANI, a number of nomadic tribes of eastern origin, who spread themsclves over Europe during the decline of the Roman empire. The name was probably at first con- fined to one tribe of Tatar race, whose original seat was on the northern shores of the Caspian Sea, and was after- wards, as the power of that race extended, applied to other tribes. It is supposed that their first encounter with the Romans was during the Mithridatic war, when Pompey led an expedition into the Caucasus. Isolated statements in ; I. — 56

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contemporary writers show that the Alani were frequently in conflict with the Roman power. In March 276 A.D. they received a decisive check in an attempt to make their way eastward into Persia, being defeated by the emperor Tacitus, who forced them to recross the Phasis. The most com- plete account of the Alani is to be found in the pages of Ammianus Marcellinus (lib. xxxi.), who describes their manners and customs at considerable length. From him, too, we learn of the advance of the Huns, who signally defeated the Alani in a battle fought on the banks of the Tanaisin 375. The race thereupon divided, some retiring to the east, while the great majority joined their conquerors in an invasion of the kingdom of the Goths. Associated with the Vandals and Suevi, they left the settlements they had in Pannonia and entered Gaul in 406, whence three years later they crossed the Pyrenees into Spain, and founded a settlement in Lusitania and Betica, where they remained in peace for some years. In 418, however, they were attacked and defeated by Wallia, king of the Visigoths, with whom they had quarrelled. Their king, Ataces, was slain in the battle, and they became subject to Gunderic, king of the Vandals, their national independence being lost. Those of the Alani who had remained in Gaul

when the others invaded Spain, settled near Valence and Orleans. Though serving under Theodoric, they sympa- thised with Attila and the Huns, and by deserting at Chalons (451), all but changed the victory of the Romans into a defeat. Soon afterwards their separate national existence in Gaul was merged in that of the Visigoths. The small portion of the Alani that had remained in their original seat in the Caucasus are frequently noticed in history down to the middle ages. In 572 they were allied with the Armenians under King Saroes. They seem to have afterwards regained their independence. In 1221 they were defeated by Gengis Khan, and in 1237 they were so completely subjugated by Batu-Khan that their very name disappears in subsequent history.

ALARCON, Hernanpo Ds, a Spanish navigator of the 16th century, known only in connection with the expedi- tion to the coast of California, of which he was leader. He set sail on the 9th May 1540, with orders from the Spanish court to await at a certain point on the coast the arrival of an expedition by land under the command of Vasquez de Coronado. The junction was not effected, though Alarcon reached the appointed place and left letters, which were afterwards found by Diaz, another explorer. Alarcon was the first to determine with certainty that Cali- fornia was a peninsula and not an island, as had been sup- posed. He made a careful and exact survey of the coast, sailed a considerable distance up the Rio del Tizon (Colo- rado), and was thus able, on his return to New Spain in 1541, to construct a map of California, which, according to M. Dufiot de Mofras, scarcely differs fron one of the present day.

ALARCON Y MENDOZA, Juan Ruiz bz, one of the most distinguished Spanish dramatists, born at Tasco in Mexico about the close of the 16th century, was descended from a noble family belonging to Alarcon in Cuenga. Nothing is known with certainty of his early life, but it is probable that he was educated at one of the Spanish univer- sities. In 1622 he had taken up his residence at Madrid, and in 1628 he was appointed to the office of relator (reporter) of the royal council of the Indies, which afforded him a com- petency. In the same year he published the first volume of his comedies, dedicating it to "the rabble" in a daringly contemptuous address. A second volume of comedies appeared at Barcelona in 1634, in which he brought charges against several poets of appropriating his productions.

About the same time he was successful in an open com- petition for a dramatic libretto to be played at the fétes in honour of Philip IV. These two facts, combined with his

haughty disdain both of the public and of his literary brethren, made Alarcon very unpopular; and he was scur- rilously lampooned by most of the poets and dramatists of the day, Calderon honourably distinguishing himself by his silence. ALARIC (Alice, 7.e., All rich), a chief, and afterwards king of the Visigoths, was born of the noble family of Balti (baltha, bold). He first appears in history (394 A.D.) a8 a commander in the army of subjugated Goths whom the Emperor Theodosius employed in his war with Eugenius. On the death of Theodosius in 395 the Goths asserted their independence, and under the leadership of Alaric made an incursion from Thrace, where they had been located, into the Morea. Athens yielded to them without resistance, and Alaric enriched himself with the movable treasures of the city, though he did not, as some have asserted, destroy buildings and works of art. Rufinus, the crafty minister of Arcadius, did nothing to check the advance of the barbarians, and it has even been said that he had a secret understanding with Alaric. Opposition came, however, from the Western Empire. Stilicho, the famous general, landed at Corinth, and drove the Goths to Mount Pholoe, on the frontiers of Elis, where he besieged their camp. With proper vigilance, the siege could not have been raised; but the Romans were careless, and Alaric with his army contrived to escape to Epirus. Stilicho was prevented from following him by an order from the Emperor Arcadius, who conferred upon Alaric the pre- fecture of eastern Illyricum. About the same time the Gothic chief was chosen king by his people. It was natural that Alaric's desire of conquest should increase with the increase of his power, and accordiugly about the year 400 a.p. he set out to invade the Empire of the West. His march was exceedingly slow, and it was not until the spring of 403 that he appeared before Milan, from which the Emperor Honorius instantly fled to the fortress of Asta in Liguria. Being besieged there, he was on the point of capitulating when he was relieved by Stilicho, who, in the battle of Pollentia, fought on Easter- day,

gained a somewhat doubtful victory over Alaric. Some time after, the contest was renewed at Verona, and Alaric sustained a decisive defeat. He was obliged to accept terms of peace, and to retreat for the time; but his attitude was always threatening, and Honorius found it expedient to buy him off by appointing him prefect of western Illyricum, with a large revenue. In this capacity Stilicho encouraged Alaric to lead his army against Con- stantinople, probably more with the design of keeping him at a distance from Italy than with any hope of reuniting the divided empire. The final expedition to Constantinople was not undertaken; but for his services during three years in Epirus, Alaric claimed an extravagant reward, and Honorius, on the advice of Stilicho, promised him 4000 pounds of gold. Shortly afterwards the weak-

minded emperor procured the assassination of his minister, the only Roman who had proved himself able to cope with the Gothic forces, and broke all the treaties which Stilicho had made with Alaric. The latter at once marched upon Rome (408) by the Via Flaminia, and laid siege to the city. On coming to treat with him, the Romans found his demands so extravagant that they threatened a desperate resistance, to which Alaric made the well-known reply, "The closer hay is pressed, the easier is it mown." At last the barbarian was induced to retire by the promise of 5000 pounds of gold and 30,000 pounds of silver, besides other treasure. The respite, however, was but for a time. Honorius, who had left Rome for Ravenna, refused to ratify by treaty certain conditions, moderate in themselves, on which Alaric firmly insisted, and the capital was again at the mercy of the enemy. With commendable forbear- ance, Alaric contented himself at first with taking posses- sion of Ostia, from which he summoned the city to sur- render, threatening the immediate destruction of the food stores in case of refusal. The terrified people at once opened their gates, and agreed that the conqueror should appoint another emperor in place of Honorius. Alaric's choice fell upon Attalus, the prefect of the city, who, though well received at first, soon proved himself thoroughly incompetent, and Honorius had to be restored. While the conferences as to the restoration were still being carried on at Ravenna, the treachery of Honorius occasioned yet another and more disastrous siege of Rome by the Goths. Sarus, a barbarian and a hereditary

enemy of the house of Balti, was permitted by the emperor to attack the camp of the Goths and return in triumph to Ravenna. Alaric was naturally indignant, laid siege to Rome for the third time, and gained an entrance by the Salarian gate on the night of the 24th August 410. For six days the city was given over to the horrors of a pillage, which the humane orders of Alaric did but little to mitigate. On the 29th August Alaric withdrew his troops from Rome, and led them into southern Italy, which he ravaged for several months. Towards the close of the year, while engaged in the siege of Cosentia (Cosenza), he was seized with an illness which proved fatal after a very short duration. He was buried with his treasures in the bed of the river Busentinus, which was diverted from its channel for that purpose, and all the prisoners who were engaged in the work were put to death in order that the place of his sepulture might remain unknown. The character of Alaric has been somewhat variously represented by historians. In forming an estimate of it many have been misled by the use of the term barbarian, which, as applied to him, it should be remembered, indicates a national and not a personal distinction. Many proofs may be found of his humanity and moderation in trying circumstances, while, on the other hand, the charges of cruelty brought against him are not borne out by evidence. His marked respect for Christianity is explained by the fact that, if he was not himself a Christian, he had come early under Christian influence, having had frequent intercourse with Arian teachers.

ALARIC II, eighth king of the Goths in Spain, suc ceeded his father Euric or Evaric about 484. His dominions not only included the greater part of Spain (Hispania Tarraconensis and Beetica), but extended into Gaul as far as the rivers Rhone and Loire. In religion Alaric was an Arian, but that he was tolerant of the orthodox Catholics is shown by the decrees of the Council of Agde, summoned by him in 506. He displayed similar wisdom and liber- ality in political affairs by appointing a commission to prepare an abstract of the Roman laws and imperial decrees, which should form the authoritative code for his dominions. This is generally known as the Breviarium

Alaricianum. It contains six books of the code of Theo- dosius, and is therefore sometimes called the Corpus Theodosu. The full text has been given by Savigny. Alaric was of a peaceful disposition, and endeavoured strictly to maintain the treaty which his father had con- cluded with the Franks. Clovis, however, desiring to obtain the Gothic province in Gaul, found a pretext for war in the Arianism of Alaric. The intervention of Theodoric, king of the Ostrogoths and father-in-law of Alaric, proved unavailing. The two armies met in 507 at Voglade (Vowillé), near Poitiers, where the Goths were defeated, and their king, who took to flight, was overtaken and slain by Clovis himself.

ALASCO, Joun (in Polish, Lascki), a Polish nobleman, born in 1499, who travelled extensively in his youth, and during a residence in Zurich imbibed the doctrines of the Reformation from Zwingli. At Basel in 1525 he had frequent intercourse with Erasmus, who held him in great esteem, and bequeathed his library to him. On his return to his native country he was offered more than once ecclesiastical preferment, which the change in his religious opinions prevented him from accepting. With the view of securing more freedom, he quitted Poland, and after travel- ling for a time, became pastor of a Protestant congregation at Embden, in East Friesland, in 1542. Foreseeing per- secution there, he went to London in 1551, on the invita- tion of Cranmer, and became superintendent of the con- gregation of foreign Protestants, most of whom were driven into exile like himself in consequence of the Interim. The revenues of the church of Augustin Friars were assigned to support him and four assistant ministers, who had to be approved by the king. On the accession of Mary in 1553, Alasco and all his congregation were banished. In 1556 he returned to Poland, where he died on the 13th January 1560. Alasco wrote a number of theological treatises, chiefly in defence of the doctrine of the sacraments as held by the Swiss Reformers, and he was one of the eighteen divines who prepared the Polish version of the Bible, which was published in 1563.

ALA-SHEHR, a city of Asiatic Turkey, in the pashalic of Anatolia, 83 miles E. of Smyrna. It is dirty and ill- built ; but, standing on elevated ground, and commanding the prospect of the extensive and fertile plain of the Hermus, presents at a distance an imposing appearance. It is the seat of a Greek archbishop, and has five Christian churches and fifteen mosques. The

city occupies the site of the ancient Philadelphia, one of the "seven churches in Asia" of the Apocalypse. The ancient city, founded two centuries B.c., was subject to frequent earthquakes. In more modern times it was celebrated for its prolonged resistance to the Turks, who took it in 1390, after all the other cities of Asia Minor had surrendered. Ala-Shehr has an active trade, and the population is about 18,000.

ALASKA, or Atiaska, formerly Russtan America, but now a territory of the United States, is a vast tract of country forming the north-west portion of North America, bounded on the N. by the Arctic Ocean, on the E. by British America, and on the S. and W. by the Pacific Ocean. The name was formerly confined to a long narrow peninsula stretching into the Pacific, but has been extended to the whole territory. Alaska comprises the whole of North America from 141° W. long. to Behring Strait, and also numerous islands along the coast, notably Prince of Wales Islands, King George ITI. Archipelago, the Kodiak Islands, and the Aleutian Islands, which stretch seaward from the extremity of the peninsula. From the main portion of the territory a narrow strip, with a breadth of about 50 miles, extends south-east along the Pacific coast, and terminates at the confines of British Columbia, in 54° 40' N. lat. From north to sout the extreme length of

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Alaska is about 1100 miles, and the greatest breadth from east to west is 800 miles. The area of the whole territory is estimated at 514,700 square miles.

The numerous islands, creeks, and inlets of Alaska lengthen out its coast-line to 7860 miles, an extent greater than that of the eastern coast-line of the United States. Beginning at the south-east, the chicf creeks and bays are

Cook's Inlet, Bristol Bay, Norton Sound, and Kotzebue Sound; while, following the same order, the principal headlands, in addition to the extremity of the peninsula, are Cape Newcnham and Cape Romanzoff in the Pacific, Cape Prince of Wales in Behring Strait, and Cape Lisburne, Icy Cape, and Point Barrow in the Arctic Ocean. Point Barrow is in 71° 23' N. lat., and is the extreme northern point of the country. The exploration of the northern coast 'was chiefly the work of the British navigators Cook, Beechy, and Franklin, and of the officers of the Hudson's Bay Company. 'The principal river of Alaska is the Yukon, or Kwichpak, which rises in British America, and, receiving the Porcupine river at Fort Yukon, flows westward across the territory, and falls into the Pacific Ocean to the south of Norton Sound. At a distance of 600 miles from the sea this magnificent river has a width of more than a mile. Its tributaries would in Europe be reckoned large rivers, and its volume is so great that 10 miles out from its principal mouth the water is fresh Among the other rivers of Alaska are the Copper river, the Suschitna, the Nuschagak, and the Kuskokwim, falling into the Pacific, and the Colville, flowing northward into the Arctic Ocean. A great moun- tain range extends from British Columbia, in a north-west direction, along the coast of Alaska, the summit being covered with snow and glaciers. Mount St Elias, an active volcano, in 60° 18' N. lat., and 140° 30' W. long., rises to the height of 14,970 feet above the sea. The mountain chain runs out along the peninsula which has given its name to the country, and at.the western extremity there are several volcanic cones of great elevation ; while in the island of Uminak, separated from the mainland by only a narrow strait, there are enormous volcanoes, one rising to more than 8000 feet in height. In the interior and to the north the country is also mountainous, with great intervening plains.

he north-west coast of this part of America was dis- covered and explored by a Russian expedition under Behring in 1741; and at subsequent periods settlements were made by the Russians at various places, chiefly for the prosecution of the fur trade. In 1799 the territory was granted to a Russo-American fur company by the Emperor Paul VIII, and in 1839 the charter of the com- pany was renewed. New Archangel, in the island of Sitka, was the principal settlement, but the company had about forty stations. They exported annually 25,000 skins of the seal, sea-otter, beaver, &c., besides about 20,000 sea-horse teeth. The privileges of the company expired in

1863; and in 1867 the whole Russian posses- sions in America were ceded to the United States for a money payment of $7,200,000. The treaty was signed on 30th March, and ratified on 20th June 1867 ; and on 9th October following, the possession of the country was formally made over to a military force of the United States at New Archangel. It still remains in the military keeping of the United States, no steps having been taken to organise a territorial government. It has, however, been constituted a revenue district, with New Archangel, or Sitka, as the port of entry. Since Alaska was ceded to the United States considerable information has been col- lected as to the resources of the less sterile parts of the country; but the central and northern parts of this region are only known as the inhospitable home of some wander-

ing tribes of Indians and Esquimaux. Portions of Alaska have also been recently explored by the employés of the Russo-American Telegraph Company in surveying a route for a line of telegraph which was designed to cross from America to Asia near Behring Strait—a project which was abandoned, after an expenditure of £600,000, on communi- cation with Europe being secured by the Atlantic cable.

The climate of the south-western coast of Alaska is Climate,

tolerably mild, considering its high latitude. The great warm current of the Pacific, sweeping in a north-easterly circuit from the East India Islands, and corresponding very much in character and effects to the Gulf Stream of the Atlantic, washcs its shores; and while it modifies the temperature, also causes an excessive rainfall. At Sitka the mean temperature is 42°-9, and the average rainfall about 80 inches. value. From the great amount of rain and the want of heat, cereals grow, but will not ripen, and vegetables do not thrive. Native grasses and berries grow plentifully, but the chief wealth of the country is in its vast forests, in the furs of its wild animals, and in the fish with which its rivers and seas abound. The forests, rising from the coast and covering the mountains to a height of 2000 feet, consist of a very durable yellow cedar, spruce, larch, and fir of great size, and also cypress

and hemlock. 'The wild animals include the elk, the deer, and various species of bear, and also many fur-bearing animals, such as the wolf and fox, the beaver, ermine, marten, otter, and squirrel. Near the coast and islands there are innumerable fur- bearing seals, which are caught in great numbers by the settlers; but from the rigour of the climate and the arduous nature of the work, the trapping of the animals of the interior is left to the Indians. The salmon abounds in the rivers, and there are great banks along the shores, the favourite haunt of cod and other fish. About eighty whalers prosecute their fishing off the coast of Alaska. Coal and iron are the most important minerals, but the value of the deposits remains to be ascertained.

The population is very limited, consisting of 8000 whites Populm and 15,000 Indians, with some Esquimaux on the northern tiou.

coast. The Indians are rapidly decreasing in number, and are described as treacherous and discontented. New Arch- angel, now called Sitka, in the island of Sitka, in 57° 3' N. lat., and 135° 18' W. long., was the seat of the Russian governor, and is the headquarters of the United States authorities. It contains about 1500 inhabitants, is the residence of a Greek bishop, and has fortifications, maga- zines, and a magnetic observatory. Of the other settle- ments, Fort Nicholas on Cook's Inlet, and Fort St Michael on Norton Sound, are the more important. The admirable harbours on the coast and the great navigable river Yukon afford facilities for the formation of new settlements and the increase of trade by the Americans. At the junction of the Porcupine river and the Yukon a fort was estab- lished by the Hudson's Bay Company in 1847. (See Whymper, Z'ravels in Alaska and on the Yukon, 1868; Dall, Alaska and tts Resources, 1870.)

ALATRI, the ancient Alatriwm, a town of Italy, 6 miles N. of Frosinone, in the province of that name, which until 1870 formed part of the papal territory. It is the see of a bishop, and has considerable remains of Pelasgian antiquity. Population of commune, 11,370.

ALAVA, one of the Provincias Vascongadas, or Basque Provinces, in the north of Spain. It is of a triangular shape, and is bounded on the N. by Guipuzcoa and Biscay, on the E. by Navarre, on the 8.W. by Logrono, and on the W. by Burgos; with an area of about 1200 square miles. The surface

of Alava is very mountainous, espe- cially on the north, where a part of the Pyrenees forms its natural boundary. It is separated from Legrono by the

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Ebro, and the other rivers are the Zadorra and the Ayuda. The soil in the valleys is fertile, yielding wheat, barley, maize, flax, hemp, and fruits. Oil, and a poor kind of wine called chacoli, are also produced. Many of the mountains are clothed with forests of oak, chestnuts, beeches, and othcr trees, and contain iron, copper, lead, and marble. Salt is also found in large quantities in the province. The manufactures of Alava are unimportant ; coarse cloth, iron ware, earthenware, hats, and shoes being among the chief. The capital of the province is Vitoria. Population in 1870, 102,494.

ALAVA, Don Micuern Ricarpo pv', a Spanish general and statesman, born at Vitoria in 1771. He served first in the navy, and had risen to be captain of a frigate when he exchanged into the army, receiving corresponding rank. In politics he followed a very devious course. At the assembly of Bayonne, in 1808, he was one of the most prominent of those who accepted the new constitution from Joseph Bonaparte as king of Spain. In 1811, when Joseph's position was becoming insecure, Alava joined the national independent party, who were fighting in alliance with the English, The Spanish Cortes appointed him commissary at the English headquarters, and Wellington, who seems to have regarded him with great favour, made him one of his aides-de-camp. Before the close of the campaign he had risen to the rank of brigadier-general. On the restoration of Ferdinand, Alava was cast into prison, but the influence of his uncle Ethenard, the in- quisitor, and of Wellington, secured his speedy release. He soon contrived to gain the favour of the king, who ap- pointed him in 1815 ambassador to the Hague. Four years later he was recalled, owing, it is said, to the marked kindness he had shown to his banished fellow-countrymen. On the breaking out of the revolution of 1820 he was chosen by the province of Alava to represent it in the Cortes, where he became conspicuous in the party of the Exaltados, and in 1822 was made president. In the latter year he fought with the militia under Ballasteros and Murillo to maintain the authority of the Cortes against the rebels). When the French invested Cadiz, Alava was

commissioned by the Cortes to treat with the Due d'Angouléme, and the negotiations resulted in the restoration of Ferdinand, who pledged himself to a liberal policy. No sooner had he regained power, however, than he ceased to hold himself bound by his promises, and Alava found it necessary to retire first to Gibraltar and then to Eng- land. On the death of Ferdinand, he returned to Spain, and, espousing the cause of Maria Christina against Don Carlos, was appointed ambassador to London in 1834, and to Paris in 1835. After the insurrection of La Granja, he refused to sign the constitution of 1812, declaring himself tired of taking new oaths, and was consequently obliged to retire to France, where he died at Baréges in 1843.

ALAY (lit. a triumphant procession), a Turkish cere- mony observed on the assembling of the forces at the out- break of war. Its essential feature is the public display of the sacred standard of Mahomet, which may be seen only by Moslems and touched only by the emirs. On one occasion, when, owing to a long interval of peace, this rule had been forgotten, the Christians, who had witnessed the spectacle in large numbers, were cruelly massacred. The procession in which the standard is carried is headed by artisans bearing the implements of their respective trades.

ALB, or ALBE, a vestment of white linen, hanging down to the feet, worn by priests at all the more solemn servicés of the church. It corresponds to the surplice of the English clergy, the difference being that the alb is closer in the sleeves, and bound at the waist by a girdle. In the ancient church it was customary for the neophytes who

were baptized on Easter-day to wear an alb for the eight days following, and hence the Sunday after Easter was called Dominica in Albis.

ALBA, the ancient Alba Pompeia, a town of Italy, in the province of Cuneo, situated on the Tanaro, 30 miles 8.E. of Turin. It is the seat of a bishop, and contains a cathedral, founded in 1486, as well as other churches and religious establishments. It has a large trade in cattle, and the surrounding district is very fertile, producing silk, wine, oil, grain, and fruits, and also marble and rock-salt. Population of the commune (1865), 9687.

ALBA LONGA, the most ancient town in Latium, was situated 15 miles S.E. from Rome, on a ridge be- tween the mountain and the lake that were both called from it Albanus. It derived its name probably from its elevated or Alpine situation, the story of the white sow discovered by Aineas on landing (Virgil, Hneid, iii. 390- 392) being of course mythical. Little beyond the bare fact of its existence for a considerable period as the foremost town in Latium can be accepted as strictly historical. According to the legendary accounts, it was founded by Ascanius, the son of Aineas, 300, or, as a later version has it, 360 years before the foundation of Rome. Four- teen kings, whose names are all preserved, are said to have reigned over it in succession, The names, however, are evidently an invention, having probably this substratum of historic truth, that the ruling family belonged to the Silvian gens. The city was destroyed by the Romans under Tullus Hostilius, and its inhabitants removed to Rome. Several of the patrician families, such as the Julit, Curratii, Servilii, Tullti, Quintii, ascribed their origin to these immigrants from Alba.

ALBACETE, one of the new provinces of Spain, was formed in 1833 out of districts taken from Murcia and New Castile. It is bounded on the N. by Cuenga, on the E. by Valencia and Alicant, on the S. by Murcia, and on the W. by Ciudad Real and Jaen. The area is 5971 square miles. The province is generally hilly, some of the peaks of the sierras rising to a height of 5000 feet ; but it contains rich plains and many fertile valleys. The principal rivers are the Mundo in the southern and the Jucar in the northern part of the province; and there are numerous smaller streams. Some parts of the country have a bare appearance, being destitute of wood, but the neigh- bourhood of Alcarez is covered with fruit trees, and pre- sents the aspect of a garden. Agriculture is in a tolerably prosperous state, more advanced than in the centre of Castile, but less so than in the rich districts of Murcia and Valencia. Cereals, pulse, and fruits of all kinds are produced, as well as wine of fair quality, and excellent honey. Saffron also is produced in large quantities, and some attention is given to the keeping of silk-worms. Many of the inhabitants devote themselves to the rearing of cattle, sheep, and goats. The bulls of Albacete are in request for bull-fights; there is a good breed of mules, and the horses of the province have long mounted the Spanish cavalry. Manufactures are confined to the spin- ning of hemp, and the making of coarse cloths, porcelain, earthenware, and cutlery. There are

several distilleries, and a considerable trade in wood. The district is rich in minerals, including silver, iron, copper, zinc, sulphur, gypsum, and coal; but, excepting stones and marble for building purposes, they are little wrought. In addition to agricultural produce, small quantities of zinc, iron, and sulphur are exported. There are numerous mineral springs, chiefly sulphureous, and hot as well as cold, at various places in the province. Among the. chief towns are Albacete, Chinchilla, Bonillo, and Alcarez. 'The rail- way from Madrid to Valencia traverses the province, and at Chinchilla a line branches southward to Murcia.

The state of cducation throughout the province is very low. In the town of Albaccte, where it is best, little more than half the population can read; while at Yestc, where it is worst, the proportion is only 1 in 15. The graver crimes are of infrequent occurrence ; but the inhabitants always wear arms, and offences against the pcrson are numcrous. Population in 1867, 221,444.

ALBACETE, a town of Spain, capital of the above pro- vince, is situated about 140 miles 8.E. of Madrid, and isa station on the railway between Madrid and Valencia. It is surrounded by a fertile plain, and has considerable trade in saffron and in the agricultural products of the district. A great market, chiefly for the sale of cattle, is held annu- ally in September, and extends over several days. The town is well built, and has several churches, two hospitals, and a normal school. At one time it had an extensive trade in cutlery, from which it received the name of the Sheffield of Spain. This manufacture has been very much reduced by the importation of cutlery from England and Germany, but Albacete is still famous for its daggers, which are held in high repute and much worn by the Spaniards. They are formidable weapons, of coarse manu- facture, but with richly-ornamented handles, and frequently bear proverbial inscriptions suitable to their murderous appearance. Population, 15,150.

ALBAN, St, usually styled the protomartyr of Britain, was born at Verulamium, and flourished towards the end of the third century. In his youth he took a journey to Rome in company with Amphibalus, a monk of Caerleon, and served seven years as a soldier under the Emperor

Diocletian. On his return home he settled at Verulamium, and, influenced by the example and instructions of Amphi- balus, renounced the errors of paganism, in which he had been educated, and became a convert to the Christian religion. It is generally agreed that Alban suffered martyrdom during the great persecution in the reign of Diocletian ; but authors differ as to the precise date. Bede, who gives a full account of the event, fixes it in 286; some refer it to the year 296; while Usher reckons it amongst the events of 303. Between 400 and 500 years after St Alban's death, Offa, king of the Mercians, built a large and stately monastery near Verulamium to his memory, and around it the present town of St Albans was gradually erected.

ALBANI, or AxBano, Francesco (1578-1660), a celebrated Italian painter, was born at Bologna. His father was a silk merchant, and intended to bring up his son to the same occupation ; but Albani was already, at the age of twelve, filled with so strong an inclination for painting, that on the death of his father he devoted him- self entirely to art. His first master was Denis Calvart, with whom Guido Reni was at the same time a pupil. He was soon left by Calvart entirely to the care of Guido, and contracted with him a close friendship. He followed Guido to the school of the Caracci; but after this, owing to mutual rivalry, their friendship began gradually to cool. They kept up for a long time a keen competition, and their mutual emulation called forth some of their best produc- tions. Notwithstanding this rivalry, they still spoke of each other with the highest esteem. Albani, after having greatly improved himself in the school of the Caracci, went to Rome, where he opened an academy and resided for many years. Here he painted, after the designs of Annibal Caracci, the whole of the frescoes in the chapel of St Diego in the church of San Giacomo degli Spagnuoli. His best frescoes are those on mythological subjects, of which there is a large number in the Verospi Palace, now Tor- lonia. On the death of his wife he returned to Bologna, where he married a second time, and resided till his death in the enjoyment of much domestic happiness and general

esteem. His wife and children were very beautiful, and served him for models. But while thus studying from nature, his love of artificial refinement and conventional expression was so great, that even his best works are defi-

cient in breadth and vigour, as well as in unaffected grace and natural feeling. The learning displayed in the com- position of his pictures, and their minute elaboration and exquisite finish, gave them great celebrity, and entitle them to a distinctive place among the products of the Bolognese school.

‘In point of original invention,” says Lanzi, “Albani is superior to Domenichino, perhaps to any other of the school ; and in his repre- sentation of female forms, according to Mengs, he has no equal. By some he is denominated the Anacreon of painting. Like that poet, with his short odes, so Albani, from his small paintings, acquired great reputation ; and as the one sings Venus and the Loves, and maids and boys, so does the artist hold up to the eyc the same delicate and graceful subjects. Nature, indecd, formed, the perusal of the poets inclined, and fortune encouraged his genius for this kind of painting ; and possessing a consort and twelve children, all of sur- prising beauty, he was at the same time blest with the finest models for the pursuit of his studies. He had a villa most delight- fully situated, which further presented him with a variety of objects enabling him to represent the beautiful rural views so familiar to his eye.

A great number of his works are at Bologna. Among the most celebrated of his pictures are the “ Four Seasons ;” “Diana and Venus,” in the Florentine gallery; the “Toilet of Venus,” in the Louvre; ‘“ Venus landing at Cythera,” in the Ghigi palace at Rome, &. Among the best of his sacred subjccts are a ‘St Sebastian ” and an “‘ Assumption of the Virgin,” both in the church of St Sebastian at Rome. He was among the first of the Italian painters to devote himself to the painting of cabinet pictures.

ALBANIA, a country of considerable extent, which though frequently ruled by turbulent and nearly independ- ent chiefs, ranks as one of the provinces of the Turkish empire. The tract of land to which this name is now applied extends from 39° to 43° N. lat., and from 18° 24’ to 21° 48’ E. long. ; from the Gulf of Cattaro in the north to the Gulf of Arta in the south, and from the coast of the Adriatic Sea and Ionian Sea on the west to an irregular ill- defined line inland towards the east, roughly indicated in its northern part by the Tchar Dagh, the ancient Scardus, a part of the Hemus or Balkan range, and southwards by the Pindus chain, or rather the portions of it now

called the mountains of Sagori, Metzovo, and Suli. Within these limits is included the ancient Hpirus, corresponding to the southern part of the country now comprehended under the general name of Albania, and divided from Albania, properly so called, by the river Voyutza or Viosa, which enters the Adriatic a few miles north of Avlona. Albania, therefore, is bounded on the N. by Dalmatia, Montenegro (from which it is separated by the river Moroka), and Bosnia; on the E. by Servia and the Turkish province of Rum-ili, in which Macedonia, or the greater part of it, is included; and on the S. by Hellas or Northern Greece, which was the Turkish province of Livadia before Greece regained its independence, and from which it is separated by the river Garla or Suli The superficial area of Albania is estimated at about 18,944 square miles, and it has a coast-line of about 280 miles from north to south, without reckoning indentations, &c. It nowhere extends more than 100 miles from the sea, and in the southern part not more than 30 miles. ;

According to the most recent division of the Turkish empire into eyalets, sanjaks, and livas, Albania is com- prehended in three eyalets, namely, Uskub or Uskup in the north; Roumelia, which also includes part of Macedonia, in the centre; and Yania, corresponding pretty nearly to the ancient Epirus, in the south. The chief towns of these eyalets are respectively Scutari, Monastir,

and Joannina, sometimes written Janina or Yanina; and these divisions are therefore spoken of by some writers as the pashaliks of Scutari, Monastir, and Joannina. The divisions chiefly recognised by the Albanians themselves are those formed by the varieties of the native tribes. Colonel Leake, who is considered one of the best informed authorities on this head, divides them into the Ngege or Ghegides, whose principal towns are Dulcigno, Scutari, and Durazzo; the Toske or Toskides, who occupy Berat and Elbasan ; the Liape, a poor and predatory race, who in- habit the mountains between the Toske and Delvino; and the Tsami, who inhabit the most southerly district, and whose principal towns are Suli and Paramithia. The country is mountainous, the interior being traversed by a range which forms a prolongation of the Dinaric Alps, and which is continued southwards in the

Pindus range. These mountains, from which numerous spurs are thrown out to the east and west, run in a direction from north to south, parallel to the course of the Tchar Dagh. Along the southern part of the coast-line, and parallel with it, run the Khimara mountains, known to the ancients as the Acro- ceraunian range, terminating northwards in the bold head- land of Cape Glossa. There are three lakes of great size in Albania—Scutari in the north, Okhrida in the centre, and Joaunina in the south. The rivers for the most part are short, and run, generally speaking, from east to west, or in a north-westerly direction. The Moroka and Zenta enter the lake of Scutari, which is connected with the sea by the Boyana, that flows into the Adriatic near Dulcigno. The White Drin, flowing in a southerly direction, and the Black Drin, running northwards from Lake Okhrida, form the head streams of the Drin. The principal streams in addition to these are the Skombia, Voyutza, Calamas, Arta, and Gurla (the ancient Acheron), with its tributary the Vuvo (the ancient Cocytus). The climate is generally healthy, though cold and bleak in the highlands; the warmer regions along the coast are also frequently visited by cold northerly winds.

Albania includes not only the ancient Zpirus, but also part of the ancient Jfacedonia, Illyria, and Chaonia. This country was in early times, as now, distinguished by the rude valour of its inhabitants. Its remote situation, and the want of union among its tribes, generally pre- vented it from acting any conspicuous part in Grecian politics. The only remarkable exception occurs in the reign of Pyrrhus, king of Epirus (296-272 3.c.), who was justly ranked among the greatest captains of antiquity. After his death the country was again split into a number of petty states, which were unable to resist the united strength of Macedon ; and to that kingdom Epirus continued subject till both were alike subdued by the Roman arms (167 8.¢.)

It was during the time of the Greek empire that the naine of Albania was first given to this district. During

the decline of the empire the Albanians gradually rose to |

distinction, and at last to independence. Their valour enabled them to maintain their ground against the Bul- garians, who had occupied all the neighbouring districts of Greece. Nor were they less successful against the Turks, a more formidable enemy. Under the command of the celebrated

George Castriot, called by the Turks Scander- beg, they baffled all the efforts of Mahomet IT., the con-

queror of Constantinople. That powerful monarch entered |

Albania only to experience a succession of defeats, and was at length compelled to acknowledge its independence by a formal treaty. On the death of Scanderbeg, the Turks redoubled their efforts against Albania, which was at length reduced to a state of nominal subjection. The siege of Scutari, in 1478, formed the termination of this memorable struggle. The subjection, however, was always the imperfect; revolts were frequent, and the inhabitants of

mountainous districts still preserved their independence. It was the motives of pay and plunder, rather than com- pulsion, that brought these hardy soldiers into the Turkish ranks. In proportion as the Ottoman empire declined in vigour, its hold of Albania became less firm ; and the vigorous and enterprising genius of Ali Pasha again con- verted this dependency into what might almost be called a separate kingdom.

In the grand insurrection of Greece (1821-1829), the Albanians, accustomed to view with disdain the Ottoman yoke, showed a considerable disposition to make common cause with the Greeks, and their co-operation would have almost ensured success. But the Greeks, imprudently and unhappily, could not divest themselves of the feelings of enmity cherished during the long series of wars which Ali had waged against them. At the siege of Tripolizza (October 5, 1821) overtures were made to them by a corps of 3000 Albanians, who formed part of the garrison; but the Greeks, having succeeded in entering the place, began a dreadful and indiscriminate massacre, in which the Albanians were not spared. At the siege of Arta, al- though the capture was much facilitated by the coming over of a corps of Albanians, the Greeks treated them extremely ill. The Albanian nation was thus forcibly thrown into the arms of the Porte, to which it has since continued nominally subject. The allegiance of the Alba- nians, however, to Turkey rests on a very precarious basis even at the present day, for, it will be remembered, in the Crimean war many Albanian chicfs fought under the Russian flag against the combined forces of England, France, and Turkey.

The inhabitants of Albania are estimated at 1,200,000, of whom a considerable proportion are Turks and Greeks; but the basis of the population consists of the original race, called Arnauts. About half of the entire population are Mahometans; of the other moiety, about 520,000 belong to the Greek Church, and the remainder to the Latin Church. The conversion of those who profess Maho- metanism has been, however, very imperfect, and chiefly induced by political motives. In every family the males usually go to the mosque, the females to church ; and some members of a family are seen in the most amicable manner eating from the same table, and even from the same plate, meats forbidden to the others. With the Turks, accord- ingly, infidel and Albanian are terms nearly synonymous. The native Albanian is of middle stature; his face is oval, with high cheek-bones; his neck long; his chest full and broad. His air is erect and majestic to a degree which never fails to strike the traveller. He holds in utter con- tempt that dissimulation which is characteristic of the Greek, and, unlike the Turk, he is gay, lively, and active. Averse, however, to regular industry, his whole delight is in arms and plunder. He goes constantly armed; and there are few Albanians who have not, in the prime of their life, belonged to some of the numerous bands of robbers who infest the mountains of their native country, of Thessaly, and of Macedonia. This occupation carries with it no disgrace: it is common for the Albanian to mention circumstances which occurred "when he was a robber." In proportion as the trade of robbing becomes overstocked, part of those engaged in it seek employment jn the service of the sultan and the different pashas throughout the Turkish empire, by all of whom the Alba- nians are regarded as the most valuable of their troops.

This fierce and haughty race display a greater degree of contempt for the female sex than is usual even among the most barbarous nations. The females are literally regarded as inferior animals, and treated accordingly ; but in the country districts they are not confined or veiled, as is cus- tomary in Mahometan countries.

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The national costume of the Albanians is handsome in appearance, and bears some resemblance to the Highland dress. It consists of a cotton shirt;

a white woollen Fustanella or kilt, which reaches to the knees ; a jacket; a sash round the waist, in which pistols and a yataghan are commonly carried ; coloured leggings; sandals; and a red cap, round which some twist a shawl or scarf. The chiefs and wealthy Albanians generally wear a jacket and vest of velvet, richly embroidered with gold, and metal grcaves over their leggings, which are usually made of fine scarlet cloth. The poorer classes, though picturesque in appear- ance, are extremely dirty in their habits, and seldom change their clothes. As a protection from the weather, every Albanian has a capote, or rough shaggy mantle with a hood attached, and usually made of horse-hair stuff or coarse woollen cloth. The dress of the females is more various, and often fantastical. A singular custom prevails among the girls of stringing together the picces of money which they have collected for their portion, and wearing them upon their heads. Some of them have their hair hanging down in braids to a great length, loaded with this species of ornament.

Scutari, on the lake of that name, is now considered the chief town of Albania. It is the centre of a large inland trade, and contains about 40,000 inhabitants. Prisrend, in the north-east, is noted for its manufactures of fire-arms and cutlery, and has a population of 25,000. Monastir, or Bitolia, although the capital of the eyalet of Roumelia, is not, strictly speaking, within the confines of Albania. It has a large transit trade between eastern and western Turkey. Joannina, with 36,000 inhabitants, situated on the south-west shore of a lake of the same name, was the capital of Albania in the time of Ali Pasha, and was his stronghold as well as the seat of his government. The other important towns of the interior are Jacova, Tirana, Okhrida, Elbasan, Delvino, and Metzovo. The principal seaports and river-ports are Dulcigno, Durazzo, Parga, Prevesa, and Arta.

The commerce of Albania is chiefly carried on through Arta and Prevesa, on the north side of the entrance to the Gulf of Arta. The principal merchants, however, are Greeks residing at Joannina, among whom a very active commercial spirit appears to prevail. The exports consist almost entirely of unmanufactured produce, live stock, and provisions, and comprise valonia (the cup of the acorn of the Valonia oak, used in tanning), raw silk, cheese, raw hides, drugs, dye-woods, sheep, horses, and salted meats. Notwithstanding its mountainous character, the fertility of its plains

affords a surplus of grain, of which a considerable quantity is sent to Italy, the Ionian Isles, Malta, and other places. The vine, olive, pomegranate, orange, lemon, mulberry, and fig are also cultivated. Wool is exported, chiefly unmanufactured, but partly also wrought into coarse cloth. Other important articles of export are oil, tobacco of good quality, cotton, and cotton yarn. Some cargoes of wood for building and firewood are annually sent to Malta. The chief imports consist of woollen cloths, used for winter coverings. For this purpose the preference is given to a coarser and cheaper kind than any that is usually manu- factured in Great Britain. This is supplied from Germany. Fire-arms, cutlery, gunpowder, hardware, coffee, and sugar are also imported. The manufactures of Albania are few and unimportant, being almost entirely confined to capotes, embroidery on cloth and velvet, fire-arms and cutlery to a limited extcnt, and gun and pistol stocks—all for home consumption.

See the Journey through Albania and Turkey of Mr J. Cain Hobhouse (Lord Broughton); Travels in the Ionian Isles, Albania, &c., by Sir Henry Holland, who resided for some time in the capacity of physician at the court of Ali

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Pasha; Rev. T. 8. Hughes's Zravels in Sicily, Greece, and Albania ; Leake's Travels in Northern Greece ; Mrs Mary A. Walker's Through Macedonia to the Albanian Lakes.

ALBANTA, in Ancient Geography, a country of Asia, bounded, according to Strabo, on the W. by Iberia, on the E. by the Caspian Sea, on the N. by Sarmatia, on the S. by Armenia and the river Cyrus (Kour). The country formerly called Albania corresponds with the modern Daghistan, Schirvan, and Leghistan, and is extremely fertile, owing to the alluvial deposits made by the river Cyrus. The ancient historians describe the Albanians as tall, strong-bodied, and, generally speaking, of a very graceful appearance. The Albanians were originally a nomad race, and never devoted themselves to agriculture or commerce. They became known to the Romans during Pompey's expedition in pursuit of Mithridates (65 B.c.), against which they opposed a force of 60,000 infantry and 22,000 cavalry. Though Pompey

exacted from them a nominal submission, they continued practically independent.

ALBANO, a town and lake in the Campagna di Roma, Italy, about 14 miles S.E. of Rome. The town is much admired for the picturesque scenery around it. It is well built, and the Roman aqueduct and other monuments of antiquity are in tolerable preservation. It contains a cathedral, and there are many handsome villas of the Roman nobles in the vicinity. Population, 6400. The lake of Albano, lying to the N.E. of the town, occupies the crater of an extinct volcano, and is of a beautiful oval form, surrounded with high wooded banks, and about 7 miles in circumference. It has long been an object of attraction to the painter and the traveller. In the fourth century of ancient Rome, during the siege of Veii, there was an extraordinary rise of the waters of this lake, and the oracle declared that there was no hope of success against Veii while the Alban lake was allowed thus to swell. This prompted the Romans to drain it by a tunnel cut through the rock, a mile and a half in length, 4 feet wide, and 6 high, which is still perfect. This outlet keeps the surface of the lake at the height of 920 feet above the level of the sea. Monte Cavo, the ancient Albanus, rises on the eastcrn side of the lake to a height of 3000 feet, and commands a magnificent prospect. On its sum- mit stood the famous temple of Jupitcr Latialis.

ALBANY, a city of the United States, capital of the state of New York and of the county of Albany, pictu- resquely situated in a beautiful and fertile country on the western bank of the Hudson, 145 miles from New York. It is, for an American city, irregularly laid out, and much of its architecture is poor, although it contains several very fine buildings, and many of its more recently made streets are broad and handsome. The Capitol, a brown stone edifice, 115 feet by 90, built in 1807, faces a square called Capitol Park; and opposite it, on the eastern side of the square, are the State Hall and City Hall, both con- structed of white marble. There are several beautiful churches, including a large Roman Catholic cathedral. Among the literary and scientific institutions of Albany may be mentioned the university, incorporated in 1852, giving instruction in most branches of education, especially practical science and law ; a medical college ; an academy, and other schools of various grades; a large observatory; the state library, with about 70,000 volumes; and the Albany Institute for the collection and

diffusion of scien- tific information. Albany is an important centre of trade, being situated at the point where the united Erie and Champlain canals join the Hudson, and possessing good railway communication with most cities of the United States. The chief articles of commerce are timber, wheat, barley, wool, and tobacco, enormous quantities of which,

especially of the first-mentioned, pass through the city annually. Besides its transit trade, its numerous foundries, its breweries, carriage and hat manufactories, and tanneries are of importance. In 1873, 536 vessels (83 sailing and 352 unrigged vessels and 101 steamers), of 68,682 tons, belonged to the port. Albany was founded by the Dutch in 1623, and is thus the oldest European settlement in the United States, with the exception of Jamestown in Vir- ginia, which dates from 1607. It was captured by the British in 1664, who changed its name from Beaverwyck or Williamstadt in honour of the Duke of York and Albany. It received its charter in 1686, and became the capital of the state of New York in 1797. It is governed by a mayor and twenty aldermen, and is divided into ten wards. Popu- lation in 1870, 69,422; number of families, 14,105 ; and of dwellings, 8748.

ALBANY, Louisa Marta Caroninz, Countsss or, daughter of Prince Gustavus Adolphus of Stolberg-Gedern, was born at Mons on the 27th Sept. 1753, and assumed the title of Albany in 1772, when she married the Pretender, Charles Edward, grandson of James II. of England. Her husband was much older than herself, and their union proved very unhappy. There were no children, and the Pretender, who was a confirmed drunkard, treated his wife with such brutality that her health and even her life were endangered. In 1780 she obtained a legal separation, and entrusted herself to the care of her husband's brother, the Cardinal of York, who placed her in a convent, and after- wards removed her to his own house at Rome. Here she was frequently visited by the poet Alfieri, who made her the object of what seems to have been the only pure attach- ment of his life, and who, according to his own avowal, was indebted to her influence for all that was best in his works. (See ALFIERI.) In 1788 she was freed from her bonds by the death of the Pretender, and in the same year she is said to have been

secretly married to Alfieri. For the remainder of her life she resided at Florence, where she continued to be known as Countess of Albany, and distinguished herself as a patroness of literary men and artists. Alfieri died at her house in 1803, and in 1810 she caused a monument to his memory, by Canova, to be erected in the church of San Croce. With the death of the Cardinal of York in 1807 the Stuart line became extinct, and the countess, who died on the 29th January 1824, was the last who was known by the name of Albany. She was buried beside Alfieri in the church of San Croce,

ALBATEGNI, an Arabian astronomer, whose proper name is Mohammed Ibn Jdbir Ibn Sendén Abii Abdillah, derived this appellation from Batan in Mesopotamia, his native town, of which he is said to have been chief. His astronomical observations extended from 877 a.p. to his death in 929, and were principally conducted at Rakkah or Aracta, on the Euphrates, and at Antioch in Syria. His principal work, Zidje Sabi, the original MS. of which is in the Vatican, was published in a Latin translation by Plato Tiburtinus at Nuremberg in 1537, under the title De Scientia Stellarum, and reprinted at Bologna in 1645, Among the unpublished works of Albategni are commentaries on the Almagest and Makalat of Ptolemy, and a Treatise on Astronomy and Geography. Instead of the tables of Ptolemy, which were imperfect, he computed new ones; these were adapted to the meridian of Rakkah, and were long used as the best among the Arabs. Albategni gives the motion of the sun's apogee since Ptolemy's time, as well as the motion of the stars, which he estimated at 1° in 70 years. He makes the obliquity of the ecliptic 23° 35'. His determination of the length of the tropical year is more exact than that of Ptolemy, being only 2m. 26s. short. Upon his observations were founded the Al- phonsine tables of the moon's motion. He first substi-

tuted sines for chords, and also introduced into trigonometry the use of tangents and versed sines. On account of hig discoveries, the chief of which is the motion of the sun's apogee, he has been called the Arabian Ptolemy, and has been placed by some at the head of Arabian astronomers,

ALBATROSS, a genus of aquatic birds (Diomedea), closely allied to the Petrels and Gulls, belonging to the family of Longipennate, or long-winged

birds, in the order Natatores. In the name Diomedea, assigned to them by Linneus, there is a reference to the mythical metamor- phosis of the companions of the Greek warrior Diomedes into birds. They have the beak large, strong, and sharp- edged, the upper mandible terminating in a large hook; the wings are narrow and very long; the feet have no hind toe, and the three anterior toes are completely webbed. Of the three species that the genus includes the best known is the Common or Wandering ¢ Albatross (D. exulans), which occurs in all parts of the Southern : Ocean, and in the seas == that wash the coast of Asia to the south of = Behring Strait. It is the largestand strongest of all sea-birds. The length of the body is => stated at 4 feet, and the weight at from 15 to 25 Ib. Itsometimes measures as much as 17 feet between the tips of the extended wings, averaging probably from 10 to 12 feet. Its strength of wing is very great. It often accompanies a ship for days—not merely following it, but wheeling in wide circles round it—without ever being observed to alight on the water, and continues its flight, apparently untired, in tempestuous as well as in moderate weather. It has even been said to sleep on the wing, and Moore alludes to this fanciful "cloud-rocked slumbering" in his Fire Worshippers. It feeds on small fish and on the animal refuse that floats on the sea, eating to such excess at times that it is unable to fly, and rests helplessly on the water. The colour of the bird is a dusky white, the back being streaked transversely with black or brown bands, and the wings darker than the rest of the body. The flesh, though hard, dry, and unsavoury, is eaten by the inhabitants of Kamtchatka, who also capture the bird for its entrails, which they inflate for net-floats, and its long wing-bones, which they manufacture into various articles, particularly tobacco-pipes. The albatross lays one egg; it is white, with a few spots, and is about 4 inches long. In breeding-time the bird resorts to solitary island groups, like the Crozet Islands and the elevated Tristan da Cunha, where it has its nest—a natural hollow or a circle of earth roughly scraped together—on the open ground. The early explorers of the great Southern Sea cheered themselves with the companionship of the alba- tross in its dreary solitudes; and the evil hap of him who shot with his cross-bow the bird of good omen is familiar to readers of Coleridge's Rime of the Ancient Mariner,

ALBAY, a town of Luzon, the chief of the Philippine Islands, in 13° 22' N. lat, and 123° 52' E. long. It is the capital of the fertile province of the same

name, and the residence of the governor, and has an active trade. Close to the town is an active volcano by which it has been fre- quently devastated. Population, 13,115.

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ALBERONI, Gru io, cardinal and statesman, was born near Piacenza, probably at the village of Fiorenzuola, on the 3lst May 1664. His father was a gardener, and he himself became first connected with the church in the humble position of verger in the cathcdral of Piacenza. Having gained the favour of Bishop Barni, he took priest's orders, and afterwards accompanied the son of his patron to Rome: During the war of the Spanish succession Alberoni laid the foundation of his political success by the services he rendered to the duke of Vendéme, commander of the French forces in Italy; and when these forces were recalled in 1706, he accompanied the duke to Paris, where le was favourably received by Louis XIV. In 1711 he followed Vendéme into Spain as his secretary. Two years later, the duke having died in the interval, Alberoni was appointed consular agent for Parma at the court of Philip V. of Spain, being raised at the same time to the dignity of count. On his arrival at Madrid he found the Princess des Ursins all but omnipotent with the king, and for a time he judged it expedient to use her influence in carrying out his plans. In concert with her he arranged the king's marriage with Elizabeth Farnese of Parma, whom he represented to be of such a facile disposition that the princess's powcr over Philip would be in no degree impaired by the union. Alberoni was already in Parma to conclude the negotiation ere the Princess des Ursins discovered that he had entirely deceived her as to the character of Elizabcth. A messenger was at once des- patched to prevent, if possible, the ratification of the engagement; but he arrived too late. On reaching Spain Elizabeth's first act, prompted doubtless by Alberoni, was to demand the instant dismissal of the outwitted favourite, who was compelled to leave the Spanish dominions. The influence of the new qucen being actively exerted on Alberoni's behalf, he speedily rose to high position. He was made a member of the king's council, bishop of Malaga, and in 1715 prime minister, and was raised to the dignity of cardinal in 1717. His internal

policy was cxceedingly vigorous, and, though carried out altogether regardless of popular rights and liberties, might have restored the lost greatness of Spain had it not been for his unscrupulous and audacious conduct of foreign affairs. The key to his daring and crafty schemes is probably to be found in the desire of Elizabeth to secure a throne for her son Don Carlos, born in 1716. Scizing the flimsiest pretext for making war upon Austria, he invaded the island of Sar- dinia, then Austrian territory, and took possession of Sicily. In France he pressed the claims of Philip V. to the regency in opposition to the Duke of Orleans; he sought to keep England employed at home by encouraging the Pretender, and he pursued a similar policy towards Austria in connection with Ragotski of Transylvania and the Sultan. An alliance which he formed with Russia and Sweden led to no practical results, and his other schemes similarly failed. England, France, Austria, and Holland united themselves in what is known as the Quadruple Alliance against the aggressions of Spain; and though their first proposals were rejected fearlessly by Alberoni, they were strong enough to succeed when, in a second negotiation, they re- quired of Philip the dismissal of his minister as an indispen- sable condition of peace. On the 5th December 1719 he was ordered to leave Spain, Elizabeth herself having taken an active part in procuring the decree of banishment. He went to Italy, and there had to take refuge among the Apennines, Pope Clement, who was his bitter enemy, having given strict orders for his arrest. On the death of Clement, Alberoni boldly appeared at the Conclave, and took part in the election of Innocent XIII. (1721), after which he was for a short time imprisoned by the

was himself proposed for the papal chair, and secured ten votes at the Conclave which elected Benedict XIII. Bene- dict's successor, Clement XII, named him legate of Ravenna, in which capacity he incurred the pope's dis- pleasure by the strong and unwarrantable measures he adopted to reduce the little republic of San Marino to subjection to Rome. He was consequently replaced by another legate in 1740, and soon after he retired to Pia- cenza, where he founded a college which still bears his name. He died on the 16th June 1752, leaving a sum of 600,000 ducats to endow the seminary he had founded, and the residue of the immense wealth he had

acquired in Spain to his nephew. Alberoni left a large quantity of manuscripts; but the genuineness of the Political Testa- ment, published in his name at Lausanne in 1753, has been questioned.

ALBERT (AuBrecut) I., Duke of Austria, and after- wards King of Germany, born in 1248, was the son of Rudolph of Habsburg, the feunder of the imperial Austrian dynasty. Rudolph having acquired the duchy of Austria by conquest, vested it in his son, with consent of the electors, in 1282, and thus founded the dynasty which still reigns. He also endeavoured to secure for Albert the suc- cession to the throne of Germany, but was unsuccessful. On the death of his father in 1291, Albert seized the in- signia of sovereignty, and with characteristic presumption declared himself king of Germany, without regard to the decision of the electors. Their choice fell (1292) upon Adolphus of Nassau, and Albert, who was called to sup- press a revolt among his subjects in Switzerland, found it necessary to acknowledge the superior claims of his rival. The government of Adolphus having become displeasing to the electors, they formally deposed him in 1298, and named Albert his successor. As, however, the former refused to recognise their verdict, the matter had to be referred to the arbitrament of the sword. The forces of the rival kings met at Gélheim, near Worms, where the army of Adolphus was defeated, and he himself slain by Albert's own hand. Upon this, Albert, wishing probably to show his moderation, resigned his claim to the throne; but he was re-elected, and crowned at Aix-la-Chapelle on the 24th August 1298. Pope Boniface VIIL, however, denied the right of the electors, and refused to confirm their choice, alleging that the empire belonged to him alone to hold or bestow at his pleasure. In league with Philip the Fair of France, Albert at first openly resisted the pope; but soon finding it advisable to change his policy, he deserted his ally, admitted the papal jurisdiction, and was rewarded with the kingdom of the deposed Philip. It should be noted, however, that he never received from the pope the crown of the Roman empire, though his name is generally included in the list of emperors. His reign as king of Germany was one of continual warfare. With a rapacity which seems to have known no bounds, he endea- voured to subdue Holland, Zealand, Friesland, Hungary, and Bohemia; but was in each case unsuccessful. The attempt to bind his yoke more firmly upon the Swiss can- tons caused the revolt of Unterwalden, Schwyz, and Uri, in January 1308, and thus laid the foundation of the Swiss

Confederation. It was while endeavouring to check this revolt that Albert met his death at the hand of his nephew, John of Habsburg, whose claim to his father's dominion of Swabia had been refused in the most insulting terms by the king. Incensed at the denial of his rights, John formed a conspiracy with three noblemen of the king's suite. On the lst May 1308 the four crossed the river Reuss at Windisch with Albert, who was slain immediately on landing, and before the eyes of the other members of the suite, who had been left on the opposite side. He died in

pontiff on the demand of Spain. At the next election he |

| the arms of a beggar woman, who happened to be passing.

ALBERT

Albert was married to Elizabeth, daughter of the count of Tyrol, who bore hin eleven children.

'Four other reigning dukes of Austria bore the name of Aupert. Of these, Albert II., surnamed the Wise, reigned from 1330 to 1358; Albert IIT. from 1365 to 1390; and Albert IV., surnamed the Pious, from 1390 to 1402. Albert V., surnamed "The Magnanimous," born in 1397, was elected king of Germany in April 1438, and is therefore sometimes styled Albert JJ., the higher dignity having been previously borne only by the first of the name. Through his marriage in 1422 with Elizabeth, daughter of Sigismund, king of Bohemia and Hungary, he ultimately added the sovereignty of these dominions to his own, being elected king of Hungary on the death of Sigismund in 1437, and king of Bohemia in May 1438. He died at Jangen-dorf on the 27th October 1439, while engaged in an ex- pedition against the Turks.

ALBERT L., margrave of Brandenburg, surnamed " The Bear," from the heraldic emblem he assumed, born in 1106, was the son of Otto the Rich, count of Ballenstidt, by his marriage with Eilica, eldest daughter of the duke of Saxony. In 1121 he received from the Emperor Lothario the marquisate of Lusatia, to be held in fief, and he served the empire faithfully in the war with Bohemia in 1126. In the following year, from some unknown motive, the emperor conferred the duchy of Saxony, to which Albert, as son

of the eldest daughter of Magnus, had the best claim, upon Henry of Bavaria, sou of a younger daughter; and in 1131 Albert was deprived of Lusatia. He still remained, how- ever, loyal to the empire, and received as a reward the margravate of Brandenburg in 1134. Jn 1136-7 he made incursions into the territory of the Wends, his troublesome neighbours on the north, and succeeded in strengthening his position. In 1138 the Emperor Conrad III. conferred upon him the duchy of Saxony; but finding himself unable to maintain his rights against Henrythe Lion, he betook himself in 1142. to the emperor, who restored Saxony to his rival, and allotted Swabia to him in compensation. A few years later Albert again attacked the Wends, and secured by conquest large accessions of territory, which he held as a fief of the empire. On the extinction of the house of Staden in 1150, Albert was raised to the dignity of an elector. A third expedition against the Wends, under- taken in 1157, ended in their almost total extinction, and Albert caused the depopulated territory to be colonised by industrious agriculturists from the Rhine and the Nether- lands, who greatly improved the face of the country. In 1158 Albert went on a crusade to the Holy Land, in com- pany with his wife, returning the following year. The close of his reign was signalised by another war with Henry of Saxony (1164-8), in which Albert was unsuc- cessful. Immediately on peace being concluded, he abdi- cated in favour of his eldest son; and after two years spent in retirement, he died at Ballenstaédt on the 18th November 1170.

ALBERT, Margrave of Brandenburg and first Duke of Prussia, third son of the Margrave Friedrich of Ans- pach, was born on the 17th May 1490. Being intended for the church, he was educated by Archbishop Hermann of Cologne, and became a canon of Cologne cathedral. He seems, however, to have himself preferred a military life, as he accompanied his father in the train of the emperor on an expedition to Venice, and was present at the siege of Pavia. On the 13th Feb. 1511 he joined the Teutonic order; and a few days after, though scarcely twenty-one years old, was chosen grand master, it being expected that, as nephew of Sigismund of Poland, he would be able to secure the privileges and immunities which the order were at the time claiming from that monarch. The refusal of Albert to swear allegiance to Sigismund led, after pro-

tracted negotiations, which proved fruitless, to a war with Poland in 1520. A four years' truce being concluded at Thorn in 1521, Albert repaired to the diet at Nuremberg to invoke the aid of his brother German princes on behalf of his order. The diet found itself unable to render him any assistance, and at the same time he received advice from Luther which altogether changed his purpose. Eim- bracing the doctrines of the Reformation, he was declared Duke of Prussia, consented to hold the duchy as a fief from Poland, and took the oath of allegiance at Cracow on the 9th April 1525. At the same time he resigned the grand mastership of the order. In 1527 he married Anne Dorothea, daughter of the king of Denmark. His subse- quent reign was marked by zealous efforts, amid many difficulties, to promote the welfare of his duchy. He intcr- ested himself especially in the advancement of learning, inviting men of letters to his court, and promoting the publication of their writings. In 1544 he founded the university of Kénigsberg, in spite of great opposition, chiefly from the pope. Keen theological disputes between the professors of this university were among the many troubles of his later years. He died of the plague on the 20th of March 1568. His second wife, the Princess Anna Maria of Brunswick, who had been attacked by the same disease, survived hiin only a single day.

ALBERT, Cardinal Archbishop of Magdeburg and Elector of Mentz, born 1489, was the youngest son of John, Elector of Brandenburg. In 1513 he was consecrated archbishop of Magdeburg, and about the same time he was chosen administrator of the diocese of Halberstadt. Next year he was raised to the still higher dignity of archbishop and elector of Mentz, and he continued to hold all three offices simultaneously. For the palliwm in connection with the latter appointment the pope demanded the exorbitant sum of 30,000 ducats, but enabled the archbishop to recoup himself by granting him the privilege of selling indulgences throughout his diocese. It was his employment of the Dominican Tetzel in this service which, by calling forth Luther's famous ninety-five theses, had so important an influence on the course of the Reformation. In 1518 he was created a cardinal as a reward for his services to the Romish church. His opposition to the doctrines of Luther did not prevent many within his own diocese from accept- ing the Reformation; and he found it necessary to grant religious liberty to his subjects in 1541, availing himself of the opportunity to extort from them in return for the boon the payment of his debts, which amounted

to 500,000 florins. Albert was a patron of learning, and counted Erasmus among his friends. He died at Mentz on the 24th September 1545.

ALBERT (PRINCE), Francis CHARLES AUGUSTUS ALBERT EMMANUEL, Prince Consort of England, born at Rosenau on the 26th Aug. 1819, was the second son of the hereditary Duke of Saxe-Coburg-Gotha, by his first wife the Princess Louise of Saxe-Gotha-Altenburg. He thus be- longed to the Ernestine or elder branch of the royal family of Saxony, which, on account of its adherence to the doctrines of the Reformation, had to surrender the king- dom to the Albertine or younger branch, which is still in possession of it. The marriage of his parents proving an unhappy one, they separated in 1824, and the young prince never again saw his mother, who died in 1831. He was educated, along with his elder brother Ernest, under the care of Consistorial-Rath Florschiitz, who, in a memoran- dum drawn up after the prince's death, speaks in the highest terms of his pupil's benevolent disposition and studious habits. At the proper age the brothers proceeded to the university of Bonn, where Herr Florschiitz still continued to exercise a general superintendence of their studies. Prince Albert devoted himself especially to the

natural sciences, political economy, and philosophy, having for teachers men of such world-wide fame as Fichte, Schlegel, and Perthes. He also diligently cultivated at this period the sister arts of music and painting, and thus qualified himself for some of the most valuable services he was afterwards to render to the land of his adoption. His feeling for art in all its forms was very sensitive, and his executive skill, both as a musician and painter, very con- siderable. In gymnastic exercises he greatly | excelled, carrying off the first prize for fencing in a competition with a large nuinber of students. ; toh

In 1836 the prince visited England in company with his father, and met his future consort for the first time. The idea of a matrimonial alliance between the cousins had occurred to various members of the family, and had been cherished especially by their grandmother the dowager- duchess of Coburg, and their uncle Leopold, the king of the Belgians. From the time of the queen's accession there seems to have been a family understanding on the

subject, though, owing to the youth of the prince and his cousin, no formal engagement was entered into till two years later. In the winter of 1838-9 the prince travelled in Italy, accompanied by Mr Seymour, a young English gentle- man, who was selected doubtless out of regard to the pro- bable future of his charge. A year later the hopes of many were realised when, on the 23d Nov. 1839, the queen announced to the Privy Council her intended mar- riage with her cousin. The circumstances of the engage- ment have been fully made known since the prince's death, and they show that the union was founded upon mutual choice, springing from mutual affection. On the 10th February 1840 the marriage was celebrated at the chapel-royal, St James's, amid universal rejoicings. A few days before the event two bills had been passed in parliament, one naturalising the prince as a British subject, and the other providing an annuity of £30,000 a year for the maintenance of his establishment. The ministry had proposed that the sum should be £50,000, following the precedent established in the case of Prince Leopold; but the reduction was made on the motion of Colonel Sibthorpe, who received the support of the radicals and the entire opposition, The result of the vote caused the prince con- siderable vexation and disappointment, which were enhanced when difficulties were raised in parliament as to the pre- cedence to be accorded to him. The latter question was only settled by an exercise of the queen's prerogative. Letters patent were issued on the 5th March, giving the prince precedence next to the queen.

The position in which the prince was placed by his marriage, while it was one of distinguished honour, was also one of peculiar difficulty, and it was only the posses- sion of a rare discretion that enabled him to fill it so irreproachably as he did. Published letters and memo- randa show how thoroughly he appreciated the delicate nature of his duties, and how clearly he perceived the limits within which his influence must be confined if it was to be legitimately and usefully exerted. A letter to the Duke of Wellington, declining, after mature considera- tion, to be designated to the office of commander-in-chief of the army, is especially noteworthy as containing an admirable description of the proper functions of a prince- consort. Generally, his idea was that it was his duty to merge his personality as completely as possible in that of the sovereign, while giving her in all things real but unob- trusive advice and support; and that he acted during his

whole life in conformity with this idea those who had the best means of knowing were the readiest to testify. Once, indeed, at the commencement of the Crimean war, it was generally believed that he had overstepped the limits of his position by interfering unwarrantably with the foreign

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policy of the country and the patronage of the army. The charges were so definite and so widely circulated that it was deemed necessary to take notice of them in parlia- ment. They were met by a complete and emphatic denial on the part of the ministry, and no one now believes that they had any real foundation. It was, of course, both natural and proper that the prince should interest himself deeply in the affairs of the country over which, by an Act passed on the 4th Aug. 1840, he had been named regent in the event of the death of the queen before the heir to the crown had attained the age of eighteen years. He had also a right to interest himself in the administration of the army, as being himself a field-arshal and a colonel of hussars,

It was fortunate for the prince, shut out as he was by the circumstances of his station from any share in party politics, that he found other and more congenial work sufficient to engage all his energies. He was qualified, as few of his rank are, to deal with those social and scientific problems in the solution of which men of all parties are equally interested. He engaged himself especially in endea- vours to secure the more perfect application of science and art to manufacturing industry. The Great Exhibition of 1851 originated in a suggestion he threw out at a meeting of the Society of Arts, and owed the greater part of its success to his intelligent and unwearied efforts. Similar institutions, on a smaller scale but with a kindred aim, always found in him warm advocacy and substantial sup- port. It was chiefly at meetings in connection with these that he found occasion for the delivery of addresses cha- racterised by profound thought and comprehensiveness of view, a collection of which was published in 1857. One of the most favourable specimens of his powers as a speaker is the inaugural address which he delivered as President of the British Association for the Advancement of Science when it met at Aberdeen in 1859, printed in an edition of his speeches which appeared in 1862. The

education of his family and the management of his domestic affairs furnished the prince with another very important sphere of action, in which he employed himself with conscientious devotedness. The training of the Prince of Wales was carried on under his own superintendence, in accordance with a plan he himself had drawn up; and it may be questioned whether so much wisdom and care was ever bestowed on the upbringing of an heir to the British throne. The estates of the Duchy of Cornwall, the here- ditary appanage of the Prince of Wales, were so greatly improved under his father's management that the rent-roll rose from £11,000 to £50,000 a year. Prince Albert, indeed, had a peculiar talent for the management of landed estates. His model farm at Windsor was in every way worthy of the name; and the grounds at Balmoral and Osborne, so universally admired, were laid out entirely in conformity with his designs.

A character so pure, anda life so useful and well-directed in all its aims, could scarcely fail to secure universal respect. As the prince became better known, the mistrust, of which the adverse votes in parliament were undoubtedly to some extent an expression, gave way, and the people vied with their queen in showering deserved honours upon him. After a keen contest with Earl Powis, he was elected chan- cellor of the university of Cambridge in 1847; and he was afterwards appointed master of the Trinity House and grand master of the Freemasons in England. In 1857 he received by letters patent the formal title of " Prince- Consort," which was conferred upon him in order to settle certain difficulties as to precedence that had been raised at foreign courts.

It was in the prime of manhood and the full career of his usefulness that the prince-consort was removed by death. He had been greatly occupied during the autumn

of 1861 with the arrangements for the projected interna- tional exhibition, and it was just after rcturning from one

of the meetings in connection with it that he was seized with his last Uness. He died of typhoid fever on the 14th

of Dec. 1861. Few have ever been more sincerely or more universally mourned. The grief of the queen was deep and lasting, and the whole nation sympathised in the truest sense

with her in her sorrow. Perhaps never before, except on the occasion of the death of the Princess Charlotte, had all classes of the people been so closely knit together in the feeling of a common bereavement and a common sorrow.

A national memorial, to be erected partly by parliamentary vote and partly by public subscription, was at once resolved

upon, and nearly every town of importance throughout the kingdom embodied in a statue or some other form its tribute to the memory of 'The Good Prince." nificent mausoleum at Frogmore, in which his remains were finally deposited, was erected at the expense of the Queen and the royal family. (See Zarly Years of H.R.H.

the Prince Consort, 1867; Principal Speeches and Addresses

of Prince Albert, with an Introduction, 1862).

ALBERT NYANZA, a large lake in East Central

Africa, extending from 2° 45' N. lat. at least as far as 2°8. Its surface is 2720 feet above the level of the sea: on its western coast are the Blue Mountains, rising 7000 feet higher ; and on the east a ridge of steep cliffs, with elevations varying from 1500 to 5000 feet. The White Nile, flowing in a north-westerly direction from Lake Victoria Nyanza, enters Lake Albert Nyanza about 2° 15' N. lat., and issues from it near its northern extremity. Messrs Speke and Grant were informed of the existence of this lake by the natives, but Sir Samuel (then Mr) Baker and his wife were the first Europeans who explored it in 1864. (See Arrica and Nixg, and also Sir 8. W.

Baker's The Albert Nyanza, the Great Basin of the Nile, and

Lxplorations of the Nile Sources, 2 vols., London, 186 6). ALBERTI, Leon Bartisra, distinguished as a painter, poet, philosopher, musician, and especially as an architect, was descended from the noble family of the Alberti of Florence. The place and date of his birth are variously given, but it is most probable that he was born at Venice about the year 1404. He was so skilled in Latin verse that a comedy he wrote in his twentieth year, entitled Phalodoxius, deceived the younger Aldus, who edited and published it as the genuine work of Lepidus. In music he was reputed one of the first organists of the age. He held the appointment of canon in the metropolitan church of Florence, and thus had leisure to devote himself to his favourite art. He is generally regarded as one of the restorers of the ancient style of architecture, and has been called by some writers the Florentine Vitruvius. At Rome he was employed by Pope Nicholas V. in the restoration of the papal palace and of the fountain of Acqua Vergine, and in the ornamentation of the fountain of the Piazza de Trevi. At Rimini he designed the celebrated church of San Francesco, which is generally esteemed his finest work, On a commission from Rucellai, he designed the principal facade of the church of Santa Maria Novella in Florence, as well as the family palace in the Via della Scala, now known as the Palazzo Strozzi. In Mantua he was employed by the Marchese Ludovico Gonzaga to design several buildings, the most important being the church of Sant' Andrea. Alberti wrote works on sculp- ture, Della Statua, and on painting, De Pictura, which are highly esteemed ; but his most celebrated treatise is that on architecture, De Re 4idificatoria, which has been translated into Italian, French, Spanish, and English. A

splendid edition of this work in English and Italian, by

Leoni, (was published at London in 17 26, in 3 vols. folio. Alberti, being of an amiable and generous disposition, was

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highly esteemed by his contemporaries. He died at Rome in 1472, or, according to others, in 1484.

ALBERTRANDY, Jan Curzocrciet, or Joun CHRISTIAN, historian, was born at Warsaw in 1731, his father being an Italian. Educated in the public school of the J esuits, he joined their order in his fifteenth year, and gave such proof of his ability that, at the early age of nineteen, he was appointed professor at the college of Pultusk. After having successively filled similar positions in Plock, Nieswiez, and Wilna, he became, in 17 66, librarian to Bishop Zaluski, who designed to make his extensive col- lection of books available to the public. A detailed catalogue of the 200,000 volumes which it contained was accordingly prepared by Albertrandy. In 1764 he was chosen by the primate Lubienski tutor to his grandson, Count Felix Lubienski, afterwards minister of justice. In this capacity he visited Italy in 1770 with his pupil, residing first at Siena and then at Rome. The preference Lubienski showed for numismatics induced Albertrandy to devote himself while in Italy to the special study of that science, and he was soon recognised as an authority on the subject. When he returned to his native country, King Stanislaus Augustus appointed him, at the request of Lubienski, keeper of his medals, and afterwards his reader and librarian, The representations he made to the king as to the extent and value of the materials for Polish history that were scattered throughout the libraries of Rome, induced Stanislaus to send him on a second visit to Italy, in order that he might collect these materials. He arrived at Rome in 1782, and devoted three years to the task. The Lacerpta, all written with his own hand, filled 110 volumes of manuscript. To complete the collection, he subsequently visited Sweden, where the difficulty of the work was greatly increased by his being forbidden to copy any portions of the books or manuscripts he consulted, An excellent memory, however, enabled him in great measure to overcome the difficulty ; and from the libraries of Stockholm and Upsala he made extracts which increased the entire collection to 200 volumes. In recognition of his merit the king bestowed on him the bishopric of Zenopolis. He was the first president of the Royal Society of the Friends of Science in Warsaw, and took a large share in its proceedings up to the time of his death, which occurred on the 10th August 1808.

ALBERTUS MAGNUS, a celebrated scholastic philo- sopher, was born of the noble family Von Bollstidt at Lauingen in Suabia. The date of his birth is most pro- bably 1193. He was educated principally at Padua, where he

received particular instruction in Aristotle's writings. In 1223 he became a member of the Dominican order, and studied theology under its rules at Bologna and else- where. Selected to fill the position of lecturer at Cologne, where the order had a house, he taught for several years there, at Regensburg, Freiburg, Strasburg, and Hildesheim. In 1245 he repaired to Paris and received his doctorate, teaching for some time, in accordance with the regulations, and with great success. In 1254 he was made provincial of his order, and fulfilled the arduous duties of the office with great care and effectiveness. During the time he held this office he publicly defended the Dominicans against the university of Paris, commented on St John, and answered the errors of the Arabian philosopher, Averroes. In 1259 the pope made him bishop of Regensburg, which office he resigned after three years. The remainder of his life he spent partly in preaching throughout Bavaria and the adjoining districts, partly in retirement in the various houses of his order; almost the last of his labours was the defence of the orthodoxy of his former pupil, Thomas Aquinas. He died in 1280, aged 87. Albert's works, published in twenty-one folios by the Dominican Peter

Jammy in 1651, sufficiently attest his great activity. He was the most widely read and most learned man of his time. The whole of Aristotle's works, presented in the Latin translations and notes of the Arabian commentators, were by him digested, interpreted, and systematised in accordance with church doctrine. Albert's activity, how- ever, is rather philosophical than theological, for while pressing philosophy in general, and Aristotle in particular, into the service of theology, he excludes from what belongs to the natural reason all that is specially biblical, as, ¢.g., miracles, the atonement, and the Trinity ; though he does not refuse to see with Augustin exemplifications, shadow- ings, of the latter doctrine even in nature. The philosophical works occupying the first six and the last of the twenty- one volumes are generally divided according to the Aristotelian scheme of the sciences, and consist of inter- pretations and condensations of Aristotle's relative works, with supplementary discussions depending on the questions then agitated, and occasionally divergences from the opinions of the master. In logic, he attempts to unite the three rival theories of universals, holding

that uni- versals cxist in three ways—(1.) Ante res, as ideas in the mind of God, from which the class is modelled, and which thereforc exist before individual things ; (2.) In rebus, as the common basis in a class of individual objects; (3.) Post res, as the mental notion of the class. In the nieta- physical and physical treatises hc mainly repeats Aristotle, differing from him as regards the cternity of the world and the definition of the soul. His principal theological works are a commentary in three volumes on the Looks of the Sentences of Peter Lombard (Magister Sententiarum), and the Summa Theologie, in two volumes. This last is in substance a repetition of the first in a more didactic form. Albert's knowledge of physical science was consider- able, and for the age accurate. His industry in every de- partment was great, and though we find in his system many of those inner gaps from which no scholastic philosophy was ever free, yet the protracted study of Aristotle gave him a great power of systematic thought and exposition, and the results of that study, as left to us, by no means warrant the contemptuous title sometimes given him—the " Ape of Aristotle." They rather lead us to appreciate the motives which caused his contemporaries to bestow on him the honourable surname " The Great," and the no less honour- able title, " Doctor Universalis." For Albert's life the best authorities are Sighart, Albertus Magnus, sein Leben und seine Wissenschaft, 1857 ; and D'Assailly, Albert le Grand, 1870. The most comprehensive surveys of his philosophy are those of Stéckl, Geschichte d. Scholastischen Philosophie, and, in smallcr compass, Erdmann, Grundriss d. Ges. d. Phil., vol. i. Hauréau, Ritter, and Prantl may also be referred to.

ALBI, a city of France, capital of the department of the Tarn, is situated on the river Tarn, 41 miles N.E. of Toulouse. It is a place of great antiquity, and was a stronghold of the early French Protestants, giving its name to the Albigenses. It is the seat of an archbishop, and has a chamber of commerce and a public library of 12,000 volumes. The cathedral, dedicated to St Cecilia, is a magnificent Gothic edifice, in the style of the 13th century, and has one of the finest choirs in France. Here there is a very valuable silver shrine, of exquisite mosaic work, containing the relics of St Clair, the first bishop of the see. The environs are charming, and the promenade of La Lice, without the city, is a beautiful terrace bordered with two rows of very fine trees. At one end is the con- vent of the Dominicans. Albi has woollen and linen manufactures ; coal, iron, and copper are wrought in the vicinity ;

and the surrounding district is very fertile, pro- ducing much grain and fruit. Population (1872), 17,469.

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ALBIGENSES, a sect opposed to the Church of Rome, which derives its name from Albiga (the modern Albi, noticed above), either because its doctrines were ex- pressly condemned at a council held there, or, more pro- bably, because its adherents were to be found in great numbers in that town and its neighbourhood. The Albi- genses were kindred in origin and more or less similar in doctrine to the sects known in Italy as Paterins, in Germany as Catharists, and in France as Bulgarians, but they are not to be entirely identified with any of these. Still less ought they to be confounded, as has frequently been the case, with the Waldenses, who first appear at a later period in history, and are materially different in their doctrinal views. The descent of the Albigenses may be traced with tolerable distinctness from the Paulicians, a sect that sprang into existence in the Eastern Church during the 6th century. (See Pauuicrans.) The Paulicians were Gnostics, and were accused by their enemies and persecutors of holding Manichzean doctrines, which, it is said, they vehemently disowned. Their creed, whatever it was pre- cisely, spread gradually westward through Europe. In the 9th century it found many adherents in Bulgaria, and 300 years later it was maintained and defended, though not without important modifications, by the Albigenses in the south of France. The attempt to discover the precise doc- trinal opinions held by the Albigenses is attended with a double difficulty. No formal creed or definite doctrinal statement framed by themselves exists, and in default of this it is impossible to depend on the representations of their views given by their opponents in the Church of Rome, who did not scruple to exaggerate and distort the opinions held by those whom they had branded as heretics. It is probably impossible now to determine accurately what is true and what is false in these representations. It seems almost certain, however, that the bond which united the Albigenses was not so much a positive fully-developed religious faith as a determined opposition to the Church of Rome. They inherited indeed, as has been already said, certain doctrines of eastern origin, such as the Manichean dualism, docetism in relation to the person of Christ, and a theory of metempsychosis. They seem, like the Manichees, to have disowned the

authority of the Old Testament; and the division of their adherents into perfecti and credentes is similar to the Manichzan distinction between electa and auditores. The statement that they rejected marriage, often made by Roman Catholics, has probably no other foundation in fact than that they denied that marriage was a sacrament; and many other statements as to their doctrine and practice must be received at least with suspicion as coming from prejudiced and implacable opponents. The history of the Albigenses may be said to be written in blood. At first the church was content to condemn their errors at various councils (1165, 1176, 1178, 1179), but as their practical opposition to Rome became stronger, more decided measures were taken. Innocent III. had scarcely ascended the papal throne when he sent legates to Toulouse (1198) to endeavour to suppress the sect. 'Two Cistercians, Guy and Regnier, were first commissioned, and in 1199 they were joined by Peter of Castelnau and others, who were known throughout the district as inquisitors. Ray- mond VI., count of Toulouse, took the part of his Albi- gensian subjects, though not himself belonging to the sect, and for this he was excommunicated in 1207. A year later the pope found a pretext for resorting to the most extreme measures in the assassination of his legate Peter of Castelnau, Jan. 15, 1208. A crusade against the Albigenses was at once ordered, and Raymond, who had meanwhile submitted and done penance, was forced to take the field against his own subjects. The bloody war of extermina tion which followed has scarcely a parallel in history. As

town after town was taken, the inhabitants were put to the sword without distinction of age or sex, and the numerous ecclesiastics who were in the army especially distinguished themselves by a bloodthirsty ferocity. At the taking of Beziers (July 22, 1209), the Abbot Arnold, being asked how the heretics were to be distinguished from the faithful, made the infamous reply, "Slay all; God will know his own." The war was carried on under the command of Simon de Montfort with undiminished cruelty for a num- ber of years. Raymond's nephew, Viscount Raymond Roger, who had espoused the cause of the Albigenses, was taken prisoner at Carcassonc, and the sect became fewer in numbers year by year. The establishment of an In-

quisition at Languedoc in 1229 accelerated the exterminat- ing process, and a few years later the sect was all but extinct.

ALBINO. The name Albinism, or Leucopathia, is ap- plied to a remarkable peculiarity in the physical constitu- tion of certain individuals, which consists in the skin and hair being perfectly white. The earliest accounts we have of it refer to its being observed among the negrocs of West Africa by the Portuguese, who called the persons so affected Albinoes, They have also been called Leuccethiopes, '.c., white negroes. Albinism is most common and most marked in the negro and Indian races, but it occurs in all parts of the world and among all the varieties of the human race. The appearance ariscs from the absence of the minute particles of colouring matter which ordinarily occur in the lowest and last-deposited layers of the epidermis or outer skin, and to the presence of which the skin owes its colour. With very rare exceptions, it affects the entire body, and continues through life. The skin of the albino is of a dull milky or pearly colour, unrelieved by the slightest tint of red or brown, and is generally of rough texture. All the hair on the body is of the same dull hue, and is commonly soft and silky. Another peculiarity that invariably accompanies this whiteness of skin and hair is an affection of the eyes: the pupil is a bright red, and the iris (or white of the eye) that surrounds it is of a pale rose colour. This redness is attributable to the absence of a colouring matter, the pigmentum nigrum of the membrane of the eye, which serves to protect the retina. In conse- quence of this defect, the eye of an albino cannot bear a strong light. Albinism is hercditary in the same limited degree as blindness, deafness, &c. See on this Darwin's Variation of Animals and Plants under Domestication (chap. xii.), where mention is made that "two brothers married two sisters, their first cousins, none of the four nor any relation heing an albino; but the seven children pro- duced from this double marriage were all perfect albinoes." Apart from the peculiarities mentioned above, there is no distinction between albinoes and other men. Albinism is not to be regarded as a diseased condition of body; and the idea, once entertained, that it is accompanied with a want of physical and mental vigour is now completely ex- ploded. Probably this notion arose from some of the albinoes whose condition was first described being unhealthy or imbecile; and even still more (as the interesting account of Saussure, Voyages dans les Alpes, 1787 , Suggests) from the temptation to which, as natural curiosities, they were exposed to

live in indolence without exerting their natural powers. In many species of animals albinism occurs, ?.¢., an abnormal whiteness of the skin, hair, feathers, &c., due to similar causes as in the human albino, but not so uni- formly permanent. Of this, white hares, mice, blackbirds, &c., are instances. White elephants are regarded with particular veneration by some eastern nations.

ALBINUS (originally Weiss), BERNARD SIEGFRIED, a celebrated anatomist, born in 1697 at Frankfort-on- the-Oder, where his father was professor of the practice of

medicine. In 1702 the latter was transferred to a pro- fessorship at Leyden, and it was there that Bernard Siegfried commenced his studies, having for his teachers such men as Boérhaave, Bidloo, and Rau. His great ability, especially in surgery and anatomy, was early recognised, and Rau, so justly celebrated as a lithotomist, is said to have seldom performed an important operation without inviting him to be present. Having finished his studies at Leyden, he went to Paris, where, under the instruction of Vaillant, Winslow, and others, he devoted himself especially to anatomy and botany. After a year's absence, he was, on the recommendation of Boérhaave, recalled in 1719 to Leyden to be a lecturer on anatomy and surgery. Two years later he succeeded his father in the professorship of these subjects, and delivered an address at his installation which was received with uni- versal approbation. Albinus speedily became one of the most famous teachers of anatomy in Europe, his class- room being resorted to not only by students, but by many practising physicians. With little original genius, and no special talent for exposition, he possessed those habits of accurate observation and patient research which are the best qualification for his department of study. The en- gravings of bones and muscles executed by Wandelaar for the treatise of Albinus on these organs were far superior in clearness and exactness to anything that had previously been produced. In 1745 Albinus was appointed professor of the practice of medicine, being succeeded in the anato- mical chair by his brother Frederick Bernard, who, as well as another brother, Christian Bernard, attaincd consider- able distinction. Bernard Siegfried was twice rector of his university, dnd was an associate of the learned

societies of London, St Petersburg, and Haarlem. He died on the 9th September 1770.

ALBINUS, Fraccus. See ALcurn.

ALBOIN, a king of the. Lombards, who invaded Italy, 568 a.p. He was murdered at Verona on the 8th June 573. See Iraty and Lomsarps.

ALBORNOZ, Git Atvarez CARILLo DE, a cardinal of Spain, was born at Cuenca early in the 14th century, and was related to the royal families of Leon and Arragon. While still young he was appointed archbishop of Toledo by Alfonso XI. of Castile. Uniting, as many in that age did, the exercise of the military with that of the clerical profession, he was able to show his gratitude to his patron by saving the king's life at the battle of Tarifa in 1340. He conducted the siege of Algeciras in 1343, when the king dubbed him a knight. Falling into disfavour with Pedro the Cruel, whose licentious life he had rebuked, he fled to Avignon, then the papal seat, and was soon after- wards made a cardinal by Pope Clement VI. In 1353 Innocent VI. sent him as a legate into Italy, with a view to the restoration of the papal authority in the States of the Church. He was recalled in 1357, but was sent again to Italy after a brief interval; and in 1362 had paved the way for the return of Urban V. to Rome. As a mark of gratitude, the pope appointed him legate at Bologna in 1367, but he died at Viterbo the same year. According to his own desire, his remains were carried to Toledo, where Henry of Castile caused them to be entombed with almost royal honours. A work by Albornoz on the con- stitution of the Church of Rome, first printed at Jesi in 1473, is now very rare. The college of St Clement at Bologna was founded by Albornoz.

ALBRECHTSBERGER, Jouann Grore, a celebrated musician, born at Kloster-Neuburg, near Vienna, on the 3d February 1736. He studied musical composition under the court organist, Mann, and became one of the most learned and skilful contrapuntists of his age. After being employed as organist at Raab and Maria-Taferl, he was

appointed in 1772 organist to the court of Vienna, and in 1792 kapellmeister of St Stephen's cathedral. His fame as a thcorist attracted to him in the Austrian capital a large number of pupils, some of whom afterwards became eminent musicians. Among these were Beethoven, Hummel, Moscheles, Seyfried, and Weigl. Albrechtsberger died in 1809. His published compositions consist of pre- ludes, fugues, and sonatas for the piano and organ, string quartettes, &c.; but the greater proportion of his works, vocal and instrumental, exist only in manuscript, and are in the possession of Prince Esterhazy. Probably the most valuable service he rendered to music was in his theoretical works, which to a great extent superseded earlier treatises, and are still standard authorities. In 1790 he published at Leipsic a treatise on composition, of which a third edition appeared in 1821. A collection of his writings on harmony, in three volumes, was published under the care of his pupil Seyfried in 1826. The English translation of the latter is from a French version, and not from the original.

ALBUERA, a small village of Spain, in the province of Badajoz, 13 miles S.E. of the town of that name. It is celebrated on account of the victory gained there on the 16th of May 1811 by the English, Portuguese, and Spaniards, under Marshal Beresford, over the French army commanded by Maishal Soult

ALBUFERA DE VALENCIA, a lagoon, 7 miles south of Valencia in Spain, about 12 miles in length and 4 in breadth, 12 feet being its greatest depth. It communi- cates with the sea by a narrow outlet, which can be opened or closed at pleasure. The Jake is crown property, and is of great value from the fish and wild fowl with which it abounds. In 1812 Marshal Suchet was created duke of Albufera by Napoleon for his conquest of Valencia, and invested with the domain; but the battle of Vitoria soon deprived him of his possession, though he still re- tained the title. Subsequently the revenues of Albufera were conferred upon the Duke of Wellington, in token of the gratitude of the Spanish nation.

ALBUM (albus, white), originally denoted a tablet on which decrees, edicts, and other public notices were inscribed in ancient Rome. It was so called probably because the tablet was made of white or whitened material,

though some authorities say that the inscription was in white characters. The Pontifex Maximus wrote his annals (Annales Maximi) upon an album. In course of time the term came to be restricted almost exclusively to lists of official names. Such were the Album Judicum, Album Senatorum, Album Decurionum, Album Centurie. In modern times album denotes a book in which verses, auto- graphs, sketches, photographs, é&c., are collected. It is also applied to the official list of matriculated students in a university, and to the roll in which a bishop inscribes the names of his clergy.

ALBUMAZAR (Asu-Maascuar), a celebrated Arabian astronomer, born at Balkh, in Turkestan, in 805 «.D., died at Wasid in 885. He had reached the age of forty- seven before he entered on the studies to which he owes his fame. His principal works are An Introduction to Astronomy aud the Book of Conjunction, both published in a Latin translation at Augsburg in 1489, and again at Venice in 1515. A work On the Revolution of the Years is also attributed to him, in which it is maintained that the world was created when the seven planets were in con- junction in the first degree of Aries, and that it will come to an end at a like conjunction in the last degree of Pisces.

ALBUMEN, an organic substance of a very complicated structure. It is typical of a group of bodies that have

the same chemical composition but very different pro-

perties. The principal varieties are named albumen,

fibrin, and casein. They are sometimes called the histo- genetic bodies, because they are essential to the building up of the animal organism. The vegetable kingdom is the original source of the albumenoid group of substances. In plants the albumen is found in greatest quantity in the seed. The mean average percentage composition of the albumenoids is as follows —

Wambo cecic sso heer ee eee 53°8 ENG OBEN | isa.cc.ccuseus- sescesscnteceece chee ates 7°0 INNGRORE 1. 2c:ccnsnencenssen aannsokceu wen nesacen seeteeeee se 15°7 SSETIEED «ns sascsnieaee ate

coeedertce te meee eo ares 1:2 LO 9713 11, Ben sa eee ROR OaCBR Srarnodd acoonsocosccacuseeaaadd 22°3

160°0

The true chemical formula of these bodies is unknown, but if we regard the sulphur as replacing oxygen, then the simplest empirical formula is C,,H,,.N,O,.

All the albumenoid bodies are capable of existing in two forms—(q) soluble, (6) insoluble. They belong to the class of bodies called colloids, and easily pass from the one con- dition into the other. Whether in the soluble or insoluble condition, they are easily dissolved by caustic potash, and may be precipitated by the addition of' acetic acid. The soluble varieties are coagulated by alcohol, and precipitated by salts of copper, lead, and mercury. Strong sulphuric acid dissolves them, with the production of leucine, tyrosine, and ammoniacal salts. Strong nitric acid produces in their solutions a coagulum of a bright orange colour, and then gradually dissolves it with effervescence. A solution of nitrate of mercury, when heated with the members of the group, produces a deep red colour, and this is one of the most delicate tests. Some varieties of albumen coagulate when heated. All the albumenoid bodies are amorphous, and may be kept when dry for any length of time, but when moist they rapidly putrefy, and produce a sickening odour. Among the products of putrefaction are found leucine and tyrosine, and carbonate, butyrate, valerate, and sulphide of ammonium. The readi- ness with which these bodies change in the moist con- dition produces the digestive and other ferments in the body, and the synaptase, diastase, and emulsin which we find in plants. The special properties of albumen, fibrin, and casein will be described in the article CHEMisTRY. From its property of coagulating when heated, albumen is employed in the arts to remove colouring matters from liquids.

ALBUQUERQUE, a town of Spain, in the province of Badajoz, 9 miles from the frontiers of Portugal. Situated on an eminence, it is defended by an almost impregnable fortress built on a high mountain. It was taken by the allies of Charles, at that time a competitor for the Spanish throne, in 1705, but was restored to the Spanish crown in 1715. It has woollen and linen manufactures, and exports cattle and fruits. Population, 7000.

ALBUQUERQUE, AtpHonso p' (in Portuguese Afonso d' Alboquerque), surnamed 'The Great," and "The Portu- guese Mars," was born in 1453 at Alexandria, near Lisbon. Through his father, Gonzalvo, who held an important position at court, he was connected by illegitimate descent with the royal family of Portugal, and through his mother, Dona Leonora de Menezes, he could claim kindred with Zarco and other illustrious navigators. He was educated at the court of Alphonso V., and after the death of that monarch seems to have served for some time in Africa. On his return he was appointed estribeiro-mor (chief equerry) to Joio II. In 1503 he set out on his first expe dition to the East, which was to be the scene of his future triumphs. In company with his kinsman Francisco he sailed round the Cape of Good Hope to India, and suc- ceeded in establishing the king of Cochin securely on his throne, obtaining in return for this service pet mission to build a Portuguese fort at Cochin, and thus

laying the foundation of his country's empire in the East. He returned home in July 1504, and was well received by King Emmanuel, who entrusted hin with the command of a squadron of five vessels in the fleet of sixteen which sailed for India in 1506 under Tristan da Cunha. After a series of successful-attacks on the Moorish cities on the east coast of Africa, Albuquerque separated from Da Cunha, and sailed with his squadron against the island of Ormuz, in the Persian Gulf, which was then one of the chief centres of commerce in the East. He arrived on the 25th September 1507, and soon obtained possession of the island, though he was unable long to maintain his position. With his squadron increased by three vessels, he reached the Malabar coast at the close of the year 1508, and im- mediately made known the commission he had received from the king empowering him to supersede the governor Almeida. The latter, however, refused to recognise Albu- querque's credentials, and cast him into prison, from which he was only released, after three months' confinement, on the arrival of the grand marshal of Portugal with a large fleet. Almeida having returned home, Albuquerque speedily showed the energy and determination of his character. An unsuccessful attack upon Calicut in Janu- ary 1510, in which the commander-in-chief received a severe wound, was immediately followed by the investment and capture of Goa. Albuquerque, finding

himself unable to hold the town on his first occupation, abandoned it in August, to return with reinforcements in November, when he obtained undisputed possession. He next directed his forces against Malacca, which he subdued after a severe struggle. He remained in the town nearly a year in order to strengthen the position of the Portuguese power. In 1512 he sailed for the coast of Malabar. On the voyage a violent storm arose, Albuquerque's vessel, the ' Flor de la Mar," which carried the treasure he had amassed in his conquests, was wrecked, and he himself barely escaped with his life. In September of the same year he arrived at Goa, where he quickly suppressed a serious revolt headed by Idalcan, and took such measures for the security and peace of the town that it became the most flourishing of the Portuguese settlements in India. Albuquerque had been for some time under orders from the home government to undertake an expedition to the Red Sea, in order to secure that channel of communication exclu- sively to Portugal. He accordingly laid siege to Aden in 1513, but was repulsed ; and a voyage into the Red Sea, the first ever made by a European fleet, led to no sub- stantial results. In order to destroy the power of Egypt, he is said to have entertained the idea of diverting the course of the Nile, and so rendering the whole country barren. His last warlike undertaking was a second attack upon Ormuz in 1515. The island yielded to him without resistance, and it remained in the possession of the Portu- guese until 1622. Albuquerque's great career had a pain- ful and ignominious close. He had several enemies at the Portuguese court who lost no opportunity of stirring up the jealousy of the king against him, and his own injudicious and arbitrary conduct on several occasions served their end only too well. On his return from Ormuz, at the entrance of the harbour of Goa, he met a vessel from Europe bearing despatches announcing that he was superseded by his personal enemy Soarez. The blow was too much for him, and he died at sea on the 16th December 1515. Before his death he wrote a letter to the king in dignified and affecting terms, vindicating his conduct and claiming for his son the honours and rewards that were justly due to himself. His body was buried at Goa in the Church of Our Lady, and it is per- haps the most convincing proof possible of the justice of his administration, that, many years after, Moors and

Hindoos used to go to his tomb to invoke protection against the injustice of his successors. The king of Por- tugal was convinced too late of his fidelity,

and endeav- oured to atone for the ingratitude with which he had treated him by heaping honours upon his natural son Affonso. The latter published a selection from his father's papers, under the title Commentarios do Grande Affonso @ Alboquerque.

ALCAEUS, one of the great lyric poets of Greece, was a native of Mitylene in Lesbos, and flourished about the year 600 B.c. From the fragments of his poems which have come down to us we learn that his life was greatly mixed up with the political disputes and internal feuds of his native city. He sided with the nobles, and took an active part against the tyrants, who at that time set themselves up in Mitylene. He was obliged, in conse- quence, to quit his native country, and spend the rest of his life in exile. The date of his death is unknown. His poems, which were composed in the Molian dialect, were collected afterwards, and apparently divided into ten books. The subjects, as we can still see from the frag- ments, were of the most varied kind: some of his poems were hymns to the gods; others were of a martial or political character ; others again breathed an ardent love of liberty and hatred of the tyrants ; and lastly, some were of an erotic kind, and appear to have been particularly remarkable for the fervour of the passion they described. Horace looks upon Alczeus as his great model, and has, in one passage (Od. ii. 13. 26, e sqq.) given a fine picture of the poetical powers of the Molian bard. The care which Alczeus bestowed upon the construction of his verses was probably the reason why one kind of metre, the Alcaic, was named after him. Not one of his compositions has come down to us entire, but a complete collection of all the extant fragments may be found in Bergk's Poete Lyrict Greci, Lipsize, 1852, 8vo.

ALCAICS, in Ancient Poetry, a name given to several kinds of verse, from Alczus, their reputed inventor. The first kind consists of five feet, viz., a spondee or iambic, an iambic, a long syllable, and two dactyles ; the second of two dactyles and two trochees. Besides these, which are called dactylic Alcaics, there is another, simply styled Alcaic, consisting of an epitrite, two choriambi, and a bacchius ; thus— ;

Cur timet flajvum Tiberim | tangere, cur | olivum?

The Alcaic ode is composed of several strophes, each con- sisting of four verses; the first two of which are always alcaics of the first kind; the third

verse is an iambic diameter hypercatalectic, consisting of four feet and a long syllable; and the fourth verse is an alcaic of the second kind. The following strophe is of this species, which Horace calls " Alewt minaces camenee"—

Non possidentem multa vocaverts

- *Recte beatum; rectius occupat*

Nomen beati, qui deorwm Muneribus sapienter uti.

ALCAIDE, or Aucaypz, a word of Moorish origin, being derived from the Arabic kdda, to head, which was applied by the Spanish, the Portuguese, and the Moors to the military officer appointed to take charge of a fortress or prison. See ALCALDE.

ALCALA DE GUADAIRA, a town of Spain, in the province of Seville, Andalusia, situated on the Guadaira, 7 miles E. of Seville. It contains an old castle and other Moorish remains ; but it is now chiefly remarkable for the excellent quality of its bread, whence the epithet de los Panaderos, sometimes applied to it. Nearly the whole of the bread required by the town of Seville is made here.

Population, 7000. I.— 58

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ALCALA DE HENARES, an ancient Spanish city on the river Henares, 17 miles E.N.E. of Madrid. It has been identified with the Roman Complutwm, which was destroyed about the year 1000, and was rebuilt by the Moors in 1083. In later times it was renowned for its richly-endowed university, founded by Cardinal Ximenes in 1510, which, at the height of its prosperity, nunibered more than 10,000 students, and was second only to that of Salamanca. Here the famous edition of the Holy Bible known as the Complutensian Polyglot was prepared. The college of St Ildefonso contains a magnificent chapel, in which Ximenes is buried, and is distinguished by its splendid architecture, partly Moorish and partly Gothic. Alcala is further celebrated as the birthplace of the Ger- man emperor Ferdinand I.,

the poet Figueroa, the naturalist Bustamente de la Camera, the historian Solis, and last and greatest of all, Cervantes, who was born here in 1547. Since the removal of the university to Madrid in 1836 the town has rapidly declined. It contains a military academy and various public institutions, but is of little commercial importance. Population, 8745.

ALCALA LA REAL, a town of the province of Jaen in Spain, 18 miles 8.W. of the town of that name. It stands on a declivity between two mountain ridges, at an elevation of about 3000 feet above the sea. It possesses a fine abbey. Its distinctive name la Real, the Royal, is derived from its capture in 1340 by Alphonso XI. of Leon, in person. In 1810 the Spaniards were defeated here by the French uuder Sebastiani. Some trade is carried on at the place in wine and wool. Population, 11,521.

ALCALDE (from the Arabic al-cadi, the judge), an official title given in Spain to various classes of functionaries entrusted with judicial dutics. Criminal judges, members of courts of appeal, magistrates, and even parish officers are all known by the name alcalde—secondary descriptive titles distinguishing their different positions and functions. It is to be observed that the word is entirely distinct from Alcaide, the latter being always employed to designate a military officer.

ALCAMENES (’AAxaperys), a famous Athenian sculp- tor, a pupil of Phidias, who is celebrated for his skill in art by Cicero, Pliny, Pausanias, Lucan, &e. He flourished from about 448 to 400 B.c., and appears as one of the great triumvirate of Greek sculptors, Phidias, Alcamenes, and Polycletus. He is said to have once competed with his master, the subject being a statue of Minerva. In this attempt the style of Aleamenes was exquisite in finish, but he had overlooked the consideration that the statue was to be placed on a high column, and there his work would not bear comparison with that of his great master. His statue of Venus Urania, in the temple of that deity at Athens, was reckoned his masterpiece.

ALCAMO, a city of Sicily, in the Italian province of Trapani, is situated 22 miles E. of Trapani, near the Gulf of Castellamare. It lies in a district of peculiar fertility, which produces some of the best wines in the island. The town is pleasantly situated on elevated ground, but its internal appearance is mean and dirty. It contains a very strong castle, and many churches and

monasteries. Near it are the ruins of the ancient Segesta, including a Doric temple and a theatre in good preservation; and there are also on the neighbouring hill Moorish towers and other remaius, standing as memorials of the Saracen occupation of Sicily. Population (1865), 19,518.

ALCANTARA, the ancient Morba Caesarea, a town of Spain, in the province of Caceres, on a rocky height on the left bank of the Tagus. Alcantara (in Arabic, the bridge) derived its name from the magnificent Roman bridge which spanned the Tagus at this point, and which was erected, according to the inscription, a.p. 104, in

honour of the emperor Trajan, who was a native of Spain. This remarkable structure is built entirely of blocks of granite without cement, and consisted, until its partial destruction, of six arches of various span, with a total length of 670 feet and a height of 210 feet. The second arch on the right bank was blown up by the English in 1809, and, although temporarily reconstructed, was again destroyed in 1836 to prevent the passage of the Carlist troops. The bridge has never since been repaired; and it is a striking illustration of the want of public spirit in Spain that the river is crossed by means of a ferry-boat in the neighbourhood of this grand engineering work, which it is a national duty to preserve. The population of the town is 4200.

ALCANTARA, a seaport of Brazil, in the province of Maranhao, on the bay of San Marcos. It has a tolerable harbour; and excellent cotton is grown in the vicinity, forming the chief article of commerce. Rice and salt, obtained from the neighbouring lagoons, are also exported. Population, 10,000.

ALCANTARA, Knicuts or (la Caballeria de Alcan- tara), an order of knights of Spain, instituted about 1156 A.D. by the brothers Don Suarez and Don Gomez de Bar- rientos for protection against the Moors. In 1177 they were confirmed as a religious order of knighthood under Bene- dictine rule by Pope Alexander III. Until about 1213 they were known as the Knights of San Julian del Pereyro; but when the defence of Alcantara, newly wrested from the Moors by Alphonso IX. of Castile, was entrusted to them, they took their name from that city. For a con- siderable time they were in some' degree subject to the grand master of the kindred order of Calatrava. Ulti-

mately, however, they asserted their independence by electing a grand master of their own, the first holder of the office being Don Diego Sanche. During the rule of thirty-seven successive grand masters, similarly chosen, the influence and wealth of the order gradually increased until the Knights of Alcantara were almost as powerful as the sovereign. In 1494-5 Juan de Zufiiga was prevailed upon to resign the grand mastership to Ferdinand, who thereupon vested it, as he had already done that of two other orders, in his own person as king; and this arrangement was ratified by a bull of Pope Alexander VI., and was declared permanent by Pope Adrian VI. in 1523. The yearly income of Zuiiga at the time of his resignation amounted to 150,000 ducats. In 1540 Pope Paul III. released the knights from the strictness of Benedictine rule by giving them permission to marry, though second marriage was forbidden. The three vows were henceforth obedientia, castitas conjugalis, and conversio morum. In modern times the history of the order has been somewhat chequered. When Joseph Bonaparte became king of Spain in 1808, he deprived the knights of their revenues, which were only partially recovered on the restoration of Ferdinand VII. in 1814. The order ceased to exist as a spiritual body in 1835, though it is sti]l recognised in its civil capacity.

ALCARAZ, a small town in Spain, in the province of Albacete, 34 miles W.S.W. of the town of that name. It stands on very hilly ground near the river Guadarmena, and has the remains of a once strong castle and of a mag- nificent Roman aqueduct. Weaving, iron-founding, and agriculture are the chief branches of industry. Copper and zine are found in the vicinity. Population, 7325.

ALCAVALA, a duty formerly charged in Spain and its colonies on all transfers of property, whether public or private. It was originallyimposed by Alphonso XI. to secure freedom from the Moors in 1341, as an ad valorem tax of 10, increased afterwards to 14 per cent., on the selling price of all commodities, whether raw or manufactured, which was chargeable as often as they were sold or ex-

changed. It subjected every farmer, every manufacturer, every merchant and shopkeeper, to the continual visits and examination of the tax-gatherers,

whose number was neces- sarily very great. This monstrous impost was permitted to ruin the industry and commerce of the greater part of the kingdom down to the invasion of Napoleon. Catalonia and Aragon purchased from Philip V. an exemption from the alcavala, and, though still burdened with other heavy taxes, were in a comparatively flourishing state, in con- sequence of their exemption from this oppressive duty. (See M'Culloch On Taxation.)

ALCAZAR DE SAN JUAN, a Spanish town, in the province of Ciudad Real, 45 miles N.E. of Ciudad Real, and on the railway between Alicante and Madrid. It isa well-built town, and has manufactures of soap, saltpetre, and gunpowder. 'This is the Alce of the Romans, taken by T. Sempronius Gracchus 180 B.c. Population, 7800.

ALCAZAR KEBIR, a city of Marocco in Africa, 80 miles N.W. of Fez. It was formerly of great note as the magazine and place of rendezvous for the Moorish invasions of Spain. It is now greatly decayed, probably on account of its low and unhealthy situation. Not far from the city is the river Elmahassen, famous for the battle fought in 1578 between Sebastian, king of Portugal, and the Moors, in which the Portuguese were defeated and their king slain. Population, 6000.

ALCESTER, pronounced Auster, a market town in the county of Warwick, situated at the junction of the Arrow and Alne, 14 miles W.S.W. of Warwick. Its position on the Roman way known as the Ickenild Street, and the dis- covery of numerous remains of ancient art, as well as urns and coins, make it sufficiently evident that this was a Roman encampment. A monastery was founded here in 1140; but the building has totally disappeared, though sufficient vestiges remain to indicate its site. The church is a fine building, and contains several interesting monu- ments, one of which, to the marquis of Hertford, is by Chantrey, and is in the best style of that sculptor. The town possesses a free grammar school and an elegant market-hall. Kmployment is afforded to about 1200 of the inhabitants in the manufacture of needles, which is the chief branch of industry. Fish-hooks are also manufactured. Population of parish, 2363.

ALCESTIS, or Aucestr, the daughter of Pelias and Anaxibia, and wife of Admetus, king of Phere in Thessaly. She consented to die in place of her

husband, and was afterwards restored to life by Hercules. This beautiful instance of conjugal devotion forms the subject of one of the best plays of Euripides, the Alcestis, which furnishes the basis for Robert Browning's Balaustion's Adventure.

ALCHEMY, Cuemy, or Hermerics. Considering the present state of the science and the advance of public opinion, the old definition of alchemy as the pretended art of making gold is no longer correct or adequate.

Modern science dates from three discoveries—that of Copernicus, the effect of which (to borrow St Simon's words) was to expel the astrologers from the society of astronomers; that of Torricelli and Pascal, of the weight of the atmosphere, a discovery which was the foundation of physics; lastly, that of Lavoisier, who, by discovering oxygen, destroyed the theory of Stahl, the last alchemist who can be excused for not being a chemist.

Before these three grand stages in the progress of science, the reign of astrology, magic, and alchemy was universal and almost uncontested. Even a genius like Kepler, who by his three great laws laid the foundations for the Coper- mican systém, was guided in his investigations by astro- logical and cabalistic considerations. Hence it follows that a philosophical history of modern science is certain to fall into the opposite superstition of idolising abstract

reason, if it does not do full justice to this long and ener- getic intellectual struggle which began in India, Greece, and Egypt, and, continuing through the dark ages down to the very dawn of modern enlightenment, preceded and paved the way for the three above-mentioned discoveries, which inaugurated a new era.

It was the alchemists who first stated, however con- fusedly, the problems which science is still engaged in solving; and to them, in conclusion, we owe the enormous service of removing the endless obstructions which a purely rationalistic method, born before its time and soon degenerating into verbal quibbles and scholastic jargon, had placed in the path of human progress.

Alchemy was, we may say, the sickly but imaginative infancy through which modern chemistry had to pass before it attained its majority, or, in other words, became a posi- tive science. The search for gold was only one crisis in this infancy. 'This crisis is over, and alchemy is now a thing of the past. There is no longer any need to exhort adventurous spirits, who hope to find Golconda at the bottom of their crucibles, to leave such visions and turn to the safer paths of science or industry. The battle has been fought and won, the problem of the unity of chemical elements or simple bodies belongs rather to the province of metaphysics than to that of experimental science. If here and there an honcst student of the black art still survives, he is regarded as a mad but harmless enthusiast; and as for the pretended searchers for the philosopher's stone, they are, if possible, less intercsting objects than the dupes they still continue to cheat. Thus the full time is come for applying to the occult sciences the same searching analysis to which the other myths of prchistoric times have been so rigorously subjected. To trace its earliest beginnings, to investigate its development by the aid of modern criticism, is the proviuce of physical science, no less than of the sister science of morals. Nay, more, we shall find that both had a common origin. Those ancient cosmogenies, those poetical systems which the genius of each nation and race has struck out to solve the problem of the universe and of the destiny of mankind, were the germs of science no less than of literature, of philosophy as well as of religion. And as in the infancy of science its various branches were confused and confounded, so in a like stage of society we often find the same person uniting the parts of philosopher, savant, and priest. Besides this, it is evident that in the absence of all scientific apparatus or instruments, the ancients, if they had limited them- selves to the exercise of their reason, must have remained observers and nothing more. It is true they did observe, and that widely and well; but observation alone, even when aided by the strongest and subtlest reason, can lead to nothing but contradictory theories, irreconcilable, because they cannot be verified. And it is not in human nature to remain a simple spectator. Curiosity was first excited by fancy (and the fancy of primitive man, we must remember, was far more active and vigorous than ours), and when it found itself baffled by a natural reaction, it had recourse to divination,

In a word, the ambition of these earliest philosophers was more intense, because its sphere was narrower, In the first stages of civilisation the magician was the man of science. The mysteries of this magic art being inseparable from those of religion and philosophy, were preserved, as it were, hermetically sealed in the adyta of the temple, Its philosophy was the cabala. We must consequently look on the various cabalas or oral traditions, transmitted from age to age as the oracles of various faiths and creeds, as constituting the elements of that theory which the Jewish cabala promulgated some centuries later in a condensed and mutilated form. Astrology and magic were the efforts

made in various ways to verify and apply this theory ; magic, indeed, or rather magical power, was at starting purely cosmogenic, 7.¢., regarded as an attribute of God or nature, before it was counterfeited by the magicians of various countries. But, as St Simon has well observed, chemical phenomena are much more complicated than astronomical—the latter requiring only observation, the former experiment—and hence astrology preceded alchemy. But there was then no hard and fast line betwcen the several branches of science, and hence the most opposite were united, not, as now, by a common philosophical or philanthropical object, but by reason of their common theological origin. Thus alchemy was the daughter of astrology, and it was not till the end of the 16th century A.D. that she passed from a state of tutelage. Just in the same. way medicine as a magical or sacred art was prior to alchemy; for, as was natural, before thinking of forming new substances, men employed already existing herbs, stones, drugs, perfumes, and vapours. The medical art was indissolubly bound up with astrology, but, judging from the natural inventiveness of the ancients, we should have expected beforehand that chemical preparations would have played a more important part among the instruments of priestly thaumaturgy.

As in the middle ages invention busied itsclf with instruments of torture, and as in our days it is taken up almost as much with the destructive engines of war as with the productive arts of peace, so in those early ages it applicd itself to the fabrication of idols, to the mechanism and theatrical

contrivances for mysteries and religious ceremonies. There was then no desirc to communicate discoveries ; science was a sort of freemasonry, and silence was effect- ually sccured by priestly anathemas ; men of science were as jealous of one another as they were of all other classes of society. If we wish to form a clear picture of this earliest stage of civilisation, an age which represents at once the naiveté of childhood and the suspi- cious reticence of senility, we must turn our eycs to the priest, on the one hand, claiming as his own all art and science, and com- manding respect by his contemptuous silence; and, on the other hand, to the mechanic plying the loom, extracting the Tyrian dye, practising chemistry, though ignorant of its very name, despised and oppressed, and only tolerated when he furnished Religion with her trappings or War with arms. Thus the growth of chemistry was slow, and by reason of its backwardness it was longer than any other art in ridding itself of the leading-strings of magic and astro- logy. Practical discoveries must have been made many times with- out scieuce acquiring thereby any new fact. For to prevent a new discovery from being lost there must be such a combination of favourable circumstances as was rare in that age and for many succeeding ages. Thcre must be publicity, and publicity is of quite recent growth; the application of the discovery must be not only possible but obvious, as satisfying some want. But wants are only felt as civilisation progresses. Nor is this all; for a practical dis- covery to become a scientific fact, it must serve to demonstrate the error of one hypothesis, and to suggest a new one, better fitted for the synthesis of existing facts. But old beliefs are proverbially obstinate and virulent in their opposition to newer and trucr theories which are destined to eject and replace them. To sum up, even in our own day chemistry rests on a less sound basis than either physics, which had the advantage of originating as late as the 17th century, or astronomy, which dates from the time when the Chaldean shepherd had sufficiently provided for his daily wants to find leisure for gazing into the starry heavens.

After this general introduction we may now proceed to consider the subject in detail under the following heads :— First, we will cast a rapid glance at certain cosmologies and philosophical systems, in order to bring prominently before the reader those points which throw light on chemical theorics. Secondly, we will consider alchemy at the moment when it ceased to be purely religious and began an independent existence ; that is to say,

during the 3d and 4th centuries A.D., and in that city which was the battlefield on which the various philosophical and religious creeds of the East met. In the fierce struggles which ensued, in the strange alliances which they there made, we shall find them, by their mutual recriminations, involuntarily revealing to us their hidden secrets. As the darkness of the middle ages approaches, we shall follow our science in its journey to

Arabia; from Arabia we shall trace it back to Europe, and hear it taught with stammering lips and feeble tongue by subtile or solemn doctors. We shall attempt to analyse its ambitious aspirations and its barren performance'. During the Renaissance we shall see it at its zenith, inspired by a mad enthusiasm which was near akin to genius, an enthu- siasm which gave birth to medicine and modern chemistry. Lastly, in the 17th and 18th centuries we shall see it degenerate into pure charlatanism. In conclusion, we shall attempt to recover the few grains of pure ore which may be extracted from its broken alembics.

I. CosMOGENIES AND PHILOSOPHIES.

In India, as is well known, the contempt in which the caste of artizans was held was still farther increased by the tendency of religion to consider birth and life, and the actions and desires which are part and parcel of man's life, as an unmixed evil. Consequently, outside the workshop, practical chemistry can have made but little progress, Nevertheless, among the priests of India, as in later times in Europe, we find the ordeal of fire and of serpents commonly practised. It follows that the Brahmins must have possessed some chemical secrets to enable them to kill or save those they thought guilty or innocent. These secrets, too, must from time to time have been divulged by indiscretion or perfidy, and spread beyond the temple; for we read of accused persons escaping unharmed from the ordeal, even when their accuser was a Brahmin. But the Mussulman traveller of the 9th century, who has pre- served this curious detail, allows that the trial was in his day becoming more elaborate and complicated, and that it was next to impossible for an accused person to escape. However this may be, it is certain that the meditative genius which distinguishes the race had, even before they conquered the yellow and black races, led these first speculators

to certain conceptions which have an important bearing on the present subject. Some had conceived ether as composed of distinct atoms, others imagined an ether decomposing itself into atoms by the free play of its own forces. These two theories, the one dualistic, the other unitarian, strangely foreshadow the discoveries of modern dynamics. We find the speculators of another race indulging the singular fancy that they could observe in atoms what we may call oscultations of the play of forces. This, at any rate, is the most natural explanation of the term nodes by which the Phenicians designated atoms. The Persians, who considered the first tree and the first bull as the two ancestors of man, discovered in physics generally two antagonistic principles, one male and one female, primordial fire and primordial water, corre- sponding to the good and bad principles of their religion. Over all creatures and all things there were presiding genii, Lzeds or Feroners. They had already formulated the paral- lelism between the Sephiroth, the empyrean, the primum mobile, the firmament, Saturn, Jupiter, Mars, Sun, Mercury, Moon, and the parts of the body, the brain, lungs, heart, &c. In this correspondence between the heavenly bodies and the human frame which ~~the ancient Persians laid down, and the Hindu belief in the peregrination of sinful souls through the animal, vegetable, and even the niineral world, till, by these pilgrimages, they at last won absorp~~ tion into the Deity, or JJoncti, we have, in their original form, the two fundamental beliefs of alchemy.

The Greeks, unrivalled as they were in poetry, art, and ethics, made little way in occult philosophy. The Greek intellect, precise and anthropomorphic, with no leaning to transcendentalism, was a protest against the bolduess of oricntal metaphysics. Thus they contented themselves with inventing a strange gamut of deities corresponding to different types of men. 'This gamut—Jupiter, Satur,

Apollo, Mercury, Mars, and Venus—was afterwards com- pleted in the cabala by the addition of the moon, typifying the phlegmatic character of northern races, and forms a connecting link between astrology and alchemy, by estab- lishing a double correspondence between planets of the same uname and metals. The whole was systematised in the works of

Paracelsus and Bohme, and called the theory of segnatures. Whether the Greek philosophers taught that the principle of all things was water, like Thales, or air, like Anaximander, or air and water, as Xenophanes, or the four elements, earth, air, fire, and water, as the school of Hippocrates, the tendency of Greek speculation was to establish those profound distinctions which resulted later in the theory of the four elements, the four humours, &c., which the disciples of Aristotle held. Hippocrates, for example, thought that if man was composed of a single element, he would never be ill; but as he is composed of many elements, complex remedies are required. Thus Hippocrates may be called an anti-alchemist ; and though the theory of the four elements reigned supreme through- out the middle ages, it easily lent itself to the search for the philosopher's stone and the universal panacea, because the oriental idea of the transmutation of elements, from the time when the various systems of the East were syneretised at Alexandria and received their final develop- ment in Arabia in the writings of Geber Rhasis and Ibn Sina (Avicenna), was a universal article of belief. But even in the palmiest days of Greek anthropomorphism there was a gradual infiltration of Asiatic ideas, partly through the mysteries of Eleusis, partly through the doctrines of certain philosophers, who were by nature susceptive of barbaric influences. For, besides Greece proper, there was a second Greece in Asia Minor and a third in Italy, not to mention the Pelasgic tribes who adhered tenaciously to the primitive ideas of the race,

Among the Greek philosophers, then, who appreciably influenced physics, chemistry, and physiology (the three sciences were then one), we may notice in particular—l. Heraclitus of Ephcsus, sur- named the "Obscure." Maintaining that fire alone was the prin- ciple of all things, he regarded generation-as an ascending road, 1.¢., a volatilisation ; and decomposition as a descending road, 4.c., a fixation. Here we have the first idea of Jacob's ladder or "'Homer's Chain" of the alchemists. 2. Empedocles, who is indeed the first who mentions the four elements; but he subordinates them as complex products to his primordial indestructible atoms, which were animated by love and hatred. 8. Democritus, who, investing these atoms with a movement of their own, proceeds to construct the universe by shocks and harmonies of shocks or vortices. 4. Anaxagoras, who saw 'the all-in-all"' (Aristotle, fet. 4, 5), the infinitcly great universe in the infinitely small atom, and ingeni- ously applied the principle of analogy to unravel the

tangled skein of ancient science. 5. Aristotle, who added to the four elements a fifth, ether, eternal and unchangeable, itself the primum mobile (Arist., De Colo, 1, 2). In the 4th century a.p., Nemesius, bishop of Emesa (the modern Homs, on the east bank of the Orontes), is one of the most distinguished representatives of Alexandrian syn- cretism. A single quotation will suffice to show that the idea of the transmutation of metals, from the time when Platonism, magic, and neo-Christianity were combined in a species of eclectic mysti- cism, was regarded as an article of orthodox belief :—"To prevent the destruction of elements, or things which are compounded of ele- ments, the Creator has wisely ordained that elements should be capable of transmutation one into the other, or into their compo- nent parts, or that their component parts should be resolved again into their original elements. Thus the perpetuity of things is secured by the continual succession of these reciprocal generations." This statement of the pious bishop is all the more weighty, inas- much as the author of The Nature of Man was only treating of psychology and physiology. The study of gnosticism would carry us too far; and one more quotation from this work, which has long fallen into unmerited oblivion, will prove to what an extent the most scientific theories of this day were tinged and vitiated by mysticism :—" Porphyry, in his treatise on sensation, tells us that vision 1s produced neither by a cone nor an image, nor any other object, but that the mind, being placed en rapport with visible objects, only seesitself in these objects, which are nothing else than itself, seeing that the mind embraces everything, and that all that exists is nothing but the mind, which contains bodies of all kinds."

Another step, and we are landed in realism. It is not surprising, then, to find that the alchemists, while working in the laboratory, aspired at the same time to find the moral quintessence and verify the doctrines of revealed religion. For mysticism in thcory is nothing but a reaction against the positivism of reason and science: the mystic, dissatisfied with these, secks in nature a reflection of his inner feelings. And in practice mysticism rests on confusions or exag- gerations, like those of Porphyry, or some such dictum asthe one whic Nemesius quotes with the following uncritical comment :—'

Now, since Porphyry asscrts that there is but one reasoning soul for all things, he is right in saying that the soul sces itself in everything."

*'Such visionaries, though they may to a certain extcnt have observed, were not likely to expcriment. Thus, at Babylon, where similar theories prevailed, the college of philosophers was divided into threc classes, the " Hhartumim," or soothsaycrs; the " Asa- phim," who were more agriculturists than zoologists, more zoologists than physicists, more physicists than chemists ; the "Mechasphim, " or doctors, who were consulted by the great, as often to rid them of their enemies as to cure their families and dependants; lastly, the '*Chasedim" or Chaldeans, properly so called ; 7.¢., the astronomers or astrologers. 1n this classification of sciences as pursued at Babylon by a peculiar caste, chemistry was little regarded. Science was the monopoly of a privileged class before it became the common pro- perty of the human race. A class is sure to cling to a monopoly ; an individual is obliged by his feebleness to impart his knowledge to others,*

In Egypt the doctrine of the Palingenesis was symbolised by the Scarabeus, which suggested to St Augustine the following strange comparison :—" Jesus Christus bonus ille scarabeus meus, non ea tantum de causa quod unigenitus, quod ipsemet sui auctor mor- talium speciem induxerit, sed quod in hac feece nostra sese volutarit et ex ipsa nasci homo voluerit."

These ideas, which St Augustine borrowed from the religious beliefs of Egypt, were adopted by certain alchemists; and Egypt, which saw in the Scarabeus "the Father, Man, a world of trial, a ladder whereby fallen souls may risc," justly claimed to be the birthplace of ancient chemistry, to which it assigned a peculiar rank, calling it the 'sacred art." But although certain Egyptian pricsts may have spread the report that they owed their enormous fortunes to their knowledge of chemical secrets, this veneration produced but few practical results. It was, however, this report which made the emperors Severus and Diocletian issue an cdict that all their magical books should be burned.

II. Toe Sacrep Art.

Paganism, at the time when it was engaged in its last struggle with Christianity, had long ceased to be exclu- sively Greek or Roman. It had assimilated Mithratic, Chaldean, and Egyptian mysteries, and even allied itself to a certain extent with the Helleno-Hebraism of the Cabala. It was not likely, then, to reject what purer times would have regarded as an utter profanation. The narrow ground on which the battle was fought, the intel- lectual affinities between such men as St Basil and the emperor Julian rendered the struggle as desperate and san- guinary as any struggle can be when the combatants are only rival creeds. The sacred and divine art (réyvy beta kal tepd), the sacred science (émirripy iepd), was one of the mysteries which paganism derived from the dim religious light of the temple. But we may presume that the sacred art of the Alexandrians was no longer the same as that of the ancient Egyptians, that their Hermes was not the Hermes of Egypt, that the pseudo-Democritus is not the true Democritus, that Pythagoras, as retouched by Iamblicus, is not the original Pythagoras. No epoch was so full of forgeries as the 3d and 4th centuries a.p.; and these forgeries were in one sense fabricated in good faith, An age of eclecticism is as eager for original documents as a parvenu is for a coat of arms or a genealogical tree. These forgeries were no obstacle to human progress; but in an age when the learning of Egypt was the fashion, it was natural that Persian, Jewish, and Platonic doctrines should be tricked out in an Egyptian dress. One of the masters of the sacred art, Alexander of Aphrodisia, invented the term chyics (xuxdv, from xéu, to pour, xevéw, to fuse or melt), to describe the operations of the laboratory. Hence the word chemics, a word unknown in the 4th century, and only popular some centuries later. The reason is, that the

true etymology of the word chemic is logical, and had therefore no charms for the psychological spirit of the age. Later on, when men began to reflect that the ancient name for Egypt was Cham or Chemia, because, according to Plutarch, its soil was black like the pupil of the eye (xyp«ia 70d épOdApov), it flattered the chemists to call chemistry "the art of the ancient Chemi." Hence from a false derivation the art received a fresh impulse.

The discovery of the principal manuscripts of the sacred art we owe to the labour of M. Ferdinand Hoefer. We can take no safer guide than the judicious and profound author of the History of Chemistry in investigating the delusions into which a mastcr of the sacred art was most

likely to fall.

"Let us forget for an instant the advances which this science has made since the 5th century. Let us fancy ourselves for a moment transported to the laboratory of one of the great masters of the sacred art, and watch as neophytes some of his operations. 1st Hxpert- ment.—Some common watcr is heated in an open vessel. The water boils and changes to an aeriform body (steam), leaving at the bottom of the vessel a white earth in the form of powder. Conclusion—water changes into air and earth. What objection could we make to this inference, if we were wholly ignorant of the substances which water holds in solution, and which are, aftcr evaporation, deposited at the bottom of the vessel? 2d Haperiment.—A piece of red-hot iron is

ut under a bell which rests in a basin full of water. The water

iminishes in volume, and a candle being introduced into the bell sets fire at once to the gas inside. Conclusion—water changes into fire. Is not this the natural conclusion which would present itself to any one who was ignorant that water is a composite body, consisting of two gases, one of which, oxygen, is absorbed by the iron, while the other, hydrogen, is ignited by contact with the lame? 3d Ex- periment.—A piece of lead, or any other metal except gold or silver, is burned (calcined) in contact with the air. It immediately loses its primitive properties, and is transformed into a powder or species of ashes or lime. The ashes, which are the product of the death of the metal, are again taken and heated in a crueible together with some grains of wheat, and the metal is seen rising from its ashes and reassuming its original form and properties. Conclusion— metals are destroyed by fire and revivified by wheat and heat. No objection could be raised against this inference, for the reduction of oxides by means of carbon, such as wheat, was as little known as the phenomenon of the oxidation of metals. It was from this power of resuscitating and reviving dead, 7.¢., calcined metals, that grains of wheat were made the symbol of the resurrection and life

eternal. 4th Expervment.—Argentiferous lead is burned in cupels composed of ashes or pulverised bones, the lead disappears, and at the end of the operation there remains in the cupel a nugget of pure silver. Nothing was more natural than to conclude that the lead was trans- formed into silver ; and to build on this and analogous facts, the theory of the transmutation of metals, a theory which, later on, led to the search for the philosopher's stone. 5th Experiment.—A strong acid is poured on copper, the metal is acted upon, and in process of time disappears, or rather is transformed into a green transparent liquid. Then a thin plate of iron is plunged into this liquid, and the copper is seen to reappear in its ordinary aspect, while the iron in its turn is dissolved. What more natural than to conclude that iron is trans- formed into copper? If instead of the solution of copper, a solution of lead, silver, or gold had been employed, they would have held that iron was transformed into. lead, silver, or gold. 6th Hupert- ment.—Mercury is poured in a gentle shower on melted sulphur, and a substance is produced as black as a raven's wing. This sub- stance, when warmed in a closed vessel, is volatilised without chang- ing, and assumes a brilliant red colour. Must not this curious phenomenon, which even science in the present day is unable to explain, have struck with amazement the worshippers of the sacred art, the more as in their eyes black and red were nothing less than the symbols of light and darkness, the good and evil principles, and that the union of these two principles represented in the moral order of things their God-universe. 7th and last Experiment.—Organic substances are heated in a still, and from the liquids which are removed by distillation and the essences which escape, there remains a solid residuum. Was it not likely that results such as these would go far to establish the theory which made earth, air, fire, and water the four elements of the world?"

But neither M. F. Hoefer's explanation of the appearances which the first master of the sacred art mistook for fact, nor the metaphysical theory of Nemesius, will enable us to understand how Zosimus the Theban, in the very infancy of the art, succeeded in discovering in sulphuric acid a solvent of metals; in assigning to mercury (which he

called “ holy water”) its proper function, a function which succeeding generations of alchemists so monstrously exag- gerated; and finally in disengaging from the red oxide of mercury oxygen gas, that Proteus which so often eluded the grasp of the alchemists, till at last it was held fast by the subtle analysis of Lavoisier. For we must remember that solid metals were considered as living bodies, and gases as souls which they allowed to escape. Of all the ingenious inventions of the Jewess Maria for regulating fusions and distillations, the only one that has survived is the Balneum Marie. The principle it depends on, viz., that the calcination of violent heat is less powerful as a solvent or component than the liquefaction produced by gentle heat, was afterwards reasserted by the Arabian Geber, and advocated by Francis Bacon. M. Hoefer ima- gines that Maria the Jewess discovered hydrochloric acid, the formidable rival of sulphuric acid. Succeeding writers on the history of chemistry have remarked that the band- ages of Egyptian mummies were not more numerous than the mysteries of the sacred art, and the injunctions not to divulge its secrets, ‘under pain of the peach tree,” or, to translate into modern English the language of an ancient papyrus, under pain of being poisoned by prussic acid. We should be wrong in thinking that all these allegories had no meaning for the initiated, and that this mystical tendency of the sacred art arrested its growth at starting. Rather the truth is, that these myths, which at a later stage prevented the free development of alchemy, at first served to stimulate its nascent powers.

Modern critics have pronounced some traditional sayings of Hermes Trismegistus to be apocryphal, but they have not given sufficient weight to the remarkable circumstance that it is precisely because these sayings are a medley of the cabalistic, gnostic, and Greek ideas with which Alexandria was then seething, that the seven golden chapters, the Emerald Table, and the Pimander obtained their authority—an authority they would never have pos- sessed had they been only a translation of some obscure Egyptian treatise. No Egyptian priest could have written a sentence like that we find so often quoted as an axiom by subsequent alchemists :—‘“‘ Natura naturam superat ; deinde verd natura nature congaudet; tandem natura naturam continet.” Plato adds (not the disciple of Socrates, but a pseudo-Plato in the famous collection called Turba Philosophorum)— continens autem omnia terra est.” For, translated into modern language, this means*

that there may indeed be in this universe things which pass our intellectual ken; but that all that exists, all that is produced by the strife and changes of the elements, all, in a word, that appears to us supernatural, is really natural. That this is his meaning we may gather from the singularly bold comment which Plato himself adds, and which we may thus translate—" Every- thing, even heaven and hell, are of this earth." It is true that the alchemists failed to draw any very definite con- clusions from this fundamental axiom. But if we con- sider it carefully, we shall see that this earliest doctrine of the sacred art, which was now rapidly passing into alchemy, by thus excluding the supernatural, was making a great advance in the direction of positive science. This early advance was, however, counterbalanced by an early error (which itself arose from a noble ambition), viz., that art is as powerful as nature. The Emerald Table begins with a sentence no less celebrated than that quoted above :— "This is true, and far distant from a lie; whatsoever 18 below is like that which is above, and that which is above is like that which is below. By this are acquired and perfected the miracles of the one thing." To understand the importance of this emphatic and categorical exordium, we must forget the sharp distinction we now draw between

art, science, and literature ; we must think of that foolish- ness of which St Paul speaks, by which he sought to save those that believe, because of the insufficiency of human reason. The seekers for the philosopher's stone were in the same case. In the absence of clear facts and just notions, reason for them was not sufficient. Thus it was that they and the masters of the sacred art, and after them the Arabs, and in later times the alchemists, one and all listened eagerly to the "foolishness" of Trismegistus's doctrine, which, in a modern form, would run thus: " We go further than the Zohar—the sacred book of the cabala —which says that as soon as man appeared, the world above and the world beneath were consummated, seeing that man is the crown of creation and unites all forms. We go further than the Zohar, which says in another place that the lower world was created after the similitude of the upper world. We perfect the doctrine of a microcosm and a macrocosm, and declare that there is no such thing as high or low—as heaven or earth, for the earth is a planet, and the planets are earths; we

affirm that the chemical processes of our alembics are similar to those of the sidereal laboratories. Allisinall. Everywhere analogy infers the same laws." From analogy to identity was an easy step for the theorists; and in the full light of the 19th century we find Hegel a devoted admirer of the mystic Bohme falling into this pitfall. If the spectrum analysis had been known, the Alexandrians, the Arabs, and the alchemists would have been able to verify and limit the sweeping generalisation by which they established a vast system of correspondencies between the three worlds, the physical or material, the rational or intermediary, and the psychical or spiritual. Between the heavens and earth and man's nature they were ever seeking to discover affinities, and ignoring differences which would have been fatal to their system. Thus, according to them, even heaven—the abode of spirits—was partly physical; and even in the mineral world there was a spiritual element— viz., colour, brightness, or, in their language, tincture. Neither Linnezus, Berzelius, nor Cuvier had yet classified living beings and things. The distinction between the animal, the vegetable, and the inorganic world was unknown, and indeed it was impossible that it should be known. The alchemists sought for physical conditions in the invisible and spiritual world, and for a spirit even in stocks and stones. This explains the magic which they found in nature, and which they tried to imitate by their art. But to establish this harmony between heaven, man, and nature, they required some fixed standard or scale, for in their eclectic system they were bound to find room for Pythagoras. Where was this scale to be found? In the heavens ; for there must be the sphere of true music. Hence arose chemical, medical, and physionomical astrology. (See Astrotocy.) Hence the sun, which vivifies all nature, the most active heavenly energy, or rather being— for with them everything had life—in the ovvyauia, OF marriage between heaven and earth, represented the male principle, ita ut celum agat et terra patiatur ; and appearing in all terrestrial objects, since everything is penetrated by heat, fire, or sulphur, presided principally over the generation of gold—his image or antitype—in the bowels of the earth. Hence, too, the moon represented silver, Venus copper, Mercury (the planet and the god) the metal of the same name, Mars iron, Jupiter tin; while to Saturn, the most distant and coldest of the planets, lead, the most unsightly of metals, was dedicated. It was an old belief that there was a time when gods and men dwelt together on earth, a belief, moreover, for which they could quote chapter and verse. Was it not written zaow ovpaviows Kowhy yatar t

Further, seeing that there were three. worlds, it followed that there were three heavens,

three suns, and three golds. For spirits still engrossed with matter the philosopher's stone meant the search for riches—the gold of the third world. For other spirits which belonged to the first world it signified the healing art—the preservation of humanity by means of the universal panacea and a universal theory of morals. Hence two rival systems, the first of which culminated in the great doctor Paracelsus, the second in the great Iluminato Postel. Did not Dante, the bitter foe, not of the science of alchemy, but of that miserable search for gold—for the riches of this world —which, with keen irony, he calls Peltro (tin whitened by mercury)—did not Dante himself write his great poem in order to bring back humanity to the right road from which it had strayed (svia), misled by those who should have been its true guides, the pope and the emperor? For the symbolism of those ancient masters included an alchemy of morals as well as an alchemy of medicine and metallurgy, though the first was even less known and less appreciated.

Recurring to our former illustration, it was this " foolish- ness" of St Paul —this divine madness-—which inspired the Alexandrians, the Arabs, Roger Bacon, Albertus Magnus, and the host of anonymous alchemists of the middle ages: such was the madness which cast a ray of genius over the daring spirit of even a second-rate author like Raymond Lully, which sustained Robert Fludd, Paracelsus, and Postel, who tried to find the universal panacea in universal peace. The fundamental axiom, the stronghold from which these terribly logical madmen were never wholly dislodged, may perhaps be summarised in a single sentence. The saying of Galen, in natura nihil plane sincerum, was adopted by his implacable adversaries :— Nature, they said, is in appearance an illegible scrawl, but when deciphered there will be found a single element, a single force, to separate and reunite, to produce decay and growth—knowledge is power. To know the process of generation in this triple universe, wherein one world resembles another; to know by its signatures this universe, which is a living organism in the eyes of all alchemists (save indeed Jacob Béhme, who,

anticipating Hegel, regarded it as a mighty tree); this is the first step towards counterfeiting nature. Monstrosities are the production of diseased metals (really alloys), which, if properly treated, may be cured, and will turn to gold, or at least silver. The second stage in this imitation of nature is to obtain by tincture or projection solid or liquid gold—the cure of all

evils. Finally, to surpass material and rational nature, this is the crowning end. For God delegates his power to the sage.

Alchemy in Arabia.—How the sacred art passed into Moslem lands it is hard, from dearth of evidence, to say. Modern criticism now does more justice to the part which Arabia took in the accumulation of scientific facts, and in the scientific theories which we find in the books of Rhazés and Geber. It is certain that in their treaties with the European Greeks of Constantinople the Arabs always stipulated for the delivery of a fixed number of manu- scripts. Their enthusiasm for Aristotle is equally noto- rious ; but it would be unjust to imagine that, in adopting the Aristotelian method, together with the astrology and alchemy of Persia, and of the Jews of Mesopotamia and Arabia, they were wholly devoid of originality. On the other hand, we must not understand Arabia in the ethno- logical sense of the word, but as signifying an agelomera- tion of various races united by a common religion. Thus Djafar (who lived in the middle of the 8th century), better known to us as Geber, was a Sabsean. Avicenna, born in 978, was a native of Shiraz. The remarkable geographer and geologist Kazwyny (geology was then a part of al- chemy), derived his name from his birthplace, Casbin, in

Persia. Mohammed-ben-Zakaria, so celebrated in medi- seval Europe under the name of Rhazés, was also a Persian. In Spain the Jews of the famous school of Saadia and Juda Halevy exercised considerable influence over the academy of Cordova. Lastly, European historians have systematically exaggerated the ignorance of the Arabs before the time of Mahomet and their intolerance after the establishment of Moslemism, either from the zeal which prompted them to carry on a sort of literary crusade in honour of Christianity, or because in the 18th century they directed against Mahomet attacks which were intended

for Christianity itself.

Alchemy received from the Arabians many significant titles. It was the science of the key, because it opened all the mysteries of creation, physiology, and medicine ; it was the science of the letter M (msam is the Arabic for balance), because by means of the balance the gain or loss of all bodies could be determined, even while undergoing chemical combinations. Later on, as is well known, it was by a rigorous and obstinate use of the balance in the hands of Priestley, Cavendish, and Lavoisier, that positive che- mistry was founded. Lastly, Rhazés gave to the science of the philosopher's stone a name which plunges us again into the mythological ages of chemistry. He called it the astrology of the lower world. .

The discoveries of Gcber as a chemist do not form part of our subject; but we may mention, in passing, the infernal stone, the corrosive sublimate, the exact process of the cupellation of gold and silver, and three sorts of distillation by evaporation, condensa- tion, and simple filtration. In another direction Geber, by re- inventing aqua fortis, and by discovering ammoniacal salts for his aqua regalis, laid the foundation both of alchemy and chemistry. The salt of ammonia, so easy to volatilise, was the source of many baseless dreams, as is proved by its various names—anima sensibilis, aqua duorum fratrum ex sorore, cancer, lapis angeli conjungentis, &c. Geber belicved in the parallelism between metals and planets ; he thought that metals were all equally composed of mercury, arsenic, and sulphur, and that in the descending scale from gold to lead, mercury, arsenic, and sulphur were each present in a greater or less degree of purity in proportion to the colour and quality of each metal. Later on, the addition of the four elemcnts—heat, cold, dryness, and moisture—complicated still more the reasonings by which the alchemists sought to prove that the transmutation of mctals was in the power of any man who imitated nature—t.e., per- fected the imperfect metal by correcting its excess of heat or mois- ture. Geber did not think that an operation of the laboratory could counterfeit the natural work of purification, which demanded a thousand years. But with him moisture played the same part as phlogiston in Stahl's system. In other words, the philosopher to whom all succeeding searchers for the philosopher's stone swore allegiance was contented to formulate his theory without considcr- ing the possibility of putting it in practice. He was an

alchemist indeed, but no gold-sceker. This forerunner of positive science foresaw the part which the gases would be found to play in the composition of bodies ; he called them spirits—a figure which took strong hold on the imagination of Geber, as well as of the masters of the sacred art, and which was formalised by the alchemists of the middle ages. Rhazés, who re-invented sulphuric acid and agua vite, was par cxeellence a doctor. The same remark applies to Avicenna, whose works are a methodical, but not very profound, systematisa- tion of the current ideas and science of his day. Artephius was a cabalist, as his theory of the apparent and latent parts of man's naturc shows. The author of Zhe Key of Wisdom and A Secret Book on the Philosopher's Stone was the reputed possessor of an elixir vite. We do not know whether this was potable gold or a quint- essence of all the active elements of the three kingdoms. However this may be, this mysterious alchemist, who lived about 1130, was the inventor of soap, and, what is of more importance for our sub- ject, the promoter of a new interpretation of Jacob's ladder or Homer's chain. Minerals, he said, come from the primitive ele- ments, plants from minerals, animals from plants, and as each body is resolved into another body of the order immediately below it, animals become vegetables and vegetables minerals. We see that in this view of the interdependence of the three kingdoms there is as much truth as error. With Calid, the author of the Book of the Three Words and of the Book of the Secrets of Alehemy, the parallelism betwecn the metals and planets takes a retrograde step towards astrology. This Calid, a soi-disant king of Egypt, held that before engaging in any operation of alchemy the stars ought tv be consulted. This recommendation was literally followed by the thaumaturgists of the middle ages and the Renaissance. The

effect was fatal, if, when Calid or one of his school saw the metals obstinatcly refuse to be purified in his crucible, he did not wait for a happy conjunction of constellations above in order to try his chance again with the operations of inferior astrology.

The East, when it accepted from Aristotle the theory of form and matter, invested it with a signification of its own never dreanied of by the Stagyrite, and invented, as it were, an Arabian Aristotle— that is, the Aristotle of the

middle ages. Not only at Alexandria had the students of the sacred art evolved the theory of the trans- mutation of the four elements (Cicero assigns the doctrine to the Stoics), but in the East the translators of Aristotle added to the theory a corollary more important than the proposition itself, viz., that every body by its form and natural motions indicates its soul, its natural propertics, &c.; that the resemblance between the external appearance of things and beings indicates their natural likenesses, &c. The idea of destiny, which all nations who accepted the doctrine of the Logos expressed by some term or other analogous to the Latin fatum (what is spoken), Mahomet translated by his famous phrase nectowb (it was written). We find a Turkish writer, the declared enemy of astrology and elixirs, Nabi Effendi, in his remarkable book, Counsels to my Son, Aboul Khair, saying that heaven is covered with a writing that only God can read, and seek- ing what letter the eyes, the eyebrows, the mouth, &c., form to find therein the secret of their better use. Like one of the Tal- mudists, the obscure Kallir for instance, he decomposes the name Mahomet in order the better to offer the prophet, as it were, the quintessence of praise, more worthy of God, who in that sacred name, as in all terrestrial things, has written at least one letter of the Word which will serve as a key to open all their hidden virtues. By pursuing an aualogous direction, medievalism, and more espe- cially the Kenaissance, introduced new subtleties into the astro- logical branch of alchemy—tetragrams, pentacles, and other mysterious characters and figures.

It is not surprising, then, to find that Nabi Effendi, who lived in the second half of the 17th century, can produce no other reasons for dissuading his son from joining the alchemists than the fact that some were poor, others quacks, and, as the most important ground of all, that God had declared his wrath against those who dare to imi- tate his works. Indeed, the peculiar syinbolism of the various nations of the East had been broken up by revolutions and conquests, and the disjecta membra again reunited, so as to form a wonderful phan- tasmagoria of ideas and images—a sort of scientific Arabian Nights.

III, AncuEeMy oF THE MippLE AGEs.

The care we have taken to note down at the moment of its birth each of the ideas which influenced alchemy, allows us to sketch more rapidly the history of its decline and fall. Albert Groot, commonly known as Albertus Magnus (1193-1280), revived the theory of Geber; and, in spite of the tendencies of the time, entertained the same doubts as his illustrious master on the possibility of trans- mutation. He is the first to speak of the affinity of bodies, a term he uses in reference to the action of sulphur on metals. He gives the savans of the day the sage advice not to take service with princes, who are sure to treat as thieves those who do not succeed. And, indirectly, he warns princes that philosopher's gold is only tinsel. Beginning with nitric acid, which he calls prime water, and so on, through a regular series of secondary, tertiary waters, &c.,, he proposed a method for dissolving all metals. Roger Bacon, while opposing magic, calls oxygen aer cibus ignis, and regards the elixir as a substitute for time, that agent of which nature takes no account. Gold is perfect, because nature has consummated her work. But Roger Bacon seems to have turned his genius principally to physics and mechanism. St Thomas Aquinas, in his theological writ- ings, forbids the sale of alchemist's gold, and in his special treatise on the subject unmasks an imposture of the char- latans of the day, who pretended to make silver by projecting a sublimate of white arsenic on copper. Further, Aquinas, by reducing the primitive elements of metals to two, revives and corroborates the theory of Galen and Albertus Magnus. About the same time we find a pope, John XXIL, and a king, Alphonso X. of Leon and Castile, occupying themselves with alchemy. But the pope in a well-known bull denounced all those searchers for gold "who pro- mised more than they could perform;" another proof that alchemy and the search for gold, though distinguished by

the true alchemist, were confounded by many adepts. It is evident that the science, as far as the seeker for gold was concerned, was approaching the times of king John and Philip the Fair, who found in unscrupulous charlatans abettors in their debasement of the currency, and that for disinterested alchemists those evil days were at hand when, disgusted at attaining no practical result, the most serious of them sought in the physiological mysteries of generation, in the Adam and Eve, the red man

and the white woman, of the first chapters of Genesis, what they failed to find in Rhazés, in Geber, and the Arabian Aristotle. The science was still called chemy. It was as a compliment to the Arabian masters, who were still quoted side by side with Genesis, that they added to the word the Arabic article a/. The popular etymology of the day was likewise Arabic, or, more correctly speaking, Semitic; the Hebrew chom or the Arabic cham signified heat. Hence their furnaces for heating, the alembics for modifying heat, and the Bains- Marie for imitating the temperature of warm blood; for they could only procecd by analogy. Nevertheless, the great men of the day were the alchemists. The boldness of their actious, the eccentricity of their genius, prove it.

Few novels are as interesting as the story of Raymond Lully (1235-1315). He began life as the passionate lover of the Lady Eleanor of Castello. He was cured of his passion by the lady her- self, who discovered to him the ulcer which was eating away her breast. At her desire he consecrated himself to God, to the service of humanity in general, and especially to the conversion of Mussul- mans. Christianity, in the mouths of the European disciples of Geber and Rhazés, was better adapted than it now is for converting infidels, whose knowledge it respected while deploring all the more their errors. In his cightieth year Raymond Lully dicd in sight of the island of Minorca, from the consequences of a stoning he had reccived at Tunis a few days before while preaching the gospel. This was on his third mission, and he did not hide from his friends that he sought the crown of martyrdom. He had invited the sup- port of all the princes of Europe, and in particular of the kings of France, England, and Castile. Alchemy, indeed, with him seems to have been mainly a means of recommending himself to these kings, and at the same time a search for the panacea. But his trust was placed much more in his rhetoric, which he borrowed from the cabala, in his oriental eloquence, and his Christian faith. By the number of conversions he made at Algiers, at Tunis, and at Bugia, where during his second voyage he was snatched from imminent martyrdom by his friends among the converted Mussul- mans—that is to say, in the very strongholds of Islamism—he suc- eeeded in demonstrating that his idea of uniting all worshippers of the true God in a common faith was not ehimerical. Lully's prin- cipal success was with the disciples of Averroes; and no onc who reflects will be surprised at this. As the moral difficulties of mis- sions were

less than they are now, so the practical dangers were greater. This too necds no explanation.

Raymond Lully's works on alchemy are hopelessly obscure, not-withstanding elucidations, compendiums, vade-mecums, and _a cer- tain dialogus demogorgon, which, if the title is to be believed, Lullianis scriptis multam proclare lucem adfert. Nor need we wonder at this. Eirenwus Philalethes, the pscudonym under which some English adept, whose real name has not been discovered, wrote, states positively that he has learned nothing from Raymond Lully, adding at the same time a curious reason —"Some who arc no adepts give more instruction to a beginner than one whom per- fect knowledge makes cautious." Eireneus is fond of quoting Bernard of Trevisa, who, he tells us, has given him, more especially in his letter to Thomas of Bologna, "the main light in the hidden secret." But of all writers he gives the palm to Sir George Ripley. Bernard of Trevisa, whom he mentions, spent a long life and a con- siderable fortune in romantic travels, in the purchase of books, and in the pursuit of ehemical experiments. _When depressed and weary with chasing shadows which were ever eluding his grasp, he uscd, as a pastime and relaxation, to read the Turba Philosophorum, or the Great Rosary, just as Don Quixote would read the romances of chivalry. At last, when seventy-five years old, the good Bernard, for so the adepts ealled him, thought he had discovered the seeret, —at least the joy of what he considered a real success served for a while to lull his restless energies. His letter to Thomas of Bologna shows no ordinary man. 'Dissolutions of this sort," he writes, "by acids or aquafortis, arc not the true foundations of the art of transmuting metals; but rather the impostures of sophistical alchemists, who think that in them resides the secret of that sacred art. They affirm that they produce dissolutions (solwtioncs), but what they can never do is to produce the various kinds of metals in

their perfection ; because metals when dissolved by corrosives do not remain in the same proportion and original form as they do when dissolved by mercury, which may be truly called the water of metals. Bodies dissolved by mercury are not decomposed (separa- buntur); their nature remains hidden in mercury till they fill up its intervals (wsgue ad sui reinspissationem). Mercury contains inter- stices (Jatentia), and therefore metals can lie hidden in mercury." He then goes on to compare the part that mercury plays in amalgams to that of water (simplex aqua) in vegetable and animal structures. He is well acquainted with what the French now call eau de composition; but, as usual, he pushes his analogies too far. We may remark in passing that it was his opponents the alchemists who, by the discovery of their agua fortes, provided modern chemistry with one of its most powerful agents.

In speaking of Bernard, we incidentally hit upon a word which exactly characterises medieval works on alchemy—they are romances, romances full of interminable allegorics; they sometimes begin and always end with an invocation to Christ and the Trinity. From time to time, amid the old abortive attempts to read the riddle of the universe, we find some new idea cropping up. The generation of plants and animals had failed to explain the genera- tion of metals; so they turned to digestion and fermentation for analogies, and though they never reached their goal, they picked up much that was valuable on the way. The road itself was barred, and therefore to profit by their works we must follow them into bypaths and digressions. Thus, for instance, we may study with advantage their dialectics. Whilst refuting their adversaries, they were gradually laying the foundations of the logic of science. True alchemists were generally haughty and con- temptuous; the mechanic often grew rich on the scraps which the alchemist was too proud to touch. We cannot always make sure of understanding them, yet from the medley of their writings more fragments of real chemistry may be gathered than is generally sup- posed. There is rhythm and harmony, a ring of true genius about the best of their works, which charms us if it does not send us to sleep with its sweet but monotonous music. In reading Laurent Ventura's book, De Ratione Conficiendi Lapidis Philosophici, we are tempted for a moment to endorse the strange fancy of the Duteh Rabbins, " that even if a man do not understand the lan- guage of

the Zohar, he ought no less to read it; for this language, as the cabalists have written it, is a medicine for the soul."

Often what appeared a work of pure fiction (as the Roman de la Rose) concealed a treatise on alehemy; often, on the other hand, what purported to be a work of pure alchemy was a medium for heretical theology, sometimes for the ideas of Spinosa and Gocthe. The times, moreover, were sad, and all could appreciate the advan- tage of a romance. It was not given to every one to follow the terrible logic of Danstin, the contemporary of Raymond Lully, the author ofa Rosarius, which has never been published, from whieh M. F, Hofer gives the following extract :—" All bodies may be divided into three classes—1. Sensible and intellectual beings (animals and men); 2. Vegetables; 3. Minerals. Like always tends to unite with like. Intellectual elements are homogencous with the Supreme Intcl- ligence; that is why the soul yearns to be absorbed into the Deity. The elements of the body are of the same nature as the surround- ing physical world; hence their tendency to unite the one with the other. Death is then for all a moment to be desired." Dico Amen tibi, reverende mi Doctor, to borrow Bernard's favourite expression.

After so much mist and fog we need a breath of fresh air. Let us pass at once, then, to the Luther of science, who reproached so bitterly the Luther of theology with only going half-way—to an epoch which witnessed the new birth of intellectual life, and to a man who was carried by the new movement into every sort of extravagance, though his errors were those of a generous and unselfish nature. Let us treat of the Renaissance and Paracclsus.

IV. PARACELSUS AND HIS INFLUENCE.

Tempting as the subject is, we must not linger either on the philosophical doctrine or the medical system of this extraordinary man, for fear of encroaching on the article MeDIcINE or the article ParaceLsus. We only wish to show that he is the pioneer of modern chemists, and the prophet of a revolution in general science. Those who only know Bacon in manuals of philosophy are never tired of repeating that the great English philosopher is the father of experimental science. This is true, indeed, in the sense that Bacon insisted with inexhaustible eloquence on the necessity of

experimental science, but it is false if it means that Bacon inaugurated modern science by personal experiments. It was this popular conception of Bacon which Liebig attacked, and he thus found no difficulty in drawing up a long and crushing indictment. Bacon was

the prophet of experimentation, and this title is sufficient to secure his fame against the abuse of modern dogmatists, who think that science increases little by little, with here a fact and there an idea, without a single pausc, a single relapse or revolution. Few take the trouble to consider how far Bacon's philosophy belongs to the past ; most are satisfied with cut and dried phrases about the part he played in modern scicnce. Just in the same way, Para- celsus, the great innovator, who thought himself even more enfranchised from the bondage of Aristotle and Galen than he really was, is dispatched with ready-made phrases, but, unlike Bacon, he gets nothing but ridicule and abuse. Madman, charlatan, impostor—no name is too bad for him with the historians; and yet they are forced to confess that this impudent adventurer brought about a necessary revolution. Thomas Thompson is very severe ; he goes so far as to reproach Paracelsus with declining the word tonttru. He would have wished, forsooth, the revolu- tionist of Basle to have delivered before his young and enthusiastic audience " the sober lectures of a professor in a university." Dryasdusts are fond of falling into such anachronisms ; a far truer estimate of Paracelsus has been given us by Mr Browning in the drama which bears his name. There are self-deceived visionaries who are always thinking that the problem is solved, who compose elaborate romances with which enthusiasts are enchanted. Raymond Lully was one of this class. There are spirits of light who point out and trace the road along which humanity travels slowly in their wake. Bacon belongs to the first category, but has played the part of

a genius of the second order. Thirdly, there are souls of fire always enveloped in clouds, from which ever and anon the lightnings of genius flash forth, who bear humanity towards a goal foreseen rather than seen by themselves, by a rough and rugged road with endless turns and windings. Such a nature was Paracelsus. His pride was more towering than the mountains of his native Switzerland. He be- lieved that through him a new race, the Germans, were destined to succeed to science. The Greeks, the Arabians, aud the Italians, their immediate disciples, had had their day with him, and through him the German era was to begin. He studied under Trithema, the abbot of Span- heim, and under his father, a distinguished alchemist : Agrippa was his fellow-student. Afterwards he resorted to strange masters—old wives and workmen, his beloved miners, who confided to him their secrets. He was the greatest traveller in that age of scientific travellers. Lastly, he practised medicine as the doctor of the poor, and inaugurated lectures in the vulgar tongue. Van Helmont, his real successor, who inherited his goodness of nature, established clinical medicine, @.e., lessons at the bedside of the patient. Stahl, who inherited his arrogance and his love of symbolism, developed from one of the ideas of his master the phlogistic theory, the elaboration of which theory was for chemistry a prosperous period of incubation, while from the refutation of this theory the science may be truly said to date its birth, Paracelsus's work, like his genius, oscillates perpetually between magic and science, but what has not been sufficiently observed is, that science invariably ends by carrying the day. If, for instance, he is giving us "the green lion," a recipe for making gold, he ends by breaking a lance with the seekers for gold :— "" Away with these false disciples who hold that this divine science, which they dishonour and prostitute, has no other end but that of making gold and silver. True alchemy has but one aim and object, to extract the quintessence of things, and to prepare arcana, tinctures, and elixirs, which may restore to man the health and soundness he has lost." He beards the " white-gloved " disciples of Galen, and, in spite of their juleps and draughts, asserts that alchemy is

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indispensable, and that without it there is no such thing as medical knowledge. – He rejects the easy cxplanation of the universe by means of an

entity, stigmatising it as paganity, meaning thercby a necessary consequence of paganism, which as a theosophist he holds in abhorrence. He rejects the favourite instrument of the schoolmen, the syllogism. Nature, as he views it, is not a clear and intelligible system of which the form declares the essence ; no, it is mysterious. There is a spirit at work beneath the outside shell. What is written on this shell no one can read but the initiated who have learned to separate the real and the apparent. " At the same time, everything is not active. To separate the active portion (the spirit) of this outside shell from the passive, is the proper province of alchemy." Thus we see that with Paracelsus alchemy ceased to be the search for the first principles of bodies, and made one step in advance towards chemistry. His innate genius for medicine, as he boasted, but more truly his noble heart, urged him to learn a study which better satisfied his pride, but which had not the practical useful- ness of medical chemistry to recommend it. The name datro- chemics marks this transition from alchemy to chemistry. A remarkable saying of Paracelsus shows us the close connection between his alchemy and his medicine: " Vita ignis, corpus lignum." This notion of the importance of combustion was taken up again by Becker and his disciple Stahl, the inventors of the term phlogiston, which they thought was of an earthy nature, because resin, phos- phorus, sulphur, and other combustible bodies are insoluble in watcr. Paracelsus was too well initiated in the cabal- istic theory of astral light, which symbolised the universal agent of light and heat, to have accepted such a gross materialistic theory. A distinguished Frenchman of the present century, who prided himself on being a follower of the cabalists, has in one of his novels, called La Peau de Chagrin, reproduced the theory of Paracelsus, vita ignis, corpus lignum. ach act, each wish of the possessor of the talisman, causes the skin to shrink; and Mr Huxley, in his remarkable lecture on The Physical Basis of Life, has not been ashamed to borrow this illustration from Balzac. What renders Paracelsus's saying so valuable is, that it is neither materialistic nor spiritualistic, but merely dynamical.

Another instance of Paracelsus's oscillating between the modern aud the ancient world is seen in the hesitation he shows when discussing the influence of the planets over the internal organs of the body. Sometimes he seems to take the symbol for the thing itself, but he ends by admitting only the parallelism of the macrocosm and the microcosm. When he assigns the

brain to the moon and the heart to the sun, he seems to say: "I do not think with Plato that the brain is all; it is but the reflector and guide—the heart is the regulator of the organism. I place my archeus a little above the heart, as a connecting-link between the nervous and sanguine circulation, as Hippocrates has his enormon," If he had lived in calmer times, and known the true Aristotle, Paracelsus would have allowed that popdy does not represent the évredexeia of the Stagyrite, that évepyéia is the true meaning. But in those times of false Aristotelianism the Spaguism of Paracelsus was pitted against the Stagyrism of Aristotle. By making the viscera the seat of diseases, Paracelsus claims to be the founder of the organicists; by his chemistry of the blood—mercury which evaporates, sulphur which burns, salt which is con- stant—he is answerable for the blunderings of Maitre Purgon; by his archeus, the grand motor and regulator of the astrology of the body, he is the ancestor in a direct line of animism, and collaterally of modern Hippocratism or vitalism of the Montpellier school. In short, it is hard to name anything that cannot be found in the works of this mad genius, who, in spite of the jars and jolts of his wild

carcer, still manages to keep the road without upsetting either at Paris or Montpellier. What, we may ask, would modern therapeutics be without the opium and mercury of Paracclsus—without the laudanum of his disciple Querce- tan, physician to Henry IV., &c.? When this charlatan had substituted for astrological influence a simple parallelism, it was easy for Van Helmont to rid modern science of this simple parallelism. Besides all this, Paracelsus was a real doctor. The death of Erasmus's friend, whom he was attending, did him less harm than the cure of another patient, who was dining with him ninety-nine days after he had been pronounced in extremis; more fatal still was the case of Cornelius de Liechtenfels, who, when cured by him of the gout, refused to pay his benefactor the stipulated price. Paracelsus would not hold his tongue or submit to the magistrates, and in consequence had to resign his professorship at Basle. A double interest attaches to this story; it hastened Paracelsus's death, and it proves that he would never have accepted the ws medicatrizx nature of Stahl. We have seen that those strange bodies which escaped from the retorts of the masters of the sacred art were called by them souls; their successors, on a closer

acquaintance with them, called them spirits. Basil Valentin and Paracelsus, recognising their importance in the trans- mutation of bodies, gave to them the name of mercury. – Van Helmont studied them more minutely, and invented the name gas. He was acquainted with carbonic acid under. the name of woody gas. But his ignorance of the action of the oxygen of the atmosphere prevented him from making the fundamental distinctions between experiments _per- formed in a closed vessel and in one open to the air. Priest- ley, Lavoisicr, and Schule, by the use of the test-tube and the balance (both Van Helmont and Stahl had also turned the balance to good account), weighed and tested the results of ancient alchemy. Hence modern chemistry was born. But we must in justice add that the work had already been begun by men of genius, such as Bernard Palissy, Boyle the eminent critic and experimentalist, Homberg, the two Geoffroys, Margraff, Bergmann, Rouelle the master of Lavoisier, who may be called the Diderot of chemistry. Moreover, the most important discoveries in chemistry have been made by men who combined with chemical expcri- ments a marked taste for alchemic theories. We may instance Glauber, ablest of mystics; Kunkel, who thought he had found in the "shining pills" of his phosphorus mirabilis as efficacious a remedy as the potable gold in which he also believed; Glaser the alchemist, master of Lemery, who has been called the father of chemistry ; Robert Fludd, &e.

It is curious to observe that soon after chemistry was established as a science there was a regular deluge of searchers for the philosopher's stone. The limits of this article prevent us from giving a full list of their names. Suffice it to mention, among Frenchmen, De Lisle, who died in the Bastile of the wounds his guardians inflicted on him to extort his secret; among Englishmen, Dr Price, who committed suicide to escape from a public trial of his pretended discovery. As to the theoretical possibility of making gold, the grcat French chemist Dumas considered that a solution might be found in the doctrine of isomer- ism; and the great English chemist Sir Humphrey Davy refused to pronounce that the alchemists must be wrong. Before concluding this short sketch of a vast subject, we must give a brief list of titles of the most important autho- rities on the subject, and enumerate the principal words which alchemy has bequeathed to scientific terminology, or which have passed into the language of common life :—

AvTHoRiTIES,—Roger Bacon, Thesaurus Chimicus, 8vo, Francof.,

1603 ; Francis Bacon Lord Verulam, History of Metals, fol., London, 1670; J. J. Becher, Opera Omnia, Francof., 1680; Chymia

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Philosophica, 8vo, Nuremberg, 1639 ; John Es agnet, Enchiridion Philosophie Hermetice, Paris, 1638 ; Robert Fludd, Clavis Alchimie, 2 vols., Francof.; T. R. Glauber, Works, Chimistry, fol., London, 1689 ; Hermis Trismegisti, Traduetion par J. Mesnard, 8vo, Paris (edited by Didier); J. Kunkel, Experiments, 8vo, London, 1705 ; Paracelsi Opera Omnia (with a remarkable preface by Fred. Bitiski), 2 vols. fol.; J. B. Porta, De ris Transmutationibus, 4to, Rome, 1610; Quercetan, Hermetieal Physic, 4to, London, 1605 ; Georgii Ripley, Opera Omnia, 8vo, Cassel, 1649; J. Trithemius, De Lapide Philosophico, 8vo, Par. 1611; Basil Valentin, Last Will, &., 8vo, London, 1671. Of compilations we may mention— Artis Auriferse quam Chemiam vocant Duo Volumina (this work includes the Turba Philosophorum), Basilex, 1610; J. J. Manget, Bibliotheca Chemica Curiosa, 2 vols, fol., 1702; Theatrum Chimi- cum, 6 vols. 8vo, Argent., 1662; The Lives of the Adepts in Alchemystical Philosophy, with a critical catalogue of the books in this scieuce, and a selection of the most celebrated treatises, &c., 8vo, London, 1814; Essai sur la Conservation de la Vie par le Vete. Le Lapasse, 8vo, Paris. Among the best historical and critical works with which we arc acquainted we will mention—Pctr. Gregor. Tholozanus Syntaxedn Artis Mirabilis, 2 vols., Lugduni, 1576; 0. Borrichius de Ortu et Progressu Chemia, 4to, 1668 ; The History of Chimistry, by Thomas Thompson, 2 vols. 8vo, London, 1830 ; Eusebe Salverte, Les Sciences Occultes, 8vo, Paris, 1829; Ferd. Hoefer, Histoire de la Chimie, 2 vols. 8vo, Paris, and an abridg- ment by the same author ; Histoire de la Physique et de la Chimie, 8vo, Paris, 1872; Louis Cruveilhier, Philosophie des Seiences Médieales, (Euvres Choisies, 8vo, Paris, 1862; Fred. Morin, Genése de la Science (an important work, which we only know from quota- tions in French reviews and encyclopedias) ; Dumas, Philosophie Chimique. Lastly, if we wish to trace the transition of alchemy to chemistry we shall find valuable information in Le Dictionnaire de Physique, dedicated to Mons. le Duc de Berry, 8 vols. 4to, Avignon, 1761, under the

words Alkali, Alum, Chimie, Pierre Philosophale, Hombecrg. The reader will observe that in this encyclopedia, written with the express purpose of propagating the Newtonian theory in France, the classical science could bring no real arguments against alchemy. He may also consult the remarkable work of La Metherie, which has been undeservedly forgotten— Essai Analytique sur]'Air pur et les Differentes Espéces d'Air, 3 vols. Paris, 1785; and The Birth of Chemistry, by G. F. Rodwell, London, 1874.

EtTyMoLoGy.—The idea that nature must be tortured to mako her reveal her secrets is preserved in the word crucible: Fr. creuset, Ital. cructolo, Span. crisol—all from the Latin erux, a cross. Tho word matrass, Fr. matras, is probably from the Celtic matara, an arrow, through the old French verb matrasser, to harass. Bain-Marie and amalgam (udAayua) are a legacy of the sacred art. We can trace the two principles, male and female, of the alehemists in the word arscnic (apoevindy, male). From the Arabs we get alcohol (al Kohl), properly anything burnt, then a powder of antimony to darken the eyelids, and lastly, spirits of wine ; alkaii, ashes ; borax, the white substance ; lackcr, from Jac, resin ; elixir, from el kestr, essence ; alembic, Arab. alanbig. Potash is obviously the ash of the pot, Germ. potasch ; laudanum is a corruption of dawdandum. Tho derivation of tartar, Fr. tartre, is strange. Paracelsus considered tartar to be the cause of the gout, and borrowed the name from the infernal regions (Tartarus). The Spaniards have borrowed from the Arabs, azogue, mereury ; azogar, to overlay with quicksilver ; azoguero, a worker in mercury ; azogamiento, agitation ; azogada- mente, with agitation. The same Celtic root which gave to Latin the word vertragus, used by Martial for greyhound, and to Greek ovépraryos, found in Alian, from which Dante took the word veltro, has also created a large family of words—the Ital. peltro, tin and mercury ; Span. peltre, lead and tin; old Fr. 'peautre = peltro; Eng. pewter, pewterer, &c. The Place Mawbert at Paris derives its name from the fact that Magister Albertus lived there (Maubert = Ma' Albert). From the alchemists we get both the ideas and the words affinity (Albertus Magnus), precipitete (B. Valentin), reduce (Paracelsus), saturation (Van Helmont), distillation, calcina- tion, quintessence, agua vite (brandy was originally only employed as a medicine), agua regalis, aqua secunda, gas, cobalt, from Kobolds, the genii of mines, &c. (3. A.)

ALCIATI, ANDREA, an eminent Italian jurist, born at Alzano, near Milan, onthe 12th January 1492, died 1550. He displayed great literary skill in his exposition of the laws, for which De Thou highly praises him. He published many legal works, and some annotations on Tacitus. His Emblems, a collection of moral sayings in Latin verse, has been greatly admired, and translated into French, Italian, and Spanish. Alciati's history of Milan, under the title Rerum Patrie, seu Historie Mediolanensis, libri IV., was published posthumously at Milan in 1625,

ALCIBIADES was born at Athens about 450 B.c. Through his father, Cleinias, he traced his descent from Eurysaces, the son of Ajax, and through his mother, Deinomache, from Megacles, the head of the Alemzxonide. He was thus related to Pericles, who, after the death of Cleinias at the battle of Coronea (447 3.c.), became his guardian. A youth early deprived of his father's coutrol, possessed of great personal beauty, and the heir to great wealth —a youth consequently universally honoured, courted, and caressed—was not in a position to acquire a knowledge of the virtue of self-restraint in any shape or form. Spoilt accordingly by flatteries and blandishments, the boy showed himself self-willed, capricious, and passionate, and indulged in the wildest freaks and most insolent, tyrannical behaviour. Nor did the instructors of his early manhood supply the corrective which his boy- hood lacked. The collection of moral, political, and reli- gious beliefs which the earlier Greeks, from custom, convenience, or the promptings of common sense, had accepted as a standard by which to regulate their own conduct and judge that of others, had been exposed by the sophists to the keenest scrutiny and the widest scepticism. Negative criticism, accompanied with showy novel paradoxes, are always attractive to a young man of intellectual vigour ; and thus Alcibiades learnt from Protagoras, Prodicus, and others, tolaugh at the common opinions about justice, temper- ance, holiness, patriotism, &c. The long, patient, laborious thought, the self-sufficing and comparatively ascetic life of his master Socrates, he was able to admire, but not to imitate or practise. On the contrary, his ostentatious vanity, his amours, his debaucheries, and his impious revels, became notorious throughout Athens. But great as were Alcibiades's moral vices, his intellectual abilities were still more

conspicuous. He proved his courage at the battle of Potidea (432 3B.c.), where, wounded, he was rescued by Socrates ; at the battle of Delium (424 B.c.), where he protected his former deliverer; and on many subsequent occasions. Though he was not a very fluent speaker, he always kept to the point. His energy was im- mense, his ambition unbounded but selfish, and provided he could gratify this passiou, he never scrupled at the means or the price. He could read the character of others, andadapt himself to it with a versatility, adroitness, and flexibility which if any even of his shifty fellow-countrymen equalled they never surpassed. Nor were his personal qualities his only recommendation to popular favour. His ancestors and relatives had been for generations the recognised leaders of the people; he had many admirers and followers among the clubs of young nobles; he had numerous de- pendants who partook of his wealth ; and he gratified the populace by the lavish expenditure with which he per- formed his various liturgical duties. On his first entering prominently into public life, he succeeded by a clever but unscrupulous trick in duping the Spartan ambassadors, and persuading the Athenians to conclude an alliance with Argos, Elis, and Mantinea (420 8.c.) Next year he was appointed general, and for three years busily traversed the Peloponnesus, endeavouring to advance the objects of the alliance. But to be the first man in Athens was far too limited an object to satisfy the ambition of Alcibiades: all Greece must be dazzled by his greatness. As the first step towards the accomplishment of this scheme he fixed upon the conquest of Sicily, which would necessarily be followed by that of the Peloponnesus and probably by that of Car- thage. With this view, he warmly advocated the adoption of measures for the relief of Segesta. The.Sicilian expedi- tion being resolved on with great enthusiasm, he, Nicias, and Lamachus, were appointed generals. But shortly before the day appointed for the armaments setting sail there took place a mysterious crime, which was destined to alter the

whole complexion of Alcibiades's future, and with it that of the Athenian state. In the course of one night (May, 415 s.c.) all the busts of Hermes in Athens were sacrilegi- ously mutilated. The enemies of Alcibiades (many of them probably the actual perpetrators) endeavoured to connect him with the sacrilege; and his well-known impieties gave plausibility to a charge which

could never have had any real foundation. Recalled to stand his trial almost as soon as he reached Sicily, he escaped, and made his way to Sparta, where he revealed all the plans of the Athenians, and induced the Spartans to send Gylippus to Sicily and an army to fortify Decelea. He then passed over to Asia Minor, and prevailed upon many of the Ionic allies of Athens to revolt. But in a few months he had lost the confidence of the Spartans ; and at the instigation of Agis II., whose personal hostility he had excited, an order was sent from Lacedzemon for his execution. Re- ceiving timely information of this order, he crossed over to Tissaphernes (412 B.c.), and quickly worming him- self into the satrap's confidence, he persuaded him to cease giving active assistance to Sparta, so that the two Grecian parties, after wearing themselves out by their mutual struggles, might both be easily expelled from Asia. But Alcibiades was now bent on returning to Athens, and he used his supposed influence with Tissaphernes to effect his purpose. In his negotiation with Peisander, though he failed in his immediate object, he succeeded in produc- ing the impression that, whatever side he joincd, he could make Tissaphernes help. Under this impression, he was recalled by Thrasybulus and the armament at Samos, and appointed one of the generals. His appointment was followed by the victories at Cynossema, Abydos, and Cyzicus, and by the recovery of Chalcedon and Byzantium. On his return to Athens after these successes he was welcomed with every demonstration of joy (407 B.c.); all the proceedings against him were cancelled, and he was appointed general with full powers. His ill success, how- ever, at Andros, and the defeat of his lieutenant at Notium, led the Athenians to dismiss him from his command. He thereupon retired to the Thracian Chersonesus ; but after the battle of Aigospotami, and the establishment of the Spartan supremacy throughout Greece, he crossed the Hellespont, and took refuge with Pharnabazus in Phrygia. There an attack was made upon him, but by whom or for what cause historians are not agreed; his residence was set on fire, and on rushing out on his cowardly assassins, dagger in hand, he was killed by a shower of arrows, 404 B.c. By his wife Hipparete, Alcibiades left one son, who was named after himself.

ALCINOUS, a Platonic philosopher of uncertain date, author of a work entitled "Exvrouy rév TlAdrwvos Soyparov, which has been translated into English by Stanley in his History of Philosophy. The best edition of the Greek original is that by Fischer, Lips. 1783, 8vo.

ALCINOUS, a mythical king of the Pheacians, in the island of Scheria, was son of Nausithous, and grandson of Neptune and Periboea. He has been immortalised in the Odyssey, the description of his reception and entertainment of Ulysses, who when cast by a storm on the shore of the island was relieved by the king's daughtcr, Nausicaa, form- ing the main subject of books vi. to xii. of that poem. The subjects of Alcinous loved pleasure and good cheer, yet were skilful seamen; and he himself is described as a good prince.

ALCIPHRON, the most eminent of the Greek epistolary writers, was probably a contemporary of Lucian. His letters, of which 116 have been published, are written in the purest Attic dialect, and are considered models of style. The imaginary authors of them are country people, fisherwomen, courtesans, and parasites, who express their

sentiments and opinions on familiar subjects in refined and elegant language, yet without any very apparent incon- sistency. 'The new Attic comedy being the principal source from which Alciphron derived his information, these letters are valuable as delineating the private life of the Athenians at that period. The best editions are by Bergler, Lips. 1715, and Wagner, Lips. 1798.

ALCIRA, probably the Swtabicula of the Romans, a Spanish town, on an island in the river Xucar, 25 miles S.W. of Valencia, in the province of that name. It is surrounded by walls, and has two fine bridges. There is a remarkable stalactite grotto in the vicinity. The prin- cipal productions are silk, rice, and oranges, which are largely exported. Population, 15,400.

ALCMAN, sometimes also called ALcmMaon, one of the most ancient, and, in the opinion of the Alexandrian critics, the most distinguished of the lyric poets of Greece. According to one account he was by birth a Lydian, while others state that he was a native of Sparta, where, at any rate, he lived from a very early age. The time at which he flourished is uncertain, but it is generally assumed that it embraced the period between the years 670 and 630 B.c. Aleman may in some respects be regarded as the father of lyric poetry among the Greeks, and it was probably for this reason that the

Alexandrian critics put him at the head of their lyric canon. His poems, which seem to have formed a collection of six books, are known to us only from a number of small fragments. Many of them were of an erotic character, but others were hymns and didactic pieces. All were written in the vigorous broad dialect of the Dorians. The best collection of these fragments was published by F. G. Welcker, Giesen, 1815, 4to; they are also contained in Bergk's Poete Lyrict Greci, 1852, 8v0.

ALOMENE, the daughter of Electryon, king of Mycene, and wife of Amphitryon. She was the mother of Hercules by Jupiter, who assumed the likeness of her husband during his absence, and of Iphicles by Amphitryon.

ALCOCK, Jon, doctor of laws, and bishop of Ely in the reign of Henry VII., was born at Beverley in York- shire before 1440, and educated at Cambridge. He was made dean of Westminster and master of the rolls in 1462. In 1470 he was appointed ambassador to the court of Castile, and in 1471 was consecrated bishop of Rochester. In 1477 he was translated to the see of Worcester; and in 1486 to that of Ely. He was a prelate of great learning and piety, and so highly esteemed by King Henry that he appointed him lord president of Wales, and after- wards lord keeper of the Great Seal. Alcock founded schools at Kingston-upon-Hull and Beverley, and built the spacious hall belonging to the episcopal palace at Ely. He was also the founder of Jesus College in Cam- bridge, for a master, six fellows, and as many scholars. This house was formerly a nunnery, dedicated to St Radi- gund ; and Godwin says that the building being greatly decayed, and the revenues reduced almost to nothing, the nuns had all forsaken it, except two; whereupon Bishop Alcock procured a grant from the crown, and converted it into a college. But Camden and others tell us that the nuns of that house were so notorious for their incontinence, that King Henry VII. and Pope Julius II. consented to its dissolution. Bishop Alcock wrote several pieces, among which are the following:—1l. Mons Perfectionis ; 2. In Psalmos Peenitentiales; 3. Iomilie Vulgares; 4. Meditationes Pie. He died at Wisbeach, October I, 1500, and was buried in the chapel built by himself in Ely cathedral.

ALCOHOL, a volatile organic body, constantly formed during the fermentation of vegetable juices containing sugar in solution. It is extracted

from spirituous liquors

accumulates in the first portion of each distillate.

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of different kinds by successive distillations or rectifica- tions ; the alcohol being more volatile than water, gradually After a few operations the spirit obtained is as strong as it can be made by this process, and further repetition does not enable us to separate more water from it. In commerce the strongest spirit is known as spirit of wine, and contains about 90 per cent. of alcohol. The remaining 10 per cent. of water must be removed by some chemical agent that will combine with water and retain it at the boiling-point of the spirit, and be without any specific action on the alcohol. The dehydrating substances in general use are certain anhydrous salts, such as carbonate of potash, acetate of potash, or sulphate of copper. These rapidly absorb water at low temperature, and part with it at a red heat; so that they may be used over and over again. The most efficient dehydrating agent is caustic lime or caustic baryta. Lime is generally used in making the absolute alcohol of commerce. For this purpose the caustic lime is broken into small pieces about the size of a walnut, and placed in a retort; spirits of wine is now poured into the vessel, just sufficient to cover the lime, and the whole is left to digest for a night. During this time the lime gradually slakes from the absorption of water, and the anhydrous alcohol is left, ready to distill off at the tempera- ture of the water-bath. Absolute alcohol is a very mobile colourless liquid, having a high refractive power, and possessing a feeble agreeable smell and an acid burning taste, which, however, diminishes as it is diluted with water. The caustic taste is in great part due to the rapidity with which it takes water from any living tissue with which it comes in contact, producing coagulation if the fluids are albuminous. Alcohol has a specific gravity of 0°794 at a temperature of 60° Fahr., and boils at 173°°1 Fahr., barometer being at 30 inches. It does not conduct electricity, and has never been obtained in the solid state, although at very low temperatures it becomes viscid. For this reason alcohol is always used to fill thermometers for registering low temperatures, as mercury freezes, and can- not be employed as an index of temperature below — 39° Fahr. Its high co-efficient of expansion makes alcohol a very sensitive fluid for

thermometric purposes. Alcohol has a great tendency to absorb water from the atmosphere, and must be kept in thoroughly sound vessels. It mixes with water in all proportions, and during the dilution there is a considerable amount of heat evolved. When alcohol and water are mixed, a contraction of volume occurs, which augments until 100 parts of alcohol are mixed with 116-23 parts of water ; 103°775 vclumes of alcohol and water mixed in that ratio contracting to 100. Addition of water beyond the proportion given above causes less and less contraction, and finally no diminution of volume can be observed. As alcohol is diluted with water its volatility and its power of dilatation diminish, whereas the specific gravity increases, continually approaching that of water. Next to water, alcohol is the substance most generally employed as a solvent. It dissolves many organic sub- stances, and is especially used in the arts for the manu- facture of varnishes. In medicine it is invaluable as a solvent of the active principle of many substances that are insoluble in water, and would soon decompose in aqueous solution. These alcoholic solutions are generally called tinctures.

Alcohol is an excellent antiseptic agent. As a pre- servative of animal structures it is generally used in the impure state—known in commerce as methylated spirit. This is spirits of wine mixed with 10 per cent. of com- mercial wood spirits, which does not interfere with its preservative or solvent powers, although it renders it unfit for use as a beverage.

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Alcohol has the following chemical composition :—

Wambonyerrectter oot ancetiiuises rec nocsscne 52°67 per cent.

Hydrogen Spagneostere ee) 36

(OAS. oasbyashoneccbebognosecagbeoueqengact 34°43 99

100-00 0

Its formula in chemical symbols is C,H,O. During the fermentation of sugar the change that takes place is repre- sented as follows :— CoH 0. = 2C,H + 2 CO, Grape sugar. Alcohol. Carbonic acid.

The complex body, grape-sugar, breaks up by the action of the ferment or yeast into alcohol or carbonic acid, without anything being added. This kind of chemical change is sometimes called an action of presence, or catalytic action, because the substance inducing it does not enter into the composition of the products of the reaction. The alcohol ferment or yeast is a minute cellular plant that grows rapidly in sugar solution, especially if albumenoid matter is also present, and during the continuance of its vital functions causes a rearrangement of the atoms of the sugar. In order that fermentation may proceed regularly, a tempera- ture of about 60° Fahr. is required, and an amount of sugar in solution not exceeding 10 per cent. The sugar is principally obtained from malt, which is barley that has been allowed to germinate for a certain time, and is then arrested in its growth by heating to a high temperature. During this process of germination there is a peculiar ferment produced called diastase ; this has the remarkable property of changing starch into grape-sugar. When the malt is treated with water, the ferment causes all the starch originally present in the grain to appear in solution as grape-sugar. All kinds of starch may be changed into grape-sugar by boiling with dilute sulphuric acid, which in this case acts somewhat like a ferment, because it is not decomposed during the action. The sulphuric acid is afterwards separated by treating with lime, which produces insoluble sulphate of lime (gypsum), and lcaves the sugar in solution. In this way sugar for the alcohol manufacture is now largely made from the potato and other starch- yielding plants. Cane-sugar is too expensive to be employed in the distillery. Molasses, or the uncrystallis- able portion of the cane-sugar, is, however, largely used.

Alcohol, when acted on by other chemical substances, produces a great variety of new compounds. With acids a remarkable class of bodies are produced called ethers, of which ordinary ether is the type. The majority of them are very volatile fluids, that in many cases have a very agree- able odour, and are not readily soluble in water. Many ethers are obtained by simply heating a mixture of the acid and alcohol in a closed vessel to a temperature of 212° Fahr., and subsequently treating with water. The water dissolves the alcohol not acted upon, and leaves the ether floating on the surface.

When alcohol is treated with chlorine, absorption occurs, and hydrochloric acid is continuously evolved for many hours, the temperature rising considerably during thé action. Many substances are formed in succession, but the principal product, after long-continued action, is the substance chloral, now largely used as an anesthetic. Bromine produces a similar body called bromal. Iodine does not act on alcohol at ordinary temperatures, further than to pass into solution. When treated with a solution of chloride of lime, alcohol is violently attacked, and the result of the action is the well-known substance chloroform. Acted on by oxidising agents, alcohol gives two new sub- stances—aldehyde and acetic acid. The ease with which acetic acid is produced by heating with a mixture of bichromate of potash and sulphuric acid gives a delicate method of detecting and estimating very small quantities

of alcohol. When the vapour of alcohol is passed through a red-hot tube filled with fragments of pumice-stone, com- plete decomposition takes place. Among the products are found naphthalin, benzol, hydrogen, marsh gas, ethylenc, and other bodies.

The synthesis of alcohol has been effected by means of the hydro-carbon called olcfiant gas, which may be made directly from carbon and hydrogen. When this gas is shaken with strong sulphuric acid it gradually combines with it; and if it is afterwards diluted with water and distilled, alcohol passes over. As olefiant gas is one of the constituents of common coal-gas, this substance may be used to make alcohol by the above method. The action that takes place is represented thus :—

C,H, + H,O = C,H,O Olefiant Gas. Water. Alcohol.

As the value of spirituous liquors depends mainly on the quantity of alcohol they contain, it is essential to find some simple and rapid means of ascertaining the percentage amount of the substance present. For this purpose three methods may be employed, viz., specific gravity determina- tion, temperature of ebullition, or rate of expansion. The easiest plan, and the most generally used, is the density method. Very accurate tables are published of the specific gravity of mixtures of alcohol and water in all

proportions, so that it is only necessary to refer to these tables to get the percentage composition. In the case of liquors, like wines or beers, that contain many other substances in solu- tion in addition to alcohol, it is necessary to separate the alcohol from the extractive matters—sugar, salts, &c.—by distillation, and to take the density of the volatile portion. As wines contain many volatile ethers that would pass over with the alcohol in the above process, and interfere with accurate results being obtained, they are generally decomposed by heating with an alkali before the distillation commences.

The physiological action of alcohol is a subject to which considerable attention has been directed of late years, and many investigators have attacked the problem. The most . important contribution to our knowledge of the subject is due to Dr Parkes, who has made a long series of observa- tions on soldiers living on a constant diet with and without the use of alcohol. In these experiments the weight of the body, the amount of nitrogen in the urine and feces, the amount of urea, the pulse, and the temperature of the body were all determined daily. The following are the principal conclusions deduced from the investigation :—

The elimination of nitrogen during exercise was unaffected by brandy; and since a similar result occurred in a series of expert- ments made during rest, it seems certain that in healthy men on uniform good diet alcohol does not interfere with the disintegration of nitrogenous tissues.

The heat of the body, as judged of by the axilla and rectum temperature, was unaffected by the amount given. The apparent heat after alcohol must therefore be owing to subjective feelings connected with the quickened circulation, rather than to an actual rise of temperature.

The pulse was increased in frequency by 4 ounces of brandy, and palpitation and breathlessness were brought on by larger doses to such an extent as greatly to lessen the amount of work the man could do, and to render quick movements impossible. As the effect of labour alone is to augment the strength and frequency of the heart's action, it would appear obviously improper to act on the heart still more by alcohol. Whether on a heart exhausted by exertion alcohol would produce good or bad effects is not shown by these experiments. :

Neither exercise nor alcohol produced any effect on the phosphoric acid of the urine, or the free acidity, or the chlorine.

As the action of alcohol in dietetic doses on the elimination of nitrogen and on the bodily temperature is so entirely negative, it seems reasonable to doubt if alcohol can have the depressing effect on the excretion of pulmonary carbon which is commonly attributed to it. It can hardly depress, one would think, the metamorphosis of tissues or substances furnishing carbon, without affecting either the changes of the nitrogenous structures or bodily heat,

+» The elimination of alcohol from the body has been a matter of dispute between different observers. Previous to the year 1860 it was the generally-received opinion that the greater portion of any alcohol taken was oxidised in the system, and only a small fraction eliminated unaltered. In that year Messrs Perrin and Lallemand published an elaborate memoir on the subject, in which they maintained that all, or at least nearly all, the aleohol taken is eliminated unaltered. This subject has been recently reinvestigated by Dr Austin, Dr Thudichum, and especially by Dr A. Dupré. The main results of Dr Dupré's series of observa- tions may be summed up as follows :-—

The amount of alcohol eliminated per day does not increase with the continuance of the alcohol diet; and therefore all the alcohol consumed daily must of necessity be disposed of daily ; and as it certainly is not eliminated within that time, it must be destroyed in the system.

The elimination of alcohol following the ingestion of a dose or doses of alcohol ceases in from nine to twenty-four hours after the last dose has been taken.

The amount of alcohol eliminated in both breath and urine is a minute fraction only of the amount of alcohol taken.

In the course of these experiments the author found that, after six weeks of total abstinence, and even in the case of a tcetotaller, a substanee is

eliminated in the urine, and perhaps also in the breath, which, though apparently not alcohol, gives all the reactions ordinarily used for the detection of traces of alcohol. The quantity présent in urine is, however, so small that the precise nature of the substance has not as yet been determined. The author points out an apparent eonnection between this substance and alcohol. It was found that, after the elimination due to the ingestion of alcohol had ceased, the amount of this substance eliminated in a given time at first remained below the quantity normally excreted, and only gradually rose again to the normal standard. A careful study of this connection may perhaps serve to throw some light upon the physiologieal action of alcohol.

ALCOY, one of the most thriving manufacturing cities of Spain, on the river Alcoy, in the province of Alicante, 24 miles N.N.W. of the town of that name. It is built on an elevated site at the foot of a gorge of the Sterra de Mariola, and presents a picturesque appearance. There are several handsome buildings and a number of public fountains, but the industry of the place is its chief character- istic. The principal employment is papermaking. About 200,000 reams are produced annually, the extraordinary quantity of 180,000 reams being a paper of light texture used for making cigarettes. Coarse woollen stuffs are also manufactured. A very curious festival is held annually in April in honour of St George, the patron saint of the town. Population, 27,000.

ALCUDIA, Manuget pe Gopoy, Duke or, "Prince of the Peace," Spanish statesman, was born of poor but noble parentage at Badajoz on the 12th May 1767 (died 1851). In 1784 he came to Madrid to join the royal body-guard, and by his handsome presence and agreeable manners soon attracted notice, The queen regarded him with great favour, and the weak-minded Charles IV. raised him rapidly from dignity to dignity, until in 1792, on the disgrace of Aranda, he became prime minister. One of the first steps he took on his accession to power was to declare war against the French convention. Though success at first attended the Spanish arms, the position of matters was reversed in a second campaign, and the war was concluded by the treaty of Basle, signed on the 22d July 1795, for negotiating which Godoy received his title of Prince of the Peace and a large landed estate. He was also made at the same time a grandee of Spain of the first class, In

1796 he formed .an offensive and defensive alliance with the French republic, which involved Spain in a war with England. Next year he was married to Maria Theresa de Bourbon, niece of the king by a mor- ganatic marriage of his brother Luis. As it was under- stood that Godoy had already married Dona Josef a Tudo, this second alliance, though it brought him nearer

to the king, did much to increase his unpopularity with the nation. On the 28th March 1798 he found himself forced to resign his position in the ministry, but he never lost the favour of the king, who appointed him grand admiral in 1799. About the same time he was restored to power, and entered into an alliance with Napoleon, having for its object the partition of Portugal. The war, in which Godoy himself commanded, was of short duration, the treaty of Badajoz, signed on the 6th June 1801, securing from Portugal a subsidy to France and a cession of terri- tory-to Spain. Godoy was rewarded for his service with the title of Count of Evoramente, and an annual income of 100,000 piastres. In 1804 he became generalissimo of

the land and sea forces of Spain; but the honours thus ~

heaped upon him by the king were accompanied by grow- ing dislike on the part of the nobility and the people. The higher classes regarded him with jcalousy as a parvenu, and he was necessarily unpopular with a nation that attri- buted to him the defeat of Trafalgar, and the stoppage of its commerce through the blockade of the ports., A change of policy, by which he endeavoured to break off his alliance with France and enter into friendly relations with England, came too late to save his position. Napoleon determined to remove the Bourbons from the throne of Spain, and the invasion of the French troops gave Godoy's enemies the wished-for opportunity to secure his downfall. The prime minister had retired from Madrid, and was making arrange- ments for the removal of the king and queen to Mexico, when the project was discovered by the Prince of Asturias, the leader of the party opposed to him. On the 18th March 1808 Godoy was seized at Aranjuez by the mob, who were only restrained from executing summary ven- geance upon him by the promise given them that he should undergo a fair trial. Napoleon, however, wishing to avail himself of his influence over Charles, sent Prince Murat to effect his release. He was

removed in April to Bayonne, where on the 5th May he signed the deed by which Charles IV. abdicated in favour of the Prince of Asturias. He continued to enjoy the undiminished favour of Charles, whom he accompanied to Rome, his possessions in Spain having been confiscated. On the death of his royal master he removed to Paris, where he received a pension of 5000 francs from Louis Philippe. In 1836-8 he published memoirs of his lifc, in which he defends his policy. In 1847 his titles and the greater part of his cstates were restored to him, and he received permission to return to Spain. He continued, however, to reside in Paris, where he died on the 4th October 1851,

ALCUIN, in Latin Albinus, surnamed Flaccus, an eminent ecclesiastic and a reviver of learning in the 8th century, was born in Yorkshire about 735 (died 804), He was educated at York under the direction of Arch- bishop Egbert, as we learn from his own letters, in which he frequently calls that prelate his beloved master, and the clergy of York the companions of his youthful studies. He succeeded Elbert as director of the seminary, and in later life modelled after it his famous school at Tours. He survived Bede about seventy years; it is therefore hardly possible that he could have received any part of his education under him, as some writers of literary history have affirmed; and it is worthy of observation that he never calls Bede his master, though he speaks of him with the highest veneration. It is not well known to what preferments he had attained in the church before he left England, though some say he was abbot of Canter- bury. He was sent to Rome by Eanbald, the successor of Ethelbert, to procure the pallium, and, in returning, at Parma he met Charlemagne, who, as Alcuin had already visited the French court, was no stranger to his extra- ordinary merit. The emperor contracted so great an

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esteem and friendship for him that he earnestly urged and at length induced him to take up his residence at court and become his preceptor in the sciences. Alcuin accord- ingly instructed Charlemagne and his family in rhetoric, logic, mathematics, and divinity. He particularly distin- guished himself by his writings in defence of the orthodox faith against the adoptionists, Felix, bishop of Urgel, and Elipandus, archbishop of Toledo,

convincing the former of his error after a six days' debate at Aix-la-Chapelle (799), and treating the latter in the most con- ciliatory manner ; and on more than one occasion he was employed in important missions between Charlemagne and Offa, king of Mercia. "France," says one of our best " writers of literary history, with some degree of truth, "is indebted to Alcuin for all the polite learning it boasted of in that and the following ages. The universities of Paris, Tours, Fulden, Soissons, and many others, owe to hin their origin and increase, those of which he was not the superior and founder being at least enlightened by his doctrine awd example, and enriched by the benefits he procured for them from Charlemagne." Alcuin, it is alleged, however, forbade the reading of the classical pocts. In 790 he went to England in the capacity of ambassador, and returned to France in 792, never again to visit his native land. After Alcuin had spent many years in the most intimate familiarity with the greatest prince of his age, he at length, in 801, with great difficulty, obtained leave to retire from court to the abbey of St Martin at Tours, of which he had been appointed the head by Charlemagne in 796. Here he remained and taught till his death in 804. In his retirement he kept up a constant correspondence with Charlemagne, which displays, on the part of both, an ardent love of learning and religion, and great zeal and earnestness in contriving and executing noble designs for their advancement. Alcuin composed many treatises on a great variety of subjects, in a style imuch superior in purity and elegance to that of most writers of the age in which he flourished. His works were collected and published by Duchesne, in 1 vol. folio, Paris, 1617: a better edition is that of Froben, 2 vols. folio, Ratisbon, 1777. They consist of (1) Tracts upon Scripture ; (2) Tracts upon doctrine, discipline, and morality ; (3) Historical treatises, letters, and poems. It is not improbable that Alcuin was the writer of the famous Caroline Books, issued under the name of Charlemagne, which denounced as idolatrous every form of image-worship. A Life of Alcuin, by Lorenz, was published at Halle in 1829, and appeared in an English translation, by Slee, in 1837.

ALCYONIUS, or Atctonrus, Prerrus, a_ learned Italian, born at Venice in 1487 (died 1527). Distin- guished as a classical scholar, he was employed for some time by Aldus Manutius as a corrector of the press, and in 1522 was appointed professor of Greek at Florence through the influence of Giulio de Medici. When the latter became pope, under the title of Clement

VII., in 1528, Alcyonius followed him to Rome, and remained there until his death. Alcyonius published at Venice, in 1521, a Latin translation of several of the works of Aristotle, which was shown by the Spaniard Sepulveda to be very incorrect. He wrote a dialogue entitled Medices Legatus, sive de Lxilio, in connection with which he was charged with plagiarism by his personal enemy, Paulus Manutius. The accusation, which Tiraboschi has shown to be groundless, bore that he had taken the finest passages in the work from Cicero's De Gloria, and that he had then destroyed the only existing copy of the original in order to escape detection. Two orations on the taking of Rome by Charles Y., and another on the knights who perished at the siege of Rhodes, are also ascribed to Alcyonius.

ALC—ALD

ALDAN, a river of Siberia, in the government of Yakutsk, which rises about 55° N. lat., and 125° E. long,, and after flowing more than 300 miles in a north-east direction, turns to the north-west, joining the Lena about 100 miles below Yakutsk. It has a total length of over 500 miles, for a considerable part of which it is navigable.

ALDAN MOUNTAINS, the name usually applied to a branch of the Stanovoi mountains, which strikes off from the main chain in the direction of the Aldan river, or toa part of this range. According to some geographers, however, the continuation of the Stanovoi range to Behring Strait, or even the whole mountain system of eastern Siberia, ought to receive the name.

ALDBOROUGH, a town of England, in the West Riding of Yorkshire, 16 miles W.N.W. of York. It formerly returned two members to parliament, but was disfranchised by the Reform Act of 1832. The place is remarkable only from its numerous ancient remains. It was the Jsurium of the Romans, and here and in the neighbourhood the remains of aqueducts, spacious buildings, and tesselated pavements have been found, as well as numerous implements, coins, and urns. Population (1871) of the parish, which extends into the North Riding, 2165 ; of the town, 502.

ALDEBURGH, or ALpBorovcH, a market-town and watering-place in the county of Suffolk, 25 miles E.N.E, of Ipswich. The borough was

incorporated by a charter of King Edward VI., and in former times was a place of considerable extent; but the old town was gradually sub- merged by the encroachments of the sea. Further destruc- tion is now stayed by the accumulated sandbanks, and the place has become a favourite resort of summer visitors. Fishing affords employment to many of the inhabitants. The town is noted as the birthplace of the poet Crabbe, who was born here on 24th December 1754. A marble bust of the poet has been placed in the parish church. Aldeburgh was formerly a parliamentary borough, but was disfranchised by the Reform Act of 1832. Population of the parish in 1871, 1990.

ALDEGREVER, or ALDEGRAF, HEINRICH, a German painter and engraver, born in 1502 at Paderborn, from which he removed in early life to Soest. From the close resemblance of his style to that of his master, Albert Diirer, he has sometimes been called the Albert of West- phalia. His numerous engravings, chiefly from his own designs, are delicate and minute, though somewhat hard in style, and entitle him to a place in the front rank of the so-called 'Little Masters." Specimens of his painting are exceedingly rare. The genuineness of the works in the Vienna and Munich collections attributed to him is at least doubtful, the only unchallenged example being a portrait in the gallery at Berlin. Aldegrever died about the year 1562.

ALDER, a genus of plants (Alnus) belonging to the order Betulacee, the best known of which is the common alder (A. glutinosa). This tree thrives best in moist soils, has a shrubby appearance, and grows, under favourable circumstances, to a height of 40 or 50 feet. Under water the wood is very durable, and it is therefore used for piles. The supports of the Rialto at Venice, and many buildings at Amsterdam, are of alder-wood, Furniture is sometimes made from the wood, and it supplies excellent charcoal for gunpowder. The bark is astringent ; it is used as a gargle, and also in tanning and dyeing.

ALDERMAN, a word derived from the Anglo-Saxon ealdorman, compounded of the comparative degree of the adjective eald (old) and man. The term implies the pos- session of an office of rank or dignity; and among

the Anglo-Saxons, earls, governors of provinces, and other persons of distinction received this title. Thus we read

of the aldermannus totius Anglie, who seems to have corre- sponded to the officer afterwards styled capitalis justi- ciartus Anglue, or chief justice of England; the alder- mannus regis, probably an occasional magistrate, answering to our justice of assize, or perhaps an officer whose duty it was to prosecute for the crown ; and aldermannus comitatus, a magistrate with a middle rank between what was after- wards called the ear/ and the sheriff, who sat at the trial of causes with the bishop, and declared the common law, while the bishop proceeded according to ecclesiastical law. Besides these, we meet with the titles of aldermannus cewitatis, burgi, castelli, hundredi sive wapentachii, &c. In modern times aldermen are office-bearers in the muncipal corporations of England and Wales, and Ireland. Before the passing of the Municipal Corporation Act their func- tions varied according to the charters of the different burghs. By the statute 5th and 6th Will. IV. c. 76, and 3d and 4th Vict. c. 118, the aldermen are clected by the councillors from among themselves (in Ireland, by the burgesses), for six years, one-half going out every three years. 'The number of councillors in each borough varies from 12 to 48, according to its magnitude. One-fourth of the municipal council consists of aldermen, and three-fourths of councillors. In the municipal corporations of Scotland there is no such title as alderman, the office-bearers of corresponding rank there being termed bailies. The cor- poration of London was not included in the Burgh Reform Act, and the antiquated system remains there in full force. The Court of Aldermen consists of twenty-six, twenty-five of whom are elected for life by the freemen of the respective wards, who return two persons, one of whom the Court of Aldermen elect to supply the vacancy. The city is divided into twenty-six wards; twenty-four of these send up one alderman each, the other two combine to choose a twenty-fifth. The twenty-sixth alderman serves for the independent borough of Southwark, and if appointed by the other aldermen, who generally select the senior from among themselves when a vacancy occurs. The lord mayor is elected from such of the aldermen as have served the office of sheriff; of these the Common Hall, which con- sists of the freemen of the different wards, select two, and the

aldermen elect one of these to the mayoralty. The Court of Aldermen act as magistrates for the city of London, and also possess authority of a judicial nature in the affairs of the corporation. The aldermen are members of the Court of Common Council, the legislative body of the corporation, which consists in all of 232 members, the remainder being elected annually by the freemen. In the United States aldermen form as a rule a legislative rather than a judicial body, although in some cities they hold courts and possess very considerable magisterial powers. ALDERNEY, onc of the Channel Islands, and the most northerly of the four, lies between 49° 41' and 49° 45' N. lat., and 2° 9' and 2° 14' W. long., 7 miles to the westward

of Cape la Hogue, and is separated from the French coast by a narrow channel called the Race of Alderney. The passage through this strait is rendered very dangerous in

stormy weather by its conflicting currents; but through it the scattered remnant of the French fleet under Tourville succeeded in escaping after the defeat of La Hogue in 1692. The harbour of Alderney is 20 miles distant from St Peter Port, Guernsey, 45 miles from St Helen's, Jersey, and 60 miles from Portland Bill, the nearest point of England. There is regular steam communication with Guernsey. The length of the island from N.E. to S.W. is 34 miles; its width about 1 mile; its greatest elevation is 280 fect; and the area is about 4 square miles.

The greater part of Alderney is a level table-land, more or less cultivated. The land continues flat to the edge of the south-eastern and southern cliffs, which present a mag- nificent succession of broken and perpendicular walls of rock. Towards the north-west, north, and east, the coast is less rocky, and is indented by several bays of tame and naked aspect, of which those of Crabby, Braye, and Longy are the most noticeable. Sandstone, granite, and por- phyry are the chief geological formations. From the importance of the island in a military sense, it has been fortified by a chain of defensive works, extending round the northern coast from the Clanque Fort on the west to Fort Essex on the east. The cliffs of the southern shore form a very strong natural bulwark. An extensive granite breakwater has been constructed, protecting the bay of Braye towards the west, intended to form an additional defence, and to convert the bay into a secure harbour of

refuge. The works have cost upwards of a million and a quarter sterling; but the new harbour is not much resorted tv, and the value of the breakwater as a mcans of defence has been questioned. Fort Touraille stands on the eastern side of the new harbour, and is a strong fortification, mounting 50 heavy guns, with bomb-proof barracks and powder magazine.

The population of Alderney has increased rapidly of recent years, on account of the extensive public works. In 1841 it was only 1030, in 1871 it was 2738. The inhabitants are Protestants, and Alderney forms part of the diocese of Winchester. Though a French patois lingers in the island, English is generally spoken and universally understood. The climate is healthy, and there is abun- dance of good water. Corn is grown, but much of the sandy soil is in grass, affording excellent pasture to the diminutive but pretty cows for which Alderney is famous. The only exports are cattle and early potatoes. St Anne's, the town of the island, is situated at some dis- tance from the beach, overlooking the new harbour. It is plainly built, but has a fine new church in the early English style, erected as a memorial of the family of Le Mesurier, long the hereditary governors of the island. The only other architectural feature worthy of notice is a Gothic arch built as a memorial of the late Prince Albert of England.

Alderney seems to have been known to the Romans as Riduna, and Roman as well as Celtic remains have been discovered. It is subject to the British crown, and is a dependency of Guernsey. For its history and relation to English legislation, see the article on the CHANNEL Istanps. The internal government is vested in a judge appointed by. the crown, and six jwrats, chosen for life by the people; and these, with twelve dowzainiers, who are popular representatives, but have not the power of voting, form the legislature. Justice is administered by the same judge and jurats, and several other officers. In civil cases an appeal may be taken to the royal court of Guernsey, while all criminal cases are referred to Guernsey for decision. Two companies of infantry and a battery of artillery com- pose the local militia.

Off the western coast of Alderney there are many unin- habited rocky islands; and six miles to 'ae westward lie

the Casqucts, a group of rocks extremely dangerous to ships coming up the English Channel. On these rocks there are threc lighthouses, with revolving lights 112 feet above the water.

ALDERSHOTT CAMP, a standing garrison for a large force, situated about 35 miles fron: London, on the confines of Hampshire and Surrey. It was established in May 1855, and was intended as a military training school, especially for officers of the higher grades. Its germ is to be found in the temporary camp on Chobham Ridges, formed in 1853 by Lord Hardinge, then commandcr-in- chief, the success of which convinced him of the necessity of giving our troops practical instruction in the field, and affording our generals opportunities of manoeuvring large bodies of the three arms. He therefore advised the pur- chase of a tract of waste land whereon a permanent camp inight be established. His choice fell on Aldershott, a spot also recommended by strategic reasons, being so placed that a force holding it covered the capital. Nothing came of Lord Hardinge's proposal till the experience of the Crimean cainpaign fully endorsed his opinion. The lands at Alder- shott—an extensive open heath country, sparsely dotted by fir woods and intersected by the Basingstoke canal—were then acquired by the Crown. The first occupants of the camp were two battalions of the Guards and seven of embodied militia. On the return of the Crimean army, cavalry, artillery, and infantry of the line arrived and took possession of the lincs of wooden huts and the permanent barracks, which had by this time been erected. Since then Aldershott has varied little in its principal features. It is separated into two grand divisions, styled the north and south camps. Beyond the latter are the permanent cavalry and infantry barracks and the queen's pavilion. Farnham is the nearest town, being only 4 miles from the south camp; Guildford and Godalming are 10 and 12 respectively, Windsor 184, and Reading 21 miles. The soil on which the camp stands is a light peat, and a fruitful source of discomfort to its inhabitants. A little wet turns it into tenacious mud, while a little sunshine produces a black dust, not soon forgotten by those who have campaigned in the " Long Valley." The force stationed at Aldershott at the beginning of 1874 was composed of 1 cavalry and 3 infantry brigades; in the former there were 3 full regiments, in the latter a total of 11 battalions, with several

depots of regiments abroad. Besides these, there were 2 batteries of horse and 6 of field artillery, 2 companies of Royal Engineers, and 4 troops of Royal Enginecrs' train (with pontoon, &c.); 7 companies of the Army Service Corps and 2 of the Army Hospital Corps—to provide for transport, and the services of bakehouse and slaughter- house and hospital—made up the total strength of all ranks, as shown in the returns dated 1st January 1874, to 10,601 men, 2198 horses, and 48 guns. It is a lieutenant-general's command, and one highly prized, from its essentially military charactcr and the practical experience it affords in handling a considerable force. Sir William Knollys (afterwards comp- troller of the houschold to the Prince of Wales) was its first chief. Hc was succeeded by Sir John Pennefather; Sir James Scarlett followed; then Sir Hope Grant, who held the command in 1874. Naturally so large a military colony soon attracted other elements to Aldershott heath. Within a few years a town of Aldershott sprang up close by, and increased rapidly. Here the professions and all trades are well represented; there are respectable solicitors, surgeons, bankers, brewers, many schools, a steam printing press, a weekly military paper, and numerous shops. Dur- ing the summer months or "drill season" the camp is a scene of incessant activity; field-days and parades follow in rapid succession, and owing to the camp's accessibility from London, the troops are often turned out at a few

hours' notice to make a show for royalty or foreign visitors. Yet there is much to beguile vacant hours ; many clubs—for cricket, croquet, racquets, and the drama—a gymnasium, and several excellent libraries. Admirable charitics also exist for the assistance and relief of the soldiers' wives and children. A. G.)

ALDHELM, or ApEtm, Str, Bishop of Sherborne in the time of the Saxon heptarchy, was born about the middle of the 7th century. He is said to have been the son of Kenred, brother to Ina, king of the West Saxons; but, in the opinion of Wiliam of Malmesbury, his father was no more than a distant relation to the king. Having received the first part of his education in the school of Mcildulf, a learned Irish monk, he travelled in France and Italy

for his improvement. On his return home he studicd some time under Adrian, abbot of St Augustin's in Canterbury, the most learned professor of the sciences who had ever been in England. The fame of his learning soon spread, not only in England, but in foreign countries. Learned men sent him their writings for his criticism; among others, a son of the king of Scotland is said to have sent his compositions to Aldhelm, '"entreating him to give them the last polish by rubbing off their Scotch rust." He was the first Englishman who wrote in the Latin language, both in prose and verse; and he coniposed a book for the instruction of his countrymen on the prosody of that language. Bede says that Aldhelm "was a man of universal erudition, having an elegant style, and being wonderfully well acquainted with books both on philosophical and reli- gious subjects." His Latin was in later times considered somewhat barbarous and corrupt. From one of his letters to Hedda, bishop of Winchester, concerning the nature of his studies whilst at Canterbury, he appears to have been indefatigable in his endeavours to acquire every species of learning in his power. For a copy of this curious epistle see Henry's History, vol. ii. p. 320. King Alfred declared that Aldhelm was the best of all the Saxon poets; and a favourite song, which was universally sung in his time, nearly 200 years after its author's death, was of his composition. He was a musician as well as a poet, and made his own songs the medium of instruction and refine ment to his barbarous countrymen. After having governed the monastery of Malmesbury, of which he was the founder, about thirty years, he was made bishop of Sherborne, where he died in May 709.

He wrote—1. De octo Vitiis Principalibus. This treatise is extant in the Bibliotheca Patrum of Canisius. 2. dinigmatwm Versus Mille. This, with several other poems of his, was published by Martin Delrio at Mentz, 1701, 8vo. 3. A book addressed to a certain king of Northumberland named Alfrid, on various subjects. 4. De Vita Monachorwm. 5. De Laude Sanctorum. 6. De Arith- metica. 7. De Astrologia. 8. A book on the mistake of the Britons concerning the celebration of Easter; printed by Sonius, 1576. 9. De Laude Virginitatis; published among Bede's Opuscutla. Besides these, he wrote many sonuets, epistles, and homilies in the Saxon language.

ALDINE EDITIONS. See Manurtius.

ALDINI, Giovannl, a distinguished physicist, born at Bologna on the 10th April 1762 (died 1834), was the nephew of Galvani, and brother of the statesman Connt Antonio Aldini. Devoted from his youth to the study of natural science, he was chosen in 1798 to succeed his former teacher Canterzani in the chair of physics at Bologna. His most important service cousisted in the numerous experimeuts by which he sought to secure the better apph- cation of science to practical purposes. The subjects of galvanism, the illumination of lighthouses by gas, and an asbestos or fireproof fabric engaged his special attention, and on all of them he published the results of his researches. He was master of the leading European languages; and most of his works were published in Italian, French, and

English. Aldini was one of the founders of the National Institute of Italy, and among his scientific honours he counted the gold medal of the Royal Society of London, and the prize of the Institute of France. In recognition of his merits, the emperor of Austria made him a knight of the Iron Crown and a councillor of state at Milan, where he died on the 17th January 1834. He left by will a considerable sum to found a school of natural science for artisans at Bologna.

ALDRED, Eatprep, or ALRED, a prominent eccle- siastic in the 11th century, was successively abbot of Tavistock, bishop of Worcester, and archbishop of York. He was promoted to the see of Worcester in 1046, and in 1050 was sent on a special mission to Rome by Edward the Confessor. In 1054 he went as ambassador to the court of the Emperor Henry III. with the object of nego- tiating for the return of Edward the Aitheling from Hungary, and remained a year at Cologne. In 1058 he undertook and accomplished a journey to Jerusalem, a pilgrimage which no English bishop had ventured on before. He was appointed archbishop of York in 1060, and proceeded to Rome to obtain the pallium; but the pope at first refused to confirm the appointment. At length, however, Aldred was duly invested with the robe of office on condition of his resigning his former see, which he had continued to hold till that time. On the death of Edward (1066) Aldred sided with Harold, and officiated at his coronation ; but after the battle of Hastings he

made submission to William, and poured the sacred oil on the head of the Conqueror ere the year was completed in which he had crowned Harold. There are several traditions, which may be regarded as having some foundation in fact, that repre- sent Aldred as administering rebuke to William in the interests of his countrymen or in defence of his church's rights. At the same time, he remained faithful to William, and when the English rose in the north against the Nor- mans, he counselled submission. He died at York, Sept. 11, 1069, of grief, it is said, because of the threatened attack on his city by the combined forces of the English and Danes.

ALDRICH, Dr Henry, theologian and philosopher, was born in 1647 at Westminster, and was educated at the collegiate school there, under Dr Busby. In 1662 he entered Christ Church College, Oxford, with which he con- tinued to be intimately connected during his whole life. He took so conspicuous a part in the controversy with the Roman Catholics during the reign of James II., that at the Revolution the deanery of Christ Church was conferred upon him, Massey, the popish dean, having fled to the con- tinent. In 1702 he was appointed rector of Wem in Shrop- shire, but continued to reside at Oxford, where he died on the 14th Dec. 1710. He was buried in the cathedral without any memorial, at his own desire. Aldrich was a mau of unusually varied gifts. He is best known as the author of a Compendium Artis Logicce, a work of almost no value in itself, but historically important as being for upwards of a century the manual in exclusive use at Oxford. His claims to distinction as a musician and an architect, though not so widely recognised, are much better founded than his repu- tation as a logician. He composed a number of anthems and church services of very considerable merit, which are still frequently sung in cathedrals. He also adapted much of the music of Palestrina and Carissimi to English words with great skill and judgment. The catch " Hark, the bonny Christ Church bells" is one of his most admired compositions in the lighter style. Aldrich wrote a treatise on architecture; and practical evidence of his skill in the art may be seen in the church and campanile of All Saints, Oxford, and in three sides of the so-called Peckwater

Quadrangle of Christ Church College, which were erected after his designs.

In classical scholarship Dr Aldrich had some reputation. Tle Muse Anglicane contains two specimens of his Latin verse, the subjects being the accession of King William and the death of the Duke of Gloucester. A humorous Latin version by Aldrich of the popular ballad—

‘© A soldier and a sailor, A tinker and a tailor,” &c.,

has been prescrved by Sir John Hawkins. Another specimen of his wit is furnished by the following epigram, entitled “ Cause Bibendi,” whieh some, however, have ascribed to Pére Sirmond :—

Si bene quid memini, Causce sunt quingue bibendi ; Hospitis Adventus, preesens Sitis, atque futura, Aut Vini Bonitas, aut quelibet altera Causa. The translation ruans— If on my theme I rightly think, There are five reasons why men drink :— Good wine; a friend; because I’m dry; Or lest I should be by and by; Or—any other reason why.

ALDROVANDI, Utissz, a celcbrated naturalist, born of noble parentage at Bologna on the 11th Sept. 1522 (died 1607). While a boy he was page in the family of a rich bishop, and afterwards appreutice to 2 merchant in Brescia. Commercial pursuits soon became distasteful to him, and he turned his attention to law and medicine, studying first in his native town and afterwards at Padua. In 1550, having been accused of heresy, he was compelled to proceed to Rome in order to vindicate himself before the Inquisition, which gave him a conditional acquittal. In Rome he published his first work, a treatise on ancient statuary. Here he made the acquaintauce of the eminent naturalist Rondelet, from whom it seems not unlikely that he derived the impulse towards what became from that time his exclusive study. On his return to Bologna he devoted himself specially to botany, under the teaching of Lucas Ghino, then professor of that science at the univer- sity. Inu 1553 he took his doctor’s degree in medicine, and in the following year he was appointed professor of philosophy and also lecturer on botany at the university. In 1560 he was transferred to the chair of natural history, which he continued to occupy until rendered infirm by age. At his instance the senate of Bologna established in 1568 a botanical garden, of which he was appointed the first director. He was also instrumental in founding the still existing public museum of Bologna, which contains, especially in the natural history department, a large number of

speci- mens collected by Aldrovandi. To procure these it is be- lieved that he visited personally most of the countries of Europe, though the details of his journeys have not been preserved. Some idea of the extent of his labours may be gathered from the fact that his herbarium occupied sixty large folio volumes. To the other offices held by Aldro- vandi was added that of inspector of drugs, in which capacity he published in 1574 a work entitled Antidotarit Bononiensis Epitome, deserving of notice as furnishing the model according to which nearly all subsequent pharma- copeias have been compiled.

The results of Aldrovandi's various researches were embodied in his magnwm opus, which was designed on the most complete scale, so as to include everything that was known about natural history. The first three volumes, comprising his ornithology, were published in 1599. Three more, treating of insects and mollusea, appcared during the author's lifetime. The seven volumes which completed the work were compiled from Aldrovandi's manuseript materials, under the editorship of scveral of his pupils, to whom the task was entrusted by the senate of Bologna. The work was enriched by a large number of pictorial illustrations, prepared at great expense, the author having, it is said, employed several cclebrated artists for thirty years. Among these were Lorenzo Benini of Florence and Christopher Coriolanus of Nuremberg. It has been said, indeed, that the cost of the undertaking was so great as to exhaust its author's means, and that he died penniless and blind in the public hospital of Bologna. This, however, is probably incorrcet, at least as regards the allegation of poverty. Published records of the senate of Bologna show that it liberally supported Aldrovandi in his under- taking, doubling his salary soon after his appointment as professor,

and bestowing on him from time to time sums amounting in all to 40,000 crowns. If, therefore, he died in the publie hospital, he probably went there for the better treatment of his disease. His death oceurred on the 10th Nov. 1607. . 3

Aldrovandi was ehicfly remarkable for laborious and patient research. He seems to have been totally destitute of the eritical faculty ; and hardly any

attempt is made in his great work to elassify facts or to distinguish between the true and the fabulous, the im- portant and the trivial. Much is thus included that is of no seientifie value, but it also contains much information of very great interest to the naturalist.

ALDSTONE, or Aston Moor, a market-town of England, in the county of Cumberland, situated on an eminence near the South Tync, 19 miles E.S.E. from Carlisle, with which it is connected by railway. The surrounding country, which is bleak and desolate, contains lead mines, mostly belonging to Greenwich Hospital, for- merly very valuable, but now almost exhausted. Thread, flannel, and shot are manufactured in the town. Popu- lation (1871) of parish, 5680 ; of town, 2627.

ALE, a fermented liquor obtained from an infusion of malt, and diffcring from beer chiefly in having a less pro- portion of hops. Before the introduction of hops into England from Flanders, about 1524, ale was the name exclusively applied to malt liquor, the term beer bcing gradually introduced at a later period to describe liquor brewed with an infusion of hops. The two words, however, arc now uscd with little distinction of meaning. Ale, the wine of barley, is said to have originally been made in Egypt. The natives alike of Spain, France, and Britain all usc an infusion of barley for their ordinary liquor, which was called celia and ceria in the first country, cerevisia in the second, and curmi in the third—all literally importing the strong water.

‘ All the several nations," says Pliny, " who inhabit the west of Europe have a liquor with which they intoxieate themselves, made of corn and water. The manner of making this liquor is sometimes different in Gaul, Spain, and other countries, and is ealled by many various names; but its uature and properties are everywhere the same. The people of Spain, in partieular, brew the liquor so well that it will keep good a long time. So exquisite is the eunning of mankind in gratifying their vicious appetites that they have thus invented a method to make water itself intoxicate."*

The method in which the ancient Britons and other Celtic nations made their ale is thus described by Isidorus and Orosius :—

‘The grain is steeped in water, and made to germinate, by whieh its spirits are exeited and set at liberty; it is then dried and ground ; after which it is infused in a eertain quantity of water, which, being fermented, beeomes a pleasant, warming, strength- ening, and intoxieating liquor.”

This ale was most commonly made of barley, but some- times of whcat, oats, and millet. Ale was the favourite liquor of the Anglo-Saxons and Danes. Before their con- version to Christianity, they belicved that drinking large and frequent draughts of ale was one of the chief felicities which those heroes cnjoycd who were admitted into the hall of Odin. Anciently the Welsh and Scots had two kinds of alc, called common ale and spiced ale, the relative values of which were thus appraised by law: “If a farmer had no mead, he shall pay two casks of spiced ale, or four casks of common ale, for one cask of mead.” By this law a cask of spiced ale, nine palms in height and eighteen palms in diameter, was valued at a sum of money equal in value to £7, 10s. of our present money; and a cask of corhmon ale of the same dimensions at a sum equal to £3, 15s. This is a sufficient proof that even common ale at that period was an article of luxury among the Welsh, which could only be obtained by the great and opulent.

For details as to the process of manufacture, statistics &c., see BREWING.

ALE-CONNER, an officer appointed yearly at the court- leet of ancient manors for the assize of ale and alc-measures.

Je

ALD—ALE

The gustatores cervisie—called in diffcrent localities by the different names, “ale-tasters,” ‘“ale-founders,” and ‘“‘alc-conners ”—were sworn to examine beer and ale, to take care that they were good and wholesome and were sold at proper prices. In London, four ale-conners are still chosen annually by the liverymen in common hall assembled, on Midsummer Day. Since ale and beer have become excisable commodities the custom of appointing ale-tasters has in most places fallen into disuse. (For the means now employed to test the quality of ales, see ADULTERATION, p. 172.

ALEANDRO, Girotamo (Hieronymus), cardinal, commonly called "the Elder," to distinguish him from his grand-nephew of the samc name, was born at Motta, near Venice, on the 13th of February 1480 (died 1542). He studicd at Venice, and while still a youth acquired great reputation for learning. In 1508 he went to Paris, on the invitation of Louis XII., as professor of belles lettres, and he held for a time the position of rector in the uni- versity. Entering the service of the prince-bishop of Liege, he was sent by that prelate on a mission to Rome, where Pope Leo X. retained him, giving him (1519) the office of librarian of the Vatican. In the autumn of 1520 he went to Germany to be present as papal nuncio at the coronation of Charles V., and in the following spring he appeared at the diet of Worms, where he headed the opposition to Luther, advocating the most extreme measures to repress the doctrines of the Reformer. His conduct not merely called forth the fiercest denunciations of Luther, but estranged from him Erasmus, who had been his intimate friend at Venice. The edict against the Reformer, which was finally adopted by the emperor and the diet, was drawn up and proposed by Aleandro. After the close of the diet the papal nuncio went to the Netherlands, where he kindled the flames of persecution, two monks of Antwerp, the first martyrs of the Reformation, being burnt to ashes in Brussels at his instigation. In 1523, Clement VIL. having appointed him archbishop of Brindisi and Oria, sent him as nuncio to the court of Francis I. He was taken prisoner along with that monarch at the battle of Pavia (1525), and was only released on the payment of a heavy ransom. He was subscquently employed on various papal missions, especially to Germany, but was unsuccessful in preventing the German princes from making a truce with the Reformers, or in checking to any extent the progress of the new doctrines. In 1538 Paul IIL. con- ferred upon him the cardiral's hat, when he took the title of St Chrysogonus. He died at Rome on the 31st January or lst February 1542.

Aleandro eompiled a Lewicon Greeco-Latinwm, and wrote Latin verse of considerable merit. The Vatiean library eontains a volume of manuseript letters and other doeuments written by him in eon-

nection with his various missions against Luther. Its historical value renders this the most important of his works.

ALEMAN, Lovts, Archbishop of Arles, and Cardinal of St Cecilia, was born at Bugey in 1390. He was one of the presidents of the Council of Basle in 1431, and led the party that maintained the supremacy of councils over popes in opposition to the claims of Eugenius IV. It was on his motion that the latter was deposed by the council, and Felix V. elected in his stead. Eugenius thereupon deposed the arch-pope, and deprived Aleman of all his ecclesiastical dignities, but these were restored by Nicholas V. in 1447, Felix V. having previously resigned, on the advice of the cardinal. In 1527 Aleman was canonised by Pope Clement VII.

ALEMANNI, a large German tribe on the Upper Rhine. They are first mentioned by Dion Cassius, who relates that the Emperor Caracalla gained, in 213 a.D., a victory over them on the banks of the Maine, and thence assumed

the surname Alemannicus. The origin of this tribe, and the country from which they came, are unknown ; but we have a distinct statement, which is apparently confirmed by the very name of the people, that they had flocked together from all parts, and were a mixed race. They proved most formidable cnemies to the Romans as well as to tlie Gauls, their western neighbours, who to this day apply the name Alemauni (Allemands) to all the Germans indiscriminately, though the Alemanni, properly so called, occupicd only the country between the Maine and the Danube. In the reign of Aurelian, 270 a.D., they attempted to invade Italy, but were repulsed. After the death of that emperor, however, they renewed their attacks by invading Gaul, and ravaging the country at different times. Several undertakings against them were of little avail, until in 357 a.p. the Empcror Julian completely defeated them in the neighbourhood of Strasburg, where all their forces were assembled under seven chiefs. This and other defeats, however, did not break the power of the Alemanni, who, being pressed on by other barbarians in the north, were forced to advance southward and westward to conquer new countries for themselves. Hence, after the middle of – the 5th century, we find them established not only in the country now called Suabia, but also in a part of Switzer- land and in Alsace. In these countries the Alemanni have maintained themselves ever since, and the

greater part of the modern Suabians and the northern Swiss are descendants of that ancient race.

ALEMBIC (Arab. alanbig, cognate to the Greek dufié), an apparatus for distillation, used chiefly by the alchemists, and now almost entirely superseded by the retort and the worm-still, It varied considerably in form and construc- tion, but consisted essentially of three parts—a vessel con- taining the material to be distilled, and called, from its gourdlike shape, the cucurbit ; a vessel to receive and con- dense the vapour, called the head or cagrtal ; and a receiver for the spirit, connected by a pipe with the capital. The entire apparatus was sometimes constructed of glass, but as this rendered it very expensive and brittle, it was more usual to make the cucurbit of copper or earthenware, and the capital alone of glass.

ALEMTEJO (Spanish Alentejo), a province of Portu- gal, bounded on the N. by Beira, on the E. by Spanish Estremadura and Andalusia, on the 8. by Algarve, and on the W. by the Atlantic and Portuguese Estremadura. It lies between 37° 20' and 39° 40' N. lat., and 6° 45' and 8° 53' W. long., and has an area of 10,225 square miles. Alemtejo is traversed by several mountain ranges, whose height does not generally rise much above 2000 feet, though one of the peaks of the Sierra de Monchique has an elevation of 4050 feet. The principal rivers are the Guadiana, which, crossing the Spanish frontier, flows southward through the province ; and the Sado, which rises in the Sierra de Mon- chique, and flows to the north. Farther northward are the Soro and the Zatas, tributaries of the Tagus. All these rivérs receive numerous affluents. There are several exten- sive plains, notably that of Alemtejo, the largest in Portugal, lying S.W. from the mountains of Portalegre ; and that of Ourique, in the southern part of the province. Some por- tions of these plains are fruitful, others marshy, while large tracts are mere desolate wastes. The climate in the lower parts of the country is exceedingly hot, and is rendered unhealthy in summer by the stagnant marshes. Towards the Spanish frontier the soil is fertile, and in the south 'the country is covered by extensive forests of oak, pine, chestnut, cork, and holm, especially on the sides of the Sierras de Monchique and Caldeiraon. Inthe more fertile parts of the province, grapes, figs, citrons, pomegranates, and other fruits are produced. Wheat, maize, and rice are grown, and some attention is given to the rearing of mules,

asses, goats, cattle, and sheep. Agriculture is, however, in a backward state, the sparse population being mostly con- centrated in the towns, leaving extensive districts unculti- vated and almost uninhabited. Droves of swine are fed on the waste lands, growing to a great size, and affording excellent hams. Minerals are to be found in the moun- tains, but they are little wrought. Manufactures scarcely exist, being confined to the preparation of olive oil of particularly good quality, and the making of earthenware, woollen cloths, and leather. For administrative purposes Alemtejo is divided into three districts—Beja, Evora, and Portalegre; and it contains 50 communal divisions and 315 parishes. The chief towns are Evora, Portalegre, Elvas, Beja, Estamoz, and Moura. There are no seaports of importance in the province. Population in 1868,

332,237.

ALENQON, the chief town of the French department of Orne, situated in a wide and fertile plain, on the Sarthe, close to its confluence with the Briante. It is a clean, regularly-built town, with broad handsome streets. It is the seat of a bishop; and the Gothic church of Notre Dame, called the cathedral, is a fine building of the 16th century. The only remains of the ancient castle of Alencon are three towers that form part of the present town-hall. The lace known as " point d'Alengon " is the most noted manu- facture of the town, although of late years its importance has somewhat diminished. Among the other industries are tanning, spinning, bleaching, linen manufacturing, and cider-making. The cutting of quartz crystals, often called Alencgon diamonds, is also carried on. Alengon was a place of small importance when it was handed over to the Normans by Charles the Simple in the beginning of the 10th century. In 1025 it became subject to the De Belesmes, counts of Alencgon, by whom it was enlarged and fortified. It was ceded to King Philip Augustus in 1221 by Alice, the heiress of the last count. The duchy of Alengon was created about the cnd of the 14th century, and remained with the original family, a branch of the house of Valois, until the middle of the 16th. The town was repeatedly taken and retaken in wars with Henry V. and Henry VI. of England, and also in the time of the League. In the war between France and Germany, Alencon was taken by the

Germans under the Grand Duke of Mecklenburg on the 17th of January 1871. The towns- people did not offer much resistance. The mayor and municipality were, indeed, in favour of yielding without a struggle; but tle newly-appointcd prefect, an ultra-repub- lican, insisted on a more martial policy.

(1872), 16,037.

ALENIO, Givxio, a missionary of the Jesuit order, born at Brescia in 1582, died 1649. He became a member of the order in 1600, and arrived at Macao as a propa- gandist in 1610. For upwards of thirty years he laboured to spread Christianityin China, adopting, in accordance with the principles of his order, the dress and manners of the country. He was the first who planted the faith in the province of Kiang-Si, and he built several churches in the province of Fo-Kien. He composed a number of works in the Chinese language, of which he was thoroughly master, the most important being a Life of Christ and a Cosmography.

ALEPPO, or Hates, a city of Syria, capital of the Turkish vilayet of the same name, in 36° 12' N. lat., 37° 12' E. long., 70 miles E. of the Mediterranean, near the N.W. extremity of the great Syrian desert. It occupies the sita

of the ancient Berea, and is a place of great antiquity. After the destruction of Palmyra it speedily became the great emporiuin of the trade between the Mediterranean and the countries of the East. It was overwhelmed by the flood of Saracen invasion in 638; and in 1260, and again in 1401, it was plundered and laid waste by the Tartars. It finally came into the possession of the Turks in 1517. To the east of the modern city extensive remains of its ancient grandeur have been discovered. Pee ian,

Aleppo is built on eight low hillocks, and is encircled by limestone hills of greater elevation, while beyond these stretches a fertile plain. The river Koeik, the ancient Chalus, flows through the town, and loses itself in a morass 18 miles distant. It is subject to floods in winter, when it overflows its banks, and inundates the neighbour- ing gardens. The city is surrounded by a stone wall, 40 feet high and 34 miles in circuit, erected by the

Saracens. This wall is flanked by frequent towers, but the ditch is partially choked up; and the city, being commanded by the adjacent heights, is entirely indefensible. The wall is pierced by seven gates, which are known by different names. Outside the city there are large irregular suburbs, erected after the great earthquakes of 1822 and 1830, and increasing the circuit of the place to 7 miles. The city suffered very severely by the earthquake of 1822; two- thirds of the inhabitants were swallowed up, the citadel and many of the mosques were overthrown, and a great part of the town was laid in ruins. Before the occurrence of these disasters Aleppo was the fairest and cleanest of Turkish cities; and although it has only partially recovered from their calamitous effects, it has still an attractive ap- pearance, especially when the white minarets of its nume- rous mosques, and its houses, picturesquely placed on the terraces of the hills, are viewed from a distance. The houses are built of freestone, with flat roofs, and are gene- rally of two or three storeys. One of the mosques, that of Zacharias, is held in peculiar veneration by the Moslem inhabitants. A new citadcl has been erected in the N.W. part of the town; and besides many mosques, warehouses, and bazaars, there are several Christian churches and schools, and also Turkish schools, libraries, and hospitals. Aleppo is the seat of a Greek and Armenian patriarch, and of a Maronite bishop. The Mahometan, the Chris- tian, and the Jewish portions of the population dwell in separate quarters of the town. Water is brought to the city by an aqueduct from a distance of 8 miles, and sup- plies upwards of 200 fountains, massive structures stand- ing in the streets. Among the chief attractions of Aleppo are its gardens, which extend continuously for about 12 miles S.E. of the city. They are watered by the Koeik, and produce abundance of fruit and culinary vegetables; but their most celebrated production is the pistachio- nut, which is regularly cultivated.

Formerly Aleppo stood in the first rank among the cities of Asia Minor as a place of trade; and it is still the emporium of Northern Syria, and has extensive commercial relations with Diarbekir and the upper parts of Anatolia, and also with Mosul and Baghdad, Large caravans resort to Aleppo from these and other eastern places, and the imported foreign goods are brought by caravans from the ports of Scanderoon or Alexandretta and Latakia, The construction of a carriage-road between Aleppo and Alex- andretta has been commenced, but no progress whatever was made with it

during 1872. Trade is conducted in Aleppo by more than 100 mercantile houses, several of them British; but no commercial bank has as yet been established in the province. The principal manufacture of the city consists of various kinds of cloth, of silk, cotton, and wool, some flowered and Striped, others woven with gold and silver thread. These cloths have long been famous

throughout the Kast, and the manufacture of them employs about 6400 looms. A large amount is invested in the manufacture of carpets, cloaks, and girdles. There are, besides, numerous soap, dyeing, and print works, and also rope-walks. In addition to cloths, the exports include wheat, sesame, wool, cotton, oil, scammony, galls, pistachio- nuts, camels' hair, &c.; while the imports chiefly consist of European manufactured goods and colonial produce. The aggregate value of the trade of the province exceeded £1,500,000 in 1872.

The air of Aleppo is dry and piercing, but not insalu- brious. The city, however, as well as the environs, ig subject to a singular epidemic disorder called the boil of Aleppo. It attacks the inhabitants chiefly in their child- hood, and the ulcers, which last for a year, commonly break out on the face. This malady is seldom fatal, and does not leave any hurtful effects except the scars, by which almost all the inhabitants are disfigured. The causes of the disease have uot been discovered, though some have supposed it due to the quality of the water. Aleppo is also subject to the ravages of the plague, the recurrence of which is anticipated by the inhabitants every ten years, Its effects are rendered the more deadly by the blind fatalism of the Turks, who cannot be persuaded to take any precautions against the progress of this dreadful dis- ease. In the end of last century about 60,000 of the inhabitants were swept off by one visitation; and that of 1827 was also very severe.

By the visitations of the plague, the earthquakes, the cholera of 1832, and the oppression of the Egyptians while Syria was subject to Mehemet Ali, the population of Aleppo has been much reduced. In the earlier part of the century the inhabitants numbered over 200,000; but the population is now estimated at less than 100,000, of whom 15,500 are Christians, 4000 Jews, and the remainder mostly Mahometans. Although the Christians enjoy tole-

ration at the hands of the Turkish government, they have nevertheless been exposed to frequent persecution through the jealousy of the turbulent Mahometan population. The tumults of 1850 and 1862 occasioned some bloodshed, and could only be suppressed by force of arms. Jn the former, property to the amount of a million sterling was destroyed.

ALES, or AtEss (ALEsIUS), ALEXANDER, a celebrated divine of the school of Augsburg, was born at Edinburgh on the 23d April 1500 (died 1565): His name was origi- nally Alane, and that by which he is more generally known (derived from dAce/yw) was assumed by him when he went into exile. He studied at St Andrews in the newly- founded college of St Leonards, where he graduated in 1515. Some time afterwards he was appointed a canon of the collegiate church, and in this office he at first contended vigorously for the scholastic theology as against the doc- trines of the Reformers. His views were entirely changed, however, on the occasion of the execution of Patrick Hamilton in 1528. He had been chosen to meet Hamil- ton in controversy, with a view to convincing him of his errors, but the arguments of the Scottish proto-martyr, and above all the spectacle of his intrepid conduct at the stake, impressed Alesius so powerfully that he was entirely won over to the cause of the Reformers, though for a time he did not make the fact known. A sermon which he preached against the dissoluteness of the clergy gave great offence to Prior Hepburn, who cast him into prison, and might have carried his resentment to the extremest limit had not Alesius contrived to escape to the Continent in 1531. After travelling in various countries of northern Europe, he settled down at Wittenberg, where he made the acquaintance of Melancthon, and signed the Augsburg confession. Meanwhile he was tried in Scotland for heresy, and condemned without a hearing. In 1533 a

decree of the Scottish clergy, prohibiting the reading of the New Testament by the laity, drew from Alcsius an ably-argued defence of the right of the people, in the form of a letter to James V. A reply to this by Jolin Coch- leus, also addressed to the Scottish king, occasioned a second Ictter from Alesius, in which he not only restates and amplifies his argument with great force and beauty of style, but enters at some length into more gencral

questious connected with the Reformation. In 1535, Henry VIII. having broken with the Church of Rome, Alesius was induced to remove to England, where he was very cor- dially reccived by the king and his advisers Cranmer and Cromwell. After a short residence at Lambeth he was appointed, through the influence of Cromwell, then chan- cellor of the university, to lecture on theology at Cam- bridge; but when he had delivered a few expositions of the Hebrew psalms, he was compelled by the opposition of the papal party to desist. Returning to London, he sup- ported himself for some time by practising as a physician. In 1537 he attended a convocation of the clergy, and at the request of Cromwell, the president, conducted a con- troversy with Stokesley, bishop of London, on the nature of the sacraments. His arguinent, which was marked by great ability, was afterwards published at Leipsic. In 1539 Alesius was compelled to flee for the second time to Germany, in consequence of the enactment of the perse- cuting statute known as the Six Articles. He was imme- diately chosen to fill a theological chair in the university of Frankfort-on-the-Oder, where he was the first professor who taught the Reformed doctrines. In 1543 he quitted Frankfort for a similar position at Leipsic, his contention that it was the duty of the civil magistrate to punish for- nication having given offence to some of the authorities of the former university. At Leipsic Alesius remained until his death, which occurred on the 17th March 1565. He enjoyed the intimate friendship of Melancthon, to whom he rendered valuable assistance in many of his disputations with the Catholic doctors.

Alesius was the author of a large number of exegetical, dogmatie, and polemical works. He displayed his warm interest in his native land by the publication (1544) of a Cohortatio ad Concordiam Pietatis, missa in Patriam suam, which had the express approval of Luther. In 1560 appeared his treatise, De Necessitate et Merito Bonorum

Operum, a valuable contribution to the synergistie side in the controversy on good works.

ALESSANDRI, Atxssanpro (Alexander ab Alexandro), a learned jurisconsult, born at Naples about the year 1461 (died 1523). He studied at Naples and Rome, and after- wards practised for a time as advocate in both cities. At Naples he is said to have been royal proto-notary in 1490.

Dissatisfied, according to his own account, with the corrupt administration of justice, he at length quitted the bar, and devoted himself entirely to literary pursuits, especially to the study of philology and antiquities. A sinecure appointment, which he owed to the favour of the pope, enabled him to lead a life of learned leisure at Rome, where he died on the 24 October 1523. What is known of his biography has been gathered chiefly from detached statements in his work entitled Dies Geniales, which appearcd at Rome in 1522, and is constructed after the model of the MNoctes Attice of Aulus Gellius, and the Saturnalia of Macrobius. The work consists of a confused mass of heterogeneous materials relating to philology, antiquities, law, dreams, spectres, &c., and shows great credulity and want of judgment on the part of its author.

ALESSANDRIA, a province of Italy, in the former duchy of Piedmont, bounded on the N. by Novara, on the E. by Pavia, on the S. by Genoa, and on the W. by Turin; with an area of 1951 square miles. There arc no hills of much clevation in the province, and the surface generally

is flat. The chief rivers are the Po, the Tanaro, the Belbo, the Orba, and the Bormida. The soil is fertile, the chief products being wheat, maize, wine, silk, madder, hemp, flax, and fruit. The capital is Alessandria; population of the province in 1871, 683,361.

ALESSANDRIA, a city of Italy, the capital of the above provinee, is situated in a marshy district near the con- fluence of the Tanaro and the Bormida. It is a strongly fortified place, its citadel, on the left bank of the Tanaro, being one of the most important in Europe. The town itself, which lies chiefly on the right bank of the river, is the seat of a bishop, and contains a cathedral and more than a dozen other churches, besides monasteries and nunneries. The principal manufactures of Alessandria are silk, linen, and woollen goods, stockings, and hats. Large quantitics of fruit and flowers are also produced in the neighbourhood. The trade of the city is extensive, and there are two important fairs held every year that are much resorted to by merchants from all parts of Italy. Alessandria was built in 1168 by the Lombard League as a bulwark against Frederick Barbarossa. It reccived its present name in honour of Pope Alexander III., but it was also called

Cesarea for a time. In 1174 it was unsuccessfully besieged by Frederick Barbarossa, who nicknamed it in derision Della Paglia, ¢.e. "of straw." It was ceded to Savoy by the peace of Utrecht in 1713, after having belonged, at different periods, to the houscs of Montferrat and Milan. Its fortifications were greatly enlarged and strengthened by Bonaparte during the French occupation, which lasted from 1800 to 1814. The citadel of Alessandria was taken by the Austrians after the battle of Novara in 1849. Near Alessandria is Marengo, where Napoleon defeated the Austrians in 1800. In consequence of this defeat the Austrians concluded the armistice of Alessandria, ceding all Italy north of the Mincio to the French. Population (1862), 27,027; of commune, 56,545.

ALESSI, GatEazzo (1500-72), a distinguished archi- tect, born at Perugia, was a pupil of Caporali and a friend of Michael Angelo. He was an enthusiastic student of ancient architecturc, aud his style gained for him a European reputation. Genoa is indebted to him for a number of its most magnificent palaces, and specimens of his skill may be seen in the churches of San-Paolo and San-Vittoria at Milan, in certain parts of the Escurial, and in numerous churches and palaces throughout Sicily, Flanders, and Germany.

ALEUTIAN ISLANDS, so called from the Russian word aleut, signifying a bold rock, is the name given by the Russian discoverers to a chain of small islands situated in the Northern Pacific Ocean, and extending in an easterly direction from the peninsula of Kamtchatka, in Asiatic Russia, to the promontory of Alaska, in North America. This archipelago has been sometimes divided into three groups; the islands nearest Kamtchatka being properly called Aleutia, the central group the Andreanov or An- drenovian, and those nearest to the promontory the Fox Islands. They are all included between 52° and 55° N. lat., and 172° KE. and 163° W. long. The Aleu- tian Islands were discovered by the Russian navigator Behring in 1728, and were carefully explored in 1760 by Captain Krenitzin, under a commission from the Empress Catherine. During his third and last voyage, in the year 1778, Captain Cook surveyed the eastern portion of the archipelago, accurately determined the positions of some of the most remarkable islands, and corrected many errors of former navigators. Subsequent expeditions of the Russians, aided by the settlement of fur traders on the islauds,.as well

as on the neighbouring cvasts of the American continent, have afforded further information as to this remarkable chain. The whole of the islands are

bare and mountainous; and thcir coasts are rocky and surrounded by breakers, by which the approach is rendered exceedingly dangerous. 'The land rises immediately from the coasts to steep bald mountains, gradually ascending into lofty ranges running from east to west. Springs take their rise at the bottom of the mountains, and either flow in broad and rapid streams into the neighbouring sea, or, collecting in the rocky vales and glens, form ample lakes, which send off their superfluous waters by natural canals

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able to any attempts at cultivation. Few trees grow on the islands, but there are some stunted shrubs of birch, willow, and alder. The timber required for building purposes is obtained from the driftwood thrown on the coasts. The principal occupations of the Aleutians are fishing and hunting, and the preparation of the imple- ments necessary for both. Since the end of last century the fur traders have had settlements here for the capture of the seal and the sea-otter, which are found in great numbers on the shores; and of the Arctic fox, which roams over the islands. Fish are abundant; and dogs and rein- deer are common. The population of the whole group is about 8000, the natives being a kindred race to the inhabit- ants of Kamtchatka. They are described as rather low

ALEXANDER

LEXANDER III., commonly called "The Great," son

of Philip IL, king of Macedonia, and of Olympias, daughter of the Molossian chief Neoptolemus, was born at Pella, 356 B.c. His father was a man of fearless courage and the soundest judgment ; his mother was a woman of savage energy and fierce superstition. Alexander inherited the

qualities of both his parents, and the result was the combination of a boundless ambition with the most sober practical wisdom. The child grew up with the conscious- ness that he was the hcir of a king whose power was rapidly growing ; and the stories told of him attest at the least the early awakening of a mind formed in the mould of the heroes of mythical Hellas. Nay, the blood of Achilles was flowing, as he believed, in his veins; and the flattery of his Acarnanian tutor Lysimachus, who addressed him as the son of Peleus, may have strengthened his love of the immortal poems which told the story of that fiery warrior. By another tutor, the Molossian Leonidas, his vehement impulses were checked by a wholesome discipline. But the genius of Alexander, the greatest of military conquerors, was moulded in a far greater degree by that of Aristotle, the greatest conqueror in the world of thought. At the age of thirteen he became for three years the pupil of a man who had examined the political constitutions of a crowd of states, and who had brought together a vast mass of facts and observations for

into the adjacent bays. These islands bear evident marks of volcanic formation, and several of them have still active volcanoes, which continually emit smoke and sometimes flames. The most important group of the chain is that called the Fox Islands, of which the largest. are Unimak and Ounalaska, both near the western extremity of Alaska, The thin argillaceous soil of the Aleutian Islands produces little vegetation, and agriculture is almost unknown. The climate is subject to sudden changes, and is very unfavour-

in stature, but plump and well-shaped, with short necks, swarthy faces, black eyes, and long straight black hair. They have nominally been converted to Christianity by the missionaries of the Greek Church, but are said to be unchaste in their habits, and addicted to intemperance whenever they have the opportunity. Until 1867 these islands belonged to Russia, but they were included in the transfer to the United States of the whole Russian posses- sions in America made in that year. They now form part of the United States territory of Alaska. (See AasKa.) From the position of the Aleutian Islands, stretching like a broken bridge from Asia to America,

some ethnologists have supposed that by means of them America was first peopled.

THE GREAT

the systematic cultivation of physical science. During these three years the boy awoke to the knowledge that a wonderful world lay before him, of which he had seen little, and threw himself eagerly, it is said, into the task of gathering at any cost a collection for the study of natural history. While his mind was thus urged in one direction, he listened to stories which told him of the great quarrel still to be fought out between the East and the West, and learnt to look upon himself as the champion of Hellas against the barbarian despot of Susa.

The future conqueror was sixteen years of age when he 84080 was left at home as regent while his father besieged Byzantium and Perinthus. Two years later the alliance of Thebes and Athens was wrecked on the fatal field of Cheeronea, where Alexander, now eighteen years of age, en- 90834 — countered and overcame the Sacred Band which had been foremost in the victories of Leuctra and Mantinea (see Epa- MINONDAS) ; but the prospects of Alexander himself became now for a time dark and uncertain. Philip had divorced Olympias and married Cleopatra, the daughter of Attalus. — This act roused the wrath not only of Olympias, but of her son, who with her took refuge in Epirus. Cleopatra became the mother of a son. Her father, Attalus, rose higher in the king's favour, and not a few of Alexander's friends were banished. But the feuds in his family were subjects of serious thought for Philip, who sought to

ALEXANDER THE GREAT

counteract their ill effects by a marriage between his daughter and her uncle, the Epirot king Alexander, the brother of Olympias. The marriage feast was celebrated at Aig. Clothed in a white robe, and walking purposely apart from his guards, Philip was approaching the theatre when he was struck down by the dagger of Pausanias,

It is certain that Alexander, if he mourned his father's death at all, deplored it only as involving himself in political difficulties ; but he took care to act

as if he were grieved by it, and he revenged it, we are told, by putting out of the way some whose claims or designs might clash with his own. The Greeks of Thebes and Athens knew little what sort of man had taken the place of Philip. Demosthenes, who, although he was mourning for the death of his own daughter, appeared in festal attire to announce the death of the Macedonian king, held up Alexander to ridicule as a bragging and senseless Margites. But they had to reckon with one who could swoop on his prey with the swiftness of the eagle. Barely two months had passed from the death of his father before the youth of twenty years stood with his army on the plains of Thessaly. The argument of the Macedonian phalanx was not to be resisted. The Thessalians recognised him as the Hegemon or leader of the Greeks; and the young king passed on to Thebes, the citadel of which had been held by a Macedonian garrison since the fight at Cheronea. Thence he took himself across the isthmus to Corinth. Here he was met by Athenian envoys, who brought him apologies more abject and honours more extravagant than any which had been paid to his father. He received them in an assembly, from which he demanded and obtained the title of supreme leader of the Hellenic armies, and to which he guarantced, at the utmost with a feigned reluc- tance, the autonomy or independence of every Hellenic city. No one knew better than Alexander that froin the whole armoury of weapons which might be employed to reduce Greeks to slavery, none could more effectually do his work than a theory of freedom which meant dissension, and of self-government which meant endless feud, faction, and war.

Alexander was now eager to carry out his great design against Persia; but he could not do so with safety until he had struck a wholesome terror of his power into the mountain tribes which hemmed in his dominions. His blows descended swiftly and surely on the Thracians of Mount Hemus (the Balkan), on the Triballians, and on some clans of Get, whom he crossed the Danube to attack. But these expeditions led him away from the world of the Greeks. Silence led to rumours of his defeat, and the rumours of defeat were followed by more confident assertions of his death. At Thebes and at Athens the tidings were received by some with cager belief. The covenant made with Alexander was made only with him personally. The Theban exiles at Athens were anxious to repeat the attempt which half a century earlier had been made against the Spartan garrison of the Cadmea by Pelopidas, With

help in arms and moncy from Demos- thenes and other Athenians, they entered Thebes, and summoned the Macedonian garrison to surrender. The answer was a blunt refusal, and a double line of circum- vallation was drawn around the citadel, while cnvoys were sent to call forth aid from every quarter ; but these efforts could not affect the issue. The belief in Alexander's death was to be dispelled, by no gradual reports of his escape from the barbarians, but by his own sudden appearance at the Bceotian Onchestus. He had just de- feated the Illyrians when he heard of the revolt, and he determined to smite the rebels without turning aside to take even a day's rest at Pella. In little more than a fortnight his army was encamped on the southern side of

Thebes, thus cutting off all chances of aid from Athens. It was his wish to avoid an assault, and he contented himself with demanding the surrender of two only of the anti-Macedonian lcaders. The citizens generally were anxious to submit, but the exiles felt or feared themselves to be too deeply committed ; and the answer took the form of a defiance, accompanied by a demand for the surrender of Antipater and Philotas. They had sealed their own doom. Personal bravery was of no use against the discipline, the numbers, and the engines of the enemy. The defenders were driven back into the city ; the invaders burst in with them ; and the slaughter which followed was by no means inflicted by the Macedonians alone. The Platzans, Thespians, and Orchomenians felt that they had old scores to settle. To these and to the rest of his Greek allies Alexander submitted the fate of the city. The sentence was promptly pronounced. The measure which the Thebans had dealt to Platese, and would have dealt to Athens, should now be dealt out to themselves. The whole town was razed to the ground, the house of the poet Pindar being alone spared from demolition, and his descendants alone allowed to retain their freedom. Alex- ander had gained his end. The spirit of the Greeks was crushed; a great city was blotted out, and the worship of its gods was ended with its ruin. These gods, it was believed, would in due time take vengeance on the con- queror; but for the present the only hindrance to his enterprise was removed from his path. Without turning aside to Athens, he went on to Corinth to receive the adulations of the independent Greeks, and to find, it is said, a less courtly

speaker in the cynic Diogenes. From Corinth he returned to Macedonia, having left Greece for the last time.

Six months later he set off from Pella, crossed the Helles- 334 2.0.

pont at Sestus, to appease at Ilium by a costly sacrifice the wrath of the luckless Priam ; and then marched on, with not more perliaps than 30,000 infantry and 4000 cavalry, and with a treasure-chest almost empty, to destroy the monarchy of Cyrus. With him went men who werc to be linked with the memory of his worst crimes and of his most astonishing triumphs— Clitus, Hephzstion, Eumenes, Seleucus, Pto- lemy the son of Lagos,and Parmenion, with his sons Philotas and Nicanor. The effects of Macedonian discipline were to be seen at once on the banks of the Granicus, a little stream flowing to the Propontis from the slopes of Ida, Losing, it is said, only 60 of his cavalry and 30 of his infantry, he annihilated the Persian force, 2000 out of 20,000 foot soldiers being taken prisoners, and nearly all the rest slain. The terror of his name did his work as he marched south- wards. The citadel of Sardis might with ease have been held against him : before he camc within eight miles of the city, the governor hastened to surrender it with all its treasure. At Ephesus he found the city abandoned by its garrison. Miletus he carried by storm. Before Hali- carnassus he encountered a more obstinate resistance from the Athenian Ephialtes ; but the generalship of the latter was of no avail, Alexander entered Halicarnassus, and the Rhodian Memnon remained shut up in the citadel. Leaving Ptolemy with 1000 men to blockade it, he spent the winter in conquering Lycia, Pamphylia, and Pisidia, ending his campaign at Gordium, on the river Sangarius. Here was preserved the ancient waggon of Gordius, the mythical Phrygian king. Whoever could untie the knot, curiously twisted with fibres of the cornel tree, which fastened its pole to the yoke, was, so the story ran, to be lord of Asia. Alexander, as much ata loss as others to unloose it, cut it with his sword; but the prophecy was none the less held to be fulfilled. If he was thus favoured by sentiment, he was still more favoured by the infatuation which led Darius to abandon the policy of defence by sea I. — 61

332 B.C.

for offensive warfare by land. From all parts of his vast empire was gathered a host, numbering, as some said, 600,000 men; and the despot was as much elated at the sight as Xerxes, when he looked down on his motley multi- tudes at Doriscus. Like Xerxes he had one (the Athenian Charidemus) by his side to warn him that Asiatic myriads were not to be trusted in an encounter with the disciplined thousands of Alexander; but he lacked the generosity which made Xerxes dismiss Demaratus with a smile for his good-will. Darius seized the exile with his own hand, and gave him over to the executioner. " My avenger, said Charidemus, " will soon teach you that I have spoken the truth." The Persian acted as though he wished to bring about the specdiest fulfilment of the prediction. The Greek mercenaries were withdrawn from the fleet to be added to the land forces; but although a hundred of these could have effectually barred the passage of Alex- ander across the range of Taurus, and the passes of the Amanian, Cilician, and Assyrian gates, the invader was suffered to cross these defiles without the loss of a man, Nay, so great was the contempt of Darius for the few thousands of the enemy, that he wished to give them a free path until they reached the plain from which he would sweep them away. But he could not wait patiently for them in his position to the east of the Amanian range. Alexander had been ill, and he had work to do in subju- gating western Cilicia. When at length he set out on his march to the southern Amanian pass, Darius, with his unwieldy train, crossed the northern pass, and entered Issus two days after Alexander had left it. He had placed himself in a trap. In a space barely more than a mile and a half in width, hemmed in by the mountains on the one side and the sea on the other, Darius, in his royal chariot, in the midst of multitudes who had scarcely room to move, awaited the attack of Alexander, who fell suddenly on his right wing. The first onset was enough. The Persians broke and fled. Darius, thinking himself in danger, fled among the foremost. The Persian centre behaved well ; but it mattered little now what they might do. Even the Greek mercenaries were pushed back and scattered. Four thousand talents filled the treasure-chest of the conqueror, and the wife, mother, and son of Darius, appearing before him as prisoners, were told that they should retain their royal titles, his enterprise being directed, not against Darius personally, but to the issue which was to determine whether he or Alexander should be lord of Asia.

The truc value of armed Asiatic hordes was now as clear to all as the sun at noonday. Parmenion advanced to attack Damascus, but he needed not to strike a blow. The governor allowed the treasure in his charge to fall into his hands, and then surrendered the city. Alexander himself marched southward to Pheenicia. At Marathus he replied to a letter in which Darius demanded the restoration of his family and reproached him for his wanton aggression. His answer repeated what he had already said to his wife, adding that, if he wrote again, Darius must address him, not as his equal, but as his lord. "{ am now master of Asia," he wrote, 'and if you will not own me as such, I shall treat you as an evil-doer. If you wish to debate the point, do so like a man on the battlefield. I shall take care to find you wherever you may be." The island city of Aradus was surrendered on his approach. Sidon opened her gates. From the Tyrians he received a submission which demurred only to his entering their city. A siege of seven months ended in its fall; and Alexander hanged 2000 of the citizens, it is said, on the sea-shore. The survivors, with the women and children, were sold as slaves. Before the catastrophe of the great Phcenician city he had received a second letter, in which Darius offered him his daughter in marriage, to-

gether with the cession of all lands to the west of the Euphrates. " Were I Alexander," said Parmenion (if we may believe the story), "I should take these terms, and run no further risk." 'So should J," answered Alexander, "if I were Parmenion ; but as J am Alexander, I cannot." "You offer me," he wrote accordingly to Darius, " part of your possession, when I am lord of all. If I choose to marry your daughter, J will do so whether you like it or not." Darius sent no more letters. The issue, he saw, must be determined by the sword. For the present he was left to himself. Alexander's face was turned towards Egypt. Gaza dared to resist; but a siege of two months was followed by a ruin as complete as that of Tyre. From Gaza a march of seven days brought him to Pelusium. The Persian governor opened its gates to receive him; and the Egyptians expressed their delight at exchanging a Persian for a Macedonian master. Marching in triumph to Memphis, he offered solemn sacrifice to the calf-god Apis ; and then, with the true instinct of the ruler and the statesman, he hastened to found for his new

kingdom a new capital, which, after more than two millenniums, remains a highway for the commerce of three continents. Success thus unparalleled was, it would seem, already producing its effects upon him. Calmly reviewing the course of his march from Sestus and Ilium to Memphis, he could explain it only on the supposition that he was no child of a human father, and he determined to obtain from the oracle of Ammon, in the Libyan Oasis, a solution of this mystery. The response greeted him as the son, not of Philip, but of Zeus; and he returned, it is said, with

the conviction that the divine honours paid to Hercules 331 3.0,

and Perseus were his own by indubitable right. March- ing back through Pheenicia, he hastened to Thapsacus, and then crossed the Euphrates. Thence turning north- wards, he made a sweep which brought him to the Tigris below Nineveh (Mosul), and there, without opposition, crossed a stream where the resistance of a few hundreds might have destroyed his army. After a few days' march to the south-east, he received the news that Darius, with all his host, was close at hand. Still convinced that mere numbers must, with ample space, decide the issue of any fight, and attributing his defeat at Issos only to the cramped position of his troops, he had gathered a vast horde, which some represent as more than a million, on the broad plain stretching from Gaugamela eastwards to Arbela. His hopes were further raised by changes made in the weapons of his troops, and more especially in the array of his war- chariots. For the Macedonians it is enough to say that they were led by a man whose consummate generalship had never shone more conspicuously than in the cautious arrangements which preceded the battle of Arbela, or rather of Gaugamela. All went as he had anticipated. As at Issus, Darius fled ; and the bravery and even gallantry of the Persians opposed to Parmenion were of no avail when the main body had hurried away after the king. So ended the last of the three great battles (if such they may be termed) which sufficed to destroy the Persian empire, or rather to make Alexander king of Persia; and so ended the first act in the great drama of his life.

The victory of Gaugamela opened for the conqueror the gates of Babylon and Susa. The treasures found in the former furnished an ample donation for all his men: those of Susa amounted, it is said, to nearly twelve millions

of pounds sterling. The Persian king had wasted men on the battlefield; he had hoarded coin which, freely spent in getting up a Greek army under Greek generals, might have rendered the enterprise of Alexander impossible. From Susa the conqueror turned his face towards Per- sepolis, the ancient capital of Cyrus. Before him lay the fortresses of the Uxii, to whom the Persian monarchs had

been accustomed to pay tribute when they went from the one capital of their kingdom to the other. The same demand was now made of Alexander, who told them to come to the pass and take it, and then, following a new track which had been pointed out to him, descended on their villages, and taught them that they had now to deal with a sovereign of another kind. With Persepolis, Pasar- gade, the city containing the tomb of Cyrus, opened its gates to receive the avenger of the iniquities of Xerxes. As such, he determined to inflict on Darius a signal punish- ment. Five thousand camels and a crowd of mules bore away the treasure, amounting, it is said, to nearly thirty millions of pounds sterling, and then the citadel was set on fire. The men in the city were killed, the women made slaves.

For a month Alexander allowed his main army to rest near Persepolis; for himself there could be no repose. With his cavalry he overran, and, in spite of the rigours of winter, subdued, the whole region of Farsistan. Then re- turning to Persepolis, he set forth on his march to Media, where the fugitive king had hoped to be safe from his pursuit. Darius had left Agbatana (Ecbatana) eight days before his pursuer could reach it. In this ancient fastness of the Median and Persian sovereigns Alexander deposited his treasures, exceeding, we are told, forty millions sterling in amount, under the charge of a strong Macedonian garrison headed by Parmenion. He then hastened on towards the Caspian gates, and learnt, when he had passed them, that Darius had been dethroned, and was now the prisoner of the Bactrian satrap Bessus. The tidings made Alexander still more eager to seize him. His efforts were so far successful that Bessus felt escape to be hopeless unless Darius could be made to leave his chariot and fly on horse- back. He refused to obey, and was left behind, mortally wounded. Before Alexander could reach him, he was dead.

The conqueror now regarded, or professed to regard, himself as the legitimate heir and successor of Xerxes. His course of conquest was still unbroken; but successful forays against the Mardians on the northern slopes of Mount Elburz, against the Arians of the modern Herat, and the Drangians of the present Seistan, were followed by an exploit of another sort. He had heard that a conspiracy against himself had been revealed to Philotas, who for two days had kept the secret to himself. On being asked why he had done this, Philotas answered that the information came from a worthless source and deserved no notice. Alexander professed himself satisfied with the explanation; but Philotas, it seems, had spoken freely to his mistress Antigone of the large share which he and his father had had in the conquests of Alexander, and Antigone had in her turn become an informer. Of real evidence against Philotas there was none ; and a letter from Parmenion to his sons, found when Philotas was treacherously arrested, could tell against them only in the eyes of one who was resolved that Philotas should die. But Alexander could not rest content with his death alone. There had been nothing yet, even in the way of shadowy slander, to criminate Parmenion, and he resolved that the needful charges should be drawn by tortures from his son. Hidden by a curtain, the conqueror of the world watched the agonies and scoffed at the screams of the friend who had fought by his side in a hundred fights. The issue was, or was said to be, what he desired. Philotas had confessed ; and Alexander sent off to Ecbatana a man bearing two despatches, one to cheat Parmenion into a false security, the other carrying to the officers next to him in command the real order for his assassination. The old man was reading the lying letter of the despot when he received a mortal stab in his back. The soldiers, on hearing of what had been done, furiously demanded the surrender of the

murderers, and were with difficulty withheld from taking summary vengeance on sceing the written orders of Alexander. The command of Philotas, who had been at the head of the companion-cavalry, was shared betwecn Clitus and Hephestion ; and Alexander turned from

private murder to public war. The autumn and winter 329 no.

were spent in overrunning parts of the modern Afghanistan and Cabul, in the formation of the Caucasian Alexandria, and in the passage of the Hindu-Kush. He was now in the satrapy of Bessus. The surrender of Aornus and Bactra was followed by the passage of the Oxus and by the betrayal of Bessus, who was sent naked and in chains to the city which had been his capital. His next exploit (there is but slender ground for calling it into question) was the slaughter, in Sogdiana, of the descendants of the Milesian Branchidee, who, having incurred the hatred of their fellow Greeks by surrendering to Xerxes the treasurcs of their temple, had followed the despot on his retreat, and by him had been placed in these distant regions. Five generations had passed away since that time, when Alex- ander gave the order that not one of them, man, woman, or child, should be left alive. From the ruined city, by way of Maracanda (Samarkand), he reached the Jaxartes (which he believed to be the Tanais or Don), and having laid on its banks the foundation of another Alexandria, he crossed the river to chase some Scythians who had shown themselves on the further side. The end of this chase marked the northernmost point reached in his campaigns.

The winter was spent in the Bactrian city of Zariaspa, 329-328 where Alexander, summoning Bessus before him, had his ®-°

nose and ears cut off, and then sent him to be killed by his countrymen at Ecbatana.

In the following summer his army was gathered again at Maracanda. Repose from field-work left room for the display of the overbearing pride to be expected from one who had convinced himself that he was a god, and for the boundless flattery of those who found their interest in keeping up the delusion. But there were not wanting others to whom this arrogance and servility were intensely disgusting, and whose anger was the more fierce from the necessity of avoiding all open expression of it ; and in the banquets of the divine son of Aminon there was always a risk that these pent-up feelings might burst forth like a winter torrent. The catastrophe was not long in coming. In a feast at Maracanda, Alexander, boasting of all that he had done since the death of his father, took credit further for the victories of Philip in the later years of his reign. The patience of Clitus had long been scverely taxed, and in the heat of the revel all thought of prudence was cast

aside. He spoke his mind plainly, telling Alexander that all his exploits taken together were not equal to those of the man who had found Macedonia a poor and distracted country, and had left it a mighty and cohcrent state; and that his own greatest victories had been won through the aid of Philip's old soldiers, some of whom he had nurdered. Stung to the quick, Alexander gave utterance to his rage ; but his retort only led Clitus to remind him of the battle- field of the Granicus, where he had saved him from death by cutting off the arm of the Persian whose sword was raised to smite him, and to warn him that, if he could not bear to listen to the words of truth, he should confine himself to the society of slaves. Alexander felt for his dagger: it had purposely been placed out of his reach. He called to his guards to sound an alarm : they hesitated to obey the orders of a raving drunkard. Some of the more sober and moderate of the party held him in their arms, praying him to do nothing hastily. By way of answer he reviled them for keeping him a prisoner as Bessus had kept Darius, and shaking himself free, snatched a pike from one of the guards, and thrust it through the body of

328 Bo. A few weeks after this murder Alexander captured the | world; and, in the midst of deluges of rain, the army set Sogdian rock, a fastness from which common care would | out on its westward journey. The reinforcements which Noy, 3964 have sent him away baffled. Having next reduced the rock of | he found on reaching the Hydaspes might, if they had Aug. 325) Chorienes, he returned to Bactra to celebrate his marriage | advanced as far as the Hyphasis, have turned the scale in ®- with Roxana, the daughter of Oxyartes, who had been | favour of progress to the east; they enabled Alexander to

327 Bc. among the captives taken on the Sogdian rock. The feast | undertake with greater ease a voyage down the Hydaspes to was seized by Alexander as an opportunity for extracting | its junction with the Indus after receiving the waters of from his Greek and Macedonian followers a public acknow- | the Acesines, Hydraotes, and Hyphasis, and thence on- ledgment of his divinity. It was arranged that the sophist | wards to the Indian Ocean. From the mouth of the Indus Anaxarchus (or, as some said, the Sicilian Cleon) should | he ordered his admiral Nearchus to take the fleet along the make a speech, advising all to worship at once the mau | shores of the

ocean and the Persian Gulf to the mouth of whom they would certainly have to worship after his | the Tigris. The army marched by land through the death. The speech was delivered. The silence of most | Gedrosian desert, suffering more from thirst and sickness of the Macedonian officers showed their disgust ; but none | than they had suffered in all their battles and forced ventured to speak until the Olynthian Callisthcenes, the | marches. At length he reached Pasargadz, to find the nephew of Aristotle, insisted on the impiety of all attempts | tomb of Cyrus broken open and plundered, and to avenge to confound the distinctions between gods and men. Con- | the insult offered to the man whom he now regarded as the ceding to the conqueror the highest place amongst military | founder of his own dynasty. Early in the following year leadcrs and the first rank amongst statesmen, he rebuked | he entered Susa, and therc, celebrating his marriage with Anaxarchus for making a suggestion which ought to have | Statira, the daughter of Darius and of Parysatis the daughter come from any one rather than from himself. The applause | of his predecessor Ochus, he offered to pay the debts of which his words drew from the Macedonians taught Alex- | those soldiers who would follow his example by taking to ander that open opposition would be useless ; but he was | themselves Persian wives—a strange mode of inviting sober none the more turned from his purpose, nor was it long | and steady men who had 'no debts, but an effectual argu- before he found a pretext for carrying it out. A con- | ment for the spendthrifts and ruffians of his army. His spiracy was discovered amongst his pages. These un- | new levies of Persian youths, armed and disciplined after fortunate men were tortured (but without extracting from | the Macedonian fashion, had now made him independent them anything to implicate Callisthenes), and then stoned | of his veteran soldiers; and his declared intention of send- to death, —as Alexander would have it, not by his orders, | ing home the aged and wounded among them called forth but by the loyal impulse of his army. Callisthenes he was | the angry remonstrances of their comrades, who bade him resolved, he said, to punish himself, together with those | complete his schemes of conquest with the aid of his father who had sent him,—an insinuation, manifestly, againsthis | Ammon. Alexander rushed into the throng, seized some uncle Aristotle, possibly also against all other Greeks, for | and had them executed, and then disbanded the whole whom freedom of speech and action had not yet altogether | force. For two days he shut himself up in his palace; on lost its value. The philosopher who had extolled

Alex- | the third he marshalled his Persian levies (Zpigoni, as he ander as the greatest of earthly generals and statesmen | called them) into divisions bearing the Macedonian mili- was first tortured and then hanged ; and the conqueror | tary titles, under Persian officers. The spirit of the veterans went calmly on to subdue the regions between the Hindu- | was broken by this ignoring of their existence. They Kush and the right bank of the Indus, and to storm the | threw down their arms at the palace gates, and begged impregnable rock of Aornus. forgiveness with cries and tears. Alexander accepted their

326 B.c. The next river to be crossed was the Indus. The bridge | contrition, and the restoration of harmony was celebrated

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Clitus, bidding him go to Philip and Parmenion. The rage of the tiger was followed by a furious remorse, in which, with considerable truth, he denounced himself as unfit to live. For three days he would neithcr eat nor drink ; and the army, alarmed at the threatened starvation of their king, voted that Clitus had been justly slain, and that his body should not receive the rites of burial. By reversing this vote, Alexander seemed to feel that he had gone a long way towards acquitting himself ; whatever inight be yet lacking to restore his self-complacence was supplied by the prophets, who assured him that the disaster had been brought about wholly by the Theban wine-god Dionysus, to whom he had offered no sacrifice on the day of the banquet.

was constructed by Hephestion and Perdiccas, probably near the prescnt Attock. The surrender of Taxila left Alexander an open path until he reached the Hydaspes (Jhelum), where Porus was beaten only after a severe struggle. The Indian prince was taken prisoner, and treated with the courtesy which the family of Darius had received after the battle of Issus. Here died Alexander's horse Boukephalos (Bucephalus), and the loss was com- memorated by the founding of Bucephalia. The passage of the Acesines (Chenab), running with a full and impetu- ous stream, was not accomplished without much danger; that of the Hydraotes (2avee) presented less formidable difficulties, but he was encountered on the other

side by Indians, who entrenched themselves in their town of Sangala. Their resistance ended, it is said, in the slaughter of 17,000

and the capture of 70,000. About 40 miles further to the south-cast flowed the Hyphasis (Sutlej). Alexander approached its bank, the limit of the Panjab, in the full confidence that a few days more would bring him to the mighty stream of the Ganges; but he had reached the goal of his conquests. The order for crossing the river called forth murmurs and protests at ouce from his officers and his soldiers, who expressed plainly their refusal to march they knew not whither. Alexander in vain laid before his officers his schemes of further conquest ; and when he offered the sacrifice customary before crossing a river, the signs were pronounced to be unfavourable. The die was cast. Twelve huge altars remained to show that Alexander had advanced thus far on his conquest of the

by a sumptuous sacrifice.

But for Alexander past victories were only a stimulus to further exploits. Arabia still remained unsubdued, and for this conquest a large addition was needed to his fleet.

Orders were sent to Pheenicia for the construction of ships, 3243.0. |

which were to be taken to pieces and sent overland to Thapsacus on the Euphrates, while others were to be built at Babylon. His journey to Ecbatana was marked by a violent quarrel between Eumenes and Hephestion. Their reconciliation was soon followed by the death of the latter from an attack of fever. The grief of the conqueror was as fierce as that of Achilles, if we may not set it down as a manifest imitation of it. For two days he neither ate nor drank; he cut his hair short, and ordered that the horses and mules in his army should have their manes

docked also. Human blood could scarcely be shed with prudence on his pyre; but he was resolved that his friend should begin his life in the unseen

world with unstinted wealth, and the precious things destined to be consumed on his funeral pile represented, it is said, a sum of nearly two millions and a half pounds sterling. Messengers were sent to the Egyptian oracle to ask if the dead man might be worshipped as a god, and Eumenes, with many others, took care to anticipate its answer by offering him such honours as might fall in with the humour of the divine mourner. His grief seemed only to render his bursts of passion more fearful. None dared to address him except in language of the most grovelling flattery ; and, in the words of Plutarch, his only consolation was found in his old habit of man-hunting. The diversion was this time furnished by some mountain tribes between Media and Farsistan. His march to Babylon steeped him still more in the intoxication of success. As he advanced on his road he was met by ambassadors not only from Ilyrians and Thracians, from Sicily and Sardinia, from Libya and Carthage, but from Lucanians and Etruscans, and, as some said, from Rome itself. The lord of all the earth could scarcely look for wider acknowledgment or more devout submission; but his self-gratulation may have been damped by the warning of the Chaldean priests that it would be safer for him not to enter the gates of Babylon. For a while he hesitated, but he had more to do than to heed their words. The preparations for his Arabian cam- paign must be hurried on ; all that might be needed must be done to improve the navigation of the Euphrates, and a new city must be builtto rival, perhaps, the Alexandria which he had founded by the banks of the Nile. More than all, he had to celebrate the obsequies of Hephzestion, whose body had been brought to Babylon from Ecbatana. The feasting which everywhere accompanied the funeral rites of the ancient world was exaggerated by the Macedonians, as by other half rude or savage tribes, into prolonged revelry. Alexander spent the whole night drinking in the house of his friend Medius, and the whole of the next day in sleep- ing off his drunkenness. Throughout the following night the same orgies were repeated. When he next awoke he was unable to rise. Fever had laid its grasp upon him, and each day its hold became tighter, while he busied himself incessantly with giving orders about his army, his fleet, his generals, until at length the powers of speech began to fail. When asked to name his successor, he said that he left his kingdom to the strongest. His signet-ring he took from his finger and gave to Perdiccas. Throughout the army the tidings of his illness spread consternation ; old grudges were all forgotten ; his veterans forced them- selves into his

presence, and with tears bade farewell to their general, who showed by signs that he still knew them. A few hours later Alexander died, after a reign of less than thirteen years, and before he had reached the age of thirty-three.

That the schemes of conquest with which almost to the last moment he had been absorbingly busied would, if he had lived, have been in great part realised, can scarcely be doubted, unless we suppose that causes were at work which at no distant period would have disturbed and upset the balance of his military judgment, and deprived him of that marvel- lous power of combination and of shaping means to cir- cumstances in which Hannibal and Napoleon are perhaps his only peers. It would be rash to say that such a darkening of his splendid powers might not have been

brought about, even before he could reach middle age, by habits which, if we may judge from the history of his later years, were fast becoming confirmed. In truth, except as a general, he had lost the balance of his mind already. The ruling despot who fancied himself a god, who could thrust a pike through the body of one friend and sneer at the cries drawn forth from another by the agonies of torture, was already far removed from the far-sighted prudence of the politic statesman and ruler. His con- quests served great ends; and before he set out on his career of victory he may have had a distinct vision of these ends. Desire for knowledge; the wish to see new forms of human and animal life; the curiosity of traversing unknown lands, of laying open their resources, of bringing them all within the limits and the influence of the Mace- donian, or, as he preferred to put it, the Greek world; the eagerness to establish over all known, possibly over all unknown, regions a mighty centralised empire, which should avail itself of all their forces, and throw down the barriers which rendered the interchange of their wealth impossible,—may have mingled with his alleged or his real purpose of avenging on the Persian king the misdoings of Xerxes, Darius, and Cyrus. But there is little evidence or none that these motives retained their power undiminished as he advanced further on his path of victory, while there seems to be evidence, only too abundant, that all other motives were gradually and even fast losing strength as the lust of conquest grew with his belief or his fancy of his superhuman power and origin. During his sojourn with Aristotle he must have learnt that real knowledge can be reached and

good government insured only where there is freedom of thought and speech, and where the people obey their own laws. A few years later he had come to look on Aristotle as an enemy to be punished with scarcely less severity than Callisthenes, But at the least it must be remembered that his work was left un- finished ; possibly he may have regarded it as little more than begun. Looking at it from this point of view, we can neither shut our eyes to the solid benefits accruing from his conquests both for the East and the West, nor, in spite of his awful crimes, can we place him in the rank of those scourges of mankind among whom Alaric and Attila, Genghiz, Timour, and Napoleon stand pre-eminent. Of the several accounts of his career which have come down to us, not one, unhappily, is strictly contemporary ; and mere fairness calls upon us to give him the benefit of a doubt, when doubt can be justly entertained, in reference even to deeds which carry with them an unutterable horror and shame. It is impossible to deny that with a higher sense of duty Alexander would better have deserved the title of Great ; but the judgment which may be passed on some of his actions cannot affect his transcendent glory as the most consummate general of ancient times, and perhaps even of all ages.

For an examination of the sources of the history of Alexander the Great, see Freeman, Historical Essays, second series, essay v. The history itsclf is presented in various aspects by Thirlwall, History of Greece, chaps. xlvii.-lv.; Grote, History of Greece, part ii,, chaps. xci.—xciv.; Niebuhr's Lectures on Ancient History, lectures xxiv.~~lxxx.; Williams, Life of Alexander the Great; St Croix, Laamen Critique des Anciens Historiens d' Alexandre le Grand ; Droysen, Geschichte Alexanders der Grossen. See also Finlay, Greece under the Romans, chap. i.; Arnold, History of Rome, chap. xxx. For the geography of Alexander's Indian cam~~ paigns, see Cunningham's Ancient Geography of India; and for the scientific results of his conquests, Humboldt's Kosmos, vol. ii., part ii., section 2. (a. w. ©.)

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ALEXANDER or Apuropisias, the most celebrated of the Greek commentators on the writings of Aristotle, and styled, by way of pre-eminence, 6 ééyyy7js, the Hxpost- tor. He was a native of Aphrodisias in Caria, and taught the Peripatetic philosophy at Athens in the end of the 2d

and the beginning of the 3d centuries of the Christian era, Commentaries by Alexander on the following works of Aristotle are still extant:—The Analytica Priora, I.; the Topica; the Meteorologica; the De Sensu; andthe Metaphysica, L-V., together with an abridgment of what he wrote on the remaining books of the Metaphysica. — His commentaries were greatly esteemed among the Arabians, who translated many of them. 'There are also several original writings by Alexander still extant. The most important of these are a work On Fate, in which he argues against the Stoic doctrine of necessity; and one On the Soul, in which he contends that the undeveloped reason in man is material (vots iAuxés), and inseparable from the body. He identified the active intellect (vots rounrixés), through whose agency the potential intellect in man becomes actual, with God. Several of Alexander's works were published in the Aldine edition of Aristotle, Venice, 1495-98; his De Lato and De Anima were priuted along with the works of The- mistius at Venice, 1534; the former work, which has been translated into Latin by Grotius and also by Schulthess, was edited by Orelli, Zurich, 1824; and his commentaries on the IMetaphysica by Bonitz, Berlin, 1847. Nourisson has treated of his doctrine of fate, Paris, 1870.

ALEXANDER or Haus (ALEXANDER HALENSIS), sur- named Doctor Irrefragabilis and Fons Vite, a celebrated English theologian of the 13th century. Born in Gloucester- shire, and trained in the monastery of Hales, from which he takes his name, he was early raised to an archdeaconry. Relinquishing this position, however, he went, like most of the scholars of his day, to study at the university of Paris, where he took the degree of doctor, and became cele- brated as a teacher of philosophy and theology. Among his pupils was Bonaventura; but it is evident from a comparison of dates that he did not teach Duns Scotus and Thomas Aquinas, as has been frequently asserted. In 1222, when at the height of his fame, Alexander entered the order of Minorite Friars, and thenceforward lived in strict seclusion. He refused, however, to renounce his degree of doctor, and was the first of his order who con- tinued to bear that title after initiation. He died in 1245, and was buried in the convent of the Cordeliers at Paris, where he had spent the last twenty-three years of his life. The most celebrated work of Alexander was his Summa Theologie (Nuremberg, 1452; Venice, 1576), undertaken by the orders of Pope Innocent IV., and approved by Alexander IV., after he had submitted it to the examina- tion of seventy

learned theologians as a system of instruc- tion for all the schools in Christendom. Based on the Sentences of Peter Lombard, it is divided into four parts; the first treating of the nature and attributes of the Deity; the second of the creation and of the various orders of creatures ; the third of the scheme of redemption, the incarnation of Christ, the law, and grace; and the fourth of the sacraments. The form is that of question and answer, and the method is rigidly scholastic.

ALEXANDER oF Traits (ALEXANDER TRALLIANUS), a medical writer, was a native of Tralles, a city of Lydia, and lived probably about the middle of the 6th century. He is the author of a work, divided into twelve books, in which he treats of bodily distempers. He was the first to open the jugular vein, and to use cantharides as a blister for the gout. Dr Freind, in his History of Physic, styles him one of the most valuable authors since the time of Hippocrates.

See also Dr Milward's Zrailianus Reviviscens; or, An Account

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of Alexander Trallian, one of the Greck Writers that flourished aftcr Galen, being a Supplement to Dr Freind's History of Physic, London, 1734, 8vo. The Greek text of his principal work was first published by Jac. Goupylus, Lutet. 1548, fol. It was reprinted, and was then accompanied with a Latin version by Jo. Guinterius, Basil, 1556, 8vo. He is likewise the author of an epistle on worms, De Lumbricis, which was published, in Greek and Latin, by Mer- curialis, in his Variew Lectiones, Venet. 1570, 4to.

ALEXANDER BALAS (@ surname that probably means '" lord"), a man of low birth who professed to be the son of Antiochus Epiphanes, and eventually became king of Syria. His claims were recognised by the Romans, who desired to revenge themselves on Demetrius Soter; and their example was followed by the king of Egypt and other monarchs. Demetrius was at first victorious, but in 150 B.c. was slain in battle, and Balas obtained possession of the kingdom. The new king soon made himself hateful to his subjects by his voluptuousness and debauchery, and this encouraged Demetrius Nicator, the eldest son of Demetrius Soter, to claim his father's crown. Alexander took the field against him, but was defeated in

a pitched battle, and fled to Abze in Arabia, where he was murdered by the emir, with whom he had sought refuge, 145 B.c.

ALEXANDER JANN ASUS, king of the Jews, suc- ceeded his brother Aristobulus in 104 B.c., and died in 79 B.c. His reign, which he commenced by putting to death one of his brothers who claimed the throne, was disgraced by the cruelties that he perpetrated in order to keep himself in power.

ALEXANDER SEVERUS, Roman emperor. SEVERUS.

See

ALEXANDER was the name of eight PopEs:— ALEXANDER [., bishop of Rome, succeeded Evaristus in 108 or 109 a.p., and, according to Eusebius, suffered martyrdom under Hadrian in the year 119. Catholic writers ascribe to him the introduction of holy water, and of the custom of mixing sacramental wine with water. ALEXANDER II., whose family name was Anselmo Baggio, was born at Milan, and occupied the papal chair from 1061 to 1073. He had previously, as bishop of Lucca, been an energetic coadjutor with Hildebrand in endeavouring to suppress simony, and to enforce the celibacy of the clergy; and his efforts to augment the influence of the Roman see prepared the way for the com- plete ascendancy which was established by his celebrated successor, The imperial sanction being withheld from Alexander's election, a council at Basle chose as anti-pope Cadolaus, bishop of Parma, who assumed the name of Honorius II., and marched to Rome. He was deposed; however, by a council held at Mantua, and Alexander's posi- tion remained unchallenged. Alexander was succeeded by his associate Hildebrand, who took the title of Gregory VII. ALEXANDER III. (Rolando Ranuci of Siena), cardinal and chancellor of the Roman church, was elected to the popedom in 1159, and reigned until 1181. His career is of great historical importance on account of the vigour and ultimate success with which he carried out the ideas and policy of Hildebrand in opposition to Frederick Barbarossa and Henry II. of England. Three anti-popes (Victor IV., 1159 ; Pascal III., 1164; Calixtus III, 1168) were con- firmed by the German emperor in succession. Alexander, however, steadfastly maintained his rights, though com- pelled to take refuge in France between the years 1162 and 1165. The contest between

pope and emperor was continued with varying fortune until, on the 29th May 1176, Frederick was decisively defeated at Legnano, when he at once withdrew his support from the anti-pope and submitted to Alexander. On the Ist August 1177 the emperor yielded the customary homage to the pope at Venice by kissing his foot, and was freed from the ban of

excommunication under which he had been placed ten years previously. There seems to be no historical autho- rity for the common story that during the ceremony Alexander placed his foot upon the emperor's neck.

In England the papal supremacy was strenuously main- tained against Henry II. by Thomas 4 Becket. Here, as in the case of Germany, the struggle was protracted and severe, but in the end the victory lay with the pope. A Becket was canonised soon after his assassination, and Henry II. was compelled to submit to a humiliating penance. A contest with William the Lion of Scotland, who insisted on instituting his chaplain Hugo, and not the papal nominec, into the see of St Andrews, ended in the excommunication of the king in 1181.

Alexander introduced several important changes in the organisation and administration of the church. Chicf among these were the restriction of the right of canonisa- tion to the pope alone, the still-existing law requiring the votes of two-thirds of the cardinals for a valid papal elec- tion, and the exemption of the clergy from civil control and of church lauds from civil burdens. Several of these measures were ratified by the third general council of the Lateran, summoned by Alexander in 1179.

ALEXANDER IV., Count Rinaldo de Segni, cardinal- bishop of Ostia, occupied the papal chair from December 1254 till his death in May 1261. He seems to have been of a weak character, and in the struggle against the house of Hohenstaufen, which he inherited from his predecessors, he did little to strengthen the position of the papacy. The opposition which he offered to Manfred, natural son of Frederick II., proved unavailing, although he obtained the aid of England by promising the disputed sovereignty of the Two Sicilies to the English Prince Edward. Manfred was crowned king at Palermo in 1258, and in 1260 he invaded the States of the

Church, and compelled the pope to recognise him as legitimate sovereign. The ecclesiastical administration of Alexander was signalised by his efforts to unite the Greek and Latin churches, by the establish- ment of the Inquisition in France (1255), and by the support he gave to the orders of Mendicant friars. The last years of his pontificate were passed at Viterbo, where he was compelled to take refuge on account of the violent struggles at Rome between the factions of the Guelphs and the Ghibellines.

ALEXANDER V. (Pietro Philargi), a native of Candia, enjoyed the dignity of Pope for only ten months, from the 26th June 1409 to the 3d May 1410. Born of poor parentage, he owed his admission to a religious house to a Franciscan monk, who noticed him begging. He studied at Paris and Oxford, where he acquired such reputation for scholarship, that on his return to Italy he was rapidly promoted from dignity to dignity. In 1402 he was appointed, through the influence of Galeazzo Visconti, to the archbishopric of Milan, and in 1405 he was made a cardinal by Innocent VII. The coungil of Pisa, after deposing Benedict XIII. and Gregory XII., elected him pope on the understanding that he would set himself to reform the abuses of the church. The weakness of his character and the shortness of his pontificate, however, prevented anything effectual being done, He died, as was generally believed, of poison administered by Balthasar Cossa, who became his successor under the title of John XXIII.

ALEXANDER VI. (Rodrigo Borgia), memorable as the most characteristic incarnation of the secular spirit of the Papacy of the 15th century, was born at Xativa in Valencia, Ist January 1431. His biographers all but unanimously assert his patronymic to have been Lenzuoli (in its original Valencian form, Llangol), and the name of

orgia (or more properly Borja) to have been assumed on

his adoption by his maternal uncle. Francisco Escolano, however, a compatriot, positively affirms (Cronica, lib. vi. cap. 33), that Llancol was his mother's name, and that his father was Giofré Borja. It is also disputed whether he originally followed the legal or the military profession ; the former appears more probable. In either case, his career was determined by his uncle's elevation to the papacy as Calixtus III., 8th April 1455, and his own immediate summons to Rome, where he was reserved in petto as

cardinal in the ensuing February, publicly pro- moted in September, and by an unparalleled act of nepotism elevated to the lucrative and dignified office of vice- chancellor in the following July. He also succeeded his uncle as archbishop of Valencia. An elder brother, Pedro Luis, was made generalissimo of the papal forces by land and sea. The animosity created by so invidious an exalta- tion prepared Rodrigo's subsequent feud with the Roman patriciate. For the moment he was all-powerful, and the letters of that dexterous courtier Aineas Sylvius attest the importance attached to his good word. We must here notice the ridiculous fiction concerning the parentage of Borgia's natural children, which owes its currency to the uncritical credulity of Gordon, his first formal biographer. An anonymous MS. romance, professing to record the secret history of the Borgia family, exists in many Italian libraries ; a copy is in the British Museum. Gordon fell in with this fiction, and whether from lack of judgment or love of marvel, adopted it into his narrative. According to this version, Rodrigo, when summoned to Rome, was living with a beautiful Valencian courtesan, Rosa Vanozza, by whom he had already had several children, Despatch- ing his family to Venice under the care of a major-domo, he entered upon a course of austere hypocrisy, designed to secure his exaltation to the papacy, thus remaining apart from his mistress and children for a period of nearly forty years! This legend, originally circulated as a prime piece of scandal, has been accepted as a vindication by Rodrigo's apologists. Wanozza, they contend, was not his concubine but his wife, and her decease must have preceded his ordi- nation: Cesar and Luerctia were consequently legitimate. The Abbé Ollivier goes a step further still, and disposes of two scandals at a stroke by identifying Vanozza with Giulia Farnese, whose charms, during Alexander's pontifi- cate forty years afterwards, notoriously procured her brother's elevation to the cardinalate. It is sufficient to reply that in this case the beautiful Lucretia must have espoused the Duke of Ferrara at forty, and have borne him children at sixty. The date of Cesar's birth, more- over is known to an hour, being fixed by the horoscope preserved in Junctinus (tom. i. p. 171) at 18th September 1475. Nor is the history of Vanozza any longer a secret. It is known that her family name was De' Cattanei; that after bearing five children to Alexander she was twice married, on each occasion to a petty official about the papal court ; that she possessed houses and other property in Rome ; that she survived Alexander many years, and made use of the name of Borgia (Rewmont, Bd.

3, pp. 202, 203). The fortune of the Borgia brothers seemed menaced with eclipse on the death of their uncle, 8th August 1458. Pedro Luis, who had incurred the bitter enmity of the Orsini family, escaped under the escort of Cardinal Barbo to Civita Vecchia, where a fever soon carried him off. Rodrigo remained for the conclave. No papal election is more dramatically narrated in that edifying collection, Conclavi de' Pontefici Romant, than the one which resulted in the choice of Aineas Sylvius (Pius II.) Borgia's share in it had earned Pius's gratitude; he was, nevertheless, compelled to submit to some diminution of the authority and emoluments of the vice-chancellorship ; and a subse- quent indiscretion in the too public indulgence of his

taste for female society while discharging a legation at Siena procured him one of the severest reprimands ever addressed to a cardinal by a pope. Pius's reproof is pre- served in Ruynaldus (Append. ad ann. 1460, num. 31), and alone refutes the fiction of Rorgia's religious hypocrisy. Cardinal Barbo, however, who succceded as Paul IL., was the same spirited patrician who had befriended the Borgias in their hour of need, aud his ostentatious pontificate ushered in the era of Rodrigo's unbroken prosperity. " He is," writes at this time Gaspar Verouensis (Muratori, tom. iii pt. 2, p. 1037), "a comely man of cheerful countenance and honeyed discourse, who gains the affce- tions of all the women he admires, and attracts them as the loadstone does iron ; it is indeed supposed that he proceeds no further." A supposition rather pious than probable.

On the death of the jovial Paul (1471), Borgia is men- tioned, along with Cardinals Orsino and Gonzaga, as one of the three who chiefly contributed to place the tiara on the brows of the then famous preacher and exemplary ascetic Sixtus IV., who immediately (per fuggire (ingrati- tudine) bestowed on him the opulent abbey of Subiaco, and raised him to the dignity of cardinal-bishop. About the same time must have commenced his intimacy with Vanozza. In 1473 he undertook a legation to Spain, avowedly with the purpose of visiting his diocese and of composing differences between the kings of Castile and Portugal, but in reality to display his magnificence to his countrymen. His demeanour on this occasion is repre- sented in the

most unfavourable light by the cardinal of Pavia, who had previously composed for him that elegant oration to his Valencian flock which the Abbé Ollivier has the simplicity to attribute to Borgia himself. The cardinal, however, is too much of a time-server and a rhctorician for his account to be altogether trustworthy. More certain is the occurrence of a tremendous tempest on Borgia's return, in which part of his retinue perished, while he himself narrowly escaped. Innocent VIII, the successor of Sixtus, owed his election to Borgia's coalition with the late pope's nephew, and the fortuncs of the former remained unimpaired throughout his tranquil ponti- ficate. The long malady which terminated it afforded scope for the intrigues of aspirants to the succession ; and when the cardinals entered into conclave (August 1492), already the rumour ran that a Spaniard would be pope. The simoniacal character of the election is indisputable. We need not believe that the opulent and high-spirited Cardinal Ascanio Sforza was tempted with four mule-loads of silver, but his instant elevation to the vice-chancellorship speaks for itself. Cardinal Orsino was bought with Borgia's palace in Rome; Cardinal Colonna with the abbey of Subiaco ; money gained the minor members of the Sacred College ; five cardinals alone are recorded as incorruptible. Borgia's uneasiness was betrayed by his hasty assumption of the pontifical vestments, and premature announcement of the election to the expectant crowd. He assumed the name of Alexander VI. His allocution to the cardinals breathed spirit and dignity: an admonitory discourse to his son Czesar, which may be read in Gordon, is an inven- tion of the anonymous romancer. The pomp of his coro- nation far surpassed preceding examples, and the compli- ments of foreign ambassadors on the majesty of his mien and the maturity of his wisdom were echoed by a public accustomed to simony, relieved at their deliverance from a period of anarchy, and seusible of their need of a firmer hand. This hope Alexander justified and surpassed. re long he had divided Rome into judicial districts, placed a magistrate at the head of each, and himself established a weekly audience, at which, by the adniission of the mal- content Infessura, "' he administered justice after a marvel- lous sort."

ALTERANDER FI

Alexander's pontificate might have been less eventful but for a circumstance beyond his control. The political system of Italy was on the cve of

dissolution. Ludovico the Moor, anxious to confirm himself in his ill-gotten duchy of Milan, was already tempting the French monarch across the Alps by the bait of the kingdom of Naples. As of old in Greece, so now dissensions and political cor- ruption were about to cast down the civilisation of Italy at the feet of the stranger. The passion for family aggrandisement on this occasion impelled Alexander to a patriotic course. His third son Giofré had espoused the illegitimate daughter of the king of Naples, and received as dowér the principality of Squillace. When, therefore, the French envoys demandcd the investiture of Naples, they met with a flat refusal. This encouraged Alexander's enemies. Cardinal della Rovere (Julius Jl.) withdrew from the papal court, seized upon Ostia, and from thence addressed urgent appeals to the French king to march upon Rome, convene a council, and purge Christendom of the simoniacal pope. On this side Alexander felt himself indeed vulnerable. Casting about for alliances, he de- spatched an envoy to the Sultan; the ambassador was arrested as he returned with a favourable reply ; and the publication of his instructions created a fresh scandal. Others still, had Roman manners been less lax, might have arisen from the marriage of the pope's acknowledged daughter Lucretia to the Lord of Pesaro, under the auspices of the whole Sacred College, and from the elevation of his second son Cesar to the cardinalate at the age of eighteen, unblushing perjury being employed to conceal his illegitimate birth. Yet, at the same period, the suc- cessor of Peter appeared for the last time in history as the undisputed bestower of kingdoms and the ultimate tribunal of appeal for Christian nations. Spain and Portugal resorted to him for the adjustment of their claims to the New World; and by tracing a line upon a map he dis- posed of three-fourths of the human race. Never, accord- ing to medizeval ideas, had a pope exerted his prerogative with equal grandeur ; but the medieval conception of the papacy was passing away, and no one's faith in it was feebler than the pope's.

Charles VIII. passed the Alps in the autumn of 1494; city after city fell before him, and by the end of the year Rome was added to the number. Alexander had retired into the castle of St Angelo. His deposition was uni- versally expected, most of all by himself. But Charles's minister, Brigonnet, had been gained by the promise of a cardinal's hat. On 16th January the reconciliation of king and pontiff was officially celebrated: they rode

together through the city; but distrust still prevailed between them. With really surprising firmness Alexander continued to refuse the investiture of Naples, with which Charles may have thought himself able to dispense. Nothing, indeed, could have been more rapid than his conquest, except his loss of that kingdom. By March the triumph of the French seemed complete: on 6th July their retreating army cut its way through the Italian hosts at Taro in Upper Italy ; on 7th July the King of Naples re-entered his capital. Nothing remained of the French incursion except a fatal contagion, and the more fatal revelation of the weakness of Italy.

The retreat of the French left Alexander at liberty to pursue what must have been the main object of any pope of intelligence and spirit in his place—the extirpation of the petty feudal vassals of the church, and the establish- ment of the temporal independence of the papacy. This was in truth but a phase of the great struggle of the crown and the people against the aristocracy, universally a characteristic of that age; but the pope's principal motive wag unquestionably the insatiable appetite of family

aggrandisement. The incurable vice, however, of his policy was imposed upon him by the lack of men and money to carry it into effect. To obtain the former, he was compelled to incline alternately to France and Spain, degrading the majesty of the Holy See, and forfeiting his liberty of action as a member of the Italian body politic. The finances had to be recruited by the sale of offices and spiritual privileges of every kind. Such practices had long been prevalent at Rome, but never had they attained the enormity, the effrontery, or the method imparted to them by Alexander.

His enterprise was at first unfortunate. After some petty successes the papal forces were routed by the Orsini, January 1497. Spanish aid was invoked; the Great Captain checked the Orsini and recovered Ostia. Alex- ander's spirits rose ; on 7th June he alienated Benevento in favour of his eldest son, the Duke of Gandia. That day week the duke disappeared ; his body, pierced with wounds, was soon found in the Tiber. The public voice attributed the murder to the pope's second son, the Cardinal Cesar Borgia, but on no other grounds than his capability of any atrocity, and the gain that accrued to him by this. Some historians know what he said to the pope in confessing

his fratricide, and can report the pope's rejoinder; so is history written. Alexander secluded himself in a passion of grief. He talked of abdication, and actually appointed a commission to inquire into the abuses of the Church. While it ineffectually deliberated on reforms, the stake was preparing for a real reformer. The history of Savonarola must be related elsewhere ; it can only be said here that Alexander appears to have been most unwilling to proceed against him, and only to have consented to do so when the Dominican's hostile attitude rendered further forbearance impossible.

Cesar Borgia, meanwhile, was bent on improving the opportunity which he had found or made. Three months after Savonarola's death he propounded to the assembled cardinals his desire to renounce ecclesiastical orders for his soul's health, and was soon at liberty to contract a royal alliance. After encountering a refusal from the daughter of the King of Naples he repaired to France, and there (May 1499) espoused a princess of the house of Navarre, receiving the title of Duke of Valentinois from the French king. Lucretia also benefited by her family's enlarged views ; her alliance with the lord of Pesaro was dissolved on a pretext of nullity, and she married the Duke of Bisceglia, a natural son of the King of Naples. This had occurred a year previously, when Alexander still attached weight to the Neapolitan alliance ; but the political horizon was now changed. In October 1499 a French army crossed the Alps and conquered Lombardy, almost without resist- ance. The watchword was thus given for the papal campaign in the Romagna. Caterina Sforza, regent of Imola and Forli, received a summons to discharge certain arrears long owing to her suzerain. Czesar Borgia followed with an army on the heels of the messenger, and although the intrepid princess defended herself stoutly by sword and poison, she was compelled to succumb to the "Gonfalonier of the Church." The Borgias' enterprise coincided fortunately with the commencement (according to the then method of reckoning) of the new century and the mighty concourse of pilgrims to Rome for the Jubilee, each representing some substantial contribution to the papal exchequer. France and Spain, meanwhile, had concerted their secret arrangement for the dispossession of the King of Naples, and Czsar Borgia prepared to remove the only obstacle to his own participation in it. In July 1500 the Duke of Bisceglia, Lucretia's Neapolitan

husband, was attacked by assassins in broad day, and left desper- ately wounded. The pope placed guards over the prince ;

Lucretia and her sister-in-law prepared his food to avoid poison; but uone the less "quum ex vulneribus sibi datis mori noluisset"—Alphonso of Bisceglia was strangled by men in masks. "All Rome," writes the Venetian anibassador, "trembles before the duke." The worst times of the empire seemed returned, even to the amuse- ments of the amphitheatre, where Cesar, whose tastes were those of a Spaniard, despatched six bulls successively, severing the head of one from the shoulders at a stroke. The pope looked on helplessly at the Frankenstein of his own creation; "he loves and hugely fears his son," reports the Venetian, who adds that Caesar had pursued his father's favourite secretary to his arms, and there butchered him, the pope's robe being saturated with the gushing blood. Alexander's easy temper stood him in good stead. "The pope," according to the same authority, "'grows younger every day, and is extremely cheerful ; his cares and troubles endure only for a night; he thinks continually of aggrandising his children—ne d'altro ha cura." In his conversations with foreign envoys he excused his son's violence as the error of youth. "Tho duke," he said, "is really a good fellow; it is only a pity that he cannot endure to be offended." Lucretia is extolled by all as "lovely, discreet, and bountiful." Rumour, indeed, imputed to her an incestuous connection with her brother ; but this aspersion, like all others upon her, is to this day utterly destitute of proof.

"These devils cannot be cast out by holy water," Cardinal Juan Borgia had formerly reported of the turbu- lent occupants of the Romagna. The experiment of casting out Satan by Beelzebub remained to be tried. In April 1501 Cesar entered upon his second campaign, and by perfidy or force quickly added Pesaro, Rimini, and Faenza to his former possessions. Attentive to the maxims of sagacious tyranny, he governed with substantial justice. If his coffers had to be filled by oppression, the odium would be cast on some subordinate agent, whose body, his mission fulfilled, would be found dismembered in the market-place. France and Spain, meanwhile, pro- ceeded to the spoliation of the defenceless king of Naples, and Cesar (July

1501) shared in the conquest and the booty. In September Alexander himself undertook a campaign against the Colounas, and humbled those haughty patricians by the capture of all their castles. Lucretia, to the general scandal, represented him in his absence. Worse scandals were in store, could we implicitly credit the con- temporary diarist's account of the scenes enacted in the apostolic palace after Alexander's return, but the passage is probably interpolated. At this period the papal court was engrossed with preparations for Lucretia's marriage to Alphonso, son of the Duke of Ferrara, which was celebrated by proxy in December. The pope's daughter, cardinals and prelates in her train, undertook a stately progress through Italy to Ferrara, where she was received with extraordinary splendour. Piombino was reduced at this time, and in July Cesar treacherously rendered himself master of Urbino. Immediately afterwards his power received a severe shock from the defection of his principal condottiert. Ceesar temporised until, to the admiration of Machiavelli, then Florentine envoy at his camp, his adver- saries were decoyed into his hands, seized, and executed (31st December 1502), The news gave the signal at Rome for the arrest of the Orsini and the occupation of their castles; thus was the humiliation of the Roman aristocracy completed. Cardinal Orsino was committed to Saint Angelo, where the services of the papal master of the cerenlonies were soon required for his interment. " But I," remarks Burcardus with quaint naiveté, "turned the business over to my assistant, for I did not want to know more than was good for me." It must be owned that in

that age it would have been impossible to bring a cardinal publicly to the block. This apology docs not apply to the charges of secret poisoning which have mainly given the Borgias their sinister celebrity, and which became fearfully rife in Alexander's latter ycars. They are unproved as yet, but are certainly countenanced by the opulence of the supposed victims, and the avidity with which the pope pounced upon their effects, especially in the case of his rapacious datary, Cardinal Ferrari.

By May 1503 Spain had dispossessed France of her share of ill-gotten Naples. A general war secmed imminent ; Alexander and Cesar leaned to the side of Spain. The Sacred College was already full of Spanish cardinals, docile instruments of their countryman, and Alexander might well deem that he had fettered the Church to the fortune of his house. Men looked for the proclamation of Cesar as king of Romagna, and the division of the temporal and the spiritual power. The ancient mutual relations of pope and emperor would have been revived, but on the narrow area of Central Italy. But this was not to be. On the morning of 12th August " Pope Alexander felt ill;" so did Cesar Borgia. Every one knows the story of the supper given to the ten cardinals in the villa, and the fatal exchange of the poisoned flask. This picturesque tale is almost certainly a fiction. An attempt to destroy ten cardinals at once is inconceivable; it would be easier to believe Cardinal Castellesi's assertion that he was to have been the victim, as his sickness at the time is confirmed from an independent source, But his character does not stand high, and the symptoms of his disorder, as described by himself, differ totally from Alcxander's, which were those of an ordinary Roman fever. The progress of the pope's malady may be minutely traced in the diary of Burcardus and the despatches of the Ferrarese envoy. He expired on the evening of 18th August, duly provided with all the needful sacraments of the Church. From his own point

of view his life probably appeared fortunate and glorious; |

but the vicissitude of human affairs is ever dramatically illustrated by the death of a pope. Ere the corpse was cold the pontifical apartments were pillaged by the satellites of Cesar Borgia ; at the funeral a brawl between

priests and soldiers left it exposed in the body of the church ; when placed before the altar, its shocking decom- position confirmed the surmise of poison ; finally, stripped of its cerements and wrapped in an old carpet, it was forced, with blows and jeers, into a narrow coffin, and flung into an obscure vault. The remains were subscquently trans- ferred to the Spanish church of St Mary of Montserrat, where they repose at this day.

Alexander has become a myth, and his "acts" are in some respects almost as legendary as those of the primitive saints and martyrs, The peculiar odium attached to his memory rests partly on the charge of incest, of which he must be acquitted; partly on that of secret poisoning, which is at least not established; partly on the confusion between his actions and Cesar Borgia's. Nearly every- thing actually criminal in his pontificate is subsequent to the preponderance of the latter. Profligate alike in public and private life, he was no malignant tyrant,—affable, familiar, easy, he justly took credit for his moderation towards notorious malcontents, and his indifference to personal injuries. These virtues, however, as well as his family affection, were merely constitutional with him,—as the many beneficial acts of his administration were rather prompted by a sense of policy than a sense of duty. His ability as a ruler is evinced by the tranquillity he main- tained in Rome, his effectual provision against dearth, the regular discharge of financial obligations, the energetic prosecution of useful public works. As a statesman he ranks high in the second class. He was too destitute of

morality to have the least insight into the tendencies of his times; but from the point of view of political expe- diency, his policy was eminently sagacious and adroit. He cannot be accused of preparing the misfortunes of Italy, but he did not disdain to profit by them. His licentiousness and contempt of ecclesiastical decorum are partly palliated by the circumstances of his initiation into the Church. He was untrained to the ecclesiastical pro- fession, never felt himself a priest, and was wholly regard- less of the Church's interest as such. In this respect he is almost unique among the successors of St Peter. Were controversies regulated by reason rather than by con- venience, the parties to this would change sides,

—Alex- ander's accusers would become his advocates, and his advocates his accusers. The Church in her secret heart must rate him the lowest of her chiefs; the world must feel that he deserves much better of it than many much better popes.

The principal contemporary authority for the reign of Alexander is the diary of the papal master of the ceremonies, Joannes Bur- cardus, a record replete with trivialities and not exempt from inter- polations, but containing indisputable evidence of perfect candour. An excellent edition, commenced in 1855 by the Abbé Gennarelli, was discontinucd after the publication of a few parts. The un- critical histories of Gordon and Tomasi are indebted to Burcardus for any value they possess. The paltry productions of modern Roman Catholic apologists (Jorry, Fave, Cerri, &c.) are beneath contempt. The Abbé Ollivier (Alexandre VI. et les Borgia, tom. i., Paris, 1870) excites respect by his good faith and amusement by his strange alliance of perverse ingenuity with infantine unsuspi- ciousness. Of late years the archives of the Italian courts have become accessible, and the transactions of Alexander's reign have been sagaciously investigated from this source by two German scholars, Von Reumont (Die Stadt Rom, Bd. 8, Abth. 1, Berlin, 1868) and Gregorovius (Rom in Mittelalter, Bd. 7, Stuttgart, 1870). The latter is the more copious, but his general estimate of Alex- ander is much too low. By far the ablest English contribution to the history of Alexander is a notice of Gregorovius in the North British Review, vol. lii., entitled The Borgias and their Latest Historian. (R. G.)

ALEXANDER VII. (Fabio Chigi), was born at Sicna on the 13th February 1599, and occupied the papal chair from the 7th April 1655 to the 22d May 1667. Before his elevation he had filled successively the offices of inquisitor at Malta, vice-legate at Ferrara, and nuncio to Germany at the conference of Munster. The conclave elected him in the belief that he was strongly opposed to the nepotism and other abuses that had characterised the reign of his immediate predecessor, Innocent X., and at the beginning of his pontificate he went so far in this direction as to forbid his relatives even to visit Rome. In a year, however, all was changed, and nepotism pre- vailed to as great an extent as under any former pontiff. Alexander was a patron of learning, and himself wrote a volume of Latin poems which appeared at Paris in 1656 uuder the title Philomatht Labores Juveniles. He also

encouraged architccture, and in particular constructed the beautiful colonnade in the piazza of St Peter's. The most noteworthy events of his pontificate were the reception of the ex-queen Christina of Sweden into the Catholic Church, the promulgation of a bull against the Jansenists, and a protracted dispute with Louis XIV. of France, during which the papal see lost possession of Avignon (1662). Alexander canonised Francis of Sales in 1665.

ALEXANDER VIII. (Pietro Ottoboni), born at Venice in 1610, was raised to the pontificate in October 1689 in succession to Innocent XI. He assisted his native state in its wars with the Turks. Although an enemy of the Jansenists, he condemned certain doctrinal errors of the Jesuits as advanced by Professor Bougot of Dijon. He carried nepotism to such an extent that the salaries and gifts bestowed on his relatives during his reign, short though it was, exhausted the papal treasury. He added

by purchase the books and mannscripts of Queen Christina to the Vatican library. He died in Feb. 1691.

ALEXANDER L, King of Scotland, son of Malcolm Canmore, succeeded his brother Edgar in 1107, and died in 1124. He was better educated than any of his prede- cessors, owing to the care of his mother, the amiable Margaret of England. All the qualities of his nature, both good and bad, were strongly marked; from the terror he inspired, he was styled by his subjects the Pierce. His reign is distinguished by the determined opposition he offered to any interference on the part of English bishops in the affairs of the Scottish Church. He contrived by energy and valour to subdue the turbulence of his kingdom; specially noticeable are the promptness and vigour he dis- played in suppressing the insurrection of Angus, grandson of Lulach, a son of Macbeth's queen. He died at Stir- ling, and, being childless, was succeeded by his brother David I.

Aexanver IL, King of Scotland, was born at Had- dington in 1198 (died 1249), and succeeded his father, William the Lion, in 1214. Though still young, he exhi- bited the same prudence and firmness which marked his whole conduct in life. He was excommunicated in 1216 for associating with

the English barons in their opposition to King John; but his prudence enabled him to recover the good opinion of the pope, and placed him on the best footing with the English king, Henry III., John's successor. His fidelity to Henry was shown by the assistance he rendered him in protecting, during Henry's absence in France, the northern borders of England, and the friendliness of the kings was strengthened by the marriage of Alexander to Henry's sister Joan (1221). Joan died in 1238, and in May 1239 Alexander married Mary de Coucy. In 1244 Henry marched against Scot- land to force from Alexander the homage due to him for the lands he held in the north of England, but in August a peace was concluded at Newcastle. Like Alexander L., he was zealous in defence of the privileges of the Scottish Church; and in 1222 he put to death 400 persons who had been implicated in the murder of the bishop of Caithness. While engaged in quelling an insurrection in Argyleshire, he died of fever in the island of Kerrera in

1249.

AtEexanper IIL, King of Scotland, son of Alexander II. by his second wife, Mary de Coucy, was born at Rox- burgh on the 4th September 1241 (died 1286), and suc- ceded to the throne on the death of his father in 1249. The fact that in this case the succession of a minor was unopposed is noteworthy, as showing that the hereditary principle had now established itself. By a provision of the treaty of Newcastle Alexander had been betrothed in infancy to the daughter of the king of England, and it suited Henry's policy to insist on an early fulfilment of the contract. Notwithstanding the extreme youth of the parties, the marriage was celebrated at York on the 25th December 1251. On this occasion Alexander is said by Matthew Paris to have done homage for his estates in England, and to have refused homage for his kingdom of Scotland, on the ground that he had not consulted on the matter with his proper advisers. The story, however, secms inconsistent with Henry's policy at the time, and is therefore questionable. With a king so young, in times so unsettled, the hopes and efforts of contending factions were naturally stimulated. At the commencement of his reign Alexander was under the power of the Comyns, the most influential family among the Scottish nobility. A rival party, under the leadership of Durward the justiciar, was supported by England, and in

1254 succeeded in seizing Edinburgh castle, and freeing the king and queen from the

domination of the Comyns. Meanwhile Henry had him- self marched to Scotland with an army, and in September he met Alexander at Roxburgh. There a regency was arranged, from which the Comyns were entirely excluded. In 1257, however, the latter regained their ascendancy, and obtained possession of the person of the king, whom they kept prisoner at Kinross and Stirling. In the fol- lowing year a new regency was formed, in which both the opposing parties were represented, and the king was liberated. In 1260 he and his queen paid a visit to the court of England. While at Windsor the queen gave birth to a daughter, Margaret, afterwards married to Eric of Norway. An account of the invasion of Scotland in 1263 by Haco, king of Norway, and of the disastrous defeat at Largs, belongs rather to the history of the country than to the personal biography of the king. Three years after the invasion, Magnus, king of Norway, ceded to Alexander the Isle of Man and the Western Isles, receiving in return a ransom of a thousand marks and an annual rent of a hundred marks. The Orkney and Shet- land islands still remained under the dominion of Norway. Alexander was involved in a protracted and on the whole successful struggle with the papal power for the independ- ence of the Scottish Church. The chief matter in dispute was the proper valuation of church lands for the purpose of taxation. In connection with this, Boiamund or Bagi- mond came from Rome in 1275 with a commission to draw sup the valution known as Bagimond's roll, which remained the basis for the taxation of church lands down to the time of the Reformation. The internal condition of the country seems to have improved greatly during the latter years of Alexander's reign. A wise and vigorous administration ensured peace and consequent prosperity. The prospect of Scotland was perhaps never brighter in all her early his- tory than towards the close of his reign, but it was sud- denly overcast. A serics of calamities, following each other in quick succession, left the nation at the mercy of its foes within and without. In 1275 Alexander's wife died, and a few years later he lost both his children. The succession in the direct line was thus left to the precarious chance of the single life of the infant princess known in history as the "Maid of Norway." In 1285 Alexandcr married Joletta, daughter of the Count of Dreux. Any hope of strengthening the succession by this union

was, however, destroyed by the calamitous event of the following year. On the 12th March 1286 the king was killed by a fall from his horse while riding on the coast of Fife opposite Edinburgh.

ALEXANDER, Pavtovicu, Emperor of Russia—born on 28th December 1777, died 1825—-was the son of Paul, afterwards emperor, by Maria, daughter of Prince Eugene of Wiirtemberg. His early education was conducted under his excellent mother, and afterwards was carefully directcd by his grandmother, the Empress Catherine II., who con-

fided its general superintendence to Frederick Cesar de La Harpe. On the assassination of his father Paul in 1801, Alexander succecded to the Russian throne. He had been married in 1793 to the Princess Louisa Maria of Baden, but the union proved an unhappy one, and had no issue.

The policy of the young emperor was indicated by his concluding a peace with Britain, against which his father had declared war. In 1805 he joined Austria and Sweden in a coalition with Great Britain against the pretensions of France. The war that followed was disastrous to the allies. The armies of Austria were totally defeated in a succession of battles between the 6th and 13th October of that year; and the combined Austrian and Russian arnties, under the two emperors, were defeated by Napoleon in the great battle of Austerlitz on the 2d December. Austria concluded a separate treaty of peace, and Alexander led the remains of his army into his own dominions. Prussia, which had injudiciously stood neutral while France was humbling Austria and Russia, rashly engaged in hostilities with Napoleon in 1806, while her allies, the Russians, were still beyond the Vistula; but the defeats at Auerstadt and Jena laid Prussia prostrate; and in the succeeding year the battles of Eylau and Friedland, in which the Russians were fairly beaten, led to the dis- memberment of Prussia, and the treaty of Tilsit with Russia. A few days after the last battle, Alexander and Napoleon met on a raft anchored in the river Niemen, and- agreed to the treaty, which was signed at Tilsit on July 7. By a secret article of this treaty Alexander was not only to withdraw from his connection with Britain, but to become her enemy; and he declared war against her on the 26th October.

For nearly five years Alexander appeared attached to the alliance of France; but the privations of his subjects by the interruption of the commerce with England, and the intolerable load of Napoleon's " Continental System," at length induced him to return to his old alliance, and to declare war against France on March 19, 1812. On the 24th April he left St Petersburg to join his armies on the west frontier of Lithuania. Napoleon assembled the most numerous and magnificent army that had ever been brought together in modern times, augmented by the unwilling levies of Prussia and Austria, and entered Russia on the 25th June 1812. The first encounter was at Borodino, where there was a well-contested action, in which each army suffered the loss of 25,000 men. The burning of Moscow, and the subsequent retreat of Napoleon, during which his army was all but annihilated, are among the best known events of modern history.

In 1813 the advancing Russians were successively joined by the forces of Prussia, Austria,and Sweden. Alexander continued with the allied armies, and in particular was present at the battles of Dresden and Leipsic. Napoleon had made wonderful exertions to repair his losses in the early part of 1814; but the victories of Wellington in Spain, and his advance into the heart of France, favoured the progress of the allies; and on March 30, 1814, 150,000 men of the allied armies took possession of Paris, which was entered next day by Alexander and the king of Prussia.

_ After the deposition of Napoleon the allied sovereigns visited England. By the treaty of Vienna, Alexander was acknowledged king of Poland; but before the congress of Vienna broke up, Napoleon had escaped from Elba, and was enthusiastically received at Paris. The two eastern emperors and the king of Prussia remained to- gether until the battle of Waterloo gave peace to Europe. On the advance of the British and Prussians to Paris, the three allied sovereigns again made their entry into that

capital, where they concluded, on September 26, the treaty which has been designated the Holy Alliance.

Alexander was henceforward chiefly occupied in the internal administration of his vast dominions, which cer- tainly improved more during the twenty-

five years of his reign than under any of his predecessors from the time of Peter I. The gradual abolition of the feudal servitude of the peasantry, begun by the most enlightened of his pre- decessors, was continued under Alexander. Education, agriculture, manufactures, commerce, were also greatly extended ; while literature and the fine arts were liberally encouraged, His disposition has been represented by his subjects as mild and merciful; yet his influence in the affairs of Europe was not exerted in the cause of public liberty. But this could hardly be expected from the autocrat of an unmitigated despotism in his own terri- tories. He will, however, bear very favourable comparison with any Russian sovereign, or even with any contem- porary monarch.

Early in the winter of 1825 he left St Petersburg for the last time on a tour of inspection of his southern pro- vinces. About the middle of November he was attacked by a violent intermittent fever, which proved fatal at Taganrog on December 1, 1825. In foreign countries his death has been attributed to poison; but this is refuted by the history of his disease, and is very improbable, from his great popularity with his countrymen. He was suc- ceeded, in accordance with a family compact, by his second brother Nicholas.

ALEXANDER JAROSLAWITZ NEVSKI, Sanz, Grand Duke of Wladimir, second son of the Grand Duke Jaroslaw II., was born at Wladimir in 1219, and died 14th November 1263. He became prince of Novgorod on the resignation of his father in 1239, his elder brother having died. While Batu Khan was sweeping with his Tatars over the south, the Swedes, Danes, and Livonian knights took advantage of this to oppress the north of Russia ; Alexander accordingly directed his arms against them, and gained a brilliant victory with his small army on the 15th July 1240. His surname of Nevski was derived from this event, which took place near the Neva, and in the vicinity of the modern St Petersburg. In a second campaign in 1241 he was no less successful, and drove his enemies out of Pleskow in Kiew. In a third campaign he defeated them near lake Peipus (1242), and forced the Livonian knights to sue for peace and retire from the district of Pskow, which they had conquered a short time before. On his father's death in 1247, a younger brother (Andrew) opposed Alexander, and seized the duchy of Wladimir; but in 1251 the latter was estab- lished in his rights by the

khan of Kaptchak, the district which the Mongolian Batu had taken under his immediate authority. He firmly opposed the proposal of Pope Inno- cent IV. to unite the Greek with the Roman church. He died at Gorodetz, 14th November 1263, on his return from a visit to Kassimcow. Towards the close of his life he is said to have taken holy orders, but the tradition rests on no sure basis. At his death the people universally spoke of him as their father and protector, and afterwards recorded his deeds in their songs, and honoured him as a saint. Peter the Great, when founding St Petersburg, erected a magnificent monastery to the east of the city in honour of the victory won there by his great predecessor, and created in 1722 one of the eight Russian orders, that of Alexander Nevski. The monastery is now one of the wealthiest in Russia, and has, according to Eckhardt, a yearly revenue of half a million silver roubles.

ALEXANDER, AxrcuiBatD, D.D., a Presbyterian divine of America, was born of a family, originally Scotch, in Rockbridge county, Virginia, on the 17th April 1772 (died

1851). After completing his preliminary education at Timber Ridge, he came under the influence of the religious movement known as the "great revival," and devoted himself to the study of theology. Licensed to preach in 1791, he was engaged for seven years as an itinerant missionary in his native state, and acquired during this period the facility of extemporaneous speaking for which he was remarkable. For a time president of Hampden Sidney College, he resigned that position in 1807 to become pastor of Pine Street church, Philadelphia. In 1810 the degree of doctor of divinity was conferred upon him by the college of New Jersey, and in the following year he was appointed first professor in the newly-estab- lished Presbyterian theological seminary at Princeton. He filled the chair until his death in 1851. Dr Alexander wrote a considerable number of works in theology, which have had a large circulation. Among these may be men- tioned his Outlines of the Evidences of Christianity (1823), which has passed through several editions, and been trans- lated into various languages; and his 7'reatise on the Canon of the Old and New Testament (1826). He was also a frequent contributor to the Lrblical Repertory, edited by Professor Hodge.

ALEXANDER, JosrpH Appison, D.D., third son of the preceding, one of the most eminent biblical scholars of America, was born in Philadelphia in 1809 (died 1860). He studied at New Jersey, devoting himself specially to Hebrew and other Oriental languages. He graduated in 1826, and from 1830 to 1833 was adjunct professor of ancient languages and literature in his alma mater. In 1838 he was appointed professor of biblical criticism and ecclesiastical history in the theological seminary at Prince- ton. He was transferred in 1852 to the chair of biblical and ecclesiastical history, which he occupied till his death in January 1860. Dr Alexander wrote several valuable works in his own department, the most important being a Translation of and Commentary on the Psalms, a Critical Commentary on the Prophecies of Isaiah, and a treatise on primitive church government. He also contributed nume- rous articles to the Beblical Repertory and the Princeton Review. At the time of his death he was engaged along with Dr Hodge in the preparation of a commentary on the New Testament.

ALEXANDER, Sir Witiam, earl of Stirling, poet. The family of Alexander of Menstrie—i.e., of the poet— is of ancient lineage, "tracing its descent from Somerled, lord of the Isles, in the reign of Malcolm IV., through a misty Highland genealogy, to John, lord of the Isles, who married the Princess Margaret, daughter of King Robert I]. Their son, Alexander, was father of Angus, who founded the family of Macalister of Loup, and of Alex- ander, who obtained from the Argyle family a grant of the lands of Menstrie in Stirlingshire, and settled there— his descendants assuming his christian name of Alexander as their surname. The fifth in descent from this personage was Alexander Alexander, whose successor was his son, William Alexander, the poet" (Works: Introductory Memoir, vol. i. p. ix., 1870). From his (rare) engraved portrait, William was, it appears, aged 57 in 1637; so that he must have been born (at Menstrie House, where afterwards was born Sir Ralph Abercromby) in 1580. The grammar school of neighbouring Stirling probably furnished his early education; of his later, it is simply known that he attended the university of Glasgow. On leaving it he proceeded on his travels with Archibald, seventh earl of Argyle. It is supposed that it was during his Sojourn on the Continent he composed his series of sonnets, afterwards published under the title of Avrora (1604). He was tutor to the young earl. Upon his return he pro- ceeded to court, and won for himself speedily a name as

a gentleman of parts and learning. The first of his Monarchicke Tragedies had been published at Edinburgh in 1603, viz. Zhe Tragedie of Darivs, which, like his Parenesis to the Prince (1604), bore on the title-page simply, "By William Alexander of Menstrie." In 1604 he reprinted Darivs along with a new tragedy of Cesar, giving the two the afterwards more celebrated title of Monarchicke Tragedies — ultimately increased by The Alexandraen and Julius Caesar (1607). In 1607 he describes himself as "' William Alexander, gentleman of the prince's privy chamber." King James was much taken with him. He held his office with the prince of Wales until his lamented death in 1612, on which he published his Elegie on the Death of Prince Henrie (Edinburgh, 1612). In 1612 he was made master of bequests, and knighted; his title-page of the Elegie bearing to be by "'Sir William Alexander of Menstrie." In 1614 appeared his Doomesday ; or, the Great Day of the Lord's Ivdgement (Edinburgh). In 1621 (September 21) he received the most prodigious "pift" ever bestowed on a subject, viz, "a gift and grant" of Canada, inclusive of Nova Scotia, or Acadie, and Newfoundland—a fact declarative of royal ignorance of what the gift really was. Yet was it subsequently confirmed by Charles I. In 1624, Alexander, in relation to his grant, published An Encouragement to Colonies— twice at least reprinted (1625 and 1630). The gift and grant belong to history rather than biography, and their later results to the romance of the peerage and of law. In 1626 he was appointed Secretary of State for Scotland, and in 1630 created a peer, as Lord Alexander of Tulli- body, and Viscount Stirling. In 1631 he was made an extraordinary judge in the Court of Session. In 1632 he built Argyle House, a quaint building, which remains one of the "'lions" of Stirling. In 1633 he was advanced a step in the peerage, being created Earl of Stirling and Viscount Canada; and in 1639 Earl of Dovan. In 1637 he collected his poetical works, and issued them as Recrea- tions with the Muses, "by William, Earle of Sterline," with his portrait engraved by Marshall. This folio did not include either Avrora or the Psalms of King David (Oxford, 1631), although there seems little doubt that he, rather than King James, was the main author of the latter. It, however, first gave his second sacred poem (incomplete) of Jonathan. He died in London on 12th February 1640, and later his remains were transferred to Stirling. Lauded by Sir Robert Ayton and William Drummond of Haw- thornden, the Earl of Stirling, nevertheless, soon fell out of men's memories. 'The recent careful and beautiful edition of his Poetical Works (3 vols.) ought to revive his fame

; for while there is too often a wearying wordiness, the student-reader is rewarded with "full many a gem of purest ray serene." His Doomesday has some grand things; his Avrora suggests comparison with Sidney's Astrophel and Stella. (Works as above; Laing's Baille's Letters and Journals, wi. 529; Drummond MSS., by Laing ; Hunter's MSS., in Brit. Museum.) (A. B. G.) ALEXANDRETTA. See ScanpEROoN. ALEXANDRIA, a city of Lower Egypt, and for a long time its capital, was situated on the Mediterranean, 12 miles west of the Canopic mouth of the Nile, in 31° 11' N. lat., and 29° 52' E. long, The ancient city was oblong in form, with a length from east to west of 3 to 4, a breadth from north to south of 1, and, according to Pliny, a circum- ference of 15 miles. Lake Mareotis bathed its walls on the south, and the Mediterranean on the north; on the west was the Necropolis, and on the east the Hippodrome. The city was laid out in straight parallel streets, one of which, about 200 feet wide, ran westward from the Canopic gate to the Necropolis. This street was decorated with magnificent houses, temples, and public buildings, and

was intersected by another of the same breadth and magni- ficeuce, runuing from south to north. Aucient Alexandria was divided into three regions: (1.) The Regio Judworum, or the Jews' quarter, forming the north-east portion of the city. (2.) 2hacotts on the west, occupied chiefly by Egyptians. Its principal building was the Serapeum, or temple of Serapis, containing au image of the god, brought probably from Pontus.

The city was founded by Alexander the Great 332 B.c. ; but the island of Pharos was from an early period a refuge of Greek and Phoenician sea-rovers, a fact commemorated in the name " Pirates' Bay," given to a deep indentation on the north side of the island; and on the mainland was the little town of Rhacotis, subsequently incorporated in the quarter of that name. The architect employed by Alexander was the celebrated Dinocrates, who had acquired a high reputation by rebuilding the temple of Diana at Ephesus. The new city prospered greatly as a centre both of commerce and of learning, particularly during the reigns of the earlier Ptolemies, to whose enlightened liberality, indeed, its literary importance was largely due. But the later monarchs of the house of Lagus were mostly weak and vicious

men, under whom the city declined in influence. In 80 s.c. Ptolemy Alexander bequeathed his city to the Romans ; but the bequest did not immediately take effect owing to the civil convulsions in Italy, into which Alexandria itself was eventually drawn, and it was not until 30 B.c. that the city submitted to Augustus. It was by him made an imperial city, goverued by a prefect appointed by the emperor, while the functions of the Alexandrian senate were suspended, a state of matters which continued until 196 a.D., when Severus restored its municipality.

Alexandria seems from this time to have regained its old prosperity, becoming an important granary of Rome, which, doubtless, was one of the chief reasons that induced Augustus to place it directly under the imperial power. In 215 a.p. the emperor Caracalla visited the city ; and, in order to repay some insulting satires that the inhabitants had made upon him, he commanded his troops to put to death all youths capable of bearing arms. This brutal

order seems to have been carried out even beyond the letter, for a general massacre was the result. Notwith- standing this terrible disaster, Alexandria soon recovered its former splendour, and for a time was esteemed the first city in the world after Rome. As the power of the Ceesars decreased, however, their hold over Alexandria was weakened, and the city itself suffered from internal com- motions and insurrections, which gradually destroyed its importance. In 616 it was taken by Chosroes, king of Persia ; and in 640 by the Arabians, under Amru, after a siege that lasted fourtecn months, during which Herac- lius, the emperor of Constantinople, did not send a single ship to its assistance. Notwithstanding the losses that the city had sustained, Amru was able to write to his master, the caliph Omar, that he had taken a city containing "4000 palaces, 4000 baths, 12,000 dealers in fresh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 theatres or places of amusement." The following story, relating to the destruction of the library, is told by Abulfaragius :—John the Grammarian, a famous Peripatetic philosopher, being in Alexandria at the time of its capture, and in high favour with Amru, begged that he would give him the royal library. Amru told him that it was not in his power to grant such a request, but

promised to write to the caliph for his consent. Omar, on hearing the request of his general, is said to have replied that if those books contained the same doctriuc with the Koran, they could be of no use, since the Koran contained all necessary truths ; but if they contained anything contrary to that book, they ought to be destroyed; and therefore, what- ever their contents were, he ordered them to be burnt. Pursuant to this order, they were distributed among the public baths, of which there was a large number in the city, where, for six months, they served to supply the fires. Shortly after its capture, Alexandria again fell into the hands of the Greeks, who took advantage of Amru's absence with the greater portion of his army. On hearing what had happened, however, Amru returned, and quickly regained possession of the city. About the year 646 Amru was deprived of his government by the caliph Oth- man. The Egyptians, by whom Amru was greatly beloved, were so much dissatisfied by this act, and even showed such a tendency to revolt, that Constantine, the Greek emperor, determined to make an effort to reduce Alex- andria. The attempt proved perfectly successful, Manuel, Constantine's general, capturing the city with inconsider- able loss. The caliph, perceiving his mistake, imniediately restored Amru, who, on his arrival in Egypt, drove the Greeks within the walls of Alexandria, but was only able to capture the city after a most obstinate resistance by the defenders. This so exasperated him that he completely demolished its fortifications, although he seems to have spared the lives of the inhabitants as far as lay in his power. Alexandria now rapidly declined in importance. It was captured by Andalusian adventurers in 823; by the Moghrebins in 924, and again in 928. The building of Cairo in 969, and, above all, the discovery of the route to the East by the Cape of Good Hope in 1497, nearly ruined its commerce; and after this we hear little of the city until the beginning of the present century. ALEXANDRIA, the modern city, stands partly on what was the island of Pharos, now a peninsula, but mostly on the isthmus by which it is connected with the mainland. This was originally an artificial dyke connecting the island with the land opposite ; but, through the constant accumulation of soil and ruins, it has attained its present dimensions. The principal public and government build- ings are on the peninsula. The ancient city was situated on the mainland, adjacent to the modern town, and the extent of the ruins that still exist sufficiently attests 1ts

greatness. The general appearance of Alexandria is by no means striking; and from its situation its environs are sandy, flat, and sterile. It was formerly surrounded by strong turreted walls, with extensive outworks, but in various parts the walls have lately been destroyed to make way for improvements. In the Turkish quarter the streets are narrow, irregular, and filthy, and the houses mean and ill-built. The Frank quarter, on the other hand, presents the appearance of a European town, having handsome streets and squares, and .excellent shops. The streets have been much improved lately by being nearly all paved. The principal hotels, shops, and offices are situated in the Great Square, the centre of which forms a very agreeable promenade, being planted with trees, and well provided with seats. It has also a. fountain at each end. In the suburbs are numerous handsome villas, with pleasant gardens. Among the principal public buildings are the palace of the pasha, the naval arsenal, the naval and military hospitals, custom-house, bourse, two theatres, several mosques, churches, convents, &c. There is an im- portant naval school, and a number of other educational

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institutions. Among the charities worthy of mention is the hospital of the Deaconesses of Kaisersworth. Formerly the town was supplied with water by means of the aucient reservoirs formed under the old city, which are in many eases as perfect now as when first made, 2000 years ago. These were annually filled with water by means of the canal from the Nile, at the time of inundation; but a system of water-works has been formed by a public company, and a constant supply of water is now obtained from the canal at some distance from the town. The principal streets, squares, and railway stations, are lighted with gas,

Few of the remains of the ancient city are now visible, Most of those that were to be seen a few years ago have Since disappeared, but frequently in making excavations portions of ancient masonry, broken columns, and fragments of statues are discovered, Among the best known of the ancient relics are the two obelisks commonly called "Cleopatra's Needles." They were originally brought from Heliopolis to Alexandria in the reign of Tiberius, and were set up in front of the temple of Cesar. They are of red granite, and covered with hieroglyphics. One is still standing, and is 71 fect high and 7 feet 7 inches in diameter at the base. The other, which is fallen

and covered with debris, is in a less perfect state, and not quite so long as the former. It was offered to the English government by Mehemet Ali, but after some consideration was declined. Near the obelisks are the ruins of an old round tower, commonly called the "' Roman Tower." But the most striking of the ancient monuments is the columu styled "' Pompey's Pillar." It stands on a mound of earth about 40 feet high, and has a height of 98 feet 9 inches. The shaft consists of a single piece of red granite, and is 73 feet long and 29 feet 8 inches in circumference. The capital is Corinthian, 9 feet high, and the base is a square of about 15 feet on each side. From an inscription it appears to have been erected in honour of the emperor Diocletian, and it was formerly surmounted by a statue of that monarch. To the 8.W. of the city are the catacombs, which served for the burial.of the dead, and are formed by excavations in the calcareous rock of which the shore is composed. They are of great extent, and one of the chambers is remarkable for its elegance. The climate of Alexandria is mild and salubrious. The heats of summer are modified by the N.W. winds from the sea, which prevail during nine months of the year, the thermometer seldom

rising above 85° Fahr. In winter a good deal of rain falls, and throughout the year the atmosphere is generally moist, being saturated with a saline vapour from the sea.

Alexandria has been mainly indebted for its prosperity to the advantages of its position for trade. It was this that first attracted the attention of its far-seeing founder to the site, and its subsequent history in no way belied his penetration. It soon rose to be the most important com- mercial city in the world, and the great emporium of trade between Europe and the East.. Subsequently its fortunes fluctuated with those of its possessors, but the great blow to its prosperity was the discovery of the route to India by the Cape of Good Hope, and under the Turks it sank into insignificance, numbering only about 6000 inhabitants, Soon after Mehemet Ali became ruler of Egypt he turned his attention to the restoration of Alexandria. One of the most important works that he effected with this view was the opening of the Mahmoudieh Canal in 1820. This was accomplished at a cost of about £300,000, and, for want of proper management, at a melancholy loss of human life. It is about 50 miles in length, with an average width of about 100 feet, and communicates with the Rosetta branch of the Nile at the village of Atfeh. Since Alexandria became the centre of the steam communication between Europe and India, and the principal station on the Over- land Route, its progress has been rapid. It has now regular communication with England, Marseilles, Brindisi, Con- stantinople, &c. In 1851 Mr Stephenson was instructed to form a railway between Alexandria and Cairo, which was accomplished, and the line opened for traffic, in 1856. This was shortly afterwards extended to Suez, and several extensions have since been made to the cotton districts of the Delta. A short line of railway (not belonging to the government) connects the town with Ramleh, a sea-bathing village about 7 miles distant.

Alexandria has two ports, an eastern and a western. The latter, called also the Old Port, is by far the larger and better of the two. It extends from the town west- ward to Marabout, nearly 6 miles, and is about a mile and a-half in width. It has three principal entrances. The first, or that nearest the city, has about 17 feet of water, but is narrow and difficult of access, and only used by small vessels and boats. The second or middle, which is also the principal entrance, is about a quarter of a mile wide, and has, where

shallowest, 27 feet of water. The eastern side of this entrance is marked by buoys, and there are landmarks for guiding to the channel. 'The third or western entrance has its western boundary about three-

eighths of a mile from Marabout Island, is about half a mile wide, and has from 25 to 27 feet of watcr where shallowest. Within the harbour ships may anchor close to the town in from 22 to 40 fect of water. Further im- provements, in course of construction by a firm of English contractors (at a cost to the Egyptian government of little short of two millions sterling), will eventually render this one of the finest and most capacious harbours on the Medi- terranean. Among these are the formation of a breakwater, extending in a south-westerly direction parallel to the shore for 2550 yards south-west of the lighthouse on Cape Eunostos; a mole, springing from the shore, and extending in a northerly direction for 1100 yards, and having a width of about 100 feet; and the construction of nearly 3 miles of quays and wharves, for vessels of the largest size, and with railway connection. The foundation-stone of the breakwater was laid by the viceroy on 15th May 1871. The area of decp water, 30 feet and upwards, enclosed within the outer breakwater, is 1400 acres; the area of 28 feet of water, enclosed by the harbour mole, will be 177 acres. The workshops of the company are at the quarries of Mex, about 3 miles west of the town. In the harbour is a magnificent floating dock, nearly 500 feet long and 100 fcet broad. The old lighthouse, on the sitc of the ancient Pharos, having been found insuffi- cient, a new lighthouse has been erected on Ras-el-tecn (1842), bearing a one-minutc revolving light, visible at a distance of 20 miles. The eastern or new port, formerly the only port open to Christians, is now little used, being exposed to the northerly gales, and having very limited space for anchorage.

In 1861 the total value of the exports was £2,638,822; and in 1871 this had risen to £10,251,608, of which £7,706,442 was to England. The value of the imports for the latter year was £5, 753,020, of which £2,469,026 was from England. The prin- cipal articles of export were eotton (£6,402,756), eotton sced (£1,008, 278), beans (£753,462), corn (£573,766), sugar (£379, 456), gums (£307,932), coffee (£122,110), ivory, wool, fed senna, and other

drugs. The principal articles of import were manufae- tured goods (£1,695,870), wool (£307,495), oils (£251,158), wines and liqueurs (£239,944), raw silk, fruits. During that year there entered 1841 sailing vessels and 883 steam vessels with eargoes, and 148 sailing vessels and 54 steam vessels in ballast; and there left 1085 sailing vessels and 843 steam vessels with cargoes, and 797 sailing vessels and 62 steam vessels in ballast. 'The total tonnage of the vessels that entered was 1,262,602; and that left, 1,267,381. The opening of the Suez Canal will no doubt serve to withdraw a portion of the traffie from Alexandria, but the improve- ments that are now being made on its harbour, and its direet rail- way communication with Suez, must still give it certain advantages over the other route, while it must continue to be the great emporium for the rapidly extending trade of Egypt itself.

The population of Alexandria is of a very mixed cha- racter, consisting, besides the native Turks and Arabs, of Armenians, Greeks, Syrians, Italians, French, English, Germans, &c. At one time the ancient city is believed to have contained 600,000 inhabitants; but at the beginning of this century the number probably did not exceed 6000. In 1825 this had increased to 16,000, in 1840 to 60,000, and in 1871 to 219,602, of whom 53,829 were foreigners.

ALEXANDRIA, a town of Scotland, in the parish of Bonhill, Dumbartonshire, pleasantly situated on the west bank of the river Leven, about 3 miles from Dumbarton, with which it is connected by a branch railway. It is a place of comparatively recent growth, owing its origin almost entirely to the cotton print and bleaching works of the vicinity, for which there is an abundant supply of excellent water. Population (1871), 4650.

ALEXANDRIA, a town and port of entry of the United States, capital of Alexandria county, Virginia, is beautifully situated on the right bank of the Potomac, 7 miles below Washington. It is neat and well-built, with a good har-

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bour, and exports considerable quantities of grain and flour ; but its foreign trade has decreased. The Chesapeake and Ohio canal begins here, and the town is connected with Washington by railway. Population (1870), 13,570.

ALEXANDRIAN MS. (Codex Alewandrimus), the name given to a Greek inanuscript of the Old and New Testa- ments, now in the British Museum. This celebrated MS. is known to biblical scholars as Codex A. This abbreviation of Alexandrinus was first employed by Bishop Walton to indicate the various readings of this MS., ap- pended to the text of the Septuagint and of the New Testament in his great Polyglott Bible, and was adopted by Wetstein in conformity with an arrangement, since fol- lowed by all editors of the Septuagint and Greek Testa- ment, by which the capital letters of the alphabet are applied to designate the uncial MSS. of the Greek Bible. The MS. was presented in the year 1628 to King Charles I. through his ambassador at the Porte, Sir Thomas Rowe, by Cyrillus Lucaris, patriarch of Constantinople. There seems no good reason to doubt that Cyrillus had brought the document from Alexandria, where he had held the office of patriarch, although Wetstein is of opinion, upon what seems inadequate evidence, that he procured it from the monastery of Mount Athos, where he had resided prior to his coming to Alexandria. It was transferred in 1753 from the king's private library to that of our national museum, where the volume containing the text of the New Testament is now, or was lately, open to public inspection under a glass case. The entire MS. consists of four small folio volumes, three of which contain the text of the Old, and oue that of the New Testament. The portion, how- ever, containing the Old Testament is more complete than that which contains the New, the /acune in the former occurring chiefly in the book of Psalms; while in the New Testament the following portions are wanting—viz., the whole of Matthew's Gospel up to chap. xxv. 6, from John vi. 50 to viii. 52, and from 2 Cor. iv. 13 to xii. 6. Occa- sionally, also, single letters, as well as the titles of certain divisions, have been destroyed by the operations of the bookbinder. The material of which the MS. is composed is very thin vellum, the page being about 13 inches high by 10 broad, containing from 50 to 52 lines in each page, each line consisting of about 20 letters. The number of pages is 773, of which 640 are occupied with the text of the Old Testament, and 133 with that of the New. The characters are wncial, but larger than in the Vatican MS. B. There are no accents or breathings, no spaces between the letters or words save at the end of a paragraph; and the contractions,

which are not numerous, are only such as are found in the oldest MSS., and are indicated by a line drawn over the word which is abbreviated, as ©3 for @cés. The punctuation consists of a point placed at the end of a sentence, usually on a level with the top of the preceding letter. As regards the date of the MS. very opposite opinions have been held. One critic placed it as low down as the 10th century, but this supposition has been justly characterised by Tregelles as so opposed to all that is known of paleography as not to deserve a serious refutation. From the circumstance that the MS. does not exhibit any traces of stichometry—a mode of arranging the text in lines consisting of a larger or smaller number of words, at the end of which the reader was to pause, which was applied to the Pauline epistles by Euthalius of Alexandria in the year 458, and which soon came into general use—it has been inferred that the MS. is not of later date than the middle of the 5th century. Again, the presence, in the text of the Gospels of the Ammonian sections and Eusebian canons, and of the epistle of Athanasius (who died in 373) to Marcellinus, which 1s prefixed to the Psalms, shows that it could not be older

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than the end of the 4th century. In addition to this external testimony, paleographic reasons, such as the general style of the writing, and the formation of certain letters, would scem to refer the MS. to about the middle of the 5th century, and this date is. now generally acquiesced in by scholars. There is an Arabic inscription, indeed, written on the page which contains the list of the various books of the Old and New Testament, which states that the MS. was written by the hand of the martyr Thecla, while a Latin inscription by Cyril himself gives the tradi- tion that the Thecla who wrote the MS. was a noble Egyptian lady who lived shortly after the Council of Nice. No reliance, however, can be placed on these statements, for, according to Scrivener,

‘Tregelles explains the origin of the Arabic inscription on which Cyril’s statement appears to rest, by remarking that the New Testament in our MS. at present commences with Matt, xxv. 6, this lesson (Matt. xxv. 1-13) being that appointed by the Greek Church for the festival of St Thecla. The Egyptian, therefore, who wrote this Arabic note, observing the name of Thecla in the now mutilated upper margin of the codex, where such rubrical notes are commonly placed by later hands, hastily concluded that she wrote the book, and thus has perplexed our biblical critics. It is hardly too much to say that Tregelles’s shrewd conjecture seeins to be cer- tain, almost to demonstration.”

This MS. contains the last twelve verses of St Mark’s Gospel. It is defective in that part of St John’s Gospel where the pericope adulterw occurs in the ordinary text, but Scrivener shows by an enumeration of the letters in each page that the two missing leaves did not contain the suspected passage. It is almost unnecessary to say that 1 John v. 7 is not found in this or in any uncial MS. of the New Testament. The reading of the MS. in 1 Tim. ii. 16 has given rise to a good deal of discussion. Woide in his fac-simile edition gave the reading ©3 for ®EOS. The element of uncertainty was whether the cross bar of the theta had not been added by a later hand, so that the original reading may have been OS. Bishop Ellicott carcfully examined the passage with the aid of a strong lens, and the result of his investigation, as given in a note appended to his Critical Commentary on First Timothy, in his edition of the Pastoral Epistles, was to satisfy him that the original reading was és, the cross bar of the theta having arisen from the central line of « in the word eboeBeia, which is directly opposite, shining through the leaf, and being mistaken by a scribe for part of the theta, and being touched up accordingly,—a view which was maintained by Wetstein. On the other hand, both Tregelles and Scrivener, who made the same investigation, are of opiion that the stroke of the epsilon cuts the theta much tov high to be mistaken by any ordinary scribe for the cross bar of the theta, When critics of such distinguished reputation differ, the question of the original reading will probably remain for ever uncertain.

The first usc that was made of the MS. for critical purposes was by Bishop Walton, who had the various read- ings which it presents inserted in his great Polyglott Bible, under the texts of the Septuagint and New Testament

respectively. It was collated by both Mili and Wetstein for their editions of the Greek Testament. In 1786 the New Testament was published in a fac-simile edition by Dr Woide, at that time librarian to the British Museum ; the types of this edition were cut so as to represent the general appearance of the letters; and the edition exhibits the MS. page for page, line for line, and letter for letter. The work was accompanied by valuable prolegomena on the history, age, &c., of the MS.; and is allowed to have been executed with remarkable accuracy. In 1828 the Rev. H. H. Baber completed the publication of the Old s estament portion in three large folio volumes (1816-1828) also in fac-simile, with useful prolegomena and notes.

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Tischendorf considers the editorial accuracy of Baber as inferior to that of Woide, and enumerates a number of instances where the readings of the original have been incorrectly given by Baber (Prolegomena to Tischendort's 4th ed. of the Septuagint, p. 69, sg.) In 1860 the text of the New Testament was published in common type by B. H. Cowper, the defective portions being supplied from Kiister's edition of Mill's Greek Testament, and some inaccuracies in Woide's edition corrected from the original. In 1864 there was published at Oxford, under the editor- ship of Mr Hansell, the text of the Codex Alexandrinus, along with that of three of the most ancient MSS., viz., Codd. B, C, D, with the Dublin Cod. Z, and a collation of the Cod. Sinaiticus. The work is arranged in parallel columns, and thus presents, at one view, the readings of four of our earliest authorities for the text of the New Testament. (uec,)

For more minute information regarding this MS. we refer to the prolegomena of Woide and Baber; to Scrivener's Introduction to the Criticism of the New Testament, Cambridge, 1861; to the fourth volume of Horne's Introduction to the New Testament, by Tregelles, London, 1866; and to Davidson's Biblical Criticism, vol. ii., Edin- burgh, 1852. We subjoin a list of the books of the Old and New Testament in the order in which they are found in the MS. :—

Tom I. Peveots Koopov…..Gencsis. | BaotAetwy a'.....Samuel I. (or Efodos Avyumrov … Exodus, Kings 1.) NEUITEKOV) <502s0c vse Leviticus. BactAciwy B'..... Samuel II. (or AGE Olina 02 sseceniaws Numbers. Kings

IT.) AcuTepovopor ..... Deuteronomy. | BaoiAewy vy'... Kings I. (or III.) Inoovs Nav7..... Joshua, son of | BaotAcwy 5'... Kings 11. (or 1V.) un. Tlapadevropevwy a' Chronicles I. S10 congosacnoqoe0de Judges. Napadesrouevwy 8' Chronicles II. 12s epeGncoscsHesanans Ruth. Tom. II. (OaziGncepeseodtboestne: Hosea EmtoroAn lepeutov Epistle of Jere- 7 YOGIC Ape ba nee ep eace: Amos miah. Dexa Sctvexciiaacaeees Micah TECEHENAs ccccceecescee Ezckiel. DCO tere cnosthe vsie son eat Joel. CTI cogacene scone: Daniel /MESSE@P boo one onceconer Obadiah. D(UGHAOS. eoppeeenacsoy. Esther LIGOETS SOR REA aoe eee Jonah. FNL rmesiaccacercs seer Tobit INGOU Mer sctcaennnoncss Nahum. MOUS.eTO) ates. «cas Judith ApBaroup..,..... Habakkuk. GO pasiag. eee anere Esdras I. > OGNOIHIS puopeonaaaen: Zephaniah. Egdpas B'...,..... Esdras II., in- Ayyatos ….....006+ Haggai. cluding Neeua, and part of BONMEPIGES «.ccevanesins Zechariah, the canonical Book of Ezra. INUCEACGECES stelisicsieisie/eere Malachi. MakraBatwy a'..... Maccabees I. LlGRaT OS aaeaepedronnaee Isaiah MaxkaBatwy B'..... Maccabees II. ME PELULCS « s wciniecnieiels ss Jeremiah. MarkaBawy y'..... Maccabees ITT. BapOUN re csnen ede: sccm Baruch MakkaBatwy 8'..... Maccabees IV. CAMPO rec rnecsrsenss Lamentations. Tom. IIT. A@avaciov ErioroA7….....Epistle of Athanasius to Marcellinus on

the Psalms. EvoeBiov Trobecers (sic) ... Hypothesis of Eusebius on the Psalms,

Waarnptioy per' Odwv….....Psalms 151, Hymns 15.

| (70/0) Se Sra rocunciceencamaeerericn Lh

WO RNEI9 oxo0n9 sonoRecNReHS0nC Proverbs.

ExkAnotaorns…. .....++. Lcclesiastes.

Aga AGMAT OV …....ceceeees Canticles.

Bopia BOAOMWVTOS....e.eeeee Wisdom of Solomon.

Zopia Incov viov Zipay…..Ecclesiasticus, or Wisdom of Jesus, son of Sirach. Tom. IV,

EvayyeAsov kata Matéaov Matthew.

EvayyeAtov kata Maprov… Mark.

EvayyeAtoy kata Aoveay… Luke.

Evayyedsov kata lwavyny John.

Mpaters AwooToAwy …..... Acts of the Apostles.

EmoroAa Kaforrwat ¢”..,.Seven Catholic Epistles, viz., 1 of James, 2 of Peter, 3 of John, and 1 of Jude.

EmtotoAat Mavaov 18’..... Fourteen Epistles of Paul.

Amoraduiis lwavvov…..... Revelation of John.

KAnuevtos EmtoroaAn a’.....1st Epistle of Clement to the Corinthians.

KAnpevtos EmtoroAn B’....2d Epistle of Clement to the Corinthians,

Wadpot Sodouwytos 7’..... Kight Psalms of Solomon.

I. — 63

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ALEXANDRIAN SCHOOL. Under this title are generally included certain strongly-marked tendencies in literature and science which took their rise in the city of Alexandria. That city, founded by Alexander the Great about the time when Greece, in losing her national inde- pendence, lost also her intellectual supremacy, was in every way admirably adapted for becoming the new centre of the world’s activity and thought. Its situation brought it into commercial relations with all the nations lying around the Mediterranean, and at the same time rendered it the one communicating link with the wealth and civilisation of the East. The great natural advantages it thus enjoyed were artificially increased to an enormous extent by the care of the sovereigns of Egypt. Ptolemy Soter (reigned 306-285 B.c.), to whom, in the general distribution of Alexander’s conquests, this

kingdom had fallen, began to draw around him from various parts of Greece a circle of men eminent in literature and philosophy. To these he gave every facility for the prosecution of their learned researches. Under the inspiration of his friend Demetrius Phalereus, the Athenian orator, this Ptolemy laid the foundations of the great library, and originated the keen search for all written works, which resulted in the forma- tion of a collection such as the world has seldom seen. Ile also built, for the convenience of his men of letters, the Museum, in which, maintained by the royal bounty, they resided, studied, and taught. This Museum or academy of science was in many respects not unlike a modern univer- sity. The work thus begun by Ptolemy Soter was carried on vigorously by his descendants, in particular by his two immediate successors, Ptolemy Philadelphus and Ptolemy Euergetes. Philadelphus (285-247 B.c.), whose librarian was the celebrated Callimachus, bought up all Aristotle's collection of books, and also introduced a number of Jewish and Egyptian works. Among these appears to have been a portion of the Septuagint. Euergetes (247-222 B.c.) largely increased the library by seizing on the original editions of the dramatists laid up in the Athenian archives, and by compelling all travellers who arrived in Alexandria to leave a copy of any work they possessed.

The intellectual movement so originated extended over a long period of years. If we date its rise from the 4th century B.c., at the time of the fall of Greece and the foundation of the Greeco-Macedonian empire, we must look for its final dissolution in the 7th century of the Christian era, at the time of the fall of Alexandria and the rise of the Mahometan power. But this very long period falls into two divisions. The first, extending from about 306 B.c. to about 30 B.c., includes the time from the foundation of the Ptolemaic dynasty to its final subjugation by the Romans; the second extends from 30 B.c. to 640 A.D. The characteristic features of these divisions are very clearly marked, and their difference affords an explanation of the variety and vagueness of meaning attaching to the term Alexandrian School. In the first of the two periods the intellectual activity was of a purely literary and scientific nature. It was an attempt to continue and develop, under new conditions, the old Hellenic culture. This direction of effort was particularly noticeable under the early Ptole- mics, Alexandria being then almost the only home in the world for pure literature. During the last century and a half before the Christian era, the school, as it might be called, began to

break up and to lose its individuality. This was due partly to the state of government under some of the later Ptolemies, partly to the formation of new lite- rary circles in Rhodes, Syria, &c., whose supporters, though retaining the Alexandrian peculiarities, could scarcely be included in the Alexandrian school. The loss of active life, consequent on this gradual dissolution, was much in- creased when Alexandria fell under Roman sway. Then

the influence of the school was extended over the whole known world, but men of letters began to concentrate at Rome rather than at Alexandria. In that city, however, there were new forces in operation which produced a second grand outburst of intellectual life. The new move- ment was not in the old direction—had, indeed, nothing in common with it. With its character largely determined by Jewish elements, and even more by contact with the dogmas of Christianity, this second Alexandrian school resulted in the speculative philosophy of the Neo-Platonists and the religious philosophy of the Gnostics and early church fathers.

There appear, therefore, to be at least two definite signi- fications of the title Alexandrian School; or rather, there are two Alexandrian schools, distinct both chronologically and in substance. The one is the Alexandrian school of poetry and science, the other the Alexandrian school of philosophy. As regards the use of the word "school" to denote these movements, it must be observed that the term is misleading. It has not the same meaning as when applied to the Academics or Peripatetics, the Stoics or Epicureans. These consisted of a company united by holding in common certain speculative principles, by having the same theory of things. There was nothing at all cor- responding to this among the Alexandrians. In literature their activities were directed to the most diverse objects; they have only in common a certain spirit or form. There was among them no definite system of philosophy. Even in the later schools of philosophy proper there is found a community rather of tendency than of definite result or of fixed principles.

Alexandrian School of Interature.—The general character of the literature of the school appears as the necessary con- sequence of the state of affairs brought about. by the fall of Greek nationality and independence. The great

works of the Greek mind had formerly been the products of a fresh life of nature and perfect freedom of thought. All their hymns, epics, and histories were bound up with their individuality as a free people. But the Macedonian con- quest at Cheronea brought about a complete dissolution of this Greek life in all its relations, private and political. The full, genial spirit of Greek thought vanished when freedom was lost, with which it was inseparably united. A substitute for this originality was found at Alexandria in learned research, extended and multifarious knowledge. Amply provided with means for acquiring information, and under the watchful care of a great monarch, the Alexan- drians readily took this new direction in literature, With all the great objects removed which could excite a true spirit of poetry, they devoted themselves to minute researches in all sciences subordinate to literature proper. They studied criticism, grammar, prosody and metre, antiquities and mythology. The results of this study constantly appear in their productions. Their works are never national, never addressed to a people, but to a circle of learned men. Moreover, the very fact of being under the protection, and, as it were, in the pay of an absolute monarch, was damaging to the character of their literature. There was introduced into it a courtly element, clear traces of which, with all its accompaniments, are found in the extant works of the school. One other fact, not to be for- gotten in forming a general estimate of the literary value of their productions, is, that the same writer was frequently or almost always distinguished in several special sciences. The most renowned poets were at the same time men of culture and science, critics, archeologists, astronomers, OF physicians. To such writers the poetical form was merely a convenient vehicle for the exposition of science.

The forms of poetical composition chiefly cultivated by the Alexaudrians were epic and lyric or elegiac. Great

epics are wanting; but in their place, as might almost have been expected, are found the historical and the didactic or expository epics. The subjects of the historical epics were generally some of the well-known myths, in the exposition of which the writer could exhibit the full extent of his learning and his perfect command of verse. These poems are in a sense valuable as

repertories of antiquities; but their style is on the whole bad, and infinite patience is required to clear up their.numerous and obscure allusions. The best extant specimen is the Argonautica of Apollonius Rhodius; the most characteristic is the Alexandra or Cas- sandra of Lycophron, the obscurity of which is almost proverbial.

The subjects of didactic epics were very numerous ; they seem to have depended on the special knowledge possessed by the writers, who used verse as a form for unfolding theirinformation. Some, ¢.g., the lost poem of Callimachus, called Arua, were on the origin of myths and religious observances; others were on special sciences. Thus we have two poems of Aratus, who, though not resident at Alexandria, was so thoroughly imbued with the Alexan- drian spirit as to be with reason included in the school ; the one is an essay on astronomy, the other an account of the signs of the weather. Nicander of Colophon has also left us two epics, one on remedies for poisons, the other on the bites of venomous beasts. Of many other epic poets only the names are known, as Dicearchus, Euphorion, Rhianus, Dionysius, Oppianus. The spirit of all their productions is the same, that of learned research. They are distinguished by artistic form, purity of expression, and strict attention to the laws of metre and prosody, qualities which, however good in themselves, do not com- pensate for want of originality, freshness, and power.

In their lyric and elegiac poetry there is much worthy of admiration. 'The specimens we possess are not devoid of talent or of a certain happy art of expression. Yet, for the most part they either relate to objects thoroughly incapable of poetic treatment, where the writer's endeavour is rather to expound the matter fully than to render it poetically beautiful, or else expend themselves on short isolated subjects, generally myths, and are erotic in cha- racter. 'The earliest of the elegiac poets was Philetas, the sweet singer of Cos. But the most distinguished was Calli- machus, undoubtedly the greatest of the Alexandrian poets. Of his numerous works there remain to us only a few hymns, epigrams, and fragments of elegies. Other lyric poets were Phanocles, Hermesianax, Alexander of Astolia, and Lycophron.

Some of the best productions of the school were their epigrams. Of these we have several specimens, and the art of composing them seems to have been assiduously cultivated, as might naturally be expected from the court life of the poets, and their constant endeavours after terse- ness and neatness of expression. Of kindred character were the parodies and satirical poems, of which the best examples were the S/AAou of Timon.

Dramatic poetry appears to have flourished to some extent. 'There are still extant three or four varying lists of the seven great dramatists who composed the Pleiad of Alexandria. Their works, perhaps not unfortunately, have perished. A ruder kind of drama, the amcebzan verse, or bucolic mime,

_ developed into the only pure stream of genial poetry found in the Alexandrian School, the Zdylls of Theocritus. The name of these poems preserves their original idea; they were pictures of fresh country life.

The most interesting fact connected with this Alexan- drian poetry is the powerful influence it exercised on Roman literature. That literature, especially in the Augustan age, is not to be thoroughly understood without due appreciation of the character of the Alexandrian School.

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Before the Alexandrians had begun to produce original works, their researches were directed towards the master- pieces of ancient Greek literature. If that literature was to be a power in the world, it must be handed down to posterity in a form capable of being understood. This was the task begun and carried out by the Alexandrian critics. These men did not merely collect works, but sought to arrange them, to subject the texts to criticism, and to explain any allusion or reference in them which at a later date might become obscure. The complete philo- logical examination of any work consisted, according to them, of the following processes :—d.dpfwors, arrangement of the text; dvdyvwors, settlement of accents; réxvy, theory of forms, syntax; égyyyors, explanation either of words or things ; and finally, xpiots, judgment on the author and his work, including all questions as to authenticity and intcg- rity. To perform their task adequately required from the critics a wide circle of knowledge; and from this requirement sprang the

sciences of grammar, prosody, lexicography, mythology, and archxology. The service rendered by these critics is invaluable. To them we owe not merely the possession of the greatest works of Greek intellect, but the possession of them in a readable state. The most celebrated critics were Zenodotus; Aristophanes of Byzantium, to whom we owe the theory of Greek accents; and Aristarchus of Samothrace, confessedly the Corypheeus of criticism. Others were Alexander of Attoha, Lycophron, Callimachus, Eratosthencs, and many of a later age, for the critical school long survived the literary. These philological labours were of great indirect import- ance, for they led immediately to the study of the natural sciences, and in particular to a more accurate knowledge of geography and history. Considerable attention began to be paid to the ancient history of Greece, and to all the myths relating to the foundation of states and cities. A large collection of such curious information is contained in the Bibliotheca of Apollodorus, a pupil of Aristarchus, who flourished in the 2d century B.c. Eratosthenes was the first to write on mathematical and physical geography ; he also first attempted to draw up a chronological table of the Egyptian kings, and of the historical events of Greece. His Egyptian chronology, along with that of Manetho, is still of great interest to scholars ; and Bunsen speaks with the highest admiration of his researches in Greek history. The sciences of mathematics, astronomy, and medicine were also cultivated with assiduity and success at Alexandria, but they can scarcely be said to have their origin there, or in any strict sense to form a part of the peculiarly Alexandrian literature. The founder of the mathematical school was the celebrated Euclid: among its scholars were Archimedes , Apollonius of Perga, author of a treatise on Conic Sections ; Eratosthenes, to whom we owe the first measurement of the earth ; and-Hipparchus, the founder of the epicyclical theory of the heavens, after- wards called the Ptolemaic system, from its most famous expositor, Claudius Ptolemeus. Alexandria continued long after the Christian era to be celebrated as a school of mathematics and science.

Alexandrian School of Philosophy.—Although it is not possible to divide literatures with absolute rigidity by centuries, and although the intellectual life of Alexandria, particularly as applied to science, long survived the Roman conquest, yet at that period the school, which for some time had been gradually breaking up, seems finally to have succumbed. The later

productions in the field of pure literature bear the stamp of Rome rather than of Alexan- dria. But in that city, for some time past, there had becn various forces secretly working, and these coming in con- tact with great spiritual changes occurring in the world around, produced a second outburst of intellectual activity.

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Among the natives of foreign countries transplanted to Alexandria by its founder had been a few Jews. These gradually increased in number, until, about the time of the Christian era, they formed an influential part of the populace of Egypt, inhabited two of the five quarters of the capital, and held high offices in the state. They had been well treated by the Ptolemies, and for some time experienced sunilar treatment from the Romans. The new move- ment of thought was in great measure due to the presence of this Jewish element. The contact of free Greek speculation with the peculiar Jewish ideas of the transcendence of God, of a special revelation, and of a singular subjective ecstasy, the prophetic state, could not fail to have a strong effect on the mode of thought of the most highly cultured Jews. From many causes they were more than ordinarily open to receive foreign ideas. Their isolated position had been broken in upon by their long residence as a small minority in the midst of an atmo- sphere of Greek custom and thought, and in the most highly cultivated city in the world. Their separation from their native country had tended to broaden their views by weakening the strong political convictions which united their destiny and their sacred writings with a definite land. It was a necessary consequence that they should endeavour so far as possible to assimilate their principles to Greek ideas. 'The two systems were not, they found, in total contradiction ; they had several points in common. 'This was specially the case with the Platonic writings. There thus arose among the Jews a constantly increasing tendency to modify or widen their doctrines so as to admit of Greek conceptions, and then, with the aid of these concep- tions, to systematise their own somewhat vague religious views. In this way philosophy and religion would be united or identified. There is truth in all philosophy, for philosophy is but a mangled reproduction of the sacred record in which all truth is contained. The Scriptures contain all philosophy, but not explicitly ; they require to be interpreted. The system thus developed has a philo-

sophical aspect, yet never ceases to be essentially Jewish, for the ultimate resort is always to a body of doctrine expressly revealed. Progress in this direction was possible in two ways. First, the pure Greek metaphysical thought rejected a body of truth said to have been revealed to a special people, but retained the idea of revelation to the individual thinker. A doctrine was thus evolved which contained most of the oriental or Jewish theosophical ideas, but in logical sequence and based for the most part on the earlier works of Greek thinkers. Religion was retained, but was explained or had a meaning given by philosophy. To this powerful movement of thought the name Neo-Platonism is given; its chief representatives were Ammonius Saccas, Plotinus, Porphyry, Jamblichus, and Proclus. Second, the introduction of the peculiar Christian dogmas could not fail to produce a lively effect on the Alexandrian thinkers. These dogmas had to be reconciled with philosophy, or the one must yield to and be absorbed by the other. The attempt to solve the pro- blem of their mutual relation gave rise to Gnosticism in all its phases, and was the cause of the speculative element in the works of such fathers as Clement of Alexandria and Origen.

'To the whole of this great movement the title Alexan- drian philosophy must be given, although that term is sometimes identified with Neo-Platonism. Of the exact historical origin of it we have no certain notice, Some thinkers are of opinion that even in the Septuagint traces of rationalism can be discovered. (See Frankel, Historisch- kritische Studien zur Septuaginta, 1841.) In Aristobulus (160 B.c.) is found a thoroughgoing attempt to show that early Greek speculations were in harmony with the divine

record, because they had been borrowed from it. Traces of allegorical interpretation are also found in him, but no conception of a theosophical system. In the peculiar tenets of the Therapeute, so far as these can be known, may perhaps be traced another stream of influence, the Neo-Pythagorean. The complete representative of the Jewish religious philosophy was Philo, surnamed Judzeus, who lived at Alexandria during the Christian era. In him are found a complete and elaborate theosophy

fusing together religious and metaphysical ideas, a firm conviction that all truth is to be found in the sacred writings, and a eonstant application to these writings of the principle of allegorical interpretation. His system is a syncretism of Oriental mysticism and Greek mctaphysics, and the effort at such a combination from the Jewish side could go no further, After Philo Judzeus there remained as possible courses either Neo-Platonism or Gnosticism.

Of Alexandrian literature there are notices in histories of Greek literature, as Miiller and Donaldson, or Bernhardy; of Alexandrian philosophy, in general histories of philosophy and of early Christianity. Special works, which, however, devote most attention to the Neo-Platonists, are—

Matter, Histoire de l Ecole d' Alexandrie, 2d ed. 3 vols. 1840-44 ; Simon, Histoire de Ecole d'Alexandrie, 2 vols, 1844-45 ; Vacherot, /istotre critique de Ecole d'Alex- andrie, 3 vols. 1846-51; Kingsley, Alexandria and her Schools, 1854; Gfrérer, Philo und die Alexandrinische Theosophie, 1835; Daehne, Geschicht. Darstellung der Judisch-Alexandrinische Religionsphilosophie, 2 vols, 1834.

ALEXANDRINE VERSE, a name given to the leading measure in French poetry. It is the heroic French verse, used in epic narrative, in tragedy, and in the higher comedy. There is some doubt as to the origin of the name; but most probably it is derived from a collection of romances, published early in the 13th century, of which Alexander of Macedon was the hero, and in which he was represented, somewhat like our own Arthur, as the pride and crown of chivalry. Before the publication of this work most of the trouvére romances appeared in octo-syllabic verse. The new work, which was henceforth to set the fashion to French literature, was written in lines of twelve syllables, but with a freedom of pause which was afterwards greatly curtailed. 'The new fashion, however, was not adopted all at once, The metre fell into disuse until the reign of Francis I., when it was revived by Jean Antoine de Beuf, one of the seven poets known as the Pleiades. It was not he, however, but Ronsard, who made the verse popular, and gave it vogue in France. From his time it became the recognised vehicle for all great poetry, and the regula- tion of its pauses became more and more strict. The fol- lowing is an example of the verse as used by Racine—

***Ou suis-je? qu'ai-je fait? || que dois-je faire encore?*

Quel transport me saisit ? || quel chagrin me dévore ?" Two inexorable laws came to be established with regard to the pauses. The first is, that each line should be divided into two equal parts, the sixth syllable always ending with a word. In the earlier use of this metre, on the contrary, it frequently happened that the sixth and seventh syllables belonged to the same word. 'The other is, that, except under the most stringent conditions, there should be none of what the French critics call enjambement, that is, the overlapping of the sense from one line on to the next. Ronsard completely ignored this rule, which was after his time settled by the authority of Malherbe. Such verses as the following by Ronsard would be intolerable in modern French poetry—

- *Cette nymphe royale est digne qu'on lui dresse*

Des autels. . . .

Les Parques se disoient: Charles, qui doit venir Au monde…

ALE—ALF 501

Je veux, s'il est possible, atteindre la louague De celle. ...

Michael Drayton, who was twenty-two years of age when Ronsard died, seemed to think that the Alexandrine might be as pleasing to English as it was to French ears, and in this metre he wrote a long poem in twenty-four books called the Polyolbion. The metre, however, failed to catch the English ear. Our principal measure is a line of ten syllables, and we use the Alexandrine only occasionally to give it variety and weight. In our ordinary heroic verse it is but rarely introduced; but in the favourite narrative metre, known as the Spenserian, it comes in regularly as the concluding line of each stanza. In English usage, moreover, it is to be observed that there is no fixed rule as to the position of the pause, though it is true that most commonly the pause occurs at the end of the sixth syllable. Spenser is very free in shifting the pause about; and though the later poets who have used this stanza are not so free, yet, with the exception of Shenstone and of

Byron, they do not scruple to obliterate all pause between the sixth and seventh syllables. Thus Thomson (Castle of Indolence, i. 42) :—

- *And music lent new gladness to the morning air."*

The danger in the use of the Alexandrine is that, in attempting to give dignity to his line, the poet may only produce heaviness, incurring the sneer of Pope—

'A needless Alexandrine ends the song,

That, like a wounded snake, drags its slow length along." (E. 8. D.)

ALEXIS, an ancient comic poet, born about 394 Bo. at Thurii in Magna Grecia, the uncle and instructor of Menander. Plutarch says that he lived to the age of 106 years, and according to Suidas he wrote 245 plays, of which the titles of 113 are known. The fragments that have been preserved by Athenzeus and Stobzeus attest the wit and elegance of the author. The plays were frequently translated by the Latin comic writers. (See Meineke, Fragm. Com. Gree. vol. i.)

ALEXIUS L, the nephew of Isaac Comnenus, and the most distinguished member of the Comnenus family, was born in 1048, and died in 1118. In early life he signalised himselfin the wars against the enemies of hiscountry; but the mean jealousies of the ministers of the emperor Nicephorus (sumamed Botaniates) drove him to take up arms against a sovereign whose cause he had thrice gallantly defended against powerful insurgent leaders; and he ascended the throne of Constantinople in 1081. His character has been too partially drawn by his favourite daughter, Anna Com- nena, who has, however, justly remarked that the disorders of the times were both the misfortune and glory of Alexius, and that he paid the penalty for the vices of his pre- decessors. In his reign the Turks extended their conquests from Persia to the Hellespont; on the north the empire was assailed by hordes of barbarians from the Danube, and on the west by the Normans; while Europe pressed on Asia by way of Constantinople, in the excitement of the first crusade. Amid these disturbances Alexius managed the affairs of the state with a dexterous and courageous hand, though his policy was ascribed by the Latins to cowardice or treachery. He was politic

enough to derive solid advantages from the romantic valour of the crusaders. Alexius outlived the love of his sub- jects, and their patience was all but exhausted in the latter part of his long reign, The nobility were irritated by the extravagance of his relations; the people by his severity and exactions; and the clergy murmured at his appropria- tion of the church funds to the defence of the state.

ALFANT, Domenico, an Italian paiuter, born at Perugia towards the close of the fifteenth century. The precise

date is uncertain, but he was a contemporary of Raphael, with whom he studied in the school of Perugino. The two artists lived on terms of intimate friendship, and the influence of the more distinguished of the two is so clearly traceable in the works of the other, that these have fre- quently becn attributed to Raphael. Towards the close of his life Alfani gradually changed his style, and approxi- mated to that of the later Florentine school. The date of his death, according to some, was 1540, while others say he was alive in 1553. Pictures by Alfani may be seen in collections at Florence, and in several churches in Perugia.

AL-FARABI, Apu Nasr MunamMap Ipn TarkuHan, one of the earliest Arabian philosophers, flourished during the former half of the 10th century. Philosophy, among the Arabs, was originally an extension of the related sciences of astronomy and medicine, and the first philo- sophers were physicians. The more eminent of them were court physicians, and to this they doubtless owed their protection against the jealous suspicions of the Maho- metan sects. Al-Farabi is supposed (for the detailed accounts of his life are legendary) to have concerned him- self more with the theory than the practice of medicine ; but he is known to have been a physician at the court of Seif-Eddaula, and died when it was at Damascus in 950. Unlike some of his successors, notably Avicenna, he was an ascetic, and his philosophy, which has a slight Platonic infusion, bears traces of the contrast. He was unsystematic, and the sketches and aphorisms of his which have come down to us (many of his treatises are still in MS.) only partially enable us to reconstruct his philosophy. In his opusculum De Scientiis he enumerates six orders of sciences :—(1.) Language, by which he means little more than grammar. (2.) Logic, which he names as an art, conceives

generally as a science, and confounds in its details with the corresponding art, with rhetoric, and with criticism. (3.) The mathematical sciences, embracing geometry, arithmetic, optics, the science of the stars, music, and the sciences of weights and of capacities (ingenia). Arithmetic is abstract and concrete; geometry is active, passive, and speculative ; and the science of the stars includes astronomy, astrology, the science of climates, and of dreams and auguries. (4.) The natural sciences, ten in number. iB Civil science, including judicial science and rhetoric. (6.) Divine science, or metaphysics. This hierarchy has striking approximations to the most modern classifications. Logic and mathematics, the most abstract sciences, are near the beginning, if not quite first; what stands for social science follows the physical concrete sciences ; and the distinction between abstract and concrete, which Comte made one of the bases of his classification, and which has been more accurately discriminated by Spencer, is on the whole clearly seized. But art is throughout confounded with science ; superstitions are mixed up with facts; physical and mental phenomena are not always separated ; the subjective and the objective (learning and science) are confused, as they afterwards were by Bacon; and there is no science of man—man was not yet conceived, metaphysically, as an individual. This agrees with Al-Farabi's science of politics as expounded in another work, in which he follows his master, Aristotle, in denying the permanence of the individual soul, and anticipates the Averrhoistic doctrine of the unity of souls. For his metaphysics is Peripatetic, as Peripateticism was interpreted by the Neo-Platonist commentators on Aristotle. Starting with the distinction between the possible and the necessary, he assumes that there must be some supreme necessary existence which accounts for all actual existence. This supreme exist- ence has infinite life, wisdom, power, beauty, goodness, &c., but it is an absolute unity, and is without distinguish- able attributes. How does the world, with its infinite

multiplicity and diversity, issue from this absolutely one and identical being? Here Al-Farabi neo-platonises. It proceeds by emanation. The absolute Being knows itself, and in virtue of this knowledge the first intelligence exists. He does not explain how self-consciousness comes to be inseparable from necessary existence, but his dynamic, at this and all the

lower stages, is self-knowledge; and indeed the act of knowing and the resultant existence appear at this height of abstraction to be all but identical. The first intelligence, intrinsically a unity, contains multiplicity, because it is no longer devoid of attributes. In so far as it necessarily exists, it evolves the second intelligence ; in so far as it is merely potential being, and knows itself, it evolves the world-soul and the uppermost world-circle, which is moved by that soul. Similarly descending intel- ligences, ever-wider world-circles and the corresponding souls, are evolved by the same process of emanation, down to the active reason, which is most nearly related to the earthly elements and human souls. The active reason, by its contact with matter, impresses on it forms, of which the human soul is one, with greater or less permanence according to the degree in which it is immersed in, or rises above, matter. The forms decline in permanence the further we descend below the active reason, and the matter which has least form is the limit of emanation. There is here nothing like what is now called evolution: the con- ception of the universe is, as in all theories of emanation, really statical, not dynamical, for the ideas of cause and perpetual causation do not yet exist; and of course the process is the reverse of that implied in the modern development theory. (For information on Al-Farabi, see Munk, Melanges, pp. 341-52; and Steinschneider, Memotres de V Académie de St Petersbourg, vii. série, tom. xiii. Two of his opuscula have been translated by Schmélders, Documenta Philosophie Arabum, and two are contained in Alpharabiz Opera Omnia, Parisiis, 1638.)

ALFIERI, Virrorto, chiefly celebrated as the author who raised the Italian tragic drama from its previous state of degradation, was born on the 17th January 1749, at the town of Asti, in Piedmont. He lost his father in early infancy ; but he continued to reside with his mother, who married a second time, till his tenth year, when he was placed at the academy of Turin. After he had passed a twelvemonth at the academy, he went on a short visit to a relation who dwelt at Coni; and during his stay there he made his first poetical attempt, in a sonnet chiefly borrowed from lines in Ariosto and Metastasio, the only poets he had at that time read. When thirteen years of age he was induced to commence the study of civil and canonical law ; but the attempt only served to disgust him with every species of application, and to increase his relish for the perusal of French romances. By the death of

his uncle, who had hitherto taken some charge of his education and conduct, he was left, at the age of fourteen, to enjoy without control his vast paternal inheritance, augmented by the recent accession of his uncle's fortune. He now began to attend the riding-school, where he acquired that rage for horses and equestrian exercise which continued to be one of his strongest passions till the close of his existence.

After some time spent in alternate fits of extravagant dissipation and ill-directed study, he was seized with a

desire of travelling ; and having obtained permission from –

the king, he departed in 1766, under the care of an English preceptor. Restless and unquiet, he posted with the utmost rapidity through the towns of Italy; and his improvement was such as was to be expected from his mode of travelling and his previous habits. Hoping to find in foreign countries some relief from the tedium and ennui with which he was oppressed, and being anxious to become acquainted with the French theatre, he proceeded to Paris.

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But he appears to have been completely dissatisfied with everything he witnessed in France, and contracted a dislike to its people, which his intercourse in future years rather contributed to augment than diminish. In Holland he became deeply enamoured of a married lady, who returned his attachment, but who was soon obliged to accompany her husband to Switzerland. Alfieri, whose feelings were of the most impetuous description, was in despair at this separation, and returned to his own country in the utmost anguish and despondency of mind. While under this depression of spirits he was induced to seek alleviation from works of literature; and the perusal of Plutarch's Jives, which he read with profound emotion, inspired him with an enthusiastic passion for freedom and independence. Under the influence of this rage for liberty he recommenced his travels ; and his only gratification, in the absence of freedom among the Continental siates, appears to have been derived from contemplating the wild and sterile

regions of the north of Sweden, where gloomy forests, lakes, and precipices conspired to excite those sublime and melancholy ideas which were congenial to his disposition. Everywhere his soul felt as if confined by the bonds of society; he panted for something more free in government, more elevated in sentiment, more devoted in love, and more perfect in friendship. In search of this ideal world he posted through various countries, more with the rapidity of a courier than of one who travels for amuse- ment or instruction, During a journey to London, he engaged in an intrigue with a married lady of high rank; and having been detected, the publicity of a rencounter with the injured husband, and of a divorcee which followed, rendered it expedient and desirable for him to quit England. He then visited Spain and Portugal, where he became acquainted with the Abbé Caluso, who remained through life the most attached and estimable friend he ever possessed. In 1772 Alfieri returned to Turin, where he again became enamoured of a lady, whom he loved with his usual ardour, and who seems to have been as undeserv- ing of a sincere attachment as those he had hitherto adored. In the course of a long attendance on his mistress, during a malady with which she was afflicted, he one day wrote a dialogue or scene of a drama, which he left at her house. On a difference taking place between them, the piece was returned to him, and being retouched and extended to five acts, it was performed at Turin in 1775, under the title of Cleopatra. ' From this moment Alfieri was seized with an insatiable thirst for theatrical fame, and the remainder of his life was devoted to its attainment. His first two tragedies, Filippo ~~and Polinice, were originally written in French prose ; and when he came to versify them in Italian, he found that, from his Lombard origin, and long intercourse with foreigners, he expressed himself with feebleness and inaccuracy. Accordingly, with the view of improving his Italian style, he went to Tuscany, and, during an alternate residence at Florence and Siena, he completed his Pippo and Polinice, and conceived the plan of various other dramas. While thus employed, he became acquainted with the Countess of Albany, who then resided with her husband at Florence. For her he formed an attachment which, if less violent than his former loves, appears to have been more permanent. With this motive to remain at Florence, he could not endure the chains by which his vast posses~~ sions bound him to Piedmont. He therefore resigned his whole property to his sister, the Countess Cumiana, reserv- ing an annuity which scarcely amounted to a half of his original revenues, At

this period the Countess of Albany, urged by the ill-treatment she received from her husband, sought refuge in Rome, where she at length received per- mission from the pope to live apart from her tormentor.

Alfieri followed the countess to that capital, where he com- pleted fourteen tragedies, four of which were now for the first time printed at Sienna.

At length, however, it was thought proper that, by leav- ing Rome, he should remove the aspersions which had been thrown on the object of his affections. During the year 1783 he therefore travelled through different states of Italy, and published six additional tragedies. The interests of his love and literary glory had not diminished his rage for horses, which seems to have been at least the third passion of his soul. He came to England solely for the purpose of purchasing a number of these animals, which he carried with him to Italy. On his return he learned that the Countess of Albany had gone to Colmar in Alsace, where he joined her, and resided with her under the same roof during the rest of his life. They chiefly passed their time between Alsace and Paris, but at length took up their abode entirely in that metropolis, While here, Alfieri made arrangements with Didot for an edition of his trage- dies ; but was soon after forced to quit Paris by the storms of the Revolution. He recrossed the Alps with the countess, and finally settled at Florence. 'The last ten years of his life, which he spent in that city, seem to have becn the happiest of his existence. During that long period his tranquillity was only interrupted by the entrance of the Revolutionary armies into Florence in 1799, Though an enemy of kings, the aristocratic feelings of Alfieri rendered him also a decided foe to the principles and leaders of the French Revolution ; and he rejected with the utmost contempt those advances which were made with a view to bring him over to their cause. The con- cluding years of his life were laudably employed in the study of the Greek literature, and in perfecting a series of comedies. His assiduous labour on this subject, which he pursued with his characteristic impetuosity, exhausted his strength, and brought on a malady for which he would not adopt the prescriptions of his physicians, but obstinately persisted in employing remedies of his own. His disorder rapidly

increased, and at length terminated his life on the 8th October 1803, in the fifty-fifth year of his age.

The character of Alfieri may be best appreciated from the portrait which he has drawn of himself in his own Jfemoirs of his Life. He was evidently of an irritable, impetuous, and almost ungovernable temper. Pride, which seems to have been a ruling seutiment, may account for many apparent inconsistencies of his character, But his less amiable qualities were greatly softened by the cultivation of literature. His application to study gradually tranquillised his temper and softened his manners, leaving him at the same time in perfect possession of those good qualities which he had inherited from nature,—a warm and dis- interested attachment to his family and friends, united to a generosity, vigour, and elevation of character, which rendered him not unworthy to embody in his dramas the actions and sentiments of Grecian heroes.

It is to his dramas that Alfieri is chiefly indebted for the high reputation he has attained. Before his time the Italian language, so harmonious in the Sonnets of Petrarch, and so energetic in the Commedia of Dante, had been invariably languid and prosaic in dramatie dialogue. The pedantic and inanimate tragedies of the 16th century were followed, during the iron age of Italian litera- ture, by dramas of which extravagance in the sentiments and im- probability in the action were the chief characteristics, The pro- digious suceess of the Merope of Maffei, which appeared in the commencement of the last ceutury, nay be attributed more to a comparison with such produetions than to intrinsic merit. In this degradation of tragic taste the appearance of the tragedies of Alfieri was perhaps the most important literary event that had oceurred in ltaly during the 18th century. On these tragedies it is diffieult to pronounce a Judgment, as the taste and system of the author under- went considerable change and modification - during the intervals which elapsed between the three-periods of their publication. An excessive harshness of style, an asperity of sentiment, and total

want of poetical ornament, arc the characteristics of his first four tragedies, Filippo, Polinice, Antigone, and Virginia. These faults were in some measure corrected in the six tragedies which he gave to the world some

years after, and in those which he published along with Saul, the drama which enjoyed the greatest success of all his productions ; a popularity which may be partly attributed to the severe and unadorned manner of Alfieri being well adapted to the patriarchal simplicity of the age in which the scene of the tragedy is placed. But though there be a considerable difference in his dramas, there are eertain observations applicable to them all. None of the

lots are of his own invention. They are founded either on mytho- ogical fable or history ; most of them had been previously treated by the Greek dramatists, or by Sencca. Rosmunda, the only one which could be supposed of his own contrivance, and which is certainly the least happy effusion of his genius, is partly founded on the eighteenth novel of the third part of Bandello, and partly on Prevost's Mémotres d'un Homme de Qualité. But whatever subject he chooses, his dramas are always formed on the Grecian model, and breathe a frecdom and independence worthy of an Athenian poct. Indeed, his Agide and Bruto may rather be considered oratorical declamations and dialogues on liberty than tragedies. The unities of time and place are not so scrupulously observed in his as in the ancient dramas ; but he has rigidly adhered to a unity of action and interest. He occupies his scene with one great action and one ruling passion, and removes from it every accessary event or feeling. In this excessive zeal for the observance of unity he seems to have forgotten that its charm consists in producing a common relation between multiplied feelings, and not in the bare exhibition of one, divested of those various aceompaniments which give harmony to the whole. Consistently with that austere and simple manner which he considered the ehief excellence of dramatic composition, he excluded from his scene all cowps de thédtre, all philosophical reflections, and that highly ornamented versification whieh had been so assiduously cultivated by his predecessors. 1n his anxiety, however, to avoid all superfluous ornament, he has stripped his dramas of the embellishments of imagination ; and for the fanibisy and flow of poetical language he has substituted, even in his best performances, a style which, though correct and pure, is generally harsh, elaborate, and abrupt ; often strained into unnatural energy, or condensed into factitious conciseness. The chief excellence of Alfieri consists in powerful delineation of dramatic character. 1n his Filippo he has represented, almost with the masterly touches of Tacitus, the sombre

character, the dark mysterious counsels, the suspensa semper ct obscura verba, of the modern Tiberius. In Polinice, the characters of the rival brothers are beautifully con- trasted ; in Maria Stuarda, that unfortunate qucen is represented unsuspicious, impatient of contradiction, and violent in her attach- ments. In Mirra, the character of Ciniro is perfect as a father and king, and Cecri is a model of a wife and mother. In the representa- tion of that species of mental alienation where the judgment has perished, but traces of character still remain, he is peculiarly happy. The insanity of Saul is skilfully managed ; and the horrid joy of Orestes in killing Agisthus rises finely and naturally to mad- ness, in finding that, at the same time, he had inadvertently slain his mother.

Whatever may be the merits or defects of Alfieri, he may be con- sidered as the founder of a new school in the Italian drama. His country hailed him as her sole tragic poet ; and his successors in the same path of literature have regarded his bold, austere, and rapid manner, as the genuine model of tragic composition.

Besides his tragedies, Alfieri published during his life many sonnets, five odes on American independence, and the poem of ktruria, founded on the assassination of Alexander J., duke of Florence, Of his prose works the most distinguished for animation and eloquence is the Panegyric on Trajan, composed in a transport of indignation at the supposed feebleness of Pliny's eulogium. 'The two books entitled La Ttrannide and the Essays on Literature and Government, are remarkable for elegance and vigour of style, but are too evidently imitations of the manner of Machiavel. His Antigallican, which was written at the same time with his Defence of Lowis X VI., comprehends an historical and satirical view of the French Revolution. The posthumous works of Alfieri consist of satires, six political comedies, and the Memoirs of his Life—a work which will always be read with interest, in spite of the cold and languid gravity with which he delineates the most interesting adventures and the strongest passions of his agitated life. See Mem. di. Vit. Alfiert ; Sismondi De la Lit. du Midé de 0 Hurope ; Walker's Memoir on Italian Tragedy; Giorn. de Pisa. tom. lviii. ; Life of Alficri, by Centofanti (Florence, 1842) ; and Vita, Giornult, Lettere di Alfieri, by Teza (Florence, 1861),

ALFORD, Henry, D.D., Dean of Canterbury, one of the most variously-accomplished churchinen of his day— poet, preacher, painter, musician, biblical scholar, critic, and philologist—was born at 25 Alfred Place, Bedford Row, London, October 7th, 1810 (died 1871). He came

of a Somersetshire family, five generations of which, in direct succession, contributed clergymen of some distinction to the English Church. The earlicst of these, his great- great-grandfather, Thomas Alford, who died in 1708, was for many ycars the vicar of Curry Rivell, ncar Taunton—a living that passed from one to another of his descendants. The father of Dean Alford studied for the bar, but after practising for a short time, followed the course of his predecessors by taking holy orders; and, until his death at a venerable age in 1852, had long been familiarly known and revered in his part of the country as the rector of Aston Sandford in Buckinghamshire. His first wife, the dean's mother, whose maiden name was Sarah Eliza Paget, was the younger daughter of a well-to-do banker of Tamworth in Staffordshire. A twelvemonth after their marriage, her husband, then practising as a special pleader, was by her premature death in childbed left a widower. The newly-born infant, who remained to the last the bereaved parent's only child, was confided in the first instance to the affectionate care of the home-circle in the house of his maternal grand- father. Towards the close of 1813 he was taken back to the lonely hearth of his father, who had now entered upon his clerical duties as curate of Stecple Ashton, near Trowbridge in Wiltshire. Being the only son of a secluded scholar, the boy's education was from an unusually early period scdulously cared for; his father being his first instructor, and at the outset his constant companion. So exceptional was his precocity that at six he had already written a little MS. volume entitled (in round hand) the Zravels of St Paul. Before he was eight he had penned a collection of Latin odes in miniature. When he was scarcely nine he had compiled, in the straggling characters of a school-boy, a compendious History of the Jews; besides drawing out a chronological scheme in which were tabulated the events of the Old Testament. Prior to the completion of his tenth year he actually produced a series of tcrse sermons or laconically outlined homilies, the significant title of which was Looking unto Jesus. During the absence of his father, who had

gone abroad as the travelling chaplain of Lord Calthorpe, Henry, at seven years of age, began the round of three academies, at Charmouth and Hammer- smith ; the happiest time of all for him as a schoolboy being three years and upwards passed in the grammar- school at Ilminster. His character was already displaying a marked individuality. He conld repeat not only readily but appreciatively an astonishing nuinber of lines in Greek, Latin, and English, selected from what were then and always afterwards his favourite classic authors. He indulged, too, in those early days, in the luxury of original versification. Then it was also that he first began to manifest that singular capacity for ingenious contrivance and that sur- prising neatuess and dexterity of manipulation for which he was afterwards remarkable. It was said of him later in life, that he could construct an organ and then play upon it ; and when his reputation for profound scholarship had been long established, his constructiveness was curiously manifested by his adaptation to the purposes of utility of the seemingly ordinary walking- stick he carried when travelling on the Continent. In its upper joint he secretcd his surplus money and his drawing materials; in its lower joint, pens, ink, wax, and pencils. Strangely contrasting with this ineradicable passion for nicety and precision was his delight at all times in giving himself up to the most diversified occupations, and in yielding, often at an instant's notice, as he sometimes notes with regret, to the temptation of mere discursiveness.

It was in the October of 1827 that the university life of Alford commenced. At seventeen he went up to Cam- bridge, having won his scholarship, and had his name eutercd at Trinity College. During the midsummer of his

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fourth year at Cambridge, in the June of 1831, he had obtained the second prize essay. As the autumn deepened into wintcr he was nervously preparing to go in for honours at the examinations. In the possibility of his success he had not the slightest confidence, yet on the 21st January 1832 he appears as thirty-fourth wrangler; while on the 25th February his name comes out eighth on the first-class list of the classical tripos. He now began to take pupils, and within the interval which elapsed between his taking his degree and giving himself up more completely to the great work of his life—

the elaboration of his edition of the Greek New Testament—it is believed that he had under his charge at least sixty. These included barristers, clergymen, peers, and members of parliament; many of whom afterwards attained positions of eminence, all of them having their characters moulded more or less under the inspiring influence of his. In his twenty-sixth year he was united in marriage to his cousin Fanny, a daughter of his uncle, the Rev. Samuel Alford, who was then, as his father and his great-grandfather had been before him, vicar of Curry Rivell. Surviving her husband after nearly thirty- five years of wedded life, during which she had seen the development of his intellectual powers and the realisation of some portions at least of his many-sided ambition, she brought out in 1872 his journals and correspondence, care- fully edited by herself. A curiously characteristie side-light is thrown upon Alford's inner nature, both moral and intel- lectual, by the circumstance there recorded—that, with a view to enable his future wife to read the New Testament in Greek, he wrote with his own hand, in the interval be- tween betrothal and marriage, an elementary Greek gram- mar of sixty folio pages. The incident is all the more interesting as affording the earliest glimpse of what soon proved to be his dominant aspiration. His researches in secular scholarship were at this time becoming every year more and more adventurous. He shrank not from proclaim- ing even then that he regarded Niebuhr as "one of the greatest men in this ignorant and obstinate world." Mean- while, in the midst of his excursive inquiries as a student in the most opposite directions, he was indulging at every available 'opportunity in the lotos-delight of his own day- dreamings; and in February 1833, he published his maiden work asa lyrist, Poems and Poetical Fragments. Simply as an instructor he was working stcadily seven hours a-day; but the time came when, in furtherance of his favourite researches, he was known to toil at the desk sometimes twelve or fourteen.

Resolved from childhood to tread the path of life in the footsteps of his forefathers, Alford was ordained deacon on the 26th October 1833, and at once began active pro- fessional work as curate of Ampton. So modest was his own estimate of his intellectual capabilities, that it was with unaffected surprise he found his name second on the lst of the six Fellows of Trinity who were elected on the Ist of the following October. On the 6th November he was admitted to priest's orders, and four months afterwards, upon the

4th March 1835—scarcely a week before his marriage—entered upon his parochial labours of eighteen years' duration as vicar of Wymeswold in Leicestershire. Twice during the interval of his scholarly seclusion in that quiet vicarage he was vainly tempted with the offer of a colonial bishopric, first in 1841 as bishop of New Zealand, and again in 1844 as bishop of New Brunswick. He con- tentedly drudged on for years together in comparative obscurity among his pupils and parishioners. Although a ripe scholar, and remarkable for his splendid versatility, it was less by the brilliancy of his achievements than by the sheer force of the most diligent perseverance that he pushed his way eventually into the front rank, and com- manded at last the recognition of his contemporaries.

Whatever he put his hand to he carried out with a zeal that at times looked almost like dogged determination. Thrown from his horse in the February of 1847 when going to deliver his first lecture, although very seriously shaken and disfigured, he nevertheless punctually appeared before his audience with his face and head covered with surgical bandages, and—resolutely lectured. His reputa- tion as a lecturer of exceptional power was within a few years from that time thoroughly established. Several of his discourses, notably one on Saul of Tarsus, with others on themes as varied as astronomy, music, scenery, and Christianity, acquired in the end a certain amount of celebrity. For two years together, in 1841 and 1842, he held the chair at Cambridge of Hulsean lecturer. As the result of his labours in that capacity, two substantial volumes afterwards made their appearance. Meanwhile, in the midst of his more serious avocations, he was at uncertain intervals making good his claim to be regarded as one of the more subtle and tender of the minor religious poets of England. Adopting an old forgotten title of Quarles's, he brought out, on his arrival at Wymeswold (1835), in two volumes, his School of the Heart, coupled with a reissue of his minor poems and sonnets. In 1838, he edited, in six vols., the works of Donne, prefixing a luminous preface, at once critical and biographical. Throughout the year 1839 and part of 1840 he edited a monthly magazine called Dearden's Miscellany. In 1841 he published, with other new poems, his Abbot of Muchelnaye. A collection of Psalms and Hymns appeared from his hand in the spring of 1844. A couple of years before that, in 1842, he had first entered upon his duties at Somerset House, where he acted for many years as examiner in logic and moral and intellectual philosophy in

the university of London. So youthful was his appearance at the date of his first receiving this appoint- ment, that on his entering the apartment where he was awaited by the candidates, he was mistaken for one of themselves.

What eventually proved to be the noblest of all his literary undertakings, lis new edition, with running commentary, of the Greek Testament, engrossed his atten- tion for fully twenty years together, from 1841 to 1861. Originally designed for the use of students in the universities, the work, from its modest first projec- tion, grew in his hands to enormous proportions. He fancied at starting that a single year might witness its completion, and that a couple of thin octavos might embrace both text and commentary. By the time the expanding scheme was actually realised twenty years had elapsed, and the work had swollen into four ponderous tomes, the con- tents of which were as weighty as they were comprehensive. The idea of the work was suggested to Alford's mind as he listened one day to a sermon at Cambridge. What he pro- posed to himself at the outset was simply to adopt the main text, and to combine with it the greater part of the readings of Philipp Buttmann and Karl Lachmann. This, however, led toa more extended plan of critical labour and research, including a comprehensive digest of the various readings founded on the latest collations of the principal manuscripts, the Codex Vaticanus, the Codex Sinaiticus, the Codex Alexandrinus, and others. With a view to illustrate more clearly than ever the verbal and idiomatic or constructional usages of the sacred text, an entirely new collection of marginal references was compiled. Added to this there was a copious abundance of English notes, both exegetical and philological. Conscious of tlic vast stores of learning that had been accumulating in Germany, Alford from an early date determined to render himself as thoroughly as possible a master of the German language and at home in German literature. This intention was fairly carried out at Bonn before the close of the summer

of 1847. Then, but hardly till then, he felt himself at last duly qualified to edit the Greek Testament. From that time he prepared in earnest to open up systematically to the contemplation of English readers the wealth of German criticism, actually made plain for the first time in our language

through his Prolegomena and subsequent inci- dental commentary. In November 1849 (the month the author took his B.D. degree at Cambridge), vol. i. of the Greck Testament was published, containing the four Gospels. Through it theological students in this country had placed within their reach in au epitomised form the latest results of the labours of continental critics on the Greek text, including portions even of those of Constantine Tischendorf. Issued from the press volume by volume, the work, as already remarked, was not completed till long afterwards. In January 1861 the fourth or final voluine, beginuing with the Epistle to the Hebrews and ending with the Book of Revelation, made its appearance. What is chiefly notice- able in regard to the work is its strictly critical character. It is the production of a philologist rather than of a theo- logian. Abbreviations, punctuations, elisions of ortho- graphy, systematic ellipses, the merest turns of the pen in this or that manuscript, are weighed against microscopic scruples in the balance of his judgment. There can be little question that the work appreciably increased the aggregate amount of the biblical knowledge of Alford's immediate contemporaries. So carefully matured were his researches in the regions of exegesis, already crossed and recrossed by the footprints of countless commentators, that the work is regarded as in many respects authoritative even among those who differ from him widely on many important questions.

Early in 1853 Alford first preached in Quebec chapel, London, the building in which his father had been ordained deacon forty years before. Before the year was out, on the 26th September, he had removed from his picturesque church in the wolds of Leicestershire to the plain con- venticle in Tyburnia. There he remained for nearly four years, toiling assiduously, preaching twice every Sunday to

'a large and cultured congregation. Seven volumes, issued

from the press at intervals, have, under the title of Zhe Quebec Chapel Sermons, preserved 153 of the more remark- able of these discourses—those preached by him in the morning—all of which were carefully prepared beforehand. As a preacher his style was severe and earnest rather than eloquent or impassioned. Perhaps the finest discourse he ever delivered was the one on the text, " A great multitude which no man could number." It

was preached from the cathedral pulpit shortly after his advancement by Lord Palmerston, in March 1857, to the deanery of Canterbury. Throughout his life, but especially towards its close, his chief delight intellectually appears to have been the rapid alternation of his pursuits. While he was yet in the midst of his biblical researches he was, simultaneously, at the beginning of 1851, translating the Odyssey, arranging his poems, with additions for their American republication, and preparing an article for the Hdinburgh Review on the St Paul of Conybeare and Howson. A series of ingenious lectures, delivered by him in his capacity of philologist, on being compacted intoa manual of idioni and usage, entitled The Queen's English, attained a high degree of popularity. Nevertheless, in spite of their wholly unpretentious and essentially humorous character, these mere casual notes on spelling and speaking drew down upon their author one of the sharpest criticisms he ever provoked, sarcas- tically entitled The Dean's English. The Contemporary Review was inaugurated under his editorship; and from January 1866 to August 1870 was conducted by him as a sort of neutral ground for religious criticism. Under the title of Zhe Year of Prayer, Alford in 1866 published a I. — 64

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book of family devotion; and in 1867, a collection of original hymns called The Year of Praise, works of little pretension, but by which his name was widely popularised. His latest poetic effusion of any considerable length was The Children of the Lord's Prayer, which appeared in 1869 as the letterpress accompaniment to designs by F. R. Pickersgill, R.A. The miscellaneous papers he had con- tributed to periodicals were, the same year, collected under the name of Essays and Addresses. He brought out, in 1865, his Letters from Abroad, eminently characteristic records of travel, mainly descriptive of Italian cities and scenery; and in 1870, a collection of spirited pen and pencil sketches of The Riviera, the latter being reproduced from his water-colour drawings by the aid of chromo-litho- graphy. The artist faculty, it has been observed, and not extravagantly, "would have made him a great land- scape painter had he not, either from preference or neces- sity, become a great Greek scholar and a dean." Such were the pliancy and the resilience of his nature that he would turn with zest, after hours of severe study given to the collation of a Hebrew manuscript or to

the examination of the exegetical subtleties of a German commentator on the Greek Testament, to doctoring the hall clock and making it strike the half-hours, to tuning the piano in the drawing-room, or to playing games with his children in the nursery. The wooden front of the organ (which instrument he could play with the hand of a master) was carved according to his own ingenious design and by his own dexterous chiselling. A Masque of the Seasons, per- formed as a holiday pastime on New Year's Day 1861, in the deanery, owed to him both the words and the music— he himself, besides, enacting in it the part of " Father Christmas." A couple of years before his death he appeared as a novelist, conjointly with his niece producing the story of Netherton on Sea. The last work of any maguitude upon which he adventured as a biblical scholar was his Com- mentary on the Old Testament. In the diversity of his avoca- tions, and the thoroughness with which they were, one and all, carried to a successful issue, he was his own severest taskmaster. Throughout life, until he was stretched upon his deathbed, he never seemed to indulge in the luxury of inaction. The end came at length to him calmly, on the 12th January 1871, and five days afterwards his remains were interred under a yew tree in St Martin's churchyard, within view of the towers of Canterbury Cathedral. It is significant of the tender poetical quaintness of his whole character, that there is inscribed above his tomb, in obedience to his own directions, " Diversorium Viatoris Hierosolymam Proficiscentis." A statue of the dean, by Pfyffers, was un- veiled, before the year of his demise had run out, in a niche on the west front of the most ancient of our cathedrals. Dean Alford was a man as variously accomplished as any of his generation; and he would unquestionably have risen to far greater eminence than he ever achieved in poetry, in oratory, in music, in painting, in theology, or in general literature, if he had aimed at excelling in one or two alone of those arts or sciences, instead of endeavouring to shine in all of them alike. (¢. K.) ALFRED, or ALFRED, THE Great, the youngest son of Aithelwulf, king of the West Saxons, was born at Wantage in Berkshire in 849 a.p. At an early age he was summoned to the assistance of his brother Aithelred against the Danes. These formidable enemies, whose object hitherto had been mere plunder, were now aiming at a permanent settlement in the country, and after ravag- ing and subduing Northumbria, East Anglia, and the greater part of Mercia, they fell with their united forces on Wessex itself. A series of encounters took place, in which Alfred greatly distinguished

himself, especially at Ashdown, where the Danes were routed with great slaughter, and

left several of their most famous leaders dead on the field of battle. Aithelred dying in the midst of the struggle, Alfred was unanimously elected king (871), in the twenty- second year of his age. About a mouth after his accession he met the enemy at Wilton, where, after a long and doubtful struggle, he was defeated. Both parties were now becoming tired of the war. Immeuse loss had been suffered on both sides, and although the Danes on the whole had been victorious, their victories had brought them no substantial results. A treaty of peace was con- eluded, and the Danes withdrew to London.

On the cessation of hostilities, Alfred was enabied to turn his attention to naval affairs. The sea was swarming with pirates, and their descents on the coast kept the country in a state of perpetual alarm. To cope with them successfully Alfred resolved to meet them on their own element, and a naval victory which he gained over seven Danish rovers in 875 is the first on reeord won by Englishmen. In the following year the peace of 871 was broken. An army of Danes from East Anglia, under their king, Guthrum, sailing along the south coast, landed in Wessex, seized upon Wareham, and afterwards upon Exeter, then the centre of a disaffected Celtic population, and it was not till 877 that the country was once more free from the invader.

The year 878 was the most eventful in the course of Alfred's reign. At mid-winter, without any warning, the Danes came pouring into Wessex from the north, seized Chippenham, and making it the centre of their operations, quickly overran the country. Many of the inhabitants, in despair, fled into foreign lands, and Alfred, totally unpre- pared to meet the storm, retired to the marshes of Somerset. Never at any other period, either before or after, were his fortunes so low, and the national existence itself was at stake. Had Alfred, like his kinsman Burhed of Mercia, left his people in their hour of need, the heathen Dane in all probability would have acted like the heathen Englishmen before him—a new race would have possessed the land, and the names of England and Englishmen would have disappeared from the page of history. Alfred's mis- fortunes only roused him to fresh exertions, and his

military skill and valour enabled him to earry his people in safety through this momentous crisis. ortifying him- self at Athelney about Easter, he secretly matured his plans for meeting the enemy, and seven weeks after, having collected his forces at Brixton near Selwood, he rapidly advanced in a north-easterly direction, and was close upon the Danes before they had any intelligence of his approach. A fierce conflict ensued at Ethandun, now Edington, in which the Danes were entirely defeated; and about fourteen days after this they were compelled to sue for peace. By the treaty of Wedmore, Watling Street (the old road running across the island from London to Chester and the Irish Channel) was to be the boundary between Alfred and the Danes, the latter were to be vassals to the kings of Wessex, and their chiefs to receive baptism. This treaty was observed by the Danes with much greater fidelity than those of an earlier date had been. Guthrum their king and about thirty of their chiefs were baptised at Wedmore, and Alfred, who stood sponsor for Guthrum, gave him the name of Aithelstan. The Danish army after this slowly withdrew, and eventually settled down peaceably in East Anglia. The acceptance of Christianity by their chiefs seems indeed to have broken for a time the fierce crusading energy which gave a special animus to the piratical expedi- tions of the heathen Danes. ;

As soon as peace had been concluded Alfred turned his attention to the internal affairs of his kingdom. He vigorously set to work to put the country in a complete state of defence. Old fortifications were repaired and new

ones raised in suitable localities. The fleet was brought into a state of greater efficiency, and it was Alfred indeed that laid the foundation of England's naval greatness. He cleared the land of the bands of robbers that infested it, and took care that justice was impartially administered to all his subjects, severely punishing any wilful perversion of it on the part of the judges. In his code of laws, which is a compilation from those of his predecessors, he wisely abstained from introducing much of his own, giving as his reason that he was afraid it might not be accepted by posterity. He greatly encouraged commerce, and took a lively interest in geographical discovery. We have from his pen a minute account of two voyages of Ohthere, especially of the one round the North Cape into the White Sea, and

also of a voyage of Wulfstan to the Baltic. And it is to Alfred that we are indebted for the best account that

has reached us of the Germany of the 9th century.

Alfred's devotion to learning, and his exertions in the cause of education are among the most remarkable features of his reign. So deep was the popular ignorance when Alfred ascended the throne that, according to his own testimony, hardly any one south of the Thames could under-

stand the ritual of the church or translate a Latin letter.

It was one of the strongest and most cherished of his purposes that this state of matters should be entirely changed, and that every free-born English youth who had

the means should qualify himself to read English correctly. In order to accomplish this, he rebuilt the monasteries

which had been cast down in the late wars, and which

were the great centres of education in those days, invited learned men from all quarters to his court, and by their assistance completed a number of works for the diffusion of knowledge throughout his dominions. These were not original compositions but free translations of Latin authors that were held in much esteem at the time, and the fact that Orosius and Bede are two of the works he selected, shows the high value he set upon an acquaintance with history and geography. A copy of his version of Gregory's Pastoral Care was sent to every diocese for the benefit of the clergy. It is in the preface to that work that Alfred gives his touching account of the decay of learning, and expresses his desire for its revival. But the work which Seems to have had the greatest attraction for him was The Consolations of Philosophy by Boethius. In his translation of this work Alfred gives us more of his owu original composition, and a deeper insight into his thoughts and feelings, than in any other of his works. His Manual or Handbook, which is known to have been in existence in the 12th century, is lost, and this is the more to be regretted since, besides the extracts from Latin authors which it

contained, it is believed that he had inserted in it not a few compositions of his own.

In occupations such as these fifteen years of comparative tranquillity, disturbed now and then by troubles with the Danes, passed away. A fresh swarm from abroad had landed in Kent in 885 and besieged Rochester, but on the king's approach they raised the siege and returned to their ships. The next eight years were years of uninterrupted peace; but the Danes, suffering a severe defeat at the hands of Arnulf, king of the East Franks, sailed for England in two divisions in 893. One of these divisions was under the command of the terrible Hastings. Their arrival was a signal to the Danes of Northumbria and East Anglia, who rose in great numbers to aid their kinsmen. Alfred, however, was better prepared to meet the danger than he had formerly been. His towns were so strong that the

anes seem studiously to have avoided them. A body of the enemy was routed by Alfred at Farnham in Surrey. Another great host, moving to the west in the line of the Thames, was followed by three of Alfred's alder-

men to Buttington in Montgomeryshire and completely defeated. Those who escaped made their way to Essex. Leaving their wives and children there, and receiving con- siderable additions to their numbers, they crossed the country once more and established themselves within the fortifications of the old Roman town of Chester, which was then uninhabited. There they remained for the winter, when, provisions failing them, they removed to Wales, and with the harvest of plunder they gathered there they retreated into Essex by way of the friendly districts of Northumbria and East Anglia. So rapid had their movements been that Alfred's army was unable to keep up with them. The same year (895), before winter set in, the Danes sailed up the Thames into the Lea, and selecting an advantageous position on the banks of the latter stream, constructed a fortress about 20 miles above London. As this proved a considerable annoyance to the citizens, they attacked it the following summer, but were repulsed with great loss. During harvest the king was obliged to encamp in the neighbourhood of the city to protect the reapers while gathering in their crops. He afterwards raised two forts on each side of the Lea, and so effectually blocked up the passage of the river that the enemy abandoned their vessels and proceeded to

Bridgenorth on the Severn. In the summer of 897 the great Danish host broke up, and part of them returned to the continent. The rest dis- persed through Northumbria and East Anglia, and for some time gave Alfred no little trouble by their piratical excursions. By means of vessels formed after a model of his own, of unusual length and speed, he succeeded at last in curbing his Danish foes, but not till after a desperate encounter with them on the south coast, in which the advantage was not all on his side. The war was, as usual, accompanied by pestilence, and great numbers perished, many being persons of the highest rank in the state. The rest of Alfred's reign, about which we know almost nothing, seems to have been passed in peace. He died in the year 901, at the age of fifty-two, and was buried at Winchester.

The memory of Alfred has ever been gratefully cherished by his countrymen. There never perhaps was a monarch: so highly esteemed ; and traditional stories of the most fascinating description cluster around his name, in which he appears almost to as much advantage as in real history. Institutions that existed long before his time, but whose origin it is impossible to trace, have erroneously been attributed to him; and in the times of Norman oppres- sion, when the people were groaning under the burden of slavery, they fondly called to mind the " Darling of the English," to whom they ascribed all those rights and privileges which they so highly valued, and of which they had been unjustly deprived. Time but adds to Alfred's praises. With one consent our historians agree in char- acterising him as the wisest, best, and greatest king that ever reigned in England.

The following is a list of Alfred's works :—

1, Manual or Handbook, of which no copy is known to exist. 2. Laws (sce Wilkin's Leges Anglo-Saxonicw, 1721, and Thorpe's Ancient Laws and Institutes of England, London, 1840). Transla- tions into Old English (Anglo-Saxon) of the following :—3. Bede's Ecclesiastical History, edited by Wheloc, Cambridge, 1643-4, and by Smith, Cambridge, 1722. 4. The Universal History of Orosius, edited by Thorpe, London, 1857. 5. The Consolations of Philosophy, by Boethius, edited by Fox, London, 1864. 6. Gregory's Pastoral Care, edited by Sweet for the Early English Text Society, London,

1871-2.

For further information about Alfred sce Pauli's Life of Alfred and Freeman's Old English History and History of the Norman Conquest.

ALG, or Hypropuyta, a large order of cellular, flowerless, cryptogamic plants, found in the sea (seaweeds), in rivers, lakes, marshes, hot springs, and moist places, all over the world. They consist of a brown, red, or green,

flattened, cellular, leaf-like expansion, called a thallus, sometimes stalked, which bears the organs of reproduction. Some have root-like processes by which they are attached to rocks. These do not act like the nourishing roots of flowering plants; they simply fix the. plants and enable them to sway about in the water. This is markedly the case with the Laminarias, or large tangles of our coasts. The leafy appendages of seaweeds are called fronds. They vary in size, colour, and consistence. Some of the red and grcen delicate fronds form beautiful objects when carefully dried and laid out on drawing-paper. In order to dry sea- weeds they must be first washed carefully in fresh water to separate saline matters, and then placed within drying- paper and subjected to pressure. Very delicate seaweeds should be floated out in water, drawing-paper being placed under them, and their fronds being carefully arranged on the paper before they are raised out of the water. They must then be dried partially in the air, and afterwards under pressure between sheets of drying-paper.

Seaweeds are composed entirely of cells, which in some instances become elongated so as to have the appearance of tubes. Some Alge are uni-cellular, that is, are composed of a single cell, as occurs in some Desmidiex, as Closterium. At other times they are composed of numerous cells, which are kept together by a gelatinous matter, but separating easily from each. other so as to have an independent exist- ence, This is observed in the red snow plant (Protococcus or Palmella vivalis). The cells of seaweeds are sometimes joined together so as to form a linear series, and to give them a thread-like appearance ; and in such a case, when the divisions between the cells are marked, the whole appears like a beaded necklace of cells. When

the cells are united both lengthwise and laterally they then form an expanded flat frond. In some instances the frond is gelatinous.

The germinating bodics or spores of seaweeds are cells often contained in cavities (Fig. 2). They vary in colour, and the fronds have frequently the same colour as the spores. In reference to their colour, Algee have been divided into three sub-orders: 1. Melanospermez, brown coloured seaweeds (Fig. 1), with olive-brown spores ; 2. Rhodospermeze, rose-coloured seaweeds, with red spores ; 3. Chlorosperme, green-coloured seaweeds, with green spores.

Fig. 1. Fig. 8.

Fig. 1.—Thallus, tt, of Fucus vesiculosus, the common Bladder Seaweed, with air-vesicle, v, and masses of conceptacles constituting the fructification, fr, fr, which is sometimes called gleba. Fig. 2.—Fructification of a Seaweed, con- taining spores, which are ultimately discharged at an opening, 0. Fig. 3.— Tetraspore of one of the rose-colourcd Seaweeds. ‘

Alge are multiplied by the division of cells and by

spores. By cell-division there is a multiplication of cells, and by separation from the parent plant these cells may

ALG 4

bear buds. union of cells, or what is called conjugation. cess two kinds of cells unite by means of a tube, and the contents of the one passes into the other, thus giving rise to germinating sporcs. the green matter often seen in ponds, and called silk-weed. There are also observed in Alge two kinds of fertilising bodies, one set called Antheridia, containing moving fila- ments or spermatozoids ; and the other called Archegonia, . containing a rudimentary cell, which, after contact with the spermatozoids, becomes a spore forming a new plant. The spores produced by some Algw move about in water, and have been called Zoospores. Their spontaneous movements are effected by means of vibratile slender threads called cilia, These zoospores are contained in a cell, which ultimately bursts and scatters them. The pro-

spores get fixed to a rock or the wood of a pier, and then the cilia disappear.

they are placed round the whole circumference of the spore.

True fertilisation is effected by means of In this pro-

This is seen in Conferve, such as

cess is well seen in a green Alga called Vaucheria. The z00- spores move about for a certain time, and ultimately the

Cilia sometimes occur in pairs at one end of a spore, numbering two or three ; at other times

Spores have a tendency to divide into four ; such com- pound spores are called tetraspores (Fig. 3). They are common in the sub-order Rhodospermee. They seem to differ from ordinary spores, and to be more of the nature of buds. In some Alga, such as Corallines, there is a coating of calcareous matter which conceals their tissue. This can be removed by means of hydrochloric acid. Diatoms, a subdivision of Alge, are so called from two Greek words signifying to cut through, in allusion to the mode of divi- sion into two valves. They are microscopic one-celled bodies, covered externally by a siliceous or flinty coat. They are on the confines of the animal and vegetable king- doms, and have been referred sometimes to the one and sometimes to the other. Their mode of reproduction by conjugation and spores seems to indicate their alliance with Algz, although some still place them among infusorial animalcules. The siliceous markings of Diatoms are very beautiful microscopic objects. After exposure to the action of fire or nitric acid, the silex remains unaltered, and in that state the streaks of the covering are easily observed.

Many of the Alge supply nutritious food. Rhodymenia palmata, one of the red_ seaweeds, is the dulse of the Scotch, the dillesk of the Irish. Chondrus (Sphcerococens) crispus and C. mammillosus, two Rhodosperms, receive the name of carrageen or Irish moss. Their fronds consist in part of a substance allied to starch, which is extracted by putting them in water, and on cooling it forms a jelly. Species of Ulva, one of the Chlorosperms, supply the green laver. Species of Caulerpa furnish food to turtles. Lamin- aria

digitata, and Laminaria saccharina, under the name of tangle, are eaten in the north of Europe. Dulse and tangle was formerly a common cry in the streets of Edinburgh. D'Urvillea utilis is used as food in Chili Alaria esculenta, a British species, is also edible. Gigartina speciosa is used for jelly in the Swan River settlement. Gracilaria lichenoides, under the name of Ceylon moss, is used for soups and jellies. Gracilaria spinosa supphes the Agar-Agar in China. Wostoc edule is a Chinese article _ of diet, The edible nests of China are supposed to be formed from seaweeds. Plocaria tenaw is used in China to furnish glue. Iridewa edulis is edible. Laurencia pin- natifida is called pepper-dulse on account of having pungent qualities. Seaweeds form an excellent manure. They are used on many farms situated near the sea-shore. Seaweeds after burning yield barilla, an impure carbonate of soda. Kelp was for many years prepared from sea weeds in Scotland, more especially in the Western and Northern Islands. '

As regards the distribution of seaweeds, some are eosmo- politan or pelagie, as species of Ulva and Enteromorpha, whieh are equally abundant in high northern and southern latitudes, as they are under the equator and in temperate regions. Many Diatomacez are distributed from pole to pole. In general, however, seaweeds are more or less limited in their distribution, so that different marine floras exist in various parts of the ocean. The marine species have been estimated at about 6000, and they are distributed in various regions. The Northern Oeean, from the pole to the 40th degree, the sea of the Antilles, the eastern coasts of South America, those of New Holland, the Indian Arehipelago, the Mediterranean, the Red Sea, the Chinese and Japanese seas, all present very large marine regions, each of which possesses a peculiar vegeta- tion. The degrec of exposure to light, and the greater or less motion of the waves, are important in the distribution of Alge. 'The intervention of great depths of the ocean has an influence on sea plants similar to that of high moun- tains on land plants. Melanospermeze inercase as we approaeh the tropics, where the maximum of the species is found. Rhodospermee chiefly abound in the temperate zone ; while Chlorospermez form the chief marine vegetation of the polar zone, and abound in the colder temperate zone. 'The green colour is characteristic of those Algee which grow either in fresh water or in the shallower parts of the sea; the olive-coloured Alge are abundant between

the tide-marks ; while the red-coloured speeies occur chiefly in the deeper and the darker parts of the sca.

Some seaweeds are worthy of note on account of the mode of their growth and distribution. Chorda Filum, a long cord-like seaweed, lies in beds of 15 to 20 miles in length, and only about 600 feet in breadth, in the North Sca and the British Channel. Sargassum bacciferwm con- stitutes the Gulf-weed, which has been noticed by all who have crossed the Atlantic. The Gulf-weed has never been seen attached, but always floating. From the abundance of this seaweed its loeality is called the Sargasso Sea. The most remarkable of the seaweeds, as regards size and the extent of range, are Macrocystis pyrifera and Lami- nuria radiata. Masses of Macroeystis, like green meadows, are found in every latitude. Many specimens have been seen about 300 feet long; some even extend to 700 feet or upwards.

ALGARDI, Atzssanpro, one of the most celebrated sculptors of Italy, was born at Bologna in 1602, and died in 1654. While he was attending the school of the Caracci his preferenee for the plastic art became evident, and he plaeed himself under the instruction of the seulptor Con- venti. At the age of twenty he was brought under the notice of Duke Ferdinand of Mantua, who gave him several commissions. He was also much employed about

the same period by jewellers and others in modelling in gold, silver, and ivory. After a short residenee in Veniee, he went to Rome in 1625 with an introduction from the Duke of Mantua to the pope's nephew, Cardinal Ludovisi, who employed him for a time in the restoration of aneient statues. The death of the Duke of Mantua left him to his own resourees, and for several years he earned a preearious maintenance from these restorations and the commissions of goldsmiths and jewellers. In 1640 he exeeuted for Pietro Buoncompagni his first work in marble, a colossal statue of San Filippo Neri, with kneeling angels. Imie- diately after, he produced a similar group, representing the execution of St Paul, for the church of the Barnabite Fathers in Bologna. These works, displaying great tech- nical

skill, though with considerable exaggeration of expression and attitude, at once cstablished Algardi's reputation, and other commissions followed in rapid sue- eession, The turning-point in Algardi's fortune was the accession of Innocent X., of the Bolognese house of Panfili, to the papal throne in 1644. He was employed by Camillo Panfili, nephew of the pontiff, to design the Villa Doria Panfili outside the San Pancrazio gate. The most important of Algardi's other works were the monu- ment of Leo XI., a bronze statue of Innoeent X. for the Capitol, and, above all, Za Fuega d'Attila, the largest alto-rilievo in the world, the two principal figures being about 10 feet high. The great teehnieal exeellence of these works is considerably marred by an exaggeration of expression resulting from the vain cndcavour to produee in marble effeets which can only be legitimately brought out on canvas. From an artistic point of view, he is most successful in his portrait-statucs and groups of children, where he is obliged to foilow nature most closely. In his later years he beeame very avaricious, and amassed a great fortune.

ALGAROTTI, Francesco, Count, was born at Venice on the 11th December 1712. He went abroad in his youth, and in 1733 visited Paris, where he issued his Newtonian Philosophy for the Ladies, in the work entitled The Plurality of Worlds. He was much honoured by Frederick the Great, who, when crowned at Kénigsberg in 1740, ereated him a eount of Prussia. He died at Pisa on the 23d of May 1764, and, by his own direetion, the following inscription was placed upon his tomb :— fe jacet Algarottus, sed non omnis. He is allowed to have been a great connoisseur in painting, sculpture, and architecture; and he contributed mueh to the reformation of the Italian opera. His works (6 vols., Leghorn, 1764; 17 vols., Venice, 1791-4) are numerous, and on a variety of sub- jects, abounding with vivaeity, elegance, and wit.

ALGARVE, the most southerly province of Portugal, is bounded on the E. by the Spanish province of Seville, from which it is separated by the river Guadiana; on the N. by Alemtejo ; and on the W. and §. by the Atlantie Ocean. Its length from east to west is 85 miles, the average width is 22 miles, and the area, according to the most recent measurement, 1865 square miles. In 1868 the population was 177,342, giving the small proportion of 95 to the square mile.

The Sierra de Caldeiraon and the Sierra de Monchique extend across the northern part of the province, and, sweeping to the south-west, terminate in the lofty pro- montory of Cape St Vincent, the south-west extremity of Europe. Between the mountainous tracts in the north and the southern coast stretches a narrow plain, watered by numerous rivers flowing southward from the hills. In the hilly districts the roads are bad, the soil unsuited for cultivation, and the inhabitants few. Flocks of goats are reared on the mountain sides. The level country along the southern coast is more fertile, and produces in abun-

dance grapes, figs, oranges, lemons, olives, almonds, and aloes, and even the plantain and the date. The land is, however, not well suited for the production of cereals ; little wheat or other corn is grown in the province, and its grain supplies are chiefly derived from Spain. On the coast the people derive their subsistence in great measure from the fisheries, tunny and sardines being caught in considerable quantities. Salt is also made from sea-water. There is no manufacturing or mining industry of any importance. The harbours are bad, and the whole foreign trade is carried on by ships of other nations, although the inhabitants of Algarve are reputed to be the best seamen and fishermen of Portugal. The chief exports are dried fruit, wine, salt, tunny, sardines, and anchovies.

The name of Algarve is derived from the Arabic, and signifies a land lying to the west. The province was taken from the Moors in 1253 by Alphonso III. king of Por- tugal, who then assumed the additional title of king of Algarve. It is sometimes designated the district of Faro, and is subdivided into fifteen communes and sixty-two parishes. The chief town is Faro, and among the other towns are Castro Marino, Tavira, Portimao, Lagos, and Sagres, all on the coast or on the estuaries of the rivers, and Silves, on the river Portimao, the ancient Moorish capital of Algarve.

ALGAU, or ALLGAU, the name now given to a compara- tively small district forming the south-western corner of Bavaria, and belonging to the province of Swabia and Neu- burg, but formerly applied to a much larger territory, which extended as far as the Danube on the north, the Inn on the south, and the Lech on the west. The Algau Alps contain several lofty peaks,

the highest of which is Madele- Gabel, 8611 feet above the sea. The district is celebrated for the cattle, milk, butter, and cheese that it produces.

AL-GAZALI, Apu Hamep MupammapD, usually described as an Arabian philosopher, was really a Moslem theologian who met the heretical philosophers on their own ground. He was born in 1058, and belonged to the sect of the Ascharites, or extreme right of the Motecallemin, who (and not the philosophers) were the real Arabian school- men. At thirty-three he became the head of a theological college at Baghdad, where his professor's chair was sur- rounded by eager crowds, including all the imams of the country. It was a time of keen speculation, when philo- sophic scepticism was encouraged in high places ; and the premature convictions of Al-Gazali gave way under a violent reaction against the orthodox creed. Driven by mental inquietude, he escaped from Baghdad on the plea of making a pilgrimage to Mecca, but went to Syria, and (after visiting, though a Mahometan, the Holy Sepulchre at Jerusalem) settled at Damascus, where he spent ten years in seclusion and meditation. Recalled by his private affairs as he was on his way to Egypt, he returned to Baghdad, reluctantly resumed teaching (which he continued for fifteen years), then retired to Tous, his native town, and devoted his remaining years to the contemplative life of the Sufis, who had been his earliest instructors. He died in 1111. His outer life, so restless and unquiet, was the reflex of a mental history disturbed by prolonged agita- tion. Revolting, in the height of his success, against the current creed, he began to examine the foundations of knowledge. Where could certainty be found? In the perceptions of the senses? But these are contradicted by one another, and disproved by reason. In the notions of reason? Reason, indeed, professes to furnish us with necessary truths ; but what assurance have we that the verdicts of reason may not be reversed by some higher authority? Al-Gazali then interrogated all the sects in succession to learn their criterion of truth. He first applied to the theological schoolmen, who grounded their religion

on reason; but their aim was only to preserve the faith from heresy. He turned to the philosophers, and examined the accepted Aristotelianism in a treatise which has come down to us—TZhe Destruction of the Philosophers.

He assails them on twenty points of their mixed physical and metaphysical peripateticism, from the statement of which, in spite of his pretended scepticism, we can deduce some very positive metaphysical opinions of hisown. He claims to have shown that the dogmas of the eternity of matter and the permanence of the world are false; that their description of the Deity as the demiurgos is unspiritual ; that they fail to prove the existence, the unity, the sim- plicity, the incorporeality, or the knowledge (both of species and accidents) of God; that their ascription of souls to the celestial spheres is unproved ; that their theory of causation, which attributes effects to the very natures of the causes, is false, for that all actions and events are to be ascribed to the Deity; and, finally, that they cannot establish the spirituality of the soul, nor prove its mortality. These criticisms disclose nothing like a sceptical state of mind, but rather a reversion from the metaphysical to the theological stage of thought. He denies the intrinsic tendencies, or souls, by which the Aristotelians explained

the motion of the spheres, because he ascribes their motion

to God. The sceptic would have denied both. Mr Lewes rightly censures M. Renan for asserting of Al-Gazali's theory of causation— Hume n'a rien dit plus.' It is true that Al-Gazali maintains that the natural law accord- ing to which effects proceed inevitably from their causes is only custom, and that there is no necessary connection between them. So far the Eastern and the European sceptic are on the same ground. But while Hume abso- lutely denies the necessity, Al-Gazali merely removes it one stage further back, and plants it in the mind of the Deity. This, of course, is not metaphysics, but theology. Having, as he believed, refuted the opinions of the philo- sophers, he next investigated the pretensions of the Alle- gorists, who derived their doctrines from an imam. These Arabian ultramontanes had no word for the doubter. Did he ask for the proof of their doctrine, they could only answer that "thus it was written." They could not, he says, even understand the problems they sought to resolve by the assumption of infallibility, and he turned again, in his despair, to the instructors of his youth—the Sufis. In their mystical intuition of the laws of life, and absorption in the immanent Deity, he at last found peace. This pathetic close of his stormy career negatives the idea that he ever wrote the philosophical work he once contem- plated on The Bases of Belief, and at

the same time shows the true character of the treatise which, alike in medizval and modern times, has been quoted as containing an exposition of his opinions. The work called The Ten- dencies of the Philosophers, and which was translated in 1506, with the title Logica et Philosophia Algazelis Arabts, contains neither the logic nor the philosophy of Al-Gazali. It is a mere abstract or statement of the Peripatetic systems, and was made preliminary to that Destruction of which we have already spoken. With this work Arabian philosophy in the East came to an end; but it revived in the new Arabia which had been planted in the West— in Mahometan Spain. If, therefore, Al-Gazali was the Oriental Descartes in being the first destructive sceptic of the old, he was its Descartes no less in being the initiator of the new philosophy.

For direct knowledge of Al-Gazali, see his Destructio, &c., in the ninth vol. of Averrhoés's works, but especially his spiritual auto- biography, translated by Schmélders in his Essai sur les Ecoles Philosophiques chez les Arabes. See also Von Hammer, introduction to O Kind; Munk, Mélanges ; and Gosche in Abhandlungen der Konig. Akad. der Wissenschaften xu Berlin, 1858.

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Definition.

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ALGEBRA

LGEBRA is that branch of the mathematical sciences which has for its object the carrying on of operations either in an order different from that which exists in arith- metic, or of a nature not contemplated in fixing the bound- aries of that science. The circumstance that algebra has its origin in arithmetic, however widely it may in the end differ from that science, led Sir Isaac Newton to designate it " Universal Arithmetic," a designation which, vague as it is, indicates its character better than any other by which it has been attempted to express its functions—hbettercertainly, to ordinary minds, than the designation which has been applied to it by Sir William Rowan Hamilton, one of the greatest mathematicians the world has seen since the

days of Newton—"the Science of Pure Time;" or even than the title by which De Morgan would paraphrase Hamilton's words — "the Calculus of Succession."

To express in few words what it is which effects the transition from the science of arithmetic into a new field is uot easy.. It will serve, probably, to convey some notion of the position of the boundary line, when it is stated that the operatious of arithmetic are all capable of direct inter- pretation per se, whilst those of algebra are in many cases interpretable only by comparison with the assumptions on which they are based. For example, multiplication of fractions—which the older writers on arithmetic, Lucas de Burgo in Italy, and Robert Recorde in England, clearly perceived to bea new application of the term multiplication, scarcely at first sight reconcilable with its original definition as the exponent of equal additions, —multiplication of fractions becomes interpretable by the introduction of the idea of multiplication into the definition of the fraction itself. On the other hand, the independent use of the sign minus, on Which Diophantus, in the 4th century, laid the foundation of the science of algebra in the West, by placing in the forefront of his treatise, as one of his earliest defini- tions, the rule of the sign minus, "that minus multiplied by minus produces plus"—this independent use of the sign has No originating operation of the same character as itself, aud might, if assumed in all its generality as existing side by side with the laws of arithmetic, more especially with the commutative law, have led to erroneous conclusions. As it is, the unlimited applicability of this definition, in con- nection with all the laws of arithmetic standing in their integrity, pushes the dominion of algebra into a field on which the oldest of the Greek arithmeticians, Euclid, in his unbending march, could never have advanced a step with- out doing violence to his convictions,

In asserting that the independent existence of the sign minus, side by side with the laws of arithmetic, might have led to anomalous results, had not the operations been subject to some limitation, we are introducing no imaginary hypothesis, but are referring to a fact actually existing. The most recent advance beyond the boundaries of algebra, as it existed fifty years ago, is that beautiful extension to which Sir W. R. Hamilton has given the designation of Qua- ternions, the very foundation of which requires the

removal of one of the ancient axioms of arithmetic, 'that opera- tions may be performed in any order."

HISTORY.

_ At What period and in what country algebra was invented? 18 a question that has been much discussed. Who were the earliest writers on the subject? What was the progress of its improvement? And lastly, by what means and at what period was the science diffused over Europe? It was a common opinion in the 17th century that the ancient Greek

mathematicians must have possessed an analysis of the nature of modern algebra, by which they discovered the theorems and solutions of the problems which we so much admire in their writings ; but that they carefully concealed their instruments of investigation, and gave only the re- sults, with synthetic demonstrations.

This opinion is, however, now exploded. A more inti- mate acquaintance with the writings of the ancient geo- meters has shown that they had an analysis, but that it was purely geometrical, and essentially different from our algebra.

Although there is no reason to suppose that the great geometers of antiquity derived any aid in their discoveries from the algebraic analysis, yet we find that at a consider- ably later period it was known to a certain extent among the Greeks.

About the middle of the 4th century of the Christian era, a period when the mathematical sciences were on the decline, and their cultivators, instead of producing original works of genius, contented themselves with commentaries on the works of their more illustrious predecessors, there was a valuable addition made to the fabric of ancient learning.

This was the treatise of Diophantus on arithmetic, con- Diophan- sisting originally of thirteen books, of which only the ts.

first six, and an incomplete book on polygonal numbers, supposed to be the thirteenth, have descended to our times. .

This precious fragment does not exhibit anything like a complete treatise on algebra. It lays, however, an excellent foundation of the science, and the author, after applying his method to the solution of simple and quadratic equations, such as to "find two numbers of which the sum and the sum or difference of the squares are given," proceeds to a peculiar class of arithmetical questions, which belong to what is now called the indeterminate analysis.

Diophantus may have been the inventor of the Greek algebra, but it is more likely that its principles were not unknown before his time ; and that, taking the science in the state in which he found it as the basis of his labours, he enriched it with new applications. The elegant solutions of Diophantus show that he possessed great address in the particular branch of which he treated, and that he was able to resolve determinate equations of the second degree. Probably this was the greatest extent to which the science had been carried among the Greeks. Indeed, in no country did it pass this limit, until it had been transplanted into Italy on the revival of learning.

The celebrated Hypatia, the daughter of Theon, com- posed a commentary on the work of Diophantus, This, however, is now lost, as well as a similar treatise, on the Conics of Apollonius, by this illustrious and ill- fated lady, who, as is commonly known, fell a sacrifice to the fury of a fanatical mob about the beginning of the 5th century.

About the middle of the 16th century, the work of Diophantus above referred to, written in the Greek lan- guage, was discovered at Rome in the Vatican library, having

| probably been brought there from Greece when the Turks

possessed themselves of Constantinople. A Latin transla- tion, without the original text, was given to the world by Xylander in 1575; and a more complete translation, by Bachet de Mezeriac (one of the earliest members of the French Academy), accompanied by a commentary, appeared in 1621. Bachet was eminently skilful in the indeterminate analysis, and therefore well qualified for the work he had undertaken ; but the text of Diophantus was so much in-

Arabian writers.

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jured, that he was frequently obliged to guess the mean- ing of the author, or supply the deficiency. At a later period, the celebrated French mathematician Fermat supple- inented the commentary of Bachet by notes of his own on the writings of the Greek algebraist. These are extremely yalnable, on account of Fermat's profonnd knowledge of this particular branch of analysis. 'This edition, the best which exists, appeared in 1670.

Although the revival of the writings of Diophantus was an important event in the history of inathematics, yet it was not from them that algebra became first known in Europe. This important invention, as well as the numeral characters and decimal arithmetic, was received from the Arabians. That ingenious people fully appreciated the value of the sciences; for at a period when all Europe was enveloped in the darkness of ignorance, they preserved from extinction the lamp of knowledge. 'hey carefully collected the writings of the Greek mathematicians ; they translated them into their language, and illustrated them with commentaries. It was through the medium of the Arabic tongne that the elements of Euclid were first introduced into Europe; aud a part of the writings of Apollouins are ouly known at the present day by a trans- lation from the Arabic, the Greek original being lost.

The Arabians ascribe the inveution of their algebra to one of their mathematicians, Mahommed-ben-Musa, or Moses, called also Mahommed of Buziana, who flourished about the middle of the 9th century, in the reign of the Caliph Almamoun.

It is certain that this person composed a treatise on this subject, because an Italian translation was known at one time to have existed in Europe, although it is now lost. Fortunately, however, a copy of the Arabic original is preserved in the Bodleian Library at Oxford, bearing a date of transcription corresponding to the year 1342. The title- page identifies its author with the ancient Arabian. A marginal note concurs in this testimony, and further declares the work to be the first treatise composed on algebra among the faithful; and the preface, besides in- dicating the author, intimates that he was encouraged by Almamoun, commander of the faithful, to compile a com- pendious treatise of calculation by algebra.

The circumstance of this treatise professing to be only a compilation, and, moreover, the first Arabian work of the kind, has led to an opinion that it was collected from books in some other language. As the author was intimately acquainted with the astronomy and computations of the Hindoos, he may have derived his knowledge of algebra from the same quarter. The Hindoos, as we shall presently see, had a science of Algebra, and knew how

to solve in- determinate problems. Hence we may conclude, with some probability, that the Arabian algebra was originally derived from India.

The algebraic analysis, having been once introduced aniong the Arabians, was cultivated by their own writers. One of these, Mahonuned Abulwafa, who flourished in the last forty years of the 10th century, composed commentaries on the writers who had preceded him. He also translated the writings of Diophantus.

It is remarkable, that although the mathematical sciences were received with avidity, and sedulously cultivated during a long period by the Arabians, yet in their hands they received hardly any improvement. It might have been expected that an acquaintance with the writings of Dio- phantus would have produced some change in their algebra. This, however, did not happen: their algebra continued nearly in the same state, from their earliest writer on the subject, to one of their latest, Behaudin, who lived between the years 953 and 1031,

Writers on the history of algebra were long under a

mistake as to the time and manner of its introduction into Europe. It has now, however, been ascertained that the science was brought into Italy by Leonardo, a merchant of Pisa, This ingenious man resided in his youth in Barbary, and there learned the Indian method of counting by the nine numeral characters. Commercial affairs led him to travel into Egypt, Syria, Greece, and Sicily, where we may suppose he made himself acquainted with everything known respecting numbers. The Indian mode of computa- tion appeared to him to be by far the best. He accordingly studied it carefully ; and, with this knowledge, and some additions of his own, and also taking some things from Euclid's Geometry, he composed a treatise on arithmetic. At that period algebra was regarded only as a part of arith- metic. It was indeed the sublime doctrine of that science; and under this view the two branches were handled in Leonardo's treatise, which was originally written in 1202, and again brought forward under a revised form in 1228. When it

is considered that this work was composed two centuries before the invention of printing, and that the subject was not such as generally to interest mankind, we need not wonder that it was but little known; hence it has always reinained in manuscript, as well as some other works by the saine author. Indeed it was not known to exist from an early period until the middle of the last century, when it was discovered in the Magliabecchian library at Florence. The extent of Leonardo's knowledge was pretty much the same as that of the preceding Arabian writers. He could resolve equations of the first and second degrees, and he was particularly skilful in the Diophantine analysis. He was well acquainted with geometry, and he employed its doctrines in demonstrating his algebraic rules. Like the Arabian writers, his reasoning was expressed in words at length ; a mode highly unfavourable to the progress of the art. The use of symbols, and the method of combin- ing them so as to convey to the mind at a single glance a long process of reasoning, was a much later invention. Considerable attention was given to the cultivation of algebra between the time of Leonardo and the invention of printing. It was publicly taught by professors. Treatises were composed on the subject; and two works of the oriental algebraists were translated from the Arabian language into Italian. One was entitled the Rule of Algebra, aud the other was the oldest of all the Arabian treatises, that of Mahommed-ben-Musa of Corasan.

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Introduce: tion into: Europe jj Leonards

The earliest printed book on algebra was composed by Lucas 7

Lucas Paciolus, or Lucas de Burgo, a minorite friar. was first printed in 1494, and again in 1523. 'The title is Summa de Arithmetica, Geometria, Proportioni, et Pro- portionalita.

This is a very complete treatise on arithmetic, algebra, and geometry, for the time in which it appeared. The author followed close on the steps of Leonardo ; and, in- deed, it is from this work that one of his lost treatises has been restored.

Lucas de Burgo's work is interesting, inasmuch as it shows the state of algebra in Europe about the year 1500: probably the state of the science was nearly the same in Arabia and Africa, from which it had been received.

The power of algebra as an instrument of research is in a very great degree derived from its notation, by which all the quantities under consideration are kept constantly in view ; but in respect of convenience and brevity of expres- sion, the algebraic analysis in the days of Lucas de Burgo was very imperfect : the only symbols employed were a few abbreviations of the words or names which occurred in the processes of calculation, a kind of short-hand, which formed a very imperfect substitute for that compactness of expression which has been attained by the modem notation.

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The application of algebra was also at this period very limited ; it was confined almost entirely to the resolution of certain questions of no great interest about numbers. No idea was then entertained of that extensive application which it has received in modern times.

The knowledge which the early algebraists had of their science was also circumscribed: it extended only to the resolution of equations of the first and second degrees ; and they divided the last into cases, each of which was resolved by its own particular rule. The important analytical fact, that the resolution of all the cases of a problem may be comprehended in a single formula, which may be obtained from the solution of one of its cases, merely by a change of the signs, was not then known: indeed, it was long before this principle was fully comprelended. Dr Halley ex- presses surprise, that a formula in optics which he had found, should by a mere change of the signs give the focus of both converging and diverging rays, whether reflected or refracted by convex or concave specula or lenses; and Molyneux speaks of the universality of Halley's formula as something that resembled magic.

The rules of algebra may be investigated by its own prin- ciples, without any aid from geometry; and although in some cases the two sciences may serve to illustrate each other, there is not now the least necessity in the more elementary parts to call in the aid of the latter in expound- ing the former. It was otherwise in former times. Lucas de Burgo found it to be convenient, after the example of Leonardo, to employ geometrical constructions to prove the truth of his rules for resolving quadratic equations, the nature of which he did not completely comprehend ; and he was induced by the imperfect nature of his nota- tion to express his rules in Latin verses, which will not now be read with the kind of satisfaction we receive from the perusal of the well-known poem, "the Loves of the Triangles."

As Italy was the first European country where algebra became known, it was there that it received its earliest im- provements. The science had been nearly stationary from the days of Leonardo to the time of Paciolus, a period of three centuries ; but the invention of printing soon excited a spirit of improvement in all the mathematical sciences. Hitherto an imperfect theory of quadratic equations was the limit to which it had been carried. At last this boundary was passed, and about the year 1505 a particular case of equations of the third degree was resolved by Scipio Ferrcus, a professor of mathematics in Bononia. This was an important step, because it showed that the difficulty of resolving equations of the higher orders, at least in the case of the third degree, was not insurmountable, and a new field was opened for discovery. It was then the practice among the cultivators of algebra, when they advanced a step, to conceal it carefully from their contemporaries, and to challenge them to resolve arithmetical questions, so framed as to require for their solution a knowledge of their own new-found rules. In this spirit did Ferreus make a secret of his discovery : he communicated it, however, to a favourite scholar, a Venetian named Florido. About the year 1535 this person, having taken up his residence at Venice, challenged Tartalea of Brescia, a man of great Ingenuity, to a trial of skill in the resolution of problems by algebra. Florido framed his questions so as to require for their solution a knowledge of the rule which he had learned from his preceptor Ferreus ; but Tartalea had, five years before this time, advanced further than Ferreus, and was more than a match for Florido. He therefore accepted the challenge, and a day was appointed when each was to Propose to the other thirty questions. Before the time

came, Tartalea had resumed the study of cubic equations, and had discovered the solution of two cases in addition to two which

he knew before. T[lorido's questions were such as could be resolved by the single rule of Ferreus; while, on the contrary, those of Tartalea could only be resolved by one or other of three rules, which he himself had found, but which could not be resolved by the remaining rule, which was also that known to Florido, The issue of the contest is easily anticipated ; 'Tartalea resolved all his adversary's questions in two hours, without receiving one answer from him in return.

The celebrated Cardan was a contemporary of Tartalea. Cardan.

This remarkable person was a professor of mathematics at Milan, and a physician. He had studied algebra with great assiduity, and had nearly finished the printing of a book on arithmetic, algebra, and geometry ; but being desirous of enriching his work with the discoveries of Tartalea, which at that period must have been the object of considerable attention among literary men in Italy, he endeavoured to draw from him a disclosure of his rules. Tartalea resisted for a time Cardan's entreaties. At last, overcome by his importunity, and his offer to swear on the holy Evangelists, and by the honour of a gentleman, never to publish them, and on his promising on the faith of a Christian to commit them to cypher, so that even after his death they would not be intelligible to any one, he ventured with much hesitation to reveal to him his practical rules, which were expressed by some very bad Italian verses, themselves in no small degree enigmatical. He reserved, however, the demonstra- tions. Cardan was not long in discovering the reason of the rules, and he even greatly improved them, so as to make them in a manner his own. From the imperfect essays of Tartalea he deduced an ingenious and systematic method of resolving all cubic equations whatsoever ; but with a remarkable disregard for the principles of honour, and the oath he had taken, he published in 1545 Tartalea's discoveries, combined with his own, as a supplement to a treatise ou arithmetic and algebra, which he had published six years before. This work is remarkable for being the second printed book on algebra known to have existed.

In the following year Tartalea also published a work on algebra, which he dedicated to Henry VIII, king of England. ,

It is to be regretted that in many instances the authors of important discoveries have been overlooked, while the honours due to them have been transferred to others hay- ing only secondary pretensions. The formule for the resolution of cubic equations are now called Cardan's rules, notwithstanding the prior claim of Tartalea. It must be confessed, however, that he evinced considerable selfishness in concealing his discovery ; and although Cardan cannot be absolved from the charge of bad faith, yet it must be recollected that by his improvements in what Tartalea communicated to him, he made the discovery in some measure his own; and he had moreover the high merit of being the first to publish this important improvement in algebra to the world.

The next step in the progress of algebra was the dis- covery of a method of resolving equations of the fourth order. An Italian algebraist had proposed a question which could not be resolved by the newly invented rules, because it produced a biquadratic equation. Some supposed that it could not be resolved at all; but Cardan was of a different

opinion. He hada pupil named Lewis Ferrari, a young man Ferrari.

of great genius, and an ardent student in the algebraic analysis: to him Cardan committed the solution of this difficult question, and he was not disappointed. Ferrari not only resolved the question, but he also found a general method of resolving equations of the fourth degree, by making them depend on the solution of equations of the third degree. I, — 65

Bombelli.

First English treatise by Recorde of Cambridge,

Vieta.

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This was another great improvement ; and although the precise nature of an equation was not then fully under- stood, nor was it indeed until half a century later, yet, in the general resolution of equations, a point of progress

was then reached which the utmost efforts of modern analysis have never been able to pass.

There was another Italian mathematician of that period who did something for the improvement of algebra. This was Bombelli. He published a valuable work on the subject in 1572, in which he brought into one view what had been done by his predecessors. He explained the nature of the irreducible case of cubic equations, which had greatly perplexed Cardan, who could not resolve it by his rule; he showed that the rule would apply sometimes to particular examples, and that all equations of this case adinitted of a real solution; and he made the important remark, that the algebraic problem to be resolved in this case corresponds to the ancient problem of the trisection of an angle.

There were two German mathematicians contemporary with Cardan and Tartalea, viz., Stifelius and Scheubelius. Their writings appeared about the middle of the 16th century, before they knew what had been done by the Italians, Their improvements were chiefly in the notation. Stifelius, in particular, introduced for the first time the characters which indicate addition and subtraction, and the symbol for the square root.

The first treatise on algebra in the English language was written by Robert Recorde, teacher of mathematics and practitioner in physic at Cambridge. At this period it was common for physicians to unite with the healing art the studies of mathematics, astrology, alchemy, and chemistry. This custom was derived from the Moors, who were equally celebrated for their skill in medicine and calculation. In Spain, where algebra was early known, the title of physician and algebraist were nearly synonymous. Accordingly, in the romance of Don Quixote, when the bachelor Samson Carasco was grievously wounded in his rencounter with the knight, an algebrista was called in to heal his bruises.

Recorde published a treatise on arithmetic, which was dedicated to Edward VI.; and another on algebra, with the title, The Whetstone of Wet, &c. Here, for the first time, the modern sign for equality was introduced.

By such gradual steps did algebra advance in improve- ment from its first introduction by Leonardo, each succeeding writer making some change for

the better; but with the exception of Tartalea, Cardan, and Ferrari, hardly any one rose to the rank of an inventor. At length came Vieta, to whom this branch of mathematical learning, as well as others, is highly indebted. His improvements in algebra were very considerable; and some of his inventions, although not then fully developed, have yet been the germs of later discoveries. He was the first that employed general characters to represent known as well as unknown quantities. Simple as this step may appear, it has yet led to important consequences. He must also be regarded as the first that applied algebra to the improvement of geometry. The older algebraists had indeed resolved geometrical pro- blems, but each solution was particular; whereas Vieta, by introducing general symbols, produced general formule, which were applicable to all problems of the same kind, without the trouble of going over the same process of analysis for each.

This happy application of algebra to geometry pro- duced great improvements: it led Vieta to the doctrine of angular sections, one of the most important of his dis- coveries, Which is now expanded into the arithmetic of sines or analytical trigonometry. He also improved the theory of algebraic equations, and he was the first that gave a

general method of resolving them by approximation. As he lived between the years 1540 and 1603, his writings belong to the latter half of the 16th century. He printed them at his own expense, and liberally bestowed them on men of science.

The Flemish mathematician Albert Girard was one of the improvers of algebra. He extended the theory of equations somewhat further than Vieta, but he did not completely unfold their composition ; he was the first that showed the use of the negative sign in the resolution of geometrical problems, and the first to speak of emaginary quantities. He also inferred by induction that every equation has precisely as many roots as there are units in the number that expresses its degree. His algebra appeared in 1629.

The next great improver of algebra was Thomas Harriot, an Englishman. As an inventor he has been the boast of this country. The French mathematicians have accused the British of giving discoveries to him which were really due to Vieta. It is probable that some of these may be justly claimed for both, because each may have made the discovery for himself, without knowing what had been done by the other. Harriot's principal discovery, and indeed the most important ever made in algebra, was, that every equation may be regarded as formed by the product of as many simple equations as there are units in the number expressing its order. This important doctrine, now familiar to every student of algebra, developed itself slowly. It was quite within the reach of Vieta, who unfolded it in part, but left its complete discovery to Harriot.

We have seen the very inartificial form in which algebra first appeared in Europe. The improvements of almost 400 years had not given its notation that compactness and elegance of which it is susceptible. Harriot made several changes in the notation, and added some new signs: he thus gave to algebra greater symmetry of form. Indeed, as it came from his hands, it differed but little from its state at the present time.

Oughtreed, another early English algebraist, was a con- temporary with Harriot, but lived long after him. He wrote a treatise on the subject, which was long taught in the universities.

In tracing the history of algebra, we have seen, that in the form under which it was received from the Arabs, it was hardly distinguishable as a peculiar mode of reason- ing, because of the want of a suitable notation; and that, poor in its resources, its applicability was limited to the resolution of a small number of uninteresting numeral questions. We have followed it through different stages of improvement, and we are now arrived at a period when it was to acquire additional power as an instrument of analysis, and to admit of new and more extended applica. tions. Vieta saw the great advantage that might be derived from the application of algebra to geometry. The essay he made in his theory of angular sections, and the rich mine of discovery thus opened, proved the importance of his labours. He did not fully explore it, but it has seldom happened that one man began and completed a dis- covery. He had, however, an able and illustrious successor

Girari,

*in Descartes, who, employing in the study of algebra that Descart_*

high power of intellect with which he was endowed, not only improved it as an abstract science, but, more especially by its application to geometry, laid the foundation of the great discoveries which have since so much engaged mathe- maticians, and have made the last two centuries evel memorable in the history of the progress of the humar mind.

Descartes' grand improvement was the application of algebra to the doctrine of curve lines. Asin geography we refer every place on the earth's surface to the equator, aud

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HISTORY. | ALGEBRA old

to a determinate meridian, so he referred every point of a curve to some line given by position. For example, in a circle, every point in the circumference might be referred to the diameter. The perpendicular from any point in the curve, and the distance of that perpendicular from the centre or from the extremity of a diameter, were lines which, although varying with every change of position in the point from which the perpendicular was drawn, yet had a deter- ininate relation to each other, which was the same for all points in the curve depending on its nature, and which, therefore, served as a characteristic to distinguish it from all other curves.

The relations of lines drawn in this way could be readily expressed in algebraic symbols ; and the expression of this relation in general terms constituted what is called the equation of the curve.

This might serve as its definition ; and from the equation by the processes of algebra, all the properties of the curve could be investigated.

Descartes' Geometry (or, as it might have been named, the application of algebra to geometry) appeared first in 1637. This was six years after the publication of Harriot's discoveries, which was a posthumous work.

Descartes availed himself of some of Harriot's views, particularly the inamner of generating an equation, without acknowledgment; and on this account Dr Wallis, in his algebra, has reflected with considerable severity on the French algebraist. This spirit has engendered a corresponding eagerness in the French mathematicians to defend him, Montucla, in his history of the mathematics, has evinced a strong national prejudice in his favour ; and, as usually happens, in order to exalt him, he hardly does justice to Harriot, the idol of his adversaries.

The new views which the labours of Vieta, Harriot, and Descartes opened in geometry and algebra were seized with avidity by the powerful minds of men eager in the pursuit of real knowledge. Accordingly, we find in the 17th century a whole host of writers on algebra, or algebra com- bined with geometry.

Our limits will not allow us to enter minutely into the claims which each has on the gratitude of posterity. Indeed, in pure algebra the new inventions were not so conspicuous as the discoveries made by its applications to geometry, and the new theories which were suggested by their union. The curious speculations of Kepler concerning the solids formed by the revolutions of curvilinear figures, the Geometry of Indivisibles by Cavalerius, the Arithmetic of Infinites of Wallis, and, above all, the Method of Fluxions of Newton, and the Differential and Integral Calculus of Leibnitz, are fruits of the happy union. All these were agitated incessantly by their inventors and contemporaries ; by such men as Barrow, James Gregory, Wren, Cotes, Taylor, Halley, De Moivre, Maclaurin, Stirling, and others, in this country ; and abroad by Roberval, Fermat, Huyghens, the two Bernoullis, Pascal, and many others.

The first half of the 18th century produced little in the way of addition either to pure algebra or to its applications. Men were employed rather in elaborating and working out what Newton, Leibnitz, and Descartes had originated, than in exercising themselves in independent investigations. There are, indeed, to be found some names of eminence

the pattern of the Universal Arithmetic of N ewton, but in his Théoriedes fonctions analytiques, and Calcul des Jonctions, he endeavoured, and with

a large amount of success, to reduce the higher analysis (the Fluxions of N ewton), to the domain of pure algebra. Nor must the labours of a

fellow-workman, Euler, be forgotten. In his voluminous Euler.

and somewhat ponderous writings will be found a perfect storehouse of investigations on every branch of algebraical and mechanical science. Especially pertinent to our present subject is his demonstration of the Binomial Theorem in the Vow Commentarit, vol. xix., which is probably the original of the development that Lagrange makes the basis of his analysis (Calcul des fonctions, legon seconde), and which for simplicity and generality leaves nothing to be desired.

This brings the history down to the close of the last century. We have been as copious as our limits would permit on the early history, because it presents the interest- ing spectacle of the progress of a science from an almost imperceptible beginning, until it has attained a mag- nitude too great to be fully grasped by the human mind.

It will be seen from what precedes, that we have not limited "algebra" to the pure science, but have retained the name when it has encroached on the territories of geometry, trigonometry, and the higher analysis. To continue to trace its course through all these branches dur- ing the present century, when it has extended into new directions within its own borders, would far exceed the limits of an introductory sketch like the present. We must, therefore, necessarily limit ourselves to what has been done in the Theory of Equations (which may be termed algebra proper), and in Determinants.

Theory of Equations.—That every numerical equation Theory of has a root —that is, some quantity in a numerical form, real] Equations.

or imaginary, which, when substituted for the unknowu quantity in the equation, shall render the equation a numerical identity—appears to have been taken for granted by all writers down to the time of Lagrange. It is by no means self-evident, nor is it easy to afford evidence for it which shall be at the same time convincing and free from limitations. The demonstrations of Lagrange, Gauss, and Ivory, have for simplicity and completeness given

way to that of Cauchy, published first in the Journal de Ecole Polytechnique, and subsequently in his Cours d@' Analyse Algébrique.

The demonstration of Cauchy (which had previously Cauchy.

been given by Argand, though in an imperfect form, in Gergonne's Annales des Mathématiques, vol. v.) cousists in showing that the quantity which it is wished to prove capable of being reduced to zero, can be exhibited as the product of two factors, one of which is incapable of assum- ing a minimum value, or, in other words, that a less value than one assigned can always be found, and therefore that it is capable of acquiring the value zero. This argument, if not absolutely free from objection, is less objectionable than any of the others. The reader may consult papers by Airy and De Morgan, in the tenth volume of the Transactions of the Cambridge Philosophical Soctety.

Admitting, then, that every equation has a root, it be- General associated with the science of algebra, such as Maclaurin, | comes a question to what extent are we in possession of Solution of but their eminence will be found to depend on their con- | an analysis by which the root can be ascertained. If the A reer nection with the extensions of the science, rather than with | question be put absolutely, we fear the answer must be, and higher the science itself. It was reserved for Lagrange, in the latter | that in this matter we are in the same position that we orders, still part of the century, to give a new impulse to extension in | have held for the last three centuries. Cubic and biquad- 4 desidera pure algebra, in a direction which has led to most important | ratic equations can be solved, whatever they may be; but results. Not only did he, in his Zraité de la Resolution des equations of higher orders, in which there exists no relation

Equations Numériques, lay the foundation on which Budan, | amongst the several coefficients, and no known or assumed Pourier, Sturm, and others, have built a goodly fabric after | connection between the different roots, have baffled all

Lagrange,

Gauss.

Abel.

Budan.

Fourier,

o16

attempts at their solution. Much skill and ingenuity have been displayed by writers of more or less eminence in the attempt to elaborate a method of solution applicable to equations of the fifth degree, but they have failed; whether it be that, like the ancient problems of the quadrature of the circle, aud the duplication of the cube, an absolute solution is an impossibility, or whether it is reserved for future mathematicians to start in the research in some new path, and reach the goal by avoiding the old tracks which appear to have been thoroughly traversed in vain.

It is scarcely necessary to refer to such writers as Hoene de Wronski, who, in 1811, announced a general method of solving all equations, giving formule without demonstra- tion. In 1817, the Academy of Sciences of Lisbon proposed as the subject of a prize, the demonstration of Wronski's formule. The prize was in the following year awarded to M. Torriani for the refutation of them.

The reader will find in the fifth volume of the Reports of the British Association, an elaborate report by Sir W. R. Hamilton on a Method of Decomposition, proposed by Mr G. B. Jerrard in his Jfathematical Researches, published at Bristol in a work of great beauty and originality, but which Hamilton is compelled to conclude fails to effect the desired object. In fact, the method which is valid when the proposed equation is itself of a sufficiently elevated degree, fails to reduce the solution of the equation of the fifth degree to that of the fourth.

But although the absolute solution of equations of higher orders than the fourth remains amongst the things un- effected, and rather to be hoped for than expected, a very great deal has been done towards preparing the way for approximate, if not for absolute solutions.

In the first place, equations of the higher orders, when they assume certain forms, have been shown to be capable of solution. An equation of this kind, to all appearance of a very general and comprehensive form, had been solved by De Moivre in the Philosophical Transactions for 1737. Binomial equations had advanced under the skilful hands of Gauss, who, in his Disquisitiones Arithmeticae, which appeared in 1801, added largely to what had been done by Vandermonde in the classification and solution of such equations ; and subsequently, Abel, a mathematician of Norwegian birth, who died too early for science, completed and extended what Gauss had left imperfect. The collected writings of Abel published at Christiania in 1839, contain original and valuable contributions to this and many other branches of mathematics.

But it is not in the solution of equations of certain forms that the greatest advance has been made during the present century. The basis of all methods of solution must evidently be found in the previous separation of the roots, and the efforts of mathematicians have been directed to the discovery of methods of effecting this. The object is not so much to classify the roots into positive and negative, real and imaginary, as to determine the situation and number of the real roots of the equation. The first writer on the subject whose methods appeared in print is Budan, whose treatise, entitled Nouvelle méthode pour la résolution des équations numériques, appeared in 1807. But there is evidence that Fourier had delivered lectures on the subject prior to the publication of Budan's work, and consequently, without detriment to the claims of Budan, we may adinit that the most valuable and original contribution to the science is to be found in Fourier's posthumous work, published by Navier in 1831, entitled Analyse des équations déterminées. The theorem which Fourier gave for the discovery of the position, within narrow limits, of a root of an equation, is one of two theorems, each of which is known by mathematicians as "Fourier's Theorem." The other is a theorem of integration, and occurs

in the author's magnificent work Théorie de la Chaleur, During the interval between the publication of Budan's work and that of Fourier, there

appeared a paper in the Philosophical Transactions of the Royal Society for 1819, by W. G. Horner, upon a new method of solving arithmetical Horner, equations. From its being somewhat obscurely expressed, | the great originality of the memoir did not at once appear, Gradually, however, Mr Horner's method came to be appre- ciated, and it now ranks as one of the best processes, approaching, in some points, to Fourier's. In the AZémoires des savans étrangers for 1835, appears a memoir, which, if it does not absolutely supersede all that had been previously done in assigning the positions of the real roots of equations, yet in simplicity, completeness, and uni- versality of application, surpayses them all. The author, M. Sturm, of French extraction, but born at Geneva, has Stun, in this memoir linked his name to a theorem which is likely to retain its place amongst the permanent extensions of the domain of analysis as long as the study of algebra shall last. It was presented to the Academy in 1829. Determinants.—The solution of simultaneous equations Detem of the first degree may be presented under the form of a ants, set of fractious, the numerators and denominators of which are symmetric products of the coefficients of the unknown quantities in the equations. These products were originally known as reswltants, a name applied to them by Laplace, and retained as late as 1841 by Cauchy in his Lvercices analyse et de physique mathématique, vol. ii. p. 161, but now replaced by the title determinants, a name first applied to certain forms of them by Gauss. In his Cours analyse algébrique, Cauchy terms them alternate fune- tions. The germ of the theory of determinants is to be found in the writings of Leibnitz, who, indeed, was far- Leibni seeing enough to anticipate for it some of the power which, about a century after his time, it began to attain. More than half that period had indeed elapsed before any trace of its existence can be found in the writings of the mathematicians who succeeded Leibnitz. The revival of the method is due to Cramer, who, in a note to his Cramer. Analyse des lignes courbes algébriques, published at Geneva in 1750, gave the rule which establishes the sign of a product as plus or minus, according as the number of dis- placements from the typical form has been even or odd. Cramer was followed in the last century by Bézout, Laplace, Lagrange, and Vandermonde. In 1801 appeared the Disquisitiones Arithmeticae of Gauss, of which a French Gauss, translation by M. Poullet-Delisle was given in 1807. Not- withstanding the somewhat obscure form in which this work was presented, its originality gave a new impetus to investigations on this and

kindred subjects. To Gauss is due the establishment of the important theorem, that the product of two determinants both of the second and third orders isa determinant. Binet, Cauchy, and others followed, and applied the results to geometrical problems. In 1826, Jacobi commenced a series of papers on the subject in Jacobi.| Crelle's Journal. In these papers, which extended over a space of ncarly twenty years, the subject was recast and made available for ordinary readers; and at the same time it was enriched by new and important theorems, through which the name of Jacobi is indissolubly asso- ciated with this branch of science. Following the steps of if Jacobi, a number of mathematicians of no mean power | have entered the field. Pre-eminent above all others are r two British names, those of Sylvester and Cayley. By Sylvest their originality, by their fecundity, by their grasp of all Cayley. the resources of analysis, these two powerful mathematicians have enriched the Zransactions of the Royal Society, Crelle's . Journal, the Cambridge and Dublin Mathematical Journal, and the Quarterly Journal of Mathematics, with papers on this and on kindred branches of science of such value as |

indian j,lgebra.

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to have placed their authors at the head of living mathe- | equations of the first degree, and probably to those of the

inaticians. The reader will find the subject admirably treated in Baltzer's Theorie und Anwendung der Deter- nanenten; and more briefly in Salmon's Higher Algebra. Elementary treatises have also been published by Spottis- woode in 1851, by Brioschi in 1854, by Todhunter in his Theory of Equations in 1861, and by Dodgson in

1867.

The attention of the learned has, during the present century, been called to a branch of the history of algebra, in no small degree interesting ; we mean

the cultivation of the science to a considerable extent, and at a remote period, in India.

We are indebted, we believe, to Mr Reuben Burrow for some of the earliest notices which reached Europe on this very curious subject. His eagerness to illustrate the history of the mathematical sciences led him to collect oriental manuscripts, some of which, in the Persian language, with partial translations, were bequeathed to his friend Mr Dalby of the Royal Military College, who communicated them to such as took an interest in the subject, about the year 1800. ; '

In the year 1813, Mr Edward Strachey published in this country a translation from the Persian of the Bya Ganita (or Vija Ganita), a Hindoo treatise on algebra; and in 1816 Dr John Taylor published at Bombay a translation of Lelawati (or Lrlavati), from the Sanscrit original. This last is a treatise on arithmetic and geometry, and both are the production of an oriental algebraist, Bhascara Acharya. Lastly, in 1817, there came out a work entitled Algebra, Arithmetic, and Mensuration, from the Sanscrit of Brahme- gupta and Bhascara, translated by Henry Thomas Cole- brooke, Esq. This contains four different treatises, origi- nally written in Sanscrit verse, viz., the Vija Gamta and Lalavati of Bhascara Acharya, and the Ganitad'haya and Cuttacadhyaya of Brahmegupta. The first two form the preliminary portion of Bhascara's Course of Astronomy, entitled Sid@hanta Stromani, and the last two are the twelfth and eightecnth chapters of a similar course of astronomy, entitled Brahma-sidd'hanta.

The time when Bhascara wrote is fixed with great pre- cision, by his own testimony and other circumstances, to a date that answers to about the year 1150 of the Chris- tian era, The works of Brahmegupta are extremely rare, and the age in which he lived is less certain. Mr Davis, an oriental scholar, who first gave the public a correct view of the astronomical computations of the Hindoos, is of opinion that he lived in the 7th century; and Dr William Hunter, another diligent inquirer into Indian science, assigns the year 628 of the Christian era as about the time he flourished. From various arguments, Mr Colebrooke concludes that the age of Brahmegupta was antecedent to the earliest dawn of the culture of the sciences among the

Arabians, so that the Hindoos must have possessed algebra before it was known to that nation.

Brahmegupta's treatise is not, however, the earliest work known to have been written on this subject. Ganessa, a distinguished astronomer and mathematician, and the must eminent scholiast of Bhascara, quotes a passage from @ much older writer, Arya-Bhatta, specifying algebra under the designation of Vija, and making separate mention of Cuttaca, a problem subservient to the resolution of inde- terminate problems of the first degree. He is understood by another of Bhascara's commentators to be at the head of the older writers, They appear to have been able to resolve quadratic equations by the process of completing the Square; and hence Mr Colebrooke presumes that the treatise of Arya-Bhatta then extant extended to quadratic equations in the determinate analvsis, and to indeterminate

second.

The exact period when Arya-Bhatta lived cannot be determined with certainty; but Mr Colebrooke thinks it probable that this earliest of known Hindoo algebraists wrote as far back as the fifth century of the Christian era, and perhaps earlier. He lived therefore nearly as early as the Grecian algebraist Diophantus, who is reckoned to have flourished in the time of the emperor Julian, or about A.D. 360.

Mr Colebrooke has instituted a comparison between the Indian algebraist and Diophantus, and found reason to conclude that in the whole science the latter is very far behind the former. He says the points in which the Hindoo algebra appears particularly distinguished from the Greek are, besides a better and more convenient algo- rithm, 1st, the management of equations of more than one unknown quantity; 2d, the resolution of equations of a higher order, in which, if they achieved little, they had at least the merit of the attempt, and anticipated a modern discovery in the resolution of biquadratics; 34d, general methods for the resolution of indeterminate pro- blems of the first and second degrees, in which they went far indeed beyond Diophantus, and anticipated discoveries of modern algebraists; and 4th, the application of algebra to astrononiical investigations and geometrical demonstration, in which also they hit upon some matters which have been re-invented in modern times.

When we consider that algebra made little or no pro- gress among the Arabians, a most ingenious people, and particularly devoted to the study of the sciences, and that centuries elapsed from its first introduction into Europe until it reached any considerable degree of perfection, we may reasonably conjecture that it may have existed in one shape or other in India long before the time of Arya- Bhatta; indeed, from its close connection with their doc- trines of astronomy, it may be supposed to have descended from a very remote period along with that science. Pro- fessor Playfair, adopting the opinion of Bailly, the eloquent author of the Astronomie Indienne, with great ingenuity attempted to prove, in a Memoir on the Astronomy of the Lrahmins, that the observations on which the Indian astronomy is founded were of great antiquity, indecd more than 3000 years before the Christian era. The very remote origin of the Indian astronomy had been strongly ques- tioned by many iu this country, and also on the Continent ; particularly by Laplace, and by Delambre in his Histoire de VAstronomie Ancienne, tome i. p. 400, &c., and again in Histoire de ? Astronomie du Moyen Age, Discours Prélimi- naire, p. 18, &c., where he speaks slightingly of their algebra; and in this country, Professor Leslie, in his Philosophy of Arithmetic, pp. 225 and 226, calls the Lilavati "a very poor performance, containing mcrely a few scanty precepts couched in obscure memorial verses." We are disposed to agree with Professor Leslie as to the value, and with Professor Playfair as to the antiquity of this Hindoo algebra. That it should have remained in a state of infancy for so many centuries is accounted for by the latter author in the following passage :—" In India everything [as well as algebra] seems cqually insurmountable, and truth and error are equally assured of permanence in the stations they have once occupied. The politics, the laws, the religion, the science, and the manners, seem all nearly the same as at the remotest period to which history extends. Is it because the power which brought about a certain degree of civilisation, and advanced science to a certain height, has either ceased to act, or has met with such a resistance as it is barely able to overcome? or is it because the dis- coveries which the Hindoos are in possession of are an. inheritance from some more inventive and more aucient

attainments in science ?”

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people, of whom no memorial remains but some of their

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NOTATION AND FIRST PRINCIPLES.

1. In arithmetic there are ten characters, which being variously combined, according to certain rules, serve to

denote all numerical magnitudes whatever.

But this me-

thod of expressing quantities (a phrase used to designate

EEE

Definitions of signs.

¥IRST PRINCIPLES. | ALGE SS EF A 519

something more than mere nuinbers), is found to be inade- quate, taken by itself, to the more difficult cases of mathe- wnatical investigation; and it is therefore neccssary, in many inquiries concerning the relations of magnitude, to have recourse to that more general mode of notation, and more extensive system of operations, which constitute the science of algebra.

In algebra quantities of every kind may be denoted by any characters whatever, but those commonly used are the letters of the alphabet; and as in the simplest mathe- matical problems there are certain magnitudes given, in order to determine other magnitudes which are unknown, the first letters of the alphabet, a, 6, c, &c., are used to denote known quantities, while those to be found are represented by v, x, y, &c., the last letters of the alphabet.

2. The sign + (plus) denotes, in arithmetic, that the quantity before which it is placed is to be added to some other quantity. Thus, «+6 denotes the sum of a and 6; 345 denotes the sum of 3 and 5, or 8.

The sign — (minus) signifies that the quantity before which it is placed is to be subtracted. Thus, a—6 de- notes the excess of a above b; 6-2 is the excess of 6 above 2, or 4.

Quantities which have the sign + prefixed to them are called positive, and such as have the sign — are called negative.

When no sign is prefixed to a quantity, + is always understood, or the quantity is to be considered as _posi- tive.

Quantities which have the same sign, either + or —, are said to have like signs. Thus, +a and +6 have like signs, but +a and —c have unlike signs.

3. A quantity which consists of one term is said to be simple; but if it consist of several terms, connected by the signs + or —, it is then said tobe compound. Thus, +a and —c are simple quantities; and 6+c, and a+6-d, are compound quantities.

4. To denote the product arising from the multiplica- tion of quantities, they are either joined together, as if intended to form a word, or else they are connected to- gether, with the sign x or . interposed between every two of them. Thus, ad, or ax 6, or a. 6, denotes the pro- duct of a and 0; also abc, oraxbxc, or a.b.c, denotes the product of a, b, and c. 'If some of the quantities to be multiplied be compound, each of these has a line drawn over it called a vinculum, and the sign x is interposed, as before. Thus, axc+dxe—f denotes that a is to be con- sidered as one quantity, the sum of c and d asa second, and the difference between ¢ and f as a third; and that these three quantities are to be multiplied into one another. Instead of placing a line over such compound quantities as enter a product, we may enclose each of them between two parentheses, so that the last product may be otherwise expressed thus, a(c+d)(e—f); or thus, a x (c+d) x (e—/).

A number prefixed to a letter is called a numerical co- eficient, and denotes how often that quantity is to be taken. Thus, 3a signifies that ais to be taken three times. When no number is prefixed, the coefficient is understood to be unity.

_9. The quotient arising from the division of one quan- tity by another is often expressed by placing the dividend

above a line, and the divisor below it. Thus, 2 denotes

the quotient arising from the division of 12 by 3, or 4; –

denotes the quotient arising from the division of b by a. 6. The equality of two quantities is expressed by putting the sign = between them. Thus, a+6=c-—d denotes

that the sum of a and 6 is equal to the excess of c above d,

7. Simple quantities, or the terms of compound quanti- ties, are said to be like, which consist of the same letter or letters taken together in the same way. Thus, +ad and — 5ab are like quantities, but +ab and + abd are unlike.

There are some other characters, such as > for greater than, < for less than, .. for therefore, which will be explained when we have occasion to use them; and in what follows we shall suppose that the operations and no- tation of common arithmetic are sufficiently understood.

8. As the science extends itself beyond its original Extension

boundaries, it begins gradually to appear that the limits of defini- imposed by these definitions have been transgressed, so #028 that almost insensibly the symbols have acquired for them- selves significations much more comprehensive than those originally attached to them. Thus, were +a to signify a gain of £a, —a would signify a loss of the same sum; were +a to signify motion forwards through a feet, —a would signify motion backwards through the same space. The extended definitions of + and — may now be such as the following: + and — are collective symbols of operations the reverse of each other. From similar con- siderations to those by which the signification of + and — has been extended, we extend that of x and + to something like the following: x and + are cumulative symbols of operations the inverse of each other. We may now exhibit the most general definition of the four sym- bols in the following form: + and — are symbols of

operations prefixed to algebraical symbols of quantity, and are such that +a —a=.+0 or —0, where +0 means simply or very nearly cncreased by 0; —0, diminished by 0. .x and + are symbols of operations prefixed to alge- braical symbols of quantity, and are such that xa+a= x 1 or +1, where x 1 means simply or very nearly multi- plied by 1; +1, divided by 1.

9. The laws by which the symbols are combined are the Laws of same as in arithmetic. 'It is desirable, however, to exhibit combina- them. They are three,— _

Law I. Quantities affected by the signs + and — are in no way influenced by the quantities to which they are united by these signs.

Law II. The Distributive Law.—Additions and subtrac-

' tions may be performed in any order.

Law III. The Commutative Law.—Multiplications and divisions may be performed in any order. We may remark that these laws are assumed for algebra,

'so that the science is limited by their applicability. Algebra

has been extended into the science of quaternions by freeing it from part of the limitation imposed by the third of these laws. In this new science ad is not the same thing as ba.

We add a few examples of the substitution of numbers Examples. for letters. (a. 3 and 4 involve processes that will be explained later.)

Ex. 1. If a=1, 6=2, c=3, find the value of (a+6+¢). (a+ 2b-—c).(b+2c—a).

It is (1+2+3).(1+4-3).(2+6-1)=84.

Ex. 2. lf a=}, 6=4, c=4, x=0 tind the value of a 0 ¢ b a A ate a +x

It is $+4+$+0=33

Fx. 3. With the same data as in example 2, find the

a—b? bc?

The first term is infinite, and the second is infinitely greater than the first, because x?=2% xx .°. the answer is — 0,

1

Hix, 4. Tf warm 5= 0; find the value of

ox =e 243 (24 Ei ONY Ai Gee A, ae ene y y

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; 1 1

Write down the expression in # by putting s for y, &c.

It becomes il r oa < fret a Gok fio t 5 (ots \(« +3) ‘oi ot ao nae = tg pr gat ok*

=2>: because x= 0.

Secr, .—FuNDAMENTAL OPERATIONS. The primary operations in algebra are the same as in

common arithmetic—namely, addition, subtraction, multi-

plication, and division ; and from the various combinations of these four, all the others are derived.

I. Addition.

10. In addition there may be three cases: the quanti- ties to be added may be like, and have like signs; or they may be like, and have unlike signs; or, lastly, they may be unlike.

Case 1. To add quantities which are like, and have like signs.

Rule. Add together the coefficients of the quantities, pre- fix the common sign to the sum, and annex the letter or letters common to each term.

EXAMPLES.

+ Ta — 2ax

+ 3a — ax

Add together < , g Add togethery _ 5 + 2a — 12ax

Sum, +1l3a Sum, —20axz

Case 2. To add quantities which are like, but have unlike signs.

Rule. Add the positive coefficients into one sum, and the negative ones into another; then subtract the less of these sums from the greater, prefix the sign of the greater to the remainder and annex the common letter or letters as before

EXAMPLES. + 2ax + 6ab+ 7 = : — 4ab+ 9 Add together { — 40 Add together, | U2" 5 | + Yax + Tab—-13 Sum of the pos. +llax Sum of the pos. +14ab+16 Sum of the neg. — 4ax Sum of the neg. – 4ab—18 Sum required, + Tax Sumrequired, +10ab-— 2

Case 3. To add unlike quantities.

Rule. Put down the quantities, one after another, in any order, with their signs and coefficients prefixed.

EXAMPLES. 2a an + 2ay 3b bb — 3bz

————— Sun, art 2ay+bb— 3bz Sum, 2a+3d- 4c Il. Subtraction.

11. General Rule.—Change the signs of the quantities to be subtracted, or suppose them changed, and then add

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EXAMPLES

From 5a — 126 Subtract 2a— 5b Remainder 3a— 7b Bay-2+ 8%- y say —-8- 8xe- d3y 2ey+6+16e+ 2y

From 6x— 8y+3 Subtract 24+ 9y-2 Remainder 4x —17y +5 aa—ax— yy bb — by +22 é¢ — pieces daa

The reason of the rule for subtraction may be explained'

thus. Let it be required to subtract 2p — 3¢ from m+n, If we subtract 2p from m+, there will remain m+n — 2p, but if we are to subtract 2p — 3g, which is less than 2g, it is evident that the remainder will be greater by a quantity equal to 3q; that is, the remainder will be m+n — 20+3g, hence the reason of the rule is evident.

TIL. Multiplication.

12. General Rule for the Signs.—If the quantities to be Rule of multiplied have like signs, the sign of the product is +; signs,

but if they have unlike signs, the sign of the product is—.

This rule, which is given by Diophantus! as the defim-

tion of + and —, may be said to constitute the basis of algebra as distinct from arithmetic. If we admit the definitions given above, the rule may be demonstrated in the following way :-— (1.) tax += +a is assumed. (2.) +ax —b will have the same value, whatever —} may be connected with, as it has when —6 is connected with +6 (Law 1). Now +ax ee +ax +0=0 (Def.) But +ax(+b—b)=+ax +b, and +ax -€ (Law 2). . +a x +6 and +ax —b make up 0° a.¢,+ab and +ax —6 make up 0. Now +ab—ab=0, ..+ax —b= —ab. (3.) Similarly -a x —b= +ab. The examples of multiplication may be referred to two cases ; the first is when both the quantities are simple, and the second when one or both of them are compound.

Case 1. To multiply simple quantities.

Rule. Find the sign of the product by the general rule, and annex to it the product of the numeral coefficients; then set down all the letters, one after another, as in one word.

EXAMPLES, Multiply +a@ + 5b — 3at L. By Ae ssi a f — 4a Biche Tab Product +ac (— 20ab — 2laabx

Case 2. To multiply compound quantities.

Rule. Multiply every term of the multiplicand by all the terms of the multiplier, one after another, according to the preceding rule, and collect their products into one sum, which will be the product required.

EXAMPLES. 1. Mult. 22 +y 2.a-b +¢ By =o a+b -c Prod. 20a + xy aa— ab+ac — Any —2yy +ab —bb+be —ac +be —c Quxe — 3xy —2yy

*aa * *—6b42bc-cc*

~ ~ ~ ~ ~ . 4

1 Asivus bx) asi rorararrncmobiioan, mont vmaptiy' agintis Di éal

them to the other quantities, agreeably to the rules of vraptv wot Asiyuy.— Diophantus, Ld. Fermat, Tolose, 1670, p. a;

addition.

Def, 9.

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Bhorter processes,

OPERATIONS. |

When several quantities are multiplied together so as to constitute a product, each of them is called a factor of that product : thus a, J, and ¢ are factors of the product abc ; also, a+" and b—«# are factors of the product (a+<).

b-— 2).

7a products arising from the continual multiplication of the same quantity are called powers of that quantity, which is called the root. Thus aa, aaa, aaaa, &e., are powers of the root a. These powers are commonly expressed by placing above the root, towards the right hand, a figure, denoting how often the root is repeated. This figure serves to denominate the power, and is called its index or exponent. Thus, the quantity a being considered as the root, or as the first power of a, we have aa or a? for its second power, aaa or a? for its third power, aaaa or a4 for its fourth power, and so on.

The second and third powers of a quantity are generally called its sguare and cube.

By considering the notation of powers, and the rules for. multiplication, it appears that powers of the same root are multiplied by adding their exponents. Thus axa=a4, also a x a=”; and in general a” x a*=a”*”.*

When the quantities to be multiplied appear under a symmetrical form, the operation of multiplying them may sometimes be shortened by detached coefficients, by symmetry, and by general considerations suggested by the particular examples under consideration.

13. Detached Coefficrents.

Ex. 1. Multiply «4 -— 32° + 2x? — Tx + 3 by w? — 5x +4. Here the powers of 2 occur in regular order, so that we

‘ need only write down the coefficients of the several terms

during the operation, having it in our power to supply the as whenever we require them ; we write, therefore,—

1=3+ 2- 7+ 3 1-5+ 4 1-3+ 2- 7+ 3

—54+15-10+35-15

+ 4-12+ 8-28+412

1-8+21—- 29 +46-43+412 The last line (for which the result might have been written down in full at once) is equivalent to

§ — 84° + Qlat — 292° + 462? —- 437412.

When any terms are wanting, they may be supplied by zeros ; thus,

Hz, 2. Multiply at -7a3+a”—-1 by z?-xv+2.

We write

evo 1 – 1

iO = l= 2

1-7 04 1-41

-1l+7 -0 -141

+2 -14 +0 42 -2

al —T8 — a + 10a — 150 — a? + 30 — 2 the product required.

14. Symmetry.

_ We may take advantage of symmetry by two considera- tions either separately or combined.

(1.) Symmetry of a Symbol. iz. Find the sum of (a+b — 2c)? + (a ¢—2b)? (b+¢-2a)?, Here a? occurs with 1 as a multiplier in the first square, with 1 as a multiplier in the second square, and with 4 as a multiplier in the third square,

.. 6a? is part of the result ;

ab occurs with 2 as a multiplier in the first square, with — 4 in the second, and with — 4 in the third—

**, —6ab is part of the result.*

But a?, 67, c?, are similarly circumstanced, as also ab, ae, be ; hence the whole result must be 6(a? + 6? +c? —ab—ac — be).

(2.) Symmetry of an Expression.

Hx, Find the sum of (a+6+c)(«#+y+z2)+(a+b-—c) (et+y—2)+(a-b+c)e-ytz)+(-atb+e)-a+y +2):

First, the product of (a+b+c) by «+y+2 is to be found by multiplying out term by term.

It is ae+ay+az+ ba + by + bz+cu+cy + cz.

The product of (a+b-c) (wx+y-—z) is now simply written down from the above, by changing the sign of every term which contains one only of the two quantities affected with a — sign, @.¢., in this case ¢ and z.

Lastly, the four products may be arranged below each other, the signs alone being written down ; thus,

at + ay + az+ ba + by + be+cut+cy+cz

+ $+ – + + = = + + – + – + – + = +

t+o- – - + + = + +

and the sum required is thercfore 4ax + 4by + 4cz.

15. General Considerations.

Ex. Find (a+b+c). By multiplying out we get*

(a+ b)>=a’ + 3a7b+

Now a, 0, ¢ are similarly involved in (a+0+c); .°. B and c? must appear along with a*, 3a%c, 37a, &e., along with 3a), and hence we can at once write down all the terms except that which contains ale. To obtain the co-efficient of abc, we observe that if a, 0, and c, are each equal to 1, (a+b+c)3 is reduced to 3° or 27. In other words, there are 27 terms, if we consider 3a?) and every similar expression as three terms; and as the terms precediug abe are in this way found to be 21 in number, we require Gabe to make up the full number 27;*

wv (atb+cP=H++4+E+307b + 307% + 307%a + 3b? + 3¢7a + 3c7b + Babe.

+ 6) 8: 6 oe

It is desirable to introduce here some examples of the application of the process of the substitution of a letter for any number or fraction to the properties of numbers, inequalities, &c.

16. Properties of Numbers.

Ex. 1, Tf unity is divided into any two parts, the dif- ference of their squares is equal to the difference of the parts themselves.

Let 2 stand for one part; 1 —« for the other.

Now (1-2)? -a? =1-2¢+a?-a@? =1 -2a=(1-—2)-«@, 2.e., the difference of the squares of the parts is equal to the difference of the parts.

Ex. 2. The product of three consecutive even numbers is divisible by 48.

Let 2n, 27 +2, 2n+4, be the three numbers **.. their pro- duct is 8n(n+1) (n+2). Now, of three consecutive numbers, x, x +1, »+2, one must be divisible by 2, and one by 3, ..** *x(n + 1)(n + 2) is divisible by 6, whence the pro- position.*

Ex. 3. The sum of the squares of three consecutive odd numbers, when increased by 1, is divisible by 12, but never by 24.

Let 22-1, 22+1, 2n+3, be the three odd numbers.

I. — 66

922

The sum of their squares when increased by 1 is 12n? + 1204+ 12=12(n? +2+4+1)=12(n.n+1+41).

Now, either 2 or n+1 is even, .. n(n+1)+1 is odd ; hence the sum under consideration is 12 times an odd number, whence the proposition.

Additional Examples in Symmetry, cc.

Wee. (a+b+o2+(atb—c)??(b+e-a) = 4(a? + 6? +¢?),

This is written down at once, from observing that a? occurs in each of the four expressions, and that 2ab occurs with a + sign in two, and with a — sign in the other two. There is no other form.

Ex, 2,(a+b+c3+(atb—c)?+(at+ce—b)+(b+c—a)3 = 2(a3 + 3 +03) + 6(a2b + a7%e + Pat Be + ca + 2b) — 12abe.

lst, a3 occurs + in three, and — in one term.

2d, 3a2b occurs + in three, and — in one term.

3d, When a, 0, ¢ are all units, the number resulting is 30; .. there are 30 terms, and as (1st) and (2d) make up 42, there fall to be subtracted 12, z.¢., the coefficient of abe ig —12.

Ex. 3. (aa + by + cz)? + (ax + cy + bz)? + (be + ay + cz)? + (bx + cy +z)? + (ca + ay + bz)? + (ca + by + az)? = 2(a? + +02) (a2 + y? + 2”) + 4(ab + ac + be) (ay + ez + yz).

Ex, 4. The difference of the squares of two consecutive numbers is equal to the sum of the numbers.

Ex. 5. The sum of the cubes of three consecutive num- bers is divisible by the sum of the numbers.

Ex. 6. If « is an odd number, 2° — x is divisible by 24, and («+ 3) (w?+7) by 32.

Ex. 7. Ti (pg—r)? + 4(p? -— 9)(pr ~ 7)? = 0, then will

4(p? — 9)? = (2p>— 3pqtr)?, and 4(q? — pr)3 = (2¢° — 3pqr +1”).

Ex. 8, Given v+y+z=0, X+Y+Z=0, to prove that (a? + X2%)y2 + (y? + Y)ex + (2 + Z?)ay = (22 + X?)YZ + (y? + Y?)ZX + (22 + Z?)XY.*

Let the left hand side equal the right +a; then multi- plying out,

aye + y +2) + X2y2+ Yee + Lay = XYZ+0e°YZ+yZX+2XV +4,

*4.€., X?yz+ Y22n + (X+ Y)*aey = wYZL + ZX +(a+y)?XV¥ 4, or, X?y(z a) + Y%a(z+y) = vY(Z+X)+y?X(Z+ Y) +4, or, — X22 — Y2¢? = — 2? Y?2- y?X?+u*

a OS 0.

Ex. 9. Tf 4a2b2c2(x? + y? + 27) (a2a? + by? + 0227) = {(B2 + cara? + (c+ a2)b2y2 + (a? + b2)c22)}?,

when a is greater than), and } greater than c; then is y =0. As the argument concerns y, multiply out, and arrange in order of powers of y. After reduction this results in

(a? — cP) bsy$ +2 { (a? — 2)(0? — c2)aPa? + (a? — c2)(a? — b2) 027} b2y?

+ {(6? — 0?) ata? — (a? — b)c%2?}? =0.*

Now each of these three terms is a positwe quantity, if it be not zero, and as the sum of three positive quantities cannot be equal to zero, it follows that each term must be eparately equal to zero,

2.6, y=0, and (b? — c?)a2a? = (a? — b? 622”.

17. Inequalities.

The demonstrations of inequalities are of so simple and instructive a character, that a somewhat lengthened exhibi- tion of them forms a valuable introduction to the higher processes of the science. In all that follows under this head, the symbols x, y, z stand for positive numbers or fractions, usually unequal.

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Ex 1, 2 +y? >2xy.

Because (w— y)? is +, whether x be greater or less than y, it follows that 2? – 2xy+y? is +, t.¢., is some positive number or fraction,

+ y? >Qey.

It will be remarked that when 2 and y are equal, the in- equality rises into an equality, and this is common to all inequalities of the character under discussion.

Cor. = + : >2; 2. the sum of a fraction and its recipro-

cal is greater than 2.

Eu. 2. v+y? +2 Say + we + yz.

For v+y?>2ay, w+2>2a2, y®+22>2yz; which being added and divided by 2, gives the result required.

LL, 3. HY Se eee ye

For (2™ — y”) (x”—y”) is +, whether « be greater or less than y.

As a particular case 7 + 93 >a?y + xy.*

fie, 4, O41 >a + a”,

For (x—-* — 1) (x* —1) is positive.*

1

Cor. 1. a+-, >a” + . x Gin ce*

Ae: 1 1 Cor. 2. Similarly, v+-.>a””+-,_), 2 a*

. ; 1.

i.¢., a8 ” increases 2” + —, increases, .”. as a particular case wa i 1 4+ —, >a+ =: a x

Ex. 5, Tf a, 6, ¢ are the sides of a triangle, a?+ 6?4¢ >ab+act be< 2(ab+act+ bc). The former inequality is proved in example 2. For the latter we have

(Euclid, I. 20), a

Ex, 6. The arithmetic mean of any number of quantities (all positive) is greater than the geometric.

(The arithmetic mean is the sum of the quantities divided by their number; the geometric is that root of their product which is represented by their number.) Let the quantities be denoted by 2%, %, %3,... %,, the num- bers 1, 2, 8, placed under the 2, indicating order only, so that x, may be read the jirst x, %» the second x, &c, Ex-

ample 1 gives 123 > ,/%%2, if we suppose the x and y of that example to be ,/2, ,/2 of the present.

i vg Pee

2 2 aay ee La + 2Xy

2 2 2

> J Ji, Jeg

> n/sefisly

In the same way we prove the proposition for 8, 16, or any number of quantities which is a power of 2,

For any other number, such, for instance, as 5, the following process is employed :—The number is made up to 8 by the insertion of three quantities, each equal to the

It also gives

arithmetic mean of the other five, viz.,

Call this quantity y; then

Ly +Vot … +3 a athrSr > Nis os » BYYY

A 82 0.€., ov Nie ae

Or) Fae, . ok

OPERATIONS. |

Pe, oe. 2;

G++ ...% i

1 2 5 5

5 = NER REO

Cor. As a particular case, 23+ 9° +2 >d3ayz.

Fx, 7. Given ,4,...%,=y”, to prove that (1+2,) (1+2,)...(1+a,)>(1+y)”.

The demonstration will be perfectly general in fact, though limited in form, if we suppose the number of quantities to be 5 ; in which case,

oa Y OE

Die ev. Oy my «

Make the number up to 8 by introducing three y's; then (1+4,) (1 +2) (te RENAL by example 1. (L+a,)(1+2,)>(1+ Ja3e,)?

(+a) (1+y) >(1+ Jay)? (l+y)(1+y) =(1+ Vyy)?

.. Multiplying these products together, and combining the right hand factors two and two,

(Ua) (1+2,)..... (1+2,)(1+y) >{(1+ vayn,)(1+ Vase)(1+ Vay) (1+y9)}? > ((1+ Vazae)(1+ Jag} >(1+ Vx,0,0,0,0,y°)8 >(1+y)8 fee) (Ure,).... (1 +a,)> (1+9)% He, 8, If the sum of n fractions makes up 1, the sum of

their reciprocals is greater than the square of their number.

Were, +e… = 1, then 2a te se o : le 6 foe et ae, as (example 6).

it NOG, .. . ys ae (example 6)<=

" 1

i = >n, 7 es

ee! 1 whence Seeie ts en. qe Tn Ltetet+... 8" nt+l/, 1 n+1 1

Ba 9 ap a < an (@ tm)? oe (+2):

Let the numerator and denominator of this fraction be designated by N and D. WN may be divided into pairs of terms, at the same distance from either end, viz., 1+ 2, a+ a2", &e., with or without a middle term, each of which (after 1+") is, by example 4, less than that quantity ; the middle term, if there be one, being less than

3 (1+2™), ae n+1 3 – meither case N<——(1+a™) . . . (1) Again (example 6), D>n%/xa3. 2. ol >na" . (2.) .". the fraction oo 1G +3)

To prove the second proposition, that the fraction is n+l EE sats 2 greater than mom | ¢ + =, it 18 only necessary to multi-

ply up and reduce the result ; thus, we (« +2) (e+e ae) =" (2N – 1-2)

Whence the proposition.

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Additional Examples,

He. 1, (n+ y+2)?< 3(2?+y2+2), and generally, EY +2)"<3" a" +y"+2"), (See Induction.)

Ex, 2. (a+y) (y+2) (c+) >8age <5 (a8 +9? +29),

Ex. 3, (at+y+ea) >axydaty +2).*

Ex, 4. ti + 6? +c?) (a? + y? + 2”) > (ax + by + cz).

Ex, 5. The arithmetic mean of the pth powers of n positive quantities is greater than the pth power of their mean, and also greater than the mean of their combina- tions p together.

Ex. 6. (ax + by + cz)? + (ax + cy + bz)? + (ba ay ae + (ba + cy + az)” + (cx + ay + bz)? + (ca + by + az)? > 6(ab + ac + be) (xy + xz + 2) < Bla? + 0? + 2%) (a? +4 +2”),

18. Induction.

It will be noted that the numerical multiplier of the second term of the powers of a+ already obtained is the same as the index. It is easy to see that this law is general. To demonstrate the fact formally we employ the method of induction.

The argument may be divided into four distinct steps— 1. Inference; 2. Hypothesis; 3. Comparison; 4. Conclusion.

The first step, «ference, is the discovery of the pro- bable existence of a law.

The second step, hypothesis, is the assumption that that law holds to a certain point, up to which the opponent to the argument may be presumed to

admit it.

The third step consists in basing on this assumption the demonstration of the law to a stage beyond what the opponent was prepared to admit.

The fourth step argues that as the law starts fair, and advances beyond a point at which any opponent is prepared to admit its existence, it is necessarily true.

Lx, 1. To prove that (a+2)”=a”na” xv, &e,

I. By multiplication we get

(a+x)=a’4a5x, &e. IT. Let it be granted that (a+ «#)”=a”ma”— a, &.,*

where m is the extreme limit to which the opponent will admit of its truth.

III. By multiplying the equals by a+, we get

(a+a)™ 1 =a”4+ma™e+, &e., a™e, Xe, =a”tt+(m+lja”xt, &e., 2.€., if the law be admettcd true for m it is proved true for m-+1; in other words, at whatever point the opponent compels us to limit our assumption, we can advance one step higher by argument.*

IV. Now, the law is true for 4, .. it is proved true for 5; and being true for 5, it is proved true for 6, and so on, ad infinitum.*

Ex, 2. The sum of the cubes of the natural numbers is the square of the sum of the numbers,

134.2=9=(1 +2= (FS) . I. Let us assume that

13427+, &., a = ae II. 7 this be so, then by adding (a 1)? we get + (e+1)?= =e (a+ 1)8

= (S at

III. Hence, if the law be true for any one number a, it is also true for x+1.

1242? ..,

O24

IV. But it is true for 2, .°. for 3,.°. for 4, &e. Lx. 3, To prove the inequality,

(aty+tz)”< ee +9" 2”) ’ From the second example of inequalities we get at once (a y+2)%< 3(x? + y? +2). Let us assume that (a +4 +2)"< 3" (a™+y"+2"), then by multiplication we get

ae + 20 + ys + 2”y).

Now, inequality, example 3, gives

ay + yaar ym, &e, ay + ya + he + aa + ya + hy < (art + yl + ett), and (at y+z)mti< 3m(amtt + ymtt 4 2th),

i.e, the law is true for m+1, if true for m; but it is true for 2, .°. it is always true.

IV. Duvision.

19. General Rule for the Signs.—If the signs of the divisor and dividend be like, the sign of the quotient is + ; but if they be unlike, the sign of the quotient is —.

This rule is derived from the general rule for the signs in multiplication, by considering that the quotient must be such a quantity as, when multiplied by the divisor, shall produce the dividend, with its proper sign.

This definition of division is the same as that of a fraction; hence the quotient arising from the division of one quantity by another may be expressed by placing the dividend above a line, and the divisor below it ; but it may also be often reduced to a more simple form by the follow- ing rules.

Case 1. When the divisor is simple, and a factor of every term of the dividend.

Rule. Divide the coefficient of each term of the dividend by the coefficient of the divisor, and expunge out of each term the letter or letters in the divisor: the result is the quotient.

Ex, Divide 16a°xy — 28a?xz + 42x by 4a%x.*

The process requires no explanation. It is founded on Laws II. and IIL., together with the rule of signs.

The quotient is 4ay — 72 + x,

If the divisor and dividend be powers of the same quan- tity, the division will evidently be performed by subtract- ing the exponent of the divisor from that of the dividend. Thus a®, divided by a', has for a quotient a5- = a?,

Case 2. When the divisor is simple, but not a factor of the dividend.

Rule. The quotient is expressed by a fraction, of which the numerator is the dividend, and the denominator the divisor.

Thus the quotient of 3ab?, divided by 2mbc, is the frac- 3ab?

It will sometimes happen that the quotient found thus may be reduced to a more simple form, as shall be ex- plained when we come to treat of fractions.

Case 3. When the divisor is compound.

Rule. The terms of the dividend are to be arranged in the order of the powers of some one of its letters, and those of the divisor according to the powers of the same

letter. The operation is then carried on precisely as for division of numbers.

To illustrate this rule, let it be required to divide 8a?+ 2ab — 150? by 2a +4 30, the operation will stand thus:

[FUNDAMENTAL 2a + 36)8a?+ 2ab— 156%(4a — 5b — 10ab — 156? — 10ab — 150?

Here the terms of the divisor and dividend are arranged according to the powers of the quantity a. We now divide 8a, the first term of the dividend, by 2a, the first term of the divisor; and thus get 4a for the first term of the quotient. We next multiply the divisor by 4a, and subtract the product 8a? +412ab from the dividend ; we get — 10ab— 150? for a new dividend.

By proceeding in all respects as before, we find — 5b for the second term of the quotient, and no remainder: the opera- tion is therefore finished, and the whole quotient is 4a — 56,

The following examples will also serve to illustrate the manner of applying the rule.

a 3a — b)3a3 — 12a? — ab + 10ab — 267(a? — 4a + 26 3a3 — a' — 12a? +10ab — 12a? + 4ab + 6ab— 2b? + 6ab— 26? Ea. 2. l-w#)l. (l+a+a?+ &e. l-2 "+a a ee +x? + 27 — 43

+2

Sometimes, as in this last example, the quotient will never terminate ; in such a case it may either be considered as an infinite series, the law according to which the terms are formed being in general sufficiently obvious; or the quotient may be completed as in arithmetical division, by annexing to it a fraction (with its proper sign), the numer- ator of which is the remainder, and denominator the divisor. Thus the completed quotient, in last example, is—

at l=%.

If x be small compared with unity, the remainders, as we advance, continually become smaller and smaller. If, on the other hand, ~ be large compared with unity, the re mainders continually become larger and larger. In this case the quotient is worthless. To obtain a quotient which shall be of any practical value, we must reverse the order of arrangement, putting —«+1 in place of 1-a The division then becomes

1+2+2°+

A

1

: Pee x

1 +-

x ee! x a

1

+e

As it is generally the largest of the quantities that we

desire to divide out, we observe that, in order to effect

this, we have had to begin with that quantity. Hence the Rule—

The terms of the divisor and dividend are to be arranged according to the powers of that letter which it is wished (if possible) to divide out.

I

Remainder after division,

OPERATIONS. | AMPGEBRA 525

Ex. 3. Divide at + b4+b(a + 6)8 by a? + 62— ab, where a | place of a in the dividend, or thing to be divided ; the

is large compared with 6. We must arrange according to powers of a.

a? — ab + b?)a + 3b + 3a? + 3ab? + 2b4(a? + 2ab + 46? at — a*b + ab? + 2a°b + 2a7b? + 3ab3 + 2a°b — 2a2b? + 2ab ‘ 4 4a2b?+ ab? +264 + 4a2b? — 4ab? + 464 + 5ab3 — 264*

We have spoken as if magnitude alone was the circum- stance which should determine the precedence of the letters jn a division. In the more advanced processes of algebra there are other circumstances which give precedence to certain letters, such, for example, as the fact that x may and often does stand for the phrase " quantity," whilst a stands for some determinate numerical quantity. This leads us to exhibit a proposition in division of the greatest value and most extensive application. It is as follows :—

20. Prorostrion.—If any function of «, consisting of powers of that letter with numerical multipliers, is divided by w—a, the remainder, when all the z's are divided out, is the same function of 'a that the dividend is of z; in other words, the remainder is the dividend altered by writ- ing a in place of x.

To prove this proposition we shall employ the following

Axiom :—If two expressions in # are identical in form and value, but one multiplied out farther than the other, we may write any numerical quantity we please in place of # in both, and the results will be equal.

For example, (c—1)?+(#-1)-—3 is identical with w?—2(¢+1)+a—1; and it is evident that if we write any number (say 1) for x, the results are the same in both.

We now proceed to prove the proposition.

Let the dividend be #"+px"1+ qu", &c., where 1 is a whole number, and p, g, &c., positive or negative numerical quantities.*

Let the quotient, when this is divided by z-a, be Q, the remainder, which does not contain x, R.; then

a" + pat 4+-ge" +, &e. =Q(x-a)+R by the definition of Division.

Now this equality is in reality an identity in terms of the axiom. If then we write a in place of z, the results will be equal ; this gives

a+pa"g<u>a"*</u> &e. =Q.04+R*

? which is the proposition to be proved.

Examples.

Ez. 1. If n be any whole number, x — a” is divisible by % —a without remainder.*

For the remainder, by the proposition, is a—a”=0.*

Ez, 2. Tf n be an even number, x— a” is divisible by 2+a without remainder.*

For the remainder is (— a)”—a”=0, since n is even.

Observe that the divisor here has to be changed to Ol ee a), so that —a@ stands in place of the a of the pro- position.

Ex. 3. Tf m be an odd number, x+ a” is divisible by “+a without remainder.*

For the remainder is (—a)”+a”=0, because n is odd.

He. 4. To prove that 452c2 — (6? + c? — a”)? is divisible by —a+6+c; and hence to resolve it into simple factors. Here the « —a of the proposition is replaced by a—(b+c) (the negative sign of the whole divisor being of no conse- quence).

To determine the remainder, therefore, we write 6+ c in

result is,

—— 4b7c? — (67 +c? -b+c)?=0, hence 467c — (6? +c? — a*)? is divisible by -a+b+e.*

Now, since the dividend contains only squares of a, and b, and c, any change in the sign of a, or 8, or c, produces no change in the dividend. What we have just proved then becomes (putting —a for a) the following :—

4670? — (b? + c? — a”)? is divisible by a+b+c.

This last becomes (putting — 6 for b, and then — ¢ for c) -— 4b%0? — (b? c? — a?) is divisible by a— b, and by a+b—-c.

Hence finally, 46%c? — (67+ c?-—a)?=(a+6+c)*

(-a+b+c)(a—b+c)(a+b—-c).

The above example is a good exercise for the student. The result may be more simply arrived at by employing a proposition of very great value and frequent use—that the difference of the squares of two quantities is the product of the sum and difference of the quantities.

Ex. 5. To prove that (1— a?) (1-6?) (1—c?) —(c+ab) (6 +ac)(a+bc) is divisible by 1 + abc.

It is simpler here to write a single letter x for abc, whereby the given quantity becomes

(1 = a2) (1 ~~8)(1~~ 2) = (v4.02) (+ 2)(a+0%),

which is obviously under the form p—p, when —1 is written for x, and .. is divisible by 1+.*

Fx. 6. Prove that (x?-x+1)(«-—«?+1)(#- a+1) (x16 — 8 +1)... (x™-2”+1)is the quotient of 2”+4+2”+1 by 22+2+1; » being any power of 2.*

The divisor (#?+2+1) being multiplied by 2?-++1 gives a4+a?+1; which, being again multiplied by x4 —x?+1, gives 2°+a++1; and so on to the end.

Additional Examples in Division.

Ex. 1. Divide 1 — 10x? + 152+ — 62° by (1 -a)8

We must first multiply out (1 — x)’, and then divide the given expression by the product, 1-—3×2+3z?-2°3. The quotient is 1+ 3+ 6x.

Ex. 2. Divide 65xy? — (x4 + 64y) by a — Txy — 8y”.*

We must arrange dividend and divisor in terms of powers of one of the letters, say 2; the division will then assume the form

x? — Txy — 8y) — x4 + 65a%y? — 64y4(giving —a?-7xy+ 8y?.*

Ex. 3. Divide 3 +y3 +2? -3xyz by x+y+z.

We must give exclusive attention to some one letter, say #, in dividing out; thus

rey te) ot pre— Saye(2? — ay +2) +(y2+2—y2)

a + oy +2) — xy +2 mee. Hy? — yete)+P+e

the quotient being 27+ 4? +2 — ay —4xz- yz.

Ex. 4. Divide the product of

w+ 3a+2, 2 -5xe+4, a+ 522-14,

by the product of x?-1, «?-—2. Here we observe that x? —1 is the product of «+1, r-1.

Now (Art. 20), 2?+32+2 is divisible by +1, and x?-—52+4 by x—-1. Hence, if the product is divisible by x?—1, «?— 2, without remainder, the third factor, a + 52 — 14 must be divisible by x? -— 2, which is found to be the case. The quotient required is therefore the product of*

(2 +2) (@ — 4) (a2 +7) =a — 903 — 2? — 149 — 56.

Horner's synthetic division.

026

Ex. 5. Divide 12x — 10z°y — 3x?y? + 30xy3 — 25y by 3a? — day + By?*

We will employ this example to indicate Horner's method of synthetic division.

Let the dividend be represented by

Aa + Ba3 + Ca? + Dat E, the divisor by an* + be+e, and the quotient by az?+ Bat+ty+cke.*

Then, multiplying the quotient by the divisor, we produce the dividend, which, exhibited by the method of detached coefficients, stands thus—

aa+aB+ay+ &e. + ba +68 + &e. +ca + c&e.

A+B+C4+é&e

The last line being the sum column by column of the three preceding lines. Now, as the upper of these three lines contains term by term the quantities required, we convert this addition into subtraction ; thus,

A+B+C+4+D+E

—b| —ba—bB —by— ke. -c¢ —ca —cB— &e. alaa + a8 + ay + ad + &e.

The first vertical column gives a; the second f, and so on. In the example before us we write,—

12-10-3 4+30-25

4) 4404484 4 he. = —5a— 5B &e. 33a+ 38+ 3y+&e.,

whence 8a=12 gives a=4; 3@= —10+4a gives B=2; 3By= —34+ 48 —5a gives y= — 5. Therefore the quotient required is 4a? + 27-5.

Srcr. I.—INvoLutTIon AND EvoLurtion.

21. In treating of multiplication, we have observed, that when a quantity is multiplied by itself any number of times, the product is called a power of that quantity, while the quantity itself, from which the powers are formed, is called the root. Thus, a, a”, and a’, are the first, second,

é on. 1 and third powers of the root a; and in like manner -, —, wv a

1 1

and —, denote the same powers of the root ~. a a

But before considering more particularly what relates to powers and roots, it will be proper to observe, that the

Boe ee al Al é é quantities ©, 7a aa &c., admit of being expressed under a

different form; for, just as the quantities a, a’, a3, &., are expressed as positive powers of the root a, so the en ll ¢

quantities a? &c., may be respectively expressed thus a, a~, a3, &c., and cousidered as negative powers of the root a.*

1 1

a a powers of the root a, but with negative indices, is a conse- quence of the rule which has been given for the division

*This method of expressing the fractions *, as*

c 1 : 66 of powers ; for we consider = 88 the quotient arising from

the division of any power of a by the next higher power ; for example, from the division of the 2d by the 3d, and so

1 @ ; : we have a ie but since powers of the same quantity are

divided by subtracting the exponent of the divisor from

2

that of the dividend (Art. 19), it follows that 3 = a

. iL =a; therefore the fraction | may also be expressed ge 1 a ae thus, a~!. By considering 8 equal to = , it will appear

: 1 ? ; in the same manner that — = =¢ 3 and proceeding in a a : Tt 1 this way, we get a ae a, da hn a~, &c., and so on, as far as we please. It also appears that unity or 1 may be represented by a°, where the exponent is a cypher, for ae == =at =a, a*

The rules which have been given for the multiplication Defni; and division of powers with positive integral exponents of inde;

will apply in every case, whether the exponents be positive or negative, integral or fractional, provided we assume as the definition of the index in such cases, the law of com- bination a" x a=a"**,*

Involution.

22. Involution is the method of finding any power of any assigned quantity, whether it be simple or compound: hence its rules are easily derived from the operation of multiplication.

Case 1. When the quantity is simple.

Rule. Multiply the exponents of the letters by the index of the power required, and raise the coefficient to the same power.

Note. If the sign of the quantity be +, all its powers will be positive ; but if it be —, then all its powers whose exponents are even numbers are positive, and all its powers whose exponents are odd numbers are nega- tive.

*Ex. 1. Required the cube, or third power, of 2a%m, (2a?x)8 = 2 × 2 × 2a? *3a18 — 8a%x3, the answer. Ex, 2. Required the fifth power of —3a?x'.*

(— 3a°a)5 = — 243a}xl5, the answer.

2

Ex. 3, Required the fourth power of — == —2ax\4 16ata8 (Se) = Blot? the answer.

Case 2. When the quantity is compound.

Rule, The powers must be found by a continual multipli- cation of the quantity by itself.

Ex. 4. Required the first four powers of the binomial quantity a+.

a+«x the root, or first power. a+a a? + ax + aa +a? a? + 2ax + x the square, or second power. a +x a? + 2a%a + ax? + ax + 2ax? +23 a? + 3a%x + 3ax* + 23 the cube, or third power. at + 3a°x + 30%x? + aa? + ax + 3a%x? + 3a + a4 a + 4a5x + 6a%x? + 4aa%+ a the fourth power. If it be required to find the same powers of a-%, it will be found, writing — for 2, that*

ne

i iz

1

Jnvolution by the -pinominal

|) theorem.

EVOLUTION. |

a—«x being the root, or first power ; then

a? —2ax+ x is the square, or second power ; a3 — 3a2x + 3ax? — x', the cube, or third power ; at — 4a3x + 6a?a? — 4ax3+ a4, the fourth power.

Hence it appears that the powers of a+. differ from the powers of a—«x only in this respect, that in the former the signs of the terms are all positive, but in the latter they are positive and negative alternately.

Besides the method of finding the powers of a compound uantity by multiplication, which we have just now ex- lained, there is another more general, as well as more expeditious, by which a quantity may be raised to any power whatever without the trouble of finding any of the inferior

powers, namely, by means of what is commonly called the binomial theorem, to be proved hereafter. This theorem may be expressed as follows : —Let a+a be a

binomial quantity, which is to be raised to any power denoted by the number n, then (a+ x)= n—1 n(n—1)\(n—2*

atta 2p) any? 4 wna – eo»)) 83 nln —1 (n= 2X03) tn

2. 3 4

= —2)\(n—3)(n—4

nen ea

n—5 5 —— A a + &e.

This series will always terminate when n is any whole positive number, by reason of some one of the factors n—1,n—2, &., becoming =0; but if n be either a nega- tive or fractional number, the series will consist of an infinite number of terms. As, however, we mean to treat in this section only of the powers of quantities when their exponents are whole positive numbers, we shall make no further remarks upon any other. The nth power of a—« will not differ from the same power of a+, except in the signs of the terms which compose it, for it will stand thus: (a—«)= nun— 1) 242 _ n(n—1)(n—2) Iho & ee 2 3 n(n —1)(n—2Kn — 8) oy me. 8 .” 4 and — alternately.*

n a= ji aly + 343

*a**x4 — &c., where the signs are +*

Let it be required, for instance, to raise a+ to the fifth power.

Here n, the exponent of the power, being 5, the first term a” of the general theorem will be equal to a5, the

second na” 4 = 5atz, the third aR et 2S ie? = ee 4 1×2 —1) (n-2) 5×4×3 l0a%s?, the fourth C@— U2) yn 9 5X 4X3 Go,0 ; e fourth 5 5 = iS Tome

Bis n(n—1)(n—2)(n—3) | 5×4×3×2 oe hefth — 5 Soak =m 1 =Daz4, and the sixth and last n _ _ _ —

Hoe 2) (n—3) (n—4) ee rere 5

: meron: Ae 1×2×3×4×5 : the remaining terms of the general theorem all vanish, by reason of the factor n—5=0 by which each of them is multiplied, so that we get (a+zx)>=a5+5ata+ 10a%x? + 1Oaa3 + Bast + 25,

If the quantity to be involyed consists of more than two terms, as, if p+q—7 were to be raised to the second power, put p=a and g—r=b, then (p+q—r)? =(a+b)? =a) + 2ab +b? =p? + 2p(q— 1) +(q-r), but 2p(q-r)= "pq — 2pr, and by the general theorem (q—7)?=g?— 2gr +r, therefore we get (p+q—7)? =p? + 2pg — 2pr +4? – 2qr +r; and by a similar method of proceeding a quantity*

consisting of four or more terms may be raised to any power,

q'5z5 =

& GiB EK A

Additional Examples.

Ez. 1. From the value of (a+)! found in example 4, to find that of (a+6+c) From example 4 we write at*

once, by symmetry, (a+6+c)=at+ 405) + 6070? +R + 64+ 4a3c + 6a2c? c# 43a + 6%?*

+ 46%

+ 4a

+4

where R is the series of remaining terms denoting the three

*following forms, a*be, b?ac, c2ab. Now when a, 6, c are*

each unity, there are 81 terms (viz. 34). But the number

of terms already written down (4a%} being considered as 4

terms, &c.) is 45. The quantity R must consequently

make up the other 36 terms, .. it can be nothing else than 12a%bc + 126? ac + 12c?ab.*

Ex, 2. (ptqtryPap?+get+r?+2(pg+qr+rp). Cor. Ifp+q+r=0; then p?+ 9? +72 + 2(pqg+r+rp) =0. Case 1. a—b+6-—c+c-—a=0, gives (a — 6)? + (b —c)? + (c— a)? + 2 {a — b)(b—c) +(b-c)(e—a) : +(c—a)(a—b)} =0. Case 2. a(b—c)+b(c—a)+c(a— 6) =0, gives a(b — ¢)® + b%(c — a)? + c%(a — 6)? + 2{ab(b — c)(c— a) + be(c — a)(a — 6) + ca(a — b)(b—c)} =O. Ex, 3. Prove that (#?—yz)>3(2—ay)s— 3(a? — yz)(y? — xz)(22 — xy) is a complete square. The expression will assume symmetry if (a? — yz)(y? — xz) (2— xy), instead of being multiplied by 3, be repeated*

three times, each being connected with one of the cubes in turn; this gives—

w? — yz) {(a? — yz)? — (9? — wz)(2? — ny) + (y? — a2) {(y? — a2)? — (a2? — yz)(22 — xy)} + (2? — ay) { (22 — ay)? — (x? — yz)(y? — xz)} = (x? — yz)a {ah + y+ 2 — 3xyz}

+ &e., &e. = (08 + y+ 2 — 8ayz)(a +> +2 — Bayz) .

Ez, 4, Prove that (a? + 6? +c?) + 2(ab + be + ca) — 3(a? +B? + c)(ab + be + ca)? = (a3 + 63 + 03 — 3abc)?.*

Combine each of the cubes with each of the products in succession, and reduce, as in the last example.

Ex, 5. To find the condition that pa? + 2gay+ry? may be incapable of changing its sign through any change of sign or value of x and y. It is evident that p and r must have the same sign. Suppose it positive. By multiply- ing by p, the quantity may be thrown into the form (pu + gy)” + (pr — 9)y*, which is the sum of two positive quantities provided pr>g*.*

The condition required is, therefore, pr >g; or as a particular case pr = q?.*

Ex. 6. To find the condition that ax? + by?cz% 2Pyz+ 2Qzea + 2Ray may be incapable of changing its sign through any change of sign or value of a, y, z.

We will suppose a, 0, ¢ to be all positive, in which case the whole result is also positive.

If we multiply the whole by a, we may write it under the form of a square and a supplement,

viz., (ax + Qz+ Ry)? + (ac — Q?)2? + ab — R?)7? + 2(aP — QR)yz.

Now as the first term of this expression is a square, it is essentially positive. Hence the required condition can be satisfied only by rendering the remainder positive.

It follows that ac>Q?, ab>R?, and

(Example 5) (ac — Q®)(ab — R?) >(aP — QR)?,

t.€., abc + 2PQR >aP? + 1Q?+cR2.

527

Square root.

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If we had begun by throwing the expression into the form of (by+Pz+Ra)?+ &c, a resulting condition would have been bc>P?%. The four conditions are con- sequently

ape henac>Q, ber, abe + 2PQR >aP? + 6Q? + cR?.*

Results of this kind are of the utmost value in the higher analysis.

Evolution.

23. Evolution is the reverse of involution, or it is the method of finding the root of any quantity, whether simple or compound, which is considered as a power of that root: hence it follows that its operations, generally speaking, must be the reverse of those of involution.

*To denote that the root of any quantity is to be taken, the sign ,/ (called the radical sign) is placed before it, and a small number placed over the sign to express the denomination of the root. Thus 7/a denotes the square root of a, J/a its cube root, 4/a its fourth root, and in general, */a its mth root. The number placed over the radical sign is called the indexw or exponent of the root, and is usually omitted in expressing the square root: thus, either 2/a or ,/a denotes the square root of a.*

Case 1. When roots of simple quantities are to be found.

Rule. Divide the exponents of the letters by the index of the root required, and prefix the root of the numeral coefficient ; the result will be the root required.

Note 1. The root of any positive quantity may be either positive or negative, if the index of the root be an even number; but if it be an odd number, the root can be positive only.

2. The root of a negative quantity is also negative when the index of the root is an odd number.

3. But if the quantity be negative, and the index of the root even, then no root can be assigned.

Ex, Required the cube root of 125a%x,

Here the index of the root is 3, and the root of the co- efficient 5, therefore 2/125a°x® =5ax3, the root required ; and in like manner the cube root of — 125a%x® is found to be — 5ax3,

The root of a fraction is found by extracting the root of both numerator and denominator. Thus the square Aart . 2as 9b?y6 ” 3by3

root of

Case 2. When the quantity of which the root is to be extracted is compound.

I. To extract the square root.

Range the terms of the quantity according to the powers of one of the letters, as in division.

Find the square root of the first term for the first part of the root sought, subtract its square from the given quantity, and divide the remainder by double the part already found, and the quotient is the second term of the root.

Add the second part to double the first, and multiply their sum by the second part; subtract the product from the remainder, and if nothing remain, the square root is obtained. But if there is a remainder, it must be divided by the double of the parts already found, and the quotient will give the third term of the root, and so on.

3 1

He. Required th — 293 , w. Required the square root of “ 2a sag 5 a6

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[INVOLUTION AND

3 foe dl 1 = Oy Gee Oo a ee a 2at+ 5x stil? G+ x

2 33,2

Qa set eee x —2/ —223+ a? ING eG 2 Fe ean ee 20+ 3\5 2°16 ee ae oe

4 2 16

2 16

*% * **

To understand the reason of the rule for finding the square root of a compound quantity, it is only necessary to involve any quantity, as a+6+¢, to the second power, and observe the composition of its square; for we have a+b+cP=a? +2ab+b? + 2ac+2be+e; but 2ab+b?= 2a + b)b and 2ac+ 2be c? =(2a 26 +c)c, therefore, (a+b+c)? =a? + (2a 4+ b)b + (2a+ 26+ c)c; and from this expression the manner of deriving the rule is obvious. As an illustration of the common rule for extracting the square root of any proposed number, we shall suppose that the root of 59049 is required. Accordingly we have (a+ +c)? = 59049, and from hence we are to find the values of a, 6, and c. ton 40-5 Hence 243 is the root

a? = 200 × 200=40000 40=6 tequired.

—-_ 3=c 2a = 400)19049 b= 40 2a+ b= 440)17600 = (2a + b)b 2a + 26 = 480)1449 c= 838

2a+ 2b +¢= 483)1449 = (2a + 2b+c)c

II. To extract the cube root.

Range the terms of the quantity according to the powers of some one of the letters.

Find the root of the first term, for the first part of the root sought ; subtract its cube from the whole quantity, and divide the remainder by three times the square of the part already found, and the quotient is the second part of the root.

Add together three times the square of the part of the root already found, three times the product of that part and the second part of the root, and the square of the second part; multiply the sum by the second part, and sub-tract the product from the first remainder, and if nothing remain, the root is obtained ; but if there is a remainder, it must be divided by three times the

square of the sum of the parts already found, and the quotient is a third term of the root, and so on, till the whole root is obtained.

Ex, Required the cube root of a? + 3a2x + 3ax?+a°,

a + 8a%x + 3aa7 + zei(a+, the root required. a? 3a? + Bas +3 a) 3a7a + ax + 9° 3a%x + Sax? + 23

- *% **

The reason of the preceding rule is evident from the composition of a cube; for if any quantity, as a+b+¢, be

raised to the third power, we have (a+6+c)'=a'+(30 + 3ab +b2)b + {3(a +b)? + 3(a +b)e +0}, and by consider-

ing in what manner the terms a, }, and ¢ are deduced from this expression for the cube of their sum, we also see the reason for the common rule for extracting the cube root in numbers. Let it be required to find the cube root

of 13312053, where the root will evidently consist of three figures ; let us suppose it to be represented by a+b-+<, and the operation for finding the numerical values of these quantities may stand as follows :—

13312053(200 =a a= 8000000 30=65>} ., 287 is the root required.*

3a? = 120000/5312053

3ab= 18000 b?= 900

T=c¢

3a? + 3ab +b? = 138900]4167000 = (3a? + 3ab +.b2)b

3 c= 4830

c= 49

a+b

. + ne = 158700}1145053

3(a + 6)? + 3(a + b)c + c? = 163579/1145053 = [3(a + 6)? + 3(a+ b)c +c? Jc

III. To extract any other root.

Range the quantity of which the root is to be found, according to the powers of one of its letters, and extract the root of the first term; that will be the first member of the root required.

Involve the first member of the root to a power less by unity than the number that denominates the root re- quired, and multiply the power that arises by the num- ber itself ; divide the second term of the given quantity by the product, and the quotient shall give the second member of the root required.

Find the remaining members of the root in the same manner by considering those already found as making one term.

24. In the preceding examples, the quantities whose roots were to be found have been all such as could have their roots expressed by a finite number of terms; but it will frequently happen that the root cannot be otherwise assigned than by a series consisting of an infinite number of terms. The preceding rules, however, will serve to de- termine any number of terms of the series. Thus, the on

square root of a?+4 2? will be found to be a+—-—-—; P 2a 8a ae 5a

a Cee at

ies iesat t &c., and the cube root of a? 4-x will stand o oo 5”9 102/12

thus, a+ 3a 908+ Blak ~ Daag t But as the ex-

traction of roots in the form of series can be more easily

performed by the aid of the binomial theorem, we shall refer the reader to the section where this subject is resumed.

Additional Examples. Lx. 1. Write down the square root of xt — 223 +502 –

1 1 on oe 9% t 76 which is given as a perfect square.

Since the square contains 5 terms, the root must con- tain 3. Of these the first is x? on account of x4, the second

1

16° But as the last term but one of the square is—, and the last term but one of the root also —, the last term of the root must be+.

1 4

He. 2. Extract the square root of 25a + 16y4— 6xy (5x? +49”) +49×7y?, We must first arrange the square in terms of some one quantity (say 2).

The first term of the square is 25a, which gives 5x? as the first term of the root. The second term of the square,

: 1

—x on account of 2×3, and the third + zon account of

., 02-24 is the root required.

— 30a°y gives — 3ay as the second term of the root. The last term 1694 gives +492; which, since the last term but one is —, leads to the root 5a? — 3xy + 4y?.

Hx. 3. Extract the cube root of

825 — 3625 + 6624 — 6323 + 33×2 —9r+1.

Since there are seven terms in the cube, there must be three terms in the root. The first is 2x”, the second — 32, the third 1, as will be seen at once

by examining the cube of p—q+1, viz, p>-3p’¢+... —38q¢4+1.

These examples have been solved by the assumption that the root is capable of extraction without leaving a remainder. When this is not the case, or when there is no certainty that it is so, the only resource is to work the example through, abbreviating the process by the aid of

detached coefficients.

Hix. 4, Extract the square root of 406+ 12a5y + 5aty? — 22343 + Tx?2y — Quy +48. The work is written thus :*

44+1245-24+7-241(203 + 3xy? — xy? + y3

4

443) 1245 12+9

Ves ee Wee

=e G4

446-241) 446-241

Hx. 5. Extract the cube root of 2728 — 27axby — Abaty? + 35a%y3 + 30×2y4 — L2ay5 — 828, We have 27 — 27 —45 +35 + 30 — 12 — 8(32? — xy — 27?

27

27) —-27-45435

~~27+ 9~~ 1

27 -18+3)-544+364+30-12-8

—~54-36— 6 [436-12 po. oe ee

Sect. JII.—Fractrions.

25. In the operation of division, the divisor may be some- times greater than the dividend, or may not be contained in it an exact number of times: in either case the quotient is expressed by means of a fraction. There can be no difficulty, however, in estimating the magnitude of such a quotient ; if, for example, it were the fraction £, we may consider it as denoting either that some unit is divided into 7 equal parts, and that 5 of these are taken, or that

5 times the same unit is divided into 7 equal parts, and one of them taken.

In any fraction the upper number, or the dividend, is called the numerator, and the lower number or divisor is

called the denominator. Thus, in the fraction 5 a is the numerator, and 6 the denominator.

If the numerator be less than the denominator, such a fraction is called a proper fraction ; but if the numerator be either equal to or greater than the denominator, it is called an improper fraction ; and if a quantity be made up of an integer and a fraction, it is called a mzxed quantity.

: ; ate : Thus, ma is a proper fraction ; 7 and wn are both im-

proper fractions ; and 6 +” is a mixed quantity.

The reciprocal of a fraction is another fraction, having its numerator and denominator respectively equal to the denominator and numerator of the former.

a

b

26. The following proposition is the foundation of the operations relating to fractions.

If the numcrator and denominator of a fraction be either both multiplied or both divided by the same quan- tity, the value of the resulting fraction is the same as before.

To demonstrate this proposition we shall throw the definition of a fraction into a categorical form. We shall a b when it is multiplied by 6, the product is a.

Thus, is the reciprocal of the fraction

accordingly define the fraction = as such a magnitude, that

a 5 x o=4.

a nx, xb=na

a 5 X nb = na

= x nb=na (Def.)

oe ey

“ 6 nb*

From this proposition, it is obvious that a fraction may

be very differently expressed without changing its value, and that any integer may be reduced to the form of a fraction, by placing the product arising from its multipli- cation by any assumed quantity as the numerator, and the assumed quantity as the denominator of the fraction. It also appears that a fraction very complex in its form may often be reduced to another of the same value, but more simple, by finding a quantity which will divide both the numerator and denominator, without leaving a remainder. Such a common divisor, or common measure, may be etther simple or compound ; if it be simple, it is readily found by inspection, but if it be compound, it may be found as in the following problem.

Then since

z.e. (Art. 9, Law 3), But

27. Pros. 1.—To find the greatest common Measure of two Quantities.

Rule 1. Range the quantities according to the power of some one of the letters, as in division, leaving out the simple divisors of each quantity.

2. Divide that quantity which is of most dimensions by the other one, and if there be a remainder, divide it by its greatest simple divisor; and then divide the last compound divisor by the resulting quantity, and if any- thing yet remain, divide it also by its greatest simple divisor, and the last compound divisor by the resulting quantity. Proceed in this way till nothing remain,

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[FRACTIONS,

and the last divisor shall be the common measure re quired.

Note.—It will sometimes be necessary to multiply the dividends by simple quantities in order to make the divisions succeed.

The demonstration of this proposition depends on the Axiom, that whatever divides a number divides any mul- tiple of the number ; and whatever divides two numbers divides their sum or difference. It was given by Euclid in Prop. 2, Book vii., very much as follows :-—

Let a, 6 be the quantities, the smaller of which is 0.

Let a be divided by 6, with a remainder ¢,

b by ¢, with a remainder d, ¢ by d, with no remainder,

d is the greatest common measure of a and 8. We have

Now, (1.) d is a common measure of a and 0; for d divides c.. ge… get+d .. 6 .. pb .. pote .. a; Hey divides a and b.

(2.) It is the greatest common divisor. For if not, let e be the greatest; then, since ¢ divides a and 8, it divides a and pb, .. a—pb .. ¢ ...ge.'. b—ge.. d; t. ¢., ¢ ism than d, and not greater.

Cor. Every other divisor of a and 0 divides their greatest common measure.

Observe that no fraction is in a form to be interpreted until it is reduced to its lowest terms.

Ex, 1. Required the greatest common measure of the quantities a2x-— 2° and a®-— 2a2x+ax?. The simple di- visor # being taken out of the former of these quantities, and a out of the latter, they are reduced to a?— «x? and a?—2ax+2×2; and as the quantity a rises to the same dimensions in both, we may take eithcr of them as the first divisor: let us take that which consists of fewest terms, and the operation will stand thus :

a® — x%\q? — 2an+ x1 a? — x

a-—pb=c, b-—qce=d, c=rd.

— 2ax + 2x? remainder, which, divided by — 22, is a—«)a?— a%(a+x

*a? —ax + an — x? + an — x? x **

Hence it appears that a-—a@ is the greatest common measure required.

Ex, 2. Required the greatest common measure of 8a2b? — 10ab? + 264, and 9atb — 9a3b? + 3a2b3 — 3ab4.

It is evident, from inspection, that b is a simple divisor of both quantities ; it will therefore be a factor of the common measure required. Let the simple divisors be now left out of both quantities, and they are reduced to 4a?-5ab+6?, and 3a?—3a%b+al?—b; but as the second of these is to be divided by the first, it must be multiplied by 4 to make the division succeed, and the operation will stand thus :*

4a? — 5ab + b?)1 2a? — 12ab + 4ab? — 4033 12a? — 15a?b + 3ab?

+ 3a7b+ ab? — 403

This remainder is to be divided by }, and the new divi- dend multiplied by 3, to make the division again succeed, and the work will stand thus: 3a? + ab — 40?)12a? -15ab+ 36°(4 12a2+ 4ab— 1602 — 19ab + 190?

OTF SS ee

a

—

FRACTIONS. |

This remainder is to be divided by — 19d, which being done, and the last divisor taken as a dividend as before,

the rest of the operation will be as follows :— a—b)3a?+ ab—4b?(3a+ 4b

3a — 3ab +4ab— 4b2 + 4ab — 462*

-
  -

from which it appears that the common divisor sought is a—, and remarking that the quantities proposed have also a simple divisor 6, the greatest common measure which is required will be b(a — b).

It will be seen that the examples we have given are not on numbers, but on algebraic quantities. In fact, the axiom and the demonstration founded on it apply, with some restrictions and modifications, to such quantities. The most important of the modifications is this: that the divisor, instead of being a whole number, is an expression of the form «+m, where m is of the nature of a numerical quantity, and does not depend on «.

The application of this modified form of the axiom has a wide range in the higher analysis. We offer two addi- tional examples for advanced students.

Ex. 1. Tf av? +ba+c, a«?+b'x+c' have a common divisor of the form «+m, prove that

(a’b — ab’) (b’c – be’) =(a’e—ac’)?. Multiply the first expression by a’, and the second by a, and subtract the products, the difference (a’b—ab’\xz+a’c – ac’, is by the axiom divisible by x m, ‘ awe—a’e , – & WE all wxUe+mMm.

Again, multiply the first expression by c’, and the

second by c, and subtract them; the difference (a’e— ac’ ac?

+(b’c-be’)x is divisible by «+m, .. a+ pd wxL+M. b’c — be’

a’c—ac ac—ac

, /

ac—ac

ab—ab”

Consequently,

the condition required.

Hz, 2. Tf ax + 3bu+d, ba? + 3du+e, have a common divisor; then*

(4bd — ae)? + 27 (ad? + Ue)? =0. Treating this question exactly as the last, viz., multiplying first by 6 and a, and then by e¢ and d, and subtracting, it appears (if w be written instead of bd — ae for brevity) that the two following expressions have a common divisor, 30°a? — 3adx+u and ux? — 3bex + 3d?, whence, by the last example, the condition is (3beu — Yad?) (3adu — 9b8e) = (u? — 9b7d?)?,

from which uw divides out as a common factor, and the result reduces to that enunciated.

28. Pros. II.—7Zo Reduce a Fraction to tts Lowest Terms.

Rule. Divide both numerator and denominator by their

greatest common measure, which may be found by Prob. I.

2 mB wei. Reduce =—~— , to its lowest terms.*

a3 — Qa%a + ax? We have already found in the first example of Prob. I. that, the greatest common measure of the numerator and denominator is a —a; and dividing both by this quantity, ara — a3 ae +o?

e have SS = : a —2a'e+ae a?—ax

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In like manner we find 9a4b — 9a%b? + 3ab3— Bab 9a? + Bab? 8a7b?— 10ab?~~+2b¢ Bab — 252" the common measure being U(a — b), as was shown in Ex~~ ample 2, Problem I. a? — b? — ¢? + Qbe Hx, 2. Reduce Se ee ree a—b—c?+2be _a®—(b—c? (a+b—c) (a-b-c) a-b+e C+h—c2+2ab (atbP—e (at+b+c)(atb—c) atb+te 12—3e—

Ex, 3, To find the value of a when «=2. Here the substitution of 2 in place of « renders the numerator and denominator separately equal to 0. This shows (Art. 20) that «—2 is a divisor of each of them. We get, therefore,

1) -—3¢-—3 1 ; 3 Sao) Po Buss » which when x =2 becomes <=. a —Qy x 2*

: a3 — 4924 I+] wi f ix, 4, Find the value o Ey ae a Tara

Dividing numerator and denominator by «-1, the

to its lowest terms.

when « = 1,

: x? —3e—-1 : ; ; , result is a. he which, when 1 is written in place

3 – :

of x, becomes 9? oF infinity.

29. Pros. IIL.—7o Reduce a Mixed Quantity to an Improper Fraction.

Rule. Multiply the integer by the denominator of the fraction, aud to the product add the numerator; and the denominator being placed under this sum, the result will be the improper fraction required.

2

Ex, 1. Reduce a-a#+ — to an improper fraction. a? (a+2%) (a—2)+a? a age tae roe gue? Ans.

30. Pros. IV.—To Reduce an Improper Fraction to a Whole or Mixed Number.

Rule. Divide the numerator by the denominator for the integral part, and place the remainder, if any, over the denominator; it will be the mixed quantity re- quired.

Qa2 2 42 ; Ex. 1. Reduce "t= and ~ Y to whole or mixed a+% y quantities.

f D2 2 First @t" =a"+——, the answer.*

a+nz a+«

2 9/2 ' ° And — Sey, y a whole quantity, which is the

Dae, answer.

31. Pros. V.—Zo Reduce Fractions having different De- nominators to others of the same value which shall have a common Denominator.

Rule. Multiply each numerator separately into all the denominators except its own for the new numerators, and all the denominators together for the common de- nominator.

a? —o?

Ex. 1. Reduce —“~ and a-—xZx a+az

having a common denominator.

to fractions of equal value,

ala + ©) = aa + ax?

(a? — 22) (a— 2) = a3 — aa — an? +08 \ the new numerators.

(a —x)(a+ x) =a? — x?, the common denominator. aa+ ax? ex? ad—ae— aato3 ia a. CP iy a+% a —%

ae Hence —= a-—%

bow 32. Pros. VI.— Zo Add or Subtract Fractions.

Rule. Reduce the fractions to a common denominator, and add or subtract their numerators; and the sum or difference placed over the common denominator is the sum or remainder required.

In practice, however, it is generally better to separate the process into two or more parts analogous to the addi- tion or subtraction of sums of money, where the pounds are added to the pounds, the shillings to the shillings, &c., and the result afterwards combined.

a Ex. 1. Add together me and re

: Z b The latter fraction is ———

a- ee b = a-b .. the sum required is ho ie Le el a” 1—a”*

ce 1 Similarly, ah

—— an” —

Ex, 2, Collect into a single fraction 1 1 2a

a—-b a+b ao i 1 2b

——— *ee*

. — — eee —. ee 4 —— ,

1 1 7

Ex. 3, Collect 7-3 55—¢ aac ie'

We observe that # — 2 is common to all the denominators ; the question may therefore be written,

1 ey i

4 3 12

on Gage Ex. 4, Collect zt + : = ere!

3a + 2y 2—4y t 3n—2y a2 —16y? Here we commence by adding the 1st and 3d together, and the 2d and 4th together ; which results in

6a 24a 9a? —4y2 a2 — 16y?

*6 1 4 6 — 3502 ~ "(oa —4y? a= on * " (9c — 4y*) (a? — 16y?)*

- 21023

(a2 — 4y?) (a? — 16y?) ltaoteto 1l—x+a?—-28 l—a+at—a8 " 1+ opar+ad

The numerator will consist of the sum of two products, the one containing +4, exactly in the same way that the other contains —2. If, then, we write down one of these products, and double the even powers of « in it, omitting the odd powers, we shall obtain the required result. The product of the denominators again may be readily obtained by regarding it as that of the difference and sum of 142? and #+a. As such processes are of constant occurrence, we will indicate the work in full.*

1414141 14+141+41

1414141 +14+14141 +1+1+4+141 +14141+4+1

Double of il +322 4344 +1 Denominator, {1+2?—(x + 2°)} {1 +224 (x+23)} =

(142)? —(@ + a8)? = 1 + 22? + at 4? -Qat-— 26 = 1 +o? — at — x8,

Ex. 5. Find the sum of

Numerator,

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[“RACTIONS, . 24+ 6a? + 6a? + 28] SS ne And the result is oo . 3 5 iL Ex. 6. Collect into one fraction ——————————— +

1+a”-” +a”? iL il

Lara ela ge Multiply numerator and denominator of the first frae- tion by #”, &c., and the given quantity becomes

*gs ee a oP gM LP gM oP * i m nm Eu. 7. If ery ess eee | and ee {al =1 1+l4+in (14+m4+ml°ltntnm ~?*

none of the denominators being zero, then /=m=n. Multiply the first quantity by J, and subtract, there

1 : ’ : results i= nm, Which, when substituted in the first

quantity, gives m=n, whence the proposition.

33. The converse problem to collecting many fractions Partial into one is frequently as important as the direct—the pro- fractions, blem, namely, of resolving a compound fraction into its components or partial fractions. For a first example, if it be required to find what simple fractions make up the

2a, : oq We commence by observing that

the denominator «? — a? is the product of «+a and #~a,

compound fraction

Ces : : Hence, 2 as the sum of the fractions whose denomina-

tors are «+a and x#-a.

ser _% A, B ; fod eta Boe which involve a only, not x, since #? does not appear in the numerator of the sum.

vee 2 A@—a)+Biata By addition, ee ‘

. 20 = A(x — a) + B(x +a).

To obtain A and B from this equality, we remark that the equality is an identity, as in Art. 20. We may, therefore, deal with it in either of two ways: 1. Make the 2’s on the left hand side to coincide with the a’s on the right, and the a@’s in like manner. 2. As in Art. 20, write any-

where A and B are quantities

thing we please in place of 2 on both sides. We will in this example take the first method, and illustrate the second method by the subsequent examples. We get 2=A+B, 0O=A-B; .. A=B=1, and the result is a a—a? s—a | 2—a 1 A B te.2. ae) ee ee “ L=A(x—b)+Bla-a). F 1 Write a for 2, then 1=A(a—6).. A=—>°

Write bfor #, then 1=B(b—a)= —(a—0).. B= -5;

7 an eee = as = ae (a—a)(a@—b) a—-b\z-a «2-6 The reader will observe that we have treated “ay as if

it were not itself a fraction. In fact, in the application of the subject before us, the letters a and b stand for arith

1

metical quantities, and the fraction a3 8 simply an arith-

metical fraction, as contradistinguished from an algebraical

fraction like —s . yO,

FRACTIONS. |

pxtg = B C

3. (=a) (–)) (—e) a-a’ 2—b’a—e

Ee.

gives pxe+q=A(x—b)(#—c)+B(a—-a) (x—c) + O(- a) («- 6), . pa+q=A(a-b)(a-c), &e., pxtg _ pata 1 a Gaiam) (c–o) “G-D(a—-9 | z-at po+q ply pe+g Bs G0) 2-0 ©—a)G—)) Boe . a+b b+e Ex, 4. Find the sum of U=NGoa C=aasn __ ae (a—b)(b—c)*

*Let a+6+c=s; and write in alphabetical order ; it gives _ aan as —_— ef am! (ab) (a—0) * (b=) (6-0) * (=a) (a—b)’ i.e, (Ex. 3), the A, B, C of the resolved fraction,*

mie dy BO («—a)(a—b)(z—¢) a—a eg

and since #—s=A(«—b) («—c)+ B(w-a)(%—c)+ C(z—a) (w—b), the sum required, being the coefficient of x’, is equal to 0.

The reader will easily extend this process to other eases, as, for instance, to prove

*bed eda ee) G-)@—4)*0-90-a Oa)” dab abe*

*(—a)(e—a) ¢—b) * @=a) d-H—9) 7*

34. Pros. VII.—TZo Multiply Fractions.

Rule. Multiply the numerators of the fractions for the numerator of the product, and the denominators for the denominator of the product.

The demonstration follows at once from the definition of a fraction given in Art. 26; thus since _ x b=a, xd=c,

a c

ve have 5 xox 7% d=ac, we, by the commutative law

35. Pros. VIII.—Z0 Divide Fracticns.

fule. Multiply the dividend by the reciprocal of the divisor, the product will be the quotient required.

This rule requires no demonstration.

Examples in Multiplication and Division of Fractions.

‘ a b a? : a a?—b? Ex. 1. Multiply os by Boy Since i a .. the product is ay ae _@ a ab ~@—-B ab bb . x —3a+2 ×2+2-+1 Ex. on M] i a eee! ee B+ 2242-1 7 —5a+4

Because the numerator of the first fraction, and the denominator of the second both become 0, when 1 is written for x, each is divisible by «—1 (Art. 20). In the same way the denominator of the first fraction, and the

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numerator of the second are both divisible by +1. Hence,

we —3a-+2 2+2e+1 «—38042 e+ 20+]

4 I+ +1 @_bee4 of ba 4 Oe + let ee 2 ol e+ Qo? —~—2 a—4 g+e+1 28—3a02-30—4

4 2

Ba, 3. Divide $-° by &- 5. : . a—h? = arb? ab The quotient is ae aoe 2 2 Wen SG Ex. 4. Reduce 1-(5=) to factorials. (0? +0? — a?\2 b2-+¢c?—a? oe) 1-(Qbe) =(1 + She)(~ Qe Cte a a’—(0-sc)! = Qbe Qbe _O+e+a) (b+e-a) (atb—-c) (a—-bte) – Ab2¢2 at +b? —¢2—d2\2 : Ex. 5. Reduce 1—-(== to factorials.*

i (ae) = { 1 a2-+ b? — ¢2 — 2 } 2(ab + cd) = 2(ab + cd)

{ l aa _(a+b)?—(c—d? (c+d?—-(a—b)? 2(ab+ cd) 2(ab + cd) 2(ab + cd)

_ (a+b+c—d) a+b—c+d) (c+d+a—b) (c+d—a+b)

i A(ab+ ced)? ;

Miscellaneous Examples in Fractions.

aA ab—ax bu—ab (a—«a) (be—cx)'

Ex. 1. Find the value of

2abe atts ; when = ae" Writing down every term with x first, there results— oe © 6% a(a—b) b(–a) c(z–a)(—-b) (%—a)(x—b) Hx. 2. Find the value of ae Fesa 'a: , when lee)

aan and #=2(a+b-—c).

Restore symmetry by writing —c for c; the numerator of the sum is (#— 3b) (#— 3c) + (a — 38a) (a —- 3c) +(x — 3a) (a — 3b) = 3{a — 2(a + b+c)x + 3(ab+ac+bc)}. But x=2(a+6+c), whence the first and second terms make*

< +~ =0, is the third term divided by abc bc @ .. the sum required is 0.

Ex, 3. Given that (a? + bc) (6? + ac) (c? + ad) + (a? — bc) (6? — ac) (c? —ab)=0, when multiplied out and reduced, may be written a?+6°+c? +abce=0, prove that (a? + bc) (6? + ac) (c? + ab) — (a? — bc) (6? — ac) (c?-ab)=0, may be

1 9 –

reduced to ate we tae 0. The latter given equality, by dividing it by abe x bac x c?ab, becomes

Lh ee fll Le 1 iL Ga) an (ata) ' I ll L wll ae! (Ge- as) Ge) Ga-e) =? "EE G4): "" \be @?] \ac 82} \ab 2 Lo Le Lil Gm Gz) aa which is identical with the first given equality, but with

i Jb al Es wba? written in place of a, 6, c. The result therefore of

up 0; and =

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reducing the second equality will be identical with that of ‘ 111 é :

reducing the first, when 5? g? we written in place of a,

b,c. Now the former result is a?+ 6° +c? +abe=0, .. the

“A ee 1. ee eee atter Is Stitats, 0 UD

ee ae Dovey ——_— 1 (a, — @y) (a, — 43) Ae (a, — an) an ” (Gq-aNq— o)...- Cana) &ec., is equal to 0 if m>n,

and equal to 1 if m=n. che

ng (x —a4)(@— aq). . « (%— An) We have

This is easily proved by resolv- into partial fractions (Art. 33).

an i —— a = —+ + &e. (w@—a,) ++. G—Gy) =a eae, Y*

**, gh i=A(e—a,).. (e—a,)+ &e. . . (1), whence, writing a,, @,, &c., successively for w, we get A,, A,, &e. “The given quantity is A,A, ... +A,, and the equation marked (1), gives, by equating coefficients of like powers of x, the result required.*

Ee, 5. 162 =”, then 22-745. q 5 p-q Ts For Lot aT ge SE d 222" =1 f 8 qg 8 q 8 gives Pi = a – Divide the former by the latter. 1) Bleee 1 2 ee Qual ee Ex. 6. aa, Tabae? then @ B=c a+b 1 1 1 1 a+b Hee a “as eRe ~ o(a+b-+e) 5 yay . oe . either a+6=0, or [= Bee a

In the latter case, a = A + 2 oh tb , ce ab ac be which is not changed by interchanging c and 0 or ¢ and a,

ee gl

so that on either alternative the proposition is true.

: ad — be ac—bd..

Ex. 7. Given that Ga) ge eee | and a not equal to 6, nor c equal to d; to prove that a+b=c+d; atb+c+d

and that either of the fractions equals 4

Write the equality thus,— ac—bd a—b+(c—d) ad—be a—b—(c—d) Apply Example 5, and there results,

ac—bd+ad—be a-—b ac—bd—ad+be c—d' (a—b)(c+d) _a—d (c—d\a+b) c—d' If now a—c or d—6b be written by a single symbol x the first fraction becomes x a ,

1.€. whence a+6=c+d.

(c+a) (b+2)—-cb_btet+a a+b atbt+etd Qn > ie. 4 ; Hees i eae). JOE Ve—Jal" ena

1 1

iad — J.' " vane

AL Gy i Bakes

[suRDs,

prove that (y+2—"2+U) (2+a—y+u) (c+y—2+u) = (@+y+2—u)s 'a (b+c¢—a) (c+a—b)(a+b—-c) 8abe j Deal with the reciprocals of x, y, z, w; thus,

Ytz2—-"x+u=yt+z2—-(e-u)

= (i+ y) ~ ou; ~ ;) =2 Jfa(yz— au)

=4 J/ayzxu(e+b—a). Hence, by symmetry, the numerator of the left hand frac- tion becomes

64 Jabe y8z2a5u3(b +c — a) (c+a—b)(at+b—c).

ie Tsai Ai et yte—anmeie) + (5-5) 7 f= 1 1 =2 Jc(uy+zu)=2 Jeayeu(= +=)

=8 Jabe xyzu,

Hence the result.

Secor, [V.—Surps.

36. It has been already observed (Art. 23), that the root of any proposed quantity is found by dividing the exponent of the quantity by the index of the root; and the rule has been illustrated by examples, in all of which, however, the quotient expressing the exponent of the result is a whole number; but there may be cases in which the quotient isa fraction. Thus, if the cube root of a? were required, it might be expressed, agreeably to the method of notation

already explained, either thus, 3/a?, or thus, a8.

Quantities which have fractional exponents are called surds, or imperfect powers, and are said to be wrational, in opposition to others with integral exponents, which are called rational.

Surds may be denoted by means of the radical sign, but it will be often more convenient to use the notation of fractional exponents. The following examples will show how they may be expressed either way.

cs = 1 Jo =a", /4ab? = 2ba3, Je+P=(a+ 2),

oe = (eye tee

The operations concerning surds depend on the following principles :—

1. If the numerator and denominator of a fractional exponent be either both multiplied or both divided by the same quantity, the value of the power is the same. Thus,

a = a : 2. The product of like powers (integral or fractional) is

the same power of the product. Thus, age = (ab)?

37, L—Reduction of a Rational Quantity to the form of 4 Surd of any given denomination.

Rule. Reduce the exponent of the quantity to the form of a fraction of the same denomination as the given surd.

Ex. Reduce a? to the form of the cube root. Here the exponent 2 must be reduced to the form of a

fraction having 3 for a denominator, which will be the & — fraction $; therefore a? =a? = 3/a®. 38. I].—Reduction of Surds of different denominations to others of the same value and of the same denomination.

Rule. Reduce the fractional exponents to others of the same value, and having the same common denominator.

— 1 Ex, Reduce ,/aand ,/b?, or a® and 63 to other equi- valent surds of the same denomination. The exponents 4, 2, when reduced to a common deno- minator, are 2 and 4; therefore the surds required are

4 Cr. Cs a® and b mor Ja' and |/6. 39. III.—Jeduction of Surds to their most simple terms.*

Rule. Reduce the surd into two factors, so that one of them may be a complete powcr, having its exponent divi- sible by the index of the surd. Extract the root of that power, and place it before the remaining quantities, with the proper radical sign between them.

Ex. 1. Reduce ,/48 to its most simple terms. The number 48 may be resolved into the two factors 16 and 3, of which the first is a complete square ; therefore

Ji = (42× 3)Pa4× 32 =4 Je,

Eu, 2. Reduce ,/98atx, and ,/24a°x+40a%x?, each to its most simple terms. First, /98aix = (72a! x 2x) = 7a? x (2x)¥ = 702 /Fe. Also ./240%m + 4008s? = (28a? (3x 522))® =2a [a 5a?

40, 1V.— Addition and Subtraction of Surds.

Rule. If the surds are of different denominations, reduce them to others of the same denomination, by prob. 2, and then reduce them to their simplest terms by last pro- blem. Then, if the surd part be the same in them all, annex it to the sum or difference of the rational parts, with the sign of multiplication, and it will give the sum or difference required. But if the surd part be not the same in all the quantities, they can only be added or subtracted by placing the signs + or — betwcen them.

Ex. 1. Required the sum of ,/27 and ,/48. By prob. 3 we find ,/27=3 ,/3 and ,/48=4 ,/3, there- fore /27+ ,/48=3 /34+4 /3=7 ,/8. . = ——_ Hx, 2. Required the sum of 3 at and 5 ,/q5. 3 3 — 3 —— Sa se 3J5=3 J/§=3 J/2 and 5 Jay =5 Jee =$./2, Sr Ss So — She = therefore 3, /F+5 Jp =3 2442-4 Wf. Hz, 3. Required the difference between ,/80a!x and

200228 ,

/80a%x = (42a! x 5a)? = 4a? (5a, and 20a = 1 — es (2?a?x? x 5a) = 2axz ,/5x; therefore ,/80 at x — /200?23 = (4a — 2ax) ,/5a . 41. V.— Multiplication and Division of Surds.*

Rule. If they are surds of the same rational quantity, add or subtract their exponents.

But if they are surds of different rational quantities, let them be brought to others of the same denomination, by prob. 2. Then, by multiplying or dividing these rational quantities, their product or quotient may be set under the common radical sign.

Note, If the surds have any rational coefficicnts, their pro- duct or quotient must be prefixed.

; Hn, B=

x. 1, Required the product of ,/a? and /a?. 5 —— ome 3 243 19 Co VE x J@=a% x aF =a Faagib= fais, Ans,

Ex. 2. Divide Ja —8 by Jato.

These surds, when reduced to the same denomination,

3 2

are (a? —b2)® and (a+b)®. Hence N@—? _ (2% i

S/a +b \ (a+b)

= (SG Pa (at 8) (0-0) b= ar Oa OF.

42, VI.—Involution and Evolution of Surds.

The powers and roots of surds are found in the same manner as any other quantities, namely, by multiplying or dividing their exponents by the index of the power or root

Bi 2 required. Thus, the square of 3 ,/3 is 3 × 3 x (3)®&=

35 1 J 9/9. The nth power of x" isa". The cube root of = } = 1 1 = V3 is 5 (2)® =5 9/9, and the nth root of a is am,

43, The reduction of quadratic surds is facilitated by the following considerations, which appear hardly to require demonstration :

1. ,/a cannot =6 + ,/c, when ,/c is a surd.

2. a+ ,/b cannot=c+ ,/d when ,/b, /d are unequal surds.

3. a cannot= ,/b ,/e when ,/d, ,/c are surds not involv- ing the same irrational part, ,/2and ,/3for example.

4. ,/a cannot equal ,/o+ ,/c when all are surds not in-

volving the same irrational part. Note. = irrational part of ,/8, for instance, is ,/2, for ,/8

2.

44, For example, we extract the square root of a binomial surd such as 28+ 10 ,/3 in the following way :

Let ,/28+10 ,/3=x+y, where one or both of x and y must be a surd.

Then 28410 /3=22? +4? + 22y,

os 28 =27+4", 10 /3=22y,

or No. 2 above would be violated.

Hence ,/28-10 /3= ,/x?+4-Qay=x2-y.*

And J/784 — 300 = a? —y?, or v+y?=28 x? — y2 = 2D e=5, y= /3,

and 5+ ,/3 is the root required.

Additional Examples in Surds.

1 1 I 1 Ex. 1. Add together 7p » en Fea and ae it 1 2 ltWe aya 0s 1 iL 2V3

Wo OS cere /3— 2 is the sum required. Hx. 2. Find the difference between a+x2+nV (a+2) an m((a+2)—V(a+2) (a+2)+V(a+ax)8 Cer) : 1 V(a+a)+1 1 V(a+x) "1l+V(a+a2) V(a+2)" The latter is the square root of 1 M(ate2)-1 , 1 ata' W(a+2)—1 > 1.6, of ee the difference required is 0.

The former is

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Proportion and Pro- gression.

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iio ee Lx. 3. Find the value of Vata) =a' _(b-oa when ie

At the first reduction a divides out, and the fraction is reduced to

Ga) b—c

Mi oars Favbc b+e+(b—e) 8 GaP) 258 bee")

J+ Abe 2 be

a+ V(2u — x)

x—V(2a—«)'

when a= ,/(b?+4ab)—6. By the process explained in this article

Ex. 4. Find the value of

— soar 4a+b J2a-a= J(2at+b— Jo+4ab)= J- 2 3 : : V2b+1 whence the fraction reduces to Vab-1°

45. In arithmetic the square root of a number is another number, which, when multiplied by itself, shall produce the first number. In algebra, where quantity takes the place of number, the definition leads to a less limited result than in arithmetic. In the latter science there can- not be two square roots of the same thing ; in the former, there will necessarily be two. For both + 2x + 2 gives 4, and—2x —2 gives 4; hence the square root of 4 is — 2 as well as + 2.

And, further, as in algebra, — 2 is a quantity subject to all the operations and definitions of the science, it is clearly competent to express, in some form or other, the result of extracting its square root. That form must of necessity be something very different in character from ,/2, whether J/2be+ or —. For the definition requires that 'the square root of — 2 shall be such a quantity as when multiplied by itself shall produce- 2. It is then clearly no arith- metical quantity either + or —, but some quantity con- nected with numerical quantities by its properties, but not by its nature. It is termed an impossible or imaginary quantity, and may be written ,/—2 or ,/2,/—1, and the same notation applies to the square roots of all negative quantities.

The propertics of imaginary quantities are almost iden- tical with those of surds, and we need not stop to consider them. One example of their application will suffice. It affords strong confirmation of the safety of assuming the commutative law to exist in every branch of pure algebra.

Ex. The product of the sum of two squares by the sum of two squares can always be represented under the form of the sum of two squares.

For (a? +62) (2+d)=(a+bJ-1) (a-6,/-1) x(c+df—-1) (e-d,/-1) =(a+b J—l) (c+d/-1)x(a-b /—I)(e-dJ-1)*

= (ac — bd)? + (ad + be)? .

Cor. (a? + 6?) (c? + d) = (ac + bd)? + (ad — bc)?, or the pro- duct may be represented in two different ways, under the form of the sum of two squares.*

SEct. V.—PROPORTION AND PROGRESSION.

46. In comparing together any two quantities of the same kind in respect of magnitude, we may consider how much the one is greater than the other, or else how many times the one contains either the whole or some part of the other ; or, which is the same thing, we may consider either

what is the difference between the quauntitics, or what is the quotient arising from the division of the one quantity by the other: the former of these is called their arithmetical ratio, and the latter their geometrical ratio. These deno- minations, however, have been assumed arbitrarily, and have little or no connection with the relations they are intended to express.

I. Arithmetical Proportion and Progression.

47. When of four quantitics the difference between the first and second is equal to the difference betwecn the third and fourth, the quantities are

called arithmetwal propor- tionals. Such, for example, are the numbers & 5, 9, 12; and, in general, the quantitics a, a+d, b, b+d.

48, The principal property of four arithmetical propor- tionals is this :—If four quantities be arithmetieally pro- portional, the sum of the extreme terms is cquat to the sum of the means. Let the quantities be a, a+d, b, b+d; where d is the differcnce between the first and second, and also between the third and fourth, the sum of the extremes is a+b+d, and that of the means a+ d+ 6; so that the truth of the proposition is evident.

49, If a series of quantities be such, that the difference between any two adjacent terms is always the same, these terms form an arithmetical progression. Thus, the num- bers 2, 4, 6, 8, 10, dvc., form a series in arithmetical pro- gression, and, in general, such a series may be represented thus:

a, a+d,a+2d,a+3d,a+4d,a+5d, a+ 6d, &c., where a denotes the first term, and d the common difference.

By a little attention to this series, we readily discover that it has the following properties:

1. The last term of the series is equal to the first term, together with the common difference taken as often as there are terms after the first. Thus, when the number of terms is 7, the last term is a+6d,; and so on. Hence if z denote the last term, m the number of terms, and a and d express the first term and common difference, we have z=at+(n—-1)d.

2. The sum of the first and last term is equal to the sum of any two tcrms at the same distance from them. Thus, suppose the number of terms to be 7, then the last term is a+ 6d, and the sum of the first and last 2a + 6d; but the same is also the sum of the second and last but one, of the third and last but two, and so on till we come to the middle term, which, because it is equally distant from the extremes, must be added to itself.

3. To find the sum of the series, it is only necessary to observe that, if the progression is written down twice, 1° from the beginning, 2° from the end, the terms of the former increase by the same amount as that by which the

terms of the latter diminish ; so that the sum of any two terms which stand under each other is always the same, viz., the same as the sum of the first and last terms; hence the double series converts addition into multiplication; so that if s denote the sum of the series, we have 2s=n(a+z), and

Ex. The sum of the odd numbers 1, 3, 5, 7, 9, &c., con- tinued to n terms, is equal to the square of the number of terms, For in this case a=1, d=2, z=1+(n-—1) d=2m

-—1, therefore s =" x In=n?.

2

II. Geometrical Proportion and Progression.

50. When, of four quantities, the quotient arising from the division of the first by the second is equal to that arising from the division of the third by the fourth, these quantities are said to be in geometrical proportion, or ate

PROGRESSION. |

called simply proportionals. numbers in geometrical proportion; and, in general, na, a

nb, b, may express any four proportionals, for "=n, and

1 nb also = =n.

To denote that any four quantitics a, b, c, d, are pro- portionals, it is common to place them thus, a:b::¢:d; or thus, a: b=c:d; which notation, when expressed in words, is read thus, a is to } as ¢ to d, or the ratio of a to

b is equal to the ratio of ¢ to d. The first and third terms of a proportion are called the antecedents, and the second and fourth the consequents.

When the two middle terms of a proportion are the

same, the remaining terms, and that quantity, constitute three geometrical proportionals; such as 4, 6, 9, and in

general na, a, . In this case the middle quantity is called

a mean proportional between the other two.

51, The principal propertics of four proportionals are the following:

1. If four quantities be proportionals, the product of the extremes is equal to the product of the means. Let a, b, c, d, be four quantities, such that a:b :: ¢:d; then, a b quotients be multiplied by 6 d, and we have ad=be. It follows, that if any three of four proportionals be given, the remaining one may be found. Thus, let a, d, c, the first three, be given, and let it be required to find a, the fourth term; because a:b::¢:2, ax=be, and dividing

from the nature of proportionals, =5i let these equal

be by a, 2= –

The converse is obviously true, viz., if four quantities be such that the product of two of them is equal to the pro- duct of the other two, these quantities are proportionals.

2, If four quantities are proportional, that is, if a: b:: c:d, then will each of the following combinations or arrange- ments of the quantities be also four proportionals.

Ist, By inversion, b:a::d:c.

2d, By alternation, a:¢::b:d.

Note.—The quantities in the second case must be all of the same kind.

3d, By composition, a+b:a::c+d:c, or, +b0:b::c+d:d. 4th, By division, a–b:a::e–d:c, or, a-b:b::c-—d:d.

5th, By mixing, a@tb:a-—b:i:e+d:e-—d, 6th, By taking any equimultiples of the antecedents, and also any equimultiples of the consequents, ROO

Poi: ne? pd . 7th, Or, by taking any parts of the antecedents and con- eae. 2% n . p ee n . p ° That the preceding combinations of the quantities a, b, ¢, d, are proportionals, may be readily proved, by taking the products of the extremes and means; for from each of them we derive this conclusion, that ad= be, which is known to be true, from the original assumption of the quantities, 8th, If four quantities be proportional, and also other four, the product of the corresponding terms will be proportional. dhet™ :0 ::¢ :d, md :f 3:9 th; Then ae: Of :: cg: dh. For ad = be, and ch= Jg, a8 before, therefore, multiplying together these equal quantities, adch = befg, or ae x dh = bf

x og; therefore, by the converse of the first property, de: Of ::e9: dh.

sequents,

ALGEBRA Thus, 12, 4, 15, 5, are four

b)

DoT

Hence it follows, that if there be any number of pro- portions whatever, the products of the corresponding terms will still be proportional.

52. Ifa series of quantities be so related to each other, that the quotient arising from the division of any term by that which precedes it is always the same quantity, thesc are said to be in geometrical progression; such are the numbers 2, 4, 8, 16, 32, &c., also 4, 3, 4, ae, &c., and in general, a series of such quantities may be represented thus, a, ar, ar®, ar®, art, ar®, &c. Here a is the first term, and r the quotient of any two adjoining terms, which is also called the common ratio.

By iuspecting this scries, we find that it has the follow- ing properties:

1, The last term is equal to the first, multiplied by the common ratio raised to a power, the index of which is onc less than the number of terms. Therefore, if z denote the last term, and 2 the number of terms, z=ar”—.

2. The product of the first and last term is equal to the product of any two terms equally distant from them: thus, supposing ar> the last term, it is evident that ax ar=ar x art=ar? x ar', &e.

The sum of 2 terms of a geometrical series may be found thus ;

Let s=atar+ar+ar'...tar™,

Then rs=ar+ar? + ar… ~~*ar"" +ar", Subtract, rs—s=ar"—a. That is, (r—1) s=a(r**~~ *1) H _ tee 1 l-r ence : Sa aa, 2 Cor. The sum to infinity = = :*

Additional Examples in Proportion and Progression.

Ex. 1. How many strokes does a clock strike in twelve hours? If s denote the number

*s= 1+ 24+...12 a ee *, 28=134134+.,.18=13×12; s=78.*

Kz, 2, Find the number of shot lying close together in the shape of an equilateral triangle.

Let » be the number of shot in a side of the triangle. Counting from one angle, and taking in successive rows parallel to the opposite side, we get as the number re- quired

142+ me kD :

Ex. 3. To find the number of shot in a pile of the form of a triangular pyramid.

As each shot les in the hollow formed by those below it, the number of shot in the successive sides from the base

; upwards will evidently be

n—-1,n-2,...1. Hence the number of shot in the pile will be ss) ag 7, (n—2)(n —1) es ee

2 2 2 2

To sum this series induction may be employed. The result 1s

n+ Y)(n+2) |

6

Ex. 4, A ratio of greater inequality is diminished, and of less inequality increased, by adding the same quantity

to each of its terms. Let a>b; then eee : By multiplying out, this is evident. I. — 68

Simple Equations,

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Ex. 5. Find the vulgar fraction which is equivalent to ! the recurring decimal.

3149

Let x == 3142, then 10x = 3142

10,0002 = 31427142

.. Subtracting 9990z = 3139

3139

“9990

Ex. 6. A sum of money doubles itself in fifteen years at a rate a little below 5 per cent. A noble Scotch family have retained in their possession gold coins of the value of £500 since the days of Mary Stuart (300 years) ; what have they lost by not allowing the moncy to accumulate at the above rate 4

Every pound would have amounted to £27; .., £500 (20-1) is the loss. It amounts to upwards of £524,000,000.

Ex. 7, The sum of the mixed series

at (at b)r+(at 2b)r? + br(l—r—) (atn—1b)r (1—ry? i

oe eee

is ae i

Sect. VI.—REsSoLUTION OF EQUATIONS INVOLVING ONE UNKNOWN QUANTITY.

53. The primary object of algebraic investigation is to discover certain unknown quantities, by comparing them with other quantities which are given, or supposed to be known. The relation between the known and unknown quantities is either that of equality, or else such as may be reduced to equality; and a proposition which affirms that certain combinations of quantities are equal to one another is called an equation. Such are the following :—

ee 24 a a 2x + 3y = xy .

The first of these equations expresses the relation between an unknown quantity « and certain known numbers; and the second expresses the relation which the two indefinite quantities x and y have to each other.

The conditions of a problem may be such as to require several equations and symbols of unknown quantities for their complete expression. These, however, by rules here- after to be explained, may be reduced to one cquation, involving ouly one unknown quantity and its powers, be- sides the known quantities; and the method of expressing that quantity by means of the known quantities consti- tutes the theory of equations, one of the most important as well as most intricate branches of algebraic analysis.

An equation is said to be resolved when the unknown quantity is made to stand alone on one side, and only known quantities on the other side; and the value of the un- known quantity is called a root of the equation. The general definition of a root of an equation is, that it is a numerical quantity (?.e., some combination of numbers) which, when written in place of the

unknown quantity, renders the equation a numerical ideality; thus 1 is the root of the equation x=1, 1 and —1 are both roots of the equation w=13;1, /-1,— /—1 and —1 are all roots of the equation a4 = 1.

54. Equations containing only one unknown quantity and its powers, are divided into different orders, according to the highest power of that quantity contained in any one of its terms. The equation, however, is supposed to be reduced to such a form that the unknown quantity is found only in the numerators of the terms, and that the exponents of its powers are expressed by positive integers.

ALGEBRA

[SIMPLE EQUATIONS,

If an equation contains only the first power of the unknown quantity, it is called a s¢mple equation, or an equation of the first order. Such is az+b=c, where x denotes an unknown, and a, 6, c, known quantities.

If the equation contains the second power of the un- known quantity, it is said to be of the second degree, or is called a quadratec equation; such is 4x?+3”%=12, and in general ax?+bx=c. If it contains the third power of the unknown quantity, it is of the third degree, or is a cubic equation ; such are 2° + 2a?+4%=10, and ax? + bz? +cx=d ; and so on with respect to equations of the higher orders.

When in the course of an algebraic investigation we arrive at an equation involving only one unknown quantity, that quantity will often be so entangled in the different terms as to render several previous reductions necessary before the equation can be expressed under its character- istic form, so as to be resolved by the rulcs which belong to that form.

These reductions depend upon the operations which have been explained in the former part of this treatise, and the application of a few self-evident principles, namely, that if equal quantities be added to or subtracted from equal quantities, the sums or remainders will be equal; if equal quantities be multiplied or divided by the same quantity, the products or quotients will

be equal ; and, lastly, if equal quantities be raised to the same power, or have the same root extracted out of each, the results will still be equal.

From these considerations are derived the following rules, which apply alike to equations of all orders, and are alone sufficient for the resolution of simple equations.

55. Rule 1. Any quantity may be transposed from one side of an equation to the other, by changing its sign.

Thus, if 3x-10=27+5, Then 3x —272=5+10,

Or oe 15°.

Again, if ax+b=cx—dute, Then ax —cu+dr=e—b,

Or (a—c+d)u=e—b.

The reason of this rule is evident, for the transposing of a quantity from one side of an equation to the other is nothing more than adding the same quantity to each side of the equation, if the sign of the quantity transposed was —; or subtracting it, if the sign was+.

From this rule we may infer, that if any quantity be found on each side of the equation with the same sign, it may be left out of both. Also, that the signs of all the terms of an equation may be changed into the contrary, without affecting the truth of the equation.

Thus, if a+xex=b+ate, Then e=b+e; And if a-x=b-—d, Then x—-a=d-—b.

56. Rule 2. If the unknown quantity in an equation be multiplied by any quantity, that quantity may be taken away, by dividing all the other terms of the equation by it.

Nef an=24,

24

Then [= if axz=b—c, mee GAOL a a a

SIMPLE EQUATIONS. |

Here equal quantities are divided by the same quantity, and therefore the quotients are equal.

57. Rule 3. If any term of an equation be a fraction, its denominator may be taken away, by multiplying all the other terms of the equation by that denominator.

x

If ae

Then = 3o.

If ~=b-c+d,

Then ace t @:*

If =<,

We have ax—b=cx and eos:

a—¢

In these examples, equal quantities are multiplied by the same quantity, and therefore the products are equal. 58. Rule 4. If the unknown quantity is found in any term

which is a surd, let that surd be made to stand alone on one side of the equation, and the remaining terms on the opposite side; then involve each side to a power denoted by the index of the surd, and thus the unknown quantity shall be freed from the surd expression.

If – v2+6=10, | Then, by transposition, ,/e=10—-6=4;

And, squaring both sides, ,/zx ,/r=4×4, Or x=16. Jae+a?-b=z, Ja+a2=b+ex, a =(b4 2) =02 + 2ba+ 22, a? — 2 2b 59. Rule 5. If the side of the equation which contains the unknown quantity be a perfect power, the*

equation may be reduced to another of a lower order, by extracting the root of that power out of each side of the equation.

Thus, if x? = 64a3,

Then, by extracting the cube root, x= 4a;

And if (a+z2)=0?-a?,

Then a+xz= ,/b—-a?.*

60. In these examples we have been able to determine the value of the unknown quantity by the rules already delivered, because in every case the first, or at most the second power of that quantity, has been made to stand alone on one side of the equation, while the other con- sisted only of known quantities; but the same methods of reduction serve to bring equations of all degrees to a pro-

per fom for solution. Thus, if eR EET l-p-a#+

Also, if By trans. And, squaring,

Hence a =b? + 2b2, x=

r ; : 33 by proper reduction, we have 2° +pz2+9z=r, a cubic

equation which may be resolved by rules to be afterwards explained.

Sect. VII.—Repvuction oF EQUATIONS INVOLVING MORE THAN ONE UNKNOWN QUANTITY.

61. Having shown in the last section in what manner an equation involving one unknown quantity may be resolved, or at least fitted for a final solution, we are next to explain the methods by which two or more equations, Involving as many unknown quantities, may at last be reduced to one equation and one unknown quantity.

_ As the unknown quantities may be combined together im very different ways, so as to constitute an equation, the methods most proper for their

elimination must therefore be various. The three following, however, are of general application, and the last of them may be used with

advantage, not only when the unknown quantity to be eliminated rises to the same power in all the equations, but also when the equations contain different powers of that quantity.

62. Method 1. Observe which of the unknown quantities is the least involved, and let its value be found from each equation, by the rules of last section.

Let the values thus found be put equal to each other, and hence new equations will arise, from which that quan- tity is wholly excluded. Let this operation be now re- peated with these equations, thus eliminating the unknown quantities one by one, till at last an equation be found which contains only one unknown quantity.

Lx. Let it be required to determine x and y from these two equations,

22+ 3y= 23, 5x —-2y=10. 23 — 3y

Fag 10+ 2y

—

Let these values of x be now put equal to each other,

10+2y 23—3y

From the first equation,

oe

From the second equation, «=

And we have

5 ae Or 20+ 4y=115 -1l5y;

109 = 95,

And y=: And since nae, or a EY, from either of

these values we find «= 4.

63. Method 2. Let the value of the unknown quantity which is to be eliminated be found from that equation wherein it is least involved. Let this value and its powers be substituted for that quantity, and its respec- tive powers in the other equations; and with the new equations thus arising, let the operation be repeated till there remain only one equation and one unknown quantity.

£x. Let the given equations, as in last method, be

2e+ 3y=23, 5a—2y=10.

: 23 —3 From the first equation, «= 5 –

2

And this value of «x being substituted in the second 23 —3y

equation, we have 5 x < = 2y=10, Or 115 — 15y-4y=20; Ee 95=19y, And y=5 And hence a= ee 4, as before.

2

64. Method 3. Let the given equations be multiplied or divided by such numbers or quantities, whether known or unknown, that the term which involves the highest power of the unknown quantity may be the same in each equation.

Then, by adding or subtracting the equations, as occa- sion may require, that term will vanish, and a new equa- tion emerge, wherein the number of

dimensions of the unknown quantity in some cases, and in others the number of unknown quantities will be diminished ; and by a repeti- tion of the same or similar operations, a final equation may be at last obtained, involving only one unknown quantity.

x. Let the same example be taken, as in the illustra- tion of the former methods, namely,

22+ 3y= 28, 5a—2y=10.

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To eliminate x, let the first equation be multiplied by 5, | tion be multiplied by 10, the second by 5, and the third

and the second by 2; thus we have by 3, the results will be these: 10z+15y=115, 120x + 80y + 60z = 14880 , 10x-— 4y= 20. 100x + 75y + 60z= 14100 ,

Here the term involving x is the same in both equations ; alia 72y + 60z= 13680 . and it is obvious, that by subtracting the one from the | Let the second equation be now subtracted from the first, other, the resulting equation will contain only y, and known | and the third from the second, and we have numbers ; for by such subtraction we find 19y=95,.and 20a + 5y =780 , therefore y= 9. 10x + 3y=420.

Having got the value of y, it is easy to see how # may be found from either of the given equations ; but it may also be found in the same manner as we found y. For let

Next, to eliminate y, let the first of these equations be multiplied by 3, and the second by 5 ; hence,

the first of the given equations be multiplied by 2, and the 60x + 15y = 2340 , second by 3, we have 50a + 15y=2100. 4x + 6y = 46, Subtracting now the latter equation from the former, 15x — 6y=30. 10z=240 and x=24, By adding these equations, we find ts '= le 102 _ 60, 19x=76, and #=4. ee _

1448 —-122—8y _ 499 65. The following examples will serve further to illus- an i :

trate these different methods of eliminating the unknown

ae : Ex. 3. Given 22-—yz=a’, y?-xz2=0, 2-axy=c?, to quantities from equations. Y 7a ’ od | ’

find x, y, and z.

Ex. 1. Given { a Lage \to determine x and y. By subtraction, we have

~. da+fy=g : — a—y)(e+y+2)=a?-8? (1), To eliminate y, let the first equation be multiplied by 2-2) (e+y+2)=c? —a? (2),

Ff, and the second by 4, and we have (y—2) (x+y +2) =i afar + ofy =o, Squaring, adding, and dividing by 2, we get

bdx + bfy = bg. Taking now the difference between these equations, afa — bdx=cf—bg,

(a2 + y® + 2? — xy — x2 —yz) (wt y+2)= at + bt +t — a2b? — a%c? — bc? .

Or af — bd)x = ¢f — bg , But 22+ 7?+2 —ay — xz — yz is the sum of the three given eke) oe 4 expressions, and ., equal to a? + 67+ c?, And therefore r= : See oe ee af — bd Hence (a? +6? +c”) (atyt+zP?=at+b4+e In the same manner may y be determined, by multiplying — ab? — ae? — be, which gives a+y+z2. the first of the given equations by d, and the second by a; Equations (1) and (2) are now two simple equations, for we find which, combined with the value of «+y+2 as determined, adx + bdy =cd , give x, y, and 2. a ch te Ex, 4. Given Ja= Jp (~~2+2~~+5) And taking the difference as before, we get * es $ _ a ¢ bdy —afy=cd—-ag , Ny = Jae (oye) _cd—ag ; — a 0 Me And therefore Wis Fr ap ae Jz = leaf a 2 <) ,*

66. This example may be considered as a general solu- Multiply the first by Jz, the second by /y, and the

tion of the following problem. Two equations expressing | third by ./z, and add two and two. There results the relation between the first powers of two unknown ‘

quantities being given, to determine those quantities ; for xaty= s/xyz si whatever be the number of terms in each equation, it will : readily appear, as in Art. 55, that by proper reduction ate = /xyz 2b they may be brought to the same form as those given in y the above example. _ [24 67. Let us next consider such equations as involve allies % three unknown quantities. Ws xetye= J xyz Qc 24H 48 = 62 oe toe xy +u2= xyz 2a

Ex. 2. Given sa s— 4 to find 2, y, and z. “ ye= Jaye (b+c-—4)

it pees w= Jaye (a+e-6)

ay= /ayz(at+b—c).

. Here the given equations, when cleared from fractions, | Multiplying any two of these we get one of the unknown ecome

12 3 quantities :

e+ 8y+ 62=1488 a eulante ine eee

20x + 15y +122 = 2820 , ( ) (a+b-c),

30a + 244 + 202= 4560. Sect. VITI.—QuEsTIONS PRODUCING SIMPLE EQuaTIONS.

To eliminate z by the third method, let the first equa- 68. When the conditions of a problem have been ex-

SIMPLE EQUATIONS. |

pressed by equations, or translated from the common language into that of algebra, we must consider whether the problem be properly limited; for in some cases the conditions may be such as to admit of innumerable solu- tions, and in others they may involve an absurdity, and thus render the problem altogether impossible.

Now, by considering the examples of last section, it will appear, that to determine any number of unknown quantities, there must be given as many equations as there are unknown quauitities. These, however, must be such as cannot be derived from each other, and they must not involve any contradiction ; for in the one case the problem would admit of an unlimited number of answers, and in the other case it would be impossible. For example, if it were required to determinc x and y from these two equa- tions, 2« — 3y = 13, 4a -—6y = 26; as the latter equation is a consequence of the former (for each term of the one is the half of the corresponding term of the other), it is evident that innumerable values of x and y might be found to satisfy both equations. Again, if x and y were to be determined from these equations, x +2y=8, 3×7 + 6y = 26, it is easy to see that it is impossible to find such values of x and yas will satisfy both; for, from the first, we find 32 = 24 — 6y; and from the second, 3x = 26 — 6y; and therefore 24 —6y = 26 —-6y, or 24=26, which is absurd; and so also must have been the conditions from which this conclusion is drawn.

69. But there is yet another case in which a problem may be impossible; and that is, when thcre are more equations than unknown quantitics ; for it appears, that in this case, by the rules of last section, we should at last find two equations, each involving the same unknown quantity. Now, unless these happened to agree, the pro- blem would admit of no solution. On the whole, therefore, it appears that a problem is limited when the conditions furnish just as many independent equations as there are unknown quantities to be determined : if there be fewer, the problem is indeterminate ; but if there be more, the problem in general admits of no solution whatever.

70. We shall now apply the preceding observations to some examples, which are so chosen as to admit of being resolved by simple equations.

Ex. 1. What is that number, to which if there be added its half, its third, and its fourth parts, the sum will be 501

Let « denote the number sought ; then its half will be

x its third : , and its fourth :

} b % 1B _ 5 oo Cet a tee 5 Hence 240+ 122+ 8x+6x=1200, Or 50x% = 1200 ;

; = 24.

Thus it appears that the number sought is 24, which upon trial will be found to answer the conditions of the question.

Hu. 2. A post is } of its length in the mud, x in the

water, and 10 feet above the water; what is its whole length ?

Let its length be x feet, then the part in the mud is

% 9

w and that in the water =) therefore, from the nature of the question,

cy fy atgtl0=a.

From this equation we find 77 +120 = 12x, and #= 24. fiz, 3. A' market-woman bought a certain number of

eggs at 2 a penny, and as many at 3 a penny, and sold them

all out again at 5 for 2d.; but, instead of getting her own

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o4].

money for them, as she expected, she lost 4d.: what num- ber of eggs did she buy ?

Let x be the number of eggs of each sort; Then will be the price of the first sort;

And ; =the price of the second sort. Now, the whole number being 2x, we have

Dae 102 : 2 = price of both sorts at 5 for 2d.-

Hence 15x + 10x — 2427 =120, And «= 120, the number of each sort.

Hx. 4, A person at play lost } of his money, and then won 3s.; after which he lost 4 of what he then had, and then won 2s.; lastly he lost + of what he then had, and, this done, found he had only 12s. left: what had he at first?

Suppose he began to play with z shillings.

He lost } of his money, or – and had left a = =.

3 12

He won 3s. and had then 3 +3= oat :

12

He lost 4 of at – a cael Sead) ales Be+12 w+4 _ 22+8

4 4 4 2; 16

He won 2s. and had then aay Qe ae 20+ 16 2¢+16 He lost + of =< MOL — , and had left 2e+16 2e+16 12%+96 4 26 8s And because he had now 12s. left, we have this equation, 12¢+-96

Hence 12% = 240, and x=20.

Lx. 5. To divide the number 90 into 4 such parts, that if the first be increased by 2, the sccond diminished by 2, the third multiplied by 2, and the fourth divided by 2, the sum, difference, product and quotient shall be all equal to each other.

In this question there are four quantities to be deter- mined; but instead of introducing several letters, having put x to denote the first of them, we may find an expres- sion for each of the remaining ones, as follows:

Because «+ 2=sccond quantity — 2,

hs x+4=the second quantity; And because #+2=third x 2;

U+2 : : 5 =the third quantity.

And in like manner 2(x+2)=the fourth quantity. Now by the question, the sum of all the four = 90;

ototh+ == 4 (n42)=90.

Hence 9x= 162, and «=18; Therefore the numbers required are 18, 22, 10, and 40.

x. 6. A and B together can perform a piece of work in 12 hours, A and C in 20, and B and OC in 15 hours; in what time will each be able to perform it when working separately

That we may have a general solution, let us suppose A and B can perform the work in a hours, A and © in 6 hours, and B and C inc hours. Let x, y, and z, denote the times in which A, B, and C, could perform it respec- tively, if each worked alone; and let the whole work be represented by 1. The question gives at once—

Quadratic

Equations. of the second degree, or quadratic equations.

1a te ole role ee eee gs ee Say doen oe bY epee e Ss c If these be added, and their sum divided by 2, we find- Se oe % yt 2a 2

From this equation let each of the three preceding be subtracted in its turn: thus we get

*the np Lireeehat hy z 2a 2b‘2¢ abe d 1 1 1 1 +ab—ac+be = = —-=s—4+>- = = se Y Qa 2b 2c Qabe Dee, ub. ab 1_ -abtac+be zg 2a ‘2b 2% Qabe a Qabe 7200 Hence *= Pabtac—be 120 1 in Qabe a 7200 90. +ab—ac+tbe 360 2ab 200 : ee*

~ —abtactbe 240 —

Sect. [X.—SoLuTIon or QuaDRATIC EQUATIONS.

71. We are next to explain the resolution of equations These in- volve the second power of the unknown quantity, and may be divided into two kinds, pure and adfected.

I. Pure quadratic equations are such as after proper reduction have the square of the unknown quantity in one term, while the remaining terms contain only known quantities. Thus, «?=64, and aa?+b=c, are examples of pure quadratics.*

II. Adfected quadratic equations contain the square of the unknown quantity in one term, and its first or simple power in another; the remaining terms consisting entirely of known quantities. Such are the following, 2?+3z = 28, 22? = 33 – 5a, ax? +be—c=d.

The manner of resolving a pure quadratic equation is sufficiently evident. If the unknown quantity be made to stand alone on one side, with unity as a coefficient, wnile the other side consists entirely of known quantities, and the square root of each side be taken, we immediately ob- tain the value of the simple power of the unknown quan- tity as directed by rule 5th of Sect. VI.

In extracting the square root of any quantity, it is necessary to observe, that the sign of the root may be either + or —, and that consequently a quadratic must always have two solutions.

72. When an adfected quadratic equation is to be re- solved, it may always, by proper reduction, be brought to the following form:

a + p=; where p and g are numerical quantities, + or —.

Let us compare the side of it which involves the un- known quantity « with the square of a binomial x +a; that is, let us compare a? + px with 22+ 2ax+a?=(x+a)?, and it will presently appear, that if we suppose p = 2a, or 2 =a, the quantities 22+ px and xz?+2ax will be equal; and as x? + 2ax is rendered a complete square, by adding to it a, so also may x?+pz be completed into a square by adding

. 2 ° . 2 to it "= , Which is equal to a?; therefore, let = be added to both sides of the equation x?+px=g, and we have

2 2 2 2

a+ pet =F 49, ot («+5) =F +93

and, extracting the square root of cach side,

— pe i = i 2? ats Weare hence om Ba [Pag

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[QUADRATIC EQUATIONS,

73. From these obscrvations we derive the following general rules for resolving adfected quadratic equations. 1. Bring all the terms involving the unknown quantity to one side, and the known quantities to the other side, and so that the term involving the square of the unknown quantity may be positive. 2. If the square of the unknown quantity be multiplied by a coefficient, let the other terms be divided by it, so that the coefficient of the square of the unknown quantity may be 1. 3. Add to both sides the square of half the coefficient of the unknown quantity itself, and the side of the equa- tion involving the unknown quantity will now be a com- plete square. 4, Extract the square root of both sides of the equation, by which it becomes simple with respect to the unknown quantity; and, by transposition, that quantity may be made to stand alone on one side of the equation, while the other side consists of known quantities; and therefore the equa- tion is resolved. Ex. 1. Given x? + 2%=35, to determine z. Here the coefficient of the second term is 2; therefore, adding the square of its half to each side, we have

24+ 9r+1=35+1=36, And, extracting the square root, x+1= /36= +6. Hence x= + 6-1, that is, = +5, orv= — 7, and either of these numbers will be found to satisfy the equation, for 5×5+2×5=35, also -7x -7+2x -7=35.

Fx, 2. Given a —12=2, to find z.

This equation, when reduced, becomes 2? —-6x=72,

And, by completing the square, 2? -6#+9=72+9=81. Hence, by extracting the square root, -3= +9, and Y= = O43; Therefore « = +12, or x= —6; and upon trial we find that each of these values satisfies the original equation, for

*2X12 _12.=12, also —SXa*_12=-6. Ex. 3. Given x?+28=11z, to find zx. Then g2—lla= —28. And, by completing the square,*

121 121 9

ao — Ey aa ar

. JU Therefore, by extracting the root, « — — +f .

pe : Hence #= > +5; that is, z= +7, orw=+4.

In the first two examples, we found one positive value for « in each, and also one negative value; but in this example both the values of x are positive, and, upon trial, each of them is found to satisfy the equation; for 7×74+28=11× 7, also4×4+28=11×4.

74, As at first sight it appears remarkable, that im every quadratic equation the unknown quantity admits always of two distinct values or roots, it will be proper to consider a little further the circumstances upon which this peculiarity depends.

To do this, let us re-examine the equation x?2«¢= 39. By bringing all the terms to one side, the equation may be expressed thus, «2 2x ~~—35=0 ; so that we shall have determined x, when we have found such a number as, when substituted for it in the quantity «?+ 2x —35, will render the result equal to 0. But x?+ 2x —~~ 35 is the product of these two factors «—5 and «+7, as may be proved by actual multiplication; therefore, to find x, we have (x – 5) (c+7)=0; and as a product can only become =0 when one of its

factors is reduced to 0, it follows that either of the two factors «—5 and «+7 may be assumed =0.

QUADRATIC EQUATIONS. |

#-5=0, then «=5; but if e+7=0, then x= —7; so that the two valucs of x, or two roots of the equation a? +22 =35, are +5 and —7, as we have already found in a different manner.

75. What has been shown in a particular case is true of any quadratic equation whatcver; that is, if x2+pa=gq, or, by bringing all the terms to one side, 2?+px—q=0, it is always possible to find two factors «—a, and «+2, such, that

x +- px —q=("-—a) (x+5), where a and 6 are known quantities, which depend only upon p and q, the given numbers in the equation ; and since that to have (w —a) (a+b) =0, we may either assume a—-a=0or«+b=0, it evidently follows that the condi- tions of the equation x? + px — ¢=0, or x? + px =4q, are alike satisfied by taking «= +a or x= —b.

From these considerations it follows, that « can have only two values in a quadratic equation; for if it could be supposed to have three or more values, then it would be possible to resolve «+pa—g into as many factors, x—c,x —d, &c.; but the product of more than two factors must necessarily contain the third or higher powers of z, – and as a" + px —q contains no higher power than the second, therefore no such resolution can take place.*

76. Soluteon of Questions which produce Quadratic Equations. Fz. 1. [t is required to divide the number 10 into two such parts that the sum of their squares may be 58. Let x be the one part; Then, since their sum is 10, the other is 10 — x; .. by the question, 2?+(10-«2z)?=58;

That is, x? 100 — 202 22=58, Or 2x? — 202 =58 -100= — 42; Hence a? —10x= -21.

And completing the square, #2 — 10x%+ 25 =25 -21 =4; Hence, by extracting the root, x-5=+ /4= +2,

And eu ht 2,

That is, w=7,orz=3.

If we take the greater value of «, viz. 7, the other number 10 — x will be 3; and if we take the less value of a, viz. 3, then the other number is 7. Thus it appears, that the greater value of the onc number corresponds to the less valuc of the other; and indeed this must neces- sarily be the case, sceing that both are alike concerned in the question. Hence, the only numbers that will answer the conditions of the question are 7 and 3.

Eu. 2. A grazier bought as many sheep as cost him £60, out of which he reserved 15, and sold the remainder for £54, gaining 2s. cach upon them. How many sheep did he buy, and what did each cost him ?

Suppose that he bought « sheep.

Then each would cost him "° shillings.

Therefore, since aftcr reserving 15, he sold each of the

1200

x for them (a — 15) :; 2) shillings. And, because £54

= 1080 shillings, we have by the question, («—15) (Gear 2) = 1080;

remaining « — 15 for + 2 shillings, he would receive

a a= ere And, taking the positive root,

"«=75, the number of sheep; and consequently "So 16 shillings, the price of each.

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fix. 3. It is required to find two numbers, of which the product shall be 6, and the sum of their cubes 35.

Cm Let x be the one number; then will be the other.

Thercfore, by the question, x? + “2 20 5

Hence x8 + 216 = 3523 , Or x — 3523 = — 216. This equation, by putting z°=y, becomes y? — 35y= — 216; vel, ory=s. e=nay, #29, or e=2.

If «= 3, then the other number is 2, and if =2, the other number is 3; so that 2 and 38 arc the numbers re- quired.

In general, if it be required to find two numbers which are exactly alike concerned in a question that produces a quadratic equation, they will be the roots of that equation. A similar observation applies to any number of quantities which require for their determination the resolution of an equation of any degree whatever.

Hence we find And since

77. On some Anomalies in the Solution of a Problem which results in an Equation.

From what has preceded, it will be evident that a root of an equation may be a very different thing from the solution of the problem on which the equation is based. It will be proper to give a few illustrations of this difference before passing on to consider equations in general.

(1.) A solution may be inapplicable to the problem as a problem of arithmetic, applying only to the algebraic pro- blem.

He. Find a number such that if it be first increased by 10, and then diminished by 10, the difference of the square roots of the results shall be cqual to 10.

Let x be the number; then the problem requires that

Vx+10-— J/x-10=10.

Transposing and squaring, we get

2+10=1004+ 20 /x-10+a-10.

Transposing and squaring again, there results x — 10 = lopa— 26:

Now, it is obvious that 26 does not satisfy the condi- tions of the problem, but that it is the solution of another problem, viz., that which substitutes "sun." for " differ- ence" in the enunciation. Generally we may remark that an algebraic statement is not definite like an arithmetical one. The algebraic square root of a quantity being + or —, algebra cannot, as arithmetic does, distinguish between the two. The cquation J/zr+10— Jxz— 10=10 is alge- braically the same as Vz 10 /z—10=10, &e.

(2.) A solution may be inverted, or rather may invert the statement.

x. Divide 15 into two such parts that the greater shall exceed three times the less by as much as half the less exceeds 3.

Let « be the greater, and .. 15 — x the less. ment produces the equation,

a—-3 (15 —«#)=4 (15 — 2) – 3, which gives at once «=11, so that 11 is the greater, 4 the less part. But, on trying the solution, we find it is not that of the problem given, but of another problem, in which " exceeds" is replaced by " falls short of." Algebra cannot, in cvery case, as arithmetic does, distinguish the order of subtraction in stating a difference.

x. 2. Find a number such that the square root of the difference between its fourth power and its square being

The state-

found and increased by 1, the square root of the sura shall be equal to the given number diminished by 1. Let x be the number, then

M(1+ Jat —e)=a2-1, . Jat — x? = x? — 22, whence «=0, w= 7»

ueither of which solves the problem as stated.

(3.) A solution may be illusory—that is, it may assume

0

the form 0

Ex. 1. There are two pieces of cloth of a and a' yards respectively. The owner sclls the same number of yards of each at 6 and 0' shillings per yard respectively, he then sclls the remainder at c and ¢' shillings a yard, and finds that the prices received for both pieces are the same. Required the number of yards first sold.

ac—a'e' b'—b+c-c'°

As a particular case, if a and a' are 60 and 80; 6 and 0' 10 shillings and 9 shillings; and ¢ and c' 4 shillings and 3

ere 0 shillings, the answer assumes the form 5°

The number is

The answer is in this case indeterminate ; in other words, the conditions of the problem are satisfied independently of the number of yards first sold; any number will do.

It is not, however, a necessary interpretation of the form

i" that it may be replaced by any number whatever. Most

frequently this form results from the fact that some frac- tion is not in its lowest terms. Solutions of this kind fre- quently occur—in ordinary equations they may be avoided ; and we offer an example simply to show the method appli- cable to cases in which they cannot be avoided.

Ex, 2. Find two numbers such that the sum of their products by a and 6 respectively is c, and the difference of their squares d.

We have ax +by=c pad 1.€ xv 1. i

(a? — 5?) 2? — 2ace = —(c? +0? d)

pee r/atc? — (a? — b?) (c?+ bd) a Qa i

To find the solution when a=, we observe that (taking

é é 0 the negative sign of the square root) «= 5°

This arises from the fact that some power or root of a —b is common to the numerator and denominator of the frac- tion.

To divide this out, we may put a?-—6?=pa?, and we

shall get 24 he, ao da yy r= pa? 1 +b" _ eee i + ke. = oe «1 e+bd 1 tad 2 ae 2 o eee

when a@ is written for 6, and 0 for p.

(4.) A solution may be tntroduced by the operation.

In the example last given, the positive sign presents us with a solution introduced by the operation, which, when a=b, is not a solution of the problem at all.

For in that case the two equations become # + y=— a

x? —y?=d,; the latter of which is at once reduced to the

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| simple equation # — y= a by means of the former. Accord-

ingly, both equatious are in this case simple equations, and can admit of only one solution.

(5.) As a solution may be introduced by the operation, so may it be dropped out, even when the operation is a perfectly legitimate one.

Hae. /(2a+1)- J/(a@+4)= f(404+4)- J/(8×4+7). Taking reciprocals, we have

il 1 V(2a+1)—W(a+4) V(40+4)—V(80+7) NV (2¢+1)+V (6+4) V(404+4)+V(32+7)

“S r—3 – “—3 or /(2a4+1)+ J(xt+4)= J/(4a+4)+ /(8x+7), which either added to the original equation, or subtracted from it, produces # = — -.

But «=8 is a solution of the equation which has been dropped out by the omission of the common denominator x — 3.

It is not necessary to point out that a solution may appear under the form Vy —a oro.

In neither case can the problem be solved arithmetically.

Sect. X.—EQUATIONS IN GENERAL.

78. Before we proceed to the resolution of cubic and the higher orders of equations, it will be proper to explain some general properties which belong to equations of every degree, aud also certain transformations which must frequently be performed upon equations in order to prepare them for solution.

In treating of equations in gencral, we shall suppose all the terms brought to one side, and put equal to 0; so that an equation of the fourth degree will stand thus:

x + pe + qu?+rea+s=0, where a denotes an unknown quantity, and p, q, 7, s, num- bers or fractions, either positive or negative. Here the coefficient of the highest power of x is unity, but had it been any other quantity, that quantity might have been taken away, and the equation reduced to the above form by rules already explained (Sect. V1).

The terms being thus arranged, if such a quantity be Defniti found as, when substituted for x, will render both sides = 0, of rest,

and therefore satisfy the equation, that quantity, whether it be positive or negative, or even imaginary, is defined to be a root of the equation. But we have seen that every quadratic equation has always two roots, real or imaginary; we may thercfore assume that a similar diversity will take place in all equations of a higher degree; and this assump- tion appears to be well founded, by the following proposi- tion, which is of great importance in the theory of equa- tions.

If a root of any equation, as 24+pa°+qa°+ra+s=0, be represented by a, the first side of that equation is divi- sible by x -—a;

For since xt+ pe + gu? +reo+s=0,

And also at +pa?+qa?+rat+s=0;

Therefore, by subtraction,

at ~ at-+p (a —a) + (a? —a*) +r (a—a)=0.*

But any quantity of this form x” —a”, where m denotes a whole positive number, is divisible by x -—a (Art. 20, ix. 1).

Hence, since every term contains a factor of this form, the equation may be written under the form

(x —a) (a8 +p’a? + gat+r’)=0. i.e, the expression x! +p? +qa?+rx+8 is divisible by

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g —a@; and since the same mode of reasoning will apply to any equation whatever, the truth of the proposition is evident. !

We have found that (x — a) (a? + p’x?+qe+7’)=0; and as a product becomes=0 when any one of its factors = 0, therefore the equation will have its conditions fulfilled, not only when x —a=0, but also when 2° + p’x? +q’a+7r’ =0.

Let us now suppose that 6 is a root of this equation; then, by reasoning exactly as before,

+ pe + dat r =("2—b) (2+ p"2+q"). By proceeding in the same manner with the quadratic

equation a? + px + 9" =0, we shall find that if ¢ denote one of its roots, then

w+ p"x+¢q"=("—c) (atetp'). So that if we put d= —(c+p"), we at last find at + pa3+ qu? + ru s =(n— a) (x —b) (4 —c) (w—d); a, b,c, d, being the roots of the equation, «4 p2°+qa2+rxa+s=0.

The mode of reasoning which has been just now employed in a particular case, may be applied to an equation of any order whatever; we may therefore conclude, that every equation may be considered as the product of as many simple factors as the number denoting its order contains unity, and therefore, that the number of roots in any equa- tion is precisely equal to the exponent of the highest power of the unknown quantity contained in that equation.

79. By considering equations of all degrees as formed from the products of factors x —a, 7-6, w—c, &c., we dis- cover certain relations subsisting between the roots of any equation and its coefficients. Thus, if we limit the num- ber of factors to four, and suppose that a, 8, c, d, are the roots of this equation of the fourth degree,

A+ px +qu®+ra+s=0, we shall also have (x—a) (w-6) (w—c) (x—d)=0; and therefore, by actual multiplication,

+ab aa + ac — abe oa ae Se; pee deta Oe -—d +6d —bed } +cd

If we compare together the coefficients of the same powers of x, we find the following series of equations : atb+c+d=-p, ab+actad+be+bd+cd=+9, abe+abd+acd+bed= —r, abcd = +8; and as similar results will be obtained for equations of all degrees, we hence derive the following propositions, which are of great importance in the theory of equations.

1. The coefficient of the second term of any equation, taken with a contrary sign, is equal to the sum of all the roots.

2. The coefficient of the third term is equal to the sum of the products of the roots multiplied together two and two.

3. The coefficient of the fourth term, taken with a con- trary sign, is equal to the sum of the roots multiplied toge- ther three and three; and so on for the remaining coeffi- cients, till we come to the last term of the equation, which 18 equal to the product of all the roots having their signs changed.

_ Instead of supposing an equation to be produced by mul- tiplying together simple equations, we may consider it as formed by the product of equations of any degree, provided that the sum of their dimensions be equal to that of the proposed equation. Thus, an equation of the fourth degree mnay be formed cither from a simple and cubic equation, or from two quadratic equations.

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80. When the roots of an equation are all positive, its simple factors will have this form, «—a, «—b, x— Ci 1GoCs, and if, for the sake of brevity, we take only these three, the cubic equation which results from their product will have this form,

2 — par+qa—r=0, where p=a+6+¢, g=ab+act be, r=abe; and here it appears that the signs of the terms are +and — alternately.

Hence we infer, that when the-roots of an equation are all positive, the signs of its terms are positive and negative alternately.

If again the roots of the equation be all negative, and therefore its factors +a, x+6, x+c, then p, g, and r being as before, the resulting equation will stand thus:

e+ per+qatr=0. And hence we conclude, that when the roots are all nega- tive, there is no change whatever in the signs.

In general, if the roots of an equation be all real, that equation will have as many positive roots as there are changes of the signs from + to-—, or from — to +; and the remaining roots are negative. This rule, however, does not apply when the equation has impossible roots, unless such roots be considered as either positive or negative.

The connection between the signs of the roots and the signs of the terms of an equation can be deduced from the proposition, that the introduction of a new positive root introduces a new change of signs amongst the terms of the equation.

The demonstration of this proposition depends on the Rule of fact already established, that an equation may be resolved signs.

into the product of simple factors, so that, for example, every equation of the fifth degree may be derived from some equation of the fourth, by multiplying the latter by 2 —a where a is the additional root. We shall show that the introduction of a new positive root produces an equa- tion with at least one more change of signs than the origi- nal, and the introduction of a new negative root produces an equation with at least one more continuation of the same sign. 'T'o save space, it will suffice if we write the signs without the letters ; thus, «2+ pa —q may be written ++-—. Let, then, any equation be written down (of the sixth degree, for instance), + + — — + — +3 multiply by x —d, and write the multiplication in the usual form,

++—+-+4

+7-74-4-

The signs of the product are all determinate except two, which we have marked with a (2). Now the changes of sign in the original equation are three—one between the Ist and 3d terms, one between the 3d and 5th, and one between the 5th and 6th; and it is evident that whatever be the signs marked (?), the produced equation has as many changes of sign as the original between the same limits, and one change beyond those limits, viz.,

between the 7th and 8th terms. This proposition is perfectly general, that the introduction of a positive root causes the introduction of at least all the original changes of sign within their limits, and one more change beyond those limits. In the same manner we may prove that the intro- duction of a negative root introduces at least one more continuation of the same sign. Hence the conclusion, that an equation cannot have more positive roots than tt has changes of sign, nor more negative roots than it has con- tenuations of the same sign. This proposition is known as Descartes' Rule of Signs.

81. Surd and impossible roots enter equations by pairs.

Let a+ ,/b be a root; where } is a positive or negative number or fraction' then a— ,/6 is also a root,

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Transfor- mation of equations,

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Tf a+ ,/b be written for x in the quantity «+pa"7+ &c., the result is composed of a series of powers of a and Jb. Of these all but the odd powers of ,/b are numerical, whilst odd powers of ,/6 may be written as uumerical products of ,/b itself. The result of the substitution is therefore of the form A+B,/b. But since a+ ,/b is a root of the equation 2*+pz""'+ &c. =0, we must have Ab yb=—0, and .. A=0, B=0.*

Now if a— ,/b be substituted for x, the result will be A —B ,/b, because even powers of — ,/b are the same as those of + /& But A=0, B=0.. A-B,/b=0; con- sequently a— ,/b is a root of the equation.

From this proposition it appears that every equation whose degree is denoted by an odd number, must have at least one real root.

82. We shall now explain some transformations which are frequently necessary to prepare the higher orders of equations for solution.

Any equation may have its positive roots changed into negative roots of the same value, and its negative roots into such as are positive, by changing the signs of the terms alternately, beginning with the second. The truth of this remark will be evident if we take the equation

(7 — a) (w—b) (e+c)=a + px? +qa+r=0, and write —« in place of x, producing

—(#+a).—(#+6).(-#+c)= -234+p2?~~qet+r=0, te, (a+a)(x+b)(2—c)=25 —~~ px? +qeu-r=0, where it appears that the signs of the first and third terms are the same as in the original equation, but the signs of the second and fourth are the opposite. And this will be found to hold true of all equations, to whatever order they belong.

83. It will sometimes be useful to transform an equa- tion into another that shall have each of its roots greater or less than the corresponding roots of the other equation, by some given quantity.

Let (#—-a)(x-6)(x+c)=0 be any proposed equation which is to be transformed into another, having its roots greater or less than those of the proposed equation by the given quantity ; then, because the roots of the trans- formed equation are to be +a+n, +b+n, and —c+n, the equation itself will be

(y=n—a) (yxn—b)(yrntc)=0. Hence the reason of the following rule is evident.

If the new equation is to have its roots greater than those of the proposed equation, for x and its powers substi- tute y-n and its powers; but if the roots are to be less, then, for z substitute y+”; and, in either case, a new equa- tion will be produced, the roots of which shall have the property required.

84. By the preceding rule, an equation may be changed into another, which has its roots either all positive or all negative; but it is chicfly used in preparing cubic and bi- quadratic equations for solution, by transforming them into others of the same degree, but which want their second term.

Let «3+ px2?+qx+r=0 be any cubic equation; if we substitute y+n for x, the equation is changed into the following:

+p +2pn- y +pn®\ _o + @g +qn(-° a7 Now, that this equation may want its second term, it is evident that we have only to suppose 3n+p=0, or n=

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p ® . . - for this assumption being made, and the value of x*

substituted in the remaining terms, the equation becomes

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} a a eeaioy

e+ (o-S)y+ si ie . 2 , Qp3 ’

or, putting -h+g=9, and + 4° — rar , the same

equation may stand thus, ytdytr=0.

85. In general, any equation whatever may be trans- formed into another, which shall want its second term, by the following rule.

Divide the coefficient of the second term of the pro- posed equation by the exponent of the first term, and add the quotient, with its sign changed, to a new unknown quantity; the sum being substituted for the unknown quantity in the proposed equation, a new equation will be produced, which will want the second term, as required.

By this rule any adfected quadratic equation may be readily resolved; for by transforming it into another equa- tion which wants the second term, we thus reduce its solu- tion to that of a pure quadratic. Thus, if the quadratic equation x? —- 5a+6=0 be proposed; by substituting y +} for w, we find

Hence y= +4, and since r=y+8&, therefore r= }$=

+3, or +2.

86. Instead of taking away the second term from an equation, any other term may be made to vanish, by an assumption similar to that which has been employed to take away the second term. Thus, if in Art. 84 we assume 3n? + 2pn+q=0, by resolving this quadratic equation, a value of » will be found which, when substituted in the equation, will cause the third term to vanish; and, by the resolution of a cubic equation, the fourth term may be taken away; and so on.

87. Another species of transformation, of use in the resolution of equations, is that by which an equation, hav- ing the coefficients of some of its terms expressed by frac- tional quantities, is changed into another, the coefficients of which are all integers. "4

Let x +E a? + jae 0 denote an equation to be so transformed, and let us assume y=abex, and therefore

ga ; then, by substitution, our equation becomes

abe . a ee ee a3b3¢3 ac aa? ee © C 0;

*and multiplying the whole equation by a*b%c?, we have y + bepy® + abc? qy + a®b'c*r =0 . Thus we have an equation free from fractions, while at*

the same time the coefficient of the highest power of the unknown quantity is unity, as before.

Examples of the Transformation and Solution of Equations when certain relations amongst the roots are known.

Ex. 1. Tf a, b, c are the roots of the equation «3-2? + 27 —3=0, to form the equation of which the roots are (1s) a+b, b+c,ct+a.

Let y be any one root of the required equation; put y=atb+e—x2=1-2 (Art. 79), and the values of y will be the roots of the equation required, which is therefore

(1-9 —-(l

or — 277+ 8y+1=0. a b Cc (2.) b+c~a' atc—b' at+b-—c¢°

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& x ee Y= a+b+o—20 12%? ite ie 7 is the equation required. (3.) Ceeu ne.

If y=2?, the values of y are a?, 6%, c?.

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Accordingly we

require to throw the given equation into a form which

involves no odd powers of x.

This is done as follows:

a3 — a? + Qe — 3 = x(x? + 2) — (a? +3)=0;

; a(a? +2) = a +3. squaring,

w(a? + 2)? = (a2 +. 3)2, or Hy +2) =(y +3)", or y® + 8y? — 2y-9=0. a b C (4) ee aes _@ _@ 84,22 Be ae TG

is the equation required. Ex. 2. Two roots of the equation

i

3

a — 1623 + 86x? -1762+105=0

are l aud 5. Find the other roots.

The quantity on the left hand side of the equation is (Art. 78) divisible by (#-1)(«—5), or by ? — 6a +5.

The quotient is #?—10x%+21, which, gives 3 and 7, the roots required.

being put =0,

Ha. 3. The equation 2? -—42?4+%+r=0 has one root,

3; find 7 and the other roots.

Write 3 for x, then r=6, and the equation may be

written (a — 3)(x® -%-2)=0, which gives e2=2,#=-1.

Ex. 4. The equation x3 +2? —16z-—16=

of the form +a, —a; find them.

0 has two roots

If we write — a for #, we get the equation

8 —2?—162+16=0,

which has also two roots, —a, +a, .. x?—a? is a common*

measure of the two quantities.

But x? — 16 is easily found

to be a common measure of the two quantities, .. a=4.

x. 5. The roots of the equation x — 62? +1la—-6=0

are in arithmetical progression; find them.

If a, a+b, a+ 2b be the roots, their sum is 3(a+6),

1.¢., three times the niddle root.

ia, .”. a+b=2, also a(a+6)(a+2b)=6, t.e., a(4 —a)=3, a? -4a4+3=0,

o=lya=3.

But (Art. 79) their sum

Ex, 6. The three roots of the equation «?— 7x?+ 16x —8=0 are in geometrical progression; find them. Let a, ar, ar? be the roots; then their product is Gay

. (ar =8, and ar =2, .-. their sum a+ar+ar?=7

which gives a=l,r=2, and 1 2, 4 are the roots.

)

Secr. XI.—Sonvurion or Cusic EquaTIoNs.

88. Cubic equations, like all equations above the first degree, are divided into two classes: they are said to be pure when they contain only one power of the unknown quantity; and adfected when they contain two or more

powers of that quantity.

Pure cubic equations are therefore of this form, x3 = 125, or #°= — 27, or, in general, 28=r; and hence it appears that a value of the simple power of the unknown quantity may always be found without difficulty, by extracting the cube root of each side of the equation; thus, from the first of the three preceding examples we find x= + 5, from the second = ~ 3, and from the third, «= °/r.

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Tt would seem at first sight that the only value which # can have in the cubic equation x3=r, or putting r = 3, x —c?=0, is this one, x=c; but since z3— c3 may be re- solved into these two factors, «—c¢ and 2?+cx+c', it fol- lows, that besides the value of x already found, which results from making the factor x-c=0, it has yet other two values, which may be found by making the other fac- tor a+ cx+c?=0; and accordingly, by resolving the qua-

dratic equation x+cx= —c?, we find these values to be —c+An — 3c? -e- V—-30 -14+7-3 ij ee eg 5 a «6 eee I*

Thus it appears, that any cubic equation of this form, a3 = ¢3, or #3 — c= 0, has these three roots,

~~1+V7~~=3 -1-V=3

os a eT the first of which is real, but the two last are imaginary. If, however, each of the imaginary values of x be raised to the third power, the same results will be obtained as from the real value of x; the original equation x3 — c?=0 may also be reproduced, by multiplyiug together the three 147-3 -1-V-3

‘ Cs; and # —- ——5-—e.

89. Let us now consider such cubic equations as have all their terms, and which are therefore of this form, 2+ Ax? +Be+C=0, where A, B, and C denote known quantities, either posi- tive or negative. It has been shown (Art. 84) how an equation having all its terms may be transformed into another which wants

t=¢, ¢=

factors x—c, #—

A : the second term ; therefore, assume x = y — 3 as directed

in that article; then, by proper substitution, the above equation will be changed into another of this form, – ye +qy+r=0, where g and r denote known quantities, whether positive or negative ; now the roots of this equation being found, it is evident that those of the former may be readily ‘ : A

obtained by means of the assumed equation w= y — 3°

Resuming, therefore, the equation 73+ qy+r=0, let us suppose y=v+z, and it becomes

® + 302 + 802" + 2 i +qu+qz> =0. ar

Thus we have a new equation, which, as it involves two unknown quantities, v and z, may be resolved into any two others, which will simplify the determination of those quantities.

Now, it appears, that the only way in which we can divide that equation into two others, so as to simplify the question, is the following :

30°2 + 8022 + qu+qz=0, eer — OF

The first of these may also be expressed thus,

(3u2+ 9)(v+z)=0.

Hence, we must either suppose that »+z2=0, or that 3uz+q=0; but the former supposition cannot be admitted without supposing also that y=0; therefore we must adopt the latter. So that to determine v and z we have these two equations,

due+q=0, #8428+47r=0.

3

From the first, we find vz= — = and… v8 = — ce – This reduces the second equation to a quadratic in v%, viz

3

8 + ry — a =0, the solution of which equation is

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Ba ine JEP ED; O= —r— JEST va —tre fe Vig +27; pai Vege tir; and y=v+z = r+ VG + ir? t J 2 r— Sig+ir. Thus we have obtained a value a the unknown quantity y, in terms of the known quantities g and r; therefore the

equation is resolved. 90. But this is only one of three values which y may have. Let us, for the sake of brevity, put

A= —irt JEP 4H, B= ~~ir~~ JEST,

=l447/ =

; t= a?

and put ee — 2

Then, from what has been shown (Art. 88), it is evident that » and z have each these three values,

v= YK v= a YR v= B YR; tm A) iee Olen eB pil,

To determine the corresponding values of v and z, we must consider that v= 2. 2/AB. Now if we observe

that af =1, it will immediately appear that »+z has these three values,

vt+e= S/A+ 8/B,

vtz2=aYA+B 2/B

v+2=B 3/A+a 3/B, which are therefore the three values of y.

The first of these formule is commonly known by the name of Cardan's rule; but it is well known that Cardan was not the inventor, and that it ought to be attributed to Nicholas Tartalea and Scipio Ferreus, who discovered it much about the same time, and independently of each other. (See the Historical Introduction.)

The formule given above for the roots of a cubic equa- tion may be put under a different form, better adapted to the purposes of arithmetical calculation, as follows :—

al a J Le aS Because vz= ¥ — = Sa re hence

V+2=

: thus it appears that the three values

of y may also be expressed thus:

g3 5/R-

91. To show the manner of applying these formulz, let it be required to determine x from the cubic equation

xv + 327+ 9" -13=0. As this equation has all its terms, the first step towards its resolution is to transform it into another which shall

directed (Art. 84). The i poreiccs will stand thus : v= —3y?+3y- 1 +327= 3y?6y 3 + 9x +9y 9

-13 -13

**, adding these, the transformed equation is xy? + 6y -20=0, which being compared with the general equation, Y+qt+r=0, gives g=6, r= — 20; hence*

A=V i+ Jeg tini-Vi0e 108,

I

[CUBIC EQUATIONS,

therefore the second formula of last article gives y= eee 2

3 —

wal 10+ /108 – ah os ile ; but as this expression in-

volves a radical quantity, let the square root of 108 be taken and added to 10, and the cube root of the sum

found; thus we have 2/10+ ,/108=2-732 nearly, and

2

therefore iopvioa 2732 — 732; hence we at last find

one of the values of y to be 2°732 — 732 =2.

In finding the cube root of the radical quantity ae 10+ ,/108, we have taken only its approximate value, so as to have the expression for the root under a rational form, and in this way we can always find, as near as we please, the cube root of any surd of the form a+ ,/b, where 6 is a positive number. But it will sometimes happen that the cube root of such a surd can be expressed exactly by another surd of the same form; and accord- ingly, in the present case, it appears that the cube root of 10+ ,/108 is 1+ ,/3, as may be proved by actually TABU 1+ /3 to the third power. Hence we find Oe: 2 — o=v38) ay, Tee 1473 (1—V3)(1+"3) (l— /3) 5 a6 that y=1+ e+ = /3= 2, as before.

The other two values of y will be had by substituting

1+ /3 and 1- ,/3 for 3/A and a in the second and

third formulz of last article, and restoring the values of a and 8. We thus have

y= LENS x 14 8) 4 – Oe

'eo i.

-1-V—3 — -l+tV=3 ya 3 x (1+ 8) 4¢ ES x – V8) –

- /-9

So that the three values of y are

2, -1 /-9, 1 /-9;

and since x= y—1, the corresponding values of x are

1, -2 /-9, 2 /=9.

Thus it appears that one of the roots of the proposed equation is real, and the other two imaginary.

The two imaginary roots might have been found other- wise, by considering that since one root of the equation is 1, the equation must be divisible by w

—1 (Art. 78). Accordingly, the division being actually performed, and the quotient put =0, we have the quadratic equation,

v+4r7+13=0; which gives x= —2+ ,/-—9, the same imaginary values

as before. 92. In the application of the preceding formule to the

luti f thi ti = 0, it is necessary to want the second term, by substituting y-1 for x as | Cadadhke Ge a ae x Le ema, y

find the square root of 359° +47; now, when that quautity is positive, as in the equation y° + 6y — 20=0, which was resolved in last article, no difficulty occurs, for 'its root may be found either exactly or to as great a degree of accuracy as we please.

As, however, the coefficients g and 7 are independent of each other, it is evident that g may be negative, and such that A? is greater than 372, In this case, the expression

ae = 172 will be negative, and therefore its square root an imaginary quantity ; so that all the roots appear under an imaginary form. But we are certain (Art. 81) that every cubic equation must have at least one real root. The truth is that roots are frequently real, though they appear under

BIQUADRATIC EQUATIONS. |

an imaginary form. Take, for instance, the equation y> — 6y+4=0, of which the roots are found to be

y= Va42 J=1+ Y2-2 71 2a $i) el #8 ./2-2,/-1 poe 20) J 1 wak/2a2 J—1

It will be found by actual involution that the imaginary expressions 2+2,/—1 and 2-2 ,/-1 are the cubes of -1+ /-1 and ~ ,/-1 respectively, whence by substitution we find

y=2, y=1+ J8, andy=1- /3.

93. We shall now prove, that as often as the roots of the equation «° +qx+r=0 are real, g is negative, and a@ greater than 777; and, conversely,

that if 493 be greater than jr, the roots are all real.

Let us suppose a to be a real root of the proposed

equation ; Then e+gratr=0, And e@+qatr=0.

And therefore, by subtraction, a? -a3+9(%—a)=0; hence, dividing by x —a, we have

v+ar+a+gq=0.

This quadratic equation is formed from the two remain- ing roots of the proposed equation, and by resolving it we find

om ~jae JORDY.

And as, by hypothesis, all the roots are real, it is evident that g must necessarily be negative, and greater than {a7 ; for otherwise the expression ,/—%a?—q would be imaginary. Let us change the sign of qg, and put q= {0”+d; thus the roots of the equation a3 —ga+r=0 will be

a, =a Jd, = 70 Jd, and here d is a positive quantity.

To find an expression for 7 in terms of a and d, let za” +d be substituted for g in the equation a -ga+r=0; we thence find r= —ia5+ad; so that to compare together the quantities g and 7, we have these equations,

g=ie+d, r= —1¢ +ad.

In order to make this comparison, let the cube of 4g be taken, also the square of 47, the results are

a = git + Zatdt 4e’d? +343, ae gtd + ie’ ; and therefore, by subtraction, a? — i? = 2 a’d ~~*1t° PP +0, = 3d(3,a* — 4a’d + Aa?) =3d(ia? — 1d). Now the square of any real quantity being always positive, it follows that 3d(ta? — 4d)? will be positive when d is posi*~~ *tive; hence it is evident that in this case 2g? must be greater than 77”, and that 93 cannot be less than 47°, un- less d be negative, that is, unless —1¢ + Jd, —4@ — Jd; the two other roots of*

the equation are imaginary. If we Suppose d=0, then 9?=47"; and the roots of the equa- tions, which in this case are also real, two of them being equal.

Upon the whole, therefore, we infer, that since a cubic equation has always one real root, its roots will be all real as often as q is negative, and a7@ greater than i7?; and consequently, that in this case the formule for the roots must express real quantities, notwithstanding their imagin- ary form.

94. Let y8—qy+r=0 denote any equation of the form which has been considered in last article, namely, that which has its roots all real ; then, if we put a= — 1},

6? = 3,93 — iv", one of the roots, as expressed by the first formula (Art. 90) will be

y= Jato J-1+ /a-b Ji.

This expression, although under an imaginary form, must (as we have shown in last article) represent a real quantity, although we cannot obtain it by the ordinary process of arithmetic.

The case of cubic equations, in which the roots are all real, is now called the zvreducible case.

It is remarkable that the expression

Jab J-l+ wl ot, v= and in general, : SP ick Jon, ce WBE where » is any power of 2, admits of being reduced to another form, in which no impossible quantity is found. Thus, s/o OV= 1 hae o —1= a eat 2 Ja? +B, ace | amet eT M/ 2042 Jat b+2 VEER), as is easily proved by first squaring and then taking the square root of the imaginary formule. But when x is 3,

it does not seem that such reduction can possibly take place.

If each of the surds be expanded into an infinite series, and their sum be taken, the imaginary quantity /-1 will vanish, and thus the root may be found by a direct process.

Sect. XII.—Soiution or BiquaDRATIC EQUATIONS.

95. When a biquadratic equation contains all its terms,

it has this form, vt+ Aa? + Br? +Cx+D=0,

where A, B, C, D denote any known quantities whatever.

We shall first consider pure biquadratics, or such as con- tain only the first and last terms, and therefore are of this form, #=64 In this case it is evident that « may be readily had by two extractions of the square root; by the first we find #?=6?, and by the second s=0. This, how- ever, is only one of the values which « may have; for since w4=b*, therefore z*—b'=0; but x*—6* may be resolved into two factors «* — b? and «+2, each of which admits of a similar resolution; for x? —b?=(#%—b)(x+b) and 2? +6? =(% —b,/-1)(a+0,/-1). Hence it appears that the equation #4 —64=0 may also be expressed thus*

(a —b) (+6) («—b f-1) («+6 ,/-1)=0; so that x may have these four values,

+, 1 +6 /-1, -b /-1, two of which are real, and the others imaginary.

96. Next to pure biquadratic equations, in respect of easiness of resolution, are such as want the second and fourth terms, and therefore have this form,

xv +ge+s=0.

These may be resolved in the manner of quadratic equa- tions; for if we put y=2?, we have

Y+qy+s=0, = ge —4s5 from which we find y= aS and therefore

9 d

s= we

= 5 3

97. When a biquadratic equation has all its terms, the manner of resolving it is not so obvious as in the two for- mer cases, but its resolution may be always reduced to that of a cubic equation. There are various methods by which

such a reduction may be effected. The following, which we select as one of the most ingenious, was first given by Euler in the Petersburg Commentaries, and afterwards ex- plained more fully in his Hlements of Algebra.

We have already explained, Art. 92, how an equation which is complete in its terms may be transformed into another of the saine degree, but which wants the second term; therefore any biquadratic equation may be reduced to this form,

ytpy+qytr=0, where the second term is wanting, and where 7, g, 7, de- note any known quantities whatever.

That we may form an equation similar to the above, let us assume y= a+ b+ ,/c, and also suppose that the letters a, 6, c denote the roots of the cubic equation

2+ P2+Qz2-R=0; then, from the theory of equations we have a+b+c= —-P, ab +ac+bc=Q, abc=R.

We square the assumed formula y= Jat Jo+ Je ” a aud obtain y? =a+b+c+2(/ab+ act ,/be), or, substituting — P for a+6+¢, and transposing;

y+ P=2(Jab+ Jact Jobe). Let this equation be also squared, and we have yt + 2Py?+ P2 = 4(ab-+ac+be) + 8(V abc + abc + Vabe?) ; and since ab+ac+be=Q, and = Vwbe+NVab%c4 Vabe? = Vabe(Va+Vb+Vc)=VR.Y, the same equation may be expressed thus:

oy + 2Py?+ P?=4Q48 JR. y. Thus we have the biquadratic equation

yt + 2Py?-8 JR. y+P?-4Q=0,

one of the roots of whichis y= a+ Jb+ ,/c, while a, b,c are the roots of the cubic equation 2° + P22? + Qz—-R=0.

98. In order to apply this resolution to the proposed equation 74+ py? + qy+7r=0, we must express the assumed coefficients P, Q, R by means of p, 9, 7, the coefficients of that equation. For this purpose, let us compare the equa- tions

ytpyt+qgtr=0, y'2Py-8 /R y P?-4Q=0, and it immediately appears that 2P=p, -8/R=q, P8-4Q=r and from these equations we find at Ge! Ape Pg) (i mae Hence it follows that the roots of the proposed equation are generally expressed by the formula y= Jat Jo+ Je;*

where a, 6, c denote the roots of this cubic equation, Dp, "eae A

Po oe am o a6 "a eA

But to find each particular root, we must consider, that as the square root of a number may be either positive or nega- tive, so each of the quantities ,/a, ./b, ./e may have either the sign + or — prefixed to it; and hence our formula will give eight different expressions for the root. It is, however, to be observed, that as the product of the three quantities /a, /b, ,/c must be equal to ,/It or to

= 3 ; when g is positive, their product must be a negative

quantity, and this can only be effected by making either one or three of them negative; again, when q is negative,

2+

[BIQUADRATIC EQUATIONS,

their product must be a positive quantity; so that in this case they must either be all positive, or two of them must be negative. These considerations

enable us to determine, that four of the eight expressions for the root belong to the case in which q is positive, and the other four to that in which it is negative.

99. We shall now give the result of the preceding in- vestigation in the form of a practical rule; and as the coefficients of the cubic equation which has been found involve fractions, we shall transform it into another, in

which the coefficients are integers, by supposing a=5.

Thus the equation

2

o+fe,h—,-F becomes, after reduction, + Ipv? + (p? —4rjv-g=0, it also follows, that if the roots of the latter equation

are a, b, c, the roots of the former are Fe if ; , so that our rule may now be expressed thus:

Let y+py?+qy+r=0 be any biquadratic equation wanting its second term. Form this cubic equation*

v + 2pv? + (p? — 4rju—g? =0,

and find its roots, which, let us denote by a, 8, c.

Then the roots of the proposed biquadratic equation are,

when q is positive,

y=4(-Vva-vb-No), y=$(-Va+vb+Ve),

when q is negative, y=} (Vatvb+W0), y=$ (Wa-vb-No), = A "A y=) (—VaerV/bowe), y=3 (Wa-Nvb+N¢), y=4 (-Va-Vb+N 0). y=3 (Va+Vvb-WVc).

100. As an example of the method of resolving a bi- quadratic equation, let it be required to determine the roots of the following,

xt — 25a? + 602% -36=0. By comparing this equation with the general formula, we have p= — 25, g= +60, r= — 36; hence 2p = -—50, p? -4r=769, g?=3600, and the cubic equation to be resolved is v® — 50v? + 769v — 3600 =0;

the roots of which are found, by the rules for cubics, to be 9, 16, and 25, so that /a=3, /b=4, c=5. Now in this case g is positive, therefore pate —6, S=4 —34+4+45)= +3,

%=$(4+3-44+5)=+2, %=$(4+3+4-5)=+41.

101. We have now explained the particular rules by which the roots of equations belonging to each of the first four orders may be determined; and this is the greatest length mathematicians have been able to go in the direct resolution of equations; for as to those of the fifth, and all higher degrees, no general method has hitherto been found, either for resolving them directly, or reducing them to others of an inferior degree.

It even appears that the formule which express the roots of cubic equations are not of universal application; for in one case, that is, when the roots are all real, they become illusory, so that no conclusion can be drawn from them. The same observation will also apply to the formule for the roots of biquadratic equations, because, before they can be applied, it is always necessary to find the roots of a cubic equation. But both in cubics and in biquadratic equations, even when the formule involve no imaginary quantities, and therefore can be always applied, it is more convenient in practice to employ other methods, which we are hereafter to explain.

RECIPROCAL EQUATIONS. |

RELATIONS ARE KNOWN TO EXIST AMONGST THE Roots.

102. When the coefficients of the terms of an equation form the same numerical series, whether taken in a direct or an inverted order, as in this example, | a+ pee+ Qu? +pr+1=0, it may always be transformed into another of a degree de- noted by half the exponent of the highest power of the unknown quantity, if that exponent be an even number; or half the exponent diminished by unity, if it be an odd number.

The same observation will also apply to any equation of this forin,

xt + pax + garx? + paix +at=0.

103. That we may effect the proposed transformation

upon the equation

at + pa? + qa? +px+1=0, let every two terms which are equally distant from the extremes be collected into one, and the whole be divided by «?, then

Pt («+5 +q=0

+ o+p a ae

1

Let us assume n+o=2;

1 | then @+2+ c= 2, and 4+ Gae—2,

: I iL Thus the equation w+ +p(x +-)+q=0,

becomes 2+pz2+q—2=0;

and since 2+ . =z, therefore «?-—za+1=0.

Hence, to determine the roots of the biquadratic equation at + par + qa? +pxe+1=0, we form the quadratic 2+p2+q—2=0, and find its roots, which, let us suppose denoted by 2' and 2'; then the four roots of the proposed equation will be found by resolving two quadratic equations, viz. e?—de+1l=0, 2-2"%+1=0.

104, It may be observed, respecting these two quadratic equations, that since the last term of each is unity, if we put a, a' to denote the roots of the one, and 6, b' those of the other, we have from the theory of equations, aa' =1,

and therefore a’ =”; also 6b’ = 1, and 0’ =e

3, now a, a’, b,

b are also the roots of the equation | w+ pe + gu? +pr+1=0. Hence it appears that the proposed equation has this property, that one-half of its roots are the reciprocals of the other half; and to that circumstance we are indebted for the simplicity of its resolution. 105. If the greatest exponent of the unknown quantity

ih a reciprocal equation is an odd number, as in this

example,

x + px + ga? + ga” +pr+1=0, the equation will always be satisfied by substituting — 1 for x; hence, ~~1 must be a root of the equation, and therefore the equation must be divisible by +1. Ac~~

cordingly, if the division be actually performed, we shall have in the present case

a + (p —1)a3 —(p—q—1)x2+(p— He+i=0, another reciprocal equation, in which the greatest exponent

of # is an even number, and therefore resolvable in the manner we have already explained.

— 106. As an application of the theory of reciprocal equa- Hons, let it be proposed to find x from this equation,

+1

@+ip where a denotes a given number.

Every expression of the form x+1 is divisible by «+1 when » is an odd number. In the present case, the numerator and denominator being divided by «+1, the equation becomes*

Cae+e—et1 a+ 4a + 6a2+4a+1 ” and this again, by proper reduction, becomes (a — 1)a + (4a + 1)a3 + (6a — 1)2? +(4a+1)e+a-1=0; and, putting p= fiat q= test 3 i eaileg a—1’ a + px + ga? +pr+1=0; a reciprocal equation, resolvable into two quadratics.*

EQUATIONS WHICH HAVE Equat Roots.

107. When an equation has two or more equal roots, these may always be discovered, and the equation reduced to another of an inferior degree, by a method of resolution which is peculiar to this class of equations,

Although the method of resolution we are to employ will apply alike to equations of every degree, having equal roots, yet, for the sake of brevity, we shall take a biqua- dratic equation,

a+ p+qa?+reat+s=0, the roots of which may be generally denoted by a, 8, ¢, and d. Thus we have, from the theory of equations, (a —a)(a —b)(x—c)(a —d) =x + pai +a? +rats. Let us put

A eae TW A” =(x-a)(x—c)(x-d),

A’ = (a—a)(x—b)(a—d), A” =(a ~ b)(x —c) a then, by actual multiplication, we have

A =23-a +ab —b> #+ac px—abc,

—¢ + be

A’ =e—@ +ab —b} a+ad >x-abd, —d\ bd

A” =3-a +ac —c > #+ad >x—-acd, —

A” =23—b + be —c > #+bd $a—bed: —d +cd

and taking the sum of these four equations ;

A+ A/+ A” +A” = 423 — 3, +2ab 1 —3b(.+2ac —abe —3c(% 42ad — abd —3d + 2be — acd + 2bd — bed. + 2cd

But since a, b, c, d are the roots of the equation a+ px+qor+ra+s=0, we have —3(a+b+c+d)=3p, 2(ab+ac+ad+ be+bd+cd)=2¢, — (abe + abd + acd + bed) =r ; A+A‘+ A+ A” = 403 4 3p0? 4 2ga+r.

This result expressed in its most general form is as follows :—Let A represent the product of all the differences a—d, &., except one, 2A, the sum of all such products ; then SA = na” + (n—1)pa” + (n—2)qa”*+ &e.*

108. Let us now suppose that the proposed biquadratic equation has two equal roots, or a=); then x—-a=2x -b, and since one or other of these equal factors enters each of the four products A, A’, A”, A’, it is evident that A+A’+A” +A”, or 423 + 3px? + 29a +r must be divisible by x—a, or x—6. Thus it appears that if the proposed equation

ood

at + px + qa+rxe+s=0 have two equal roots, each of them must also be a root of this equation,*

4a + 3pa? + 2qa+r=0; for when the first of these equations is divisible by (« — @)?, the latter is necessarily divisible by x —a. ;

Let us next suppose that the proposed equation has three equal roots, or a=b=c; then, two at least of the three equal factors «—a, «—6, x—c, must enter each of the four products A, A’, A”, A’, it is evident that A+A’+ A” +A”, or 4234 3pu?+2ga+r must be twice divisible by z—a. Hence it follows that as often as the proposed equation has three equal roots, two of them must also be equal roots of the equation

493 4. 3a + 2ga+r=0.

109. Proceeding in the same manner, it may be shown, that whatever number of equal roots are in the proposed equation

+ pe +gu?+re+s=0, they will remain, except one, in this equation, 423 + 30a? +2qr+r=0, which may be derived from the former, by multiplying each of its terms by the exponent of «x in that term, and then diniinishing the exponent by unity.

110. If we suppose that the proposed equation has two equal roots, or a= 6, and also two other equal roots, or c= d, then, by reasoning as before, it will appear that the equa- tion derived from it must have one root equal to a or 8, and another equal to c or d; so that when the former is divisible both by (#-— a)? and («-c)?, the latter will be divisible by (# —a) (a—c).

111. As a particular example, let us take this equation,

x — 13a4 + 6703 — 1712? + 216a-108=0,

and apply to it the method we have explained, in order to discover whether it has equal roots, and if so, what they are. We must seek the greatest common measure of the proposed equation and this other equation, which is formed agreeably to what has been shown (Art. 109),

Batt — 5203 + 20142 — 3420 +216 =0;

and the operation being performed, we find that they have a common divisor, z—8z?+2lz-—18, which is of the third degree, and consequently may have several factors. Let us therefore try whether the last equation, and the following,*

20a — 15622 + 402x — 342=0,

which is derived from it by the same process, have any common divisor; and, by proceeding as before, we find that they admit of this divisor, x—3, which is also a factor of the last divisor, «3 — 822+ 2la%—18; and therefore the product of the remaining factors is immediately found by division to be «? — 5x+ 6, which is evidently resolvable into z-—2anda-3.

Thus it appears that the common divisor of the original equation, and that which is immediately derived from it, is (c— 2) («-—3)?; and that the common divisor of the second and third equations is'#—3. Hence it follows

that the proposed equation has (a — 2) for one factor, and (x — 3)° for another factor, and may therefore be expressed thus, (# – 2)? (c-—3)3=0. The truth of this conclusion may be easily verified by multiplication. The five roots are 2, 2, 3, 3, and 3. ;

112. The property proved in Art. 107 enables us to establish numerous relations between the coefficients and roots of an equation, in addition to the fundamental one established in Art. 79, such as the following :—

Since a+ pa” + qa” + &e. =(a—a) (a—b) (x -¢) &e.*

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[EQUATIONS WITH

and na— + (n — 1)pa** + (n — 2)ga”* + &e. = (x —b)(a-—c)....+(@-a) (e—c)... +..5, by division na! +. (% — 1)par-* + (nm — 2)qun3 + &e. an + po”! + gar-24 &e.*

1

—+ ke. —¢

where §,, Sz, Sz, &c., are the sums of the first, second, third, &c., powers of the roots of the equation. Multiplying out and equating coefficients, we get — ie —l)p=S,+ pagee S.+p8, +ng (n—3)r=S,+p8.4+98,+ur &e, = &e. Or S,+p=0 S,t+pS,+2¢=0 83 pSo gs, + or = @) &e, &e. Ex. 1. As a particular case, take the cubic equation 2+geu+r=0.

Here

The last may be written—

= ees a ie Me” oat ae, if a+b+c=0, then will C++ a+F+3 a+P+e

5 es, Sr From 8, +98;+78,=0, we get

§,=8,.2+ 8) – S;_ Ss Ss Or sta St. Fd, de

Ex. 2. Take the biquadratic equation at +- qa? + ra+-s=0 Here S,=0 Ss + 3r = 0 S,+ qd, +4s=0

or

ie. if a+b+ce+d=0, b+ h4+c4d) 3464403 a+%+c8+d nig 7… aks =

EQUATIONS WHOSE Roots ARE RATIONAL

113. It has been shown in Art. 79, that the last term of any equation is always the product of its roots taken with contrary signs. Hence, when the roots are rational, they may be discovered by the following rule:

Bring all the terms of the equation to one side; find all the divisors of the last term, and substitute them suc- cessively for the unknown quantity. Then each divisor, which produces a result equal to 0, is a root of the equation.

Ex. Let «3 — 42? -724+10=0.

EQUAL ROOTS. |

The divisors of 10, the last term, are 1, 2, 5, 10, each of which may be taken either positively or negatively; and these being substituted successivelv for x we obtain the following results:

By putting +1lfors, 1—- 4- 7+10= 0,

eet — 24+.74+10=. 12, +2, 8— 16-144+10=-12, —2, —8 16+14+10= 0,

+5, Pp —100-—354-10= 0. Here the divisors which produce results equal to 0 are +1, —2, and +5; therefore these are the three roots of the proposed equation

Ssor. XIV. Sotution or Equations By APPROXI- MATION

114. When the roots of an equation cannot be accu- rately expressed by rational numbers, it is necessary to have recourse to methods of approximation ; and by these we can always determine the numerical values of the roots to as great a degree of accuracy as we please.

The application of methods of approximation is rendered easy by means of the following proposition ;

If two numbers, either whole or fractional, be found, which, when substituted for the unknown quantity in any equation, produce results with contrary signs, we may conclude that at least one root of the proposed equation is between those numbers, and is consequently real.

Let the proposed equation be

0 — 5a+102—-15=0,*

which, by collecting the positive terms into one sum, and the negative into another, may also be expressed thus,

a + 10x — (5a? +15)=0; then, to determine a root of the equation, we must find such a number as, when substituted for x, will render

+10%=54?+15.

Let us suppose x to increase and to have every degree of magnitude from 0 upwards in the scale of number ; then 2° + 10x and 52°+15 will both continually increase, but with different degrees of quickness, as appears from the following table :—

Successive values of ;0, 1, 2, 8, 4, 5, 6, &e. See 0! 2 + 10r; 0, 11, 28, 57, 104, 175, 276, &e. of 527 ++ 15; 15, 20, 35, 60, 95, 140, 195, dc.

By inspecting this table, it appears that while x increases from 0 to a certain numerical value, which exceeds 3, the positive part of the equation, or a? + 10x, is always less than the negative part, or 5×2+15; so that the expression

a + 10" — (5a? 15) or #3 — 5a? 4- 10x — 15 must necessarily be negative.

It also appears, that when x has increased beyond that numerical value, and which is evidently less than 4, the positive part of the equation, instead of being less than the negative part, is now greater, and therefore the expression

xv — 542 +10e~15

is changed from a negative to a positive quantity.

Hence we may conclude that there is some real and determinate value of x, which is greater than 3, but less than 4, and which will render the positive and negative parts of the equation equal to one another; therefore that value of x must be a root of the proposed equation; and as what has been just now shown in a particular case will readily apply to any equation whatever, the truth of the proposition is obvious,

115. From the preceding proposition it will not be difficult to discover, by means of a few trials, the nearest integers to the roots of any proposed numerical equation ;

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and those being found, we may approximate to the roots continually, as in the following example :

at — 49? —374+97=0.

To determine the limits of the roots, let 0, 1, 2, 3, 4, be substituted successively for x; thus we obtain the fol- lowing corresponding results :

Substitutions for 2, 0, 1, 2, 3, 4, Results, +27,+21, +5, —9,+15. Hence it appears that the equation has two real roots, one between 2 aud 3, and another between 3 and 4.

That we may approximate to the first root, let us sup- pose r=2+y, where y is a fraction less than unity, and therefore its second and higher powers small in com- parison to its first power: hence, in finding an approxi- mate value of y, they may be rejected. Thus we have

w= +16432y, &c. — 4×3 = —32—48y, &e.

—3% =-— 6-—B8y

+2 = +27

HenceO0 = 5—19y nearly,

5 : :

and Y=ag= ‘26; therefore, for a first approximation we

have x= 2:26,

Let us next suppose «=2:26+y’; then, rejecting ag before the second and higher powers of y’ on account of their smallness, and retaining three decimal places, we have Om ai = “0075, and «= 2:26 + ¥’ =2-2675. This value of x is true to the last figure, but a more accurate value may be obtained by supposing «=2:2675+y”, and pro- ceeding as before.

116. The method we have hitherto employed for approxi- mating to the roots of equations is known by the name of the method of successive substitutions, and was first proposed by Newton. It has been since improved by Lagrange, who has given it a form which has the advan- tage of showing the progress made in the approximation by each operation. This improved form we now proceed to explain.

Let a denote the whole number next less to the root

sought, and : the fraction, which, when added to a, com-

pletes the root ; then «=a+ . . If this value of x be sub-

stituted in the proposed equation, a new equation involving

y will be had, which, when cleared of fractions, will neces- sarily have a root greater than unity.

Let 6 be the whole number which is next less than that

: : 1

root ; then, for the first approximation, we have x=a+ x

But 6 being only an approximate value of y, in the same

manner as @ is an approximate value of x, we may suppose

Deo a y=b+ L ; then, by substituting 6 te for y, we shall have y

a new equation, involving only y', which must be greater than unity. Putting therefore 0' to denote the next whole number less than the root of the equation involving y', we

have y=b+53 and substituting this value in that of a,

the result is .

L=A+ fi

b! for a second approximate value of x.

b+

To find a third value, we may take y'=b' + BD , and so

on, to obtain more accurate approximations. I. — 70

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Srct. XV.—INDETERMINATE PROBLEMS.

117. When the conditions of a question are such that the number of unknown quantities exceeds the number of equations, that question will admit of innumerable solu- tions, and is therefore said to be indeterminate. Thus, if it be required to find two numbers subject to no other limi- tation than that their sum be 10, we have two unknown quantities x and y, and only one equation, viz. x+y= 10, which may evidently be satisfied by innumerable different values of x and y, if fractional solutions be admitted. It is, however, usual, in such questions as this, to restrict values of the numbers sought to positive integers, and therefore, in this case, we can have only these nine solu- tions, :

mel, 2, 354, 0,6, Teas

y=9, 8, 7, 6, 5, 4, 3, 2, 1; which indeed may be reduced to five; for the first four be- come the same as the last four, by simply changing x into y, and the contrary.

118. Indeterminate problems are of different orders, according to the dimensions of the equation which is obtained after all the unknown quantities but two have been eliminated by means of the given equations. Those of the first order lead always to equations of this form,

ax + by =e, where a, b, c, denote given whole numbers, and a, y, two numbers to be found, so that both may be integers. That this condition may be fulfilled, it is necessary that: the coefficients a, 6, have no common divisor which is not also a, divisor of c; for if a=mdand b= me, then ax + by = mdz

+mey =c, and dx+ey= = ; but d, e, x, y, are supposed to

Ot be whole numbers, therefore = 8 @ whole number; hence

m must be a divisor of c. We proceed to illustrate the manner of resolving inde- terminate equations of the, first order, by some numerical examples. Ex. 1. Given 2% + 3y = 25, to determine x and y in whole positive uuinbers. 25 — By

2

Now, since x must be a whole number, it follows

From the given equation we have «=

y—1

3

=12-y-

= =

that = must be a whole number. Let us assume hy

=z, then y= 1 + 22; and x = 11 — 32, where z might be any whole number whatever, if there were no limitation as to the signs of « and y. But since these quantities are required to be positive, it is evident, from the value of y, that z must be either 0 or positive, and from the value of x, that it must be less than 4; hence z may have these three values, 0, 1, 2, 3. liz= 0, =", 2=2

x=11, v= 8, x= Dd, vee,

Then { ja 1, y = 3, y=5,

Ex, 2. It is required to find all the possible ways in which £60 can be paid in guineas and moidores only.

Let « be the number of guineas, and y the number of moidores. Then the value of the guineas, expressed in shillings, is 21", and that of the moidores 27y; therefore, from the nature of the question, 21z + 27y = 1200, or, dividing the equation by 3, 7z+9y=400; hence, proceed- ing as before, we obtain

y=7Tv —3, x= 61 — 9v.

From the value of x, it appears that » cannot exceed 6, and from the value of y, that it cannot be less than 1.

[un DETERMINATE PROBLEMS,

Hence if w= 1, '°2, 3, 4, 9, 6, we have 7=52, 43, 34, 25, 16, 7, y= 4, 11, 18, 25, 32, 39.

119. In the foregoing examples the unknown quantities

x and y have each a determinate number of positive values;

and this will evidently be the case as often as the proposed equation is of this form, ax+by=c. If, however, b be negative, that is, if the equation be of this form, ax —by =c, or ax=by+c, we shall have questions of a different

kind, admitting each of an infinite number of solutions; these, however, may be resolved in the same manner as the preceding. . .

120. If an equation were proposed involving three unknown quantities, as ax + by + cz=d, by transposition we have ax+by=d-—cz, and, putting d—cz=c', aw+by=c. From this last equation we may find values of « and y of

'this form,

x=mrtne,y=mr+n'c, or =mr+n(d—cz), y=mir+n(d—cz);

where zand 7 may be taken at pleasure, except in so far as the values of x, y, z, may be required to be all positive; for from such restriction the values of z and 7 may be con- fined within certain limits to be determined from the given equation.

121. We proceed to indeterminate problems of the second degree: limiting ourselves to the consideration of the for- mula y?=a+bx+cx", where x is to be found, so that y may be a rational quantity. The possibility of rendering the proposed formula a square depends altogether upon the coefficients a, b, c; and there are four cases of the problem, the solution of each of which is connected with some pecu- liarity in its nature.

Case 1. Let a be a square number; then, putting g? for a, we have y2=g? +ba+cx%, Suppose /g?+ bx + ca =9+ mx; then g? + ba + cx? =g?+ 29gmz+ mx", or ba+cat= 2gmx + mx?, that is, b cx= 2gm ma; hence

_ 2gm—b = Ppp rer a la a = ee TE Cl ae

-Case 2. Let c be a square number=g?; then, putting Na+ bat 9x? =m a, we find a ba + g?x? =m? + Imge +9°x", or a+ba=m? + 2ntgx; hence we find _ ae) bm — gm? —ag = 52mg 7 b-Img

Case 3. When neither a nor c is a square number, yet if the expression a+ bx +c? can be resolved into two simple factors, as f+gxz and h+kzx, the irrationality may be taken away as follows :

Assume Ja+ba + ca? = J(f + ga)(h + hx) =m(f+ga), then (f+ga)(h+kx) =m f+gu), or h+ke=m(f+ga); hence we find .

ED Vatbat Pat =

_ fm—-h ~ k—gm??

and in all these formule m may be taken at pleasure.

Case 4. The expression a + bx+cxz® may be transformed into a square as often as it can be resolved into two parts, one of which is a complete square, and the other a product of two simple factors; for then it has this form, p?+97, where p, g, and 7 are quantities which contain no power of « higher than the first. Let us assume Jp? qr=pt mg; thus we have p? 9r=p? + 2mpqt mq? and r= 2mp +m'q, and as this equation involves only the first power of x, we may by proper reduction obtain from it rational values of x and y, as in the three foregoing cases.

The application of the preceding general methods of reso- lution to any particular case is very easy; we shall there fore conclude with a single example. :

ve Gta) =

a k— gm?

2

ai

BINOMIAL THEOREM. |

Ex. It is required to find two square numbers whose sum is a given square number.

Let a? be the given square number, and 2?, y?, the num- bers required ; then, by the question, z?+ y?=a?, and y= Ja?—a«. This equation is evidently of such a form as to be resolvable by the method employed in case 1.. Accord- ingly, by comparing \/a? — x? with the general expression dg?*

+ ba + cx, we have g=a, 6=0, c= —1, and substi- tuting these values in the formule. and also—n for +m, we find :

_ fan aln?—1) =e +1 i n+l If a=n+1; there results x=2n, y=n?-1, a=n?+ 1. Hence if 7 be an even number, the three sides of a rational*

2 2

right-angled triangle are r, () —1, (5) +1. If r bean ve—] 24d ie RL Oe

For example, if r=4; 4, 4-1, 4+1, or 4, 3, 5 are the sides of a right-angled triangle; if r=7, 7, 24, 25 are the sides of a right-angled triangle.

odd number, they become (dividing by 2) ,

Sxeot. XVI.—THrEoREMS or EXPANSION. 1. Binomial Theorem.

122. To demonstrate this theorem, which has for its object the expansion of (a+)" in the form P+ Qz + Az? + Ba? +&c., we shall first find P and Q; and then de- termine the other coefficients A, B, &c. in terms of P and Q.

(L.) (a+x)= { a(1+2) braan(1 45), ~ it being assumed that the power of a product is the. pro-*

duct of the powers of the factors, whatever be the index.

(2.) Let n be a whole number. Since (l+2)i=l+e (l+x)?=1+2x+ 22 :

(1l+2)8=14+32+ &.; te if we assume (1 + #)"'=1 + (n—1) 2+ &c., and multiply both sides by 1 , we shall obtain (14 2)*=1+nx+ &. ; whence our induction is complete to prove that the numerical of coefficient # is the same as the index.*

P

(3.) Let x be a positive fraction ee We may take

! (1+ aja= 14+Qzx &c. (1 x)P=(14+Qa + &c.)!

or, 1l+pet+ &. = 1+¢Qxrt+ &. “(Case 2.) ; Q=£ ; , qY (4.) If x be negative = —m

1

*(* eee as 1+x)*=(1+2) (+a*

1

F here is. (Case 3.)

=1-mx+ &e. by division. Hence, gencrally the numerical coefficient of x is the same as the index.

To obtain A, B, &c., in terms of the first and second terms, we break up a into two parts, y, z, which enables us to write the expression 1+. in two different ways: Ist, retaining the parts-of in connection 3 2d, dissevering them. In the first form we simply multiply out. and thus exhibit a result not dependent on the properties of an index, except in so far as relates to the first and second terms. In the second form we apply the properties of an

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index to every term. The consequence is, that the latter form, bearing a more intimate connection with the pro- perty of an index than the former, is more determinate than the other. The comvarison of the two results com- pletes the demonstration.

I. (l+a)”=(1+y+2)” alin (+e) +A(y+2)+Biy+s)9+&e =l+ny+Ay? +By +&c. +72 2Ay2 3By22+ &e. +&e. +&¢,

iE, (1 +x)”=(1 +y+2)”=(L+e+y)

= ” a>) =(1-+2) a+ 74)

mf ae. py 4. AY Ye =(1+2) Legg tai Baoet =(1+2)“4+n(1 2)-ly A(1 +2)”-29y24 &e = l+ny + Ay?+ ke. + ne+n(n—1)ey+A(n—2)ay? + &e. + &c. + &e. + ke. Now, as these two expansions are the expansions of the same thing in the same form, the coefficients of z, zy, zy?, &c., must be the same in both. Comparing them, we get*

n=n, 2A=n(n—1), 3B=A(n—2) &e _ nn—1) _A(n—2) n(n—1) n-2) i sia! ee le20% – &c. = &.; and finally, whatever x be,

- n(n —1) n(n —1) (n—2)

(1 +2) =ltset> % x? te ge + he,

Cor. 1. If is a positive whole number, the series is finite, since every term after the (n+ 1)th will involve n -n as a factor.

Cor. 2. Since the coefficients, when the index is a whole number, are the results of simple multiplication, they are necessarily whole numbers, 7.¢., any such expression as n(n —1)(n—2). ‘ Die: jal“ Se Willis whole number when 7 is such

Cor. 3. The sum of the numerical coefficients is 2”, for it is equal to (1+1)”, as will appear if we write 1 for z.

Cor. 4. The sum of the coefficients in the even places is equal to the sum of the coefficients in the odd. This will appear if we write —1 in place of a,

Cor. 5. If the index is a whole number, the coefficients from the end are the same as those from the beginning ; for they occur at the beginning of («+ 1)” in the same positions as at the end of (1+ .x)«. .

Cor. 6. The product 1.2.3….7 1s sometimes expressed by the abbreviated form |r. With this notation the coeffi-

cient of x” in (1+.)” may be Baa rae cree pee :

Cor. 7. The sum of the squares of the coefficients of (1+ x)” isthe coefficient of x in the expausion of (1 +x)”, 2n*

pie (|2)?

and is equal to

Examples, —2 —2.-3 —2.—-3.—-4 —2 _— 2 ee Ex, 1. (1+) = les ot re 2.3 e | + &e, = 1 -— 2x + 32? -— 425 + &.

1

generally (1+a#)”=1 ~ ne ya kes and (L-aytal4net@Or) 924 &o,*

Ex, 2. Find the -coefficient of a7 in (x + 2? + a3 + a4 + x + x8)? The expression may be written

{ (G==) bial — 28)2 (1 —%)-?

1-« = 0°(1 — 298 + wl2)(1 + 20 + 34? + 425 + &e.) The coefficient required is therefore that of x in the last factor, viz. 6.

2 ~1)(n—2 Gee mmaiieatorenl one = al ee

I le Bok + &e. ; By writing 1+1 for 2,1+2 for 3, &c., this series may

=)

be broken up into the sum of 1+ n+ MOD + &e. ~~*l and n+2 — + &e. Al Ge The latter isn 1 phot CE) + &e. ; *, the sum required is 2" + n2°*~~*)*

=

Ba, 4, Find the sum of 1+n+3”@—) 4 Ge,

Multiply by x +1; the product is Gee. (n1+1)n(n—1) ee

ee | ors . ee grt! — 1 . the sum required is =

Ex. 5. Tf «, denote the product a(x—-1)(w- 2)...

(«—r-+1) whatever be 7, and a similar notation be applied to y, and (x+y), then

—1 (ety), =0, +72 nt Da, st &e, 2 x w, We have (1 +a)=1+aa+775 0 +793 a + ke. (l+a)”=1 + ya a? + &e,*

*(1 +a)**” =their product. But (l+a)*#=14+(¢+y),a+ ekDe a? + &e,*

Equating coefficients of a in the two expressions for (1+a)**¥, and multiplying by 1.2…%, the required result is obtained.*

Ex, 6. Tf « and n be less than 1, then (1 +2)”<(1+nz2).

For (1+a)r=L4nat De 4 Ps,

*- ml—n) of, _ 2-0 _ =l+ne—-— 2 * (1 5 n) &e.*

Lx. 7. On the same hypothesis (1 +x)<—*

1—na Prove that (1+)”>1-—- xa exactly as in the last example. ie. 8. Ti <1; 2n>rthe sum of the first r+1 terms of the expansion; and < the sum of the first 7+ 2 terms.*

ix. 9, The difference between the sums of the squares of the even coefficients of the expansion of (1+.)”, when m is an even whole number, and the sum of the squares

raed of the odd coefficients is (—1)?/|n\?.

(3)

2. Logarithmic Theorem.

123. The definition of a logarithm is precisely the same as that of an index or exponent (Art. 21) viz.—the logarithm of a product rs equal to the sum of the logarithms of the factors. Such being the case, we are at liberty to employ the definition, either in the form first given, or in the algebraic form a=y. In this last form x is called the logarithm of y to the index or base a. The base of the common or tabular logarithms is 10.*

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[THEOREMS OF EXPANSION,

124. Before proceeding to the demonstration of the theorem by which a logarithm is expressed in the form of a series, it may be as well to illustrate the definition as applied to common logarithms.

lst, Since 1 is the logarithm of 10, we may inquire of what is } the logarithm; if we resume the form 10°=y, and write 4 for x, we have to inquire what is y.

Since 107 =y, 10? x LOPay?.

102 × 107 =102? (def.) =10, gy? =10 end y= / W=33 G22777 , so that the number of which 3 is the logarithm is not a whole number, but a fraction lying between 3 and 34.*

In the same way, we may, but with great labour, ascer- tain the numbers of which any given fraction is the logarithm.

2d, The definition will evidently enable us to obtain a large number of logarithms, when a few have become known. For example: Given log 2=.30103 to find log 4 and log 5.

Log 4=log (2 × 2) =log 2+log 2 (def.) =2 log 2=. 60206 ;

Log 5 = log = =log 10 -log 2 =1-log 2=. 69897.

If in addition to log 2, log 3 be known, we can find a vast nuinber of others. For example: Given—

Log 3=.47712 to find log 6 and log 72. Log 6=log 2× 3=log 2+log 3=. 77815, Log 72 =log 8× 9=3 log 2+2 log 3=1. 85733.

125. To expand log (1+) in terms of a.

Since log 1=0; the expansion must commence with the first power of x, the coefficient of which will depend on the radix or base. This coefficient we

shall determine afterwards for the common logarithms. In the meantime we shall denote it by A.

Let then log (1+) =Ax+ Ba? + Cx3 + &.

Put y+z for xz; then

I. Log (l+y+2)=A(y+2) +Biyt+2P+é&c,

=Ay +By? C0y? &e. +Az +2Byz2+3Cy?2+ &e.

But

+&e. +&c. II. Log (1 +2)=log (1 (aa g (L+y+2)=log (1+y) 1% \ =log (1 1 i og (1 +y)+log Coes =Ay+ By?+&c. AR 1+y + &e. = Ay+ By?+ &e. +Az(1—y+y?—&c.) +&e,

Equating coefficients of z, yz, y%, &c., in the two ex- pansions, there results

Amt, Opera Agee 1

ee ‘ log (lt2)=A(e-F4+5—&e)

126. Cor. If =a-—1, where a is the base of the system, we have | =A} a—1 -5 (a — 1)? + &c.

This expansion of log (1+.) is not convergent, 1¢, the terms do not diminish as we advance, but the contrary, when x is any whole number greater than 1. We can, how- ever, readily obtain from it a converging series for the dif- ference between the logarithms of the consecutive numbers.

THEOREMS OF EXPANSION. |

fe ye For log (L4+2)=A(x—- 3 t&.)

2

log (1 -2)=A(2 = ~ &c.) x log (1 2) — log (1—2) =2A(a o +o &e,)

1

Now log (1+) -log (1 —2z)=log = , and « has to be found, so that ee shall be the quotient of A l+u consecutive numbers =—— . a: 1 This gives cay

1+u il 1 1 and log = 24! oats Garp & | 127. To apply this formula to the calculation of com- mon logarithms, we will commence by finding from it a few logarithms of the system for which A=1. In this system il

uel, log 2=21 545-374 &e.}

=. 693, 147, 2.

1 1

2. Ur u=4, log 5=log 4424 545.5

=1.609, 437, 9.

Hence log 10 =log 2+ log 5

=2. 302, 585, 1.

This system, for which A=1 is the so-called Napierian system, which assumes no base, but defines a logarithm to be such that the increment of the number shall be thc product of the number by the increment of the logarithm. In this system the number of which the logarithm is 1 is 2.718…. and is generally designated by the letter e.

To pass from Napierian logarithms to common, we observe that if e¢=10%=7n; «x is the logarithm of x to the base e, and y to the base 10. Now, taking the Napierian logarithm of each side of this cquation, we obtain x= y Nap. log 10.*

Or

+ &c. i

x x Y Nap. log 10~ 2.802, 585, 1° =xx . 4342944819 =2x . 4343 very nearly.

This multiplier, which was previously denoted by A, is called the modulus of the common system of logarithms. A celebrated calculator of the last century, Mr A. Sharp, found it to be

**4342944819032518276511289189166050822943970058036665661144 54.*

For further details on the construction and use of loga-

rithmic tables, the reader is referred to the Article on LoGariris.

3. Exponential Theorem.

128. It is now required to expand a” in terms of x.

1. Write 1 +a -1 for a, and apply the binomial theorem ; the result is

{1+ (a—-1)}=14x(a~1) +2) (124 &e.*

Here the only term which does not contain x is 1 3 and

the coefficient of x being traced through the different terms, 1s easily seen to be

1

a-1~5(a-1)+5(a-1)'— &e. Thus will seem (Art, 126) to be the reciprocal of the

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modulus of the system of logarithms whose base is a: call it 7. We have now to determine B, O, &c., in terms of r, from the form of expansion

a =1+re+ Ba? + C23 + &e. Write y+2 is place of x; then*

1. wt=l4+r(yte) +Biyt+2)?4+&e. =l+ry +By? +&c. +7re 2Byz &c. + &e. LL way xa =(1+ry+By?+&c.) x(l+re +B +4&c.) =1 +ry +By? +&c +72 +r°yz+rBy'2 +&c.*

+ &.

Equating coefficients of 2, yz, y%z, &c., in I. and 11., we get r=r, 2B=7", 30= 7B, &c. vid 7

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129. Now, since ¢ is such (Art. 127) that e—1-

5 (e- 1)? e. =1,and r=a-1 -5(a-1)'&e, what-

ever a be, it follows that when e takes the place ef a, 7 becomes 1.

pat gi? ae n a— eg "ers © Cs

aud putting #=1, e=1+1+ +5 + &.

= 2.718281828459045…

2

Again ev=l+r +75 the. : o

but since, a=1+re+ i &e.

2

we have a=1+r +79 t &.

r

=¢ From this equation we have r=Nap. log a, a result obtained before.

130. We may approximate directly to the value of r when a= 10, thus

1l\2 ed y) 6 eC ae ee

ieee ; ; I\ AR so that the coefficient of x in (;) is —7%

Now (7) = (145 – Le whence (Art, 128) the coef

5 IN? cieut of 2 in () 1s

&

1 1 2 el i r=1 -545 (1-7) +3 (1-5) + &e =i5+5 (io) 3 (io) + & 10° 2\10 3 \10 = eee Orne

Additional Hxamples, Ex. 1. To find the value to which € +;-) approaches

as m becomes larger and larger. By the binomial thcorem

=h)/2\2 m 2 ; (2) + &e. m nv

1.2 2-0-9

=l+a+ 5 a+ ” M/_o3 + &e oe? x slte+To tre gt & P seat Oe dbo; an Mm 5 so that (1+) approaches the value l4+a+ “5 + &e.

or e”, as m becomes larger and larger.

m 2 Fa. 2. (+ =) approaches to e” ¢ – a) as mincreases. m 2m Er, 3. n> (n – 1p 4M) (n — 2)” — &e, =, Zee

when 2 is a whole number.

nig? 19 &e.

*(n — 1)?x:**

1.2

e=l+naet+*

Dt 14 (n—1)e+ + &e,

Now I. (e = Is = 6M _ elle aL, Aue et _ &e,*

oe oe But ae — Wes Vises tee, — Nee

1.2

a. ae (ce? —1)=2" + pa*t! + &e. Equating coefficients of «* in I. and IT., we get*

nm = n(w—1)“_— n(n—1) (n—2)” eet

Ce Vee eee” ko oe which is the required result.

Cor. When 7 is less than n,

r ve n(n 1) r

n’ —n(n—1)”+- i 2)°— ke. =0.

Ex. 4. The logarithm of a number to the base a” is a mean proportional between its logarithms to the bases aand @™. Jf «, y, z, are the logarithms to the three bases in order, we have (at)” = 0″ =(a”)

ne=y na =n72 consequently oe =e.

Ex. 5. & >1+42, whatever be z. If x be positive, or if it be negative and less than unity, the expansion may be thrown into the form tod 2 faltaty (145) +e every term of which after 1 + is positive.

~~ (Se) Ex. 6. é ae :

1

1

For eo > IES ale mh en® >(1 +n)” Hence e. l’>21 ée. 22>3?

*en™ >(1 +n)” and, by multiplication, ¢”|n >(1 +n)”. Ex, 7. Tin be a whole number > e, n*t! > (n+1)*. By the demonstration of Ex. 6, en* >(1 +n)” : But n>e att >(L+n)% ke. 8. If n*’=(n+1), then n>1*

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[CONTINUED FRACTIONS,

For 7 is evidently > 1.

n= (142) . WV

Cae: =14+14+54\ 14+ +] + the.

3

=2-+a series of positive terms by the hypo- thesis n < 2, which is absurd, .°. n >2. Taking the Napierian logarithms of each side of the

¢ NS equation n=(1 +), we get

If then we suppose n>1

<1

NE,

Liz, 9. Nap. log g>l-t

1 1 1 l\2 Because log «= —log = =1 -5+3(1-3) + &e.

1

log z>l1 a:

And because when «>1, 2<1+(x-1)+ ~, (a— 1}? + &e.

< er ie: logw

1

Ex. 10. Nap. log x approaches to 2” (a”- 1) a5 2

increases.

Sect. XVIJ.—Conrinvep Fractions.

131. Every quantity which admits of being expressed by a common fraction may also be expressed in the form cf what is called a continued fraction. The nature of such fractions will be easily understood by the following example:

: 314159 on Let the fraction be ionoog? which is the same, 3+

14159

ceo, i = f [00000 Since 100000 = 7 × 14159 + 887, therefore 14159 _ 14159 = al ana 314159 am 100000 7× 14159+887 + 887 100000

14519

ae

887

1+ Ta169 .

: : 887 .

By treating the fraction i459 2 the same way, and con- tinuing the process, we readily obtain

314189 1.

100) a Ot Hi vedi oy

By an operation in all respects the same as has been just now performed, may any proper fraction whatever be reduced to the form

— + 1 1 +2 we. as and it is then called a continued fraction. ‘ 132. When the root of any equation is found by the

method explained in Art. 116, the value of the unknown

quantity is evidently expressed by a continued fraction.

1 1

For if x be the root sought, we have x=a Tap y=bt 7

y= Ot – me O +o &c. where a, 5, 0’, b”, &c. denote y

the whole numbers, which are next less than the true values of x, y, 7’, y”, &c. If, therefore, in the value of x

. 1 ‘ we substitute b+ re for y, it becomes

i t=at l b+. | ek: | Again, if in this second value of x we substitute 0’ + y” for y’, it become] ‘= – 1 eat 54 — +—. y

And so on continually,

133. It is easy to see in what manner the inverse of the preceding operation is to be performed, or a continued frac- tion reduced to a common fraction.

The fractions which result from omitting portions of a continued fraction are termed the convergents to that frac-

1

tion. Thus, if the fraction be @, +— , 1; — is the first te F ie |

3

Ge Gy Gy+1

134. The principal practical application of the properties of continued fractions is to approximate to the value of a given fraction. The proposition on which this application depends is the following :—

No fraction in terms equally low can give so good an ap- proximation to the value of a fraction as a convergent to the continued fraction which expresses it does.

To demonstrate this proposition, it is requisite to estab- as hg preliminary propositions, which we shall do very

riefly.

convergent, the second, &c.

ed, (1.) If Px denote the nth convergent, or the re-

duced fraction which results from stopping at a,, and reduc- ing, then Pati = UntiPn Ft Pn—-1s Unt = UntiIn + Uni

Since no denominator can be multiplied by itself, the re- duced fraction must give p, =a,A +B.

1

Qnty

Now p,;, is obtained by writing a, + for a,, and

reducing, : Pati = Onta(dyA a B) an i = OntiPn ot A >

2.6.5 the multiplier of any a is the previous p, and the other term is the multiplier of @ in the previous convergent, hence the proposition.

136. (2.) Darin IntiPx=(—1).*

This 1s at once obtained by eliminating a,,, from the two equations of last article.

137. (3.) The successive convergents are alternately greater and less than the complete fraction, and each convergent approaches nearer in value to it than the preceding.

If A denote the complete denominator Oni + &e. ; wu the

ee… APntDn— complete fraction; then w ee and by subtract-

ing successively Pn ond ; “= from w in this form, it will be n n—l

seen at once that the results have different signs, and that

the latter difference is the larger.

i We are now able to prove the proposition enun-

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| 224,700 days and 365,256 days.

d59

Pn+1 : i”; then since

Let 2 bea fraction nearer to u than

+1

the convergents are alternately too great and too small;

re : 7 2 , must be in order of magnitude. atl ” .. If the first be the greatest, Cen ie? _ Be

Qntt Gn GY Wn

Reducing and applying Prop. 2, there results g>9,,,.

Similarly by inverting the fractions, it may be proved that p>pnai-

Ex. 1. To determine when a transit of Venus may be expected.

The relative sidereal periods of Venus and the earth are The continued fraction which expresses the quotient of these numbers is

1

Tiga ee eee Poa + &¢ 29 i

235 382

1 :

On account of the smallness of 39° the former is a very

The fifth convergent is “ ; the sixth

close approximation, z.e., 8 years and 13 sidereal periods of Venus are very nearly equal.

In consequence of this, a transit occurs after one period of 8 years, and then again not till after 235 years have been completed.

The last pair of transits at the descending node occurred in 1769, 1777 ; and at the ascending node in 1639, 1647.

The next pair will accordingly occur at the latter node in 1874 and 1882. The days of transit will be December 8 and December 6, respectively.

Ex, 2. To find the periods of probable recurrence of eclipses of the sun.

An eclipse of the sun will occur whenever the place of the new moon is within about 13° of the line of nodes. Now, the interval between two new moons is 29°5306 days ; and the mean synodic period of the earth and the line of nodes is 346:6196 days. The proportion of the latter of these numbers to the former, reduced to a con-

47 223 &

4? woe

Hence, after 47 lunar months, things have come nearly to their original position, and after 223 lunar months, very nearly. This latter period, termed the savos, has been known from the remotest antiquity. It enabled the Chaldean shepherds to predict the return of eclipses. It amounts to 18 years and 10 or 11 days. Thus, there was a total eclipse on the 18th July 1860; adding 18 years 11 days, we get for an eclipse 29th July 1878. If we add 47 lunations or 1388 days, we get 6th March 1864, on which day there was an eclipse.

This period of 1388 days, multiplied by 5, makes exactly 19 years—a period which is designated as the cycle of Meton, giving eclipses which occur on the same day of the month. Thus, eclipses happened 18th July 1841 and 18th July 1860, and another will happen 18th July 1879.

iz, 3, The fraction given (Art. 131) represents the ratio of the circumference of a circle to its diameter. By taking the first two terms we have r=3+}= % nearly; and this is the proportion which was found by Archimedes.

Again, by taking the first three terms, we have ~ “106° 106

tinued fraction, gives as convergents

2

which is nearer the truth than the former. And, by taking the first four terms, we have

060

1 855

a 8 =r

which is the proportion assigned by Metius.

Ex, 4. The mean tropical year consists of 365°2422642 days.

*The fraction *2422642, reduced to a continued fraction, gives as successive convergents*

1 7 8 39 47 Bal 4g, 4° 99? 33’ 161’ 194” 1325’

To make the civil year approximate to the tropical, 1 leap year in 4 (the Julian Calendar) serves but imperfectly. 7 leap years in 29 would be inconvenient. The Gregorian Calendar, now in use, is based on combining the fractions

47 194

of the former, and trebling those of the latter, and adding

di, by doubling the numerator and denominator

them respectively. The resulting fraction is he giving

97 leap years in 400 years, instead of 100 as the Julian does. This diminution of 3 leap years in 400 years is produced periodically, by causing

years which indicate the completion of centuries not to be leap years unless the number of centuries is divisible by 4. Thus, 1900 will not be a leap year.

Sect, XVITI.—PeErMvurations, CoMBINATIONS, AND PROBABILITIES.

139. Hitherto wehave supposed the letters of the alphabet, a, b, c, &e., to stand for arithmetical quantities of some kind or other. Now we have to employ them, as in geometry, to represent magnitudes or objects, such as pens, pencils, &c., and to investigate the numbers of different ways in which a given set of them can be grouped according to a certain law.

Permutations are their arrangements in a line, reference being had to the order of sequence ; thus ab and ba are the two permutations of a and 6; combinations are their arrangements in groups, without reference to the order of sequence; thus abe is a combination involving a, 6, andc; and bac is the same combination, both con- sisting simply of a, b, and c grouped together.

Prop. 1. To find the number of permutations of n things (1), two and two (2), three and three, &c., together.

Set aside a, and lay down the other things in a line; place a before each of them in succession, and you obtain ab, ac, ad, &ec., 1.e., 2-1 arrangements, each containing two things, with a first.

In the same way you can form n—1 arrangements, each containing two things, with b first. The same is true of each of the other letters, and as there are 7 of them, the total number of arrangements of the n things, two together, is n(n — 1).

Again, lay aside a, and group the other n—1 things, two together; as we have just shown, there are(— 1) (n — 2) such groups. Place a before each of them, and there will be formed (n-—1)(~—2) arrangements, each containing three things, with a first; and there can be no more arrangements with a first.

Treat 6, c, &c., in the same manner, and it will appear that there are (n—1) (m—2) groups of things, three to- gether, in which every separate thing in

succession stands iirst. Hence, the total number of arrangements, three and three, is n(n — 1) (m — 2).

By proceeding in the same manner we shall find the total number of permutations of m things, 7 together, to be n(m—1)..... (n-r-+l1).

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[PERMUTATIONS, ETC.

Cor. The number of permutations of » things, all to- gether, ae nial). aoe 3. Qe

Prop. 2. To find the number of combinations of » things, r together.

Let # be the number required.

Take any one of the x groups of r things. The number of permutations which can be formed with it will be (Propiul. Cor. Van a ee 305 lore? G7

Now, since each of the x groups is different from all the others, if we treat each of the x groups separately in this way, we shall form 1.2….. rx x permutations, all different. Also, since the x groups contain every possible combination of the n things, r together, we shall thus have formed all the permutations which can be formed; and conse- quently (Prop. 1) the number is n(n —-1)...(n—r+1).

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Prop. 3. To find the number of combinations which can be formed of x sets of things, containing respectively 7, s, ¢, &c. things, by taking one from each set to form a com- bination.

1. Let there be two sets, one containing r and the other s things.

Any one (say a) of the r things may be placed succes- sively with each of the s things, and thus form s groups, in each of which a appears. ‘The same is true of }, c, &e.; ae, each of the r things gives rise to s groups, ... the number required is 7’s.

2. Any one of the ¢ things may be placed in succession with each of the groups of two things referred to in Case 1, so that every one of the ¢ things will give rise to 7s com- binations of three things; .. the number required is rst. The same may be indefinitely extended.

140. The first and most obvious application of the theory of combinations is to the doctrine of chances. As, however, this application will form the subject of a separate article, all that is requisite for us now to do is to indicate the connecting link between the two subjects.

If we agree to designate certainty by unity, then the chance of an event happening, when it is less than cer- tainty, will be designated by a proper fraction. Thus, if the average number of wet days and of dry is the same, the chance of any day named at random turning out wet

‘ ret! Spars will be represented by the fraction 33 that is, if the num-

ber of days under consideration be 100, the chance is 50 number of wet days 100’ °” total number of days sued Gy mewn number of favourable events ned by the Zrachon “total number of events.

The only proposition by which chances are combined that we shall offer is this.

If there are two events, and the probability of one of

Chance is accordingly de-

them happening to be> , and of the other ; then the pro-

bability that both will happen is =

For a and c may be taken to represent the favourable events respectively, and be combined (Art. 139, Prop. 3) so as to give ac ways in which they may happen together. And in the same way 6 and d may be combined to give the total number of events. . ’

Ex. A bag contains 3 white and 4 black balls. Find the chance of drawing (1) two white balls; (2) a white and a black; (3) one white at least, when

two balls are drawn.

The chance of drawing two white balls is the fraction,

Number of combinations of 3 things, 2 together

Number of combinations of 7 things, 2 together.

3.2

2h 1 — F

Tr.

The chance of drawing a white and a black is (Art. 139, Prop 3),

To find the chance of drawing at least a white ball, we may remark that it is the same as the chance of not draw- ing two black balls, z.¢., certainty—the chance of drawing two black balls.

- Now the chance of drawing two black balls is

4.3

iy? 2 Th

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., the chance of drawing at least one white ball is {95 a io

Szot. XIX.—On Serius IN GENERAL; THEIR SUMMATION AND CONVERGENCE.

141. Certain series, from their very appearance, indicate that they are really the sums or differences of two other series. From this circumstance their sum may frequently be determined, as in the following examples :—

1

Ee. 1. 2.3 wee ke) Cae rt nn+1) 1 f

1 1 3

che ° . . . e . n+l

or nn =i) ~B ea edad n(n 1) and the sum is 1 —1 ——. n n+1 142. The sum of a series may often be easily found by the method of increments or differences, and this method is especially adapted to the summation of integral series, such as the squares of the natural numbers. We shall exhibit one or two illustrations only. » If we write 8, =n(a+1), we have S.41= (n+ 1) (n+ 2) ' poe Sy41-S, = 2(0 + 1). Hence conversely, and dividing by 2; if S.u -S,=2+ 1 ?

then will g, = et 1). Similarly, if 3,41-8,=(n+1)(n+2)... (ntr—1), then will ee Set). fetr—l) r

This last conclusion, of course, assumes that S, is 0 when n is 0. If it be otherwise, some numerical constant, easy of determination, will have to be added.

Ex. 2. 124974324 . . n2, Here Si – 8, = (2 +1)? = (1 +1) (n4+2)-(n +1);

Ex. 3. 144+ 24+34+ 2. wf

S42 — 8, = (2+ 1)4 Let (n+1)=(n+1)(n+2) (n +3) (n+4)+A(n+1)(n+2) (n+3 + B(n+1) Get D4 Ord ‘ Ee reer Dividing by »+1, and proceeding as in Art. 33, we get A=-6, B=7, C=-1,*

S,=5n (n+1)(n+2)(n +8) (n+4)—

an(n-+1)(n-+2) (n+-3)-+An(n+ 1) (n+ 2)—3n(n-+1)

DA GEE Ger) 1) { 3n(n+1)-1 } :

On the Convergency and Divergency of Infinite Series.

143. Def. If the limit to which the sum of a series approaches, as the number of terms increases, is finite, the series is a converging series; if otherwise, diverging. For example, the sum of the series 1+7+77+ ... to

terms. is —" (Art. 52), which, when r is less than 1,

cdl ; : te VG approaches to iu? 2 which case the series is a con-

verging series.

Prop. 1. It is necessary and sufficient for convergency that the remaining terms after the mth have zero for their limit, both individually and collectively, as m increases.

It is obviously necessary and sufficient for convergency that the sum of the series after the mth term shall have 0 as its limit; and consequently, when all the terms of the series are positive, the same must be true of each individual term. But when the terms are alternately positive and negative, though it is necessary for convergency that the sum of the consecutive terms with their proper signs should have 0 as its limit, this is not sufficient; for, were it so, the sum to 2 terms would depend on whether n is even or odd.

El. l+ita+ ... although each term after the nth tends to 0 as its limit—

1 1

ine ED! eS.

Hee il 1 1! which is greater than Le

is not a converging series ; for

the sum of x terms after the nth, viz.,

Qn? to 2 terms, 3 1 Ric telat w.¢., greater than 3? does not tend to 0 as its limit.

q 1 1 Ex. De ate ts oT1L.: 2.3

e (Art. 129), is convergent. The sum of the terms after the nth is

+... the expression for

the limit of which as ~ increases is 0.

Prop. 2. Tf the limit of the nth term is 0, and the terms continually diminish; then when the signs of the terms are alternately + and —, the series is convergent.

Let w,—w,u,— &c., be the series; the terms after the nth (or —) make up the series of positive groups

(Up1 7 a+2) te (Unss = nts) + &e.

But these terms may also be written 1; — (Us42— Us4s) — &c., which, since the whole group is_ positive, must I,— 71

° ee

g Mnt+1)(n+2) n(n+1)_n(nt+1)(2n+1) | . 3 a5 6 ,

562 ALGAE [SERIES. be less than w,,,, the only positive term init. But Uqs, Again, series (2) is equai to or greater than the follow-

has O for its limit, therefore the scries is convergent. ing, term by term,

, Lee bie, 3k am

: i ‘ the scrics after the nth term is less than aig which has

. is convergent, tor the sum of 1b, + (dy + Uy) + (Uy HU; tUgtUy)+... which is series (1).

Hence if series (1) be divergent, series (2) is also 0 as its limit. divergent.

Prop. 3. If the terms of the series are all positive, and E cee a ; ; the limit of the nth term is 0; then if the limit of the ae oa SCE. on ae 2. » 18 conversa quotient of the (n 1)th term by the mth be less than |, r>1, but divergent if r= or <1.

De

the series is convergent ; but if the limit be greater than 1, The two series (1) and (2) now become the sum is divergent. it aya Ue . Ir + oF + 3, + 1. Let & be the greatest value of a after a certain er: value of n, and & <1; then, Cile = oOo bee

2

Unpit Unie t os +

< 1 1

1—k' Sa ror which has 0 for its limit. Hence the series is convergent ene di . (Prop. 1). which is convergent or divergent according as r>1 or the

contrary. Hence the same is true of the given series. fx. 2, The binomial series 1+nx+ &e., is convergent

2. Let &, the least value of "s+! atter a certain finite 4 when w<1, divergent when x>1.

value of n, be greater than 1; then

Una, = or >ktt, Ex. 3. To find when the binomial series 1 — 72 + mn a = ed 2 :

Ung2 = OF >hAty &e., is convergent.

&e. &e 4

ee er er ey Let »<1; the (r+1) term may be written

which is infinite. Heuce the series is divergent. i aig an

ages ‘ r r—-1 r—2 Prop. 4. If — be less than 1; then the two series Un my, __® 1-2 Wt Ut ut umt…. = Sail 5) ade M+ 2u,+4u,8u . . . . (2 – ee 1A are both convergent, or both divergent together. = “(1 oa ¢ 1 =) – » (Art. 122, Ex, 7) Series (2)+u,=2(u,+u,+2u,4u,...), which is iS Ne equal to or less than the following, term by term, viz. :— —e (5) ; (=) – 2 {a, + Uy + (Ug + Uy) + (Ul; + gt U, + Uy) +.» -}, PY a.e., twice series (1).

Hence if the one series be convergent, the other will be also convergent; and if series (2) be divergent, series (1) | whence (Prop. 4, Ex. 1) the series is convergent. Similarly is also divergent, in other cases. (PoE

reverse; but on the 12th he again attacked the enemy, whose fleet was double his own strength, and inflicted on them a complete defeat. Population, 14,000.

ALGER or Litcr, known also as ALGER oF CLUGNY

ALGECIRAS, or ALGEZIRAS, a seaport of Spain, in the province of Cadiz, 6 miles W. of Gibraltar, on the opposite side of the bay. The town is picturesquely situated, and its name, which signifies in Arabic the «sland, is derived from a small islet which forms one side of the harbour. It | and ALcERUs MacistTER, a learned French priest who is supplied with water by means of a beautiful aqueduct. | lived in the first half of the 12th century. He was first It has a dilapidated fortress, and also a military hospital. | a deacon of the church of St Bartholomew at Lidge, his Though the harbour is bad, and the commerce of the town | native town, was afterwards trauslated to the cathedral has considerably declined, there is still a good coasting | church of St Lambert, and finally retired to the monastery tradc; the exports and imports averaging about £60,000 | of Clugny, where he died not later than 1145, though the annually. Charcoal and tanned leather are the chief articles | precise date is uncertain. His History of the Church of of export. Algeciras was the Portus Albus of the Romans, | Z7ége, and many of his other works are lost. The most im-

and the first place in Spain taken by the Moors. It | portant of his still extant works are -—l. De Misericordia remained in their possession from 713 till 1844, when it | et Justitia, a collection of extracts from Fathers, with was taken by Alphonso XI. of Castile after a celebrated | reflections, which is to be found in the Anecdota of siege of twenty months, which attracted crusaders from all | Marténe, vol. v. 2. De Sacramento Corporis et Sangumis parts of Europe, among whom was the English earl of | Dominz; a treatise, in three books, against the Berengarian Derby, grandson of Edward III. It is said that during | heresy, highly commended by Peter of Clugny and Erasmus. this siege gunpowder was first used by the Moors in | 3. De Libero Arbitrio; given in Pez's Anecdota, vol. iv. the wars of Europe. The Moorish city was destroyed by | 4. De Sacrificio Miss; given in the Collectio Scriptor. Alphonso, and the modern town was not erected till 1760. | Vet. of Angelo Mai, vol. ix.

During the siege of Gibraltar in 1780-82, Algeciras was ALGERIA, or Axcrers (French, L' Algérie), the largest the station of the Spanish fleet and floating batteries. | and most important of the French colonial possessions, 18 Near Algeciras, on 6th July 1801, the English admiral | a country of Northern Africa, bounded on the N. by the Saumarez attacked a Franco-Spanish fleet, and sustained a | Mediterranean, W. by the state of Marocco, S. by the

Rivers.

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desert of the Sahara, and E. by Tunis. The boundaries, however, are In many parts not accurately determined. It extends for about 550 miles along the coast, and stretches inland from 320 to 380 miles; lying between 2° 10' W. and 8° 50' E. long., and 32° and 37° N. lat. The area is estimated at about 150,500 English square miles.

The country is generally mountainous, being traversed by lofty ranges of the Atlas system, which run nearly parallel to the coast, and rise in some places to the height of upwards of 7000 feet. These are commonly divided into two leading chains, which are distinguished as the Great

and Little Atlas. The former, which is the more southern and bordering on the Sahara, contains some of the highest points in the country. The Little Atlas or Maritime Atlas, as it is sometimes called, lies between the sea and the Great Atlas, and is composed of numerous diversificd ranges generally of no great elevation, A number of smaller chains lie between these principal ones, and also between the latter and the sea, forming so many ascending steps or degrees. These principal ranges are connected by numerous transverse ones, thus forming extensive table-lands and elevated valleys, with no connec- tion between them but the intervening heights. Occasion- ally the principal ranges are broken by deep defiles and narrow valleys. The maritime region presents numerous narrow valleys, each carrying down to the sea its mountain stream. In some parts the mountains rise abruptly from the sea, in others a tract of flat land intervenes between the mountains and the coast, and this is usually marshy, but sometimes fertile and well cultivated. There are a number of extensive plains near the coast, one of the most important of which is that of Metidja, commencing on the eastern side of the bay of Algiers, and stretching thence inland to the south and west. It is about 60 miles in length by 10 or 12 in breadth. Another great alluvial plain extends south and west for many miles from the vicinity of Bona. A third similar plain lies to the south- east and south-west of Oran, and south of Mostaganem is the plain of Shellif. The coast is generally steep and rocky, abounding in capes and gulfs, but very deficient in good harbours, and even in secure roadsteads, in conse- quence of its exposure to the north winds.

The rivers are numerous, but the majority of them have short courses. They mostly rise in the mountains near the coast, and rush down with great impetuosity through deep and rocky channels, presenting the character of mountain torrents. During the rainy season they are much swollen, so as to render communication with different parts of the country extremely difficult. The most important river, both from the length of its course and the volume of its waters, is the Shellif, which, rising in the northern slopes of the Djebel Amur, flows first north and then west till it empties itself into the Mediterranean near Mostaganem after a course of 370 miles, during which it receives numerous tributary streams. The Seybouse is formed by the union of several

small streams in the interior of the province of Constantine, south-east of the town of that name, and after a course of about 120 miles falls into the Mediterranean near Bona, The Summam, which contains the greatest body of water after the Shellif, rises in the interior of the province of Algiers near Aumale, and pursues a generally north-east direction to its mouth near Bougie. The Rum- mel, formed of several small streams south of the town of Constantine, passes that town and pursues a north-west direction to the sea. Among the less important rivers whicn empty themselves into the Mediterranean are the Harrach, Isser, Mazefran, Tafna, and Macta. Besides these, there are a number of streams in the interior, but they are less known and are generally dry except in the rainy season.

Algeria abounds in extensive lakes and marshes. Of

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the lakes in the northern part of the country, near the Lakes.

coast, the principal are,—the Fezara 14 miles south-west of Bona; the two lakes Sebkha and El Melah south of Oran; the three small lakes in the immediate vicinity of Calle, and several others. In the southern parts of the country are the extensive lakes of Chott-el-Harbi or Western Chott; the Chott-el-Chergui or Eastern Chott; the Zarhez-Gherbi and the Zarhez-Chergui; the Grand Sebkha-el-Chott, and a number of others. These are mostly dried up in summer, leaving a thick stratum of salt. Many of the marshes, especially in the neighbourhood of the larger towns, have been drained by the French, and the climate has thus beeu rendered more salubrious. There are also a number of warm mineral springs, containing principally salts of lime, which are used with success by the Arabs in several kinds of disease. Some of these are in the vicinity of Calle, Bougie, Milianah, &e.

Algeria is divided by a line running nearly east and Natural west into two distinct zones, called by the natives the Zed] Divisions

and Sahara, The Tell constitutes the zone bordering upon the Mediterranean, and is the cultivated land—the land of corn. It consists of a series of fertile basins, yielding almost exclusively corn of different kinds, especially wheat and barley. Some parts of it are extremely fertile, but at the same time flat and uniform. The chains separating the basins are clothed with timber, and peopled by the Kabyles. The Sahara lies to the south of the Tell, and is the region of pastures and of fruits. Hence, while the inhabitants of the Tell are agriculturists, those of the Sahara are shepherds and gardeners. The Sahara is some- times spoken of as a desert, at other times as the country of dates. It may properly be divided into two regions; the northern is mountainous, but at the same time more fertile, better watered, and more populous than the other, which, bordering on the Great Desert, consists chiefly of oases of greater or less extent. The villages of the Sahara are surrounded by belts of fruit trees, of which the palm is the chief, though there are also pomegranate, fig, apricot, peach, and other trees, and vincs. On the mountain ranges near the coast are extensive forests of various species of oak, pine, cedar, elm, ash, maple, olive, &c. The cork tree is also very common. The trees, especially the ccdars and oaks, are frequently of gigantic size. Great injury is often done to the forests by the people annually burning up the grass of thcir fields. In this way extensive forests are sometimes consumed. The want of roads and navigable rivers has prevented the French from deriving much benefit as yet from the forests. Besides wheat and barley, the cotton plant, sugar-cane, and tobacco are extensively cultivated.

The animal kingdom presents little calling for notice. Animals.

Lious, formerly very plentiful, are now extremely rare ; leopards, panthers, jackals, and hyzenas are still common ; and monkeys and apes are numerous. The wild boar is found in the oak forests, and the brown bear in the higher parts of the country. There are also various species of antelope. Of the feathered tribes, eagles, vultures, hawks, and owls are common; snipes, curlews, plovers, storks, and herons frequent the marshy parts; and the ostrich has its habitat in the desert. Among the reptiles are various species of serpents, tortoises, turtles,

lizards, &c. Locusts are common, and sometimes do great damage to the crops. One of the severest invasions of these pests ever known occurred in 1866, when the crops were nearly all destroyed, and the loss sustained by the colonists was estimated at £809,000. The coast is rich in coral and sponges, and the obtaining of these forms a considerable branch of industry. The chief wealth of most of the Arab tribes consists in their sheep, of which they frequently possess immense flocks; camels are also common, but the horses and mules are more esteemed, and are noted for their excclllence,

Climate.

Inhabit- ants,

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From its position, Algeria might be supposed to enjoy a warm climate; but the temperature varies considerably in different parts, according to the elevation and configuration of the country. In the northern districts the climate very much resembles that of the south of Spain, while in the Sahara the heat is often excessive. In the more elevated regions the winter is frequently very severe; but along the coast the temperature is mild, very rarely sinking to the freezing-point even in winter, when heavy rains are of frequent occurrence. Dr Shaw knew the thermometer reach the freezing-point only twice during twelve years' residence at Algiers. The coldest month is January, the hottest August. The rains prevail from December to February; the temperate season continues from March to June, and the hot season lasts from July to November. The mean annual temperature of the town of Algiers is about 66°5° Fahr.; being for the coldest month 48°, and for the hottest 83°. During summer there is a great difference between the day and night temperature, especially in the inland districts. The simoom or hot wind of the desert sweeps at intervals over the country, between May and September, impregnating the air with fine sand from the desert. In general, with the exception of places in the vicinity of the marshes, Algeria possesses a healthy climate. Ophthalmia, however, is very common, and elephantiasis is by no means an unusual disease, owing to the want of cleanliness among the country people.

Besides the Europeans there are eight distinct races of inhabitants in Algcria—(1.) The Kabyles or Berbers, the descendants of the aboriginal inhabitants of the country, constitute a large portion of the entire population. They occupy chiefly the more elevated and mountainous parts, but numbers of them also inhabit the plains and valleys. They are described as an active, industrious race, living in villages, and principally engaged in agriculture and the cultivation of fruit trees. They also make their own agricultural implements, guns, gunpowder, leather, carpets, &c. (2.) The Arabs are a very numerous class, and inhabit principally the southern parts of the country. Some of them are cultivators of the soil, and live in villages in the neighbourhood of the towns; but the majority of them have no fixed habitation, dwelling in tents and moving about from place to place. These are the Bedouins or nomadic Arabs, and are the most unsettled and turbulent of the Algerine population. (3.) The Moors, a mixed race, inhabit the towns and villages chiefly on or near the sea-coast. (4.) The Jews are also to be found in the towns, and are engaged in mercantile pursuits. (5.) The Turks, though long the dominant race, were never very numerous, and since the French conquest they have nearly disappeared. (6.) The Kolougis are the descendants of Turks by native women, and constitute a considerable proportion of the inhabitants of Algiers and other towns. (7.) The Negroes were originally brought from the interior and sold as slaves, but slavery now no longer exists. (8.) The Mozabites are an African race, to be found inhabiting the coast towns, and chiefly engaged in manual labour. They are described as an honest, industrious, and peaceable people.

1 A Parliamentary Report on the climate of Algeria published in 1867 is of great interest, particularly as investigating the causes of the great reduction in the mortality of the French troops serving there. The death-rate in Algerian hospitals for the first five years succeeding the conquest amounted to nearly 79 per 1000; and for the period from 1831 to 1846 it is given as high as 80 per 1000. In 1860 the death- rate per 1000 was only 17°8; in 1861, 11°3; in 1862, 12°21; in 1868, 12°29; and in 1864, 14:48. he causes of this remarkable difference are stated to be—the former existence of certain unhealthy conditions in

the country itself, and in the mode of life of both troops and colonists, which were accompanied by a high death-rate; and the subsequent removal to a certain extent of these conditions, together with the introduction of improved habits and modes of life, accompanied by improved health and lower death-rates. :

ALGERIA

The European civil population of Algeria amounted to only 45,000 Popul In Dee, tion,

persons in 1840, and in 1845 it had incrcased to 75,867. 1849 it had risen to 112,607, of whom 58,005 were French, 6943 Maltesc, 38,659 Spaniards, 6986 Italians, 2515 Germans, 1253 Swiss, and 3246 of other nations. Aceording to the census of 1861 the entire population of Algeria was 2,966,836, of whom 2,374,091 were nomadic native races, 112,229 French, and 80,517 other Europeans. In 1866 the entire population was 2,921,246, of whom 2,434,974 were of indigenous wandering tribes, 217,990 Europeans, and 251,050 natives settled in towns. Of the Europeans, 122,119 were French, 58,510 Spaniards, 16,655 Italians, 10,627 Maltese, and 5636 Germans. In the civil territory the entire population in 1870 is given as 478,342, of which 121,629 were French, 97,913 other Europeans, 33,117 Jews, and 225,693 Mahometans.

When under the dominion of the Turks, this country Gove was governed by a dey, and divided into four provinces— ment,

Algiers and Titterie in the centre, Tlemcen in the west, and Constantine in the east. The last three were governed by beys under the dey. At present it is divided into three provinces—Algiers in the centre, Oran in the west, and Constantine in the east. 'Till 1871 the country was entirely under military rule, but in that year various important reforms were introduced; and in place of the former military governor a civil governor-general was appointed to. administer the affairs of the colony, and to direct the action of both civil and military authorities, He is invested with legislative powers in civil matters; but in all important cases he has to take the advice of a colonial council, the

members of which are appointed by the French government. The power of the governor- general, however, extends only over the settled districts In the thinly-populated parts, and the districts where the nomadic tribes are chiefly found, military rule still prevails, The three provinces are subdivided into twelve departments, at the head of each of which is a prefect, and under him are sub-prefects who rule over smaller divisions. By an Act of 14th July 1865, the natives, both Mahometan and Jewish, were declared entitled to the rank and prerogatives of French citizens, on placing themselves completely and absolutely under the civil and political laws of France, and thus were made admissible to all the grades in the army and navy, and to many posts in the civil service of the state.

In 1840 the revenue amounted to 5,610,706 frs. and the expendi- Revenue

ture to 7,206,372 frs.; in 1850 these were respectively 19,632,271 frs. and 27,959,358 frs.; in 1860, 38,908,900 frs. and 39,471,372 frs.; and in 1870, 45,360,859 frs. and 51,762,316 frs, or £1,814, 434 and £2,070,492. This expenditure does not include the cost of the maintenance of the army, the expenditure for public works, and other large sums disbursed by the home government. In the French financial estimates for 1873 the home expenditure for Algeria was set down at 24,496,109 frs. or £979,844, and the revenue derived from the colony at 19,008,584 frs. or £760,343. According to a statement made in the Freneh legislative assembly in 1864, Algeria had cost the mother country three milliards of francs, or £120,000,000 in moncy and 150,000 lives. The French army in Algcria numbers about 60,000 men, and consists of two classes, namely, Freneh troops, who remain there for a certain number of years, and then return to France; and native troops, who never quit the country exeept for fighting purposes.

Algeria in the time of the Romans was noted for its fertility, and Agrictl this is still the character of the cultivated parts of the country. ture.

Many parts only want water to render them fertile, and the govern- ment has lately sunk a number of Artesian wells with the most beneficial results. The principal grain crops are wheat and barley. In

1866 there were in the three provinces 4,163,367 acres of land under different kinds of grain, and the produce amounted to 2,802,208 quarters ; 28,132 acres of vineyards, 14,266 acres under cotton, 5957 under flax, and 9793 under tobacco. In the province of Algiers the total arca of land under cultivation with cereals In 1868 was, in the civil portion, 178,642 acres, of which 120,286 were eultivated by Euvopeans; and in the military portion, 808,89 aeres. The total yield in the former case was 266,578, and in the latter 668,666 quarters. These figures do not include other agri cultural prodnee, such as beans, maize, &e, of which about 277,062 quarters were produced by 99,503 acres. The produce of tobacco throughout the country was estimated at 6,845,000 Tb, Olives are grown largely and almost exclusively in the mountains of Kabylit

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ALGHRIA

In that portion of the distriet included in the provinee of Algiers the quantity of fruit gathered is estimated at over 100,000,000 ib. At present not mueh attention is given to this article of produe- tion; but there can be no doubt that with more eare and attention Algcria might become one of the best olive-produeing eountries in the world. Oranges are grown to a considerable extent, and the trade in this artiele is incrcasing. The vine is cultivated; but the produee is chiefly for home consumption, and it has scareely yet become an artiele of export. In the provinee of Algiers in 1868 about 1,350,000 gallons of wine were produced. During the same year the exportation of eork from the eolony amounted to £63,932. The most important fibre is the crin vegetal, or vegetable horse hair, produced from the dwarf palm (Chamcrops humilis), with whieh a vast proportion of the uneultivated parts of the eountry is covered. Throughout the entire eolony, fibre to the value of £89,332 was exported in 1868. The alpha fibre or esparto grass of Oran ranks next in importance, and is largely used in the

manufaeture of paper. During the American war the cultivation of eotton was extensively earried on, but sinee the elose of the war it has very mueh fallen off. Flax is eultivated to a eonsiderable extent in some parts. The rear- ing of the silk-worm is also proseeutcd.

Although the mineral wealth of Algeria is enormous, mining operations have not hitherto been earried on very extensively. The most important mincral produets are iron, eopper, lead, mereury, and antimony. During 1868 the iron mines in the province of Constantine turned out about 240,000 tons of ore, valued at £486,672, being an inerease of £185,532 as eompared with the pre- ceding year. Nearly the whole of this was from the mine of Ain Mokra or Mokhta-el-Hadid, which yields on an average 200,000 tons of ore perannum. The ore contains 65 per cent. of the metal. Lead ore to the value of £125,745 was exported during that year.

The trade of Algeria has very much inereased since it beeame a French eolony. 'The imports, which in 1831 amounted to only £280,000, rose to £1,600,000 in 1844, to £3,249,377 in 1854, and to nearly £4,500,000 in 1863. The exports, however, have not grown in proportion; and during the ten years preceding 1863 they never exceeded froin 14 to 2 millions stcrling. In 1865 an Act declared the navigation not only between Franee and Algeria but also between Algeria and foreign countries open to all nations, and abolished various oppressive taxes affeeting foreign shipping. The following year these privileges were extended: the eoasting trade was thrown open and free navigation permitted, tonnage duties on foreign shipping were abolished, and raw manufactured goods enter- ing Franee free of duty had the same advantage eoneeded to them in Algeria. Algerian products might enter Franee free of duty, and the same privilege was aecorded to Freneh produets in Algeria, sugar excepted. In 1868 the imports amounted to £7,706,574, which was an inerease of £199,494 over the previous year. The proportions reccived from the different eountries were—Franee, 75 per eent.; Turkey, 8°44; Russia, 4°29; Spain, 3°99; Great Britain, 3°54; Italy, 2°56; Barbary States, 1°40. The imports from Turkey and Russia are exceptionally high, owing to the necessity of obtain- ing grain supplies from these countries in

eonsequence of a failure in the erops. The prineipal ports of import were—Algiers, 40°43 per eent.; Oran, 33°33; Philippevillc, 15:04; Bona, 7°01; Mosta-

nem, 2°33. In 1869 the imports amounted to £7,332,192, and mn 1870 to £6,907,628. The prineipal imports are cotton goods, wines, spirits, sugar, glass, erystal, cheese, salt-fish, soap, &c. The total value of the exports during 1868 amounted to £4,122,772, being an inerease of £236,293 as eompared with 1867. The propor- tions sent to the different eountries were—France, 79°20 per ecnt.; Spain, 11°68; Great Britain, 5°84; Italy, 1°80. The principal exports are sheep, oxen, skins, wool, tobaeco, flour, fresh and dried vegetables, olive-oil, flax, eotton, ores, crin vegetal. In 1869 the total exports amounted to £4,438,045, and in 1870 to £4,978, 250. The overland trade between Algeria and its neighbours, Maroeeo and Tunis, now begins to assume some importance. 'The number of vessels that entcred and left the various ports in 1868 was 8740, of an aggregate burden of 1,664,513 tons, and manned by 16,173 men. This is an increase over the previous year of 18°40 per eent. as regards the number of ships, and of 12°63 per eent. as regards the tonnage. As engaged in the dircet trade with Britain, there entercd 99 British vessels with an aggregate of 17,940 tons, and eleared 109 British vessels with an aggregate of 12,528 tons. Besides thesc there were British vessels engaged in the direet or earrying trade with other eountrics, of which entered 125 with an aggregate burden of 14,972 tons, and cleared 106 with an aggregate of 19,960 tons. The number of British vessels trading at the four principal ports, naniely, Algiers, Oran, Bona, and Philippeville in 1872 was as follows :— direet, entered, 171— tonnage, 60,285 ; left, 251— tonnage, 76,973; indirect, entered, 170—tonnage, 79,454; left, 125— tonnage, 63,645. Daring that year 1595 vessels of 3,746,130 tons entered, and 1587 vessels of 376,402 tons eleared, at the port of Algiers. The most important articles of export, as far as British trade is concerned, are erin vegetal and alpha fibre. During the first nine months of 1872 about 6000 tons of the former were ,exported from the port of Algiers alone; and about 60,000 tons of

the latter from the whole eolony, ehiefly from Oran. Some idea of the rapidly advancing eommercial prosperity of Algeria may be gathcred from the fact that the amount of sums diseounted at the Bank of Algeria (whieh was established in 1851) had risen from £3,900,130 in 1866-7 to £8,131,535 in 1871-2. Much has been done, partieu- larly of late years, in the way of opening up the eountry and de- veloping its resourecs. Roads have been formed and bridges built in various parts, harbours have been improved, and lighthouses erceted. There are now 374 miles of railway open for traffic, forming a line from Algiers to Oran and one from Philippeville to Constantine.

In carly times this country was inhabited by two nations, the Massyli and the Masszsyl. During the struggle be- tween Hannibal and the Romans, Syphax, the prince of the Masszsyli, espoused the cause of the former, and Massinissa, the prince of the Massyli, that of the latter. On the defeat of the Carthaginians the territories of Syphax were annexed to those of Masinissa, who reccived the title of King of Numidia. During the Roman civil war, Juba, king of Numidia, sided with Pompey, and being defeated by Cesar, his kingdom became a Roman province. Under the Romans the country enjoyed a great degree of pros-

perity. Agriculture was encouraged, commerce extended,

roads were formed, and towns sprang up. Christianity, too, was early introduced and flourished. This state of things, however, received a severe check when the Romans were driven out of Africa by the Vandals about the middle of the 5th century. These in turn were expelled by Belisarius, Justinian's general, in 533. About the middle of the 7th century the Saracens made themselves masters of the country, which came afterwards to be divided into a num- ber of petty states under independent chiefs, and the people sank into a state of barbarism. About the middle of the 11th century Abdallah-ben-Yazim, a learned Arab, formed a numerous sect of religionists, known as Morabites, who overran the country, subdued many of the petty chiefs, and laid the foundation of the dynasty of the Almoravides, That dynasty reigned for nearly a hundred years, and at one time nearly the

whole of Barbary and a great part of Spain were under their government. They were succeeded by the dynasty of the Almohades, who reigned over the region till 1273, when it was again split up into a number of small states. In 1505, Ferdinand, king of Spain, sent a powerful fleet and army against the country, undcr the Count of Navarre, who soon made himself master of Oran, Bugia, and other towns, and finally, in 1509, took the town of Algiers. The Spanish rule, however, was very distasteful to the Algerines; and on hearing of the death of Ferdinand, in 1516, one of the native princes sent an embassy to Aruch Barbarossa, the famous Turkish pirate, requesting his aid against the invaders. his was readily granted; and no sooner had he established himself in the country than he murdered the prince and caused himsclf to be proclaimed king in his room. He introduced that system of piracy for which Algeria was afterwards noted down to 1830. By force and treachery he extended his dominion over other parts of the country, till at length the Spaniards marched a large army against him from Oran, and being joined by many of the natives, defeated him in various engagements, took him prisoner, and beheaded him. His brother Hayradin was then chosen sultan; and he feeling

'himself unable to cope with the Spaniards, sought the

assistance of Turkey, and put himself under the protection of the Grand Seignior. Aid was readily granted, and he himself was appointed pasha or viceroy of Algicrs. Having thus got rid of his enemies the Spaniards, he turned his attention to the extension of his piratical enterprises; and in order to do this with the greater security, he fortified the port of Algiers and built a strong mole for the protec- tion of his ships. He is said to have employed 30,000 Christian slaves for three years in the construction of the mole. The Algerine pirates soon became dreaded, not

only by the Arabs and Moors, but also by the maritime Christian powers, particularly the Spaniards. At length Pope Paul III. induced

Charles V. to undertake an expedi- tion to suppress these depredations, and issued a bull offer- ing remission of sins and the crown of martyrdom to all who either fell in battle or were made slaves. 'The emperor set sail with 120 ships and 20 galleys, having on board 30,000 chosen men. They landed in safety, and were procecding to attack the town of Algiers when a fearful storm arose, and in one night (28th Oct. 1541) destroyed 86 ships and 15 galleys with all their crews and military stores, so that the army on shore was deprived of the means of subsistence. This was then fallen upon by the Algerines, when many were killed and a great number taken prisoners, Charles himself and the remains of his army escaping with difficulty.

Algiers continued to be governed by viceroys or pashas appointed by the Porte till the beginning of the 17th century, when the janissarics solicited and obtained the right to choose tlicir own dey or governor from among them- selves. This subsequently led to frequent altercations between the pashas and the deys, the former seeking to recover their lost power, the latter to reduce it. In 1609, the Moors being expelled from Spain, flocked in great num- bers to Algiers, and, as many of them were very able sailors, they contributed to raise the power of the Algerine fleet. In 1616 it consisted of forty sail of ships, of between 200 and 400 tons, their flagship having 500 tons. The Algerine pirates now became so formidable to the European powers, that in 1617 the French sent against them a fleet of fifty sail, under Beaulieu, who defcated their fleet aud took two of their vessels. In 1620 the English sent out a squadron under the cominand of Sir Robert Mansel on the same errand, but it returned without effecting anything. Their depredations becoming still more frequent and trouble- some, the Venetians equipped a fleet of twenty-eight sail, under the command. of Admiral Capello, with orders to burn, sink, or take all the Barbary corsairs he should meet. In an engagement which speedily took place he signally defeated them, and took and destroyed sixteen of their galleys. They soon, however, regained their former strength; and at Icngth Louis XIV., provoked by the outrages committed by them on the coasts of Provence and Languedoc, ordered, in 1681, a considerable fleet to be fitted out against them, under the command of Vice-admiral Duquesne. He attacked them near the island of Scios,

and destroyed fourteen of their ships. This, however, had little effect upon them, and the following year he bom- barded the town of Algiers and nearly reduced it to ashes. The Algerines, by way of reprisal, sent a number of galleys to the coast of Provence, where they committed great ravages. In May 1683, Duquesne with his fleet again cast anchor before Algiers, and proceeded to bombard the town. The dey and the people sued for peace; but Mezo- morto, the Algerine admiral, who was to have been delivered up as one of the hostages, violently opposed coming to terms, stirred up the soldiery against the dey, and caused him to be murdered, and was himself chosen as his suc- cessor. The bombardment was renewed, and Mezomorto, reduced to extremities, caused all the French in the city to be cruelly murdered, and the French consul to be tied to the mouth of a mortar and shot off in the direction of the bombarding fleet. Duquesne was so exasperated by this piece of cruelty that he did not leave Algiers till he had utterly destroyed the fortifications, shipping, almost all the lower, and about two-thirds of the upper part of the town, The Algerines, now thoroughly humbled, sent an embassy to France to sue for peace, which was readily granted them. In 1686 the English concluded a treaty with the Algerines on favourable terms, and this was

several times subsequently renewed; but it was not till the taking of Gibraltar and Port Mahon that England had sufficient check upon them to enforce the observance of treaties. From that time England was treated with greater deference than any other European power. In 1710 the Turkish pasha was expelled and his office united to that of dey. The dey thus became the supreme ruler in the country. He had the charge of the Turkish militia, recruited fron: Constantinople and Smyrna, because their children by native mothers could not be allowed to enjoy the same privileges as themselves in consequence of former rebellions against the government. Under the dey there was a divan or council of state, chosen from the principal civic functionaries.

Matters continued very much in the same state, and the history of Algiers presents little calling for special notice down to the expedition

of Lord Exmouth. The principal States of Europe had had their attention taken up with weightier matters; but on the establishment of the peace of 1815 the English sent a squadron of ships, under Lord Exmouth, to Algiers, to demand the liberation of all slaves then in bondage there, and the entire discontinuance of piratical depredations. Afraid to refusc, the Algerines returned a conciliatory answer, and released a number of their slaves; but no sooner had the ships left than they redoubled their activity and perpetrated every sort of cruelty against the Christians. Among other acts of cruelty, they attacked and massacred a number of Neapo- litan fishermen who were engaged in the pearl-fishery at Bona. The news of this cxcitcd great indignation in England, and Lord Exmouth was again despatched with five ships of the line and eight smaller vessels, and at Gibraltar he was joined bya Dutch fleet of six frigates, under Admiral Capellen. They anchored in front of Algiers on the 26th August 1816. Certain terms, which were extremcly moderate, were proposed to the dey; but these not meeting with acceptance, a fierce bombardment was at once commenced. At first the assailants were subjected to a heavy fire from the enemy's batteries; but after a time these were one by one silenced, and ship after ship caught fire, till the destruction of the Algerine naval force was complete. Next day the terms proposed to the dey were accepted; Christian slaves to the number of 1211 were set at liberty, and a promise was given that piracy and Christian slavery should ccase for ever. The Algerines, however, did not long adhere to the terms of the treaty. They lost no time in putting their city in a more formid- able state of defence than before, and this done, they considered themselves in a condition to set the great powers of Europe at defiance.

Various injuries had from time to time been inflicted on the French shipping, but that which more directly led to a declaration of war was an insult offered to the French consul by the dey. A debt had been contracted by the French government to two Jewish merchants of Algiers at the time of the expedition to Egypt, and the dey having a direct interest in the matter, had made repeated applications for payment, but without success. Annoyed at this and at what he considered insulting language on the part of the consul, he struck the latter on the face in public. In consequence of this, a French squadron

was sent to Algiers which took the consul on board, and for three years main- tained an ineffective blockade. At length war on a great scale was resolved on, and a fleet was equipped at Toulon in May 1830 under the command of Admiral Duperré. It had also on board a land force, under the command of General Bourmont, consisting of 37,000 infantry, 4000 cavalry, and a proportionate number of artillery. The troops began to laud on the 14th June upon the western side of the peninsula of Sidi Ferruch, in the bay of Torre

Chica. They did not meet with much opposition till the 19th, when a general attack was made upon them by a force of from 40,000 to 50,000 men. These, after a fierce conflict, were completely routed. They renewed their attack on the 24th and 25th, but were on both occasions repulsed. The French then advanced upon Algiers, and on the 29th the trenches were opened. On the morning of the 4th of July the bombardment commenced, and before night a treaty was concluded for the entire surrender of Algiers. The next day the French took possession of the town; and 12 ships of war, 1500 brass cannon, and over £2,000,000 sterling came into their hands as conquerors. The Turkish troops were permitted to go wherever they pleased, provided they left Algiers, and most of them were conveyed to Asia Minor. The dey himself, with his private property and a large body of attendants, retired to Naples.

When the French undertook the expedition against

Algiers a pledge was given to the English government

that they did not aim at the permanent possession of the country, but only at obtaining satisfaction for the injuries and insults that they had received, and putting down that system of piracy which had so long outraged Europe. The French government engaged that these objects being accoin- plished, the final settlement and government of the country should be arranged in concert with the other Europcan powers for the general advantage. Notwithstanding this,

‘the French ministry in 1833 publicly declared that it was

the intention of their government to retain possession of Algiers and to colonise it. Subsequently, the English government acquiesced in this, on receiving an engagement that the French would not extend their conquests beyond Algeria either on the side of Tunis or of Marocco.

The capture of Algiers was celebrated in France with great demonstrations of joy. General Bourmont was raised to the rank of marshal, and Admiral Duperré was promoted to the peerage. The revolution of 1830 followed, when Bourmont was deposed, and General Clausel appointed to succeed him. The conquerors, instead of attempting to gain the good-will of the natives, destroyed a number of their mosques, seized upon lands set apart for religious pur- poses, and attempted to introduce their own laws and usages in place of those of the country, the consequence of which was that the natives entertained the greatest abhorrence for their oppressors, whom they regarded as the enemies of God and their prophet. General Clausel incensed them still more by seizing upon the possessions of the dey, the beys, and the expelled Turks in direct opposition to the conditions on which the capital had been surrendered. Bona was taken possession of, and an incursion was made into the southern province of Titterie, when the troops of the bey were defeated and Mediah taken. The beys of Titterie and Oran were deposed, and tributary rulers set up in their room. Still the war continued. The French were incessantly harassed by irruptions of hordes of the Arabs, so that no Frenchman was safe, even in the vicinity of the town; and little reliance could be placed on the fidelity of the beys who governed the provinces. Mediah was evacuated, and Oran abandoned. In February 1831 General Berthezene was appointed commander-in-chief, and undertook several expeditions into the interior to chastise the hostile tribes, but met with little success. In October Bona was surrounded and taken by the Kabyles. There was now no safety but in the town of Algiers; agriculture was consequently neglected, and it was necessary to send to France for supplies of provisions and for fresh troops, In November 1831 General Savary, Duc de Rovigo, was sent out with an additional force of 16,000 men. The new eovernor sought to accomplish his ends

by the grossest acts of cruelty and treachery. One of his exploits was the massacre of a whole Arab tribe, including old men, women,

and children, during night, on account of a robbery com- mitted by some of them. He also treacherously murdered two Arab chiefs whom he had enticcd into his power by a written assurance of safety. Thesc proceedings exasperated the natives still further against the French, and those tribes that had hitherto remained quiet took up arms against them.

About this time Abd-el-Kader first appears upon the field. His father, a Marabout, had collected a few followers, and attacked and taken possession of the town of Oran. Om this they wished to elect him as their chief, but he declined the honour on account of his great age; and recommended his son who, he said, was endowed with all the qualities necessary to success. Abd-el-Kader was born about the beginning of 1807, and had early acquired a great reputa- tion among his countrymen for learning and piety, as he was also distinguished among them for skill in horse- manship and other manly excrcises. He had made two pilgrimages to Mecca in company with his father, once when a child and again in 1828, by which he obtained the title of Hadji. At this time he was living in obscurity, distinguished by the austerity of his manners, his piety, and his zeal in observing the precepts of the Koran. He collected an army of 10,000 horsemen, and, accompanied by his father, marched to attack Oran, which had been taken possession of by the French. They arrived before the town about the middle of May 1832, but after con- tinuing their attack for three days with great bravery they were repulsed with considerable loss. This was followed by a series of conflicts, more or less severe, between the parties, but without any permanent or decided advantage to either side. In March 1833 the Due de Rovigo was obliged, on account of his health, to return to France, and General Avizard was appointed interim governor; but the latter dying soon after, General Voirol was nominated his successor. Abd-cl-Kader was still extending his influence more and more widely among the Arab tribes; and the French at last considered it to be their interest to offer him terms of peace. A treaty was accordingly concluded with him by Gencral

Desmichels, governor of Oran, in February 1834, in which he acknowledged the supremacy of France, and was recognised by them as emir of the province of Mascara. One of the conditions of the treaty was that the emir was to have a monopoly of the trade with the French in corn. This part of the treaty was regarded with great dissatisfaction at home, and the general was removed from his post. In July General Drouet d'Erlon was sent out as governor-general of the colony. An intendant or head of the civil department was also appointed, as well as a commissary of justice at the head of the judicature. Tribunals of justice were also estab- lished, by which both French and natives were allowed to enjoy their respective laws. From the tranquil state of the country at this time the new governor was enabled to devote his attention to its improvement. The French, however, soon became jealous of the power of the emir, and on the pretence that he had been encroaching on their territory, General Trezel, who had succeeded Desmichels in the governorship of Oran, was sent against him with a considerable force. The armies met at the river Makta, and the French were routed with great slaughter on the 28th of June 1835. On the news of this defeat Marshal Clausel was sent to Algiers to succeed Count d'Erlon. In order effectually to humble the emir, he set out for his capital, Mascara, accompanied by the Duke of Orleans, at the head of 11,000 men. On reaching the town the French found it deserted, and, having set it on fire, they returned without having effected anything of consequence. In January 1836 Marshal Clausel undertook an expedition against Tlemcen, which he took and garrisoned. Soon

aftcr this the emir attacked and put to flight a body of 3000 men under Count d'Arlanges on the Tafna. General Bugeaud, who had succeeded Marshal Clausel, attacked the Arabs under Abd-el-Kader on the Sikak river, 6th July 1836, and gained a complete victory over them. An expedition against the bey of Constantine was next resolved on, and Marshal Clauscl, at the head of 8000 men, set out from Bona for this purpose in November 1836. They encountered on their march a severe storm of hail and snow, followed by a sharp frost, so that many of them

died; and when they arrived before the walls of the town they were unable to undertake the siege, and effected their retreat with difficulty. The French were now anxious to conclude a peace with Abd-el-Kader, and with this view General Bugeaud arranged a mecting with him on the banks of the Tafna, and a treaty was signed, 30th May 1837. They were then free to turn their strength against the bey of Constantine, and an army of 20,000 men set out from Bona with this object under the command of General Damrémont early in October. The town was, after a very gallant defence, taken by storm on the 12th of that month by General Valée, General Damrémont having been killed by a cannon-ball the previous day. On the capture of the city the neighbouring tribes hastened to make thcir submission to the conquerors, and a strong garrison being left to defend the town, the army returned to Bona. As a reward for his services, General Valée was made a marshal and appointed governor-general of the colony. Disputes with the emir as to the boundaries of his territory were frequent, and at length war was again declared between the parties. The immediate cause of war on this occasion was the marching of an armed force of French troops through the emir's territory. This the latter looked upon as an infringement of the treaty, and consequently declared war. In October 1839, he suddenly fell upon the French troops in the plain of Metidja, and routed them with great slaughter, destroying and laying waste the European settlements. He surprised and cut to pieces bodies of troops on their march ; outposts and encamp- ments were taken by sudden assault; and at length the possessions of the French were reduced to the fortified places which they occupied. On the news of these events reach- ing France, reinforcements to the amount of 20,000 men were sent out. The spring campaign was vigorously opened on both sides, and numerous skirmishes took place, but without decisive results to either party. The French were, indeed, everywhere successful in the field, but the scattered troops of the enemy would speedily reassemble and sweep the plains, so that there was no safety beyond the camp and the walls of the towns. The fort of Masagran, near Mostaganem, with a garrison of only 123 men, gallantly withstood a fierce attack by 12,000 to 15,000 Arabs, which lasted for three days. Marshal Valée was now recalled, and Gencral Bugeaud appointed to succeed him. The latter

arrived at Algiers on the 22d of February 1841, and adopted a new system, which was completely successful. He made use of movable columns radiating from Algiers, Oran, and Constantine, and having from 80,000 to 100,000 troops at his disposal, the result soon told against the emir. Many of the Arab tribes were thus intimidated or brought under subjection, hard pressed garrisons were relieved and victualled, and town after town taken. Tekedemt, the principal stronghold of Abd-el-Kader, was destroyed, and the citadel blown up; Mascara was taken; and Saida, the only remaining fortress in the possession of the emir, was entirely demolished. In January 1842 the town of Tlemcen was taken, and ten days afterwards the fort of Tafna, which was demolished. The terrified Arabs sub- initted on all sides, and now almost the entire country was subdued. The emir himself, driven to extremities, was

compelled to take refuge in Marocco. Here he succeeded in raising a considerable force, and returned to Algeria. He made up for the want of troops by the rapidity of his movemcnts, aud would suddenly make an attack on one place when he was supposed to be in quite an opposite quarter. In November 1842 the Duke of Aumale arrived in Algiers to take part in the operations against the emir; and in the spring of the following ycar he suddenly fell upon the camp of Abd-el-Kader while the great body of his troops were absent, and took scveral thousand prisoners and a large booty, the emir himself making his escape with difficulty. Not long afterwards the latter again took refuge in Marocco, and so excited the fanatical passions of the people of that country that their ruler was forced into a war with France. The army which was sent into Algeria was attacked and defeated by Bugeaud at the river Isly, 14th August 1844. The emperor of Marocco soon after- wards sued for peace, which was granted him on condition that he should no longer succour or shelter the emir, but aid in pursuing him. Abd-el-Kader was now reduced to great extremities, and obliged to take refuge in the moun- tain fastnesses, whence he would from time to time come down to annoy the French. In June 1845 a tribe of Arabs, who were being pursued by a body of French troops under General

Pelissier, took refuge in a cave. As they refused to surrender, the general ordered a fire to be kindled at the mouth of the cave, and the whole of those within, » men, women, and children, to the number of 500, were suffocated. The emir at length was brought to such straits that he agreed to deliver himself up to the French on being allowed to retire to Alexandria or St Jean d'Acre. Not- withstanding this promise, which was given by General Lamoriciére, and ratified by the governor-general, he was taken to France, where he arrived on the 29th of January 1848; and was imprisoned first in the castle of Pau, and afterwards in that of Amboise, near Blois. In October 1852 Louis Napoleon, then president of the French Re- public, gave him his liberty on condition that he should not return to Algeria, but reside at Brousso in Asia Minor. Here he remained till 1855 when, in consequence of the destruction of that town by an earthquake, he obtained permission to remove to Constantinople, and afterwards to Damascus. At the latter place he reudered valuable aid to the Christians by protecting them during the massacre by the Turks in Syria in 1860.

On the revolution in France of 1848, General Cavaignac was appointed governor-general of the colony; and the National Assembly, wishing to establish a closer connection between the country and France, offered to incorporate it with the republic. This proposal, however, met with con- siderable opposition, and Algeria was simply declared a permanent possession, with the right to send four deputies to the National Assembly, to be heard on all matters affecting the interests of the colony. Colonists were also sent out to settle ther, and other means taken to further its prosperity. Still the republic did not seem to be more successful in the administration of affairs than the monarchy had been. 'The colonists died off or left in disgust, the natives were not more reconciled to the French yoke, and many of them rose in open rebellion. The Kabyles, in particular, the most intelligent and industrious of the native population, manifested the greatest repugnance to the im- position of taxes and of the usages of civilisation. In 1849 General Pelissier marched against several of the rebellious tribes, and reduced them to subjection. Generals Canrobert and Herbillon were sent into the district of Zaab to quell an insurrection excited by the Marabout Bon-Zian. The latter was driven

to take refuge in Zaatcha, which resisted the utmost efforts of the French to take it for fifty-one days, but at last it was carried by storm. In 1850 there

were several expeditions sent out against the natives, and in 1851 General St Arnaud succeeded in reducing to sub- jection Little Kabylia. In 1852 General M'Mahon set out against Eastern Kabylia, and Pelissier, in the south, took Laghouat by storm. The next few years present us with several expeditions against the Kabyles, but these were not productive of very marked results. In 1854 there was an expedition against certain Arab tribes in the south, who were reduced to subjection. In 1856 a great expedition, under the command of General Randon, was organised against the tribes of Great Kabylia that had not yet submitted to the French; and after many months' fighting they were brought under subjection. The autho- rity of France was now undisputed over the country, and peace for a time was established.

In 1858 the administration of the colony was confided to a special minister, the first nominated being Prince Napoleon ; but he only held office for a short time; and soon after, the special ministry was abolished. In October 1859 certain Arab tribes rose in rebellion, but were speedily subdued. In 1860 Marshal Pelissier was made governor-general, with a vice-governor, a director-general of civil affairs, and a council of thirty members. In the beginning of 1863 the emperor promised to Algeria a constitution, with a representative assembly for provincial matters; and said that it was not a colony properly so called, but an Arab kingdom, and that the natives had an equal right to his protection with the colonists. In April 1864 a for- midable insurrection of the Arabs broke out in the south, in consequence of an insult offered to one of their chiefs in a court of justice, and they suddenly fell upon and cut to pieces a detachment of French troops. A large force was speedily assembled and sent against them, and after they had been beaten in several encounters the insurrection was at length put down. Marshal Pelissier died in May, and Marshal M'Mahon was appointed to succeed him. A fresh insurrection of the

Arabs broke out in October, but after several defeats they were brought to subjection. In May 1865 the Emperor Napoleon visited Algeria, and was everywhere received with the greatest demonstrations of joy. After his return to France he wrote a letter to Marshal M'Mahon respecting the future government of the colony. He particularly pointed out the necessity of seeking to gain the good-will of the natives by permitting them to enjoy their territories unmolested, and to maintain their own customs, and that they should be held as equal with the colonists before the law. He further directed him to seek to stimulate the industry of the colonists, and to strive to develop the resources of the country. In October a fresh insurrection broke out in the province of Oran. It commenced with an attack upon a friendly tribe, but was at length put down by a body of troops under the command of Colonel de Colomb. It again broke out in March 1866, and Colonel de Colomb was a second time sent out against the insurgents. He encountered them on the 16th, and, after a fierce engagement, put them to flight with great loss. In the beginning of 1867 a new expedi- tion was organised against the refractory Arabs in the south, and these being effectually put down, a period of comparative peace followed. The crops in 1866 were almost entirely destroyed by an invasion of locusts, and in January 1867 a violent earthquake destroyed several villages in the vicinity of Blidah. A prolonged drought followed, which dried up the sources of the springs and produced a famine, from which the natives suffered much. A visitation of cholera succeeded, which is estimated to have carried off not less than 50,000 persous. In January 1868 a fresh revolt broke out among the Arabs, instigated by Si-Hamed, who had led on more than one of the pre- vious revolts. They assailed and plundered some of the

friendly tribes, and being pursucd and attacked by a body of French troops, a fierce engagement took place, in which Si-Hamed was killed and his followers put to fight. Peace was enjoyed for the rest of that year; but towards the end of January 1869 several large bands of insurgent Arabs in the extreme south marched northward, took by surprise Tagguin, and being joined by others, in a short time they numbered 3000 horse. A body of French troops was sent out against them from Laghouat, under the command of Colonel Sonis, and after

two and a half hours' hard fighting the insurgents were put to flight with great slaughter. In 1871 a widespread insurrection of Arab and Kabyle tribes broke out, stimulated no doubt by a knowledge of the weakened condition of France at home. It commenced with El-Mokrani, the hereditary bach-agha of the Medjana, attacking and burning the village of Brody-Bon-Arreredy, destroying isolated houscs and posts throughout the district subject to his influence, the colonists who did not succeed in reaching a place of safety being massacred. All his attacks against the forti- fied places, however, failed; and as soon as the French were able to assume the offensive he was beaten in every engagement, and subsequently killed in action. When this rebellion appeared almost overcome, the whole of Kabylia rose in arms at the command of the sheikh El- Haddad, one of the most powerful chiefs in Kabylia, and head of an influential religious confraternity. The Kabyles, for the first time in history, descended from thcir mountain fastnesses, and attcmpted to invade the plains of the Metidja. The most horrible massacres were perpetrated, and all the principal ports on the coast were strictly blockaded on the landward side. It was not till after the fall of the commune in Paris that troops could be spared in sufficient numbers to suppress the insurrection. But this was at length effected, and a war contribution of £1,200,000 imposed upon the rebels, whose lands were also sequestrated, but the owners were permitted to resume possession on comparatively easy terms. The greater part of the sum recovered was distributed among the colonists who had suffered during the insurrection, and a consider- able portion of it has been allotted for public works. The sequestration has also opened up much valuable territory for European colonisation. Since the insurrection many new colonists have arrived here, and among them many from Alsace and Lorraine. A law passed by the French Chamber, 15th Septcmber 1871, authorises, on certain conditions, the gratuitous concession of 247,000 acres of land to such natives of Alsace and Lorraine as might desire to preserve their Trench nationality. A more favourable era, it is believed, has now dawned for the colony. Down to 1871 it had continued undcr military rule, and this, it was thought, had had not a little to do with the frequent insurrections that had broken out in the country. Accordingly, in October of that year, a civil government was established, as has been

already noticed, and since that time the colony has continued in a morc peaceable and flourishing condition. (D. K.) ALGHERO, a seaport of Italy, in the province of Sassari, Sardinia, situated on the west coast of the island, 14 miles §.W. of Sassari. It was founded by the Genoesc, and was afterwards taken by the Catalonians, whose language is still spoken. Though strongly fortified towards the sea, the landward side of the town is commanded by the overhanging hills. Alghero is an episcopal see, and has a cathedral, erected in 1517, several monasteries, convents, and public schools. Many of the houses arc of antique architecture. Near the town are some fine stalactite grottoes. The neighbourhood produces oil and fruit, and the best wine of the island; and the corals of Alghero are the most beautiful found in the Mediterranean, I. — 72

The other exports include grain, wool, tobacco, bones, skins, and anchovies. Porte Conte, 9 miles to the N.W., is the roadstead frequented by the largest vessels, and is a secure and fortified anchorage, capable of accominodating a large fleet. Population of commune (1865), 8419.

ALGIERS (Fr. Alger, Arab. Al-Jezair, t.e., The Islands), a city and seaport of Northern Africa, and capital of Algeria, is situated on the west side of a bay of the same name in the Mediterranean. Lat. (of lighthouse), 36° 47’ 20’ N., long. 3° 4’ 32” E. Itis built, in the form of an amphitheatre, on the northern slope of a steep hill rising abruptly from the coast. It ascends the side of the hill in the form of an irregular triangle, the apex of which is occupied by the Casbah, or ancient fortress of the deys, which is about 500 feet above the level of the sea. As seen from a distance, the city presents a very imposing aud picturesque appearance ; and the houses rising one above the other, and being all built of white stone, it has been compared to a ship under sail. It consists of two towns—the new, which is entirely European in its character, and is built on the lower part of the slope and along the shore; and the old town, which occupies the higher region, and is entirely Oriental in its character. The new town consists of hand- some

streets and squares, and contains the government houses, hotels, warehouses, barracks, &c. In the centre of the new town is the Place du Gouvernement, a large and handsome square in the European style, with a fountain, and planted with orange and lime trees. The streets are regular, spacious, and handsome, and adorned with arcades. In the Arab or old town the streets are narrow, winding, and dirty. The houses are square substantial-looking buildings, presenting to the street bare walls, with only a few slits protected by iron gratings in place of windows. Each house has a quadrangle in the centre, into which it looks, and which is entered by a low narrow doorway. Algiers is surrounded by walls and otherwise fortified, but its landward defences are weak and exposed, while the batteries which defend it towards the sea are very strong. It has two handsome suburbs, and numerous elegant villas are scattered over the vicinity. The town is the residence of the governor-general of Algeria, of the prefect of the departinent of Algiers, and of the chiefs of the different administrative services. It is also the seat of a bishop aud of the supreme courts of justice, and has a chamber and tribunal of commerce, a royal college, various schools, a bank, public library, and museum. Among the principal buildings are a cathedral and several Roman Catholic churches, a Protestant church, several synagogues, and a number of mosques. The town is well supplied with water, and there are numerous public and private foun- tains and baths. Various markets are held here, and horse-racing is a favourite amusement. Algiers has of late come to be noted as a winter residence for invalids. The French have spent large sums of money in the improve- ment of the port of Algiers. It has an area of 220 acres, and it is calculated that when a rock near the centre, called Roche Sans Nom, is removed, it will be capable of accommodating 40 vessels of war and 300 trading vessels. It has two docks, capable of containing the largest vessels. The lighthouse has a revolving light visible at the distance of 15 miles. Population (1866), 52,614. (For the trade and climate of Algiers, see ALGERIA.)

ALGOA BAY, an inlet in Cape Colony, on the S.E. coast of Africa, 425 miles east from the Cape of Good Hope. Lat. of Croix Island, in the bay, 30° 47’ N., and long. 25° 46’. Algoa Bay lies between capes Recife and Padrone, on the former of which there is a lighthouse. It

receives the rivers Sunday and Baasher. The best anchorage is on the west side of the inlet, near Port

Elizabeth, which is the most important seaport on the | built.

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south coast of Africa. Here the holding ground is good, and the anchorage is sheltered, except from the south-east winds. Fort Frederick stands on a hill overlooking Port Elizabeth. Algoa Bay was the first landing-place of the British emigrants to the eastern province of the Cape Colony, and as the harbour of that province it enjoys a rapidly increasing trade.

ALHAMA, a city of Spain, in the province of Granada, 24 miles 8.W. of Granada. It is very picturesquely situated on the edge of a gorge in the hills of the Sierra de Alhama, the streets rising in terraces one above another. The river Marchan flows through the chasm, and the mountains behind the town reach a height of 8000 feet. The name Alhama signifies in Arabic "the bath," and is derived from the hot mineral springs in the neighbour- hood. 'These springs, which have a temperature of 118° Fahr., are considered beneficial in cases of dyspepsia and rheumatism, and in former times had as many as 14,000 visitors annually. Alhama was a most important fortress while the Moors ruled in Granada, and its capture by the Marquis of Cadiz in 1482 was the most decisive step in the reduction of their power. Remains of the Moorish castle and walls are still to be seen, as well as an aqueduct of Roman or Moorish origin. Many of the houses are of Moorish architecture, and the antiquities of the town, the mineral springs, and the wild scenery of the environs attract numerous visitors. Population, about 7000.

ALHAMA, a town in Spain, in the province of Murcia, 13 miles S.W. of the town of that name. It is celebrated for its sulphur springs, which have a temperature ranging from 91° to 113° Fahr., and attract

numerous visitors. The town has a hospital and the ruins of an ancient castle. Population, about 6500.

ALHAMBRA, the ancient fortress and residence of the Moorish monarchs of Granada, lies on a hill overlooking the city of Granada, on the north. The name, signifying in Arabic "the red," is derived from the colour of the sun- dried tapia, or bricks made of fine gravel and clay, of which the outer walls are built. This famous Moorish palace was erected at various dates, chiefly between 1248 and 1354, under the reigns of Ibn-l-Ahmar and his suc- cessors. The splendid decorations, and in particular the exquisite painting of the interior, are ascribed to Yusuf L, who died in 1354. Immediately after the expulsion of the Moors in 1492, their conquerors began, by innumer- able acts of vandalism, to spoil the marvellous beauty of the Alhambra. The open work was filled up with white- wash, the painting and gilding effaced, the furniture soiled, torn, or removed. Charles V. rebuilt portions in the modern style of the period, and destroyed the greater part of the Winter Palace to make room for a modern structure which has never been completed. Philip V. Italianised the rooms, and completed the degradation by running up partitions which blocked up whole apartments, gems of taste and patient ingenuity. In subsequent centuries the carelessness of the Spanish authorities permitted this pearl of Moorish art to be still further defaced ; and in 1812 some of the towers were blown up by the French under Sebastiani, while the whole buildings narrowly escaped the same fate. In 1821 the ancient pile was shattered by an earthquake. Directions were given in 1862, by Isabella, then queen of Spain, for the restoration of the Alhambra to its original condition. The work has been carried on with considerable skill, but the sums devoted to it have been too small for its satisfactory accomplishment.

The hilly terrace on which the Alhambra stands is about 2430 feet in length by 674 in breadth at the widest part. A strongly-fortified wall, flanked by thirteen square towers, encloses an area of 35 acres, within which the palace 1s Approaching from the city, the visitor passes

through the Gate of Pomegranates and enters the grounds of the Alhambra, which are well wooded, and in spring are covered by sweet-scented wild flowers. The gardens, though weedy and ravined, are a charming resort, adorned by beautiful waterfalls and sparkling fountains, and en- livened by the song of the nightingale. Passing the pillars of Charles V., a steep ascent leads to the chief entrance to the Alhambra, the Gate of Judgment—a massive arch- way, surmounted by a square tower 62 feet high, which, while serving as an outwork of the fortress and as an entrance-hall to the palace, was principally used as an open-air court of justice, according to the patriarchal custom of the east. The pillars of the gate are of sculp- tured marble, and the horse-shoe arch is 28 feet high. A narrow passage leads to the Plaza de los Algibes, the Place of the Cisterns, so called from the tanks underneath filled with water from the Darro, which foams through the ravine to the north of the hill. The Plaza is about 225 feet long by 187 wide. To the left rises Alcazaba, the ruined fortress of the Alhambra, with the Zorre de la Vela or Watch Tower, where the Christian flag was first hoisted on the expulsion of the Moors in 1492. It commands a noble prospect. Below lies the city of Granada, with its hundred churches ; and above rise overhanging heights, with white houses glancing out from the green foliage, reminding one of the saying of the Arabic poet, that Granada is like a pearl set round with emerald. In the Place of the Cisterns stands an isolated Moorish tower, the Torre del Vino, erected in 1345; and to the right lies the palace of Charles V., displacing so much that was curious in Moorish art. It is a majestic but cold-looking structure in the Renaissance style, unfinished and roofless, and presenting a desolate and ruinous aspect. Behind this edifice lies the Moorish palace, the exterior being severe, plain, and almost forbidding in appearance, accord- ing to the peculiarity of Moorish architecture, by which they contrived to heighten the splendour of the interior by contrast with the bare and unadorned structure of the outer walls. But within, the palace stands unrivalled in the gorgeous splendour of its halls and the exquisite beauty of its decorations. Everywhere are seen evidences of the delicate taste and the artistic luxury of the Moors. Spacious courts, with marble pillars and fretted ceilings, partitions coloured and gilt like the sides of a Stamboul casket, and filagree stuccos of veil-like transparency, all distinguished

by airy lightness and grace, are among the main features of this palace of the voluptuous caliphs of Granada, who held dominion over that sunny land which their poets described as a terrestrial paradise. The colours chiefly employed are blue, red, and a golden yellow. In the hey-day of Moorish prosperity the palace must have been the most delicious of royal residences. Odoriferous gardens, in which the orange and the myrtle bloomed, alternated with sparkling fountains and soft couches, inviting to a luxurious repose. Everything contributed to render the whole the most splendid abode of Oriental magnificence, to which only the fantastic creations of the Arabian Nights can be fitly compared.

The present entrance is by a small insignificant door, from which a corridor conducts to the Patio de la Berkah, the Court of the Blessing. This court is 140 feet long by 74 broad ; and in the centre there is a large pond set in the marble pavement, full of gold-fish, from which some have called this the Court of the Pond. It is also known as the Court of the Myrtles, from the myrtles which grow along its sides. There are galleries on the north and south sides; that on the south 27 feet high, and supported by a marble colonnade. Underneath it, to the right, was the principal entrance, and over it are three elegant windows with arches and miniature pillars. The columns

supporting the galleries are light in structure, and arches, slender and bending gracefully like palms, spring from the capitals and meet overhead. From this court the walls of the Yorre de Comares are seen rising over the roof to the north, and its tower and colonnades are reflected in the crystal mirror of the pond.

The Hall of Ambassadors (Sala de Ambajadores) is the largest in the Alhambra, and occupies all the Tower of Comares. It is a square room, the sides being 37 feet in length, while the centre of the dome is 75 feet high. This was the grand reception-room, and the throne of the sultan was placed opposite the entrance. The azulejos are nearly 4 feet high all round, and the colours vary at inter- vals. Over them-is a series of oval medallions with in- scriptions, interwoven with flowers and leaves. There are nine windows, three on each facade, and the ceiling

is admirably diversified with inlaid work of white, blue, and gold, in the shape of circles, crowns, and stars—a kind of imitation of the vault of heaven. The walls are covered with varied stucco-work of most delicate pattern, surround- ing many ancient escutcheons.

Another of the more celebrated courts of the palace is the Patio de los Leones, the Court of the Lions. This is an oblong court, 116 feet in length by 66 in breadth, sur- rounded by a low gallery supported on 124 white marble columns. A pavilion projects into the court at each extremity, with filigree walls and light-domed roof, elabor- ately ornamented. The square is paved with coloured tiles, and the colonnade with white marble; while the walls are covered 5 feet up from the ground with blue and yellow tiles, with a border above and below enamelled blue and gold. The columns supporting the roof and gallery are irregularly placed, with a view to artistic effect; and the general form of the piers, arches, and pillars is most graceful. They are adorned by varieties of foliage, é&c.; about each arch there is a large square of arabesques; and over the pillars is another square of exquisite filigree work. In the centre of the court is the celebrated Fountain of Lions, a magnificent alabaster basin supported by the figures of twelve lions in white marble, not designed with sculptural accuracy, but as emblems of strength and courage. When the fountain was in good order a great volume of water was thrown up, which fell into the basin, passed through the lions, and issued from their mouths,

The Hall of the Abencerrages derives its name from a legend according to which Boabdil, the last king of Granada, having invited the chiefs of that illustrious line to a banquet, massacred them here. This room isa perfect square, with a lofty dome, and trellised windows at its base. The roof is exquisitely decorated in blue, brown, red, and gold, and the columns supporting it spring out into the arch form in a remarkably beautiful manner. Opposite to this hall is the Hall of the Two Sisters, so called from two very beautiful white marble slabs laid as part of the pavement. These slabs measure 15 feet by 7}, and are without flaw or stain. There is a fountain in the middle of this hall, and the roof is composed of stalactites, nearly 5000 pieces entering into its

construction. The whole decorations here are of the most exquisite description.

Among the other wonders of the Alhambra are the Hall of Justice; the mosque; the Mirador de Lindaraja, or boudoir of the sultana ; the Patia de la Reja ; the Tocador. de la Reina, or queen's boudoir ; and the Sala de los Banos, in all which are to be seen the same delicate and beautiful architecture, the same costly and elegant decorations. There must also be noticed the celebrated vase of the Alhambra, a splendid specimen of Moorish ceramic art, dating from 1320, and belonging to the first period of Moorish porcelain. It is 4 feet 3 inches high ; the ground is white, and the enamelling is in blue, white, and gold,

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A new hall, called the Hall of the Shields or Escutcheons, has recently been discovered; and the palace contains, besides the more important halls already mentioned, ranges of bed-rooms and summer-rooms, a whispering gallery and labyrinth, and vaulted sepulchres.

The towers of the fortress have also much of the orna- mented character of the palacc. Separated from the Alhambra by a ravine lics Generalife, the Garden of the Architect, probably in the first instance an outwork of the fortress, afterwards the summer villa of the sultans of Granada. It is impossible to conclude the description of the Alhambra without remarking how admirably every thing was planned to render this palace the most voluptu- ous of all retreats—the numerous fountains which cooled the air, the judicious disposition of doors and windows securing a free ventilation, the shady gardens, and the noble views of the hills and plains around. Some idea of the beauty of the original is afforded by the Alhambra Court in the Crystal Palace at Sydenham, imitating the Moorish palace in gorgeousness of colouring, elaborateness of ornamentation, and quaint grace of architectural style.

One of the most striking features of the Alhambra is the appliance of poetical conceits and passages from the Koran to enhance and form

part of the ornamentation. "There is no God but Allah," '" There is no conqueror but God," " Glory be given to our Lord," and other similar inscriptions are everywhere to be observed.

(See Mr Owen Jones's Plans, Elevations, and Sections of the Alhambra, 2 vols. fol., 1848.)

ALHAZEN (full name, Apu Att at-Hasan Ipn AL- HASAN), a@ mathematician of the 11th century, was born at Bassora, and died at Cairo in 1038. He is to be dis- tinguished from another Alhazen who translated Ptolemy's Almagest in the 10th century. Alhazen having boasted that he could construct a machine for regulating the inundations of the Nile, was summoned to Egypt by the caliph Hakem; but, aware of the impracticability of his scheme, and fearing the caliph's anger, he feigned madness until Hakem's death in 1021. Alhazen was, nevertheless, a diligent and success- ful student, being the first great discoverer in optics after the time of Ptolemy. His researches were prosecuted under the greatest disadvantages, as he was compelled to eke out a livelihood by copying his own works and selling them. To him, and not to Ptolemy, is due the explanation of the apparent increase of heavenly bodies near the horizon. He correctly attributed the phenomenon to the fact that the eye compares these bodies with intervening terrestrial objects. He taught, previous to Vitello, that vision does not result from the emission of rays from the eye, and wrote also on the refraction of light, especially on atmospheric refraction, showing, ¢.g., the cause of morning and evening twilight. He solved the problem of finding the point in a convex mirror at which a ray coming from one given point shall be reflected to another given point. As a writer, Alhazen is remarkable for prolixity and scholastic subtilty. Only two of his works have been printed—his J'reatise on Twilight, and his Thesaurus Optice, (See Casiri, Bibl. Arab. Hisp. Escur.)

ALI, the fourth in order of the caliphs or successors of Mahomet, was born at Mecca, about the year 600 a.p. His father, Abu Taleb, was an uncle of the prophet, and Ali himself was adopted by Mahomet and educated under his care. While he was still a mere boy he dis-

tinguished himself by being the first to declare his adhesion to the cause of Mahomct, who in return made him his vicegerent, and some years after gave him his daughter Fatima in marriage. Ali proved himself to be a brave and faithful soldier ; and when Mahomet died without male issue, he seemed to have the best claims to become the recognised head of Islamism. Three other companions of

Mahomet, however, Abubekr, Omar, and Othman, occupied this position before him, and it was not until 656, after the murder of Othman, that he assumed the title of caliph. Almost the first act of his reign was the suppres- sion of a rebellion under Telha and Zobeir, who were instigated by Ayesha, the widow of Mahomet, a bitter enemy of Ali, and hitherto one of the chief hindrances to his advancement to the caliphate. The rebcl army was defeated at Kharibah, near Bassorah, the two generals being killed, and Ayesha taken prisoner. Ali's next care was to get rid of the opposition of Moawyah, who had established himself in Syria at the head of a numerous army.

ALI BEY (1728-73), an adventurer, said to have been a native of the Caucasus, and to have been sold about the age of twelve or fourteen for a slave in Cairo. The two Jews who became his masters presented him to Ibrahim, then one of the most influential men in the kingdom. In the family of Ibrahim he received the rudiments of a literary education, and was also instructed in the military art. He gradually gained the affection of his patron to such a degree that he gave him his freedom, permitted him to marry, and promoted him to the rank of governor of a

district. Afterwards he was elected to the elevated station of one of the governors of provinces. dof protector by death, and engaging in the dangerous intrigues that pave the way to power in an unstable

government, he procured his own banishment to Upper Egypt. Here he speut two years in maturing his schemes for future great- ness; and in 1766, returning to Cairo, he either slew or expelled the beys, and seized the rcigns of government. Emboldened by success, he rescued himself from the power of the Porte, coined money in his own name, and assumed the rank of sultan of Egypt. Occupied in more important concerns, the Porte made no vigorous opposition to his measures, and Ali seized the opportunity to recover a part of the Said, or Upper Egypt, which had been taken pos- session of by an Arabsheik. He next sent out a fleet from Suez, which, seizing upon Djedda, entered the port of Mecca; while a body of cavalry, commanded by Mahomet Bey, his favourite, took and plundered Mecca itself. Hav- ing formed an alliance in 1770 with the Sheik Daher, a rebel against the Porte in Syria, he aimed at the conquest of all Syria and Palestine. He first endeavoured to secure Gaza ; then his army, forming a junction with that of Daher at Acre, advanced to Damascus. There, on the 6th of June 1771, a battle was fought with the Turkish pashas, and Mahomet and Daher, Ali's generals, routed them with great slaughter. The latter instantly took pos- session of Damascus, and the castle itself had also capitu- lated, when Mahomet unexpectedly hastened back to Ugypt with all his Mamelukes. Some ascribe this strange conduct to an impression made upon Mahomet by the Turkish agents, and others to a report of the death of Ali Bey.

Although unsuccessful, Ali never lost sight of his favourite object; and Mahomet, losing his confidence, was forced to save his life by exile. Mahomet, however, quickly returned with an army, and drove Ali Bey from Cairo. In this unfortunate state of affairs Ali fled to Daher, and, combining their forces, they attacked the Turkish commander at Sidon, and came off victorious, although the Turkish army was three times their number. After a siege of eight months, they next took the town of Jaffa, Deceived by letters from Cairo, which were only intended to ensnare him, and stimulated by his recent victories, Ali returned to Cairo. Entering the deserts which divide Gaza from Egypt, he was furiously attacked by a thousand chosen Mamelukes led on by Murad Bey, who was enamoured of Ali's wife, and had obtained the promise of her, provided that he could take Ali captive. Ali was wounded, made

prisoner, and carried to Mahomet. He died three days after, from the effects either of poison or of his wounds.

ALI PASHA, surnamed Arslan or "The Lion," wag born at Tepelini, a village of Albania, on the Voyutza, at the foot of the Klissoura Mountains, in 1741. He belonged to the Toske tribe, and his ancestors had for some years held the title of Bey of Tepelini, this dignity having become hereditary in his family. His grandfather fell in 1716 at the siege of Corfu, which was then held by the Venetians. His father, who died when Ali was in his fourteenth year, is represented by most authorities as a man of amiable character and peaceful habits, who was despoiled of his territories by the chiefs that lived around him ; but his mother was a woman of fierce and unyield- Ing disposition. Inciting her son to recover the posses- sions of his father, she roused in him a spirit of cruelty and aggression, tempered, however, by a considerable amount of cunning and foresight, which bore bitter fruit in his Miper years. Many romantic stories are told of Ali's adventures at the outset of his career, but the only facts that are known with certainty are, that after living in the

Deprived of his

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mountains as a robber for some years, and enduring great privations, he made himself master of his beylik of Tepe- lini by the aid of his associates. He is said to have then murdered his brother and imprisoned his mother, who died shortly after, on a charge of attempting to poison him. In order to increase and establish his power, he then made overtures to the Turkish government, by whose orders he attacked and defeated the pasha of Scutari, then in rebellion against the sultan, and put to death Selim, pasha of Delvino. For these acts he was rewarded by being placed in possession of the whole of his father's territories, and he was appointed lieutenant to the Derwend-pacha of Rum-ili, an officer who was charged with the suppression of brigandage and highway robbery in the district. Ali, however, by permitting the robbers to go unchecked in return for a share of the spoil, brought his superior to disgrace and death, but escaped himself

by sending bribes to the ministers of the sultan. For his: services in the field in the war between Prussia and Turkey in 1787 he was appointed pasha of Trikala in Thessaly, and Derwend-pasha of Rum-ili. He soon cleared the country of robbers, mainly by summoning to his standard all who were willing to serve under him, and by their aid he took forcible possession of Joannina in 1788. By means of the powerful body of troops at his command, and the wise measures that he introduced, he wrought considerable ainelioration in the districts under his charge, and the Porte seeing this, confirmed him in the pashalik of Joannina. His whole attention was now turned to the agerandisement of his territory and personal power. He obtained possession of the western part of Northern Greece, or Livadia as it was then called ; but was baffled for many years in his attempts to occupy the country of the Suliotes in the south-west of Hpirus. These brave and hardy mountaineers at last, in 1803, agreed to evacuate their

'country, and were treacherously massacred by Ali whilé on

their way to the coast to embark for Corfu. When the French took Venice in 1797, Ali, by pretending admiration for the principles of the revolution, induced Napoleon to send him engineers, by whose aid he fortified Joannina ; but failing to obtain from him, as he had hoped, the Venetian ports on the scaboard of Epirus, he took occasion, after the defeat of Napoleon in Egypt, to lay siege to Prevesa, which was surrendered by the French troops. Ali had now a difficult part to play, but he succeeded so well with his master the sultan, that he was confirmed in the possession of the whole of Albania northwards from Epirus to Montenegro, over which he had asserted his autho- rity, partly by intrigue and partly by force of arms. He also held the high position of governor of Rum-ili for a brief period (1799), during which he amassed a large sum of money by his extortions. The cruel massacre of the inhabitants of Gardiki, for an alleged insult to his mother and sister about forty years previously, was perpe- trated about this time. He contrived to make his peace with the French in spite of the capture of Prevesa, and in 1807 once more entered into alliance with them, with the view of obtaining Parga, which he had attempted

to capture, but without success, in 1800. Napoleon, however, neglected to secure Parga for him at the peace of Tilsit, and the fortress remained in the hands of the French until it was taken in 1814 by the English, who gave it up in 1817, ostensibly to the sultan, but in reality to Ali. Ali was now at the height of his power: he was almost supreine over Albania, Epirus, part of Thessaly, and the western part of Northern Greece; while one of his sons held the pashalik of the Morea. So powerful was he that, though he was nearly eighty years of age, the Porte feared and hated him, and desired his death, but could find no good pretext for taking measures against him until

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1820, when Ali procured the assassination of an officer who had left him and taken service under the sultan at Con- stantinople. For this daring act the sultan proscribed Ali, and ordered all the European pashas to march against him. He resisted every effort to capture him, but was at last induced by Kourschid Pasha to surrender in January 1822 on promise of a pardon from the sultan. On 5th February, on pretence of handing him the necessary document, Kourschid Pasha procured an interview with him, and then produced the firman authorising his execu- tion. The brave old despot defended himself with his usual resolution and courage, but was overpowered by numbers, and his head was struck from his body and sent to Constantinople.

ALIAS, signifying at another time, is used in judicial proceedings to connect the several names of a person who attempts to conceal his true name, or to pass under a feigned one; as Smith alias Jones, James alias John.

ALIBI, in Zaw, denotes the absence of the accused from the place where he is charged with having committed a crime; or his being elsewhere, as the word imports, at the time specified.

ALICANTE, a province of Spain, bounded on the N. by Valencia, on the W. by Albacete and Murcia, on the S. by Murcia, and on the S.E. and E. by the Mediterranean Sea. It was formed in 1834 of districts

taken from the ancient provinces of Valencia and Murcia, the former con- tributing by far the larger portion. Its length is about 73 miles, its breadth 68 miles, and the area 2090 square miles. The surface of the province is extremely diversified. In the north and west there are extensive mountain ranges of calcareous formation, intersected by deep ravines ; while farther south the land is more level, and there are many fertile valleys. On the Mediterranean coast, salt marshes, exhaling an insalubrious miasma, alternate with rich plains and pleasant and productive huertas or gardens, such as those of Alicante and Denia. There is no considerable river in the province, but a few rivulets flow east through the valleys into the Mediterranean. The sky is clear, the climate temperate, and the rainfall very slight. Notwith- standing the want of rivers and of rain, agriculture is in a very flourishing condition. The inhabitants possess a spirit of steady industry uncommon in Spain, and by means of wells and canals they have to a large extent suc- ceeded in overcoming the disadvantages of nature. Many tracts originally rocky and sterile have been levelled, and now present terraces covered with the vine and with use- ful trees. Cereals are grown, but the inhabitants prefer to raise such articles of produce as are in demand for export, and consequently part of the grain supply of the province has to be imported. LEsparto grass, ricc, the sugar-cane, and tropical fruits and vegetables are largely produced. Great attention is given to the rearing of bees and silk- worms ; and the wine of the province is held in high repute throughout Spain, while some inferior kinds are sent to France to be mixed with claret. Cattle are not extensively reared, The most important minerals of the province are lead, copper, iron, and coal. There are about twenty lead and copper mines; and mineral springs are found at various places. The manufactures consist of fine cloths, silk, cotton, woollen and linen fabrics, girdles and lace, paper, hats, leather, earthenware, and soap. There are numerous oil-mills and brandy distilleries. Many of the inhabitants are engaged in the carrying trade, while the fisheries on the coast are also actively prosecuted, tunny and anchovies being caught in great numbers. Barilla is obtained from the sea-wced on the shores, and some of the saline marshes yield large supplies of salt by spontaneous evaporation. The province is divided into 16 judicial divisions and 206 parishes. Alicante is the

chief town, and the other places of importance are Denia and Villajoyosa on the coast ; and Orihuela, Elche, Villena, and Alcoy in the interior. Education is in a low state;

of the criminals arrested it is found that 14 in 15 cay

neither read nor write. The people are of a lively and irascible temperament, and offences against the person are frequent. Population (1870), estimated at 440,000.

ALICANTE, the capital of the above province, and, after Cadiz and Barcelona, the most considerable seaport of Spain. It is situated at the head of the bay of Alicante, in the Mediterranean Sea, in 38° 20' N. lat., and 0° 30' W. long. The city is built on the bay in the form of a half-moon, and is overlooked by a rock 400 feet high, surmounted by a castle, which has been suffered to fall into decay. There is good anchoring-ground in the bay, but only the smaller vessels can come up to the mole or pier. The bay is protected by batteries, and there is a fixed light on the mole, 95 feet high, and visible for a distance of 15 miles. Alicante was the Lucentum of the Romans ; but notwithstanding its antiquity, the town pre- sents a modern appearance, and has few remains of Roman, medizeval, or Moorish times. It is the seat of a bishop, and has a cathedral and episcopal palace. It has also a good town-house, an orphanage, a lyceum, a public library, and a school of navigation. Cotton, linen, and woollen goods, cigars, and confections are manufactured. There is a considerable trade in the fruit and other produce of the surrounding plain; and the vino tinto, or dark red wine, produced in the vicinity, is sent to France for mixing purposes. At the island of Plana, on the coast, very beautiful marble is procured. The foreign trade of the port, though still considerable, has greatly declined on account of the imposition of an excessive import tariff, In 1871, besides coasting traders, 372 Spanish and foreign vessels, with a tonnage of 62,546, entered the port. Of these vessels, 78 were British, measuring 29,021 tons. The value of the imports under foreign and native flags was £542,526, and the duties paid were £90,421, without reckoning duties corresponding to material and fuel for railways,

which are admitted free. The chief imports are coals, iron, machinery, and guano; and the chief exports esparto—of which 11,000 tons were shipped in 1871— raisins, almonds, oranges, olive oil, silk, saffron, wine, lead, salt, and soda. There are here English and other European consuls. Alicante was besieged by the Moors in 1331, and again by the French in 1709, when the English com- mandant and his staff were killed by the explosion of a mine. Population, 31,500.

ALICATA, or Licata, a seaport of Italy, in the pro- vince of Girgenti, Sicily, situated on the south coast, at the mouth of the Salso, the largest river in the island. It is supposed to occupy the site of the ancient Phentias, built by Phintias, tyrant of Agrigentum, in 280 B.c, after the destruction of Gela. The neighbourhood was the scene of many of the most memorable events of the Punic wars. On the hill overlooking the modern town there are extensive ancient remains. Alicata is now the most important com- mercial town on the south coast of Sicily, though the port is only an open shallow roadstead. The larger vessels lie a mile off shore, and are laden and discharged by means of barges. The chief trade is in sulphur, and the other exports include corn, fruit, macaroni, soda, and excellent wine. Population, 16,000.

ALICUDI, one of the Lipari Islands. IsLANDS.

ALIEN, obviously derived from the Latin alienus, is the technical term applied by British constitutional law to any one who does not enjoy the privileges of a British subject. The jealousy which has generally existed agaist communicating the privileges of citizenship to foreigners

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has its foundation in mistaken views of political economy. It arose from the impression that the produce of the energy and enterprise of any community is a limited quantity, of which each man's share will be the less the more com- petitors there are; superscding the just view that the wealth of a state depends on the number and energy of the producers. Thus the skilled workmen who would increase its riches

have often been jealously kept out of a country. But, on the other hand, special temptations, including the gift of citizenship, have often been offered to skilled foreigners by states desiring to acquire them as citizens. Britain has occasionally received industrious and valuable citizens, driven forth by the folly or tyranny of other powers, as in the memorable instance of the revocation of the edict of Nantes, which sent the Spitalfields colony and many other Frenchmen to this country. Looking on the full benefit of British citizenship as a transcendent boon, the principle of our older legislation on the subject has been to allow friendly aliens to possess at least a portion of it. There never existed in Britain a law so harsh as the Droit d' Aubaine of France, which confiscated to the crown all the property of a deceased alien. The courts of justice have ever been opened to them, and they have thus been entitled to protect themselves from any inequalities which do not apply to them by special law. It seems to be a rule of the general public law that an alien can be sent out of the realm by exercise of the crown's prero- gative; but in modern practice, whenever it has seemed necessary to extrude foreigners, a special Act of Parliament has been obtained for the purpose. (See Phillimore's Internat. Law, vol. 1, p. 133; Forsyth's Cases and Opinions on Const. Law, p. 181.)

Our law, save with the special exceptions mentioned afterwards, admits to the privileges of subjects all who are born within the British dominions. In the celebrated question of the post-nati in the reign of James I. of England, it was found, after solemn trial, that natives of Scotland born before the union of the crowns were aliens in England, but that those born subsequently enjoyed the privileges of English subjects. A child born abroad, whose father or whose grandfather on the father's side was a British subject, may claim the same privilege, unless at the time of his birth his father was a traitor or felon, or engaged in war against the British empire (4th Geo. II. c. 22). Owing to this exceptional provision, some sons of Jacobite refugees, born abroad, who joined in the rebellion of 1745, were admitted to the privilege of prisoners of war, because, as the conduct of their fathers deprived them of the privileges of citizenship, they were held not to be liable to its burdens.

It has been enacted with regard to the national status of women and children that a married woman is held to be a citizen of the state of which her husband is for the time being a subject ; that a natural-born British woman, having become an alien by marriage, and thereafter being a widow, may be rehabilitated by certificate of the Secretary of State ; that where a father or a widow becomes an alien, the children in infancy becoming resident in the country where the parent is naturalised, and being naturalised by the local law, are held to be subjects of that country ; that those of a father or of a widow readmitted 'to British nationality become British subjects also; and that the children of a father or of a widow who obtains a certificate of naturalisation, becoming resident with such parent in the United Kingdom, become naturalised (33 and 34 Vict. ¢. 14, s. 10). The same statute provides that a declaration of alienage before a justice of peace or other competent judge, having the effect of divesting the declarant of the character of a British subject, may be made by a naturalised British subject desiring to resume the nationality

of the country to which he originally belonged, if there be a convention to that effect with that country; by natural- born subjects who were also born subjects of another state according to its law; or by persons born abroad having British fathers. .

The main characteristic disabilities to which aliens have been subjected are incompetency to exercise political pri- vileges, such as that of electing or being elected to sit in Parliament, and incapacity to hold landed property. The privilege of sitting on a jury was also counted among the political rights from which they are excluded; but when a foreigner is on trial, he had in England the privilege of the jury de medietate linguce, in which half the panel consisted of foreigners, a privilege which was taken away in 1870, and never existcd in Scotland. An alien enemy can neither by himself nor assignee sue for the recovery of a debt due to him in this country, unless by the Queen's special licence. But his right to do so revives when the war is terminated. (See Mr Justice Story's judgment in Society for Propagation of the Gospel v. Wheeler, 2 Gallison's Reports, 127, and Phillimore's Jnter- national Law, iii. 121).

Many of the special disabilities to which alicns were subject under the Navigation Act and other laws connected with our old restrictive commercial policy, have been removed or neutralised by the free trade measures of later years; but it is still impossible for an alien to be the owner of a British ship. In other respects the tendency has been to communicate some of the rights of citizenship to aliens, and to widen the definition of subjects.

Most of the acts of Parliament passed with regard to aliens during the last and the present centuries have been repealed by 33 & 34 Vict. c. 14—the Naturalisation Act, 1870. It enables aliens to take, acquire, hold, and dispose of real and personal property of every description (except British ships), and to transmit a title to land, in all respects as natural-born British subjects. But the act expressly declares that this relaxation of the law does not qualify aliens for any office or any municipal, parliamentary, or other franchise, or confer any right of a British subject other than those above expressed in regard to property, nor does it affect interests vested in possession or expect- ancy under dispositions made before the act, or by devolu- tion of law on the death of any one dying before the act.

The Act 6 & 7 Will. IV. c. 11 has not been repealed by the Act of 1870. It requires masters of vessels to intimate the arrival of all aliens, who are thereby bound to have their names registered and to obtain certificates of regis- tration. It is believed that these conditions have seldom been complied with or enforced.

It may be remarked that the repealed Act of 1864 (7 & 8 Vict. c. 66) was the first considerable relaxation of the alien law. It communicated to the children born abroad of a British mother the privilege of acquiring land by purchase or succession. It gave friendly aliens the privilege of holding leases for any time not exceeding twenty-one years. Before this act the rights of citizenship could only be conferred on aliens by statute; and it was enacted at the commencement of the Hanover succession, that no private naturalisation bill should be brought in unless it contained a clause disqualifying the person it applied to from being a privy councillor or a member of Parliament,

and from holding any office, civil or military, and from being a freeholder; but this restriction is repealed by the act of 1844. Limited privileges could formerly be given by the sovereign's letters of denization; but by the act of 1844 an alien intending to reside and settle in Britain was enabled, by application to the Home Secretary, to obtain a certificate giving him all the rights of a natural- born subject, with certain exceptions. N aturalisation,

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which is accompanied by political and other rights, privileges, and obligations, may now, under the act of 1870, be obtained by applying to the Home Secretary and producing evidence of having resided for not less than five years in the United Kingdom, or of having been in the service of the crown for not less than five years, and of intention to reside in the United Kingdom or serve under the crown. Such a certificate may be granted by the Secretary of State to one naturalised previously to the passing of the act, or to a British subject as to whose nationality a doubt exists, or to a statutory alien, 2.¢., one who has become an alien by declaration in pursuance of the act 1870. The laws of a British colony with regard to naturalisation have effect only within the limits of that colony. Naturalisation is also effected by the operation of the law upon the acts of individuals, as a woman by marriage acquires the nationality of her husband. The

naturalisation of a father carries with it that of his children

in minority ; and Felix holds that that of a widow has the same effect upon her minor children. (Sce Feelix, Z'raité de Droit Internat. Priv., |. i. t. 2, 8. 2; Savigny, Priv. Internat. Law, translated by Guthrie, pp. 26, 31, 32; Phillimore's Jnternat. Law, vol. i.; Bar, Das Internat. Privat und Strafrecht, § 30; Gand, Code des Htrangers ; Hansard on Aliens; Heffter, Hurop. Volkerrecht, § 59 sqq. ; Sir A. E. Cockburn on Nationality, Lond. 1869; Cutler on Naturalisation, Lond. 1871).

In the United States an alien desiring to be naturalised must declare on oath his intention to become a citizen of the Unitcd States ; two years afterwards must declare on oath his intention to support the constitution of the United States and renounce allegiance to every foreign power, including that of which he was before a subject; must prove residence in the United States for five years, and in the state where his application is made for one year, as a good citizen; and must renounce any title of nobility. In France an alien desiring naturalisation must obtain per- mission to establish his domicile in France ;: three years after (in special cases one year) he is entitled to apply for naturalisation, which involves the renunciation of any existing allegiance. (See further, ALLEGIANCE; Law or Nations).

ALIGARH, a district of British India, in the Meerut division, and undcr the jurisdiction of the Lieutenant- Governor of the North-West Provinces, lies between lat. 27° 29’ and 28° 10’ 30” N., and between long. 77° 32’ 30” and 78° 42’ 30” E. It contains an area of 1954 square miles, of which upwards of two-thirds, or 884,060 acres, are under cultivation. Population in 1865 returned at 925,538 souls, and by the census of 1872 ascertained to be 1,073,108. Alfgarh is bounded on the N. by the Bulandshahr district and a portion of Buddon; on the E. by Etah district; on the 8. by Mathura district; and on the W. by Gurgdon and Mathuré districts. The district is nearly a level plain, but with a slight elevation in the centre, between the two great rivers, the Ganges and Jamna, The only other important river is the Kali Nadf, which traverses the entire length of the district from north-west to south-east.

The civil station and principal town is Koel, situated a short distance to the south of Aligarh Fort. The chief products are wheat, barley, jodr, bajra, pulses, oil-seeds, gram, and indigo. There are no manufactures. In 1870-71 the total net revenue of the district was returned at £283,709, and the expenditure at £45,488; the land revenue in the same year amounted to £190, 655, or 84 per cent. of the total net revenue. Nine towns are returned as containing a population of upwards of 5000 souls, as follows :— Koel, the eivil station and principal city, population within muni- cipal limits, 55,228; Hatras,

population, 33,100; Atrauli, popula- tion within municipal limits, 15,895; Sikandrdé Rao, population within municipal limits, 11,988 ; Jalali, population, 7516; Mursdn, population, 6113; Tapal, population, 6031; Bijaigarh, population,

5779; and Hardeoganj, population, 6202. There are five municipal towns in the district, the revenue raised being derived from octroi duties. The following was the municipal revenue and its incidence per head in 1871-72 :—Koel (Al{garh), municipal revenue, £5467 ; incidenee, 1s. 113d. per head of the municipal population. Hatras, municipal revenue, £5221, 16s. ; incidence per head, 3s. 1jd. _ Sik- andra Rdéo, municipal income, £505, 12s. ; incidence, 10d. per head, Atrauli, municipal income, £709; incidence, 103d. per head, Hardeoganj, muuivipal income, £462, 18s, ; incidence, Is. 94d, per head. In 1871-72, the district contained 370 schools, attended by a total of 7989 pupils, of whom 6766 were Hindus and 1173 Mahometans. For the protection of person and property, a regular police force is maintained, consisting of 1056 men of all grades, equal to one man to every 1°85 square mile of area, or one to every 1016 of the population. 'The Village Watch or rural police numbered 2000 in 1871, equal to one man to every '67 square miles, or one to every 586 inhabitants.

Axfcaru Fort, in the district of the same name, is situated on the Grand Trunk Road, in lat. 27° 56' N., and long, 78° 8' E. The fort consists of a regular puly- gon, surrounded by a very broad and dcep ditch. It was captured from the Marhattds under the leadership of Perron, a French officer, by Lord Lake's army, in September 1803, since which time it has been much strengthened and im- proved. In the rebellion of 1857 the troops stationed at Aligarh mutinied, but abstained from murdering their officers, who, with the other residents and ladies and children, succeeded in reaching Hatras.

ALIMENT, in the Law of Scotland, is the sum paid or allowance given in respect of the reciprocal obligation of parents and children, husband and wife, grandparents and grandchildren, to contribute to each

other's maintenance. The term is also used in regard to a similar obligation of other parties, as of creditors to imprisoned debtors, the payments by parishes to paupers, &c. Alimentary funds, whether of the kind above mentioned, or set apart as such by the deed of a testator, are intended for the mere support of the recipient, and are not attachable by creditors.

ALIMONY is, in Znglish Law, the allowance for main- tenance to which a wife is entitled out of her husband's estate on a decree, obtained at the wife's instance, for judicial separation or for the dissolution of the marriage. It is settled by the judge of the Divorce Court on a con- sideration of all the circumstances of the case.

ALISON, Rev. ARCHIBALD, an author of great reputa- tion in his own day, was born on the 13th November 1757 at Edinburgh, of which his father was for a time lord provost. After studying at the university of Glasgow and at Balliol college, Oxford, he took orders in the Church of England, and was appointed in 1778 to the curacy of Brancepeth, near Durham. In 1780 he married Dorothea, youngest daughter of Professor Gregory of Edinburgh. The next twenty years of his life were spent in Shropshire, where he held in succession the livings of High Ercall, Roddington, and Kenley. In 1800 he removed to Edin- burgh, having been appointed scnior incumbent of St Paul's chapel in the Cowgate. For thirty-four years he filled this position with great acceptance, his preaching attracting so many hearers that a new and larger church was built for him. His last years were spent at Colinton, near Edinburgh, where he died on the 17th May 1899. Mr Alison published, besides a Life of Lord Woodhouselee, a volume of sermons, which passed through several editions, and a work entitled Essays on the Nature and Principles of Taste, which received a very laudatory criticism from Lord Jeffrey in the Ldinburgh Review for May 1811. His theory of the beautiful, which is based on the principle of association, is incomplete and unsatisfactory, and his work is now only of historical importance. Two sons of Mr Alison attained distinction. The elder, Dr Wil liam Pulteney Alison, born in 1790, was from 1820 until within a few years of his death, in 1859, a pro- minent member of the medical faculty in the university

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of Edinburgh. The younger son is the subject of the following notice.

ALISON, Sir ArcuiBaLp, Bart., the celebrated his- torian, younger son of the preccding, was born at Kenley, Shropshire, on the 29th December 1792. He studicd at the university of Edinburgh, distinguishing himself espe- cially in the classes of Greek and mathematics. In 1814 he passed at the Scotch bar, but he did not at once enter on the regular practice of his profession. The close of the war had opened up the Continent, and Alison, sharing with many of his countrymen the desire to witncss the scene of the stirring events of the previous twenty years, sct out in the autumn of 1814 for a lengthened tour in France. It was during this period, as he tells us in a characteristic passage of the work itsclf, that he "conceived the first idea" of writing his History, and "inhaled that ardent spirit, that dcep enthusiasm," which enabled him to accom- plish his self-imposed task. A more immediate result of the tour was his first literary work of any importance, Z'ravels in France during the Years 1814-15, which appearcd in the latter year. On his return to Edinburgh, Mr Alison practised at the bar for some years with but very modcrate success. In 1822, however, he became one of the four advocates-depute for Scotland. The extensive and varied

"experience gained in this office, which he held until 1830,

gave him the necessary qualifications for writing his Prin- ciples of the Criminal Law of Scotland (1832), and Practice of the Oriminal Law of Scotland (1833), works that are still of standard authority. It was the acknowledged merit of these treatises that chiefly induced Sir Robert Peel, during his brief administration of 1834, to confer on Mr Alison the important judicial office of sheriff of Lanark- shire, which ranks next in dignity and cmolument.to a judgeship in the supreme court. The office, though by no means a sinecure, afforded considerable leisure, which Mr Alison employed in not only making frequent contribu- tions to periodical literature, but also writing the long- projected History of

Europe, for which he had been collect- ing materials for more than fifteen years. The history of the period from the commenccment of the French revolu- tion till the restoration of the Bourbons in 1815 was completed in ten volumes in 1842, and met with a success almost unexampled in works of its class. Within a few years it ran through ten editions, and was translated into most of the languages of Europe, as well as into Arabic and Hindustani. At the time of the author's death it was stated that 108,000 volumes of the library edition and 439,000 volumes of the popular edition had been sold. A popularity so wide-spread must almost of necessity have had some basis of real merit on which to rest, and the good qualities of Mr Alison's work lay upon the surface. It brought together, though uot always in a well-arranged form, an immense amount of information that had before been practically inaccessible to the general public. It made an attempt at least to show the organic connection in the policy and progress of the different nations of Europe; and its descriptions of what may be called ex- ternal history—of battles, sieges, and state pageants—were always spirited and interesting. On the other hand, the faults. of the work were so numerous and glaring as to prevent it from ever taking rank as a classic. The general Style was prolix, involved, and vicious; inaccurate state- ments and fallacious arguments were to be found in almost every page; and the constant repetition of trite moral reflections and egotistical references seriously detracted from its dignity. A more grave defect resulted from the author's strong political partisanship, which entirely un- fitted him for dealing with the problems of history in a philosophical spirit. In the position of unbending Toryism which he occupied, it was impossible for him to give any

explanation of so complex a fact as the French revolution that would be satisfactory to reflective minds. Accordingly, his treatment of what may be called the inner history of those forces hidden in the French revolution which have made modern Europe what it is, was meagre and incomplete in the last degree.

A continuation of the History, embracing the period from 1815 to 1852, which was completed in four volumes in 1856, did not meet with the same success as the earlier work. The course of events did not

afford the same material for the cxercise of the author's powers of descrip- tion, and the period being so near as to be almost contem- porary, thcre was a stronger temptation, which he seems to have found it impossible to resist, to yield to political prejudice. Three great measures of English legislation— the Act restricting the paper currency, the Reform Act of 1832, and the Act abolishing the corn laws —were the object of his special aversion ; and, with little regard for consistency, he was in the habit of tracing, now to one and now to another of these measures, all the real and many imaginary evils in the state of thc nation. On the currency question, in regard to which he stood from the first almost alone in opinion, he has inserted several tedious disserta- tions in the continuation of his History, besides publishing a separate pamphlet in 1847. On the two other great measures he clung tenaciously to his opinion long after the more intelligent of his party had admitted the necessity, if not the justice, of the concessions that had bcen made. The use which Mr Alison made of statistics in the con- tinuation of his History to support his peculiar political and economic theories was little short of astounding. He will be acquitted of intentional unfairness only by those who are aware, not merely how easy it is to make figures yield any result that may be wished, but also how difficult it is to bring out the correct result, even with the most honest purpose, unless there be special aptitude and special training on the part of the investigator.

Mr Alison's successful litcrary carcer reccived from time to time duc recognition in the form of public honours. In 1845 he was chosen rector of Marischal College, Abcr- deen, and in 1851 he was raised to the same honourable position by the students of Glasgow University. In 1852 the dignity of baronet was conferred upon him by Lord Derby, and in the following year he was made a D.C.L. of Oxford. His literary activity continued till within a short time of his death, the chief works he published in addition to his History being the Principles of Population (1840), in answer to Malthus ; a Life of Marlborough (1847); and the Lives of Lord Castlereagh and Sir C. Stewart (1861). Three volumes of his political, historical, and miscellaneous essays were reprinted in 1850. Sir Archibald died at Possil House, Glasgow, on the 23d May 1867.

ALIZARIN, the principal colouring matter of madder, may be obtained by subliming on paper an alcoholic extract of madder, or by exhausting the root with water, precipi- tating with sulphuric acid, dissolving the moist precipitate in a solution of chloride of alumina, and separating the impure alizarin by the addition of hydrochloric acid. The impure alizarin is dissolved in alcohol, and separated as a lake on treating with hydrate of alumina, which is now boiled with carbonate of soda to separate another colouring matter called purpurin, and is finally treated with hydro- chloric acid, which dissolves the alumina and leaves the pure substance.

Alizarin in the anhydrous state forms red prisms, and in the hydrated condition crystals like mosaic gold. It dissolves sparingly in water even at the boiling point, but is soluble in alcohol or ether. Mineral acids do not de- compose the colouring matter at ordinary tempcratures. Caustic alkalis or alkaline carbonates dissolve alizarin.

forming deep purple solutions, from which acids precipitate in orange-coloured flakes. Alizarin has the atomic com- position C,,H,O,, and has recently been made synthetically from the hydrocarbon C,,H,, called anthracene, which occurs among the products of the destructive distillation of coal. This is the first example of the artificial forma- tion of a natural colouring matter. For further details see CHEMISTRY.

ALKALI, a term originally applied to the ashes of plants, now employed in inorganic chemistry as a generic name given to the group of compounds that have the pro- perty of neutralising acids. The use of the term is, however, generally confined to such members of the group as are soluble in water. 'The most soluble alkaline bodies are the oxides of potassium (potash), sodium (soda), lithium (lithia), and ammouium (aqueous ammonia); and next in order the oxides of calcium (lime), barium (baryta), and strontium (strontia). The solutions of these bodies excrt a canstic or corrosive action on vegetable and animal sub- stances, and precipitate the oxides of the

heavy metals from solutions of their salts. Many vegetable colouring matters are changed in tint by alkaline solutions—for instance, reddened litmus becomes blue, yellow turmeric brown, and syrup of violets and infusions of red cabbage green.

ALKALOIDS, the name of a group of organic bodies that possess alkaline properties. They are characterised by the property of combining with acids to form salts, and many have the power of giving an alkaline reaction with vege- table colours. All the natural alkaloids contain nitrogen as an essential constituent, and they are especially marked by possessing great medicinal power. Many artificial alkaloids have been made of recent years in which phos- phorus, arsenic, and antimony occupy the place of nitrogen. For the individual properties, tests, &c., of different alka-

‘ loids, see CHEMISTRY.

ALKANET (Alkanna tinctoria, or Anchusa tinctoria), a plant of the order Boraginacew, indigenous to the south of France and the shores of the Levant. It is extensively cultivated on the Continent for the sake of the root, which yields a fine colouring matter, imparting a beautiful car- inine tint to oils, wines, wax, and all unctuous substances. Being perfectly harmless, alkanct is much used for colour- ing in pharmacy. Some of the mixtures styled port wine owe their colour to this dye, and it is also employed in staining furniture.

AL-KINDI, Azu Yusur, &c., styled by pre-eminence “ The Philosopher of the Arabs,” flourished during the first half of the 10th century, and died at some unknown date posterior to 961. His literary activity was encyclopedic, and spread itself over all the sciences. The titles of his works number nearly 200 in the catalogue of Casiri, and amount to 265 in that of Fliigel; but the latter appears in some cases to have enumerated the same works under two divisions, and it is doubtful whether the philosopher has not been confounded with another writer of the same name. His treatises are arranged under the following heads, which throw some light on his classification of the sciences :— Philosophy in general, logic, politics, ethics, arithmetic (under which he discusses the unity of God), spherology, theory of music (which was

closely connected with all primitive speculation from its religious character), astronomy, meteorology, gco- metry, cosmology (the form, é&c., of the heavens), astrology, medicine, and on various arts, besides his commentaries and controversial writings. Of all these, none except some treatises on medicine and astrology remain. Others of them must have been known in the Middle Ages, for Al-Kindi is placed by Roger Bacon, along with Alhazen, in the first rank after Ptolemy as a writer on perspective (optics). Some of them were certainly trauslated by Gerard of Cremona. Whatever his influence may have been

on the Schoolmen, he was undoubtedly a great initiator as regards his countrymen. He was one of the carliest translators and commentators of Aristotle, but he appears to have been, like Al-Farabi, superseded by Avicenna. He marks the first philosophic revolt against Islamism, aud his doctrine on the simplicity and unity of the Deity was apparently equally Aristotelian and un-Mahometan. See Fliigel, Abhandlungen fiir die Kunde des Morgen- landes, erster Band, 1859.)

ALKMAAR, a town of the Netherlands, in the province of North Holland, situated on the Helder canal and on the railway between Haarlem and the Helder, about 20 miles N.N.W. of Amsterdam. The streets of Alkmaar

are extremely neat and regular, and are intersected by

canals lined with trees, while the ramparts of the town

have been converted into beautiful boulevards. Many of the public buildings are elegant, especially the church of

St Lawrence, a Gothic edifice of the 15th century. Alk-

maar is the seat of a court of primary jurisdiction and of a tribunal of commerce, and possesses good schools as well as several literary and scientific societies. Its principal article of commerce is cheese, for which it is said to be the

chief market in the kingdom, if not in the world. Besides

cheese, it has a good trade in butter, corn, and cattle, and manufactures of salt, sailcloth, soap, vinegar, and leather. Alkmaar successfully sustained a siege by the Duke of Alba in 1573, and in 1799 gave its name to a convention

signed by the Duke of York and the French general Brune, in accordance with which the Russo-British army evacuated Holland. Population, 12,000.

ALKMAAR, Hxrnrik von, the German translator of

the celebrated satirical poem Reineke de Vos, flourished in

the latter half of the 15th century. In the preface to his work, which is the only source of information as to his life, he states that he was tutor to the Duke of Lorraine, and that he translated the poem from the Walsch. In spite of the latter statement, many have attributed the authorship to him ; but it is now known that the story had a much earlier origin. Some have supposed the name Alkmaar to be a pseudonym.

ALL-SAINTS DAY, Att-HatLows, or HALLowMAS, 4 festival, first instituted about 610 a.D., on the Ist of May, in memory of the martyrs, and celebrated since 834 on the 1st of November, as a general commemoration of all the saints. As the number of saints increased, it became im- possible to dedicate a feast-day to each. Hence it was found expedient to have an annual aggregate commemora- tion of such as had not special days for themselves. The festival is common to the Roman Catholic, English, and Lutheran churches. See BELTANE.

ALLAH, the Arabic name for the one true God which is employed in the Koran, and has been adopted into the language of all Mahometan nations. It is compounded of al, the definite article, and tah, meaning worthy to be adored. See MAHOMETANISM.

ALLAHABAD, a division, district, and city of British India, under the jurisdiction of the heutenant-governor of the North-Western Provinces. The ALLAHABAD DIvision comprises the six districts of Allahabad,

Cawnpur, Fathi- pur, Hamirpur, Bandé, and Jaunpur. It is bounded on the north and east by the EtAwah and Farrakhabdd districts and the province of Oudh; on the south by the Benares division aud the Rewah state; and on the west by the states of Bandelkhand and the Jhéusi division. Total population (1872), 5,466,116.

ALLAHABAD District lies between 24° 49' and 25°44 N. lat., and between 81°14' and 82° 26' E. long. _In shape the district is that of an irregular oblong; and it is dilli- cult accurately to describe its boundaries, as at one extre mity it wanders into Oudh, while on the south the villages

of the state of Rewah and those of this district are hope- lessly intermingled. Roughly speaking, however, the boun- daries may be described as follows:—On the north by the district of Jaunpur and by the Ganges; on the west by the districts of Fathipur and Banda; on the south by the inde- pendent state of Rewah;, and on the east by the districts of Mirz4pur and Jaunpur. The settlement of the district is at present undergoing revision; and as the measurements are still ineomplete, it is impossible to state the exact area. For practical purposes, it may be estimated at 2802 square miles, or 1,793,906 acres, of which 1,065,990 acres are cultivated, and 727,916 acres are uneultivated; of this latter, however, there are about 250,000 acres capable of being brought under tillage, although not actually eulti- vated. The eensus of 1872 returned the population of the district at 1,394,245 souls, of whom 1,211,778 are Hindus, 181,574 Mussulmans, and 893 Christians. There is, how- ever, a manifest error in these figures, as the European and Eurasian population of Allahabad eity alone eannot be set at a lower figure than 3500. The eensus returns are in consequence undergoing revision. Of the Hindu popula- tion, 173,916 are returned as Brdhmaus,

The Jamna and the Ganges meet at Allahabad city, and enclose within their angle a fertile tract, well irrigated by means of tanks and wells. The Kast Indian Railway and the Grand Trunk road afford the principal means of land communication. The former enters the district

from the east, crosses the Jamnda at Allahabad city, and travels westward, leaving the district near Khaga station. The Grand Trunk road enters Allahabad froin the north-cast, meets the railway at Allahabad city, and thence runs almost parallel with it till it leaves the district. Only three towns are returned as con- taining a population of over 5000 souls—viz., Allahabad, population 144,464; Manaima, population 6146; and Chizwa, population 5791. Rice is the principal crop, the area under it being returned at 139,000 acres, and the average produce at 5} cwt. per acre. A little more than half of the total rice crop is retained for local con- sumption, and the remainder exported. 'The average price of com- mou rice in February 1873 was 6s. 9d. per cwt. Pulses are also grown in large quantitics, the area under the various sorts being about the same as ricc, and the yield also about the same. Joar and bajra cover as large an area as either rice or pulses, but the yield is neither so large nor of such value. About half the crop 1s said to be annualiy cxported. Wheat is cultivated to the extent of about 150,000 cwt. per annum, of which about one-half is exported ; the average yield is said to be about 64 cwt. per acre, and the average price from 6s. 2d. to 6s. 9d. per cwt. Mustard, tobacco, opium, linseed, and indigo are also cultivated largely, with cotton and sugar-cane in sinall quantities. Indigo stands first among the manufactures of the district, and large factories exist at Alam- chand, Sardi Salem, Gadupur, Kansaridh, Thardai, and Dum-duma. These are generally under the supervision of European managers, and the produce is forwarded direct to the Calcutta market. Next to indigo, the most important industry is stone-cutting. The stone is chiefly quarried from a low range of hills nea1 Shiorajpur, whence it is carricd in country carts to the Jamna river; and after crossing it in flat-bottomed boats, it is finally landed at Balwa Ghat. Here the stone-masous take it in hand. The gross income of the Balwé Ghat stone traders is cstimated at £2000 per annum. A brisk trade is also carried on in hides, the principal mart being the village of Karwa, in Arail fiscal division, where it is estimated that the sale of skins amounts to upwards of £10,000 pcr annum for the Mirzapur and Calcutta hide markets. Paper is manufactured in the fiscal division of Karra, and a considerable quantity exported to Oudh. Several villages in the fiscal divisions of Karra and Chail are noted for the manufacture of brass

and copper vessels; and iron vessels are largely manufacturcd in Khairdégarh, Karra, and Phulpur. The East India Railway Company have a large castor-oil manufac- tory at the village of Manauri. The total net revenue of the district in18/1-72 is returned at £244,537, and the total nct civil expenditure at £51,770. The district passed into the hands of the English in 1801, by a treaty between the Vazir of Oudh and the East India Conipany.

Autanspdp Crry, the capital of the North-Western Provinces, is also the administrative headquarters of the Allahdbéd division and of the district of the same name. It is situated at the confluence of the Ganges and Jamné rivers, in 25° 26' N. lat., and 81° 55' E. long. Its most conspicuous feature is the fort, which rises directly from the banks of the eonflucut rivers, and com-

pletely commands the navigation of both streams. Within the fort are the remains of a splendid palace, erected by the Emperor Akbar, and once a favourite residence of his, A great portion of it has been destroyed, and its hall is converted into an arsenal. Outside the fort, the places most of importance are the Sardi and garden of Khasru, the son of the Emperor Jahangir, and the Juma Masjid, or great mosque. When the town first came into the hands of the English this mosque was used as a residence by the military officer commanding the station, and after- wards as an assembly-room. Ultimately it was returned to its former owners, but the Mahometans considered it desecrated, and it has never since been used as a place of worship. Allahabad is one of the most noted resorts of Hindu pilgrimage. It owes its sanetity to its being the reputed confluenee of three sacred streams—the Ganges, the Jaina, and the Saraswati. This last stream, howevcr, is not visible. It leaves the Himalayas to the west of the Jamnd, passes elose to Thducswar in the Panjab, and loses itself in the sands of Sirhind, 400 miles north-west of Allahabad. The Hindus, however, assert that the streain joins the other two rivers under ground, and in a subter- raneous temple below the fort a little moisture trickling from the rocky walls is pointed out as the waters of the Saraswati. An annual fair is held at AJlahabAd, at the confluence of the streams, on the occasion of the great bathing festival, at the full

moon of the Hindu month of Magh. Allahdbad was taken by the British, in the year 1765, from the Vazir of Oudh, and assigned as a residence for Shah Alam, the titular Emperor of Dehli. Upon that prince throwing himself into the hands of the Marhattas, the place was resumed by us in 1771, and again trans- ferred to the Nawab of Oudh, by whom it was finally ceded, together with the district, to the British in 1801, in commutation of the subsidy which the Vazir had agreed to pay for British protection. The population and trade of Allahabad city have rapidly increased of late years, Aceording to the eensus of 1853, the city and suburbs contained 72,098 inhabitants. Before 1872 the popula- tion had exactly doubled, the census returns for that year exhibiting a total population of 144,464. The municipal ineome and expenditure of Allahabad city in 1871-72 were as follows :—Income—Octroi duties, £13,676, 14s.; tax on professions, £220, 10s.; carriage tax, £1264, 4s.; proceeds of the Hindu fair and ground rents, £5364: total municipal income, £20,525, 8s.; incidence of taxation, 2s. 11d. per head of the population. Expenditure—Establishment, in- eluding eost of collection, police, conservancy, and lighting, £9906, 4s. ; street watering, £1002, 12s. ; new works, £7677, 16s.; repairs, £1088, 2s.; vaccination, £20; dispensary, £330; charities, £250; Alfred Park, £800; other items, £223, 2s.: total, £21,297, 16s, Allahdbad forms the junc- tion of the great railway system whieh unitcs Bengal with Central India and Bombay, and it is rapidly developing into a great centre of inland and export trade. ALLAMAND, Jean Nicouas SEBASTIAN, natural philo- sopher, born at Lausanne in 1713, was educated for the church, and held for a short time a clerical appointment at Leyden. Here he enjoyed the patronage and friendship of the celebrated S'Gravesende, who made him his literary executor. In 1747 he was appointed professor of philosophy and natural history at Franeker, and two years later he was transferred to a similar ehair at Leyden, whieh he occupied until his death in 1787, Allamand's ehicf service to science consisted in translating and editing the seientific works of others, but he also made some original discoveries of importance, especially in connection with electricity. He was the first to explain fully the pheno- mena of the Leyden jar, and he made a near approach to the diseovery of negative electricity. He greatly cnriched

the botanical garden and natural history museum at Leyden by specimens from all quarters of the globe. His translation of Buffon’s works was published at Amsterdam, in thirty-eight quarto volumes, between 1766 and 1779. Allamand was a member of the Royal Society of London and of the Academy of Sciences at Haarlem. ALLAN, Davin, a Scottish historical painter of cousider- able celebrity, was born at Alloa on the 13th February 1744. At a very early age he gave such proofs of natural artistic talent as led to his being placed under the care of the Messrs Foulis, who some time before had instituted an academy in Glasgow for painting and engraving. On leaving the academy (1762), after seven years’ successful study, he obtained the patronage of Lord Cathcart and of Erskine of Mar, on whose estate he had been born. The latter furnished him with the mcaus of proceeding to Rome (1764), where he remained for a number of years engaged principally in copying the old masters. Among the original works which he then painted was the “Origin of Portraiture ”—represent- ing a Corinthian maid drawing her lover’s shadow—well known through Cunego’s excellent engraving. This gained for him the gold medal given by the Academy of St Luke in the year 1773 for the best specimen of historical com- position. Returning from Rome in 1777, be resided for a time in London, and occupied himself in portrait- painting. In 1780 he removed to Edinburgh, where, on the death of Alexander Runciman in 1786, he was appointed director and master of the Academy of Arts. There he painted and etched in aquatint a variety of works, those by which he is best known—as the Scotch Wedding, the Highland Dance, the Repentance Stool, and his Jllustrations of the Gentle Shepherd—being remarkable for their comic humour. He has had frequently applied to him the name of the “Scottish Hogarth ;” but his drolleries are not to be compared for a moment with the productions of the great English satirist. Allan died at Edinburgh on

the 6th August 1796. ALLAN, Srr Witiiam, R.A., and president of the Royal Scottish Academy, was born at Edinburgh in 1782. At an early age he was entered as a pupil in the School of Design established in Edinburgh by the Board of Trustees for Arts and Manufactures, where he had as companions, Wilkie, Burnet the engraver, and others who afterwards distinguished themselves as artists. Here Allan and Wilkie were placed at the same table, studied the same designs, and contracted a friendship which termi- nated only with their lives. Leaving the Edinburgh school, 'Allan prosecuted his studies for some time in London ; but his attempt to establish himself there was unsuccessful, and after exhibiting at the Royal Academy (1805) his first picture, A Gipsy Boy and Ass, an imitation in style of Opie, he determined, in spite of his scanty resources, to seek his fortune abroad. He accordingly set out the same year for Russia, but was carried by stress of weather to Memel, where he remained for some time, sup- porting himsclf by his pencil. At last, however, he reached St Petersburg, where the kindness of Sir Alexander Crichton, the court physician, and other friends procured him abundant employment. The emoluments of his profession enabled him by and by to make excursions into southern Russia, Turkey, the Crimea, and Circassia, where he filled his portfolio with vivid sketches, of which he made admirable use in his subsequent pictures. In 1814 he returned to Edinburgh, and in the two following years exhibited at the Royal Academy The Circassian Captives and Bashkirs conducting Convicts to Siberia. The former composition, which united graceful forms and powerful expression with novel and picturesque costumes, established his reputation as a master in the highest walk of art; but the picture remained so long unsold in the studio of the artist, that, thoroughly disheartened, he threatened to retire to Circassia

when, through the kindness of Sir Walter Scott, a sub- scription of 1000 guineas was obtained for the picture, which fell by lot into the possession of the Earl of Wemyss. About the same time the Grand Duke Nicholas, after- wards emperor of Russia, visited Edinburgh, and purchased his Siberian Exiles and Haslan Gheray crossing the River

Kuban, giving a very favourable turn to the fortunes of the painter, whose pictures were now sought for by col- lectors. From this time to 1834 we find him pursuing his art in the sphere in which he achieved his greatest success and firmly established his fame, the illustration of Scottish history. His most important works of this class were Archbishop Sharpe on Magus Moor; John Know admonishing Mary Queen of Scots (1823), engraved by Burnet; Mary Queen of Scots signing her Abdication (1824); and Regent Murray shot by Hamilton of Bothwell- haugh. The last procured his election as an associate of the Royal Academy (1825). Later Scottish subjects were Lord Byron (1831), portraits of Scott, and The Orphan (1834), which represented Anne Scott seated near the chair of her deceased father. In 1830 he was compelled, on account of an attack of ophthalmia, to seek a milder cli- mate, and visited Rome, Naples, and Constantinople. He returned with a rich store of materials, of which he made excellent use in his Constantinople Slave Market and other productions, In 1834 he visited Spain and Morocco, and in 1841 went again to St Petersburg, when he undertook, at the request of the Czar, his Peter the Great teaching his Subjects the Art of Shipbualding, exhibited in London in 1845, and now in the Winter Palace of St Petersburg. His Polish Exiles and Moorish Love-letter, &c., had secured his election as a Royal Academician in 1835; he was appointed president of the Royal Scottish Academy (1838), and limner to Her Majesty for Scotland, after Wilkie's death (1841); and in 1842 received the honour of knight- hood. His later years were occupied with battle-pieces, the last he finished being the second of his two companion pictures of the Battle of Waterloo. He died on the 22d February 1850, leaving a large picture unfinished—Bruce at Bannockburn—which exhibits no traces of impaired power.

ALLEGHANY, A LLEecHENy, or ALLEGANY Movwn- TAINS, is the name often given to the Appalachian Moun- tains in the United States. A more exact use of the name restricts it to the portion of the system that lies west of the Hudson river, and forms the watershed of the Mississippi basin on the south-east. See APPALACHIAN MouNnTAINS.

ALLEGHANY, a river of the United States, which rises in the north of Pennsylvania, and after flowing about 300 miles, first in a northerly, but for the greater part of its course in a westerly direction, during which it passes for a short distance into the state of New York, unites with the Monongahela at Pittsburg to form the Ohio. The country through which it flows is mostly hilly, and large numbers of pines, white oaks, and chestnuts grow upon its banks, It is navigable for small steamers for about 200 miles above Pittsburg.

ALLEGHENY, a large suburb of Prrrspure (g.v.) In 1870 it contained 53,180 inhabitants.

ALLEGIANCE, either derived from the French alle- geance or taken from the same Latin source, has been used to express that duty which a person possessing the privi- leges of a citizen owes to the state to which he belongs, and is technically applied in law to the duty which @ British subject owes to the sovereign as representing the state. It has been divided by the English legal com- mentators into natural and local ; the latter applying only to the deference which a foreigner must pay to the institu- tions of the country in which he happens to live ; but 1t is in its wider sense that the word is important, as repre- senting a condition attached to mankind of which it 1s

very difficult in theory, and still more in practice, to adjust the true character and limits. or a state to decide what persons are bound to it by allegiance may be easy, but for 4 man to know where his allegiance lies when two or more states claim him—and hence for jurists to decide what is the reasonable extent to which any state ought to make such a claim—is often involved in difficulty. The English doctrine, which was also adopted in the United States, asserted that allegiance was indelible. Nemo potest exuere patriam (Forsyth's Cases and Opinions in Constitutional Law, pp. 257, sqq., 333, sq.) Accordingly, as the law stood before 1870, every person born within the British dominions, though he should be removed in infancy to another country where his family resides, owes an allegiance to the British crown which he could never resign or lose, except by Act of Parliament or by

the recognition of the independence or the cession of the portion of British terri- tory in which he resided. By the Naturalisation Act, 1870, 33 d& 34 Vict. c. 14 (see ALIEN), it was made possible for British subjects to renounce their nationality and allegiance, and the ways in which that nationality is lost are defined. So British subjects voluntarily naturalised in a foreign state are deemed aliens from the time of such naturalisation, unless, in the case of persons naturalised before the passing of the Act, they have declared their desire to remain British subjects within two years from the passing of the Act. Persons who, from having been born within British territory are British subjects, but who at birth became under the law of any foreign state subjects of such state, and also persons who, though born abroad are British subjects by reason of parentage, may by declarations of alienage get rid of British nationality.

ALLEGIANCE, Oath of, an oath of fidelity to the sove- reign taken by all persons holding public office. By ancient common law it might be required of all persons above the age of twelve, and it has repeatedly been used as a test for the disaffected. It was first imposed by statute in the reign of Elizabeth (I. c. 1), and its form has more than once been altered since. Up to the time of the Revolution the promise was "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to kuow or hear of any ill or damage intended him without defending him therefrom." This was thought to favour the doctrine of absolute non-resistance, and accordingly the Convention Parliament enacted the form that has been in use since that time—'"TI do sincerely promise and swear that I will be faithful and bear true allegiance to Her Majesty Queen Victoria." These words are included in the form pre-

scribed by 21 & 22 Vict. c. 48, which substitutes one oath |

for the oaths of allegiance, supremacy, and abjuration. ALLEGORY (ddXos, other, and dyopetw, to speak), a figurative representation conveying a meaning other than and in addition to the literal. It is generally treated as a figure of rhetoric, but the medium of representation is not necessarily language. An allegory may be

addressed to the eye, and is often embodied in painting, sculpture, or some form of mimetic art. The etymological meaning of the word is wider than that which it bears in actual use. An allegory is distinguished from a metaphor by being longer sustained and more fully carried out in its details, and from an analogy by the fact that the one appeals to the imagination and the other to the reason. The fable or parable is a short allegory with one definite moral. The allegory has been a favourite form in the literature of nearly every nation. The Hebrew scrip- tures present frequent instances of it, one of the most beautiful being the comparison of the history of Israel to the growth of a vine, in the 80th psalm. In classical literature one of the best known allegories is the

story of the stomach and its members in the speech of Menenius Agrippa (Livy, ii. 32); and several occur in Ovid's Metamorphoses. Perhaps the most elaborate and the most successful specimens of allegory are to be found in the works of English authors. Spencer's Faerie Queene, Swift's Tale of a Tub, Addison's Vision of Mirza, and, above all, Bunyan's Pilgrim's Progress, are examples that it would be impossible to match in elaboration, beauty, and fitness, from the literature of any other nation.

ALLEGRI, Anronto. See CoRREGGIO.

ALLEGRI, Grecorio, musical composer, probably of the Correggio family, was born at Rome about 1580. He studied music under Nanini, the intimate friend of Pales- trina. Being intended for the church, he obtained a benefice in the cathedral of Fermo. Here he composed a large number of motetts and sacred pieces, which, being brought under the notice of Pope Urban VIII., obtained for him an appointment in the choir of the Sistine chapel at Rome. He held this from Dec. 1629 till his death on the 18th Feb. 1652. His character seems to have been singularly 'pure and benevolent. Among the musical compositions of Allegri were two volumes of Concerti, published in 1618 and 1619; two volumes of Motetts, published in 1620 and 1621; besides a number of works still in manuscript. He was one of the earliest composers for stringed instruments, and Kircher has given one speci- men of this

class of his works in the Musurgia. But the most celebrated composition of Allegri is the dfiserere, still annually performed in the Sistine chapel at Rome. It is written for two choirs, the one of five and the other of four voices, and has obtained a celebrity which, if not entirely factitious, is certainly not due to its intrinsic merits alone. The mystery in which the composition was long enshrouded, no single copy being allowed to reach the public, the place and circumstances of the performance, and the added embellishments of the singers, account to a great degree for much of the impressive effect of which all who have heard the music speak. This view is confirmed by the fact, that when the music was performed at Venice by permission of the pope, it produced so little effect that the Emperor Leopold IL. at whose request the manuscript had been sent, thought that something else had been sub- stituted. In spite of the precautions of the popes, the Miserere has long been public property. In 1769 Mozart was able to write it down after hearing it twice ; and in 1771 a copy was procured and published in England by Dr Burney. The entire music performed at Rome in Holy Week, Allegri's Miserere included, has been issued at Leipsic by Breitkopf and Hartel. Interesting accounts of the impression produced by the performance at Rome may be found in the first volum? of Mcndelssohn's letters, and in Miss Taylor's Letters from Italy.

ALLEINE, Josepxu, Nonconformist divine, the author of An Alarm to the Unconverted—a book which remains as potential as when first modestly sent forth, scarcely second to Richard Baxter's Call to the Unconverted—was otherwise noticeable. Baxter himself wrote a characteristic introduction to his Life fully two centuries ago (1672); while recently (1861) the Rev. Charles Stanford has retold his story and the story of his age with great fulness of knowledge and historical fidelity. The Alleines came out of Suffolk, and as early as 1430 some of them—sprung of Alan, lord of Buckenhall—settled in the neighbourhood of Calne and Devizes, whence descended the immediate ances- tors of "' worthy Mr Tobie Alleine of Devizes," father of our worthy. Joseph Alleine, fourth of a large family, was born at Devizes early in 1634. 1645 is marked in the title-page of a quaint old tractate, by an eye-witness, as his "' setting forth in the Christian

race.’ His eldest brother Edward had been a clergyman, but in thiS‘year died, in his twenty-

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seventh year ; and Joseph entreated his father that he might be educated to succeed his brother in the work of the ministry. His father consented, and he was immediately scnt to Poulshot, then under a fellow of Exeter College, Oxford (William Spinage) In April 1649 he set out for Lincoln College, Oxford, in the pre- sidency of Dr Paul Hood, with Dr John Owen as the vice-chancellor of the university. A Wiltshire place be- eoming vacant in Corpus Christi College, on the 3d Nov. 1651 he was chosen scholar of that house. Of his student life it was written contemporaneotisly, " fe could toil terribly." On 6th July 1653 he took the degree of B.D., and thereupon becanie a tutor of his college. He became also chaplain of Corpus Christi, preferring this to a fellow- ship. In 1654 he had offers of high prefermeut in the state, which he declined. 'The succeeding year (1655) brought him another offer, which he did not decline. George Newton, of the great church of St Mary Magdalene, Taunton, sought him for assistant ; and putting from him all other things, even forsaking further academical honours within his immediate grasp, he accepted the invitation by proceeding at once to Tauuton, undergoing the accustomed probation, and at last being ordained as the associate of one of the most venerable of the later Puritan fathers. The ministry that resulted stands out lustrous and noble in the history of historical Taunton, and in the Life of the junior pastor, as told by Baxter and Stanford. Almost coincident with ordination came the marriage of the associate – pastor with Theodosia Alleine, daughter of Richard Allcine. Friendships among "gentle and simple" —of the former, with Lady Farewell, grand-daughter of Pro- tector Somersct—bear witness to the attraction of Alleine's private life. His public life—in preaching after the in- tense, awakening, wistful type; in catechising with all diligence and fidelity ; in visitation among the poor and mean and sad; in letter-writing, tender and sympa- thetic; in devotional intercession through long consecrated hours of day and night—was a modcl of pastoral devo- tion. This is all the more remarkable as the pastor continued the student-toil of Corpus Christi, one monu- ment of which was his Theologia Philosophica, a lost MS., establishing the harmony between revelation and nature, and whose learning—classical, patristic, and recondite—drew forth the wonder of Baxter. Allcine was no mere scholar or divine, but a man who asso-

ciated on equal terms with the patriarchs of the Royal Society, then laying those broad and deep foundations on which rests England's present scicutifie renown. These scientific studies and experiments, nevertheless, were ever kept in subordination to his proper work. The extent of his influence was, in so young a man, unique, resting fundament- ally on the earnestuess of his nature and the manifest power of his ministry. The year 1662 found senior and junior pastors like-minded, and both were of the Two Thousand. Alleine, when the Ejection blow fell, with John Wesley (grandfather of the celebrated John Wesley) for fellow- labourer, also ejected, carried on a kind of itineracy where- ever opportunity was found for preaching the gospel. For this he was cast into prison, indicted at sessions, and ' suffered as hundreds of England's noblest men have suf- fered. His Letters from Prison were an earlier Cardi- phoma. He was released on 26th May 1664; and spite of the Conventicle Act (Five Mile Act), he returned to his beloved work as a preacher of the gospel. He found limself again in prison, and again and again a sufferer. Tempestuous and troubled were his remaining years. Now in hiding, now in great bodily weakness, now coming to the front in some act of charity or patriotism, now at the waters of Bath, slowly but serenely wearing out. He died November 17, 1668; and the mourners, remember-

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ing their beloved minister's words while yet with them, "Tf I should die fifty miles away, let me be buried at Taunton," found a grave for him in St Mary's chancel,

Pilgrims from over the sea read with dim eyes the brief

Latin inscription on his stone. No Puritan-Nonconformist name is so affectionately cherished as is that of Joseph Allcine. " Being dead he yet speaketh" through his im- perishable practical books. (Life, cdited by Baxter; Joseph Alleine: his Companions and Times, by Charles Stanford, 1861; Wood's Athene,; Palmer's Nonc. Mem., s.v.; Har- leian MSS., and Williams MSS.) (A. BG

ALLEINE, Ricnarp, M.A., author of Vindiciee Pietatis, was educated at St Albans Hall, Oxford, where Anthony & Wood states he was entered commoner in 1627, aged sixtecn ; and where, having taken the degree of B.A., he transferred himself to New Inn, and continued there until he proceeded M.A. He and the like-minded William Alleine were sons of Richard Alleine, rector for upwards of fifty years of Dichet, Somerset. The younger Richard being ordained, became assistant to his venerable father, and immediately stirred the entire county by his burning eloquence. In March 1641 he succceded to many-sided Richard Bernard as rector of Batcomb (Somerset). He declared himself on the side of the Puritans by subscribing "The testimony of the ministers in Somersetshire to the truth of Jesus Christ" and "The Solemn League and Covenant." He continued for twenty years rector of Batcomb. On the Act of Uniformity being passed, he cast in his lot with the Two Thousand of the ejected. Upon the Five-Mile Act he removed to Frome Sclwood, and preached there and around until his death on December 22, 1681. His works are all of the richest spiritual cha- ractcr, with a wistfulness of appeal that goes right to the heart. His Vindicte Pietatis (which appeared succes- sively in 1660, 1663, and 1665) was refused licence by Sheldon, and was published, in common with other Non- conformist books, without it. It was rapidly bought up, and 'did much to mend this bad world." Roger Norton, the king's printcr, caused a large part of the first impres- sion to be seized, on the ground of not being licensed, and to be sent to the royal kitchen. Glancing over its pages, he was struck with what he read, and on secoud thoughts it seemed to him a sin that a book so holy—and so sale- able—should be destroyed. He therefore bought back the shects, says Calamy, for an old song, bound them, and sold them in his own shop. This in turn was complained of against him, and the shrewd publisher had to beg pardon on his knees before the council-table ; and the remaining copies were sentenced to be " bisk'd," or rubbed over with au inky brush, and sent back to the kitchen for lighting fires. Such " bisk'd" copies occasionally occur still. The book was not killed. It was reissued, with additions, and a contribution by Joseph Alleine, and went forth on a mission which has endured to our day. (Calamy, s.2. ; Palmer's Nonconf. Mem. iii. pp. 167-8; C. Stanford's

Joseph Alleine; Researches at Batcomb and Frome Selwood; Wood's Athene, s.v.) (A. B. G.)

ALLEN, Boo or, the name given to a congeries of morasses in Kildare and King's County, Ireland. Clane Bog, the eastern extremity, is 'within 17 miles of Dublin, and the morasses extend westward almost to the Shannon. Their total area is about 238,500 acres. They do not form one continuous bog, the tract of the country to which the name is given being intersected by strips of dry cultivated land. The rivers Brosna, Barrow, and Boyne take their rise in these morasses; and the Grand Canal crosses them. The Bog of Allen has a gencral elevation of 250 feet above the level of the sea, and the average thickness of the peat of which it consists is 25 feet. It rests on a subsoil of clay and marl.

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ALLEN, Joun (1770-1843), was born near Edinburgh, aud,educated at the university of that city, where he took the degree of M.D. in 1791. With youthful enthusiasm, Allen joined the Scottish movement of that period for parliamentary rcform. He was an acute metaphysician, aud the prelections on physiology which he delivered in Edinburgh are distinguished by clearness and_ precise philosophical views. Leaving Edinburgh, he took up his abode at Holland House as the friend and private secre- tary of the late Lord Holland. In 1811 he was elected warden of Dulwich College; and in 1820 obtained the comfortable sinecure of master of that institution, where he died in 1843. Allen's detached publications, though well written, are not very important, if we except his valuable Inquiry into the Growth of the Royal Prerogative (1830), "a learned and luminous work ;" but he was an able contributor to the Edinburgh Leview, to which he is said to have furnished no less than forty articles, chiefly on physiological, metaphysical, and political subjects; and some of his contributions on French and Spanish history are very interesting. For this last department he was peculiarly fitted by his residence with Lord Holland in France and Spain; he had even collected materials for a history of Spain, but was hindered from fulfilling his pur- pose by his deep

interest in politics. The latter portion of his life was divided between politics and the study of the history of the British constitution. Brougham, in his éloge of Allen (Works, vol. iv., 1872), has highly commended him for extensive learning and philosophical talent.

ALLEN, or ALLEYN, Tuomas (1542-1632), a famous English mathematician, was boru at Uttoxeter in Stafford- shire, 21st December 1542. He was admitted scholar of Trinity College, Oxford, in 1561; and in 1567 took his degrce of master of arts. In 1580 he quitted his college and fellowship, and retired to Gloucester Hall, where he studied very closely, and became famous for his knowledge of antiquity, philosophy, and mathematics. Having received an invitation from Henry, Earl of Nor- thumberland, a great friend and patron of men of science, he spent some time at the earl's house, where he became acquainted with Thomas Harriot, John Dee, aud other famous mathematicians. He was also intimate with Cotton, Camden, and their antiquarian associates. Robert, Earl of Leicester, had a particular esteem for Allen, and would have conferred a bishopric upon him, but his love of solitude made him decline the offer. His great skill in mathematics earned him, as was usual in those times, the eredit of being a magician; and the author of Levcester's Commonwealth accuses him of employing the art of "figuring" to further the Earl of Leicester's unlawful designs, and of endeavouring by the black art to bring about a match between his patron and Queen Elizabeth. Allen was indefatigable in collecting scattered manuscripts relating to history, antiquity, astronomy, philosophy, and mathematics. A considerable part of his collection was presented to the Bodleian library by Sir Kenelm Digby. He published in Latin the second and third books of Claudius Ptolemy of Pelusium, Concerning the Judgment of the Stars, or, as it is commonly called, of the Quadri: partite Construction, with an exposition. He wrote also notes on some of Lilly's books, and on Bale's De Scrip- toribus M, Britannic.

_ ALLENTOWN, formerly called NortHamptoy, a thriv- ig town of the United States, capital of Lehigh county. Pennsylvania, is pleasantly situated on a height on the western bank of the Lehigh River, 85 miles E.N.E. of Harrisburg. It is a well-built place, and contains a good

court-house, a military institute, an academy, and a theo- logical seminary. Most of the inhabitants are of German aescent ; the German language is commonly spoken, and

is used along with English both in the newspapers and in the courts of law. The valley of the Lehigh is very rich in iron ore and anthracite, and in the town and neigh- bourhood extensive iron-works and anthracite furnaces are in operation. This trade is being rapidly developed, and is favoured by good railway comnimunication, New York and Philadelphia being both within 100 miles of Allentown by rail. A tenth of the whole iron manufactured in the United States is said to be produced here. Population

(1870), 13,884.

ALLESTRY, or Axuestrer, Ruicwarp, D.D., was born at Uppingtown in Shropshire in 1619, and educated in the grammar school of Coventry, and afterwards at Christ Church, Oxford. After passing as bachelor of arts he was made successively moderator in philosophy, canon of Christ Church, doctor of divinity, chaplain in ordinary to the king, and regins professor of divinity. His early studies, however, were interrupted by the hos- tilities of the times. In the year 1641 he and many other students of Oxford entered the royal service, and gave signal proofs of their. courage and loyalty. A short interval of hostilities permitted Allestry to return to his literary pursuits ; but scon after, he again took up arms, and was present at the battle of Keintonficld. On his way to Oxford to prepare for the reception of the king he was taken prisoner, but was released by the king's forces. A violent discase which then prevailed in the garrison of Oxford brought Allestry to the brink of the grave; but recovering, he again joined a regiment of voluntecrs, chiefly consisting of Oxford students. Here he served as a common soldier, and was often seen with the musket in one hand and a book in the other. At the close of the revolutionary struggle he returned to his favourite studies, but still continued true to his party. Tus occasioned his expulsion from the college; but he was provided with a comfortable retreat in the familics of the Honourable Francis

Newport and Sir Anthony Cope. Such was the confidence reposed in him that when the friends of Charles II. were secretly preparing the way for his restoration, they entrusted him with personal messages to the king. In returning from one of these interviews he was seized at Dover, and upon examination committed a prisoner to Lambeth House. The Earl of Shaftesbury obtained his release in a few weeks. His valuable library was be- queathed to the university. He died in January 1681. He erected at his own private expense the west side of the outward court of Eton College, and the grammar school in Christ Church College ; besides settling several liberal pensions upon individual persons and families. His only extant work is a volume of sermons, printed at Oxford in 1684.

ALLEYN, Epwarp, eminent as a stage-player in the reigns of Elizabeth and James I., but better remembered in after-times as the founder of Dulwich college, was born in London, in the parish of St Botolph, Bishopsgate, on the 1st of September 1566. When he was only four years old, his father, an innkeeper, died, and his mother soon afterwards married an actor named Browne. This change in his domestic surroundings brought young Alleyn into early and close association with the stage, for which he possessed great natural aptitude. Thus it chanced that 'che was bred a stage-player," as stated by Fuller (WVorthzes). A tenacious memory, a polished elocution, a stateliness of figure and countenance, and a genial temperament, were among the natural and acquired accomplishments that he brought to bear on his chosen pursuit. He gained distinc tion in his calling while yet quite a young man, and by common consent was eventually rated as the foremost actor of lis time. Several prominent dramatists and other writers of the period have left forcible testimony to his

rare excellence in the histrionic art. Ben Jonson, a critic nowise prone to exalt the merits of men of mark among his contemporaries, but addicted rather to disparagement, and even, as Drummond of Hawthornden tells, to bitterest detraction, bestowed, ucvertheless, unstinted praise on Alleyn's acting (see Jonson's Hpigrams, No. 89).

Nash, in Pierce Pennyless, his Supplication to the Devil, expresses in prose the same eulogy that Jonson renders in verse. Hey- wood calls Allcyn "inimitable," "the best of actors," and " Proteus for shapes and Roscius for a tongue."

—(Prologue to Marlowe's Jew of Malta.) Peele's Ictter to Marlowe, quoted by several of Alleyn's biographers, telling of a merry meeting at which Shake- speare, Ben Jonson, and Alleyn figure in the front rank of a group of choice spirits, has long been numbercd among literary forgeries. (Sec the Life prefixed to Dyce's Peele's Works, 1829.)

But ample and clear evidence remains to show his great celebrity as an actor. His professional earnings as a player formed, however, one only, and not the chicf, among several sources from which he drew the wealth that afterwards sustained his great foundation ; and his fame as an actor must long since have faded into a dim tradition, of little or no concern to present times, but for the association of his name with an institution around which cluster interesting historic reminiscences, and whose future is fraught with high promise. He inherited house property in Bishops- gate from his father. His marriage, in 1592, with Joan Woodward, stepdaughter to Henslowe, a successful specu- lator in theatrical and kindred enterprises, brought him eventually much wealth. He became successively part owner in Henslowe's ventures, and in the end sole pro- prietor of sundry play-houscs and other resorts for the diversion of pleasure-seekers. Among these were the Rose Theatre at Bankside, in close contiguity to Shakespeare's Hobe Theatre; the Paris Garden, in the same vicinage, where were enacted such pastimes as bear-baiting, bull- baiting, and other sports of the period ; and the Fortune Theatre in St Luke's. He filled, too, in conjunction with Henslowe, the post of "master of the king's games of bears, bulls, and dogs." He continued to discharge the duties of this office long after he had relinquished his other profes- sional work.

Alleyn's ownership in Dulwich lands began in 1606, and further acquisitions, made in the course of the uext five years, duritig which he was gradually breaking away from the actual practice of the histrionic art, though not from theatrical speculations or kindred enterprises,

increased his holding to more than 1300 acres. His residential connection with Dulwich began in 1607. He occupied the manor-house, a mansion even then very ancient, but which is still tenanted, after many additions and alterations. The priors and abbots of Bermondscy owned and occupied it through the four centuries preceding their expulsion in 1537, when Henry VIII. assigned their house and adjacent church lands to Thomas Oalton, grandfather to the Calton who sold his heritage to Alleyn. Some details respecting this and other purchases of neighbouring estates are set forth in Alleyn's own writing, in a small thick memorandum-book which, with other Alleyn papers pre- served at Dulwich, has been carefully scrutinised by the writer of this notice. .

The landed property stretches from the crest of that range of Surrey hills on whose summit rests the Crystal Palace, to the crest of the parallel ridge, three miles nearer London, known in its several portions as Herne Hill, Denmark Hill, and Champion Hill, Alleyn acquired this Jarge suburban property for little more than £10,000, which may be estimated as equivalent to £50,000 in the present day. But the present value of the lands which he

bought for such a price is hardly under a million and a-half sterling, so enormous has been the rise in the value of land in and near London. Alleyn had barely got full possession of this property before the question how to dispose of it began to press upon him. He was still childless, after twenty years of wedded life. Then it was that the prosperous player—the man "so acting to the life that he made any part to become him" (Fuller, Worthies)—began "playing the last act of his life so well" (Bacon's Letter to the Marquis of Buckingham, dated 18th August 1618), as to gain the general applause of his own age, and a large measure of admiration in after times. He built and endowed in his own lifetime the College of God's Gift at Dulwich. All was completed in 1617, except the charter or deed of incorporation for setting his lands in mortmain. Tedious delays occurred in the Star Chamber, where Lord Chancellor Bacon was scheming to bring the pressure of kingly authority to bear on Alleyn with the aim of securing

a large portion of the proposed endow- ment for the maintenance of lectureships at Oxford and Cambridge. Alleyn finally carried his point, and the Jollege of God's Gift at Dulwich was founded, and endowed under letters patent of James I. dated 21st of June 1619. The college, as thus incorporated, consisted of twelve "poor scholars" and as many pensioners, the latter comprising equal numbers of men and women—"poor brethren" and "poor sisters,"—togcether with a teaching and governing staff of six higher officials. These latter included a master and a warden, who were always to be of the founder's surname, and four fellows, all "graduates and divines," among whom were apportioned the ministerial work of the chapel, the instruction of the boys, and the supervision of the almspeople or pensioners. The scholars and pensioncrs were to be drawn in equal numbers from the four London parishes out of which the founder drew his wealth. A curious legend, dating from the time of the founder, and always current afterwards among the pen- sioners on his bounty, tells that he was scared into his generous and charitable scheme by an apparition of the devil, in propria persona, among some theatrical demons in a drama in which he was acting. In the fright thus occasioned he was said to have made a vow, which he redeemed in the founding of Dulwich College.

Alleyn was never a member of his own foundation, as stated by Heywood, and copied by succeeding writers. The college records clearly set this point at rest. But he coutinued to the close of his life to guide and control the affairs of his foundation, under powers reserved to himself in the letters patent. His diary shows that he mixed much and intimately in the daily life of the college. Many of the jottings in that curious record of daily doings and incidents favour the inference that he was genial, kind, ainiable, and withal a religious man. His fondness for his old professional work is indicated by the fact that he engaged the boys in occasional theatrical performances. At a festive gathering on the 6th of January 1622 " the boyes play'd a playe."

Shakespeare's name is interwoven with local traditions bearing on Alleyn's life at Dulwich, and the links of association between these famous contemporaries afford strong antecedent probability that the

tradition sprang from something more solid than " such stuff as dreams are made of." Each began and closed his professional career as a stage-player in nearly the sclf-same period and im neighbouring theatres. During several years they were near neighbours in their homes at Bankside, then the headquarters of players and play-houses. Leading actors then, as afterwards, came much in coutact with the living authors whose creations they personated. Alleyn ye formed in " Leir," the "Moore of Venis," " Romeo,

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"Pericles," and "Henry VIII," as appears from his inventory of his own theatrical wardrobe. Among the intimate friends of both were Ben Jonson, Michael Dray- ton, and other members of the goodly company of poets and dramatists whose genius shed a lustre on their day. Shakespeare had not finally betaken himself to the retire- ment of Stratford-on-Avon until seven years after Alleyn took up his abode at Dulwich. In the face of all these facts, it can hardly be said the local tradition is groundless, though no direct proof has yet been brought to bear on the point.

Alleyn's first wife died in the summer of 1623. In December of the same year he married Constance Donne, who survived him. This lady was a daughter of Dr Donne, dean of St Paul's. Her maiden name was mis- quoted by an early biographer. This mistake gave rise to the further error which attributes to Alleyn a third wife. He died in November 1626, in the sixty-first year of his age. His gravestone at Dulwich fixes the date of his death on 21st November, but there are grounds for the belief that the true date is the 25th of the same month.

Besides dispensing bounties within the bounds of his college, Alleyn provided, by an after-thought, some years later than his deed of foundation, for certain extensions of the benefits of his endowment. But successive actions at law, carried on at various periods, resulted in the ruling that it was not within the competence of the founder to divert any portion of the revenues of his foundation to the use of others than the members thereof, as specified in the letters patent. Chief among the good intents on the part of the founder that were thus frustrated was

his scheme for embracing in the school work within the college as many outsiders as would bring the total number to eighty boys, inclusive of the twelve foundationers. But as this was not within the bond, his successors in the administration of the trust, for more than two centuries after his death, declined the work. In the latter part of that period, decay, and not development, fixed on the time-honoured memorial of Aleyn's high but thwarted purposes the stigma of a public scandal. Then came, in 1842, a grudging and partial, rather than a full and loyal, concession towards the realisation of the founder's aims. Finally, however, an Act of Parliament, in 1857, ex- tinguished the stagnant and unprogressive corporation. Alleyn's College of God's Gift at Dulwich entered thence- forward on that prosperous career which already links its name with the front rank of institutions doing good ser- Vice in the educational work of the day. (J. Go.)

ALLIANCE, a league between independent states for the purpose of combined action, defensive or offensive, or both—a subject which falls to be treated under the heading Law or Nations. The alliances of greatest historical importance are the Triple Alliance (1688) of Great Britain, Sweden, and the Netherlands against Franve; the Grand Alliance (1689) of the Emperor Leopold I. and Holland, subsequently joined by England, Spain, and Saxony, against Louis XIV.; the Quadruple Alliance (1718) ,of Great Britain, France, Austria, and Holland, against Spain ; the Holy Alliance (1815) of Russia, Austria, and Prussia, for the maintenance of peace and the establishment of the existing dynasties; and the alliance (1854) of Great Britain, France, and Turkey, against Russia.

ALLIER, a department in the centre of France, so called from the river of the same name; bounded on the N. by the department of Cher and Niévre, on the E. by those of Saéne-et-Loire and Loire, on the S. by that of Puys de Déme, and on the W. by those of Creuse and Cher ; extending at the widest points 82 miles from E. to W., and 55 from N. to S.; and containing an area of 2821 square miles. Its surface is in general undulating,

rising to considerable elevations among the mountains of Forez on the south-east, and among those of Auvergne towards the west. The river Allier flows northward between these ranges, receiving the Andelot, the' Sioule, and the Bioudre, all from the left; east of the Allier is the Bébre, which joins the Loire within the limits of the department ; and on the west the Cher, with its tributary the Aumance. The soil is for the most part fertile, espe- cially in the valleys of the Allier, the Sioule, and the Bébre, yielding wheat, oats, barley, rye, fruits, and potatoes, in quantities exceeding what is required for home consump- tion, as well as some red and white wines. Good timber is grown, and cattle, sheep, goats, and horses are reared in large numbers; but agriculture is on the whole in a back- ward condition, owing to the inhabitants' aversion to change. The mineral wealth of the department is very considerable, including iron, coal, antimony, marble, and manganese —the coal mines of Commentry being among the most important. The chief manufactures are of cutlery, earthenware, glass, cloth, leather, and paper. The climate is healthy, but is liable to sudden variations of tempera- ture. The mineral waters at Vichy, Néris, and Bourbon Y Archambault, in the department, are in much repute. Allier comprehends the greater portion of the old province of Bourbonnais, and is at present divided into four arron- dissements—Moulins, Gannat, La Palisse, and Montlucon, which are subdivided into 28 cantons and 317 communes. Moulins is the capital, and the seat of a bishop whose diocese is co-extensive with the department. The other important towns are La Palisse, Cusset, Vichy, Gannat, Saint Pourcain, Montlugon, and Commentry. Population in 1871, 390,812; of whom 196,831 were males, and 193,981 females. Of the total population, 223,374 could neither read nor write, and 36,786 could read but could not write.

ALLER, the ancient Hlaver, a river of France, which rises in the department of Loztre, among the Margeride mountains, a few miles east of the town of Mende, and, after traversing Haute Loire, Puys de Dime, and Allier, forms the boundary between Cher and Niévre, until it falls into the Loire four miles west of Nevers. Its length is 200 miles, for a considerable portion of which it is navi- gable, and its chief tributaries are the Dore and the Sioule.

ALLIGATOR, (probably derived from the Spanish el lagarto, the lizard), an animal so closely alled to the crocodile that some naturalists have classed them together as forming one genus. It differs from the true crocodile principally in having the head broader and shorter, and the snout more obtuse ; in having a large canine tooth of the under jaw received, not into an external furrow, but into a pit formed for it within the upper one; im wanting a jagged fringe which appears on the hind legs and feet of the crocodile; and in having the toes of the hind feet webbed not more than half-way to the tips. The principal species, all found in America only, are the common alligator (Alligator Mississippiensis or Crocodilus Lucius), occurring in the southern United States; the caiman or cayman (A. palpebrosus), in Surinam and Guiana; and the spec- tacled alligator or jacaré (A. sclerops), principally in Brazil. The names alligator and crocodile are often con- founded in popular speech ; and the structure and habits of the two animals are so similar that both may be con- veniently considered under the heading CrocopiLe.

ALLITERATION. As Milton defined rhyme to be "the jingling sound of like endings," so alliteration is the jingle of like beginnings. All language has a tendency to jingle in both ways, even in prose. Thus in prose we speak of "near and dear," "high and dry," "health and wealth." But the initial form of jingle is much more common—" safe and sound," "thick and thin," "weal or

woe," "fair or foul," "spick and span," "fish, flesh, or fowl," "kith and kin." The poets of nearly all times and tongues have not been slow to seize upon the emphasis which could thus be produced. Accordingly we read in Shakespeare :—

'Full fathom five thy father lies : Of his bones are corals made."

In Pope :— " Here files of pins extend their shining rows Pufis, powders, patches, bibles, billet-doux

Tn Gray :— “ Weave the warp and weave the woof, The winding-sheet of Edward’s race.”

In Coleridge :— “The fair breeze blew, the white foam flew, The furrow followed free ; We were the first that ever burst Into that silent sea.” Churchill describes himself as one “Who often, but without success, had prayed For apt alliteration’s artful aid,—” an example which is itself a proof of his failure ; for allitera- tion is never effective unless it runs upon consonants.

As thus far considered, alliteration is a device wholly dependent on the poet’s fancy. He may use it or not, or use it much or little, at his pleasure. But there is an extensive range of poetry whose metrical laws are entirely based on alliteration. This, for example, is the principle on which Icelandic verse is founded; and we have a yet nearer interest in it, because it furnishes the key to Anglo-Saxon and a large portion of early English verse. Fora specimen take the following lines, the spelling modernised, from the beginning of Piers the Ploughman :—

‘But in a May morning | on Malvern hills,

Me befel a ferly | of fairy methought ;

I was weary of wandering | and went me to rest

Under a broad bank | by a burn-side ;

And as I day and Jeaned | and Jooked on the waters,

I slumbered in a sleeping | it sounded so merry.” The rule of this verse is indifferent as to the number of syllables it may contain, but imperative as to the number of accented ones. The line is divided in the middle by a pause, and each half ought to contain two accented syllables. Of the four accented syllables, the first three should begin with the same letter; the fourth is free, and may start with any letter. Those who wish for a more minute analysis of the laws of alliterative verse, as practised by the Anglo-Saxon and early English poets, may consult an exhaustive essay on the subject by the Rev. W. W. Skeat,

prefixed to vol. iii. of Bishop Percy's Folio Manu- script; only the reader must be on his guard against an error which pervades it, and which this able writer seems to have derived from Rask. 'The question arises—What is the nature of the cadence in alliterative verse? Now all metrical movement is of two kinds, according as the beat or emphasis begins the movement or ends it. If the beat is initial, we say in classical language that the move- ment is trochaic or dactylic, according to the number of its syllables ; and if the beat is final, we in like manner say that the movement is iambic or anapzestic. Mr Skeat and many others object with some reason to use the classical terms, and therefore brushing them aside, let us put the question in the simplest form—Has the movement of alliterative verse got the initial or the final beat? In the middle of last century Bishop Percy decided this question with sufficient accuracy, though he mixed up his statement with a blunder which it is not easy to account for. He points out how the poets began to introduce rhyme into alliterative verse, until at length rhyme came to pre- dominate over alliteration, and "thus was this kind of

ALL—ALL

metre at length swallowed up and lost in our common burlesque Alexandrine or anapzestic verse, as

A cobbler there was, and he lived in a stall."

Percy made a serious mistake when he gave the name of Alexandrine to anapeestic verse; but he is quite right in his general statement that alliterative verse became lost in a measure, the movement of which had the final beat Conybeare has stated the fact still more accurately. "Tn the Saxon poetry a trochaic character is predominant. In Piers Plowman there is a prevailing tendency to an anapestic cadence." It is the result of a change in the language—the loss of inflection. Take the word man. The genitive in Saxon would be mannes, a trochee; in English, of man, an iambus. The tendency of the language was thus to pass from a metrical movement, in which the beat was initial, to one in which it was final. It may therefore be quite right to speak of Anglo-Saxon alliterative poetry as trochaic or dactylic, and quite wrong to

apply the same terms to the cadence of our later alliterative verse, And this is precisely the error into which Mr Skeat has fallen. He says—Lines do not always begin with a loud syllable, but often one or two and sometimes (in early English especially) even three soft syllables precede it. These syllables are necessary to the sense, but not to the scansion of the line." That is just the point at issue. By leaving out of account the light syllable or syllables at the beginning of a line, and taking his start from the first syllable that has the alliterative beat, Mr Skeat may certainly prove that all the later alliterative poetry has a movement of initial beat. But English ears will not submit to this rule. It is those light syllables of no account which have altered the rhythm of English descant from one of initial to one of final beat. E. S. D.)

ALLIX, Pierre, a distinguished divine of the French Reformed Church, was born at Alengon in 1641. He was pastor first at St Agobile in Champagne, and then at Charenton, near Paris. The revocation of the Edict of Nantes in 1685 compelled him to take refuge in London, where, under the sanction of James II., he opened a church for the French exiles. His reputation for learning was such as to obtain for him, soon after his arrival, the degree of doctor of divinity from both universities, and in 1690 he received from Bishop Burnet the more substantial honour of the treasurership and a canonry in Salisbury cathedral. He died at London in March 1717.

The works of Allix, which are very numerous, are chiefly of a controversial and apologetic character, and, like most works of that class, are not thoroughly trustworthy. At the invitation of a number of English ministers, he is said to have written a history of the councils of the church, which, however, owing to want of support, never was published. In opposition to Bossuet he issued Some Remarks upon the Ecclesiastical History of the Ancient Churches of Piedmont (1690), and Remarks upon the Heele- siastical History of the Ancient Churches of the Albigenses (1692), with the view of showing that the Albigenses were not Manichzans, but historically identical with the Wal- denses. His Dissertation on the First Rise of the Trisagium or Dowology (1674), and Reflections upon the Books of Holy Scripture (1688), are of little present value.

ALLOA, a seaport town of Scotland, in the county of Clackmannan, situated on the north side of the Firth of Forth, 25 miles from Edinburgh, and 6 below Stirling, with which it is connected by railway. The town as a whole 1s irregularly built, although in the modern portions there are several spacious streets, with good shops and houses. The parish church, opened in 1819, is a fine Gothic edifice, with a handsome spire 200 feet high; there are also places of worship belonging to the other denomina-

tions, as well as the county court-house, a corn exchange,

ALLOTROPY (from éAAos, other, and rpézos, manner),

and schools of various grades. In the immediate vicinity | a name applied to a property, whereby certain substances,

of the town is an ancient towcr, 89 feet high, with walls 11 feet in thickness, said to have been built about the year 1315, formerly the residence of the powerful family of Erskine, descendants of the Earls of Mar. Here many of the Scottish princes received their education as wards of the Lords Erskine and the Earls of Mar, the last of these educated here being Henry, the eldest son of James VI. Among the manufactures of Alloa are ale, whisky, iron goods, glass (especially bottles), bricks, yarns, shawls, and blankets. Shipbuilding is also carried on to some extent, and in the ncighbourhood there are several collieries. The harbour is safe and commodious, having a depth of 16 feet at neap, and 22 at spring tides; adjoining it is an excellent dry dock, and a capacious wet dock was con- structed in 1863. In 1872, 446 vessels of 49,941 tons entered, and 533 of 70,499 cleared the port of Alloa, in addition to coasting vessels in ballast; and in the same year £453 were derived from customs duties. The chief exports were pig-iron, ale, glass, and coals; the imports, timber, grain, iron, linseed, and flax. There is a ferry here across the Forth. Population in 1871, 9362.

ALLODIUM or ALODIUM denotes lands which are the absolute property of their owner, and not subject to any service or acknowledgement to a superior. It is thus the opposite of fe-odum or fief. The proper derivation of the word has been much discussed and is still doubtful, though it is probably compounded of all, whole or entire, and odh, property. Allodial tenure seems to have been common throughout northern Europe. It exists in Orkney and Shetland, where the proprietor of an allodial estate was known until recently as an udaller. (See Sir Walter Scott's Pirate.) In England allodial tenure is unknown, the feudal system having been made universal by William the Conqueror.

ALLORI, AtEssanpRo, a painter of the Florentine school, was born at Florence in 1535, and died in 1607. Having lost his father in his fifth year, he was brought up and trained in art by his uncle, Angelo Bronzino, whose nanie he sometimes assumed in his pictures. Visiting Rome in his nineteenth year, he carcfully studied the works of Michael Angelo; but having himself little genius and uo originality, the influence of that great master can only be traced in the anatomical correctness of his draw- ing of nude figures. He was very successful as a portrait- painter.

ALLORI, Crisrorano, son of the preceding, was born at Florence on the 17th October 1577, and died in 1621. He received his first lessons in painting from his father, but becoming dissatisfied with the hard anatomical drawing and cold colouring of the latter, he entered the studio of Pagani, who was one of the leaders of that later Florentine school which endeavoured to unite the rich colouring of the Venetians with the correct drawing of Michael Angelo's disciples. Allori became onc of the foremost of this school. His pictures are distinguished by their close adherence to nature and. the delicacy and technical perfection of their execution. His technical skill is proved by the fact that several copies he made after Correggio have been taken to be duplicates by Correggio himself. His extreme fastidiousness limited his power cf production, though the number of his works is not so small as is sometimes asserted. Several specimens are to.be seen at Florence and elsewhere. 'The finest of all his works is his " Judith and

Holofernes," in the Pitti palace. The model for the Judith was his mistress, the beautiful Mazzafirra, who is also represented in his Magdalene ; and the head of Holo- fernes is generally supposed to represent himself, though this is questioned by the best authorities.

chemically simple, assume different forms and conditions without undergoing chemical change. Sulphur and phos- phorus, for instance, occur sometimes in crystals and sometimes in an amorphous state, being in the latter case sometimes translucent and sometimes opaque, and present very different properties under these different conditions. Ozone is an allotropic form of oxygen. The name ésomerism is given to the similar by no means uncommon property whereby compound bodies, although entirely distinct, are made up of the same chemical elements in precisely the same proportions,

ALLOXAN, a product of the action of oxidising agents on uric acid, obtained by adding slowly, in small quantities, uric acid to strong nitric acid of specific gravity 1°4, kept cool, and stirring constantly. Carbonic acid and nitrogen are evolved during the action, and the alloxan crystallises out on standing. It is purified by recrystallisation from water, and then has the composition C,H,N,O,+ag. The crystals of this compound are large and colourless, and when heated to a temperature of 150° C., lose the water of crystallisation, and acquireared colour. Alloxan is readily soluble in water and alcohol, and its aqueous solution reddens litmus, has an astringent taste, and colours the skin purple after some time. It produces a great number of derivatives, for which see Uric Acrp.

ALLOY, the name given to a combination obtained by fnsing metals with each other. Few metals are employed in the pure state, with the exception of iron, coppcr, lead, tin, zinc, platinum, aluminium; metals are more frequently used in the forms of alloys for technical purposes. Every indus- trial application necessitates special qualities that may not occur in any isolated metal, but which may be produced by the proper mixture of two or more of these substances. Thus gold and silver, which in their pure state are too soft and flexible for the manufacture of plate, coin, trinkets, &c., are hardened by the addition

of a tenth part of copper, while the colour and other valuable qualities are not mate- rially impaired. Similarly copper is rendered hard by mixture with zinc, when we obtain brass, au alloy of a beautiful yellow colour, easier to work than the pure metal. If brass has to be used in turning operations it is found to tear under the action of the chisel, unless a small quantity of lead has been added. These exaniples are sufficient to show that an alloy is really an industrial metal, often of greater importance than the metals which compose it.

Alloys are equally interesting from a purely scientific point of vicw. They are not only mixtures of metals having certain particular qualities, but in reality are true chemical compounds, generally dissolved in an excess of one of the constituent metals. In the appearances which accompany the union of the metals, and in the properties of the resulting products, we observe that which charac- terises the manifestation of affinity, that is, an evolution of heat and light, resulting in the formation of substances having adefinite composition, distinct crystalline form, and a variety of properties different from those of the constituents. If a picce of clean sodium is rubbed in a mortar with a quantity of dry mercury, the metal dissolves, producing a harsh sound resembling the immersion of red hot iron in water. This phenomenon is due to the large evolution of heat which accompanies the combination, as the mercury rises rapidly in temperature on the addition of each succes- sive piece of sodium. If the mass is allowed to cool after the action, long needles of a white brilliant alloy of definite composition crystallise from the middle of the liquid, from which the excess of mercury may be separated by decanta- tion. Platinum, iridium, gold, rhodium, ruthenium, and silver unite with tin, producing an cvolution of heat ; if

the tin is in excess after cooling, a metallic ingot is obtained resembling closely the original substance ; but if the mass is treated with strong hydrochloric acid, the excess of tin is dissolved and crystals remain of a definite alloy of tin and the precious metal. These alloys are in- soluble in strong hydrochloric acid, which dissolves tin

so easily ; but they are soluble in aqua regia, even when the precious metal contained therein (rhodium, ruthenium, iridium) is in the free state absolutely insoluble. This is no proof that the industrial alloys are always the result of one definite combination dissolved in excess of one of the metals, as many combinations are able to co-exist in the game alloy. This may be proved by taking an alloy of tin, lead, and bismuth, which melts below the boiling point of water, heating to a temperature of 25° O., and observing the rate of cooling by means of a thermometer. The thermometer falls at first regularly as far as a certain degree, where it remains stationary for some time, after which it descends to a lower temperature, where it is again similarly arrested. These two stoppages in the rate of cooling can only be explained by admitting the production of a less fusible alloy in the fluid mass, which solidifies with an evolution of heat, rendering the thermometer stationary for a time. Each successive arrest will therefore correspond to the formation of more fusible combinations. Thus the metals form amongst themselves true chemical combinations ; and alloys are often formed by the mixture of one or more of these compounds with excess of one of the constituents.

Recently hydrogen, which, although a gaseous substance, has chemical properties resembling those of the true metals, has been combined with palladium, sodium, and potassium, producing compounds similar in properties to the recognised alloys.

*Properties oF Attoys. Density.—If the density of any alloy is calculated from that of the components—assum- ing that there is no condensation of volume—the resulting number is sometimes greater than, equal to, or less than, the experimental result. Thus the alloys of gold and silver are less*dense than the theoretical mean density; whereas brass and the alloys of lead and antimony vary in the opposite direction. The former are therefore produced through an expansion, the latter through a condensation of their constituents. In the formation of many alloys there is no alteration of volume, and then the calculated density is correct. Colouwr.—This is generally grey, unless when we have a coloured metal like copper or gold present in sufficicnt quantity. Hardness, Ductihty, and Tenacity.— Alloys are for the most part*

harder and more brittle, and are generally less ductile and possess less tenacity than the constituent metal that has these properties in excess. Aluminium bronze is an exception, as its tenacity 1s greater than that of either of the components. Fusibility. —This is always greater than that of the least fusible metal entering into the composition of the alloy, and is sometimes greater than in any of the components. Thus an alloy, composed of 5 parts of bismuth, 3 of lead, and 2 of tin, melts at 91° C, Alloys of lead and silver, containing a small quantity of the latter, are more fusible than lead, and potassium and sodium form an alloy fluid at the ordi- nary temperature of the air. Ziquation.—The constituents of an alloy heated gradually to near its point of liquefication frequently unite anew in such proportions as to form a mass that is fusible at the given temperature. If the fluid por- tion is poured off, there remains a solid alloy less fusible than the original. Copper is separated from silver by this process. Decomposition.—When the alloy contains a vola- tile metal like zinc or mercury, heat decomposes it, but the temperature required to expel the last trace of the volatile metal must be considerably higher than that

metal's normal temperature of ebullition. Zemper.—The alloy of 94 parts of copper and 6 parts of tin forms a bronze so brittle that it may be pulverised with a hammer when it has been slowly cooled; but if, on the contrary, it is cooled rapidly by tempering it in cold water, it becomes malleable. Injluence of the Constituent Metals.—Mercury, bismuth, tin, and cadmium give fusibility to alloys into which they enter; tin also gives hardness and tenacity if present in considerable quantity ; lead and iron give hard- ness; arsenic and antimony render alloys brittle.

Composition or ALLoys.—A statement of the average proportions in which the metals enter into the best known alloys, the composition of which is generally very variable, is given in the following table:—

‘ Gold, 90. Specuia of tcle- { Copper, 67. Coinage of gold,. { Copper, 10. ECOPOSiosssecseenese ep { Tin, 33. Gold jewellery { Gold, 75 to 92. , Copper, 90. and plate,..... Copper, 25 to 8. PAMCHDGCH,...~~essavenns \ Zinc, 10. ‘ Silver, 90. j Copper, 67 to 72. Silver coinage,..... { Copper, 10. BYASS,...c0ccocscseceesees) Zinc, 33 to 28, Silver, 95. Copper, 50. Silver vessels,..... { Copper, 5. ° German silver,.....~~ Zinc, 25. Silver jewellery,.. ea wicks

, 20. , 80.

Aluminium Copper, 90 to 95. Typrmnretellssaese +++: { Antimony, 20, BrOMNZe,...~~ccere0 Aluminium, 10 to 5. Tin, 100. ; Copper, 94 to 96. Antimony, 8. ee Coins, Tin, 4 to 6 English metal,..... Bismuth ia csi ts Zinc, 1 to 5. Copper, 4 Bronze.—Cannon, { pag 90: PEWLEY,...ccccrccsercress \ ~~· Py? ? 2 ? Bronze,—Bells,.... { a ee 78. Liquid measures,..... se A ? . 4 le Bronze. — Cym~~ { Copper, 80. ’ { Tin, 67. + ee \ ‘in, 20. Plumbers sulder,..—) peed, 38.

Preearation or Attoys.—The metals are generally fused together under a layer of charcoal to prevent oxida- tion, thoroughly mixed by agitating, and the mass left to cool slowly. This process can only be employed when the constituent metals are all non-volatile at the temperature required for combination. If the mixture contains volatile metals, like sodium, potassium, magnesium, or zinc, they are added after the more refractory metal is fused.

ALLSTON, WasHrIneron, an eminent American his- torical painter and poet, was born 5th November 1779, at Waccamaw, in South Carolina, where his father was a planter. He early displayed a taste for the art to which he afterwards devoted himself. He graduated at Harvard in 1800, and for a short time pursued his artistic studies at Charleston with Malbone and Charles Fraser. He then removed to London, and entered the Royal Academy as a student of Benjamin West, with whom he formed a life- long friendship. In 1804 he repaired to Paris, and from that city, after a few months’ residence, to Rome, where he spent the greater part of the next four years studying Italian art and Italian scenery. During this period he became intimate with Coleridge and Thorwaldsen. From 1809 to 1811 he resided in his

native country, and from this latter date to 1817 he painted in England. After visiting Paris for a second time, he returned to the United States, and practised his profession at Boston (1818-30), and afterwards at Cambridge, Massachusetts, where he died on the 9th July 1843. He was elected an associate of the Royal Academy in 1819. The paintings of Allston are characterised rather by grandeur of conception than by skilful execution. In colour and the management of light and shade he closely imitated the Venetian school, and he has hence been styled "the American Titian." Many of his pictures have biblical subjects, and Allston himself had a profoundly religious nature. His first great painting, "The Dead Man Revived," executed shortly after his second visit to England, gained a prize of 200 guineas from the British Institution ; in England he also prepared his " St Peter Liberated by the Angel," 'Uriel in the Sun," "J acob 8 Dream," and "Elijah in the Wilderness." To the period of

his residence in America belong "The Prophet Jeremiah," "Saul and the Witch of Endor," ' Miriam," " Beatrice," "Rosalie," "Spalatro's Vision of the Bloody Hand," and the vast but unfinished " Belshazzar's Feast," at which he was working at the time of his death. As a writer, Allston shows great facility of expression and imaginative power. His friend Colcridge said of him that he was surpassed by no man of his age in artistic and poetic genius. His literary works are—Zhe Sylphs of the Seasons and other Poems (1813), where he displays true sympathy with nature and deep knowledge of the human heart; Monaldi (1841), a tragical romance, the scene of which is laid in Italy ; and Lectures on Art, edited by his brother-in-law, R. H. Dana the novelist (1850).

ALLUVIUM, soil or land made up of the sediment deposited by running water. Rivers act on the rocks in their course both mechanically and chemically, and are in consequence always more or less loaded with detritus, which in its turn again aids the water in abrading other rocks. A great proportion of the matter with which rivers are thus charged is carried out to sea. But in level tracts, where the motion of a river is slow, it frequently overflows its banks, and

leaves a sediment of earth, mud, gravel, &c., when it returns to its ordinary channel. The principal alluvial tracts are the deltas or deltoid formations at the mouths of large rivers. These vary in character very con- siderably. The Delta of the Nile is the best-marked speci- men; the waters of the Rhine, Ganges, &c., arrested by the solid matter they have washed down, force their way through it in numerous smaller channels ; the Mississippi has carried the solid matter it holds in suspension far into the Gulf of Mexico, forming long spits of land on the banks of the stream. The cognate term diluvium (now little used) has been applied to formations produced by extraordinary aqueous agencies.

ALMA, a river of Russia, in the §.W. of the Crimea, which falls into the sea about 16 miles N. of Sebas- topol. It gives its name to a battle gained over the Russians, on the 20th September 1854, by the allied British, French, and Turkish armies. The British num- bered 25,000 men, with 60 guns, and were commanded by Lord Raglan; the French force consisted of 30,000 men and 68 guns, to which were added 7000 Turkish infantry—all under the command of Marshal St Arnaud. To these were opposed 36,000 Russians, with 122 guns, under Prince Menschikoff, strongly posted on the heights on the left bank of the river. The victory was largely due to the determined advance of the British in face of the Russian fire.

ALMADEN, or ALMADEN DEL AZOQUE (in Arabic, the "Mine of Quicksilver"), a town of Spain, in the province of Ciudad Real, lies in the Sierra Morena, 55 miles 8.W. of the town of Ciudad Real. It is the Sisapon of the Romans, and is famous for its quicksilver mines, which have been wrought extensively both in ancient and in modern times. They were the richest and most productive in the world until the discovery of quicksilver at New Almaden in California. The annual yield is about 1,400,000 ib, and 4000 workpeople are employed. The principal vein is 25 feet thick ; a depth of 1000 feet has been reached, and the ore increases in richness with the depth of the descent. These mines belong to the Spanish Government, and yield a large revenue. At various periods they have been leased to private speculators. The town has a good hospital and mining schools. Population, 9000. –

ALMAGEST, compounded of the Arabic al and peyéory, the name applied by the Arabians to their translation of the MeydAy 2ivragis of Claudius Ptolemy, which contains a large collection of problems in geometry and astronomy. The translation was made about the year 827 a.p. by order

of the caliph Al-Mamun. The naime is also applied to other editions and translations of the work, as well as to other scientific compilations. Thus Riccioli published a book of astronomy, the Vew Almagest, and Plukenet an Almagestum Botanicum.

ALMAGRO, a town of Spain, in the province of Ciudad Real, 12 miles E.S.E. of the town of that name. It stands in a fertile plain, and is a well-built town, with spacious streets and a fine square. It was once almost exclusively inhabited by monks and the Knights of Calatrava, and contains several ruined churches, monasteries, and con- vents. In the town and neighbourhood lace is extensively manufactured, as many as 9000 workmen being employed. Brandy, soap, earthenware, and leather are also made; and the surrounding district is famous for its breed of asses and mules, for the sale of which two great fairs are annually held. Excellent red wine is produccd in the district. Population, 14,000. ;

ALMAGRO, Dieco pz, a Spanish commander, the com- panion and rival of Pizarro, was born at Aldca del Rey in 1475. According to another account he was a foundling in the village from which he derived his name. Nothing is known of his life until 1525, when he joined Pizarro and Hernando de Luque at Panama in a scheme for the conquest of Peru. The details of his subsequent career are given at length in the article Peru. He was executed by order of his former associate Pizarro in 1538.

ALMALI, a prosperous town of Asiatic Turkey, situated on the river Myra, 25 miles from its mouth, and 50 miles W.S.W. of Adalia. It lies 5000 feet above the sea, in a valley at the extremity of an extensive plain, the neigh- bouring mountains rising to a height of 10,000 feet. The town is well built, with handsome houses, several mosques, and a bazaar; and its appearance is rendered very attractive by the lofty

trees interspersed through the streets, and by the gardens of the environs. There are numerous mills and factories, tanyards and dyeworks; and the inhabitants are exceedingly industrious. The town is much frequented by inerchants from Smyrna and other places, who purchase the produce of the district and send it to the coast for shipment. Population, 8000. .

AL-MAMUN (also written At-Mamoun, At-Mamon, and simply Mamun), one of the most renowned of the Abbasside dynasty of caliphs, was born in 786 a.p. He was the son of Harun-al-Raschid, whose caliphate is the golden age of Mahometan history. Harun, dying in 808, left the supremacy to his son Al-Amin, Al-Mamun being at the time governor of Khorassan, and favourable to the succession of his brother. Irritated, however, by the treat- ment he received at the hands of Amin, and supported by a portion of the army, Mamun speedily betook himself to arms. The result was a five years' struggle between the two brothers, ending in the death of Amin, 4th October 813, and the proclamation of Al-Mamun as caliph at Baghdad. Various factions and revolts, which disturbed the first years of his reign, were readily quelled by his prudent and energetic measures. But a much more serious rebellion, stirred up by his countenancing the here- tical sect of Ali and adopting their colours, soon after threatened his throne. His crown was actually on the head of his uncle Ibrahim ben Mahdi (surnamed Mobarek) for a short time, and a civil war with the orthodox Mussul- mans was imminent, when the timely death of Mamun's vizier and of the imam Rizza removed his principal here- tical advisers, and restored the people to their allegiance. This inaugurated a period of tranquillity, which Al-Mamun employed in patronising and fostering the cultivation of literature and scicnce throughout his empire. He had already, while governor of Khorassan, founded a college there, and attracted to it the most emincnt men of the

day; and now Baghdad became, under his auspices, the seat of academical instruction and the centre of intelli- gence. At his own expense he caused to be translated into Arabic many valuable books

from the Greek, Persian, Chaldean, and Coptic languages; and he was himself an ardent student of mathematics and astronomy. The first Arabic translation of Euclid was dedicated to him in 813. Mamun founded observatories at Baghdad and Kassiun (near Damascus) for astronomical purposes, and he suc- ceeded in determining the inclination of the ecliptic. He also caused a degree of the meridian to be measured on the plain of Shinar; and he constructed astronomical tables, which are said to be wonderfully accurate. The supposed antagonism of orthodoxy and science receives some support from the conduct of Mamun. A lover of philosophy and letters, he did not concern himself about the creed of the professors he appointed to his colleges, or the physicians he employed at his court; and on the occasion of his marriage he distributed largesses to Mussulmans, Jews, and Chris- tians indiscriminately. These liberal measures culminated, however, in his becoming a convert in 827 to the heterodox faith of the Motasali, who asserted the free-will of man and denied the eternity of the Koran. The later years (829-830) of his reign were distracted by hostilities with the Greek empéror Theophilus, occasioned, it is said, by a dispute about an eminent Greek priest whom the caliph wished to attach to his college at Baghdad. A series of revolts in different parts of the Arabian empire be- tokened the decline of the military glory of the caliphs. Already had Spain and part of Africa asserted their inde- pendence, and Egypt and Syria were now inclined to follow. In 833, after quelling Egypt, at least nominally, Mamun marched into Cilicia to prosecute the war with the Greeks; but with this expedition the career of one of the most famous of the caliphs was to terminate. He died near Tarsus, leaving his crown to a younger brother, Motassem. The death of Al-Mamun ended an important epoch in the history of science and letters, and the period of Arabian prosperity which his father's reign had begun. The in- fluence of these two sovereigns is sometimes exaggerated ; but there can be no doubt we owe much to their exertions at a time when Europe was sunk in barbarism. Mamun was the author of Jnquiries into the Koran, of a tract on the Signs of Prophecy, and of one on the Lhetoric of the Priests and Panegyrists of the Caliphs.

ALMANAC, a book or table, published from year to year, containing a calendar of the days, weeks, and months of the year, a register of ecclesiastical festivals and saints' days, and a record of various astronomical phenomena, particularly the rising and setting of the sun, the changes and phases of the moon, eclipses of the sun and moon, the times of high water at particular ports, &c. In addition to these contents, which may be regarded as essential to the almanac, it generally presents additional information, which is more or less extensive and varied according to the many different special objects contemplated in works of this kind) The derivation of the word is doubtful. The first syllable is the Arabic definite article; the rest of the word has been variously derived from the Greek pyy, a month; the Anglo-Saxon mona, the moon; and (which appears the most probable derivation) the Arabic manah, to reckon.

The CaLenpar will be treated of in a separate article (which see). Here we have to do with the publication which contains the calendar of any particular year, along with other matter, astronomical, statistical, political, &c. The Hphemeris again, it is to be observed, is a strict astronomical term, being a register from day to day of the places and motions of the heavenly bodies.

The attention given to astronomy by Eastern nations,

and the practice that prevailed among them of divination' by means of the stars, must have led to the early con. struction of such tables as are comprised in our almanacs, Our information respecting these is extremely scanty; but we are not left in the same ignorance with regard to the practice of the ancient Romans. The peculiar arrangement of their calendar is well known, and their fasti sacri or kalendares were very similar to modern almanacs. Origin- ally knowledge of the calendar was confined to the class of pontifices or priests, whom the people had to consult not only about the dates of the festivals, but also regarding the proper times of instituting various legal proceedings, But about 300 B.c. one Cn. Flavius, the secretary of Appius Claudius, possessed himself of the secret, either by the stealthy use of documents

in the possession of his master, or, according to Pliny, by repeatedly consulting the pontifices and jurists, and collating the particulars of the information he obtained from them. It was neither more nor less than publishing an almanac when, as Livy! relates, he exhibited the fast2 on white tablets round the forum. From this time tablets containing the calendar, the festivals, astronomical phenomena, and sometimes historical notices, seem to have been common. The Fasti of Ovid is a poetical relation of incidents and traditions connected with the calendar. The researches of anti- quaries have brought to light numerous fasti or calendaria cut on marble and other kinds of stone. Representations of several of these will be found in Gruter's Jnscriptiones. One figured there, the Farnese rustic calendar, is a cubical block of stone, on each of the four vertical faces of which three columns are engraved, detailing for each different month the number of days, the date of the nones, the lengths of the day and night, the sun's place in the zodiac (which is also indicated by a representation of the sign at the top of the column), the tutelary deity of the month, the rural operations of the season, and the chief festivals. Almanacs of a ruder kind, known as clogg almanacs, were in use in some parts of England as late as the end of the 17th century. Dr Robert Plot, keeper of the Ashmolean Museum and professor of chemistry at Oxford, gives a figure of one of these, with a very minute description, in his Natural History of Staffordshire (Oxford, 1686); and another is represented in Gough's edition of Camden's Britannia (1806, vol. ii. p. 499). The cloggs were square blocks of hard wood, about 8 inches in length, with notches along the four angles corresponding to the days of the year. The accompanying illustration shows the angle

on which is registered the almanac for the months of January, February, and March, taking it from left to nght. The marks on the under side in the figure exhibit the primes or golden numbers of a cycle, which is fully described in Plot's work. They generally increase by 8, 19 being struck off when that number is exceeded; and the same number will be found to stand against all the dates (approximately) of new moon throughout the year. The cross mark is for X, and the hook at the end of a line for V. The weeks are indicated by a deeper notch

for every seventh day, and a broadening stroke on the upper side in the figure represents the first day of each month. ee

1 " Fastos circa forum in albo proposuit, ut quando lege agi posset, sciretur" (ix. 46).

The other characters on the upper side are for saints' days and festivals. Thus Epiphany (Jan. 5) is indicated by a star, St Hilary (Jan. 13) by a bishop's double cross, the con- version of St Paul (Jan. 25) by an axe, St Valentine (Feb. 14) by a true lover's knot, St Matthias (Feb. 24) by a battle-axe, &c. All the feasts of the Virgin, as the Puri- fication (Feb. 2) and the Annunciation (March 25), are denoted by a heart—Dr Plot was greatly puzzled to know why. St Blaise (Feb. 3), St Agatha (Feb. 5), and others were indicated by their initials; and opposite the day (March 1) consecrated to David, the patron saint of Wales, is a symbol which some consider a harp and others a leek.

The earliest almanac regarding which Lalande (whose Bibliographie Astronomique, Paris, 1803, is the best autho- rity on publications of this kind) could obtain any definite information belongs to the 12th century. Manuscript almanacs of considerable antiquity are preserved in the British Museum and in the libraries of Oxford and Cam- bridge. Of these the most remarkable are a calendar ascribed to Roger Bacon (1292), and those of Peter de Dacia (about 1300), Walter de Elvendene (1327), John Somers (1380), &c. It is to be remembered that early calendars (such as the Kalendarium Lincolniense of Bishop Robert Grosseteste) frequently bear the names, not of their compilers, but of the writers of the treatises on ecclesiastical computation on which the calendars are based. In 1812 there was printed at Hackney what pur- ported to be a transcription of the greater part of an almanac for 1386. This, if it exists, must be one of the earliest, perhaps the earliest, in the English language that has been preserved. The earliest English calendar in the British Museum is one for the year 1431. The first printed almanac known is one for the year 1457 ; the first of importance is that of Joannes de Monte-Regio, better known as Regiomontanus, which appears to have been printed at Nuremberg in

1472. In this work the almanacs for the different months embrace three Metonic cycles, or the 57 years from 1475 to 1531 inclusive. The Lphemerides of Regiomontanus, which are to be distin- guished from his almanac, were sold, it is said, for ten crowns of gold, considerably more than their own weight. The earliest almanac printed in England was The Kalendar of Shepardes, a translation from the French, printed by Richard Pynson about 1497.

The exclusive right to sell "almanacs and prognostica- tions," enjoyed in the time of Elizabeth by two members of the Company of Stationers, was extended by James I. to the two universities and the Stationers' Company jointly ; but the universities commuted their privilege for an annuity from the company. About a century ago one Thomas Carnan, a bookseller, conceiving that the company had no just title to its monopoly, published an almanac for three successive years, and was thrice imprisoned on that account by the company. In 1775 the case came before the Court of Common Pleas, and was decided in Carnan's favour. The question argued was, "Whether almanacs were such public ordinances, such matters of state, as belonged to the king by his prerogative, so as to enable him to communi- cate an exclusive right of printing them to a grantee of the crown ?" and the judges were unanimously of the opinion that the crown had no such right. The minister, Lord North, made an attempt in 1779 to put the company in possession, by a parliamentary enactment, of what the Judges had denied it ; but the proposed monopoly was denounced by Erskine and others with such ability and Severity that the bill was thrown out by a majority of forty-five. Tn consequence of this loss to the company of its exclusive right to issue almanacs, the universities lost their title to their annuity, and in lieu of it they received

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a parliamentary grant. The company continued, however, virtually to retain its monopoly by buying up as much as possible all the almanacs issued by other publishers, and by means of the great influence it possessed over the book trade. In more recent times the power to control the sale of this class of publications has altogether ceased, but

a considerable proportion of the almanacs published in this country still issue from the hall of the Stationers' Company. A. lively description of "Almanac Day" at Stationers' Hall will be found in Knight's Cyclopedia of London (1851), p. 588.

The influence of the heavenly bodies on the conditions and affairs of men has been believed in, and a superstitious importance has been attached to particular times and seasons by the credulous from the remotest times. As might be imagined, therefore, since the bases on which the whole system of judicial astrology rested all fall within the field of the almanac-makers' labours, great prominence was given to omens and predictions in many of these publications. The early almanacs had commonly the name of "prognostications" in addition, and what they pro- fessed to show may be gathered from titles like the fol- lowing, which is quoted by Mr Halliwell :—"~~Pronosty~~ cacyon of Mayster John Thybault, medycyner and astro- nomer of the Emperyall Majestie, of the year of our Lorde God mcccccxxxilJ., comprehending the itij. partes of this yere, and of the influence of the mone, of peas and warre, and of the sykenesses of this yere, with the constellacions of them that be under the vij. planettes, and the revolu- cions of kynges and princes, and of the eclipses and comets." In 1579 Henry III. of France deemed it neces- sary to prohibit all almanac-makers from indulging in predictions. No such restriction, however, existed in this country ; and it was to their prophesyings that the almanacs of the Stationers' Company were long indebted for much of their popularity. Among almanacs of this class pub- lished in England, and principally by the Stationers' Gom- pany, are Leonard Digges's Prognostication Everlasting of Right Good Effect, for 1553, 1555, &c.; William Lilly's Merlinus Anglicus Junior, for 1644, é&c., and other al- manacs and "' prognostications;" Booker's Bloody Almanac and Bloody Irish Almanac, for 1643, 1647, é&c.—the last attributed erroneously to Napier; Partridge's Mercurius Celestis, for 1681, Merlinus Redivivus, &c. The name of Partridge has been immortalised in Pope's Rape of the Lock; and his almanacs were very cleverly burlesqued by Swift, who predicted Partridge's own death, with all details of time and circumstance, in genuine prognosticator's style. The most famous of all the Stationers' Company's predict- ing almanacs was the Vox

Stellarwm of Francis Moore, dating from about 1680. Of a different but not a better sort was Poor Robin, dating from 1663, and published by the company down to 1828, which abounded in coarse, sometimes extremely coarse, humour.

On the Ist of January 1828 the Society for the Diffu- sion of Useful Knowledge issued the British Almanac for that year—a publication greatly superior in every way to the almanacs of the time. To quote the society's Almanac for 1829—

"This was almost the first attempt in this country to produce an almanac that should not only be useful to all classes, and of which the information should be wholly of a popular character, but which should be purified from the superstitions, prejudices, and indecencies which have characterised some of the almanacs of which the circula- tion has been the most extensive. Bya parliamentary return of the year 1828 we find that the stamp duty paid upon the almanacs of England exhibits a circulation of 451,593 annually. It may be safely asserted that two-thirds of these publications contain some large portion of the matter just described ; and they thus keep alive

a spirit of ignorance utterly opposed to the desire for sound and practical information which distinguishes our own times."

The success of the British Almanac, with its valuable

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supplement, the Companion to the Almanac, led to a great improvement in this class of publications. The Stationers' Company issued the English Almanac, a work of a similar kind. The entirc repeal in 1834, by the 3d and 4th Will. IV., c. 57, of the heavy stamp duty on all almanacs of fifteenpence per copy, gave an additional stimulus to the publication of almanacs of a better class, and from that time the number has greatly increased. It is interesting to remark that the British Almanac and Companion still exist, and retain their original form and character, and that this has from 1870 been the principal almanac pub- lished by the Stationers' Company.

The variety of extraneous matter included in almanacs, corresponding to the very numerous other objects to which the almanac proper is often only secondary, can be merely alluded to here. A number of publications, issued in Ger- many from the middle of the 18th to the middle of the 19th century, under such titles as Afusenalmanach, or Almanach des Muses, contain some of the best works of some of the most celebrated German poets. The Almanach de Gotha, which has existed since 1764, and is published at present both in French and German, gives a particular account of all the royal and princely families of Europe, and ample details, compressed into little space, concerning the administration and the statistics of the different states of the world. As works of general statistical reference, the two national almanacs, Oliver and Boyd's New Edinburgh Almanac (from 1837) and Lhom's Irish Almanac (from 1843) are of very great value.

The Nautical Almanac is a publication the object of which is to supply information that is indispensable to the navigator and the astronomer. It gives with the utmost precision the positions of the principal heavenly bodies at short intervals of time, and other important details of celestial phenomena. The moon's exact position is regis- tered for every hour, and also the angular distances at

noon and midnight daily of the moon from the sun and:

several fixed stars. By means of the data thus supplied, in connection with observations of the heavenly bodies, time, latitude, and longitude can be determined. The Nautical Almanac has been published regularly since the issue in 1766 of the Almanac for 1767. It was originated by Dr Maskelyne, the astronomer-royal, who conducted it for many years. – About 1830 the Lords of the Admiralty were induced by complaints of its defects to bring the subject under the notice of the Royal Astronomical Society. The society appointed a committee to consider what changes seemed necessary, and, on the committee's recommendation, the form was adopted which has continued with little change from 1834 to the present time. During that period the Almanac has been published under the superintendence of the Admiralty. It is issued generally three years at least before it comes into use. The

Connatssance des Temps (from 1679), the Berliner Jahrbuch (from 1776), and the American Ephemeris and Nautical Almanack (from 1855) are publications of a similar kind.

(See, in addition to works referred to above, interesting

papers by Mr J. O. Halliwell and Professor De Morgan in:

a Wa to the Almanac for 1839, 1840, 1845,

846.

ALMANSA, a town of Spain, in the province of Al- bacete, 35 miles E.S.E. of the town of that name, on the Madrid and Alicante railway. The surrounding plain is very fertile, and irrigated by means of a large reservoir. There are manufactures of linen and cotton fabrics, and also of brandy, leather, and soap. A Moorish castle is to be seen on a hill to the north-west of the town. About a mile from Almansa stands an obelisk commemorating the decisive battle fought here on 25th April 1707, in which the French, under the Duke of Berwick, the natural son

of James II. of England, completely defeated the allied English and Spanish armies. The French greatly out- nuinbered the opposing force. This battle hastened the conclusion of the war of the Spanish succession. Popula- tion of the town, about 8000.

ALME, or Amat (from dlim, wise, learned), the name of a distinct class of singing girls in Egypt. To be received into it, according to M. Savary, it is necessary to have a good voice, to understand the language well, to know the rules of poetry, and be able to conipose and sing impromptu couplets adapted to the circumstances. The almai are present at all festivals and entertainments, and also at funerals, where they act the part of hired mourners. They are to be distinguished from the ghawazce, or dancing girls, who perform in the public streets, and are of a lower order,

ALMEIDA, a strongly-fortified town of Portugal, in the province of Beira, situated between the Coa and the Duas Casas, a branch of the Agueda, 95 miles N.E. of Coimbra, and 25 miles from the Spanish fortress of Ciudad Rodrigo, It was taken by the Spaniards in 1762, and again by the French in 1810. The recapture of it by the Duke of Wellington in 1811 was deemed one of the most brilliant exploits of the Peninsular war. It is well fortified, and contains an ancient church and two hospitals. Popula- tion, 6580.

ALMEIDA, Don Francisco vz, the first viceroy of Portuguese India, was born at Lisbon about the middle of the 15th century. He was the seventh son of the second Count of Abrantes, and thus belonged to one of the most distinguished families in Portugal. In his youth he took part under Ferdinand of Aragon in the wars against the Moors (1485-92). In March 1505, having received from Emmanuel I. the appointment of viceroy of the newly-con- quered territory in India, he set sail from Lisbon in com- mand of a large and powerful fleet, and arrived in July at Quiloa, which yielded to him almost without a struggle. A much more vigorous resistance was offered by the Moors of Mombaza, but the town was taken and destroyed, and its large treasures went to strengthen the resources of Almeida. At other places on his way, such as the island of Angediva, near Goa, and Cananore, he built forts, and adopted measures to secure the Portuguese supremacy. On his arrival in India he took up his residence at Cochin, where a Portuguese fort had been built by Albuquerque in 1503. The most important events of Almeida's brief but vigorous administration were the conclusion of a com- mercial treaty with Malacca, and the discoveries made by his son Lorenzo, who acted as his lieutenant. The latter was probably the first Portuguese who visited Ceylon, where he established a settlement, and is also celebrated as the discoverer of Madagascar and the Maldive islands. In 1508 he was killed at Dabul in a naval engagement with the Moors. His father was preparing signally to avenge his death when Albuquerque arrived in Cochin, and pre- sented a commission empowering him to supersede Almeida in the government. It was probably Almeida's unwilling- ness to be thwarted in his scheme of vengeance that chiefly induced him to refuse to recognise Albuquerque's com- mission, and to cast him into prison. (See

ALBUQUERQUE.) The punishment he inflicted on the Moors was speedy and terrible. Sailing along the coast, he pillaged and burned various ports, including Goa and Dabul, and finally encountering the enemy's combined fleet off Diu early in 1509, he completely destroyed it. Returning immediately to Cochin, he held out for a few months against the claims of Albuquerque, but in November 1509 he was compelled to yield. On the 1st December he set sail for Europe with an escort of three vessels. On the voyage the fleet called at Saldanha Bay, in South Africa, to

procure water, and here Almeida was killed (March 1, 1510) in an unprovoked attack upon the Caffre natives, during which he showed great personal courage. His body was recovered on the following day, frightfully mutilated, and received a hasty burial.

ALMERIA, a modern province of Spain, comprehending the eastern portion of the ancient kingdom of Granada. It is bounded on the N. by Jaen and Murcia, on the E. and 8. by Murcia and the Mediterranean, and on the W. by Granada; with an area of about 3300 square miles. The province is traversed by mountain ridges, some of them of considerable elevation, with corresponding valleys and plains of great fertility. The principal sierras are those of Maria, Almahilla, Cabrera, Almagrera, Gata, and Gador, and in the W. some offshoots of the Sierra Nevada. The most considerable rivers are the Almanzora, running from west to east, with a course of about 50 miles; the Almeria, flowing from north-west to south-east; and the Adra from north to south, watering the fertile district between the Sierra de Gador and the Alpujarras. On the S. coast is the Gulf of Almeria, a spacious bay, 25 miles wide at the entrance, and about 10 miles in depth. The climate of the province is mild, except in the interior, where the winter is cold. On the coast rain seldom falls, and south-west winds prevail. The inhabitants are prin- cipally engaged in mining and agriculture. Many of the pro- prietors farm their own land, the number of landed pro- perties being 44,858, while the tenants are only 7365. Of the area of the province, 376,698 acres are arable and pasture

land; 13,538 acres vineyards; 5360 acres olive plantations ; 30,797 acres cultivated mountain and wood lands; and 1,686,738 acres uncultivated. There arc 438,357 head of live stock. All kinds of grain are raised in abundance. The common fruits are plentiful, as well as oranges, lemons, and vines. Much excellent silk is produced in the western districts ; cotton is raised to some extent along the coast, and the sugar-cane is also cultivated. Cattle are extensively bred ; those of the valley of the Almeria are especially remarkable for their size and beauty. The province is one of the richest in minerals of all Spain, the mountains yielding silver, mercury, lead, antimony, copper, and iron. The silver mines of the Sierra de Almagrera, opened in 1839, produced in 1843 nearly 1,700,000 ounces ; while the lead mines of the Sierra de Gador are computed to have yielded, from 1795 to 1841 inclusive, 11,000,000 quintals of lead, and the present annual output is from 30,000 to 40,000 tons of ore. In the Sierra de Gata, Jaspers and agates are found ; in the Sierra Nevada, to the west, are the celebrated quarries of Macael marble; and the Sierra Cabrera yields antimony, malachite, gypsum, Magnetic iron, &e. The manufactures of the province consist chiefly of esparto cordage, white-lead, shot, salt-petre, soap, leather, and earthenware. The principal exports are lead, esparto, barilla, and soap; while the imports include coal and machinery from England, woollen and cotton stuffs from Catalonia, silk from Valencia and Malaga, and linen from Marseilles and Gibraltar. From the want of adequate facilities for communication, the development of the agricultural and mining resources of Almeria has not been so rapid as might have been expected. The disturbances attending the revolution of 1868 have also had a prejudicial effect. Education is in a backward state, the proportion of the population at school being only fifteen in the thousand. Crime, although great, is not excessive, offences against the person forming the greater number of the cases tried. The people generally are simple, sober, and religious. Population in 1870, estimated at 361,553.

Atmeria, the capital of the above province, lics on the Gulf of Almeria, on the Mediterranean, 72 miles E.S.E.

of Granada. From the strength of the port it was deemed by the Moorish kings of Granada one of the most valuable of their fortresses and their best commercial harbour. Sailing hence, their cruisers overawed the Catalans and Italians, and their merchant ships conveyed the produce of the country to Africa, Egypt, and Syria. In the time of the Moors Almeria was the seat of hordes of pirates, The walls of the town, and the Moorish fortress, or Alcazaba, overlooking it, as well as the architecture of many of the houses, still attest its Moorish origin. It is pretty well built, and has several handsome squares, although the streets are generally narrow. Almeria is the seat of a bishop, and has a cathedral and theological seminaries. Off the port there is good anchorage in 12 and 14 fathoms water; and in addition to its landward defences the place is protected towards the sea by the forts of Trinidad and Tiro. In 1866, 46 vessels, of 21 ,603 tons, with cargoes, entered and cleared the port; and the annual value of the exports is about £50,000. The manufactures are trifling, but there is a good export trade in wine, soda, esparto, silk, and lead; while the imports consist chiefly of coal and manufactured goods. Here sy are also some mineral springs. Population (1857),

27,036.

ALMOHADES (Almoahedun, Unitarian), a Mahometan dynasty that flourished in Africa and in Spain during the 12th and 13th centuries. Mohammed-Ibn-Abdallah, the founder of the Almoahedun sect, was the son of a lamp- lighter in the great mosque at Sous-el-Aksa. He studied at Cordova, and afterwards visited Cairo and Baghdad, where he became the disciple of the famous philosopher Algazali. In order to establish his power with his country- meu, he connected himself with Abd-el-Mumen, a young Mussulman of great abilities, whom he sent forth as his apostle to propagate the new doctrine (1116-17) ; while in his own person he affected an unusual degree of piety and mortification, appearing in tattered garments, and interdicting the use of wine and music and every gratifica- tion of the senses. His fame spread rapidly among the mountain tribes of Mahgreb, and the ignorant multitude adopted his opinions with eager zeal, His followers saluted lim as the Al-Mehedi on the 28th November 1121. Entering the

city of Marocco, this new prophet foretold the downfall of the existing dynasty, and mocked the authority of the reigning prince Ali-Ibn-Yussef. Ali, lulled in security, despised his predictions as the mere ravings of a fanatic ; and it was not without some difficulty that he was at length prevailed on to banish him from the city. Mohammed retired to the mountains, and fortified the town of Tinmal, which he defended against every assault of his enemies (1123). His retreat became the rendezvous of a numerous sect, who assumed the title of Almoahedi, or Almohades, and asserted that they alone of all the Mussulmans maintained the religion of Islam in its original purity. Many Arab and Berber tribes acknowledged him as their political chief, and 20,000 soldiers rallied around his standard. Ali only perceived the error he had com- mitted when it was too late: his armies, at each encounter, were panic-struck, and fled. Yet notwithstanding the great success of the Almohades, the vast empire of the Almoravides was not at once subdued: and Mohammed, after an ineffectual attempt to reduce the city of Marocco, died in the year 1130, having failed to eccomplish the object of his ambition, the possession of a throne. He was succeeded by Abd-el-Mumen, who assumed the title of Emir-el-Mumenin, or Commander of the Faithful. During the thirty years that he reigned, and under his descendants, Yussef and Yakub, called Almanzor-Billah, the dynasty of the Almohades was exceedingly illustrious, and the arts flourished greatly. They rendered themselves masters of

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the provinces of Fez, Marocco, Tlemcen, Oran, and Tunis; and passing into Spain, they overran Andalusia, Valencia, and a part of Aragon and Portugal, as far the Ebro on one side and the Tagus on the other. But this vast empire was not of long continuance ; for in the year 1212, when the Moslems under Mohammed were defeated by the Christian princes of Spain in the great battle of Las Navas, near Tolosa, the governors of the several provinces took advantage of that disaster to throw off their allegiance, and declared themselves independent—an example that was the signal for a general revolt. The dynasty of the

Almohades became extinct in Spain in the year 1257, and in Africa in 1269. The last sovereign of this race, Abu Dabus Edris, who had with difficulty maintained a shadow of power in the city of Marocco, was assassinated by a slave. They were succeeded by the dynasties of the Hassides, the Mevanides, and the Merinides. See ALMORAVIDES.

ALMON, Joun, a political pamphleteer and publisher of considerable note, was born at Liverpool about 1738. In early life he was apprentice to a printer in his native town, and he subsequently spent two years at sea. He came to London in 1758, and at once commenced a career which, if not important in itself, had a very important influence on the political history of the country. The opposition, hampered and harassed by the government to an extent that threatened the total suppression of independent opinion, were in great need of a channel of communication with the public, and they found what they wanted in Almon. He had become personally known to the leaders through various publications of his own which had a great though transient popularity; the more important of these being The Conduct of a late Noble Commander [Lord George Sackville] Examined (1759); a Review of the Reign of George II., published on the death of that monarch; a Review of Mr Pitt's Administration (1761); and a collection of letters on political subjects. The review of Pitt's administration passed through four editions, and secured for its author the friendship of Lord Temple, to whom it was dedicated. Being thus in the counsels of the party, he was persuaded in 1763 to open a bookseller's shop in Piccadilly, chiefly for the publication and sale of political pamphlets. As he generally received with every pamphlet a sum sufficient to secure him against all contingencies, it cannot be said that he acted entirely from disinterested or patriotic motives. At the same time, he deserves the credit of intrepidity; and it cannot be denied that, whether he knew the full value of the principle for which he was con- tending or not, he did very much to secure the freedom of the press. The government of course were not unobservant of Almon's proceedings, and, as has often been the case, strengthened his influence by the very measures they took to repress it. In 1765 the Attorney-General moved to have him tried for the publication of the pamphlet entitled Juries and Libels, but the prosecution failed; and in 1770, for merely selling a copy of the London Museum con- taining Junius's celebrated "Letter

to the King," he was sentenced by Lord Mansfield to pay a fine of ten marks, and give security for his good behaviour. It was this trial that called forth the letter to Lord Mansfield, one of the most bitter of the Junius series, Almon himself published an account of the trial, and of course did not let slip the opportunity of reprinting the matter that had been the ground of indictment, but no further proceedings were taken against him. In 1774 Almon commenced the pub- lication of his Parliamentary Register, and he also issued an abstract of the debates from 1742, when Chandler's Reports ceased, to 1774. About the same time, having earned a competency, he retired to Boxmoor in Hertford-shire, though he still continued to write on political subjects. He afterwards became proprietor of the General Advertcser,

in the management of which he lost his fortune, and was declared insolvent. To these calamities was added an imprisonment for libel and a sentence of outlawry. Being enabled at last to return to Boxmoor, he continued for some years a career of undiminished literary activity. His last work, a Life of Wilkes, in five volumes (1805), was perhaps his worst, being entirely wanting in proportion and arrangement. He died on the 12th December 1805, A complete list of Almon's works, most of which appeared anonymously, is given in Watt's Biblwtheca Britannica. Though their literary merit is not great, they are of very considerable value to the student of the political history of the period.

ALMOND. This is the fruit of Amygdalus communis, a plant belonging to the natural order Rosaceze, sub-order Amygdalezx or Drupiferee. The tree appears to be a native of Asia, Barbary, and Marocco; but it has been extensively distributed over the warm temperate region of the Old World. It is a tree of moderate size ; the leaves are oblong-lanceolate, and ser- rated at the edges ; and the flowers, whichappear early in spring, are of a pink colour. The fruit is a drupe, having a downy outer coat,

called the epicarp, covering a tough portion called the

mesocarp, which en-

closes the reticulated

hard stony shell or

endocarp. The seed

is the kernel which

is contained within onl ete 4

*these coverings. The * “24° 324g AEG shell-almonds of MS{m*ainy Unrate omer trade consist of the Hey rN prefer sites endocarps enclosing Numb. xvii. 8). The word Luz, which occurs in the seeds, ‘The trop Sees 225 37 end. there, ineiiad May grows in Syria and Shaked is the name of the frnit. Palestine; and is referred to in the Bible under the name of Shaked, meaning “hasten.” The word Luz, which occurs in Genesis xxx. 37, and which has been translated hazel, is supposed to be another name for the almond. In Pales- tine the tree flowers in January, and this hastening of the period of flowering seems to be alluded to in Jeremiah i. 11, 12, where the Lord asks the prophet, ‘What seest thou?” and he replies, “The rod of an almond-tree;” and the Lord says, “Thou hast well seen, for I will hasten my word to perform it.” In Ecclesiastes xii. 5 it is said the “ almond-tree shall flourish.” This has often been supposed to refer to the resemblance of the hoary locks of age to the flowers of the almond; but this exposition is not borne out by the facts of the case, inasmuch as the flowers of the almond are not white but pink. The passage 1s more probably intended to allude to the hastening or rapid approach of old age. The application of Shaked or hasten to the almond is similar to the use of the name “May” for the hawthorn, which usually flowers in that month in Britain. The rod of Aaron, mentioned in Numbers xvu., was taken from an almond-tree; and the Jews still carry rods of almond-blossom to the synagogues on great festival days. The fruit of the almond supplied a model for certain kinds of ornamental carved work (Exodus xxv. 33, 34; xxxvii. 19, 20). Dr Tristram remarks: “The blossom of the almond is a very pale pink, but where, as in the*

orchards near Nablous (Shechem), the peach and almond trees are intermingled, the almond looks white by com- parisou. In early spring it forms a beautiful feature in the landscape there, as the lower slopes of Gerizim, as well as the valley, are studded with almonds and peaches, in lively contrast with the deep green foliage of the orange-trees, and rivalling an apple orchard in splendour of colour. There are also many wild almond-trees on Mount Carmel. The tree seldom exceeds 12 to 16 feet in height." There are two varieties of the plant, the one producing sweet, the other bitter almonds. The kernel of the former contains a fixed oil and emulsin; while that of the latter has in addi- tion a nitrogenous substance called amygdalin, which, by combination with emulsin, produces a volatile oil and prus- sic acid. The flowers of the bitter almond-tree (Amygdalus communis, Variety amara) are larger and whiter than those of the sweet almond-tree (Amygdalus communis, variety dulcis). The sweet almond is bland and inodorous. There are numerous commercial varieties, of which the most esteemed is the Jordan almond, imported from Malaga. Valentia almonds are also valued. Fresh sweet almonds are nutritive and demulcent, but as the outer brown skin or episperm sometimes causes irritation of the alimentary canal, they are blanched by removal of this skin when used at dessert. When bitter almonds are pounded in water a ratafia odour is produced, on account of the formation of prussie acid. The essential oil or essence of almonds, so much employed for flavouring dishes, requires to be used with caution, as it possesses marked poisonous qualities. In some cases the oil, even when taken in small quantities, produces nettle-rash. The import of sweet almonds into Britain in 1870 amounted tu 36,189 cwt.; of, bitter almonds, 7618 cwt.

ALMONDBURY, an extensive parish and township of Yorkshire in England, lying to the S.E. of Huddersfield. As the manufactures of Huddersfield have increased, various outlying districts have been built on, so that the parish of Almondbury now includes a considerable part of that important and flourishing town. The parish contains 28,092 acres. The town lies on the river Calder, 2 miles 8.E. of Huddersfield,

and had formerly a cathedral and a strong castle. By some writers it is supposed to occupy the site of the Roman Campodunum mentioned by Antoninus; but whether or not, the place can boast a Roman origin—it was at least a town of importance in Saxon times, and a seat of the kings of Northumbria. It has a free grammar school founded by James I., a good church, and several other public buildings. The inhabitants of the town and parish are chiefly engaged in the manu- facture of fine cloths, and woollen, cotton, and silk goods. In 1871 the population of the parish was 46,299; of the township, 11,669.

ALMONER, in its primitive sense, denotes an officer in religious houses, to whom belonged the management and distribution of the alms of the house. By the ancient canons, all monasteries were to spend at least a tenth part of their income in alms to the poor, and all bishops were required to keep almoners.

Lorp AtMonsr, or Lorp Hich ALMoNER oF ENGLAND, is an ecclesiastical officer, generally a bishop, who has a right to the forfeiture of all deodands and the goods of a Jelo de se, which he is to distribute among the poor. He has also, by virtue of an ancient custom, the power of giving the first dish from the king's table to whatever poor person he pleases, or, instead of it, an alms in money. See Maunpay THURSDAY.

ALMORA, the principal town in the British district of Kuméon, within the lieutenant-governorship of the North- Western Provinces, is situated in 29° 35' N. lat., and 79° 42' E. long. The town is built on the crest of a ridge of

the Himalayas, running east and west, and 5337 feet above sea-level. It consists chiefly of a single street, about 50 feet wide and three-quarters of a mile long, closed by a gate at each end. A few detached houses, inhabited by Europeans, are scattered along the face of the mountain below the town. The town was captured by the Gurkhas in 1790, who constructed a fort on the eastern extremity of the ridge. Another citadel, Fort Moira, is situated on the other extremity of the

ridge. Almoréa is also celebrated as the scene of the British victory which terminated the war with Nepal in April 1815, and which resulted in the evacuation of Kumaon by the Gurkhas, and the annexa- tion of the province by the British. According to the census of 1872, the town contains a population of 5900 souls. It has been constituted a municipality, the revenue and expenditure of which in 1871-72 is returned as fol- lows :—Revenue—Receipts from octroi, £29, 16s.; house- tax, £211, 8s.; other sources of income, £30, 14s.: total, £271, 18s, Expenditure—Establishment, including cost of collection, police, and conservancy, £182; repairs, £90, 16s.; other items, £3, 16s.: total, £276, 12s. ALMORAVIDES, a family of Mahometan princes who reigned in Africa and in Spain between 1073 and 1147 A.D. This appellation was derived from the sect of Al- Morabethun (Dedicated to the service of God), which arose about the middle of the 11th century, among a poor ignorant tribe of Berbers inhabiting the mountains of Atlas, on the shores of the Atlantic Ocean. At the request of a sheik of Lamtouna, who had acquired some taste for learning by travelling in the East, Abdallah-ben-Yazim, an Arabian of extraordinary erudition, consented to instruct the people in the truths of Islam. The enthusiasm of Abdallah created a like zeal in the hearts of his ignorant hearers ; and by the energy and novelty of his discourses he so inflamed the minds of his disciples that they com- pelled those whom persuasion could not move to embrace the new religion. Thus Abdallah found himself at the head of a numerous sect, who soon began to regard him as their leader both in temporal and spiritual matters. Under the name of Almorabethun or Almoravides, they overran the country of Daza, lying between the desert of Sahara and the ancient Getulia, and ultimately extended their conquests from the shores of the Mediterranean to the frontiers of Nigritia. Abdallah died on the field of battle in the year 1058. He was succeeded by Abu-Bekr-Ibn-Omar, a man whose abilities were scarcely equal to the difficulties of the position in which he was placed. In 1072 he was supplanted by Yussef-Ibn-Tashfyn, to whom he had entrusted the government on setting out for Atlas to quell an insurrection of the Berbers. Yussef completely established the Almoravide power in Al-Magreb in 1073. On the invitation of Mohammed of Seville, he crossed to Algeciras in 1086, and at once marched against Alphonso VI., the most powerful prince

in Christendom. They met in the plains of Zalaca (23d Oct. 1086), and Alphonso was defeated with terrible slaughter. The news of Yussef's success induced many of the Arabs of Spain to enlist under his victorious banner. Spain (1091), he attacked Mohammed, and after a protracted siege became master of Seville. This conquest was followed by the subjugation of Almeria, Denia, Xativa, and Valen- cia. The acquisition of the Balearic Isles was the com- pletion of this vast empire, which extended from the Ebro and the Tagus to the frontiers of Soudan. Although Marocco was his capital, he frequently visited his Spanish dominions ; and on the last occasion, having assembled the governors of the province at Cordova, he appointed Ali, the youngest of his sons, as his successor. He then re- turned to Marocco, where he died at a very advanced age, 1106 a.p. (500 of the Hegira), after a reign of forty years.

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\ew kings have received so noble a heritage as that to which Ali succeeded. The first years of his reign were prosperous, though disturbed by the Almohades, who were preparing the way for the destruction of the Almoravides. Ali was at last obliged to recall from Spain his son Tashtyn, who was using his utmost endeavours to oppose the victo- rious career of Alphonso of Aragon, surnamed the Fighter. But the valour of Tashfyn was of little avail against the rising power of the Almohades: disaster followed disaster ; and when, in 1143, he succeeded to the throne, but a moiety of the kingdom remained. It was in vain that he received succours from Spain, the troops from that soft climate being little fitted for service in the wild regions of Atlas. Driven from Tlemecen, he sought refuge in Oran ; but: Abd-el-Mumen appeared before its walls, and by threats so intimidated the inhabitants

that Tashfyn was compelled to attempt escape on horseback, with his favourite wife behind him ; but being closely pursued, he urged his horse over a precipice, and with his wife was dashed to pieces. With Tashfyn expired the domination of the Almoravides ; for although they still remained in possession of the city of Marocco, their power was completely broken. Ishak- Ibrahim, the son of Tashfyn, was taken and put to death at Alcazar in 1147, on the surrender of Marocco by treachery, and with him the dynasty of the Almoravides became extinct. The remnant of the sect, driven from Spain, took refuge in the Balearic Islands, but it was finally sup- pressed in 1208. (For the history of the Arabians in Spain, see the works of Cardonne, Condé, St Hilaire, D'Herbelot, Al-Makkari, and Dozy.)

ALMQVIST, Kart Jonas Lupwic, one of the most extraordinary figures that the history of literature can produce, was born at Stockholm in 1793. He began life under highly favourable auspices ; but becoming tired of a university career, he threw up the position he held in the capital to lead a colony of friends to the wilds of Werm- land. This ideal Scandinavian life soon proved a failure ; Alinqvist found the pen easier to wield than the plough, and in 1829 we find him once more settled in Stockholm. Now began his literary life; and after bringing out several educational works, he made himself suddenly famous by the publication of his great novel, The Book of the Thorn-Rose. The career so begun developed with extraordinary rapidity ; few writers have equalled Almqvist in productiveness and versatility ; lyrical, epic, and dramatic poems ; romances ; lectures ; philosophical, cesthetical, moral, political, and educational treatises; works of religious edification, studies in lexicography and history, in mathematics and philology, form the most prominent of his countless contributions to modern Swedish literature. So excellent was his style, that in this respect he has been consideréd the first of Swedish writers. His life was as varied as his work. Unsettled, unstable in all his doings, he passed from one lucrative post to another, at last subsisting entirely on the proceeds of literary and journalistic labour. More and niore vehemently he espoused the cause of socialisin in his brilliant novels and pamphlets ; friends were beginning to leave, him, foes beginning to triumph, when suddenly all ininor criticism was silenced by the

astounding news that Almgqvist, convicted of forgery and charged with murder, had fied from Sweden. This occurred in 1851. For many years no more was heard of him; but it is now known that he went over to America, and under a feigned name succeeded in being appointed secretary to Abraham Lincoln. After Lincoln's death, Almqvist again fell under the ban of the law ; his MSS., including several unprinted novels, were confiscated and destroyed, but he himself escaped to Europe, where under another alias he continued to exist a short time longer. His strange and sinister existence came to a close at Bremen in 1866. It is by his romances, un-

doubtedly the best in Swedish, that his literary fame will mainly be supported ; but his singular history will always point him out as a remarkable figure even when his works are no longer read. He was another Eugene Aram, but of greater genius, and so far more successful that he escaped the judicial penalty of his crimes. (E. W. G.)

ALMUG or ALGUM TREE. The Hebrew words Almuggim or Algummim are translated Almug or Algum trees in our version of the Bible (see 1 Kings x. 11, 12; 2 Chron. ii. 8, and ix. 10, 11). The wood of the tree wag very precious, and was brought from Ophir (probably some part of India), along with gold and precious stones, by Hiram, and was used in the formation of pillars for the temple at Jerusalem, and for the king's house; also for the inlaying of stairs, as well as for harps and psalteries. Itis probably the red sandal-wood of India (Pterocarpus santa- linus). This tree belongs to the natural order Leguminosz, sub-order Papilionacese. The wood is hard, heavy, close. grained, and of a fine red colour. It is different from the white fragrant sandal-wood, which is the produce of San- talum album, a tree belonging to a distinct natural order.

ALMUNECAR, a small seaport town of Spain, in the province of Granada, about 33 miles south of the town of that name. It isa place of Moorish origin, and is toler- ably well built. The harbour is fit for small vessels only, and is much exposed to gales from the east. Sugar, cotton, and fruits are the chicf products of Almunecar and the

surrounding country, which is naturally very fertile, but the trade is small compared with that of former times, Population, 5000.

ALNWICK, the county town of Northumberland, is situated on the south bank of the river Alne, 310 miles N, of London, 34 N. of Newcastle, and 29 S. of Berwick. There are remains of the old wall which surrounded the town, and one of the four gates still exists; but most of the houses are comparatively modern, and are laid out in well-paved spacious streets. In the market-place there is a large town-hall, and a handsome building containing an assembly-room and a reading-room. Besides the parish church, Alnwick possesses a beautiful district church, a Roman Catholic chapel, and several Protestant dissenting places of worship. The chief employments are brewing, tanning, and brickmaking, but these manufactures are here of little importance. A small export trade is carried on through Alnmouth in corn, pork, and eggs, and a market is held every Saturday chiefly for these articles. The local government consists of a bailiff, nominated by the Duke of Northumberland, and twenty-four common coun- cilmen, four of whom are elected annually as chamberlains; the councilmen fill up vacancies in their body from the freemen, who usually are about 300 in number. The ceremony of making freemen is of a very peculiar kind. The candidates, mounted on horseback, assemble in the market-place very early in the morning of St Mark's day— the 25th April—clad in white from head to foot, with swords by their sides, and attended by the bailiff and chamberlains, who are mounted and armed in the same manner. From the market-place they procced, with music playing before them, to a large pool called Freeman's Well, where they dismount and draw up in a body at some dis tance from the water, and, on a given signal from the bailiff, rush into the pool, and scramble through the mud as fast as they can. As the water is generally very foul, they come out ina dirty condition; but they put on dry clothes, remount their horses, and ride at full gallop round the boundaries of the town. According to tradition, the observance of this custom was enjoined by King John to punish the inhabitants for their carelessness, the king having, it is said, lost his way, and been bemired in a bog, from their neglect of the roads near the town. To the

north-west of the town is Alnwick Castle, which has belonged to the Northumberland family since 1310. In early times this fortress was an important defence against the Scotch, and was besieged by them on scveral occasions, most memorably in 1093, when Malcolm Canmore and his son Edward were slain under its walls; and in 1174, when William the Lion was defeated and taken prisoner. For a long time it was permitted to fall into decay, but it has recently been restored, and to some extent remodelled, and is now one of the most magnificent specimens of a baronial residence in England. The grounds are extensive, and contain the remains of two abbeys, Alnwick and Hulme. The population of Alnwick in 1871 was 5822.

ALOE. Aloes is a medicinal substance used as a purgative, and produced from various species of aloe, such as A. spicata, vulgaris, socotrina, indica, and purpurascens, all belonging to the natural order Liliaceze. Several kinds of aloes are distinguished in commerce—Barbadoes, soco- trine, hepatic, Indian, and Cape aloes. The first two are those commonly uscd for medicinal purposes. Aloes is the inspissated juice of the leaves of the plant. When the leaves'are cut the juice flows out, and is collected and evaporated. After the juice has been obtained, the leaves are sometimes boiled, so as to yield an inferior kind of aloes. The active principle is called aloein. Aloes is used in the form of extract, pill, tincture, and wine. It is irritant, and requires to be used with caution.

The plant called American aloe belongs to a different order, viz., Amaryllidacee. The plant is called Agave Americana. The juice of the plant, taken immediately before flowering, is used in America for the manufacture of an intoxicating beverage. In Ecuador the spongy substance of the flower stem is used instead of tinder, and in the schools the green leaves serve as paper. A punish- ment among the Aztecs was introducing the spiny points of the leaves into the skin. The plant often delays flower- ing for many years, and then pushes up a flowering stalk with great rapidity, sometimes at the rate of 1 foot or

even 2 feet in twenty-four hours. The fibrous matter procured from the agave by maceration supplies pita flax.

The aloes or lign aloes of the Bible (Nuinb. xxiv. 6, and Psalm xlv. 8) is quite different from the medicinal aloes. The Hebrew words ahalim and ahaloth, and the Greek word aloe, arc rendered aloes in our version of the Scrip- tures. The substance is supposed by some to be the fragrant wood of Aguilaria Agallochum, a plant belonging to the natural order Aquilariacee. There are, however, considerable doubts as to the correctness of this view, more especially as the tree is a native of Cochin China, Silhet, and Northern India, and is not found in Chaldea or Syria. From the allusion made to the trees of lign aloes by Balaam, it seems probable that they were known as growing in Syria. It is quite possible, however, that the precious fragrant substance called aloes, and mentioned in Scripture along with cinnamon, cassia, myrrh, and spices, may have been brought from India. As a perfume it is noted in Psalm xlv. 8; Prov. vii. 17; Song of Sol. iv. 14. The use of aloes in perfuming the coverings of the dead is referred to in John xix. 39, 40.

ALOID A, or Atorap#, the designation of Otus and Ephialtes, sons of Poseidon by Iphimedea, wife of Aloeus. They are celebrated for their extraordinary stature, being 27 cubits in height and 9 in breadth when only nine years old. The story of their piling Pelion upon Ossa in their war with the Olympian gods is one of the best known of the early Greek myths. According to Homer's account, they were destroyed by Apollo ere their beards began to grow. (Odyssey, xi. 305; Iliad, v. 385.)

ALOMPRA, Atounc P'nours, founder of the reigning dynasty in Burmah, was born in 1711 at Mouchaboo, a

small village 50 miles north-west of Ava. Of humble origin, he had risen to be chief of his native village when the invasion of Birmah by the king of Pegu in 1752 gave him the opportunity of attaining to the highest distinction. The whole country had tamely submitted to the invader, and the leading chiefs had taken the oaths of allegiance.

Alompra, however, with a more independent spirit, not only contrived to regain possession of his village, but was able to defeat a body of Peguan troops that had been sent to punish him. Upon this the Birmese, to the number of a thousand, rallied to his standard, and marched with him upon Ava, which was recovered from the invaders before the close of 1753. For several years he prosecuted the war with uniform success. In 1754 the Peguans, to avenge themselves for a severe defeat at Keoum-nuoum, slew the king of Birmah, who was their prisoner. The son of the latter claimed the throne, and was supported by the tribe of Quois; but Alompra resisted, being determined to maintain his own supremacy. In 1755 Alompra founded the city of Rangoon. In 1757 he had established his position as one of the most powerful monarchs of the East by the invasion and conquest of Pegu. Ere a year elapsed the Peguans revolted; but Alompra, with his usual promptitude, at once quelled the insurrection. The Euro- peans were suspected of having instigated the rising, and the massacre of the English at Negrais in October 1759 is supposed to have been approved by Alompra after the event, though there is no evidence that he ordered it. Against the Siamese, who were also suspected of having abetted the Peguan rebels, he proceeded more openly and severely. Entering their territory, he was just about to invest the capital when he was seized with an illness which proved fatal on the 15th May 1760. Alompra is certainly one of the most remarkable figures in modern Oriental history. To undoubted military genius he added considerable poli- tical sagacity, and he deserves particular credit for his efforts to improve the administration of justice. His cruelty and deceitfulness are faults common to all Eastern despots.

ALOST, or Aatst, a town of Belgium, on the eastern frontier of the province of East Flanders, about midway between Ghent and Brussels. The Dender, a navigable tributary of the Scheldt, passes through the town, which is a clean, well-built place, surrounded by a wall with five gates. The church of St Martin, a fine edifice, although unfinished, contains a celebrated picture by Rubens, "St Roche Praying for the Cessation of the Plague." Among the other public buildings are a town-hall, which was founded about 1200 a.p., a college, and an hospital. The trade is extensive, chiefly in corn, oil, hops, and beer;

and there are linen, lace, and cotton manufactories, and iron foundries of considerable importance. Alost was formerly the capital of imperial Flanders. The French under Turenne took it in 1667, but were obliged to abandon it after the battle of Ramillies in 1706. Population, 19,000.

ALPACA is a name applied generally to several allied South American wool-bearing animals, but more properly restricted to one of the species. It is further used to dis- tinguish the wool obtained from these animals, and the woven textures manufactured from the wool are also known as alpacas. The alpacas or llamas are natives of the lofty table-lands and mountain-range of the Andes in Peru and Chili, and in that region of the globe they long occupied the position held in the Old World by their congeners of larger size, the camels. To the ancient Peruvians the llamas were the only available beasts of burden and wool-bearing creatures, just as to the present day the camel is to the tribes of the Asiatic deserts. The camel (Camelus) and the llama (Auchenia) form the two existing genera of the family Camelide; and thus in a zoological sense also the one

represents the other in different regions of the earth. A great deal of doubt and confusion has existed as to the number of species into which the llamas can be divided—a very common occurrence in dealing with domesticated or semi-domesticated creatures. Most authorities now, how- ever, agree in regarding them as separable into four species, following the classification of Von Tschudi, who has given much careful consideration to the subject. The species, according to that naturalist, are the lama (Auchenia lama), the huanaco or guanaco (A. hwanaco), the alpaca or paco (A. paco), and the vicugna (A. vicunna.) The two first-named species are, or rather were, more valued as beasts of burden, and for their flesh, than as sources of wool, being able to bear from 120 to 150 tb burden over long distances daily. The guanaco attains a size not much less than our red dcer; and is the largest and most widely spread of all the species, being found from the equator southward to Patagonia. The llama is next in size, but its habitat is limited to the loftier mountains of North Peru. Although both species

yield aserviceable quality of wool, which is uscd by the Peruvians and found in com- merce, it is chiefly to the alpaca we owe the supply of wool imported into this country under that name. The alpaca is considerably smaller than either the llama or the guanaco, but in general outline all the species resemble each other. In its native condition the alpaca ranges between 10° and 20° S. lat., from the centre of Peru into Bolivia, not coming lower down in vertical distribution than between 8000 and 9000 feet above the sea-level. At and above these heights it lives in herds in a semi- domesticated condition, being only driven into the villages to be shorn. The wool, which varies in length from 2 to 6 inches, is of a very lustrous and fine quality, and is mostly white, black, or gray, shades of brown or fawn being rarer. The vicugna is a much rarer animal than the alpaca, being found sparsely scattered from Ecuador, throughout Peru, inte Bolivia, but seldom descending under 13,000 fect above the sea-level. It is about the same size as the alpaca, and yields an exceedingly delicate wool, varying in colour from a reddish yellow to a dull white. It is usually worth about twice as much as alpaca, and is greatly valued for fine felts.

There is evidence of these animals having been held domesticated and used for their wool in their native regions from remote antiquity. Remains of clothing made from alpaca wools have been found in the graves of the Incas; and when, in the early part of the 16th century, Europeans first visited Peru, these animals formed the chief wealth of the natives, being the carriers of their commerce as well as the main source of their food and clothing. Small quan- tities of the wool were occasionally met with in English com- merce; but it was not till 1836 that it became established as a regular trading commodity with Europe. In that year Mr (now Sir) Titus Salt, a wool-broker and manufacturer in Bradford, purchased a quantity he met with in a Liver- pool warehouse at 8d. per tb, and set himself to discover its capabilities. The amount and manner of his success will be described in the articles Woon and WoRrsTED MANUFACTURES; it need only be remarked here that his experiments have resulted in making alpaca a staple second in importance to wool, and so creating an industry of great and rapidly increasing dimensions. The success of his

experiments led to the erection of his great manu- facturing establishment of Saltaire, in which upwards of 3000 hands are employed in the alpaca manufacture. The quantity of alpaca imported into England from 1836—the year of Sir Titus Salt's first experimental purchase—to 1840, averaged 560,800 ib yearly, which sold at about 10d. per fb. In 1852 the imports had risen to 2,186,480 Ib, and the price advanced to 2s. 6d. per tb. In 1864 the

imports amounted to 2,664,027 tb, aud in 1872 they were 3,878,739 tb; the value of average qualities being from 2s. 6d. to 2s. 10d. per tb. The introduction of the various species of llama into Europe has been frequently urged, Gcoffrey St Hilaire and other French naturalists having specially pointed out the desirability of their introduction into France, and at one time a herd existed in the Pyrences; but in Europe the creatures must be still re. garded as curiosities of zoological collections. In 1859 systematic and costly attempts were made to acclimatise the alpaca in our Australian colonies by Mr Ledger, a gen- tleman who had devoted many years to observation of the conditions of life of the animal. At first the experiment presented most encouraging prospects; the herds continued healthy and increased in numbers; but gradually the subtle influences of the loss of their native mountain climate became apparent,—the creatures drooped, their numbers dwindled, and for the present the undertaking must be regarded as a complete failure.

ALP ARSLAN or AXAN, Monwammepd Ben Daovn, the second sultan of the dynasty of Seljuk, in Persia, and great- grandson of Seljuk, the founder of the dynasty. He was born in the year 1029 a.p., 421 of the Hegira. He assumed the name of Mohammed when he embraced the Mussulman faith; and on account of his military prowess he obtained the surname Alp Arslan, which signifies 'a valiant lion," He succeeded his father Daoud as ruler of Khorassan in 1059, and his uncle Togrul Bey as sultan of Oran in 1063, and thus became sole monarch of Persia, from the river Oxus to the Tigris. In consolidating his empire and sub- duing contending factions he was ably assisted by Nizam- al-

Mulk, his vizier, one of the most eminent statesmen in early Mahometan history. Peace and security being established in his dominions, he convoked an assembly of the states, and declared his son Malik Shah his heir and successor. With the hope of acquiring immense booty in the rich temple of St Basil in Cesarea, the capital of Cappadocia, he placed himself at the head of the Turkish cavalry, crossed the Euphrates, and entered and plundered that city. He then marched into Armenia and Georgia, which, in the year 1064, he finally subdued. To punish the Georgians for the brave defence which they had made, and as a badge of their humiliating condition, the conqueror obliged them to wear at their ears horse-shoes of iron. In the year 1068 Alp Arslan invaded the Roman empire, the seat of which was then at Constantinople. The Emperor Romanus Diogenes, assuming the command in person, met the invaders in Cilicia. In three several campaigns his arms were victorious, and the Turks were forced to retreat beyond the Euphrates. In the fourth he advanced with an army of 100,000 men into the Armenian territory, for the relief of that country. Here he was met by Alp Arslan; and the sultan having proposed terms of peace, which were insultingly rejected by the emperor, a bloody and decisive engagement took place near Malazkurd, in which the Greeks, after a terrible slaughter, were totally routed. Romanus was taken prisoner and conducted into the presence of Alp Arslan, who treated him with a noble generosity. A ransom of a million and an annual tribute of 3000 pieces of gold, an intermarriage between the families, and the deliverance: of all the captive Mussulmans in the power of the Greeks, having been agreed to as the terms of peace and the liberty of the emperor, Romanus was dismissed, loaded with presents and respectfully attended by a military guard. He was unable, however, to fulfil the terms of the treaty, and the war was accordingly renewed. At this time the dominion of Alp Arslan extended over the fairest part of Asia: 1200 princes oF sons of princes surrounded his throne, and 200,000 soldiers were ready to execute his commands. He now declared

his purpose of attempting the conquest of Turkestan, the original seat of his ancestors. After great preparations for the expedition, he marched with a powerful army, and arrived at the banks of the Oxus. Before he could pass the river with safety, it was necessary to gain possession of some fortresses in its vicinity, one of which was for several days vigorously defended by the governor, Yussuf Kothual, a Kharizmian. He was, however, obliged to sur- render, and was carried a prisoner before the sultan. Being condemned to suffer a cruel death, Yussuf became incensed, rushed upon the sultan, and stabbed him in the breast. The wound proved mortal, and Alp Arslan expired a few hours after he received it, on the 15th Dec.

1072.

ALPES, the name of three departments in the south- east of France,— Basses Alpes, Hautes Alpes, and Alpes Maritimes.

Basses ALPEs is bounded on the N. by the department of Hautes Alpes; on the E. by the kingdom of Italy and the department of Alpes Maritimes; on the S. by the departments of Var and Bouches du Rhéne; and on the W. by those of Vaucluse and Dréme. It extends at the widest points 90 miles from N.E. to S.W., and 70 from E. to W., and contains an area of 2680 square miles. Its surface is mountainous, especially on the north-east, where offshoots of the Maritime Alps penetrate into the country, rising near the river Ubaye to an elevation of over 9000 feet above the level of the sea. With the excep- tion of the south-eastern corner, which is drained by the Var, the whole department is in the basin of the Durance, which for a considerable distance separates Basses from Hautes Alpes, but eventually strikes south- ward through the former. Its chief tributaries are the Buech aud the Jabron on the right, and the Ubaye, the Bléone, the Asse, and the Verdon on the left. The climate in the mountainous districts of the north is cold and variable. The soil there is poor, but it is cultivated with great industry — producing rye, oats, barley, potatoes, and timber. In the south and south-west, however, where the country is comparatively flat, the temperature is milder and the soil more fertile; here plums, almonds, apricots, peaches, and other fruits are produced in large quantities, as

well as wine of an excellent description, chiefly for home consumption. Considerable numbers of cattle, sheep, goats, and pigs are reared in the Basses Alpes, besides which many flocks of sheep, from Var and Bouches du Rhéne, are pastured during summer in the upper valleys of the department. Game is abundant. There are mines of lead and other metals of some value. The manufactures are few and of little importance, the chief being leather, coarse woollen cloths, cutlery, earthenware, and paper. Basses Alpes, one of the departments formed out of ancient Provence, is divided into five arrondissements—Digne, in the centre; Barcelonnette and Castellane, on the east; Sisteron and Forcalquier on the west; which together contain 30 cantons and 251 communes. Digne is the capital and the seat of a bishop, whose diocese is co-extensive with the department; and among the other towns are Barcelonnette, Castellane, Sisteron, Forcalquier, and Manosque. Popu- lation (1871), 139,332.

Hautes Atpes is bounded on the N. by the depart- ments of Isere and Savoir; on the E. by the kingdom of Italy; on the S. by the department of Alpes Basses; and on the W. by that of Dréme. It extends nearly 80 miles from N.E. to S.W., and contains an area of 2158 Square miles. Its surface is very mountainous, being tra- versed in all directions by the Cottian and Dauphiné Alps, which, in Mont Pelvoux and other peaks, rise to an eleva-

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tion of about 13,000 feet above the sea, the highest sum- mits in France. The Drac, flowing northwards into the Isére, and the Durance, with its tributaries the Guil and the Buech, are the chief rivers of Hautes Alpes. The climate is cold in winter, and in summer variable; the soil is barren, yielding only oats, barley, potatoes, rye, and timber, except in a few favoured valleys, where wine of a fair quality and fruits of various kinds are produced. Large numbers of sheep and other domestic animals are reared or pastured in the department. Game, both large and small, is found in great abundance. The mines produce lead, copper, iron, and other metals. There are no manufactures of any commercial importance, although some leather, coarse woollen cloth,

hats, woodwork, and iron wares are made. Hautes Alpes, a part of the old province of Dauphiné, is divided into three arrondisse- ments: Gap on the west, Embrun on the south-east, and Briangon on the north-east, with 24 cantons and 89 com- munes. 'The capital is Gap, the seat of the bishop ; Em- brun and Briangon being the only other towns of any size. Population, 118,898.

Autres Maritimes, bounded on the N. by Basses Alpes and the kingdom of Italy, which also forms its boundary on the E.; on the 8. by the Mediterranean Sea; and on the W. by Var and Basses Alpes. It extends at the widest points 55 miles from N. to §., and 50 from E, to W.; and contains an area of 1517 square miles. The surface of this department, like that of the two former, is more or less mountainous, branches of the Maritimes Alpes covering the greater part of the territory. It is watered by the Roya, the Paillon, the Var (with its tributaries the Tinéa and the Esteron), the Loup, and the Siagne. The climate is on the whole warm and gentle, except among the higher mountains; while the mildness of the tempera- ture along the shores of the Mediterranean has made that portion of the department a favourite resort for invalids. The upper valleys and mountain slopes are chiefly devoted to pasture for sheep, being ill-suited for cultivation, although a little barley and maize is grown; the richer districts of the south produce fruits of various kinds, tobacco, honey, and flowers, used in the making of perfumes. The other manu- factures are of dried fruits, olive-oil, preserved anchovies and sardines, silk, soap, and paper. Alpes Maritimes is divided into three arrondissements—Grasse and Nice on the south, and Puget Théniers on the north, containing 25 cantons and 146 communes. The arrondissements of Nice and Puget Théniers constitute the bishopric of Nice ; Grasse belongs to that of Fréjus. Nice is the capital; and among the other towns are Mentone, Villafranche, Grasse, Antibes, Cannes, and Puget Théniers. The Marseilles, Nice, and Ventimille railway, skirting the coast, connects Cannes, Antibes, Nice, and Mentone, and joins an Italian line which affords direct railway communication with Genoa. The department of Alpes Maritimes was formed in 1860 from the territory of Nice, which had been ceded to France, together with Mentone and Roccabruna,

pur- chased from the Prince of Monaco, and the arrondisse- ment of Grasse, transferred from Var. It had a popula- tion of 119,037 in 1871.

ALPHA and OMEGA (A and Q), the first and last letters of the Greek alphabet, frequently employed to symbolise the idea of completeness or infinity. They are used as a designation of himself by the speaker in Rev. i. 8; xxi. 6; xxii. 13. In the last passage the speaker is undoubtedly Jesus Christ. In the symbolism of the early church A and Q, combined with a cross or with the mono- gram of Xpiords, represented Christianity, or, more speci- fically, faith in the divinity of Christ.

600. ALPHABET

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ALPHABET

Y an alphabet we mean a list of symbols which repre- B sent conventionally to the eye the sounds which are heard in the speech of a nation. An alphabet will therefore be perfect if the number of its symbols exactly correspouds to the number of simple sounds which are commonly distinguishable in the spoken language. But this perfection has probably never yet been reached: all known alphabets have failed, either by defect, ¢.¢., from not representing all the simple sounds ; or by redundancy, in having more than one symbol for the same sound. They must also necessarily become imperfect by lapse of

time. No nation keeps the sound of its language unaltered'

through many centuries: sounds change as well as grammatical forms, though they may endure longer, so that the symbols no longer retain their proper values ; often, too, several different sounds come to be denoted by the same symbol ; and in strictness the alphabet should be changed to correspond to all these changes. But little inconvenience is practically caused by the tacit acceptance of the old symbol to express the new sound; indeed the change in language is so gradual that the variation in the values of the symbols is imperceptible. It is only when we attempt to produce the exact sounds of the English language less than three centuries ago that we realise the fact that if Shakespeare could now stand on our stage he would seem to us to speak in an unknown tongue ; though one of his plays, when written, is as perfectly intelligible now as then. Such changes of sound are most developed in countries where many different dialects, through con- quest, immigration, or otherwise, exist side by side: they are checked by the increase of education and by facility of locomotion—both of which causes tend to assimilate all dialects to that one which by some lucky chance has become the literary speech of the nation.

The term alphabet has come to us from the Latin alphabetwm, which, however, occurs in no prose writer before Tertullian. It could not have been used, for metrical reasons, by Juvenal, when he wrote, " Hoc discunt omnes ante alpha et beta puelle"—theiraBc, But there is no reason why it should not have existed earlier: the word was borrowed from the Greek, as seems clear from the compound avaAdaByros, which is as old as the comedian Philyllius (Meineke, Com. Frag. ii. 857), and he was alive in 392 8.0. It does not seem likely that this compound adjective would have been coined if the noun itself had not already existed in the same sense which it now bears.

The symbols of our alphabet are nearly those of the Latin; these in their turn were borrowed from a Greek alphabet; and there seems no reasonable ground for doubting the common tradition that the Greeks derived their characters from a Phoenician source. All these borrowings will be fully described hereafter. At this point absolute certainty ends. We cannot prove to de- monstration the origin of our alphabet ; but positive facts and analogical arguments may be adduced which enable us to attain a very high degree of probability. It is now commonly believed that the characters were originally hieroglyphics, and in that ultimate form were devised in Eigypt. There, for conveniénce of writing, they took a simpler form (called hieratic). In this shape they were borrowed by the Phcenicians; and thus, in their long course down to us, they passed gradually from being the written expression of an idea into the written expression each of a single sound. It is true that the proof is not clear throughout : sometimes the links are feeble, and here we have to employ the analogy of other languages, in which

the particular step which we want to prove has un- doubtedly been made under similar circumstances. Still, it may with some truth be said that we can only prove the possibility of such a process, while any given alphabet may have had a perfectly independent origin; the Phoenician alphabet may have been developed in Phoenicia itself, and never been hieroglyphic at all But this is very difficult to conceive. The a priort argument for the derivation of phonetic from hieroglyphic characters is strong. Hiero- glyphics have unquestionably been the

first attempt of many nations in a rude state to record their thoughts in a permanent and universally intelligible form. It is also certain that these hieroglyphics have undergone progressive degradation of shape, so that their visible connection with the thing signified was often lost; they became in many cases the expression of those combinations of sounds by which the things were denoted in the spoken language, though they still generally retained their original value as well. Here, at all events, a certain connection between hieroglyphics and sounds establishes itself ; and a priort it is more probable that all alphabets should have derived the single sounds of which they consist from hieroglyphics, through the medium of their derived phonetic values, than that any alphabet should have been produced independently of hieroglyphics (which are admitted to have existed), by some arbitrary process of formation for which absolutely no testimony can be adduced. As we have said above, such a process is not impossible, and may be true for any particular alphabet ; but the opposite theory has the most internal probability and all the evidence of which the case admits. Against this it seems insufficient to urge (as has been done) that there exist upon earth savages who have never developed any alphabetic writing out of their rude attempts—a fact which may be readily granted; or that civilised men often return to the simple methods employed by uncivilised nations, such as cutting notches on sticks or tying knots in strings—such return being apparently adduced to prove that two totally different methods of expression can co-exist without there being any tendency to pass from one to the other; nay, it is added that in Egypt the hieroglyphic and the common (or demotic) character did certainly exist side by side; and if the latter were borrowed from the former, it would have superseded it, which it did not do. Now, in answer to this, reasons will appear shortly why the hieroglyphic characters lingered so persistently, even when the later phonetic character was in common use—nay, in the very same inscription or docu- ment with the hieroglyphic. Still, the argument would have some weight if it were not grounded on the false assumption that the demotic alphabet was a purely phonetic one, totally unconnected with its more aged rival. But modern research has proved incontestably that the demotic characters can be traced back to their original hieroglyphic shape through the medium of the hieratic;

in fact, that the cumbrous hieroglyphics were successively put into more and more abbreviated shapes, for convenience of writing, as its use increased.

Excluding, then, attempts of savages such as have been mentioned above, which were neither durable nor in- telligible enough to make them of service, except for the smallest number of men during the most limited time— excluding these as not deserving the name, we derive all real writing from hieroglyphics, such hieroglyphics being either purely pictorial, the expression of visible objects in the external world; or symbolic, when some external object is conventionally chosen to represent some action of

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some abstract idea. These two methods were probably nearly contemporaneous in their origin, because the necessity of writing at all supposes a considerable advance in civilisation, and therefore a considerable development of ideas. 'To this system as a whole the convenient term ideography is now generally applied. From this men have passed to phonetic writing, first, apparently, in the form of syllabism, in which each syllable of a word is regarded as an independent whole and represented by a siugle sign ; then from this to alphabetism, in which the syllable is no longer denoted by an indivisible symbol, but is resolved into vowel and consonant, each with its own accepted sign.

It seems probable that all known alphabets (with oue or.

two: possible exceptions) may be traced back to four or five parents, These have differed much in fruitfulness, but all were originally hieroglyphic. These five systems of writing are the Egyptian, the cuneiform, the Chinese, the Mexican or Aztec, and the curiously cumbrous charactcrs of Yucatan and central America: these last may be seen interspersed with figurative paintings in a facsimile given by M. de Rosny at p. 20 of his very useful little summary, Les Heri- tures

Figuratives des Different Peuples Anciens et Modernes. Of these, the first three alone can be said to have had any great extension; and the first, if the Phoenician, and by consequence the European alphabets, were derived from it, far exceeds in importance all the rest together. These systems wcre perfectly independent, and developed them- selves, cach in the same course, but in its own manner, and each in the main to a different degree. At certain points in their history all but one became crystallised, and remained to show us the steps by which the progress to phonetism can be made. We do not propose to describe here fully any of these systems of hieroglyphics. We are only concerned to point out their relative degrees of de- velopment, their deficiencies, and the consequent motives which must have impelled men by degrees to the produc- tion of a genuine alphabet.

There are obvious deficiencies even in the most highly developed hieroglyphics. In the first place, they must have been excessively burdensome to the memory. They speedily lost their original form, which was in most cases too cumbrous to be retained when writing became frequent ; their pictorial value was therefore lost, and the new form could not generally have been intelligible to a learncr, who was thus obliged to acquire by memory an enormous number of symbols, compared with which even the Sans- krit alphabet may be regarded as easy. Secondly, it is impossible by hieroglyphics to express grammatical rela- tions : the order, indeed, in which the symbols are placed may denote the distinction between subject and object ; plurality may be expressed by the repetition of a symbol ; some even of the relations in space, denoted in more advanced languages by cascs, may be pictorially rendered ; but all these helps do not go far to remedy this obvious want. Experience, however, shows how much incon- venience a nation will undergo rather than make any radical change in its phonetic system. We have only to look at our own alphabet, with its numerous and univer- sally confessed deficiencies and rcdundancies, and then

**The authorities referred to chiefly are Endlicher (Chinesische Grammatik), Oppert (Expédition Scientifique en Mésopotamie, tom. 2), and Bunsen (Egypt's Place in History, vol. v.) Frequent use has been*

made of De Rosny's book mentioned above, and still more of the Fissai sur la Propagation del' Alphabet Phénicien dans Ancien M onde, by M. Frangois Lenormant, of which the first volume only has yet appeared. It contains an introduction to his special subject, in which the labours of Champollion, Young, Lepsius, Bunsen, De Rougé, in Egyptian hieroglyphics, and of Grotefend, Rawlinson, Hincks, and Oppert, among the cuneiform characters, are ably summarised, and set forth with much clearness.

reinember the fruitless attempts which have been made to work a reform in it, to be convinced that no people will of its own accord strike out a thoroughly new system of writing. Such revolutions can only be produced by the meeting of two different civilisations, and the reception by the one of the arts and ideas of the other. But such a meeting may, and more commonly docs, only stimulate the inferior race to some partial development. For the new ideas new names are required: these may be metaphori- cally represented out of the old vocabulary, as when the Romans called the unknown elephant the Lucanian ox, and of course wrote it so. But suppose the inferior people to be one which has not yet advanced beyond hiero- glyphic writing; their simplest and most obvious plan will be to take the strange name, and express it by those symbols out of their old stock which denote the nearest sounds to that of the name required. Such symbols then cease to represent ideas only, as they used to do; they are consciously employed to represent mcre sounds, and thus arise the first beginnings of phonetism. A good example of this process may be found in the Aztec (Lenormant, i, 29; De Rosny, p. 19, who also gives others). When Christianity was introduced into Mexico, the Lord's Prayer was reduced to writing in the following manner :—The Mexican symbols nearest to the two syllables of pater were a flag (sounded as pantlz), and a rock (tetl) : pater was there- fore represented pictorially by a flag and a rock ; we cannot tell whether it was sounded as pan-tetl, or only as pa-te— the nearest possible equivalent in the Mexican language, which has nor. Similarly, noster was phonetically repre- sented by noch-tetl, pictorially by the Indian fig (nochili) and the rock

as before. Here, then, we have the application of symbols to denote sound without regard to the original sense ; just as we might draw the figures of an eye, a saw, and a horse, and convey by them the idea, "I saw a horse." The Aztec would not long have the ideas of a flag, a rock, and a fig presented to his mind when he read these symbols; and so the first conception of phonetism was gained, the first move from hieroglyphic to alphabetic writing. Yet he had not attained the first real step in the progress—i.e, syllabic writing—because if he had decomposed his new words, pan would not have represented to his mind merely so much sound—a syllable by itself meaningless: it would have given him only the idea of a flag. And further than this the Aztec language did not pass: probably it only reached this stage incompletely with a small number of words. The great advance to syllabic writing is to be found elsewhere ; first in the Chinese, perhaps through the accident of the monosyllabic nature of the language; but with a clearly-developed purpose in the Aramaic cunciform inscriptions.

In the Chinese written character we find a considcrable number of symbols which were unquestionably at. first pictorial. Though but very slight vestiges of their original meaning can now be seen in them, yet they can be traced back to older forms which are unmistakeable ; and their origin is further attested by the name " images," which the Chinese give them, as distinguished from others which they call "letters." These symbols were simple, and denoted very ingeniously natural objects—the sun (by a circle with a dot inside), the moon (by a crescent with a line inside), a mouutain (by three peaks side by side), rain

y a mother (fp, a figure expressing the arms and bosom

effectively enough), &c. These symbols could be combined: thus the symbols for water and eye combined denoted tears, an ear and a door expressed hearing and under-

(by drops under an overarching line), a child (thus

standing; but such combinations of pure hieroglyphics were rare, as they would have been liable to be confused with combinations of the same kind used in a different way, as will be scen immediately. There were also some hieroglyphs used symbolically; ¢g., a hand to denote a workman, the two valves of a shell-fish to denote friends. These also are few in number, and not very ingenious. Last in this class come some symbols which are essentially pictorial, though they represent no visible object; eg., "above" was expressed by a dot above a horizontal line ; "below," by a dot below it; the numerals one, two, three,

by so many horizontal lines ; "right," by the symbol = eft," by F: és. So far, we have simple hieroglyphs,

or ideograms (a more convenient term),—pictorial repre- sentations, expressing not merely visible objects, but also abstract ideas, and even actions ; but each of these could also have the phonetic value of the name of the object which it depicted.

Distinct from these are the " letters"—in use, though not in origin. These have two parts—one, a symbol which was originally an ideogram, and which could still be used as such, but which in this particular combination lost its ideographic value, and retained only the phonetic value of the name of its object; the other, an ideogram, which laid aside its phonetic value, and only restricted to a particular class the phonetic symbol which it accompanied. Thus, for example, the ideogram of a ship had also the phonetic value tchew—-1.¢., the name denoting ship in the spoken language ; the ideogram of fire had the phonetic value hwé: these two symbols combined were still pronounced tchew,

.and meant the flickering of flame. The second symbol

dropped its phonetic value altogether, but kept the generic idea of fire: the ship was lost, but the idea of undulating motion modified that of fire, and the complex symbol com- bined the two ideas, with the one sound tcheu. Similarly, the ideogram ship and speech combined expressed loquacity, and this in the spoken language was also tcheu,

the phonetic value of the symbol for speech being dropped, just like that of the symbol fire above. In this way there

‘are teu different ideas given by Endlicher (p. 10), all called

in the spoken language tchew, and all expressed to the eye by different complex symbols formed on this principle. These symbols, he reckons, form at least 28ths of the written language.

This is a very imperfect sketch of the Chinese system of writing, and into the history of the ‘“ keys,” which indeed belong rather to Chinese lexicography, we do not propose to enter. But it is enough to throw light on some questions connected with our subject. First of all, we see ideography and phonetism existing side by side ; and even the same symbol, having in most cases (not in all) either an ideographic or a phonetic value at will. Therefore, in this case the passage from the one system to the other may be considered as certain ; but how it was made there is not sufficient evidence to show. It must have been earlier than the combination of pure ideograms mentioned above. It was probably greatly facilitated by the Chinese being a monosyllabic language ; each syllable is a complete word in itself, expressing a complete notion : hence the idea of completeness and individuality would attach to such a combination of sound more easily than would be possible in polysyllabic language ; and it would seem more natural to give that sound a symbol for itself, quite apart from its ideographic meaning. Further, as the whole number of single syllables of which the language consists is ouly 450, the effort of remembering the symbols could not be great, and the memory must have been already trained in that

direction, because the symbols (even in their ideographic acceptation) had lost their obviously pictorial character, and must have been kept by the memory, not recognised each time by the eye ; just as children, in learning to read, commonly remember short and familiar words as a whole, without analysing them into the component letters.

The explanation of the cumbrous “letters” described above is simple ; and it will show us, secondly, how so ap- parently monstrous a system of writing could be maintained, and has been in its essence

maintained, down to the present day. With so few radical sounds in the language, it was inevitable that many different objects must have bcen expressed, as ideas grew and multiplied, by the same sound, as we saw above that there were eleven different ideas (including the ship itself) all called tchew. These could be distinguished in the spoken language by tone or accent, and actually were so distinguished. But how were they to be distinguished in writing? Now, writing is but the visible exponent of language, and therefore is naturally formed under the same conditions—those conditions which, because the effect is obvious while the reason is often difficult to detect, we vaguely call the genius of the language: and it must accommodate itself to the defects as well as the strength of the language. There is an inherent evil in Chinese speech—inevitable in a mono- syllabic language with a limited number of radicals—that the same combination of sound should serve to express many different ideas. A combination, therefore, of symbols is absolutely necessary, which shall represent to the mind through the eye the fact that the sound which is heard has changed its meaning to meet that of another sound which is not heard—that tehew no longer means a ship, but means the flickering of flame, or something else quite different. It would have been easy enough to have had different symbols for the different meanings of tcheu ; but it would not practically have been so convenient, because it would not have represented so well the facts of the language. Jf the Chinese had chosen in their speech to do universally what they did occasionally, to form com- pounds like " ear-dooring" for "hearing" a thing, the native genius for pictorial representation would have pro- duced a symbolism which might have supplied all its wants down to the present day. But that was not the bent of the language; and the writing therefore remains to the present day a mixture of ideography and phonetism, and is perhaps better so. Still, a great deal of confusion is possible. In modern writing, according to Endlicher, each syllable has several symbols, partly because of the extra- ordinary number of meanings belonging, as we have seen, to each combination of sound, partly from considerations of calligraphy, because it is not every symbol which will combine neatly with every other; and therefore for par- ticular combinations a different symbol with the same phonetic value is required, so that the shapes of the mixed symbols increase in

number. Also, the pictorial symbols being comparatively few, and many of these being em- ployed phonetically for the same syllable, it is obvious that, with the growth of ideas, many new symbols must have been required. To meet this want, the mixed symbols so often mentioned were employed purely phoneti- cally, each in new combination on the old principle with an ideogram, whose meaning was disregarded. Generally these symbols kept their phonetic worth, but sometimes in combination with particular ideograms they change. Thus we see a double evil arise in the language. Not only have we several symbols for each combination of sound, but also the same symbol can under certain circumstances have different phonetic values. But the difficulties thus caused seem greater to a stranger than to a native; and the Chinese have never been moved thereby to exchange their

picturesque but unwieldy system. The impure syllabism marked out for them by the genius of their language has been their furthest development. It was reserved for the Japanese to borrow the Chinese characters, and, expelling all ideographic associations, to employ them simply as syllables, thus advancing to a pure syllabic writing. This borrowing and extension of a system by a foreign nation will be more fully dwelt upon hereafter. It should perhaps be added that the expression of many different senses by one symbol, which has so largely modified the Chinese writing, is not peculiar to monosyllabic language. It is found in all languages, though not to the same extent: roots of different sense have been worn down by phonetic decay till they reach the same form, and this cause may have operated to some extent in China, though it cannot have been very important.

The cuneiform writing, so called from the wedge-like

shape of the characters, | or W, which compose it, was

employed by different nationalities. It was first deci- phered by Grotefend on inscriptions of Persepolis, and was found to be the exponent of the Aryan spoken by the conquering Persians, which

belonged, as is well known, to the Indo-European family of languages. But cuneiform inscriptions in three languages were found on a monument at Behistun: the first was the Persian, and much the simplest in form; the second and third were composed of elements of the same shape in much more unwieldy combinations. It was obvious that the three inscriptions were identical in meaning, but in different languages; and principally by the help afforded by recur- ring proper names, whose value could be compared with the known values in Persian, the characters of the last two inscriptions were deciphered, and found to belong, one to the language of the Assyrian and Babylonian subjects of Darius, the other to the old Scythian population of Media, who used a Turanian speech. Other languages, the old Armenian and that of Susa, were found afterwards to be represented by the same characters; and to these different systems the collective name Anarien (i.e. non-Aryan) has been given by French writers (Oppert, &c.), to distinguish them from the Aryan-Persian, which is a purely phonetic character.

It seems clear that the origin of this system was Turanian, and that it was borrowed by the Semitic races who used it. It was originally hieroglyphic, though the stiff combinations of wedges give but little indication of such an origin. But both in Assyrian and Babylonian there is an older character and a newer one, and the older forms can again be traced back to a still more archaic shape, which was unquestionably the original of both, and which is not cuneiform, but composed of straight lines only." These show little of the brilliancy of invention of the Chinese ; they seem to appeal to the reason rather than to the eye; they are obviously intended to recall the image of the object, but they must have been first explained in order to be intelligible at all, and then they might be remembered.

For example, a house was denoted by lira: a town by

&. Neither of these are symbols which will be intelli- gible as soon as seen by a person who has not been taught them. This is probably due to the fact that they were produced, not by the hair-pencil of the Chinese, but by the chisel; they were intended to be written on rock,

and for this straight lines are more convenient; and the wedge shape which they assumed afterwards may be explained

PA. part of this trilingual inscription is printed in De Rosny's Eeritures Figuratives, p. 70.

**¥For specimens, see Oppert, vol. ii., p. 63.*

by the ease with which it can be made by two strokes of the chisel—perhaps no other figure so clear can be produced with such facility.

This system seems to have reached syllabism before it was adopted by the Aramaic peoples. But the syllabism was still mixed up with ideography, just as we have seen was the case in China—that is, the same symbol denoted ideographically the object, and phonetically the sound, of the name of the object; as though in English we should denote by the symbol B both the insect bee and the sound be, But there is a difference between this idiom and the Chinese; it was polysyllabic, whereas Chinese was syllabic. When, then, the name of the object contained more than one syllable, the first alone was taken to be denoted phoneti- cally by the symbol. The evidence for this is small in quantity, owing to the scanty remains of the language of that Turanian element of the Chaldee nation from which the cuneiform writing was borrowed. To this language the name Accadian has been given by Dr Hincks, and this name seems to be now generally received. But the Medo-Scythic, mentioned above, which is a closely-con- nected dialect, supplies us with forms sufficiently close to the old Scythian spoken originally by all the Turanian stock in that part of Asia. Thus one symbol in Assyrian denotes ideographically God and phonetically an; now the name for God in Medo-Scythic is Annap. Another denotes a city and but; batin is a city in Scythian. Another is a father and at; in Scythian a father is atfa. (Oppert, ii 79; Lenormant, i. 41.) This evidence will doubtless be strengthened with time, but even now it is conclusive; and the principle thus established, the arbitrary selection of the first part of a name to have a particular phonetic value, seems to be exactly the principle which we should a prion have expected to find

if we had tried to conceive the possible ways in which ideography could pass into phonetism.

The confusion which was occasioned by the imperfection of Assyrian writing was immensely increased by the fact of their characters being borrowed, not indigenous, as in China. There is first of all the obvious difficulty of adapting Turanian symbols to a Semitic language, in which the short vowels were not written, and the meaning of the radical group of consonants in any particular place had to be determined by the context. Instead of being able to retain the same symbol to express a root in its modified forms, e.g. in the conjugation of a verb, a new symbol would be necessary for each person-form, which could be expressed by mere vowel change in the root, and these sym- bols might be totally unconnected, so that all sense of the connection of different parts of a verb would be lost. This is bad enough, but it is an evil inherent in the borrowing of such a system of writing to express a language whose genius was so essentially different. But there was another evil, much greater, which might have becn avoided, and was not. This is polyphony—the expression of many different sounds by the same symbol. When the Assyrians took an Accadian symbol, they should have taken only its phonetic value, or one of them, if it had more than one, and in this way they might have acquired a purely syllabic character, as the people of Susa afterwards actually did. But, as was not unnatural at the time, they took it with all its values, ideographic and phonetic, and added more of their own.

make this plain. In Accadian this symbol aa was the

ideogram for an open hand, doubtless originally in a more elaborate form. In the spoken language a hand was called kurpi, and therefore, by the principle mentioned above, this symbol had also the phonetic value kur. But by & metaphor the hand symbol had the further ideographic

A bee ae BE a

values of seizing, possessing, and understanding. To seize in the spoken language must have been mat, or something very like it (¢mid occurs in this sense in the Scythian), for this phonetic value also belonged to one symbol. But further, in Accadian a mountain was called kur, sunrise, kurra; earth was mat; to go was mit; and these sounds, identical or nearly identical, were every one expressed by the same symbol, which thus had eight ideographic and two phonetic values, kur and mat; and in this wretched condition it was taken by the Assyrians, and employed by them in all these different senses. But this was not all. In the Assyrian language kur was the name of a furnace, and mat meant to die; and as it must have been to obtain a visible exponent for these sounds that the foreign symbol was adopted, both of these ideas were necessarily denoted by it. Again, in Assyrian, "to understand" was pro- nounced as nat, and to " possess" was nal; and so were added two more phonetic values by reason of the meta- phoric value of maéin Accadian. Lastly was added the phonetic value shat, because that was the Assyrian name for a mountain, which we saw was denoted in Accadian by kur. Thus, when an Assyrian came upon this little plain- looking symbol he had to determine whcther it meant the earth, a mountain, sunrise, a furnace, or seizing, possessing, understanding, going, or dying; or whether it had only one of the phonetic values, kur, mat, shat, nal, or nat. And a large list of other symbols is given by M. Oppert, which, in a similar way, have two, three, four, and even six different phonetic values. It may seem incredible that a people under such difficulties should ever have been able to express what they wished to say, much less to understand what was written. It is a great witness to the strength of the feeling which must have existed in these old people that ideography was the natural and proper method of writing, and phonetics were only a supplement to eke out its deficiencies. To us such a feeling is at first incompre- hensible, but after such an example we cannot doubt its existence. With respect, indeed, to the difficulty caused by one symbol having many ideographic values, we have only to think of the many different significations expressed in our own language by the same combination of sound, without any confusion arising, because the particular meaning is marked out by the context; for instance, when the one

sound but denotes a conjunction, a verb, and a noun with two senses—one original and one derived, but now quite different,—we should therefore only see in the Assyrian an aggravated case of this want of clearness. But the difficulty is much more serious when the same symbol has different phonetic values; and much help can- not have been obtained from the grammatical lists which have actually been dug out under the superintendence of Mr Layard, in which the Assyrian kings state, avowedly for the instruction of their subjects, the different values which each symbol could possess. (See Oppert, ii. 53.) By these lists some hmit might undoubtedly be put to the further multipli- cation of values for the same sign, but it could not help a reader to trace which of all the authorised valucs he was to give to a symbol at any particular time. It would appear that in the cuneiform, as unquestionably in the Egyptian, conventional phonetic symbols could be used as complements to other symbols, which might represent an idea or a mere syllable, and by these phonetic comple- ments the special sense could be defined with some approach to exactness. But into these remedies of the ills of poly- phony we need not further enter.

It is far beyond the scope of the present article to describe fully the development of hieroglyphism in Egypt, the country in which the last step to alphabetism—the separation of the vowel-symbols from those which mark the consonants—was undoubtedly taken, though with much

faltering, and even turning back. According to M. Lenor- mant, the Egyptians passed through every stage which we have already seen successively reached by different peoples ; and at one of which every one of these peoples halted, with- out ever achieving for themselves the triumph of alphabetic writing. And evidence of each stage, more or less distinct, certainly lingers in the Egyptian, producing an extra-ordinary medley, little suited for popular or even literary use, but well adapted for the transmission of occult records and rituals, the purpose for which the Greeks not un- naturally supposed the whole hieroglyphic system to have been invented by the priests. As we have

already de- scribed the phenomena of each stage with some fulness, it is not necessary to do more here than to indicate their occurrence in Egyptian. The hieroglyphs themselves are certainly the finest of their kind. Whether they represent the full contour of the object with all the assistance of vivid colouring, or whethcr they are simply formed by lines which convey its essential character—a practice which doubtless owed its origin to the increased use of writing— it is impossible not to admire the cxtraordinary complete- ness of the representation. Nothing can be morc perfectly pictorial than the portraiture of the different emotions, each by the figure of a man affected by it: the position of the body and the gestures of the arms are simply perfect. These belong in the main to the symbolic use of the hieroglyphs : this use we saw in Chinese was but slight, but in Egypt it was immense. Thus, the sun, with rays streaming from it, denoted to the Egyptian light and clear- ness ; the moon, with its horns turned downward, denoted the month,— in these cases the cause is put for the effect. Sometimes the part is put for the whole: two arms, onc holding a shield and one an offensive weapon, express battle ; two legs with the feet denote movement, forward

or backward according to the direction of the feet, \ or

A, ; anarm holding a stick denotes force. Sometimes

the symbol is purely metaphorical: as when a king is expressed by a bee; knowledge by a roll of papyrus ; or justice by the feather of an ostrich, because all feathers of that bird were supposed to be of equal length. Such symbols are clearly of later origin than the other ; they imply the existence of conventional rules, which could acquire currency for meanings quitc unintelligible in them- selves. These symbolic ideograms were not very often used alone; most commonly they accompanied other symbols used phonetically, mercly to determine their special meaning in cach place: as such they are commonly called determinatives ; this practice we also saw in China, less skilfully employed. Thus, for example, on the Rosetta stone— whose trilingual inscription, hieroglyphic, demotic, and Greek, is the basis of all our knowledge of Egyptian writing—the word for a decree

is expressed by characters, consonant and vowel, which denote the sounds of which it is composed, just as in any modern writing ; but at the end of these, forming part of the word, though adding nothing to its pronunciation, is the figure of a man with his hand raised to his mouth, which adds the idea of pas- sive obedience to the phonetic combination, and limits it to the idea of a decree. In like manner, the arm with the stick, which as we said denotes force, is added as a deter- minative to express actions which require force; and thc idcogram of motion is also very frequent. This seems to us unnecessary and cumbrous; but when a phonetic com- bination might have two different mcanings, they could hardly have been differentiated in a more intelligible manner. A good list of these symbols may be seen in Dc Rosny, p. 46.

The traces of the rebus stage which we saw in the Aztce,

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in which a symbol could be transferred from one object to another, because the names of the two had the same sound in the spoken language, are not very distinct, and have not been fully cxamined ; on this point we may hope for more light from M. Lenormant. He points out that the same symbol denotes "holiness" and a "slave." No meta- phorical explanation seems possible here; but both are sounded hen in the spoken language, and the community of symbol becomes at once intelligible. In such a practice as this we see at once a cause of great confusion, especially when the same symbol was employed to denote two things the names of which were not exact homophones, and yet sufficiently near in sound to allow themselves to be ex- pressed by the same symbol; ¢.g., when the circle which denoted the sun was also taken to denote the idea of day, the sun was called ra, the day hru, and so the symbol became a polyphonc ; it had two not very different sounds. It is true that here the application of the symbol for the sun to denote the day was not caused only by the similarity of sound in the two words—it was probably employed at first metaphorically ; but there can be little doubt that it was helped to its double use by the indistinctness of the Egyptian vowel-sounds, which caused the two

words to be sounded nearly alike. From this and similar causes arosc that polyphony which necessitated the use of the deter- munatives described above. Vestiges of the syllabic stage in Egyptian exist beyond a doubt, and they point to a slowly- effected transition from the older to the newer form of writing. Thus the symbol of a fish represented at the syllabic stage the syllable an ; later on, the letter a alone came to be denoted by a reed, and » by a waving linc. Now we find the syllable an represented not merely by its own simple exponent, the fish, but also by the reed and fish together, that is,in phonetic value, by A. an; by the reed

above the waving line my ; and cven by all three (4. oa

(Lenormant, ii. 44), This surely points to a stage at which the alphabetic values of the reed and line were not yet so firmly fixed that the writer could dispense with the older and more familiar sign of the fish to specialise the other two, Of Egyptian alphabetism proper it is not necessary to give examples; we are sufficiently acquainted with the use of letters pure and simple, and their use in Egypt is not denied.

To what cause are we to assign the progress of the Egyptian beyond the Assyrian method of writing? What circumstances enabled the one nation to develop at least an imperfect alphabetism, while the other never advanced beyond syllabism? No certain answer can be given; but at least a probable suggestion is made by M. Lenormant. The Egyptian vowel-sounds were indistinct: the consonants were clear and definite. Therefore it was natural (as Lepsius pointed out) that in each syllable the consonant should come to be regarded as the intportant element, and should finally extrude the following vowel altogether. Thus a large number of symbols, which originally represented syllables beginning with the game consonant but followed by differ- ent vowels, would become in time absolutely identical in value, the different representatives of the same consonant. And a great abundance of such homophones is actually found in Egyptian. The method, therefore, which was followed in passing from the syllable to the mere alphabetic sign, was identical with that which we have already pointed out in Assyrian, by which the symbol of a polysyllabic

word was taken to have the phonetic value of the first syllable of that word ; in each casc it denoted the first element of the name—the syllable in Assyrian, the single sound in Egyptian. And in each language the symbol thus applied to a new use still retained for a long time its old value

ALPHABET

matcrial object or of an idea. Thus in Egypt nefer meant good. This word in writing is cxpressed in two Ways : first, by a single symbol—which had originally been the pictorial representation of some material object, but was afterwards the conventional symbol of the idea of good- ness ; secondly, by this same symbol followed by two others, which had also, from being originally hieroglyphs, acquired the phonetic values of f andr; that is to say, one symbol could at will express the whole word nefer and its initial letter x. This is the natural, perhaps the only possible way of eliminating the single sound ; but it is obvious that great difficulties would attend it at the outset, There could be at first no convention to restrict the symbol for x to that of the particular word nefer ; any other begin- ning with » would have served. There was no law to prevent a writer taking as many symbols for 7 as took his fancy ; and in fact each letter in this way did have several different symbols.

It follows that while Egypt must be credited with having first invented an alphabetic system, and must for ever claim for this the gratitude of the world, yet that system was far too imperfect to become the instrument of a popular literature. It suffered equally from the opposite diseases of homophony and polyphony, from the expression of the game sound by many different symbols, and from the use of one symbol to denote many different syllables. And cach of these evils was only aggravated by time. The earlicr Egyptian writing is much more simple than the later, wherein homophones increased to a degree to which there was practically no limit except the strength of the memory; and the numerous phonetic devices to unravel the confusions of polyphony must have been equally burden- some. It might have been expected that polyphony at least would have become extinct with time; that the

different symbols for the same syllable would all have been worn down into single letters, and thus, though homophony might have multiphed, polyphony would have perished. This might have been the case if these symbols had ever become perfectly clear of their originally pictorial or con- ventional origin. But this was never the case. 'To the last, the employment of a symbol to express an object or idea continued side by side with its employment as a single letter. The spirit of hieroglyphism, real if not apparent, could not be vanquished by alphabetism ; and in order that ideography may be finally expelled, it would seem that circumstances are needed more favourable than can be often found combined at any period of any nation's history. In fact, a purely phonetic alphabet is most likely to be produced when one nation borrows from another such portion of that nation's symbols as it requires for its own needs, and rejects that superfluity which only leads to confusion. We have already seen indications of this fact.

Many circumstances combine to render it difficult for a nation to reach of itself pure phonetism in writing, There is the strong disinclination to change, of which we have before spoken. It is always easier to put up with diff- culties to which we have been accustomed all our life than to make any radical change, especially when that change causes at once serious difficulties at every moment. It was easier for the Egyptians to retain the odd mixture of ideographic, syllabic, and alphabetic writing, and occasion- ally to add some new key for unlocking the difficulties to the formidable list which was already in use. The in- genuity of these grammatical devices almost surpasses belief. We can only refer the curious to the hieroglyphic grammar in the fifth volume of Bunsen's Egypt's Place m Universal History. In the sccond place, a good deal must be allowed to the restraining influence of religion. It is well known that most of the ancient nations ascribed @

as the hieroglyphic or at least conventional exponent of a! divinc origin to their systems of writing. It might well

scem to them to be too wonderful a thing for the result of human ingenuity. Thus in one of the Assyrian lists of the different valucs of

syllables, published, as has been already mentioned, by royal authority, Sardanapalus V. states that the god Nebo has revealed to the kings, his ancestors, the cuneiform writing, which he thus endeavours to simplify for the better understanding of his people (Oppert, ii. 53). The Sanskrit character, which is now known to be due to a Phoenician source, was called Devandgari, " belonging to the city of the gods," unless, as Prof. M. Miiller suggests (Sanskrit Grammar, p. 1), we are to understand by the gods here only the Brahmans ; but whatever thc name may mean, their belief in its divine origin is certain enough. And M. Lenormant points out (i. 80) that the native Egyptian term for writing meant "writing heavenly words." Now it is clear that no nation among which this belief lingered in any degree would be likely to alter fundament- ally the spirit of their system of writing. Lastly, it is possible, though, as we have suggested above, not very probable, that the obscurities of the existing system may have recommended it to the priests. These reasons may suffice to show that it was not in Egypt that we should expect to find the development of a purely phonetic system. But just as the Japanese took the Chinese characters, and

ave them a development which they have never had in the land of their creation—just as the people of Susiana took the cuneiform writing and made it purely phonetic, without any remnant of ideography,—so the work of ex- tracting order out of the chaos of Egyptian writing was reserved for the Phoenicians.

The Phcenicians were peculiarly fitted to perform this inestimable part in the history of human development. An active and enterprising nation, they were early brought ito commercial relations with Egypt, and must of neces- sity have learnt something of their system of writing; they could see its advantages and its perfectly remediable faults; the advantage of one definite symbol for one sound, and the disadvantage of a dozen; the desirability that this symbol should signify that sound only, and the undesir- ability of its denoting a horse or a man as well. And the religious scruples which may have affected the Egyptians need have no weight for strangers. If the characters were divine for the priests of Isis, they were a convenient instru- ment to supply every-day wants for the sailors of Tyre.}

These considerations do not, of course, amount to a proof that the Pheenician alphabet was derived from Egypt. It is of course possible that it disengaged itself by degrees out of an earlier hieroglyphic system at home. But of such a system no vestiges remain; and the correspondence between the Phoenician characters and those of the earlier Egyptian hieratic is sufficiently striking to warrant us in regarding it as at least provisionally true that what was natural and perfectly possible did actually take place.?2 The general testimony of the early Greek and Roman writers, that the alphabet was invented in Pheenicia, must then be limited to the sense in which Tacitus says that the Pheeni- cians had this credit—tanquam repererint, que acceperant.

_ It cannot be known with certainty whether the Phceni- cians took, together with the Egyptian symbols, the phonetic values which they had in Egypt, or whether they totally disregarded those values, and simply assigned to the symbols the value of their own sounds at will. The first view, however, seems clearly the more probable. The Pheenicians could only become acquainted with the Egyptian "i ee

1M. Lenormant (p. 83) will have it that the Phenicians must have been "trés peu religieux, et au fond presque athée." They

may have been so, but surely not merely in order to borrow an

alphabet from Egypt. It is enough that that alphabet could have had no sanctity for them.

- *For evidence of this, see plate, p. 630.*

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symbol and sound together ; the one would naturally sug- gest the other; and we should expect that they would first take the symbols belonging to those sounds which exactly corresponded in Egyptian and Pheenician, then the symbols of other Egyptian sounds which did not exactly correspond to their own, but which seemed in each case the most analogous to them ; but that there would never be any violent rupture between the symbol and its old sound. Yet it seems quite

certain that there is no connectiou between the names which the letters bore in Phcenicia and the original object of which the Egyptian character is the debased representation. Thus the first letter of the Phoenician alphabet (corresponding to the Hebrew aleph) was named from its fancied resemblance to an ox's head, the second (Hebrew beth) to a horse, and so on. But the symbol which strangely seemed to the Phcenicians like an ox is only the form, rapidly drawn, of an eagle ; beth, in like manner, is the quickly-drawn figure of a crane. It would seem, then, that the Phcenicians borrowed sound and symbol, but no name. They cared nothing for the history of the symbols; and when they found it convenient to have a name for each symbol they chose some object whose name began with the letter in question ;and we should have said that it was totally impossible that any similarity in form between the letter and the object whose name it borrowed could have helped to give currency to the nomen- clature, did we not see evidence of similar and apparently equally impossible fancies in the names of the constella- tions, let the origin of those names be what it may.

Such, very briefly traced, seems to have been the origin of the Phoenician alphabet, the parent of almost every alphabet, properly so called, existing on the earth. For the main ramifications of this alphabet in subsequent times we cannot do better than translate the summary of an author already often referred to, M. Frangois Lenormant. He distinguishes (p. 110) five main stems. These are—

1. The Semitic stem, wherein the values of the letters have re- mained exactly the same as those of the Pheenicians, except in a few derived alphabets framed in Persia and the eountries imme- diately adjacent, which being employed to write Indo-European languages, turn the soft breathings of the Pheenician into genuine vowels. This stem subdivides itself into two main branches—the Hebreeo-Samaritan and the Aramaie.

2. The Central stem, whose provinee ineludcs Greeee, Asia Minor, and Italy. The transformation of the symbols of the smooth, and even of the rough, breathings into symbols of vowels is here the invariable rule.

This stem contains first the different varieties of the Hellenie' alphabet, then the alphabets derived from the Greek, including three families—the Albanian, Asiatic (taking Asia in the same sense as the old Greeks did), and the Italian. In the Asiatie family we distinguish two groups—one for the Phrygian alphabet only, which is made up of elements whose origin is exelu- sively Greek, the other containing the Lyeian and Carian, where these elements are mixed up with Cypriote! eharacters. The Italian family must also be subdivided into an Etrusean group and a Latin group, between whieh stands the Faliscan alphabet, of a mixed eharacter.

3. The Western stem, containing the systems of writing which resulted from the spread of the alphabet by the colonists of Tyre among the indigenous inhabitants of ancient Spain. This stem reckons but one single family. It has, as that whieh precedes it, for its fundainental charaeter the change of the value of the Pheeni- eian breathings. But the direetion in whieh the forms of the letters vary is signally different. . .

4. The Northern stem, eontaining only one branch, the runes of the Teutonie and Scandinavian peoples, who were settled at a partieular epoch in the north of Europe, but had arrived from Asia, where they still lived during a part of historie time, and where they must have had imparted to them the alphabet produced by thc Pheenieians. Some elements in the runie writing seem to point to a direct reception of the writing from the seamen of Canaan ; others, on the eontrary, bear a certain stamp of Greck influenee. . . .

ieee

1 The only two alphabets, in the strict sense of the term, which M. Lenormant cannot classify' as of Pheenician origin are the Cypriote and the Persian cuneiform—the former still imperfectly deeiphered, but seemingly to some extent syllabic ; the latter perhaps not pure alphabetic, but retaining certain ideograms.

5. The Indo-Homerite stem, distinguished by the appearance of a new principle, the expression of vowel sounds by means of conven- tional adjuncts attached to the symbol of the consonant, and thus sometimes considerably modifying its shape. The place of its origin seems to have becn southern Arabia. From thence it has radiated on the one side to Africa, where the Abyssinian and the African systems form a scparate family with the Himyaritic, or alphabet of the old 'inhabitants of Yemen ; on the other side to Ariana, where a special form of writing cstablished itself ; and to India, whose most ancient alphabet, Magadhi, now referred by A. Weber to a Phoenician origin, has given birth to an enormous list of derivatives, which can be classificd among six families—Devandgari, Palt, Dravidian, Transgangctic, Oceanic, and Thibetan—which we here enumerate in their chronological order of descent.

It will of course be observed that this classification of alphabets runs entirely counter to the universally-accepted classification of languages into certain well-recognised groups under three main heads—Indo-European, Semitic, and that family which, rather because its members differ from the two first-named than from any especial bond of union among themselves, is called Turanian. This is in nowise surprising. There is no necessary connection what- ever between the sound and the symbol which signifies it —between the language and the alphabet. The languages of nearly all Europe are Indo-European (or Aryan, as they are sometimes called) ; the alphabets are universally Semitic — that is the fact, explain it as we may. In fact, if we wish to maintain that sound and symbol correspond, so that the second is the only natural exponent of the first, we must form two hypotheses which refute themselves— first, that it was possible that any race of men, when they first felt the need of an alphabet, deliberately set them- selves to form their letters so as to represent the different positions of the organs of speech as each sound was pro- duced; secondly, that such forms could have been exactly preserved through long lapse of time, so as to convey to subsequent generations exactly the same idea as they gave to their inventors. But each supposition is clearly impossible. An alphabet so formed would also be an artificial alphabet, such as could never have cntered the minds of men who needed to supply just their

actual wants as they arose, not to construct a scientific table of signs to denote all possible sounds. But the construction of such a pictorial alphabet as we have supposed is quite possible, and it has actually been formed most ingeniously by Mr Melville Bell, In his system, which lhe calls 'Visible Speech," consonants are denoted by curved lines, which represent the position of the tonguc or lips in their formation. For example, in forming the gutturals k, g, ng, the back of the tongue is raised, and this is expressed by

the curve €; in pronouncing 9, the front of the tongue is arched, and this is denoted by @); in pronouncing dentals, the point of the tongue is raised, and this is expressed by (9; in sounding labials, the lips are closed, and this is denoted by (); where the passage of the mouth is com-

pletely closed by the symbolised organ (as in &, g, ¢, d, p, 6), the ends of the curve are shut by a connecting line—

thus CI denotes k; the consonants which are voice articu-

lations (i.e, in producing which the chorde vocales vibrate, and so produce voice), as g, d, 6, &c., are further distin- tinguished by a short straight line within the curve, the physiological sign which is chosen (conventionally, it must be allowed) to represent voice being (1) a straight line ; and the other distinguishing marks of the consonants are similarly expressed either by added marks or by slight modifications of the primary curve. Equally ingeniously, the vowels are expressed by the straight line which is the sign of voice, a subordinate symbol, or "definer," being

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added to denote the part of the mouth which modifies the vowel—e.g., a hook or a solid point at the top or bottom of the vowel-line, a bar across the line to express that the lips are contracted or drawn across the aperture of the mouth, &c., &e. We need not enter further into the minutiz of the system ; enough has been said to show the principle on which it is formed. It is obvious that there would be no greater

difficulty in teaching this alphabet to a child than in teaching it a, 6, c, except that the number of symbols is greater, because one is provided for every sound in the language, which our alphabet certainly fails to do; still, to learn either our alphabet or "visible speech" must for a child be simply an effort of memory, And one great practical gain which would be derived from the general adoption of such a system is the ease with which foreign languages could be mastcred. The great difficulty in learning to speak a foreign language does not consist in the mere mastering so many declensions ; it lies in the fact that two alphabets may be composed of exactly the same symbols, and yet many of these symbols may express to the two nations quite different sounds. This ig a preliminary difficulty which must be mastered at once; and it would be immensely lessened if such dissimilar sounds—as, e.g., the German, French, and English «—were not all presented to the learner under the same symbol. It seems certain that, with the lapse of time and the progress of invention, the intercourse between nations must be largely increased; and the need of some more perfect instrument of speech between them must increase propor- tionately. But in spite of the obvious gains, it is utopian to suppose that the world will ever be converted to a system of universal writing; and the real and immense gain of such a method is the power which it gives to a linguistic inquirer to denote accurately on paper the exact sounds heard in any dialect spoken in any part of the world, civilised or uncivilised; for it is as competent to register the click of the Hottentot as the most subtle vowel sound of Europe. With our present alphabet it is utterly impossible to represent adequately the strange sounds of some out-of-the-way dialect (which for students of language may be as important as the literary speech) in such a way as to be generally intelligible, because there often is no symbol to correspond exactly, and naturally no two inquircrs agree upon the nearest out of the existing symbols, The science of language is therefore greatly indebted to Mr Bell for providing so effective a method for preserving for ever those dialectic peculiarities which are vanishing with startling rapidity in these days of con- stant communication between different parts of a country. Another system, equally valuable scientifically, has been invented by the eminent philologer, Mr Alexander J. Ellis. In his " Paleotype" only the ordinary symbols are employed, but they are printed in different

ways to denote different sounds—sometimes as capitals, sometimes in italics, some times turned upside down; so that, despite the familiarity of the letters, a page of palzotype is at least as appalling to the uninitiated as the curves and lines of "visible speech." We may proceed to trace the variations from the Phoenician alphabet to our own, down the central stem of Greece and Italy. The Phcenician alphabet consisted of twenty-eight letters, which for convenience we may call by the names of their Hebrew equivalents. These were (1) Aleph, (2) Beth, (3) Gimel, (4) Daleth, (5) He, (6) Vav, (7) Zayin, (8) Cheth, (9) Teth, (10) Yodh, (11) Kaph, (12) Lamedh, (13) Mem, (14) Nun, (15) Samekh, (16) Ayin, (17) Pe, (18) Tsadhe, (19) Koph, (20) Resh, (21) Shin, (22) Tav. None of these were vowel sounds. Aleph was the lightest guttural or rather faucal sound, being pronounced below the guttura point at the very top of the larynx: it can have been barely audible even before a vowel. He corresponded nearly

to our/. Cheth was a strougly-marked ch, a continuous guttural sound produced at the back 'of the palate. Ayin represents a faucal sound peculiar to the Semitic race, varying betwcen an evanescent breathing and a g rolled in the throat.

The Phcenicians employed hardly any vowel signs: in Hebrew the three principal sounds a, 2, u (see article A) were sometimes expressed in writing, and long 2 and « were denoted, not by special signs, but by consonants akin to them, yodh and vav: a was regularly omitted except at the end of a word, where it was denoted by He and sometimes by Aleph. In fact, in all Semitic languages the practice was to ignore vowels in writing, leaving it to the reader to fill in, according to the context, the unvarying frame- work of consonantal sounds: the Hebrew vowel-points were a later invention, rendered necessary when the language had ceased to be spoken.

When the Greeks received the Phcenician alphabet it is obvious that they must have made considerable changes in the values of the symbols. Several of them would be unnecessary, for they had no sounds in their language to correspond to them: while for other most

important sounds, é.g., the vowels, no symbol was provided. It is clear how imperfect any previous alphabet of the Greeks must have been when they adopted in its stead another so foreign to the genius of their language, which developed the vowels and marked strongly the momentary consonants and nasals, but rejected as far as possible the continuous consonants, both palatal and labial, and even under many circumstances the dental s, the one sibilant they employed. But they ingeniously adopted the strange signs to new ends. Aleph, He, and Ayin were turned without difficulty into a, «, and o: Yodh became 1, as it seems that the semi-vowel y had totally disappeared from Greece even at that early period: on the same principle Vav might have served to express v, although apparently the w-sound was still sufficiently common to require the retention of Vav with its con- sonantal value. But from what source they took their upsilon cannot be known with certainty. Professor Key thinks that it is the Hebrew form of Ayin, which differs much in shape from the nearly perfect circle of the old Phenician. This is possible enough, for the sound of Ayin was not more like o than uw; and if the Greeks knew the two forms, it is not likely that they may have taken both. On the other hand, it is equally possible that v may be a remnant of an earlier native alphabet. Among the consonants 8, y, 6, x, A, Mm, v, 7, p, T were borrowed with little change of form, and probably of value. And these letters (with o and the vowels already mentioned) are stated by tradition to have been the only ones brought to Greece from Phoenicia by Cadmus, others having been added by Palamedes, Simonides, or Epicharmus; but which were the letters added by each of these is a question on which the different authorities do not agree; and the incor- rectness of most of them is proved by the letters being found in Greek inscriptions before the time of their supposed inventor. In fact, all tradition on this point is worthless, unless it is borne out by inscriptions. It is at least probable that the whole alphabet was borrowed at one time, for all, or nearly all, the characters occur on the oldest inscriptions we possess. Thus on inscriptions of Thera dating from Olympiad 40 (see Franz, Hpigraphice Greca, pp. 51-59; Kirchhoff, Studien zur Geschichte des Griechischen Alphabets,

41), we find Cheth in the form f , denoting mainly the

rough breathing ’, but also applied to denote e, as it afterwards did regularly by the name Mia: Teth occurs

as @, nearly the later Theta; and Koph as 9 , Koppa, a

symbol which was once current throughout Greece, and

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remained universally as the numeral 90, though as a letter it was retained only by the Dorians, and passed with the Doric alphabet into Italy as Q. It may be observed that in this alphabet, and in some later ones of Crete, Corinth, and Corcyra, Iota appears not as a straight line, but in many curved shapes, approximating much nearer to the old Phoenician; and the same is true of Pi, which has the top rounded like a crook. We have then left only the four sibilants, Zayin, Samekh, Tsadhe, and Shin. These are believed to have had the values dz, s, ts, sh respectively. We have already said that the Greeks had no great affec- tion for sibilants; witness the manner in which o was constantly dropped, eg., in yéveos for yéveo-os. It was therefore not to be expected that they could employ all the wealth of the Phoenicians; and one symbol (Tsadhe) appears in no Greek alphabet. The name, however, recalls

the name Zeta; but the shape of Zeta (always TJ) is

unquestionably that of Zayin; and its place in the alphabet agrees to this. It seems, therefore, most probable that the Greeks confounded together the two compound sounds dz and ts, and kept but one symbol, perhaps with the name of the other (Tsadhe), because it was most like that of the neighbouring letters Eta and Theta. This con- fusion of the two sounds seems the more probable when we remember that no symbol was requircd for the com- pound ¢s at the time when a special symbol for ps was added, and that for ks (another analogous compound) perhaps revived. There is also much uncertainty with regard to ‘the relations of Samekh and Shin in their Greek dress. .X? (=&s) occupies the place of Samekh, sigma of Shin. One form of

Samekh seems unquestionably to have furnished that of the Greek & (see the forms, p. 600);

another = is exactly the Greek € of all the inscriptions.

Sigma had the sound (s) of Samekh, and cannot be shown ever to have had the sound (sh) of Shin. Two names were preserved among the Greeks, segma and san. Herodotus (i. 139) speaks of the "same letter which the Dorians call ody, the Ionians ofypa;" and though san was no letter of the Ionic alphabet, the compound sampi (= caw + 71) denoted 900. The name san is obviously the Semitic shin or sin: it is just possible that ofypa may be an attempt to turn samekh into a form which should explain its meaning to Greek ears. The oldest Greek alphabets known to us— those of Thera, Melos, Crete, and the earlier forms of

those of Argos, Corinth, and Corcyra—have the form |

to denote s,—that is, the equivalent of Shin. It seems fair to infer that this was originally the case in the other alphabets also. Then this symbol was dropped by degrees to avoid confusion with m, while one form of samekh, with the name sigma, was introduced into its place: another form was kept in its old place to denote the compound ks (a1).

aM now come to the apparently non-Phcenician letters of the Greek alphabet, ¢, x, ¥, wo Of v we have already spoken: we may add that its sound was not a pure w, but modified, perhaps as is the German uw This appears from the fact that, when the Romans borrowed Greek words in the later times of the republic (when Roman taste had grown more scrupulous), they did not use their own symbol u to denote the Greek wpsilon (as their forefathers had done), but together with the sound borrowed the symbol also: which clearly shows that the sound of upsilon was different from the ordinary vu. We now take the aspirates g and x. It is most probable that the sounds of the Greek aspirates x, 6, p, were not those of the German ch, and the English th and f: that is, they were probably not continuous consonants, but momentary

sounds, followed in each case by a slight but distinctly audible breath; so that x might be represented in English characters by #h, though the following breath is not so – distinct as an English 4,—if it were, we should have a compound, not a simple sound. Now two of these aspirates were actually written in the oldest alphabets KH

and rc H (pi having the right down-stroke much shorter

than the left): for the dental the single symbol 6, borrowed from the Phoenician, sufficed. Afterwards the symbols ¢ and x (variants @ and +) were taken to supply the place of these compounds, from what source cannot be certainly known; but it is not impossible that they may have been characters of an older Greek alphabet which originally had the values p and &. This draws some proba- bility from the history of y. That letter was originally

written rs ; and é, of which we have already spoken,

written as KS (or KM). But each of these also appears as ®S and X3; so that here at least ¢ and x appear as no

more than p and &; the compound @Zremained perma-

nently in the Western alphabets. It is to Epicharmus that tradition (hcre with some probability) ascribes the estab- lishment of y in the alphabet. The history of w is closely connected with that of » At an early period, certainly before the 40th Olympiad, in the eastern part of Hellas an attempt was made to distinguish the different kinds of e. The symbol ¢« had hitherto denoted both e and the diphthong «, where the « was probably not a much more important sound than the y—eg., in our day. The habit of writing the two symbols came in late in the Ionic alphabet, and so spread through Greece. But at the earlier time of which we speak the symbol H began to denote some e. It is commonly supposed that this was long ¢ as distinguished from epsilon, which, by

the way, does not mean short e, but ‘“e unaccompanied,” perhaps by that after sound of « mentioned above, though a different reason is commonly given for the name. It seems very strange that the Greeks should have introduced symbols to express long e and o, and none to mark the length of the other vowels, which must have been just as urgently needed: surely this would have been done at Athens at the time of the formal introduction of the Ionian alphabet. Again, there are a great many recognisable varieties of sound which border closely on pure e and o (but none of im- portance near 7 and w), and such varieties are clearly marked in the south of Europe now. For these two separate reasons, it seems at least more probable that y was adopted to express a sound the same, or nearly the same, as the open e of the Italians. For the same reasons, it seems probable that w was taken not to denote long o, but a more open sound; perhaps something between open o and the English aw. The form 2 is of doubtful origin. It is found in an alphabet of Miletus of about Olympiad 60; not earlier. It looks like a conscious modification of O. Greek writing in the earliest times was from right to left, following the example of Pheenicia: several specimens of this still exist. The more convenient practice of writing from left to right soon became universal. It was preceded, however, by an intermediate method, in which the direction of the lines was alternately right to left and left to right, so that it was not necessary to carry the eye back, as with us, from the end of one line to the beginning of the next. This was called Bovorpodydév, because the lines were made in the same way as the furrows by oxen in ploughing. Kirchhoff distinguishes two main divisions of Greek alphabets—the East and the West; not that this geographi- cal distribution is exact, but it is the most convenient. The eastern includes first the alphabets of the towns of Asia

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Minor—Halicarnassus, Ephesus, Teos, Miletus, Colophon, and Rhodes, which, agreeing esscntially, became that Ionic alphabet that was adopted at Athens 463 B.c., and igs the Greek alphabet with which we are familiar ; secondly, those of the Aigean islands—Thera, Melos, Crete, Paros, Siphnos, Thasos, Naxos,—in which © does not stand for

Omega, but occasionally appears as well as o for Omicron, and there are other minute differences in the shape of the letters ; thirdly, some of the alphabets of the mainland of Greece, which have a closer affinity to the Ionic than to their neighbours, viz., the old one of Attica, down to Ol. 94—Argos, Corinth and its colonies, Corcyra, and even Syracuse. The western division includes the remainder of the towns of Greece proper and their Sicilian and Ttalian colonies; these are marked by peculiar variations of certain characters, especially g, e, h, th, l, r, and s, by the use of 4 as the aspirate only, by the absence of omega,

Y or Wy, to denote, not ps, but ch, whilst X or +, the symbol of ch in the eastern alphabets, here denotes x. Compare with this last variation what we have said above of the use of XS to express X: there can be little doubt that it was from the occurrence of X in this collocation, and no other, that this new value for it arose, and } was dropped. It is significant that in the old Latin alphabet XS appear instead of X. The difference in value of \V in the eastern and western alphabets is perplexing: it seems that in one or the other the original value must have been consciously changed, but it is not easy to say in which. The most important alphabet of this group for our purpose is that of the Chalcidian colonies of Sicily and the west coast of Italy —Cume, Neapolis, é&c.—because from this was derived the Latin alphabet, the direct progenitor of our own. It is distinguished from others of the same class by the

and by the universal application of the symbol

rounded form of the Gamma (, by the peculiar form of the Lambda { , by the very old Mu (jw), and by a rounded Sigma Z , though it has also the two other ordinary forms

and 3: in common with some other western alphabets, it has a double rho (P and R). (See p. 600.)

From this Chalcidian alphabet it seems clear that all the Italian alphabets were derived. They fall into two families, which differ from each other considerably, but principally in the loss of old letters and

the insertion of new—differences which do not militate against their com- mon origin, but show the cause of their separate develop- ment. ‘The first family contains the Etruscan, Umbrian, and Oscan alphabets; the second the Latin and Faliscan. Into the peculiarities of the members of the first group we do not propose to enter at length: they agree in the total rejection of O and X, and the addition of a strange symbol

§ to denote the,f sound, vaw being retained with a slightly

modified form for v: the Etruscan retains the symbols © and Y which the other two dropped, and the Etruscan and Umbrian agree in rejecting the soft mutes. The Umbrian, however, has a new symbol for a modified d, peculiar to itself, and also for a modified &; the Oscan has new symbols for a modified ¢ and a, and in general shows a difference in the shape of its characters from all the other Italian dialects, which does not seem due to any other foreign influence so much as to its own individuality. These three languages are all written from right to left, in which the Faliscan agrees with them: the Latin alone, from the earliest time of which we have any records, was written from left to right; but there can be little doubt that it did not originally differ from its fellows, but changed at a later time, just as the Greek alphabet itself

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The fact that X, found in the Latin and Faliscan alphabets, has the value of a, and not of ch, and that WY, as already mentioned, is found with the value of ch in Etruscan, shows that the common source of these five alphabets was a western, not an eastern. Greek alphabet ; and the rounded form of C, and the peculiar L (V, not A) limit the choice to the Chalcidian family. The points in which the Latin differs from the Chalcidian alphabet of Cumz, from which it was probably derived through com-

had done.

mercial intercourse, lie—

(1.) In the application of the symbol vax (F), to denote not the » but the / sound, which was probably strange to

the Greeks.

(2.) In allowing K to fall almost out of use—it was employed only in abbreviations, such as the first letter of a prenomen, as Kzso, or for Kalende, é&c.—and employing C instead, which had of course in the present Greek alpha- bet the power of gy. This change may point to a time when

the distinction of the sounds & and g was obliterated, to be afterwards restored.

(3.) In the formation of the new symbol G—i.e., C with a distinguishing line—to mark the soft gutturals, when the want of a distinctive symbol was again felt. This was some time in the 3d century B.c.; but instead of replacing K for the hard guttural sound, they preferred to leave C in its old place, but with a new value, & instead of g; while the modified form G was inserted into the place

of 1s (Z), which may have been taken by the Romans

(as it certainly was found in the other Italian alphabets), but which fell out of use absolutely without any record.

(4.) In absence of the aspirates VW, , and Q: these sounds were not natural to the Roman tongue, and there- fore the symbols were never regularly received into their alphabet, though they were taken to represent numerals. Their forms, however, were much altered, and so in process of time they became confused with other letters: thus y denoted 50; but it came to be written L, and so naturally passed into the quite meaningless L: denoted 10, but being too cumbrous to write, the circle was dropped, and the cross (X) alone remained. A variant form of the same letter () seems to have originally represented 100, and either to have been shortened into the common form C, or C superseded it as being the first letter of centwm.

© was taken for 1000, but for convenience of writing it was broken up into CI), and this was the more easily done because the parts were characters in use; but this symbol also was replaced by M, the first letter of mille. It is probable that was simply divided, and the half of it (D) then stood for half of 1000, or 500; and half of X, ten, became V, five. Neither D nor V have any other propriety as symbols,

(5.) In the addition, in the 1st century B.c., of the two symbols Y and Z after X (which had long been the last letter of the alphabet), to express the Greek sounds v and Z. In borrowed words these in earlier times had been roughly denoted by wu and ss; but in Cicero's day greater Precision was desired; and not being able to compound two characters of their own to denote the strange sound (as they did for the aspirates kh, th, ph, formerly denoted only by &, t, and p or b), they took sound and symbol together, so that Ppvyes appeared, not as Bruges, but as Phryges : tparclirns ceased to be tarpessita, and sona be- came zona, &ec.

The Latin alphabet agrees with the Chalcidian in the retention of koppa (?); the downward stroke became by degrees more oblique. This symbol had a much wider use in Latin than it had in any Greek language : it was needed to express a modified k-sound which the Latins liked, wherein a slight w sound was heard after the &.

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This sound was distasteful to the Greeks, and consequently they changed this kw (or qu) into p; so also did the other Italians (compare equos, ios, Epona, &c.); but the Romans liked it, and therefore, alone in Italy, kept the ? to denote it, It is true that the Q was generally followed by a written uw, though not always in the older inscriptions ; but it was fully recognised that this « was not a real letter. It was only a symbol expressing further, and somewhat unnecessarily, the indistinct after-sound which made Q different from K ; it would have been more logical to have written Q alone, as was actually attempted under the empire, where we find on inscriptions forms such as gis, gudem, qaerella; but this never became general. The Latin and

Chalcidian alphabets are again at one in not having the symbol M for s, differing in this respect from the alphabets of South Italy, and also from the Etruscan and Umbrian, which had both forms, Lastly, the Chal- cidian (as we saw) had two forms for 7, P and R ; of these the Latin chose the last, and generally employed the first

for p; though for that letter the genuine Greek form hk

also appears rarely.

The Romans did not retain the Greek names for the characters of the alphabet. .The vowels were known by their sounds only. The momentary sounds and h were denoted by their own sound followed by a vowel, as be, ce, de, ge, pe, and te, but ka, ha; g, aS we saw, had sufficient vowel sound to float it ; on the other hand, the continuous consonants were preceded by the vowel, as ef, el, em, EN, er, es; « was called ix. The difference in the names of the consonants obviously was caused by their nature: momentary sounds are produced by a complete closure and opening of the organs required in each case; when this Opening is made, the organs are so placed as to form a vowel, which naturally is produced by the remnant of sound required for the consonant ; whereas a vowel cannot be produced before any one of these sounds without conscious effort : hence it was simpler to call £, ka, than to call it ak. But the continuous sounds are pronounced when the necessary organs only approximate more or less closely to each other; the channel through which the sound passes from the larynx to the lips is never closed altogether, and by reason of this slightly open position a certain amount of vowel sound tends to escape-just as the organs are drawing together to produce the consonant, and thus is heard before it ; but to sound a vowel after one of these consonants the organs must be intentionally put into the proper position, Thus, then, exactly the same principle —the conscious or unconscious striving for ease of articula- tion—produces exactly opposite results in the case of the momentary and the continuous consonants. The same reason caused a different vowel to be employed for 2 and k from that which is used for the other lettcrs. In sounding a the organs are in nearly the same position as in sounding these two gutturals, only a little more

open; whereas the position of ¢ is more nearly that of all the other consonants, It must of course be remembered that a Roman, if he had wished to speak of his a Bc, would not have said, as we do, a-bee-see, but ah-bay-kay.

The arrangement of the letters of the alphabet has caused much ingenious speculation. It has been more than once pointed out (as by Prof. Key, The Alphabet, p. 28) that there are certainly traces of regularity of arrangement. The three soft momentary sounds 6, g, d, were placed together ; and it is possible that p, k, t (if denoted by Pe, Koph, Tau), may have once been together, and sepa- rated by later intrusions; J, m, » have an affinity more apparent than real, which was perpetuated by their meaningless designation as "liquids;" still, the appearance is sufficient to justify the idea that they may have been

purposely put together. It has been suggested that the alphabet was at first composed of " four quaternions" of letters, each headed by a vowel, and the scattered position of the vowels lends itself to this arrangement ; but it must be remembered that the arrangement of the European alphabets is certainly the same as that of Phoenicia, and in the Phcenician there were breathings but no vowel symbols. Besides, the remaining letters are just as necessary a8 any sixteen which we might so arrange, and to all appearance just as ancient. The author of the New Cratylus, indeed (p. 170, ed. 3), actually drew up his list of fours: the three soft momentaries headed by aleph; then came 4, followed by vau, cheth, and teth, oddly grouped as aspirates ; then the three " liquids," with samekh behind them ; and lastly, pe, koph, and tau, under the care of ayin. This, of course, renders it necessary to " omit caph, which is only a softened form of coph, the liquid resh, and the semi-vowel yodh, which are of more recent introduction." Also it is " quite certain that at the first there was only one sibilant, samekh." In this way Dr Donaldson satisfies himself that the " original Semitic alphabet contained only sixteen letters." We give this futile attempt at arrange- ment with no wish to sneer at a philologer who did good work in his day, but simply to show the arbitrary nature of all such

attempts, resting as they must do simply on internal evidence. If we bear in mind the history of the derivation of the Phcenician alphabet, as we have attempted to give it, from the Egyptian hieratic, we shall conclude that it is hardly probable that symbols borrowed for practical uses should have been arranged upon any scientific method ; that chance guided the general arrangement, though a few sounds obviously similar may have been put intentionally together. No argument can be drawn (as by Rédiger in his Hebrew Grammar) from the juxtaposition of two letters meaning a hand (yodh and kaph), two meaning a head (koph and resh), dc. ; reasons have been given above for believing that these names have no relation to the original import of the signs, but were merely fanciful analogies drawn by the Phcenicians themselves; and it seems as possible that the juxtaposition may have suggested the idea of the names as that the names caused the arrange- ment. But if the argument be sound, it is valid against the supposition that the order was fixed throughout on scientific grounds,

It is quite certain that the Teutonic tribes of north- western Europe possessed characters of some sort before they received the Greek or Latin alphabets. These characters are generally called runes, and have been the subject of some sound scholarship and much baseless speculation. They may be divided into three main classes —the Anglo-Saxon, the German, and the Scandinavian ; each of these contain a number of lists of characters, which, however, do not differ from each other more than the Greek alphabets ; and there is so much likeness in the whole family that we may infer a common origin for all. The term rune is recognised as the name of a German letter by Venantius Fortunatus at the beginning of the seventh century, in the hnes—

Barbara fraxineis pingatur rhuna tabellis ; Quodque papyrus agit, virgula plana valet. 2.€., these characters were cut on smoothed ash-boughs. The meaning of the word réin in Anglo-Saxon is a " secret ;" and the verb rgnan, which is derived from the same, means " to whisper"—the same verb which appears in the now disused phrase, to "round in the ear." Rina denoted a magician; the word is contained in the German alruna, the well-known designation of those prophetesses

whom the German tribes venerated, which appears corrupted by Tacitus (Germ. c. viii.) into aurinia. There is sufficient

evidence to show that the knowledge of these runes was |

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confined to a small class; that they were used as magical characters, and also as means of augury. It was for this reason undoubtedly that they were generally proscribed on the introduction of Christianity ; and the reception of the Latin characters by the Anglo-Saxons was regarded as important as their reception of the Christian doctrines.

It is impossible to believe that the barbarous inhabitants of the German forests should have worked out for them- selves a genuine alphabet before they came into intercourse with the civilised nations of the south. When we remember the long process through which a pure alphabet was reached by the highly-developed nations which dwelt on the eastern shores of the Mediterranean, it. is utterly incredible that such success should have been achieved, as it were, per saltum, under so much more unfavourable circumstances in the West. It may be asserted with some confidence that if the runes were genuine alphabets (which there secms no reason to deny), they must have been derived from the Pheenicians in process of commerce. There is quite sufficient similarity in several of the characters to make this view antecedently probable, but any historical proof would be extremely difficult, if not impossible. It is true that even where the characters resemble the Phoenician the names of the letters differ altogether; but this, as we have before seen in the case of the Phcenicians themselves, is nowise unnatural when an alphabet is borrowed ; the form is important, the name signifies little, and new names are attached according to the fancy of the borrowers. It is highly probable, both from the meaning of the word rune itself and from the evidence of foreign writers, that these symbols were not used by their owners for any of the ordinary ends of an alphabet (except, perhaps, for inscrip- tions) until the Teutonic nations came into contact with Greek and Roman civilisation; by the mass of the people they were probably looked on simply as charms, the unknown symbols of an occult science. Nay, it might be held that even

to the initiated they had merely a sort of hieroglyphic value, and were developed into phonetic significance only by the contact of the Greek and Roman alphabets. For this view, indeed, there is no evidence, and it is not in itself probable. But we should be driven to it if we were to suppose that the runes were the creation of the Teutonic intellect.

These ancient characters occur plentifully on memorial stones, rings, coins, &c., in Scandinavia. In England they have been found principally in Northumbria, Mercia, and East Anglia. It has been suggested (by Mr Haigh) that this may be due to the milder principles of the Irish monks, who restored Christianity to the north of England after its fall with Edwin in 633, and did not pursue that system of eradicating every trace of paganism which had been originally commanded by Gregory. Runic writing was even employed in the service of Christianity. Mr Kemble (Archologia, vol. xxviii. p. 349) interpreted with great ingenuity the mutilated inscription on the famous cross discovered at Ruthwell, and showed that it refers to the Crucifixion. But the Anglo-Saxon alphabet was soon —early in the 7th century—conformed to the Latin type, those letters of the older form alone being retained which were required to denote sounds that had no counterparts in Latin ; these were p (wén), and (thorn), the latter of which expresses the surd breathing heard in " thin :" in order to express the corresponding sonant (heard in "that," and confusedly denoted by the same compound #h) a stroke was drawn across the simple d (3), and the new letter was called edk. The symbol 3 is sometimes found instead of y. Curious admixtures of runes with Latin characters occasionally occur even to late times, Thus, in the Codex Exoniensis (p. 400, ed. Thorpe), an enigma occurs in verse, and the parts apparently of the subject to be guessed are

A Wea 2B T 613

writtcn in runes; the odd effect is increased by these runes being written in the regular way—(sometimes they were written Bovorpodydév)—from right to left, contrary to the general run of the words. Kemble, in the Arch@ologia, has given an interesting translation of an Anglo-Saxon poem, each stanza of which begins with

the name of a runic letter; thus the first stanza begins with Fesh, "money," the name of /, the first runic letter, and goes on to say— ' Money is a consolation*

To every man:

Yet shall every man

Liberally distribute it ;

If he will that, before God,

Honour shall fall to his lot.' The second stanza is dedicated to the bull, Ur (x), the third to thorn (¢h), &c. This poem accordingly gives the order of the alphabet, which agrees in the main with that of all other runic alphabets. Yet the poem is not old, for the name of s (Sigel, "the sun") is treated by the writer as though it had been Segel "a sail "— clearly a mistake of a later time, when the true name had passed out of use. It may be added that the names of this alphabet are some- times strangely abstract ; thus we find " gift," "hope," "need," "war," which differ much from the very concrete objects which the Phoénicians chose to denote their letters. In consequence of all these old alphabets beginning with the letters f,,u, th, 0, 7, c, in the same order, the alphabets are called by some antiquarians "futhorcs," just as we commonly speak of the ordinary alphabet as the a Bc.

The doctrines of Christianity were first presented to a Teutonic people in a written form by Ulfilas, who, though not the first successful missionary to the Goths, has thereby established his claim to be regarded as the apostle of his race; and while the main body of the Goths, spurning the weak control of Rome, poured westward in their fierce career of victory towards Italy and Spain, a remnant was left in Meesia, to whom Ulfilas gave the gospel in their own tongue, This was at the end of the 4th century of our era. He employed an alphabet of twenty-four or twenty-five letters, some of which are unmistakably Greek in form ; others are common (or nearly so) to the Greek and the runic alphabets, and may therefore have been derived from either ; but if they were runic, they at least received a more rounded form, it being

no longer necessary to retain those angles which (as we saw above in describing the cuneiform characters) were most convenient in days when writing meant cutting on stone or wood. But some of the letters seem to be beyond doubt runic: most clearly so are f, 7, u, y, and the symbol for the compound sound kw ; and the reason for all these (except 7) appears to be the lack of a proper equivalent in Greek. The letter which Ulfilas adopted to denote the surd breath th is not runic, so that the Gothic and Anglo-Saxon alphabets here differ: it is apparently the Greek ¢. It would seem, therefore, that this letter still denoted an aspirate (p'h) in Greek, and not a breath, otherwise it would surely have been taken for f; here, on the contrary, it seems to have been selected at random from a list of symbols which denoted no corre- sponding sounds in Gothic. On the same lack of principle © was taken to denote iw. X was the exponent of the breath ch, as heard in German words: here the difference between the true aspirate and the breath is not great. Long o formed a symbol which is very like omega. Another alphabet which has had an important influence

on Europe, and which may be destined to a yet wider extension as the alphabet (in a modified form) of the great and progressive Russian empire, is the Cyrillic. This was the work of Cyril, a monk of Constantinople, who, together with Methodius preached the gospel among the Sclavonic tribes of Bulgaria and Moravia, in the 9th

ence of Christianity. Cyril held the services of the church among his new converts in the vulgar tongue, into which he also translated certain books of the Scriptures. The alphabet which he employed for' this purpose is more thoroughly Greek than that of Ulfilas; but since the Greek alphabet was not nearly sufficient to express all the Sclavonic sounds—especially the numerous sibilants—he added further signs, the history of which is not clear. This alphabet has been largely adopted by the eastern branches of the Sclavonic race, including the Russians, Bulgarians, and the Illyrian division of the Sclaves. The old Bulgarian (commonly called the Ecclesiastical Sclavonic) is the language into which Cyril translated the Scriptures ; in philology it holds the same rank as the Gothic has among the Teutonic languages: it is the parent, however, only of one of the least

important dialects, the modern Bulgarian. The Illyrian family is divided into the Servians on the one hand, and the Croats and Slovenian peoples on the other. These parties are separated by difference of religion : the Servians belong mainly to the Greek Church, while the others are exclusively Roman Catholic; and the members of the Greek Church naturally cling to the Cyrillic characters, while the Catholics have adopted the Latin alphabet. It is not easy to predict which characters will ultimately predominate. The Latin letters are in- sufficient to express the Sclavonic sounds ; but this deficiency can be eked out by diacritical signs, and the greatest literary activity is shown by the Latinising party. Lastly, the Cyrillic alphabet has been adopted by the Wallachians, through the influence of their Sclavonic neighbours, though it is little adaptcd to express their essentially Latin speech, derived from the colonists whom Trajan settled in the new Roman province of Dacia. Most of the needless symbols have becn dropped in the newest form of the Wallachian alphabet. (See Max Miiller, Survey of Languages, pp. 39-84.)

Cyril's original alphabet consisted of forty-eight symbols, but some of these are slightly different representations of the same sound; others are tachygraphies for combina- tions of sound, as sht, ts, &c. The names were not Greek, with the exception of three—ksi,,psi, and thita —which were relegated to the end as unnecessary, but they retained their original Greek place as numerical signs. The alphabet is printed at the end of this article. It will be seen that B occupies the third place, while a modified B stands second: the reason is, that B had come to denote the v sound in Greek, and therefore carried this value into the Sclavonic. The modified letter denotes the old 6 sound. The 7th letter, which is not Greek, had the sound of English soft 7, a little softer than the French j in jamais. The 8th and 9th symbols are the Greek s and z: they are supposed to have had the same sound, that of the soft English z (not dz)—perhaps one of them may have originally denoted dz, a sound which easily passes into dj; dj had a special symbol both in the Servian and Wallachian, though it had none in the Cyrillic, probably because the sound had not then been produced; if it had, we may conclude, from the exactness which the Cyrillic alphabet everywhere shows, that it would not have been left without a mark. The 8th letter

has been expelled from the Russian alphabet as superfluous: the Russians have no djsound. The 10th and 11th letters were sounded alike as 7; the 10th is the Greck Eta, which had therefore become undistinguishable from Tota in Cyril's day, as it is in modern Greek. The 12th letter, J pure and simple, denoted the semi-vowel y. The 22d was ¢t, followed by a parasitic y The 23d and 24th are only different ways of writing the same combination ou ; the Greeks having changed the u sound into #, Cyril was obliged to write ow for uw, as the Greeks: themselves did.

century, long after the Teutons had come under the infiu- | The Russian has one symbcl (Y) to denote this sound: it is

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denoted respectively the breathings f and German ch. We may recall here the different treatment of ¢ by Ulfilas; it seems a fair inference that the sound of ¢ had changed from an aspirate to a breathing between the times of Ulfilas and Cyril. The 27th and 28th are the Greek Omega in the simple and in a modified form: they de- noted the sounds heard in note and not respectively; these have been dropped in all the derived alphabets, in which the 17th letter does work for both. We now come to a series of letters (29-44) which are not Greek, and denote sounds which were probably unknown, or at least had no separate exponents, in the Greek system. The first four are sibilants, simple or compound. It will be remem- bered how the Greek dropped the large Phcenician stock of sibilants, through their own disinclination to such sounds. Cyril, however, did not go back to the original types, but had recourse to the inartistic expedient of using two or three upright strokes, with small modifiers below. Letter 29 is the compound ¢s, 30 denotes the fuller compound ¢sch (English ch in "' church"), 31 is the simple sh, 32 is sht, which in Russian is said to be expressible only by schtsch, unquestionably a very strong sibilant; the newer form of Wallachian used 29 to express dj. The letters 33-36 were attempts to express the neutral vowel (heard in English in fir, sun, &c.), the first two in its aspect nearest to w, the last two nearer to7. The first and last are important in Russian: they are written, but not

pronounced; but the first hardens a preceding letter, or, if it be a continuous consonant, makes it be sounded as though it were double. The 36th, on the contrary, softens a preceding letter, giving it the mowillé sound. The 34th letter has been dropped in Russian; the 35th has a pecu- liar kind of i sound. The 37th letter has an e¢ sound; it was apparently introduced into the alphabet in consequence of the polyphony of the original e, which in Russian does the work of e, 0, and @, and also of each of these preceded by the semi-vowel y ; but as the new letter has three of these sounds, there is not much gain of clearness. A third symbol,

however, has been introduced—an inverted e, 3. which did

not belong to the Cyrillic alphabet: it is used at the begin- ning of words where the pure e sound is heard—not ye, and also in foreign words beginning with w. Letters 38-40 are compounds expressing the w, a, and e sounds, preceded by y. The combinations seem to us needless, but the Greek had no symbol for y; therefore Cyril probably thought it necessary to connect the I-symbol with the following vowel, in order to show that it was only the semi-vowel, not a full vowel, which would have caused another syllable. The first of these symbols has been retained in Russian unchanged; the second is now written

ALPHABET prebably a tachygraphy of the 24th. The 25th and 26th !

rather like an inverted r 4; the third was suffered to drop—whence arose the confusion respecting e which we have just mentioned. Nos. 41 and 42 denote nasalised vowels, e¢ and o, as heard in the French en and on: these sounds seem to have fallen out of all Sclavonic languages, except the Polish. 43 and 44 denote the same vowels " pre-iotised," like the three 38-40: these also are now unknown. Then came the Greek Ksi and Psi, the char- acters being very slightly altered: they have fallen out of use altogether. No. 47, Thita, is retainedin Russian, but sounded as an f, which has thus two exponents, 9 and ¢. Lastly came the equivalent of the Greek Upsilon called ijica: this is employed in Russian in words borrowed from the Greek,

Fourteen of these letters have been expelled from the Russian alphabet, namely 8, 11, 22, 23, 27, 28, 34, 40-46; their list of 35 letters is made up by the addition of the inverted ¢, which stands in the 31st place of the alphabet, The forms of the letters are more rounded than those of Cyril, as will be seen by a comparison of the two. This reform, among others, was due to Peter the Great, who printed the first Russian periodical at Moscow in 1704, (Max Miller, Survey, p. 49.)

The Servian alphabet differs from the Russian chiefly by the insertion of symbols to denote modification of sound caused by a following y. Thus we find a character to express dy (equivalent to the Hungarian gy heard in " Magyar"); another for ly, denoting the sound of the Italian gli; another for ny, the Italian aud French gn; and one for ty, a softer sound than the tsch, the symbol for which is common to Russian and Servian.

The Wallachian adopted nearly all the Cyrillic charac ters, except the superfluous vowel-symbols and the nasalised vowels, The list was soon considerably shortened, as was natural in a language originally non-Sclavonic, though in the course of time it has naturally borrowed many words from its neighbours. Since it has been used for literary purposes, it has been further diminished to 27 symbols by the loss of the short sibilant (32), the second e, and the iotised a4; the other iotised vowels had gone before. The forms of the characters have also been much assimilated to the Latin types: instead of the peculiar symbol for sch, — which the Russian retains, the new Wallachian has a J with a wavy stroke through the middle; x is written as N, not as H; and Cyril's combinations of perpendicular lines ~ are more rounded than the Russian. The Wallachian has

one special symbol T to denote the sound wn.

We have thus described the alphabets used in modern Europe. The only others which have any special interest for Englishmen are the different Indian alphabets ; but these are too numerous and complicated to be fully_ described here. (J. P.)

CYRILLIC AND RUSSIAN ALPHABETS.

CYR. ;

A aiA aljH wv un KE 6iB off i

K «iB spit wilii r rir rjiK «ik k A.Si Aa i nid a € ci:E e IM wiM um Rx Ka liN wh a 3 S| 0 0 0 0 Z 2:3 3 I will o

: RUSS. | CYR. : RUSS. | CYR. { RUSS, | CYR. : RUSS. | CYR.

RUSS. | CYR. : RUSS.

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ALP—ALP

ALPHEUS, (‘AAdetés), the chief river of Peloponnesus, uow called Lujia or Rouphi. Its sources are in the mountains of Arcadia, to the east of Megalopolis. Being fed by a great number of small streams, it becomes navi- gable, and traversing Elis, empties itself into the Ionian sea. At several points in its course it runs in a subter- ranean channel. This fact probably gave rise to the well- known myth which represents Alpheus, the river-god, as passing under the sea to the nymph Arethusa, who had been changed into a fountain in the island of Ortygia. Milton in his Arcades thus alludes to the story—

“That renowned flood, so often sung, Divine Alphéus, who by secret sluice Stole under seas to meet his Arethuse.”

ALPHONSO, Atronso, ALonzo, AFFONSO, or ILDEFONSo. This name, so famous in the annals of the Spanish peninsula, has been borne by no fewer than twenty-two of its sovereigns —viz., by ten of the Asturias and Leon, one of Castile when separate from Leon, five of Aragon, and six of Portugal.

Ist, Asturias and Leon.—Aupuonso I., surnamed " The Catholic," King of the Asturias, the son of Pedro, duke of Biscay, was born in the year 693. On the death of Favila, the son of Pelayo, Alphonso, who had married Ormisinda, the daughter of the latter, was proclaimed king of Asturias. During his whole reign he was engaged in almost perpetual conflicts with the Moors, and is said to have wrested Leon, Galicia, and Castile from their hands. His zeal for the church, displayed in endowing and repairing monasteries and churches, gained for him his surname of " The Catholic." Alphonso died at Cangas in 757, and was succeeded by his son Fruela I.

AupHonso IT., surnamed "The Chaste," King of the Astu- rias, the son of Fruela I., was but a child when his father was assassinated in 768, and consequently his claims to the throne were passed over in favour of Aurelio, who was probably a cousin of Fruela. Alphonso was invested with regal authority by Silo, the successor of Aurelio ; on whose death, in 783, he became sole ruler. He was afterwards dethroned by his uncle Mauregato, and was compelled to retire into Biscay. Mauregato, after a reign of about five years, was succeeded by Bermudo, who, in 791, took Alphonso as his partner on the throne. Bermudo reigned for only about four years longer. A rebellion of many of the chief nobles in 802 compelled Alphonso to surrender his throne for the third time ; but he was soon afterwards restored, mainly through the assistance of Theudius, one of his most faithful followers. In addition to having to defend himself against these internal dissensions, Alphonso was during the greater part of his reign at war with the Moors, obtaining, among other successes, a signal victory over Mohammed, governor of Merida, in 830. Alphonso died in 843, in the city of Oviedo, which he had greatly adorned and made the capital of his kingdom. He had Some years previously abdicated in favour of Ramiro, son of Bermudo. His surname of "The Chaste" has been connected by some with the legend that he refused to pay the Moors their tribute of a hundred Spanish virgins, but 1s rather to be ascribed to his vow to preserve an absolute continence.

AtpHonso ITI, surnamed "The Great," King of the As- turlas, was born in the year 848, and succeeded his father Ordofio I. in 866. In the

following year, Fruela, count of Galicia, disputed Alphonso's right of succession, and forced him to retire to Alava ; but Fruela's tyranny so exasper- ated the people that he was assassinated before he had been a year in power, and they gladly recalled Alphonso to the throne. Other conspiracies marked the beginning of Alphonso's reign, but he soon felt himself tolerably Secure at home, and turned his arms against the Moors. By 901, the year in which he gained a splendid victory at

Zamora, he had, it is said, extended his empire to the banks of the Guadiana, and had, by founding and fortifying cities, made good his hold over a large part of the con- quered territory. But Alphonso's victories abroad were greatly neutralised by discontent among his own subjects, who found it difficult to bear the heavy war taxes that had been imposed upon them. There was a rising under Ano in 885, and another under Witiza in 894; and in 907 a more formidable insurrection broke out, headed by Garcia, the king's eldest son. Garcia was defeated and taken prisoner ; but as the greater part of the nation sided with the queen in demanding that he should be released, Alphonso, either wishing to prevent a civil war, or think- ing that his cause was hopeless, resigned his crown to his son in 901. After his abdication, Alphonso, offering his services to his son in the true spirit of the age, led an expedition against the Moors, in which he gained fresh victories. He died towards the end of the same year (901). He was the last monarch who bore the title King of Astu- rias, his successors being called kings of Leou, from the new capital of the kingdom. It was in his reign that the counts of Navarre became independent. There is still extant a Latin chronicle, treating of the history of Spain from the Moorish invasion down to the death of Ordoiio, which is usually attributed to Alphonso.

Atpuonso IV., "The Monk," King of Leon, succeeded Fruela II., his uncle in 924. On the death of his wife, about six years afterwards, he resigned his crown to his brother Ramiro, and retired into a cloister ; but soon grow- ing weary of monastic life, he made an attempt to resume the sceptre. He was, however, taken prisoner at Leon, and

confined in the monastery of St Julien, where he died, probably about two and a half years after.

A.pHonso V. succeeded his father Bermudo II. in 999, being then about five years of age. Gonsalez, count of Galicia, and his wife, were, by appointment of Bermudo JRE guardians of the young king; and on arriving at manhood he married their daughter Elvira. The regency is remark- able for the defeat and death of the famous Moor Almansur in 1002—a success that led ultimately to the conquest of Cordova by the Christians. Alphonso himself made war upon the Moors, recapturing Leon and other places that had been lost during his minority. Alphonso died at the siege of Viseo in 1028. He was succeeded in the king- dom of Leon by his son Bermudo III., while the hitherto dependent countship of Castile became a separate kingdom under the sovereignty of Sancho el Mayor, king of Navarre, and husband of the eldest daughter of the late count.

AxpHonso VI. of Leon, and eventually I. of Castile, surnamed "The Valiant," was born in the year 1030. His father, Fernando the Great, who in his own right was king of Castile only, but succeeded to the throne of Leon in right of his wife, died in 1065, leaving his kingdom divided among his children. Sancho, the eldest son, received as his portion Castile ; to Alphonso was given the kingdom of Leon, the territory of Campos, part of Asturias, and some towns in Galicia; and Garcia the youngest brother, received a part of Galicia and of Portugal ; while the towns of Toro and Zamora were left to Urraca and Elvira, Fernando's two daughters. Peace was not lon maintained between the three brothers. In 1068 Sancho made war upon Alphonso, and defeated him in a bloody battle at Piantica, on the Pisuerga. In 1071, hostilities, which seem to have been suspended, again commenced, and Alphonso having recruited his army, defeated Sancho at a place called Valpellage, on the banks of the Carrion ; but the latter, being reinforced, it is said by the famous Roderigo Diaz de Bivar, commonly called " The Cid," made an attack during the night, and almost exterminated the Leonnese army, Alphonso himself being taken prisoner. He

was compelled to abdicate his throne, and was imprisoned in the monastery of Sahagun, probably with the intention of making him become a monk; but escaping from this place of confinement, he sought refuge with Almamun, the Moorish king of Toledo, who received him with great hospi- tality. Sancho having taken possession of Leon, advanced into Galicia against Garcia. The two brothers met at Santarem, when the Galicians were defeated with great slaughter, and Garcia himsclf captured and thrown into prison. Sancho was assassinated in 1073, and Alphonso, after aking a solemn declaration that he was guiltless of his brother's death, was reinstated in his own dominion, besides receiving his brother's kingdom of Castile. Garcia, who had been liberated on the death of his brother, was preparing to recover his throne, when Alphonso, having treacherously invited him to his court, shut him up in the castle of Luna, where he died ten years afterwards. Being now the undisputed master of nearly all his father's king- dom, Alphonso was at liberty to turn his arms against the Moors. His first expedition, in 1074, was in defence of Almamun of Toledo, who had befriended him in his ad- versity, and whose kingdom was now invaded by the Cor- dovans. Some years later, however, disregarding the ties of gratitude, he himself laid waste the territories of Yahia ben Ismail, the son and successor of Almamun, and ended by taking the city of Toledo itself in 1085. Many parts of Spain, hitherto subject to the Moors, were now added to the empire of Alphonso ; and it is not improbable that he would have reduced the entire peninsula to his sway, had not a new and formidable power arisen, which threatened to undo all he and his predecessors had accom- plished. A large army of Moors from Africa, under Yussef ben Tashfyn, one of the Almoravides, entered Spain, and, with the assistance of Ben Abad, king of Seville, inflicted a terrible defeat upon Alphonso near Zalaca, in the year 1086. Fortunately for the Christian cause, the Moorish chiefs began to quarrel among themselves, and Alphonso was enabled not only to recover his position, but even to extend his conquests in some directions. In 1108, how- ever, the Almoravides made another serious attempt to destroy the power of Alphonso. A bloody battle was fought at Uclés, in which the Leonnese army was com- pletely defeated, and

Sancho, Alphonso's only son, who commanded in place of his father, slain. Alphonso died at Toledo in 1109, and was succeeded by his daughter Urraca, whose husband, Alphonso I. of Aragon, is by some historians enumerated among the kings of Leon as Alphonso VII. Through his illegitimate daughter Teresa, whom he gave in marriage to Henry of Burgundy, Alphonso became an ancestor of the kings of Portugal.

AtpHonso VIL, the same as AtpHonso I. of Aragon

(4.0.)

AtrHonso VIIL. of Leon (or VIL, according to those who do not consider Alphonso of Aragon as properly a king of Leon) and II. (or IIL) of Castile, often called Alphonso Raymond and " The Emperor," was born in the year 1106. He was the son of Urraca, daughter of Alphonso VI., and Raymond of Burgundy, her first husband. In 1112 he was proclaimed king of Galicia, by whom it does not clearly appear ; in 1122 he was associated with his mother in the government of Leon and Castile ; and on her death in 1126 he became sole monarch. Soon after this event he made war upon his stepfather, Alphonso of Aragon, in order to recover the territories, properly belonging to Leon and Castile, which had been lost owing to his mother's misgovernment. The two kings caine to an agreement about the year 1129, Alphonso of Leon having regained most of his possessions. In 1136, Alphonso, elated by the homage of the king of Navarre and the counts of Barcelona and Toulouse, caused himself

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to be solemnly crowned emperor of Spain. This dignity was, however, little more than a name, for Alphongo Henriquez of Portugal and Garcia Ramiro of Navarre declared war upon the ucw emperor almost immediately after his elevation. Intestine feuds between the various Christian princes of Spain, which resulted in uo very definite gain to any of them, lasted until the advance of large Moorish armies under the Almohades compelled the Christians to turn against their common foe. Alphonso invaded Andalusia in 1150, and gained several victories

which contributed greatly to the extension of Christian territory in Spain. He died in 1157 at Tremada, on his return from an indecisive battle with Cid Yussef at Jaen; and was succeeded by his elder son, Sancho, in the throne e Castile, and by his younger, Fernando, in that of Leon, In 1156 he instituted the order of St Julien, afterwards so celebrated under the name ALCANTARA (q.v.)

AupHonso IX. (VIIL), King of Leon only, succeeded his father Fernando in 1188. In 1190 he sought to strengthen his position by marrying his cousin Teresa of Portugal. This marriage, being within the forbidden degrees, was pro- nounced null by the pope (Celestine IIJ.), who excom- municated Alphonso and his queen until 1195, when they agreed to separate. In 1197 Alphonsoa second time defied the papal authority by marrying his cousin Berengaria, daughter of Alphonso III. of Castile, with a view of putting a stop to the frequent quarrels between the two kingdoms. As before, the pope (Innocent III.) prevailed, and in 1204 the separation took place, Innocent, however, granting that the children already born should be recognised as legitimate. After the dissolution of the marriage the old chronic state of feud between the two kings returned, and was kept up, although with little actual warfare, until the death of Alphonso of Castile in 1214. In 1217, Fernando, the eldest son of Alphonso and Berengaria, became king of Castile. Alphonso, thinking that his own claims had _ been unjustly passed over, declared war upon his son; but finding that the people preferred Fernando, he relinquished his claims. The remainder of Alphonso's reign was chiefly spent in campaigns against the Moors. Along with his son, he captured Merida, Badajoz, and other cities ; and in 1230 gained a brilliant victory over Mohammed Ibn Hud at Merida. He died in the same year, and was succeeded by his son Fernando, who thus finally united the kingdoms of Leon and Castile.

Atpuonso X., surnamed Hl Sabio, or "The Wise," King of Leon and Castile, was born in 1221, and succeeded his father Fernando III. in 1252. He ascended the throne with the entire approbation of his subjects, and with every prospect of a happy reign; but, through the ill-directed aims of his ambition, few sovereigns have been more unfortunate. He first attempted to gain possession of Gascony,

contending that he had a better right to that province than Henry III. of England. The arms of England, however, proved too formidable; and he agreed to renounce his claim on condition that Henry's son, afterwards Edward I., should marry his sister Eleonora. The marriage was solemnised with great pomp and magn- ficence towards the end of October 1254. Alphonso's next act was to lay claim to the duchy of Swabia, which he believed to be his in right of his mother Beatrix, daughter of the late duke. This claim was passed over, but when advancing it Alphonso formed a connection with the German princes, and in 1256 became a competitor, against Richard, Earl of Cornwall, for the imperial crown. 1 was again unsuccessful, the Earl of Cornwall being elected by a small majority. In 1271, on the death of Richard, he a second time attempted to make himself emperor of Germany, and even after Rodolph of Hapsburg had actually been clected, he undertook a fruitless journey to Beaucaire

in order to prevent the pope (Gregory X.) from confirm- ing the election. These repeated attempts to increase his dignity weakened rather than strengthened the power of Alphonso, and forced him to impose heavy taxes upon his subjects, and even to debase the coinage, thus producing much discontent and disturbance, while the Moors were ever ready to take advantage of any misfortunes that might happen to him. From 1261 to 1266 he was engaged in a war with Mohammed of Granada, during which his army suffered several defeats. In 1270 an insurrection broke out, headed by Felipe, brother of the king, who was assisted by Mohammed of Granada; it was only quelled after nearly all their demands had been conceded to the rebels. In 1275, when Alphonso was absent on his fruitless journey to Beaucaire, his eldest son, Fernando de la Cerda, died, an event which, raising as it did the question of the succession to the crown, threatened anew to involve the kingdom in war. Sancho, Alphonso's second son, was, according to the law of the Visigoths, proclaimed heir by the Cortes at Segovia; but Philip of France, uncle of the two young sons of Fernando, declared war with Alphonso on their behalf; actual hostilities were, however, prevented by the intercession of Pope

Nicolas III. In 1281, Sancho, irritated probably by some attempt that Alphonso had made to favour the sons of Fernando, raised the standard of revolt against his father. Sancho, who was a favourite with the people, having secured the assistance of Mohammed of Granada, reduced his father to such extremities that the latter solemnly cursed and disinherited his son, an act which he confirmed by his will in 1283, and at the same time solicited aid from the king of Marocco. At the com- mencement of the following year, however, Alphonso, on recelving intelligence from Salamanca that Sancho was dangerously ill, pardoned him. Alphonso died a few days afterwards, on 4th April 1284. He was a learned prince, and a great encourager of learning, brave and energetic, but at the same time restless and ambitious. He has been charged with impiety, chiefly on account of a well-known saying of his, that 'had he been present at the creation, he could have given some useful hints for the better ordering of the universe." T'o him science is indebted for a set of astro- nomical observations known as the Alphonsine Tables, which were drawn up under his auspices by the best astronomers of the age; and in the palace of Segovia a room is still shown as the observatory of Alphonso. He was also distinguished as a poet and as a legislator. In the Escurial is preserved 4 curious manuscript containing some hymns of his com- position; and he was the principal compiler of a code of laws which is still extant under the name of Las Siete Partidas,

ApHonso XI, "The Avenger," was an infant when he succeeded his father, Ferdinand IV., in 1312. During his long minority the kingdom was cruelly distracted by Intestine warfare. Assuming the reins of government in 1324, he strove to repress the turbulent spirit of the nobility, and to put down that system of brigandage to which it had given rise, acquiring by his inflexible severity the title of "The Avenger." He lost Gibraltar in 1329, but as commander of the allied armies of Catholic Spain, on the 29th Oct. 1340 he gained a complete victory over the Kings of Morocco and Granada at the Salado. The slaughter was immense, and the booty so rich that the Value of gold is said to have fallen one-sixteenth. In 1342 Alphonso laid siege to Algeciras, where cannon were employed for the first time in Europe by the Moors in defence of their walls. This siege had lasted two years,

when the Moors capitulated on condition of a truce between the two nations for ten years; but the king of Castile broke his word a few years after by besieging Gibraltar,

where he died of the plague on the 26th March 1350, aged 40. He was succeeded by his son, Pedro the Cruel. From this reign dates the institution of regidors or jurats, to whom was committed the administration of the communes; and these regidors became the exclusive electors of the Cortes, in which the people ceased to have a voice.

2d, Castile —AtPuonso IIT. (according to other enume- rations, VIII. or [X.), surnamed '" The Noble," is the only king of Castile of the name who was not also king of Leon. He was born in 1155, and succeeded his father, Sancho JIL, in 1158. His mimority was disturbed by the contention of the two powerful houses of Lara and Castro for the regency ; but after his marriage with Eleanor, daughter of Henry II. of England, he was proclaimed sole ruler. After compelling the kings of Aragon, Navarre, and Leon to surrender the territories they had taken possession of during his minority, he turned his arms against the Moors, and at Alarcos, in 1195, sustained one of the most terrible defeats recorded in the annals of Spain. This disaster encouraged the kings of Leon and Navarre to renew their hostilities, which were carried on for several years with varying success. In 1211 the Moors again threatened Castile ; but in the following year, Alphonso, along with Pedro IL. of Aragon and Sancho VIL of Navarre, gained a most complete and splendid victory over them at La Navas de Tolosa. Alphonso died at Garci Mufios in 1214, and was succeeded by hisson, Enrique J. Alphonso was a patron of literature, and in 1208 founded a university at Palencia, the first in Christian Spain. This university was afterwards transferred to Salamanca.

3d, Aragon.—ALPHonso I., surnamed £/ Batallador, "The Fighter," King of Navarre and Aragon, was the second son of Don Sancho Ramirez, and succeeded his brother Pedro I. in 1104. By his marriage in 1109 with Urraca, daughter and heiress of Alphonso VI. of Leon

and Castile, he became her associate in the government of these kingdoms, and in the same year assumed the title of " Emperor of all Spain." Misunderstandings soon arose between Alphonso and his wife, and he separated from her shortly after their marriage, an act which was confirmed by the council of Palencia in 1114. Alphonso, however, refused to give up his claims to the kingdoms of Leon and Castile, and maintained a constant struggle with Urraca till her death in 1126. Alphonso's chief victories were gained over the Moors. He laid siege to Saragossa for the first time in 1114, but the city was not captured until 1118, after several bloody battles had been fought in its neighbourhood. In 1120 his territories were menaced by a large force sent against him by Ali; but engaging the enemy near Daroca, he left 20,000 Almoravides dead on the field. Three years afterwards, while the king of Marocco was fully occupied at home by the rise of a dangerous sect of Almohades, Alphonso seized the oppor- tunity to invade Valencia. In 1125 he undertook a new expedition against Granada in aid of the Mozarabes or Christian Moors. The Moors in their reprisals invaded Estremadura, and defeated the Castilians near Badajoz. The king of Aragon, so far from rendering his neighbour any assistance, determined to take advantage of the critical position of Alphonso Raymond, as well as of the troubles which the death of Urraca had occasioned in several parts of his dominions, but when on the point of battle the two kings came to an agreement. Alphonso next crossed the Pyrenees, and captured the cities of Bordeaux in 1130, and Bayonne in 1131. On his return to Spain he took Mequinenza from the Moors in 1133, and invested Fraga in 1134, where, during a sally from the town, he received a wound from which he died a few days after.

Axpuonso II. was born in 1152, and in 1163 succeeded his father, Raymondo V., as count of Barcelona, his mother, Petronilla, daughter of Ramiro II., king of Aragon, at the same time resigning that kingdom to him. He was frequently at war with Raymondo of Toulouse, and also

directed an expedition against the Almohades, from which

the invasion of Aragon by Sancho of Navarre recalled him. He assisted Alphonso of Castile against Cuenga, for which service he was relieved from doing homage to Castile. He died in 1196. He was a patron of the troubadours, and wrote some poems in the Provengal language.

AtpHonso IIL. the son of Pedro III., was born in 1265, and in 1285, on the death of his father, being absent in Majorca on an expedition against his uncle Jayme, assumed the title of king without taking the oaths of adherence to the articles to-which his predecessors had subscribed. When he returned in 1286, however, he was compelled to go through the usual coronation ceremony. In 1287 he signed the Privilege of Union, which permitted his subjects to have- recourse to arms to defend their liberties, and invested the justizero with the power of citing the king himself to appear before the Cortes. Alphonso's chief wars were with Jayme of Majorca, Sancho of Castile, and the pope. He died in 1291.

Axpuonso IV., son of Jayme IL, was born in 1299, and ascended the throne in 1327. During almost the whole of his reign he was occupied in war with the Genoese about the possession of Corsica and Sardinia. He died in 1336.

AtpHonso V. of Aragon, I. of Sicily and Sardinia, and latterly I. of Naples, was born in 1385, and succeeded his father, Fernando the Just, as king of Aragon and of Sicily and Sardinia, in 1416. In 1420 Joanna I. of Naples offered to make Alphonso her successor if he would assist her against Louis of Anjou. This he did; but, owing to misunderstandings, the queen revoked her adoption of Alphonso in 1423, making Louis of Anjou her heir. Recalled to Spain immediately after by an attack made by the Castilians upon his hereditary kingdom, he left his brother Pedro as his lieutenant at Naples, which he had taken by storm the year before. On his way to Spain he captured, but generously refrained from pillaging, Marseilles, a city belonging to his rival the duke of Anjou. After restoring peace at home, Alphonso again turned his atten- tion to Naples, where his-cause now appeared to be hope- less. Louis of Anjou died in 1434, and Queen Joanna the following year, leaving Naples to Louis's brother René, who had in his

possession the whole kingdom except a few fortresses which still held out for Alphonso. In the same year (1435) Alphonso laid siege to Gaéta, but the siege was raised, and Alphonso himself taken prisoner by Philippo Maria Visconti, duke of Milan. Visconti, however, being greatly pleased with the high character and noble appear- ance of Alphonso, soon released him, and even made him his ally. Immediately on recovering his liberty, Alphonso made a third attempt upon the kingdom of Naples. The issue of the war at first was doubtful, but latterly the arms of Alphonso were nearly everywhere victorious. He laid siege to Naples, and after an obstinate resistance captured it in 1442. The States-General were then convoked, and solemnly proclaimed Alphonso king; his election being sanctioned by Pope Eugenius IV., who had previously promised that honour to René. Alphonso now fixed his residence at Naples, and devoted himself chiefly to the improvement of his kingdom; although he was also fre- quently involved in the wars and disputes of the Italian princes. He died at Naples on the 27th June 1458; and was succeeded in his kingdoms of Aragon and of Sicily and

Sardinia by his brother John, and in that of N aples by

his natural son Ferdinand. Alphonso was undoubtedly

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one of the best monarchs of his name. His bravery and generalship fitted him for the warlike enterprises he had to undertake; and it is evident that, from his generous and humane disposition, as well as from his love of litera. ture and encouragement of law and justice, his rule would have been equally successful had it been his lot to live in more peaceful times.

4th, Portugal.—AupHonso I., Hnriquez, son of Henry of Burgundy, count of Portugal, and Teresa of Castile, was born at Guimaraens in 1094. He succeeded his father in 1112, and was placed under the tutelage of his mother, When he came of age he was obliged to wrest from her by force that power which her vices and incapacity had rendered disastrous to the state. Being proclaimed sole ruler of

Portugal in 1128, he defeated his mother's troops near Guimaraens, making her at the same time his prisoner, He also vanquished Alphonso Raymond of Castile, his mother's ally, and thus freed Portugal from dependence on the crown of Leon. Next turning his arms against the Moors, he obtained, on the 26th July 1139, the famous victory of Ourique, and immediately after was proclaimed king by his soldiers. Not satisfied with this, however, he assembled the Cortes of the kingdom at Lamego, where he received the crown from the archbishop of Braganza; the assembly also declaring that Portugal was no longer a dependency of Leon. Alphonso continued to distinguish himself by his exploits against the Moors, from whom he wrested Santarem in 1146, and Lisbon in 1147. Some years later he became involved in a war that had broken out among the kings of Spain; and in 1167, being disabled during an engagement near Badajoz by a fall from his horse, he was made prisoner by the soldiers of the king of Leon, and was obliged to surrender as his ransom almost all the conquests he had made in Galicia. In 1184, in spite of his great age, he had still sufficient energy to relieve his son Sancho, who was besieged in Santarem by the Moors. He died shortly after, in 1185. Alphonso was a man of gigantic stature, being 7 feet high according to some authors. He has long been regarded as a saint by the Portuguese, who reverence him both on account of his personal character and as the founder of their kingdom.

Apuonso IT., "The Fat," was born in 1185, and succeeded his father, Sancho L, in 1211. He was engaged in war with the Moors, and gained a victory over them at Alcazar do Sal in 1217. He also endeavoured to weaken the power of the clergy, and to apply a portion of their enormous revenues to purposes of national utility. Having been excommunicated for this by the pope (Honorius TIL), he promised to make amends to the church; but he died in 1223 before doing anything to fulfil his engagement. Alphonso framed a code which introduced several bene- ficial changes into the laws of his kingdom.

AtpuHonso III., son of Alphonso II., was born in 1210, and succeeded his brother, Sancho IL, in 1248. Besides making war upon the. Moors,

he was, like his father, fre- quently embroiled with the church. In his reign Algarve became part of Portugal. Alphonso died in 1279.

Axpuonso IV. was born in 1290, and in 1325 succeeded his father, Dionis, whose death he had hastened by his intrigues and rebellions. Hostilities with the Castilians and with the Moors occupied many years of his reign, during which he gained some successes; but by consentmg to the barbarous murder of Iitez de Castro, who was secretly espoused to his son Pedro, he has fixed an indelible stam on his character. Enraged at this barbarous act, Pedro put himself at the head of an army, and devastated the whole of the country between the Douro and the Minho before he was reconciled to his father. Alphonso died almost immediately after, on the 12th May 1357.

Auruonso V., Africano, was born in 1432, and succeeded

his father Edward in 1438. During his minority he was placed under the regency, first of his mother, and latterly of his uncle, Don Pedro. In 1448 he assumed the reins of government, and at the same time married his cousin Isabella, daughter of Don Pedro. In the following year, being led by what he afterwards discovered to be false representations, he declared Don Pedro a rebel, and de- feated his army in a battle at Alfarrobeira, in which his ~~uncle was slain. In 1458, and with more numerous forces in 1471, he invaded the territories of the Moors in Africa, and by his successes there acquired his surname of 'The African." On his return to Portugal in 1475 his ambition led him into Castile, where two princesses were disputing the succession to the throne. Having been affianced to the Princess Juana, Alphonso caused himself to be pro~~ claimed king of Castile and Leon; but in the following year he was defeated at Toro by Ferdinand, the husband of Isabella of Castile. Alphonso went to France to obtain the assistance of Louis XI., but finding himself deceived by the French monarch, he abdicated in favour of his son Juan. When he returned to Portugal, however, he was compelled by his son to resume the sceptre, which he con- tinued to wield for two years longer. After that he fell into a deep

melancholy, and retired into a monastery at Cintra, where he died in 1481.

Axpnonso VI., the second king of the house of Braganza, was born in 1643, and succceded his father in 1656. In 1667 he was compelled by his wife and brother to abdicate the throne, and was banished to the island of Terceira. These acts, which the vices of Alphonso had rendered necessary, were sanctioned. by the Cortes in 1668. Alphonso died at Cintra in i675.

ALPHONSUS a Sancta Marta, or ALPHONSO DE CARTAGENA, a celebrated Spanish historian, was born at Carthagena in 1396, and died on the 12th July 1456. He succeeded his father, Paulus, as bishop of Burgos. In 1431 he was deputed by Juan II. of Castile to attend the council of Basle, in which he made himself conspicuous by his learning. He was the author of several works, the prin- cipal of which is a History of Spain from the earliest times down to the year 1496, printed at Granada in 1545, fol.

ALPINI, Prospero (in Latin Prosper Alpinus), a cele- brated physician and botanist, was born at Marostica, in the republic of Venice, on the 23d November 1553. In his youth he served for a time in the Milanese army, but in 1574 he quitted it, and went to Padua to study medi- cine. He was admitted to the degree of doctor of physic in 1578, soon after which he left the university, and settled as a physician in Campo San Pietro, a small town in the Paduan territory, at the invitation of its citizens. In the course of his studies he had paid particular attention to

botanical science; but the sphere of his present practice was too limited to afford him much opportunity of prose- cuting his favourite study. He wished particularly to extend his knowledge of cxotic plants, by observing their economy and habits in their native soil. To gratify this laudable curiosity an opportunity presented itself when George Emo or Hemi, the consul for the Venetian republic in Egypt, appointed Alpini his physician. They sailed from Venice in September 1580, and arrived at Grand Cairo in the following year. Alpini spent three years in Egypt, and by his industry and assiduity greatly im- proved his botanical knowledge, having travelled along the banks of the Nile,

visited every place, and consulted every person from whom he expected any new information. From a practice in the management of date-trees which he observed in this country, Alpini seems to have deduced the doctrine of the sexual difference of plants, which was adopted as the foundation of the celebrated system of Linneus. He says that "the female date-trees or palms do not bear fruit unless the branches of the male and female plants are mixed together; or, as is generally done, unless the dust found in the male sheath or male flowers is sprinkled over the female flowers." His treatise De Medicina Aigyptiorum contains the first account of the coffee-plant that was published in Europe. When Alpini returned to Venice in 1586 he was appointed physician to Andre Doria, prince of Melfi; and during his residence at Genoa he was esteemed the first physician of his age. The Venetians were unwilling that the Genoese state should number among its citizens a person of such distinguished merit aud reputation; and in the year 1593 he was recalled to fill the botanical chair in the university of Padua, with a salary of 200 florins, afterwards increased to 750. He discharged the duties of his professorship for many years with great reputation, till his declining health interrupted his labours. He died of slow fever on the 6th February 1617, in the sixty-fourth year of his age, and was succeeded as botanical professor by one of his sons. The genus Alpinia, belonging to the order Zingiberacez, is named after him. Alpini wrote the following works in Latin:—1. De Medicina Aigyptiorum Inbri w., Venice, 1591, 4to; 2. De Plantis Aigypti Tiber, Venice, 1592, 4t0; 3. De Balsamo Dialogus, Venice, 1592, 4to; 4. De Preesageenda Vita e Morte Aigrotantium Lnbri vii., Venice, 1601, 4to; 5. De Medicina Methodica Inbri xiit., Padua, 1611, folio; 6. De Rhapontico Disputatio, Padua, 1612, 4to. Of all these works various editions have appeared; and besides these, two posthumous treatises were published by his son — 1. De Plantis Exoticis Inbri ii., Venice, 1627, 4to; 2. Historie Naturalis Egypti [nbri w., Lugd. Bat. 1635, 4to. Several other works of Alpini remain in manuscript.

Ack. Pog

AKING a general view of the earth's surface, the | a large portion of their surface. But in height and im-

continent of Europe appears to be no more than a great peninsula extending westward from the much vaster continent of Asia. Its shores are deeply indented by two inland seas connected by narrow straits with the Atlantic Ocean, and these in their turn are divided into gulfs that penetrate still more deeply into the land, and form a number of secondary peninsulas. The Mediterranean Sea, by its branches—the Gulf of Genoa, the Adriatic, and the Aigean Sea—forms the Iberian, the Italian, and the Greek peninsulas; and the Baltic Sea, extending northward into the Gulf of Bothnia, forms on one side the great Scandi- navian peninsula, and on the other that of Denmark.

portance these are much surpassed by a great mountain zone stretching from the south-east of France to the fron- tiers of Hungary, and between Italy and the plains of southern Germany, which is collectively known as the Alps, and which must be considered as the most important feature in the physical geography of our continent. Of the influence of this mountain system on the climate of the surrounding regions, on the distribution of animal and vegetable life, and, indirectly, on the political condition of Europe, some brief notice will here be given; but it may be well to remark that owing to the peculiar disposition of the greater masses which form this system, the Alps do

Save the last, all these peninsulas of Europe are essentially | not present so continuous a barrier as might be expected mountain regions, traversed by lofty chains that occupy ' from a comparison with other great mountain ranges.

Origin of the name Alps.

Limits of the Alps.

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'Thus if we take the great masses of the Himalaya in Asia, the Andes in South America, or even such lesser ranges as the Pyrenees or the

Great Atlas, we find that they interpose a far more absolute limit between the regions lying on their opposite flanks than occurs in respect to the Alps. These are formed of numerous ranges divided by comparatively deep valleys, which, with many local excep- tions, tend towards parallelism with the general direction of the entire mass. This, between Dauphiné and the borders of Hungary, forms a broad band convex towards the north, and most of the main valleys lie between the directions west to east and south-west to north-east. But in many parts deep transverse valleys intersect the pre- vailing direction of the ridges, and facilitate the passage not only for purposes of human intercourse, but also for the migration of animals and plants, and for currents of air which mitigate the contrast that would otherwise be found between the climates of the opposite slopes.

The received opinion is, that the name Alps is derived from a Celtic root—alp or alb—signifying height. This has been connected by some writers with the Latin ald, albus, white, refcrring to the colour of the peaks. Strabo says that the name "Adm was formerly "AAPio. Alp in south Germany—alpa in old High German—is exclusively applied to mountain pastures. For the present the deriva- tion must remain somewhat uncertain.

To define the precise limits of the Alps, as will be seen fully in describing the several groups, is a somewhat arbi- trary operation. To the W. they extend through a large portion of the French departments of Savoie, Haute-Savoie, Hautes Alpes, and Basses Alpes, being divided from the mountain district of the Cevennes by the broad and deep valley through which the Rhone flows from Lyons to the Mediterranean. The Jura range, usually regarded as distinct from the Alps, is nevertheless closely connected on one side with the outer ranges of the Alps of western Savoy, and on the other with those of northern Switzer- land. On the N. side the Alps are definitely bounded by the lake of Constance, the plain of Bavaria, and the low country extending from Salzburg to the ncighbourhood of Vienna. By these they are completely separated from the mountainous districts of central Germany, which extend through western Bohemia and Saxony in one direction to the Hartz mountains, and in the other to the Sudeten, or

Riesengebirge, of Silesia. Hence it happens that the drainage of the northern slopes of the Alps flows either to the North Sea through the Rhine, or is diverted through the Danube to the Black Sea, and no portion of it reaches the Baltic. The eastern limit of the Alps is not easily defined with accuracy. The region of high hills, chiefly formed of tertiary strata, that extends from the left bank of the Mur into Hungary is continued by the north side of Lake Balaton to the Danube near Buda; and some geographers see in the hilly district that stretches thence to the northern Carpathians a connection between that range and the Alps. For practical purposes it seems that the line of depression, partly formed by the valley of the Mur, through which the railway is carried from Vienna to Laybach, may be considered as the eastern boundary of the Alpine chain. On the southern side the difficulty of fixing the precise limits of the Alpine chain is still more apparent. For a distance of some 350 miles, from the neigh- bourhood of Turin to that of Gorizia, the boundary is sufficiently obvious. The mountains subside into the con- tinuous plain which includes the greater part of Piedmont, Lombardy, and Venetia; and their drainage is all borne eastward to the Adriatic. But on the west side of Piedmont the Alpine chain dividing Italy from France extends nearly due southward till it approaches to the Mediterranean in the neighbourhood of Nice. About 40 miles north of this city,

that which, from its superior height and its geological struc- ture, we call the main chain, is bent round from west to east in a curve, slightly convex towards the south, till it becomes parallel to the Mediterranean shore, and is merged in the chain of the Apennines. For reasons hereafter mentioned it would appear that the limits of the Alps in this direction may best be fixed at the Col d'Altare, west of Savona, thougti the boundary commonly adopted is that of the Col di Tenda, lying considerably farther to the west. At the south- eastern extremity of the Alpine chain the difficulty of fixing its limits arises rather from the vague use of geographical terms by ancient and modern writers than from the physical structure of the region. Taking no account of the arbitrary proceedings of geographers who have included in the Alps

the mountains dividing Bosnia from Croatia and Dalmatia, and regarding only the natural features of the country, it seems clear that the south-eastern extremity of the Alps must be looked for in the group of lofty peaks between the head waters of the Isonzo and those of the Save, whose highest summit is the Terglou; and if we are not to include all the mountain ranges of European Turkey and Greece within the same designation, the plateau of the Karst must be held to form the boundary between these and the Alps. Within these limits the Alps extend from about the 44th to the 48th parallel of N. lat., and from about 5° 10' to 18° 10' E. long.

In every mountain system geographers are disposed to Main day regard the watershed, or boundary dividing the waters ofthe Als

flowing towards opposite sides of the range, as marking the main chain; and this usage is often justified by the fact that the highest peaks le on, or very near, the boundary so defined. In applying this term in the case of the Alps, there are, however, difficulties arising from their great extent and the number of their branches and ramifications. Many of the loftiest groups lie altogether on one side of that which we call the main chain, and at the eastern extremity, where all the drainage is ultimately borne to the Black Sea, we must be partly guided by geological considerations in deciding which of several ranges deserves to be considered pre-eminent.

Starting from the pass of Altare or Cadibona, west of Savona, the main chain extends first south-west, then nearly due west, to the Col di Tenda, but nowhere rising beyond the zone of coniferous trees. Beyond that limit the range is more lofty, and includes four peaks exceeding 10,000 fect in height, till the line dividing the waters flowing to the Adriatic, through the Po, from the short streams that flow into the Gulf of Genoa, reaches the Mont Enchastraye. Beyond that point, although the line of watershed is very sinuous, its general direction for a distance of about 75 miles is nearly due north. On the east side the waters run to the Po; on the west they flow through the Durance to join the Rhone near Avignon. The most considerable peaks in the range immediately north of the Mont Enchastraye are the Grand

Rioburent and the Aiguille de Chambeyron; but these are much surpassed by the Monte Viso, which is the highest peak in the range dividing Piedmont from Dauphiné. On the north side of Monte Viso the main chain diminishes much in average height, and presents no prominent peaks until we reach the Mont Tabor. That summit forms the apex of a salient angle which the main chain here presents on the side of France. For a distance of about 28 miles this extends eastward to the prominent peak of the Roche Melon, which may be considered as a re-entering angle in the great rampart by which Italy is guarded from her northern neighbours. Here the main chain resumes Its northerly direction, and attains a greater average height than it had previously exhibited. Several of the prominent peaks in the range connecting the Roche Melon with Mont

Blanc exceed 11,000 English feet in height, though they are much surpassed by the highest group of the Graian Alps, lying on the side of Piedmont, and that of the Tarentaise Alps in Savoy ; while there is in this part of the main range but one considerable depression, which is that crossed by the road of the Little St Bernard. In the range crowned by the summit of Mont Blanc the Alpine chain attains its highest elevation. From thence to the Pass of St Gotthard its general direction varies between east and north-east. 'To the east of Mont Blane a comparatively low tract allows of several comparatively easy passes between Switzerland and Piedmont, one of which has long been famous as the Pass of the Great St Bernard ; but from that to the Simplon Pass, a distance of about 52 miles in a straight line, or about 75 miles if measured along the watershed, the main chain preserves a greater average height than in any other part. Several peaks lying in the dividing ridge, such as the Grand Combin, Matterhorn, Lyskamm, aud Monte Rosa, exceed 14,000 feet in height ; and these are rivalled by at least six summits on the north side of the same ridge, which at two points only sinks below the level of 10,000 feet. The Simplon Pass corre- sponds to what may be called a dislocation of the main chain. From thence to the St Gotthard the dividing ridge runs nearly due north-east, and does not prescnt any dominant summit excepting the

Monte Leone. On the east and south-east side of the St Gotthard Pass, as far as that of the Maloya, the line of watershed between the affluents of the Rhine and that of the Po is determined by what may be called accidental conditions. The chief mountain ridges, which culminate in the Cima Camadra, Piz Valrhein, and Tambohorn, instead of being arranged along the parting of the waters, lie in a transverse direc- tion, aud hence the natural frontier of Italy is here more broken and irregular than elsewhere ; and it is only on the south side of the Maloya Pass that the main chain assumes a tolerably continuous direction from west-south-west to east-north-east, as between Piz Giiz and the Bernina Pass it rises into the lofty group whose dominant peaks are Piz Tremoggia, Piz Bernina, and Piz Cambrena. £East- ward of the Bernina Pass the same direction is preserved, and in the range including the Corno di Campo, Monte Zembrasca, and Monte Foscagno the level scarcely sinks below 9000 feet; but beyond the last-named summit, in the space lying between the Lower Engadine, the head waters of the Adige, and those of the Adda, the semblance of a continuous ridge forming the watershed between the Inn and the Adriatic altogether disappears. If we adhere to the usage of designating as the main chain the ridges which part the waters flowing in different directions, it must be owned that the disposition of the chief mountain masses has no connection with the direction of that chain. Lying between the great mass of the Orteles Alps to the south and the considerable group of the Silvretta Alps on the north side of the Inn, the greater part of the mass in question is drained by streams that flow into the latter river; but the arrangement of the valleys seems to be largely due to erosive action. Few summits in this part of. the main chain exceed 10,000 feet, the highest being Piz Scesvenna, on the east side of Val Scarla.

The break in the continuity of the Alpine chain marked by the deep valley through which the main branch of the Adige descends, first southward and then eastward from its source to Meran and Botzen, is one of the most remark- able features in the orography of the Alps. The little lake which is regarded as the chief source of the river lies within less than five miles of the Inn, where that river enters the Tyrol, and no

apparent barrier divides the lake from the Inn valley. Eastward of this limit the Alpine chain exhibits a degree of order in its general arrange-

ment which it is impossible to trace in its western and central portions. For a distance of some 250 miles a broad zone of crystalline rocks extends from west to east, flanked on the north and south sides by parallel zones of sedimentary rocks, chiefly belonging to the older secondary formations. Two great valley systems on the opposite sides of the central zone closely coincide with those geological boundaries, and mark out in the physical aspect of this region the limits between the central and the secondary zones. In the former are situated all the highest peaks of the eastern Alps. For a distance of about 140 miles, from the Schafkogel, south-east of Nauders, to the Markkahrspitz, the average level of the main chain is nearly as high as in any equally long section of the central or western Alps. There is one very considerable depression which is marked by the Brenner Pass, but elsewhere in that long barrier there are but three points where the range is passable by beasts of burden. Between the two main sources of the Adige, at the Reschen Scheideck and the Brenner Pass, the considerable groups of the Oetzthal aud Stubay Alps attain a great average elevation, though two points only—the Wildspitz and the Weisskugel—surpass the level of 12,000 feet. The drainage of these groups is mostly carried to the Inn, and the line of watershed, about 53 miles in length, is much less direct than in the more easterly portion of the chain. This extends nearly due east for about 90 miles from the Brenner Pass, nowhere falling below the level of 8000 feet, and in two promineut peaks—the Gross Venediger and the Gross Glockner—rising considerably above the limit of 12,000 feet. At a point somewhat north of the Mark- kahrspitz the ceutral chain divides into two parallel ranges, between which lies the upper valley of the Mur. This river flows for a distance of fully 80 miles nearly due east, till at Bruck-an-der-Mur it turns southward to approach

the Drave, and ultimately joins that stream. Various reasons combine to induce geographers to regard the more northern of the two ranges above mentioned, which divides

the Enns and other minor tributaries of the Danube from

those of the Drave, as constituting the eastern extremity

of the main chain of the Alps. This extends a little north

of due east for more than 110 miles, with a comparatively

low mean elevation, from the Arlscharte to the Semmering

Pass, which we regard as the eastern limit of the main

chain of the Alps.

Measured along the watershed, as above defined, but without taking into account the minor sinuosities, which would considerably increase the total, the length of the main chain is about 790 English miles.

For ages before there existed any correct knowledge of Passes of the configuration of the Alpine chain, the needs of war and the Alps. commerce had urged the people dwelling on the opposite sides of the great barrier to seek out the easiest and most direct routes for traversing it. Hence the chief passes of the Alps have been known and frequented from a period antecedent to authentic history, while until a quite modern period little attention was given to the parts of the chain — which did not lie in or near the lines of traffic. It is highly probable that many other passes, affording the easiest means of communication between adjacent valleys, have been known and used by the native population from a very remote period, but only those which served for international purposes of war or peace became known at a distance, and are alluded to by ancient writcrs. A pass is a depression between two adjacent mountains, and the track is usually carried over the lowest part of that depres- sion ; but nevertheless nearly all the passes of the Alps involve a long ascent to reach the summit, and a long descent upon the opposite slopes. Hence the Romans, who were the first semi-civilised people to make extensive

Ancient

use of the Alpine passes, applied to each of them the term Mons. The same names, more or less modified in the middle ages, have been preserved in the dialects of Latin origin that prevail throughout the western half of the Alpine chain, and the modern name for the chief passes are still Mont Genévre, Mont Cenis, Mont Iséran, Petit Mont St Bernard, Grand Mont St Bernard, Monte Moro, and Monte San Gottardo. In more recent times, since geographers have attempted to fix the names and positions of the chicf summits of the Alps, they have been con- tinually misled by the supposition that a name of high antiquity designating a mountain must belong to some prominent peak. The errors arising from that source have not yet disappeared from geographical works of high repute, but in point of fact each of the names above enumerated belongs solely to the pass, and there is no neighbouring peak entitled to the same designation. The more important passes of the Alps are enumerated in the following description of the chief groups of the Alps ; but it may be here remarked that the direction of the main routes for traffic is not exclusively determined by the position of the lowest and easiest passes over the main chain. The configuration of the mountains is such that a traveller procecding from Italy to France, Switzerland, or Germany, after crossing a comparatively easy pass over the main chain, may find it necessary to traverse a second and loftier pass over a lateral chain, or clse follow a circuitous route that may double the length of his journey. Thus a traveller going from Turin to Lyons, who should take what appears to be the direct course over the pass of Mont Genévre, the easiest in the whole range of the western Alps, will find on descending to Briancgon that he must cross the much higher and more difficult pass of the Col de Lautaret, or else descend along the Durance till it emerges into the lower country near Gap, and thus more than double the length of his journey. Including the Semmering Pass, there are now not less than 60 Alpine passes that are traversed by carriage roads; and besides three lines of railway now open for traffic, several others are in course of construction.

From the time of Julius Cesar downwards, the Romans, in the

divisions of prosecution of their policy of universal dominion, or for the purpose

the Alps.

of maintaining communication with their military colonies, had become acquainted with all the easiest and most serviceable passes of the Alps, and were thus naturally led to attach names to the chicf groups. As their acquaintance with the entire region was very incomplete, the exact boundaries of these groups were imper- fectly understood, and the denominations adoptcd by them were never accurately defined. As might have been expected, the divisions thus roughly established had reference rather to the aspect of the mountains as presented to one travelling from Italy towards the north or west, than to a general view of the physical conforma- tion of the entire region. Hence the ancient divisions arc essentially defective, as taking no note of some important groups, or including under a single designation groups entirely distinct. Notwith- standing these defects, the ancient divisions have been adhered to by all but a few modern geographers, and it is therefore desirable to record them separately.

ALPS

great range including Mont Blanc and Monte Rosa, whi

the time of Julius Cesar, if not earlier, was recognised ae Eel portion of the entire chain. The word Pen or Ben is still in use in the living dialects of the Celtie stock as a common designation for a conspicuous mountain, and was certainly in use in the speech of this part of Cisalpine Gaul, where many other Celtic terms are preserved in the local names. The Roman designation Jupiter Penninus was undoubtedly taken from the Celtie root, but the asserted use of the name Pen for a divinity by the native tribes is not established by valid evidence.

5. Lepontine Alps (Alpes Lepontine).—It would appear that this denomination was originally restricted to the parts of the main chain lying on either side of the pass of St Gotthard, including the sources of

the river Ticino, with those of its tributaries, of which the most important is the Tosa or Toccia, draining the range between the neighbourhood of the Simplon Pass and that of the Gries. The name is derived from the Lepontii, a tribe of doubtful extraction (Rhetian, aecording to Strabo) who inhabited the main valley of the Tessin or Ticino, the upper part of which is still ealled Val Leventina. The eastern limit of this group was usually fixed at the pass of San Bernardino.

6. Rhetian Alps (Alpes Rhetice) derived their name from the Rheti, a powerful tribe or nation holding a large tract of territory which appcars to have extended from the sources of the Rhine and the Ticino on the west, to those of the Adige and the Salza on the east. The area included under this vague heading is at least equal in arca to that of the five divisions hitherto enumerated.

7. Noric Alps (Alpes Norice).—Under this name the entire region lying north of the Drave, and extending thence to the valley of the Danube on the north and the plains of Hungary on the east, was included.

8. Carnie Alps (Alpcs Carnice).—This name was given to the mountain tract lying between the upper Dravc and the low country of Friuli. By some writers it has been limited to the ranges that feed the Tagliamento (7ilaventus) and its tributaries ; by others the range seems to have been held to extend from the sources of the Piave to those of the Save. The name Carnia is still in use in Friuli, but is strictly limited to the basin of the Tagliamento.

7. Julian Alps (Alpes J ulice).—This designation has been still more vaguely used by ancient and modern geographers than any of the preceding. The lofty group of peaks crowned by the Tergiou, and lying between the head waters of the Isonzo and those of the Save, undoubtedly forms the chief nucleus of the group distinguished by this name; but it also appears to have included the ranges of castern Friuli, which province, as well as the Alps in question, took its name from the Roman Forum Julii, now known as Cividale. By others, and even by contemporary Italian writers, the term Julian Alps is made to extend southward through the district of Karst between Carniola and

the shores of the Adriatic, and thence through Croatia to the frontiers of Bosnia. A great part of this district is an undulating plateau, in part not attaining to 2000 feet above the sea-level, to which by no stretch of language ean the term Alps be properly applied.

Inaddition to the groups above mentioned some writers have enumerated the Dinaric Alps (Alpes Dinarice), and include undcr that term the mountain range extending along the western frontier of Bosnia. Thisisa portion of the extensive mountain system of European Turkey, whichin onedirectionincludes the Balkan, and inanother is eontinued through Albania into Greece. The Romans probably applied to these the designation Alps as some of their later writers did to the Pyrenees and the mountains of southern Spain ; but it can merely cause confusion to speak of them as a portion of the great system to which the name Alps specially applics. For the reasons already mentioned it is impossible to regard the ancient groups above enumerated as affording a satisfactory division of the region under consideration ; but so far as they can be made to correspond with the divisions suggested by a more exact knowledge of its physieal configuration, it secms desirable to retain the established nomenclature.

1. Maritime Alps (Alpes Maritime).—These included the portion of the main chain dividing south-western Piedmont from the coast of the Mediterranean, and extending northward to the neighbour- hood of the conspicuous peak of Monte Viso.

2. Cottian Alps (Alpes Cottie or Cottiane) included the portion of the main ehain dividing Piedmont from Dauphiné and Savoy, and extending from Monte Viso to the neighbourhood of the Mont Cenis. The name appears to be derived from Cottius, the king or chief of a powerful tribe who ruled the greater part of this region when the paramount authority of Augustus was established in Cisalpine Gaul.

3. Graian Alps (Alpes Graix).—Under this designation was known the great group of mountains between Turin and the upper Val d'Aosta, and the portion of the main ehain lying between the Mont Cenis and the Little St Bernard. Pliny and other Latin writers derive the name from the legendary passage of a body of Greeks led by Herculcs

through this region ; but the true derivation is probably from some lost Celtic appellation.

4. Pennine Alps (Alpes Pennine) was the name applied to the

Actual observation of the Alpine region through the Modem / greater part of its extent, or even the careful study of capt accurate models, must convince any one who seeks t0 jy) — divide it into groups that it is not possible to do this by groups adhering rigidly to any single test or rule. Ina general way, it is natural and desirable to include under the same name mountain masses that are not divided by a broad and deep opening; but it is sometimes more convenient to include in one group disjoined masses that have some natural connexion with each other, rather than multiply groups to an inconvenient extent. In some cases the geological structure may supply a rational ground for preferring one arrangement to another, when the choice would otherwise be arbitrary; and in a few cases it may be well to yield something to ancient usage, based upon political

or ethnological grounds. Accurate knowledge of the Alps is so recent that few attempts have been made to establish a general division of the entire region, and it cannot be said that any one arrangement has obtained such general recognition as not to be open to future modification 3 but there is a pretty general agreement as to the main features of that here proposed, to which a few general remarks must be premised.

Whatever may have been the original cause of those disturbances of the earth's crust to which great mountain chains owe their existence, it is generally, though not universally, true that the higher masses (formed of rocks geologically more ancient) are found towards the central part, and that these are flanked by lower ranges, composed of more recent rocks, which surround the central groups very much as an outer line of entrenchment may be seen to surround a fort. In most cases it is not possible to descend continuously in a nearly direct line from the crest of a great mountain chain to the plains on either side,

for there are usually intermediate valleys, running more or less parallel to the central range, which separate this from outer secondary ranges. These, in their turn, are often accompanied by external ranges, intermediate between them and the plains, and related to them as they are to the central ranges. The type of arrangement here described is more or less traceable throughout the greater part of the Alps, but is most distinctly exhibited in the eastern por- tion lying between the Adige and the frontier of Hungary. We have a central range, composed mainly of crystalline rock ; a northern range, formed of secondary rocks, sepa- rated from the first by the great valleys of the Inn, the Salza, and the Enns; a southern range, somewhat similar to the last in geological structure, divided from the central one by the Rienz, or east branch of the Adige, and the Drave. Flanking the whole, as an external entrenchment on the north side, are the outer ranges of the Bavarian Alps, of the Salzkammergut, and of Upper Austria, to which correspond on the south side the Monti Lessini, near Verona, the mountains of Recoaro, those of the Sette Comuni, and the considerable masses crowned by the summits of the Grappa, the Col Vicentino, the Monte Cavallo, the Monte Matajur, and Monte Nanos. Where, as in the cases above mentioned, the secondary ranges of the Alps rise to a greater altitude, and are completely separated from the neighbouring portions of the central chain, it is impossible not to distinguish them as distinct groups ; but the outermost ranges, which rarely rise above the forest zone, are in all cases regarded as appendages of the adjoining groups. These outer ranges are called in German Voralpen, and in Italian Prealpi, and it is to be desired that equivalents should be introduced in other European languages. A complete catalogue of the peaks and passes of the Alps would exceed the limits of this article, but it seems desirable to append to each of the main groups in the following arrangement the names of the more conspicuous summits, with the height of each above the sea-level in English feet. No limit of absolute height has been fixed in selecting the peaks here enume- rated, as the highest summits of the less lofty groups would appear insignificant in those whose average elevation is much greater. The more important passes are also enu- merated, distinguishing those traversed — (1) by carriage toad, (2) by bridle-path, practicable for

beasts of burden, and (3) by footpath; and (4) snow passes, involving the necessity of crossing snow-fields or glacier

Main Divisions oF tue ALps.

1. Maritime Alps.—On examining a map of the region Where the chain of the Alps approaches the shores of the Mediterranean, it will be scen that, about 50 miles

N.N.W. of Nice, and about 20 S.S.W. of the Monte Viso, several valleys diverge in various directions, disposed, roughly speaking, like the rays of afan. These are formed by a number of ridges which converge towards, although they do not actually meet at, the Mont Linchastraye or Cima dec Quattro Vescovadi. On the west side one of these ridges divides the upper valley of the Ubaye from that of the Verdon, and sends out a branch which sepa- rates the latter from the Bléone. A third ridge divides the Verdon from the Var, and a fourth separates this from its main affluent, the Tinéa, As already mentioned, the range extending §.E. from Mont Enchastraye is regarded as the main chain of the Maritime Alps, and extends, with numerous diverging secondary ridges, in a curved line, gradually approaching nearer to the coast till it is merged in the chain of the Apennines. To fix the limit between the Alps and the Apennines in this direction is necessarily a somewhat arbitrary process, and different criteria may be applied with different results; but it seems most natural to fix on the depression west of Savona known as the Col d'Altare or Col di Cadibona, over which the road is carried which leads in one direction to Alessandria, and in the other to Mondovi. This is by far the lowest depres- sion in the barrier dividing the Adriatic from the Mediter- ranean, the summit being only 1608 feet above the sea- level; and during the Miocene epoch it formed a strait connecting those seas. In modern times the project of utilising the same pass for the construction of a canal to connect the Po with the Gulf of Genoa is an illustration of its geographical significance. On the north side of the Mont Enchastraye, a comparatively low pass, Col de PArgentiére, divides that mountain from the adjoining portion of the main chain. This might properly be

regarded as the northern limit of the Maritime Alps, but ancient usage has included in that group the ranges that cnclose the Val Maira, and separate it on one side from the Stura di Demonte, and on the other from the Vraita. Conform- ing to that practice, we fix the northern limit of the Maritime Alps at the Col de Longet, S.E. of the peak of Monte Viso, connecting the head of Val Vraita in Pied- mont with the sources of the Ubaye in France.

Chief Peaks of the Maritime Alps. (The heights are given in English feet.)

Donte! Gallet ssscscccecescseccesorese 5, 649" SMiontewmMiattOs-..csssc-erecs2c:css0e< 10,2380 Monte wh nOnitetes.reses-ss.css,<.0 CUSSa) lon teilnmilnas ~~.secseecseeezesees~~ 10,223 Monte Bertram c.cc..-..<...~~5~~- 8,209 | Mont Enchastrayc.….....000 9,747 Rocca dell' Abisso ….....0005 9,193 | Grand Rioburent.….....1000 11,142 Cima dei Gelas…...cccscseccscees 10,433 | Aiguille de Chambeyron…...11,155 Rocca dell' Argentera …..... 10,617 | Pointe Hautc de Mary….....10,537 Chief Passes of the Maritime Alps. Col di San Bernardo (Albenga to Garessio), carriage road… 3301 Col di Nava (Oneglia to Ormea), carriage road….ccsscscssseseecsscsceseee 3150 Col di Tenda (Tenda to Cuneo), carriage road … s..cssssseceseecsesceeeses 6158 Col delle Finestre (8. Martino to Entracque), footpath …....sss00 8189 Col delle Cerese (S. Martino to Valdieri), footpatlh….....ccsssssceesenee 8412 Col di Frema Morta (Val Tinea to Valdieri), bridle-path ….....006. 8839 Col della Lombarda (Vai Tinea to Vinadio), footpath ….:ssecsee 7858 ColiditStaseAmnay (game); if Ootpatiln csvesc.—z-220ee-)0s-0s-/ ceeeee eee 8009 Col de Pouriac (San Stefano to Bersesio), footpath….....ssscesssvseecees 0 Col de l'Argentiére (Val. of the Stura to Barcelonnctte), bridle-path 6545 Col de Sautron (Val Maira to Barcelonnette), footpath …..... about 8000 Col de Lauzanier (Val Tinea to the Ubaye), footpath…..... about 8300

2. Cottian Alps.—In the well-known panorama pre- sented to an observer who takes his stand on the Superga, or some other eminence

near Turin, the most distant objects are the peaks of the Maritime Alps south of Cuneo and, exactly in the opposite direction, the great mass of Monte Rosa. In the western horizon, subtended by this chord, about 120 miles in length, the eye follows the irregular curve traced out by the main peaks of the western Alps, that separate upper Italy from France. More than any other part of the Alpine chain, this is characterised by extreme irregularity in the disposition of the mountain masses and the chief valleys On the west side the pre-

vailing direction seems to be from south-west to north-east, while on the east side it is more nearly from west to east; but the valleys and the ridges that enclose them are oftcn curved or irregularly sinuous. Convenicnce seems to confirm immemorial usage in subdividing this region into two or more groups; but it is not easy to decide how this is to be effected. The great valley of the Dora Riparia, and the low passes connecting it with the valley of the Durance, seem to afford the most natural division. Ancient and modern usage being alike opposed to this, it appears that the valley of the Orco in Piedmont and that of the Arc in Savoy, with the connecting pass of the Col del Carro, may best be taken as the boundary between the northern and southern portions. The lattér is distinguished as the group of the Cottian Alps. This includes a number of secondary ridges that extend from the main chain on the side of Piedmont, with a general direction from west to east; aud on the French side one considerable range, stretching south- west from the neighbourhood of Monte Viso, that divides the Ubaye from the Guil, besides a lesser parallel ridge lying between the Guil and the head waters of the Durance.

Chief Peaks of the Cottian Alps.

Monte VilsO! :sccce—sveceneccsesscee 12,605 | Mont Albaron …....0.00008 12,014 Monte Meidassa …...:.sese0e 10,991 | Mont Chardonnet …..... 12,378 Mont Albergian …....:cceeeeee DOD |) Tors We Fae ocoeoscoseeccceacocecnen 11,516 Roche du Grand Galibier …10,637 | Pointe de Sainte Anne, or

Mion elialbonecssccrsseecuse-conesess 10,486 Pte. des Orches…...about 11,000 Roche d'AmDin …...~~.~~---++++ 11,096 | Roche Brune …….~~.~~++++. 10,906 Roche Melon…….ss0ecceeeeee 11,621 | Mont Chaberton…..... 10,258 @igimate) | aeeccese—ccorssteteenceses 12,081

Chief Passes of the Cottian Alps.

Col de Longet (Val Vraita to the Ubaye), footpath …….e-+ 8,727 Col de St Veran (Val Vraita to Queyras), footpath…....sseeceeeceee 9,564 Col de la Traversette (Crissolo to Abriés), footpath …....-..sse 9,827 Col de la Croix (La Tour de Luserne to Abriés), bridle-path…..... 7,611 Col de Sestriéres (Pignerol to Cesanne), carriage road….. «- 6,335 Mont Genevre (Cesanne to Briancon), carriage road …....s.ccssescrree 6,102 Col d'Izouard (Queyras to Briancon), bridle-path…..... about 6,500 Col des Echelles de Planpinet (Bardonnéche to Briangon), footpath 5,873 Col de la Rone (Bardonnéche to Modane), bridle-path…....- 8,334 Col d'Etiaches (Bardonnéche to Bramans), footpath …….:0.:0+ 9,301 Col du Clapier (Bramans to Susa), footpath …..—.------- eseeseeseeeesees 8,107 Mont Cenis (Susa to Lanslebourg), carriage road. .....~~.c.~~-:eseeees 6,772 Col de l'Autaret (Vil to Lanslebourg), SNOW .....cccsscsseereeeeeeseees 10,170 Col de Colorin (Ala to Lanslebourg), glacier…....cssssseeeeceeeeeces 10,662 Col de Séa (Groscavallo to Lanslebourg), glacier…...----c.---:~~/del>—e0 10,154 Col della Crocetta (Groscavallo to Ceresole), footpath …..... -.+ 9,179~~

3. Dauphiné Alps.—On the west side of the Cottian Alps, and separated from these by the broad valley of the Durance, rises a group of lofty peaks, surpassing them cousiderably in height, and almost completely isolatcd from their neighbours. This group has not usually becn included amongst the Cottian Alps by geographers, and it is more natural to regard it as the nucleus of a distinct division constituting the Dauphiné Alps. side of this central mass, and separated by the valley of the Romanche and the Col de Lautaret, is a considerable group, including three principal ridges, whose direction is nearly due north and south, separated from the neighbour- ing mountains of Savoy by the deep valleys of the Arc and the Isére, which may best be regarded as an outlying portion of this division. On the south side of the main group another outlying mass, which on one side feeds the chief sources of the Drac, and on the other several short tributaries to the Durance, must also be included in this division. The ranges of secondary rocks lying west of the broad valley between Grenoble and Chambéry, which are geologically and orographically a southern extension of the chain of the Jura, arc at the same time exactly parallel to the northern ranges of the Dauphiné Alps, and must be regarded as the outer range or " Border Alps" (Voralpen) of the group. The only doubt in fixing the limits of the Dauphiné Alps is as to the boundary between their northern group and the adjoining mass of the Cottian Alps. It seems that this may best be fixed at the Col de Galibier,

On the north.

ALPS

connecting the chiet source of the Durance with the valle of Valloires in Savoy. 4

Pic des Ecrins, or Pointe randes Rousses…..... 395

des ArCineS eseccsesesene 13,462" | Taillefer oa… 000… ae La Meije, or Aiguille du Pic de Belledonne …..... 9°78

Midi de la Grave …..... 13,081 | Pic dt) Fréne®.....:. eee 9903 Pic d'Ailefroide…..... about 13,000 | Pic Bonvoisin .. ss… 11503 Mont Pelvoux (highest peak) 12,973 | Dormillouse …....:sseceeeseese 10:57] Pie d'Olan …..... ceeteeaserercore 11,789 | Chamechaude …....-..000000 6,847 Aiguille d'Arve (highest).....11,529 | Mont Granier …....s:csssee 6.348 Aiguille de laSausse(high'st)10,896 | Dent du Chat …....s:ceces. 5,302

; La Beérarde), glacier .2…..:.....0c.0me 11 Col du Glacier Blanc (Vallouise to La Grave en Oisans), glacier 10am

pulse to Monestier), bridle-path …..... 9 Col de la Lauze (St Christophe to La Grave en Oisans), glacier "10ee

Col de Sais (La Bérarde to Val Godemar), glacier …....ssssssres 10.289 Col de Célar (Vallouise to Val Godemar), glacicr…....sscsscsssceeees 10,092 Col des Tourettes (Orciéres to Chateanroux), footpath…....ss-e000 8465

Mordlle2poatle.. crssececsssssssescccu-s00- teeters oerce ees etter 6,500

4. Graian Alps.—The lofty group of snowy inountains lying between the plain of Piedmont and Mont Blanc has from a remote period borne the designation Graian Alps. To the north they are bounded by the Val d'Aosta, and to the south by the valley of the Orco; but on the west side the boundary is not so easily determined. The portion of the main chain dividing Savoy from Piedmont, between the Levana and Mont Blanc, must undoubtedly be in- cluded in this division; but it is not so easy to determine the relations of a group of lofty summits that are divided from the rest of the Graian Alps by the upper valley of the Isére, filling the space between the upper course of that river and that of the Arc. This is further geologically distinguished by the fact that the higher summits are chiefly composed of nearly unaltered sedimentary rocks. This group has by some writers been associated with the mountains of Beaufort, lying between the Istre and the Arly, to form, with some subordinate brauches, a group of south Savoy Alps; but we prefer to adhere to the older usage of those who have united

them with the Graian Alps. The exact boundary between these and the Mont Blane group may best be fixed at the pass of the Little St Bernard, the lowest in the main chain between the Mont Cenis and the Simplon.

Chief Peaks of the Graian Alps.

Main Chain. WuaeGrivola .iicsessseeeeee 18,028 Grand Apparet …….....-0e0 11,494 | Becea di Nona. .....sss000 10,834 Aiguille de la Sassiére …... 125326 | Mont Emiliusi…....~~ee 11,677 Mont Bassac Punta di Tersiva …..~~.. 11,503 Ormelune…... Savoy Group. RAUHGOT ac cscrescsscerssreesesereeeeer Grande Motte …..... about 11,800

Piedmontese Group. Grande Casse…....<..:seee 12,78 Grand Paradis, ...--.. 13,300 || Dent Parassee .-sesstees 12,137 Tour du Grand St Pierre… 12,069 | Roche Chevriére ….....+ 10,765 punted) Wavina)c:..~~etereseres 10\824 | Mont Povmri.:...~~-cc.-coseceemm 12,491 Bee d'Invergnuon…...about 12,100 Chief Passes in the Graian Alps.

Col del Carro (Locana to Lanslebourg), glacier .. Brrerorcecuoccce 10,292 Col de Galese (Locana to Tignes), snOW …....seessee ast aun ee Col de Gailletta (Tignes to Val de Rhémes), glacier ….....~~> + 10,049 Col Vaudet (Tignes to Val Grisanche), SnOW….....ssssssscssssseeeeeeeese 9,309 Col du Mont (Sainte Foi to Val Grisanche), footpath …....-00 8 635~~

Pass of Little St Bernard (Bourg St Maurice to Aosta), car. road 7,192 Col de la Croix de Nivolet (Ceresole to Val Savaranche), bridle-path 7 a

11.0:

Col de Grancron (Cogne to Noasca), glacier .....scssccsssesreercenerscsees 03% Col de Telleccio (Cogne to Locana), glacicr …....ccsscsseseeceerseees 10,925 Col della Nouva (Ponte to Cogne), glacier …....sscessssssserssersssster 9,664 Col de Lauzon (Cogne to Val Savaranche), bridle-path…..... about 9,500

Fenétre de Cogne (Cogne to Bard), bridle-path…....csccscsesseseeesessoes 8,860 Col de Lore (Cogne to Brissogne), glacier …....sss-sssescesesercesee eeeeees 10,049 Col d'Iséran (Bourg St Maurice to Lanslebourg), bridle-path …... 9,085 Col de la Leisse (Tignes to Entre-deux-Haux), SMOW.....sssese-s+ser0 9,127 Col de la Vanoise (Moutiers Tarentaise to Lanslebourg), footpath 8,271 Col de Chavitre (Pralognan to Modane), Snow «.. .-.sscsseseoesssereeseeee 9,144 Col de la Platiére (Moutiers Tarentaise to St Jean de Maurienne), a

footpath

Prrrrrerrrrrrerrrrrrr rere eee terre

AYLJIP § 625

5, Pennine Alps.—The portion of the great chain that Ga te Wee (Gomonay to Riva), bridle-path …....scsessseee fy aN

: f 7 urlo Pass (Alagna to Macugnaga), SNOW .....eccsssssescesseseessescesoseee i includes the peaks of Mont Blane and Monte Rosa has Col di Barranea (Varallo to Ponte Grande), bridle-path ….....0.. 5,749 always been recognised. as the most Important among the | Alphubel Joch (Zermatt to Saas), glacicl…....sssssssecseec 12,474 ivisions the Alps. i -emi c Adler Pass (Zermatt to Distel Alp), glacier…....scsccscssssesescescesseee 12,461 "as . Ps aoe pre-eminence is due not only Monte Moro (Saas to Macugnaga), snow Brteteccsees ECOL EL EEE eeee 9,390

to its surpassing height, but to the fact that its peaks are so conspicuous. Throughout the plain of Upper Italy, from Turin to Milan, and even as far ag the slopes of the Apennines, Monte Rosa, with its attendant peaks, is com- monly the most remarkable object in the northern horizon ; while in western Switzerland, and as far westward as the heights above Lyons, the dome of Mont Blanc, rising in the distant eastern horizon, attracts the frequent attention alike of natives and strangers. Some doubts may arise as to the precise limits that should be assigned to this group. Towards the north-east it is generally

agreed that the Simplon Pass is the most natural limit. In the opposite direction most writers have fixed on the Col de Bonhomme, south-west of Mont Blanc, as the proper boundary; but it seemsreasonable inageneral arrangement toregard the range extending from the last-named pass to Grand Cceur, in the valley of the Istre, as a south-western prolongation of the range of Mont Blanc. From the portion of the main chain connecting the Mont Combin with Monte Rosa, numerous branches, with peaks that rival these in height, diverge northward. 'The secondary ranges that extend on the side of Italy, southward and eastward from Monte Rosa, are much inferior in altitude. On the north and west sides of Mont Blane an extensive mountain district, including the French department of Haute Savoie, must be considered as an appendage to the group of the Pennine Alps. On the south side, the short range extending parallel to that of Mont Blanc, from Courmayeur to the Val de Bellaval, corresponding to the range of the Aiguilles Rouges and the Brévent, on the opposite side, may best be included within the group of the Pennine Alps.

Chief Peaks of the Pennine Alps.

6. Bernese Alps.—There is no considerable mass of Alpine summits whose boundaries are better defined than that which is generally known as the group of the Bernese Alps. By the number and height of the peaks, that rise far above the limits of perpetual snow, it ranks next in importance to the Pennine group ; and its position with reference to that group has largely contributed to the fame of the region which they occupy for a marvellous and almost unique combination of grandeur and variety. The most characteristic feature in the orography of Switzerland is the great. valley system that extends in a nearly direct line from Martigny to Coire —interrupted, it is true, by two passes (the Furka and Oberalp) of small elevation compared to the surrounding heights. On the opposite sides of this great trench the chief groups of the central Alps are arranged in masses that, amid much apparent irregularity, approach to parallelism with the direction of the central valley. Hence the traveller who attains any considerable height on either side sees over against him the dominant summits of the opposite group in constantly varying combination. The highest groups (the

Pennine and Bernese) are so placed that the chief peaks on the one side are rarely more than 20 miles apart from their rivals in the opposite chain, and the projecting summits of the secondary ridges between them afford panoramic views of wonderful beauty and grandeur. What may be called the main chain of the Bernese Alps, forming the boundary

Cima des Fours …....ssssssse 12.615 | Fletschhorn (Laquinhorn) 13,176 | between the Swiss cantons of Bern and Valais, extends peeuille oe Ze sissee io, Count seseeenssetnasensssesens ae parallel to the course of the Rhone, from the glacier which iguille de bionnassay…... Tv CO recccccccccvcccccccsce ° ° . . . Me Blinc (Calottc).... 15,781 | Pointe de Salles …..about 10,200 | 18 the main source of that river, to Martigny, a distance of BegMtlle Verbe…..~~.....cseee0e MBE UCU ono cisccceieccencecssncassconnaes 10,207 | about 70 miles; and we must regard as a dependency of Grandes Jorasses .. ooctconeacee 13,799 | Tour Sallitre poRgaSacSgocnoOSCROSE 10,587 | that chain the mouutain district that lies ou its northern Aiguille d'Argentiére…..... TZ 5226) Dott Au Wid ic…s..00..csecess0e 10,450 ° b ii he Anmanckihe lana Grande Rossere…..sesceseen 10,904 | Pigne d'Arolla s….secusns.s 12,471 | Side, between the upper course of the Aar and the head o ees CcONCICEESEO Ee vee | eee Best naa the Lake of Geneva. Desiring to adhere to the divisions BANC COMDIN .....~~..00.00000es ont Blane de Cheillon … 12 cr G BORE GENE oonnsccccssescscsesses "589 | Dent Blanche. 14318 | Of the Alps admitted by ancient geographers, many modern MONE COlOD…....c.+scsseseeseese Grand Cornier ….cscsesseeees 13,022 | writers have included the Bernese group among the Lepon- Dent d'Hérens pmowel setevenenesesessersenes ae tine Alps ; but this arrangement is not consistent with any OGIO cesses. sctennesesessenes ; : Spe : . Rothhorn, dr Moming …... 13,855 rational criterion that can be applied. The only question MMOD sicvscnsscsnnscvsossenes 14,804 | admitting of doubt is as to the eastern limit of this group.

y ; mS Geeeerteenceccocce eee 13,750 Mte. Rosa (highest peak)... 15,217 | Mischabelhérner (Dom) ... 14,935 EVEIGSIMIGS!

....sssrcesecsesoraceree 13,225

Chief Passes of the Pennine Alps.

The Aar issues from its parent glacier at a point very near _to the chief source of the Rhone, aud separated only by a comparatively deep and broad depression, the Grimsel Pass; and it might appear that the Bernese Alps should

Col de Bonhomme (Contamines to Chapiu), bridle-path …..... 8,195 :

Col de la Seigne (Chapiu to Courmayeur), bridle-path…..... 8,327 | be defined as the group enclosed between those rivers.

a du helo oe ere to et ae glacier…..... ee But some ten miles east of the Grimsel Pass the range ol de Miage (Contamines to Courmayeur URCIGN, |ctesecescsersessteres BLA : : 2 3

Col du Géant (Chamouni to Courmayeur), glacier «ws. 11,030 | lying north of the great valley of Switzerland is completely

Col du Tour (Chamouni to Orsidres), glacier-.s.sessesessescessesoseoreccces 11,213 | cut through by the valley of the Reuss, where that stream

descends towards the Lake of Lucerne through the famous defile of the Devil's Bridge; and as it would be incon- venient to reckon the comparatively small group that lies between the head waters of the Reuss and those of the Aar as a separate division, we prefer to include this as a portion of the Bernese Alps.

Col de Vessona (O Col de Vacornére

Col de Torrent (Evolena to Vissoie), footpath 9 593 Chief Peaks of the Bernese Alps.

Pas du Beeuf (St Luc to Turtmanthal), footpath Grand Moveran …....se0. 10,048 ; Aletschborn sahemeessesesser tionally CUD,

Augstbord Pass (Griiben to St N iklaus), Maablerets.ccvs-sscc-00steeaserseees MOORS | Uhunyed hears coooneeeorecercs. 13,671 Trift Joch (Zinal to Zermatt) Walch Ornigess-cossectecsser eestor LOS F225) OMG TG lapses se-cfseccsssacecee 13,438. Col de St Théodule (Zermatt NWaldstritbeldc…..sce eee OS 7AD SH Gern seteaccsrs <2, cece eee 13,045 Schwarz Thor (Zermatt BaAlMHOUN ..cseerccscssnceceseees 12,100 | Finsteraarhorn..... .~~..:+414,026 Lys Joch (Zermatt to V Woldenhorne…cccccccccccees 11,965 | Schreckhorn ….....see00613,394 Weiss Thor (Zermatt to Macugnaga), glacier Bliimlis Alp (Bliimlisalp~~ Wetterhorn (Mittelhorn).....12,166 Betta Furke (Val d'Ayas to Val de Lys), ODD Patlie:secceteere-ccssscececs 8,639 OTM), csseee-seceteececee 12.041 Erzithorneersns eeeserece 10,774 Col d'Ollen (Gressonay to PAETING) 5 WUC PAL. .-....0-ereseenssenenenenee 9,544 | Bietschhorn 4.4…..... eee 12,969! Eggischhorn ….....ccscscesessees 9,649

626

Inetve norm ete. -s-cecteeeece se ROSE Tag PRR ee araivcesn-ccte OBOE (Gallons toCkeeeccssses---eesesansees-=e WirieRothstock «neccce---------- OA Dammastock…. wee INWeSeOM ceetereesecs-occescseneesere=-<= 7,768 Sustenhorn….....— Brienzer Rothhormn….....—+ iy Gross Spannort Pilatus (Oberhaupt) .....---. 7,290 Chief Passes in the Bernese Alps. Col de Cheville (Bex to Sion), bridle-path …....—s-cesceresestenseseeseree 6,680 Sanetsch Pass (Sion to Saanen), bridle-path ….....-.:e-seeseesesereeres 7,369 Rawyl Pass (Sion to Zweisimmen), bridle-path …....—s:0e+-e-e0 7,948*

Gemmi Pass (Kandersteg to Leuk), bridle-path … Létschen Pass (Kandersteg to Turtman), glacier …....

T'schiugel Pass (Kandersteg to Lauterbrunnen), glacier . . 9,252 Petersgrat (Lauterbrunnen to Kippel), glacier…..... seseneneeeesenensanens 10,550 Létschen Liicke (Kippel to the Aiggischhorn), glacier…....._-..++ 10,512 Kleine Scheidegg (Lauterbrunnen to Grindelwald), bridle-path… 6,763 Grosse Scheidegg (Grindelwald to Meyringen), bridle-path …..... 6,910

Monch Joch (Grindelwald to Viesch), glacier ….....0+—+--about 11,600 Strahleck Pass (Grindelwald to the Grimsel), glacier «...-..- 10,994 Briinig Pass (Brieuz to Sarnen), Carriage TOA .....ceseescceeereessssserees 3,648 Engelberger Joch (Meyringen to Engelberg), bridle-path …..... 7,244 Susten Pass (Meyringen to Wasen), carriage road (2) ...~~.sssssssssssee 7,440 Triftlimmi (Trift Glacier to Grimsel), glacier …..+++~~+s+sesee++ about 10,200 Geschenenlimmi (Gesclienen to Steiu Alp), glacier …..... about 10,170 Sureneu Pass (Engelberg to Altdorf), bridle-path …..ssecsessesesees 7,562

7. North Swiss Alps.—Attention has already been called to the great line of valley that traverses Switzerland from Martigny to Coire. The range of high peaks lying on the north side of this valley is interrupted at one point only, where the Reuss flows through the deep defile of the Devil's Bridge from Andermatt to Altdorf, and this breach in the continuity of the range has been here regarded as the eastern limit of the Bernese Alps. The range extend- ing eastward from that boundary to the neighbourhood of Coire might perhaps be considered as a prolongation of the range of the Bernese Alps; but independently of the inconvenience of assigning such wide boundaries to a single group, there are geologic as well as orographic grounds for preferring to class this along with the dependent ranges lying further north as a separate division of the Alps. With regard to the latter ranges, those lying between the valley of the Reuss and the Lake of Lucerne, on one side, and the ancient valley of the Rhine, which included the lakes of Wallenstadt and Zurich, on the other, manifestly correspond to the outer ranges of central Switzerland, which we regard as appendages of the Bernese Alps. The case is somewhat different as regards the small detached group culminating in the Hoh Sentis, and lying in the angle between the ancient course of the Rhine and the modern Rhine valley from Sargans to the Lake of Con- stance. This is so far separated orographically and by geological structure that it might properly rank as a separate division, but it is on the whole more convenient to reckon it as an outlying portion of this group. The Oberalp Pass, a few miles east of Andermatt, forms the watershed between the Reuss and the main branch of the Rhine, and the waters meet again at the confluence

with the latter of the united streams of the Aar and the Reuss at Waldshut, so that the entire territory comprehending this division of the Alps is enclosed between the two first- named rivers.

Chief Peaks of the North Swiss Alps.

Crispalt (Piz Giuf)..... 10,164 | Kirpfstock…….c.---seeeseees 9,180 Oberalpstock (Piz Cotschen) 10,925 | Saurenstock …..sss-sensseeres 10,026 UNG To ercereetcne sececceoccacaocce: : Scheihes:.cscccsmttesectieeen—. 9,587 Piz Tumbif, or Brigelserhorn 10,663 | Mythen (higher peak) ..... 6,244 Bifertenstock, or Piz Durgin 11,237 | Glarnisch (highest peak,

MIG ISS LOCK mers resets: scccereeenecrss 10,355 Bae@istoclo)p..scesccsssseresst 9,584 DOOM ESMOMM ce: cce-ccszveceesussesetee 10,870 | Miirtschenstock . oo SLOLA (CRIEINGID, ccocosncoscmcnrccoarocsenn: 9,213 | Mageren …....sccsceerserereessers 8,294 ITISEEGSLOGlues-s-o-e-ceccttsrcsestcs 10,089 | Churfirsten (highest peak,

Scheerhorn…e.e.es.ssssesseesereeees 11,142 Scheibenstoll) .....00> 7 ,po4 (ClaridlenstOck: ~-..------.ce.c—e-- 10,709 | Faulfirst …....:sssecccssseessseeees 7,916 Se lUsam liieesetessec sce cece cssesseererss 9,921 | Holi Sentis……..2..--ccssesesees 8,215

Chief Passes of the North Swiss Alps.

Oberalp Pass (Dissentis to Andermatt), carriage road ……..-+++ + 6,732 Kreuzli Pass (Dissentis to Amsteg), footpath ….....:seseseeeeeees 7,710 Sand Grat Pass (Dissentis to Stachelberg), glacier……..1-sssee-+ 9,138 Clariden Grat (Amsteg to Stachelberg), glacier ….....—ssssccesseeres 9,842 Kisten Pass (Ilanz to Stachelberg), snow …..s.-.ss:scsssessssesseccoeeeeee 8,281 Ranier bass (Manz tomilm), bridle-patiec..c.1-<:—c1-es-secemeseeeene ae 7,907

Ais P

Segnes Pass (Reichenau to Elm), SnOW….....sees esse eceesserseceeneeees 8,612 Sardona Pass (Elm to Vattis), glacier ….....:00-se:-sceeerecsnee about 9,500 Ramin Pass (Elm to Sargans), footpath) ~~1.:....s:....~~.0c-e.—++-cousnarevens 6,772 Klausen Pass (Altdorf to Stachelberg), bridle-path ….....ccsee 6,437 Pragel Pass (Schwyz to Glarus), bridle-path.….....006.-...:scsssssseees 5,062 Kamor Pass (Weissbad to Riiti), bridle-path.….....0 ---- about 5,300

8. Lepontine Alps.—The portion of the Alpine chain lying between the Simplon and Spliigen passes, and form-

ing the boundary between the tributaries of the Po and those of the Rhine, presents some peculiar orographic characteristics. The line of watershed is pretty nearly parallel to that great line of depression traced across Switzerland by the valley of the Rhone, the Urserenthal, and the valley of the Vorderrhein; and a tendency to parallelism with the same system may be traced in many parts of this group. But the dominant direction of the secondary valleys and ridges is that of the meridian ; and on the south side we find a series of long valleys running from north to south, with occasional slight distortions. The most considerable of these are partly occupied by the two famous Lombard lakes—Maggiore and Como—which have from an early period attracted the admiration of strangers to this region. Ancient geographers limited the term Lepontine Alps to the portion of this group that sends its drainage on the south side to the river Ticino ; but the ranges between the Spliigen and Bernardino passes, and be- tween the lakes Maggiore and Como, evidently belong to the same system, and must be united in any-natural arrange- ment of the Alps. On considering a tolerably correct model, it is impossible not to be struck by the fact that all the valleys that contain the most considerable streams of the central Alps appear to radiate from the neighbour- hood of the St Gotthard Pass. If we measure from the summit of that pass to the head valleys of the Rhone, the Aar, the Reuss, the Vorderrhein, the Ticino, and the Toccia, we find that the most distant lics within 9 English miles from that point. This fact has doubtless a signif- cance which we are not yet able fully to appreciate, but scarcely suffices to justify the view of those who regard the St Gotthard Pass as in some

special sense the central point of the whole system of the Alps. It is worth remarking that, so far from being distinguished by superior height, the neighbouring peaks are surpassed by all the surround- ing groups, and that the valleys are much deeper than in many other districts, and especially than those of eastern Switzerland.

Chief Peaks of the Lepontine Alps.

Montellieone:..<:-<.:~~ccssee~~-o0o 11,696 | Piz Vial, or Gallinario…..... 10,387 Wi SEHIIOUD oseceserocoreess-neeensees 103628 | Biz Valvhein .:— oversees 11,148 Ofenhorn, or Punta d'Arbola 10,728 | Vogelberg …....sscssescseeees 10,564 IB linmenhOrmsesses-cscs-etetenee 0,932 | Piz Terri…... 10,338 Monte Basodine ….....00+ TOR ENS || [By (Chie becscerecec cccconacnoo: wwe 9600 Pizzo Rotond ….....-<++0.0- 10,489 | Fanellahorn .....scseeseceees 10,2438 Pizzo di Campo Tenca.....- 10,096 ; Lochliberg .....cccceeseeesee 9,990 Pioda di Crana.....ssssecceseeee 7,959 | Piz Beverin.....—-sseeseseseees 9,34 Cima di Laurasca ….....-+ 7,264 | Tambolorn «.....~~ccssesesseeeees 10,748 Badus, or Six Meaduna…..... 9,616 | Cima di Balniscio …..... +..~~ 9,607 SCOpicrerteeteere etree ene 10,499 | Monte Camogh ….....0e 7,304 Cima Camadra….-.. cesses 10,509

Chief Passes in the Lepontine Alps. Ritter Pass (Viesch to Isella), snOW … .cssssscessssssseceeeesseesssenenrensees 8,854 Albrun Pass (Viesch to Premia), bridle-path….....+ me Gries Pass (Obergestelen to Formazza), bridle-path

Nufencn Pass (Obergestelen to Airolo), bridle-path : 09 Passo di San Giacomo (Formazza to Airolo), bridle-path ….....- 'ole Furka Pass (Obergestelen to Hospenthal), carriage road….....- 7,992 St Gotthard Pass (Hospenthal to Airolo), carriage road ….....+++ 6,936 Criner Furka (Locarno to Val Formazza), footpath ….....seeccces 7,631 Passo di Narret (Locarno to Airolo), footpath …..s.seesercerseeeeres 8,013 Passo dell' Uomo (Disscutis to Airolo), footpath…....eeeeeeenccm 7,257 Lukmanicr Pass (Dissentis to Olivone), bridle-path ….....0.~~se~~+ 6,289 Greina Pass (Trons to Olivone), bridle-path ….....:.s:sseneeeeeres 7,148 Disrut Pass (Ilanz

to Olivone), footpath …....ccecesscesersesersseeestestees 7,953 Scaradra Pass (Ilanz to Ghirone), SOW ...esscesserssessserenensecetenes seers 9,088

Passo di Buffalora (Val Calanca to Mesocco), bridle-path …....- 6,686 Bernardino Pass (Hinterrhein to Val Mesocco), carriage road….-. 6,769 Valserberg Pass (Ilanz to Hinterrhein), bridle-path ….- ---+-++—+0-+ 8,22

Lichliberg Pass (Reichenau to Spliigen), foot path…....-scssnsee 8.165

ALP §

Spligen Pass (Spliigen to Chiavenna), carriage voad…..s.sscseseseee 6,945 Passo di Balniscio (Campodolcino to Mesocco), footpath… 7,715 Passo della Forcola (Chiavenna to Roveredo), footpath …....00.0 7,274 Passo di San Jorio (Gravedona to Bellinzona), footpath …... sss 6,417

9. The Khetian Alps.—The older geographers included under the term Rhetian Alps a vast mountain region extending over 6° of long., from the cast side of the Lago Maggiore to the left bank of the Salza, and through 24° of lat., from the neighbourhood of Brescia to the plain of Bavaria. There is no assignable reason for uniting in a single division mountain groups so distinct as many of those included within this wide space—scarcely less than that occupied by all the divisions hitherto enumerated— save the fact that at an early period they received a com- mon designation from writers who had a most imperfect acquaintance with their topography. It might be expe- dient to discard a term to which it is difficult to assign a limited meaning without incurring the risk of confusion ; but general usage has so constantly applied the term Rhetia to the mountain region of Switzerland lying east of the Rhine, with the adjoining portion of Tyrol, that it seems best to preserve the ancient name while endeavour- ing to restrict it within juster limits. With that object it is necessary to take account of one of the most remarkable features in the orography of the Alps—the great breach in the continuity of the main chain shown in the upper valley of the Adige. Ona general view of western Tyrol it is apparent that the

lakes which feed the head of that stream lie on the northern side of the axis of elevation of the main chain, and in fact several streams draining the northern slopes of the central mass are borne southward to the Adriatic through that opening. This is not the place to take into consideration the important influence that this breach in the line of defence between Italy and the north, and the equally deep opening of the Brenner Pass at the head of the other main branch of the Adige, has had on the history of Europe, nor to discuss the geological significance of the same depression throughout an incalculably longer period ; but it is sufficiently clear that this should be taken as the eastern limit of the group to which the term Rhetian Alps most properly applics. On the west the limit, as we have already seen, is markcd by the valley of the Rhine, and the line of depression over which the Spliigen road is carried to the head of the lake of Como. In the space between these boundaries the chief mountains of the Rhetian Alps appear as islands of crystalline rock, divided by intervening masses of paleozoic and oldersecondary strata ; but on the south side liesa district which differs considerably in geological structure, and is cut off by a distinct orographic boundary. A straight line drawn from the head of the lake of Como to Cles in Tyrol, will throughout lie close to a trench formed by the valley of the Adda, the low pass of Aprica, the head of Val Camonica, the Tonale Pass, and the Tyrolese Val di Sole. On the south side of this trench, and parallel to it, extend in succession a broad band of palzeozoic rock and a still broader zone of trias, bordered on the southern 'slope by a narrow girdle of jurassic rocks which decline towards the plain of Lombardy. Towards the east these are interrupted by a great mass of very peculiar granite, the most consider- able tract of true granite to be found in the Alps. Beyond this the ridges and valleys no longer preserve the direction from east to west, but become parallél to the lake of Garda and the valley of the Adige. The district thus limited is enumerated hereafter as a distinct division under the designation Lombard Alps, the boundary between this and the Rhzetian division being the trench above described, which is prolonged from near Cles over the low Gampen Pass to the neighbourhood of Meran. On the northern side the Rhetian Alps are divided from the Vindelician by a well-marked trench, closely corresponding with the

northern limit: of the crystalline rocks of the Silvretta group, formed by the valley of the Ill, the Voralberg Pass, and the course of the Rosanna: Within the limits here assigned the Rhetian Alps occupy an area measuring about 80 miles by 60. The entire mass is divided into two nearly equal portions by the upper valley of the Inn, known in Switzerland as the Engadine.

Chief Peaks of the Rhetian Alps.

Riga Gulia tierce reevsscttsseneer ORSO2 | Ofeny Wand. c..0ccssecssscevescescsees EAzzonetelllaWescssssaesreccssce-s 10,266 | Venezia Spitze…..... Pizzo della Duana ….....00++ 10,279 | Hasenohr …..... Baigt Maroney ss.cesecssscesees …-10,855 | Pallon della Mare … iz) Gauze: MIBOGGR MMGSeROresesccoseserccesctvsscicevssered Piz Tremogei 11,326 | Monte Confinale ….....2:00+. ERINOSCR: cccccs-stscsetcveeee eens 12,9386 | Monte Sobretta …..... DizeBoimitaineccecccscceseces GS 20 4 | RAZICUTVER: .secevonssssaceosteesssess 9,761 BizaC@ambrenameess rcs cere: TE885 || RiziStarlenay s..:—..s.c-ccssesssees Punta Trubinesea ….....:.. NOG I 7; elatstatecscsceteeeccceeerce > Cima del Largo….....s.-++-11,162 | Gravasalvas (Piz Lungen) ...10,421 Monte della Disgrazia …..... AOD PPIZ YAGI R, eetscsesceecsecssse corsets 10,893 EMaaOndi Vier@nal vesce-ser eases iL aS) |l LEA GPL Prati rrccerscenconconcerecapcocall)L aIIBXS Corno di Campo ….....0.00-+ LOSSES Cima da, Bites s.seetraesecevesteee OLOA | Monte Foscagno …....ssesee 10,148) | Piz' Munteratsch …....~~.....0~~ 11,106 PES YON GHARE. «0. .0s0-ceneecevssceses LOK LOW VRIZKO ttre occ ceteevaveeccscexeriaves 10,660 PHO UATETVALS.....cc0-nesseasseees 105359! | Piz Wertsel: .....:csssesess 10,738 EVZAVTTUTEOTOM 5… cossserssenescunetan TO) PE esha U0 Gesccocse cecosocsoceceets 11,211 BiZZorditSeiiat..ccerss.s.0-.0-0ss008s TONOOON Riz MVaclred es. rtrsccetyssssssree 10,610 Corno di Degdis…....c0stsencce 10,597 | Schéne Bleise ….....0.0+° 9,794 PAB BOOM osizscs sus

osessuezareens WO}427 | Scasa) Plana, ...~~cesceecsecs.ssss000 9,738 RIZSCEGWOUNE <.ceessscesscorsvas VORGGSMBlanlcahionnl vecesersssscreese+.ces 10,382 [27 Wim rRilcss...~~-<0es00e008eeaces 9,954 | Piz Linard ….. 11,208 Monte Cristallo: ....00-..sce.scees 11,370 | Fluchthorn.. 42 Ontéler Spitze'ss…....s:ccs:+--- MAR SIAD OMG t1Cr faresteess.cerseerecessasveres 10,824 ISOM HS DIZ ee.e0resscsn-s cece V2NG4G. | MP izeMOmeitre:.cess-..esee00eetecs sss 10,877 Monte Cevedale …....ssssse- 12,505 | Vestilepitz: .ti…....sscecsseoreielO 154 Pederspitz (lighest peak) ...11,849

Chief Passes in the Rhetian Alps. Passo di Madesimo (Campo Dolcino to Avers Thal), footpath …... 7,480 Passo della Duana (Casaccia to Avers Thal), glacier …...s0.ssssse 8,720 Septimer Pass (Casaccia to Molins), bridle-path …....sssssesscesseeees 7,582 Maloya Pass (Casaccia to Silvaplana), carriage road …ssescsesesseseee § 942 Passo di Zocea (Casaccia to Vat UTGSINO) ES IACICT: cazesssceseecssnresescees 8,957 Muretto Pass (Casaccia to Sondrio), SNOW «.usssesssoseeserereaeeeeseee 8,616 Bernina Pass (Pontresina to Poschiavo), carriage roatl….scssessesees 7,658 Passo di Canciano (Chiesa to Poschiavo), footpath…..ssscseseseeesees 8,366 Lavirum Pass (Ponte to Val Livigno), snOW ….cscsssssscsssscsesescesceseees 9 249 Passo di Val Viola (Poschiavo to Bormio), footpath …..... about 7,900 Foseagno Pass (Bormio to Zernetz), bridle-patll …....sscceeccsseseeseee 6,329 Ofen Pass (Zernetz to Santa Maria), carriage road …....scsseceseeeeees 7,070 Umbrail Pass (Bormio to Santa Maria), footpath …....s.cecsecsecees 8,342 Stelvio Pass (Bormio to Prad), carriage road…....cssccsccscsessssssesaee 9,218 Passo Cevedale (Sta. Catarina to Latsch), glacier …....:ssssssesees 10,765 Passo di Vios (Sta. Catarina to Pejo), glacier …...-.sssessssssecsscers 10,868 Passo di Sforzellina (Val Gavia to Pejo), glacier …....s.scescssssscseeees 9,950 Gavia Pass (Sta. Catarina to Val Camonica), bridle-path…...about 8,600 Hohenferner Joch (Martell Thal to Val della Mare), glacier…..... 9,904 Saént Pass (Martell Thal to Rabbi), glacier …....sssseeere . 9,954

Kirchberger Joch (Ulten Thal to Rabbi), footpath

Julicr Pass (Molins to Silvaplana), carriage road … aio (pid Albula Pass (Bergiin to Ponte), carriage road ….....ceeccseeceseeeeeeeee 7,589 Sertig Pass (Scanfs to Bergiin), footpatlr….....sscccsscecseseesenesesees 9,062 Strela Pass (Coire to Davos), bridle-path….....cccccrsecccssesseserscenes 7,789 Laret Pass (Bergiin to Klosters), carriage roal….....cesccccesseeceesees 5,338 Scaletta Pass (Davos to Scanfs), SNOW ..eecseeseeee DICHORERPOEEE CO eRIO OIE 8,613 Fluéla Pass (Davos to Sits), carriage road ….....scssseressccesccensresoee 7,891 Vereina Pass (Klosters to Siis), footpath…..... RECS Ever pacooeoetbectirnne 8,138 Silvretta Pass (Klosters to Guarda), glacier ….....-0 gadtecasectrees 9,928 Cavell Joch (Bludenz to Seewis), footpath ….....sesccsees pSpEpARAAaCCDOD 7,562

Fermunt Pass (Pattencn to Guarda), glacier….....sssssesesees peoonronco0 h

Bieler Joch (Montafun to Paznaun Thal); bridle-path ….... about 6,000 Fimher Joch (Ischgl] to Remiis), Snow ….....ssescssssossssscesessecseoseeess 8,547 Vignitz Pass (Kappel to Samnaunthal), snow …..... cenaceeebooconacen 8,855

10. Lombard Alps.—The limits of the Lombard Alps have been already pointed out. They are enclosed on the east and west sides by the Adige and the lake of Como, extending through about 90 miles from near Meran to Lecco. Their northern boundary is the great orographic trough that stretches from the head of the lake of Como along the valley of the Adda to Tresenda, thence by the low Aprica Pass to the upper Val Camonica, and over the Tonale Pass to the Val di Sole. Where that valley bends abruptly to SSE., the trough still keeps its original direc- tion across the Gampen Pass to the right bank of the Adige below Meran. In spite of the zeal with which

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travellers have of late years explored the unfrequented parts of the Alps, this group continues to be very im- perfectly known, although it

offers abundant attractions to the naturalist and the lover of picturesque and grand

scenery. Chief Peaks of the Lombard Alps.

IUCRIINGSNE coccecsooscesncoccencncnocece: 8,568 | Crozzon di Laris …….-.~~00+ 10,889 Pizzo dei Tre Signori, about 8,600 | Monte Adamello……~~.—++.~~+ 11,832 Grigna (Monte Codeno) ..... 7,908 | Card Alto ..ssescesessereecsresserees 11,352 COmMORO LEN Ris ccresrescssecseesoeee= 8,845 | Presanella, or Cima di Nar~~ Aralalta ….. .. 6,585 NSPleccscscecoccesueaseasiucrsset tees 11,688 Monte Arera.. 8,255 | Cima delle Rochette …..... 10,777 Monte Redorta…... 9,980 | Brenta Alta …rserssererrees (2) 10,771 Pizzo del Diavolo …...ceeceees 9,574 | Monte Baldo (highest pea TPiveaa) OT (COWEN cconcecnoceecr 9,705 me (C0) ITH orn toceepocscecon Gaal Monte Presolana …...~~+~~.see-2+0 8,202 | Mendola (Monte Roen) ..... 6,919 Monte Freronc …....-sese-ssreeees 8,676 | Monte Bondone ….....00+. 7,412 Monte Blumone …...ceeeeeeeeee 9,321

Chief Passes in the Lombard Alps. Passo di San Marco (Morbegno to Val Brembana), bridle-path … 5,997 Passo del Salto (Sondrio to Val Seriana), footpath…..... about 7,500 Presolana Pass (Castione to Val di Scalve), footpath …....—..—++ 5265 Aprica Pass (Sondrio to Edolo), carriage Toad …....~~.sssecessseeseees 4,052 Tonale Pass (Edolo to Val di Sole), carriage road …....~~.------ee-seeee 6,483 Gampen Pass (Cles to Meran), bridle-path…....---.se-sesseseoes about 4,000 Croce Domini Pass (Breno to Lodron), bridle-patl…..... about 6,500 Passo di S. Valentino (Val di Fum to Tione), snow …..... about 9,300 Passo del Lago Ghiacciato (Ponte di Legno to Pinzolo), snow…... 9, 437 Passo di Lares (Pinzolo to Val di Fum), glacier …....-s+:scscsseeeees 9,230 Ginevrie Pass (Pinzolo to Val di Non), bridle-path …....----ss+++- 5,200 Bocca di Brenta (Pinzolo to Molveno), SNOW ....s..ressssssseeeceeeceeeeeeeee 8,502 Mendelscharte (Cles to Botzen), bridle-path …....ssccsseeeseeeeeseeeeeees 4,964

11. Vindelician Alps.—Reference has already been made to the contrast offered by the orderly arrangement of the Eastern Alps, as

compared with the far more complicated and irregular disposition of the masses that make up the Western and Central Alps. In the former we have a broad zone of crystalline or metamorphic paleozoic rocks, extend- ing from the upper valley of the Adige to the frontier of Hungary, flanked on either side by a parallel zone of secondary rocks, which rise into peaks that do not much exceed the limit of perpetual snow. The northern zone extends for a distance of fully 260 miles from the lake of Constance to the neighbourhood of Vienna, with an average width varying from 30 to 40 miles. For the greater part of that distance this is separated from the central range by broad and deep valleys, through which the Inn, Salza, and Enns flow from west to east, till each of them, turning abruptly northward, runs through an opening that cuts across the general strike of the stratification to reach the plain of South Germany. In geological structure and general aspect the mountains of this tract show many common characteristics, and convenience supplies the only good reason for dividing it into two main groups, separated by the valley of the Inn, the greatest of the tributaries which the Alps send to the Danube. Of the western portion of this region the larger part belongs to Bavaria, but a considerable share lies in the Austrian provinces of Tyrol and Vorarlberg; and on this account the designa- tions Bavarian Alps and North Tyrol Alps are open to objection, and have the further disadvantage of excluding the Alpine districts of Bavaria and North Tyrol lying east of the Inn. The name Swabean Alps is liable to the serious objection that none but a very small part of this district was ever included in the circle of Suabia. On the whole, it seems that the region lying north of the Vorarlberg road and the valley of the Inn, between the lake of Constance and the latter river, may best be termed the Vindelician Alps. The whole was included within the territory of the Vindelici before that powerful tribe was conquered by the Romans, and their territory joined to that of the Rhztians to form a single Roman province. In height the mountains of this division fall considerably short of those hitherto enumerated, not more than four or five exceeding 9000 feet. It is impossible to consider a map of this region without being struck by the

fact, that although the general slope inclines northward towards the plain of Bavaria, or southward towards the Til and the Inn, nearly all the ridges and minor valleys lie east and west parallel to the course of those rivers and to the outcrop of the sedimentary strata, which is equally the direction of the line of depression followed by the Vorarl-berg road forming the southern boundary of this group. Chief Peaks of the Vindelician Alps.

NOUNS Os poeeconesoacmenecoce eo 6,851 | Mieniingergebirge (highest) 8,856 WROGME Rye Glecsserssecesenenssnareanees 8,842 | Karwandlspitz……..sccsscoeees 8,259 SOME DGIE coonccccoscoscceacnncoosec S774 | Koreuzspitzi-.:—..—.:—.seseeeeee 7,156 Madelegabel ……...-..:0.0—+-+8 8,674 | Solstein' << ...c0-..:-:cssconeseeee 8,649 Biber op iitessssesstessstanssseceatcers 81543 || Wdkorspitz……..—+1-.-se-seeee 8,911 Wid denstelniesscc:.ccss-cee-ceeseees 8,294 | Lavatscherspitz ….....-+00 9.081 Tein Wares) | perceeecesccogsencecoan SF501" | Viompe4njoch —.....-2-2…2 se 7,505 Stanzenkopl .c-.cccsscecsssessee-2-> QIOAT || Solennspitizs……...c0.—ccsscereere 7,303 BVEUIGLEIO pp lieeetsccseseecs-eeneeess-eee DUT || URES Soccorpocsccoenercacco 7,144 FARES) CINTA concer pecrosoeceoncede Ben 9,716 Chief Passes in the Vindelician Alps.

Arlberg Pass (Bludenz to Landeck), carriage road …....-s-se-sereeeees 5,902 Haldenwanger Eck (Schrecken to Oberstdorf), footpath ….—.+00 6,070 Schrofen Pass (Oberstdorf to Steg in Lechthal), bridle-path …..... 5,569

Midelejoch (Oberstdorf to Holzgau), footpath……..—s- about 7,000 Kaiserjoch (Steg to Petnen in Stanzerthal), footpath …..... about 7,000 Zamserjoch (Elbigen Alp to Landeck or Imst), footpath…...about 7,000 Fern Pass (Lermoos to Telfs), carriage road

Seefeld Pass (Partenkirch to Zirl), carriage road……..scesscseesssoees 3,900 Geissel Pass (Mittenwald to Lermoos), footpath ….....:ssereseesees 4,258 Stempeljoch (Scharnitz to Hall), footpath,.....~~…sssssssssseeessseeeees 7,346 Haller Anger (Scharnitz to Schwaz), footpath …..~~..sscsseseesssesees 5,835 Plumserjoch (Hinter-

Riss to Pertisau), bridle-path….....sssrere 5,492 Pfans Joch (Fall to Pertisau), footpath….....esessesceesesseseees about 5,800 Stockeralp Pass (Schliersee to Brixlegg), bridle-path…..... about 4,000 Horhag Pass (Bairisch-zell to Kufstein), bridle-path…..... about 4,000

12. Northern Noric Alps.—We have already spoken of the broad mountain zone extending from the Inn to the neighbourhood of Vienna, and bearing a general resem- blance in orographic and geological character to the group last described. For reasons given hereafter, it seems impossible to preserve the ancient designation Norice Alps for any portion of the central chain of the Eastern Alps, but the name Northern Noric Alps seems the most suitable for a region which was altogether included in the Roman province of Noricwm, and which closely coincides with the northern half of the Alpine district known to them as Alpes Norice. The boundaries of this division are easily determined. To the north and east the mountains subside towards the valley of the Danube. To the -west it is bounded by the Inn, which bends first to north-east, then to north, to enter the plain of Bavaria. On the south side the boundary runs from the Inn through a part of the Zillerthal, over the low Gerlos Pass, and along the valleys of the Salza and the Enns, evidently forming a single line of depression; but where the Enns enters the defile of Gesatise, a broad and low valley, through which runs the road from Rottenmann to Leoben, seems to form the most natural division between this and the central chain. The line of separation is completed by the valley of the Mur and the depression of the Semmering Pass, over which the railroad is carried to Vienna. The highest peaks of the Dachstein group form the most considerable prominence in the entire range of the Northern Alps; but the average height of the mountains of this division does not exceed that of the Vindelician Alps.

EivOrie linge cesseseseoueecesersssescs F THOTStGIN! <<-.-.02- secsseneseeseeten toheiSaliyesscsse-scccctercccesesoes 5,993 | Dachstein .... Retbemstbeinipgecsssss-cvess-cosesecees Th(50) || Sausteiit...—25- Scheffauer Kaiser …….++. 7,611 | Grimming «.....eeee TEPER EY ccrccenenennaccrocneSoLnoIO00 8,635 | Grosser Priel StaUeI wesrececececareererssteceree 5,950 |

Waschenegg Watrmi@nni:..÷.csoscscccnseecorees= 8,988 | Buchstein …...scerceseecsereerts Untersberg (highest point)... 6,467 | Hochthor …....ssessccssseesereees . Eiohe Gols. ttcccsetern sceesee-se 8,266 | Eisenerzer Reichenstein …... 7,082 Hlochiealifer fiteccOEE ro 643 | Brandstein…...ccscereeseseseeees 6,542 Tannengebirge (Raucheck)... 7,947 | Hochschwab….s-.-s-sssesserenes 7,441 Sey Stee Gonoceccseocaoceeenacece 5,837 | Raxalpsessercssccecsessersersee sees 6,575 V5 (Beer) Gocsocponncencconcracccccnecace 5,754 | Schnee berg… ersreersereeees aw 6,809 ERTAUSLEMMersereresneeeaeeess pee 5,538

ALPS

Chief Passes in the Northern Noric Alps.

38,958

Wagram Sattel (St Johanu im Pongau to Radstadt), carriage road 2,933 Pass Gschiitt (Abtenan to Gosan), carriage road…...cssssercceseseseees 3,247 Pyrhn Pass (Windischgarsten to Lietzen), carriage road…....+- : 3,162 Prebichel Pass (Bisenerz to Leoben), carriage road

Eisenerzer Hohe (Eiseuerz to Wildalpen), bridle-track….....0.0+ 4,760

Kastenriegel Pass (Weichselboden to Wegscheid), bridle-path….. 8,556 Seeberg Pass (Mariazell to Aflenz), carriage road …....ssceessssceeee ;099 Niederalpl (Mariazell to Miirzsteg), carriage road …....cscsssseevsrees 3,994

Semmering Pass (Bruck-an-der-Mur to Wiener Neustadt), c. rd. 3,256

13. Central Tyrol Alps.—To the eye of the geologist, taking a cursory view of the Eastern Alps, it may appear that the great central zone, extending from the upper valley of the Adige eastward to the neighbourhood of Gratz, forms but a single district of tolerably uniform structure. He will, however, remark that about the centre of

the range the prevailing crystalline rocks—gneiss and mica-schist—give place to metamorphic schists, probably of paleozoic age, that rise into several of the highest peaks of the entire mass. Those who are disposed to regard the above-named crystalline rocks as merely extreme forms of metamorphic sedimentary strata, may not attach much importance to this circumstance; but it is a still more significant fact that at a short distance east of the same extension of the metamorphic rocks we have proof of the former existence of a depression which seenis to have cut completely through the central range. On the north side triassic rocks extend from the Enns to the upper valley of the Mur, and the presence of miocene deposits at several points in the latter valley, the Lieserthal and the Malta- thal, seems to show that at a much later period this portion of the chain underwent great relative depression as com- pared with those on either side. Another and more obvious character that distinguishes the western from the eastern portion of the central zone, is the fact that in the latter the great range that extends like a vertebral column from the Weisskugel to the Hochalpenspitz forks into two branches of inferior height, that enclose between them the upper valley of the Mur. Ancient geographers divided the main mass of the Alps between the Bernardine Pass and the frontier of Hungary into two vast divisions, respec- tively called the Rhetian and Noric Alps, placing the boundary between these at or about the Dreiherrnspitz, at the head of the Ahrenthal, and their example has been followed by some modern geographers. Nothing in the form or structure of the chain justifies the adoption of that arbitrary boundary between two main divisions of the Alps. We have already assigned reasons for fixing the western boundary of the Rhztian Alps at the upper valley of the Adige, and we propose to retain the designation Central Tyrol Alps for the portion of the main chain extending thence to the head of the Malta Thal in Carin- thia, nearly the whole of which lies within the limits of Tyrol. The exact boundaries of this division are, on the north, the course of the Inn from Landeck to the opening of the Zillerthal, the track thence over the Gerlos Pass to the head of the Pinzgau, and the valley of the Salza to the opening of the Gross Arl Thal ; to the east, the way through the latter valley, over the Arlscharte, through the Malta Thal to Gmiind, and the road thence to Villach 3 on the south, the continuous trough extending from near

the latter town to Mihlwald, on the Reinz, through the Gail Thal, the Lessach Thal, the head of the Drauthal and the

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upper valley of the Rienz. From Mihlwald the tortuous course of the Hisack forms the boundary as far as Botzen, whence the high road running N.W. along the Adige and though the Finstermiinz completes the western boundary. Although the region thus limited does not present many prominent peaks, it is remarkable for the great average height of the main chain which forms the watershed between the affluents of the Danube on one side, and those of the Adige and the Drave on the other. In a dis- tance of 120 miles—which would be much increased if measured along the sinuosities of the main chain—there is but a single low pass, that of the Brenner, none other being below 8000 feet in height, or suited for the construction of a carriage road. The Brenner is the lowest pass in the entire range of the Alps, and has from a remote period afforded the easiest access from middle Europe to the plains of northern Italy, but is properly described as a pass rather than as a breach in the continuity of the chain.

Chief Peaks of the Central Tyrol Alps,

WAPI" pil zteccssesesteeeserett eee: LOPS Sa Blnotellsiitai-.:caseeseetseeseessees 11,108 Glockenblimmniss:..sesceesere- ee 10,998 | Reichenspitz…...~.+s.~s»sessso 10,866 OVpleSeSpitz).....ccccesee-sre tress 10,066 | Wildgerlos-spitz ….....ssses00es 10,771 IROMS-SPULZ -.ceccsscascsoensceses +-10,511 | Eidechsberg, or Hegedex…... 8,975 SG les pat zareseseeeeseeyes NVCISIM OO] cas. sccesene ceo. sseczacsss WA PLE || AROSE ONITA Gereceeseenerecperer tree 11,459 WWALAS DIEZ. ccesercce ce ccvote- se sceee 12,390 | Gross Diirreck ….....s.01seseseee 10,525 PATITE HIS 1UZteressccssesessererereters 11,654 | Gross Venediger…... 12,053 SLUT AR te ccsaves westcsnecoscsessosees 11,810 | Hohe Fiirleg….. 11,114 Rothbergspitz (The "Rithen- WeaSOrlinGrresconsersseesese — 10,171

spitz ” of Sonklar)..... 11,904 | Hochgall, or Rieser …..... 11,284 INGRETSPICZ) <-s..cceesesensss ---10,890 | Schneebige Nock, or Ruth- Birkkogel cooctecenn (ZEIT PIGTHOMN iecess csetetvec- sano: se cerss 11,068 Grieskogel (highest peak) ...10,638 | Tauernkogel .....s.sssssssseeseeenee 9,790 Ruderhofspitz .....4. +11,893 Kitzsteinhorn .....s.se00e00s 10,482 Sehrankagl!.:scssec-.sceeters sss 11,474 ; Johannisberg .....scecccvsees 11,425 Serles-spitz, or Waldraster- Gross Glocker: .:-0<+0-<++0s0++s 12,405

Spullzpeeststesratssecscetsrrerett ss 8,898 | Hoch Schober …...s..:.-scsseeesee 10,628 Sehaufelspitz…...:..s-0,s000-000-:s TOSSEAT RCE Ze CK ie satverstterss-cesscvse seston 10,761 Wilder Pfaff (Zuckerhiitl) ...11,512 | Vischbachhorm…....:+esessseee- 11,738 SON MAGS Plt Giereosscse-+ce—cossccese 11,410 | Fuscherkahrkopf …..... 10,957 PERUGIA Mecossszesesccestertreesscters MON Aa Ob EOC lian, cerreere.ccorcerees.SEMEN SCHATLC:s0:ccesoeecncreverse CPZ 00M | PATIKOPLescocsstssenscesvnertacss vee. 0,674 IMIGGHETH OTN rcecscsercessecsseeeees 8,064 | Hochalpenspitz …....eesese 11,026 (GUMS LZ6T, ccreertcossescesseerynes SI(ASD| || SERS veteerrerrecreiccrne choo 10,108 Gilfentskieng Necvsscecsersssssensss-02 SAO | AK TOUZNGLOLs sc secseossorscessccesiers 8,979 Olperer Fuss-steiu …..... 11,451 | Dobratch, or Villacher Alp 7,067 IFNGC HCW GH.

Chief Passes of the Central Tyrol Alps.

Reschen Scheideck (Landeck to Meran), carriage road…..... searesessoMnOOO Weisse See Joch (Glurns to Kaunser Thal), glacicr …....sssssssesseees 9,657 Langtauferer Joch (Mallag to Fend), glacier …....sssssssssssscssssecsvers 10,3385

630

Auf der Stanz (Bucheben to Gastein), bridle-path Tramerscharte (Rauris to Déllach), glacier…....

Klein Zirknitzscharte (Rauris to Fragant), SnOW…...+---sseeeeeeeeree

Mallnitzer Tauern (Gastein to Malinitz), bridle-path…...-.:- 8,088 Arlscharte (St Johann in Pongau to Gmiind), footpath… 7,499 Klein Elendscharte (Gastein to Gintind), glacier…….~~.ssseeeses 8,231 Déssner Scharte (Gmiind to Ober Vellach), SNOW ..s.~~ sseesereereerrves 8,748 Toblacher Feld (Bruneck to Licnz), carriage road. «..sseeeee 3,951 Zochen Pass (Lienz to Maria Lukau), footpatlh…...-sseseesessssersere 7,394 Kétschach Sattel (Oberdrauburg to Kétschach), carriage road….. 8,210

14. Styrian Alps.—The boundary between the central range of lofty peaks that extends through Tyrol and the adjacent province of Salzburg, and the much lower masses that spread eastward through Styria to the frontier of Hungary, has been already fixed at the Arlscharte. On the cast side of that pass the mass whose conspicuous summits are the Markkahrspitz and the Hafnereck is divided into two parallel branches that enclose between them the upper valley of the Mur. The northernmost of these ranges is cut through by the broad and deep valley, traversed by the road that leads from Liesing on the Enns to Leoben, which we have regarded as the limit between the Northern Noric Alps and the central mass. The eastern boundary of this division, which we at the same time regard as the proper limit of the Alps, is marked by the river Mur, which, after flowing eastward for about 100 miles to Bruck-an-der-Mur, turns southward, and finally joins the Drave in Hungary. The eastern limit of the Alps is completed by the depression between Spielfeld and Marburg, over which is carried the railway from Vienna to Trieste. The southern boundary of the central range is unmistakably marked by the great valley of the Drave. The whole of this region was, along with large portions of the adjoining divisions, included under the term Noric Alps by ancient geographers; but as the retention of that designation can only lead to confusion, we readily adopt the name Styrian Alps, proposed by Karl v. Sonklar, whose writings have done so much to increase our knowledge of the Eastern Alps. It must, however, be remarked that the region above defined also includes a considerable district of Carinthia, along with a small part of the province of Salzburg, which extends to the head of the valley of the Mur. Excepting the com- paratively high mass in which that river takes its source, the summits of this region do not attain

nearly so great a height as those of the other main divisions of the Alps, and only two or three reach the limit of perpetual snow.

Chief Peaks of the Styrian Alps.

Markkahrspitz…..-sseesee 9,245 | Hisenhut…....seceseeeeseseseees 8,008 WeafirereGk et -cceercss-ce—TCT) SOT coconcpecoccocnereeceere 8,511 | Rappenkogel….....s21sess0+ 6,310 BUSH SteIN .<<.sccrsseeseceetereerers 8,018 | Obdacher Speikkogel …..... 6,625 Hoch Reichart…....—+-+e+s0+ 7,900 | Gleinalpen Speikkogel…..... 6,508 Womigstullicersen cece eeeennaeees 7,648 Chief Passes in the Styrian Alps.

Radstidter Tauern (Radstadt to St Michael), carriage road …..... 5,703 Katschberg (St Michael to Gmiind), carriage road… 5,261 Windsfeld (Flachau to Zederhaus), footpath …....ssceseereererseeeees 7,037 Waldhornthérl (Schladming to Tamsweg), foot able: ccccanee cossemeere 7,437 Sélkerscharte (Grébming to Murau), bridle-path….....ssseeeeeseee 5,767 Rottenmanner Tauern (Rottenmann to Jndenburg),c. road…abont 4,900 Turrach Pass (Feldkirchen to Tamsweg), carriage road …...++—0+- 820 Fladnitz Pass (Friesach to Stadl), bridle-path….....s abont 5,000 Perchauer Pass (Friesach to Scheifling), carriage road…...—-+-+ 3,274 Obdacher Sattel (Wolfsberg to Judenburg), carriage road ….....- 3,174 Stubalp Pass (Kéflach to Weisskirchen), carriage road…....-.+++ 5,130 Die Pack (Kéflach to Wolfsberg), carriage road …....sseeeeseessseees 3,870 Gleinalp Pass (Peggau to Knittelfeld), footpath ….....+-..bout 5,500

15. South Tyrol and Venetian Alps.—it has been seen that the mountain zone on the northern side of the main range of Tyrol extends from the lake of Constance to near Vienna, with a remarkable uniformity both of general aspect and of geological structure, so that no reason much more valid than convenience could be assigned for form- ing it into two separate divisions. The same remark. does

ALPS

not hold good on the southern side of the main range, There is, indeed, a general similarity between the northern and southern zones, especially in their geological structure, so far as regards the sedimentary rocks; but in the western portion of the latter—in the region lying between the Adige and the sources of the Piave—the intrusion of igneous rocks on a large scale, and the accumulation of deposits formed from ejected volcanic matter, have pro- foundly modified the structure and outward aspect of the country. Nowhere else in the Alps do the peaks rise so

abruptly and with so little apparent connection, and nowhere are the contrasts depending on differences of geological structure so marked as those which strike the

mere passing traveller, when, beside rounded masses of

red and black porphyry, he sees white and pink crystalline

dolomite limestone rising in towers and pinnacles of extra-

ordinary height and steepness. Dolomite limestone is

found in many other parts of the Alps, but nowhere else

is it developed on so grand a scale, and the exquisite

beauty of this region has of late years led an increasing — number of travellers to spots that before were scarcely

known even to the inhabitants of adjoining valleys,

Though there are abundant grounds for regarding the

district here spoken of as a separate division of the Alps,

it is very difficult to assign to it a satisfactory designation.

The larger portion of the region has long been politically

connected with Tyrol, and is partly inhabited by a German. speaking population, while the remainder has been politically connected with Venice, and the inhabitants are thoroughly Italian in language and manners. Were it not for a reluctance to introduce new and unfamiliar terms, the present division might be denominated Crmbrie Alps, as, according to ancient tradition, the Cimbri, after their final defeat by Marius, sought and found a refuge in this part of the Alps; but for the present it seems best to designate as South Tyrol and Venetian Alps the region lying between the valley of the Adige and the sources of the Drave and the Piave, and south of the great valley traversed by the Eisack and the Rienz between Botzen and Innichen. The eastern limit may best be fixed by the track leading through the Sextenthal from Innichen to San Stefano in the head valley of the Piave, and by the road from that place to Conegliano.

Chief Peaks of the South Tyrol and Venetian Alps.

SIETAGIAN cpeccesecccacecoccomencencco® 8,405 | Cima delle Dodici…....sse+ 7,601 Rosengarten…..ccescrseceeecees 10,163 | Cima C'ASta…..eesseesrereers 9,132 Langkofel …....ssccccseeeseeeses

10,392 | Monte Pavione, or Col di Warnrolata <...cc2sc-cecteeees (2) 11,045 Tania. es.cc:..eeccereeeeee 7,817 Monten fiamascsscs-.s0scseeares= 10,724 | Palle di S. Martino..... (2) 10,648 Croda Rossa, or flohe Gaisl 10,262 | Cimon della Pala ..... abont 11,000 Nomen @iastallOs:sssceeseasar= 10,644 | Monte Civetta 10,440 Drei Zinnen, or Cima di Jeet eocons-ccnenancs Lavared0.....--00+-+ above 10,300 | Sorapis .....
Dreischnstcrspitz «.....-.000+ 10,368 | Antclad …....:sesssescceresreeees Cima di Posta…....c0ccccesesse- 7,547 | Marmarolo. «....~~..e Cowelalior~~ ~~...0s~~---0s-2= about 7,500

Chief Passes in the South Tyrol and Venetian Alps.

Piano delle Fugazze (Roveredo to Schio), carriage road Passo di Manazzo (Asiago to Levico), bridle-path . Caressa Pass (Botzen to Vigo di Fassa), bridle-path …..1..sss Mahlknecht Pass (Vils to Campidello), bridle-path ….—+..ssesse0 Fedaya Pass (Val di Fassa to Caprile), footpath….....ssssrseeseen

La Costonzella (Paneveggio to Primiero), carriage TOR rsesrcceseens 6,657 Passo di Valles (Paneveggio to Cencenighe), bridle-path…...—.-- 6,877 Grédner Joch (St Ulrich to Bruneck), Dridle-path … csesssesceeseesees p ba

Campolungo (Corfara to Araba), Dridle-path…..sscessssescoesssesereereess Pordoi Pass (Gries to Araba), bridle-path 2 Passo dei 'Tre Sassi (Andraz to Cortina), carriage TOA. sssereeeseenseees 7,078 Monte Giau, or P. di Falzarego (Caprile to Cortina), bridle-path… 7,6U Pentelstein Pass (Niederndorf to Cortina), carriage road…... about 5,000 Passo delle Tre Croci (Cortina to Auronzo), bridle-path … 5 Forcella Grande (Auronzo to San Vito), footpath " Kreuzberg (Innichen to S, Stephano), carriage TOA .esseescereerceeceens

16. South-Eastern Alps.—Ancient geographers, and those who have followed their example, use the terms Carnic Alps and Julian Alps to designate two of the main divl- sions of the Alps; but the latter of these at least has

~ Wolaver Joch (Forno Avoltri to Kétschach), footpath …

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been applicd in a vague and inconsistent way. In point of fact, the south-eastern portion of the Alps, which includes both the groups above specified, presents three principal groups which are very closcly connected together. The first of these—the Carnic Alps, properly so called—have been defined as including the region between the upper valley of the Drave and the plain of Friuli. But to the orographer the true head of the Drave valley is the Gail- thal, which extends in an almost straight and broad trench from near Innichen to Villach, while the main stream flows through a sinuous and contracted valley. For this reason we have taken the Gailthal as the boundary between the Central Tyrol and the Carnic Alps. Almost continuous with the Carnic Alps is a range, very similar in geological struc- ture, which divides the Drave from the northern branch of the Save, and includes the mountains locally known as the Karawaukas and the Sulzbacher Alps. Throughout these, which may be called the main range of the South-Eastern Alps, paleeozvic rocks, probably of carboniferous age, extend in a narrow band for a distance of fully 100 miles, giving place at the eastern cxtremity to the small granitic mass that forms the hills of the Bacher Gebirge near Marburg. On the south side of the main range of the Carnic Alps two mountain masses, mainly formed of triassic rocks and Dachstein limestone, attain a considerable height in the Monte Cavallo on the west, and the Monte Canin on the east side of Friuli. In a similar position as regards the Karawankas is a still loftier mass which is crowned by the Terglou—thc highest peak of the South-Eastern Alps. This group is referred by geographers to the Julian Alps, which are said to divide the Save and its tributaries from the Adriatic. As has been alrcady said, there is no range to which the term Alps can properly be applied forming such a boundary. The plateau of the Karst, though rising here and there into hills of moderate height, has an average eleva- tion of about 2000 feet above the sca, and cannot correctly be spoken of as a mountain chain. The orographer, if seeking

an eastern prolongation to the Terglou group, would prefer the hilly region between the Save and the southern Gurk; but the low country through which the railway is carried from Marburg to Laybach, and the road thence to Gorizia, may for all practical purposes be taken as the south-castern limit of the Alps and of the division here described.

Chief Peaks of the South-Eastern Alps.

WlGmbesPatallbales.<..<-.~~seccreeeeee S) (0907 || (ORSIE: cocceeeneonnnone porn soenooeoeeeeog 7,001 PROMO ATIC 4…~~ c0-ssece EOC THOM NU OMIM MITILOZiecetsecessaceesemerMPMI ISUCULZEerevsccerer-arsocese+. scree: 7,701 Monte Premaggiore …..... 8,127 | Bacher Gebirge (Velka

orate (CE Cr 7377 JECAVOFDE)) eaARecuococoponssssseneoccoe 041 BOTILC CLOSLIS <.~~.....000ceeseee 7B) || INTENSE), Sessceeecosconsoeeacacocoxoos 8,776 Jof di Montasio …..... ADOC RO OOM MCTSIOM. <....~~---c0r-c-res-eenneeneres 9,371 Monte Canin (Prestreléenick) 8,711 | Krn …....-.:sscsssssssessseesoors 7,358 PLO Uereeee seeeer ses sersacrsecsecsoevoee (2783 || FRAUE ccosscnosocessooessancapcecenndaae 6,829 HSOSCMIUGLA Meese cesecsssasnsseseseeee 6,895 =

Chief Passes of the South-Eastern Alps. Kartischer Joch (Sillian to Tilliach), carriage road. .....ssssese 5,363

Passo di Mauria (Ampezzo to Pieve di Cadore), carriage road…... 4,191 Piano di Sappada (San Stefano to Forno Avultri), car. road, about 4,100 Giogo Veranis (Forno Avoltri to Lorenzen), footpath 1

Monte Croce (T'olmezzo to Kitschach), bridle-path…....- Nosfeld Pass (Pontebba to Hermagor), footpatl…..... Saifnitz Pass (Pontebba to Tarvis), carriage road .. Predil Pass (Tarvis to Flitsch), carriage road… Wurzener Berg (Villach to Wurzen), carriage road…..... Loib] Pass (Neumarktl to Unterbergen), carriage road Seeberg Pass (Krainburg to Kappel), carriage road .. St Leonhard Sattel (Kappel to | ebach), bridle-path Schkaria Pass (Sulzbach to Stein), footpath ….

Worschez Sattel (Flitsch to Kronau), footpath Kerma Pass (Moistrana to Feistritz), footpath… Skarhinja Joch (Tolmino to HGISURItZ)y COOL PALI .....+--- about 6,000

It is well known that as we rise from the sea-level into the upper regions of the atmosphere the temperature decreases. The effect of mountain chains on prevailing

winds is to carry warm air belonging to the lower region into an upper zone, where it expands in volume at the cost of a proportionate loss of heat, often accompanied by the precipitation of moisture in the form of snow or rain. The position of the Alps about the centre of the European continent has profoundly modified the climate of all the surrounding regions. The accumulation of vast masses of snow, which have gradually been converted into permanent glaciers, maintains a gradation of very diffcrent climates within the narrow space that intervenes between the foot of the mountains and their upper ridges; it cools the breezes that are wafted to the plains on either side, but its most important function is to regulate the water supply of that large region which is traversed by the streams of the Alps. Nearly all the moisture that is precipitated during six or seven months is stored up in the form of snow, and gradually diffused in the course of the succeeding suinmer ; and even in the hottest and driest seasons the reserves accumulated during a long preceding period of years in the form of glaciers are available to maintain the regular flow of the greater streams. Nor is this all; the lakes that fill several of the main valleys on the southern side of the Alps are somewhat above the level of the plains of Lombardy and Venetia, and afford an inexhaustible supply, which, from a remote period, has been uscd for that system of irrigation to which they owe their proverbial fertility. Six regions or zones, which are best distinguished by their characteristic vegetation, are found in the Alps. It has been a common error to suppose that these are indicated by absolute heiglit above the sea-level. Local conditions of exposure to the sun, protection from cold winds, or the

reverse, are of primary importance in determining the climate and the corresponding vegetation.

1. Olive Region.—The great plain of Upper Italy has a Zones of winter climate colder than that of the British Tslands. The vegetation.

olive and the characteristic shrubs of the northern coasts of the Mediterranean do not thrive in the open air, but the former valuable tree ripens its fruit in sheltered places at the foot of the mountains, and penctrates along the deeper valleys and the shores of the Italian lakes. The evergreen oak is wild on the rocks about the lake of Garda; and lemons are cultivated on a large scale, with partial protection in winter. The olive has been known to survive severe cold when of short duration, but it cannot be culti- vated with success where frosts are prolonged, or where the mean winter temperature falls below 42° Fahr.; and to produce fruit it requires a heat of at least 75° Falir. during the day, continued through four or five months of the summer aud autumn.

2. Vine Region.—The vine is far more tolerant of cold than the olive, but to produce tolerable wine it demands, at the season of ripening, a degree of heat not much less than that needed by the more delicate tree. These con- ditions are satisfied in the deeper valleys of the Alps, even in the interior of the chain, and up to a considcrable height on slopes exposed to the sun. The protection afforded by winter snow enables the plant to resist severe and prolonged frosts, such as would be fatal in more exposed situations. Along with the vine, many wild plants charactcristic of the warmer parts of middle Europe are seen to flourish. A mean suinmer temperature of at least 68° Fahr. is con- sidered necessary to producc tolerable wine, but in ordinary seasons this is much exceeded in many of the great valleys of the Alps.

3. Mountain Region, or Region of Deciduous Trees.— Many writers take the growth of corn as the characteristic of this region; but so many varieties of all the common species are in cultivation, and these have such different climatal requirements, that they do not afford a satisfactory criterion. A more natural limit is afforded by the presence

of the chief deciduous trees—oak, beech, ash, and syca- more. These do not reach exactly to the same elevation, nor are they often found growing together; but their upper limit corresponds accurately enough to the change from a temperate to a colder climate that is further proved by a change in the wild herbaceous vegetation. This limit usually lies about 4000 fect above the sea on the north side of the Alps, but on the southern slopes it often rises to 5000 fect, sometimes even to 5500 feet. It must not be supposed that this region is always marked by the presence of the characteristic trees. The interference of man has in many districts almost extirpated them, and, excepting the beech forests of the Austrian Alps, a con- siderable wood of deciduous trees is scarcely anywhere to be found. In many districts where such woods once existed, their place has been occupied by the pine and Scotch fir, which suffer less from the ravages of goats, the worst enemies of tree vegetation. The mean annual temperature of this region differs little from that of the British islands; but the climatal conditions are widely different. Here suow usually lies for several months, till it gives place to a spring and summer considerably warmer than the average of our seasons.

4, Subalpine Region, or Region of Conrferous Trees.— This is the region which mainly determines the manner of life of the population of the Alps. On a rough estimate, we may reckon that, of the space lying between the summits of the Alps and the low country on either side, one quarter is available for cultivation, of which about one-half may be vineyards and corn-fields, and the remainder produces forage and grass. About another quarter is utterly barren, consisting of snow-fields, glaciers, bare rock, lakes, and the beds of streams; and there remains about one-half, which is divided between forest and pasture, and it is the produce of this which mainly supports the relatively large popula- tion. For nearly half the year the flocks and herds are fed on the upper pastures; but the true limit of the wealth of a district is the number of animals that can be sup- ported during the long winter, and while one part of the population is engaged in tending the beasts and in making cheese and butter, the remainder is busy cutting hay and

storing up winter food. The larger villages are mostly in the mountain region, but in many parts of the Alps the villages stand in the subalpine region at heights varying from 4000 to 5500 feet above the sea, more rarely extend- ing to about 6000 feet. The most characteristic feature of this region is the prevalence of coniferous trees, which, where they have not been artificially reduced, form vast forests that cover a large part of the surface. These play a most important part in the natural economy of the country. They protect the valleys from destructive ava- lanches, and, retaining the superficial soil by their roots, they mitigate the destructive effects of heavy rains. In valleys where they have been rashly cut away, and the waters pour down the slopes unchecked, every tiny rivulet becomes a raging torrent, that cuts away and carries off the grassy slopes and devastates the floor of the valley, cover- ing the soil with gravel and debris. In the pine forests of the Alps the prevailing species are the common spruce and the silver fir; on siliceous soil the larch flourishes, and surpasses every other European species in height. The Scotch fir is chiefly found at a lower level, and rarely forms forests. The Siberian fir is found scattered at intervals throughout the Alps, but is not common. The mughus, creeping pine, or Krummholz of the Germans, is common in the Eastern Alps, and sometimes forms on the higher mountains a distinct zone above the level of its con- geners. In the Northern Alps the pine forests rarely surpass the limit of 6000 feet above the sea, but on the south side they commonly attain to 7000 feet; and the

larch, Siberian fir, and mughus often extend above that elevation.

5. Alpine Region.—Throughout the German Alps the word alp is used specifically for the upper pastures, where cattle are fed in summer, but this region is held to include the whole space between the uppermost limit of trees and the first appearance of permanent masses of snow. It is here that the characteristic vegetation of the Alps is developed in its full beauty and variety. Shrubs are not wanting, Three species of rhododendron vie with each other in the brilliancy of their masses of red or pink flowers; the common juniper rises higher still, along with

three species of bilberry; and several dwarf willows attain nearly to the utmost limit of vegetation. The upper limit of this region coincides with the so-called limit of perpetual snow, which demands further explanation.

6. Glacial Region.—On the higher parts of lofty moun- tains more snow falls in each year than is melted on the spot. A portion of this is carried away by the wind before it is consolidated ; a larger portion accumulates in hollows and depressions of the surface, and is gradually converted into glacier-ice, which descends by a slow secular motion into the deeper valleys, where it goes to swell perennial streams. As on a mountain the snow does not lie in beds of uniform thickness, and some parts are more exposed to the sun and warm winds than othcrs, we commonly find beds of snow alternating with exposed slopes covered with brilliant vegetation; and to the observer near at hand there is no appearance in the least corresponding to the term limit of perpetual snow. But the case is otherwise when a high mountain chain is viewed from a distance, Similar conditions are repeated at many different points, so that the level at which large snow-beds show themselves along its flanks is approximately horizontal. But this holds good only so far as the conditions are similar. On the opposite sides of the same chain the exposure to the sun or to warm winds may cause a wide difference in the level of permanent snow; but in some cases the increased fall of snow on the side exposed to moist winds may more than compensate the increased influence of the sun's rays. Still, even with these reservations, the so-called line of perpetual snow is not fixed. The occurrence of favourable meteorological conditions during several successive seasons may and does increase the extent of the snow-fields, and lower the limit of seemingly permanent snow; while an opposite state of things may cause the limit to rise higher on the flanks of the mountains. From these remarks it may be inferred that all attempts to fix accurately the level of perpetual snow in the Alps are fallacious, and can at the best approach only to local accuracy for a particular district. In some parts of the Alps the limit may be set at about 8000 feet above the sea, while in others it cannot be placed much below 9500 feet. As very little snow cau rest on rocks that lie at an angle

exceeding 60°, and this ig soon removed by the wind, some steep masses of rock remain bare even near the summits of the highest peaks, but as almost every spot offering the least hold for vegeta- tion is covered with snow, few flowering plants are seen above 10,000 feet. There is reason to think, however, that it is the want of soil rather than climatal conditions that checks the upward extension of the Alpine flora. Increased direct effect of solar radiation compensates for the cold of the nights, and in the few spots where plants have been found in flower up toa height of 12,000 feet, nothing has indicated that the processes of vegetation were arrested by the severe cold which they must sometimes endure. The climate of the glacial region has often been compared to that of the polar regions, but they are widely different. Here, intense solar radiation by day, which raises the surface when dry, to a temperature approaching 80° Fahr.,

Population

of the Alps.

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alternates with severe frost by night. There, a sun which never scts sends feeble rays that maintain a low equable temperature, rarely rising more than a few degrees above the freezing-point. Hence the upper region of the Alps sustains a far more varied and brilliant vegetation.

At the earliest period of which records are preserved the Alps appear to have been mainly inhabited by Celtic tribes, some of which, before they were subjugated by the Romans, had made considerable progress in the know- ledge of the useful arts. The Rheetians and Vindelicians especially, in whom a primitive Turanian stock seems to have been amalgamated with a dominant Celtic race, readily assimilated the civilisation of Rome ; and the language of the conqueror, modified by peculiarities of pronunciation and the retention of some native terms, still survives in Eastern Switzerland, and in a few isolated valleys of Tyrol. Throughout by far the larger part of the Alps, however, the flood of Teutonic invasion either exterminated or drove into exile the

previous population. The Alemanni and other kindred tribes settled in the main valleys of the Eastern Alps, and finally became masters of the greater part of Switzerland, leaving to the original Celtic population the Western Alps and both slopes of the great Pennine chain. At a later period the invasion of Slavonic hordes threatened to substitute a new nationality throughout the same region, but after pro- longed contests these tribes were restricted to its south- eastern portion, being nearly confined to the upper valleys of the Drave and the Save, with their tributaries. The Italian valleys of the Alps, from the Val d'Ossola to the Tagliamento, inhabited by people of mixed race, have, with a few exceptions, preserved the language of Italy, much varied in the local dialects; while the western dis- tricts, in which the Celtic element remained predominant, have for the most part clung to the French tongue. The estimates formed of the present population of the Alps are uncertain, because they usually include towns and populous districts lying without the mountain region. It is usually reckoned that there are about 1,500,000 of Celto-Gallic stock in the French and Savoy Alps, western Switzerland, and some valleys of Piedmont ; about 4,000,000 of Teutonic origin in the Swiss and German Alps ; about 1,000,000 of Slavonic stock, chiefly Slovenes ; and about 1,000,000 of Italians in the valleys of Northern Italy, the Swiss cantons of Tessin and Grisons, and in the Italian Tyrol, making an ageregate of 7,500,000. To these should be added about 70,000 people speaking some dialect of the Rheeto-Roman or Romansch. All these numbers excepting the last are excessive, if we would restrict the estimate within the proper limits of the Alps.

Although no conspicuous species of quadruped or bird

: is known to be exclusively confined to the Alps, they have

'afforded an asylum to many animals that have become rare or extinct elsewhere. The great urus, the elk, and the wild swine have disappeared since the Roman period, and the beaver in more recent times ; but the brown bear, the lynx, the wild cat, and the wolf still survive. Among Ruminants, the red deer, fallow deer, and roebuck, chiefly found in the lower forest region, are common to other mountain

districts. More characteristic of the Alps is the chamois, which is found elsewhere only in the Carpathians, Pyrenees, and the mountains of European Turkey, and is the sole representative of the antelopes in this part of the World. Much rarer is the ibex or bouquetin, which still lives in the higher Alpine region of the Graian Alps, and possibly also in some recesses of the Pennine chain. like the chamois, which descends at night to find suste- fance as low as the verge of the pine forests, this fine animal remains, at least in the summer, in the upper Tegion, on the verge of the snow-fields, or on the rocks that

Un- |

rise amidst the glaciers.

Alps.

increasing human population.

in the stony recesses of the Alpine region, and does not diminish in numbers as most other wild animals have done. The most singular of this group is the snow-vole (Arvicola nivalis), whose nearest ally is a native of East

Siberia. Several forms (varieties or sub-species) are found

in various parts of the Alps. They ascend through the Alpine region to the rocks of the glacial zone, at least as far as 12,000 feet above the sea ; and, unlike other animals framed to endure severe cold, they continue in activity throughout the long winter. There is at least one species of shrew (Sorex alpinus) peculiar to the Alps. The Cheiroptera are represented by numerous forms, which, with one exception (Vesperugo maurus), are not confined to this region ; but the Alps form a limit to the distribu- tion of many of this order: some species of middle Europe do not cross the main range, while several species of the Mediterranean region find their northern limit in the valleys on the southern side.

The Birds of the Alps are proportionately very numer- ous. Many southern species find a home in the warmer Italian valleys, and there meet northern forms that descend during the winter and spring, but return to the upper zone in the warm season. Of the more conspicuous species of the high Alps, the limmergeyer (Gypaétos barbatus) —once common, but now become very rare—is pre-eminent. It is also found in Algeria, in Syria, and in Northern Asia, but is one of those animals that is threatened with ex- tinction by the progress of civilisation. The rock chough (Pyrrhocorax alpinus), distinguished by golden-yellow bill and feet, builds on rocks in the glacial region as high as 10,000 feet above the sea. Several song birds, such as the snow lark and snow finch, ascend to the limits of vegetation. The Gallinaceze are well represented. The cock of the woods (Zetrao wrogallus), the grouse, ptarmigan, blackcock, gelinotte, and rock partridge (Caccabis saxatilis), are the most remarkable. The first, which is somewhat rare and extremely shy, surpasses the dimensions of an ordinary well-grown fowl.

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The massive horns of the male are often a yard or more in length. Closely allied species are found in the Pyrenees and other mountain ranges of the Iberian peninsula, and in the Caucasus, but the true ibex seems to be now confined to this small corner of the The few endemic species of Mammalia found in the Alps are chiefly small Rodentia and Insectivora, which alone can multiply rapidly in the midst of a large and The marmot, which is the most characteristic of the Rodentia, maintains its ground

Birds.

Several Reptiles are found even in the upper region of Reptiles.

the Alps, though none are very common. Of three venomous species of viper, Vipera berus ascends to about 8000 feet ; and the black viper (V. prester) also reaches the Alpine region. V. Redii is confined to the warmer Italian valleys. The snakes and lizards frequent the lower

zones, excepting Lacerta pyrrhogastra, which is sometimes seen in the upper region.

Batrachians are more common than true reptiles. An Batrach- Alpine frog attains the extreme limit of vegetation, and a ians.

toad ascends nearly as far. These have been considered by some as distinct species, by others as varieties of the common animals. At least one triton (7. Wurfbeinii) is peculiar to the Alps. The spotted salamander is common in the sub-Alpine region, but in the Eastern Alps it is re- placed by S. atra, which is entirely black. This is some- times found far above the limit of the pine forests.

only as regards the number of individuals, but in species

also. Thus in the Chiemsee, at the northern foot of the

Bavarian Alps, thirty-three species have been found, in

the lake of Constance' twenty-six species, and twenty-four I. — 80

The great lakes of the Alps are very rich in Fish, not Fishes.

Inverte- brata,

Flora of the Alps,

*634 ALP *%*

in the lake of Lucerne. The most esteemed are those of the trout and salmon tribe, whose specific differences have not yet been fully investigated by ichthyologists. F irst in rank is the saibling (Salmo salvellinus), which flourishes in lakes between 2000 and 4000 feet above the sca, and occasionally extends to those of the Alpine region between 6000 and 7000 feet. The fish of the northern side of the Alps are fully described in Siebold's Stisswasser-Hische Mitteleuropas. Those of the waters running to the Mediterranean have not been so fully investigated. Two or three peculiar species have been found in the

lake of Geneva. In some of the Lombard lakes, the agone, a small fish of the herring tribe (Clupec jinta), is a much esteemed article of diet.

In the classes hitherto noticed the number of species peculiar to the Alps is very small. This rule is reversed among the Invertebrata, especially as regards the Articu- lata and Mollusca. The number of insects is very great, and a considerable proportion extend to the limit of per- petual snow. Oswald Heer has pointed out several pecu- liarities in the insect fauna of the higher Alps. In ascend- ing from the mountain region the proportion of the carnivorous tribes rapidly increases, and the families that feed on living vegetable matter either disappear or are much reduced in numbers. Beetles and other insects either lose their wings in the upper region, or are represented by allied wingless species. Along with the tendency to lose the power of flight, a diminution of brilliancy of colour appears, the prevailing hues being black or dingy grey. These peculiarities are to be explained by the fact that in the upper Alpine zone most insects live under stones, and the power of flight generally proves injurious to animals liable to be carried by the wind and upward air-currents over the snow-fields, whence they are unable to return. This'is often seen to occur to butterflies and a few moths, which ascend as far as the highest flowering plants. The snow-fields and glaciers are not devoid of insect life. Several species of snow-flea have been detected; and further observation will probably bring to light other minute animals living in the pools that form on the surface of glaciers, or on the snow-beds, although their activity is often interrupted by the freezing of the surface.

The Arachnida are eminently characteristic of the fauna of the high Alps, where they abound both in species and individuals. Spiders ascend to the utmost limit of vegeta- tion, and are even to be found on the bare rocks that rise out of the snow up to a height of 11,000 feet.

Although most of the orders of Articulata are repre- sented in the Alps by numerous forms, these are far out- numbered by the total number of European species of that class ; but among land and fresh-water Mollusca the pro- portion is reversed, and as many as seven-eighths of

all the species known in middle Europe, and a large propor- tion of those of the Mediterranean region, have been found in the Alps. Still more remarkable is the large propor- tion of endemic species. In the important group of the Heliceze fully one hundred species, or four-tenths of the whole number, are peculiar to the Alps. Between thirty and forty species only have been found in the Alpine zone, and of these but five—Vitrina diaphana, V. glacialis, Helix glacialis, H. foetens, and Vertigo Charpentieri—attain the upper limit of vegetation.

The Annulosa and Radiata of the Alps, so far as they are known, do not offer any points of special interest; and the study of the minute organisms, which have been proved to exist as high as 12,000 feet above the sea, is still in its infancy.

In describing the several regions which are found in ascending from the low country to the snow-clad summits of the Alps, and whose existence is due to climatal differ-

ences, it was necessary to refer to the characteristic vege- tation of each zone, inasmuch as this affords the chief apparent distinction which climatal conditions impress on the earth's surface. The most cursory observation suffices to show that within each of the zones thus broadly sketched out there exist marked differences in the vegetable popula- tion, so that a comparison of the local floras in two spots possessing a similar climate as regards temperature may exhibit but few points of agreement along with many marked contrasts. This partly depends on external con- ditions, of which the most important are differences in the amount and distribution of moisture in the air and the soil, and differences in the composition and state of aggre- gation of the soil itself. But a more important element in determining the flora of any particular district depends upon the causes which have operated throughout the whole period since it has become dry land to facilitate migration for certain species, and to impede it for others. The sub- ject of the distribution of Alpine plants, so far as regards the eastern half of the chain, has been very well discussed in an essay by Dr A. Kerner in the lst vol. of the 2d edit. of Schaubach's Deutsche Alpen, although some of the con- clusions of the writer may not bear

careful criticism. He divides the natural floras of the Alps into four—named respectively Arctic, Baltic, Pontic, and Mediterranean, the term Baltic referring to the region that includes Germany, Southern Scandinavia, and North-Western Russia; while Pontic comprehends the region north and west of the Euxine —the northern provinces of Turkey and the whole space between the Carpathians and the Crimea. It does not appear that the writer holds that the plants existing in the Alps have actually migrated to their present homes from the geographical regions corresponding to the above deno- minations, but merely that they belong to the types of vegetation characteristic of each of them. It must be borne in mind that the Alps, and especially the mountain and sub-Alpine regions, produce a large number of peculiar forms, many of which have no near allies in the other mountain regions of Europe, while at the same time the differences are seldom so wide as to place these in distinct generic groups; and it seems quite inadmissible to suppose that the flora has been altogether formed by colonisation from surrounding districts. No space can be here found for details, but it may broadly be said that while the highest zone of all, lying close to the hmit of permanent snow, exhibits throughout the whole chain an approach to uniformity, several of the most conspicuous species being common to this and to Arctic flora, the zone immediately below this, as well as those lower down, shows a large admixture of quite distinct elements. This is especially true of the southern slopes. In truth, but a very few of the well-marked endemic species of the Alps are confined to the north side of the main chain. A considerable number are common to both slopes, and a still larger pro- portion are restricted exclusively to the southern side. Of the larger groups which are represented in the Alps by numerous well-marked endemic species, the genera Alsine, Androsace, Arabis, Campanula, Crepis, Gentiana, Pedicu- laris, Primula, and Saxifraga may be especially noted. Without attempting to enter into details, it may be said that, along with a general Alpine flora, which extends throughout the entire chain, there are three large districts where, along with species common to all, we find a con- siderable number of others either absolutely local and endemic, or else representative in the Alps of the floras of other distant mountain groups. Only a few of the more remarkable species characteristic of each can be cited. The West

Alpine Flora is found in Dauphiné, South Savoy, and Western Piedmont, as far north as the group of the Graian Alps. In the following list of the more remark-

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able species those which are either identical with or nearly allied to Pyrenean forms have an asterisk pre- fixed :—

*Arabis pedemontana, Huguenina tanacetifolia, *Dianthus ne- glectus, Silene cordifolia, *Saponaria lutea, *Hypericum nummu- lariafolium, Astragalus alopecuroides, Saxtfraga florulenta, 8. diapensioides, *S. pedemontana, *Asperula hexaphylla, Cephalaria alpina, Achillea Herbarota, Berardia subacaulis, Campanula*

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in most other mountain districts; but of late ycars this has been actively pursued, and has tended to clear up many difficulties, while much room is left for further investiga- tion. The reader is referred to the article GEoLocy, and, with reference to detailed information as to the structura of the Alps, to the list of works on alpine geology given below.

*Allionti, C. elatives, Primula marginata, P. Allionti, *Erinus alpinus, Veronica Allionti, Thymus piperella, and Alopecurus Gerardi.*

The number of publications relating to the Alps has been so Biblio- largely increased during the last quarter of a century that a bare graphy of catalogue would fill a considerable space. The majority of these the Alps.

Glaciers of

The Lombard Flora is marked by a considerable number of very distinct species that are limited to the southern declivity of the Alps, between the Lago Maggiore and the lake of Garda. Most of these are absolutely confined within these boundaries, but a few extend some

distance east of the lake of Garda. The following deserve to be specified :—

Viola Comollia, V. heterophylla, Silene Elizabethe, Arenaria grinecnsis, Cytisus glabrescens, Sanguisorba dodcecandra, Saxifraga Vandellii, S. arachnoidea, Laserpitium nitidum, Telekia spectosis-sima, Leontodon tenuiflorus, Hieracium porrifoliwm, Campanula Raineri, C. elatinoides, Daphne rupestris, Euphorbia variabilis, and Carex baldensts.

The Last Alpine Flora, extending through the region east of the valley of the Adige, is characterised by a large number of peculiar species, and by a perhaps equal number of plants not seen elsewhere in the Alps, but also natives of the Carpathians, or of the region lying between Servia and the Adriatic. In the following list those included in the latter category are marked with an asterisk :—

*Arabis vochinensis, * A. Scopoliana, *Cardamine trifolia, Braya alpina, Cochlearia brevicaulis, Silene pumilio, S. alpestris, Dianthus alpinus, *Genista sericea, Mcdicago Pirone, *Potcntilla Clusiana, Saxifraga Burscriana, S. tenella, *S. petrea, *S. hicracifolia, *Hacquetia Epipactis, Astrantia carniolica, Hladnikia golacensis, Anthemis alpina, Achillea Clusiana, *Senecio abrotanifolius, Cen-tawrea alpina, C. rupestris, *Saussurea pygmea, Phytewma comosum, Campanula pulla, *C. alpina, C. morettiana, O. Zoysii, Rhododen-dron chamecistus, Gentiana tinbricata, *G. frigida, G. Fréhlichit, *Primula minima, P. glutinosa, Androsace Hausmanni, Peederota Bonarota, P. Ageria, Wulfenia carinthiaca, Sesleria sphecrocephala, and §. microcephala.*

It is worthy of remark that the central and highest part of the Alpine chain, including the Pennine and Bernese groups, the Lepontine Alps, and those of North Switzer- land, produce scarcely a well-marked species—with the doubtful exceptions of Rumex nivalis and of Potentilla grammopetala, which is confined to a small district south east of Monte Rosa—that does not spread throughout the rest of the chain.

The phenomena of glaciers have been chiefly studicd in

especially during the last thirty years, yet it may be safely asserted that it will continue to offer new problems to the researches of at least another generation. There is scarcely a single difficult question regarding the nature and mode of deposition of the strata that make up the earth's crust, the mode of elevation of mountain chains, the causes of the formation of valleys and lake basins, the action of meteoric forces, of rivers and ice-streams, that must not be decided before we can give a rational account of the struc- ture of the Alps. Along with these, and scarcely less im- portant, is the study of the various agencies involved in the phenomena of metamorphism, and that of the part played by volcanic action in some parts of the chain. The study of the organic remains embedded in the rocks is not So constantly the duty of the geologist in the Alps as it is

are of a narrative and descriptive character, and do not add much to our knowledge of the Alps, cither topographically or scientifically. It will suffice to give here a brief list of the chief works that may fairly be considered to have achieved that object. Works of exclu- sively scientific character, especially those relating to Alpine geology, are separately enumerated.

Scheuchzer (J. J.), Itinera Alpina, Leyden, 1728. Griiner, Die Eisgebirge des Schweizerlandes, Bern, 1760. Saussure (H. B. de), Voyages dans les Alpes, Neuchatel, 1803-6. Hugi (J. J.), Natur-historische Alpenreise, Solothurn, 1830. Agassiz (L.), Etudes sur les Glaciers, Neuchatel, 1840; Systéme Glacaire, ou Nouvelles Etudes, &c., Paris, 1847. Forbes (J. D.), Travels through the Alps of Savoy, &c., Edinburgh, 1843. Desor (E.), Excursions et Séjours dans les Glaciers ct les Hautes Régions des Alpes ; 2 series, Neuchatel, 1844-5. Saluzzo (A. di), Le Alpi che cingono |' ltalia, 1™ Parte, Torino, 1845. Schlagintweit (H. und A.), Untersu- chungen tiber die Physicalische Geographie die Alpen; 2 series, Leipzig, 1850-4, Tyndall (J.), The Glaciers of the Alps, London, 1860. Berlepsch (H. A.), Die Alpen in Natur- und Lebensbildern dargestellt, Leipzig, 1861. Browne (Rev. G. F.), Icc-caves of France and Switzerland, London, 1865. Morell,

Scientific Guide to Switzerland, London, 1866. Sonklar (Karl von), Die Oetzthaler Gebirgsgruppe, &c., Gotha, 1860; Die Gebirgsgruppe der Hohen Tauern, &c., Wien, 1866. Schaubach Die Deutsche Alpen; 2d edition, Jena, 1865~71. Bonney. (Rev. T. G.), The Alpine Regions of Switzerland and the neighbouring countries, Cambridge and London, 1868. Ball (J.), The Alpine Guide; new edition, in ten parts, London, 1878. Considerable additions to our knowledge of the Alps are also to be found in the periodical publi- cations of the English, Swiss, Austrian, Italian, and German Alpine Clubs; and also in papers that have appeared in Pctermann's Geographische Mitthetlungen.

No general zoological works of a purely scientific character relat- ing exclusively to the fauna of the Alps can be quoted; but much valuable information, conveyed in a popular form, will be found in Tschudi's Thierleben der Alpenwelt, of which translations have appeared in English and French. The want of a compact work containing descriptions of all the plants of the Alps has been much felt by botanists. Those of Switzerland and the Eastern Alps are included in Koch's Synopsis Flore Germanice et Helvetice, a work of high authority, written in Latin; but it does not compre- hend the species peculiar to Piedmont and the Western Alps. An illustrated work, by J. C. Weber, Die Alpenpflanzen Deutschlands und der Schweiz, may also be recommended. Of numerous books and memoirs connected with the geology of the Alps, the following deserve special mention :—L. von Buch, Geologische Beobachtung- en auf Reisen, 1802. Sir R. I. Murchison, On the Geological Structure of the Alps, the Apennines, and the Carpathians, Quart.

te the Alps, but they are not especially characteristic of the | Journal Geol. Soc. of London, vol. v.; a translation of this im- mountains of central Europe. The investigation of their | portant pene rae tahoe ae appli Er 18s eeu end

teal f i | G. Meneghini, Florence, 1851. Sedgwick and Murchison, On the

Sith oe ae cure, oe i ke og ial he Bee fall Geology of the Eastern Alps, Trans. Geol. Soc. Lond, 1832, J. de

: eee uce 0 pee, POP esOpier,sand ‘re Charpentier, Essai sur les Glaciers et sur le Terrain Erratique du

discussed elsewhere. See Gracrers. Bassin du Rhone, 1841. B. Studer, Geologie der Schweiz, 1853 ;

Geology of The geological structure of the Alps is a subject that has | ld. Index der Petrographie und Stratigraphie der Schweiz, &c., the Alps, occupied the labours of many eminent men of science, | Bern, 1872. A. Stoppani, Studii Geologichi e Paleontologichi sulla

Lombardia, 1857. C. Lory, Description Géologique du Dauphiné, 1860. Giimbel, Gcologie des Konigreichs Baycrn, 1861. 0. Heer, Die Urwelt der Schweiz, Ziirich, 1865. KE. Desor, Der Gebirgsbau der Alpen, &c., Wiesbaden, 1865. A. Favre, Recherches Géo- logiques dans les Parties de la Savoie, &c.; Voisines du Mont Blane, Genéve, 1867. L. Riitimeyer, Ueber Thal- und Seebilding, Basel, 1869. A copious collection of facts and observations bearing on the physics and recent geology of the Alps will be found in a work by M. Dollfuss-Ausset, Materiaux pour l’Etude des Glaciers, of which nine volumes have appeared. Many important contributions to Alpine geology are scattered through the Proceedings of scientific societies. The Bulletin of the French Geological Society contains valuable papers by Collegno, Dausse, Gras, Huber, Mortillet, Omboni, Rozet, and others. The geology of the Austrian Alps is illustrated by numerous papers in the Jahrbuch der k, k. Reichsan- stalt. The memoirs of A. Sismonda and B. Gastaldi, in the Memorie della R. Academia di Torino, must be consulted by those who would study the geology of Piedmont. The phenomena of the motion and structure of glacicrs. have been discussed in numerous

Carto- graphy of the Alps.

papers that have appeared in the London and Edinburgh Philoso- phical Magazine during the last thirty years. The important memoirs of Professor Tyndall were published in the Philosophical Transactions for

1857, 1858, and 1859 ; and those of the late Mr Hopkins in the Transactions of the Cambridge Philosophical Society, vol. viii. Various contributions to illustrate and enforce the views first set forth by the late Principal Forbes in his Travels through the Alps were published in a collected form by Messrs Black, Edin- burgh, in 1859. La

With the exception of special maps of small districts, the only maps of the Alps founded on actual survey are those which have been published under the authority of the governments whose territory is concerned. Among these the first place is due to the federal map of Switzerland, executed under the direction of General Dufour, on the scale +y¢5y0, in 25 sheets. Considering the diffi- culty of the task, this is unsurpassed both for aceuracy and skill in execution. The Austrian War Offiee has brought out, during the last sixty years, a series of maps, executed on a large scale, of the several states of the empire. These are of very unequal merit. That of the kingdom of Venetian Lombardy, in 42 sheets, on the scale of =g1-5, las considerable merit, but falls short of the stand- ard of the Swiss map. A new map of Tyrol is in preparation, and will doubtless sustain the reputation of Austrian cartographers. The general map of Piedmont, in 91 sheets, on the scale spau0, 18 sufficiently correct as regards the inhabited districts, but quite unsatisfactory as regards the higher region. Until lately there

ALPUJARRAS, or ALpuxARAs, a mountainous district in the south of Spain, in the province of Andalusia, lying between the Sierra Nevada and the Sierras Lugar and Contraviesa, and consisting principally of valleys, which descend at right angles from the crest of the Sierra Nevada. These valleys are among the most beautiful and fertile in Spain. They contain a rich abundance of fruit trees, especially vincs, oranges, lemons, and figs, and in some parts present scenes of almost Alpine grandeur. The inhabitants are the descendants of the Moors, who vainly

sought to preserve the last relics of their independence in,

their mountain fastnesses, and many of the names of places in the district are of Moorish origin. The principal villages are Lanjaron, Orgiba, Trevelez, and Ugijar, all situated at a considerable elevation—

the highest, Trevelez, being 5333 feet above the sea—and containing from 1500 to 4000 inhabitants.

ALREDUS, AturepD, or ALUREDUs, of Beverley, one of the carliest English historians, was born at Beverley, in Yorkshire. He wrote in the reign of Henry I., but little is known with certainty of his life. It is generally believed that he was educated at Cambridge, and afterwards became one of the canons and treasurer of the church of St John's at Beverley. We learn from a note in Bishop Tanners Bibliotheca Brit-Hib. that, for the sake of im- provement, he travelled through France and Italy, and at Rome became domestic chaplain to Cardinal Othoboui. He died in the year 1128 or 1129. His chief work, entitled Annales sive Historia de gestis Regum Britannice, was edited by Thomas Hearne from a manuscript belonging to Thonias Rawlinson, and was published at Oxford in 1716. It contains an outline of the history of England from Brutus to Henry I., written in elegant Latin, and with remarkable accuracy as to facts and dates, though, of course, much of the earlier portion is fabulous. A manu- script entitled Zbertates Ecclesiae S. Johannis de Beverle, in the Cottonian library, is also ascribed to him, but on doubtful authority. It isa collection of records relative to the church of Beverley, translated from the Saxon.

ALRESFORD (New), a market town in Hampshire, so named from a ford on the river Arle, a tributary of the Itchin, on which it is situated. Itis 58 miles distant from London and 7 from Winchester. It suffered severely from a series of conflagrations, and partly on this account and from the decline of a small manufacture of linseys, it is now

a place of little importance. Alresford House, the seat of :

existed no tolerable map of the Alpiuc provinces of France. The general map of France, on the scale gy¢yz, has of late years been extended to the greater part of Dauphiné, and will before long include the newly-acquired departments of Savoy and Nice. The portion already published is quite on a level with modern requirements, and reflects credit on the French war department. The only tolerable map that includes the entire chain of the Alps is that compiled by J. G. Mayr. It is ona small scale (qgypyq), and is not free from serious

crrors. A map published by Worl, in 48 sheets, on a scale xyesss, entitled ‘ Atlas von Siidwest Deutsehland und dem Alpen- lande,”’ is very unsatisfaetory. Seheda’s general map of the Aus- trian Empire and adjoining territories, in 20 sheets, is an excellent eompilation. It includes the Alps as far west as Monte Rosa pn a. lake of Thun, but the scale (s7¢y0y) is inconveniently small.

Of geological maps including any considerable portion of the Alps the following deserve to be specified :-—

Favre (A.), Carte Géologique des Parties de la Savoie, &c., Voisines du Mont Blane. Giimbel, Geognostische Karte des Konigreichs Bayern. Hauer (F. von), Gcologische Uebersichtskarte der Oester- reichischen Monarchie ; sheets 5 and 6 include the Austrian Alps. Lory (C.), Carte Géologique du Dauphiné. Morlot, Ucbersichts- karte der Nordéstlichen Alpen. Sismonda (A.), Carta Geologica di Savoja, Picmonte, e Liguria. Société Géologique de France, Carte Géologique de la Savoie. Studer (B.) u. Escher v. d. Linth, Carte Géologique de la Suisse. (J. B.)

the Rodney family, is in the neighbourhood, and the naval hero of that name was interred in New Alresford church in 1792. Miss Mitford was a native of Alresford. Alres- ford is a station on the L. and S.-W. Railway. Population of the parish of New Alresford (1871), 1623.

ALSACE (Germ. Eisass), a former province of France, divided after the Revolution into the departments of Haut Rhin and Bas Rhin, and incorporated since the war of 1870 with the German empire. It is bounded on the north by the Rhine palatiuate, on the east by the Rhine, on the south by Switzerland, and on the west by the Vosges Mountains; and it comprises an area of 3344 English square miles. The district possesses many natural attractions, and is one of the most fertile in central Europe. There are several ranges of hills, but no point within the province attains a great elevation. The only river of importance is the Ill, which falls into the Rhine after a course of more than 100 miles, and is navigable below Colmar. The hills are generally richly wooded, chiefly with fir, beech, and oak. The agricultural products are corn, flax, tobacco, grapes, and various other fruits. The country has a

great wealth of minerals, silver having been found, and copper, lead, iron, coal, and rock-salt being wrought with profit. There are considerable manufactures, chiefly of cotton and linen. The chief towns are Mihl- hausen aud Colmar in the upper district, and Strasburg in the lower. The province is traversed from east to west by the railway from Strasburg to Nancy, and the main line north and south runs between Basle and Strasburg.

From a very early period and for many ages Alsace has been a disputed territory, and has suffered in the contentions of rival races. It formed part of ancient Gaul, and was therefore included in the Roman empire. The Romans held it nearly five hundred years, and on the dissolution of their power it passed under the sway of the Franks and of the early French monarchs, by whom it was governed until the time of Otho I., Emperor of Germany, who reigned about the middle of the 10th century. It was at that period that Alsace became German : its original population of Celtic tribes, which had been first Romanised and then further qualified by a Frankish element, was now to a great extent supplanted by a purely Teutonic stock. By Otho IJ. the province was ereeted into a landgraviate, and it subsequently came into the possession of the House of Austria, which succecded in 1273 to the imperial dignity of Germany. This state of things continued until 1648, when a large part of Alsace was ceded to France by the treaty of Miinster. In the war which preceded this peace (generally known as the Thirty Years' War) Alsace had been so terribly devastated by the Freneh that the German emperor found himself unable to hold it. The population was greatly reduced in numbers, and much of the

land was left uncultivated. In the subsequent war between Franee and the empire of Germany, arising out of the attempt of Louis XIV. to seize Holland, that part of Alsaee which remained to Germany was again overrun by the Freneh. Although this war was termi- nated in 1678 by the treaty of Nimeguen, the French monareh was desirous of ineorporating a still larger amount of Rhine territory ; and aeeordingly, in 1680 he laid elaim to a number of territories,

belonging to prinees of the empire, which he alleged had been dis- membered from Alsace. It was ordered that these territories should be at once restored to that provinee under the erown of France, and several independent sovereigns were cited to appear before two chambers of inquiry whieh Louis had established at Brissae and Metz. The prinees appealed to the German emperor and to the Diet; but the previous wars had so exhausted the power of the former that nothing could be done to resist the aggression. In 1€81 the Freneh troops under Louvois seized Strasburg, aided by the treaehery of the bishop and other great men of the city. A further war broke out, but by the treaty of Ratisbon in 1684, Strasburg was secured to Franee. Again the war was renewed in 1688, and continued for nine years, when, at the peaee of Ryswick, in 1697, another considerable portion of Alsace was eeded. to Franee. Some remaining territories of small extent were aequired by the French after the revolution of 1789.

It will be seen from the foregoing sketch that Alsaee' was originally Freneh, that it then beeame German, and then Freneh again. From the middle of the tenth century, however, the popu- lation has in the main been Teutonie ; and the Freneh conquests of the seventeenth century, while modifying this element, still left it predominant. The people continued to use German as their native tongue, though the edueated classes also spoke French. Pro- testantism was professed by a large number of the inhabitants ; and in many respeets their characteristics identified them rather with the race to the east than that to the west of the Rhine. In process of time, however, they eonsidered themselves Freneh, and lost all desire for re-annexation to any of the German States.

Alsace suffered a good deal in the war of 1870-71. The earlier battles of the campaign were fought there ; Strasburg and other of its fortified towns were besieged and taken; and its people were compelled to submit to very severe exactions. The civil and military govern- ment of the province, as well as that of Lorraine, was assumed by the Germans as soon as they obtained pos- session of those parts of France, which was very shortly after the commencement of the war. The Alsatian rail- ways were reorganised and provided with a staff of German officials.

German stamps were introduced from Berlin ; the occupied towns were garrisoned by the Landwehr ; and requisitions on a large scale were demanded, and paid for in cheques which, at the close of the war, were to be honoured by whichever side should stand in the unpleasant position of the conquered. The people, notwithstanding their German origin, showed a very strong feeling against the invaders, and in no part of France was the enemy resisted with greater stubbornness. It was evident from an early period of the war, however, that Prussia was resolved to reannex Alsace to German territory. When the preliminaries of peace came to be discussed at Versailles in February 1871, the cession of Alsace, together with what is called German Lorraine, was one of the earliest con- ditions laid down by Count Bismarck and accepted by M. Thiers. This sacrifice of territory was afterwards ratified by the National Assembly at Bordeaux, though not without a protest from the representatives of the departments about to be given up ; and thus Alsace once more became German. By the bill for the incorporation of Alsace and German Lorraine, introduced into the German Parliament in May 1871, it was provided that the sole and supreme control of the two provinces should be vested in the Emperor of Germany and the Federal Council until January 1st, 1873, when the constitution of the German empire was to be established. Bismarck admitted the aversion of the popu- lace to Prussian rule, but said that everything would be done to conciliate the people. This policy appears really to have been carried out, and it was not long in bearing fruit. Many of the inhabitants of the conquered districts, however, still clung to the old connection, and on the 30th

of September 1872—the day by which the people were required to determine whether they would consider them- selves German subjects and remain, or French subjects and transfer their domicile to France —45,000 elected to be still French, and sorrowfully took their departure. The German system of compulsory education of every child above the age of six was introduced directly after the annexation. The population in 1871 amounted to upwards of 1,060,000.

ALSEN, an island in the Baltic, situated off the coast of Schleswig, in the Little Belt. It formerly belonged to Denmark, but, as a result of the Danish war of 1864, was incorporated with Germany. Its area is 105 square miles ; the length nearly 20, and the breadth from 3 to 12 miles. The island is fertile, richly wooded, and yields grain and fruit. Sonderburg, the capital, a town of 5475 inhabitants, with a good harbour and a considerable trade, is situated on the narrow channel that separates Alsen from the mainland. Population, 22,500.

ALSOP, Vincent, a celebrated Nonconformist divine, was educated in St John's College, Cambridge. He received deacon's orders from a bishop, whereupon he settled as assistant-master in the free school of Oakham, Rutland. He was recovered from indifferent associates here by a very worthy minister, the Rev. Benjamin King. Subsequently he married Mr King's daughter, and " becoming a convert to his principles, received ordination in the Presbyterian way, not being satisfied with that which he had from the bishop." He was presented to the living of Wilby in Northamptonshire ; but was thence ejected by the Act of Uniformity in 1662. After his ejection he preached privately at Oakham and Wellingborough, sharing the common pains and penalties of Nonconformists—e.g., he was imprisoned six months for praying with a sick person. A book against Sherlock, called Antisozzo (after Socinus), written in the vein of Andrew Marvell's Rehearsal Trans-prosed, procured him much celebrity as a wit. Dr Robert South, who cannot be supposed to have been favourably disposed towards the Nonconformists, publicly pronounced that Alsop had the advantage of Sherlock in every way. Besides fame, Antisozzo procured for its author an invita- tion to succeed the venerable Mr Cawton in Westminster. He accepted the call, and drew great multitudes to his chapel. The other books he published showed a fecundity of wit, a playful strength of reasoning, and a provoking indomitableness of raillery. Even with Dr Goodman and Dr Stillingfleet for antagonists, he more than held his own. His Jlischief of Impositions in answer to the latter's Mischief of Separation, and Melius Inquirendum in answer to the former's Compassionate Inquiry, remain historical landmarks in the history of Nonconformity. Later on, from the entanglements of a son in alleged

treasonable practices, he had to sue for and obtained pardon froin King James II. This seems to have given a somewhat diplomatic character to his closing years, inasmuch as, while remaining a Nonconformist, he had a good deal to do with proposed political-ecclesiastical compromises. He died May 8, 1703. (a. B. G.)

ALSTED, Joann Hernricu,a German Protestant divine, aud one of the most voluminous writers of the 17th century, was born in 1588. He was some time pro- fessor of philosophy and divinity at Herborn, in the county of Nassau, and afterwards at Weissenburg in Transylvania, where he continued till his death in 1638. His Lncyclo- peedia, the most considerable of the earlier works of that class, was long held in very high estimation. It was pub- lished in 1630, in two large folio volumes, the whole having been composed by himself. His Thesaurus Chrono- logie has gone through several editions. He published in 1627 a treatise, De Mille Annis, in which he asserted

that the reign of the saints on earth was to begin in

1694.

ALSTON, Cuartes, M.D., a botanical and medical writer, was born in the west of Scotland in the year 1683. He began his studies at the university of Glasgow; and on the death of his father, prosecuted them under the patron- age of the Duchess of Hamilton. After studying at Ley- den under Boerhaave, along with Alexander Monro (1716— 19), he returned to Edinburgh, and shared with Monro, Rutherford, Sinclair, and Plummer, the honour of laying the foundation of the renowned school of medicine there. He lectured on botany and materia medica with increasing reputation till his death”in November 1760. He was a man of great ability, and an assiduous student of science. His most valuable work is his Lectures on Materia Medica, 2 vols., 1770.

ALSTROEMER, Jonas, a Swedish industrial reformer, was born, at Alingsaes, in West Gothland, on the 7th Jan. 1685. He left his native village at an early age, and in 1707 became clerk to Alberg, a

merchant of Stockholm, whom he accompanied to London. After carrying on business for three years, Alberg failed, and Alstrém (as the clerk then called himself) engaged in the business of shipbroker on his own account, which eventually proved very successful. After travelling for several years on the Continent, he was seized with the patriotic desire to trans- plant to his native country some of the industries he had seen flourishing in Britain. He accordingly returned to Alingsaes, and in 1724 established a woollen factory in the village, which after preliminary difficulties was completely successful. He next established a sugar refinery at Gothen- burg ; introduced improvements in the cultivation of potatoes and of plants suitable for dyeing; and directed attention to improved methods in shipbuilding, tanning, and the manufacture of cutlery. But his most successful undertaking was the importation of sheep from England, Spain, and Angora. In return for his services he received many marks of distinction. He was created (1748) knight of the order of the North Star; and a few years later re- ceived letters of nobility, with permission to change his name to Alstrémer. He died June 2, 1761, leaving several works on practical industrial subjects. A statue was erected to his honour in the exchange at Stockholm. One of his sons, Clas (i.¢., Claude), was a naturalist of considerable eminence.

ALT, or Auta, a tributary of the Danube, which, rising in the eastern Carpathian mountains, flows through Transylvania and Wallachia, entering the latter by the pass of Rothenthurm, and joins the Danube opposite Nicopoli, after a course of more than 300 miles.

ALTAI MOUNTAINS, a group of mountains in central Asia, separating the tablelands of Mongolia from Siberia. The irregular chains of which the group consists extend from 85° to 103° E. long., and from 48° to 34° N. lat. The great Siberian rivers, the Obi, Irtish, and Yenesei, take their rise in these mountains, which are said to abound in scenes of picturesque beauty. The highest summits exceed 12,000 feet. The range is rich in mineral produc- tions, particularly silver, copper, and iron. See Asta, and GEOGRAPHY, PHYSICAL.

ALTAMURA, a cathedral town in the south of Italy, province of Terra di Bari, 28 miles S.W. of Bari. It is situated in a fertile country, which produces wine and oil, and is said to occupy the site of the ancient Lupatia. Population, 17,365.

ALTAR, in Classical Antiquity, was a solid base or pedestal on which supplication was made and sacrifice offered to the gods and deified heroes. According to this difference in the service for which they were employed, altars fell into two classes, of which the one, smaller and

lower so that the suppliant could kneel upon it, stood inside temples, in front of the sacred image ; while the other, destined for burnt sacrifice, was placed in the open air, and, if connected with a temple, in front of the entrance.

Possibly altars of the former class were substitutes for, and Greek ang rendered the same service in historical times as, in an early Roman age, the base of the sacred image within a temple. In Altar

this case the altar of Apollo at Delphi, on which Neopto- lemus is frequently represented on the Greek vases as taking refuge from Orestes, might be regarded as the pedestal of an invisible image of the

god, and as fulfilling the same function [=>

as did the base of the actual image of Minerva in Troy, towards which Cas- sandra fled from Ajax. The other class of altars, called Bwpoi by the Greeks and altarva by the Romans, appear to have originated in such temporary construc- tions as heaps of earth, turf, or stone, made as occasion offered for kindling a fire for sacrifice. The next step was to allow the bones and ashes of the victims sacrificed to accumulate, and upon this to kindle new fires. Altars so raised were viewed with particular sanctity, the most remarkable recorded instances of them being the altars of Juno at Samus and at Olympia (Pausanias, v. 14, 5;

v. 15, 6), of Apollo at Thebes (Pausanias, ix. 11, 5), and of Jupiter at Olympia. The last-mentioned stood on a platform (apdévo1s) measuring 125 feet in circumference, and led up to by steps, the altar itself being 22 feet high. Women were excluded from the platform. Where heca- tombs were sacrificed, the mpd@vor1s necessarily assumed colossal proportions, as in the case of the altar at Parion, where it measured on each side 600 feet. The altar of Apollo at Delos (6 xepdérwos PBwpds) was made of the horns of deer believed to have been slain by Diana; while at Miletus was an altar composed of the blood of victims sacrificed. The altar used at the festival in honour of Dedalus on Mount Citheron was of wood, and was consumed along with the sacrifice (Pausanias, ix. 3, 2). Others, of bronze, are mentioned; but while these were exceptional, the usual material of an altar was marble, and its form, both among the Greeks and Romans, either square or round; polygo- 4 TD ren

nal altars, of which ex- SE a A | amples still exist, being exceptions. When sculp- tured decorations were added they frequently took the form of imita- tions of the actual festoons with which it was usual to ornament altars, or of sym- bols, such as' crania and horns of oxen, referring to the victims sacrificed. As a rule, the altars which existed apart from temples bore the name of the person by whom they were dedicated, and the names of the deities in whose service they were; or, if not the name, some obvious representation of the deity. Such is the purpose of the figures of the Muses on analtar to them in the British Museum. An altar was retained for the service of one particular god, except where, through local tradition, two or more deities had become intimately asso- ciated, as in the case of the altar at Olympia to Diana and Alpheus jointly, or that of Neptune and Erechtheus in the Erechtheum at Athens, and others. Such deities were styled

Fia. 1.—Greek altar: usual form.

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Fria. 2.—Polygonal Greek Altar.

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cipBupo., each having a separate part of the altar, if we may judge from that at the Amphiareum at Oropos (Pau- sanias, i. 34, 2). Deities of an inferior order, who were conceived as working together—e.g., the wind gods—had an altar in common. In the same way, the "unknown gods" were regarded as a unit, and had in Athens and at Olympia one altar for all (Pausanias, i. 1, 4; v. 14, 5; Acts of Apostles, xvii. 18). An altar to all the gods is

mentioned by Aischylus (Suppl. v. 225). Among the excep-

tional classes of altars are also to be mentioned those on

which fire could not be kindled (@wpoi érvpor), and those which were kept free from blood (Bwyot dvaiwaxrot), of which in both respects the altar of Zeus Hypatos at Athens

was an example. The éor/a was a round altar; the érxapa,

one employed apparently for sacrifice to inferior deities or heroes, or on comparatively unimportant occasions, as was also the ara among the Romans ; though ara is sometimes used with the same signification as altare, and etymo- logically would have the same meaning if it is correctly derived from defpw, not from ardere; while altare is con-

nected with altus, " high."

Egyptian altars were'monoliths, in the form of a truncated Some are extant, made of granite, others of green basalt; in almost every case they

cone about four feet in height.

bear hieroglyphical inscriptions. In the temple of Jupiter at Babylon there was an altar of massive gold. Assyrian, Egyptian, and Persian altars were either square or oblong.

The most ancient altars of which any record has been preserved are those mentioned in the Bible. As sacrifice implies an altar, there must

have been altars for those of Cain and Abel; but the first which is mentioned is that which Noah after the flood "builded unto Jehovah" (Gen. viii. 20). The three patriarchs, Abraham, Isaac, and J. acob, are repeatedly said to have built an altar in the different parts of the land of Canaan in which they sojourned ; and though it is not stated expressly, yet it may be inferred from there having evidently been a place where Abraham was accustomed to "stand before Jehovah" (ibid. xix. 27), that, once built, it remained during the whole period of the encampment at the particular place, and was frequently used for the purpose of sacrificing.

But the most remarkable altar mentioned in the book of Genesis is that which Abraham built for the sacrifice of his son Isaac, from which we glean several particulars relative to the patriarchal worship. The altar was evi- dently something distinct from the wood by whose fire the sacrifice was to be burnt, for Abraham " built an altar and laid the wood in order," which he had brought with him from Beersheba, as if he could not count upon finding it at the place. The victim also was bound, laid upon the wood, and there slain. This was contrary to the practice under the Levitical dispensation, when the fire on the top of the altar was kept continually burning, and the animal was killed before being carried up to it 3 but it is pro- bably alluded to in a verse of the Psalms, which has given much trouble to commentators, who have tried to reconcile it with the precepts of the Mosaic law— Bind the sacrifice with cords unto the horns of the altar " To this simple patriarchal ritual belong also the rules about the construction of altars given to the Israelites shortly after they left Egypt (Exod. xx. 24-26). While Sojourning in that country they do not seem to have offered any sacrifice to Jehovah, till, just as they were leaving it, they were commanded to sacrifice the passover. It is not unlikely that they might have despised the simple altars of their forefathers, and tried to imitate those which they had seen in Egypt, as they so soon copied their late oppressors in a still graver matter, the making a supposed likeness of the Deity. They were therefore ordered to make their altars of earth. Stones might also be used,*

(Ps. exviii. 27). |

but they were not to be hewn, nor were the altars to be so high as to require the offerer to go up by steps to arrange the sacrifices upon them.

The first altar that is mentioned as having been built after these directions were given, was the one for the solemn covenanting sacrifice between God and the Israclites (Ex. xxiv. 4-8). There it is mentioned that Moses "builded an altar under the hill, and twelve pillars, according to the twelve tribes of Israel." Its being wnder the hill may have been a significant protest against the prevalent heathen error of localising the Deity in the sky, and the twelve pillars or rough blocks of stone appear to have been a principal part of the materials used in constructing it. They may be compared with the "twelve stones, according to the number of the tribes of the sons of Jacob," with which Elijah built his altar on Carmel (1 Kings xviii. 31). We seem to learn from these examples that when an altar was to be constructed for a special occasion, it was fitting that it should beara symbolism of all in whose name the sacrifice was offered. It is to be observed that this precept about making altars of earth or of unhewn stones was anterior to the Levitical ceremonial, and was superseded by it. After the sin of making the polden calf, the whole ceremonial of the worship of the Israelites was altered. According to the new ritual, two different altars were required, and they were permanent, being carried about in the people's wanderings, and replaced by others, similar, but larger and more costly, when the ark was placed in the temple on Mount Moriah.

The first of these altars was that for burnt offerings. For the tabernacle this was hollow, made of boards of shittim-wood, covered with brass. It was three cubits or about five feet high, and five cubits or eight fect square, It had a horn at each commer, and was carried about by means of staves. The corresponding altar in the temple was of greatly larger dimensions, ten cubits or about 18 feet high, and in the first temple 20 cubits square, and in the second 24 cubits. The tradition of the Jews is, that it was 32 cubits (about 50 feet) square at the base, contracting to 24 at the top, by several ledges round it at different heights. It must

therefore have been an immense struc- ture, and though called "an altar of brass," was probably built of stones, and merely covered with plates of that metal. From the account of the building of the altar in the second temple given in 1 Mace. iv. 45-47, it is pro- bable that it consisted merely of a mass of masonry of the proper form. Ezekiel, in his vision of the temple, gives a description of the altar of burnt-offerings, from which we learn that it was surrounded by several ledges or steps, each a cubit broad. The uppermost of these was two cubits (about 3 feet) below the top of the altar, so that, standing upon it, the priest was able to arrange the sacrifice upon the fire, which was kept always burning, to supply it with fuel, and to remove the ashes. The lower ledges were to enable him to sprinkle the blood on the sides of the altar, which (according to the Levitical ritual) was sometimes to be done on the upper part of the altar, and sometimes on the lower part. The lowest step is said to have had a raised ledge on the outside, by which the blood poured upon it was confined till it ran through a hole into a subterranean pipe.

One of the most difficult questions about the Levitical altars is their having horns ; for these do not seem to have been used in that ritual, yet they are specially ordered to be made, not only in the altar of burnt-offerings, but also in that of incense; and on certain solemn occasions they were sprinkled with blood, as if they were not mere append- ages or ornaments of the altar, but had a special signi- ficance of their own. From the way they are spoken of in the book of Exodus, we see that they must then have been

well known, and it might almost be thought that they were retained from the older ritual, according to which they were used to bind the victim that was slain upon the altar.

The sccond temple having suffered greatly in the wars between the kings of Syria and Egypt, and been plundered by the Romans, was almost rebuilt by Herod, the restora- tion occupying forty-six years. The altar of burnt-offering erected then is thus described by Josephus (De Bell. Jud. v. 5, 6) :—" Before this temple stood the altar, 15 cubits

high, and equal both in length and breadth, each of which dimensions was 50 cubits. The figure it was built in was a square: it had corners like horns, and the passage up to it was by an insensible acclivity from the south. It was formed without any iron tool, nor did any iron tool so much as touch it at any time."

The second altar belonging to the Jewish worship was the altar of incense, the golden altar (Ex. xxx. 1). It was placed in the holy place, between the table of shew-bread and the golden candlestick. This altar, in the tabernacle, was made of shittim-wood overlaid with gold plates, 1 cubit in length and breadth, and 2 cubits in height. It had horns of the same materials; and round the flat surface was a border of wrought gold, underneath which were the rings to receive "the staves, made of shittim-wood overlaid with gold, to bear it withal;" (Exod. xxx. 1-5; Joseph. Antig. tii. 6, 8). The altar in Solomon's temple was similar in form, but made of cedar overlaid with gold (1 Kings vi. 20). It is a question whether it was hollow or filled up with stones, the construction of the Hebrew being doubt- ful, but the former supposition appears the more probable. The altar in the second temple was taken away by Antiochus Epiphanes (1 Mace. i. 21), and restored by Judas Maccabeeus (1 Mace. iv. 49). The archangel Gabriel stood at the right side of this altar when he announced the birth of John the Baptist to Zacharias, who was burning incense upon it (Luke i. 11); and it is alluded to in the vision shown to St John (Rev. viii. 3), where it is immediately "before the throne," the veil, which under the Mosaic dispensation had separated it from the holy of holies, having been rent asunder at the crucifixion.

On this altar incense was offered twice every day, and this was the only use of incense under the Levitical ritual; for though the word "censer" is repeatedly used in our common translation of the Old Testament, neither in the Hebrew nor the Greek has the word any connection with incense, but denotes the fire-pan in which the burning charcoal was carried from the brazen altar to be emptied out upon that of incense. The true equivalent for censer is only used of sinful or heathen worship (2 Chron. xxvi. 14; Ezek. viii. 11, and perhaps 2 Chron. xxx. 14). The fire- pans used as censers in the story of Korah,

and of the atonement subsequently made by Aaron burning incense among the people, do not belong to the Levitical ritual, but were to prove whether it was to be observed or not.

The single exception to the exclusive use of the golden altar for incense was on the great day of atonement, when the high priest went into the holy of holies, carrying a fire-pan containing lighted charcoal from the great altar, and having set it down, threw incense upon it, and left it for some time before the ark while he went and came

back once and again to sprinkle it with the blood of the sacrifices. This fire-pan is accordingly called a golden censer by the author of the Epistle to the Hebrews (ix. 4); but even this is no precedent for the swinging censers which have been used for so many centuries in the Latin churches. Incense, indeed, was put on the loaves of shew- bread ; but it does not appear that it was burned upon that table, which is nowhere called an altar. More pro- bably, when the loaves were taken away, the incense was burnt on the proper altar. But the shew-bread was so completely special an appointment of the Mosaic ritual that it is impossible to class it among sacrifices.

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Among the early Christians, alike in the Kast and West, Christian

that on which the bread and wine were put in the celebra- altars,

tion of the Eucharist appears to have been regarded as an altar, and accordingly sacrificial words were used in connec-

tion with it, such as “offering,” “unbloody sacrifice.” It.

should be observed, however, that the Greek fathers scarcely ever apply the word Bwpds to Christian altars, confining themselves to @vavacrprov ; while in the West there seems to have been a preference for altare rather than ara, though the latter term is often found. As the

Christians generally shrunk from disclosing to the heathen the details of their worship, their enemies used to taunt them with having neither temples ner altars, and some of the apologists admit this ; but all they meant by this was that they had no such altars as the heathen had, altars for slain beasts and for the burning of their bodies.

From the privacy with which the early believers had to meet, their altars at first would naturally be simple and unobtrusive. We have seen that the Levitical altars were four-square, but Christian altars seem to have been always longer than they were broad, and to have been placed "athwart" the length of the basilica or church, so as to present one of the broad sides and both the sacred vessels to the eyes of the great body of the worshippers.

There does not seem to have been any rule as to the material of which altars might be made. At first they appear to have been mostly of wood, as being easily pro- cured and fashioned. But when the persecutions ceased, and the Christians began to erect churches for worship, there seems to have sprung up some diversity of usage, each province following its own traditional custom, which perhaps was affected in some degree by the nature of the building-stone found there, and the use commonly made of it. It seems that in Egypt and the region afterwards called Barbary the altars were of wood; and there is a tradition that this was also the case originally at Rome. On the other hand, in the latter half of the 4th century, they were made of stone in Asia Minor. Early in the 6th century a council, held at Epaone in Burgundy, ordered that only altars made of stone should be consecrated with the chrism, which shows that wooden altars also were still made in that province. In England the change from wood to stone seems to have taken place about the time of the Norman Conquest, Wulfstan, bishop-of Worcester, being mentioned as having introduced it in his diocese. No doctrinal significance can be ascribed to the change, which was simply in keeping with the greater costliness of the whole structure, when the cessation of the inroads of the Scandinavian sea-kings allowed the nations of Western Europe to accumulate wealth, of which a portion was dedicated to religion. A few exceptional instances are mentioned of altars of silver, and they were

sometimes even covered in part with plates of gold; but the current set in steadily in favour of stone as the most suitable material, and by degrees the legislation of the Latin church on this point grew more definite. The altar could only be of stone; not that it was necessary that the whole struc ture should be so, for it was enough if there was a slab of

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stone on the top large enough for the sacred vessels to stand upon; the upper face of the altar must have five crosses incised in the stone; before being used, it must have been consecrated by the bishop with the chrism, according to the ritual prescribed in the pontificals, which by degrees grew more elaborate; and at first a plain Cross,

and afterwards a crucifix, was placed erect upon it.

At the Reformation the altars in churches were looked upon as symbols of the old Catholic doctrine, in those countries where the struggle lay between the Catholics and the " Reformed " or Calvinists, who on this point went In England the name "altar" was retained in the Communion Office in English, printed in 1548, and in the complete English Prayer-book of the following year, known to students as the First Book of Edward. But orders were given soon after that the altars should be destroyed, and replaced by movable wooden tables; while from the revised Prayer-book of 1552 the word "altar" was carefully expunged. The short reign of Mary reversed all this, but the work was resumed

much further than the Lutherans.

on the accession of Elizabeth, and has been carried out so

thoroughly that the industry of recent antiquaries has only

been able to find about thirty cases in all England where the old stone altar-slabs still exist, and of these that at Arundel is almost the ouly one which is still used.

The name "altar" has been all along retained in the Coronation Office of the kings of England, where it occurs frequently. It was also recognised in the canons of 1640, and an important change was then made in the posi- tion of the communion tables, which has become universal throughout the Church of England. In primitive times the position of the Christian altar seems to have been such that, like the Jewish and patriarchal altars, they could be surrounded on all sides by the worshippers. The chair of the bishop or celebrant was on their west side, and the assistant clergy were ranged on each side of him. But in the Middle Ages the altars were placed against the east wall of the churches, or else a screen, called a reredos (generally much decorated with carving), was erected close to the east of the altar, so as to cut off any one on that side from joining in the worship, and the celebrant was brought round to the west side, to stand between the people and the altar; while there were often curtains on the north and south sides. When tables were substituted for altars in the English. churches, these were not merely movable, but at the administration of the Lord's Supper were actually moved into the body of the church, and placed table-wise as it was called—that is, with the long sides turned to the north and south, and the narrow ends to the east and west—the officiating clergyman standing at the north side. In the time of Archbishop Laud, however, the present practice of the Church of England was introduced. The communion table, though still of wood and movable, is, as @ matter of fact, never moved; it is placed altar-wise— that is, with its longer axis running north and south, and close against the east wall, with for the most part a reredos behind it ; it is also fenced in by rails, within which the laity do not enter.

When, under the superintendence and partly at the charge of the Camden Society, the church of Saint Sepul- chre at Cambridge, founded 1101, was restored, a stone altar, consisting of a flat slab resting upon three other upright slabs, was presented to the parish, and set up in the church at the east wall of the chancel. This circum-Stance was brought before the Court of Arches in 1845, and Sir H. Jenner Fust (Faulkner v. Lichfield and Stearn) ordered it to be removed, on the ground that a stone struc- ture so weighty that it could not be moved, and seeming to be a mass of solid masonry, was not a

communion-table within the meaning of the Church of England. No attempt

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has been made to obtain a reversal of this judgment ; but from other decisions some infer that only such altars as cannot also be considered as tables are forbidden,

Few particulars have come down to us regarding the. construction of the wooden altars used by the Christian Church in early times, except that several circumstances indicate that they were hollow, Gregory of Tours applies the word " arca" or "chest" to them ; and in other cases they must have been simply like ordinary tables supported by legs, since we read of persons taking refuge beneath them. There is nothing, therefore, either in the matter or the form of the ordinary English communion-tables, to prevent them serving as altars. The stone altars at first were probably only one or more blocks of rough hewn stone; but by degrees they were ornamented, and this produced two different types. Either the altar romained a solid mass of masonry, but had its front richly panelled (in later times it had figures in bas-relief), or the upper slab was supported by from one to five columns, often of highly-polished stone. It was in the 16th century that a new fashion was introduced in France, according to which the altar was regarded as being itself a tomb or sarcophagus, and to which are due the unsightly altars which now dis- figure the wonderfully beautiful medizval churches of that country. So complete was the change, that now, perhaps, there are not more ancient altars in France than there are in England,

In early times, before the altars were placed close to the east wall or to a large reredos, they were often surmounted by a canopy or baldacchino, supported by four pillars rising from the ground just beyond the corners of the altar.

At first there was but one altar in a church 3 but for many centuries this rule has been disregarded in the Latin churches, and almost every large church contains several altars dedicated in honour of different

saints, and sometimes appropriated to the use of particular guilds, or endowed for a series of masses for the repose of the founder. These, however, must not be confounded with the principal altar, called the high altar or ma%tre autel, situated towards the east end of the choir or chancel. A few cases occur where there are two high altars, the second being placed near the west end of the church.

Altars are "vested" during service ; that is, covered with cloths of various kinds. 'There is often a frontal, richly embroidered, whose colour depends upon the ecclesi- astical season or the particular festival; but in all cases the uppermost cloth on the top is of linen, to represent that in which the body of the Lord was wrapped in the sepulchre.

Since the age of Bede, portable altars have been used in the Latin Church ; but the East has never adopted them, and they quite put out of sight the symbolism of the form of an altar. They consist simply of a small slab of stone, large enough to support the chalice and paten. This must bear the incised crosses and must have been consecrated by the bishop. They may be carried about on a journey by a bishop or priest in a heathen or heretical country, as now it is not allowed to say mass except on a duly conse- crated altar, and they are also used in oratories attached to private houses.

Those who wish to investigate the matter further may be referred to the standard works on church ritual and ecclesiastical architecture. For the altars of the Israelites, much information will be found in Lightfoot's two treatises on the Temple Service, and in Carpzov's notes to his trans- lation of Godwin's Moses and Aaron. Christian altars are described by Bona, Martene, and Bingham 3 but the stand- ard work on the subject is probably that by the Lutheran Voigt, published after his death by J. A. Fabricius. Nearly twenty years ago an Essay on Christian Altars, by Laib

and Schwartz, appeared at Rottenburg; while for France, the Abbé Thiers' Dissertation on the subject is full of curious information, like all his works. Drawings of medizval altars which have been preserved will be found in many works on architecture. Parker's Glossary gives the most noticeable preserved in England ; but the Dvc- tionnaire de T Architecture of Viollet le Duc is much superior, and, with its beautiful illustrations and careful descriptions, has nearly exhausted the subject so far as regards French examples, to which it is almost exclusively confined. (a. H. F.)

ALTDORF, or Attorr, a town in Switzerland, capital of the canton of Uri, situated at the northern end of the pass of St Gotthard, near the lake of Lucerne. It contains the oldest Capuchin monastery in Switzerland, but is otherwise of little interest, except as the place pointed out by tradition where William Tell shot the apple from his son's head. 'The lime tree, under which it is alleged the boy stood, has disappeared, but a fountain still marks the spot. There is also an old tower, with rude frescoes commemorating the feat. Biirglen, a village in the neigh- bourhood, is Tell's reputed birthplace. Population, 2724.

ALTDORFER, ALBRECHT, a painter and engraver of the early German school, was born at Regensburg, not later than 1480, and died in 1538. His paintings are remarkable for minute and careful finish, and for close study of nature. The most important of them are to be found in the Pinakothek at Munich. A representation of the battle of Arbela, included in that collection, is usually considered his chief work. His engravings on wood and copper are very numerous, and rank next to those of Albert Diirer.

ALTENBURG, a town in Germany, capital of the duchy of Saxe-Altenburg, situated near the river Pleisse, about 24 miles south of Leipsic. The town, from its hilly position, is irregularly built; but many of its streets are wide, and contain a number of large and beautiful build- ings. Its ancient castle is picturesquely situated on a lofty rock, and is memorable as the place from which, in 1455, Kunz von Kaufungen carried off the young princes Albert and Ernest, the founders of the present royal and ducal families of Saxony. Altenburg

is the seat of the higher courts of the duchy, and possesses a cathedral and several churches, a gymnasium, a library, a gallery of pictures and a school of art, several elementary schools, an infirmary, and various learned societies. There is considerable traffic in grain and cattle brought from the surrounding district ; twice a year there are large horse fairs; and the book trade is extensive. Cigars, woollen goods, gloves, hats, and porcelain are among the chief manufactures. Population (1871), 19,966.

ALTEN OETTING, or Atrorrtine, a small market town in Upper Bavaria, situated on the Morn, not far from its junction with the Inn. It has long been famous as a place of pilgrimage to which Roman Catholics resort in very large numbers, especially from Austria, Bavaria, and Swabia, on account of a celebrated image of the Virgin Mary in one of the churches. Another church contains the tomb of Tilly. Population, 1500.

ALTENSTEIN, a castle upon a rocky mountain in Saxe-Meiningen, on the south-western slope of the Thiir- inger Wald, not far from Eisenach. It is the summer residence of the dukes of Meiningen, and is surrounded by a noble park, which contains, among other objects of interest, a remarkable underground cavern, 500 feet long, through which flows a large and rapid stream. Boniface, the apostle of the Germans, lived and preached at Alten- stein in 724 ; and near the castle is the place from which, in 1521, Luther was seized, to be carried off to the Wart- burg. There used to be an old beech called " Luther's

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tree," which association connected with the Reformer, but it was blown down in 1841, and a small monument now stands in its place.

ALTIN, a lake of Siberia, which gives rise to the Bija, one of the head streams of the Obi, is situated among the Altai mountains, 320 miles south of the city of Tomsk. It is about 80 miles long, and its greatest

breadth is about 50 miles ; but the large quantities of melted snow which flow down from the surrounding mountains make it larger in summer than in winter. It is remarkable that in winter the northern part is frozen so hard as to be passable on sledges, while the southern is never covered with ice.

ALTING, Hetnricu, a German divine, was born at Embden in 1583. His father, Menso Alting, was minister of Embden, and early destined his son to the same pro- fession. He studied with great assiduity and success at the universities of Herborn and Groningen. In 1608 he was appointed tutor of Frederick, afterwards elector-palatine, at Heidelberg, and in 1612 accompanied him to England. Returning in 1613 to Heidelberg after the marriage of the elector with the Princess Elizabeth of England, he was appointed professor of theology, and in 1616, director of the Collegium Sapientie. In 1618, along with Scultetus, he represented the university in the synod of Dort. When Count Tilly took the city of Heidelberg, and handed it over to plunder, Alting found great difficulty in escaping the fury of the soldiers. THe first retired to Schorndorf; but in 1623 he removed with his family to Embden, and afterwards followed to the Hague his late pupil, the Elector Frederick, who had been compelled to flee from his new kingdom of Bohemia. Such was the regard this prince had for Alting that he made him preceptor to his eldest son, and prevented him from accepting the charge of the church at Embden, and likewise a professorship in the university of Franeker. In 1627, Alting, with some difficulty, obtained leave from his patron to remove to Groningen, where he was appointed to the chair of divinity ; and there he continued to lecture, with increasing reputa- tion, until his death, which took place in 1644. Alting was a man of great ability and extensive learning. Among the productions of his pen are:—Note in Decadem Pro- blematum Jacobi Behm, Heidelberg, 1618; Scripta Theolo- gica Heidelbergensia, Amst. 1662; Exegesis Augustane Confessionis, Amst. 1647. Ee

ALTING, Jacos, son of the preceding, was born at Heidelberg in 1618. He studied theology and the Oriental languages at Groningen, and in 1638 he put himself under the tuition of a Jewish rabbi at Embden. In

1640 he went to England, and was admitted to clerical orders by Dr Prideaux, bishop of Worcester; but an offer of the Hebrew professorship in the university of Groningen induced him to return to Holland in 1643. In 1667 he was appointed professor of theology in the university. In this office he gave great offence to his colleague, Samuel Desmarets, by his disuse of the scholastic method of teaching. Desmarets preferred a charge of heresy against him; but the divines at Leyden pronounced that Alting was not guilty of any- thing more serious than imprudent fondness for innovation. Alting died of a fever in 1679. The fondness which he showed for rabbinical learning gave birth to the general re- port that he was inclined to become a Jew. His opinions, which seem to have excited more general attention than they deserve, may be seen in his writings, which were collected a few years after his death, and published in five volumes folio, by his pupil, the well-known Balthasar Bekker.

ALTON, a town of Hampshire, on the Wey, 17 miles E. of Winchester, and 47 8.W. of London by road; by the London and South-Western Railway it is 60 miles from London. Large markets and fairs are held for corn, hops,

cattle, and sheep; and the town contains some highly reputed ale breweries, besides paper manufactories and an iron foundry. The church, a fine old building, was the scene of a fierce conflict between the royalist and parlia- mentary troops in 1643. Population in 1871, 4092.

ALTON, a town in Madison county, Illinois, United States, stands on a high bluff on the left bank of the Mississippi, 21 miles above St Louis, and 3 above the mouth of the Missouri. It is a place of considerable importance, and carries on a thriving export trade in the produce of the surrounding country—grain, hay, fruit, coal, and lime. It has an excellent wharf, and good means of communication by railway, the two great lines from Chicago and Indianopolis having their junction at Alton. The town contains a Roman Catholic cathedral, about ten other churches belonging to various sects, and several schools. It has also a

printing trade, with daily and weekly newspapers. Population in 1870, 8665.

ALTONA, the richest and most populous city of the Prussian province of Schleswig-Holstein, is situated on the north bank of the Elbe, so close to Hamburg that the two cities are virtually one. The rise of Altona to its present position has been rapid, at least for a continental city, and is mainly due to the fostering care of the Danish government, who established it as a rival to Hamburg. In 1640, when it became the property of Denmark, it was a small fishing village; in 1871 it contained 74,131 inhabitants. After the war of 1864 it ceased to belong to Denmark, aud eventually became part of Prussia, although, with Hamburg, it is not included in the Zollverein. It carries on a large trade with Britain, France, the West Indies, and other countries; but it has by no means succeeded in depriving Hamburg of its commercial pre-eminence—great part of the business of Altona being, indeed, transacted on the Hamburg exchange. Tobacco is probably the chief manufacture, but there are also breweries, tanneries, oil- works, soap-works, and linen factories. Altona is a well-built modern town, really dating from 1713 (when the Swedes burnt it to the ground), with a higher situation than that of Hamburg, and consequently a purer and healthier atmosphere. It contains an observatory of some celebrity, several churches, two synagogues, a gymnasium, and an infirmary. It is the terminus of the Altona-Kiel Railway, which places it in connection with the principal towns of Schleswig-Holstein.

ALTOONA, a town of the United States, in Blair county, Pennsylvania, on the Central Railway, 244 miles west of Philadelphia, situated near the eastern base of the Alle- ghany Mountain, where the railroad begins to ascend it. It contains extensive locomotive and railway carriage manu- factories belonging to the Pennsylvania Central Railway Company. Near Altoona is the famous "Horse Shoe Bend," where trains of but ordinary length are seen to be moving in opposite directions at the same time. The line of railway, in its ascent between Altoona and Cresson, winds round the side of the mountain, affording

some of the finest mountain scenery on the continent. Population in 1870, 10,610.

ALTO-RILIEVO (high relief) is the term applied to sculpture that projects from the plane to which it is attached to the extent of more than one-half the outline of the principal figures. It is thus distinguished from basso-rilievo, m which there is a greater or less approximation to the pictorial method, the figures being made to appear as pro- jecting more than half their outline without actually doing so. See Reiter and ScuLPTure.

ALTRINGHAM, or AttrincHaM, a market town in the north of Cheshire, 8 miles south of Manchester, with which it is connected by railway. It is a ncat, clean place, surrounded by villas of Manchester manufacturers, who

are attracted by its healthy climate and pleasant situation. It has no parish church, but there is a chapel of ease belonging to the parish of Bowdon, in which it is situated, and also a Roman Catholic and several dissenting places of worship. Yarn, worsted, and cotton arc the chief manufactures; and large quantities of fruit and vegetables are sent to the Manchester market. Population in 1871,

8478,

ALUM, a compound salt employed in dyeing and various other industrial processes. It is soluble in water, has an astringent, acid, and sweetish taste; reddens vege- table blues, and crystallises in regular octahedrons. When heated, it liquefies; and if the heat be continued, the water of crystallisation is driven off, the salt frothes and swells, and at last a white matter remains, known by the name of burnt alum.

Its constituents are sulphuric acid, alumina, an alkali, and water. The alkali may be either potash, soda, or ammonia. Hence there are three distinct species of alum, depending upon the nature of the alkali which each con- tains. Potash alum (in which the alkali is potash) is the

common alum of this country, although both soda alun and ammoniacal alum are manufactured. The term alum is now used in chemistry as a generic one, and is applied to the class of double salts formed by the union of the sulphates of alumina, chromium, or iron with the sulphates of the alkalies. The composition of the ordinary potash alum is represented by the formula AlK(SO,),-12H,0.

The progress made by chemists in the discovery of the constitution of alum was very slow. The species first investigated was potash alum. That it contained sulphuric acid as a constituent was known even to the alchemists. Pott and Marggraff demonstrated that alumina was another constituent. Pott, in his Lithogeognosia, showed that the earth of alum, or the precipitate obtained when an alkali is poured into a solution of alum, is quite different from lime and chalk, with which it had been confounded by Stahl. Marggraff went much farther. He not only showed that alumina is one of the constituents of alum, but that this earth possesses peculiar properties, is different from every other substance, and is one of the ingredicnts in common clay (" Expériences faites sur la Terre d'Alun," Marggraff's Opusc. ii. 111). Marggraff showed likewise, by many experiments, that crystals of alum cannot be obtained by dissolving alumina in sulphuric acid, and evaporating the solutions. The crystals formed are always soft, and quite different in their appearance from alum crystals. But when a solution of potash or ammonia is dropt into this liquid, it immediately deposits perfect crystals of alum ("Sur la Régénération de |'Alun," Marg- graff's Opuse. ii. 86). He mentions likewise that manu- facturers of alum in general were unable to procure the salt without a similar addition, that at first it had been customary to add a quantity of putrid urine, and that afterwards a solution of carbonate of potash was sub- stituted in its place. But subsequent chemists do not seem to have paid much attention to these important observations of Margeraff: they still continued, without

'any rigid examination, to consider alum as a sulphate of

alumina.

Bergmann indeed had observed that the addition of potash or ammonia made the alum crystallise, but that the same effect was not produced by the addition of soda or of lime ("De Confectione Aluminis," Bergmann's Opusc. i. 225). He had observed likewise that sulphate of potash is fre- quently found in alum. He decomposed the solution of alum by means of ammonia, evaporated the filtered liquid to dryness, and exposed the residue to a red heat. A quantity of sulphate of potash often remained behind in the crucible (dbid., p. 326). From these facts he drew

the conclusion that sulphate of potash readily combines with sulphate of alumina.

After Klaproth had discovered the existence of potash as an ingredient in lewcite and lepidolite, it occurred to Vauquelin that it was probably an ingredient likewise in many other minerals. He recollected that alum crystals often make their appearance during the analysis of stony bodies; and, considering that alum cannot be obtained in crystals without the addition of potash, he began to suspect that this alkali constituted an essential ingredient in the salt. A set of experiments, undertaken on purpose to elucidate this important point, soon satisfied him that his conjecture was well-founded. Accordingly, in the year 1797 he published a dissertation demonstrating that alum is a double salt, composed of sulphuric acid, alumina, and potash (Annales de Chimie, xxii. 258). Soon after, Chaptal published the analysis of four different kinds of alum, namely, Roman alum, Levant alum, British alum, and alum manufactured by himself. This analysis led to the same result as that of Vauquelin (Ann. de Chim. xxii. 280).

Since that time alum has been admitted by chemists to be a triple salt, and various analyses of it have been made to determine its constituents. Vauquelin (Ann. de Chim. 1. 167), Thenard and Roard (

One of the most remarkable differences between the three species of alum. is the solubility of each in water. At the temperature of 60°, 100 parts of water dissolve—

9°37 parts of ammoniacal alum,

14°79 parts of potash alum, 327°6 parts of soda alum.

This great solubility of soda alum renders the manufacture of it very difficult. It does not easily crystallise; indeed, when the weather is hot, crystals of it can hardly be obtained. Its great solubility would render it more con- venient and more economical for dyers and calico-printers, provided it could be furnished at the same rate with conmmon alum. But the greater difficulty attending the making of it would probably prevent it from being sale- able at a price sufficiently low to make it available as a mordant.

Soda alum was first mentioned by Mr Winter in 1810, in his account of the Whitby alum processes (Nicholson's Jour. xxv. pp. 254, 255); but before that time it had been made by Mr Charles Macintosh of Crossbasket. Mr William Wilson, at Hurlet, near Glasgow, afterwards made it in considerable quantities. Specimens of it have been sent by Dr Gillies from the neighbourhood of Mendoza, in South America, where it occurs native in considerable quantity.

These three different species of alum differ also some- what from each other in their specific gravities, which are as follows :—

ATO TEE NUT cconh pnecosponboadsoondancoanoabessee 1°56 Povaanwalum …. 2.2: oeens.. cece seed ca eae 1°75 Sodavalinn.. 2:2: 5.:-4:5..0 cee 1°88}

The word alwmen, which we translate alwm, occurs in Pliny's Natural History. In the 15th chapter of his 35th book he gives us a detailed description of it. By com- paring this with the account of orumrnpia given by Diosco- rides in the 123d chapter of his 5th book, it is obvious that the two are identical. Pliny informs us that alumen SSS eee

1 The soda alum whose specific gravity is here given was the native, from the province of St Juan, on the north of Mendoza. It contains less water, and therefore is probably heavier than common soda alum.

was found naturally in the earth. He calls it salsugo terre. Different substances, he informs us, were dis- tinguished by the name of alumen; but they were all characterised by a certain degree of astringency, and were all employed in dyeing and medicine. The light-coloured alumen was useful in brilliant dyes, the dark-coloured only in dyeing black or very dark colours. One species was a

liquid, which was apt to be adulterated; but when pure

it had the property of striking a black with the juice of the pomegranate. This property seems to characterise a solution of sulphate of iron in water. It is quite obvious that a solution of our alum would possess no such property, Pliny says that there is another kind of alum which the Greeks call schistos. It forms in white threads upon the surface of certain stones. From the name schistos, and the mode of formation, there can be little doubt that this species was the salt which forms spontaneously on certain slaty minerals, as alum slate and bituminous shale, and which consists chiefly of sulphate of iron and sulphate of alumina. Possibly in certain places the sulphate of iron may have been nearly wanting, and then the salt would be white, and would answer, as Pliny says it did, for dye- ing bright colours. Several other species of alumen are described by Pliny, but we are unable to make out to what minerals he alludes.

The alumen of the ancients, then, was not the same with the alum of the moderns. It was most commonly a sulphate of iron, sometimes probably a sulphate of alumina, and usually a mixture of the two. But the ancients were unacquainted with our alum. They were acquainted with sulphate of iron in a crystallised state, and distinguished it by the names of misy, sory, chalcanthum (Pliny, xxxiv. 12). As alum and green vitriol were applied to a variety of purposes in common, and as both are distinguished by a sweetish and astringent taste, writers, even after the discovery of alum, do not seem to have discriminated the two salts accurately from each other. In the writings of the alchemists we find the words misy, sory, chalcanthum, applied to alum as well as to sulphate of iron; and the name atramentum sutorium, which ought to

belong, one would suppose, exclusively to green vitriol, applied in- differently to both.

When our alum was discovered is entirely unknown. Beckmann devoted a good deal of attention to the history of this salt, and published a curious dissertation on the sub- ject; but his attempts to trace its origin were unsuccessful. The manufacture of it was discovered in the East, but at what time or place is totally unknown. It would appear that, about four or five hundred years ago, there was @ manufactory of it at Edessa in Syria, at that time called Rocca,— hence, it is supposed, the origin of the term rock alum, commonly employed in Europe; though others allege that the term originated at Civita Vecchia, where alum is made from a yellow mineral which occurs in the state of a hard rock. |

Different alum works existed in the neighbourhood of Constantinople. About the time of the fall of the Grecian empire the art of making alum was transported into Italy, at that period the richest and most manufacturing country in Europe. Bartholomew Pernix, a Genoese merchant, discovered alum ore in the island of Ischia, about the year 1459. Nearly at the same time John di Castro, who was well acquainted with the alum works in the neighbourhood of Constantinople, suspected that a mine- ral fit for yielding alum existed at Tolfa, because it was covered with the same trees that grew on the alum mine- ral near Constantinople. His conjecture was verified by trials, and the celebrated manufactory at Tolfa established. Another was begun in the neighbourhood of Genoa; and the manufacture flourished in different parts of Italy. To

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this country it was confined for the greater part of a century. Various manufactories of it were established in Germany by the year 1544,

England possessed no alum works till the reign of Charles I. Thomas Chaloner, son of Dr Chaloner, who had been tutor to Charles, while

hunting on a common in Yorkshire took notice of the soil and herbage, and tasted the water. He found them similar to what he had seen in Germany where alum works were established. In consequence of this he got a patent from Charles for an alum work. Since that time various alum works have

been established in different parts of Great Britain,—

the most important now in operation being the Whitby works, originally established by Mr Chaloner; and the

works at Pendleton, near Manchester, and Goole, York-

shire, and at Hurlet and Campsie, both in the neighbour- hood of Glasgow.

Several alum works exist in Sweden, particularly in West Gothland. There is one, for example, at Heenszeter, near the borders of the Wener Lake. But for a descrip- tion of the Swedish works we refer to Bergmann's Opus- cula, 1. 284, or English translation, i 342.

Various minerals are employed in the manufacture of alum, but by far the most important of them are the fol- lowing three : alum-stone, alum-slate, bituminous shule.

Alum-stone or Alunite was first observed at Tolfa, near Rome, in the 15th century, and afterwards in Hungary and several other places, chiefly in trachyte or other vol- canic rocks. It appears to be produced by the action of sulphureous vapours on the felspars they contain, and gene- rally occurs in compact, granular, or earthy masses, mixed with quartz or felspar. Small crystals are found in cavities, and are either rhombohedrons with angles of 89° 10', and thus nearly cubes, or these with the polar angles replaced by the basal plane. The specific gravity ranges from 2-58 to 2-752, the compact varieties being the lighter. Its hardness is 3°5 to 4, or rather softer than fluor spar. It has a distinct cleavage perpendicular to the axis of the thombohedron, and conchoidal fracture in other directions. The pure varieties are white and colourless, but it is often coloured greyish, yellowish, or reddish.

The erystals de- crepitate before the blowpipe, but are infusible, as well as the compact alunite. The alum is extracted from this mineral by repeated roasting and treating with water. The absence of iron accounts for the superior purity for which the Roman alum was long celebrated.

Alum-slate is a far more abundant substance, occurring in beds in different formations. Thus it is common in the older Palaeozoic or Silurian strata of Scandinavia and Scotland. Generally it is distinctly slaty, but sometimes forms rounded balls or concretions. It contains much carbonaceous matter, and hence its colour is greyish or bluish-black. It has a dull lustre, is soft and sectile. It contains much disseminated iron pyrites, and on decom- position in the air yields sulphate of iron, and alum as an efflorescence on the surface.

Many of the shales or slate clays in the coal formation also contain much iron pyrites, and thus also produce alum when acted on by the atmosphere. Such are those used for manufacturing alum at Campsie and other places near Glasgow. Where they contain much bituminous matter they show a shining resinous streak and greyish- black colour, and are named bituminous shales. These burn when heated, with a pale flame and sulphureous odour.

The alum. slates at Whitby in Yorkshire belong to the Lias, and are used in the alum works in that neigh- bourhood. In other places, as in many parts of Germany, similar beds are found in Tertiary formations, particularly MM connection with the brown coal deposits. When fresh

dug they often show no trace of alum, which only appears after exposure to the air, or when the decomposition of the iron pyrites is assisted by the action of heat.

Several native varieties of sulphate of alumina and soda alum occur in South America, some of the most remarkable of which it may be proper to specify.

1, Sulphate of alumina, or Alunogene, was first found at Rio Saldanha, but is now obtained from several places in Europe and America. The

colour is white, here and there tinged yellow, obviously from external impurities. It occurs in fine crystalline needles ; lustre silky ; taste that of alum, but stronger; specific gravity, 1-6 to 1-7; soft; before the blowpipe behaves like alum.

2. Soda-alum. It occurs native in the province of St Juan, situated to the north of Mendoza, on the east side of the Chilian Andes, at about 30°S. lat. The alum is white, and composed of fibres adhering longitudinally, and having a certain breadth, but very thin. It bears some resemblance to fibrous gypsum, but it is harder, not being scratched by the nail, though the knife scratches it with great ease. It is sectile. The outer fibres are white and only slightly translucent, as if they had lost a portion of their water; but the internal fibres are transparent, and have a silky aspect. It tastes precisely like alum, and is very soluble, water at the temperature of 62° dissolving 3-773 parts of it, and boiling water dissolving any quantity whatever. When exposed to heat, it behaves very nearly as common alum.

3. There is a mineral called aluminite, which was ob- served in the environs of Halle many years ago, and which was afterwards detected by Mr Webster in clay resting on chalk at Newhaven in Sussex. This, if it were sufficiently abundant, would constitute an excellent material for the manufacture of alum. Its colour is snow-white. It occurs in reniform pieces of greater or smaller size ; fracture fine earthy ; dull ; streak glistening ; opaque ; adheres feebly to the tongue ; soils very slightly ; very soft; feels fine, but meagre ; specific gravity, 1:7054. It consists of alumina, sulphuric acid, and water.

Four different processes are employed in the manufac- ture of alum, according to the nature of the mineral from which the alum is to be extracted.

The process employed at Tolfa is the simplest of all. If the Tolfa stone be kept constantly moistened with water for about two months, it falls to powder of itself, and yields alum by lixiviation. But this is not the pro- cess employed by the manufacturers. The alum-stone is broken into small pieces, and piled on the top of a per- forated dome, in-which a wood fireis kindled. The smoke and flame of the wood penetrate

through the pieces of alum-stone, and a sulphureous odour is disengaged, owing to the decomposition of a portion of the sulphuric acid in the stone. This roasting is twice performed ; the pieces of ore which the first time were at the edge of the dome, being the second time put in the middle. The process of roasting this stone requires considerable attention, If the heat be too great, the quality of yielding alum is destroyed: if the heat be too small, the stone does not readily fall to powder. There can be little doubt that the unroasted stone would yield more alum than the roasted ; but probably the additional labour requisite in the latter case would more than swallow up the increase of product.

The roasted stone, which has now acquired a reddish colour, is placed in rows between trenches filled with water. This liquid is so frequently sprinkled on it that the stone is always moist. In two or three days it falls to powder, like slacked quicklime ; but the daily watering is continued for a month. The success of this part of the operation is said to depend very much on the weather. When the weather is rainy, the alum is all washed

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out, and little or nothing left for the manufacturer to extract.

When the stone has by this process been reduced to a sufficiently fine powder, it is thrown into a leaden boiler filled two-thirds with water. During the boiling the powder is frequently stirred up, and the water that eva- porates is replaccd. When the boiling has been continued for a sufficient time, the fire is withdrawn, and tine allowed for the earthy matter to subside to the bottom. A cock is then opened, which allows the clear liquor to flow out into deep wooden square vessels, so made that they can be easily taken to pieces. Here the alum gradu- ally crystalliscs, and attaches itself to the sides and bottom of the vessel. The mother liquid is then drawn off into shallower wooden troughs, where more alum crystals are deposited. The liquid has now a red colour, and is muddy ; and the last alum crystals are mixed with this

red matter. They are washed clean in the mother liquor, which is finally pumped into a trough, and used in subse- quent processes.

The alum obtained at Tolfa is known by the name of Roman alum, and is in very high estimation. It is always mixed with a little reddish powdery matter, which is easily separated from it.

Alum-slate, being very different in its composition, re- quires a different treatment to fit it for yielding alum. If the alum-slate contain a notable quantity of lime or mag- nesia, it does not answer the purposes of the manufacturer so well. The essential ingredients in alum-slate, for the alum-makers, are alumina and iron pyrites.

The first process is to roast the ore. In Sweden, where the fuel is wood, and consequently expensive, it is cus- tomary to use the alum-slate itself as fuel for roasting the ore. For this purpose a small layer of brushwood is covered with pieces of alum-slate, and set on fire; and, as the combustion proceeds, new layers of alum-slate are added. It is usual to place alternate layers of roasted and unroasted alum-slate. The combustion continues for a month or six weeks. At Whitby, coal is employcd for roasting the alum-slate. Indeed the alum-slate of Whitby is lighter coloured than that of Sweden, and probably would not burn of itself. So great is the quantity of com- bustible matter in the Swedish alum-slate that it is em- ployed as fuel for burning limestone. Great quantitics of limestone are burnt in this manner at Hunneberg, near the south side of the lake Wener. The roasted ore has usually a brown colour. When it is red the quantity of alum which it yields is considerably diminished.

By this roasting the pyrites is oxidised into sulphate of iron and sulphuric acid, thus :—

FeS,+0,+H,O = FeSO,+H,SO, The sulphuric acid as it is produced is, however, at once neutralised by the large excess of alumina producing sul- phate, so that the result of the action is to produce a mixture of the sulphates of iron and alumina.

The roasted ore has an astringent taste, owing to the sulphate of iron and sulphate of alumina which it con- tains. The next process is to lixiviate it with water, in order to dissolve these salts. For this purpose it is put into reservoirs made of wood or masonry, with a stop- cock at the bottom to draw off the water. The usual method is to keep the water for twelve hours in contact with ore that has been twice lixiviated; then to draw it off, and allow it to remain for au equal period on ore that has been once lixiviated. Lastly, it is run upon fresh ore, and allowed to remain on it for twelve hours longer. If the specific gravity of the liquid thus treated be 1:25 at the temperature of 55°, it may be considered as saturated with sulphate of alumina and sulphate of iron ; but probably this specific gravity is not often obtained.

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ALUM

The liquid, thus impregnated with salt, is now boiled down in lcaden vessels to the proper consistency for crys- tallisation. In Sweden the fuel employed for this pur- pose is alum-slate. By this means a double effect is produced—the liquid is evaporated, and the alum-slate is roasted. During the boiling abundance of oxide of iron falls, mixed with selenite, if lime be one of the con- stituents of the alum-slate. When the liquid is suffi- ciently concentrated it is let into a square reservoir, in order to crystallisc. Great quantities of sulphate of iron crystals arc usually deposited in this vessel. These are collected by drawing the liquid off into another reservoir, When all the sulphate of iron that can be obtained hag been separated, a quantity of sulphate of potash or am- monia, muriate of potash, or putrid urine, is mixed with the liquid. The sulphate of potash is procured from the sulphuric acid makers, and the muriate of potash from the soap-makers. By this addition alum is formed in the liquid, and it gradually deposits itself in crystals on the sides of the vessel. These crystals are collected, and dis- solved in the smallest quantity of boiling water that will take them up. This solution is poured into large wooden casks. Iu a fortnight or three weeks the alum crystal- lises, and covers the sides and bottom of the cask. The hoops are now taken off, and the staves of the cask

removed. A mass of alum crystals, having the shape of the cask, remains: This mass is pierced, the mother liquor allowed to run out, and preserved for a subsequent process. The alum, being now broken in pieces, is fit for sale.

The manufacture of alum from bituminous shale and slate-clay bears a considerable resemblance to the manu- facture from alum-slate, but differs in several particu- lars. We shall give a sketch of the processes followed in two works of this kind that are in operation in the neigh- bourhood of Glasgow. The bituminous shale and slate- clay employed are obtained from old coal-pits, which are very extensive near Glasgow. 'The air in these coal-pits is moist, and its average temperature about 62°. The shale having been exposed for many years, has gradually opened in the direction of its slaty fracture, so as to re- semble in some respects a half-shut fan ; and all the chinks in it are filled with a saline efflorescence in threads. This salt is white, with a shade of green, has a sweetish as- tringent taste, and consists of a mixture of sulphate of iron and sulphate of alumina. In order to obtain these salts in a state of solution, nothing more is requisite than to lixiviate this shale with water. The lixiviated ore being left exposed to the weather, forms more salt, which is gradually washed out of it by the rain-water, and this water is collected and preserved for use.

The next step in the process is to boil down the liquid to a sufficient state of concentration. At Campsie all the boilers are composed of stone, and the heat is applied to the surface. This is a great saving, as leaden vessels are not only much more expensive, but require more fre- quent renewal. When the liquid is raised to a sufficiently high teniperature in the stone reservoir, pounded sulphate of potash, or muriate of potash, as they can be procured, is mixed with it ; and there is an agitator in the vessel, by which it is continually stirred about. This addition con- verts the sulphate of alumina into alum. The liquid 1s now let into another trough, and allowed to remain till it crystallises. In this liquid there are two salts contained in solution— viz., sulphate of iron and alum ; and It 1s al object of great consequence to separate them completely from each other. The principal secret consists in drawing off the mother liquor at the proper

time; for the alum 1s much less soluble in water than the sulphate of iron, and therefore crystallises first. The first crystals of alum formed are very impure. They have a yellow colour, and

seem to be partly impregnated with sulphate of iron. They are dissolved in hot water, and the solution poured into troughs, and allowed to crystallise a sccond time. These second crystals, though much purer, are not quite free from sulphate of iron; but the separation is accom- plished by washing them repeatedly with cold water ; for sulphate of iron is much more soluble in that liquid than alum. These second crystals are now dissolved in as small a quantity of hot water as possible, and the concentrated liquid poured while hot into large casks, the surface of As the liquor cools, a vast number of alum crystals form on the sides The casks are allowed to remain till the liquid within is supposed to be nearly of the temperature This, in winter, requires eleven days ; The liquid, after standing eleven days in summer, has been observed to be still above The hoops are then removed, precisely as in

which is covered with two cross beams. and surface.

of the atmospliere. in summer, fourteen or more.

blood heat. the manufacture of alum from alum-slate.

There always remains in the boilers a yellowish sub-

stance, consisting chiefly of peroxide of iron. This is exposed to a stroug heat in a reverberatory furnace, and it becomes red. In this state it is washed, and yields more alum. The red residue is ground to a fine powder, and dried. It then answers all the purposes of Venetian red asa pigment. By altering the temperature to which this matter is exposed, a yellow ochre is obtained instcad of a red.

In France, where alum ores are by no means abundant, alum is manufactured from clay. This method of. making the salt was first put

in practice by Chaptal when pro- fessor of chemistry at Montpellier. His methods have been since gradually improved, and brought to a state of considerable perfection. The first process tried was this: The clay was reduced to a fine powder in a mill, and then mixed with sulphuric acid. After remaining some days, it was exposed for twenty-four hours to a temperature of about 130°. It was then lixiviated, and the liquid mixed with urine or potash. This method being found inconvenient, was abandoned for the following :—The clay being well ground, was mixed with half its weight of the saline residue from a mixture of sulphur and nitre. This residue is little else than sulphate of potash. The mixture was formed into balls about 5 inches in diameter, which were calcined in a potter's furnace. They were then placed ou the floor of a chamber in which sulphuric acid was made. The acid vapour caused them to swell, and to open on all sides. In about a month they were sufficiently penetrated with the acid. They were then exposed to the air, under shades, that the saturation might become more complete. Finally, they were lixiviated, and the liquid being evapo- rated, yielded pure alum.

This process was considerably improved by Berard, of the Montpellier alum work. Instead of exposing the calcined balls to the fumes of sulphuric acid, he sprinkled them with a quantity of sulphuric acid of the specific gravity 1-367, equal to the weight of the clay employed ; but it is obvious that the proportion must vary with the nature of the clay. The solution takes place with the greatest facility, and crystals of alum are obtained by evaporating the liquid.

Another process was put in practice by Chaptal, in the neighbourhood of Paris. A mixture is made of 100 parts of clay, 50 parts of nitre, and 50 parts of sulphuric acid of the specific gravity 1-367 ; and this mixture is put into @ retort and distilled. Aquafortis comes over, and the residue in the retort being lixiviated with water, yields abundance of excellent alum.

For chemical constitution and relations of the alums, see CHEMISTRY.

ALUMBAGH, the name of a large park or walled enclosure, containing a palace, a mosque, and other build- ings, as well as a beautiful garden, situated about 4 miles from Lucknow, near the Cawnpore road. It was converted into a fort by the mutineers in 1857; and after its capture by the British was of importance in connection with the military operations around Lucknow. See Lucknow.

ALUMINIUM, a metallic substance, first separated from the chloride by Wohler in 1828, It remained a laboratory product until Deville, about 1858, succecded in improving the mode of production, so as to render the operations capable of management on the manufacturing scale. The process consists in heating to a red heat a mixture of the double chloride of aluminiuin and sodium, or the double fluoride of aluminium and sodium (cryolite), with the metal sodium.

Aluminium is a white metal resembling silver in appear- ance. It is very malleable and ductile, and may be beaten and rolled into thin sheets, or drawn into fine wire. By hammering in the cold it becomes as hard as soft iron, but may be softencd again by fusion. Being highly sonorous, it has been used for making bells. It is very light, being only 24 times heavier than water, and is thus four times lighter than silver. After fusion it has a specific gravity of 2°56; by hammering this may be increased to 2°67. It melts at a red heat, and is non-volatile at very high temperatures. The metal conducts heat and electricity as well as silver. Aluminium does not oxidise in air, even at a red heat, has no action on water at ordinary tempera- tures, and is not acted upon by sulphuretted hydrogen or sulphide of ammonium, and thus preserves its lustre where silver would be tarnished and blackened. It is not at- tacked by nitric acid, even when concentrated, and is not soluble in dilute sulphuric acid, but is readily soluble in dilute or concentrated hydrochloric acid with evolution of hydrogen. Solutions of caustic potash or soda dissolve the metal with great ease, forming aluminate of potash or soda, and giving off hydrogen. Aluminium forms alloys with most metals. The copper alloy called aluminium- bronze is the most important because of its colour, hard- ness, and malleability, and is largely used for articles of jewellery, for mounting sextants and other astronomical instruments, and for making balance beams.

ALUTA, an affluent of the Danube. See Att.

ALVA, a village in Stirlingshire, Scotland, situated at the foot of Craigleith, one of the Ochil range, 7 miles N.E. of Stirling, with which it is connected by railway. Besides the parish church, there are places of worship belonging to the Free and United Presbyterian churches, Yarn spin- ning and the manufacture of shawls and tweeds are carried on to a considerable extent. Population in 1871, 4096.

ALVA, or AtBa, FERNANDO ALVAREZ DE TOLEDO, Duke of, born in 1508, was descended from one of the most illustrious families in Spain. His grandfather, Ferdinand

of Toledo, educated him in military science and politics ; and he was engaged with distinction at the battle of Pavia while still a youth. Selected for a military command by Charles V., he took part in the siege of Tunis (1535), and successfully defended Perpignan against the Dauphin of France. He was present at the battle of Miihlberg (1547), and the victory gained there over John of Saxony was due inainly to his exertions. He took part in the subsequent siege of Wittenberg, and presided at the eourt-martial which tried the Elector and condemned him to death. In 1552 Alva was intrusted with the command of the army intended to invade France, and was engaged for several months in an unsuccessful siege of Metz. In consequence of the success of the French arms in Picdmont, he was made commander-in-chief of all the emperor's forces in Italy, and at the same time invested with unlimited power. Success did not, however, attend his first attempts, and after several unfortunate attacks he was obliged to retire into winter quarters. After the abdication of Charles he was continued in the command by Philip I., who, how- ever, restrained him from extreme measures. Alva had subdued the whole Campagna, and was at the gates of Rome, when he was compelled by Philip's orders to nego- tiate a peace. One of its terms was, that the Duke of Alva should in person ask forgiveness of the haughty pontiff whom hc had conquered. Proud as the duke was by nature, and accustomed to treat with persons of the highest dignity, yet such was the superstitious veneration then

entertained for the papal character that he confessed his voice failed him at the interview, and his presence of mind forsook him. Not long after this (1559) he was sent at the head of a splendid embassy to Paris, to espouse, in the name of his master, Elizabeth, daughter of Henry, king of France. In 1567, Philip, who was a bigoted Catholic, sent Alva into the Netherlands at the head of an army of 10,000 men, with unlimited powers for the extir- pation of heretics. When he arrived he soon showed how much he merited the confidence which his master reposed in him, and instantly erected a tribunal which soon became known to its victims as the "Court of Blood," to try all persons who had been engaged in the late commotions which the civil and religious tyranny of Philip had excited. He imprisoned the counts D'Egmont and Horn, the two popular leaders of the Protestants, brought them to an unjust trial, and condemned them to death. In a short time he totally annihilated every privilege of the people, and, with unrelenting cruelty, put multitudes of them to death. The executioner was employed in removing all those friends of freedom whom the sword had spared. In most of the considerable towns Alva built citadels. In the city of Antwerp he erected a statue of himself, which was a monument no less of his vanity than of his tyranny: he was figured trampling on the necks of two smaller statues, representing the two estates of the Low Countries. By his unusual and arbitrary demand of new supplies from the states he greatly aggravated this insult. The exiles from the Low Countries, roused to action by his oppression, fitted out a fleet of privateers, and after strengthening themselves by successful depredations, ventured upon the bold exploit of seizing the town of Breil. Thus Alva, by his cruelty, became the unwitting instrument of the future independence of the scven Duteh provinces. The fleet of the exiles having met the Spanish fleet, totally defeated it, and reduced North Holland and Mons. Many cities hastened to throw off the yoke; while the States-General, assembling at Dordrecht, openly declared against Alva's government, and marshalled wnder the banners of the Prince of Orange. Alva's preparations to oppose the gathering storm were made with his usual vigour, and he succeeded in recovering Mons, Mechlin, and Zutphen,

under the conduct of his son Frederick. With the excep- tion of Zealand and Holland, he regained all the provinces; and at last his son storined Waerdan, and massacring its inhabitants, proceeded to invest the city of Haarlem, whieh, after standing an obstinate sicge, was taken and pillaged. Their next attack was upon Alkmaar ; but the spirit of desperate resistance was raised to such a height in the breasts of the Hollanders that the Spanish veterans were repulsed with great loss, and Frederick constrained reluetantly to retire. Alva's feeble state of health and con- tinued disasters indueed him to solicit his recall from the government of the Low Countries; a measure which, in all probability, was not displeasing to Philip, who was now resolved to make trial of a milder administration. In December 1573 the much oppressed country was relieved from the presence of the Duke of Alva, who, returning home aecompanied by his son, made the infamous boast that during the course of six years, besides the multitudes destroyed in battle and massacred after victory, he had consigned 18,000 persons to the executioner. (For further details of his administration in the Netherlands, see HoLLAND.)

On his return he was treated for some time with great distinction by Philip. A tardy and imperfect justice, how- ever, overtook him, when he was banished from court and eonfined in the castle of Uzeda for complicity in certain disgraceful conduct of his son. Here he had remained two years, when the success of Don Antonio in assuming the erown of Portugal determined Philip to turn his eyes towards Alva as the person in whose fidelity and abilities he eould most confide. A secretary was instantly despatched to Alva to aseertain whether his health was sufficiently vigorous to enable him to undertake the command of an army. 'The aged chief returned an answer full of loyal zeal, and was immediately appointed to the supreme com- mand in Portugal. It is a striking fact, however, that the liberation and elevation of Alva were not followed by forgiveness. In 1581 Alva entered Portugal, defeated Antonio, drove him from the kingdom, and soon reduced the whole under the subjection of Philip. Entering Lisbon, he seized an immense treasure, and suffered his soldiers, with

their accustomed violence and rapacity, to sack the suburbs and vicinity. It is reported that Alva, being requested to give an account of the money expended on that occasion, sternly replied, " If the king asks me for an account, I will make him a statement of kingdoms preserved or conquered, of signal victories, of successful sieges, and of sixty years' service." Philip deemed it proper to make no further inquiries. Alva, however, did not enjoy the honours and rewards of his last expedition, for he died in January 1583, at the age of 74.

ALVARADO, PEpRo DE, one of the Spanish leaders in the discovery and conquest of America, was born at Badajoz about 1495. He held a command in the expedition sent from Cuba against Yucatan in the spring of 1518, and returned in a few months, bearing reports of the wealth and splendour of Montezuma's empire. In February 1519 he accompanied Hernando Cortez in the expedition for the conquest of Mexico, being appointed to the command of one of the eleven vessels of the fleet. (For the details of this expedition and of Hernando's share in it, see CorTEZ and Mexico.) He was engaged (1523-4) in the conquest of Guatemala, of which he was subsequently appointed governor by Charles V, In 1534 he attempted to bring the province of Quito under his power, but had to content himself with the exaction of a pecuniary indemnity for the expenses of the expedition. During a visit to Spain, three years later, he had the governorship of Honduras conferred upon him in addition to that of Guatemala. He died in Guatemala in 1541.

ALVAREZ, Francisco, born at Coimbra after 1460, a

priest and almoner to Dom Manuel, king of Portugal, was sent in 1515 as secretary to Duarte Galvao, on an embassy The expedition having been delayed by the way, it was not until 1520 that he reached

to David, king of Abyssinia.

Abyssinia, where he remained six years, returning to Lisbon in 1527.

to Pope Clement VII. The precise date of his death, like

that of his birth, is unknown; but it must have been later than 1540, in which year he published at Lisbon, under

the king's patronage, an account of his travels, in one

volume folio, entitled Verdadeira Informacam do Preste

Joas das Indias. This curious work was translated in

Latin, under the title of De Fide, Regione, et Moribus Aithiopum, by Damien Goez, a Portuguese gentleman 3 and

has often been reprinted and translated into other lan- guages. The information it contains must, however, be received with caution, as the author is prone to exaggerate, and does not confine himself to what came within his own observation.

ALVAREZ, Dow Joss, the foremost Spanish sculptor of modern times, was born at Priego, in the province of Cordova, in 1768, and died at Madrid in 1827. Bred to his father's trade of a stone-mason, he devoted all his spare time to drawing and modelling. In his twentieth year he became a pupil of the Academy of Granada. A work he executed soon afterwards for a fountain in his native town attracted the noticc of the Bishop of Cordova, who took the young artist into his house and maintained him for several years. In 1799 he obtained from Charles IV. a pension of 12,000 reals, to enable him to visit Paris and Rome. In the former city he executed, in 1804, a statue of Ganymede, which placed him at once in the front tank of sculptors. Shortly afterwards his pension was more than doubled, and he left Paris for Rome, where he remained till within a year of his death. The most im- portant of his numerous works, executed during this period, was a group representing Antilochus and Memnon, which was commissioned in marble (1818) by Ferdinand VIL, and secured for the artist the appointment of court sculptor. It is now in the Muscum of Madrid. Alvarez modelled a few portrait busts (Ferdinand VII., Rossini, the Duchess of Alba), which are remarkable for their vigour and fidelity.

ALVAREZ, Don ManveEt, a Spanish sculptor, was born at Salamanca in 1727, and died in 1797. He followed classical models so closely that he was styled by his countrymen 4 G'riego, "The Greek." His works, which are very numerous, are chicfly to be found at Madrid.

ALWAR, a semi-independent state of Rajputana, and under the control of the Governor-General's agent for Rajputan4, lies between 28° 13' 25" and 27° 14' 34" N. lat., and between 77° 15' 35" and 76° 14' 10" E, long. It is bounded on the E. by the state of Bhartpur and the British district of Gurgdon, on the N. by Gurgdon district and the states of Patidlé and Nabha, on the W. by the states of NAbh4 and J aipur, and on the S. by the states of Jaipur and Bhartpur. Its configuration is irregular, the greatest. length from north to south being about 80 miles, and breadth from east to west about 60 miles, with a total area of about 3000 square miles. The total population of the state, as ascertained by a census taken in 1872, was 778,596, consisting of 598,333 Hindus, 180,225 Mahometans, and 38 Christians. The number of males was returned at 418,723, and females at 359,873, the proportion of males to the total population being 53°76 Per cent. The eastern portion of the state is open and highly cultivated ; the western is diversified by hills and peaks, which form a continuation of the Aravalli range, from 12 to 20 miles in breadth. These hills run in rocky and precipitous parallel ridges, in some places upwards of 2200 feet in height. The Sabhi river flows through the

In 1533 he was sent to Rome on an embassy

north-western part of the state, the only other stream of importance being the Ruparel, which rises in the Alwar

hills, and flows through the state into the Bhartpur terri- tory.

The one attempt at road-making in the state is a line which con- nects the chief town, Alwar, with RAjghar on the onc side and with Tijard on the other. The greater portion of this road was metalled during the minority of the present raja, but it has been neglected since fe took the

management of the state into his own hands, aud is now said to be almost impassable, and worse than the ordinary cart tracks. The earthwork for a road from Alwar to the Bhartpur border was thrown up, but it has never been metalled, and the line is not used for traffic. The Alwar hills are rich in minerals. Iron ore is found in large quantities close to the surface. Thirty smelting furnaces are kept at work, and are capable of turning out 390 tons a-year. They give employment to a large number of people. Two copper mines have been in operation for a number of years, but with doubtful advantage to the state. Silver, Icad, and sulphur are also found in small quantities, and attempts have been made to work them, but without success. The rincipal agricultural products are wheat and barley during the Ba weather, with grain to a less extent. Jodr, bajré, and Indian corn are raised during the rains. Cotton is extensively cultivated, and exported on a considerable scale, A ten years' land settlement, which was formed by a late re resident, is now expiring, and a fresh settlement for a onger term is being made. 'The revenue of the state has for some time becn in an unsatisfactory state. When the raja attained his majority, and was invested with the full administration of his terri- tory in 1863, the treasury contained a surplus of £205,000. Within seven years this surplus had dwindled away, and dcbts to the extent of £160,000 accumulated. Under these circumstances, the govern- ment found it necessary to place the administration of the state in the hands of the political resident, assisted by a council of manage- ment consisting of five of the principal chiefs and native gentlemen of the state. In 1870-71, the first year under the new management, the revenue of the state amounted to £213,085, and the expenditure to £135, 201, leaving a surplus of £77,884, part of which was devoted to the liquidation of the state debt, the remainder being kept as a working balance. An allowance of £18,000 a-year is made for the household expenses of the rajé, besides an establishment of horses, carriages, and elephants maintained for his use. The educational institutions consist of a high school, attended in 1871-72 by 382 students ; a Thakur school, for the education of the sons of chiefs and native gentlemen, and attended by 51 pupils ; and sixty other schools, containing a total of 2785 pupils. Seven towns in the state are returned as containing a population of upwards of 5000 souls—namely, Alwar,

52,357; Réjghar, 12,070 ; Tijara, 7382; Govindgarh, 5720; Ramgarh, 5581 ; Rampur, 5381; and Bahror, 5213. 'The only municipality is the town of Alwar. It derives its municipal revenue from a tax of 1 per cent. on the supposed income of the owners of houscs. This tax yields about £800 per annum, out of which, with some assistance from the state, the city police, conservancy establishment, &c., are paid.

ALYPIUS, one of the seven Greek writers on music whose works are collected and published, with a com- mentary and explanatory notes, by Meibomius (Antique Musicee Auctores Septem, Amstel., 1652). The time in which he flourished cannot be precisely ascertained. He is said to have written before Euclid and Ptolemy; and Cassiodorus arranges his work, entitled Introduction to Music, between those of Nicomachus and Gaudentius, The work consists solely of a list of symbols of the various scales and modes, and is therefore probably only a fragment.

ALYPIUS or Antiocu, a geographer of the 4th century, who was sent by the Emperor Julian into Britain as prefect, and was afterwards commissioned to rebuild the temple of Jerusalem. Among the letters of Julian are two (29 and 30) addressed to Alypius; one inviting him to Rome, the other thanking him for a geographical treatise, which no longer exists.

ALYTH, a town on the eastern borders of Perthshire, in a parish of the same name, situated in the valley of Strathmore, 13 miles west of Forfar. It is tolerably well built, and contains a handsome parish church, and also Free, United Presbyterian, and Scottish Episcopal churches, The chief industrial employments are linen manufacturing and wool spinning, and there is a fair nearly every month. Alyth was created a burgh of barony by James III. Population in 1871, 2134,

AMADEUS V., surnamed the Great, Count of Savoy, was born at Bourget in 1249, and succeeded his uncle Philip in 1285. The cautious prudence of Amadeus enabled him greatly to increase his territory by

mcans of marriage, purchase, and donations. He gradually rose to such cminence among the European powers, that he was constituted their umpire to settle their differences—an office which he performed with much reputation to himself and advantage to them. In 1310 he was created a prince of the empire by Henry VII. When the Turks attempted to retake Rhodes from the knights of St John of Jerusalem, he acquired great renown by the valour with which he led an expedition to the relief of the island. A Maltese cross with the letters F.E.R.T. (Yortitudo ejus Rhodum tenuit), it is said, became the arms of Amadeus and his successors, in memory of this victory. Amadeus undertook a journey to Avignon to persuade Pope John XXII. to preach a crusade in favour of Andronicus. He died there in the year 1323.

AMADEUS VIIL., Count and first Duke of Savoy, and latterly pope or anti-pope, under the name of Felix V., was born at Chambery in 1383, and succeeded his father, Amadeus VII, in 1391. Having, by purchase or other- wise, added large territories to his patrimonial possessions, he became so powerful that the Emperor Sigismund erected Savoy into a duchy in 1416; and after his elevation Amadeus added Piedmont and other provinces to his dominions. After this increase of rank and of territory he suddenly, in 1434, retired to a monastery at Ripaille. He does not appear, however, to have resigned his duchy, but continued to adnuinister it through his son Louis. It is said, too, although some historians have cast doubts upon the story, that, instead of leading a life of asceticism, he spent much of the ducal revenues in furthering his own luxury and enjoyment. In 1439, when the pope, Eugenius IV., was deposed by the council at Basle, Amadeus, although not in orders, was elected, through bribery some say, his successor; and after resigning his duchy, was crowned in

the following year as Felix V. In the stormy conflict that

followed, the Emperor Frederick sided with Kugenius, and the nations of Europe, exccpt Germany, which remained neutral, declared for the one pope or the other. In 1449 Amadeus thought it prudent to renounce his claim to the pontificate in favour of Nicholas V., who had been elected on the death of Eugenius. He, however, induced Nicholas to

annul all the acts of Eugenius; to confirm the determi- nation of the council of Basle to appoint him perpetual apostolical legate in Savoy, Piedmont, and the other places of his own dominions; and even to confer on him the bishoprics of Basle, Lausanne, Strasburg, and Constance. It was also conceded to Amadeus that he should continue to wear the pontifical dress, except in a very few particulars; that he should not be obliged to go to Rome to attend any general council; and that he, instead of kissing the pope's toe, should be permitted to kiss his cheek. Amadeus died at Geneva in 1451.

AMADIS OF GAUL. The best edition for English readcrs of this famous work is to be found in the abridged translation of Southey, and the best account of it is to be found in his preface, which, however, is not void of error. Here, for example, is its final sentence :—" Amadis of Gaul is among prose what Orlando Furioso is among metrical romances—not the oldest of its kind, but the best." We, of course, in England would place the Morte d'Arthur above all romances of the kind; and the praise that we allow to Amadis of Gaul is precisely that which Cervantes bestows upon it—of being the earliest and best of the Spanish romances. When the licentiate and the barber burnt the library of Don Quixote, they spared from the flames only three romances—Amadis of Gaul, Palmerin of

England, and Tirante the White. "I have heard," said

the licentiate, " that Amadis of Gaul was the first book of chivalry printed in Spain, and that all the rest sprung from it; I think, therefore, as head of so pernicious a sect, we ought to condemn him to the fire without mercy." "'Not so, sir," said the barber, "for I have heard also that it is the best of all the books of this kind; and therefore— as being unequalled in its way—it ought to be spared." " You are right," said the priest, "and for that reason its life is granted." Although Cervantes speaks of the romance as a Spanish one, and although Southey translated it from the oldest extant edition, which is also Spanish, it is

cur- rently supposed to have been originally written in Portu- guese by Vasco Lobeira, himself a good knight, who re- ceived his spurs on the field of battle from King Joam, and who died in 1403. The work, however, has been claimed as of French origin by the Comte de Tressan. Southey ridicules this theory, and insists upon the claims of the Portuguese author. It is quite certain that the Comte de Tressan attempted to prove too much; but, on the other hand, Southey has not allowed weight enough to the fact that the Amadis of Gaul is but the first work of romance which appeared in the Portuguese and Castilian languages; that it was preceded for more than a century by other romances of Anglo-Norman origin; and that, if not in its names and personages, yet in its idea—in the character of its incidents and in much of its geography—it belongs to the world of Anglo-Norman romance. What though we cannot lay our hands on the French original from which Lobeira translated, any more than we can lay our hands on Lobeira's own work from which the Castilian version has been made, we still know that all the ideas and materials, all the design, all the machinery of Amadis of Gaul, belong to the Anglo-Norman cycle of romance which was in vogue before Lobeira was born. And in this creed we cheat him of nothing when we say that we know not to what extent he is entitled to the praise of originality. Knowing what we do of these romances, it is not enough to say, for the establishment of Lobeira's claims, that we cannot trace the Amadis of Gaul to any one before him. Expressions of his own throughout his work show that if he was nota literal translator, he was at least a borrower. Thus, towards the end of his third chapter he writes—" The author ceaseth to speak of this, and returneth to the child whom Gandales brought up." The Spanish translator, Montalus, confesses to have taken liberties with the Portuguese version from which he worked, altering, adding, and abridging. The Comte de Tressan maintains that the original French work must have ended with the third book and the rescue of Oriana; and that from this point we can distinctly trace the work of Spanish hands. Southey, again, thinks that the work, as it left the hands of Lobeira, ended in the fourth book with the marriage of Amadis and Oriana, and that all which follows is due to the tasteless accretions of Montalus. Although this is mere conjecture, still it is natural that we should attach no little force to the correct feeling of Southey. For the

story itself, it is impossible to give a summary of it—the plot being too discon- nected; but he who has read one such tale, or even a few chapters of one, may have a general impression of all— hacking and hewing in every page, knights always at war and seeking adventures, giants in the path, lions in the forest, damsels in durance, castles to be attacked, wizards and witches with hate in their hearts, kings everywhere plentiful as blackberries, and lovely ladies abounding in tenderness. 'The sentiment of the work is very noble, and some of the descriptions are full of fire; but the reader owes more than he is aware to the curtailments of Southey. AMADOU (Polyporus fomentarius), a fungus that grows upon old trees, especially the oak, ash, fir, and cherry. When beaten soft it is used as a styptic for slight hemorrhage,

After being boiled in a

and as material for surgical pads. solution of nitre it is employed as tinder.

AMAGER, or Amax, a small island belonging to Den- mark, lying in the Sound, close to the east coast of See- land. The channel which separates its northern extremity from Seeland forms the harbour of Copenhagen ; and nearly the third part of that city, the suburb of Christians- The island is about 9 miles long and 4 broad, with a fertile soil, which produces large quantities of vegetables for the Copenhagen market. It is peopled chiefly by the descendants of a Dutch colony which Christian IJ. brought there in 1516, who still

hafen, is situated in Amager.

retain many of the old peculiarities of dress, language, and

manners. Population about 9000, exclusive of the inhabit-

auts of Christianshafen. Castrup.

AMALASONTHA, or AMALasuENTHA, daughter of Theodoric, king of the Ostrogotls, was born about 498 A.D. In 515 she married Eutharic, the last representative of the Amali family, who died (524-5), leaving an only son, Athalaric. The latter was designated by his grand-father Theodoric as the heir to the throne, and Amala- sontha was appointed his guardian. On the death of Theodoric in 526, Amalasontha became regent, and en- deavoured by a wise and vigorous administration to carry on the work of civilisation and enlightenment which her father had commenced. She devoted herself with special solicitude to the education of Athalaric, but her efforts were frustrated by the opposition of the Gothic nobles. Encouraged by them, the young heir to the throne threw off the restraints imposed by his mother, plunged into debauchery, and died at the age of sixteen (534). In the same year Amalasontha married her cousin Theodahadus, and made him co-regeut with herself. A few months later (April 535) she was assassinated by order of her husband in an island on Lake Bolsena.

AMALEKITES, an ancient people, widely spread throughout the country lying on the south and east of Palestine, often mentioned in the Jewish Scriptures, and celebrated also in Arabian tradition. In Scripture they occur first in Gen. xiv. 7, occupying the territory around Kadesh, and suffering from the invasion of Chedorlaomer and his confederates. They appear next assaulting the Israehtes, shortly after the exodus from Egypt, at Rephidim, in the neighbourhood of Mount Sinai (Ex. xvii. 8; cf. Deut. xxv. 17). They again occur falling upon a party of the Israelites on the southern verge of the promised land (Num. xiv. 45; cf. xiii. 29). In the time of the judges they are found associated with the Moabites, the Ammonites, the Midianites, and "the children of the east," in repeated attacks upon the Israelites, invading their territory from the eastern side of Jordan (Judges iii. 13; vi. 3). Saul, by divine command, led an expedition into the country of Amalek, waging against them an exterminating war, "smiting them from Havilah until thou comest to Shur, that is over against Egypt" (1 Sam. xv. 1). David also "invaded the Geshurites, and the Gezrites, and the Amalekites ; for these nations were of old the inhabitants of the land as thou goest to Shur, even unto the land of Egypt" (1 Sam. xxvii.

8). The last notice occurs in 1 Chron. iv. 43, from which we learn that in the days of Hezekiah a body of Simeonites "went to mount Seir" and "smote the rest of the Ama- lekites that were escaped ;" a notice showing the accom- plishment of the doom of extermination which had been denounced against them (Ex. xvii. 14-16; Num. xxv. 20), and finding an echo in the words of an Arabian poet, "The race of Amlak has disappeared, and there is left of it neither mean man nor mighty" (Macoudi, Les Prairies

The other towus are Dragoe and

@Or, par Meynard et Courteille, vol. iti. 104). We twice

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hear of Agag as the name of the king of the nation (Num. xxiv. 7; 1 Sam. xv. 8); and it is reasonably supposed that this, like Pharaoh in Egypt, was a name common to all their kings. It has been generally supposed that the Haman of the book of Esther, called "the Agagite," be- longed to the royal line of the Amalekites; but it is now found, from Assyrian records, that Agagi was the name of a country east of Assyria, from which it may be assumed that the title was derived. See Lenormant, Lettres Ass. i. 45.

Josephus agrees with Scripture in assigning to the Ama- lekites the territory immediately to the south of Palestine. Thus he speaks of them as inhabiting "Gobolitis and Petra" (Gobolitis=Gebal, in Ps. Ixxxiii. 7; cf. Reland, Palestina, p. 71); and as reaching "from Pelusium to the Red Sea" (Ant. Jud. iii. 2, 1; vi. 7, aeck it 2B, 2) The country which they are thus represented as occupying is suited only to a nomadic population ; and accordingly the indications of the Scripture narrative point to this as the general character of the Amalekite people. They appear as the Bedouins of ancient times, rapid and de- vastating in their movements (1 Sam. xxx. 1); and in their expeditions "coming up with their cattle and their tents" (Jud. vi. 5). At the same time, in the more fertile portions of their territory they doubtless had settled abodes. We read in 1 Sam. xv. 5 of "a city of Amalek ;" and Josephus

speaks, apparently in an exaggerated way, of their cities being captured by means of elaborate slege operations (Ant. Jud. vi. 7, 2).

The ethnical character and relation of this people, and their com- plete national history, it is impossible satisfactorily to make out from the fragmentary materials in our hands. They are not men- tioned in the table of nations in Gen. x., while in Gen. xxxvi. 1G, 16, their ancestry seems to be referred to Esau. At the same time, the existence of the nation is notieed in Gen xiv., long before Esau ; and it seems unnatural to understand this, with Hengstenberg and others, in a proleptic sense, especially as there are other independent grounds for referring the beginning of their history to an earlier date. It is certain that the genealogical tables of Seripture, like those of Arabia, inelude cases of adoption or affiliation as well as of direct deseent, and probably it is in this sense that the notice: referring Amalek to Esau should be understood. _In Balaam's pro- phecy Amalek is called 'the first of nations" (2°3 P°YN7, prestan- tissima gentium, Gesenius), Num. xxiv. 20, an expression scarcely reconeilable in the circumstanees with descent from Jaeob's brother. Again, though found in Jewish scripture located in the immediate south and east of the Israelitish territory, yet there are indications in Scripture itself that at one time they had had a wider extension. "The mount of the Amalekites" is mentioned as situated in 'the land of Ephraim" (Jud. xii. 15), apparently warranting the infer- ence that they once held possessions on the west of the Jordan (see Stanley, Sin. and Pal., p. 237, n.) " Amalek" also is found in some copies of the LXX., as the translation of Maacah, in 2 Sam. x. 6, 8, giving some ground for the belief that a seetion of the same race had once been settled on the north-east of Palestine (see Ewald, Gesch. Israel's, Bd. I. 335). There is little in the Bible to illustrate their linguistie affinity; but so far as appears their language was Shemitie, identieal with or very closely allied to the Hebrew. Samuel and the captive Agag (1 Sam. xv. 32), and David and the Amalekite youth (2 Sam. i. 13) converse together; and it has been attempted also to explain the names Amalek and Agag by Shemitic analogies (Meier, Zeitschrift d. morg. Ges., Bd. xvii. p- 577). By Philo (Vita Afosis, § 39) the Amalekites of the Sinaitie peninsula are called Pheenicians.

The traditions of the Arabians regarding this raee are confused and conflicting, yet eertainly are not to be summarily rejected as destitute of any elaim to historic credibility ; and with ail their entanglement they speak strongly for the ancient and far-extended power of the people in question, and also more doubtfully for their Shemitic affinities. In these traditions, Amlak or Amlik, the father of the Amalekites, is represented sometimes as the son of Laud (Z.e., Lud), the son of Shem ; sometimes as the son of Aram, the son of Laud ; while sometimes also he is spoken of as a son of Ham. They belong, with the Adites, Thamudites, and others, to the primitive raees of Arabia. They are said to have been expelled from Babylonia by the Assyrian conquerors, and driven westward into Arabia and Syria, to have built and reigned in Aleppo, to have eonquered and for some centuries retained possession of Egypt, and to be the ancestors of the Berbers in North Africa (see Abulfeda, Hist. Ante-Isl., pp. 16, 178 ; Magoudi, op. cit., vol. iii., p. 106; C. de

Perceval, Hist. des Arabes, vol. i., p. 18); Knobel, Volkertafel, p- 198; Movers, Phinizier, 2ter Th., Bd. ii., p. 422). With these Arabian accounts it is natural to bring into conneetion the facts narrated by Manetho, and now in substance asecrtained from old Egyptian records, regarding the eonquest of the Nile valley by an Arabian race, called Hycsos by the former, and Afenit, or shep- herds, in the latter (see Bunsen, Egypt's Place, vol. iil., p. 266 ; Brugsch, Hist. d' Egypte, vol. i., p. 75; Chabas, Les Pasteurs en Egypte, p. 9) Now, from the time of the eighteenth dynasty, northern Arabia is found in Egyptian monuments to be in posses- sion of a people called Shasu, a name which Egyptologers generally compare with the second syllable of Hyesos, and which also, per- haps, corresponds with Zuzim of Gen. xiv. 5. These Shasu may with confidence be identified with the Amalekites of Scripture ; their Jocale and their habits are the same; and of them we learn that " they were spread over a vast territory, quite like the wander- ing Arabs of our day. They are found near Djor, on the north- east frontier of Egypt, as well as in the defiles of Lebanon, where their depredations made themselves felt fourteen

centuries before our era" (Chabas, Etudes sur 1 Antiquité Historique, p. 114; cf. his Voyage d'un Egyptien, p. 111). " They wear short tunics, a turban-like head-dress, and are armed with spears and axes. A characteristic feature is the long beard, as among the Canaanitish nations" (Brugseh, Geog. Inschriften, Bd. ii. 58).

The notices oceurring in Arabian writers, which speak of Amalek- ites as spread over various more southern portions of Arabia, may probably be referred to the period subsequent to their expulsion from their northern seats by the Israelites and other enemies. The Benu-Kerker, who dwell around Mecca, are by some referred to this stock ; the same is true of the Benu-Amila, who, before migrating northwards into Syria, dwelt in Yemen. We hear of Amalekites also in "Cheibar, Jatrib, and other parts of Hedjaz"' (Abulfeda,

op. cit., p. 179); in regard to whieh notice a certain degrce of

confirmation is afforded by the mention by Pliny of an Arabian town, the name of which reads Marippa Palmalacum, but which probably should be read Jatrippa Alamalacum, that is, Jatrib the Amalekite (see Pliny, Hist. Nat. vi. 32; Blau, Zeitschrift d. m. Ges., Bd. xxii. 668; ef. Noldeke, Uber d. Amalekiter, 37). Aecord- ing to some (Tuch, Blau, and others), the famous Sinaitic inscrip- tions, ascertained to be written in a Shemitic dialect, are to be ascribed to the Amalekite race. Doubtless their authors dwelt in the country once inhabited by this people, but that they belonged to them, and not to some succeeding race, has not yet been demonstrated.

From the cuneiform records we have gained as yet no illustration of this subjeet, unless the people Malikhu, or Malaku, mentioned in the inscriptions of Sennacherib among certain Aramzan tribes in- habiting the valley of the Euphrates, may be identified with Amalek (sec Records of the Past, vol. i., pp. 26, 57).

AMALFI, a town of Italy, in the Principato Citeriore, situated at the entrance of a deep ravine on the north side of the Gulf of Salerno. It was founded, according to the common account, under Constantine the Great, and was one of the first cities to recover from the irruption of

the barbarians into Italy. During the 10th and 11th centuries it was an independent republic of great commercial im- portance, with a trade which extended to Egypt and the east, and a population of 50,000. Its code of maritime laws (Tabula Amalfitana) is said to have regulated com- merce at one time throughout the whole of Italy, but the truth of this statement appears to be extremely question- able. In 1135 Amalfi was plundered by the Pisans, who are said to have then discovered and carried off the far-famed manuscript of the Pandects of Justinian, which is now in the Laurentian library at Florence. Soon after this the town passed under the dominion of Naples, and from that time rapidly declined. In 1343 a terrible storm buried a large part of the town under the sea, and at the present day it is a mere wreck of its former greatness. It has only about 6500 inhabitants, whose chief employments are fishing and the manufacture of macaroni, silk, and paper. It is still the seat of an archbishop, and contains an ancient cathedral dedicated to St Andrew. Flavio Gioja, to whom the invention of the mariner's compass has been ascribed, and Masaniello were born at Amalfi.

AMALGAM, the name given to an alloy of mercury and another metal. The amalgams are a very numerous class of compounds, and many of them are used largely in the arts. Many amalgams are produced by direct contact of the metals, with evolution of heat. Others are obtained

by the action of mercury on a salt of the metal, or the action of the metal on a salt of mercury, assisted by the passage of a weak eléctric current in some cases. Some amalgams are solid, others liquid. They are, generally speaking, weak compounds, many of them being decom- posed. by pressure, and all are decomposed at a white heat. Tin amalgam is used for "'silvering" mirrors, gold and silver amalgam in gilding and silvering, cadmium and copper amalgam in dentistry, and an amalgam of zinc and tin for the rubbers of electrical machines. See MERcuRY and CHEMISTRY.

AMALIA, Anna, Duchess of Saxe-Weimar, was born at Wolfenbiittel on the 24th October 1739, and married Duke Ernest of Saxe-Weimar in 1756. Her husband died in 1758, leaving her regent for their infant son, Karl August. During the protracted minority she administered the affairs of the duchy with the greatest prudence, strengthening its resources and improving its position in spite of the troubles of the Seven Years' War. She was a warm patroness of art and literature, and attracted to Weimar many of the most eminent men in Germany. Wieland was appointed tutor to her son; and the names of Herder, Goethe, Knebel, Bottiger, Muszus, and Schiller shed an undying lustre on her court. In 1775 she retired into private life, her son having attained his majority. In 1788 she set out on a lengthened tour through Italy, being accompanied by Goethe. She died on the 10th April 1807. A memorial of the duchess is included in Goethe's works under the title Zwm Andenken der Fiirstin Anna-Amalia.

AMALRIC or Amauri or Bena, so called from his birthplace, a small village in the diocese of Chartres, was the founder of a school of pantheists known by his name. He lectured at Paris about the year 1200, and attracted a large circle of hearers. In 1204 his doctrines were con- demued by the university; and on a. personal appeal to Pope Innocent III. the sentence was ratified, Amalric being ordered to return to Paris and recant his errors. This he did in 1207. His death, two years later, was caused, it is said, by grief at the humiliation to which he had been subjected. In the same year (1209) ten of his followers were burnt before the gates of Paris, and Amalric's own body was exhumed and burnt, and the ashes given to the winds. The doctrines of the Amal- ricians were formally condemned by the fourth Lateran | Council in 1215.

AMALTEO, the name of a family belonging to Oderzo, Treviso, several members of which were distinguished in literature. The best known are three brothers, Geronimo (1507-74), Giambattista (1525-73), and Cornelio (1530- 1603), whose Latin poems were published in one collection under the title Triwm Fratrum Amaltheorum Carmina (Venice, 1627; Amst. 1689). The eldest brother, Geronimo, was a celebrated physician; the second, Giambattista, accompanied a

Venetian embassy to England in 1554, and was secretary to Pius IV. at the Council of Trent; the third, Cornelio, was a physician and secretary to the re- public of Ragusa.

AMALTEO, Pomponto, a painter of the Venetian school, was born at San Vito in Friuli in 1505, and died in 1584. He was a pupil of Pordenone, whose style he closely imitated. His works consist chiefly of frescoes and altar-pieces, and many of them have suffered greatly from the ravages of time.

AMARA SINHA, a Sanscrit grammarian and poet, of whose personal history hardly anything is known. He is said to have been "one of the nine gems that adorned the throne of Vikramaditya," and accordingly to have flourished about 56 B.c. This seems on the whole the most pro- bable date, though the fifth century of the Christian era,

and cven the eleventh, have also been assigned, on the sup- position that the Vikramaditya spoken of was not the first Amara seems to have been a Buddhist; and an early tradition asserts that his works, with one exception, were destroyed during the per- secution carried on by the orthodox Brahmins in the fifth century. The exception is the celebrated Amara-Kosha (Treasury of Amara), a vocabulary of Sanscrit roots, in three books, and hence sometimes called Trikanda, or the "Tripartite." It contains 10,000 words, and is arranged,

but a later monarch of the name.

like other works of its class, in metre, to aid the memory.

The first chapter of the Kosha was printed at Rome in An edition of the entire work, with English notes and an index by Colebrooke, appeared The Sanscrit text was printed at A French translation by Loiseleur-

Tamil character, in 1798.

at Serampore in 1808.

Calcutta in 1831.

Deslongchamps was published at Paris in 1839. AMARANTH, or AMaranrt (from the Greek dudpavros,

unwithering), a name chiefly used in poetry, and applied to certain plants which, from not soon fading, typified

immortality. Thus Milton (Paradise Lost, iii. 353) :—

“ Immortal amarant, a flower whieh once In paradise, fast by the tree of life, Began to bloom; but soon for inan’s offence To heaven removed, where first it grew, there grows, And flowers aloft, shading the fount of life, And where the river of bliss through midst of heaven Rolls o’er elysian flowers her amber stream: With these that never fade the spirits elect Bind their resplendent locks.” The famous flowers, however, still live upon earth, and are known in our gardens as love-lies-bleeding, prince’s feather, cockscomb, and the globe amaranth. As we wreathe our churches in winter with holly and ivy, the churches in Portugal and other southern countries are adorned with the purple tints of the globe amaranth, which is said to retain its colour for years. It should be noted that the proper spelling of the word is amarant; the more common spelling seems to have come from a hazy notion that the final syllable is the Greek word for flower, which enters into a vast number of botanical names. AMARAPURA, literally “ the City of the Gods,” a town of independent Burmah, situated on the east bank of the Trawadi river, in 21° 57’ N. lat., and 73° 4’ E. long. The town was founded in 1783, and made the capital of the Burmese kingdom. It increased rapidly in size and popu- lation, and in 1810 was estimated to contain 170,000 inhabitants; but in that year the town was destroyed by fire, and this disaster, together with the removal of the native court in 1819, caused a decline in the prosperity of the place. In 1827 its population was estimated at only 30,000. Since then it has

suffered another severe calamity from an earthquake, which in 1839 destroyed the greater part of the city. It is regularly laid out, but, with the exception of some temples, is built only of bamboos, although several of the buildings, being richly gilt, have a showy appearance. The most remarkable edifice is a cele- brated temple, adorned with 250 lofty pillars of gilt wood, and containing a colossal bronze statue of Buddha, The remains of the ancient palace of the Burmese monarchs still survive in the centre of the town. During the time of its prosperity Amarapura was defended by a rampart and a large square citadel, with a broad moat, the walls being 7000 feet long and 20 feet high, with a bastion at each corner. é _AMASTA, or Amasrayan, a town in Anatolia, Turkey, situated on both sides of the Yeshil-Irmak, or Tris, in a narrow gorge about 80 miles from the mouth of the river. The houses being ill-built and the streets narrow, the town would have a mean appearance but for its situation and the splendid remains of antiquity in its neighbourhood.

The most remarkable of these are the Acropolis, which is built on a lofty rock overhanging the town; the tombs of the kings of Pontus, described by Strabo the geographer, a native of Amasia; and a handsome mosque, erected in 1490 by the Sultan Bajazet I]. The chief productions of Amasia and the surrounding districts are silk, salt, wheat, wine, and cotton. Population of the town, 25,000.

AMASIS, King of Egypt, ascended the throne 569 B.c. From the rank of a common soldier he gradually rose to be one of the principal officers in the court of Apries, the last king of the line of Psammetichus. Being commissioned by Apries to quell an insurrection, he went over to the rebels, who proclaimed him king. Apries, whose tyranny had caused nearly all his subjects to desert him, took the field with an army of mercenaries, and meeting Amasis near Memphis, was defeated and taken prisoner. The usurper treated the captive prince with great lenity; but so violent was the popular hatred, that he was conipelled to deliver him into the hands of his enraged countrymen, who in- stantly put him to death by strangling. Under the pru- dent administration of

Amasis, Egypt enjoyed the greatest prosperity. He adorned it with numerous and splendid buildings, among which were a portico to the temple of Minerva at Sais, and the great temple of Isis at Mem- phis. He also erected a colossus before the temple of Vulcan, 75 feet in length, resting on its back ; and on the basis stood two statues, each 20 feet high, cut out of the same stone. To gain the alliance of the Greeks, he allotted settlements for them on the sea-coast, permitting them to build temples, and to observe all the rites of their religion unmolested; and when the temple of the Delphians was burnt he presented them with 1000 talents to assist them in rebuilding it. He also married a Grecian lady, named Ladice, the daughter of Battus of Cyrene, dnd had a bodyguard of Greeks in his pay. Solon, the celebrated lawgiver, is reported to have visited Amasis. The close of his reign was disturbed by the threatened invasion of Cambyses, king of Persia, and by the rupture of the alliance between Amasis and Polycrates of Samos. (See PoLycraTEs.) Amasis, however, did not live to see the conquest of Egypt, for he died in 525, before the Persians had eutered the country.

AMAT, Fenix, a Spanish ecclesiastical historian, was born at Sabadell, in the diocese of Barcelona, 10th August 1750. He entered the church in 1767, and after taking his doctor's degree at Grenada in 1770, was made professor of philosophy and librarian in the episcopal seminary at Barcelona. In these offices, and in that of director of the seminary, which he subsequently held, his talents and energy did much to advance the efficiency of the institu- tion. In 1803 he was made archbishop of Palmyra by the pope, and in the same year the king, Charles IV., created him abbot of St Ildefonso. When the war with France broke out in 1794, Amat was at first looked upon as al undoubted patriot, but latterly he was suspected, and with some reason, of favouring the French cause. He was compelled to leave Madrid on the entry of the British in 1812; and was subsequently, in 1814, banished to Cata- lonia. He died in a Franciscan convent near Salent on 28th September 1824. Amat's chief work is his Heclesias- tical History, from the birth of Christ, to the end of the 18th century, originally published in twelve volumes (1793-1803). It was condemned by the Inquisition, but rather on political than on religious grounds. His other works are numerous, the most important being his

Observations on Keclesiastical Power and his Six Letters to Irenicus, in which he attacked the theory that consent of the subjects is the necessary foundation of sovereignty. Amat was a man of gigantic stature, being, it is said, at the age of seventeen, 7 feet 2 inches in height,

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AMATI. the name of a family of violin-nakers who flourished at Cremona from about 1550 to 1692. Accord- ing to Fétis, Andrea and Nicolo Amati, two brothers, were the first Italians who made violins. They were succeeded by Antonio and Geronimo, sons of Nicolo. Another Nicolo, son of Geronimo, was alive in 1692. The violins made by this family are distinguished by their small size, exquisite finish, and the mathematical proportion of the parts. Their toue is soft and sweet, but deficient in inten- sity, owing to the flatness of their model. Stradivari was a pupil of the Aimatis.

AMATITLAN, the name of a lake and town in Guate- mala, Central America. The lake is 18 miles from the city of Guatemala, and is about 9 miles long and 3 broad. The town, which is sometimes called St Juan d'Amatitlan, is situated on the shores of the lake. The houses are all of one storey, and are mostly built of mud. The Jesuits formerly had extensive sugar plantations at Amatitlan, but the chief industry now is the raising of the cochineal. The wells of the town are strongly impregnated with salt and alum, and in the vicinity there are several hot springs. Population about 10,000, chiefly mulattoes and samboes.

AMAUROSIS (dpavpwors), a deprivation of sight. The term is now limited chiefly to those forms of defect or loss of vision which are caused by diseases not directly involv- ing the eye, although sooner or later the optic nerve widergoes changes recognisable by the ophthalmoscope. Sometimes the amaurosis is temporary, disappearing with the removal of the disease with which it is associated ; but in many cases, more especially where the brain and spinal cord are affected, the amaurosis remains permanent.

AMAXICHI, a seaport town on the N. of the Ionian island of Santa Maura. It is the capital of the island, and the residence of a Greek archbishop. The frequent occur- rence of earthquakes compels the inhabitants to construct their houses of wood; hence the town is of mean appear- ance. Its harbour admits small craft only. Population,

7000.

AMAZON, MaraNon, ORELLANA, or SOLIMOENS, a river of South America, the largest in the world. Its head stream is either the Ucayale or Apurimac, which rises in Peru about 16° S. lat., and 72° W. long. ; or the more northerly Marafion, also called Tunguragua, which flows from Lake Lauricocha, 10° 30' S. lat., and 76° 10' W. long. The former is the longer river, but the latter has perhaps the weight of authority in its favour. The Maraiion flows in a north-westerly direction, parallel to the Ucayale, as far as 6° S. lat., when it bends to the north-east, and, on reaching the frontiers of Equador, turns almost due east. It thence forms the boundary between Equador and Peru, with an easterly direction, until it joins the Ucayale. The united river continues to separate Equador aud Peru as long as these countries are conterminous, and thereafter strikes through Brazil, the general direction being north-north-east. It finally dis- charges itself into the Atlantic under the equator. From the source of the Apurimac to the ocean this mighty river has a length, including windings, of nearly 4000 miles. It receives enormous tributaries—from the north, the Napo and the Putumayo, each about 700 miles long; the Yapura, 1000 miles; the Negro, 1400; as well as others of less importance : from the south, besides the Yavari, the Yutai, the Yurua, Tefe, the Puruo, and others, there are the Madeira, of nearly 2000 miles ; the Topayos, of 1200; the Xingu, of 1300; and the Tocantins, of 1200. In addition to these, the Huallaga, of 500 miles, joins the Marafion, from the south, above its union with the Ucayale. The area drained by the Amazon and its tributaries is pro- bably not less than 2,500,000 square miles, or more than a third part of South Ainerica. The breadth of the river,

of course, varies at different points. At some distance below Jaen, on the Marafion, it was found to be 860 feet wide ; at a pass called the Pongo de Manseriche its bed is suddenly contracted from 250 to 25 fathoms, being enclosed on either side by rocks, which rise like perpen- dicular walls to a great height; at the junction with the Napo its breadth has increased to 900 fathoms. Between the Negro and the Madeira it has the breadth of a league, which extends to two leagues at those parts where islands abound ; but during the annual rise of the water it covers a great part of the adjacent country, and has then no determinate limits. The main mouth is about 50 miles wide above the island of Caviana, but the whole delta, including the Para mouth and the island of Joannes, is nearly 200 miles from shore to shore. The depth of the Amazon in some parts exceeds 50 fathoms, and the river is navigable for vessels of the largest size up to the con. fluence of the Marafion and the Ucayale. Beyond this point vessels of a smaller size can proceed as far as San Borja, on the Marafion, and a considerable distance up the Ucayale and the Huallaga. The velocity of the water above San Borja so greatly excecds the average (which is about 24 miles an hour), that navigation becomes difficult, and among the rapids is impossible, even to canoes. Nearly all the branches of the Amazon are navigable toa great distance from their junction with the main stream; and collectively the whole presents an extent of water communication unparalleled in any other part of the globe. It may be mentioned, too, that as the wind and current are usually, at least from July to December, opposed to each other, a vessel can make her way either up or down with great facility by availing herself of her sails in the one case, and committing herself to the force of the current in the other. Since the introduction of steamers, however, this circumstance is of less importance. The influence of the tides is felt 400 miles above the mouth of the Amazon, while on the other hand the river current is distinctly perceptible in the ocean for more than 200 miles from the shore. The curious tidal pheno- menon called the bore, or proroca, is thus described by La Condamine :—

“During three days before the new and full moons, the period of the highest tides, the sea, instead of oecupying six hours to reaeh its flood, swells to its highest limit in one or two minutes. The noise of this terrible flood is heard five or six miles off, and inereases as it approaches. Presently you see a liquid promontory 12 or 15 feet high, followed by another, and another, and sometimes by a fourth. These watery mountains spread across the whole channel, and advance with a prodigious rapidity, rending and alee

everything in their way. Iminense trees are sometimes uproote by it, and sometimes whole traets of land are swept away.”

The Amazon traverses a region thickly covered with lofty forests, which are the haunts of the jaguar, bear, panther, and other wild animals, and are inhabited by numerous small tribes of savages, among whom the Spaniards and Portuguese have established missionaries. The river abounds with fish, many of which are delicious eating; and turtles of an excellent quality are numerous. Large alligators may be frequently seen stretched motionless in the mud like trunks of trees. The name Amazon (which is also written Amazons and Amazonas) is derived from the Indian word Amassona, or “ boat-destroyer,” the reference being to the destructive proroca. According to native usage, the name Amazon ought to be restricted to the lower part of the river, below the mouth of the Rio Negro, the portion above that point, as far at least as the junction of the Marafion and the Ucayale, being termed by the natives Solimoens. The other two designations by which the river is sometimes known owe their origi respectively to Francis Orellana, who in 1540 sailed from the mouth of the Rio Napo to the ocean, and Maranon,

Yajiez Pinzon, however, visited the river before either, having discovered (Sec the works of Bates, Wallace,

who visited the upper waters in 1513.

the mouth in 1500. and W. H. Edwards, and the article BRaZzit.)

AMAZONS (‘Apd€oves), a race of women represented in Greek legend as having lived in the north-east of Asia Minor, near the shore of the Black Sea, and as having there formed an independent state, with a queen at its head, and with the mythical town of Themiscyra, on the From this centre they made warlike excursions, sometimes northward, but chiefly From the traditions that to repel and conquer them was assigned as a task to Bellerophon by the King of Lycia, and again to Hercules by Eurystheus, it may be inferred that they were regarded by the Greeks at least as a permanent source of danger. But equally, if the task of conquering them is to be strictly compared with the other tasks in which these heroes were generally opposed to monsters and beings impossible in themselves, but possible as illus- trations of permanent danger and damage, it would follow that the Amazons were mythical illustrations of the dangers which beset the Greeks on the coast of Asia Their impossibility as actual beings is further

river Thermodon, as its capital.

against the people on the coast of Asia Minor.

Minor. recognised in works of art, in which combats between

them and Greeks are placed on the same level as, and

often associated with, combats of Greeks and centaurs. The belief in the existence of the Amazons, however, having been once accepted and introduced into the national poetry and art, it became necessary to surround them as far as possible with the appearance of not unnatural beings. Their occupation was hunting and war; their arms the bow, spear, axe, a half shield, nearly in the shape of a crescent, called pedta, and in early art a helmet, the model before the Greek mind having apparently been the goddess Athcne (Minerva). In later art they approach the model of Artemis (Diana), wearing a thin dress, girt high for speed; while on the later painted vases their dress is often peculiarly Persian—that is, close-fitting trousers, and a high cap called the kidaris. They fought partly on foot, partly on horseback, and always without quarter ; so that the epithet of dvdpoxrdvor, or otorpata, which is the Scythian equivalent (Herod. iv. 110), was

applied to them. To maintain their stock, annual visits were paid to the neighbouring peoples ; and when, in con- sequence of this, children were born, the males were either sent over the borders or retained and brought up crippled, and in the condition of slaves, while the female children Were assiduously trained to hunting and war. So as to have freedom in the use of the bow, the right breast was either removed by burning and other processes, or was checked in its growth ; hence the ancient derivation of the name Amazon from d-pdéLos, " breastless." But instead of there being any indication of this in works of art, it is noticeable that in the case of wounded Amazons the wound is in the breast, as if the artist conceived them as truly womanly in that region. The other derivations are—(1) from d-ydfos, in the sense of "'strong-breasted," so as to compare with their deity Artemis Polymazos ; (2) from d-udoow, "not touching (men);" (3) from the Scythian am azen, a "virago." 'The deities of the Amazons were Ares (Mars) and Artemis, the former being consistently assigned to them as a god of war, and as a god of Thracian and generally northern origin. In the case of Artemis, it was not here the usual Greek goddess of that name, but an Asiatic deity in some respects her equivalent, but different, among other points, in this, that troops of women (hiero- dul) were associated with her worship, especially as it existed at Ephesus in historical times. That it may have been so also in the early myth-making age, and that

accordingly the idea of the Amazons as a race may have originated in the ecstatic lawless life of these women, has been conjectured. With regard to Ephesus, it was said that a body of Amazons, under a princess named Lainpedo, had founded that town, and established the worship of Artemis ; though in another account they appear as enemies of this religion, and as having burnt the temple of Artemis at Ephesus. Several other towns of Asia Minor claimed to have been founded by Amazons pabttt according to Diodorus (ii. 52, 55), the Amazons in this case were a race of women who inhabited the west of Libya, and who once, led by their queen Myrina, advanced through Asia Minor and on to Thrace, where they were defeated by Mopsus,

and compelled to return. Other memorials of the expeditions and battle-fields of the Ama- zons were recognised in the tumuli in the Troad and elsewhere in Asia Minor. These ancient local traditions derived a strong colour of reality afterwards, when inroads of barbarians, under a female leader, occurred, as in the time of Cyrus, or when Thalestris appeared before Alex- ander the Great, announcing herself as the queen of the Amazons ; but chiefly when it was observed that certain characteristics of the Amazons actually existed among the women of Sarmatia. The effect of this mixture of fact and legend nay be seen in the account given by Herodotus (iv. 110) of the collapse of the Amazonian state, or in the origin of it as related by Justin (ii. 4). On the other hand, the Persian war seems to have freshened, as if to supply a mythical prototype, the national legends of combats between Greeks and Amazons. These legends recounted the defeat of the Amazons, first by Bellerophon, and secondly by Hercules, who had been ordered by Eurystheus to bring him the girdle of their queen Hippo- lyte, or, in other words, since the girdle of their queen would in Greek eyes be the most sacred object, to conquer the whole race of Amazons. It is supposed that he was accompanied by his friend Theseus, and that this was the occasion on which the latter became possessed of the Amazon princess Antiope. From his possession of her originated a third legend, which described an invasion of Attica by a body of Amazons, with the view of carrying off Antiope. Their utter defeat by Theseus must have seemed, in the light of Marathon and Salamis, as a fore- cast of the glory then won by Athens. The fourth legend, which deals with the appearance of an army of Amazons, led by their queen Penthesilea on the side of the Trojans in the Trojan war, was developed by Arctinus of Miletus in his poem the Zthiopis. Achilles and the queen meet in battle, and she falls by his hand ; but the hero is smitten with grief, and lifts her gently before she dies. It is this feeling of regret on the part of a hero who is com- pelled to kill a woman in his own defence, that gives the principal tone to the existing works of Greek art, in which combats with Amazons are represented, and especially to works of sculpture. Of this class there exist (besides a number of reliefs, among which those from the temple of Apollo at Phigalia, now in the British Museum, are con- spicuous for many touching motives of this kind), several statues of wounded Amazons,

the sad expression of which, combined with the nobility of form and powcr of limb, shows what was the highest conception of them in the best days of Greek art. (A. 8. M.) AMBALA, a division, district, and city of British India, under the jurisdiction of the Lieutenant-Governor of the Panjab. The Ambal4 pivision comprises the districts of Ambala and Ludhiind in the plains, and the district of Simld in the Himélayas. The last-named district consists of a few detached patches of territory, scattered among the territories of the petty chieftains by whom the neigh- bouring hills are held. Simla district is, however, the

seat of the supreme government of India during the hot weather, and its chief town, of the same name, is the largest hill station in India. The other two districts of the divi- sion lie upon the plains at the foot of the Himalayas. They arc bounded on the N.E. by those mountains, on the N.W. by the river Satlej, on the S.W. by the district of Firozpur, the independent native state of Patiala, and the 'district of Karnal, and on the 8.E. by the river Jamna. Ampdtd District stretches N.W. and 8.E. along the lower face of the Himalayas, and lies between 29° 55' and 31° 14' N. lat., and between 76° 37' and 77° 38' E. long. It is bounded on the N.E. by the Himalayas, on the N.W. by the river Satlej, on the S.E. by the river Jamna, and on the §.W. by the district of Ludhiana, the state of Patiala, and the district of Karnal. The total area of the district is 2628 square miles, or 1,681,930 acres, of which 945,526 acres are cultivated, 283,989 acres are cultivable, but not actually under tillage, and 452,415 acres are uncultivable and waste. The total population of the district, according to the census of 1868, amounts to 1,035,488 souls, divided into the following classes :— Hindus, 689,333; Mahometans, 286,874; Sikhs, 56,440; others, 2841. The males numbered 567,930, and the females 467,558; the proportion of males to the total population being 54°84 percent. The principal tribes and castes in point of numbers are—(1.) Jats, viz., Hindus and Sikhs, 161,967; Mahometans, 13,368: total, 175,335. (2.) Chaméars (Hindus), 125,638. (3.) Rajputs—viz., Hindus and Sikhs, 20,121; Mahometans, 62,866: total, 82,987. (4.) Brdbmans, 63,744. (5.) Gujjars—viz., Hindus and Sikhs, 24,500 ; Mahontetans, 24,195: total,

48,695. (6.) Banids (Hindus), 39,093. The total agricultural population was 501,056. Taking the population as compared with the area, the result gives 1°62 acres per head of the population, or 3°35 acres per head of the agricultural population. Putting aside the uncultivable and waste land, there are 1°18 acres of cultivated or cultivable land per head of the population, or 2°45 acres per head of the agri- cultural population. Taking only the area undcr actual cultivation, there are '91 acres per head of population, or 1°88 acres per head of the agricultural population. With one small exception, the whole district consists of a Icvel alluvial plain, sloping away gradually from the foot of the Himalayas, and lying between the rivers Jamna and Satle}. These rivers do not materially affect the district, which has a drainage system of its own, consisting of the numerous torrents and water-courses which pour down upon it from the hills. In the southern portion of the district these torrents run in broad sandy beds. scarcely below the sur- face of the country, and vary from 200 yards to a mile in width, until, at a distance of 20 or 30 miles from the hills, they assume the form of comparatively docile streams, with well-defined clay banks. Towards the northern por- tion of the district the torrents run in deep beds from the point where they debouch from the hills; they also differ from the streams of the southern tract in being free from sand. The principal of these northern streams is the Ghaggar, into which all the other minor streams sooner or later empty themselves, some within and some beyond the limits of the district. Whatever surplus water of this river is not swallowed up by irrigation passes on through Patialé state and Sirs4, and is finally lost in the sands of Rajputand. The Ghaggar is the only perennial stream within the district, and even it dwindles down to a tiny rivulet in the dry weather, and disappears altogether beyond the border of the district.

The Sind, Panjab, and Dehli railway passes through the centre of the district from south-east to north-west. The other principal land routes are two main lines of road, one passing through the district parallel to the line of railway, and the other coming from Dehli and

Karnal, entering it on the south, and running northward till the two roads meet at Ambala city. A less important road runs northward from this town to the foot of the Himalayas, and forms the route to the hill station of Simla. The principal agricultural products of Ambala district are wheat, grain, and barley for the spring harvest, and rice, joar (spiked millet), and Indian corn in the autumn. 'The total area under cultivation in 1871-72 was, for the spring harvest 437,377 acres, and for the autumn crop 496,542 acres. The land settlement of the southern portion of the district was completed in 1858, and that of the northern part in 1855. Both will expire in 1880. The following eight towns are returned as containing a population of upwards of 5000 souls, the first-named seven bein also municipalities ; Ambala, population, 50,662 souls; Shahabad, 11,678; Jagadhri, 11,678; Sadhaura, 11,198; Rupar, 8700; Buna, 8351; Thaneswar, 7929; Mani Majra, 5989. A municipal in- come is also raised from the following seven towns :— Kharar, Siswan, Morindah, Pihewah, Radaur, Ladwah, and Khizirabéd. All the municipalities derive their revenue from a system of octroi duties. The total revenue of Ambala district for 1871 was £101,362, of which 74 per cent., or £74,446, was derived from the iand. The other principal items of revenue were as follows:— Distilleries, £3594, 14s. ; drugs and opium, £3181, 4s. ; income-tax, £2709, 14s.; stamps, £9308, 14s.; local rates levied under Act xx. of 187], £7653, 18s, Ambala is one of the territories previously held by a Sikh Sarddér which lapsed to the East India Company in default of rightful heirs. The district was seized by Ranjit Singh during one of his marauding expeditions. This aggression caused the movement of British troops in 1809 which resulted in the treaty with Ranjit Singh by which he was required to withdraw his army from the left bank of the Satlej, and to relinquish his recent con- quests in Sirhind.

AMBALA City, the capital of the district of the same name, is situated in 30° 24' N. lat., and 76° 49' E. long. It forms a large and important station on the Sind, Pan- jab, and Dehli railway. The military station and can- tonments lie a few miles south-east of the town. Ambdald is a large walled town, situated in a level and highly-culti- vated country,

well supplied with water, and capable of furnishing abundant supplies. The houses are built of burnt brick, and the streets are very narrow. The town population is returned at 50,662 souls, but this probably includes the English station. The population within muni- cipal limits numbers 24,040, divided as follows :—Agricul- turists, 3226; non-agriculturists, 20,814. The town has been constituted a second-class municipality, the affairs of which are conducted by a committee consisting of six official and five non-official members. The municipal in- come is derived from an octroi duty, and the revenue has increased from £836, 16s. in 1867-68, to £1520 in 1871-72. The average incidence of municipal taxation in the latter year was 1s. 34d. per head of the population within municipal limits.

AMBARVALIA, or AmBarvaLe Sacrum (ambio and arvum,to go round the field), an annual festival celebrated in ancient Rome on three days during the month of May. The private ambarvalia is to be distinguished from the sacrifictum dece die celebrated by the twelve fratres arvales, though the two festivals were coincident in point of time and had a common object, namely, to obtain from the gods a favourable harvest. The sacrificiwm was offered up on behalf of the entire state ; the ambarvalia was cele- brated by each proprietor for himself. The victims were a sow, a sheep, and a bull, and were called by the combined name swovetaurilia. Previous to the sacrifice these were led round the fields, while the peasants sang hymns to Ceres. The form of prayer used (carmen ambarvale) 1s preserved in an inscription of the date of the Emperor Elagabalus (218 a.p.), which was discovered-in 1777. The same inscription gives an interesting account of the entire ceremony. (See Marini's Gli Atti e Monwmenti de Fratelli Arvali, Rome, 1792.) The Christian festival that seems to have taken the place of the ambarvalia is the Rogation or Gang Week of the Roman Catholic Church, for which the perambulation of the parish boundaries was substituted at the Reformation.

AMBASSADOR

AMBASSADOR, a word introduced into the English language from the Fr. ambassadeur, the Ital. ambasciatore, or the Span. embaxador,

which Wicquefort derives, perhaps without sufficient authority, from the Span. embiar, to send. The word denotes a public minister of the highest rank, accredited and sent by the head of a sovereign state to a foreign court or country, with power to represent the person of the sovereign by whom he is sent, to negotiate with a foreign government, and to watch over the interests of his own nation abroad. The power thus conferred is contained in the credentials or letters of credence of which the ambassador is the bearer, and in the instructions under the sign-manual delivered to himself. The creden- tials consist in a sealed letter addressed by the sovereign in person whose representative he is, to the sovereign to whom he is sent, and they contain a general assurance that the sovereign by whom he is despatched will approve and confirm whatever is done by the ambassador in his name. In England these letters of credence are under the sign- manual of the Queen, and are not countersigned by the Secretary of State. On special occasions, as for the nego- tiation of treaties, additional and express powers are given to an ambassador under the great seal, and sometimes (but very rarely) full general powers to treat on all subjects. Lord Clarendon held such powers at the congress of Paris in 1856

Diplomatic envoys are of three ranks, as was finally determined by a common agreement of all the powers which was annexed to the final act of the treaty of Vienna in 1815 :—1l. Ambassadors; the ambassador of the pope being called a nuncio, and the ambassador of the Emperor of Austria to the Sublime Porte being called his inter- nuncio. These only have representative rank. 2. Envoys extraordi- nary or ministers plenipotentiary, accredited to sovereigns (aupres des souverains). 3. Chargés d'affaires, who are only entitled to transact business with the Minister of Foreign Affairs. We shall confine ourselves in this article to the diplomatic officers of the first rank. The relative number of ambassadors, as distinguished from ministers, has of late years been considerably increased. The Emperor Nicholas refused for many years to send an ambassador to the court of France, and he therefore suppressed the grade for a time altogether. His example was imitated by other powers. But the old practice has now been reverted to. The Queen of England has embassies at Paris, Constantinople, Vienna, St Petersburg,and Berlin. The number of

British ministers plenipotentiary is twenty-three, and three chargés d'affaires; but these numbers vary.

From the 15th century, when the practice of sending resident embassies may be said to have commenced in Europe, down to the close of the 18th century, these missions were surrounded with a prodigious amount of splendour, ceremonial, and contentious dignity. British ambassadors were commonly sent out till within the last thirty years in ships of war. The ambassador represented a Monarch, and was to play the part of one. The memoirs of those ages are full of the magnificence and profuse display which marked their progress—lacqueys, liveries, state coaches, led horses, and all the pageantry of state. Fierce disputes frequently arose between rival ambassadors for precedence ; sometimes these disputes even extended to the courts and ministers to whom these envoys were despatched as messengers of peace, and a vast deal of time was lost (especially at the Congress of Miinster) in adjusting them. On the part of the sovereign to whom they were to present their credentials the same display was made. The new ambassador was fetched by the master of the ceremonies in the king's coaches and feasted at the king's expense. The solemn entry and the public audience, as they were termed, were an essential part of the mission.

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The ambassador had the right to stand covered in the presence of royalty. At Venice the doge placed Sir Harry Vane, covered and seated, on his right hand in the Council of Ten. A speech was then delivered, in which the ambassador declared the friendly sentiments of his own sovereign, and his own humble desire to give effect to them. Modern simplicity and the facility of intercourse has swept away many of these formalities. Traces of them survive at the courts of Berlin and Vienna, but elsewhere an am- bassador is presented with little more than the customary ceremony of a court. It has long been held that every state is at liberty to receive ambassadors with or without ceremony, just as it pleases, provided they are all treated alike. Formalities of this kind are, however, still of moment in dealing with Oriental states, where

ceremony is the language of power. Perhaps it is nowhere carried to higher perfection than at the court of Japan. The knotty question of precedence was also settled at the Congress of Vienna by an agreement that precedency should be regu- lated by seniority, dating from the notification of the arrival of the envoy. In foreign countries the senior am- bassador is known as the dean or doyen of the diplomatic body; but in England the diplomatic body has no general mouthpiece or representative.

Every state or sovereign has the right, if it thinks fit, to refuse to receive a particular person as an ambassador, or even to receive any ambassador at all. It is therefore customary to ascertain beforehand whether the person desig- nated for an embassy is favourably regarded, and will be well received. There have been instances, not very remote, of unfavourable answers or refusals to receive given individuals.

The rank of an ambassador, as regards the society of the nation to which he is accredited, places him immediately after the princes of the blood royal, because he represents a sovereign power, and this rank is universally conceded to him. The rank of a minister plenipotentiary is rather more dubious, but by a rule laid down by Her Majesty for the court of St James they follow dukes and precede marquises. An ambassador or minister not actually accredited to this court has of course no official rank at all, and must take his personal rank. No distinction is made between the ambassadors of monarchies and of republics. The Venetian ambassadors held in their time a very prominent rank in Europe; so in our day do the ministers of the United States; but the United States have never sent any ambassador to Europe—their representatives therefore rank in the second class of public ministers.

We shall now proceed briefly to enumerate that which constitutes the essential dignity and utility of an ambassador —on the one hand his rights and privileges, on the other his duties.

A. The first right of an ambassador is that of personal audience of the sovereign. His credentials must invariably be presented to the

sovereign in person, and he may ask for an audience on any fitting occasion. In England, however, the sovereign does not officially receive an ambassador except in the presence of one or more of the ministers of the crown, Mr Canning complained bitterly of the influence of Prince Lieven and Prince Esterhazy over George IV., who lived on intimate terms with these ambassadors, and used to say " his father would never have done so." In England the right of audience is now generally limited to the presentation of some congratulatory letter; but at Continental courts it ig not without con- siderable utility and importance, as was shown by the memorable conversation of Sir Hamilton Seymour with the Emperor Nicholas, and the personal interviews of Lord Cowley and Lord Clarendon with the Emperor Napoleon III.

In all ages the perfect personal security of persons in- vested with high diplomatic functions, as the representa- I. — 83

tives of a foreign power, has been an essential and funda- mental principle of the law of nations. Indeed it was the law of nations when there was no other. Alexander the Great destroyed Tyre for an insult offered to his ambas- sador; and it stands recorded in the Roman law, "Si quis legatum hostium pulsassct, contra jus gentium id commis- sum esse existimatur, guia sancti habentur legat." (Dig. L. Tit. vii. § 17). In moments of excessive excitement or revolutionary frenzy even this principle has been vio- lated, as in the murder of Dr Dorislaus at the Hague (1649), and of the French envoys at Rastadt (1799); but such acts leave an indelible disgrace on those who have committed them. For it is the interest of all mankind that ambassadors and envoys should have absolute security to perform their missions with freedom of specch and the liberty "eundi et redeundi" undis- turbed, insomuch that to intercept or refuse passage to an ambassador, even through the territory of a third party, is justly regarded as a base action, though probably the leave of the third party to grant the passage ought to be asked. It was the barbarous custom of Turkey to send an ambas- sador to the Seven Towers on a declaration of war, and detain him there as

long as the war lasted; but the Porte formally relinquished and abandoned this practice on the breaking out of war with Russia in 1827. To secure this immunity from all interference, an accredited ambassador or envoy is wholly free from the jurisdiction of the courts of law, or of any other authority in the country in which he is sent to reside. This constitutes the doctrine of extra- territoriality. His house is as sacred as his person. It is supposed, like a ship at sea, to form part of the territory represented by the flag which he may hoist over it. All the members of the embassy, and even the servants of the ambassador, share the same inviolability. They cannot even be arrested and prosecuted for offences without his consent. Hence, as the courts of justice have no jurisdiction over them, and indeed would have no means of enforcing an adverse decision either by distress or imprisonment, these diplomatic agents cannot be impleaded or sued. The only means of obtaining redress for an injury or breach of con- tract is an appeal to the head of the mission, or a further appeal to the government which he represents, which, it must be presumed, will not allow a wrong to be committed with impunity under the shelter of privilege. In England, by the statute 7 Anne, c. 12, it is expressly enacted that any process against foreign ambassadors or ministers, or their goods and chattels, shall be altogether void. This Act was passed in consequence of an attempt, made in 1708, to arrest an ambassador of Peter the Great in London for a debt of £50, and it is still law; but in fact it is only declaratory, and in confirmation of the common law and the law of nations.

An ambassador or envoy pays no taxes or contributions to the public revenue of the country in which he resides, and on this principle he is entitled to receive commodities from abroad free of customs dutics. But he is not exempted from the payment of local rates,—though, indeed, if he were to decline to pay them, no process could issue against him for the purpose of levying them. He also pays the ordinary rates of postage, but he has the privi- lege of sending his own couriers carrying sealed despatches, which exempts him from the monopoly of the post office. These couriers, and their despatches or mails, are also regarded by common consent as inviolable messengers, unless they chance in time of war to fall into the hands of a hostile belligerent. In

some countries ambassadors and their couriers have been allowed to have a prior claim for post horses over private travellers.

Another of the important privileges of an ambassador or envoy is the free exercise of the religion or form of worship

to which he adheres; but it is laid down by the best writers on the subject that a foreign minister has not the right of maintaining a chapel or chaplain within his hotel, under the law of nations; hence the liberty of religious worship for the ambassador and his suite was made a matter of treaty engagement between Catholics and Protestants, and between Christians and Mussulmans. By courtesy, though not of strict right, the usage of ambassadors' chapels has, however, become general; and it had a real importance in countries where the free exercise of different forms of belief was not tolerated by law. Thus, at the time when the rites of the Church of Rome were forbidden in England, the Spanish and Bavarian chapels in London were free; and they have remained in existence till our own days, although the enlarged tolerance of the present age has removed in every civilised country those barriers. In China and Japan the free exercise of the Christian religion by the Christian embassies is formally secured by treaty. B. We now pass to the duties of an ambassador, and we place at the head of them that of keeping his own sove- reign well informed of all that may concern his interests in foreign countries. He is the eye of the government he serves, specially directed to a particular spot, and he ought to be thoroughly acquainted with the course of policy, the movements of parties, the character and disposition of individual statesmen, and the material and commercial resources of the country in which he resides. His public despatches, and his private correspondence with the Minister of Foreign Affairs under whom he serves, ought to be a record of all that can interest or concern the state which he represents. In this sense the diplomatic reports of the ambassadors of former times are invaluable materials for history. His next duty is to protect and defend, if neces- sary, the persons and interests of his fellow-countrymen abroad; and this is of

especial moment in the case of a British ambassador, whose countrymen are to be met with as travellers, navigators, or merchants in all parts of the globe. To them the presence and influence of the diplo- matic representatives of their country is of incalculable value, and nothing can be more ill-judged than the pro-

-posals that have been made to cut down and contract

our foreign embassies and missions. A third, but not less important, duty of an ambassador is to maintain the most amicable relations with the sovereign to whom he is accredited, and with his ministers, and to observe towards them the strictest respect, veracity, and good-will. It has been said in joke that the first duty of an ambassador is to keep a good cook; but if this implies that he is to exercise a liberal hospitality and to make his house agreeable, those no doubt are means which may powerfully assist him in the objects of his mission. In former times it was con- sidered to be essential to good diplomacy to act as a spy upon the motives and conduct of foreign statesmen, to cheat without being cheated, to use clandestine means to obtain information, to endeavour to form a party in foreign states favourable to the ambassador's own national interests, to observe and resist with the utinost jealousy the demeanour of other foreign envoys, and to carry on a species of warfare under the mask of courtesy and good-breeding. These practices have given diplomacy and the functions of ambassadors a bad name, but it must be said that they are repudiated by the principles and practice of the present time, and more especially by the foreign policy of this country. Down to a recent period, these struggles for ascendancy in foreign countries were carried on with great eagerness, and they led to unfor- tunate results. In Spain, for example, the untoward marriage of Queen Isabella was notoriously brought about by the violent and arbitrary interference of the French ambassador; and in 1848, when Lord Palmerston instructed

Sir Henry Bulwer to represent to the Spanish minister | by the pitying gods transformed into poplar trees, and the

that they would do well to adopt a more liberal and con- stitutional system of government, General Narvaez imme- diately sent the British envoy out of the country. This was the exercise of an extreme right, for which the British government could claim no redress. So, again, when in the course of the Russian war (1855) it appeared to the American government that the British envoy in Wash- ington had infringed the neutrality laws of the United States by endeavouring to enlist recruits for the service of Her Majesty, he was compelled to leave the country, and Great Britain had no just cause of complaint. These modern cases are important, because they prove that no state which respects itself will tolerate, on the part of a foreign envoy, a direct interference in the internal affairs of government or an infraction of its own laws. Hence arises the great principle on which our modern practice is founded, namely, that it is the duty of an ambassador to observe a strict neutrality between contending parties in the state to which he is accredited; to accept the govern- ment de facto with which he communicates as the govern- ment and sovereign of the nation; to pay implicit obedience to the laws of that state, whatever they be; and to abstain as much as possible from all intervention in its internal affairs. 'These doctrines are comparatively new, but they are sound, and they may be said to have received the assent and the approval of the most enlightened govern- ments of Europe. Great changes have occurred within the last few years in France, Germany, Austria, Italy, and Spain; but they have all the distinguishing mark that they are wholly independent of foreign diplomatic influ- euce. The first, perhaps we ought to say the sole duty, of an ambassador is to protect his own national interests and to promote the most friendly relations with the sovereign to whom he is accredited; and experience has proved that these objects are best secured by confining himself to the principal objects of his mission, and by relying on no arts but those of sincerity, forbearance, and truth. (H. R.)

AMBATO, or AstEnto pD'AMBATO, a town of Ecuador, on the northern slope of Chimborazo, about 65 miles south of Quinto, 8859

feet above the sea. It was destroyed by an eruption of Cotopaxi in 1698, but was soon rebuilt, and now carries on a flourishing trade in grain, sugar, and cochineal. Population, 12,000.

*AMBER (Gr. *HAexrpov; Lat. Succinwm, Electrum ; Fr. Succin, Ambre; Ger. Bernstein) is a hard, brittle substance with a resinous lustre, sometimes found perfectly transparent, but more usually of varying degrees of trans- lucency, and possessing a prevailing yellow colour, passing from a pale straw tint to a deep orange. It occurs in irregular masses, and has neither taste nor, at ordinary temperatures, odour. It develops electrical phenomena by friction, a property which doubtless early drew atten- tion to amber, and invested it with the romantic interest which attached to it in ancient times. The popular regard for the substance among the nations of antiquity was further maintained by the fabulous tales of the manner in which amber was formed and the mystery connected with its occurrence.*

The earliest notice of amber we find occurs in the Odyssey of Homer, where in the list of jewels offered by Phoenician traders to the Queen of Syra occurs " the gold necklace hung with bits of amber" (Od. xv. 460). Thales of Miletus, 600 B.c., noticed that amber when rubbed attracted light bodies, and that remote and simple observa- tion is the foundation of the modern science of electricity, So named from the Greek 7Aextpov. Among the Greek fables purporting to account for the origin of amber, it is narrated that the Heliade, on sceing their brother Pheethon hurled by the lightning of Jove into the Eridanus, were

tears they shed were dropped as amber on the shores of the river. Hence arose the Greek term for amber, "HAexrwp being one of the names of the sun god. A less poetical theory of its origin states that it was formed from the condensed urine of the lynx inhabiting northern Italy, the pale varieties being produced by the females, while the deeper tints were attributed to males. In such repute was amber in Rome in the time of Pliny that he sarcastically remarks, "the price of a small figure in it, however diminutive, exceeds that of a living healthy slave." Besides its application to jewellery and carved ornaments, and its use, partly decorative and partly prophylactic, as necklaces,

peculiar virtues were attributed to it. Pliny observes—" True it is that a collar of amber beads worn about the necks of young infants is a singular preservative to them against secret poison, and a counter-charm for witchcraft and sorceries." As an article of personal orna-mentation, the same authority states that amber was used to produce imitations of precious stones by artificial staining, a use to which it was peculiarly adapted owing to its brilliant lustre combined with the ease with which it could be worked and polished.

The great source of supply of amber in all ages appears to have been the Baltic coasts, from which the supplies of commerce still continue to be drawn. During the reign of Nero an expedition was sent from Rome to explore the amber-producing country, and so successful was the party that a present of 13,000 Ib of amber was brought back to the emperor, including a piece weighing 13 1b. It occurs in regular veins along the Baltic coast, but in greatest abundance between Pillau and Grosz Hubenicken, on the Prussian coast. Professor Phillips thus describes the mines :—

" Near the sea-coast in Prussia there are regular mines for the working of amber : under a stratum of sand and clay, about 20 feet thick, a stratum of bituminous wood occurs, from 40 to 50 fect thick, of a blackish brown colour, and impregnated with pyrites. Parts of these trees are impregnated with amber, which sometimes is found in stalactites depending from them. Under the stratum of trees were found pyrites, sulphate of irou, and coarse sand, in which were rounded masses of amber. The nine is worked to the depth of 100 feet; and from the circumstances under which the amber is found it scems plain that it originates from vegetable juices,"

After heavy storms large quantities are usually found thrown up on the coast at the localities where it is regularly excavated, and the assumption is, that amberifer- ous deposits crop up in the shallow waters near the shores, from which pieces become detached during the violent com- motion of the water. It is further sparingly cast on the Swedish and Danish coasts, and occasionally pieces are picked up along the shores of Norfolk, Essex, and Sussex in England. It occurs at

numerous localities' inland throughout Europe, among which may be noted the neighbourhood of Basle in Switzerland, the departments of Aisne, Loire, Gard, and Bas Rhin in France, and in the Paris clay it is associated with bituminous deposits. In England it has been found in the sandy deposits of the London clay at Kensington. The coasts of Sicily and the Adriatic likewise afford amber. The most beautiful specimens are perhaps those which are found at Catania. They often possess a beautiful play of colour, approaching to purple, not to be observed in the product of other places. Professor Dana gives the following note on its occurrence in America :—

"It has been found in various parts of the greensand formation of the United States, either loosely embedded in the soil or engaged in marl or lignite, as at Gay Head or Mather's Vineyard, near Trenton, and also at Camden, in New Jersey, and at Cape Sable, near Magothy river, in Maryland."

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It is said to be taken in large quantities from the north of Burmah to the markets of China, where it is highly prized.

The appearance of enclosed foreign bodies, such as insects, leaves, twigs, &c., which amber very often presents, and the markings on its surface, very early led to correct inferences as to its origin. Pliny states that " amber is an exudation from trecs of the pine family, hke gum from the cherry and resin from the ordinary pine; and in accordance with this opinion is its Latin name succinum, the gum-stone. The opinion cxpressed by Pliny is that which at the present day may be fairly held as established ; but of course amber differs from other resins owing to changes induced by its fossilised condition. Sir David Brewster has pointed out that in optical properties it agrees with other resinous exudations. The insects found enclosed in amber are for the most part of extinct species, and so also are the remains of plants. A species of conifer has been established provisionally as the amber-yielding tree, Pinites succinefer, but Goppert has shown that many trees may have yielded the exudation, and these not all neces- sarily belonging to the pine order.

The close relation of amber to ordinary resins is further brought out by its chemical properties and composition. According to Berzelius, it consists mainly of a resin, succinite, insoluble in alcohol, in combination with small proportions of two others, isomeric with the first, but soluble in alcohol and ether. By dry distillation it gives off at a low temperature water, succinic acid, and oil of amber, which last substance was formerly used in medicine in combination with alcohol and ammonia under the name of eau de luce; but now amber and all its products have

disappeared from the standard pharmacopeeias. Its com- position is, according to Schrétter—

CRON Pease. ccegeicee ater eset ener eee aces 78°94

IEP Veen 5 oc eee ase etme ns vase 10°53

OON 55.5255 atcateeta ee eene eeee 10°53

and mineralogically it belongs to Dana's class of oxygenated hydrocarbons. It burns with a pale yellow flame, with a good deal of black smoke, evolving an agreeable odour, and leaving a shining black carbonaceous residuc.

It is said that by exposing amber covered with sand in an iron pot to the influence of heat for forty hours, or boiling it for twenty hours in rape oil, it will become transparent, and pieces will cement and mould together. The great size of vessels of amber which have come down from ancient times suggests the probability of some such art being practised in remote periods. It is now applied to few useful purposes among western nations beyond forming the mouthpieces for tobacco-pipes and cigar-holders. Fine pieces are in some demand for public collections and for the purposes of the carver. In the East, besides its being highly prized for ornamental purposes, a feeling of veneration for its mystic properties still en- hances its value. The Turks esteem it highly as a mouth- piece for tobacco pipes, and believe that it resists the transmission of infection. The principal demand for the amber of commerce is among the Armenians, through whom it is conveyed to

Egypt, Persia, China, and Japan ; and a great quantity is purchased to be consumed at the shrine of Mahomet by the pilgrims bound to Mecca. The value of amber depends upon its colour, its lustre, and its size. In 1576 a mass weighing 11 tb was found in Prussia, and deemed worthy of being presented to the emperor; later, a mass of 13 ib was found, for which it is said 5000 dollars were refused. In the royal cabinet at Berlin a piece is shown weighing 18 tb; but such masses are of very great rarity.

AMBERG, a walled town of Bavaria, formerly the capital of the Upper Palatinate, and at present the seat of the appeal court for the district, is situated on both sides

of the Vils, 35 miles east of Nuremberg. It is a well. built town, and has a library, a gymnasium, a lyceum, elementary schools, an arsenal, and several churches, the finest of which is St Martin's, with many fine paintings, and a tower 300 feet high. The principal manufactures are fire-arms, ironmongery, earthenware, woollen cloth, beer, and salt; in the neighbourhood are iron and coal mines, The French under Jourdan were defeated by the Austrians near Amberg in 1796. Population in 1871, 11,688. AMBERGRIS (Ambra grisea, Ambre gris, or Grey Amber) is a solid, fatty, inflammable substance of a dull grey or blackish colour, the shades being varicgated like marble, possessing a peculiar sweet earthy odour. It is now known to be a morbid secretion formed in the intes- tines of the spermaceti whale (Physeter macrocephalus), and is found floating upon the sea, on the sea-coast, or in the sand near the sea-coast. It is met with in the Atlantic Ocean, on the coasts of Brazil and Madagascar; also on the coast of Africa, of the East Indies, China, Japan, and the Molucca Islands; but most of the ambergris which is brought to England comes from the Bahama Islands, Providence, &c. It is also sometimes found in the ab- domen of whales, always in lumps in various shapes and sizes, weighing from 4 oz. to 100 or more Ib. A piece which the Dutch East India Company bought from the King of Tydore weighed 182 tb. An American fisherman from Antigua found, inside a whale, about 52 leagues south-

east from the Windward Islands, a piece of ambergris which weighed about 130 tb, and sold for £500 sterling. Like many other substances regarding the origin of which there existed some obscurity or mystery, ambergris in former times possessed a value, and had properties attributed to it, more on account of the source from which it was drawn than from its inherent qualities. Many ridiculous hypo- theses were started to account for its origin, and among others it was conjectured to be the solidified foam of the sea, a fungoid growth in the ocean similar to the fungi which form on trees, the excreta of sea-birds, &c. The true source and character of ambergris was first satisfac- torily established by Dr Swediaur in a communication to the Royal Society (Philosophical Transactions, vol. Ixxiii.) It was found by Dr Swediaur that ambergris very fre- quently contained the horny mandibles or beaks of the squid (Sepia moschata), on which sperm whales are known to feed. That observation, in connection with the fact of ambergris being frequently taken frum the intestines of the sperm whale, sufficiently proved that it was formed within that creature, and not an extraneous substance swallowed by the whale. It was further observed that the whales in which ambergris was found were cither dead or much wasted and evidently in a sickly condition. From this it was inferred that ambergris was in some way connected with a morbid condition of the sperm whale. Ambergris, when taken from the intestinal canal of the sperm whale, is of a deep grey colour, soft consistence, and a disagreeable smell. On exposure to the air it gradually hardens, becomes pale, and develops its peculiar sweet earthy odour. In that condition its specific gravity ranges from 0-780 to 0-926. It melts at a temperature of about 145° Fahr. into a fatty yellow resinous-like liquid; and at 212° it is volatilised into a white vapour. It is soluble in ether, volatile and fixed oils, but only feebly acted on by acids. By digesting in hot alcohol, a peculiar substance termed ambrein is obtained, which deposits in brilliant white crystals as the solution cools. In chemical constitu- tion ambrein very closely resembles cholesterin, a principle found abundantly in biliary calculi. It is therefore more than probable that ambergris, from the position in which it is found and its chemical constitution, is a biliary concre- tion analogous to what is formed in other mammals. The

use of ambergris in Europe is now entirely confined to perfumery, though it formerly occupied no inconsiderable place in medicine. Asa material of perfumery its price varies from 15s. to 25s. per ounce; and in minute quantities its alcoholic solution is much used for giving a " floral" fragrance to bouquets, washes, and other preparations of the perfumer. It occupies a very important place in the perfumery of the East, and there it is also used in phar- macy, and as a flavouring material in cookery. The high price it commands makes it peculiarly liable to adultera- tion, but its genuineness is easily tested by its solubility in hot alcohol, its fragrant odour, and its uniform fatty consistence on being penetrated by a hot wire.

AMBERT, chief town of an arrondissement of the same name in the department of Puy de Dome, France, situated on the Dore, 35 miles from Clermont. Its chief manu- factures are paper, linen, lace, ribands, and pins; it has also an extensive trade in cheese of a very fine quality. Population in 1872, 7625.

AMBLESIDE, a small market town in Westmoreland, situated about a mile from the head of Lake Windermere, and 14 miles from Kendal. During the summer it is much frequented by tourists on account of its beautiful situation. In its vicinity is Rydal Mount, for many years the resi- dence of the poet Wordsworth. Some indistinct remains of Roman fortifications, in which coins, urns, and other relics have been frequently discovered, exist in the neigh- bourhood. Coarsc woollen cloths are manufactured at Ambleside. Population in 1871, 1988.

AMBLETEUSE, a seaport town of France, in the department of the Pas de Calais, on the English Channel, 6 miles north of Boulogne. From the accumulation of sand in its harbour it has lost its importance as a seaport, and the town is now almost deserted. It possesses an historical interest as the landing-place of James II. after his abdication in 1688; and Napoleon I. in 1804 attempted to improve the harbour for the flat-bottomed boats by means of which he was to invade England. Near Amble- teuse is the column which he erected to the grand army in 1805. Population, about 700.

AMBO, or Amzon (Gr. duBwv, from dvaBaivw), a read- ing-desk or pulpit in early Christian churches which was placed in the middle of the nave. It was ascended by a flight of steps on both the east and west sides, and was in some cases so large as to accommodate fifty persons. From it the lessons were read, and hence it was sometimes called suggestus lectorum and Biya trav dvayvwordv. It was also occasionally used by the preacher. Two movable ambos may be seen in the church of St John Lateran at Rome. 'The purposes of the ambo were served in medieval churches by the rood-loft, a gallery across the chancel-arch, and in modern churches it has given place to the lectern and the pulpit.

_AMBOISE, a town situated in a rich wine-producing district in the department of Indre-et-Loire, France, on the left bank of the Loire, 14 miles east of Tours. Its chief manufactures are cloth and files. At Amboise the French Protestants were first called Huguenots, and 1200 of them were massacred there in 1560 on the discovery of their conspiracy against the Guises. The ancient castle, which is situated on a height above the town, was a seat of the French kings, and it was set apart as a residence for the Arab chief Abd-el-Kader during his captivity in France. Population, 4570.

AMBOYNA, one of the Moluccas or Spice Islands, be- longing to the Dutch, lying south-west of Ceram, in 3° 41' S. lat. and 128° 10' E. long. It is 32 miles in length, with an area of about 280 square miles, and is of very regular figure, being almost divided into two. The south-eastern and smaller portion (called Leitimor) is united to

the northern (known as Hitoe) by a neck of land about a mile broad. The island is mountainous, but is for the most part fertile and well-watered. Large tracts are covered with rich tropical forests, which embrace a great variety of trees, although ordinary building timber is scarce. The climate is comparatively pleasant and healthy ; the average temperature is 80° Fahr., rarely sinking below 72°. The rainfall, however, after the eastern monsoons, is very heavy, and the island is lable to violent hurricanes and earthquakes. Amboyna produces most of the-;common tropical fruits and vegetables,

including the sago-palm, bread-fruit, cocoa-nut, sugar-cane, maize, coffee, pepper, and cotton. Cloves, however, form its chief product, and the only one that is of any real commercial import- ance. The Dutch have done much to foster the cultiva- tion of this article in the island, and at one time prohibited the rearing of the clove-tree in all the other islands subject to their rule, in order to secure the monopoly to Amboyna. Each tree yields annually from 2 to 5 lb of cloves, and sometimes even more; while the total annual quantity produced probably averages about 500,000 ib. The animal kingdom is poorly represented. Indigenous mammals are feeble in species as well as few in number; birds are more abundant, but of no greater variety. The entomology of the island is, however, very rich, particularly among the Lepi- doptera. The aborigines of Amboya are a race called Horaforas, but Malays constitute the main body of the population; there are also Chinese, Dutch, and a few Por- tuguese. The Malays in most points resemble those of Java. They are naturally lazy and effeminate, but when properly trained make good soldiers. The inhabitants are mostly Christians or Mahometans. Amboyna is the chief island of the Dutch residence of the Moluccas, which comprises, in addition, the islands of Boeroe, Amblauw, Ceram, Manipa, Kilang, Bonoe, Haroekoe, Honimoa or Saparoa, Noesa-laut, and Hila. The Portuguese were the first European nation to visit Amboyna (1512). They esta- blished a factory there in 1521, but did not obtain peace- able possession of it till 1580, and were dispossessed by the Dutch in 1605. About the year 1615 the British formed a settlement in the island, at Cambello, which they retained until 1623, when it was destroyed by the Dutch, and frightful tortures inflicted on the unfortunate persons connected with it. In 1654, after many fruitless nego- tiations, Cromwell compelled the United Provinces to give the sum of £300,000, together with a small island, as compensation to the descendants of those who suffered in the " Amboyna massacre." In 1796 the British, under Admiral Rainier, captured Amboyna, but restored it to the Dutch at the peace of Amiens in 1802. It was recaptured by the British in 1810, but once more restored to the Dutch in 1814. Population, about 50,000. See Mo.vccas.

Amboyna, the chief town of the above island, and also of the Dutch Moluccas, is situated towards the north-west of the peninsula of Leitimor. 'The streets are broad and unpaved, running at right angles to one another, and inter- sected by numerous rivulets. The houses are of wood, roofed with palm leaves, and mostly of one storey, on account of the frequent earthquakes. An esplanade of 250 yards reaches from Fort Victoria to the town, and is terminated by a handsome range of houses. The town- house is a neat structure of two storeys; and among the other buildings are two Protestant churches and a hospital. The government offices are in Fort Victoria. The road- stead of Amboyna is safe and commodious. Population, about 13,000.

AMBRACIA, or AmpPRactA, an important city of ancient Epirus, situated on the eastern bank of the river Arach- thus, about seven miles from the Ambracian Gulf.

According to tradition, it was originally a Thesprotian town, founded by Ambrax, son of Thesprotus, or by Ambracia, daughter of Augeas. About 635 B.c. it was colonised by Corinthians, and so became a Greek city. Its power increased rapidly until the time of the Peloponnesian war, when it commanded the whole of Amphilochia, including. the town of Argos, from which the original inhabitants were expelled. In 432 B.c. the expelled citizens, with the assistance of the Athenians under Phormion, retook Argos. In 430 the Ambracians nade an unsuccessful attempt to recover the town, and a second attack in 426 resulted in a still more disastrous failure. The power of Ambracia now declined as rapidly as it had grown. In 338-7 it was compelled to submit to Philip of Macedonia, and it remained subject to that kingdom until it was ceded by Alexander V. to Pyrrhus of Epirus about 295. The latter made it his capital, and enriched it with numerous works of art. It subsequently came under the power of the Aitolian League (239), and sustained a memorable siege in the war between the latter and Rome (189). In the end the city opened its gates to the enemy, who removed many of its most valuable works of art to Rome. In 31 B.c. the inhabitants of Ambracia were removed by Augustus to

Nicopolis, the town he had founded in commemoration of the victory of Actium. The site of Ambracia is occupied by the modern Arta, near which remains of the ancient fortifications may be seen.

AMBROSE or ALEXANDRIA lived in the beginning of the third century. Jerome and Eusebius differ in the account they give of him, the one calling him a Marcionite, the other a Valentinian; but they agree in alleging that he was converted to the orthodox faith by the preaching of Origen. Origen dedicated many of his works, among others his book Ox Martyrdom, to Ambrose, at whose desire and expense they were published, and the two lived on terms of thc most intimate friendship. According to some, Ambrose died a martyr in the persecution under Maximin, about the year 236; but the dedication of Origen's Hight Books against Celsus proves that he lived to the year 250, or near that period. Origen speaks of him as a man of sincere piety, and much devoted to the study of the Scriptures.

AMBROSE, Sarnt, Bishop of Milan, was one of the inost eminent fathers of the church in the fourth century. He was a citizen of Rome, born in Gaul,—according to some historians, in the year 334, but according to others in 340. At the period of his birth his father was pre- torian prefect of Gallia Narbonensis; and upon his death the widow repaired to Rome with her family. Ambrose received a religious education, and was reared in habits of virtue by his mother, an accomplished woman, and eminent for her piety. The names of his instructors in the rudi- ments of Greek and Roman literature have not been trans- mitted to posterity ; but in these branches he made early proficiency, and having directed his attention to the law, he employed his eloquence with such reputation in the pre- torlan court of Anicius Probus, that he was-soon deemed worthy of a place in the council. After he had continued in this station for some time, Probus appointed him con- sular prefect of Liguria and A®milia, comprehending the territories of Milan, Liguria, Turin, Genoa, and Bologna. Milan was chosen as the place of his residence; and, by the prudent and gentle use of his power, he conducted the affairs of the province with general approbation and grow- ing popularity.

The death of Auxentius, bishop of Milan, in the year 374, made a sudden change in the fortune and literary pursuits of Ambrose. At that period the tide of religious conten- tion ran high between the orthodox and the Arians, and a violent contest arose concerning the choice of a successor

to Auxentius. When the people were assembled in the church to elect the new bishop, Ambrose, in the character of governor of the place, presented himself to the assembly, and in a grave, eloquent, and pathetic address, admonished the multitude to lay aside their contentions, and proceed to the election in the spirit of religious meekness. It jg reported that when Ambrose had finished his address, a child cricd out, 'Ambrose is bishop," and that the agitated multitude, regarding this as a miraculous inti- mation, unanimously elected Ambrose bishop of Milan. Some suppose that this was entirely a device of Ambrose or his friends; others ascribe it to mere accident. Am- brose professed strong reluctance, and even fled, or pre- tended to fly, from the city in order to avoid the intended honour. The place of his concealment, however, was soon discovered ; the emperor's confirmation of his election was made known to him; and after being baptized, he was ordained bishop of Milan, about the end of the year 374. Whatcver we may think of the singular conduct of Ambrose in accepting an office for which he was certainly unqualified in respect of previous studies, habits, and employments, it must be admitted that he immediately betook himself to the necessary studies, and acquitted himself in his new elevation with ability, boldness, and integrity. Having apportioned his money among the poor, and settled his lands upon the church, with the exception of making his sister tenant during life, and having committed the care of his family to his brother, he entered upon a regular course of theological study, under the care of Simplician, a pres- byter of Rome, and devoted himself to the labours of the church.

The irruption of the Goths and the northern barbarians, who rushed down upon the Roman empire at this time, spreading terror and

desolation all around, compelled Ambrose, along with several others, to retire to [Nyricum, but his exile was of short duration, for the northern in- vaders were quickly defeated by the forces of the emperor, and driven back with considerable loss into their own territories.

The eloquence of Ambrose soou found ample scope in the dispute between the Arians and the-orthodox. About this era the doctrine of Arius concerning the person of Christ had been extensively received, and had many power- ful defenders both among the clergy and the common people. Ambrose espoused the cause of the Catholics. Gratian, the son of the elder Valentinian, took the same side; but the younger Valentian, who had now become his colleague in the empire, adopted the opinions of the Arians; and all the arguments and eloquence of Ambrose were in- sufficient to reclaim the young prince to the orthodox faith. Theodosius, the emperor of the East, also professed the | orthodox belief ; but there were many adherents of Arius scattered throughout his dominions. In this distracted state of religious opinion, two leaders of the Arians, Pal- ladius and Secundianus, confident of numbers, prevailed upon Gratian to call a general council from all parts of that empire. This request appearcd so equitable that he complied without hesitation ; but Ambrose, foreseeing the consequence, prevailed upon the emperor to have the matter determined by a council of the Western bishops. A synod, composed of thirty-two bishops, was accordingly held at Aquileia in the year 381. Ambrose was elected president; and Palladius being called upon to defend his opinions, declined, insisting that the meeting was a partial one, and that the whole bishops of the empire not being present, the sense of the Christian church concerning the question in dispute could not be obtained. A vote was then taken, when Palladius and his associate Secundianus were de- posed from the episcopal office. ,

Ambrose was equally zealous in combating the heathen

superstitions. Upon the accession of Valentinian IL, many of the senators who remained attached to the pagan idolatry made a vigorous

effort to restore the worship of the heathen deities. Symmachus, a very opulent man and a great orator, who was at that time prefect of the city, was intrusted with the management of the pagan cause, and drew up a forcible petition, praying for the restoration of the altar of Victory to its ancient station in the hall of the senate, the proper support of seven vestal virgins, and the regular observance of the other pagan ceremonies. In the petition he argued that this form of religion had long been profitable to the Roman state,and reminded the emperor howmuch Rome had been indebted to Victory, and that it had been the uniform custom of the senators to swear fidelity to the government upon that altar. He likewise adduced many facts to prove the advantages accruing to the statefrom its ancient religious institutions, and pleaded that, as it was one divinity that all men worshipped under different forms, ancient practice should not be rashly laid aside. He even proceeded so far as to assert the justice of increasing the public revenue by robbing the church, and attributed the late famine which had overtaken the empire to the neglect of the ancient worship. To this petition Ambrose replied in a letter to Valentinian, arguing that the devoted worshippers of idols had often been forsaken by their deities; that the native valour of the Roman soldiers had gained their victories, and not the pretended influence of pagan priests; that these idolatrous worshippers requested for themselves what they refused to Christians; that voluntary was more honourable than constrained virginity ; that as the Christian ministers declined to receive temporal emoluments, they should also be denied to pagan priests; that it was absurd to suppose that God would inflict a famine upon the empire for neglecting to support a religious system con- trary to His will as revealed in the Scriptures; that the whole process of nature encouraged innovations, and that all nations had permitted them, even in religion; that heathen sacrifices were offensive to Christians; and that it was the duty of a Christian prince to suppress pagan ceremonies. In the epistles of Symmachus and of Ambrose both the petition and the reply are preserved, in which sophistry, superstition, sound ‘sense, and solid argument are strangely blended. It is scarcely necessary to add that the petition was unsuccessful.

The increasing strength of the Arians proved too formidable for Ambrose. In 384 the young emperor and his mother Justina, along with a considerable number of clergy and laity professing the Arian faith, requested from the bishop the use of two churches, one in the city, the other in the suburbs of Milan. The prelate believing the bishops to be the guardians both of the temporal and spiritual interests of the church, and regarding the religious edifices as the unquestionable property of the church, positively refused to deliver up the temples of the Lord into the impious hands of heretics. Filled with indig- nation, Justina resolved to employ the imperial authority of her son in procuring by force what she could not obtain by persuasion. Ambrose was required to answer for his conduct before the council. He went, attended by a numerous crowd of people, whose impetuous zeal so over- awed the ministers of Valentinian that he was permitted to retire without making the surrender of the churches. The day following, when he was performing divine service In the Basilica, the prefect of the city came to persuade him to give up at least the Portian church in the suburbs. As he still continued obstinate, the court proceeded to violent measures: the officers of the household were com- Inanded to prepare the Basilica and the Portian churches to celebrate divine service upon the arrival of the emperor and his mother at the ensuing festival of Easter. Perceiving

the growing strength of the prelate's interest, the court deemed it prudent to restrict its demand to the use of one of the churches. But all entreaties proved in vain, and drew forth the following characteristic declaration from the bishop :—" If you demand my person, I am ready to submit : carry me to prison or to death, I will uot resist ; but I will never betray the church of Christ. I will not call upon the people to succour me; I will die at the foot of the altar rather than desert it. The tumult of the people I will not encourage ; but God alone can appease it."

Many circumstances in the history of Ambrose are strongly characteristic of the general spirit of the times. The chief causes of his

victory over his opponents were his great popularity and the superstitious reverence paid to the episcopal character at that period. But it must also be noted that he used several indirect means to obtain and support his authority with the people. He was liberal to the poor; it was his custom to comment severely in his preaching on the public characters of his times; and he introduced popular reforms in the order and manner of public worship. It is alleged, too, that at a time when the influence of Ambrose required vigorous support, he was admonished in a dream to search for, and found under the pavement of the church, the remains of two martyrs, Gervasius and Protasius. The vulgar crowded to beliold these venerable relics, and, according to report, a number of sick persons were healed by touching the bones. Ambrose exulted in these miracles, and appealed to them in his eloquent sermons; while the court derided and called in question their existence. It is remarkable that these and many other miracles obtained current credit among the Christian historians of the second, third, and fourth centuries; and Dr Cave, in speaking of them, says—" I make no doubt but God suffered them to be wrought at this time on purpose to gonfront the Arian impieties,"

Although the court was displeased with the religious principles and conduct of Ambrose, it respected his great political talents ; and when necessity required, his aid was solicited and generously granted. When Maximus usurped the supreme power in Gaul, and was meditating a descent upon Italy, Valentinian sent Ambrose to dissuade him from the undertaking ; and the embassy was successful. On a second attempt of the same kind Ambrose was again employed ; and although he was unsuccessful, it cannot be doubted that, if his advice had been followed, the schemes of the usurper would have proved abortive ; but the enemy was permitted to enter Italy, and Milan was taken. Justina and her son fled; but Ambrose remained at his post, and did good service to many of the sufferers by causing the plate of the church to be melted for their relief. Theodosius, the emperor of the East, espoused the cause of Justina, and regained the kingdom.

In the year 390 a tumult happened at Thessalonica, in which Botheric, one of the imperial officers, was slain. Theodosius was so enraged at

this that he issued a royal mandate for the promiscuous massacre of the inhabitants of the place, and about 7000 persons were butchered without distinction or mercy. The deed called forth a severe rebuke from Ambrose, who charged the emperor not to approach the holy communion with his hands stained with innocent blood. The emperor reminded him that David had been guilty of murder and of adultery. The bishop replied, "You have imitated David in his guilt ; go and imitate him in his repentance." The prince obeyed, and after a course of eight months' penance he was absolved, on condition that in future an interval of thirty days should intervene before any sentence of death or con- fiscation was executed.

The generosity of Ambrose was favourably exhibited in

the year 392, after the assassination of Valentinian and the usurpation of Eugenius. Rather than join the standard of the usurper, he fled from Milan ; but when Theodosius was eventually victorious, he supplicated the emperor for the pardon of those who had supported Eugenius. Soon after acquiring the undisputed possession of the Roman empire, Theodosius died at Milan (395). Bishop Ambrose did not long survive him, having died in the year 397.

On many accounts the character of the bishop of Milan stands high among the fathers of the ancient church. With unvarying steadiness he delivered his religious senti- ments on all occasions; with unwearied assiduity he dis- charged the duties of his office; with unabated zeal and boldness he defended the orthodox cause in opposition to the Arians; with a liberal hand he fed the numerous poor who flocked to his dwelling; with uncommon generosity he manifested kindness to his adversaries; and with Christian affection he sought the happiness of all men. His general disposition and habits were amiable and virtuous, and his powers of mind vigorous and persevering. Ambition and bigotry were the chief blemishes in his character.

The writings of Ambrose are voluminous, but many of them are little more than reproductions of the works of Origen and other Greek

fathers. The great design of them was to defend and propagate the Catholic faith. His expositions of Scripture contain many extreme examples of allegorical and mystical interpretation. Modern readers will regard much in the writings of Ambrose as trivial, and even as ludicrous; but his style is vigorous, and the sentiment is often weighty. Gibbon's judgment appears to be too severe: " Ambrose could act better than he could write ; his compositions are destitute of taste or genius, without the spirit of Tertullian, the copious elegance of Lactantius, the lively wit of Jerome, or the grave energy of Augustin." His exegetical writings include an exposi- tion of the Gospel of St Luke, and commentaries on certain Psalms. His Hexaémeron is a homiletical treatise on the history of the creation. "Zhe Hymns of St Ambrose have exercised a powerful influence on Christendom. They were designed by him to be a preventive against the errors of Arianism, and to confirm the professors of the true faith in the doctrines of the Trinity and the divinity of Christ.

.. Very many of them have found a place in the liturgies of the western Church. On account of the celebrity of St Ambrose, many hymns have been attributed to him which are not his; and, on the other hand, some critics have gone into the opposite extreme, and have deprived him of his property. In the Benedictine edition of his works only twelve hymns are admitted; and Dom. Biraghi [of the Ambrosian Library, who has endeavoured, in his Inni Sincert di Sant? Ambrogio, to restore the hymns to their primitive form] shows reason for believing that only seven of these are genuine" (Journal of a Tour in Italy, by Chr. Wordsworth, D.D., 1863.) The most accurate and complete edition of his works is that published by the Benedictines, printed at Paris in 1686 and 1690, in two volumes folio.

A liturgical form, the Ambrosian Ritual, which is still in use in the arch-diocese of Milan, has been tradition- ally ascribed to Saint Ambrose. Several attempts were made, in particular by the Emperor Charlemagne and Pope Nicolas IT., to secure uniformity by enforcing the adoption of the Roman breviary throughout the Western Church, but the clergy of Milan refused to yield. The ritual of Ambrose is included in the Liturgia Latinorum of Pamelius (Cologne, 1571-6).

“Full information concerning its history will be found in the Ceremoniale Ambrosiano, by Dom. Giovanni an published at Milan, 1853” (Wordsworth’s Zour,

For a description of the famous church of St Ambrose,

AMBROSE

founded by him at Milan 387 a.D., see Mitan. For the Ambrosian Library, see LisprariEs. Notices of his Lirurey and Hymys will be found under these headings,

AMBROSE, Isaac, a Puritan divine. Formerly the practical and devotional writings of this eminent Noncon- formist rivalled John Bunyan’s in popularity, and his Looking to Jesus holds its own even now. Prominent name as his was in his generation, very scanty are the personal memorials of him. His own “ Media,” under the head of “ Experiences,” yields a few incidents of his life. According to Anthony & Wood, he was a minister’s son descending from those of the name living at Lowick, and they from the Ambroses of Ambrose Hall in Lancashire, It is probable that his father was Richard Ambrose, vicar of Ormskirk, who was succeeded by another son, Henry. It seems improbable that any of his line could descend of the Lowick Ambroses, inasmuch as they were the most ‘persistent Catholics of Lancashire ;” and there is the additional consideration that, while in our worthy’s writ- ings there are many references to the Papists, he makes not the slightest allusion to his conversion from Popery, or to any Catholic relatives or associations. He entered Brazenose college, Oxford, in 1621, in the seventeenth year of his age, aud must therefore have been born in 1603-4, Having proceeded M.A. and been ordained, he received at the outset a little cure in Derbyshire, which was at that time and onward to Puritanism what Goshen was to Egypt and Israel. By the influence of the Earl of Bed- ford, he was appointed one of the king’s itinerant preachers in Lancashire. Having later served for a time a curacy in Garstang, he was selected by the Lady Margaret Hoghton as vicar of Preston. He was on the celebrated committee for the ejection of “scandalous and ignorant ministers and schoolmasters” during the Commonwealth. So long as Ambrose

continued at Preston he was favoured with the warm friendship of the Hoghton family, as was John Howe,—their ancestral woods and the tower near to Blackburn affording him sequestered places for those devout meditations and "experiences" that give such a charm to his diary. The immense auditory of his sermon at the funeral of Lady Hoghton is a living tradition still all over the county. For some reason which is unknown,

perhaps failing strength for so onerous a charge, Ambrose

left his great church of Preston, and became minister of Garstang, where before he had been curate. He was vicar of Garstang when the Act of Uniformity was passed. He could have conscientiously complied with many of its requirements, for he was willing to use the Prayer-book, and did not stickle at things whereat other tender con- sciences did; but the enforcement was so absolute, not to say brutal, that he found himself constrained to form one of the Two Thousand. His after years were passed among old friends at Preston. He spent a great part of his time every summer in Widdicre wood, where, seldom seen by any except on the Sabbath, he communed with his own heart and his God. The last time he was seen alive was by some friends from Garstang, of whom he 1s said to have taken leave with unusual affection and gravity. Immediately after they left him he retired to his wonted place of meditation, where he was found by an attendant in articulis mortis. He died in 1664 at the age of sixty-one. Calamy says he was seventy-two, but his college entry shows he was mistaken. As a religious writer, Ambrose has 4 vividness and freshness of imagination possessed by scarcely any of the Puritan Nonconformists. He is plaintive as Flavel and as intense as Baxter. Many who have no love for Puritan doctrine, nor sympathy with Puritan expe rience, have appreciated the pathos and beauty of his writ- ings, which have never been out of print from their original issue until now. (A. B. G.)

AMBROSIUS, Avretranus, a leader of the Britons during the 5th century. He is said, on somewhat doubt- ful authority, to have been a son of Constantine, who was elected emperor by the Roman army in

Britain in 407. The usually received account of his life, based chiefly upon the history of Geoffrey of Monmouth, contains much that is evidently fabulous. It seems probable that he was educated at the court of Aldroén, king of Armorica, who sent him over with a strong force to assist his countrymen against the Saxons, whom Vortigern had invited to Britain. There is also little doubt that, having defeated Vortigern, he was chosen to succeed him as king of Britain. Geoffrey also states that he built Stonehenge (sce STONEHENGE), that he defeated Hengist, and that he compelled the Saxons to surrender at York; but these stories are inhe- rently improbable. The circumstances of his death are in- volved in equal obscurity. According to Geoffrey's account, he died of poison at Winchester; but others state that he

was killed in a battle with Cerdic the Saxon in 508.

AMBULANCE, the French ambulance, hémital ambulant, derived from the Latin ambulare, to move from place to

place.

Ambulances, in military phraseology, are hospital esta- blishments moving with armies in the field, and organised for providing early surgical assistance to the wounded | after battles. They are only prepared for affording help of a more or less temporary kind, and they are thus distinguished from the stationary or Jjixed hospitals, in which sick and wounded soldiers receive care and treat. ment of a permanent character. The term is not un- frequently misapplied in common speech in England to the ambulance waggons, or other conveyances by which the Wounded are carried from the field to the ambulances and

fixed hospitals. Such vehicles form part of the ambulance equipment, and will be noticed presently. The constitution of an ambulance includes (1) a certain

staff of officers and subordinates, and (2) a certain equip-

ment. The equipment naturally divides itself into (a) the medical and surgical equipment, and (6) the equipment forming the means of

transport for the wounded. But the constitution would hardly be understood without a general

comprehension of the system on which the functions of

ambulances are discharged, or, in other words, the plan of administering surgical assistance in the field to the wounded of armies. Ambulance administration will therefore be first noticed, keeping in view the circumstances of armies operating in Europe, and the ambulance staf' and equipment subsequently.

AMBULANCE ADMINISTRATION. —The origin of the ambu- lance system which now prevails in all civilised armies, though variously modified among them in particular details, only dates from the last decade of the last century. Be- fore that time no ambulance establishments had been organised for effecting the removal of the wounded, or for giving the requisite surgical attention to them, while battles were in progress. Soldiers wounded in the ranks were either carried to the rear by comrades, or were left to lie exposed to all risks, and unheeded, until after the fighting had ceased. The means of surgical agsist- ance did not reach the battle-field till the day after the engagement, or often later, and to a large proportion of the wounded it was then of no avail. In 1792 Larrey Introduced his system of ambulances volantes, or flying field hospitals, establishments capable of moving from Place to place with speed, like the flying artillery of the time, They were adapted both for giving the necessary Puumary surgical help, and also for removing the wounded quickly out of the sphere of fighting. The first N apoleon warmly supported Larrey in his endeavours to introduce and perfect the new system of surgical aid to the wounded

in battle; and, being received with much favour by the troops, the plan obtained a firm footing, and was subse- quently brought to a high state of perfection. About the same time another distinguished surgeon of high position in the French army, Baron Percy, introduced and developed a corps of brancardiers, or stretcher-bearers. These con- sisted of soldiers trained and regularly equipped for the duty of collecting the wounded while a battle was in pro- gress, and carrying

them on stretchers to places where means of surgical aid were provided.

From the period when these improvements were intro- duced most civilised armies have had ambulance establish- ments formed for giving surgical help near to the com- batants. It is only, however, during the last twenty years that ambulances have acquired the completeness of organisa- tion which they have now attained in some armies, espe- cially in those of Germany. In the armies of the United States of America, during the late great civil war, the ambulance system attained a very complete organisation, particularly from March 1864, when an Act was passed by Congress, entitled "An Act to establish a uniform system of Ambulances in the United States." This law fixed a definite and single system of ambulance arrangements for all the armies of the United States at that time in the field.

The ambulance arrangements of the British army have never reached the degree of completeness which they have reached in Continental armies. During the Peninsular war the want of a trained ambulance corps, and of properly- constructed sick-transport carriages, formed a theme of constant complaint. For the former, soldiers from the ranks were substituted—a double evil, as they were un- suited for the work, while their employment lessened the fighting strength; for the latter, commissariat waggons, or the agricultural carts of the country in which the troops Were operating. It was not from want of attention being called to the subject, as the writings of Sir J. M'Grigor, Hennen, Millingen, and other Peninsular surgeons suf- ficiently testify. The last-named military surgeon published a very complete scheme of an ambulance establishment shortly after the war was concluded, approaching closely in its principles to those put into practice of late years in the armies of Germany. There is reason for believing that had the operations of the British troops on the Continent not been discontinued, some plan of the kind would have been introduced. As it was, subsequently to 1815, so far as army hospitals were concerned, administrative atten- tion was chiefly given to improving those for the accom- modation of the sick in peace time. The wars that British troops were engaged in in India, China, the south of Africa, and

elsewhere, did not lead to improvements like those which have been made in Continental armies ; for either the habits of the natives of the respective countries, or the nature of the climate, or the state of the country, necessitated special arrangements for the care of the sick and wounded unsuited for meeting the circumstances of European warfare, Thus, when the Crimean war broke out the English army was still without an ambulance corps, or an ambulance establishment of matériel. An ambulance corps of military pensioners was hastily raised, but failed from the habits and enfeebled constitutions of the men. They were succeeded by a corps formed of civilians, unused to the discipline and habits of military life, which likewise failed. Several forms of sick-transport vehicles were tried, but only indifferently answered their intended purposes. Fortunately, as the troops were for the most part stationary during the war, the want of thoroughly organised ambulances was not felt to the same extent as it would have been had the Operations been extended far into the interior of the couutry. The ex- perience of the Crimean war led to efforts to repair the I. — 84

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defects which were then made manifest. Since that time a trained army hospital corps has becn constituted, and much of the ambulance equipment has been revised.

One scrious impediment to perfecting an ambulance system is the costliness of majntaining, in time of peace, establishments which will only be required for use in time of war. All that can be donc is to form a nucleus which can be expanded according to need when war breaks out. But even in Continental armies, with frequent wars pressing upon them, the urgency of giving close attention to the subject, and in countries where the existence of conscrip- tion furnishes a greater supply of men at less cost than in England, the deficiencies of the ambulance establishments have hitherto been so great in respect to the numbers and necessities of the wounded on occasions of great battles, that an extcnsive volunteer organisation, with national societies in every country of Europe, has sprung up for giving additional

assistance. This is not the place to dis- cuss the advantages of such volunteer aid; but, if accepted, all who have considered the subject well have admitted the necessity for its being placed under military authority, and under distinct regulations, in order to secure maintenance of order and discipline. It is also generally admitted that volunteer aid to wounded soldiers is out of place in the ambulances, and can best be employed in the fixed hospitals, by which means some of the regular military personnel may be set free for work in the field.

One important step, taken a few years since, towards the amelioration of the condition of the wounded of armies in the field must be just mentioned. This was the Euro- pean Convention signed at Geneva in 1864, by the terms of which, subject to certain regulations, not only the wounded theinselves, but the official staff of ambulances and their equipment have been rendered neutral; the former, therefore, not being liable to be retained as prisoners of war, nor the latter to be taken as prize of war, This convention has greatly favoured the develop- ment of ambulance establishments.

The conditions of modern warfare have led to the need of army ambulances being arranged on principles different from what were applicable only a few years ago. The immensely increased range of rifles and artillery in the present day, the consequent extension of the area over which fire is maintained, the suddenness with which armies can be brought into the field from increased facilities of locomotion, the rapidity of their movements, the shortened duration of campaigns, the large numbers of wounded which have to be dealt with, not merely from the destructive qualities of the firc-arms, but from the vast forces collected on occasions of important battles, the increased proportion of severe wounds,—are all eircum- stances which have entailed nced for revision of am- bulances and their administration. The ambulances must be so organised as to be able to keep up with the troops, and so disposed as in no way to interfere with their movements. They must be capable of meeting the wants of a partial or general engagement at any moment, and. if the troops advaice, must be prepared to accompany them, so as to be ready to mect future wants.

Whatever the details of organisation may be when an important battle is fought, the ambulance system must admit of three help stations at least being established in rear of the combatants. There must be a station of limited character immediately in rear of the troops for attention to such wounds as entail speedy loss of life if no assistance be rendered ; a second station, more remote, where tem- porary assistance of a more general nature can be afforded ; a third, where more thorough attention can be given, and where the wounded can receive food and protection until there are means of sending them away. Recently, in some

armies, the ambulance arrangements have been calculated for furnishing aid at four stations ; and, indeed, owing to the increased range of fire, and the consequent distance between the help stations when only three are formed, the fatigue thrown on the bearcrs is so great, and the time the wounded are left without help so long, that the division essential. If this arrangement be followed, there will be transfer station, where the wounded will be transferred

dressing station, where the provisional dressings will be

tive treatment will be adopted.

the fourth station, with a running stream or well at hand if

may be necessary before being sent on to the fourth or field

of the ambulances into four stations has become almost —lst, the field station, for help of prime urgency ; 2d, the from the hand conveyances to whecled vehicles; 3d, the applied; and 4th, the field hospital station, where defini-

The disposition and distances of these four ambulance sections must vary according to the nature of the battle, the configuration of the terrain, and other circumstances, but in a general way will be as follows :—I1st, the field station, in the immediate rear of the troops,

moving with them, and therefore under fire ; 2d, the transfer station, elear of the enemy's rifle fire, but not too far for the bearers, and at a place practicable for waggons, from 800 to 900 yards behind the troops engaged ; 3d, the dressing station, beyond range of artillery fire, at a spot easily reached by the ambulance waggons, and on the way to

possible, from 800 to 1000 yards in rear of No. 2; and 4th, the field hospital station, at a place free from risk of being brought within the sphere of fighting, from 2 to 4 miles in rear of the combatants. This last station may be at a farm or country house, or in a village, but should not be in a place of strategical importance, or in one likely to be blocked by the general transport of the army. When the four stations are in working order, as men fall badly wounded, those within reach will be placed on stretchers by the men told off for duty as bearers, and, after hasty imspec- tion by the field surgeon, and, as far as practicable, receiv- ing such help as is of vital importance, they will be borne to the second or transfer station, and placcd in ambulance waggons, or on wheeled stretchers if they are in use. The bearers, then taking vacant stretchers, will return to the field station for more wounded. The wounded who have been transferred to the wheeled conveyances will be driven by the men of the ambulance train to the third or dressing

station, and there receive whatever provisional dressing

hospital station, where definitive treatment will be adopted, and any surgical operations performed that may be re- quired. It is obvious that such a system of help can only be carried out, with any approach to regularity and requisite speed, with ambulance establishments proportionate to the number of troops in the field, each ambulance being well organised, provided with a sufficient staff and complete equipment, and acting under the general supervision of, an experienced director, whose duty it is to watch the varying events of the contest while it is in progress, and to order changes in the ambulance arrangements according as the troops advance, retire, or otherwise change position. Even with these advantages, the difficulties

of adequately meeting the wants of the wounded must always be very great, owing to the rapid manceuvres of the troops, the varying features of the ground over which battles are cxtended, and the rapidity with which the wounded fall ; but without a proper organisation arranged beforehand, the difficulties are insuperable, and no help of much value can be afforded until all fighting has ceased.

Anibulance arrangements have to be modified to suit par- ticular military operations, such as when troops disembark on a hostile shore, on occasion of sieges, &c.

AMBULANCE Starr.—The scheme of ambulance adminis- tration and action just described involves the necessity of a staff comprising the following personnel, viz. :—1. Bearers of wounded; 2. Surgeons and attendants Os Ambulance train personnel ; 4. Ambulance police ; 5,

Servants to officers.

Bearers of Wounded. — These are soldiers specially trained and told off for the duty of picking up and carry- ing the badly wounded on stretchers. In Continental armies special provision is made to meet this particular want, but under different systems in different armies, In the Prussian army companies of bearers, distinguished by a particular uniform, and denominated " sanitiits-detache- ments," have the duty assigned to them of gathering the wounded during battles, and carrying them to the dressing and field hospital stations. Each of these bearer columns consists of a military staff of officers for discipline and direction, non-commissioned officers, buglers, and a large number of bearers ; a special medical staff, with assistants and dressers ; a transport staff of non-conmmissioned officers

and drivers, with a certain number of stretchers, wheeled stretcher supports, sick transport waggons, and_ store waggons for the carriage of instruments, dressings, and other necessary materials. Separate establishments exist for the field hospitals. In addition to these sanitary detachments, auxiliary sick-bearers (Llilfs-krankentréiger) are

provided for service on occasions of great battles. To form these auxiliaries, four men in each company of every battalion of the army are practised at regular periods with the sanitary detachments in time of peace in the modes of picking up, temporarily attending to, and carrying wounded. 'These auxiliary bearers wear the uniform of their regiments, of which they perform the ordinary duties, but have a distinguishing badge on the left arm when serving as bearers. When a battle is imminent, the auxi- liary bearers fall out, are provided with stretchers and other needful appliances from the ambulance waggons, and act under the orders of the officers of the divisional sanitary detachments. The system in the Austrian army is very like that in the Prussian. In the British army no corresponding establishment exists. The hospital attend- ants belonging to the Army Hospital Corps are trained in all that refers to the care of wounded men, but in time of war they will be too urgently needed for their duties in the field and fixed hospitals to be spared for duty as bearers of the wounded from the field to the dressing stations, 'The regimental bandsmen are generally regarded as available for these duties in the British service ; but though the army regulations order that bandsmen are liable to serve in the ranks on an emergency, they nowhere constitute them bearers of wounded, nor do bandsmen receive the necessary training to fit them for the duties, As it is understood that the ambulance arrangements of the British army are at present under consideration, this; with other details, will probably be shortly placed on a settled basis.

Surgical Staf.—This section embraces the medical officers (administrative and executive), the dispensers of medicine, and the. officers, non-commissioned officers, and men of the Army Hospital Corps. The last-named corps includes the dressers, nurses, cooks, and all the hospital subordinates who are required for the care, dieting, watch- ing, and protection of the patients, for the hospital cor- Tespondence, &. The men act professionally under the directions of the surgeons ; in respect of other matters,

under their own officers. The constitution and duties of

the several divisions and grades of the army medical department are shown in a special code of instructions known as the " Army Medical Regulations."

Ambulance Train—On the officers and men of the

ambulance train devolve the duties of conducting the wheeled transport, and the mule litters and cacolets when such conveyances are used. In the British service these duties are entrusted to the ordinary transport branch of the Control department. It has been recommended that the officers and men to whom these duties are entrusted

should be specially selected and trained, as well as fami- |

liarised, to co-operate with the bearers and ambulance corps. They would thus form an ambulance train some- what like that which exists in the sanitary detachments of the Prussian army.

Military Servants.—Orderlies are required as servants to the ambulance surgeons and other officers, in order that they may give their time fully to the concerns of the sick and wounded. When special orderlies are not provided, men of the Army Hospital Corps usually act as servants to officers,—a bad system, for the whole time and services of these trained men should be devoted to their legitimate functions.

Ambulance Police.-—Many irregularities are liable to occur in the rear of troops engaged in a general action; not so much from acts of the troops themselves as from camp followers, hired drivers, and others. The officers charged with the military discipline of the bearer, train, and hospital corps have other pressing duties to engage them on such occasions. In the British army it devolves on the provost-marshal to arrange for this service,

AMBULANCE Equipment.—As before mentioned, ambu- lance equipment divides itself into two categories :—1, The medical and surgical equipment; 2. The equipment for the transport of wounded. These divisions will therefore be noticed separately, and the

description will be confined to the equipment supplied in the British army for service in Europe. In India and in tropical countries special ambulance equipments are rendered necessary,

Medical and Surgical Equipment.—This portion of am- bulance equipment consists of the articles necessary for the service of the wounded in the field itself, at the dressing stations, and in the field hospitals. It has to be distributed in forms such that it may be readily couveyed to the places where it is required, and such also as will admit of its being hastily packed up and removed should the circum- stances of the ficld operations require it. At the same time, these forms must be adapted for use at all seasons of the year, for passage over all descriptions of ground that troops can march over, and must be protected against the effects of exposure to all varieties of weather.

It would occupy too much space to name the articles comprising this equipment. The special forms under which it is issued will be mentioned, and a brief explanation of them and the nature of their contents be added.

The equipment is distributed as follows :—Supplies of instruments, dressings, medicines, and restoratives, of first necessity, in small cases named " medical field com- panions," and in large cases named "field panniers 3 OF cooking utensils and other articles for field hospital service in "canteens ;" of articles of light nourishment, stimu- lants, &c.,in "medical comfort boxes;" of hospital tents, bedding, and the bulkier articles of surgical equipment, in ambulance equipment carts or store waggons. In addi- tion, every soldier on taking the field is supphed with a "field dressing ;" each surgeon carries a pouch-belt, ar- ranged both for distinguishing his functions and at the same time carrying his "pocket case" of instruments ; and each Army Hospital Corps man has his " orderly's dressing-case." Every wounded man has therefore on his person the means of a first dressing for his wound, every surgeon has at hand instruments for affording surgical aid, and every ambulance and field hospital attendant the

means of assisting the surgeon in his duties. Moreover, wherever the soldier can go, there the first two forms of the surgical equipment—the medical field companion and the field panniers—can also be taken. The articles for use in the field hospitals, being carried in wheeled vehicles, can only move where the other transport of the army can be taken.

Medical Field Companions.—These are small cases car- ried by men of the Army Hospital Corps selected to accom- pany surgeons. They consist of two. pouches and a wallet, worn nearly in the same way as the pouches and belt-bag in which ammunition is carried by combatant troops. The two. pouches, carried on the waist-belt, contain sinall sup- plies of essential medicines and styptics; the surgical wallet, also carried on the waist-belt, and supported by valise straps, contains materials for surgical dressings and other articles. As these attendants are not armed with rifles, they can carry their valises and the medical field conipanions at the same time without inconvenience. With each medical field companion is carried, by a shoulder-strap, a water-bottle and a drinking-cup.

Field Panniers.—These are tough wicker baskets covered with hide, each being 2 feet 2 inches in length, by 1 foot 24 inches in breadth, and 1 foot 44h inches indepth. They are supplied in pairs, and are arranged for being attachcd to a pack-saddle and carried on a bat- pony or mule. They are capable of being opened while on the animal in such a way that all the contents can be readily got at. The field panniers contain instruments for important surgical opera- tions, chloroform, surgical materials (such as splints, ban- dages, plaisters, &c.), a lamp, supplies of wax candles, restoratives, and medical comforts in concentrated forms, and other articles necessary for urgent cases at the dressing stations and field hospitals. Each pannier has a double lid, and the four lids of the two panniers, when they are laid on the ground, can be connected so as to form a substi- tute for an operating table.

Field. Hospital Canteens.—These arc also supplied in pairs, and are distinguished as A and B canteens. are wooden boxes nearly similar in

size to the field panniers, so that, although usually cartied in the equipment vehicles, they can, in case of need, be carried on the backs of bat- animals. Their contents consist of camp-kettles and other

utensils for cooking purposes; tin plates, drinking-cups,

and other such requisites; sets of measures and weights ; a lantern of coloured glass for indicating the field hospital at night; together with various articles required for the service of patients in a tent or other field hospital.

Medical Comfort Boxes.—These also are supplied in pairs, and resemble the canteens in shape and dimensions. The contents of the two are different, and they are there- fore marked No. 1 and No. 2 respectively. Each box is partitioned and fitted with cases or bottles with labels in- dicating their contents. These principally. consist of essence of beef, groceries, arrowroot, preserved vegetables, brandy, wine, and sundry accessory articles. The wounded are supplied with the same rations as the healthy troops, and they are turned to the best account available for their nutriment, supplemented by such medical comforts as are named above.

Ambulance Equipment Waggons.—In these vehicles are carried the tents for forming the field hospital in case of no building being available, with a supply of blankets, water- proof covers, and other articles of bedding for the patients. The canteens and medical comfort boxes are also carried in these vehicles. Certain implements, as reaping-hooks, spades, pickaxes, saws, which are constantly required when men are thrown so much on their own resources as they must be in campaigning, are also carried in the equipment waggons.

in the British army are of four kinds. lowing :—1. Conveyances carried by the hands of bearers,

by horses, ambulance waggons.

They

Ambulance Equipment for the Transport of Wounded Troops.—The ambulance conveyances authorised for use They are the fol-

called stretchers; 2. Conveyances wheeled by men, wheeled stretchers ; 3. Conveyances borne by mules, mule letters and mule cacolets; and 4. Wheeled conveyances drawn The forms of all these conveyances have been lately revised by a committee which was appointed in 1868 by Sir J. Pakington, then Secretary of State for War, to inquire into the general question of ambulance and hospital conveyances for the army, and the new pattern vehicles have now been authorised for use. (tT. L.)

AMELOT DE LA HOUSSAYE, Asravam Nico.as, historian and publicist, was born at Orleans in February 1634, and died at Paris 8th December 1706. Little is known of his personal history beyond the fact that he was secretary to an embassy from the French court to the republic of Venice. At a later period he was imprisoned in the Bastile by order of Louis XIV. In 1676 he pub- lished at Amsterdam his Histoire du Gouvernement de Venise, in three volumes. Under the assumed name of De la Mothe Josseval, he published in 1683 a translation of Fra Paolo Sarpi's History of the Council of Trent. This work, and especially certain notes added by the translator, gave great offence to the advocates of the unlimited authority of the pope, and three separate memorials were presented to have it repressed. Amelot also published translations of Machiavel's Prince, and of the Annals of Tacitus, besides several other works. :

AMELOTTE, Dents, a French ecclesiastic and author, was born at Saintes in Saintonge in 1606, and died October 7, 1678. Soon after receiving priest's orders he became a member of the congregation of the oratory of St Philip Neri. In 1643 he published a Life of Charles de Goudren, second superior of the congregation, which by some of its remarks on the famous abbot of St Cyran, gave' great offence to the Port Royalists. Another work, containing a vchement attack on the doctrines of the Jansenisis, still further embittered the feelings of the party towards him, and elicited from Nicole a se- verely satirical reply entitled Idée Générale de VEsprit et du Livre du P. Amelotte. Amelotte

in revenge availed himself of his influence with the chancellor to prevent the publication of the newly-completed Port Royalist translation of the New Testament, which had therefore to be issued at Mons in Flanders. He thus secured a free field for a transla- tion of his own with annotations, which appeared in 4 vols. octavo in 1666-8. The dedication to the archbishop of Paris contained an-

other abusive denunciation of the zetuta alba (the common birch), Jansenists. an amentiferous tree, the male

*AMENTIFERZE, or AMEN- ‘icine ‘Znd‘sp are the femal vacez, Under this name are *°weTs®*

included apetalous unisexual plants bearing their flowers in catkins (amenta). This group of plants includes trees and shrubs chiefly of temperate climates. It is divided into the following orders :— Salicacee, willows and poplars ; Corylacee or Cupulifere, hazel, oak, beech, chest- nut, hornbeam, &c.; Betulaceee, birch, alder ; Casuarinacee, Casuarina (beefwood); Altingracee or Balsamiflue, liquid- ambar; Platanacee, the plane; Juglandacece, walnut ; Garryacee Garrya; Myricacee, bog myrtle.

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AMERICA

UR object in this article is to take a comprehensive | comparatively narrow strip of land. South America has survey of the American continent in its physical. /@ more regular form, and as a mass is situated much moral, and political relations. In attempting this, we shall | farther east than North America.

dwell at some length upon those great features and peculiar-

In South America the most central point lies in about 58° W.; but in North

ities which belong to it as a whole, or facts which can be most advantageously considered in connection with one another, The new continent may be styled emphatically "a land of promise." The present there derives its greatest impor- tance from the germs it contains of a mighty future. It is this prospective greatness which lends an interest to the Western continent similar to that which the Eastern derives from its historical associations. But the Western continent also has its past, which abounds in points of interest relating to both the historic and prehistoric periods. Facts show that although America may be called the New World in consequence of its having been the last to come under the general knowledge of geographers, it is from most other points of view an old world. It abounds in the oldest known strata; it has yielded some of the oldest known remains of man, indicating that he has long been a denizen there; and it has afforded evidences of a civilised era, which may even have preceded that of Western Europe.

The new continent, when compared with the old, enjoys three important advantages. First, it is free from such vast deserts as cover a large part of the surface of Asia and Africa, and which not only withdraw a great proportion of the soil from the use of man, but are obstacles to communi- cation between the settled districts, and generate that ex- cessive heat which is often injurious to health, and always destructive to industry. Secondly, no part of its soil is so far from the ocean as the central regions of Asia and Africa. Thirdly, the interior of America is penetrated by majestic rivers, the Mississippi, Amazon, and Plata, greatly surpass- ing those of the old continent in magnitude, and still more in the facilities they present for enabling the remotest inland districts to communicate with the sea.

In the physical formation of North and South America there is a remarkable resemblance. Both are very broad in the north, and gradually contract towards the south till they end, the one in a narrow isthmus, and the other in & narrow promontory. Each has a lofty chain of moun- tains near its western coast, abounding in volcanoes, with a lower ridge on the opposite side, destitute of any recent trace of internal fire ; and each has one great central plain declining to the south and the north, and watered by two gigantic streams, the

Mississippi, corresponding to the Plata, and the St Lawrence to the Amazon. In their climate, vegetable productions, and animal tribes, the two regions are very dissimilar.

The extent of the American continent and the islands connected with it is as follows :—

Square Eng. miles.

RM 5, tbs soscecctiseckevséeice,..... 7,400,000 hong ooe cece cesses… 6,500, 000

=... .,;..... 150,000

Greenland, and the islands connected with it lying 900,000

north of Hudson's Straits, may be estimated at….. a

14,950,000

__The American continent, therefore, with its dependent islands, is four times as large as Europe, and about one- third larger than Africa, but somewhat less than Asia, while 1b is nearly five times the size of the Australian continent. It constitutes about three-tenths of the dry land on the sur- lace of the globe. It is characterised by having a greater length from N. to 8. than any other continent ; and by the northern and southern portions being connected by a

America the most central point would be in about 100° W.

Sketch Map of America.

As regards continuity of land, America comprises some islands at the southern end ; a main continental portion, including South America, Central America, and North America; some islands off the north shore, and many other islands along the east and west coasts, those on the east being the most important. The most northern point of the mainland is that of Boothia Felix, in Bellot Strait, 71° 55' N., 92° 25' W. The islands to the north extend beyond 82° 16' N.,65° W., which

point was reached by the “Polaris” in August 1871. The southernmost point of the mainland is Cape Froward, which lies close to 54° §., 71° W.; while Cape Horn, the most southern point of the islands, isin 56°S., 67° 20’W. The extreme points traced are consequently 138° apart ; and the continental part stretches over about 126 degrees of latitude. This corresponds to lengths of 8280 and 7560 geographical miles respectively. The extreme east points of the continent are Cape St Roque, in 5°28’S., 35°40’ W., in South America, and Cape St Charles, in 52°17’ N., 55° 35’ W., in North America. The most western point of South America is Point Parina, in 4° 40’ S., 81° 10’ W. F and of North America, Prince of Wales Cape, in 65° 30’ N., 167° W. The greatest breadth of North America is

Physical regions.

S. America: Mountains.

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South America, between Pernambuco and Point Aguja. The narrowest part is 28 miles, at the isthmus of Panama. The nearest approach to the Old World is at Behring Strait, which is 48 miles across, and shallow. On the east side the nearest point to the Old World is Cape St Roque, which is opposite the projecting part of the African coast at Sierra Leone. Greenland is separated from the archipelago of Arctic America by a deep and for the most part broad sea, and seems naturally to belong to the European rather than the American area.

North America, with the general form of a triangle, natu- rally divides itself into five physicalregions: 1. The table-land of Mexico, with the strip of low country on its eastern and western shores; 2. The plateau lying between the Rocky

Mountains and the Pacific Ocean, a country with a mild °

and humid atmosphere as far north as the 55th parallel, but inhospitable and barren beyond this boundary ; 3. The great central valley of the Mississippi, rich and well wooded on the east side; bare

but not unfertile in the middle ; dry, sandy, and almost a desert on the west; 4. The eastern declivities of the Alleghany Mountains, a region of natural forests, and of mixed but rather poor soil; 5. The great northern plain beyond the 50th parallel, four-fifths of which is a bleak and bare waste, overspread with innumerable lakes, and resembling Siberia both in the physical char- acter of its surface and the rigour of its climate.

South America is a peninsula likewise of triangular form. Its greatest length from north to south is 4550 miles; its greatest breadth 3200 ; and it covers an area, as already men- tioned, of 6,500,000 square English miles, about three-fourths of which lie between the tropics, and the other fourth in the temperate zone. From the configuration of its surface, this peninsula also may be divided into five physical regions— 1. The low country skirting the shores of the Pacific Ocean, from 50 to 150 miles in breadth, and 4000 in length. The two extremities of this territory are fertile, the middle a sandy desert. 2. The basin of the Orinoco, a country con- sisting of extensive plains or steppes, called Llanos, either destitute of wood or merely dotted with trees, but covered with a very tall herbage during a part of the year. During the dry season the heat is intense here, and the parched soil opens into long fissures, in which lizards and serpents lie ina state of torpor. 3. The basin of the Amazon, a vast plain, embracing a surface of more than two millions of square miles, possessing a rich soil and a humid climate.

Tt is covered almost everywhere with dense forests, which –

harbour innumerable tribes of wild animals, and are thinly inhabited by savages, who live by hunting and fishing. 4, The great southern plain, watered by the Plata and the numerous streams descending from the eastern summits of the Cordilleras. Open steppes, which are here called Pampas, occupy the greater proportion of this region, which is dry, and in some parts barren, but in general is covered with a strong growth of weeds and tall grass, which feeds prodigious herds of horses and cattle, and affords shelter to a few wild animals. 5. The country of Brazil, eastward of the Parana and Uruguay, presenting alternate

ridges and valleys, thickly covered with wood on the side next the Atlantic, and open- ing into steppes or pastures in the interior.

In our more particular description of the physical con- formation, the geological structure, the mountains, rivers, and forests, and the climates of America, we shall first deal with the southern peninsula, as having the more strongly marked conditions.

The mountain areas of South America are, as a general rule, those which have received the thickest accumulations of sedimentary matter, and this thickness is nearly pro- portional to their height. During the periods of the formation of such deposits, these areas were to a great

AMERICA

between Cape Lisburne and Melville Peninsula ; and of

‘thus forming

[s. AMERICA.

extent areas of subsidence, and since those beds which once formed the sea bottoms now constitute the highest peaks, these areas must have been subjected to subsequent upheaval. Vertical movements of this kind have occurred again and again, indicating that these areas are specially liable to disturbance, either from comparative weakness or from the greater comparative power of the moving forces. The bistory of the mountain chains is almost co- extensive with that of the continent itself. In the sea the beds were deposited horizontally, or nearly so ; and at cet tain intervals the deposition was arrested, in consequence of the beds being uplifted above the sea. Each successive sub- mergence and emergence occupied a long period of time, during which the rocks were at one time faulted, folded, and metamorphosed, and at other times denuded both by the sea and by meteoric agents. Asa general rule, the strike or line of direction of the strata ran approximately parallel to the trend of the shore line on the large scale, and the dip was at right angles to their direetion. During each elevation the land was uplifted in a broad band, the axis of which ran

parallel to the shore of the sea in which the beds were formed. 'The axes of the principal folds and faults usually run parallel to the stratigraphical axis or strike. The principal ridges formed during the same period usually coincide in direction with the stratigraphical strike of the bed forming them. In the mountains of South America, and especially in the Andes, several of these groups of ridges, formed at different periods, combine to make up a single system of mountains. The high range of moun- tains which extends from the most southern parts of South America, and runs approximately on the same meridian of 72° to the isthmus of Panama, forms the Andes. These consist of a vast rampart, having an average height of some 11,000 or 12,000 feet, anda width varying from 20 to 300 or 400 miles. In most places the chain rises to heights of several thousand feet, and upon this chain rest two or three principal ridges of mountains, enclosing lofty plains or valleys, separated one from another by mountain knots, which mark the spots where ridges belonging to different systems intersect. In one sense, the lofty plains of the Desaguadero, Quito, and others, are valleys, since they are encompassed by mountains; but in a certain sense they are plateaus, since they form the broad summit of the range or platform on which the bounding ridges them- selves stand. Further details respecting the Andes are given under ANDES, and in the geological remarks of this article.

Three branches or transverse chains proceed from the Andes, nearly at right angles to the direction of the prin- cipal chain, and pass eastward across the continent, about the parallels of 18° of S. and 4° and 9° of N. latitude; the three natural areas of the Orinoco, Amazon, and La Plata river basins. The most northern of these is "the Cordillera of the coast," which parts from the main trunk near the south extremity of the lake Maracaybo, reaches the sea at Puerto Cabello, and then passes eastward through Caraccas to the Gulf of Paria. Its length is about 700 miles, and its medium height from 4000 to 5000 feet; but the Silla de Caraccas, one of its summits, has an elevation of about 8682 feet ; and its western part, which is at some distance from the sea, contains the Sierra of Merida, 15,000 feet in height. The second transverse chain is connected with the Andes at the parallels of 3° and 4° north, and passing eastward, terminates in French Guiana, at no great

distance from the mouth of the Amazon. It consists properly of a suc- cession of chains nearly parallel to the coast, and is some- times called the Cordillera of Parimé, but is named by Humboldt the " Cordillera of the Cataracts of the Orinoco,"

because this river, which flows amidst its ridges in the

Transvers

chains.

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MOUNTAINS. |

upper parts of its course, forms the cataracts of Maypure at the point where it descends into the plains. Its mean height is estimated at 4000 feet above the level of the sea ; but at about 70° and 75° W. longitude, it sinks to less than 1000 feet, and at other points rises to 10,000. This chain divides the waters of the Orinoco and the rivers of Guiana from the basin of the Amazon, and is covered with mag- nificent forests. Its breadth is supposed to be from 200 to 400 miles, and it encloses amidst its ridges the great lake Parimé, in longitude 60°, and several of smaller size. At the Caratal gold-field, which lies south of Angostura, the range is about 60 miles across, and the watershed about 1100 feet above the sea. On a table-land forming part of it, about the 67th degree of longitude, the Cassi- quiari forms an intermediate channel which connects the rivers Orinoco and Negro, so that, during the annual floods, a part of the waters of the former flows into the latter. This singular phenomenon was made known long ago by the Spanish missionaries, but was thought to be a fable till the truth was ascertained by Humboldt. The length of this chain is about 1500 miles. The third transverse chain leaves the main trunk near 17° 25' S.

and extends almost as far as Santa Cruz, near the river _Mamore. Some of the mountains in the western part are of considerable height.

South of this range are a number of ridges having an east and west direction, an average height of about 10,000 feet, and terminating in the plains near the Paraguay. This country, which divides the waters of the Amazon from those of the Plata, is a broad plateau of elevated land, rather than a distinct mountainous ridge, and consists of low hills or uneven plains, with very little wood, presenting in some places extensive pastures, and in others tracts of a poor sandy soil. Its average height probably does not exceed 2000 or 3000 feet above the level of the sea.

The mountains of Brazil, which are of moderate height, and occupy a great breadth of country, form an irregular plateau, bristled with sharp ridges running in a direction approximately parallel to the eastern coast, connected by offsets running in a more or less east and west direction. They extend from 5° to 25° of south latitude, and their ex- treme breadth may be about 1000 miles. Between Victoria on the north and Morro de St Martha on the south, a range with numerous curves lies a little way back from the coast, and is, for the greater part of its length, known as the Sierra do Mar; somewhat farther inland is a higher range, the different parts of which have different names, but it is best known as the Sierra de Mantiqueira. It con- tains the highest peaks in Brazil, amongst which may be mentioned Mount Itacolumi, famous for the gold and diamond yielding strata in its vicinity; the Pico dos Orgaos, which is 7700 feet high; and Itambe, 8426 feet. Some of the peaks are believed to be cven higher. West of this the uplands of Brazil stretch far into the interior, and at length sink into the great central plain through which flows the Paraguay and its tributaries.

Although large areas of South America remain as yet unexplored by geologists, the researches of D'Orbigny, Humboldt, Boussingault, Darwin, Forbes, Agassiz, and many other travellers, suffice to give an approximately cor- rect general view. This is mainly owing to the simplicity of the stratigraphy of the country. The same groups of tocks spread over such extensive areas, that, from what is Seen in the areas which have been examined, we can safely iufer the general condition of those which have not been explored. The general disposition of the rocks is as fol- lows:—The oldest rocks, which are Pre-Silurian,

possibly Laurentian, form the outermost rim of the continent, of which the N.E. and §.E. corners have probably been swept away. These corners now correspond with the mouths

of the Orinoco, the Amazon, and the La Plata rivers. Within this basin, and following close upon these old rocks, are schists and quartzites, which are in all proba- bility of Silurian age. These enter largely into the transverse ranges by which the central hollow is subdivided into three basins. Within this again are sandstones and limestones, usually referred to the Carboniferous period, which also form part of the transverse ridges. A band of rocks of secondary age follow, some of which are believed to be Triassic, while others are identified as Cretaceous. 'Tertiary beds, some of Miocene date, together with Post-Tertiary beds, cover the largest part of the areas of the great river basins and the hollows in the mountain range, and also occur on the sea- ward flanks of the principal chains.

By following the development of these beds, we shall be able to give a brief account of the growth of the present continent. In the Argentine Confederation a few bosses of gneiss protrude through the more recent beds constituting the Pampas. Granite, supporting gneiss and quartzite, occurs along the coast of Chili. In Bolivia we find a range of granitic mountains which have a general direction somewhat to the E. of N., and which are flanked on either side by zones of gneiss and quartzite. The gneiss also prevails along the shores of Peru, Ecuador, and New Granada, or, to call it by the name which it received in 1861, Columbia. The gneiss is again seen at the eastern base of the Andes, in the last-mentioned State, associated with quartzites, and both these can be traced along the Vene- zuelan coast. Gineiss is largely developed near Angostura, and has a strike approaching E. and W. At Limones, which is near the Caratal gold-field, the country consists largely of granite and gneiss, which latter lies here a little to the E. or to the W. of N. In Brazil the gneiss forms a long band from Bahia to the southern portion of the pro- vince of Santa Catharina. Near the coast

it rests upon and apparently passes into granite; but towards the west, as far as the Mantiqueira chain, it gradually becomes more and more schistoid. Gneiss, again, is met with in the mountains which stretch through the Bolivian provinces of Moxos and Chiquitos. It has not been ascertained if these older rocks appeared above the waters before the deposi- tion of those which follow, and which will next be noticed.

In Chili the succeeding rocks are slaty schists. In Bolivia the mountainous district crossing the country is largely composed of talcose schists, which, where exposed to the weather, have formed by their decomposition a layer of clay; in advancing from the east towards the west the schists become more and more crystalline, and are at last replaced by gneiss. This, as has already been stated, rests against granite, on the west side of which gneiss 1s again brought in by an anticlinal arrangement of the beds, and dips beneath a thick mass of schists, which constitute the great bulk of the Andes in this district. In this mountain range the lower portion of the formation is mainly siliceous schist, alternating with beds of compact quartz; above this come talc-bearing quartzites, alternating with slaty schists, which latter become more and more prevalent as we ascend in the strata, and at last constitute the predominating rock. They form, indeed, the crest of the range ; the thickness of the formation may be roughly estimated at 10,000 feet. These rocks are much dis- turbed and faulted against other and probably newer rocks, which with them constitute the great bulk of the lofty eminences in the range of which Mount Illimani forms so conspicuous a feature. The lower argillaceous schist, which is associated with gneiss all along the Pacific coast from lower Peru to Panama, possibly belongs to this group of rocks. In the high valleys of Ecuador the oldest rocks visible are granite, gneiss, and schists, which are fre- quently in a vertical position. The schistose group appears

to be absent on the east side of the Andes in Columbia, as also along the coast of Venezuela. In the mountain range south of the Orinoco, hornblende, talcose, and mica schists again appear on a large scale,

more especially in the Caratal district, where auriferous veins occur. In Brazil the mi- caceous and talcose schists enter into the composition of the Mantiqueira chain and of the uplands to the west; they probably pass beneath the valley of the Panama, since they occur to the west of it, and extend through the pro- vinces of Goyaz and Matto Grosso, so as to approach within a moderate distance of the similar strata in Bolivia. They are associated with talc-bearing quartzites, which are famous for the diamonds and auriferous particles they have yielded in the district around Mount Itacolumi. The soil is usually a clay, such as would result from the decomposition of talcose schist; but we shall have occasion to refer to the soil of South America subsequently. Some of these rocks in various parts of the continent have yielded Silurian fossils. Facts are not sufficient yet to warrant the correlation of these strata with those of other countries, or to settle how far they belong to distinct geological periods. The pre- valent strike of the rocks is about east and west, but some- times the strike approaches to a north and south direction. At any rate, the rocks which overlie them do so uncon- formably, indicating that, prior to the deposition of these newer rocks, land had appeared at least once on areas now constituting part of South America. At this early date the continent was represented by a few islands only; one corresponded with part of Brazil, another with parts of Venezuela and Columbia; perhaps a third more or less with Peru, Bolivia, Ecuador, and Chili; while a few small islands appeared where now we have the Pampas. These were the nuclei around which the present land has accumu- lated, and already we see faint indications of the existing outline and broad geographic features of the future con- tinent.

The next group of rocks are always in stratigraphical discordance with those beneath them; and, in consequence of the highly metamorphosed condition of those on the west side of the continent, it is difficult to correlate them with the rocks of Brazil. In the Andes of Chili they are represented by enormous stratified masses of quartzose porphyries, which there is good reason to believe are metamorphosed argillaceous schists and felspathic sand- stones, into which rocks they have been seen gradually to pass. These porphyries not only form the great bulk of the principal chain of the Andes, but also the smaller chain on the

west, the interval between them being formed by the longitudinal valley of Chili. Further west they rest on syenitic rocks, beyond which come the older rocks already noticed. On passing into Bolivia, we find that to the west of the great fault developed there, the beds con- sist of micaceous sandstones and dark bituminous schists, which are believed to be the equivalents of the porphyries of Chili. Such formations constitute the west slope of the Andes from Sorata to Illimani, and also form two bands, one stretching from Illimani to Cochabamba, the other between Calamarca and Chayanta. Towards the west they dip beneath black bituminousand siliceous limestones, which are well developed near Tiahuanaco. Carboniferous strata with seams of coal occur near Pisco and Arequipa in Peru. In Brazil the beds which succeed those previously men- tioned are quartzites, rich in mica and magnetic oxide of iron; talcose schists; and crystalline limestones, containing a great deal of tale. These rocks form the highest regions and loftiest peaks in Brazil. Unconformably upon these rest micaceous sandstones and argillaceous schists, which occupy the western part of St Paul province between Ytu and the banks of the Parana. some other places, a carboniferous limestone succeeds and

area. together with more recent beds, it is a marked feature in

In Mount Arasoyaba and

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is overlain by a thick white or yellowish sandstone, siliceous limestones, and bituminous schists. The limestones occupy most of the area between the Uruguay and the Parana. In the Diamantina district the carboniferous limestone is over- lain by red sandstone, which belongs to the succeeding group of beds. The beds in Brazil appear to be fuller than those on the west side of the continent, and represent pro- bably both the Devonian and Carboniferous periods. Rocks of this age are also exposed in a narrow band round por- tions of the basin of the river Amazon. The strata next in succession are of secondary age. The lowest formation is a red sandstone, which is spread over a very extensive It is remarkably well developed in Chili, where,

the crest of the Andes. In the small chain to the west it is associated with conglomerates. In the small chain of Colorado, near Tiahuanaco, a thick conglomerate rests on

the older limestones, and supports red sandstones and con- glomerates dipping west beneath marls.

The red sand- stone extends across the province of Carangas, and unin- terruptedly over both slopes of the western Cordillera. In

the desert of Atacama the red sandstone, with the over-

lying marls, forms a number of parallel chains directed north and south. Red sandstones and conglomerates form the base of the Cordilleras of Quito; they stretch north into the

basins of the Magdalena and Cauca rivers, and east over

the basin of the Orinoco. In the province of Bahia, and far away to the north, there is a great development of red sandstone. The age of these sandstones has been variously stated; their stratigraphical position would indicate a secondary age, and possibly they may be Triassic. After their deposition, and prior to that of the marls, syenitic rocks were introduced amongst the strata in the Andes, causing the red sandstones, as also the older sandstones and schists, to be converted into porphyries. This erup- tion was also accompanied by, and probably connected with, the formation of auriferous veins, the elevation of the strata, and the faulting of the rocks. The strike of the strata, as also of the faults, was about 8° to the E. of N., but subsequent movements have modified the direction in places. 'The red sandstone has a similar strike from Venezuela in the north to Magalhaens Strait on the south, and this favours the idea that all are of the same age. Several of the ranges in the Andes have a corresponding direction. As the sandstone is believed to underlie the basins of the great rivers, it appears that during its deposi- tion South America was still represented by a few large islands only. Its elevation gave rise to north and south

trending mountains, whereby these scattered portions were

connected, and the Andes received their first development. The great features of the continent were then first dis- tinctly marked out, and only a few gaps remained to be filled up. The next succeeding period, represented by strata, is characterised by saliferous and gypseous marls, which rest unconformably on the rocks beneath. In Chil they occur in the lower plains, or abut against the western spurs of the Andes; but they have been largely denuded, so that they now occur in isolated plateaux or basins, and there is a patch capping the lofty Aconcagua. It is stated that in Chili the marls, or at least some of them, are Liassic. In Bolivia, also, they form plateaux between San Andres and the mountains of Tarija. Here they consist of alter- nations of greenish marls and wine-coloured beds support- ing limestones, with -interstratified beds of gypsum and saliferous clay. There are beds of gypsum and limestone in the Orinoco plains. Marls are associated with marly sandstones in the Gulf of Bahia and in the plains of

Reconcavo. ‘These beds are arranged along strikes which are approximately east and west, and their elevation 18

apparently connected with the formation of chains running

in the same direction, as, for instance, most of the lateral spurs from the Andes. Some geologists think it is also connected with the cast and west faults, through which, in the-Andes, labradorite and hypersthenite rocks have been erupted. This eruption, it is said, has caused the metamor- phism of the calcareous rocks into crystalline limestories, marls into jaspers, and red sandstones into porphyries ; and has also given rise to the copper-bearing veins. Calcare- ous beds occupy large areas in Venezuela, Columbia, and other parts of the continent. Miocene strata occur in Venezuela, and probably in other districts, Finally, there are deposits of Post-Mioceue date, which chiefly belong to the Post-Pliocene and recent periods, and which cover most of the lower lands along the coasts and in the interior of the continent. In Chili they occur in the valleys, and fill up the gulfs in the old granite range near the coast. Here the succession is a calcareous sandstone abounding in marine shells and beds of lignite; above this is a pumiceous conglomerate, which passes in places into a pebbly con- glomerate, and then follow the marine sands which stretch from Coquimbo across the desert of Atacama. The most recent formation is drift, which occurs in patches and sheets. In the valley plains of the Desaguadero there are clays and sandy marls overlain by pumiceous conglomerates, which near La Paz are surmounted by drift. ‘ Near this place the drift is many hundred feet thick, and formed of large blocks; but, on receding from the mountains, it passes into a sand which encircles the plains of the Desaguadero, which are chiefly formed by limestone deposits, such as concretionary limestone, which abounds in the fossil remains of plants and fresh water shells. The lacustrine beds ap- proximate in age to the marine tertiary beds near the coast. Jn Peru the pumiceous conglomerate is overlain by drift. Tertiary beds occur at Guayaquil in Ecuador, while in the valley of Quito there are enormous layers of pumice, scori, and drift, which last has yielded the

remains of various Post-Pliocene mammals and terrestrial shells. Drift with similarremains occurs in the lower grounds of Columbia. In the Gulf of Bahia there are recent beds 3 and near St Paul, as also in many other parts of Brazil, there are patches of lacustrine deposits. On the west side of the continent the pumiceous conglomerate is intimately con- nected with trachytes, and indeed is formed from them. It is intermediate in age between the lacustrine beds, the marine deposits near the shore, and the drift, which is in its turn covered by the more recent lava overflows ; and it is in this intermediate age that the upheaval of the principal chain of the Andes occurred. The ranges and faults which are assigned to this period, probably Pliocene or Post-Pliocene, run very nearly north and south. This elevation did not materially alter the extent of land west of the Andes, its general effect being to add a strip about thirty miles in width. On the east the change was Steat, since the larger proportion of the great central plain then emerged, and thus connected the high lands on the east, west, and north into one great continent. The erup- tion of the trachytes, which form so marked a feature in the Andes, was accompanied by a metamorphism distinct in character from those of earlier ages. The rocks were then subjected not only to heat and water, but also to acid vapours, which changed the felspar into sulphates of alumina and iron, salt into anhydrous sulphate of soda; and, probably, by freeing the chlorine and iodine, originated the chlorides and iodides which are so abundant in the argentiferous veins. Since the drift there has been a slight elevation along a meridional axis.

Such is a brief account of the growth of South America. . We must, however, mention that Professor Agassiz and his Coadjutors believe that the red soil and immediately under- lying beds, seen near Rio Janeiro and in the valley of

the Amazon, are true glacial formations, and infer that the similar beds which are spread over such an enormous area in South America have been formed under similar conditions. Professor Agassiz has

found moraines and ice-transported boulders in various places in the mountains of Brazil, as also indications of valley glaciers. Professor Orton has found marine shells in these beds at Pebas in Ecuador.

The foregoing sketch indicates that there have been sevc- ral periods of volcanic activity ; and that, so far as our present knowledge goes, such activity has only been manifested along the line of the Andes. Volcanic rocks have rarely been observed on the east side of the continent, but some of the Tertiary and Post-Tertiary beds of the plains contain matter which has been showered upon them during erup- tions, and which now forms a portion of the Pampean de- posits. At one period or other the whole system of the Andes has been subjected to volcanic disturbance, but at the present time the active volcanoes occur in groups more or less widely separated. The most southern active voleano is Corcovado, in 43° 10'S. There are, besides, some twenty or more volcanic cones, of which about a dozen are known to be active. Bolivia has one or two active vents, and Peru several; but it is in Ecuador, with its dozen igni- vomous vents, that have occurred the grandest and most frequent displays. Columbia has four or five volcanoes. With the exception of the Moluccas, no country in the world has had so many and so destructive earthquake shocks as South America. But these are concentrated, both as regards frequency and strength, along the Andes, and more particularly their western slope. Comparatively few are felt in the plains to the east of them; but occasionally it happens that shocks are felt, at points on the opposite slopes of this great range without being perceived in the inter- mediate higher regions. Peru seems to be the principal focus of action; and next to it in importance as a seismic area comes Chili; but although some earthquake shocks spread over both these areas, there does not seem to be the community of action which we should expect between the two areas. In Peru the maxima of seismic intensity were in the decades ending 1590, 1610, 1660, 1690, 1710, 1720, 1730, 1750, 1770, 1790, 1840, 1870. In Chili they occurred in the decades cnding 1580, 1640, 1650, 1660, 1690, 1730, 1780, 1800, 1820, 1840, 1850. Nearly every other portion of the continent is subject to earthquakes. Bolivia, which lies between Peru and Chili, is compara- tively free from them, as also are Brazil, Patagonia, and the Argentine

Confederation, but they are more frequent in Ecuador, Columbia, Venezuela, and the three Guianas.

The mountains of North and Central America will not detain us long. The ranges of Central America have no relation to the Andes, differing from them both as regards age and direction, which is generally N. 55° W., and being separated from them by gaps only a few hundred feet above the sea, and upwards of 100 miles wide. During the Tertiary period the mountains of N. and 8S. America had still less connection than at present, for where the isthmus now forms a bridge of land there was a broad strait, which lasted up to the end of the Pliocene, or beginning of the Post-Pliocene period. Volcanoes are frequent in Central America; and basalt and other volcanic products cover a large portion of the country. The large develop- ment of trachytes indicates an earlier period of volcanic activity, during which most of the Tertiary strata werc metamorphosed into porphyries. At any rate these rest upon cretaceous limestones. In many places the clays and sandstones of the Cretaceous age have been metamorphosed into granite rocks. From Puebla to Durango the Mexican mountains no longer present the appearance of a chain, but spread out to a table-land or elevated plain, from 5000

to 9000 feet in height, and from 100 to 300 miles in breadth. Across this plain, close to the 19th parallel, six vol- canoes are distributed in a line running east and west, as if a vast rent, extending from the Atlantic to the Pacific, had opened a passage for the internal fires of

the globe at this spot. Two of those on the east side of the continent, with a group of four or five other concs lying between Jalapa and Cordoba, have an elevation exceeding 17,000 feet, and are the only mountains in New Spain that rise to the region of perpetual snow, which commences here at 15,000 feet above the level of the sea. Jorullo, the lowest of the six volcanoes, rose suddenly in the middle of a plain, in September 1759, after fearful concussions of the ground, which continued for fifty or sixty days. Near the tropic the Mexican Cordillera divides into three parts. One runs parallel to the eastern coast at the distance of thirty or forty leagues, and terminates in New Leon. Another proceeds in a north-western direction, and sinks gradually as it approaches the Californian Gulf in Sonora. The third or central Cordillera traverses Durango and New Mexico, divides the sources of the Rio Gila from the Rio Bravo del Norte, and dies out before reaching the Rocky Mountains.

In a recent scientific survey of the Rocky Mountains, conducted by Professor Hayden of Yale College, a higher peak has been discovered than was formerly known. Holy Cross mountain was computed to reach 17,000 feet above the sea, or 2000 feet higher than Big Horn (15,000), which has hitherto been supposed to be the highest of the chain. The greatest altitudes on the North American continent are now said to be the following——St Elias (17,900) in Alaska, Popocatepet] (17,884) in Mexico, Orizaba (17,337) in Mexico, Holy Cross (17,000), Rocky Mountains, Big Horn (15,000), and Mount Lincoln (14,300), both in the same chain. The Great Salt Lake of Utah isin 41° N. and 112° W., and has intensely salt waters. It is nearly 300 miles in circumference, and its shores, for a breadth of several miles, are covered with an incrustation of very pure salt. It lies in a basin, which measures about 500 miles each way, and contains much fertile soil.

If we run a line westward across the continent of North America at the latitude of Delaware Bay (38°), the geolo- gical formations present themselves in the following order: —l. Tertiary and Cretaceous strata on the shcres of the Atlantic ;, 2. Gneiss underlying these strata, and present- ing itself on the eastern slope of the Alleghany or Appala- chian mountains, but covered in parts by New Red Sand- stone; 3.

Palzozoic rocks, consisting of Silurian, Devonian, and Carboniferous strata, curiously bent into parallel fold- ings, with synclinal and anticlinal axes, the crests of the latter forming the ridges of the Alleghany Mountains, which in this region rise to the height of 2500 feet. Upon these Paleozoic rocks rest three great coal-fields—the Appala- chian, that of Illinois, and that of Michigan, covering a large portion of the space between the Alleghanies and the Mississippi, and embracing collectively an area equal to the surface of Great Britain. From the Mississippi west- ward to Utah the Paleozoic rocks occur in great folds, be- tween which are extensive areas of Triassic, Oolitic, Creta- ceous, and Tertiary beds. In California the rocks are chiefly metamorphosed secondary strata on which lie patches of Tertiary sediments. In British America there is an enormous development of the Laurentian and Huronian rocks, which are the oldest yet discovered, and occupy most of the country immediately north of the large lakes. Newfoundland and the neighbouring British territories con- sist of Pre-Silurian, Silurian, Devonian, Carboniferous (which includes coal-fields of considerable extent), and Triassic rocks. The area north of about 40° N. is also covered and strewed with glacial drift and boulders.

The Ozark Mountains resemble the Alleghanies in their |

mineral structure, containing the same rocks from the granite to the carboniferous, and probably upwards to the chalk.

In no single circumstance is the superiority of America N. and¢ over the old world so conspicuous, as in the number and America,

magnitude of its navigable rivers. The Amazon alone dis- charges a greater quantity of water than the eight prin- cipal rivers of Asia, the Yenesei, Indus, Ganges, Oby, Lena, Amoor, and the Hoang-ho and

Yang-tse of China. The Mississippi, with its branches, affords a greater amount of inland navigation than all the streams, great and small, which irrigate Europe; and the Plata, in this respect, may probably claim a superiority over the collective water of Africa. But the American rivers not only surpass those of the Old World in length and volume of water,—they are so placed as to penetrate everywhere to the heart of the continent. By the Amazon, a person living at the eastern foot of the Andes, 2000 miles of direct distance from the Atlantic, may ¢onvey himself or his property to the shores of that sea in forty-five days, almost without effort, by confiding his bark to the gliding current. If he wish to return, he has but to spread his sails to the eastern breeze, which blows perennially against the stream. The navigation is not interrupted by a single cataract or rapid, from the Atlantic to Jaen, in west longitude 78° where the surface of the stream is only 1240 feet above thé level of its estuary at Para. The part of North America most remote from the sea is the great interior plain extending from the Rocky Mountains to the Alle- ghanies and the lakes, between the parallels of 40° and 50°; but the Mississippi, Missouri, and St Lawrence, with their branches, are wonderfully ramified over this region, and the Missouri is in some degree navigable to the centre of the continent. It is only necessary to cast the eye over a map of South America, to see that all the most sequestered parts of the interior are visited by branches of the Plata and the Amazon. These streams, having their courses in general remarkably level, and seldom interrupted by cataracts, may be con- sidered without a figure of speech, as a vast system of natural canals, terminating in two main trunks, which communicate with the ocean at the equator and the 35th degree of south latitude. Since the invention of steam navigation, rivers are, in the truest sense of the term, Nature's highways, especially for infant communities, where the people are too poor, and live too widely dis- persed, to bear the expense of constructing roads. There is little risk in predicting, that in two or three centuries the Mississippi, the Amazon, and the Plata, will be the scenes of an active inland commerce, far surpassing m magnitude anything at present known on the surface of the globe. The Mississippi is navigable for boats from the sea to the falls of its principal branch the Missouni, 1700 miles from the Mexican Gulf in a direct line, or 3900 by the stream; and the

whole amount of boat navigation afforded by the system of rivers, of which the Mississippi is the main trunk, has been estimated as equal to 40,000 miles in length, spread over a surface of 1,350,000 square miles. This, however, is perhaps an exaggeration; a navigable length of 35,000 miles may be nearer the truth.

The Amazon contains many islands, is broad, and in the upper part so deep, that on one occasion Condamine found no bottom with a line 620 feet long. At its mouth, two days before and after the full moon, the phenomenon called a Bore occurs in a very formidable shape. It is a high upright wave of water rushing from the sea, which no small vessel can encounter without certain destruction.

The estuaries of all these great American rivers open to the eastward; and thus Providence seems to have plainly

Rivers,

Climate.

CLIMATE. |

indicated that the most intimate commercial relations of the inhabitants of America should be with the western shores of the Old World. It should at the same time be observed, that this position of the great rivers of America is but one example of a physical arrangement which is common to the whole globe; for it is remarkable that, in the Old World as well as in the New, no river of the first class flows to the westward. Some, as the Nile, the Lena, and the Oby, flow to the north; others, as the Indus and the rivers of Ava, to the south; but the largest, as the Volga, the Ganges, the Yang-tse, the Hoang-ho, the Euphrates, and the Amoor, have their courses to the east or south-east. This arrangement is not accidental, but depends most probably on the inclination of the primary rocks, which, in all cases where their direction approaches to the south and north, seem to have their steepest sides to the west and the longest declivities to the east. We have examples in the Scandinavian Alps, the mountains of Bri- tain, the Ghauts of India, the Andes, and the Rocky Mountains.

The following table exhibits the lengths, size of the basins, and probable extent of the navigable waters of the greater rivers of America.

Table of Principal American Rivers.

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: 8q. miles. miles.

MMs cence { 4800 1,880,000 85,000 ~ saiaeae through the 2200 600,000 4,000 OO tees. 1800 400,000 8,000 NEU cerercceeene, | 4000 %100,000 50,000 Plata, including Uruguay… 2400 1,200,000 20,000

The latitude and elevation of the land in each country, 'ts position in reference to the sea, and the direction of the prevailing winds, are the chief circumstances which deter- mine the nature of the climate. We have already men- tioned that three-fourths of South America lie within the tropics, and the remaining fourth in the temperate zone ; but, in both divisions, it might be naturally inferred that a huge wall like the Andes, rising into the atmosphere to the height of two or three miles, and running across the course of the tropical and extra-tropical winds, would exert a powerful influence on the temperature, the humidity, and the distribution of the seasons. 'This is actually the case; and it is this vast chain of mountains, with its prolonga- tion in North America, which affords a key to the most remarkable peculiarities in the climate of the whole con- tment. The subject, which has been frequently mis- understood, admits of being explained in a very simple manner,

The trade-winds blowing from the east occupy a zone 60 degrees in breadth, extending from 30° of N. to 30° of S. latitude. Beyond these limits are variable winds but the prevailing direction in the open sea, where no acci- dental causes operate, is well known by navigators to be from the west. Now these winds are the agents which transport the equable temperature of the ocean, and the moisture exhaled from its surface, to the interior of the gteat continents, where it is precipitated in the shape of rain, dew, or snow. Mountains receive the moisture

which floats in the atmosphere ; they obstruct and lift the aerial currents, and by causing a reduction of temperature, favour precipitation. Rain, accordingly, in all countries falls most abundantly on the elevated land. Let us con- Sider, then, what will be the effect of a mural ridge like the Andes in the situation which it occupies. In the tegion within the 30th parallel, the moisture swept up by

the trade-wind from the Atlantic will be precipitated in part upon the mountains of Brazil, which are but low, and so distributed as to extend far into the interior. The por- tion which remains will be borne westward, and, losing a little as it proceeds, will be arrested by the Andes, and fall down in showers on their slopes. The aerial current will now be deprived of all the humidity which it can part with, and arrive in a state of complete exsiccation at Peru, where no rain will consequently fall. That even a much lower ridge than the Andes may intercept the whole mois- ture of the atmosphere, is proved by a well-known pheno- menon in India, where the Ghauts, a chain only 3000 or 4000 feet high, divide summer from winter, as it is called; that is, they have copious rains on their windward side, while on the other the weather remaius clear and dry; and the rains regularly change from the west side to the east, and vice versa, with the monsoons. In the region beyond the 30th parallel this effect will be reversed. The Andes will in this case serve as a screen to intercept the mois- ture brought by the prevailing west winds from the Pacific Ocean ; rains will be copious on their slopes, and in Chili on their western declivities, but none will fall on the plains to the eastward, except occasionally, when the winds blow from the Atlantic. The phenomena of the weather correspond in a remarkable manner with this hypothesis. On the shore of the Pacific, from Coquimbo, at the 30th parallel, to Amatapu, at the 5th of south latitude, no rain falls; and the whole of this tract is a sandy desert, except the narrow strips of land skirting the streams that descend from the Andes, where the soil is rendered productive by irrigation. From the 30th parallel southward the scene changes. Rains

are frequent; vegetation appears on the surface, and grows more vigorous as we advance south- ward. “At Conception,” says Captain Hall, “the eye was delighted with the richest and most luxuriant foliage; at Valparaiso the hills were poorly clad with a stunted brush-wood and a poor attempt at grass, the ground looking starved and naked ; at Coquimbo the brushwood was gone, with nothing in its place but a vile sort of prickly pear bush, and a thin sprinkling of gray wiry grass ; at Huasco (latitude 284°) there was not a trace of vegetation, and the hills were covered with bare sand.”! It follows from the principle we have laid down, that in this southern part of the continent the dry tract should be found on the east side of the mountains, and such is the fact. At Mendoza, in latitude 32°, rain scarcely ever falls, and the district along the east foot of the Andes is known to consist chiefly of parched sands, on which a few stunted shrubs grow, and in which many of the streams that descend from the mountains are absorbed before they reach the sea. The whole country, indeed, south of the Plata, suffers from drought; but on the eastern side this is remedied to some extent by winds from the east or south-east, which bring occasional rains to refresh the soil. From Amatapu north-ward, on the other hand, the west coast is well watered and fruitful; and this is easily accounted for. The line of the coast here changes its direction, and trends to the north-east as far as the isthmus of Panama, where the mountains sink to a few hundred feet in height, and leave a free passage to the trade-wind, which here often assumes a direction from the north-east, or even the north. The exhalations of the Atlantic are thus brought in abundance to the coast of Quito, which is in consequence well watered ; while the neighbouring district of Peru suffers from per- petual aridity.

Our principle applies equally to the explanation of some peculiar facts connected with the climate of North Ame- rica. The western coast of Mexico, as far as St Blas or

1 Hall’s Extracts from a Journal, vol ii. p. 12.

Forests,

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Mazatlan, in latitude 23° N., is well watered, because, first, the continent here is narrow; secondly, the table-land of Mexico, which is much lower than the Andes of Chili, is not so effectual a screen to intercept the moisture; and, thirdly, there is reason to believe that a branch of the trade-wind, which crosses the low part of the continent at Panama and Nicaragua, sweeps along the west coast during part of the year, and transports humidity with it. But beyond the point we have mentioned drought prevails. Sonora, though visited occasionally by rains, consists of sandy plains without herbage, where the streams lose them- selves in the parched soil without reaching the sea; and even Old California, which has the ocean on one side, and a broad gulf on the other, and ought apparently to be ex- cessively humid, is covered with sterile rocks and sandy hills, where the vegetation is scanty, and no timber is seen except brushwood. This dry region extends as far as 33° or 34° N.; but immediately beyond this we have another change of scene. New California is in all respects a contrast to the Old. It is rich, fertile, and humid, abounding in luxuriant forests and fine pastures; and the other American possessions to the northward preserve the same character. How can we account for this singular diversity of climate, except upon the principle which has been explained, namely, that in all regions where ranges of mountains intersect the course of the constant or pre- dominant winds, the country on the windward side of the mountains will be moist, and that on the leeward dry; and hence parched deserts will generally be found on the west side of countries within the tropics, and on the east side of those beyond them? Our hypothesis applies equally to the country east of the Rocky Mountains. For the space of about 3000 miles along the foot of this chain the surface consists of dry sands or gravel, sometimes covered with saline incrustations, almost destitute of trees and herbage, and watered by streams flowing from the mountains, which are sometimes entirely absorbed by the arid soil. The central and eastern part of the basin of the Mississippi would in all probability have been equally barren had the configuration of the land been a little different in the south.

The views on the subject of climate we have been un- folding will enable us to throw some light on an interest- ing point—the distribution of forests. Weare induced to think, that in all countries having a summer heat exceed- ing 70°, the presence or absence of natural woods, and their greater or less luxuriance, may be taken as a measure of the amount of humidity, and of the fertility of the soil. Short and heavy rains in a warm country will produce grass, which, having its roots near the surface, springs up in a few days, and withers when the moisture is exhausted ; but transitory rains, however heavy, will not nourish trees, because after the surface is saturated with water, the rest runs off, and the moisture lodged in the soil neither sinks deep enough, nor is in sufficient quantity to furnish the giants of the forest with the necessary sustenance. It may be assumed that 20 inches of rain falling moderately, or at intervals, will leave a greater permanent supply in the soil than 40 inches falling, as it sometimes does in the torrid zone, in as many hours. It is only necessary to qualify this conclusion by stating, that something depends on the subsoil, If that is gravel, or a rock full of fissures, the

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-where a few trees

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water imbedded will soon drain of ; if it is clay or a com- pact rock, the water will remain in the soil. It must be remembered, also, : 5

that both heat and moisture diminishas we ascend in the at- mosphere, while eva- poration increases ; and hence that trees will not grow on very high ground, though its position in reference to the sea and the prevail- ing winds should be favourable in other respects. In speak- ing of the region of jorests, we neither restrict the term to those districts where |: the natural woods present an unbroken continuity, nor ex- tend it to every place

Sketch Map showing the Forest Regions of America.

grow 1n open plains. It is not easy to give a definition that will be always appropriate ; but in using the expression, we wish to be understood as applying it to ground where the natural woods cover more than one-fourth of the surface.

The small map of America prefixed will enable the reader to follow our statements with ease. The long black lines show the positions of the chains of mountains ; the shading represents the regions of forests ; the dense forests being marked by the double shading, and the thinner ones by the open lines. The white spaces represent the lands on which little or no wood grows. The equator and the parallel of 30° on each side are indicated by the horizontal lines marked 0 and 30. The arrows show the direction of the prevailing winds; but it must be remembered that, though the intertropical wind is assumed to have its course right from the east, this is only true at the equator, its direction inclining to north-east as we approach the northern tropic, and to the south-east as we approach the southern. In North America A is the woody region on the west coast, extending from latitude 35° to about 58°, and of unknown breadth. B, the region on the east side of the Rocky Mountains, partly a bare desert, partly covered with grass and dotted with trees. C, the forests of the Alleghany chain, thick on the east and south, and thin on the west; bounded by a curved line passing from St Luis, in Mexico, through Lake Huron, to the mouth of the St Lawrence, in latitude 50° N. The arrow at M points out the direction of the wind, which ascends the valley of the Mississippl, and nourishes the western part of these forests ; and the arrow at R that which blows across the isthmus of Panama. D is the table-land of Mexico, graduating on the north- west into the dry plains of Sonora and California, all bare, or nearly bare, of wood. E is the Llanos or bare plains of Caraccas, nearly fenced round with mountains. F Gis the long strip of bare dry sands on the west side of the Andes which constitutes Lower Peru and the north part of Chili; and N is Amatapu, its northern boundary. His the great region of forests which constitutes the basin of the Amazon, and occupies all the rest of Brazil. Near the equator the moisture is so excessive, that after 150 or 200 inches of rain have fallen on the east coast, there 1s still sufficient humidity in the atmosphere to afford copious showers to all the country up to the Andes. Here, there

Moderating Influences.

CLIMATE. |

fore, the woods reach from side to side of the continent. But as we recede from the equator the humidity diminishes rapidly ; and though the continent becomes narrower to- wards the south, the supply of rain falls off in a still greater proportion, and the forests extend over a much smaller space. At the foot of the Andes the forests ex- tend to 16° or 18° of 8. latitude; on the east coast to 25° or probably 30°. K L are the Pampas or open lands of Buenos Ayres, extending on the east side of the Andes from Cape Horn to the latitudes just mentioned. If we divide this region into three parts, the most easterly, refreshed by occasional rains from the Atlantic, is covered with a strong nutritive herbage ; the second, which is drier, dis- plays a thin coarse wiry grass; and the third portion, which extends to the Andes, receiving little or no rain, is nearly a desert: all the three are destitute of timber, but the sur- face of the third is dotted with dwarfish shrubs. JT is the southern part of Chili. Here the prevailing winds, which are from the west, coming loaded with the moisture of the Pacific Ocean, produce copious rains to nourish the herbage and the forests. This applies, however, chiefly to the country south of the 35th parallel. From that to Coquimbo, in latitude 30°, the wood is scanty. Beyond 50° on the east coast of North America, and 55° or 58° on the west, very little wood grows, in consequence of the rigour of the climate.

Great misapprehensions have arisen with regard to thé climate of America, from comparisons being drawn between the east side of the new continent and the west side of the old. We have already pointed out the influence of winds blowing from the sea in modifying the state of the atmo- sphere over the land, both as to heat and humidity. When this circumstance is attended to, and when the east and west sides of the old and the new continents are respectively com- pared with one another, the difference is found to be small, and easily accounted for. In the torrid zone, and on the seashore, the temperature of both continents is found to be the same, viz., 82°; but in the interior the difference is rather in favour of America. There is no counterpart in

the New World to the burning heats felt in the plains of Arabia and N. Africa. Even in the western and warmest part of the parched steppes of Caraccas, the hottest known region in America, the temperature of the air during the day is only 98° in the shade, which rises to 112° in the sandy deserts which surround the Red Sea. At Calabozo, farther east in the Llanos, the common temperature of the day is only from 88° to 90°; and at sunrise the thermo- meter sinks to 80°. The basin of the Amazon is shaded with lofty woods; and a cool breeze from the east, a minor branch of the trade wind, ascends the channel of the stream, following all its windings, almost to the foot of the Andes, Hence this region, though under the equator, and visited with almost constant rains, is neither excessively hot nor unhealthy. Brazil, and the vast country extending west- ward from it between the Plata and the Amazon, is an uneven table-land, blest with an equable climate. At Rio Janeiro, which stands low, and is exposed to a heat comparatively great, the temperature in summer varies from 68° to 89° Fahr., and the mean is only about 7A, Farther north, and in the interior, the Indians find it necessary to keep fires in their huts ; and in the country near the sources of the Paraguay, hoar-frost is seen on the hills during the colder months, and the mean tem- perature of the year falls below 65° or 67°. On the de- clivities of the Andes, and on the high plains of Upper Peru, the heats are so moderate that the plants of Italy, France, and Germany come to maturity. Lower Peru, though a sandy desert, enjoys a wonderful degree of cool- Ness, owing to the fogs which intercept the solar rays. At Lima, which is 540 feet above the sea, the temperature varies from 53° to 82°, but the mean for the whole year is

only 72°. In the plains of La Plata the mean temperature of the year is very nearly the same as at the corresponding north latitudes on the east side of the Atlantic. At Buenos Ayres, for instance, the mean annual heat is 19°-7 of the centigrade thermometer (68° Fahr.), while that of places on the same parallel in the Old World is 19°8. The range of temperature is probably greater in the basin of the Plata ; but as we

advance southwards, the diminishing breadth of the continent makes the climate approximate to that of an island, and the extremes of course approach each other. In the Strait of Magalhaens the temperature of the warmest month does not exceed 43° or 46°; and snow falls almost daily in the middle of winter, though the latitude corre- sponds with that of England. But the inference drawn from this, that the climate is unmatched for severity, is by no means just, for the winter at Staten Island is milder than in London. In point of fact, the climate of Patagonia is absolutely colder than that of places in the same latitude in Europe; but the difference lies chiefly in the very low temperature of the summer. This peculiarity no doubt results chiefly from the greater coolness of the sea in the southern hemisphere; for beyond the parallel of 48°, the difference of temperature in the North and South Atlantic amounts, according to Humboldt, to 10° or 12° of Fahren- heit's scale. If we push our researches a step farther, and inquire what is the cause of the great warmth of the Northern Sea, we shall be forced to admit that a very satisfactory answer cannot be given. Something may be due to the influence of the Gulf Stream, a minute branch of which is supposed to carry the waters of the torrid zone to the shores of Shetland and N orway; but such an agent seems too trifling to account for the phenomenon. The sum, then, of the peculiar qualities which distinguish the climate of South America may be briefly stated. Near the equator the new continent is perhaps more humid than the old; and within the tropics generally, owing to its vast forests, the absence of sandy deserts, and the elevation of the soil, it is cooler. Beyond the tropics the heat is nearly the same in the south temperate zone of America and the northern one of the old continent, till we ascend to the latitude of Cape Horn, where we have cold summers and a very limited range of the thermometer.

The mountain ranges of North America form two widely Highlands distant highland regions, separated from each other by the of N. vast interior plain, which contains, in its southern slope, America. the Mississippi with all its tributaries, and the other rivers flowing into the Gulf of Mexico, while its northern part contains the great fresh-water lakes, and many rivers taking a northward course to Hudson's Bay or to the Arctic seas. The watershed of this plain, dividing the streams

that run into the Missouri and Mississippi from those communicating with the Saskatchewan, with Lake Winnipeg, and with Lake Superior, is along a line from west to east nearly coinciding with the 48th parallel of latitude, and has a mean elevation of 1500 feet.

Along the whole of the western side, from near the mouth of the Mackenzie in the Arctic Ocean, and from Alaska on the Pacific shore, to the Isthmus of Nicaragua and Panama, that is, across 60° of latitude from north to south, extends with a grand double curve the continuous length of the Rocky Mountains, and others which prolong the line, having a position in North America similar to that of the Andes in South America, and shutting off, in some parts, a comparatively narrow portion of the con- tinent, with the Pacific shore, from the great central plain. But several minor ranges, branching off or confronting the principal mountain-ridge or backbone of North America, enclose large spaces of a table-land, traversed by the Columbia, the Fraser, and the Colorado rivers, with those which join them, and holding the Great Salt Lake of

Utah in its central basin. The Cascade Mountains of Washington and Oregon, the Sierra Nevada of California, and the Coast Range prolonged through the Californian peninsula, have a general direction from north to south; while the Wahsatch, the Humboldt, the Blue Moun- tains, the Salmon River, and other ranges, stand rather across the table-land, or obliquely, from west to east. It may be convenient to speak of the former series, regarded altogether, as the general Pacific Coast Range, which we also observe to be continued northward, with some intervals, beyond latitude 60° N. to the peninsula of Alaska, pre- seuting summits of increased height, that of Mount St Elias being above 17,000 feet, and Mount Fairweather nearly 15,000 feet. In the Cascade Range are Mount St Helens, north of the Columbia River, attaining an eleva- tion of 15,750 feet; Mount Hood and Mount Jefferson, about 15,500 feet. The Sierra Nevada, at its northern extremity, where it forms an acute angle with the coast range, displays the lofty terminal peak of Mount Shasta, having an altitude of 14,400

feet. The minor Californian Coast Range nowhere riscs to 4000 feet. The main Cor- dillera or spine of Western North America, which in the British Dominion and in the United States' territory is called the Rocky Mountains, but which takes the name of the Sierra Madre in Mexico, and in the isthmus, farther south, is split into two lower groups of a volcanic character, attains the height of 16,000 feet in Mount Brown, and 15,700 feet in Mount Hooker, both near the 54th degree of latitude, above the source of the Saskatchewan river; but Fremont, in the Wind River group, between Oregon and Nebraska, is 13,560 feet high, and there are peaks of 10,000 feet or 12,000 feet in Utah and New Mexico. 'The highest mountains, however, in North America, ex- celling even Mount St Elias, belong to a volcanic series which crosses the table-land of southern Mexico from west to east, and of which the culminating points are Popo- catepetl, 17,884 feet, and Orizaba, 17,373 feet; while Agua, in Guatemala, rises to 13,000 feet. Thus we may remark, at each extremity of the Cordillera, at its north end, towards Alaska, and at its south end, in Central America, it is encountered by a cluster of volcanoes, Mount St Elias being one of this description, which exceed the height of the Rocky Mountains. The spaces enclosed between the main trunk and branches of this immense system of mountains are several hundred miles wide, and their surface is elevated 5000 feet or 6000 feet above the sea-level, as in the Utah lake-basin, the Nevada territory, and the plateau of Anahuac, or southern Mexico, which last has an elevation of 6000 feet to 8000 fect, and has therefore a temperate climate within the tropics.

An outline merely has been given of the western high- land region of North America. The eastern highlands of this continent are mainly constituted by the Alleghanies or Appalachian system of mountains, with their dependen- cies, which are of no great height, the Black Mountain, or Mount Guyot, in North Carolina, being the highest, at 6476 feet; but they extend nearly 2000 miles, from the Gulf of St Lawrence to the Gulf of Mexico, having a gene- ral direction from north-east to south-west. The strip of land, one or two hundred miles widc, between these moun- tains and the Atlantic coast, is of the greatest historical interest, as it includes the seats of all the oldcr English scttlements on this continent, which seems destined for the

grandest dwelling-place of our nation. North of the Gulf of St Lawrence, through the peninsula that terminates with Labrador between the Atlantic and Hudson's Bay, the Appalachian system of mountains is continued, or resumed, in a range called the Watchish, only 1500 feet

high, but in the severe climate of that region covered with The Alleghanics, south of the St Law-

perpetual snow.

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rence, including the Green Mountains of Vermont and the White Mountains of New Hampshire, are not so much a chain of mountains as a long plateau, crested by several different ridges, and intersected by wide valleys of con- siderable elevation, but altogether on a much smaller scale than the highlands of Western America. river Hudson the mountains are chiefly granitic, with rounded summits, often covered with turf or moss to the top; they assume a more regular formation in Penn- sylvania, Virginia, and North Carolina, but again decline and break into detached groups in approaching their southern extremity in Alabama. North Carolina, which is named above, Mount Washington in New Hampshire stands pre-eminent, with an altitude of 6428 feet. The scenery of these " White Mountains" is very striking, especially where the Saco river cleaves its way through the barrier of granite by a cutting two miles long, in one place only 22 feet wide, between lofty pre- cipitous walls. ing these to the west, and giving their name in French to the neighbouring State, that the prevalent form becomes that of round humps on a broad base, with firs or shrubs growing on the slopes, and with scanty grass or lichens on the summits. England mountains enter the State of Massachusetts from the north; the Hoosac and Taconic extensions of the Green Mountains rise on the west side, while the White Moun- tains are continued by those of which Mount Holyoke and Wachusett are the most conspicuous; and between their

East of the

Next to the summit in

It is in the "Green Mountains," succeed-

Both these two contrasted groups of New

parallel ranges is the Connecticut river, with the Housa-

tonic, Mount Tom, and Blue Hills to overlook its lower

course. These features of the country, though of far less

physical importance than the towering peaks of Colorado and California, will always be associated with the genuine traditions of English rural, domestic, and social life, trans-

planted to the New World in the 17th century, and defended by a long struggle against stern nature and savage men in the early age of the American colonies. The natural boundary separating New England from the

great and more modern State of New York is that noble

river the Hudson, rising in the Adirondack Mountains, near Lake Champlain and the waters of the St Lawrence, but pouring its beautiful and useful stream directly south, to the greatest of American commercial ports and cities. This river passes close by the Catskill and Shawangunk Mountains, from which is continued the general distribution of the eastern American highlands along the Atlantic states, but with a more westerly declination from the coast, running through Pennsylvania, West Virginia, the borders of Tennessec, and North Carolina, the upper parts of Georgia and Alabama. It is in Virginia that the Alle- ghanies have their greatest breadth, which is about 150 miles. They rise highest in North Carolina and Tennessee, and subsequently keep up a distinct line of position, across the cotton-growing States, between those of the Atlantic seaboard and those of the

Lower Mississippi. This cir- cumstance, it may be remarked, has had most important effects on the political and military events of late years, in the results of the attempted secession of the slavehold- ing States from the Union. Another feature of physical geography, which probably conditioned the earlier stages of that momentous civil struggle, in the disputes relating to the Missouri compromise and to the admission of Kansas as a free-soil State, is the existence of the Ozark range of mountains, These stand in the middle of the great Mis- sissippi valley, stretching across from northern Texas to Arkansas and the confluence of the Missouri with the Mississippi. By the elevation they give to the soil, in latitudes between 30° and 40°, as well as by the raised table-land of New Mexico and Arizona farther west, the

area of United States' territory suitable for cotton planta- tions and for slave labour was so far limited, and confined to the shores of the Gulf of Mexico and the Atlantic sea- board. At the same time, in the latitudes north of these, between 40° and 50°, the whole vast prairie region from the Ohio to the Rocky Mountains was adapted to the growth of corn, while it had such continuity and unifor- mity of surface, and was so pervaded by the grand river- system of this middle plain of North America, that it could not well undergo political division. The entire West being thus secured to the Union, and the better part of the South being thus rescued from the curse of Negro slavery, by the moulding hand of nature in planning the distribution of mountain ranges and the level ground all over this continent, we may consider that the political and social destinies of the great English Republic, vindi- eated in the civil war from 1861 to 1865, were predeter- mined in the formation of the land.

The North American continent affords an interesting study of the geological changes and adjustments, by which the mighty work of preparation for what promises to be a noble development of humanity was slowly effected in the remote epochs of the past. The oldest sedimentary rocks anywhere found on the globe are those which under- lie the whole of Canada, New Brunswick, and Newfound- land, the

Labrador peninsula, and the country north of Lake Superior, perhaps also the less explored regions of the far north-west towards the Arctic Sea. This series, named the Laurentian, from the St Lawrence river, is per- ceived to exist in Europe only in a few scattered instances, in the Hebrides, and in Norway or Sweden. In North America it occupies the most extensive areas; the thick- ness of its beds is estimated by Sir William Logan at 30,000 feet; it rises to hills or mountains 4000 feet high, and in the deep gorge of the Saguenay river, forms per- pendicular cliffs of 1500 feet. Only one fossil animal, which has been called the Eozoon Canadense, has been dis- covered to have left its trace in this most ancient bottom of the primeval ocean; it was one of the Foraminifera, which covered its gelatinous body with a thin crust of carbonate of lime, having numerous holes or pores for the emission of its filament-members, with which to fecl and to feed outside. Next to the Laurentian, but with a vast unknown interval of time, comes the Huronian or Lower Cambrian series. It is suggested by geologists that, as the vast level bed of the Laurentian sea was cracked by internal changes of the earth's density, these cracks threw up certain ridges along the surface of the present con- tinent, which laid a foundation for the principal mountain ranges we have described. At the borders and extremities of these mountain ranges, it is evident that there were intense volcanic eruptions, producing great quantities of Java and conglomerate, basalt, greenstone, and other formations resulting from igneous action. The northern shores of Lakes Huron and Superior exhibit results of this kind; but it is in the table-lands between the Rocky Mountains and the west coast ranges, as in the singular lava beds near the Klamath, on the frontier of Oregon and North California, that voleanic forces have made their strongest marks on the earth. On the eastern side also of the grand Cordillera, between the sources of the Missouri and of the Yellowstone rivers, is a wonderful region of boiling springs or geysers, of sulphur beds and other natural curiosities, which have recently been described by Dr Hayden, of the United States' Government Survey. To speak more generally of the local arrangement of dif- ferent geological formations, it may be remarked that crystalline rocks are spread over the western parts of North America, from Alaska to Nicaragua, and over the most hortiern parts, also including Gycenland ; but some of

jater date are found in the eastern or Appalachian range, consisting of felspathic gneiss and quartz rocks, mingled with talcose and chloritic schists. The Paleozoic forma- tions occupy that middle part of the continent which lies between the Rocky Mountains and the great lakes, as well as the shores of Hudson's Bay, and some portions of the Atlantic coasts. With reference to the Lower Silurian or Siluro-Cambrian period, it is abundantly illustrated by the Trenton and associated limestones, which can be traced over 40° of longitude, their beds consisting entirely of débris of coral, shells, and crinoids, from the shallow inland sea, teeming with animal life, that once filled the whole level space between the Alleghanies and the Rocky Mountains, separated by these ridges from the Atlantic and Pacific Occans, and sheltered from the cold Arctic currents by the northern Laurentian highlands. This space, which is now the central plain of North America, comprising the prairies and the Mississippi valley, was then a coral sea with archipelagos of volcanic isles, resembling that of Australasia in the South Pacific. The next forma- tion succeeding the Silurian presents immense deposits of sandstone and shale from the muddy waters troubled by subterranean motions; this is the Devonian formation, which in America has been called the Erian, on account of the great development of such beds south of Lake Erie, The deposits of this period in the western continent are stated to be 15,000 feet in thickness. They include the cliff limestones, studded with calcareous corals of great size and beauty of shape, noticed by Sir Charles Lyell at the falls of the Ohio, near Louisville; these limestones are estimated to extend, as an ancient coral reef, over 500,000 square miles of the American middle plain. In the State of New York and in Western Canada there is the corni- ferous limestone, in which the imbedded corals have been replaced, in the cavitics they once filled, by flinty horn- stones which present the perfect coral forms, as though cast in a mould. In the Carboniferous age the great internal sea of the continent was slowly changed into swampy flats and shallow lakes or creeks, and gradually filled with a rank vegetable growth, afterwards buried

under later marine deposits and pressed into the existing coal-beds. Of this period there are very extensive de- velopments throughout the eastern half of the great middle plain to the Alleghanies. This portion of America seems to have been land, covered with the forests of that period, while the western half of the middle plain, a northward extension of the Gulf of Mexico, was still under water. As the eastern half of North America, between the Mis- sissippi and the Atlantic, was thus in the Carboniferous cra well raised out of the sea, it exhibits no traces of the succeeding Permian age, such as we find in Europe. The earliest periods also of Mesozoic time have failed to leave any record here, but their formations appear towards the western range of mountains in what was the bed of a Mediterranean Sea. It is, however, the Cretaceous system, with its characteristic greensand, its sands, clays, marls, and soft grey limestones, that occupies most space in Western America, between the meridians of 97° and 112°. These strata, overlaid sometimes by those of the Tertiary periods, extend through the country up the Missouri, the Platte, the Arkansas, and the Red River, to the Rocky Mountains; they also form parts of the plains enclosed by different mountain ranges beyond the Cordillera. Along the eastern side of the Appalachians therc is a broad belt of the Cretaceous formation, stretching from the Delaware across the upper parts of Virginia, Carolina, Georgia, and Alabama. Among the fossil animal remains discovered in this formation in North America, which are enumerated in a separate list, one of the most remarkable is that of the Mosasaurus, a combination of the serpent with the lizard

form, sometimes 80 feet in length, and of aquatic habits. The Tertiary deposits, including the boulder clay, prevail chiefly along the seaward districts, from Long Island, above New York, to the peninsula of Florida, and around the shores of the Mexican Gulf, and likewise on the Pacific shore from Lower California to Vancouver Island, also in some detached instances, as in Nebraska, in the midst of the interior plain. The newer Pliocene is met with in the southern part of Maine, and on the shores of Lake Cham- plain. The drift formation lies mostly north of 40° lati- tude. Alluvial deposits are of great amount from the

large rivers and lakes, especially in the delta of the Missis- sippi, which has an area of 13,600 square miles, and must,

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period, a nation that may become greater in material resources than the most powerful kingdoms of Europe. In view of these prospects from the working of the useful metals, by the aid of that most useful product of the earth which supplies heat and mechanical force to the service of human industry, we may regard the Californian gold-fields as a matter of secondary importance. They have indeed been surpassed by the productiveness of those in Australia and New Zealand.

Nine-tenths of North America lying under the tempe- rate zone, the climate follows a different law from what is observed in the southern peninsula,and presents more strik- ing contrasts with that of the best known parts of the Old

World. The long narrow region now denominated Central Central America, which connects the two great divisions of the con- and North tinent, stretching from Panama to Tehuantepec, has in Ane

by Sir Charles Lyell's reckoning, have taken 67,000 years for its composition, at the rate of the bringing down of solid

matter by that mighty river. Climate,

Minerals.

The mineral products of North America are of unequalled richness and variety. Gold is abundant, to a proverb, in California, and likewise in Nevada and Montana. It is also found in British Columbia, Mexico, Central America, and Canada, and sparingly in Virginia and South Caro- lina. Silver is obtained from Mexico in larger quantities than from any other country; it is supplied also by Cali- fornia and by Honduras, and a vein of this metal is worked in Newfoundland. Great

masses of almost pure copper are found in the Huronian rock strata, the north and east shores of Lake Superior being the richest of copper-mining regions: while New York State and Indiana possess a share of the same metal, and it is found among the wes- tern mountains in different countries from British Columbia to the isthmus. 'The iron ores of Pennsylvania, and those of Canada, including New Brunswick, are of the greatest importance; the former are rendered more available by their occurring close to the beds of bituminous coal, giving materials for the manufacturing industry of Pittsburg; while anthracite coal is obtained from the eastern districts of Pennsylvania. It is estimated that one third of the total area of this State is occupied by coal-fields, which can scarcely be exhausted. Lead is found in Wisconsin, Illinois, and Missouri, in New York State, in Canada, in California, and in Central America, as well as quicksilver ; white zinc is got from Arkansas and New Jersey; both Canada and Mexico produce tin. Reverting to the subject of coal, as having an intimate economic connection with all metallic wealth, it should be observed that the united area of all the coal-fields in the United States is estimated at 190,000 square miles, exceeding twentyfold those of Europe. The chief of these coal-fields are, first, the Appalachian, extending from the Susquehanna, in Pennsylvania, to the Tuscaloosa, in Alabama, along the west side of the Alle- ghany Mountains; the area of this coal-field is 70,000 square miles, and its greatest thickness 2500 feet ; secondly, the coal-field of Michigan, about the centre of that State; thirdly, the extensive coal-field between the Ohio and the Mississippi, across the States of Indiana and Illinois; lastly, the Iowa and Missouri coal-field, which occupies a large space in the very centre of the continent. Coal is found also in Nova Scotia, in British Columbia, and Van- couver Island, and wherever the Upper Palzozoic strata prevail in the geological structure. Butin the vast extent of British American territory north-west of Lake Superior, around Lake Winnipeg and up the Saskatchewan river, even as far as the Peace river, in latitude 56° N., it may be expected that manufacturing as well as agricultural prosperity will result from the use of immense stores of natural wealth existing in the soil of that long-neglected land, which is now proved to have a climate not more severe than the inhabited provinces of Canada. The iron and copper, more especially of the

Canadian Dominion, will employ and enrich, in all probability, at some future

general a very humid atmosphere; but, for a tropical coun- try, it must be only moderately hot, as every part of it is within a small distance of the sea. At Vera Paz the rains fall during nine months of the year. Mexico is hot, moist, and unhealthy on the low coasts; but two-thirds of its area, comprising all the populous districts, consist of table-land, from 5000 to 9000 feet in height. In consequence of this singular configuration of its surface, Mexico, though chiefly within the torrid zone, enjoys a temperate and equable cli- mate. The mean heat at the capital, which is 7400 feet above the sea, is 624°, and the difference between the warmest and coldest months, which exceeds 30° at London, is here only about 12°; but the atmosphere is deficient in moisture, and the country suffers from drought. Beyond the parallel of 24° N. the western shores are hot and arid.

In the extensive region lying between the parallels of 30° and 50° N., which comprehends three-fourths of the useful soil of North America, we have three well-marked varieties of climate, that of the east coast, the west coast, and the basin of the Mississippi. On the east coast, from Georgia to Lower Canada, the mean temperature of the year is lower than in Europe by 9° at the latitude of 40°, and by 124° at the latitude of 50°, according to Humboldt's calculation. In the next place, the range of the thermo- meter is much greater than in Europe, the summer being much hotter and the winter much colder. At Quebec the temperature of the warmest month exceeds that of the coldest by no less than 604° of Fahr.; while at Paris, which is nearly under the same latitude, the difference is only 31'. In the third place, the climate undergoes a more rapid change in America as we proceed from south to north, a degree of latitude in the middle of the temperate zone pro- ducing a decrease of annual temperature of 1°13 Fahr. in Europe, and of 1°57 Fahr. in America. The comparison is greatly to the disadvantage of America when made in this form; but when the east coasts of the two continents are compared, the case is altered; the Old World is found to have no superiority over the New, for Pekin has still colder winters and warmer summers than Philadelphia, which is under

the same latitude. It is the west coast of the new continent which ought to exhibit the climate of Europe ; and from the observations made, we have reason to believe that it is quite as mild and equable. At the mouth of Columbia river, in latitude 464° N., it appears that the mean heat of the warmest month was about 62° Fahr., of the coldest about 36°, and of the whole year 51°. Now the place is under the same latitude with Quebec, where the snow lies five months, and the mean temperature during the three winter months is 18° below the freezing point. This single circumstance marks emphatically the contrast in the climate of the east and west coasts of North America. But the mouth of Columbia river is also under the same parallel with Nantes at the mouth of the Loire; and we have, therefore, good grounds to conclude that the west

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CLIMATE. |

coast of America, in the middle latitudes, has nearly as mild and cquable a climate as the west coast of Europe. The climate of the great central valley, or basin of the Mississippi, has a considerable affinity to that of the east coast. It was long a matter of dispute in what the difference between the two consists, but this seems at last to have been clearly settled by the meteorological registers kept at the military posts of the United States. From a comparison of four of these registers, from posts near the centre of this great val- ley, with others kept on the Atlantic coast in the same latitudes, it appears that the extremes of heat and cold in the basin of the Mississippi are from 5° to 6° higher and lower than on the coasts of New England. The pro- portion of fair weather to cloudy is as 5 to 1 in favour of the east coast. The climate of the interior, therefore, exhibits in still greater excess those extremes of tem. perature which distinguish the eastern coast of this con- tinent from the western, and from the shores of Europe. The fourth region of extra-tropical America includes the parts beyond Mount St Elias on the west coast, and, in the interior, the plains extending from the 50th parallel to the Polar Seas. The intensity of the cold in this tract of

country is scarcely equalled by anything that is known under the same parallels in Northern Asia. The northernmost spot in America where grain is raised is at Lord Selkirk's colony, on Red River, in latitude 50°. Wheat, and also maize, which requires a high summer heat, are cultivated here. Barley would certainly grow as far north as Fort Chippewyan, in latitude 582°, where the heat of the four summer months was found by Captain Franklin to be 4° higher than at Edinburgh. There is even reason to believe, that both this species of grain and potatoes might thrive as far north as Slave Lake, since the spruce fir attains the height of 50 feet three degrees farther north, at Fort Franklin, in latitude 65°. These, however,

are low and sheltered spots; but in this dreary waste –

generally, it will not be found practicable, we suspect, to carry the arts of civilised life beyond the 60th parallel ; and the desirable country, capable of supporting a large population, and meriting the name of temperate, can scarcely be said to extend beyond the 52d parallel. At 65° the snow covers the ground in winter to the depth of only two feet, but small lakes continue frozen for eight months. The sea is open only for a few weeks, fogs darken the surface, and the thermometer in February descended in one instance to minus 58°, or 90° below the freezing point. At Melville Island, under the 75th parallel, such is the frightful rigour of the climate, that the temperature of the year falls 1° or 2° below the zero of Fahrenheit's scale. It isa peculiarity in the climate of America, that beyond the parallel of 50° or 52°, it scems to become suddenly severe at both extremities. At the one, summer disappears from the circle of the seasons; at the other, winter is armed with double terrors.

The zoology of America is especially interesting, on account of the contrast which exists between the faunas of the north and south portions of the continent—a contrast which is especially exhibited in the case of the Mammalia. The zoological province which naturalists mark off as con- stituted by South America and part of Central America has been termed the neotropical region, and the area which has the nearest relationship to this is the Indian region. As regards

South America, the Andes have the highest value as zoological boundaries; next to then: I importance are the rivers, and then the confines of the forest region. The Quadrumana are well represented, and are especially characteristic of the forest region which principally prevails in the western half of the con- tinent. None are known to occur on the west side of the Andes south of Guayaquil. The sub-order Platyrhina is

peculiar to South America, and so far as research has yet extended, it is not known even to have existed on any other area. On the other hand, no catarhine or lemurine Quadrumana have yet been found in South America, Some of the lower forms of monkey appear to have some affinity with the Lemuride, which occur in India, Africa, and Madagascar. There are two families, viz., the Cebidee and Hapalide, all the members of which are strictly arboreal in habits. Some of these monkeys are the most highly developed tree-climbers known, and in many cases theyrarely if ever descend to the ground ; and since the monkeys of South America have never been seen to swim, it might be expected that the broad streams of the continent effectually limit the distribution of certain monkeys. The largest species is Lagothriz Humboldtii, 30 that as a whole the American monkeys are smallcr than those of Asia and Africa, As they are the most powerful of arboreal Mammalia, they rule the forests, and this may in part account for the scarcity of squirrels in this region. The Cebidse have a wide Tauge, extending from the south of Mexico to the Uruguay. They include the highcst forms of American monkey, and its most specialised representatives are those which have the best adaptation for life in trecs, as may be exemplified by Ateles, with its long limbs and prehensile tail. This latter organ serves all the purposes of a fifth hand 3 the under surface is bare and provided with tactile papillz, so that a monkey not only holds by, but also feels with it. It is as mobile and flexible, and in its way as useful to this genus of monkey as is the trunk to the elephant. The genus includes numerous species, the estimate of

different natural- ists varying from 8 to 40, but about 10 Species have been well established. Most of them occur in Brazil and the Guianas ; but each species generally has circumscribed limits. Thus A. paniscus occurs in the north-east corner of the continent, between the Rio N egro and the Amazon. On the south side of the Amazon its place is taken by another species, A. marginatus. A. Bartlettii occurs on the Upper Amazon. Brachyteles is represented by a single species in South-East Brazil. Several species of Lagothrix have been described, although perhaps all are but varic- ties of but one species. Z. Humboldtii is confined to the Upper Amazon, west of the Rio N egro, and in some of the contiguous valleys of the Orinoco basin. Mycetes has six species, ranging from Guatemala to South Brazil. I. seniculus occurs on the north side of the Lower Amazon : MM. caraya on the Upper Amazon ; and I. belzebuth is the species which occurs near Para, and south of the Lower Amazon. All the above genera have prehensile tails, with

bare under surfaces. Nyctipithecus, with three orfourspecies,

occurs in the upper portions of the Rio N egro, Amazon,

and Orinoco basins. Callithrix ranges over the same

ground, butalso extends into South-East Brazil. Chrysothrix

occurs throughout the northern part of the region. The

genus Pithecia (including Brachyurus) is represented by about 12 species in the Amazon basin. P. irrorata is confined to the south bank of the Upper Amazon 3 another species only occurs on the north side to the west of the Rio Negro. PP. satanas is the species east of the Rio N egro, and there is a species limited to the south side of the Upper Amazon. The family Hapalide, or marmosets, has about 30 species, belonging to the genera Hapale and Midas,

which range throughout the forests of South America.

One species, 7. a@dipus, occurs in Costa Rica, but this is the

northernmost limit of the family. It secms that the

distribution of the monkeys is restricted to the areas clad with continuous forests, so that the absence of monkeys in the Pampean, Andisian, and Peruvian sub-regions is mainly due to the absence of continuous forests. It is also notice- able that the sub-orders, families, and gencra extend over the greater portion of the Brazilian sub-region ; whereas in

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Carnivora,

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characteristic genus Dicotyles is the sole representative in South America of the sub-order Omnivora and of the family Suide, a family which is restricted (naturally) to the Neotropical, Aithiopian, and Indian regions. Another remarkable genus is Tapirus, which represents in this region the elephants and rhinoceroses of the Old World. Until recently, the tapirs of Sumatra and the Malay Archipelago were cousidered to belong to the same genus, but Dr Gray has proposed that the latter be ranked in a distinct genus, Rhinocherus. There are several species of South Anierican tapirs, viz., 7. americanus, T. villosus, T. Laurillardu, Tf. Roulinii, and perhaps one or two others not determined, An allied form exists in the isthmus of Panama, namely

682 [zooLocy. many instances this sub-region is parcelled out into districts by the larger streams, which are characterised by distinct species. Hence it is probable that the continuousness of the forest area has lasted throughout the duration of those species, but not so long as the genera have existed ; and that those species which occur on both sides of the Amazon, Rio Negro, and other large rivers, originated at an earlier period than those restricted to one side. The want of means of communication with North America would account for the absence of monkeys in that region. Our space will not allow of our dwelling so fully on the other orders, but we may notice that the arboreal habit is strongly

marked in many, and that the strictly arboreal groups are frequently represented in river-bounded areas by distinct species. It often happens that genera, both of vertebrates and invertebrates, which are elsewhere terrestrial, are represented in the Amazonian forests by arboreal species. The Carnivoradonot present so marked a feature as regards distribution as the monkeys. The families Felide, Canide, Mustelidee, and Urside are represented ; but the Hyzenidee and Viverridse are absent, unless Bassaris of Mexico be referred to the latter family. The Felide comprise two groups, one formed of species which are uniformly coloured, the other of those which are striped or spotted. /elis onca, the jaguar, is the largest feline animal of this region, and ranges from La Plata to Louisiana, and on both sides of the Peruvian Andes. The puma or J£ concolor is known everywhere from Patagonia to as far as 50° or 60° N., a range from north to south of about 110°, which is probably greater than that of any other mammal. '. payeros occurs on all the pampas of the southern portion of South America. F. mitis and F. macrura belong to South-East Brazil ; £. tigrina and celidogaster to the Amazon basin ; while Ff' pardalis, F. eyra, and F. yagouaround: range from Brazil to Texas. The Canide family is represented by the genera Icticyon and Canis. The former comprises but one species, which is confined to Brazil, viz., J. venaticus, which is an aberrant form between dogs and badgers. The dogs com- prise C. jubatus, C. canerworus, C'. vetulus, C. fulvicaudus, C. azare, C. magellanicus, and one or two. other species. The Mustclide are not abundant, there being only a few species of each of the sub-families Musteline, Lutrine, and Meline ; and among others Mustela frenata; two species of Galictis, a genus only found in this region; Lutra chilensis and braziliensis; and scveral species of Mephitis belonging to the sub-genus Thiosmus. Of Urside there occur Ursus ornatus in Peru, and perhaps Ursus frugilegus ; Procyon cancrivorus, Nasua, and Cercoleptes. The last two genera are characteristic of South America. In this order the species, with the exception of a few which range into North America, are restricted to this area ; but only four of the eleven gencra are peculiar, the others ranging not only into North America, but also into the Old World. The latter genera do not form a prominent feature in the fauna, and the species have probably migrated from North America in comparatively

recent times from a geological point of view, In the order Artiodactyla the sub-order Ruminantia is represented by a few species only of Cervus, belonging to the neotropical sub-genera Furcifer, Coassus, and Blastocerus, and even these only occur sparingly in the open tracts. There is nothing to represent the enormous herds of Antelopes and Bovide, which are so characteristic of North Aimerica and portions of the Old World. Auchemia, how- ever, is a characteristic genus frequenting the Andes, and is interesting on account of its being the only genus of Ruminants which is confined to South America. It is isolated and far distant from the other members of the

family Camelidz, which are now special to Asia ; but, as"

we shall presently find, the gap in distribution and structure is supplied by the extinct species of North America. The

Elasmognathus Bairdii, which is considered as the type of a distinct sub-family. There are no true Proboscidcans in this region. Manatus, of which three or four species occur in the Amazon and other large rivers. distribution, since species belonging to it frequent the fresh-water streams of the opposite coast of Africa. species of dolphins and porpoises occur in the larger rivers ; some of them range up almost to their sources, and are strictly river species, being unknown in the adjoining seas. The presence of these cetaceans, together with the distance of the shores (several miles) and the high waves, impart to some portions of these rivers a more or less oceanic aspect. The order Bruta is abundantly represented in this region, of the fauna of which it constitutes the most marked peculiarity.

The order Sirenia is represented by the genus This genus is remarkable for its

Several

Marsupialism is not a prominent feature in this region, but

its presence is important, because it now occurs nowhere else

out of the Australian region. It should be observed that the connection is stronger with the extinct marsupial fauna of Palearctic regions than with the living one of Australia. The fossil and living mammalia of this region seem to indicate that at present our knowledge of the extinct faunas is very fragmentary. This is shown in various ways. None of the remains can be definitely assigned to an older period than the Post-Pliocene. The region was essentially the same as at present, zoologically, the same characteristic groups of platyrhine apes, rodents, cats, dogs, edentates, and opossums being represented ; while the catarhine apes, insectivora, oxen, rhinoceroses, and other groups were ex- cluded, or at any rate are not known to have existed in it, so that its isolation from the other zoological regions must have commenced before the Post-Pliocene period. The extra- ordinary development of large forms allied to the slothsand ant-eaters ; the restriction of the Toxodontia amongst the Post-Pliocene mammals, and of the subungulated Rodents among the living mammals to this region, —these and other facts would lead the paleontologist to believe that the area must have been inhabited by mammals during the periods which preceded the Post-Pliocene, as far back, perhaps, as the Miocene or Eocene. The Toxodontia include the forms of Pachyderms most ncarly allied to the Rodents, while the subungulated Rodents are those of the order which approach nearest to the Pachyderms. As both these groups occur here, and here only, we may reasonably expect to find genera partaking of the general features of both orders in beds of an earlier geological age in South America. The principal genera and species found fossil in this region are the following. In the Argentine Confederation we have—

Felis longifrons.

Maerauchenia pataehoniea. Canis protalopex.

Glyptodon spinieandus.

clavipes. avus. tubereulatus. Mephitis primeeva. pumilio. Ursus bonerensis. elavieaudatus. Myopotamus bonzrensis. clavatus. antiquus.

asper. Ctenomys bonerensis. elongatus. Lagostomus augustidens.

Maehairodus neogeus. | Cavia breviplicata.

ZOOLOGY. |

Megatherium americanum.

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Megalonyx meridionalis,

Mylodon giganteus. jeffersoni. gracilis, Equus curvidens. robustus. devillei. darwinii, Toxodon burmcisteri.

Scelidotherium leptocephalum. owenii.

cuvieri, Mastodon humboldtii,

Some of these also occur in Brazil, where species have also been found belonging to the genera Callithrix, Cebus, Protopithecus, Chlamydotherium, Ceelogenys, Colodon, Dasypus, Lquus neogeus, Equus principalis, Euryidon, Heterodon, Hoplophorus, Myrmecophaga, N esodon, Pachy- therium, and Xenurus. Remains of many of these genera have also been found on the banks of the Rio Negro in Uruguay, and those of some, such ag Mastodon, Equus, Auchenia, &c.,in Ecuador. As space forbids our dwelling upon the points of interest which these fossil forms present, we pass on to the lists of the extinct faunas of North America.

The oldest species yet found in North America belongs to Dromatherium, and was found in the Triassic beds of Virginia. Then nothing is known until we come to the Tertiary deposits which were formed in lakes along the base and in the midst of the Rocky Mountains and neighbouring ranges, and in the marine beds which lie nearer the pre- sent sea margin. The following lists are given by Dr Leidy,! who considers the oldest beds in N ebraska, which rest on the Cretaceous series, as of Miocene age. They contain Titanotherium

prouti, Lophiodons, and several other forms which would induce us to regard them as Eocene. However, we follow his lists. The Miocene species are—

Elotherium mortoni.

Since this list was published numerous have been discovered in Wyoming and other districts in the far west from what appear to be the older or Eocene group ; Amongst these the most remarkable is the large Dinoceras mirabilis, an animal which had three pairs of horns, and which was intermediate in character between the Proboscideans and the Perissodactyles. There are also

of beds.

*Carnivora. Artiodactyla. Canide. Suide. Amphicyon vetus. Elotherium ingens. gracilis, superbum. Hyenodontide. leidyanum, Hyenodon horridus. Percheerus probus. cruentus. Leptocherus spectabilis. crucians, Nanohyus percinus. Felide, Anthracotheride. Drepanodon (Machairodus) Hyopotamus americanus, primevus. Anoplotheride. (Machairodus) Titanotherium prouti. occidentalis. | Perissodactyla. Dinictis felina. Rhinocerotide, Ruminantia. Rhinoceros. Oreodontidie. Hyrocodon. Oreodon culbertsoni. Tapiride. gracilis. ophiodon. major. Solidungula. affinis. Anchitheriide. hybridus. Anchitherium bullatus. Anchippus. Merycochorus proprius Hypohippus. Leptauchenia major. Parahippus, decora. Anchippodus. nitida. Rodentia. Agriochceride. Leporidz. ‘ Agriocheerus antiquus. alzolagus haydeni. major. Castoride. latifrons. Palzocastor nebrascensis. Camelide, * Muride. Poebrotherium wilsoni. Eumys elegans. Protomeryx halli, Insectivora. Moschide. Erinacide. _Leptomeryx evansi. – Leptictis haydeni. eeeiyla Ictops dakotensis. wide,*

Omomys carteri.

ail abate 1 Journ. Acad. Nat. Sci. Philadelphia, vol. vii. 1869.

several generalised forms in the foregoing lists, which present a fauna with numerous remarkable features, which we can only briefly allude to. It is quite distinct in character from the present South American fauna, and yet, like it, it has a strong Asiatic facies ; at the same time it resembles in many points the older Tertiary fauna of Europe. The occurrence of rhinoceroses, camels, and musk-deer, is notice- able ; but its great feature is the abundance of oreodonts (which family is not known elsewhere) and of equine forms.

j The. Pliocene fauna consists of the following genera and species :—

Carnivora. Ruminantia. Canide. Antilopide. Canis sacvus. Cosoryx furcatus. temerarius. Artiodactyla. vafer. Suide. haydeni. Dicotyles. Felidae, Perissodactyla. Pseudzlurus intrepidus. Rhinocerotide Hlurodon ferox. Rhinoceros. tside., Proboscidex, Leptarctus primus. Mastodon. Ruminantia, Elephas. Oreodontide. Solidungula. Merychyus elegans, Equide. medius. Hipparion. major. Protohippus. Camelide. Merychippus, Procamelus robustus. Equus. occidentalis, Rodentia. gracilis. Castoridee. Homocamelus caninus. Castor. Megalomeryx niobrarensis. Hystricide. Hystrix.

Merycodus necatus. | Cervide. Cervus warreni. |

genera and species

The Post-Pliocene forms are—

Carnivora. Canidae.

Canis, Felide. Felis Urside.

Procyon lotor.

priscus.

Ursus americanus

amplidens.

Arctodon pristinus,

Mustelide. Galera macrodon, Ruminantia. Camelide. Camelops kansanus. Cervide.

Cervus virginianus. canadensis, tarandus. americanus,

Capride. Ovis manimillaris, Ovibos moschatus,

bombifrons. cavifrons, Bovide.

Bison amcricanus. latifrons. antiquus. priscus.

Artiodactyla. Suide.

Dicotyles nasutus. Platygonus compressus. Perissodactyla. Tapiride. Tapirus americanus. haysii.

Here it is observable that, while this fauna has a general resemblance to that of the preceding period, most of the Several existing genera make their appearance, as also a number of forms which appear to have migrated from South America, and after a temporary estab-

genera are distinct.

Picsrsodactyla. Proboscidex. Mastodon. Elephas. Solidungula. Equide. Hipparion venustum. Equus major. fraternus. pacificus. conversidens. tau. fossilis. Rodentia. Leporide. Lepus sylvatica. Sciuride, Arctomys monax, Sciurus, Castoride. Castor canadensis. Castoroides ohioensis. Cavide. Hydrocheerus esopi. Chinchillide. Amblyrhiza inundata Muride. Neotoma magister. Marsupialia, Didelphys virginiana, Edentata. Megatherium mirabile. Megalonyx jeffcrsoni. dissimilis, validus. Megalocinus rodens. Ereptodon priscus. Mylodon harlani.

N. Ame- rica: Mammalia,

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lishment to have disappeared. One remarkable feature is the abundance of horses, which is such that North America may be regarded as the land of horses during the Pliocene and Post-Pliocene period.

The existing mammals of North America must now be considered. We can only refer to a few of the more con- spicuous species here. South America has numerous families peculiar to itself, but North America has none which are not also represented in South America. There are numerous representatives of the Canide or dog family, such as the prairie, Mexican, and maned wolves, and several foxes, of which the Arctic, common American, cross, and silver foxes are of high commercial value on account of theirfurs. Amongst the cats are three or four species of lynx, which afford valuable furs. The beaver, though abundant in some places, is, like the bison, fast diminish- ing before the encroaching steps of the colonists. The grizzly, the black, and the polar bears are common in the more mountainous and colder regions of the continent, and are much hunted by the fur traders. Racoons and Vir- ginian opossums are prevalent in the south portion of the United States. The Rocky Mountain goat reigns supreme amidst the rocks in inaccessible fastnesses of the Rocky Mountain range; while the rein- deer, the elk, and the wapiti give a character to the mammalian fauna of the more level districts. Further details respecting the mammals of North America will be found under the names of the separate countries; and those who wish for still fuller information may consult the works of Lord, Small, Miiller, Harlan, and Allen on the mammals of various regions, Zhe

_ Quadrupeds of North America by Audubon and Bachman,

Birds.

Ophidia.

the articles by Gilpin in the publications of the Institute of Natural Science at Halifax, Adams' /ield and Forest Rambles, The North-West

Passage by Viscount Milton and Dr Cheadle, Morgan's work on the Beaver, and the nume- rous reports issued by exploration expeditions.

The birds of America are very numerous in almost every great family. The researches of Wilson, Charles Lucien Bonaparte, Audubon, Richardson, Dekay, Blakiston, Cassin, Gundlach, Lord Lawrence, Sclater, Salvin, and Baird, have beautifully ilustrated the ornithology of North America ; while those of Azara, Humboldt, Swainson, Waterton, Edmonstone, Darwin, Landbeck, Philippi, Cassin, &c., have thrown great light on that of South America. The North American specics of birds already described amount to nearly 700; the species of South America are over 2300 ; so that we may fairly estimate the ornithology of America to include upwards of 3000 species. The fossil remains deserve particular notice. It is very probable that the footprints on the older secondary rocks of North America are those of birds. A large number of remarkable genera found in the Cretaceous rocks have recently been described by Professor Marsh and others.

The serpents of America are very numerous, and in- clude amongst others, the following genera :—Tortrix, Calamaria, Coronella, Xenodon, MHeterodon, Lycodon, Coluber, Herpetodryas, Psammophis, Dendrophis, Dryophis, Dipsas, Tropidonotus, Homalopsis, Boa, Elaps, Trigono- cephalus, Crotalus. .

Of these the genera Heterodon and Crotalus or rattle- snake are entirely peculiar to America, and the latter are by far the most deadly of serpents. The reptilia of North America have been well described by Dekay and Hol- brooke.

The North American saurians belong to the genera Crocodile, Alligator, Anolis, Skink, Agama, Tropidolepis, Ophisaurus, Leptophis. Of the Ranide there are Rana, Bufo, and Hyla.

_ The North American and Asiatic regions form a zoological kingdom, according to Dr Strauch, which is characterised

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by the prevalence of Emydes and by the presence of Trionychides. In the North American region there are 44 species distributed over four sub-regions—viz., the north- west part, which lies west of the Rocky Mountains; the north-east part, which lies east of them; the south-east part and the south-west part, which embraces Central America. . South America and Australia together form another king- | dom, characterised by the prevalence of Chelydes, and the total absence of Trionychides. in the South American region.

The multitude of fishes in South America is extraordinary, and still more so is the marvellous variety of form which they exhibit. A large number of species have very circum- scribed ranges, so that not only does each river basin have a distinct fauna, but a number of distinct faunas occupy different portions of the same river, as is well exemplified in the Amazons, Tocantins, Rio Negro, and other rivers, where most of the fishes at stations a few hundred miles apart are for the most part specifically distinct. Professor Agassiz, in his scientific journey through Brazil, collected about 2000 species from the Amazon basin only. In fishes, as in other classes, there is a remarkable difference between the faunas of North and South America, and in this class also North America has much in common with Europe and North Asia. The sturgeons abound in North America, but are absent in South America, where the corre- sponding group is the Goniodonts; the Siluroids areabundant in both portions of the continent ; the perches are numerous throughout North America, but none occur in South America, where, however, they are represented by the Chromids, The Cyprinoids are abundant in North America, but absent in South America, where we have the allied group of Cyprinodonts. The Characines of South America represent the Salmonide of North America, each group being confined to its own portion of the continent. There are several other small families present in South America, such as the Erythrinoids, Gymnotines, and others.

In the meagre outline of American vegetation which it Botany, is possible to attempt here, we shall more or less strictly adhere to the

principle laid down by Schouw, viz., that in constituting a botanical region, at least one-half of the species and one-fourth of the genera should be peculiar to it. We shall therefore divide the horizontal range of the vast continent into zones, commencing with the Arctic, and proceeding towards the Antarctic Circle.

In the Arctic Region or Region of Saxtfragacece, as near to the Pole as man has yet penetrated, is found the red snow plant (Protococcus nivalis), penetrating the snow itself, sometimes to the depth of 12 feet, and covering for miles with its crimson tints the cliffs and ice-floes of the Polar Sea. Greenland is botanically distinguishable from Arctic America proper, inasmuch as it produces heath (Calluna vulgaris), which, it is somewhat remark- able, is nowhere to be found on the continent.

The most remarkable of the sub-arctic lichens is that known as TJ'ripe de Roche, which has often preserved the lives of famished " trappers," who, but for its sustenance, must have perished of hunger. The Saxifrages which dis- tinguish this region vary in species, and sometimes in genera, from those of Europe, but, generally speaking, there is a strong resemblance, which amounts almost to identity, as the Arctic shores are approached.

Emerging from the region of Sasxifragacew, we find ourselves in that of the Asters and Solidagos, extending to the parallel of 36° N. This region not only produces many species of aster and solidago, but also a great variety of oaks and firs, and numerous species of Vaccinium. Among the oaks of Canada and the United States are, the lime oak (Quercus virens), the laurel oak (Quercus laurifolia), the black oak (Quercus tinctoria), the white or iron oak

There are about 35 species

Fishes,

BOTANY. |

(Quercus coccinea). of their timber, can stand comparison with the British oak, though some of them are very valuable.

The western or Californian and Oregon districts of this Pole- moniacece abound ; also Eschscholtzia californica, species of Platystemon, Nemophila, Gilia, Collinsia, Clarkia, Bar- tonta, and Hutocha. Coniferze also exist in abundance, some great botanical interest, such as Abies

region are in many respects distinct in character.

of them possessing Douglasii, Pattoniana, nobilis, amabilis, grandis, lasiocarpa, Pinus Lambertiana, Sabiniana, derosa, monticola, californica, Fremontiana, Coulteri, flexilis, Thuja gigantea, Sesquoia gigantea, Juniperus dealbata and occidentalis, and Castanea chrysophylla. Pinus ponderosa predominates in the forests of Upper Oregon, and along with it occur Adtes Lalsamea, canadensis, Douglasti, nodilis, and alba. Vivid colours mark the basaltic region of Upper Oregon. Rhododendron macrophyllum is found in Vancouver Island. Barley, oats, rye, wheat, buckwheat, and maize, along with the common fruit-trees and culinary vegetables of the temperate regions, are cultivated.

The region of Magnolias lies between parallels 30° and 36°, embracing the southern portion of North America, Nearly seventy spccies are known to exist, Cycadacee, Anonacee, Sapindacee, Zingiberacee, Melastomacee, Cac- tace, and numerous other tropical forms, show themselves.

The forest trees display either broad shining foliage like the Liriodendron and disculus, or pinnated leaves like the Acacia and Robinia. They are, moreover, decked with magnificent blossoms. Rice, sugar-cane, and cotton are the special objects of culture in this region,

The region of Cactuses and Peppers includes Mexico, Guatemala, and South America to the Amazon (to an elevation of 5000 feet above the sea-level), as also Guiana, certain parts of Peru, and New Granada. The leaves of the plants of the isthmus of Panama are covered with

hair and tomentum, while greenish and yellow flowers predomi- nate. The included portion of South America produces Mauritia flexuosa, the Murichi or Ita Palm, and Victoria regia. 'The vegetable-ivory palm (Phytelephas macrocarpt) is a native of Columbia and Peru. Yams, plantains, chocolate, sugar, coffee, cocoa-nut, &e., are cultivated in this region.

The Mexican highlands, rising over 5500 feet above the sea-level, produce Pinus religiosa, Pinus apulcensis, Pinus Hartwegti, Pinus Montezume, and Laxodium distichum. European grains are cultivated with success.

The region of medicinal bark trees (Cinchonas) em- braces the Cordilleras between parallels 5° N. and 20° S., where the elevation ranges between 5000 and 9600 feet. In the lower parts of this region coffee, maize, and potato are cultivated.

The region of Calceolarias and Escallonias is, generally Speaking, coextensive with the preceding, but at an ele- vation greater than 9600.

The West Indian region is marked by the prevalence of ferns and orchids, and has a vegetation intermediate be- tween that of Mexico and the north of South America,

We next come to the region of Palms and Melastomas, which lies to the east of the Andes, between the Equator and the Tropic of Capricorn. Here the luxuriance of vegetable life is almost startling to European eyes. The forest trees of Brazil tower to an almost incredible height, while the very underwood is composed of Palms, Melasto- mace, Myrtacee, Crotons, and Tree Ferns. In the tree- less belts are found Heliconias, Dorstenias, and tall grasses.

mmense Composite, Vernonias, arborescent Solanums,

and species of Fuchsia, Solandra, Lasiandra, Laurus, Ficus, .

and Cassia abound. The trees are covered, stem aud branch,

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(Quercus alba and Quercus obtustloba), and the scarlet oak None of these, in regard to the quality

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with Ferns, Aracez, Tillandrias, Orchids, Cactuses, Pepero- mias, Gesneras, and innumerable other epiphytic plants.

The region of arborescent Composite, extending from the Tropic of Capricorn to lat. 40° S., embraces Southern Brazil, La Plata, and Chili. The distinctive features of the Upper Cordilleras reappear here; Calceolarias and Escal- lonias abound. Thuja tetragona, Podocarpus chiliana, Thuja chilensis, and Chili pine (Araucaria imbricata), are native to this region, the last-named being a hardy conifer, extend- ing along the Chilian Andes from 37° to 40° §. In the neighbourhood of Rio Janeiro is found Araucaria brazt- liana. Wheat, vine, peach, and many European plants are cultivated to great perfection in this region,

The Antarctic region comprehends the Strait of Magal- haens, Tierra del Fuego, and the Falkland Islands, Many European, and more especially British, genera appear in this region, and species of Saxifraga, Gentiana, Arbutus, Primula, and other Arctic and North Temperate forms are common. In Fuegia the evergreen beech (Fagus Forstert), the deciduous beech (Fagus antartica), and Drymis Win- tert, correspond to the birch, oak, and mountain ash of Scotland. The Fuchsia is a native of Fuegia. Among shrubs may be mentioned Chiliotricwm amelloides, Veronica elliptica and decussata, Limpetrum rubrum, and Pernettya empetrifolia; among ferns, Lomaria alpina and Magel- lanica; and among lichens, Usnea melaxantha.

Northern America, though its vast forests have now Chief in- been exposed for centuries to the axe of civilised man, ig digenous still one of the best wooded regions of the world. Among ee the principal forest- trees are the pine, oak, ash, hickory, can con. red-beech, Canadian

poplar, chestnut, black walnut, maple, tinent. tulip-tree, and white cedar.

Central Amcrica produces extensively mahogany, pimento, sarsaparilla, vanilla, Peruvian balsam, and many other valuable woods and drugs.

Nearly two-thirds of the surface of South America are still covered with gigantic forests, which must ultimately disappear, like many of those in the north, before the combined efforts and necessities of commerce and agri- culture. The most distinctive and valuable forest-trees of South America are the greenheart and the mora. The cow-tree, which yields a juice very like milk in its pro- perties, is also a remarkable product of this region.

Maize is by far the most important farinaceous product of the New World. It was the only grain which the earliest European settlers found cultivated, to some extent, by the natives. For nutrition it is inferior to wheat, but it is much more prolific, and is suited to a greater variety of soils. Tobacco is also indigenous to America, whence its use has extended over the whole world. Among roots, the potato, which we also owe to America, is without a rival. Millet, tapioca, arrow-root, cocoa, copaiva, cinchona, jalap, sassafras, nux-vomica, the cochineal plant, the agave or American aloe, and the pine-apple are also indigenous to the continent.

It is impossible here to do more than touch on the vast subject of the botany and the indigenous vegetable pro- ducts of the New World. For fuller information, in addi- tion to that contained in articles in the present work that treat of the geographical distribution of plants, the reader is referred to the numerous valuable American works of such authors as Beck, Bigelow, Breckenridge, Brown, Carson (Medical Botany), Darby, Darlington (Agricultural Botany), Asa Gray, Harvey (Alge), Ravenel, Sprague, Strong, Torrey, &c. An extended description of the forest trees of North America will be found in the great work of Michaux and Nuttall, The North American Sylva.

The origin, history, languages, and condition of the Ethnology. American nations present ample materials for speculation ; but before touching on these subjects, the question presents

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itself, What is the total of the indigenous population ? Humboldt, in 1823, estimated the number of Indians at 8,610,000, Bollaert estimated the number existing in 18638 as follows :-—

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It is probable that these numbers have been diminished : the latest official returns for the United States’ territories, in 1872, estimate the Indian population at 300,000.

The indigenous population of America presents man undcr many aspects, and society in various stages, from the regular but limited civilisation of Mexico and Peru, to savage life in its most brutal state of abasement. At one extremity of the country we find the pigmy Esquimaux of four feet and a half in height, and at the other the Patagonian standing above six feet. In complexion the variety is great, and

may be said to embrace almost every hue known elsewhere on the face of the earth, except the pitchy black of the Negro, About one-half of all the known languages belong to America; and if we consider every little wander- ing horde a distinct community, we have a greater number of nations here than in all the rest of the world. Amidst all this diversity philosophers have thought they were able to discover certain gencral characters, sufficiently marked to distinguish the American nations from those of the old continent. It is foreign to our purpose to inquire whether the varieties of form, stature, and complexion, in the human species, are modifications produced by external causes operating differently on distinct portions of the progeny of one primitive pair, or whether several races were originally created, and have given birth, by their mixture, to the amazing varieties we witness. We assume the former opinion as true, because the probabilities seem to be in its favour ; but the phenomena present themselves to us in the same light in whichever way they originated.

Physiologists are not at one in their accounts of the characteristics of the aborigines of the new world, nor are agrecd as to whether they should be considered one race or several. Blumenbach places them all under one class, except the Esquimaux. Bory St Vincent divides them into four races, or five if we include the Esqui- maux, under the following designations:—1l. The Colom- bian, which comprehends the tribes formerly inhabiting the Alleghany Mountains, Canada, Florida, the eastern coasts of Mexico, and Central America; and the Caribs, who occupied the West India Islands and Guiana. 2. The American, embracing the tribes which occupy all the other parts of South America east of the Andes, except Pata- gonia. 3. The Patagonian race, inhabiting the southern extremity of the continent. 4. The Neptunian, inhabiting the western coasts of both divisions of the continent, from California to Cape Horn, and which he considers as essen- tially the same with the race spread over the Malay Penin- sulaand the Indian Archipelago. With this race are classed the Mexicans and Peruvians. By another writer the species are reduced to two, the Colombian and the American; the former including all the North American tribes, with the Caribs, the Mexicans, and Peruvians, and other in- habitants of the Cordillera; and the latter the Brazilian

Indians and Patagonians, Neither of these systems, when tested by facts, is very satisfactory. Dr Prichard thinks that the mutual resemblance among the American nations has been exaggerated by some writers; yet it is certain

that there is more of a common family character in their organisation than in that of the indigenous population of Asia or Africa. "The Indians of New Spain," says Humboldt, "bear a general resemblance to those who in- habit Canada, Florida, Peru, and Brazil. We have the same swarthy and copper colour, straight and smooth hair, small beard, squat body, long eye, with the corner directed upwards towards the temples, prominent cheek-bones, thick lips, and expression of gentleness in the mouth, strongly contrasted with a gloomy and severe look. Over a million and a half of square leagues, from Cape Horn to the river St Lawrence and Behring's Straits, we are struck at the first glance with the general rescmblance in the features of the inhabitants. We think we perceive them all to be descended from the same stock, notwithstanding the pro- digious diversity of their languages. In the portrait drawn by Volney of the Canadian Indians, we recognise the tribes scattered over the savannahs of the Apure and the Carony. The same style of features exists in both Americas."

On the authority of Dr Morton, the most natural division of the Americans is into two families, the Zoltecan and the American; the former of which bears evidence of centuries of half-civilisation, while the latter embraces all the barbarous nations of the New World, with the exception of the Polar tribes, which are evidently of Mongolian origin. In each of these, however, there are several subordinate groups,

which may be distinguished as the Appalachian, the-

Brazilian, the Patagonian, and the Fuegian. The Appa- lachian branch includes all the nations of North America, except the Mexicans, together with the tribes of South America north of the river Amazon and east of the Andes. In this race the head is rounded, the nose large, salient, and aquiline ; the eyes dark brown, with little or no obliquity of position ; the mouth large and straight ; the teeth nearly vertical ; and the whole face triangular. The neck is long, the chest broad but rarely deep, the body and limbs mus- cular, and seldom disposed to fatness, In character these nations are warlike, cruel, and unforgiving ; they turn with aversion from the restraints of civilised life, and have made but little progress in mental culture or the useful arts. The Brazilian branch is spread over a great part of South Ame- rica, east of the Andes, including the whole of Brazil and Paraguay, between the river Amazon and 30° §. latitude. Their physical characteristics differ but little from those of the Appalachian branch ; they possess, perhaps, a larger and more expanded nose, with larger mouths and lips. The eyes are small, more or less oblique, and far asunder; the neck short and thick; the body and limbs stout and full, even to clumsiness. In character, also, they differ litle. None of the Americans are less susceptible of cultivation; and what they are taught by compulsion seldom exceeds the humblest elements of knowledge. The Patagonian branch includes the nations to the south of the Plata, as far as the Strait of Magalhaens, including also the mountain tribes of Chili. They are chiefly distinguished by their tall stature, handsome forms, and indomitable courage. The Fuegians, who call themselves Yacannacunnee, rove over the sterile wastes of Tierra del Fuego, which is computed to be half the size of Ireland, and yet their whole number has been computed as not exceeding 2000. The physical aspect of the Fuegians is altogether repulsive. They are of low stature, with large heads, broad faces, and small eyes. Their chests are large, their bodies clumsy, with large knees, and ill-shaped legs. Their hair is lank, black, and. coarse, and their complexion a decided brown, like that of the more northern tribes. Their expression of face is vacant, and their mental operations are to the last degree slow and stupid ; they are

almost destitute of the usual curiosity of savages, caring little for anything that does not minister to their present wants.

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| ETHNOLOGY. | AMERICA 687 | American The American race is distinguished by the form of the | of the skin so correctly designates the Americans as that of i: and skull, which, except in its greater length, resembles the | the brown race. There are, however, among them occa-

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Mongol type. The cheek-bones are prominent, but not so angular, as in the Mongol head ; the occiput is rather flat, the cavity for lodging the cerebellum small, the orbits large and deep. The nose is generally aquiline, but in some tribes flat, aud the nasal cavities are large. Compared with the head of the Negro, that of the American is broader, and the teeth are less prominent : when placed by the side of the Caucasian head, it is seen to be smaller in size, less rounded and symmetrical, and less developed in the part before the ear. The skull is generally thin and light. There are, however, many deviations from this typical form. The Carib skull and the Araucanian are large ; the Peru-vian small, and singularly flattened behind, so as to present a short line from the forehead to the occiput.

The colour of the Americans, though it includes a con- siderable diversity of shade, is more uniform than that of the inhabitants of Asia or Africa; and, what is more re- markable, its varieties do not bear any visible relation to the teniperature of the climate. A brownish yellow, or copper colour, as it has been called, pervades nearly all the nume-rous tribes from the Arctic Ocean to Cape Horn, but still with many different degrees of intensity. The eastern na- tions of Chili have but a

slight tinge of the brown colour, and the Boroanes are still whiter. On the north-west coast, from latitude 43° to 60°, there are tribes who, though embrowned with soot and mud, were found, when their skins were washed, to have the brilliant white and red which is the characteristic of the Caucasian race. But within the tropics, the Malapoques in Brazil, the Guaranis in Paraguay, the Guiacas of Guiana, the Scheries of La Plata, have tolerably fair complexions, sometimes united with blue eyes and auburn hair; and, in the hot country watered by the Orinoco, Humboldt found tribes of a dark, and others of a light hue, living almost in juxtaposition. It is remarkable, too, that the nations whose colour approaches nearest to black are found in the tempe- rate zone, namely, the Charruas of the Banda Oriental, in latitude 33° §., and the Cochimies, Pericus, and Guay-curus, spread over the peninsula of California. These people have skins of a very deep hue, but are not absolutely black ; and they have neither the woolly hair of the Negroes, nor their social and good-humoured disposition. The Charruas, especially, are distinguished by a high degree of that auste- rity and stern fortitude which are common to the American nations. The Caribs and some Brazilian tribes have the yellowish hue of the Chinese, and the same cast of features. Among the nations dwelling on the west side of the Alle- ghanies, and near the northern lakes, there is also a con- siderable variety of complexion ; but the brown or copper shade is found more or less in them all, It may be said, then, of the American nations, that, with the exception of two or three tribes on the north—west coast, who probably arrived from Asia at a later period than the others, the two extremes of complexion, the white of Northern Europe and the black of Ethiopia, are unknown amongst them ; and that, when compared with the Moors, Abyssinians, and other swarthy nations of the Old World, their colour inclines less to the yellow, and more to the reddish brown.

Long, black, lank hair is common to all the American tribes, among which no traces of the frizzled locks of the Polynesian,or the woolly texture of the African Negro have ever been observed. The beard is very deficient, and the little that nature gives them they assiduously root out. A copper-coloured skin has been also assumed by most

writers as a, characteristic distinction of the Americans ; but their real colour is in general brown, of the hue most nearly resem- bling that of

with Dr M'Culloch, that no epithet derivable from the colour

cinnamon ; and Dr Morton coincides in opinion |

sional and very remarkable deviations, including all the va- rieties of tint from a decided white to an unequivocally black skin. That climate has a very subordinate influence in producing these different hues must be inferred from the fact that the tribes which wander in the equinoctial regions are not darker than the mountaineers of the temperate zone. The Puelches, and other tribes of the Magellanic regions, beyond 55° S. latitude, are darker than the Abipones, Mocobies, and Tobas, who are many degrees nearer the equator ; and the Botocudos are of a clear brown colour, sometimes approaching nearly to white, at no great distance from the tropic ; while the Guiacas under the line are cha- racterised bya fair complexion ; the Charruas, who are almost black, live at the 30th degree of S. latitude ; and the still blacker Californians are 25° north of the equator. Every- where, indeed, it is found that the colour of the American depends very little on the local situation which he actually occupies ; and never, in the same individual, are those parts of the body which are constantly covered of a fairer colour than those which are exposed to a hot and moist atmosphere. ' Children are never white when they are bor, as is the case among even the darkest of the Caucasian races ; and the Indian caciques, who enjoy a considerable degree of luxury, and keep themselves constantly dressed, have all parts of their body, except the palms of the hands and the soles of the feet, of the same brownish-red or copper colour. These differences of complexion are, however, extremely partial, forming mere exceptions to the general tint which charac- terises all the Americans, from Cape Horn to Canada. The cause of such anomalies is not easily ascertained ; that it is not climate is sufficiently obvious ; but whether or not it arises from partial immigrations from other countries re- mains yet to be decided.

The Americans of indigenous races might also be divided into three great classes distinguished by the pur- suits on which they depend for

subsistence, namely, hunt- ing, fishing, and agriculture. The greater number of them are devoted to hunting ; the fishing tribes are not numerous, and are wholly destitute of the spirit of maritime adven- ture, and even of fondness for the sea. A few tribes were strictly agricultural before the arrival of Europeans, but a much greater number have become so since. Many tribes regularly resort to all these modes of subsistence, according to the seasons ; employing the spring in fishing, the summer in agriculture, and the autumn and winter in hunting.

The intellectual faculties of this great family appear to be Intellectual decidedly inferior, when compared with those of the Cauca- faculties.

sian or Mongolian race. The Americans are not only averse to the restraints of education, but are for the most part in- capable of a continued process of reasoning on abstract sub- jects. Their minds seize with avidity on simple truths, but reject whatever requires investigation and analysis. Their proximity for more than two centuries to European in- stitutions has made scarcely any perceptible change in their mode of thinking or their manner of life; and, as to their own social condition, they are probably in most respects exactly as they were at the earliest period of their national existence. They have made few or no improvements in constructing their houses or their boats ; their inventive and imitative faculties appear to be of very humble capacity, nor have they the smallest taste for the arts and sciences, One of the most remarkable of their intellectual defects is the great difficulty they find in comprehending the relations of numbers ; and Mr Schoolcraft, the United States Indian agent, assured Dr Morton that this deficiency was one cause of most of the misunderstanding in respect to treaties en-

_ tered into between the United States Government and the

native tribes. The natives sell their land for a sum of money, without having any conception of the amount ; and it is only when the proceeds come to be divided that each man becomes acquainted with his own intcrest in the transaction. Then disappointment and murmurs invariably ensue.

Every unwritten tongue is subject to continual fluctuations, which will be numerous and rapid in proportion as the tribe using it is exposed to frequent vicissitudes of fortune, and the individuals composing it have little intercourse with one another. When the population of one of these societies in- creases, it splits into several branches ; and if these have little intercourse, the original language divides by degrees into as many dialects. These smaller societies subdivide in their turn with the same effects ; and, in such continual sub- divisions, the dialects of the extreme branches deviate farther and farther from one another, and from the parent tongue, till time, aided by migrations and wars, producing mixtures of different hordes, obliterates all distinct traces of a com- mon origm. The cause of these changes becomes more ob- vious when we reflect on the principles which give stability toalanguage. These are—l. The abundant use of writing ; 2. The teaching of a language as a branch of education ; 3. Frequency of intercourse among all the people speaking it; 4. The existence of an order of men, such as priests or lawyers, who employ it for professional purposes; 5. Stability of condition in the people, or exemption from vicissitudes and revolutions; 6. A large stock of popular poetry, which, if universally diffused, may almost become a substitute for writing. All these conditions were wanting (with some trifling exceptions) in the whole of the wan- dering tribes of America. The great multiplication of languages, therefore, proves two things—first, that the people are in a low state of savage life ; and, secondly, that they have becn for many ages in this condition ; for time is a necessary clement in the process of splitting human speech into so many varieties.

Among the seven or eight millions of American abori- gines, it is estimated that there are as many languages spoken as among the seven or eight hundred million inhabitants of the Old World. Just as there is

a marked physiological resemblance attaching to all the New World tribes, so judged by the evidence of language, the native American is swt generis, having no connection, except the most remote, with the rest of the human family. The few corresponding words in Old and New World lan- guages, which are not of an imitative character, bear the stamp of fortuitous coincidence rather than that of common origin. Vater, in his Linguarum Totvus Orbis Index, estimated the number of American aboriginal languages at about 500, and Balbi at 423, of which 211 belonged to North, 44 to Central, and 158 to South America. In the absence of certain data, it may be safe to set down the number of native American languages at about 450.

Throughout the whole of these runs a thread of con- nection. They are all characterised by polysynthesis, as Duponceau calls it, or holophrasm, to adopt the phraseology of Dr Lieber. Holophrasm is a process more or less com- mon to every language at a particular stage of its develop- ment. We have glimpses of it in most of the Turanian group of languages, and it appears, in a faint degree, in the Basque; but it belongs to a very large proportion of the languages of America, so extremely numerous, and many of which have nothing else in common. This diffusion of a peculiar and common character over materials so dissimilar has been plausibly accounted for by the supposition of a community of origin in the tribes, whether few or many, which peopled the continent. As no person has the full command of all the vocables in his native lan-

guage, individual terms must be coutinually dropping out of dialects preserved by oral communication; and new ones will be introduced as new wants and new objects solicit attention. But during the gradual change which thus takes place, the new words will be combined and modified according to the rules which belong to the genius of the spoken dialect with which they are incor- porated; and thus it may happen that the grammatical forms of an ancient language may live, while its materials perish, The changes of structure which present

them- selves in the history of European languages, it must be remembered, took place in progressive communities, Among nations like the American Indians, whose bar- barism, we may suppose, remained almost stationary, the forms of speech might be more permanent, though its sub- stance was in a state of slow but constant mutation. But even were this community of origin admitted, it cannot be looked on as entire and absolute among the American nations.

Analysis and generalisation are processes that distinguish the languages of reflective and civilised races. " Nothing," says Schoolcraft, "could apparently be further removed from the analytical class of languages than the various dialects spoken by the Indians of America, who invariably express their ideas of objects and actions precisely as they are pre- sented to their eyes and ears, %.e., in all their compound associations." To "encapsulate" words, as Dr Lieber expresses it, "is the striking feature of all these languages, and hence a word will consist sometimes of seven or eight syllables, each one conveying one individual idea, like a set of boxes each one contained in the other." This common feature of American languages is both psychologically and philologically of the greatest interest. Of all the groups of American languages, the various dialects of the Algonquin stock furnish the most inviting field for the philologist. It is from the Algonquin, therefore, that we draw the follow- ing examples of the process of syllabical agglutination :—

Thus, waub is the root of the verb ¢o see, and of the word

light. Waubun is the east or sunlight, and inferentially place of light. Aub is the eye-ball; hence, arauh=to see, to eye. Waub itself appears to be a compound of aub

and the letter w, which is the sign of the third person. Waubuno is a member of a society of men who continue their orgies till daylight. The simplest concrete forms of the verb to see are as follow :-—

Ne waub =I see.

Ke waub = Thou seest.

O waub =He or she sees.

But all this is vague to the Indian mind until the verb is made transitive, and the class of objects acted on is thereby shown. 'The Indian order of thought, moreover, requires that the object should generally precede the verb, ¢.g—

Inine ne wau bum au=man, I see him. ne ne wau bun daun =house, I see it.

Such examples show the tendency of these languages to accretion. The verb is made to include within itself, as it were, the noun, pronoun, and adjective. " Declen- sion, cases, articles, are deficient," says Bancroft, " but everything is conjugated. The adjective assumes a verbal termination, and is conjugated as a verb; the idea expressed by a noun is clothed in verbal forms, and at once does the office of a verb….. Then, since the Indian verb includes within itsclf the agent and the object, it may pass through as many transitions as the persons and numbers of the pronouns will admit of dif- ferent combinations ; and each of these combinations may be used positively or negatively, with a reflex or a causa- tive signification. In this manner changes are so multi- plied, that the number of possible forms of a Chippewa

verb is said to amouut to five or six thousand 3 in other words, the number of possible variations is indefinite." The formidable array of syllables arises partly from the fact, that there are some sixteen modes of forming the plural of nouns represented in the verb by sixteen corre- sponding modifications. Nouns are divided, as in the Dravidian languages of South India, into animate and inanimate.

The best account of those peculiarities, as well as the best general distribution of the American languages, are given by Professor Whitney of Yale College, in his work on Language and the Study of Language, pp. 346-351 :—

“The conditions of the linguistic problem presented by the American languages are exceedingly perplexing, for the same reason as those presented by the Polynesian and Afriean dialects, and in a yet higher degree. the different tongues is wonderful. Dialectic division is carried to its extreme among them; the isolating and diversifying tendencies have had full course, with little counteraction from the conserving and assimilating forces. The contincnt seems ever to have been peopled by a congeries of petty tribes, incessantly at warfare, or standing off from one another in jealous and suspicious seclusion.

Certain striking exceptions, it is true, are present to the mind of

every one. Mexico, Central America, and Peru, at the time of the Spanish discovery and conquest, were the seat of empires possessing an organised system of government, with national creeds and institutions, with modes of writing and styles of architecture, and other appliances of a considerably developed culture, of indigenous origin. Sueh relics, too, as the great mounds which are scattered so widely through our western country, and the ancient workings upon the veins and ledges of native copper along the southern shore of Lake Superior, show that other large portions of the northern continent had not always been in the same savage condition as that in which our ancestors fouud them. Yet these were exceptions only, not changing the general rule; and there is reason to belicve that, as the civilisation of the Mississippi valley had been extinguished by the incursion and conquest of more barbarous tribes, so a similar fate was threatening that of the southern peoples: that, in fact, American culture was on its way to destruction even without European inter- ference, as European culture for a time had seemed to be during the Dark Ages which attended the downfall of the Roman empire. If the differentiation of Ameriean gen had been thus un- ehecked by the influence of eulture, it has been also favoured by the influence of the variety of climate and mode of life. While the other great families occupy, for the most part, one region or one zone, the Ameriean tribes have been exposed to all the difference of circumstances which can find place between the Arctic and the Antarctic oceans, amid ice-fields, mountains, valleys, on dry table- lands, and in reeking river-basins, along shores of every

clime. Moreover, these languages have shown themselves to possess a peculiar mobility an changeableness of material. There are groups of kindred tribes whose separation is known to be of not very long standing, but in whose speech the correspondences are almost over-whelmed and hidden from sight by the discordances which have sprung up. In more than one tongue it has been remarked that books of instruetion prepared by missionaries have become anti- quated and almost unintelligible in three or four generations. Add to all this, that our knowledge of the family begins in the most recent period, less than four hundred years ago; that, though it has been since penetrated and pressed on every side by cultivated nations, the efforts made to collect and preserve information respect- ing it have been only spasmodic and fragmentary; that it is almost wholly destitute of literature, and even of traditions of any authority and value; and that great numbers of its constituent members have perished, in the wasting away of the tribes by mutual warfare, by pestilence and famine, and by the eneroach-ments of more powerful races—and it will be clearly seen that the comprehensive comparative study of American languages is beset with very great difficulties.

"Yet it is the confident opinion of linguistic scholars that a fun-damental unity lies at the base of all these infinitely varying forms of speech ; that they may be, and probably are, all descended from a single parent language. For, whatever their differences of material, there is a single type or plan upon whieh their forms are developed and their constructious made, from the Arctic Ocean to Cape Horn, and one sufficiently peculiar and distinctive to con- stitute a genuine indication of relationship. . This type is called the Incorporative or polysynthetic. It tends to the excessive and abnormal agglomeration of distinct significant elements in its words; whereby, on the one hand, cumbrous compounds are formed as the names of objeets, and a eharacter of tedious and time-wasting poly- syllabism is given to the language—see, for example, the three to ten-syllabled numeral and pronominal words of our western Indian

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tongues; or the Mexican name for 'goat,' Lwa-kwauh tentsone, literally 'head-tree (horn) – lip – hair (beard),' or 'the horned and bearded one'—and, on the other hand, and what is of yet more importance, an unwieldy aggregation, verbal or guast-verbal, is substituted for the phrase or sentence, with its distinct and balanced members. Thus, the Mexican says, ' I-flesh-eat,' as a single word, compounded of three elements; or if, for emphasis, the object is left to stand separate, it is at least first represented by a pronoun in the verbal compound ; as, 'I-it-eat, the flesh ; or, '1-it-him-give, the bread, my son,' for 'I give my son the bread.'

"The incorporative type is not wholly peculiar to the languages of our continent. A trace of it (in the insertion, among the verbal forms, of an objective as well as a subjective pronominal ending) is found cven in one of the Ugrian dialects of the Scythian family, the Hungarian; and the Basque, of which we shall presently speak more particularly, exhibits it in a very notable measure. It is found, too, in considerably varying degree and style of development in the different branches of the American family. But its general effect is still such that the linguist is able to claim that the lan- guages to which it belongs are, in virtue of their structure, akin with one another, and distinguished from all other known tongues. _ "Not only do the subjective and objective pronouns thus enter into the substance of the verb, but also a great variety of inodifiers of the verbal action, adverbs, in the form of particles and frag- ments of words; thus, almost everything which helps to make ex- pression forms a part of verbal conjugation, and the verbal paradigm becomes well-nigh interminable. "An extreme instance of excessive synthesis is afforded in the Chcrokee word-phrase wi-ni-taw-ti-ge-gt- na-li-skaw-lung-ta-naw-ne-li-ti-se-stt, 'they will by that time have nearly finished granting [favours] from a distanee to thee and me.'

"Other common traits, which help to strengthen our. conclusion that these languages are ultimately related, are not wanting. Sueh are, for

example, the habit of combining words by fragments, by one or two representative syllables; the direct conversion of nouns, substantive and adjective, into verbs, and their conjugation as such 2 pobnllorities of generic distinction—many languages dividing animate rom inanimate beings (somewhat as we do by the use of who and what), with arbitrary and fanciful details of classification, like those exhibited by the Indo-European languages in their separation of masculine and feminine; the possession of a very peculiar scheme for denoting the degrecs of family relationship ; and so on.

"' As regards their material constitution, their assignment of cer- tain sounds to represent certain ideas, our Indian dialects show, as already remarked, a very great discordance. It has been claimed that there are not less than a hundred languages or groups upon the continent, between whose words are discoverable no correspondences which might not be sufficiently explained as the result of accident, Doubtless a more thorough and sharpsighted investigation, a more penetrating linguistic analysis and comparison—though, under exist- ing circumstances, any even distant approximation to the actual beginning may be hopeless—-would considerably reduce this number 5 yet there might still remain as many unconnected groups as are to be found in all Kurope and Asia. It is needless to undertake here an enumeration of the divisions of Indian speech: we will but notice a few of the most important groups occupying our own portion of the continent.

"In the extreme north, along the whole shore of the Arctie Ocean, are the Eskimo dialects, with which is nearly allied the Greenlandish. Below them is spread out, on the west, the great Athapaskan group. On the east, and as far south as the line of Tennessee and North Carolina, stretches the immense region occupied by the numerous dialects of the Algonquin or Delaware stock; within it, however, is enclosed the distinct branch of Iroquois languages. Our south- eastern states were in possession of the Florida group, comprising the Creek, Choctaw, and Cherokec. The great nation of the Sioux or Dakotas gives its name to the branch which occupied the Mis- souri valley and parts of the lower Mississippi. Another wide- spread sub-family, including the Shoshonee and Comanche, ranged from the shores of Texas north-

westward to the borders of California and the territory of the Athapaskas; and the Paeifie coast was occupied by a medley of tribes. Mexico and Central America, finally, were the home of a great variety of tongues, that of the cultivated Aztecs, with its kindred, having the widest range.”

For further information regarding the aboriginal lan- guages of America, the reader is referred to the researches of Balbi, Gallatin, Vater, and Schoolcraft; to Lewis H. Morgan’s Tables, with accompanying text and forms, vol. xvil. of the Smithsonian Contributions to Knowledge (1871), entitled “ Systems of Consanguinity and Affinity of the Human Family,” and to an invaluable work, The Literature of American Aboriginal Languages, by Dr Ludewig, edited by Nicolas Triibner, 1858.

Though any attempt to reduce the American popula- tion under a few general classes, either on physical or

ethnographical grounds, would be idle, we may notice one or two of the most remarkable nations or families.

All the northern coast of the continent is tenanted by the Esquimaux,a dwarfish race, rarely exceeding five feet in height. Their territories commence near Mackenzie’s River, in 68° N. lat., and extend to the Arctic Ocean. They occupy all the northern Archipelago, the shores of Hud- son’s and Baftin’s Bays, of Labrador, and of Russian Ame- rica round by Behring’s Straits, to the peninsula of Al- aska. They live entirely by fishing, the whale and the seal being their most common food ; they inhabit skin tents during their short summer, and in winter caves or houses built with snow in the shape of domes, within which a

single rude lamp is kept perpetually burning. They are crafty and dirty, but appeared to Captain Franklin more intelligent and provident than the northern Indians. There is a wide diversity in their dialects, which still display decided marks of identity in their roots.

The north-west coast of Alaska, from Cook's Inlet to the 48th parallel, is inhabited by four tribes, of whom the Kaluschi are the most remarkable. These people are distinguished from all the native races of America by having as fair a complexion when their skins are washed as the inhabitants of Europe; and this distinction, accom- panied sometimes with auburn hair, has been considered as indicating an origin different from that of the copper- coloured tribes who people all the rest of the continent.

The Indians of the east coast belong almost entirely to three stems; and, before the arrival of the English colo- nists, occupied both sides of the Alleghany Mountains, from the Gulf of Mexico to Canada and New Brunswick. 1. The Delaware or Algonquin Indians, comprehending the Ottogamies, Shawnees, Narragansets, Chippeways, Knisteneaux, Delawares, and other nations, to the number of thirty or forty, were spread over the space between the Mississippi and the Atlantic, as far north as Hudson's Bay, and all spoke dialects of one language. 2. The Iroquois, often called the " Five Nations," and the 'Six Nations," but comprehending 15 tribes or more, among whom were the Mohawks, Oneidas, Hurons, and Senecas, all spoke dialects of one language. They lived on the south side of the great lakes, and finally obtained a complete ascend- ency over the Algonquin race, 3. The Florida Indians, including the Creeks, Seminoles, Choctaws, Chickasaws, Natches, and Mobiles. 'Tribes belonging to these three families (with the Wocons and Catawbas) occupied nearly all the region east of the Mississippi, from the Gulf of Mexico to Hudson's Bay, comprising more than a million of square miles. The Catawbas alone, however, are said to have included 20 tribes, and nearly as many dialects. The Powhattans were a confederacy of 33 tribes, comprehend- ing 10,000 persons. It is probable that when the English settlers landed in the country, the region mentioned was inhabited by a quarter of a million of Indians,

divided into many tribes, and speaking dialects belonging to half a dozen radically distinct languages.

These nations have the virtues of savage life—a high sense of honour, according to their perceptions of duty, mutual fidelity among individuals, a fortitude that mocks at the most crucl torments, and a devotion to their tribe which makes self-immolation in its defence easy. On the other hand, they treat their wives cruelly, and their children with indifference. The apathy under the good and ill of life which the Stoic affected, is the grand element of the Indian's character. Gloomy, stern, and severe, he is a stranger to mirth and laughter. All outward expression of pleasure or pain he regards as a weakness; and the only feeling to which he ever yields is the boisterous joy which he manifests in the moment of victory, or under the excitement of intoxication. He is capable of great

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sidered as adding to a man's consequence.

excrtions in war or the chase, but has an unconquerable aversion to regular labour. He is extremely improvident; eats enormously while he has abundance of food, without thinking of the famine which may follow; and, when liquors are supplied to him, will continue drunk for days,

Most of the Indians of North America believe in the existence of a supreme being, whom thcy call the Great Spirit; and of a subordinate one, whose nature is evil and hostile to man. To the latter their worship is principally addressed ; the Good Spirit, in their opinion, needing no prayers to induce him to aid and protect his creatures. They generally believe in a future state, in which the souls of brave warriors and chaste wives enjoy a tranquil and happy existence with their ancestors and friends, spending their time in those exercises in which they delighted when on the earth. The Dakotas believe that the road to these "villages of the dead" leads over a rock with an edge as sharp as a knife, on which only the good are able to keep their footing. The

wicked fall off, and descend to the region of the Evil Spirit, where they are hard worked, and often flogged by their relentless master.

Polygamy is allowed; and a number of wives is con. Marriage cus- toms differ in different tribes, but in every case the pre- senting of gifts to the father of the intended wife is an essential feature of the transaction, and shows that the wife is considered as procured by purchase. Deformed children, and lame or decrepit old persons, are destroyed sometimes ; but the practice is uncommon. Incest and unnatural vices are practised in some tribes, but they are always viewed as matters of reproach. The Indian fune- rals are conducted with much decorum, The deceased is dressed in his best clothes, and laid in a grave, in a verti- cal, horizontal, or inclined position, according to his own previous directions, with his moccasins, knife, money, and silver ornaments beside him, and a small quantity of food near his head. It is usual to mark the graves with a post, on which figures are carved expressive of the nature of the pursuits and achievements of the deceased.

Some nations of Indians wear-little or no clothing ; but

Customs,

Clothes,

the general dress of the men in the temperate and cold houses,an

parts of the country, previous to the arrival of the Euro- peans, consisted of three articles: a cloak of buffalo-skin hanging from the shoulders, a piece of skin used as an apron, and a pair of moccasins or loose boots, made of un- dressed skin also. The women wore a long robe of the same material, which was fastened round the waist; but among the tribes living near the whites, coarse woollens are now frequently substituted for the hides of wild ani- mals, except for the

moccasins. The habitations of the Indians are huts or cabins, generally of a circular form and small size, but sometimes of 30 or 40 feet in diameter, formed by stakes fixed in the ground, and covered with the bark of trees. Sometimes the spaces between the stakes are filled up with twigs, grass, and mud, and the roof is covered nearly in the same way. A hole in the top serves for the escape of the smoke, and the skins of wild beasts form the beds and seats. When they go to a distance to' hunt, they erect for temporary use large tents, which are covered with skins. On the west side of the Mississippi, whcre the ground is open, many of the tribes make use of horses, which are seldom em- ployed amidst the woods covering the territories east of that river. The custom of painting their bodies is nearly universal, They introduce the colours by making punctures on their skin; and the extent of surface which this ornament covers is proportioned to the exploits they have performed. Some paint only their arms, others both their arms and legs, others again their thighs; while those who have attained the summit of warlike

ornaments,

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renown have their bodies painted from the waist upwards, This is the heraldry of the Indians, the devices.of which are probably more exactly adjusted to the merits of the persons who bear them than those of more civilised coun- tries. Besides these ornaments, the warriors also carry plumes of feathers on their heads, their arms, or ancles. Their arms were the tomahawk, the war-club, knife, the bow and arrow, but now they have muskets,

Each tribe is governed by a chicf and council, who are elective ; but in matters of importance the whole warriors are consulted ; and Mr Keating informs us that questions are not decided by the votes of a majority, but the reso- Intion adopted must have the consent of every individual warrior. Thcir assemblies are conducted with much for- mality and decorum. The eldest chief commences the debate, which is

often carried on by set speeches, abound- ing in bold figures aud metaphors, and bursts of a rude but impassioned eloquence. The young are permitted to be present and to express their approbation by crics, but not to speak. In their wars the object commonly is, to secure the right of hunting within particular limits, to maintam the liberty of passing through their accustomed tracts, and to guard from infringement those lands which they consider as their own tenure. War is declared by sending a slave with a hatchet, the handle of which js painted red, to the nation they intend to break with. They generally take the field in small numbers. Each warrior, besides his weapons, carries a mat, and supports himself till he is near the enemy by killing game. From the time they enter the enemy's country, no game is killed, no fires lighted, or shouting heard, and their vigi- lance and caution are extreme. They are not even per- mitted to speak, but must communicate by signs and motions. Having discovered the objects of their hostility, they first reconnoitre them, then hold a council ; and they generally make their attack just before daybreak, that they may surprise their enemies while asleep. They will lic the whole night flat on their faces without stirring, and, at the fit moment for action, will creep on their hands and feet till they have got within a bow-shot of those they have doomed to destruction. On a signal given by the chief warrior, which is answered by the yells of the whole party, they start up, and, after discharging their arrows, they rush upon their adversaries, without giving them time to recover from their confusion, with their war-clubs and tomahawks. If they succeed, the scene of horror which follows baffles description. The savage fury of the conquerors, the desperation of the conquered, the horrid yells of both, and their grim figures besmeared with paint and blood, form an assemblage of objects worthy of pandemonium. When the victory is secured, they select a certain number of their prisoners to carry home: they kill the rest in cold blood, take their scalps, and then march off with the spoil. The prisoners des- tined to death are soon led to the place of execution, where they are stripped, have their bodies blackened, and are bound to a stake. In this situation, while the burn- ing faggots embrace his limbs, and the knives of his revengeful enemies are inflicting a thousand tortures, it is common for the warrior to recount his exploits, boast of the cruelties he has committed

upon his enemies, and to irritate and insult his tormenters in every way. Some- times it happens that this has the effect of provoking onc of the spectators to dispatch him with a club or toma- hawk. Sometimes the male adult prisoners are given as slaves to women who have lost their husbands in the war, aud by whom they are often married. The women taken are distributed among the warriors ; the boys and girls are considered as slaves.

Nearly all the Indian tribes raise maize, beans, and

pumpkins, by the labour of their women, but only to a small extent, and as a resource against famine, their chief reliance being upon the chase. The buffaloes which wander over the prairies of the west, in herds of tens of thousands, are their great support ; but deer, bears, and in time of need otters, beavers, foxes, squirrels, and cven reptiles, are devoured.

The Toltecan family embraced the civilised nations of Toltecan Mexico, Peru, aud Bogota, extending from the Rio Gila in ae 5 33° N. latitude along the western shore of the conti- ite = nent to the frontiers of Chili ; and on the eastern coast, along the Gulf of Mexico, in North America, In South America, on the contrary, this family chiefly occupied a narrow strip of land between the Andes and the Pacific Ocean, bounded on the south by the great desert of Atacama. Farther north, however, in New Granada, were the Bogotese, a people whose civilisation, like their geographical position, was intermediate between that of the Peruvians and the Mexi- cans. But, even before the Spanish conquest, the Toltecan family were not the exclusive possessors of the regions which we have assigned to them; they were only the dominant race or caste, while other tribes of the American race,always constituted a large mass of the population. The arrival of the Spaniards reduced both classcs alike to vassalage ; aud three centuries of slavery and oppression have left few traces of Mexican and Peruvian civilisation, except what may be gleaned from their history

and autiquities. These nations can no longer be identified in existing communities ; and the mixed and motley races which now respectively bear the name, are as unlike their predecessors in moral and intellectual character, as the degraded Copts are unlike the ancient Egyptians. It is in the intellectual faculties that the great difference between the Toltecan and the American families consists. In the arts and sciences of the former we see the evidences of an advanced civilisation ; their architectural remains everywhere surprise the traveller and confound the antiquary. Among these are pyramids, temples, grottoes, bas-reliefs, and arabesques ; while their roads, aqueducts, and fortifications, and the traces of their mining operations, sufficiently attest their attainments in the practical arts of life.

*The origin of the populations of America is a problem Origin of which has yet to be solved. It is known that in Europe American man was in existence at a very remote period ; and there peer are facts which lend some support to the view that man : has also been a denizen of America for ages. Thus there have been found portions of the human skeleton and fragments of human handiwork, associated with the bones of mammals which now have no existence, under circumstances which imply great antiquity. In most instances, however, it is not certain that such relics are of the age of the deposit in which they have been found. Human skeletons and bones in a fossilised state, or associated with bones of extinct mammals, have been found at Guadaloupe, in Missouri, near Natchez, at New Orleans, in the coral reef of Florida, near Charleston, in California, in Orchilla, at Petit Anse, and in Kansas, Some of these are referred to a very distant period. Thus the conglomerate in which the remains occur in the Florida reef is estimated by Agassiz to be 10,000 years old; but, what is still more amazing, ° the skeleton found by Dr Dowler beneath four buried Antiquity forests in the delta near New Orleans, is said to be 50,000 of man in years old, and the remains from California were found in a A™*ica. deposit beneath Table Mountain, which deposit was formed in an old river of the Post-Pliocene, or Pliocene period, Atany rate, when this deposit was formed there was a river vallcy here, down which an overflow of volcanic matter was poured. Since that time denudation has been so great, and the volcanic matter so hard,*

that the sides of the valley have been swept away, leaving the valley bottom with its pro-

tecting cover standing up far above the level of the neigh- bouring country. Articles made by man also occur under conditions indicating great antiquity. Thus along the coast of Ecuador there are volcanic deposits which belong to the period of voleanic activity preceding the present, which may probably be referred to the Post-Pliocene period. This matter is arranged in terraces, and in one of these terraces, now 24 miles from the coast and 150 feet above the sea, Mr Wilson has found beneath the vegetable mould, beds of clay with sand and gravel which contain fragments of pot- tery. These beds, it is believed, were deposited beneath the sea, implying an elevation of 150 feet since their forma- tion. On the coast there is a pottery-containing stratum, which has been followed for 80 miles, and patches of a similar bed occur over a further distance of 200 miles. These facts, taken in conjunction with what we learn from the traditions and histories of numerous nations, as also the characters of the present natives, render it highly probable that man existed in America long before the origin or arrival of the civilised communities to which allusion will be pre- sently made. The histories of these communities generally agree that civilisation was introduced by persons who first appeared as strangers amidst the people already in possession of the country. Hence the question has a twofold aspect, viz., the origin of the earliest uncivilised as well as that of the earliest civilised tribes. It is possible, as the traditions suggest, that people have arrived from various quarters and at various times. As yet we have little positive evidence to rely upon, and caution is required in drawing conclusions from resemblauces in customs or religion. For instance, to take one remarkable case. Amongst tribes living high up the Amazon basin there are customs which correspond with those in Borneo. In both areas we find blow-pipes for discharging arrows; large houses inhabited by several families and similarly constructed; baskets and bamboo boxes of almost identical form and

construction; and the smoke-dried heads of enemies hung up in the houses. In one tribe on the Amazon the throwing-stick is used, and not the blow-pipe, which is employed by all the surrounding tribes ; the throwing-stick is also used by the Esquimaux, the Andaman Islanders, and the Australians. On the Amazon an arrow or spear is used for catching turtle, which has the barb loosely attached to the shaft, so that when the turtle disappears the shaft floats on the surface and indicates its movements and position. The Australians catch turtle in precisely the same way. Again, many other customs are common to the Americans and tribes living in areas far remote from them, with which they have no apparent direct relationship. If these analogies were always proofs of affinities, then we might infer, as has been done, that America was first peopled by emigrants from the opposite shores of Africa, W. Europe, E. Asia, and Polynesia.

In the great valley of the Mississippi and its mighty tributaries, the Ohio and Missouri, are the remains of the works of an extinct race of men, who seem to have made advances in civilisation far beyond the races of red men dis- covered there by the first European adventurers. These remaius consist chiefly of tumuli and ramparts of earth, enclosing areas of great extent and much regularity of form. Some of them recall the barrows of Europe and of Asia, or the huge mounds and ramparts of Mesopotamia, as displayed at Babylon and Nineveh ; while others remind us of the ruined hippodromes and amphitheatres of the Greeks and Romans. In that part of North America the barrows are usually truncated cones ; but in advancing farther south, they often assume the figure of four-sided pyramids in suc- cessive stages, with flattened tops, like the Zeocallis, or temples of Mexico and Yucatan. They have been accurately described, and many of them delineated, in the Smethsoniun

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Contributions to Knowledge, from the researches of Messrs Squier and Davis.

The barrows and ramparts are constructed of mingled earth and stones ; and from their solidity and extent, must have required the labour of a numerous population, with leisure and skill sufficient to undertake combined and vast operations. The barrows often contain human bones, and the smaller tumuli appear to have been tombs; but the larger, especially the quadrangular mounds, would seem to have served as temples to the early inhabitants. These barrows vary in size, from a few feet in circumference and elevation, to structures with a basal circumference of 1000 or 2000 feet, and an altitude of from 60 to 90 feet, resem- bling, in dimensions, the vast tumulus of Alyattes neai Sardis. One in Mississippi is said to cover a base of six acres. The ramparts also vary in thickness, and in height from 6 to 30 feet, and usually enclose areas varying from 100 to 200 acres. Some contain 400; and one on the Mis: gouri has an area of 600 acres. The enclosures generally are very exact circles or squares, sometimes a union of both ; occasionally they form parallelograms, or follow the sinuo- sities of a hill ; and in one district, that of Wisconsin, they assume the fanciful shape of men, quadrupeds, birds, or ser- pents, delineated with some ingenuity, on the surface of undulating plains or wide savannahs.

These ramparts are usually placed on elevations or hills, or on the banks of streams, so as to show that they were erected for defensive purposes, and their sites are judiciously chosen for this end. The area enclosed, therefore, bears no proportion to the relative labour bestowed on such ramparts : thus, in Ohio, an area of not more than 40 acres is enclosed by mounds of a mile and a half in circumference ; and on the Little Miami, in the same state, is found an enclosure fully four miles round, that contains an area of about 100 acres, These remains are not solitary and few, for in the state of Ohio they amount to at least 10,000.

The enclosures in the form of animals are more rare than those now noticed, and seem nearly confined to Wisconsin. One of these represents a gigantic man with two heads, the size of which may be estimated, by the body being 50 feet long, and 25 feet across the breast. Another on a slope near Bush Creek, represents a tolerably

designed snake, with an oval ball in its mouth; the undulating folds of its body and spiral of its tail extending to a length of 700 feet. The forms of quadrupeds and birds are also characteristically represented in these works. Those that have been explored contain human boues; but, though the Indians deposit their dead within them occasionally, they have no tradition of their having belonged to their ancestors. The most pro- bable supposition respecting them is that of Mr R. C. Taylor, that each was the sepulchral monument of a different tribe, who have all disappeared from America.

The question immediately suggests itself, to what people must we ascribe those vast works? They can scarcely be the works of the ancestors of the red men discovered by Europeans in North America. Neither can we ascribe them to the early Greenland and Iceland colonists, who seem never to have passed westward of the Alleghanies. We can scarcely attribute them to the somewhat apocryphal advent of the Welsh Madoc. Can their authors be the people obscurely mentioned in the Icelandic sagas, as the inhabitants of Mew Iceland ?

A curious tradition of the present Iroquois records, that when the Lenni Lenapi, the common ancestors of the Iro- quois and other tribes, whose language is still widely spread among the Indians, advanced from the north-west to the Mississippi, they found on its eastern side a great nation more civilised than themselves, who lived in fortified towns and cultivated the ground. This people at first granted the Lenni Lenapi leave to pass through their territories to seek

| |) Central | |), American | |) antiquities.

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an eastward settlement, but treacherously attacked them while crossing the river. This conduct gave rise to inve- te ate hostilities, that terminated in the extermination or subjugation of their opponents, and the establishment of the red men in those regions. ‘This not improbable, though imperfect, account of such rude comnunities, where neither letters nor hieroglyphics existed, is probably all that we

shall ever learn of the pcople who executed those works that now excite our surprise.

As we advance southward we find proofs of still greater refinement on the table-land of Anahuac or Mexico 3 and on descending into the humid valleys of Central America, the peninsula of Yucatan, and the shores of Honduras, we find striking remains of the semi-civilisation of the races that inhabited those countries before the Spanish invasion. The barbarous policy of Cortcz aud other invaders was to eradicate every trace of the former grandeur of the native races, and thereby to inure them to a degrading servitude. The systematic destruction of the native works of art and gorgeous buildings in Mexico was relentlessly carried on for ages, to the infinite regret of the modern ethnographical inquirer. Little positive information on these subjects can be gleaned froin the early Spanish historians of the con- quest ; and it was not until the publication of Humboldt's Researches that Europe knew anything of the state of the Great Mexican pyramid, or of the wonderful remains of Palenque and Papantla.

In the nriddle of the last century, however, some Spanish adventurers penetrated with difficulty the densc forests of the Mexican province of Chiapas, in which they discovered the remains of an ancient city, of which all memory had been lost, and to which they gave the name of PALENQUE, from a poor adjacent village. Stimulated by their report, the Spanish Government some years afterwards despatched two intelligent travellers to explore those wilds; but the report of Del Rio and Du Paix, from the commotions that agitated Europe and convulsed Spain, remained unpublished until a few years ago. It has since appeared, with very in- teresting designs of the ruins they explored. Our know- ledge of such remains, however, has been greatly enlarged by the labours of an enterprising North American traveller, Mr Stephens, given to the world in four volumes, entitled Incidents of Travel in Central America, Chiapus, and Yucatan, 1838, and Incidents of Travel in Y: ucatan, 1842. This gentleman discovered, in the almost impenetrable forests of those regions, the remains of no less than 44 towns, some of them with extensive and highly decorated structures. These exhibit walls of hewn stone, admirably put together with mortar,

often enriched by sculptures in bold relief, and hieroglyphical inscriptions, exactly resembling the Aztec MSS. in the museums of Europe, and in the publications of Humboldt ; well executed vaulted roofs, and obelisks covered with mythic figures and pictorial or hieroglyphical inscriptions. These curi-

ous remains have been concealed for ages by a luxu-|

riant tropical vegetation, so dense that they seem to have been unknown to people living within half a mile of their site.

The most conspicuous ruins are those of temples and palaces, which almost invariably have a pyramidal form, in Several stages, with wide intervening terraces, the ascent to which is by grand flights of steps. The chambers in those buildings have generally a length disproportioned to their width, they have no windows, but receive their light from the doors, just as the rooms do at this day in Barbary and some other eastern countries. The apartments are in two parallel rows, a narrow corridor or series of chambers runs along the front, and the apartments behind this receive their light only from the front rooms into which they open. Yet these interior apartments are often richly decorated with

sculptures, ornamented with stuccos, and gaily painted red, yellow, white, and black.

The ruins of Palenque, as may be scen in the researches of Humboldt, have the characters just mentioned, They are covered with hicroglyphics, and sculptures in relief, with ornainental cornices. The largest building stands on a terrace, faced with stone, measuring 310 by 260 feet ; the building itself is 200 by 180 feet; its walls are 25 feet high. The stone has been originally covered with painted stucco ; fronts the east, and contains 14 doors, separated by picrs ornamented with stucco figures, In this building some of the figures are ercct, while

others sit cross-legged, in what we term the oriental fashion ; one statue, 104 feet high, was found at Palenque ; and two fragments of two torsos and a head were also discovered that exhibited a severe but fair style of sculpture, that recalls something of the early style of Greek art.

The ruins at Copan, in Honduras, are of vast extent. Here a pyramidal structure remains, with an elevation of 150 feet measured along its slope, and this appears to bea principal temple, included with several smaller structures within a sacred enclosure, in the manner of the temples of ancicnt Egypt. On its walls are many skulls of a quadru- manous animal, well executed in high relief ; a large figure of a baboon was discovered among the ruins, bearing no in- considerable resemblance to the cynocephalus of the Egyp- tians. Here also several sculptured obelisks occur, from 11 to 13 feet in height, and from 3 to 4 fect wide, which, as well as the walls of the temple, were highly ornamented with sculptures in bold relief,

The similarity between the ruins at Copan and Palenque, and the identity of the hieroglyphic tablets in both, show that the former inhabitants of Chiapas and Honduras had

the same written language, though the present Indians of

those provinces do not understand each other,

At several places, but more especially at Uxmal, in Yucatan, are very magnificent ruins of the same kind. Here are found sculptured obelisks, bearing on their prin- cipal face the figure, probably, of some deity, with a be- nignant countenance represented in full, and the hands applied to the breast. The other sides of the obclisks are covered with hicroglyphical tablets, proving that the same race once inhabited the plains of Honduras and the table- land of Anahuac. The principal building at Uximal seems to have been a very magnificent pyramid in three stages or terraces, faced with hewn stone, and neatly rounded at the angles. The first terrace is 575 feet long, 15 feet broad, and 3 fcet high, serving as a sort of plinth to the whole : the second terrace is 545 feet long, 250 feet wide, and 20 fect high ; the third terrace is 360

fect long, by 30 feet wide, and 19 feet in height. From the centre of the second terrace, the upper part is gained by a vast flight of well-constructed steps 130 feet wide. This leads to the temple, the fa;ade of which is no less than 322 feet long, but has not had a greater elevation than 25 feet ; yet its grandeur is enhanced by the rich sculpture that covers the upper part above a fillet, or cornice, that surrounds the whole building at about half its elevation. The interior consists of two parallel ranges of chambers, 11 in each row. The front apartments are entered by 11 doorways, enriched with sculpture, which gives sufficient light to those rooms; but the posterior row receives no light except what enters by their doors from the exteriorrooms. The roofs here, unlike those of Palenque and Copan, are not stone arches, but are sup-ported on bearers of a very hard wood, that must have been brought from a distance of some hundred miles, and these beams too are covered with hieroglyphics. The flat roof of this building has been externally covered with a hard cement, In a building placed on a lower level is a rectan- gular court, which has been once wholly paved with well-

carved figures of tortoises in demi-relief. These are ar- rauged in groups of four, with their heads placed together ; and from the dimensions of the court, this sala de las Tor- éugus must have required 43,660 of sueh earved stones for its pavement.

The ruins of Chichen, also in Yucatan, extend over an area of two miles in circumferenee. One of the best pre- served buildings with an ambit of 638 feet, is construeted in three terraees, whieh gave it an apparent altitude of 65 fect. The buildings here, on the second terrace, have the facades highly sculptured, both above and below the horizontal fil- let ; and the doorways are enriched with mouldings, and truss-like ornaments supporting a drip-stone. The staircase here is 56 feet wide. The front apartments are 47 feet long and only 9 wide. There arc three doors in the front, and in the eentral apartment are nine niches. The roofs are stone arches; and all has been once painted of

various colours. A curious adjoining structure consists of two parallel stone walls, 274 feet long, and 30 feet apart. The walls are 30 feet thiek. It has been eonjectured to have becu connected with the celebration of some public games, like the palwstre of the Greeks.

In several of the ruins now noticed are found buildings to which there is no access. They have doorways, but these seem to have been walled up when the buildingswere erected. Their use is unknown ; they are named casas cerradas, or "shut up houses." Their interior docs not differ from the other apartments above described.

It is worthy of notice, that the builders of those cities took great pains to supply them with one of the prime essentials of human comfort—abundance of good water, by means of wells and cisterns of excellent construction.

The remains in all the 44 ancient towns visited by Stephens have a similar character; so that we can have no hesitation to ascribe them to the same nation, or to kindred raees of men, who had certainly attained no inconsiderable civilisation, although unaequainted with the use of iron, or even of bronze. Many of these towns are repeatedly referred to in the native histories, and it is almost certain that a large proportion of them were founded and inhabited by the Tutul-Xius, Nahoas, and other tribes speaking the Nahuatl tongue. In not a few instances the dates and the names of the founders have been preserved.

It has been generally admitted by physiologists, that the temperate regions of the globe are best fitted to de- velope all the powers of our nature; and it is a fact in accordance with this opinion, that among the aborigines of America, civilisation followed very closely the chain of the Andes, and was found either upon their sides or the table-land of their summits, where the elevation of the ground moderates the heat of the tropical sun, and pro- duces a climate analogous to that of Central and Southern Europe. This civilisation did not exist merely at the two distant and isolated points of Mexico and Peru, but pre- sented itself at intermediate places, and may be said to have formed a continuous line from lat. 35° N. to lat. 35° 8, with few interruptions, except at those parts where the moun- tainous chain disappears, or sinks down to a

trifling eleva- tion. Some large buildings near the Rio Gila, in lat. 33° N., with fragments of porcelain, indicate the existence of a people there who had some knowledge of the arts. These were most probably a branch of the Aztecs or Toltecs, who afterwards oecupied Mexico, as the annals of that country tell. Though some pursued their march south- ward, it may be reasonably supposed that a part remained in the district; and the Indians living here, who culti- vate corn, weave eloth, and live in villages consisting of houses built of solid materials, sometimes two stories in height, may either be their descendants, or have bor- rowed from them the improvements they possess. Next

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-southern continent.

[ANTIQUITIES,

in order as we proceed southward, are the various nations of Mexico, of whose condition we shall speak by and by. In Chiapa were the Zapotecs, in Yucatan the Mayas, in Guatemala the Quiches and Kachiquels, all nearly ag much advanced in civilisation as the Mexicans, and pro- bably of the same primitive stock. From this point, where the Andes lose their elevation, or break into isolated cones, no distinct traces of civilisation appear till we enter the Here were found the Muyscas or Moscas, on the table-land of Bogota, a nation consisting of several tribes, who worshipped the sun and practised some of the useful arts. To these succeeded the nations of Peru, living under the Incas, whose dominion extended from the equator to the 35th degree of 8. latitude, Beyond this boundary were the Chilian tribes, who, though inferior to the Peruvians, had made some advances beyond the rudeness of the savage state. It is proper to mention that some of the nations named were extinct before the arrival of the Spaniards ; but the degrée of civilisation they had attained is attested by the monuments they have left behind them. There were no othcr tribes in the new continent which had made any progress in social improve- ment. We would not except the Guaranis of Brazil, and a few others, who derived their subsistence chiefly from agriculture, but were in other respects savages. We place among the exceptions, however,

the extinct race of the Allegewis, or whatever was the name of the people, who erected the military works existing between the Ohio and the northern lakes ; but they also, it must be remembered, inhabited a temperate climate, though not a mountainous country. It may be affirmed, then, as a general proposi- tion, that from 35° of N. to 35° of S. latitude, the sides and summits of the Andes were the exclusive seats of Ameriean civilisation, We admit that some of the tribes in Chiapa, Oaxaea, and Yucatan, inhabited low districts; but they were still near the Cordillera, and may be fairly considered as offsets from the nations dwelling upon it. The faet is important, as marking the effect of climate on the active energies of our species. There is no doubt that, with the improved arts of modern times, eivilisation can subsist under the burning sky of the torrid zone, but not in such vigour as in countries whieh enjoy a more moderate temperature. Perhaps it will be found that the moral and physical powers of man attain their highest perfection in those regions where he is accompanied by wheat and the vine. The zone occupied by the former extends from the 30th to the 57th or 58th parallel ; and within the tropics the corresponding climate is found on the flanks or summits of mountains, from 4500 to 10,000 feet above the level of the sea.

It is remarkable that the Mexican annals reach to a Mexi

very remote date, although they were preserved merely by picture-writing. We do not pretend to enter into the question as to the authenticity of the records themselves, and their correctness. It is enough that they have received eredit from Humboldt, Vater, and other men of learning and judgment. From the annals thus preserved, of which further details will be subsequently given, we learn that at the earliest dawn of history the Quinames were in possession of the country, that civilisation was introduced by strangers coming from the east, and that several nations belonging to one race migrated in suecession from the north-west, and settled in Anahuac or Mexico. The Toltecs, it is stated, left their original seat, far to the west, in 544 of our era, and after a long journey invaded Mexico, then occupied by wandering hordes, in 648. This people, who penetrated to Nicaragua, if not to South America, were nearly destroyed after the lapse of some

centuries; but were followed by the Chichimecs, a half savage tribe, about 1120, and these a few years afterwards by the Anahuatlels,

princes of the line.

ANCIENT MEXICO. |

or seven tribes, including the Acolhuans, the Tlascaltecs, and the Aztecs or proper Mexicans. All these people spoke dialects of one language, and had similar arts, customs, and institutions. The town of Mexico or Tenochtitlan was founded in 1325, and the series of Mexican kings which commenced in 1352 was continued through eight monarchs to Montezuma. The monarchy was small at first, and passed through many vicissitudes 3 but it was gradually enlarged, especially by the policy and enterprise of the later When Cortes arrived, it embraced what are now the provinces of Vera Cruz, Oaxaca, Puebla, Mexico, and part of Valladolid, a surface of 130,000 square miles; but within this were comprehendcd three smal) independent states, Tlascala, Cholullan, and Zapeaca, The pastoral state, which forms the intermediate stage between savage and civilised life, had never existed in Mexico 3 for the native wild ox had not been tamed, and the use of milk as food was unknown. The Mexican nations derived their subsistence from agriculture, which, however, was conducted in the rudest manner, with very imperfect instruments. They cultivated maize, potatoes, plantains, and various other esculent vegetables. They raised cotton, and under- stood the art of spinning and weaving it into cloth, of a texture which excited the admiration of the Spaniards. They had no iron, but showed considerable skill in fashion- ing the gold, silver, and copper, found in a native state, into domestic utensils and ornamental articles. In some of their buildings the stones were hewn into regular forms, and accurately joined ; and from the ruins of the palace of

Mitla, in Oaxaca, still existing, it appears that they had

the art of designing ornaments like arabesques, in paste, with great neatness, and attaching them to the walls; but aolid structures of masonry evincing any considerable skill are extremely rare in the

country. Their carvings in wood were tolerably well executed, but the figures were disproportioned and uncouth. The same remark applies to their hieroglyphical drawings, which were far inferior

‘In taste and design to those of the Hindoos, Japanese,

and Thibetians. For papcr they employed sometimes the large leaves of the aloe, sometimes cotton cloth, or the skins: of deer dressed. Their books consisted of strips or webs of such materials, composed of pieces neatly joined, one or two feet broad and twenty or thirty long, which were divided into pages by folding them in a zig-zag manner ; and two pieces of thin deal attached to the outer- most folds served as boards, and gave these manuscripts, when closed, an appearance very much like our old folios in wooden binding. The written language of Mexico con- tained a few real hieroglyphics or symbols, purely conven- tional, to designate such objects as water, earth, air, day, night, speech, and also for numbers ; but it was essentially a system of pictwre-writing in which objects were represented by coloured figures having a resemblance more or less exact to themselves. With all its necessary imperfections, this instrument was familiarly employed to a prodigious ex- tent in deeds and instruments for effecting the transmission and sale of property. The government kept couriers for conveying intelligence from all parts of the empire ; and the capital was watched and cleaned by a sort of police estab- lishment. This is the bright side of Mexican civilisation. On the other hand, it must be kept in view, that the Mexi- cans had no tame animals, no made roads, no money to serve as a universal medium of exchange in commercial transactions, The government was originally a perfect feudal monarchy, in which all power was monopolised by @ numerous nobility and the priesthood. The great mass of the people were serfs, attached to the soil, and trans- ferred with it from owner to owner by descent or purchase. The peasants or slaves of a nobleman were allowed a cer- tam portion of land, which they cultivated in common

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for their subsistence: the rest of their labour belonged to their lord. The country swarmed with beggars, and thousands were swept off every few years by famine. As among the ancient Egyptians and the Chinesc, immutable custom, regulating every act of civil and common life, chained up the course of improvement, and spread a languid monotony over society. The crown was clective, aud the powers of the monarch small, till the privileges of the nobles were destroyed by the policy and ambition of Montezuma, The religion of the Mcxicans breathed a savage spirit, which degraded them, in a moral point of view, far below the hordes of wandering Indians. Their deities, represented by mis-shapen images of serpents and other hideous animals, were the crcation of the darkest passions of the human breast, of terror, hatred, cruelty, and revenge. They delighted in blood, and thou- sands of human sacrifices were annually offered at their shrines. The places of worship, called Teocallis, were pyra- mids composed of terraccs placcd one above another, like the temple of Belus at Babylon. These were built of clay, or of alternate layers of clay and unburnt bricks, but in some cases faccd with slabs of polished stone, on which figures of animals are sculptured in relief.) One or two small chapels stood upon the summit, enclosing images of the deity. The largest known, which is com- posed of four stories or terraces, has a breadth of 480 yards at the base, and a height of 55. These structures served as temples, tombs, and observatories ; and it is re- markable that their sides are always placed exactly in the direction of the meridian. teresting fact connected with Mexican civilisation, we mean the perfection of their calendar. The civil year was composed of 365 days, divided into 18 months of 20 days, and 5 supplementary days. The Mexicans had besides a ritual or religious year for the regulation of their festivals ; and, by means of a cycle of 52 years, and a very complicated method of computation, the religious and civil periods were connected with one another, and the civil year was made to correspond with the natural by the inter- calation of 13 days at the end of the cycle. The month was divided into four weeks of five days, but cach day of the month had a distinct name ; and Humboldt has given strong reasons for belicving that these names were bor- rowed from an ancient zodiac formed of 27 or 28 lunar houses, which was made use of from the remotest anti- quity m Tartary, Thibct, and India. Thc

calendar of the Mexicans bespcaks a degree of scientific skill, and an accuracy of observation, which are not easily reconciled with their semi-barbarous habits, their general ignorance in othcr things, and the recent date of their civilisation according to their own account. It is here, indeed, and not in thcir language, that we find distinct traces of thcir connection with Asiatic nations. The character of the Mexicans is probably the same at this day as before the conquest, which, we are disposed to think, made less change in the situation of the people than is often sup- posed, though it annihilated the rank and privileges of the nobles. The Mexican Indian is grave, suspicious, and taciturn ; quiet and placid in his external deportment, but rancorous in his spirit ; submissive to his superiors, harsh and cruel to those beneath him. His intellect is limited, and chiefly developes itself in imitative labours and mechanical arts. Slow, cautious, and persevering, he loves, both in his acts and thoughts, to travel in a beaten track. The people, though speaking many different lan- guages, have nearly the same physical character. The Mexicans have olive complexions, narrow foreheads, black

1 Robertson was mistaken in believing that the Teocallis were in all cases mere masses of earth, without masonry. See Humboldt's Researches, vol. i. p. 111, English translation.

This leads us to the most in- Calendar,

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eyes, coarse glossy black hair, and thin beards. They are of the middle size, and well-proportioned in their limbs. A person with any defect or deformity is rarely seen amougst them. They are healthy, and live to an advanced age, when life is not shortened by drunken- ness. The Toltcc and Aztec races, when they established themselves in the country, diffused their own language partially from the Lake of Nicaragua to the 37th parallel. They reclaimed, by degrees, many of the neighbouring savage tribes to a settled mode of life, and spread a feeble degree of civilisation over a mixed mass of nations, speak- ing,

according to Clavigero, 35 languages, of which Hum- boldt tells us that 20 still exist. The Aztec language is one of the most copious and polished of the American tongues, and abounds in words of the immoderate length of 12 or 15 syllables. It is uncertain what was the number of sub- jects over whom Montezuma ruled, The ruins in the valley of Tenochtitlan, on which the capital stands, show that it must have been more populous before the conquest than now; but the population at present is diffused over an incomparably wider space ; and, upon the whole, there are no good grounds for believing that the number of civilised Indians was much greater when Cortes landed, than in 1803, when it amounted to 2,000,000.

The civilisation of Mexico, as well as of Peru, owed its existence to a single cause,—the patient, submissive, and superstitious character of the people, which fitted them to be beasts of burden, under an aristocracy of priests and nobles, who were led, perhaps, partly by influenccs from abroad, partly by the instinct of self-interest, to devise means for holding the mass of the community in subjection. Many of the nations which continued savage, such as the Algonquins and Iroquois, were pro- bably equal to the Mexicans in intellect; but their propensity to superstition was less, and their energy of character was too great to permit of their being enslaved by their chiefs. mitive character that we must seek for the cause of the diversity of manners and institutions we find among the American nations. ;

The ancient empire of Peru, more extensive than that of Mexico, embraced the whole sea-coast from Pastos to the river Maule, a line of 2500 miles in length. Its breadth is uncertain ; but as it included both declivities of the Andes, it must have extended in some cases to 500 miles, and the entire surface of the empire probably exceeded 500,000 square miles. It is plain, however, from the imperfect history of the Incas which has been preserved, that within this space there were many dis- tricts where their authority was feeble, and others inhabited by tribes which were entirely independent. One part of the country, besides, consisted of a sandy desert, while the most elevated tracts were uninhabitable from cold. It must not therefore be supposed that the capacity of the country to support population was commensurate

with the extent of its surface. Still the magnitude of the Peruvian empire, in the midst of an immense multitude of independent savage communities, so extremely minute, that a hundred of them might have been planted with- out crowding in one of its provinces, is an extraordinary phenomenon. The creating and maintaining of such an empire 1s a proof that the Peruvians had made no trifling progress in the useful arts and in the science of government. To keep in subjection so many remote provinces, there must have been an efficient military force, rapid means of com- munication, considerable revenues, and an organised magis- tracy capable of understanding and executing the plans of rulers, who had sufficient political skill and knowledge of human nature to adapt their institutions and arrange- ments to the wants, habits, and character of a great

It is chiefly in the variety of their pri- |

variety of dissimilar nations, spread over a territory reach- ing as far as from Lisbon to the banks of the Volga. It is clear that the ruling tribe, which was able to extend its dominion, and to a considcrable extent its language, over a space of 2500 miles, must have possessed a marked superiority of some kind over the hordes that surrounded it. We must remeinber, besides, that the Peruvians lay under the disadvantage of being destitute of even such an imperfect instrument of communication as the hieroglyphic language of the Mexicans, and that they were extremely deficient in military spirit. Indeed, it is one of the most singular facts connected with the history of America, that by far the largest cmpire it contained was formed by the most unwarlike people in it. The dominion of the Incas was founded entirely on policy, superstition, and the arts. It could only be by the intelligence and skill which civi- lisation developes, that the Peruvians conquered tribes superior to themselves in courage ; and it was by policy and superstition that the Incas tamed the rudeness of savage tribes, and hcld distant countries in subjection. Robertson justly observes, that the Peruvians "had ad- vanced far beyond the Mexicans, both in the

necessary arts of life, and in such as had some title to the name of elegant." In two points ouly were they inferior; in their calendar or mode of computing time, and in their want of such a substitute for writing as the Aztecs possessed in their hieroglyphics.

Agriculture was conducted with greater care and suc- Arts in The lands capable of cul- Peru

cess in Peru than in Mexico. tivation were divided into three shares. One was conse- crated to the service of religion, the erection of temples, and the maintenance of priests ; the second was set apart as a provision for the support of the government; and the third and largest share, which was reserved for the people, was parcelled out, not among individuals, but among the hamlets and villages, according to the number and rank of the inhabitants ; and a new division was made every year to meet any change that might arise in the circumstances of the parties. The members of each

little community went to the fields under overseers, and

cultivated the land by their joint labour. The produce was distributed among the families and individuals accord- ing to their wants, while the evils of famine were pro- vided against by storing up the corn in granaries, The Peruvians having no draught animals, and no ploughs, turned up the earth with wooden mattocks; but their skill and care were exemplified in irrigation, which they practised extensively, and in their employing as manure guano, or the dung of sea birds, which abounds on the islands near the coast. Their masonry was superior to that of the Mexicans. Like the ancient Egyptians, they understood mechanics sufficiently to move stones of vast size, even of 30 feet in length, of which speci- mens are still existing in the walls of the fortress of Cuzco. They had the art of squaring and cutting blocks for building with great accuracy ; and they did not effect their purpose, as Robertson supposes, merely by chip- ping the stones, or rubbing them together so as to fit the surface of the one to that of the other, without re- gard to symmetry of form. It is now known that they had hard chiscls, made of copper, with a mixture of 6 per cent. of tin,—a proof of

considerable skill in the work- ing of metals. With these they hewed the stones

into parallelopipeds, which were disposed in " courses as Building

regular," says Humboldt, "as those of Roman workman- ship." They are joined with such nicety, that the line which divides the blocks can scarcely be perceived ; and the outer surface is in some cases covered with carving. The palaces or lodges of the Incas, of which there are many remains, had doors with slanting sides like the

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Egyptian ; sloping roofs, which, it is supposed, were covered with rushes or stonc slabs; no windows, but niches symmetrically distributed! Ancient stone structures, which are so rare in Mexico, are pretty abundant in Peru,—a fact for which we can only account by the dif- ficulty with which the Mexicans erected buildings, in consequence of their inferiority in the art of masonry. The architecture of the Peruvians, like everything elsc connected with their social state, displays a remarkable uniformity, not only of style, but of plan. "It is impos- sible," says Humboldt, "to examine a single edifice of the time of the Incas, without recognising the same type in all the others which cover the ridge of the Andes, along an extent of 450 leagucs."

ANCIENT PERU. | 897 a sort of nobility; and above the whole, the family of the Incas, the members of which, by intermarrying only with themselves, formed a numerous and distinct caste. For the purposes of police and civil jurisdiction, the people were divided into parties of ten families, like the tithings of Alfred, over each of which was an officer. A second class of officers had control over five or ten tithings, a third class over fifty or a hundred. These last rendered account to the Incas, who exercised a vigilant superintendence over the whole, and employed inspectors to visit the provinces as a check upou mal-administration. Each of these officers, down to the lowest, judged,

without appeal, in all differences that arose within his division, and enforced the laws of the empire,

in a high degree, reminds one, in some of its features, of the old system of the Saxons in England, but bears a More general resemblance to that of the ancient Egyp- tlans, The mass of the people were in a state of servi- tude, except a small number, who were free; above these in rank were the Curacas, or chiefs of districts, who formed

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1See Humboldt's account of the ancient buildings of Callo and Cunnar, vols. i. and ii. of his Researches.

|| Roads. The ancient public roads of Peru are justly considered | among which were some for punishing idleness, and com- | as striking monuments of the political genius of the | pelling every one to labour, It is probable that the government. One of these extended along the sides of the tithings and hundreds, as in England, would losc their Andes from Quito to Cuzco, a distance of 1500 miles. It | numerical signification in course of time, and become is about forty feet broad, and paved with the earth and | mere local allotments. In the hamlets and villages a stones which were turned up from the soil; but in some person mounted a tower every evening, and announced marshy places it is formed, like the old Roman roads, of a | where and how the inhabitants were to be employed next compact body of solid masonry. – A tolerably level line is day. The taxes were paid in the produce of the fields, preserved, by filling up hollows, cutting down small emi- | and magazines for receiving them were established in nences, and winding round the sides of large ones. At every district. Such is the account given by Acosta and proper distances tambos or storchouscs were erected, for | Garcilasso of the civil institutions of Peru, which may be the accommodation of the Inca and his messengers. A | correct with regard to the oldest possessions of the Incas similar road was made along the coast in the low country. | near Cuzco, where their power had been long established ; Fissures a few yards in breadth were passed by bridges | but it is not probable that such a complicated system was formed of beams laid horizontally ; and an invention, at |

ever fully in operation in the more distant parts of the once bold and ingenious, afforded the means of crossing | empire. deep ravines, or the channels of rivers, which hap- The government of Peru was a theocracy. The Inca Govern- pened to intersect the route. This consisted of a suspen- | was at once the temporal sovereign and the supreme ment and sion bridge, perfectly analogous in its principle to those pontiff. He was regarded as the descendant and repre- Religion. with which we are familiar. It was formed of half a | sentative of the great deity the sun, who was supposed to dozen of cables of twisted osiers, passed over wooden inspire his counsels, and speak through his orders and supports, and stretched from bank to bank; then bound | decrees. Hence even slight offences were punished with together with smaller ropes, and covered with bamboos. death, because they were regarded as insults offered to Humboldt passed over one of these pendulous bridges, of | the divinity. The race of the Incas was held sacred. 120 feet span ; and Mr Miers crossed one of 225 feet span, | To support its pretensions, it was very desirable that it over which loaded animals might travel. In low grounds | should be kept pure and distinct from the people ; but the rivers were crossed on rafts with a mast and sail, which, | human passions are often too strong for the dictates of by a particular contrivance, could be made to tack and policy ; and though the marriages of the family were con- veer. In this respect the Peruvians were a stage in | fined to their own race, the emperor, as well as the other advance of all the other American races, who had nothing | males of the blood royal, kept large harems stocked with superior to the canoe with paddles. The Peruvians manu. | beauties drawn from all parts of the empire, and multi- Manufac- factured a rude species of pottery: they understood the | plied a spurious progeny, in whom the blood of the a art of spinning, and, in an imperfect degree, that of weav- | "children of the sun" was blended with that of the " chil- ing. They procured native gold by washing the gravel of | dren of the earth." Among a simple-minded and credulous rivers; and silver, and perhaps copper, by working veins | people the claims of the Incas to a celestial origin seem downward from the outcrop. They knew how to smelt | to have been implicitly believed. They were blindly and refine the silyer ore ; and they possessed the secret of obeyed, and treated with a respect bordering on adora- giving great hardness and

durability to copper by mixing | tion, by the nobles as well as the common people. The it with tin. Their utensils and trinkets of gold and silver | Peruvians worshipped the sun, the moon, the evening are said to have been fashioned with neatness and even | star, the spirit of thunder, and the rainbow, and had taste. On the other hand, they had no money, no know- | erected temples in Cuzco to all these deities. That of ledge of iron or glass ; and they were ignorant of the | the sun, which was the most magnificent, had its walls mode of mortising or joining beams, and of casting arches. | covered with plates of gold. The sacrifices consisted of They had no animals fitted for draught ; but the llama, a | the objects most prized by the people, of grain and fruits, small species of camel, which they had tamed, was em- | of a few animals, and of the productions of their own in- ployed to some extent as a beast of burden. dustry. Sabianism, as it is the most rational of all the ee k The political organisation of Peru, which was artificial | forms of idolatry, is also generally the most mild 3 and

doubtless this results from the tendency which it has to fix the thoughts on the marks of beneficence and wisdom which are displayed in the works of nature. The Peru- vian temples were accordingly never polluted, like those of Mexico, with the blood of human victims 5 and the Incas even went farther, and signalised their zeal against such horrid rites, by suppressing them in all the countries they conquered. Though their history exhibits some bloody deeds, the general character of their government I. — 88

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was the reverse of cruel. The severe punishments pre- scribed by their laws were rarely inflicted, and rebellion was scarcely known in their dominions. The Inca not only assumed the title of the father of his people, but the vices as well as the merits of his government sprung partly from the attempt madc to construct the govern- ment on the model of paternal authority, and partly from the blending of moral and religious injunctions with civil duties. Hence the idle pretension of the state to reward virtuous conduct, as wcll as to punish crimes; hence too the plan of labouring in common, the extinction of individual

property, the absurditics of eating, drinking, sleeping, tilling, building, according to fixed universal rules; in fine, that minute and vexatious regulation of all the acts of ordinary life, which converted the people into mere machines in the hands of an immense corps of civil and religious officers. Such a system may have served to reclaim some tribes from the savage state; but it must have stifled the seeds of improvement, and left the mass of the people more stupid and imbecile than it found them. The government was as pure a despotism, probably, as ever existed; but its theocratic character, no doubt, helped to mitigate the ferocity of its spirit. Super- stition and force are the two bases on which tyranny rests in all countries ; and in proportion as it is firmly seated on the one, it stands less in need of the support of the other. The Inca had so completely enslaved the minds of his subjects, and the apparatus he wielded for directing and controlling their acts was so perfect, that he was able in a great measure to dispense with those ter- rific examples of cruelty and bloodshed, by which the pure military despot operates on the fears of those who live under his authority.

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[ANCIENT PERU.

their arts and religion wherever they established their authority. Huayna Capac, the twelfth in succession from the founder of the dynasty, occupied the throne when the first party of Spaniards visited Peru in 1527, and the em- pire was then still in a state of progress. There is, however, little doubt that some advance in civilisation had been made in times before the Incas.

Such is the account which the Peruvians give of the Foreign origin of their civilisation, which we should be disposed to legislators

reject as a fable, if there were not peculiar circumstances ™ which give it some credibility. First, their institutions, taken in the mass, do not present what may be called the Amcrican type. The mild and paternal character which they display, the injunction to "love one another" raised to the rank of a positive precept, the preference of the

useful arts to war, all breathe a spirit, not only foreign to the genius of the American tribes, but exactly opposed in character to anything which a native self-taught legisla- tor was likely to produce. Secondly, the artificial and systematic form of the Peruvian institutions renders it improbable that they were developed by the natural ac- tion of political causes, but strongly favours the idea, that they were framed by a few designing heads, as an instru- ment to tame and govern a patient, feeble, and credulous people of rude or savage habits. A small number of Jesuits were led, by a sagacious study of the savage charac- ter, to devise a system extremely similar in its nature, which worked admirably. These missionaries were the Manco Capacs of Paraguay ; and, like the Incas, might, in the course of two or three centuries, have extended their theocracy over as large a space as Peru, if their situation had permitted them to employ force. Thirdly, a million of native Peruvians yet survive, the living descen-

Origin of This system of the Peruvian monarchs, by which the | dants of those who built the temples of Cuzco ; and their on people were kept in a state of perpetual tutelage, merits | extreme stolidity, apathy, and feebleness of character,

the greater attention, because it is preciscly that which the Jesuits employed, in Paraguay and other districts, to teduce the natives to a settled mode of life ; and it seems, in fact, to be the only mcthod by which a semblance of civilisation can be introduced amongst the American nations. Two things must be supposed to account for its prevalence : first, a certain amount of timidity, passive- ness, and superstition, in the body of the people, implying weak passions, but not necessarily smallness of intellect ; and, secondly, a few minds of a higher class, to give an impulse to the rest, and to control and regulate their acts. In the case of Peru, did these ruling intellects spring from the body of the people, and, after striking out new lights in morals and legislation for themselves, devise a complex and artificial system for establishing their power over the minds of the rest, by the help of superstition and force? or were they strangers from another country, and imbued with the principles of a higher civilisation? If we may

believe the Peruvian annals, the: latter was the case. About the year 1000 of our era, or perhaps a cen-

sufficiently testify that the chances were nearly as great against a legislator like Manco Capac arising amongst them, as against the Jews in the time of Augustus pro- ducing a being like Jesus Christ. They have the weak- ness arid passiveness which fit them to receive an im- pression from superior directing minds ; but they discover no trace of the intelligence, energy, and originality which must have been united in the persons who planned and carried into effect the political system of the Incas. We admit that oppression may have degraded their character, but it cannot have entirely changed it.

If, then, the civilisation of Peru was exotic, whence was it derived? To us it appears most probable, that the legis- lators of Peru were either Chinese, or persons who had received at second-hand a knowledge of the arts and in- stitutions of China ; and our opinion is grounded on traits of resemblance in the manners, laws, arts, and institutions of the two nations, which, in our opinion, are too nume- rous, striking, and peculiar, to be the effect of chance. We shall mention some of the most prominent.

teachers,

tury later, Manco Capac, with his wife and sister Mama Ocello, appeared as strangers on the banks of the lake Titicaca. They were persons of majestic appearance, and

1. The first and most obvious resemblance is in the Peruvians singularly artificial frame of society in both countries. In a China, as in Peru, the legislation is directive as well as ™°°°

announced themselves as "children of the sun," sent by their beneficent parent to reclaim the tribes living there from the miseries of savage life. Their injunctions, ad- dressed to a people who probably worshipped the god of day, were listened to by a few, who settled around them, and founded Cuzco. By degrees, other tribes were in- duced to renounce their wandering habits. Manco Capac instructed

the men in agriculture and the arts, and Mama Ocello taught the women to spin and to weave. Laws, Institutions, and religious rites, were added. The form of a civilised society arose, which was gradually extended by persuasion or conquest,—the Incas having always planted

punitive, and is distinguished by that minute and elaborate? system of regulation, inspection, and control, which inter- feres with the most trifling actions of ordinary life, and reduces the mass of the people to the condition of automata, moved and guided in everything by the rulers. China, says Mr Barrow, is a great school, in which the magis- trates are the masters, and the people the scholars. It might be more correctly compared to a large monastic establishment, in which each person has his place and his duty assigned to him, and all his acts directed by supe- tiors, whose wisdom and authority he is not permitted to question. The Chinese have the same immense multitude

of civil officers which the

petty constable.

tribe of savages on the sides of the Andes, as in Peru, the emperor assumes the title of of his people ;"

the sun, and he with that of temporal prince. There are vestiges, too, of the worship of the heavenly bodies in China,!

agriculture, by celebrating an annual festival honour, on which occasion he proceeds to the field in

great pomp, and takes a part in the labour of cultivating

the ground with his own hands. This singular custom existed in Peru, where the Incas went through an annual ceremony perfectly similar. How foreign was such an institution to the spirit of the American tribes'! 4, In China agriculture is in a rude state, and exhibits proofs of intelligence and_ skill only in two things—the use of manures, and a

laborious system of irrigation. Pre- cisely the same circumstances characterised the agricul- ture of Peru. 5. The internal taxes of China, like those of Peru, are paid in kind (maize, rice, silk, cotton, &c.),and stored in public magazines or granaries. 6. The Chinese government maintained public roads, even in those provinces where neither carriages nor beasts of burden were used, of course for the use of pedestrians, and storehouses or places of refreshment were built upon them at proper distances. The Peruvians constructed roads on precisely the same plan, and for the same pur- poses ; and this was done by no other people in America. 7. The Chinese do not inter the bodies of the dead, but lay them on the ground and raise a tumulus or conical heap of earth over them. Such was also the practice in Peru. The only barbarously cruel rite practised in Peru, that of immolating the Inca's domestics at the obsequies of their master, was brought into China by the Tartars. Its existence is an anomaly in each case, for the genius of both nations was peaceful and mild. 8. The architecture of the Chinese displays little taste, but is distinguished by two peculiarities—the power shown of cutting and moving immense masses of stone, and the uniformity of style which pervades their structures, of every size and description. "All the buildings," says Mr Barrow, "from the meanest hut to the viceroy's palace, are upon one plan." Humboldt remarks the same adherence to a single model among the Peruvians, and the walls of Cuzco show that they were acquainted with the method of moving stones of prodigious size. The Chinese were fond of covering their walls with carving, and examples of the same practice occur in Beru. if any of the Peruvian buildings had remained entire with their roofs on, it would perhaps have been found, that the type or primary architectural form employed in the two countries was not very dissimilar, and some allowance should be made for the circumstance, that Peru must have borrowed her models from China 700 or perhaps 1000 years ago. 9. The Peruvians made coarse pottery, and all the world knows that this is an art in which the Chinese excel. The Peruvians were the only American nation who had made any progress in the art of fusing and alloying metals, in which the Chinese have long been distinguished by their skill. 10. The

1 See accounts of the temples at Pekin dedicated to the heavens, the north star, the moon, the earth, &c., and of the festival kept at the summer solstice, like the grand solar festival in Peru.

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Peruvians had, and the same chain of subordination from the emperor down to the In China this system was undoubtedly the growth of many centuries ; but it was too artificial to occur to the thoughts of a cacique, educated amongst a 2. In China the "father and his government is modelled upon this figure of speech. He affects to be sprung from pro- genitors who descended from heaven like the children of unites the character of supreme pontiff

3. The Chinese emperor extends an ostentatious patronage to in its

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Peruvians had dramas and dramatic spectacles, Whence could a people so uninventive have derived the idea of such entertainments, if not from China, where they have been long familiar to. the people? There were mimics and buf- foons in Mexico, but nothing, we believe, to which the term drama could be applied. 11. But perhaps the most remarkable coincidence is found in an invention entirely confined to the two countries. We have described the sus- pension bridges made of ropes, employed by the Peruvians in crossing deep ravines. Now, it is singular that bridges of the very same description, some of chains, and some of ropes, are found in the south of China, and nowhere else except in Thibet, which has interchanged arts and cus- toms with China from time immemorial, This single fact we would consider as a proof of communication between the two countries. The Peruvians made their ropes of twisted osiers, and the Chinese had ropes also of this description. 12. From what people nearer than the Chinese could the Peruvians borrow the idea of rafts with a mast and sail? These rafts, supporting covered huts, may be considered as literal copies of some that are used in China ; and the peculiar mechanism employed in lieu of a rudder is no doubt borrowed from the paddles attached to the Chinese boats, fore and aft. 13. The Chinese in ancient times made use

of quipus or knotted cords to facilitate calculation. Is it not probable that this invention had passed from them to the Peruvians, the Mexicans, the Kaluschi, and other American nations who employed it? It would be easy to trace similar analogies in many other customs, laws, and institutions of the two nations. Both had nunneries or religious societies of women, who lived under a vow of celibacy; both had a class of literary men (the Haravecs and Amautas, or poets and philosophers, in Peru), patronised by the government; both divided the year into twelve months, and placed the beginning of it in January (a coincidence the more remarkable, as the year of the Mexicans and other northern nations consisted of 18 months); both were strangers to the use of milk, cheese, and butter.? These facts may suffice, for we have

| not room for lengthened inquiries, neither are we anxious

to press our argument beyond its proper limits. Our po- sition is, not that the Peruvians are descended from the Chinese, but simply that Peru had been inoculated with civilisation by persons who derived their ideas from China. If it be asked why these persons did not import from China the use of letters, the method of casting arches, and many other arts practised there, our answer is, that no individual, and still less any casual assemblage of individuals such as the purposes of trade or navigation might bring together, possesses a knowledge of every art and science which exists in his country. How many men are there in Eng- land at this day, who could not even carry the knowledge of the alphabet to another country? We must remember, too, that all the arts existing in China do not exist in every province of it, and have not always existed in those provinces where we now find them.2 As to the means of communication, it is evident that the trade- wind renders Peru almost unapproachable from Eastern Asia, between the parallels of 30° N. and 30° S. latitude.

? Sir John Barrow is our authority for this fact, which is the more remarkable, as the Mongols, the neighbours and conquerors of the Chinese, had the use of all the three articles iinmemorially.

3 The uniformity and unchangcableness of customs in China have evidently been much exaggerated. The empire is formed of an assemblage of small states, conquered one after another, each of which must have had its peculiar laws, manners, and superstitions ; and common sense tells us, that to blend these into one perfectly homo-Seneous mass, must have required a much longer period than has elapsed since the empire attained its present magnitude. It would be easy, too, to find instances of the Chinese having changed their customs, both in matters of business and matters of domestic economy,

Peruvian language.

The people.

Manners.

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But beyond these limits the west winds prevail, and hence China, in point of facility of access, is nearer to Peru than the Society or Marquesas Islands. The Chinese have long exposed themselves to the casualties of a maritime life, in vessels of large size, provisioned for many months ; and at this day they perform voyages of 3000 or 4000 miles, to Ceylon and Polynesia.

The Quichua language, or that of Peru, was spread, by the care of the Incas, over all the countries which they conquered, so far at least as to be understood, if not spoken, by the great variety of tribes subject to their sway. It is understood at present as far as Santiago del Estero, 1200 miles of direct distance south-east from Cuzco, This single fact proves both the long duration of their power, and the efficiency of their internal adminis- tration. It is said to be the most rich, polished, and har- monious of the South American languages, abounding in vowel sounds, but wanting those corresponding to the Spanish consonants 6, d, f, 9, 1, x,v. Like all the other American tongues, it wants terms for abstract and uni- versal ideas, such as éime, space, being, substance, matter, body, and even such as wrtue, justice, liberty, gratitude. There are five dialects of the Quichua, which are spoken in Peru proper, and

in Quito, New Granada, and a con- siderable part of La Plata, and not only by the aborigines, but by many Spaniards of the higher classes. The Peru- vians had no alphabetic writing. They possessed a very rade species of hieroglyphics, of which little use was made, and the quipus or knotted cords of various colours, which last were originally employed simply as aids to calculation, but latterly as records of facts, laws, &c. Each quipu required a verbal commentary. About ten years ago a copy of an old MS. was discovered, which contained an account of the Maya alphabet of Yucatan —the only alphabet yet known to have existed in America.

The Peruvians of the aboriginal Quichua race are of a copper colour, with a small forehead, the hair growing on each side from the extremities of the eye-brows; thcy have small black eyes, a small nose, a moderately sized mouth, with beautiful teeth ; beardless chin (except in old age), and a round face. Their hair is black, coarse, and sleek, the body well proportioned, the feet small, the stature rather diminutive. Their intellectual qualities, according to M. Ulloa, are of the lowest order. The. most prominent trait in their character is an imperturbable and incurable apathy. Though half-naked, they are as con- tented as the Spaniard in his most splendid raiment. Gold and silver have so little influence over them, that the greatest recompense will not induce them to perform the slightest service voluntarily. Neither power nor dignity moves them, and they receive with the same indifference the office of alcalde and that of executioner. They are habitually slow in their motions, and extremely indolent. When employed at any piece of labour, if the master with- draws his eye for a moment, they cease to work. They are timid, shy, secretive, and always grave, even in the dances, which are their favourite pastime. The love of intoxicating liquors is deeply rooted in their nature. They prepare a fermented beverage called chicha from maize, by a process known to them before the conquest, and at their festivals drink till their senses fail them, day after day. This vicious habit, however, is common to all the American nations, and is confined to the men, for the women are in general strictly sober. The Peruvians are a gentle and mild people ; they are fond of their dogs, and breed up hogs, geese, and chickens, for which they have so tender a regard, that they will often neither kill nor

sell them. Their huts, says Mr Stevenson, consist of stones laid upon one another without any cement or mortar, thatched over with long grass or straw, affording

no defence from either the wind or the rain. One small room contains the whole family; their bed a sheep-skin or two; their furniture one or two earthen pots. The principal food of the Peruvians is maize ; but they raise also potatocs, wheat, beans, tomatos, yucas, pumpkins, and other vegetables. Christianity, imposed upon them dogma- tically, by priests who take no pains to enlighten them, has scarcely gained admission to their understandings, and has no hold on their affections. They attend divine service from the dread of chastisement, and give an out- ward assent to whatever they are taught, but without any real religious impression being made upon their minds, They meet death with the same stupid indifference as the ordinary accidents of life, and rather decline than seek the assistance of a priest in their last hours, It ought not to be forgotten, however, that the intellectual torpor which the Peruvians display may be attributed in part to the deadening and debasing effects of three centuries of brutal oppression. They still cherish in secret a strong venera- tion for their ancient faith and their native government, which displays itself even in the large towns. The story of Manco Capac (whom, since numbers of our countrymen appeared in Peru, they affect to call an Englishman) and Mama Ocello, the wealth, power, and beneficence of the Incas, are still fresh in their memories, and are handed down from father to son with a degree of fond admiration which three centuries of humiliation and misfortune seem only to have rendered more intense. The barbarous murder of the Inca Atahualpa by Pizarro is annually represented in the form of a tragedy. "In this performance," says Mr Stevenson, "the grief of the Indians is so natural, though excessive, their songs so plaintive, and the whole is such a scene of distress, that I never witnessed it without mingling my tears with theirs. The Spanish authorities have endeavoured to prevent this exhibition, but without

effect. The Indians in the territory of Quito wear black clothes, and affirm that it is mourning for their Incas, of whom they never speak but in a doleful tone."

The oppression of the mita, or forced labour in the Populatio

mines, with the introduction of the small-pox and the use of spirituous liquors, has destroyed prodigious multitudes of the Indians since the conquest. What their number was before that event it is impossible to tell ; but, judging from the extent of the Inca's dominions, he probably had not less than three or four millions of subjects. A pre- tended Spanish account, assigning a population of eight millions to Peru shortly after the conquest, is known to be fictitious. An official estimate in 1862 made the num- ber of Indians'in Peru amount to 1,600,000, being three- fourths of the entire population.!

Jn Chili there were several tribes who possessed nearly Chili.

all the arts known to the Peruvians, but were distin- guished from them by a finer physical constitution and an unconquerable spirit. When the Spaniards arrived, Chili, according to Molina, was inhabited by fifteen tribes independent of each other, who were spread over the country on both sides of the Andes, from latitude 30° to the Strait of Magalhaens. They all spoke dialects of one language, which is described as rich, harmonious, abound- ing in compound words, and having, like the other Ameri- can tongues, very complicated grammatical forms. It has no affinity to the Quichua or Peruvian. The inhabitants of the plains are a stout people, of middle stature ; those

1 Jn this account of the Peruvians we have chiefly followed Garci- lasso, Acosta, Frezier, and Ulloa, of whose statements a copious digest is given by Prevost in the 13th volume of his Histoire Générale des Voyages. We have also taken some facts from Humboldt's Researches, Balbi's Ethnographical Atlas, and W. B. Stevenson's Narrative of Twenty Years' Residence in South America, a useful work, although the author lias shown rather too great an anxiety to exalt the character of the Indians,

of the mountains are tall; and one tribe, the Tehuels or Patagonians, surpass in size every other nation in the world. All the tribes inhabiting the plains, except those of the extreme south, now make use of horses. The com- plexion of the Chilian tribes is, like that of the other American nations, a reddish brown ; but one tribe is said to be of a clear red and white. They do not paint their bodies. The Chilians lived partly by hunting, but chiefly by agriculture, before they had any intercourse with Europeans. They cultivated maize, magu, guegen, tuca, quinoa, the potato, pumpkins, and some species of pulse; and to these they added, as food, the flesh of the biz. eacho, and of the llama or Araucanian camel, of whose wool they are said to have manufactured cloth, Like the Peruvians, they understood the use of manure, prac- tised irrigation with considerable skill, and turned up the ground with a wooden spade or mattock. They boiled their grain in earthen pots, or brayed it into meal after roasting it in hot sand ; of the meal they made puddings or bread, which they knew how to leaven, and various species of fermented drink. They had gold, silver, copper, tin, and lead, procured probably by washing; but they seem to have had few or no edge-tools of metal, those found being almost always of basalt. They made baskets and nats, extracted salt from sea-water, and were able to give various dyes to their cloths. They used guipus or knotted cords for calculation, and, according to Mr Stevenson, for the transmission of intelligence and for recording events, They lived in villages formed of houses standing at a distance from one another, under hereditary chiefs, but whose power was limited. It is remarkable that the Chinese mode of catching wild ducks on the rivers, by covering the fisher's head with a gourd, was practised in Chili.

The Araucanians, the most intelligent, improved, and warlike of the Chilian tribes, occupy about 200 miles of the sea-coast, between the 37th and 39th parallels. They are of ordinary stature, but vigorously formed ; bold, hardy, hospitable, faithful to their engagements, generous to a fallen enemy, ardent, intrepid, and enthusiastic lovers of liberty. Their vices are drunkenness, and a contempt of other nations, springing from pride. Their govern- ment, in the regularity of its form

and its sub-division of authority, has an outward resemblance to the Peruvian ; but the spirit of the two systems differs as widely as the genius of the two nations. Araucania contains four tetrarchies, under four toguds or princes, who are inde- pendent of one another, but confederated for their joint security against foreign enemies. Each tetrarchy is divided into five provinces, ruled by five chiefs called apo-ulmen; and each province into nine districts, governed by as Many uwlmen, who are subject to the apo-ulmen, as the latter are to the toquis. These various chiefs (who all bear the title of ulmen, as our nobility of all orders are barons) compose the aristocracy of the country. They hold their dignities by hereditary descent in the male line, and in the order of primogeniture. The supreme power of each tetrarchy resides in a diet or great coun- cil of the ulmen, who assemble annually in a large plain, like the Poles and Germans in old times; but as the people are all armed, and have a high love of liberty, no resolution of the diet is of any avail if it has not their hearty roneurrence. The chiefs, indeed, are little more than leaders in war ; for the right of private revenge, which is fully admitted, limits their authority in judicial mat- ters; and they receive no taxes, Their laws are merely primeval usages. The Araucanians can raise altogether 6000 or 7000 men, besides a body of reserve. When war 1s declared by the great council, messengers bearing "ar- Tows dipt in blood" are sent to all parts of the country

to summon the men to arms. Unlike many barbarous nations, which are immovably attached to their ancient cus- toms, the Araucanians were not slow in copying the mili- tary arts and tactics of the Spaniards. Their troops now consist of infantry and cavalry; the former armed with pikes or clubs, the latter with swords and lances, The infantry are formed into regiments of ten companies, each company containing a hundred men. When they take the field, they carry parched meal with them for provisions s they station sentinels, send out scouts, and have advanced guards preceding their main body.

When necessary for their security, they dig ditches, and plant stakes along their sides, and throw up mounds of earth. They advance to battle in lines, well formed, and fight with intrepidity. Their history affords a brilliant example of what a brave nation, animated by an enthusiastic love of liberty, can accomplish under the greatest disadvantages. After re- sisting the best troops and the best generals of Spain for two hundred years, they at last compelled their proud enemies to acknowledge their;independence. The Arau- canians were indebted for./their success to a deliberate species of courage, to which even the bravest of the North American tribes arestrangers ; and they combined with ita degree of sagacity and intelligence which led them to adapt their mode of fighting to the new circumstances in which they were placed. Experience having taught them the inefficiency of their old missiles when opposed to musket balls, they soon laid aside their bows, and armed them- selves with spears, swords, or other weapons fitted for close combat. Their practice was to advance rapidly within such a distance of the Spaniards as would not leave them time to reload after firing. Here they received without shrinking a volley, which was certain to destroy a number of them, and then rushing forward in a close column, fought their enemies hand to hand. In this way they gained many victories, and impressed the Spaniards with such a respect for their courage that an individual of that nation made their achievements the subject of an epic poem. Combining the moral, intellectual, and physi- cal qualities of the Araucanians, they were certainly the finest native race in the New World. They had nearly all the germs of civilisation which belonged to the Mexi- cans and Peruvians, without the ferocity of the former, the apathy of the latter, or the slavish habits common to both 3 and without having their minds stupified by that grovel- ling superstition which the rulers of these two nations seem to have considered as the only secure foundation of their authority. In true courage, in manliness and energy of character, they take precedence of all the American nations,

The Araucanians believe in a supreme being, and in many subordinate spirits, good and bad. They believe also in omens and divination, but they have neither temples nor idols, nor religious rites; and discover upon the whole so little aptitude for the reception of religious ideas

that the Catholic missionaries who have settled among them have had very little success in imbuing their minds with a knowledge of Christianity. They believe in a future state, and have a confused tradition respecting a deluge, from which some persons were saved on a high mountain. They divide the year into twelve months of 30 days, which have significant names, and add five days by intercalation. They esteem poetry and eloquence, but can scarcely be induced to learn reading or writing. Chess, a game of oriental origin, is said to have been known among them from time immemorial ; and it may be further observed, that the numbers 5 and 9, employed in their geographical and civil divisions, are favourite num- bers in China.

The other Chilian tribes are all much behind the Arau-

Patago- uilans.

Indians of Brazil : Guaranis.

canians in civilisation; but some, as the Puelches and the Tehuels, surpass them in strength and stature. Part of them live on horse flesh, part by keeping sheep and cattle, and part by hunting. Some of these tribes paint their faces. With regard to the height of the Patago- nians, M. Lesson, an eminent Freuch naturalist, has col- lected the authorities on the subject in a note published by Balbi in his Ethnographical Atlas ; aud they appear to us to remove every rational doubt as to the fact of a race of men existing there whose average stature is about six feet, and among whom men seven feet high are perhaps more frequently to be met with than among an equal nuin- ber of men in any other country. They have large heads, but their hands and feet are small, and thcy are not strong in proportion to their tall stature. They ride on horse- back, and hunt the huanaco or the ostrich with a sling, which they cast so as to entangle the animal's legs. They dwell in tents, and lead a wandering life.

Of the nunierous nations that inhabited Brazil there is only one to which we can afford any special notice in this article. The Guaranis

have at one time formed a numerous people, which seems to have becn spread over a larger surface than any other now existing in America. Tribes, or remnants of tribes, whose relationship to the Guaranis is attested by the stroug evidence of their lan- guage, are found diffused over the wide space between the Orinoco and the embouchure of the Plata, or more than the half of South America. They are met with among the Andes of Peru, in the province of Chiquitos, in Matto Grosso, in Paraguay, in Minas Geraes ; and the Omaguas, in the republic of Ecuador, who, from their nautical habits, and the influence they obtained on the upper part of the

_Amazon, have been called the Phoenicians of the new world,

are believed to be of the same race. They constituted the bulk of the native population of Brazil when the Portu- guese gained possession of it, but were divided into many distinct tribes, quite independent of one another, and living, not in contiguity, but mixed with other nations. They are of low stature, two inches shorter than the Spaniards, according to Azara; of a square form, fleshy, and ugly. Their colour has a strong shade of the copper red, while that of the other Brazilian tribes inclines generally to the tawny or black. Their character, like their physical form, resembles that of the Peruvians. They are patient, tor- pid, silent, downcast in their mien, mild, and passionless. Nearly all the Indians whom the Portuguese have civi- lised or converted belong to this race. It is difficult to account for their dissemination through the southern con- tinent, amidst nations much more brave and powerful than themselves. May we suppose that, like the subjects of the Incas, they had been at one time the dominant tribe of an extensive empire, which derived its force from union and civilisation? But if such a state did exist, its date cannot be very ancient; for the identity or close resemblance of the dialects spoken by the scattered portions of the Guaranis shows that their dispersion from a com- mon point did not happen at a very remote period! Yet no memorial of its existence survives, either in traditions or monuments. The supposition, therefore, that the Guarani tribes are the remnants of a once powerful and united people, is scarcely admissible ; and Azara thinks it more probable that they have crept gradually from uorth to south. Their dispersion is the

more remarkable, as they are not a wandering but an agricultural people. They live in the woods, or in small open spaces in the forests ; cultivate maize, beans, gourds, yams, mandioc; and eat also wild honey, and the flesh of monkeys and various small quadrupeds.

1 Dr Prichard's Researches, vol. ii. p. 487.

*The Indians whom the Jesuits civilised and collected Paraguay into communities in the celebrated settlements of Para- mission guay belonged chiefly to the nation of the Guaranis, *t#e 'These missionaries are said to have borrowed the plan a of the theocracy which they established here from that which the Incas had introduced into Peru. There is no doubt that the spirit of their system was the same; and, considering that they were precluded from any other means of extending and supporting their authority than persuasion, their success was remarkable. The settle- ments were commenced about 1610, and were gradually extended over the country watered by the Parana and Uruguay, between the 27th and 30th degrees of south latitude, till the order of the Jesuits was suppressed in 1767. The plan of the government may be called paro- chial, for it was administered entirely by the parochial clergy. The Indians were collected into villages. Each village had its church and its curate, wha was assisted by one, two, or more priests, according to the number of In- dians under his charge. The curate and assistant priests were nominated, not by the Spanish authorities, but by the father superior, also a Jesuit, who exercised a vigilant*

| superintendence over the whole. Indians were appointed

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'tion, as Raynal says, for the quicting of their consciences,

in each village with the titles of regidors and alcaldes ; but they were merely instruments in the hands of the curate and his assistants, in whom all power was lodged. The curate gave his whole attention to religious offices, saying mass in the church, and visiting the sick ; while the assistant priests managed all secular matters, direct- ing the

labour of the Indians who cultivated the ground, and training others to the crafts of the weaver, mason, carpenter, goldsmith, painter, and sculptor; for the fine arts were by no meaus neglectcd. Private property did not exist. The produce of the labour of the community was stored in magazines, from which each family was sup- plied according to its wants, special provision being made for aged persons, widows, and orphaus. The surplus was | sold by agents at Buenos Ayres, and the procceds em- ployed in paying the taxes to the king, in procuring or- naments for the churches, and various articles which the colonists could not manufacture for themselves, The religious instruction was of the most simple kind ; but the service of the church was conducted with a well-trained choir, a pompous ceremonial, and every accessory calculated to strike the senses. The punishments were mild; and they were always accompanied with such admonitions as a parent would address to a child whom he was chastising. Crimes, in truth, were rare. The Indians, who regarded their spiritual chiefs with the veneration due to beneficent beings of a superior order, scarcely felt humbled in confess- ing their misdeeds ; and offenders may have solicited correc-

The incursions of the Portuguese compelled the Jesuits to take means for repelling force by force. All the male Indians of the proper age were accordingly armed with muskets, and disciplined as a militia. In 1732, according to Dobrizhoffer, the thirty villages or parishes under the care of the missionaries contained a population of 141,000 souls. The Jesuits had another establishment of the same kind among the Chiriguas, a branch of the Guara- nis, in the province of Chiquitos, containing 30,000 or 40,000 Indians ; a third, of smaller size, in the province of Moxos; a fourth in California ; and probably others. After the suppression of the order, all these were com- mitted to the care of friars of other descriptions ; and we believe they have universally fallen into a state of decay. The social system established in Paraguay was the most effectual ever contrived for reclaiming the Indians from their savage mode of life ; but even its success shows how hopeless the attempt is to raise the American tribes to

the rank of thoroughly civilised nations, The Jesuits were able to introduce settled habits and a slight know- ledge of religion and the arts among the Indians only by means of the personal ascendancy they acquired over them. It was a few superior minds gaining the respect and confidence of a horde of savages, then employing the influence they acquired to lead them as children ; giving them such portions of instruction as taught them to trust implicitly in their guides, working alternately on their fears, their pride, their kind affections, but never fully revealing to them the springs of the machinery by which they were governed. The incurable indolence of the savages rendered it necessary to prescribe the labour as task-work, and to carry it on under the constant in- spection of the missionaries. The plan of cultivating the ground in common, and of storing the produce in- maga- zines, out of which the wauts of each family were supplied, was resorted to as a check upon their improvident habits. In short, the eye and the hand of the missionaries were everywhere ; and the social system was held together en- tirely by their knowledge and address. When these were withdrawn, the fabric soon fell into ruins, and the Indians relapsed into their idolatry and savage habits. Other races 'To complete our general view of the aboriginal races, a of Indians. few particulars remain to be mentioned. Many of the tribes who inhabit the Pampas of South America make use of horses. Dobrizhoffer enumerates eight equestrian tribes in the province of Chaco, on the west side of the river Paraguay, who are generally distinguished by tall and vigorous forms, and a bold and active character. The Abipones and Mbayas are the most celebrated of these. The woods of Brazil are too dense for eques- trians; but horses are used by a few hordes in the great plain of the Mississippi and in the north of Mexico. The American tribes in general either kill their prisoners or adopt them; but a few retain them as slaves, and compel them to work. The Guaycurus of Brazil are an example. The food of different tribes is extremely va- tious. Maize, beans, pumpkins, and mandioc are raised in small quantities by some; natural fruits, berries, bulbous roots, and bananas are gathered by others. Those who dwell on the sides of rivers live greatly on fish; in the plains, buffaloes, horses, and sheep are killed. In the) forests of Brazil, monkeys, pigs, armadillos, pacas, agoutis, | and tapirs are the favourite food ; but birds, turtles, | i |

ing it. with leaves so as to form a screen on the windward side, while it is left entirely open on the other. The manufacture of bows and arrows, war-clubs, baskets, mats (which, swung from a tree, serve them both as seats and hammocks), and in some cases a coarse pottery, comprises the sum of their practical skill in the arts. Tt has long been the practice of bands of Portuguese, con- sisting chiefly of outlaws and vagabonds, to make maraud- ing expeditions among the Indians living near the great rivers, and to carry them off and sell them clandestinely for slaves. This infamous trade is carried on in despite of the orders of the government, which has issued many decrees for the protection of the Indians, and, besides employing missionaries to convert them, enjoined the governors of provinces to furnish them with hoes and other agricultural implements. Wherever the negroes are introduced in great numbers, as in the Capitanias of Santo Paulo and Rio J aneiro, and in the whole of the West India islands, the aborigines rapidly disappear, the former being more intelligent, more tractable in their habits, and more active and industrious. The negroes are indeed a superior race to the Indians 3 and the existence of one or two hundred blacks, as slaves, among some thousands of the Cherokees, does not detract froni the accuracy of this opinion. Missions for the conversion of the Indians have been supported for more than two centuries by the goveruments of Spain and Portugal. They are thinly spread over those parts of Mexico, La Plata, Peru, Brazil, and Co- lombia, which are still occupied by the savages; but there are extensive districts in all these provinces in which they have never been established, owing to the fierce character of the tribes, or the remote and inaccessible nature of the country. A mission consists in general of one or two ~ friars or priests, who settle among the savages, learn their language, and, besides teaching them the elements of Christianity, always endeavour to instruct them in the more simple and useful arts, and to train them to settled habits. We believe that many of these establishments have been abandoned, owing to the failure of the funds with which they were supported; and that the success of the others has been extremely trifling. The late revolutions in those countries, by liberating the Indians from their ancient state of tutelage under the whites, have in many cases broken up the little settlements which the mission. aries had formed. This has been the result even in Brazil, where the political

changes have been least felt, ; Owing to the fanaticism of the Spaniards alarge propor- tion of the manuscripts of the natives were destroyed, so that now we are unable to acquire so full and accurate a history of the more civilised nations as we might otherwise have done. The literature which still exists, together with the numerous remains of cities, temples, roads, bridges, and other works of art, testify to the general truth of the his- torical narratives. However obscure they may now be, or Traditional however difficult the reconciliation of statements, it seems history of clear they have been founded on facts. As in the case of pee other histories, there is much error and tradition, mingled _ with truth, which renders their correct interpretation diffi- cult. Amongst some of the nations we know that historians were appointed by the government, and that such historians were severely punished if they ventured to tamper with the truth wilfully. The best connected account of these his- tories, so far as concerns the nations of Central America, is that given by the Abbé Brasseur de Bourbourg.! If we 80 entirely naked, except in the neighbourhood of the | credit the native accounts, the earliest traces of civilisation Portuguese settlements, where some wear a band of cloth originated in Yucatan and the neighbouring districts, a — the loins. In such situations, where the want of | region which is amongst the most fertile in the New World. fe. little felt, their dwellings one etten ee " Histoire des Nations civilisées du Mexique et de l Amérique centrale,

more than a sort of arbour formed by interlacing the open durant les siacles antérieurs a Christophe Columb. 4 tomes, 8yo. Space between two or three trees with twigs, and cover- | 1857-59,

deer, and the coati are also taken ; and in an emergency the Indians do not scruple to feed on serpents, toads, and lizards, the larvze of insects, and other disgusting sub- stances. Salt is used where it can be easily obtained, and some season their food with capsicum. Some roast their meat, others boil it; and not only several savage tribes, but even the civilised Peruvians, ate their flesh raw. The Ottomaques, a tribe near the Orinoco, eat a species of unctuous clay; this strange diet, which no doubt owed its introduction to the stern monitor famine, i$ not extremely rare in Brazil, and Captain Franklin found the same food in

use among an Indian tribe near the Frozen Ocean. The clay is stated by that traveller to have a milky and not disagreeable taste. A great | Proportion of the tribes in Brazil and the basin of the Orinoco, and some in other parts of America, indulge in the horrid banquet of human flesh. Shame, in our sense of the term, is nearly a stranger to the breasts of these sa- vages. Inthe warm regions of Brazil men and women

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It is stated that many centuries before the Christian era, Votan, the oldest of the American legislators, established himself in the region watered by the rivers Tabasco and Usumasinta. It is near the sources of this latter river, in the highlands of Vera Paz, that cities of civilised Indians still exist, according to travellers who have recently visited the adjoining districts. However this may be, this river was the principal highway into the interior of Central America for the earliest civilised tribes, as it is now for the existing natives. Near the mouths of the rivers mentioned the ground is scarcely above the level of the sea, and is for the most part a recent alluvial formation. During the rainy season it is covered with water, and all intercourse between village and village takes place by water. Just where the land acquires a slight rise, Palenque, said to be the oldest city in Central America, was founded. At this time, according to the tradition, the low land was occupied by a lake. Votan, it seems, came from some foreign land, and found the whole of the country from Darien to California occupied by a barbarous people, who used the skins of wild beasts for clothing, caverns and huts made with branches for shelter, and wild fruits and roots, with raw flesh, for food, Votan announced to these people a knowledge of the Supreme Deity, who was at first worshipped as the God "of all truth." At first no temples or altars were dedicated to him, and it was not until long after that Nezahualcoyotl erected a teocalli, or "house of God," as it means in the Mexican language, and dedicated it "to the unknown God." At a later period the religious ideas were considerably debased. In Votan's time there seems to have

been but one language prevalent over a large area, and this language was probably the Maya, which is the stock of many of the languages formerly in use among the natives, and is still the language of Yucatan. The people apparently formed tribes differing somewhat in manners, the most prominent of which tribes are referred to as the Quinames or giants. Votan and his companions arrived in large ships, wore long flowing garments, and spoke the Nahuatl language. These strangers married the daughters of the country, and established a settled form of government. According to one document, the year 905 B.C. is assigned to these events; but it is quite imprac- ticable to give any trustworthy fixed date. Votan, it is said, wrote an account of the origin of the Indians, and of their immigration into America. He attempted to prove that they were the descendants of Imos, of the race of Chan, or the serpent. Votan made four voyages to his original country, and described the route he followed. On one of these voyages he visited the dwelling of the thirteen serpents, as also the ruins of an old building which had been erected by men for the purpose of reaching heaven. The people who lived in its vicinity told him it was the place where God had given to each family its particular language. Allusion is also made by him to certain mysteries like those of Egypt and Greece, of which traces were still discoverable amongst the civilised nations of America. On returning from his first voyage to his native country he found the people at Palenque had attempted to usurp his authority and overturn his power. Thereupon he parted his monarchy into four divisions. One of these had for its capital the town of Tulha, the ruins of which may be seen near Ocosingo in Chiapa. Votan also is the reputed founder of Tsequil, which was afterwards called Ghowel, and the site of which is now occupied by a suburb of Ciudad Real. Some time, pos- sibly not many years, after Votan, Zamna appeared in Yucatan. He introduced the Maya civilisation, founded the town of Mayapan, and called the country Maayha, or land without water, a term well applied to the extremity of the peninsula of Yucatan, where rivers are almost absent.

AMERICA

[TRADITIONAL HISTORY.

Mayapan was once the capital of Yucatan, and in Zamna's time the sea covered the country to within a short distance of it. He lived to a great age, and during the later years of his life dwelt on the sea-coast, and was buried at this place. The spot became the site of a large temple erected to his honour, which was visited by pilgrims from great distances. A town sprung up around it called Itzamal, which is believed to correspond with the modern Isamal, now about 30 miles distant from the sea. The region to seaward is reported to be geologically very recent as land, and the remarkable absence of names of any antiquity in a country whcre almost every locality has its appellation is some confirmation of the traditions. The architectural character of the oldest towns also lends some support to the considerable antiquity claimed for them. The forest-covered ruins of Mexico and Central America present so many different architectural styles that it seems very probable they were built at different periods and by different people. Those which appear to be the oldest, and which are most uniform in style, are the substructures in Mayapan, some of the buildings in Tulha, many of those in Palenque, and others which occur in the country of the Lacandons.

The names of the successors to Votan are mentioned, but without details. One of the last of the dynasty was Chinax, in whose reign mention is made of the Nahuatl people. Not long after his death, this people, who were called Nahoas or Toltecs, obtained the dominion of the country, and the throne was occupied by Nahoa princes. They originally came from Huehue-Tlapallan (but where this country was situated is not known), having been induced to leave it in consequence of a revolution. This event seems to have occurred shortly before the Christian era. The journey to America from their native country was a long and painful one, and indicates that seas and lands intervened between them. The traditions report it to be in the far east, and that the first comers filled seven ships and disembarked at Tampico, near the mouth of the Panuco. The leader of the band bore the title of Quetzalcohuatl, and was the first known by that name. They then coasted along the shore as far as Tamoanclia, which place was evidently somewhere near the mouth of the Tabasco. In this district there was a tradition in the time of the Spaniards that twenty

illustrious chiefs from the east landed there many centuries before, who had long flowing garments and large beards, of whom the principal was Cukulcan, a name which has the same meaning as Quetzalcohuatl. Quetzalcohuatl and his comrades soon obtained possession of the capital of the country, Xibalba, which is believed to be the same as Palenque. Their success induced others of the Nahoa nation to join the first colonists, and their power gradually spread over a large portion of Central America. The strangers, however, met with considerable resistance from the princes of Xibalba, who compelled the Nahoa to leave their country and disperse themselves over the surrounding region. This dispersion is stated to have occurred in A.D. 174. Before this date, the lunar calendar, so prevalent among the civilised nations of America, was introduced. It was one of these parties of _Nahoa that established itself in Mexico, and founded many of the more im- portant cities. They were called Olmeques, and were led by Olmecatl and Xelhua. The latter was one of Quetzal- cohuatl's companions, and was once shipwrecked along with him. In order to commemorate his delivery he erected the great pyramid of Cholullan. Before the arrival of the Olmeques the valley of Mexico was inhabited by the Quinames or giants, and they continued to dwell in the mountains around for centuries after they had been driven from their native valley. The Totonacs, Mixtecas, and Othomis were the contemporaries, or possibly the

predecessors, of the Olmeques. The first mentioned people erected the pyramids of the Teotihuocan, or the City of the Gods, near Mexico. distinct from the Nahuatl. The Totunacs placed the cradle of their race at Chicomoztoc, which was said to be far to the north ; but the Othomis seem to have been in posses- sion of the land from time immemorial. According to the traditions of the Quiches and other nations of North America, they originally came from Tulan. They allude to several places of this name. Onc was in the region of the setting sun and beyond the sea; and another, from which the Quiches came, was also in the direction of the setting sun and was apparently situated in California. In the descriptions given of the migrations from

the more distant Tulan, which seem to have occurred at frequent intervals, each migration consisting of a moderate number of people, the difficulties and hardships are prominently noticed. They pointedly allude to the intense cold,-to the long dak night, and to the sterility of the country, which allusions seem to point to travels in Arctic regions. The travellers were reduced to such extremities as to be obliged to suck juicy woods in order to sustain life. The name Chichimecs, which means suckers of maguey, given to the invading hordes from the north, may have some connection with this traditional fact. Chicomoztoc has been identified by some with the extensive ruins near the Rio Gila, in California. The history of these early nations is somewhat obscure, but it may be gathered from the preserved records that the worship of the sun and the practice of human sacrifice had nearly or wholly superseded the earlier and purer religions. 'Towards the end of the 7th century we first hear of the Chichimecs invading Mexico from the north. This name is a general one given to all invading hordes from the north, and is similar to that of barbarians applicd to the people who invaded the Roman empire. The first invasion was by the Chichimecs-Culhuas, headed by Mixcohuatl Mazatzm. They commenced their march, or rather progress, from Chicomoztoc about 635, and reached the valley of Mexico about 40 years after. After many years' fighting the Toltcc empire was established in about 686 ; and from this period we enter upon more detailed and trustworthy historical ground. At first the government of the Toltecs was republican and theocratical, but it soon became monarchical, and Nauhyotzin was elected the first king. The most illustrious of his successors was Topiltzin Ceacatl Quetzalcohuatl, during whose reign the Toltec empire arrived at its most flourishing condition. According to tradition, the Toltecs were taller and of larger build than the existing Indians, were great runners, and were as white as Europeans. They carried many of the arts to a high state of perfection, such as weaving, building, jewelling, and making ornaments with the feathers of birds. There were astrologers and poets, sorcerers and philosophers and orators. They were well acquainted with the medical properties of plants, and were in the habit of recording in books their observations on dis- cases. uetzalcohuatl's reign was for the most part one of prolonged peace, but this peace was disturbed by the religious party who advocated human sacrifice, a

practice which he used every effort to abolish. 'The rebellion becoming very formidable, Quetzalcohuatl left the country with a few chosen attendants, and founded a new Toltec empire on the plain of Huitzilapan, which corresponds with the one on which La Puebla now stands. This occurred in 895. The town of La Pucbla stands on the site of the old Huitzilapan, and at the time of Quetzalcohuatl's arrival it was said that the pyramids of Cholullan had existed from time immemorial, and had been built by the giants. According to this legend, the country was inhabited by giants, all but seven of whom were either destroyed by a

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These tribes spoke a language quite.

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great inundation or turned into fishes. 'Thesc seven took refuge in a cave, and when the waters abated, one of them, named Xelhua, went to Cholullan, and built the famous pyramid to commemorate his escape. Quetzalcohuatl built a temple here, which he dedicated to the "creator of light," and around this temple sprang up Cholullan, or the "town of the exile." His disciples carried the Toltec civilisation into Oaxaca. After having reigned at Cholullan about ten years, during which period his subjects enjoyed all the blessings of peace, he was attacked by enemies again. Huemac had ascénded the throne which he had vacated, and being jealous of Quetzalcohuatl's power and prosperity, he suddenly resolved to march with his army against Cholullan. In order that the town might be spared the horrors of a siege, Quetzalcohuatl informed his pricsts of his intention to leave the place and to visit other countries, Accordingly he proceeded to the mouth of the Coatzocualco river, then entered a boat with four companions, and nothing more was heard of him. Huemac finding his

| enemy had escaped, wreaked his vengeance on Choluillan, and

took up his residence there with a view to subjugating the surrounding districts. He also re-established the practice of human sacrifice.

During Huemac's absence from his kingdom of Tulan, Nauhyotl was elected king in his stead. A battle took place between the rivals, which resulted in the defeat and subsequent death of Huemac and the establishment of Nauhyotl's power. His reign lasted for fifteen years, and as he was one of Quetzalcohuatl's disciples, he governed according to similar principles, so that the reign was a prosperous one. His death occurred in 945. After this a series of disasters broke over the country, and these, with constant civil war, weakened the power of the empire in Anahuac. This soon became known to other nations, and led to the Chichimecs-Teotenancas leaving their homes in Texas and New Mexico to make an irruption upon the valley of Mexico. This occurred between 1041 and 1047. The internal discord continued, and the disorder was increased by the uprising of the sect of Ixcuinames, the devotees of which practised the most abominable rites. In the midst of this corruption another horde of barbarians, the Teo-Chichimecs, poured down from the north, and took possession of the country. The Toltec power rapidly declined, and the last king of the empire was Huemac Atecpanecatl, who after his dethronement lived for some years at Chapultepec, and dicd there in 1070. According to the Guatemalian traditions, four individuals of the Tutul-Xius, a nation speaking a Nahuatl language, left their country of Tulapan, to the west of Zuyna, in A.D. 174, and arrived the same year at Chacnouitan, which seems to be the name for some place in Yucatan. In 258 another migration of Tutul-Xius occurred, the new colony being established in the province of Zyan-Caan, which is believed to be the district around Chetumal Bay. About the end of the 10th century, it is stated that a venerable personage arrived in Yucatan, called Cukulcan, who retrieved the falling fortunes of the Tutul-Xius. According to the Abbé Brasseur de Bourbourg, this personage was no other than the, Ceacatl Quetzalecohuatl whose departure from the Coatzocoalco river has already been mentioned, After reigning here ten years, he voluntarily abdicated the throne and left the country. According to a Mexican legend he went to Tlapallan, and died there. His successor transferred the capital of the Tutul-Xius from Mayapan to Uxmal, a town which seems to have been founded some centuries before, but which first rose to importance at this period, or near the end of the 10th century. Numerous temples and public buildings were erected, the

ruins of which are now so abundantly met with in Yucatan. Artificial ponds or zonotes were constructed; and the number and magnitude of these indicate a large number of I. -— 89

AMERICA

that the Norwegians must have been ascending through Norwegi Davis' Straits as high as the latitude mentioned, annually, Disco perhaps for two or three centuries, will admit that, with half "°"°

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towns as well as a thickly-populated country. At the present day they have all the appearance of being natural ponds, and indeed were long considered to be such, not-

[DISCOVERY.

withstanding the repeated assertions of the Indians that they had been built by their ancestors, until chance led to the discovery that the muddy floor of one was entirely composed of flat stones, the interstices between which were stopped with a kind of clay not known in the neighbourhood. The centre was occupied by four artificial wells, the walls of which were formed of polished stones. Further research led to the discovery of numerous other zonotes. After the final fall vf the Toltec empire there commenced the great movement of the northern tribes towards the south, a movement which continued throughout the 11th, 12th, and 13th centuries. The movement consisted of a succession of migrations, and its starting-point appears to have been in New Mexico and California, which region was evidently the seat of a semi-civilised empire. Amongst these in- vading tribes was one which subsequently rose to high importance. The Aztecs, or Mexicans proper, were living at Atzlan in the 11th century, a country which was sur-rounded by water, and where their usual occupation was as boatmen and carriers of wood. Other tribes also lived in this region, which is believed to be that of Lower California. The Aztecs commenced their journey towards Mexico in 1090. In 1116 they reached Chicomoztoc, and in 1177 they entered Anahuac. Settlements were gradually estab-lished in the valley, towards which peoples of various nations converged from the south as well as the north. The numbers of the Aztecs were slowly augmented by fresh arrivals ; but it was not until 1325 that they were able to lay the foundations of Mexico-Tenochtitlan, and thus to inaugurate their assumption of power. In 1464 the empire of the Tutul-Xius was overthrown. The Mexican empire had, however, acquired large proportions, and was conducted with a magnificence and splendour scarcely equalled by any other court in America, and this empire continued up to the time of the Spanish conquest.

the spirit of enterprise which had carried them so far, the discovery of some portion of the west coast of these straits was almost unavoidable. Now, the position and direction of this coast once known, it required no great effort to trace it southwards to Labrador and Newfoundland. We mention these particulars because Mr Murray, one of the few who

have denied the discovery of America by the Norwegians, grounded his disbelief chiefly on the hypothesis that the colonies and the navigation of that people at the period alluded to were confined to the east coast of Greenland.

In 1001 an Icelander, sailing to Greenland, was driven away by a tempest far to the south-west, where he saw a level country covered with wood. The wind abating, he turned his course homeward, and on his arrival gave such a flattering account of the country he had seen as induced Lief, the son of the founder of the Greenland colony, to undertake a voyage thither. Lief and Bjorn, who sailed together, first reached a rocky island, to which they gave the name of Helluland ; then a low country, thickly wooded, which they called Markland ; and some days afterwards they found trees loaded with fruits on the banks of a river. They

spent the winter in the country ; and one of them, who was –

a German, having found wild vines growing, they called it Vinland. They had some intercourse and‘ traded for furs with a people who came in leathern boats, and were called Skreelings, from their dwarfish size. A colony was planted, and remained for many years in the country, the situation of which is indicated by a fact casually mentioned, that the sun remained nine hours above the horizon at the shortest day. This indicates the 41st parallel of latitude;.and the actual latitude of Rhode Island, the country which every col- lateral circumstance would lead us to fix upon as the seat of the colony, is from 41° to 42°. The Skreelings were of course the Esquimaux.? The vine appears to be the fox grape (Vitis vulpina), which grows wild in that part of America,

Discovery The discovery of a continent so large that it may be said | Only a few unimportant particulars respecting the settle- “_ ene to have doubled the habitable world, is an event so much | ment are preserved ; but it was probably abandoned or y Euro-

peans.,

the more grand and interesting that nothing parallel to it can ever occur again in the history of mankind. America had of course been known to the barbarous tribes of eastern Asia for thousands of years ; but it is singular that it should have been visited by one of the most enterprising nations of Europe five centuries before the time of Columbus without awakening the attention of either statesmen or philosophers. Iceland was discovered about 860, and colonised by the Nor- wegians in 874. About 50, or, according to other accounts, 100 years later, the same people planted colonies in Green- land. Into the disputes respecting the situation of these colonies we have not room to enter. Sir Charles Giesecke, a good authority, states that their ruins exist near the south- crn point of the peninsula. It is obvious that the same ad- venturous spirit which enabled these northern mariners to discover the southern extremity of the country, would not permit them to stop short without visiting what is nowknown to be the most habitable part of it—the western coast ; and the fact has been established by an inscription in runic cha- racters found on a stone four miles beyond Upernavik, at the 73d parallel, intimating that " Erling the son of Sigvat, and Enride Oddsoen, had cleared that place and raised a hillock on the Friday after Rogation day." The marking of the date is indistinct, but it is supposed by Professor Rask, the translator, to be either 1135 or 1170 ; and the runic characters show at any rate that it was anterior to the Refor- mation, when this mode of writing was prohibited.! Whoever looks at the map of Greenland, and reflects on the fact OE

1 Ferussac, Bulletin des Sciences Historiques, Julliet 1828.

destroyed, like the Greenland colonies, of which it was an offset. The account, though meagre, is distinct and consis- tent. Its authenticity can scarcely be disputed ; and it is almost equally obvious that the country it refers to under the name of Vinland is in the vicinity of Rhode Island. A conclusion resting on such strong grounds scarcely requires to be supported by the high authority of Humboldt and Malte-Brun. That the colony disappeared, and that the discoveries made were not prosecuted farther, are not cir- cumstances which will shake the credit of the narrative in the minds of those who know the numerous

reverses which befell the early colonies in New England and other parts of America. The hostilities of the Skrelings was no doubt the principal cause of the abandonment of the colony. The Norsemen describe Vinland as a rich country, with a de- lightful climate. Helluland, Markland, and Vinland, were no doubt regarded as countries either connected with or similar to Greenland, the flattering descriptions of which, given by the first discoverers were sadly belied by later ex- perience. The interest excited by the obscure accounts

2 See the curious work of Torfeus called Vinlandia Antiqua, Hafn, 1705 ; and the valuable Antigquitates Americanc, published at Copen- hagen in 1887. Also Humboldt's Cosmos, vol. ii. p. 283, Sabine's transl. 1848.

3M. Rafn, a Dane, who was much engaged in researches respecting these early voyages, announced that he had ascertained, from original documents, various facts previously unknown; among others, that America (first discovered in 985) was repeatedly visited by the Ice- landers in the 11th, 12th, and 18th centuries ; that the embouchure of the St Lawrence, and in particular the bay of Gaspe, was their principal station ; that they had penetrated along the coast as far south as Carolina; and that they introduced a knowledge of Chris-

of these countries was probably such as the announcement of a new island eastward of Spitzbergen would produce at the present day. No reasonable doubt can exist, however, that the north-eastern portions of America (considering Greenland as a distinct country) were familiarly known to the Norwegians in the eleventh century.

The obscure allusions of Aristotle, Plato, and Seneca, to a country hid in the Western Ocean, must have derived fresh

~ importance from the discovery of the Canary Isles, Madeira,

and the Azores in the early part of the fifteenth century. The love of maritime adventure was excited by these events ; and among the active spirits who were attracted to nautical life by the career of distinction which was then opened up, was Christopher Columbus. Our limits do not permit us to enter into details respecting this great man, an outline of whose life will be found under the proper heading. He had received a learned education, and the study of the geographi- cal systems then in vogue impressed him with a strong con- viction that a voyage to India by a course directly westward was quite practicable with the degree of nautical science which his contemporaries possessed. From the old and im- perfect maps of Ptolemy he was led to believe that the parts of the globe known to the ancients embraced 15 hours, or 225 degrees of longitude, which exceeds the truth by more than one-third. The discovery of the Azores on the west side had lengthened the space by one hour; and the accounts gleaned by Marco Polo in Asia induced him to think that the isles connected with this continent stretched out so far to the eastward that their distance from Europe could not be great. Columbus was, however, without the fortune neces- sary to fit out ships ; and when he attempted to interest some of the princes of those times in his project, he encountered neglects and difficulties which would have exhausted the patience of any mind less ardent than his own. At length, after many delays and discouragements, Ferdinand and Isa- bella of Spain supplied him with three small vessels, two of them only half-decked ; and in this little armament, accom-

opinion of Martin Alonzo Pinzon, and steered to the south- west. The effect of this change in his course curiously ex- emplifies the influence of small and apparently trivial events on the world's history. If Columbus, resisting the counsel of Pinzon, had kept his original route, he would have en- tered the warm current of the Gulf Stream, have reached Florida, and thence perhaps been carried to Cape Hatteras and Virginia, The result would probably have been to give the present United States a Roman Catholic Spanish popula- tion, instead of a

Protestant English one, a circumstance of immeasurable importance. Pinzon was guided in forming his opinion by a flight of parrots towards the south-west. Never, says the Prussian philosopher, had the flight of birds more important consequences. It may be said to have de- termined the first settlements on the new continent, and its distribution between the Latin and Germanic races, It was on the 12th of October that the western world revealed itself to the wondering eyesof Columbus and his companions, What a triumph for this extraordinary man, who had trea- sured in his breast for twenty years, amidst neglect, dis- couragement, and ridicule, the grand truth which his own incomparable skill, wisdom, and firmness had now demon- strated in the eyes of an incredulous world! The spot which he first touched was Guanahani, or Watling Island, as was suggested by Mufioz in 1793, and proved by Mr R. H. Major in 1870. After spending nearly three months in visiting Cuba, Hispaniola, and other isles, he returned to Spain. He made three other voyages, and in the second coasted along a part of South America, which he rightly judged to be a continent from the volume of water poured into the sea by the Orinoco. But he died ignorant of the real extent and grandeur of his discoveries, still believing that the countries he had made known to Europe be- longed to that part of Eastern Asia which the ancients called India. Hence the name of West Indies which the tropical islands and part of the continent have ever since received,

panied by 120 men, he set sail from the port of Palos on the 3d of August 1492. He proceeded first to the Canary Isles, where he was detained three weeks in repairing one of his

We should extend this article to an unreasonable length Progress cf were we to describe in detail the discoveries and settlements discovery

made by the several nations of Europe in America. We is 1c °

vessels. On leaving these isles he entered on a region of ocean where all was mystery. The trade-wind, however, bore him steadily along, and the labour of the ships pro- ceeded cheerfully, till the increasing length of the voyage, the failure of prognostics which had from time to time kept alive the hopes of the crew, and various circumstances interpreted

by their superstition as evil omens, produced a mutinous spirit, which all the address. and authority of Co- lumbus would not have been able to quell had the discovery of land happened one day later than it did, Columbus, says Humboldt, on sailing westward of the meridian of the Azores, through an unexplored sea, sought the east of Asia by the western route, not as an adventurer, but according to a pre-conceived and steadfastly-pursued plan. He had on board the sea-chart which the Florentine astronomer Toscanelli had sent him in 1477, If he had followed the chart, he would have held a more northern course, along a parallel of latitude from Lisbon. Instead of this, in the hope of reaching Zipangu (Japan), he sailed for half the distance in the latitude of Gomera, one of the Canary Islands, Un- easy at not having discovered Zipangu, which, according to his reckoning, he should have met with 216 nautical miles more to the east, he after a long debate yielded to the

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tianity among the natives. The announcement was contained in a letter addressed to a person in Washington, and published in Nile's Register (Baltimore), in November 1828. But M. Rafn afterwards found reason to change his opinion as to the site of the Icelandic colony, and he latterly considered that it was at the mouth of the River Taunton, which falls into the sea in Narraganset Bay, at the north end of Rhode Island.

shall therefore confine ourselves to a very brief chronologi- cal notice of the more important events.

1495. The first place in which the Spaniards established their power was the large island of Hayti or Hispaniola, which was inhabited by a numerous race of Indians of a mild and gentle character, a third part of whom are said to have perished within two or three years after the Spaniards conquered them.

1497. John Cabot discovered Newfoundland June 24th, and coasted along the shores of North America to Florida.

1498. Columbus first saw the mainland, May 30.

1500. Cabral, a Portuguese, visited the coast of Brazil, and discovered the mouth of the Amazon. It was probably colonised before 1515. In 1500, too, Cortereal touched at Labrador.

1508. Vincent Pinzon is said to have entered the Rio de la Plata. It was in the same year that the Spaniards, find- ing the aborigines too weak for the labour of the mines jn Hayti, first imported negroes from Guinea, and thus laid the foundation of a traffic which continued to disgrace the civilisation of Europe for three centuries,

1511. Diego Columbus conquered the island of Cuba with 300 soldiers, of whom he did not lose one.

1513. Balboa crossed the Isthmus of Darien with 290 men, and discovered the South Sea,

1519. Hernando Cortes sailed from Cuba with 11 ships and 550 men, and landed on the coast of Mexico, which had been discovered in the previous year. The conquest of the empire was finished in 1521 by 950 Spaniards, assisted by a vast nuniber of the Indians of Tlascala.

British colonies,

1531. Peru invaded by Pizarro, and conquered in little more than one year, with a force of 1000 men.

1535. Jacques Cartier, a Frenchman, discovers the Gulf of St Lawrence.

1535. Mendoza, a Spaniard, with 2000 followers, founds Bucnos Ayres, and conquers all the country as far as Potosi, at which silver mines were discovered nine years after. :

1537. Cortes discovers California.

1541. Chili conquered; Santiago founded ; Orellana sails from the sources of the Rio Napo down the Amazon to the Atlantic.

1578. New Albion, on the north-west coast of Ame- rica, discovered by Sir Francis Drake.

1586. The Spaniards found St Thomas' Island, in Guiana.

1587. Davis' Straits and Cumberland Islands discovered by John Davis. .

1604. De Monts, a Frenchman, founded the first sct- tlement in Nova Scotia, then called Acadie.

1607. After many ineffectual attempts during more than twenty years, the first permanent settlement of the English in North America was made this year, on the banks of the James River, in Virginia.

1608. Quebec founded by the French, who had had a small neglected colony in Canada from 1542.

1611. Newfoundland colonised by the English ; a Dutch colony established at Hudson's River.

1614. New York founded.

1618. Baffin penetrates to the 78th degree of latitude, in the bay which bears his name.

1620. The first English colony established in New England at Plymouth. It was in this year that the first negroes were imported into Virginia. They were brought by a Dutch vessel.

1635. A French colony established in Guiana.

1655. Jamaica conquered by the English.

1664. The Dutch colonies on Hudson's River capitu- late to the English.

1666. The Buccancers begin their depredations on the Spanish colonies.

1682. William Penn establishes a colony in Pennsyl- vania. La Salle takes possession of Louisiana in the name of the French king.

1698. A colony of 1200 Scots planted at Darien. In the following year the scttlement was attacked by the Spaniards, and abandoned.

1733. Georgia colonised by the English.

1760. Canada and all the other French settlements in North America conquered by the English.

We must pause at this point to give a very short ac- eount of the colonial system introduced by the principal European nations who occupied extensive tracts of the new world. The English settlements extended from the 31st to the 50th degree on the cast coast, and were divided into 15 or 16 provinces. The colonists had car- ried the love of liberty characteristic of their country- men with them ; and after many struggles with their Bri- tish rulers, all the provinces, with one or two exceptions, were permitted to cnjoy a form of government extremely popular. The executive power was vested in a governor appointed by the king. He was assisted by a council, which sometimes conjoined the functions of a Privy Council aud a House of Peers. The people were represented by a House of Asscmbly, consisting of persons.chosen by the freeholders in the country parts, and the householders or corporations of towns. The governor could levy no money without the consent of the House of Assembly: the British parliament, however, claimed, but scarcely ever exercised, the privilege of imposing taxes upon the colonists

without consulting them. Against this assumption of power the local legislatures always protested as an in- fringement of their rights. The vessels of foreign states were not permitted to trade with the colonies;

but the colonists were allowed to trade in thcir own ships with one another, with the mothcr country, and, to a limited extent, with foreign states. Their taxcs, which. were always small, were all consumed in defraying internal expenses ; and, compared with any other people in the new world, they enjoyed an unexampled degree of commer- cial and political liberty. It was the growing prosperity of the colonies and the increasing debt of the mother country, which induced the British ministers, for the first time, in 1764, to attempt raising a revenue in America, for purposes not colonial. The experiment was made by imposing a stamp-duty on newspapers and commercial writings. The sum was trifling; but the Americans, far-sighted and jealous of their rights, saw in it the introduction of a principle which deprived them of all security for their property. The people declared themselves against it as one man, in local assemblies, and by petitions and publi- cations of all kinds. The ministers became uneasy, and repcaled the tax; but, as a salve to the pride of the mother country, a declaratory Act was passed, asserting her right "to bind the colonies in all cases whatsoever." The idea of raising a revenue in America was not re- nounced, but another mode was to be tried. Duties were laid on glass, colours, paper, and tea, and were met by an opposition in the colonics still more zealous and determined. The British ministers, irritated, but waver- ing in their purpose, dropped all the taxes but that on tea, and commenced at the same time a series of alarm- ing innovations. They closed the port of Boston, changed the charter of the province, placcd judges and juries on a footing to render them morc subservient to the views of the government, and introduced a strong military force to overawe the people. On the other side, the colonists passed resolutions not to import or consume any British goods, and hastencd to supply themselves with powder and arms. Blood was at length shed in April 1775, at the village of Lexington ; and in the following year the American Congress published their celebrated declaration of independence. We shall not enter into the details of the war, which was closed in 1782. Suffice it to say that, on the part of the Americans, it rested on high grounds; it was a war to vindicate a principle—for the practical grievance was admitted to be slight; and it was conducted with a regard to humanity of which there are few examples in history.

The Spanish possessions in America before the revolu- Spanish tion formed nine distinct governments, all constructed 'loi

on the same plan and independent of one another. Four of these, of the first rank, were vice-royalties, viz., Mexico, Peru, La Plata, and New Granada; and five were captain- generalships, viz., Yucatan, Guatemala, Chili, Venezuela, and the island of Cuba. The government was vested in the viceroy or captain-general, who was held to repre- sent the king, and to enjoy all his prerogatives within the colony. But in these countrics, as in others where the supreme power is apparently unlimited, it was in- directly restrained by the influence of the courts of jus- ticc, corporations, and other public bodies. The royal audiencias or supreme courts, composed of Spaniards nominated by the crown, had extensive judicial powers, and were independent of the viceroys. The cabildos or municipalities, and the fueros or corporations (similar to our guilds), also possessed considerable privileges, which derived security and importance from long prescrip- tion. Lastly, the clergy, who were numerous and rich, necessarily possessed great influence among.a supersti-

tious people. The vices naturally inherent in the colo- imal system existed in full force in the Spanish American dominions. There was tolerable security for all classes except the miserable Indians, who were regarded and treated precisely as beasts of burden, out of whose toil and sufferings a provision as ample as possible was to be extracted, first to supply the wants of the royal treasury, and uext to provide for and satisfy the cupidity of a shoal of do-nothing public officers and priests. Edicts were indeed issued for the protection of the Indians, and persons appointed to enforce them; but these were feeble correctives of the evils rooted in the system, and not unfrequently increased their weight. The Indians, after the conquest, were at first slaves; they paid a capitation tax to the crown, and their labour was entirely at the disposal of their lord. This system was modified from time to time; but all the changes introduced down to the revolution did not release them from their state of vas- salage. They still continued

liable, in a less or greater degree, to the performance of compulsory labour, under the orders of persons against whom they had no protection, This was an enormous grievance ; but, what was equally bad, being held incompetent in law to buy or sell, or enter into any pecuniary engagement beyond the value of a few shillings, without the agency of white men, the swarm of public functionaries had-an unlimited power of inter- fering in their concerns, of vexing, harassing, and plunder- ing them, under the forms of law. The memoir of Ulloa, long buried amidst the Spanish archives, with various other documents published since the revolution, depicts acts of extortion, perfidy, cruelty, and oppression prac- tised upon the Indians which have rarely been paralleled. Men rose to affluence in offices without salaries; and the priests rivalled the laymen in the art of extracting money from those whom they ought to have protected. As the sole aim of the Spaniards in the colonies was to enrich themsclves, so the government at home made all its acts and regulations subordinate to the grand object of raising a revenue. Spain retained in her hands the whole trade of the colonies, and guarded her monopoly with the most severe penalties. The price of all European commodities was enhanced three, four, or six fold, in America. 'The colonists were not allowed to manufacture or raise any article which the mother country could supply ; they were compelled to root up their vines and olives; and for a long period one colony was not even permitted to send a ship to another. To support such a system it was necessary to keep the people in profound ignorance, and to cherish prejudices and superstition. The schools were extremely few, and permission to establish them was often refused, even in towns where the Spaniards and Creoles were numerous. The importation of books, except books of Catholic devotion, was rigorously prohibited. Even the more grave and dry sciences, such as botany, che- mistry, and geometry, were objects of suspicion. And the more effectually to crush.all mental activity, natives of America could rarely obtain leave to go abroad, to seek in foreign countries what was denied them in their own. On the other hand, the priests, sharing in the spoil, filled the minds of the pcople with childish superstitions, as a means of confirming their own power, and employed the terrors of religion to teach them patience under Oppression. To create a race of servants devoted to its purposes, the court bestowed

all offices, from the highest to the lowest, on natives of the peninsula exclusively. The wisdom of the plan seems questionable, but that it was adhered to with wonderful pertinacity is certain. "It was the darling policy of Spain," says Mr Ward, "to dis- seminate through her Amcrican dominions a class of men distinct from the people in feelings, habits, and interests,

taught to consider themselves as a privileged caste, and to regard their own existence as intimately connected with that of the system of which they were the principal sup- port." With all those means and appliances, it is extra- ordinary that Spain should have been able to uphold for threc centuries a system in which the interests of so many millions of human beings were so habitually and unrelentingly sacrificed. It was the course of events, much more than its own inherent weakness, which ultimatcly caused its subversion.

After the seizure of Ferdinand and the elevation of Revolu-

Joseph Buonaparte to the throne of Spain, orders were dis- patched to all the colonies with the view of securing their obedience to the new dynasty. The men in office were generally disposed to submit, but the treacherous conduct of the French excited a universal hatred of their cause among the people; and when the regency established in Spain presented the semblance of a patriot government, the loyalty of the Americans blazed forth, and poured large contributions of money into the hands of Ferdi- nand's adherents. The weak and suspicious conduct of the regency, however, and its subserviency to the grasp- ing spirit of the merchants of Cadiz, at length alienated the colonists, and roused them to take measures for their own security. But the diversity of views and interests among the colonists rendered the course to be adopted a matter of some delicacy. Ferdinand, being a prisoner, was, politically speaking, a nonentity. Napoleon's brother was clearly an usurper, odious to, and rejected by, the mass of the Spanish people. The regency, shut up in Cadiz, without troops or revenue, was but a

phantom; and the little power it had was so employed as to raise doubts whether its members were not secretly in league with the enemy. In these circumstances, when the only govern- ment to which the colonists owed allegiance had fallen into abeyance, the wisest course they could have pursued was to declare themselves independent. This would at once put a stop to the machinations of France, which they dreaded, and prevent the regency from compromising or sacrificing their interests by its weakness or treachery. The Spaniards, however, who occupied all public situa- tions, were averse to a change which they foresaw must tead to the downfall of their power. This was perfectly understood by the other classes; and in the first move- ments which took place in the different colonies nothing was said derogatory to the supremacy of Spain, though independence was clearly aimed at. By spontaneous efforts of the people "juntas of government" were formed,

at Caraccas in April 1809, at La Paz in Upper Peru Chili and in July, at Quito in August, at Santa Fe and at Bue- Peru.

nos Ayres in May 1810, and at Santiago in Chili in September the same year. In 1810, also, the first insur- rection broke out in Mexico, The colonists unluckily had been too long the slaves of superstition and tyranny to be fit for conducting so bold an experiment ; and after a struggle, which was generally short, but almost every- where bloody, the juntas were all put down except in Colombia and Buenos Ayres. But in the stir and tumult of the contest old prejudices had received a shock, and the seeds of political change had struck their roots too decp in the soil to be eradicated. A desultory war was carried on for six ycars between Buenos Ayres and Upper Peru, with little advantage on either side. At length, in 1817, the former state, which had assumed the style of an independent republic four years before, sent an army across the Andes to Chili, under General San Martin, and defeated the Spaniards at Chacabuco. A second victory, gained at Maipo in April 1818, led to the entire subver. sion of the Spanish power in this colony. The war was now transferred to Peru, where the Spaniards continued

New Granada.

Mexico.

Guate- mala.

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to lose ground, till the decisive battle of Ayacucho put an end to their power in Decembcr 1824. Rodil and Olaveta, with the obstinacy of their nation, held out for some months longer, when cvery chance of success was gone ; but after the surrender of Callao in January 1826, the Spanish flag no longer waved on any spot in the land of the Incas.

In New Granada and Venezuela the struggle was more bloody, variable, and protracted than in any other part of South America. As this portion of the dominions of Spain was comparatively easy of access, and from its cen- tral position was in some measure the key to the whole, she made immense efforts for its preservation. No less than ten thousand troops were sent out to it within the course of one year. The patriots, on the other hand, pos. sessed advantages here, in the greater intelligence of the population, and the easy intercourse with the West Indies. From 1809, when juntas were established in Caraccas and Quito, to the surrender of Porto Cabello in 1823, the vicissitudes of the war were numerous and extraordinary. The patriots were repeatedly on the eve of a complete triumph, and as often the state of their affairs seemcd nearly hopeless. But the spirit of resistance never was entircly subdued. The cause was rooted in the hearts of the pcoplc, and was insensibly gaining ground even during its reverses. To attempt the: faintest outline of the military operations would lead us beyond our proper limits. It is cnough to state that the decisive victory of Carabobo, gained by the patriots in 1819, gave them an ascendancy which thcy never afterwards lost; but the Spaniards, according to their custom, continued to main- tain the contest as long as they had a foot of land in the couutry, and were only finally expclled in 1823.

In Mexico the revolutionary movement began at Dolores in 1810, and soon wore a very prosperous appearance ; but the weakness or false pride of the Creoles, who were cajoled into the ranks of their oppressors the old Spaniards, armed against the patriots those who

should have been thcir firmest supporters, and by one or two mischances the force of the independent | .arty was ruined in November 1815, when Morelos, their able leader, was taken prisoncr and executed. For six years after this period many gucrilla bands maintained themselves in the provinces, and greatly annoyed the Spaniards; but they did not act in concert, and no congress or junta professing to represent the Mexican people existed. Even during this interval the desire for independence was making great progress among the population; but the establishment of a constitutional government in Spain in 1820, and its extension to the colonies, gave a new aspect to the affairs of Mexico. The viceroy Apodaca, while outwardly yielding obedience to the new system, was silently taking measures to effect its overthrow; but he mis- took the character of the agent he employed. This per- son, the celebrated Iturbidc, turned his own arms against him, proclaimed a constitution under the name of "the three guarantees,' and put an end to the dominion of Spain in 1821, almost without bloodshed. Iturbide, who had nothing in view but his own aggrandisement, called a congress, which he soon dissolved after getting himself proclaimed emperor. His usurpation kindled a spirit of resistance. He was exiled in 1823, made a new attempt on the liberties of his country in 1824, was taken prisoner, and expiated his crimes by a military death within a few weeks after he landed.

Guatemala was the last portion of the American con- tinent which threw off the Spanish yoke. In 1821 the persons in office assembled and formed a junta. Divi- sions arosc, which were fomented by the intrusion of a Mexican army sent by Iturbide. 'This force however.

was beaten, and an elective assembly called, which de- clared the country independent, and established a consti- tution in July 1823. Spain now retains none of her pos- sessions in the new world but Cuba and Porto Rico.

The government of Brazil was conducted by the Por- Portugues

tuguese on a system extremely similar to that of the See of

Spanish colonies. The monopoly which the mother coun- try retained of the commerce of the colony was equally rigorous ; the restrictions on its internal industry as se- vere ; and the same means were employed to keep the people in a state of pupilage and ignorance. Down to 1806 a single printing-press had never existed in Brazil, In 1807, when the emperor Napoleon had resolved to possess himself of Portugal, and if possible to get the royal family into his power, the king, seeing no other means of escaping from the clutches of his enemy, em- barked with his suite in several ships, and sailed for Brazil, where he arrived in January 1808. He was received with joy by the colonists, who anticipated great benefits from his residence, of which they were not disappointed, One by one the fetters of colonial dependence fell off. Within a few months printing-presses and newspapers were established, the ports were opened to the trade of all nations, and the people were invited and encouraged to prosecute all those branches of internal industry from which they had till now been interdicted. 'To crown and secure these advantages, Brazil was declarcd an inde- pendent kingdom in 1815, subject to the crown of Portugal, but entitled to its separate administration and its own laws. The revolutionary spirit pervading the Spanish colonies now found its way into Brazil, and produced an insurrection at Pernambuco in 1817. It was soon sub- dued, but received a new impulse from the constitutional systems suddenly introduced into Spain and Portugal in 1820. To quiet the popular feeling, it was announced that the Portuguese constitution would be extended to Brazil. Before this had been done, however, the old king had sailed for Europe, leaving his son Don Pedro to rule in his absence. The people now discovered, or believed, that the object of the king was to degrade Brazil again to the rank of a colony, and to restore the old system in all its rigour. Meetings were held, and resolutions adopted to maintain the independence of the country at all hazards ; and the patriots, gaining confidence by degrees, called loudly for the establishment of a legislature, and besought Don Pedro to put himself at the head of the

independent government. Ambition or policy induced Empire of Pedro to listen to the solicitation: in 1822 he was pro- Bra.

claimed emperor, and had his own title and the indepen- dence of Brazil acknowledged by his father three years afterwards. A representative system was at the same time introduced. An unlucky war now arose with Buenos Ayres, which weakened both countries ; but it was at length terminated in 1828 by the recognition of the dis- puted territory as an independent state under the title of the Banda Oriental.

Having finished this brief notice of the series of revo- Existing |

lutions which broke the fetters of America, we shall now Political f Divisions.

give a very short sketch of the new political order o things which has arisen out of these changes, referring for a detailed account of the several states to the articles appropriated to them in the different volumes of the pre- sent work.

America, with its islands, embraces at present (1874) twenty-one independent states, and various colonies belong- ing to six European powers, The former are—l. The United States of North America; 2. Brazil; 3. Mexico; 4, Venezuela; 5. Colombia; 6. Ecuador or Quito; 7. Peru ; 8. Bolivia or Upper Peru; 9. Chili; 10. La Plata, or the Argentine Republic ; 11. Uruguay ; 12. Paraguay ;

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temala ; 17. Honduras ; 18. Nicaragua : 20. Hayti; 21. San Domingo.

by a native king ;

more important ones.

The United States were colonised a century later than rapid progress shows in a striking light how much more the prosperity of nations

depends on moral than on physical advantages. The North Americans had no gold mines, and a territory of only indifferent fertility, covered with impenetrable woods ; but they brought with them intelligence, industry, a love

Spanish America; but their brilliant and

of freedom, habits of order, and a pure and severe morality.

Armed with these gifts of the soul, they have converted the wilderness into a land teeming with life and smiling with plenty ; and they have built up a social system so pre-emi- nently calculated to promote the happiness and moral im- provement of mankind, that it has truly become the " envy of nations." The republic is bounded on the north by Canada, on the south-west by Mexico, and on the other It now consists of

sides by the sea or the Indian lands, thirty-seven states, with eleven territories and one district, which will be converted into states as soon as each acquires

a sufficient population. The extent of the country, including: the Indian lands stretching west to the Pacific Ocean, over

which it claims a right of pre-emption, embraces 3,603,844 square miles of land. The agriculture of the United States partakes to some extent of a tropical character, cane is cultivated in Louisiana, Florida, and other states as far north as the latitude of 314°. Cotton is raised in all the south-east states S. of the 37th parallel, and tobacco chiefly in the middle states. Wheat succeeds in the middle and northern states, and maize thrives in every part of the Union. Agriculture is conducted with considerable skill 3 but the "high farming" practised in England would not pay in America, where money is of much value and land of little. Scarcely any portion of the soil is rented in the United States: the farmers are almost universally proprietors ; and when their property is extensive, which rarely happens, it is Soon broken into- small occupancies under the law of equal division, The advance the Americans have made in manu- factures may be judged of from the fact

that in 1870, according to the census then taken, there were upwards of 135,000 operatives employed in 969 cotton factories, and 77,870 in 1938 manufactories of woollen goods. The iron industries gave employmentto upwards of 140,000 hands, the iron produced in the country reaching nearly two millions of tons. In the useful arts generally America is on a level with France and England. The internal commerce of the United States is conducted with extraordinary spirit. The amount of capital expended on roads, canals, harbours, bridges, and other public works, is very great. The length of the lines of railway open for traffic now exceeds 70,000 mniles, and is rapidly increasing. The extent of the foreign trade of the country, and the amount of its shipping, place it next to Great Britain in the list of commercial nations.

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Since 1800 the rate of increase has been remarkably uniform at nearly 34 per cent, per annum. In 1871 the

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13. Patagonia ; 14. Costa Rica; 15. Mosquitia ; 16. Gua- 19. San Salvador ; The colonies belong to Britain, Denmark, Sweden, Holland, France, and Spain. Patagonia is merely the geographical name of a district of Chili, occupied by independent tribes of Indians 3 Mos-quitia, or the Mosquito coast, is a small Indian state ruled and Hayti is a negro republic proclaimed in 1867. For detailed accounts of these various states and colonies we refer to the articles under the proper heads, At present we must confine ourselves to a brief notice of the

The sugar-

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number of immigrants was 346,938, of whom 198,843 migrated from the British Isles, 107 ,201 from Germany, 6030 from China, and the

remainder from British N orth America, Sweden, Norway, France, Austria, Italy, Switzer- land, Denmark, and Russia.

Slaves were first introduced in 1619. In 1775 slavery was abolished in Rhode Island; in 1780 Massachusetts abolished it; then numerous northern states followed, and in December 1865 slavery was abolished throughout the United States. By subsequent amendment of the constitution all negroes were admitted to all the privileges of citizenship. Thus it was enacted on March 30, 1870, that "no discrimination should be made in the United States among the citizens of the United States in the exercise of their elective franchise, or in the right to hold office in any state, on account of race, colour, nativity, property, education, or creed." Every person born or naturalised in the United States is recognised to be a citizen thereof,

The American government is a pure representative de- mocracy in which the people are recognised as the fountain of all power; and the sole object of all its mechanism is to give effect to their deliberate opinions. The federal government and the governments of the separate states are constituted on the same plan. The legislature consists in every case of two bodies, a House of Representatives chosen

for one or two years, and a Senate for a period varying

from two years to six—all chosen by popular election, except in the case of the Federal Senate, which is elected by the legislatures of the thirty-seven states. The President holds his. office for four years, but is occasionally re-elected for four years more.

The characteristic facts in the condition of America are the non-existence of titles, of privileged classes, of corpora- tions in our sense of the term, of a landed aristocracy, of mendicity except to a very limited extent, and of an en- dowed church; the cheapness and efficiency of its govern- ment, the universality of education, the omniprescuce of its periodical press, the high fecling of self-respect which exists in the very humblest classes, and the boundless spirit of enterprise which pervades all classes of society. The higher classes are less polished than in England, the middle are perhaps less carefully

instructed ; but the American people, taken collectively, are at least as well educated and have as much intelligence and manliness of character as any other nation in the world.

In 1867 the territory formerly known as Russian America

was purchased by the United States, and called Alaska. It occupies the north-west corner of the continent, and extends along the coast as far south as Mount Elias, where itis bounded by British Columbia and the southern end of Prince of Wales Island, in 54° 40'N. It comprises an area of about 570,390 square miles. Furs and fish are the most valuable commodities. Sitka is the capital. It is situated on an island in 57° 2' 45" N. and 135° 17' 10" W. It has a population of over 2000 persons. The Yukon river, which is about 2000 miles long, flows through the territory.

British North America is bounded on the south by the British United States, on the north by the Arctic Ocean, and on North the west by Alaska. In 1867 the provinces of Ontario America. (formerly Upper Canada), Quebec (formerly Lower Canada), Nova Scotia, New Brunswick, Manitoba (formerly Hudson's Bay Territory), and British Columbia, were united under the title of "The Dominion of Canada," while Newfound- land and Prince Edward's Island still remain independent. The executive power is vested in the sovereign of the British empire, but is carried out by a Governor-General and Privy Council. The Parliament consists of a Senate and a House of Commons. The senators are nominated for life

by the Governor-General, and are 75 in number. The mem- bers of the House of Commons are elected by the people in the proportion of one member for each 17,000 souls. The seat is retainable for five years, and each member is allowed a salary and travelling expenses. Ottawa is the capital of the Dominion, According to the latest census, taken on

April 3, 1871, the area and population of the several pro- vinces are as under :— .

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ing Indians. In 1823 it was estimated at 4,000,000 by Humboldt. M. Scheffer carries it to 5,700,000, and an estimate for 1867 makes it 9,858,000, comprising 8,148,000 free persons, and 1,674,000 slaves. The census taken in 1872 gives a population of 10,095,978, including 1,683,864 slaves.

Brazil, unlike the Spanish American provinces, has re- mained, subject to its ancient sovereign ; and its govern-

Area, square miles. Population. ment, from being colonial, has become imperial and inde- Deiter Oe eniinss.. ~~*sommmenriavane 121, 1,620,842 pendent, without any violent revolution. The result has Qchepeivesrsnneeiereene BORED UAE ag, || gent erent inl semtou of the ypeace: aadlepamaaesiy GEN New Brunswick……..cec0+ 27,105 285,777 country. See BRAZIL. : ; BW ern ia yetcess ia soos co aiiooneenseare 2,891,734 111,963 The portion of South America next to the isthmus in*~~ *Colombia, British Columbia. ,.....6..0000++5 218,000 50,000 cludes the states of Venezuela, Colombia, and Ecuador. From Venezula, 3. 481,779 3.647.887 1820 till 1831, when a separation took place, it formed eo Tata aes : ba of one state under the name of Colombia; which name has ~ Bip aye een 1871) ae ven recently been assumed by the republic long known as New*

In 1871 the Dominion had 2854 miles of railway open, 1173 miles in preparation, and 3000 miles for which con- ecssions had been granted by the government. A line has been projected to extend from Lake Superior to the Pacific Ocean.

Brazil is the largest state in South America, and enjoys the greatest combination of natural advantages. It is bounded on the south, west, and north, by La Plata, Paraguay, Uruguay, Bolivia, Peru, Ecuador,

Colombia, Venezuela, and Guiana. Embracing an area of 3,100,000 English miles, it is nearly as large as Europe, and is capable of supporting a much greater population. Its climate is probably cooler and morc salubrious than that of any other extensive tropical country ; and every part of its soil is rich and fruitful, as its magnificent forests and the exuberance and boundless variety of its vegctable productions attest. Its commerical advantages are admirable. No country in the new world has the same facilities for carrying on in- tercourse with Europe and with all its neighbours. The Amazon, with its numerous branches, the Parana, the To- cantins, the St Francisco, and other streams, supply the most remote parts of the interior with easy means of communi- cation with the sea. Brazil possesses iron, copper, and pro- bably all the other metals ; but her mines of gold and dia- monds are remarkably rich. Her most valuable productions for exportation are cotton, sugar, coffee, hides, tobacco, vanilla, dyewoods, aromatic plants, timber, &c. Her com- merce is much greater than that of all the Spanish colonies put together. The Brazilians are lively, irritable, hospitable, but ignorant, superstitious, and rather inclined to indol- ence, Their acquisition of independence in 1822, however, worked like a charm, and produced an extraordinary change in their industry, opinions, and modes of thinking. There are numerous schools, but although the education is gra- tuitous, they are not well attended. The advance litera- ture has made will be allowed to be great when it is remembered that printing was unknown in the country in 1807. According to the constitution introduced by Don Pedro, the legislature consists of a Senate of 52 members, who hold their places for life, and a House of Congress of 107, elected by the people for four years; upon the acts of both of which bodies the emperor has a negative. The members of the lower house are chosen by elections of two stages. The householders of a parish meet and appoint one elector for every thirty of their number, and the electors thus chosen meet in districts and choose the depu- ties. The members of both houses receive salaries. The executive power is invested in the emperor assisted by a ministry and a council of state.

The population of Brazil amounted to 3,671,558, accord- ing to returns published in 1818, and procured probably for the purpose of taxation,

This was exclusive of the wander-

Granada. The territories of these three states are bounded on the south by Peru, on the south-east and east by Brazil and Guiana, on the other sides by the sea, and embracc an area of 1,020,000 square English miles. The soil is fruitful and the climate salubrious, except along the coast and in a few other low situations. The eastern part consists chiefly of the llanos or steppes of the Orinoco, which are very hot ; the western, of the mountain ridges of the Andes, which support tracts of table-land where the blessings of a temperate climate are enjoyed, and the cerealia of Europe can be successfully cultivated. The tropical vegetation extends to the height of 4000 feet ; from 4000 to 9000 is the region where wheat, barley, and Icguminous plants thrive. Above the level of 9000 feet the climate becomes severe ; and at 15,700 feet vegetation ceases. The situation of Colombia is highly favourable for commerce. It has excellent ports on both seas ; and being mistress of the isthmus of Panama, it has superior facilities for establishing a communication from the one to the other. The Orinoco and the Amazon afford the inmost districts of Venezuela and Ecuador the advantages of water carriage to the ocean. The Cassiquiari, an inter- mediate channel, by which the Orinoco bifurcates or con- nects with the Amazon (a remarkable hydrographical pheno- menon), is within the limits of Venezuela. The territory contains much gold and silver—the former in alluvial depo- sits : it has mines of copper and mercury also, with platinum, iron, and coal. Its tropical productions are similar to those of Brazil; but it has as yet cultivated few articles for foreign markets, and its exports are inconsiderable. The civilised population of this country is chiefly located in the districts near the coast, and in the high valleys or table-land of the

Andes. Its amount, according to the Statesman's Year- Book, is—~ MVFETCZ ING lat eway sasavaecassatuermcmr ee emace re meanen

5,658,906

It is always of importance to know in what proportions the different races are blended, but on this subject we have only approximate data. In Colombia the whites form about half of the population, the Indians

about one-third, and the negroes about one-tenth, the remainder being of mixed blood. In Venezuela the whites form about one-third, the Indians about one-thirtieth, and Zamboes (from Indians and negroes) about one-half. In Ecuador the proportions are, roughly—whites one-sixth, Indians nearly one-half, negroes one-thirteenth.

All the three states are republican. CoLomBia, and Ecvapor.

The Argentine Republic, or La Plata, is, in point of natural advantages, the second state of importance in South

See VENEZUELA,

| Argentine Republic, or La

|) Plata.

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America. It is bounded on the west by Chili; on the north by Bolivia; on the east by Paraguay, Brazil, Uruguay, and the sea; and on the south by Patagonia. It embraces an area of 515,000 square miles if we include Tucuman, Salta, Santiago del Estero, and Jujuy, which scarcely acknowledge its authority. Nearly the whole territory of this republic consists of open plains destitute of timber, called pampas, extending from the Atlantic and the river Paraguay to the Andes. The eastern part of these plains exhibits a vigorous growth of herbage, intermixed with a forest of giganticplants, 9 or 10 feet high, which have been called thistles, but are now known to be artichokes ; in the middle they are covered with grass ; and the western division, which extends to the foot of the Andes, consists of barren sandy plains, thinly sprinkled with shrubs and thorny trees. The openness and dryness of the country, however, render it healthy ; and by the Parana, the Paraguay, and their branches, it possesses a great extent of natural

inland navigation, It has mines of gold, silver, copper, lead, and probably iron; but its mineral riches have been greatly diminished by the separation of Potosi, Cochabamba, La Paz, and other pro- vinces now forming part of Bolivia. The force of this republic lies almost entirely in the wealth, intelligence, and commercial spirit of its capital, Buenos Ayres, which contains 150,000 souls, including a large proportion of foreigners, A small number of estancias, or grazing farms, are sparingly diffused over its boundless plains, the pro- prietors of which keep multitudes of horses and mules, flocks of sheep, and vast herds of cattle; the latter being chiefly valued for their skins, These people are a bold, frank, hardy, half-civilised race, who live isolated in the wilderness, and scarcely acknowledge any government. The census of 1869 gives a total population of 1,736,922. See ARGENTINE REPUBLIC; and for the two small states formed out of the north-eastern portion of its territory, see Paracuay and Urueuay. Entre Rios, formerly a sepa- rate state, is now a province of La Plata,

Chili extends along the coast of the Pacific from 25° to 44° of south latitude: its length is 1300 miles ; its breadth varies from 30 to 120; and its surface, exclusive of Arau- cania and the district beyond the 44th parallel, is estimated at 130,977 English square miles. "The country consists properly of the western slope or declivity of the Andes, for the branches of the mountains running out in tortuous directions from the main trunk reach to the sea-shore. It enjoys an excellent and healthful climate ; severe cold is un- known in the inhabited parts, and the heat is seldom exces- sive. The useful soil bears a small proportion to the entire surface of the country, consisting merely of the bottom of the valleys. It has rich mines of gold, silver, and copper in the northern provinces ; but very few of them can be worked in consequence of the absolute sterility of the adjacent country. Its two northern provinces, occupying 450 miles of the coast, are nearly perfect deserts. The soil continues extremely dry, and yields nothing without irrigation, till we reach the latitude of 35°; and it is believed that not one- fiftieth part of the country is fit for cultivation. But south of the river Maule the land is covered with fine timber, and bears crops of wheat and other grain without the aid of any other moisture than what is supplied by the atmosphere. This is in truth the

fine and fruitful part of Chili; and the project was once entertained of selecting its chief town, Con- ception, for the seat of the government. Chili has no manu- factures, and is unfavourably situated for commerce. It has no navigable rivers, while its mountainous surface is an obstacle to the formation of roads; but nevertheless it has now upwards of 500 miles of railway opened. A represen- tative constitution was established in Chili in 1833, An enumeration dated 1869 makcs the population, exclusive of Araucania (with 70,000 aborigines), 1,938,861. See Cruz.

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Peru may be regarded as a continuation of Chili, consist- Peru.

ing of the western declivities of the Andes, from the 4th to the 22d degree of south latitude, with the addition of a considerable tract on the east side of the mountains, be- tween the 4th and 15th parallels. There are few countries in the world which have a more singular physical charac- ter than the western part of Peru. It is a belt or zone of sands, 1240 miles in length and from 70 to 600 in breadth, with inequalities of surface which might be called mountains if they were not seen in connection with the stupendous background of the Andes. This long line of desert is intersected by rivers and streams, which are seldom less than 20 or more than 80 miles apart, and on the sides of which narrow strips of productive soil are created by means of irrigation. These isolated valleys form the whole habitable country. Some of the large rivers reach the sea; the smaller are either consumed in irrigating the patches of cultivated land or absorbed by the encom- passing desert, where it never rains, where neither beast nor bird lives, and a blade of vegetation never grew. No stranger can travel from one of these valleys to another without a guide, for the desert is trackless ; and the only indications of a route are an occasional cluster of bones, the remaius of beasts of burden that have perished. Even experienced guides, who regulate their course by the stars, the sun, or the direction of the wind, sometimes lose their path, and they almost inevitably perish. Of a party of 300 soldiers thrown

ashore by a shipwreck in 1823 on one of these desert spaces, nearly a hundred expired before they reached the nearest valley. Ignorance and wonder have been busy with this singular region: lcgends are current, which tell that descendants of the ancient Peruvians have lived in some of these mysterious valleys, hid from the know- ledge of their merciless invaders, since the days of the Incas. We have no reason to believe that more than one acre in a hundred of maritime Peru will ever be available for the sustenance of mankind. The country has two ad-

‘ vantages—its mines of the precious metals, and a temperate

and delightful climate, in consequence of the absence of rain and the fogs which intercept the solar heat. It can never be rich in the proper sense of the term, or make much pro- gress in the improvements which depend upon a dense popu- lation. Like Chili, it has no navigable rivers—and nature has deprived it of the means of forming good roads. There are indeed few countries in the world whose natural advan- tages have been so much overrated as Peru ; and it requires little sagacity to discover that its future career cannot cor- respond with its past celebrity. The districts east of the Andes, which have a hot climate accompanied with a rich soil, will ultimately be the most valuable part of the country ; but their secluded situation and want of communication with other countries must keep them long in a backward state. The government is republican. Peru comprehends a surface of 502,760 square miles; the capital, Lima, contained in 1862 a population of 121,370. In that year a rough calculation was made which gave 3,199,000 as the entire population of the republic. It was also estimated that the proportions of races were :—

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Bolivia, or Upper Peru, lies eastward of Lower Peru, and Bolivia.

is bounded on the south by the Argentine Republic, and on the north and east by Brazil. It is of an irregular form, and comprehends a space of 473,300 square miles. The climate is pleasant and healthful, the soil

is generally dry, and in the eastern parts, as well as the elevated table-land, its aridity produces barrenness. Nature, however, as a compensation for its other disadvantages, has bestowed upon it some of the richest mines in the world. The country was erected I. — go

Guate- mala,

Mexico.

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into an independent state only in 1826, and named Bolivia in honour of its liberator Bolivar. It has a small strip of barren territory on the shores of the Pacific Ocean, between the 22d and 25th parallel; but it is, properly speaking, entirely an inland country, and more deficient in the mcans of communicating with foreign nations than any otner state in America, Sce BoLivia. ;

Guatemala or "Central America" originally occupied all the narrow part of the continent from the 83d to the 94th degree of west longitude, extending 800 miles in length, and covering a space of 130,000 square miles. The surface of the country is hilly, and in most parts mountainous; the climate warm and very moist. The mineral wealth of the country is not great; but this is compensated by the rich- ness of its soil and its excellent commercial position. It was a fcdcral republic, but its five provinces have now become independent statcs. Humboldt estimated the population of the five states at 1,600,000. According to a statement furnished to Mr Thomson, a former British envoy by the government, it was 2,000,000; while the most recent of the estimates made by the resident officials give a total of 2,335,019, viz. :—

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2,835,019

The proportions of the different races have been esti- mated as follows :—

Humboldt. Thomson.

W lnitest¥and ‘Creolési……..2.2-ceses 20 per cent. 20 per cent. IMixediclaseesiyes…2..ceccrotee Lavaetens 28 . 40, 1 0(0 FE 01- aren eR RE 5 nvonancqnciAbeGed 52 6 40 06

Mexico is the most populous and powerful of all the new states erected in America since the commencement of the present century. Previous to the war with the United States it embraced an area of 1,600,000 square miles, which was reduced to 1,030,442 by the cession of the northern provinces in 1848. About three-fourths of the surface con- sists either of mountains or table-land, raised from 5000 to 10,000 feet above the sea. Owing to this extraordinary elevation, even those parts of the country which lie within the torrid zone (the low ground on the coast excepted) enjoy a dry, cool, and salubrious atmosphere; but this advantage is counterbalanced by the insufficient supply of moisture and the rapid evaporation resulting from the same cause, which render the soil generally rather arid, and in many parts absolutely barren; by the smallness of the rivers and the almost entire absence of inland navigation ; and by the obstacles which the steep and tugged ascents from the coast present to land-carriage. The republic is, besides, almost destitute of ports on the Atlantic side. Mexico is extremely rich in the precious metals ; and there are few regions upon which nature has lavished so great a variety of vegetable productions, or where plants fitted to the coldest and the hottest climates may be seen so nearly in juxtaposition. The low ground on the east coast is admirably adapted for raising sugar ; and no country is more favourably situated for growing the other great articles of West India produce—coffee, cotton, cocoa, indigo, and tobacco. The raising of bread- stufs—as they are tcrmed by the Anglo-Americans—whcat, maize, and barley, with potatoes, the cassava root, beans, pumpkins, fruit, &c.—for domestic consumption, will neces- sarily be the chief branch of industry on the table-lands. The mines have never employed above 30,000 labourers ; and their superior productivencss depends chiefly

on two circumstances—the great abundance of the ore, which is only of poor quality, and the comparative facility with

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[STATES.

which they can be worked owing to their being generally situated in fertile districts, where provisions, wood, and ali materials can be easily procured,

Mexico has had her full share of the ignorance and super- stition which belonged to Spain; and these cvils, with her internal dissensions and her rapacious, immoral, and intole- rant clergy, are great obstacles to her improvement. That excessive inequality of fortune which corrupts both extremes of society has been nowhere in the world more prevalent than in Mexico. Individual proprietors possessed immense tracts of land and boundless wealth, while all the great towns swarmed with beggars, and thousands fell a sacrifice to fa- mine from time to time. The Mexican constitution, which is federal and almost a literal copy of that of the United States, was established in 1824, The distinction of castes, which was maintained in the greatest rigour under the colo- nial system, has now disappcared, and power and office are open, not only legally but practically, to men of all colours, The African blacks formed an extremely small proportion of the Mexican population at all times ; and since the revolution slavery has ceased. The number of inhabitants was estimated at 6,800,000 by Humboldt in 1823, and classed as follows :—

Numbers. Proportions, Ui Meg eas. 207, cos ceva tiaeeiieane 1,230,000 29 per cent. DUN XCCERACES.. 0c senseessenne+crand (00,000 Dy Mites Bone vevcormisavcnteues 3,710,000 04s

Mr Ward states that very few of the whites, so called, are free from a mixture of Indian blood ; and now when the odious distinctions founded on complexion are abolished, they readily acknowledge it. Mr Ward estimated the population at 8,000,000 in 1827. In 1869 that of

Mexico with its present boundaries was stated to be 9,176,082. See Mexico.

Hayti, called formely Hispaniola and St Domingo, was Hayti

a colony belonging partly to France and partly to Spain till 1791, when the blacks rose in arms, killed a number of whites, and expelled the rest. The attempts of England in 1793, and of France in 1801, to conquer the island, both failed, and Hayti has at length been acknowledged as an independent state by all the great powers, including France. The island, which contains about 28,000 square miles, is remarkably fertile; but its climate, like that of the West Indies generally, is rather unhealthy. The population, which before the revolution was estimated at 600,000, is now said to amount to 900,000 or 1,000,000, and it is almost entirely composed of blacks and mulattoes. The island formed one state till 1844, when the eastern or Spanish portion revolted, and established its independence. It is now the republic of '" Dominica," ruled by a president, while the western portion, retaining the name of Hayti, was formed into an empire under Faustin I.; but in 1867 a republican constitution was proclaimed. After long negotia- tions, the French government agreed in 1838 to acknow- ledge the independence of Hayti on condition of the latter paying 60,000,000 of francs by sinall annual instalments continued for 30 years. The money was destined chiefly to indemnify the French proprietors who were chased from the island in 1791. Nothing has been paid of late years.

The multifarious nature of the subject prevents us from West

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attempting any description of the West India colonies, in- Indies. |

sular and continental. The islands have been variously denominated, but.the most convenient division seems to us the following :—1l. The Great Antilles, comprehending Cuba, Hayti, Jamaica, and Porto Rico; 2. The Small Antilles, extending in a semicircle from Porto Rico to the

coast of Guiana; 3. The Bahama Isles, about 500 in num- ber, of which, however, only a small number are inhabited.

The British colonies are 18 in number, viz., 16 ensular— Jamaica, Antigua, Barbadoes, Dominica, Grenada, Mont- serrat, Nevis, St Kitts, St Lucia, St Vincent, Tobago,

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Transit from the Atlantic to the Pacific.

COMMUNICATION. |

and 2 continental—British colonies contained a whom probably four-fifths were persons of colour.

Guiana and Honduras.

The Spanish colonies are Cuba and Porto Rico. Cuba has population Porto Rico has an area of 169 square miles, In 1867 there were upwards of 7 00,000 slaves in these two colonies,

In August 1872 the Spanish government issued a decree ordering that arrangements should be made for the gradual and in December 1872 a bill was laid before the Spanish Cortes for the abolition of slavery so that probably slavery will soon

an area of 2058 square miles, and in 1867 the was 1,414,508. and in 1866 a population of 646,362 persons.

emancipation of the slaves ;

in Porto Rico in 18738 ; be extinct throughout the whole of America,

The French colonies in the West Indies tinique, Guadaloupe, and some smaller isles continent, Guiana. population of these colonies was 318,934,

The Dutch have Surinam on the continent, with the

islands of Curacoa, St Eustatius, and St Martin.

In 1870 the population of the islands was 35,482, and of Surinam 59,885, occupying an area of 2812 geographical Slavery has ceased since July 1863, when the Dutch government compensated the owners for 44,645 slaves,

The Danes have the small islands of Santa Cruz and St John, containing a population of 24,698 in 1860, of whom St Thomas had a population of 13,463 in 1860 ; and in 1867 was purchased by the United St Bartholomew, another of the Lesser Antilles,

square miles,

most are frecd slaves,

States. belongs to Sweden.

The problem of making a grand highway for travel and to the Pacific, either across the or by taking advantage of the narrow isthmus that joins its northern to its southern

traffic from the Atlantic breadth of the American continent

portion, has been the subject of many schemes since its

western as well as its eastern shores have been inhabited by.

enterprising nations, skilled in commerce and in mechanical

arts. It is interesting to remark that, whereas the hope of

sailing to India by a westward route was the motive which guided the navigators of the 15th century to the disco- very of America, the means of internal communication for this part of the earth, and the geographical exploration of its remote extremities, have been more recently advanced by the desire of finding a path in this direction to the Asiatic resorts of mercantile activity. Arctic voyagers were at first invited to the icy seas of high latitudes by the dream of a north-west

passage to China and the East Indies. It was a passage by sca from the Atlantic to the Pacific which Sir John Franklin went to seck in his last expedition in 1845, but which Captain Maclure effected in 1856, though by an opposite course from Behring's Strait to Baffin's Bay. But it is scarcely possible that this route along the north coasts of America should ever be habitually frequented by mariners going to and fro between the two Oceans. At the opposite extremity of the continent arrange- ments have lately been made to substitute a shorter way to the Pacific for that round Cape Horn by improving the navigation of the Strait of Magalhaens, which separates Tierra del Fuego from the south portion of the mainland. The project of cutting a canal through the central American isthmus has often been discussed. There can be no doubt of the practicability of a system of inland navigation from the Atlantic coast by the river San Juan to Lake Nicar- agua, and thence by a canal to the neighbouring Lake Managua or Leon, with a short artificial channel of exit to the Pacific. A different route, of combined river and canal navigation, has more recently been proposed, which would cut off the whole of the isthmus from the body of South

America—entering the uppermost part of that mainland |

AMERICA

Tortola, Trinidad, Bahamas, Bermuda, Falkland Island ' The population of 1,228,967 in 1871, of

include Mar- 3 and on the According to a recent authority the

715

by the river Atrato from the Gulf of Darien, ascending this river 150 miles, then following up the course of the Napipi or the Bajaya, tributaries of the Atrato—crossing the coast range of hills by a canal with several locks, and descending to the Pacific either in Limon Bay or in the Gulf of Cupica. But these projects could be adapted only to the admission of vessels of smaller size than such as in the present day are commonly employed for commercial traffic between distant regions of the world. In spite of the grand example of the Suez Canal, it seems

likely that, in a country tolerably productive of wealth and capable of supporting population, the more profitable means of provid- ing for a through traffic will be found in railroads, which serve also for the accommodation of intermediate districts, In this class of undertakings North America has of late years displayed a wonderful degree of active enterprise. The line of 60 miles from Aspinwall, near Chagres, across the neck of land, which is there so narrow, to Panama, on the Pacific side, though situated in the territory of a Spanish republic, was constructed by citizens of the United States, expressly for the traffic between New York and San Francisco. But since that first opening of a gateway of communication with California, Australia, or China, for the travellers and merchandise of the Atlantic states or of Europe, the whole breadth of the continent whcre it widens, in latitudes between 35° and 45° N., all belonging to the United States, has been traversed by a continuous railroad system. The middle link of this system is the Union Pacific Railway, 1600 miles long, from Omaha, on the Missouri, in the state of Iowa, through Nebraska, up the course of the Platte river, and through Wyoming, Idaho, Utah, and Nevada, crossing the summits of three great mountain ranges from 7000 feet to 8250 feet high, and mecting the Central Pacific Railway of California. This line was through a barren desert for several hundred miles, in the arid uplands of Idaho and the salt plains of Utah; but its construction has served to bring the com- mercial cities of the Atlantic and of the Pacific within six or seven days' journey of each other. Three or four rival projects of railways across the width of the United States, or extensions of the existing railway system westward from the Mississippi and Missouri, have been taken up with some promise of their realisation. The one which offers the greatest advantages is that designed to ascend the long and broad valley of the Arkansas river, and to cross the Rocky Mountains with a southerly inclination into New Mexico, opening up the Rio Grande and San Juan country, which is said to be very rich, and thence passing on to the Grand Cajion of the Colorado, and to the Nevada mining district. Near the northern frontier of the United States territory, where it borders on the British Dominion of Canada, another continental line from cast to west is now in progress—that is, from the western extremity of Lake Superior, through Minnesota, Dakotah, and Washington, to Puget Sound, just

below Vancouver Island. But the work of this kind that will be most interesting to many of our readers is that undertaken in 1871 by the government of the Canadian Dominion. By the extension of the Dominion beyond the Rocky Mountains to include British Columbia, and the incorporation of the vast territories of the Hudson's Bay Company, nearly the whole of North America above the 49th parallel is united in one grand British colonial province, and the Canadian Pacific Railway will do much to promote a compact union between the widely-scattcred communities of Her Majesty's subjects on this great con- tinent. The line will proceed from a port on the northern shore of Lake Superior, westward to the Red River settle- ment, near Lake Winnipcg, now forming the province of Manitoba ; and will thence be conducted up the valley of the river Saskatchewan to the foot of the Rocky

Mountains, which it will cross by the Yellowhead Pass, to descend along the Thomson and Fraser rivers, in British Columbia, till it finally reaches the coast of the Pacific Ocean, possibly connecting Vancouver Island with the mainland by a bridge over the narrowest part of the straits. In connection with the Grand Trunk and other railways of Canada, supplemented by the Intercolonial Railway between Lower Canada, New Brunswick, and Nova Scotia, this new western line will afford the most direct and expeditious means of transit across North Ame- rica, and will probably become the favourite route for mails and passengers and light traffic from Europe to China. It will open a country which abounds in mineral wealth, especially of iron, coal, and copper; while the Saskat- chewan valley, and the belt of fertile soil lying at the base of the Rocky Mountains (where the climate, as far north as Fort Dunvegan on the Peace river, is not more severe than that of Toronto, though in latitudes beyond 56° N., nearly thirteen degrees above that place), are capable of sustaining an agricultural population. The progress of railroad con- struction in North America, stimulating and assisting the development of industrial resources with amazing rapidity, is a feature of high importance in the most recent phases of the world's civilisation. Its average rate of

advance in the United States alone, during the five years preceding January 1873, was nearly 6000 miles annually of new railway; and the aggregate length of railway lines in the Union, all com- pleted and in actual working, was then computed at 71,000 miles. British America, as we have seen, will not be left deficient of similar appliances for its internal improvement.

A great auriferous deposit was discovered in Upper Cali- fornia in the end of 1847, just before its formal cession to the United States. It is situated in the valley of the Sacramento river, and its principal branch the Joaquin, and is believed to extend over a range of country 200 miles in length, or more. The gold is found in its virgin state in small grains in three different situations—/irst, in sand and gravel beds; secondly, ainong decomposed or disin- tegrated granite ; and thirdly, intermixed with a friable talcose slate standing in vertical strata, and containing white quartz, interlaminated or in veins. The largest pieces of gold are found in and near the talcose slate rocks, over which the streams flow; but the finer particles and scales have been carried down by the water to the lowest part of the valleys. It was known before that gold existed in the country ; but the wonderful richness of the deposit was only discovered in 1847, in making a mill-race on American Fork, a small branch of the Sacramento. It soon became widely known, and attracted multitudes of persons, first from the neighbouring districts, and by and by from all parts of the world. The population, which was estimated at 15,000 in 1848, had increased to 92,000 in 1850, and in 1870 was found to be 560,247.

Humboldt gave the following estimate of the entire popu- lation of America in 1823 :—

. Number, Proportion. WItes ovaj ccecstaecab cage meee 18, 471,000 28 per cent. aca de avoodeencsncesendG 660000000006 8,610,000 ZO ss Negroes Free." wht soancaasa 6,433,000 10) Mixed races …..... – fd aa eguiehiatee sists 6, 428,000 WES} og

34,942,000 — Bollaert made the following estimate for 1863 :—

, Number. Proportion. Me Gsalejsieisiion) «aieelss sia steeeteeale reste meee 88,074,423 52 per cent. a UMS Seseodaonenneaeega ono caAearaéencarsocncoce 11,014,710 Ny Ag

egroes eee eee ay

OC oy oc viinan.ne sosiveseeaaneveommmmen 6,031,000

pee odedbOoneahoosedoousoond say wo ODS sees Wais'ey acute edive céea ccm 1,563,230

72,842, 833

What will be the number of the inhabitants of the new continent two or three centuries hence, and of what races will it consist? Setting aside the negroes, to simplify the question, and the Indians, who will gradually disappear, it is evident that the soil of America is destined to be occupied by two races, who may be designated as the Anglo-Saxon and the Spanish-Indian. In the latter the Indian blvod greatly predominates, for the Creoles or pure progeny of the Spaniards probably do not constitute more than 20 per cent. of the population, while the civilised Indians may amount to 50, and the Mestizoes to 30.

The whites in the United States were in 1850 …..... 19,500,000 The population of British America… 0ss0ceeseeees 2,500, 000

22,000,000

The population of Spanish and Portuguese America, exclusive of slaves, was in round numbers….....- 20,000,000

The Anglo-Saxon population in America increases at 3 per cent. annually, and doubles its numbers in 25 years.

Iisvamountiim PS 50"Wasi….,.c.cesssnet nae 22,000,000 Tn VS Satawilll betemss.cor. .caseneeemoceneernets 44,000,000 Tn WOOO, Sess esoges cocawoes sgeners cacueaneemesente 88,000,000 ee ee a 176,000,000

A population of 176,000,000 spread over the territories of the United States and Canada would only afford an average of 40 persons to each square mile, about 1-7th part of the density which England now exhibits, and could occa- sion no pressure. But let us suppose the rate of increase after 1925 to fall to 2 per cent., the period of doubling will then be 35 years.

In 1960 the number will be….....852, 000,000 In 1995 do. GOn sivecsenesocsenes 704,000,000

Suppose the rate again to decline to 14 per cent., which scarcely exceeds that of England and Prussia, the period of doubling will then be 50 years.

In 2045 the number will be….....1,408,000, 000 In 2095 do. dor" " necscseresss 2,816, 000,000

Let us now compare with this the growth of the Spanisu-

Indian population, doubling its numbers in 75 years.

Its amounteine 850 waseee.ssccess terete 20,000,000 Tn 19 2b) at will ber, 2 tcatsececccnccouenmen ees: 40,000,000 In 2000 Che anee eroecohcucnadreermanierinss 80,000, 000 In 2075 QO. sasteneene si steasteaememnertnes 160,000,000 In 2095 (interval of 20 years).....000 200,000,000

It hence appears that, supposing both races to have free Prospects _ space for expansion, the Anglo-Saxon population in 220 ofAmerica years from the present time will amount to 2816 millions, while the Spanish-Indian population will only have multi- plied to 200 millions, or one-fourteenth part of the other. It will be shown by and by, on probable grounds, that the new continent, if fully peopled, could support 3600 millions, and there would consequently be room enough for both; but long before this density is attained the two races will inevi- tably come into collision. In new settlements, where the best lands are invariably first occupied and the inferior neglected, the population is always thinly diffused. The Anglo-Saxons will therefore

crowd to the richer fields of the south, while millions of acres of their own poorer lands are still untenanted ; for we may rest assured that before cultivation is extended to the third-rate soils on the north side of the boundary, means will be found to appropriate the first-rate soils on the south side. These may be acquired by purchase like the lands of Louisiana, or by conquest like those of New Mexico and California, but in one way or another they will be acquired. Nearly forty years ago M. de Tocqueville calculated that along the great space from the Gulf of Mexico to the Canadian lakes the whites were advancing over the wilderness at an average rate of 17 miles per annum, and that enlightened observer was powerfully impressed by the grandeur and solemnity of this deluge of men, for ever swelling and flowing onward,

| Old Conti-

| Useful soil in New and the new continent, though less than half the size of the old,

PROSPECTS. |

to the west, the south, and the north, as 'driven by the hand of God." Since he wrote the rate of progress has perhaps doubled, and every year will quicken its pace. If, then, we take a glance at the state of America at any future period, say 220 years hence (a.p. 2095), we must take the ratio of increase of the two civilised races as the prime element of our calculation. We may assume that the whole continent, from Behring's Straits and Hudson's Bay to Cape Horn, will be divided between the two races in some such proportion as their rate of growth indicates—it may be 10, 15, or 20 to 1. Supposing them to maintain a separate existence, the weaker race will probably be driven, like the Welsh before the English, into the mountainous and inhospitable regions. On the other hand, it is possible, and not improbable, that the smaller population may be absorbed into the mass of the greater, be incorporated with it, and adopt its language. The result, like other things in the womb of time, may be modified by causes yet unseen saint in whatever shape it may present itself, there is little risk in predicting that the Anglo-Saxon race is destined by its superior intelligence and energy to rule the New World from end to end. American statesmen

now speak of the whole continent as the heritage of their people. Paradoxical as the fact may appear, we are satisfied that

contains at least an equal quantity of useful soil and much more than an equal amount of productive power. America is indebted for this advantage to its comparatively small breadth, which brings nearly all its interior within reach of the fertilising exhalations of the ocean. In the old conti- nent, owing to its great extent from east to west, the central parts, deprived of moisture, are almost everywhere de- serts ; and a belt round the western, southern, and eastern shores, comprises nearly all that contributes to the support of man. How much fruitful land, for instance, is there in continental Asia? If we draw a line from the Gulf of Cutch (near the Indus) to the head of the Yellow Sea, we cut off India and China, with the intervening Birman em- pire and the southern valleys of Thibet ; and this space, which comprises only about oue-fifth of the surface of Asia, embraces five-sixths of its productive power. Arabia, Persia, Central Thibet, Western India, Chinese and Inde- pendent Tartary are deserts, with scattered patches of use- ful soil not amounting to the twentieth part of their extent. Siberia, or Northern Asia, is little better, owing to aridity and cold together. Anatolia, Armenia, the Punjab, and a narrow strip aloug the western shores of the Pacific Occan, north as far as the 60th parallel, compose the only valuable agricultural territory beyond India and China. Europe, which is merely the western margin of Asia, is all fruitful in the south ; but on the north its fruitfulness terminates at the GOth or 62d parallel. Africa has simply a border of useful soil round three-fourths of its sea-coast, with some detached portions of tolerably good land in its interior, Of the 31,000,000 of square miles which these three continents occupy, we cannot find, after some calculation, that the pro- ductive soil constitutes so much as one-third, and of that third a part is but poor,

Now, in estimating the useful soil in America we reject— 1. Most of the region north of the latitude of 53°, amounting to 2,600,000 square miles ; 2. A belt of barren land about 300 miles broad by 1000 in length, or 300,000 square miles, lying on the east side of the Rocky Mountains; 3. A belt of arid land of similar extent situated on the cast

side of the Andes, between 24° and 40° of south latitude; 4. The desert shore of Peru, equal to 100,000 square miles; 5. An extent of 100,000 Square miles for the arid country of Lower Cali- fornia and Sonora; and 6. An extent of 500,000 square miles for the summits of the Andes and the south extremity of Patagonia. These make an aggregate of 3,900,000

AMERICA

ty square miles; and this, deducted from 13,900,000, leaves

10,000,000 square miles as the quantity of uscful soil in the New World.

Now, what relation does the fruitfulness of the ground Ratio of The productive powers fertility to of the soil depend on two circumstances, heat and moisture ; !titude.

bear to the latitude of the place ?

and these increase as we approach the equator. First, the warm regions of the globe yield larger returns of those plants which they have in common with the temperate zones; and next, they have peculiar plants which afford a much greater portion of nourishment from the same extent of surface, Thus, maize, which produces 40 or 50 for one in France, produces 150 for one on an average in Mexico; and Hum- boldt computes that an arpent (five-sixths of an acre), which will scarcely support two men when sown in wheat, will support fifty when planted with bananas. From a consider- ation of these and other facts we infer that the productive or rather nutritive powers of the soil will be pretty correctly indicated by combining the ratios of the hcat and the mois- ture, expressing the former of these in degrees of the centi- grade scale. Something, we know, depends on the distri- bution of the heat through the different seasons ; but as we do not aim at minute accuracy, this may be overlooked.

Latitude. oe ie 4 ain, eine Product. Ratio.

60 16 112 4

45 29 14 406 ils)

0 96 28 2688 100

Thus, if the description of food were a matter of indiffer- ence, the same extent of ground which supports four persons at the latitude of 60°, would support 15 at the latitude ‘of 45°, and 100 at the equator. But the food preferred will not always be that which the land yields in greatest abund- ance ; and another most important qualifying circumstance must be considered—it is labour which renders the ground fruitful ; and the power of the human frame to sustain labour is greatly diminished in hot climates. In the torrid zone, in low situations, we doubt if it is possible for men to work regularly in the fields for more than five hours a-day, or half the daily period of labour in England. On these grounds, and to avoid all exaggeration, we shall consider the capacity of the land to support population as proportional to the third power of the cosine (or radius of gyration) for the latitude. It will therefore stand thus in round numbers :—

Latitude, 0° 30° 45° 60° Productiveness, 100 65 35 124

15”

90

In England the density of population is about 389 per- Increase of sons per square mile; but England is in some measure the population.

workshop of the world, and supports, by her foreign trade, a greater population than her soil can nourish. In France the density of population is about 177; in Germany it varies from 100 to 200. On these grounds, we may assume that the number of persons which a square mile can properly sus- tain without generating the pressure of a redundant popula- tion is 150 at the latitude of 50°, and 26 is the sum which expresses the productiveness of this parallel. Then taking, for the sake of simplicity, 35 as the index of the productive- ness of the

useful soil beyond 30° in America, and 85 as that of the country within the parallel of 30° on each side of the equator, we have about 4,000,000 square miles, each capable of supporting 200 persons, and 5, 700,000 square miles, each capable of supporting 490 persons. It follows that if the natural resources of America were fully developed it would afford sustenance to 3,600,000,000 of inhabitants, a number nearly five times as great as the entire mass of human beings now existing upon the globe! And, what is even more surprising, it is not improbable that this prodigious population will be in existence within three or at most four centuries.

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AMERICAN LITHRATURE

I.— INTRODUCTORY.

The litcrature of the United States, while still half our own, is pervaded, to a degree not easily estimated, by a foreign element. 'The relationship between Englishmen and Americans, making them ignorant of their mutual ignorance, operates against the soundness of their judg- ment on each other's work. Community of spcech, which ought to be a bond of union, is often a medium of offence; for it dispenses with a study of the language, and in studying a language we learn something also of the habits and social histories which are reflected in, and serve to interpret, distinctly alien literatures. Facility of travel, making it easy to acquire first impressions, is a temptation to such hasty estimates as many of the most accomplished Americans have formed of England, and many of the most accomplished Englishmen have formed of America. The least satisfactory works of some of their foremost writers, as Mr Hawthorne's Old Home and Mr Emerson's Hnglish Traits, are those associated with their transatlantic experiences. But of the mistakes on both sides, ludicrous and grave, we have had perhaps the larger share. Few Americans have ever so misconceived a British statesman as we misconccived Mr Lincoln, or gone so far astray in regard to any crisis of our history as we did in reference to the moving springs and results of their Civil War. The source of this greater ignorance lies not so much in greater indifference as in greater difficulty. England is one, compact and stable. The United States are many, vast, various, and in perpetual motion. An old country is a study, but a new country is a problem. Antiquity is brought to our firesides in the classics, till Athens and Rome

"To us are nothing novel, nothing strange."

We are more familiar with the Acropolis than with the Western Capitol —with Mt. Soracte than with the Catskills. Our scholars know more about Babylon than about Chicago. Dante immortalises for us the Middle Age; Plantagenet England is revived in Chaucer ; the inner life

*of modern England has a voice in Tennyson and the Brownings. Where is the poet who will reveal to us " the secrets of a land," in some respects indeed like our own, but separated in other respects by differences which the distance of 3000 miles of ocean only half represents ; which, starting on another basis, has developed itself with energies hitherto unknown in directions hitherto unimagined? Who will become the interpreter of a race which has in two centuries diffused itself over a continent, the resources of which are not more than half discovered, and which has to absorb within itself and harmonise the discordant elements of other races for whom the resources of the Old World are well-nigh exhausted? Caret vate sacro; but it does not want poetical aspirations as well as practical daring : ** This land o' ourn I tell ye's gut to be*

A better country than man ever sce ;

I feel my sperit swellin' with a cry

That seems to say, ' Break forth and prophesy.'

O strange New World, thet yet wast never young,

Whose youth from thee by gripin' want was wrung,

Brown foundlin o' the woods, whose baby bed

Was prowled round by the Injun's eracklin' tread,

An' who grew'st strong thru' shifts an' wants an' pains, Nursed by stern men with empires in their brains."

II.—Conpirions ANnpD CHARACTERISTICS OF AMERICAN LITERATURE.

The number of writers who have acquired some amount

of well-founded reputation in the United States is startling. The mere roll of their names would absorb a great part of the space here available for an estimate of the works which best represent them. Mr

Griswold informs us that he has in his own library more than 700 volumes of native novels and tales; his list of "remarkable men" is like Homer's catalogue of ships. Almost every Yankee town has indeed its local representatives of literature, reflecting in prose or verse the impulses and tendencies of the time. But while America has given birth to more than a fair proportion of eminent theologians, jurists, economists, and naturalists, hardly any great modern country, excepting Russia, has in the same number of years produced fewer works of general interest likcly to become classical ; and Bishop Berkcley's prophecy of another golden age of arts in the Empire of the West still awaits fulfilment. This fact, mainly attributable to obvious historic causes, is frankly recognised by her own best authors, one of whom has confessed—" From Washington, proverbially the city of magnificent distances, through all its cities, states, and territories, ours is a country of beginnings, of projects, of designs, of expectations." The conditions under which the communities of the New World were established, and the terms on which they have hitherto cxisted, have been unfavourable to Art. The religious and commercial en- thusiasms of the first adventurers to her shores, supplying themes for the romancers of a later age, were themselves antagonistic to romance. The spirit which tore down the aisles of St Regulus, and was revived in England in a reaction against music, painting, and poetry, the Pilgrim Fathers bore with them in the " Mayflower," and planted across the scas. The life of the early colonists left no Icisure for refinement. They had to conquer nature before admiring it, to fecd and clothe before analysing them- selves. The ordinary cares of existence beset them to the exclusion of its embellishments. While Dryden, Pope, and Addison were polishing stanzas and adding grace to Iinglish prose, they were felling trees, navigating rivers, and fertilising valleys. We had time, amid our wars, to form new measures, to balance canons of criticism, to dis- cuss systems of philosophy ; with them

" The need that pressed sorest Was to vanquish the seasons, the ocean, the forest.'

The struggle for independence, absorbing the whole energies of the nation, developed military genius, states- manship, and oratory, but

was hostile to what is called polite literature. The people of the United States have had to act their Ilad, and they have not had time to sing it. They have had to piece together the disjecta membra of various races, sects, and parties, in a ravromwAov moAtreov, Their genius is an unwedded Vulcan, melting down all the elements of civilisation in a gigantic furnace. An enlightened people in a new land, " where almost every- one has facilities elsewhere unknown for making his fortune," it is not to be wondered that the pursuit of wealth has been their leading impulse ; nor is it perhaps to be regretted that much of their originality has been expended upon inventing machines instead of manufactur- ing verses, or that their religion itself has taken a practical turn. One of their own authors confesses that the " com- mon New England life is still a lean impoverished life, in distinction from a rich and suggestive one ;" but it 18 there alone that the speculative and artistic tendencies of recent years have found room and occasion for develop- ment. Our travellers find a peculiar charm in the manly force and rough adventurous spirit of the Far West, but

the poetry of the pioneer is unconscious.

struck its roots deeply into native soil.

fidence—in labour.

round them.

When we remember that the Romans lived under the

sky of Italy, that the character of the modern Swiss is

like that of the modern Dutch, we shall be on our guard against attributing too much to the influence of external

nature. Another race than the Anglo-Saxon would doubt-

less have made another America ; but we cannot avoid the belief that the climate and soil of America have had

something to do in moulding the Anglo-Saxon race, in

making its features approximate to those of the Red

Indian, and stamping it with a new character. An electric _ atmosphere, and a temperature ranging at some seasons from

50° to 100° in twenty-four hours, have contributed largely

to engender that restlessness which is so conspicuous "a note" of the people. as the ocean has been

a material agent in fostering an ambition unbridled by

traditionary restraints. When

European poets and essayists write of nature, it is to con-

trast her permanence with the mutability of human life. We talk of the. everlasting hills, the perennial fountains, the ever-recurring seasons. "Damna tamen celeres reparant ceelestia lunze—nos ubi decidimus"— In the same spirit Byron contemplates the sea and Tennyson a running stream. In America, on the other hand, it is the extent of nature that is dwelt upon—the infinity of space, rather than the infinity of time, is opposed to the limited rather than to the transient existence of man. Nothing strikes a traveller in that country so much as this feature of magni- tude. The rivers like rolling lakes, the lakes like inland seas, the forests, the plains, N iagara itself, with its world of waters, owe their magnificence to their immensity ; and by a transference, not unnatural although fallacious, the Americans generally have modelled their ideas of art after the same standard of size. Their wars, their hotels, their language, are pitched on the huge scale of their distances, "Orphaned of the solemn inspiration of anti-quity," they gain in surface what they have lost in age; in hope, what they have lost in memory.

“‘——That untravelled world whose margin fades

For ever and for ever when they move,”

is all their own; and they have the arena and the expecta-

The attractive culture of the South has been limited in extent and degree. The hothouse fruit of wealth and leisure, it has never Since the Revolu- tion days, when Virginia was the nurse of statesmen, the few thinkers of America born south of Mason and Dixon’s line—outnumbered by those belonging to the single State of Massachusetts —have commonly migrated to New York or Boston in search of a university training. In the world of letters at least, the Southern States have shone by reflected light ; nor is it too much to say, that mainly by their connection with the North the Carolinas have been saved from sinking to the level of Mexico or the Autilles. Whether we look to India or Louisiana, it would seem that the tropical sun takes the poetic fire out of Anglo- Saxon veins, and the indolence which is the concomitant of despotism has the same benumbing effect. Like the Spartan marshalling his helots, the planter lounging among his slaves was made dead to Art by a paralysing sense of his own superiority. All the best transatlantic literature is inspired by the spirit of confidence—often of over-con- It has only flourished freely ina free soil; and for almost all its vitality and aspirations, its comparatively scant performance and large promise, we must turn to New England. Its defects and merits are those of the national character as developed in the Northern States, and we must seek for an explanation of its peculiari- ties in the physical and moral circumstances which sur-

A territory which seems boundless |

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tions of a continent to set against the culture and the ancestral voices of a thousand years. Where Englishmen remember, Americans anticipate. In thought and action they are ever rushing into empty spaces. Except in a few of the older States, a family mansion is rarely rooted to the same town or district; and the tie which unites one gene-

ration with another being easily broken, the want of con- tinuity in life breeds a want of continuity in ideas. The American mind delights in speculative and practical, social and political experiments, as Shakerism, Mormonism, Pan- tagamy ; and a host of authors, from Emerson to Walt Whitman, have tried to glorify every mode of human life from the transcendental to the brutish. The habit of in- stability, fostered by the rapid vicissitudes of their com- mercial life and the melting of one class into another, drifts away all landmarks but that of a temporary public opinion ; and where there is little time for verification and the study of details, men satisfy their curiosity with crude generalisa- tions. The great literary fault of the Americans thus comes to be tmpatience. The majority of them have never learnt that " raw haste is half-sister to delay ;" that "' works done least rapidly, art most cherishes." The makeshifts which were at first a necessity with the Northern settlers have grown intoa custom. They adopt ten half measures instead of one whole one ; and, beginning bravely, like the grandi- loquent preambles to their Constitutions, end somctimes in the sublime, sometimes in the ridiculous.

Many of the artistic as well as many of the social pecu- liarities of the United States may doubtless be traced to their form of government. After the most obvious wants of life are provided for, democracy stimulates the produc- tion of literature. When the hereditary privileges of rank have ceased to be recognised, the utility, if not the beauty, of knowledge becomes conspicuous. The intellectual world is spurred into activity: there is a race in which the prize is to the swift. Everyone tries to draw the eyes of others by innumerable imperfect efforts with a large insignificant sum total. Art is abundant and inferior: whitewashed wood and brick pass for marble, and rhythmical spasms for poetry. It is acknowledged that the prevailing defect of Aristocratic literatures is formality; they are apt to be precise and restricted. A Democratic literature runs the risk of lawlessness, inaccuracy, and irreverence. From both these extremes the Athenian, the Florentine, and the Elizabethan classics were preserved by the artistic inspirations of a flexible tradition. The one is exemplified in the so-called Augustan ages of letters, in the France of Louis XTV. and the England of Queen Anne, when men of genius, caring more to

perfect their style than to estab- lish truth, more to captivate the taste than to stir the passions, moved with clipt wings in a charmed circle of thought. The other has its best illustration in the leaders of our own romantic schools, but its most conspicuous development in America; a country which is not only democratic but youthful without the modesty of youth, unmellowed by the past and untrammelled by authority, where the spirit of adventure is unrestrained by feelings of personal loyalty—where order and regularity of all kinds are apt to be misnamed subservience—whcre vehemence, vigour, and wit are common, good taste, profundity, and imagination rare ;—a country whose untamed material infects the people, and diverts them from the task of civilisation to the desire of conquest.

American literature is cramped on another side by the spirit of imitation. It has been in great measure an offshoot or prolongation of our own. As English sculptors study at Rome and Naples, the most prominent Western artists in every department have almost invariably inaugurated their careers by travelling in Europe, and writing descriptions of the foreign lands where they have found their richest intel-

lectual culture. They have sought the sources, the themes, the rules, and the sanctions of their art in the Old World, and their highest ambition, like that of all colonists, has hitherto been to receive a favourable verdict, not from the country of their birth, but from that of their ancestors. Even Franklin—in some respects an American of the Americans—was in philosophy a practical disciple of Locke, as Jefferson was of the French Revolution. " The literary genius of Great Britain," says De Tocqueville, "still darts its rays into the recesses of the West. . . . The small

number of men who write are English in substance, and

still more in form." Of the great number of men who have written in America since the date of this criticism, only a few have written much to confute it. Washington Irving, who, in the course of four distinct

visits, spent much of his life in Europe, only escapes from the infiuence of Addison in his Knickerbocker and Dutch sketches. On land at least, Cooper—though in many respects an original writer—evcrywhere remembers Scott. As in the works of the Scotch novelist, the semi-barbarous feudal spirit is repre- sented in conflict with modern law, in those of the Ameri- can the enterprise of New England is struggling against the ruggedness of nature and a savage life. The writers of the last thirty years have been making strenuous, some- times spasmodic, cfforts after originality, but they are still affected by transatlantic associations. In the style of Mr Motley we cannot help observing the stamp of Carlyle. The Transcendental movement begun by Emerson is ad- mitted to have derived its first impulse from Sartor Resartus; and among the eccentricities of its leading followers none is more remarkable than their mania for German and Oriental quotations. The tyranny which five centuries' load of classics in the same tonguc exercises over the mind of a nation not yet a century old, is very much strengthened by the non-existence of an international copyright, which leads to the intellectual market being glutted with stolen goods. As long as a publisher in Boston or New York can republish a good book written in Edinburgh or London without paying for it, he is likely to prefer an undertaking which involves no risk and com- paratively no outlay, to another which involves both; that is, the republication of the English to the first publication of an American book; for the English book has already attained its reputation, and its popularity in America is secured, while the Amcrican book, for the copyright of which he has to pay, has, except in the case of a few authors, still to win its spurs. If the people of the United States had spoken a language of their own, it is probable they would have gained in originality; as it is, they are only now beginning to sign their intellectual declaration of independence,—a fact confessed among the latest words of their own greatest prose artist:— Bred in English habits of thought as most of us are, we have not yet modified our instincts to the necessities of our new modes of life. Our philosophers have not yet taught us what is best, nor have our poets sung to us what is most beautiful in the kind of life that we must lead, and therefore we still read the old English wisdom, and harp upon the ancient strings."

TIL—Earurer AMERICAN LITERATURE.

We may trace the influence of the foregoing controlling facts or tendencies, subject to various phases of personal power, through the three great periods under which Anglo- American history obviously falls:—The Colonial, the Revolutionary, and that of the 19th Century.

1. The Colonial Period.—Little of interest in the world of letters has come down to us from the 17th century in the West. Sandys's Ovid, translated on the banks of the James River, dedicated to Charles I., and published 1626,

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is worthy of note as the first contribution to English literature from America, About the same date the Welsh Puritan Vaughan sent home his Golden Fleece from New- foundland, and Captain Smith gave to the world his descriptions of Virginia. But the earliest verse that has a real claim to be regarded as American is a doggerel list, by an anonymous author, of New England's annoyances, which, if we remember the date—a generation after Spenser had cclebrated "the Indian Peru" in his Faery Queen—will confirm our view of the backwoodsman's want of leisure for " polishing his stanza:"— " The place where we live is a wilderness wood,

Where grass is much wanting that's fruitful and good.

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If fresh meat be wanting to fill up our dish,

We have carrots and pumpkins, and turnips and fish ;

We have pumpkins at morning and pumpkins at noon,

If it was not for pumpkins we should be undone." A little later we have a Puritan version of the Psalms, the worst of many bad; and about 1650 the poems of Anne Bradstreet and Benjamin Thomson, worthy of mention, but scarcely readable. In prose are relics of the sermons and controversies of Roger Williams and John Cotton and Eliot, the apostle of the Indians, with the ponderous Magnalia and witch denunciations of Cotton Mather. The main literary event of the century was thc founda- tion (1636) of Harvard University. That of Yale followed at a long interval, and subseqnéntly those of New Jersey, Rhode Island, and Princeton. In all new countries in- dustrial and commercial interests are at first the strongest. The febrile activity produced by fear of a sterile future leaves little room for speculative imagination. But in the New World, colonised in part by adventurers, in part by reli- gious refugees and enthusiasts, another influence was from the first at work. When her solitudes began to give place to cities, the brains of her people were expended on the farm or the exchange with a zeal materially modified by the spirit and formule of the faith which led the founders of the Northern States across the sea, and continued to infuse a religious element into their enterprises. This element, which elevated the settlers of New England above ordinary emigrants, adding to their strength and giving a faster dye to their morality, was yet, in its original form, no more favourable to freedom or variety of thought than the industrialism by which it was surrounded. But it begat and fostercd the Puritan theological literature which was concentrated in the massive yet incisive treatises and

discussions of Jonathan Edwards of Connecticut—(1703— Edwards.

1758)—who, if not, as asserted by American panegynists, "the first man of the world during the second quarter of the 18th century," was yet, by the clear vigour of his thought and the force of its expression, one of the fore- most figures of that era. An estimate of his rank as a theologian belongs to a distinct branch of the history of American literature. It is enough here to refer to the testimony of all competent judges as to the singular lucidity of his style, and to that of his contemporaries as to the fervour of his eloquence and the modest

simplicity of his life. Passages of his occasional writings, as the description of his future wife, evince a " sweetness an

light" of temper not always associated with the views of which he was and remains the most salient English advo- cate. A slightly junior contemporary of Edwards, the exponent xar' é£ox#v of the other—that is, the secular side of early American life—was destined to sce the end of one and play a prominent part in opening another era of his country's history. Benjamin Franklin, t tarian philosophy endures, will be a name to conjure with. It is clarum et venerabile, though its owner was endowed with as little as possible for a great man of the "faculty divine." Franklin's autobiography, the details of which

as long as Utili Franklio.

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*need not find place here, is as romantic as the life of an unromantic person can be. The incidents of the young candle-moulder — the printer's apprentice —the ballad- monger wisely discouraged by the wise paternal criticism, *Versemakers are generally beggars "—the runaway, eating rolls on the Philadelphia street—his struggling life in London with Ralph of the Dunciad—his return, " cor- recting the erratum" of his infidelities by marriage with his old Pennsylvanian friend—his success as a printer, economist, statesman, and iplomatist —his triumphs in natural and_ political philosophy, clenched in Turgot's line, adapted from Manilius—*

" Eripuit czlo fulmen, sceptrumque tyrannis "—*

his examination before the House of Commons, resulting

in the repeal of the Stamp Act, when Lord Chatham spoke of him as one who was "an honour not to England only,

but to human nature "——his signature of the Declaration of

Independence—his ministry in France and popular triumph with Voltaire, who said, parler un moment la langue de Franklin" —the acclamations of shouting multitudes on his return home—Mirabeau's announcement of his death (in 1790, in his eighty-fourth year) to the Assembly— the genius which has freed America, and poured a flood of light over Europe, has returned to the bosom of the divinity "—are elementary facts of schoolboy history. They are the records of the successive stages of the greatest success achieved in modern times by the genius of common-sense, integrity, and in- dustry indomitable. Franklin's experiments and physical discoveries form a chapter in the history of science; but half of his fame even in this field is due to the precision and clearness of the manner in which they are announced. "The most profound observations," says Lord J effrey, "are suggested by him as if they were the most obvious and natural way of accounting for phenomena." The same literary merit characterises the financjal pamphlets and treatises which first brought him into celebrity. Both are marked by the same spirit,—the love of the Useful, which was his passion through life. Franklin follows Bacon, to an extreme opposed to that of the Platonists, in decrying abstractions. Archytas is said to have apologised for inventing the arch. Franklin is ashamed to have wasted time over pure mathematics in his " magical squares." His aim is everywhere to bring down philo- sophy, like the lightning, from heaven to earth, "clustrans commoda wte." His ethics—those of Confucius or the Seven Sages, modified by the experience and the circum- stances of a later age—are embodied in the most famous of popular annuals, Poor Richard's Almanack, in which for twenty-six years he taught his readers (rising to the number of 10,000) "the way to be healthy and wealthy and wise," by following simple utilitarian rules, set forth in plain incisive prose and rhyme, rendered attractive by a vein of quaint humour and the homely illustrations always acceptable to his countrymen. The same train of thought appears in the " Whistle," among the letters from Passy, where his persistent deification of thrift appears side by side with graceful compliments to Mesdames Helvetius and Brillon, records of the aftermath of senti- ment that often marks a green old age. Franklin remains the most practical of philosophers in perhaps the most practical of nations.*

2. The Revolution Period.—It has been often remarked that periods of political national crisis are more favourable to the preparation than to the actual production of litera- ture. Wordsworth's assertion, that poetry is the outcome of emotion recollected in tranquillity, applies with slight modification also to artistic prose. The demands of instant action cast the reflective powers into abeyance, and a

"Je n'ai pu résister au désir de

Wal

stormy era is the seed-time of a later harvest. There is only one exercise of the imagination that it directly stimu- lates—that of the orator ; and the conditions of his success, save in a few instances, make a drain on his posthumous reputation. In reading even the greatest speeches of the past, divested of the living presence which gave them colour and force, we find it difficult to account for the effect which they are known to have produced. They are the ashes or the fossils of genius. Little that is of per- manent literary value is left us of the harangues that were the trumpet-calls of patriotism during the American Revolutionary War. The triumphs of Patrick Henry, who Orators. "wielded at will that young democraty," are commemor- ated in the judicious biography of Wirt, but few of his orations are accurately preserved ; and of the speeches of James Otis, which were compared to " flames of fire," we have mainly a tradition. His pamphlet (1762), entitled A Vindication of the conduct of the House of Representa- tives, is considered to contain the germ of the Declaration of Independence. Among other considerable efforts of eloquence, those of Fisher Ames are worthy of uote as being directed in great measure against the excesses of democracy. The inaster-minds of the era were the states- Statesmen. men and jurists, who fought for the free soil, sunk the deep foundations, and reared the superstructure of the new Commonwealth. The history of American law is a distinct theme. It must suffice here to mention, as claiming recog- nition in the field of letters, Washington himself, in his clear and incisive though seldom highly-polished corre- spondence ; his biographer John Marshall, chief justice of the supreme court from 1801 to 1835, one of the early

pilots of the state, who left behind him a noble and stainless name, and laid down the first principles of that international code afterwards elaborated by Wheaton; Madison, John Jay, the elder Adams, and Alexander Hamilton, during the war Washington's "most confiden-
Hamilton. tial aid," afterwards the presiding genius of the movement represented by the Mederalist, the organ of the anti- democratic party. To this he contributed three-fourths of the material, marked, as are all his papers and speeches, by originality of thought, breadth of view, and purity of style. As secretary of the treasury, he became perhaps the greatest of financiers. The general judgment of his countrymen acquiesces in the terms of the tribute paid to his memary by Guizot. "He must be classed among the men who have best known the vital principles and fundamental con- ditions of a government worthy of its name and mission," Of Hamilton's numerous historical sketches, the most celebrated is his letter to Colonel Laurens giving an account of the fate of Major André, in which refinement of feeling and inflexible impartiality of view are alike conspicuous. The great and unhappily the bitter anta- Jefferson. gonist of the Federalists is one of the most conspicuous figures in the history of American thought. Thomas Jefferson (1743-1826), President from 1801 to 1808, is the representative in chief of the revolutionary spirit of his age and country. While his rival compeers stood firmly on the defensive against the encroachments of an arbitrary government, his desire was, in politics as in speculation generally, to break with the past. Inspired with patriotic zeal by Patrick Henry's denunciations of the Stamp Act, he came forward prominently in 1769 as a member of the Colonial Assembly of Virginia, In 1776 the main part of the responsibility of drawing up the Declaration of Independence fell upon him. In 1784 he was appointed minister of the congress in Paris, where he spent the

greater part of six years, and brought back an admiration for those phases of the French Revolution from which

the more temperate judgments of Hamilton and Fisher

Ames had recoiled. He threw himself heart and soul into

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Minor writers.

Ballad literature.

the arms of the Democratic party, and in the constitutional struggle that cnsued his keener sense of the direction in which popular sympathies were tending, with the weight of his half physical energies, gave him the ascend- ancy over the wider knowledge and more far-seeing intel- lects of his adversaries. Jefferson might be tcrmed the Danton of the West, but his forte lay not so much in oratory as in political management and incisive vivacity. More perhaps than any other great statesman of his age, he aspired to be an author, to which title the best passages in his Votes on Virginia, his Autobiography, and Correspond- ence, give hima fair claim. His descriptions of scenery in the first are always pleasing and gencrally graphic. His sketches of Continental society are lively, and his occasional flights of fancy, as the dialogue between the head and heart, at least ingenious. His religion and ethics were those of his friend Tom Paine and the Lncyclopédie.

The age of the Titans in transatlantic history abounds in minor literati, whose light effusions, mainly satirical or descriptive sketches in prose and verse, throw a somewhat dim and ragged lustre over its graver page. The bulk of these obvious reflections of the manner and thought of Butler, Pope, and Swift, or of Gay, Prior, and Shenstone, are a penance to wade through, and scarce claim re- membrance for their authors. A few stand out conspicuously by the celebrity of the names with which tlicy are associated, or a certain raciness and approach to originality in their style. Of these the chief are :—The social caricatures of Judge Brackenridge (who, though born in Scotland, lived in America from infancy), and his doggerel but vigorous lines on Bunker's Hill; the once popular humorous lyric entitled M¢Fingal, by J. Trumbull, also the author of The Progress of Duliess, in the Hudibrastic metre which seems to have been used by imitators to show how intolerable it is in any but the original hands ; the more flowing but on the whole commonplace odes of Philip Freneau, including his

patriotic hymns to Washington, with the moremusical lyricsthe " Wild Honcysuckle" and the " Indian Death Song," and his prose entitled Advice to Authors ; the political satires of Mercy Warren, authoress of Things necessary to a Woman (the obvious model of the more modern squib, Nothing to Wear), and of a History of the Revolution, remembered only as being the first in date ; the patriotic rhapsodies of Phillis Wheatley, interesting as the production of a young negress brought from Africa in 1761, and soon afterwards sold in Boston to the mistress from whom she took her name ; Francis Hopkinson's Battle of the Kegs and his Pretty Story—a burlesque closely fashioned after Arbuthnot's John Bull—his New Roof, meaning the American constitution, and his satire on the pedantry of the sciences entitled the Salt Box ; Joel Barlow's Hasty Pudding ; the humorous Wants of Man, by Quincy Adams, more prominent as a statesman than as a poct ; and on a similar but highcr platform the best of too large a volume of verses, in which the ' Triumph of Infidelity" (after the manner of Cowper), the "Conquest of Canaan," and "Columbia," are the leading pieces, by the amiable theologian Dr Timothy Dwight. Dwight's prose descriptions, as that of the Notch of the White Moun- tains and the evening on Lake George, are superior in grace to his efforts in rhyme.*

The ballad literature of the revolution days is said to have at- tracted the attention of Lord Chatham, less probably from its intrinsic merit than from its faithful though rough embodiment of the sentiment that not only moved over the surface, but penetrated the depths of the national life. The anonymous popular literature of a country is the best " abstract and brief chronicle of the time" in which it is produced. The songs current in America during this era, iuspired by the same spirit and pitched in the same key, are historically interesting and artistically monotonous. They celebrate in rude verse the achievements of native heroes, like " Bold Haw- thorne ;" or ridicule, like "Jack Brag," the British Lion, or, like the "' Fate of Burgoyne," the overthrow of vaulting ambition ; or, as in ' Wyoming Massacre," bewail the fate of the fallen ; or, as in* ***' Free America," celebrate with schoolboy huzzahs the triumph of the good cause. Among the very rude national anthems of the West, "Yankee Doodle" is remarkable as having been an old Dutch catch adapted into an English satirical***

chant, and adopted, with conscious or unconscious irony, by the American troops. “ Hail Columbia,” which as a poetical production takes even a lower rank than ‘Rule Britannia,” was a somewhat later production by Joseph Hopkinson (1798) ; and the ‘ *Star-Spangled Banner” of Francis 8. Key 1s associated with the traditions of the second British war. As inspired with the spirit of the 18th, though belonging in date to the early years of the 19th century, we may mention in advance the “ Pilgrim Fathers” of J. Pierpont, Wood- worth’s “Old Oaken Bucket,” ‘Home, Sweet Home,” by de 18k. Payne ; the humorous burlesque of J. G. Saxe, “ Miss Macbride ;”*

and the verses of the great painter and creditable romancer Washington Allston, with the refrain ‘‘ We are one.”*

English philology and literature were during this period represented by the famous Lindley Murray, and Noah Webster (1788-1805), the author of the best dictionary of our language that has appeared since Johnson’s. In natural science, the two Bertrams; Alexander Wilson the ornithologist ; and Audubon, the literary glory of Louisiana, whose descriptions of animate nature rival those of Buffon, are illustrious names.

IV.—TseE LITERATURE OF THE NINETEENTH CENTURY. Prose Writings.

1. In a rapid estimate of the literature of this prolific age we can only signalise its contributions to the several branches of physical and mental science. The United States have during the last two generations been justly proud of the names of Morton and Schoolcraft in ethnology, of Bowditch in mathematics, of Sullivan and Dana in chemistry and mineralogy. Their classical scholarship, which hardly competes with that of England, has yet been fairly maintained by Everett, Felton, Woolsey, Anthon, and Robinson. Dr Marsh is an accomplished English scholar, while Professor Whitncy is a learned and accurate philologist, whose researches in Sanscrit are well known and appreciated by European Orientalists. The meta- physical schools of Locke and Reid are nowhere better represented than in America by Dr Bowen and Dr N. Porter. The place of Marshall as a jurist has been worthily filled by

Chief-Justice Kent and Judge Story; the latter of whom ranks, by virtue of his essay on classical studics and his graceful descriptions of natural scenery, among the most accomplished of the numerous professional men who have in the New World devoted their leisure hours to lighter literature. — –

The inhabitants of the United States have always been Orators, noted for remarkable fluency, sometimes a super-fluency, of speech. The early years of the century were illustrated by the fiery zeal of Randolph and the practical force and occasional impassioned eloquence of Henry Clay. The great political controversics inherited from the preceding age found their most conspicuous popular exponents in two leading minds laying claim to diverse kinds of great- ness, and destined to be in almost incessant antagonism.

John C. Calhoun, the most illustrious representative of Calhoun the Southern States, of whose rights, real or imaginary, he was during his life the foremost champion, was by educa- tion and choice a professional statesman. Secretary of War in 1817, and Vice-President of the Commonwealth in 1824, he resigned the latter office on occasion of the dis- pute about the tariff law of that year, to become the leader of the Opposition ; and in vindicating the attitude of South Carolina was the first to lay the strands of the future Secession war. The most accomplished modern apologist for slavery, it is probable that he only hastened the conflict between opposing principles which was sooner or later inevitable. Calhoun's eloquence, as attested by his audi- tors and the numerous speeches and papers preserved in the six volumes of his published works, was notable for its earnestness and gravity, the terse polish of its manner, for philosophic generalisations and analytical dialectic. His prevailing sincerity and candour have made his memory respected by those farthest removed from him in sentiment and opinion. Daniel Webster, on the whole the grandest Webster orator of the New World, was during the greater part of his career the champion of Massachusetts and the assertor of her policy. His defence of that State in the Senate (1830) against General Haynesof Carolina, and hisoratorical duel with Calhoun (1838),

resulting in the temporary over- throw of the doctrine of nullification, are among the most

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remarkable triumphs of debate in history. Some of his pleadings on criminal trials have an almost terrible power. But his literary genius and richness of illustration found freer scope in his famous appeal for the Greeks in 1823, his great speech (1820) on the second centennial anni. versary of the landing of the Pilgrims, or his address (1825) on laying the corner-stone of Bunker Hill monu- solid, massive, and on great occasions glowing with a lurid light, is not it is “vital in every part,” and belongs to the permanent literature of his country, in whose political arena he was during his life The art of making ‘technically called «“ orations,” The great master in this species of composition was Edward Everett, distinguished by his early association with Lord Byron in Greece, the high dignities—governor of Massa- chusetts, minister to the court of St James’s, and president of Harvard—to which he attained, and by the variety of his accomplishments. Mr Everett was for ten years a In his literary work he

ment, Webster’s eloquence, everywhere

the mere record of half-forgotten strifes ;

perhaps the most powerful actor. commemorative speeches, has been cultivated in North America to excess,

useful member of Congress. displayed an almost fatal fluency, having contributed to the “ North American Review,” of which he was for some time editor, upwards of a hundred articles in the space of a few years. These articles are inevitably of uncqual merit, but they everywhere evince the ripe scholarship of a highly cultivated mind. The volume by which he is best remembered —twenty-seven Orations — published in 1836, is marked by the same characteristics. Discoursing on a wide range of subjects—among which the refrains

are America and Greece, the " Mayflower," the Progress of Dis- covery, Patriotism, Reform, the Republic, Concord, Lex- ington, and the inevitable Bunker Hill—these speeches are always able, but seldom inspiring: carefully elaborated and richly adorned, they are the production of the first of rhetoricians rather than a genuine orator.

Among the remaining lawyers and statesmen, remarkably nume- rous in the States, who have in the course of their professional careers made highly creditable contributions to literature, it may suffice to mention H. Swinton Legaré of Charlestown, at one time a student of law at Edinburgh, a prominent speaker in the House of Representatives, afterwards President Tyler's attorney-general, who published in the Southern Quarterly and New York Reviews a series of masterly criticisms mainly relating to Greek and Roman litera- ture; J. P. Kennedy of Baltimore, a successful barrister and Con- gressman, also a vigorous essayist and author of some remarkably lively sketches of country life and manners in the Old Dominion ; Richard H. Wilde, of Georgia, in which State, after surmounting unusual difficulties with remarkable perseverance, he rosc at the bar to be attorney-general, author of the song entitled the " Lament of the Captive," and of a Life of Tasso, displaying great rescarch and occasionally subtle criticism, written after two years' residence in Europe ; and, taking higher rank as an author, Richard Dana, a barrister of the early years of the century, and adherent in politics of the old Federalist party in the state. "Dana became known in the world of letters as the author of a Fourth of J uly Oration in 1814, and somewhat later as the contributor to the North American Review of appreciative and discriminating criticisms of the English lake poets. In 1827 he published hisfantastic ghost story of the " Buc- caneer" and other poems, to which he continued to add at intervals. Many of his minor verses are characterised by remarkable grace, but they want original force. Among contemporary politicians, Mr Wendell Phillips is the only one who can be called a great orator ; the ease and energy of his style at its best being rarely surpassed. But the specches of Mr Sumner are eloquent, and his arrange- ment of facts converging to clench his argument is often masterly.

2. Hisrory, as the reflection of philosophy on the states- manship and the struggles of the past, seldom comes very early in national literature. The 18th century in America supplied, in letters, journals, and contemporary chronicles, material for more elaborate and comprehensive treatment in the 19th at the hands of George Bancroft, a leading Democrat, who held the post of representative of his country in Great Britain from 1846 to 1849, His great work—

three volumes of which are devoted to the Colonisation and three to the Revolutionary period —was published at inter- vals between 1834 and 1854, and has been generally accepted as the standard history of the United States up to this time. The book is written for the most part in a sufficiently vigorous style; somewhat defective, however, in elegance, and characterised by a certain monotony and want of ease, which detracts from the pleasure of the reader. Bancroft's statements of matters of fact are generally reliable ; but his comments are moulded even more than is usual by the foregone theories of a political partisan. The

rival history of Richard Hildreth, which appeared also in Hildreth.

six volumes, issued in rapid succession (1849-53), while marked by the same Puritan tone, is even more severe in its judgments. The style is more animated, but more prone to the torva voluptas of false rhetoric. The key- note of the sentiment which pervades Mr Hildreth's book is to be found in his keen abolitionist views, previously expressed in a juvenile work of the author, The White Slave. One of its merits is its appreciation of the Federalists, and especially of the genius and character of their leader, Hamilton. Of the host of national bio- graphies in which the West abounds, Sanderson's Lives of the Signers, the historical sketches of G. C. Verplanck, Wirt's Patrick Henry, and the stupendous series edited and largely written by Jared Sparks, may be signalised. Nearly one-half of the works of the most classic American prose writers of the generations previous to our own are historical or biographical. of Granada, and his lives of Columbus, of the Followers of Mahomet, and of Goldsmith, although not the most

original, are among the most interesting of his works—accurate in their leading estimates, and marked by the usual smooth- ness and even flow of his style. Irving contemplated a continuation of the record of the early relations of Spain to the New World, but, with his wonted generosity, abandoned the theme on hearing that the task had

been assumed by worthy hands. The works of William H. Prescott.

Prescott, the most artistic historian to whom the United States have hitherto given birth, are remarkable from the difficulties under which they were produced, and for the well- deserved success which thcy have achicved. This success is due in part to the genius and indomitable industry of the writer, in part to the steady concentration of his powers on the arduous undertaking of which he had at an early age formed a just estimate. In a diary of 1819 (that is, in his twenty-fifth year) he allows ten years for preliminary studies and ten more for the execution of his task—a notable example to his countrymen, nirie-tenths of whose literary performances will prove ephemeral, less from lack of ability in the writers than from an utterly inadequate sense of the time and toil that every true Musc demands of her votaries. Ferdinand and Isabella, given to the world in 1838, was written while Mr Prescott was, owing to an accident at college, almost wholly deprived of his sight. His authorities, in a foreign tongue, were read to him by an assistant, and by aid of a writing-case for the blind he scrawled the pages of his great work. It soon attained a European as well as an American fame, and superseded all other records of the period of which it treats. No such comprehensive view of Spain at the zenith of her greatness has ever appeared in English. The proportion of its parts and the justice of its estimates are universally acknow-ledged; while hypercriticism of the style—graceful, correct, and sufficiently varicd—can only point to the occasional possibility of greater condensation. Among the most notable of the descriptions, which can seldom be detached from the whole into which they are woven, we may refer to the return of Columbus and the contrasted characters of Queen Isabella and Elizabeth. The Conquest of Mexico,

Washington Irving's Conquest Irving,

written with somewhat improved sight, followed in 1843 ; that of Perw in 1847. These have attained an even wider popularity than their precursor, owing to the more con- densed romance and greater novelty of their themes. They arc "open sesames" to an old world of wonders, real, and yet from its strangeness invested with half the charms of fairyland. Few passages of fiction are so enthralling to the youthful reader as the story of Nezahualcoyotl, king of Tezcuco, the life and exploits of Montezuma, the night retreat from the Aztec capital, or the account of the sun-worshippers in the Golden City. Both works are dramas in which our sympathy is divided betwecn the chivalry of Spain in her hey-day and the poetical traditions and innocent patriotism of a vanished race. But their author has never, in the midst of his "Claude-like descriptions" and charmingly vivid narratives, allowed himself to forget that he is writing history. Boys read his Mexico and Peru as they read the Arabian Nights; critics can point to few flaws in the accuracy of the author's judgment. Philip IJ., Mr Pres- cott's latest work, has similar excellencies in dealing with a less attractive theme. John Lothrop Motley, a dis- tinguished ambassador in foreign courts, and author of the best existing history of Holland, is Mr Prescott's only more recent rival. Less faultless, he is more strik- ingly original ; and the greater complexity of the theme,

which he has made his own, calls for the exercise of even'

higher powers. The Dutch Republic, which appeared in 1856, at once arrested attention by its evidence of careful and long research, comprehensive grasp, rich pictorial power, and the enthusiasm which, only here and there interfering with the impartial judgment of the author, gives colour and life to the work. Mr Motley's style, even to minute turns in his sentences, bears the impress of the influence of Carlyle. The very titles of his chapters, especially in the first volume, seem transferred from the French Revolution. Such are "Sowing the Wind," " The Harvest Ripening," "The First Whirlwind," "The Taciturn against King, Cardinal, and Elector," &c. From the same

source he may have caught some of his hero-worship, which, however, by the choice of a worthy object, he has done much to vindicate. The Dutch Republic, preluded by the overture of a masterly and vivid historical survey, is a drama, which facts have made highly sensational, of the most terrific struggle against temporal and spiritual despotism that, within the same space of years, modern times have seen. It is divided, not inappropriately, though perhaps with some regard for effect, into a prologue and five acts, to each of which in succession the name of the Spanish governor for the time is attached. The por- traits of those emissaries, particularly those of Granvelle of Arras and Duchess Margaret of Alva, Don John of Lepanto, and Alexander of Parma, are drawn with bold strokes and in lasting colours. Behind the scenes, director of the assailing forces, is the evil genius Philip himself, to whose ghastly figure, writing letters in the Hscurial, our attention is called with a wearisome, if not affected, itera- tion of phrase ; while the presence of the great champion, like that of Achilles in the J/iad, is felt at every crisis retrieving the retreat and urging on the victory. The most horrible chapter of modern history —that of the Inquisition —is unfolded with a power that brands its records into the memory of the reader; and amid a throng of scenes of pageantry and pathos we may refer to those of the resigna- tion of Charles V., Egmont's triumph at St Quentin and his death, the misery of Mook Heath, the siege of Leyden, and the hero's death. The United Netherlands (1867-69) is a continuation of the same history in the same spirit ; but, as regards style, a somewhat calmer and more matured composition. The most thrilling chapters in those four

later volumes are the siege of Antwerp—which compares with that of Syracuse in Thucydides—and that on the wreck of the Armada, unsurpassed in vividness and vigour by either Froude or Kingsley; to which we should add the episodes of the battle of Ivry and the skirmish at Zutphen, with one of the most eloquent tributes ever paid to the genius and character of Sir Philip Sidney. Of the other full-length pictures, which, with the campaigns of Parma, Spinola, and Maurice, and the intrigues of England and France, divide the interest of the

book, are those of Queen Elizabeth (whose habitual treachery, real meanness, and shallow pretences to magnanimity are exposed, as afterwards by Mr Froude), Henry of Navarre, St Alde- gonde, the Earl of Leicester, and the great Barneveld, who, with the Prince of Nassau, divides our sympathy at the close of the book. Since the death of Lord Macaulay no equally solid and valuable contribution has been made to historical literature. to the volumes of Mr Prescott, we may mention here the Mistory of Spanish Interature by his friend and coadjutor George Ticknor, of which it is enough to say that it is incomparably the best, the most comprehensive, most criti- cal, and most interesting work which exists on the subject.

Of other contributions to literary criticism, from which, owing to their superabundance, it is hard to select, those of George S. Hilliard, one of the most highly cultured writers in New England; of Henry T. Tuckermann, author of Thoughts on the Poets, an elegant but sentimental essayist ; of E. P. Whipple, a critic who, according to Mr Griswold, combines "the strength of the Areopagitica with the liveliness of the Spectator" (!) ; of Margaret Fuller D'Ossoli, a pre- cocious linguist, translator of Eckermann's Conversations with Gocthe, herself a brilliant conversationalist and somewhat cloudy transcendentalist and advocate of the superiority of women to men; and the always lively, seldom profound, reviews of Mr Lowell, with numerous papers, in the North American and Atlantic Reviews,—may be referred to.

3. Poxrtre Lireraturg, of any excellence, in the lighter branches is, in the West, almost wholly a growth of the present century. The most widely and justly celebrated of transatlantic authors in this field, during its earlier half,

was the amiable and versatile Washington Irving. Of his Irving,

numerous writings, we have referred in last section to those which are directly historical. The rest fall under two heads, according as they are concerned mainly with American or with European themes. On the same principle on which Agassiz, and Follen, and Paine, even Berkeley and Priestley, have been claimed by the United States, Irving

is associated with the progress of English litera, ture; for in virtue of his Scotch parentage, and in the course of four distinct and extended visits to Europe— 1803-6, 1815-20, 1827-32, and 1841-46—he may be said to have become half an Englishman. His style is in the main that of the essayists of Queen Anne, modified by the humour of Charles Lamb; and many of his most effective sketches of life, manners, and society relate to the eastern hemisphere. Such are his Histories, the Zales of a Travel- ler, Bracebridge Hall, Newstead and Abbotsford, the Alhambra, and half of the Sketch Book. In reference to those works—the best passages of which are classical—a French critic has said that Irving describes all countries but his own in the style of Addison. In others, however, and these the earliest and latest of his works, he treats of national legend and scenery in a manner peculiar to himself. His first literary efforts, which resulted in the series of papers entitled Salmagundi, were gently satirical descriptions of the features of society in American cities. The Iistory of New York, by " Dietrich Knickerbocker," in point of pure originality his masterpiece, is one of the richest farragoes of fact, fancy, and irouy that have ever issued from the press. In later life, his Zour of the Prairies—The Adventures of Bonneville, and Astoria, are instinct with the spirit of western discovery and adventure,

As supplementary in some measure Ticknor,

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In this, as in other points of view, versatility and grace are his prevailing characteristics. He belonged historically to both worlds, and was equally at home in each; he reflected the quiet philosophy of the Tatler and Spectator, adding to it the pathos which dims the eye of the reader over his "Wife," and "Widow and Son," and "Broken Heart," and " Pride of the Village." He started the vein of burlesque that has run through his country's literature,

but under the restraints of taste and temperance that have unfortunately been often discarded. The even grace of his manner often leads hasty critics to do scant justice to the range of his sympathy. His manly but gentle style is at home in Spanish history,

English essay, and American legend; in the Alhambra and among the slopes of

Sleepy Hollow, where, as in the famous " Rip Van

Winkle," we have some of the earliest models of amuse- ment with grave faces and the melancholy parties of pleasure that are, under various forms of buffoonery, still typical of American humour. Associated with Irving in his . Salmagundi, the name of J. K. Paulding deserves a distinct

place for the humorous vigour of his character sketches,

and his vivid pictures of early colonial life, in the Dutch- man's Fireside and Westward Ho! where the features of

the contest between the new settlers and the aborigines are brought before us in clear relief. His apologue of " Bull and Jonathan," and the thirteen good farms over which they squabbled—founded on Swift's Vale of a Tub—pre- sents us, in a satire which lies on the border of irony and a rougher form of wit, with an early American view of the relations between his own and the mother country.

Some of the same themes have been handled with superior:

richness of illustration and force by the greatest, with one exception, of transatlantic novelists—J. Fenimore Cooper (1789-1851)—a man remarkable no less for the somewhat defiant independence of his character, which led him to defend his countrymen in Europe, where he travelled from 1827-33, and to assail their foibles in America, than by the marked originality of his genius. His first consider- able work, The Spy, appeared in 1821, and from its fresh treatment of a patriotic theme obtained a European reputa- tion. His second, The Pioneers (1823), with a vivid repre- sentation of the scenery of the author's early life, introducing for the first time his ever-recurring hero the famous Natty Bumpo, or Leather-Stocking, established his place as a new actor on a crowded stage. Then followed The Pilot, in which he first asserted his claim to an empire since indisputably made his own

among novelists—that of the sea; and-somewhat later The Last of the Mohicans and The Prairie, in which he asserted a similar sway over the "gardens of the desert" and the hills of the remoter West. While abroad he wrote his Red Rover and The Bravo—a graphic tale of Venice, and flung on the aspersors of his country the American in Europe. Shortly after his return he issued his satirical assault on newspaper editors and other delinquents — his Homeward Bound, which led him into several actions for libel, in which he claims to have been almost invariably successful— The Pathfinder, and The Deerslayer (1840-41). The latter, perhaps the best of the Leather-Stocking series, completes the list of his great novels; to which must be added another important work—The History of the American Navy—published in 1839. There is a certain severity about Cooper's genius, showing itself in a hardness in his style, which restricts the Tange of his readers. He wastes perhaps too many words on descriptions, is exhaustive where he might have been Suggestive, and his plots are apt to be deficient in interest —The Red Rover conspicuously excepted. But, deducting the echoes of Scott, to which we have referred, he is

erican to the core; he needs no slang or affectation to establish his originality, but moves on his own way with

something like disdain of comment. His best descriptions —as, for example, those of the prairie on fire, of the " Ariel" among the shoals, of the capture of the whale and the panther in The Pioneers, of the last sea-fight in The Rover, of the regatta in The Bravo—are unsurpassed. His ships move over the seas like things of life. His hunters traverse the prairies with a sense of possession, His best characters are few ; but Natty Bumpo, Bob Varn, Nightingale, Long Tom Coffin, Hetty Hunter, and Brand Merideth are undying creations. The earliest American romancer of note, Charles Brockden Brown (177 1-1810), Brockden who came before the world (1797) in Alcuin, a Dialogue Brown. on the lights of Women (first of a mob of tracts on the same theme), set the example on his side of the Atlantic of that love of the anomalous, fantastic, and horrible, repre- sented on our own by

Beckford, Walpole, and Godwin, and later by Mrs Radcliffe and Mrs Shelley. His main works— Wieland, Ormond, Arthur Mervyn, and Edgar Huntly—are unmistakably the productions of a man of genius. None are wanting in passages of thrilling interest, striking situations, and subtle analysis of character. But they dwell too prevailingly on the night-side of nature— on such themes as insanity and somnambulism, and all the repulsive anatomy of mental disease. Brown's account of the yellow fever in Arthur Mervyn may be compared with the corresponding narratives in Thucydides, Lucretius, and Defoe; and Wieland's confession of the murder of his wife (a favourite subject of Western fiction) is hideously vivid ; but the author's plots as a whole are wanting in method, his bursts of passion are dulled by intervening tediousness, and his style deformed by pedantic circumlocutions. Brown must be credited with considerable originality of con- ception, and blamed for introducing a morbid vein of thought. His influence is apparent in two novels of Richard Dana—to whom we have before referred—Tom Thornton and Paul Felton, in which a more graceful style is employed with almost equal vigour to illustrate similar monstrosities of character on the basis of incidents almost equally unnatural. Of the same school are many of the sketches of Charles F. Hoffmann, as "Ben Blower's Story " Hoffman, of being immured in a steam-boiler, and the " Flying Head ;" but alongside of these are others, as his " Winter in the West," " Romance of the Mohawks," and " Adiron- dacks," that are steeped in the fresh atmosphere of the green fields and hills. Hoffmann is also the author of three deservedly popular songs, "Myrtle and Steel," "Sparkling and Bright," and "Rosalie Clare." The influence of those writers, along with that of a profounder analyst, the French Balzac, is apparent in the works of Poo. the most morbid genius the modern world of letters has known. In the regions of the strangely terrible, remotely phantastic, and ghastly, Edgar Allan Poe reigns supreme. For clearness of style, aptness of illustration, and subtilty of thought, he distances in this field all his predecessors except Balzac, who in the mental dissecting-room is hig only master. But while the Frenchman deals with anomalous realities, the power of the American consists in making unrealities appear natural. One of his great charms is his perpetual interest. Confining his imagina- tion within limited bounds of space, he is never dull, save

in his acridly jealous criticisms and miserable attempts at humour. Criticism would hardly strike a line from the longest and perhaps the most thrilling of his narratives, that of " Arthur Gordon Pym." In fictitious verisimilitude it is only equalled by De Quincey's "Flight of the Kalmuck Tartars." With the "Adventure of Hans Pfaall" in his balloon, and the " Descent into the Maelstrom," it is the obvious source of the ingenious pseudo-scientific romances of Jules Verne, which have lately attained so wide a popularity. Poe's most hideous tales, as "Thou art the

Haw

thorne.

Man," "The Black Cat," "The Premature Burial," 'The Pit and the Pendulum," "The Cask of Amontillado," "' The Tell-Tale Heart," are redeemed by their literary merits and their reference, under the form of grotesque circumstances, to dominant fears and passions of mankind. In the "F all of the House of Usher," "The Domain of Arnheim," "William Wilson," and " Ligeia," a more purely poetic or deeply psychological element is added to the horror. In the " Murders of the Rue Morgue," "' The Mystery of Marie Roget," "The Purloined Letter," and "The Gold Bug," he is on the border-land between romance and reality, and seems to prove himself in potentiality the prince of all detectives. We shall have to refer to him again as a poet. The super-subtilty of Balzac and Poe appears with higher qualities in the works of the greatest of New England romancers, on the whole the most artistic of American prose writers, Nathaniel Hawthorne. Of his style it is impossible to speak too highly ; for without any of the defects often found in the writings of his countrymen, it has a healthy flavour of nationality. It is accurate and strong, terse and yet full, rich and yet simple, harmonious, varied, and suggestive. These excellencies of form give a fascination to his most ordinary themes as to his descriptions of scenery and works of art. The only modern pictures of Italy comparable to those of Rome and her sculptures in Transformation are Ruskin's Venice and the finest stanzas in the fourth canto of Childe

Harold. But Hawthorne's scenery can seldom be disentangled from the mood of mind in which he views it, and which constantly associates it with some remoter purpose or underlying allegory. Amid the din of voices in the Custom-house or half-buried in the mosses of his Manse, walking along the Appian Way or gliding down the Assabeth, he dwells among strange visions, 'The sea-shore tells him secrets of the past, and the prattling village is full of a present sympathy. But the features of nature, and life, and character which he loves to draw are peculiar. They are for the most part sombre and mysterious; not with the sort of mystery that attends unprecedented events and unnatural marvels, but with the mystery which he finds underneath the current of common lives. One of his prevailing thoughts is, things are not what they seem —he is so fond of peering beneath the surface of existence, that in his pages it almost loses its ordinary reality ; he tries so constantly to look through life that he scarcely takes time to look at it. The highest art of all is that which comprehends both aspects, and, seeing the face of nature as it is, also penetrates to its hidden meanings. Hawthorne, on the other hand, weaves his fictions, to borrow a phrase from himself, in "the moonlight of romance ;" and while he admits that materials for a better book than he has written 'lie scattered on the page of life open before him, he has seldom stooped to gather them."

*'** Moonlight," he repeats in his preface to the Scarlet Letter, '*moonlight in a familiar room, falling so white upon the carpet and showing all its figures so distinctly, making every object so distinctly visible, yet so unlike a morning or noontide visibility, is a medium the most suitable for a romance writer to get acquainted with his illusive guests. The room becomes a neutral territory, somewhere between the real world and fairyland, where the actual and imaginary may meet, and each imbue itself with the nature of the other."*

Hawthorne has sometimes abandoned this neutral terri- tory, and given us a few short sketches which show that he is eminently capable, when he chooses, of illustrating and characterising common things ; such, among his minor tales, are "The Old Apple Dealer," " Little Annie's Ramble," " A Rill from the Town Pump," " Sights from a Steeple," "The Village Uncle," that well-named " Buds and Bird

Voices," and "The Seven Vagabonds," the most humorous and genial of his lighter pieces. His prevailing

themes are drawn on a border-land or twilight between two worlds, half real and half ideal ; fairy tales, in which human beings are the fairies, and are made to point morals of their own histories. He haunts us, as he himself was haunted, by problems. Of the five volumes of his minor sketches, three at least are filled with allegories—riddles, some of them hard to read, and open to doubtful because double interpretations. 'The Great Stone Face" is a noble piece of writing, apart from the lesson it is intended to convey. " Drowne's Wooden Image" and " The Artist of the Beautiful " are in themselves "beautiful exceedingly." The exquisite pathos of " Lily's Guest" and " Edward Fane's Rosebud" lies on the surface. 'Lady Eleanor's Mantle " tells its own story in a parable of the Nemesis of pride ; but in " Roger Malvin's Burial," "The Wedding Knell," "Young Goodman Brown," and others, the meaning is either more intricate or more remote. Hawthorne's longer works are all conceived in the same spirit. Their incidents are comparatively few, and might have easily been condensed into one of his shorter tales ; which in their turn might easily have been expanded into elaborate romances—what a consummate story, for instance, might have been reared on the basis of "' Rappacini's Daughter!" His forte lies in the analysis of character and situations, rather than the dramatic arrangement of events. "To live in other lives, and to'endeavour to learn the secret which was hidden even from themselves," is the purpose set before himself by a character which in one of those romances nearly represents the author. Everywhere he seems to be carrying out this purpose, operating upon some three or four characters, and removing them—as he tells us in the introduction to Blithedale—a little from the highway of ordinary travel to a theatre where these creatures of his brain may play their phantasmagorical antics without exposing them to too close a comparison with the actual events of real lives. A small group of figures is thus made to work out some problem of life, or at least to throw by their ideal actions a light on some puzzle in the author's mind. The great question over which, in one form or other, he perpetually broods, is the nature of evil—the effect of sin and error on

the soul— and their relation to virtue and human progress. In the Blithedale Romance, for instance, his theme is that the exaggeration of good may turn to evil. This almost pain- fully minute anatomy of four lives, relieved by passages of delicate description and a few scenes of thrilling power, is designed to show the blighting effects of a one-sided idea, even though it assumes the guise of a benevolent impulse, when it overrides private and personal claims. In Z'rans- formation, or the Romance of Monte Beni, a conception in some respects the converse of this, is wrought out of richer materials ; and we are taught to appreciate the possibilities of good that there may be in evil, by the effect which an impulsive crime has in inspiring a simple instinctive nature with a stronger life. The Scarlet Letter, which is at once the most solid and the subtlest of the author's works, illustrates the fatal influence which a single sin exerts on all the persons whom it involves; but unlike the Blithedale Romance, which is a dismal tragedy, it ends with a magmifi- cent triumph of expiation. The Scarlet Letter appears to us to be the best analytical novel of this century, the nearest approach to it in artistic finish and pyschological penetration being Goethe's Elective Affinities. The House of the Seven Gables has more variety, aud mixes humour with its pathos ; but the web of this last romance, which has for its moral the malign influences which may be transmitted from one generation to another, is woven of thinner threads. Hawthorne's Protean genius is a power in American thought. His influence as a teacher and an artist is still crescent among the contemporaries from

whom he has lately passed. His symbolic yet real cha- racters—Hester and Pearl by the forest brook ; Dimmesdale by the scaffold, with the red morning upon his brow; the dead Judge sitting with his watch; the Cleopatra of Brook Farm plunging in the pool; Miriam and Hilda, and Donatello the Faun—are stamped in letters of fine gold on the pages of his country's literature, and the music of his quiet sentences yet lingers on the ear of strangers as of friends. But his name remains as a warning as well as an example. In one sense he was a patriot, glorying in the great deeds of his country's past. Of this feeling the " Gray

Champion ” and “ Howe’s Masquerade” give sufti- cient evidence. At the close of the last he writes, as we may fancy with a grim Puritan smile: “On the anniver- sary night of Britain’s discomfiture the ghosts of the ancient governors of Massachusetts still glide through the portals of the Province House.” But as a politician he wrecked himself with the democratic party. He looked upon slavery as “ one of those evils which Providence does not leave to be remedied by human contrivances,” He had no sympathy with the abolitionists, and at least a half sympathy with the planters. “ As regards human progress,” he wrote, “let them believe it who can ;” and in the pre- face to his last completed work, as his excuse for laying the scene in Italy,—“ There is in our country no shadow, no ambiguity, no mystery, no picturesque and gloomy ‘wrong.” “Romance and poetry, ivy, lichens, and wall-flowers, need ruin to make them grow.” Hawthorne lived to see the beginning of what he could only regard as ruin: he did not live to see his country rising stronger after a great struggle with a gloomy wrong.

Oliver Wendell Holmes, the accomplished physician of Harvard, better known as a humourist and author of occasional verses, has contributed to psychological romance two remarkable volumes : Elsie Venner and The Guardian Angel. The former, and more striking of the two, is a weird tale of destiny, dwelling upon the idea of transmitted qualities in a manner which suggests comparison with Zhe House of the Seven Gables ; but Holmes’s story has a more

incredible plot, the chief character being a sort of sprite, having mysterious relations to the animal world, a snake- charmer, herself half a snake (as Donatello in Transforma- tion is half a faun), like the Lamia of tradition and Keats, but endowed with the graces of Undine. The vigorous sketch of the hero Langdon, with which the book opens, is impaired by the somewhat obtrusive manner in which he is vaunted as a type of the blue-blooded or Brahmin caste of New England. The same pathological treatment of human nature pervades The Guardian Angel, which turns partly on mysterious physical and psychical affinities. The Margaret of Sylvester J udd, a Unitarian clergyman of Maine, belongs, by virtue of some of the problems with which it deals, to the category of metaphysical novels. This work of decided genius, to

which a just tribute is paid by Mr Lowell in his Fables Jor Critics, has hardly attained the popularity it merits, owing to the slender cha-Tacter of the plot, and the frequency of the dissertations by which the author endeavours to impress his own views of society, art, and religion. But it is a powerful picture of the more ideal sides of New England life; the character of Margaret and Chilion are permanent types, and the whole book is extremely fresh and original. The most . Senuine successor of Hawthorne is Theodore Winthrop, who left a counting-house in New York for an adventurous life, and fell at Great Bethel in 1861 in his thirty-third year. His best novel, Cecil Dreeme, teems with life-like characterisation, bathed in a poetic element of mystery ; and John Brent, the next in merit, is a graphic sketch of

Tomantic incidents in the Far West, drawn from his own Xperience.

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Of tales evincing talent there is shelves of the libraries Among those worthy of note are the pictures of Southern society by W. G. Simms, whose fertile brain is said to have produced fifty volumes in twenty years ; Zhe Bee Hunter, and other narratives of the south-west, by T. B. Thorpe of Baton Rouge ; John Neal's Rachel Dyer and Ruth Elder ; the classical romances of Ware, Zenobia and Probus and Julian; Mrs E. O. Smith's Indian Reminiscences ; The Linwoods, Hope Leslie, and other philan- throphic tales of New England, by Miss Sedgwick ; Mrs Lydia Child's Hobomok, and her Philothea, a romance of Pericles and Aspasia, somewhat too sentimental in its style, and not free from anachronisms ; with the anti-slavery pictures represented by Mrs Stowe's Unele Tom, a book which, inspired by ordinary talent and written in an earnest spirit, owed its success to the air of simple narration which pervades it, and its having the aggressive strength of a political pamphlet appearing at the right time in harmony with the passion on one side of an impending struggle. The light but graceful and often incisive sketches of N. P. Willis take a what higher rank. A rapid writer, but at his best a brilliant colourist, his fertile fancy has been employed in almost all the countries of Europe, and in his own, in prose and verse, with more than average success. His Peneillings by

the Way and People I have Met are among the most agreeable of books for a leisure hour; his descriptions are always interesting as well as aceurate, and his characters, grave and gay, are generally life-like. His picture of the Indian girl, Nunu, in the Inklings of Adventure, is fascinating and vivacious enough to be worthy of a higher artist.

a plethora ;

Books of TRAVEL, among which those of Mr Willis hold a Travels,

respectable place, superabound in the literature of the West. Nine-tenths of the literary men of America have crossed the Atlantic, and nine-tenths of those who have done so have published their impressions of the Old World, with every variety of good and bad taste, from the Old Lome to the Innocents Abroad. After that of his birth, an American author's travels are the first essential of his being. We may next predict his praise of Italy, his half satirical half curious view of England, and his wonder at the Pyramids. Of the raultifarious descriptions of Europe to which this habit has given birth, the worthiest of note are those of Hawthorne and Emerson, of Story and Cheever, and Curtis's Wile Notes. In the "Lotus Eating" of the last named we have pleasing reminiscences of the watering- places of his own country. But the most interesting records of western scenery are those of Fremont ; Win- throp's Canoe and Saddle, and Life in the Open Air; and the numerous remarkable "Excursions" of Emerson's leading pupil, H. D. Thoreau—his " Maine Woods," "Cape Cod," and "Merrimack ;" with the vacation voyage to Cuba of the younger Dana.

4. A leading feature of transatlantic literature 18 its Humorona Humour is a word of many meanings : it writers,

Humovr. begins on the low level of any laughter-provoking absurdity, and rises, as in the speeches of Lear's Fool, to a tragic height. In the Greek classics it shows itself in the Rabelaisian exuberance of Aristophanes or in the Socratic irony: in the English we have an even more subtle appre- ciation of the curiosities of character, and a deeper sense of the contradiction or conflict between the higher and lower

phases of human nature. In Sterne and Fielding, as in Ben Jonson, we hare every man in his humour. As developed in America, this quality of the mind seldom penetrates to the under-currents of life ; its insight is clear but not profound ; it relies mainly on exaggeration, and a blending of jest and earnest which has the effect of singing comic words to a sad tune, or telling a preposterous story with a grave face. Mr Lowell makes us laugh by his description of a negro "so black that charcoal made a chalk mark upon him," and of a wooden shingle " painted so like marble that it sank in the water." Mr Browne (Artemus Ward) excited the same sort of laughter by his remark in pointing to a hill daubed on his canvas, " the highest part of this mountain is the top." In both cases there is a surprise, excited in the one by a falsehood plausibly pre- tending to be the truth, in the other by a truism asserting

*they lie on the Minor **thick as the leaves on Vallombrosa." novelists,*

some- Willis,

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itself as a novelty. Similarly, when the latter writer, among his anecdotes of the conscription, tells us that "" one young man who was drawn claimed to be cxempt because he was the only son of a widowed mother—who supported him," the amusement is all in.the unexpected turn of the last three words. In contradistinction to this, the humour of Don Quixote, of Falstaff, of Uncle Toby, of Major Bath, of the Vicar of Wakefield and Sir Roger de Coverley, of Major Pendennis and Bishop Blongram, consists in its truth. What these people do or say never surprises us, It is absurd as a great part of human life is absurd, and, laughing at them, we feel we are laughing at something in ourselves. The best recent instances of this higher kind of humour which American literature affords are to be found in Washington Irving, in Mr Lowell's Biglow Papers (to which, as a considerable national poem, we shall have to revert), in passages of Mr Longfellow's Kavanagh, in Mr Hawthorne's Seven Gables and Seven Vagabonds, and in the prose and verse of Dr Holmes. In his three pleasant volumes, The Autocrat, The Professor, and The Poet at the Breakfast

Table, there is much that might have been omitted, more that should have been compressed. They contain too many jokes, good, bad, and indifferent, and are tainted here and there with what we must be excused for regarding as New England slang. But they are pervaded by a genial glow of kindly sym- pathy, and they exhibit, with a quaint mannerism—not without its attractions—personages, and situations, and sentiments which we recognise as at once odd and real. Dr Holmes's works have frequent reflections of Montaigne and Burton, and the Noctes Ambrosiane; he mixes pathos and whimsicality after the manner of Lamb and Sterne. His humorous verses, the best known of which, " Daily Trials," « Evening, by a Tailor," and the " Music-grinders," inevi- tably recall the drolleries of Hood. His genius has, nevertheless, an original vein, less mellow, but at its best as genuine as that of his older masters. Several of the miscellaneous papers, essays, and periodicals belonging to the earlier years of the century, as Salmagundi, The Talisman of Bryant and Verplanck, The Olipodiana of W. G. Clarke, and the Sparrow Grass Papers, are fre- quently enlivened by sparkles of wit and evidences of keen discrimination. In others we trace the germs of a vicious style which threatens to degrade the lighter litera- ture of the States. The Charcoal Sketches of Joseph Neal —which might be entitled Comicalities of the Mississippi —are among the earliest examples of the habit of playing with slang terms characteristic of his successors. An author who relies for effect on giving his imaginary personages such nicknames as " Dawson Dawdle," '"' Peter Ploddy," " Tippleton Tipps," and '" Shiverton Shanks," is more likely to be the cause of wit in others than the source of humour himself. During the last generation in America the anxiety to be national has led many of her minor authors to make themselves ridiculous. To avoid walking like Englishmen, they have gone on all-fours ; to escape the imputation of Anglo-Saxon features, they have painted their faces with ochre and put ear-rings through their nostrils; forsaking the speech of Addison and Steele, they have expressed themselves in an unseemly jargon of strange tongues. Of this mocking-bird humour the most legitimate form is that of the Biglow Papers, where the New England dialect is employed with effect to give voice to the sentiments of that district of the country during the national struggle, on one side of which it took the lead. A similar justification

may be put forward in behalf of the Californian peculiarities, which are perhaps not too promi- nent in the often really humorous pieces of Bret Harte. The mixture of two dialects in the Breitmann Ballads is a bolder licence, though for the best of these Mr Leland

may plead the wide-spread use of the mongrel speech, and the original success of a drollery which has only become tiresome from his not knowing when his readers have had more than enough of it. The parodies of Mr Browne (Artemus Ward) are open to the same criticism. The writer was a man of wit and talent, and therefore his writings are amusing. They are good specimens of the worst style of satire : for the wit that relies on bad spelling is almost as false as that which consists in bad language. In vindication of the " Showman," it must, however, be observed that his sarcasm is generally directed against mean or ridiculous things. But his example has paved, for those who have caught the trick of his phrase and who are unrestrained by his good feeling and good sense, an easy descent to the lowest form of light literature— that which panders to the vice of moral scepticism and thrives on the buffoonery of making great and noble things appear mean or ridiculous. The names of those who habitually feed on mental garbage should be left to sink into the oblivion from which they have unfortu- nately emerged. It is painful but necessary to observe that some of the more considerable writers and thinkers of the New World are apt to condescend on occasion to this burlesque way of writing. American light literature bristles in puns which are at best the "a-b abs" of wit. Of these, Mr Lowell (a severe critic of everything English) has made the worst—" Milton is the only man who has got much poetry out of a cataract—and that was a cataract in his eye." Mr Leland, the next worst, in his book of travels—" If a thing of beauty be a jaw for ever, as the American said of his handsome, scolding wife, then the donkey boys of Cairo are the most jaw-ous and beautiful creatures; for the sound of their voices drieth not up." Lccentricities of this sort, with the graver irreverences which intrude themselves even into the pulpits of the West, should be universally discredited as blasphemies against the first principles of taste. They are as "flat,

stale, and unprofitable" as the contortions of a wearied clown. True humour—as ever in our classics —must go hand-in-hand with seriousness ; it must never forget that behind the comic there is a tragic element in human life. The mere "farce" is contemptible, because it is aS unnatural as the expression of a countenance distorted by a continual grin. In forgetfulness of this lies the greatest danger of the recent literature of America, and we can only trust to the higher intellectual instincts and tendencies of the age to detect and resist it.

5. New ENGLAND TRANSCENDENTALISM.—Religion, the Theology.

first motive power of thought in America, has continued to flow, both in its old channel—that of the orthodox Puritanism which came down from Eliot and Edwards through Dwight to Hodge and the Princeton Essays—and in another, that of the new forms of faith advocated by

W. E. Channing, and with gravely heterodox modifica- Channin

tions by Theodore Parker. Criticism of Channing's theological position is apart from our purpose here. He claims notice in a review of literature by the vigour of his conceptions and his graceful and correct expression of them. His earliest considerable essay, the Moral Argument against Calvinism, one of the best known of his numerous controversial works, indicates by its title his prevailing attitude. He relied through life on a priori moral arguments, and employed them as his engines of attack against all persons, institutions, or practices that offended his rigid sense of justice or his enthusiastic benevolence—e.g., Napoleon J., War, and Slavery. A generous indignation against wrong, and keen practical sense of the duties of life, are more conspicuous in his writings than speculative power; but his insight into the political position of parties and the probability of future

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Though at variance with the older creeds of Christendom, Channing's writings are everywhere marked by a reverential spirit, and not un- frequently by a touch of asceticism inherited from the Puritan days, whose abstract doctrines alone he proposed to modify. On the other hand, he admired the higher forms of Art, and in his eloquent essays on Self-culture anticipated much that has been said more recently by itself, and his style, except on rare occasions, is free from the defects of taste so frequent in the writings of his con- His reviews of Milton and Fenelon abound in passages—as the picture of religious peace in the latter —which exhibit the delicacy and the breadth of his sympathies. Theodore Parker—unlike Channing—assails the whole basis of the old theology, and frequently errs He had, perhaps, a

conflicts is remarkable.

Emerson. He loved beauty as well as virtue for

temporaries.

from arrogance and impetuosity.

more powerful but a less highly cultivated mind. He

was a pupil of the transcendental movement of New

England, to which, because of its influence on literature and its association with the most original thinker of the New World, we must accord some space.

In the early years of this century the mental philosophy

- of the West, beyond that which was a handmaid to the

Calvinistic theology, was limited to commentaries on Locke and Brown and the eclecticism of Cousin, when the repub- lication of Sartor Resartus, and the works of the German idealists which it introduced, gave life and voice to a new intellectual world. Idcas which filter slowly into English soil and abide thcre for a generation, flash like

comets through the electric atmosphere of America. Coleridge and Carlyle were hailed as prophets in Boston while their own countrymen were still examining their credentials. The rate of this transformation was surpassed by its thoroughness. The converts put their teachers to the blush ; and in recoil from solid Scotch psychology and practical materialism, rushed to the outer verges of idealism, mysticism, and pan- theism. Their quarterly magazine, the Dial, during the space of four years represented thcir views throughout four volumes of miscellaneous merit. The Dial is a pantheon from which only Calvinists and Utilitarians are excluded, where the worshippers, Parker, Fuller, Alcott, and a host, meet and sing hymns to Confucius, Zoroaster, Socrates, Goethe, Tieck, and Richter, set to German music; and pass from antiquated laudations of Homer and Shakespeare to friendly recognitions of new heresies ; from thoughts on labour to puffs of poetasters; from Hindoo mythology and Chinese ethics to 19th century truisms about progress and union, prudence and humanity ; from soaring among the heights of a modern religion of beauty to raking among the tangled roots and dead leaves of a second-hand Orientalism. But those vapours of ideal- ism might have soon faded into the light of common day, had not all their best aspirations been concentrated and vitalised by Mr R. W. Emerson. His first oration, delivered at Cambridge thirty-five years ago—the refrain of which is the independence of American literature—is referred to by recent critics as a landmark in the annals of their country. Tn this discourse—as in the six volumes through which the author enforces the same conceptions—there is scarce any- thing of which, taken separately, we need fail to trace the pedigree. Fichte had many ycars before spoken in the same strain of the vocation and nature of the scholar; the view of science comes from Swedenborg and Schelling; and the dignity of labour from Carlyle. The originality, as is the case with the author's whole system of thought, is in the combination—which, it may be, is the only kind of origin- ality now possible. His position, as far as it is tenable, illustrates the fact that the divisions of philosophy are being continually altered as old systems form affinitics with new

beliefs and historical conditions. Mysticism in the New World has been combined with the opposite extravagances of Mount Lebanon and Oneida Creek, but it has been dis- tinguished from idealism proper by its exaltation of emotion above reasoning. Mr Emerson, defining transccndentalism as "the saturnalia of faith," differs from the older mystics in his absolute rejection of all external authority, his almost arrogant confidence in the sufficiency of the inner light, and his new American preference for the active to the passive sides of life. He has an historical sympathy with the un- satisfied aspirations of all ages, with the day-dreams of restlessness in search of rest that inspired the quest of the Sangreal, and led the monks to Christianise the eastern Nirvana; that laid out Brook Farm in Massachusetts, and gave Novalis and Newman back to the fold of Rome: but he will not be drawn by them into any church with walls. All religions are to him "the same wine poured into dif- ferent glasses." He drinks the wine, and tries to shatter the glasses. His unflinching scepticism pierces the armour of all definite dogmas, while he entrenches himself behind an optinism like that of Spinoza. Mysticism has in the main been fatalistic. Asa developed system, its natural home is in the East; where the influence of great uniform- ities of soil and climate have only in recent years been partially counteracted by the conquering activities of an energetic race. Beneath her burning sun and surrounded by her tropic vegetation, the mass of men were overwhelmed by a sense of their insignificance, and this feeling of sub- jugation was intensified by absolute forms of government. The same listlessness which permitted a secular and priestly despotism, led its victims to welcome the idea of a final absorption of their individuality. Their philosophical ambition was to pass into the framework of a gigantic nature, to be "rolled round the earth's diurnal course with rocks and stones and trees." There is a relic of this spirit in the drapagia, drdbea, and ypevia, which are the aims at once of the Epicurean and Stoic systems; but the doctrines of passive obedience had been banished from Greece as early as the overthrow of the Pythagorean institute. They revived in the dark and middle ages, when the church took upon itself the task of legislating for the intellect so ancl even the precursors of the Reformation were possessed with an almost oppressive sentiment of resignation. The reproduction of the Oriental spirit in America, in so

far as it is genuine and not the mere expression of a love of far-fetched quotations, may be attributed to external influences in some respects comparable to those which weighed on the inhabitants of ancient India. In the Western, as formerly in the Eastern World, nature still struggles to assert her old supremacy, and threatens to domineer over men's minds by the vastness of her empire. But in other respects the conditions are reversed. In place of stagnation and uniform although magnificent decay, we have to deal with the manifold progress of 19th century civilisation in a land where every one is more or less inspired by the resolve of the modern mariner with an ancient name to "sail beyond the sunset" in pursuit of fresh adventures; where the energies of the individual are in constant, and in the long run triumphant, struggle with all that tends to restrict the full sweep of his arm or to retard the freest activities of his mind. Where every moon sees new forests felled, new rivers crossed, new fleets built, new tribes amalgamated, new discussions raised, and new problems solved, mysticism, if it exist at all, must take on a form very different from that handed down from the East of 3000 years ago to the Alexandrians, and trans- mitted to the European ages of implicit faith by the pseudo Dionysius. Mr Emerson strikes the key-note of the dif- ference when he writes, "Feudalism and orientalism had long enough thought it majestic to do nothing; the modern

majesty consists in work." Retaining from the mystics his belief in the supremacy of the higher emotions, he substi- tutes for a religious creed an idealised view of modern physical science. His combination of stern practical recti- tude with an ideal standard is his point of contact with Puritanism. A chivalric nobility, in which beauty and goodness are blended, is at once the goal, the sanction, and the motive of his ethical system. Praise of the virtue which, transcending all prudence and disdaining all conse- quences, is its own reward, is the refrain of his moral monologue. His severe censure of Goethe's artistic indif- ferentism recalls the age when the Bible and theological commentaries

were regarded as the sum of honest literature. He writes of our great dramatist in the spirit of the men who closed the theatres: " He was the master of the revels to mankind'—a sentence far removed from the spirit of modern art-worship. But those which follow, protesting against the opposite extremes of austerity, indicate his divergence on the other side from the old faith of New England.

Mr Emerson is, we believe, most widely known in this country by his Representative Men: by no means the most satisfactory of his works. A series of gencrally acute criti- cisms, pervaded by no well-marked ethical idea, it leaves on the mind a somewhat indefinite impression. Its cate- gories are not exhaustive, and it is difficult to determine on what principle they are chosen: but it serves as an interest- ing point of comparison with the corresponding lectures of the great English advocate of hero-worship, to the sugges- tions of which it probably owes its existence. Mr Carlyle, whose whole faith is centred in strong individualities, adopts the view of history which practically resolves it into a series of biographies. Mr Buckle, caring little for persons, and confiding rather in general laws, resolves biography into history. Mr Emerson on this question steers a middle course. He believes in great men, "to educate whom the state exists, with the appcarance of whom the state expires;" but he regards them as inspired mouthpieces of universal or national ideas rather than as controlling forces. Thcir mission is not so much to regulate our action as to "fortify our hopes." Possessed of a larger share of the Over Soul which " makes the whole world kin," they appre- hend and explain phenomena which have hitherto passed unheeded; but their indirect services are the best. Their examples, more weighty than their acts or discoveries, are perpetual encouragements. The great man is an encyclo- pedia of fact and thought; the belief born in his brain spreads like a current over humanity, and he becomes for a time the golden key to the ill-defined ideal of the multi- tude. But his career should rouse us to a like assertion of our liberties. We ought not to obey, but to follow some- times by not obeying him. Our author accepts the position upheld by Aristotle and popularised by Macaulay, that different forms of government are adapted to different social conditions; but maintains that the tendency of modern times, attaching more weight to the

equality of persons and less to the inequalities of property, is towards Democracy, with which and the industrialism of his age he has in the main a cordial sympathy. He believes in collective wisdom as the best check on collective folly, and, allowing that the state exists for its members, he thinks they can act best in union when all are subject to the fewest external restraints. He differs from Thoreau and others of his disciples in having no share in their selfish isolation. His best eSSays, woven of two curiously intersecting threads, present us with a unique conjunction of shrewdness and idealism. There never was a mystic with so much of the spirit of the good farmer, the inventor, or the enterprising merchant.

As regards form, Mr Emerson is the most unsystematic of writers. The concentration of his style resembles that

of a classic, but, as with others who have adopted tho aphoristic mode of conveying their thoughts, he everywhcre sacrifices unity to riches of detail. His essays are bundles of loose ideas tacked together by a common title, handfuls of scraps tossed down before his audience like the contents of a conjuror's hat. He delights in proverbs and apt quotations; he exaggerates like an American, loves a con- tradiction for itself, and prefers a surprise to an argument. His epigrams are electric shocks. He sacrifices everything to directness. His terse refinement of phrase and trenchant illustrations are his charm. His ideas are on the scale of a continent; his sentences are adapted for a cabinet of curiosities—bits of mosaic work, sweeping generalisations given in essences. His style, armed with points like the bristles of a hedgchog, wants repose. This feature is con- spicuous in the Lnglish Traits, where his estimates of men and things, frequently felicitous and generally racy, are often marred by an unpruned violence. His eye is keen, but its range is narrow, and he is ignorant of the fact. Unconsciously infected by the haste which he condemns, he looks at other nations through the folding telescope of a tourist. His representations of our leading writers and statesmen seldom rise above the level of Mr Willis's Pen- cillings by the Way. His taste is

constantly at fault, and an incessant straining after mots often leads him into caricature. His judgments of those whose lives and writ- ings do not square with his theories are valucless; and in dealing with foreign languages he betrays the weakness of his scholarship.

One qualification for a good critic is a well-defined artistic standard, another is the dramatic capacity of placing himself for the time in the position of the person who is being criticised. Mr Emerson has neither of these. With the spirit of a fearless inquirer, he unfortunately blends so much presumption as to fecl an absolute indif- ference regarding the opinions of others; and this in excess constitutes a moral as well as an artistic defect. Thought is free, and the expression of it ought to be so; but when our thought wanders very far from that of the majority of the wise and good, we are bound to watch it, to sift its conclusions, and to state them moderately. Mr Emerson's thought does wander far, and it runs fast; he does not know what moderation in expression means, and his almost childish love of contradiction perpetually, and often justly, provokes offence. He rides rough-shod over the most cherished convictions, or waives them aside with a com- placent smile and a sort of divine impudence. Every claim of authority he receives as a challenge to his per- sonal rights, and he stabs the bull Apis, in utter disregard of the historian's warning. His impatient anticipationes nature detract from his reliability in matters of detail, while by a similar carelessness he repeats and contradicts himself with equal frequency. His soundest judgments relate to the men around him, of whom he is at once the panegyrist and the censor. All that is weak and foolish in their mode of life he condemns, all that is noblest and most hopeful he applauds.

Mr Emerson has left his mark on the century; to use 4 favourite phrase of his own, "he cannot be skipped." Even where his results are least satisfactory, his intense suggestiveness is the cause of thought in others; and as one of the " genetic" powers of modern literature, his fer- tilising influence will survive his inconclusive speculations. His faults are manifest: a petulant irreverence, frequent superficiality,a rash bravery,an inadequate solution of diffi- culties deeming itself adequate, are among the chief. But he is original, natural, attractive,

and direct—limpid in phrase and pure in fancy. His best eloquence flows as easily as a stream. In an era of excessive reticence and cautious hypocrisy he lives within a case of crystal where

Long: fellow.

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there are no concealments. We never suspect him of with- holding half of what he knows, or of formularising for our satisfaction a belief which he does not sincerely hold. He is transparently honest and honourable. His courage has no limits. Isolated by force of character, there is no weak- ness in his solitude. He leads us into a region whcre we escape at once from deserts and from noisy cities; for he rises above without depreciating ordinary philanthropy, and his philosophy at least endeavours to meet our daily wants. In every social and political controversy he has thrown his weight into the scale of justice, on the side of a rational and progressive liberty; and his lack of sym- pathy with merely personal emotions is recompensed by a veneration for the ideal of the race which recalls the beau- tiful sentiment of Malebranche: "When I touch a human hand I touch heaven."

Poetry.

Half the litcrary men and all the literary women of this century in America have written verses; most of them are respectable and many are excellent. But a brief review of the poctry of the West must dwell on the works of four or five authors who most clearly and saliently express the main tendencies of their nation. It must suffice here to name as familiar, or worthy to be so, the graceful vers de société of Holmes, especially his " Punch Bowl" and "Old Constitution ;" the patriotic chaunts of James Percival ; the sparkling fancies of the "Culprit Fay," by J. RB. Drake; the fashionable satires of Halleck—Fanny and the Croakers;" J. Saxe's "Miss MacBride;" the well-balanced stanzas of Hillhouse; the plays of Conrad and Bird; "Woodman, spare that Trec" and the " Whip-poor- Will," by G. P. Morris; A. B. Street's "Settler" and "Forest Walk ;" and, pre-eminent among female minstrels, Mrs Sigourney, whose blank verse

descriptions of nature approach those of Bryant; the youthful prodigics, Lucretia and Maria Davidson; and Maria Brooks, authoress of the richly imaginative southern romance of Zophiel, whom Southey, her friend and admirer, pronounced to be "the most impassioned of poetcsses." We proceed to review the position of the really great poets of the United States, as re- presenting somewhat different mannersand modes of thought.

1. Tun Evropzan Scxoox.—Of these, in our judgment, Mr Longfellow is still the first. His works are free from the defects that stamp the national literature of his country. He has none of the uncouth power and spasmodic exag- geration of his contemporaries. He is all grace, polish, and sweetness. His prose masterpiece, "' Hyperion,' is the key-note of his minor poems. The source of their inspira- tion is "Outre Mer" among feudal towers, Flemish towns, aud Alpine passes. Like Irving in the variety of his culture and superior in genius, his imagination is Teutonic rather than American. He lingers in Nuremberg, Bruges, and Prague; and chooses for his emblem of life's river, not the Ohio, nor the Hudson, nor the Assabeth, but the "Moldau's rushing stream." His "New England Trage- dies" are perhaps his least successful efforts, partly because dramatic literature has seldom yct flourished in American soil, and partly because his sympathy with the ruder age is not keen enough to enable him to vitalise it. Mr Long- fellow has given us the best translations in the world from Swedish, German, Spanish, and Italian authors, and many of his best verses arc avowedly suggested by proverbs or sentences, or bits of old romance. A few words from an old French author give him the burden of the "Old Clock on the Stairs ;"? a leaf out of Mather's Magnalia Christi is rhymed into the " Phantom Ship ;" the ballad of the Count Amaldos scts him dreaming over the secrct of the sea; a verse of Euripides is the key-note to his "Voices of the N ight;" a few lines from Goethe gather

up the essence of the "Psalm of Life." In the New World, but not of it, he dwells with almost wearisome fondness on the word "old." Volumes

of old days, old associations that we cannot buy with gold, quaint old cities, old poets and painters, sweet old songs, old haunted houses, dear old friends, the grey old manse, Nature the dear old nurse, dear old England,—on phrases and thoughts like these his fancy broods. American verse is fre- quently rough-hewn and audacious, sometimes obscure and pedantic; its novelty is often more striking than its truth, Every sentence that Longfellow has penned is as clear as crystal and as pure as snow. He wears his weight of learning lightly as a flower; and though he cannot create, he cannot touch without adorning, He seldom gives us thoughts absolutely new, but he puts our best thoughts in the best language. Critics react against his popularity, and complain of his want of concentration and the con- ventionality of his epithets (a fault more rare in his later volumes); but his place as the laureate of women and children and gentle men is unimpregnable; and there are seasons when we prefer his company to that of the grand old masters, when we seek an anodyne rather than a stimulant— "His songs have power to quict The restless pulse of care." Longfellow's command of verse alone proves him to be a genuine poet. There are passages in the " Arsenal," the "Occultation of Orion," the "Building of the Ship," and the " Household Poems" unsurpassed in melody by any in contemporary English verse. The introduction to "Hia- watha," the closing lines of " Evangeline," and some of the character sketches which preface the "Tales of the Wayside Inn," have a music equally attractive and more decidedly original. The highest flights of Longfellow's imagination are in the strangely-confused old-world story of the "Golden Legend ;". but the work on which his fame most securely rests is " Hiawatha." This poem, in which a series of idylls are strung together on the thread of an idea common to Indian and Scandinavian legend, has that exhilarating flavour of nationality wanting in many of the author's works, and it yields to none of them in artistic finish. The monotony of the verse is like that of a bird's song which has only two or three notes, and yet from its everlasting freshness never palls upon the ear. Most modern attempts to reproduce old ballads put new wine into old bottles; but the American poet has thrown himself as completely into the spirit of aboriginal western life as he has into that of Gothic paganism in the " Chal- lenge of Thor." Like Chibiabos the musician he is at home among the pine-groves and

the prairies and "the great lakes of the Northland ;' and ' All the many sounds of Nature Borrow sweetness from his singing." Longfellow's descriptions charm us more than they astonish. Inferior in luxuriance to those of "Enoch Arden," in in- tensity to those of "Locksley Hall," in subtilty to Brown- ing's Italian pictures, they are superior in simplicity. If they do not adorn Nature as a mistress with the subjective fancies of a lover, they bring her before us as a faithful nurse, careful for her children. In " Evangeline" the poet follows the wheels of the emigrant's waggon over*

" Billowy bays of grass, ever rolling in sunshine and shadow ;" and "'Over them wander the buffalo herds and the elk and the roebuek." :*

Hiawatha speaks of Nature with the familiarity of an inhabitant; there is no trace of the grandiose style of the tourist. In the best episodes of the volume—ag the account of the hero's childhood and his friends—of the wooing of Minnehaha—of the son of the evening star—of

Poe

Bryant.

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the ghosts and the famine—the parable of human life, with its incidents of birth, love, and death—of civilisation and decay—is told in a narrative of child-like tenderness as well as masculine grasp. He who runs may read it, and yet the whole is lit up by an imagination like an aurora borealis. A recent New York critic ridicules the European view of " Hiawatha" as an American poem. It is true that the feverish ardour of Wall Street has no place in its pages; but it is none the less manifestly transatlantic and sui generis. In celebrating Red Indian life, it inevitably discloses some of the features of the race which has come into close contact with that life. The New Zealand myth about the strength of the dead enemy passing into his conqueror applies here. Mr Dixon has dwelt very justly on the extent to which the aborigines of America have communicated their spirit to the pioneers before whom they have given way. Hiawatha sings of the decadence of a primitive

people in strains that recall by their pathos the old British legends of the death of Arthur, but has also a prophetic side; from the meeting-point of two races it looks before as well as after.

More devoid of national sentiment and local colouring are the remarkable verses of Edgar Allan Poe, to whom we have before referred as a romancer. If the aim of poetry be to astonish or to fascinate, Poe takes a high rank among poets. According to Wordsworth's definition of the art, he has hardly a place among them at all. He teaches nothing, and living in one world writes in another. All we know of the personality of most of the authors we have named adds to the charm of their works. Regarding Poe's career it is otherwise. The vain and captious jea- lousy of his criticism is as repulsive as his graver defects. It has been said that he is the greatest of American writers in verse. This is an exaggeration of his powers only surpassed by his own exaggeration of them. It is true, however, that by pure intensity of delirium he now and then takes a flight beyond that of any other Western poet. His " Politian" is perhaps the stupidest fragment of a play that exists. But in his lyrics the fervour of his sympathy with himself makes artistic recompense for his want of sympathy for others. The passion of " Annabel Lee" is at a white heat, and is pervaded by a true pathos. The class finish of the best of his verses is unsurpassed, and his musical cadences give a charm even to those which are comparatively meaningless. The "Raven" is at the worst a marvellous piece of mechanism; and the same deli- cacy of touch is everywhere visible in the rushing lines of " Annie," '"Eulalie," '"'Ulalume," '"'Leonore," and the 'City in the Sea." The purity of those poems is one of their most remarkable features. Bythe side of the author's life, they are like nuns in the convent of a disorderly city; but they are at the same disadvantage—their isolation gives them an air of unreality. The "banners, yellow, glorious, golden," of his fancy " float and flow" on the roof of an imaginary palace.

2. ScHooL of AMERICAN SCENERY AND ADVENTURE.— The French critic M. De Tocqueville remarks that, in democratic communities, where men are all socially. insig- nificant, poetry will be

less apt to celebrate individuals, but will incline to dwell on external nature or on the ideas which concern mankind in general. It will be either descriptive or abstract. The works of Mr Bryant, the earliest considerable American poet, help to vindicate the generalisation. His " Thanatopsis," written fifty-five years ago, is perhaps the masterpiece of, his sombre contempla- tive Imagination. The reason why the author has never surpassed this effort of his youth is be found partly in the cast of his mind, characterised by a narrow greatness, and partly in the fact that, during the major part of his life he has been constrained to "scrawl strange words with the barbarous pen" as the editor of a daily newspaper: a fact

to which, at the close of his "Green River," he makes a touching reference. Mr Bryant has lived in thronging cities, an honest and energetic politician; but in his leisure hours his fancy has roamed to breezy hills and valleys and the undulating sea of the prairies. The perpetual autumn of his writings is peculiar. He has written smoothly in various measures, but he is never lively. An American Alastor, he loves "'the air that cools the twilight of the sultry day" better than morning " clad in russet vest." In the beautiful verses on the ' Death of the Flowers" his ear catches a dirge in the wind

'

he bore, And sighs to find them in the wood and bv the stream no more.

The high rank grass of the meadow is to his eye the garniture of the graves of a race represented by his " Dis- interred Warrior." His " Evening Wind," " Forest Hymn," "Monument Mountain," "The Burial Place," and "The Past," are set to the same slow music, and pervaded by the thought of life as the avenue of death. If we com- pare his " Address to a Waterfowl" with Wordsworth's or Shelley's "' Skylark," we appreciate the monotony of his mind, which is like that of Cowper without Cowper's occasional vivacity. Mr Bryant stands on a high level, but the space he covers is limited; he has no touch of humour, and only the distant pathos of prevailing melan- choly. Master

of his position where he is at home in the woods, he loses his inspiration when he draws near his own cities. His nature-worship has a parallel in the feeling which animates some of the most grapluc passages in New England prose; as when Emerson writes—

‘ At the gates of the forest, the surprised man of the world is foreed to leave his eity estimates of great and small, wise and foolish. The knapsaek of eustom falls off his baek with the first step he makes into these preeinets. Here is sanctity which shames our religions, and reality which discredits our heroes. ... We have erept out of our erowded houses into the night and morning. . . . . The incommunieable trees begin to persuade us to live wit*

them, and quit our life of solemn trifles. Here no history or ehurch or state is interpolated on the divine sky and the immortal year.”

The whole life and writings of the morbidly eccentric Thoreau,

genius H. D. Thoreau are a comment on the results of this one-sided spirit. It pervades half the volumes of Theodore Winthrop, a manlier though less original mind. It has taken possession of the poetic advocate of Far Western and wild Indian life, Joaquin Miller, whose “Songs of the Sierras” in their best passages add to Bryant’s descriptive power more of the fire of adventure, finding expression in the quicker pulse of the verse. But the lyrics of this writer, though the vehicle of national thought, bear the mark of foreign influence. Their cadences are echoes of Mr Swinburne. The impulse which made captive the “Scholar Gipsy,” which the hero of ‘“ Locksley Hall” welcomes and then rejects, is a leading feature of Western literature. imaginative and ardent minds, oppressed by what Mr Arnold calls “this strange disease of modern life,” try to escape from the region of the real drama into that of the ideal lyric,—“ arva, beata petamus arva, divites et insulas,”—-and have now and then endeavoured to convert it into an actual idyll, as when Thoreau buried himself in a log hut by Walden lake, or Theodore Winthrop, leaving his ledgers in New York, scoured over the crags of Oregon; or Horne, with his “ Orion” still unsold, was found mining in a quarry of New South Wales. But this emigré spirit, when put into practice, ultimately cures itself: a poet

soon tires of working with his hands for a livelihood. The aspirations of Clough's " Bothie" are stifled by the witiose cure of a hard life, or terminate in the catastrophes of a fanaticism, such as Hawthorne has branded with his genius in the Blithedale Romance. The philosophical refugees

| Emerson.

Whitman.

AMER LCA hie PATURE

find that the solitude they desired charms only by its contrast with the civilisation they have left 3 as the beauty of the sea is its contrast with the shore. But this wander- ing impulse, strong in the ancient Greek and the modern English race, has colonised and civilised the world: it is especially strong in the Anglo-American. The very restless- ness which makes his cities so noisy bid him long for a remoter rest, and this longing acts in conjunction with more material demands to drive him across the Mississippi, and pioneer the way to the Pacific.

3. TRANSCENDENTAL AND Eccentric Scuoor. —The freshness which breathes through Mr Emerson's essays reappears in his poems: but they are seldom so successful as his prose. Apart from the obscurity of their matter, which is great—for he has chosen verse as the vehicle of his remoter mysticism—they are defaced by frequent mannerisms and incongruities: most of them are wanting in melody, many in syntax. The writer seems to trust to providence for his rhymes, and changes his metres at will. Nevertheless, his genius has a lyric side, and the imagina- tive sympathy with nature which makes his prose poetical, prevents his verse, even when awkward, from becoming prosaic. The rippling of rivers, the sough of the pine, the murmur of the harvest, and the whirr of insects per- vade and give life to his descriptions. + A morning light is thrown over his happiest pages, and some of his quieter reflective pictures are not unworthy of the author of the "Excursion." Interleaved between the gold-dust of Alex- andrian rhapsody there are pieces that speak of a love that is neither " initial," "demonic," nor "celestial," but human. Of these, "The Dirge," "In

Memoriam," " The Farewell," the lines "To J. W.," "To Ellen," and the "Threnody," are the most conspicuous. The prevailing tone of the greater part of Emerson's poetry is cheerful. Unlike those of Bryant, his '"woodnotes" are those of the spring.

'Thousand minstrels wake within me, Our music's on the hills,"

is the perpetual refrain of the exulting worshipper of nature. His lines entitled "Good-bye, proud World," breathe the hermit-like spirit of Quarles or Andrew Mar- vell; but the Puritanism of older days has here assumed another shape. There are other pieces relating to the intercourse of men with each other showing a keen obser- vation of common life and sound worldly wisdom, in neat quatrains and a few vigorous political songs. The "Hymn on Concord Monument" is strong and dignified, while the verses relating to the civil war address the nation in forcible terms both of warning and encouragement. Those prac- tical manifestoes are the more striking from the fact that they are printed by the side of others proclaiming in tran- scendental enigmas the emptiness of transitory things, the fixity of fate, and the doctrine of the absorption of the individual in the infinite.

Mr Emerson was one of the first to praise the extra- ordinary rhapsodies of Mr Walt Whitman, which have since attracted too much attention to be passed without notice. But although this author on various occasions displays an uncouth power, his success is in the main owing to the love of novelty, wildness, and even of ab- surdity, which has infected a considerable class of critics and readers on both sides of the Atlantic. Mr Whitman does not write in verse ; he discards not only rhyme, but

all ordinary rhythm. What there is of the latter seems to |.

come by accident in lines of various léngth, and arranged either on no principle or on one which we have failed to discover. "The Leaves of Grass" is redeemed by a few grand descriptive passages from absolute barbarism both of manner and matter. It is a glorification of nature in her most unabashed forms, an audacious protest against all that civilisation has done to raise men above the savage

state. The "Drum Taps," a set of generally vigorous pictures of the war, are less objectionable; the dirge on Lincoln in particular has many qualities of a noble elegy ,— the imagery is rich though sometimes fantastic, and there is here and there a wild music in the composition,—but it is still defaced by pedantic words and unjustifiable, because unnecessary, novelties of phrase.

4, Parriotic aND PotiricaL Portry.—The assertion of Henri Beyle, that politics are like a stone tied round the neck of literature, must be accepted with a reservation ; for if the songs make the laws, the battles often make the songs of a nation. The growth of a history on their own soil is, in the minds of most Americans, a requisite to the full development of national art. English history inade- quately supplies the desired background, for they cannot associate it with what they see around them. Memories of the Revolution war have, during this century, been recalled in some stirring verses, as " Paul Revere's Ride," in Mr Longfellow's " Wayside Inn;" but the most effective national poetry has been suggested by more recent events.

The " Biglow Papers," a series of metrical pamphlets, born Lowell.

of the last great social and political struggle of the New World, are among the most original contributions to its literature. Mr James Russell Lowell is the author of several volumes of miscellaneous verse. His earlier efforts, buoyant and vigorous, but bearing the marks of haste, display more impetuosity than power. His genius every- where appears in contrast to Bryant's. Far from shrinking into solitary places, he loves great cities and their cries, and sets them to rhyme with hearty good-will. When he goes into the country, it is on a "day in June," to have his blood sent faster through his veins by the spring morning, and not to dream among the autuinn woods of "Thanatopsis." His " Allegra," " Fountain," and "Indian Summer Reverie," are marked by the same jubilant energy and the same apparent carelessness. Mr Lowell's diffuse- ness is only half redeemed by his fluency. He writes currente calamo ; and, unchecked by any spirit of reverence, contemns what he is pleased to call "the

*blaspheming past" and the "dotard Orient." In dealing with the forms of nature around him, he shows a keen eye and a fine sense of analogies: his images drawn from history are less successful. Few Americans know how to use the classics with reticence, and Mr Lowell's pages are infected with schoolboy commonplaces. His 'Ode to Freedom," "The Present Crisis," with other semi-political and social pieces, are noble and stirring platform verse, but they will not bear analysis. His "Trene," "Requiem," and " Beg- gar Bard" are marked by genuine sentiment and true pathos. But the prevailing flaw of his earlier and later serious poems—as 'The Cathedral," and "Under the Willows," is the confusion of inspiration with aspiration. In the "Fable for Critics," which may be compared with Leigh Hunt's "Feast of the Poets," he breaks ground on the field in which he has found his harvest. The merit of this piece lies in its candour and the general fairness of its criticisms, in the course of which "the whole tuneful herd" of American authors are reviewed with good-humoured banter. In several instances, as in the following, he shows himself alive to the defects which he shares with the majority of his countrymen— *'Neal wants balance; he throws his mind always too far,*

And whisks out flocks of comets and never a star 5

He has so much musele, and longs so to show it,

That he strips himself naked to prove he's a poet." The author's style is rapid and sparkling; his points fol- low one another like the sparks from a Leyden jar; his love of freedom and truth and detestation of pretence are always admirable; but his carlier poems are constantly defaced by violences. ;

Whittier.

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Mr Lowell informs us that the Mexican war, which he regarded as a crime perpetrated in behalf of slavery, led to the publication, in 1846, of the first of his series of " Big- low Papers." After an interval of thirteen years, the second began to appear in 1861, and closed with

the war in 1865. In his preface to those remarkable productions the author makes a successful defence of the language in which they are written. The more homely standards of the present as compared with those of the last ceutury give countenance to his mottocs—“ Unser Sprach ist auch cin Sprach,” and “Vim rebus aliquando ipsa verborum humilitas affert.” The essential to the use of a patois is that it be natural to the writer. Mr Lowell has taken pains to show that the peculiarities of the Yankee dialect are not indigenous; that the pronunciation and meanings given to familiar words, and the employincnt of words now unknown in England, are authorised by the example of our elder classics. We are more concerned to know that lhe has been happy in his use of the words and phrases in question. The popularity of his work is im this respect a voucher for luis success. The rural dialect seems to suit his genius better than the English of his university. The quasi-dramatic form he has adopted confines within limits a too discursive fancy. The letters of Mr Sawin are excel- lent examples of the form of satire in which contemptible qualities are stripped of their varnish by the sheer effrontery of the wearer. The style of the book is more trenchant and better matured than that of Lowell’s other works, and it is really humorous. The humour of the “ Biglow Papers” is broad and obvious. They derive their force from the incisive expression given to the sentiments shared by the author with a large section of his countrymen; and the lines most frequently quoted owe everything to a startling directness, something bordering on irreverence. Mr Lowell’s poetical powers are set on fire by political zeal, and his animosity sharpens the edge of his most effective verse. The satiric scorn of the lines put into the mouth of Calhoun, with the speeches of Garrison, Phillips, and Sumner, helped to hasten the irrepressible conflict of the contending forces in the Western Continent. The second series of the ‘ Biglow Papers” are animated by the spirit of an uncompromising Unionist as well as that of an Abolitionist. In these the poet’s patriotism glows with a deeper fervour, and his songs rise out of the battlefield “like rockets druv’ by their own burnin’.” The graver poetry of this volume reaches a higher standard than the author has elsewhere attained. The short rural romance entitled “The Courtin’” is one of the freshest bits of pas- toral in the language. The

stanzas beginning "' Under the yallar pines I house," and ending " A nation saved, a race delivered," are his masterpicces.

Mr John Greenleaf Whittier is the political lyrist par excellence of Amcrica; and the best of his lyrics have a verve, swing, and fire that impart to the reader a share of the writer's enthusiasm. His verse, rapid as a torrent, is perpetually overflowing its banks. No one stands more in need of the advice once given to Southey, '" squeeze out the whey;" and to no works more than to his is the maxim Adv nutov mavtds more applicable. There are few more graceful tales in verse thau those of his "Tent on the Beach." They are remarkable for their smooth- ness and quiet beauty of sentiment. The music of " River-mouth Rocks," " Revisited," and the "' Grave by the Lake" recalls that of Longfcllow's best ballads. The most strik- ing is the " Brother of Mercy," Piero Luca, who, like Abu Ben Adhem, loves his fellow-men. The same trust in the divine love which is the sum of Whittier's ardent faith, appears in the beautiful verses entitled "The Eternal Goodness" and " Our Master." The strongest lines in the book, addressed to "Thomas Starr King," have the rare

merit of condensation, Of Whittier's national lyrics, the most powerful is '"'Laus Deo," the burst of acclamation suggested by the passing of Lincoln's constitutional amend- ment. His narrative power is best illustrated in " Maud Muller," an original and more innocent version of Brown- ing's " Statue and the Bust," springing up in an American meadow.

V.—SUMMARY.

The critics of one nation must, to a certain extent, regard the works of another from an outside point of view. Few are able to divest themselves wholly of the influence of local standards; and this is pre-eminently the case when the early efforts of a young country are submitted to the judgment of an older country, strong in its prescriptive rights, and intolerant of changes the drift of which it is unable or unwilling to appreciate. English critics are apt to bear down on the

writers and thinkers of the New World with a sort of aristocratic hauteur; they are perpetually reminding them of their immaturity aud their disregard of the gelden mean. Americans, en the other hand, are hard to please. Ordin- ary men among them are as sensitive to foreign, and above all to British, censure, as the irritable genus of other lands. Mr Emerson is permitted to impress home truths on his countrymen, as 'Your American eagle is very well; but beware of the American peacock." Such remarks are not permitted to Englishmen: if they point to any flaws in transatlantic manners or ways of thinking with an effort after politeness, it is "the good-natured cynicism of well- . to-do age;" if they commend transatlantic institutions or achievements, it is, according to Mr Lowell, " with that pleasant European air of self-compliment in condescending to be pleased by American merit which we find so con- ciliating." Now that the United States have reached their full majority, it is time that England should cease to assume the attitude of their guardian, and time that they should cease to be on the alert to resent the assump- tion. Foremost among the more attractive features of transatlantic literature is its freshness. The authority which is the guide of old nations constantly threatens to become tyrannical: they wear their traditions like a chain; and, in the canonisation of laws of taste, the creative powers are depressed. Even in England we write under fixed conditions; with the fear of critics before our eyes, we are all bound to cast our ideas into similar moulds, and the name of "free-thinker" has grown into a term of reproach, Bunyan's Pilgrim's Progress is perhaps the last English book written without a thought of being reviewed. There is a gain in the habit of self-restraint fostered by this state of things; but there is a loss in the consequent lack of spontaneity; and we may learn some- thing from a literature which is ever ready for adventures. In America the love of uniformity gives place to im- petuous impulses: the most extreme sentiments are made audible, the most noxious "have their day, and ccase to be;" and truth being left to vindicate itself, the overthrow of error, though more gradual, may at last prove more complete. A New England poet can write with confi- dence of his country as the land

'¢ Where no one suffers loss or bleeds For thoughts that men call heresies."

Another feature of American literature is its comprehen- siveness: what it has lost in depth it has gained in breadth. Addressing a vast audience, it appeals to universal symr pathies. In the Northern States, where comparatively few have leisure to write well, almost every man, woman, and child can read and does read. Books are to be found in every log-hut, and public questions are discussed by

every scavenger. During the war, when the Lowell fac- tory girls were writing verses, the " Biglow Papers" were

being recited in every smithy, The consequence is, that | slave.

ism based on the antipathics of race, was worse than

Athenian slavery. But there is no song of an Athenian When the ancients were unjust to their infcriors,

(setting aside the newspapers) there is little that is sec- | they were so without moral disquietude: the lie had got

tional in the popular religion or literature ; it exalts and despises no elass, and almost wholly ignores the lines that in other countries divide the upper ten thousand and the lower ten million. Where manners make men the people are proud of their peerage, but they blush for their boors. In the New World there are no "Grand Seigniors," and no human vegetables; and if there are fewer giants, there are also fewer mannikins. American poets reeognise no essential distinetion between the " Village Blacksmith" and the "'caste of Vere de Vere." Burns speaks for the one; Byron and Tennyson for the other; Longfellow, to the extent of his genius, for both. The same spirit whieh glorifies labour denounces every form of despotism but that of the multitude. American slavery, being an anachron-

into the soul. Christianity, which substituted the word "brother" for " barbarian," first gave meaning to the word "humanity." But the feudalism of the Middle Ages long contended successfully against the higher precepts of the chureh : the teaching of Froissart held its ground against that of Langland. The hero-worship of our greatest living author is apt to degenerate into a reassertion of the feudal spirit. The aspirations of our descendants in the West point, on the other hand, to a freedom whieh is in danger of being eorrupted by licence. But if the vulgarism of demagogic excess is restrained and overeome by the good taste and culture of her nobler minds, we may anticipate for the literature of America, under the mellowing influ- ences of time, an illustrious future. (3. N.)

AMERIGO VESPUCCI. See Vespvect.

AMERSFOORT, a town of Holland, in the province of Utreeht, situated 12 miles E.N.E. of the city of that name, ou the Kem, which here is navigable. It contains a town- house, several churches—Protestant and Roman Catholic —a court of primary jurisdiction, a Jansenist college, an industrial and several other schools. Woollen goods, cotton, silk, glass, and brandy are the chief manufactures, and there is a large trade in corn, tobaeco, and dried herrings. Amersfoort received its municipal privileges in 1249. It was taken by the Archduke Maximilian in 1483, and by the French in 1672 and in 1795. Population, 13,200.

AMERSHAM, or AcmonpEsHam, an old market town in Buckinghamshire, pleasantly situated in the valley of the Misbourn, a small tributary of the Colne, 32 miles from Buckingham, and 26 from London. It eonsists chiefly of a main street crossed by a smaller one; and possesses a handsome ehurch, containing some beautiful monuments, several dissenting places of worship, a town- hali, built in 1642 by Sir William Drake, and a grammar school. It has manufactures of black lace, eotton, straw- plait, wooden chairs, flour, and beer. Edmund Waller, the poet, was born near Amersham, and sat for the borough, which sent two members to parliament until 1832. Population of parish in 1871, 3259.

AMES, FisHer, an eminent American statesman and political writer, son of Nathaniel Ames, a physieian, was born at Dedham, in Massachusetts, on 9th April 1758. He studied at Harvard college, where he graduated in 1774, After practising the law for some little time, he abandoned that profession for the more eongenial pursuit of politics, and in 1788 hecame a member of the Massa- ehusetts convention for ratifying the constitution. In this assembly he bore a conspicuous part, and in the next year, having passed to the house of representatives in the state legislature, he distinguished himself greatly by his elo- quence and sprightliness and readiness in debate. Dur- ing the eight years of Washington's administration he took a prominent part in the national couneils ; and on Washington's retirement, he returned to his residence at Dedham to resume the practice of the law, whieh the state of his health after a few years obliged him to relinquish. He still continued his literary labours, and published pumerous essays, chiefly in relation to the contest between Great Britain and revolutionary France, as it might affect the liberty and prosperity of America. Four years before his death he was ehosen president of Harvard college, an honour which his broken state of health obliged him to

decline. He died on the 4th July 1808, admired and respected by his eountrymen from the brillianey of his talents and his private virtues, His writings, which abound in sparkling passages, displaying great fertility of imagina- tion, were collected aud published, with a memoir of the author, in 1809, by the Rev. Dr Kirkland, in one large octavo volume. A more complete edition in two volumes was published by his son, Seth Ames, in 1854.

AMES, Josmpu, author of a valuable work on the pro- gress of printing in England, called Typographical Anti- quities (1749), which is often quoted by bibliographers, He was born in 1689, and died in 1759. The best editions of his work are those published with the additions of Herbert (1785-90), and of Dibdin (1810-16). These both include a life of Ames written by Mr Gough.

AMES, Witt1am, D.D. In the Latinised form of Amesius this distinguished English theologian is now better known on the Continent than in our own country, through works that were a power in their day, and are not yet spent of their force. He was born at Ipswich, Suffolk, in 1576. He received an excellent education at the graminar school of Ipswich ; and procecded next to the university of Cambridge, where he was entered of Christ's college. Froin the outset, as to the latest, he was an oninivorous student. Entering half-carelessly into the church where the great Master William Perkins was the preacher, he. was, under the sermon, roused and alarmed in such fashion as Was not rare under so burning and intense an orator as Perkins. Like another Nicodemus he visited the vener- able preacher, and was taught and comforted so as never through life to forget his interviews with the "old man eloquent." Perkins having died at a ripe old age, was sneeecded by one of kindred intellect and fervour, Paul Bayne, and his friendship also was gained by Ames. He proceeded B.A. and M.A. in due course, and was chosen to a fellowship in Christ's college. He was universally beloved in the university. His own college (Christ's) would have chosen him for the mastership ; but a party-opposi- tion led to the election of a Dr Carey, who at once sought a quarrel by arraigning Ames for disapproving of the sur- plice and other outward symbols. Not succeeding by threats of expulsion, which were illegal and powerless, the master resorted to transparent flattery. Ames stood firm, was lcd to re-examine former opinions, and the result was that more absolutely than ever he decided against con- formity. Nevertheless, he preached in season and out of season, and always with profound impression. One ser- mon became historical in the Puritan controversies. It was delivered on St Thomas' day, before the feast of Christ's

nativity, and in it he rebuked sharply Lusory Lotts and the "heathenish debauchery" of the students during the twelve days ensuing. His exposures and scathing denun- ciations won thunders of applause, but there were sheathed in them lightnings of wrath among the High Church party. He was summoned before the vice-chancellor and whole

senate of the university. He appcared, and in presence of as brilliant an assembly as ever met in the congregation- house, defended himself triumphantly. Nonconformity, admittedly in lesser things, was regarded as excluding him from the Church of England. He left the university, and would have accepted the great church of Colchester in Essex, but the relentless bishop of London refused to grant institution and induction. Like furtive persecution awaited him elsewhere, and at last he passed over to Holland. To leave England was not so simple or easy a thing then, and Ames had to disguise himself for safety. His disguise was singularly timed, for it produced an incident that has long been worked into the very fabric of church history in Eng- land and Holland. Coincident with his arrival at Rotterdam a congress of theologians—Remonstrant and non-Remon- strant—was being held. Ames went into the meeting in his " habit of a fisherman, with his canvas slops about his body, and a red cap on his head." As the debate pro- ceeded, the English visitor rose and craved permission to oppose Grevinchovius—a theologian long since in oblivion, but a tower of strength in heresy at that day—in Latin. The Remonstrant champion was rather taken aback at first ; but jeered and flouted the plain countryman, "like an- other Goliath scorning David." The question was the old- new one of the " self-determining power of the human will to spiritual good, without any need of the previous effica- cious operations of divine grace." Ames bore his op- ponent's gibes at his dress, and overwhelmed him with his logical reasoning from Phil. ii. 13, "It is God that worketh in us both to will and to do." The fisherman-contro- versialist made a great stir, and from that day became known and honoured in the Low Countries. Subsequently Ames entered into a controversy in print with Grevin- chovius on universal redemption and election, and cognate problems. He brought together all he had maintained in his Coronis ad Collationem Hagiensem—his most master- ful book, which figures largely in Dutch church history. At Leyden, Ames became intimate with the venerable Mr Goodyear, pastor of the English church there. While thus resident in comparative privacy he was sent for to the Hague by Sir Horatio Vere, who appointed him a minister in the army of the states-general, and of the English soldiers in their service, a post held by some of the greatest of England's exiled Puritans. He married at the Hague a

daughter of Dr Burgess, who was domestic pastor of Vere. On his father-in-law's return to England, Ames succeeded to his place It was at this time he began his memorable controversy with Episcopius, who, in attacking the Coronvs, railed against the author as having been "a disturber of the public peace in his native country, so that the English magistrates had banished him thence; and now, by his late printed Coronis, he was raising new disturbances in the peaceable Netherlands." It was a miserable libel. Mr Goodyear being present in the lecture-room when Epis- copius vented his malice, there and then rebutted his charge against his absent friend None the less did the controversy proceed. Ultimately Ames reduced the Re- monstrants to silence. The Coronis had been primarily prepared for the Synod of Dort, which sat from November 1618 until May 1619. At this celebrated synod the posi- tion of Dr Ames, if an extremely honourable, was a peculiar one. The High Church party in England had in- duced the king to interfere and bring about his removal from the Hague, on the ground of his nonconformity ; but

he was still held, deservedly, in such reverence that it was arranged he should attend the synod informally. Through- out its sittings Dr Ames appears to have been the most active aud influential of the foreign divines. It is a sorrowful fact that, from 1611-12 onward, Ames was interfered with harassingly by the High Church party in England. Twice over, when chosen professor, the most envenomed opposition was led from England. He was kept from the university of Leyden; and when later in- vited by the state of Friesland to a professoriate at Franeker, the persecution was renewed, but this time abortively. He was installed at Franeker on 7th May 1622, and de- livered a most learned discourse on the occasion on " Urim and Thummim." He soon brought renown to Franeker as professor, preacher, pastor, and theological writer. He prepared his Medulla Theologica for his students. His Casus Conscientie followed. Both these treatises left their mark on the thought of the century. His " Cases of Con- science" was a new thing in Protestantism. The work shows much insight into human nature, and may be favourably compared with the bulkier Ductor Dulitantiwm. Having continued twelve years at Franeker, his health gave way, and he contemplated removal to New England. But

another door was opened for him. His English heart yearned for more frequent opportunities of preaching the gospel to his fellow-countrymen, and an invitation to Rotterdam gave him such opportunity. His friends at Franeker were passionately opposed to the transference, but ultimately acquiesced. At Rotterdam he drew all hearts to him by his eloquence and fervour in the pulpit, and his irrepres- sible activity asa pastor. Home-controversy engaged him again, and he prepared his P'resh Suit ggainst Ceremonies—extrinsically having the distinction of being the book which made Richard Baxter a Nonconformist. It was posthu- mously published. He did not long survive his removal to Rotterdam. Having caught a cold from a flood which drenched his house, he died in November 1633, in his fifty-seventh year.

*Few Englishmen have exercised so formative and controlling an influence on continental thought and opinion as Dr Ames. He was a master in theological controversy, shunning not to cross swords with the formidable Bellarmine. He was a scholar among scholars, being furnished with extraordinary resources of learning. His works, which even the Biographia Britannica (1778) testifies, were famous over Europe, were collected at Amsterdam in 5 vols. 4to. Only a very small proportion were translated into his mother tongue. His Lectiones in omnes Psalmos Davidis (1635) is exceedingly sug- gestive and terse in its style, reminding of Bengel's Gnomon, as does also his Commentartus utriusque Epist. S. Petri. His "Replies" to Bishop Morton and Dr Burgess on '*Ceremonies " tell us that even kinship could not prevent him from " contending earnestly for the faith." (John Quick's MS. Icones Sacree Anglicane, who gives the fisherman anecdote on the personal authority of one who was present; Brook's Puritans, vol. ii. pp. 405-8; Win- wood's Memorials, vol. iii. pp. 846-7; Neal's Puritans; Fuller's Cambridge (Christ's College) ; Sylvester's Life of Baxter, part 1, pp. 13, 14; Biogr. Brit., vol. i. pp. 172-3; Mather's New England, book iii. ; Palmer's Nonconf. Memorial. ; Mosheim's Eecles. Hist, who mistakenly calls him a Scotsman; Hanburg, s.v. ; Collections of the Massachusetts Historical Socicty, vol. vi., fourth series, 1863, pp. 576-7.) (A. B. G.)*

AMESBURY, an old town in Wiltshire, on the Avon, 8 miles north of Salisbury, and 78 west of London. It is an ill-built place, with little trade. It contains an old parish church, which probably belonged to an abbey, @ chapel for the Wesleyan Methodists, and a beautiful house erected by Inigo Jones for the Duke of Queensberry. Near Amesbury are Stonehenge, and Milston, where Addi- son was born. Population, 1169.

AMETHYST, properly, is only a variety of quartz or rock-crystal distinguished by its fine violet-blue or purple colour. This tint seems to be caused by a minute muxture of the peroxide either of iron or of manganese, and is lost when the stone is exposed to the action of the fire. It

then changes through yellow and green to colourless ; and in this condition is often sold for the aquamarine or Amethyst is generally found in thick columnar masses, of short hexagonal prisms terminating in pyramids. The faces, especially in Brazilian Specimens, are often marked by zig-zag or undulating lines, and the colour in many is similarly disposed, showing a peculiar internal It has been proposed to name all varieties of quartz, whether coloured or uncoloured, show-

topaz.

structure in the stone.

ing this peculiarity, amethyst, but without sufficient reason.

Amethyst, according to Pliny, got its name, dueOveros, from Though an orna-

its supposed power of preventing drunkenness. not a true gem, it was formerly much valued as mental stone, but has greatly declined in value in the present century, being obtained in great abundance from Brazil. There it is often white or yellow, and named topaz.

The finest blue stones are found in Ceylon and Siberia;

and less remarkable ones in many places in Europe, India, and Australia. Amethysts may be counterfeited by glasses, to which the proper colour or stain is given by mineral matter. There were fine ones made in France about the year 1690, which even imposed on connoisseurs, but with the decrease in price there is now less danger of such deceptions.

AMHERST, a district and city within the Tenasscrim division of British Burmah, and within the jurisdiction of the chief commissioner of that province. The District forms a narrow strip of land between the Indian Ocean and the mountains which separate it from the independent kingdom of Siam. It lies in 16° N. lat., 98° EF. long., and consists partly of fertile valleys formed by spurs of the mountain system which divides it from Siam, and partly of a rich alluvial tract created by the great rivers which issue from them. The most important of these are the Salwcen river and the Houng-da-raw Khyoung. The river highways bring down inexhaustible supplies of rice to Maulmain, the chief town of the district, as also of the province of Tenasserim, and the second city in British Burmah. The district comprises an area of 15,144 square miles, of which 346 are cultivated, 4889 are capable of being brought under cultivation, and the remaining 9909 square miles are

returned as uncultivable. The population in 1872 numbered 235,738 souls, occupying 38,945 houses, and consisting of 203,774 Buddhists, 15,598 Hindus, 12,279 Mahometans, and 4081 Christians. The town of Maulmain contains 53,653 inhabitants. The rainfall is very heavy, 245°85 inches being registered in1871-72. The temperature is uniform, but not excessive, and averaged 83° at 2 p.m. throughout the month of May 1871, 80° at 2 p.m. throughout July, and the same at 2 p.m. through- out December 1871.

Amuerst Town, situated in the district of the same name, about 30 miles south of Maulmain. It was founded by the English in 1826 on the restoration of the town of Martaban to the Burmese, and named in compliment to the Governor-General of India who projected it. The proclamation inviting the natives to people the town was well adapted to the character and capacities of those whom it addressed. 'The inhabitants of the towns and villages who wish to come shall be free from molestation, extortion, and oppression. They shall be free to worship as usual, temples, monasteries, priests, and holy men. The people shall go and come, buy and sell, do and live as they Please, conforming to the laws. In regard to slavery, since all men, common people or chiefs, are by nature equal, there shall be under the English government no slaves. Whoever desires to come to the new town may come from all parts and live happy, and those who do hot wish to remain may go where they please without hindrance." Shortly after its settlement the numbcr of

houses amounted to 230, and the population to 1200, Large teak forests abound in its neighbourhood, and the timber is exported in considerable quantities. The harbour, though large and capable of accommodating ships of any burden, is difficult of access, and dangerous during the south-west monsoon. Amherst town has been eclipsed by the rapidly rising city of Maulmain, which has absorbed to itself the trade and mercantile enterprise alike of Amherst district and of the Tenasserim province.

AMHERST, a post township of Hampshire county, Massachusetts, United States. It is a picturesque village intersected by two branches of the Connecticut river. Its water-power is utilised for manufactories of machinery, edge tools, cotton goods, paper, &.; but it is principally known as the seat of Amherst college, a valuable institu- tion founded in 1821, mainly for the purpose of educating poor and pious young men for the ministry. The charity fund is large, and pays the tuition fees of forty or fifty students. The faculty of the college consists of eighteen professors, beside the president. The number of students in 1873 was 261. The buildings of Amherst college are situated on a hill at the southern extremity of the village. An octagonal building in advance of the line of college halls is devoted to the purposes of a museum. Some of the collections are of great value, especially those in the paleontological department. The Massachusetts Agri- cultural school, founded in 1863, has also its seat at Amherst. Its handsome buildings are on the edge of a rich plain from which fine views are obtained of the moun- tains on the west and south. There is a large farm for experiment attached to the school, which is esteemed one of the best in America. The population of Amherst in 1870 was 4035.

AMHERST, Earn (Wint1am Pier AMHERST), born in 1773, was the nephew of Jeffery Amherst, who, for his services in America, where he was commander-in-chief at the time of the conquest of Canada, was raised to the peerage as Baron Amherst in 1776. The patent of nobility was renewed in 1788 with remainder to the subject of this notice, who succeeded to the title in 1797. In 1816 he was sent as ambassador extraordinary to the court of China, with the view of establishing more satisfactory commercial relations between that country and Great Britain. On arriving in the Peiho, he was given to understand that he could only be admitted to the emperor's presence on condi- tion of performing the ho-tou, a ceremony which Western nations have always considered degrading, and which is, indeed, a homage exacted by the Chinese sovereign from his tributaries. This Lord Amherst, following the advice of Sir George T. Staunton, who accompanied him as second commissioner, refused to consent to, as Lord Macartney had done in 1793, unless the admission was made that his sovereign was entitled to the same show of reverence from a mandarin of his rank. In

consequence of this he was not allowed to entcr Peking, and the object of his mission was frustrated. His ship, the " Alceste," after a cruise along the coast of Corea and to the Loo-Choo Islands, on proceeding homewards was totally wrecked on a sunken rock in Gaspar Strait. Lord Amherst and part of his shipwrecked com- panions escaped in the ship's boats to Batavia, whence relief was sent to the rest. The ship in which he returned to England in 1817 having touched at St Helena, he had several interviews with the Emperor Napoleon (Ellis's Proceedings of the Late Embassy to China, 1817; M'Leod's Narrative of a Voyage in H.M.S. " Alceste," 1817). Lord Amherst held the office of governor-general of India from August 1823 to February 1828. The principal event of his government was the Burmese war, resulting in the cession of Aracan and Tenasserim to Great Britain. He was created Earl Amherst of Aracan in 1826. On his

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return to England he lived in retirement till his death in March 1857. we

AMHURST, Nicuotas, an English poet and political writer of the 18th century, was born at Marden in Kent, and entered (1716) at St John's college, Oxford, from which he was expelled, ostensibly for libertinism and irregular conduct, but really, according to his own state- ment, on account of the liberality of his opinions. Retain- ing great resentment against the university on this account, he gave expression to his feeling in a poem published in 1724, called Oculus Britannic, and in a book entitled Terre Filius. He published a Miscellany of Poems, sacred and profane; and The Convocation, a poem in five cantos, which was a satire on the bishop of Bangor's antagonists. But he is best known for the share he had in the political paper called Zhe Craftsman, which he conducted for several years. It attained a circulation of 10,000 or 12,000 copies, and had very considerable influence in inflaming popular opinion against Sir Robert Walpole, and in bring- ing about the political change of 1742. Ambhurst's party made no provision for him, however, on their accession to power, and their neglect is

supposed to have hastened his death, which occurred at Twickenham on the 27th April

1742.

AMIANTHUS (unstained, from a privative, and puaive, to stain), the best known and most beautiful of the asbestos class of substances. See ASBESTOS.

AMICI, Giovanni Bartista, a celebrated designer and constructor of optical instruments, was born at Modena in 1784. While studying mathematics at Bologna, he acquired a taste for astronomical science, and devoted himself early in life to the improvement of astronomical instruments with great ingenuity and success. For the specula of his reflecting telescopes he prepared a very hard alloy, capable of receiving and retaining a fine polish, and to prevent spherical aberration he wrought the specula into an elliptical form. About 1812 he undertook the con- struction of a telescope with a five-foot speculum, and the gun-foundry at Pavia was put at his disposal for this purpose by the war minister of Italy, but the project was broken off, owing apparently to political complications. Amici is still better known from his microscopes. His reflecting microscopes, with ellipsoidal specula, were an improvement on all that had preceded them, and he attained still greater success in the construction of com- pound achromatic object-glasses. His compound micro- scope was the first that could be used either in a vertical or in a horizontal position. His prism, too, for the oblique ilumination of objects of microscopical observation is much commended. Amici was a very diligent and skilful observer ; and his intimate acquaintance with the principles of optical science enabled him to arrange his apparatus to the very best advantage. Various papers recording the results of his observations, which he read before learned societies, were published in scientific journals. They treat of the measurement of the diameters of the sun (by means of a-micrometer he invented) and other astronomical subjects, the circulation of the sap in plants, the fructifica- tion of plants, infusoria, &c. After holding for some time a professorship of

mathematics in Modena, he was in 1831 appointed inspector-general of studies in the duchy.

AMIENS, an ancient city of France, capital of the department of Somme, and formerly of the old province of Picardy, situated on the Somme, about 40 miles from its mouth, and 71 miles N. of Paris. It was once a place of great strength, and still possesses a citadel, but the ramparts

which surrounded it have been replaced by beautiful boule- vards. The new part of the town is well built, but the streets of the old quarter are narrow and irregular, and are so cut up by the eleven canals into which the Somme is here divided, that Louis XI. is said to have called the town "little Venice." The most interesting object in Amiens is its magnificent cathedral, one of the finest in Europe, commenced in the year 1220 and finished in 1288, although additions to it were afterwards made. Among the other important public buildings are the Hotel de Ville, the Chateau d'Eau, the theatre, the museum, the hospital, and several churches. The town is the seat of a bishop, of a prefect, and of the departmental courts of justice ; and possesses a library containing more than 50,000 volumes, besides manuscripts, an academy of sciences, various other learned societies, a theological seminary, a lyceum, and several ordinary schools. It has many important manu- factures, the chief being cotton velvets, kerseymeres, woollen and linen cloths, flax, beetroot sugar, soap, leather, and paper. Amiens occupies the site of the ancient Samarobriva, capital of the Ambiani, from whom it probably derives its name. After the dissolution of the empire of the west it repeatedly changed owners, becoming for the first time a dependency of the French crown: in 1185, when Philip of Alsace ceded it to Philip Augustus ; and since that date it has more than once passed out of the power of the French kings. The famous treaty between Great Britain, France, Spain, and Holland, which took its name from this city, was signed in the H6tel de Ville on March 25th, 1802. During the recent war between France and Germany Amiens fell

into the hands of the Prussians on the 28th of November 1870. General Manteuffel was operating against the French army of the north, which had been formed with the view of helping the armies of Paris and of the Loire to effect a junction, and thus raise the siege of the capital. The French, however, were defeated in a battle in front of Amiens, which was fought on the 27th of November, along a line stretching from Saleux to Marceleane, and extending, it is said, more than four leagues. They retreated northward in the direction of Arras, and Amiens surrendered on the following day, after a very slight demonstration of force on the part of the Prussians. Peter the Hermit was born at Amiens about 1050. Population (1872), 63,747.

AMIOT, Pere Josupu, a learned Jesuit missionary to China, was born at Toulon in 1718. In 1750 he arrived, along with two others of his order, at Macao, from which, on a favourable answer to a petition being received from the emperor Kien-Lung, he removed to Peking in the autumn of the following year. He continued to reside in the capital until his death in 1794, devoting himself almost exclusively to the study of Chinese and Manchoo- Tatar literature. The results of his labours were com- municated at frequent intervals to Europe in works which did more than had ever been done before to make known to the Western world the thought and life of the farthest East. Many of his statements, however, are not trust- worthy, and his works are practically superseded by those of others who entered the field later. His Dictionnaire Tatarmantchou-Francais (Paris, 1789) was a work of great value, the language having been previously quite unknown in Europe. His other writings are to be found chiefly in the Jfémotres concernant [Histoire, les Sciences, et les Arts de Chinois (15 vols. 4to, Paris, 1776-91). The Ve de Confucius, which occupies the twelfth volume of that collection, is very complete and accurate.

AMLWCH, a town of Anglesey, North Wales, situated on a rising ground on the north coast of the island, 15 miles from Beaumaris. It owes its importance almost entirely to the copper mines of the Parys Mountain: before

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the discovery of the ore in 1768 it was a small hamlet of At one time the mines produced 3000 tons of metal annually, but in recent years the quantity has greatly diminished. The harbour has been cut out of rock at considerable expense, and is protected by a break- water. A branch of the Chester and Holyhead Railway Amlwch, which is associated with Beaumaris, Holyhead, and Llangefni, in returning one member to parliament, had a population of 2968 in

some six houses.

terminates in the town.

1871.

AMMAN, Jonann Conran, a physician, and one of the earliest writers on the instruction of the deaf and dumb, was born at Schaffhausen, in Switzerland, in 1669. In 1687 he graduated at Basle, and commenced the practice of his profession at Amsterdam, to which he had to flee on He first called the atten- tion of the public to his method of training the deaf and dumb in a paper which was inserted in the Philosophical Transactions, and which appeared in a separate form in It was

account of his religious views.

the year 1692, under the title Swrdus Loquens, again issued, with much additional matter, in 1702 and 1728, under the title Dissertatio de Loquela. In this work, which Haller terms "vere aurewm," he develops, with great ability, the mechanism of vocal utterance, and describes the process which he employed in teaching its use. This consisted principally in exciting the attention of his pupils to the motions of his lips and larynx while he spoke, and then inducing them by gentle means to imitate these movements, till he brought them to repeat distinctly letters, syllables, and words. As his method was excellent, we may readily give him credit for the all but universal success to which he laid claim. The edition of Ceelius Aurelianus, which was undertaken by the Wet- steins in 1709, and still ranks as one of the best editions of that author, was superintended by Amman. He died about 1730.

AMMAN, Josr, an artist celebrated chiefly for his en- gravings on wood, was born at Zurich in June 1539. Of his personal history little is known beyond the fact that he removed in 1560 to Nuremberg, where he continued to reside until his death in March 1591. His productiveness was very remarkable, as may be gathered from the state- ment of one of his pupils, that the drawings he made during a period of four years would have filled a hay- waggon. A large number of his original drawings are contained in the Berlin collection of engravings. The genuineness of not a few of the specimens to be seen else- where is at least questionable. A series of copperplate engravings by Amman of the kings of France, with short biographies, appeared at Frankfort in 1576. He also executed many of the woodcut illustrations for the Bible published at Frankfort by Feierabend. Another serial work, the Panoplia Omnium Liberalium Mechanicarum et Sedentariarum Artium Genera Continens, containing 115 plates, is of great value. Amman's drawing is correct and spirited, and his delineation of the details of costume, &c., is minute and accurate. He executed too much, however, to permit of his reaching the highest style of art. Paint- ings in oil and on glass are attributed to him, but no Specimen of these is known to exist.

AMMAN, Paut, a physician and botanist, was born at Breslau on the 30th August 1634. In 1662 he received the degree of doctor of physic from the university of Leipsic, and in 1664 was admitted a member of the society Nature Curiosorum, under the name of Dryander. Shortly afterwards he was chosen extraordinary professor of medicine in the above-mentioned university; and in 1674 he was promoted to the botanical chair, which he again in 1682 exchanged for the physiological. He died on the 4th February 1691. Paul Amman seems to have

been a man of acute mind and extensive learning; but a restless and irritable disposition led him to engage too much in controversy, and to indulge in raillery in his writings to a degree which the nature of the subjects hardly warranted,

Amman's principal works were—Medicina Critica, seu Centuria Casuum in Facultate Lipsienst resolutorum variis Discursibus aucta ; Parenesis ad Docentes occupata circa Institutionum Medicarum Emendationem ; Irenicwm Nume Pompilii cum Hippocrate ; Supellex Botanica, et Manuductio ad Materiam Medicam ; and Character Naturalis Plantarum.

AMMANATI, Bartotomeo, a celebrated Florentine architect and sculptor, was born in 1511, and died in 1592. He studied under Bandinelli and Sansovius, and closely imitated the style of Michael Angelo. He was more distinguished in architecture than in sculpture. He designed many buildings in Rome, Lucca, and Florence, an addition to the Pitti palace in the last-named city being one of his most celebrated works. He also planned the beautiful bridge over the Arno, known as Ponte della Trinita—one of his celebrated works, The three arches are elliptic, and though very light and elegant, have resisted the fury of the river, which has swept away several other bridges at different times. Ammanati's wife, daughter of Giov. Antonio Battiferri, an elegant and accomplished woman, published a volume of poems of considerable merit.

AMMIANUS, Marcetzinvs, a Roman historian of the 4th century, was born in the city of Antioch, in Syria. In his youth he was enrolled among the protectores domestici, or household guards, which proves him to have been of noble birth. In the year 350 he entered the service of Constantius, the emperor of the East, and, under the command of Ursicinus, a general of the horse, he served during several expeditions. According to his own modest account, it appears that he acquired considerable military fame, and that he deserved well of his sovereign. He attended the Emperor Julian in his expedition into Persia, but it is not known that he obtained any higher military promotion than that which has already been mentioned. He was either in the city or in the vicinity of Antioch when the conspiracy of Theodorus was discovered, in the reign of Valens, and was an eye-witness of the severe tortures to which many persons were subjected by the emperor on that account. But his lasting reputation was not to be acquired from military service. He left the army and retired to Rome,

where he employed himself in writing a history of the Roman empire, comprising a period of 282 years. Though a Greek by birth, he wrote in the Latin language ; but, according to the remark of Vossius, his Latin shows that he was a Greek, and also a soldier. His history extended from the accession of Nerva to the death of Valens ; and the work was originally divided into thirty- one books. Of these the first thirteen have perished, and the eighteen which remain commence with the seventeenth year of the reign of Constantius, and terminate at the year 378. But there are several facts mentioned in the history which prove that the author was alive in the year 380, Of this number are the accession of Theodosius to the Eastern empire, the character of Gratian, and the consulate of Neothorius. The style is harsh and redundant, as was to be expected from the author's education and military life ; but the work is valuable as a source of information for the period of which it treats. Gibbon appears to give a correct estimate when he says that Ammianus is "an accurate and faithful guide, who composed the history of his own times without indulging the prejudices and pas- sions which usually affect the mind of a contemporary." From the respectful manner in which he speaks of pagan deities, and of the advantage of heathen auguries in fore- telling future events, it is evident that Ammianus was a

heathen, The favourable account which he gives of the religion, manners, and fortitude of Christians, is the result of his candour and impartiality as an historian. The work of Ammianus has passed through several editions, of which the best are the Leyden edition of 1693, by Gronovius, aud those of Leipsic, published in 1773 and 1808. The latter was edited by Wagner and Erfurdt.

AMMIRATO, Scrrio, an Italian historian, born at Lecce, in the kingdom of Naples, on the 27th September 1531. His father intending him for the profession of law, sent him to study at Naples, but his own decided preference for literature prevented him from fulfilling his father's wishes. Entering the church, he resided for a time at Venice, and afterwards engaged in the service of Pope Pius IV. In 1569 he

went to Florence, where he was fortunate in securing the patronage and support of Duke Cosmo I. It was at the suggestion of this prince that he wrote the work by which he is best known, his Istorie Fiorentine (1600). In 1595 he was made a canon of the cathedral of Florence. He died in 1601. Among the other works of Ammirato, some of which were first published after his death, may be mentioned discourses on Tacitus and histories of the families of Naples and Florence.

AMMON, the name of an Egyptian deity, called by the ancient Kgyptians Amen or Amun, and one of the chief gods of the country. His name meant the hidden or concealed god, and in this respect was analogous to Hapi or Apis, which conveyed the same idea. He was the local deity of Thebes or Diospolis, and supposed by the Greeks to be the same as Zeus or Jupiter. His type was that of a man wearing on his head the red crown teshr, emblem of dominion over the lower world or hemisphere, surmounted by the sun's disc to indicate his solar nature, flanked by two tail feathers of a hawk, also symbolical of his relation to the gods of light. Ammon was not one of the oldest deities of Egypt, for his form and name do not appear till the eleventh or Diospolitan dynasty, when the kings of that line assumed his name, and built a sanctuary to him at Medinat Habu. From this period the monarchs of Thebes introduced his name into their titles, and the worship of Amen became the predominant one of ancient Egypt; and the embellishment of his shrine and enrichment of his treasury were the chief object of the policy of the Pharaohs. Victory and conquest were the chicf gifts he offered to his adorers ; and he is often seen leading up the conquered nations of the north and south to the monarchs whom he endows with power and victory. In this character Amen is often represcnted holding the Egyptian scimitar khepsh. In his celestial character his flesh was coloured blue, that of the heaven. He is said to have been called on some monu- ments the son of Hapimaa (or the Nile); but inthe hymns addressed to him the title of self-engendered is applied to him, and he was one of the self-existent deities. His principal titles are—lord of the heaven, king of the gods, substance of the world, and resident on the thrones of the world, eternal ruler,—appellatives of his celestial and ter- restrial functions. He was also lord of heaven and earth, streams

and hills, and as a demiurgos, the creator of beings. The hymns addressed to him designate him as the sole or only god, in terms applicable to one god who alone exists, who moulds and governs the world. At one time an attempt was made to identify him with the solar orb. Con- sidered as the active, intelligent, and pervading spirit of the universe, he transfuses the breath of life into the nostrils of kings and other persons In his solar characters, Ammon was allied with Ra, and called Amen Ra, or Amen Ra Harmachis, or "the sun in the horizou," Amen being considered one of the forms of the sun itself. The worship of the celestial Ammon prevailed chiefly at Thebes, where,

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with the Mut, or "mother" goddess, and his son Khonsu or Chons, he formed the Theban triad, and the sacred name of Thebes was "the abode of Amen." Besides Thcbes, his worship has been found at Siuah in Lybia, at Beit Oually, and at Meroe in Ethiopia, marked respect being shown to his worship by the later Ethiopian monarchs. At Phil and Debud his name also appears as one of the dominant deities. In the representations at Hermonthis he assists at the birth of Har-pa-Ra; and in the scenes of the passage of Ra, or the sun, through the hours of the night, the gigantic arm of Amen strangles the serpent Apophis, "the great dragon" of Egyptian mythology, the spirit of dark- ness, who warred against the gods of light. Another of the types of Amen represents him as the reproductive power of nature, still in the human form, but mummied, and holding—instead of the usual sceptre, wasm, or so- called kukupha sceptre—the whip nekhekh. In this type he was supposed to be Amen the father and Horus the child of the triad, which then consisted of Amen, Ament, or the female Ammon, and Harka. His titles in this character are Amen-ka-mut-f,—Amen, "the husband of his mother," considered as the final avatar of the god, the alpha and omega, the oldest and youngest of created beings. He is, considered in his youthful character, called Harnekht, or "the powerful Horus," and identified with Khons, the local god of Chemmo or Panopolis. As Horus he is called the "son of Isis," but this is clearly a later fusion of

the two myths. In the inscriptions it is said "he has tall plumes," and in the esoterical explanations of the seventeenth chapter of the Ritual, these plumes are explained by "his two eyes," or Isis and Nephthys, who are seen accompanying Horus in certain scenes. This type of Amen was not usually exhibited, but brought out on the occasion of his festival, called the manifestation of Khem, one of the oldest fétes of Egypt. This type of Amen is principally found at the Ruan, or valley of El Hammamat, on the way to Coptos; and at Wady Halfa, where a temple was erected to him by Amenophis III. As the god of the reproductive powers of nature, the kings of Egypt are seen hoeing the ground before him, or offering various coloured calves and gazelles to him. A great fes- tival in his honour is represented at Medinat Habu, where his statue is carried by twenty priests, and Rameses III. cuts down before him the corn which has just ripened for the sickle. The negroes of Arabia, or else the Regio Barbarica of later geographers, appear as assistants at this festival. Another type of Amen connected him with the god Khnum or Chnoumis, the spirit of the waters. In this relation he has the head of a ram instead of the usual human one. Khnum was one of the demiurgi, and creator of mankind, whom he had made as a potter out of clay on the wheel, as also Osiris and Horus. Sometimes the type of Khnum bears the name of Amen; and with the ram's head he was worshipped in the Oasis of Ammon, as also up the Nile at the cataracts, Syene, Elephantine, Beghe, Beit Oually, and Meroe. It is this type of Amen with which the later Greek and Roman writers were most fami- liar; and Rameses IT., as the son of Amen, assumes the ram's horn, which Alexander the Great adopted at a later date. The worship of Khnum was older than that of Amen, as it appears on the Pyramids and at the Wady Magaresh, but became less important, and finally fused into that of Amen. Although it has been supposed that the worship of Amen came from Meroe, it is now known that the Ethiopian civilisation was comparatively of much more recent date than the Egyptian, and that it was implanted in Ethiopia by the conquests of the Pharaohs, and subsequently adopted by the later rulers of Meroe; and that the statements of Herodotus, that it was brought from thence to the Oasis of Ammon are incorrect, the existing temple at the Oasis

not being older than the Persian rulers of Egypt, while the worship of the god at Thebes dates from a much older epoch. The later chapters of the Ritual, added at the time of the twentieth dynasty, which contain the mystic names and appellatives of the god in the language of the negroes of Punt, are also of too late a date to throw any light on the origin of Amen, which appears prior to the Hykshos, when the Egyptian princes were driven to the south. The sheep was sacred to the god, and the inhabitants of Thebes in consequence abstained from it; but it is said they annually the figure of the The reasons assigned by classical authorities for this action, as well as for the astronomical meaning of his horns, are not confirmed by On the conquest of Egypt Alex- ander the Great called himself the son of Ammon, and his In this he had only imitated the Pharaohs of the nineteenth dynasty. Aimen. is only mentioned by the Hebrew prophets in speaking of

sacrificed a ram to Amen, and dressed god in the hide of the animal.

monumental evidence.

portraits wear the ram's horn.

Diospolis as the city of No or No Amon.

Jablonski, Panth. Agypt., i. 160-184 ; Birch, Gallery

of Antig., pt. i. 1; Wilkinson, Manners and Customs, iii, 313, iv. 246, f.; Goodwin, Zrans. Soc. Bibl. Arch., ii. pp. 353-9; Herodotus, ii. 42, 54; Diodorus, iii. 72; Jer, xlvi. 25; Nah. iii. 8. (8. B.) AMMON, Curisrorx Friepricn von, a distinguished theological writer and preacher, was born at Baireuth in

January 1766, studied at Erlangen, held various professor-

ships in the philosophical and theological faculties of Erlangen and Gottingen, succeeded Reinhard in 1813 as court preacher and counsellor at Dresden, retired from these offices in 1849, and died

May 21, 1850. He sought to establish for himself a middle position between rational- ism and supernaturalism, inclining, however, decidedly to the former. He declared for a "rational supernaturalism," and contended that there must be a gradual development of Christian doctrine corresponding to the advance of know- ledge and science. He was a man of great versatility and extensive learning, and a very voluminous author, his principal work being the Fortbildung des Christenthums cur Weltreligion, in 4 vols. (Leipsic, 1833-40). Hntwurf einer rein biblischen Theologie appeared in 1792 (second edition, 1801), and Summa Theologica in 1803 (other editions, 1808, 1816, 1830). Von Ammon's style in preaching was terse aud lively, and some of his discourses are regarded as models of pulpit treatment of political questions, AMMONTA (NH,), sometimes called the Volatile alkali, or Alkaline air, was known to the alchemists in aqueous solution. Priestley first separated it in the gase- ous state in 1774. Scheele in 1777 discovered that it contained nitrogen, and its true composition was ascer- tained by Berthollet about 1785. Ammonia occurs in the atmosphere as carbonate and nitrate, in sea-water, and in many mineral springs. Iron ores and many clayey Soils contain it in small quantity, and sal-ammoniac and ammonia alum are found as minerals in volcanic districts. Carbonate of ammonia is obtained in large quantity by the putrefaction of the urine of animals, or the dry distilla- tion of animal matter. Ammonia is obtained from its salts by the acting of slaked lime or solutions of potash or soda, and is freed from water by passing over quick- lime or solid potash, and finally collected over mercury. It is a colourless gas, of a pungent smell, and alkaline taste and reaction. It does not support combustion or respiration, and is feebly combustible. It is remark- ably soluble in water, 1 volume dissolving nearly 700 of

the gas. It may by the action of a low temperature and great pressure be changed into the liquid or solid State.

The gas is easily decomposed into its elements by a succession of electric sparks, or by passing it over red-

hot iron or platinum wire. The aqueous solution in pre- sence of finely divided platinum and atmospheric air is converted into nitrite of ammonia; and conversely, the oxides of nitrogen, mixed with excess of hydrogen and passed over platinised asbestos, are changed into ammonia, Nitrogen and hydrogen have not by any process been in- duced to combine so as to yield this compound directly, unless in very small quantity. For theoretical relations of ammonia, salts, &c., see CHEMISTRY.

AMMONTIAC, Sat (NH,Cl), the earliest known salt of ammonia, now named chloride of ammonium, formerly much used in dyeing and metallurgic operations.

The name Hammoniacus sal occurs in Pliny (Wat. Hist. xxxi. 39), who relates that it was applied to a kind of fossil salt found below the saud, in a district of Cyre- uaica. It was similar in appearance to the alumen scissile, and had a disagreeable taste, but was useful in medicine. The general opinion is, that the sal-ammoniac of the ancients was the same as that of the moderns; but the imperfect description of Pliny is far from being sufficient to decide the point. The native sal-ammoniac of Bucharia, described by Model and Karsten, and analysed by Klaproth, has no resemblance to the salt described by Pliny. The same remark applies to the sal-ammoniac of volcanoes.

‘Dioscorides (v. 126), in mentioning sal-ammoniac, makes

use of a phrase quite irreconcilable with the description of Pliny, and rather applicable to rock-salt than to our sal- amimoniac. Sal-ammoniac, he says, is peculiarly prized if it can be easily split into rectangular fragments. Finally, we have no proof whatever that sal-ammoniac occurs at present, either near the temple of Jupiter Ammon, or in any part of Cyrenaica. These circumstances induce us to conclude that the term sal-ammoniac was applied as indc- finitely by the ancients as most of their other chemical terms. It may have been given to the same salt which is known to the moderns by that appellation, but was not confined to it.

Some derive thename sal-ammoniactrom J upiter Ammon, uear whose temple it is alleged to have been found ; others, from a district of Cyrenaica called Ammonia, Pliny's derivation is from the sand (duos) in which it occurred.

Whether our sal-ammoniac was known to the ancients or not, there can be no doubt that it was well known to the alchemists as early as the 13th century. Albertus Magnus, in his treatise De Alchymia, informs us that there were two kinds of sal-ammoniac, a natural and an artificial The natural was sometimes white, and some- times red; the artificial was more useful to the chemist. He does not tell us how it was prepared, but he describes the method of subliming it, which can leave no doubt that it was real sal-ammoniac. In the Opera Mineralia of Isaac Hollandus the elder, there is likewise a description of the mode of subliming sal-ammoniac, Basil Valentine, in his Currus Triumphalis Antimonit, describes some of the peculiar properties of sal-ammoniac in, if possible, a still less equivocal manner.

Egypt is the country where sal-ammoniac was first manufactured, and from which Europe for many years was supplied with it. This commerce was first carried on by the Venetians, and afterwards by the Dutch. N othing was known about the method employed by the Egyptians till the year 1719. In 1716 the younger Geoffroy read a paper to the French Academy, showing that sal-ammoniac must be formed by sublimation 3 but his opinion was opposed so violently by Homberg and Lemery, that the paper was not printed. In 1719 M. Lemaire, the French consul at Cairo, sent the Academy an account of the mode of manufacturing sal-ammoniac in Egypt. The salt, it appeared, was obtained by simple sublimation from soot. In the year 1760 Linnzeus communicated to the Royal

Society a correct detail of the whole process, which he had received from Dr Hasselquist, who had travelled in that country as a naturalist. 'his account is published in the 51st volume of the Philosophical Transactions, 1760, p. 504. Almost the only fuel used in Egypt is the dung of cattle. The dung of black cattle, horses, sheep, goats, é&c.,

which contains the sal-ammoniac ready formed, is collected during the first four months of the year, when the animals feed ou the spring grass,a kind of clover. It is dried, and sold to the common people as fuel. The soot from this fuel is carefully collected and sold to the sal-ammoniac makers, who work only during the months of March and April, for it is only at that season of the year that the dung is fit for their purpose.

The composition of this salt seems to have been first discovered by Tournefort in 1700. The experiments of the younger Geoffroy in 1716 and 1723 were still more decisive, and those of Duhamel, in 1735, left no doubt upon the subject. Dr Thomson first pointed out a process by synthesis, which has the advantage of being very simple, and at the same time rigidly accurate, resulting from his observation that when muriatic gas and ammoniacal gas, both as dry as possible, are brought in contact with each other, they always combine in equal volumes.

The first attempt to manufacture sal-ammoniac in Europe was made, about the beginning of the 18th cen- tury, by Mr Goodwin, a chemist of London, who appears to have used the mother ley of common salt and putrid urine as ingredients. The first successful manufacture of sal-ammoniac in this country was established in Edinburgh by Dr Hutton and Mr Davy, about the year 1760. It was first manufactured in France about the same time by Baumé. Manufactories of it were afterwards established in Germany, Holland, and Flanders.

Chloride of ammonia is now manufactured in large quan- tity from the crude carbonate of ammonia obtained in gas- works, or from the destructive distillation of animal matter. This salt is changed into chloride by the addition of hydrochloric acid or the mother liquor of salt-works, called b62ttern, containing the chlorides of calcium and magnesium. When hydrochloric acid is not easily got for neutralisation, the crude gas liquor is transformed into sulphate, and this is mixed with an equivalent quantity of common salt. During the subsequent evaporation the sulphate of soda separates in hard granular crystals, which are apt to adhere to the sides of the boiler. The liquor is agitated to prevent this adhesion taking place, and assist

in the separation of the sulphate of soda. The sulphate of soda is removed by drainers as it is formed, and the mother liquor boiled up to the crystallising point, and run off into coolers. The crystals of impure muriate of am- monia are dried carefully and subsequently sublimed.

Sal-ammoniac occurs usually in the form of a hard, white cake, opaque, or only slightly translucent. Its taste is cooling, saline, and rather disagreeable. It dissolves in 2°72 parts of water at 18°°7 C. with great reduction of tem- perature, and in about an equal weight of water at the boiling-point. The feathery crystals it forms are found on microscopic examination to be masses of cubes or octahedrons ; their specific gravity is about 1°5. When exposed to a moist atmosphere, the salt gradually absorbs water, and deliquesces, though very slowly, becoming slightly acid. When heated, it sublimes unaltered in a white smoke, having a peculiar smell, very characteristic of sal-ammoniac. If a cold body be presented to this smoke, the sal-ammoniac condenses on it, aud forms a white crust. When thus sublimed, it has the property of carrying along with it various bodies, which, when heated by themselves, are perfectly fixed.

For the other ammoniacal salts see CuemisTRY.

AMMONTACUM, or Ammontac, a gum-resinous exuda- tion from the stem of a perennial herb (Dorema ammonia- cum) belonging to the natural order Umbellifere. The plant grows to the height of 8 or 9 feet, and its whole stem is pervaded with a milky juice, which oozes out on an incision being made at any part. This juice quickly hardens into round ‘tears, forming the “tear ammonia- cum” of commerce. Lump aminoniacum, the other form in which the substance is imported, consists of aggrega- tions of tears, frequently incorporating large quantities of the fruits of the plant itself, as well as other foreign bodies. In order to free lump ammoniacum from these impurities, it has to be melted and strained, operations which depre- ciate its therapeutical value. Ammoniacum has a faintly foetid unpleasant odour, which becomes more distinct ou heating ; externally it possesses a reddish yellow appear- ance, aud when the tears or lumps are freshly fractured

.they exhibit an opalescent lustre. It is chiefly collected

in the province of Irak in Persia; but some quantity is also produced in the Punjab, and comes to the European market by way of Bombay. Its composition, according to Hagen, is—resin, 68°6; gum, 19°3; gluten, 5:4; volatile oil and water, 2°8; extractive, &c., 3°9. Ammoniacum is closely related to assafcetida, not only in the plant yielding it, but also in its therapeutical effects. It may be used as a substitute for assafcetida, although, containing a much smaller proportion of volatile oil, its effect is less powerful. Internally it is used in conjunction with squills in bronchial affections; and in asthma and chronic colds it is found useful. It is, however, more used externally in the form of plasters, as a discutient or resolvent application in indo- lent tumours, affections of the joints, é&c.

African ammoniacum is a totally different substance, though often confounded with the real gum-resin, which is produced only in the East. It is the product of an un- known plant growing in North Africa, and occasionally shipped to our markets from Marocco. It is a dark-coloured gum-resin, possessed of a very weak odour and a persistent acrid taste. A considerable commerce in it is carried on between Mogador and Alexandria, where it is in demand for purposes of fumigation.

AMMONITES, called also very frequently the children of Ammon, a people allied by descent to the Israelites, and living in their vicinity, sprung from Lot, Abraham's nephew, by the younger of his daughters, as the imme- diately adjoining people, the Moabites, were by the elder (Gen. xix. 37-38). Both peoples are sometimes spoken of under the common name of the children of Lot (Deut. ii. 19; Ps. Ixxxiii. 8); and the whole history shows that they preserved throughout the course of their natural existence a sense of the closest brotherhood. The original territory of the two tribes was the country lying imme- diately on the east of the Dead Sea and of the lower half of the Jordan, having the Jabbok for its northern boundary; and of this tract the Ammonites laid claim to the northern portion, the "half mount Gilead" (Deut. iii. 12), lying between the Arnon and the Jabbok, out of which they had

expelled the Zamzummim (Judg. xi. 13; Deut. ii. 20, 21; ef. Gen. xiv. 5), though apparently it had been held, in part at least, conjointly with the Moabites, or perhaps under their supremacy (Num. xxi. 26, xxii. 1; Josh. xi. 32). From this their original territory they had been in their turn expelled by the Amorites, who were found by the Israelites after their deliverance from Egypt m possession of both Gilead and Bashan, that is, of the whole country on the left bank of the Jordan, lying to the north of the Arnon (Num. xxi. 13). By this Amorite invasion, as the Moabites were driven to the south of the Arnon, which formed their northern boundary from that time so the Ammonites were driven out of Gilead

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across the upper waters of the Jabbok where it flows from south to north, which henceforth continued to be their western boundary (Num. xxi. 24; Deut. ii. 37, ii. 16). The other limits of the Ammonitis, or country of the Ammonites (Appaviris yOpa, 2 Mac. iv. 26), there are no means of exactly defining. On the south it probably adjoined the land of Moab (but ¢f Ewald, Gesch, Israels, ii. 266); Geshur (2 Sam. xiii. 37); melted away into the desert peopled by Amalekites and other nomadic races.

The chief city of the country, called Rabbah, or Rabbath of the

children of Ammon, ¢.¢., the metropolis of the Ammonites (Deut. iti.

11), and Rabbathammana by the later Greeks (Polyb. v. 7, 4), whose name was changed into Philadelphia by Ptolemy Philadelphus, a large and strong city with an acropolis, was situated on both sides of a branch of the Jabbok, bearing at the present day the name of Moiet or Nahr Amman, the water or river of Ammon, whence the

designation " city of waters" (2 Sam. xii, 27 3G. Burckhardt, Syria,

361). The ruins called Amman by the natives are extensive and and east of Amman is dis- tinguished by its fertility; and ruined towns are scattered thickly

Imposing. The country to the south

over it, attesting that it was once oceupicd by a population which, however fierce, was settled and industrious (see Burckhardt, op. cit.,

357, of. Lindsay, Holy Land, 5th ed., p. 279), a fact indicated also

by the tribute of corn paid annually to Jotham (2 Chron. xxvii. 5).

The Israelites on their journey out of Egypt to the land of promise were forbidden to meddle with the territory of Ammon as of Moab

(Deut. ii. 19); and it seems to indicate that friendly relations sub-

sisted at first between this people and the chosen nation, that after the latter had conquered and slain Og, the giant king of Bashan, the

enemy of both, his bedstead was placed in Rabbah (Deut. iii. 11).

Like Moab, however, the Ammonites beheld with jeer "on rising iring Balaam to

greatness of Israel. They joined the former in curse them (Deut. xxiii. 4); and thenceforward their history, so

far as known, reveals a spirit of bitter hostility against the people of Jehovah—shown in invasions repeated and violent, and cruelties the most outrageous and unsparing (Judg. x. 8; Amos i, 13). They could not forget that the Gileadite portion of the inheritance of Israel had once been their possession, nor cease to press their claim We find them joined first with

for its recovery (Judg. xi. 13). Moab (Judg. iii. 12), and then with the Philistines (Judg. x. 7, 8),

in the invasion and oppression for lengthened periods of the land of their enemies. Subdued by the prowess of J ephthah, they began again to act on the offensive in the days of Saul, laying siege to

Jabesh-Gilead (1 Sam. xi. 1). David offered his friendship to the king of Ammon, but his offer was rejected with contumely and

outrage, for which a terrible vengeance was exacted in the capture and overthrow of their metropolis, and the deliberate slaughter of

the people (2 Sam. x.) They were united with Moab against Judah in the days of Jehoshaphat (2 Chron. xx. 1); they paid tribute to Uzziah and Jotham (2 Chron. neighbouring tribes helpcd the Chaldean monarch against Jehoiakim (2 Kings xxiv. 2). When, after the destruction of J crusalem, the poor remnants of the Israelites were gathered togethcr under the

rotectorate of Nebuchadnezzar, it was by the instigation of a

ing of Ammon that Gedaliah, the ruler appointed over them, was murdered, and new calamities were incurred (Jer. xii. 14); and when Jerusalem was to be rebuilt, the foremost in opposing the patriotic Jews were a Moabite and an Ammonite (Neh. ii. 10, 19; iv. 1-3). True to their antecedents, the Ammonites, with some of the neighbouring tribes, did their utmost to resist and check the revival of the Jewish power under Judas Maccabeeus (1 Mace. v. 6 ; of. Jos, Ant. Jud. xiii. 8,1). The last historical notice of them is in Justin Martyr (Dial. cum Tryph. §119), where it is affirmed that they were still a numerous people. The Ammonites are repeatedly mentioned under the form Bit-Amman, ¢.¢., house of Amman, in the inscrip- tions of Nineveh among the tributaries of the kings of Assyria (Schrader, Keilinschrifien und d. A. T. 52). The names of their

ings, so far as known,—in Scripture, Nahash, Hanun, Baalis, or Baalim (2 Sam. x. 2; Jer. xl, 14); in Assyrian, Puduilu (¢/. Pedahel (Num. xxxiy, 28), Basa (¢f. Baasha, 1 Kings xv. 33), and Sanibi (of less obvious analogy),—testify, in harmony with other Considerations, that their language was Scmitic, closely allied to the Hebrew; and this fact is now placed beyond question by the dis- covery of the Mesha-stele, presenting the language of the Moabites,

and doubtless that also of the brother tribe (see Moazrrrs). Their |

national deity, Moloch or Milcom (see Motocu), was worshipped with crucl rites,—a circumstance tending to foster that fierccness

. Peer which distinguished this people throughout their Istory,

AMMONTUS, surnamed HERML#, or the son of Hermias, Studied at Alexandria, along with his brother Heliodorus,

on the north it may have met that of the king of and on the east it probably

Xxvi, 8, xxvii. 5); and with the

kept secret, after the fashion of the society. Thus, while all the later developments of neo-

"originator, little is known of his special tenets.

under the neo-Platonist Proclus during the latter part of the 5th century a.p. He was afterwards the head of a school for philosophy; and among his scholars were Asclepias, John Philoponus, Damascius, and Simplicius. Although a neo-Platonist, Ammonius appears to have devoted most of his attention to the works of Aristotle. Commentaries on some of these are all that remains of his reputedly numerous writings. Of the commentaries we have—1. One on the Lsagoge of Porphyry, published at Venice, 1500, fol.; 2. One on the Categories, Venice, 1503, fol., the authenticity of which is doubted by Brandis; 3. One on the De Interpretatione, Venice, 1503, fol. Of each of the commentaries there are several Latin transla- tions, and the three have been published in a collected form, with a Latin translation, Venice, 1546, 3 vols, 8vo. They are also printed in Brandis' Scholia to Aristotle, forming the fourth volume of the Berlin Aristotle. The special section on fate has been published separately by Orelli, Alea. Aphrod. Ammonti et all. de Fato que super- sunt, Zurich, 1824. A life of Aristotle, generally ascribed to Ammonius, but with more accuracy to John Philoponus, is often prefixed to editions of Aristotle. It has been

printed separately, with Latin translation and Scholia, at Leyden, 1621, and again at Helmstidt, 1666. Other com- mentaries on the Zopics and the first six books of the Metaphysics still exist in manuscript. Of the value of the logical writings of Ammonius there are various opinions. Prantl, perhaps the highest recent authority, speaks of them with great but hardly merited contempt (Geschichte der Logik, i. 642). (For list of his works, see Fabricius, Bibliotheca Greea, v. 704-707; and also Brandis, Afemoirs of the Berlin Academy, 1833.)

AMMONIUS, surnamed Saccas, or " The Sack Carrier," from the fact of his having been obliged in the early part of his life to gain his livelihood by acting as a porter in the market, lived at Alexandria during the 2d century A.D., and died there 241 a.p. Very little is known of the events of his life. He is said by Porphyry to have been born of Christian parents, and to have belonged originally to their faith, from which he afterwards apostatised. Eusebius (Church History, vi. 19) denies this apostasy, and affirms that Ammonius continued a Christian to the end of his life. It is clear, however, that Eusebius ig referring to another Ammonius, a Christian who lived at Alexandria during the 3d century A.D. Ammonius, after long study and meditation, opened a school for philosophy in Alexandria. Among his pupils were Herennius, the two Origens, Longinus, and, most distinguished of all, Plotinus, who in his search for true wisdom found himself irresistibly attracted by Ammonius, remained his close companion for eleven years, and in all his later philosophy professed to be the mere exponent of his great master. Ammonius himself designedly wrote nothing, and the doctrines taught in his school were, at least during his life, old Pythagorean

to him as their From the notices of Hierocles, a scholar of Plutarch, in the early part of the 5th century a.p., preserved in Photius, we

Platonism are in a general way referred

learn that his fundamental doctrine was an eclecticism, or

union of Plato and Aristotle. a system of philosophy, common to both and higher than their special views, was contained in their writings.

He thus, according to his admirers, put an end to the inter- minable disputes of the rival schools. What other elements Ammonius included in his eclectic System, and in par- ticular how he stood related to the Jewish and Christian theosophies, are points on which no information can be procured. Few direct references to him exist, and even

He attempted to show that

these are not of unquestionable authority. He un- doubtedly originated the neo-Platonic movement, but it cannot be determined to what extent that philosophy, as known to us through Plotinus and Proclus, represents his ideas. Eusebius (Church History, vi. 19) mentions some Christian works by Ammonius. As Porphyry expressly tells us that Ammonius the philosopher wrote nothing, Eusebius must be referring to the later Christian of the same name. 'To this later Ammonius belongs the Dzates- saron, or Harmony of the Four Gospels, sometimes ascribed to the philosopher. (See Fabricius, Bibliotheca Greeca, v. 701, 713; and Zeller, Phil. d. Griechen, 2d ed., ili. 2, 398, note 6.) On Ammonius the philosopher, besides general works on the Alexandrian school and the history of philosophy, see Risler, De Commentitiis Philosophie Ammoniace Fraudibus et Noxis, Tiibingen, 1786; and Dehaut, Hssai Historique sur la Vie et la Doctrine d'Ammonius Saccas, Brussels, 1836.

AMMUNITION in its general sense comprises not only the powder and projectiles employed in guns of all classes, but also all stores directly connected with artillery fire, such as friction-tubes, fuses, percussion-caps, and rockets.

Gunpowder, as manufactured in England, consists of 75 parts of saltpetre, 15 parts of charcoal, and 10 parts of sulphur, reduced to a fine powder and mechanically mixed together, pressed into a cake, and granulated to a size varying according to the purpose which it is designed to fulfil. In cannon, a large grain is necessary for regular and thorough burning, a fine powder choking up the inter- stices, and so preventing the flame from finding its way through the entire charge. On

the other hand, a large grain is blown out of a small piece before it is burnt to the centre. For the very heavy guns recently introduced into the British service powder formed into ‘ pellets” or “pebbles” has been adopted, by which the pressure of the gas is kept up till the shell leaves the muzzle, without being at any instant excessive and likely to injure the gun. Modified forms of powder and gun-cotton have been employed experimentally as the charges of guns.

For heavy guns or cannon the charge is carefully weighed and made up in a serge cartridge sewn with worsted, which entirely consumes in firing—any residue left ignited in the bore being liable to cause explosion when the cartridge of the succeeding round is rammed down on it, and so to blow off the arms of the gunner using the sponge stave. The shell or other projectile employed is forced home on the cartridge (vide fig. 1) in muzzle-loading guns. In breech-loaders the shell is introduced first, and pressed into the shot chamber, beyond which it can only pass by the “lands” of the rifling cutting into the lead coat, which is effected by the explosion of the charge. The cartridge is pressed forward against the base of the projectile.

Rifled guns—that is, guns constructed to impart rotation to the projectiles they discharge—have superseded smooth- bored cannon in the armaments of all civilised nations ; elongated projectiles, which are impeded by the resistace of the air much less than spherical ones, being in all cases employed. Fig. 1 shows a section of the bore of the

Fig. 1.—1, 1, wrought-iron coils; 2, steel; 3, copper studs; 4, worsted braids.

muzzle-loading gun, whose projectiles are made to rotate

AMM—

by means of gun-metal studs which fit in the spiral grooves of the bore. The following kinds of projectiles are fired from rifled cannon in the British service:—Common shell, Shrapnel shell, Palliser shell and

shot, and case-shot. Light balls, carcasses, and spherical shells are discharged from smooth-bored mortars. The two last mentioned, as well as spherical Shrapnel, round shot, grape, and case, are fired from smooth-bored guns.

Common shell for rifled guns are simply hollow elongated projectiles filled with powder, which is fired by the action of a fuse, and bursts the shell with great violence, acting in walls or earth into which it has penetrated like a small mine, the largest shells, which are twelve inches in diameter, containing nearly 37 tb of powder. Gun cotton, nitro- glycerine, and other substances, have been tried for burst- ing purposes, but it has been found very difficult to prevent premature explosion from the sudden shock of discharge of the gun. Picrate of potash, or " picric powder," has been recommended as stronger than gunpowder and quite safe, but it is not as yet adopted. Common shells are generally fired at earthworks, buildings, and wooden ships. When carried, as in English men-of-war, filled and fused with percussion fuses, they can be discharged as rapidly as shot. The most terrible instance of their use in history is the entire destruction of the Turkish frigates by the Russian fleet at Sinope on November 30th, 1853. At the battle of Sedan in 1870 the Prussians made such havoc among the crowded French troops that the ground became covered with "heaps of flesh and rags;" and a similar result was produced by the fire of mortars concentrated on the Russian troops in the Redan at the termination of the siege of Sebastopol. 'The slaughter in the two last named instances is, however, to be attributed to the concentration of fire on masses of men rather than to the description of shell used, for the showers of bullets ejected by Shrapnel shell would have struck many more men, although the ghastly spectacle of dismembered human bodies would not have been exhibited.

Shrapnel shell are hollow projectiles containing bullets and avery small bursting charge. Fig. 2 exhibits the construction of the Boxer Shrapnel AF shell for the 40-pounder breech-load- tte 7 ing Armstrong gun, and is a good | specimen of this class of projectile. The shell follows the usual course of flight up to within about 100 yards of the object, when the time fuse, if / properly set, fires the bursting charge, |

and opens the shell by splitting it | along certain grooves forming lines { of least resistance. The bullets and j fragments then continue their course | in the form of a shower of missiles This class of shell was designed fo smooth-bore guns by General Shrap- | nel. It was used with great effect | during the Peninsular war, especially | in clearing the breach and ramparts | of St Sebastian of defenders, over | the heads of the English storming | ~

arty, who drew back into the ditch – for : time. The projectile has never . been understood and_ thoroughly NN ne taken up by foreign powers, and has ¥- fame ee never been used to full advantage iron or mild steel ; 6, lead; on service. In skilful hands it is %??™ capable of producing results far beyond any that have as yet been achieved.

The Armstrong segment shell fulfiils the same general purpose,—that is to say, it is designed to sweep down bodies

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AMMUNITION

of troops, but it opens rather more suddenly, segments of iron taking the place of lead and antimony bullets, which segments being built up in a ring with the bursting charge in the centre, are dispersed more widely when the shell opens than the bullets of the Shrapnel. The segment shell consequently is rather suited for the action of a percussion fuse on striking the head of a column of men, or the ground In this way results have been obtained proportion to anything that has ever At Dartmoor in 1869 the average number of hits for every segment shell fired during the series of experiments, including failures of all kinds, The meaning of this estimate may be appre- For example, at On the Dartmoor scale this would give 161,885 casualties, This result shows that after making the most liberal deductions for the peculiar circumstances of war, appalling effects might be produced by modern artillery with segment or

close in front of it. which are out of all occurred in actual service.

was 17:1. ciated by applying it to some action. Waterloo the English artillery fired 9467 rounds.

Shrapnel shells.

Palliser shell and shot are projectiles made with specially

hard and rigid heads, with the object of piercing the sides of armour-clad vessels. The form of the head, which is

termed "ogival," is seen inside the gun in Fig. 1. A point of

this shape causes the resistance of the plate to fall on the shell as an increasing pressure, acting inwards towards poiuts distributed along the axis, rather than as the 'full sudden blow that would be experienced by a round shot. This enables chilled tron to be used, which has great hard- ness and crushing strength, but is very brittle. Sir W. Palliser first proposed chilled projectiles ; subsequently mottled iron projectiles with chilled heads have been used. Sir J. Whitworth has obtained great results with flat-headed projectiles of a special quality of steel, which have been made to penetrate iron plates at an angle even more oblique than 45°. Solid and hollow shot, as well as shell, have been employed against plates. The shot, having thicker sides or walls, have some advantage in penetration. Shells, by their explosion, destroy wood backing better than shot, when the front plating is not too thick for them to pene- trate. They are charged with powder through a filling hole in the base of fhe shell, closed with a strong screw plug. No fuse is required, impact against thick iron being sufficient to explode the bursting charge of a shell without any fuse. The greatest penetration that has yet been obtained in armour was achieved by the 35-ton Woolwich gun (termed the Woolwich "infant "), at Shoeburyness on June 20th, 1872, the head of a Palliser projectile passing entirely through 184 inches of iron and 12 of teak, a thick-hess of armour exceeding that of any iron-clad vessel afloat.

Solid shot have gradually disappeared since the introduc- tion of rifled guns, and the reasons are obvious. A round shot fired from a smooth-bored gun, after its first graze, continued to ricochet in a straight line;

it produced, there- fore, a considerable moral effect, and on smooth ground was actually formidable. A rifled shot, on the other hand, is violently deflected after each graze, from the fact that it is rotating rapidly as it touches the ground, and this, coupled with its liability to bury itself, detracts greatly from its efficiency. Shells for any rifled gun may be made of such length as to bring them to the same weight as the corresponding shot, which was not the case with smooth- bore projectiles, they being all of one size instead of one weight. In short, Palliser shell with thick walls (fired as hollow shot) excepted, the only projectiles of the shot class now employed with rifled guns are case shot. Owing, how- ever, to the fact that the charge of a rifled gun varies from 3th to 3th the weight of the projectile, while in smooth-bored guns it was sometimes as great as 4d that of the shot, the effect of rifled case is comparatively weak. At any time

the range of case shot hardly exceeds 300 yards, while its efficiency depends on the ground along which it bounds being hard and level. Lach shot consists of a number of balls enclosed in a thin metal cylinder, which breaks up in the gun, the balls scattering from the muzzle, but sweep- ing the ground with great effect under favourable circum- stances. Grape differs only in the balls being larger. At the battle of Friedland, at the bridge of Lodi, and at Sebastopol, grape and case were fired with great effect. Time and percussion fuses have been mentioned. Time Juses are those which open a shell at any given time, whether in the air or during penetration. Fig. 2 shows the " Boxer 9-second fuse" for breech-loading guns, fixed in the shell. On the shell moving, the hammer in the head, by its inertia, shears a copper wire, fires a detonating patch of composition beneath it, and lights the fuse composi- tion. This burns until it reaches the point at which a hole is bored in the fuse, when it flashes down the channel shown on the left side of the cut, and fires the powder primer and bursting charge of loose powder. The action of this fuse therefore depends on its correct boring and regular burning. A percussion fuse is one that acts on impact or graze. Fig. 3 shows the Pettman general service fuse. On the first movement of the — shell, the detonating ball A, and the plugs

above and below it, by their + inertia, crush the lead cap C, and shear the copper pin above F. During flight the ball becomes detached from the upper or steady plug B, and on im- pact is fired by its momentum against the part in front of it. The steady plug itself has also a ring of detonating ie. composition, DD, which, should the ; \ plug fail to escape from the detonating $. MEL SS ball, and so hold against it, is thrown Fic. 3.—1, copper parts; 2, against the little plain ball E. The s™™-metal; 3, lead. flash in cither case acts down the tube F, and fires the burst- ing charge of the shell. This fuse is made not to explode against a wave, being chiefly used for sea service. It acts both with smooth-bored and rifled guns. For land service more sensitive ones are employed to explode on graze, Friction tubes are copper tubes driven with mealed powder, and pierced from end to end. A friction bar in the head is rubbed against patches of de- tonating composition by pulling a lanyard, which hooks into a loop at the end of it, The tube is entered in the vent of a gun, which is thus fired by pulling the lanyard. For mitrailleuses and breech-loading small arms, lead bullets or lead and tin bullets, fixed in central-fire cartridges, are used. The cases are made of sheet brass, with a thick base disc containing a cap chamber, cap, and anvil. Fig. 4 shows the Boxer-Henry am- munition for the Martini-Henry rifle. These metal-cased cartridges are not liable to ex- plode in store, even from the firing of a small charge of powder confined inside the same packing-case with them. They admit of a very rapid rate of firing, The Gatling mitrail- leuse has discharged 657 rounds in two minutes at Shoeburyness, The Martini- Henry rifle has fired 25 rounds in a minute. Rockets are projectiles containing composi- tion which, as it burns, generates sufficient gas to drive forward the rocket by an action resembling that of the recoil of agun. Of rockets there are three kinds: first, war rockets, with iron cases, introduced by Sir W. Congreve, and subsequently

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Fia. 4.—1, 1, sheet brass; 2, cop- per; 3, wrought iron; 4, paper; 6, 6, mill-board ; 7, bees'-wax.

brought by Mr Hale to the form shown in Fig. 5. Con- greve rockets were kept point first by sticks screwed into their bases, which acted on the principle qj

of the feathers of an arrow. The Hale (|| rocket is kept point first by rotation, caused iy by the gas escaping from the vents pressing |) |\\} against the curved shields) The second |) \\} class of rockets are signal rockets, made of |) | paper, and containing stars, which throw a bright light in falling. The third class are the rockets used to carry a line and establish communication between a wrecked vessel and the sea-shore. (c, 0.

AMNESTY (duvyoria, oblivion), an act of grace by which the supreme power in a state restores those who may have been guilty of any offence against it to the position of innocent persons. It includes more than pardon, inasmuch as it obliterates all legal remembrance of the offence. It is chiefly exercised towards associations of political criminals, and is sometimes granted absolutely, though more frequently there are certain specified excep- tions. Thus in the case of the earliest recorded amnesty, that of Thrasybulus at Athens, the thirty tyrants and a few others were expressly excluded from its operation ; and the amnesty proclaimed on the restoration of Charles II. did not extend to those who had taken part in the execu- tion of his father. Other celebrated amnesties are that proclaimed by Napoleon on 13th March 1815, from which thirteen eminent persons, including Talleyrand, were excepted ; the Prussian amnesty of 10th August 1840; and the general amnesty proclaimed by the Emperor Francis Joseph of Austria in 1857. The last Act of amnesty passed in Great Britain is 20 Geo. IL, c. 52, which proclaimed a pardon to those who had taken part in the second Jacobite rebellion.

AMOL, or AmUt, a town of Persia, in the province of Mazanderan, about 12 miles above the mouth of the Heraz, a river which flows into the Caspian Sea. It is not walled, and is now a place of no great importance, but in and around it there are ruins and ancient buildings which bear witness to its former greatness. Of these the most conspicuous is the magnificent mausoleum of Seyed Quam-u-deen,

king of Sari and Amol, who died in 1378. At Amol there is a bridge of twelve arches over the Heraz, and the bazaars of the town are large and well supplied. The population is about 40,000, but a great number of these leave the city in summer to tend their flocks.

AMONTONS, GuittaumE, a celebrated French ex- perimental philosopher, was the son of an advocate who had left his native province of Normandy and established himself at Paris, where the subject of this notice was born on the 3lst August 1663. The exertions of genius fre- quently take a particular direction from accidental circum- stances. A severe illness with which Amontons was afflicted in his early youth had the effect of rendering him almost entirely deaf, and consequently of secluding him in a great measure from the ordinary intercourse of society. Being compelled by this accident to depend for his cnjoy- ments on the resources of his own mind, he began to take great pleasure in the construction of machines of various kinds, and in the study of the laws of mechanics, a path of inquiry which he pursued through life with unremitting ardour and distinguished success. One of the first objects which engaged his attention was the discovery of the perpetual motion,—an attempt which, though necessarily unsuccessful, was productive of greater advantage to him than it has usually been to those who have pursued that vain chimera. Amontons devoted himself particularly to the improvement of instruments employed in physical experiments, a subject which requires the finest applica-

tions of mechanical principles, and which till that time had not met with a due share of attention. In 1687, before he had attained his 24th year, he presented to the Academy of Sciences an hygrometer of his own invention, which was received with approbation by that learned body. In 1695 he published the only work which he has given to the world. It was dedicated to the Academy, and entitled Remarques et Expériences Physiques sur la Construction d'un Nouvel Clepsydre, sur les Barométres, les Thermometres, et les Hygrométres. After

Huyghens's beautiful application of the pendulum to the regulation of the motion of clocks, any attempt to revive the clepsydra, an incommodious instrument, and not susceptible of much accuracy, might seem to subject its author to the imputation of not suf- ficiently appreciating the great importance of a discovery which has so completely changed the face of astronomical science ; but the object of Amontons was to produce an instrument capable of measuring time on board ship, in circumstances where the motion of the vessel rendered such timekeepers as were then known useless, The machine which he constructed is said to have been extremely ingenious, and probably differed entirely from those of the ancients, among whom the clepsydra was in common use. In 1689 Amontons was admitted into the Academy of Sciences, the Memoirs of which he enriched with many important contributions. The first paper which he presented after his admission was one on the theory of friction, a subject then involved in great obscurity, and on which his inquiries tended to throw con- siderable light. After that appeared in succession de- scriptions of a new thermometer, and of numerous experi- ments made with the barometer relative to the nature and properties of air,—a detailed account of all which is given in the history of the Academy. In the course of thesé investigations he found that the boiling point of water varies with the pressure of the atmosphere, a discovery made almost contemporaneously in England by Dr Halley. By his countrymen he is generally regarded as the inventor of the telegraph ; and he had the honour of exhibiting the methods by which he proposed to accomplish the object in view before some members of the royal family. It appears, however, from a paper read by Dr Hooke to the Royal Society in 1684, that that ingenious philosopher had brought the telegraph, in theory at least, to a state of far greater maturity than Amontons, and nearly 20 years earlier, The experiments of the latter were made about the year 1702. It may be regarded as a curious fact in the history of inventions, that although the great import- ance of telegraphic communication is obvious, and the method of accomplishing it was clearly explained by Hooke, and its practicability demonstrated by Amontons, it con- tinued to be regarded as of no practical value, and was not regularly applied to useful purposes till nearly a century afterwards, at the time of the French Revolution. Amontons died in 1705, aged 42.

AMOOR, Amour, or Amur, a large and important river of eastern Asia, formed by the confluence of the Argun and the Shilka, at a place called Ust Strelkoi, in 53° 19'N. lat. and 121° 50'E. long. Both these rivers come from the south-west: the Argun, or Kerulen as it is called above Lake Kulon, through which it flows about half-way between its source and Ust Strelkoi, rises near Mount Kentei, in 49° N. lat. and 109° E. long.; the Shilka is formed by the union of the Onon and the Ingoda, both of which rise in the Kingan mountains, not far from the source of the Argun. The Amoor proper flows at first in a south-easterly direction for about 800 miles, as far as 47° 42' lat. ; it then turns to the north-east, and after a total course of over 1600 miles discharges itself into the Sea of Okhotsk, opposite to the island of Saghalien. Its principal tribu-

taries from the south are the Songari, which the Chinese consider to be the true head river of: the Amoor, and the Ussuri; from the north it receives the Zeya, the Bureia, the Gyrin, and the Omogun. The climate of the valley of the Amoor varies very much in different parts: in the upper portion of its course there are long and cold winters and short summers; as the river descends into more southern latitudes the rigour of the climate relaxes, and the heat becomes almost tropical ; the vegetation is rich and luxu- riant, and large forests of oaks, limes, and elms replace barren larches and firs ; while on the lower Amoor the cold again to a certain extent prevails, and at the mouth the river is ice-bound for more than half the year, a circum- stance which greatly impairs its othcrwise admirable facilities for navigation. The river is abundantly stocked with fish, and the mountains near it are believed to contain iron and gold. The Amoor became known to the Russians in 1639, and they resolved to annex it to their empire along with the territory through which it flows. In 1651 a party of Cossacks, under a bold leader named Khabaroff, built a fort at Albazin, about 100 miles below Ust Strelkoi. Many sanguinary conflicts between the Chinese and the Russians followed. Albazin more than once changed owners ;

but at last, in 1689, a treaty was concluded, by which the river Gorbiza or Kerbeche became the easterly limit of the Russian empire on the Amoor, the boundary stretching from the source of the Gorbiza, along the Yablonnoi moun. tains, to the Sea of Okhotsk. This state of matters con- tinued till 1847, when the Russians again began to make preparations for the conquest of the Amoor valley. In 1850 and the three succeeding years, expeditious were sent up the river, and the towns of N ikolaevsk, Marinsk, and Blagovchenk were founded ; in 1854 a powerful flotilla sailed down from Ust Strclkoi to the mouth of the river. A large and very important tract was added to the Russian empire by the cession in 1858 of the whole left bank of the Amoor and the right bank below the Ussuri, and the further cession in 1860 of all the territory between the Ussuri and the Eastern Sea.

AMORITES, a powerful people, widely spread through the Promised Land before the settlement of the Israelites, belonging to the Canaanitic stock, according to Gen. x. 16, though some think they belong rather to the pre-Canaanitic inhabitants of the Jordan basin (see Knobel, Volkertafel, 201, sq., who refers them to the Shemitic race of Lud). In all probability there were incorporated among them the remnants of the older tribe of the Rephaim. Their name, "the high ones," has by Ewald (Gesch. Israels, i, 315), after Simonis (Onomasticon, s.v.) been interpreted highlanders, or inhabitants of the heights, as Canaanites is supposed to mean lowlanders, or inhabitants of the plains (cf. Num. xii, 29; Deut. i. 44; Josh. v. 1 , x. 6). Others call this in question, and find an explanation rather in the tallness of stature by which they seem to have been distinguished (Num. xiii, 32, 33; Amos ii, 9, cf. Kurtz, Gesch. d. Alt. Bundes, i. § 45 ; Pusey, Minor Prophets, 174, u.)

That this people had a certain preponderance among the Canaan- itic tribes is shown by their name often standing in Scripture for Canaanites in general (Gen. xv. 16 ; Josh. xxiv. 18 ; Jud. vi. 10). Their principal seat on the west of the J ordan was the mountains of Judah and their southern slopes,—to the whole of which moun- tainous region, indeed, the name the Mount of the Amorites is applied (Gen. xiv. 7, 13; Num. xiii. 29; Deut. i. 7, 20, 44; Josh. xl. 3; Jud. i. 36). We

hear of them also at Gibeon, north-west of Jerusalem (2 Sam. xxi. 2), at Aijalon, west of Gibeon, and in the northern part of the Philistine plain (Jud. i. 34, 35), and in the land of Ephraim (Gen. xlviii. 22). On the east of Jordan, after having driven back the Ammonites and Moabites, they occupied the whole of Gilead and Bashan, from the Arnon, the northern limit of Moab, as far as Mount Hermon, forming in this region at the epoch of Moses two powerful kingdoms,—that of Sihon, whose

capital was Heshbon, the more southerly ; and that of Og, whose capital was Ashtaroth, the more northerly (Num. xxi. 21-35 ; Deut.

747

lil. 8, 10; iv. 48). It was with this east-J ordanic section of the Amorites that the Israelites first came into conflict. After these had been subdued, and after the Israelites had erossed the Jordan and had begun to capture the Canaanitish towns, five of the most powerful of the Amorite kings of the western seetion formed a con- federacy to oppose the advaneing host (Josh. x. 5, sq.) When this combination had been overthrown, a final attempt at resistance was made by the more northerly portion of the Canaanites, under the auspices of Jabin, king of Hazor; and in the united forces, which were overthrown at the waters of Merom, Amorites were included (Josh. xi. 3). Those of this and the other tribes of the Canaanites who survived the conquests of Joshua, cither gradually became mingled with the Philistines and others of the neighbour- ing nations, or they continued to live among the Israelites in the condition of tributaries and slaves (Josh. xi, 22; Jud. i. 34,35; 1 Kings ix. 21; 2 Chron. viii. 8).

In old Egyptian literature inention is frequently made, from the time of Sethos I., of an Asiatie people called the Amar or Amaor, whom Egyptologers agree in identifying with the Amorites (Bunsen, Egypt's Place, vol. iii, 212), There is as yet less agreement in regard to the position of their country. Brugseh is of opinion that the people in question are located in the north of Syria, on the banks of the Orontes (see his Geog. Inschriften, Bd. ii. 21; Hist. @' Egypte, 132, 187). The later researches of Chabas, however, have rendered the interpretation

on which this view depends very doubtful, and shown that in all probability their territory lies, in entire harmony with the representations of Scripture regarding the Amorites, on the west of the Dead Sea and south of the land of Judah (Chabas, Etudes sur U Antiquité, 267, f.; Recherches, 44, 107.) Among the towns of the Amaor are mentioned Dapur and ere evidently to be identified with the scriptural Debir and Kadesh.

The language, &e., of the Amorites will be more conveniently considered under CANAANITES,

AMORPHISM. (from a privative, and popdy, form), a term used in chemistry and mineralogy to denote the absence of regular structure in a body. Glass, resin, coal, albuminous substances, é&c., are amorphous, exhibiting uniformity of properties in every direction: they have no planes of cleavage, as crystals have; they conduct heat equally in all directions ; and they do not show double refraction unless in a constrained state. Amorphism is not peculiar to one kind of substances, for the same molecules Inay exist either in the amorphous or the crystalline state. Thus charcoal or lamp-black is the amorphous form of the diamond; sulphur and phosphorus, when slowly cooled, assume a crystalline arrangement, but when rapidly cooled are perfectly homogeneous—the suddenness of transition from the liquid or fused state giving no time for definite arrangement of particles.

AMOS (not the same as Amoz, the father of Isaiah) was an inhabitant of the district of Tekoa, a fortified town (2d Chron. xi. 6) among the hills of the south of J udah, where a breed of stunted sheep and goats, prized, how- ever, for their wool and hair, found a scanty pasturage (Amos i, 1). Possibly he was a common day labourer ; certainly he was far from wealthy, as the Jewish com. mentators would have him; for though he is called a "noked" (loc. cit.), like one of the kings of Moab (2 Kings iii. 4), he tells us himself that he was glad to com- bine this employment with that of a dresser of sycamore fruit (vii. 14). He may thus be contrasted, as the peasant prophet, with Isaiah, the prophet of the capital and the court. It does not, however, follow that Amos was devoid of such cultivation as could then be had. Distinctions of rank

were not, among the primitive Semitic races, co- incident with those of culture ; it is enough to refer to the pre-Mohammedan Arabs, whose poetry has been so accu- rately reproduced by Riickert. And in the case of Amos there is evidence in his own works that he was well acquainted with the literature of hig day. It is true that he boldly admits the irregularity, from an official point of view, of his prophetic ministrations—" No prophet I, and no prophet's disciple I" (vii. 14); but his discourses are not only full of references (sometimes dubious) to the book of Jocl and the Pentateuch, but framed, however

imperfectly, on a genuine artistic plan. This is unmis- takably the case in the discourse contained in i. 3-i1. 16; but with greater or less correspondence to the course of thought in the remainder of the book. Thus, according to Ewald (who aims, it is true, at an unattainable pre- cision), chapters iii, and iv. consist of five strophes—ili. 1-8, iii. 9-15, iv. 1-3 (incomplete), iv. 5-11, iv. 12, 13; chapters v. and vi. of a prologue (v. 1-3) and four strophes —v. 4-6, 8, 9; v. 7, 10-17 ; v. 18-27; vi. 1-10; with a sort of epilogue in vi. 11-14. And the great critic De Wette goes so far as to declare that no Hebrew prophet has shown an equal regard for clearness and harmony of pro- portion. (Comp. Dr Pusey, Minor Prophets, p. 152.)

The date of the first public appearance of Amos cannot be ascertained. From the heading of the book (i. 1), which, though not by the prophet himself, has the air of a genuine tradition (Ewald, Dre Propheten, i. 123), we learn that he "saw "—that is, prophesied—" two years before the earthquake." This earthquake is referred to again in Zech. xiv. 5, and, as some think, in passages of Joel and other prophcts. It seems, therefore, to have constituted an era in popular tradition, but is of no significance for chronology, as has been well shown by Dr Pusey (Afinor Prophets, p. 148). More to our purpose is the former part of the heading, which limits the prophetic career of Amos to the twenty- five ycars that Uzziah and Jeroboam II. were contemporary—zi.e., 810-784, according to the common chronology; 775-750, according to the Assyrian. (Comp. Schrader, Die Keilinschriften und das Alte Testa-

ment, p. 120.) He flourished, therefore, in the greatest age of Hebrew prophecy. He seems to have been younger than Joel, to whose prophecy he makes several references, and more or less senior to Hosea and Isaiah. This view is fully borne out by the gradual emergence of the Assy- rians on the prophetic horizon. Altogether absent froin Joel's prophecy, they are but vaguely alluded.to in Amos, and first mentioned by name in Hosea and Isaiah.

It was while "following the flock" (vii. 14, 15) that Amos received a prophetic impulse to leave his home and preach in the sister country. The circumstances are on several accounts worthy of notice. They indicate—l. A distinction between Hebrew prophecy, in its mature stage, and non-Hebrew—viz., that the former is not dependent on a special artificial training ; 2. That though his writ- ings are included in the prophetic canon, Amos did not consider himself officially a prophet (which has a bearing on the great controversy of Daniel); and 3. That prophets of the higher or spiritual order did not recognise the revolt of the first Jeroboam (comp. ix. 11; Hos. iii. 5). But the prophecies of Amos had a wider scope than the destiny of Israel. They show a dim presentiment of the philosophy of history, and of the reproductive power of revolutions. Accordingly, Syria, Philistia, Phoenicia, Edom, Ammon, Moab, and Judah were successively rebuked by the in- spired messenger. But the chief blame fell upon Israel, whose unparalleled prosperity under Jeroboam II. had developed the germs of vices inconsistent with the religion of Jehovah. The denunciations of Amos produced a power- ful impression. He was expelled with contumely by Amaziah, a priest of the reactionary image cultus at the frontier town of Bethel (vii. 10-17).

It is not to be supposed that the discourses of Amos were delivered exactly as they stand. This view is pre- cluded by their elaborate litcrary character, and by the allusions to the prophet's experience in Israel in ii. 12, v. 10, 13. He probably put them together, with the addi- tion of a grand Messianic epilogue, after his return to Tekoa. There has never been a doubt of their genuineness. The text is good, but there are a few corrupt passages.

Some of the characteristics of Amos have been already

mentioned. The tradition that he was a stammerer (based on an absurd etymology of his name), and the statement — of Jerome that he was "imperitus sermone (sed non scientia)," only prove the incapacity of the ancients for literary criticism. The simplicity of his style is that of the highest art. He delights in abrupt short clauses, but they are linked together by the closest parallelism. And the supposed rusticity of his dialect is deduced from the spelling of only five words, analogies to which may be traced in the great poem of Job. All that we can admit as probable is, that the native force and talent for observa- tion displayed by this prophet were derived from his early converse with nature on the wild hills of Judah. His imagery, in fact, from its freshness and appropriateness (compe ii 13 dit, 125 ime2eDpewell ; -vireli2s ae 0) almost reminds us of Dante, and entitles him to as high a place in the history of literature as in that of theistic religion. @. He)

AMOY, a city and seaport in the province of Fo-kien, China, situated on the slope of a hill, on the south coast of a small and barren island of the same name, in 24° 28' N. lat. and 118°10 E. long. It is a large and exceed- ingly dirty place, about 9 miles in circumference, and is divided into two portions, an inner and an outer town, which are separated from each other by a ridge of hills, on which a citadel of considerable strength has been built. Each of these divisions of the city posscsses a large and commodious harbour, that of the inner town, or city proper, being protected by strong fortifications. Amoy may be regarded as the port of the inland city of Chang-chu, with which it has river communication; and its trade, both foreign and coastwise, is extensive and valuable. In 1870, 560 vessels, exclusive of Chinese junks, entered the port, of an aggregate burden of 224,436 tons; of these, 315, of 150,171 tons, were British. The chief articles imported were sugar, rice, raw cotton, and opium, as well as cotton cloths, iron goods, and other European manufactures; their value was £1,915,427. In the same year, 554 vessels, of 226,911 tons, cleared the port,

including 314 British, of 150,826 tons; the chief exports were tea, porcelain, and paper, and their value was £1,144,046. It is not possible to give the statistics of the trade that is carried on by means of Chinese junks, but it is said to be large; and the native merchants are considered 'to be among the wealthiest and most enterprising in China. Amoy was captured by the British in 1841, after a determined resist- ance, and is one of the five ports that were opened to British commerce by the treaty of 1842; it is now open to the ships of all nations. The population of Amoy is esti- mated at 250,000.

AMPERE, Anprit-Mariz, the founder of the science of ~electro-dynamics, was born at Lyons in January 1775. He took a passionate delight in the pursuit of knowledge from his very infancy, and is reported to have worked out lengthy arithmetical sums by means of pebbles and biscuit-crumbs before he knew the figures. His father began to teach him Latin, but left this off on discovering the boy's greater inclination and aptitude for mathematical studies. The young Ampére, however, soon resumed his Latin lessons, to enable him to master the works of Eulcr and Bernouilli. In later life he was accustomed to say that he knew as much about mathematics when he was eighteen as ever he kuew; but his reading embraced nearly the whole round of knowledge,—history, travels, poetry, philosophy, and the natural sciences. At this age he had read the whole of the Encyclopédie, and with such interest and attention that he could repeat passages from it fifty years after. When Lyons was taken by the army of the Convention in 1793, the father of Ampére, who, holding the office of juge de paix, had stood out resolutely against the previous revulu-

tionary excesses, was at once thrown into prison, and soon after perished on the scaffold. This event produced such an impression on the susceptible mind of Ampere, that he continued for more than a year in a state little removed from idiocy. But Rousseau's letters on botany falling into his hands, the subject engrossed him, and roused him fron his apathy. His passion for knowledge returned. From botany he turned to the study of the classic poets, and to the writing of verses

himself. About this time (1796) an attachment sprang up, the progress of which he naively In 1799 he was happily From about 1796 Ampére gave private lessons at Lyons in mathe- matics, chemistry, and languages; and in 1801 he removed to Bourg, as professor of physics and chemistry, leaving His wiie died in 1804. After two years' absence he returned to Lyons, on his appointment as professor of mathematics at the Lyceum. His small treatise, Considérations sur la Théorte Mathématique du Jeu (Lyons, 1802), in which he success- fully solved a problem that had oceupied Buffon, Pascal, and others, and demonstrated that the chances of play are decidedly against the habitual gambler, attracted consider- able attention. It was this work that brought him under the notice of M. Delambre, whose recommendation obtained for him the Lyons appointment, and afterwards (1805) a

recorded in a journal (Amorum). married to the object of his attachment.

his ailing wife and infant son at Lyons.

subordinate position in the Polytechnic School at Paris, where he was elected professor of analysis in 1809.

multifarious studies with unabated diligence. He was admitted a member of the Institute in 1814. It is on the service that he rendered to science in establishing the rela- tions between electricity and magnetism, and in developing

the science of electro-magnetism, or, as he called it, electro-

dynamics, that Ampére's faine mainly rests. On the 11th of September 1820 he heard of the discovery of Professor Oersted of Copenhagen, that a magnetic needle may be deflected by a voltaic current. On the 18th of the same month he presented a paper to the Academy, containing a far more complete exposition of the phenomenon, which he had in the interval investigated by experiment, and show- ing that magnetic defects can be produced, without magnets, by aid of electricity alone. In particular he showed that two wires connecting

the opposite poles of a battery attract or repel each other according as the currents pass in the same or in opposite directions, According to the theory of magnetism which Ampeére's subsequent investigations led him to adopt, every molecule of magnetic matter is acted on by a closed electric current, and magnetisation takes place in proportion as the direction of these currents approaches parallelism. The whole field thus opened up he explored with characteristic industry and care. He anticipated the invention of the electric telegraph, having Suggested in 1821 an apparatus of the kind with a sepa- rate wire for each letter, Late in life he prepared a remarkable work on the classification of the sciences, which was published after his death. In addition to this and one or two works of less importance, he wrote a great number of meioirs and papers that appeared in scientific Journals. He died at Marseilles in June 1836. The great amiability and child-like simplicity of Ampére's character are well brought out in his Journal et Correspondence, published by Madame Chevreux (Paris, 1872).

AMPERE, JEAN-JACQUES-ANTOINE, the only child of the preceding, was born at Lyons, August 12, 1800. He showed an early preference for literary pursuits, and this Was strengthened by his intimate intercourse with the brilliant circle to which his introduction to Madame Récamier's celebrated réwnions admitted him. He began his literary career as a contributor to the Globe and Revue

Here he continued to prosecute his scientific researches and his

Frangaise, which Guizot conducted in opposition to the government of Charles X. After spending some time in travel, he commenced a course of lectures at the Atheneum of Marseilles in 1830, the first of which, De [Histoire de la Poésie, he published. The revolution of J uly led to his return to Paris, where he lectured at the Sorbonne, till, in 1833, he succeeded Andrieux as professor of the history of French literature in the college of France. His lectures here, which were greatly admired, form the basis of several works, particularly of his Histoire littératre de la France avant le 12me Siecle, 3 vols., Paris, 1839, 1840. Ampére was a constant contributor to various periodical publica- tions. He

wrote for the Revue des Deux Mondes sprightly accounts of his long journeys in Egypt and North America, as well as in various parts of Europe, which were ofter- wards collected under the title, Litéérature et Voyages (2 vols., 1834). His principal work is the Wistotre Romaine a Rome (4 vols., 1856-64), a series of papers, reprinted in

part from the Revue des Deux Aondes, showing shrewd

sense and great and varied learning, particularly on archeological questions, and written in an attractive though often discursive style. Ampére was officer of the Legion of Honour from 1846, and in 1847 was admitted to the French Academy. He died March 27, 1864,
AMPHIARAUS, in Greek legend, a son of Oicles and Hypermnestra, descended on the paternal side from the kingly scer Melampus, and, like his ancestor, endowed with the prophetic gift; but at the same time known for his valour in the great enterprises of his time—the expedition of the Argonauts and the hunt of the Calydonian boar. The expedition, however, on which the chicf events of his life hinge is that of the Seven against Thebes, into which he was unwillingly driven by the treachery of his wife, Eriphyle (Odyssey, xi. 326), a sister of Adrastus, who then ruled in Sicyon, and by whom the enterprise was planned to restore Polynices to the throne of Thebes. As prince of Argos, Amphiaraus was in a position to assist greatly; but when called upon by Adrastus to take a part, he declined, on the ground that the cause was unholy, and would end fatally. His marriage with Eriphyle, however, had not only becn meant to heal previous quarrels between him and Adrastus, but was to be a bond of peace for the future in this way, that she should always arbitrate between them. To secure her favour now, Polynices gave her the fatal necklace which Cadmus had once given to Harmonia, and, thongh warned of the consequenccs, Eriphyle accepted it and decided against her husband. Knowing that he would never return, Amphiaraus enjoined his son Alemzon, then a boy, to avenge his death upon his mother ; and to his children generally he gave wise counsel. As he stepped into his chariot to depart he turned with a look of anger towards lis wife, a scene which was represented on the chest of Cypselus. The assault of Thebes was disastrous to the Seven ; and Amphiaraus, pursued by Periclymenus,

would have fallen by his spear had not Jupiter, at a critical moment, struck the earth with a thunderbolt, and caused it to open and swallow him with his horses, Thoas and Dias, his chariot, and his charioteer, Baton. J upiter and Apollo, it is said in the Odyssey (xv. 245), loved Amphiaraus dearly ; yet he did not reach an old age, but fell at Thebes, through the gift accepted by his wife. After death he continued, as a deified hero, to exercise his prophetic power by giving oracles on the spot where he had sunk into the earth. In earlier times this was believed to have happened at Harma, on the way from Thebes to Potnie, and it was there that the oracle of Amphiaraus was which Croesus and Mar- donius consulted (Herodotus, i. 49, 52; viii. 134). After- wards this oracle yielded to that in the neighbourhood of Oropus, where was also a sanctuary to Amphiaraus (Jupiter Amphiaraus, as he was styled), with athletic and

inusical festivals in his honour, and with a sacred enclosure (temenos) in which were two springs. At one of them he was thought to have risen from the lower world, and hence its water was employed for no sacred purpose. Invalids who had been cured by oracular prescriptions threw a piece of money in it. The water of the other spring was ex- cellent to drink and to bathe in (Apduapdov Aourpa). The oracles were conveyed in dreams, to obtain which it was

necessary to fast for a time, then to offer sacrifice at the great altar (Pausanias, i. 34, 2), and again to sacrifice a ram aud to sleep on its skin. The ruins of the temple, with inscriptions which identify them as such, exist still at Maurodilissi, in the ancient Oropia. In the derivation of his name from éu¢i-dpdopou, the piety for which Amphi- araus was celebrated is expressed. (A. 8. M.)

AMPHIBIA

INNEUS originally employed this term to denote a class of the Animal Kingdom comprising crocodiles, lizards and salamanders, snakes and

Cecilie, tortoises aud turtles, and frogs; to which, in the later editions of the Systema Nature, he added some groups of fishes. In the Tableau Llémentaire, published in 1795, Cuvier adopts Linneeus's term in its earlier sense, but uses the French word ' Reptiles," already brought into use by Brisson, as the equivalent of Amphibia. In addition, Cuvier accepts the Linnean subdivisions of Amphibia- Reptilia for the tortoises, lizards (including crocodiles), salamanders, and frogs; and Amphibia-Serpentes for the snakes, apodal lizards, and Cecilice.

In 1799! Brongniart pointed out the wide differences which separate the frogs and salamanders (which he terms Batrachia) from the other reptiles; and in 1804, Latreille,? rightly estimating the value of these differences, though he was not an original worker in the field of vertebrate zoology, proposed to separate Brongniart's Batrachia from the class of Heptilia proper, as a group of equal value, for which he retained the Linnean name of Amphibia.

Cuvier went no further than Brongniart, and, in the Regne Animal, he dropped the term Amphibia, and substi- tuted Reptilia for it. Meckel, on the other hand, while equally accepting Brongniart's classification, retained the term Amphibia in its earlier Linnean sense; and his example has been generally followed by German writers ; as, for instance, by Stannius, in that remarkable monument of accurate and extensive research, the J/andbuch der Zootomre (Zweite Auflage, 1856).*

In 1816, De Blainville, adopting Latreille's view, divided the Linnzan Amphibia into Squamiféres aud Nudipelliféres, or Amphibiens ; though he offered an alternative arrange- ment, in which the class Reptiles is preserved and divided into two sub-classes, the Ornethoides and the Ichthyoides. The latter are Brougniart's Batrachia, plus the Cecilie, whose true affinities had, in the meanwhile, been shown by Dumeril; and, in this arrangement, the name Amphibiens is restricted to Proteus and Siren.*

Merrem's Pholidota and Batrachia (1820), Leuckart's AMonopnoa and Dipnoa (1821), Miiller's Sqguamata and Nuda (1832), are merely new names for De Blainville's Ornithoides and Ichthyoides, though Miiller

gave far better anatomical characters of the two groups than had pre- viously been put forward. Moreover, following the indica- tions already given by Von Bar in 1828,° Miiller calls the attention of naturalists to the important fact, that while all the Sgwamata possess an amnion and an allantois, these structures are absent in the embryos of all the Wuda.

? Brongniart's " Essai d'une Classification Naturelle des Reptiles" was not published in full till 1803. It appears in the volume of the Mémoires presentés aU Institut par divers Savans for 1805.

? Nouveau Dictionnaire a' Histoire Naturelle, xxiv., cited in La- treille's Familles Naturelles du Réegne Animal.

3 System der Vergleichenden Anatomie, 1821.

- *"Prodrome d'une Nouvelle Distribution du Régne Animal,"*

serch des Sctences par la Soctété Philomatique de Paris, 1816, p. ;

5 Entwickelungs-Geschichte der Thiere, p. 262.

Miller makes an appeal for observations on the develop- ment of the Cecilie, and of those Amphibia which retain gills or gill-clefts throughout life, which has unfortunately yielded uo fruits from that time to this.

In 1825, Latreille published a new classification of the Vertebrata,® which are primarily divided into Hamatherma, containing the three classes of Afammifera, Monotremata, and Aves; and Mcemacryma, also containing three classes ~~—Ieptilia, Amphibia, and Pisces. This division of the Vertebrata into hot and cold blooded is a curiously retro~~ grade step, only intelligible when we reflect that the excel- lent entomologist had no real comprehension of vertebrate morphology ; but he makes some atonement for the blunder by steadily upholding the class distinctness of the Amphibia. In this he was followed by Dr J. E. Gray; but Duméril and Bibron in their great work,' and Dr Giinther in his Cata- logue, in substance, adopt Brongniart's arrangement, the

Latrachia being simply one of the four orders of the class Reptilia. Professor Huxley has adopted Latreille's view of the distinctness of the Amphibia, as a class of the Verte- brata, co-ordinate with the Mammalia, Aves, Reptilia, and Pisces ; and the same arrangement is accepted by Gegenbaur and Haeckel. In the Hunterian lectures delivered at the Royal College of Surgeons in 1863, Professor Huxley divided the Vertebrata into Mammals, Sauroids, and Ichthyoids, the latter division containing the Amphibia and Pisces. Sub- sequently he proposed the names of Sawropsida and Ichthy- opsida for the Sauroids and Ichthyoids respectively. It is proper to mention, finally, that Professor Owen, in his work on The Anatomy of Vertebrates, follows Latreille in dividing the Vertebrata into Hamatotherma and Hcama- tocrya, and adopts Leuckart's term of Dipnoa for the Amphibia.

The Amphibia are distinguished from the Sauwropsida and jJ/ammalia by very important and sharply-defined characters. The visceral arches of the embryo develop gills, which temporarily, or permanently, perform the respi- ratory function. There is no trace of an amnion, and it is still a question whether the urinary bladder, which all Am- phibia possess, answers to the allantois of the higher Verte- brata or not. At any rate, it plays no part in the respira- tion of the embryo, nor is it an organ by which nutriment is obtained from the parent. There are two occipital condyles, aud the basi-occipital region of the skull is either very incompletely, or not at all, ossified. There is no basi- sphenoidal ossification. When young, the Amphibia are provided with, at fewest, three, and usually four, cartilagin- ous, or more or less ossified, branchial arches. From Pisces, on the other hand, they are distinguishable only by the characters of their locomotive apparatus. When they possess median fins and limbs, these never present fin- rays ; and the limbs exhibit, in full development, the type of structure which obtains among the Sauropsida and Mammalia, and differ very widely from the fins of any fish at present known. 'This difference obtains even among

8 Familles Naturelles du Regne Animal. ' " Erpétologie Générale, ou Histoire Naturelle compléte des Reptues.

1836,

Urodela.

Anura,

a iE ete h A

the long extinct Amphibia of the Carboniferous epoch. In other respects, the lower Amphibia approach the Chimere, the Ganordet, and the Dipnoi very closely; while, in their development, they present curious approximations to the Marsipobranchit.

With respect to the

primary subdivisions, or orders, of the class Amphibia,

no one can doubt the propriety of the

separation of the recent forms into what may be broadly

termed Newts (Urodela) ; Frogs and Toads (Anura) ; and Coeciee (Peromela) effected by Duméril 3 while all that is known of the organisation of the extinct Amphibia of the newer Paleozoic, and older Mesozoic, formations tends to show that they form a fourth natural assemblage of equal value to each of the others.

The names of Urodela and Anura, given to the first two of these divisions, are undoubtedly open to criticism ; but if well-understood terms, which have acquired a definite scientific connotation, are to be changed whenever ad- vancing knowledge renders them etymologically inappro- priate, the nomenclature of taxonomy will before long become hopelessly burdened ; and, to set a good example, the names of Urodela, Anura, Peromela, and Labyrintho- donta are adopted here for the four orders of the Amphibia, even although it be true that the Labyrinthodonta do not all possess the dental structure on which the name was founded ; though there is reason to believe that some Labyrinthodonts were devoid of limbs, or peromelous ; that the

Anura are not more tail-less than are the Peromela ; and that the tails of the Urodela are not more conspicuous than were those of the Labyrinthodonts,

The URoDELA are Amphibia with elongated bodies and relatively short limbs, devoid of scales or pectoral plates, with numerous pre-caudal vertebrze, and with amphiccelous, or opisthoccelous, vertebral centra. The hyoidean arch re- mains counected with the suspensorium throughout life, and its cornua are large in proportion to its body. The mandible is dentigerous. There are one or two pairs of limbs, the pectoral arch and limbs being always present. The manus never possesses more than four digits. The bones of the antebrachium and of the crus remain distinct, and the tarsus is not elongated. So far as the spermatozoa are known, they are elongated filaments with a vibratile fringe. The larva develops external gills only ; and, except Stren, none are known to possess, at any time, a horny masticatory apparatus,!

The ANURA have relatively short and broad bodies, and both pairs of limbs are constantly present, the hinder being the longer and stronger. There are no scales, nor pectoral platcs, but ossification sometimes occurs in the dorsal integument. The vertebreo vary in character, but are usually procoelous. The pre-sacral vertebrie never exceed nine in number, and the caudal portion of the verte- bral column is represented by a peculiar styliform coccyx. The hyoidean arch detaches itself from the suspensorium, and almost always becomes connected with the pro-otic region of the skull. The cornua are usually slender, as compared with the broad body of the hyoid. The mandible is almost always devoid of teeth. The bones of the ante- brachium and of the crus early ankylose, and the astragalus and caleaneum are much elongated. The manus has a rudimentary fifth digit. Except in Bombinator, the sperma- tozoa have flagelliform appendages, like those of ordinary Vertebrata. The larvee develop first external, and after- wards internal, gills, and, so far as is known at present, are provided with deciduous horny masticatory plates. The gill

den Hornschnabel der F roscblarven.”—(Beitrag zur Anat. der Amphi- ot ne 209.) Duinéril and Bibron affirm the contrary (op. cit., t. ix. p.

16).

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apertures are closed by the growing over them of an oper- cular membrane.

The PERoMELA have snake-like bodies, totally devoid of Peromela.

limbs and limb arches. In most, the integument is pro- vided with transverse rows of imbedded cycloid scales, but there are no pectoral plates. The vertebrae of the trunk are very numerous, and are amphiccelous; those of the caudal region are very few, and are free. The hyoidean arch is attached ueither to the suspensorium, nor to the skull; its cornua are very slender, and no distinct body is developed ; it is followed by several slender, hoop- like, branchial arches. The mandible. is dentigerous. Nothing is known of the early stages of development; but Miller discovered branchial clefts, with rudimentary bran- chial filaments, in young Cecilie.

The LapyrintHoponta for the most part resembled the Labyrinth- proportions of the tail and limbs to the odonta.

Urodela in the body, but some (as Ophiderpeton) were serpentiform, and apparently apodal ; no raniform Labyrinthodonts have yet been discovered. The vertebree are amphiccelous. The . mandible is dentigerous. The bones of the antebrachium and crus remain distinct, and the tarsus is not elongated. The manus and pes appear to have been pentadactyle. Three sculptured pectoral plates and a peculiar dermal armour of small scales, confined to the ventral face of the body, are present in many genera. Nothing is known of the early stages of development, but the young Archegosauria appear to have possessed ossified branchial arches,

In giving a sketch of the organisation of the Amphibia, it will be necessary to enter much more fully into the characters of the SKELETON than into those of the other systems of organs.

The Vertebral Column, ibs, and Sternum.—Leaving the extinct Archegosauria aside for the preseut, all the Amphibia possess well-ossified vertebrae, the arches of which, in the adult condition (except, perhaps, in some Labyrinthodonts), are not separated by a neuro-central suture from the centra. The latter may be amphiccelous, as in the lower Urodela, the Peromela, and the Labyrinthodonta ; or opis-thoccelons, as in the higher Urodela and some Anura (e.g., Pipa and Bombinator) ; or proccelous, as in the majority of the Anura (with the exception of the eighth vertebra, which is usually amphiccelous 3 and of the ninth, which commonly has one convexity in front and two behind). In all the recent forms which have been examined, the centra and intervertebral masses contain more or les¢ dis- tinct remains of the notochord. The arches of the trunk vertebrae are connected by zygapophyses ; the spinous pro- cesses are usually low, but attain a great relative length in the caudal region of some of the Labyrinthodonts (e.g. Urocordylus). Transverse processes are present in all the trunk vertebrae, except the atlas ; they are shortest in the Peromela, longest in the Anura. In most Urodela, these transverse processes, at any rate in the anterior trunk ver- tebree, are divided into two portions, a dorsal and a ventral, which diverge towards their free ends 3 Or, more strictly speaking, these processes are made up of two subequal trans- verse processes, a dorsal "tubercular" process, and a ventral "capitular" process, Sometimesthis division prevails through-out the whole length of the trunk, but, more commonly, the two transverse processes become fused into one, posteriorly.

In the long-bodied Urodela (Stren, Proteus, Amphiuma), only a small number of the vertebra: which succeed the atlas present traces of double transverse processes ; further back, the coalesced transverse processes form trihedral pro-

jections, their dorsal and ventral contours converging

instead of diverging, and giving a very characteristic aspect to these vertebra.

In some Labyrinthodonts, the capitular and tubercular processes, divergent and subequal in some (probably the anterior) vertcbre, coalesce into one in other vertebre ; and the capitular division being shorter than the tubercular, transverse processes, like those of the middle thoracic region of the crocodiles, are thus produced.

In the Peromela, there is a short capitular process, but the tubercular process is represented by a mere facet placed below the prezygapophysis.

In the Aura, finally, the vertebrae have only a single transverse process (possibly representing the coalesced double transverse processes of the posterior trunk vertebrae of such Urodela as Menopoma), which, in some of the vertebrae, may attain a great length.

Ribs are present in a few Anura, in all Urodela, Peromela, and Labyrinthodonta ; and, in the last-named and some Uvo- dela, they attain as great relative dimensions as in other Vertebrata. But theyare always vertebral ribs, no Amphibian being known to possess more than rudiments of sternal ribs. The atlas is never provided with ribs. In the Peromeda, ribs are borne by all the other vertebra, except the very hind- most. In the long-bodied Urodela, on the other hand, they are restricted to a few of the anterior vertebra. In the other Urodela they are usually confined to the pre-sacral and sacral vertebra ; but, in some cases, one or two of the auterior caudal vertebra have free ribs. The form of the proximal end of the rib corresponds with that of the transverse processes or process. Where this is double, the rib presents a fork, formed by the capitulum and tuberculum ; and when the capitular and tubercular trans- verse processes are of equal length, the capitula and tuber- cula of the ribs are equal; but when either of the former is shorter than the other, the corresponding part of the rib is longer. The Peromela have no sternum, and that of the Labyrinthodonta (if they possessed any) is un- known. In the Urodela, the sternum never ossifies, and there is no trace of even a cartilaginous sternum in Proteus. In Menobranchus, there is a very small cartilaginous sternal plate, which sends lateral prolongations

into two of the inter- muscular ligaments, representing rudimentary sternal ribs.

In the Newts! the sternum becomes a broad and stout plate of cartilage, with a median, posterior, cristate, xiphoid process, and with articular surfaces on its antero-lateral margins for the reception of the coracoids. The sternum attains its highest development in the raniform Anuwra, the xiphoid process becoming elongated and dilated at its ex- tremity, and more or less converted into bone, while calci- fication of the body of the sternum itself may also occur.

Fia. 1.—The first two vertebree of Menopoma

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x Qo): vertebra; a, intercondyloid proccess of the atlas; b, the articular surfucea for the

occipital condyles. The ribs of the second vert repr' ted dorsal; B, ventral; C, lateral view. Ss nee Sere a

Vil, atlas; Vi?, second

.} See Parker On the Shoulder Girdle, pp. 63, 68.

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In the Urodela, the first vertebra always presents two slightly concave articular facets, the faces of which look outwards and forwards to adapt themselves to the occipital condyles.. Between these facets, the dorsal moiety of the anterior face of the centrum gives rise to a process, which is little more than a ridge in Proteus, but in other genera beconies very prominent, and has a curious resemblance to the odontoid process of the axis vertebra of a bird. This "intercondyloid" process of the atlas sometimes (Amphiuma, e.g.) exhibits on each side, near its termination, an articular facet, which plays on a corresponding facet of the adjacent face of the occipital condyle.

Mayer (Analecten, p. 10) was misled by the form of this process into the supposition that the vertebra to which it belongs is not the atlas, but the odontoid, vertebra. But there is a similar process of the first vertebra in the Rays, and the relations of the vertebra to the nerves show that it is certainly not the homologue of the axis vertebra of other Vertebrates. The first spinal nerve, which has the distribution of the hypo-glossal of the higher Vertebrata, passes out of the spinal canal, either between the first and second vertebree, or through a foramen in the arch of the first, in the Amphibia, which have no proper suboccipital nerve. This is a very curious circumstance, and requires elucidation by the study of development.

In the Anura, the atlas has the same general form, but the median process is either inconspicuous, as in Rana esculenta, or may be absent.

Among the Labyrinthodonta, the atlas of Mastodonsaurus only is known. It presents two concave facets anteriorly, separated for about half their length by a notch, which probably lodged a ligament.

The atlas of the Peromela has the two characteristic facets for the occipital condyles, but the intercondyloid process is absent, and the anterior margin of the arch of the vertebra projects forwards towards the corresponding margin of the occipital foramen (Hpicrium).

Inthose Urodela which possess posterior limbs (except Pro- teus and Amphiwma), one vertebra, or sometimes two (Meno- poma), are distinguished from the rest as "sacral" by having stouter ribs, the outer ends of which abut against, and are united by ligaments with, the ilia,

The Anura always possess a sacral verte- bra (sometimes anky- losed with its predeces- sor or successor), the transverse processes of which are often en- larged, and sometimes greatly expanded, at their iliac ends. The characters of the sa- crum of the Labyrintho- donta are not known.

In the Urodela, the anterior caudal verte- bree, except the first, Fig. 2. —Menopoma. Posterior (A) and ventral have inferior arches, (8) views of the sacral vertebra (S.V.); SR), which, like the neural 8.22, sacral ribs; J7, Ilium; Js. Ischium. arches, are continuously ossified with the centra; and the same condition obtained in the caudal vertebrae of the Labyrinthodonts.

In the Anura, the caudal vertebree are replaced by a long coccyx, consisting of an osseous style, to the dorsal aspect of the anterior end of which two neural arches are

sre

A MePIB PBT A

ankylosed. The anterior face of the style usually presents two concavities (one in Bombinator and some other genera), which articulate with the corresponding convexities on the

posterior face of the id centrum of the sa- cral vertebra. The number of the verte- bre in the spinal column of the Uro- dela and Peromela varies very much. In the long-bodied

Urodela and Pero- Fe. 3.—A caudal vertebra of Menopoma. WV, neural arch; C, centrum; 4, 2', pre- and post-zygapo- 7.p. transverse process; S.V, sub-verte-

mela they may be very numerous. According to Cuvier, Cecilia has 230 P uma, 75 ; in Menobranchus there are 18 pre-sacral and 25 caudal ; in Salamandra, 15 and 26 ;

physes; bral arch. A, lateral; B, posterior view.

the other hand, in the Anura the number of

number undergoes an apparent reduction, in some cases, by the ankylosis of the first and second vertebra

by that of the sacral vertebra with Dactylethra, Breviceps, Pelobates),

In the carboniferous Labyrinthodont, Archegosaurus, the notochord appears to have persisted throughout life, and the ossification of the centra of the vertebrae to have gone no further than the development of bony rings, such as

the coceyx (Pipa,

those with which the ossification of the centra of the verte-

bre of a tadpole commences,

The Cranium.—The skull is always very depressed, and is usually broad in proportion to its length, though, in

this respect, there is considerable variation, the skulls of

Proteus, Menobranchus, and Amphiuma being narrow, when compared with those of Siredon, M énopoma, and the Anura. The occipital

foramen is situated in posterior face of the cranium, and occipital condyles. pedicle by which the mandible is connected with the side-

there are always two

walls of the brain-case, varies much in its direction— passing obliquely downwards and forwards in the lower Amphibia and in the larval condition of all, but swinging

back until it stands out at right angles to the axis of the skull, or becomes directed downwards and backwards, in the higher Amphibia. The suspensorium is almost immovy- able upon the skull, being mosal bone, besides being, as a Some part of the wall of the skull by synchondrosis. The " primordial skull," or chondro-cranium, usually remains, to a great extent, unossified, even in the adult. In the Urodela, the hyoidean arch is always connected by strong ligaments with the suspensorium ; but, in the Anura and in the Peromela, it becomes completely detached from the suspensorium, and may be free (Peromela), or acquire a new attachment to the periotic region of the skull in front of the fenestra ovalis (Anura).

The bones which are always present in the Amphibian Skull are the exoccipital, pro-otic, parasphenoid, vomer, parietal, frontal, Squamosal, premaxillary, palatine, quad- rate, dentary, splenial, and angular. The basi-occipital and the basisphenoid are always absent, or are repre- Sented by imere partial calcifications of the chondro-craniuin. There is always a fenestra ovalis closed by a stapes. The branchial arches do not exceed four pairs in number, and, in the perennibranchiate Amphibia, there are never fewer than three pairs.

The skull of the Frog (Figs. 4-7), as the most accessible

general rule, united with

Stren, 99; Amphi- and a similar varia-

tion appears to have obtained in the Labyrinthodonts. On

vertebrae (ex- cluding the coccyx) is very constantly nine; though this

(Cera- tophrys dorsata, Pipa, Dactylethra, Breviceps), and in others

the middle of the

The long axis of the suspensorium, or

clamped thereto by the squa-

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member of the group, and that, the development of which has been most carefully studied, may be taken as the starting-point from whence to follow the various modifica- tions of the Amphibian skull, At the sides of the occipi- tal foramen, it presents two large exoccipi- tal ossifica- tions (£. 0.), which bear the prominent oc- cipital con- dyles, and, in old specimens, may meet in the middle ventral line. Dorsally, how- ever, they re- main sepa- rated by a narrow tract of cartilage, which may be- come more or less calcified, External to the condyles, are the fora- mina,by which the vagus and glosso-pharyn- geal nerves emerge from the cranial cavity; and, beyond these, the bones ex- pand outwards and forwards, so as to em- brace the pos- terior half of the fenestra ovalzs, while above, they enclose the greater part of the posterior vertical semi- circular canal. The cartilage which incloses the summit of

the arch of Fies. 4, 5, 6, 7.—Dorsal, ventral, lateral, and posterior views

of the skull of Rana esculenta. The letters have the same

that canal, signification throughout. Pmz. premaxilla; Mz. maxilla; however, &P- Yo. vomer; Na. nasal; Se. sphen-ethmoid; Fr. frontal; ears always a. parietal; Z.0. exoccipital; Ep. epiotic process; Pr.O P y pro-otic; ¢.¢. tegmen tympani; Sq.squamosal; Q.J. quad-

to remain un- ossified, and its place is oc- cupied by a groove in the dry skull (Fig. .¥ 4, Ep.) These ossifications, therefore, answer primarily to the exoccipitals, but, in addition, represent the opisthotic and epiotic elements. Above the Jenestra ovalis, the wall of the otic capsule is produced out- wards into a stout shelf, which forms the roof of the tympanic cavity, and corresponds with the tegmen tym-

I= 95

rato-jugal; Pt.! pterygoid, anterior process; Pt. internal process; Pt.3 posterior or external process; C.a. columella auris; St. stapes; Hy. hyoidean cornu; P.S. parasphenoid; An. angulare; D. dentale. V. foramen of exit of the trige- minal; 1l. of the optic; X. of the pneumogastric and glosso-pharyngeal nerves; V.! foramen by which the orbito-nasal or first division of the fifth passes to the nasal cavity

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pant in man (t.t.) This is largely ossified in continuity with the exoccipital! posteriorly, and the pro-otic (to which in all probability it properly belongs) in front. The outer extremity of the tegmen, however, remains car- tilaginous, and, in front, it passes into a curved band of cartilage, which, as it is continued backwards into the suspensorium, may be termed the "dorsal crus" of the suspensorium (Fig. 9,¢.d.) The T-shaped squamosal bone (Sq.) sends a broad, flat process inwards, which rests upon the teymen tympani, while its long descending process hes external to the cartilaginous suspensorium, and the pos- terior half of its cross-piece, or proper squamoso-zygoinatic part, has the same relation to the dorsal crus of the suspen- sorium. The suspensorium has a second attachment to the skull, by a "ventral crus" (Fig. 9, c.v.), which diverges from the dorsal crus at the anterior extremity of the sus- peusorium, and is continued into two branches. One of these, passing outwards and forwards, becomes the ptery- goid cartilage. The other (Fig. 9, pd.), directed backwards and inwards, may be termed the "pedicle of the suspen- sorium ;" it becomes thickened at its inner extremity, and articulates with a facet in front of the fenestra ovalis, and close to the attachment of the hyoidean cornu. A thin fibrous band extends from this inferior crus to the side walls of

the skull, passing between the first division of the fifth nerve in front, and the second and third divisions behind. The space between the dorsal crus of the suspen- sorium and the pedicle is filled, in the fresh state, with fibrous tissue, which constitutes the anterior boundary of the tympanum. It is traversed (as Duges long since pointed out) by the posterior division of the seventh nerve, which therefore lies above the pedicle. The pro-otic ossification (Pr. 0.) not only walls in the anterior part of the otic capsule, but extends for a short distance forwards in the side walls of the skull. Hence, the foramen of exit for the trigeminal and portio dura (V.) is pierced in this por- tion of the pro-otic ; and the foramen for the sixth nerve is seen at its lower margin. In front of the pro-otic, the lateral walls of the skull remain cartilaginous for some distance, and are perforated by the large optic foramen (II.) Anteriorly to the exit of the optic nerves, the side walls of the skull are formed by elongated plates of boue, which are parts of an extensive ossification of the anterior moiety of the brain-case and the posterior part of the nasal capsules, constituting the complex structure termed by Cuvier '"'os en ceinture," and by Dugeés "ethmoide." As it takes the place of the ethmoid, presphenoid, and orbito- sphenoids, it may be termed the sphen-ethmoid (S.e.) It may be compared to a dice-box, one-half of which is divided by a longitudinal partition. This half is anterior, the longitudinal partition being represented by the ossified mesethmoid ; while the posterior, undivided, half lodges the anterior portion of the cerebral hemispheres and the olfactory lobes. The front wall of this posterior cavity is perforated by the olfactory foramina ; while the outer and posterior wall of each anterior, or nasal, chamber presents, where it forms the anterior and inner boundary of the orbit, a small aperture (V1) through which the orbito-nasal nerve passes. The exoccipitals, pro-otics, and sphen-ethmoid are ossifications which involve the chondrocranium, though they largely consist of secondary bone. The supra- occipital is represented, if at all, by a mere calcification of the cartilage, and the like is true of the quadrate, which 8 an ossification of the distal end of the suspensorium. The quadrate, however, very early becomes continuous with a slender style of membrane bone, the proper jugal, which

' Dugés (p. 37) states that the pro-otic and the exoccipital always

remain distinct in Rana esculenta ; but it is common to find them extensively ankylosed and inseparable in old frogs of this species.

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maxilla, and thus gives rise to the quadrato-jugal (Q./.) Ligamentous fibres also connect the anterior end of the zygomatic process of the squamosal directly with the ptery- goid, and indirectly with the maxilla and jugal, and pass from the same process to the fronto-parietal bone, forming a fascia over the levators of the mandible, and encircling the orbit. A strong band is continued forwards, over the ascending process of the maxilla, to the alinasal cartilage of the chondrocranium.

The short premaxillz (Pmz.) are united suturally in the middle line, and have stout ascending processes, which become closely connected with the alinasal cartilages by means of oval nodules of cartilage adherent to their poste- rior surfaces. The long maxille unite with the premaxillz in front, and with the jugals behind: each sends up a short anterior ascending process towards the alinasal cartilage, with which it is united by ligament,? and further back, gives off a longer ascending process which becomes con- nected with the nasal bones. The palatine bones (/7/.) are straight, slender, and flattened. They lie transversely to the axis of the skull, behind the posterior nares, closely applied to the ventral surface of the sphen-cthmoid and of the antorbital processes of the chondrocranium. Externally they come into contact with the pterygoids and maxille ; internally and anteriorly with the vomers. Each pterygoid (/.) is a triradiate bone, with an anterior, an inner, and a posterior, or outer, ray. The first, or anterior, process of the pterygoid (Jt) is the longest, and lies, for a considerable distance, in contact with the maxilla, reaching forward to the outer extremity of the palatine. The second (P#) underlies the pedicle of the suspensorium, and comes into contact with the end of the transversely elongated, sub-auditory, portion of the para- sphenoid. The third, or posterior, process of the pterygoid (Pt*) is prolonged, in correspondence with the backward elongation of the suspensorium, along the inner side of which it lies, as far as the articulation of the mandible.*

The vomers (Vo.) are broad triangular plates of bone, with irregularly-notched outer edges, which are closely applied to the ventral surface of the sphen-ethmoid. Their inner edges are separated by a narrow interval, and each bears numerous teeth, set along a line which is not quite trans- verse to the axis of the skull. On the dorsal aspect of the skull two elongated flattened bones, united in a median suture, represent the coalesced frontal and parietals (/'r., Pa.), which are separate in the young frog. In front of these, also meeting in the middle line, are two triangular bones, the apices of which extend outwards to the ascend- ing processes of the maxille, and which roof over the nasal capsules (Va.) These correspond in position and relations with the nasal and so-called "prefrontal" bones of Sawrop- sida, and perhaps with the lachrymals: for brevity's sake, they may be termed nasals.

The parasphenoid has the form of a dagger with a very wide guard and short handle. The latter lies beneath the ventral junction of the exoccipitals, while the blade extends forwards, and its point underlies the posterior moiety of the sphen-ethmoid, but does not reach the vomers. The "guard" passes outwards on each side beneath the auditory capsules, and ends by an abruptly-truncated extremity, its anterior and external angle coming into relation with the inner process of the pterygoid.

The slender, permanently cartilaginous, hyoidean cornu (Hy.) passes into the cartilage of the auditory capsule on the ventral side, between the fenestra ovalis and the articu- lar surface for the inferior crus of the suspensorium. The fenestra ovalis lies in a cartilaginous interspace between the exoccipital and the pro-otic, and is filled by the oval

2 The small ossifications in this region, termed " cornets"' by Dugés, were absent in the skull figured.

i

A MPT A

cartilaginous stapes (S¢.) The anterior face of this pre- sents a concave facet, for articulation with a corresponding surface occupying the posterior half of the inner end of the columella auris (C. a.), the anterior half of which fits The columella auris itself consists of three portions—a middle elongated osseous rod, an inner swollen and enlarged cartilaginous part, which articulates partly with the pro-otic and partly with the stapes, and an outer portion, which is elongated at right angles to the rest, fixed into the tympanic membrane, and attached

into a fossa in the pro-otic bone.

by its dorsal end to the tegmen tympani.

The mandible presents one cartilaginous and three Of the latter, one, the " Mento-Meckelian " (Parker), is a short curved rod of bone, which unites with its fellow in the symphysis, and is,

osseous constituents on each side.

in fact, the ossified symphysial end of Meckel's cartilage, which extends thence through the length of the -ramus,

becoming thicker posteriorly, and furnishing the articular

surface for the quadrate. The second, and largest, bony constituent of the mandible is a long membrane bone, which ensheaths the inner and under region of the outer surface of Meckel's cartilage, rising at one part into a low coronoid process. It obviously represents the angular, coronary, and splenial elements, and may be termed the angulo-splenial (An.) A small dentary element, which bears no teeth, lies over the outer face of the anterior half of Meckel's cartilage,

The hyoidean apparatus of the adult frog (Fig. 8) pre- sents a body and two slender cornua. The body consists of a broad and thin squarish plate of cartilage, produced on each side into three processes, which may be called anterior, lateral, and posterior. 'The anterior process (a) is slender, curves outwards, and very soon divides in- to two processes,

one short, anterior, forming a loop by its ligamentary connection with the second, or pos- terior, branch, which passes into 4 the long and slender cornu of the &W~ : hyoid. The lateral process (b) passes Fre, 8—ventral view of the outwards and slightly dorsad—ex- "bent ee panding into a broad, hatchet-shaped terior processes; d, thyro- free extremity. The posterior pro- byals. cess © is a mere prolongation of the postero-lateral angles of the body of the hyoid. Finally, from the middle of the posterior margin of the body of the hyoid there project two strong bony rods, wider at the ends than in the middle, which embrace the larynx, and have been termed the thyro-hyals (d).

The parieto-frontals, nasals, premaxille, maxille, squa- mosals, palatines, pterygoids, and parasphenoid, the dentary and angulo-opercular bones, may be removed from the frog's skull without injury to the chondrocranium, the structure of which then becomes apparent (Fig. 9).

It furnishes a floor, side walls, and roof to the brain case, interrupted only by a large space (fontanelle), covered in by membrane, which lies in the interorbital region under the parieto-frontals; and by the foramina for the exit of the cranial nerves. It consists entirely of cartilage, except where the exoccipitals, the pro-otics, and the sphen-eth- moid invade its substance. In front of the septum of the anterior cavity of the sphen-ethmoid, it is continued for- ward, between the two nasal sacs, as the cartilaginous septum narium, from which are given off, dorsally and ven- trally, transverse ale of cartilage, which furnish a roof and a floor, respectively, to the nasal chamber. Of these, the floor is the wider. The dorsal and ventral ale pass into One another where the chondrocranium ends anteriorly, and give rise to a truncated terminal face, which is wide

from side to side, narrow from above downwards, and convex in the latter direction. The lateral] angles of this truncated face are produced outwards and forwards into two flattened prae-nasal processes (p. nl.); these widen ex- ternally, and end by free edges, which support the adjacent por- tions of the pre- maxille and maxille. From the ventral

face, just behind the truncated ante- rior end of the chondrocranium, spring two slen- der cartilages (7.p., 7-p.), Which do not seem to have been no- ticed hitherto. Each of these inclines towards the middle line, and ends against the middle of the posterior face of the ascending process of the premaxilla by a vertically elongated extremity. These may be termed the rhinal processes. An oval nodule of cartilage is attached to the posterior face of the dorsal end of the ascending process of the premaxilla, and serves to connect it with the alinasal process. On the dorsal face of the chondrocranium, just above the point ot attachinent of the rhinal processes, the external nasal aper- tures are situated, and the outer and posterior margins of each of these apertures is surrounded and supported by a curious curved process of the cartilaginous ala—the alinasal process (a.n.) Where the sphenoidal and the ethmoidal portions of the sphen-ethmoid meet, a stout, trans- verse, partly osseous and partly cartilaginous, bar (4.0.) is given off, which is perforated, at its origin, by the canal for the orbito-nasal nerve. It then narrows, but becoming flattened from above downwards, rapidly widens again, and its axe-head-like extremity abuts against the inner face of the maxilla. The anterior angle of the axe-head is free; the posterior angle is continued back into a slender cartilagin- ous rod, which bifurcates posteriorly ; theouterdivision passes into the ventral crus (c.v.) of the suspensorium, The inner (pd.) is the pedicle of the suspensorium already described.

Meckel's cartilage, articulated to the free end of the Suspensorium, is unossified throughout the greater part of its extent, no osseous articulare being developed ; but, at its symphysial end, each cartilage becomes ossified, and forms the "'mento-Meckelian" element of the mandible.

The slender cornu of the hyoid passes directly into the periotic cartilage immediately in front of, though below, the fenestra ovalis. It is unossified throughout its whole length.}

With many variations in detail, the skulls of the Anura in general are readily reducible to the type of that of the frog. In the Aglossa, which

differ so widely in many respects from the other Anwra, the cranium presents some notable peculiarities.

In Dactylethra® the skull is similar to that of the ordj- nary Anwra in general form, but the nasal region is small in proportion to the orbito-temporal space. The fronto- parietals are ankylosed together, and extend forwards as far as a line drawn along the anterior edge of the antorbital

F.07 Qu, Fie. 9—Chondrocranium of Rana esculenta—ventral aspect. 7p. the rhinal process; p.n.l, the preenasal pro- cesses; a.n. the alinasal processes, shown by the removal of part of the floor of the lcft nasal chamber; 4.0. the antorbital process; pd. the pedicle of the suspensorium continued into ¢.. the ventral crus of the suspen- sorium ; e.d. its dorsal crus; ¢.t. the tegmen tympani; S.#.the sphen-ethmoid; #.0. the exoccipitals; Qu.J. the quadratojugal. 1I. V. VI. foramina by which the optic, trigeminal and portio dura, and abducens nerves leave the skull.

? Compare Mr Parker's full account of the structure of. Rana tem- poraria, Philosophical Transactions, 1871. ? This description applies especially to D. levis

processes. Here they overlap avery singular bone, consist- ing of two broad ale, which lie between the anterior edge of the frontal and the external nares, and of a median portion which is continued forwards, as a narrow, flat, curved process, between the nasal chambers, being received into a sort of groove of the chondrocranium. The bone is readily raised up from the subjacent chondrocranium, of which it appears to be quite independent. At the outer end of each of its ale, and between the antorbital process and the nasal capsule, is a small, transversely elongated, slender bone, loosely connected by fibrous tissue with the foregoing. The ethmoid is completely cartilaginous. The paraspheu- oid has the ordinary sword shape, except that the " guard" is extremely short; but its point extends along the base of the skull, passing between the nasal sacs, underlying their septum, and

terminating close to the premaxille. The vomers are represented by a transversely elongated rhomboidal osseous plate, devoid of teeth, which lies be- tween the two posterior nasal apertures, and therefore much behind the anterior end of the parasphenoid. The side walls of the cranial cavity are ossified from the antor- bital process to the anterior boundary of the foramen for the fifth nerve, just in front of which they are pierced by the optic foramen. There is no palatine bone. The pterygoid, in the main, resembles that of the ordinary frogs ; but, in consequence of the shortness and little back- ward extension of the suspensorium, the outer process passes almost directly outwards, with hardly any back- ward inclination. A bony plate, which extends backwards from the posterior edge of the inner and outer branches of the pterygoid, underlies the tympanic cavity and the audi- tory capsule, and forms the floor of the Eustachian canal. The squamosal is a short broad bone, with a long anterior process, which becomes connected, by direct articulation, with the pterygoid, and by ligament with the maxilla. The premaxille are small, and the maxilla are connected merely by ligaments with the suspensorium, there being no jugal. The columella auris is remarkably strong, and is bent in the middle, so that its two halves form an obtuse angle; the anterior half lies against the inner face of the tympanic membrane. The posterior half runs parallel with the posterior edge of the tegmen tympani, towards the fenestra ovalis. Ligamentous fibres fix the columella firmly, though movably, to the superior margin of the tympanic cavity, where it is bounded by the squamosal. 'The stout car- tilaginous hyoidean cornua are attached just beneath the anterior and inferior part of the margin of the fenestra ovalis. The body of the hyoid is very small, but the two "thyro-hyals" are extremely long and broad cartilages. There is no ossified " mento-Meckelian" element.

In Pipa, the skull is extraordinarily depressed and broad. The nasal bones are wide, flat, triangular, and quite distinct from one another, a forward prolongation of the coalesced fronto-parietals extending between the two. The parasphenoid, very broad in the greater part of its ex- tent, and having the guard rudimentary, sends a narrow median process forwards underneath the nasal septum, as in Dactylethra. No trace of a vomer, or palatine bone, was to be found in the specimen

examined. The pterygoid is very like that of Dactylethra, but its inner branch is greatly prolonged, and the floor sent under the Eustachian tube unites much more closely with the produced exoccipital. The squamosal is very small, and the place of its zygomatic process is taken by ligament. This ligament, however, unites with the pterygoid in the same way as the bony process which answers to it in Dactylethra. The columella is less massive than in Dactylethra, and the end which abuts against the tympanic membrane is imbedded in a disk of sartilage. The occipital condyles look outwards and back- wards, instead of inwards and backwards, as in Dactylethra.

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The hyoidean cornua are wanting, the ttayrochyeila being large, but not so large proportionally as in Dactylethra.

The skulls of the URoDELA present a very interesting series of modifications, leading from a condition in which the cranium retains, throughout life, a strongly-marked embryonic character, up to a structure which closely ap- proximates that found in the Anura.

In Menobranchus, for example, the chondrocranium of the adult is in nearly the same state as that in which it

Figs. 10, 11, 12.—Lateral, dorsal, and ventral views of the eranium of MMeno- branchus lateralis. In the dorsal view, the bones are removed from the left half of the skull; in the ventral view, the parasphenoid, palato-pterygoid, and vomers are given in outline. The letters have, for the most part, the same signification as before. VII. p. posterior division of the seventh nerve; VII. chorda tympani; V!, V2, V°%, first, second, and third divisions of the tri- geminal; s.s./. stapedio-suspensorial ligament; h.s./. hyo-suspensorial ligament; m, h, i. mandibulo-hyoid ligament; a, ascending process of the suspensorium; p, pterygo-palatine process; g, quadrate process; 0, otic process; Wa. posterior nares; Jfck. Meckel's eartilage; Gl. (Fig. 10), the position of the glottis, Bb', Bb?, basibranchials.

exists in a young tadpole or larval salamander (Figs. 10,

11, 12).

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Instead of there being a well-developed cartilaginous

brain-case, interrupted only by a dorsal fontanelle, as in the frog, both the floor and roof of the cranial cavity are formed by merely fibrous tissue, which underlies the the parasphenoid ; and only its sides and its anterior end are bounded by

frontal and parietal bones, and overlies

cartilage.

The occipital region remains membranous in the middle line, both dorsally and ventrally, and exhibits, in the latter cartilaginous rods (7'r.), which bound the cranial cavity laterally, and represent the trabecule of the embryonic vertebrate skull, are separated by a wide oval spacc, which occupies the An- teriorly, they converge, and, just before they do so, give attachment to the slender antorbital processes (A. O.) which They then unite, and, be- coming applied together, coalesce into a flattened narrow mesethmoid, to the anterior extremity of which the pre- maxillary bones are applied. They give off neither alinasal nor subnasal processes, and therefore furnish neither roof Posteriorly, they become flattened from above downwards, and coalesce with the auditory capsules, and with the cartilage which extends be-

aspect, the remains of the notochord. The

whole length of the floor of the cranial chamber,

lie behind the posterior nares.

nor floor to the nasal chaniber.

neath these, and gives rise to the occipital condyles (Z. O.)

Each auditory capsule has a generally oval form, but is produced posteriorly, so as to give rise to a conical epiotic process (Hp. O.), which projects beyond the level of the occipital condyle. Fitted into the outer wall of each is the relatively large, conical, stapes, whence strong ligament- ous fibres proceed to the posterior face of the suspensorium.

Immediately in front of the auditory capsule, the suspen- sorium passes by a strong pedicle (shown, but not lettered in Fig. 12) into the trabecula, and then, directed outwards, downwards, and forwards, ends in the quadrate process (q), with which the dorsal end of Meckel's cartilage arti- culates. A large process (0) ascends from the posterior face of the suspensorium, and applies itself to the outer and anterior face of the auditory capsule. A small and hardly perceptible elevation (p) is seen near the quadrate process of the suspensorium. Finally, a flat process (a, Fig. 11) ascends above the pedicle, and applies itself to the dorsal face of the trabecula.

On comparing this with the suspensorium of the frog, it is clear that the rudimentary process (p) answers to the pterygoid cartilage ; and that the process 0 (the otic process) answers to the dorsal crus of the suspensorium. In fact, the posterior, or hyo-mandibular, branch of the seventh nerve passes back beneath this, and above the stapedial ligament, to its distribution.

The pedicle answers to the part so named (including the

ventral crus of the suspensorium) in the frog, though it retains the embryonic relations to the trabecula, such as exist in the tadpole. The ascending process (a) lies be- tween the orbito-nasal and the other branches of the trige- minal, the orbito-nasal passing between it and the trabecula. A similar process is very generally found in the Urodela (being particularly large, for example, in Menopoma), but appears to be represented only by fibrous tissue in .the Anura. _ Meckel's cartilage (Mck., Fig. 12) is thick and deep at its articular end, but, after furnishing a surface of attach- ment for the elevator muscles of the jaw, it rapidly narrows, and ends in a point, at some distance from the symphysis of the dentary bones.

_ The hyoidean apparatus (Fig. 13) is represented, on each side, by a cartilaginous rod, subdivided into a short hypo- hyal (H. h.) and long cerato-hyal (C. hk.) A strong ligament extends from the front face of the latter, below its frce s20mit, to the suspensorium, reaching this at the same

place as the stapedial ligament, into which it is continued. From a point a little above the attachment of this ligament, another ligamentous band arises, and, crossing the former, on the inner side of which it passes, becomes attached to the angle of the mandible. It answers to the inter- operculum of a fish, and has nearly the same relations as the stylo-maxillary ligament of the higher Vertebrata,

In the ventral median line, the hypo-hyals are connected only by fibrous tissue. Firmly united with this, however, there is a median Jirst basibranchial cartilage (Bd1), suc- ceeded by a second basibranchial (Bb), which is ossified, and is the only bony con- stituent of the hyo-branchial apparatus. There are only three branchial arches. The first consists of a stout and long cerato-branchial (Cb), bearing an equally well – deve- loped epibranchial £15 (pb). The second We is represented by @ Fie. 13.—Hyoid and branchial apparatus of Aeno-mere module of car- franehus Jeurais.. Hh. hyporhyal: Ch certo tilage (Cb?), with second basibranchial ; Ep.b}, Ep. b?, Ep.t8, first, which the expanded second, and third epibranchials: Gl. glottis. end of the second epibranchial (Zp.b”) articulates. The third and smallest epibranchial (Zp. 6) is articulated with the step-like broad end of the second. There is no trace of any fourth branchial arch, such as exists in tadpoles and in young salamanders; and in Siredon, Siren, Amphi-uma, and Menopoma.*

The most curiousfeaturein the bony skull, or osteo-cranium, of Menobranchus is the presence of the prominent conical ossifications which lie external to the exoccipitals, and occupy the place of the epiotic and opisthotic bones. In possessing these elements of the skull, in so large and distinct a form, Menobranchus differs from all Amphibia, save Proteus and the extinct Labyrinthodonts. The parietal

bones are sepa- rate from the frontals, and send, as is usual in the Urodela, a long process forwards on each side of the latter. In Menobranchus, this process is extremely long, reaching the olfactory foramen, the posterior margin of which it bounds. There are no nasal nor prefrontal bones, nor any distinct ali- sphenoidal, orbito-sphenoidal, or ethmoidal ossifications; of the maxilla, nothing but a rudiment appears, and this is sometimes absent. There are no jugal or quadrato-jugal ossifications. A palato-pterygoid plate, bearing teeth on its expanded palatine portion, extends from the antorbita] process to the inner face of the suspensorium, which, as stated above, has a mere tubercle in the place of a pterygoid process. The vomers are long, bear teeth along their outer edges, and diverge backwards so as to leave an interspace between their inner edges. Posteriorly, they articulate with the anterior ends of the palato-pterygoids.

The squamosal is a long, slender, curved bone, devoid of any zygomatic process, which extends from the articular end of the suspensorium, along its outer edge, to the outer side of the epiotic. From its posterior margin it sends down a short process over the stapedial ligament.

The parasphenoid is a broad thin plate of bone, which extends from near the junction of the vomers to the occipital foramen. The distal end of the suspensorium is incompletely ossified, as a quadrate bone 3 and a dentary and a splenial element, both dentigerous, lie, the former

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external to and below, the latter internal to, Meckel's cartilage.

The skull of Proteus is, in its general characters, similar to that of Menobranchus, but is more extensively ossified.

In Stren, the skull, which has the same elongated form and forwardly directed suspensoria as in Jfenobranchus and Proteus, possesses, in the epiotic region, two strong crests, which project backwards beyond

the level of the occipital condyles, but are otherwise very different from the epiotics of the latter genera. The " exoccipitals" and prootics are completely fused together, even in half-grown specimens, a mere rim of cartilage being left around the fenestra ovalis. The lateral walls of the skull present ossi- fications extending from the exits of the orbito-nasal nerves, forwards to the mesethmoid, or internasa] portion of the trabecule, and completely encircling the olfactory fora- mina. But these ossifications remain distinct for a con- siderable time, if they ever coalesce. Each, therefore, represents half of the sphen-ethmoid of the Frog.

The flat and wide parasphenoid extends forwards to the space left by the divergence of the vomers. On the roof of the skull, each broad parietal sends forward a pro- longation along the outer edge of the frontal, which reaches the antorbital process. The premaxille have very long ascending processes, which lie upon the mesethmoid, and are received between the ends of the froutal bones. Between these ascending processes one or two elongated ossifica- tions are situated. These were termed "'nasals" by Cuvier, but their position does not accord with this determination. The horizontal, or oral, portions of the premaxille, on the other hand, are very short and edentulous, each being coated by a thin plate of horny substance. The maxille are rudi- mentary or absent. The vomers are two, flat, oval, bony plates, the ventral aspect of which is beset with parallel rows of teeth set in obliquely-disposed curved lines, the con- vexities of the curves being turned inwards and backwards. The vomers are in contact anteriorly, but diverge posteriorly. The posterior extremity of each abuts upon a plate of similar form, but much smaller, and bearing fewer series of teeth, which lies on the ventral side of the origin of the antorbital process, and represents the palatine bone. The aperture of the posterior nares les just opposite, and ex- ternal to, the junction of these two bones.

The suspensorium is short, thick, and completely carti- laginous. Dorsally and internally, it is attached by a stout pedicle to the trabecula in front of the auditory capsule, while its dorsal and posterior face lies against the trun- cated anterior face of the pro-otic.

The angle formed where this face joins the outer face represents the otic process of Menobranchus. There is no pterygoid process, nor any trace of a pterygoid bone. Just above the suspensorium, and seemingly connected with it, there proceeds from the anterior face of the pro-otic region of the skull, a strong, triangular, forwardly-directed cartilaginous process. From the free anterior end of this, a band of fibrous tissue passes, and, encircling the eye, is attached to the antorbital process. The squamosal is a slender curved bone, extending from the epiotic ridge to the articular end of the suspensorium, where it is widest. It exhibits only a rudiment of the well-marked process which extends towards the stapes in Menobranchus and Proteus. The mandible presents a dentary, an angular, and a dentigerous splenial element ; and the proximal end of Meckel's cartilage is ossified, giving tise to a dense nodular articulare. The dentary is tooth- less, and supports the inferior horny beak.

The cornu of the hyoid is very stout, and its ventral moiety is ossified. The much thicker dorsal moiety is cartilaginous, and its recurved dorsal end extends beyond

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the cxtremity of the skull. At a considcrable distance below its apex, a strong short ligament proceeds from its anterior face to the stapes. A broad sheet of ligamentous fibres further unites the hyoid with the lateral walls of the ear capsule, and with the posterior face of the suspen- sorium (hyo-suspensorial ligament); and a slender ligament {mandibulo-hyoid) proceeds from near the insertion of the hyo-stapedial ligament to the angle of the mandible. There are two basibranchials, both ossified, the posterior ending in short radiating processes; two cerato-branchials and four epibranchials.

In Amphiuma, the suspensoria are very little inclined forwards, and their long axes make nearly a right angle with that of the skull. The portion of the skull which lies behind a line joining the articular ends of the ossa quadrata is very much shorter than the region in front of it. Moreover, although the epiotic processes are pro- minent, the occipital condyles project far beyond them, One bone represents the exoccipital,

epiotic, and opis- thotic on each side. The pro-otic is large, and gives rise to the anterior moiety of a strongly-marked temporal ridge. Its exposed surface presents two fosse, divided by a nearly vertical linear elevation. The large parietals form the posterior portion of the temporal ridge, and diverge anteriorly, to be continued forwards, on each side of the frontals, to the sphen-ethmoid. The frontals, in like man- ner, diverge in front to receive a median ossification, which is continuous with the coalesced median processes of the premaxille. The anterior half of each frontal is rugose, as are the exposed surfaces of the sphen-ethmoid and of the nasal bones, and the integument is firmly adherent to these rugosities. The nasals are broad and triangular. The truncated base of each lies over the nasal aperture ; the inner edge articulates with the ascending process of the pre- maxilla; the outer edge joins first the maxilla, and then the sphen-ethmoid. The premaxille are so thoroughly ankylosed that no trace of their primitive distinctness is to be seen. The large maxillz extend back for half the length of the skull, are firmly united with the adjacent bones, and are connected by dense ligament with the extremity of the quadrate bone. The greatly elongated vomers diverge but little ; nevertheless, they come in contact only by their anterior extremities. In the rest of their extent they are separated, in front, by a median ossification representing the anterior part of the sphen-ethmoid, and, behind, by the anterior forked prolongation of the parasphenoid which embraces this ossification. The rest of the parasphenoid is~ broad and flat ; it widens a little, in front of the auditory capsules, so as to form a rudiment of the "guard" in the frog's skull.

The osseous pterygoid is a curved plate of bone, convex inwards and concave outwards, which articulates posteriorly with the quadrate, and, in front, stops short, at little more than half the distance from its posterior end to the internal nostril. The cartilaginous pterygoid process of the sus- pensorium extends some way beyond it, and, widening, is attached by ligament to the maxilla. Posteriorly, the car- tilaginous pterygoid is traceable, as a comparatively narrow band, on the inner side of the bony pterygoid, to the pedicle of the suspensorium, which is attached in front of the fenestra ovalis, and above the rudimentary " guard" of the parasphenoid. An ascending

process passes from it be- tween the orbito-nasal and the other divisions of the trigeminal. The otic process of the suspensorium, which is articulated with the outer face of the auditory capsule, is cartilaginous; but the rest of the suspensorium is ossified as a quadrate bone. This is, as usual, clamped to the skull by the squamosal, which is broad and expanded above, and narrow below. Behind, the suspensorium is directly articu-

lated with the styliform projection of the centre of the A very strong hyo-suspensorial ligament passes trom near the distal end of the suspensorium to the cornu of

stapes.

the hyoid. The mandibulo-hyoid ligament is much weaker.

The hyoidean apparatus presents a median basi-hyal, con- nected by a rounded hypo-hyal on each side, with a long

and curved cerato-hyal, which is almost completely ossified.

The first basibranchial is elongated and cartilaginous—the second is absent. The first branchial arch is a single elon- gated bone, representing the similarly coalesced cerato-

branchial and epibranchial in Menopoma. The second cerato-branchial is small and cartilaginous. The three posterior epibranchials are simple curved cartilages ; and the single branchial cleft is placed between the third and fourth epibranchials.

The skulls of the four genera, Menobranchus, Proteus, Siren, and Amphiuma, now described, resemble one another, and differ from those of other Amphibia, in their elongated form ; and, especially, in the relative narrowness of the facial region in front of the orbits, which, as the case of Amphiuma shows, arises, not from any want of development of the maxillary bones, when they exist, but from their

taking a direction which but slightly diverges from paral- lelism with the axis of the skull. Moreover, they all possess well-marked epiotic prominences. Amphiuma differs widely from the other three, in the great size of its maxil- lary bones, in the absence of palatine bones, in the pro- jection of the occipital condyles beyond the epiotic pro- cesses, in the ankylosis of the premaxillz, in the presence of well-developed nasal bones, in the coalescence of the first cerato-branchial with the first epibranchial, and in the transverse direction of the suspensorium.

In most of those respects, in which Amphiuma differs from Menobranchus, Proteus, and Siren, it approaches the Salamanders ; especially if we take such forms as Anaides into account. On the other hand, in the entire absence of a palatine bone, and in the fusion of the first cerato-bran- chial with its epibranchial, it agrees with Jfenopoma and Cryptobranchus.

In Menopoma, the skull has a broadly-rounded snout, and its posterior contour slopes forwards and outwards (with- out being interrupted by conspicuous epiotic prominences), in the manner characteristic of the higher Urodela. The small pro-otics are separated from the exoccipitals (which also represent the epiotics and episthotics), by a wide car- tilaginous interspace, in which the fenestra ovalis is situated, The parietal sends a process forwards, along the outer edge of the frontal, between it and the orbito-sphenoid. This Meets a curved flat bone, which bounds the orbit anteriorly and internally, and articulates with an ascending process of the maxillary bone, It may therefore be regarded as a prefronto-lachrymal. The frontals unite in a long median suture, and then, diverging, embrace the nasal bones, and articulate externally with the fore part of the ascending process of the maxillary bone, which is thus received be. tween the frontal and the prefronto-iachrymal. The very broad parasphenoid extends from the exoccipitals to the vomers, with which it unites by a denticulated squamous suture. The wide vomers are united by a median suture, and expand in front, ending in arched edges, close behind which the teeth are set. The premaxillz are separate and small, articulate with the arched edges of the vomers. and send up strong ascending processes to the dorsal face

of the skull, where they firmly unite with the nasals. The Squamosal is a flattened prismatic bone, as broad at one end as at the other, which articulates with the parietal externally, and with the quadrate internally. Like the

suspensorium, which it covers, it stands out at right angles with the axis of the skull. 'There is no palatine bone. The pterygoid is broader and more square than in any other Amphibian, in consequence of the great expansion of its internal process, which articulates by its whole length with the parasphenoid. The anterior process ends in a free pointed cartilage, directed outwards and forwards, and united with the maxilla by ligament, as in the higher Urodela, The external process extends to the articular end of the quadrate, as usual, and is continued thence along the cartilaginous suspensorium to its attached end.

The chondrocranium forms a complete ring of cartilage round the occipital foramen, continuous at the sides with the auditory capsules. From these the trabeculze are con- tinued forwards, as in Alenobranchus, leaving a very wide ventral fontanelle. At the anterior end of this they unite and form the mesethmoid, from which roof and floor plates of the nasal capsules are continued. The suspensoriuim is connected by a pedicle with the trabecula, in front of the auditory capsule, and gives off a broad ascending process, which becomes ossified continuously with the pterygoid, over the orbito-nasal nerve, A stout otic process is articu- lated with a facet on the antero-external region of the periotic capsule, and is further connected with it by liga- mentous fibres. The quadrate ossification involves a small portion of the articular end of the suspensorium ; it thence extends upwards, on the dorsal aspect of the suspensorium, gradually becoming more slender, and nearly reaches the point at which the otic process of the suspensorium articu- lates with the periotic cartilage,

The osseous skull of Cryptobranchus is extremely like that of Menopoma.

In Menopoma the hyo-branchial apparatus presents the same general structure as that of Siredon, except that the second basibranchial seems to be wanting, while the first is very broad and rounded ; at the same time, the epi- branchial and the cerato-branchial of the first arch are represented by only one continuous cartilage.

In Cryptobranchus,! however, a considerable reduction has taken place, the two posterior pairs of branchial arches present in Afenopoma having disappeared. The second arch still presents a division into cerato-branchial and epibranchial, but the dorsal end of the latter is closely united with that of the preceding arch. It is interesting to observe, however, that the modification thus effected is quite different from that which occurs in the Salamanders, in which, in the adult state, the first branchial arch retains its two segments ; while the second, reduced to its cerato- branchial, is applied against the first, at the junction of the cerato- and epi-branchial; and the second basibranchial persists as the ossiculum thyroideum of Von Siebold.

Menopoma and Cryptobranchus further differ from the proper Salamanders in having the vomerine teeth disposed along the anterior edges of the expanded vomers. Unfor- tunately nothing is known of the larvze of these forms, but it would seem as if, in them, the primitive vomers enlarge by extension of ossification behind, and not in front of, the originally existent teeth.

In the remaining Urodela, the Salamanders proper, the skull has the broadly-arched snout and the shelving poste- rior contour of Menopoma, but the vomers and pterygoids are very different.

The structure of the skull in these animals will be best understood by commencing with that of Stredon, which, though perennobranchiate under ordinary circumstances, is totally unlike the other so-called Perennibranchiata in ee

1 See Hyrtl, " Cryptobranchus japonicus, Schediasma anatomicum," tab. iii.

cranial structure, and is, in fact, to all intents and purposes a larval Salamander.

An ossification on each side of the occipital foramen represents the exoccipitals, epiotics, and episthotics. In front of each of these is a pro-otic, and an orbito-sphenoid. The latter is sometimes united with its fellow of the opposite side.) The skull is roofed in by pairs of parietal, frontal, prefronto-lachrymal, and uasal bones. The maxille are short, and are united with the ends of the suspensorium only by fibrous tissue. There is a very broad and flat para- sphenoid, which extends from the inferior margin of the occipital foramen, and ends, anteriorly, by a wide, irregu- larly convex edge, which does not reach the vomers. The latter bones are elongated and curved, and their long axes diverge posteriorly, as in Menobranchus; but their auterior ends are far apart, and thcy lie, separated by the whole breadth of the parasphenoid, and between that bone and the premaxilla and maxilla, adherent to the ventral face of the subnasal process of the chondrocranium.

The short palatine bones are situated immediately be- hind, and on the inner side of, the posterior nares, but their somewhat tapering, external and posterior, ends do uot articulate directly with the pterygoids. The latter are triradiate bones, with an inner process which passes towards the base of the skull; an outer, which runs down the suspensorium; and a long anterior process, which gradually diminishes in breadth forwards, and is connected only by ligament with the palatine. Three ossifications embrace Meckel's cartilage. The dentary covers its outer face throughout its whole length. The angular lies on the inner face of its posterior two-thirds, and the small denti-gerous splcnial is also applied to its inner face between the angular and the dentary. The chondrocranium is in much the same condition as that of Afenopoma. There is a broad basicranial cartilage situated between the auditory capsules, and passing, at the sides and above, into a com- plete occipital arch. But, in front, the trabecule, though they have increased in vertical height, remain united by fibrous tissue only, both in the floor and in the roof of the skull, which thus presents two great "fontanelles" when the parasphenoid, pariectals, and frontals are removed, In front, they coalesce, each giving off, as it does

so, a flat antorbital process, which is expanded at its outer end, where it supports the maxilla, Below, this process gives attachment to the palatine. By their coalescence, the trabecule give rise to a broad internasal septum (or mesethmoid cartilage), and they expand, on each side, below, into subnasal plates, which are separated, anteriorly, by a wide notchin the middle line. The curved outer edges of these plates give attachment to the premaxillz and maxille, and they answer to the pre-nasal processes of the chondro- cranium of the frog. Between the posterior edge of each of these and the anterior edge of the corresponding ant- orbital process, the posterior nostril is situated; and the inferior surface of the subnasal plate gives attachment to the vomer. Superiorly, the mesethmoid cartilage expands into a very thin (alinasal) plate, which roofs in each nasal chamber, and supports the prcfronto-lachrymal and nasal bones.

The suspensorium is connected, above and internally, with the trabecula of its side by a pedicle; and it has an ascending process which lies over the orbito-nasal nerve (which is therefore included between the pedicle and the ascending process) immediately after its exit from the skull. Posteriorly and superiorly, it gives off an otic process, which is articulated with the outer and front

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a See Friedrich and Gegenbaur—‘ Der Schidel des Axolotl (Siredon pisciformis) in the Berichte der Koniglichen Zootomischen Anstalt eo Wiireburg, 1849, This memoir contains an excellent account of the chondrocranium of the Axolotl.

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part of the auditory capsule ; while, inferiorly and exter- nally, it furnishes an articular surface to the mandible. The pterygoid process has the form of a style tapering forwards, and nearly reaching the antorbital process, with which it is connected, however, only by ligamentous fibres.

The posterior moiety of Meckel’s cartilage is very stout as

far as the coronoid process, and then tapers rapidly to its free, pointed, symphysial extremity.

The hyoidean and branchial apparatus is entirely fibrous and cartilaginous, none of its parts having undergone ossification. Each cornu of the hyoid is connected with the upper and posterior face of the suspensorium, and with the angle of the mandible, by ligamentous fibres—the hyo- suspensorial aud mandibulo-suspensorial ligaments. The cornua are not subdivided, and are united in the median ventral line by ligament. A triangular first basibranchial extends back from their junction, and is succeeded by a second, as in Menobranchus; but this second basibranchial is not ossified. Two cerato-branchials are attached to the posterior extremity of the first basibranchial on each side, and the anterior is, as usual, followed by a long and strong epibranchial, which supports the anterior gill. The pos- terior cerato-branchial supports the second epibranchial directly, and the third and fourth epibranchials indirectly.

The interesting observations of Professor A. Duméril have shown that, under certain conditions, the ordinarily perenni-branchiate Siredon passes into the caduci-branchiate Amblystoma ; and this metamorphosis is accompanied by some very interesting modifications in the structure of the

cranium, especially in the vomerine, palatine, and pterygoid

regions. Ossification extends forwards from the vomers beneath the pree-nasal processes, so that the series of teeth, which originally lay along the anterior margins of these bones, come to be situated at their posterior edges. At the same time they take up a direction at right angles to the axis of the skull, instead of being greatly inclined to that axis, as they are in Siredon, and the two sets of vomerine teeth thus form a single transverse row. Moreover, the anterior process of the pterygoid moves outwards until it comes into contact with the inner facé of the maxilla. The one end of the palatine remaining attached to the vomer, the other swings outwards, in correspondence with the change of position of the pterygoid, and thus becomes directed transversely to the axis of the skull, immedi- ately behind the posterior

nostril, its teeth continuing the transverse line of the teeth of the vomers. Salamanders with the teeth thus disposed have been termed " lechrio- dont." The maxillary bones are larger than in Siredon, but the jugal arch remains ligamentous. The dorsal ends of the cornua of the hyoid retain their ligamentous connection with the suspensorium, and the ventral ends with the ante- rior basibranchial. The first cerato-branchial and epi- branchial persist, and retain their articulation with one another. The second cerato-branchial remains, but its dorsal or outer end becomes attached to the preceding, and all the three posterior epibranchials disappear. The second basibranchial becomes detached as a Y-shaped piece, which lies in the middle line, in front of the larynx.

In all the other Salamanders, the vomers, in the adult, present the same enlargement of the part in front of the teeth, at the expense of the region behind them, as in Amblystoma. But the teeth rarely offer the same dis- position. More commonly they form two series, inclined to one another at a more or less acute angle, open forwards, and supported upon bony plates, which appear like pro- longations of the vomers, extending backwards on the ven- tral face of the parasphenoid. This " mecodont" arrange- ment is strikingly exemplified by Salamandra maculosa, and still more remarkably by Plethodon and Anaides, where these longitudinal series of teeth beneath the parasphenoid

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are commonly termed "sphenoidal" teeth. Dugés} and other observers, however, have shown that, in larval Sala- mandre and Tritones, the vomerine and palato-pterygoid apparatus have, at first, the same disposition as in Stredon , and Dugés has described the process by which the palatine bones, becoming detached from the pterygoids, which rotate outwards, ankylose with the vomers, taking up a posi- tion beneath the parasphenoid, and more or legs parallel with the axis of the skull; and it can hardly be doubted that the so-called " sphenoidal " dentigerous plates of other genera of Salamandrida have the same origin. If this conclusion be correct, it indicates a very

curious morpho- logical difference between the “mecodont” and “ lechrio- dont” Salamandrida.

In all the Salamandrida the parietal bones send long processes forwards on each side of the frontals, The parasphenoid is a broad flat plate. Very often the pre- maxillz are ankylosed into one bone, and the bones of the periotic capsule coalesce. In some cases there are epiotic processes or ridges. Maxille are always present, and the snout is usually broadly arched. Nasal bones, distinct from the prefronto-lachrymals, are usually present.

In the genus Anaides the skull is comparatively long and narrow, and the muzzle is less arched than usual. The single premaxilla, and the two well-developed max- ill, follow the semicircular curve of the broad subnasal plates, to the edges of which they are attached. The hinder free extremities of the maxillx are curved upwards, and the jugal arch is represented only by ligament. Thus far the skull is salamandrine; as it is also in the pre- sence of distinct nasal and prefronto-lachrymal bones, in the disposition of the vomerine and so-called “ sphenoidal ” teeth, in the absence of an apparent palatine bone, and in the manner in which the pterygoid is produced into a long process, which becomes connected with the inner face of the maxilla. But, in the well-marked downward and for- ward inclination of the suspensorium, and in the strong crests into which the epiotic processes are developed, the skull of Anaides is very like that of Siren.

occipital condyles are continued into two ossifications, which rise on to the roof of the skull, where they unite in a short suture, and, spreading out so as to embrace the parietals, are continued over the auditory apparatus, as far as the squamosal and the quadrate bones. Ventrally, no indica- tion of any suture between these bones and the broad parasphenoid is visible; laterally, they pass forward into a continuous ossification, which constitutes the side walls of the auditory capsule, and, in front of this, is perforated by the wide foramen for the trigeminal nerve, and enters largely into the lateral wall of the cranial cavity. The parietal bone rests on the dorsal edge of this lateral ossifica- tion, which terminates, anteriorly, by an irregularly exca-

vated border, between which and the posterior margin of the sphen-ethmoid the cranial wall is unossified. Through- out its whole extent, this large ossification, which repre- sents the exoccipitals, the elements of the periotic capsule, and the alisphenoids, is firmly ankylosed with the para- sphenoid. There isa well-developed sphen-ethmoid, similar in its general characters to that of the frog. It is very closely united, if not ankylosed, with the vomers and pre- maxilla. The roof of the skull is completed by two parietals, two frontals, and two large nasals, which unite in a long suture, except in front, where, for a short distance, they are separated by the ascending processes of the pre-maxille. The dentigerous oral processes of these bones are short, and unite by suture with the maxillw. These send up broad plates which lie in front of and below the orbit, on the sides of the face. The canal for the suborbital tentacle perforates the maxilla in front of the orbit. Pos-teriorly, the maxilla unites with the squamosal, which is a broad plate firmly fixed to the quadrate, but somewhat loosely united with the frontal and parietal and with the complex occipito-otic bone. A small crescentic post-orbital bone (denoted by 1 in Fig. 14) articulates with the maxil- lary and squamosal, and with another bone (2), which answers very nearly to the prefrontal of a reptile. Be- tween the nasal bone and the premaxilla, above and below, and the maxilla behind, a small bone (3) is fitted. The quadrate bone is represented by the ossification of the distal end of the suspensorium, which is inclined a little backwards. The stapes is large and well ossified. Two distinct ossifications, an angulo-articular and a dentary, are discernible in the mandible ; and the second short row of teeth, inside those of the dentary, seems to indicate the existence of a splenial element.

In the skull of Zpicrium glutinosum (Fig. 14), which may be selected as an example of the PrRoMELA, the strong

In the Lasyrinrnoponta the skull presents the ex- tremes of form which are met with among the Amphibia, from the elongation observable in Archegosaurus, to the short and broad form of Metopias and Brachyops. The chief characters by which the labyrinthodont cranium differs from that of its existing allies are the following —~

The occipital condyles in some genera remained long, if not permanently, cartilaginous; and one or two supra- occipital ossifications (probably membrane bones) very generally occur. The epiotics are prominent, and appear to remain permanently separate from the adjacent bones, In front of them, and articulated with the outer edges of the parietal and frontal, are two bones, which are commonly identified with the "squamosal" and " post-frontal" of the higher Vertebrata. The " post-frontal" articulates anteriorly with a large " prefrontal" bone, which bounds the dorsal and anterior contour of the orbit. The outer edges of the "squamosal" and "post-frontal" articulate with two bones, termed the " post-orbital" and the " supra- temporal." The post-orbital lies in front of the other, and contributes to the posterior margin of the orbit,—the rest of the contour of which, between the post-orbital and the prefrontal, is usually completed by a large jugal. Articu-

Fig, 1s-—The skull of Epicrium glutinosum. A, dorsal; B, ventral; C, lateral, view. The letters have the same signification as before.

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Recherches, pp. 172, 173, pl. xiv. fig. 89. Rusconi, Observations natomiques sur la Stréne, pl. vi. figs. 3 and 10,

lated, dorsally and internally, with the '"supra-temporal," and, anteriorly, with the jugal, is a " quadrato-jugal," which sometimes extends into the articular surface for the lower jaw, and in some cases, at any rate, overlaid a quadrate ossification. There are long paired nasals, between the antcrior ends of which the ascending processes of the premaxillz: are received; and between these bones, the unusually long maxilla, and the prefrontals, distinet 'lach- rymal" ossifications, occur.

The vomcrs are large, meet in a long median suture, and bear teeth. The palatine bones, also dentigerous, bound the posterior nares in front, and are elongated antero-posteriorly.

The mandible presents a dentary (probably including a splenial) element, an angular and an articular ossification.

Those surfaces of the cranial bones which were covered by the skin are usually rugose, and sculptured much in the same way as those of the crocodiles, and they fre- quently present symmetrically-disposed grooves, the so- called '" mucous canals," which, very probably, lodged sen- sory apparatuses resembling the similarly-named struc- tures in fishes—the homologues of which are found in existing Urodela.

The hyoid is unknown, and what appear to be traces of a branchial apparatus have been observed only in young specimens of Archegosaurus. Hence it is probable, not only that no known Labyrinthodonts were perennibranchiate, but that the air-breathing condition supervened early in the course of their development.

The Labyrinthodonts doubtless possessed a well-developed chondrocranium, but such a structure would necessarily perish in the course of fossilisation. The singular resem- blance of the labyrinthodont skull to that of the Peromela, in the arrangement of the bones which bound the cavity of the mouth, and the disposition of the teeth upon them, suggests a comparison of the other cranial bones in the two groups. Starting from the nasals of Hpicriwm, which may be safely identified with those of the Labyrinthodonts, the bone marked (2) in Hpicriwm corresponds very closely with the labyrinthodont " prefrontal ;" and that numbered (1), with the " post-orbital." No. 3 in Lpicriwm, in some respects answers to the so-called "lachrymal" of the Laby- rinthodonts ; while the maxilla of the Cecilian may be taken to represent both maxilla and jugal of the Laby- rinthodont. ' But if this be so, the squamosal of Hpicrium corresponds with the supra- temporal of the Labyrinthodont; and a question arises as to the true nature of the "squa- mosal" and " post-frontal" of the latter.?

The Integumentary Organs.—In all reeent Amphibia, the integument is remarkable for the great abundance of simple: follicular glands which arc distributed through it, and are sometimes all of one kind (¢9., Proteus), though in other cases two sorts of such glands can be distinguished (Rana) In many Anura and Urodela these glandular structures attain a greater complication of structure, espe- cially near the angle of the jaw, and constitute what are termed the "parotoid" glands. In some cases, the secre- tion of these glands is extremely acrid and irritating. In some Urodela (Proteus and Stredon), and in the tadpole, the epidermis becomes modified in relation with the termina- tion of sensory nerves, in thc head and along the body, in the region of the nerve of the lateral line, and gives rise to sensory organs of the same nature as those which are found

u On the structure of the skull, as of whatever else is known of the organisation of the Labyrinthodonts, the reader will find full, ex- cellently arranged, and well-digested information in the " Report of the Committee of the British Association on the Labyrinthodonts of the a Measures," drawn up by Mr Miall, British Association Reports,

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in the lateral line and the so-called mucous sacs and canals of fishes."

In a few Anura, ossification takes place in the dorsal integument, and this process may go so far as to give rise to bony plates, which may become closely connected with the spines of the subjacent vertebrae (Brachycephalus, Ceratophrys). In the majority of the Peromeda, oval, cycloid,

| scales are imbeddcd in the transverse folds of the integu-

ment, and constitute another point of resemblance between the members of this group and the Labyrinthodonts. But the rows of scales are not confined to the ventral surface, and the scales themselves differ in structure from those of the Labyrinthodonts.

In the Urodela and Anura, the epidermis is periodically exuviated.

The Alimentary Organs.—The teeth of the recent Amphibia vary a good deal inform. In the Urodela, they are usually conical and pointed; frequently more or less curved; some- times, as in Anaides, lancet-shaped. Siren has the surfaces of the vomers and palatines covered with parallel series of small dents en brosse. In Ceratophrys, the bases of the teeth are slightly grooved longitudinally. In

Teeth may be developed upon the premaxille and maxille, the palatines, and the dentary and the splenial elements of the mandible; but they do not occur else- where,—the so-called sphenoidal teeth of some Salaman- ders being really borne, as has been seen, on the peculiarly modified palatines.

The buccal cavity is usually spacious, and the widely- separated posterior nares open into the anterior part of it. In the lower Urodela, the branchial clefts lie at the sides of the pharynx, and the median aperture of the glottis is situated far back. In the Urodela, and some Anura, there are no Eustachian passages ; but, in most Anura, these pas- sages have the form of wide recesses leading out of the pharynx. In Pipa and Dactylethra alone, the "recesses" are converted into Eustachian "tubes," which open by a common median aperture ; this is relatively wider in Dacty- lethra. Two grooves in the mucous membrane of the roof of the mouth pass from the Eustachian to the posterior nasal apertures, and enclose a lyratc space, in these genera.

The tongue is rudimentary in the lower Urodela; but, in the Salamanders, it may be free, fleshy, and even mush- room-shaped. In Pipa. and Dactylethra, no trace of a tongue is to be observed. In Rana, as in most Anura, the anterior end of the tongue is comparatively small and little elevated above the mucous membrane of the floor of the mouth, but the posterior end is produced into a free fleshy mass, bifurcated at its extremity. It is this free end which is thrown forward in the act of prehension, the tongue turning on its anterior end as on a hinge. Rhinophrynus

2 Recherches sur les organs sensitifs, qui se trouvent dans Vepderme du Protée et deV Axzolotl, by E. Bugnion. Lausanne, 1878.

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is the only Anuran in which the anterior end of the tongue alone is free,

In the males of many Anura the mucous membrane of the mouth is produced outwards, on each side, between the mandible and the hyoid, into a sac, which becomes filled with air, and gives rise to a conspicuous projection of the integument of the throat. In some cases these two sacs coalesce into one,

Salivary glands have not been discovered in any Amphibia.

Except in the Peromela, the gullet is short. It passes into an elongated stomach, the long axis of which coincides with that of the body in the Urodela and Peromela, but becomes oblique, or transverse, in the Anura. The in- testine is never very long, and, consequently, its convolu- tions are few and simple. 'There is always a marked distinction between the small and the large intestine. The latter opens into a cloaca, which receives the ducts of the urinary and genital apparatus. The stomach and intestine are enclosed in peritoneum, and suspended to the roof of the abdominal cavity by a mesenteric fold. The liver is always provided with a gall-bladder. It is distinctly bi-lobed in most Anwura ; and, in Pipa and Dactylethra, the two lobes are completely separate, the gall-bladder being attached to the right lobe. In the Peromela, the liver has an exceptional form, being divided into a great number of small lobes, arranged in a longitudinal series so as to over- lap one another.

A pancreas is always present; in Rana, it is small, and its glandular substance surrounds the hepatic duct. The spleen, enclosed in the mesentery, is elongated in the Urodela and Peromela, rounded in the Anura,

but sometimes, as

The Organs of Circulation.—The heart is contained within a pericardium, the walls of which generally exhibit numerous _scat- tered pigment cells, and though delicate in the fresh state, are apt to become tough andalmost «| \ pergainentaceous in spirit speci- mens. The heart (if we apply that name to the whole apparatus enclosed within the pericardium, except the venz cave), presents a series of five segments, to which, enumera- ting them from behind forwards, the following terms may be applied:—1, The sinus venosus ; 2, the atrium ; 3, the ventriculus; 4, the pylangium (from wuddv, a gateway, and dyyeiov, a vessel) ; and 5, the synangium. Atrium here denotes the auricular division of the heart, comprising the right and left auricles. Pylangium and synangium, together, are the equivalents of that portion of the heart which lies between the ventricle and the anterior wall of the pericardium, and which has been variously named bulbus, cavus, and truncus, artervosus.

These five segments of the heart are so arranged, that the sinus and atrium lie on the dorsal and posterior aspect of the organ, while the others occupy its ventral and anterior region. Viewed sideways, in fact, the heart has the shape

Fig. 15.—The heart of Seredon mericanus. Lateral view of the heart contained within the pericardium, the left wall of the sinus venosus and of the auricles being removed; S. sinus venosus; /.v.c. inferior vena cava; I. s. v. c. left superior vena cava; L.A. left auricle; fh. A. right auricle; Spt. septum anriculorum; VY. ventricle; 7. a. truncus arteriosus; 1, 2, 3, 4, the aortic arches. The arrow traverses the sinu-auricular aperture. The auriculo-ventricular aperture lies to the right of the arch formed by the free edge of the septum.

of a =, of which the sinus and atrium occupy the upper and the other segments the lower half. But it also always presents,

more or less, a z lateral flexure, : between its an- terior and poste- rior points of adherence to the middle line of the _pericar- dium; so that,

viewed from above, it ap- proximates the form of an N, of which the right half is repre- sented by the synangium, py- v

langium, and Fic. 16.—Ventral view of the same heart contained in the

a pericardium. 2&.3.v.c, right superior vena cava. The ventricle, and pylangium laid open to show the two transverse rows the left half by

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*of valves, V1, V2. The commencement of the synan- the * trium and gium (Sg.), cut across.*

sinus. The pylangium, in fact, always arises from the right side of the ventricle, while a large part of the atrium

aud of the sinus very often lies to the left of the ventricle, the auriculo-ventricu- Ta.

lar aperture of the ven- tricle looking to the left side and forwards.

There is an interest- ing difference to be observed in the relative position of these seg- ments of the heart in the lower and the higher Amphibia. In Stredon, for example, the greater part of the sinus lies completely behind the ventricle, and the sinu-auricular aperture is situated on the posterior face of the atrium, on a level with the posterior part of the ventricle; but, in the Frogs, the sinus lies altogether above the ventricle, without sensibly projecting behind it, and the sinu- auricular opening lies in the dorsal face of the atrium, in front of the level of the auriculo- ventricular aperture. In other words, the seg- ments of the heart have a less marked vertical flexure in the lower, than in the higher Am- phibia, and more nearly approach the condition of the embryonic heart. In correspondence with this, the superior cave traverse the pericardium to enter the sinus near its posterior end in Stredon, but about its middle in the Frog.

The stnus venosus is a thin walled sac, which is relatively largest in the lower Amphibia and smallest in the Frogs, Anteriorly, it usually

receives, on each side, one of the two superior vene cave ; posteriorly, the single vena cava

L.sv.c.

A

Pv.

Fig. 17.—Posterior view of the same heart, re- moved from the pericardium; P.v. pulmonary vein.

Fie. 18.—The atrium of the same heart laid open and its walls sprcad out, so as to show the opening of the pulmonary vein, P.v., and the sinu-auricular aperture, S.a@

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inferior opens into it. But, in some cases (as in Meno- branchus and Pipa, according to Meyer) the inferior vena cava divides in-

totwobranches, .\~ opr each of which ; ; coalesces with the superior — vena cava of its sidebefore open- ing into the sinus. Thesupe-

rior cave may eke aaa

open into the Ve 5 ’ : Fra. 19.—The Heart of Rana esculenia.—Lateral view of the SLs immedi heart contained within the pericardium. (The heart has ately after they been carefully drawn to scale én situ, and the parts shown d by dissection put in as if the organ were transparent.)

have traverse S sinus venosus; /.c. inferior vena cava; S.v.c.l. left

he

Fe:

the pericardi- superior cava; S.v.cr. opening of the right superior _ eava; P.V. pulinonary vein (its dotted contour is scen um, as 1 Meno-

through the left superior cava); c, style introduced into é the pulmonary vein and passing into the left auricle;

branchus ; Of, Pp y T &

6, style introduced into the sinu-auricular aperture and passing into the right auricle (#.4.), where its end is visible to the right of the septum, Spt. Ve. ventricular cavity. Za. truncus arteriosus. Ao. aortic arch; a, ligament passing from the wall of the pericardium to the ventricle,

they may be short trunks, as inthe Frogs; or, as in Stredon and the Salamanders, the right cava may be long and the left short.

The sinu-auricular aperture, by which the sinus and the right auricle communicate, is small, relatively to the size of these two cavities, and ! hasan ovalform. Its lips may be slightly prolonged towards the cavity of the auricle, but do not give rise to very de- finite sinu – auricular valves.

The auricular seg- ment of the heart, or atrium, is always more or less bi-lobed, the truncus arteriosus being embraced by the two lobes, one of which projects on its right side and the other on the left. The right and left lobes are equal in Proteus ; both lobes are large and sacculated in Stren ; in Menobranchus, the left lobe seems to be large, in Lpicriwm, the right ; but many of these differences are pro- bably accidental. In the Bullfrog (Rana pipiens) the two lobes of the atrial segment of the heart com- pletely envelop the truncus arteriosus, and become united together by fibrous tissue, which connects their walls on the ventral side of the truncus. The atrium is usually divided into two cavities, of which the left is smaller than the right, by a septum, which ex- Fie.21.—The heart of Rana esculenta, view- tends from the left wall of webs fieeuiasome 9 aie Ae the atrium towards the R.p.v. left and right pulmonary veins. auriculo-ventricular aperture. The cavity of the auricular seginent thus becomes divided into a smaller, left, auricle, which lies behind and to the left of the septum, and a larger, right, auricle, to the right and in front of the

Fra. 20.— Ventral view of the heart of Rana escu- lenta, obtained in the same way. A style is passed through the aperture which leads from the ventricle into the pylanginm; JZ.A. left auricle; Ao. Ao}. aortic urches; #.s.v. ¢. right, and L.s. v.c. left superior cava.

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septum. In the Frogs, the septum auriculorum is a com- plete partition, containing muscular fibres, and the septal © branches, with their ganglia, of the cardiac nerves of the pneumogastric. It divides the auriculo-ventricu – lar aperture, pass- ing from one au- riculo – ventricular valve to the other, and ending be- tween them by a free edge, which might almost be said to lie in the cavity of the ven- tricle (Fig. 23). In Lissotriton punctatus, and in

Stredon, the sep-

tum still com- F1¢ 22.—The left auricle of the builfrog (Ranu piptens} 2 a laid open in such a manner as to show the septum

plete, ends in the with its nerves (n) and ganglia (g), and the manner ° in which it descends upon the free surfaces of the

cavity of the au- auriculo-ventricular valves, V1, V%. P.v. opening of

ricular segment by

a free edge, which

the pulmonary vein; JZ.s.v.c. left superior vena cava; V. ventricular cavity. arches over the auriculo-ventricular aperture. In Meno- branchus, the septum is reduced to little more than a wide-meshed network of branched muscular bands, and, in Proteus, the existence of a septum is doubtful.

The auriculo-ventricular aperture is always situated at the left side of the posterior end of the auricular segment, where the latter joins the ventricle. In Rana esculenta and pipiens it possesses distinct, though

short, membrane- ous valves, the free edges of which, directed towards the ventricular cavity, are kept down by fine tendinous filaments.

The common trunk, formed by the union of the two pulmonary veins, runs over the dorsal wall of the seus venosus, passes between the two superior cavee, and, usually dilating, opens into the cavity of the left auricle, close to the sinu-auricular aperture; and, in fact, separated from it only by the septum, which continues the direction of the right wall of the pulmonary vein.

The ventricular segment always has thick walls and a comparatively small cavity, which lies in the anterior half or base of the ventricle, and takes a direction from left to right, or from the auriculo-ventricular aperture to that of the truncus arteriosus. In consequence of the loose and spongy texture of the greater part of the thickness of the ventricular wall, it must be recollected that its apparent cavity by no means represents its capacity.

The truncus arteriosus of Menobranchus is subcylindrical, in that half which is nearest the ventricle, but, in the other half, has a dilated and ovoid form. The latter, in reality, consists of the origins of the aortic arches, closely united together (synangiwm), while the former subdivision is the gateway between the ventricle and the great vessels, or the pylangium. It presents two transverse rows of semilunar valves, three in each row; the lower or posterior row being close to the opening of communication between the pylan- gium and the ventricle, while the other row is near the anterior end of the pylangium.

In Stredon (Figs. 15 and 16)there is the same division into a.pylangium proper and a large oval bulb-like synangium, formed by the united aortic arches. Three valves in a transverse row are situated at each end of the pylangium. An oblique ridge projects from the dorsal wall of the pylangium, beginning low on the left side, and gradually increasing in size, until it passes into the dorsal valve of the anterior row. There is a small space in front of the anterior row of valves, into which projects the posterior,

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free end of an oblique, but nearly horizontal septum, which ' divides the cavity of the synangium. From this thick parti- tion thinner septa radiate to the walls of the synangium, which they thus divide into five longitudinal canals, of which that which lies to the right is twice as large as any of the others. In fact, it also becomes subdivided, further forwards, by a longitudinal septum, and then there are six canals answering to the six aortic arches which spring from the synangium, where it reaches the anterior end of the pericardium. According to Hyrtl's account, the pylan- gium of Cryptobranchus has a very similar structure; but the synangium is completely split into two trunks, each of which contains three canals,

This leads to the structure of the truncus arteriosus observed in the Frogs, which consists almost wholly of the pylangium. Three thick semilunar valves are placed at the ventricular end of this – re- gion, and three others, also of un- equal dimensions, at its synangial end. A longitudi- nal ridge, with a rounded, free, ven- tral edge, projects from the dorsal wall of the py- langium. It is thicker anteriorly than posteriorly, and is directed obliquely, so that its anterior end passes into the right anterior valve, while its posterior extre- mity is close to the left posterior valve. The ante- rior valves of the pylangium (v?) are much larger than the posterior valves ; and, of the three anterior valves, that which lies on the dorsal side is the smallest. Imme- diately beyond it is situated the aperture (p), which leads into the pulmonary trunks. In front of the pulmonary aperture is a wide cavity, whence the two great aortic trunks (do, do!) spring. A tongue-lke projection springs from the dorsal wall, and divides the cavity imperfectly. On the ventral side of. the base of this tongue are the two open- ings (Ca) which lead into the carotid trunks. The three trunks—carotid, aortic, and pulmonary—pass out of the pericardium together, so closely united that they appear one. It is only at some distance beyond the pericardium that they separate,—the anterior ending in the rete mirabile, which has received the name of the "carotid gland ;" the middle becoming the arch of the aorta ; the posterior, the pulmo-cutaneous artery.

_ In the Peromela (e.g. Epwrium), singular peculiarities (Fig. 24), moved back to a distance which is relatively far greater than in any other Amphibia and in most lizards, N ext, it is extremely elongated, and the truncus arteriosus is relatively nlore prolonged than any other part of the heart. But es

? The structure of the heart in the Amphibia has been recently dis-

cussed with great ability, by M. Armand Sabatier in his Hiudes sur le cwur, Montpellier, 1873,

Fig. 23.—The heart of Rana pipiens. The ventricle (V.), the truncus arteriosus, and the aortic trunks (Ao.) are laid open from the ventral] side. Spt. free edge of the septum auriculorum; v!, semilunar valves at the ventricular end of the pylangium ; v2. valves at its synangial eud; S, the septum of the pylangium ; p, the aperture of the pulmonary trunks; Ca, the apertures of the carotid trunks.

the heart presents many In the first place, it is

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the relative proportions of the pylangium and synangium are the reverse of those which obtain in the Anura. The two transverse rows of valves which mark the boundaries of the pylangium are situated close to one another, near the origin of the truncus, all the rest of which is made up of the synangium. A longitudinal partition, at first, divides the cavity of the synangium into two unequal passages; but, towards its anterior end, it contains four equal canals. Having reached the anterior extremity of the pericardium, the synangium divides, and the two pairs of canals become independent, but closely united, trunks, which run, on each side of the trachea, to about the level of the glottis. Here the two trunks join, and pass into the single arch of the aorta, which turns sharply back beneath the vertebral column, The carotid

artery is given off from the junction of the two trunks with the single dorsal aortic arch, Shortly before the two trunks join, that upon the dorsal side gives off the pulmon- ary artery. A single pulmonary vein opens into the left auricle; and it is worthy of notice, that the auricles and sinus are situated as far forwards on the dorsal aspect of the heart as in the Frogs.

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As regards the number and destination of the great vessels which arise from the synangium, great differences obtain in the — different groups of the Amphibia.

In the perennibranchiate Urodela, each of the three, or four, branchial arches has its appropriate aortic trunk, which springs mediately, or immediately, from the synan- gium. The three anterior aortic trunks supply the gills, but are not wholly distri- buted to them; so that the trunks which unite to form the dorsal aorta are derived partly from the gills and partly come di- rectly from the ventralaorta. The anterior – aortic arch gives off, on its ventral side, a hyomandibular artery to the walls of the oral cavity, which appears to represent the remains of the hyoidean and mandibular aortic arches, while, dorsally, it supplies the internal carotid. The pulmonary artery is given off from the fourth aortic arch, or from the common trunk, which is formed by the union of this with those which pre- cede it.

In Cryptobranchus, according to Hyrtl,

Fic. 24.—Ventral view of the head and trunk of Z£pi- crium glutinosum. Mn. mandible; Hy. hyoid; Br!, Br2, Br?, branchial arches; Gl. glottis; 7r. trachea; f.v.c. inferior

three trunks are given off on cach side from pute? a, berets . . = e : eanee the synangium. The most anterior cor Lsvc, right and left

responds with the hyomandibular artery of the perennibranchiate forms. The second belongs to the first branchial arch. It gives off no branch, but unites with the third and largest vessel to form a common trunk, which unites with its fellow beneath the vertebral column, and gives rise to the dorsal aorta. The posterior aortic arch gives off the pulmonary artery (which supplies a branch to the alimentary canal). From the common trunk a maxillary and an internal curotid artery are supplied ; while a third branch passes to the ventral side of the atlas, and, turning backwards, passes between the transverse process of the second and succeeding vertcbre as a collateral vertebral artery.

In Salamandra, there are four aortic arches. The most anterior of these belongs to the first branchial arch. It gives off a hyoman- dibular branch, then breaks up into a rete mirabile, whence the internal carotid artery is continued, and is connected by a mere ductus Botalli with the second arch. The second and third arches give off no branches; but, along with the slender ductus Botalli of the fourth arch, coalesce into the trunk which unites with its fellow to form the dorsal aorta. The fourth arch gives off the

superior cave, Zu. trun- cus arteriosus; Ao. left aortic arch; PA. right pulmonary artery. The pericardium dightly shaded) extends as far as the bifurcation of the synangium.

a

pulmonary artery, and a smaller dorsal cutaneous branch (Hyrtl). The pulmonary artery gives twigs to the stomach.

It is clear that the posterior trunk of Cryptobranchus repre- sents the seeond, third, and fourth aortie arches of Salamandra; and that the first aortie arch of Salamandra answers to the first and second trunks whieh spring fron the synangium of Cryptobranehus.

In the Anwra there are apparently only two aortic arehes; but, as has already been observed, each of them is divided into three eanals. The

anterior eanal ends in a rete mirabile, whenee the internal carotid artery proceeds, and it gives off the hyomandibular or lingual artery. It therefore answers to the first areh of the Salamanders. Thesecond or middle eanal is the largest, and passes into a trunk which runs along the sides of the gullet; and curving backwards, unites with that of the opposite side in the dorsal aorta. The third canal ends in a trunk which divides into the pulmonary , and the great eutancous arteries, which latter is distributed to the dorsal integument. It answers to the third and fourth arches

in the Salamanders.

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Fira. 25,—The heart, great arterial trunks, and the adjacent principal nerves of Rana esculenta, drawn to scale. The positions of the auditory capsule (Aw), Eustachian tube (£u.), and hyoidean cornu (/y.), are indicated diagram- matically. Z, root of the left Inng; S.V. sinus venosus; ¢é. ventricle; Aw. auricle; 7r. A. truncus arteriosus; C.G. carotid gland; ig. lingual artery; Cr. carotid artery; Oph. ophthalmic artery. 2. Left arch of the aorta, pass- ing through the muscular diaphragm to the aorta (Ao.) beneath; tr. a7. the transverse process of the third vertebra, br. the brachial artery. 3. Pulmo- cutaneous artery; ct. its cutaneous, p. its pulmonary division. Nerves:—V}, V2, V3, first, second, and third divisions of the trigeminal; Vile, V11p, anterior and posterior divisions of the portio dura; 1X., the glossopharyngeal ; X}, the cutaneous branch of the vagus; X?, the visceral trunk, giving off X3, the cardiac, X5, the pulmonic, and X®, the gastric branches; X‘, the laryngeal branch. Sp.J. the first spinal (hypoglossal) nerve; Sp.J/. the cut trunk of the second spinal nerve.

In the Peromela (Epicrium) the two aortie trunks whieh spring from the truncus arteriosus would seem to eorrespond with the seeond and third of the frog, the first having beeome absorbed into the second.

This is a point which ean be cleared up satisfactorily only by the study of development; but it is obvious that the heart and its arehes have undergone greater changes in this group than in any of the others.

With respeet to the venous system, it is worthy of notice that the blood returning from the hinder part of the body and the pos- terior extremities is, in part, carried to the kidneys, and in part poured into a vein whieh runs in the anterior wall of the abdominal eavity,—the anterior abdominal vein. Of the branches in whieh this vein terminates anteriorly, one communicates with the portal vein, and one is distributed to the liver direetly. In the Anura, venous radieles in the integument eovering the back of the head and shoulders, unite to form a great cutaneous vein, which passes baekwards, perforates the external oblique muscle, and then turn- ing abruptly forwards, ends in the subelavian vein. This vein carries away a large part of the blood of the cutaneous artery, which aeeompanies it in a great part of its course.

The lymphatic system has been most carefully studied in the frog, where it consists of (1.)widely-distributed lymphatic capillaries, andsinuses which ensheath the blood-vessels ; (2.) subcutaneous lymph sacs; (3.) a large subvertebral cisterna, enclosed between the diverging lamellze of the mesentery, and placed in communication with the peritoneal cavity by minute openings or stomata; (4.) four lymph hearts, two situated close to the transverse process of the third ver- tebra and two at the sides of the coccygeal style. These

hearts pump the lymph into the adjacent veins. As the two pairs of lymph hearts have been discovered in Z'riton and Salamandra as well as in Fana, it is probable that they are present in the Urodela generally. No Amphibia possess lymphatic glands.

The Thymus gland in the Urodela lies behind the angle of the mandible (Zriton, Salamandra), or close to the dorsal ends of the branchial arches (Proteus, Menobranchus, Siredon, Amphiuma, Menopoma). In the Peromela it has the same position as in the abranchiate Urodela. In the tadpole the thymus occupies a place similar to that which it possesses in the branchiate Urodela. In the adult frog it is to be found

just behind the suspensorium. The Thyroid gland, usually double, but single (according to Leydig) in Proteus, always lies in the immediate vicinity of the lingual vessels.1

The Respiratory Organs.—The glottis in the Amphibia is situated in the middle line of the floor of the pharynx.

| In the perennibranchiate Urodela, it is a very small longi-

tudinal slit leading into a narrow passage, which widens into a chamber into which the elongated pulmonary sacs open. The Urodela and the Peromela present mere car- tilaginous rudiments of a larynx; but, in the Anwra, this structure attains a great development, and becomes the instrument of the powerful voice with which many of these animals are provided. 'The larynx is lodged in the angle between the two thyro-hyals, with which it is closely con- nected. The chief part of the larynx is an annular cricoid cartilage, with which two arytenoid cartilages are articu- lated. Membranous folds, or freely projecting cartilagin- ous processes of the arytenoid cartilages (Pipa), play the part of vocal ligaments. In Pipa the larynx is extensively ossified. In Proteus, the lungs are long tubes, dilated at their posterior blind ends, and fixed to the dorsal walls of the abdominal cavity by folds of the peritoneum, In 7riton they are somewhat wider sacs, but, in both, the inner sur- faces of the pulmonary sacs are smooth. In Siren and Salamandra, the walls of the sacs become cellular, and in Amphiuma, Menopoma, Cryptobranchus, and the Anura, the cellulation acquires a considerable development.

In Amphiuma, Menopoma, Cryptobranchus, and in the Peromela, there is a distinct trachea, which is of great length in the Peromela. In Pipa and Dactylethra there is no trachea, but each lung is connected with the laryngeal cavity by a bronchus.

The Renal Organs.—The. kidney is a more or less elongated organ—longer in the Urodela and Peromela, shorter in the Anwra—which lies on each side of the vertebral column, its posterior end being close to, or even extending back on the dorsal side of, the cloaca.

In the female the efferent ducts of each kidney unite into a longer or shorter common trunk, which appears always to open into the cloaca by an aperture distinct from. that of the oviduct, though the contrary statement is very generally received.2, In Mana esculenta, there can be no doubt as to the distinctness of the minute urimary apertures from the large and conspicuous oviducal openings, close to which they are situated. Hyrtl says of Crypto- branchus—'"Ureter .. . . super latera cloacee descendens in collum allantoidis exoneratur" (op. cit., p. 84).

In the male Amphibia, on the other hand, there is a longer or shorter duct common to both the renal and the genital products, which opeus into the cloaca. In the Urodela, the duct is continued forwards along the outer side of the kidney to the anterior end of the ab-

1 See Leydig, Anatomseh-histologische Untersuchungen sber Fische und Reptilien, 1853.

2 See, for example, Stannius, Handbuch der Amphibien, pp. 250, 251. On the other side, comp. Milne-Edwards, Lecons, t. vii. p. 336.

dominal cavity, and clearly Tepresents the Wolffian duct of the embryo. Both the urinary tubuli and the vasa eferentia of the testis open into this duct, In Crypto- hranchus the kidney is divided by a constriction into two portions—a slender, anterior, and a much thicker and longer, posterior, division. From the latter the efferent urinary canals proceed, and, curving outwards and back- wards, join the posterior part of the Wolffian duct. The former is traversed by the vasa eferentia of the testes, which pass from its outer edge to the anterior portion of the Wolffian duct, so that it resembles an epididymis,

In Proteus, according to Leydig, the anterior end of the Wolffian duct is infundibuliform and open ; the vasa effer- entia of the testes open into the anterior moiety of the duct, the renal ducts, into its posterior moiety. The numerous arcuated renal ducts of the Salamanders and Tritons unite together, and open into the Wolffian duct near its cloacal ed. The Wolffian duct persists in Bombinator agneus and Disco-

glossus pictus® ; but, in most Anura, it becomes obliterated for the greater part of its extent, and the same canals serve to convey both the urinary and the spermatic fluids to the persistent cloacal end of the Wolffian duct, which ordinarily receives the name of ureter. The urinary bladder is always large, and is often bifurcated anteriorly,

Cryptobrauchus ; but sections of the brain are needful before the actual absence of the chiasma can be considered to be satisfactorily proved.

3. The oculomotor nerve remains distinct from the trigeminal in most Amphibia, but its branch to the superior rectus muscle appears to coalesce with the orbito-nasal division of the fifth in Salamandra terrestris (Fischer),

4. The pathetic nerve remains distinct in Stredon and Cryptobranchus, and in the Anura; but in Salamandra ter- restris, Fischer found that the Superior oblique muscle was supplied by a branch from the orbito-nasal, with which, therefore, the pathetic had probably coalesced.

5. The trigeminal gives rise, as usual, to a Gasserian ganglion ; and this ganglion remains distinct from that of the seventh nerve in all the Urodela, though united with it by a commissural band, which appears to answer to the nervus petrosus superficialis minor of the higher Vertebrata. In the Anura, on the contrary, the two ganglia are closely approximated (Pelobates, Bombinator), or confounded together (Rana, Hyla, Bufo) in the adult, though they are distinct in the tadpole. The orbito-nasal, or first division of the trigeminal, is always separated from the second and third divisions by the ascending process of the suspen- sorium, when this structure is present. It supplies the j tentacles of the Peromela, In the tadpole, and in some Urodela, a cutaneous branch to the dorsum of the head is given off from the fifth,*

6. The abducens is distinct from the trigeminal in Sala- mandra and Bufo, but coalesces with the Gasserian gan- glion in Rana, Pipa, and most Anura.

7 and 8. The portio dura and portio mollis arise by a common trunk, from which the portio dura soon separates, and either forms a distinct ganglion, as in the Urodela and Peromela, or fuses with the trigeminal.

9. The ganglion of the glossopharyngeal nerve appears. to coalesce with that of the vagus, and the roots of the two nerves pass out of the same foramen in all the Amphibia except Siren, where, according to Fischer (op. cit., p.147), the nerve leaves the skull by a distinct aperture, close in front of that for the pneumogastric, and forms a ganglion of its own.

10, The vagus or Ppueumogastric, in the perennibranchiate Amphibia, supplies the second and third branchia, and the cucullaris muscle ; gives off cutaneous, laryngeal, cardiac, pulmonic, and gastric branches, and sometimes as many as three cutaneous branches, one of which tuns along the junction of the dorsal and ventral muscles to the hinder part of the body. These lateral nerves of the pheumo- gastric exist also in MU enopoma, Amphiuma, and Triton, and in tadpoles ; but appear to be absent in Salamandra ter- restris and in the adult Anura (Fischer, dc.) These, however, possess a cutaneous branch of the vagus, which accompanies the cutaneous branch of the pulmo-cutaneous | artery, and is distributed more or less widely to the dorsal integument of the head and trunk.

Fischer considers that a fine nerve, arising lower down than the vagus, and distributed to the abductors of the head in Pipa, is to be regarded as an accessorius, But, seeing that, in the Amphibia generally, the motor nerves of the larynx, and, where a cucullaris exists, the nerves of that muscle also, are supplied from the pneumogastric, the question of the presence or absence of an accessorius seems to reduce itself to this: Does the pnheumogastric receive nerve fibres arising from the sides of the medulla oblongata and spinal cord between the roots of the spinal nerves ? And, as it certainly does not, the accessorius, as it exists in the higher Vertebrata, must be admitted to be absent in Amphibia.

The Nervous System.—The amphibian brain is remark- able for the rudimentary condition of the cerebellum, which has the form of a mere band arching over the anterior part of the fourth ventricle. The mesencephalon is divided above, more or less distinctly, into two optic lobes. The cerebral hemispheres are always relatively large, subcylin- drical in the Urodela, but wider behind than in front in the Anura, and they are generally closely united together by their inner faces,

Ten pairs of cranial nerves are always found—viz,, 1, The olfactory ; 2, optic ; 3, oculomotor; 4, pathetic; 5, trigeminal ; 6, abducens ; 7, portio dura; 8, auditory ; 9, glossopharyngeal ; 10, pneumogastric. The hypoglossal is always an extra-cranial nerve.

1. The olfactory is usually a rounded cord, not dilated at its anterior end. Fischer has observed it to arise by two roots in Pipa.

2. The optic nerves are attached, as usual, to the floor of the thalamencephalon. Fischer? found no chiasma in Stredon or Menobranchus. Dr Humphrey found none in

t Schmidt, Goddard, and Van der Hoeven, Aanteckningen over de Anatomie van den Cryptobranchus japonicus,

2 According to Von Wittich. "Beitrage zur morphologischen und his- Weg : . tologischen Entwickelung der Harn und Geschlechtswerkzeuge der nack- In most Amp habia, the first cervical nerve has the dis-

ten Amphibien," Zeitschrift fir We ussenschafiliche Zoologie, bd. iv. " =

« Anatomische Abhandlungen, p. 123, e seg. J According to Stannius, Handbuch, p. 150.

tribution of the hypoglossal; in Menobranchus, however, the corresponding uervous supply is furnished by the second and third cervical nerves,—-the first spinal nerve, in this genus, perforating the

sides of the body of the atlas, and being distributed to a muscle which passes from this vertebra to the occiput (Fischer, lc. p. 158). In Pipa the hypoglossal is furnished by the second cervical nerve; in Salamandra, by the first and second. — There is no trace of any suboccipital nerve in the Amphibia ; and as, in the absence of this nerve, the first spinal would appear to answer to the second cervical of the higher Verte- brata, the fact that it takes the place of the hypoglossal becomes very perplexing.

In the Anura (Rana) the sympathetic is represented by a double chain of ganglia, situated at the sides of the aorta, and receiving branches from the anterior divisions of the spinal nerves. It appears to be continued in the skull by commissural cords which pass forwards on the inner side of the auditory capsule, and connect the ganglion of the vagus with that of the trigenzinal.

The Organs of the Higher Senses.—The nasal sacs are elongated in Proteus, Menobranchus, and Stren, and not covered by nasal bones or alinasal cartilages. In the other Amphibia they are broader, and enclosed by cranial carti- lages and ossifications. The olfactory mucous membrane is variously folded; and, in Rana, some of these folds are supported by ingrowths of the anterior cartilaginous wall of the nasal chamber.

In Proteus the eye is completely hidden by the continua- tion of the unaltered integument over it, and the organ of vision is almost as much obscured in the Peromela. In the other perennibrancluate Urodela, and in Pipa, the in- tegument covering the eye forms a transparent cornea, but -there are no eyelids. The abranchiate Urodela have au upper and a lower lid; and, in the higher Anwra, the lower lid becomes transparent, and is usually regarded as a membrana nictitans, as it is provided with a peculiar motor apparatus. In the Aznura, the eye possesses not only the ordinary four rect muscles and the two obligut, but there is a retractor bulb. The Frogs and probably other Anuru, possess a Harderian gland; but no lachrymal gland has been observed. The sclerotic may be chondrified, but it is not ossified There is no pecten.

With regard to the organ of hearing, the membranous labyrinth is enclosed between the pro-otic bone, in front, and the representatives of the opisthotic and epiotic (usually confounded with the exoccipital), behind. The fenestra ovalis always occupies a space in the line of junction of the pro- otic with the posterior ossification, whether it be occupied by a broad unossified space, as in Menopoma, or the twa bones be ankylosed together, as in Stren, Triton, and old Frogs. The stapes is more or less ossified, and its outer face is frequently provided with a styliform appendage, in the Urodela. In the Urodela (which have no tympanic cavity), a ligament passes from the stapes to the suspensorium, and there is no columella awris. The like absence of columella auris and of a tympanum obtains in several Anura. Dugés states that the columella is wanting in Bombinator and Pelobates! (Recherches, p. 41), and the absence of the colw- mella auris, as of the tympanum and Eustachian tubes, has since been noticed in Telmatobius, Phryniscus, Atelopus varius, and Brachycephalus ephippium (Stannius, op. cit., p. 61). In the higher Anwra, there is a complete tym- panum, with Eustachian tubes, and a columella auris, which extends from the stapes to the membrana tympani. The tympanic membrane is either quite similar to the rest

1 : ‘ : Pelobates, however, has an extremely minute, ossified, columella auris,

of the integument or markedly different from it. In some genera (eg. ana), the tympanic membrane is set in a frame of cartilage. In Pipa and Dactylethra, the Eusta- chian tubes, as already remarked, have a common opening, and the columella is very peculiar. Recent investigations make it probable that the Amphibia possess a rudimentary cochlea. Whether the opening, which in the Frogs has been described as a fenestra rotunda, is really of that nature, is doubtful.

The Reproductive Organs.—The ovaria and testes are attached to the dorsal wall of the abdominal cavity, in the immediate vicinity of the

kidneys, by the mesoarial and mesorchial folds ofthe peritoneum, which invest them.

The ovaria, when fully developed, become hollow, and in the Anura their internal cavities may be divided by septa.

The oviducts are long, usually more or less convoluted, tubes, which open posteriorly into the cloaca; while, ante- riorly, their funnel-shaped apertures lie in the anterior part of the abdomen, sometimes, as in the Frogs, as far forward as the root of the lung. Their walls are glandular, and secrete a viscid substance which invests the ova in their passage down the oviduct.

In the male Urodela, the persistent Wolffian duct, al- ready mentioned, occupies the position of the oviduct in the female, and the vasa efferentia, after traversing the kidney, open into it. This duct persists in Bombinator igneus and Discoglossus pictus ; but in the male Anwra, in general, the greater part of it is obliterated, only so much remaining as plays the part of ureter and vas deferens. In the Urodela accessory glands open into the cloaca, and in Triton there is a rudimentary copulatory papilla. Some female Urodela are provided with receptacula seminis. In the terrestrial Salamanders and in the anurous Rhinoderma Gayt the young are developed within the dilated uterine terminations of the oviducts. In Pipa the eggs are deposited on the back of the female, and the integument grows up round each, and encloses it in a cell, in which it undergoes its development. In some tree-frogs (ototrema and Opis- thodelphys) the eggs are received into a sort of marsupial ° pouch formed by an up-growth of the margins of the dorsal integument, which, when complete, has a small posterior aper- ture. On the other hand, it is the male Alytes obstetricans which twists the strings of eggs laid by the female round his hind-legs, and, thus cross-gartered, retires into seclusion until the young are ready to be hatched, when he resorts to the water in which the tadpoles are to perform their further metamorphoses.

Development of the Amphibia.—The yelk of the ovum undergoes complete division, in which respect the Amphibia agree with the Pharyngobranchit, Marsipobranchit, and Mammatia, and differ from

other Vertebrata; though it must be remembered that the process of yelk division in the Ganoidei and Dipnoi is not yet known.

Except in some viviparous species, the embryo, when hatched, is pisciform and apodal; and three pairs of external gills, which become more or less branched, are developed from the first, second, and third branchial arehes. 1n the larval Z'riton a very singular elongated appendage makes its appearance on each side of the hcad, in front of the branchiz ;? and in the tadpole two eminences of the ventral integument, with glandular terminal faces, are developed—one on each side of the middle line, behind the mouth. The larve of Dactylethra have two long tentacles attached near the angle of the mouth. An opercular fold of the integument grows back from each hyoidean arch, and the two are connected by a free fold of the sub-gular integument. The limbs make their appearance as buds from the sides of the body, the anterior pair appearing first. The anterior limbs attain a considerable size before the posterior pair are developed in Triton; but, in the Frogs, the posterior limbs grow mueh faster than the antcrior, which long remain inconspicuous and hidden.

In the Urodele larve, teeth are very early developed in the pre-maxillary, maxillary, vomerine, palatine, splenial, and dentary

2 See Hasse, Die vergleichende Anatomie des hautigen Gehvrorganes, Leipsic, 1873. ® The larval Siredon has no sueh hyoidean (?) appendage.

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phibia is world-wide, but the different groups are very remarkably

regions ; and, indced, in 7'riton and Stredon, the tceth precede the corresponding bones, which arise by the ossification of the mucous membrane about the bases of the teeth ; and there are no labial cartilages, and no horny labial papilla, or beak-like armature of the jaw. The abdomen is slender, in accordance with the brevity of the intestine, and the little animal is altogether carnivorous.

In the dnwra, on the other hand, teeth are not developed until a later stage. A pair of cartilages appcar in the roof of the mouth in front of the ends of the trabecule (“rostraux supérieurs, ’ Dugés ; ‘Supper labials,” Parker), and another pair opposite them (“‘rostraua inférieurs,” Duges ; ‘lower labials,” Parker) ; and the epithelium of the mucous membrane covering them becomes con- verted into an upper and a lower brown horny toothed plate, having seme reseniblance to the beaks of a Chelonian. The curtain-like lips, which surround the oral aperture, are also beset with horny papille, which call to mind the corneous teeth of the Marsipo- branchii. The abdomen is swollen and almost globular, and lodges a long and spirally-coiled intestine. The animal is herbivorous, though it does not despise animal food, even in the shape of the weaker members of its own family.

The space allotted to this article does not allow the details of the

development of the Amphibia to be even sketched ; but attention may be directed to one or two of the more important points.

The skull presents some singular differences in the course of its development in the Urodela (Triton, Siredon) and the Anura (Rana, Alytes) respectively. In the former, the mandibular and trabecular

arches become connected only at their dorsal ends, by the pedicle of

the mandibular arch ; the pterygoid arch is developed late; and the mandibular arch appears to give rise to no orbital process. In the latter, the mandibular and trabecular arches not only unite at their dorsal ends by the pedicle, but, at a very early period, the mandi- bular arch is united with the antorbital process of the trabecula ; and the pterygoid grows pari passu with the subsequent divergence of the mandibular and the trabecular arches. A large orbital pro- cess is developed from the mandibular arch.

In the Urodela, the hyoidean and branchial apparatus consists, at first, of elongated cartilaginous hyoidean cornua, united with a median chondrification, which represents the basihyal and _basi- branchial pieces, to which last two cerato-branchials are attached. The first

cerato-branchial is continued dorsally into the first epibranchial, while the second cerato-branchial supports the other three epibranchials. As the development of the 7'riton procceds, the hyoidean arch becomes connected with the suspensoriuin, and with the stapes, by ligament. The second hasi-branchial ossifies,

detaches itself from the first, and lies as a forked bone in front of

the larynx ; and only the two ccrato-branchials, with the first epi-branchial, remain—the rest of the branchial apparatus disappearing.

In the Anwra, the hyoidean arches are, at an early period, very thick, and relatively short, and are articulated with the suspensoria. A relatively broad and short cartilage represents the basihyal and basibranchial, and at the sides of this are two very broad cartilages, which correspond with the two ccrato-branchials, inasmuch as their dorsal edges bear the four epibranchia] cartilages. As the tadpole

grows older, the hyo-branchial apparatus becomes more like that of

the Urodele larva, the hyoid arch elon ating into a slender rod, and the two cerato-branchials becoming eit The basibranchial region of the median cartilage, which unites the cerato-branchials ventrally, becomes forked, and the processes which form the fork ossify and become the thyro-hyals, which therefore would seem to correspond with the os ypstloides of the Urodela. Finally, the extreme dorsal end of the hyoidean arch detaches itsclf from the suspensorium, and enters into close union with the periotic capsule, from the outer wall of which the columella auris is developed.

The Distribution of the Amphibia. —Darwin has pointed out (Origin of Species, p. 350) that Amphibia are met with on no islands but New Zealand, New Caledonia, the Andaman Islands, and perhaps the Solomon Islands and the Seychelles. " This general absence of frogs, toads, and newts in so many true oceanic islands cannot be accounted for by their physical conditions; indeed, it seems that these are peculiarly fitted for those animals, for frogs have been introduced into Madeira, the Azores, and Mauritius, and have multiplied so as to

become a nuisance. But as these animals and their spawn are immediately killed (with the exception, so far as is known, of one Indian species) by sea-water, there would be great difficulty in their transportal across the sea, and therefore we can see why they do not exist in strictly oceanic islands."

Leaving the oceanic islands aside, the distribution of the Am-

a

' See the Memoirs of Dugts and Parker, already cited, for the details of these metamorphoses. The account given by Mr Parker of the modifications of the dorsal extremity of the hyoidean arch, how- ever, does not accord with the results of the present writer's later Investigations. No coalescence of the hyoidean with the mandibular arch takes place; and the " supra-hyo-mandibular" has nothing to do with the columella auris,

localised.

The Urodela, for example, are limited not only to the arctogeal province, but to the temperate parts of that province ; and, in curi- ous correspondence with the Ganoid fishes, their headquarters are in North America. Siren, Menobranchus, Amphiuma, Menopoma, Dicamptodon, Heredia, Anatdcs, Desmognathus, Batrachoscps, Hemi-dactylus, and Plethodon are exclusively North American ; and the majority of specics of Amblystoma and Spelerpes appertain to that region, —Amblystoma being represented in North Asia, and Spelerpes in the circum-Mediterranean area. Triton alone is spread over the whole temperate arctogral area. Salamandra, Pleurodeles, Bradybates, Chroglossa, and Salamandrina are confined to Kurope and North Africa. The singular Salamandra atra is limited to the Swiss and Austrian Alps, Proteus to Carniola and Carinthia. Four genera— Ellipsoglossa, Isodactylium, Onychodactylus, and Ranodon— are confined to North Asia; and Cryptobranchus, if it be a distinct genus, is limited to Japan.

If the distribution of the Urodela calls to mind that of the Ganoid fishes, that of the Peromela is rather comparable to the distribution of the Tapirs. Of the four genera, Siphonops and Rhinatrema are exclusively inhabitants of the hotter part of the Austro-Columbian province—as are the great number of the species of Cecilia; but the remaining species of that genus are East Indian, and Epicrinm is confined to Java and Ceylon.

In strong contrast with the foregoing, the Anura? are of world- Wide distribution, being abundantly represented in all the great provinces. A great preponderance of the genera and species, how- ever, are Austro-Columbian, the Anura having their headquarters in South America, as markedly as the Urodela have theirs in the northern division of that continent. North America, in fact, is poor in Anura, having only three peculiar genera, viz., Scaphiopus, Acris, and Pseudacris; while the rest of northern Arctogea has five, viz., Pelodytes, Discoglossus, Alytes, Pelobates, and Bombinator.

The genus Rana itself, however, is characteristically arctogeal, having only a single species in the Mexican border-land of Austro- Columbia, and none in Australia. Rana esculenta extends from France to China and Japan, and from North Europe to Tunis. Rana temporaria covers even a larger area, as it occurs in the British Islands and in North America, as well as in North Asia and Japan.

The Austro-Columbian region not only presents the greatest number of species, but among them are some of the most singular forms, such as Psendis, Ceratophrys, Brachycephalus, Lthinoderma, Engystoma, Otilophus, Nototrema, Opisthodelphys, Rhinophrynus, and Pipa ;in which respect the South Amcrican Anura run parallel with the birds of the same region. And, as is seen in other cases, the nearest allies of many of these singular forms are to be found in Ultra-Saharal (Athiopic) Africa, e. g., Hemisus (Brachycephalus), Breviceps (Engystoma), Dactylethra (Pipa). It is remarkable that. Pseudophryne, which is closely allied with the Aithiopic Hemisus and the Austro-Columbian Brachycephalus; and Chelydobatrachus, which is similarly

related to the Aithiopic Breviceps and the Austro- Columbian Engystoma, are Australian.

The Australian region is remarkable for the absence of the genera Rana aud Bufo, which occur everywhere elsc ; and for the occurrence of Cystignathus, which is an Austro-Columbian, North American, and Aithiopian form, but does not occur in India. If it were not for its tree-frogs, Australia would be poorer in Anura than Europe is,

These Anwra, modified for arboreal life, or " tree-frogs," are represented in all the distributional provinces—the genus Hyla having its chief seat in Austro-Columbia, and extending thence over North America, Europe, North Africa, Western and Eastern Asia, and Australia, but not into India or Ultra-Saharal Africa, in which other forms of the same group are met with.

The British Islands possess the following species of Amphibia : ~-Rana temporaria, Bufo vulgaris, B. calamita, Triton cristatus, 7'. Bibronit, Iissotriton punctatus, L. palmipes.

Geological Distribution.—No fossil Peromela are known. Anura occur in the Miocene deposits of France and Germany. The best preserved forms belong to the gencra Palcobatrachus and Latonia, and occur in the schists of Gningen along with their tadpoles. They possess maxillary teeth, and present no iniportant differences from existing Anura, cxcept that, in Palcobatrachius, the sacral vertebra has coalesced with the two preceding vertebre, while, in existing forms, only one of the pre-sacral vertebra ig known to become confluent with the sacral. Urodela also occur in the same Miocene deposits. Of these the famous Andrias Scheuchzert is very closely allied to Alenopoma and Cryptobranchus, while other forms appear to be generically identical with Triton and Salamandra. The singular genus Orthophysis presents a good deal of resemblance to Proteus, but appears to have possessed no limbs.

The older Cainozoic and the upper and middle Mesozoic forma- tions have yielded no Amphibia. A doubtful form, Rhinosaurus,

? See Dr Giinther's valuable Catalogue of the Batrachia sahentia.

occurs in the Lias of Simbirsk. In the earlicst Mcsozoic deposits—the Trias,—and in the later Paleozoic—the Permian and the Carboniferous formations, Amphibia occur, sometimes in great abundance. In the Trias, they have been found in greatest numbers in Germany, while the Carboniferous formations have furnished the largest supply in the British Islands, Germany, and North America, It is inter- esting to observe that the last-named region has recently yielded elongated apodal forms, allied to the Ophiderpeton of the Kilkenny eoal measures.

Attiology of the Amphibia.—In taking a gencral survey of the relations of the different great divisions of the Amphibia, the most striking fact is their singular distinctness and isolation from one another. None of the Peromela present the slightest indication of an approximation towards the Anura or the Urodela. : ;

It may be suggested that the incompletencss of the jugal areh in Breviceps, Pipa, and Dactylcthra; the absence or rudimentary condition of the palatine bones in Breviceps, Bombinator, and Alytes; the rudimentary condition of the tympanum, and the absence, or reduction to a rudiment, of the columella auris, in so many forms ; the presence of rudimentary ribs attached to some of the anterior vertebrae of Bombinator and Alytes; the presenee of mandibular teeth in Hemiphractus and Grypiscus; and the peculiar spermatozoa of Bombinator, are so many indications of an approach towards the type of structure observed in the higher Urodela.

But, without underestimating the force of these considerations, it must be admitted that they count for very little, when we take into eonsideration the fixity of the number of the vertebre, and of the eharacters of the pelvis and of the limbs, in the Anura.

It is to be regretted that nothing is known of the development of any of the Peromela; of any of the Urodela, except Salamandra, Triton, and Stredon (Amblystoma) ; and of more than a few of the Anura. Among the lower forms of this division, the development of Alytes and Pelobates has been studied thoroughly by Vogt! and Van Bambeke ; and the more advanced conditions of the tadpole of Dactylethra are known. So far as these observations go, however, they tend to show that the larve of all the 4nura possess the horny beak, which distinguishes them from those of the Urodcla.*

If we assume, as the fundamental similarities between the different divisions of the Amphibia lead us to do, that they have resulted from the modification of some one primitive form, the problem, at present seemingly insoluble, presents itself, whether these differ- enccs in structure and habit of the larvee of the Urodela and Anura indicate that the caudate ancestor of the Anwra was already different from the ancestor of the Urodela, or whether they result from modi- fieations which have taken place in the larve of the Anura, since that group came into existence.

In view of this problem, Siren possesses a particular interest. Its horny jaw-sheaths might be compared to those of the Anuran tad- pole, and it might be regarded as showing the way by which the Anuran became differentiated from the caudate original stock. But the horny sheaths in Stren rest directly upon the premaxille and the dentaries, and not on labial cartilages; and as to its habits of life, Siren appears to be eminently carnivorous (Duméril et Bibron, Erpétologie Généraic, i. 196). As has been already stated, no fossil remains of Peronicla are known, but Uredela and Anura occur in some abundance, and, in certain eases, in an excellent state of preservation, as far back as the middle of the Tertiary epoch. Now, thesc fossils show that the Anurous and Urodelous types of organisation were, at that timc, thoroughly differentiated from one another. Paleobatrachus, with its three vertebre ankyloscd into a sacrum, is, in fact, a singularly modified frog; while among the Urodela, the Salamandrida, the Menoponida, and very possibly the Proteida, are severally represented. The young of the Miocene Anura were tadpoles so similar in form to those of the

existing frogs and toads, that there is no reason to doubt their resembling them in other respects.

There can be little question, then, that the Anurous and the Uro- delous types inust have been represented before the Tertiary epoch ; but here their history breaks otf, no amphibian belonging to any living groups having been discovered in Mesozoic or older strata, as far as the Lias.

From the Trias to the Carboniferous formations, inclusively, the fresh-water deposits abound in Amphibia. But all these, so far as we have any positive knowledge, are referable to the Labyrintho- dont type. No Labyrinthodont presents the slightest approxima- tion towards the Anura ; but elongated and apodal, as well as sala- mandroid forms occur ; and in their cranial structure, no less than in the presence of scale-like dermal ossifications, they approach the Peromelu, In regard to their possible relations with the Urodela, it is Interesting to observe that in some Labyrinthodonts, at any

eee 1 Vogt, Untersuchungen tiber die Entwickelu J > p ngsgeschichte a ts- helferkrote (Alytes obstetricans), 1842. a: a

? Van Bambeke, “ Recherches sur le dével du | bron,” Mém. de ?Acad, de Belgique, 1868, °°

rate, the manus has the five digits, one of which, at least, is lost in all the Urodcia, and the pelvis appears to have had a distinct and completely ossified pubic element, which has also disappeared in all existing Amphibia (Miall, Report, .c.)

The Labyrinthodonts present a few characters—such as the paired supra-occipital ossifications aud the complications of the folds of their tecth-—by which they approach the Ganoid fishes more than any other Vertebrata ; and it is worthy of notiec that the lowest Labyrinthodonts, such as Archegosaurus, present no approxima- tion to the cranial characters of the lower Uredela, and show no evidence of the largcely-developed branchial apparatus which is so characteristic of the latter.

Thus, if upon such slender evidence as exists, it is justifiable to speculate at all concerning the " phylogeny" of the Amphibia, the most probable conclusion appears to be that the Labyrinthodonta, the Urodela, and the Anura diverged from one another at a very early period of gcologieal history; while, possibly, the Peromela are the last remnants of the peromelous modification of the Labyrintho- dont type.

With respect to the origin of the amphibian stock itself, the fol- lowing considerations appear to be of fundamental importance :— 1. The early stages of development of the Amphibia do not resemble those of any known Ganoid, Telostean, or Elasmobranch fish, and are similar to the eorresponding stages of the Marsipobranchit. 2. The skull of the lowest Urodela has, in some respects, advanced but little beyond the Marsipobranch stage. In the higher Urodela there are numerous points of resemblance with the Ganoids. The skull of the tadpole, on the other hand, has much in common with that of Chimera (as Miiller has pointed out), and with that of the Dignoi, while the chondrocranium of the adult frog has many singular affinities with that of the Elasmobranchii, and particularly of the Rays. 3. The only Vertebrata, besides the Amphibia, which have transitory external gills are the Hlasmobranchii, the Dipnot, and perhaps some Ganoids. 4. The only fishes in which the cere- bellum is rudimentary are the Marsipobranchii and Ganoidct. 5. The only fishes in which the amphibian and embryonic connection between the male reproductive organs and the renal efferent ducts is observed are the Ganoids. 6. The only fishes which have a "pylangium," with valves disposed as in the Amphibia, are the Ganoids, Elasmobranchis, and Dipnot. 7. The only fishes which pos- sess morphological (Polypterus) or functional (Dipnoz) lungs are the Ganoids and Dipnot. The eonclusions suggested by these facts appear to be that the Amphibia took their origin from some primordial form common to them, the Elasmobranchii, the Ganoidei, and the Dipnot; and that the main distinction by which their earliest forms were marked off from those of the other groups, was the development of that pentadactyle type of limb, which is eommon to all the higher Vertebrata. And seeing that the Elasmobranch, Ganoid, and Dipnous types were fully differentiated from one another in the Devonian epoch, it is reasonable to believe

that the existence of the Amphibia, as a group, dates back at least as far as that remote period of the earth's history.

TAXONOMIC SYNOPSIS OF THE AMPHIBIA.

I. Tue URODELA.

A. Branchiz persistent throughout life. (Pcrennibranchiata.) 1. Trachystomata.—Skull elongated ; preemaxille and den- tary piece of the mandible provided with horny plates ; premaxille not ankylosed; no nasal bones, but osst- fications between the ascending processes of the pre- maxille ; maxille rudimentary or absent; palatines small, oval, and beset with " dents en brosse;" ptery- goid absent; four persistent branchial arches; pelvi>

arch and limbs absent.

Siren

2. Protcida.—Skull elongated; premaxille and dentaries dentigerous ; maxille rudimentary or absent; pre- maxille not ankylosed; no nasal bones; palatines bearing a single row of teeth, and coalescent with the pterygoids ; three persistent branchial arches ; both the pectoral and the pelvic arches and limbs developed.

Proteus, Alcnobranchus.

B. Branchie eaducous; gill-clefts persistent. (Derotremata.) 3. Anphiwmida.—Skull elongated; premaxille and den- taries dentigerous; maxille large; premaxille anky- losed ; large nasal bones; palatines absent; pterygoid present, elongated; a basihyal cartilage; four persis- tent branchial arches ; both the pectoral and the pelvic

limbs developed, though very small.

Amphiuma.

3 " Description of the Vertebrate Remains from the Jarrow Colliery," by Prof. Huxley, F.R.S., Transactions of the Royal Irish Academy, vol.

xxiv. 1867, pl. xix. fig, 2.

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4. Menopomida.—Skull broad; premaxillz and dentaries dentigerous ; maxilla large; premaxille not anky- losed.; large nasal bones ; palatines absent; pterygoid present and very broad; a basihyal cartilage ; per- sistent branchial arches may be reduced to the first and second; the cerato-hyal and epibranchial are confluent in the first, distinct in the second bran- chial arch; both pectoral and pelvic limbs well de- veloped.

Menopoma, Cryptobranchus,

C. Branchiz caducous, and gill-clefts closed in the adult condi- tion. (MMyctodera.)

5. Salamandrida,—Skull broad ; premaxille and dentaries dentigerous; maxille large; premaxille separate or ankylosed; nasal bones present, and usualiy large; palatines present in the young state, and situated as in the Trachystomata aud Proteidea, but changing their relations in the adult; pterygoids present; the first and second branchial arches persistent, —the first two- jointed, the second a single piece.

[The latest writer on the classification of the Urodela, Professor Strauch (“ Revision der Salamandrinen-gattungen,” Meém. del Acad. Imp. des Sciences de St Petcrsbourg, se. vii. tome xvi.), divides the Salamandrida into two tribes,—Mecodonta and Lechriodonta ; the first comprising all those species, the vomero-palatine teeth of which are disposed along the inner edges of two backwardly diverging pro- cesses of the bones, and therefore form two longitudinal scries divergent posteriorly; and the second, those which have the teeth disposed along the postcrior edges of the vomero-palatine bones, which are sometimes truncated posteriorly, sometimes produced into a longer or shorter median process, and on which, therefore, the teeth are either directed transversely, or form two oblique series, more or less rapidly converging backwards.]

a. Mecodonta—

Salamandra, Pleurodcles, Bradybates, Triton,

Chioglossa, Salamandrina. b. Lechriodonta—

LEllipsoglossa, Isodactylium, Onychodactylus, Am- blystoma, Ranodon, Dicamptodon, Plethodon, Desmognathus, Anaidcs, Hemidactylium, Heredia, Spelerpes, Batrachoseps.

Il. Toe Anura.

[For the classification of the Anura, consult Dr Giinther's valu- able Catalogue of the Batrachia salionéia s Mr Cope's papers in the Natural History Review, 1865, and in the Journal of the Academy of Natural Science of Philadelphia, N.S., vol. vi. ; and Mr Mivart's essay "On the Classification of the Anurous Batrachians," in the Proceedings of the Zoological Society, vestigation of the structure of the Anura than has yet been carried out seems to be requisite before their classification can be placed upon more than a provisional footing. The phases through which the Frog 'eae in the course of its development, show that those Anura w The arboreal habit is so evidently adaptive, that it can hardly be regarded as a safe Even Rana temporaria, at a year old, will climb up the vertical side of a glass vessel, flattening out the ends of its toes, and applying its belly against the surface of the glass,

A. The tympanic cavity, with its Eustachian passage of com- munication with the mouth, may be present or abscnt. When present, the oral apertures of the Eustachian tubes are separate, and the pterygoid bones do not furnish a floor to them.

a. No teeth in the premaxille or maxille ; tongue free, either in front or behind, but usually be- hind.

a. No tympanic cavity. Eustachian recesses sometimes present. Lhinophrynus (1), Phryniscus, Pscudophryne, Brachyccphalus (2), Henvisus (3), Jficro- hyla.

8. A tympanic cavity and Eustachian tubes.

LHylaplesia, Kalophrynus, Bufo, Otilophus, Peltaphryne, Pseudobufo, Schismaderma, Xenorhina (4), Engystoma (4), Diplo- pelma (4), Cacopus (Systoma) (4), Gly- phoglossus (4), Callula (4), Brachy- merus (4), Adenomera (4), Pachyba- trachus(?), Breviceps, Chelydobatrachus, Hypopachus, Ehinoderma, Atelopus, Copea, Paludicola.

tl) Tongne free in front. (2) Dorsal dermal Ossifications. (8) Tongue retrac-

tile. (4) No Precoracvids,

6. Teeth in the premaxille and maxille; the tongue may be fixed by its whole circumference, but is usually free behind. a. No tympanic cavity ; sometimes present.

Bonbinator (1), Pelobates, Didocus, Alsodes,

Telmatobius, Cacotus, Liopelma,

B. A tympanic cavity and Eustachian tubes, Plectromantis, Alytes (1), Scaphiopus, Hy- perolius, Helioporus, Naticreria, Phyl- lomedusa, Pelodryas, Chirodryas, Hyla, Hylella, Otolygon, Pseudacris, Pohlia, Lttoria, — Triprion, Opisthodelphys, Trachycephalus, Nototrema, Lealus, Megalixalus, Hylarana, Leptomantis, Hylambates, Platymantis, Cornufer, Hemimantis, Rhacophorus, Chiromantis, Polypedates, Theloderma, Rappia, Acris, Leciyla, Elosia, Lpirhexis, Phyllobates, ITylodes, Crossodactylus, Strabomantis, Calostethus, Rana, Odontophrynus, Dicroglossus, Oxyglossus, Phrynoba- trachus, Hoplobatrachus, Phrynoglossus, Clinotarsus, Pscudis, Pithccopsis, Mixo- phycs, Pyzicephalus, Ceratophrys (2), Zachenus, Platyplectrum, Neobatrachus, Cyclorhamphus, Limnodynastes, Crinia, Lusophleus, Pleurodema, Leiuperus, Hylorhina, Limnocharis, Cystignathus, Hemiphractus (3), Chiroleptes, Calypto- cephalus, Cryptotis (4),

(1) Opisthoccelian verteore ; rudimentary ribs attached to the anterior vertebra, (2) Dorsal dermal ossifications, (8) Mandibular teeth. (4) Opisthoccelian vertebren.

Eustachian recesses

B. The Eustachian tubes of the well-developed tympanic cavity have a common median aperture in the roof of the mouth, and the pterygoid bones extend beneath and form a floor to them. The tongue is wanting. The lungs are attached to bronchial tubes; and the vertebra are opistho- ceelous. a. No teeth. Pipa. 6. Teeth in the premaxill and maxille Dactylethra,

III. Ture PEeromeca.

a, With a tentaculiferous fossa on the fore part of the ace. Cecilia, Siphonops (1), Epicrium. b. With no tentaculiferous fossa,

Rhinatrema. (1) Siphonops annulatus has no scales

IV. Tue Lasyrinruoponra.

Amphibamus, Anthracosaurus, Apateon, Archcgosaurus,+ Baphetes,* Batrachider- peton, Bothriceps, + Lrachydectes, Brachy-ops,* Capitosaurus,* ~Chalcosa urus,* Cocytinus, Colosteus,+ Dasyceps,* Den- drerpeton, * Dictyocephalus, Dolichosoma, Lrpetocephalus,* Eupelor,* Lurythoraz,* Gonioglyptus, * ylerpeton, Hylonomus, Ichthycrpcton,* Ichthyocampsa, Kerater peton,* Labyrinthodon,* Lepidotosaurus, Lepterpeton,* Lcptophractus, Loxomma,* Mastodonsaurus,* Mclosaurus,* Meto- pias,* Micropholis,* Molgophis,+ CEsto- cephalus (2)+ Ophiderpcton,+ — Osteo- phorus,* Pachygonia,* Pariostegus, Pholi- derpeton,* Phicgethontior,+ Pteroplax, Piyonius,t Raniccps,+ Lhinosaurus, Sauropleura,* Trematosaurus,t+ Tudi- tanus,+ Urocordylus,+ X estorrhytias, * Zygosaurus.**

[A satisfactory grouping of these genera has not yet been effected ; and it is possible that some of the forms here enumcrated may not be

*true Labyrinthodonts. To those about the truly Labyrinthodont character of which there scems no doubt a * or a + is attached— the + denoting the serpentiform gencra. Batrachiderpeton, Pario- stegus, and Pteroplax arc remarkable for the incompleteness of the jugal arch, and some other characters by which they appear to represent the Proteidea. The true position of Hylerpeton and Hylonomus is still doubtful.} CTs 11. i)*

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AMPHICTYONY, in Greek Antiquity, was an associa- tion of several tribes for the purpose of protecting some temple common to them all, and for maintaining worship within it. The members were called dpduxrioves or apdux- tvoves, a word which means " the dwellers around." The second form of the word Benfey supposes to have arisen from a digammated éyduxrifoves. Out of the name the Athenians, according to their habit, easily discovered the founder of the Delphic Amphictyony, with which they were connected; and hence in later times, by an inverse process, the name was derived from Amphictyon, one of the fabulous kings of Attica.

Similar religious confederations existed in Greece at a very early period, and there is reason to believe that at their stated assemblies they discussed questions of international law and matters affecting their political union as well as religious subjects. Gradually, however, the political influ- ence of the Amphictyonies died away. As states of great power stood on an equality with insignificant tribes in the number of votes, they naturally prevented the settlement of important political matters in such an assembly. Accordingly, during the flourishing period of Greek his- tory the Amphictyonies almost disappear. They are not mentioned in Thucydides and Xenophon. But they appear again in vigour in the time of Philip, and become engines by which political parties, under pretence of religious zeal for the interests of the gods, wreak their vengeance on their rivals aud antagonists.

This is especially true of the Amphictyony of Delphi, the most important of all these associations. Though we know better about this

confederation than about any other, yet many particulars are hidden in obscurity, and consider- able doubts gather around others of which we know somc- thing. The Amphictyony existed in very early times, and /@schines states that it arose when the temple at Delphi was first built. It is more likely, however, that it was originally connected with Thermopyle and the temple of Demeter Amphictyonis which was there. The Amphic- tyony consisted of a union of twelve tribes, each of which had a right to two votes. These tribes were for the most part Thessalian or bordering on Thessaly; and it is probable that the others, as the Dorians and Jonians, gained admis- sion in consequence of colonies that came to them from Thessaly.

There are nine lists of the tribes that constituted the Delphic Amphictyony in the classical writers and in in- scriptions. Of these only one is complete, and the rest differ from each other in some particulars. The one that is complete was found on a Delphic stone containing a decree of the Amphictyonic council in regard to money due to the Delphic treasury. On this stone are given the votes of each tribe, and the final decision of the council in har- mony with the majority of votes for one of the opinions

held. The list is as follows :—The Delphians, two votes;

Thessalians, two votes; Phocians, two votes; Dorians from Metropolis, one vote; the Dorians from Peloponnesus, one vote; the Athenians, one votc; the Eubceans, one vote , the Beeotians, two votes; the Achzean Phthiots, two votes; the Malians, one vote; the (Eteans, one vote; the Dolopians, one vote; the Perrhzbians, one vote; the Magnetes, two votcs; the Ainianes, two votes; the Locri Hypocnemidii, one vote; the Locri Hesperii, one vote. The exact date of the decree recorded on the Delphic stone is matter of dispute, but the most probable conjecture places it about the year 130 B.c. We have therefore clear testimony as to the constitution of the Amphictyonic council at this date; and, starting from this, we can form some idea of the changes which took place in the members of the council. Tt is generally believed that no change took place in the ribes forming the league till the time of the second sacred

war, 345 B.c. Of these tribes Aischines gives us a list, with the omission of one. They are the Thessalians, Boeotians, Dorians, Ionians, Perrhzebians, Magnetes, Locri, (Eteans, Phthiots, Malians, Phocians; and there can be little doubt that it is the Dolopians who have been by some mistake omitted. The confusions in some of the other lists have arisen probably from the ignorance of transcribers, who did not know that the Acnianes and CEteans lived close to each other, and were often comprehended under the same name, and who made two tribes of the Achzean Phthiots, Achzeans and Phthiots. Auschines says that all these tribes had equal right of voting; but the inscription on the Delphic stone shows that the two votes of one tribe might be divided among two different portions of it. At the con- clusion of the Phocian war the Phocians were excluded, and the Macedonians received their votes; and the vote of the Lacedzemoniaus was given to the other Doric tribes of Peloponnesus. The Delphians also obtained votes, either at this time or after the third sacred war, 338 B.c., by some of the smaller tribes that had two votes being restricted to one. In the same way, and also by the ex- clusion of the Locri Ozoke, the Aitolians secured a place in the council in 338 B.c., aud gradually took possession of a great number of votes. The Phocians were restored to their place in 279 3B.c., on account of their gallant resistance to the Gauls. Finally, the Aitolians and Mace- donians were excluded from the council, and the constitu- tion of the council as given in the Delphic stone was formed. The last change mentioned in classical writers is detailed by Pausanias, but the passage is evidently corrupt. Augustus wished to give votes to Nicopolis, and for this purpose so altered the constitution of the council as to make the votes thirty in number.

The objects of the league are distinctly expressed in the oath which the Amphictyons had to take, and which is preserved in Adschines's oration "De Falsa Legatione." This oath bound the Amphictyons not to destroy any of the Amphictyonic towns, not to turn away its running waters either in time of war or in time of peace; and if any one should attempt to rob the temple of Delphi (the common centre of the

confederacy), to employ their hands, feet, tongue, and their whole power to bring him to punishment. The humanising influence which this and other enactments of the confederacy were intended to exercise, is perceptible in the part relating to war. The framer of the law evi- dently regarded war only as an unavoidable means of settling disputes between two states; but it was to be carried on only for the purpose of bringing the dispute to a decision, and not for destruction and devastation. An- other enactment probably was that the inhabitants of a conquered city should not be sold as slaves. But the chief care of the Amphictyons appears to have been to watch over the temple, to punish those who were guilty of a crime against it, and to reward those who did anything to increasc its splendour and glory.

There is difficulty in determining how often the Am- phictyons met. But the most likely inference from the somewhat indefinite statements of ancient writers is, that they went twice every year both to Delphi and Ther- mopyle, in spring and in autumn. There is also some difficulty in determining the relative positions of the two sets of officials named in connection with the Amphictyony, the Hieromnemones and the Pylagoroi or Pylagorai. But there can scarcely be a doubt that the Hieromnemon was the principal official, There were as many Hieromnemones as there were votes; and the Hieromnemones were alone entitled to vote. The assembly proper consisted therefore only of the Hieromnemones. It is most likely that the Hieromnemones were elected annually by lot. In the case of the smaller states it is probable that the right to elect

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went round by turns, while the more important states sent There might be several 4Eschines mentions that there were on one occasion three from Athens, They were elected been to advise with the Hieromnemon, to address the assembly when any- thing relating to their own state was discussed, and to bring all their influence to bear on the assembly on behalf of their The office of Hieromnemon remained in high When the Dionysiac theatre in Athens was excavated in 1862, a chair of honour was found with the inscription tiepopvyjovos, and as it is

certain that dramatic exhibitions took place in this theatre in the time of the Antonines, the office of Hieromnemon must

their representatives every year. Pylagoroi from each state.

by vote. Their function seems to have

own state. honour till a late period.

have existed at that period.

The meetings, however, were attended not only by the deputies, but by thousands of others who flocked to Delphi or Thermopyle for religious and mercantile purposes, or This occasioned popular (éxxAnotar) distinct from those of the regular

But we cannot suppose that all the Greeks indiscriminately were allowed to take part in those popular

only for the sake of amusement. meetings deputies.

assemblies, which must have consisted of visitors from the states which were members of the Amphictyony.

Wise and humane as were the objects of the Amphic-

tyons, yet wherever they actively interfered in the affairs

of Greece during the historical period, we find that they

were more powerful for evil than for good; and the holy

wars which were carried on by them in the defence of the

Delphic temple and the honour of its god, contributed not a little to the demoralisation of the Greeks.

The very first time that the Amphictyons interfered in the affairs of Greece we find them acting in direct oppo- sition to the spirit of their

institution. We allude to the Crisseean or first sacred war, which broke out in 594, and lasted till 585 b.c. The inhabitants of Crissa (or Cirrha), on the Corinthian Gulf, were charged with extor- tion and violence towards the strangers who landed at their port, or passed through their territory on their way to Delphi. or this the Amphictyons declared war agaist Crissa, and it was vigorously carried on by the Thessalians and Cleisthenes, the tyrant of Sicyon. They even pretended to have the sanction of Apollo to dedicate the Crisseans and their territory to the god, to enslave them, and make their land a waste for ever. The war is said to have been terminated by a stratagem of Solon, who poisoned the waters of the river Pleistos, from which the town was supplied. When the town was taken, the vow of the Amphictyous was literally carried into effect: Crissa was razed to the ground, its harbour choked up, and its fertile plain changed into a wilderness. Such was the terrible vengeance taken by a body of confederates, whose original object was to prevent those very things which they now perpetrated to uphold the honour of the deity presid- ing over them. The second sacred war, which likewise lasted for ten years, from 355 to 346 B.C., was carried on with unparalleled exasperation for all that period, and nearly all the Greeks took part in it. The Thebans had set their hearts upon conquering Phocis, but screeued their designs behind a charge preferred against the Locrians, alleging that they had robbed the temple of Delphi, because they had taken into cultivation a tract of land belonging to the Delphic temple. The Amphictyonic council, before which the charge was brought, condemned the Phocians to pay a heavy fine, and to destroy the crops of the sacred fields, No soouer was this verdict pronounced than the Thebans, Thessalians, Locrians, and CEteans tovk up arms to execute it. The Phocians were joined by Athens and Sparta, and took possession of the temple of Delphi and its treasures, which they were obliged to employ in defraying

the expenses of the war. The war was carried on with unexampled cruelty, for even the surrender of the dead for burial was refused, and all Phocian captives were put to death. This war also afforded Philip

of Macedonia an opportunity to interfere in the affairs of Greece. Being invited by the Thesvalians to co-operate with them against the Phocians, Philip and his Macedonians acted as the champions of the god, and defeated the Phocians ina bloody battle near Magnesia, Three thousand captive Phocians were put to death. The latter, however, remained un- daunted until at length they were compelled by treachery to surrender. The Amphictyons now excluded them for ever from the league, their arms and horses were to be delivered up, their towns to be destroyed, and the people were henceforth to live in small villages, and to pay annu- ally to the god sixty talents (about £15,000) until the temple should be completely indemnified. Macedonian and Theban troops carried the judgment into cxecution; twenty-two towns disappeared from the face of the earth, and the otherwise fertile country remained for many years a wilderness. A third sacred war was decreed against the town of Amphissa, because its inhabitants had taken into cultivation the plain of Crissa ; but in reality the war was brought about by the venal creatures who endeavoured to promote the ambitious schemes of Philip of Macedon, who was bent upon making himself master of Greece, This war broke out in 338 B.c., and its unfortunate conse- quences led to the catastrophe which deprived Greece of her independence in the battle of Chzeronea. Such is a brief outline of the history of the Delphic Amphictyony, which not only itself violated its first principles, but is not known to have ever raised its voice to condemn the wanton destruction of other Amphictyonic towns, such as Platzze and Thebes.

There were many other confederations of a similar kind, some of which, however, do not bear the name of Amphic- tyonies in the authorities from which we derive our infor- mation regarding them. The following were among the most noted :—

1. The Amphictyony of Calauria, an island near Troezen, consisted of the seven states of Hermione, Epidaurus, ffigina, Athens, Prasiz, Nauplia, and the Minyan Orcho- menos. These states took part in the sacrifices which were offered up in the temple of Poseidon, situated on the island. Sparta and Argos displaced Nauplia and Prasize when these lost their independence. It is difficult to see what object could

unite states so widely apart. Some suppose that the tribes forming the league were originally Tonian ; others, that they all were interested in the defence of seaports against inland states.

2. Amphictyony of Onchestos, in the territory of Hali- artus in Boeotia, was likewise connected with the temple of Poseidon. As at all other Amphictyonies, the meetings of the members were celebrated with various religious rites, solemnities, and public games. We do not know the nations that constituted this league.

3. Amphictyony of Amarynthos, in Eubcea, connected with the temple of Artemis. We know that the two towns of Eretria and Chalcis were members of it, and that there existed an ancient treaty by which these two cities pledged themselves not to use against each other any missiles thrown from afar.

4. Amphictyony of Delos, connected with the temple of Apollo, was a league formed among the inhabitants of the Cyclades and the Ionians in the neighbourhood. Its insti- tution was ascribed to Theseus. The solemnities connected with its meetings gradually fell into disuse, until they were revived aud increased in 426 B.C., when the island of Delos was purified by the Athenians, The Athenians, after this time, regularly sent an annual embassy to Delos, and

they also retained for themselves the superintendence of the temple and the adnuinistration of its treasures.

AMPHION, in Greek Mythology, the son of Zeus by Antiope, and the husband of Niobe, was a musician of such wonderful power, that at the sounds of his lyre the stones began to move, and formed themselves into walls around Thebes, after his conquest of that city. He was killed by Apollo for assaulting lus temple j or, as sonie report, he destroyed himself in despair at the slaughter of his children by that god. The famous Farnese bull, discovered in 1546, represents Amphion punishing Dirce for her treatment of his mother. There are four other mythical personages of this name.

AMPHIOXUS, a species of fish, differing widely from all other known animals. See LANCELET.

AMPHIPOLIS, a city of Macedonia, situated on the east bank of the river Strymon, about three miles from the sea. It was originally a Thracian town, known as the 'Evvéa odot (Nine Roads), and was colonised by the Athenians in 437 B.c., two previous attempts (497 and 465 B.c.) having been unsuccessful. In 424 B.c. it surrendered to the Lacedzemoniaus without resistance, and the Athenians never afterwards recovered possession of it. For his failure to pre- vent this disaster Thucydides was banished from Athens. The site of Amphipolis is occupied by the modern Jeni Keui.

AMPHISBANA (from éudis, on both sides, and Batve, to go), a genus of animals, found only in South America and the West Indies, which, though they have the general appearance of snakes or worms, belong to the order Lacer- tila, or Lizards. The best known species are the sooty or dusky amphisbena (A. fuliginosa), and the rarer A. alba. The body of the amphisbena, from 18 to 24 inches long, is of nearly the same thickness throughout. The head is small, and there can scarcely be said to be a tail, the vent being close to the extremity of the body. The animal lives mostly underground, burrowing in soft earth, and feeds on ants and other small animals. From its appearance, and the ease with which it moves backwards, the popular belief in the countries where it prevails has been that the amphisbzena has two heads, and that when the body is cut in two the parts seek each other out and reunite. From this has arisen another popular error, which attributes extraordinary curative properties to its flesh when dried and pulverised.

AMPHITHEATRE (from dui and Oéarpov) denotes a theatre in which the spectators were placed "all round" the stage. Though the word is of Greek formation, the thing itself is distinctively Roman, being designed for those cruel shows of gladiators and wild beasts in which that people took great pleasure, and which in modern times are only re- presented by the barbarous bull-fights still popular in Spain.

In the present article we do not enter on the considera- tion of the spectacles themselves, but shail confine our- selves to the buildings, which were devised to allow as large a number of spectators as possible to enjoy the sight of the show. In a dramatic representation it is necessary that the actors should be heard, and also that their faces should be seen, and the audience has therefore to be arranged in a semicircle in front of them; but when men fought with other men or with beasts, they could be seen equally well from all sides.

In Italy, combats of gladiators at first took place in the forums, where temporary wooden scaffoldings were erected for the spectators; and Vitruvius gives this as the reason why in that country the forums were in the shape of a parallelogram instead of being squares as in Greece. Wild beasts were also hunted in the circus. But towards the end of the Roman republic, when the shows increased both in frequency and in costliness as the city grew in power, special buildings began to be provided for them ; and when

the consolidation of peace under the empire had secured great material prosperity for the provinces, such as they had never enjoyed when separated into small states and often at war with each other, the example of the capital was followed by many other towns in the West 3 so that nearly a hundred amphitheatres have been identified, either by the existence of their ruins or by being mentioned by old writers. There were even a few in the East, although such cruel games were quite alien to the elegance and re- finement of the Hellenic mind.

From their being so admirably adapted for enabling the greatest possible number of people to behold a spectacle, it is natural to suppose that they would be occasionally used for purposes different from those usually intended by them; and accordingly Suetonius relates how Caligula had an impertinent poet burnt alive in the amphitheatre, and how Titus ordered the informers, after having been whipped in the forum, to be led through the arena, apparently that they might be exposed to the execrations of the people. Criminals were also

sometimes exposed in them to be de- voured by wild beasts, and many of the Christian martyrs died in this way.

The first amphitheatre was that constructed, 59 B.c., by C. Scribonius Curio. The only author by whom it is described is Pliny, whose account of it rather taxes our credulity. He tells that Scribonius built two wooden theatres, which were placed back to back, and that after the dramatic representations were finished, they were turned round, with all the spectators in them, so as to make one circular theatre, in the centre of which gladiators fought. And this was repeated more than once. Thirteen years later, Ceesar built (also of wood) the first regular amphi- theatre, and exhibited wild beasts in it; and sixteen years after, C. Statilius Taurus built the first one of stone, which was burnt in the great fire of Rome during the reign of Nero. Probably the outside walls only were of stone.

Several others were constructed under the early em- perors, but they were entirely superseded and eclipsed by that of Vespasian and Titus, the vast ruins of which strike the traveller with awe. Set on fire by lightning under the emperor Macrinus, it was restored by Alexander Severus, the shows during the interval being held (as of old) in the circus. The latest record of its being used is in the 6th century, when Cassiodorus was present ; but Bede in the 8th century speaks of the edifice as still entire. During the Middle Ages, many of the stones of this, as of many other ancient buildings, were carried away for building purposes; and among the plunderers we regret to have to reckon the great Michel Angelo, who worked up a large number of its stones into a palace for one of the Roman noble families. As, however, the Colosseum had been the scene of many of the Christian martyrdoms, Benedict XIV., whose name ought never to be mentioned without an expression of admiration and gratitude for his enlightened patronage of learning and antiquities, took advantage of this to consecrate the interior by the erec- tion of crosses and oratories, thereby preserving it from further depredations. Of late years considerable excava- tions have been made to examine its substructures. Its name is variously written, but on the whole it would seem that the most correct orthography is Colosseum (not Coliseum),

and that it is derived from its colossal size, which far surpassed any former edifice of the sort. Many of its minor arrangements are uncertain, but the main features and general plan are sufficiently intelligible.

The external elevation of the Colosseum consisted of four stages, each adorned with engaged columns of the three orders of Greek architecture. The lowest three were arcaded, having each eighty columns and as many arches. Those of the basement story served as entrances; seventy-

| | six being numbered and allotted to the general body of | spectators, while four, at the extremities of the axes of the ellipse, were the principal entrances. The higher arcades had a low parapet with (apparently) a statue in each arch, and gave light and air to the passages which surrounded the building. The openings of the arcades above the principal entrances were larger than the rest, and were I adorned with figures of chariots. The highest stage was much more solid, being composed of a continuous wall I of masonry, only pierced by forty small square windows, The object of this may have been to obtain the necessary solidity and weight for steadying the poles which supported the awning, and must have had to carry a severe inward strain. The alternate arcades were ornamented with metal shields. There was also a series of brackets to support the poles on which the awning was stretched. The interior may be naturally divided into the arena and the cavea, with their respective appendages,

portion assigned to the combatants,

and derived its name from the sand with which it was

strewn, to absorb the blood and prevent it from becoming slippery. Some of the emperors showed their prodigality | by substituting precious powders, and even gold dust, for sand. The arena was generally of the same shape as the amphitheatre itself, and was separated from the spectators by a wall built perfectly smooth, that the wild beasts might not by any possibility climb it. At Rome it was faced inside with polished marble, but at Pompeii it was simply painted. For

further security, it was surrounded by a metal railing or network, and the arena was some- times surrounded also by a ditch (ewripus), especially on account of the elephants. Connected with the arena were the dens from which the beasts came, and the rooms where the gladiators met before the show began. In spite of the excavations which have been made, it is not very easy to understand how all the effects described by ancient authors were produced; for after the regular shows were over, the arena was sometimes filled with water, and sea-fights were exhibited with ships.

The part assigned to the spectators was called cavea. Tn the different amphitheatres whose ruins have been examined, there are some differences in the arrangements, but the general features are nearly the same in all. The cavea was divided into several galleries, concentric with the outer walls, and therefore, like them, of an elliptic form. The place of honour was the lowest of these, nearest to the arena, and called the podiwm. The divisions in it were arger, so as to be able to contain movable seats. At

ome it was here that the emperor sat, his seat bearing the name of suggestum. The senators, principal magis- trates, vestal virgins, the provider (editor) of the show, and other persons of note, occupied the rest of the

| The arena was the

podium. At Nismes, besides the high officials of the town, the podium had places assigned to the principal guilds, whose names are still seen inscribed upon it, with the number of places reserved for each, In the Colosseum there were three meniana or galleries above the podium, separated from each other by terraces (preecinctiones) and walls (balte?). The lowest was appropriated to the eques- trian order. Numerous passages (vomitoria) and small stairs gave access to them; while long covered corridors, behind and below them, served for

shelter in the event of rain. At Pompeii each place was numbered, and elsewhere their extent is defined by little marks cut in the stone. The spectators were admitted by tickets (tesserae), and order preserved by a staff of officers appointed for the purpose.

The height of the Colosseum is given as from 160 to 180 feet. The seats in the interior do not rise higher than the level of the third order of the exterior, that is, about half the entire height of the building; and this apparent excess of height beyond what was made available, has led some to suppose that there were upper seats and galleries, of which no trace now exists, The height, however, appears to have becn necessary for the ventilation of the building. When such enormous crowds were packed closely together for several hours at a time on an Italian summer day, with an awning drawn over them, the atmo- sphere would have become quite pestilential if there had not been a considerable space overhead, and at least one range of open arcades, unencumbered by any galleries to prevent the free circulation of air, Scented liquids were at times squirted over the spectators from concealed tubes : but no aroma would have compensated for the want of air, which the arcade all round the building, above the highest spectators, would supply. There may also have been another series of openings serving the same purpose be- tween the top of the wall and the edge of the awning, which was supported upon poles, It has been calculated that the Colosseum contained 87,000 places, and that besides these, 15,000 more spectators could be admitted. The greatest length is about 612 feet, and the length of the shortest axis of the ellipse about 515 feet. The dimensions of the arena are variously stated by different writers, some making it 247 feet by 150, and others 281 by 176.

With regard to the provincial amphitheatres, Maffei, in his account of that of Verona, appears to have unduly restricted their number, with the object of exalting the honour of the one he describes, Besides the Colosseum, he would hardly allow any ruins to be entitled to this name except those at Verona and Capua. But subsequent writers have not followed him in this rigorism; and Fricd- lander, who is the latest and most complete authority on the subject, gives the measurements and

description of fifty-two. Naturally, the early ones would be of wood, like that erected by Atilius at Fidene in the time of Tiberius, which gave way while shows were being exhibited, on which occason 50,000 persons were killed or injured. One at Placentia is also mentioned, which is said to have been the most spacious then in Italy, and to have been burned in the wars between Otho and Vitellius by the inhabitants of a neighbouring town whose envy it had

| excited. Such disasters, coupled with the growing scarcity

of wood and the greater facilities for quarrying stone, would naturally lead to the construction of more solid buildings. At the same time, the progress of this im- provement must have been slow, and the building of at least the great majority of the provincial amphitheatres of stone may be ascribed to the period between the reign of Vespasian and that of Constantine, when the establish- ment of Christianity threw a discredit on the cruel and bloody shows for which these vast structures were designed. Hadrian is especially commemorated for the numerous

buildings he caused to be erected almost everywlicre, and this is mentioned in connection with gamics being held.

In constructing many of the amphitheatres in the pro- vincial towns, advantage was taken of the natural slope of a hill to lessen the labour of construction; and in some cases a narrow ravine between two hills allowed of both sides being formed on the natural slopes, and of the stream at their feet being dammed up for combats on the water. The conformation of the ground and the caprices of local authorities have produced slight minor differences of plan, but the general description of the Colosseum will suffice for all. For details regarding others the reader may con- sult, in addition to other authorities, the descriptions given in this work of the different towns where their remaius arc still found. Here it may be sufficient to name that at Pompeii, which is probably better known to most persons by the graphic description in Lord Lytton's novel than by any of the illustrated accounts that have been published of that wonderful town; that at Verona, which scrved as

a basis to Maffei's careful investigation of the whole sub- ject; those at Capua and Pozzuoli, which almost rival the Colosseum in dimensions; those at Nismes, Arlcs, and Frejus in France; that at Italica, near Seville in Spain, remarkable for the thickness of its walls and the strength of its masonry—leading Florez to remark that its ruin is due not to the injuries of time and the weather, but to the hand of man; that at the ancient Thysdrus, in the province of Carthage, now called £/- Djemm, which alone resembles the Colosseum in having five gallcries or corridors in the first storey; and that at Pola in Istria, whose external shell —the internal fittings, which were probably all of wood, having quite disappeared—forms a striking object as seen from the sea.

A very fair summary of the whole subject will be found in Smith's Dictionary of Classical Antiquities ; anda much more minute and elaborate account, by C. Thierry, with good illustrations, in the Dictionnazre des Antiquités of Daremberg and Saglio, which has the further advantage of giving numerous references to larger works on the subject, —its chicf defect being one too common in French books, the almost complete ignoring of everything published in this country, where Taylor and Cresy's Architectural Anti- quities of Rome, of which a second edition has recently appeared, is entitled to special mention. Nor does it notice that treasure of information about Spanish history and antiquities, the Zspaiia Sagrada, where (vol. xii. p. 228) will be found the most careful account of the amphitheatre at Italica, with several drawings. The fol- lowing table, abridged from Friedlinder's Darstellung aus der Sittengeschichte Roms (1865, 2d ed. 1867), gives the dimensions, in English feet, of a few of the principal amphitheatres that have been examined :-—

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| Entire Building. { Arena. Greater t Shorter Greater Shorter Axis. | Axis. Axis. Axis. : Feet. Feet. Feet. Feet. Puzzles ccccceee 6264 475 367 216 Rome (Colosseum), ... 616 5104 281 176 JUENOUUL ceseesesseaseaccocenocd) exe} 348 rs sah Ca D) Mageeireroc asnccosoaes: | 557 458 250 150 Julia Crsarea, ...00: 551 289 459

197 Italica (Seviile), ... 3 513 4393 aes ses perens. airisoe vauennene a5 oie 5054 403 248 145 Ta! eras SACRE IRE 4386 390 DE 181 : pace sodoaaansadconodnone 457 392 2534 188 ee OclecH OB aHSEOCRAAREU Ee: ce 452 3694 230 147 " Oe, SEG Ma RES RO ce 448 352 228 129 Pompei sof SsncoAnassoaneoec: 445 341 2184 115 cae eee eaiisce o Suen cae: 443 393k 223 983 INISTITES).. 2.000006 ves] 4333 3324 227 1264

(G. H. F.)

AMP—AMP

AMPHITRITE, in Greek Mythology, the supreme god- degs of the sca, and as such the wife of Poseidon (Neptune), but, unlike him, so entircly confined in her authority to the sea and the creatures in it, that not only was her name (from dpdi-rpiw, the saine root as Tpvo) sometimes used as an equivalent for that element, but she was never associated with her husband either for purposes of worship or in works of art, except when he was to be distinctly re- garded as the god who controlled the sea, though generally his functions extended to the whole watery element. She was one of the nereids, and distinguishable from the others only by her queenly attributes. It was said that Neptune saw her first dancing at Naxus among the other nereids, and carried her off. But in another version of the myth, she then fied from him to the farthest ends of the sea, where the dolphin of Neptune found her out. In works of art she is represented either enthroned beside him, or driving with him in a chariot drawn by hippocamps or other fabulous creatures of the deep, and attended by tritons and nereids.

AMPHORA (from éudi and ¢épo), a large vessel used by the ancient Greeks and Romans for preserving wine, oil, fruits, &c., and so named from its usually having an ear or handle on each side of the neck, whence it was also called diota. It was commonly made of earthenware, but sometimes of stone, glass, or even more costly materials; its usual form was tall and narrow, diminishing below to a point. A number of specimens of the various kinds of amphore are to be seen in the Elgin collection in the British Museum. Homer and Sophocles mention amphore uscd as cinerary urns; and a discovery

made in 1820 at Salona shows that they were sometimes uscd as coffins. The amphora was divided lengthwise to receive the corpse, then closed and deposited in the earth, thus preserving the skeletons entire (Steinbiichel, Alterthum, p. 67). The amphora was a standard measure of capacity among both Greeks and Romans. The Attic amphora contained nearly nine gallons, and the Roman amphora about SIX.

AMPLITUDE, in Astronomy, is the amount of deviation towards the north or south of a celestial object from the true east at rising, and the true west at setting. For the fixed stars it is constant; for the sun and planets it varies with the declination. At the equinoxes the sun rises exactly in the east, and sets in the west point,—the am- plitude then is zero; at the solstices it amounts at London to 39° 44", ;

AMPTHILL, a small neatly-built market town © Bedfordshire, situated about 8 miles south of Bedford. Besides the old parish church, it contains various dissent- ing chapels, a county court-house, a savings bank, severa schools, and an almshouse. Near the town is Ampthill house, a mansion of the late Lord Holland, containing 4 valuable collection of paintings, a hbrary, and a museum. The site of the old castle in which Catherine of Aragon resided while her divorce from Henry VIII. was pending, is marked by a cross within the grounds. The district 18 chiefly agricultural, but in Ampthill there is a large brewery, and a considcrable amount of straw-plaiting and lace-making- Population in 1871, 2220. : k

AMPULLA, a Latin word denoting 4 small jar or a for holding liquids. In mediaeval church Latin it usualy signifies the vessels that contained the consecrated oils, . which the three principal—for the catechumens, for _ : sick, and for confirmation—were hallowed by the "a on the Thursday before Easter. The word has passé a : our language in connection with the coronation of the _ – of England, and occurs repeatedly in the coronation Se? aie Thus, in that uscd for Queen Victoria, we rea aking anthem being concluded, the Dean of Westin fe the ampulla and spoon from off the altar, holdet

ee ee

ready, pouring some of the holy oil into the spoon, and with it the archbishop anointeth the Queen in the form of Then the Dean of Westminster layeth the ampulla and spoon upon the altar." Gildas mentions its use as established among the Britons in hig time, and St Columba is said to have employed it in the coronation of King Aidan. The most celebrated ampulla in history is that known as la sainte ampoule at Rheims, from which the kings of France were anointed. According to the legend, which gained for itself a secure place in the national belief, it had been brought from heaven by an angel for the coronation of Clovis, and at one period the kings of France claimed precedence over all other sovereigns on account of it. It seems, however, that Pepin in the 8th century was the first French king who was anointed, and this in connection with his baptism rather than (See the preface to the 3d volume of Maskell's Monumenta Ritualia and the authorities there

a Cross.

his coronation.

referred to.)

AMRAOTI, a district and city of India, in the com. missionership of East Berar, within the HaidarAbAd The district lies between 20° 23' and 21°7'N. lat., and between 77° 24' and 78°13' E. long. It is bounded on the N. by the Elichpur district; on the E. by the Wardha river, separating it from the central provinces; on the 8. by the Basim and Wun districts; and The area is estimated at 2566 square miles, but the survey has not yet been com- pleted. The population in 1867 was returned at 407,276 souls, which, taking the area as given above, would show an average density of 158 persons per square mile; num-

assigned districts.

on the W. by Akola district.

ber of males, 212,575; females, 194,701; the proportion of males to the total population being 52°19 per cent. The

district consists of an extensive plain, about 800 feet above

sea-level, the general flatness being only broken by a small chain of hills, running in a north-westerly direction, be- tween Amraot{ and Chandor, with an average height of from 400 to 500 feet above the level of the lowlands. Four towns are returned as containing a population ex- ceeding 5000 souls—namely, Amrdoti, population 23,410; Karinji, a considerable commercial town, population 11,750; Badnerd, a town on the Great Indian Peninsula Railway, which intersects the district, population 6876, Kolapur, population 6169.

AMRITSAR, a division, district, and city of British India, under the jurisdiction of the Lieutenant-Governor of the Panjab. The Amritsar Diviston comprises the dis- tricts of Amritsar, Sialkot, and Gurd4spur. It is bounded on the N.E. by the Himalayas; on the 8. W. by the Gujran- walé and Lahor districts; on the N.W. by the river Chenab; and on the S.E. by the river Bids. The total population of the division is returned at 2,7 43,880 souls, divided into the following classes:— Hindus, 659,905 ; Mahometans, 1,401,290; Sikhs, 352,885; others, 329,800. The number of males was returned at 1,512,480, and the females at 1,231,400, the proportion of males to the entire population of the division being 55 per cent.

Amritsar District lies between 30° 40’ and 32° 10’ N. lat., and between 74° 40’ and 75° 40’ E, long. It is bounded on the N.W. by the river Ravi, on the SE. by the river Bids, on the N.E. by the district of Gurdas- pur, and on the §.W. by the district of Lahor. Amritsar district is a nearly level plain, with a very slight slope from east to west. The banks of the Bids are high, and on this side of the district well-water is not found ex- cept at 50 feet below the surface; while towards the Ravi wells are less than 20 feet in depth. The only stream passing through the district is the Kirni or Saki, which takes its rise in a marsh in the Gurdaspur district, and after traversing part of the district empties itself into

the Ravi, Numerous canals intersect the district, affording ample means of irrigation. The Sind, Panjab, and Dehli Railway, and Grand Trunk Road, which runs parallel with it, afford the principal means of land communication and traffic. Total population of Amritsar district, 832,750, divided into the following classes :—Hindus, 138,027; Mahometans, 377,135; Sikhs, 223,219; others, 94,369. The males number 465,074, and the females 367 sO(0; the proportion of males to the total population being 55°84 per cent. The principal tribes and castes in point of num- – bers are as. follow:—(1.) Jats, viz., Hindus and Sikhs, 189,065; Mahometans, 65,964: total, 255,029. (2.) Brahmans, 43,846. (3.) Kshattriyas, 39,892. (4.) Kashmiris, 37,456. (5.) Arords, 29,103. The total agricultural popu- lation is returned at 417,747. Area of the district, 2036°23 square miles, or 1,303,188 acres, of which 927 ,730 acres are under cultivation, 178,939 acres arc cultivable, but not actually under tillage, and 196,519 acres are uncultivable and waste. This result gives 1:56 acres (of which 1°11 acres are cultivated and '21 cultivable) per head of the population, or 3°12 acres (2°22 cultivated and ~~42 culti~~ vable) per head of the agricultural population.

The principal agricultural products of Amritsar are wheat, barley, and grain for the spring crop; and rice, jor (spiked millet), Indian corn, moth (Phaseolus aconitifolius), and mash (Phaseolus radiatus) for the autumn crop. The current settlement of the district expires in 1875-76. Five towns are returned as containing a population of upwards of 5000 souls—namely, Amritsar, population 135,813; Jandral4, 6975; Majitha, 6600; Ram Das, 5855; Bundalé, 5287. Of the foregoing towns Amritsar has been constituted a first-elass, and Jandrali, Majitha, and Ram Das third-class munieipalities, Besides the regularly-constituted municipalities, however, a muni- cipal income is also realised at the following ten places :—Tarn Téran, Fathidbad, Govindwal, Naushahrd Pannian, Verowal, Jalalabad, Attari, Chamidri, Vanniki, and Bhallar. Municipal revenue is in all cases levied by means of octroi duties, supplemented in some instances by house rates and other direct taxation. The total revenue of Amritsar district in 1871-72 amounted to £113,785, of which £85,727, 18s., or 75 per cent., was derived from the land. The other principal items of revenue were as follows :—

Distilleries, £3677, 14s. ; drugs and opium, £3548, 6s. ; income tax, £1724, 8s; stamps, £13,621, 18s.; local rates levied under the provisions of Act. 20 of 1871, £5208, 10s. The staple manufacture of Amritsar is woollen shawls, in imitation of those of Kashmir. The value of this manufacture in 1871-72 was estimated at £91,742,

AMRITSAR CITy, the divisional hcadquarters and capital of the district of the same name, is situated in 31° 40' N. lat. and 74° 45' E. long. It lies at an equal distance be- tween the Bids and Ravi rivers, is about 8 miles in cir- cumference, and forms at once the great trading centre of the Panjab, and a celebrated seat of the Sikh religion and learning. The following description of the town is ex- tracted from Thornton's Gazetteer (ed. 1862) :—

" Amritsar owes its importance to a taldo or reservoir whieh Ram Das, the fourth guru or spiritual guide of the Sikhs, caused to be made herein 1581, and which he termed Amrita Saras, or the Fount of Immortality. It thenceforward became a place of pilgrimage. Nearly two centuries afterwards, Ahmad Shah, the founder of the Durani empire, alarmed and enraged at the progress of the Sikhs, blew up the shrine with gunpowder, filled up the holy tank, and caused kine to be slaughtered upon the site, thus desecrating the spot. On his return to Kabul, the Sikhs repaired the shrine and reservoir, and eommenced the overthrow of Mahometan sway in Hindustan. The sacred tank is a square of 150 paces, eontaining a great body of water, pure as crystal, notwithstanding the multitudes that bathe in it, and supplied apparently by natural springs. In the middle, on a small island, is a temple of Hari or Vishnu; and on the bank a diminutive structure, where the founder, Ram Das, is said to have spent his life in a sitting posture. The temple on the island is riehly adorned with gold and other costly embellish- ments, and in it sits the sovereign guru of the Sikhs to receive the presents and homage of his followers. Thcre are five or six hundred akalis or priests attached to the temple, who have erected for them- selves good houses from the eontributions of the visitors. Amritsar is a very populous and extcnsive place. The streets are narrow, but the houses in general are tolerably lofty, and built of burnt brick. On the whole, Amritsar may claim some little architectural

superiority over the towns of Hindustiu. Besides eonsiderable manufaetures of shawls and silks in imitation of the Kashmir fabrie, Amritsar earries on a very extensive transit trade, as well as considerable monetary transactions, with Hindustan and Central Asia. Provision is made for an ample supply of water to the town from the Bari Dodb canal. A striking objeet at Amritsar is the huge fortress of Govindgarh, built by Ranjit Sinh in 1809, ostensibly to proteet the pilgrims visiting the place, but in reality to overawe their vast and dangerous assemblage.

Amritsar was the first mission station of the Church of England in the Panjab. The census of 1868 gives a population within municipal limits of 43,931, The total population, however, of the city and suburbs is returned at 135,813, of whom 3477 are agriculturists, the rest being engaged in trade or other non-agricultural pursuits. The town has been constituted a first-class municipality, the affairs of which are conducted by a committee of twenty- eight members. The municipal income is derived from octroi duties, local taxes, house tax, &c., and amounted in 1871-72 to £19,800, or 9s. per head of the population within municipal limits. Since the opening of the Panjab railway Amritsar has rapidly become the great centre of trade in that province. Its position on the line and the enterprise of its merchants promise also to give it the com- mand of the trade wd Leh to Central Asia, which is now (1874) being opened up. It is the chief entrepét in the Panjab for Manchester goods, in return for which it ex- ports to other parts of India food-grains, the local manu- factures in imitation of the Kashmir fabrics, and the costly shawls and stuffs which form the staple of the Kashmir trade.

AMRU-BEN-EL-ASS, or Amer, one of the most famous of the first race of Saracen leaders, was descended of Aasi, of the tribe of Korcish. In his youth he wrote satirical verses against the person and doctrine of Mahomet. His zeal in opposing the new religion proniptcd him to under- take an embassy to the king of Ethiopia, in order to stimu- late

him against the converts whom he had taken under his protection, but he returned a convert to the Mahometan faith, and, along with Khaled, joined the fugitive prophet at Medina. When Abu-Bekr resolved to make a new attack upon Syria, he entrusted Amru with a high command. In this he was so successful that he rose to the elevated station of chief in Irak, when Khaled requested the attend- ance of all the Arabian generals before Damascus. During the caliphate of Omar he also served in Palestine under Abu-Obeidah, taking the command in the siege of Czsarea, which yielded to him in July 638 a.p. After the death of Obeidah, Amru assumed the chief command in Syria, in which he was confirmed by the caliph, notwithstanding the oppesition of Othman. Soon afterwards (639) he led an army of 4000 Arabs into Egypt. During the progress of his march a messenger from Omar arrived with a letter containing directions to return, if he should receive this letter in the territories of Syria; but if he should receive it in those of Egypt, he might advance, and all needful assistance would be instantly sent to him. The contents of the letter were not made known to his officers until he was assured that the army was on Egyptian soil, so that the expedition might be continued under the sanction of Omar's orders. Having taken Pharma, he advanced to Misrah, the ancient Memphis, and besieged it for seven months, Although numerous reinforcements arrived, he would have found it very difficult to storm the place pre- vious to the inundation of the Nile, but for a treacherous lessening of the forces of the citadel, which was consequently taken by storm; and the Greeks who remained there were either made prisoners or put to the sword. On the same spot Amru erected a city named Fostat, the ruins of which

are known by the name of Old Cairo. Amru pursued the Grecks to Alexandria, and after an ob

siege of fourteen months, the city was taken, 640 a.p. To Amru has generally been attributed the burning of the famous Alexandrian library, by command of the caliph Omar. But with this act of barbarism, so inconsistent with the character of Omar and his general, he is for the first time charged by Abul-Faragtus, a Christian writer, who lived six centuries later. It is highly probable that few of the 700,000 volumes collected by the Ptolemies remained at the time of the Arab conquest, when we con- sider the various calamities of Alexandria from the time of Cesar to those of Caracalla and Diocletian, and the dis- graceful pillage of the library in 389 a.p. under the rule of a Christian bishop, Theophilus (see Gibbon, c. 51). Amru died 663 a.p. In a pathetic oration to his children on his death-bed he bitterly lamented his youthful offence in satirising the prophet, although Mahomet had forgiven him, and had frequently affirmed that "there was no Mussulman more sincere and steadfast in the faith than Amru."

AMRU-EL-KAITS, an Arabian poet, contemporary with Mahomet. He wrote one of the seven Moallakat (Sus- pended), or poems, composed before the promulgation of Mahometanism, which derived their name from the fact that they were suspended in the Kaaba at Mecca. He was hostile to the claims of the prophet, and wrote verses against him. It is said that his death was occasioned by his wearing a poisoned shirt presented to him by the Greek emperor Heraclius, to whom he had gone to ask aid against the Beni-Asad, his own tribe. The story is, however, dis- credited by Abulfeda. The Moallakat of Amru, in the original text, was published by Lette at Leyden in 1848, and an English translation by Sir William Jones appeared in 1782. The edition of Hengstenberg (Bonn, 1823) con- tainsa Latin version. Another edition, by Arnold, appeared at Leipsicin 1850. The edition of Baron MacGuckin Slane (Paris, 1837) includes the miscellaneous poems, a translation, notes, and a life of the poet.

AMSANCTI (or AMPSANCTI) VALLIS, a valley with a small sulphureous lake and cavern in the territory of the Hirpini, or Principato Ultra (east of Naples), about four miles from the town of

Frigento (Cicero, Pliny), or eight from Gesualdo. The spot can most easily be visited by railway from Ariano, on the Naples and Benevento line. It is described by Virgil (dn. vii. 563-71) as an outlet from a cave giving access to the infernal regions :—

“Hie speeus horrendum, seevi spiracula Ditis,

Monstratur, ruptoque ingens Aeheronte vorago

Pestiferas aperit fauces; quis eondita Erinnys,

Invisum numen, terras ecelumque levabat.” The inodern name is Le Afofete, after the goddess Mephitis, who, according to Pliny (W.H. ii. 95), had a temple here, of which there are no remains. The lake is considered by Dr C. T. Ramage (who made a special visit to it) as of volcanic character, and appears to lie on the edge of a crater-shaped valley. ‘The water,” he says, “had a dark, pitchy appearance, and was thrown up occasionally in several places to the height of 4 or 5 feet. At the edge (of the crater) we were possibly 40 feet above the water, and we did not dare to descend, as the exhalations of sulphur were so strong that we should have been suffocated long before we reached the water. ... . In fact, the whole of this country seems to be volcanic, and is constantly subject to carthquakes.” (See Vooks and Byways of Italy, by C. T. Ramage, LL.D., 1868; Swinburne’s Travels, vol. i. ; Murray’s Handbook for South Italy,}1873.)

AMSDORF, Nicotaus, a Protestant reformer of the 16th century, was born, Dec. 3, 1483, at Gross-Zschopa, near Wurzen, on the Mulde. He was educated at Leipsic, and then at Wittenberg, where he was one of the first who matriculated (1502) in the recently-founded university.

stinate and bloody | He soon obtained various academical honours, and became

professor of theology in 1511. He joined Luther at the very beginning of his great struggle (1517); continued all along one of his most

admiring aud determined supporters; was with him at the Leipsic conference (1519), and the Diet of Worms (1521) ; and was in the secret of his Wart. burg seclusion. He assisted the first efforts of the Refor- mation at Magdeburg (1524), at Goslar (1531), and at Einbeck (1534) ; took an active part in the debates at Schmalkald (1537), where he defended the use of the sacrament by the unbelieving; and (1539) spoke out strongly against the bigamy of the Elector of Hesse. After the death of the Count Palatine, bishop of N aumburg- Zeiz, he was installed there (Jan. 20, 1542), though in opposition to the chapter, by the elector of Saxony and Luther. His position was a painful one, and he longed to get back to Magdeburg, but was persuaded by Luther to stay. After Luther's death (1546) and the battle of Miihlberg (1547) he had to yield to his rival Pflug, and retire to the protection of the young duke of Weimar. Here he took part in founding Jena university (1548) ; opposed the " Augsburg Interim" (1548) ; superintended the publication of the Jena edition of Luther's works 3 and debated on the freedom of the will, original sin, and, more _hoticeably, on the Christian value of good works, in regard to which he held that they were not only useless, but pre- judicial. He urged the separation of the High Lutheran party from Melanchthon (1557), got the Saxon dukes to oppose the Frankfurt Recess (1558), and continued to fight for the purity of Lutheran doctrine. He died at Eisenach, May 14, 1565, and was buried in the high church there, where his effigy shows a well-knit frame and sharp- cut features. He wasa man of strong will, of great apti- tude for controversy, and considerable learning, and thus exercised a decided influence on the Reformation. Many letters and other short productions of his pen are extant in MS., especially five thick volumes of Amsdorfiana, in the Weimar library. A small sect, which adopted his opinion on good works, was called after him; but it is now of mere historical interest.

AMSLER, Samuet, one of the most distinguished of modern engravers, was born at Schinznach, in the canton of Aargau, in 1791. He studied his art under Lips and Hess, and from 1816 pursued it in Italy, and chiefly at Rome, till in 1829 he succeeded his former master Hess as professor of copper engraving in the Munich academy. The works he designed and engraved are remarkable for the grace of the figures,

and for the wonderful skill with which he retains and expresses the characteristics of the original paintings and statues. He was a passionate admirer of Raphael, and had great success in reproducing his works. Amsler's principal engravings are—" The Triumphal March of Alexander the Great," and a full-length " Christ," after the sculptures of Thorwaldsen and Dannecker ; the "Burial of Christ," and two "Madonnas," after the pictures of Raphael; and the "Triumph of Religion in the Arts," after Overbeck, his last work, on which he spent six years. He died May 18, 1849.

AMSTERDAM, or AMsTELDAM, formerly called Amstel- redam, capital of the N etherlands, situated in the province of North Holland, is built somewhat in the form of a half- moon, on the Y or Ij, an arm of the Zuyder Zee, in 52° 22' 'N. lat., and 4° 53' E. long. The name Amsterdam means "the dam or dyke of the Amstel," from a river 80 called which passes in a north-easterly direction through the city,—the "dam" referring to the extensive and costly system of embankments, canals, and sluices necessary to secure this low-lying city against the encroachments of the tide. Towards the land Amsterdam was at one time sur- Tounded by a fosse or canal, and regularly fortified; but its ramparts have been demolished, and the twenty-eight

bastions that formed part of the defences are now used as promenades, or covered with buildings. Within the city, four canals—the Prinsen Gracht, Keizer's Gracht, Heeren

REFERENCE 2 THE PACAce aig cro XCHANGE OR|OPALEIS VOOR guRS VOLKSVLILT HBUVE KERK | 7 SCHREIJERS OE K « 'OREN 8 FREDERIKS PLEIN

AMSTERDAM

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Gracht, and the Singel—extend, in the form of polygonal crescents, nearly parallel to each other and to the former fosse; while numerous smaller canals intersect the city in every direction, dividing it into about 90 islands, with nearly 290 bridges. Some of these are of stone, but the majority are of iron and wood, and constructed so as to allow vessels for inland navigation to pass through. The site of Amsterdam was originally a peat bog, and all its buildings rest upon piles that are driven some 40 or 50 feet through a mass of loose sand and mud until they reach a solid stratum of firm clay. This foundation is perfectly secure as long as the piles remain under water. In 1822, however, an overladen corn magazine sank into the mud. The piles are liable to the ravages of wood-worms that are supposed to have been brought by vessels from foreign ports. The streets in the oldest parts of the town are narrow and irregular, but are.nowhere without pavements or footways. The houses frequently present a picturesque sky-line, broken by fantastic gables, roofs, chimneys, towers, and turrets of all forms and dimensions. Four of the principal of those towers have exterior galleries very near the top, running round them, from which an alarm used to be blown in case of fire, and a light shown to indicate the locality of the fire to the citizens, who from the age of twenty to fifty are all enrolled in the fire-brigade and civic guard. This mode of signalling is now, however, super- seded by a system of telegraphic communication embrac- ing the whole city. Westward of the Amstel, which passes almost through the centre of the city, is the more modern part, where the houses are often exceedingly handsome, and the streets broad, and planted with rows of large trees between the houses and the canals. The chief promenades are the Vondelspark, laid out and maintained by private individuals, with the design of its being ultimately pre- sented to the city; and the Plantaadje or Plantation, part of which is occupied by the botanic and the zoological gardens, and which is also supported by private contribu- tions. Of the public buildings, the principal is the palace, an imposing structure, built in 1648, by the architect Jacob van Kampen, and adorned with stone carvings by the cele- brated artist Artus Quellinus of Antwerp. It is supported on 13,659 piles, and is 282 feet long, with a breadth of 235

feet and a height of 116, exclusive of a turreted cupola, which rises 66 feet above the main building. It was originally the Stadhuis, but was appropriated as a palace by King Louis Napoleon in 1808. The most mag-

nificent apartment in it is the great hall, measuring 120 feet by 57, and 90 in height, with walls incrusted with white Italian marble. On the opposite side from the palace of the square called the Dam, stands the Beurs or Exchange, a fine tetraprostyle Ionic building, serving as a front to a large quadrangle with a handsome peristyle of the same order. The Oude Kerk, built about the year 1300, has some beautiful stained windows and a fine organ, as well as monuments to various celebrated Dutchmen, including the naval heroes Van Heemskerk and Sweerts. The Niewe Kerk, a much finer edifice, where the kings of Holland are crowned, dating from 1408, is remarkable for the carving of its pulpit, for the elaborate bronze castings of its choir, and for the monuments to the famous Admiral De Ruyter and Holland's greatest poet, Vondel, whose statue stands in the park which bears his name. There are many other places of worship in Amsterdam, including those belonging to the Dutch Reformed Church, the English Episcopalians, the Scotch Presbyterians, the Lutherans, the Jansenists, the Roman Catholics, the Greeks, &c., and also several Jewish synagogues; but, as a rule, the church architecture of the town is bald and uninteresting. We may except, however, the synagogue of the Shephardim Jews, the equal of which is only to be found at Leghorn; the Moses and Aaron's Church (R.C.); and the new Lutheran place of worship, which has a green copper cupola. The Paleis voor Volks- vlijt is a building of iron and glass, 440 feet long by 280

*broad, with a dome 200 feet high, erected between 1855_*

and 1864. It is used for industrial exhibitions, the per- formance of operas, &c., and possesses a collection of pictures (copies and some originals), as well as a fine garden. 'The Schreijerstoren, or " crier's tower," at the end of the Geldersche Kade, where vessels left for all parts of the globe, was built about 1482, and got its name from the

tears of the sailors who here bid their friends farewell. The chief literary institutions of Amsterdam are the Atheneum, the society called "Felix Meritis," from the first words of the inscription on their place of meet- ing; the society " Natura Artis Magistra," to whom the zoological gardens belong; the Royal Academy of the Fine Arts, and the Seaman's In- stitute. The galleries of pic- tures in the city are of great value The museum in the Trippenhuiscon- tains over 400 works, chiefly of the Flemish and Dutch schools, including the "Night Guard" of Rembrandt, whose statue may be seen on the Kaasplein, opposite the house he occupied, and the " Banquet of the Civic Guard," by Van der Helst; besides nearly 4000 engravings, and a magnificent numismatic col- lection, considered one of the finest in the world. Among the other collections are those in the Museum Van der Hoop and in the Fodor Museum, that belonging to the "Arti et Amicitie " Society, as well as several private galleries. Amsterdam is also remarkable for the number and high character of its benevolent institutions, which are to a large extent supported by voluntary contributions. Among others may be mentioned hospitals for the sick, the aged, the infirm, the blind, the deaf, the dumb, the insane, widows, orphans, and foundlings. There is a noble institution, the Society for the Public Welfare, whose object is to promote the education and improvement of all classes. It has branches

City Arms of Amsterdam.

in nearly every town and village in Holland. There is also an admirable sailors' home.

Amsterdam is now capitally supplied with water for drinking and culinary purposes from the Haarlem dunes. Formerly the inhabitants were dependent on the rain-water collected in cisterns, and the supply brought from Weesp in large flat-bottomed barges. This, added to the general humidity of the atmosphere caused by the canals, made Amsterdam an unpleasant place of residence in summer, but the exertions of the inhabitants have done much of late to counteract these noxious influences. The people usually have a robust appearance, and the death-rate of the city is low.

The population (1874) is estimated at 285,000, of whom about 60,000 are Roman Catholics, and 30,000 Jews, the rest being mostly Protestants of various sects.

The accompanying plan indicates the extent and position of the docks of Amsterdam. The arsenal and the admiralty offices are situated on the island of Kattenburg, between the Dijk Gracht and the Niewe Vaart. The approach to the city from the Zuyder Zee is intricate and dangerous, owing to the numerous shallows ; and a bar at the entrance to the Y compels vessels to unload part of their cargo in the roadstead. These delays and dangers were to a largo extent provided against in 1825, by the opening of a canal across North Holland from the Niewe Diep, opposite the Texel, to Amsterdam ; and a more direct and capacious canal to the North Sea is at present in process of construction. The following table gives the chief shipping statistics for the five years ending December 1870 :—

Arrivals. Departures.

Year.

Vessels. Tonnage. Vessels. Tonnage.

1866 1604 420,094 1662 423, 623 1867 1466 892,975 1560 404,717 1868 1465 430,799 1508 421,566 1869 1374 425,329 1443 448,891 1870 1297 405,109 1341 402,933

The principal imports of Amsterdam are—coffee, amount- ing in 1870 to 1,147,240 bags and 1499 casks; tea, in the same year, 79,573 chests; sugar, in the same year, 273,750,000 ib; tobacco, rice, cotton, indigo, timber, tin, hemp, and grain. The exports comprise cheese, butter, madder, clover, rape, linseed oil, gin, and other products of Holland, besides general goods and manufactures from various European countries. There is also a large export trade in the produce of the East and West Indies. There are two lines of railway, the one connecting Amsterdam with Haarlem, Leyden, and Rotterdam; and the other with Utrecht, Arnheim, and Prussia. Amsterdam has sugar refineries ; soap, oil, glass, iron, dye, and chemical ° works;

distilleries, breweries, tanneries ; tobacco and snuff factories. The cutting of diamonds has long been exten- sively practised in the city by the Jews. Although no longer the centre of the banking transactions of the world, Amsterdam is still a place of considerable importance in this respect. The celebrated bank of Amsterdam, founded in 1609, was dissolved in 1796; and the present bank of the Netherlands was established on the model of the Bank of England in 1814.

About the year 1200 Amsterdam was a small fishing village, held in fief by the lords of Amstel, together with the surrounding district, called Amstelland. Towards the close of the 13th century it reverted, in consequence of the complicity of Gysbrecht Van Amstel in the murder of Count Floris V., to the counts of Holland, who gave it a charter and other privileges. It was fortified in 1482, and soon rose to be the most important commercial city of the Netherlands. The early voyages to India, and the union of the seven provinces in 1579, added greatly to the

prosperity of Amsterdam—so much so, that it excited the cupidity of the earl of Leicester, who made a futile at- tempt to surprise it in 1587; and its position was still further improved by the peace of Westphalia in 1648, which closed the navigation of the Scheldt, and conse- quently ruined the trade of Antwerp. Two years later, the stadtholder William II. intended to surprise it, but the bold attitude of the inhabitants obliged him to give up his project. Amsterdam suffered so severely from the war in the time of Cromwell, that more than 4000 houses stood tenantless ; and the French occupation during the First Empire inflicted @ more permanent injury upon the city. Since 1813, however, much of its former commercial influence has returned ; and the completion of the above- mentioned canal will, no doubt, confirm its position as the chief commercial city of the kingdom, its secondary place as a seaport lately having been due to the difficulty of access to it from the sea. Among the many eminent men who saw the light in Amsterdam may be mentioned the celebrated philosopher Baruch, Spinosa (1632), the flower painter Van Huysum (1682), the naturalist

Swammerdam (1637), and the poet Bilderdyk (1750). (See Caspar Com- melins, Beschryving van Amsterdam, and J. Wagenaar's work bearing the same title.)

AMSTERDAM, an uninhabited and almost inaccessible island in the Indian Ocean, in 37° 58' S. lat., and 70° 34' E, long., about 60 miles 8. of St Paul's Island, and nearly mid- way between the Cape of Good Hope and Tasmania. It was discovered by Van Diemen in 1633.

AMULET (in late Latin amuletum, probably from the Arabic hamalet, a pendant), anything worn as a charm, generally, but not invariably, hung from the neck, to pro- tect the wearer against witchcraft, sickness, accidents, and other evils, or to deliver him from ills under which he labours. Amulets have been of many different kinds, and formed of different substances,—stones, metals, and strips of parchment being the most common, with or without characters or legends engraved or written on them. Gems have often been employed and greatly prized, serving for ornaments as well as for charms. Certain herbs, too, and animal preparations have been used in the same way. In setting them apart to their use as amu- lets, great precau- § tions have been taken that fitting times be selected, stellar and other magic influences propitious, and BOGGS G55 everything avoided that might be supposed to destroy or weaken the force of the charm. From the earliest ages the Oriental races have had a firm belief in the prevalence of occult evil influences, and a superstitious trust in amulets and similar preservatives against them. There are refer- ences to, and apparently correctives of, these customs in the Mosaic injunctions to bind portions of the law upon the hand and as frontlets, between the eyes, as well as write them upon the door-posts and the gates ; but, among the later Jews especially, the original design and meaning of these usages were lost sight of ; and though it has been said that the phylacteries were not strictly amulets, there 18 no doubt that they were held in superstitious regard. Amulets were much used by the ancient Egyptians, and also among the Greeks and Romans. We find traces of them too in the early Christian church, in the emphatic protests of Chrysostom, Augustine, and others against them. The fish was a favourite symbol on these charms, from the word ixOvs being

the initials of "Imcotds Xpucrds @eod vids curfp A firm faith in amulets still prevails

widely among Asiatic nations. The accompanying wood- cut represents the boxes employed to hold written charms worn by Arab women at the present day. Talisman, also from the Arabic, is a word of similar meaning and use, but some distinguish it as importing a more powerful charm. A talisman, whose "virtues are still applied to for stopping blood and in cases of canine madness," figures prominently in, and gives name to, one of Scott's Zules of the Crusaders. A measure of belief in amulets or charms exists, but appears to be diminishing, among the unedu- cated of our own country and time. (See Arpe, De Prodigiis Nature et Artis Operibus Talismanes et Amuleta dictis, Hamburg, 1717; Ewele, Veber Amulete, 1827; and Kopp's Paleographica Critica, vols. iii. and iv., 1829.)

AMURATH or Murap I. was born in 1326 ap. (726 .u.), succeeded his father Orkhan as sultan of the Ottoman Turks in 1360, and died in 1389. He is entitled to notice as being the first who led the Turkish arms into Europe, which he quickly overran as far as the Balkan. In 13861 he made himself master of Adrianople, where he fixed his residence, built a splendid mosque, and otherwise added to the architectural adornment of the city. The first treaty of peace between a Christian people and this formidable neighbour was struck in 1365, when the little republic of Ragusa put itself under his protection. His power becoming more and more formidable, Urban V. preached a crusade—disastrous, as it proved, for the crusaders—against him ; and John Palzologus, the Greek emperor, entered into an alliance with him. He had seve- ral rebellions to contend against, but he was invariably successful. One of his sons persuaded a son of Paleeologus, who had been sent by his father to learn the art of war under Amurath, to join him in a revolt; but the youthful conspirators were defeated. Immediate revenge was taken by the sultan on his own son, and the young Paleologus was sent back to his father with an imperious demand that he too should be punished. Like all great conquerors,

Amurath was active in military reform; he perfected the discipline of the spahis (or cavalry) and woinaks (or baggage corps), and gave stability to the janissaries, a body of troops that had been first incorporated by his father. Of literary culture he was altogether destitute, signing his treaties by dipping his hand in ink, and impressing the mark of three fingers together, with the thumb and fourth finger at a slight distance on each side. He lost his life at the close of a great battle at Cassova, which he had successfully fought against Lazarus, despot of Servia, and was succeeded by his son Bajazet.

AMURATH IL, the tenth emperor of the Turks, was born about 1404, and died February 9, 1451. He suc- ceeded Mohammed IJ. in 1422. At first he had to contend against a pretender, the pseudo-Mustapha, who was sup- ported by the Greek emperor and others ; but through the assistance of an astute state prisoner, Mohammed Bey (Michael Ogli), he obtained a bloodless victory over him. He then turned his arms against the Greek emperor him- self, but failed in the siege of Constantinople. Against his younger brother Mustapha he was successful by bribes. In April 1429 he besieged and took Saloniki (Thessalonica), which was under Venetian rule, thus opening up the way for the final subjugation of Greece. He continued almost without any reverses of fortune till 1442, when Hunniades defeated his forces in the battle of Vasag, and obliged him to make peace with the Christian princes. The treaty was hardly concluded when his son Ala-Eddin died. In his grief he abdicated in favour of his gon Mohammed, a boy of fourteen, while he retired to Mag- nesia in search of repose. But the Christian princes took advantage of his abdication to renew their attacks, and he was called to oppose them, which he did with terrible suc-

cess in the battle of Varna, Nov. 10, 1444, when the king of Hungary, Ladislaus, fell. Having saved his country, he again gave up the reins to his son, and returned to Magnesia. But the janissaries revolted, and his presence was demanded. Again on his throne, he invaded Albania and

Peloponnesus, but was repulsed by George Castriot or Scanderbeg. He retreated, however, ouly to gain a great victory over his former adversary Hunniades at Cassova (Oct. 17, 1448), the battle lasting threc days. He died at Adrianople, Feb. 11, 1451, from a stroke of apoplexy, according to the most probable account. His Mussulman biographers tell that whenever he took a town he was careful to build in it a jamz (or cathedral), a mosque, an imaret, a medrésseh (or ecclesiastical school), and a khan. The mosque of Adrianople is especially remarkable. He was the first Ottoman emperor who caused bridges of great length to be built; and during his reign, poetry, juris-prudence, and theology began to flourish with promise of the Augustan luxuriance which they attained under his son and successor, Sultan Mohammed-Elfatyh.

AMURATH IIL, sultan of the Turks, born about 1545, succeeded in 1574 his father Selim II. The first words he addressed to his courtiers were—'I am hungry: give mnie something to eat ;" and the evil omen was fulfilled in the famines and disasters that marked his reign. In 1579 Queen Elizabeth of England managed to gain his friend- ship, and obtained a favourable commercial treaty for Great Britain. It was under him that the janissaries began to feel their power, and to hasten the ruin of the state by their revolt. He was superstitious, feeble, and irritable, as well as extremely addicted to the pleasures of the harem. He was fond of dancing and music, and has left a few literary trifles. He died Jan. 16, 1595.

AMURATH IV. was born about 1611, and succeeded his uncle Mustapha in 1623. The chief event of his reign was the recovery in 1638, after thirty days of unremitting assault, of the city of Baghdad which had fallen into the hands of the Persians. He disgraced his victory by re- volting cruelties, slaughtering 30,000 Persians in cold blood. So numerous and horrible are the atrocities recorded of him, that he stands pre-eminent even among Turkish Neroes. Some historians ascribe this feature of his cha- ractcr to his almost perpetual inebriation. Be this as it may, he soon enfeebled his constitution, and falling at the same time under a superstitious anticipation of death, he dicd in 1640, at the early age of twenty-nine.

AMWELL, a village of Hertfordshire, in the parish of Great Amwell, on a hill overlooking the Lea, 3 miles from Hertford and 20 from London. Near it are the sources of the New River, formed between 1606 and 1612 in order to supply London with water; and on a small island in the stream there is a monument to Sir Hugh Myddleton, through whose exertions this work was carried out. Haileybury college, formerly the property of the East India Company, is also in this parish, which has a population of 2245,

AMYMONE (Apvpdvy), in Greek Legend, a daughter of Danaiis, by whom, with her sisters, she had been sent to look for water, the district of Argus being then parched through the anger of Neptune. Amymone having thrown her spear at a stag, missed it, but hit a satyr asleep in the brake. The satyr pursued her, and she called on Neptune for help, who appeared, and for love of her beauty caused a spring to well up, which received her name. By Neptune she became the mother of Nauplius, the wrecker. Amymone at the spring is represented on ancient engraved gems.

AMYOT, Jacquzs, a famous French writer, was born, of poor parents, at Melun, October 30, 1513; found his way—a pale-faced, bare-footed, ill-clad boy—to the "Col- lege de France" in Paris, and there picked up a know-

ledge of the classical languages, serving some of the richer students as valet and composer of Latin, to enable him to continue his studies. He became M.A. at Paris, and doctor of civil law at Bourges ; obtained, through Jacques Colure (or Colin), abbot of St Ambrose in the latter city, a tutorship in the family of a secretary of state ; by the secretary was recommended to the duchess of Berry, only sister of Francis I. ; and, through her influence, was made professor of Greek and Latin at Bourges. Here he trans- lated the Theagenes and Chariclea of Heliodorus (1547, fol.), for which ~~he was rewarded by Francis I. with the abbey of Bellozane, and thereby enabled to go to Italy to study the Vatican text of Plutarch, on whose Lives he had been some time engaged. On the way he tured aside on a mission to the council of~~

~~Trent. Returning home, he was selected as tutor to the sons of Henry IL., by one of whom (Charles IX.) he was afterwards made grand almoner, and by the other (Henry III.) was ap~~ pointed commander of the order of the Holy Ghost. Pius. I. promoted him to the bishopric of Auxerre, and here he continued to live in comparative quiet, repairing his cathedral and perfecting his translations, for the rest of his days, though troubled towards the close by the insub- ordination and revolts of kis clergy. He died February 6, 15938, bequeathing, it is said, 120 crowns to the hospital at Orleans for the twelve "deniers" he received there when "poor and naked" on his way to Paris. His fame rests on his vigorous and idiomatic version of Plutarch's Lives (1559, 2 vols.), which was translated into English by North, and supplied Shakespeare with materials for his Roman plays. His style was greatly admired by Racine and Rousseau, and Montaigne said of him, "I give the palm, and rightly, methinks, to Jacques Amyot over all our French writers."

AMYRAUT, Moszs, a pre-eminent French Protestant theologian and metaphysician, was born at Bourgueil, in the valley of Anjou, in 1596. His family was an aucient and illustrious one from Hagenau, Alsace. They migrated to Orleans in the 13th or 14th century. His father was a lawyer of local note, and designing Moses for his own pro- fession, on the completion of his studies at Orleans of humanity and philosophy, he sent him to the university of

Poictiers. It is recorded that there the youth studied

fourteen hours a day, and made such swift progress that he was able to maintain theses and disputations, and to take the degree of licentiate (B.A.) of laws. On his way home from the university he passed through Saumur, and having visited Mons. Bonchereau, pastor of the Protestant church there, he introduced him to the renowned lord of Plessis-Mornay, governor of the city. Both were struck with young Amyraut's ability and culture, and both urged him to change from law to theology. Plessis-Mornay, who was chary of laudations, pronounced that 'there was nothing above the grasp of his great parts." Returned home, his father, after considerable hesitation, gave consent to the change from law to divinity, with a proviso that he . should revise his

philological and philosophical studies, and read over Mons. Calvin's Jnstitutions, before finally deter- mining. He did so, and, as might have been anticipated, decided for theology. He thereupon removed to Saumur —destined to be for ever associated with his name—and "sat at the feet of the great Cameron," who ultimately regarded him as his greatest scholar. He had a brilliant course, and was in due time licensed as a minister of the French Protestant Church. The contemporary civil wars and excitements hindered his advancement. His first church was in St Aignau, in the province of Maine. There he remained two years. The celebrated Daille, being then removed to Paris, advised the church at Saumur to secure Amyraut as his successor, praising him "as above himself."

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The university of Saumur at the same time had fixed its eyes on him as professor of theology. The great churches of Paris and Rouen also contended for him, and sent their

deputies to win him, to the provincial synod of Anjou. Amyraut had left the choice to the synod.

the pastorate. maintained for thesis De Sacerdotio Christi.

were also Cameron's pupils. long friendship of these three remarkable men,

divinity entitled Theses Salmurienses.

of love with a fine enthusiasm? of love of labour. very speedily gave French Protestantism a had never possessed before. In 1631 he published his Traité des Religions, a book that still lives ; and from this

year onward he was a foremost man in the church, especi-

ally at the national and provincial synods. One incident in his synodical services stands out, as the like do in the story of Luther and of John Knox. Chosen to represent the provincial synod of Anjou,

Touraine, and Maine at the national synod held in 1631 at Charenton, that assembly appointed him their orator to address the king, and to present to him "The Copy of their Complaints and Grievances for the Infractions and Violations of the Edict of Nantes." Previous deputies had addressed the king on their bended knees, whereas the representatives of the Roman Catholics had been permitted to stand. Amyraut consented to be orator only if the assembly authorised him tostand. There was intense resistance. Richelieu himself, preceded by lesser dignitaries, condescended to visit Amy- raut privately, to draw him over to kneel ; but the stout-hearted orator held resolutely to equahty with the Roman Catholics, and carried his point. Standing in the presence of king and court, he recounted the complaints and grievances of his church, and charmed even his adver- saries with his mingled dignity of manner and suavity of address. Long afterwards Richelieu recalled the memorable Incident ; and the "Oration," which was immediately published in the French Mercury, remains a historic land- mark in the history of French Protestantism. During his absence on this matter the assembly debated " Whether the Luthcrans who desired it, might be admitted into communion with the Reformed Churches of France at the Lord's Table?" It was decided in the affirmative previous to his return ; but he approved with astonishing eloquence, and thereafter was ever in the front rank in maintaining intercommunication between all churches holding the main doctrines of the Reformation. His defence against many adversaries on the question was published in 1647—De Secessione ab Ecclesid Romané deque Ratione Pacis inter Hvangelicos in Religionis N egotvo constituende. Bayle (s.v.) recounts the title-pages of no fewer than thirty-two books of which Amyraut was the author. These show that he took part in all the great controversies on Predestination and Arminianism which then so agitated and harassed all Europe. Substantially he held fast the Calvinism of his preceptor Cameron ; but, like Richard Baxter in England, by his breadth and charity exposed himself to all manner of misconstruction from Peter du Moulin and others ultra- orthodox, His La Defense de Calvini never was answered, although superabundantly replied to. The university of Saumur became the university of French Protestantism. Amyraut had

as many as a hundred students in attendance upon his prelections. Another historic part filled by

yraut was in the negotiations originated with Mons. le Goux, lord of Berchére, first president of the parliament of Burgundy, when exiled to Saumur, for a reconciliation

He was appointed to Saumur, and to the professor's chair along with On the occasion of hig inauguration he His co- professors were Lewis Capell and Josua de la Place, who Very beautiful was the life- They remain associated still as the joint authors of a body of Full of energy in every atom of him, Amyraut devoted himself to his labour He potentiality it

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and reunion of the Roman Catholics of France with the French Protestants. Very large were the concessions made by Richelieu in his personal interviews with Amy- raut; but, as with the Worcester House negotiations in England between the Church of England and Non-conformists, they inevitably fell through. On all sides the statesmanship and eloquence of Amyraut were con- ceded." When the king visited Saumur in 1651, Amyraut declined to close his church on the Sunday, but preached a sermon that rang through Europe on the text, 'Fear God, honour the king." Amyraut remained to the end one of the most prominent names of French Protestantism : and his De l'Elévation de la Foy et de UV Abaissement de la faison en la Oréance des Mystéres de la Religion (1641) gave him early a high place as a metaphysician, which was sustained by "after works. Exclusive of his controversial writings, he left behind him a very voluminous series of practical evangelical books, which remain the fireside favourites of the peasantry of French Protestantism still. His "stat des Fidéles aprés la Mort has coniforted many mourners ; his Sur ?'Oraison Dominicale is striking and rich ; his Du Mérite des Guvres and Traité dela Justification, weighty and powerful ; his Paraphrases on Old Testa- ment and New Testament books of Holy Scripture, judicious and suggestive—sometimes peuetrative. His closing years were weakened by a severe fall he met with in 1657. He died on 18th January 1664.

His portrait was published by his son, but with no name or inscription underneath, (Bayle, s.v. ; Biog. Univ., s.v. ; John Quick's Synod. in Gall. Reform., pp. 352-7 3 ibid. MS. Icones Sacre Galli- cane; Life of Cameron.) (A. B. G.)

ANA, a Latin plural termination appropriated to various collections of the observations and criticisms of eminent men, delivered in conversation and recorded by their friends, or discovered among their papers after their de- cease. Though the term Ana is of comparatively modern origin, the introduction of this species of composition is not of recent date. It appears, from D'Herbelot's Biblio- theque Orientale, that from the earliest periods the Eastern nations were in the habit of preserving the maxims of their sages. From them the practice passed to the Greeks and Romans. Plato and Xenophon treasured up and re- corded the sayings of their master Socrates 3 and Arrian, in the concluding books of his Linchiridion, now lost, col- lected the casual observations of Epictetus. The numerous apophthegms scattered in Plutarch, Diogenes Laertius, and other writers, show that it was customary in Greece to pre- serve the colloquially expressed ideas of illustrious men. Tt appears that Julius Cesar compiled a book of apophthegins, in which he related the bon mots of Cicero 3 and Quintilian informs us that a freedman of that celebrated wit and orator composed three books of a work entitled De Jocis Crceronis, We are told by Suetonius that Caius Melissus, originally the slave but afterwards the freedman and librarian of Meecenas, collected the sayings of his master ; and Aulus Gellius has filled his Noctes Attice with anec. dotes which he heard from the eminent scholars and critics whose society he frequented in Rome.

But though vestiges of Ana may be traced in the classi- cal ages, it is only in modern times that they have come to be regarded as constituting a distinct specics of composi- tion, comprising literary anecdotes, critical reflections, and historical incidents, mingled with the detail of bon mots and ludicrous tales. The term Ana seems to lave been applied to such collections as far back as the beginning of the 15th century. Francesco Barbaro, in a letter to Poggio, says that the information and anecdotes which Poggio and Barthelemi

Montepolitiano had picked up dur- ing a literary excursion through Germany will be called Ana: "Quemadmodum mala ab Appio e Claudia gente

Appiana, et pira a Mallio Malliana cognominata sunt, sic hee literarum que vestra ope et opera Germania in Italiam deferentur, aliquando et Poggiana et Monte- politrana vocabuntur."

Poggio Bracciolini, to whom this letter is addressed, and to whom the world is indebted for the preservation of so many classical remains, is the first eminent person of modern times whose jests and opinions have been trans- mitted to posterity. Poggio was secretary to five succes- sive popes. During the pontificate of Martin V., who was chosen in 1417, Poggio and other members of the Roman chancery were in the habit of assembling in a common hall adjoining the Vatican, in order to converse freely on all subjects. Being more studious of wit than of truth, they termed this apartment Buggzale, a word which Poggio himself interprets Mendaciorum Oficina. Here Poggio and his friends discussed the news and scandal of the day ; communicated entertaining anecdotes ; attacked what they did not approve (and they approved of little); and in- dulged in the utmost latitude of satiric remark, not sparing even the pope and cardinals, The jests and stories which occurred in these unrestrained conversations were collected by Poggio, and formed the chief materials of his Facetic, first printed, according to De Bure, in 1470. This collec- tion, which forms a principal part of the Poggiana, is chiefly valuable as recording interesting anecdotes of eminent men of the 14th and 15th centuries. It also contains a number of quibbles or jeux de mots, and a still greater number of idle and licentious stories. Many of these are not original, some of them being taken from ancient authors, and a still greater number from the Fabliaux of the Zrouveurs. On the other hand, Poggio has suggested much to succeeding writers. Prior's Hans Carvel and several of Fontaine's fables are from stories originally related by Poggio. The Facetie forms, upon the whole, the most amusing and interesting part of the Poggiana printed at Amsterdam in 1720; but

this collec- tion also comprehends additional anecdotes of Poggio's life, and a few extracts from his graver compositions.

Though Poggio was the first person whose remarks and bon mots were collected under the name of Ana, the Sca- ligerana, which contains the opinions of Joseph Scaliger, was the first work published under that appellation, and accordingly may be regarded as having led the way to that class of publications, There are two collections of Scaligerana—the Prima and Secunda. The first was com- piled by a physician named Francis Vertunien, Sieur de Lavau, who attended a family with whom Joseph Scaliger resided. He, in consequence, had frequent opportunities of meeting the celebrated critic, and was in the custom of committing to writing the observations which dropped from him in the course of conversation, to which he occasionally added remarks of his own. This collection, which was chiefly Latin, remained in manuscript many years after the death of the compiler. It was at length purchased by M. de Sigogne, who published it in 1669, under the title of Prima Scaligerana, nusquam antehac edita, calling it prima in order to preserve its claim of priority over another Scaligerana, which, though published three years before, had been more recently compiled. This second work, known as Secunda Scaligerana, was collected by two brothers of the name of Vassan, students of the university of Leyden, of which Scaliger was one of the professors. Being particularly recommended to Scaliger, they were received in his house, and enjoyed his conversa- tion. Writing down what they had heard, particularly on historical and critical subjects, they soon made up a large manuscript volume, in which, however, there was neither connection nor arrangement of any description. After pass- ing through various hands, this manuscript came into the

possession of M. Daillé, who for his own use arranged in alphabetical order the articles which it contained. Isaac Vossius, obtaining the manuscript in loan from M. Daillé, transcribed it, and afterwards published it at the Hague, under the title of Scaligerana, sive Hucerpta ex Ore Josephi Scaligeri. This edition was full of inaccuracies and blunders, and a more correct impression was afterwards published by M. Daillé, with a preface complaining of the use that Vossius had made

of the manuscript, which he declares was never intended for publication, and was not of a nature to be given to the world. Indeed, most literary men in that age conceived that the Scaligerana, particularly the second, detracted considerably from the reputa- tion of the great scholar. Joseph Scaliger, with more extensive erudition, but, as some think, less genius than his father Julius Ceesar Scaliger, had inherited his vanity and dogmatical spirit. Conversing with two young students, he would probably be but little cautious in the opinions he expressed, as his literary errors could not be detected or exposed. Unfortunately the blind admiration of his pupils led them to regard his opinions as the responses of an oracle, and his most unmerited censures as just condemna- tions. The Scaligerana, accordingly, contains many false- hoods, with much unworthy personal abuse of the most distinguished characters of the age.

In imitation of the Scaligerana, a prodigious number of similar works appeared in France towards the end of the 17th and beginning of the 18th century. At first these collections were confined to what had fallen from eminent men in conversation ; but they were afterwards made to embrace fragments found among their papers, and even passages extracted from their works and correspondence. Of those which merely record the conversations of eminent men, the best known and most valuable is the Menagiana. Gilles Ménage was a person of good sense, of various and extensive information, and of a most communicative dis- position. For a long period an assembly of literary men met once a week at his house; and during his later years he daily received critics and scholars as visitors. Much of his time was thus spent in conversation ; and his habitual associates were at pains to record his opinions, which were generally founded on a correct taste and judg- ment, and were always delivered in an interesting and lively manner. A collection of his oral opinions was pub- lished in 1693, soon after his death ; and this collection, which was entitled Menagiana, was afterwards corrected and enlarged by M. la Monnoye, in an edition published by him in 1715.

The Perroniana, which exhibits the opinions of Cardinal du Perron, was compiled from his conversation by M. de Puy, and published by

Vossius, by the same contrivance which put him in possession of the Scaligerana. Some parts of this collection are useful in illustrating the literary and ecclesiastical history of the age in which Du Perron lived ; but it contains many pucrile, imprudent, and absurd remarks, many of them the interpolations of his friends. The Zhuana, or observations of the president De Thou, have usually been published along with the Perrontana. This collection is not extensive, and by no means of such value as might have been expected from a man so able and distinguished.

The Valesiana is a collection of the literary opinions of the historiographer Adrian de Valois, published by his son. M. de Valois was a great student of history, and the Valesiana accordingly comprehends many valuable histort- cal observations, particularly on the works of Du Cange.

The Fureteriana (1696) contains the bon mots of M. Furetiére of the French Academy, the stories which he was in the habit of telling, and a number of anecdotes and remarks found in his papers after his decease. This pro-

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duction, however, compreheuds but few thoughts, opinions, or criticisms un books, consisting chiefly of short stories, and containing numerous allusions to a violent quarrel he had with the French Academy, of which he was a member, concerning his Dictionnaire Francaise.

The Chevreana (2 vols. 8vo, 1700), so called from M.

Chevreau, exhibits more research than most works of a similar description, and is probably more accurate, as it differs from the Ana proper, of which the works described above are instances, in having been published during the Among other interesting articles, it contains a learned and ingenious commeutary on the works of Malherbe, to whom the French language and poetry were greatly indebted for their per-

life of the author, and revised by himself.

fection.

Parrhasiana (Amst., 2 vols. 8vo, 1699-1701) is the work of Jean le Clerc, a professor of Amsterdam, who bestowed this appellation on his miscellaneous productions with the view of discussing various topics of philosophy and politics with more freedom than he could have employed under his own name. This work is not of the light aud unconnected description of most of the Ana which have been above enumerated, as it contains much learned philological disquisition, and a long dissertation on poetry In the first volume there is a list of his published works, and a bitter reply to all who had censured

and eloquence.

them.

The ZIuetiana contains the detached thoughts and criti- cisms of Huet, bishop of Avranches, which he himself

committed to writing when he was far advanced in life.

Huet was born in 1630, and in 1712 he was attacked by a malady which impaired his memory, and rendered him incapable of the sustained attention necessary for the com- In this situation he employed himself in putting his detached observations on paper. These were published by the Abbé d'Olivet the year after his death (1722), under the name of Huetiana,—a work which is not, like some other Ana, a succession of Yon mots or anecdotes, but forms a series of thoughts and criticisms on various topics of morals, philosophy, and One of the most instructive discussions to a scholar, in this collection, is that on the Latinisation of

pletion of a long or laborious work.

literature.

names and surnames. taigne, Rochefoucauld, and Tacitus are valuable.

His critical judgments on Mon- But

were there no other literary memorials of the bishop of

Avranches, he certainly would not derive high reputation from the Huetiana. It was not, indeed, to be expected from the circumstances in which the articles were com- posed, that they should always display that correct judg- ment which distinguishes many of the other works of this learned writer.

The Casauboniana presents us with the miscellaneous observations, chiefly philological, of the celebrated Isaac Casaubon. During the course of a long life that eminent commentator was in the daily practice of committing to paper anything remarkable which he heard in conversa- tion with his friends, especially if it bore on the studies in which he was engaged. He also made annotations from day to day on the works he read, with which he connected his judgments concerning the authors and their writings. This compilation, which was styled Ephemerides, together with his Adversaria, and materials amassed for a refutation of the Ecclesiastical Annals of Baronius, were bequeathed by his son Meric Casaubon to the Bodleian library at Oxford. These were shown to Christopher Wolfius during a visit which he paid to that university; and having been transcribed by him, were published in 1710 under the title of Casauboniana. This collection consists of opinions con- cerning various eminent writers, illustrations of passages

of Scripture, and philological observations and animadver- sions on the first thirty-four years of the Annals of Baron- tus. The materials and information which it contains are probably more accurate than is usually the case in works of the same description, as they were not reported by others, but were committed to writing by Casaubon himself

while the works on which he commented remained fresh in his recollection.

Besides the above a great many works, under the title of Ana, appeared in France about the same period. Thus, the 6pinions and conversation of Charpentier, Colomesius, and St Evremond were recorded in the Carpenteriana, Colomesiana, and St Evremoniana; and those of Segrais in the Segraisiana,—a collection formed by a person stationed behind the tapestry in a house where Segrais was accustomed to visit, of which Voltaire declared, " que de tous les Ana c'est celui qui merite le plus d'étre mis au rang des mensonges imprimés, et surtout des mensonges insipides." The Ana, indeed, from the popularity which they now enjoyed, were compiled in such numbers and with so little care that they became almost proverbial for inaccuracy. About the middle of the 18th century, too, they were sometimes made the vehicles of revolutionary and heretical opinions. Thus the evil naturally began to cure itself, and by a reaction the French Ana sunk in public esteem as much below their intrinsic value as they had formerly been exalted above it.

Of the examples England has produced of this species of composition, perhaps the most interesting is the Wal- polwana, a transcript of the literary conversation of Horace Walpole, Earl of Orford. That multifarious author spent a great portion of his time in conversation, and, possess- ing opportunities of information enjoyed by few, was dis- tinguished for his resources of anecdote, wit, and judicious remark. It was suggested to him that he ought to form a collection of anecdotes and observations, but: this he declined, furnishing, however, the editor of the Walpoliana with many anecdotes in his own handwriting. After his death several specimens of this miscellany were published in the Monthly Magazine; and being afterwards enlarged by the recollections of the editor and the communications of others, were published in two volumes under the title of Walpoliana. Most other works which in this country have been published under the name of Ana, as Baconiana, Atterburyana, &e., are rather extracts from the writings and correspondence of eminent men than memorials of their conversation.

There are some works which, though they do not bear the title, belong more strictly to the class of Ana than many of the collections which are known under that appella- tion. Such are the Mélanges d'Histoire et de Littérature, published under the name of Vigneul Marville, though the work of a Benedictine, D'Argonne; and the Locorum Com- munium Collectanea, ex Lectionibus Philippi Melanchthonis, ——a work of considerable reputation on account of its theological learning, and the information it communicates concerning the early state of the Reformed Church. But of those productions which belong to the class, though they do not bear the name, of Ana, the most celebrated are the Colloquia Mensalia of Luther and Selden's Table- Talk. The former, which comprehends the conversation of Luther with his friends and coadjutors in the great work of the Reformation, was first published in 1566. Captain Bell, who translated it into English in the time of the Commonwealth, informs us that, an edict having been pro- mulgated commanding the works of Luther to be destroyed, it was for some time supposed that all the copies of the Colloquia Mensalia had been burned; but in 1626, on the foundation of a house being removed, a printed copy was found lying in a deep hole, and wrapped up in a linen

cloth. The book translated by Bell, and again by the younger Hazlitt in 1847, is said to have been originally collected by Dr Anthony Lauterbach, "out of the holy mouth of Luther." It consists chiefly of observations and discussions on idolatry, auricular confession, the mass, excommunication, clerical jurisdiction, general councils, and all the points agitated by the Reformed Church in those early periods. The Z'able-Talk of Selden contains a more genuine and undisguised expression of the sentiments of that eminent man than we find in his more studied pro- ductions. It was published after his death by Richard Milward, his amanuensis, who affirms that for twenty years he enjoyed the opportunity of daily hearing his dis- course, and made it his practice faithfully to commit to writing "the excellent things that usually fell from him." The work contains, along with much of a

lighter kind, many curious facts and opinions concerning the political and ecclesiastical history of the interesting period during which Selden lived, and in the important events of which he bore a considerable share. The style of Selden, in most of the works published under his own care, is harsh and obscure; but Clarendon describes him as "a clear dis- courser, possessed of the faculty of making difficult things easy, and presenting them clearly to the understanding." This talent for elucidation shines chiefly in his Table-Talk, which is filled with the stores of his extensive reading, de- livered without any pretensions to that order and method the want of which has been attributed to his other pro- ductions. Many more recent works, under such titles as Literary Remains, Table-Talk, &c., partake more or less of the nature of Ana, but do not call for separate notice.

The most remarkable collection of Ana in the English language—and, indeed, in any language—is to be found in a work which docs not correspond to the normal type either in name orin form. In his Life of Samuel John- son, LL.D., Boswell relates that to his remark, d@ propos of French literature, " Their Ana are good," Johnson replied, "A few of them are good; but we have one book of that kind better than any of them—Selden's Table-Talk." Bos- well's own work is incomparably superior to all. In worth as a book this has been rated, on the high authority of Carlyle, beyond any other product of the 18th century, and the value it has depends mainly on its Ana. Its interest arises, not from the details it furnishes of the events of Dr Johnson's career, still less from any attempt at a discriminating estimate of his work and character, but from the graphic representation it gives of his habitual manner of life and speech. The innate greatness of Johnson appears, more than in all his writings, in his portrait, delineated with the exactness of a sharply-defined photograph, as he appeared to the eyes of his admiring biographer in his daily dishabille.

Wolfius has given a history of the Ana in a preliminary discourse to his edition of the Casauboniana, published in 1710. In the Répertoire de Bibliographies Spéciales, Curicuses, et Instructives, by Peignot, there is a Notice Bibliographique of these collections; but

many of the books there enumerated consist of mere extracts from the writings of popular authors.

ANABAPTISTS (re-baptisers, from évé and Barritw), A name sometimes applied indiscriminately to all denomi- nations of Christians that denythe validity of infant baptism, but restricted in general usage to certain sects which became prominent in Germany and elsewhere at the period of the Reformation, In both cases the designation originates with opponents, and is repudiated by the great majority of those to whom it is applied. Believing, as they do, that the baptism of infants is no baptism, they naturally object to a name which implies that their baptism of such persons as may have been baptised in infancy is a second adminis- tration of the rite. It is therefore desirable to avoid the

use of the term as descriptive of those who hold what are otherwise known as antipzedobaptist views. In its more limited sense the word has becn too long in use, and is too well known to be now discarded, though it is open to the further objection, in addition to that already stated, that it describes a sect by one of the least important of its distinctive doctrines and practices. The Anabaptists of Germany are historically noteworthy, not because they insisted on re-baptism as the condition of admission to their communion, but because the enthusiasm of the Refor- mation manifested itself in them in a form and manner altogether peculiar. Their views as to the true constitution of the church and its relation to the state, and the efforts they made to realise these views, furnish a problem, partly theological, partly historical, of which a satisfactory solution isnot easy. To one who looks merely at the extravagance and lawlessness which appear on the surface, fanaticism and madness may furnish a sufficient explana- tion of the whole Anabaptist movement, but a deeper in- sight will find many elements in it that are quite incon- sistent with the supposition of nothing more than bare- faced imposture in the leaders, and blind delusion in the followers. There is an obvious genetic, though not

histori- cal connection between the Anabaptists and those earlier sects (Novatians, Donatists, Albigenses, Waldenses) which did not practise infant baptism. It is more important, however, to trace the relation between the Anabaptists and the great body of the Reformers. Anabaptism, as a system, may be defined as the Reformation doctrinc carried to its utmost limit; the Anabaptists were the extreme left in the army of the Reformers. It is true that they regarded each other as in different camps ; but their mutual denunciations cannot conceal the fact that even the most peculiar doctrines of the Anabaptists were to them only corollaries, illegiti- mately drawn, as the more orthodox Reformers thought, from the fundamental principle, common to both, of the independence of the individual judgment, and the supreme importance of the subjective element, personal faith, in religion. The connection of this principle with their theory of the church and its relation to the state, their doctrine of the sacraments, and even their political rising, is so obvious that it need not be dwelt upon. The history of the Anabaptist movement in its outward development is brief but eventful. In 1521 their first rising took place at Zwickau, under the leadership of Thomas Miinzer, the Lutheran pastor of that place. (See Mtnzer.) Compelled to leave Zwickau, Miinzer visited Bohemia, resided two years at Altstadt and Thuringia, and in 1524 spent some time in Switzerland. During this period he proclaimed his revolutionary doctrines in religion and politics with grow- ing vehemence, and, so far as the lower orders were con- cerned, with growing success. The crisis came in the so- called Peasants' War in South Germany, in 1525. In its origin a revolt against feudal oppression, it became, under the leadership of Miinzer, a war against all constituted authorities, and an attempt to establish by force his ideal Christian commonwealth, with absolute equality and the community of goods. The total defeat of the insurgents at Frankenhausen (May 15, 1525), followed as it was by the execution of Miinzer and several other leaders, proved only a temporary check to the Anabaptist movement. Here and there throughout Germany, Switzerland, and the Netherlands there were zealous propagandists, through whose teaching many were prepared to follow as soon as another leader should arise. A second and more deter- mined attempt to establish a theocracy was made at Miin- ster, in Westphalia (1532-

5). Here the sect had gained considerable influence, through the adhesion of Rothmann, the Lutheran pastor, and several prominent citizens ; and the leaders, Johann Matthyszoon or Matthiesen, a baker of

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Haarlem, and Johann Bockhold, a tailor of Leyden, had little difficulty in obtaining possession of the town and – deposing the magistrates. Vigorous preparations were at once made, not only to hold what had been gained, but to proceed from Miinster as a centre to the conquest of the world. The town being besieged by Count Waldeck, its ex- pelled bishop (April 1534), Matthiesen, who was first in com- mand, made a sally with only thirty followers, under the fanatical idea that he was a second Gideon, and was cut off with his entire band. Bockhold, better known in history as John of Leyden, was now supreme. Giving himself out as the successor of David, he claimed royal honours and absolute power in the new "Zion," He justified the most arbitrary and extravagant measures by the authority of visions from heaven, as others have done in similar circumstances. With this pretended sanction he legalised polygamy, and himself took four wives, one of whom he beheaded with his own hand in the market-place in a fit of frenzy. As a natural consequence of such licence, Minster was for twelve months a scene of unbridled pro- fligacy. After an obstinate resistance the town was taken by the besiegers on the 24th June 1535, and in J anuary of the following year Bockhold and some of his more pro- minent followers, after being cruelly tortured, were executed in the market-place. The outbreak at Miinster was the crisis of the Anabaptist movement. It never again had the opportunity of assuming political importance, the civil powers naturally adopting the most stringent measures to suppress an agitation whose avowed object was to suppress them. It is difficult to trace the subsequent history of the sect as a religious body. 'The fact that, after the Miinster insurrection, the very name Anabaptist was proscribed in Europe, is a source of twofold confusion. The enforced adoption of new names makes it easy to lose the historical identity of many who really belonged to the Miinster Ana- baptists, and, on the other hand; has led to the

classifica- tion of many with the Miinster sect who had no real connection with it. The latter mistake, it is to be noted, has been much more common than the former. The Men- nonites, for example, have been identified with the earlier Anabaptists, on the ground that they included among their number many of the fanatics of Miinster. But the con- tinuity of a sect is to be traced in its principles and not in its adherents, and it must be remembered that Menno and his followers expressly repudiated the distinctive doctrines of the Miinster Anabaptists. They have never aimed at any social or political revolution, and have been as remark- able for sobriety of conduct as the Miinster sect was for its fanaticism. (See Mennonites.) In English history frequent reference is made to the Anabaptists during the 16th and 17th centuries, but there is no evidence that any considerable number of native Englishmen ever adopted the principles of the Miinster sect. Many of the followers of Miinzer and Bockhold seem to have fled from persecution in Germany and the Netherlands to be sub- jected to a persecution scarcely less severe in England. The mildest measure adopted towards these refugees was banishment from the kingdom, and a large number suffered atthe stake. It has already been explained that the appli- cation of the term Anabaptist to those English sects that had nothing in common with the German Anabaptists except the practice of adult baptism, is unjustifiable. (See Baptists,

ANABASIS (dvéBaors, a march into the interior ; from dvaBaivw, to ascend), the title given by Xenophon to his narrative of the expedition of Cyrus the younger against his brother, Artaxerxes of Persia, 401 B.c., and adopted by Arrian for his history of the expedition of Alexander the Great. (See Ainsworth's 7rav. in Track of Ten Thousand Greeks: Journal of Roy. Geog. Soc. 1870, p. 463.)

ANACHARSIS, a Scythian philosopher, who lived about 600 B.c. His father was one of the chiefs of his nation, and married a woman of Greece, Instructed in the Greek language by his mother, he prevailed upon the king to intrust him with an embassy to Athens. On his arrival in that renowned city he became acquainted with Solon, from whom he

rapidly acquired a knowledge of the wisdom and learning of Greece. By the influence of Solon he was introduced to the principal persons in Athens, and was the first stranger who received the privileges of citizen- ship. After he had resided several years at Athens, he travelled through different countries in quest of knowledge, and then returned home filled with the desire of instruct. ing his countrymen in the laws and the religion of the Greeks, According to Herodotus, he was killed by his brother Saulius while he was performing sacrifice to the goddess Cybele. His simple and forcible mode of expressing himself gave birth to the proverbial expression, " Scythian eloquence." (Herodot. iv. 76 ; Lucian, Scytha.)

ANACHRONISM, a neglect or falsification, whether wilful or undesigned, of chronological relation. Its com- Monest use restricts it (agreeably to its etymology, dvd, back, and ypévos, time) to the ante-dating of events, cir- cumstances, or customs; in other words, to the introduction, especially in works of imagination that rest on a historical basis, of details borrowed from a later age. Anachronisms may be committed in many ways, originating, for instance,: in disregard of the different modes of life and thought that characterise different periods, or in ignorance of the progress of the arts and sciences and the other ascertained facts of history, and may vary from glaring inconsistency to scarcely perceptible misrepresentation. Much of the thought entertained about the past is so deficient in his- torical perspective as to be little better than a continuous anachronism. It is only since the close of the 18th cen- tury that this kind of untruthfulness has jarred on the general intelligence. Anachronisms abound in the works of Raphael and Shakespeare, as well as in those of the meanest daubers and playwrights of earlier times. In par: ticular, the artists, on the stage and on the canvas, in story and in song, assimilated their dramatis persone to their own nationality and their own time. The Virgin was represented here as au Italian contadina, and there as a Flemish frow; Alexander the Great appeared on the French stage in the full costume of Louis Quatorze down to the time of Voltaire ; and in our own country the con- temporaries of Addison could behold, without any suspicion of burlesque,

“‘Cato’s long wig, flower’d gown, and lacquer’d chair.”

Considerable difference of opinion has been expressed regarding the legitimacy of anachronism, especially when it is introduced designedly into historical novels. The safe and the just course here appears to be to “ regard the writer’s end,” and not to hold an author responsible for historical accuracy or verisimilitude who does not profess to write history.

ANACOLUTHON is the lack of grammatical symmetry in a sentence, either through the consequent taking an un- expected form or being altogether suppressed, the writer or speaker desiring to present his thought in another aspect, or feeling that he has already made his meaning sufficiently plain. In the case of a man who is full of his subject, or who is carried along by the passion of the moment, such inconsequents are very apt to occur. Of Niebuhr it is told that his oral lectures consisted almost entirely of anacoluthic constructions. To this kind of licence some languages, as Greek and English, readily lend themselves ; while the grammatical rigidity of others, as Latin and French admits of it but sparingly. In Hero-

dotus, Thucydides, Aschylus, Pindar, and Plato, abundant specimens are to be found; and the same is true of the writers of the Elizabethan age in our own language. The

following is an example :—“ And he charged him to tell:

no man; but go show thyself,” &c. (Luke v. 14). ; ANACONDA, a gigantic snake of South America, sometimes over 30 feet in length, called the water-serpent, from frequenting swamps and rivers, and preying on water animals. rings on each side, and two rows of large black spots along the back. The natives kill it for an oil they obtain from its carcase. It is not venomous, and is said to be harmless. ANACREON, an Ionian Greek, born at Teos, on the coast of Asia Minor, probably about 562 B.c. His repu- tation as a lyric poet stood very high both in his own age and in those that followed. “‘The

charming ”—“ the honey-tongued ”—“ the swan of Teos”—“the glory of Tonia,” are some of the epithets constantly given him by ancient writers. ‘ Sing us one of the songs of Alczeus or Anacreon,” cries one of the guests in a comedy of Aristo- phanes. “ When I hear the verses of Sappho or Anacreon,” says the poet to his friends, in the Symposium of Plato, “T set down my cup for very shame of my own perform- ances.” But though he has given his name to that class of light and free lyric effusions which celebrate the joys of love and wine, he is to us moderns little more than a name. We can no longer say of him, as Horace could, that “time has not drowned his sportive lays ;” and we have to judge of his merits as a poet chiefly from the warm praises of those who had his poems in their hands. Of the five books of lyrical pieces by Anacreon which Suidas and Athenzeus mention as extant in their time, we have now but the mercst fragments, collected from the citations of later writers. Those graceful little poems (most of them first printed from the MSS. by Henry Stephens in 1554), which long passed among the learned for the songs of Anacreon, and which are well known to many English readers in the translations of Cowley and Moore, are really of much later date, though possibly here and there genuine fragments of the poet have been woven up in them. They will always retain a certain popularity from their lightness and elegance, and some of them are fair copies of Ana- creon’s style, which would lend itself readily enough to a clever imitator. But an almost conclusive argument against their genuineness lies in the fact that the peculiar forms of the Ionic Greek, in which Anacreon wrote, are not to be found in these reputed odes, while the frag- ments of his poems quoted by ancient writers are full of Ionicisms. Of the poet’s life little is known beyond a few scattered notices, not in all cases certainly authentic. He probably shared the voluntary exile of the mass of his fellow- townsmen, who, when Cyrus the Great was laying siege to the Greek cities of Asia, took ship, and founded a colony at Abdera in Thrace, rather than surrender their city to his general Harpagus. From Thrace he soon removed to the island of Samos, ruled at that time by Poly- crates, one of the grandest of those old “ tyrants ” who by no means deserved the name in its worst sense. It is said that he acted as Polycrates’s tutor; that he stood very high in his confidence we learn from so good an authority as Herodotus, who represents the poet as

sitting in the royal chamber when audience was given to the Persian herald. In return for such favour and protection, he wrote many complimentary odes upon Polycrates and his favourites. But if an anecdote found in Stobzeus is true, he was no mercenary flatterer. On one occasion the "tyrant" pre- sented him with the sum of five talents. He spent two wakeful nights in thinking of his money, and then re- turned it to the giver, saying that it "was not worth the care it cost him." A cursory remark in the writings of

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Its colour is a rich brown, with bright golden |

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Maximus of Tyre shows at least the high estimation in which the poet was supposed to have been held by his royal patrou. That writer says that not even the warning given to Polycrates by Amasis, king of Egypt, that his too great prosperity would surely arouse the jealousy of the gods, could make a man doubt the stability of his happi- ness, who had, like Polycrates, the command of the Ionian sca, a navy so powerful, and such a friend as Anacreon. The same authority tells us that this companionship exer- cised a beneficial influence over the stern temper of the tyrant. Like his fellow-lyrist, Horace, who was one of his great admirers, and in many respect of a kindred spirit, Anacreon seems to have been made for the society of courts. On the death of Polycrates, Hipparchus, who was then in power at Athens, and who inherited the literary tastes of his father Pisistratus, sent a special eni- bassy to fetch the popular poet to Athens in a galley of fifty oars. He must have fully enjoyed and contributed much to the enjoyment of the brilliant circle with which Hipparchus had surrounded himself, and there he made acquaintance, amongst others, with the poet Simonides. When this circle was broken up by the assassination of Hipparchus, Anacreon seems to have returned to his native town of Teos. There, according to a metrical epitaph ascribed to his friend Simonides, he died and was buried. Lucian mentions him amongst his instances of the longevity of eminent men, as having completed eighty-five years. Tf an anecdote given by Pliny (Wat. Hist.

vii. 7) is to be trusted, he was choked at last by a grape-stone ; but the story has an air of mythical adapta- tion to the poet's habits, which makes it somewhat apocry- phat. Anacreon had a reputation as a composer of hymus, as well as of those bacchanalian and amatory lyrics which are commonly associated with his name. Two short hymns to Diana and Bacchus, consisting of eight and eleven lines respectively, stand first amongst his few undisputed re- mains, as printed by recent editors. But pagan hymns, especially when addressed to such deities as Venus, Eros, and Bacchus, are not so very unlike what we call " Ana- creontic " poetry as to make the contrast of style so great as the word might seem to imply. The tone of Anacreon's lyric effusions has probably led to an unjust estimate, both by ancients and moderns, of the poet's personal character. As Homer was accused of bibulous propensities by some because he makes frequent and kindly mention of "the purple wine," so Anacreon was held to have been a thorough sensualist because he sang so persistently of wine and love. But a poet must not always be judged by the flights of his fancy. The "triple worship" of the Muses, Wine, and Love, ascribed to him as his religion in an old Greek epigram (Anthol. iii, 25, 51), may have been as purely professional in the two last cases as in the first, and his private character on such points was probably neither much better nor worse than that of his contem- poraries. Athenzus remarks acutely that he seems at least to have been sober when he wrote; and he himself strongly repudiates, as Horace does, the brutal character- istics of intoxication as fit only for " barbarians" and " Scythians" (Fragm. 64, Bergk). His own excuse, when charged with hymning the reigning beauties of the day rather than the orthodox gods and goddesses, is said to have been made in these words—

" But are not these also lesser divinities ?"*

The best editions of Anacreon are those of J. F. Fischer, Leipsic, 1703, and I. Bergk, Leipsic, 1854. (w. Lc.) – ANADYOMENE ('Avadvopévn), an epithet of Aphrodite (Venus), expressive of her having risen (i.¢., been born) from the foam of the sea. In works of ancient art—eg-, in many existing bronze statuettes—Venus was represented

under this title as if just emerged from the sea, and in the act of wringing her tresses. This was the subject of a painting by Apelies, one of the most celebrated pictures of antiquity, the conception having been, it was said, sug- gested to him by seeing Phryne bathing. This painting belonged first to the people of Cos, front whom it was taken to Rome by Augustus in part payment of tribute levied by him. By the time of Nero it had become almost entirely ruined by decay.

ANADYR, the name of a gulf and of a river in the north-east of Siberia. The gulf extends from Cape Tehutotskoi, on the north, to Cape St Thadeus, on the south, forming part of the Behring Sea ; while the river, taking its rise from a lake in the Stanovoi mountains, called Ivashki or Ivachno, about 67° N. lat., and 173° E. long., flows through the Tchutchee country, at first to the west and then to the east, entering the gulf of Anadyrsk- aia, a branch of the gulf of Anadyr, after a course of about 600 miles. Anadyrsk is the only town on its banks, and the country through which it passes is thinly popu- lated, barren, and desolate. For nine months of the year the ground is covered with snow, and there is not sufficient pasturage for cattle. Reindeer, upon which the inhabit- ants feed, are found in considerable numbers.

ANASTHESIA (a privative, aic@yors, sensation), a term in medicine used to describe a state of insensibility to external impressions, either as the result of disease or as induced artificially by the employment of certain sub- stances known as anesthetics.

In diseases of the brain or spinal cord anesthesia is an occasional symptom, but in such cases it is usually limited in extent, involving a limb or a definite area of the surface of the body. Complete anesthesia has been observed in persons who were in a state of catalepsy or trance.

The artificial induction of anzsthesia by the use of drugs or the inhalation of vapours is a subject of great interest, both historically and from its practical application to the relief of suffering and the treatment of disease. Although it is mainly owing to the researches of

distin- guished chemists and physicians of the present- century that the employment of anesthesia has come to occupy a foremost place among remedies, there is abundant evidence to show that it is a practice of great antiquity. Besides the mention by Homer of the anesthetic' effects of nepenthe, and the reference by Herodotus to the practice of the Scythians of inhaling the vapours of a certain kind of hemp to produce intoxication, the employment of anesthetics in surgery by the use of mandragora is par- ticularly alluded to by Dioscorides and Pliny. It also appears, from an old Chinese manuscript laid before the French Academy by M. Julien, that a physician named Hoa-tho, who lived in the 3d century, gave his patients a preparation of hemp, whereby they were rendered in- sensible during the performance of surgical operations. Mandragora was extensively used as an anesthetic by Hugo de Lucca, who practised in the 13th century. The Soporific effects of mandrake are alluded to by Shake- Speare, who also makes frequent mention of anzesthetising draughts, the composition of which is not specified.

In the Medical Gazette, vol. xii. p. 515, Dr Sylvester, quoting from a German work by Meissner, published in 1782, mentions the case of Augustus, king of Poland, who underwent amputation while rendered insensible by a narcotic. But the practice of anzsthesia had never become general, and surgeons appear to have usually regarded it with disfavour. When, towards the close of last century, the brilliant discoveries of Priestley gave an impetus to chemical research, the properties of gases and vapours began to be more closely investigated, and the belief was then entertained that many of them would

become of great medicinal value. In 1800, Sir Humphrey Davy, experimenting on nitrous oxide gas, discovered its anesthetic properties, and described the effects it had on himself when inhaled, with the view of relieving local pain. He suggested its employment in surgery in the fol- lowing words :—" As nitrous oxide, in its extensive opera- tion, seems capable of destroying physical pain, it may probably be used with advantage in surgical operations in which no

great effusion of bloud takes place." His sug- gestion, however, remained unheeded for nearly half a century. The inhalation of sulphuric ether for the relief of asthma and other lung affections had been employed by Dr Pearson, of Birmingham, as early as 1785 3 and in 1805 Dr Warren, of Boston, U.S., used this treatment in the later stages of pulmonary consumption.

In 1818 Faraday showed that the inhalation of the vapour of sulphuric ether produced anesthetic effects similar to those of nitrous oxide gas; and this property of ether was also shown by the American physicians, Godman (1822), Jackson (1833), Wood and Bache (1834).

These observations, however, appear to have been re- garded in the light of mere scientific curiosities and sub- jects for lecture-room experiment, rather than as facts capable of being applied practically in the treatment of disease, till December 1844, when Dr Horace Wells, a dentist of Hartford, Connecticut, underwent in his own person the operation of tooth extraction while rendered insensible by nitrous oxide gas. Satisfied, from further experience, that teeth could be extracted in this way without pain, Dr Wells proposed to establish the practice of painless dentistry under the influence of the gas; but in consequence of an unfortunate failure in an experiment at Boston, he abandoned the project. On 30th September 1846, Dr Morton, a dentist of Boston, employed the vapour of sulphuric ether to procure general anesthesia in a case of tooth extraction, and thereafter administered it in cases requiring surgical operation with complete success. This great achievement marked a new era in surgery. Operations were performed in America in nume- rous instauces under ether inhalation, the result being only to establish more firmly its value as a successful anzsthetic. The news of the discovery reached England on 17th December 1846. On 19th Deceniber, Mr Robinson,

' a dentist in London, and on the 21st, Mr Liston, the emi-

nent surgeon, operated on patients anzesthetised by ether ; and the practice soon became general both in Great Britain and on the Continent.

The late Sir James Y. Simpson, of Edinburgh, was the first to apply anesthesia by ether in midwifery practice. This he did on 19th January 1847, and he 'subsequently employed ether inhalation in numerous cases of both easy and difficult parturition, an account of which he published, containing much important information. The results of his trials showed that while the anesthesia annulled the conscious sufferings of the patient, it in no way interfered with the muscular contractions of the uterus and the pro- gress of the labour, and that it did not injuriously affect the child.

These observations excited great interest in the medical world, and Jed to the extensive employment of ether inhala- tion till November 1847, when Simpson announced his discovery of the anzsthetic properties of chloroform (the trial of which had been suggested to him by Mr Waldie, a chemist of Liverpool), and proposed it as a substitute for sulphuric ether. So convincingly did he demonstrate the great advantages of chloroform, that this substance speedily superseded the use of ether as an anesthetic, and continues to the present time probably the most widely-used of all the agents employed in medicine for the relief of human suffering.

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As the result of further investigations in this depart- ment of scientific rescarch, in which the labours of Dr Snow, Mr Nunneley, and Dr Richardson have been con- spicuous, numerous other volatile organic fluids have been found to possess anzesthetic properties. Several of these have been used in surgical practice, but as yet none of them have been found to possess such superiority as would entitle them to supersede chloroform.?

There are many who prefer ether as being a safer anes- thetic than chloroform, less apt to depress the circulation, and less apt to excite vomiting ; but any advantage it has in these respects appears, in the estimation of surgeons, to be practically counterbalanced by the greater efficiency and facility of application of the latter substance. ther, however, continues to be largely used in America.

When introduced by inhalation into the system, anzs- thetic vapours act upon the brain and sensory nerves in such a manner as more or less completely to abolish their natural sensibility. The degree in which they do this can be in large measure regulated by the quantity administered. Thus, taking the familiar instance of chloroform, the effect of the inhalation of a small quantity (say less than half a drachm) is a feeling of exhilaration or semi-intoxica- tion, accompanied with diminished sensibility to pain, but without entire loss of consciousness. By continuing the inhalation and increasing the quantity, profound stupor, stertorous breathing, fixing of the eyes, and muscular relaxation mark the occurrence of complete anesthesia, In many cases it is desirable to produce merely the former of these conditions, viz., that of imperfect anzesthesia; and this is the extent to which chloroform is usually applied in un- complicated labour. On the other hand, in surgical opera- tions requiring absolute stillness on the part of the patient the inhalation must be carried to the extent of producing total unconsciousness. The state of anesthesia can be safely kept up for long periods by continuing to apply, with due caution, the anesthetic vapour. Whenever the inhalation is stopped, consciousness begins to return, and, in niost cases, is soon completely restored.

The importance to the science of medicine of the intro- duction of anzesthesia can scarcely be over-estimated. By the employment of anesthetics in surgery, not only is the work of the surgeon relieved of a source of embarrass- ment, and operations the most difficult and delicate under-

taken which otherwise would have been impossible, but the death-rate in the worst cases has by universal testi- mony been greatly diminished. In no department of medicine has the use of anesthetics been so extensive, or their value so manifest, as in midwifery. The power of chloroform in mitigating the pain attendant on ordinary labour, and in facilitating operative interference in cases of difficulty, is a matter of every-day experience in the practice of the accoucheur. In short, there is almost no condition of great physical suffering which may not be alleviated by the employment, under proper precautions, of anesthetics. But if the boon has been great to medical science, it has

been greater still to mankind ; for not merely is an incal- culable amount of actual pain prevented, but the dread of submitting to surgical operations is beyond measure lessened by the thought that they can be performed while the sufferer is kept in a state of tranquil sleep.

Unfortunately, there is no known method of artificially producing insensibility which is entirely free from risk, and deaths have occasionally occurred under the adminis- tration of anesthetic vapours. Like all medicinal sub- stances of a poisonous nature, the utmost care and watch- fulness are requisite in their administration. The danger,

1 Nitrous oxide gas has been reintroduced, and is now extensively employed in dentistry,

ceteris paribus, is in proportion to the dose. It is more than probable that many of the fatal instances of anes- thetic inhalation have been the result of carclessness; and it is certain that by a better acquaintance with the physiv- logical action of the agents employed, and a closer observa- tion of the indications of danger in their use, the deaths may be greatly diminished. The importance of this has been recognised in many large hospitals, where the adminis- tration of anzesthetics is entrusted to one individual skilled in their properties and uses.

But it is doubtful whether many of the deaths occurring under anesthesia can justly be ascribed to that cause. Sudden deaths occurring in the course of operations were by no means unheard of before anesthetics came to be employed in surgery at all. . Even, however, admitting that all the reported cases of death from anesthesia are correct, it must be acknowledged that they are insignificant in amount, considering the enormous extent to which the use of

chloroform and other anesthetic agents prevails in all departments of medical practice.

The employment of local anesthesia in surgery has the obvious advantage of being free from risk to life. Many means of accomplishing this have been suggested, the best known of which is the method of Dr Richardson, of the application of ether spray to the part of the body which it is desired to render insensible. By the rapid evaporation of the ether the tissues become frozen, and insensibility of the part is produced. Since, however, the anesthesia merely affects the superficial textures, this plan is only available in the minor operations of surgery. (J. 0. A.)

ANAGNI, a town of Italy, in the province of Roma, situated on a hill 37 miles E.S.E. of Rome. It is ill-built, but contains a cathedral, of the 11th century, and several ruins. Anagni is the ancient Anagnia, at one time the capital of the Hernici, and a place of considerable im- portance both under the Empire and under the popes. It is still the seat of a bishop. Population, 8220.

ANAGRAM, the transposition of the letters of a word or words, is derived from the Greek dvéypaypoa, which was used in precisely the same sense. But the number of different ways in which even a few letters can be arranged being very great (with eight different letters, for instance, it is lx2×38×4×5× 6× 7×8=40,320), the term ana- gram is generally restricted to such rearrangements of the letters as form other words, and these usually words which express a meaning. Camden (Jtemains, 7th ed., 1674) defines " Anagrammatisme" as "a dissolution of a name truly written into his letters, as his elements, and a new connection of it by artificial transposition, without addition, substraction, or change of any letter, into different words, making some perfect sence applyable to the person named." Considering the amount of labour that has been spent (or misspeut) in transpositions of this kind,—in "torturing one poor word ten thousand ways,'—the anagrams that display a felicitous perfection of "'applyable sence" are remarkably few Among the best are the anagrammatic answer to Pilate's question, " Quid est veritas ?"—namely, " Hst vir qui adest;"

and the transposition of '" Horatio Nelson" into " Honor est a Nilo ;" and of " Florence Night- ingale" into '"Flit on, cheering angel." James I.'s courtiers discovered in " James Stuart" " A just master," and con- verted "Charles James Stuart" into "Claimes Arthur's seat." "Eleanor Audeley," wife of Sir John Davies, is said to have been brought before the High Commission in 1634 for extravagances, stimulated by the discovery that her name could be transposed to " Reveale, O Daniel," and to have been laughed out of court by another anagram sub- mitted by the Dean of the Arches, " Dame Eleanor Davies,' "' Never soe mad a ladie." There must be few names that

could furnish so many anagrams as that of " Augustus de

Morgan," who tells that a friend had constructed about 800 on his name, specimens of which are given in his Budget of Paradoues, p. 82. The pseudonyms adopted by authors are often transposed forms, more or less exact, of their names; thus '" Calvinus" becomes " Alcuinus ;" " Francois Rabelais," " Alcofribas Nasier;" " Bryan Waller Proctor," "Barry Cornwall, poet;" " Henry Rogers," "R. E. H. Greyson," &e. It is to be noted that the last two are impure anagrams, an "r" being left out in both cases, "Telliamed," a simple reversal, is the title of a well-known work by " De Maillet." The most remarkable pseudonym of this class is the name " Voltaire," which the celebrated philosopher assumed instead of his family name, " Francois Marie Arouet," and which is now generally allowed to be an anagram of " Arouet, 1.j-," that is, Arouet the younger. Perhaps the only practical use to which anagrams have been turned is to be found in the transpositions in which some of the astronomers of the 17th century embodied their discoveries, with the design apparently of avoiding the risk that, while they were engaged in further verifica. tion, the credit of what they had found out might be claimed by others. Thus Galileo announced his discovery that Venus had phases like the moon in the form, " Heec immatura a me jam frustra leguntur —oy," that is, "Cynthia figuras emulatur Mater Amorum." ANAHUAGC, the name of the great central plateau of

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duction and a syllogism; the particular case of Thebes against Phocis started from being first inductively widened into war between neighbours generally, and the particular case of Athens against Thebes arrived at being then drawn out by regular syllogism from that major. Example, or, to speak of it by its later name, the inference from analogy, is thus presented by Aristotle as directly related to induc- tion : it differs from an imperfect induction—what is now often called real or material induction from particulars incompletely enumerated—only in having its conclusion particular instead of general, and its datum singular in- stead of plural.

Kant and his followers, while maintaining a relation between induction and analogy, mark the difference other- wise than Aristotle. By induction, it is said, we seek to prove that some attribute belongs (or not) to all the mem- bers of a class, because it belongs (or not) to many of that class ; by analogy, that all the attributes of a thing belong (or uot) to another thing, because many of the attributes belong (or not) to this other. In this country Sir William Hamilton has adopted this view (Lectures on Logic, vol. ii. pp. 165-174), though he differs from Kant in understand- ing it only of the process called applied or modified induc- tion,—not of the pure form of reasoning from all the parts to the whole, which, in the manner of Aristotle, he puts on a level with pure syllogistic deduction. The relation

Mexico, lying between 15° and 30° N. lat., and 95° and 110° W. long., at an elevation of from 6000 to 9000 feet above the sea, Anahuac comprises three-fourths of the territory of Mexico, including the capital ; and although much of its surface is level, many lofty mountains rise out of the table-land, the highest of which is Popocatepetl (17,720 feet), an active volcano. The name Anahuac is also used to designate a much less extensive part of the table-land, as well as that portion of the Rocky Mountains which lies to the south of 40° N. lat. The word itself is said to signify "near the water" in the old Mexican lan-

guage, and seems to have been at one time the name of

several other places in the ancient empire of Mexico,

ANALOGY is the name in logic for a mode of real or material inference, proceeding upon the resemblance be- tween particulars: speaking generally, it is that process whereby, from the known agreement of two or more things in certain respects, we infer agreement in some other point known to be present in one or more, but not known to be present in the other or others. It was signalised already by Aristotle under the different name of Example (zapa-devryua), the word Analogy (avadoyia) having with him the special sense of mathematical proportion or resemblance (equality) of ratios. The earliest use of the name in its current logical sense is to be found apparently in Galen. While, in popular language, the word has come to be vaguely used as a synonym for resemblance, the logical authorities, though having generally the same kind of inference in view, are by no means agreed as to its exact nature and ground. It has chiefly to be distinguished from the related process of Induction, in their conception of which logicians are notoriously at variance. (See Induction.)

Aristotle, distinguishing SyHogism and Induction as passing the one from whole to part (any part), and the other from part (all the parts) to whole, notes under each a loose or rhetorical form—Enthymeme under Syllogism, and Paradigm, or Example, under Induction. Thus, to give his own instance, it is an inference by way of example—if a war to come of Athens against Thebes is condemned because a past war of Thebes against Phocis is known to have been disastrous. Here the reason- ing, which may be said to pass from part to part, is tesolved by Aristotle as compounded of an imperfect in-

for all reasoning from experience,—namely,

and diffcrence of the two processes may be formulated in the short expressions : One in many, therefore one in all (Induction) ; Many in one, therefore all in one (Analogy). For instance, it would be an analogical inference—to con- clude that a disease corresponding in many symptoms with those observed in typhus corresponds in all, or, in other words, is typhus ; whereas it would be an induction—to infer that

a particular symptom appearing in a number of typhus patients will appear in all.

The view of Kant and Hamilton does not reach below the surface of the matter, if it can be maintained at all. In the first of the examples just given the inference might well be a good induction, all depending upon the kind of symptoms that are made the ground of the conclusion jon the other hand, the second might be a case of mere analogy, not to be called induction, N either, again, is Aristotle's view satisfactory, which practically makes the difference to depend upon the mere quantity of the conclusion, worked out as particular for analogy by appending to the induc- tion involved a syllogism of application. Since the univer- sal always carries with it the particular, and cannot be affirmed unless the particular can, the two processes be- come to all intents and purposes one and the same. If the particular or analogical conclusion is justifiable, it is because there was ground for a good induction (only not of the pure sort); if there was no ground for a good induction, then, upon Aristotle's resolution, there can be no ground for the particular inference either. Should it be said, indeed, that the peculiarity of the case lies not so much in the conclusion, as in the start being made from one particular instance, whence the process gets its naine Example, that undoubtedly will distinguish it from any- thing that can seriously be called induction ; but theu what becomes of the resolution that Aristotle makes of it? That resolution can be upheld only at the cost of the character of the inductive process,

The logician who has done most to elaborate the theory of real or material induction, John Stuart Mill, has also been able to give an interpretation of analogy, which, without in the least severing its connection with induction, leaves it as a process for which a distinct name is neces- sary. According to him, the two kinds of argument, while homogeneous in the type of their inference, which holds that things

agrecing with one another in certain respects agree also in certain other respects,—yet differ in respect of their degree of evidence. In

both the argument is from known points of agrcement to unknown ; but, whereas in induction the known points of agreement are supposed by due compari- son of instances to have been ascertained as the material ones for the case in hand or conclusion in view,—in other words, to be invariably connected by way of causation with the inferred properties,—it is otherwise in analogy, where it is only supposed that there is no incompatibility between the inferred properties and the common propertics, or known points of resemblance, that are taken as the ground of inference. Thus, if by comparison of instances it had been ascertained, or otherwise it were known, that organic life is dependent on the bare possession of an atmosphere in planetary bodies rotating upon an axis, then it would be an induction to infer the presence of life upon any heavenly body, known or as yet undiscovered, in which these conditions should be detected. With our actual knowledge, confined to the case of the Earth, and only cnabling us to say that the absence of an atmosphere must destroy life, the inference to such a planet as Mars, where the conditions stated seem to be present, is but analogical ; while to the Moon, which seems to have no atmosphcre, the inference has not even this amount of force, but there is rather ground for inductively concluding against the possibility of organic life. Upon this view it ceases to be characteristic of analogy that the inference should be to a particular case only; for the inductive conclusion, when the evidence is of a kind to admit of such being drawn, may as well be particular; and, again, it may equally well happen that the analogical inference, where nothing stronger can-be drawn, should have universal application. Notwithstanding, it will be found in general that, where the evidence, consisting of bare similarity of attributes in two or more particular instances, permits only of an ana- logical inference being made, the extension in thought takes place to particular cases only which have a special interest, and the mind hesitates to commit itself to a general law or rule. Mill, therefore, though he does not raisc the point, is practically at one with Aristotle and all others who make example or analogy to consist in the passage from one or more particular cases to a particular new case bearing resemblance to the former. It is his peculiar merit to have determined the specific conditions under which

the passage in thought, whcther to a particular or a general, acquires the authority of an effective induction.

Analogy is so much resorted to in science in default of induction, either provisionally till induction can be made, or as its substitute where the appropriate evidence cannot be obtained,—it is also much relied upon in practical life for the guidance of conduct,—that it becomes a matter of great importance to determine its conditions. Whether in science or in the affairs of life, the abuse of the process, or what is technically called False Analogy, is one of the most besetting snares set for the human mind. It is obvious that, as the argument from analogy proceeds upon bare resemblance, its strength increases with the amount of similarity ; so that, though no connection is, or can be, in- ductively made out between any of the agreeing properties and the additional property which is the subject of infer- ence, yet (in Mill's words), " where the resemblance is very great, the ascertained difference very small, and our know- ledge of the subject-matter very extensive, the argument from analogy may approach in strength very near to a valid induction. If (he continues), after much observa- tion of B, we find that it agrees with A in nine out of ten of its known properties, we may conclude, with a pro- bability of nine to one, that it will possess any given deriva- tive property of A" (Logic, b. iii., c. xx., § 3). But it-is

equally obvious that against the resemblances the ascertain- able differences should be told off. or bare analogy, the differences in the two (or more) cases must as little as the resemblances be known to have any connection, one way or the other, with the point in question; both alike must only not be known to be immaterial, else they should fall quite out of the reckoning. As regards the differences, however, this is what can least easily be discovered, or is, by the mind in its eagerness to bring things together, most easily overlooked; and, accordingly, the error of false analogy ariscs chiefly from neglecting so to con- 'sider them. Thus, if the inference is to the presence of organic life of the terrestrial type on other planetary bodics, any

agrecments, even when extending to the details of chemical constitution, are of small account in the positive sense, compared with the negative import of such facts as absence of atmosphere in the Moon, and excess of heat or cold in the inmost or outermost planets. To neglect such points will not simply make the analogy loose ; but, as the very point in question is concerned in them, the analogy becomes false and positively misleading. Still greater is the danger when the things analogically brought together belong not at all to the same natural classes, but the resemblance is only in some internal relation of each to another thing of its own kind; as when, for example, under the name of motives, particular states of mind (feelings, &c.) are supposed to determine the action of a man, as the motion of a body may be determined by a composition of forces. In such cases there may be nothing to prevent the drawing of a good analogy upon a strictly limited issue ; nay, thcre may even sometimes, in special circumstances, be ground for drawing an inductive conclusion ; but genc- rally the elements of difference are so numerous, and their import either so hard to appreciate, or, when appreci- able, so decisive in a sense opposite to the conclusion aimed at, that to leave them out of sight and argue with- out reference to them, as the mind is tempted to do, vitiates the whole proceeding. What is not sufficient for analogy may, however, be good as metaphor, and metaphor is of no small use for expository purposes; while (as Mill says), though it is not an argument, it may imply that an argu- ment exists.

The sense just mentioned of a resemblance of relations suggests the question how far the common argument from analogy and mathematically determinate proportion, which was originally called by the name, are cognate processes. Undoubtedly the common argument, proceeding upon resemblance in the properties of things, can be made to assume roughly the guise of a proportion,—e.g., Earth : Mars :: Men : Mars-dwellers, or Earth : Men = Mars : Mars- dwellers, the- fact of planetary nature, or other resembling | attributes gone upon, being regarded as common exponent. Less easy is it to interpret a determinate proportion, with numerical equality of ratios, as analogy in the common sense; for here the very determinateness makes all the difference.

The name analogy is so suggestive to English readers of Bishop Butler's famous treatise, that a word, in conclusion, seems called for on the nature and scope of the particular application of the process made by him. His work 1s entitled The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature, and consists in an attempt to convince deists that there are no difficulties urged against revelation, or the system of natural religion, which do not bear with equal force against the order of nature as determined by Providence. The argument 1s & perfectly fair one within the limits assigned, and Butler must be allowed the credit of very well apprehending the logical conditions involved in it. In his introduction he understates rather than overstates the strength of his post

Aw A tion; for, on the assumption that the system of nature and the system of religion must both spring from one causal source, his argument acquires rather an inductive cha- racter. Accordingly, it is interesting to see how, in con- nection with his sense of analogy, he practically raises, in his Introduction, the question which the general theory of inductive logic, as now understood, has first to consider, — the question, namely, "whence it proceeds that likeness should beget that presumptive opinion and full conviction is formed to receive from it Saal though he would not take it upon him to say " how far the extent, compass, and force of analogical reasoning can be reduced to general heads and rules, and the whole be

which the human mind

formed into a system." (G. O RB.)

ANALOGY, in Comparative Anatomy, is equivalent to

"similarity of function." See ANaromy,

ANALYSIS means literally, in the Greek, an unloosen- ing or breaking-up, understood of anything complex in which simpler constituents or elements may thus be brought to view. It is this general sense that must be supposed to have been present to the mind of Aristotle when he gave

the name of Analytica to the great logical work in which

he sought to break up into its elements the complex pro- cess of reasoning ; as, accordingly, in the body of the work

(Anal. Prior. i. 32), we find him once using the verb "analyse" of arguments, when they are to be presented in "figure," or brought to the ultimate formal expression in which they can best be tested or understood. Obviously any more special sense that may be ascribed to the process of analysis must vary with the kind of complex to be resolved. Mental states, material substances, motions of bodies, relations of figures, are but a few examples of the complex things or subjects that fall to be analysed, if there is to be any scientific comprehension of them. Nor is it only that the analysis will be into constituents differing from each other as much as the complex subjects differ ; for the same subject may be analysed in different ways, and with very different results, according to the particular aspect in which it is considered. Hence it becomes im- possible, or at least very difficult, to describe the process in any terms fitting equally all the variety of its applications. It is from taking stand by some particular application, and either overlooking all others, or trying to force them within the frame of the one, that different writers have given such discrepant accounts of the process—discrepant often to the extent of being mutually exclusive. The express object of the present article will, on the contrary, be to give an un- prejudiced view of the different applications of analysis in science, that one being first and most prominently put for- ward which was earliest recognised and practised, namely, mathematical analysis. The other applications, selected for their representative character, will, as they follow, naturally suggest the consideration how far the difference of matter in the various sciences tends to modify the nature of the process which is called analysis in all.

By the side of Analysis, at the different stages, we shall at the same time treat of the related process called, after the Greek, Synthesis, which means a putting together or compounding. If analysis and synthesis were merely re- lated to each other as mutually inverse

processes, exposi- tory convenience alone might be pleaded in favour of the parallel treatment ; but the two are in practice often em- ployed as strictly complementary processes, in support of each other on the same occasion ; or, in other words, the com- position in synthesis may be a direct re-composition of the principles or elements then and there got out by analysis. As a matter of course, therefore, the foregoing general remarks apply also to synthesis, especially the remark as

to the modifying effect of difference in the subject-matter

worked with.

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ANA 793

I. Mathematical Analysis and Synthesis.—In the Hle- ments of Euclid, containing so many examples of geometri- cal propositions variously established, there is a scholion near the beginning of Book XIII. which distinguishes two general methods for the treatment of particular questions, under the names of Analysis and Synthesis. In analysis, it is said, the thing sought is taken for granted, and consequences are deduced from it which lead to some truth recognised; synthesis, on the other hand, starts from that which is recognised, and deduces consequences there- from, till the thing sought is arrived at. With more detail, but some wavering in his use of terms, Pappus of Alex. andria (about 380 4.p.) describes the two processes at the beginning of Book VII. of his Mathematical Collections. He appears, however, to regard synthesis not at all as an in- dependent process to be applied alternatively with analysis for the solution of particular questions (which is the view suggested by Euclid), ~~but rather as a complementary pro~~ cess bound up with the use of analysis. These are his words : "In synthesis, putting forward as done the thing arrived at as ultimate result in the way of analysis, and disposing now in a natural order as antecedents what were consequents in the analysis, we put them together, and finally come at the construction of the thing sought." The two processes are involved together in what he calls the Tos dvaAvdpevos, Or, aS We may call it, one general Method of

Analysis, the use of which for the solution of problems, he says, has to be learned after the Elements, having been developed by Euclid himself, Apollonius of Perga, and Aristeeus the elder. In a similar sense, Robert Simson, its modern editor, speaking of the Euclidean book of Data, calls it "the first in order of the books written by the ancient geometers to facilitate and promote the method of resolution or analysis." Beyond Euclid, however, the invention of the method was carried back by the tradition of antiquity to Plato. The philosopher, whom we know to have been an ardent student of geometry, and otherwise a discoverer in the science, is said by Diogenes Laertius (IIL. i. 19), to have devised the method for one Leodamas, and is further said by Proclus (Comm. in Hucl., ed. Basil, p. 58) to have made much use of it himself. Though the report is a loose one, it may well be that this method of analysis was first expressly formulated by the theoretic genius of Plato, especially in view of a passage (Lith. Nicom, iti. 5) in Aristotle, which has not been sufficiently noticed, showing that in his time, before Euclid was born, it was currently employed by geometricians. Aristotle there compares the gradually regressive process of thought, whereby the means of effecting a practical end is discovered, to the mathematical way of inquiry upon a diagram, re- marking of both that the last stage in the analysis (dvadvorer) is the first in the production or construction (yevéorer). However surprising it may be thought that Aristotle in his logical works makes so little of a process which thus must have been familiar to him, the fact that it was familiar carries it back at least to the time of Plato. In truth it must have been practised earlier still, from the very beginnings of scientific geometry, though it may have had to wait some time to be formulated.

Taking analysis and synthesis, thus defined, either as distinct processes or as conjoined in one method, called analytical, we have next to see how they were brought to bear by the ancients in treating geometrical questions, Propositions such as those contained in the Elements fall into two classes with respect to the form of their enuncia- tion, namely, theorems and problems. The distinction was not marked by Euclid himself, nor is it in any sense radi- cal, for either kind of proposition

may easily be trans- formed into the expression of the other; but, as commonly accepted, it amounts to this—that a theorem is given out

as an assertion to be accepted, and has to be shown true ; a problem is given out as an act to be done, and has to be shown possible. ‘ In the case of a theorem, Euclid accord- ingly, after enunciating the proposition, proceeds generally to show, with more or less of construction on a particular diagram, and working always with fixed definitions, that the assertion follows deductively from certain truths, either assumed as evident (axioms), or formerly proved therefrom, and seen to be applicable to the present ease by inspection of the figure as constructed. The grounding propositions are allowed by the reader as they are brought forward, though he may for the moment have not the least idea whither the author is tending, and at the end the con- clusion is accepted, because the successive premises, being allowed, have been combined logically. In the ease of a problem, after an express construction for which no reason is given, the object is to show that what has been brought to pass really supplies what was sought; but the procedure is not different from what it was in the ease of a theorem, because the object is attained by showing again that certain truths allowed, in their particular application to the figure constructed, involve as a conclusion some relation which the figure is seen to exhibit. Now if this is Euclid’s procedure in general—there is an exception, afterwards to be noted, where he proves his point in- directly—it is undeniably synthetic, in any meaning that ean be ascribed to that term, the result being obtained by a massing or combining of elements or conditions. But on Euclid’s part the process is one of demonstration, not of discovery. Still less is the reader’s mind in the attitude of discovery: he is led on to a result which is indeed indicated, but by a way which he does not know, and, as it were, blind- fold. ‘There must, however, have been discovery before there eould be such demonstration ; or how should the proposi- tion admit of definite enunciation at the beginning? Thus there is, in the background, an

earlier question of procedure or method, and it is this that the ancient geometricians had chiefly in view when speaking of analysis and synthesis. Now, some propositions are so simple that they must have been seen into almost as soon as conceived, and con- eeived as soon as the human mind began to be directed to the consideration of forms or figures; in which case no method of discovery, to speak of, can have been necessary. 'There is, again, another class of propositions, more complex though still simple, which probably were established by a process of straightforward synthesis. An inquirer must have in his head some knowledge in the shape of principles more or less fixed, or he would not be an inquirer ; and either the accidental combination of such principles may lead in his mind to particular results, or the first time a particular question suggests itself to him, it may be seen at once to involve, or to follow from, certain of the principles. Many propositions in the Elements, giving the most apparent properties of triangles, circles, &c., it ean hardly be doubted, were arrived at by this way of dis- covery, even when a more elaborate process of synthesis was employed for their formal demonstration ; as, for ex- ample, in the case of the famous fifth proposition of Book I. But the same process of direct composition (understood always as joined with inspection) is no longer applicable, or 1s not effective, when the question is of less obvious properties, or of construction to be made under special conditions. To discover the fact or the feasibility in such cases 18 so much the real difficulty, that the question of demonstration becomes of merely secondary importance. And there is even a still prior question of discovery ; for it has to be determined that some points rather than others should be made the subject of express inquiry. This, how- ever, may be left aside. To any one engaged in geometri- cal inquiry, in the constant inspection of figures for the

understanding of their properties and mutual relations, questions must inccssantly be occurring—so incessantly and inevitably that it is needless, if it were not vain, to seek out a reason for the particular suggestions. As in all discovery to the last, so more especially at the first stages, there is an element of instinctive tact in the mind's action which eludes expression ; and there is also an element of what might be called chance, were it not that those only get the benefit of it who

are consciously on the look-out, either generally or in some special direction. A particular question being started by whatsoever suggestion, how shall the mind arrive at certain knowledge regarding it? Such, practically, is the form which is assumed by geometrical inquiry.

Besides the thing sought there is nothing else given, or at least there is nothing else immediately given or suggested. But the mind is supposed to have some knowledge pertain- ing to the matter—though not extending to the particular aspect of it—in question, also some knowledge of such mat- ters generally. In such circumstances the aim of the inquirer must be to bring what is sought into some definite relation with what is known. Direct composition or synthesis of the known, with more or less of eonstruction, if it led to that which is sought as a result, would determine the re- lation for the inquirer, and determine it in like manner for all who allow the principles whence the conclusion is logi- cally deduced, being thus at one stroke both discovery and demonstration. But synthesis, arbitrarily made, as it must be where the question is at all difficult, may fail, however often it is attempted. Without a proper start it avails nothing; and what is to determine the start? There is always one course open. Let the objective itself be made the starting-point, and let it be seen whether thence it may not be possible by some continuous route to get upon known ground. In other words, a thing sought, when itself assumed, may admit of being brought into re- lation, upon some side or other, with the body of ascertained knowledge. If it can be so brought, through whatever number of steps, there is then attained as a result what before it was impossible to light upon as a beginning ; and now nothing hinders from making the start originally desired, and from reaching as a proper conclusion the assumed beginning, if the path struck out before is mea- sured over again in the opposite direction. The course thus becomes once more synthetic, but only because of what was first aceomplished. 'Till the point in question was madc to yield up its own secret by a process fitly called analysis or resolution, nothing certain could be determined. At the analytic stage, however, the line taken may be twofold. The proposition, assumed at starting as something definite to work from, either may be held as following deductively from some

other, which again is dependent on still another or others, till one is worked up to that is known to be true; or it may be taken as itself a premiss leading deductively to some other proposition, which in turn, by one or more steps, leads to a true pro- position as conclusion. In either ease the implication is that a proposition must itself be true, if by any line of formally correct logic it leads to a proposition known to be true. And though the expression must be modified for questions in the form of problems, requiring something to be done—to which form of question, indeed, the analytic pro- cess is peculiarly applicable—the point of logical principle remains there exactly the same.

But is the process, thus stated as it was understood by the ancient geometricians, logically valid? In the first of the two alternative forms, it is valid: the proposition assumed at starting will undoubtedly be true, if a proposi- tion on which it is shown to be ultimately dependent is true. At the same time, there is in this case no guarantee

that the most effective linc for establishing it has been taken,

in view of the well-known logical principle that the same conclusion may follow from different premisses, In the other form of the process, where the proposition assumed is itself used as a premiss, the cage as to validity is otherwise. As Aristotle first clearly apprehended and showed, it is quite possible to reach a (materially) true conclusion by strict logical deduction from premisses eithcr one or both false _ and thus the mere fact that the proposition assumed is found, in combination with others, to lead to a conclusion known to be true, does nothing to establish its own char- Yet although the process of analysis thus carried out by way of deduction, as formulated by Euclid and (in one of his expressions) by Pappus, is theoretically faulty, through neglect or ignorance of Aristotle's observation, the It was his habit, as Pappus also enjoins, to follow up the analysis by a synthesis consisting in a reversal of it, and this would effectively get rid of error; since the result of the analysis, if it did not follow from the assumed premiss by true im- plication, but only accidentally, could not itself, when in turn used as a premiss for the synthesis, be made to yield the

original proposition as a legitimate conclusion. In order, however, to validate this form of analysis it is not unecessary to resort to the laborious expedient of retracing the whole path synthetically. As Duhamel, in his treatise Des Méthodes dans les Sciences de Raisonnement (ptri. cS), has pointed out, it is enough if, at the different stages of the deduction, the inquirer assures himself, as he easily may do where it is the fact, that there is perfect "reci-

acter.

practice of Euclid is not therefore invalidated,

procity" among the propositions successively obtained from the one first assumed ; meaning that, in the circumstances of the deduction, each may as well follow from the one coming after as it is fitted to yield that. And the same simple expedient suffices equally to obviate the less grave defect above noted in analysis carried out by regression from consequents to conditions, or conclusions to premises : reciprocity, if it can be made out here at the different stages, will guarantee the exclusive validity of the line of reasoning taken. So may analysis become perfectly inde- pendent as a method of discovery, and give as much in- sight as synthesis, where this is directly applicable, does ; while it is—what synthesis is not directly—applicable to every kind of question, however complex.

Tt is unnecessary, for the purposes of the present article, to enter further into details respecting the methods anciently practised in geometry.' Let it suffice to mention only the method of indirect proof known as reductio ad absurdum, employed sometimes by Euclid in the Zlements. This con. forms to the type of analysis in that it starts from the question to be determined, though it is peculiar in follow- ing out, not the assumption itself, but what is thereby sug- gested as excluded, with the final result that the point in question is established upon the ruin of every other sup- position. It is a method of discovery as well as a method of demonstration ; while the previous argument has shown that analysis, directly practised, may be made a method of demonstration by itself, besides being the most potent and unfailing instrument of discovery. Also it was seen before that synthesis may be

a method of discovery, though it is more frequently employed as a method of demonstra- tion in sequence upon discovery by analysis. To insist thus upon the double character alike of analysis and syn- thesis, as practised in geometry, is of vital importance, be- cause of the change in application which the terms have undergone among mathematicians. In modern times analysis has come to mean the employment of the alge- braical and higher calculus, and synthesis any direct treat- ment of the properties of geometrical figures, in the manner of the ancients, without the use of algebraical notation and

transformations. The excuse for the change lies in the fact that, while the Greeks had only extremely undeveloped means of analysis, they gave the highest possible finish and exactness to their synthetic demonstrations of geometrical propositions, seldom being content to let their discoveries rest upon the ground of that analysis by which they were made. But though it has this excuse or motive, the change

involves a misunderstanding, as all mathcmaticians allow who have turned their minds seriously to consider the

rationale of their practice. It is, in the first place, clear that only by the process described above, rightly called analysis, can anything be determined about the more com- plex properties and relations of geometrical figures ; hap-

hazard syuthesis is of no avail. The ancients therefore,

in their geometry, had an analysis. It is next to be re-

marked that the algebraical solution of problems is not so

exclusively analytic in character that it may not in simple

cases assume the form of direct (algebraical) synthesis ; and

in all cases, for verification, it admits of being followed

up by an exposition that is truly synthetic. The moderns, therefore, in their calculus, are not without their synthesis. Furthermore, the ancients, however little progress they made, comparatively speaking, in the general science of calculation, and however their special methods for the resolution of geometrical questions, even as involving direct figured construction, still more as applying calculation, fell short of the variety and pliability of modern devices, yet . had their own analytical weapons, though they cannot be specified here. For our present purpose it is equally un- necessary to enter into details as regards the modern devices, whether belonging to the lower or higher ana- lysis, or as regards the principle for applying them de- veloped by Descartes and his successors ; but to arrogate for these exclusively the name of analysis, it cannot be too pointedly declared, is to lose sight of the end in the means,

Il. Chemical Analysis and Synthesis.—After mathe- matics, chemistry is the science in which application has most expressly been made of proccsses termed analysis and synthesis. In physics, regarded as the science of motion, whether abstractly taken or as manifested actually in natural bodies, the application is universal ; the resolu- tion and composition of velocities, motions, and forces being fundamental

processes pervading the whole science under all variety of circumstances. There is nothing, however, in such an employment of analysis and synthesis that is not easily intelligible in the light of the processes as practised either in the more general science of mathematics, dealing with relations of quantity in number and form, or in the more special science of chemistry, which deals with those characteristic qualities of actual bodies for which no definite expression in terms of motion can be found.

The concrete substances in nature are found to be such that some by no means in our power can be brought to anything simpler, while others can be broken up into con- stituents differing in character from the original substances and also among themselves. Hence a division is made of bodies into elements and compounds; elements being all such bodies, not farther reducible, as are either actually found in nature, or, though not so found, have emerged in the manipulation of actual bodies 3 compounds, all such as, being actually found, are reducible to two or more different elements, or have by artificial combination been constituted. The process of reduction to elements is called analysis ; the process of re-combination or free combination is called synthesis. When the analysis is carried out simply with the view of detecting what elements are present in a sub- stance, it is called qualitative; and quautitative, if with the further view of detcrmining the definite proportions

(by weight) in which the constituents are present in a definite quantity of the substance. There are correspond- ing varieties of synthesis.

Now here the subject-matter is so manifestly different from what it is in mathematics, that it is idle to look for exact correspondence in the processes practised under the same names within the two sciences. In fact, however, the correspondence is greater than may at first sight appear. Chemical analysis of a given substance is a process of discovery real and actual, like the analysis of a mathematical problem, and proceeds similarly by taking what is given, and working with it in relation to other substances, to see whether it cau be made to yield up

aught that is already known, or may be regarded as fixed and certain. Again, just as mathematical synthesis may be a process of inven- tion, either generally, by way of combination of principles, or sometimes specially, in reference to particular questions, so does chemical synthesis give a knowledge of new forms of matter, or haply solve the question as to the constitution of particular substances in hand. Once more, the relation of analysis and synthesis as two complementary phases of one process (instead of their being regarded as two processes) is exhibited as plainly in chemistry as in mathe- matics. It may seem to be exhibited even more impres- sively, when the very constituents got out by analysis of a substance are used in the synthesis to give it being again. This circumstance, however, is far from giving to the science of chemistry a character of evidence superior to that of mathematics: its inferiority in this respect is but too well marked, and has a reason that at the same time explains what else is peculiar in its application of analysis and synthesis, The chemist deals with things known only by experience, and connected by way of physical causation: true, they are things with which he can freely experiment—and this gives to chemistry a prerogative character among the natural sciences—but the things are taken as they are found, and experience is constantly dis- closing in each new attributes which have simply to be accepted, at least in the present state of our knowledge, by the side of the others. On the contrary, the mathe- matician deals with things over which he has full power of construction, and whose relations in the fact of con- structing he constitutes, whether they are internal or ex- ternal relations. But positive construction carries with it an insight which is wanting in experiment, be the physical conditions ever so favourable; and thus analysis and synthesis have in mathematics, along with perfect freedom of scope, a determinateness far surpassing anything that is attainable in chemistry.

III. Psychological Analysis and Synthesis——Passing for the next signal application of analysis from the world of matter to mind, we have here a subject which more perhaps than any other calls for an exercise of the pro- cess in order to be scientifically understood. Physical things in their superficial relations lie to a great extent open to direct apprehension, and, whatever deeper connec- tions there may

be to be traced out among things the most remote in their nature as apprehended, yet the fact of their separation in space involved in our perception of them is already something done, leaving the scientific function (analytic and synthetic) to be exercised chiefly in the attempt to comprehend them. Very different is the state of affairs in mind, where everything, as it were, runs or melts into everything else. Even to lay hold of par- ticular mental phenomena, with a view to the explanation of them, implies already an express scientific attitude, which must be called analytic.

Particular mental states being supposed to be got, with such definiteness of apprehension (always more or less imperfect) as the subject-matter admits of, the business of

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the psychologist becomes substantially one with that of the physical inquirer. Accordingly, it is often urged that com- plex mental states conform to the two types of mechanical and chemical composition, in the sense that some are to be resolved after the manner of complex phenomena of motion, and others by a process analogous to that em- ployed in chemistry for the qualities of concrete substances. The analogy, however, especially in the second class of states, is decidedly loose. cognition or emotion, held to be developed, under general

Psychological phenomena of

mental laws, out of simpler states of sense, resemble chemi- cal compounds only in having a character unlike that of any of the elements that go to make them; in particular, they do not admit of that actual resolution into their elements which lends so much evidence to the processes of chemistry. The realm of nature supplies a far apter ana- logy in the phenomena of organic growth, more especially as mental states do, in fact, stand in direct relation with states of the bodily organism. It is as impossible to make an actual analysis or synthesis of the physiological complex of life as of the psychological complex of mind; and it is only more difficult (the phenomena being undoubtedly more recondite and fluctuating) to practise experiments in

psychology than in physiology. But, at all events, there is no new principle involved in the scientific treatment of mind; nor again in the treatment of moral and social questions, for an insight into which psychological know- ledge is indispensable.

IV. Logical Analysis and Synthesis—To logic, taken in its widest sense as the methodology of all science, it belongs to appreciate the general import of all such applica- tions of analysis and synthesis as have now been considered. There remains, however, a special variety which is itself entitled logical analysis and synthesis, and which has the more carefully to be distinguished from the other heads, because it stands in an opposition to them all.

Logical analysis is the same process as that which is otherwise called metaphysical division. (The process called logical division is different. See Locicand Division.) Given, say, a concrete subject like man, this may be divided physically into a number of parts in space, or, as a concept, metaphysically into a number of qualities or attributes,—metaphysically, because none of these has an independent subsistence or physical existence apart. They are distin- guished in the way of mental consideration, or, as it is technically called, abstraction; and, this being a thought- process or logical act, the resolution of the given complex into such conceptual elements gets the name also of logical analysis. The corresponding act of synthesis pro- ceeds by the way that is technically called determination; thus the general concept man, to take the traditional example, has the attribute of rational joined to the attri- butes of animal, or is determined by that addition, and much else has to be added in a similar way before the par- ticular concrete can be determined.

Now it is evident that such analysis and synthesis have an application to any kind of thought that the mind can conceive; and thus logicians, in meaning, as they have commonly done, nothing more by the names, have sig- nalised processes that are in truth of no small account for knowledge in general. 'There is no kind of scientific inquiry, strictly so called, and whatever be its scope and method, that does not involve at all stages from the first such analysis or abstract mental consideration.

Nay, it may be said that science, as opposed to the natural experi- ence of things, or to the artistic interest which centres upon fully bodied-out concretes, is analysis in this pre-. sent sense, everywhere breaking up to find community of character under the mask of superficial difference, and sift- ing out the one from the many. But when logicians, not

disregarding the various applied methods of the real sciences, or consciously excluding them as lying beyond the province of pure logic, would seek to reduce all scientific procedure to this kind of mental action, the attempt implies a deep inisapprehension. It is one thing for the mind to have its subject of inquiry clearly and sharply defined apart from what else is given therewith, or again to have its existing knowledge always well in hand and sifted out to the uttermost; it is another thing for the mind to be making advances, to be passing out from the known to the unknown, or labouring to bring the unknown into relation with that which is known already. Condillac is the thinker who has most expressly made the attempt to bring all scientific method back to the conception of mere logical analysis, repeating it everywhere throughout his works, The sixteenth chapter of his unfinished treatise, the Langue des Calculs, may especially be noted in this respect; the more because he there endeavours to justify his developed expression for the procedure of all science— that it consists in a continued substitution of identical pro- positions—by the actual solution of an algebraical problem. Simple, however, though the instance chosen is, he fails to make good his view, appearing to prove it only by leaving out the step of critical moment,

To analysis and synthesis in the specially logical sense is undoubtedly related the distinction that logicians have made of analytic and synthetic method. Without stepping beyond the bounds of logic conceived as a formal doctrine, a fourth department, under the name of Method or Dis- posing, may be added to the three departments regularly assigned — Conceiving (Simple Apprehension), Judging, Reasoning; and this would consider how reasonings, when employed

continuously upon any matter whatever, should be set forth to produce their combined effect upon the mind. The question is formal, being one of mere exposition, and Concerns the teacher in relation to the learner. How should results, attained by continuous reasoning, be set before the mind of a learner? Upon a line representing the course by which they were actually wrought out? Or always in the fixed order of following from express prin- ciples to which preliminary assent is required? If the latter, all teaching becomes synthetic, and follows a pro- gressive route from principles to conclusions, even when discovery (supposing discovery foregone) was made by analysis or regression to principles; of which expository method no better illustration could be given than the practice of Euclid in the demonstrations of his Llements. On the other hand, it may be said that the line of dis- covery is itself the line upon which the truth about any question can best be expounded or understood, for the Same reason that was found successful in discovery, namely, that the mind (now of the learner) has before it something quite definite and specific to start from; upon which view, the method of exposition should be analytic or regressive to principles, at least wherever the discovery took that route. The blending of both methods, where possible, is doubtless most effective; otherwise it depends upon circumstances—chiefly the character of the learner, but also the nature of the subject in respect of com- plexity—which should be preferred, when one alone is followed.

The question of prime logical, or general, importance remaining is to determine the relation of Analysis and Synthesis as methods of rea] science, to the ground-processes of all reasoning, known since the days of Aristotle under the names of Induction and Deduction. Much difference of opinion has been expressed on this subject, not only because of the want of agreement as to what should be

called analysis and synthesis, but also because of more

fundamental disagreement regarding the nature of the inductive and deductive processes,

It was remarked before as somewhat surprising, that Aristotle himself did not more expressly consider the relation, when we have seen that he was familiar with the process of geometrical analysis, under the very name. The distinction, however, upon which he lays so much stress throughout his works, between knowledge from principles, prior or better known by nature, and knowledge of or from facts, prior in experience or relatively to us, has generally been understood to imply a connection of synthesis with deduction, of analysis with induction; so much so indeed, that synthetic and deductive method, analytic and induc- tive method, have come to be used respectively almost as

interchangeable terms. N. or, although Sir William

Hamilton seems to wish to reverse the usual association of

the terms, when he calls induction a purely synthetic pro- cess, and declares it to be erroneously viewed as analytic (Metaphysics, i, p. 102), is he really at variance with the other authorities; his observation having a special reference which the others also might allow. But any such asgo- ciation seems to rest upon a misconception, not to be laid to the charge of Aristotle himself, analysis and synthesis for which it is important to deter- mine the relation, namely, when they are taken ag the means of real discovery in science, the true view rather is that they are the different methods in which reasoning, whether inductive or deductive, must be applied for dis- covering truth in the form of special or particular ques- tions, of deduction, as we have seen in the process of mathe- matics; on the other hand, synthesis as applied in chemistry is as much an inductive act, being strictly experimental, as anything could well be. concerned about the relation of the particular and general in thought; analysis and synthesis about the relation of the known and the unknown,

In the sense of

Analysis, as well as synthesis, may proceed by way

Induction and deduction are

The two points of view are of course related to each other: analysis and synthesis,

as practised by the human mind, either for purposes of science or in the affairs of life, cannot be worked except under those highest laws of the relation between the par-

ticular and general in thought which Aristotle's genius first was able to extract from the instinctive practice of human reason. But whether the processes are applied singly, or,

for greater assurance, conjointly, it depends upon the

matter of the inquiry under which laws—those of induc. tion or those of deduction—they shall be worked 3 and in any case there is implied a peculiar intellectual attitude different from that of mere formal reasoning. It is the difference between the act of finding out and proving. If it should ever become possible to develop a logic of Dis-covery, it must consist in the formulation of the processes of Analysis and Synthesis, conceived in the general sense attributed to them in the foregoing article. (a. c. RB.) ANALYTIC JUDGMENTS have been distinguished under that name, in opposition to Synthetic, since the time of Kant. It was necessary, for the purposes of his critica] inquiry into the principles of human knowledge, that he should carefully determine the character of those assertions which metaphysicians had go freely made respecting the Supernatural, and he found them to be such that, while the predicate was added on to the subject, not involved in it, the connection was affirmed as necessary and universal. He therefore called them, as well as other assertions of like character in mathematics and pure physics, synthetic judg- ments @ priori, and the aim of his critical inquiry came to be the determining of the conditions under which such

judgments were possible. N ow, as differing from these, he

noted two classes of judgments: (1), such as in the predi- cate added indeed to the content of the subject, but only

empirically, as, for example, Bodies have weight, and these he called synthetic @ posteriori; (2), such as were indeed necessary and universal, but added nothing to the content of the subject, as, for example, Bodies are extended, and these he called analytic.

The general distinction of analytic and synthetic judg- ments has a value apart from the specific character of those (synthetic) judgments in which Kant was most interested, and for the sake of which mainly it was fixed by him. Trained in the metaphysics of the Leibnitzo-Wolffian school, which marked off necessary judgmeuts from those of simple fact without considering the kinds of necessity, Kant, when he came, by the route that can be traced in his earlier works, to apprehend the difference betwcen merely logical analysis and real synthesis in thought, applied it almost exclusively to those judgmeuts for which a character of necessity was claimed. He therefore noticed traces of the distinction in other thinkers, as Locke, only in so far as there was a suggestion also of this special reference. In truth, the general distinction, under a variety of expres- sions, was familiar to both Hume and Locke, and it had already been drawn by the ancients. The old doctrine of the Predicables, in distinguishing the essential predication of genus, species, and difference from the non-essential predication of property and accident, plainly involves it; making besides, as between the last two predicables, a distinction which is very closely related to that drawn by Kant between the priori and postertort synthetic. From the nominalistic point of view it is expresscd by the difference of Verbal and Real propositions, as in Mill's Logic, and also often in Locke.

While the synthetic judgment, as the name implies, brings together in thought two distinct concepts, each of which may be thought apart, the analytic judgment is merely the explication of a single concept in the form of a proposition, It is disputed what may be the ground of syuthesis in different cases, but on all hands it is agreed that the logical Law of Contradiction is the controlling prin- ciple for the explication of concepts already in the mind, however they may have

come there. Now the explication may be made either completely or partially, according as the whole or part only of the intension of the concept is set forth: in other words, the aim may be-to give the definition 'where, in the full sense, that is possible), or simply to express any one or more of the contained attributes. Pro- positions giving such partial explication are spoken of by Locke as "'trifling;" and it is true that, if the concept is supposed already in the mind, no increase of knowledge is thereby obtained. This word, however, is unfortunate. Not to say that it is equally applicable to definitions, where the explication is only more complete, it tends to keep out of view the fact that analytic judgments, when not arbi- trarily formed, are themselves—or rather the concepts, of which they are the explications, are—the permanent result or deposit of foregone real synthesis. So much, indeed, is this the case with concepts of things in nature—what Mill calls natural kinds—that in them a constant process of accretion is going on; new attributes, as they are discovered, being taken up into the essence, if they are at the same time characteristic and underived. Much also that is mere explication to one mind is real information to another.

The terms Analytic and Synthetic, thus applied to judg- ments, are so expressive in themselves that they have now come into general use. It is, however, a serious drawback to such an association of the terms, that it traverses what is otherwise the consistent use of the words analysis and synthesis in relation to each other. As the article ANALYSIS has shown, there is a synthesis which, as much as any analysis, is purely logical, and there is an analysis which, as much as any synthesis, is a means of real advance in

knowledge. The terms Explicative (Hrlduterungsurthcile) and Amphative (Hrweiterungsurtheile), also employed by Kant, while not less expressive, are open to no such objec- tion. (Gc. c. RB.)

ANAM, or AnnaAM, also called CocuIn CHINA, a large empire of Asia, forming the eastern portion of the Indo- Chinese peninsula. See Cocuin CHINA.

ANASTASIUS IL, Emperor of Constantinople, was born at Dyrrhachium not later than 430 a.p. At the

time of the death of Zeno (491), Anastasius, though only

one of the guards (stlentzariz) in the palace, held a very high character, and was raised to the throne of the Roman einpire of the East, mainly through the influence of Ariadne, Zeno's widow, whom he married shortly after his accession. His reign, though afterwards disturbed by foreign and intestine wars and religious distractions, commenced aus- piciously. He gained the popular favour by a judicious remission of taxation, aud displayed great vigour and energy in administering the affairs of the empire. The principal wars in which Anastasius was engaged were those known as the Isaurian and the Persian. The former (492-8) was stirred up by the supporters of Longinus, the brother of Zeno, and resulted in Anastasius's favour; in the latter (502-5) he was signally defeated, but the provinces the Persians had won from him were restored on payment of a ransom. He also suffered defeat at the hands of the Goths of Italy, to check whose incursions he built the " Anastasian wall," extending from the Propontis to the Euxine. For the support he gave to the Eutychians, Anastasius was anathematised by Pope Symmachus. The latter years of his reign were troubled by revolts in Con- stantinople, excited by his avarice and by his reputed heretical tendencies. He died in 518.

ANASTASIUS II., Emperor, whose original name was Artemius, was raised to the throne of Constantinople by the voice of the senate and people in 713 a.p., on the deposition of Philippicus, whom he had served in the capacity of secretary. His territories being threatened both by sea and land, he sent an army under Leo the Isaurian, afterwards emperor, to defend Syria; adopted wise and resolute measures for the defence of his capital ; and equipped and despatched a formidable naval force, with orders not only to resist the approach of the enemy, but to destroy their naval stores. The fleet mutinied-at

Rhodes, and proclaimed Theodosius, a person of low ex- traction, emperor. After a six months' reign, Constanti- nople was taken by Theodosius; and Anastasius, who had fled to Niczea, was compelled to submit to the new emperor, and, retiring to Thessalonica, became a menk (716). In 721 he headed a revolt against Leo, who had succeeded Theodo- sius, and receivingaconsiderableamount of support, laid siege to Constantinople; but the enterprise failed, and Anastasius falling into Leo's hands, was put to death by his orders.

ANATHEMA (évd6eya, from dvariOnys, lit. anything offered up) is frequently used in classic Greek (in the form dvd@npa) to denote things consecrated to the gods, and deposited in a temple. In the LXX. it is the equivalent of the Hebrew =7h, which denotes an offering devoted to God absolutely, and therefore, in the case of a living creature, put to death. The idea of destruction or perdition thus became associated with the word, which gradually lost its primary sense of consccration. In the New Testament it signifies separated from the church and accursed, and it became the technical term for a form of excommunication at an early date.

ANATOLIA (from évarod7, the east), a name first used under the Byzantine empire for the country east of the Bosphorus. In the form Anadoli, it denotes a modern Turkish division almost coincident with Asis MINOR, g.v.

NATOMY ('Avarouy) means in its literal sense the dis- section or separation of parts by cutting, but in its

usual acceptation it is employed to denote the science the province of which is to determine the construction, the form, and the structure of organised bodies, 7.¢., of bodies which either are or have been living. It is therefore a depart- ment of the science of Biotocy. It resolves itself into two great divisions—AnIMaL ANATOMY or Zootomy, the object of which is to investigate the structure of animals ; and VEGETABLE

ANATOMY or Puytotomy, the object of which is to elucidate the structure of plants. As Vege- table Anatomy will be treated of in the article Botany, it does not. require to be considered here. ANIMAL Ana- TOMY, again, naturally resolves itself into two divisions : one in which the construction, form, and structure of two or more animals are compared with each other, so as to bring out their features of resemblance or dissimilarity,—this is called CoMPARATIVE ANATOMY 3 the other, in which the construction, form, and structure of parts in a single ani- mal are considered, which is termed SPECIAL ANAToMy, The special anatomy of an animal may be studied from various points of view: (a) with reference to the succession of forms which it exhibits at various periods from its first appearance as an embryo to the assumption of its adult characters ; this is termed DEVELOPMENTAL, or Empryo- LoGicaL ANATOMY ; (6) with reference either to its form and structure, or to the investigation of the laws by which these are determined, termed MorPHoLocicaL ANATOMY 5 (c) with reference to the function, use, or purpose per- formed by a part or structure in an animal, termed TELEOLOGIcAL or Puystotocrcat ANATOMY ; (d) with re- ference merely to the relative position of different parts or structures, termed TopocrapnicaL ANATOMY ; (e) with reference to the structure and general properties of the tissues or textures which enter into the construction of the parts or organs of animals; to this branch of study have been applied the terms GENERAL ANAToMY, ANATOMY oF TEXTURES, Histotoey, and, from the microscope being so | who was son of Heraclides and Phenarita, and grandson largely employed in the examination of the textures, | of the first Hippocrates, was indeed distinguished as a Microscopic or MInuTE ANATomy ; (f) with reference to | physician of great observation and experience, and the the changes induced by disease in the organs or tissues, | first who appreciated the value of studying accurately the termed Morzrp or PatTHo.ocicaL Anatomy. From its phenomena, effects, and terminations of disease. It does manifold aspects anatomy forms the basis of the Biological | not appear, however, notwithstanding the vague and general Sciences, As a knowledge of the laws of motion is essen- | panegyrics of Riolan, Bartholin, Le Clerc, and Portal, that tial, and must be constantly recurred to at every step | the anatomical knowledge of this illustrious

person was before any true progress can be made in the investigation | either accurate or profound. Of the works ascribed to of the physical Sciences, so must the structure of animal | Hippocrates, five only are genuine. Most of them were bodies be constantly appealed to by the zoologist in all | written either by subsequent authors of the same name, or attempts at classification ; by the physiologist in all in- | by one or other of the numerous impostors who took quiries into the functions performed by the organs and advantage of the zealous munificence of the Ptolemies, by textures in a state of health, and into the special adapta- | fabricating works under that illustrious name. Of the few tion of parts to particular uses; and by the physician in | which are genuine, there is none expressly devoted to considering the alterations or disturbance of the functions anatomy; and of his knowledge on this subject the only of parts in the course of disease. To describe the anatomy | proofs are to be found in the exposition of his physiological of the multitudinous forms of animal life from these dif- opinions, and his medical or surgical instructions, From ferent points of view would require, not one, but several | thesc it appears that Hippocrates had some accurate notions Voluminous treatises, and would much exceed the compass | on ostcology, but that of the structure of the human body of a single article. Moreover, it is advisable that the | in general his ideas were at once superficial and erroneous, anatomy of the different classes of the animal kingdom | In his book on injuries of the head, and in that on fractures, should be considered under their respective heads,—e.g., | he shows that he knew the sutures of the cranium and that of the Crabs under Crustacea, that of Reptiles under | the relative situation of the bones, and that he had some Repritra, &. It is intended to devote this article more notion of the shape of the bones in general, and of their particularly to the description of the Special Anatomy of | mutual connections. Of the muscles, of the soft parts in the Human Body in a state of health ; in other words, to | general, and of the internal organs, his ideas are confused, make it a short treatise on HUMAN Anatomy or ANTHRO- indistinct, and erroneous. The term pA€Bs he seems, in PoToMY, which, as forming a department of the general | imitation of the colloquial Greek, to have used generally

science of Comparative Anatomy, is interesting not only to men of science generally, but, from its intimate con- nection with the several divisions of the art of healing, and with the study of the functions of the human body, possesses the highest importance to the physician, surgeon, and physiologist.

Previous to entering on the consideration of the Anatomy of the Human Body, it may be well to take a historical view of the progress of the science from its origin to tho present time.

HISTORY OF ANATOMY,

In tracing the history of the origin of anatomy, it may be justly said that more learning than judgment has been displayed. Some writers claim for it the highest antiquity, and pretend to find its first rudiments altcrnately in the animal sacrifices of the shepherd kings, the J ews, and other ancient nations, and in the art of embalming as practised by the Egyptian priests. Even the descriptions of wounds in the Iliad have been supposed adequate to prove that in the time of Homer mankind had distinct notions of the structure of the human body. Of the first it may be said that the rude information obtained by the slaughter of animals for sacrifice does not imply profound anatomical knowledge; and those who adduce the second as evidence are deceived by the language of the poet of the Trojan war, which, distinguishing certain parts by their ordinary Greek epithets, as afterwards used by Hippocrates, Galen, and all anatomists, has been rather too easily supposed to prove that the poet had studied systematically the structure of the human frame.

With not much greater justice has the cultivation of anatomical knowledge been ascribed to Hippocrates, who, because he is universally allowed to be the father of medicine, has also been thought to be the creator of the

Hipp- crates.

sclence of anatomy. Of the seven individuals of the family 460-377 of the Heracleidze who bore this cclebrated name, the second, B.c.

Polybus.

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to signify a blood-vessel, without being aware of the distinction of vein and artery; and the term dprnpia, or air-holder, is restricted to the windpipe. He appears to have been unaware of the existence of the nervous chords ; and the term nerve is used by him, as by Grecian authors in general, to signify a sinew or tendon. On other points his views are so much combined with peculiar physiological doctrines, that it is impossible to assign them the character of anatomical facts; and even the works in which these doctrines are contained are with little probability to be ascribed to the second Hippocrates. If, however, we over- look this difficulty, and admit what is contained in the genuine Hippocratic writings to represent at least the sum of knowledge possessed by Hippocrates and his immediate descendants, we find that he represents the brain as a gland, from which exudes a viscid fluid; that the heart is muscular and of pyramidal shape, and has two ventricles separated by a partition, the fountains of life—and two auricles, receptacles of air; that the lungs consist of five ash-coloured lobes, the substance of which is cellular and spongy, naturally dry, but refreshed by the air; and that the kidneys are glands, but possess an attractive faculty, by virtue of which the moisture of the drink is separated, and descends into the bladder. He distinguishes the bowels into colon and rectum (6 dpxés).

The knowledge possessed by the second Hippocrates was transmitted in various degrees of purity to the descend- ants and pupils, chiefly of the family of the Heracleide, who succeeded him. Several of these, with feelings of grateful affection, appear to have studied to preserve the written memory of his instructions, and in this manner to have contributed to form part of that collection of treatises which have long been known to the learned world under the general name of the Hippocratic writings. Though composed, like the genuine remains of the physician of Cos, in the Jonian dialect, all of them differ from these in being more diffuse in style, more elaborate in form, and in studying

to invest their anatomical and medical matter with the fanciful ornaments of the Platonic philosophy. Hippocrates had the merit of early recognising the value of facts apart from opinions, and of those facts especially which lead to general results; and in the few genuine writings which are now extant it is easy to perceive that he has recourse to the simplest language, expresses himself in terms which, though short and pithy, are always precise and perspicuous, and is averse to the introduction of philosophical dogmas. Of the greater part of the writings collected under his name, on the contrary, the general character is verboseness, prolixity, and a great tendency to speculative opinions. For these reasons, as well as for others derived from internal evidence, while the Aphorisms, the Epidemics, and the works above mentioned, bear distinct marks of being the genuine remains of Hippocrates, it is impossible to regard the book wept ®iavos AvOpurov as entirely the composition of that physician; and it appears more reasonable to view it as the work of some one of the numerous disciples to whom the author had communicated the results of his observation, which they uuwisely attempted to combine with the philosophy of the Platonic school and their own mysterious opinions.

Among those who aimcd at this distinction, the most fortunate in the preservation of his name is Polybus, the son-in-law of the physician of Cos. This person, who must not be confounded with the monarch of Corinth immor- talised by Sophocles in the tragic story of CEdipus, is represented as a recluse, severed from the world and its enjoyments, and devoting himself to the study of anatomy and physiology, and to the composition of works on these subjects. To him has been ascribed the whole of the book on the Nature of the Child and most of that On Man ;

both physiological treatises interspersed with anatomica! sketches. His anatomical information, with which we are specially concerned, appears to have been rude aud inaccurate, like that of his preceptor. He represents the large vessels of the body as consisting of four pairs ; the first proceeding from the head by the back of the neck and spinal chord to the hips, lower extremities, and outer ankle ; the second, consisting of the jugular vessels (ai opayirides), proceeding to the

loins, thighs, hams, and inner ankle; the third proceeding from the temples by the neck to the t scapula and lungs, and thence by mutual intercrossings to the spleen and left kidney, and the liver and right kidney, and finally to the rectum ; and the fourth from the fore- part of the neck to the upper extremities, the fore-part of the trunk, and the organs of generation.

This specimen of the anatomical knowledge of one of 333, the most illustrious of the Hippocratic disciples differs not essentially from that of Syennesis, the physician of Cyprus, and Diogenes, the philosopher of Apollonia, two authors for the preservation of whose opinions we are indebted to i Aristotle. They may be admitted as representing the state of anatomical knowledge among the most enlightened men at that time, and they only show how rude and erroneous were their ideas on the structure of the animal body. It may indeed, without injustice, be said that the anatomy of the Hippocratic school is not only erroneous, but fanciful and imaginary, in often substituting mere supposition and assertion for what ought to be matter of fact. From this censure it is impossible to exempt even the name of Plato himself, for whom some notices in the Timeus on the structure of the animal body, as taught by Hippocrates and Polybus, have procured a place in the history of the science.

Amidst the general obscurity in which the early history Aristotle, of anatomy is involved, only two leading facts may be admitted with certainty. The first is, that previous to the time of Aristotle there was no accurate knowledge of anatomy; and the second, that all that was known was derived from the dissection of the loweranimals only. By the appearance of Aristotle this species of knowledge, which was hitherto acquired in a desultory and irregular manner, began to be cultivated systematically and with a definite object ; and among the services which the philo- sopher of Stagira rendered to mankind, one of the greatest and most substantial is, that he was the founder of Com- parative Anatomy, and was the first to apply its facts to the elucidation of zoology. The works of this ardent and original naturalist show that his zootomical knowledge was extensive and often accurate; and from several of his descriptions it is impossible to doubt that they were

derived from frequent personal dissection. Aristotle, who was born 384 years before the Christian era, or in the first 384. year of the 99th Olympiad, was, at the age of 39, requested by Philip to undertake the education of his son Alexander. During this period it is said he composed several works on anatomy, which, however, are now lost. The military expedition of his royal pupil into Asia, by laying open the animal stores of that vast and little known continent, furnished Aristotle with the means of extending his know- ledge, not only of the animal tribes, but of their structure, and of communicating more accurate and distinct notions than were yet accessible to the world. A sum of 800 ; talents, and the concurrent aid of numerous intelligent 334-92/ assistants in Greece and Asia, were intended to facilitate his researches in composing a system of zoological know- ledge ; but it has been observed that the number of instances in which he was thus compelled to trust to the testimony of other observers led him to commit errors description which personal observation might have enabled him to avoid.

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Parts of Animals, constitute the great monument of the Aristotelian Anatomy. From these we find that Aristotle was the first who eorreeted the erroneous statements ot Polybus, Syennesis, and Diogenes vessels, which they made, as we have scen, to arise from the head and brain. These he represents to be two in number, placed before the spinal column, the larger on the right, the smaller on the left, whieh, he also remarks, is by some called aorta (dopr#), the first time we observe that this epithet oecurs in the history. Both he repre- sents to arise from the heart, the larger from the largest upper cavity, the smaller or aorta from the middle cavity, but in a different manner and forming a narrower eanal. He also distinguishes the thick, firm, and more tendinous strueture of the aorta from the thin and membranous strueture of vein. In describing the distribution of the latter, however, he confounds the vena cava and pulmonary artery, and, as might be expected, he confounds the ramifieations of the former with those of the arterial tubes in general. While he represents the lung to be liberally supplied with blood, he describes the brain ag an organ

almost destitute of this fluid. His account of the distribu- tion of the aorta is wonderfully correct. Thongh he does uot notice the cceliac, and remarks that the aorta sends no direct branches to the liver and spleen, he had observed the mesenteric, the renal, and the common iliac arteries. It is nevertheless singular that though he remarks parti- cularly that the renal branches of the aorta go to the substance and not the pelvis (xowia) of the kidney, he appears to mistake the ureters for branches of the aorta. Of the nerves (vevpd) he appears to have the most confused notions. Making them arise from the heart, which he says has nerves (tendons) in its largest cavity, he represents the aorta to be a nervous or tendinous vein (vevpwdys prcBs). By and by, afterwards saying that all the articu- lated bones are connected by nerves, he makes them the same as ligaments.

He distinguishes the windpipe or air-holder (aprnpia) from the cesophagus, beeause it is placed before the latter, because food or drink passing into it causes distressing cough and suffoeation, and beeause there is no passage from the lung to the stomach. He knew the situation and use of the epiglottis, seems to have had some indistinct notions of the larynx, represents the windpipe to be neces- sary to convey air to and from the lungs, and appears to have a tolerable understanding of the structure of the lungs. He repeatedly represents the heart, the shape and site of which he describes aecurately, to be the origin of the blood-vessels, in opposition to those who made them desecnd from the head; yet, though he represents it as full of blood and the souree and fountain of that fluid, and even speaks of the blood flowing from the heart to the veins, and thenee to every part of the body, he says nothing of the circular motion of the blood. The diaphragm he distinguishes by the name dudlwpa, and trdfopa. With the liver and spleen, and the whole alimentary canal, he seems well acquainted. The several parts of the quadruple stomaeh of the rnminating animals are distinguished and named ; and he even traees the relations between the teeth and the several forms of stomaeh, and the length or brevity, the simplicity or complication, of the intestinal tube. Upon the same principle he distinguishes the jejunwm (j vores), or the empty portion of the smal! intestines in animals (ré evrepov Aerrédv), thecacum (rupddv re kal dyKudes), the colon (76 k@dov),

and the sigmoid flexure (orevdrepov kai eiAvypévov). The modern epithet of rectum is the literal translation of his deseription of the straight progress (

aN TOM Y

The first three books of the History of Animals, a treatise consisting of ten books, and the four books on the

regarding the blood-

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eavitics and the passage from the tympanal cavity of the ear to the palate, afterwards deseribed by Eustachius, He distinguishes as "partes similares" those structures, such as bone, cartilage, vessels, sinews, blood, lymph, fat, flesh, which, not confined to one loeality, but distributed throughout the body generally, we now term the tissues or textures, whilst he applies the term " partes dissimilares" to the regions of the head, neck, trunk, and extremities,

Next to Aristotle occur the names of Diocles of Carystus, 354. and Praxagoras of Cos, the last of the family of the Aselepiade. The latter is remarkable for being the first 341, who distinguished the arteries from the veins, and the author of the opinion that the former were air-vessels,

Hitherto anatomical inquiry was confined to the examina- tion of the bodies of brute animals. We have, indeed, no testimony of the human body being submitted to examina- tion previous to the time of Erasistratus and Herophilus ; and it is vain to look for authentic faets on this point before the foundation of the Ptolemaic dynasty of sovereigns in Egypt. This event, whieh, as is generally known, suceeeded the death of Alexander, 320 years before the Christian era, colleeted into one spot the scattered embers of literature and scienee, which were beginning to languish in Greeee under a weak and distracted governinent and an Alexan- unsettled state of soeiety. The children of her divided drian states, whom domestie diseord and the

uncertainties of School. war rendered unhappy at home, wandered into Egypt, and found, under the fostering hand of the Alexandrian monarchs, the means of cultivating the sciences, and repaying with interest to the country of Thoth and Osiris the benefits which had been conferred on the infaney of Greece by Thales and Pythagoras. Alexandria became in this manner the repository of all the learning and know- ledge of the civilised world ; and while other natious were Sinking under the effects of internal animosities-and mutual dissensions, or ravaging the earth with the evils of war, the Egyptian Greeks kept -alive the sacred flame of science, and preserved mankind from relapsing into their original barbarism. These happy effects are to be aseribed in an eminent degree to the enlightened government and liberal opinions of Ptolemy Soter, and his immediate successors Philadelphus and Euergetes. The two latter prinees, whose authority was equalled only by the zeal with which they patronised scienee and its professors, were the first who enabled physicians to disseet the human body, and prevented the prejudiees of ignorance and superstition from compromising the welfare of the human race. To this happy cireumstance Herophilus and Erasistratus are indebted for the distinction of being known to posterity as the first anatomists who dissected and deseribed the parts of the human body. Both these physicians flourished » under Ptolemy Soter, and probably Ptolemy Philadelphus, and were indeed the prineipal supports of what has been named in medieal history the Alexandrian School, to which their reputation seems to have attraeted numerous pupils.

But though the coneurrent testimony of antiquity assigns

to these physicians the merit of disseeting the human body,

time, whieh wages endless war with the vanity and ambition of man, has dealt hardly with the monuments of

their labours. As the works of neither have been preserved,

great uneertainty prevails as to the respeetive merits of these aneient anatomists; and all that is now known of their anatomieal researehes

is obtained from the occasional notices of Galen, Oribasius, and some other writers, From

these it appears that Erasistratus recognised the valves of Erasis- the heart, and distinguished them by the names of tricuspid tratus. and segmoid ; that he studied particularly the shape and °° strueture of the brain, and its divisions, and cavities, and membranes, and likened the convolutions to the folds of*

the jejunum ; that he first formed a distinct idea of the

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Hero- philus,

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Celsus. 53 B.C.— 7 A.D.

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nature of the nerves, which he made issue from the brain ; and that he discovered lymphatic vessels in the mesentery, first in brute animals, and afterwards, it is said, in man. He appears also to have distinguished the nerves into those of sensation and those of motion.

Of Herophilus it'is said that he had extensive anatomical knowledge, acquired by dissecting not only brutes but human bodics. Of these he probably dissected more than any of his predecessors or contemporaries. Devoted to the assiduous cultivation of anatomy, he appears to have studied with particular attention those parts which were least understood. He recognised the nature of the pul- monary artery, which he denominates arterious vein ; he knew the vessels of the mesentery, and showed that they did not go to the vena porte, but to certain glandular bodies ; and he first applied the name of twelve-inch or duodenum (8wSexadéxrvdos) to that part of the alimentary canal which is next tothe stomach. Like Erasistratus, he appears to have studied carefully the configuration of the brain; and though, like

him, he distinguishes the nerves into those of sensation and those of voluntary motion, he adds to them the ligaments and tendons. A tolerable description of the liver by this anatomist is preserved in the writings of Galen. He first applied the name of choroid or vascular membrane to that which is found in the cerebral ventricles ; he knew the straight venous sinus which still bears his name; and to him the linear furrow at the bottom of the fourth ventricle is indebted for its name of calamus scriptorius.

The celebrity of these two great anatomists appears to have thrown into the shade for a long period the names of all other inquirers; for, among their numerous and rather celebrated successors in the Alexandrian school, it is impossible to recognise a name which is entitled to dis tinction in the history of anatomy. In a chasm so wide it is not unintcresting to find, in one who combined the characters of the greatest orator and philosopher of Rome, the most distinct traces of attention to anatomical know- ledge. Cicero, in his treatise De Natura Deorum, in a short sketch of physiology, such as it was taught by Aristotle and his disciples, introduces various anatomical notices, from which the classical reader may form some idea of the state of anatomy at that time. The Roman orator appears to have formed a pretty distinct idea of the shape and connections of the windpipe and lungs; and though he informs his readers that he knows the alimentary canal, he omits the details through motives of delicacy. In imitation of Aristotle, he talks of the blood being con- veyed by the veins (ven), that is, blood-vessels, through the body at large; and, like Praxagoras, of the air inhaled by the iungs being conveyed through the arteries.

Aretzus, though chiefly known as a medical author, makes some observations on the lung and the pleura, maintains the glandular structure of the kidney, and describes the anastomosis or communications of the capil- lary extremities of the vena cava with those of the portal vein.

The most valuable depository of the anatomical know- ledge of these times is the work of Celsus, one of the most judicious medical authors of antiquity. He left, indeed, no express anatomical treatise; but from

the introductions to the 4th and 8th books of his work, De Medicina, with incidental remarks in the 7th, the modern reader may form very just ideas of his anatomical attain- ments. rom these it appears that Celsus was well acquainted with the windpipe and lungs and the heart; with the difference between the windpipe and ceso- phagus (stomachus), which leads to the stomach (ventri- culus) ; and with the shape, situation, and relations of the diaphragm. He enumerates also the principal facts relating

to the situation of the liver, the spleen, the kidneys, and the stomach. He appears, however, to have been unaware of the distinction of duodenum or twelve-inch. bowel, already admitted by Herophilus, and represents the stomach as directly connected by means of the pylorus with the jejunum or upper part of the small intestine.

The 7th and 8th books, which are devoted to the consideration of those diseases which are treated by manual operation, contain sundry anatomical notices necessary to explain the nature of the diseases or mode of treatment. Of these, indeed, the merit is uncqual; and it is not wonderful that the ignorance of the day prevented Celsus _ from understanding rightly the mechanism of the pathology of hernia. He appears, however, to have formed a tolerably just idea of the mode of cutting into the urinary bladder; and even his obstetrical instructions show that his knowledge of the uterus, vagina, and appendages was not contemptible. It is in osteology, however, that the information of Celsus is chiefly conspicuous. He enume- rates the sutures and several of the holes of the cranium, and describes at great length the superior and inferior maxillary bones and the teeth. With a good deal of care he describes the vertebrae and the ribs, and gives very briefly the situation and shape of the scapula, humerus, radius, and ulna, and even of the carpal and metacarpal bones, and then of the different bones of the pelvis and lower extremities. He had formed a just idea of the articular connections, and is desirous to impress the fact that none is formed without cartilage. From his mention of many minute holes

(multa et tenuia foramina), in the recess of the nasal cavitics, it is evident that he was acquainted with the perforated plate of the ethmoid bone ; and from saying that the straight part of the auditory canal becomes flexuous, and terminates in numerous minute cavities (multu et tenwa foramina diducitur), it is inferred by Portal that he knew the semicircular canals.

Though the writings of Celsus show that he cultivated anatomical knowledge, it does not appear that the science was much studied by the Romans ; and there is reason to believe that, after the decay of the school of Alexandria, it languished in neglect and obscurity. It is at least certain that the appearance of Marinus during the reign of Nero is mentioned by authors as an era remarkable for anatomical inquiry, and that this person is distinguished by Galen as the restorer of a branch of knowledge which had been before him suffered to fall into undeserved neglect. From Galen also we learn that Marinus gave an accurate account of the muscles, that he studied particularly the glands, and that he discovered those of the. mesentery. He fixed the number of nerves at seven; he observed the palatine nerves, which he rated as the fourth pair; and described as the fifth the auditory and facial, which he regards as one pair, and the hypoglossal as the sixth.

Not long after Marinus appeared Ruffus of Ephesus, a Rufus.

Greek physician, who in the reign of Trajan was much attached to physiology, and as a means of cultivating this science studied Comparative Anatomy, and made sundry experiments on living animals. Of the anatomical writings of this author there remains only a list or catalogue of names of different regions and parts of the animal body. He appears, however, to' have directed attention particu- larly to the tortuous course of the uterine vessels, and to have recognised even at this early period the Fallopian tube. He distinguishes the nerves into those of sensation and those of motion. He knew the recurrent nerve. His name is further associated with the ancient experiment of compressing in the situation of the carotid artcries the pheumogastric nerve, and thereby inducing insensibility and loss of voice.

Of all the authors of antiquity, however, nonce possesses

the 130th reigns of Hadrian, the Antonines, Commodus, and Severus. He was embalms astronomer) in all the learning of particularly into the mysteries of

sophy. In an order somewhat whimsical

medicine ; but it was fully two years after that Galen

entered on this pursuit, under the auspices of an instructor

whose name he has thought proper to conceal. Shortly

after he betook himself to the study of anatomy under

Satyrus, a pupil of Quintus, and of medicine under Stra- tonicus, a Hippocratic physician, and AEschrion, an empiric. He had scarcely attained the age of twenty when he had occasion to deplore the loss of the first and most affectionate guide of his studies; and soon after he proceeded to Smyrna to obtain the anatomical instructions of Pelops, who, though mystified by some of the errors of Hippocrates, is commemorated by his pupil as a skilful anatomist. After this he appears to have visited various cities dis- tinguished for philosophical or medical teachers ; and, finally, to have gone to Alexandria with the view of cultivating more accurately and intimately the study of anatomy under Heraclianus. Here he remained till his twenty-eighth year, when he regarded himself as possessed of all the knowledge then attainable through the medium of teachers. He now returned to Pergamus to exercise the art which he had so anxiously studied, and received, in his twenty-ninth year, an unequivocal testimony of the confidence which his fellow-citizens reposed in his skill, by being intrusted with the treatment of the wounded gladia- tors ; and in this capacity he is said to have treated wounds with success which were fatal under former treatment. A seditious tumult appears to have caused him to form the resolution of quitting Pergamus and proceeding to Rome, at the age of thirty-two. Here, however, he remained only five years ; and returning once more to Pergamus, after

travelling for some time, finally settled in Rome as physician to the Emperor Commodus. The anatomical writings ascribed to Galen, which are numerous, are to be viewed not merely as the result of personal research and information, but as the common depository of the anatomical knowledge of the day, and as combining all that he had learnt from the several teachers under whom he successively studied with whatever personal investigation enabled him to acquire. It is on this account not always easy to distinguish what Galen had himself ascertained by personal research from that which was known by other anatomists. This, however, though of moment to the history of Galen as an anatomist, is of little consequence to the science itself ; and from the anatomical remains of this author a pretty just idea may be formed both of the progress and of the actual state of the science at that time.

The osteology of Galen is undoubtedly the most perfect of the departments of the anatomy of the ancients. He names and distinguishes the bones and sutures of the cranium nearly in the same manner as at present. Thus, he notices the quadrilateral shape of the parietal bones ; he distinguishes the Squamous, the styloid, the mastoid, and the petrous portions of the temporal bones; and he remarks the peculiar situation and shape of the sphenoid bone. Of the ethmoid, which he omits at first, he after- wards speaks more at large in another treatise. The malar he notices under the name of zygomatic bone; and he

ANATOMY

so just a claim to the title of anatomist as Claudius Galenus, the celebrated physician of Perganwus, who was born about year of the Christian era, and lived under the

trained by his father Nicon (whose memory he as an eminent mathematician, architect, and the day, and initiated the Aristotelian philo- he afterwards studied philosophy successively in the schools of the Stoics, the Academics, the Peripatetics, and the Epicureans. When he was seventeen years of age, his father, he informs us, Was admonished by a dream to devote his son to the study of

describes at length the upper maxillary and nasal bones, and the connection of the former with the sphenoid, He gives the first clear account of the number and situation of the vertebree, which he divides into cervical, dorsal, and lumbar, and distinguishes from the sacrum and coccyx. Under the head Bones of the Thorax, he enumcrates the sternum, the ribs (ai wAcupai), and the dorsal vertebrae, the connection of which with the former he designates as a variety of diarthrosis. The description of the bones of the extremities and their articulations concludes the treatise.

Though in myology Galen appears to less advantage than in osteology, he nevertheless had carried this part of anatomical knowledge to greater perfection than any of his predecessors. He describes a frontal muscle, the six muscles of the eye, and a seventh proper to animals; a muscle to each ala nasi, four muscles of the lips, the thin cutaneous muscle of the neck, which he first termed platysma myoides, or muscular expansion, two muscles of the eyelids, and four pairs of muscles of the lower jaw—the temporal to raise, the masseter to draw to one side, and two depressors, corresponding to the digastric and internal pterygoid muscles. After speaking of the muscles which move the head and the scapula, he adverts to those by Which the windpipe is opened and shut, and the intrinsic or proper muscles of the larynx and hyoid bone. Then follow those of the tongue, pharynx, and neck, those of the upper extremities, the trunk, and the lower extremities successively ; and in the course of this description he Swerves so little from the actual facts that most of the names by which he distinguishes the principal muscles have been retained by the best modern anatomists. It is chiefly in the minute account of these organs, and especially in reference to the minuter muscles, that he appears inferior to the moderns.

The angiological knowledge of Galen, though vitiated by the erroneous physiology of the times and ignorance of the separate uses of the arterics and veins, exhibits, never- theless, some accurate facts which show the diligence of the author in dissection. Though, in opposition to

the opinions of Praxagoras and Erasistratus, he proved that the arteries in the living animal contain not air but blood, it does not appear to have occurred to him to determine in what direction the blood flows, or whether it was movable or stationary. Representing the left ventricle of the heart as the common origin of all the arteries, though he is misled by the pulmonary artery, he nevertheless traces the distribution of the branches of the aorta with some accuracy. The vena azygos also, and the jugular veins, have contri- buted to add to the confusion of his description, and to render his angiology the most imperfect of his works.

In neurology we find him to be the author of the dogma that the brain is the origin of the nerves of sensation, and the spinal chord of those of motion ; and he distinguishes the former from the latter by their greater softness or less consistence. Though he admits only seven cerebral pairs, he has the merit of distinguishing and tracing the distribu. tion of the greater part of both classes of nerves with great accuracy. His description of the brain is derived from dissection of the lower animals, and his distinctions of the several parts of the organ have been retained by modern anatomists. His mode of demonstrating this organ, which indeed is clearly described, consists of five different steps. In the first the bisecting membrane—ie. the falx (uivey€é dtxorouotca)— and the connecting blood-vessels areremoved : and the dissector, commencing at the anterior extremity of the great fissure, separates the hemispheres gently as far as the torcular, and exposes a smooth surface (THY xdpay TvAdy ws obcav), the mesolobe of the moderns, or the middle band. Inthe second he exposes by successive sections the ventricles, the choroid plexus, and the middle partition.

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The third exhibits the pineal body (c@pa Kwvoedés) or conarium, concealed by a membrane with numerous veins, ineaning that part of the plexus which is now known by the name of velwm interpositum, and a complete view of the ventricles. The fourth unfolds the third ventricle (ris dAAn tpirn Koda), the communication between the two lateral ones, the arch-like body (cdpa wadsdoedés) fornix, and the

passage from the third to the fourth ventricle, In the fifth he gives an accurate description of the relations of the third and fourth ventricle, of the situation of the two pairs of eniinences, nates (yAourd) and testes (SiSvpta or épxets), the scolecoid or wor1n-like process, anterior and posterior, and lastly the linear furrow, called by Herophilus calamus scriptorius.

In the account of the thoracie organs equal accuracy may be recognised. He distinguishes the plewra by the name of inclosing membrane (tyAv tmeLoxas, membrana succingens), and remarks its similitude in structure to that of the peritoneum, and the covering which it affords to all the organs. The pericardium also he describes as a membran- ous sac with a circular basis corresponding to the base of the heart, and a conical apex ; and after an account of the tunics of the arteries and veins, he speaks shortly of the lung, and more at length of the heart, which, however, he takes some pains to prove not to be muscular, because it is harder, its fibres are differently arranged, and its action is incessaut, whereas that of muscle alternates with the state of rest; he gives a good account of the valves and of the vessels ; and notices especially the bony ring formed in the heart of the horse, elephant, and other large animals.

The description of the abdominal organs, and of the kidneys and urinary apparatus, is still more minute, and in general accurate. Our limits, however, do uot permit us to give any abstract of them; and it is sufficient in general to say that Galen gives correct views of the arrangement of the pceritoncum and omentum, and distin- guishes accurately the several divisions of the alimentary canal and its component tissues. In the liver, which he allows to receive an envelope from the peritoneum, he admits, in imitation of Erasistratus, a propcr substance or parenchyma, interposed between the vessels, and capable of removal by suitable dissection. His description of the organs of gencration is rather brief, and is, like most of his anatomical sketches, too much blended with physiological dogmas.

This short sketch may communicate some idea of the condition of anatomical knowledge in the days of Galen, who indeed is justly

entitled to the character of rectifying and digesting, if not of creating, the science of anatomy among the ancients. Though evidently confined, perhaps entirely by the circumstances of the times, to the dissection of brute animals, so indefatigable and judicious was he in the mode of acquiring knowledge, that many of his names and distinctions are still retained with advantage in the writings of the moderns. Galen was a practical anatomist, and not only describes the organs of the animal body from actual dissection, but gives ample instructions for the proper mode of exposition. His language is in general elcar, his style as correct as in most of the authors of the same period, and his manner is animated. Few passages in early science are indecd so interesting as the description of the process for demonstrating the brain and other internal organs which is given by this patient and enthusiastic obscrver of nature. 'lo some it may appear absurd to speak of anything like good anatomical descrip- tion in an author who writes in the Greek language, or anything like an interesting and correct manner in a writer who flourished at a period when taste was depraved or extinct and literature corrupted,—when the philosophy of Antoninus and the mild virtues of Aurelius could do

little to soften the iron sway of Lucius Verus and Com- modus; but the habit of faithful observation in Galen seems to have been so powerful that, in the description of material objects, his genius invariably rises above the circumstances of his age. Though not so directly con- nected with this subject, it is nevertheless proper to mention that he appears to have been the first anatomist who can be said, on authentic grounds, to have attempted to discover the uses of organs by vivisection aud experi- ments on living animals. In this manner he ascertained the position and demonstrated the action of the heart ; and he mentions two instances in which, in consequence of disease or injury, he had an opportunity of observing the motions of this organ in the human body. In short, without enlogis- ing an ancient author at the expense of critical justice, or commending his anatomical descriptions as

superior to those of the moderns, it must be admitted that the anatomical writings of the physician of Pergamus formi a remarkable era in the history of the science; and that by diligence in dissection and accuracy in description he gave the science a degree of importance and stability which it has retained through the lapse of many centuries.

The death of Galen, which took place at Pergamus in the ninetieth year of his age and the 193d of the Christian era, nlay be regarded as the downfall of anatomy in ancicnt times. After this period we recognise only two names of any celebrity in the history of the scicnce —those of Soranus and Oribasius, with the more obscure ones of Meletius and Theophilus, the latter the chief of the imperial guard of Heraclius.

Soranus, who was an Ephesian, and flourished under the emperors Trajan and Hadrian, distinguished himsclf by his researches on the female organs of generation. He appears to have dissected the human subject; and this perhaps is one reason why his descriptions of these parts are more copious and more accurate than those of Galen, who derived his knowledge from the bodies of the lower animals. He denies the existence of the hymen, but describes accurately the clitoris. Soranus the anatomist must be distinguished from the physician of that name, who was also a native of Ephesus.

Oribasius, who was born at Pergamus, is said to have Oribasus

been at once the friend and physician of the Emperor

Julian, and to have contributed to the elevation of 361-303,

that apostate to the imperial throne. For this he appears to have suffered the punishment of a temporary exile under Valens and Valentinian ; but was soon recalled, and lived in great honour till the period of his death. By

Le Clerc, Oribasius is regarded as a compiler ; and indeed 38/.

his anatomical writings bear so close a correspondence with those of Galen that the character is not altogether ground- less. In various points, nevertheless, he has rendered the Galenian anatomy more accurate ; and he has distinguished himself by a good account of the salivary glands, which were overlooked by Galen.

To the same period generally is referred the Anatomical Introduction of an anonymous author, first published in 1618 by Lauremberg, and more recently by Bernard. It is to be regarded as a compilation formed on the model of Galen and Oribasius. The same character is applicable to the treatises of Meletius and Theophilus.

The decline indicated by these languid efforts soon sunk into a state of total inactivity ; and the unscttled state of society during the latter ages of the Roman empire was extremely unfavourable to the successful cultivation of science. The sangninary conflicts in which the southern countries of Europe were repeatedly engaged with their northern neighbours, between the second and eighth cen- turies, tended gradually to cstrange their minds from scientific pursuits ; and the hordes of barbarians by which

the Roman empire was latterly overrun, while they urged them to the necessity of making hostile resistance, and adopting means of self-defence, introdueed such habits of ignoranee and barbarism, that science was almost univer- sally forgotten. While the art of healing was professed only by some few ecclesiasties or by itinerant practitioners, anatomy was utterly negleeted ; and no name of anatomieal celebrity occurs to diversify period commonly distinguished as the Dark Ages,

Anatomieal learning, thus neg'eeted by European nations, is believed to have reeeived a temporary cultivation fron the Asiatics. Europeans under the general denomination of Arabs and Saraeens, had gradually eoaleseed under various leaders ; and by their habits of endurance, as

well as of enthusiastic valour in suecessive expeditions against the eastern division of the Roman empire, had acquired such military reputation as to render them formidable wherever they appeared. After a century and a half of foreign warfare or internal animosity, under the successive dynasties of the Ommiads and Abbassides, in which the propagation of Islamism was the pretext for the extinetion of learning and civilisation, and the most remorseless system of rapine and destruction, the Saracens began, under the latter dynasty of princes, to recognise the value of seience, and especially of that which prolongs life, heals disease, and alleviates the pain of wounds and injuries. The caliph Almansor combiued with his official knowledge of Moslem law the successful cultiva- tion of astronomy; but to his grandson Almamun, the seventh prince of the line of the Abbassides, belongs the merit of undertaking to render his subjects philosophers and physicians. By the directions of this prince the works of the Greek and Roman authors were translated into Arabic ; and the favour and munificenee with which literature and its professors were patronised speedily raised a suecession of learned Arabians. The residue of the rival family of the Ommiads, already settled in Spain, was prompted by motives of rivalry or honourable ambition to adopt the same course ; and while the academy, hospitals, and library of Baghdad bore testimony to the zeal and liberality of the Abbassides, the munifieenee of the Ommiades was not less conspicuous in the literary institutions of Cordova, Seville, and Toledo.

Notwithstanding the efforts of the Arabian princes, however, and the diligence of the Arabian physicians, little was done for anatomy, and the science made no substantial aequisition. The Koran denounces as unelean the per- son who touches a corpse; the rules of Islamism forbid disseetion ; and whatever their instructors taught was borrowed from the Greeks. Abu-Bekr Al-Rasi, Abu-Ali Ibn-Sina, Abul-Cassein, and Abu-Walid Ibn-Roshd, the Rhazes, Avicenna, Abulcasis, and Averrhoes of European authors, are their most eelebrated names in medicine 3 yet to none of these can the historian with justice ascribe any anatomieal merit. AJ-Rasi has indeed left deseriptions of the eye, of the ear and its meatus, and of the heart; and Ibn-Sina, Abul-Cassem, and Ibn-Roshd give anatomieal descriptions of the parts of

the human body. But of these the general character is, that they are copies from Galen, Sometimes not very just, and in all instances mystified with a large proportion of the fanciful and absurd imagery and inflated style of the Arabian writers. The chief reason of their obtaining a plaee in anatomical history is, that by the influence which their medical authority enabled them to exereise in the European schools, the nomenclature which they employed was adopted by European anatomists, and eontinued till the revival of aneient learning restored the original nomenelature of the Greek physieians. Thus, the cervix, or nape of the neck, is nucha ; the esophagus is meri; the umbilical region is sumen or sumac; the

the long and uninteresting

Of these, several nomadie tribes, known to

abdomen is myrach ; the peritoneum is siphac ; and the omentum, zirbus.

From the general charaeter now given justice requires that we except Abdallatif, the annalist of Egyptian affairs. This author, who maintains that it is impossible to learn anatomy from books, and that the authority of Galen must yield to personal inspection, informs us that the Moslem doetors did not neglect opportunities of study- ing the bones of the human body in cemeteries j and that he himself, by onee examining a collection of bones in this manner, ascertained that the lower jaw is formed of one piece; that the sacrum, though sometimes composed of several, is most generally of one; and that Galen is mistaken when he asserts that these bones are not single,

The era of Saraeen learning extends to the 13th century ; School of and after this we begin to approach happier times. 'The Bologna. university of Bologna, which, as a school of literature and law, was already celebrated in the twelfth century, became, in the course of the

following one, not less distinguished for its medical teachers. Though the misgovernment of 1222-24. the municipal rulers of Bologna had disgusted both teachers and students, and given rise to the foundation of similar institutions in Padua and N aples,—and though the school of Salerno, in the territory of the latter, was still in high 1241-71. repute, —it appears, from the testimony of Sarti, that medicine was in the highest esteem in Bologna, and that it was in sueh perfection as to require a division of its professors into physicians, surgeons, physicians for wounds, barber-surgeons, oeulists, and even some others, Notwith- standing these indications of refinement, however, anatomy was manifestly cultivated rather as an appendage of surgery than a branch of medical scienee ; and, according to the testimony of Guy de Chauliae, the cultivation of anatomical knowledge was confined to Roger, Roland, Jamerio, Bruno, and Lanfranc ; and this they borrowed chiefly from Galen.

In this state matters appear to have proceeded with the medical school of Bologna till the commencement of the fourteenth century, when the circumstance of possessing a teacher of originality enabled this university to be the agent of as great an improvement in medieal science as she had already effected in jurisprudence. This era, indeed, is distinguished for the appearance of Mondino, under whose Mondino. zealous cultivation the seienee first began to rise from the ashes in which it had been buried. This father of modern auatomy, who taught in Bologna about the year 1315, quickly drew the curiosity of the medieal profession by well-ordered demonstrations of the different parts of the human body. In 1315 he dissected and demonstrated the parts of the human body in two female subjeets; and in the eourse of the following year he aceomplished the same task on the person of a single female. But while he seems to have had sufficient original force of intellect to direct his own route, Riolan aecuses him of copying Galen ; and it is certain that his deseriptions are corrupted by the barbarons leaven of the Arabian sehools, and his Latin defaced by the exotie nomenelature of Ibn-Sina and Al- Rasi. He died, aecording to Tiraboschi, in 1325.

Mondino divides the body into three cavities (ventres), the upper containing the animal members, as the head, the lower containing the natural members, and the middle containing the spiritual members. He first describes the anatomy of the lower cavity or the abdomen, then proceeds to the middle or thoraeic organs, and coneludes with the upper, comprising the head and its contents and append- ages. His general manner is to notice shortly the situation and shape or distribution of textures or meinbranes, and then to mention the disorders to whieh they are subject. The peritoneum he describes under the name of siphac, in imitation of the Arabians, the omentun under that of zirbus, and the mesentery or eucharus as distinct from

1480.

Achillini.

1463-1512.

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both. In speaking of the intestines he treats first of the reetum, then the eolon, the left or sigmoid flexure of whieh, as well as the transverse arch and its eonnection with the stomach, he particularly remarks ; then the eecum or monoculus, after this the small intestines in general under the heads of ileum and jejunum, and latterly the duodenum, making in all six bowels. The liver and its vessels are minutely, if not aceurately, examined ; and the cava, under the name chilis, a corruption from the Greek xotAn, is treated at length, with the emulgents and kidneys. His anatomy of the heart is wonderfully accurate ; and it is a remarkable faet, which seems to be omitted by all subsequent authors, that his deseription eontains the rudi- ments of the eirculation of the blood. ‘“ Postea vero versus pulmonem est aliud orifieium ven arterialis, que vortat sanguinem ad pulmonem a eorde ; quia eum pulmo deserviat cordi secundum modum dictum, ut ei recompenset, cor ei ¢ransmittit sanguinem per hane venam, que voeatur vena arterialis; est vena, quia portat sanguinem, et arterialis,

quia habet duas tunieas ; et habet duas tunieas, primo quia vadit ad membrum quod existit in eontinuo motu, et seeundo quia portat sanguinem valde subtilem et eholeri- eum." The merit of these distinetions, however, he after- wards destroys by repeating the old assertion that the left ventricle ought to eontain spirit or air, whieh it generates from the blood. His osteology of the skull is erroneous. In his aceount of the eerebral membranes, though short, he notiees the principal eharaeters of the dura mater. He deseribes shortly the lateral ventricles, with their anterior and posterior cornua, and the ehoroid plexus as a blood-red substanee like a long worm. He then speaks of the third or middle ventricle, and one posterior, which seems to eorrespond with the fourth ; and describes the infundibulum under the names of lacuna and emboton. In the base of the organ he remarks, first, two mammillary earuneles, the optic nerves, whieh he reekous the first pair; the oeulo- muscular, which he aeeounts the second ; the third, whieh appears to be the sixth of the moderns; the fourth ; the fifth, evidently the seventh ; a sixth, the nervus vagus ; and a seventh, whieh is the ninth of the moderns. Not- withstanding the misrepresentations into whieh this early anatomist was betrayed, his book is valuable, and has been illustrated by the suecessive eommentaries of Aehillini, Berenger, and Dryander.

Matthew de Gradibus, a native of Gradi, a town in Friuli, near Milan, distinguished himself by eomposing a series of treatises on the anatomy of various parts of the human body. He is the first who represents the ovaries of the female in the éorrect light in whieh they were subsequently regarded by Steno.

Objeetions similar to those already urged in speaking of Mondino apply to another eminent anatomist of those Gabriel de Zerbis, who flourished at Verona towards the eonclusion of the 15th eentury, is eelebrated as the author of a system in whieh he is obviously more anxious to astonish his readers by the wonders of a verbose and eomplieated style than to instruet by preeise and faithful description. In the vanity of his heart he assumed the title of Medicus Theoricus ; but though, like Mondino, he derived his information from the disseetion of the human subject, he is not entitled to the merit either of

deseribing truly or of adding to the knowledge previously aequired. He is superior to Mondino, however, in knowing the olfactory nerves.

Eminent in the history of the seienee, and more distin- guished than any of this age in the history of eerebral anatomy, Alexander Aehillini of Bologna, the pupil and eommentator of Mondino, appeared at the close of the 15th century. Though a follower of the Arabian sehool, the assiduity with whieh he eultivated anatomy has reseued

his name from the inglorious obseurity in whieh the Arabian doetors have in general slumbered. He is known in the history of anatomieal diseovery as the first who described the two tympanal bones, termed malleus and incus. In 1503 he showed that the tarsus consists of seven bones ; he rediscovered the fornix and the infundi- bulum ; and he was fortunate enough to observe the eourse of the eerebral eavities into the inferior cornua, and to remark peeuliarities to whieh the anatomists of a future age did not advert. He mentions the orifices of the duets, afterwards deseribed by Wharton. He knew the ileo-excal valve ; and his deseription of the duodenum, ileum, and colon shows that he was better aequainted with the site and disposition of these bowels than any of his predeeessors or eontemporaries.

Not long after, the seienee boasts of one of its most Berenger, James Berenger of Carpi, in the 1518.

distinguished founders. Modenese territory, flourished at Bologna' at the beginning of the 16th eentury. In the annals of medieine his name will be remembered not only as the most zealous and eminent in eultivating the anatomy of the human body, but as the first physielan who was fortunate enough to calm the alarms of Europe, suffering under the ravages of syphilis, then raging with uneontrollable virulenee. In the former eharacter he surpassed both predecessors and contemporaries ; and it was long before the anatomists of the following age eould boast of equalling him. His assiduity was

indefatigable; and he deelares that he disseeted above one hundred human bodies. He is the author of a eompendium, of several treatises whieh he names Introduetions (Jsagoge), and of eonimentaries on the treatise of Mondino, in whieh he not only rectifies the mistakes of that anatomist, but gives minute and in

general aceurate anatomieal deseriptions.

He is the first who undertakes a systematie view of the several textures of which the human body is eomposed ; and in a preliminary eommentary he treats successively of the anatomieal eharaeters and properties of fat, of mem- brane in general (panniculus), of flesh, of nerve, of villus or fibre ("ium), of ligament, of sinew or tendon, and of musele in general. He then proeeeds to deseribe with eonsiderable precision the museles of the abdomen, and illustrates their site and eonneetions by woodeuts, whieh, though rude, are spirited, and show that anatomieal drawing was in that early age beginning to be understood. In his aeeount of the peritoneum he admits only the intestinal division of that membrane, and is at some pains to prove that Gentilis, who justly admits the museular division also, is in error. In his aecount of the intestines he is the first who mentions the vermiform proeess of the eecum ; he remarks the yellow tint eommunieated to the duodenum by the gall-bladder; and he reeognises the opening of the eommon biliary duct into the duodenum (guidam porus portans choleram). In the aceount of the stomach he deseribes the several tissues of whieh that organ is eomposed, and whieh, after Alman- sor, he represents to be three, and a fourth from the peritoneum ; and afterwards notices the rug of its villous surfaee. He is at eonsiderable pains to explain the organs of generation in both sexes, and gives a long aecount of the anatomy of the foetus. He was the first who reeognised the larger proportional size of the ehest in the male than in the female, and conversely the greater eapaeity of the female than of the male pelvis. In the larynx he dis- eovered the two arytenoid cartilages. He gives the first good deseription of the thymus; distinguishes the oblique situation of the heart; describes the pericardium, and maintains the uniform presence of perieardial liquor. He then deseribes the cavities of the heart ; but perplexes him- self, as

did all the anatomists of that age, about the spirit supposed to be containcd. The aorta he properly makes

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to arise from the left ventricle ; but confuses himself with the arteria venalis, the pulmonary vein, and the vena arte- reals, the pulmonary artery. His account of the brain is better. He gives a minute and clear account of the vent- ricles, remarks the corpus striatum, and has the sagacity to perceive that the choroid plexus consists of veins aud arteries; he then describes the middle or third ventricle, the infundibulum or lacuna of Mondino, and the pituitary gland ; and lastly, the passage to the fourth ventricle, the conarium or pineal gland, and the fourth or posterior ventricle itself, the relations of which he had studied

accurately. He rectifies the mistake of Mondino as to the |

olfactory or first pair of nerves, gives a good account of the optic and others, and is entitled to the praise of originality in being the first observer who contradicts the fiction of the wonderful net, and indicates the principal divisions of the carotid arteries. He enumerates the tunics and humours of the eye, and gives an account of the internal ear, in which he notices the malleus and incus.

Italy long retained the distinction of giving birth to the first eminent anatomists in Europe, and the glory she acquired in the names of Mondino, Achillini, Carpi, and Massa, was destined to become more conspicuous in the labours of Columbus, Fallopius, and Eustachius, While Italy, however, was thus advancing the progress of science, the other nations of Europe were either in profound ignorance or in the most supine indifference to the brilliant career of their zealous neighbours. The sixteeuth century had commenced before France began to acquire ana- tomical distinction in the names of Dubois, Fernel, and Etienne ; and even these celebrated teachers were less solicitous in the personal study of the animal body than in the faithful explanation of the anatomical writings of Galen. The infancy of the French school had to contend with other difficulties. The small portion

of kuowledge which had been hitherto diffused in the country was so inadequate to cradicate the prejudices of ignorance, that it was either difficult or absolutely impossible to procure human bodies for the purposes of science ; and we are assured, on the testimony of Vesalius and other competent authorities, that the practical part of anatomical instruction was obtained entirely from the bodies of the lower animals. The works of the Italian anatomists were unknown ; and it is a proof of the tardy communication of knowledge that, while the structure of the human body had been taught in Italy for more than a century by Mondino and his followers, these anatomists are never mentioned by Etienne, who flourished long after.

Such was the aspect of the times at the appearance of Jacques Dubois, who, under the Romanised name of Jacobus Sylvius, according to the fashion of the day, has been fortunate in acquiring a reputation to which his researches do not entitle him. For the name of J acques Dubois the history of anatomy, it is said, is indebted to his inordinate love of money. At the instance of his brother Francis, who was professor of eloquence in the college of Tournay at Paris, he devoted himself to the study of the learned languages and mathematics ; but discovering that these elegant accomplishments do not invariably reward their cultivators with the goods of fortune, Dubois betook himself to medicine. After the acquisition of a medical degree in the university of Mont- pellier, at the ripe age of fifty-one Dubois returned to Paris to resume a course of anatomical instruction. Here he taught anatomy to a numerous audience in the college of Trinquet ; and on the departure of Vidus Vidius for Italy Was appointed to succeed that physician as professor of Surgery to the Royal College. His character is easily estimated. With greater coarseness in his manners and language than even the rude state of society in his times

can palliate, with much varicd learning and considerable eloquence, he was a blind, indiscriminate, and irrational admirer of Galen, and interpreted the anatomical and | physiological writings of that author

in preference to giving demonstrations from the subject. Without talent for original research or discovery himself, his envy and jealousy made him detest every one who gave proofs of either. We are assured by Vesalius, who was some time his pupil, that his manner of teaching was calculated neither to advance the science nor to rectify the mistakes of his predecessors. A human body was never seen in the theatre of Dubois; the carcases of dogs and other animals were the materials from which he taught; and so difficult even was it to obtain human bones, that unless Vesalius and his fellow-students had collected assiduously from the Innocents and other cemeteries, they must have committed numerous errors in acquiring the first principles. This assertion, however, is contradicted by Riolan, and after- wards by Sprengel and Lauth, the last of whom decidedly censures Vesalius for this ungrateful treatment of his instructor. It is certain that opportunities of inspecting the human body were by no means so frequent as to facilitate the study of the science, Though his mention of injections has led some to suppose him the discoverer of that art, he appears to have made no substantial addition to the information already acquired ; and the first acknow- ledged professor of anatomy to the university of Paris appears in history as one who lived without true honour and died without just celebrity. He must not be con- founded with Franciscus Sylvius (De le Boe), who igs mentioned by Ruysch and Malacarne as the author of a particular method of demonstrating the brain.

Almost coeval may be placed Charles Etienne, a younger Etienne. brother of the celebrated printers, and son to Henry, who 1503-64. Hellenised the family name by the classical appellation of Stephen (Sréavos). It is uncertain whether he taught publicly. But his tranquillity was disturbed, and his pursuits interrupted, by the oppressive persecutions in which their religious opinions involved the family ; and Charles Etienne drew the last breath of a miserable life in a dungeon in 1564. Etienne, though sprung of a family whose classical taste has been their principal glory, does not betray the same servile imitation of the Galenian anatomy with which Dubois is charged. He appears to have been the first to detect valves in the orifice of the hepatic veins. He was ignorant, however, of the researches of the

Italian anatomists ; and his description of the brain is inferior to that given sixty years before by Achillini. His comparison of the cerebral cavities to the human ear has persuaded Portal that he knew the inferior cornua, the hippocampus, aud its prolongations ; but this is no reason for giving hina that honour to the detriment of the reputation of Achillini, to whom, so far as historical testimony goes, the first knowledge of this fact is due. The researches of Etienne into the structure of the nervous system are, however, neither useless nor inglorious; and the circumstance of demonstrating a canal through the entire length of the spinal chord, which had neither been suspected by contem- – poraries nor noticed by successors till Senac made it known, is sufficient to place him high in the rank of anatomical discoverers.

The French anatomy of the sixteenth century was distinguished by two circumstances unfavourable to the advancement of the science,— extravagant admiration of antiquity, with excessive confidence in the writings of Galen, and the general practice of dissecting principally the bodies of the lower animals. Both these errors were Vesalius, much amended, if not entirely removed, by the exer- 1514. tions of a young Fleming, whose appearance forms a con- spicuous era in the history of anatomy. Andrew Vesalius,

a native of Brussels, after acquiring at Louvain the ordinary classical attainments of the day, began at the age of fourteen to study anatomy under the auspices of Dubois. Though the originality of his mind soon led him to abandon the prejudices by which he was cnvironed, and take the most direct course for attaining a knowledge of the structure of the human frame, he ueither underrated the Galenian anatomy uor was indolent in the dissection of brute animals, The difficulties, however, with which the practical pursuit of human anatomy was beset in France, and the dangers with which he had to contend, made him look to Italy as a suitable field for the cultivation of the science ; and in 1536 we find him at Venice, at once pursuing the study of human anatomy with the utmost zeal, and requested, ere he had attained his twenty-second year, to demonstrate publicly in the university of Padua.

After remaining here about seven years, Vesalius went by ex- press invitation to Bologna, and shortly afterwards to Pisa ;

and thus professor in three universities, he appears to-

have carried on his anatomical investigations and instruc- tions alternately at Padua, Bologna, and Pisa, in the course of the same winter. It is on this account that Vesalius, though a Fleming by birth and trained originally in the French school, belongs, as an anatomist, to the Italian, and may be viewed as the first of an illustrious line of teachers by whom the anatomical reputation of that country was in the course of the sixteenth century raised to the greatest eminence.

Vesalius is known as the first author of a comprehensive and systematic view of human anatomy. The knowlcdge with which his dissections had furnished him proved how inany errors were daily taught and learned under the broad mantle of Galenian authority; and he perceived the necessity of a new system of anatomical instruction, divested of the omissions of ignorance and the misrepresentations of prejudice and fancy. The early age at which he effected this object has been to his biographers the theme of boundless commendation ; and we arc told that he began at the age of twenty-five to arrange the materials he had collected, and accomplished his task ere he had completed his 28th year.

Soon alter this period we find him invited as imperial physician to the court of Charles V., where he was occupied in the duties of practice, and answering the various charges which were unceasingly brought against him by the disciples of Galen. After the abdication of Charles he continued at court in great favour with his son Philip IL To this he seems to have been led principally by the troublesome controversies in which his anatomical writings had involved him. It is painful to think, however, that even imperial patronage bestowed on cminent talents does not insure immunity from popular prejudice ; and the fate of Vesalius will be a lasting example of the barbarism of the times, and of the precarious tenure of the safety even of a great physician. On the preliminary circumstances authors are not agreed ; but the most general account states that when Vesalius was inspecting, with the

consent of his kinsmen, the body of a Spanish grandee, it was observed that the heart still gave some feeble palpitations when divided by the knife. The immediate effects of this outrage to human feelings were the denunciation of the anatomist to the Inquisition ; and Vesalius escaped the severe treat- ment of that tribunal only by the influence of the king, and by promising to perform a pilgrimage to the Holy Land. He forthwith proceeded to Venice, from which he sailed with the Venetian fleet, under James Malatesta, for Cyprus. When he reached Jerusalem, he received from the Venetian senate a message requesting him again to accept the Paduan professorship, which had become vacant by the death of his friend and pupi! Fallopius. His

destiny, however, which pursued him fast, suffered him not again to breathe the Italian air. After struggling for many days with adverse winds in the Ionian Sea, he was

wrecked on the island of Zante, where he quickly breathed 1564.

his last in such penury that unless a liberal goldsmith had defrayed the funeral charges, his remains must have been devoured by beasts of prey. At the time of his death he was scarcely fifty years of age.

To form a correct estimate of the character and merits of Vesalius, we must not compare him, in the spirit of modern perfection, with the anatomical authors either of later times or of the present day. Whoever would frame a just idea of this anatomist must imagine, not a bold innovator without academical learning,—not a genius coming from a foreign country, unused to the forms and habits of Catholic Europe,—nor a wild reformer, blaming indiscriminately everything which accorded not with his opinion ; but a young student scarcely emancipated from the authority of instructors, and whose intellect was still influenced by the doctrines with which it had been originally imbued,—a scholar strictly trained in the opinions of the time, living amidst men who venerated Galen as the oracle of anatomy and the

divinity of medicine,—exercising his reason to estimate the soundness of the instructions then in use, and proceeding, in the way least likely to offend authority and wound prejudice, to rectify errors, and to establish on the solid basis of observation the true elements of anatomical science. Vesalius has been deno- minated the founder of human anatomy ; and though we have seen that in this career he was preceded with honour by Mondino and Berenger, still the small proportion of correct observation which their reverence for Galen and Arabian doctrines allowed them to communicate, will not in a material degree impair the original merits of Vesalius. The errors which he rectified and the additions which he made are so numerous, that it is impossible, in such a sketch as the present, to communicate a just idea of them.

Besides the first good description of the sphenoid bone, he showed that the sternum consists of three portions and the sacrum of five or six; and described accurately the vestibule in the interior of the temporal bone. He not only verified the observation of Etienne on the valves of the hepatic veins, but he described well the vena azygos,

_and discovered the canal which passes in the foetus between

the umbilical vein and the vena cava, since named ductus venosus. He described the omentum, and its connections with the stomach, the spleen, and the colon; gave the first correct views of the structure of the pylorus ; remarked the small size of the cecal appendix in man; gave the first good account of the mediastinum and pleura, and the fullest description of the anatomy of the brain yet advanced. He appears, however, not to have understood well the inferior recesses ; and his account of the nerves is confused by regarding the optic as the first pair, the third as the fifth, and the fifth as the sevcuth.

The labours of Vesalius were not limited to the iminediate effect produced by his own writings. His instructions and example produced a multitude of anatomical inquirers of different characters and varied celebrity, by whom the science was extended and rectified. Of these we cannot speak in detail ; but historical justice requires us to notice

shortly those to whose exertions the science of anatomy has been most indebted.

The first that claims attention on this account is Eustach.us. Bartholomeo Eustachi of San Severino, near Salerno, who i e

though greatly less fortunate in reputation than Vesalius, divides with him the merit of creating the science of human anatomy. He extended the knowledge of the internal car by rediscovering and describing correctly the

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tube which bears his name; and if we admit that Ingras- sias anticipated him in the knowledge of the third bone of the tympanal cavity, the stapes, he is still the first who described the internal and auterior muscles of the malleus, as also the stapedius, and the complicated figure of the cochlea. He is the first who studied accurately the anatomy of the teeth, and the phenomena of the first and second dentition. The work, however, which demonstrates at once the great merit and the unhappy fate of Eustachius is his Anatomical Hngravings, which, though completed in 1552, nine years after the impression of the work of Vesalius, the author was unable to publish, First com- municated to the world in 1714 by Lancisi, afterwards in 1744 by Cajetan Petrioli, again in 1744 by Albinus, and more recently at Bonn in 1790, the engravings show that Eustachius had dissected with the greatest care and diligence, and taken the utmost pains to give just views of the shape, size, and relative position of the organs of the human body..

The first seven plates illustrate the history of the kidneys, and some of the facts relating to the structure of the ear. The eighth represents the heart, the ramifications of the vena azygos, and the valve of the vena cava, named from the author. In the seven subsequent plates is given a succession of different views of the viscera of the chest and abdomen. The seventeenth contains the brain and spinal chord ; and the eighteenth more accurate views of the origin, course, and distribution

of the nerves than had been given before. Fourteen plates are devoted to the muscles,

Kustachius did not confine his researches to the study of relative anatomy. He investigated the intimate structure of organs with assiduity and success. What was too minute for unassisted vision he inspected by means of glasses. Structure which could not be understood in the recent state, he unfolded by maceration in different fluids, or rendered more distinct by injection and exsiccation. The facts unfolded in these figures are so important that it is justly remarked by Lauth, that if the author himself had been fortunate enough to publish them, anatomy would have attained the perfection of the 18th century two centuries earlier at least. Their seclusion for that period in the papal library has given celebrity to many names which would have been known only in the verifica- tion of the discoveries of Eustachius.:

Eustachius was the contemporary of Vesalius. Columbus and Fallopius were his pupils. Columbus, as his immediate Successor in Padua, and afterwards as professor at Rome, distinguished himself by rectifying and improving the anatomy of the bones ; by giving correct accounts of the shape and cavities of the heart, of the pulmonary artery and aorta and their valves, and tracing the course of the blood from the right to the left side of the heart 3 by a good description of the brain and its vessels, and by correct understanding of the internal ear, and the first good account of the ventricles of the larynx.

Fallopius, who, after being professor at Pisa in 1548, and at Padua in 1551, died at the age of forty, studied the general anatomy of the bones; described better than heretofore the internal ear, especially the tympanum and its osseous ring, the two fenestre and their communication with the vestibule and cochlea ; and gave the first good account of the stylo-mastoid hole and canal, of the ethmoid bone and cells, and of the lacrymal passages. In myology he rectified several mistakes of Vesalius. He also devoted attention to the organs of generation in both sexes, and dis- covered the utero-peritoneal canal which still bears his name.

Osteology nearly at the same time found an assiduous cultivator in John Philip Ingrassias, a learned Sicilian physician, who, in a skilful commentary on the osteology of Galen, corrected numerous mistakes. He gave the first

distinct account of the true configuration of the sphenoid

and ethmoid bones, and has the merit of first describing 1548. the third bone of the tympanum, called stapes, though this

is also claimed by Eustachius and Fallopius.

The anatomical descriptions of Vesalius underwent the Aranzi. scrutiny of various inquirers. Those most distinguished 1530-£9. by the importance and accuracy of their researches, as well as the temperate tone of their observations, were Julius Cesar Aranzi, anatomical professor for thirty-two years in the university of Bologna, and Constantio Varoli, physician to Pope Gregory XIII. To the former we are indebted for the first correct account of the anatomical peculiarities of the foetus, and he was the first to show that the muscles of the eye do not, as was falsely imagined, arise from the dura mater, but from the margin of the optic hole. He also, after considering the anatomical relations of the cavities of the heart, the valves, and the great vessels, corroborates the views of Columbus regarding the course which the blood follows in passing from the right to the left side of the heart. Aranzi is the first anatomist who describes distinctly the inferior cornua of the ventricles of the cerebrum, who recognises the objects by which they are distinguished, and who gives them the name by which they are still known (hippocampus) ; and his account is more minute and perspicuous than that of the authors of the subsequent century. He speaks at large of the choroid plexus, and gives a particular description of the fourth ventricle, under the name of cistern of the cerebellum, as a discovery of his own.

Italy, though rich in anatomical talent, has probably few Varolizs. greater names than that of Constantio Varoli of Bologna, 1545. Though he died at the early age of thirt ~~two, he acquired a reputation not inferior to that of the most eminent of his contemporaries. He is now known chiefly as the author of an epistle, inscribed to Hieronymo Mercuriali, ou the optic nerves, in which he describes a new method of dissecting the brain, and communicates many interesting particulars relating to the anatomy of the organ. He observes the threefold division of the inferior surface or base, defines the limits of the anterior, middle, and posterior eminences, as marked by the compartments of the skull, and justly remarks that the cerebral cavities are capacious, communicate with each other, extending first backward and then forward, near the angle of the pyramidal portion of the temporal bone, and that they are folded on themselves, and finally lost above the middle and inferior eminence of the brain. He appears to have been aware that at this point they communicate with the exterior or convo~~ luted surface. He recognised the impropriety of the term corpus callosum, seems to have known the communication called afterwards foramen Monroianum, and describes the hippocampus more minutely than had been previously done.

Among the anatomists of the Italian school, as a pupil 1534. of Fallopius, Eustachius, and Aldrovandus, is generally enumerated' Volcher Coiter of Groningen. He distin- guished himself by accurate researches on the cartilages, the bones, and the nerves, recognised the value of morbid anatomy, and made experiments on living animals to ascer- tain the action of the heart and the influence of the brain.

The Frutefull and Necessary Briefe Worke of John Halle (1565), and The Englisheman's Treasure, by Master Thomas Vicary (1586), English works published at this time, are tolerable compilations from former authors, much tinged by Galenian and Arabian distinctions. A more valuable compendium than either is, however, that of John Banister (1578), entitled The Historie of Man, from the most approved Anathomistes in this Present Age. .

The celebrity of the anatomical school of Italy was Fabricius, worthily maintained by Hieronymo Fabricio of Acquapen- dente, who, in imitation of his master Fallopius, laboured

to render anatomical knowledge more precise by repeated dissections, and to illustrate the obscure by researches on the structure of animals in general. In this manner he investigated the formation of the foetus, the structure of the cesophagus, stomach, and bowels, and the peculiarities of the eye, the car, and the larynx. The discovery, however, on which his surest claims to eminence rest is that of the membranous folds, which he names valves, in the interior of veins. Several of these folds had been observed by Fernel, Sylvius, and Vesalius; and in 1547 Cannani observed those of the vena azygos ; but no one appears to have offered any rational conjecture on their use, or to have traced them through the venous system at large, until Fabricius in 1574, upon this hypothesis, demonstrated the presence of these valvular folds in all the veins of the extremities.

Fabricius, though succeeded by his pupil Julius Casserius of Placenza, may be regarded as the last of that illustrious line of anatomical teachers by whom the science was so successfully studicd and taught in the universitics of Italy. The discoveries which each made, and the errors which their successive labours rectified, tended gradually to give anatomy the character of a useful as well as an accurate science, and to pave the way for a discovery which, though not anatomical but physiological, is so intimately connected with correct knowledge of the shape and situation of parts, that it excrcised the most powerful influence on the future progress of anatoniical inquiry. This was the knowledge of the circular motion of the blood,—a fact which, though obscurely conjectured by Aristotle, Nemesius, Mondino, and Berenger, and partially taught by Servetus, Colum- bus, Czsalpinus, and

Fabricius, it was nevertheless re- served to William Harvey fully and satisfactorily to demonstrate.

Mondino believed that the blood procceds from the heart to the lungs through the vena arterialis or pul- monary artery, and that the aorta conveys the spirit into the blood through all parts of the body. This doctrine was adopted with little modification by Berenger, who further demonstrated the existence and operation of the tricuspid valves in the right ventricle, and of the sigmoid valves at the beginning of the pulmonary artery and aorta, and that there were only two ventricles separated by a solid impervious septum. These were afterwards described in greater detail by Vesalius, who neverthe- less appears not to have been aware of the important use which might be made of this knowledge. It was the Spaniard Michael Servet or Servetus (born in 1509; burnt in 1553), who in his treatise De 7'rinitatis Erroribus, published at Haguenau in 1531, first maintained the imperviousness of the septum, and the transition of the blood by what he terms an unknown route, namely, from the right ventricle by the vena arteriosa (pulmonary artery) to the lungs, and thence into the arteria venosa or pulmonary vein and left auricle and ventricle, from which, he adds afterwards, it is conveyed by the aorta to all parts of the body.}

1 The passage of Servetus is so interesting that our readers may feel some curiosity in perusing it in the language of the author; and it is not unimportant to remark that Servetus appears to have been led to think of the course of the blood by the desire of explaining the manner in which the animal spirits were supposed to be generated :— "Vitalis spiritus in sinistro cordis ventriculo suam originem habet, Juvantibus maxime pulmonibus ad ipsius perfectionem. Est spiritus tenuis, caloris vi elaboratus, flavo colore, ignea potentia, ut sit quasi ex purlore sanguine lucens, vapor substantiam continens aque, aeris, et ignis. Generatur ex facta in pulmone commixtione inspirati aeris cum elaborato subtili sanguine, quem dexter veutriculus sinistro com- mlunicat, Fit autem communicatio hee, non per parietem cordis medium, ut vulgo creditur, sed magno artificio a dextro cordis ventri- culo, longo per pulmones ductu agitatur sanguis subtilis ; a pulmonibus preparatur, flavus efficitur, et a vena arteriosa in arteriam

venosam transfunditur. Deinde in ipsa arteria venosa, inspirato aeri miscetur

ANATOMY

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Though the leading outlines, not only of the pulmonary or small but even of the great circulation, were sketched thus early by one who, though a philosopher, was attached to the church, it was only in his work De Re Anatomica, published at Venice in 1559, that Columbus formally and distinctly announced the circular course of the blood as a discovery of his own; and maintained, in addition to the imperviousness of the septum, the fact that the arteria venalis (pulmonary vein) contains, not air, but blood mixed with air brought from the lungs to the left ventricle of the heart, to be distributed through the body at large.

Soon after, views still more complete of the small or 1570-93,

pulmonary circulation were given by Andrew Cesalpinus of Arezzo, who not only maintained the analogy betwcen the structure of the arterious vein or pulmonary artery and the aorta, and that between the venous artery or pulmonary veins and veins in general, but was the first to remark the swelling of veins below ligatures, and to infer from it a refluent motion of blood in these vessels. The discoveries of Aranzi and Eustachius in the vessels of the foetus tended at first to perplex and afterwards to elucidate some of these notions. the years 1598 and 1600, a young Englishman, William Harvey, pursuing his anatomical studies at Padua under Fabricius of Acquapendente, learnt from that anatomist the existence of the valves in the veins of the extremities, and undertook to ascertain the use of these valves by experimental inquiry. It is uncertain whether he learnt from the writings of Ceesalpinus the fact observed by that author, of the tumescence of a vein below the ligature ; but he could not fail to be aware, and indeed he shows that he was aware, of the small circulation as taught by Servetus and Columbus. Combining these facts already known, he, by a series of well-executed experiments, de- monstrated clearly the existence, not

only of the small, but of a general circulation from the left side of the heart by the aorta and its subdivisions, to the right side by the veins. This memorable truth was first announced in the year 1619.

It belongs not to this place either to consider the arguments and facts by which Harvey defended his theory, or to notice the numerous assaults to which he was exposed, and the controversies in which his opponents wished to involve him. It is sufficient to say, that after the temporary ebullitions of spleen and envy had subsided, the doctrine of the circular motion of the blood was admitted by all enlightened and unprejudiced persons, and finally was universally adopted as affording the most satisfactory explanation of many facts in anatomical structure which were either misunderstood or entirely overlooked. The inquiries to which the investigation of the doctrine gave rise produced numerous researches on the shape and structure of the heart and its divisions, of the lungs, and of the blood-vessels and their distribution. Of this descrip- tion were the researches of Nicolas Steno on the structure of the heart, the classical work of Richard Lower, the dissertation of Pechlin, the treatise of Vieussens, the

et exspiratione a fuligine expurgatur ; atque ita tandem a sinistro cordis ventriculo totum mixtum per diastolen attrahitur, apta supellex, ut fiat spivitus vitalis. Quod ita per pulmones fiat communicatio et preparatio, docet conjunctio varia, et communicatio vene arteriose cum arteria venosa in pulmonibus. Confirmat hoc magnitudo insignis ven arteriose, que nec talis nec tanta esset facta, nec tantam a corde ipso vini purissimi sanguinis in pulmones emitteret, ob solum: eorum nutrimeutum ; nec cor pulmonibus hac ratione serviret, cum preser- tim antea in embryone solerent pulmones ipsi aliunde nutriri, ob mem branulas illas seu valvulas cordis, usqne ad horum nativita- tem; ut docet Galenus, &c. Itaque ille spiritus a sinistro cordis veutriculo arterias totius corporis deinde transfunditur, ita ut qui tennior est, superiora petit, ubi magis elaboratur, precipue in plexu retiformi, sub basi cerebri sito, ubi ex vitali fieri incipit animalis, ad propriam rationalis anime rationem accedens."— De Trinitate, lib, v.

At length it happened that, between Harvey,

| Asellius.

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HISTORY. |

work of Malpighi on the structure of the lungs, several sketches in the writings of Mayow, and other treatises of less moment. Systematic treatises of anatomy began to assume 4 more instructive form, and to breathe a more philosophical spirit. The great work of Adrian Spigelius, which appeared in 1627, two years after the death of the author, contains indeed no proof that he was aware of the valuable generalisation of Harvey ; but in the institutions of Caspar Bartholin, as republished and improved by his son Thomas in 1651, the anatomical descriptions and explanations are given with reference to the new doctrine. A still more unequivocal proof of the progress of correct anatomical knowledge was given in the lectures delivered by Peter Dionis, at the Jardin Royal of Paris, in 1673 and the seven following years, in which that intelligent surgeon gave most accurate demonstrations of all the parts com- posing the human frame, and especially of the heart, its auricles, ventricles, and valves, and the large vessels connected with it and the lungs. These demonstrations, first published in 1690, were so much esteemed that they passed through seven editions in the space of thirty years, and were translated into English.

The progress of anatomical discovery continued in the meantime to advance. In the eourse of the 16th century Eustachius, in studying minutely the structure of the vena azygos had recognised in the horse a white vessel full of watery fluid, connected with the internal jugular vein, on the left side of the vertebral column, corresponding accu- rately with the vessel since named thoracic duct. Fallopius also described vessels belonging to the liver distinct from arteries and veins ; and similar vessels appear to have been noticed by Nicolaus Massa. ‘he nature and properties of these vessels were, however, entirely unknown. On the 23d July 1622 Gaspar Asellius, professor of anatomy at Pavia, while engaged in demonstrating the recurrent nerves in a living dog, first observed numerous white delicate filaments crossing

the mesentery in all directions 3 and though he took them at first for nerves, the opaque white fluid which they shed quickly convinced him that they were a new order of vessels. The repetition of the experiment the following day showed that these vessels were best seen in animals recently fed ; and as he traced them from the villous membrane of the intestines, and observed the valves with which they were liberally supplied, he inferred that they were genuine chyliferous vessels. By confounding them with the lymphatics, he made them proceed to the pancreas and liver,—a mistake which appears to have been first rectified by Francis De le Boe. The discovery of Asellius was announced in 1627; and the following year, by means of the zealous efforts of Nicolas Peiresc, a liberal senator of Aix, the vessels were seen in the person of a felon who had eaten copiously before execution, and whose body was inspected an hour anda half after. In 1629 they were publicly demonstrated at Copenhagen by Simon Pauli, and the same year the thoracic duct was observed by Mentel for the first time since it was described by Eustachius. Five years after (1634), John Wesling, professor of anatomy and surgery at Venice, gave the first delineation of the lacteals from the human subject, and evinced more accurate knowledge than his predecessors of the thoracic duct and the lymphatics. Highmore in 1637 demonstrated unequivocally the difference between the lacteals and the mesenteric veins ; and though some per- plexity was occasioned by the discovery of the pancreatic duct by Wirsung, this mistake was corrected by Thomas Bartholin ; and the discovery by Pecquet in 1647 of the common trunk of the lacteals and lymphatics, and of the eourse which the chyle follows to reach the blood, may be regarded as the last of the series of isolated facts by the generalisation of which the extent, distribution, and

uses of the most important organs of the animal body were at length developed.

To eomplete the history of this part of anatomical science one step yet remained,—the distinction between the lacteals and lymphatics, and

the discovery of the termination of the latter order of vessels. The honour of this discovery is divided between J olyffe, an English anatomist, and Olaus Rudbeck, a young Swede. 'The former, according to the testimony of Glisson and Wharton, was aware of the distinct existence of the lymphatics in 1650, and demonstrated them as such in 1652. Tt is nevertheless doubtful whether he knew them much before the latter period ; and it is certain that Rudbeck observed the lymphatics of the large intestines, and traced them to glands, on the 27th January 1651, after he had, in the course of 1650, made various erroneous conjectures regard- ing them, and, like others, attempted to trace them to the liver. The following year he demonstrated them in presence of Queen Christina, and traced them to the thoracic duct, and the latter to the subclavian vein. Their course and distribution were still more fully investigated by Thomas Bartholin, Wharton, Swammerdam, and Blaes, the last two of whom recognised the existence of valves ; while Antony Nuck of Leyden, by rectifying various errors of his predecessors, and adding several new and valuable observations, rendered this part of anatomy much more precise than formerly.

After this period anatomists began to study more minutely the organs and textures. guished himself by a minute description of the liver, and a clearer account of the stomach and intestines, than had

yet been given. Thomas Wharton investigated the structure 1656.

of the glands with particular care; and though rather prone to indulge in fanciful generalisation, he developed some interesting views of these organs ; while Charleton, who appears to have been a person of great genius, though addicted to hypothesis, made some good remarks on the communication of the arteries with the veins, the fcetal circulation, and the course of the lymphatics. But the circumstance which chiefly distinguished the history of anatomy at the beginning of the seventeenth century was the appearance of Thomas eminent not only by good researches on the brain and nerves, but by many judicious observations on the structure of the lungs, the intestines, the blood-vessels, and the glands. His anatomy of the brain and nerves is so

minute and elaborate, and abounds so much in new information, that the reader is struck by the immense chasin between the vague and meagre notices of his predecessors, and the ample and correct descriptions of Willis. This excellent work, however, is not the result of his own personal and unaided exertions; and the character of Willis derives additional lustre from the candid avowal of his obligations to Wren and Millington, and, above all, to the diligent researches of his fellow-anatomist Richard Lower.

Willis was the first who numbered the cranial nerves in the order in which they are now usually enumerated by anatomists. His observation of the connection of the eighth pair with the slender nerve which issues from the beginning of the spinal chord is known to all. He remarked the parallel lines of the mesolobe, afterwards minutely described by Vicq d'Azyr. He seems to have recognised the communication of the convoluted surface of the brain and that between the lateral cavities beneath the fornix. He described the corpora striata and optic thalami ; the four orbicular eminences, with the bridge, which he first named annular protuberance ; and the white mam- millary eminences, behind the infundibulum. In the cerebellum he remarks the arborescent arrangement of the white and grey matter, and gives a good account of the

Francis Glisson distin- 1654.

Wills, who rendered himself Willis.

Malpighi.

1660.

Ruysch.

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internal carotids, and the communications which they make with the branches of the basilar artery.

About the middle of the 17th century Rt. Hooke and Nehemiah Grew employed the simple microscope in the minute examination of plants and animals ; and the Dutch

philosopher Leeuwenhoeck with great acuteness examined _

microscopically the solids and fluids of the body, recognised the presence of scales in the cuticle, and discovered the corpuscles in the blood and milk, and the spermatozoa in the seminal fluid. The researches of Malpighi also tended greatly to improve the knowledge of minute structure. He gave the first distinct ideas on the organisation of the lung, and the mode in which the bronchial tubes and vessels terminate in that organ. By the microscope he traced the transition of the arteries into the veins, and saw the movements of the blood corpuscles in the capillaries. He endeavoured to unfold, by dissection and microscopic observation, the minute structure of the brain. He studied the structure of bone, he traced the formation and explained the structure of the teeth; and his name is to this day associated with the discovery of the deeper layer of the cuticle and the Malpighian bodies in the spleen and kidney. In these difficult inquiries the observations of Malpighi are in general faithful, and he may be regarded as the founder of histological anatomy.

Nicolas Steno described with accuracy the lacrymal gland and passages, and rediscovered the parotid duct. Bellini studied the structure of the kidneys, and described the tongue and tonsils with some care; and Drelincourt laboured to investigate the changes effected on the uterus by impregnation, and to elucidate the formation of the foetus. The science might have derived still greater advantages from the genius of Regnier de Graaf, who investigated with accuracy the structure of the pancreas and of the organs of generation in both sexes, had he not been cut off at the early age of thirty-two. Lastly, Wepfer, though more devoted to morbid anatomy, made, neverthe- less, some just observations on the anatomical disposition of the cerebral vessels, the glandular structure of the liver, and the termination of the common duct in the duodenum.

The appearance of Frederic Ruysch, who was born in 1638, and became professor of anatomy at Amsterdam in 1665, gave a new impulse to anatomical research, and tended not only to give the science greater precision, but to extend its limits in every direction. The talents of Ruysch are said to have been developed by accident. To repel the audacious and calumnious aspersions with which De Bils attacked De le Boe and Van Horne, Ruysch published his tract on the valves of the lymphatics, which completely established his character as an anatomist of originality and research. This, however, is the smallest of his services to the science. The art of injecting, which had been originally attempted by Eustachi and Varoli, and was afterwards rudely practised by Glisson, Bellini, and Willis, was at length carried to greater perfection by De Graaf and Swammerdam, the former of whom injected the spermatic vessels with mercury and variously – coloured liquors; while the latter, by employing melted wax with other ingredients, made the first approach to the refinements of modern anatomy. By improving this idea of using substances which, though solid, may be rendered fluid at the period of injecting, Ruysch carried this art to the highest perfection.

By the application of this happy contrivance he was enabled to demonstrate the arrangement of minute vessels in the interior of organs which had escaped the scrutiny of previous anatomists. Scarcely a part of the human body eluded the penetration of his syringe; and his discoveries were proportionally great. His account of the valves of the lymphatics, of the vessels of the lungs, and

their minute structure; his researches on the vascular structure of the skin, of the bones, and their epiphyses, and their mode of growth and union; his observations on the spleen, the glans penis, the clitoris, and the womb impregnated and unimpregnated, were but a limited part of his anatomical labours. He studied the minute structure of the brain; he demonstrated the organisation of the choroid plexus ; he described the state of the hair when affected with Polish plait ; he proved the

vascular structure of the teeth ; he injected the dura mater, the pleura, the pericardium, and peritoneum; he unfolded the minute structure of the conglomerate glands; he investigated that of the synovial apparatus placed in the interior of the joints ; and he discovered several curious particulars relating to the lacteals, the lymphatics, and the lymphatic glands.

Meanwhile, Meibomius rediscovered the palpebral glands, 1670,

which were known to Casserius; Swammerdam studied the action of the lungs, described the structure of the human uterus, and made numerous valuable observations on the cceca and pancreatoid organs of fishes; and Kerck- ringius laid the foundation of a knowledge of the process of ossification. experiments on the pancreas, discovered the glands of the

duodenum named after him, and Conrad Peyer described 1677-81,

the solitary and agminated glands of the intestinal canal.

Leonard Tassin, distinguished for original observation, 1678,

rendered the anatomical history of the brain more accurate than heretofore, and gave particular accounts of the intes- tinal tube, the pancreatic duct, and the hepatic ligaments.

That France might not be without participation in the glory of advancing the progress of anatomical knowledge, the names of Duverney and Vieussens are commemorated with distinction. duced into public life in 1676 in the Royal Academy of Sciences, decorated with the honorary title of professor of anatomy to the Dauphin, and appointed in 1679 professor at the Jardin Royal, distinguished himself by the first accurate account of the organ of hearing, and by his dissections of several animals at the academy, supplied valuable materials for the anatomical details of the natural history of animals published by that learned body. He appears to have been the first who demonstrated the fact that the cerebral sinuses open into the jugular veins, and to have been aware that the former receive the veins of the

brain, and are the venous receptacles of the organ. He understood the cerebral cavities and their mode of communication ; distinguishes the posterior pillars of the vault from the pedes hippocampi; recognises the two plates of the septum lucidum; and, what is still more remarkable, he first indicates distinctly the decussation of the anterior pyramids of the medulla oblongata—a fact afterwards verified by the researches of Mistichelli, Petit, and Santorini. He studied the ganglions attentively, and gives the first distinct account of the formation, connections, and distribution of the intercostal nerve. It is interesting to remark that his statement that the veins or sinuses of the spinal chord terminate in the vena azygos was verified by the more recent researches of Dupuytren and Breschet, which show that the vertebral veins communicate by means of the intercostal and superior lumbar veins with the azygos and demi-azygos. His account of the structure of bones, and of the progress of ossification, is valuable. He recognised the vascular structure of the spleen, and described the excretory ducts of the prostate gland, the verumontanum, and the anteprostates.

One of the circumstances which at this time tended considerably to the improvement of anatomical science was the attention with which Comparative Anatomy was beginning to be cultivated. In ancient times, and at the revival of letters the dissection of the lower animals

John Conrad Brunner, in the course of 1687,

Duverney, born in 1648, and first intro- Duverney

HISTORY. |

was substituted for that of the human body; and the descriptions of the organs of the latter were too often derived from the former. The obloquy and contempt in which this abuse involved the study of animal anatomy caused it to be neglected, or pursued with indifference, for more than two centuries, during which anatomists confined their descriptions, at least very much, to the parts ofthe human body. At this period, however, the prejudice against Comparative Anatomy began to subside; and animal dissection, though not substituted for that of the

human body, was employed, as it ought always to have been, to illustrate obscurities, to determine doubts, and to explain difficulties, and, in short, to enlarge and rectify the knowledge of the structure of animal bodies generally.

For this revolution in its favour, Comparative Anatomy was in a great measure indebted to the learned societies which were established about this time in the different countries of Europe. Among these, the Royal Society of London, embodied by charter by Charles II. in 1663, and the Academy of Sciences of Paris, founded in 1665 by Colbert, are undoubtedly entitled to the first rank. Though later in establishment, the latter institution was distinguished by making the first great efforts in favour of Comparative Anatomy ; and Perrault, Pecquet, Duverney, and Mery, by the dissections of rare animals obtained from the royal menagerie, speedily supplied valuable materials for the anatomical naturalist. In England, Nehemiah Grew, Edward Tyson, and Samuel Collins cultivated the same department with diligence and success. Grew has left an interesting account of the anatomical peculiarities of the intestinal canal in various animals; Tyson in the dissection of a porpoise, an opossum, and an ourang outang, adduces some valuable illustrations of the comparative differences between the structure of the human body and that of the lower animals; Collins has the merit of con- ceiving, and executing on an enlarged plan, a comprehensive 'system, embodying all the information then extant. With the aid of Tyson and his own researches, which were both extensive and accurate, he composed a system of anato- mical knowledge in which he not only gives ample and accurate descriptions of the structure of the human body, and the various morbid changes to which the organs are liable, but illustrates the whole by accurate and interesting sketches of the peculiarities of the lower animals. The matter of this work is so excellent that it can only be ascribed to ignorance that it has received so little attention. Though regarded as a compilation, and though indeed much of the human anatomy is derived from Vesalius, it has the advantage of the works published on the Continent at that time, that it embodies most of the valuable facts derived from Malpighi, Willis, and Vieussens. The Com- parative Anatomy is almost all original, the result of personal researéh and dissection; and the

pathological observations, though occasionally tinged with the spirit of the times, show the author to have been endowed with the powers of observation and judicious reflection in no ordinary degree.

About this time also we recognise the first attempts to study the minute constitution of the tissues, by the combination of the microscope and the effects of chemical agents. Bone furnished the first instance in which this method was put in use; and though Gagliardi, who undertook the inquiry, had fallen into some mistakes which it required the observation of Malpighi to rectify, this did not deter Clopton Havers and Nesbitt, in England, and Courtial, Du Hamel, and Delasone, and afterwards Heris- sant, in France, from resuming the same train of investi- gation. The mistakes into which these anatomists fell belong to the imperfect method of inquiry. The facts Which they ascertained have been verified by recent experi-

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glands,

ment, and constitute no unessential part of our knowledge of the structure of bone.

Ten years after the publication of the work of Collins, 1695, Henry Ridley, another English anatomist, distinguished himself by a monograph on the brain, which, though not free from errors, contains, nevertheless, some valuable observa- tions. Ridley is the first who distinguishes by name the restiform processes, or the posterior pyramidal eminences. He recognised the figure of the four eminences in the human subject ; he remarked the mammillary bodies ; and he discovered the sinus which passes under his name.

Raymond Vieussens, by the publication of his great work Vieussens, on neurography in 1684, threw new light on the configura- tion and structure of the brain, the spinal chord, and the nerves ; and gave a description of the arrangement and distribution of the latter more

precise than heretofore. Of the formation and connections of the sympathetic nerve especially he gave views which have been generally adopted by subsequent anatomists. His new arrangement of the vessels, published in 1705, contains several curious opinions His observations on the structure of the heart, published

in 1706, and enlarged in 1715, exhibit the first correct views

of the intimate structure of an organ which afterwards was

most fully developed by the labours of Lancisi and Senac.

To the same period belong the rival publications of 1685-97, Godfrey Bidloo and William Cowper, the latter of whom, however, stained a reputation otherwise good by publishing as his own the engravings of the former. Cowper further distinguished himself by a minute account of the urethral already known to Columbus and Mery; a good description of the intestinal glands, discovered by Brunner and Peyer ; and by demonstrating the communication of the arteries and veins of the mesentery.

The anatomical genius of Italy, which had slumbered since the death of Malpighi, was destined once more to revive in Lancisi, Valsalva, and his illustrious pupils Santoriniand Morgagni. Valsalva especially distinguished himself by his description of the structure of the ear, which, in possessing still greater precision and minuteness than that of Duverney, is valuable in setting the example of rendering anatomy altogether a science of description. Santorini, who was professor at Venice, was no unworthy Santorini, friend of Valsalva and Morgagni. His anatomical observa- tions, which relate to the muscles of the face, the brain, and several of the nerves, the ducts of the lacrymal gland, the nose and its cavities, the larynx, the viscera of the chest and belly, and the organs of generation in the two sexes, furnish beautiful models of essays, distinguished for perspicuity, precision, and novelty, above anything which had then appeared. These observations, indeed, which bear the impress of accurate observation and clear con- ception, may be safely compared with any anatomical writings which have appeared since. Those on the brain are particularly interesting. Morgagni, though chiefly Morgagni known as a pathological anatomist, did not neglect the healthy structure. His Adversaria, which appeared between 1706 and 1719, and his Epistles, published in 1728, contain a series of observations to rectify the mistakes of previous anatomists, and to determine the characters of the healthy structure of many parts of the human body. Many parts he describes anew, and indicates facts not previously observed. All his remarks show how well he knew what true anatomical description ought to be. In this respect, indeed, the three

anatomists now mentioned may be said to have anticipated their contemporaries nearly a century ; for, while other authors were satisfied with giving loose and inaccurate or meagre notices of parts, with much fanciful supposition, Valsalva, Santorini, and Morgagni laboured to determine with precision the ana- tomical characters of the parts which they describe.

Winslow.

Albinus.

Haller.

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The same character is due to Winslow, a native of Denmark, but, as pupil and successor of Duverney, as well as a convert to Catholicism, naturalised in France, and finally professor of anatomy at the Royal Gardens. His exposition of the structure of the human body is distinguished for being not only the first treatise of de- scriptive anatomy, divested of physiological details and hypothetical explanations foreign to the subject, but for being a close description derived from actual objects, without reference to the writings of previous anatomists. About the same time Cheselden in London, the first

_ Monro in Edinburgh, and Albinus in Leyden, contributed

by their several treatises to render anatomy still more precise as a descriptive science. The Osteographia of the first-mentioned was of much use in directing attention to the study of the skeleton and the morbid changes to which it is liable. This work, however, magnificeut as it was, was excelled by that of Albinus, who, in 1747, published engravings descriptive of the bones and muscles, which perhaps will never be surpassed either in accuracy of outline or beauty of execution. The several labours of this author, indeed, constitute an important era in the history of the science. He was the first who classified and exhibited the muscles in a proper arrangement, and

applied to them a nomenclature which is still retained by the consent of the best anatomists. He gives a luminous account of the arteries and veins of the intestines, represents with singular fidelity and beauty the bones of the foetus, inquires into the structure of the skin and the cause of its colour in different races ; represents the changes incident to the womb in different periods of pregnancy, and de- scribes the relations of the thoracic duct and the vena azygos with the contiguous parts. Besides these large and magnificent works, illustrated by the most beautiful en- gravings, six books of Academical Annotations were the fruits of his long and assiduous cultivation of anatomy. These contain valuable remarks on the sound structure and morbid deviations of numerous parts of the human body.

Albinus found a worthy successor in his pupil Albert Von Haller, who, with a mind imbued with every depart- ment of literature and science, directed his chief attention, nevertheless, to the cultivation of anatomical and physio- logical knowledge. Having undertaken at an early age (twenty-one) to illustrate, with commentaries, the physio- logical prelections of his preceptor Boerhaave, he devotcd himself assiduously to the perusal of every work which could tend to facilitate his purpose; and as he found numerous erroneous or imperfect statements, and many deficiencies to supply, he undertook an extensive course of dissection of human and animal bodies to obtain the. requisite information. During the seventeen years he was professor at Gottingen, he dissected 400 bodies, and inspected their organs with the utmost care. The result of these assiduous labours appeared at intervals in the form of dissertations by himself, or under the name of some one of his pupils, finally published in a collected shape, between 1746 and 1751 (Disputationes Anatomice Selectiores), and in eight numbers of most accurate and beautiful engravings, represeuting the most important parts of the human body, ¢.g., the diaphragm, the uterus, ovaries, and vagina, the arteries of the different regions and organs, with learned and critical explanatory observa- tions. He verified the observations that in the foetus the testicles lie in the abdomen, and showed that their descent into the scrotum may be complicated with the formation of congenital hernia. Some years after, when he had retired from his academical duties at Gdéttingen, he

published, between 1757 and 1765, the large and elaborate work which, with singular modesty, he styled Elements

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of Physiology. This work, though professedly devoted to physiology, rendered, nevertheless, the most essential services to anatomy. Haller, drawing an accurate line of distinction between the two, gave the most clear, precise, and complete descriptions of the situation, position, figure, componcnt parts, and minute structure of the different organs and their appendages. The results of previous and coeval inquiry, obtained by extensive reading, he sedulously verificd by personal observation; and though he never rejected facts stated on credible authorities, he in all cases laboured to ascertain their real value by experiment. The anatomical descriptions are on this account not only the most valuable part of his work, but the most valuable that had then or for a long time after appeared. It is painful, nevertheless, to think that the very form in which this work is composed, with copious and scrupulous reference to authorities, made it be regarded as a compilation only ; and that the author was compelled to show, by a list of his personal researches, that the most learned work ever given to the physiologist was also the most abundant in original information.

With the researches of Haller it is proper to notice those of his contemporaries, John Frederick Meckel, J. N. Lieberkiihn, and his pupil John Godfrey Zinn. The

first, who was professor of anatomy at Berlin, described 1748-51.

the Casserian ganglion, the first pair of nerves and its distribution, and that of the facial nerves generally, and discovered the spheno-palatine ganglion. He made some original and judicious observations on the tissue of the

skin and the mucous net ; and above all, he recognised the 1753-57

connection of the lymphatic vessels with the veins,—a doctrine which, after long neglect, was revived by Fohmann and Lippi. He also collected several valuable observa- tions on the morbid states of the heart and brain. Lie- berkiihn published in 1745 a dissertation on the villi and glands of the small intestines. Zinn, who was professor of medicine at Géttingen, published a classical

treatise on the eye, which demonstrated at once the defects 1755.

of previous inquiries, and how inuch it was possible to elucidate, by accurate research and precise description, the structure of one of the most important organs of the human frame. About the same time Weitbrecht gave a copious and minute account of the ligaments, and M. Lieutaud, who had already laboured to rectify many errors in anatomy, de- scribed with care the structure and relations of the heart and its cavities, and rendered the anatomy of the bladder very precise, by describing the triangular space and the mammillary eminence at its neck.

The study of the minute anatomy of the tissues, which had originally been commenced by Leeuwenhoeck, Malpighi, and Ruysch, began at this period to attract more general attention. general distribution of cellular membrane, and showed that it not only incloses every part of the animal frame, but forms the basis of every organ,—a doctrine which was adopted,

and still more fully expanded, by his friend Haller, in 1757.

opposition to what was asserted by Albinus, who maintains that each part has a proper tissue. same time gave a clear and ingenious statement of the difference between cellular membrane and adipose tissue, in which he maintained the general distribution of the former, and represented it as forming the serous membranes,

and regulating their physiological and pathological pro- 1757.

perties,—doctrines which were afterwards confirmed by his brother John Hunter. A few years after, the department of general anatomy first

assumed a substantial form in the systematic view of the membranes and their mutual con-

nections traced by Andrew Bonn of Amsterdam, In his A. Bont.

inaugural dissertation De Continuationibus Membranarum,

It was republished after his death by Wrisberg. 1780.

De Bergen had already demonstrated the 1782.

William Hunter at the W. Hunter

1763.

1767.

1718-26.

Camper,

1760,

HISTORY. | published at Leyden in 1763, this author, after some preliminary observations on membranes in general and

their structure, and an exposition of that of the skin, traces iss transition into the mucous membranes and their several divisions. He then explains the distribution of the cellular membrane, the aponeurotic expansions, and the perios- teum and perichondrium, by either of which, he shows, every bone of the skeleton is invested and connected. He finally gives a very distinct view of the arrangement of the internal membranes of cavities, those named serous and fibro-serous, and the manner of their distribution over the contained organs. This essay, which is a happy example of generalisation, is remarkable for the interesting general views of the structure of the animal body which it exhibits : and to Bonn belongs the merit of sketching the first outlines of that system which it was reserved for the genius of Bichat to complete and embellish. Lastly, Bordeu, in an elaborate essay on the

mucous tissue, or cellular organ, as he terms it, brought forward some interesting views of the constitution, nature, and extent of the cellular membrane.

Though anatomy was hitherto cultivated with much success as illustrating the natural history and morbid states of the human body, yet little had been done for the elucida- tion of local diseases, and the surgical means by which they may be successfully treated. The idea of applying anatomical knowledge directly to this purpose appears to have originated with Bernardin Genga, a Roman surgeon, who published in 1672, at Rome, a work entitled Surgical Anatomy, or the Anatomical Listory of the Bones and Muscles of the Human Body, with the Description of the Blood-vessels. This work, which reached a second edition in 1687, is highly creditable to the author, who appears to have studied intimately the mutual relations of different parts. It is not improbable that the example of Genga led Palfyn, a surgeon at Ghent, to undertake a similar task about thirty years after. For this, however, he was by no means well qualified; and the work of Palfyn, though bearing the name of Surgical Anatomy, is a miserable compilation, meagre in details, inaccurate in description, and altogether unworthy of the honour of being republished, as it afterwards was by Antony Petit.

While these two authors, however, were usefully employed in showing what was wanted for the surgeon, others were occupied in the collection of new and more accurate facts. Albinus, indeed, ever assiduous, had, in his account of the operations of Rau, given some good sketches of the relative anatomy of the bladder and urethra; and Cheselden had already, in his mode of cutting into the urinary bladder, shown the necessity of an exact knowledge of the relations of contiguous parts. The first decided application, however, of this species of anatomical research it was reserved for a Dutch anatomist of the 18th century to make. Peter Camper, professor of anatomy at Amsterdam, published in 1760 and 1762 his anatomico-pathological demonstrations of the parts of the human arm and pelvis, of the diseases incident to them, and the mode of relieving them by operation, and explained with great clearness the situation of the blood-vessels,

nerves, and important muscles. His remarks on the lateral operation of lithotomy, which contain all that was then known on the subject, are exceed- ingly interesting and valuable to the surgeon. It appears, further, that he was the first who examined anatomically the mechanism of ruptures, his delineations of which were published in 1801 by Sommering. Camper also wrote some important memoirs on Comparative Anatomy, and he was the author of a well-known work on the Felations of Anatomy to the Fine Arts.

The attention of anatomists was now directed to the elucidation of the most obscure and least explored parts

of the human frame—the lymphatic vessels and the nerves. Although, since the first discovery of the former by Asellius, Rudbeck, and Peequet, much had been done, especially by Ruysch, Nuck, Meckel, and Haller, many points, notwithstanding, relating to their origin and distrj- bution in particular organs, and in the several classes of animals, were imperfectly ascertained or entirely unknown, William Hunter investigated their arrangement, and pro- w. and J, posed the doctrine that they are absorbents ; and John Hunter. Hunter, who undertook to demonstrate the truth of this 1746-51. hypothesis by experiment, discovered, in 1758, lymphatics in the neck in birds. As the doctrine required the existence – of this order of vessels, not only in quadrupeds and birds, but in reptiles and fishes, the inquiry attracted attention among the pupils of Hunter; and William Hewson at Hewson, length communicated, in December 1768, to the Royal Society of London, an account of the lacteals and lymphatics in birds, fishes, and reptiles, as he had discovered and demonstrated them. The subject was about the same time investigated by the second Monro, who indeed claimed the merit of discovering these vessels in the classes of animals now mentioned. But whatever researches this anatomist may have instituted, Hewson, by communicating his observations to the Royal Society, must be allowed to possess the strongest as well as the clearest claim to discovery. The same author, in 1774, gave the first complete

account of the anatomical peculiarities of the lymphatic system in man and other animals, and thereby supplied an important gap in this department. Hewson is the first who distinguishes the lymphatics into two orders—the superficial and the deep—both in the extremi- ties and in the internal organs. He also studied the structure of the intestinal villi, in which he verified the observations of Lieberkiihn; and he made many important observations on the corpuscles of the lymph and blood. He finally applied his anatomical discoveries to explain many of the physiological and pathological phenomena of the animal body. Ten years after, John Sheldon, another pupil of Hunter, gave a second history and description of the lymphatics, which, though divested of the charm of novelty, contains many interesting anatomical facts. He also examined the structure of the villi.

Lastly, Cruikshank, in 1786, published a valuable Cruik- history of the anatomy of the lymphatic system, in which shank. he maintains the accuracy of the Hunterian doctrine, that gia the lymphatics are the only absorbents; gave a more minute account than heretofore of these vessels, of their coats and valves; and explained the structure of the lymphatic glands. He also injected the villi, and examined them microscopically, verifying most of the observations of Lieberkiihn. The origin of the lymphatics he maintains rather by inference than direct demonstration. To these three works, though in other respects very excellent, it is a considerable objection that the anatomical descriptions are much mixed with hypothetical speculation and reason- ings on properties, and that the facts are by no means always distinguished from mere matters of opinion, At the same time Haase published an account of the lymphatics of the skin and intestines, and the plexiform nets of the pelvis.

To complete this sketch of the history of the anatomy of the lymphatic system, it may be added that Mascagni, who had been engaged from the year 1777 to 1781 in the same train of investigation, first demonstrated to his pupils several curious facts relating to the anatomy of the lymphatic system. When at Florence in 1782 he made several preparations, at the request of Peter Leopold, Grand Duke of Tuscany; and when the Royal Academy of Sciences at Paris announced

the anatomy of this system for their prize essay appointed for March 1784, Mascagni resolved on communicating to the public the results of

Mascagni,

1783 1794

1780.

19th cen- tury.

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his researches—the first part of his commentary, with four engravings. Anxiety, however, to complete his prepara- tions detained him at Florence till the close of 1785 ; and from these causes his work did not appear till 1787. These delays, however, unfavourable as they were to his claims of priority to Sheldon and Cruikshank, were on the whole advantageous to the perfection of his work, which is not only the most magnificent, but also the most complete that ever was published on the lymphatics. In his account of the vessels and their valves he confirms some of Hewson's observations, and rectifies others. Their origin he proves by inference much in the same manner as Cruikshank; but he anticipates this author in the account of the glands, and he gives the most minute description of the superficial and deep lymphatics, both in the members and in the internal organs.

General accounts of the nerves had been given with various degrees of accuracy by Willis, Vieussens, Winslow, and the first Monro; aud the subject had been much rectified and improved by the indefatigable Haller. The first example of minute descriptive neurography was given in 1748 by John Frederick Meckel, whose account of the fifth pair, and of the nerves of the face, will long remain a lasting proof of accuracy and research. The same subject was investigated in 1765 by Hirsch, and in 1777 by Wrisberg. In 1766 Metzger examined the origin, distribution, and termination of the first pair, —a point which was afterwards very minutely treated by Scarpa in his anatomical disquisitions, published in 1780 ; and the internal nerves of the

nostrils were examined in 1791 by Haase. The optic nerve, which had been 'studied originally by Varoli, and afterwards by Mery, Duverney, Henkel, Moeller, Hein, and Kaldschmid, was examined with extreme accuracy, with the other nerves of the organ of vision, by Zinn, in his elaborate treatise. The phrenic nerves and the cesophageal branches of the eighth pair were studied by Haase; the phrenic, the abdominal, and the pharyngeal nerves, by Wrisberg ; those of the heart most minutely by Andersch; and the origins, formation, and distribution of the intercostal nerve, by Iwanoff, Ludwig, and Girardi. The labours of these anatomists, however, were eclipsed by the splendid works of Walter on the nerves of the chest and belly ; and those of Scarpa on the distribution of the 8th pair, and splanchnic nerves in general. In minuteness of description and in beauty of engraving these works have not yet been equalled, and will never perhaps be surpassed. About the same time, Scarpa, so distinguished in every branch of anatomical research, investigated the minute structure of the ganglions and plexuses. The anatomy of the brain itself was also studied with great attention by the second Monro, Malacarne, and Vicq d'Azyr.

Lastly, the anatomy of the gravid uterus, which had been originally studied by Albinus, Roederer, and Smellie, was again illustrated most completely by William Hunter, whose engravings will remain a lasting memorial of scientific zeal and artistic talent.

The perfection which anatomical science attained in the last ten years of the eighteenth and during the pre- sent century is evinced not only in the improved character of the systems published by anatomists, but in the enor- mous advance which has taken place in the knowledge of the minute structure of the animal tissues, of the de- velopment of the tissues and organs, and of the modifica- tions' in form and structure exhibited by various groups of animals.

The first who gave a good modern system was Sabatier ; but his work was speedily eclipsed by the superior merits of the treatises of Sémmering, Bichat, and Portal. The excellent work by Samuel Thomas Sémmering, originally

published in the German language, between the years Simmer. 1791 and 1796; then in the Latin language, between the i™g-

years 1794 and 1800; and in a second edition in the German language in 1800 and 1801, maintaining the high character which it first possessed for clear arrangement, accurate description, and general precision, was, between the years 1841 and 1844, republished in eight volumes at Leipsic by Bischoff, Henle, Huschke, Theile, Valentin, Vogel, and Wagner, with suitable additions, and a large amount of new and accurate information. In this edition Rudolph Wagner gives, in the first division of the first volume, the life, correspondence, and literary writings of Sonmering; and in the second volume the anatomy of the bones and ligaments. The third volume contains the anatomy of the muscles and the vascular system by Theile. Valentin devotes one volume, the fourth, to the minute anatomy of the nervous system and its parts, as disclosed by careful examination by the microscope; and it must be allowed that the author has been at great pains to present just views of the true anatomy of the brain, the spinal cord, the nervous branches, and the ganglia. In the fifth volume, Huschke of Jena gives the anatomical history of the viscera and the organs of the senses, a department which had been left in some degree incomplete in the original, but for one division of which the author had left useful materials in his large figures already mentioned. In the sixth volume, an entire and complete system of general anatomy, deduced from personal obser- vation and that of other careful observers, the materials being in general new, and in all instances confirmed and rectified, is given by Prof. Henle. The seventh volume con- tains the history of the process of development in mammalia and man, by Th. L. W. Bischoff. The eighth volume treats of the pathological anatomy of the human body, by Julius Vogel, but contains only the first division, relating to the generalities of the subject. This, which is probably the most accurate as it is the most elaborate system of anatomical knowledge up to the date of its publication in 1844, was translated into the French language by Jourdan, and published in 1846 under the

name of Hncyclopédie Anatomique. The eighth volume was translated into English in the year 1847.

The Anatomie Générale of Bichat is a monument of his Bickat,

philosophical genius which will last as long as the structure and functions of the human body are objects of interest. His Anatomie Descriptive is distinguished by clear and natural arrangement, precise and accurate description, and the general ingenuity with which the subject is treated. The physiological observations are in general correct, often novel, and always highly interesting. It is unfortunate, however, that the ingenious author was cut off prematurely during the preparation of the third volume. The later volumes are, however, pervaded with the general spirit by which the others are impressed, and are highly creditable to the learning, the judgment, and the diligence of MM. Roux and Buisson. and correct digest of anatomical and pathological know- ledge, which, in exact literary information, is worthy 0 the author of the Histoire de ? Anatomie et de la Chirurgre, and, in accuracy of descriptive details, shows that M. Portal trusts not to the labours of his predecessors only. Boyer published in 1803 a complete treatise on Descriptive Anatomy. Cloquet formed, on the model of the Anatomie Descriptive of Bichat, a system in which he avails himself of the literature and precision of Sémmering and the details of Portal. An English translation of this work was prepared by Dr Knox. Cruveilhier published in 1834-35 a good general treatise on Descriptive Anatomy, which was translated into English, and published as a part of The Library of Medicine. Cruveilhier's treatise

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has passed through several editions. About the same time Blandin published an elementary work on Descriptive Anatomy, and a useful

treatise on Topographical Anatomy. But the most elaborate system of human anatomy which has proceeded from the French school is the great treatise of Bourgery, illustrated by numerous large and beautifully- coloured plates of the parts and organs. two divisions, one on Medical and Physiological Anatomy ; the other on Surgical Anatomy.

J. F. Meckel published between 1815 and 1820 a manual of Descriptive Anatomy which combines the philosophical generalisations of Bichat with the precise description and pathological knowledge of Portal. During the succeeding thirty years excellent systematic treatises in the German language were prepared by Rosenmiiller, C. F. P. Krause, Frederick Hildebrand (the 4th edition of which was edited in 1830 by the eminent anatomist E. H. Weber), and Fred. Arnold. In 1846 Joseph Hyrtl published a system of Human Anatomy, and in the following year a manual of Topographical and Surgical Anatomy, both of which, but more especially the latter, have gone through several editions.. Luschka, the professor of anatomy in Tubingen, has prepared a valuable treatise on Regional Anatomy, in which attention is particularly directed to the relations of the parts which are of interest to the physician and surgeon. The text-book by Hermann Meyer of Zurich is also worthy of mention as a work in which the mechanical construction and uses of parts are described with great care. Henle's treatise on Human Anatomy, the publication of which was commenced in 1855, though the last volume was not completed until 1873, is, however, the most complete work on the subject which has as yet issued from the German press during the latter half 'of the present century. It is remarkable not only for the elaborate description of the organs and tissues of the body, and the ample references to the labours of other observers, but for the number and beauty of the wood engravings.

In Great Britain systematic treatises on Human Anatomy were published in the earlier part of the present century by Andrew Fyfe, John Bell, the third Monro, and John Gordon, all of whom were teachers in the Edinburgh school. In London, Jones Quain prepared an excellent text-book, which, under a succession of editors, who have

kept each new edition on a level with the advancing tide of anatomical knowledge, has been much esteemed not only for the clearness of its descriptions, but for the soundness of its information on the various branches of human Systematic Anatomy. The 7th edition, under the editorial superin- tendence of Professors Sharpey, Allen Thomson, and Cleland, appeared between 1864 and 1867. The passing of the Anatomy Act in 1832, by affording facilities for the pursuit of practical anatomy, gave a great stimulus to its study in this country, and to facilitate the acquisition of a knowledge of the subject many text-books have been published. The most important are Harrison's Dublin Dissector,and the well-known Demonstrations of Anatomy by Prof. Ellis. The increased importance attached bysurgeonsto a precise acquaintance with the knowledge of those regions in which operations have most frequently to be performed, has led to the production of valuable special works on their anatomy. The treatise of Allen Burns on the head and neck, those of Sir Astley Cooper and Sir W. Lawrence on hernia, Morton's Anatomy of the Surgical Regions, the excellent plates on Surgical Anatomy by Joseph Maclise, and the beautiful drawings by Ford from the dissections of Prof. Ellis, with descriptive letterpress, are highly creditable to British anatomists ; whilst the treatise on hernia by Scarpa, and Cloquet's and Hesselbach's works on the same subject, reflect credit on the Italian, French, and German schools.

But special treatises have also been written on other

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departments of human descriptive anatomy. Innes, Sandi- Special fort, and Barclay published works on the muscles generally ; treatises. and Sir Charles Bell, in his classical treatise on the Ana- tomy of Expression, described with care the attachments and action of the muscles of the face. Of late years the variations in the usually described arrangements in the muscular system in man have been

carefully inquired into, and numerous memoirs have been written, more especially by M'Whinnie, Hallett, W. Gruber, John Wood, W. Turner, and M'Alister. F. O. Ward published a work on Human Osteology which is characterised by the minuteness and accuracy of its description; G. M. Humphry, a treatise in which the physical, physiological, and pathological aspects of the skeleton are dwelt upon; and Luther Holden, a pro- fusely-illustrated work on the same subject, in which the surfaces for muscular attachments are carefully delineated. Sir Charles Bell's engravings of the arteries, Tiedemann's more elaborate plates, and Harrison's admirable description of these vessels, all deserve notice. But the most complete work on the Anatomy of the Arteries which has yet appeared is that by Richard Quain, which consists of eighty-seven large plates, with 543 pages of descriptive letterpress. It will long continue a standard work on the subject. Numerous treatises on the anatomy of the nervous system have been published. In Germany the brothers Wenzel, Reil, Tiedemann, Gall and Spurzheim, Arnold, and Reichert have prepared works on the descriptive anatomy of the great nerve centres, not only in man but in various animals; and by Tiedemann, Reichert, and Kcker, the development of the brain has been especially studied. In Italy the memoirs of Rolando on the anatomy of the brain, and of Bellingeri on the spinal cord and its nerves, are of importance. From the French school the writings of Serres, of Foville, of Leuret and Gratiolet, have thrown much new light on the structure of the brain. Jn Great Britain, Sir Charles Bell, in his great work on the nervous system, developed and established the truth of the separate nature of the nerves of sensation and motion. In 1836, and again in 1847, Samuel Solly published an instructive treatise on the anatomy of the brain. Between 1830 and 1834 Joseph Swan published a valuable series of engravings in illustration of the distribution of the nerves, and Robert Lee has especially investigated the arrangement and distribution of the nerves of the heart and uterus. Inthe Cyclopedia of Anatomy and Physiology, under the editorial superintendence of Dr Robert B. Todd, original memoirs, not only on human but comparative anatomy, by eminent writers, have appeared, and have done much to diffuse a knowledge of anatomical science. The improvement which has been effected in the con- Improve- struction of the compound microscope during. the fifty

ments in years subsequent to 1822, has contributed in no small oe degree to enable anatomists to obtain more correct infor- °°P mation on the intimate structure of different organs and tissues of the animal body. For the first twenty years of the nineteenth century, opticians and instrument-makers had at intervals endeavoured to render the compound microscope at once an instrument of greater power and more free from sources of error and optical illusion than it had hitherto been possible to obtain it. Two defects, how- ever, still adhered to the compound microscope. The instru- ment was not achromatic ; anda considerable degree of spheri- cal aberration uncorrected rendered the image indistinct. Between 1812 and 1815 Professor Amici of Modena had attempted to construct an achromatic object-glass of one single lens, but found that this was impracticable. M. Selligues of Paris, in 1823, after various trials, found that this could be done by making the object-glass consist of four achromatic compound lenses, each of which was composed of two single lenses, This pit hed was carried »*

into practice and improved by the two MM. Chevalier of Paris. About the same time Dr Goring in London, with the aid of Mr Tulley and Mr Pritchard, constructed com- pound microscopes upon a similar principle.

By the labours of these practical opticians, and the suggestions of various scientific persons, as Sir John Herschel, Sir Richard Airy, Mr Barlow, one great defect of the compound microscope was obviated. The effects of spherical aberration werc in the next place overcome in a very simple manner by the experiments of Mr Joseph Jackson Lister, who had early observed that the combined achromatic object-glasses devised by Selligues were fixed in their cells with the convex side foremost, a most improper position, as it renders the spherical errors very great. This gentleman found, after various trials, that by placing three or more achromatic glasses with their plane surfaces directed

foremost, it was possible to correct completely all spherical aberration.

This fact was made known in the beginning of the year 1830 ; and by its application the compound microscope was brought to a high degree of perfection as an achromatic instrument in 1831 and 1832, and became the means of affording valuable assistance in anatomical inquiries. The use of the microscope in anatomy, which had in the times of Malpighi, Leeuwenhoeck, William Cowper, Baker, Fontana, Hewson, and the second Monro, been much cultivated, but had afterwards, from the imperfection of the instrument and the illusions to which it not unfre- quently gave rise, been neglected, now became so general and so necessary, that since the ycar 1832 minute struc- tural anatomy has been, if not created anew, at least most thoroughly revised. The amount of knowledge has been enormously increased ; that which was already pos- sessed has been rendered greatly more accurate and precise.

It is impossible in this place to. name the authors of all the valuable monographs which have appeared during the past forty years, but those who have especially advanced the progress of our knowledge of the minute structure of the tissues and organs may be referred to. Johannes Miiller in 1830 published an elaborate commentary on the minute structure of the glands, the first work in which the anatomy of these organs was examined and elucidated in a comprehensive and systematic manner. Ehrenberg explained the structure of numerous infusoria, and disclosed the peculiarities of many other structures, animal, vegetable, and mineral, which had previously eluded the most skilful researches. Francis Kiernan, in 1833, gave the first correct account of the minute anatomy of the liver. Schleiden in 1838, and Schwann in 1839, published most important generalisations on the cellular structure of vegetable and animal organisms. Martin Barry communi- cated new facts on the structure of the ovum and on the structure of cells generally. John Goodsir laid great emphasis on the office of the nucleus in the nutrition, growth, and reproduction of cells, and on the arrangement of the cells within an organism into departments or territories. Virchow, by his researches into the

connective tissues, has still further developed the idea of the cellular structure of the animal organism, and the importance of

eells in the performance of physiological and pathological:

processes. Lionel Beale attributed both to the nucleus and to the substance of the cell immediately surrounding it import- ant functional properties. Max Schultze showed the identity in nature between the sarcode substance of the lower animal organisms and the contents of the cells in the higher animals, and applied to these substances the common term proto- plasm, which had previously been introduced by Hugo von Moh] to designate a similar material in the vegetable cell. The minute structure and development of bone has been carefully investigated by J. Goodsir, W. Sharpey, H.

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Miiller, C. Gegenbaur, and A. Kélliker ; that of muscle by Bowman, Kélliker, and Sharpey; of nerve by Schwann, Remak, Stilling, Gerlach, Lockhart Clarke, and Deiters ; of cartilage by Schwann and Schultze; of the blood and blood-vesscls by Henle, Gulliver, Quekett, Pagct, and Wharton Jones ; of the mucous membranes by Bowman; of the serous membranes by Henle, Recklinghausen, Ludwig, and Klein ; of the teeth by Retzius, A. Nasmyth, J. Goodsir, J. Tomes, R. Owen, Czermak, Huxley, and Waldeyer. Thestructure of the lungs has been investigated by Addison, Rainey, and Rossignol; of the kidney by Bowman, Henle, and Schweiggerseidel ; of the liver by Beale and Hering; of the spleen by Sanders, Gray, Billroth, and W. Miiller ; of the testicle by A. Cooper, Kolliker, and Henle ; of the ovary by Pfliiger and Waldeyer ; of the thymus by A. Cooper and Simon ; of the stomach and intestines by KoOlliker, Brinton, and Frey; of the placenta by Eschricht, Reid, Sharpey, Goodsir, Van der Kolk, Virchow, Farre, Priestley, Rolleston, Ercolani, and Turner; of the organs of sense by Henle, Bowman, His, H. Miller, Schultze, Corti, Reissner, and Deiters.

The general results of the labours of these and other investigators have been from time to time incorporated into systematic treatises on microscopic anatomy, of which reference may more especially be made to those prepared by J. Berres, F. Gerber, A. Hill Hassall, A. Kolliker, W. Sharpey, W. Bowman, F. Leydig, Frey, and S. Stricker. Side by side with these inquiries into the structure and development of the tissues, the evolution of the embryo out of the fertilised ovum has been carried on. Purkinje, Von Baer, Coste, Wharton Jones, Valentin, R. Wagner, Rathke, J. Miiller, Prevost and Dumas, Martin Barry, Reichert, Bischoff, Kélliker, Vogt, Allen Thomson, Owen, Von Siebold, Dujardin, Milne-Edwards, Claparéde, Agassiz, Huxley, Kitchen Parker, and Kowalevsky have all contri- buted important memoirs on various branches of embryology.

Comparative Anatomy, which during the 18th century was diligently cultivated by Daubenton, Pallas, Haller, Buffon, John Hunter, and the second Monro, has become during the present ceutury a subject of increased interest, from its inti- mate connection with the sciences of zoology, physiology, and geology. It has consequently been studied with great zeal and assiduity, and multitudes of monographs, as well as numerous systematic treatises on the'anatomy both of the vertebrata and invertebrata, have been published.

To name even a tithe of the workers and authors who have added to our knowledge of the facts of comparative anatomy would occupy considerable space. It may sutftice to refer to those whose writings have contributed most materially to the advance of the science. In France, Cuvier, Dumeril, the Saint-Hilaires, Blanchard, De Blain-ville, H. and Alphonse Milne-Edwards, Gervais, and Gratiolet ; in Germany, Meckel, Tiedemann, Von Baer, Spix, Martius, Bojanus, Otto, Carus, J. Miiller, Leuckart, Gegenbaur, and Haeckel; in Sweden and Denmark, Retzius and Eschricht ; in Holland and Belgium, Van der Kolk, Vrolik, and Van Beneden; in America, Agassiz, Wyman, and Burmeister; in Great Britain, E. Home, A. Carlisle, R. Grant, Richard Owen, J. Barclay, R. Knox, J. Goodsir, G. Busk, Rymer Jones, W. B. Carpenter, T. H. Huxley, G. J. Allman, W. H. Flower, St George Mivart,

and J. Murie are names identified with one or more branches of the subject.

The investigations into the form and structure of animals have led anatomists to search for parts in one animal which correspond with parts in other animals in their mode of development and arrangement, and to evolve from their researches general doctrines of organic forms. 'The conception entertained by Goethe of the presence of a pre-maxillary element in the human upper

Compara- tive anatomy,

HUMAN ANATOMY. |

ment of the theory of the vertebrate nature of the skull by Goethe and Oken, directed anatomists into a line of inquiry which has been productive of fruitful results, and has exercised a great influence on the progress and direction of biological science. Geoffrey St Hilaire and C. Martins in France; Spix, Carus, Gegenbaur, and Haeckel in Germany; and Owen, Goodsir, Humphry, Huxley, Parker, and Cleland in Great Britain, have all published important memoirs in this department of anatomical research.

The formation of anatomical museums in connection with universities, and elsewhere, by enabling specimens to be accumulated for observation and comparison, has contributed in no small degree to the progress of anatomical science. Pre-eminent amongst these is the collection originally formed by the genius, energy, aud self-devotedness of John Hunter, which, under the fostering care of the council of the Royal College of Surgeons of England, has been materially augmented in all its departments by a succession of curators—Clift, Owen, Quekett, and Flower. The aid which has been afforded to anatomists in the publication of their researches, more especially in providing plates and other expensive means of illustration, by the learned societies of Europe, and the circulation which has been given to their memoirs through the 7ransactions and Proceedings of these societies, and through the Journals devoted to anatomical and

physiological science, have materially contributed to the diffusion of a knowledge of discoveries, and to the general advance of the science.

SPECIAL ANATOMY OF THE HUMAN BODY.

Man, zoologically speaking, belongs to the Mammalian class of the Verte- brate sub-kingdom, 2.¢., his young are brought forth alive, and nourished during infancy on milk secreted in mammary or milk-forming glands. In common with all vertebrate organisms, he possesses a spine or vertebral column and a skull, in which are contained the brain and the spinal marrow, and on the ventral surface of the spinal column are situated the several sub- divisions of the alimentary canal.

But man possesses certain special or distinctive anatomical characters. The most noticeable, as seen on an external inspection of his body, is his erect position. He is, indeed, the only liv- ing creature that can walk or stand erect, 2.¢., with the axis of the spine vertical ; with the hip and knee joints capable of being fully extended, so that the leg is brought into line with the thigh ; with the foot so planted on the ground that it rests on the heel behind and on the roots of the toes in front; with the upper limbs so arranged as to act, not as instruments of progression, but of prehension; and with the head so balanced on the top F Metit nee of the spine that the face and eyes head and trunk. The look directly to the front. His bones, eer oer sehen joints, and muscles are constructed ay Rit say nk sp Eo gin and arranged so as to enable him to tho back. The aliment~ Preserve the erect attitude without ™yand pecriestlle oy fatigue. In other vertebrata the axis of the spine is oblique or horizontal, the hip and knee joints are perma- nently bent at a more or less acute angle, the limbs_ cor-

tral, or atthe front. The dotted line V represents the vertieal axis of the trunk.

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jaw because it exists in other vertebrates, and the announce-

which are. employed in

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responding to the human upper extremities, are, in the form of legs, wings, or fins, Instruments of progression, and the

head is articulated with ass the spine at or near the {weet

*hinder end of the skull. Owing to the oblique or horizontal attitude of the body in the vertebrata generally, and its erect position in man, the terms F!¢. 2.—Outline diagram of a quadruped ; the axis of the spine is almost at right angles nal to the vertieal dotted line. (After Goodsir.) describing the relative position of different parts are not used in the same sense by the human and comparative anatomist. Thus, parts which are su- perior, or above other parts, in the human body, are anterior, or in front, in other vertebrata; and parts which are posterior, or behind other parts In man, are superior to them in other vertebrata. To obviate the confusion which must necessarily arise when com- paring the human body with that of other vertebrates, certain descriptive terms have been recommended which may be employed whether the position of the body be erect or non-erect, Thus, \} the aspect of parts directed towards the | region where the atlas or first vertebra ig ‘ situated is atlantal, that directed towards the sacrum is sacral, that towards the * whe ee back is dorsal, that towards the front EF tee ese is ventral or heemal. Quite recently ine, ” (After Goodsir) the term pre-axial has been introduced ag equivalent to atlantal, and post-awial to sacral. The body may be considered as divided by an imaginary plane, the mesial plane, into two lateral and similar halves, a right and left, so that it exhibits a bilateral sym- metry; and the constituent parts are described as being external or i internal to each other, according to their relative position to this plane. For descriptive purposes, also, we may subdivide the body into AxiaL =.“ ~ iN and APPENDICULAR portions. The 7 AXIAL part is the stock or stem of , Fé the body, and consists of the Head, | A the Neck, and the Trunk. The ‘.__ LN. trunk is again subdivided into the ria. 4.—Outiine diagram of a chest or Thorax, and the belly or Josition, Theatisermg cree Abdomen; and the abdomen is erg he me Mea again subdivided into*

the abdo- : men proper and the Pelvis. The axial part contains the organs essential to the preservation of life. In the head is lodged the brain, from which the spinal marrow is prolonged down the spinal canal. At the sides of the head are the ears, and opening on to the face are the eyes, nostrils, and mouth. Prolonged down the neck are the gullet and windpipe, with the latter of which is associated the organ of voice. Within the chest lie the heart, lungs, and gullet; and in the abdomen are contained the stomach, intestine, liver, spleen, pancreas, kidneys, and other organs concerned in the urinary and generative functions, The APPENDICULAR part forms the limbs, which do not contain organs essential to life. In man the limbs are called Upper and Lower—the former are instruments of prehen- sion, the latter of progression. The subdivisions of the body are not homogeneous in structure, but are built up of several systems of organs, each system being characterised

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not only by peculiarities in form, appearance, and structure, but by possessing special functions and uses. Thus the bones collectively form the Osseous system; the joints the Articulatory system; the muscles, which move the bones at the joints, the Muscular system; and these several systems collectively constitute the organs of Locomotion. The blood and lymph vessels form the Vascular system; the brain, spinal marrow, and nerves, the Nervous system, with which is intimately associated the organs of Sense; the lungs and windpipe, the Respiratory system; the alimentary canal, with the glands opening into it, the Digestive system; the kidneys, bladder, and urethra, the Urinary system; the testicles, spermatic ducts, and penis in the male, with the ovaries, uterus, and clitoris in the female, the Generative or Reproductive system; the skin, with the hair and nails, the Tegumentary system, These various systems are so arranged with reference to each other as to form an organic whole,

ANATOMY OF THE ORGANS OF LocoMuTION.

The organs of locomotion consist of the muscles or active organs, and the bones and joints or passive organs. The anatomy of the bones will first attract our attention.

OssEous SystEM—OsTEOLOGY—SKELETON.—The word Skelcton (from oxéddw, to dry) signifies literally the dry or hard parts of the body. When used in a limited sense it is applied merely to the bones, but when used in a wider and more philosophic sense it comprises not only the bones or osseous skeleton, but the cartilages and fibrous mem- branes which complete the framework of the body. The first evidence of a skeleton in the embryo is the appear- ance of membranes in many parts of which cartilage is developed, and in course of time this cartilage is converted into bone. In some animals, however, as in the cartila- ginous fish, the osseous conversion does not take place, and the skeleton remains permanently cartilaginous; and in the very remarkable fish called Lancelet, or Amphioxus, the skeleton consists almost entirely of fibrous membrane,

The skeleton serves as a basis of support for the soft parts, as affording surfaces of attachment for muscles and as a protection for many delicate organs. In the verte- brata the osseous skeleton is clothed by the muscles and skin, and is technically called an endo-skeleton. In inverte- brata the skeleton is not unfrequently on the surface of the body, and is termed an exo- or dermo-skeleton. In some vertebrates (e.g., the armadillo, tortoise, and sturgeon), in addition to the proper endo-skeleton, skeletal plates are developed in connection with the integument, so that they possess a dermo-skeleton likewise. In some vertebrates, also, a partial skeleton is formed within the substance of some of the viscera—e.g., in ruminant animals a bone is situated in the heart ; in the walrus and other carnivora, in rodents, bats, and some monkeys, a bone lies in the penis ; and in the leopard, jackal, and other carnivora, a cartilaginous style lies in the middle of the tongue. These parts form a splanchno- or visceral skeleton. By some anatomists the teeth, which are unquestionably hard parts of the body, are also referred to the splanchno-skeleton, though they are special

modifications of the papillee of the mucous membrane of the gum. In man, the teeth being excluded, there is neither exo- nor splanchno-skeleton, but only an endo-skeleton.

In each of the great subdivisions of the body an endo- skeleton exists, so that we may speak of an Axial Skeleton and an Appendicular Skeleton. The Axial Skeleton con- sists of the bones of the spine and head, the ribs, and the breastbone ; the Appendicular Skeleton, of the bones of the limbs. The number of bones in the skeleton varies at different periods of life. In the adult there are about 200,

| neck or cervical; of the chest,

but in the child they are more numerous; for in the pro- cess of consolidation of the skeleton certain bones originally distinct become fused together. In Plates XIL, Silly and XIV., front, back, and side views of the entire skeleton are given, together with figures of the skull and several of its constituent bones,

We shall commence the description of the AXIAL SKELE- TON by giving an account of the bones of the spine.

The SPINE, SPINAL or VERTEBRAL CoLumy, chine, or back- Spine,

bone, consists of a number of superimposed bones which are named Vertebre, because they can move or turn some- what on each other. It lies in the middle of the back of the neck and trunk ; has the cranium at its summit; the ribs at its sides, which in their turn support the upper limbs ; whilst the pelvis, with the lower limbs, is jointed to its lower end. The spine consists in an adult of twenty- six bones, in a young child of thirty-three, certain of the bones in the spine of the child becoming ankylosed or blended with each other in theadult. These blended bones lose their mobility, and are called false vertebra ; whilst those which retain their mobility are the true vertebre. In the

vertebrata the bones of the spine are arranged in groups, which may be named from their position -—vertebre of the

dorsal or thoracic; of the loins, lumbar ; of the pelvis, gq, 5,~~The Axial Skeleton. C,, the sacral and of the tail, coccy~~ cervical vertebra; Dye, the dorsal;

L;, the lumbar; S;, the sacral; Coc,, geal or caudal ; and the num- thé cocey geal; GG, the series of twelve ber of vertebrae in each group sree 3 akan ah te maybe expressed inaformula, sternum. The dotted line VV repre- In man the formula is as fol- sents the yertical axis of the spine. lows :—C7D2L;S;Cocy= 33 bones, as seen in the child; but the five sacral vertebre fuse together into a single bone— the sacrum— and the four coccygeal into the single coccyx. Hence the sacrum and coccyx of the adult are the false, whilst the lumbar, dorsal, and cervica] are the true vertebree.

The vertebre are irregularly-shaped bones, but as a rule have certain characters in common. Lach possesses a body and an arch, which enclose a ring, with.certain pro- cesses and notches. The Body, or Centrum, is a short cylinder, which by its upper and lower surfaces is con- nected by means of fibro-cartilage with the bodies of the vertebrae immediately above and below. The collective series of vertebral bodies forms the great column of the spine. The Arch, also called Neural Arch, because it en- closes the spinal marrow or nervous axis, springs from the back of the body, and consists of two symmetrical halves united behind in the middle line. Each half consists of an anterior part or pedicle, and a posterior part or lamina. The Rings collectively form the spinal canal. The Pro- cesses usually spring from the arch. The spinous process projects backwards from the junction of the two lamine, and the collective series of these processes gives to the entire column the spiny character from which has arisen the

Vertebre,

— ——S—S—S————E——E—— ——

term Spine, applied to it. The transverse processes project outwards, one from each side of the arch. The articular processes project, two upwards and two downwards, and are for connecting adjacent vertebre together. The Notches, situated on the upper and lower borders of the pedicles, form in the articulated spine the intervertebral foramina through which the nerves pass out of the spinal canal.

The vertebree in each group have characters which specially distinguish them. In man and all mammals, with few exceptions, whatever be the length of the neck, the Cervical Vertebree are seven in number. The excep- tions are the three-toed sloth, which has nine, and Hoff- mann's sloth and the manatee, in which there are only six. In many whales the seven cervicals are fused in the adult into a single bone. In man the body of a cervical vertebra is comparatively small, and its upper surface is transversely concave ; the arch has long and obliquely sloping laminze ; the ring is large and triangular; the spine is short, bifid, and horizontal ; the transverse process consists of two bars of bone, the anterior springing from the side of the body, the posterior from the arch, and uniting externally to enclose a foramen, through which, as a rulc, the vertebral artery passes ; the articular processes are flat and oblique, and the upper pair of notches are deeper than the lower. The first, second, and seventh cervical vertebra have characters which specially distinguish them. The first, or Atlas, has no body or spine : its ring is very large, and on each side of the ring is a thick mass of bone, the lateral mass, by which it articulates with the occipital bone above and the second vertebra below. The second vertebra, Axis, or Vertebra dentata, has its body surmounted by a thick tooth-like odontoid process, which is regarded as the body of the atlas displaced from its proper vertebra and fused with the axis. This process forms a pivot round which the atlas and head move in turning the head from one side to the other; the spine is large, thick, and deeply bifid. The seventh, called Vertebra prominens, is distinguished by its long prominent spine, which is uot bifid, and by the small size of the foramen at the root of the transverse process. In the human spine the distinguishing character

of all the cervical vertebre is the foramen at the root of

the transverse process, but amongst mammals this is not an invariable character, for in the cetacea the transverse process of the atlas is imperforate, and in the horse, ruminants, and many quadrumana, the seventh cervical vertebra has no foramen at the root of its transverse process.

The Dorsal Vertebrae, more appropriately called costal or thoracic, are twelve in number in the human spine ; but amongst mammals they range from eleven in the arma- dillo to twenty-two in the Cape hyrax and Hoffmann's sloth. They are intermediate in size and position to the cervical and lumbar vertebre, and are all distinguished by having one or two smooth surfaces on each side of the body for articulation with the head of one or two ribs. The arch is short and with imbricated laminz ; the ring is nearly circular; the spine is oblique, elongated, and bayonet-shaped ; the transverse processes are directed back and out, not bifid, and with an articular surface in front for the tubercle of a rib ; and the articular processes are flat and nearly vertical. The first, twelfth, eleventh, tenth, and sometimes the ninth, dorsal vertebree are dis- "nguished from the rest. The first is in shape like the seventh cervical, but has no foramen at the root of the transverse process, and has two articular facets on each Side of the body ; the ninth has sometimes only one facet

processes, and the twelfth has its lower articulay processes shaped like those of a lumbar vertebra. The Lumbar Vertebree in man ar

eight in the hyrax or agouti. They are the lowest of the true vertebre, and also the largest, especially in the body. The arch has short and deep laminz ; the ring is triangular; the spine is massive and hatchet-shaped ; the transverse processes are long and pointed; the articular are thick and strong, the superior pair concave, the inferior convex, and the inferior notches, as in the dorsal vertebrae, are deeper than

the superior. In the lumbar vertebrae and in the lower dorsal an accessory process projects from the base of each transverse process, and a mammillary tubercle from each superior articular process. In man these are small and rudimentary ; but in some mammals, as the kangaroo, armadillo, and scaly ant-eater, the mammillary tubercles are large, and in the baboon, dog, cat, and beaver, the accessory processes are well developed. The fifth lumbar vertebra has its body much thicker in front than behind;

its spine is less massive, and its lower articular processes are flat.

The Sacrum is composed of five originally separate Sacrum.

vertebrae fused into a single bone. In the bandicoot it consists of a single vertebra, whilst it has as many as eight in the armadillo. The relative size and completeness of the Sacrum are associated with the development of the haunch bones and of the lower limbs. In whales, where the pelvic bones are rudimentary and there are no hind limbs, there isno sacrum. It forms the posterior wall of the pelvis, is triangular in form, and possesses two surfaces, two borders, a base, and an apex. The anterior or pelvic surface is con- cave, and is marked by four transverse lines, which indicate its original subdivision into five bones, and by four pairs of foramina, through which are trausmitted the anterior sacral nerves. Its posterior surface is convex ; In the middle line are tubercles or rudimentary spines, and on each side of these are two rows of tubercles, the inner of which are the conjoined articular and mammillary pro- cesses, the outer the transverse processes of the originally distinct vertebrae ; in addition, four pairs of foramina are found which transmit the posterior sacral nerves from the sacral canal, which extends through the bone from base to apex, and forms the lower end of the spinal canal. By its borders the sacrum is articulated with the haunch-bones— by its base with the last lumbar vertebra, by its apex with the coccyx. The human sacrum is broader in proportion to its length than in other mammals; this great breadth gives solidity to the lower part of the spine, and, conjoined with the size of the lateral articular surfaces, it permits a more perfect junction with the haunch-bones, and is correlated with

the erect position. Owing to the need in woman for a wide pelvis, the sacrum is broader than in man.

The Coccyx consists of only four vertebree in the human Coccyx.

spine, It is the rudimentary tail, but instead of projecting back, as in mammals generally, is curved forwards, and is not visible externally, an arrangement which is also found in the anthropoid apes and in Hoffmann's sloth. In the spider monkeys as many as thirty-three vertebree are found in the tail, and in the long-tailed pangolin the number reaches forty-six. Not only is the tail itself rudimentary in man, but the vertebrae of which it is composed are small, and represent merely the bodies of the true vertebrie, As there are no arches, the ring is not formed, and the spinal canal does not extend, therefore, beyond the apex of

e five in number, but Lumbar ainongst mammals they range from two in the platypus to vertebre.

the sacrum. The first coccygeal vertebra, in addition to a body, possesses two processes or horns, which are jointed with two corresponding processes from the last' sacral vertebra.

at the side of the body; the tenth, eleventh, and twelfth | have invariably only a single facet on the side of the body, | but the eleventh and twelfth have stunted transverse

Thorax.

Sternum.

Coste.

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The Human Spine is more uniform in length in persons of the same race than might be supposed from the indi- vidual differences in stature, the variation in the height of the body in adults being due

chicfly to differences in the length of the lower limbs. The average length of the spine is 28 inches; its widest part is at the base of the sacrum, from which it tapers down to the tip of the coccyx. It diminishes also in breadth from the base of the sacrum upwards to the region of the neck. Owing to the pro- jection of the spines behind and the transverse processes on each side, it presents an irregular outline on those aspects; but in front it is more uniformly rounded, owing to the convex form of the antero-lateral surfaces of the bodies of its respective vertebree. In its general contour two series of curves may be seen, an antero-posterior and a lateral. The antero-posterior is the more important. In the infant at the time of birth the sacro-coccygeal part of the spine is concave forwards, but the rest of the spine, exccpt a slight forward concavity in the series of dorsal vertebree is almost straight. When the infant begins to sit up in the arms of its nurse, a convexity for- wards in the region of the neck appears, and subsequently, as the child learns to walk, a convexity forwards in the region of the loins. Hence in the adult spine a series of convexo-concave curves are found, which are alternate and mutually dependent, and are associated with the erect attitude of man. In the human spine alone are the lumbar vertebree convex forward. A lateral curve, convex to the right, opposite the third, fourth, and fifth dorsal vertebre, with compensatory curve convex to the left immediatcly above and below, is due apparently to the much greater use of the muscles of the right arm over those of the left, drawing the spine in that region some- what to the right. In disease of the spine its natural eurvatures are much increased, and the deformity known as humpback is produced. As the spine forms the central part of the axial skeleton, it acts as a column to support not only the weight of the body, but of all that can be carried on the head, back, and in the upper limbs: by its transverse and spinous processes it serves also to give attachment to numerous muscles, and the transverse pro- eesses of its dorsal vertebrae are also for articulation with the ribs. .

The THorax, Pectus, or CHEST is a cavity or enclosure the walls of which are in part formed of bone and cartilage. Its skeleton consists of the sternum in front, the twelve dorsal vertebrze behind, and the twelve ribs, with their eorresponding cartilages, on each side.

The Sternum or Breast Bone is an elongated bone which inclines downwards and forwards in the front wall of the chest. It consists of three parts—an upper, called manubrium or pre-sternum ; a middle, the body or meso- sternum; and a lower, the ensiform process or xiphi-sternum. Its anterior and posterior surfaces are marked by transverse lines, which indicate not only the subdivision of the entire bone into three parts, but that of the meso- sternum into four originally distinct segments. ach lateral border of the bone is marked by seven depressed surfaces for articulation with the seven upper ribs: at each side of the upper border of the pra-sternum is a sinuous depression, where the clavicle, a bone of the upper limb, articulates with this bone of the axial skeleton. The xiphi-sternum remaius cartilaginous up to a late period of life, and from its pointed form has been named the ensi- form cartilage.

The Ribs or Coste, twenty-four in number, twelve on each side of the thorax, consist not only of the bony ribs, but of a bar of cartilage continuous with the anterior end of each bone, called a costal cartilage, so that they furnish examples of a cartilaginous skeleton in the adult human

body; in aged persons these cartilages usually become converted into bone. 'The upper seven ribs are connected by their costal cartilages to the side of the sternum, and are called sternal or true ribs; the lower five do not reach the sternum, and are named a-sternal or false, and of these the two lowest, from being comparatively unattached in front, are called free or floating. All the ribs are articu- lated behind to the dorsal vertebrae, and as they are sym- metrical on the two sides of the body, the ribs in any given animal are always twice as numerous as the dorsal vertcbree in that animal. They form a series of osseo-cartilaginous arches, which extend more or less perfectly around the sides of the chest. A rib is an clongated bone, and as a rule possesses a head, a neck, a tubercle, and a shaft. The head usually possesses two articular surfaccs, and is connected to the side of the body of two

adjacent dorsal vertebree; the neck is a constricted part of the bone, uniting the head to the shaft; the tubercle, close to the junction of the shaft and neck, is the part which articu- lates with the transverse process of the vertebra. The shaft is compressed, possesses an inner and outer surface, and an upper and lower border, but from the shaft being somewhat twisted on itself, the direction of the surfaces and borders is not uniform throughout the length of the bone. The ribs slope from their attachments to the spine, at first outwards, downwards, and backwards, then down- wards and forwards, and where the curve changes from the backward to the forward direction an angle is formed on the rib. The first, tenth, eleventh, and twelfth ribs articulate each with only a single vertebra, so that only a single surface exists on the head : the surfaces of the shaft of the first rib are almost horizontal ; those of the second very oblique; the eleventh and twelfth ribs are rudi- mentary, have neither neck nor tubercle, and are pointed anteriorly. 'The ribs are by no means uniform in length: they increase from the first to the seventh or eighth, and then diminish to the twelfth; the first and twelfth are therefore the shortest ribs. The first and second costal cartilages are almost horizontal, but the others are directed upwards and inwards.

In its general form the chest may be likened to a trun- cated cone. It is rounded at the sides and flattened in front and behind, so that a man can lie either on his back or his belly. Its truncated apex slopes downwards and forwards, is small in size, and allows of the passage of the windpipe, gullet, large veins, and nerves into the chest, and of several large arteries out of the chest into the neck. The base or lower boundary of the cavity is much larger than the apex, slopes downwards and backwards, and is occupied by the diaphragm, a muscle which separates the chest from the cavity of the abdomen. 'The transverse diameter is greater than the antero-posterior, and the antero- posterior is greater laterally, where the lungs are lodged, than inthe mesial plane, which is occupied by the heart.

The Heap forms the summit of the axial part of the body. It consists of two portions—the Cranium and the Face.

The SKULL, or skeleton of the head, is composed of 22 Skull.

bones, 8 of which form the skcleton of the cranium, 14 that of the face. Except the lower jaw, which is move able, the bones are all firmly united by immovable joints. The 8 bones of the cranium are so united together by their edges as to form the walls of a box or cavity, the cranial cavity, in which the brain is lodged. The box of the cranium possesses a base or floor, a vault or roof, an anterior, a posterior, and two lateral walls. The posterior wall is formed by the occipital bone, which also extends for some distance forwards along the middle of the base; in front of the basal part of the occipital is the sphenoid, which also sends a process upwards on each side of the

SKULL. |

skull; in front of the basal part of the sphenoid is the ethmoid; mounting upwards in front of the ethmoid is the

Fic. 6.—Profile of the skull. Fr, frontal bona; Pa, parietal; SO, supra-occipital ; Sq, squamous-temporal; MT, mastoid-temporal; Ty, tympanic; St, styloid- temporal; As, ali-sphenoid; E, os planum of ethmoid; L, lachrymal ; N, nasal; Mx, superior maxilla; Ma, malar; Mn, mandible; 6A, basi-hyal; th, thyro-hyal; ch, cerato-hyal; em. external meatus; cs, coronal suture; 1s, lambdoidal suture; ss, squamous suture.

frontal, which forms the forehead, and closes in the front of the cranial box; forming the vault and side walls are the two parietal bones; completing the side walls, and extending for a short distance along the side of the floor, are the two temporal bones; the vertex of the skull is at the junction of the two parietal bones with each other.

Fic. 7.—Section through the skull immediately to the right of the mesial planc, The lettering as in Fig. 6, with, in addition, BO, basi-occipital; EO, ex-occipital; PT, petrous-temporal; BS, basi-sphenoid; PS, pre-sphenoid (the letters are placed in the sphenoidal sinus); OS, orbito-sphenoid; ME, mes-ethmoid; SC, septal cartilage of nose; V, vomer; Pl, palate; Pt, pterygoid of sphenoid; /s, frontal Sinus; Pf,

Pituitary fossa; jm, foramen magnum; a, angle; and s, symphysis of lower jaw.

The fourteen bones of the face, which are situated below and in front of the cranium, euter into the formation of the walls of cavities which open on the front of the face; thus they complete, along with the frontal, sphenoid, and ethmoid, the walls of the two orbits in which the eye-balls are lodged; along with the ethmoid and sphenoid, the walls of the nostrils; and they form the osseous walls of the mouth. As a general rule, the cranial bones are expanded, and plate- like in form. The outer surface of each bone assists in forming the exterior of the cranium, and not unfrequently 18 marked by ridges or processes for the attachment of mus¢les. The inner surface, again, is smooth, and pitted

with depressions, in which the convolutions of the brain are lodged, and also marked by grooves for the lodgment of dilated veins called blood sinuses, and of arteries termed meningeal, The two surfaces of a cranial bone, dense in structure, are called its tables, outer and inner, and are separated from each other by bone, looser and more spongy in its texture, called diploé. In some localities, more especially in certain of the bones which form the walls of the nostrils, the diploé disappears, and comparatively wide interspaces separate the two tables which contain air, and are called air-sinuses, The margins of the bones are denticulated, and it is by the interlocking of the denticulations of adjacent bones that they are jointed together, the joints being named sutures. The bones are pierced by holes or foramina, and similar holes exist between the adjacent margins of some of the bones. These foramina are mostly situated in the floor of the skull, and transmit arteries into the cranial cavity to supply the brain and the inner table with blood, and veins and nerves out of the cavity. The largest of these holes is called foramen magnum. It lies in the occipital bone, immediately above the ring of the atlas; through it the spinal

marrow becomes continuous with the brain, and the vertebral arteries pass to supply the brain with blood.

The Occipital, or bone of the Back of the Head (Figs. 6 Occipital.

and 7, and Plate XIII), consists of four originally distinct pieces fused into a curved plate-like bone. Its subdivisions are arranged around the foramen magnum—the basilar part, basi-occipital, in front; the condyloid parts, ex-occipi- tals, one on each side ; and the tabular part, or supra-occipital, behind. The anterior surface of the supra-occipital is sub- divided into four fossew, in the two upper of which are lodged the occipital lobes of the cerebrum, in the two lower the cerebellum ; the upper and lower pairs of fosse are separated by a groove for the lodgment of the lateral venous sinus. The posterior surface is marked by a pro- tuberance and by curved lines for the attachment of muscles; by its margin the supra-occipital articulates with the parietal and temporal bones, Each ex-occipital hag on its under surface a smooth condyle for articulation with the atlas; in front of the condyle is a foramen which transmits the last or ninth cranial nerve, called hypoglossal, and behind it a foramen for the transmission of a vein sometimes exists. The basi-occipital articulates and, in the adult skull, is fused with the body of the sphenoid (Fig. 7). The upper surface of the basi-occipital is grooved for the lodgment of the medulla oblongata.

Sometimes the part of the supra-occipital situated above the protuberance and upper curved line ossifies as an inde- peudent bone, called interparietal. In some mamunals, as the sheep, the existence of an interparietal in the young skull is the rule and not the exception.

XII.), lies at the base of the skull ; it articulates behind with the occipital; in front it is jointed to the ethmoid and frontal, and by its lateral processes or wings to the frontal, parietal, and temporal bones, From its position, therefore, it binds together all the bones of the cranium, and, more- over, articulates with many of those of the face. For con- structive purposes it is the most important bone of: the head. It consists of a centrum or body, with which four pairs of processes are connected. The body has a deep depression on its upper surface,

compared in shape to a Turkish saddle, in which is lodged the pituitary body; hence it is called pituitary fossa. In frout of this fossa is a ridge which marks the place of union of the pre- and post-sphenoidal subdivisions of the body of this bone; the body is grooved laterally for the internal carotid artery and the cavernous blood sinuses, and it is hollowed out in its interior to form the sphenoidal air-sinuses: these air-

The Sphenoid or Wedge-shaped_ bone (Fig. 7, and Plate Sphenoid.

Ethmoid.

Frontal.

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sinuses are partially closed in front by a pair of small bony plates called sphenoidal spongy bones, or bones of Bertin. Behind the pituitary fossa is a pair of processes called posterior clinoid, from which the bone slopes back to the basi-occipital; this slope is called the dorsum selle, and on it rests the pons Varolii. From the posterior part of each side of the body the great wings, or alz-sphenords, pass outwards and upwards to the sides of the skull, and each sends off a plate-like process to enter into the formation of the outer wall of the orbit. From the anterior part of each side of the body the lesser wings, orbito-sphenoids, pass outwards, and assist in forming the roof of each orbit; each orbito-sphenoid ends internally in a knob-like process called anterior clinoid, and at its root is a foramen called optic, which transmits the second nerve, or nerve of sight, into the orbit. From the great wings ou each side, close to its junction with the body, a pair of pterygoid processes, called internal and external, project downwards, and the internal process ends in a slender hook termed the hanvular process. The ali-sphenoid is pierced by foramina called rotundum, ovale, and spinoswm, the two former of which transmit divisions of the fifth cranial nerve, the last an artery to the membranes of the brain; between the orbito- and ali-sphenoids is a fissure which transmits the third, fourth, sixth, and first divisions of the fifth cranial nerve into the

orbit; and at the root of the pterygoid processes is the vidian canal, for the transmission of a nerve of the same name,

The Ethmoid, or Sieve-like bone (Fig. 7, and Plate XIII, fig. 5),is situated between the two orbital plates of the frontal, and in front of the body of the sphenoid. It is cuboidal in shape, and is composed of a central portion and two lateral masses, which are connected togethcr by a thin horizontal plate pierced with holes like a sieve, and called cribriform. This cribriform plate forms a part of the floor of the cranial cavity ; on it rest the two olfactory bulbs, and the branches of the nerves of smell, called olfactory or first cranial nerves, pass from the bulbs through the holes in this plate into the nose. The central portion of the bone is a mesial perpendicular plate, mes-ethmoid, and forms a part of the septum which subdivides the nose into the right and left nostrils. Each lateral mass consists of an external smooth plate, os planwm, which assists in forming the inner wall of the orbit; and an internal convoluted part, called superior and middle spongy bones or turbinals, which enter into the formation of the outer wall of the nostril. These turbinals are associated with the distribution of the nerves of smell; in the toothed whales, where there are no olfactory nerves, the turbinals are absent, whilst in some mammals, as the crested seal, they assume a highly convoluted form. The lateral masses are hollowed out into air-sinuses, called ethmoidal cells, which communicate with the nostrils and with corresponding sinuses in the sphenoid and frontal bones.

The Frontal, or bone of the Forehead (Figs. 6 and 7, and Plate XIII.), consists originally of a right and left lateral half, united by the frontal suture in the middle line of the fore- head. As a rule, this suture disappears in early life, and a single greatly curved bone is formed. The bone is convex forwards, to form the rounded forehead, and presents two eminences, the centres of ossification of the bone; at the root of the nose is an elevation called glabella, extending outwards, from which, on each side, is the supra-ciliary ridge, corresponding to the position of the eyebrow. In the crania of some races, ¢.g., the Australian, the forward projection of the glabella and supra-ciliary ridges is con- siderable ; and in the well-known skull from the valley of

the Neander it has reached a remarkable size. These ridges and the glabella mark the position of the air-sinuses in the frontal bone. The upper border of each orbit, which

ends internally and externally in a process of bone called angular, forms the lower boundary of the forehead. The cerebral surface of the bone is deeply concave, for the reception of the frontal lobes of the brain ; the concavity is deepened by the backward projection of two thin plates of bone which form the roofs of the orbits, which plates are separated from each other by the deep notch in which the ethmoid bone is lodged ; along the margins of this notch may be seen the openings into the frontal air-sinuses.

The Parietal bones, two in number (Figs. 6 and 7, and Parietal,

Plate XIV.), form the greater part of the side wall of the skull, and mount upwards to the vertex, where they unite together along the line of the sagzttal suture. Each bone possesses about the centre of its outer surface an eminence, the centre of ossification of the bone, with which a hollow on the cerebral surface, lodging a convolution of the parietal lobe of the brain, corresponds. The bone is quadrilateral in form. Three of its margins are strongly denticulated, for junction with the occipital, frontal, and corresponding parietal ; the fourth is scale-like, for union with the tem- poral, and forms the sgwamous suture; near the upper margin on the cerebral surface is a groove for the lodgment of the superior longitudinal venous sinus. The anterior inferior angle articulates with the ali-sphenoid, and is marked by a groove for the meningeal artery; the posterior inferior is grooved for the lateral venous sinus, and articu- lates with the mastoid of the temporal.

The Temporal bones, two in number (Figs. 6 and 7, and Plate XIV.), are placed at the side and base of the skull, and are remarkable for containing in their interior the organs of hearing. Each bone consists originally of four subdivisions—a squamoso-zygomatic, a tympanic, a

petro-mastoid, and a styloid—which in course of time fuse together to form an irregular-shaped bone. The squamous part of the squamoso-zygomatic is a thin plate which forms that part of the side of the skull familiarly known as the "temple." The zygoma extends horizontally forwards as a distinct arched process, to join the malar or cheek-bone, At the root of the zygoma is a smooth fossa, called glenoid, which receives the condyle of the lower jaw, and assists in forming the temporo-maxillary joint. The tympanic portion forms in the foetus a ring, which enlarges subsequently into a curved plate that forms the wall of the external auditory meatus, or passage into the tympanum or middle ear, The tympanic and squamoso-zygomatic parts of the bone fuse together; but a fissure, called Glaserian, situated behind the glenoid fossa, marks their original separation ; in this fissure the slender process of the malleus (one of the bones of the tympanum) is lodged. The petro-mastoid or periotic part of the temporal contains the organ of hearing, and is complicated in its internal anatomy. It extends forwards and inwards along the floor of the skull, and forms on the exterior of the skull the large nipple-shaped mastoid pro- cess. This process is rough on its outer surface, for the attachment of muscles, and is hollowed out internally into the mastoid cells or air-sinuses, which communicate with the tympanum or middle ear. The petrous-temporal is distinguished by its stony hardness, and has the form of a three-sided pyramid. Its apex lies in relation to the side of the body of the sphenoid; its base corresponds to the tympanic cavity and external meatus ; its under surface is rough, and forms a part of the under surface of the skull; its anterior and posterior surfaces are smooth and in rela- tion to certain parts of the brain. The petrous part of the bone is traversed by a canal which transmits the internal carotid artery and sympathetic nerve into the cranial cavity; in its posterior surface is a passage, internal meatus, down which the seventh cranial nerve proceeds ; at the bottom of the meatus the auditory part of that nerve enters the internal ear, whilst the part of the nerve

Temporal,

Bones of the face.

Upper jaw.

a

Vomer,

SKULI. |

which goes to the niuscles of the face traverses a canal in the bone, called aqueduct of Fallopius, which ends ex- ternally, between the styloid and mastoid processes, in the stylo-mastoid foramen. The styloid process is a slender part of the bone which projects downwards from the tympanic plate, and is connected with the small cornu of the hyoid bone by the stylo-hyoid ligament. It does not unite with the rest of the bone until a comparatively late period. Between the petrous-temporal and ex-occipital is the jugular foramen, which transmits out of the skull the cighth cranial nerve and the internal jugular vein.

The fourteen bones of the Face are, as a rule, much smaller than those of the Cranium; some have the form of thin scales, others are more irregular in shape. They are named as follows :— Two superior maxillary, two palate, two malar, two nasal, two lachrymal, two inferior turbinal, a vomer, and an inferior maxilla.

The Superior Maxillz, or bones of the Upper Jaw (Figs. 6 and 7,and Plate XIV.), form the skeleton of a large part of the face, and enter into the formation of the walls of the cavities of the nose, mouth, and orbit 3 around them the other bones of the face are grouped. The facial surface of each bone presents in front a large foramen for the transmission of the infra-orbital branch of the fifth cranial nerve, and behind, several small foramina for the trans- mission of nerves to the teeth in the upper jaw. On the same surface is a rough process for articulation with the malar bone. The orbital surface is smooth, forms the floor of the orbit, and possesses a canal in which the infra- orbital nerve lies. The nasal surface forms a part of the outer wall and floor of the nostril, and presents a hole leading into a large hollow in the substance of the bone, called the antrum, or superior maxillary air-sinus. The nasal surface articulates with the inferior turbinal and

palate bones. The nasal and facial surfaces become con- tinuous with each other at the anterior aperture of the nose, and from them a strong process ascends to join the frontal bone close to the glabella ; this process also articu- lates with the lachrymal and nasal bones, The palatal surface forms a part of the bony roof of the mouth, and presents in front a small hole (the incisive foramen) which communicates with the nose. In the sheep and many other mammals this hole is of large size; the palatal surface is bounded externally by a thick elevated border, in which are the sockets, or alveoli, for the lodgment of the fangs of the teeth; internally this surface articulates by a narrow border with the other superior maxilla and with the vomer, and, posteriorly, with the palate-bone.

The Palate-bone (Fig. 7, and Plate XIV.) lies in con- tact with the inner surface and posterior border of the Superior maxilla, and separates it from the sphenoid. It isin shape not unlike the capital letter L, the horizontal limb forming the hinder part of the bony roof of the mouth by its lower surface, and the back part of the floor of the nose by its upper. The ascending limb assists in forming the outer wall of the nose, and subdivides into an anterior, or orbital, and a posterior, or sphenoidal, pro- cess. At the junction of the two limbs is the pyramidal process, which articulates with the lower ends of the pterygoid processes of the sphenoid.

The Vomer (Fig. 7), shaped like a ploughshare, lies vertically in the mesial plane of the nose, and forms a large part of the partition which separates one nostril from the other. It articulates above with the under surface of the body of the sphenoid and the mes-ethinoid ; below with the palatal processes of the superior maxille and palate-bones; in front with the septal cartilage of the nose, whilst the posterior border is free, and forms the hinder edge of the nasal septum.

The Inferior Turbinated is a slightly convoluted bone

Josse, and give origin to the temporal

it articulates Inferior L and palate a little below the turbinated, iniddle turbinal of the ethmoid.

maxilla, and frontal bones, It has a groove on the outer surface, in which is lodged the lachrymal sac, –

The Nasal (Fig. 6) is a thin, somewhat elongated Nasal. bone, which, articulating with its fellow in the middle line, forms with it the bony bridge of the nose 3 above, it articulates with the frontal, and by its outer border with the ascending process of the superior maxilla.

The Malar bone (Fig. 6), irregular in shape, forms the Malar. prominence of the cheek, and completes the outer wall of the orbit. It rests upon the superior maxilla 3 by its orbital plate it articulates with the great wing of the sphenoid ; by its ascending process with the external angular process of the frontal ; by its posterior process with the zygomatic process of the temporal, so as to complete the zygomatic arch.

The Inferior Maxilla, LowerJ aw, or Mandible (Figs. 6 and Mandible. 7, and Plate XIV., fig. 9), is a large horse-shoe shaped bone, which has the distinction of being the only movable bone of the head. It consists originally of two separate halves, which unite during the first year of life into a single bone at the symphysis or chin, A characteristic feature of the human lower jaw is the forward slope of the bone at the chin, for in other mammals the symphysis inclines backwards, In the upper border of this bone are the sockets for the lower series of teeth. At the posterior end of the horse-shoe curve on cach side the bone ascends almost vertically, and terminates in two processes—an anterior, or coronoid, which is for the insertion of the temporal muscle, and a posterior, or condyle, which is for articulation with the glen- oid fossa of the temporal bone. Where the ascending and horizontal limbs of the bone are continuous, it forms the angle, which is almost a right angle. On the inner surface of the ascending limb is a large foramen, communicating with a canal which traverses the bone below the

sockets for the teeth. In this canal are lodged the nerves and blood-vessels for these teeth.

The Hyoid bone lies in the neck, on the same plane as Hyoid.

the lower border of the inferior maxilla (Figs.6 and 7). It is shaped like the letter U, and consists of a body, or basi- hyal, from which two long horns, or stylo-hyals, project backwards. At the junction of the body and horns two smaller cornua, or cerato-hyals, project upwards, and are connected with the styloid processes of the temporal bones, or stylo-hyals, by the stylo-hyoid ligaments, or epi-hyals. The hyoid is the bone from which the muscles of the tongue arise, and it is situated immediately above the thyroid cartilage of the larynx, to which it is attached by ligaments.

*In its general form the Skull is ovoid, with the long General axis extending antero-posteriorly, the frontal and occipital] form and ends rounded, and the sides somewhat flattened. Its Oe the average length in the people of the British Islands is g *<™- little more than 7 inches; its greatest breadth about 54 inches ; and its height, from the plane of the foramen magnum to the vertex, about 5} inches. Its greatest circumference is about 21 inches. The breadth of the face across the zygomatic arches is about 5 inches. The average capacity of the brain cavity is 92 cubic inches.*

The British skull is dolicho-cephalic and orthognathic. (See ANTHROPOLOGY.)

The lateral regions of the skull are called the temporal muscles. Under cover of each zygomatic arch is the zygomatic fossa. At

the bottom of this is a hollow between the superior maxilla

and sphenoid, called spheno-maxillary fossa, from which the pterygo-maxilary fissure extends downwards between the pterygoid and superior maxillary; and the spheno- maxillary fissure extends upwards into the orbit. The orbit is a four-walled pyramidal cavity, with the base directed forward to the face, and the apex backward to the brain cavity. At the apex are the foramina in the sphenoid, through which the nerve of sight and other nerves pass from the brain to the eyeball, muscles, and other soft structures within the orbit.

The nostrils open on the front of the face by a large opening situated between the two superior maxille, and bounded above by the two nasals. The sides of the opening pass down almost vertically to join the floor, and are not rounded off as in the ape's skull; from the centre of the floor a sharp process, the nasal spine of the superior maxillz projects forwards, and forms a characteristic feature of the human skull. Attached to the sides of the opening are the lateral cartilages of the nose, which form the wings of the nostrils, and so modify the position of their openings that in the face they look downwards. The nostrils are separated from each other by a vertical mesial partition composed of the mes-ethmoid, vomer, and triangular nasal cartilage, the last-named of which projects forward beyond the anterior surface of the upper jaw, and con- tributes materially to the prominence of the nose. The outer wall of each nostril presents the convoluted turbinals, which are separated from each other by horizontal passages extending antero-posteriorly; the superior passage or meatus lies between the superior and middle turbinals of the ethmoid, and is continued into the sphenoidal and posterior ethmoidal air-sinuses; the mzddle meatus lies between the middle and inferior turbinals, and is continued into the frontal, anterior ethmoidal, and maxillary air sinuses. These sinuses are therefore extensions of the nasal chamber or respiratory passage, and correspoud with the air cavities which exist in so many of the bones of birds; the inferior meatus lies between the inferior turbinal and floor of the nose; into its anterior part opens the nasal duct which conveys the tears from the front of the eyeball. The posterior openings of the nose are separated from each other by the hinder edge of the vomer, and are placed between the internal pterygoid plates of the sphenoid.

The skull varies in appearance at different periods of life. In infancy the face is small, about {th of the size of the entire head, for the teeth are still rudimentary and the jaws are feeble; the centres of ossification of the cranial bones are prominent; the forehead projects; the skull is widest at the parietal eminences ; the air-sinuses, and bony ridges corresponding to them, have not formed. In the adult the face is about half the size of the head, and its vertical diameter greatly elongated, from the growth of the antrum, the nose, and the dental borders of the jaws; and the angle of the lower jaw is almost a right angle. Inold age the teeth fall out, the jaws shrink in, their dental borders become absorbed, the angle of the lower jaw, as in infancy, is obtuse; the vertex and floor of the skull also become flattened, and the sides bulge outwards,—changes due to gravitation and the subsidence of the bones by their own weight.

The skull of a woman is smaller and lighter, with the muscular ridges and projections due to the air sinuses less strongly marked than in a man, but with the eminences or centres of ossification more prominent. The more feeble air sinuses imply a more restricted respiratory activity and a less active mode of life than ina man. The internal capacity is about 10 per cent. less than that of the male. The face is smaller in proportion to the cranium; the cranium is more flattened at the vertex, and the height is consequently not so great in proportion to the length as

in the man. In the female skull, therefore, the infantile characters are less departed from than is the case in the male.

Turning now to the APPENDICULAR SKELETON, we shall consider first that of the SuprERion or THORACIC or

Pectoral Extremity, or Upper Lims. The Upper Limb Upper may be subdivided into a proximal part or shoulder, a Limb.

distal part or hand, and an intermediate shaft, which con- sists of an upper arm or brachium, and a fore-arm or anti- brachium. In each of these subdivisions certain bones are found: in the shoulder, the clavicle and scapula; in the upper arm, the humerus; in the fore-arm, the radius and ulna, the bone of the upper arm in man being longer than the bones of the fore-arm; in the hand, the carpal and metacarpal bones and the phalanges. The scapula and clavicle together form an imperfect bony arch, the Scapular Arch or Shoulder Girdle ; the shaft and hand form a free divergent Appendage. The shoulder girdle is the direct niedium of connection between the axial skeleton and the divergent part of the limb; its anterior segment, the clavicle, articulates with the upper end of the sternum, whilst its posterior segment, the scapula, approaches, but does not reach, the dorsal spines.

Fic. 8.—Diagrammatic section to represent the relations of the shoulder girdle to the trunk. V, a Dorsal Vertebra; C, a Rib; St, the Sternum; Sc, the Scapula; Cr, the Coracoid; Cl, the Clavicle; M, the Meniscus at its sternal end; H, the Humerus.

The Clavicle, or Collar Bone (Fig. 9), is an elongated Clavicle,

bone which extends from the upper end of the sternum horizontally outwards, to articulate with the acromion process of the scapula. It presents a strong sigmoidal curve, which is associated with the transverse and horizontal direction of the axis of the human shoulder. It is slender in the female, but powerful in muscular males ; its sternal end thick and somewhat triangular; its acromial end, flattened from above downwards, has an oval articular surface for the acromion. Its shaft has four surfaces for the attachment of muscles; and a strong ligament, con- necting it with the coracoid, is attached to the under surface, near the outer end, whilst near the inner a strong ligament passes between it and the first rib. The clavicle is absent in the hoofed quadrupeds, in the seals and whales, and is feeble in the carnivora; but is well formed, not only in man, but in apes, bats, and in many rodents and insectivora.

The Scapula, or Shoulder Blade (Fig. 9), is the most Scapula

important bone of the shoulder girdle, and is present in all mammals. It lies at the upper and back part of the wall of the chest, reaching from the second to the seventh rib. Its form is plate-like and triangular, with three surfaces, three borders, and three angles. The funda- mental form of the scapula, as seen in the mole, is that of a three-sided prismatic rod, and its assumption of the plate or blade-like character in man is in connection with the great development of the muscles which rotate the humerus at the shoulder joint. Its costal or ventral surface is in relation to the ribs, from which it is separated by certain muscles: one, called subscapularis, arises from the surface itself, which is often termed subscapular fossa. The dorsum or back of the scapula is traversed from behind forwards by a prominent spine (Pl. XIV., fig. 1,8), which lies in the proper axis of the scapula, and subdivides this aspect of the bone into a surface above the spine, the

supra- or pree-spinous fossa, and one below the spine, the infra- or post-spinous fossa. The spine arches forwards, to end ina broad flattened process, the acromion, which has an oval articular surface for the clavicle ‘ both spine and acromion are largely developed in the human scapula in correlation with the great size of the trapezius and deltoid muscles, which are con- cerned in the elevation and ab- duction of the upper limb. The borders of the scapula, directed upwards, backwards, and down- wards, give attachment to several muscles, The angles are inferior, supero-posterior, and supero-an- terior. The supero-anterior is the most important ; it is truncated, and presents a large, shallow, oval, ‘smooth surface, the glenoid fossa, for articulation with the humerus, to forin the shoulder joint. Over- hanging the glenoid fossa is a curved beak-like process, the coracoid, which is of importance as corresponding with the separate coracoid bone of birds and reptiles. The line of demarcation between it and the scapula proper is marked on the upper border of the scapula by the supra-scapular notch.

The Humerus, or bone of the Upper Arm (Fig. 9), is a long bone, and consists of a shaft and two extremities. The upper extremity of this

bone possesses a convex spheroidal smooth surface, the head, for articulation with the glenoid fossa of the scapula; it is surrounded by a narrow con- stricted neck, and where the neck and shaft become continuous with each other, two processes or ¢tuberosities are found, to which are attached the rotator muscles arising from the scapular fosse. Between the tuberosities is a groove in which the long tendon of the biceps rests. A line drawn through the head of the humerus perpendicular to the middle of its articular surface, forms with the axis of the shaft of the bone an angle of 40°. The shaft of the humerus is cylindriform above, but flattened and expanded below ; about midway down the outer surface is a rough ridge for the insertion of the deltoid muscle, and on the inner 'surface another rough mark for the insertion of the coraco-brachialis. The demarcation between the cylindri- form and expanded parts of the shaft is marked by a shallow groove winding round the back of the bone, in which the musculo-spiral nerve is lodged. The lower extremity of the humerus consists of an articular and a non-articular portion. The articular presents a small head or capitellum for the radius, and a pulley or trochlea for the movements of the ulna in flexion and extension of the limb. The non-articular part consists of two condyloid eminences, internal and external. From the external, or epi- condyle, a ridge passes for some distance along the outer border of the bone ; it gives origin to the supinator and extensor muscles in the forearm. From the internal emi- hence, or epr-trochlea, a ridge passes up the inner border of the shaft of the bone; this eminence gives origin to the

Fre. 9.—The Appendicular Skele- ton of the Left Upper Limb. Cl, clavicle; Sc, scapula; Ac, acromion process; Cr, coracoid process of scapula; H, humerus; R, radius; U, ulna; C, opposite the eight carpal bones; Me, op- posite the five metacarpal bones; P, pollex, or thumb; 11, index, Ill. middle, IV. ring, V. little finger,

pronator and flexor muscles in the fore-arm, In nearly two per cent of the bodies examined in the anatomy-rooms in the university of

Edinburgh, a hooked process has been seen projecting from the shaft of the bone, about 2 inches above the epi-trochlea ; this process is connected to the epi-trochlea by a fibrous band, so as to form a foramen, which has been called supra-condyloid. In these cases the median nerve invariably passes through the foramen, and not unfrequently is accompanied by the brachial artery. In the feline carnivora and some other mammals a foramen constantly occurs in this part of the humerus, through which, as a rule, both nerve and artery proceed, though in the common seal it transmits only the nerve.

Before describing the two bones of the fore-arm, the anatomist should note the range of movement which can take place between them. In one position, which is called supine, they lie parallel to each other, the radius being the more external bone, and the palm of the hand being directed forwards; in the other or prone position the radius crosses obliquely in front of the ulna, and the palm of the hand is directed backwards. Not only the bones of the fore-arm, but those of the hand are supposed to be in the supine position when they are described.

The Radius (Fig. 9) is the outer bone of the Fore-arm, and Radius. like all long bones possesses a shaft and two extremities. The upper extremity or head has a shallow, smooth cup for moving on the capitellum of the humerus ; the outer margin of the cup is also smooth, for articulation with the ulna and annular ligament; below the cup is a constricted neck, and immediately below the neck a tuberosity for the insertion of the biceps. The shaft of the bone possesses three surfaces for the attachment of muscles, and a sharp inner border for the interosseous membrane. The lower end of the bone is much broader than the upper, and is marked posteriorly by grooves for the lodgment of tendons passing to the back of the hand: from its outer border a pointed styloid process projects downwards; its inner border has a smooth shallow fossa for articulation with the ulna, and its broad lower surface is smooth and concave, for articula- tion with the scaphoid and semilunar bones of the wrist.

The Ulna (Fig. 9) is also a long bone. Its upper end is Ulna. subdivided into two strong processes by a deep fossa, the greater

sigmoid cavity, which possesses a smooth surface for articulation with the trochlea of the humerus, The anterior or coronoid process is marked by an oblique ridge for the insertion of the brachialis anticus, whilst the pos- terior or olecranon process gives insertion to the large triceps muscle of the upper arm. Immediately below the outer border of the great sigmoid cavity is the small sigmovd cavity for articulation with the side of the head of the radius. The shaft of the bone possesses three surfaces for the attachment of muscles, and a sharp outer border for the interosseous membrane. The lower end, much smaller than the upper, has a pointed styloid process and a smooth articular surface, the outer portion of which is for the lower end of the radius, the lower part for moving on a cartilage of the wrist joint called the triangular fibro- cartilage.

The Hand consists of the Carpus or wrist, of the Meta- Hand. carpus or palm, and of the free Digits, the thumb and four fingers. Anatomists describe it with the palm turned to the front, and with its axis in line with the axis of the fore-arm.

The Carpal or Wrist bones (Fig. 9) are eight in number Carpus, and small in size: they are arranged in two rows, a proximal,—i.e. a row next the fore-arm.—consisting of the scaphoid, semilunar, cuneiform, and pisiform ; and a distal, ~—t2.€. a row next the bones of the paln,—consisting of a trapezium, trapezoid, os magnum, and unciform ; the bones in each row being named in the order they are met with,

Meta-

carpus.

Digits.

Lower limb.

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from the radial or outer to the ulnar or inner side of the wrist. It is unnecessary to give a separate description of each bone. Except the

pisiform or pea-shaped bone, which articulates with the front of the cuneiform, each carpal bone is short and irregularly cuboidal in shape ; its anterior (or palmar) surface and its posterior (or dorsal) being rough, for the attachment of ligaments; its superior and inferior surfaces being invariably smooth, for articulation with adjacent bones; whilst the inner and outer surfaces are also smooth, for articulation, except the outcr surfaces of the scaphoid and trapezium (the two external bones of the carpus), and the inner surfaces of the cuneiform and unciform (the two internal bones), Occasionally a ninth or supernumerary bone may arise from the subdivision of the scaphoid,. semilunar, or trapezoid, into two pieces ; more rarely a distinct bone is found in the human wrist inter- calated between the trapezoid, os magnum, semilunar, and scaphoid, which corresponds in position to the os inter- medium, found constantly in the wrist of the orang, gibbon, the tailed apes, and many rodents and insectivora.

The Metacarpal bones, or hones of the Palm of the Hand, are five in number (Fig. 9). They are miniature long bones, and each possesses a shaft and two extremities. The metacarpal of the thumb is the shortest, and diverges outwards from the rest: its carpal extremity is saddle-shaped, for articulation with the trapezium; its shaft is somewhat compressed, and its phalangeal end is smooth and rounded, for the first phalanx of the thumb. The four other metacarpal bones belong to the four fingers : they are almost parallel to each other, and diminish in size from the second to the fifth. Their carpal ends articulate with the trapezoid, os magnum, and unciform : their shafts are three-sided: their phalangeal ends articulate with the first phalanges of the fingers.

The number of Digits in the hand is five, which is the highest number found in the mammalia. They are dis- tinguished by the names of pollex or thumb, and index, middle, ring, and little fingers. Their skeleton consists of fourteen bones, named phalanges, of which the thumb possesses two, and each of the four fingers three. The phalanx next the metacarpal bone is the first, that which carries the nail is the terminal or ungual phalanx, whilst the intermediate bone is the second phalanx. Each is a miniature long bone, with two articular extremities and an intermediate shaft, except the terminal phalanges, which have

an articular surface only at their proximal ends, the distal end being rounded and rough, to afford a surface for the lodgment of the nail.

The INFERIOR or PEtvic Extremity, or LowER Limp, consists of a proximal part or haunch, a distal part or foot, and an intermediate shaft subdivided into thigh and leg. Each part has its appropriate skeleton : in the haunch, the pel- vic or innomi- nate bone; in the thigh, the femur ; in the leg, the

tibia and fibula Fre.10.—Diagrammatie section to represent the relations

: of the Pelvic Girdle to the Trunk. V,a saeral vertebra; (the thigh-bone ll, the ilium; P, the two pubie bones meeting in front in man _ being

at the symphysis; F; the femur.

longer than the leg-bones); in front of the knee, the patella ; in the foot, the tarsal and metatarsal bones and phalanges. The bone of the haunch forms an arch or Pelvic Girdle, which articulates bchind with the side of the sacrum, and arches forward to articulate with the opposite haunch-bone at the pubic symphysis. It is the direct medium of connection between the axial skeleton and the shaft and foot, which form a free divergent Appendage.

ANATOMY

The Os Innominatum, or Haunch-bone, is a large irre- Pelvic gular plate-like bone, which forms the lateral and anterior girdle.

boundary of the cavity of the pelvis. In early life it con- sists of three bones—ilium, ischium, and pubis—which unite about the twenty-fifth year into a single bone. These bones converge, and join to form a deep fossa or cup, the acetabulum or cotyloid cavity, on the outer surface of the bone, which lodges the head of the thigh-bone at the hip-joint. One-fifth of this cup is formed by the pubes, and about two-fifths each by the ischium and ilium. At the bottom of the acetabulum is a depression, to the sides of which the interarticular ligament of the hip-

joint is attached. From the acetabulum the illum extends upwards and backwards, the ischium downwards and backwards, the pubis forwards and inwards. In front of the acetabulum is a large hole, the obturator or thyroid foramen, which is bounded by the ischium and pubes; behind the acetabulum is the deep sciatic notch, which is bounded by the ischium and iliuim. The Ilium (Fig. 10) in man is a broad plate-like bone.- In its most simple form, as in the kangaroo, it is a three- sided, prismatic, rod-like bone, one end of which enters into the formation of the acetabu- lum, whilst the other is free, and forms the ihac crest. In man, notwithstanding its ex- panded form, three surfaces may also be recognised, cor- responding to the surfaces in theilium of the kangaroo; and, as in that animal, the lower end aids in forming the acetabulum, while the upper end forms the iliac crest, which, in man, in conformity with the general expansion of the bone, is elon- gated into the sinuous crest of the ilium. This crest is of great importance, for it affords attachment tothe broad muscles which form the wall of the ab- dominal cavity. One surface of the ilium is external, and marked by curved lines which subdivide it into areas for the origin of the muscles of the buttock ; another surface is anterior, and hollowed out to give origin to the iliacus muscle; the third, or internal, surface articulates Fy. 11.—The Appendieular Skeleton posteriorly with the sacrum, {ithe tet Lover ane the three whilst anteriorly it forms a part parts of the innominate bone; F, of the wall of the truc pelvis, femars,P. patella; Tb, ubia, Eo The external is separated from bones; C, 0s ealcis, forming promi- : nence of heel; Mt, opposite the five the anterior surface by a border metatarsal bones; H, hallux or which joins the anterior end of fye,toes My second, 40 hid the crest, where it forms a pro- The dotted line HH represents the q C 9 horizontal plane, whilst the dotted cess, the anterior SUPerior Spine. ine Vis in line with the vertical About the middle of this border xis of the spine. is the anterior inferior spine. Between the externaland inter- nal surfaces is a border on which are found the posterwor swperiorand inferior spines ; between theanterior and internal surfaces is the pectineal border, which forms part of the line of separation between the true and false pelvis. The Pubis (Fig. 11) is also a three-sided, prismatic, rod-

[SKELETON—

Tlium,

Pubis.

Ischium.

LOWER LIMB. |

like bone, the fundamental form of which is obscured by the modification in shape of its inner end. In human anatomy it is customary to regard it as consisting of a body and of two branches, a horizontal and a descending ramus. 'The body and horizontal ramus form the funda- mental prismatic rod, and the descending ramus is merely a special offshoot from the inner end of the rod. The outer end of the rod takes a part in the formation of the acetabulum ; the inner end is expanded into the body of the pubis, and has a broad margin, or symphysis, for articulation with the corresponding bone on the opposite side of the pelvis. The three surfaces are—a supervor, for the origin of the pectineus muscle 3 & posterior, which enters into the wall of the true pelvis ; aud an inferior, which forms the upper boundary of the obturator foramen, The descending ramus is merely a downward prolongation of the inner end of the bone which joins the ischium, and aids in forming the side of the pubic arch. The junction of the outer end of the pubis with the ilimm is marked by the pectineal eminence. The superior and posterior sur- faces are separated by the sharp pectineal line, which, starting from the spine of the pubis, runs outwards to aid in forming the brim of the true pelvis.

The Ischium (Fig. 11), like the ilium and pubis, has the fundamental form of a three-sided prismatic rod. One extremity (the upper) completes the acetabulum, whilst the lower forms the large prominence, or tuber ischit. The surfaces of the bone are internal or pelvic, external, and anterior. The pelvic and external surfaces are separated from each other by a sharp border, on which is seen the ischial spine. The pelvic and anterior surfaces are sepa- rated by a border, which forms a part of the boundary of the obturator foramen ; but the margin between the external and anterior surfaces is feebly marked. The tuberosity, a thick, rough, and strong process, gives origin

to several powerful muscles: on it the body rests in the sitting posture; an offshoot, or ramus, ascends from it to jom the descending ramus of the pubis, and com- pletes both the pubic arch and the margin of the obturator forainen.

By the articulation of the two innominate bones with each other in front at the pubic symphysis, and with the sides of the sacrum behind, the osseous walls of the cavity of the Penvis are formed. This cavity is subdivided into a false and a true pelvis. The false pelvis lies between the expanded wing-like portions of the two ilia. The true pelvis lies below the two pectineal lines and the base of the sacrum, which surround the upper orifice or brim of the true pelvis, or pelvic inlet; whilst its lower orifice or outlet is bounded behind by the coceyx, laterally by the ischial tuberosities, and in front by the pubic arch. In the erect attitude the pelvis is so inclined that the plane of the brim forms with the horizontal plane an angle of from 60° to 65°. The axis of the cavity is curved, and is represented by a line drawn perpendicularly to the planes of the brim, the cavity, and the outlet 3 at the brim it is directed upwards and forwards, at the outlet downwards and a little forwards. Owing to the inclination of the pelvis, the base of the sacrum is nearly 4 inches higher than the upper border of the pubic symphysis. The female Pelvis is distinguished from the male by certain sexual characters. The bones are more slender, the ridges and processes for muscular attachment more feeble, the breadth and capacity greater, the depth less, the ilia more expanded, giving the greater breadth to the hips of a woman than a man ; the inlet more nearly circular, the pubic arch wider, the distance between the tuberosities greater, and the obturator foramen more triangular in the female than in the male. The greater capacity of the woman's than the man's pelvis is to afford greater room for the expansion of the nterus

during pregnancy, and for the expulsion of the child at the time of birth.

The Femur or Thigh-bone (Fig. 11) is the longest bone Femur.

in the body, and consists of a shaft and two extremities. The upper extremity or head possesses a smooth convex surface, in which an oval roughened fossa, for the attachment of the inter-articular ligament of the hip, is found; from the head a strong elongated neck passes downwards and out- wards to join the upper end of the shaft; the place of junction is marked by two processes or trochanters: the external is of large size, and to it are attached many muscles; the internal is much smaller, and gives attach- ment to the psoas and iliacus. A line drawn through the axis of the head and neck forms with a vertical line drawn through the shaft an angle of 30°; in a woman this angle is less obtuse than in a inan, and the obliquity of the shaft of the femur is greater in the former than in the latter. The shaft is almost cylindrical about its centre, but expanded above and below ; Its front and sides give origin to the extensor muscles of the leg; behind there is a rough ridge, which, though called linea aspera, is really a narrow surface and not a line; it gives attachment to several muscles. The lower end of the bone presents a large smooth articular surface for the knee joint, the anterior portion of which forms a trochlea or pulley for the movements of the patella, whilst the lower and posterior part is subdivided into two convex condyles by a deep fossa which gives attachment to the crucial ligaments of the knee. The inner and outer surfaces of this end of the bone are rough, for the attachment of muscles and the lateral ligaments of the knee.

The Patella or Knee-pan (Fig. 11) is a small triangular Patella.

flattened bone developed in the tendon of the great extensor muscles of the leg. Its anterior surface and sides are rough, for the attachment of the fibres of that tendon ates posterior surface is smooth, and enters into the formation of the knee-joint.

Between the two bones of the leg there are no move- ments of pronation and supination as between the two bones of the fore-arm. The tibia and fibula are fixed in position; the fibula is always external, the tibia internal.

The Tibia or Shin-bone (Fig. 11) is the larger and Tibia.

more important of the two bones of the leg; the femur moves and rests upon its upper end, and down it the weight of the body in the erect position is transmitted to the foot. Except the femur, it is the longest bone of the skeleton, and consists of a shaft and two extremities. The upper extremity is broad, and is expanded into two tuber- osttves, the external of which has a small articular facet inferiorly, for the head of the fibula; superiorly, the tuber- osities have two smooth surfaces, for articulation with the condyles of the femur ; they are separated by an intermediate rough surface, from which a short spine projects, which gives attachments to the inter-articular crucial ligaments and semilunar cartilages of the knee, and lies opposite the inter- condyloid fossa of the femur. The shaft of the bone is three-sided ; its inner surface is subcutaneous, and forms the shin; its outer and posterior surfaces are for the origin of muscles; the anterior border forms the sharp ridge of the shin, and terminates superiorly in a tubercle for the inser- tion of the extensor tendon of the leg; the outer border of the bone gives attachment to the inter-osseous membrane of the leg. The lower end of the bone, smaller than the upper, is prolonged into a broad process, internal malleolus, which forms the inner prominence of the ankle: its under surface is smooth for articulation with the astragalus ; exter- nally it articulates with the lower end of the fibula.

The Fibula, or Splint-bone of the leg (Fig. 11), is a Fibula.

slender long bone with a shaft and two extremities. The upper end or head articulates with the outer tuberosity of

Foot.

Tarsus.

Toes,

the tibia. The shaft is three-sided, and roughened for the origins of muscles; along the inner surface is a slender ridge for the attachment of the imterosseous membrane. The lower end has a strong process (external malleolus) projecting downwards to form the outer prominence of the ankle, and possesses a smooth inner surface for articulation with the astragalus, above which is a rough surface for the attachment of ligaments which bind together the tibia and fibula.

The Foot consists of the Tarsus, the Metatarsus, and the five free Digits or Toes, which is the maxinum number found in mammals. The human foot is placed in the prone position, with the sole or plantar surface in relation to the ground ; the dorsum or back of the foot directed upwards ; the axis of the foot at about a right angle to the axis of the leg ; and the great toe or hallux, which is the corresponding digit to the thumb, at the inner border of the foot. The human foot, therefore, is a pentadactylous, plautigrade foot.

The boncs of the Tarsus, or Ankle (Fig. 11, Tr), are seven in number, and are arranged in two transverse rows,—a proximal, next the bones of the leg, consisting of the astragalus, os calcis, and scaphoid; a distal, next the metatarsus, consisting of the cuboid, ecto-, meso-, aud ento-cuneiform. If the tarsal bones be looked at along with those of the metatarsus aud toes, the bones of the foot may be arranged in two longitudinal columns,—an outer, consisting of the os calcis, cuboid, and the metatarsal bones and phalanges of the fourth and fifth toes ; an inner column consisting of the astragalus, scaphoid, three cunei-form, aud the metatarsal bones and phalanges of the first, second, and third toes. The tarsal, like the carpal bones, are short and irregularly cuboidal; the dorsal and plantar surfaces are as a rule rough for ligameuts, but as the astragalus is locked in between the boues of the leg and the os calcis, its dorsal and plantar surfaces, as well as the dorsum of the os calcis, are smooth for articu- lation; similarly, its lateral surfaces are smooth for articulation with the two malleoli. The posterior surface of the os calcis projects backwards to form the prominence of the heel. With this exception, the bones have their anterior and posterior surfaces smooth for articulation. Their lateral surfaces are also articular, except the outer surface of the os calcis

and cuboid, which form the outer border ; aud the inner surfacc of the os calcis, scaphoid, and ento-cuneiform, which form the inner border of the tarsus. A supernumerary bone is sometimes found in the human tarsus, from a subdivision of either the ento-cunei- form, astragalus, os calcis, or cuboid into two parts. In some rodents and other mammals eight is the normal number of bones in the tarsus.

The Metatarsal bones and the Phalanges of the toes agree in number and general form with the metacarpal bones and the phalanges in the hand. The bones of the great toe or hallux are more massive than those of the other digits, and this digit, unlike the thumb or pollex, does not diverge from the other digits, but lies almost parallel to them.

Development and Homologies of the Skeleton.

It will now be advisable to consider briefly the mode of develop- ment of the skeleton, and along with the study of its genesis to compare its several parts with each other, in order to ascertaiu if correspondences in their arrangement and mode of origin exist, even if they differ in the function or office which they perform. When two or more parts or organs correspond with each other in structure, relative position, and mode of origin, we say they are homologous parts, or homologucs; whilst parts which have the same function, but do not correspond in structure, relative position, and mode of origin, are analogous parts, or analogues. Homologous parts have therefore a morphological identity with each other, whilst analogous a have a physiological agreement. The same parts may be oth homologous and analogous, as the fore-limbs of a bat and a

bird, both of which, with the same fundamental type of structure, are subservient to flight. In other cases analogous parts are not homologues, as is illustrated by the wing of the insect, which, though subservient to flight, is fuudamentally different in structure from the wing of the bat or bird.

In the germinal area of the fertilised vertebrate ovum a longitudi- nal groove appears which marks the beginning of the cranial cavity and spinal eanal of the youngembryo. At the bottom of this cranio- spinal groove a slender rod is formed, called chorda dorsalis or ioto- chord. Each side of the groove then becomes elevated as a thin mem- brane, to nect behind to enclose a canal in which the brain and spinal marrow are developed. Small dark masses, the primordial or proto-vertebree, next form on each side of the chcrda dorsalis. In these proto-vertebree, about the sixth or seventh week of intra-uterine life of the human ovum, little masses of cartilage appear, which correspond in number and position to the future spinal vertebre. The part of the cartilage which forms the body of the future vertebra is developed around the chorda dorsalis, which it encloses in its substance, whilst the cartilaginous neural arch forms in the mem- brane which closes in the spinal canal. The formation of these cartilaginous vertebree is completed in the human embryo about the fourth month of intra-uterine life. The bodies of the cartilaginous vertebre are connected together by plates or discs of intervening fibro-cartilage, which are also developed around the chorda dorsalis. After the euclosure of the rod-like chorda by the cartilaginous vertebre and the inter-vertebral discs it disappears, no remains being found in the adult human body, or in that of the higher vertebrates, except perhaps some slight traces in the soft pulpy centres of the inter-vertebral discs ; although in the cartilaginous fish it remains as a more or less eomplete structure throughout life.

In each of the cartilaginous vertebre bone begins to form and to spread beyond its original point of formation, which is called a centre or nucleus of ossification; the greater part of the body is formed from one of these centres, and each half of the neural arch from another; whilst small ossific centres arise for the tips of the spinous, transverse, and mammillary processes, and a special plate appears for both the upper and lower surfaces of the body; the fusion of the various centres together to form a complete vertcbra takes place between the twentieth and twenty-fifth year. The atlas has a separate centre for each latcral mass and one for the anterior boundary of the ring. The axis, in addition to the ossific centres found in the vertebrae generally, has one

or two for the odontoid process. The seventh cervical vertebra has the anterior bar of its transverse process developed from a separate centre. Each coecygeal vertcbra possesses only a single centre, which represents the body of the bone.

At the time when the cranio-spinal canal is being closed in by the development of its membranous walls, the germinal layers of the young embryo grow towards its anterior or ventral surface, and niect in the ventral mesial line, so as to enclose the cavities in whieh the thoracic andabdominal viscera are developed. In the membranous wall on each side of the thoracic cavity twelve cartilaginous rods, the future ribs, are developed ; and, connected with the anterior ends of the seven pairs of upper ribs, the cartilaginous sternum is formed. Each rib ossifies from one centre for its shaft, and one each for the head and tubercle. The sternum ossifies in transverse segments,— one for the pre-sternum, one or sometimes two for each of the four subdivisions of the meso-sternum, and one for the xiphi-sternum. The complete ossification and fusion of the different parts of the sternum into a single bone does not take place until an advanced age.

The axial part of the skeleton, formed by the vertebre, ribs, and sternum, is built up of a series of thirty-three transverse segments, equal in number, therefore, to the bones of the spine; so that each vertebra, according as it is, or is not, articulated with a pair of ribs and a segment of the sternum, constitutes a complete or incomplete transverse seginent. These several segments are serially homologous with each other, but the homology is not so complete in some of the segments as in the others. In the coccygeal, saeral, and lumbar regions of man and most vertebrates, only the verte- bral portion of each skeletal segment is represented, though in the abdominal wall of the crocodiles abdominal ribs and a sternum are developed. In the thoracic region the five lowest dorsal vertebra have five pairs of ribs devcloped in connection with them ; whilst the seven highest vertebr have not only their corresponding pairs of ribs, but also a sternum, which bone, however, has only six trans- verse segments. In the cervical region seven vertcbre are found, but the anterior bar of the transverse process, although fused with the vertebral body, is

homologous with a rib, for in man it some- times develops as a distinct movable rib in connection with the seventh cervical; and in the crocodiles small movable ribs are regularly developed in connection with the different cervieal verte- brie. The bodies and neural arches of the vertebre are serially homologous with each other; as a rule this is also the case with their processes, but the articular processes of the atlas and the superior pair of the axis, although functionally analogous, are not homologous with the articular processes of the other vertebra, but with the articular surfaces for the ribs on the bodics of the dorsal

vertebra, for they lie in front of, and not behind, the vertebral The

development of the odontoid process of the axis shows it to be the

notches through whieh the spinal nerves are transmitted.

body of the atlas displaced froin its proper bone and fused with the body of the axis.

The development and homology of the skull is a much more difficult problem to solve than that of the spine. dorsalis extends aloug the floor of the skull as far forward as the posterior wall of the pituitary fossa. Cartilage is formed around it, without, however, the previous production of proto-vertebre, and this cartilage is prolonged forward on each side of the fossa, forming two bars, the trabecule cranii; these bars then unite, and form the mes-ethmoid cartilage; at the same time the eartilage grows out- wards for some distance in the membranous wall of the skull, but it does not mount upwards so as to close it in superiorly, so that the cartilage is limited to the floor of the skull ; moreover, the cartilage is not segmented. The roof, side walls, and anterior wall of the cranium retain fora time their primordial membranous struc- ture. This membrane is prolonged downwards into the face proper, where it forms a pair of maxillary lobes or processes, whieh pass forwards beneath the eyes to form the side parts of the face, and a mid- or frontal-nasal process, into which the cartilaginous

mes- ethmoid extends. Immediately below each maxillary lobe four arches, called branchial or visceral, arise in the ventral aspect of the head, and in each of the three first of these arches a rod of eartilage is formed. The arches on opposite sides unite with each other in the ventral mesial line, but those on the same side are separated from each other by intermediate branchial clefts; these clefts all close up in course of time, except the upper part of the first, which remains as the external meatus of the ear, the tympanum, and the Eustachian tube; whilst the interval between the first visceral areh and the maxillary lobes forms the eavity of the mouth. The eon- version of the primordial cartilaginous and membranous cranium into the bones of the head takes place by the formation in it of numerous centres of ossification. The basi-, ex-, and so much of the supra-occipital as lies below the superior curved line, are formed from distinet centres in the cartilaginous floor of the skull; whilst the part of the supra-occipital above the curved line arises from independent ecntres in the membranous cranium, the whole ulti- mately fusing together to form the oecipital bone. The basi- or post-sphenoid, the pre- with the orbito-sphenoids, the ali-sphenoid with the external pterygoid and the internal pterygoid, also arise in the eartilaginous floor, and they, together with the sphenoidal spongy bones which are formed in the membranous cranium, fuse into the sphenoid bone. The palate is apparently formed by ossifica- tion of cartilage continuous with the bar in which the internal pterygoid arises. The central plate and each lateral mass of the ethmoid also arise in the cartilage by distinct centres. The inferior turbinal has also a distinct origin in cartilage. The petro-mastoid part of the temporal arises in cartilage from at least three centres, peri-, pro-, and opisth-otie, and soon blends with the squamous and tympanic elements which arise in the membranous eranium ; subsequently the styloid process, which is ossified in the rod of eartilage in the second visceral arch, joins the temporal. The lower end of this same rod forms the lesser cornu of the hyoid; the upper end forms two small bones, the stapes and incus, situated within

the cavity of the tympanum. The cartilage of the third visceral |

arch forms the great eornu and body of the hyoid bone. The name of Meckel's eartilage is applied to the rod found in the first visceral arch ; its upper end is ossified into the malleus, a small bone situated in the tympanie cavity; whilst in the membrane sur- rounding the rest of the cartilage the lower jaw-bone is formed. The parietal and frontal bones arise altogether in the membranous vault ; and the nasal, lachrymal, malar, and superior maxille arise in connection with the bones which form the face; the vomer is developed in the membrane investing the mes-ethmcid cartilage. The human superior maxilla represents not only the superior maxilla of other vertebrates, but the pre-maxillary bone also; but the two bones become fused together at so very early a period that it is difficult to recognise their original independence. In the deformity of hare-lip and cleft palate, they are not unfrequently separated by a distinct fissure.

Since the time when Oken and Goethe propounded the theory that the skull was built up of several vertebra, the vertebral struc- ture of the skull las led to much discussion amongst anatomists. Every one admits that the skull is in series with the spine, that the cranial cavity is continuous with the spinal canal, and that the cranial vault is formed in the wall of the embryonie cerebro-spinal eanal, The skull also, like the spine, is transversely segmented, but whether we regard these segments as vertebre or not will depend upon the conception we entertain of the meaning of the term vertebra. If with Owen we define a vertebra to be "one of those segments of the endo-skeleton which eonstitute the axis of the body and the protective canals of the nervous and vascular trunks," then we may support the vertebral nature of the cranial Segments on the following grounds :—I1st, The presence of a series of bones extending forwards from the foramen magnum along the

basis cranii, in series with the bodies of the spinal vertebr: J. the basi-oecipital, basi-sphenoid, pre-sphenoid, hies-ethmoid (Fig, Ay 2d, The presence of a series of neural arches which enclose and complete the wall of the cranial cavity, and lie in series with the neural arches of the spinal vertebre,—e. g., the ex- and supra-occi- pitals, which form the neural arches of the basi-oceipital scgment ; the ali-sphenoids and parietals, which form the neural arches of the basi-sphenoid segment ; the orbito-sphenoids and frontal, which form the neural arches of the pre-sphenoid segment ; 3d, The presence of a series of visceral arches of which the mandibular and hyoidean enclose the alimentary and vascular canals, just as the ribs enelose them in the thorax ; and 4th, The presence of foramina between the cranial segments like the inter-vertebral foramina between the spinal vertebre for the transmission of nerves, —e.g., the sphenoidal fissure and the jugular foramen.

But if we are to regard a vertebra as a segment of the axial skeleton, which in course of its formation passes through a definite serles of developmental changes, then the cranial segments cannot be regarded as vertebree in the sae sense as the spinal segments ; for, 1st, The chorda dorsalis is not co-equal in length with the basis cranii, as with the bodies of the spinal vertebre, so that if the basi-occipital and basi-sphenoid segments, the bodies of which are developed around it, were to be regarded as cranial vertebrae, the pre-sphenoidal and ethmoido-nasal would not be morphologically the same, as they are formed in front of the anterior end of the chorda. 2d, Proto-vertebre are formed in the spine, but not in the basis cranii. 8d, The spine is transversely segmented in its cartilaginous stage of development, but the skull is not. 4th, The transverse Segmentation of the skull only appears when the bones are formed, but the individuality of the segments becomes again eoneealed by the fusion of the pre- and basi-sphenoids and the basi-oeeipital into a eontinuous bar of bone, a eondition which is not found in the spine exeept in the sacro-coccygeal region. 5th, The neural arches in the spine are, like the bodies, ossified in cartilage, but in the cranium they are for the most part ossified in membrane. These differences in the mode of development of the spine and basis cranii may be summarised as below :—

Spine.

Ist Stage, 2d Stage, 3d Stage, 4th Stage, Unsegmented Proto-vertebree. Segmented Segmented ehorda. cartilage, bones, Basis Cranit. 1sé Stage, 2d Stage, 3d Stage, 4th Stage, Unsegmented Unseginented Segmented Unsegmented

chorda in part. cartilage. bones, Lones.

It is evident, therefore, that, although both skull and spine are developed in the walls of the cerebro-spinal groove, yet, to quote the words of Huxley, 'though they are identieal in general plan of construction, the two begin to diverge as soon as the one puts on the special character of a skull and the other that of a – vertebral eoluinn ; the skull is no more a modified vertebral eolumn than the vertebral column isa modified skull."

The limbs, at thcir first appearance, sprout like little buds or lappets from the sidcs of the trunk ; cartilage forms within them, which assumes the shape of the future bones, and as the limbs grow outwards, nianifestations of joints appear, and the subdivision of each limb into its several segments takes place. The elaviele, whieh ossifies before any of the other bones, begins to form, how- ever, in fibrous membrane; and at a mucli later period the ends of the bone, which are formed in cartilage, unite with the intermediate shaft. The scapula ossifies from one centre for its expanded plate and spine, two small centres each for the acromion and vertebral border, and one for the eoracoid. In many vertebrates, more espe- cially birds and reptiles, the eoracoid is a distinet bone from the scapula, but they articulate with each other to form the glenoid fossa, Lach of the threc rod-like bones of which the innominate bone is composed, ossifies from one centre for the shaft of the bone, and one for each extremity ; in the ilium these terminal eentres are situated at the crest and acetabulum ; in the ischium, at the tuber and acetabulum ; and in the pubis, at the symphysis aud acetabu- lum. Each of the long bones of the shafts of the limbs ossifics from a single centre for the shaft, and one or more eentres for each articular extremity. Each earpal and tarsal bone ossifies from a single centre, except the os calcis, which possesses an

independent eentre for its posterior surface. The metacarpal and metatarsal bones and the phalanges ossify each from two centres, one for the shaft and one for one of the extremities. In the metacarpal bones of the fingers and the four outer metatarsals, the distal end is that which ossifies independently ; in the metacarpal of the thumb, in the meta- tarsal of the great toe, and in all the phalanges, the proximal end is that which ossifies independently. As the method of ossification of the first metacarpal and first metatarsal corresponds with that of the phalanges, some anatomists hold that these boues are really the first phalanges of their respective digits, and that the bone which is absent in these digits, when eompared with the other digits, is not a phalanx, but a meta-carpal or tarsal bone. When the extremity

of a bone ossifies from a eentre distinct from the eentre from which the shaft arises, it is called an epiphysis. The epiphysis is united to the shaft of the growing bone by an intermediate plate of cartilage, and so long as any of this eartilage remains unossified the bone can eontinue to grow in length. The ossification is not completed in the different bones until from the twentieth to the twenty-fifth year. In the case of the long bones, the epiphysis situated at the end of the bone, towards whieh the eanal in the shaft which trans- mits the nutrient artery is directed, ossifies to the shaft before the epiphysis at the other end. In the humerus, tibia, and fibula, where the eanal is directed downwards, the epiphyses at the lower ends of the bones first unite with the shaft; whilst in the femur, radius, and ulna, where the eanal is directed upwards, the ossifiea- tion first takes place between the upper epiphysis and the shaft. All anatomists hold that the bones of the shaft and distal part of a limb belong to the appendieular part of the skeleton, but there is a differenee of opinion as to the place in the skeleton to which the bones of the shoulder girdle and hauneh are to be referred. Owen eonsiders that the seapular and pelvie arehes belong to the axial skeleton, and are homologous with the ribs ; the seapula and coracoid as the viseeral or rib-areh of the oeeipital

vertebra, the elaviele of the atlas, and the innominate bone of the upper sacral vertebra. Goodsir objected to this eonelusion of Owen's on the ground that the shoulder girdle was not in series with the visceral arehes, but was developed outside the viseeral wall, at the junction of the eervical and thoracie regions, from which region the upper limb reeeives its nerves, and not from the occipito-atlantal region, whence they would have proceeded had it been an appendage of the rib-arches of those segments. Owen's ehief argument for regarding the seapula and eoracoid as the eostal arch of the occi- pital vertebra is because in fish the seapula is attached to the oeeipital bone by a bone which Cuvier ealled the supra-seapula, and which he believed to be homologous with the supra-seapular cartilage of many other vertebrates. Parker, however, has recently pointed out that the so-called supra-scapula of a fish is not homolo- gous with the supra-seapula of a reptile or mammal, that it is not a eartilage bone, but is a splint or scale-like bone, developed as a part of the dermo-skeleton. Between the seapula and coracoid and the innominate bone, anatomists have long reeognised homologies to exist ; the seapula is generally admitted to be the homotype of the ilium and the eoracoid of the isehinm, so that if these elements of the shoulder girdle be not a eostal arch, neither ean those of the pelvie girdle. The clavicle has by some been re- garded as the homotype of the pubis; but in all probability the pubis is homologous with the procoracoid bone which is found in the amphibia and some reptiles, but is absent in crocodiles, birds, and mammals; whilst the elaviele is represented in the pelvie girdle, not by a bone, but by a fibrous band ealled Poupart's ligament. Between the bones of the shafts of the limbs homologies exist : the humerus is the homotype of the femur, the radius of the tibia, the ulna of the fibula ; whilst the patclla has no representative in the human upper limb. The scaphoid and semilunar bones in the carpus are homotypes of the astragalus in the tarsus, the cunei- form is the homotype of the os caleis, the euboid of the uneiform ; the trapezium of the ento-cuneiform, the trapezoid of the meso-, and the os magnum of the ecto-cuneiform. The tarsal seaphoid is not, as a rule, represented in the human carpus, but its homotype is the os intermedium, found in many mammals. The earpal piseiform is a sesamoid bone developed in the tendon of a muscle. The metacarpal bones and phalanges are

homologous with the metatarsal bones and phalanges ; the thumb with the great toe, and the fingers with the four outer toes. During the growth of the limbs outward, and their change from the simple lappet-like form to their elongated condition, a rotation of the proximal segment of the shaft takes place—that of the upper limb a quarter of a cirele baekward, that of the lower limb a quarter of a eirele forward—to produce in the former ease a supine position of the fore-arm and hand, with the thumb as the outermost digit; in the latter ease, a prone eondition of the leg and foot, with the great toe as the inner- most digit. The range of movement at the radio-ulnar joints enables us, however, to pronate the hand and fore-arm by throwing the radius across the ulna, so as to make the thumb the innermost digit. In many quadrupeds the fore-leg is fixed in this position, so that these animals walk on the soles of both the fore and hind feet.

GENERAL OBSERVATIONS ON THE ARTICULATORY AND MuscuLaR SYSTEMS.

A Joint or ARTICULATION is the junction or union of any two adjacent parts of the body. Most usually the term is employed to signify the connection established between contiguous bones. It is by the joints that the various bones are knit together to form the skeleton. Joints may be either emmovable or movable.

The immovable joints are divided into the synchondroses

ANATOMY

[JOINTS AND

and the sutures.

cartilage, the fibrous membrane or periosteum which invests the bones being prolonged from one bone to the other over the surface of the cartilage. connection of two boues by the interlocking of adjacent toothed margins; the periosteal fibrous =

membrane is prolonged from one bone to the other, and is also Fig. 12 —Vertical section through in 7 : a cranial suture. 6,6, the two terposed between their adjacent 5 .ncs: s, opposite the sutures 2 margins. In a young skull the the fibrous membrane, or peri- a4 ee : : osteum, passing between the basi occipital and basi-sphenoid fwo bones, which playe' the part are united by synchondrosis, but of 4 ligament, and which is é ; : # continuous with the interposed junction by sutures is the mode fibrous membrane. of union which prevails in the bones of the head. In .old persons the sutures become obliterated by the ossification of the intermediate fibrous membrane, —— and the bones are permanently fused 262332 together. The cranial sutures may con- 2 veniently be arranged in three groups: = a, Median longitudinal, consisting of Fi. 13.—Verticalsee- the tal t tach ie tion through a syn- e frontal suture, which connects the chondrosis. 6, 6, the two halves of the frontal bone, and the [¥° bones: Sa the

: interposed _ cartil- sagittal suture, between the two parietal age; 4, the fibrous : o fs ° membrane which bones ; 0, Lateral longitudinal, consist- plays the part of a ing on each side of the head of the ligament.

fronto-nasal, fronto-maxillary, fronto-lachrymal, fronto- ethmoidal, fronto-malar, frouto-sphenoidal, parieto-sphe- noidal, parieto-squamous, parieto-mastoid sutures; c, Verti- cal transverse, consisting of the coronal or fronto-parietal, the lambdoidal or parieto-occipital, the sphenoido-malar, sphenoido-squamous and occipito-mastoid sutures. As the skull grows by ossification of the cartilage of the base and the membranous vault, the direction of growth is perpendicular to the margins of the bones and the sutures and synchondroses which connect them to- gether. The growth of the skull in length is perpen- dicular, therefore, to the basi-cranial syn- chondrosis and the vertical transverse group of sutures; its growth, in breadth, to the median longi- tudinal group, and in height to the lateral longitudinal group. So long as any of the cartilage or membrane be- tween the margins of the bones remains unossified, bone may continue to form, and the skull may in- crease in size, It sometimes happens that the cartilage or membrane is pre- maturely ossified in a particular locality, and the

further Fig. 14.—Vertex view of a boat-shaped or scapho- growth of the skull cephalic skull, showing the complete disappear- put a stop to in that ®¢e of the sagittal suture.

region; if the brain is still growing, the skull must increase in other directions to permit of the expansion of the cranial cavity, and deformities of the skull are thereby occasioned. One of the most usual of these deformities 18 due to premature closure of the sagittal suture, causing

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| yi; y

_ A synchondrosis is the junction of two Synchon- bones by the interposition of an intermediate plate of roses.

A suture is the Sutures,

4

Amphiar- throses.

Diar- throses.

disc is soft, or may even be

MUSCLES. |

cranium,

The movable joints are divided into the amphiarthrodial An amphiarthrosis or half-

and the diarthrodial joints.

joint has only a feeble range of WRC ay ao ee : : : – Pee. Meas sang movement. It consists of two [f/ AS ana eeco an Ie bones, each of which has its h pO OC ae

articular surface covered by af plate of cartilage, and which |} plates are firmly connected to- \ gether by an intermediate disc of ||

fibro-cartilage, The centre of this Fie. 15.—Vertical section through an amphiarthrodial joint, b, b, the two bones; c, c, the plate of cartilage on the articular sur- face ofeach bone; Fe, the inter- mediate fibro – cartilage; 1, J, the external ligaments,

hollowed out into a cavity, lined by a smooth synovial membrane, and containing a little fluid. Ligamentous bands, continuous with the periosteum invest- ing the bones, invest the fibro-cartilage, and assist in bind- ing the bones together. arthrodial joints are furnished by the articulations between the bodies of the true vertebrae.

A diarthrosis admits of more or less perfect movement. In it the two articular surfaces are each covered by a plate of encrusting cartilage, the free gore: surface of which is smooth and sili polished ; between these surfaces is a cavity containing a glairy

Teg wh Vi ‘

two spaces,

Fi¢.17.—Vertical section through a diarthrodial joint, in which the cavity is subdivided into two by an interposed fibro-car- tilage or meniscus, Fc. The

age and facilitating the movements | (ae)

attached to the bones, and the ehh which secretes the synovia. Some- FiG.16.—Vertical sectionthrongh

cartilage on the articular sur- without, however, being attached

line within which represents less perfectly to subdivide the of the joint.

The apposition with each other, some- tendons; at others by atmospheric The form of the articular or mov- joints, and the

*modifications in some, as the carpal and tarsal the movement i ivel paeeel * ahem ai y other letters as in Fig. 16.*

surfaced joints. In other joints the articular surfaces may are called rotation joints, and they present various modifica-

fluid, the synowa, for lubricating of the joint. This cavity is en- | {pipe fi ; : WY es Inner surface of these ligaments ihe times a plate or meniscus of fibro- diarthrodial joint. , 6, the face of each bone; J, J, the in- to the encrusting cartilages of a the synovial membrane. The cavity enclosed by the ligaments into times by investing ligaments, at pressure, aided by the adhesive able surfaces varies very materi- | form determine the direction of joints, the surfaces are almost flat, slight, and about an axis perpen- be regarded as produced by the rotation of a straight or tions according to the direction and relation of the rotat-

the smooth surfaces of the cartil- i x

closed by ligaments, which are { Tae bie

is lined by a synovial membrane

cartilage is interposed between, omen sy Tho gine plate of vesting ligament, the dotted

diarthrodial joint, so as more or letter s is placed in the cavity

articular surfaces of diarthrodial

others by surrounding muscles and

character of the interposed synovia.

ally in different examples of these

the movements of the joints. In

so that they glide on each other ”

dicular to the moving surfaces: these are called plane-

curved line about an axis lying in the same plane; these

ing line to the axis. One form of a rotation joint is the

stoppage of the growth of the skull in breadth, and, by way of compensation, great increase in its length, so as to produce a very elongated and somewhat boat-shaped

The best examples of am phi-

prot jomt, in which the movement takes place about the axis of one of the bones, which is the axis of rotation of the joint ; examples of this joint are found in the joint between the atlas and odontoid process of the axis and the radio-ulnar joint. Another form is the ginglymus or hinge joint, in which the axis of rotation of the joint is perpendicular to the axis of the. two bones ; the move- ments of the hinge are called flexion when the angle between the two bones is diminished, and extension when the angle is increased. An important modification of the ginglymus is the screwed-surfaced joint, examples of which are found in the elbow and ankle ; here the plane of flexion is uot perpendicular, but oblique to the axis of the jot. The saddle-shaped and oblong joints are also modi- fied hinges, but allow motion about two axes; in the oblong both axcs are on the same side of the joint ; but in the saddle-shaped there is an axis of rotation on each side of the joint. The best example of the saddle-shaped is found between the metacarpal bone of the thumb and the trape- zium; of the oblong between the fore-arm and the carpus. In the ball-and-socket joint a spheroidal head fits into a cup, and rotation takes place about any diameter of the sphere; the joint therefore is multi-axial; the hip and shoulder joints are the best examples. Some joints, in which the forms of the articular surfaces are more complex, are called composite; in them the movements of a hinge and of a ball-and-socket joint may be

combined; the knee may be cited as an example of this form of articulation. In a large number of movable joints only portions of the opposite articular surfaces are in contact with each other at a given time ; but, as the joint describes its path of movement, different parts of the surfaces come into contact with each other successively, and it is not unusual to find the articular surface both of the cartilage and the sub- jacent bone mapped out into distinct areas or facets, which are adapted to corresponding facets on the opposite arti- cular surface in particular positions of the joint. When the corresponding facets on opposite articular surfaces break contact with each other, the space between becomes occupied by synovia,: or in some joints, more especially the knee, by folds of synovial membrane enclosing clumps of fat, which have been called synovial pads. In the simple hinge, in that with screwed surfaces, in the oblong and composite joints, the principal ligaments are situated at the sides of the joint, and are called lateral ; they not only prevent lateral displacement of the bones, but, by a tightening of their fibres, check excessive movement for- wards or backwards during flexion and extension. In the saddle-shaped and ball-and-socket joints, the joint is in- cluded within a bag-like ligament called capsular. In the pivot joints the cavity in which the pivot fits is completed by a transverse or a ring-shaped ligament. The Muscuxs are the organs which, by their contraction Muscles or shortening, move the bones on each other at the joints. The niuscles constitute the flesh of the body. They are so arranged as to be capable not only of moving the various bones on each other, but the entire body from place to place. Hence the muscles are organs both of motion and locomotion. As they can be brought into action at the will of the individual, they are called voluntary muscles. Some of the muscles are engaged in the movement of other structures than the bones, such as the eye-ball, tongue, cartilages of the larynx, &c. About 400 muscles are usually enumerated, and the names applied to them express either their position, or relative size, or shape, or direction, or attachments, or mode of action. The word muscle is itself derived from the Latin musculus, a little mouse, from a fancicd resemblance between that animal and some of the most simply formed muscles. It is customary to dis- tinguish in a muscle a central part, or py and two ex- .— 105

tremities, one of which is the head or the origin, the other the insertion. The belly is the fleshy part of the muscle, and possesses a deep-red characteristic colour; it is the active contractile structure, the source of motor power. The two extremities are called the tendons of the muscle, or sinews; the tendons are bluish- white in colour, possess no power of contractility, and are merely, as it were, the ropes by which the belly of the muscle is attached to the bone or other structure which is moved by its contraction. The term tendon of origin, applied to one extremity of the muscle, signifies the fixed end of the muscle, that to which it draws during its contraction; as a rule this is the end nearest the trunk, the proximal end. The term tendon of insertion is applied to the end which is moved by the contraction; as a rule this is the end most removed from the trunk, the distal "end. Entering the sub- stance of each muscle is at least one artery, which conveys blood for its nutrition; this artery ends in a net- work of capillary blood-vessels, from which a vein arises and conveys the blood out of the muscle again; an- other small vessel, called a lymphatic, also arises within the muscle, and conveys the fluid lymph out of the muscle. Each musele also is pene- trated by a nerve, through which it is brought into connection with the brain, so as to be subject to the in- fluence of the will. The will is the natural stimulus for exciting muscular action, which action is in many cases so rapid that scarcely an appreci- able interval of time intervenes be- tween willing and doing the action. The bones form a series of rod-like levers, and, in study- ing the mode of action of the muscles, the place of inser- tion of the muscle into the bone—that is to say, the point of application of the power which eauses the movement— and its relations to the joint, or fulcrum, or centre of motion, and to the weight or resistance which is to be overcome, have to be kept in view. The relative positions of ful- crum, point of application of power, and resistance, are not the same in all the bony levers. As a rule, the muscles are inserted into bones between the fulerum and the move- able point of resistance, and nearer the fulerum than the movable point, as may be seen in the museles which bend the fore-arm at the elbow-joint. Although from the weight- arm of the lever being in these eases much longer than the power-arm, the muscles, as

regards the application of the power, act at a disadvantage, yet the movement gains in velocity. Sometimes the muscle is inserted, as is the case in the great muscle which straightens or extends the fore-arm, at one end of the lever, and the fulcrum or joint is placed between it and the movable point. At other times, as in the ease of the ehief depressor muscle of the lower jaw, whilst the muscle is attached to one end of the lever, the fulerum is at the opposite end. When a musele is so placed that its tendon of insertion is perpen- dicular to the bone to which it is attached, it acts to great advantage; when placed obliquely or nearly parallel, a loss of power occurs. Many muscles at the commencement of contraction lie obliquely to the bones which they move,

Fic. 18.—The rectus muscle of the thigh; to show the constituent parts of a muscle. R, the fleshy belly; to, tendon of ori- gin; ¢2, tendon of inser- tion; n, nerve of supply ; a, artery of supply; 2, vein; 1, lymphatic vessel ; P, the patella. :

but as contraction goes on they become more nearly per- pendicular, so that they act with more advantage near the close than at the commencement of eontraction. If a

‘muscle passes over only one joint, it acts on that joint only;

but if it passes over two or more joints, it acts on them in succession, beginning with the joint next the point of insertion. A given movement may be performed by the contraction of a single muscle, but as a rule two or more muscles are associated together, and they are not unfre- quently so arranged that one muscle initiates the move- ment, which is then kept up and completed by the rest. Muscles producing movement in one direction have opposed to them muscles which by their contraction effect the opposite movement; when both groups act simultaneously and with equal force, they antagonise each other, and no motion is produced; when a muscle is paralysed or divided, its antagonistic muscle draws and permanently retains the part to its own

side. The rapidity of action of a muscle is proportioned to the length of its fasciculi, its power of contraction to their number.

Each muscle is invested by a sheath formed of connective tissue. In the limbs and in the neck not only has each muscle a sheath, but a strong fibrous membrane envelopes the whole of the museles, and assists materially in giving form and compactness to the region. Thismembrane is called generally a fascia or aponeurosis, but special descriptive names are given to it in the different regions—e.g., cervical fascia, brachial aponeurosis, fascia lata, or fascia of the thigh. In some localities muscles arise from the faseia, and in others they are inserted into it. The fascia is separated from the skin by a layer of subcutaneous fatty tissue, and in this layer muscles are in some loealities de- veloped. In the fat of the inner border of the palm of the hand a small muscle, the palmaris brevis, is found, which is inserted into the skin covering the ball of the little finger ; at each side of the neck, also, lies a thin muscle called platysma myoides, and the muscles on the face and scalp which move the skin of the face and head belong to the same category. These muscles form the group of sub- cutaneous or dermal muscles which, except in the localities above referred to, are not represented in the human body, but are well known in the bodies of the mammalia gene- rally as the panniculus carnosus.

In arranging the muscles for deseriptive purposes, either a morphological, a topographical, or a physiological method may be pursued. The morphological arrangement is to be preferred when the object is to compare the muscular system in man with that in different animals, and the basis of the arrangement should be into museles of the axial, the appendicular, and the axi-appendieular skeletons, and sub-cutaneous muscles; a topographieal arrangement is most suitable for the purposes of the practical surgeon ; a physio- logical arrangement, when the object is to study the action of the muscles in connection with the movements of the joints. In Plates XV. and XVI., a front and back view of the voluntary muscles of the body is given.

JOINTs AND MUSCLES OF THE AXIAL SKELETON.

The Intervertebral Joints are complex in construction. The bodies of the true vertebrae are connected together by an amphiarthrodial joint: the fibro-cartilaginous plate or intervertebral dise is tough and fibrous in its peripheral part, but soft and pulpy within. (Fig. 15.) Remains of the chorda dorsalis are said to occur in the soft pulp, and some- times a distinct cavity, lined by a synovial membrane, is found in the centre of the disc, which in the finner whales is expanded into a large central cavity containing many ounees of synovia. A diarthrodial joint connects the supe rior and inferior articular processes of adjacent vertebra on each side. Elastic yellow ligaments, the ligamenta subflava,

Interverte- bral joints.

pass between their laminez. Jpnter- and supra-spinous liga- | bones and joints play but a small part. The lumbar Muscles of ments connect adjacent spinous processes, and in the neck | vertebre behind, the expanded wings of the iliac bones @bdomen. the supra-spinous ligament forms a broad band, the liga- | below, and the false ribs above, are the only bones to be mentum nuche. In those mammals which possess big | considered. Three pairs of greatly expanded muscles—— heads or heavy horns, this ligameut of the back of the | the external oblique, internal oblique, and transverse—lie neck forms a powerful elastic band for the support of the | at the sides and in front, and two puirs of muscles—the head. The joints between the atlas and axis, and the | recti and pyramidales—are situated wholly in front. The atlas and occiput, are specially modified in connection with | interna] oblique and the transverse muscles are attached the movements of the head on the top of the spine. The | above to the ribs, behind to the lumbar spine, below to the intervertebral discs are absent, and the range of movement | iliac crest and toa strong band, Poupart's ligament, extend. either from before backward, as in nodding the head, or | ing from the crest of the ilium to the pubic spine ; the ex- from side to side, as in looking over the shoulder, are | ternal oblique has similar connections above and below, but more extensive than

between any of the other true vertebre, | is not attached behind to the lumbar spine. The muscles The head rotates along with the atlas around the odontoid | all terminate in front in strong cxpanded tendons, called or pivot process of the axis, which is lodged between the | the anterior abdominal aponeuroses, which blend together in anterior part of the atlas and a strong transverse ligament | the middle line anteriorly to form the band called Linea which lies behind the odontoid. Too great movement to | alba, which stretches longitudinally from the xiphi-sternum one side or the otheris prevented by the check ligaments, | to the pubic symphysis. These expanded tendons enclose which pass from the top of the odontoid to the occipital | the recti muscles, which pass from the pubis upwards to bone, in front of the foramen magnum. The nodding | the cartilages of the lower true ribs, and the pyramidal movements take place between the occiput and atlas, and | muscles, which pass from the pubis to be inserted into the are permitted by the size and shape of the occipital condyles | linea alba. The entire arrangement is admirably adapted and hollow upper articular surfaces of the atlas These | for completing the walls of the great abdominal chamber, joints are all diarthrodial. The spine is flexible and | and for enabling the muscles to compress the abdominal elastic ; except in the joints above referred to, the range | viscera, an action which takes place when the contents of of movement between any two true vertebrae is very small, | the bowels and bladder are being expelled during defzca- but the sum of the movement in the entire Spine, owing to | tion and micturition, the number of bones, is considerable. The elasticity of Bones and joints play a more important part in the the spine is partly due to the numerous diarthrodial joints | formation of the walls of the thoracic than of the abdo- between its articular processes, but more especially to the | minal cavity. Not only are there thoracic vertebrea behind, discs of fibro-cartilage interposed between the bodies of | and the sternum in front, but on each side the twelve ribs the vertebrae, which act like elastic pads or buffers to pre- | arch more or less completely forward from the Spine; each vent shock. The spine and trunk may be bent either | rib is articulated behind. to one or two vertebrae, and the forwards or backwards, or to the right and left side; or | seven upper ribs, through their costal cartilages, articulate without being bent, the spine may be screwed to

the right | with the sternum, or to the left, the screwing movement being permitted by The Costo-vertebral Joints are situated between the head Costal the oblique direction of the articular processes, of the rib and the vertebral body ; also, except in the float- joints. The muscles which move the vertebrae on each other are ing ribs, between the tubercle of the rib and the transverse principally situated on the back of the trunk. In the | process of the vertebra, the joints being diarthrodial, and hollow on each side of the vertebral spines lies the great | completed in the usual manner by ligaments and synovial erector spines muscle, the fibres of which pass longitudin- | membrane. he Costo-sternal Joints are also diarthrodial ally upwards. When both muscles act together, the entire | (except the first costal cartilage, which is directly united to spine is bent back; but when the muscle of one side only | the pre-sternum), a capsular ligament, lined by a synovial contracts, then the spine is bent to that side. These | membrane, connecting the cartilages of the true ribs to the muscles also act in raising the spine from the bent to the | sternum. The cartilages from the sixth to the ninth ribs erect position, and they are assisted by small inter-spinal | are also united by ligamentous fibres, muscles, situated between the spines in the cervical and The movements of the ribs and stcrnum at the costo- lumbar regions, The spine is bent forward by the psov | vertebral and costo-sternal joints are of the utmost import- and longi colli muscles; and the straight muscles of the | ance in the process of breathing. Breathing or respiration abdomen, inserted into the lower true ribs, assist in this | consists of two acts—breathing in, or inspiration, and breath- movement. The screwing movements of the spine are | ing out, or expiration. During inspiration, the air rushes effected by a series of muscles, the fibres of which pass through the nose or mouth down the windpipe, and dilates obliquely between the laminz and spines of adjacent verte- | the air-cells of the lungs ; together with the expansion of bre, and are known as the semispinales, multifidi, and | the lungs the walls of the chest rise, so that the capacity rotatores spins muscles, both of lungs and chest at the end of a full inspiration is The head is balanced on the summit of the spine, and | nearly doubled. During inspiration the following changes is maintained in a quiescent position without any appre- | occur in the walls of the chest: the ribs are

elevated and ciable muscular action, but it can be moved in various | rotated, the lower borders of their shafts are everted, directions by the muscles inserted into its bones. The | while their surfaces are at the same time rendered more nodding movements of the head on the atlas are due to oblique, and the width of the intercostal spaces is thereby. the posterior recti, the two superior obliques, the two | increased ; the elevation and rotation of the ribs throw splenii, and the two complexus muscles, which draw it | the sternum upwards and forwards, and make the thoracic backwards, and the anterior recti and sterno-cleido-mastoid | part of the spinal column straighter ; the diaphragm is muscles, which draw it forwards. When the right splenius | depressed, and the antero-lateral walls of the abdomen are and greater posterior rectus and inferior oblique act along | thrown forward. The muscles which cause these move- with the left complexus and sterno-mastoid, the head is | ments are as follows :—In each of the spaces between rotated to the right shoulder ; the opposite rotation being | the different ribs a pair of intercostal muscles is situated : due to the action of the corresponding muscles on the | these elevate and rotate the ribs, and the movements are | cther side of the body. assisted by the levatores costarum, and, in the case of the In the formation of the walls of the abdomen proper, upper and lower ribs, by the scaleni and serrati postici

Joints and muscles of the head.

muscles; and by these agents the transverse and antero- posterior diameter of the chest is increased. The increase in its vertical diameter is due to the action of the dia- phragm or midriff, the great muscle which, arising by its circumference from the xiphi-sternum, six lower ribs, and. bodies of the lumbar vertebre, forms the floor of the thoracic and the roof of the abdominal cavity.- It constitutes a great arch, with its convexity directed to the cavity of the chest. By the contraction of its fibres the arch is rendered less convex, and the floor of the chest is thereby depressed. Under circumstances which require more powerful efforts of inspiration, the muscles which pass from the walls of the

chest to the upper limbs may, by taking their fixed points at the limbs, act as elevators of the ribs. During expiration the ribs are depressed, their lower borders in- verted, the width of the intercostal spaces diminished, the sternum depressed, the spine more curved, and the dia-

Fic, 19.—The concave abdominal surface of the diaphragm, a, 4th lumbar vertebra; 6, c, 12th and 11th 1ibs; d, xiphi-sternum; e, 7, cruraof diaphragm ; g, h, arched tendons of origin of diaphragm; &, aorta; 7, esophagus; m, inferior vena cava; n, psoas; 0, quadratus muscle; gqqg, central tendon of diaphragm, into which the muscular fibres are inserted.

phragm more convex. These movements are principally due to the recoil of the elastic tissue of the lungs previously rendered tense by the inflation of the air-cells, and to the untwisting of the ribs when the inspiratory muscles cease to elevate and rotate them. Muscular action plays but a small part in quict expiration, but the expulsion of the air from the lungs may be facilitated by contracting the abdominal muscles, which, pressing the abdominal viscera against the under surface of the diaphragm, force that muscle upwards.

The Temporo-maxillary Joints are the only diarthrodial articulations in the head. The condyle of the lower jaw on each side is received into the glenoid fossa of the temporal bone; each joint is enclosed by a capsular ligament, and between the articular surfaces is a meniscus, which sub- divides the interior of the joint into two cavities, each lined by a synovial membrane. The movements of the lower Jaw take place simultaneously at both its articulations during mastication and speech, through the action of the several muscles which are inserted into it. This bone is elevated by the temporal muscles, inserted into the coronoid processes ; and by the masseterics, inserted into the outer surface, and the internal pterygoids, into the inner surface of each angle. Itis depressed partly by its own weight and partly by the action of the digastrics and genio-hyoids, in- serted close to the symphysis ; by the platysma, inserted into the outer surface of each horizontal ramus; and the mylo-

[MUSCLES OF

hyoids, into their inner surfaces. The elevators of the jaw are much more powerful than the depressors, for they not only have to overcome the weight of the bone, but during mastication have to exercise force sufficient to cut or break down the food between the teeth. In carnivorous animals, more especially those which, like the tiger or hyzena, crack the bones of their prey, these muscles attain a great size. The lower jaw can be projected in front of the upper by the external pterygoid muscles, inserted into the neck of the bone on each side; but excessive movement forward is checked by the action of the stylo-maxillary ligaments, which pass from the styloid processes to the angles of the bone ; when projected forward, the jaw is drawn back by the posterior fibres of the temporal muscles. When the elevator, depressor, protractor, and retractor muscles are successively brought into action, the lateral or grinding movements of the bone, so important in mastication, are produced.

Along with the movements of the lower jaw those of the hyoid bone and larynx must be considered, for the digastrics, the genio- and mylo-hyoids, which depress the lower jaw, act, when their action is reversed, along with the stylo- hyoid muscles in elevating the hyoid bone and larynx, which structures can be depressed or drawn downwards by the action of the sterno-hyoids, sterno-thyroids, thyro- hyoids, and omo-hyoids ; the elevation of the hyoid, when drawn down by its depressor muscles, is effected by the elastic stylo-hyoid ligaments attached to its small cornua, which, by their recoil when the depressor muscles have ceased to contract, draw the bone up to its former position.

Numerous muscles are situated immediately beneath the skin of the scalp and face. They are not of so deep red a colour as the muscles of the trunk and limbs, and whilst © they arise from one or other of the bones of the head, they are inserted into the deep surface of the skin itself. Hence when they contract they move the skin of the scalp and face, and as they are the instruments through which the various passions and emotions are expressed, they are grouped to- gether as the Muscles of Expression (Plate XVI, figs. 2 and 3). The occipito-frontalis, or great muscle of the scalp, passes from the occipital bone over the vertex to the fore- head ; when it contracts, the skin of the

forehead is wrinkled transversely, the eyebrows are elevated, and an expression of amazement or surprise is produced. Some persons havea greater power over this muscle than others, and by the alter- _ nate contractionsof its occipital and frontal portions can move the hairy scalp to and fro with great rapidity. A pair of muscles, the corrugatores supercilii, arises from the supra- ciliary ridges, on the frontal bone, to be inserted into the eyebrows: they draw the eyebrows downwards and in- wards, wrinkle the skin of the forehead longitudinally, and contract with great vigour in the act of frowning. The auricle of the external ear has three small muscles inserted into it, one behind, the posterior, one above, the superior, one in front, the anterior auricular muscle: in man, as a rule, these muscles are feeble, and have little action ; but in many mammals they are large, and by them the animal pricks its ears to detect the faintest sound of danger. The eyelids are drawn together, so as to close the eye as in the act of sleep, by the orbicularis palpebrarum, the fibres of which lie in the eyelids and on the borders of the orbit, and surround the fissure between the eyelids. This muscle is a characteristic specimen of the group of sphincter muscles, 7.e., muscles which surround orifices, and by their contraction close them. When the upper fibres of the muscle alone contract, the upper eyelid is depressed,— a movement which takes place almost involuntarily and with great frequency during our waking hours, so as to wash the tears over the exposed part of the cyeball and keep it moist. In expressing a " knowing wink," the

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lower fibres alone of the orbicularis contract, and the lower lid is elevated. The elevation of the upper lid, as in opening the eye, is due to the levator palpebre superioris, which, arising within the orbit, is inserted into the upper eyclid. Muscles are inserted into the framework of the nostrils so as to increase or diminish the size of their orifices, and thus to promote or impede the passage of air into the nose. The size of the orifice is increased by two elevator muscles inserted into the ala, or side of the nostril; and when violent exercise is being

performed, or respiration is from any cause impeded, the nostrils are always widely dilated. One of these elevator muscles, which also sends a slip down to the upper lip, and is con- sequently called the common elevator, is the muscle by the contraction of which a sneer is expressed. A partial closure of the nostril can be effected by small muscles which depress and compress the ale of the nose: in man these muscles are rudimentary as compared with the seal and other aquatic mammals, in which a powerful sphincter muscle closes the nostrils in the act of diving. The lips can be elevated or depressed so as to close or open the mouth ; they can be protruded or retracted, or the corners of the mouth can be drawn to one side or the other, by the action of various muscles which are inserted into these movable folds of the integument. The orbicularis oris is a sphincter muscle, the fibres of which lie both in the upper and lower lips; by its contraction the mouth is closed and the lips pressed against the teeth, as when a firm resolution is intended to be expressed, The mouth is opened by the elevator muscles of the upper and the depressors of the lower lip ; it is transversely elon- gated by the zygomatic and risorius muscles, which pass to its corners, and which are brought into action in the acts of smiling and laughing. But the muscles of the lips also play an important part in connection with the reception of food into the mouth, and with the act of articula- tion.

The cavity of ‘ the mouth forms the commence- ment of the ali- mentary canal, and is lined by a soft mucous mem- brane. In it the teeth and tongue are situated, and into it the secre- tion called saliva is poured. It opens behind into the pharynx. The side walls of the mouth are called the cheeks, and into the formation of each cheek a flattened quadrila- teral muscle, the buccinator, enters. This muscle is at- tached above and below to the upper and lower jaw- bones, behind to constrictor muscle

Fig. 20.—Profile of cheek and pharynx. a, buceinator; do, tensor; ¢, levator palati; d, e 7, superior, middie, and inferior constrictors; g, thyro-hyoid; k, hyo- glossus; 1, mylo-hyoid; m, ecrico-thyroid; n, stylo- pharyngeus; 0, stylo-glossus; g, fibrous band which gives origin to buccinator and superior constrictor; 1, glosso-pharyngeal nerve; 2,

superior laryngeal artery; 3, supcrior laryngeal nerve; 4, its branch to crico-thyroid; 5, inferior laryngeal nerve and artery.

a fibrous band, to which the upper is also connected, so that the walls of

| jaw, and internal

the mouth and pharynx are continuous with each other, whilst in front the buccinator blends with the structures in the lips. It compresses the checks, and drives the air out of the cavity of the mouth ag in playing a wind instru- ment ; hence the name, "trumpeter's muscle."

The aperture of communication between the mouth and

pharynx is named the isthmus of the Jauces. Itis bounded below by the root of the tongue, on each side by the tonsils, and above by the soft palate. The soft palate is a structure which hangs pendulous from the posterior edge of the hard bony palate. From its centre depends an elongated body, the wula, and from each of its sides two folds extend, one downwards and forwards to the tongue, the other down- wards and backwards to the pharynx. These folds are called the anterior and posterior pillars of the fauces or palate. Between the anterior and posterior pillar, on each side, the tonsil is seated. The soft palate and its pillars are invested by the mucous lining of the mouth and pharynx, and contain small but important muscles. The muscles of the soft palate and uvula, termed the elevators and tensors, raise and make them tense during the process of deglutition. The muscles of the posterior pillars, or palato-pharyngei, by their contraction, approximate the walls of the pharynx tu the soft palate and uvula, whilst the muscles of the anterior pillars, or palato-glossi, diminish the size of the fauces,

The pharynx is a tube with muscular walls, lined by a Muscles of mucous membrane, which communicates above and in front Pharynx. with the cavities of the nose, mouth, and larynx, whilst below it is continuous with the cesophagus or gullet. It serves as the chamber or passage down which the food goes from the mouth to the cesophagus in the act of swallowing, and through which the air is transmitted fron the nose or mouth to the larynx in the act of breathing.

It lies immediately behind the nose, mouth, and larynx,

and in front of the five upper cervical _verte- bre. Its length is from 44 to 54 inches ;its widest part is opposite the back of the mouth. The prin- cipal muscles in its walls are call- ed the constric- tors, and are named, from above down- wards, superior, middle, and in- ferior. They are arranged in pairs, and arise from the cartil- ages of the larynx, from the hyoid bone, lower

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pterygoid _ pro- cess of the sphe- noid; whilst the superior also springs from the fibrous band to which the buccinator is attached ; their fasciculi curve backwards to the middle line of the posterior wall of the pharynx, to be inserted into a tendinous band which extends longitudinally along this wall of the tube.

The action of the muscles of the mouth, palate, and pharynx may now be considered in connection with the

Fic. 21,—Interior of the pharynx, seen by opening ts posterior wall, a, a, Eustachian tube; 6, b, tensor; ¢, levator palati; d, levator uvulz; ¢, ¢, palato-pharyngeus; J, palato-glossus; g, 2, &, the three constrictors; J, J, ton- sils.

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Process of process of deglutition or swallowing. When the food is

swallow-

ing.

received into the mouth, it is moistened by the secretion of the salivary and other buccal glands, and is broken down by the grinding action of the molar teeth. The buccinator muscles press it from between the gums and the cheek, and, along with the movements of the tongue, aid in col- lecting it into a bolus on the surface of that organ. Dur- ing the process of mastication the palato-glossi contract so as to close the fauces. When the bolus is sufficiently tritu- rated and moistened, the palato-glossi relax, the tip of the tongue is pressed against the roof of the mouth, and by a heave backward of that organ the bolus is pressed through the posterior orifice of the mouth into the pharynx, where it is grasped by the superior constrictor muscles, and forced downwards by them and the other constrictor muscles into the cesophagus, and thence into the stomach. As both the nose and larynx open into the pharynx, the one imme- diately above, the other immediately below the orifice of the mouth, it is of great importance that none of the food should enter into these chainbers, and obstruct the respira- tory passages. To guard against any accident of this kind, two valvular structures are provided,—viz., the soft palate and the epiglottis,—which, whilst leaving the orifices into their respective chambers open during breathing, may effectually close them when deglutition is being performed. As the bolus is being projected through the fauces into the pharynx, the soft palate and uvula are elevated and made tense, and at the same time the wall of the pharynx is brought in contact with it by the contraction of the palato- pharyngei; the part of the pharynx into which the nose opens is thus temporarily shut off from that into which the mouth opens. If laughter, however, be excited at this time, the tension of the soft palate is destroyed, and part of the food may find its way upwards into the nose. The closure of the larynx by the epiglottis is due partly to the depression of that valve and partly to the elevation of the larynx. The backward heave of the tongue relaxes the ligaments which connect the front of the epiglottis to that organ, and enables the small epiglottidean muscles to depress the valve. The elevation of the hyoid and larynx is due to the action of the mylo-hyoid, digastric, and genio-hyoid muscles, which pass from the lower jaw to the hyoid, and of the thyro-hyoid, which pass from the hyoid to the thyroid cartilage

of the larynx; preliminary to their action, the lower jaw must be fixed, which is done by the closure of the mouth prior to the act of swallowing. The aperture of the larynx is thus brought into contact with the depressed epiglottis, which is adapted more exactly to the opening by a change in its form due to the projection of a cushion- like pad from its posterior surface. By these ingenious arrangements the adaptation of a single chamber to the very different functions of breathing and swallowing is effectually provided for.

JoINTs AND Muscies oF THE Upper Limp.

The upper limb is jointed to the trunk at the sterno- clavicular articulation. This is a diarthrodial joint: the bones are retained together by investing ligaments; a meniscus is interposed between the articular surfaces, so that the joint possesses two synovial membranes. A strong ligament, which checks too great upward movement, con- nects the clavicle and first rib. The two bones of the shoulder girdle articulate with each other at the diarthrodial acromio-clavicular joint ; but, in addition, a strong ligament, which checks too great displacement of the bones, passes between the clavicle and coracoid. The movements of the upper limb on the trunk take place at the sterno- clavicular joint, and consist in the elevation, depression, and forward and backward movement of the shoulder. The movements at. the acromio-clavicular joint occur when the scapula is

rotated on the clavicle im the act of elevating the arm above the head. The muscles which cause these move- ments are inserted into the bones of the shoulder girdle ; the trapezius into the clavicle, acromion, and spine of the

scapula; the rhomboid, levator anguli scapule, and serratus ~

magnus into the vertebral border of the scapula; the pectoralis minor into the coracoid; and the subclavius into the clavicle. Elevation of the

entiré shoulder, as in shrugging the shoulders, is due to the contraction of the trapezius, levator scapule, and rhomboideus; depression partly to the weight of the limb and partly to the action of the subclavius and pectoralis minor; movement forward to the serratus and pectoralis; and backward to the trapezius and rhomboid. In rotation of the scapula on the clavicle, the inferior angle of the scapula is drawn forward by the serratus and lower fibres of trapezius, and backward by the levator scapulz, rhomboid, and lesser pectoral.

The Shoulder Joint is a ball-and-socket joint, the ball Shoulder being the head of the humerus, the socket the glenoid fossa joint.

of the scapula. A large capsular ligament, which is pierced by the long tendon of the biceps muscle, and lined by a synovial membrane, encloses the articular ends of the two bones, and is so loose as to permit a range of movement greater than takes place in any other joint in the body. The muscles which cause these movements are inserted into the humerus; the supra-spinatus, infra- spinatus, and teres minor into the great tuberosity; the sub-scapularis into the small tuberosity; the latissimus dorsi and teres major into the bottom of the bicipital groove; the pectoralis major into its anterior border; the coraco-brachialis into the inner aspect, and the deltcid, which forms the fleshy prominence of the shoulder, into the outer aspect of the shaft, Abduction and elevation or extension of the arm outwards at the shoulder joint are due to the supra-spinatus and deltoid; adduction or de- pression, to the coraco-brachialis, latissimus, and teres major, assisted by the weight of the limb; movement for- wards and elevation, to the anterior fibres of the deltoid, pectoralis, and subscapularis; backward movement to the latissimus and teres; rotation outwards to the infra-spinatus and teres minor; rotation inwards to the subscapularis, pectoralis, latissimus, and teres. A combination of abduc- tion, movement forwards, adduction, and movement back- wards, produces the movement of circumduction. Certain movements of the upper limb, however, take place not only at the shoulder joint, but between the two bones of the shoulder girdle; for in elevating the arm, whilst the supra- spinatus and deltoid initiate the movement at the shoulder joint, the farther elevation, as in raising the arm above

the head, takes place by the trapezius and serratus, which rotate the scapula and draw its inferior angle forward. The free range of movement of the human shoulder is one of its most striking characters, so that the arm can be moved in every direction through space, and its efficiency as an instrument of prehension is thus greatly increased. The movement of abduction, or extension, which elevates the arm in line with the axis of the scapula, is characteristi- cally shea and a pci Fic. aD cares of hme Me articular area is provided on merus. e articular area for com= the head of the eee for Be ee ie this movement. ,

The Elbow Joint is the articulation between the humerus, radius, and ulna: the great sigmoid cavity of the ulna 1s adapted to the trochlea of the humerus, and the cup of the radius to the capitellum. The joint is enclosed by a

Elbow.

Joints of fore-arm.

Wrist.

Joints of hand,

UPPER LIMB. |

capsular ligament lined by a synovial membrane, which is subdivided into anterior, posterior, internal, and ex- ternal bands of fibres. Flexion and extension are the two movements of the joint, and the range of movement is limited by the locking at the end of flexion of the coronoid process into the coronoid fossa of the humerus, and at the end of extension of the olecranon process into the olecranoid fossa. The elbow joint is a hinge with screwed surfaces ; the path described by the hand and fore-arm is a spiral, so that during flexion they are thrown forwards and inwards, The muscles which cause the movements are inserted into the bones of the fore-arm. The flexors are the brachialis anticus, inserted into the coronoid of the ulna ; the biceps, which forms the fleshy mass on the front of the upper arm, into the tuberosity of the radius ; the supinator longus into the styloid

process of the radius. The only extensor is the triceps-anconeus, which forms the fleshy mass on the back of the upper arm, and is inserted into the olecranon,

The Radio-ulnar Joints are found between the two bones of the fore-arm. The head of the radius rolls in the lesser sigmoid cavity of the ulna, and is retained in position by a ring-like ligament which surrounds it ; the shafts of the two bones are connected together by the interosseous membrane, their lower ends by a capsular ligament and a triangular fibro-cartilage or meniscus. The radius rotates round an axis drawn through the centre of its head and the styloid process of the ulna; rotation of the fore-arm and hand forward is called pronation,—rotation backwards, supination. The supinator and pronator muscles are all inserted into the radius : the supinators are the longus and brevis and the biceps; the pronators are the teres and quadratus. Where delicate manipulation is required the fore-arm is semi-flexed on the upper arm, for the cup- shaped head of the radius is then brought into contact with the capitellum of the humerus, and the rotatory movements of the bone can be performed with greater precision.

The Wrist or Radio-carpal Joint is formed above by the lower end of the radius and the triangular meniscus, below by the upper articular surfaces of the scaphoid, semi-lunar, and cuneiform bones. An investing ligament, lined by a synovial membrane, and subdivided into anterior, posterior, internal, and external bands of fibres, encloses the joint. It is the oblong form of hinge-joint, and possesses two axes, a long and a short; around the long axis movements occur which bend the hand forwards, or bring it in line with the fore-arm, or bend it backwards ; around the short axis the hand may be moved towards the radial or ulnar margins of the fore-arm. The flexors forward are the palmaris longus, inserted into the palmar fascia ; the flexor carpi radialis into the metacarpal bone of the index; the flexor carpi ulnaris into the pisiform bone; the extensors and flexors backwards are the longer and shorter radial extensors inserted into the metacarpal bones of the index and middle fingers, and the ulnar extensor into the mcta-carpal bone of the little finger ; the flexors and extensors of the fingers have also a secondary action on the wrist joint. The ulnar flexor and

ulnar extensor of the wrist draw the hand to the ulnar side, and the radial flexor and extensor, together with the extensors of the thumb, draw the hand towards the radial border of the fore-arm.

The Carpal and Carpo-metacarpal Joints are constructed thus :—The articular surfaces are retained in contact by certain ligaments passing betwecn the dorsal surfaces of adjacent bones, by others between their palmar surfaces, and by interosseous ligaments between the semi-lunar and cuneiform, semi-lunar and scaphoid, os magnum and unci-form, os magnum and trapezoid ; lateral ligaments also attach the scaphoid to the trapezium, and the cuneiform to the unciform. Similarly, the trapezoid, os magnum, and

| unciform are connected to the metacarpal bones of the

fingers by dorsal, palmar, and interosseous ligaments, and the metacarpal bones of the fingers have a like mode of union at their carpal ends 3; further, a transverse ligament extends between the distal ends of the metacarpal bones of the fingers, and checks too great lateral displacement. The range of movement at any one of these carpal joints is very slight, but the multiplicity of joints in this locality con- tributes to the mobility of the wrist, and makes the junction between the hand and fore-arm less rigid in its nature, The metacarpal bone of the thumb is not jointed to the index, and has a distinct saddle-shaped articulation with the trapezium, invested by a capsular ligament, so that its range of movement is extensive.

The Metacarpo-phalangeal and Inter-phalangeal Joints Joints of are connected by lateral ligaments passing between the fingers.

bones, and by an arrangement of fibres on their dorsal and palmar surfaces,

In studying the muscles which move the digits, it will be advisable, on account of the freedom and importance of the movements of thethumb, to examine its muscles indepen- dently. These muscles either pass from the fore-arm to the thumb, or are grouped together at the outer part of the palm, and form the elevation known as the ball of the thumb ; they are inserted either into the metacarpal bone or the pha- langes. The thumb is extended and abducted, z.e., drawn away from the index, by three ex- tensormuscles descending from the fore-arm, and inserted one into each of its three bones, and a small muscle, specially named abductor pollicis, in- serted into the outer side of the first phalanx: its bones are bent on each other by a long and short flexor muscle 4 it is drawn back to the index by an adductor muscle; and the entire thumb is thrown Fra. 23.—Deep muscles of the palm of

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across the surface of the palm the hand. "1, abductor pollicis cut 's hb, Ba short; 2, opponens; 3 and 4, snb-

y the opponens po ICIS, —_ divisions of ficxor brevis; 5, ad- which is inserted into the Suctor; 6,6', tendon of long flexor

pollicis; 7, abductor of the little tinger ; 8, short flexor ; 9, opponens; 10, tendon of flexor carpi ulnaris ; 11, tendon of long supinator; ++ transverse metacarpal ligament,

or drawn together, 7.e., The ungual phalanges can be bent by the

shaft of the metacarpal bone. The four fingers can be either bent, or extended, or drawn asunder, 7.¢., abducted – adducted.

5, deep flexor; , d, a lumbrical muscle; e, an interosseous muscle ; and interosseous muscles joining

Fic. 24.—Tendons attached to a finger. a, the extensor tendon;

¢, Superficial flexor; J, tendinous expansion from the lumbrical the extensor tendon, action of the deep flexor muscle, the four tendons of

which are inserted into them ; the second phalanges by the super- ficial flexor, also inserted by four tendons, one into each phalanx ; these muscles descend from the front of the fore- arm into the palm in front of the wrist, where they are

Sacro-iliac joint.

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enclosed in a canal by a strong band, the anterior annular ligament, and their surfaces are invested by a synovial membrane, which facilitates their movements to and fro beneath that ligament ; as they pass downwards in front of the fingers they are enclosed in a strong fibrous sheath lined by a synovial membrane, and the tendon of the super- ficial flexor is pierced by the deep flexor, so that the latter may reach the third phalanx into which it is inserted. Four rounded muscles, the lumbricales, arise in the palm from the deep flexor tendons, turn round the radial borders of the first phalanges, and are inserted one into the extensor tendon on the dorsum of each finger; these muscles bend the first phalanges on the metacarpal bones, but from their insertion into the extensor tendons they also extend the second and third phalanges on the first ; as they are much used in playing stringed instruments, they have been called "fddlers'muscles." The fingers are extended or straightened by muscles inserted into the back of the second and third phalanges ; the extensor muscles descend from the back of the fore-arm,—one, the common extensor, subdivides into four tendons, one for each finger, but in addition the index and little have each a separate extensor muscle, the tendon of which joins that of the common extensor. The index finger possesses more independent movement than the other digits—hence its more frequent use as a " pointer ;" the extensor tendons of the little and ring fingers are usually united together, so that these digits are associated in their movements. Abduction and adduction of the fingers are caused by seven small muscles situated in the intervals between the metacarpal bones,—hence called interossei; four of these lie on the back of the hand, three on its palmar surface ; they are inserted into the sides of the first phalanges, and either pull the fingers away from a line drawn

through the middle finger or approximate them to that line. Too great abduction is checked by the trans- verse netacarpal ligament. The human hand is a perfect in-

strument of prehension; not only can the individual fingers:

be bent into hooks, but the thumb can be thrown across the front of the palm, so that it can be opposed to the several fingers, and objects can therefore be grasped between it and them ; but further, this power of opposing the thumb permits objects to be held in the palm of the hand, which may be hollowed into a cup or made to grasp a sphere. The movements of the joints are indicated on the surface of the palm by tegumentary folds,—an oblique fold for the thumb, and two oblique folds for the metacarpo-phalangeal joints of the fingers; the joints of the second and third phalanges are also marked on the surface by folds.

Joints AND MusciEs oF THE Lower Lime.

The innominate bones are connected to the spinal column by the sacro-iliac joints and the sacro-sciatic ligaments. The Sacro-iliac Joint is between the side of the sacrum and the internal surface of the ilium, the articular surfaces of which bones are covered by cartilage, and connected together by short, strong ligaments. The sacro-sciatic ligaments stretch from the side of the sacrum and coccyx to the spine and tuberosity of the ischium. The two innominate bones are also connected together at the pubic symphysis, which is an amphiarthrodial joint. The sacro- iliac joints and pubic symphysis permit only slight move- ment; that at the former is around an imaginary axis, drawn transversely through the second sacral vertebra, which allows the base of the sacrum to be thrown forward and its apex backward in the stooping position of the body; but too great movement backward of the apex is checked by the sacro-sciatic ligaments. As the weight of the trunk, or of what may be carried in the arms or on the back, is transmitted through the haunch-bones to the lower limbs,

joint ;

[JOINTS AND MUSCLES

the sacro-iliac Hgaments require to be of great strength, because the sacrum, and with it the entire trunk, are sus- pended by them on the two innominate bones.

The Jip Joint is a ball-and-socket joint; the ball is the Hip joint

head of the femur, and the socket the cup-shaped acetabu- lum in the haunch bone, the depth of the cup being in- creased by a ligament which is attached around the brim. A large capsular ligament, which is especially strong in front, encloses the articular surfaces. The ligament is lined by a synovial membrane, which also invests the neck of the thigh bone. Within the joint is the round or sus- pensory ligament attached to the head of the thigh bone and to the sides of the depression at the bottom of the acetabulum. Whilst the hip joint possesses considerable mobility, it has much more stability than the shoulder, owing to the acetabulum being deeper than the glenoid fossa, and the greater strength and tension of the fibres of its capsular ligament. The muscles which move the thigh at the hip joint are situated either behind the joint, where they form the fleshy mass of the buttock, or at the front

and the innerside of the thigh. They are inserted either

into the femur or fascia lata, and the great and small trochanters serve as their principal surfaces of attachment. The thigh can be bent on the abdomen by the action of the psoas, iliacus, and pectineus, which lie in front of the it can be extended or drawn into line with the trunk by the gluteus-maximus and medius ; it can be abducted or drawn away from the opposite thigh by the gluteus maximus, medius, and minimus, which muscles are of large sizc, and form the fleshy mass of the buttocks. It can be adducted or drawn to touch its fellow, or, if slightly bent, drawn in front of its fellow, by the adductor longus, brevis, and magnus, which muscles are inserted into the linea aspera, and form the fleshy mass on the inner side of the thigh; and by the pectineus and

quad- ratus femoris. It can be rotated outwards by the obturator and gemelli muscles, the glutsus maximus, pyriformis, and quadratus femoris; and rotated inwards by the gluteus medius, minimus, and tensor fasciz femoris. In standing erect the hip joints are fully extended, and the mechanical arrangements in and around these articulations are such as to enable them to be retained in the extended position with but a small expenditure of muscular power. As the weight of the body in the erect attitude falls behind the joints, the strong anterior fibres of their capsular liga- ments are made tense, and the extended position of the joints is preserved. So long as the centre of gravity falls Within the basis of support of the body, 2.¢., the space between the two feet when standing on both legs, the body will not fall. If the body is made to lean forward, then the capsular ligament is no longer tense, and the gluteal muscles are put in action to re-extend the trunk on the thigh, and prevent it from falling forward ; if the body is made to lean to one side or the other, the round ligament is made tense, or the strong ilio-tibial band of the fascia lata of the thigh, which stretches from the ilium to the tibia, is put on the stretch, and falling sideways is pre- vented. When, in standing erect either on one or both feet, the balance of the body is disturbed, then various muscles both of the trunk and lower limb are brought into action to assist in preserving the erect position. In the erect position the weight of the trunk is transmitted through the acetabula to the heads of the thigh-bones, but the position and connections of the round ligament enable it to suspend that portion of the trunk the weight of which is thrown upon it, and to distribute the weight over the head of the femur.

The Knee is the largest and most complicated joint in Knee.

the body. It consists of the femur, tibia, and patella. The patella moves up and down the trochlear surface of

the femur, whilst the condyles of the femur roll upon the semilunar cartilages and articular surfaces of the tibia. A powerful investing ligament encloses the articular sur-

exists between the astragalus and os calcis, between which bones a powerful interosseous ligament passes. Between

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faces. This ligament is subdivided into bands, one on each side of the joint—the internal and external lateral liga- ments—a posterior and an antcrior. The anterior extends from the patella to the anterior tubercle of the tibia, and serves both as a ligament and as the tendon of insertion of the extensor muscles of the leg. Within the investing ligament two interarticular or crucial ligaments pass from the inter-condyloid fossa to the upper surface of the tibia ; and interposed between the tibia and femoral condyles are two menisci, which from their shape are called the semi- lunar cartilages. The synovial membrane not only lines the investing ligaments, but covers the front of the femur for some distance above the trochlea, and forms folds or pads within the joint itself, which in certain movements are interposed between the articular surfaces of the bones. The movements at this joint are those of flexion and exten- sion. The flexors are the three great muscles on the back of the thigh, called the ham-strings ; they all arise from the ischial tuberosity, and are inserted—the biceps into the head of the fibula, the semi-tendinosus and semi-mem- branosus into the upper end of the tibia. The extensors form the fleshy mass on the front and outer side of the thigh ; one muscle, the rectus, arises from the ilium—the others, the vasti, from the shaft of the femur ; and they are all inserted by a powerful tendon into the patella, and through the anterior ligament of the knee into the tibia. The patella is indeed a sesamoid bone, developed in the tendon of these muscles (Fig. 18). The knee can be bent so that the calf can touch the back of the thigh, and in this position the patella is drawn down in front of the joint, as in

kneeling. The articular surface of the patella is divided into seven areas or facets, and in passing from the bent to the extended position of the joint, these facets come successively into contact with the articular surface of the femur, until, when the leg is fully extended on the thigh, the whole of the patella is raised above the femoral trochlea, except the lowest pair of narrow facets. It is in order to provide a smooth surface for the patella in this position that the synovial nembrane of the joint covers

the front of the lower end of the femur. At the com- mencement of flexion a slight rotation inwards of the leg

and foot takes place through the action of the sartorius,

gracilis, and semi-tendinosus, which are inserted close

together into the tibia ; whilst the extensor muscles cause,

at the completion of extension, a slight rotation outwards

of the leg and foot. The movements of flexion and exten-

Sion are not simply in the antero-posterior plane, but

along oblique patlis which are determined by the screwed

configuration of the femoral condyles. In complete exten-

sion of the leg the joint is "screwed home ;" and as this

position is necessary for the preservation of the erect

attitude, the lateral, the posterior, and the anterior crucial

ligaments are then all tense, to prevent displacement of

the bones. The muscles which rotate the leg and foot

inwards initiate the act of flexion by unlocking the joint.

The Tibio-fibular Joints are found between the upper and lower ends of the bones, and in addition a strong interosseous membrane fills up the interval between their shafts. The movement between the two bones is almost inappreciable.

The Ankle Joint is formed by the convex upper and the lateral surfaces of the astragalus fitting into the concavity formed by the lower end of the tibia and the two malleoli. An investing ligament, lined by synovial membrane, encloses the joint; the lateral portions of this ligament form distinct bands, and are much stronger than the anterior and posterior fibres. A diarthrodial joint also

the astragalus and scaphoid, and the os calcis and cuboid, important diarthrodial joints are found, which are enclosed by ligamentous bands. The remaining tarsal bones arc connected together usually by dorsal, plantar, and inter- osseous ligaments, and a similar mode of union is found between the distal row of tarsal bones and the metatarsals, except between the great toe and ento-cuneiform, where there is no interosseous ligament. – The four outer meta- tarsals are also connected at their proximal ends by distal, plantar, and interosseous ligaments; and further, a trans- verse metatarsal ligament passes between the distal ends of all the metatarsal bones. The metatarsal bones articu- late with the phalanges, and the phalanges with each other, in a similar manner to that described in the corresponding bones of the hand.

At the ankle joint movements of flexion and extension take place. The dorsum of the foot is bent towards the front of the leg by the direct action of the muscles on the front of the leg, more especially the tibialis anticus, inserted into the ento-cuneiform and metatarsal of great toe, and the peroneus tcrtius, inserted into the metatarsal of little toe ; the opposite movement, the so-called extension of the foot, is due to the action of the gastrocnemius and soleus, the great muscles of the calf of the leg, which are inserted by the Tendo Achillis into the posterior prominence of the os calcis or heel. This movement is made at every step in walking or running, and the great size of the calf-muscles is in relation to their use in the act of progression. The foot cannot,

however, be drawn so far back as to be brought into direct line with the leg. In standing erect the foot is at right angles to the axis of the leg, the astragalus is locked in between the two malleoli, and the fibres of the lateral ligaments are tense, so as to check movement forwards or backwards, and prevent displacement.

Between the several bones of the tarsus a certain amount of gliding is permitted, more especially between the os calcis and cuboid and the astragalus and scaphoid, so that it is possible to invert or evert the foot, i¢., to raise its inner or outer borders from the ground. The inversion is performed by the tibialis anticus and by the tibialis posticus, which latter is inserted into the scaphoid bone ; the eversion by the peroneus longus and brevis muscles, situated on the outer side of the leg, the tendons of which pass behind the outer malleolus,—the brevis to be inserted into the metatarsal bone of the little toe, the longus into the plantar surface of the metatarsal bone of the great toe. The individual toes are bent on the sole by the action of the flexor muscles inserted into the plantar surface of the phalanges, and they are straightened by the extensor muscles inserted into their dorsal surfaces; the toes also can be drawn asunder or abducted, and drawn together or adducted, chiefly by the action of the interossei muscles. The hallux or great toe is the most im- portant digit; a line prolonged backwards through it to the heel forms the proper axis of the foot, and the sole chiefly rests upon the pads of integument situated beneath its mctatarso-phalangeal joint and the heel. The hallux is much more restricted in its movements than the thumb: the configuration of its tarso-metatarsal joint and the attachment of the transverse metatarsal ligament prevent the great toe from being thrown across the surface of the sole as the thumb is thrown across the palm in the move- ment of opposition; an object can, however, be grasped between the hallux and second toe by the action of its adductor muscles, and persous can be trained to write with a pen or pencil held in this position.

The act of walking consists in the movement forwards of the trunk by the alternate advancement of the lower

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linbs. Suppose a person to be standing erect, with one leg a little in advance of the other; the body, being inclined slightly forwards, is pushed in advance by the extension of the hindmost limb, so that the weight falls more and more upon the advanced leg, which at the same time is shortencd by bending the knee and ankle. The heel of the hindmost limb being then raised by the action of the muscles of the calf, the toes press against the ground so as to push the trunk so far in front of the advanced limb as to be no longer safely supported by it; the hind- most limb is then raised from the ground by muscular action, and allowed to swing forward by its own weight, but guided by the muscles, until the toes touch the ground in front of the opposite limb. A step has now been made, and the limbs are in a corresponding but opposite position from that in which they were when the step commenced : a repetition of the act constitutes another step, and so the alternate action continues, At one moment in each step both feet touch the ground at the same time, é.¢, when the hind foot presses against the earth. The act of running consists in a repctition of the movements of walking per- formed with so much greater rapidity that the feet never touch the ground at the same moment; the heels also are never brought to the ground. The propulsive action is also greatly increased by the extension of the hip and knee joints, so that a succession of small leaps on to alternate feet takes place. In leaping from the standing position the joints of both lower limbs, previously flexed, aresuddenly and simultaneously extended, and the body is projected forwards with a rapid impulse.

Development and Homologies of the Voluntary Muscular System.

The voluntary muscles, like the bones and joints with which they are so intimately associated, are developed out of the middle of the three layers—the meso-blast—into which the germinal area or blusioderm of the young embryo is divided. The muscles of the axial skeleton are capable of subdivision into a group situated outside the endo-skeleton, ¢.¢., between it and the integument— which muscles have recently

been called epi-skeletal—and a group lying on the ventral swrface of the vertebral bodies and within the rib arches, which lave been termed the hemal or hypo-skeletal muscles. The epi-skeletal muscles, like the vertebra themselves, are developed within the proto-vertcbree, but it is not known if the hypo-skcletal group have the same origin. In fishes the cpi- skeletal muscles preserve their fundamental arrangement with but little modifivation. They are disposed in transverse scements or myotomes, which equal in number the vertebre. These myotomes are separated from each other by bands of fibrous tissuc, the dnter-museular septu. In man and the higher vertebrates the simple transversely segmented arrangement is to a large extent lost. Traces are preserved, however, in the interspinales and intertransversales muscles, situated in the intervals between the spines and transverse proeesses of some of the vertebral scginents ; in the external inter-costals and in the recti abdominis muscles, in the last-named of which tendinous bands subdivide tlic inuscle into several transverse segments. More usually, the intermuscular septa either are not formed or disappear, and adjacent myotomes beeome blended into a continuous mass of muscle. In some instances the fibres of this muscle run longitudinally, and the entire mass subdivides longi- tudinally into separate and distinct parallel muscles, as is seen in the subdivision of the great erector spin into the sacro-lumbalis, musculus accessorius, cervicalis ascendens, longissimus dorsi, trans- versalis cervieis, trachclo-mastoid, and spinalis dorsi muscles. In other instances the muscles run obliquely ; some on the back of the body pass obliquely from below upwards and outwards, as the splenius and obliquus inferior ; others obliquely from below, up- wards and inwards, as the complexus, obliquus superior, semi- spinalis, multifidus and rotatores spine ; others again, as the external and internal oblique muscles of the abdomen, extend obliquely from behind forwards to the ventral mesial line.

Of the hypo-skeletal group of muscles, the internal intercostals dis-play the transverse segmentation. As a rule, however, the muscles of this group extend longitudinally, and form the pree-vertebra. group, named anterior recti, longi colli, and psor ; though the diaphragm, triangulares sterni, transversi abdominis, and levatores ani, which lie

in relation to the inner surfaces of the ribs and visceral cavities, are not longitudinal, but are specially modified in arrangement for functional reasons. 'I'he planc of demarcation between the hypo- and epi-skeletal groups of muscles, where they form together the

walls of the great viscera: chambers,—the thorax and abdomen,— is narked off by the position and course of the intercostal series of spinal nerves,

The inuscles of the appendicular skeleton are either limited to the limbs (purely appendicular, therefore), or pass from the axial part of the body to the limb (axi-appendicular). he axi-appen- dicular group are undoubtedly prolongations of the axial system of muscles. 'They arc in the upper limb devived from the epi-skeletal subdivision, and form the trapezius, rhomboid, levator anguli scapule, latissimus dorsi, scrratus magnus, greater and smaller pectorals, and subclavius muscles of each superior extremity. In the lower limb they are in part derived from the hypo-skeletal subdivision, and form the psoas and pyriformis ; and in part, as the gluteus maximus, from the epi-skeletal subdivision. It is not improbable that the purely appendicular muscles are also prolon- gations of the axial system, and that as the linibs, in their develop- ment from their fundamental bud-like lappets, undergo both a transverse and a longitudinal segmentation, so the muscular mass, prolonged into them, differentiates both transversely and longi- tudinally into a motor apparatus, fitted for the performance of the special functions of each extremity.

ANATOMY OF THE TEXTURES OR TISSUES.

Introductory.

Before proceeding to the description of the other organic systems of which the human body is built up, it may be well to enter into the consideration of the minute or microscopic structure of its constituent

parts. These parts may primarily be divided into fluids and solids. The fluids are the blood, the lymph, the chyle, the secretions of the various glands, and of the serous and synovial membranes. The solids form the framework of the several organic systems, and assume different appearances in different localitics. Sometimes they are arranged in compact solid nasses, as in cartilage ; at others they are elongated into fine threads or fibres, as in muscle, tendon, nerve; at others they are expauded into thin membranes, as in the fascize or aponcuroses, the serous, synovial, and mucous membranes ; at others they are hollowed out into distinct tubes for the conveyance of fluids, as in the blood-vessels, the lymph and chyle vessels, and the ducts of glands. To the solids of the body, whatever their form may be, the general name of Tissues or Textures is applied. Each organic system may be regarded as in the main composed of a tissue or texture peculiar to and characteristic of it- self. Thus, the bones are essentially composed of the osseous tissue, the muscles of the muscular tissue, the nervous systein of the nervous tissue, fibrous membranes of the fibrous or connective tissue, &c. But though the essential constituent of each organic system is a tissue peculiar to that system, yct in most localities certain other tissucs are mingled with that which is to be regarded as the characteristic texture of the part. In a muscle, for example, not only is the muscular tissue present, but mingled with. it are connective tissue, uerve tissue, blood- vessels, and lymph-vessels. A gland also not only consists of its proper tissue, the secreting cells, but of more or less connective tissue, nerves, blood and lymph vessels, and gland ducts. Indeed, there are few localities in which, along with the proper tissue of the part, blood and lymph vessels, nerves and connective tissue, are not found; and to a part built up of two or more tissues the name of au Organ is applied. Thus the muscular system consists of the scries of organs which we call the muscles, the gland- ular system of the several organs called glands, and so on. Each tissue and each organ, into the construction of which that tissue enters as the charactcristic texture, possesses not only distinctive structural, but also distinctive functional properties. Thus the muscular tissue is charactcrised by

the property of contractility, and the muscles, of which it forms the essential texture, are organs of motion or locomotion ; the osseous tissue is characterised by its

TEXTURES. |

hardness and strength, and the bones, of which it forms the essential texture, are organs of protection and support.

But the study of the textures embraces an inquiry not only into the special, structural, and functional properties of each tissue and organ —into the special part which each plays in the animal economy—but the consideration of their properties as living structures. It would be out of place in this article to enter into a discussion of the mean- ing of the term Lirs, or Lrvina, or to attempt an analysis of the various definitions of the term which have been suggested from time to time by different philosophers, which will naturally find a place in the article Puystonoay. It will suffice for our present purpose to adopt the old Aristotelian definition, and to speak of Life as the faculties of self-nourishment, self-growth, and self-decay. All the tissues, over and above the special properties which they possess, have the power of growing and of maintaining themselves in full structural perfection and functional activity for a given period of time. After a time they begin to exhibit signs of diminished perfection and activity, they degenerate or decay; ultimately they die, and the entire organism of which they form the constituent parts is resolved by the putrefactive process into more simple forms of matter.

GENERAL CONSIDERATIONS oN CELLS.

The simplest form of organic matter capable of ex- hibiting the phenomena ‘of life is called Cyto-blastema or Protoplasm. It possesses a viscous or jelly-like con- sistency. Under the highest powers of the microscope it seems to be homogeneous, or dimly granulated, like a sheet of ground glass. Not only can it assimilate nutri- ment and increase in size, but it possesses the power of spontaneous movement and contractility. It enters in a very important manner into the structure of the bodies of the lower animals. The elongated processes,

or pseudo- podia, to which Dujardin applied the name of sarcode, which the Rhizopoda can project from their surface into the surrounding medium, and again with- draw into their substance, consist of protoplasm, and may be cited as fur- nishing excellent examples of its motive and contractile power. From the receut researches of Haeckel it would appear that protoplasm is capable of forming, without the super- addition of any other structure, inde- pendent organisms, which stand at the lowest grade of organisation, and from their extreme simplicity are named by him Monera. 'To the group Monera belong the genera Protamceba, Protogenes, and Bathybius. Of these, Bathybius is that which has attracted most attention. It has been regarded as a layer of soft slimy un- differentiated protoplasm covering the bot- tom of the deep sea, and capable of exhibit- ing the phenomena of contractility, growth, assiinlation of food, and reproduction, Doubts, however, have been expressed _ re- garding the nature of this Bathybius, so that it cannot now be cited as so definite an organism as the freely-swimming Pro- tamoeba and Protogenes. Haeckel has re- ferred these simple organisms to a sub- kingdom of Prorisrx, which he considers to lie on the confines of both the animal and vegetable kingdoms. To a mass of protoplasm, whether it forms, as in one of these PROTIST#, an independent organism, or is merely a portion of the substance of the

Fig. 25.— Undifferentiated cytode mass of proto- plasm.

Fra. 26.—A simple

form of nu- cleated cell P, protoplasm cell- Substance; JN, nucleus; 4/7, nu- cleolus,

body of a higher organism, he has given the general name of a Cytode. Sometimes soft protoplasm, without a trace of differentiation either on its surface or in its substance, as in the freely-moving Monera ; at others the peripheral part of the cytode hardens, and differentiates into a more or less perfect envelope, as in the genera Protomonas and Protomyxa. So far back as 1861, Lionel Beale had described, under the name of germinal matter (Bioplasm), minute living particles of vegetable protoplasm, and in 1863 he demon- strated the presence of extremely minute particles of living matter in the blood. More recently Stricker has also called attention, in the bodies of the higher animals, to minute detached clumps of protoplasm which exhibited the phenomena of life.

As a rule, however, in both vegetable and animal Cell,

organisms the specks or clumps of protoplasm assume definite shapes, and show evidence of an internal dif- ferentiation. In the midst of a minute clump of this substance a sharply-defined body called a nucleus is found, which differs from the surrounding protoplasm in not being contractile; and sometimes a minute speck, or nucleolus, exists within the nucleus. When a definite clump of protoplasm contains a nucleus in its interior, Whether a nucleolus be present or not, it is called a Nucleated Cell. Cells are definite anatomical and physiological units, and exhibit all the phenomena of life. Some of the lowest organisms consist merely of a. single cell, others of two or more cells united together, and these are called uni- or multi-cellular organisms, Cells also enter in the most material manner into the constitution of the textures of all the higher forms of plants and

animals. Not unfrequently the peripheral part of the protoplasm of the cell differentiates into a distinct investing envelope, technically named a cell wall or cell membrane.

In the earlier periods of investigation into the minute structure of cells it was believed that a cell wall was con- stantly present, and that each cell was a minute micro- scopic vesicle or bladder, which in its typical shape was globular or ovoid, but capable of undergoing various modi- fications both in form and chemical composition. The material enclosed by the cell wall was termed the cell con- tents, and either in the midst of these contents or in con- tact with the cell wall was the nucleus, which might or might not contain a nucleolus. Schwann believed that the cell wall was the most active constituent of the cell, 1.€., POs- sessed the power not only of producing chemical and physical changes in its own substance and in the cell contents, but of separating materials from the surrounding media,—of secreting them, as it were, into the interior of the cell. In this manner he accounted for the formation in some cells of fat, in others of pigment, in others of the characteristic secrction of glands, and so on.

It was then maintained by John Goodsir that the nucleus was the part of a cell which in all probability was concerned in separating and preparing its characteristic ecll contents, and in its nutrition. Martin Barry and Goodsir also contended that the reproduction and multi- plication of cells were due to self-division of the nucleus, which was thus the source of successive broods of young cells. They gave to the nucleus, therefore, an importance in the economy of the cell greater than had previously been assigned to it.

As the investigations into cell structure became more extended, it was ascertained that a cell wall was by no means always present; that in many of the cells in which it had been supposed to exist it could not satisfactorily be demonstrated, and that in others, more especially in young actively-growing cells, no trace of an investing envelope

a cytode is a naked clump of Cytode.

Ovum.

could be observed. Hence the importance of the cell wall as an essential component of a cell was still further diminished ; and Leydig then defined a cell to be a little mass composed of a soft substance enclosing a central nucleus.

But a most important advance in our conceptions of the essential structure of a cell was made when Briicke pointed out that the contents of cells not unfre- quently possessed the property of spontaneous move- ment and contractility, and when Max Schultze deter- mined that the contractile substance termed sarcode, which forms so large a part of the bodies of the lower animals, was analogous and apparently homologous with the contents of young actively-growing animal and vege- table cells, before a differentiation of these contents into special secretions or other materials had taken place. As the term " protoplasm" had been introduced by Von Mohl to express the contents of the vegetable cell, which under- goes changes in the process of growth, it was adopted by the animal histologist; and Max Schultze suggested that a cell should be defined to be.a nucleated mass of protoplasm,—a definition which is adopted in this article. Now, as protoplasm, whether it occurs along with a nucleus in the form of a cell, or in independent clumps or cytodes, exhibits not merely the property of contrac- tility, but the power of growing and maintaining itself, it is regarded as the functionally active constituent of the eell. And thus our conceptions as to the part of the cell in which its functional activity resides have passed through three phases. In the first, the cell wall; in the second, the nucleus; in the third, the protoplasm cell contents, or cell substance, has been regarded as the active constituent, not only as regards its nutrition, but the reproduction of young cells. But though the protoplasm can of itself perform these offices, yet there ean be no doubt, as Barry and Goodsir were the first to show, that the nucleus of the cell plays a part not unfrequently in the multiplication of cells by self-division.

One of the most characteristic cells is the mammalian ovum. In it a cell wall exists, known as the zona pellucida or vitelline membrane ; within this envelope is the granular yelk or cell contents, in the midst of which is imbedded the nucleus or germinal vesicle, which in its turn contains the nucleolus or germinal spot. The granules of 7", 7Za;Ormm of 8 shech- the yelk are a special metamorphosis eida; P, protoplasm or of the protoplasm cell substance. bee eouscie wi hie

Schwann made the important 7 serminal spot. generalisation that the tissues of the animal body are eomposed of cells, or of materials derived from cells, "that there is one universal principle of development for the elementary part of organisms, however different, and that this principle is the formation of cells." The ovum is the primordial or fundamental cell, or germ-cell, from which, after being fertilised by the male sperm, the tissues and organs of the animal body are derived. Within the fertilised ovum multiplication of cells takes place with great rapidity. It is as yet an un- settled question how far the original nucleus of the ovum participates in this process of multiplication ; but there can be no doubt that the protoplasm cell contents divide, first into two, then four, then eight, then sixteen segments, and so on. Each of these segments of protoplasm con- tains a nucleus—is, in short, a nucleated cell, and the protoplasm of these cells exhibits the property of eon- tractility. The ovum or germ-cell is therefore the imme- diate parent of all the new cells which are formed within It, and mediately it is the parent of all the cells which, in the subsequent processes of development and growth,

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are descended from those produced by the segmentation of the yelk. The process of development of young cells within a parent cell, whether it occurs in the ovum or in a cell derived by descent from the ovum, is called the endogenous reproduction of cells. But cells may multiply by a process of fission—1.e., a constriction, gradually deep- ening, may take place in a cell until it is subdivided into two; the nucleus at the same time participating in the constriction and

subdivision. A third mode of multipli- cation of eells is by budding : little clumps of protoplasm bud out from the protoplasm of the parent ccll, beconie detached, and assume an independent vitality. If a nucleus differentiates in the interior of such a clump, it becomes a cell; if it remains as a mere elump of proto- plasm, it is a cytode.

These various methods of multiplication are all eon- firmatory of Schwann's generalisation of the descent or derivation of cells from pre-existing eells. But as the nucleated cell, either with or without a eell wall, is not, in the present state of science, regarded as the simplest and most elementary unit capable of exhibiting vital pheno- mena, and as these phenomena can be displayed by indi- vidual clumps of protoplasm, without the presence of a nucleus, some modification of the doctrine, as regards the formation of the tissues from nucleated cells, seems to be necessary. For, although there can be no doubt that all the tissues are mediately derived from the ovum or funda- mental cell, and that most of 'the tissues are derived directly from nucleated cells, yet there is reason to think that a differentiation of a cytode clump of protoplasm into tissue may take place, so that the direct formation of such a tissue would be, not from a nucleated eell, but from the more simple eytode. Hence a more comprehensive gene- ralisation, to which observers have gradually been led from the consideration of numerous facts, has now been arrived at,—that the tissues and organs of the body, what- ever may be their form and composition, are formed of protoplasm, or produced by its differentiation ; and that the protoplasm itself is derived by descent from the proto- plasm substance of the primordial germ-cell. Some, in- deed, have contended that protoplasm, eells, and their derivatives can arise by a process of precipitation or aguregation of minute particles or molecules in an organic infusion, and that living matter may be thus spontane- ously generated. But the evidence which has been advanced in support of this hypothesis is by no means satisfactory or conclusive, whilst the correctness of the theory of the direct descent of protoplasm from pre-exist- ing living protoplasm is supported by thousands of observations made by the most eompetent inquirers.

In the process of conversion of protoplasm into the several tissues, there takes place a differentiation of form

and structure (<.e., a morphological differentiation), and of –

composition (7.e.,a ehemical differentiation), as the result of which a physiological differentiation is occasioned, whereby tissues and organs are adapted to the performance of special functions. Hence arise the several forms of tissue which occur in the human body and in the higher animals. Many of the tissues consist exclusively of cells which present in different parts of the body characteristic modifications in external configuration, in composition, and in properties, as may be seen in the fatty tissue, pigmentary tissue, and epithelium. Other tissues, again, consist partly of cells, and partly of an intermediate material which sepa- rates the constituent cells from each other. Here also the cells present various modifications; and the intermediate material, termed the matrix or intercellular substance, varies in structure, in composition, and in properties in the different textures, as is seen in the connective, eartilaginous, osseous and muscular tissues.

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Blood.

Red cor- puscles

TEXTURES. |

It is not an easy matter to devise a classification of the tissues, based on their structural characters, which shall be in all respects logically perfect ; but a convenient basis of arrangement for descriptive purposes may be found by dividing them into those which consist—lst, of cells sus- pended in fluids ; 2d, of cells placed on free surfaces ; 3d, of cells imbedded in solid tissues.

lst Group.—Cells Suspended in Fluids.

The fluids of the body which have cells or other minute solid particles suspended in them arc the blood, the lymph, and the chyle. Sometimes cells are found floating in the secretions of glands,

Tur Brioop.—The blood is the well-known red fluid which circulates throughout the blood-vascular system. As its composition and general properties will be described in the article PuystoLoey, the solid particles only, which are suspended in the liquor sanguinis, will be considered here. If adrop of human blood be examined under the microscope, crowds of minute bodies, the blood corpuscles, or blood globules, may be seen in it. These present two different appearances, and are distinguished by the names of red and white blood corpuscles.

The red corpuscles, which are by far the more numerous, are minute circular discs, slightly concave on both surfaces. Their average diaincter is about sth of an inch, and their thickness about }th of that measurement; hence they are not spheres, as the old name blood globules would imply. They are non-nucleated. Single corpuscles have a faint fawn-coloured hue, but collectively they give to the blood its characteristic red colour. This colour is due to the presence in the corpuscles of the' substance termed hemoglobin. It has been estimated by Vierordt and Welcker that 5,000,000 red corpuscles are present in every cubic millimetre of healthy human blood. The red corpuscles in the blood of all mammals, except the tribe of camels, are circular bi-concave discs ; but in these exceptional mammals they have an elliptical outline. In all mammals the red corpuscles are non-nucleated, though appearances of nucleation have becn scen in exceptional individual cases; for Rolleston saw a nucleated appearance in a small proportion of the dried red blood corpuscles of a two-toed sloth; and Turner observed in a proportion of the red blood dises of a Hoffmann's sloth an appearance of a central nucleus.

In all birds, reptiles, and amphibia the red corpuscles are oval or elliptical, and in each corpuscle an oval or elliptical nucleus is situated. In all fishes they are nu- cleated and also elliptical in form, except in some of the Cyclostomata, which possess circular discs. ¢()

In the elliptical nu- So f cleated corpuscles the 7

surfaces are not bi- —_— concave, but have central projections, which correspond in position to the nu- . cleus (2, 4, 5, Fig. 28). The red cor- puscles vary mate- rially in size in dif- ferent vertebrata, and these variations have been especi- ally studied by Gul- liver. He has found them to vary in mammals from an average diameter of 5,,th of an inch in the clephant, and rrsgth in Orycteropus capensis, to yghysth in Tragulus javanicus, and he concludes that the smallest blood dises

Fic. 28.—1, red corpuscles of human blood ; 2, red corpuscles of blood of common fowl, seen on the surface and edgeways; 3, red corpuscles of frog; 4, of Squalus squatina; 5, of Lophius ptscatorius; 6, corpuscles of the blood of a scor- pion.

occur in the small species of an order or family, the largest in the large species. In birds they are larger than in mammals, and vary in length from an average of +qxz inch in Casuarius javanicus to ypygth in Linaria minor. Tn reptiles they are still larger, and vary in length from an average of pjygth in Anguis fragilis to +45th in Lacerta viridis. In amphibia the largest corpuscles, according to Gulliver, are about 7}, inch in length in Proteus and Sren, though Riddell states that in Amphiuma tridactylum they are 4d larger ; whilst the smallest, as in the common frog, average in length +), inch. In cartilaginous fish the corpuscles are larger than in osseous. In Lamna cor- nubica Gulliver found their long diameter to be poz inch ; while in the Salmonidx, which have the largest blood discs among osseous fish, the long diameter in the salmon and cominon trout is only about +255 inch.

_ The white or colourless corpuscles are comparatively few White in number in the healthy human blood. Welcker has corpuscles.

estimated the normal relative number as one white to 335 red; in pregnant and menstruating women the pro- portion is increased to about 1 to 280. In some forms of disease the proportion is so very materially increased that they appear to be almost as numerous as the

red, They are rounded in form, fincly granulated or mulberry-like in appearance, and nucleated—the nucleus becoming more distinct after the addition of acetic acid ; moreover, they are larger than the red corpuscles, their average diameter being from ygqth to gpyath of an inch. Corpuscles of a similar form are found in the blood of all vertebrata. They do not vary so much in size in different animals as do the red corpuscles. In Zriton, according to Gul- liver, their average diameter is y755th, whilst in Herpestes griseus they are not more than yg, inch. The white blood corpuscles are minute nucleated clumps of proto- plasm ; they are therefore minute cells. It is very doubt- ful if they possess a cell wall, the evidence being against rather than in favour of its presence.

The red blood corpuscles in all vertebrata, except the mammalia, are nucleated clumps of protoplasm; they are therefore minute cells. In mammals, owing to thé ab- sence of a nucleus, they do not accord with the definition of a cell adopted in this article, and they are not therefore morphologically identical with the red corpuscles in other vertebrates. What their precise homology may be is some- what difficult to say, owing to the obscurity which prevails as to their exact origin. If they are merely clumps of specially modified protoplasm, budded off from the white corpuscles, then they are cytodes. If, as some have sup- posed, they are the nuclei of the white corpuscles, specially modified in composition, then they are free nuclei. If, again, they are the white corpuscles, the cell substance of which has undergone a special differentiation, and the nucleus has disappeared, then they are potentially cells, though no nucleus is visible. Whatever may be their exact homology, there can be no doubt that the non-nucleated mammalian red corpuscle, and that part of the nucleated red corpuscle which lies outside the nucleus, are function- ally identical with each other; the protoplasm having undergone a special chemical differentiation into hemo- globin, a proximate principle characterised by containing iron as its essential constituent. The action of watcr, spirit, acids, alkalies, various gases, heat, cold, and electri- cal currents, on the red corpuscles has been studied by several observers, and the conclusion has been reached that the corpuscles consist of a "stroma," with which the colouring matter is blended, but from which

it may be separated without the stroma affording any evidence of the presence of an investing envelope or membrane. When blood is drawn from the vessels the red corpuscles, in about half a minute, run together into piles, like rowleauz of coins

(Fig. 29), which arrange themselves into irregular meshes. In inflammatory diseases, and in the blood of pregnant women, the piles of corpuscles form more readily, and at the same time sink rapidly below the surface of the fluid,

D = f = A Vin S: = {AMIE A oS S BY, OR omaninn = dy' my ul M Ny = = Pr aay oly dip At iN D Fra. 29.—1, red corpuscles of healthy human blood; 2, red corpuscles beginning

to form rouleaux; 3, mesh-like arrangement in healthy blood; 4, mesh-like arrangement in buffy blood, where the meshes are larger than in healthy blood.

so as to cause the 'buffy coat" scen in the blood coagulum. In the healthy blood. of horses a buffy coat is formed as a natural condition of the coagulation.

One of the most curious properties possessed by the living white blood corpuscle is that of protruding delicate processes from its circumference, which processes may change their shape, or be again withdrawn into the sub- stance of the corpuscle, which then resumes its former circular outline. These processes resemble the sarcode prolongations which Ameba and other Rhizopods can pro- ject from various parts of their circumference ; and as d white blood corpuscle, like an Amoeba, can by the move- ments of the processes change its position, the term "amceboid movements" has been applied to the pheno- mena in question. Like an Ameba, also, a white corpuscle can by these movements include within its substance minute particles of solid matter which it may come in contact with in its path. Thirty years ago W. Addison stated that the white blood corpuscles could pass through the walls of the blood-vessels into the surrounding tissue,

where they formed mucus corpuscles, and, under certain pathological conditions, the corpuscles of pus or inflam- matory lymph. The passage of white blood corpuscles through the wall of the capillaries was seen in 1846 by A. Waller; and though for many years his observations were ignored, yet the more recent inquiries of Cohnheim and others into the subject have anew directed attention to them. It is now generally admitted that the migration of these corpuscles from the blood through the wall of the capillaries into the tissues does take place, and that they may then " wander" to and fro, owing to the mobility of their contractile protoplasm. These migrated corpuscles are also believed to play an important part in many physiological and pathological processes.

But the blood contains, in addition to the red and white corpuscles, still more minute particles, which are, however, inconstant in number. Minute globules have been de- scribed by Beale and Max Schultze, which are probably detached fragments of. protoplasm budded off from the white corpuscles; and Zimmermann has described, as elementary corpuscles, minute particles, which are appar- ently derived from broken-up red corpuscles.

In the very young embryo the blood corpuscles, like the capillary blood-vessels themselves, are formed by special differentiation of certain of the cells of the embryo, and these young corpuscles seem to have the power of multiply- ing by fission. At first they are colourless, but afterwards assume a red colour. Even in mammals the earliest red

blood corpuscles are nucleated and larger than the future red discs, but as development goes on, non-nucleated red corpuscles appear, and as their number increases, both absolutely and relatively with the progress of the foetus, in course of time all the nucleated red corpuscles have dis- appeared, and are replaced by the non-nucleated discs. In adults the red corpuscles are believed to be derived from the white corpuscles, though the exact process of meta- morphosis has not been satisfactorily ascertained. It is also believed that red corpuscles may be new-formed in the spleen, and Neumann has recently stated that the red marrow of the bones may serve as a centre of origin for the

red blood corpuscles, In the foetus the liver apparently serves as a centre of origin for the white corpuscles, but its blood corpuscle forming function ceases at the time of birth. Throughout extra-uterine life the spleen and the lymphatic glands are without doubt organs of formation of the colourless corpuscles, those produced in the lymph- atic glands, under the name of lymph corpuscles, being mingled with the blood-stream where the fluid lymph flows into the venous system. When mixed with the blood, the lymph corpuscles become the white blood corpuscles.

Corpuscles are also found in the blood of the inverte- brata. They are as a rule colourless, but R. Wagner pointed out that in the Cephalopods they are coloured. They are sometimes round, at others oval or fusiform, and in worms and insects have even branched processes. They are always nucleated.

Tux Lympu and Cuyte.—The lymph is the fluid found Lymph, in a subdivision of the vascular system named the lymph vascular system. It is transparent and colourless, and con- tains numerous corpuscles floating in it, which correspond, in appearance, structure, and the possession of the pro- perty of amoeboid movements, to the white corpuscles of the blood. The lymph corpuscles are formed in the glands situated in the course of the lymph vessels, and are carried away from the glands by the stream of lymph which flows through them.

The chyle is a milky fluid found during the period of Chyle, digestion in the delicate lacteal vessels which pass from the walls of the intestine. The lacteals join the lymphatics at the back of the abdomen to form the thoracic duct in which the lymph and chyle become mingled together. The chyle contains corpuscles similar to the lymph corpuscles, which are apparently derived from the lymph glands in the mesentery, through which the chyle flows on its way to the thoracic duct. The fluid of the lymph, the chyle, and the blood, in which the corpuscles are suspended, is some- times described as a fluid intercellular substance. Cor- puscles possessing the type of structure of the lymph corpuscles, are named lymphoid cells or leucocytes.

Cells are also met with floating free in the secretions formed in the interior of some of the glands. They are more particularly found in the secretion of mucus from the mucous glands, and of saliva from the salivary glands.

They are round, colourless, nucleated corpuscles, not unlike the white corpuscles of the blood, and have been detached from their original position in the gland follicles.

2d Group.—Cells placed on Free Surfaces.

*By the term free surface is meant a surface which is not blended with or attached to adjacent structures, but is free or separable from them without dissection. Every free surface is covered by one or more layers of cells. Some- times these cells are named an Epithelium, at others an Endothelium. By the term Epithelium is meant the cells 1 situated on free surfaces which are exposed either directly | or indirectly to the air. By the term Endothelium is t *

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meant the cells situated on free surfaces which are not ex- posed either directly or indirectly to the air.

Epithe- lium.

Mucous Mcm- branes.

TEXTURES. |

EPITHELIUM.—The free surfaces covered by an epithe- lium are the skin and the membrancs, named, from the character of their secretion, mucous membranes. The Mucous Membranes line interna] passages and canals, and are continuous at certain orifices with the skin,—eg., the Inucous membrane of the alimentary canal opens ou the surface at the mouth and anus ; the respiratory mucous membrane opens on the surface at the nostrils, and is continuous in the pharynx with the alimentary mucous membrane—it is also prolonged through the

Eustachian tube into the tympanum, and is continuous through the nasal duct with the conjunctiva ; the genito-urinary mucous membrane opens on the surface at the orifice of the urethra and vagina. Mucous membranes also line the ducts of the various glands which open on the surface either of the skin or the several mucous membranes. The epithelial cells are as a rule arranged in layers or Strata, and the shape of the cells is by no means uniform in the different layers. The cells of the deeper strata are usually smaller, softer, more rounded, and more recently formed than those of the super- ficial strata, though sometimes, as in the bladder, conjunc- tiva, and some other mucous surfaces, they may be irregular in form and size, or even elongated into short columns. The cells next the free surface have a tendency to be shed, and their place is then taken by the cells of the deeper layers, which become modified in form as they approach the surface. he form of the cells of the superficial layer varies in different localities, which has led to a division of epithelium into groups bearing appropriate nanies, Epithe- hum is distinguished further by being devoid of blood-vessels, 7.¢., it is non-vascular; and also, with some excep- tions, devoid of nerves, v.¢., 10n-sensitive,

The epithelial cells, whether arranged in one or sevcral Strata, rest upon a subjacent tissue, which, from its rela- tion to the cells, may be called sub-emthelial. The sub- epithelial tissue is a delicate modification of the fibrous form of connective tissue, to be subsequently described, and in it the nerves and the blood and lymph vessels of the skin and mucous membranes ramif ; hence it is sometimes described as a fibro-vascular tissue or cortum. It was for a long time believed that between the deeper surface of the epithelium and the corium a homogeneous continuous membrane, named by Bowman a basement membrane, intervened. Bowman, however, himself admitted that in some of the localities where this membrane was theoreti- cally supposed to exist it could not satisfactorily be demon- strated ; and the general opinion of anatomists now is, that a distinct separable membrane docs not intervene between the epithelium and the fibro-vascular corium, but that the cells of the former rest directly upon the surface of the latter. The corium is also the seat of the numerous glands, with the blood and lymph vessels and

the nerves belonging to them, found in connection with both the skin and the mucous membranes ; and the epithelial lining of the glands is con- tinuous at their orifices with the epithelial investment of the corium. The surface both of the skin and nucous mem- branes is usually more or lesg undulated—sometimes it is thrown into strong folds or ruge, at others it is elevated into minute, frequently conical, processes, named in some locali- ties papillee, in others villi ; but in all these cases the epithe-

_ lium is prolonged as a continuous covering over the undulat-

ing free surface. The free surface of all mucous membranes is kept moist by the secretion or mucus which lubricates it.

Tessellated, – pavement, scaly, or squamous epithelium is situated on the free surface of the mucous lining of the mouth, pharynx, cesophagus, vestibular entrance to the nose, ocular conjunctiva, and entrance to the urethra and vagina. It forms, under the special name of the horny layer of the cuticle or epidermis, the superficial investment ofthe skin. Its cells are nucleated flattened scales, varying

in diameter from 345th to rosath inch. Those in the same layer, being in contact by their edges, form a tessellated, pave- ment-like arrangement, whilst the cells in adjacent layers have their flattened surfaces in con- tact with each other. Sometimes the cells have jagged, serrated edges, or fluted surfaces, and usually they contain scattered

granular particles. In the fornia- F16. 30.—Scaly epithelium from the same tinie a chemical differentiation of their soft contents froni the cesophageal orifice of the stomach to the anus, it gall bladder. Its cells are elongated, cylindrical columns, to the surface on which other times they are group of tells: Cd stares einen 8 the deeper extremity being narrower and more pointed. tinal villi have a clear space at their broad free ends, Ciliated epithelium is situated on the free surface of

the free surface of the mucous membrane of the windpipe as and on the lining membrane of the ventricles of the brain cilia are specially differentiated at the body of the cell is prolonged along the Ciliated epithelium During life these processes move rapidly to and fro to zo'soth inch in length 3 but in various marine in-

A t . : mucous membrane of the mouth, tion of this epithclium a morpho- logical differentiation of the protoplasm of the rounded into a horny material, have occurred.

Columnar or cylindrical epithelium is situated on the is prolonged into the ducts of various glands which open on the alimentary mucous membrane 3 it covers the mucous about xZ5th inch long, placed side by side like a row of palisades, and with their 2 the cells rest. Some- cs er times the cells are uni-

ene of ou : tS 4 striated columnar cell compressed at the sides; “”°™ 'mtestinal villus. at others they vary in circumference,—the broader end, The nuclei are distinct, and the cell contents are finely granular. Usually this epithelium forms only a single which is often streaked with fine parallel lines. Inter- mingled with the cells of the columnar epithelium of the nasal mucous membrane, which extends into the air- sinuses within the cranial bones, into the nasal duct and lachry- far as the terminal branches of the bronchial tubes; on the mucous surface of the uterus and Fallopian tubes ; on and central canal of the spinal cord. It generally consists of columnar cells, which have at their free ends extremely free ends of the epithelium cells from which they project. Beale states that axis of each cilium, whilst the peri- . phery possesses the firmer consistence Fr¢.32.— in the fluid which moistens the surface of the mem- brane on which this form of epithelium is situated, In vertebrata they are both longer and stronger. Sometimes, as in the lining membrane of the cerebral ventricles and

cells of the deeper strata into flattened scales, and at the free surface of the mucous lining of the alimentary canal lining of the urethra and the mucous membrane of the long axes perpendicular

formly cylindrical ; at ¥!9; 81—Columnar epithelium. A, side view lying next the surface, being rounded or polygonal ; layer of cells. The columnar cells which cover the intes- alimentary canal are small goblet-shaped cells.

mal sac, into the Eustachian tube and tympanum ; on the the mucous lining of the commencement of the vas deferens, slender, soft, pellucid, hair-like processes, or cilia. These the soft bioplasm (protoplasm) of the

of formed or differentiated material.

the human body the cilia are not more than from y.5th central canal of the spinal cord, the cells carrying the cilia

Secreting glands.

Endothe- lium.

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are either spheroidal or cylindrical; but as the cavities lined by these cells are shut off from the air, the cells ought rather to be referred to the endothelial than the epithelial series of structures. Cilia occasion currents in the fluid in which they move, and play an important part in the economy of many animals; in some of the invertebrata they serve as organs of locomotion, in others they propel currents over respiratory surfaces, and in others aid in bringing food within the animal's reach.

Spheroidal or glandular epithelium is situated on the free surface of the follicles or ultimate secreting apparatus of glands, and the commencement of gland ducts. The cells are often spheroidal in form, though not unfrequently they are polyhedral. Their contentsare specially differentiated into the secretion of the particular gland in which they are situated.

*The epithelial cells of a Secreting Gland rest upon a sub- epithelial tissue. Not unfrequently this tissue has the appearance of a membrane; it represents, indeed, the base- ment membrane of Bowman, and is called membrana pro- pria. Decper than this apparent membrane is a delicate connective tissuc in which the blood and lymph vessels and the nerves of the gland ramify. The anatomical structures necessary for secretion are cells, blood-vessels, and nerves- The blood-vessels convey the blood from which the secretion has to be derived; the cells, as Goodsir showed by a variety of proofs, are * © the active agents m separat- Fig. 33.—A, polyhedral gland eells from ing the secretion from the – the liver; B, spheroidal gland cells from blood; the nerves regulate '* 5!" the size of the blood-vessels, and therefore the amount of blood which circulates through the gland, and perhaps also exercise some direct influence on the activity of the cells. The connective tissue and the membrana propria are merely supporting structures for the cells, vessels, and nerves. All secreting glands have the same general type of structure, though they differ from each other, as will be pointed out when the individual glands are described, in the degree of complexity in which their constituent parts are arranged.*

Transitional epithelium is the name applied to epithelial cells, situated on some free surfaces, which possess transi- tional forms either between the columnar and tessellated epithelia, or the columnar and spheroidal. The epithclium of the mucous lining of the bladder is transitional between the columnar and scaly varieties; and in many glands the continuity of the epithelial layer from the spheroidal epithelium of the gland follicles to the columnar epi- thelium of the ducts is preserved by the interposition of intermediate transitional forms of cells.

The epithelial surfaces of the upper part of the mucous lining of the nose and of the back of the tongue are specially modified in connection with the senses of smell] and taste localised in those regions, as will afterwards be considered when their anatomy is described.

ENDOTHELIUM.—The free surfaces covered by an endo- thelium are the serous membranes, the inner surface of the walls of the lymph and

blood vessels and of the heart, the synovial membranes of the joints and of synovial bursze, the free surface of the osseous and membranous labyrinth of the internal ear, and the free surface of the ventricular cavities of the brain and central canal of the spinal cord. an endothelium are shut off from all communication with the external atmosphere. The cells of the endothelium are arranged so as to give perfect smoothness to the sur- face which they cover. In the blood and lymph vessels this smoothness of surface is in order to facilitate the flow of the blood and lymph in the course of the circulation. The serous and synovial membranes are found covering

The tubes, canals, and cavities lined by

the surfaces of parts which move on eacn other, and the smoothness of their respective surfaces, by permitting free- dom of movement, diminishes the friction.

Each Serous Membrane consists of a portion which invests Serous the viscus or organ, named the visceral layer, and a portion mem-

which lines the walls of the cavity in which the organ is situated, named the parietal layer. Between these two layers is the so-called serous cavity, the wall of which is formed by the smooth surfaces of both the parietal and the visceral layers, The serous membranes are as follows :—The two pleurz situated in the cavity of the chest, one invest- ing each lung, and lining the interior of that part of the thoracic cavity in which the lung is situated; the pericar- dium, which invests the heart, and lines the bag in which the heart is contained; the peritoneum, which invests the abdominal viscera, and lines the abdominal cavity ; and the arachnoid membrane, which invests the brain and spinal cord, and is regarded by many as lining the dura mater, which encloses these important organs. The smooth free surfaces of the serous membranes are moistened by a limpid fluid, or serum, which facilitates their movement on each other, just as the free

smooth surfaces of the synovial membranes are lubricated by the viscid synovia which they secrete.

Endothelial cells form usually only a single layer, and are, as a rule, flattened scale-like cells, arranged after the manner of a tessellated epithelium. Endothelium, like epithelium, is non-vascular, and, so far as is known, non-nervous. –

The endothelial cells rest upon a sub-endothelial tissue, consisting of a delicate modification of the fibrous form of connective tissue. Here, as in the surfaces covered by epithelium, a basement membrane was at one time sup- posed to intervene between the cells and the connective tissue; but it is now believed that the cells are in direct contact, by their deeper surface, with the connective tissue itself. Inthe serous membranes and in the coats of the larger blood-vessels elastic fibres are present in considerable numbers in the sub-endothelial tissue, which serves as the framework of support for the blood and lymph vessels and the nerves of the part. In the serous membranes the lymph-vessels are very abundant in the sub-epithelial tissue, where they form a layer parallel to the free surface of the mem- brane, from which short vessels pass vertically to open by minute orifices into the serous cavity. 'The serous mem- branes are attached by the sub-endothelial connective tissue to the organs which they invest.

The endothelium of the Serous Membranes consists of irregular and squamous cells, the edges of which may be smooth or slightly serrated. The cells are closely adapted to each other by their edges, so as to form a continuous smooth layer, which forms the free surface of the serous membrane. Scattered irre- gularly over this surface arc the minute orifices, or stomata, which open into lymphatic vessels. The cells which sur- round the stomata differ in form and appearance from the ordinary endothelium ; they are smaller, and are polyhedral, their contents are granular, and the nucleus is more distinct.

The endothelium lining the Lymphatic Vessels consists of flattened cells, which, instead of having an irregular shape, are elongated spindles, slightly sinuous in outline. The endothelium of the lymphatics is continuous with that of the serous membranes through the stomata,

so that the cavities of the serous membranes are now regarded as great lymph-sacs.

Fig. 84.— Endothelial cells from the peritoneal serous membrane, Three stomata may be seen surrounded by polyhedral nueleated eells; the one to the left is closed. The light band marks the position of a vertieal lym- phatic vessel, (After Klein.)

branes.

TEXTURES. |

The endothelial lining of the Blood Vessels corresponds in general characters with that of the lymphatics. In the small blood capillaries the cells are fusiform ; in those of larger size, more irregular: in the veins they are broader, more irregular, and less distinctly fusiform than in the arteries. The endothelial covering of the endocardial lining of the heart consists of a layer of flattened cells with irregular outlines. The endothelial lining of the blood-vascular system is continuous with that of the lymph-vascular system, where the thoracic duct and other large lymph-vessels open into the great veins, and thus a continuity of surface is established between the serous membranes and the lining membrane of the blood-vascular system through the lymphatics.

The endothelium of the Synovial Membranes is formed of roundish, or polygonal, or tessellated cells, arranged after the manner of a stratified epithelium. Not unfrequently processes of the sub-endothelial vascular connective tissue covered by the endothelium project into the cavities of joints and synovial burs. They have been called synovial fringes, and contribute to the formation of the synovia which lubricates the surfaces of a synovial membrane.

The endothelium of the Cerebral Ventricles and Central Canal of the spinal cord is, as already stated, formed of spheroidal or cylindrical cells, possessing cilia on the free surface. The endothelial lining of the osseous labyrinth consists of flattened scales, whilst the membranous laby- rinth possesses a layer of polygonal cells.

3d Group.—Cells imbedded in Solid Tissues,

The cells which are imbedded in the solid tissues are either grouped together in considerable masses, Or, as not unfrequently happens, are more or less separated by an intermediate matrix or intercellular substance. The matrix substance varies in its character in different tissues, and sometimes is so abundant as to obscure the cells, The textures which are constructed on this plan are of great importance, and constitute by far the larger propor- tion of the tissues not only of the human body, but of the bodies of animals generally. Sometimes these tissues are elongated into delicate threads or fibres, at other times they are expanded into thin membranes, at others they form solid masses of considerable thickness,

Connective Tissue.—By the term connective tissue is meant a group of tissues which, though the members of the group differ in various respects from each other, both in naked eye and microscopic characters, yet agree in the property of binding or connecting together other tissues or parts of the body, and in serving as a supporting frame- work for more delicate tissues. This group of tissues is the most extensively diffused of all the textures, for there is no organ in the body which does not contain one or other of its forms. The following varieties, based on modifica- tions in their appearance and structure, may be recognised.

a. Neuroglia. This name, which means nerve glue, has been applied by Virchow to the delicate tissue in the cen- tral organs of the . ; . nervous system, and of the retina, which supports the nerve cells, nerve fibres, and blood-vessels of those parts. Mi- croscopically it consists of small round or ovoid corpuscles, im- bedded in a soft undifferentiated protoplasm. A form of tumour, named

Fie. 35.—Section of the white matter of the ccrebrum. The neuroglia, nerve fibres, and capillary blood-vessels are represented.

ANATOMY

jelly of Wharton,

Glioma, is sometimes produced by the excessive growth in the brain or retina of this variety of connective tissue.

b. Retiform connective tissue constitutes the stroma or supporting framework of the lymphatic and other glands which possess the adenoid type .) = of tissue. It also forms the middle subdivision of the enamel organ of the tecth. It consists of stel- late branching cells, the branches of which blend with each other, and form a delicate anastomosing Fie. 36—Retiform connective network or reticulum. In the ‘issue from a lymphatic gland. lymph glands, the colourless lymph corpuscles are set in the meshes of this network. In the solitary and Peyer’s glands of the alimentary canal, in the tonsils, the back of the tongue, the posterior wall of ; the nasal part of the pharynx, the palpebral conj unctiva, the thymus gland, the pulp and Malpighian bodies of the spleen, colourless lymph-like corpusclesarealsoincluded in the meshesofareticulum. The name adenoid or lymphoid tissue is sometimes employed in describing this type of structure, and in some forms of disease the tissue increases in certain localities so largely Fic. 37—Lymphoid cells, included in a in quantity as to form well- from a Ipernoty Coumective tissue defined lymphoid tumours. — _™cdiastinum.

c. Gelatinous or mucous connective tissuc (Schleimgewebe), forms the connective tissue of the embryo, the vitreous humour of the eye-ball, and the

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{ 1~S which invests the Raa Pa (blood-vessels of) ae Aw

the umbilical \ oS Sse cord. It is soft iy ~ \-2 <—_— > SS

*‘ 5 A ie. § . = and jelly-like in *

consistency. Mi- croscopically it consists of round- ed, or spindle- like, or stellate cells, imbedded in a soft gela- tinous _ intercel- lular substance. Sometimes the intercellular substance is in part differenti- ated into short delicate fibres. Under some pathological conditions, this form of tissue increases largely in quantity in some parts of the body, and forms a kind of tumour named Myxoma. .

d. Fibrous connective tissue presents four modifications in appearance. It may be soft and delicate, with the fibres short and but faintly marked, as in the sub-epithelial tissue of the skin and mucous membranes. It may be loose, flocculent, and filamentous, and may contain small spaces or areole (when it is called areolar tissue), which is well seen in the subcutaneous tissue of the adult, and in the omenta. It may be expanded in the form of a Jibrous membrane, as in the fasciee or aponeuroses, and the threads or fibres, strong and well marked, sometimes run parallel, sometimes cross each other at various angles. It may be collected into rounded or flattened bands, as in tendons and ligaments, where it forms the tendinous and ligamentous tissues. Here also the threads or fibres may be distinctly recognised and seen to run in parallel bundles, so as to.

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Fig. 38.—Gelatinous connective tissue. The fusiform and stellate cells, and the partial differentiation into fibres of the intercellular substance, are shown.

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connect together the two structures between which the tendon or ligament passes.

In the fibrous form of connective tissue, both cells and intercellular substance, the latter of which is differentiated into fibres, may be recognised. The cells are, as a rule, either elongated, or fusiform, or caudate, or stellate branched cells, and are familiarly known as the connective tissue corpuscles. ‘In these cells the nucleus is round or oval, and usually well marked. It is surrounded by granular proto-

plasm, but it is very doubtful if the protoplasm is invested bya cell wall. Not unfrequently, more especially where the cells are stellate, the delicate branched protoplasm processes of adjacent cells appear to blend at their extremities with each other, and form an anastomosing network. In tend- ons the cells are arranged in linear rows, which lie parallel to the long axis of the tendon itself. In adults these cells are flattened, but in younger tendons they are more poly- gonal in form. There seems reason to think, indeed, as Thin has shown, that the bundles of connective tissue are invested by a layer of flattened cells. The wide dif- fusion of the connective tissue throughout the body, and the great importance of its cellular elements, have been especially dwelt on by Virchow as sources of origin of the new cell forms which arise in various pathological processes.

The wtercellular substance consists of fibres, which are not uniform in shape, and are divided into the two groups of white and yellow fibres.

ing, but the elastic fibres do not. The white fibres swell up and become so transparent under the action of acetic acid as to be no longer recognisable. The yellow fibres, again, are not affected by that reagent. Quekett pointed out that the elastic fibres of the liganhentum nuche of the giraffe were marked by transverse striz, and M. Watson has seen a similar appearance in the elastic pericardiac ligament of the elephant. These transverse striz are apparently cracks in the fibre; and, as Beale has shown, are not unfrequently seen in the elastic fibres in beef and mutton which have passed through the alimentary canal.

Bearing on the mode of nutrition of the tendons, and other fibrous forms of connective tissues, the existence of plasma, or juice, canals has been described, along which, not blood, but the liquor sanguinis is supposed to flow. Virchow conceived that the connective tissue corpuscles formed an anastomosing network for this purpose. Briicke believed that delicate channels or lacune existed between the bundles of connective tissue, whilst Recklinghausen maintained that serous

canaliculi were situated in the homogeneous substance which connects the fibrous fasciculi and lamellze of the connective tissue with each other. These lacunee or canaliculi are, in all probability, the root- lets of origin of the lymphatic system of vessels. There can indeed be no doubt, as the recent injections of Ludwig and Schweigger-Seidel have shown, that tendons and fascize are well provided with lymph vessels, for they have in-

White The white fibres of connective tissue constitute the | jected in them a minute net- fibrous = most common form, and make up the great bulk of most | work, consisting in part of a sia ligaments, tendons, and fibrous membranes. polygonal meshes, and in part They consist of excessively delicate filaments, of vessels running longitudin- varying from gg}pyth to gyhqqth inch in ally and parallel to the con- thickness, which are united together in nective tissue bundles, and bundles or fasciculi of variable size. The the walls of these vessels were bundles, as well as the filaments of which formed of endothelial cells. they are composed, have a wavy course, and Recklinghausen and _ others a , the filaments in each bundle le almost have recently deseribed cor- Ps 0) — Contes ee 3 ‘ . 4 g the parallel to each other. The bundles also \ pusclesin the connective tissue characteristic fusiform corpuscles. in some cases are parallel, though in others \)\ which resemble in size and 3 ere ey eet: ave soveral bleaa they cross at various angles. Not only the \W appearance the white cor- corpuscles which have probably filaments in each bundle, but the bundles puscles of the blood and ed from the vessel themselves, are cemented together ; the firm- lymph. These corpuscles are believed to move about in ness of the adhesion varies in the different Fic.39.—Fascieuli | the juice canals already referred to, and it is possible that modifications of the fibrous connective tissue, of “bowncctive they may have migrated into the tissue through the walls being much more decided in the tendons, tissue. of its nutrient blood-vessels. ligaments, and fascie, than in the lax areolar tissue. The vascularity of the connective tissue varies in differ- Yellow The yellow fibres of connective tissue, named elastic | ent localities. The periosteum and perichondrium are very cg fibres, from their elasticity, make up the mass of the liga- | vascular; but their numerous vessels are concerned in the

mentum nuchex, the ligamenta sub-flava, and the yellow elastic coat of the arteries. They are also found, mingled with the white fibres, in the fibrous membranes, the skin, mucous and serous membranes, the areolar tissue, in ten- dons, and some ligaments. In the liga- menta sub-flava and nuche the yellow fibres are arranged in bundles, the in-

nutrition not merely of these fibrous membranes, but of the bone and cartilage which they invest. The sheath of connective tissue which invests a tendon is more vascular than the substance of the tendon itself. As a rule, it may be stated that the fibrous connective tissues are not highly vascular, and that the nutritive changes which take place in them after their growth is completed are not very active.

dividual fibres of which are comparatively broad, with a distinct dark outline. They branch, and their branches readily break

The mode of development of the connective tissue has Develop |

been much discussed by anatomists, and various views have ~ ss been advanced as to the changes which lead to its pro- 4.4.

across, and the broken end then curls

upon itself. Their diameter is about

zvorth inch. In the coats of the arteries

the elastic fibres form an anastomosing

network. When mingled with the white

fibres they are much finer, and sometimes

Thay pea ebza eh in diameter a Sa ;; : stinct and de- elastic tissue from

finite outline; they branch and occasion- [#amentwm nuche.

ally anastomose; and the individual fibres, possessing a ring-

like, spiral, or twisted course, are wound around the bundles

of the white fibres. The white fibres yield gelatine on boil-

duction. It is now, however, generally admitted that it arises from the embryonic cells by a special morphological and chemical differentiation of their protoplasm, but the degree to which this differentiation may proceed varies with the particular form of the texture. In the neuroglia the tissue is apparently a simple nucleated protoplasm. In the retiform connective tissue the cells have assumed a stellate shape, and their branches anastomose. In the gelatinous and fibrous forms an intercellular matrix is extensively pro- duced, and exhibits a differentiation into fibres. In these last-named forms, which are the most characteristic varie- ties of the tissue, the cells of the embryo change their form,

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and assume a fusiform, caudate, or stellate

other forms the fibrous intercellular matrix.

then occurs.

whether the metamorphosis takes place directly, or through

the intermediate stage of a homogeneous matrix, is a secondary question, and in all probability both modes of

conversion take place at different times and in different localities. As the differentiation into fibres progresses, the

tissue becomes firmer and tougher, and the proportion of Hence, say

the cellular to the fibrous element diminishes, in a young tendon, the rows of connective tissue cells are not only closer together, but are much more readily seen than in an adult tendon, in which the increased production of fibres obscures the cellular element.

The mode of origin of the yellow elastic fibres has also been much discussed. At one time it was believed that they were derived from nuclei, and on this supposition they were named nuclear fibres. But from more recent observa- tions there is reason to believe that they are produced, like the white fibres, by a special differentiation of the proto- plasm of the embryonic cells, or of a homogeneous matrix derived from that protoplasm. In such localities as the ligamentum nuche, where the fibres are both large and numerous, the whole of the cell protoplasm appears to become converted into elastic tissue. In tendons, and those parts where these fibres are slender and scanty, and coil round the bundles of white fibrous tissue, they apparently arise from a differentiation of the protoplasm on the sur- face only of the formative embryonic cells.

AvirosE Tissuz.—The adipose or fatty tissue varies in its amount in different individuals. It is especially found in the marrow of the bones; as a layer beneath the skin, differing in thickness in different individuals ; and collected in the cavity of the abdomen in the folds of peritoneum, known as the mesentery and omenta, in which, and indeed in the other localities where it occurs, it is intimately associated with the connective tissue. It consists of cells, which vary in size from },th to ggath inch, usually ovoid or spherical in form, though when collected into masses they may be laterally compressed. These cells are sometimes isolated, though most usually arranged in rows or clusters to form lobules of fat. The number of cells in a given lobule varies with the size of the lobule. The distinctive contents of these cells is a minute drop of oil, which, when examined by transmitted light, presents a bright appearance; but when seen by reflected light, looks, as ee ee Monro primus described it long ago, like a cluster of pearls. Each fat cell possesses a distinct wall, as can be readily demonstrated by digesting these cells in ether, when the oil is dissolved out and the membranous wall remains. The nucleus of the fat cell is more difficult to demonstrate, and when seen is found attached to the inner surface of the cell wall. In the fat of old persons, and in Specimens of this tissue which have been removed from the body for a length of time, a stellate group of acicular crystals is not unfrequently to be seen in the interior of the cell, which consists either of margarin or margaric

shape ; and, subsequently a delicate fibrillated structure appears between them, which assumes the characters of the bundles of white fibrous tissue, and by separating the cells from each It has been much disputed whether these white fibres take their rise immediately from the peripheral portion of the cells by a direct differentiation of their protoplasm, or whether this protoplasm is not in the first instance converted into a homogeneous matrix in which the fibrous differentiation There can be no doubt that the fibres are formed by a metamorphosis of the protoplasm of the cells;

acid, one of the constituents of human fat. The lobules

of fat cells are included between bundles of the areolar variety of connective tissue, which form their supporting framework, But in addition, they are more or less per- fectly surrounded by a network of capillary vessels, which not only serves to convey to them blood for their nutrition, but aids in retaining them in position. The close anatomical relation between the adipose and the connective tissue points to a genetic relationship between them. It has now been ascertained that the first stage in the formation of a fat cell consists in the appearance of extremely minute drops of oil in the protoplasm of the con- nective tissue corpuscles of the part ; as these run together larger drops are produced, 'a cell wall at the same time differentiates from the peripheral part of the protoplasm, and as the cell becomes distended with oil, by the conver- sion into fat of its substance, it swells out into a spherical or ovoid cell, Klein hag recently shown that the fatty tissue of the omentum and mesentery is formed by the production of oil drops within the branched cells, which form the reticular tissue that supports the lymphoid cells found so abundantly between these folds of peritoneum. PicMENTARY Tissuz.—In some parts of the body a Pigment, yellow, brown, or black pigment is found in the interior of cells, which gives to the tissue and organ a characteristic colour. In the coloured races of mankind, and in certain parts of the body of the white races, pigment is produced in the cells of the cuticle or

epidermis, more especially in the cells of the deeper strata or rete Malpighi. In the con- nective tissue corpuscles, also, more especially in the dermis of fish, amphibia, and reptiles, pigment is found in con- siderable abundance. The choroid coat of the eyeball owes its dark brown or black colour to the presence of pigment in the interior of the cells. The 2 é pigment cells of the choroid are usually polyhedrons, 5 or 6-sided, and are arranged to form a mosaic ee pattern. In the centre is a nu- fic. ot Gent of Beisel alice cleus, and the cell substance is en eee ee occupied by numbers of minute brown granules. In the connective tissue on the outer surface of the choroid, the pigment is contained in stellate cells. In the skin of fishes and amphibia, the stellate pigment cells branch and subdivide so as to form highly complex patterns, and the cells are crowd- ed with brown or yellow granules. The production of pigment, either in the in- terior of epidermal cells, in the poly- hedral cells of the choroid, or in the stellate connective tissue corpuscles, is owing to a special metamorphosis or dif- ferentiation of the protoplasm of these cells. CaRTILaGinous Tissuz.—By the term cartilage, or Cartilage. cartilaginous tissue, is meant a group of tissues which, though usually found in the form of plates or bars, yet differ in various aspects from each other, both in naked eye and microscopic characters. They agree, however, in forming solid textures, opaque when seen in mass, but, in thin slices, translucent, pearly, or bluish white, firm in consistence, but easily cut with a knife, endowed with considerable elasticity, and yielding chondrine on boiling. Cartilage is of greater importance in the foetus, and in the immature condition of the body than in the adult, for in early life the bones are in a great measure formed of it, As development and growth proceed, a considerable pro- portion of the cartilage becomes converted into bone, and is called, therefore, temporary cartilage, whilst the remain- ing portion continues as cartilage throughout life, and is

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Fig. 44.—Stellate pig- substance ment cells from the skin of a codfish.

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termed permanent. The following varieties of cartilage, based on modifications in structure and appearance, may be recognised :—

Cells with matrix substance.

Cellular cartilage.

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Matrix homogeneous. (Hyaline cartilage.)

Matrix fibrous. (Fibro-cartilage.}

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omen)

Yellow fibro-cartilage.

White fibro-cartilage.

The Cellular or Parenchymatous Cartilage does not exist in the adult human body. It occurs, however, in the human embryo, in the embryos of all the vertebrata, and in the larval stage of development of the tunicata, as the slender rod named chorda dorsalis or notochord. In all the higher vertebrata the chorda dorsalis disappears as development advances, but in the lower vertebrates it per- sists throughout life as a more or less perfect structure. In the lamprey and myxine it forms a continuous rod in the vertebral region. In fish gene- rally, but more especially in the cartilaginous group, it forms a jelly-like mass, occupying the concayities between the bodies of the vertebra. The cells lie in contact with each other. They are comparatively large in Size, are sometimes rounded, but more usually compressed late- rally. The nucleus is often very distinct, though at other times more difficult to detect, and the cell wall is well marked. Sometimes alittle inter-cellular substance is found. By some anatomists the chorda dorsalis is regarded as a variety of connective tissue, and not of cartilage.

The cartilaginous framework of the ear of some small mammals—as the mouse, the bat, and the rat—is formed of cellular cartilage, the cells of which (are smaller in size than those of the chorda dorsalis, irregularly poly- gonal, and closely packed together so as to form a solid tissue.

The Hyaline Cartilage consists of cells imbedded in a pellucid or hyaline matrix, which, under some conditions, however, may assume 'ese ee ee eter a dimly granulated appearance. The of the mouse. xiphoid and costal cartilages, the encrusting cartilages at the articular ends of the bones, the cartilages of the nose, those of the windpipe, except the epiglottis and cornicula laryngis, belong to this var- iety, asalso the temporary car- tilages. In hyaline cartilage the cells are ovoid or poly- gonal, or even fusiform, and sometimes flattened, the flat- tened form of cell being found next the surface of the cartilage. They lie singly, or in groups of two, or three, or four ; sometimes they are arranged in linear series, at other times they are irregularly grouped together. The cell contents are dimly granular, with a well-defined nucleus containing a nucleolus. Not unfrequently two or more nuclei are present in a cell; and in old cartilage the con- tents are often coarsely granular, or even infiltrated with drops of oil. Heidenhain has shown that powerful induc- tion shocks cause contraction of the protoplasm of the cells towards the central nucleus. The cells lie in cavities in the matrix substance, and the part of the matrix which forms the immediate wall of the hollow is named the

Fia. 45.—Cells of the chorda dor- salis of the lamprey.

Fig. 46.—Cells of the cartilagi-

Fig. 47.—Hyaline costal cartilage,

capsule of the cell. Two or more cells may sometimes lie in the same hollow.

The matrix of hyaline cartilage is usually homogeneous. In some animals the matrix appears to have a concentric arrangement around the cells; and Rollett has stated that by the use of dilute sulphuric acid or chromic acid the matrix may be made to split up into concentric layers. Sometimes the matrix appears granulated, a change which is very apt to occur in sections of cartilage which have been removed for some time from the body. In the costal cartilages of old persons the matrix becomes fibrous; and it is by no means uncommon to find in advanced age these bars of cartilage converted into bone.

In the articular or encrusting cartilages the arrangement of the cells is quite distinctive. If a vertical section be made through a plate of this carti- lage, the cells next the bone are seen to be arranged in parallel rows perpendicular to the surface of the bone on which the cartilage rests; the cells are smaller than those of the costal cartilage, oblong in form, and the adjacent rows are separated by intermediate hyaline matrix. Near the free surface of the cartilage the cells are flattened, placed parallel to the plane of the surface, and so closely packed together that the proportion of matrix is much re- duced. In the intermediate parts of the cartilage the cells lie irregularly in the matrix, and are rounded in form. It was from the study of the changes which take place in articular cartilage in disease that Goodsir was enabled to establish the production of new cells by the multiplication of the normal pre-existing cells of the cartilage,—an observation which formed the starting-point of the modern doctrine of cellular pathology.

Fibro-cartilages are divided into white and yellow. White fibro-cartilage may form the connecting medium between the articular surfaces of an 38 i) amphiarthrodial joint, as in the inter- } vertebral discs; or it may form plates in the interior of joints, as in the semi-lunar cartilages of the knee and other menisci in diarthrodial joints; or it may extend around the margin of the socket of a joint, as in the cotyloid ligament of the hip; or it may invest the surfaces of bones over which tendons have to play, as where the' tendons of the peronei muscles play in the groove on the back of the external malleolus. In the intervertebral discs,

Fre. 48—Verticul section through an encrusting cartilage. 3B, the bone on which the cartilage rests,

Fie, 49.— White fibro – cartilage of an intervertebral dise.

“which give the best illustrations of the structure of white

fibro-cartilage, the cells are ovoid in form and distinctly nucleated. Sometimes two or three are grouped together, but not unfrequently they occur singly. They are sepa- rated from each other by short fibres. In these discs the fibrous matrix is always stronger and more distinct in the peripheral than in the central part. The other forms of white fibro-cartilage are transitional between the true cartilage and connective tissue, t.e., the cells possess the characters of cartilage cells, whilst the fibrous matrix approximates to the matrix of the connective tissue.

The yellow elastic fibro-cartilages are the epiglottis, the cornicula laryngis, the cartilaginous framework of the auricle of the human ear, and the ears of mammalia generally, and the cartilaginous wall of the Eustachian tube. The cells are rounded or ovoid, distinctly nucleated, and usually arranged singly or in pairs. The matrix is distinctly fibrous; the fibres, which form a close intersecting net-

Develop- ment of cartilage.

Bone.

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work, branch and sometimes anastomose. They resist the action of acetic acid like the yellow fibres of connective tissue; and Donders has described a continuity between them aud the elastic fibres of the counective tissue, which forms the investing perichondrium of this form of cartilage. The yellow fibro-cartilage has no tendency to ossify.

The bars and plates of cartilage,—except the encrusting hyaline cartilages, and the interarticular, marginal, and in- vesting white fibro-cartilages,—are surrounded by a fibrous membrane or perichondrium.

In the adult human body cartilage is uot penetrated by blood-vessels, but is nourished by the vessels which ramify in its investing perichondrium. In the foetus, however, and in the large masscs of cartilage which are found in the skeletons of the cetacea and of the cartilaginous fishes, the cartilage is permeated by canals in which blood-vessels ramify. In the encrusting cartilages, the cartilage is nourished by the blood-vessels of the synovial membrane of the joint, which, in the case of the articular cartilage, form a vascular ring around its margin; and, both in it and in the forms of white fibro-cartilage that do not possess a perichondrium, by the vessels of the bone, to which these cartilages are as a rule attached. In the movable joints, after the child has begun to use its limbs, the synovial membrane is not continued over the free surface of the articular cartilage, but stops at its margin along the line of the vascular ring. In the foetus, however, it has been stated that both blood-vessels and synovial membrane are prolouged over the frec surface of the articular cartilage.

In the development of hyaline cartilage the contents of the embryonic cells of the part, where the cartilage is to be produced, become clear, and a cell wall differentiates around the exterior of the cell. The nuclei in the cells divide and subdivide, so that a multiplication of the cells by endo- genous reproduction takes place. Hyalinc matrix sub-

Stance then appears between the cells, and is concentrically

arranged around them; it is believed to be formed by a special conversion of successive layers of the cell proto- plasm into a substance which yields chonarine on boiling. The fibro-cartilages, both white and yellow, but especially the latter, yield but little chondrine on boiling, for the fibrous matrix of the white fibro-cartilage is a gelatine- yielding substance, like the white fibres of connective tissue, whilst the fibres of the yellow fibro-cartilage partake of the nature of elastic tissue. The fibro-cartilages, there- fore, form a group which links together the connective and cartilaginous tissues.

OssEous TissuE—The osseous tissue, or bone, is that which constitutes the hard framework of the skeleton. Each bone consists of a hard, more

or less dense, tough, and but slightly elastic material. The clasticity of the bones is more marked in young than in adult and aged persons. From differences in their external configuration, bones are divided into long or cylindrical, e.g., femur; short, e.g., carpal or tarsal bones; flat or plate-like, ¢.g., scapula; irregular bones, e.g., vertcbre. These variations in shape do not, however, involve differences either in composition or minute structure. Bone consists chemically of an earthy and an animal substance intimately blended together. The earthy matter forms about two-thirds of it, and consists chiefly of phosphate of lime, which, from its abundance in bone, is frequently called "bone earth." Carbonate of lime and a small proportion of soda and magnesia salts are also prescnt. The hardness of bone is due to the presence of the earthy matter. The animal inatter forms the remaining third, and yields gelatine on boiling; it imparts elasticity and toughness to the bone, aud binds together the particles of earthy matter.

Bone presents two different structural characters to the naked eye. The outer part of a bone is its hardest part,

and forms a dense external shell, technically called the compact tissue. 'The interior of a bone is much less firm, and is made up of thin delicate plates or bars, or trabecles, which intersect each other at various augles, and form a lattice-like arrangement, technically called the spongy or cancellated tissue. The plates and bars of the spongy tissue are continuous with the inner surface of the compact tissue. In the long bones the interior of the shaft is hol- lowed into a canal, named the medullary canal, the walls of which are formed by the compact tissue, and the can- cellated tissue is found only at the articular ends of these bones; the thickness of the compact tissue in a long bone is always greater at the centre of the shaft than at or near the articular ends.

If the outer surface of the compact tissue of a long bone and the wall of the medullary canal be examined with a pockct lens, they will be seen to be riddled by multitudes of minute orifices, which are the mouths of minute tubular passages or canals that traverse the compact tissue. These passages are named L/aversian canals, and their arrange- ment may be studied by making thin sections through the compact tissue, and submitting these to microscopic examination, when they will be scen to pass longitudinally or very obliquely through its substance, so as to terminate by rounded orifices either on its outer surface, or ou the inner surface, which forms the wall of the medullary canal. These canals are connccted together at intervals by short transverse or oblique canals. Owing to these communica- tions the dense osseous tissue is permeated by an anasto- mosing network of canals, which, as they contain blvod- vessels, may be named vascular canals. These canals are circular in section, and vary in diameter from about gipth tO yy'ppth inch. They not unfrequently are dilated at the inner end, where they open into the spaces of the canccllated tissue. The compact tissue of all bones possesses a system of canals similar to those found in the long bones, but when bone occurs in the form of very thin plates the canals may be absent. In addition to the Haversian canals, irregular spaces, named L/aversian spaces by Tomes and De Morgan, may also be seen in sections through the com- pact tissue. They are mct with not only in young but in adult bones, and are regarded as produced by absorption of the bone in those particular localities. In thin sections through bonc, more especially when the Haversian canals are transversely divided, the densc tissue or matrix of the bone which surrounds the canals is seen to be arranged in concentric rings, as if it were built up of a series of lamella superimposed on each other. These lamelle do not at all times form complete circles, and the number which sur- round a canal may vary from two or three to half a dozen; they are somctimes called the Haversian lamella. Other lamellee lie in rclation to the periosteal surface of the bone, and are called peripheral lamellz ; whilst others again are, asit were, intercalated between adjaceut Haversian systems of lainellee, and are named intcrmediatc or interstitial. It has been pointed out by Sharpey that a bone lamella, after the earthy mattcr has been dissolved out by the action of an acid, is made up of multitudes of fine trans- parent fibres, which interscct

each other and form a net- work. But he has further shown that the lamelle are perforated by fibres, or bundles of fibres, which pass through them either perpendicularly or obliquely, so as to bolt adjacent lamclle together. With a little care, the per- forating fibres of Sharpey may be drawn out of the holes or sockets in which they are lodged.

When thin sections through a macerated and dried bone are examined under the higher powers of the microscope, the lamellated matrix is seen to exhibit a very peculiar appearance, which is characteristic of the osseous tissue. Between the surfaces of adjacent lamell« irregularly

elongated spaces, called lacune, are to be seen in con- siderable numbers; these lacunz, like the lamelle be- tween which they are situated, have a concentric arrange- ment around the Haversian canals. The lacune, the lamella, and the Haver- a prgeerncpane a sian canal which they @ surround, are sometimes named a Haversian sys- tem. From the ends and sides of any one of these lacune very minute branching canals, termed = dana hovle, proceed which PY ste or imental Oe ee penetrate the lamelleand Haversian canals, lamellx, lacune, and anastomose with the eanaliculi are shown.

canaliculi proceeding from adjacent lacunz, whilst the canaliculi, springing from the sides of those lacunze which lie nearest to the Haversian canal, open on the wall of the canal itself. The lacune average in length yeo7th inch, and their transverse diameter is about geypth inch ; the canaliculi vary from +54 55th to ggtyyth inch in diameter. When examined in a dried bone by transmitted light, the lacunz look like solid, black bodies, and the canaliculi seem to be processes branching off from them, hence they were erroneously called by the earlier observers bone-corpuscles. But if a little turpentine be added to the section, the fluid displaces the air which the lacune and canaliculi contain in the dried bone, renders the part more transparent, and affords a satisfac- tory demonstration that they are, in a macerated and dry bone, not solid bodies, but a minute system of

spaces and anastomosing little canals; and that all those which lie in the same Haversian system not only freely communicate with each other, but, either directly or indirectly, with the Haversian canal which they surround.

But a macerated and dried bone, such as one sees in museums and in articulated skeletons, and the structure of which has just been described, is a bone which has been deprived = of several soft tissues by the pro- = cess of putrefaction, which tis- suesare of theutmost importance – in the economy of the bone inthe living animal. A living bone is 2 acomplex organ, anda macerated bone – only the skeleton of ~ Fig. . 51. — Longitudinal seetion living bene. It is essential, through the compact tissue of a therefore, in studying the struc- ¢t"biooduvessels. from. the perk ture of bone, that the attention ph Na should not be limited to the ap- , pearances presented by the macerated bone, but that the arrangement and structure of its soft tissues should be con- sidered. The soft tissues of a bone are the periosteum and its prolongations, the marrow, the minute masscs of nucleated = protoplasm which occupy the lacunze of the bone, the bloodand lymph vessels, and the nerves,

The Periosteum is a strong fibrous membrane which invests all the exterior of a bone, except 'fle: APN i'? BPN SS HRY where the encrusting cartilage ¢//A4" Ai (ee X ys i 1s continuous with its articular Fi. 52.—Seetion through the peri-

end. It is subdivided into two . osteum and compact tissue of a

layers: a, a firm external fibrous elon cet oe aati layer, consisting of bundles cellular layer prolonged into H H, of connective tissue, which de- Pe es Bye tern ica shtasine cussate with each other jin ® canal

various directions, and amidst which a network of small blood-vessels is freely distributed prior to their

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passage into the Haversian canals; 6, a softer internal layer, which is especially well marked in young growing bones. This soft layer partly consists of very delicate connective tissue, in which rounded or oval cells are found, which give off slender processes at various points of their periphery, and partly of larger granular cells, which lie next the bone itself. Processes of the soft inner layer are prolonged into the Haversian canals, in which, as Goodsir pointed out, a layer of cellular substance lies between the wall of the canal and its contained blood-vessel, so that these canals are not, as in macerated bones, empty passages, but are filled up by the blood-vessels and the cellular layer.

The Marrow occupies the medullary canal of a long bone and the spaces in the cancellated tissue of bones generally, It occurs in two forms, red and yellow marrow. Red marrow is found in the bones of the fcetus generally, and in the cancelli of the plate-like, short, and irregular bones at a more advanced period. It consists principally of large many-nucleated masses of protoplasm, the myeloid cells of Kélliker and Robin, lying in a very delicate areolar tissue, and supplied by a network of capillary blood-vessels. It contains little or no fat. Yel- low marrow, again, is composed of fat cells lying in a delicate areolar tissue with accompanying blood-vessels. The areolar tissue, which supports the marrow cells, lines the medullary canal and cancelli, and is named the medul- lary membrane, or the endosteum.

In the fresh bone the lacunz are not empty spaces as in the macerated bone. They are filled up by nucleated clumps of protoplasm, and are therefore, as Goodsir was the first to show, the seats of little masses of nucleated cells, which cells are the true bone-corpuscles. The protoplasm of these cells is apparently prolonged into the canaliculi. Hence the hard part of the osseous texture has within it a system of nucleated cells, some of which occupy the lacunz and canaliculi, while others form a lining to the Haversian canals,

The blood-vessels of a bone are abundant. It receives its arteries partly from the small arteries which ramify in the periosteum, the fine branches of which enter the Haversian canals, and form within them an anastomosing network of capillaries; partly through a special

artery which enters the nutrient canal in the bone, to be distri- buted chiefly to the marrow; partly through small arteries which enter openings in the compact tissue near the articular extremities. The veins of bones are also abun- dant. In the cancellated tissue they are large, and leave the interior of the bone partly through foramina situated near the articular ends, and partly by a vein which accom- panies the artery that traverses the nutrient canal. In the plate-like bones of the skull the veins lie in distinct channels in the diploé, and in the bodies of the vertebrae the veins pass out through large holes in the posterior surface. Bones possess lymph-vessels, but their exact mode of arrangement has not yet been ascertained. Fine nerves have been traced into bones accompanying the arteries which enter the nutrient and Haversian canals.

It is clear, therefore, that a bone, hard and dense though its texture seems to be, is yet hollowed out by spaces, passages, and canals which, under the several names of medullary canal, cancellated spaces, nutrient canal, Haversian canals, Haversian spaces, lacune, and canaliculi, are occupied by blood-vessels or other soft tis- sues. By the penetration of blood-vessels into the bone, blood is conveyed not only to the medulla, but into the very substance even of the compact tissue ; and there can be no doubt that the nucleated masses of protoplasm which occupy the lacunz and canaliculi, and line the Haversian canals, are, as Goodsir long ago pointed out, centres con- cerned in the nutrition of the matrix substance of the bone in their immediate neighbourhood. These cells,

nutrition of the osseous tissue. In the description of the development of the skeleton,

it was stated that the bones are formed by ossification in cartilage and fibrous membrane, so that bones are pro-

duced by secondary changes in a pre-existing material,

The mode of production of the osseous tissue in the car- tilagiuous and fibrous tissues will now be considered, and

it should be clearly understood at the outset that, in normal

ossification, bone is not formed by a mere calcification of the matrix of the pre-existing tissue, and a conversion of the cartilage or connective tissue corpuscles into bone

corpuscles; but, as the researches of H. Miiller, Lovén, and Gegenbaur have due to a development of new corpuscles,

Sharpey, Bruch, made known, is which Gegenbaur

has named osteo-blasts, accompanied by an abundant forma-

tion of blood-vessels.

When the process of ossification in temporary cartilage begins, a change takes place in the arrangement of its cells

at the centre, or point, or nucleus of ossification. The cells,

instead of preserving their irregularly scattered arrange-

ment in the matrix, are now collected into longitudinal parallel rows, not unlike what was described in a previous section, in the deeper cells of encrusting cartilage. In each row the cells lie with their long axes transverse, and apparently multiply by a process of fission. The cells at the end of the rows which lie nearest the centre of ossific change swell out and become more rounded. Calcification of the matrix substance, which Separates not only the parallel rows of cells, but also the cells in the same row, from each other, then takes place, which calcification in-cludes also the capsules of the cartilage cells. A general opacity of the cartilage is the result of this calcification, and the further progress of ossification is rendered obscure, It is necessary, therefore, to dissolve out by an acid the calcareous matter, in order to' follow the steps of the process,

Spaces or canals now form in the ossifying cartilage,

into which blood-vessels, continuous with the vessels of

the perichondrium, are prolonged. These spaces are lined by concentric layers of small rounded cells, not unlike lym- phoid cells in size and appearance, and form the medullary spaces of foetal cartilage, whilst the cells and blood-vessels form the medulla. Respecting the source of origin of the cells of this medulla, there have been difficulties in arriving at a correct conclusion. Some have believed them to be descended from the cartilage cells, though no demonstration of their derivation from this source has ever been obtained. Henke conceived that they might be blood corpuscles migrated from the blood-vessels within the spaces. But the recent observations of Stieda seem satisfactorily to show that the layers of medulla cells are continuous with similar layers beneath the perichondrium, which layers are prolonged along with the blood-vessels into the medullary spaces as they form in the ossifying cartil-age. But, whatever be their derivation, there can be no doubt that these cells undergo certain modifications which are of the utmost importance in the further stages of the ossific process. A few become elongated into fusiform or

Stellate corpuscles, like those of connective tissue 3 others

have oil drops forming in their interior, and become the cells of yellow marrow; others become the corpuscles of red marrow ; others, again, which form the osteo-blasts, properly so-called, are the direct agents in the production of the osseous tissue itself.

The formation of the medullary spaces in cartilage is owing to an absorption of the calcified cartilaginous tissue. Kolliker points out that the absorption is effected through the agency of colossal, many-nucleated cells (myeloplaxes), which he believes to be derived from the osteo-blastic cells

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together with the periosteum, the medulla, and their blood- vessels, are active agents in the development, growth, and

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of the medulla already described, so that a destruction of the calcified cartilage precedes the formation of the proper

undergo an important shape. They become

from the periphery towards the nucleated centre of the cell, so as to give Origin to the dense matrix substance of a bone lamella; protoplasm immediately investing

—they form the //@ soft contents of the Ps lacune and canaliculi.)) RS

A second layer of y) osteo-blastic medulla ” Wi.

cells then passes through a similar Raat metamorphosis, and Wi

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the bone are produced. Hence it would appear that the dense solid matrix of the osseous tissue is produced by a special hardening of the protoplasm of the osteo-blastic cells in the medullary spaces, and as layer after layer of these cells is ossified successive lamellz are produced. The per- sistence, however, of. the nucleus of each osteo-blast, and of a small portion of its investing protoplasm, preserves within the hard matrix a certain amount of soft material, which being destroyed when a bone is macerated, leaves the lacunary and canalicular system already described. The formation of successive

lamella diminishes the size of the medullary spaces, which then form the Haversian canals, The vascular and cellular contents of these canals are therefore the remains of the contents of the medullary spaces of the fcetal cartilage, and are continuous with the deeper layer of the periosteum.

So long as any cartilage remains in a feetal or young bone the process of replacement of the cartilaginous tissue by the proper osseous tissue goes on, until none of the cartilage is left, except the thin layer of encrusting cartil- age at each articular extremity. Bones grow in length by an ossification in cartilage; and a provision for their longitudinal increase is furnished up to, and even beyond the age of puberty, by the plate of cartilage which separ- rates the epiphysis from the shaft of a bone. The ossifica- tion of this plate of cartilage marks the period when growth ceases in the long axis of the bone. But bones also grow in thickness, and this addition to their girth takes place by an ossification of material situated at their circumference. It has already been pointed out that a bone is invested by a fibrous membrane, the periosteum, which fulfils for it the same purpose as does the peri-chondrium for the cartilage. On the deeper surface of the periosteum, 7.¢., next the bone itself, are osteo-blastic cells, similar to those which lie in the medullary spaces of the foetal cartilage. These cells pass through a similar scries

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Fic. 63,—Section through a foetal bone to illustrate its development. B, B, the dense osseous tissue, in which the lacune, with their soft nueleated contents, may be seen. M, M, the medullary tissue in the medullary spaces. OB, OB, layer of osteo-blastie cells of the medulla, next the osseous tissue, some of whieh in plaees are obviously beeoming included in it. V,V, trans- versely divided blood-vessels, surrounded by medulla cells, situated in medullary spaces, which are assuming the form of Haversian canals.

of changes, and produce successive layers of new bone at the periphery. The importance of the periosteum as a centre of origin of new bone has, indeed, long been recog- nised by both surgeons and pathologists. The parts of this membrane in which the special bone-producing power resides is the deep layer of osteo-blastic cells, whilst the blood-vessels furnish the pabulum for their nutrition. If strips of periosteum be removed, along with the cells of the deeper osteo-blastic layer, from a bone, and transplanted to other parts of the living body, bone will continue to be produced by their agency.

The intra-membranous ossification of bone was _ first recognised by Nesbitt, and has been worked out in most of its details by Sharpey, Kolliker, and Gegenbaur. tabular bones of the skull offer the best illustration of this mode of ossification. Sharpey has pointed out that a network of minute spicula of bone forms in the membrane, and extends in radiating lines from the centre of ossifica- tion towards the circumference of the bone. The ossify- ing tissue consists of fibres, of multitudes of granular cor- pu cles or osteo-blasts, and of blood-vessels. The osteo-blasts invest the fibres, but as the investing osteo-blastic cells calcify, from the periphery towards the nucleus, they assume a stellate configuration, and pass through a series of changes similar to those described in the intra-cartilaginous mode of ossification. The fibres, which are in the first instance soft, also calcify, and contribute to the formation of the bone. Here, however, as in the intra-cartilaginous ossifica- tion, the active agents in the ossific process are the osteo- blastic cells. The lamellated structure is due to ossifica- tion of successive layers of these cells, and the formation of the lacuns and canaliculi is owing to the persistence of their nuclei with a sinall proportion of unossified investing protoplasm. The increase in thickness of a membrane bone, like that of a cartilage bone, takes place through ossification in a deep periosteal layer of osteo-blasts. Hence it follows that, though the tissue which precedes the appearance of bone in the skeleton is not uniformly the same, in some cases being membrane, in others cartilage, there is an identity in the ossific process in the two forms of pre-existing tissue, in both of which the osteo-blastic cells are the active agents in ossification, The chemical differentiation which takes place in the protoplasm of the

osteo-blasts during bone-formation is not merely a calcifica- tion, but a coincident production of a gelatine-yielding substance, within which the minute calcareous particles are deposited.)

Stress has been laid by some anatomists, in discussing the homologies of the several bones of the skeleton, on the differences niet with in the place of their formation. Thus, it has been supposed that a bone originally developed in cartilage cannot be homologous with one originally de- veloped in membrane, and that a fundamental morpho- logical distinction should be drawn between cartilage bones and membrane bones. But when it is considered that, though the place of formation may vary, the method of formation is the same in all localities, it does not appear that so much importance should be attached to the distinc- tion between cartilage and membrane bones as it has some- times received. Moreover, the differenccs between these two varieties of bones are, during the growth of the bone, still further diminished, for in both cases increase in thick- ness takes place in the same kind of pre-existing tissue, and in the same way, viz., by ossification of the deep periosteal layer of osteo-blasts.

In the description of the development of bone in the foetus and young person, the formation of medullary spaces was referred to, But the production of spaces in bone is by no means limited to its early stages of growth. The medullary canal in a long bone can scarcely be said to

exist in the bones of an infant's limbs. The hollowing out of the shaft of a long bone into a large canal, and the enlargement of the spaces of the cancellated tissue, goes on not only up to the period of adult life, but even to ad- vanced years; so that in an old person the relative size of this canal is greater than in the prime of life. The Haver- sian spaces also, as Tomes and De Morgan pointed out, are produced by the absorption of the lamelle of the osseous' tissue surrounding the

Haversian canals, and the production of these spaces is constantly going on during the life of the bone. The air-sinuses in the cranial bones are also formed by the absorption of the diploé, and con- sequent separation of the two tables of the skull. Bones, therefore, are organs which are continually undergoing change. During growth additious are being made to their length and thickness, and additional lamellze are being formed in the walls of the Haversian canals. At the same time a hollowing out of spaces in their interior is going on, so that an increase in weight commensurate with their growth does not take place. The interstitial absorptive changes, whether occurring during growth or after growth is completed, are due, as Kélliker has shown, to the action of many-nucleated colossal cells which line the walls of the spaces where absorption is going on, which cells he has named ostco-klasts. The development and configuration of a bone is therefore, as has been well expressed by Kolliker, the product of the formation of osseous tissue by the agency of the osteo-blasts, and of its absorption or destruction by the action of the osteo-klasts.

From the fact that osseous tissue may be produced either in the cartilaginous or in the fibrous tissues, and that all three contribute to the formation of the skeleton, it is evident that these tissues are closely allied. To express this alliance they have all been grouped together under the common term connective substances.

Muscutar Tissur.—The muscular tissue is that which Muscle.

is actively concerned either in the movement of parts of the body on each other, or in the movement of the entire body from place to place; it is the active agent, therefore, both in motion and locomotion. It forms a large pro- portion of the general mass of the body, is the essential constituent of the muscles or flesh, and enters into the formation of the walls of the hollow viscera. It consists structurally of threads or fibres, some of which are distin- guished by being marked with transverse stripes or strie ; others have no such markings. Hence it is customary to divide the fibres of the muscular tissue into transversely striped fibres and non-striped fibres. As a rule, the striped fibres are collected together to form those muscles which are under the

influence of the will, so that both the muscles and the fibres of which they are composed are called volun- tary. One important exception to this rule is, however, met with, for the muscular fibres of the heart, though transversely striped, are involuntary ; the will exercises no, control over the action of the heart. The non-striped fibres, and the muscles into the construction of which they enter, are in no instance, however, subject to the influence of the will; so that, without exception, they may be named in- voluntary.

The Non-striped or Involuntary fibre, sometimes called pale or smooth muscular fibre, enters into the forma- tion of the walls of the hollow viscera—e.g., stomach, intestines, bladder, uterus—of the walls of the air-tubes, gland-ducts, blood and lymph vessels, of the skin, and various mucous membranes. 'The fibres are usually col- lected into bundles or fasciculi, which are not aggregated together into such compact red masses as in the voluntary muscles, but are of a paler red colour, and are set farther apart, and often cross and interlace with each other in the walls of the tubes and hollow viscera, in which this form

of wnuscle is found. The fasciculi are separated from each other by a delicate, arcolar connective tissue, or perimysium. The size of the fasciculi varies in different localities ; in the hollow viscera they are so large that their arrangement can be observed with the naked eye; but in the skin, the walls of gland- ducts, &c., they can only be seen with the aid of the microscope. If a fasciculus be carefully torn up with needles it can be resolved into its constituent fibres, and the number of the fibres varies with the size of the fasciculus. The non-striped fibres are pale and almost colourless, with soft, ill-defined outlines, from atooth to B yoooth inch in diameter; they are rounded

in form or laterally compressed, and are so easily flattened by artificial pressure, that they have erroneously been regarded as flat

or ribbon-shaped fibres. When digested pe ne ti for a few hours in dilute nitric or hydro- muscular fibre; B, chloric acid, and somctimes

even without at tems oo any reagent, the fibres may be resolved into highly magnified. elongated fusiform cells—the contractile Jibro-cells of Killiker —which vary in length from séoth to g1,th inch, and which taper off usually into attenuated ends. In the middle of each cell is a characteristically elongated, rod- shaped nucleus, and sometimes the substance of the cell is finely granular, or even faintly longitudinally striped. No cell wall or sarcolemma can be distinguished. In some localities, as was pointed out by Lister in the minute arteries in the web of the frog's foot, isolated contractile fibro-cells are wound spirally around the wall of the vessel,

The Transversely Striped fibre is the characteristic tissue of the voluntary muscular system, and is found wherever energetic movements arc to be performed. In these muscles the fibres are collected together in fasciculi, which bundles usually lie parallel to each other, and extend from the tendon of origin to the tendon of insertion, Each muscle is invested by a membranous sheath formed of conncctive tissue, the perimysium externum, which sheath gives off processes that dip into the substance of the muscle, so as to form delicate partitions between the fasciculi, and from these partitions still more slender prolongations of connec- tive tissue, named perimysium internum, pass between the fibres, The number and size of the fasciculi vary with the size and texture of the muscle ; In some, as the deltvid and gluteus maximus, the fasciculi are large and coarse ; whilst in others, as the gracilis and omo-hyoid, they are much finer. The number of fibres in a fasciculus varics with its length and thickness, and the fibres which are adjacent to each other in a fasciculus lie parallel. The striped fibres are cylindrical or laterally com- pressed; they usually taper off at their extremities, and apparently do not, even in muscles with long fasciculi, excced 1} inch in length. The transverse diameter of the striped fibres varies, in different localities in the human body, from 4th to zz'yoth inch, according to the measure- ments of Kolliker. Much wider differences in diameter are found in the aniinal series, in insects the fibres being of extreme minuteness, whilst in cold-blooded animals they are much larger than in man and mammals.

If a fibre be carefully separated from a fasciculus, and examined microscopically by transmitted light, transverse stripes may be readily seen to extend across it from side to side. These transverse strie are not mere surface marks, but, as Bowman pointed out, pass through its entire thickness, and lie parallel to each other. The stria- tion is due to the structure of the fibre, which consists of dark and light bands or discs, alternately dark and

light. The discs differ in optical properties, for, as Briicke's observations show, the light discs refract light singly—are isotropic; whilst the dark discs refract light doubly, and consist of an anisotropic substance. Busk and Huxley described in 1853 a dark line passing across the light disc, so as to sub- divide it into two halves 3 and this appear- ance has also been figured by Sharpey, Krause, and others, It is believed to be due to the presence of a strongly refracting stripe in the middle of the feebly refracting disc, More recently Hensen has directed attention to a slender, feebly refracting stripe passing transversely across the strongly refracting disc, so as to subdivide it also into two halves, In addition to the transverse strie, the fibres not unfrequently show markings which extend longitudinally, but these are irregular in position, do not cor- respond to the whole length of the fibre, or necessarily pass through its entire thickness. The transverse and longitudinal mark- versely striped Ings indicate that a muscular fibre has a muscular abre disposition to split up transversely or longitudinally into smaller particles. The transverse subdivision of the fibre is promoted by digesting a piece of muscle for some hours in dilute hydrochloric acid. If the fibres be then examined, Saps or fissures will be seen to extend transversely into the substance of the fibre ; and, if the digestion has been sufficiently prolonged, the fissures have extended completely across the fibre, and

Fid. 55.—A trans-

have subdivided it into a multitude of plate or disc-shaped

bodies—the muscular – Jibre discs. These discs are the strongly and feebly refracting discs already described, and the transverse diameter of each disc corresponds to that of the fibre from which it has been derived. The longitudinal marks in the fibre are best seen by digesting a piece of muscle in strong spirit of wine, or in a solution of chromic acid. If a fibre so treated be teased out with needles, and the thin covering glass be smartly tapped, the fibre will split up longitudinally into multitudes of minute, clongated threads—the muscular-fibre jibrile.

Another view of the structure of muscular fibre has just been advanced by E. A. Schifer. He describes the dark, or, a8 seen in a living fibre, the "dim discs," as traversed by multitudes of excessively fine, dark, rod-shaped particles parallel in their direction to the fibre itself, which extend into the contiguous bright discs, near the middle of which each muscle rod ends in a knob-like extreinity, and the series of knobs form a line of minute dark dots, passing transversely across each bright disc. The muscle rods are

imbedded in a " ground substance," that forms the altcr- nating dim and bright discs, which substance he believes to be anisotropous, whilst the muscle rods are isotropous. He regards the ground substance as the true contractile part of the fibre.

Each transversely striped fibre is invested by a honio- geneous membrane, the sarcolemma or myolemma, which is so transparent as to allow the characteristic transverse striz to be distinctly seen through it. The sarcolemma is so closely incorporated with the periphery of the fibre, that its isolation and demonstration as a distinct membrane are attended with some difficulty, but when water is added to a living fibre

it is absorbed, and elevates the sarcolemma from the sarcous contractile particles. If acetic acid be added to a muscular fibre the transverse strize become less distinct, and a number of oval bodies come into view. These are especially to be seen next the periphery of the fibre in relation to the inner surface of the sarcolemma, though some apparently lie deeper in the substance of the fibre. These bodies have long been known as the nuclei of the striped fibre. More recent investigations have, how- ever, shown that each nucleus lies in a little finely-dotted protoplasm, which often extends in a fusiform manner beyond the ends of the nucleus. These nuclei, with their investing protoplasm, have the anatomical characters of nucleated cells, and are called the muscle corpuscles.

Some peculiar modifications of the striped muscular fibre are met with in certain localities. As a rule, this form of fibre docs not branch ; but in the muscles of the tongue and lip, and other muscles of the face, these fibres usually branch prior to their insertion, and the branches taper off to finely attenuated ends. In the heart also the fibres branch ; and the branches of adjacent fibres anastomose, so that the muscular wall of this organ consists of a com- pact network of fibres. The individual fibres are smaller than those of the voluntary muscles, the transverse stria- tion is much less distinct, and it is doubtful if an investing sarcolemma be present.

Some difficulty has been experienced in determining the exact mode of connection of the fibres of the belly of a muscle with those of its terminal tendons. By some it has been supposed that the fibres of the one are directly con- tinued into those of the other; whilst Weismann has de- scribed the muscular fibre as terminating in a sharply- defined, rounded, or pointed extremity, to which the fibres of the tendons are closely apposed.

Both the striped and non-striped forms of muscle are well provided with blood-vessels, which ramify in the sub- stance of the muscle lying in the areolar connective tissue that separates the fasciculi and fibres from each other. The capillaries form an elongated network, the principal strands of which lie parallel to the muscular fibres, but never

penetrate the sarcolemma. Hence, though the belly of a muscle is a highly vascular organ, its individual fibres are extra-vascular. 'The vascularity of the fleshy belly is much greater than that of the terminal tendons of attach- ment, and the nutritive changes are much more active in it than in them.

The contractile fibro-cells of the non-striped muscular fibre are formed by the gradual elongation of the rounded cells of the middle germinal layer of the embryo into spindle-shaped cells, the oval nuclei at the same time be- coming elongated, so as to assume a rod-shaped form. Usually the spindle cells which lie in the same linear series become cemented together into the smooth fibres of this form of muscle.

_The mode of development of the striped fibre is more difficult to follow out, and various statements have been made as to the successive stages of its formation. Schwann believed that a fibre was built up of the embryonic cells of

the part, which arranged themselves in linear series, coalesc- ing with each other at their surfaces of contact; that the contents of the cells then became transversely striated, and that the cell walls formed the sarcolemma. Savory and Lockhart Clarke maintained that a formation of blastema took place around free nuclei, and that this blastema gradually assumed the striated character. Remak, Klliker, Wilson Fox, and Frey have, however, by studying the earliest stages of development in the very young embryo, established the fact that the striped fibres are developed from the cells of the embryo, though not in the manner described by Schwann. The process, briefly stated, is as follows: The embryonic cells elongate, the nucleus may remain single, but more usually it divides and subdivides, so that many nuclei appear in the interior of the elongated cell. The nuclei lie in linear series, and may either be separated from each other, or two or more may be in contact, and they may lie either near the periphery of the elongated cell, or in its axis. With this multiplication of the nuclei, the cell increases in

length and assumes the form of a fibre. The cell protoplasm, both in the single and many-nucleated fibres, then differentiates into the sarcous particles of the transverse striz, and as this progresses the fibre assumes its characteristic striped appearance. The whole amount of the protoplasm does not, however, assume the transversely striped appearance, for a small quantity remains around each nucleus and forms with it a muscle corpuscle. The differentiation of the protoplasm occasions an anatomical and chemico-physical change in the fibre, and confers on it the property of energetic contractility. W. Engelmann has endeavoured to show that the opaque anisotropic discs of the fibre are those in which the power of contractility resides, and that the clear isotropic discs possess only elastic properties. The mode of development of the sarcolemma is still somewhat obscure. By some it is regarded as the wall of the embryonic cell, which has become metamorphosed into a inuscular fibre ; by others it is regarded as a special differentiation of the protoplasm at the periphery of the fibre taking place at the time when the transverse striz are being formed ; whilst by others it is considered to be a special modification of connective tissue formed around the fibre. In the-development of the muscular fibres of the heart, the cells of the embryo heart branch and anasto- mose, and the nuclei multiply. By the transverse striation of the protoplasm of these cells the branched muscular fibres of the heart are produced.

In the growth of a muscle the individual fibres increase in size, so that they are bigger in the adult than at the time of birth. The observations of Budge, Weismann, and Beale show that new fibres may also form in a muscle. Weismann believes that this increase may be due to a longitudinal splitting of a pre-existing fibre; but Beale maintains that the new fibres are produced in the muscle in the same manner as the original fibres of the part.

NERvouS SYSTEM.

The Nervous System consists of a number of organs which are named respectively Nerve Centres, Nerves, and Peripheral End-organs. The largest and most important Nerve Centres are the brain and spinal

cord, which together constitute the cerebro-spinal nervous axis, and are lodged in the cranial cavity and spinal canal. But, in addition, numcrous small bodies, usually oval in form, technically called ganglia, are situated in the axial part of the body, and form smaller nerve centres. The Nerves are white cords which traverse the different regions of the body, both axial and appendicular, for a greater or less distance, for the purpose of connecting together the other sub-divisions of the nervous system. The Peripheral End-organs are

minute structures connected with the peripheral extrem- ities of the nerves. These end-organs are situated in the skin and other organs of sense, in the glands, blood-vessels, and muscles. The nerves establish communications and con- duct nervous impulses, either between different nerve centres, or between nerve centres and peripheral end-organs, so as to associate together in their action parts of the nervous system often widely separated from each other. N erves, therefore, are internuncial structures. When a nerve con. nects two nerve centres together it is intercentral. When a nerve connects a nerve centre with a peripheral end- organ, and conducts impulses from the centre to the end-organ, it is a centro-peripheral or centrifugal nerve. When a nerve connects a peripheral end-organ with a centre, and conducts impulses from the end-organ to the centre, it is a periphero-central or centripetal nerve. Owing to the different directions in which impulses are conducted by nerves, the varying nature of their end- organs, and the functional differentiation of the nerve centres, or portions of the nerve centres in which their central extremities terminate, nerves vary so in their functions, that a classification of the nerves, based upon their functional properties, has been proposed. Of the centro-peripheral nerves, those which end in the muscles are motor nerves; those which end in the muscular coat of the blood-vessels are vaso-motor nerves ; whilst some physiologists have named nerves which they believe to terminate in connection with the secreting cells of a gland, secretory nerves; and others, which they believe to terminate in the tissues and to be concerned in the regulation of their nutrition, trophic nerves. It should be stated, however, that itis not yet absolutely

determined that the secreting cells of glands and the cell elements of the tissues have special nerves terminating in connection with them for the purpose of exercising a direct influence over secretion and nutrition. Should these special nerves be non-existent, then the secretory and nutritive functions would be influenced solely by the vaso-motor nerves, which regulate the size of the blood-vessels and the amount of blood which flows through a part in a given time. Of the periphero-central nerves, those which arise in the end-organs in the skin, terminate in a nerve centre, and excite in it the sense of touch, are nerves of common sensation ; those which arise in the end-organs in the eye, ear, nose, and tongue, and excite in their appropriate nerve centres the sensations of sight, sound, smell, and taste, are nerves of special sense; whilst nerves which conduct impulses from peripheral end-organs to a nerve centre, and, instead of exciting in the latter a sensation, have the impulses reflected to motor nerves, are reflex or excito-motory nerves,

The nerve centres, nerves, and peripheral cnd-organs are arranged in two groups or systems—a Cerebro-spinal and a Sympathetic. The Cerebro-spinal nervous system con- sists of the brain and spinal cord, the nerves which arise from or terminate in these large centres, the small ganglia connected with these nerves, and the end-organs at their peripheral terminations. The Sympathetic nervous system consists of the sympathetic ganglia, with their nerves and end-organs.

Nervous Tissuz.—The several parts of the nervous system are not uniform in colour, some being white, others grey. The nerves, at least those of the cerebro- spinal system, are invariably white, and white masses, variable in size, are met with in the brain and spinal cord ; they constitute the white matter of the nervous syste. In the nerve centres, both of the cerebro-spinal and sym- pathetic systems, grey matter is found, sometimes in con- siderable quantities. This grey colour is so characteristic,

that it may be regarded as marking the position of a nerve centre,

The nervous system possesses a characteristic form of tissue—the nervous tissue—which in part consists of fibres (Nerve Fibres), and in part of cells (Nerve Cells). The nerve cells are found in the grey matter —that is, in the nerve centres—and sometimes also in the peripheral end-organs. The nerve fibres constitute the nerves, enter into the nerve centres, and pass into the peripheral end-organs; they form the white matter. But in addition to the characteristic nervous tissue, the nervous system also contains a con- siderable quantity of connective tissue, numerous blood- vessels, and some lymph vessels,*

Nerve Fibres.—Nerve fibres are of two kinds: a, the white, medullated, or dark-bordered fibres, which are the characteristic fibres of the cerebro-spinal nervous system, though they do also sparingly occur in the sympathetic system ; 6, the pale, non-medullated, or gelatinous nerve fibres, which are the characteristic fibres of the sympa- thetic nervous system.

Medullated Nerve Fibres.—To examine the structure of these fibres, a portion of a cerebro-spinal nerve may be selected. In the first place, it will be seen to be invested by a sheath of connective tissue, the perinewrium, which gives off processes that pass into the nerve, and subdivide it into fasciculi or funiculi. Each fasciculus is in its turn composed of nerve fibres, which are separated from each other by bundles of delicate connective tissue, prolonged from the perineurium, in which the nutrient blood- vessels of the nerve ramify. The size of a nerve is in relation to the number and size of its fasciculi, and the size of a fasciculus is in relation to the number of its fibres, The fibres and the fasciculi lie parallel to each other in the same nerve ; but as nerves branch at intervals, the more external of the fasciculi diverge from the main stem to form the branches. In the white matter of the brain and spinal cord the nerve fibres are not arranged in such definite fasciculi as in a distributory nerve, and the con- nective tissue between the fibres is the soft, delicate form called neuroglia.

A medullated nerve fibre is an elongated cylinder, which, when examined in the body of a living animal, or im- mediately after

removal from. the living body, consists apparently of a soft, homogeneous, or glassy-looking sub- stance enclosed within a limiting membrane. When ex- amined some time after death, or after the addition of re- agents, such as water, spirit, ether, collodion, acetic acid, &c., it loses its homogeneous aspect, and the following struc- tures can be distinguished in it: A (Fig. 56),a delicate trans- parent investing membrane, —the so-called tubular or _, primitive membrane, or neuri- (¢ lemma; C, a delicate thread, @S extending along the axis of /\° Di} the fibre,—the axial cylinder ay © or central band of Remak ; 7S B, a substance which lies be- tween the primitive mem- brane and the axial cylin- der,—the white substance of Schwann, or the medullary sheath. Within the external outline of the fibre, formed by the investing membrane, is a second line, not quite parallel to the first. and the presence of these two lines gives to the fibre a characteristic double-contoured appearance. The investing membrane is a perfectly pellucid, homogeneous structure, with nuclei arranged at intervals in it. It is

Waly

Fie. 56.—1. Medullated nerve fibres, showing the double contour. 2. A similar fibre in whieh A is the pri- mitive membrane, B the medullary sheath, C the axial eylinder, pro- truding beyond the broken end of the fibre. 3. Transverse section through the medulated fibres of a nerve, showing the axial cylinder in each fibre. Between the fibres is the interfibrous connective tissue.

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believed to be absent from the nerve fibres in the brain and spinal cord, as well as at the peripheral terminations of many nerves. The medullary sheath is a fatty and albu- minous substance, which refracts the light strongly. Not unfrequently it collects into little ball-like masses, and sometimes causes irregular bulgings on the fibre, and pro- duces a knotted, varicose appearance; at other times it becomes granular, and makes the fibre opaque. By gentle pressure it can be squcezed out of the broken end of a fibre. The axial cylinder is a pale, grey, cylindriform band, usually about one-third or one-fourth the diameter of the fibre, which possesses more tenacity than the

medullary sheath, and not unfrequently, as in Fig. 56, 2, projects for some distance beyond the broken end of a fibre. Max Schultze showed that itis not homogeneous, but exhibits a very delicate longitudinal fibrillation, and at the ends of the nerves these primitive fibrillz may separate from each other.

Although from its great delicacy the axial cylinder can- not be seen in the living fibre of a cerebro-spinal nerve, yet there are many reasons for regarding it as a structure existing in the living nerve, and not the product of a post mortem change. It is the part of a fibre which first appears in the course of development, the medullary sheath and primitive membrane being secondary investing structures, superadded as development proceeds. It forms not un- frequently the only constituent of a nerve fibre at its central and peripheral terminations, and is therefore the part of the fibre which is anatomically continuous with the nerve cell, or with the peripheral end-organ. As it is the sole constituent of many nerve fibres at their terminations, and of all nerve fibres in the earlier stage of development, and as it forms the medium of 'connection between them and the structures in which they terminate, it is obviously of primary importance, both anatomically and physiologi- cally, and is believed to be the part of the fibre directly concerned in the conduction of impulses; whilst the investing structures scrve the purpose of insulating mate- rials, Lister and Turner pointed out, in 1859, that essential differences in chemical composition existed between the axial cylinder and the medullary sheath ; the former being unaffected by chromic acid, though the latter is rendered opaque and brown, and concentrically striated under its influence ; while, on the other hand, the axial cylinder is stained red by an ammoniacal solution of carmine with great facility, although the medullary sheath is unaffected by it. They further showed that these differences in the mode of action of chromic acid and carmine might advantageously be employed in the demonstration of the structure of nerve fibres. Ranke has subsequently stated that the axial cylinder possesses an acid, and the medullary sheath an alkaline reaction.

Medullated nerve fibres vary materially in diameter in different parts of the nervous system. In the brain, for instance, they are sometimes as

fine as the yy}, th inch; whilst, in the distributory nerves, fibres of yg5yth of an inch in diameter may be seen ; though it should be stated that, even in the nerves of distribution, fibres of great minuteness are often placed in the same bundle with those of the largest size. Nerve fibres do not branch in their course, but only at their central or peripheral terminations, and much more frequently at the latter than the former.

Non-medullated Nerve Fibres.—These fibres, which are characterised by the absence of a medullary sheath, are chiefly found in the sympathetic nervous system, but they occur also in the cerebro-spinal system. The fibres of the olfactory nerve are non-medullated, so also are the peri- pheral terminations of the cerebro-spinal nerves, and indeed all nerve fibres in the first stage of their development. In Petromyzon it has been stated that all the nerve fibres are distinguished by the absence of a medullary sheath.

ANATOMY

[NERVOUS

This form of nerve fibre consists of pale grey, translucent, flattened bands, the gz‘55th to gyy5th inch in diameter. They usually appear as if homo- geneous or faintly granular; but Schultze showed that, when carefully examined, they present a delicate fibrillated appearance, like that scen in the axial cylinder of a medullated nerve; so that, like that cylinder, they are supposed to be composed of multitudes of extremely delicate primitive fibrille imbedded in a finely granulated material. Sometimes these fibres consist solely of this fibrillated material, at other times they are invested by a sheath similar to the primitive membrane of a medullated fibre. Nuclei are also found both in the substance of the fibre and in | relation with the primitive membrane. The ro. 57. — Non-

presence of multitudes of fibres in the sym- medullated pathetic nervous system, formed either en- from the sym- tirely, or almost entircly, of a material Pathetic sys

precisely similar in structure to the axial

cylinder of a medullated fibre, and by which the proper function of the fibre can alone, therefore, be exercised, is, of course, an additional argument to those previously advanced, in favour of the existence of the axial cylinder as a normal constituent of the fibre, and of its functional importance.

Nerve Cells.—Nerve cells constitute an important division of the nervous tissue. They are the characteristic structures in the nerve centres, aresusceptible toimpressions, or nervous impulses, and are the texture in which the molecular changes occur that produce or disengage the special form of energy named nerve energy, the evolution of which is the distinc- tive mark of a nerve centre. The central extremities of the nerve fibres lie in relation to, and are often directly con- tinous with, the nerve cells. It was at one time thought that nerve cells were globular in form ; but it is now gene- rally understood that, though the body of the cell is not unfrequently globular, two or more processes or poles project from it, and are continuous with its substance, Nerve cells are distinctly nucleated ; the nuclei are usually large, and contain one, and often two nucleoli. The cell substance is granular, and not unfrequently brown or yellow pigment is collected around the nucleus. A cell wall is sometimes apparently present, though at others it cannot be demonstrated. The nerve cells in the grey matter of the brain and spinal cord are imbedded in the neuroglia. In the smaller nerve centres, as the sympathetic ganglia and the ganglia on the posterior roots of the spinal nerves, the nerve cells are surrounded by a capsule of connective tissue. Frantzel, Kolliker, and others, have described this capsule as lined by an endothelium formed of flattened cells; and it should be stated that Ranvier has described a similar endo- thelium in relation to the connective tissue investment of the cerebro-spinal nerves. It is not improbable that these endothelial cells form the walls of delicate capillary rootlets of the lymphatic vascular system.

Nerve cells from which two poles or pro- cesses proceed are called bipolar. Charac. teristic specimens of these cells, as was first pointed

out by Robin and R. Wagner, may be recognised without difficulty in the gan- glia on the posterior roots of the spinal nerves of fishes, and it is probable that "6. 58.— Bipolss similar cells exist in the corresponding nerve fibres con- centres in other vertebrates. These cells Aen oa usually possess a globular body, though sometimes it may be elongated; and from

of a skate. opposite points

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of the surface of the body a strong process is given off, which is directly continued into a nerve fibre. The axial cylinder of the fibre is continuous with the cell substance, and Schultze has shown that both exhibit a delicate fibril- ' lated structure. The medullary sheath and the primitive membrane are also usually continued from the fibre over the nerve cell. Hence these bipolar cells seem to be, as Schultze expressed it, nucleated enlargements of the axial cylinder.

A remarkable modification of the bipolar nerve cell, carefully studied and described by Lionel Beale, is found in the sympathetic ganglia of the frog. The cells are pear-shaped, and from the narrow end of the pear two nerve fibres arise, one of which, called the straight fibre, forms, as it were, the stalk of the pear; whilst the other, or spiral fibre, winds spirally round the straight fibre, and then passes away from the cell in the opposite direction. Both fibres are nucleated, and at their origin consist, apparently, of axial cylinder substance only; but in their course they may acquire both a medullary sheath and a primitive membrane. The straight fibre passes into the interior of the cell sub- x stance, and Arnold and Courvoisier be- Fis, 59.— Pyriform lieve that they have traced it into the phi ne

. ght-nerve fibre; nucleus ; but the spiral fibre apparently sp, spiral nerve arises nearer the periphery of the cell. meeps ee The pyriform cells are invested by a dis- around nerve cell, tinct capsule of connective tissue. The 4%" Zeal) nerve fibres of these pyriform cells, although they both arise close together from one end of the cell, represent its poles. Should one of the poles, either in this, or in the

bipolar form of nerve cell described in the preceding paragraph, be from any cause removed or not developed, then the cell would be unipolar ; and if both poles were absent it would be apolar.

In other localities, as in the sympathetic ganglia of man and many other vertebrates, and in the several subdivisions of the cerebro-spinal nervous axis, the nerve cells have more than two poles or processes projecting from them. Cells of this kind are called multipolar, and in many localities they present characteristic forms. In the grey matter of the spinal cord, more especially in its anterior horn, they give rise to numerous processes, and have a stellate or radiate form. In the grey matter on the surface of the convolutions of the cerebrum they are pyramidal in shape. The apex is directed to the surface of the convolution, the base towards the white matter. 'The processes arise from the ¢ base, apex, and sides of the pyramid. In the grey matter on the surface of the cerebellum the body of the cell is almost globular. From that aspect of the cell which is directed towards the white matter Fig. 60.—Multipolar cell a slender central process arises; from the a eee opposite or peripheral aspect of the cell capsule of connective two strong, many-branched processes ex- #5¥¢- tend for a considerable distance. In the human sympa- thetic ganglia, again, the stellate form of cell prevails, and the existence of a capsule of connective tissue around the individual cells can be recognised. The processes which arise from a multipolar nerve cell, as a rule, divide and subdivide as they pass away from the body of the cell, until at last they give rise to branches of extreme tenuity. These branching processes apparently consist exclusively of cell protoplasm, and have been called protoplasm processes. Gerlach has described the protoplasm processes of the

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| individual muscular fibres from each other.

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multi-polar nerve cells of the brain and spinal cord as forming an excessively minute network, from which minute medullated nerve fibres

arise; and F. Boll conceives that a simi- lar arrangement occurs in the cellsof the cerebellum, One, at least, of the pro- cesses of a multipolar nerve cell does not branch, but becomes directly con- tinuous with a nerve fibre, and has been named the axial – cylinder process, This process was first re- cognised by Deiters in the cells of the spinal cord; but Hadlich and Kosch- Fia. 61.—Multipolar cell from the grey matter ennikoff have since de- 9f,!ery sum in he spina tard." G scribed the central process continuous with a nerve fibre.

of the cells of the cerebellum as continuous with a medullated nerve fibre; and the latter observer has pointed out, that from the base of a pyramidal nerve cell in a cerebral con- volution a process may be traced directly into a nerve fibre. Hence it would appear that the multipolar nerve cells may have two modes of union with nerve fibres —one directly through the passage of the non-branched axial-cylinder pro- cess into a fibre, the other through the origin of fibres from the minute network in which the branched protoplasm processes terminate. The branched processes of adjacent nerve cells may also blend with each other, so as to form an anastomosing cell network, though these anastomoses are, in all probability, not so frequent as was at one time supposed. Schultze has pointed out that not only the protoplasm substance of the body of a multipolar nerve cell, but both the nou-branched and branched processes, possess a fibrillated structure similar to that described by him in the axial cylinder of the nerve fibres.

Peripheral End-Organs or End Bodies.—Nerve fibres at their peripheral extremities terminate in connection with peculiar structures, named end-bodies, terminal bodies, or peri- pheral end-organs, which are situated in the several organs of the body. The motor nerves end in the voluntary and in- voluntary muscles; the vaso-motor nerves end in the mus- cular coat of the blood-vessels; the sensory nerves end in the skin, mucous membranes, and organs of special sense; and it has been stated that secretory nerves terminate in connection with the ultimate cell elements of the secreting glands. These end-organs possess certain structural pecu- harities, which are by no means uniform in the different parts, so that the end-body

connected with the peripheral termination of a nerve is distinctive of the organ in which it is situated. It will be a matter of convenience to defer the consideration of the peripheral end-bodies in the skin, organs of special sense, coats of the blood-vessels, and the several glands, until these parts are described. In this place the mode of termination of the motor nerves in the voluntary and involuntary muscles, of the sensory nerves in the mucous membranes, and of the ending of the nerves in the remarkable bodies named Pacinian corpuscles, will alone be examined.

After a nerve has entered a voluntary muscle it raimifies in the connective tissue, which lies between the fasciculi, and at the same time divides and subdivides into smaller branches. These branches interlace with each other and form plexuses, from which slender nervous twigs, often consisting of only a single medullated nerve fibre, pro- ceed, which ramify in the connective tissue, separating the The single

nerve fibres in their turn branch, accompanied by a splitting of the axial cylinder, and these branches usually lose the medullated character. The mode of termination of these very delicate branches has been a subject of much dispute. Beale described them as forming a minute net- work, situated on the exterior of the sarcolemma, but in contact with it, and the fibres of this nervous network were distinctly nucleated. Other observers have, however, described peculiar bodies, called motorial end-plates, at the extremity of these nerves. These end-plates consist of a clump of richly nucleated protoplasm, somewhat oval or perhaps irregular in form, into which the axial cylinder of the nerve fibre penctrates. The exact position of these end-plates in relation to the muscular fibres is difficult to determine. Krause holds that they lie outside the sarco- lemma, but adherent to it; whilst Ktihne, Margo, and Rouget maintain that the end-plate lies within the sarco-lemma, and that the nerve fibre has to pierce that mem- brane before it can enter the end-plate. After the axial cylinder has entered the end-plate it subdivides into very minute branches. Each muscular fibre has apparently only a single end-plate, and consequently only a single axial cylinder in connection with it.

In the non-striped muscles the nerves are distributed in the connective tissue which separates the fasciculi from each other. Here they form plexuses, which in some loca- lities, as in the myenteric plexus of Auerbach in the mus- cular coat of the intestines, have collections of nerve cells, forming microscopic ganglia lying in them. From these plexuses fibres arise which subdivide into delicate non- medullated fibres possessing nuclei. These delicate fibres form still finer plexuses, which in their turn give origin to minute fibres, which pass between the muscular fibre cells to form a still more minute intra-muscular network. Frankenhauser maintains that the delicate nerve fibrils which arise from this terminal network penetrate the muscular fibre cells, enter the nucleus, and terminate in the nucleolus; but Arnold considers that, after having entered the nucleus, the fibril again gives off a filament, which passes out of the cell to join the intra-muscular plexus; the ending of the uerve, therefore, within the nucleus is only apparent, and is rather to be regarded as the nodal point of a fine intra-nuclear plexus.

The termination of the sensory nerves in the mucous mem- branes has been especially studied in the conjunctiva, the mucous membrane of the soft palate, and the glans of the penis and clitoris. In these parts Krause discovered oval or globular end-bodies, which consisted of a soft, homogeneous substance invested by a nucleated capsule of connective tissue. A nerve fibre pierces the capsule and terminates in the interior of the end-body, which forms a bulbous enlarge- ment at the end of the nerve, and is called the end-bulb. After the nerve has entered the end-bulb, it may consist only of the axial cylinder and terminate in a pointed extremity, or it may twist upon itself and form a coil within the end-bulb. When the structure of the skin is described, it will be seen that the ending of the nerves in the cutaneous papille bears a general resemblance to their termination in the end-bulbs of a mucous mem- brane.

But in certain of the mucous membranes delicate nerves have been traced into the layer of epithelium, situated on the free surface of the membrane. Petermdller described nerve fibres continuous with the nerves of the cornea pass- ing into the layer of conjunctival epithelium

on the front of the cornea. Klein recognised an intra-epithelial nervous network in the same locality. Chrschtschonovitsch traced non-medullated nerve fibres proceeding from a_ sub- epithelial network into the deeper epithelial layers of the vaginal mucous membrane, and similar nerve fibres have

been seen by Elin to end in the epithelial investment of the mucous membrane of the mouth. ‘

Connected with the sensory nerves in some localities are Pacinian the remarkable bodies named the Corpuscles of Pacini, corpuscles, which were the first terminal organs discovered in connec- tion with the peripheral distribution of the nerves. These corpuscles have been found attached to the nerves which pass to the skin of the fingers and toes, to the nerves which supply the skin of the neck and arm, to the inter- costal nerves, to the nerves of the joints, to the nerves of the periosteum, to the nerves of the genital organs, and to the mesenteric nerves. In cats they are often extremely abundant both in the mesentery and omenta. A Pacinian

Fia. 62.—1. Nerves of one finger with the Pacinian corpuscles attached. 2, a Pacinian corpuscle X 350; 4a, stalk or peduncle; 6, nerve fibre in stalk; c, external layers of capsule; d, inner layers; e, non-medullated nerve fibre in the central core; f, branching of terminal end of nerve fibre. (From A. Kélliker.)

corpuscle can be seen by the naked eye, and looks like a minute grain from 7th to zyth inch long. It is elliptical in form, and may either be sessile or attached to the nerve stem by a slender stalk. Examined microscopically, it 18 seen to consist of numerous layers of connective tissue concentrically arranged, which form its capsule, and surround a central core. Numerous connective tissue cor- puscles may be seen in the concentric layers, and Hoyer has recently shown that an endothelial-like appearance exists on the inner surface of the corpuscle. Entering one pole of the corpuscle is a nerve fibre which extends along the axial core for a considerable distance, and usually terml-

Develop- ment of nerve tissue.

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nates in a slight bulbous enlargement. The nerve fibre parts with its perineurial sheath after it enters the Pacinian corpuscle; and as it lies in the core it loses its medullary sub- stance, so that its terminal part consists only of the axial cylinder. Sometimes the nerve fibre dividesintotwo branches within the corpuscle. Capillary blood-vessels are distributed to the concentric layers of the Pacinian corpuscle.

The mode of origin of the nervous tissue in the course of development of the embryo is still involved in some obscurity, It is, however, believed that the nerve cells are derived from the embryo cells, which multiply, and the young cells then grow and assume characteristically granular and finely fibrillated contents. Processes or poles then appear at the periphery of the cells, which, according to the observations of Beale, connect adjacent cells together. As the growth of the part goes on, the cells are more widely separated from each other, and the anastomosing processes in consequence become considerably elongated, and form the axial cylinder of the nerve fibre. In the course of time the medullary sheath and the primitive membrane may form around this axial cylinder so as to insulate it, The exact mode of formation of the medullary sheath is not properly understood; but it is believed that the primi- tive membrane, and the perineurial connective tissue, are derived from those surrounding embryonic cells which differentiate into connective tissue. Of the two originally contiguous cells from which the nerve fibre is, as it were, spun out, one, as Hensen conceived, may form a cell in a nerve centre, the other may differentiate into a peripheral end-organ. In the tail of the tadpole the formation and growth of nerve fibres have been studied by Kélliker and others, and it has been seen that the terminal part of a fibre may have fusiform or tri-radiate cells connected with it, the processes of which cells gradually differentiate into nerve fibres. The young cerebro-spinal nerve fibres are distinctly nucleated, and correspond in appearance and structural characters to the non-medullated nerve fibres of the adult. If in a young or adult person a nerve be cut across,

its conducting power is destroyed; but after a time it reunites, and its function is restored. The part of the nerve which lics between the place of section and its peripheral extremity, undergoes, as Waller pointed out, degenerative changes. To how great an extent the dc- generation affects the various constituents of each fibre, it is difficult to determine; for whilst some experiments would seem to show that only the medullary sheath broke up into granular particles and was absorbed, in others both it and the axial cylinder disappeared. In process of time, however, these parts may be reproduced, and the nerve then recovers its functional activity.

DeEscRiptiveE ANATOMY OF THE CEREBRO-SPINAL NeERvovus System.

In this section the anatomy of the Brain and Spinal Cord, and of the numerous distributory Nerves which arise from them, will be described. The brain and spinal cord are the largest and most important of all the nerve centres. They occupy the cranial cavity and spinal canal, and are continuous with each other through the foramen magnum in the occipital bone. As the arrangement of the struc- tures which compose the brain and spinal cord is extremely complex, and as the names applied to the several parts are numerous and often very arbitrary, it may be well, before commencing a detailed description, to make a few general observations on their mode of development.

Development of the Cerebro-Spinal Nervous Axts.—The brain and spinal cord are developed in the cranio-spinal groove of the embryo, and appear originally as a thin band extending along the whole length of this groove. About the time when the walls of the

groove meet posteriorly to complete the cranio-spinal cavity, the margins of this band become elevated, bend backwards, and meet,

fissure those of the posterior commissure.

so that the originally simple band becomes converted into a cylindri- Develop- form cerebro-spinal tubc. In the walls of this tube the nervous ment of structures of the brain and spinal cord are formed, whilst the axis cerebro- of the tube forms a central canal. In the part which becomes the spinal Spinal Cord the central cana] persists as the ccnéral canal of the system. spinal cord, and around it a layer of ciliated cylindrical endothelium

is developed. Outside this layer a mass of grey matter containing

nerve cells is formed, which is subsequently divided into two lateral crescent-shaped masscs. Outside the grey matter white matter ig produced, which ultimately becomes arranged in the form of longi-

tudinal columns of nerve fibres. With the formation and growth

of these columns and of the internal grey matter, a longitudinal

mesial fissure appears on the anterior and another on the posterior

surface of the cord, which gradually increase in depth until the

cord is almost completely divided into two lateral halves. At the

bottom of the anterior median fissure the nerve fibres of the anterior commussure are developed, and at the bottom of the posterior median

These commissures unite

the two halves of the cord together.

The upper or cerebral end of the cerebro-spinal tube becomes the Encephalon, or Brain. At first the cerebral part of the tube is uniform in appearance with the spinal part, but it soon expands into three vesicular dilatations — the primary cercbral vesicles. These vesicles, named (from before backwards) anterior, middle, and posterior, are separated from each other by constrictions, and as the development progresses the vesicles bend on each other and on the upper end of the spinal cord. As each vesicle is an cxpan- sion of the doibro-spiail tube,

it is necessarily hollow, and the space in its interior is continuous with the central canal of the spinal cord. Jn the walls of the vesicles the nervous structures are produced, which form the several subdivisions of the enccphalon.

The posterior cerebral vesicle bends first forwards from the upper end of the spinal cord, and then backwards; the part which bends forward becomes the medulla oblongata; that which bends backward the cercbellum, whilst the pons is developed at the angle where these two parts are continuous with each other; the central hollow forms the central canal of the medulla oblongata and the dilated space called the fourth ventricle. In the medulla oblongata shallow anterior and posterior median furrows then appear continuous with those in the cord, and each lateral half differen- tiates into grey matter and into a longitudinal arrangement of nerve fibres continuous with the corresponding structures in the cord. A large proportion of these fibres are continued upwards through the pons as its longitudinal fibres. The cerebellum consists at first of a central lobe, and in the lower vertebrates its development does not procecd beyond this stage; but in mammals, including man, a latcral lobe or hemisphere is superadded on each side, and with the growth of these latcral lobes numerous transverse fibres, which connect the two hemispheres together, are developed in the pons. The cerebellum is also connected below with the medulla oblongata by the pair of restiform bodies, or ¢nferior peduncles, and above with the corpora quadrigemina by the pair of superior peduncles.

The a cercbral vesicle bends forwards from the posterior vesicle. In its roof the optic lobes are formed; in its floor the crura cercbri; whilst the central hollow becomes the aqueduct of Sylvius. At first the optic lobes form a single structure, but about the sixth month of embryo life a median furrow divides this struc- ture into two lateral halves (the corpora bigemina), and in the lower vertebrates the development does not proceed beyond this stage; but in the seventh month of embryo life of the human fetus cach lateral half is subdivided into two by a transverse fissure, so that four bodies (the corpora quadrigemina) are produced. The crura cerebri form the two cerebral peduncles, which,

diverging from each other, pass upwards to the hemisphere of the cerebrum. They consist almost entirely of nerve fibres continuous with the longitudinal fibres of the pons, a few of which go to the corpora quadrigemina, but the greater number ascend to the cerebrum.

The antcrior cerebral vesicle bends downwards‘from the middle vesicle. The posterior part of this vesicle forms at first a simple hollow sac, but subsequently divides into the two optic thalamt, one on each side of the central hollow, which hollow becomes the third ventricle. This ventricle is prolonged downwards into a funnel-shaped process, the infundibulum, which is connected with the pituitary body, or hypophysis cercbri, lodged in the. pitui- tary fossa in the sphenoid bone, whilst posteriorly it is continuous with the aqueduct of Sylvius. In its upper and posterior wall the pineal body, or epiphysis cercbri, is developed, and from this body two white peduncles run forwards on the sides of the optic thalami. Immediately below these peduncles the transverse fibres of the postertor commissure are developed, which pass between the two optic thalami. The anterior wall of this ventricle is closed in by the lamina cinerea or lamina terminalts, and behind it are formed the transverse nerve fibres of the anterior commissure, and the vertical fibres of the anterior pillars of the fornix. These fornix fibres pass to the base of the brain, and form the corpora albicantia, prior to entering the optic thalami. The posterior part of the anterior vesicle gives off from each side a flask-shaped prolongation, the

primary optic vestele. The stem of the prolongation, at first hollow, hecomes solid, and forms the optie nerve and tract, whilst the expanded distal end forms the nervous elements of the retina.

The antero-lateral part of the anterior cerebral vesicle is prolonged forward as two hollow processes, the hemisphere vesicles, which become the cerebral hemispheres, and are separated from each other by a median longitudinal fissure ; whilst the hollow in the interior of cach fornis the lateral ventricle. In the floor of each heniisphere

vesicle is developed a large grey mass, striated with bundles of nerve fibres, the corpus striatwm, which lies immediately in front and to the outer side of the optic thalamus; a curved band, the tenia semicircularis, is fornied along the junction of the thalamus with the corpus striatum, and at the inner and anterior end of this band, immediately behind the anterior pillars of the fornix, the two lateral ventricles become continuous with each other and with the third ventricle through the foramen of Monro. The roof and side walls of each hemisphere vesicle form a grey expansion or mantle, which is at first smooth, but subsequently becomes divided into lobes and convolutions, separated from each other by fissures. A deep gap or fissure now appears on the inner wall of each hemi- sphere vesicle, and is-bounded above by a longitudinal band of fibres, which, continuous anteriorly with the anterior pillar of the fornix, joins its fellow in the middle line to form the body of the fornix, and then again diverging from its fellow passes backwards,

downwards, and forwards as the postertor pillar of the fornix or the

tenia hippocampt. A transverse arrangement of fibres then forms in each hemisphere vesicle, above the plane of the fornix, which, reaching the mesial plane, joins its follow, connects the two hemi-spheres together, and forms the corpus callosum. In the hinder part this corpus rests upon the upper surface of the fornix, but more anteriorly it lies some distance above the fornix, and then bends down in front of it. Hence there is enclosed between the fornix and the antero-inferior part of the corpus callosum two thin layers of grey matter, one belonging to the inner surface of each hemisphere vesicle, and called the septwm lucidum. Between these two layers is a narrow space, the fifth ventricle, which, unlike the other ventricles, is not derived from the cerebro-spinal tube, but is merely a portion of the longitudinal median fissure shut in by the develop- ment of the corpus callosum and fornix. Each hemisphere vesicle also gives off from its anterior part a hollow process, which expands in front into a bulbous dilatation, named the olfactory bulb, from which the nerves of smell arise, whilst the stalk of the bulb solidifies and forms the olfactory pedunele.

Owing to the great development of the mantle of the hemisphere vesicles in the human brain, and the size and complexity of the eonvolutions, these parts of the hemispheres grow forward so as to overlap the olfactory bulbs and peduncles, and backward, so as to conceal not only the corpora striata and optic thalami, but also the corpora quadrigemina, crura cerebri, cerebellum, pons, and medulla oblongata, so that when the human brain is looked at from above, none of these structures can be seen. It is only when the brain is turned over and its base exposed that the medulla, pons, cerebellum, and crura are visible; and before the corpora quadrigemina, optic thalami, and corpora striata can be exposed, portions of the hemi- sphere substance must be removed. The great growth of the hemi- sphere vesicle leads also to a great expansion of the central hollow or lateral ventricle, which is prolonged forwards, backwards, and downwards as the anterior, posterior, and deseending cornua. In the descending cornu isa projection, the hippocamus major, along which the tenia hippocampi of the fornix runs; in the posterior cornu isa smaller eminence, the hippocampus minor; and at the junction of these two cornua is a third elevation, the eminentia collateralis.

Immediately investing the spinal cord and encephalon a vascular membrane, the pia mater, is developed, processes from which dip into the fissures between the two halves of the cord and between the cerebral convolutions. A broad band, the velwm interpositwm, which possesses two marginal fringes, the choroid plexuses, is admitted into th® lateral ventricle through the gap or fissure in the inner wall of cach hemisphere vesicle. This fissure is bounded above by the arch-shaped fornix, with its tania hippocampi. When the two hemispheres are in situ, and the two halves of the fornix are joined together to form the body of that structure, the fissure, with its contained velum interpositum, passes across the mesial plane from one hemisphere to the other, having the fornix and taniz for Its roof, and the optic thalami and corpora quadrigemiina for its floor ; it is known as the great transverse fissure of the cerebrum.

MEMBRANES oF BRAIN AND SprnaL Corp.—These nerve centres are invested by three membranes or meninges, which lie between them

and the bones that form the walls of the cranial cavity and spinal canal. The membranes are named dura mater, arachnoid mater, and pia mater.

Dura mater.—-The most external membrane, named dura from its firmness, consists of a cranial and a spinal subdivision. The cranial part is in contact with the inner

table of the cranial bones, and is adherent along the lines of the sutures and to the margins of the foramina, which transmit the nerves, more especially to the foramen mag: num. It forms, therefore, for these bones an internal periosteum, and the meningeal arteries which ramify in it are the nutrient arteries of the inner table. As the growth of bone is more active in infancy and youth than in the adult, the adhesion between the dura mater and the cranial bones is greater in early life than at maturity. From the inner surface of the dura mater strong bands pass into the cranial cavity, and form partitions between.certain of the subdivisions of the brain. A vertical longitudinal mesial band, named, from its sickle shape, falz cerebri, dips between the two hemispheres of the cerebrum. A smaller sickle- shaped vertical mesial band, the falx cerebelli, attached to the internal occipital crest, passes between the two hemi- spheres of the cerebellum. A large band arches forward in the horizontal plane of the cavity, from the transverse groove in the occipital bone to the clinoid processes of the sphenoid, and is attached laterally to the upper border of the petrous part of each temporal bone. It separates the cerebrum from the cerebellum, and, as it forms a tent- like covering for the latter, is named tentoriwm cerebelli. Along certain lines the cranial dura mater splits into two layers, to form tubular passages for the transmission of venous blood. These passages are named the venous blood stnuses of the dura mater, and they are lodged in the grooves on the inner surface of the skull referred to in the descrip- tion of the cranial bones. Opening into these sinuses are

Fig. 63.—Dura mater and cranial sinuses. 1, Falx cerebri; 2, tentorium; 3, 3, superior longitudinal sinus; 4, lateral sinus; 5,

internal jugular vein; 6, occi- pital sinus; 6', torcular Herophili; 7, inferior longitudinal sinus; 8, veins of Galen; 9 and 10, superior and inferior petrosal sinus; 11, cavernous sinus; 12, circular sinus, which connects the two cavernous sinuses together; 13, ophthal- mic vein, from 15, the eyeball; 14, crista galli of ethimoid bone.

numerous veins, which convey from the brain the blood

that has been circulating through it; and two of these

sinuses, called cavernous, which lie at the sides of the body of the sphenoid bone, receive the ophthalmic veins from — the eyeballs situated in the orbital cavities. These blood sinuses pass usually from before backwards: a superior longitudinal along the upper border of the falx cerebri as far as the internal occipital protuberance; an fervor longitudinal along its lower border as far as the tentorium, where it joins the straight sinus, which passes back as far as the same protuberance. One or two small occipital sinuses, which lie in the falx ccrebelli, also pass to join the straight and longitudinal sinuses opposite this protuberance ; several currents of blood meet, therefore, at this spot, and as Herophilus supposed that a sort of whirlpool was formed in the blood, the name torcular Herophilt has been used to express the meeting of these sinuses. From the torcular the blood is drained away by two large

Arachnoid. menibrane,

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sinuses, named lateral, which curve forwards and down- wards to the jugular foramina to terminate in the internal jugular veius. In its course each lateral sinus receives two petrosal sinuses, which pass from the cavernous sinus back. wards along the upper and lower borders of the petrous part of the temporal bone.

The spinal part of the dura mater hangs loosely. in the spinal canal. It does not form a periosteum for the vertebrae, but is separated from their bony rings by loose fat and a plexus of veins. It gives off no bands

from its inner surface, and it does not split into two layers for the lodgment of venous blood sinuses. The spinal dura mater forms a tubular envelope for the spinal cord and the origins of the spinal nerves, It extends from the foramen magnum, where it is continuous with the cranial dura mater, to the lowerend of the sacral canal, ends below in a funnel-shaped prolongation, and is pierced laterally by the roots of the several spinal nerves in their passage outwards to the intervertebral foramina.

Both the cranial and the spinal parts of the dura mater consist of a tough, fibrous membrane 3 somewhat flocculent externally, but smooth, glistening, and free on its inner surface. The inner surface has the appearance of a serous membrane, and when examined microscopically is seen to consist of a layer of squamous endothelial cells, similar to those drawn in fig. 34. Hence the dura mater is sometimes called a fibro-serous membrane. The dura mater is well provided with lymph vessels, which in all probability Open by stomata on the free inner surface. Between the dura mater and the subjacent arachnoid membrane is a fine Space containing a minute quantity of limpid serum, which moistens the smooth inner surface of the dura and the corresponding smooth outer surface of the arachnoid. It is regarded as equivalent to the cavity of a serous mem- brane, and is named the arachnoid cavity, or, more appropriately, the sub-dural space.

Arachnoid mater.—The arachnoid is a membrane of great delicacy and transparency, which loosely envelopes both the brain and spinal cord. It is separated from these organs by the pia mater; but between it and the latter membrane is a distinct space, called sub-arachnoid. The sub-arachnoid space is more distinctly marked beneath the spinal than beneath the cerebral parts of the membrane, which forms a looser investment for the cord than for the brain. At the base of the brain, and opposite the fissures between the convolutions of the cerebrum, the interval between the arachnoid and the pla matter can, however, always be seen, for the arachnoid does not, like the pia mater, clothe the sides of the fissures, but passes directly across between the summits of adjacent convolu- tions. The sub-arachnoid space is subdivided into

numerous freely-communicating loculi by bundles of delicate areolar tissue, which bundles are invested, as Key and Retzius have shown, by a layer of squamous endothelium, The space contains a limpid cerebro-spinal fluid, which varies in quan- tity from 2 drachms to 2 ounces. The fluid is alkaline, of sp. gr: 1-005, contains a little albumen, and a substance which, as Turner pointed out, reduces blue oxide of copper to the state of yellow sub-oxide, The arachnoid membrane is made up of delicate connective tissue. The free surface next the sub-dural space is smooth, like a serous membrane, and covered by a layer of squam- ous endothelium. This layer is reflected on to the roots of the spinal and cranial nerves, and, when they pierce the dura mater, it becomes continuous with the endothelial lining of that membrane. As the arrangement and _ struc- ture so closely correspond with what is seen in the serous membranes, many anatomists regard the arachnoid as the visceral layer of a serous membrane, and the endothelial lining of the dura mater as the parietal layer, whilst the sub-dural space is the intermediate cavity.

When the skull cap is removed, clusters of granular Pacchio- bodies are usually to he seen imbedded in the dura mater nian on each side of the superior longitudinal sinus; these are bodies. named the Pacchionian bodies, When traced through the dura mater they are found to spring from the visceral or proper cerebral arachnoid, The observations of Luschka and Cleland have proved that villous processes invariably grow from the free surface of that membrane, and that when these villi greatly increase in size they form the bodies in question. Sometimes the Pacchionian bodies greatly hypertrophy, occasion absorption of the bones of the cranial – vault, and depressions on the upper surface of the brain.

Pra mater.—This membrane closely invests the whole Pia mater. outer surface of the brain, It dips into the fissures between the convolutions, and a wide prolongation, named velum interpositum, lies in the interior of the cerebrum. With a little care it can be stripped off the

brain without causing injury to its substance. The pia mater invests the spinal cord, and is more intimately attached to it than to the brain, for not only does it send prolongations into the anterior and posterior fissures of the cord, but slender bands pass repeatedly from its inner surface into the columns of the cord, Hence it cannot be stripped off the cord without causing injury to its sub- stance. The pia matter is prolonged on to the roots both of the cranial and spinal nerves, and on to the filum terminale. This membrane consists. of a delicate connective tissue, in which the arteries of the brain and spinal cord ramify and subdivide into small branches before they penetrate the nervous substance, and in which the veins conveying the blood from the nerve centres lie before they open into the blood sinuses of the cranial dura mater and the extra- dural venous plexus of the spinal canal. The arteries Which pass from the pia mater into the brain and spinal cord are invested by a loose sheath, which has been de- scribed as forming the wall of a peri-vascular lymphatic vessel ; but Key and Retzius have shown that the space between the blood-vessel and the sheath opens into the sub- arachnoid space, and contains cerebro-spinal fluid. A net- work of lymph vessels ramifies freely in the pia mater. It is also well provided with nerves, which arise from the posterior roots of the spinal nerves, from some of the cranial nerves, and from the carotid and vertebral plexuses of the sympathetic. The epi-cerebral and epi-spinal spaces described by His as existing between this membrane and the brain and spinal cord are in all probability artificial productions.

In the spinal canal a slender fibrous band projects from Ligamen- the pia mater covering the side of the cord, and, pushing tum denti- the arachnoid membrane in front of it, is attached by neem about twenty-two pairs of denticulated processes to the inner surface of the dura mater, It is named ligamentum denticulatum, and its teeth alternate with the successive pairs of spinal nerves,

SPINAL CorD.—The MEpuLia SPINALIS, or SPINAL Spinal Corp, occupies the spinal canal, and extends from the cord. foramen magnum to opposite the body of the first lumbar vertebra, In the early foetus it equals in length the canal itself ; but as the spinal column grows at a

greater pro- portional rate than the cord, the latter, when growth has ceased, is several inches shorter than the column, The cord is continuous above with the medulla oblongata, whilst it tapers off below into a slender thread, the filum terminale, which lies in the axis of the sacral canal, and is attached below to the back of the coccyx, or to the fibrous mem. brane which closes in below the sacral canal, The length of the cord is from 15 to 18 inches. Tt approaches a cylinder in shape, but is flattened on its anterior and pos- terior surfaces, and presents two enlargements which havo a greater girth than the rest of the cord. The upper,

called the cervical or brachial enlargement, extends from opposite the third cervical to the first dorsal vertebra, and from it arise the nerves which supply the upper limbs ; the lower, called the crural or lumbar enlargement, is opposite the last dorsal vertebra, and supplies with nerves the lower limbs. The cord is almost completely divided into right and left lateral halves by two fissures, named re- spectively anterior and posterior median fissures, which do not quite reach the centre of the cord, for at the bottom of the anterior fissure are the transverse fibres of the anterior white commissure, and at the bottom of the posterior fissure the fibres of the posterior grey commissure. By these com- missures the two halves of the cord are united together. The fibres of the posterior commissure surround a canal, called the central canal, which extends along the whole length of the cord, and even passes into the upper end of the filum terminale. This canal is lined by a ciliated columnar endothelium, and expands superiorly into the cavity of the fourth ventricle. Each lateral half of the cord is subdivided into three columus by two depressions, which mark the points of emergence of the roots of the spinal nerves. The anterior nerve roots pass through the antero-lateral depression or fissure, and between it and the antcro-median fissure is the anterior column of the cord. The posterior nerve roots pass through the postero-lateral fissure, and between it and the postero-median fissure is the posterior

column, whilst between the anterior and posterior nerve roots lies the lateral column. In the

cervical region, the part of the posterior column which lies

next the postero-median fissure is marked off by a fissure The sub-

into a small internal or postero-median column. division of each lateral half of the cord into the columns, and the arrangement of its nervous tissues, are well seen in trans-

verse sections through its sub- stance. The cord

is composed of white and grey matter. The white matter is external, Fia. 64.—Transverse section through the spinal cord. and forms the co- .. Sgimienaren sed fe neent mea sae lumus of the cord. Af, anterior, and PR, posterior nerve roots; C, 5 central canal of cord, with its columnar endothelial The grey matter 18 ining. The pia mater is shown investing the cord, surrounded. by tie Siuar Betas tes Sis arueeenans Sete white, and has. columns. The crescentic arrangement of the grey in each lateral matter is shown by the darker shaded portion. half of the cord a crescentic shape. The horns of the crescent are directed towards the fissures of emergence of the nerve roots ; the anterior horn is rounded ; the posterior long and narrow. The proportion of grey matter to the white varies in different parts of the cord. At the com- mencement of the filum terminale there is scarcely any white matter; but the white matter increases in amount from below upwards, so that its absolute quantity is greatest in the cervical part of the cord. The grey crescents are thicker in the upper and lower enlargements than in the intermediate part.

The cord contains both nerve fibres and nerve cells. The external, columnar, white part of the cord consists of nerve fibres, with a supporting reticular framework of connective tissue and blood-vessels derived from the pia mater. Well- formed stellate connective tissue corpuscles lie in this sup- porting framework. The nerve fibres of the various columns extend longitudinally, and lie parallel to each other, so that In transverse sections through the columns the fibres are

transversely divided. The individual fibres vary much in diameter, but in all the axial cylinder and medullary sheath can be distinctly seen. Wherever the nerve roots enter into the cord, the fibres of these roots pass transversely or obliquely in their course inwards to the grey matter. Horizontal fibres are also found in the white anterior commissure, and a similar appearance can be seen in the posterior commissure. Horizontal fibres have also been traced from the lateral columns into the adjacent part of the grey matter.

The grey crescentic portion of the cord contains con- nective tissue, blood-vessels, nerve fibres, and nerve cells. The nerve fibres in the grey matter are numerous ; and whilst some possess a medullary sheath, others consist only of the axial cylinder; they divide and subdivide, and, as Gerlach has shown, form a narrow – meshed network of extremely minute fibres. The nerve cells are multipolar, and are chiefly collected in the anterior and posterior horns of each crescent. The cells of the an- terior cornu are large, distinct, and stellate, and form a well-defined group of nerve cells. Those of the posterior cornu are smaller in size, more elongated in shape, but with stellate branched processes. They are not so distinct as in the anterior horn, owing to the connective tissue with its corpuscles being so abundant. This tissue is best marked at the tip of the posterior horn, where it forms the substantia gelatinosa of Rolando. Lockhart Clarke has described an intermedio-lateral group of nerve cells situated at the outer side of the grey matter, about midway between the anterior and posterior horns, in the upper part of the cervical portion of the cord, and in the thoracic part between the brachial and crural enlargements.

The course of the fibres in the cord and their relations to the nerve cells should now be considered. There can be no doubt that of the longitudinal fibres some ascend from below upwards, and conduct either excito-motory impulses to the regions of the spinal cord itself, or sen- sory impulses to the brain. Other longitudinal fibres again descend from the brain and higher regions of the cord to the lower, and

conduct motor and vaso-motor impulses from above downwards. 'The horizontal and oblique fibres of an anterior or motor nerve root enter the grey matter of the anterior cornu, and seem to have the following arrange- ment: some become directly continuous with the axial cylin- drical processes of the nerve cells; others pass into the an- terior commissure; others extend as far as the grey matter of the posterior horn. The nerve cells of the anterior cornu give origin, therefore, directly to nerve fibres by their un- branched processes. Gerlach's observations show that the branched processes of these cells become continuous with the network of extremely minute fibres already described in the grey matter; from this network medullated fibres appear to arise which leave the grey matter; some enter the lateral column, and ascend as the fibres of this structure; others pass as fibres of the anterior commissure to the opposite side of the cord, and ascend as the anterior columu of that side. The anterior and lateral columns, therefore, are constantly receiving accessions of fibres from the enclosed grey matter.

The fibres of a posterior or sensory nerve root on entering the cord subdivide into two bundles; one does not enter the grey matter, but applies itself to the posterior column, of which it forms some of the vertical fibres. These fibres may ascend to the brain, or they may at some higher point in the cord enter the grey matter of the posterior horn. The other bundle of posterior root fibres at once enters the posterior horn of grey matter. The connections and ulti- mate arrangement of these fibres in the grey matter have not been satisfactorily made out. Gerlach states that, as they frequently subdivide on entering the grey matter, it

_ of lumbar nerves in the region of the loins; five pairs of

is possible they may form the fine nerve fibre plexus of the grey substance; but a direct continuity between them and the axial-cylinder processes of the cells of the posterior horn does not seem to have been observed. From the plexus, formed by the much subdivided processes of these cells, fibres arise, which, forming the fibres of the pos- terior

commissure, pass both in front of and behind the central canal to the opposite side, where they ascend towards the brain, " partly in the vertical fasciculi of the posterior cornua and partly in the posterior columns."

The structure of the spinal cord shows it to be both a nerve centre and a conductor of nervous impulses. The nerve cells in its grey matter give rise either directly, or through the delicate plexus formed by their branching processes, to nerve fibres, which may either pass out of the cord as the auterior and posterior roots of the spinal nerves, or may ascend to the brain as the columns of the cord. Hence the cord is anatomically continuous, on the one hand, through the nerves which arise from it, with the peripheral end-organs in the skin, and muscular system in which those nerves terminate; and, on the other hand, it is continuous with the brain. It serves, therefore, to conduct the impulses of touch-sensation from the skin upwards to the brain, and the motor impulses from the brain downwards to the muscles. But further, the cord is the great nerve centre concerned in reflex excito-motory actions. It must, also, be remembered that the two halves of the cord are anatomically continuous with each other through the nerve fibres of the commissures, so that it acts as a single organ, and not as two organs. Experiments have shown that sensory impulses are conducted upwards through the cord, not by that half from which the nerves arise that have been excited, but by the opposite half of the cord, which is obviously due to the crossing of the fibres of the posterior commissure, Motor impressions are, however, conducted downwards by that half of the cord from which the nerves arise that pass to supply the muscles to be moved.

The spinal cord is well supplied with blood by numerous arteries, which terminate in a diffused capillary network. The capillaries are much more numerous in the grey matter of the cord than in the white columns,

Oricin, ARRANGEMENT, AND DIsTRIBUTION OF THE Spinat NERves.—The spinal cord gives origin to thirty- one pairs of SpinaL nerves, which pass out of the spinal canal through the intervertebral

foramina, These nerves are arranged in groups, according to the region of the spine through the foramina in which they proceed. There are eight pairs of cervical nerves 3 the first or sub-oceipital emerges between the occipital bone and the atlas, the eighth between the seventh cervical and. first dorsal vertebra, Twelve dorsal or thoracic nerves pass out on each side in relation to the dorsal vertebre: five pairs

pass through each ganglion, are apparently connected with the poles of the cells. The roots of the spinal nerves vary in direction and length. Those of the cervical nerves are short, and run almost horizontally outwards to their respective intervertebral foramina; those of the dorsal are longer and more oblique; whilst the roots of the lumbar and sacral nerves, owing to the cord ending much above the foramina through which the nerves proceed, are very long, and form a leash of nerves in the lower part of the spinal canal, which surrounds the filum terminale, and, from its general resemblance in arrangement to the hairs of a horse's tail, has been named cauda equina.

The anterior nerve root joins the posterior immediately outside the ganglion, and by their junction a spinal nerve is formed. 'This nerve contains a mixture of both motor and sensory fibres, and is compound therefore in function. Almost immediately after its formation the nerve separates into two divisions, an anterior and a posterior, and each division, like the nerve itself, contains both motor and sensory fibres.

The Posterior Primary Divisions of the spinal nerves, smaller than the anterior, are distributed both to the muscles and skin on the back of the axial part of the body. Their general arrangement is as follows: each division, with some three or four exceptions, subdivides into an internal and an external branch. In the back of the neck and the back of the upper part of the chest, the external branches of these nerves supply the deep muscles; the internal branches pierce the muscles close to the spines of the vertebre, and end in the skin ; the internal branch of the second nerve, called great occipital, and that of the third cervical, pass to the skin over the occipital bone. In the back of the lower part of the chest and of the loins, the internal branches supply

the deep muscles, the external branches pass to the skin, those of some of the lumbar nerves extending as far as the skin of the buttock.

The Anterior Primary Divisions are not so uniform either in arrangement or distribution as are the pos- terior. They supply the front and sides of the axial part of the neck and trunk, and the extremities. The anterior divisions of the twelve thoracic nerves have the most simple arrange- ment. Each nerve, called from its position an ¢nter- costal nerve, runs out- wards, immediately below the lower border of a rib, Fic. 65.—Diagram of the arrangement ofa

J ons pair of thoracic spinal nerves. SC, spinal and gives origin to three cord; AR, anterior nerve root; PR, pos- series of branches, named _fercr Took, with itt ganglion: PD, pot communicating, muscular, primary division, or intereostal nerve; ond cuteneous. By the. Stnuhe techie ee Communicating branch anterior division; M, muscles, with the

2 : motor branches entering them; LC, each intercostal nerve is lateral cutaneous, and AC, anterior connected with an ad- ‘taneous nerves.

Jacent ganglion on the thoracic portion of the sympathetic system. By the Muscular or motor branches these nerves supply the intercostal muscles, the levatores costarum, and the triangularis sterni, whilst the lower intercostal nerves run forwards and downwards into the wall of the abdomen, aud supply the two oblique, the transverse, rectus, and pyramidalis muscles. The skin of the sides of the thorax and abdomen receives its nervous supply from the Lateral | Cutaneous branches, whilst the skin on the front of the trunk is supplied by the Anterior Cutaneous terminations of these nerves, The lateral cutaneous branches of the second and third intercostal nerves are comparatively large in size, and assist in the supply of the skin of the inner side of

sacral nerves through the sacral foramina 3 and one pair of coccygeal nerves through the lowest Openings in the spinal canal. Each spinal nerve arises by two roots, an anterior and a posterior, from the side of the cord. These roots are distinguished from each other both anatomically and physiologically. The posterior root has a swelling or

ganglion on it, whilst no ganglion exists on the anterior root. The posterior root consists of sensory nerve fibres, a.e., of fibres which conduct impulses from the periphery into the nerve centre; whilst the anterior root is composed of motor nerve fibres, zc., of fibres which conduct im- pulses from the centre to the periphery. The ganglion is situated on the posterior root, as a rule, in the interverte- bral foramen ; but the lower sacral nerves have the ganglia on their posterior roots in the spinal canal. These ganglia contain bipolar nerve cells, and the nerve fibres, as they

the upper arm; hence they are called intercosto-humeral nerves.

In the regions of the neck, loins, and pelvis, the anterior divisions of the spinal nerves do not pass simply outwards to their distribution. In each region adjacent nerves In- terlace with each other, and form what is technically called a nervous plecus. When a branch arises from a thoracic nerve, it contains fibres derived from that nerve only ; but when a brauch arises from a plexus, it may contain fibres, not of one only, but of two or more of the nerves which, by their interlacement, form the plexus. Hence the parts which are supplied by these branches are brought into con- nection with a greater number of nerves, and consequently with a greater extent of the spinal cord or nerve centre, than are the parts which receive branches from a single nerve only. These plexuses are especially found in con- nection with the nerves which supply the extremities, where, owing to the complexity of the muscular move- ments, the co-ordination of these movements through the nervous system is rendered necessary.

The anterior divisions of the eight cervical nerves are arranged in two plexuses, named cervical and brachial.

The Cervical plexus (Pl. XVII.) is formed of the four upper cervical nerves, which make, by interlacement with each other, a series of loops in front of the transverse processes of the cervical vertebra. Arising

either directly from these nerves, or from the plexus which they form, are communicating, muscular, and cutaneous branches. The Communicating branches connect these nerves with the large superior cervical ganglion of the sympathetic system, also with the vagus, accessory, and hypoglossal cranial nerves, and with the descending branch of the hypoglossal. The Muscular branches supply the anterior recti muscles of the neck, the levator scapule, the posterior scalenus, the diaphragm, and in part the sterno-mastoid and trape- zius. The branch to the diaphragm, or the phrenic nerve, is the most important (Pl. XVII. 9); it springs from the third, fourth, and fifth cervical, and passes down the lower part of the neck, and through the thorax, to supply its own half of the diaphragm. The Cutaneous branches are as follows:—the occipitalis minor, to the skin of the occiput; the auriculo-parotidean, to the skin over the parotid gland and the adjacent part of the auricle; the transversalis colli, to the skin of the front of the side of the neck; the swpra-clavicular nerves, to the skin of the lower part of the side of the neck, and upper part of the chest.

The Brachial plexus (Pl. XVII. 1, 2, 3, 4) is formed of the four lower cervical nerves, and of the larger por- tion of the first intercostal, called also first dorsal nerve. It is of large size, and is principally for the supply of the upper limb. Its exact mode of arrangement presents many variations, but the following is not un- frequently found:—The fifth and sixth nerves join to form a large nerve, which, after a short course, is joined by the seventh; in this manner the upper cord of the plexus is formed. The eighth cervical and the first dorsal then join, to form the Jower cord of the plexus. These cords then pass behind the clavicle and subclavius muscle into the axilla, where they become modified in arrangement. From each a large branch arises, and these two branches then join to form a third cord. These three cords have special relations to the axillary artery : the one which lies to its outer side is named the owter cord ; that to the inner, the zwver cord; that behind, the posterior cord. These nerves and the cords formed by them give origin to communicating, muscular, cutaneous, and mixed branches. The Communicating branches join the middle and in- ferior cervical and first thoracic ganglia of the sympathetic system. The Muscular branches supply the scaleni, longus

colli, rhomboid, and subclavius muscles; the supra and infra-spinatus muscles, through a branch called supra- scapular ; the serratus magnus, through the posterior thoracic branch ; the greater and lesser pectorals, through the two anterior thoracic branches; and the subscapu- laris, teres major, and latissimus dorsi, through the three subscapular branches. The C'wtaneous branches arise from the inner cord, and are the lesser internal cutaneous, which ends in the skin of the inner side of the upper arm, and joins the intercosto-humeral; and the internal cutaneous, which not only sends branches to the skin of the upper arm, but supplies the skin of the inner side of the forearm, both on its anterior and posterior surfaces. The Afixed branches are large and very important:— a, The Circumflex, from the posterior cord, supplies the deltoid aud teres minor muscles, the skin over the del- toid, and the shoulder joint. 6, The Musculo-Spiral, also from the posterior cord, supplies the triceps and anconeus, the supinator longus and extensor carpi radialis longior muscles ; and by its external cutaneous branch, the skin of the outer side of the back of the forearm. It then divides into the radial and posterior interosseous branches. The radial passes through the forearm to the hand, and supplies the skin on the back of the thumb, index and middle digits, and radial side of the ring digit. The posterior interosse- ous supplies the muscles on the back of the forearm and the articulations of the carpal joints. c, The Mfusculo-Cutane- ous branch of the outer cord of the plexus supplies the biceps, brachialis anticus, and coraco-brachialis muscles, and ends in an external cutaneous branch, which supplies the skin of the outer side of the forearm, both in front and behind. d, The Ulnar nerve arises from the inuer cord, passes through the upper arm, and enters the forearm be- tween the inner condyle and olecranon, where it supplies the elbow joint. Here it may easily be compressed, when a pricking sensation is experienced in the course of its dis- tribution. In this spot it is popularly called the " funny bone." In the forearm the ulnar nerve supplies the flexor carpi ulnaris and inner part of the flexor profundus digi- torum muscles. In the hand it supplies the

muscles of the ball of the little finger, the two inner lumbricales, the inter- ossei muscles, and the adductor and deep part of the short flexor of the thumb. It also supplies a dorsal cutaneous branch to the back of the hand, and the back of the little and of the ulnar side of the ring digits. Palmar cutaneous branches are also given to the palm and the palmar aspects of the same digits. e, The Afedian nerve arises by two roots, one from the inner, the other from the outer cord of the plexus. It enters the forearm in front of the elbow joint, supplies, either directly or through its antertor interosseous branch, all the flexors and pronators, except those supplied by the ulnar; is continued to the hand, where it supplies the abductor, opponens, superficial part of the short flexor | of the thumb, and two outer lumbrical muscles. It also supplies a palmer branch to the skin of the palm, and gives digital cutaneous branches to the thumb, index and middle digits, and radial side of the ring digit.

The Lumbar plexus, of large size, is situated at the back of the abdominal cavity in the region of the loins, and is formed by the four upper lumbar nerves, which form a series of loop-like interlacements in front of the transverse processes of the lumbar vertebra. It gives origin to com- municating, muscular, cutaneous, and mixed branches. The Communicating branches join the four upper lumbar ganglia of the sympathetic system. The Jd/uscular branches supply the quadratus lumborum muscle, and give branches to the psoas. The Cutaneous branches are named—a, Ilio-hypogastric, which gives an iliac branch to the skin of the buttuck, and a hypogastric branch to the skin of the abdomen above the pubic symphysis; 2%,

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Llio-inguinal, which supplies the skin of the groin; this nerve is by some said to send a branch to the internal oblique muscle ; c, External Cutaneous, which supplics the skin on the outer aspect of the thigh. The Mixed branches are as follows :—a, Genito-crural, which supplies the cre- master muscle, and a cutaneous branch to the skin of the groin. b, Anterior Crural, a large nerve which enters the thigh by passing behind Poupart's ligament, and supplies the great extensor

muscles of the knee-joint, and also the sar- torius, the psoas-iliacus and the pectineus, which act as flexors of the hip-joint; it gives off the following cutaneous branches :—An internal cutaneous to the skin of the inner side, a middle cutaneous to the skin of the middle of the front of the thigh, and the long saphenous nerve, which supplies the skin of the inner side of the knee-joint, the inner side of the leg and the foot. c, Qbturator nerve, which leaves the pelvis through the obturator foramen, and sup- plies the obturator externus and adductor muscles of the thigh, and sends a branch to the pectineus; it also supplies the hip and knee joints, and not unfrequently gives a branch to the skin ef the lower part of the inner side of the thigh. d, An Accessory Obturator nerve is sometimes present, which goes to the pectineus, to the hip-joint, and ‘ also joins the obturator nerve,

Fic. 65.—Lumbar, sacral, and sacro-ceceygeal plexuses. DXII, the lowest thoracic nerve of the intercostal series; LI to IV, the nerves of the Iumbar plexus; the fifth lumbar, with 8, the lumbo-sacral cord; SI to IV, sacral nerves going to form the sacral plexus; V and CI, the sacro-coccygeal plexus; a, chain of

communicating branches with

called coceygeal gangiion, or ganglion impar; 6, position of solar plexus; 1, itio-hypogastric nerve; 2, itio-

4, genito-crural; 5, anterior erural; 6,

The Lumbo-sacral Cord is formed of the fifth lumbar nerve and of a branch from the fourth lumbar. It joins the sacral plexus. Before the junction it gives origin to a com- municating and a muscular branch. The Communicating joins the fifth lumbar ganglion of the sympathetic. The Muscular branch, named the superior glutwal nerve, sup- plies the gluteus medius and minimus and the tensor fasciz femoris muscle.

The Sacral plexus is situated in the cavity of the pelvis, and is the largest of all the plexuses. It is formed by the

junction of the Jumbo-sacral cord, the first, second, third, and part of the fourth sacral nerves, and appears as aflattened mass in front of the sacrum. It gives origin to com- municating, muscular, and mixed branches. The Com- municating branches join the upper sacral ganglia of the Sympathetic system. The Muscular branches supply the upper fibres of the gluteus maximus, the pyriformis, gemelli, quadratus femoris, and obturator internus muscles. The Mixed nerves are as follows —a, Pudic, which supplies the muscles and skin of the external organs of generation. 6, Small Sciatic, which supplies not only the lower fibres of the gluteus maximus muscle, but the skin of the buttock, the back of the thigh, of the popliteal space, and of the leg; it also gives a long pudendal branch to the skin of the perineum. c, Great Sciatic; this is the largest nerve in the body. It leaves the pelvis through the great sciatic foramen, and passes down the back of the thigh, when it divides into external and internal popliteal branches. Before dividing it supplies the hamstring muscles, and gives a branch to the adductor magnus. The eaternal popliteal branch gives offsets to the knee. joint, passes down the outer side of the leg, supplies the peronei longus and_ brevis, gives off the communicans peronet branch to the skin of the outer side of the back of the leg, and ends as the external cutaneous nerve for the dorsum of the foot and the dorsal surfaces of all the toes, except the outer side of the little and the adjacent sides of the great and second toes. 'The internal popliteal branch gives offsets to the knee-joint, and supplies the communi. cans tibialis nerve, which joins the communicans peronei, and forms with it the external saphenous nerve that passes to the outer side of the foot and little toe. The internal popliteal also supplies the muscles of the calf and the popliteus muscle, and subdivides into the anterior and posterior tibial nerves. The anterior tibial passes to the front of the leg, supplies the tibialis anticus, peroneus ter- tius, and extensor muscles of the toes, and terminates as the cutaneous digital nerve for the adjacent sides of the great and second toes. The posterior tibial nerve passes down the back of the leg, supplies the tibialis posticus and long flexors of the toes, gives off a cutaneows branch to the skin of the heel, and terminates by dividing into the internal and external plantar nerves.

The internal plantar nerve supplies the skin of the sole and sends digital bvanches to the skin of the great, second, third, and tibial side of the fourth toes ; it also supplies the abductor pollicis, flexor brevis digitorum, flexor brevis pollicis, and two inner lumbrical muscles. The external plantar nerve supplies digital branches to the skin of the little and fibular sides of the fourth toes, and branches to all the muscles of the sole of the foot which are not supphed by the internal plantar nerve.

The Sacro-Coccygeal is the smallest plexus belonging to the anterior divisions of the spinal nerves. It is formed bya part of the fourth sacral, the fifth sacral, and the coccygeal nerves. It lies in front of the last sacral and the first coccy- geal vertcbre, and gives origin to communicating, visceral, muscular, and cutaneous branches. The Communicating branches join the lower sacral and the coccygeal ganglia of the sympathetic system; the Visceral pass to the pelvic plexus of the sympathetic, and through it to the bladder and rectum ; the Muscular to the levator ani, coccygeus, and sphincter ani externus muscles ; the Cutaneous to the skin about the anus and tip of the coccyx.

THe Brarn.—By the tenn Bratn or ENCEPHALON is Brain. meant all that part of the central nervous axis which is contained within the cavity of the skull. It is divided into several parts, named medulla oblongata, pons, cere- bellum, and cerebrum. The medulla oblongata is directly

continuous with the spinal cord through the foramen magnum. The cerebellum lies above, and immediately behind the medulla oblongata, with which it is directly continuous. The pons lies above and in front of the medulla, with which it is directly continuous. The cere- brum is the highest division, and lies above both pons and cerebellum, with both of which it is directly, continuous. Several figures of the brain are given in Plate XVIII.

The MEpuLLA OBLONGATA rests upon the basi-occipital. It is somewhat pyramidal in form, about 1} inch long, and 1 inch broad in its widest part. It is a bilateral organ, and is divided into a right and a left half by shallow anterior and posterior median fissures, continuous with the corre- sponding fissures in the spinal cord; the posterior fissure ends above in the 4th ventricle. Each half is subdivided into elongated tracts of nervous matter. Next to, and parallel with the anterior fissure is the anterior pyramid (Pl. XVILL. figs. 1 and 2, P). This pyramid is continuous below with the cord, and the place of continuity is marked by the passage across the fissure of three or four bundles of nerve fibres, from each half of the cord to the opposite anterior pyramid; this crossing is called the decussation of the pyramids, 'To the side of the pyramid, and separated from it by a faint fissure, is the olcvary fasciculus, which at its upper end is elevated into the projecting oval-shaped olivary body (Pl. XVIII. figs. 1 and 2,0). Behind the olive, and separated from it by a faint groove, is the strong tract named restiform body; as it ascends from the cord it diverges from its fellow in the opposite half of the medulla oblongata. By this divergence the central part of the medulla is opened up, and the lower half of the cavity of the 4th ventricle is formed. Internal to the restiform body is the posterior pyramid, which. is continuous with the postero-median column, and bounds the postero-median fissure. Where the restiform bodies diverge from each other, there also the posterior pyramids diverge outwards from the sides of the postero-median fissure. At the upper part of the floor of the 4th ventricle a longitudinal tract of nerve fibres, the fasciculus teres, ascends on each side of its median furrow (Fig. 68, 7). Slender tracts of nerve fibres, the arciform fibres, arch across the side of the medulla immediately below the olive; and white slender tracts emerge from the median furrow of the 4th ventricle, pass outwards across its floor, and form the striw medullares or acoustice, the rootsof origin of the auditory nerve (Fig. 68, 8).

The medulla oblongata, like the spinal cord, with which it is continuous, consists both of grey and white matter. But the exterior of the medulla is not so exclusively formed of white matter as is the outer part of the cord, for the divergence from each other of the restiform bodies and posterior pyramids of opposite sides opens out the central

part of the medulla, and allows the grey matter to become superficial on the floor of the 4th ventricle. The nerve fibres which enter into the formation of the pyramids and the other tracts just described, are partly continuous below with the columns of the spinal cord, and are prolonged upwards either to the pons and cerebrum, or to the cere- bellum, or they partly take their rise in the medulla oblongata itself from the cells of its grey matter. As the medulla is a bilateral organ, its two halves are united together by commissural fibres, which cross obliquely its mesial plane from one side to the other, and as they decus- sate in that plane, they form a well-marked mesial band or raphé. Further, the medulla is a centre of origin for several pairs of the more posterior encephalic nerves, and for the vaso-motor nerves. In the passage upwards through the medulla of the columns of the cord, a re-arrangement of their fibres takes place ; just as in a great central railway station, the rails, which enter it in one direction, intersect and are rearranged before they emerge from it in the opposite

direction. The fibres of the posterior median column of the cord are prolonged upwards as the posterior pyramid. The fibres of the posterior column of the cord are for the most part prolonged upwards into the restiform body, though some fibres pass to the front of the medulla to participate in the decussation of the anterior pyramids. The lateral column of the cord divides into three parts: a, the greater number of its fibres pass inwards across the anterior median fissure, to assist in forming the anterior pyramid of the opposite side, so as to produce the decussation already referred to; 6, others join the restiform body ; ce, others form the fasciculus teres situated on the floor of the 4th ventricle. The ante- rior column of the cord also divides into three parts: a, some fibres form the arciform fibres and join the restiform body ; 6, others assist in the formation of the olivary fasciculus; c, others are prolonged up- wards in the anterior pyramid of the same side (Fig. 67).

The anterior pyramid consists partly of fibres of the anterior column of the cord of the same side, partly of decus- sating fibres of the ante- rior commissure, partly of decussating fibres from the posterior co- lumns and posterior cor- nu of grey matter, but principally of the decus- sating fibres of the lateral column of the opposite side of the cord. The fibres of the anterior pyramid are prolonged through the pons to the cerebrum. Owing to the decussation of the lateral columns of the cord in the formation of the pyramids, the motor nerve fibres from one-half of the brain are trans- mitted to the opposite side of the cord, so that injuries affecting one side of the brain occasion paralysis of the motor nerves arising from the opposite half of the cord. The olivary fasciculus is formed partly of fibres of the anterior column of the same side, and partly of fibres arising from the grey matter of the olive. It is continued upwards through the pons to the cerebrum. The restiform body is formed principally of fibres of the posterior column of the same side, but partly of fibres of the lateral column, and also of the arciform fibres from the anterior column, and from the grey matter of the superior and inferior olives. As the restiform body is continued upwards to the cerebellum, and forms its inferior peduncles, the arciform fibres have been called by Solly the superyicial cerebellar fibres of the medulla. Through the restiform body the cerebellum is connected with the posterior, lateral, and anterior columns of the cord as well as with the olivary nuclei in the grey matter of the medulla oblongata. The posterior pyramid consists of the posterior median column of the cord, and is prolonged through the pons to the cerebrum, The fasciculus teres is formed of a small part

Fig. 67.—Diagrammatic dissection of the me- dulla oblongata and pons to show the course of the fibres. a, superficial, a', deep transverse fihres of the pons; 8, b, anterior pyramids ascending at 0' through the pons; ¢, ¢, otivary bodies; ¢, otivary fasciculus in the pons; d, d, anterior columns of cord; ¢, inner part of the right column joining the anterior pyramid; 7, the outer part going to the olivary fasciculus; g, lateral column of cord; h, the part which decussutes at x, the decussa- tion of the pyramids ; 7, the part which joins the restiform body ; m, that which forms the fasciculus teres; , arciform fibres. land 2, sensory and motor roots of fifth nerve; 8, sixth nerve; 4, portio dura; 5, portio

intermedia; 6, portio mollis of seventh nerve; 7, glosso-pharyngeal; 8, pneumo-gastric; 9, spinal accessory of eighth nerve ; 10, hypo- glossal nerve.

‘of the lateral column of the cord, and is also prolonged

through the pons to the cerebrum.

The grey matter of the medulla oblongata, which contains numerous multipolar nerve cells, is in part continuous with the grey matter of the spinal cord, and in part consists of in-

; dependent masses. As the grey matter of the cord enters the | | medulla it loses its crescentic arrangement. The posterior

transverse fibres, whilst others pass through its substance and form the deep transverse fibres. The transverse fibres of the pons constitute, therefore, the commissural or connecting arrangement by which the two hemispheres of the cerebellum become anatomically continuous with each other. The longitudinal fibres of the pons ascend or pass vertically upwards from the medulla oblongata, and consist of the fibres of the anterior pyramids, olivary fasciculi, fasciculi teretes, and posterior pyramids, They leave the pons by emerging from its upper surface as fibres of the two crura cerebri. The pons possesses a median raphe continuous with that of the medulla oblongata, and formed like it by a decussation of fibres in the mesial plane.

The grey matter of the pons is scattered irregularly through its substance, and appears on its posterior surface 2 but not on the anterior surface, which is composed exelu- sively of the superficial transverse fibres. It is traversed both by the longitudinal and deep transverse fibres, which form a well-defined Jormatio reticularis. To a portion of grey matter, containing nerve cells charged with dark pigment, the name of locus ceruleus is applied. The locus lies on the floor of the 4th ventricle, close to the entrance to the aqueduct of Sylvius, and serves as the origin of the sensory root of the 5th, and

perhaps of the posterior root of the 4th cranial nerve. The nerve cells of the pons are multi- polar and stellate. The pons acts as a conductor of impressions through its nerve fibres, and as a centre of origin of nerve fibres from nerve cells, Meynert states that some of the fibres of the crura cerebri end in the nerve cells of the pons, which cells again give origin to fibres that pass outwards to the cerebellum.

The Ceresenium, Lirrur Brain, or AFTER Brain (PI. Cere- XVIII. fig. 2, c), occupies the inferior pair of occipital fosse, bellum. and, along with the pons and medulla oblongata, lies below the plane of the tentorium cerebelli, It consists of two hemi- spheres or lateral lobes, and of a median or central lobe, which in human anatomy is called the vermiform process. It is connected below with the medulla oblongata by the two resti- form bodies which form its inferior peduncles, and above to the corpora quadrigemina of the cerebrum by two bands, which form its superior peduncles; whilst the two hemi- spheres are connccted together by the transverse fibres of the pons, which form the middle peduncles of the cerebellum. On the superior or tentorial surface of the cerebellum the median or vermiform lobe is a mere elevation, but on its inferior or occipital surface this lobe forms a well-defined wnferior vermiform process, which lies at the bottom of a deep fossa or vallecula ; this fossa is prolonged to the posterior border of the cercbellum, and forms there a deep notch which separates the two hemispheres from each other 3 In this notch the falx cercbelli is lodged. Extending horizontally backwards from the middle cerebral peduncle, along the outer border of each hemisphere is the great horizontal Jissure, which divides the hemisphere into its tentoria] and occipital surfaces. Each of these surfaces is again sub- divided by fissures into smaller lobes, of which the most important are the amygdala or tonsil, which forms the lateral boundary of the anterior part of the vallecula, and the jlocculus, which is situated immediatcly behind the middle peduncle of the cerebellum. The inferior vermiforni process is subdivided into a posterior part or pyramid ; an elevation or uvula, situated between the two tonsils ; and an anterior pointed process or nodule. Stretching between the two flocculi, and attached midway to the sides of the nodule, is a thin, white, semilunar-shaped plate of nervous matter, called the posterior medullary velum.

The whole outer surface of the cerebellum possesses a

cornua are thrown outwards towards the surface, lose their pointed form, and dilate into rounded masses named the grey tubercles of Rolando, whilst portions are prolonged into both the posterior pyramid and the restiform body. The grey matter of the anterior cornua and of the intermedio- lateral tracts loses its continuity, and becomes subdivided into numerous small masses, owing to being traversed by bundles of nerve fibres, which give rise to a network termed Jormatio reticularis, in the meshes of which the groups of . nerve cells are contained. In the lower part of the medulla a central canal continuous with that of the cord exists, but when the restiform bodies and posterior pyramids on the opposite sides of the medulla diverge from each other, the central canal loses its posterior boundary, and dilates into the cavity of the 4th ventricle. The grey inatter in the i interior of the medulla appears, therefore, on the floor of the ventricle; that which corresponds to the anterior cornua being situated immediately on each side of the median fur- row, whilst that which is continuous with the grey tubercles of Rolando and the posterior cornua is some distance ex- ternal to it. This grey matter forms collections of nerve cells, which are the centres of origin of several important encephalic nerves. Of the independent masses of grey matter of the medulla, that which forms the corpus dentatum within the olivary body is the most important, and constitutes the nucleus of i the inferior olive. It is folded on itself in a zig-zag or denticulated manner, and forms a sort of capsule open on the inner aspect, through which openings a bundle of nerve fibres from the interior of the capsule proceeds. These q fibres aid in the formation of the olivary fasciculus, and as Deiters and Meynert have pointed out, in part arch across the mesial plane and join the restiform body on the opposite side, whilst some apparently join the posterior pyramid. The 4) nerve cells of the olive are multipolar and flask-shaped, and | in all probability give origin to the nerve fibres proceeding from the interior of the capsule. Separated from the inner part of the olive by a layer of reticular substance is a smaller grey mass, called by Stilling nucleus olivaris accessorius. Crossing the anterior surface of the medulla oblongata, immediatcly below the pons, in the majority of mammals is a transverse arrangement of fibres forming the trapezium, which

contains a grey nucleus, named by Van der Kolk the superior olive. In the human brain the trapeziurna is concealed by the lower transverse fibres of the pons, but when sections are made through it, as L. Clarke pointed out, the grey matter of the superior olive can be seen. Meynert states that its nerve cells give origin to some fibres, which run straight backwards to the restiform body of the same side, and to others which pass across the mesial plane to the opposite corpus restiforme. Pons The Pons Varoui or BripcE (Pl. XVIII. figs. 1, 2, 3,.N)) "li. ig cuboidal in form: its anterior surface rests upon the dorsum sellze of the sphenoid, and is marked by a median longitudinal groove ; its inferior surface receives the pyra- midal and olivary tracts of the medulla oblongata ; at its superior surface are the two crura cerebri ; each lateral Surface is in relation to a hemisphere of the cerebellum, and a peduncle passes from the pons into the interior of each hemisphere; the posterior surface forms in part the upper portion of the floor of the 4th ventricle, and in part is in contact with the corpora quadrigemina. The pons consists of white and grey mattcr: the nerve fibres of the white matter pass through the substance of the pons, either in a transverse or a longitudinal direction.

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characteristic foliated or laminated appearance, due to its subdivision into multitudes of thin plates or lamellae by numerous fissures. The cerebellum consists both of grey and white matter. The grey matter forms the exterior or cortex of the lamella, and passes from one to the other across the bottoms of the several fissures. The white matter lies in the interior of the organ, and extends into the core of each lamella. When a vertical section is made through the organ, the prolongations of white matter branching off into the interior of the several lamelle give to the section an arborescent appearance, known by the fanciful name of arbor vite (Pl. XVIII. fig. 3,c). Independent masses of grey matter are, however, found in the interior of the cerebellum. If the hemisphere be cut through a little to the outer side of the median lobe, a zig-zag arrange- ment of grey matter, similar in appearance and

structure to the nucleus of the olivary body in the medulla oblongata, and known as the corpus dentatum of the cerebellum, is seen; it lies in the midst of the white core of the hemi- sphere, and encloses white fibres, which leave the interior of the corpus at its inner and lower side. Stilling has de- scribed, in connection with the anterior end of the in- ferior vermiform process, which projects forwards into the valve of Vieussens, and aids in the formation of the roof of the 4th ventricle, two grey masses, named roof nuclez. They possess flask-shaped nerve cells like those of the corpus dentatum. The white matter is more abundant in the hemispheres than in the median lobe, and is for the most part directly continuous with the fibres of the peduncles of the cerebellum. Thus the restiform or inferior peduncles pass from below upwards through the white core, to end in the grey matter of the tentorial surface of the cerebellum, more especially in that of the central lobe ; on their way they are connected both with the grey matter of the corpus dentatum and of the roof nuclei. The superior peduncles, which descend from the corpora quadrigemina of the cerebrum, reach the grey cortical matter, more especially on the inferior surface of the cerebellum, though they also form connections with the corpus dentatum. The middle peduncles form a large proportion of the white core, and their fibres terminate in the grey matter of the foliated cortex of the hemispheres. But, in addition to these peduncular fibres, which connect the ccrebellum to other subdivisions of the encephalon, its white matter contains fibres proper to the cerebellum itself. The fibre proprie have been especially described by Stilling ; some, which he has termed the median fasciculi, lie near the mesial plane, and connect the grey matter on the tentorial aspect of the middle lobe with that of the inferior vermiform process, whilst others cross directly the mesial plane to unite opposite and symmetrical regions of the hemispheres. Further, the auditory nerve was said by Foville to derive some of its fibres of origin from the cerebellum ; the connection of this nerve with the cerebellum has been strongly insisted on by Meynert, and this anatomist has also ascribed a cerebellar origin to a portion of the sensory root of the 5th cranial nerve.

The grey matter of the cortex is divided into two well- defined layers, an external grey, and an inner rust coloured layer of about equal thickness. The rust coloured layer is distinguished by containing multitudes of so called " gran- ules," the well-defined nucleus in which, as described by Strachan, is invested by a small quantity of branched protoplasm. These "granules" are, therefore, minute stellate cells. Where the rust coloured layer joins the grey layer the characteristic nerve cells of the cerebel- lum, named the corpuscles of Purkinje, are situated. A slender central process arising from each cell enters the rust coloured layer, and, as the observations of Hadlich and Koschennikoff show, becomes continuous with the

axial cylinder of a medullated nerve fibre; for the nerve fibres of the white core enter this layer, divide into minute fibres, and ramify amidst the granules. From the oppo- site aspect of each cell two peripheral processes arise, and ramify in an antler-like manner in the external grey layer. Obersteiner and Hadlich maintain that the finer branches of these processes curve back towards the rust coloured layer, where, according to Boll, they form a net- work of extreme minuteness, from which it is believed that nerve fibres may arise. The substratum of the grey layer, in which the branched processes of the cells of Purkinje lie, consists of a very delicate neuroglia, in which scattered corpuscles are imbedded ; but, in the outer part of this layer, delicate supporting connective tissue-like fibres are also met with.

The Fourth Ventricle is the dilated upper end of the cen- Fourth Its shape is like an Ventricle,

tral canal of the medulla oblongata. heraldic lozenge. Its floor is formed by the grey matter of

Fig. 68.—Floor of the fourth ventricle and adjacent structures. 1, pineal gland; 2,the nates, and 3, the testcs of the corpora quadrigemina; 4, 4, middle peduncles, 5, 5, superior peduncles, 9, 9,

inferior peduncles of the cerebcllum; 6, 6, valve of Vieusseng divided; 7, 7, fasciculi teretes; 8, 8, roots of the auditory nerves; 9', corpus dentatum; 10, 10, posterior pyramids; 11, calamus scriptorius,

the posterior surfaces of the medulla oblongata and pons; — its roof partly by the inferior vermiform process of the cere- bellum, the xodule of which projects into its cavity, and partly by a thin layer, called valve of Viewssens, or anterior medullary velum ; its lower lateral boundaries, by the diver- gent restiform bodies and posterior pyramids ; its upper lateral boundaries, by the superior peduncles of the cere- bellum ; the reflection of the arachnoid membrane from the back of the medulla to the inferior vermiform process closes it in below, but allows of a communication between its cavity and the sub-arachuoid space ; above, it communicates with the aqueduct of Sylvius, which is tunnelled through the sub- stance of the corpora quadrigemina. Along the centre of the floor is the median furrow, which terminates below in a pen-shaped form, the so-called calamus scriptorwus. Situated on its floor are the fasciculi teretes, striz acous- tice, and deposits of grey matter described in connection with the medulla oblongata. Its endothelial lining is con- tinuous with that of the central canal.

The CerEBRUM or GREAT Brain lies above the plane of the tentorium, and forms much the largest division of the encephalon, It is customary in human anatomy to include under the name of cerebrum, not only the convo- lutions, the corpora striata, and the optic thalami, developed . in the anterior cerebral vesicle, but also the corpora quadri- gemina and crura cerebri developed in the middle cerebral vesicle. The cerebrum is ovoid in shape, and presents superiorly, anteriorly, and posteriorly a deep median longitt-

dinal jisswre, which subdivides it into two hemispheres, {nferiorly there is a continuity of structure between the two hemispheres across the mesial plane, and if the two hemispheres be drawn asunder by opening out the longi- tudinal fissure, a broad white band, the corpus callosum, may be seen at the bottom of the fissure passing across the mesial plane from one hemisphere to the other. The outer surface of

each hemisphere is convex, and adapted in shape to the concavity of the inner table of the cranial bones ; its inner surface, which bounds the longitudinal fissure, is flat aud is separated from the opposite hemisphere by the falx cerebri; its under surface, where it rests on the tentorium, is concave, and is separated by that membrane from the cerebellum and pons. From the front of the pons two strong white bands, the crura cerebri or cerebrul peduncles, pass forwards and upwards to enter the optic thalami in their respective hemispheres. Winding round the outer side of each crus is a flat white band, the optic tract. These tracts converge in front, and join to form the optic commissure, from which the two optic nerves arise. The crura cerebri, optic tracts, and optic commissure enclose a lozenge-shaped space, which includes—a, a grey layer, called pons Tarint, which, from being perforated by seve- ral small arteries, is often called locus perforatus posticus,; 6, two white mammillz, the corpora albicantia ; c, a grey nodule, the tuber cinereum, from which, d, the infundi- bulum projects to join the pituitary body. Immediately in front of the optic commissure is a grey layer, the lamina cinerea or lamina terminalis of the 3d ventricle ; and between the optic commissure and the inner end of each Sylvian fissure is a grey spot perforated by small arteries, the locus perforatus anticus.

The peripheral part of each hemisphere, which consists of grey matter, exhibits a characteristic folded appearance, known as the convolutions or gyri of the cerebrum. These convolutions are separated from each other by jissures or sulct, some of which are considered to subdivide the hemi- sphere into lobes, whilst others separate the convolutions in each lobe from each other. In each hemisphere of the human brain five lobes are recognised: the temporo-sphe- noidal, frontal, parietal, occipital, and the central lobe or insula. Passing obliquely on the outer face of the hemi- sphere from before, upwards and backwards, is the well- marked Sylvian fissure, which is the first to appear in the development of the hemisphere. Below it lies the tem- poro-sphenoidal lobe, and above and in front of it, the parietal and frontal lobes. The frontal lobe is separated from the parietal by the fissure of Rolando, which extends on the outer face of the hemisphere from the longitudinal fissure obliquely downwards and forwards towards the

Sylvian fissure. About two inches from the hinder end of the hemisphere is the parieto-occipital fissure, which, commencing at the longitudinal fissure, passes down the inner surface of the hemisphere, and transversely outwards for a short distance on the outer surface of the hemi- sphere; it separates the parietal and occipital lobes from each other.

The Yemporo-Sphenoidal Lobe presents on the outer surface of the hemisphere three convolutions, arranged in parallel tiersfrom above downwards, and named superior, middle, and inferior temporo-sphenordal convolutions. The fissure which separates the superior and middle of these convolutions is called the parallel fissure. The Occipital Lobe also con- sists from above downwards of three parallel convolutions, named superior, middle, and inferior occipital. The Frontal Lobe is more complex ; immediately in front of the fissure of Rolando, and forming indeed its anterior boundary, is a convolution named ascending frontal, which ascends obliquely backwards and upwards from the Sylvian to the

longitudinal fissure. Springing from the front of this con-

volution, and passing forwards to the anterior end of the cerebrum, are three convolutions, arranged in parallel ¢zers from above downwards, and named superior, middle, and inferior frontal convolutions, which are also prolonged on to the orbital face of the frontal lobe, The Parietal Lobe is also complex; its most anterior convolution, named ascending parietal, ascends parallel to and immediately behind the fissure of Rolando. Springing from the upper

end of the back of this convolution is the postero-parietal convolution, which, forming the boundary of the longitudinal fissure, extends as far back as the parieto-occipital fissure ; springing from the lower end of the back of this convo. marginal convolution, which forms of the hinder part of the Sylvian

lution is the supra – the upper boundary

Fig. 70.

Figs. 69 and 70.—Profile and vertex views of cerebrum. Fr, the frontal lobe; Par, parietal; Oc, occipital; 7s, temporo-sphenoidal lobe; SS, Sylvian fissure; RR, fissure of Rolando; PO, parieto-occipital fissure; IP, intra-parietal fissure; PP, Parallel fissure; SF and IF, supero- and infero-frontal fissures; 1, 1, 1, inferior, 2, 2, 2, middle, and 3, 3, 3, superior frontal convolutions; 4, 4, ascending frontal convolution ; 5, 5, 5, ascending parietal, 5', postero-parietal, and 6, 6, angular convolutions; A, supra-marginal, or convolution of the parietal eminence; 7, 7, superior, 8, 8, 8, middle, and 9, 9, 9, inferior temporc~-sphenoidal convolutions; 10, superior, 11, middle, and 12, inferior occipital conyolutions; a, B, Y 6, four annectent convolutions,

fissure ; as this gyrus occupies the hollow in the parietal bone, which corresponds to the eminence, it may appro- priately be named the convolution of the parietal eminence. Continuous with the convolution of the parietal eminence is the angular convolution, which bends round the posterior extremity of the Sylvian fissure. Lying in the parietal lobe is the tntra-parietal fissure, which separates the convolution of the parietal eminence from the postero-parietal con- I. — 110

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volution. The occipital is connected with the parietal lobe

by two annectent or bridging gyri, which bridge across the transverse external part of the parieto-occipital fissure ; the

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Fic. 71.—Side view of the Brain in the sical?

depth and extent of this fissure vary in different brains in proportion to the size of these bridging convolutions. The supertor annectent gyrus

passes between the postero-parietal and the superior occipital convolutions, whilst the second an- nectent gyrus connects the middle occipital with the angular gyrus. Two annectent gyri also pass from the inferior occi- pital convolution to the lower convolutions of the temporo- sphenoidal lobe. These lobes of the cerebrum, though named after the bones which form the vault of the skull, are not exactly co-terminous with them. The frontal lobe not only lies under cover of the frontal bone, but extends back- wards under the anterior part of the parietal ; for the fissure of Rolando, which forms its posterior boundary, lies from 1} to 2 inches behind the coronal suture. The occipital lobe is not limited to the upper tabular part of the occipital bone, but extends forwards under cover of the posterior part of the parietal, for the parieto-occipital fissure lies about #inch in front of the apex of the lambdoidal fissure. The temporo-sphenoidal lobe not only lies under the squamous-temporal and great wing of the sphenoid, but passes upwards under cover of the lower part of the parietal, for the Sylvian fissure passes from below obliquely upwards and backwards across the line of the squamous suture near its middle. The area covered by the parietal bone so far,

1 The above view of the brain im situ, shows the relations of the sur-face convolutions to the regions of the skull. R, fissure of Rolando, which separates the frontal from the parietal lobe. PO, parieto-occi-pital fissure between the parietal and occipital lobes. SS, fissure of Sylvius, which separates the temporo-sphenoidal from the frontal and parietal lobes. SF, MF, IF, the supero-, mid-, and infcro-frontal sub-divisions of the frontal area of the skull; the letters are placed on the superior, middle, and inferior frontal convolutions ; the inferior frontal region is separated from the middle frontal by the frontal part of the curved line of the temporal ridge; the mid- from the supero-frontal by an antero-posterior line through the frontal eminence. SAP, the supero- antero-parietal area of the skull; § is placed on the ascending parietal convolution, AP on the ascending frontal convolution. IAP, the infero- antero-parietal area of the skull; I is placed on the ascending parietal, AP on the ascending frontal convolution. SPP, the supero-postero-parietal area of the skull; the letters are placed on the angular convolution. IPP, the infero-postero-parietal area of the skull

; the letters are placed on the mid-temporo-sphenoidal convolution; the temporal ridge separates the supero- and infero-parietal regions from each other; a vertical line drawn through the parietal eminence separates the antero- and postero- parietal regions. X, the convolution of the parietal eminence, or supra- marginal gyrus. 0, the occipital area of the skull ; the letter is placed on the mid-occipital convolution. $q, the squamoso-temporal region of the skull ; the letters are placed on the mid-temporo-sphenoidal con- volution. AS, the ali-sphenoid region of the skull; the letters are placed on the tip of the supero-temporo-sphenoidal convolution. The black lines mark the boundaries of different cranial regions.

then, from being co-terminous with the parietal lobe of the cerebrum, is trenched on anteriorly by the frontal, poste- riorly by the occipital, and inferiorly by the temporo- sphenoidal lobe. The convolutions of the parietal lobe itself are grouped around the parietal eminence, and in the interval between it and the sagittal suture. The inner table of the cranial bones is an almost exact mould of the convolutions of these lobes ; but this is not so with the ex- terior of the skull, the configuration of which is modified by the formation of ridges and processes for the attachment of muscles, by variations in the thickness of the diploé, and by the development of the frontal and mastoid air-sinuses. Hence the outcr surface of the skull does not correspond in shape to the outside of the brain.

*The Central Lobe of the hemisphere, more usually called the ensula or island of Reil, does not come to the surface of the hemisphere, but lies deeply within the Sylvian fissure, the convolutions * forming the margin of which conceal it. It consists of four or five short convolu- tions, which radiate from the locus per- foratus anticus, situ- ated at the inner end of the fissure. This lobe is almost entirely surrounded by a deep sulcus, which insulates it from the adjacent convolutions. It lies opposite the upper part of the ali- sphenoid, where it articulates with the parietal and squa- . : mous-temporal.*

Convolutions also exist on the inner surface of the hemi- sphere, and on the under surface which rests on the tento- rium, but these have no relation to the bones of the cranial vault. They may be studied in connection with the corpus callosum or great transverse commissure, which connects the two hemispheres, and with certain fissures situated on these surfaces of the hemisphere. The small convolutions which lie behind the internal part of the parieto-occipital fissure form the inner convolutions of the occipital lobe, or the occt- pital lobule (Fig. 73). Those which lie immediately in front of the same fissure belong to the inner face of the parietal lobe, and form the quadrilateral lobule. It is customary, however, to name the convolution which extends forwards from that fissure along the margin of the longitudinal fissure to the anterior end of the hemisphere, and which then turns back to the locus perforatus anticus as the marginal convolution. Thisis separated by a fissure called calloso-marginal, from the callosal convolution or gyrus fornicatus, which, conmmencing at the locus perforatus an- ticus, turns round the anterior end of the corpus callosum, extends parallel to its upper surface, and then turns round its posterior end. It is separated from the corpus callosum by the callosal fissure, at the bottom of which the grey matter of the gyrus fornicatus termintes in a well-defined edge.

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Fig. 72.—Orbital surface of the left frontal lobe and the island of Reil; the tip of the temporo- sphenoidal lobe has been removed to display the latter. 17, convolution of the margin of the longi- tudinal fissure; O, olfactory fissure, over which the olfactory peduncle and lobe are situated; TR, tri-radiate fissure; 1” 1’, convolutions on the orbital surface; 1, 1, 1, 1, under surface of infero- frontal convolution; 4, under surface of ascend- ing frontal, and 5, of ascending parietal convolu- tions; C, central lobe or insula.

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The callosal convolution encloses the corpus callosum within the concavity of its arch, and from its direction is

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Fic. 73.—Convolutions of the inner and tentorial surfaces of the left hemi-

sphere. 4, 7, 7, calloso-marginal fissure; J, 1, calearine fissure; m, m, hippo- campal fissure; n, n, collatcral fissure; PO, paricto-occipital fissure; 17, 17, marginal convolution; 18, 18, gyrus fornicatus; 18', quadrilateral lobule; 19, hippocampal gyrus; 19', its recurved end; 25, occipital lobule; 9, 9, infe- rior temporo-sphenoidal convolution.

appropriately called fornicatus (arch-shaped). 'The pos- terior end of the eallosal convolution curves downwards and then forwards, under the name of gyrus hippocampi, to the tip of the inner surface of the temporo-sphenoidal lobe. This gyrus is separated anteriorly by a narrow eurved fissure ealled hippocampal fissure, from a white band, the tania hippocampi, which band possesses a free curved border, round which the pia mater and ehoroidal artery enter the lateral ventricle through the great transverse fissure of the eerebrum. 'The hippocampal fissure is eon- tinuous round the posterior end of the eorpus callosum with the callosal fissure, and at the bottom of the hippo- campal fissure the grey matter of the gyrus hippocampi terminates in a well-defined dentated border (fascia den- tata). The hippocampal fissure on this surface of the hemisphere marks the position of an eminence in the de- scending eornu of the ventricle called hippocampus major. The gyrus hippocampi is separated posteriorly from the adjacent temporo-sphenoidal convolution by a fissure, named collateral, which marks the position on this surface of the hemisphere of the collateral eminence in the interior of the ventricle. From the lower end of the parieto-occipital fissure an offshoot, ealled the calcarine Jissure, passes almost horizontally backwards in the occipital lobe, which fissure marks on this surface of

the hemisphere the eminence named calear avis, or hippocampus minor, in the posterior cornu of the ventriele.

If a horizontal slice be removed from the upper part of each hemisphere, the peripheral grey matter of the convo- lutions will be seen to follow their various windings, whilst the core of each convolution consists of white matter con- tinuous with a mass of white matter in the interior of the hemisphere. If a decper slice be now made down to the plane of the corpus eallosum, the white matter of that structure will be seen to be continuous with the white centre of each hemisphere. The corpus callosum does not equal the hemispheres in length, but approaches nearer to their anterior than their posterior ends (Pl. XVIII. fig. 3, B.) It terminates behind in a free rounded end, whilst in front it forms a knee-shaped bend, and passes downwards and backwards as far as the lamina cinerea. If the dissec- tion be performed on a brain which has been hardened in spirit, the corpus eallosum is seen to consist almost entirely of bundles of nerve fibres, passing transversely across the mesial plane between the two hemispheres ; these fibres may be traced into the white cores and grey matter of the convolutions, and apparently connect the corresponding convolutions in the opposite hemispheres. Hence the corpus eallosum is a connecting or commissural structure, which brings the convolutions of the two hemispheres into anatomical and physiological relation with each other. On

the surface of the corpus callosum a few fibres, the strice longitudinales, run in the antero-posterior or longitudinal

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Fic. 74.—To show the right ventricle and the left half of the corpus callosum. a, transverse fibres, and 0, longitudinal fibres of corpus

callosum; ¢, anterior,

and d, posterior cornua of lateral ventricle; ¢, septum lucidum; f, corpus

striatum ; g, tenia semicircularis ; A, optic thalamus; &, choroid plexus ; J, tenia hippocampi; m, hippocampus major; n, hippocampus minor; 0, eminentia col- lateralis. © direction. If the corpus callosum be now cut through on each side of its mesial line, the large cavity or lateral ventricle in each hemisphere will be opened into.

The lateral ventricle is subdivided into a central space or body, and three bent prolongations or cornua ; the anterior cornu extends forwards and outwards into the frontal lobe; the posterior cornu curves backwards, outwards, and inwards into the occipital lobe; the de- scending cornu curves backwards, outwards, downwards, forwards, and inwards, behind and below the optie tha- lamus into the temporo-sphenoidal lobe. On the floor of the central space may be seen from before backwards the grey upper surface of the pear-shaped corpus striatum, and to its inner and posterior part a small portion of the optic thalamus, whilst between the two is the curved flat band, the tenia semicircularis, Resting on the upper surface of the thalamus is the vascular fringe of the velum interposi- tum, named choroid plexus, and immediately internal to this fringe is the free edge of the white posterior pillar of the fornix. The anterior cornu has the anterior end of the corpus striatum projecting into it. The posterior cornu has an elevation on its floor, the hippocampus minor, and between this cornu and the descending cornu is the eleva- tion called eminentia collateralis,

Extending down the descending eornu and following its curvature is the hippocampus major, which terminates below in a nodular end, the pes hippocampi ; on its inner border is the white tenia hippocampi, continuous above with the posterior pillar of the fornix. If the tenia be drawn on one side the hippocampal fissure is exposed, at the bottom of which the grey matter of the gyrus hippo- campi may be seen to form a well-defined dentated border (the so-called fascia dentata). he choroid plexus of the pia mater turns round the gyrus hippocampi, and enters

the descending cornu through the great transverse fissure be- tween the tenia hippocampi and optic thalamus. The

jateral ventricle is lined by a cylindrical endothelium,

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which is in many parts ciliated, and which rests on a layer of neuroglia. This lining is continuous through the fora- men of Monro with that of the third ventricle, which again is continuous with the lining of the fourth ventricle through the aqueduct of Sylvius. A little fluid is con- tained in the cerebral ventricles, which, under some patho- logical conditions, may increase greatly in quantity, so as to occasion considerable dilatation of the ventricular

cavities. ve ; If the corpus callosum be now divided about its middle

Fia. 75.—A deeper dissection of the lateral ventricle, and of the velum inter- positum. a, under surface of corpus callosum, turned back; 6, , posterior pillars of the fornix, turned back; c¢, ¢c, anterior pillars of the fornix; d@, velum interpositum and veins of Galen; e, fifth ventricle; % f, corpus striatum; 9, g, tenia semicircularis; A, A, optic thalamus; &, choroid plexus; J, teenia hippocampi; m, hippocampus major in descending cornu; n, hippocampus minor; o, eminentia collateralis.

by a transverse incision, and the posterior half of this structure be turned back, the body of the fornix on which the corpus callosum rests is exposed. If the anterior half of the corpus callosum be now turned forward, the grey partition, or septum lucidum, between the two lateral ventri- cles is exposed. This septum fits into the interval between the under surface of the corpus callosum and the upper surface of the anterior part of the fornix. It consists of two layers of grey matter, between which is a narrow ver- tical mesial space, the fifth ventricle. If the septum be now removed, the anterior part of the fornix is brought into view.

The fornix or arch is an arch-shaped band of nerve fibres extending in the antero-posterior direction. Its ante- rior end forms the anterior piers or pillars of the arch, its posterior end the posterior piers or pillars, whilst the inter- mediate body of the fornix forms the summit or crown of the arch. It consists of two lateral halves, one belonging to each hemisphere. At the summit of the arch the two lateral halves are conjoined to form the body; but in front of the body the two halves separate. from each other, and

form two anterior pillars, which descend in front of the'

third ventricle to the base of the cerebrum, where they form the corpora albicantia, and then enter the substance of the optic thalamus. Behind the body the two halves diverge much more from each other, and form the posterior pillars ; each of which curves downwards and outwards into the descending cornu of the ventricle, and, under the

name of tenia hippocampt, forms the free border of the hippocampus major. If the body of the fornix be now divided by a transverse incision, its anterior part thrown forwards, and its posterior part backwards, the great trans- verse fissure of the cerebrum is opened into, and the velum interpositum lying in that fissure is exposed.

The velum interpositum is an expanded fold of pia mater, which passes into the interior of the hemispheres through the great transverse fissure. It is triangular in shape; its base is in a line with the posterior end of the corpus callosum, where it is continuous with the external pia mater ; its lateral margins are fringed by the choroid plexuses, which are seen in the bodies and descending cornua of the lateral ventricles, where they are invested by the endothelial lining of those cavities. Its apex, where the two choroid plexuses blend with each other, lies just behind the anterior pillars of the fornix. The interval between the apex and these pillars is the aperture of communication betwecn the two latcral ventricles and the third, already referred to as

the foramen of Monro. The choroid plexuses contain the small choroidal arteries, which supply the cor- pora striata, optic thalami, and corpora quadrigemina; and the blood from these bodies is returned by small veins, which join to form the veins of Galen (Fig. 75). These veins pass along the centre of the velum, and, as is shown in Fig. 63, open into the straight sinus. If the velum interpositum be now carefully raised from before backwards, the optic thalami, third ventricle, pincal gland, and corpora quadri- gemina are exposed.

The optic thalamus is a large, somewhat ovoid body situated behind the corpus striatum, and above the crus cerebri. Its upper surface is partly seen in the floor of the body of the lateral ventricle, but is for the most part covered by the fornix and velum interpositum. Its postero- inferior surface forms the roof of the descending cornu of the ventricle, whilst its inner surface forms the side wall of the third ventricle. At its outer and posterior part are two slight elevations, placed one on each side of the optic tract, and named respectively corpus geuiculatum internum and externum.

The third ventricle is a cavity situated in the mesial plane between the two optic thalami. Its roof is formed by the velum interpositum and body of fornix; its floor, by the pons Tarini, corpora albicantia, tuber cinereum, infundibulum, and optic commissure ; its anterior bound- ary, by the antcrior pillars of the fornix, anterior commis- sure, and lamina cinerea ; its posterior boundary, by the corpora quadrigemina and posterior commissure. The cavity of this ventricle is of small size in the living head, for the inner surfaces. of the two thalami are connected together by intermediate gr atter, named the middle or soft commissure; but m me the ~~*brain out of the cranial cavity this commissure Is usually more or less torn through, and the cavity is consequently enlarged. Imme*~~ *diately in front of the corpora quadrigemina, the white fibres of the postertor commissure pass across between the two optic thalami. If the anterior pillars of the fornix be separated from each other, the white fibres of the anterior commissure may be seen entering the two corpora striata.*

The pineal body is a reddish cone-shaped body, enveloped by the velum interpositum, and situated upon the more anterior pair of the corpora quadrigemina. From its broad anterior end two white bands, the peduncles of the pineal body, pass forwards, one on the inner side of each optic thalamus. Each peduncle joins, along with the tenia semicircularis, the anterior pillar of the fornix of its own side. In its structure this body consists of a vascular stroma of connective tissue, in the meshes of which lymphoid cells are contained. Branched corpuscles are also found not unlike nerve cells. Amylaccous and gritty

calcareous particles, constituting the brain sand, are also found in it. Usually it is hollowed out into two or more small cavities. The function of the pineal body is not understood, but both it and the pituitary body, which possess a certain structural correspondence, are usually referred to the type of the ductless glands.

The corpora quadrigemina or optic lobes are situated behind and between the two optic thalami, and rest upon the posterior surface of the crura cerebri. The division into two lateral halves is marked by a shallow longitu- dinal fissure, and the subdivision of each half into an an- terior and a posterior eminence, by a shallow transverse fissure, The anterior pair of eminences are called nates; the posterior, testes. From each testis a strong white band, the superior peduncle of the cerebellum, passes back- wards té the cerebellum, and stretching between the pair of peduncles is the valve of Vieussens or anterior medullary velum. The corpora quadrigemina are tunnelled in the antero-posterior direction by the aqueduct of Sylvius, which opens anteriorly into the third ventricle immediately below the posterior commissure, and posteriorly into the fourth ventricle under cover of the valve of Vieussens. It is lined by a cylindrical ciliated endothelium.

INTERNAL STRUCTURE OF THE CEREBRUM.—-The cere- brum is composed both of grey and white matter; the general relations of these two forms of nerve matter to each other may be seen by making sections through the cerebrum. The determination, however, of their

minute structure, and of the relations and connections of the nerve fibres to the nerve cells is, owing to the delicacy of the organ, one of the most difficult departments of ana- tomical study. Several anatomists have endeavoured to trace out the course of the nerve fibres in the organ, and though our knowledge is by no means complete, yet many important facts have undoubtedly been ascertained. These facts have been summarised, and numerous valuable addi- tions made to them by Meynert in a recent elaborate memoir, which has been frequently consulted and made use of in writing the following description. :

The Grey Matter of the cerebrum is disposed in three great groups: a, The grey matter of the cortex of the hemi- spheres ; 6, the grey matter of the great ganglia of the base of the cerebrum ; c, the central grey matter which forms the wall of the cerebral end of the cerebro-spinal tube.

a, The grey matter of the cortex of the hemisphere forms the superficial part of the convolutions, and is known as the great hemispherical ganglion, but in some localities, as at the loci perforati antici and the septum lucidum, it has received distinctive names. When a convolution is divided vertically the grey matter is seen to be confined to the surface and to enclose a white core. The grey matter presents a laminated appearance, and as a rule consists of five or six layers, which are composed of the characteristic pyramidal nerve cells of the cortex of the cerebrum, of nerve fibres, of matrix or neuroglia, and of blood-vessels. The most superficial layer consists of neuroglia, in which nerve fibres extend parallel to the surface of the convolutions. In the deeper layers are found the pyramidal nerve cells, which lie with their long axes vertical to the surface of the convolutions, and which contain angular nuclei. From the observations of Lockhart Clarke, Arndt, Cleland, and Meynert, there can be no doubt that the pyramidal nerve cells vary in relative size and in numbers in the different layers of the grey cortex, and that the largest sized pyra- midal cells lie in the third and fourth layers. 1. Clarke Stated that the cells of all the layers of the posterior or occipital lobe were small and of nearly uniform

size, whilst in the convolutions anterior to it numerous cells of a much larger kind were found ; but though it is undoubtedly true

that large pyramidal cells are found in the frontal lobe in |

considerable numbers, and that the greater number of the cells of the occipital lobe are small and nearly uniform in size, there is no difficulty IM recognising in the occipital lobe a small proportion of cells, quite equal in magnitude to the largest cells of the frontal lobe, interspersed amongst the smaller pyramidal cells. The nerve fibres which ascend into the grey matter from the white core of the convolution radiate into its several layers, and are apparently continuous with the basal axis-cylinder processes of the nerve cells, According to Cleland, the elongated apices of the cells, which are directed to the surface of the convolution, are continuous with the nerve fibres situated in the superficia] layer of horizontal fibres, Immediately subjacent to the large pyramidal cells numerous small, irregularly shaped nerve corpuscles, like those of the internal granule layer of the retina, form the so-called granule layer of the grey matter, Fusiform cells, which give off lateral processes, are found in the deepest layer of the grey matter, and form the claustral layer of Mcynert. Gerlach has described here, as in the spinal cord, a network of extremely minute nerve fibres, with which the branched lateral processes of the nerve cells are apparently continuous. The neuroglia con- tains multitudes of small rounded corpuscles. In it also are found sinall stellate cells, provided with minute branched processes, which cells, as Meynert States, are so pellucid, that in the healthy brain they seem to be only free nuclei ; it is difficult to say whether these cells belong to the neuroglia, or are nerve cell elements. The grey cortex of the cerebrum is much more vascular than the white matter. The arteries derived from the pia mater pass vertically into it, and end ina close polygonal network of capillaries ; but it is also traversed by the arteries, which terminate in the capillary network of supply for the white matter.

In the grey matter of the cortex of the occipital lobe eight layers have been described by Clarke and Meynert. The increase in number is due to the intercalation of two additional granule layers, which coalesce and form a dis- tinct white band in the grey matter, owing, as Meynert states, to the absence of pigment in the cells of the granule layers.

The grey matter of the cortex of the island of Reil and of the convolutions bounding the Sylvian fissure contains a very large proportion of fusiform cells, They form the chief constituent of the grey claustr-um, situated deeper than the grey matter of the island, and separated from the outer part of the corpus striatum by a thin layer of white matter. Fusiform cells also occur abundantly in the nucleus amyg- dale, a grey mass situated below the corpus striatum, which in some sections seems as if isolated, but in reality is continuous with the grey matter of the inferior temporo- sphenoidal convolution.

The grey matter of the cortex of the gyrus hippocampi and of the hippocampns major is apparently destitute of both the granule and claustral layers of cells. Its super- ficial layer has been named the nuclear lamina, and contains small and scattered nerve corpuscles. Next this lamina lies the striatum reticulare, in which the apiccs of the numerous pyramidal cells of the third layer branch and again unite to form a delicate network. Deeper than the pyramidal cells is a thick layer of so-called " granules," which A. B. Stirling recognised some years ago as like the granules of the rust coloured layer of the cerebellum ; like them they consist of a well-defined nucleus invested by delicate branched protoplasm. The grey matter of the two layers of the septum lucidum, though included be- tween the corpus callosum and fornix, is yet in the same plane as the grey matter of the cortex of the inner surface of the hemispheres, but is cut off from it by the develop- ment of the transverse fibres of the corpus callosum. The grey matter of the locus perforatus anticus contains

clusters of minute granules and a compact arrangement of small nerve cells,

6, The great ganglia of the base of the ccrebrum are the corpora striata, the optic thalami, the corpora geniculata, the corpora quadrigemina, and the locus niger in each crus cerebri.

The corpus striatum cerebri consists of two masses of grey matter separated from each other by numerous strize of white fibres, which ascend from bclow upwards through its substance. The upper mass of grey matter projects into the lateral ventricle, and is called the intra-ventricular portion or nucleus caudatus. The lower extra-ventricular portion or nucleus lenticularis forms the outer and lower part of the corpus striatum, and is separated by the claustrum from the island of Reil. Multipolar nerve cells are found in both the caudate and lenticular masscs, and in the latter cells of large size have been seen. The optic thalamus forms an almost continuous mass of grey matter traversed by nerve fibres, which are not, however, collected into definite striz. The nerve cells in the grey matter are both multipolar and fusiform. The external corpus geni- culatum consists of alternate layers of grey and white inatter, due to the zig-zag folding of the grey matter; the nerve cells are multipolar, and‘ contain pigment. In the internal corpus geniculatum the cells are smaller in size and fusiform. The grey matter of the corpora quadrigemina consists of two distinct masses. Onc, the zonular layer, lies near the surface, and contains small multipolar nerve cells; the other, the Sylvian or central layer, lies at the sides of the Sylvian fissure and belongs to the grey matter of the wall of the ccrebro-spinal tube, and serves as a centre of origin for the roots of both the 3d and 4th cranial nerves. The grey matter of the crus cerebri occupies the centre of the cerebral peduncle. Its cells are multipolar, and contain dark brown or black pigment, so that the name locus niger is applied to this collection of nerve cells.

ce, The central grey matter of the cerebrum is in series with the grey matter of the floor of the 4th ventricle and the grey matter of the spinal cord. It is situated around the Sylvian aqueduct, and at the sides and floor of the third ventricle, which form the cerebral portion of the cerebro- spinal tube. That which is situated in relation with the aqueduct of Sylvius forms the Sylvian or central layer just described in the corpora quadrigemina. ‘That which lies in relation to the third

ventricle forms the middle or soft com- missure, and the well-defined grey layer which covers the inner wall of each optic thalamus; also the grey masses situated at the base of the brain between and in front of the crura cerebri, viz., the pons Tarini, tuber cinereum, lamina cinerea, infundibulum, and the grey matter of the pituitary body. By some anatomists the grey matter of the pineal body is referred to the same category, but Arnold has pointed out that it is separated by its peduncle from the soft coim- missure ; and Meynert is disposed to regard it as a ganglion of origin of the tegmentum. Both the pituitary and pineal bodies contain, besides the nervous matter, structures of the type of the glands without ducts.

The White Matter of the cerebrum consists of tracts or fasciculi of nerve fibres, of which—a, some connect the cere- brum with the lower divisions of the encephalon; 6, others connect the two hemispheres together; c, others connect different structures in the same hemisphere; d, others serve as roots of origin for the more anterior encephalic nerves.

a, The tracts of fibres which connect the cerebrum with the lower divisions of the encephalon are called peduncular fibres. The largest of these peduncles are the two crura cerebrt or cerebral peduncles. Continuous below with the longitudinal fibres of the pons they ascend into the optic thalami and corpora striata, and their fibres are named the

peduncular fibres. From the corpora striata and optic .

thalami fibres radiate into the convolutions of the lobes of the hemisphere and form the corona radiata. To some extent the fibres of the corona are directly continuous with those of the cerebral peduncles, but there can be no doubt that a large portion of the peduncular fibres terminate in the grey matter of the ganglia of the base of the cecrebrum, and that a still larger number arise from their nerve cells to aid in the formation of the corona radiata. The direct continuity, therefore, of many of the peduncular fibres with those of the

corona is broken or interrupted by the inter- position of the cerebral ganglia, which Meynert has named ganglia of interruption.

system of fibres of Meynert, a term devised to express that they conduct upwards to the grey cortex of the hemispheres sensory impulses derived from the external werld, the image of which is projected upon the cortex. But it should also not be forgotten that many of the fibres of this system conduct motor impulses downwards to be propagated along the motor cranial and spinal nerves. The peduncular fibres of the crura cerebri are arranged in two groups, named respectively crusta and teymentum, which are separated from each other by the uerve cells of the locus niger. The crusta forms the superficial or anterior part of the crus. Its fibres are in greater part continuous with the longi- tudinal fibres of the pons derived from the anterior pyramids of the medulla; but it receives additional fibres from the grey matter of the locus niger, and from the cells of the Sylvian layer in the corpora quadrigemina. Some of the fibres of the crusta pass directly upwards as radiating fibres to the grey cortex of the occipital and temporal lobes, but the larger number terminate in the nucleus caudatus and nucleus lenticularis of the corpus striatum. From these nuclei a great mass of fibres radiates into the cortex of the fronto-parietal lobes, more especially the frontal, but a few also, bearing the special name of stria cornea, pass to the grey matter of the apex of the temporal lobe ; fibres also enter the convolutions of the insula. In addition to the radiating fibres, the grey matter of the corpus striatum gives origin to fibres of the middle root of the olfactory peduncle, and to connecting fibres with the grey matter of the septum lucidum. The tegmentum forms the posterior or deeper part of the crus cerebri. Its fibres are continuous with the longitudinal fibres of the pons derived from the olivary fasciculi, fasciculi teretes, aud posterior pyramids of the medulla. A few of the fibres of the tegmentum enter the corpora quadrigemina and corpora geniculata, but the great majority enter the optic thalami, in the grey matter of which many evidently terminate, though some may pass through into the cortex of the hemispheres as fibres of the corona radiata. But the grey matter of the thalamus gives origin to numerous radiating fibres: those which arise in its posterior part radiate into the occipital and temporal lobes, whilst those

proceeding out of its anterior part radiate into the frontal, parietal, and temporal lobes, and the insula. In the optic thalamus the fornix arises. Its fibres emerge from the under surface of the thalamus, form the corpus albicans, and then pass backwards as the upper boundary of the great transverse fissure to end as the tania hippo- campi in the gyrus hippocampi; hence this convolution has aspecial connection with the optic thalamus through the fornix. In the corpus albicans the fibres of the fornix are arranged in loops, in the concavities of which nerve cells

are situated. The optic thalamus also gives origin to the

middle root of the optic tract. Owing to the connections of the locus niger, nucleus caudatus, and nucleus lenticu- laris with the crusta, Meynert has named thein the ganglia of the crusta ; whilst the optic thalami, corpora quadrige- mina, and geniculata are the ganglia of the tegmentum. The comparison of the human brain with those of different

The peduncular fibres and those White of the corona constitute the cerebral portion of the projection matter,

BRAIN. |

mammals has shown that the development of the hemi- spheres bears a direct relation to the size of the crusta and its ganglia, whilst the devclopment of the hemispheres is in inverse relation to the sizc of the tegmcntum and its ganglia,

The superior peduncles of the cerebellum connect that organ with the cerebrum. They arise in the grey matter of the vermiform process, ascend to the corpora quadri- gemina, and some fibres are even prolonged apparently into the tegmentum, and through it doubtless into the optic thalamus.

6, The fibres which connect together the two hemispheres are called commissural fibres. The largest of these com- missures is the corpus callosum, which, as has already been described, connects corresponding convolutions in the opposite hemispheres. As its fibres

lie on a plane superior to those of the corona radiata, the two systems of fibres intersect with each other on their way to the convolutions. The anterior commissure, though often described as con- necting the two corpora striata, yet, as Spurzheim pointed out half a century ago, passes through these bodies to the convolutions around the Sylvian fissure, and gives a root of origin to the olfactory nerve. The posterior commissure passes into the two optic thalami; some of its fibres are said to extend into the tegmentum, and others into the sub- stance of the hemisphere.

c, The tracts which connect different convolutions in the same hemisphere are named arcuate Jibres, or fibre proprie. The arcuate fibres are situated immediately beneath the inner surface of the cortex of the hemispheres, and connect together the grey matter of adjacent convolutions. In some localities they are strongly marked, and have received special nantes.

The fasciculus uncinatus passes across the Sylvian fissure, traverses the claustrum and amygdala, and connects the eonvolutions of the frontal with those of the tem poro- sphenoidal lobe. The jillet of the gyrus fornicatus extends longitudinally in that convolution, immediately above the corpus callosum, from its anterior to its posterior ends, and connects two different parts of its grey matter together. The longitudinal fibres of the corpus callosum, or nerves of Lancisi, also connect the anterior and posterior ends of the callosal convolution. The longitudinal inferior fasci- culus connects the convolutions of the occipital with those of the temporal lobe. Longitudinal fibres lie on the inner surface of the septum lucidum, and extend into the gyrus fornicatus.

The corpora quadrigemina are connected with the optic thalami by nervous tracts called brachia, and smaller tracts also connect the thalami with the corpora geniculata. The peduncles of the pineal gland connect that body with the fornix, and are probably continued into the optic thalamus. The tenia semicircularis is also at one end apparently con- nected with the optic thalamus, but its posterior termination is not well ascertained.

The great cerebral ganglia and the central masses of grey matter are centres of origin for sensori-motor nerves. The hemispherical ganglia, again, are the parts of the brain associated with the intellectual processes. The question has often been put, Are not the individual convolutions distinct organs, each endowed with special properties ? and various arguments based on physiological, pathological, and anatomical grounds have been advanced in support of this proposition. In connection with the anatomical branch of the argument it may be stated that the convolutions possess, not only in man, but in all animals with convoluted brains, great regularity both in position and arrangement; but Specialisation of form is not in itself a sufficient test of specialisation of function. Again, though the convolutions have definite forms they are not disconnected from each

other, for the grey matter forms a continuous layer over the whole surface of the hemisphere. Hence a group of cerebral convolutions differs from a group of muscles, cach member of which is undoubtedly a distinct organ, for each muscle is isolated from those around it by a definite invest- ing sheath. As regards internal structure, evidence has already been given that all the convolutions are not con- structed on precisely the same plan, and it has also been pointed out that the convolutions are not all connected in the same way with the great cerebral ganglia. These structural modifications unquestionably point to functional differences in the several parts in which they are found. But further, special connections through the arcuate fibres are established between certain convolutions and not be- tween others, and it is possible not only that particular combinations of convolutions through an interchange of internuncial fibres may condition a particular state of intellectual activity, but that these combinations associate various convolutions together in the performance of a given intellectual act, just as in the muscular system several muscles are as a rule associated together for the performance of a given movement. A clue to the special functions of the convolutions may perhaps be

obtained by studying their connections, just as the action of the members of a group of muscles is ascertained by examining the direction of their fibres and the attachment of their terminal tendons.

Mass AnD WeicuT or THE Brarn.—The human brain Weight of than the brain of any brain.

is absolutely bigger and heavier animal, except the elephant and the larger whales. It ig also heavier relatively to the bulk and weight of the body than are the brains of lower animals, except in some small birds and mammals. Considerable variations, however, exist in the size and weight of the human brain, not only in the different races of mankind, but in individuals of the same race and in the two sexes. The heaviest brains occur in the white races. The average weight of the adult European male brain is 49 to 50 oz., that of the adult female 44 to 45 oz. ; so that the brain of a man is on the average fully 10 per cent. heavier than that of a woman, The greater weight of the brain in man as compared with woman is not in relation merely to his greater bulk, but is a funda- mental sexual distinction; for, whilst there is a difference of 10 per cent. in the brain weight, the average stature of women is, as Thurnam has calculated, only 8 per cent. less than that of men. Dr Boyd states that the average weight of the brain in the newly born male infant is 11-67 oz. 5 ln the female only 10 oz. The exact age at which the brain reaches its maximum size has been variously placed at from the 3d to the 8th years by different authors 3 but it con- tinues to increase in weight to 25 or 30, or even 40. After 60 the brain begins to diminish in weight ; in aged males the average weight is about 45 oz., in females about 41 oz. In some cases the adult brain considerably exceeds the average weight. The brains of several men distinguished for their intellectual attainments have been weighed : the brain of Cuvier weighed 644 oz.; of Dr Abercrombie, 63 0z.; of Professor Goodsir, 574 0z.; of Spurzheim, 55 oz. ; of Sir J. Y. Simpson, 54 oz. ; of Agassiz, 53-4 oz. ; and of Dr Chalmers, 53 0z. But high brain weights have also been found where there was no evidence of great intellectual capacity. Peacock weighed four male brains which ranged from 62°75 to 61 0z.; Boyd, a specimen of 60°75 oz.; and Turner has recorded one of a boy aged fifteen which weighed 60 oz. In the brains of the insane

high brain weights have also been observed. Buckuill met with a brain in a male epileptic which weighed 644 oz.; Thurnam, one which weighed 62 oz.; and in the West Riding Asylum, out of 375 males examined, the weight of the brain in 30 cases was 55 oz. or upwards, and the highest weights wero

61 oz. in a case of senile dementia, 603 oz. in a case of dementia, and 60 oz. in one of melancholia. No case has as yet been recorded of the weight of the brain in a woman possessing intellectual eminence; but Boyd met with a woman's brain as high as 55:25 oz., and many instances of upwards of 50 oz. in women where there was no evidence of high mental endowment. Skac, in a female monomaniac, observed a brain which weighed 614 oz.; and of 300 females examined in the West Riding Asylum the weight of the brain in 26 cases was 50 oz. or upwards, the highest weights being 56 and 55 oz. in two cases of mania. The size and weight of the brain do not therefore, per se, give an exact method of estimating the intellectual power of the individual, and a high brain weight and great intellectual capacity are not necessarily correlated with each other. It seems certain, if the human brain, even amongst the most uncultivated peoples, falls below 30 oz., that this low weight is not merely incompatible with intellectual power and activity, but is invariably associated with idiocy or imbe- cility ; so that the human brain has a minimum weight below which intcllectual action is impossible. Amongst the more cultivated races the minimum weight-limit of intelli-

gence is, however, in all probability higher than 30 oz. It |

has been placed by Broca at 32 oz. for the female, and 37 oz. for the male brain ; and Thurnam's numbers are almost the same. To how low a weight the brain in the microcepha- lous idiot may fall is well shown in a case recorded by Theile, where it weighed only 10°6 oz., in Gore's case of 10 oz. 5 grs,, and in Marshall's case, 84 oz. But instances are not wanting in which the brains of idiots have exceeded even 50 oz. Langdon Down observed the brain of a male idiot aged 22, which weighed 594 oz.; and J. B. Tuke has recently met with a brain of 60 oz.

in a male idiot aged 37, the capacity of whose cranium was 1103 cubic inches. In the West Riding Asylum tables the brain weights in 10 idiots were not less than 34 oz., and in 5 cases exceeded 40 oz. As yet the opportunities of weighing the brain in the coloured races of men have been but scanty. But from a very extensive series of observations made by Barnard Davis, not on the brains themselves, but on the cubic capacities of crania, from which an approximate estimate of the brain weight may be obtained with a fair measure of accuracy, the following facts are derived :—The average weight of the male brain in the African races is 45°6 oz.; of the female brain, 42°7 oz.: the average weight of the male brain in the Australian races is 42°8 oz.; of the female brain, 39-2 oz.: the average weight of the male brain in the Oceanic races, 46°5 oz.; of the female brain, 43 oz. The conclusions which may legitimately be drawn from an analysis of Barnard Davis's observations are as follows :— Ist, That the average brain weight is considerably higher in the civilised European than in the savage raccs; 2d, That the range of variation is much greater in the former than in the latter; 3d, That there is an absence, almost complete, of specimens heavier than 54 oz. in the exotic races, so that the higher terms of the series are not repre- sented ; 4th, That though the male brains are heavier than the female, there is not the same amount of difference in the average brain weight between the two sexes in the uncultivated as in the cultivated peoples.

No reliable determinations have as yet been made of the exact proportion, as regards bulk and weight, which the convolutions bear to the corpora striata, optic thalami, and corpora quadrigemina, but data are obtainable of the rela- tive weight of the pons, cerebellum, and inedulla to the entire encephalon. Between the ages of 20 and 70 the ratio of weight of the pous, cerebellum, and medulla, to the eutire brain, is as 13 to 100, and this relative weight is virtually the same in both sexes. –

ORIGIN, ARRANGEMENT, AND DisTRIBUTION oF THE

EncepHatic Nerves.—Several pairs of nerves, called Cranial CRANIAL or ENCEPHALIC, arisc from the under surface or nerves.

base of the encephalon, and pass outwards through foramina situated in the floor of the cranial cavity. Continental anatomists usually enumerate twelve pairs of cranial nerves;

but because in one locality two of these nerves lie together

and pass through the same foramen, and in another spot three of these nerves emerge together from the skull, British " anatomists have restricted the number to nine pairs. These nerves are numbered from before backwards, in the order in which they are seen at the base of the brain.

The names applied to the individual nerves, and their numerical designations, according to both the Continental

and British methods, are given in the following table :—

Continental. British. OMACtOTY ANGEVGS, ..0.-0s:0..sceeces ae Ist pair Ist pair Ominc WNenveste…ceredea mares Pel oso Bl oe Oculo-motor Nerves, ...4. OKC. OLC ys Trochlear Nerves) ....:..:. ..... "4th ,, Atlin. Trifacial or Trigeminal Nerves,... 5th ,, Stphiese Abducent Nerves, ...00055 GN ge 6th ., Facial Nerves (Portio dura), ... (isto. rth Auditory Nerves (Portio mollis), 8th ,, 2 Glosso-pharyngeal Nerves, ... 9th ,. } Pneumogastric Nerves (Vagus), 10th ,, / Sth 55 Spinal Accessory Nerves, ... jiktde 5. \ Hypoglossal Nerves,..... 12th ,, GAB py.

These nerves may be arranged in three groups according to the presence or absence of motor and sensory fibres.

First group.—Sensory nerves, or nerves of special sense: a, olfactory, the nerve of smell; 6, optic, nerve of sight ; c, auditory, nerve of hearing.

Second group. —Motor nerves : a, oculo-motor, the prin- cipal nerve of supply for the muscles of the eyeball; 6, trochlear, the nerve for the superior oblique muscle ; c, abducent, the nerve for the external rectus ; d, portio dura, the nerve for the facial muscles of expression; ¢,

spinal accessory, the nerve which gives a motor root to the pneumogastric, and supplies the sterno-mastoid and tra- , pezius muscles ; f, hypoglossal, the nerve for the muscles of the tongue.

Third group.—Jixed nerves: a, trifacial, distributed to the muscles of mastication, the skin of the face, various mucous membranes, and to the anterior and lateral surfaces of the tongue, where it may play the part of a nerve of the special sense of taste ; b, glosso-pharyngeal, distributed to the mucous membrane of the pharynx, to certain palato-pharyngeal muscles, and to the mucous membrane of the back of the tongue, where it acts as a nerve of the special sense of taste; c, the pneumogastric, conjoined with the internal division of the spinal accessory, is distributed to several muscles, mucous membranes, and internal organs.

The consideration of the lst group of cranial nerves may appropriately be deferred until the organs of sense, in which they terminate, are described. The anatomy of the motor nerves is as follows :—

The Oculo-motor or third nerve springs out of the inner Motor

surface of the crus cerebri. When its fibres are traced into cranial the crus, some are seen to pass to the nerve cells of the — locus niger, whilst others sink into the corpora quadri- gemina, and extend as far as the Sylvian group of large nerve cells. The nerve, after it has emerged from the crus, runs forwards in the outer wall of the cavernous sinus, and enters the orbit through the sphenoidal fissure. It supplies the levator palpebrze superioris, the superior, inferior, and intcrnal recti muscles, and the inferior oblique. It contributes the short or motor root to the ciliary ganglion, and through it influences the iris and ciliary muscles within the cyeball. It also communicates with the cavernous plexus of the sympathetic.

CRANIAL NERVES. |

The Trochlearis or fourth, the smallest cranial nerve, lies at the outer side of the crus cerebri. When traced backwards to its origin it is seen to sink into the valve of Vieussens, where its fibres divide into three

roots: one decussates across the valve with a root of the corresponding nerve on the opposite side; another passes backwards to the locus ceruleus; the third sinks into the corpora quadri- gemina and reaches the Sylvian group of nerve cells, from which the third nerve also arises. The fourth nerve runs forward in the outer wall of the cavernous sinus, enters the orbit through the sphenoidal fissure, and ends in the superior oblique muscle. It also communicates with the cavernous plexus of the sympathetic.

The Abducent or sixth nerve springs out of the groove between the lower border of the pons and the anterior pyramid of the medulla oblongata. Its roots sink deeply into the pons, and arise from a nucleus of grey matter at the floor of the fourth ventricle, common to it and the portio dura. The sixth nerve runs forward in the inner wall of the cavernous sinus, enters the orbit through the sphenoidal fissure, and ends in the external rectus muscle. It com- municates with the carotid plexus of the sympathetic.

The Portio dura or motor facial portion of the seventh nerve springs out of the groove between the lower border of the pons and the restiform body. Its roots sink deeply into the pons, and whilst some of its fibres arise from a grey nucleus, at the floor of the fourth ventricle, common to it and the sixth nerve, others ascend from a nucleus which, according to Meynert, lies just on the outer side of the superior olivary body, and others again decussate across the median raphe of the pons. An accessory por- tion, called portio intermedia, which is said to arise from the lateral columns of the cord, joins the portio dura. The portio dura enters the internal auditory meatus in the petrous-temporal bone along with the auditory nerve; but at the bottom of the meatus it leaves that nerve and enters the aqueduct of Fallopius along which it is conducted through the bone to emerge at the stylo-mastoid foramen. When in the aqueduct it forms a knee-shaped bend, and expands into a small ganglion, which is joined by the great, small, and external petrosal nerves, and through the external petrosal it communicates with the sympathetic. The portio dura gives off—a, a minute branch to the sta- pedius muscle ; 6, the chorda tympani, which, entering the tympanum, passes across that cavity, emerges through the Glaserian

fissure, and joins the lingual branch of the fifth nerve, which it accompanies as far as the submaxillary ganglion ; it gives a branck to the ganglion, and one to the lingualis muscle. After the portio dura has passed through the stylo-mastoid foramen it gives oft—c, the poste- rior auricular branch to the occipital belly of tue occipito- frontalis and to the retrahens aurem muscle, and d, the digastric branch to the posterior belly of the digastric and stylo-hyoid muscles ; and then runs forwards through the parotid gland to the face, where it breaks up into numerous (e) facial branches to supply the facial muscles of expres- sion and 'the buccinator muscle. 'The facial is also the secretory nerve for the salivary glands. Through the chorda tympani it influences the secretion of the submaxil- lary and sublingual glands, and through the connection between its lesser petrosal nerve and the auriculo-temporal in the otic ganglion it influences the parotid gland.

The Spinal Accessory is the lowest division of the eighth nerve. It springs out of the side of the mcdulla oblongata, and from the lateral column of the cervical part of the spinal cord as low as the fifth cervical nerve: its roots arise from the intermedio-lateral group of nerve cells in the cord, and from a nucleus of grey matter in the floor of the fourth ventricle. The spinal fibres of origin enter the skull through the foramen magum, join the fibres from the

medulla, and leave the cranial cavity through the jugular foramen. This nerve, purely motor in function, is sub- divided into two parts, an internal and an external. The external passes obliquely outwards across the side of the neck, pierces the sterno-mastvid, and ends in the trapezius, both of which muscles it supplics. The internal joins the pneumogastric nerve, of which it forms the motor or acces- sory root, and is distributed along with it.

The Hypoglossal or ninth nerve springs out of the groove between the anterior pyramid and olivary body of the medulla oblongata, in series with the anterior roots of the spinal nerves. Its roots pass through the

medulla to the floor of the fourth ventricle, to arise from the nerve cells in two nuclei of grey matter situated close to the median furrow. This grey matter is in series with the anterior cornua in the spina] cord. The nerve passes out of the skull through the anterior condyloid foramen, and arches across the side of the neck to the tongue, to end in glossal branches for the supply of the intrinsic and extrinsic muscles of the tongue. It also gives off—a, the descendens noni branch, which, after been joined by the communicantes nont from the cervical plexus, supplies the omo-hyoid, sterno-hyoid, and sterno-thyroid muscles ; 6, the thyro-hyoid branch to the thyro-hyoid muscle; c, the genro-hyord branch to the genio-hyoid muscle. It communicates in the neck with the sympathetic, vagus, lingual branch of the fifth, and cervical plexus.

The group of mixed nerves will now be considered.

The Zrifacial or fifth is the largest cranial nerve.

nucleus of grey matter situated in the back of the pons, near the floor of the upper part of the fourth ventricle. The larger or sensory root has, according to Meynert, a complex origin—a, from a uucleus of grey matter in the pons to the outer side of the origin of the motor root; 6, by descending fibres which arise from nerve cells in the substance of the corpora quadrigemina, from the grey matter of the locus ceruleus, and from the longitudinal fibres of the pons ; ¢, by ascending fibres which apparently arise from the grey tubercle of Rolando ; d, probably by fibres which traverse and embrace the superior peduncle of the cerebellum. As the large sensory root of the fifth lies on the petrous bone it expands into the Gasserian ganglion, which resembles in structure the ganglion on the posterior root of a spinal nerve. From this ganglion three large branches arise, named respectively the Ist, 2d, and 3d divisions of the ganglion.

The 1st or Ophthalmic division is the upper sensory nerve of the face, and divides into three branches, which pass out of the cranial cavity through the sphenoidal fissure. By its lachrymal branch it supplies the lachrymal gland, and the outer part of the skin and conjunctiva of the upper eye- lid ; by its frontal branch, the inner part of the skin and conjunctiva of the upper lid, and the skin of the forehead; by its ocwlo-

nasal branch, it gives long ciliary nerves to the eyeball, and a nasal nerve to the mucous membrane of the nose, and the skin of the side of the nose. From the oculo-nasal nerve arises the long or sensory root of the eiliary ganglion, which lies in the cavity of the orbit, and which receives also a motor root from the third nerve, and a root from the sympathetic. This ganglion gives origin to the short ciliary nerves for the eyeball.

The 2d or Superior Maxillary division is the sensory nerve for the middle part of the face. It leaves the skull by the foramen rotundum, passes across the spheno-maxillary fissure, then lies in the canal in the floor of the orbit, from which it emerges on the face through the infra-orbital foramen as the infra-orbital nerve. It gives off a small orbital branch to a small part of the skin of the temple,

I. — 111

*é It Mixed springs by two distinct roots out of the side of the pons, cranial The smaller or motor root arises from the nerve cells of a 2°T'***

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and that over the chcek bone; dental branches to the teeth in the upper jaw ; palpebral branches to the skin and con- junctiva of the lower eye-lid; nasal branches to the skin and mucous menibrane of the nose ; /abéal branches to the skin and mucous membrane of the upper lip. It also gives off, when in the spheno-maxillary fossa, spheno- palatine branches, which form the sensory root of the spheno-palatine or Meckel's ganglion. This ganglion receives a motor root through the great petrosal nerve from the knee-shaped bend of the portio dura, and a sympathetic root from the carotid plexus, which runs along with the great petrosal, and forms with it the wdsan nerve. The ganglion gives origin to—a, an orbital branch, which supplies a layer of non-striped muscular fibres, described by H. Miller and Turner as developed in connection with the periosteum of the orbit, where it eovers the spheno-maxillary fissure ; b, wpper nasal and maso-palatine branches to the mucous membrane of the nose and hard palate; c, descend- ing

palatine branehes to the mucous membrane of the hard and soft palate; d, pterygo-palatine to the mucous mem- brane of the upper part of the pharnyx.

The 3d or Inferior Maxillary division passes out of the skull through the foramen ovale, and as it does so is joined by the motor root of the 5th. By the junction a mixed nerve is formed, which is the sensory nerve for the lower part of the face, and the skin of the temple, and the motor nerve for the muscles of mastication. Immediately after passing through the foramen this nerve divides into a small and large division, in each of which motor and sensory fibres are found. The small division supplies motor masticatory branches to the masseter, temporal, external, and internal pterygoid muscles; but further it gives off a loug buccal branch, which, though often described as the motor nerve for the buccinator muscle, is really a sensory nerve for the skin and mucous membrane of the cheek. The sensory nature of this nerve is proved, not only by physiological and pathological experiments, but by tracing its fibres through the buccinator muscle to the mucous membrane. 'Turner has also recorded two cases in which the long buccal nerve arose as a branch of the sensory superior maxillary nerve. The large division separatcs into three branches—a, auriculo-temporal, which ascends to supply the parotid gland, the skin of the auricle, external meatus, and temple, and the temporo-maxillary joint ; 6, 7n- Jertor dental, which enters the dental canal in the lower jaw, and supplies the lower set of teeth and the skin and mucous membrane of the lower lip; it also gives off a mylo-hyoid branch to the mylo-hyoid and anterior belly of the digas- tric muscle; c, Lingual or gustatory, which runs forward along the side of the tongue to end in the filiform and fungiform papille of its mucous membrane. The lingual branches are sensory nerves of touch, though some physiolo- gists believe that they are also nerves of taste. Connected with the branches of the inferior maxillary division are two small ganglia, which, like the ciliary and spheno-pala- tine ganglia, are of a greyish colour, contain nerve cells, and receive roots from motor, sensory, and sympathetic nerves. The submaxillary ganglion lies under eover of the mylo-hyoid muscle, and receives a root from the motor ehorda tympani nerve, a root from the sensory lingual, and a sympathetic root. It gives

branches to the sub-maxillary and sublingual salivary glands. The otic ganglion lies close to the Eustachian tube, and receives a root from the mus- eular nerve to the internal pterygoid, a root from the sensory auriculo-temporal, and a sympathetic root. It also receives the small petrosal nerve, by which it is connected to the knee-shaped bend of the portio dura and to the glosso-pharyngeal nerve. It supplies the tensor tympani and tensor palati muscles. The branches of the three divi- sions of the fifth cranial nerve, whieh pass to the skin of

the temple, forehead, and face, freely communicate with the branches of the portio dura, which supply the muscles situated in those regious.

The Glosso-pharyngeal or uppermost division of the eighth nerve springs out of the side of the medulla oblongata between the olivary and restiform bodies; its roots arise from two small masses or nuclei of grey matter in the floor of the 4th ventricle. The nerve passes out of the skull through the jugular foramen, where it possesses two small ganglia, named jugular and petrous. It then passes across the side of the neck and gives off carotid branches, which run along the internal carotid artery; pharyngeal branches to the mucous membrane of the pharyux ; tousil- atve branches to the tonsil and soft palate; glossal branches to the base of the tongue and the circumvallate papillz, which branches are unquestionably nerves of the special scnse of taste; muscular branches to the stylo- pharyngeus and perhaps the constrictor muscles. Through the jugular and petrous ganglia the nerve cominunicates with the vagus and sympathetic. The petrous ganglion gives off the tympanic branch or nerve of Jacobson, which enters the tympanie cavity, supplies its mucous niembrane, and gives off three communicating branches—one to the sympatlhctic ; a second to the great petrosal, and through it to the knec-shaped bend of the facial; a third to the small petrosal, and through it to the otic ganglion.

The Pneumogastric or Vagus is the middle subdivision of the eighth eranial nerve. It springs out of the side of the medulla oblongata,

between the olivary and _ restiform bodies ; its roots arise from a nucleus of grey matter in the floor of the 4th ventricle, which nucleus, along with those for the glosso-pharyngeal nerve, is in series with the posterior cornu of grey matter in the spinal cord. It goes through the jugular foramen, is joined by the inner divi- sion of the spinal accessory which is its motor root, then passes down the side of the neck, enters the thorax, reaches the outer wall of the cesophagus, accompanies that tube through the diaphragm, and terminates in the wall of the stomach. The left nerve lies on a plane anterior to the right : it crosses in front of the arch of the aorta, and is dis- tributed to the anterior wall of the stomach, whilst the right nerve supplies the posterior wall. Each: nerve possesses high in the neck two enlargements, named wpper and lower ganglia, The branches of the vagus are numerous and im- portant. The upper ganglion gives origin to the auricular branch, which traversing a small canal in the petrous tempo- ral bone, is distributed to the skin of the back of the auricle. The lower ganglion gives origin to—a, the pharyngeal branch, which forms a plexus with the glosso-pharyngeal and sympathetic nerves, from which the muscles of the pharynx are supplied; 6, the superior laryngeal, which divides into an external branch to supply the crico-thyroid muscle, and an sternal, which pierces the thyro-hyoid mem- brane, and supplies the mucous lining of the larynx and the mucous covering of the epiglottis. The trunk of the nerve gives origin to—a, the recurrent laryngeal branch, which on the right side turns round the subclavian artery, and on the left round the arch of the aorta, and ascends to the larynx to supply its intrinsic muscles except the crieo-thyroid; 8, cardiac branches, which arise from the nerve partly in the neck and partly in the chest, and join the great cardiac plexus for the heart ; c, pulmonary branches, which arise in the chest, pass into the substance of the lungs, and form along with the sympathetic an anterior plexus in front of, and a posterior plexus behind the root of the lung; d, esophageal branches, which supply the coats of the cesophagus ; e, gastric branches, which supply the coats of the stomach, and give important offshoots to the great solar plexus of the sympathetic situated at the pit of the stomach.

Sympathe- tic nervous system.

Gangliated cord and branches.

SYSTEM. |

DEsoriIPTIVE ANATOMY OF THE SymPatTHETIC NERVOUS SYSTEM.

The Sympathetic Nervous System consists of a pair of gangliated cords, situated one on each side of the spinal column ; of three great gangliated prevertebral plexuses situated in the thoracic and abdominal cavities ; of nume- rous smaller ganglia lying more especially in relation with the thoracic and abdominal viscera ; of multitudes of fine distributory nerves. :

Each Ganglated Cord of the sympathetic extends along the side of the spine from the base of the skull to the coccyx. In the neck it lies in front of the transverse processes of the vertebre ; in the thorax, in front of the heads of the ribs ; in the abdomen, on the sides of the verte- bral bodies; and as it descends in front of the sacrum it approaches its fellow, so that in front of the coccyx the two are united ina single ganglion, the ganglion impar (Fig. 66, c). Each cord consists of a number of ganglia united into a continuous cord by intermediate nerves. As a rule, the ganglia equal in number the vertebre of the region. Thus, in the sacral region there are five ganglia, in the lumbar five, and in the thorax twelve ; but in the neck there are only three, named superior, iniddle, and inferior; of these the superior is very large, and represents without doubt several smaller ganglia, From the superior cervical ganglion the cord is prolonged upwards by an ascending or cranial offshoot through the carotid canal] into the cranial cavity, and forms a plexus around the internal carotid artery, both in the carotid canal, named the carotid plexus, and in the inner wall of the cavernous sinus, named the cavernous plexus. Through branches derived either directly or indirectly from these plexuses the sympathetic roots for the ciliary and spheno-palatine ganglia, described in connection with the fifth nerve, are derived.

From the gangliated cord and its ascending or cranial prolongation a communicating and a distributory series of branches are derived.

By the Communicating branches this portion of the synipathetic is connected with most of the cranial and with the anterior divisions of all the spinal nerves, so as to bring the cerebro-spinal and sympathetic systems into close anatomical and physiological relation with each other. It is important also to observe that eacli communicating branch contains not only non-medullated nerve fibres from the sympathetic system to the cerebro-spinal nerves, but medullated fibres from the cerebro-spina] to the sympa- thetic, so that a double interchange takes place between the two systems. The cranial prolongation of the sympa- thetic and the superior cervical ganglion communicate with the 3d and 4th nerves, the Gasserian ganglion of the 5th, the 6th, the portio dura of the 7th, the glosso-pharyngeal and pneumogastric of the 8th, and the 9th cranial nerves, and with the anterior divisions of the four upper cervical spinal nerves, The middle cervical ganglion communicates with the 5th and 6th cervical nerves, the inferior cervical gan- glion with the 7th and 8th cervical uerves, the twelve thoracic ganglia with the series of intercostal nerves, the five lumbar ganglia with the series of lumbar spinal uerves, the sacral and coccygeal ganglia with the sacra] nerves and the coccygeal nerve.

The Distributory branches of the gangliated cord are as follows :—a, Pharyngeal branches from the superior cervical ganglion, which join the pharyngeal branches of the glosso- pharyngeal and pncumogastric nerves, to form the pharyn- geal plexus, which supplies the muscles and mucous membrane of the pharynx. 06, Articular branches from the upper thoracic and the lumbar ganglia to the articulations between the adjacent vertebrae. c, Pulmonary branches from the 3d or 4th thoracic ganglia, which joi the posterior

pulmonary plexus. d, Vaso-motor branches or nervi molles, which supply the muscular coat of the arteries : those which arise from the cranial prolongation of the superior cervical ganglion supply the internal carotid artery and its branches to the brain and eyeball: those which arise from the superior cervical ganglia itself supply the

external carotid artery and its branches; from the branch accompanying the facial artery the submaxilliary ganglion derives its sympathetic root; from that accompanying the middle meningeal artery the otic ganglion derives its sympathetic root: the vaso-motor nerves which arise from the middle cervical ganglion supply the inferior thyroid artery, and pass to the thyroid gland: the vaso-motor branches of the inferior cervical ganglion supply the vertebral aud basilar arteries and their several branches, which pass to the spinal cord and the hinder part of the encephalon. Vaso-motor nerves also arise from the thoracic ganglia, which pass to the thoracic aorta, from the lumbar ganglia to the abdominal aorta, and from the sacral ganglia to the middle sacral artery; the ganglion impar gives branches to a peculiar vascular struc- ture, named the coccygeal body, developed in connection with the end of the middle sacral artery ; a body of similar structure, called intercarotic body, situated in the angle of bifurcation of the common carotid artery, receives branches from the superior cervical ganglion. e, Cardiac branches fromthe superior, middle, and inferior cervical and the Ist thoracic ganglia, which pass into the thorax to join the pre- vertebral cardiac plexus. f, Splanchntc branches as follows: great splanchnic nerve, by the union of branches from the thoracic ganglia, the 3d to the 10th inclusive ; it pierces the crus of the diaphragm, and passes to the prevertebral solar plexus ; small splanchnic nerve, also to the solar plexus from the 10th or 11th thoracic ganglia ; smallest splanchnic nerve, from the 12th thoracic ganglion to the renal plexus. gy, Hypogastric branches, from the lumbar and sacral ganglia to the prevertebral hypogastric plexus.

The Prevertebral Curdiac plexus (Pl. XVII. c) is situated at the base of the heart, and is divided into a superficial part, which lies in the concavity of the arch of the aorta, and a deep part between the aorta and trachea. It receives the cardiac branches of the pneumogastric and the cervical ganglia of the sympathetic. It contains collections of nerve cells and a dense plexiform arrangement of nerve fibres. It gives off branches to the heart, which wind around the surface of that organ and penetrate its muscular substance: on these branches minute ganglia are found which regulate its rhythmical movements. Through these branches and the cardiac plexus the heart is brought into

connection with both the cerebro-spinal and sympathetic systems of nerves. The sympathetic apparently regulates its contraction, for when this nerve is stimulated the action of the heart is accelerated. The pneumogastric again exer- cises an inhibitory or restraining influence on the contrac- tions of the organ, for when this nerve is irritated the activity of contraction is diminished, but when divided it is greatly increased. The cardiac plexus also sends offsets to the anterior and posterior pulmonary plexuses for the supply of nerves to the lungs.

The Prevertebral Solar or Epigastric plexus is situated at the pit of the stomach around the coeliac axis, a branch of the abdominal aorta. It receives the great and small splanchnic nerves from the thoracic ganglia of the sympa- thetic, and some of the terminal branches of the pneumo- gastric nerve. It contains large collections of nerve cells, which form the two semilunar ganglia, aud a dense plexi- form arrangement of nerve fibres. It gives origin, either directly or indirectly, to numerous plexiform branches, which accompany, and are named after, the abdominal aorta aud its various branches given off to the walls and viscera of the abdomen proper. In this manuer, not only

Gangliated prever- tebral plexuses.

do the arteries which supply the abdominal viscera receive their vaso-motor nerves, but the muscular and mucous coats of the stomach, intestines, gall bladder, bile ducts, ureters, and seininal ducts, and the glandular structures of the liver, pancreas, kidneys, spleen, and supra-renal cap- sules. It is important also to observe that these plexuses of distribution not unfrequently contain small ganglia, and the branches which supply the muscular coat of the stomach and intestines have minute microscopic ganglia, with stellate nerve cells lying amidst them. The distribu- tion of the pneumogastric nerve to the stomach, and its connection with the solar plexus, enables that nerve to stimulate its peristaltic contraction, and, according to some experimenters, that of the small intestine also; but the precise action of the sympathetic on these organs is still a disputed question.

The Prevertebral Hypogastric plexus is situated in front of the last lumbar vertebra. It receives branches from the lumbar ganglia of the sympathetic, and from the plexus surrounding the abdominal aorta. It divides into two parts, which lie one on each side of the rectum, and are called the pelvic plexuses ; these plexuses are joined by branches from the sacral ganglia of the sympathetic, and from the 3d and 4th sacral spinal nerves, and contain small gangliform collections of nerve cells. From the pelvic plexuses numerous plexiform nerves arise, which accompany the internal iliac artery and its branches to the walls and viscera of the pelvis, and are named after them. These nerves not only supply the vaso-motor nerves for these blood-vessels, but also the muscular coat and mucous incmbrane of the bladder, rectum, and urethra, besides the prostate gland in the male, and the uterus and vagina, and in part the ovary, in the female; in connection with their distribution to these viscera, minute ganglia are found lying amidst the nerves, the nerve cells in which act undoubtedly as centres of reinforcement for the origin of additional. nerve fibres.

From the distribution of the branches of the gangliated cord of the sympathetic, and of the gangliated prevertebral plexuses, it will be seen that this nerve is especially related to the blood-vessels and to the viscera contained within the great cavities of the body. As the cerebro-spinal sys- ten is engaged in the supply of nerves to the voluntary muscles, the sympathctic is the medium of supply for the involuntary muscular apparatus, both in the coats of the vessels and in the walls of the hollow viscera. But though the vaso-motor nerves branch from the sympathetic gauglia, it must not be supposed that they have no con- nection with the cerebro-spinal system. The communicat- ing branches between the sympathetic ganglia and the anterior divisions of the spinal nerves establish a connection between them and the cerebro-spinal nervous axis. By recent experiments, the tract of transmission of the vaso- motor fibres has been traced along with the anterior roots of the spinal nerves, through the lateral columns of the cord to the medulla oblongata, in which the vaso-motor nerve centre lies a little to one side of the mesial plane, above the calamus scriptorius. In the distribution of the sympathetic to the glandular viscera, not only is it im- portant to attend to their terminations in the muscular coat of the

blood-vessels of the glands, but the termina- tion of the nerves in connection with the secreting cells themselves must be taken into consideration. The com- munications between the cerebro-spinal and sympathetic systems, not only through the spinal nerves, but also through the pneumogastric, are to be kept in mind in con- nection with the effects produced by varying mental con- ditious on the secretions of the glands.

ANATOMY

[ORGANS OF SENSE—

ORGANS OF SENSE.

The organs of sense are the organs through the interme- diation of which the mind becomes cognisant of the appear- ance and properties of the various objects in the external world. These organs are severally named nose, eye, ear, tongue, andskin. For the excitation and perception of a sensation three sets of structures are necessary: 4,a peripheral end-organ; 6, a seusory nerve; c, a central organ. 'The peripheral end-organ is the part of the appa- ratus to which the stimulus necessary for the production of the sensation is applied. This stimulus causes nervous impulses to be propagated from the end-organ along the fibres of the sensory nerve to the central organ, in which that nerve terminates at its central extremity. These ner- vous impulses oceasion molecular changes in the nerve cells of the brain, and the mind becomes conscious of a sensation. The shape and construction of each organ of sensc is adapted to the application of the stimulus required for the produc- tion of the particular sensation to which the organ is sub- servient. Each organ of sense possesses its own character- istic form of end-organ. The touch corpuscles of the skin, the end bulbs found in several mucous membranes, and the Pacinian corpuscles, are the end-organs occurring in their several localities; they have the peripheral ends of the seusory nerves terminating in their substance, and the axial cylinder of the nerve fibre ends in their interior. The rods and cones of the retina, the rods of Corti in the cochlea, the olfactory cells of the nose, and the gus- tatory bodies in the tongue, are the end-organs belong- ing to their several organs of

sense; the sensory nerve fibres which terminate in relation with them have not yet, however, been traced into actual continuity with their substance. A stimulus, whatever may be its nature, applied to any organ of sense can excite only that kind of sensation for the production of which the organ is subser- vient. Thus a stimulus applicd to the eye, whether it be the natural stimulus of the waves of light, the mechanical stimulus of a blow, or an electric stimulus, can only excite the sensation of light. Stimuli applied to the ear can only excite the sensation of sound, aud in like manner with the other senses. In studying the anatomy of the organs of sense the arrangement of numerous accessory structures, which assist either in conducting stimuli or in modifiying their effects, the arrangement and structure of the peripheral end-organs, and the origin, course, and distribution of the sensory nerves, will have to be considered.

The Noss or organ of smell is a large cavity situated in Nose.

the fuce, between the orbits, above the mouth, and below the cribriform plate of the ethmoid bone. It communicates by the anterior nares, or nostrils, with the external atmo- sphere, by the posterior nares with the pharynx, aud through it with the larynx, trachea, and lungs. It is the proper' entrance to the respiratory passage, is accessory to the pro- duction of the voice, aids in the sense of taste, and forms one of the most important features of the face. It is sub-divided into a right and a left chamber by a vertical inesial partition, the septum nasi, so that the nose is a double organ in the same sense as the eyes or ears are double. The walls of the cavity of the nose are formed partly of bone and partly of cartilage. The osseous walls are referred toon page 826. The cartilages form the point, the ale, and a part of the septum nasi. The mesial or septal cartilage is triangular in shape, and fits into the interval between the vomer, the mesial plate of the ethmoid, and the nasal spine of the superior maxilla. Anteriorly and inferiorly its border is free, projects on to the face, and forms the colwmna of the nose. The Jateral cartilages form the tip and ale. On each side is an upper lateral cartilage attached by its

NOSE. |

outer margin to the free edge of the nasal bone and supe- rior maxilla, whilst by its inner it is continuous with the anterior border of the septal cartilage. The lower lateral cartilage curves inwards upon itself, touches its fellow in the mesial plane at the tip, and forms the anterior and lateral boundary of the orifice of the nostril. It is con- nected by fibrous membrane above to the upper lateral cartilage, and behind to the anterior edge of the superior maxilla. In this membrane two to five small cartilaginous plates, called the epactal cartilages, are often found imbedded. The skin of the nose which covers the lower lateral cartilages contains numerous sebaceous follicles, which open by comparatively large orifices on the surface. It is closely connected to these cartilages, and to the muscles of the ale. The lower lateral cartilage forms the wall of the vestibule or entrance to the nasal chamber, and the vestibule is lined by a prolongation of the integument, which is studded with numerous short hairs or vibrisse. Each nasal chamber is lined by a mucous membrane called the potwitary or Schneiderian. This membrane is prolonged into the meatuses and the air sinuses which open into them; posteriorly it is continuous with the mucous lining of the pharynx, and anteriorly it blends with the cutaneous lining of the vestibule. The pituitary membrane is thick and soft, and diminishes the size of the mceatuses and the openings of the air sinuses as seen in the skeleton. The mucous membrane is divided into a respiratory and an olfactory region. The respiratory region corresponds to the floor of the nose, to the inferior turbinated bone, and to the lower third of the nasal septum. It is covered by a ciliated columnar epithelium, and contains numerous race- mose glands for the secretion of mucus or pituita. It is also vascular, and the veins which ramify in it have a plexiform arrangement. The mucous lining of the air sinuses is also ciliated, but almost devoid of glands, except in the antrum, in which region the glands sometiines dilate into cystic tumours,

The olfactory region is the seat of distribution of the olfactory nerve and of its peripheral end-organs. It corre- sponds to the roof of the nose, to the superior and middle turbinals, and the upper 2rds of the septum. The mucous membrane is thick, soft, easily destroyed, of a yellowish brown colour, and blended with the periosteum. When

vertical sections through this membrane are examined microscopically the tubular glands discovered by Bowman may be seen in its vascular con- nective tissue layer. These glands contain roundish secreting cells with yellowish-brown pigment-stained contents. The epithelium is cylindrical, but uot usually ciliated, though patches of ciliated epithelium cells are said to occur in man. Long, slender, and even branched processes proceed from the deeper end of each cell towards or even into the sub- epithelial connective tissue. The cells usually contain pigment granules. Between the epithe- lium cells the characteristic olfactory cells of Schultze are situated. Each olfactory cell con- gp oles eh

: ie : g re sists of a globular or fusiform body, from which olfactory mu- two long processes arise: one, the peripheral fran. ¢ epi. process, passes vertically between the adjacent bei elle cylindrical epithelinm cells to the free surface Cen; ¢ its per- of the mucous membrane: in amphibia, rep- gl ae) tiles, and birds it projects beyond the plane ricose process. of the epithelium as a simple hair-like struc. 4“ Swe) ture, or subdivided into several slender “ olfactory hairs ;” in fish and mammals, man inclusive, it ends, without form- ing a hair-like prolongation, on the general plane of the mucous surface. The second or central process of the olfac-

tory cell extends towards the sub-epithelial connective tissue: it is finer than the peripheral process, and has not unfrequently a varicose appearance like a nerve fibre.

In the description of the development of the brain (p.864), the origin of the olfactory bulb and peduncle from the hemisphere vesicle was referred to. In the adult brain the olfactory peduncle is in contact with the under surface of the frontal lobe. It is a white band, which divides in frout of the locus perforatus anticus into three so-called roots of the olfactory nerve. The external or long root passes outwards across the Sylvian fissure to the gyrus hippocampi, and perhaps also to the

insula: a few fibres are continuous with the anterior commissure; but in mammals, where the olfactory peduncle forms a good- sized lobe, it receives many fibres from the commissure. The middle or grey root contains white fibres which proceed from the corpus striatum. The internal or short root has been traced into the anterior end of the gyrus fornicatus; hence the inner and outer roots of the olfactory peduncle are connected with the anterior and posterior extremities of the arch-shaped gyrus. The olfactory bulbs rest on the upper surface of the cribri- form plate of the ethmoid, one on each side of the crista galli. The bulb consists both of grey and white matter, and sometimes retains the central cavity lined by a ciliated epithelium. The grey matter contains fusi- form and pyramidal nerve cells imbedded in neuroglia (the stratum gelatinosum of L. Clarke). Between it and the central cavity is the white matter formed of nerve fibres interspersed with "granules," similar to those seen in the rust coloured layer of the cerebellum. Between the grey matter and the surface is the stratum glomerulosum of Meynert, which apparently consists of coils of the olfactory nerve fibres with interspersed "granules." The olfactory nerve fibres form the first pair of cranial nerves or nerves of smell; they leave these glomeruli in from 15 to 25 bundles, and enter the roof of the nose through the holes in the cribri- form plate (Pl. XIX. figs. 1, 2); they lie in grooves in the bones of the olfactory region, and form a network from which bundles of fine non-medullated fibres arise that enter the mucous membrane and run between the glands into the epithelial layer. These nerves have a varicose appearance, and though their terminations have not been precisely ascertained, it is believed that they are connected with the central processes of the olfactory cells, which cells are therefore regarded as the peripheral end-organs of the olfactory nerve fibres. The mucous menibrane of the nose also receives branches from the lst and 2d divisions of the 5th cranial nerve. Their mode of termination in that membrane is not known, but they are associated with the sense of touch, and not with the special sense of smell.

The EyEBALL, globe of the eye, or organ of vision, is a Eyeball.

complex optical apparatus situated in the cavity of the orbit, imbedded to a large extent in loose fat, and with several niuscles attached to it. Its form approximates to the spheroidal, but it actually consists of segments of two spheres, the posterior of which is the larger.

The eyeball consists of three coats or tunics, which enclose three translucent refracting media. The first or external coat consists of a posterior, white, opaque part, the sclerotic, which corresponds in its area with the posterior larger segment of the ball, and of an anterior, translucent part, the cornea, which corresponds in its area with the anterior smaller segment of the eyeball. Piercing the sclerotic coat is the optic nerve, which enters the globe about 4th inch to the nasal or inner side of its antero- posterior axis. The second or middle coat, or tunica vasculosa, consists of a posterior part or choroid, the area of which corresponds almost exactly with the sclerotic ;

Sclerotic coat.

Cornea.

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this coat possesses anteriorly numerous folds, the ctliary processes, Which are continuous. with the i7is, a structure which lies behind the cornea. The third or internal or nervous coat is named the retina, and in it the optic nerve

Fic, 77.—Diagrammatic section through the eyeball. q, conjunctiva; co, cornea; Sc, sclerotic; ch, choroid; pc, ciliary processes; me, ciliary muscle; O, optic nerve; R, retina; 1, iris; aq, anterior chamber of aqueous humour; L, lens; V, vitreous body; Z, zonule of Zinn, the ciliary process being removed to show it; p, canal ot Petit; m, yellow spot. The dotted line behind the cornea re- presents its posterior epithelium.

terminates. The enclosed refracting media occupy the axis of the globe, and are named from before backwards the aqueous humour, crystalline lens, and vitreous body.

The Sclerotic coat, called from its white appearance the white of the eye, is a firm, unyielding fibrous membrane, which forms the posterior §ths of the outer coat of the eyeball. It is thicker behind than in front, and where pierced by the optic nerve it has a cribriform structure, as the bundles of nerve fibres do not pass through one large, but several small openings. The sclerotic consists of the white fibrous form of connective tissue, intermingled with a small proportion of elastic fibres. The bundles of white fibres lie in two directions; sonie pass in the meridian of the globe from the optic nerve towards the cornea, others lie parallel to its equator. The sclerotic is joined by accessory fibres behind, derived from the perineurium of the optic nerve, where the nerve pierces it; and in front from the tendons of the recti and obliqui muscles, which are inserted into it. In the cetacea the sclerotic possesses extra- ordinary thickness. In fish and amphibia it consists largely of cartilage, and in birds a ring of bone is developed around its anterior margin. Itis the protecting coat of the eyeball.

The Cornea forms the translucent anterior 4th of the outer coat of the eyeball. Jt is almost circular in form, and is blended at its circumference with the anterior border of the sclerotic. Its anterior surface is convex, and covered by the conjunctival epithelium. The forward projection of the cornea is always greater in young than in aged persons. Its posterior surface is concave, and bounds the chamber in which the aqueous humour is contained: if the chamber be punctured, and the humour evacuated, the cornea loses its translucency, its tension, and its forward con- vexity, and becomes flaccid and opaque. It has considerable thickness, and can be readily split up into lamine. When antero-posterior sections are made through it and the epithelium on its anterior and posterior surfaces, four distinct series of structures may be seen, viz., the anterior epithelium, the proper tissue of the cornea, the posterior elastic lamina, and the posterior epi-(endo)-thelium.

The anterior epithelium of the cornea, often called the con-

junctival epithelium, is stratified. The deepest layer, which lies next the cornea, is formed of elongated cells, which lie vertically to the plane of the surface of the cornea. The more superficial layers are squamous cells, often with fluted surfaces and serrated or spinous edges. The intermediate layers are irregular in shape, and often possess, as Cleland pointed out, long digitate processes, which interlock with those of the adjacent cells.

The proper tissue of the cornea is a modified form of connective tissue. When examined fresh it appears as if perfectly homogeneous, but after a time, and more espe- cially if hardened in alcohol, chloride of gold, and other reagents, it is seen to consist of cells and an intercellular matrix. The cells consist of two kinds,—those which belong to the cornea, and those which have migrated into it. The proper cornea cells or cornea corpuscles were first seen by Toynbee, and have been carefully studied by numerous subsequent observers. They are large stel- late, flattened cells, and lie with their surfaces parallel to the surfaces of the cornea ; they possess many branching processes, and the processes of adjacent cells anastomose to form a cell network. They consist of nucleated masses of protoplasm, which Kiihne showed to be contractile, and are apparently destitute of a cell wall. In vertical sections through the cornea the corpuscles seem as if shaped like elongated spindles. The migrating cells of the cornea were first seen by Von Recklinghausen. They resemble white blood corpuscles, and possess active amceboid movements, so that they can wander through the corneal tissue. Ina healthy cornea they have migrated out of the marginal blood-vessels; but in an inflamed cornea, where their num- ber is greatly increased, they are in part white corpuscles derived from the blood, and in part produced by prolifera- tion of the proper cornea corpuscles. The ¢tercellular matrix of the cornea consists of a laminated substance, the lamelle being arranged parallel to the surfaces of the cornea. The lamelle consist of fasciculi of extremely delicate fila- ments ; immediately under the anterior epithelium the fasciculi decussate with each other, and at the circumference of the cornea the fasciculi run into the connective tissue of the sclerotic. Bowman described a translucent structureless layer or anterior elastic lamina between the conjunctival epithelium and the cornea proper, but

it is doubtful if this layer exists as a constant arrangement. Bownian and other observers have injected tubular spaces in the cornea which are apparently situated between the lamelle. The exact nature of these spaces is somewhat doubtful, but Thin believes them to be lymph-vessels traversing its sub- stance, for he has scen an endothelial lining similar to the endothelial cells of the lymphatics. It is probable that these spaces serve as the channels for the migrating cor- puscles to wander through. Thin also describes the proper cornea corpuscles as lying in lacune, which communicate with each other and with the lymph-vessels. The postercor elastic lamina forms a distinct translucent, structureless layer adherent to the back of the proper tissue of the cornea, from which it may be stripped off without much difficulty. When torn across, the edges curl inwards towards the corneal tissue. It is from go /yq to gpyzy th inch thick, and resists the action of various reagents. This lamina thins off at its circumference and splits into fibres, which become continuous with the pectinate ligament of the iris.

The posterior epithelium of the cornea, also called the endothelium of the aqueous humour, forms a single layer of polygonal cells on the back of the posterior elastic lamina. It is continuous with the endothelial covering of the pec- tinate ligament and of the anterior surface of the iris.

The cornea is not in the adult traversed by blood-vessels, though in the foetus a layer of capillaries lies near its anterior surface. In the adult, however, the margin of

the cornea 1s penetrated by a zone of capillary loops derived from the arterics of the conjunctiva ; these loops, according to Lightbody, are invested by perivascular lymph spaces. The venous canal of Schlemm runs round the circumference of the cornea, at the junction of its deeper layers with the sclerotic. Leber states that it is not a simple canal, but a plexiform arrangement of veins. ‘The uerves of the cornea

first seen by Schlemm have been carefully cxamined by recent observers. They arise from the ciliary nerves, and enter the margin of the cornea in from twenty to forty fasciculi, which run from the circumference to the centre and to the anterior surface of the cornea, and give off numerous branches. The nerve fibres soon lose their medullary sheath, and branch; adjacent branches then communicate, and form plexuses which possess nuclei at the points of intersection of the nerves. From these

plexuses delicate branches again arise, some of which.

penetrate between the cells of the azterior epithelium, whilst others end in the proper tissue of the cornea. Kiihne stated that the terminal fibres ended in the cornea corpuscles, but this statement has not been confirmed.

The Choroid coat forms the largest portion of the middle coat of the eyeball. It lies immediately internal to the sclerotic, and extends as far forward as the corpus ciliare, or annulus albidus, where it forms the ciliary processes ; it is pierced posteriorly by the optic nerve. It has a deep black colour, from the numerous pigment cells it contains, and is abundantly provided with blood-vessels and nerves. The Corpus ciliare, or annulus albidus, is a greyish-white ring which surrounds the anterior border of the choroid close to the junction of the sclerotic and cornea. It consists of two portions—an external, the ciliury muscle, which lies next the sclerotic, and an internal, the ciliary processes (Plate XIX. fig. 4). These processes, about 80 in number, are folds, separated from each other by furrows which extend forwards in the meridional direction as far as the iris, and form collectively a zone-like plated frill around the circumference of the iris. On the one hand, they are continuous with the vasculo-pigmentary structures of the choroid ; on the other, with the vasculo-pigmentary struc- tures of the iris.

The Iris is a circular, flattened disc-shaped diaphragm, situated behind the cornea, in front of the crystalline lens, and bathed by the aqueous humour. By its circumference or ciliary border the iris is not only continuous with the ciliary processes, but is connected by fibres, termed ligamentum pectinatum, with the posterior elastic lamina of the

cornea. The iris is the structure which gives the characteristic colour to the eye—blue, grey, brown, hazel, as the case may be. It is perforated at, or immediately to the inner side of, its centre by a circular aperture, the pupil, the size of which is regulated by the contraction or relaxation of the muscular tissue of the iris.

The structure of the several divisions of the middle coat will now be considered. The Chorotd coat has its inner or anterior surface formed by a distinct pigmentary layer of hexagonal pigment cells (Fig. 43). In the eyes of Albinos, though the cells are present, they contain no pigment. In many mammals also, the pigment is absent from the inner surface, so that the choroid possesses a beautiful iridescent lustre, the tapetum lucidum. In ruminant animals and in the horse the iridescence is due to the reflection of the light by the bundles of the connective tissuc stroma, but in cats from polygonal nucleated cells, which Schultze states con- tain double refracting crystals. Next the inner pigmen- tary layer is the lamina vitrea, the elastic layer of Kolliker. It forms a translucent membrane, described by some as structureless, but by Kolliker as faintly fibrous, which is intimately connected with the stroma of the choroid. The stroma consists of a plexiform arrangement of bundles

of connective tissue, in the intervals between which numc- rous stellate pigment cells are situated, which give to the entire thickness of the choroid its black appearance. This stroma connects the outer surface of the choroid with the inner surface of the sclerotic, and forms the lamina Susca. Ramifying in the stroma are the blood-vessels and nerves, The vessels of the choroid are arranged in two layers. Next the lamina vitrea is a plexiform capillary layer, the meshes of which are so minute, and the vessels so coinpacted to- gether, as to give the appearance of a vascular membrane, long known as the membrana Ruyschiana, The capillaries radi- ate like minute stars from the terminal twigs of the choroidal arteries and veins. The choroidal arteries and veins form a layer external to the capillaries, ¢.¢., next

the lamina fusca, The arteries are the short posterior ciliary branches of the ophthalmic artery, which pierce the sclerotic close to the cntrance of the optic nerve, and, running forwards in a tor- tuous manner, divide dichotomously before ending in the capillaries. The veins of the choroid are arranged in a series of remarkable whorls, named the vene vorticose, which receive the blood not only from the capillaries of the choreid proper, but from those of the iris and ciliary body ; they discharge their blood by means of from 4 to 6 veins into the ophthalmic vein. The ciliary muscle is the greyish white structure which forms the outer part of the ciliary body. It was at one time called the ciliary ligament, but its muscular nature was discovercd almost simultaneously by Bowman and Briicke. It consists of smooth involuntary muscle, the fibres of which are arranged in two layers. The outer and thicker part of the muscle consists of fasci- culi, which arise close to the canal of Schlemm, 2.¢., opposite the junction of the sclerotic and cornca, and radiate from before backwards in the meridian of the eyeball, between the ciliary processes and the sclerotic. The inner part of the muscle forms a ring-like arrangement of fasciculi close to the circumference of the iris, and is often called the annular muscle of Miiller. Iwanoff hag shown that in long-sighted persons (hypermetropic) the annular muscle is strongly developed ; whilst in short-sighted (myopic) eyes its fasciculi are very feeble. The Ciliary Processes have on their inner surface a black pigmentary layer of eclls continuous with that of the choroid. The vitreous layer is also present, but according to H. Miiller is no longer smooth but reticulated. The stroma does not con- tain so large a proportion of stellate pigment cells as in the choroid. The arteries have been carefully studied by Leber; they are the long posterior ciliary branches of the ophthalmic, and the anterior ciliary branches of the muscu- lar branches of the ophthalmic. They pierce the sclerotic, run forwards, and at the anterior border of the ciliary muscle form by their anastomoses the circulus arteriosus, which gives origin to the arteries for the ciliary processes and the iris. The arteries for the ciliary processes are short, and divide into tortuous branches, which frequently anastomose, and form highly complex vascular plexuses, from which arise veins that join the vene vorticosz. Before the long ciliary arteries contribute to the formation of the arterial circle they

send branches to the ciliary muscle, and recurrent branches to the anterior part of the proper choroid coat.

The iris has its anterior surface covered by a layer of cells continuous with the endothelium of the aqueous humour. 'This layer is continuous at the pupillary border with a thick layer of cells filled with black pigment granules, the wea, which covers the posterior surface of the iris, and is continuous at its ciliary border with the pigmentary layer of the ciliary processes. The connective tissue stroma of the iris also contains stellate pigment cells. The variations in colour of the iris in different cyes depends upon the dis- tribution and amount of the pigment in the uvea and the

Retina.

stellate cells: in dark-coloured eyes, both are filled with dark pigment granules; whilst in light-coloured eyes the stellate cells of the stroma are either devoid of pigment or only faintly coloured. The iris contains numerous fasciculi of involuntary or non-striped muscular fibre arranged in two directions. Circularly arranged fibres surround the aperture of the pupil, and form the sphincter muscle, by the contraction of which the size of the pupil is diminished. Smooth muscular fibres also radiate from the pupillary to the ciliary border of the iris and form the dilatator muscle. The muscular nature of these fibres in the human iris was long disputed, but was satisfactorily demonstrated in 1852 by Lister. Jerophecf has also described circular fasciculi surrounding the ciliary border. In birds and reptiles the muscular tissue of the iris consists of transversely striped fibres. The arteries of the iris arise from the circulus arteriosus, and run radially forwards towards the pupil, where they anastomose and form the circulus tridis minor. They possess relatively thick external and muscular coats. The capillaries form a plexus not so compact as that of the choroid coat. The veins of the iris end in the vene vorti- cose. In the foetus the pupil is closed in by a delicate membrane, membrana pupillaris, into which the blood- vessels of the iris are prolonged. This membrane disap- pears by absorption during the later months of

embryo life. The nerves of the middle coat of the eyeball are the long ciliary branches of the ophthalmic division of the 5th and the short ciliary branches of the ciliary ganglion (Pl. XIX.

fig. 7, t). They pierce the sclerotic near the optic nerve,

and run forward in the lamina fusca of the choroid. They give off branches to the choroid which form in it a plexus in which H. Miiller found nerve cells. From this plexus delicate branches pass to the muscular coat of the choroidal arteries. The ciliary nerves then enter the ciliary muscle, and form plexuses with interspersed nerve cells, from which branches pass to the muscular fibres. Other branches of the ciliary nerves enter the iris, and form plexuses, from which branches proceed to the muscular tissue.

The Letina is the delicate nervous coat of the eyeball which lies immediately internal to the choroid, and extends

PQ —

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Fig. 78—Diagrammatic section through the retina to show the several layers which are numbered asin the text, Ct, the radial fibres of the supporting con- nective tissue.

from the place of entrance of the optic nerve as far forward

as the ciliary processes, where it forms a jagged border, the

ora serrata. In the living eye it is translucent and colour- less, but shortly after death it becomes grey: itis soft and so easily torn that it is difficult to display it in a dissection without injury. Its inner or anterior surface, concave forwards, is moulded on the vitreous body, and presents the following appearances :—Almost exactly in the antero-posterior axis of the eyeball is a transversely oval yellow spot, about z5th inch in its long diameter, which amongst mammals is found only in man and apes, though, as Knox and Hulke have shown, it exists in

reptiles; in the centre of this spot is a depression, the fovea centralis ; about 4th inch to the inner side of the yellow spot is a slight elevation, the papilla optica, which marks the disc-like entrance of the optic nerve into the retina ; here the fibres of' the nerve radiate outwards aud forwards to the ora serrata, and branches of the arterta centralis retince accompany then. The retina is highly complex in structure, and consists

of uerve fibres and cells, of peripheral end-organs, of con- nective tissue, and of blood-vessels, arranged in several layers. Max Schultze, who is the chief authority on the subject, recognises ten layers, but includes among these the layer of hexagonal pigment cells just described as the inner pigmentary layer of the choroid. If this layer be omitted, nine layers may then be recognised, and, following Schultze, be named from before backwards as follows:—l. Mem- brana limitans interna; 2. Layer of optic nerve fibres ; 3. Layer of ganglion cells; 4. Internal granulated (molecular) layer; 5. Internal granule layer; 6. External granulated layer ; 7. External granule layer ; 8. Membrana limitans externa ; 9. Bacillary layer (Fig. 78).

The nervous elements of the retina will first be con- sidered. The optic nerve fibres (2), where they pierce the sclerotic, as a rule lose the medullary sheath, and radiate outwards as non-medullated fibres from the optic disc to the ora serrata immediately behind and parallel to the mem- brana limitans interna. These fibres vary greatly in size, and are frequently varicose. When any of the optic nerve fibres retain the medullary sheath the retina is there ren- dered opaque. Immediately behind the nerve fibres is the layer of ganglionic nerve cells (3). These cells are either bi- polar or multipolar. In the living eye the cell substance is hyaline and the nucleus transparent, but after death the wubstance both of the body of the cell and the processes assumes a fibrillated appearance, like the axial cylinder of an optic nerve fibre. One process, the central process, extends into the layer of optic nerve fibres; and another, the peripheral, into the internal granulated layer. The internal granulated layer (4) contains the branching pro- cesses of

the nerve cells, some of which apparently become continuous with an arrangement of excessively fine fibrils, probably nervous in their nature. These fibrils are inter- mingled with a delicate plexus of connective tissue. The internal granule layer (5) contains numerous fusiform nucleated enlargements, thé so-called internal granules, arranged in superimposed strata; from each fusiform enlargement a fibre proceeds in two directions, one centrally

into the internal granulated layer, and one peripherally into ©

the external granulated layer. These fibres possess vari- cosities, and resemble the optic nerve fibres. The caternal granulated layer (6) is very thin, and consists of an ex- panded network of minute fibres, with nuclei situated at the points of intersection of the fibres. Krause has called it the membrana fenestrata. The external granule layer (7) contains numerous fusiform nucleated enlargements, the so-called external granules, arranged in superimposed strata: from each enlargement a fibre proceeds in two directions, one centrally into the external granulated layer, and one peripherally through the membrana limitans externa to the bacillary layer, where it becomes continuous with the anterior end of either a rod or a cone, as the case may be. Hence these fibres of the external granule layer are called by Schultze rod and cone fibres, and the external granules are nucleated enlargements of these fibres. These fibres possess varicosities like those of the internal granule layer.

The bacillary layer (9) or membrane of Jacob consists of multitudes of elongated bodies arranged side by side like rows of palisades, and vertically to the surfaces of the retina. Some of these bodies are cylindrical, and are named the rods of the retina ; others flask-shaped, and named the cones of the retina: the rods equal in length the entire thickness of the bacillary layer; the cones are shorter than the rods, and are interspersed at regular intervals between them ; the apex of each cone is directed towards, but does not reach, the plane of the posterior or choroidal surface of the retina. The posterior or outer end of each rod rests against the pigmentary layer of the choroid.

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The anterior or inner ends of both rods and cones are con- tinuous with the rod and cone fibres of the external granule layer, as already described.

refractile segment. By the action of various reagents the

outer segments both of the rods and cones exhibit a trans-

verse striation, and ultimately break up into discs. Hensen has described a longitudinal striation in the outer segments,

and Ritter has stated that both in the outer and inner

segments of the rods an axial fibre exists. Max Schultze has also seen the inner segments of both rods and cones longitudinally striped on the surface. Modifications in the

relative numbers and appearances of the rods and cones

have been seen in the eyes of various vertebrata. In birds, for example, the cones are much more numerous than the rods, whilst the reverse is the case in mammals generally. In the cartilaginous fishes the cones are entirely absent ; so also, as Schultze has shown, in the bat, hedge-hog, and mole ; whilst in reptiles the bacillary layer is exclusively

composed of cones. In all the vertebrata, except the

mammalia, the twin or double cones described by Hannover

probably exist. In the amphibia, lens-shaped bodies have been described in the inner segments of the cones. The rods and cones are the peripheral end-organs in connection with the fibres of the optic nerve, and their apparent rela- tion to these fibres is as follows :—The optic nerve fibres are continuous with the central processes of the ganglion cells of the retina, the peripheral branching processes of which pass into the internal granulated layer, where they may possibly become continuous with the central processes of the inner granular

layer. The peripheral processes of the inner granular layer enter the external granulated layer, but it is difficult to say whether or not they become con- tinuous with the central processes of that layer. There can, however, be no doubt that the peripheral processes of this layer are directly continuous with the rods and cones of the bacillary layer. 'The entire arrangement is sometimes called the radial nervous fibres of the retina.

In addition to the nervous structures just described, the retina contains a delicate supporting connective tissue like the neuroglia of the brain and spinal cord. Not only does it lie between the fibres, cells, and so-called granules in the several nervous layers, and form in them a radial arrange- meut of supporting fibres, but it constitutes the two limitary membranes of the retina. The membrana limitans externa (8) is excessively thin, and appears in vertical sections through the retina as a mere line between the bacillary and external granular layers, continuous on thé one hand with the connective tissue which passes for a short distance be- tween the rods and cones, and on the other with the connec- tive tissue framework of the external granule layer.

The membrana limitans interna (1) covers the anterior surface of the retina, and lies next the vitreous body ; its posterior surface blends with the radial arrangement of connective tissue between the optic nerve fibres, but its anterior or hyaloid surface, as J. C. Ewart has recently shown, possesses a mosaic appearance, like that of a layer of squamous endothelium.

The yellow spot exhibits some structural differences from the rest of the retina. It owes its colour to the presence of yellow pigment deposited in the more anterior layers of the retina. Except at its central depression, the fovea centralis, it is thicker than the surrounding parts of the retina ; but it is much softer, a condition which is due to the almost complete absence of the layer of optic nerve fibres, and a diminution in the amount of the supporting con- nective tissue; the membrana limitans interna is, however, relatively stronger. In the fovea centralis itself the rods of the bacillary layer have entirely disappeared, and are replaced by cones which are distinguished by their close

Each rod and cone is sub- divided into an outer strongly refractile and an inner feebly

arrangement, and the more slender form and increased length, especially of their outer segments. The external granule layer is well marked, and the central fibres belong- ing to it, instead of passing vertically forwards, incline very obliquely or almost horizontally outwards to the internal granule layer, which, together with the layers anterior to it is so thin as almost to have disappeared. In the yellow spot surrounding the fovea the bacillary layer is also composed of cones which are not, however, so slender or so long as at the fovea itself. The layer of nerve cells and the inner part of the external granule layer are thicker than in the rest of the retina. The yellow spot is the part of the retina most sensitive to light.

At the ora serrata or anterior border of the retina the nervous layers, including the rods and cones, cease to exist. The radial connective tissue and internal limiting membrana are present ; from the radial tissue a layer of cells is prolonged forward in contact with the deep surface of the ciliary processes as the pars ciliaris retine.

The retina is supplied with blood by the arteria centralis, which, traversing the axis of the optic nerve, reaches the retina at the optic disc, In the retina it branches dicho- tomously in the nerve fibre layer, avoiding however the yellow spot, and its terminal twigs reach the ora serrata. The capillaries form in the more anterior layers of the retina a distinct network, which does not enter the external granule and bacillary layers, but penetrates the yellow spot, though not the fovea centralis. The blood is conveyed from the retina by the central vein which accompanies the artery inthe optic nerve, and opens either into the ophthalmic vein or directly into the cavernous sinus, The veins and capillaries of the retina have been described by His as completely invested by perivascular lymphatic sheaths, whilst the arteries only possess such sheaths for a limited part of their course.

The Optic Nerve itself passes from the orbit through the Nerve of optic foramen into the cranial cavity, where it arises from sight. the optic commissure, This commissure is a flattened band formed by the junction of the two optic tracts. Each tract winds backwards around the tuber cinereum and crus cerebri to arise from the optic thalamus, corpora quadrige- mina, and geniculata ; and some observers also state that it derives fibres from the tuber cinereum and lamina cinerea. In the commissure an interchange takes place between the fibres of opposite nerves and tracts, so that not only does an optic nerve contain fibres derived from the tract on its own side, but from the opposite tract, and it has even been stated that fibres pass across the commissure from one optic nerve to the other, and from one optic tract to the other.

The Aqueous Humour isa limpid watery fluid, containing Refracting a little common salt in solution, which occupies the space media. between the cornea and the front of the crystalline lens. In this space the iris lies, and imperfectly divides it into two chambers, an anterior and a posterior, which commu- nicate with each other through the pupil. The anterior chamber, of some size, is situated between the iris and cornea ; but as the iris is in contact with the front of the lens, the posterior chamber is reduced to a mere chink between the circumference of the iris and that of the lens.

The Crystalline Lens is situated behind the iris and pupil, and in front of the vitreous body. It is a trans- parent bi-convex lens, with its antero-posterior diameter 4d less than the transverse, its posterior surface more convex than the anterior, and with its circumference rounded. It consists of a capsule and the body of the lens enclosed by the capsule. The lens capsule is a transparent, smooth, struc- tureless, and very elastic membrane, about twice as thick on the anterior as on the posterior surface of the lens. It is non-vascular in the adult, though in the foetus a branch of the central artery of the retina, which traverses the

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The eye an optical instrument.

vitreous humour, ramifies in its posterior portion. A single layer of polygonal cells lies between the body of the lens and the anterior portion of the capsule. 'The lens body is softer at its periphery than in its centre. It is built up of concentric layers, and on both the anterior and posterior surfaces lines are to be seen radiating from the central pole of cach surface towards the circumference of the body. The radiated pattern varies in diffcrent animals. In the human foetus there are usually threc lines, but in the adult they are more numerous. The lines on one surface do not lic immediately opposite those on the other, but are inter- inediate. By the action of strong spirit and other reagents the body of the lens can be split up from the periphery towards the centre in the direction of these lines, so that they mark the edges of apposition of its concentric laminz. Each lamina consists of numerous hexagonal fibres about ¥oyth inch wide, which extend from one surface to the 000 t

other over the circumference of the lens, so that a fibre which begins at the polar end of a radius on the one surface terminates at the circumferential end of a radius on the opposite. The edges of the fibres are sinuous in man, but denticulated in many animals, especially fishes, so that the fibres, not only in the same, but in superimposed layers, are closely interlocked. The lens fibres are nucleated, a structural fact which gives a clue to their true nature, and they are now regarded as peculiarly modified elongated cells. Babuchin states that he can trace the transition from the cells of the layer between the lens-body and capsule to the proper lens fibres. The lens-body is non-vascular and non-nervous. The surfaces of the lens become more flattened in old age, and its substance hardens and is less transparent.

The Vitreous Body is much the largest of the refracting media, and occupies the largest part of the space enclosed by the tunics. Anteriorly it is hollowed out to receive the postcrior convexity of the lens, but posteriorly it is convex, and the retina is moulded on it. It is as trans- lucent as glass, jelly-like in consistency, and when punctured a watery fluid drains out. Its minute structure is difficult to ascertain,

but as it, like the subcutaneous tissue of the embryo, contains rounded, stellate, and fusiform cells, it is customary to refer it to the gelatinous form of connective tissue; concentric lamelle, and even a radiated arrangement of fibres, have also been described. It has been customary also to consider it as invested by a delicate structureless membrane, the hyaloid membrane ; but this is now regarded as belouging to the retina, where it is known as the mem- brana limitans interna. Almost opposite the ora serrata a membrane springs from the vitrcous body, passes forwards for some distance in relation to the deep surface of the ciliary processes, but separated from them by the pars ciliaris retinze, and then inclines inwards to become attached to the anterior surface of the capsule of the lens close to its circumference. It is so closely connected at its origin with the membrana limitans that it is difficult to recognise it as a distinct membrane. It is named the suspensory lugament of the lens, or zonule of Zinn, aud contains fibres, which run in the meridional direction. Where it leaves the vitreous body a uarrow space is enclosed between it and that body, which space surrounds the circumference of the lens, and 1s called the canal of Petit. From the relation of the Suspensory ligament to the ciliary processes it has a plicated surface, and when these processes are torn away from it a portion of the pigment of the processes is often left behind, so that the zonule is sometimes named the ciliary processes of the vitreous body.

The Eyeball is an optical instrument, constructed on the plan of the camera obscura. The sclerotic forms the wall of the chamber. The choroid represents the black lining for absorbing the surplus rays of light. The cornea,

aqueous humour, lens, and vitreous body are the trans- lucent media which, like the glass lens of the camera obscura, bring the rays of light to a focus. The retina is the sensitive plate on which the optical picture is thrown. In considering the relation of the retina to the visual rays, it must be kept in mind that the place of entrance of the optic nerve is

insensible to light, and that the most sensitive part of the retina is the yellow spot, with its fovea centralis, where the optic nerve fibres are absent, but where the bacillary layer reaches its maximum size. It is clear, therefore, that the rods and cones of this layer, and not the optic nerve fibres, are the structures in the retina which are stimulated by the light; and it is probable, as was suggested many years ago by Goodsir, that these rods and cones are impressed by the light, not as it enters the eye directly, but as it is reflected backwards from the choroid along their axes. The iris is the diaphragm which, by opening or closing the pupil, admits or cuts off the rays of light. The ciliary muscle represents the adjusting screw of the camera; through its attachment to the ciliary processes and their relation to the suspensory ligament of the lens, it is able to act upon the lens and modify the curvature of its anterior surface ; for when the eye is to be accommodated to the vision of near objects the anterior surface of the lens becomes more convex than when distant

‘objects are being examined.

It has already been stated on p. 864 that the retina is Develop-

formed in the primary optic vesicle, which grows forwards to the integument. By the involution and growth of the skin at this spot a hollow is produced at the front of the vesicle, which gradually deepening forms a pouch, the secondary optic vesicle, in which the involuted part of the skin is lodged. From the included sub-epidermal tissue the vitreous body is derived ; from the included epidermis, the lens ; whilst the cornea sclerotic and iris are produced by the subcutaneous connective tissue. The optic nerve and retina are formed from the primary optic vesicle and its peduncle, and it is probable that the bacillary layer is a special development of its internal epithelial lining. The choroid coat again is derived from the pia mater. Hence the eyeball is compounded of structures derived partly from the integument and partly from the embryo brain.

Accessory Parts to THE Eyreaty.—In relation to the cyeball several accessory parts are found.

The Lye-Brows are projections of the integument, from which short, stiff hairs grow.

The Hye-Lids, or palpebre, are two movable curtains, an upper and a lower, which protect the front of the globe. Between each pair of lids is a horizontal fissure, the palpe- bral fissure. From the free margins of the two lids project short hairs, the eye-lashes or cilia; the upper set curve downwards and forwards, the lower set upwards and for- wards ; they also protect the front of the globe. eye-lid consists of skin; of the fibres of the orbicular sphincter muscle; of a thin plate of fibro-cartilage, the tarsal cartilage, to the inner end of which a fibrous band, the tendo palpebrarum, is attached, this tendon springing from the ascending process of the superior maxilla ; and of the conjunctiva. Between the conjunctiva and the tarsal cartilage is a layer of glands, the Meibomian glands ; each gland consists of a short duct, which expands at its sides into small sacculi. The sacculi contain short columnar cells ; these secrete a sebaceous material, which escapes through the orifice of the duct at the border of the eye‘lid.

ment of eye.

Eyelids.

Each |

The Conjunctiva isa mucous membrane, which forms the Con- | posterior layer of the eye-lid, and is reflected on to the Juctiva

anterior part of the sclerotic. At the inner angle of junc- tion of the eye-lids is a soft reddish clevation of the conjunctiva, the caruncula lachrymalis, and immediately external to it is a vertical fold, the plica semilunaris, the

Lachrymal apparatus.

) Muscles of | eyeball.

EAR. |

rudiment of the third eye-lid, or membrana nictitans, sd well developed in birds. The palpebral conjunctiva has small papille scattered over its surface ; its epithelium is stratified, with scaly cells on the free surface and elongated cells in the deepest layer. In the sub-epithelial tissue are small branched mucous glands, which are numerous in the caruncula. Little masses of adenoid tissue (p. 849) with lymphatic vessels are also found in it, and the conjunctiva of the front of the eyeball is thinner than the palpebral part. It is not glandular, and its nerves terminate in end-bulbs (p. 862). The palpebral conjunctiva, and in part that of the eyeball, receive their blood-vessels from those of the eye-lids, but the portion of the conjunctiva next the cornea is supplied by the arteries of the sclerotic coat.

The Lachrymal Apparatus is engaged in the secretion of the tears, and in conveying them away from the front of the globe. The lachrymal gland occupies a depression in the outer part of the roof of the orbit. It is smaller than an almond, is sub-divided into lobules, and belongs to the group of compound racemose glands. It consists of the ramifications of short ducts, which terminate in small sacculi. The wall of each sacculus consists of a delicate membrana propria, and the cavity contains the polyhedral secreting cells. Outside the membrana propria is a capillary network derived from the lachrymal artery, but Giannuzzi and Boll have recently described a space between this network and the membrana propria which they believe to be continuous with the lymphatic system. Pfliiger has described nerves as terminating in connection with the secreting cells. The excretory ducts of the gland are from six to eight, and open on the back of the upper eye-lid. The tears are washed over the surface of the globe by the involuntary wink- ing of this lid. When the secre- tion is increased in quantity, in the act of crying, the tears flowover | the cheek, but in = ordinary: circum- = stances they are conveyed away by two slender tubes, the lachrymal canals, which open by minute orifices, the puncta lachry- malia, one at the inner end of the free border of each eye-lid. These tubes open at their opposite ends into a small reservoir, the lachrymal sac, situated in a hollow in the lachrymal bone. From this sac a duct, the nasal or lachrymal duct, proceeds which opens into the

inferior meatus of the nose, and here the tears mingle with the mucous secretion of that cavity.

Muscles of the Eyeball.—The sclerotic coat of the eyeball has six muscles inserted into it. Four of the muscles are called rect?, and are situated, one superior, one inferior, one external to, another internal to, the globe. They all arise from the rim of bone which bounds the optic foramen ; the external and internal muscles are inserted vertically into the sides of the sclerotic, but the superior and inferior recti have oblique insertions into its upper and lower aspects. The other two muscles are called obligui. The superior oblique arises along with the recti, passes to the inner end of the upper border of the orbit, where its tendon goes through a pulley, and is directed back to be inserted

Fig. 79.—Lachrymal canals and duct. 1, orbicular muscle; 2, lachrymal canal; 3, punctum; 4, caruncula; 5, lachrymal sac; 6, lachrymal duct; 7, angular artery.

obliquely into the upper and outer part of the sclerotic. The inferior oblique arises from the lower border of the orbit, passes outwards and upwards to be inserted obliquely into the sclerotic. These muscles roll the eyeball in the orbit, and, without entering into a minute analysis of their actions, their office may be stated generally as follows :— The internal rectus rolls it inwards, the external outwards, about its vertical axis; the superior rectus rolls it upwards, the inferior downwards, about its transverse horizontal axis, though from the obliquity of their insertions they give it at the same time a slight inward or outward movement as the case may be ; the superior and inferior oblique roll the globe around its antero-posterior or sagittal axis, the superior upwards and outwards, the inferior downwards and out- wards.

Periosteal Muscle of the Orbit.—The periosteum of the orbit contains, as H. Miiller and Turner have described, a layer of non-striped muscular fibre in the part which covers over the spheno-maxillary fissure. In man it is rudimen- tary, but in the sheep, deer, elephant, &c., where the osseous wall of the orbit is deficient, this muscle forms a well-defined structure. It has been suggested that it acts as a protractor muscle of the globe.

The Ear, or organ of hearing, is a complex acoustic ap- Ear.

paratus, situated in connection with the temporal bone. It is divided into three parts, named external, middle, and internal ear.

The Luternal Ear consists of the pinna or auricle and Exteinal The auricle is the oblong ear.

the external auditory meatus, convoluted body situated at the side of the head. Its incurved outer border is named the helix. Within this lies a curved ridge, the anti-helix, in front of which is a deep hollow, the concha, which leads into the external meatus. The concha is bounded in front by a prominence, the tragus, and behind by a smaller prominence, the anti-tragus ; below the anti-tragus is the lobule, which forms the most depending part of the auricle. The framework of the auricle is formed of yellow elastic fibro-cartilage invested by integument, except the lobule, which consists merely of a fold of integument containing fat. Attached to the car- tilage are not only the three auricular muscles referred to on

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Fia. 80.—The ear as seen in section. a, helix; 6, anti-tragus; c, anti-helix; ¢, concha; ¢, lobule; 7, mastoid process; g, portio dura; h, styloid process; k, internal carotid artery ; 7, Eustachian tube; m, tip of petrous process; n, exter- nal auditory meatus; 0, membrani tympani; p, tympanum; 1, points to mal- leus; 2, to incus; 3, to stapes; 4, to cochlea; 5, 6, 7, the three semicircular canals; 8 and 9, portio dura and portio mollis,

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page 836, but also certain smaller muscles called the proper muscles of the pinna. Thus the greater muscle of the helix is placed on its anterior border ; the lesser muscle of the

Middle ear.

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helix is situated where it ariscs out of the concha eine muscle of the tragus lies on the front of that prominence ; the muscle of the anti-

tragus is placed on the back of that prominence; the transverse muscle ou the posterlor or cranial surface of the auricle.

The Hxternal Meatus leads from the bottom of the concha into the temporal bone, and is separatcd from the tympanum or middle ear by the membrana tympani. It is a crooked passage one and quarter inch long, inclined at first forwards and upwards, then downwards and inwards. The wall of the outer end of the passage is formed of fibro-cartilage continuous with the cartilage of the auricle, whilst that of the decper end is formed of the plate-like tympanic part of the temporal bone. The passage is lined with integu- ment continuous with the skin of the auricle, in which are situated numerous hairs, together with ceruminous glands which secrete the well-known yellow ‘ wax.”

The Zympanum, or Drum, or Middle Kar, is a chamber irregularly cuboidal in form, situated in the temporal bone between the bottom of the meatus and the internal ear. The outer wall is formed of the membrani tympani, which inclines obliquely downwards and inwards at the bottom of the external meatus, at an angle of 55° to the axis of the meatus, whilst the membranes in the two ears form with each other an obtuse angle of 130° to 135°. The tym- panic membrane is attached to a groove at the bottom of the meatus, and is concave on its outer, convex on its inner surface. It consists of three layers: an external tegumen- tary, continuous with the skin of the meatus, which con- tains no hairs or glands ; an internal mucous, continuous with the mucous lining of the tympanum; and an inter- mediate membrana propria, which consists of unyielding fibres arranged both radially and circularly. The radial fibres radiate from the point of attachment of the handle of the malleus. The membrana propria is usually said to be destitute both of nerves and vessels, but Kessel states that nerves, blood, and lymph vessels exist in it as well as in the mucous and tegumentary layers. Immediately in front of the membrana tympani is the Glaserian fissure. The inner wall separates the tympanum from the labyrinth, and presents the following appearances : a rounded elevation or promontory caused by the first turn of the cochlea, on the surface of which promontory are grooves for the lodgment of the tympanic plexus of nerves; above the promontory is an oval opening

closed in by a membrane, the fenestra ovalis, which corresponds with the vestibule ; behind and below the promontory is a round opening closed in by a membrane, the fenestra rotunda, which corresponds with the tympanic passage in the cochlea. The floor of the tympanum is a narrow chink between the inner and outer walls ; and the roof is formed by the anterior surface of the petrous-temporal bone. At its anterior wall the tympanum opens into the Hustachian tube, a canal which communicates with the nasal compartment of the pharynx immediately behind the inferior turbinal. The wall of the tympanic end of this tube is formed of bone, that of the pharyngeal end of a curved plate of hyaline cartilage, which is connected to the bone by fibro-cartilage; its pharyngeal orifice is dilated into a trumpct-shaped mouth ; through this tube the ciliated mucous membrane of the nasal part of the pharynx is prolonged into the tympanum. The cartilaginous wall of the tube does not completely surround it, but is completed by a fibrous membrane, and a layer of voluntary muscle, named by Riidinger the dila- tator tube. Above the tympanic orifice of the Eustachian tube is a fine canal, through which the tensor tympani muscle enters the tympanum. At its posterior wall the tympanum communicates with the air-sinuses in the mastoid temporal; here also is found a small hollow eminence, the pyramid, through a hole at the apex of which the ten-

don of the stapedius muscle passes ; and a foramen which transmits the chorda tympani nerve.

The tympanic cavity contains three small bones, named malleus, incus, and stapes, arranged so as to form an irregular chain, stretching across the cavity from the outer to the inner wall.

The Malleus or hammer is the most external bone. In it may be recognised a head separated by a constricted neck from an elongated handle. Close to the junction of tho neck and handle a long slender process projects downwards and forwards to be inserted into the

Glaserian fissure, and near the root of the long process a short process projects outwards. By its handle the malleus is intimately con- nected with the centre of the membrana tympani; by its head it articulates with the incus; whilst ligamentous fibres pass from it upwards, forwards, outwards, and backwards to the tympanic walls.

The Zicus, or anvil-shaped bone, possesses a body and two processes; on the anterior surface of the body is a saddle-shaped hollow in which the head of the malleus fits; the short process projects almost horizontally backwards, and is attached by a ligament to the posterior wall of the tympanum ; the long process extends at first down- wards and then inwards, to end in a rounded projection, named os orbiculare, through which it articulates with the stapes.

The Stapes, or stirrup-shaped bone, possesses a head and neck, a base and two crura; the head articulates with the os orbiculare of the incus; from the constricted neck the two crura curve inwards to the base, which is attached to the fenestra ovalis. The joint between the malleus and incus is diarthrodial and saddle-shaped, and the articular surfaces are enclosed by a capsular ligament. The joint between the incus and stapes is also diarthrodial, and pos- sesses an investing capsular ligament. Toynbee and Riid- inger have described the base of the stapes and the margin of the fenestra ovalis as each invested by hyaline cartilage. Between these plates elastic fibres extend in a plexiform manner, and the intervals between them are occupied by fluid ; the joint seems, therefore, a modified amphiarthrosis, The bones are moved on each other at these joints by small muscles. The tensor tympani arises from the apex of the petrous temporal, and the cartilage of the Eustachian tubo enters the tympanum at its anterior wall, and is inserted into the malleus near the root. The laxator tympani muscle arises from the spine of the sphenoid, and the car- tilage of the Eustachian tube enters the tympanum through the Glaserian fissure, and is inserted into the neck of the malleus. The stapedius arises within the pyramid, enters the tympanum through the hole at its apex, and is inserted into the neck of the stapes. The tympanum is lined by a mucous membrane continuous with that of the Eustachian tube, which invests the tympanic ossicles, ligaments, and muscles, and is prolonged

backwards so as to line tho mastoid air-sinuses. The epithelium covering this mem- brane, where it lines the floor and the adjacent part of the anterior, posterior, and internal walls, consists of ciliated columnar cells; but the epithelium covering the roof, tha promontory, the membrani tympani, and the tympanic ossicles, is tessellated. In the sub-epithelial connective tissue the blood and lymph vessels and nerves of the tympanum ramify. Kessel has recently described in it certain peculiar bodies, which consist of a central axial band with a series of capsules, possessing a fibrillar struc- ture, arranged concentrically around the axis ; the function of these bodies is not known.

The formation of the auricle and external meatus is well adapted for collecting and transmitting sound-vibrations inwards to the middle ear and labyrinth. These vibrations strike the membrana tympani, and are propagated by the

chain of bones across the tympanic cavity to the labyrinth. The pressure of the vibrations on the tympanic membrane forces that membrane inwards, so that its inner surface presses on the handle of the malleus, the effect of which is to rotate the hammer about its axis; but by the ligamentous attachment of the malleus to the tympanic walls and to the

incus, and, as Helmholtz has shown, by the interlocking of

cog-like processes connected with the articular surfaces of the two bones, the range of movement is so limited that the pressure on the malleus is transmitted through the incus upon the stapes, which presses, therefore, on the mem- brane of the fenestra ovalis, so that the movements of the membrana tympani are thus transmitted to fluid within the labyrinth. The tensor tympani muscle tightens the tympanic membrane by drawing the handle of the malleus inwards, and still further adapts the structures for the transmission of sound-vibrations.

An antagonistic muscle, the laxator tympani, has also been described. There is some difficulty in determining the action of the stapedius, but if, as is probable, it draws the stapes from the fenestra ovalis, it will diminish the pressure of the chain of bones on that membrane.

The Internal Har, named the Labyrinth, from its com- plex construction, is the part of the auditory apparatus in which the nerve of hearing is distributed, and where the peripheral end-organs are situated. It is imbedded in the petrous bone, and is divided into three parts, viz., vestibule, semicircular canals, and cochlea, each of which consists of an osseous and a membranous portion (Pl. XIX. figs. 8, 9, 10).

The Vest2bule lies immediately internal to the tympanum, between it and the bottom of the internal auditory meatus ; behind it are the semicircular canals, and in front is situated the cochlea. It is the part of the labyrinth which first appears in animals, and is therefore the most constant part of the organ. In the myxinoid fishes a single semicircular canal is superadded to the vestibule, in the lamprey two canals, but in other fishes and in the higher vertebrates three canals exist. In amphibia, reptiles, and birds the cochlea is small and rudimentary in comparison with its develop- ment in mammals. The osseous vestibule is an ovoid chamber about {th inch in diameter. In its outer or tympanic wall is the fenestra ovalis ; in its inner are small auditory foramina, which transmit from the internal meatus the vestibular branches of the auditory nerve ; behind these holes is the opening of a minute canal, the aqueductus vestibuli ; its anterior wall communicates with the scala vestebuli of the cochlea, and into its posterior wall open the five orifices of the three semicircular canals.

The Semicircular Canals are named superior, posterior, and external. The superior and posterior are sometimes called the vertical canals, and the external the horizontal canal, but, as Crum Brown has shown, the superior and posterior lie in planes equally inclined to the mesial plane cf the head, and the external is in a plane at right angles to the mesial plane. Further, the canals in the two ears have definite relations to each other; for whilst the superior canal of each ear is nearly

parallel to the posterior canal of the other, the external canals in both ears lie nearly in the same plane. The canals are bent, forming nearly $ds of a circle, and would have had six openings into the vestibule had not the contiguous ends of the superior and posterior blended together to open by a common orifice. The opposite end of each of these canals and the outer end of the external canal dilate close to the vestibule to twice their usual diameter, and form an ampulla. The osseous vestibule and semicircular canals are lined by a periosteum invested by a tessellated endothelium, and contain a little fluid, the perilymph. In this fluid the membranous laby- rinth is suspended.

The membranous vestibule is formed of two small sac-like

ject into the lumen.

dilatations, the walls of which are directly continuous with each other, though the cavities are separated by an inter- mediate partition. The upper and posterior dilatation named wtriculus, is larger than the lower and anterior, named sacculus. The sacculus is continuous with the ductus cochlearis of the membranous cochlea, and both sacculus and utriculus communicate by slender tubes with a short diverticulum lodged in the aqueductus vestibuli, to which the name of ductus vestibuli may be given. The membranous semicircular canals are about $d the diameter of the osseous. Their walls are continuous with that of the utriculus, and they open by five orifices into it. Each has an ampulla within the ampulla of the osseous canal, Both the sacculus and utriculus are in places attached to the periosteal linings of the osseous vestibule, and delicate ligamentous bands connect the membranous semicircular canals to the periosteal lining of the tubes in which they are con- tained. The wall of the mem- branous vestibule and canals con- sists of a delicate fibrous mem- brane lined by a tessellated endo- thelium. The inner part of this membrane has a vitreous or hya- line lustre, and gives origin in the canals to short papillee which pro- The mem- branous vestibule and canals are

distended with the fluid endo- lymph. The sacculus, utriculus, aud ampulle are specially modified in connection with the peripheral termination of the vestibular branches of the auditory nerve. The membranous wall forms in each of these dilatations a project- ing ridge, the crista acoustica, to which calcareous particles, the otoliths, which may be either amorphous or crystalline, are adherent. The endothelial investment of the crista is elongated into columnar cells, and intercalated between them are fusiform cells, the auditory cells, each of which, as Schultze and other observers have described, possesses a peripheral and a central process. The peripheral process projects beyond the plane of the free surface of the endo- thelium into the endolymph as the auditory hair, whilst the central process extends into the sub-endothelial tissue, where the nerve plexus belonging to the terminal branches of the auditory nerve ramifies, and with which it is probably continuous. These auditory cells are, therefore, the peri- pheral end-organs of the vestibular branches of the auditory nerve, and their general arrangement is not unlike that of the olfactory cells of the nose.

The Cochlea is by far the most complex part of the labyrinth. It is about 4th inch long, and shaped like the shell of a common snail ; its base lies near the internal meatus, and its apex is directed outwards. The osse- ous cochlea is a tube wound spirally two

Fie. 81.—cl, columnar cells covering the crtsta acoustica; Pp, peripheral, and c, central processes of auditory cells; n, nerve fibres. (After Riid- inger.)

Fic. 82.—Diagram of the membranous labyrinth. and abalftimes round — guccutues U. utricaless do gee ea a central pillar or SC, semicircular canals. (After Waldeyer.)

modiolus. Both the pillar and the tube diminish rapidly in diameter from the base to the apex of the cochlea.

The tube is imperfectly divided into two passages by a

plate of bone, the osseous spiral lamina, which, springing from the modiolus, winds spirally around it, and projects into the tube. When the membranous cochlea is in its place the division is completed by a membrane, the mem- branous spiral lamina, or basilar membrane, which bridges across the interval between the free edge of the osseous spiral lamina and the outer wall of the tube, to which it is attached by the spiral cochlear ligament. These passages are called scala tympani and scala vestibult. But another membrane, the membrane of Reissner, also arises from a denticulated spiral crest, dimbus or crista spiralis, attached to the vestibular border of the free edge of the osseous spiral lamina, and extends to the spiral liga- ment at the outer wall of the tube, on the vestibular aspect of the basilar membrane, so as to enclose a passage between it and the basilar membrane, called scala intermedia or ductus cochlearis. The membrane of Reissner is formed cf delicate vascular connective tissue, with an endothelial

Fic. 83.—Transverse section through the tube of the cochlea. m, modiolus; O, outer wall of cochlea; SV, scala vestibuli; ST, scala tympani; DC, ductus cochlearis; mR, membrane of Reissner; dm, basilar membrane; cs, crista spiralis; s/, spiral ligament; sg, spiral ganglion of auditory nerve; oc, organ of of Corti.

layer on each of its two surfaces. The scala tympani or

lower passage, widest at the base of the cochlea, begins at

the inner wall of the tympanum, into which it would have opened through the fenestra rotunda, had not the fenestra been closed up by a membrane. The scala vestibuli or upper passage, also widest at the base, communicates with the cavity of the osseous vestibule. At the apex of the cochlea these two scale communicate with each other through a small hole, the helicotrema. As the scala vestibuli opens into the osseous vestibule, the perilymph is continued into it, and through the helicotrema into the scala tympani. The ductus cochlearis is the membranous cochlea, and its walls are formed of the basilar membrane next the scala tympani, of the membrane of Reissner next the scala vestibuli, and of the spiral ligament next the wall of the cochlea, which connects the two membranes together. It follows the

spiral windings of the cochlea, terminates at the apex of the spiral in a closed end, whilst at the base it communicates with the sacculus of the membranous vesti- bule by a slender tube, the canalis reuniens ; hence the membranous cochlea contains endolymph. The termina- tion of the cochlear branches of the auditory nerve and the arrangement of the peripheral end-organs in relation to

them are to be looked for in the basilar membrane. These parts have been repeatedly investigated and described in elaborate monographs, the titles of which are given as an appendix to Waldeyer's article on the cochlea in Stricker's Handbuch der Lehre von den Geweben, Leipsic, 1872. The general results only of these investigations will be given here, and the original memoirs may be referred to for further details.

On the surface of the basilar membrane directed to the Organ of

ductus cochlearis a remarkable arrangement of cells exists, which presents an appearance that has been compared with the key-board of a pianoforte, and has been named the organ of Corti ; it consists of the following parts:—Some of these cells, distinguished by their elongated curved form, are arranged in two groups, an inner and an outer. The cells of the inner group rest by a broad foot on the inner part of the basilar membrane, close to its attachment to the spiral lamina, project obliquely forwards and outwards, and expand into a dilated head: the cells of the outer group also rest by a broad foot on the same membrane, incline forwards and inwards, and fit into a depression in the head of the cells of the inner group: these two groups of cells form the rods or pillars of Corti, and by their juxtaposition arch over an excessively minute canal enclosed between them and the basilar membrane, which may be named the canal of Corti. The inner rods are, however, more numerous than the outer, and Pritchard has shown that the rods increase in length from the base to the apex of the cochlea. Immediately internal and almost parallel to the inner group

of these rods, and adjacent therefore to the crista spiralis, is a row of compressed conical cells, which possess at their anterior ends short stiff hair-like processes; they are the inner hair cells of Deiters. Immediately external and almost parallel to the outer group of rods are four or five rows of hair cells, the outer hair cells, which are attached by their bases to the basilar membrane, whilst from the opposite extremity a brush of hairs projects through the reticular membrane. The outer hair cells are, according to Waldeyer, relatively of large size in man. The reticular membrane of Kolliker is a delicate framework perforated

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Fic. 84.—Vertical transverse section through the basilar membrane and organ of Corti. 6m, cs, sl, &c., as in fig. 83; 1, inner hair cell; tr, inner, and or, outer rod of Corti; o, outer hair cells; sp, supporting cells; en, cochlear nerve; ce, canal ot Corti; rm, reticular membrane; mi, membrana tectoria, (Adapted Jrom Waldeyer.)

by rounded holes. It extends parallel to the basilar mem-

brane from the inner rods of Corti to the external row of

outer hair cells, and through the holes in it the hairs of the latter project. It obviously acts as a support for the anterior ends of these cells, and binds together these important elements of the organ of Corti. The interval between the outer hair cells and the spiral ligament is occupied by cells of a more or less columnar form, the supporting cells of Hensen. Covering over the organ of

Nerre of hearing.

TONGUE. |

Corti, and separating it from the endolymph of the ductus cochlearis, is the membrana tectoria, which springs from the crista spiralis close to the attachment of the membrane of Reissner, passes outwards superficial to the membrana reticularis, and ends externally at the spiral ligament.

The origin, course, and distribution of the auditory nerve in the labyrinth will now be considered. The auditory nerve is the portio mollis of the seventh cranial nerve. It appears at the base of the brain at the lower border of the pons Varolii. Traced to its origin its roots wind round the vestiform body to the floor of the 4th ventricle, where they form the strie acoustics, and sink into the grey matter of the floor. Some of the fibres arise from an inner, others from an anterior collection of nerve cells, whilst others again ere connected with the cells in the restiform body, and probably with the flocculus of the cerebellum. Where the uerve emerges at the lower border of the pons it contains a cluster of nerve cells. The auditory nerve passes down the internal meatus, and divides into a vestibular and a cochlear division. The vestibular division enters the vesti- bule, and divides into five branches for the sacculus, utricu- Jus, and three ampullz of the membranous semicircular canals. Each branch enters a crista acoustica and forms a plexus, in the meshes of which nerve cells are imbedded. From this plexus fine non-medullated fibres arise, which enter the layer of cells on the surface of the crista, where they anastomose and form a very delicate plexus, from which fibres spring that in all probability join the central processes of the auditory cells.

The cochlear division enters a canal in the axis of the modiolus, and gives off lateral branches, which pass into the canals situated in the osseous spiral lamina. Here they radiate outwards to the membranous spiral lamina, and have connected with them collections of nerve cells forming the spiral ganglion. Beyond the ganglion they form a flat plexiform expansion, from which delicate nerves pass through a gap in the edge of the osseous lamina into the organ of Corti. In this organ the nerves, as Gottstein and Waldeyer have described, are arranged in two groups of fibres ; the inner group become continuous with the deep end of the inner hair cells; the outer group pass across the canal of

Corti and end in the outer hair cells, Hence these cells are the peripheral end-organs of the cochlear branch of the auditory nerve, or the auditory cells of the cochlea.

The perilymph of the labyrinth is set in vibration by the movements of the tympanic ossicles and the fenestra ovalis ; notion is thus communicated to the membranous labyrinth and the endolymph which it contains. The auditory hairs and cells would thus be set in motion, and the vestibular branches of the auditory nerve would be stimulated to con- duct sound-impulses to the brain. The movements of the perilymph in the scala tympani and of the endolymph in the ductus cochlearis would set in vibration the basilar mem- brane, and the auditory cells resting on it, by which the cochlear branches of the auditory nerve would be stimulated to conduct sound-impulses to the brain. It has been custom- ary for physiologists to regard the vestibule as the part of the labyrinth by which sound or mere noise is determined; the cochlea, as the part which determines variations and degrees of sound, as musical notes or harmony; the semi- circular canals, as determining the directions from which sound proceeds. But within the last two years experiments and arguments have been advanced almost simultaneously by Crum Brown and Mach in favour of the view that the semicircular canals act as peripheral end-organs for the sense of rotation, by which sense the axis about which rotation of the head takes place, the direction of that rotation, and its rate, are determined.

Tn the account of the development of the skeleton, p.

ANATOMY

895

831, it was stated that the external meatus, tympanum, Develop- and Eustachian tube are the remains of the first branchial ment of cleft of the embryo, that the tympanic ossicles are formed &

in the first and second visceral arches, and that the petrous

bone is ossified in the cartilaginous basis cranii. The membranous labyrinth apparently arises as an invagination

of the integument at the upper end of the second branchial

cleft. The invaginated fold then closes in to form a shut

sac, the primary auditory vesicle. Out of this vesicle the

three divisions of the labyrinth are successively produced,

and become enclosed by the petrous cartilage, which when ossified forms the osseous labyrinth. The epidermal invest-

ment of the invaginated tegumentary sac becomes trans- formed into the special cell structures within the mem- branous labyrinth, and the sub-epidermal connective tissue

forms its fibrous wall. The cochlear and vestibular nerves

form at the same time as the labyrinth, and become ae through the trunk of the auditory nerve with the

rain.

The Toncug, situated on the floor of the cavity of the Tongne. mouth, is the chief organ provided for the excitation of the special sense of taste, but the under surface of the soft palate participates to some extent in this property. The tongue is also highly endowed with the sense of touch. The structures concerned in the excitation of taste and touch are situated in the mucous membrane which envelopes the tongue. The tongue is also a muscular organ, and plays an important part in articulation, mastication, and deglutition. Its shape is flattened from above downwards, so that it presents an upper surface or dorsum and a lower surface. Its posterior part is broad, forms the base or root of the organ, and is attached to the hyoid bone. Its ante- rior extremity or tip is more or less pointed, and its lateral margins or sides are rounded.

The muscles connected with the tongue are arranged in pairs, and form three distinct groups, Viz., accessory, extrin- sic, and intrinsic muscles. The accessory muscles are the stylo-hyoid, digastric, mylo-hyoid, genio-hyoid, omo-hyoid, sterno-hyoid, and thyro-hyoid, already referred to on page 836, which act upon the hyoid bone, and thus indirectly are concerned in the movements of the tongue. The extrinsic muscles pass from adjacent parts into the substance of the tongue, and are as follows :—The stylo-glossus arises from the tip of the styloid process and the stylo-maxillary liga- inent ; it runs forwards along the side of the tongue to the tip. The hyo-glossus is divided into three parts ; a, basi- glossus, which arises from the body of the hyoid ; 3, cerato-glossus, from the great cornu of the hyoid; c, chondro- glossus, from the small cornu of the hyoid. The fibres from these origins ascend into the side of the tongue. The genio-hyo-glossus arises from the upper tubercle of the symphysis of the lower jaw, its fibres radiate into the sub- stance of the tongue along its whole length from base to tip ; this muscle is separated from the corresponding muscle of the opposite half of the tongue by a mesial septum of fibrous tissue. The palato-glossus arises in the substance of the soft palate, and descends to the tongue in the anterior pillar of the fauces. The zntrinsic muscles lie in the sub-stance of the tongue itself, and are as follows :—The lingua- lis superior (noto-glossus), consisting of longitudinal fibres, which extend from the base to the tip beneath the mucous membrane of the dorsum ; the lingualis inferior, consisting of longitudinal fibres, which extend from the base to the tip along the under surface between the hyo-glossus and genio- hyo-glossus; transverse muscular fibres, which spring from the mesial fibrous septum and curve outwards and upwards to the sides of the tongue; vertical fibres, which pass through the substance of the tongue from the dorsum to the under surface, The extrinsic and intrinsic muscles can not only

move the entire tongue within the cavity of the mouth, protrude it between the lips, and again retract it, but can modify its form ; thus the dorsum can be flattened, made convex or concave, the margins can be raised or depressed, and the tip elevated or depressed.

The mucous membrane of the tongue forms a part of the general mucous lining of the mouth; it covers the dorsum, tip, sides, and under surface; is reflected from the under surface to the floor of the mouth, where it forms the franum or bridle of the tongue, and is reflected also from the base to the epiglottis as the frana of the epiglottis, as well as over the tonsils and anterior palatine pillars. 'This mem- brane has its free surface elevated into multitudes of fine processes, called the papille of the tongue, some of which are simple, others compound. The simple papille are situated on the back part of the dorsum and the under sur- face of the mucous membrane, as well as scattered between the compound papille; they are simple conical elevations of the membrane. The compound papille are arranged in three groups, named filiform, fungiform, and cireumvallate papillae. The jiliform papille, elongated and thread-like, are the smallest and most numerous, and cover the dorsum in front of the circumvallate papille. The fungiform or club-shaped are scattered over the anterior and middle parts of the dorsum, and at the tip and sides. The circumvallate papille, seven to twelve in number, form a V-shaped figure on the dorsum towards its base ; a depres- sion in the mucous membrane, called foramen caecum, marks the apex of the V. These are the largest papille ; each is sunk in a vallum or trench-like depression of the mucous membrane, which isolates it from the surrounding surface. The compound character of these papille is due to each having projecting from it numerous small secondary papille. The epithelial covering of the filiform papille is characterised by the peculiar modification which the tessel- lated epithelium of the mouth has undergonc; the cells have become cornified and elongated into dense, imbricated brush-like processes. In the carnivora the epithelium is so hardened as to form sharp spines, with the points turned backwards, which give to the tongues of these animals a rough prickly character. In the fungiform and circumval- late papille the inequalities between the secondary papillze, which project from them, are filled up by the tessellated epithelium, so that the surface of the compound papille bas a smooth appearance. Both the simple and compound

Fic. 85.—Section through a gustatory lamella of the rabbit' j ug] L t's tongue. G, gusta- ee woh ped y mpg the epithelial layer of the mueous

ee Sara : Ve capil- -vessels in the sub-epithelial conneetive ti i “1 eparati by A. B. Stirling.) Dp eetive tissue. (From a preparation

papille are highly vascular; the lingual artery not only supplies the muscular substance of the tongue, but gives off fine branches to the mucous membrane, These branches end in capillaries, which form simple loops in the simple papille, but in the compound papillz the capillaries are so multiplied that each secondary papilla has a capillary loop within it. The tongue is provided with several nerves. The. hypo-glossal nerve supplies its muscular structure, but

the infcrior lingualis apparently receives a branch from the chorda tympani of the facial. The lingual branch of the fifth is distributed to the mucous membrane of the anterior two-thirds of the tonguc: it breaks up into minute branches, which enter the fungiform and filiform: papille, but their exact mode of termination has not been precisely ascertained, though end-bulbs and gustatory bodies are said to have been seen in connection with some of the terminal branches. The glossal branch of the glosso-pharyngeal is distributed to the mucous membrane of the root of the tongue aud of the circumvallate papillae. In connection with its terminal branches peculiar flask-shaped organs, called gustatory bulbs or bodies, have recently been described by Lovén, Schwalbe, and Engelmann, in the sides of the circumvallate papille. These have beeu found in large numbers in lamellated folds of the mucous membrane of the posterior part of the side of the rabbit’s tongue, which folds may appropriately therefore be called gustatory lamelle. When sections are made through one of these folds, or through a circumval- late papilla and the trench which surrounds it, numerous flask-shaped gustatory bulbs may be seen in the epithelium, which covers the side of the papilla and the opposite side of the trench, The bottom of each flask is next the sub-epithelial tissue, whilst its short neck opens on.the surface by a mouth, the gustatory pore ; similar bodies, though in much smaller numbers, have also been seen in the fungiform papille. Each gustatory body consists

of two diffe- 5. 94 rent forms of cells, named covering cells and gustatory cells. The covering cells are elongated, nucleated spindles, which, arranged in layers, form the envelope of each gustatory bulb, and reach from the bottom to the mouth of the flask; they enclose the gustatory cells. The gustatory cells are attenuated, homogeneous, and highly refractile cells, which possess an elliptical nucleated body with two processes, a central and peripheral. These cells occupy the axis of the gustatory bulb. 'The peri- pheral process, broader than the central, sometimes ends in a short hair-like tip, which almost reaches the gus- tatory pore; the central process extends to the base of the flask, and often divides into small branches.

—s, superficial eovering eells of a gustatory bulb; G, gustatory cell, with p, its peripheral, and c, its central process.

of a nerve fibre. The branches of the glosso-pharyngeal nerve, which are distributed to the back of the tongue, enter the circumvallate papille, and form a minute plexus, with groups of nerve cells interspersed in it, from which bundles both of medullated and non-medullated fibres pass to the basis of the gustatory bulbs ; and it is believed that the finest non-medullated fibres are continuous with the peripheral processes of the gustatory cells, which are there- fore regarded as the peripheral end-organs of the uerve of taste, and by the excitation of these bodies gustative or taste sensations are produced. As the glosso-pharyngeal is the nerve distributed to the cireumvallate papillz, where these gustatory bulbs are especially found, it is therefore the special nerve of taste ; but as these bulbs have also been sparingly seen in the other papilla, where the lingual nerve is distributed, that nerve probably acts in a minor degree as a nerve of taste, though its special function is undoubtedly that of a nerve of touch. The gustatory bulbs are not penetrated by blood-vessels, but, as Fig. 85 shows, the vascular sub-epithelial tissue is prolonged upwards along the sides of the bulbs almost as far as the plane of the gustatory pore. Key, Beale, and other observers have described special modifications of the epithelium in connection with the terminations of the gusta- tory nerves in the frog. The mucous membrane of the

This Nerve of process is varicose, and not unlike the axial cylinder taste.

SKIN. |

tongue contains numerous small tubular or branched glands, more especially on the dorsum near its root, which secrete mucus. Depressions also occur in this part of the mucous membrane, around the walls of which groups of lymphoid cells are collected in the sub-epithelial connective tissue, which have an arrangement closely resembling the structure of the adjacent tonsils,and form an example of adenoid tissue,

The Sgrn, or Integument, invests the entire outer surface of the body, and contains structures by the excitation of which the properties of things are determined by the sense of touch. The skinalso contains accessory structures, as the nails, hairs, sebaceous glands, and sweat glands. The skin consists of a non-vascular cuticle or epidermis, and of a vascular and sensitive corium, or cutis vera.

The Cuticle, Epidermis, or scarf skin, forms the outer covering of the skin, and protects the cutis. It is a laminated structure, and consists of numerous layers of cells superimposed on each other. As these cells cover a free surface exposed to the air, they belong to the epithe- lum group. The thickness of the cuticle varies in diffe- rent localities from th to 345th inch ; where the skin is frequently exposed to pressure, as in the soles of the feet, the cuticle is the thickest and hardest; and the hands of those accustomed to manual labour have a hard and horny cuticle. The increase in thickness in these localities is for the purpose of protecting the highly sensi- tive cutis from injury. The outer surface of the cuticle in many parts of the body, especially the palm of the hand and

the fingers, is marked by ridges and furrows; the ridges'

indicate the position and arrangement of the papillz of the cutis, whilst the furrows are due to the sinking of the cuticle into the spaces between the rows of papille. The mouths of the sweat glands open on

the surface of these ridges. The cuticle is divided into two strata, The super- Jicial horny stratum consists of layers of flat, polygonal scales like a tessellated epithelium ; the cells in the superimposed layers firmly adhere to each other by their surfaces, and in vertical sections this stratum presents a fibrous appearance ; but the cells may be readily isolated by digestion in a caustic alkali. The deeper or mucous stratum, or rete Malpighii, lies next the cutis, and closely follows the undulations of its papillary surface. The cells forming the layer next the cutis are columnar in shape, those in the layers immediately succeeding are rounded or cubical, whilst those next in order are polygonal, and not unfrequently possess pointed processes or prickles projecting from them, hence the name, prickle cells, employed by Schultze. The cells which lie next the horny stratum assume the scale-like form. It is in the cells of the mucous stratum that the colouring matter of the skin is found, which in the fair races of men forms the isolated coloured spots called freckles and moles, but in the dark races the pigment granules are uniformly distributed through the cells of this stratum. The super- ficial cells of the horny stratum of the cuticle are continually being shed, so that the cells of the deeper layers gradually approach the surface, and new cells are continually being formed in the deeper part of the rete Malpighii. The cuticle is closely adherent to the cutis in the healthy living skin, but on the application of a blister, or when putrefac- tion sets in after death, it separates from it.

The Cutis vera.—When the cuticle is removed the surface of the cutis is seen to be studded with multitudes of minute elevations, the papilla of the skin. These papille are either simple conical structures, or compound with two or three branches. They are largest in the palm and sole, being from 445th to y4,th of an inch high, and are arranged in ridges, but more usually they are much shorter and irregularly distributed. The cutis is formed of connec-

tive tissue, in which stellate connective tissuc corpuscles and elastic fibres are abundant. The deeper surface of the connective tis- sue of

the cutis is reticulated, and is continu- ous with the bundles of con- nective tissue that form the areolar subcu- taneous tissue. In the papillz themselves the fibres of the connective tis- sue are not so well marked, and the surface of the papille possesses more of a homoge- neous aspect, which gives rise to the ap- pearance de- scribed as a basement membrane, The cutis is highly vascu- lar ; the small arteries which go to the skin give off branches to the lobules of fat in the subcutaneous tissue, then pene- trate the cutis, and form a plexus from which capillaries arise, which enter the papillw, and form vascular loops within them. The lymphatic vessels of the skin are numerous; they form a plexus in the cutis, which lies beneath the vascular plexus, forms, as Neumann's injections show, a network around both the sebaceous and sweat glands, and gives off capillary loops into the papilla. The nerves of the skin are the cutaneous branches both of the spinal and of certain of the cranial nerves, the origin and distribution of which have already been described. They run through the subcutaneous tissue, and enter the deep surface of the cutis, where they divide into branches.

Fig. 87.—Vertical section through the skin and snbcuta- neous tissue. As, ho ny stratum, and rm, rete Malpighi of cuticle; pp, papille of cutis; ¢, a touch corpuscles | with n, a nerve fibre; bc, a blood and Jc, a lymph capillary; ct, connective subcutaneous tissue; 7, fat lobule; s, a sweat gland with its duct.

from which smaller branches arise to enter the papilla, and terminate, more especially in the skin of the palm of the hand, fingers, and sole, which are the surfaces most sensitive to touch impressions, in the tactile or touch corpuscles. The touch corpuscles discovered by Wagner and Meissner are the peripheral end-organs of the nerves of touch. They may be single or compound; are usually ovoid inform, not unlike a minute fir cone; and are trans- versely marked, from the transverse direction of the nuclei of fusiform cells which form an investing capsule. Each single corpuscle and each division of a compound corpuscle is penetrated by one, and, according to Thin, by never more than one, medullated nerve fibre, but the exact mode of termination of the axial cylinder of the fibre has not been ascertained.

Virchow and other German observers have stated that the papille which contain capillaries do not contain nerves or touch corpuscles, and we versa ; but Dalzell and Thin have shown that certainly the majority of papille that contain nerve fibres and touch corpuscles are also vascular papilla. Non-medullated nerve fibres ascend to the surface of the cutis, and, according to Lan- gerhans, pass into the rete Malpighii between the cells of the mucous layer.

WNazls,—On the back of the last phalanx of each thumb, Nails.

TI. — 113

As these pass Nerves of towards the papillae they unite to form a nerve plexus, touch.

flair.

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finger, and toe is situated a firm horny curved plate, the nail, Each nail rests on a bed, the surface of which is formed of the cutis, which also overlaps the side and root of the nail; thus the nail fits into a groove formed of the cutis something after the manner in which a watch-glass {its into its rim. A nail is merely a special modifica- tion of the cuticle, the cells of the superficial stratum of which are more horny, harder, and more firmly adherent to each other than in the cuticle proper. Deeper than the horny stratum is the rete Malpighii of the nail, the cells of which are soft, as in the cuticle itself. The cutis forming the bed of the nail is studded with papillz, which are arranged in almost parallel rows, and are highly vascular. Nails grow both in length and thickness : the increase in thickness is due to the formation of nerve cells on the bed of the nail ; the increase in length takes place through the formation of nail cells at its root, and as the nail is thus slowly pushed forward it requires to be cut at intervals. At the root, sides, and below the free border of the nail the cuticle is continuous with the substance of the nail itself.

Hair.—Projecting from the surface of the skin are multi- tudes of elongated cylindrical horny structures, the hairs. In the skin of the scalp, the armpits, and the pubis, they are long and numerous; but in the eye-brows, eye-lashes, vibrissee of the nostrils, and surface of the body generally, they are short. They are stronger and thicker in the skin of man than of woman, more especially on the cheeks, lips, and chin. Hairs do not grow from the skin of the palms aud soles, the back of the ungual phalanges, and the surface of the upper eye-lids. ach hair is partially em- bedded in a depression of the skin, called a hair follicle. 'The deeper end of the follicle is somewhat dilated, and has in it a papilla, the hair papilla. The wall of the hair follicle is formed of the constituent structures of the skin ; the outer part of the wall belongs to the cutis, and has been described as arranged in three layers, the external, middle, and inner layer of the hair follicle. The external and middle layers are formed of connective tissue, with blood-vessels ; whilst the inner, sometimes called the wtreous layer, is trausparent and homogeneous, and continuous with the so-called base- ment membrane of the cutis. The inner part of the wall of the hair follicle, or the root-sheath, belongs to the cuticle, and consists of two layers, the outer and inner root-sheaths. The outer root-sheath is continuous with the rete Malpighii, and consists of cells similar to those of that stratum. The wner root-sheath is continuous with the horny stratum of the cuticle, and consists of elongated scale-like translucent cells in which no nuclei can be seen.

A hair possesses a root, a shaft, and a tip; the root is embedded in the hair follicle, whilst the shaft and tip form the free projecting part of the hair. In the human hair the substance of the hair is composed of a jibrous-looking horny material, which by the action of strong sulphuric acid is resolved into elongated, closely compacted, fusiform cells, which in coloured hairs contain pigment granules. In the thicker hairs the cells in the axis of the hair are polygonal, contain air, and form a central pith or medulla. The hair is invested by imbricated scale-like cells, which form the hair cuticle. In different animals the size and relative pro- portion of the cells of the cuticle, medulla, and fibrous part of the hair present many modifications, 'The wool of the sheep has its cuticle scales, with well-defined serrated margins, so that the

hair of this animal is well adapted for felting into cloth; in the bat, also, the cuticle cells are large and strongly serrated. The bristles of the pig, again, have the fibrous part of the hair largely developed. In the deer tribe the hair consists of polygonal medulla-like cells, which contain air. The root of the hair dilates at its deeper end into a bulb which embraces the hair papilla. ft is softer in texture than the shaft, so that the cellular

structure of the hair is more easily demonstrated. Next the papilla the cells are like those of the rete Malpighii, but when traced onwards to the shaft they are seen to become differentiated, both in structure and composition, into the proper hair cells. The root is enveloped in a special sheath, termed the sheath of Hualey, composed of nucleated cells, which sheath, in the more superficial part of the follicle, blends with the internal root-sheath. The hair papilla bears to the hair the same relation as a papilla of the cutis has to its investing cuticle, so that a hair is to be regarded as a specially modified cuticular structure. The human hair papilla is vascular, but no nerves have been traced into it. In the tactile hairs of the mammalia, how- ever, nerves have been traced into their papille.

The bristles, feathers, claws, hoofs, the horny envelope of the horn cores in the hollow horned ruminants, and various tegumentary spines and scales, present in many animals, are, like hairs and nails, special modifications of the tegumentary system.

Kach hair follicle has opening into it the excretory duct of a small gland, named a sebaceous gland. This gland consists of the excretory duct, and of from two to twenty grape-like saccular expansions which open into the duct. The wall of the sacculi and of the duct is continuous with the vitreous layer of the outer wall of the hair follicle. Capillary blood-vessels are distributed on the outer wall of the sacculi. The sacculi are almost entirely filled with polygonal cells containing drops

of fat, which cells are continuous with the epithelial lining of the gland duct and the cells of the outer root-sheath. These glands secrete a

fatty material, which lubricates the surface of the hair.

Sometimes a small parasite, called Acarus folliculorum, is found in a sebaceous gland.

Some years ago Kélliker described one or two bundles of smooth muscular fibres extending from the wall of the hair follicle to the deep surface of the cutis; these muscles, named arrectores pil, by their contraction erect the hairs, that is, cause them to become more prominent, and produce the condition of skin, called cuts anserina or goose skin, well known to occur when cold is applied to the surface of the body.

Hairs are developed about the 4th month of embryo life, within depressions in the cutis, which form the future hair follicles, filled with cells similar to, and continuous with, those of the rete Malpighii. A papilla forms at the bottom of this depression, around which the cells become arranged in a bulbous expansion. The cells, in line with the bulb, elongate and harden, and group themselves so as to form the shaft of the young hair, which at this stage is com- pletely buried within the follicle. A rapid production of new cells takes place at the bulb, the hair consequently increases in length, and is pushed outwards through the superficial horny stratum of the cuticle, which had closed in the mouth of the depression or follicle in which the hair is produced. At the same time, the more external cells within the follicle are pushed outwards towards its wall, and form the cells of the root-sheath. When a hair is pulled out of its follicle the cells of the root-sheath are drawn out along with it. A new hair will be developed at the bottom of a follicle from which the hair has been shed as long as cells continue to be formed around the papilla. When the growth of cells ceases within the hair follicles then permanent baldness is the result.

The sebaceous glands are developed as bud-like offshoots from the hair follicles, filled, like the follicles themselves, with cells continuous

with those of the rete Malpighii. Instead of the cells in these buds differentiating into a hair, they become filled with fatty particles, and the wall of the bud assumes the characteristic sacculated form of the gland.

Sweat Glands.

Vessels.

Circulation of the blood

VASCULAR SYSTEM. |

Sweat Glands, or sudoriparous glands, are found generally distributed throughout the skin, but are most abundant in the palms and soles, where they number 2500 to 3000 in each square inch. In the skin of the back, again, there are only between 400 and 500 in the square inch. Each gland consists of a ball-like body lying in the subcutaneous tissue, from which a tubular duct proceeds through the skin to open on its free surface. The ball is composed of a convoluted tube continuous with the tubular duct, and terminating in a blind end. The wall of the gland tube consists of a delicate nucleated membrane lined by columnar secreting cells. It is surrounded by connective tissue containing capillary blood-vessels. As the gland-duct pierces the cutis it passes between the papille; in its course through the cuticle it pursues a spiral direction, and has its walls formed, not of a distinct membrane, but of the cuticle cells themselves. The epithelial lining of the duct is continuous with the cells of the rete Malpighii of the cuticle. Tn the axilla and groin the sweat glands are much larger than in the skin generally. 'The sweat glands arise as flask-shaped pouches of the rete Malpighii projecting into the cutis, which in course of time become elongated into tubes, and the cells contained in which become the secreting cells of the gland.

VASCULAR SYSTEM.

The human body and the bodies of all the more highly organised animals are traversed by numerous tubes or pipes, technically called

Vessels, some of which in man are nearly an inch in diameter, others so small as to require a micro- scope for their examination, others again of every interme- diate size. In connection with the vessels is a central organ, the Heart. The heart and the vessels collectively constitute the Vascular System. Of these vessels some contain blood, and form the Blood-vascular system ; others contain lymph, and form the Lymph-vascular system. The lymph-vascular system is not independent of the blood-vascular system, but communicates with it at several points. The vascular system is a hydraulic apparatus, possessing a pump, pipes, and valves, The heart is the pump, which works, not by the movements of a piston, but by the contraction of its muscular walls ; the vessels are the pipes, which convey the contained fluid, and they are provided in certain locali- ties with valves for modifying its flow.

Buioop-VascuLaR SystEm.—The movement of the blood in the blood-vascular system is called the circulation of the blood. In the lower Vertebrata the heart is a single organ, and the blood flows from it through the vessels back again into the part of the heart from which it had proceeded, forming a simple circulation. In man and the higher ver- tebrates the heart is a double organ, 7.e., it consists of a right and left portion, intimately united to, but not directly communicating with, each other. The blood which flows from its right side passes through vessels which traverse the lungs, and is conveyed to the left side of the heart ; whilst the blood which flows from the left side passes through vessels which traverse the body generally, and is conveyed to the right side of the heart. This is called a double circulation ; that which appertains to the lungs is the pulmonic circulation ; that which appertains to the body generally is the systemic circulation. The vessels which carry the blood away from the heart are called arteries ; those which convey it back to the heart are veins. The arteries and veins do not communicate directly with each other, but through the intermediation of a network of extremely minute vessels, the capillaries. Hence, both in the pulmonary and systemic circulation, the blood in its passage from the arteries into the veins must go through capillaries. The blood which flows from the left side of the heart into the systemic arteries is pure or arterial blood ;

as it traverses the systemic capillaries it parts with certain

of its constituents to nourish the organs and tissues, and as 1t receives from them waste products it becomes impure blood ; in which condition it flows back to the right side of the heart by the systemic veins as venous blood ; hence the right side of the heart is often called the venous side. The blood which flows from the right side of the heart along the pulmonary artery is this impure blood; as it traverses the pulmonary capillaries it is purified by the action of the air in the lungs, and is changed into arterial or pure blood, in which condition it flows back by the pulmonary veins to the left side of the heart, which consequently is called the arterial side. The object of the pulmonary circulation, therefore, is to reconvert into pure blood the blood which has been rendered impure during its passage through the systemic capillaries,

The Heart.—The heart is a hollow muscle contained Heart.

in the cavity of the chest, and enclosed within a bag called the Pericardium. The pericardium, with its enclosed heart, occupies the space called mediastinwm, between the two lungs ; lt lies therefore behind the sternum, and in front of the spinal column, but projects more to the left than to the right side of the mesial plane. The bag of the pericardium is formed externally of a strong fibrous membrane, which is attached below to the central tendon of the diaphragm, but blends above with the sheaths of the great vessels which pass to and from the heart. When the bag is cut open its inner surface 18 seen to possess a smooth glistening serous aspect, for it is lined by a layer of squamous endothelium, which layer is continuous with the serous membrane that invests the heart, and forms the visceral layer of the pericardium. The continuity of the serous lining of the bag with the serous investment of the heart takes place where the great blood-vessels pierce the fibrous bag.

The heart lies obliquely from above downwards, from right to left, and from behind forwards. For descriptive

Fic. 88.—The Thoracic Viscera.

In this diagram the lungs are turned to the side, and the pericardium re-

moved to display the heart. a, upper, a', lower lobe of left lung; 5, upper; v, middle, 6", lower lobe of right lung; c, trachea; d, arch of aorta; e, superior vena cava; f, pulmonary artery; g, left, and A, right auricle; &, right, and J, left ventricle; m, inferier vena cava; n, descending aorta; 1, innominate artery; 2, right, and 4, left common carotid artery; 3, right, and 5, left sub- clavian artery; 6, 6, right and left innominate vein; 7 and 9, left and right interna) jugular veins; 8 and 106, left and right subclavian veins; 11, 12, 13, left pulmonary artery, bronchus, and vein; 14, 15, 16, right pulmonary bronchus artery, and vein; 17 and 18, left and right coronary arteries.

purposes it may be regarded as possessing a base, an apex, an anterior and a posterior surface, a right and left border. The base les backwards, upwards, and to the right, opposite

the 4th to the 8th dorsal vertebra. The apex is directed forwards, downwards, and to the left, opposite to the inter- val between the 5th and 6th left ribs. The heart has on its surface grooves which indicate its division internally into four chambers, two in its right half, two in its left half. The right chambers are the right auricle and right ventricle. The left chambers are the left auricle and left ventricle, All these chambers are lined by a smooth membrane, the endocardium, which is continuous on the one hand with the lining membrane of the veins, on the other with the lining membrane of the arteries.

The Right Auricle occupies the right part of the base of the heart. It consists of a large dilated portion, the sinus venosus, and of a small ear-shaped appendage, the auricula. Its muscular wall is smooth

internally, except in the auri- cula and adjacent anterior wall of the sinus venosus, where it is thrown into parallel ridges like the teeth of a comb, and named musculi pectinatt. Into the sinus venosus open the great systemic veins or vense cave. The superior vena cava conveys to the auricle the systemic blood that has been circulating in the body above the diaphragm ; it opens by a patent mouth into the upper and back part of the sinus venosus. The znferior vena cava conveys to the auricle the blood that has been circulating in the parts of the body below the diaphragm ; it opens into the lower and back part of the auricle, and at its mouth is a rudimentary valve, the KHustachian valve. Close to its orifice is the mouth of another large vein, the coronary venous sinus, which also possesses a small valve. Several minute open- ings, the foramina Thebeswi, scattered over the inner wall of the auricle, are the mouths of small veins ramifying in the wall itself. Through these various orifices the venous blood pours into the auricle, and then flows into the right ventricle through a large orifice of communication between them. 'The right auricle is separated by a partition, the auricular septum, from the left auricle. On the surface of this septum is a depression, the fossa ovalts, surrounded by a raised border, the annulus ovalis, with which border the inner end of the Eustachian valve is continuous. Before the birth of the child the septum is perforated by a hole, called foramen ovale, through which the blood flows directly into the left auricle, but this foramen is obliterated after the birth of the child.

The Faght Ventricle forms the right border, a large part of the anterior surface, but only a small part of the posterior surface of the heart. It is shaped somewhat like a flattened cone, its apex being directed downwards towards the apex of the heart, its base to the corresponding auricle. 'The inner surface of its wall is very irregular, owing to the muscular bundles being elevated into strong ridges, called column carne. 'Two, or it may be three, of these fleshy columns project like nipples or big papille into the cavity of the ventricle, and are called muscult papillares. Attached to the free apex of each papillary muscle are several fibrous threads, the chorde tendinee, which, by their opposite extre- mities, are connected to the segments of a large valve situ- ated around the opening between the right auricle

and ventricle, The right auriculo-ventricular opening, situated at the base of the ventricle, is sufficiently large to admit three fingers, and possesses a valve which consists of three large pointed segments or cusps(hence the name tricuspid given to it), between which three small intermediate cusps lie. One of the large cusps lies opposite the anterior wall of the ven- tricle, another opposite the posterior, whilst the third is between the auriculo-ventricular and pulmonary openings. The cusps are flattened triangular folds of membrane con- nected by their bases around the opening ; when the valve 1s not in action the apex of each cusp hangs pendulous in the ventricle : one surface is smooth, and looks to the cavity of the ventricle, the other surface is rough and directed to

its wall; to this rough surface, to the apex, and to the edges of the cusp, the chords tendinez are attached. As the musculi papillares, from which the chorde tendinez spring, lie opposite the intervals between the cusps, the chord tendineze from any given papillary muscle divide them- selves into two groups, one for each of the two cusps between which it is situated. Attention has recently been

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Fia. 89.— Cavities of the right side of the Heart.

a, superior, and 0, inferior vena cava; ¢, arch of aorta; d, pulmonary artery; e, right, and f, left auricular appendage; g, fossa ovalis; h, Eustachian valve; k, mouth of coronary vein; 1, m, n, cusps of the tricuspid valve; 0, 0, papil- lary muscles; p, semilunar valve; q, corpus Arantii; r, lunula.

drawn by Rolleston to a band which passes from the base of the anterior papillary muscle to the septal wall of the ventricle, As it

prevents over-distension of the ventricle, he has named it the moderator band. The base of this ventricle forms to the left and in front of the auriculo- ventricular opening, a funnel-shaped prolongation, the conus arteriosus, from which the pulmonary artery arises, through the intermediation of a strong fibrous ring. Surrounding the mouth of this artery is a valve called semzlunar, which consists of threc semilunar segments. Each segment is attached by its convex border to the artery where it springs from the ventricle. The opposite border is free, and pos- sesses at its centre a minute nodule, the corpus Arantii, from which slender threads curve outwards at the free border and in the substance of the valve to strengthen it. A thin lunated portion lies immediately within the free border. One surface of the valve is convex, and directed to the lumen (¢.¢., the space contained by the walls) of the artery; the other is concave, and directed to the wall of the artery, and between it and the wall is a pouch named sinus of Valsalva. 'The pulmonary artery extends upwards and to the left for about 1? inch, and then divides into two branches, one for each lung. The right ventricle is com- pletely separated from the left by the ventricular septum, which passes obliquely from left to right, and from before backwards, so that it forms the posterior wall of the right ventricle and the anterior wall of the left.

The Left Auricle occupies the left part of the base of the heart, and, like the right auricle, consists of a dilated sinus venosus and an ear-shaped auricula. Its muscular wall forms a smooth surface internally, except in the auricula, where the ridge-shaped musculi pectinatt occur. Opening into the sinus are the orifices of the four pulmonary veins, two from the right, two from the left lung; these

orifices are without valves. At the lower part of the auricle is the large orifice of communication between it and the base of the left ventricle.

The Left Ventricle forms the left border, the apex, a large part of the posterior surface, but only a small part of the anterior surface of the heart. It is conical in form, its apex is at the apex of the heart, the base at the corre- sponding auricle. Asin the right ventricle, the inner

surface of its wall is elevated into fleshy columns, two of which project like nipples into the cavity and form musculi papillares, which have chorde tendinee connected with them. 'The left auriculo-ventricular opening is large enough to admit two fingers. It possesses a valve, which consists of two large pointed segments or cusps, between which two small intermediate cusps lie, hence it is called the bicuspid valve ; and as these cusps are placed one in front of the other like the segments of a bishop's mitre, the name mitral valve is often given to it. The cusps agree in shape, general arrangement, and mode of attachment with those of the tricuspid valve, but they are stronger; and as the more anterior segment lies obliquely between the auricular and aortic orifices, both its surfaces are smooth. From the base of this ventricle the great systemic artery or aorta arises through the intermediation of a strong fibrous ring. The mouth of the aorta is surrounded by a three segmented semilunar valve, similar to the semilunar pulmonary valve, but with thicker and stronger segments, and possessing 'more strongly marked sinuses of Valsalva. The base of each ventricle has therefore two openings in it, one for communication with the auricle, the other with the great artery arising from the ventricle. The auriculo-ventricular openings are the most posterior, and almost in the same plane; the aortic opening lies in front of the interval between the two auriculo-ventricular, and the pulmonary opening is in front of the aortic.

The walls of the cavities of the heart are formed of striped muscular fibre, over the contractions of which the will exercises no control. The fibres are collected into fasciculi, which have a reticulated arrangement, and the fibres themselves branch and again unite to form a compli- cated network. 'The fibres of the walls of the auricles are distinct from those of the ventricles, so that the auricular and ventricular compartments are connected together, not by an interchange of muscular tissue, but by an intermediate ring-like arrangement of fibres of connective tissue. The muscular fasciculi of the auricles are arranged in two strata. The deeper stratum consists of fibres proper to each auricle, some of which run obliquely in the wall, others form the musculi pectinati, surround the auricula, and are prolonged in rings into the coats of the vene cave and pulmonary

veins, whilst fibres extend longitudinally and obliquely along the wall of the coronary venous sinus. The superficial stratum consists of fasciculi, which run obliquely from one auricle to the other on both the anterior and posterior surfaces, and are said to be prolonged into the auricular septum.

The muscular wall of the ventricles is much thicker than that of the auricles, and the wall of the left ventricle is about three times thicker than the right. The fibres vary in their direction in different parts of the thickness of the ventricular walls. The superficial ex- ternal fibres run obliquely from above downwards, and from right to left, and on the anterior surface of the ven- tricles dip into the anterior ventricular groove to enter the septum, whilst on the posterior surface they extend across the posterior ventricular groove ; at the apex of the heart they turn inwards in a whorl-like manner, and, as was known to Lower and Gerdy, become continuous with superficial fibres on the inner wall of the ventricle ; at the base of the ventricles they turn round the border of the

auriculo-ventricular openings, and, as Pettigrew has shown, become continuous with these superficial internal fibres which run in the reverse direction. 'The internal fibres are also prolonged into the musculi papillares, the chordx tendinez springing from which serve therefore as tendons of insertion for these muscles. If the substance of the wall be now dissected the fibres situated in the centre of the wall are seen to lie in the horizontal plane. Various anatomists have described these fibres of the ventricles as arranged in layers. Lower recognised two layers spirally crossing each other ; Haller, three ; Wolff, three in the right and six in the left ventricle. Pettigrew at one time believed he could dissect nine layers, but has subsequently reduced the number to seven—three external, a fourth or central, and three internal. He conceives that the fibres of the three external layers run in a spiral direction from left to right downwards, the first layer being more vertical than the second, and the second than the third,

whilst the fibres of the fourth or central layer are horizontal. The three internal layers also run spirally, but in the reverse direction from the external, with which they become con- tinuous both at the base and apex. The subdivision of the ventricular wall into such precise and determinate layers as is implied in the descriptions of Pettigrew is, however, to some extent an artificial procedure. 'There can be no doubt, as his dissections so beautifully show, that the direction of the fibres in the ventricular wall varies at different depths ; but owing to the reticulated arrangement of the fibres, not only are those connected together which lic in one of the so-called layers, but they also anastomose with the fibres in the layer contiguous to it on either aspect. Hence when one layer is peeled off, that imme- diately subjacent exhibits, not a smooth face, which it would have done had the definition of the layers been dis- tinct, but a rough appearance, due to the tearing through of intermediate connecting muscular fibres. Owing to these connections the substance of the wall of the ventricle, as Henle's dissections show, may, with the exception of the superficial internal and external fibres, be split up into lamellse, which extend either horizontally, obliquely, or in an arched manner through the wall between its two sur- faces ; and the surfaces of those lamellze are not parallel to the wall of the ventricle, but are directed upwards and downwards.

Except at the fibrous rings, where both the white and yellow fibres are distinct, the connective tissue of the heart is small in quantity. The endocardial lining consists of connective tissue with elastic fibres, with a layer of endo- thelium on the free surface; and Schweigger-Seidel has also described smooth muscular fibres in it. Hence, as Luschka has stated, the endocardium represents not merely the inner coat of the blood-vessels but all the structures of the vascular wall. Purkinje described fibres beneath the endocardium, which are now regarded as imperfectly formed striated muscular fibres. The valves are folds of the endo- cardium, enclosing fibres continuous with those in the fibrous rings: the cuspidate auriculo-ventricular valves receive fibres from the chorde tendinea:.

The heart is well supplied with blood, not by the blood which flows through its cavities, but by two special coro- nary arteries which ramify in its walls, and end in nume- rous capillaries lying between the fibres. From these capillaries the coronary veins arise, which join to form the coronary venous sinus. Lymphatic vessels occur both in the endocardium and pericardium, and apparently ramify in the muscular wall. The nerves of the heart have been dissected especially by Scarpa, Remak, Lee, and Pettigrew, and numerous small ganglia described in connection with them (see p. 883).

The blood flows along the great veins into the auricles,

Arteries.

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and is forced by the contraction of their muscular walls through the auriculo-ventricular openings, the valves of which open outwards, into the ventricles. When the ven- tricles are distended their muscular walls contract and force the blood into the arterics—the right ventricle into the pulmonary artery, the left into the aorta—the valves at the mouth of each artery opening outwards to allow of the free passage of the fluid. 'To prevent, during the ventricular contraction, the regurgitation of blood into the auricles, the auriculo-ventricular valves are floated away from the sides of the ventricle across their respective openings, and by the apposition and slight overlapping of their edges temporarily close the openings. The tilting upwards of the valves into the auricles is prevented by the contraction of the musculi papillares, and their connection with the cusps of the valve through the chorde tendine. Pettigrew has shown that casts of the ventricular cavities, more especially of the left, have the form of a double cone, spirally twisted froin right to left, and has described the blood as forced in spiral streams against the under surface of the segments of the valve, which are twisted and wedged into each other so as to prevent regurgitation. 'he propulsion of the blood into the arteries distends the elastic walls of those tubes ; but when the ventricular contraction has ceased, the elastic wall recoils, and the blood is propelled onwards in the circula- tion. The regurgitation of the blood into the ventricles is

prevented by the closure of the semilunar valves, the scg- ments of which are thrown across the arterial orifices through the pressure exercised on the coluinn of. blood in the lumen of the artery and in the sinuses of Valsalva. The Arteries.—These vessels were named arteries by the older anatomists, on the supposition, now known to be erroneous, that they contained air. The term is now employed to express a blood-vessel, which, arising either directly or indirectly from the heart, conveys blood away from that organ. Arteries divide and subdivide into smaller vessels in their course, and to the individual branches descriptive names are applied. Some of these names express the position of an artery, as subclavian, axillary ; others, the organ in which it is distributed, as pulmonary, hepatic ; others a peculiarity in its course, as circumflex, coronary. 'The branches of arterics may be either collateral or terminal. 'The collateral branches arise from the sides of the parent artery either at an acute, a right, or an obtuse angle. 'Terminal branches arise at an acute angle by the bifurcation of the parent artery, which is the most common form, or by the breaking up of the artery into a cluster of branches. Branches which arise either from the same artery or from different arteries may be distributed in a common locality, may there unite together, and form what is called an inosculation or anastomosis, so that the blood from one artery may thus flow from it into another. The most common anastomosis is by the formation of loops between adjacent branches, but sometimes, as when the two vertebral arteries join to form the basilar, a convergence of two almost straight arteries takes place; and in other cases, as where the two anterior cerebral arteries are joined together by the anterior communicating, a connecting branch passes transversely across the mesial plane. A more complex form of anastomosis is when an artery (and a similar arrangement is sometimes found in veins) rapidly subdivides into numerous branches, which may again join to form a trunk either with or without the formation of a plexus. This is called a rete mirabile, an arrangement not uncommon in the cetacea, in the internal carotid arteries of ruminants, in the mesenteric arteries of the pig, in the arteries of the limbs of the sloths and lemurs, and in the arterial system of fishes. The only examples of a rete in the human body are the convoluted Malpighian tufts of the kidney and the arterial distribution in the coccygeal body.

ANATOMY

[VASCULAR SYSTEM—

The distribution of the pulmonary artery will be con- sidered in the anatomy of the lungs. That of the aorta will now be briefly described.

The Aorta (Plate XX. figs. 2, 3, a) lies in the cavities of the Aorta.

thorax and abdomen,and arises from the base of the left ven- tricle. It ascends forwards, upwards, and to the right as far as the level of the second right costal cartilage, then runs backwards and to the left to reach the left side of the body of the 4th dorsal vertebra, and then descends almost verti- cally to reach the left side of the body of the 5th dorsal ver- tebra. It forms, therefore, an arch, well known as the arch of the aorta, which arches over the root of the left lung, and which has attached to its concave surface a fibrous cord, known as the obliterated ductus arteriosus, which connects it with the left branch of the pulmonary artery. The aorta continues its course downwards in close relation to the bodies of the lower dorsal vertebrae, then passes through an opening in the diaphragm, enters the abdomen, and descends in front of the bodies of the lumbar vertebree as low as the 4th, where it is usually described as dividing into the two terminal branches, the common iliac arteries. At the angle of bifurcation, however, a long slender artery, called the mzddle sacral, is prolonged downwards in front of the sacrum to the end of the coccyx. In animals with long tails this artery can be recognised as a direct continuation of the aorta, prolonging it downwards in front of the caudal vertebree, whilst the iliacs are seen to be collateral branches ; but in man, where the coccyx is rudi- mentary, and the lower limbs largely developed, the iliac arteries which supply those limbs are so big as to obscure the true signification of the middle sacral artery, and appear themselves to be the terminal branches of the aorta. The branches which arise directly from the aorta may be arranged in four groups.—Ist, Branches for the supply of the viscera of the thorax and abdomen proper ; 2d, branches for the walls of the thorax, abdomen, and pelvis; 3d, branches for the head, neck, and upper limbs ; 4th, branches for the lower limbs, pelvic walls, and viscera.

The branches of the aorta which supply the viscera of Visceral the thorax are the coronary, the cesophageal, the bronchial, branches.

and the pericardial. The coronary arteries, two in num- ber, are the first branches of the aorta, and arise opposite the right and left segments of the semilunar valve, from the wall of the aorta, where it dilates into the sinuses of Valsalva. The mouths of these arteries are closed by the opening outwards of the aortic valves during the ventricular contraction. The elastic recoil of the aorta following that contraction not only closes the aortic valves, but drives the blood into the coronary arteries. These arteries break up into branches in the muscular walls of the heart, and the sudden turgescence of its walls, which results from the fill- ing of these vessels, is, according to Briicke and Garrod, the cause of the dilatation of the ventricular cavities.

The bronchial arteries are two in number; one accom- panies each bronchial tube, and supplies the tissues of the lung.

The esophageal arteries, three or four in number, supply the coats of the cesophagus.

The pericardial branches are very small arteries which supply the back of the bag of the pericardiuin.

The branches of the aorta which supply the viscera of the abdomen arise either singly or in pairs. The single arteries are the cceliac axis, the superior mesenteric, and the inferior mesenteric, which arise from the front of the aorta ; the pairs are the capsular, the two renal, and the two spermatic or ovarian, which arise from its sides. The single arteries supply viscera which are either completely or almost completely invested by the peritoneum, and the veins corresponding to them are the roots of the vena porte. The pairs of arteries supply visccra developed

Parietal branches.

ARTERIES. |

behind the peritoneum, and the veins corresponding to them ure rootlets of the inferior vena cava.

The celiac axis is a thick, short artery, which almost immediately divides into the coronary, hepatic, and splenic branches. The coronary artery subdivides into an cesoph- ageal branch for the lower end of the cesophagus, and a gastric branch for the coats of the stomach. 'Lhe hepatic artery ends in the substance of the liver; but gives off a cystic branch to the gall bladder, a pyloric branch to the stomach, a gastro-duodenal branch, which divides into a superior pancreatico-duodenal for the pancreas and duode- num, and a right gastro-epiploic for the stomach and omentum. The splenic artery ends in the substance of the spleen ; but gives off pancreatic branches to the pancreas, vasa brevia to the great end of the stomach, and a le/t gastro-eprplorc to the stomach and omentum.

The superior mesenteric artery gives off an inferior pancreatico-duodenal branch to the pancreas and duodenum ; about twelve intestinal branches to the small intestines, which form in the substance of the mesentery a series of arches before they end in the wall of the intestines; an aleocolic branch to the end of the ileum, the cecum, and beginning of the colon; a right colic branch to the ascend- ing colon ; and a middle colic branch to the transverse colon.

The inferior mesenteric artery gives off a left colic branch to the descending colon, a sigmoid branch to the sigmoid flexure of the colon, and ends in the superior hemorrhoidal artery which supplies the rectum. 'The arteries which supply the coats of the alimentary tube from the oesophagus to the rectum anastomose freely with each other in the wall of the tube, or in its mesenteric attachment, and the anastomoses are usually by the forma- tion of arches or loops between adjacent branches.

The capsular arteries, small in size, ran outwards from the aorta to end in the supra-renal capsules.

The renal arteries pass one to each kidney, in which they for the most part end, but in the substance of the organ they give off small

perforating branches, which pierce the capsule of the kidney, and are distributed in the sur- rounding fat.

The spermatic arteries are two long slender arteries, which descend, one in each spermatic cord, into the scrotum to supply the testicle. The corresponding arteries in the female, called the ovarian, do not leave the abdomen ; they supply the ovaries.

The branches of the aorta which supply the walls of the thorax, abdomen, and pelvis, are the intercostal, the lumbar, the phrenic, and the middle sacral.

The intercostal arteries arise from the back of the thoracic aorta, and are usually ten pairs. They run down the sides of the vertebral bodies as far as the commence- ment of the intercostal spaces, when each divides into a dorsal and a proper intercostal branch ; the dorsal branch passes to the back of the thorax to supply the deep muscles of the spine; the proper inter- costal branch runs outwards in the intercostal space to supply its muscles, and the lower pairs of intercostals also give branches to thediaphragm and wall of the abdomen.

The lumbar arteries arise from the back of the abdominal aorta, and are usually four pairs. They run down the sides of the lumbar vertebre, and divide into adorsal branch, which supplies the deep mus- cles of the back of the loins, and an abdominal branch

Fia. 90.—Diagram of a pair of inter- costal arterics. Ao, the aorta trans- versely divided, giving off at each side an intercostal artery; PB, the posterior or dorsal branch; AB, the anterior or proper intercostal branch; IM, a transverse section through the internal mammary artery.

which runs outwards to supply the wall of the abdomen. The distribution of the lumbar and intercostal arteries exhibits a

transversely-segmented arrangement of the vas- cular system, similar to the transversely-segmented arrange- ment of the bones, muscles, and nerves met with in these localities, but more especially in the thoracic region,

The phrenic arteries, two in number, pass to supply the under surface of the diaphragm.

The middle sacral artery, as already stated, is rather the continuation of the aorta than a branch. As it runs down the front of the sacrum it gives branches to the back of the pelvic wall.

The statement has frequently been made that the visceral and parietal branches of the aorta do not anastomose with each other. Injections made by Turner have, however, shown that, both in the thoracic and abdominal cavities, slender anastomosing communications exist between the two sets of branches. In the abdominal cavity a wide meshed plexus of small arteries, named by him swb- or extra-pert- toneal plexus, lies in the fat outside the peritoneum. It com- municates, on the one hand, with the perforating branches of the renal arteries and with slender branches of the capsu- lar, spermatic, colic, and pancreatic arteries, and in the re- gion of the diaphragm with the hepatic artery. On the other hand, it communicates with the phrenic arteries, the lower intercostals, the lumbar branches of the aorta, and with the ilio-lumbar, circumflex ilii, and epigastric branches of the iliac arteries, which also go to the wall of the abdomen. In the pelvis also the visceral superior hemorrhoidal artery anastomoses with the middle and lateral sacral arteries. The extra-peritoneal plexus supplies the fat and lymphatic glands lying outside the peritoneum, and it also gives origin to vasa vasorum for the coats of the aorta and vena cava. This plexus may, when the visceral branches of the aorta are obstructed, aid in an important manner in carrying on the circulation. In a subject examined by J. Chiene, in the dissecting room of the University of Edinburgh, where the coeliac axis and the superior and inferior mesenteric arteries were obliterated at their origins, the blood flowed into these arteries and the viscera they supplied through a great enlargement of the arteries of this plexus. In the thoracic cavity

a similar plexus, named the extra-pleural plexus, lies between the pleura and pericardium, which communicates on the one hand with the internal mammary arteries, and on the other passes in front of the root of the lung to join the bronchial system of vessels. Another portion of this plexus joins on the one hand the intercostal arteries near the dorsal vertebree, and on the other passes to the lung at the back of its root.

The branches for the head, neck, and upper limbs arise as three large arteries from the transverse part of the aorta ; they are named arteria innominata, left common carotid, and leftsubclavian. The arteria innominata is the largest ; it passes, upwards and to the right, to the root of the neck, and then divides into the right common carotid and the right subclavian. The carotid arteries supply the two sides of the head and neck; the subclavian arteries the two upper extremities.

The subclavian artery is the commencement of the great Subclavian Jt passes across the root system.

arterial trunk for the upper limb. of the neck and under the clavicle, when it enters the arm- pit, and becomes the axillary artery ; by that nanie it extends as far as the posterior fold of the axilla, when it enters the upper arm, takes the name of brachial or humeral artery, and courses as far as the bend of the elbow, where it bifurcates into the radial and ulnar arteries. From the subclavian part of the trunk the following branches arise :—a, Vertebral, which enters the foramen at the root of the transverse process of the 6th cervical vertebra, ascends through the corresponding foramina in

Carotid system.

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the vertebrae above, lies in a groove on the arch of the atlas, and enters the skull through the foramen magnum, where it joins its fellow to form the basilar artery ; it gives off muscular branches to the deep muscles of the neck, spinal branches to the spinal cord, meningeal branches to the dura mater, and an inferior cerebellar branch to the

under surface of the cerebellum. The baszlar artery, formed by the junction of the two vertebrals, extends from the lower to the upper border of the pons Varolii; it gives off collaterally transverse branches to the pons, auditory branches which accompany the portio mollis to the internal ear, inferior cerebellar branches to the under surface of the cerebellum, whilst it breaks up into four terminal branches, viz., two superior cerebellar to the upper surface of the cerebellum, and two posterior cerebral which supply the tentorial aspect of the temporo-sphenoidal lobes, the occi- pital lobes, and the posterior convolutions of the parietal lobes. b, Thyroid axis, which immediatcly divides into the inferior thyroid, the supra-scapular, and the transverse cervical branches ; the inferior thyroid supplies the thyroid body, and gives off an ascending cervical branch to the muscles of the neck ; the supra-scapwlar supplies the mus- eles on the dorsum scapule ; the transverse cervical sup- plies the trapezius and the muscles attached to the vertebral border of the scapula. c, Jnternal mammary, supplies the anterior surface of the walls of the chest and abdomen, and the upper surface of the diaphragm. d, Superior tnter- costal supplies the first intercostal space, and by its deep cervical branch the deep muscles of the back of the neck.

The axillary artery supplies long and short thoracic branches to the wall of the chest and the pectoral muscles ; an alar thoracic branch to the fat and glands of the axilla ; an acromial thoracic to the parts about the acromion ; anterior and posterior circumflex branches to the shoulder joint and deltoid muscle; a subscapular branch to the imuscles of the posterior fold of the axilla.

The brachial artery supplies muscular branches to the muscles of the upper arm; a nautrent branch to the humerus ; swperior and infemor profunda branches and an cmastomotic to the muscles of the upper arm and the region of the elbow joint.

The znar artery extends down the ulnar side of the front of the forearm to the palm of the hand, where it curves outwards towards the thumb, and anastomoses with the superficial volar and radial index branches of the radial artery to form the superficial palmar arterial arch. In the

fore-arm the ulnar gives off the cnterosseous arteries, which supply the muscles of the fore-arm and give nutrient branches to the bones; two recurrent branches to the region of the elbow ; carpal branches to the wrist joint: in the hand it gives a deep branch to the deep muscles of the hand, and from the superficial arch arise digital branches to the sides of the little, ring, and middle fingers, and the ulnar border of the index finger.

The radial artery extends down the radial side of the front of the fore-arm, turns round the outer side of the wrist to the back of the hand, passes between the Ist and 2d metacarpal bones to the palm, where it joins the deep branch of the ulnar, and forms the deep palmar arterial arch. In the fore-arm it gives off a recurrent branch to the elbow joint ; carpal branches to the wrist joint; and mus- cular branches, one of which, named superficialis vole, supplies the muscles of the thumb and joins the ulnar artery : in the hand it gives off a digital branch to the

thumb, and one to the radial side of the index, interosseous |

branches to the interosseous muscles, perforating branches to the back of the hand, and recurrent branches to the wrist.

The common carotid artery runs up the neck by the side of the windpipe, and on a level with the upper border of

the thyroid cartilage divides into the internal and external carotid arteries,

The txternal carotid artery ascends through the carotid eanal in the temporal bone into the eranial cavity. It gives off an ophthalmic branch to the eyeball and other eoutents of tho orbit, and then divides into the! anterior and meddle cerebral arteries, The middle cerebral artery extends outwards into the Sylvian fissure, and supplies the island of Reil, the orbital part, and the outer face of the frontal lobe,

the parietal-lobe, and the temporo-sphe- noidal lobe ; it also gives a choroid branch to the ehoroid plexus of the veluin interpositum. The anterior cerebral artery supplies the inner face of the hemisphere from the anterior end of the frontal lobe as far back as the internal parieto-occipital fissure, At the base of the brain not only do the two internal earotids anastomose with each other through the anterior communicating artery, which passes between their anterior cerebral branches, but the internal carotid on each side anastomoses with the posterior eerebral branch of the basilar, by a posterior communicating artery. In this manner a vascular circle, the circle of Willis, is formed, which permits of freedom of the arterial circula- tion by the anastomoses between arteries not only on the same side, but on opposite sides of the mesial plane. The vertebral and internal earotid arteries, which are the arteries of supply for the brain, are distinguished by lying at some depth from the surface in their course to the organ, by having eurves or twists in their course, whereby the force of the flow of blood is retarded, and by the absence of large collateral branehes. Further, as the ophthalmic artery is a branch of the internal carotid, the circulation in the eyeball is in sympathy with that in the brain.

The external carotid artery ascends through the upper part of the side.of the neck, and behind the lower jaw.into the parotid gland, where it divides into the internal maxillary and temporal branches. This artery gives off the following branches :—a, Superior thyroid to the larynx and thyroid body ; b, Lingual to the muscles and mucous membrane of the tongue, and to the sublingual gland ; c, Facial to the face, palate, tonsil, and sub-maxillary gland ; d, Occyntal to the sterno-mastoid muscle and back of the scalp ; e, Posterior auricular to the back of the ear and the adjacent part of the scalp; /, Superjicial temporal to the scalp in front of the ear, and by its transverse facial branch to the back part of the face; g, Internal maxillary, giving muscular branches to the muscles of mastication, meningeal branehes to the dura mater, dental branches to the teeth, and other branches to the nose, palate, and tympanum ; h, Ascending pharyngeal, which gives branches to the pharynx, palate, and tonsils.

The common iliac artery, after a short eourse, divides Iliac The internal system.

into the internal and external iliae arteries. uvac enters the pelvis and divides into branches for the supply of the pelvic walls and viscera, including the organs of generation, and for the great muscles of the buttock. The external iliac descends behind Poupart's ligament into the thigh, where ittakes the name of femoral artery. The femoral descends along the front and inner surface of the thigh, gives off a profunda or deep branch, which, by its circumflex and perforating branches, supplies the numerous muscles of the thigh; most of these extend to the back of the limb to carry blood to the muscles situated there. The femoral artery then runs to the back of the limb in the ham, where it is ealled popliteal artery. The popliteal divides into two branehes, of which one, ealled anterior tibial, passes between the bones to the front of the leg, and then downwards to the upper surface of the foot ; the other, posterior tibial, continues down the back of the leg to the sole of the foot, and divides into the ¢nternal and external plantar arteries ; branches proceed from the external plan-

Structure of arteries.

Capillaries.

"SYSTEM. |

tar artery to the sides of the toes, and constitute the digital arteries. From the large arterial trunks in the leg many branches proceed, to carry blood to the different structures in the limb.

The wall of an artery consists of several coats. The outermost is the tunica adventitia, composed of connective tissue ; immediately internal to this is the yellow elastic coat; within this again the muscular coat, formed of invol- untary muscular tissue, the contractile fibro-cells of which are for the most part arranged transversely to the long axis of the artery; in the larger arteries the elastic coat is much thicker than the muscular, but in the smaller arteries the muscular coat is relatively strong ; the vaso-motor nerves terminate in the muscular coat. Internal

to the muscular coat is the elastic fenestrated coat, formed of a smooth elastic membrane perforated by small apertures. Most internal of

Fie. 91.—Diagram of the structure of an artery. A, tunica adventitia; E, elastic coat; M, muscular coat; F, fenestrated coat; En, endothelium continuous with the endothelial wall of C, the capillaries.

all is a layer of endothelial cells, which form the free surface

over which the blood flows. The arteries are not nourished

by the blood which flows through them, but by minute vessels, vasa vasorum, distributed in their external, elastic, and muscular coats.

The Capillartes.—These are the minute tubes which con- nect together the terminal branches of the arteries and the rootlets of the veins. They vary in diameter in different localities from +45 gth to yz4yth inch. They are arranged in more or less compact networks, which lie in the interstices between the tissues of the part or organ. The vascularity

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Fie, 92.—Capillary Network in the Web of the Foot of the Frog (A. Thomson).

of a tissue depends upon the relative proportion of the capillaries that it contains. Some tissues, as adult cartilage, the cornea, epithelium, and endothelium, are destitute of capillaries, z.e., are non-vascular. The capillary wall is very simple in structure; in the smallest capillaries it consists merely of a layer of endothelial cells, continuous with the endothelial lining of the arteries and veins; in the larger capillaries a delicate tunica adventitia is superadded. The

transition from a capillary to a small artery or a small vein is marked by the development of a muscular and an elastic coat in the wall of the

blood-conveying tube.

Lhe Veins.—The veins convey the blood from the peri- Veins.

phery back to the heart, and in their course increase in size, by junction or anastomosis with each other. In most of the veins delicate valves are found, each of which consists of two semicircular segments, and a pouch-like dilatation of the wall of the vein is opposite each segment. When the blood flows along the veins, the valves lie against the wall of the vessel, but if pressure be applied to a vein so as to obstruct the onward flow of the circulation, then the blood passes into the pouch between the wall of the vein and the valve adjacent to the seat of pressure, when the valve closes so as to stop regurgitation. The valves are found especially in those veins where the circulation is likely to be interfered with either by the pressure of the muscles on the veins during their action, or by the pres- sure of blood caused by gravity, and are usually seated at the points of confluence of veins. They are absent in the veins of the lungs, of the brain, and of several of the abdominal viscera. Some of the veins lie in the sub- cutaneous fat, and are called superficial veins, others lie amidst the muscles, and form the deep veins. The deep veins accompany the arteries and are named after them ; the superficial veins do not accompany arteries ; frequent anastomoses take place between the superficial and deep veins.

The veins are arranged primarily into two groups—the

| Pulmonary veins and the Systemic veins. The distribution

of the pulmonary veins will be given in the anatomy of the lungs.

The Systemic veins consist of the coronary venous system ; of the system of the superior vena cava; of the system of the inferior vena cava; and associated with the inferior vena cava is the portal venous system. The arrangement of the coronary vein has been described in the anatomy of the heart.

The system of the Superior Vena Cava consists of both superficial and deep veins, and is arranged as follows :—

The superficial veins of the hand commence at the tips and sides of the fingers, from which they proceed along the back of the hand, beneath the skin of which they may be distinctly seen. They then ascend along the fore-arm, form- ing three large veins: the radial, on the outer side; the ulnar, on the inner; and the median, in the middle of the front of the forearm. At the bend of the elbow the median divides into two branches, of which one joins the radial to form the cephalic, the other joins the ulnar to form the basilic. Into one or other of the two branches of the median the surgeon generally makes an opening when he is desirous of drawing blood from the patient. The cephalic and basilic veins terminate by joining the deep or axdlary vein. The communications between the superficial and deep veins are not, however, confined to the point of ter- mination of the former, but occur at various parts of their course.

The deep veins of the hand commence at the tips of the fingers, and pass as digital veins up the sides of the fingers to the palm of the hand, where they form an arch cor- responding to the arterial arch of the palm ; from this they extend upwards along the front of the forearm, as far as the bend of the elbow, closely accompanying the arteries of the forearm, and receiving from the muscles numerous small branches corresponding to the small arteries sent to those muscles. At the bend of the elbow two brachial veins result from the junction of these different veins of the fore-arm, which pass up the inner side of the upper-arm, closely accompanying the brachial artery as far as the

armpit, where they join to form a single large vein, the

| ing to the deep artery of the thigh, which conveys back

axillary. They receive in their course many small branches from the muscles. The axillary vein also receives the cephalic and basilic veins. Thus, a single large trunk con- veys away all the blood that has becn circulating through the upper limb. This large vein passes as the subclanian vein behind the clavicle, and reaches the lower part of the side of the neck, where it is joined by the large veins that return the blood from the head and neck.

The veins that return the blood from the inner and outer parts of the head and neck are called the eaternal and internal jugular veins. The external 1s the smaller, and may commonly be seen beneath the skin on the side of the neck. It returns the blood that has been circulating on the outer part of the head, and must be regarded as a superficial vein. The internal jugular returns the blood that has been circulating on the face, in the brain, and cranial blood-sinuses, and in the deeper parts of the neck. It accompanies the carotid artery, and must thus be regarded as a deep vein. By the junction of the jugular and sub- clavian veins at the root of the ncck a large brachio-cephalie vein on each side is formed; these gradually converge, join, and form a single trunk, the superior vena cava, which, after a short course, entcrs the upper part of the right auricle of the heart. The veins corresponding to the inter-costal arteries, which run between the ribs, do not open directly into either the superior or inferior vena cava, but pass to form the azygos vein, which begins in the cavity of the abdomen, then enters the cavity of the chest, and, as it courses upwards, gradually increases in size by recciving the various intercostal veins, until it finally terminates by joining the superior vena cava.

The system of the Inferior Vena Cava consists of both superficial and deep veins, and is arranged as follows :— The superficial veins of the foot are scparated from the deep veins by the strong membrane or fascia which binds down the nmuuscles. They commence by very fine branches arising from the capillaries of the skin. On the back of the foot the digital veins proceeding from the skin of the toes form an arch, from the inner side of which a vein, called the Jong saphena, arises. This passes upwards along the inner side of the leg and thigh, increasing consider- ably in size in its course, owing to tle number of

veins joining it from the extensive surface of the skin of the limb. It terminates, at the upper part of the thigh, by passing through a hole in the fascia, and joins the femoral vein, From the outer side of the same arch arises the external saphenous vein, which runs up the back of the leg to the ham, and picrces the fascia to join the popliteal vein. The deep veins begin both on the back of the foot and in the sole. Those which arise on the back of the foot form the anterior tibial veins, and accompany the anterior tibial artery ; they reccive a considerable number of branches in their upward course, which proceed from the great mass of muscles lying on the outer side of the leg. The veins which begin in the sole of the foot accom- pany the plantar arteries, and then pass upwards, along the inner side of the ankle-joint, to reach the back of the leg, along which they ascend as the posterior tibial veins, closely accompanying the posterior tibial artery, and receiv- ing in their course numerous small veins that proceed from the muscles of the calf of the leg. At the upper part of

the leg the anterior tibial veins pass to the back of the leg,

and join the posterior tibial veins. The large popliteal vein, formed by their junction, ascends behind the knee- joint, lying in the ham, along with the popliteal artery. It leaves the upper part of this space, and, passing to the inner side of the thigh, ascends as the femoral yein along with the femoral artery as far as Poupart's ligament, when it enters the cavity of the abdomen, At the upper part of the thigh it receives the profunda vein, correspond-

the blood that has been carried by that vessel to the nuinerous large and important muscles of the thigh. The femoral vein is also joined at this spot by the long saphena vein. When the femoral vein enters the cavity of the abdomen it becomes the external tliac vein. The external iliac vein receives the smaller veins which ramify in the lower part of the walls of the abdomen, as well as the large internal iliac vein, which corresponds to the internal iliac artery, and by their junction the common iliac vein is formed. The two common iliac veins gradually converge, and, about the level of the last vertebra of the loins, join to

form a single large vein, the inferior vena cava. The inferior vena cava ascends at the back of the abdominal cavity lying on the right side of the aorta. Several veins open into it ; some corresponding with the parietal branches of the abdominal aorta, others with the capsular, renal, and spermatic arteries. The greater number of the veins proceeding from the organs contained in the cavity of the abdomen do not open directly into the vena cava, but form a large vein called portal. The vena cava passes through the diaphragm, enters the cavity of the chest, and terminates by opening into the right auricle of the heart.

The Portal system of veins is formed by the veins which proceed from the large and small intestines, from the stomach, pancreas, and spleen ; they form the zxferior mesenteric, superior mesenteric, splenic, and gastric veins, which join togetHer in the neighbourhood of the pancreas to form the portal venous trunk. The portal vein then ascends to the under surface of the liver, which it enters at the portal transverse fissure. In the substance of the liver it subdivides into branches just like an artery, and the finest branches terminate in the lobules of the liver in a plexus of capillaries. From this plexus the rootlets of the hepatic veins arise, which joining together form the large hepatic vein, which opens into the inferior vena cava before it pierces the diaphragm. Retzius has pointed out that an extra-peritoneal venous plexus exists in the abdo- minal cavity, which connects the rootlets of the portal vein with those of the veins of the parietes of the abdomen.

The wall of a vein possesses the same number of coats as that of an artery, but the coats are thinner. Veins are also extensively provided with valves, which are absent from the arteries except at the mouths of the aorta and pulmonary artery.

LympH-VascuLaR SysremM.—This subdivision of the Lympha vascular system consists partly of small tubes or vessels, ts.

the lynyph vessels, and partly of collections of lymphoid or adenoid tissue (p. 849), the lymph glands. The lymph vessels or lymphatics are tubes with delicate transparent walls, which convey the fluid called lymph and chyle. They arise in the tissues and terminate by joining the venous system, so that their contained fluid flows towards the heart.

They resemble veins in having a course from periphery to centre; in possessing valves, which are generally two in number and semilunar in shape; in being divided into a superficial and a deep set—the superficial lymphatics being situated, like the superficial veins, in the subcutaneous tissue ; the deep lymphatics accompanying the arteries and deep veins. Lymphatics differ, however, from veins in possessing in their course glandular enlargements, in having thinner coats, in being almost uniform in size, and not uniting into larger vessels as they pass onwards in their course. As a rule they are like fine threads, and their main trunk, the thoracic duct, is not bigger than a crow- quill. The lymph-vesscls are divided into lacteal or chyle vessels and lymphatics proper.

The lacteal or chyle vessels, named from the milk-like chyle which they contain, arise in the minute processes called intestinal villi, which project from the free surface

Thoracic duct.

SYSTEM. |

of the mucous membrane of the small intestine into the lumen of the bowel. Their exact mode of origin within the villi is difficult to determine. ach villus has a lacteal vessel in its axis, and it not unfrequently seems as if this vessel arose as a flask-shaped dilatation possessing a delicate but definite wall in the centre of the connective tissue matrix of the villus. Some observers, however, think that the lacteal is continuous with the connective tissue corpuscles of the villus, and others consider it to be derived from a network continuous with the deeper ends either of the goblet-shaped or cylindriform epithelial cells with which the villus is invested. The lacteals from adjacent villi form a network in the submucous coat of the intestine, from which larger lacteals arise, which pierce the muscular coat, and then run between the folds of the mesentery to the posterior wall of the abdomen, where opposite the body of the first lumbar vertebra they join the deep lymphatic vessels of the abdomen to form the thoracic duct.

The lymphatic vessels proper correspond so closely in their distribution in the extremities and in the head and neck with the veins of those parts, that a special description of their arrangement is not necessary, the more so as a general representation of these vessels is given in Plate XXI. The superficial and deep lymphatics of the lower limbs euter the abdominal cavity, and are joined by the lymphatics of the pelvis. They ascend in front of the bodies of the lumbar vertebra, join the lacteal vessels to form the thoracic duct, the place of junction being marked by a dilatation of the duct called receptaculum chylt, The thoracic duct passes through the opening in the diaphragm which transmits the aorta, ascends in front of the bodies of the dorsal vertebra, receives in its course the deep lymphatics of the left half of the chest, reaches the root of the neck on the left side, is joined there by the deep and superficial lymphatics of the left upper limb and left side of the head and neck, and opens into the great veins at the angle of junction between the left internal jugular and sub- clavian. This duct conveys, therefore, thé chyle during diges- tion, and the lymph contained in the lymph-vessels below the diaphragm and in the lymph-vessels situated to the left side of the mesial plane in the parts of the body above the diaphragm. The lymph-vessels on the right side of the supra-diaphragmatic parts of the mesial plane do not join the thoracic duct, but converge to the root of the neck on the right side, where they join to forin the right lymphatic duct, which opens into the angle of junction of the right internal jugular and subclavian veius,

The mode of origin of the lymph-vessels has long been a vexed question amongst anatomists. The lacteal vessels were at one time supposed to arise by open mouths on the free surface of the intestinal villi, and this idea has been re- vived in a modified form by some recent observers, who con- ceive that the lacteals are continuous with a network formed by the anastomoses of processes proceeding from the deep ends of the goblet cells, the mouths of which cells open on the free surface of the villus. The lymph-vessels proper are in some localities continuous with the serous cavities p. 848) ; in others they arise within the textures and organs. The most minute lymph-vessels, called lymph-capillaries, like the blood-capillaries, have walls formed of a single layer of elongated endothelial cells. These capillaries take their rise in the connective tissue of a part or organ. Some believe that they are anatomically continuous with the corpuscles of the connective tissue ; others hold that they spring from spaces, or juice-canals, between the bundles of the connective tissue, which bundles are invested by an endothelial layer of cells; whilst Recklinghausen maintains that the juice-canals, which give origin to the lymph-capil- laries, lie in the cement-substance which binds the bundles

of connective tissue together, According to any one of these views a provision is considered to exist outside the blood-vessels, consisting of a minute network of spaces or canals, which allows the tissues to be permeated by a nutrient juice derived from the blood, Carter, again, believed that the minute network which exists in the tissues serves as a medium of communication between the blood and lymph-capillaries.

In some localities, as the brain and eyeball, the blood- vessels have been described as enclosed in tubular spaces, called peri-vascular canals, in which cells like the corpuscles of the lymph have been seen, and which are believed to be continuous with the lymphatic system. The researches of Ludwig and some of his pupils into the minute

structure of the lachrymal gland, the glands of the skin, and the testis, have shown that lymph-capillaries lie in close relation

| to the secreting structures of these glands,

The coats of the lymph-vessels resemble in structure those of the veins, but they are thinner and more trans- parent. The valves are numerous, and an injected lymph- vessel possesses a beaded appearance,

The lymphatic glands are small bodies, varying in size from a pea to an almond, situated in the course of the lymph-vessels in several regions of the body. They are found especially in the groin, armpit, mesentery, back of the abdomen, roots of the lungs, and side of the neck CPL XXI,) Entering one end of each gland are lymph-vessels, named vasa afferentia, and emerging from the opposite end of the gland are the lymph-vessels named vasa eferentia. Each gland is invested by a capsule of connective tissue, which sends processes into the substance of the gland to divide it into compartments ; it consists of adenoid tissue, and the meshes of its retiform connective tissue contain multi- tudes of lymph corpuscles. Each gland is permeated by a network of minute canals, which are continuous with both the vasa afferentia and efferentia; the gland, therefore, is traversed by a stream of lymph which washes the lymph corpuscles out of the meshes of the reticulum, and in this manner these corpuscles find their way into the lymph. The lymph glands are, therefore, centres of origin for the lymph corpuscles. The collections of adenoid tissue, forin- ing the solitary and Peyer's glands of the intestine, and found in the tonsils and other localities (p. 849), are also without doubt centres of formation for the lymph cor- puscles,

Bioop-VascuLarR Guanps.—Intimately associated with Blooa- the vascular system are certain organs to which the names vascular of blood-vascular glands, or glands without ducts, are 8lands. applied. These organs are the spleen, the thyroid gland, the thymus gland, the suprarenal capsules, and portions of the pituitary and pineal glands. The Spleen is situated in the cavity of the abdomen between the stomach and the diaphragm. It is invested by peritoneum, and has a fibro- elastic coat in which involuntary muscular fibro-cells are

formed. This coat sends multitudes of fine trabecule iuto the interior of the organ, which subdivide it into numbers of minute compartments, in which the red, highly vascular spleen pulp is contained. This pulp consists of collections of small spherical masses of adenoid tissue, forming the Malpighian corpuscles, of the terminal branches of the splenic blood-vessels, and of the lymph-vessels, together with numerous cells, some of which are red blood corpuscles, others lymph corpuscles, others contain pigment granules or fat, others contain in their interior numerous blood cor- puscles. The arteries of the spleen in part end in capil- laries from which the veins arise, but more frequently they open into lacune or blood spaces, which give origin to the veins. The Thymus gland, best seen in infaney and child- hood, lies in the cavity of the thorax near the base of the heart. It consists of two lobes, each of which is composed

of lobules of adenoid tissue, to which numerous lymph- vessels may be traced. In the adult it is converted into a mass of fat. The Thyroid gland is situated in the neck at the front and sides of the windpipe. It consists of multi- tudes of minute closed follicles, each of which is lined by a layer of cells. The Suprarenal capsules, two in number, lie in the abdomen one above each kidney. They conta cells, some of which are arranged in columns, others ina reticulated manner, and are well provided with blood-vessels, nerves, and lymphatics.

DEVELOPMENT OF THE VASCULAR System.—The vascular system is formed in the middle or mesoblastic layer of the early embryo. The cells of the mesoblast lose their origi- nal spherical form and become stellate, the processes of adjacent cells unite together and form a network, and the nuclei rapidly increase in numbers. The peripheral part of the protoplasm of the stellate cells differentiates into a wall of nucleated protoplasm, and forms the wall of the blood-vessels, whilst the central part of the protoplasm liquefies, and the nuclei contained in it become the blood- corpuscles. If the vessel remains as a capillary, its wall assumes merely the character of a single layer of endo- thelial

cells ; but if it becomes an artery or a vein, a further differentiation of the mesoblastic cells into the muscular and elastic coats and the tunica adventitia takes place. The name vascular area is applied to that part of the meso- blast in which the eatly blood-vessels are formed. The heart appears immediately below the head in the form of a collection of cells in the splanchnopleure layer of the mesoblast. It is believed that these cells form in the first 'nstance a solid mass, the central part of which liquefies to form blood and blood-corpuscles, whilst the peripheral cells form the wall of a tube. This tube then communi- cates below and behind with the two omphalo-mesarate veins, which convey blood from the vascular area into the heart, whilst its anterior or npper end communicates with the primitive aorte. The heart tube now presents two constrictions, which indicate its division into an auricle, & ventricle, and a bulbus arteriosus, and at the same time bends on itself in a sigmoid curve, so that the auricular end, which receives the omphalo-mesaraic veins, 1s approxi- mated to and lies behind the bulbus arteriosus, from which the primitive aorte spring. The single ventricle then subdivides into two by the gradual growth of the septum from the apex to the base, and about the eighth week of embryo-life the right and left ventricles are completely separated from each other. A septum then begins to form in the originally single auricle, but its growth is not com- pleted until aftcr the birth of the child, so that during foetal life the cavities of the right and left auricles com- municate with each other through a hole in the septum, named foramen ovale. The primitive aorte, right and left, extend upwards to the Ist pair of visceral arches, into which they pass and arch backwards to the sides of the spinal column, where they form the dorsal aorte. Four

additional pairs of arterial arches then spring from the primitive aorte below the Ist pair, and the whole are enumerated from above dowuwards as the Ist, 2d, 3d, 4th, and 5th pairs of vascular arches ; but it should be stated that they are not all in existence at the same

time, as, before the 5th pair appear, the Ist and often the 2d have shrivelled up and disappeared. Each arch communicates behind with the dorsal aorta of its own side. The two dorsal aortz then approximate and blend with each other to form the descending thoracic and the abdominal aorta, A longitu- dinal septum also forms within the bulbus arteriosus itself, which divides it into two vessels: the one, the ascending aorta, becoming continuous with the cavity of the left ventricle and with the Ist, 2d, 3d and 4th pairs of vascular arches ; the other the pulmonary artery, becoming contin- uous with the cavity of the right ventricle and with the 5th pair of vascular arches. The 4th left vascular arch enlarges to form the transverse part of the arch of the aorta, and the left subclavian artcry springs as a collateral branch from it; The 4th right arch forms the innominate, and the commencement of the right subclavian artery. The 3d pairs of arches form the two internal carotid arteries ; each common carotid is formed from the part of the primitive aorta which connects the 3d and 4th arches with each other; whilst the external carotid is an enlarge- ment of that part of the primitive aorta which runs upwards from the 3d to the 1st visceral arch. Branches proceed from these various arteries to form the arteries of supply situated in the upper limbs and head and neck. From the dorsal aorte arise those arteries which supply the parietes and viscera of the trunk and the lower limbs ; and the produc- tion of all these arteries in the body and limbs of the embryo is due, like the origin of the vessels in the vascular area itself, to a histological differentiation of the cells of the mesoblast. From the 5th left vascular arch, which is now continuous with the pulmonary artery, two collateral branches arise, which proceed one to each lung, and form the right and left pulmonary arteries, whilst the terminal part of this arch joins the end of the transverse part of the arch of the aorta, and forms the ductus arteriosus. During foetal life, the lungs being inactive, the blood of the right ventricle which passes into the pulmouary artery almost entirely flows through the ductus arteriosus into the aorta. But when the child is born, and the lungs come into play as respiratory organs, then the blood of the right ventricle flows into the lungs through the right and left pulmonary arteries, and the ductus arteriosus, being no longer required, shrivels up into a slender fibrous

cord. The capillaries, veins, and lymphatics are also produced by a histological differentiation of the cells of the mesobiast.

In order to complete the exposition of the subject, the Digestive, Respiratory, Reproductive, and Urinary systems of organs have still to be considered. These will be dealt with in detail under other headings in the succeeding volumes.

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VOLT ANATOMY. PLATE XVI

Fig. 3.

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ANATOMY. PLATE XIX.

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ANATOMY.

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NINTH EDITION.

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ENCYCLOPADIA BRITANNICA

NINTH EDITION

ENCYCLOPAEDIA BRITANNICA : DICTIONARY

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME II

EDINBURGH: ADAM AND CHARLES BLACK : MDCCCLXXV

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ENCYCLOPADIA BRITANNICA.

ANAXAGORAS

NAXAGORAS, according to the most probable calcula- tions, was born about the year 500 B.c. At his native town of Clazomenz, in Asia Minor, he had, it appears, some amount of property and prospects of political influence, both of which he surrendered, from a fear that they would interfere with his search after the knowledge of nature. In early manhood he went to Athens, which was rapidly be- coming the headquarters of Greek culture; and in that city he is said to have continued for thirty years. Here Pericles learnt to love and admire him; and the poet Euripides derived from him an enthusiasm for science and humanity. His influence was due partly to his astronomical and mathematical eminence, but still more to the ascetic dignity of his nature, and his superiority to ordinary weaknesses— traits which .legend has embalmed. His observations of the celestial bodies led him to form new theories of the universal order, and brought him into collision with the popular faith which found the objects of its worship in the heavens. Anaxagoras had tried to reduce eclipses to the operation of known causes: he had removed the halo of deity from the sun, and profanely turned Apollo into a mass of blazing metal, larger than Peloponnesus; and he was even reported to have brought the phenomena of meteoric stones within the limits of predictable events. The dominant polytheism, and the ignorance of the multi- tude, could not tolerate such explanation ; and the enemies of Pericles used the superstitions of their countrymen as a means of attacking the ideas of that statesman in the per- son of his friend. Anaxagoras was arrested on a charge of contravening the established dogmas of religion ; and it required all the eloquence of Pericles to rescue him from the persecutors. ven then Athens could no longer be the sphere of his activity. He was forced to retire to Lampsacus, where he died about 428 z.c.

It is difficult to present the cosmical theory of Anaxa- goras in an intelligible scheme. All things have existed in a sort of way from the beginning. But originally they existed in infinitesimally small fragments of themselves, endless in their number, inextricably mixed throughout the spaces of the world. All things were in that mass, but in the obscurity of indistinguishableness. There were the seeds or miniatures of corn, and flesh, and gold, in the primitive mixture; but these parts, of like nature with

their wholes (the éyovomep4 of Aristotle), had to be elimi- nated from the complex mass before they could receive a definite name and character. The

existing species of things having thus been transferred, with all their speci- alities, to the prehistoric stage, they were multiplied end- lessly in number, by reducing their size through continued subdivision, at the same time that each one thing is so indissolubly connected with every other that the keenest analysis can never completely sever them. The work of arrangement, the segregation of like from unlike, and the summation of the éduocoepy into totals of the same name, was the work of Mind or Reason. This peculiar thing, called Mind (vods), was no less illimitable than the chaotic mass, but it stood pure and independent, a thing of finer texture, alike in all its manifestations, and everywhere the same. ‘ruis subtle agent, possessed of all knowledge and power, is especially seen ruling in all the forms of life. Its first appearance, and the only manifestation of it which Anaxagoras describes, is Motion. Reason originated a rotatory movement in the mass (a movement far exceeding the most rapid in this present scene), which, arising in one corner or point, gradually extended till it gave distinct- ness and reality to the aggregates of like parts. But even after it has done its best, the original intermixture of things is not wholly overcome. No one thing in the world is ever abruptly separated, as by the blow of an axe, from the rest of things. The name given to it merely signifies that in that congeries of fragments the particular seed is preponderant. Every a of this present universe is only a by a majority, and is also in lesser number 8, ¢, d. Anaxagoras proceeded to give some account of the stages in the process from original chaos to present arrange- ments. The division into cold mist and warm ether first broke the spell of confusion. With increasing cold, the former gave rise to water, earth, and stones. The seeds of life which continued floating in the air were carried down with the rains, and produced vegetation. Animals, including man, sprang from the warm and moist clay. If these things be so, then the evidence of the senses must be held in slight esteem. We seem to see things coming into being and passing from it ; but reflection tells us that decease and growth only mean a new aggregation and dis-

ruption, Thus Anaxagoras distrusted the an and gave .— 1

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the preference to the conclusions of reflection. People even said that he maintained snow to be really black ; for was it not produced from the dark water 1

Anaxagoras marks a turning-point in the history of philosophy. With him speculation passed from the colonies of Greece to settle at Athens. By the theory of minute constituents of things, and his emphasis on me- chanical processes in the formation of order, he paved the way for the Atomic theory. By his enunciation of the order that comes from Reason, on the other hand, he sug- gested the theory that nature is the work of Design. But the features of this Reason he described in a vague and analogical way. Aristotle and Plato have blamed him for basing his explanations on natural, not on final causes. These charges are scarcely fair. Anaxagoras seems to have held that the order was the work of Mind; but he needed not on that account to assume what the order was, and then employ the conception to explain why things were so and so. The order is rather the general postulate which the details have to prove, instead of themselves resting upon it. The conception of Reason in the world passed from him to Aristotle, to whom it seemed the dawn of sober thought after a night of distempered dreams. From Aristotle it descended to his commentators, and under the influence of Averrocs became the engrossing topic of speculation. The fragments of Anaxagoras have been collected by Schaubach (Leipsic, 1827), and Schorn (Bonn, 1829). See also Mullach, Fragmenta Philos. Greece. i. 243-252. (w. Ww.)

ANAXARCHUS, a Grecian philosopher of the Eleatic school, was born in Abdera, and flourished about 340 B.c. He was the companion of Alexander in his expedition into Asia, and seems, from anecdotes that have been preserved, to have enjoyed his intimate friendship. He checked the vainglory of Alexander, when, elated with pride, he aspired to the honours of divinity, by pointing to his wounded finger, saying, “See the blood of a mortal, not of a god.” When Alexander was tortured with remorse at having slain his friend Clitus, Anaxarchus endeavoured to soothe him by saying, that “ kings, like the gods, could do no wrong.” It is said that Nicocreon, tyrant of Cyprus, commanded him to be pounded in a mortar, and that he endured this torture with the greatest patience; but the story is doubtful, having no earlier authority than Cicero. Regarding his philosophical doctrines we have no infor- mation. Some have inferred from the epithet

evdarzo- vixds (“ The Fortunate”), usually applied to him, that he held the end of life to be Evdapovia.

ANAXILAUS of Larissa, a physician and Pythagorean philosopher, was banished from Rome by Augustus, B.c. 28, on the charge of practising the magic art. This accusation appears to have originated in his superior skill in natural philosophy, by which he produced effects that the ignorant attributed tomagic. (Euseb., Chron. ad Olymp. clxxxviii. ; St Iren. 1. 13; Phin. xix, 4, xxv. 95, xxvii 49, xxi, 52, xxxv. 50.)

ANAXIMANDER, the second of the physical philoso- phers of Ionia, belonged, like his predecessor Thales, to the city of Miletus. His biography is a blank. The computations of Apollodorus have fixed the year of his birth at 611, and of his death a short while after 547 B.o. Tradition, probably correct in its general estimate, repre- sents him as a successful student of astronomy and geo- graphy, and as one of the pioneers of exact science among the Greeks. But it is not to his delineations of the divisions of the globe, or to his dialling, or to his enlarged acquaint- ance with the celestial phenomena, especially of the obliquity of the ecliptic, that we can attribute the preservation of his name to the present day. That honour he owes to the broad views of the origin of things which his glimpses of natural

knowledge suggested, and which he propounded in a treatise on nature or growth (vous). Of that work only a few words are left. The beginning or first principle (dpy7, a word which, it is said, he was the first to use) was an end- less, unlimited mass (dzepov), subject neither to old age nor decay, and perpetually yielding fresh materials for the series of beings which issued from it. It embraced every- thing, and directed the movement of things, by which there grew up a host of shapes and differences. Out of the vague and limitless body there sprung a central mass,— this earth of ours, cylindrical in shape, poised equidistant from surrounding orbs of fire, which had originally clung to it like the bark round a tree, until their continuity was severed, and they parted into several wheel-shaped and fire-filled bubbles of air. Man himself and the animals had come into being by like transmutations. Mankind was supposed by Anaximander to have sprung from some other species of animals, probably aquatic. But as the

measureless and endless had been the prime cause of the motion into separate existences and individual forms, so also, according to the just award of destiny, these forms would at an appointed season suffer the vengeance due to their earlier act of separation, and return into the vague immensity whence they had issued. Thus the world, and all definite existences contained in it, would lose their inde- pendence and disappear. The “indeterminate” alone is perennial and godlike, all-embracing and all-guiding. The blazing orbs, which have drawn off from the cold earth and water, are the temporary gods of the world, clustering round the earth, which, to the ancient thinker, is the central figure. (See Ritter et Preller, Historia Phil. §§ 17-22 ; Mullach, Pragmenta Phil. Greece. i. 237-240.) (w. w.) ANAXIMENES of Miletus may have been a younger contemporary of Anaximander, whose pupil or friend the ordinary tradition represents him to have been. To him it seemed that the air, with all its variety of contents, its universal presence, and all the vagueness which it has for the popular fancy as the apparent source of life and growth, was what maintained the universe, even as breath, which is our life and soul, sustains us. This vital air, boundless in its kind, is the source of the world’s life. Everything is air at a different degree of density. Eternal movement pervades it; and under the influence of heat, which expands, and of cold, which contracts its volume, it gives rise to the several phases of existence. The process is a gradual one, and takes place in two directions, as heat or cold predo- minates. In this way was formed a broad disk of earth, which floats like a leaf on the circumambient air. Similar condensations produced the sun and stars ; and the flaming state of these bodies is due solely to the extreme velocity of their motions. (See Ritter et Preller, Historia Phil. §§ 23- 27; Mullach, Fragmenta Phil. Greee.i. 241-243). (w.w.) ANAXIMENES, a Greek historian and rhetorician, was born at Lampsacus, in Asia Minor, in the 4th century B.c. He accompanied Alexander, whom he is said to have in- structed in rhetoric, on his expedition against Persia. He wrote a history of Philip and of Alexander, and likewise twelve books on the early history of Greece, but only a very few fragments of these exist. The treatise “Pytopuy mpos ‘Adé€avdpoy, usually included among the works of Aristotle, has been ascribed by many critics to Anaximenes, on grounds that are generally admitted to be conclusive. ANCELOT, JacquEs ARSENE FRANgoIs PoLycaRPE, a French dramatist and littérateur, was born at Havre, 9th Feb. 1794, and died 7th Sept. 1854. -He completed his studies at

Paris, wher> he made his literary début in 1819, with Lows LX., a five-act tragedy, of which three editions were speedily exhausted. It had a run of fifty representa- tions, and brought him a pension of 2000 francs from the king, Louis XVIII. His next work The Mayor of the

Palace, was played in 1823 with less success; but for it he received the cross of the Legion of Honour. Five years to a day after his Zowis 1X., he produced Mesque, a clever adaptation of Schiller's /vesco. In 1828 appeared Olga, or the Russian Orphan, the plot of which had been inspired by a voyage he made to Russia in 1826, of which he also published an account in prose. About the same period he produced in succession Mary of Brabant, a poem in six cantos; Zhe Man of the World, a novel in four volumes, afterwards dramatised with success; and in 1829 Elizabeth of England, which became very popular. By the revolution of July 1830 he lost at once his royal pen- sion and his office as librarian at Meudon; and, obliged by the cares of a wife and family to resign a life of art for one of industry, he was chiefly employed during the next ten years in writing vaudevilles and light dramas and comedies, working, as he happily remarked, pro fame instead of pro fama. A well-conceived tragedy, Maria Padilla, gained him admission to the French Academy, who chose him to succeed Bonald in 1841. Ancelot was sent by the French Government in 1849 to Turin, Florence, Brussels, and other capitals, to negotiate on the subject of international copyright; and the treaties on this question, which were concluded soon after, were the result, in a great measure, of his tact and intelligence.

ANCHISES (Ayxions), in Greek Legend, son of Capys and grandson of Assaracus, his mother being Themis, a daughter of Jlus, the founder of Ilium or Troy, to the ruling family of which, at the time of the Trojan war, he was also, on the paternal side, related, since Assaracus had been a. brother of Ilus (liad, xx. 231-239). From the Assyrian character of the name Assaracus, from the inter- course between the Phcenicians and the early inhabitants of the Troad, and from the connection of Venus, the pro- tecting goddess of the Phcenicians, with Anchises, it has been inferred that the family of the latter had originally come from somewhere near the centre of

Assyrian influence. Venus met Anchises on Mount Ida, and, enamoured of his beauty, bore him Aineas (Jliad, ii. 820, v. 247). He was not to mention the mother of the child on pain of being killed by a thunderbolt from Jupiter. He did mention it, however, and, by one account, was slain as foretold; but according to others, was only wounded and blinded. In the more recent legend, adopted by Virgil, he was couveyed out of Troy on the shoulders of his son A®neas, whose wanderings he followed, it is differently stated, as far only as Sicily, where he was buried on Mount Eryx, or as far as Italy. On the other hand, there was a grave on Mount Ida at Troy pointed out as his. At Segesta in Sicily he had a sanctuary. He was said by some to have had pro- phetic power. The scenes of his life represented in works of art are his being carried on the shoulders of A®neas, which frequently occurs on engraved gems of the Roman period ; and his visits from Venus, which is rendered in a beautiful bronze relief, engraved in Millingen's Unedited Monuments, pl. 12.

ANCHOR, in Wavigation, from the Greek déyxvpa, which Vossius thinks is from dyn, a crook or hook, an instrument of iron or other heavy material used for holding ships in any situation in which they may be required to lie, and preventing them from drifting by the winds or tides, by the currents of rivers, or any other cause. This is done by the anchor, after it is let down from the ship by means of the cable, fixing itself into the ground, and there hold- ing the vessel fast. The anchor is thus obviously an im- plement of the first importance in avigation, and one on which too much attention cannot bé}bestowed in its manu- facture and proper construction, seeing that on it depends the safety of the vessel in storms. The invention of so necessary an instrument is to be referred, as may be sup-

posed, to the remotest antiquity.

stones, sacks filled with sand, or logs of wood loaded with lead. Of this kind were the anchors of the ancient Greeks, which, according to Apollonius Rhodius and Stephen of Byzantium, were formed of stone; and Athenzus states that they were sometimes made of wood. These sorts of anchors retained the vessel merely by their inertia, and by the friction along the bottom. Iron was afterwards introduced for the construction of anchors, and also the grand improvement of forming them with teeth or flukes to

fasten themselves into the bottom; whence the words éddvres and dentes are frequently taken for anchors in the Greek and Latin poets. The invention of the teeth is ascribed by Pliny to the Tuscans; but Pausanias gives the merit to Midas, king of Phrygia. Originally there was only one fluke or tooth, whence anchors were called érepoorouor; but shortly afterwards the second was added, according to Pliny, by Eupalamus, or, according to Strabo, by Anacharsis, the Scythian philosopher. The anchors with two teeth were called éupiBoro or dudicropo, and from ancient monuments appear to have been much the same with those used in our days, except that the stock is wanting in them all. Every ship had several anchors, the largest of which, corresponding to our sheet-anchor, was never used but in extreme danger, and was hence peculiarly termed iepa or sacra; whence the proverb sacram anchoram solvere, as flying to the last refuge.

Up to the commencement of the present century what Modern was termed the “old plan long-shanked” anchor seems to #2chors.

have been generally used. It was made of wrought iron, but the appliances of the anchor smith were so crude that little dependence could be placed upon it. About this time public attention was drawn to the importance of the auchor by a clerk of Plymouth yard named Pering, who published a book, and argued, from the number of broken anchors which came to the yard for repair, that there “must be something wrong in the workmanship—undue proportion or the manner of combining the parts.” Mr Pering altered the sectional form, made the arms curved instead of straight, used iron of better quality, and intro- duced improvements in the process of manufacture. Since 1820 about 130 patents have been taken out for anchors ; and the attention thus given to the subject, with the intro- duction of steam hammers and furnaces, the substitution of the fan blast for the old bellows, and the better know- ledge obtained of the forgeman’s art, have rendered the anchor of the present day so far superior to that of fifty years ago, that we rarely hear of one being broken, the ground in which it is embedded generally giving way before the anchor.

Fic. 1.—Common Anchor. Fic. 2.—Admiralty’s. Fic. 3.—Rodger’s. ’ Fig. 1 represents the “common” anchor.

the straight part, ab; the square, ac, is that part of the shank to which the stock and the shackle are attached ; d is the crown; de and df the arms; gg the palms or flukes ; the pee, the bill, or the point is the extreme end of the arm beyond the palm; the 6lade is the part of the arm at the back of the palm; f is the shackle or ring to which the cable is attached; H/ is the stock, placed at right angles

The most ancient Antiquity anchors consisted merely of large stones, baskets full of of anchors.

The various Common parts are known by the following terms:—The shank is anchor.

4 ANCHOR

1.---Chains and Anchors for Steam Vessels required by Lloyd’s Register of British and Foreign Shipping (1874).

Minimum Weights of Anchors ea. Stock, Sizes and Length of Chain Cables, and the Proof Strain to whi : ch they a to be tested ; also Sizes and Length of Hawsers and Warps,—the Anchors and the Links of the Chains to . if unexceptionable form and proportions.

ANCHORS. ‘ Hawsers an g | ‘ CHORS Stud-Chain Cables. (90 fath ie pes Number » Number i 4 3 Be Se : E Weight. s a Stream. Vessels.! & Bowers.” Including Stock. 5 rs F : B : Fl & Ex Admiralty oe 2 eg BE & : . = ry 3 : eights. ‘ga 6-3 a a A a ig Stock. Test. : ee Kedge. ae Z &R 8 A = 9, 750 “5 : 1 | “oF ot = os eS Ome Be eid Se Inch. re aa Inch, 3750 | 1121 2 | 1 | 1 | 4b | 688 st | 14 | 9 | 2 | $e | 20x | 120 eS ete ee Ze7o | 150| 2 | 1/1 | 5 7 | 10 oo 4 lig | iss | Selon @ |... 5,420 | 188] 2 | 1 | 1 53 Tits | 2 1 de | 188s betes) | dge| wy 4 1k. éi7o | 25| 2 | 1} 1) 6 | sae | 18 | 2% | £5. | 154 pul) AGbu lied 4 lettin Vie Meliss 6,840 | 262} 2 | 1 | 1 7h 9.2 144 a; \ r lie | tee | aa.| ee ee . 7500 | 300! B | 1 | 1 gt | 10d 234 | 38 14 ie loage| sos | Ge”) Gee 3750 | 3751 8 | 1 | 2 | 10 | 12 ong | 49 | 2h is |oots | 195 | 33 | 84 | 64 | --- Sao | 250| 8 | 1 | 2 | 12 | 184s | 34 | 5 | 2b | 1d | date | Bae | 195 | ae ee 10,800 | 525] 8 | 1 | 2 | 18% | 15a 38h | 6 3 1h | Ite | 28×51 210 | ol 7 le ieee | 600) 8 \ 1 | 2 | doe | ioky |) “age 1 O80) Ge Gta ie eee) ae % 1101.8 | 6 12750 | 675/ 8 | 1 | 2 | 16% | 18 473 | 7 | 3k | ae | ny (84 | 240 | ae [10 | 8 | 5 13.670 | 750; 8 | 1 | 2 |

18 | 19 sit | 8 | 4 | 2 | ape | 8% | 240 | 38 | 10 | 8 | 5b teavo | poo | 3 | 2 | 2 | al | 21g | 60 jue | eam | steel] Daeieaee ee ie | 10 | 9. | Se v’o00 |1050| 3 | 1 | 2 | 384 | 2348 | 67 | 10 | 5 | 2h | Ive | 4388 | 270 re at 6 poo | 1200) 8 | 1 | 2 | 25h | 2dr | 72a [10k | Sk | 24 | 18g | A7es | 270 | 2 | 10 6 | arieo | 1850} 8 | 1 | 2 | ame | aeee | 70 [11 | 5k | 22 | 1b | Side | 270 | te 11 64 aveon | 1500 3 | 1 | 2 | 80 | 284g | 85h 12 | 6 | 8 | Ike | Sbys | 270 i. | 7 sr’seo |1s00| 3 | 1 | 2 | 82 | 80% | lf | 18 | 6b | SE | 148 | 50s | 270 1 | 11 7 a7 g00 | 2100 | 8 | 1 | 2 | 84 | Bas | 97 | 18h | OF | Bb | 14g | Gbxe | 200 ie |i 74 esp | 2400} 8 | 1 | 2 | 86 | Bax | 104 | 14 | 7 | 8h | Ide | S¥ab | 300 13, | 12 8 ee too ja7o0| 8 | 1 | 2 | a8 | sake | lose | 14h | 7h | Oh 2 ee 12, | 12 8 aP7e0 | 3000; 8 | 1 | 2 | 40 | Soe | 114 | 15 | 7h | Sf | Ste | OR | 800 ia, | 12 8 ooo | 3750 | 4 | 1 | 2 | 42 | Bt | 161g 17 | 8k | 4b | 2ae | Slay | 800 Iv, | 12 8 45,100 | 4500 | 4 i {2 | 45 | aoe | 173 | 19 | 98 | 4% | 2x | Slee | 300 | Ii | 12 9

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9.—Chains and Anchors for Sailing Vessels required by Lloyd’s Register of British and Foreign Shipping (1874).

Hawsers and Warps

AN iE F : em Stud-Chain Cables. (90 fathoms of each). icles 2 Number. Weight. z 8 Stream. Vessels.! 8 ’ © } Bowers.” Including Stock. g 2 a e a & 5 Ch apa a 5 Collective Bs D’S ; 4 2 : = | £ | S | o | Ex. | Admiralty) Weights. BE | ee | ® 3 3 e oe a é td stock. Test. ¥| Welghts. (Stream. | Kedge, toiee 2″ E A 8 3 s & = 2600 50 : ‘ “ ay pee oF ve Cwts. | Cwts. Inch. ag’ Fath, ee Inch, | Inch. | Inch. 3200 wpe Oe ad || EL 4} 6i3 8% | 13 tel i3 oe a Em ite? 3400 | too | 2 | 1 | 1]| 5 we | ow | ola). |e ape: a ie 3810 | 125| 2 |°1 | 1 2 | 8 im | | 1 ay late sl teal ae i mao | 166:| 2B at a 64 gig | 18 ae le | y5i8 | 165 | oy a ie 3 acid. | gb || 2 |) Aol a le ae ee ae a lage | aes Tee Gee 5020 | 900) 8 | 1 | 1 8 1035 234 | 8 14 1a, | 208 | 165 | 48 rae a e070 | 960) 8 | 1 | 2 | 20 12 og, | 4g) 2t | i | 14a | 2288 a | A late 6920 | 300; 3 | 1 | 2 | 12 1345 sat | 5 | O8k | agen | See | Bl os 7ga0 | 350) 3 | 1 | 2 | 18% iss, | sa |6 | 8 7 ie Ce et aa l 3600 | 400} 3 | 1 | 2 | 15k | 1635 re a a es 73 : ‘ie | ee aco | | a | 2 | eee | ee Ole ao ane | oie) ae 2 A ie 10,080 | 500| 8 | 1 | 2 is | 19 an) 8 | eel oe |e Fie aa . ee: ! 17300 | 600| 8 | 1 | 2 | 21 | Sigg | Oo | 9 | 4 | Bt jn | done. odo | ae) oRe| Tree 12500 | 700| 8 | 1 | 2 | 288 | 2388 | 67, | 10 5 | of | ie | 438s] 970 | 48 he Ale isso | 300| 3 | 1 | 2 | 25 | Qe | 72g | 104 | 5b | 2 148 | 4743 | 270 | 44 | 10 | 8 | 5

3 18 LA 14a20 | 900) 8 | 1 | 2 | 3 | ee | oe las | 6 Pa: ea ee a | 17500 | 1200} 8 | 1 | 2 | 82 soe | of (13 | of | 3h | 148 | 50x | 270 Pela let – i 197320 |1400| 3 | 1 | 2 | 34 | Bldg | 97 | 18h | SF | 3 1: | 632 | 270 | 1 | 10 ot ae | sii00 | 1600; 8 | 1 | 2 | 86h | 88% | 104 J 14 | 7 i | ae | 674 | 270 | 12 a | 92790 |1800| 8 | 1 | 2 | 38 eae | tos | ia | 7 eee i'\ oro | 1k THe ar4o0 |2000| 8 | 1 | 2 | 40 | 3586 | 14 [15 | 7h | BF | Bee 7633 | 270 | ly | a | i | 7 38300 | 2500| 8 | 1 | 2 | 42 | 87% | 1199 | 17 | 8h | & a2 | sig, | 300 | 13 | 12 | 12 | 8 32100 | 3000| 8 | 1 | 2 | 45 | 80% | 128 | 19 | 9b | 4 o« | 91%, | 300 | 1% | 12 | 12 | 8

1 The rules for the building and classification of iron ships provide that " their equipment is to be regulated by the number produced by the sum of the measurements of the half moulded breadth of the vessel amidships, her depth from the upper part of keel to the top of the upper deck beams, and the girth of her half midship section to the same height, multiplied by the vessel's length, for a one, two, and three decked vessel, and for a spar-decked steam vessel." q

3 Two of the bower anchors must not be less than the weight set forth above; in the third a reduction of 15 per cent. will be allowed.

ANCHOR

~ t

3.— Weights of Anchors and Sizes of Cables and Messengers for all classes of Screw Ships and Vessels of HM. Navy. (The weight given for Anchors ts exclusive of the Stock.)

Despateh Vessels.

Line-of-Battle Ships. Frigates, Corvettes, Gunboats. z = – 43 s See g, S,, 2. S. S. F S . a a. S. S 3 |. 3 S. 3 3 3 ah | 28 |evs/Selesles|8(S8|s8/e8/Selselsdleaisdlcflteledicgl ae m5 ES 558 e* s* ES 2*|o* 2″ 3° e* | 24 Be = gs 38 eee 3s Bee ss Siw oltre ie ie ie is Is [4 je |§ [2 | Is (4 12 (6 12 1d Anchors. : Omer… eth bask ewt.| 100 | 100 95 | 90 | 75 185 75 | 70 | 60 | 50 | 45 | 40} 80] 25 | 20/| 25 | 20/14] 91 7 ING lOt Gree: shatgsssenenne 4 4 4 4 |, oA) 4 Si eh a A ae eS Oe i, S|. SS 2 2). || 2 Stream. .cwt.| 380 80 25 25 | 20 |25 20) 2001S a01e | ete 8h 7 | ET Fe eo) & | 8 Bag

Older cetcnnicve- oa. Ne = 40 Saas nas Tn eM ct Nos Mae Vase tt sacolbaerewtoet I See Wbews d[t das Nl aes are leer Large kedge …..... zs WS 15 15° | 12 | #9 te Bip De MB sey El LG B eG wee |S a Bal Qa! Binal cds. seve ursaeae An 9 9 8 i ae lor Crafmeron |) BOWEL sales sardenee.see inches 23 28 2} | 23) 23) 24 | 21) 2] 12) 1Z! 19) 1g] at 18 14] 13] 13; 14] 1 Z Stream a 14 14 12} #12! 14) 12 14) 14} 14 1g) 14 1 i 4 4} a #].. SO EGMIIS ents cannes = Mee || Pees a capil |ceo 2{{pcerill| cool | Meee wl erie MesCew| eee | teen (ee ear lll cco |) aeevent meats, IIa ie Messenger…..... 55 – 14%} las} 13) 14) leet 14) 18) 18) TH Ub ois} oad} 1to1d 1) Og .. Cables—Hempen. BOWED co: cneecnees co ‘ 18 19 183 | 18 | 17 174 | 17 | 163) 153) 144] 14 | 184] 12 PSEYOATD . cwaisreisenscos a 143] 154 | 14% | 143] 183)144 | 134) 184] 18 | 12 | 11 | 104] ...

Weight of Anchors supplied to Boats.—42 ft. Launch, 120 tb ; 32 ft. Pinnace, 56 tb; 30 ft. Cutter, 40 ib ; Jollyboats or Gigs, 30 tb.

to the plane of the arms and shank. The use of the stock is to “‘cant” the anchor. If it falls with the arms on the ground, the other end resting on the end of the stock, the pull of the cable will turn it over, so that the stock will lie upon the ground, and the weight of the crown and arms then resting upon the sharp point, will cause it to enter the soil and take fast hold.

The stock is made of iron in anchors of 60 cwt. and under, and of wood for anchors above that weight.

The weight of the stock, whether of wood or iron, is about $th that of the anchor.

The shank and each arm are forged under the steam- hammer in three pieces, and are then welded together at: mand n, fig. 8. The welding is done- by the “ Hercules,” which is a heavy iron ram placed over an anvil, so that it can be raised by steam power to a height of some 9 or 10 feet, and then let fall, being guided in its descent by three men, who hold rods attached toit. It is needless to say that

the welding must be carefully done, as the whole strength of the anchor depends upon it.

.To ensure safety, every anchor should be tested at a Testing.

public testing-house to $d of its breaking strain. The anchor is held by a chain attached to the shackle, and the strain is applied to each arm separately at 4d of its length from the point. The proof of the anchor is that it must show no sign of fracture, and that if any deflection is caused by the strain, it must return very nearly to its original shape. A good anchor, after being deflected half an inch, will return to its former shape, leaving no permanent set.

The size of anchors for various ships has been deter- Size of mined by practice, but is based upon the theory that ag anchors.

the anchor is required to withstand the force brought upon the ship by the wind and tide, which would otherwise cause her to drift, its strength must be nearly proportional to her resistance. A result which will accord with sound practice may be obtained by calculating the resistance of a given ship at a speed of twelve knots, and taking this for the working load of the anchor. The working load should be half the testing strain, and consequently Ath of the breaking strength.

A large ironclad carries 8 anchors,—2 bower, 2 sheet, 1 stream, 1 stern, and 2 kedge. The bower anchors (fig. 7) are stowed at the bow, and are for ordinary use in a roadstead ; if there is any difference in weight, the heavier is stowed on the starboard side, and is termed the best bower. The sheet anchors (fig. 8) are stowed as far forward as is convenient in the waist of the ship, and are sometimes called the waist anchors; they are only used in cases of emergency, or in the event of any accident befalling the bowers. The stream anchor is for use in a

| river or sheltered place, where a small anchor is sufficient

to hold the ship. The stern anchor is used when it is required to moor at both head and stern, as is the case when there is not room for the ship to swing with the tide. The kedge anchors are generally of different sizes, one large and one small; they are used to warp the ship along a narrow channel, the kedge being carried out in a boat with the hempen cable attached to it, and

dropped; the ship can then be hauled to the anchor. Kedge anchors are still supplied in the Royal Navy, but are very rarely

‘ j i i i « 128; 28 per cent. superior to Admiralty. used, the service for which they are intended being gene- ey Pee a Py Pp ig ae y rally performed by the aid of a steam-tug vessel. Witcheson’s, . 1-2), qe 20 ds. do, oy The tables on pp. 4 and 5 give the sizes and number of | [enox’s, . 113, or 18 ‘do. ae. rg anchors and cables carried by ships of the Royal Navy, Honiball’s, 1:09, or 9 oe 7 and those required by Lloyd’s rules to be carried in mer- pepsi , 0 ba ae 0. 0. chant ships. The sheet eens ae apt a. bende ? ‘73, or 27 per cent. inferior to Aamiralty. S i i i tables under the headin ; ; ; Ce ee : The decisions of the committee have been much

“¢ Bower.”

questioned, one of the objections being that the qualities

irected to the subject of gu Te yin i ea ci. Pinan pe De Achy of strength and holding on, neither of which is of any use

Committee of 1852.

anchors by the specimeus which were exhibited at the Exhibition of 1851, a committee was appointed by the Admiralty in the succeeding year to consider and report upon the qualifications of the various kinds. The committee determined the qualities it was desirable for an anchor to possess, and assigned numerical values to each. The following tables give the result of their labours, show- ing the number of marks obtained by each anchor under trial :—

Table showing the relative order in which the several Anchors stand with regard to each of the properties essential to a good Anchor—the names arranged alphabetically.

;

=| i z F § ; Bulg |2 = Isaac’s, PORE ivey porter iy) dion Aico tal PR: 2A P2170) i NO Pes) PR) the SBE a Lenox’s, . 6 |3|2 ale 8/211/38]2 Re- Mitcheson’s, . . . nthe 1/3/1}/8|/2/8/2|4]4 tria Rodger’s, id (does 8 Vee al Pe D7 eb i i NG Protmanisy is a. ae EOP GE So Bale ee BB

Table showing the estimated numerical values of the several Anchors in regard to the properties considered essential to a good Anchor.

without the other, were assigned such different values as 15 and 80; it has also been stated that the Admiralty

‘anchor was treated unfairly, as one was taken promiscu-

ously out of store for the trial, whereas the other com- peting anchors were made specially for it.

The Admiralty anchor (fig. 2) differs only from the ordi- nary anchor in having.a nut, a, worked on the square, so that a wooden stock may be fitted temporarily if the iron stock is damaged, and that its proportions and form have been carefully considered and definitely fixed. Lenox’s and Aylen’s were modifications of the Admiralty anchor. Mitcheson’s was of a difficult section to forge, and conse quently expensive, and was withdrawn from the test of strength. Isaac’s was of a peculiar construction, and may be passed over as more curious than useful,

Rodger’s anchor, placed second on the list, was one Rodger’s of Captain Rodger’s, R.N., who for the last forty years anchor.

has devoted considerable pains to the improvement of anchors. Among his earlier inventions is an anchor with a hollow shank, to obtain greater strength with a given weight of iron; then an anchor without a palm, which he termed a “ prckaxe anchor ;” afterwards a “ small-palmed” anchor ; and by a patent taken in 1868, an “indented small- palmed anchor” (figs. 3 aud 7). The stock is of iron in large as well as small anchors, and is made with a mortice, to fit over the shank instead of passing through it. It is somewhat heavier than the stocks of other anchors; the arms are shorter than usual in proportion to the length of the shank, and are of a wedge shape, varying in sharpness from the throat to the head of the palms ; the back part of the

arms is parallel from palm to palm ; the palm is double concave on the front, and has a small border at the edge for confining the soil through which it is dragged ; it also has a large indentation on the back for the same purpose

° te |e 3 iy ails |pd . 5 spk ‘ 2.1% & a | @ & & &, and to save weight ; the shank is rectangular at its junction 3S . 7 ° BG les|s | elle |e l2 |ss with the arms,.and square close to the collar for the stock : ANCHORS. [So |ES|2 | 8/2 Se 1S be g ae 4 “(22 |28i 3/3 | 8/8. 5 [sgiac. 3 the crown is made longer than usual, and has a large fe) 4 8/8 [<3 o . ° . . bes eel eS ae| B\ESIRE * || countersunk hole in its centre to save weight. It is claimed Seeissla 8/18 8818 Stiles a 5 f gece” 2 (21S ia”| 2 ele i for this anchor that the peculiar form of the palms and + = = ° ° . . . = arms, with the hole in the crown, give it great holding “Foleo: aie Ub power, and that it will bury itself in the soil until the qualities, . upper palm is beneath the surface, and consequently is Admiralty, .| 2-07 1817| | not liable to be fouled by the cable. ble RE ay aes Trotman’s anchor (fig. 5), which obtained the highest place Trotman’s _borter’), } Pe “ol in the committee’s estimation, was an qe seoie Tiiaana Bhs doe1| | improved Honiball’s (Porter’s). The ARS Pages ,| | Stock is of iron, similar to the Admi- ¢ Mitcheson’s, . his 21°85 : ‘ trial. ralty anchor; the shank is of rect- \ Rodger’s, 1:94 22:86 n j ; eee el) ae a gular section, somewhat larger at the centre than at the ends, and is Totals, . . | 15-00

5:00 pane

Note. —This Table only professes to show approximate values, and has no pretensions to mathematical accuracy or precision.

The following is a recapitulation of the order in which the anchors were ranked by the committee, together with their relative percentage of inferiority or superiority to the Admiralty anchor, the value of which, as given in the foregoing table (18°17), was taken as the standard or wut —

made fork-shaped at one end to re- ceive the arms; the arms are in one

Fig. 5.—Trotman’s. piece, and are connected to the shank by a bolt pass-

ing through their centre. The peculiarity of the anchor is that the arms pivot about this bolt, so that when it takes hold the upper fluke is brought in contact with the shank, thus reducing the height above ground, and rendering it almost impossible for the cable to get entangled round it, or, in other words, for the anchor to become foul.

Of the anchors tested by the committee, Trotman's,

Martin's anchor.

Stockless

anchor. –

Stowing bower anchor,

Rodger's, and the Admiralty find the most favour at the present time. 'Trotman's and the Admiralty have under- gone no alteration, but Captain Rodgers has taken out two patents for improvements in his anchor since the com- mittee reported.

We now come to an anchor of entirely different shape from the preceding, patented by a Frenchman named Martin. The anchor is represented in fig. 6 in the position in which it lies on the ground just before taking hold. The shank is made in one forging, is of rectangular sec- tion, having a shoulder for the stock to fit against, and is increased both in thickness and area at the crown; the arms with the palms are forged in one piece, and then bent to the required shape ; one of the arms is passed through a hole in the crown and is kept in position by a bolt screwed through the end of the crown, so that its point reaches a little way into an indent made for it in the round part at the back of the arms. Until very recently this securing bolt was placed in the shank in a vertical position (supposing the anchor to be lying with the palms horizontal), so as to cut into the hollow part at the front of the bent-arm.

Fic. 6.—Martin's.

the soil, so that it takes hold immediately ; it is impossible

to foul it; it stows much more neatly than any other anchor ; its holding power is very great, as both arms are in the soil at the same time, and the stock, which is flat and broad, adds materially to this quality ; the strength is also very great. At an experiment made at Portsmouth dockyard in March 1867, two of the anchors were sub- jected to a strain of 50 per cent. over the Admiralty proof ; the arms were deflected but three-tenths of an inch by this great strain, and when it was removed they regained their former shape. The anchor is made in three separate forgings without a weld. Unmasted turret ships, which have an all-round fire, are, almost without exception, fitted with Martin's anchor on account of the neatness with which it can be stowed, as the stock of any other anchor, if not unshipped, would obstruct the fire of the guns. The Admiralty allow a reduction of 25 per cent. in weight for Martin's anchor, using an 80 cwt. Martin where a 90 cwt. Admiralty or Rodger's anchor, weighing with its stock from 108 to 112 cwt., would be fitted, the weight given for Martin's anchor including the stock.

Smith's patent stockless anchor has been highly spoken of. It is a modification of Martin's anchor, but without the stock.

A bower anchor is stowed in H.M. service as shown in fiz. 7. A, is the cathead ; B, the fish davit ; O, and E, bol- lards ; D, the bill-board. The anchor is held in place by two chains, a and b, termed the cat-stopper and shank painter respectively, each of which is fitted with a long link at one end. A bolt 6, about 5 or 6 inches long, is fixed on the side of the cathead, on a hinge at its lower end ; it is held in the upright position by another bolt ¢, which passes through the cathead, and is worked by a lever d ; dis provided with a hole at the end for a lanyard, so that two or three men can pull it. This whole arrange- ment is termed a slip-stopper. A somewhat similar com- bination of bolts and levers is fitted close to the bill-board

D, ¢ being a short bolt secured at its lower end with a hinge to the ship's side ; and f a hooked lever which holds it in its upright position; f has a socket at its inboard end, to which a shifting arm, provided with a lanyard like the lever d, is fitted. The cat-stopper is rove through the shackle of the anchor, and the long link placed over the

Fic. 7.—Bower Anchor, and manner of stowing.

bolt 6; it is then passed over a cleat g, on the side of the cathead, and belayed at the bollards C. The end of the shank painter is passed under the crown and over the shank ; its long link is placed over the bolt e, and it is belayed at the bollards E. When it is desired to let go the anchor, the arm is shipped at f, and the lanyards at f and d are manned ; then, at the word of command (given, if the ship is rolling, when she lurches towards the side on which the anchor is stowed), the men pull the lanyards, and 6 and ¢ are released simultaneously, the links of the cat-stopper and shank painter drop off, and the anchor falls clear of the ship. In merchant ships it is not usual to fit the second slip-stopper, 6 and ¢; in this case it is neces- sary, before letting go, to " cock-bill" the anchor,—that is, to ease away the shank painter, so that the anchor hangs by the cathead alone. The next thing is to "weigh" the anchor. It is hove up by the capstan, and when it appears at the bows, the operations of " catting " and " fishing " have to be performed. A chain called the "cat pendant" is rove over the sheave h in the cathead, and shackled to a short piece of a similar chain attached to the anchor at one end, and stoppered to the cable at the other ; the in- board end of the cat pendant is taken to a leading block on the opposite side of the ship, and a purchase tackle attached to it, so as to give the men a run right aft. When all is ready, the word is given, and the men run away with the purchase until the anchor hangs from the cathead instead of the hawse-pipe; it is then said to be "'catted." A chain rove through the block at the head of the fish davit, and having a large hook at the end, is then hooked to the inner arm of the anchor, which is then raised and swung inboard (the fish davit being made to revolve), so that the fluke rests upon the bill-board D, and the auchor is " fished." The cat-stopper and shank painter are then rove, and all made ready to let go again at a moment's notice.

The cathead shown in the figure is made of plates and angle irons, and is similar in shape to the old wooden cat- heads ; it is fitted with a single sheave h, made to swivel so as to give a fair lead for the chain when the anchor is at the hawse-pipe. Catheads are frequently made of solid forgings, with a block hanging from the head for the cat pendant or fall. In ships designed for ramming, the cat- head is made to revolve like the fish davit B,

so that it can be turned inboard, and there will be no projection on the bow to foul the enemy’s rigging.

Fig. 8 shows a sheet anchor as stowed in a man-of-war. Stowing

The anchor rests upon stout iron rods, a, a, called tumblers ; they are connected to the ship’s side at the lower ends, so that they will fall outwards. 2, 8, are short bolts to keep the anchor in its proper position, with the tumblers slightly

Mooring anchors.

8 . ANCHOR

inclining outboard. Both a, a, and 3, 6, are fitted to the shank of the anchor, and so arranged that rope lashings

RS

Fig. 8.—Stowing a Sheet Anchor.

passing round the shank can be secured to them. A strong bolt, fitted with three lugs, ‘c, d, and e, is secured to the ship’s side by eye-bolts, which allow it to revolve. Chains, f and g, fastened to the ship’s side at one end, are passed round the shank of the anchor, and held by the lugs ¢ and e at the other. A slip-stopper, 4, clasps the lug d, and keeps the bolt in the position shown; the inner fluke of the anchor rests on the bill-board k, the point is held down by a securing chain fitted with a slip at 7, and the upper end of the stock is secured in a similar way. When it is desired to “let go,” the rope lashings on a, a, and 8, b, are cut, the slips at the point and stock are knocked away, and then the stopper h is the only thing which holds the anchor. A shifting lever, shown by dotted lines, is fitted to a socket in h; when a strain is brought upon this, the lug d is released from the grip of the stopper h, and the anchor let go, the tumblers, a, a, throwing it clear of the ship.

it should be observed that whenever a slip-stopper is fitted, care must be,taken, by placing a pin at the back of it, or otherwise, to prevent the

anchor being let go by accident.

Stern and stream anchors are stowed at the stern of the ship in the way described for sheet anchors,

The kedge anchors are generally stowed in the main- chains.

Sheet, stream, and stern anchors being very rarely used, have to be re-stowed by the aid of the yard-arm, without any special appliances being fitted.

Mooring anchors are those which are placed in harbours, &c., for the convenience of vessels frequenting them.

project above the ground, as any projection in the shallow waters in which they are usually placed would render ships liable to injury from grounding on them, and be dangerous to fishing-nets, &c. Mooring anchors may there-fore be of stone, as shown in .

P g. 9; or of cast-iron, as in FG. 9.—Buoy Mooring Block. fig. 10. Mushroom anchors (fig. 11), first proposed for ships, are now only used for moorings. An old anchorwhich has one arm dam- U& aged is frequently ™“ used aS a mooring anchor, the damaged arm being bent down close to the shank; the anchor is sunk with the bent arm uppermost, and there is no projection above the ground. In harbours where there (aa is not much rom it =$— is usual to place two anchors, connected by a cable, in a line at right angles to the = direction of the tide ; Sa a swivel is fitted at Fig. 11.—Mushroom Anchor, the centre of this cable, and the buoy chain is made fast to the swivel. With this arrangement the ship does not sweep such a large circle in swinging.

The best mooring anchor which has yet been devised is shown in fig. 12. Its shank is a round bar of wrought iron, a, about 7 feet in length and 6 inches in f diameter ; it is increased at b to 9 inches diameter for about 1 foot of its length, and terminated at / similarly to the point of a gimlet ; holes are made in the stout part b, and a screw flange of 34 feet diameter is cast around it; the molten metal gets into if the holes and makes a good connection F1¢.12.—Mooring with the wrought-iron shank. A swivel Anchor,

c, to which a large shackle d, is attached, is fitted on as shown, and secured by a strong nut ; the end of the shank eis made square. To place this anchor in about 8 fathoms of water, four iron bars, each about 17 feet in length, and provided with a socket at one end and a square head at the other, are used. As the anchor is lowered the socket of the first bar is fitted on at é, and the socket of the second bar in its turn fitted to the square end of the first, and so on till the anchor reaches the bottom. A drumhead, similar to a capstan, is then fitted on the last bar, and capstan bars shipped in it ; by these means the anchor is turned round, and so screwed into the ground. It must be sunk through the soft mud or sand into the harder soil beneath it, and when this is done the holding powerof the anchor isenor- mous. An anchor of the dimensions given weighs about 14 ewt., and will hold far more than a cast-iron mooring anchor of 7 tons. The only objections to it seem to be the difficulty of removing it if the moorings are required to be taken up, and that special appliances are required. for putting it down.

A good anchorage is where there are from 10 to 20 Anchorage, fathoms of water, and the ground is not rocky or loose sand. Where there are more than about 20 fathoms the cable bears too nearly perpendicular, and is liable to tri the anchor. For anchoring in ordinary weather the length of cable veered out is about three times the depth of water. (T. M.)

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ANC—ANC . 9

ANCHOVY (Zngraulis, Cuv.), a family of small fishes akin tothe shad and thesprat, all three being of the Clupeade, or Herring tribe. There are six or seven species of anchovy found in the seas of Europe, of tropical America, and of India. Of these the most important and the largest is the common anchovy, Lngraulis encrasicholus, so called from the bitter taste of its head, and the ancient belief that its bile was in that part. From the days of the Greeks and Romans it has been esteemed for its delicate and unique flavour; anchovy sauce isreferred to under the name garum in Horace, Sat. ii. 8, 46. ‘The common anchovy is from five to seven inches long, and resembles the sprat and sardine. Its distinguishing peculiarities are a short

anal fin, the dorsal fin right over the ventral, a long sharp head with projecting upper jaw and mouth cleft behind the eyes, the colour rich bluish green on the back and silvery white on the belly, and large loose silvery scalés. Anchovies are abundant on the coasts of Britain, but the markets are supplied chiefly from the Mediterranean fisheries, the best qualities coming from Gorgona, a small island near Leghorn. They leave the Atlantic depths, and come in shoals to the coasts of Spain, Portugal, France, and Italy, to deposit their spawn during the months of May, June, and July. Like herring they are caught with nets at night, being allured round the fishing-boats by fires kept burning at the stern. They are “headed,” “ gutted,” pickled, and packed for exportation in barrels of five to twenty pounds, being repacked when brought to this country, and bottled up for use. Some relish them raw from the brine in which they are pickled; but they are commonly used in the shape of sauce or paste—a little vinegar, which dissolves the whole fish, including the bones, being used to produce the necessary consistence.

ANCHYLOSIS, or Anxyosis (from dyxvAos, bent, crooked), stiffness of a joint, the result of injury or disease. The rigidity may be complete or only partial, and may be due. to disease of the tendinous or muscular structures outside the joint, or to disease of the joint itself. When the structures outside the joint are affected, the term “false” anchylosis has been used in contradistinction to “true” anchylosis, in which the disease is within the joint. An- chylosis is also used as an anatomical term, bones being said to anchylose (or ankylose) when, from being originally distinct, they coalesce, or become so joined together that no motion can take place between them. The form anky- losis agrees best with the etymology.

ANCILLON, Cuartss, son of David Ancillon, and one of a distinguished family of French Protestants, was born 28th July 1659, at Metz, and died, 5th July 1715, at Berlin. He studied law at Marburg, Geneva, and Paris, where he was called to the bar. At the request of the Huguenots of his native place, he pleaded its cause at the court of Louis XIV., urging that it should be excepted in the revocation of the Edict of Nantes; but his efforts were so unsuccessful that he quitted the country and joined his father, who was already in Berlin. Through the influence of his father with the elector of Brandenburg, he was appointed at first judge and director of French refugees, and ultimately embassy counsel, historian to the king, and

superintendent of the French school. He is known chiefly by his writings, several of which relate to the revocation of the Edict of Nantes, and other events of his time. He also wrote Miscellaneous Literary Criticisms, a Life of Soliman LI., and a Treatise on Eunuchs, the last of which he pub- lished under the name of Ollincan, an anagram of Ancillon.

_ANCILLON, Davin, an eminent French Protestant divine, father of the preceding, was born, 17th March 1617, at Metz, and died, 3d September 1692, at Berlin. At the age of sixteen he went to Geneva to complete his theo- logical studies ; and in 1641 he was appointed minister of

Meaux, where he remained till 1653. At this time he accepted a call to his native town, Mctz; and he continued to officiate there till 1685, when the revocation of the Edict of Nantcs compelled him to retire to Frankfort. He left this for Hanau, and finally settled at Berlin, filling the office of French Protestant pastor there, much esteemed

by the highest classes, till his death in 1692. He was

a scholarly writer, and a man remarkable for the moral beauty of his character.

ANCILLON, Jowann Peter FRIEDERICH, a historian and Prussian statesman, one of the family of French Pro- testant refugees noticed above, was born at Berlin, 30th April 1766, aud died there, 19th April 1837. Desccended from a family of divines, he early selectcd the ecclesiastical profession, and studied theology first at Berlin and then at Geneva. Shortly after finishing his course he was appointed minister to the French community at Berlin, as well as professor of history in the military academy, and he attracted attention even at court by the eloquence of his style. In 1793 he visited Switzerland and, a few years after, France, the details of his journeys and observations being published on his return. He was a frequent and able contributor to the literary journals of the period, and in 1801 appeared as the author of Laterary and Philosophical Miscellanies, revealing a shrewd, philosophic cast of mind. Ancillon took rank among the most famous historians of his day by his next work, A Picture of Political Revolu- tions in Hurope since the 15th Century, which gained him the eulogium of the Institute of France, and adinission to the

Royal Academy of Berlin. It is unfortunate that this work was never finished, for it is one of the ablest and most philosophical on the subject. The merits of Ancillon were not overlooked. He was appointed tutor to the prince royal of Prussia and his cousin in 1806, by Frederie William III, and received various appointments from the Government. In 1814 he accompanied the princes to Paris, and there became acquainted with Guizot, De Broglie, and other persons of eminence. After completing the term of his office as tutor, he was attached to the department of foreign affairs, and made a counsellor of state. He took an active part in many diplomatic transactions, rendering his country some signal services, and securing more and more the confidence of the court. Soon after the revolution of July 1830, he was made minister of foreign affairs, with the entire control of the whole department; and he retained the title of minister of state till his death. Besides the works already mentioned, he published, in 1817, Vew Literary and Philosophical Miscellanies ; in 1819, The Science of Poltrtics ; in 1824, Odjects of Faith and Knowledge in Philosophy ; in 1829, Thoughts on Man —his Relations and Interests ; and a number of other works on politics and philosophy. ANCONA, a province of the kingdom of Italy, bounded on the N. by the Adriatic Sea and the province of Pesaro- Urbino, on the W. by Pesaro-Urbino and Umbria, on the S. by Macerata, and on the E. by the Adriatic. It forms part of the old district of the Marches, which passed from the dominion of the Pope to that of Victor Emmanuel in 1860, The Marches comprise the March of Ancona on the north and the March of Fermo on the south, although the whole territory is sometimes called the March of Ancona. The name, however, has long ceased to be the official designation of any part of Italy, and the present province of Ancona, which has an area of 740 square miles, and a population of 262,369, corresponds in extent neither to the March of Ancona, nor to the Papal delegation of the same name. There is little that is peculiar in the. physical features of the province; the rivers are small and unim- portant, and the hills are of no great height. Agriculture is the chief industry, and the soil, although naturally poor,

yields large and profitable crops through a energy of its ae

inhabitants.

are grown to some extent. The cultivation of the silk- yvorm has not of late years been very successful, owing to the prevalence of disease in the worm. Chalk, sulphur, and raw petroleum are found in different parts of the province, but as yet little has been done to utilise those discoveries. The principal towns are Ancona, Jesi, and Osimo.

ANooNA, a city of Italy, and capital of the province of the same name, is pleasantly situated on the Adriatic, 132 miles N.E. of Rome, in a sort of amphitheatre between two hills—Monte Ciriaco and Monte Guasco or Conero. The strects are narrow and irregular, but the city contains some fine buildings, among which may be mentioned the cathedral of St Ciriaco (which is said to occupy the site of an ancient and famous temple of Venus), several of the churches, and the citadel. The harbour, one of the best on the Adriatic, is defended by several forts and protected by two moles. On the older of these moles there is a magni- ficent triumphal arch of Parian marble, erected in honour of the Emperor Trajan, by whom the mole was built, while the other mole possesses a second arch, of much inferior beauty, dedicated to Pope Benedict XIV. Ancona ceased to be a free port in 1869, and this circumstance, together with the gradual accumulation of mud in the harbour, and the conversion of a mercantile ship-building yard into a naval arsenal, has had a very unfavourable effect upon the commerce of the place. In 1843 the value of the imports was £1,020,770, and of the exports £428,219; in 1869 the respective amounts had decreased to £585,296, and £157,969. The chief articles imported are coal, hardware, sugar, fish, cottons, woollens, linens, lead, iron, and petro- lcum; while the chief exports are wheat, maize, wine, rags, liquorice, and manufactured goods; the principal manu- factures of the town being silk, paper, tallow, wax, and leather. Ancona has a population of 46,000, many of whom are Jews and Greeks. The city was founded about 380 3.c. by Syracusan exiles, who fled from Sicily in order to escape the tyranny of the elder Dionysius. From its admirable position it rapidly rose in importance as a seaport, and it also became celebrated for its purple dye. The exact time of its subjection to the Romans is un- certain, but it was probably about 268 B.c., when the rest of Picenum came under the power of Rome. After the dis- solution of the Western Empire, Ancona was plundered by the Goths, Lombards, and Saracens successively, but it always recovered its strength and importance, and eventually became a semi-independent republic, under the protection of

the Popes. It continued in this posi- tion until 1532, when Clement VII. made himself master of it, and incorporated it with the Papal dominion. In 1797 it was taken by the French, who, in 1799, had in turn to surrender to a combined force of Austrians, Rus- sians, and Turks, after a long and gallant defence under General Meunier. The French recovered possession of it in 1805, and soon after annexed it to their kingdom of Italy, but the Treaty of Vienna restored it to the Pope in 1815. In 1832 the French seized Ancona, in order to check the Austrians, who were then occupying Bologna and the surrounding country; and they retained possession of it until the Austrians evacuated the Papal territory in 1838. In 1860 Ancona was held by a hastily organised body of Belgians and Irishmen under the command of the French general, Lamoricitre. It was here that Lamoriciére retired after his disastrous defeat at Castelfidardo by Cial- dini, when Victor Emanuel determined on invading the Papal States. On the 29th of September (eleven days after Castelfidardo), Lamoriciére capitulated at Ancona with his entire army. In 1861 the city of Ancona, like

Considerable attcntion is also paid to the rearing of cattle and sheep, and the vine and the mulberry

the rest of the province, became part of the new kingdom of Italy.

ANCUS Marctus, the fourth king of the Romans, succeeded Tullus Hostilius about 638 Bc., and reigned until 614. He defeated the Latins and other tribes, enlarged Rome by joining to it the J aniculum, and made the harbour of Ostia. In his reign many of the conquered Latins were incorporated with the Roman state, and not receiving the full franchise, formed, according to Niebuhr, the first elements of the Roman plebs.

ANCYRA. See ANGORA.

ANDALUSIA, or ANDALUCIA, an extensive region in the south of Spain, bounded on the N. by New Castile and Estremadura, on the W. by Portugal, on the 8. by the Atlantic and the Mediterranean, and on the E. by the Mediterranean and Murcia. Although no longer officially recognised, yet, like the other ancient divisions of Spain, it is probably better known and

oftener referred to, at least in popular language, than the modern provinces which have been formed out of it. These are eight in number— Seville, Huelva, Cadiz, Jaen, Cordova, Granada, Almeria, Malaga. It also corresponds to the “four kingdoms” Seville, Jaen, Cordova, and Granada — into which the Moors divided the south of Spain, to the still older Roman province of Betica, and probably, in part at all events, to the Tarshish of the Bible, a famous trading emporium and district belonging to the Phcenicians, who were the earliest known inhabitants of the country. The name Andalusia is said to be a corruption of Vandalusia, from the Vandals, who overran this part of Spain after the downfall of the Roman Empire; other authorities, however, consider that the Moors, who occupied the country after the Vandals, gave it its present name from their term Andalosh, “land of the West.” Andalusia has an area of about 33,000 square miles, and in 1867 had a population of 3,200,944. The principal river of Andalusia is the Guadalquivir, the Roman Batis, which rises in the mountains of Jaen, and flows in a south-westerly direction to the Mediterranean at San Lucar. Its chief affluents are the Jandula, the Guadiata, and the Huebla on the right, and the Xenil on the left. Among the other rivers of the province are the Tinto, the Guadalete, and the Guadaljorce. The country is very mountainous; the chief ranges are the Sierras Morena and de Arsohe in the north, the Sierra Susana in the centre, and the Sierras Nevada, de Gador, and Bermeja in the south, There are several peaks of great elevation; among the highest are Mulahacen (11,781 feet) and Picacho de la Veleta (11,597 feet), both in the Sierra Nevada. Many of the mountains abound with metals, as silver, lead, copper, iron, and with coal; while marble and quartz are also found, the former in large quantities, and of a fine quality. Though its soil and climate vary with the elevation of the land, Andalusia must be considered the finest and most delight- ful of all the divisions of the peninsula. Some of the higher mountains are covered with perpctual snow, a luxury which is highly prized by the inhabitants of the valleys, where the summer is usually extremely hot, and in winter the snow falls only to melt when it reaches the ground. Here the more common European plants and trees give place to the wild olive, the caper bush, the aloe, the cactus, the evergreen oak, the orange, the lemon, the palm, and other productions of a tropical climate. On the coasts of the Mediterranean, about Marbella and Malaga, the sugar-cane is successfully cultivated; and no inconsiderable quantity of silk is produced in the same region. Agriculture is in a very

backward state, and the inrplements used are of the most primitive description ; nevertheless, owing to the natural richness of the soil, large crops of wheat and other cereals are grown. ‘There are, however, considerable tracts of land ‘which, from want of water, are neither cultivated nor

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inhabited; these occur chiefly in the west of the province. The horses and bulls of Andalusia are celebrated all over Spain; sheep and swine are extensively bred, and game is abundant. The inhabitants are a lively, good-humoured, and ready-witted people, fond of pleasure, lazy, and extremely superstitious, great boasters, and, like most boasters, very cowardly and unwarlike. The men are tall, handsome, and well-made, and the women are among the most beau- tiful in Spain; while the dark complexion and hair of both sexes, and their peculiar dialect of Spanish, so distasteful to pure Castilians, are as evident traces of the long rule of the Moors, as arc the magnificent architectural remains which adorn many of the Andalusian towns.

ANDAMAN ISLANDS. These islands lie in the Bay of Bengal, 590 geographical miles from the Hoogly mouth of the Ganges, 160 miles from Cape Negrais in British Burma, the nearest point of the mainland, and about 340 from the north extremity of Sumatra. Between the An- damans and Cape Negrais intervene two small groups, Preparis and Cocos; between the Andamans and Sumatra intervene the Nicobar Islands, all seeming to indicate a submarine range stretching in a curve, to which the meridian forms a tangent, between Cape Negrais and Sumatra; and though this curved linc measures 700 miles, the widest sea-space is less than 90. Some zoological facts are held to point to the former existence of con- tinuous land from Negrais to Achin Head. If we can accept the doubtful authority of Wilford, Hindu legends notice this remarkable chain, and ascribe it to Rama, who attempted here first to bridge the sea, an enterprise after- wards transferred to the south of India, and accomplished at the place we call Adam’s Bridge.

The main part of the group is a: band of four islands, so closely adjoining, end to end, but slightly overlapping, that they have long been known as one,

viz., “the Great Andaman.” The axis of this band, almost a meridian line, is 156 statute miles long. The four islands are (north to south)—North Andaman, 51 miles long; Middle Anda- man, 59 miles; South Andaman, 49 miles; and Rutland Island, 11 miles. Of the three straits which part these four islands, the two most southerly, Macpherson’s and Middle Straits, though narrow are navigable. Andaman Strait, between Middle and North islands, is at low water a fetid swampy creek, not passable by a boat.

Little Andaman, 30 miles by 17, forming the southern extreme of the group, is detached from Great Andaman by Duncan Passage, 28 miles in width. One considerable island (Interview Island) lies immediately west of Great Andaman, and many islets are scattered round. The highest point in the group is Saddle Mountain, in North Andaman, approaching 3000 feet. From this southward the hills sink in height.

People. —These islands, so near countries that have for ages attained considerable civilisation and have been the seat of great empires, and elose to the track of a great eommerce whieh has gone on at least 2000 years, continue to our day the abode of savages as low in civilisation as almost any known on earth. Our earliest notice of them is in that remarkable eolleetion of early Arab notes on India and China which was translated by Eus. Renaudot, and again in our own time by M. Reinaud. It accurately represents the view entertained of this people by mariners down to our own time. ‘The inhabitants of these islands eat men alive. They are black, with woolly hair, and in their eyes and eountenances there is some- thing quite frightful….. They go naked, and have no boats. If they had, they would devour all who passed near them. Some- times ships that are windbound, and have exhausted their provision of water, touch here and apply to the natives for it; in such eases the erews sometimes fall into the hands of the latter, and most of them are massacred.” The traditional eharge of eannibalism has been very persistent; but it is entirely denied by themselves, and rejected by all who have taken part in our recent eolony. Of their massacres of shipwrecked crews, there is no doubt; such horrvrs

have continued to our own day on these islands, as well as on the Nicobars.

The people are Oriental Negroes, and idle stories were onee eur- rent of their deseent from wreeked cargoes of Afriean slaves. Races of somewhat like character are found in the mountains of the Malay peninsula (Semangs) and in the Philippine group (4jitas or Aétas) ; there is reason to believe a similar race exists in the interior of Great Nieobar; there are recent rumours of the like in Borneo; and, strange to say, late research has shown a possibility of near conneetion with the Andamanners of the aboriginal race of Tasmania, recently extinet—eircumstanees which seem to indicate a former diffusion of this variety of mankind over a large space of the south-eastern world. But, in truth, aecurate eomparison of these tribes has yet scarcely been attained. The Andaman eountenanee has generally impressed Kuropeans at first as highly repulsive, and as Afriean in eharaeter; but when we eome to particulars, it has usually neither the exaggerated blubber-lip, nor to a like extent the prognathous profile, of the true Negro; nor has the Andamanner the Negro's large or ill-formed feet. 'The ear is small and well-formed ; the hair grows in short detached tufts, curled in small rings elose to the head, but is deelared not to be woolly. (There are tribes of a long-haired raee on Interview Island, and it is also said on Rut- land. These are of superior stature, and may have been modified by alien blood from shipwrecked erews.) The skin is of a lustrous black; the people, espeeially the men, are often robust and vigorous, though their stature is lw—seldom 5 feet, and generally mueh less. In this respect they ean look down on the Cape Boschmen alone. The general resemblanee of countenance ascribed to the people in some aceounts is entirely denied by those who have beeome familiar with them. Professor Owen, in a skull whieh he examined, found none of the distinctive characters of the African Negro. The people, as a rule, are absolutely devoid of elothing. The men's nearest approach to it is to twist a few fibres round the forehead or neck, or below the knec; the women sometimes makc a slight attempt at deeent covering with leaves or tails of plaited fibre—the last appear- ing to be only a modern innovation, and the result of partial eon- tact with our settlement. Adult males are alleged to be tattooed, or rather eicatrised (though photographs do not confirm the univer- sality of this). 'The process begins about the age of ciglit, and goes on at intervals. It used to be done with a flint; now usually with bottle-glass. Till the process is eomplete, the youth is ineligible for marriage. With both sexes all hair is shaven off, exeept a narrow strip from erown to nape, which is kept cut close, The men rarely have beard, and in

general their eye-lashes are few. The people are neither long-lived nor healthy. Indeed, few are believed to pass forty. They suffer especially from fevers, eolds, and lung eomplieations; but also from bowel eomplaints, headache, tooth- ache, abseesses, andrheumatism. ‘he malarious influence of newly- eleared jungle affects them as violently as Europeans. Formerly their almost sole remedial treatment was to coat themselves in whole or part with mud and turtle-oil. This mud daubing in various forms is also used as mourning, and as a protection against musquitoes or the sun’s rays. Paint made from ferruginous red earth is used as a decoration. Of late the natives round the eolony appreciate quinine highly.

They have nothing whatever approaching to agriculture, nor does their rude shelter of leaves deserve the name of hut. Their chief food in the hot season eonsists of turtle, wild fruits, and honey, which they procure with great dexterity. In the rains the seeds of an Artocarpus are a staple, and in the intermediate season the wild hog; when the hog beeomes scaree, fish and turtle. They have large appetites: a man will eonsume 6 Ib of fish at a sitting, and soon be ready to begin again. At their haunts kitehen-middens are formed from bones and shells till the steneh becomes unbear- able; then they shift quarters. Col. Man mentions a kitehen- midden at Hope Town 15 feet high and nearly 50 in diameter, almost exclusively composed of shells. They secm kindly among themselves, and capable of strong attachments; and though irritable, they are not vindietive. They are very fearless, and are formidable arelhers, shooting strongly and truly with a bow between 5 and 6 feet long, of tough wood, hard to bend. They shoot and harpoon fish with skill, and catch it also by hand; and have hand-nets, and stake- nets for turtle.

Monogamy seems the rule. A young man proclaims himself a eandidate for marriage by eating a speeial kind of fish (a species of ray), whilst marriageable girls wear eertain flowers. The young man, if a pig-hunter, abstains from pork for a year; if a turtle- hunter, from turtle; and during the probationary year honey is for- bidden. ‘The wife provides shelter and mats to lie on, does the eooking (all food is cooked), procures water and shell-fish, earries loads, shaves and paints her husband, and tends him when siek. The husband protects his wife, makes eanoes, weapons, &c., and sometimes goes in seareh of food; but this generally devolves on the unmarried. They

pet their children, but many perish. A family of three living children is rare. If an adult dies, he is quiekly buried, and the tribe migrates 8 or 10 miles for about a month, Some months later the bones, as they dry, are taken up, and these, the skull especially, are earried about by the kinsfolk—for how long we are not told. Mourning is shown by a daily danbing of

clive mud, particularly a thick coat on the head. It lasts a month. During their sorrow they are silent, refrain from red paint and decoration, and from mueh food, especially from pork and honey ; but have daily to throw a piece of honey-comb into the fire.

A notable eecentricity with these people is crying, as an utter- ance of emotion. It is an expression of reconciliation with enemies, and of joy at meeting friends after long separation. Something similar is known in New Zealand, and, it would seem, among the Patagonians. When two Andaman tribes meet under sueh cireum- stanees, the new-comers begin the proecss, the women weeping first ; their men then take up the lugubrious funetion ; finally, the tribe on whose ground the scene oecurs reciprocate, commencing with their women. This doleful antistrophe is eontinued long —“some- times through several days” —and then they take to dancing!

They are said to have no idea of a God or future state, though Colonel Symes in his narrative gives a different account, and per- haps information on this point is still-too imperfect. We find reference made to their belief that evil spirits cause disease, and to their dread of the ghosts of the dead.

They were always very hostile to strangers, repulsing all approaches with treachery, or with violence and showers of arrows. This may have originated in ancient liability to slave raids. Not till five years after the establishment of Port Blair colony did they begin to abate hostility. Robberies were frequent, and the murder of persons straying into the woods. The Government established homes for the aborigines in the environs of the settlement—viz., sheds for shelter, with some aid in rations, &c., and this conduced to a better state of things. An orphanage also has now been established under European matrons.

They are perfect swimmers and divers, and expert in managing canoes, These are neatly formed, and, according to Mouat, some are fitted with outriggers, which enable them to go seaward for con- siderable distanees.! Two centuries ago, according to Captain A. Hamilton, they used to make hostile descents on the Nicobars, and this is confirmed by a Nicobar tradition mentioned in the Asiatic Researches.2 But there is apparently no later evidence of such expeditions, and they were probably confined to March and April, when the sea is generally like a pond.

The number of aborigines is unknown, and conjecture has varied from 3000 up to 10,000, or cven 15,000. Dr Mouat, in 1857, whilst steaming rapidly round the islands, everywhere saw natives in considerable numbers, and was induced to believe that the older and lower estimates had been much under the truth ; but there is reason to believe that the population is on the coast only. They are divided into tribes or groups, not usually containing more than thirty individuals ; and among these the country is partitioned in some fashion, for we are told that trespasses are a common ground of war between tribes. Each tribe has a depét, or headquarters, where the siek are tended and surplus storcs are kept.

The name Mincopie is applied to the Andaman raee in books, originating with a vocabulary given by Lieutenant Colebrooke.? One suspeets some misunderstanding about this. Of the language we have as yet little information. It is said to be very defieient in words, and there is the tendency usual in the cireumstances to strong dialectic differences. Thus the people of Little Andaman are said not to understand those of South Andaman, ‘Those near the settlement begin to incorporate English and Hindustani words. lt is stated positively that they have no nwmerals. It was once believed that they had no proper names, but this proves erroneous. The child is named before birth; hence names seem of common gender, and as they are few—some twenty in all—a special epithet is prefixed to each, personal or local in origin.

Climate.-—This is very moist, as might be expected. The islands are exposed to the full force of the south-west monsoon of summer, and also in some seasons share that rainy effect of the north-east monsoon of the late autumn which characterises the Coromandel coast in the same lati- tude.

Hence Colonel Kyd, who was chief of the settle- ment abandoned in 1796, says only four months' fair weather could be counted on, and a later explorer uses nearly the same phrase. The natives divide the year into three seasons—(1.) The dry, literally 'the northern sun," February to May; (2.) The rainy, June to September; (3.) The moderate season, October to January. There is, however, rather a remarkable want of uniformity in the seasons. 'The rainfall at Port Blair for four years is re- ported as follows :—

1 The native boats near Port Blair have no outrigger. 2 ji, 344. ;

3 As. Res., iv. 392. j

1869, 155°7 inches. 1870, OES 5 1S dal LO0;09 —; 1872, TOO op

The annual mean temperature, reduced to sea-level, is about 81° Fahr.

Geology, &c.—The islands appear from the sea as a series of low hills. These being covered with dense and lofty forest, we have as yet little information on the geology. The surface is excessively irregular, and the islands are toc narrow to have rivers. There has been no alluvial deposit, and in many places the rocky formation is bare. Near our settlement in South Andaman the principal rocks are grey tertiary sandstones, identical with those prevailing in Aracan. This sandstone affords excellent building material. Traces of coal have been found, but only small pockets in the sandstone, without seam. Serpentine rock occurs on the east coast south of Port Blair, and on Rutland. A broad strip of indurated chloritic rock extends from Port Blair north-north-east to the east coast of Middle Andaman. Coral reef barriers gird the islands on all sides. The general dip of the rocks is to the westward, and thus the depth of sca on the east is much greater. On the west the corals are continuous and very extensive, forming patches of reef even 20 or 25 miles from shore. Agate flakes have been found on the site of an old encampment. It is curious that Captain A. Hamilton speaks of an

adventurer known to him who made money by quicksilver obtained from these islands, but no confirmation of this has been reported. No fossils have yet been got.

Vegetation.—On the east the prevailing character is of forest trees with straight stems of 100 feet in mean height, often entirely covered with climbing plants. On the west vegetation is not so lofty. Deciduous trees are every- where sporadic, and large tracts of them occur, robbing the landscape in the hot season of its tropical richness by their grey sterile aspect. These trees are generally of little utility. Bombax malabaricum is abundant among them. The immense buttressing of the stems of many of the trees is notable. Extensive tracts are also occupied by bamboo jungle, 30 to 35 feet high, almost entirely of Bambusa andamanica, from which lofty forest trees stand out, very far apart. The bamboo seems to attach especially to the indurated chloritic rock. Mangrove swamps fringe the little bays and straits, with many orchids. Behind the swamps are palms, Phenix paludosa and Licuala paludosa ; also Barringtonia and Excecaria Agallocha, recognised by their red decaying leaves in June and July, and Lager- stremia and Pterocarpus by their rich lilac or yellow blossoms. Arborescent euphorbias, screw-pines, and a Cycas of considerable height, give a remarkable aspect to the coast vegetation in many places. Above these are the coast forests, on the slopes of hills, and valleys influenced by the sea. Jfimusops indica, believed to be a very valu- able wood, forms whole forests; sometimes in equal pro- portions with Hemicyclia andam: Around these are tropical mixed forests, through which it is hard to force a way from the multitude of climbers. Dipterocarpus levis is the typical tree here. Palms are numerous—e. g., Locuala peltata and Areca triandra. On one small island (Ter- mooklee) there is a gigantic Corypha with leaves 30 fcet long, but stemless. The high forests of the interior are little known. The quantity of intricate climbers is less, and the uniformity of vegetation greater. Treeless spots are confined to craggy islands completely exposed to wind and weather. The general cliaracter of the vegetation is Burmese, altered by some unfavourable circumstances, prin- cipally the scarcity of running water. But there are also a number of Malayan types not found on tlie adjacent There are no tree ferns, apparently. There

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are a considerable number of edible wild fruits. No in- digenous coco-palms exist, though these are so plentiful on the adjoining Cocos and Nicobars. Much of the scenery of the islands is very beautiful.

Animal Life-—This is greatly deficient throughout the whole group, especially as regards Mammalia, of which the species are very few. There is a small pig (S. andaman- ensis), important to the food of the people—perhaps that found on the Nicobars; a Pauradoxurus; a rat with spiny hairs (JZ. andam.); a small frugivorous bat (Cynopterus marginatus). A “wild cat” is alleged, but there seems doubt about it. No Quadrumana have been seen. Of birds several species seem peculiar to this group, or to the Nicobars, or to the two together; and some of the Anda- man species are considered by Mr Blyth to accord better with corresponding species at a distance than with those on the adjoining part of the continent. Thus, Artamus and Oriolus of the Andamans seem identical with those of Java, not with those of India or Burma; and a shrike of these islands agrees better with a species of China and the Philippines than with the nearest species in Bengal, Aracan, and the Malay peninsula. Caves on the coast are fre- quented by the swift, which forms the edible nest of the China market. Pigeons, kingfishers, and woodpeckers are numerous. Reptiles are pretty numerous, both as regards species (15 to 20) and individuals, including eight Ophidia and several Geckoes, of which four or five are peculiar. Among these is one (Phelsuma andam.) the immediate kindred of which is known only in Madagascar and the adjoining islands. The Indian toad is common. Turtle are abundant, and now supply Calcutta. The species of fish are very numerous, and many are peculiar. They have been especially studied by Dr F. Day. It is much to be desired that these islands should have a thorough scientific exploration whilst the type of their productions is still substantially uninfluenced by foreign agency.

History.—It is uncertain whether any of the names of the islands given by Ptolemy ought to be attached to the Andamans; yet it is probable that this name itself is traecable in the Alexandrian geographer. Andaman first appears distinctly in the Arab notices of the 9th eentury, already quoted. But it seems possible that the tradition of marine nomenclature had never perished ; that the *A-ya0od Saluovos vijcos was really a misunderstanding of some form like Agdamdén, while Nijoo: Bapodooa: survived as Lanka

Bais, the nanie applied by the Arabs to the Nicobars. ‘The islands are briefly noticed by Marco Polo, who probably saw without visiting them, under the name Angamanain, seemingly an Arabic dual, ‘‘ The two Angamans,” with the exaggerated but not unnatural picture of the natives, long current, as «log-faced Anthropophagi. Another notice occurs in the story of Nicolo Conti (ez7ca 1440), who explains the name to mean ‘Island of Gold,” and speaks of a lake with peculiar virtues as existing in it (the natives do report the existence of a fresh-water lake on the Great Andaman). Later travellers repeat the stories, too well founded, of the ferocious hostility of the people ; of whom we may instance Cesare Federici (1569), whose narrative is given in Ramusio, vol. iii. (only in the later editions), and in Purehas. A good deal is also told of them in the vulgar and gos- sipping, but uscful work of Captain Hamilton (1727). In 1788-89 the Government of Bengal sought to establish in the Andamans a penal colony, associated with a harbour of refuge. Two able officers, Colebrooke of the Bengal Engineers, and Blair of the sea service, were sent to survey and report. ~~In the scquel the settlement was established by Captain Blair, in September 1789, on Chatham Island, in the 8.E. bay of the Great Andaman, now called Port Blair, but then Port Cornwallis. There was much sickness, and after two years, urged by Admiral Cornwallis, the Government transferred the colony to the N.E. part of Great Andaman, where a naval arsenal was to be established. With the colony the name also of Port Cornwallis was transferred to this new locality. The scheme did ill; and in 1796 the Government put an end to it, owing to the great mortality and the embarrassments of maintenance. The settlers were finally removed in May 1796. In 1824 Port Corn~~ wallis was the rendezvous of the fleet carrying the army to the first Burmese war. In 1839, Dr Helfer, a German savant employed by the Indian Government, having landed in the islands, was attacked and killed. In 1844 two troop-ships, ‘‘ Briton” and ‘‘Runnymede,” were driven ashore here, almost close together. The natives showed their usual hostility, killing all stragglers. Outrages on ship-

wreeked crews continued so rife that the question of occupation had to be taken up again; and in 1855 a project was formed for such a settlement, embraeing a convict establishment. This was inter- rupted by the great

mutiny of 1857, but as soon as the neck of that revolt was broken, it beeame more urgent than ever to provide such a resource, on account of the great number of prisoners daily falling into our hands. Lord Canning, therefore, in November 1857, sent a eommission, headed by Dr F. Mouat, to examine and report. The eommission reported favourably, selecting as a site Blair's original Port Cornwallis, but pointing out and avoiding the vicinity of a salt swamp which seemed to have been pernicious to the old colony. To avoid confusion, the name of Port Blair was given to the new settlement, which was established in the beginning of 1858. At the end of 1871 the number of econviets in the colony was 7603. For some time sickness and mortality were exeessively large, but the reclamation of swamp and clearance of jungle on an extensive scale by Colonel Henry Man when in charge (1868-1870), had a most beneficial effect, and the health of the settlement has sinee been notable. Of late years the European detachment of 120 men has sometimes been withont a man in hospital.! Cattle have been introduced in considerable numbers; extensive gardens have been planted, embracing many thousands of valuable fruit and timber trees. Mangocs, oranges, pommeloes, pine-apples, and jack-fruit are grown with espeeial success. The Andaman colony obtained a tragical notoriety from the murder of the viceroy, the Earl of Mayo, by a Mohammedan convict, when on a visit to the settlement, 8th February 1872. Recently the two groups, Andaman and Nicobar, the oceupation of the latter also having been forced on the British Government (in 1869) by the continuance of outrage upon vessels, have been united under a chief commissioner residing at Port Blair. Steamers run from Caleutta to both groups monthly.

(See, ainong other works, Lieut. Colebrooke in Asiatic Researches, vol. iv.; New Ace. of the H. Indices, by Capt. A. Hamilton; Adven- tures and Researches, by Dr Mouat ; Papers in the Journal and Proceedings of the As. Soc. Bengal; Kurz, Report on the Vegetation of the Andaman Islands ; and other official documents.)

(H. Y.)

ANDELYS (Les), a town in the department of Eure, France, formed by the union of Le Grand and Le Petit Andely, which are situated, the latter on the eastern bank of the Seine, and the former nearly half a mile from the river,

at a distance of about 20 miles north-east of Evreux. Grand Andely, the older of the two, dates from the 6th century, and contains a collegiate church, whose stained- glass windows are remarkably beautiful. Petit Andely sprang up around the chateau Gaillard, which was built by Richard Cceur de Lion in 1195, and was formerly one of the strongest fortresses in France. The chief manu- factures at Les Andelys are cloth, thread, and leather, and there is a considerable trade in grain and wool. Popula- tion (1872), 5379.

ANDENNE, a town of Belgium, in the province of Namur, situated on the right bank of the Meuse, 10 miles east of Namur. It contains no buildings of note, but is a place of considerable manufacturing activity. The principal productions are porcelain, tobacco-pipes, and paper, and in the neighbourhood are beds of pipe-clay and marble quar- ries. Population, 6370.

ANDERNACH, a small town of Rhenish Prussia, situ- ated on the left bank of the Rhine, 10 miles north-west of Coblenz. It is the Antwnnacum of the Romans, and in the Middle Ages was a fortified town of considerable im- portance, but at the present day the walls only add to its picturesque appearance. Among the objects of interest are a lofty watch tower, the Coblenz gate, and the fine parish church, built in the beginning of the 13th century. Andernach has a trade in leather, corn, and wine; but its most noted articles of commerce are millstones, made of lava and of tufa-stone, which when pounded and mixed with lime, possesses the property of hardening under water, and has been much used by the Dutch as a cement in the construction of their dykes. Population about 4000.

1 In 1867 the mortality among conviets was 10°16 per cent., and in only one previous year had it been below that figure, often in exeess. 1868 gave 3°9 per cent. ; 1869 2 per eent.; 1870, 1:07 per cents; 1871, about the same.

ANDERSON, Apam, a Scottish economist, was born in 1692, and died in London on the 10th January 1765. He was a clerk for forty years in the South Sea House, where he published a work entitled Historical and Chrono- logical Deduction of the Origin of Commerce, containing a History

of the Great Commercial Interests of the Britesh Empire (1762, 2 vols. fol.) A third edition appeared in 1797-9, in four vols. 4to, the last volume being an appen- dix and continuation by the editor, Mr Walton.

ANDERSON, ALEXANDER, an eminent mathematician, was born at Aberdecn about 1582. In his youth he went to the Continent, and settled as a private teacher or pro- fessor of mathematics at Paris, where he published or edited, between the years 1612 and 1619, various geo- metrical and algebraical tracts, which are conspicuous for their ingenuity and elegance. He was selected by the executors of the celebrated Vieta to revise and edit his manuscript works, a task which he discharged with great ability. He afterwards produced a specimen of the applica- tion of geometrical analysis, which is distinguished by its clearness and classic elegance. The works of Anderson amount to six thin 4to volumes, which are now very scarce. ‘As the last of them was published in 1619, it is probable that the author died soon after that year, but the precise date is unknown.

ANDERSON, Srr Epmunp, a younger son of an ancient Scottish family settled in Lincolnshire, was born at Brough- ton or Flixborough about 1540, and died in 1605. He was some time a student of Lincoln College, Oxford, and removed from thence to the Inner Temple, where he applied himself diligently to the study of the law, and became a barrister. In 1582 he was made lord chief-justice of the common pleas, and in the year following was knighted. THe was one of the commissioners appointed to try Quecn Mary of Scotland in 1586.

Queen Elizabeth in the Common Bench, Lond. 1644, fol.; 2. Resolutions and Judgments on all the Cases and Matters agitated in all Courts of Westminster in the latter end of the reign of Queen Elizabeth, Lond. 1655, 4to.

ANDERSON, James, LL.D., was born at the village of Hermiston, in the county of Edinburgh, in the year 1739. At an early age he lost his parents, who were in humble life, but this did not interrupt his education, and being desirous to obtain an acquaintance with chemistry as a means of professional success, he attended the lectures of DrCullen. Enlarging the sphere of his cmployments, Anderson forsook the farm in Mid-Lothian which his family had occupied for several generations, and rented in

Aberdcenshire a farm of 1300 acres of unimproved land. But previous to this he had become known to men of letters by some essays on planting, which, under the signature “ Agricola,” he published in the Hdinburgh Weekly Magazine, in 1771. ‘After withdrawing from his northern farm, where he re- sided above twenty years, he settled in the vicinity of Edinburgh, and continued to interest himself in agricultural questions. In 1791 he projected a periodical publication called The Bee, consisting of miscellaneous original matter, which attained the extent of eighteen octavo volumes. It was published weekly, and a large proportion of it came from his own pen. From this period till 1803 he issucd a number of publications chicfly on agricultural subjects, which had no small influence in advancing national im- provements. Dr Anderson, after a gradual decline, partly occasioned by excessive mental exertion, died in 1808.

ANDERSON, James, a learned and industrious anti- quary of Edinburgh, was born there August 5, 1662, and educated to the legal profession, in which he became a writer to the Signet. His reputation as a historian stood so high, that just before the Union the Scottish parliament

Diplomatum et Numismatum Scotie Thesaurus. paration of this great national work involved the author in considerable pecuniary loss; and soon after his death, the numerous plates, £530. These plates are now lost, and the

His works are—l. Leports of many principal Cases argued and adjudged in the time of

ANDERSON

commissioned him to prepare for publication what remained. of the public records of the kingdom, and in their last session voted a sum of £1940 sterling to defray his expenses. At this work he laboured for several years with great judg- ment and perseverance; but it was not completed at his death in 1728. The book was published posthumously in

1739, edited by Thomas Ruddiman, undcr the title Selectus The pre-

engraved by Sturt, were sold for book has be- come exceedingly scarce. After the union of the crowns, Anderson was appointed in 1715 postmaster-general for Scotland, as some compensation for his valuable labours ; put in the political struggles of 1717 he was deprived of this office, and never again obtained any reward for his important services to his country.

ANDERSON, Jou, natural philosopher, was born at Roseneath in Dumbartonshire in 1726. In 1756 he became professor of Oriental languages in the University of Glas- gow, where he had finished his education; but in 1760 he was appointed to the chair of natural philosophy, a subject more suited to his tastes and acquirements. In this de- partment he laboured assiduously to apply scientific know- ledge to the improvement of the niechanical arts, studying industrial processes in the various workshops of the city, and thus qualifying himself to be the scientific instructor of the artizan. He opened a class for the instruction of mechanics in the principles of their arts, in which his familiar extempore discourses were illustrated by appro- priate experiments. He is thus to be regarded as the father of those Mechanics' Institutions which have since become so common. His anxiety for the improvement of artizans was not confined to his personal exertions. Shortly before his death in 1796, he bequeathed the whole of his property to 81 trustees, for the purpose of founding an institution for educational purposes in Glasgow. He had seemingly intended it as a sort of rival to the univer- sity in which he was himself a professor; for his will mentions the founding of four halls or colleges with nine professors in each, for the faculties of arts, medicine, law, and theology. But the trustees found the funds entrusted to them utterly inadequate to so gigantic a scheme; and they contented themsclves with founding what is now called, in its official calendar, Anderson's University. This institution was opened in 1797, by the appointment of Dr Thomas Garnett as professor of natural philosophy, who commenced with a popular course of lectures, which was attended by a considerable audicnce of both sexes. In 1798 a professor of mathematics and geography was appointed; and the institution has since had the aid of many able teachers. In 1799 Dr Garnett was succeeded by Dr Birkbeck, who had the merit of introducing in the institution a system of gratuitous scientific instruction, given annually to 500 operative mechanics. Ou the removal of Dr Birkbeck to the London Royal Institu- tion, he was succeeded by Dr Andrew Ure in 1804; and Dr Ure by Dr William Gregory. In recent years the institution has received several munificent endowments from private persons, and its staff of teachers has been consequently greatly strengthened. It now possesses a complete medical school, whose certificates are recogniscd by the various examining bodies both in England

and Scotland. In 1872-3 there were 460 medical students, and 2508 persons in all attended the various classes of the institution.

ANDERSON, Rozert, an author and critic of consider- able note in his own day, was born at Carnwath, Lanark- shire, on the 7th January 1750. He wasat first destined for

the ehurch, and was sent to the University of Edinburgh in 1767. After a few sessions, however, he quitted the divinity elasses in order to study medicine. He was for a short time employed as surgeon to the dispensary at Bamborough Castle in Northumberland. Returning to Seotland he took the degree of M.D. at St Andrews, on the 20th of May 1778. He now began to praetise as a physieian at Alnwick; but his general habits were rather those of speeulation than exertion, and a moderate provi- sion, aequired by his marriage with the daughter of Mr John Gray, of Alnwick, had emancipated him from the neeessity of professional labour. In 1784 he finally returned to Edinburgh, where he eontinued to reside till the close of his life. For several years his attention was oecupied with his edition of The Works of the British Poets, with Prefaces Biographical and Critical (14 vols. 8vo, Edin. 1792-1807). His other publications were, The Miscellaneous Works of Tobias Smollett, M.D., with Memoirs of lus Life and Writings (Edin. 1796); Life of Samuel Johnson, LL.D., with Critical Observations on his Works (Edin. 1815); Zhe Works of John Moore, M.D., with Memoirs of las Life and Writings (Edin. 1820); and The Grave and other Poems, by Robert Blair; to which are prefixed some Account of his Life and Observations on his Writings (Edin. 1826). Dr Anderson died on the 20th Feb. 1830.

ANDES. The Andes form a mountain ehain seeond only to the Himalayas in the vastness of its proportions, and possessing many remarkable peeuliarities. The origin of the name appears to be unknown, although numerous meanings have been authoritatively assigned to it. It has been variously supposed to be derived from the Peruvian words Anta, or tapir; Anti, meaning metal or copper; and Antzs, the name of a tribe resident in the mountains ; or from the Spanish Andenes, applied to the gardens on the terraces whieh oeeur on the western slopes of the Andes in Chili. Humboldt believes its meaning has been lost. In eonneetion with this may be noticed

the eurious fact mentioned by Colonel Tod, that the Hindoos of North India ealled the Himalayas by the name Andes.

The Andes form a continuous belt of mountainous high- land along the western margin of South Ameriea, and have been eonsidered by many writers as the southern continuation of the Roeky Mountains, whieh form a simi- lar belt along the west side of North America. There are many objeetions against this view, and in favour of that which makes the Andes and Rocky Mountains two distinct ranges. In New Granada, or Columbia, as it is now ealled, the eastern range of the Andes terminates on the western side of the Gulf of Maraeaybo, near 72° W. long. South of the gulf a braneh range is thrown off, which traverses Vene- zuela. The eentral range dies out in the low lands south of the junction of the Cauea and Magdalena rivers. The western range also lowers and spreads in breadth in ad- vaneing northwards, and is lost in the low flats along the south margin of the Gulf of Darien. At the neck of the Panama isthmus, the Naipi and Cupica valleys stretch from the Atlantie to the Paeifie Ocean, and are nowhere more than a few hundred feet above the level of the sea. North of the Atrato a serpentine ridge of mountains oeeurs, which terminates in Cape Tiburon. It is erossed by a pass ealled Tanela, which is about 5 miles in length, and 130 feet above the sea. Most of the isthmus between 8° and 9° N. lat. is below the level of this pass. Here the Isthmus of Panama curves round westwardly ; and west of Panama there is another broad low traet stretehing right aeross. This distriet eannot be regarded as belong- ing in any way to the Andes. In Central America the mountains form numerous isolated ranges. In Mexico there are two high sierras. The eastern sierra does not

reach the Rio Braneo. The western sierra terminates at its north end in the Sierra Madre de Durango, which dies out in the northern part of Chihuahua and in Sonora, without being in any way eonnected with the Roeky Mountains.

The Rocky Mountains eommenee in about 100° W. long. at their south end, and terminate in about 145° W. at the north end, and have a general north-westerly direetion. The Andes, on the other hand, eommenee near 54° §. lat. and 70° W. long. The southern portion forms a gentle eurve, bending round

to 73° W. in Patagonia, and reaching 70° again in the south of Chili. It eontinues on this line to Coquimbo, where it bends easterly, and after a slight double eurve it euts the meridian of 70° again south of Lake Titieaea. There is then a sharp bend, eorresponding to that in the coast, which earries the range nearly to 80° W. in Eeuador, beyond whieh it again has an easterly bend, so as to eause it to terminate between 72° W. and 76° W. The north and south ends are eonsequently nearly in the same meridian. There are other dissimilarities between the Andes and the Roeky Mountains.

The formation of the Andes is due to several causes operating at distinet intervals of time. They consist mainly of stratified material which has been more or less altered. This material was deposited at the bottom of a sea, so that at some former time the highest portions were submerged, probably in eonsequenee, to a eertain extent, of subsidence of the sea bottom. Since the latest deposits there has been upheaval and denudation. The range, then, has resulted from the aceumulation of sediment on a subsiding area ; from the subsequent upheaval of such deposits, which have been increased in height by the ejee- tion of voleanie produets; and from the operation of denuding agents.

As far as our present knowledge goes, it appears to be probable that the Andes mark an area on which sedimen- tary deposits have been aeeumulated to a greater thickness than on any other portion of South America. It is further demonstrable that these deposits belong to several geological periods, the elevation having oeeurred at different periods, while their axes extend in different direetions. Henee it is a complex range of mountains formed by the com- bination of several distinct systems of ridges. The width of the range varies from about 60 to 300 or more miles, but, as eompared with other mountains, the Andes are for the most part narrow relatively to their height. Where their speeial features are most eharaeteristieally developed, they eonsist of a massive embankment-like foundation, rising with a rapid slope from the low eountry on either side, and having its margins surmounted by lofty ridges of ragged or dome-like summits. These Cordilleras, as they are usually termed, flank longitudinal valleys, or plain- like depressions whieh form the highest levels of the central portion of the gigantic embankment, and which vary in width from 20 to 60 miles. At intervals the longitudinal depression is broken up, either

by ridges eonnecting the Cordilleras, or by lofty plateau-like uplands. In several cases these transverse ridges and belts of high ground form the main watershed of the country. They are rarely eut across by the river systems, whereas both the marginal Cordilleras are intersected at numerous points, and more especially by the rivers draining the eastern slope of the eountry. In no ease do these eastern rivers originate to the west of the western Cordilleras. A few of the eentral valleys, or plain-like depressions, have no conneetion either with the western or eastern river system. Roughly speaking, the height of the central plains or valleys is from 6000 to 11,000 feet above the sea; of the passes and knots, from 10,000 to 15,000 fect; and of the highest peaks, from 18,000 to 23,290 feet—the last being the

altitude of Aconcagua in Chili, which is generally con- sidered to be the highest peak in America. Judging from

these estimates, we may regard the bulk of the Andes as”

somewhere about that of a mass 4400 miles long, 100 miles wide, and 13,000 feet high, which is equivalent to 5,349,801,600,000,000 cubic feet. On this basis we find that the Mississippi would carry down an equivalent mass of matter in 785,000 years. The rate of denudation in certain river basins varies from one foot in 700 years, to one foot in 12,000 years. Assuming that similar rates would apply to the Andes, they would be denuded away in from 9 to 156 million years. In all probability, much less than 9 million years would suffice. On the other hand, the Andes would be swept away in 135,000 years, supposing the denuding powers of the globe were concentrated on them alone. From the above data, and assuming the average ‘specific gravity of the matter forming the Andes to be 2°5, the weight of the portion above the sea may be estimated at 368,951,834,482,750 tons, giving an average of about 1000 tons on each square foot at the level of the sea. Under Aconcagua the pressure would be about 1780 tons per square foot at the same course, it were not, as it no doubt is, more or less modified by lateral pressure. These figures afford some, though at best a vague, conception of the mighty grandeur of this range of mountains, and of the scope there is for the exertion of enormous pressure. How vast, then, must be those forces which have counteracted

such pressures, and upheaved the ocean-spread sediments of the continent, until the Andes, that— * siant of the Western Star, Looks from his throne of clouds O’er half the world !”

But, however vast the Andes may seem to us, it should be remembered that they form but an insignificant portion of the globe itself. Aconcagua is about spooth of the earth’s diameter, which is relatively not more than a pimple jyth of an inch high on the skin of a tall man.

The range may be considered as commencing on the south with Cape Horn, although for several degrees it is much broken up by arms and straits of the sea. The first portion of any extent commences between Cape Good Success and Cape San Paulo, and stretches across Tierra del Fuego, by Mount Darwin and Mount Sarmiento, and the range of hills on either side of Admiralty Sound. The mountains named are from 6600 to 6800 feet high. The Strait of Magellan also cuts through and across the range, isolating. the mountainous islands of Clarence and Santa Ines. Otway Water cuts through the range, and pene- trates to the plain of Patagonia. North of this are several snowy eminences, and in some places glaciers descend almost to the sea-level. At Last Hope Inlet, or a little north of 52° 8., we have the commencement of the Andes ag a continuous range, Disappointment Bay being the most uorthern place where the Pacific reaches the plains to the east of the Andes. South of this, and for several degrees to the north, the islands which fringe the coast have a mountainous character, and appear to belong essentially to the Andes range, with which there is reason to believe they were once connected. Along this space the Andcs en- eroach upon the ocean, and have no western slope proper. Many of the sea channels are very narrow and ravine-lhke in character; they appear to represent a valley between two ridges of mountains,—a feature which is most con- spicuous farther north. The highest part or crest of the range is close to the sea, and consequently the streams which fall into the Pacific are all small. Towards the south the width is about 20 miles; and in the latitude of Mount Stokes, which is 6400 feet high, it is 40 miles. North of this the range is in places more than 40 miles

level, provided, of

across. From 46° to 42° S., the mountains become somc- what higher, the loftier peaks ranging from 4000 to 8000 fect. Among the more conspicuous are Mount Yanteles, 8030 feet; Mount Melimoyu, 7500 feet; Mount Corcovado, 7510 feet; and Mount Minchinmadiva, 7406 feet above the sea-level. The Eyre Sound glaciers descend to the sea- level. At about 41°30'S. lat. there is a low pass across the Andes; and to the north of this the slope is more or less distant from the sca, execpt, perhaps, at one part where the desert of Atacama terminates in lofty cliffs on the shore. In Chili the Andes increase in height and width, and between about 38° and 28° S. run approximately north and south; and nowhere do they recede so far from the sea asin the southern part of Chili. At this part, or in about the latitude of Antuco (36° 50' S.), the lower land on the west is more than 100 miles broad, and the width of the range itself is probably more than 100 miles. Here the Andes consist of two ranges, the crests of which are from 60 to 80 miles apart, enclosing a longitudinal valley. Across these ranges there is a pass, which, with the excep- tion of those near the mountains Osorno and Villarica, is the most southern in Chili. The summit of this pass is not more than 12,000 feet above the sea. The pass of Planchon lies north of Mount Descabezado; and to the south of Peteroa is the pass of Las Damas, which is pro- bably not more than 11,000 feet at its highest point. At the hcad of the Maypu valley a pass traverses the two ranges of the Andes as well as the included valley of Tunuyan. That through the western range is called Peu-

uenes Pass, and rises to 13,210 feet above the sea-level ; while that through the eastern range is called Portillo, and rises to 14,365 feet above the sea. Near 32° 38'S., Aconcagua rises to 23,290 feet, and is, so far as known, the highest peak in America, and the highest volcano in the world. A little to the south of it is the Cumbre or Uspallata Pass. In the western range it rises to 12,454 feet above the sea; and on its north flank is the pass of Los Patos. At about 30° S. the mountainous system becomes more complicated, owing to the appearance of several ranges which rise out of the plains towards the north-west corner of the Argentine Confederation, some of which run north and join the lofty highlands of the Bolivian Andes. Itis doubtful whether all strictly belong to the Andes. 'Thus, in the latitude of Coquimbo, where both the mountains and the coast line trend somewhat to the east of north, there are three parallel mountain ranges. The western is called the Andes, the central range is known as the Sierra Famatina, and the eastern as the Sierra

Velasco. The two latter ranges are quite isolated from the first-mentioned range, terminating abruptly on the north and south. North of 28° S., however, a number of sierras which rise from the Argentine plain form an extensive mass of mountains. These are continuous into the Cordilleras de los Valles, de Despoblado, and Abra de Cortaderas, which form the eastern margin of the lofty mountain plains of Bolivia. These plains slope down from the eastern side of the Andes, just as the Atacama desert seems to form part of the western slope. At about 22° 5. the Andes begin to trend somewhat to the west of north. At about 20°S. the eastern and western ranges are connected by a lofty transverse chain about 60 miles broad, and similar to the mountain knots of Peru. North of this the ranges bend more to the west, and enclose the extensive valley of the Desaguadero river and Lake Titicaca, which is shut in on the north by the transverse chain of the Vilcafiota Moun- tains. The width of the range is in this part from 200 to 250 miles; or if the offset running eastward to Santa Cruz be included, the width is between 500 and 600 miles. One special feature about this part of the range is, that the Desaguadero valley (13,000 feet above the sca) is the

largest in the Andes which has no connection with the river systems on the outer flanks, whether to the east or to the west. There are one or two small ones of a similar kind in the north-west part of the Argentine Confedera- tion. The highlands which surround this great valley (which might be appropriately called the navel of South America) form a continuous re- entering watershed, sepa- rating respectively the numerous small rivers flowing into the Pacific, the Amazon system, which drains a large por- tion of the northern part of South America, and the La Plata system, which drains most of the southern part of the same area. In this region, too, more especially in the eastern Cordillera, it was for a time believed, on the authority of Mr Pentland, that the highest peaks of the Andes were situated; his first estimates were, however, ascertained by himself and others to have been too great. The highest peak is the Nevado de Sorata, close to Lake Titicaca, and estimated at 21,286 feet high; next to it comes the twin peaked Illimani, a little further south, which rises to 21,181 feet. The passes crossing the valley have summits averaging 14,000 feet, but the one which skirts the Nevado de Sorata rises nearly to 16,000 feet above the sea. From

about 18° the Andes, like the coast, runs north-west, so that whcreas in about 18° S. the crest of the western Cordillera is in 70°W. long., at 14°S. it has reached alittle beyond 75°. Here there is another change of direc- tion, this portion of the western Cordillera stretching from about 14°S. to 6° 8., the south end being near 75° W., and the north near 80° W., the westing being rather more than half a degree per degree of latitude. From 6° S. to the equator the direction is very slightly to the east of north; beyond this the trend is still more east, so that the termina- tion of the west Cordillera lies between 76° and 78° W. long. in between 7° and 8°N. lat. The northern end of the eastern Cordillera is near 72° W. Returning again to the Peru vian Andes, we find some lofty peaks which rival, and it may be surpass, those of Bolivia. Thus Sehama is reputed to be 22,000 feet; Chungara somewhat less; Chipicani, 18,898 feet; Arequipa, 18,373; Chuquibamba, 21,000 feet. There are numerous passes over the Andes in Peru, such as those of Gualillos, of the Altos de los Huescos, and of the Altos de Toledo—the first mentioned of which rise to 17,820 feet above the sea. North of the Vilcafiota Mountains the eastern portion of the Andes is much cut up by the numerous feeders of the Ucayali and Madeira rivers, most of which originate on the flanks of the western Cordillera. At Pasco there is a lofty mountain knot or table-land, which connects the Cordilleras, and at the same time forms the watershed between the upper portions of the basins of the rivers Ucayali, Huallaga, and the Marajion, or Upper Amazon. From this table-land three Cordilleras extend northward, of which the eastern dies out between the Ucayali and Huallaga rivers; the central between the Huallaga and the Upper Amazon; while the western Cordillera is continuous into the moun- tain knot of Loja, which forms the southern portion of the Andes of Ecuador, and which is estimated to be 11,650 Square miles in extent. From this knot two lofty Cor- dilleras, abounding in volcanoes, both active and extinct, run nearly parallel. They are separated at intervals by transverse ridges into three vast mountain valley plains, of which the two southernmost drain into the Amazon basin, and the northernmost into the basin of the Esme- raldas river. The two Cordilleras are again united in the north by the mountair knot of Los Pastos, on the borders of Ecuador and Columbia. The valley plains are about 40 miles wide. On the south is the valley of Cuenca, which is about 50 miles long, and about 7800 feet above the sea. From it the way into the central valley plain, that of Ambato, is across the transverse ridge by

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the pass of Assuay, which rises to 15,520 feet. It is

about 130 miles long, and about 8000 feet above the sea.

The mountain fringe comprises several important volcanoes,

viz., Sangay, Tunguragua, and Cotopaxi in the eastern Cordillera; and the volcano Carguirazo in the western

Cordillera, which also includes the lofty Chimborazo, esti-

mated to reach 21,424 feet above the sea. Then crossing

over the low transverse ridge of the Alto de Chisinche,

we descend into the valley-plain of Quito, which is

bordered by one of the most intensely volcanic areas on: the globe. To the east are Sinchulagua, Antisana, and Cayambe ; the last is now extinct, stands on the equator,

and is 19,534 feet above the sea. It is the highest point on the equator in the globe, and is the only one along that line where perpetual snow exists. In the western Cor- dillera the prominent eminences are Pichincha and Imba- bura. The valley-plain is about 9500 feet above the sea.

Taking Cotopaxi as a centre, Orton observes that the other peaks may be arranged in concentric orbits thus. Ruminaqui and Sinchulagua are 10 miles distant ; Iliniza, Corazon,

Atacatzo, and Antisana are 25 miles; Quirotoa, Pichin- cha, and Guamani are 30 miles; Llanganati is 40 miles; Tunguragua, Carguirazo, Cayambi, are 50 miles; Chimbo- razo, Imbabura, and Cotocachi, are 60 miles; Altar is 65

miles; Sangay is 75 miles; lastly, Chiles and Assuay are 100 miles. Chimborazo is the most conspicuous feature in this part of the Andes, and from one point its outline resembles that of a lion at rest. Cotopaxi is the

most symmetrical active volcano on the globe. Its apical angle is 122° 30’; and the slope is a little over 30° on the south, west, and east sides, and nearly 27° on the north side. Its summit was attained for the first time on November 27, 1872, by Drs Riess and Stubel. The height was found to be about 19,500 feet. Beyond the mountain knot of Log Pastos two Cordilleras run in a north-easterly direction to about 2° N. The western Cordillera is broken by the valley of the Patia, which has its source on the slopes of the valley between the mountain knot of Los Pastos and the trans-

verse ridge south of Popayan. The eastern Cordillera is

continued into the Paramo de Guanacas, from which

basis the Andes spread out fan-like into three Cordilleras.

This paramo, like the cross range between Iliniza and

Cotopaxi, forms part of the main watershed between the

rivers draining into the Atlantic and Pacific Oceans.

North of the paramo this watershed runs along the wes-

tern Cordillera for some distance, and then crosses several

minor ranges of hills with their intervening valleys. The

low watersheds at the head of the Atrato basin coincide

with it; and north of Cupica Bay it suddenly bends, pass-

ing from within a few miles of the Pacific to within a few

miles of the Atlantic Ocean. Having commenced this

general account of the Andes with a notice of the moun-

tain ranges of Columbia, and of the lowlands of the

Isthmus of Panama, we thus come round to our starting-

point. In the article Amertca there is a brief account of

the chain from a geological point of view, as well as of

the transverse chains of South America; and under the

heads of the various countries through which these pass

further particulars are given.

The following references will assist the reader who wishes to enter more minutely into this subject:—Hum- boldt's works on South America; his papers in the Journal de Physique, vol. liii. p. 30 (1801); another in Gilbert's Annalen, vol. xvi. pp. 394, 450 (1804); Pentland's papers in Phil. Mag., vol. ix. p. 115 (1828), and in the Journal of the Roy. Geog. Soc., vol. v. p. 80 (1835); papers by Pissis in Comptes Rendus, vol. xl. p. 764 (1855), and vol. hii. p. 1147 (1861), as also in Annales des Mines, fifth series, vol. ix. p. 81 (1856); D. Forbes, "On the Geology of Bolivia and South Peru" in Q. Jour. os Soc., vol. xvii.

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dispute, were satisfied by the " Act of Division " executed in 1278. 'The claims of the bishopric dated from Carlo- vingian times, and the independence of Andorra, like most other Pyrenean anomalies, has been traditionally ascribed to Charlemagne. Preserved from innovations by the mutual jealousy of rival potentates, as well as by the conservative temper of a pastoral population, Andorra has kept its medieval usages and institutions almost unchanged. In each parish two consuls, assisted by a local council, decide matters relating to roads, police, slight taxes, the division of pastures, the right to collect wood, &c. Such matters, as well as the general internal administration of the terri- tory, arc finally regulated by a conseil général of 24 mem- bers (4 to each parish), elected, since 1866, by the suffrages of all heads of families, but previously confined to an aristocracy

composed of the richest and oldest families, whose supremacy had been preserved by the principle of primogeniture. A general syndic, with two inferior syndics, chosen by the consei/ général, constitutes the supreme execu- tive of the state. Two viguiers—one nominated by France, and the other by the bishop of Urgel—command the militia, which consists of about 600 men, although all capable of bearing arms are liable to be called out. This force is exempt from all foreign service, and the chief office of the viguiers is the administration of criminal justice, in which their decisions, given simply according to their judgment and conscience, there being no written laws, are final. Civil cases, on the other hand, are tried in the first instance before one of the two aldermen, who act as deputies of the viguiers ; the judgment of this court may be set aside by the civil judge of appeal, an officer nominated by France and the bishop of Urgel alternately ; the final appeal is either to the Court of Cassation at Paris, or to the Episcopal College at Urgel. A tribute of 960 francs is paid annually to France, in return for which the Andorrans are permitted to import certain articles free of duty ; the bishop of Urgel receives a tribute of almost the same amount. The expenses of government are defrayed by a species of rent paid by owners of flocks to the community for the use of the

asture land.

ANDOVER, an ancient market-town in the north-west of Hampshire, situated near the left bank of the river Anton, 63 miles from London, and 12 from Winchester. It is well built, and contains a large parish church—crected about forty years ago on the , site of the old one, which existed in thetimeof William the Conqueror—several dis- senting places of worship, various elementary schools, and a spacious town hall. Tt returns one member to parliament; and its corpora- tion, which is said to date from the reign of King John, consists of a mayor, four a aldermen, and twelve coun-
Seal and Arms. cillors. Andover is the centre of a large agricultural district; its weekly markets and its fairs, held three times a year, are well attended, while at Weyhill, a village about 3 miles to the west, a fair is held every October, which was formerly one of the most celebrated in England. Malting is largely carried on, and there is an extensive iron foundry near the town; but the silk manufactures, once so prosperous, are now almost extinct. The Romans hada station at Andover, and the remains of their

encampment are still to be seen in the neighbourhood. Population in 1871, 5501.

ANDOVER, a post township of Essex county, Massa- chusetts, U.S., pleasantly situated on the southern bank of the Merrimack river, 21 miles north of Boston… Its first

Dp 73 Rammelsberg in Monatsbericht Akad. Wiss., Berlin, p. 326 (1870); Orton, The Andes and the Amazon (1870); Rickard, A Mi ining Journey Across the Andes (1863); Cunningham (R. O.), Natural History of the Strait of Magellan (1871).

ANDOCIDES, a Greek orator and diplomatist, was born at Athens in 467, and died about 391 B.c. After holding a command for atime in the Athenian fleet, he was engaged ‘n various embassies to foreign states. In 415 he was implicated with Alcibiades in the charge of mutilating the busts of Hermes, suspicion being specially roused against him from a large bust near his house having been almost the only one that was left entire. On the information he gave against others, they were put to death ; and Ando- cides himself was dcprived of his rights of citizenship, and went into exile. He returned to Athens on three different occasions, and though he was as many times driven again into banishment, he appears to have held a position of trust and influence in the city from 403 to 393. Three orations of his—De Reditis, De Mysteriis, and De Pace— are extant, which are of great historical value. The authority of a fourth, Contra Alcibiadem, which has been attributed to him, is disputed on what appear to be good grounds. Andocides was one of the ten Attic orators, whose lives were written by Plutarch.

ANDORRE, or ANDORRA, & small semi-independent state on the south side of the Pyrenees, between the Spanish province of Lerida and the French department of Ariége. It is surrounded by mountains, and consists of one main valley, which is watered by the Balira, a tributary of the Segre, which itself flows into the Ebro, and of several smaller valleys, the most important of which are those of the Ordino and the Os. It has an area of about 600 square miles, and is divided into six parishes, Andorra la Viéja (the capital), San Julian de Loria, Canillo, En- camp, Ordino, Massana. The population is under 7000. The territory was once densely wooded, whence

probably its name, from the Arabic Aldarra, “a place thick with trees ;” but the forests have been almost entirely destroyed for fuel. The pasturage is extensive and excellent ; the mountains contain iron and lead mines; rye, potatoes, fruits, and tobacco, are grown on the lower grounds; game and trout are abundant. The population is rather pastoral than agricultural ; but smuggling, together with the manu- facture of tobacco, occasion some traffic. The Andorrans are a robust and well-proportioned race, of an independent spirit, simple and severe in their manners, but mostly ignorant and ill-educated, although they receive instruction gratuitously at the parish schools; they speak the Catalan dialect of Spanish, and are all Roman Catholics. This remarkable little state is a surviving specimen of the. in- dependence possessed in medizval times by the warlike inhabitants of many Pyrenean valleys. Its privileges have remained intact, because the suzerainetė of the district be- came equally and indivisibly shared, in 1278, between the bishops of Urgel and the counts of Foix; the divided suzerainetė being now inherited by the French crown and the present bishop of Urgel, and the two powers having mutually checked innovations, while the insignificant ter- ritory has not been worth a dispute. Thus Andorra is not a republic, but is designated in official documents as the “ Vallées et Suzerainetés.” Before 1278 it was under the suzerainetė of the neighbouring counts of Castelbo, to whom it had been ceded, in 1170, by the counts of Urgel. A mar- riage between the heiress of Castelbo and Roger Bernard, sount of Foix, carried the rights of the above-named Spanish counts into the house of Foix, and hence, sub- sequently, to the crown of France, when the heritage of the feudal system was absorbed by the sovereign ; but the bishops ‘of Urgel claimed certain rights, which, after long

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settlers came from Andover in England in 1643, and purchased a part of the Indian domain known as Cochi- chewick from the natives for $26.64 and a cloth coat. The streams in the vicinity afford water power, which is em- ployed to some extent in manufactures of flannels, linen, and shoe thread ; but the town is chiefly known by its academic institutions. The Punchard High School has a high local reputation. Phillips Academy is one of the most popular schools in New England. It was endowed by the Phillips family in 1778 with $85,000 (£17,000) and considerable landed estates, and

has always been well sustained. It has a principal and eight instructors, and the number of pupils in 1873 was 252. The Andover Theo- logical Seminary was founded in 1807, under the auspices of the Congregationalists, but is open to Protestants of all denominations. It has five professors and generally more than 100 students. Tuition and room rent are free to all, and additional aid is given to indigent students. The Abbot Female Academy, for the education of female teachers (founded in 1829), is also a flourishing institution. Andover has a bank, four churches, and two hotels. Its population in 1870 was 4873.

ANDRADA, Dizco Payva pD' (born at Coimbra in 1528, died 1575), a learned Portuguese theologian, who distinguished himself at the Council of Trent, to which he was sent by king Sebastian. He wrote seven volumes of sermons, besides several other works, one of which, De Conciliorum Auctoritate, was much esteemed at Rome for the great extension of authority it accorded to the Pope. His Defensio Tridentine Fidei, a rare and curious work, in which he discusses, among other subjects, immaculate conception, was published posthumously (1578).

ANDRADA E SYLVA, Bontracto Jozi vp', a distin- guished Brazilian statesman and naturalist, was born at Villa de Santos, near Rio Janeiro, 1765, and died at Nicthe- roy, 1838. In 1800 he was appointed professor of geology at Coimbra, where he had studied, and soon after inspector- general of the Portuguese mines ; and, in 1812, he was made perpetual secretary of the Academy of Lisbon. Returning to Brazil in 1819, he urged Dom Pedro to resist the recall of the Lisbon court, and was appointed one of his minis- ters in 1821. When the independence of Brazil was declared, Andrada was made minister of the interior and of foreign affairs; and when it was established, he was again elected by the constituent Assembly, but his democratic principles resulted in his dismissal from office, July 1823. On the dissolution of the Assembly in Nov- ember, he was arrested and banished to France, where he lived in exile near Bordeaux till, in 1829, he was per- mitted to return to Brazil. But being again arrested, in 1833, and tried for intriguing on behalf of Dom Pedro L., he passed the rest of his days in retirement. He has left no single work of any length, but a multitude of memoirs, chiefly on mines.

ANDRE, Jonn, an accomplished soldier, who has gained a place in history by his unfortunate end, was born in London, in 1751, of Genevese parents. Accident brought him in 1769 to Lichfield, where, in the literary circle of Miss Anna Seward, he met Miss Honora Sneyd.

the post of major and adjutant-general of the forces. While André was in this situation, the American general, Arnold, who had displayed much energy in the cause of the colonies, conceiving himself injuriously treated by his collcagues, made a proposition to the British to betray to them the important fortress of West-Point, on the Hudson River, the key of the American position. This seemed a favourable opportunity of concluding the war, and Major André was appointed to negotiate with Arnold. For this purpose he landed from a vessel bearing a flag of truce, and had an interview with Arnold ; but before the negotiations were finished, an American fort had fired on the vessel, and forced her to drop down the river. André, therefore, could not return by the way he came, and it was necessary to pass the night within the American lines at the house of his guide, Smith, and set out next day by land for New York. Both were provided by Arnold with passports, and succeeded in passing the American outposts undetected. Next day, however, just when all danger seemed to be over, and Smith had left André in sight of the English lines, André was stopped by three militiamen of the enemy, and carried back a prisoner. Washington sent him before a court-martial, and notwithstanding a spirited defence, and the remonstrances of the British general, who did all he could to save him, Major André was executed at Tappan as a spy on the 2d October 1780—a sentence perhaps justified by the extreme rigour of martial law, as he had been in disguise within the lines of the enemy; but the traitor Arnold, through the address of poor André, escaped by timely flight the punishment he justly merited. Besides courage, and distinguished military talents, Major André possessed a well-cultivated mind. He was a proficient in drawing and in music, and showed considerable poetic talent in his humorous Cow-chase, a kind of parody on Chevy-chase, which appeared in three successive parts at New York, the last on the very day of his capture. One of his last letters gives an affecting incident relating to his first love. When stripped of everything by those who seized him, he

contrived to retain the portrait of Miss Sneyd, which he always carried on his person, by concealing it in his mouth. He was not aware that this lady had breathed her last some months before. His unhappy fate cxcited universal sympathy both in America and all over Europe, and the whole British army went into mourning for him. A mural sculptured monument to the memory of Major André was crected in Westminster Abbey by the British Government, when his remains were brought over and interred there in 1821.

ANDREA, Giovanni, the most famous Italian canonist of the 14th century, was born at Mugello, near Florence, about 1275. He studied canon law at Bologna, where he distinguished himself in this subject so much that he obtained a professorship of law, first at Padua, then at Pisa, and lastly at Bologna, rapidly acquiring a high reputation for his learning and his moral character. Little is posi- tively known of his history, though many curious stories are told regarding him—e.g., that, by way of self-mortification, he lay every night for twenty years on the bare ground with only a bear's skin for a covering; that, in an audience he had with Pope Boniface VIII., his extraordinary shortness of stature led the Pope to believe he was kneeling, and to ask him three times to rise, to the immense merriment of the cardinals ; and that he had a daughter, Novella, so ac- complished in law as to be able to read her father's lectures in his absence, and so beautiful, that she had to read behind a curtain lest her face should distract the attention of the students. He is said to have died at Bologna of the plague in 1348, after having been a professor for forty-five years. He was buried in the church of the Dominicans, and the public estimation of his character is testified by his

epitaph, in which he is styled Rabbi Doctorwm, Lux, Censor', Normaque Morum. Andrea wrote the following works : Gloss on the Sixth Book of the Decretals ; Glosses on the Clementines ; Commentary on the Lvules of Sextus. His additions to the Speculum of Durando are a mere adapta- tion from the Consilia of Oldradus, as is also the book De Sponsalibus et Matrimonio, from J. Anguisciola.

ANDREANI, Anprea, a celebrated engraver on wood, in chiaroscuro, was born at Mantua about 1540, and died at Rome in 1623. His engravings are

scarce and valuable, and are chiefly copies of Mantegna, Diier, and Titian. The most remarkable of his works are “ Mercury and Tgnorance,” the “ Deluge,” “ Pharaoh’s host drowned in the Red: Sea” (after Titian), the “ Triumph of Cesar” (after Mantegna), and “ Christ retiring from the judgment-seat of Pilate.”

ANDREASBERG, a town of Prussia, in the former kingdom of Hanover, situated in the Hartz mountains, at an elevation of nearly 2009 feet above the level of the sea, and at a distance of about 10 miles S.E. from Clausthal. It contains 3321 inhabitants, many of whom are employed in the manufacture of lace, thread, or matches. In the vicinity there are valuable mines of silver, iron, lead, cobalt, arsenic, and copper.

ANDREEVA, or Envert, a town of Russia, in the dis- trict of the Caucasus, situated on the Aktash, 45 miles south of Kizliar. It once had a large trade in slaves. Population, 12,000.

ANDREOSSI, ANTOINE-FRANGOIS, COMTE D’, a very dis- tinguished French officer, was born at Castelnaudary in Languedoc, 6th March 1761, and died at Montauban, September 1828. He was of Italian extraction, and his grandfather, Frangois Andreossi, had taken part with Riquet in the construction of the Languedoc canal in 1669. At the age of twenty he became a lieutenant of artillery, and he early jomed the republican party. He accompanied Bonaparte to Egypt as a chef de brigade, serving with great distinction, and was selected as one of Napoleon’s com-

anions on his unexpected return to Europe. Andreossi filled with honour many important offices of command during subsequent campaigns, and was appointed ambas- sador to London after the treaty of Amiens. When Napo- leon assumed the title of Emperor, Andreossi was advanced to be inspector-general of artillery, and made a count of the empire. He was sent as ambassador to Austria, where he remained till the rupture with France in 1809; and when the fatal battle of Wagram prostrated Austria, he held the post of governor of Vienna as long as that capital was occupied by the French. He was after- wards sent by Napoleon as ambassador to Constanti- nople, where he conciliated the friendship of both Franks and Mahometans. In 1814 he was recalled by Louis XVIIL, who sent him, however, the cross of St Louis. Andreossi now retired into private life, till the escape of his

former master from Elba once again called him forth. After the battle of Waterloo he finally quitted the scene of political life, relieving the tedium of retire- ment by writing several scientific memoirs. He was a man of solid and extensive acquirements. While in Egypt he had contributed to the Institute of Cairo memoirs on the Valley of Lake Natron, and on Lake Menzaleh. Subsequently he published an account of the Campaign on the Main and the Rednitz; a memoir on the Flow of the Black Sea into the Mediterranean; a history of the Canal du Midi, known previously as the Canal de Languedoc, the chief share in the construction of which he claimed for his ancestor ; and a memoir on the Constantinople Water-works System.

ANDRES, Juan (1740-1817), an erudite Jesuit, born in Valencia, and some time professor of literature in the

university of Gandia. He is the author of a great number of treatises on science, music, the art of teaching the deaf and dumb, &c. But his chief work, the labour of fully twenty years, is one in 7 vols. 4to., entitled Dell' Origine, dei Progressi, e dello Stato attuale @ogni Letteratura, where a great deal of information is accumulated. (See Hallam's Lit. of Hur. and Sismondi's Tit. of S. Hurope, vol. i.

ANDREW, St, the apostle, born at Bethsaida in Gali- lee, brother to Simon Peter. He had been a disciple of John the Baptist, and followed Jesus upon the testimony given of Him by the Baptist (John i. 35, 40, &c.) Andrew troduced his brother Simon, and they passed a day with Jesus, after which they went to the marriage in Cana (ibid. ii.), and then returned to their ordinary occupation. Some months after, Jesus meeting them while they were both fishing together, called them to him, and promised to make them fishers of men. Immediately they left their nets and followed him (Matt. iv. 19). Tradition assigns Scythia, Greece, and Thrace, as the scenes of St Andrew's ministry : he is said to have suffered crucifixion at Patra in Achaia, on a cross of the form called Crux decussata (x), and commonly known as "St Andrew's cross." His relics, it is said, were afterwards removed from Patre to Constantinople. An apocryphal book, bearing the title of The Acts of Andrew, is mentioned by Eusebius, Epiphanius, and

others. It is now completely lost, and seems never to have been received except by some heretical sects, as the Encratites, Origenians, &c. This book, as well as a Gospel of St Andrew, was declared apocryphal by a decree of Pope Gelasius (Jones On the Canon, vol, i. p. 179, e seq. – NDREWES, Lancetot, D.D., Bishop of Winchester, one of the most illustrious of the prelates of England, was born in 1555 in Thames Street, Allhallows, Barking, London. His father Thomas was of the ancient family of the Suffolk Andrewes ; in his later years he became master of Trinity House. Lancelot was sent while a mere child to the Coopers' Free School, Ratcliff, in the parish of Stepney. From this the youth passed to Merchant Taylors' School, then under the celebrated Richard Mulcaster. In 1571 he was entered at Pembroke College, Cambridge. He was here one of the first four scholars upon the founda- tion of Dr Thomas Watts, successor of the venerable Nowell. Contemporaneously he was appointed to a scholar- ship in Jesus College, Oxford, at the request of the founder (Dr Price), by Queen Elizabeth. In 1574-5, he took his degree of B.A.; in 1576 he was chosen to a fellowship at his college ; in 1578 he proceeded M.A. ; in 1580 he was ordained, and in the same year his name appears as junior treasurer ; in 1581 he was senior treasurer, and on July 11, was incorporated M.A. at Oxford. On passing M.A., he was appointed catechist in his college, and read lectures upon the Decalogue, afterwards published, causing a furor of 'interest far and near, as his first quaint biographer Isaacson tells. The notes of these lectures printed in 1642 authenticate themselves; later editions have been suspiciously enlarged, and otherwise altered for the worse. The notes are historically valuable and important, inasmuch as with Bishops Jewell and Bilson, he teaches in them, that Christ is offered in a sacrament, that is, his offering is represented and a memory of his passion celebrated. Nothing can be more definite or emphatic than Andrewes' repudiation of a real external sacrifice in the bread and wine. From the university Andrewes went into the North, on the invitation of Henry Hastings, earl of Huntingdon, lord president of the North. In 1585 he is again found at Cambridge taking his degree of B.D. In 1588 he suc- ceeded Crowley in the vicarage of St Giles, Cripplegate. Here he delivered his most penetrative and striking

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sermons on the Zemptatwon in the Wilderness, and the Lord's Prayer—the former published in 1592, the latter in 1611. Ina great sermon on April 10, in Easter week 1588, he most effectively, and with burning eloquence, vindicated the Protestantism of the Church of England against the Romanists. It sounds oddly to have "Mr Calvin" adduced herein and elsewhere as a new writer, with lavish praise and affection. Passing other ecclesi- astical advancements, Andrewes was preferred by Grindal, at the suit of Walsingham, to the prebendal stall of St Pancras in St Paul's, London, in 1589. The prebendary had ''the courage of his opinious," for Sir John Harington records that Sir Francis Walsingham, his patron, having laboured to get him to maintain certain points of ultra- Puritanism, he refused, having, as the garrulous Knight, in his State of the Church of England (pp. 148, 144), pun- ningly remarks, "too much of the dvdpos in him to be scared with a councillor's frown, or blown aside with his breath," and accordingly answered him plainly, that 'they were not only against his learning, but his conscience." On September 6, 1589, he succeeded Fulke as master of his own college of Pembroke, being at the time one of the chaplains of Archbishop Whitgift. His mastership of Pem- broke was a success in every way. In 1589-90, as one of the twelve chaplains of the queen, he preached before her majesty a singwarly outspoken sermon (March 4, 1590). In this year, on October 13, he preached his introductory lecture at St Paul's, upon undertaking to comment upon the first four chapters of Genesis. These form part of the Orphan Lectures, of the folio of 1657, than which there is no richer contribution to the theological literature of Eng- land, notwithstanding the imperfection of the notes in some cases. He was an incessant worker as well as preacher. He delighted to move among the people, and yet found time to meet with a society of antiquaries, whereof Raleigh, Sidney, Burleigh, Arundel, the Herberts, Saville, Stow, and Camden, were members. What by his often preaching, testifies Isaacson, at St Giles's, and his no less often read- ing in St Paul's, he became so infirm that his friends despaired of his life. His charities were lavish, and yet discriminative. The dearth of 1594 exhibits him as another Joseph in his care for the afflicted and poor of "the Israel of God." In 1595 appeared The Lambeth Articles, a landmark in our national church history. Andrewes adopted the doctrine of St Augustine as modi- fied by Aquinas. Philosophically, as well as theologically, his interpretations of these deep things remain a permanent advance in theological-metaphysical thought. In

1598 he declined offers of the two bishoprics of Ely and Salisbury, his “nolo episcopari” resting on an intended alienation of the lands attached to these sees. On November 23, 1600, was preached at Whitehall his memorable sermon on Justification, around which surged a controversy that is even now unspent. The preacher maintained the evan- gelical view as opposed to the sacerdotal. On July 4, 1601, he was appointed dean of Westminster, and his sedulousness over the renowned school is magnified by Bishop Hacket in his Life of Archbishop Williams. On July 25, 1603, Andrewes assisted at the coronation of James I. In 1604 he took part in the Hampton Court Conference, and, better service, was one of the committee to whom we owe our authorised version of Holy Scripture. The dean frequently preached before the king, and his majesty’s own learning, given him by George Buchanan, made him a sympathetic hearer. Many of these state sermons are me- morable from their results and place in our ecclesiastical history. In 1605 he was appointed, after a third declina- ture, bishop of Chichester. In 1609 he published his Lortura Torti, in answer to Bellarmine’s Mattheus Tortus. This work is one of many born of the gunpowder plot and

related controversies. It is packed full of learning, and yet the argument moves freely. Nowhere does Andrewes’ scholarship cumber him. It is as a coat of mail, strong but mobile. In this same year he was transferred from Chichester to Ely. His studiousness here was as intent as before. He again assailed Bellarmine in his Responsio ad Apologiam, a treatise never answered. From 1611 to 1618, Andrewes is to be traced as preacher and contro- versialist in season and out of season. In 1617 he attended the king to Scotland. In 1618 he was translated to the see of Winchester. In this year he proceeded to the Synod of Dort. Upon his return he became in word and deed a model bishop, while in every prominent ecclesiastical event of the period he is seen in the front, but ever walk- ing in all beauty of modesty and benignity. His bene- factions were unprecedented. His lcarning made him the equal and the friend of Grotius, and of the foremost con- temporary scholars. His preaching was unique for its combined rhetorical splendour and scholarly richness, and yet we feel that the printed page poorly represents the preaching. His piety was that of an ancient saint, semi-

ascetic and unearthly in its self-denial, but rooted in a deep and glowing love for his Lord. No shadow rests on his beautiful and holy life. He died 25th September 1626, and the leaders in church and state mourned for him as for a father. Two generations later, Richard Crashaw caught up the universal sentiment, when in his lines Vpon Bishop Andrewes' Picture before his Sermons, he exclaims :— ''This reverend shadow cast that setting sun,

Whose glorious course through our horizon run,

Left the dimme face of this dull hemisphere,

All one great eye, all drown'd in one great teare." It is to be regretted that the works of Bishop Andrewes have been only fragmentarily and uncritically collected and edited ; but the edition of the Anglo-Catholic Series suffices to place him in the front rank of the theologians of England. (Works, as originally published, and as col- lected wt supra ; Isaacson's Life in Fuller's Abel Redwivus ; Buckeridge's Sermon; Russell's Memoirs of the Life and Works (1860), a medley of materials and discursive notes ; British Museum Harleian MSS.) (A. B. G.)

ANDREWS, James Perrit, an English historian and miscellaneous writer, was the younger son of Joseph Andrews, of Shaw-house, near Newbury, Berks, where he was born in 1737. He was educated privately, and early discovered a taste for literature and the fine arts. Andrews was the author of several miscellaneous works, but his most extensive undertaking was his Hvstory of Great Britain, connected with the Chronology of Europe, with Notes, &c., of which, however, he lived to complete but two volumes. The first, which was published in 1794, in 4to, commences with Czsar's invasion, and ends with the deposition and death of Richard II. ; and the second, which appeared in 1795, continues the history to the accession of Edward VI. The plan of this work was new, and in some respects singular ; a portion of the history of England is given on one page, and a general sketch of the contemporaneous history of Europe on the page opposite. He appears to have left off this work to prepare a con- tinuation of Henry's History of Britain, which he published in 1796 in one volume 4to, and two volumes 8vo. He. died at Brompton 6th August 1797.

ANDRIA, a town of Italy, in the province of Terra di Bari, situated in a plain 31 miles west of Bari. The town, which is said to derive its name from the caverns (antra) in the vicinity, is well built, and possesses a fine cathedral, founded in 1046 by Petro Normano, count of Trani. It has no manufactures of importance, but there is an exten- sive trade in almonds, which are imported in large quan- tities from the surrounding country. Andria was burned

in 1799 by General Broussier, and in 1861 it became part of the new kingdom of Italy. Population, 34,000. ANDRIEU, Berrranp, a celebrated engraver of medals, born, 24th November 1761, at Bordeaux. He is considered as the restorer of the art in France, which had declined after the time of Louis XIV.; and was so highly esteemed, that during the last twenty years of his life he was en- trusted by the French Government with the execution of every, work of importance. Many of his medals are figured in the Medallic History of Napoleon. He died at Paris 6th December 1822. ANDRISCUS, a man of mean extraction, who, pretend- ing to be the natural son of Perseus, last king of Macedonia, assumed the name of Philip, for which reason he was called Pseudo-Philippus, the False Philip. Escaping from Rome, where he was imprisoned for his pretensions, he found a sufficient number of partisans in Thrace to en- courage him to assert his claim to the throne of Macedonia, and enable him to defeat the Roman pretor Juventius, who had been sent against him. His brief reign was marked by great cruelty and extortion. In 148 B.c. he was completely defeated, and was carried captive to Rome

by Q. Cazcilius Metellus, for whom this triumph gained the

name of Macedonicus. The victory placed Macedonia once

more in the hands of the Romans, though at a cost of

25,000 men. senate. ANDROCLUS, a Roman slave who used to lead about the streets a lion that had forborne to injure him when turned loose upon him in the circus. The story is re- lated, on the authority of an eye-witness, by Aulus Gellius (Woct. Att., v. 14), who states that Androclus, having

taken refuge from the severities of his master in a cave in Africa, a lion entered the cave and presented to him his swollen paw, from which Androclus extracted a large thorn. ANDROMACHE, in Greek legend, was the wife of Hector (Iliad, vi. 395), and daughter of Eétion, prince of Thebe in Mysia. Her father and seven brothers had fallen by the hands of Achilles, when their town was taken by him. Her mother, ransomed at a high price, was slain by Diana (Zliad, vi. 428). To Hector Andromache bore a son, Scamandrius or Astyanax, whose death by the Greeks she was forced to look on; and when, her husband also slain by them and Troy taken, the captives were apportioned, she fell to Neoptolemus, the son of Achilles, with whom she went to Phthia, or, as it is also said, to Epirus, and there bore him the sons Molossus, Pielus, and Pergamus. Neo- ptolemus having been slain by Orestes, left her to the Trojan seer Helenus, who had followed him, and who now married her, and governed the kingdom of Molossia for her sons. After the death of Helenus, Andromache re- turned to Asia Minor with her youngest son Pergamus, who there founded a town named after himself. The tragic poets found a favourite subject in the events of her life, and in her faithful and affectionate character as the wife of Hector. In works of art the death of Astyanax, and the farewell scene between Andromache and Hector (Ziad, vi. 323) were represented,—the latter, it is said, in a painting which drew tears from Portia the wife of Brutus (Plutarch, Brut. 23). ANDROMEDA, in Greek legend, the daughter of Cepheus and Cassiopea, or Cassiepea, king and queen of the Athiopians. Cassiepea having boasted herself equal in beauty to the Nereids, drew down the vengeance of Neptune, the sea god, who sent an inundation on the land, and a sea monster which destroyed man and beast. The oracle of Ammon announced that no relief would be found until the king exposed his daughter Andromeda to the monster, and accordingly she was fastened to a rock on

Andriscus was put to death by order of the

the shore. Perseus, returning from having slain the Gorgon, found her in this position, slew the monster, set her free, and married her against the opposition of Phincus, to whom she had before been engaged. Before leaving Aithiopia she bore a son, Perses, from whom the Persian kings

traced their descent, as did also the kings of Pontus and Cappa- docia, who had a portrait of Perseus on their coins… Re- turning with her husband first to Seriphus, and finally to Argos, Andromeda bore him Alczus, Sthenelus, and Electryon, and thus founded the dynasty of the Persides. After her death Andromeda was translated by Minerva to a constellation in the northern sky, near Perseus and Cassiepea. The tragic poets used the legend of her life, and in works of art the slaying of the monster by Perseus was represented.

ANDRONICUS I. (Comyenvs), Emperor of Constan- tinople, son of Isaac, and grandson of Alexis I. Comnenus, was born about the beginning of the 12th century. He was endowed by nature with the most remarkable gifts both of mind and body. He was handsome and eloquent, but licentious; and at the same time active, hardy, courageous, and an excellent soldier. His early years were spent in alternate pleasure and military service. In 1141 he was taken captive by the Turks-Seljuks, and remained in their hands for a year. On being ransomed, he went to Con- stantinople, where was held the court of his cousin, the emperor Manuel, with whom he was a great favourite. Here the charms of his niece, the princess Eudoxia, attracted him. She became his mistress, while her sister Theodora stood in a similar relation to the emperor Manuel. In 1152, accompanied by Eudoxia, he set out for an important command in Cilicia. Failing in his principal enterprise, an attack upon Mopsuestia, he returned, but was again appointed to the command of a province. This second post he seems also to have left after a short interval, for he appeared again in Constantinople, and narrowly escaped death at the hands of the brothers of Eudoxia. About this time (1158) a conspiracy against the emperor, in which Andronicus participated, was discovered, and he was thrown into prison. There he remained for about twelve years, during which time he made repeated but un- successful attempts to escape. At last, in 1165, he was successful; and, after passing through many dangers, reached the court of Jaroslav, grand duke of Russia, at Kiev. While under the protection of the grand duke, Andronicus brought about an alliance between him and the emperor Manuel, and so restored himself to the emperor’s favour. With a Russian army he joined Manuel in the invasion of Hungary, and assisted at the siege of Semlin. After a successful campaign, they returned to- gether to Constantinople; but a year after (1167), An- dronicus refused to take the oath of allegiance to the

prince of Hungary, whom Manuel desired to become his successor. He was removed from court, but received the province of Cilicia. Being still under the displeasure of the emperor, Andronicus fled to the court of Raymond, prince of Antioch. While residing here he captivated and seduced the beautiful daughter of the prince, Philippa, sister of the empress Maria. The anger of the emperor was again roused by this dishonour, and Andronicus was compelled to fly. He took refuge with Amaury, king of Jerusalem, whose favour he gained, and who invested him with the town of Berytus, now Beirout. In Jerusalem he saw Theodora, the beautiful widow of the late king Baldwin, and niece of the emperor Manuel. Although Andronicus was at that time fifty-six years old, age had not diminished his charms, and Theodora became the next victim of his artful seduction. To avoid the vengeance of the emperor, she fled with him to the court of the sultan of Damascus; but not deeming themselves safe there, they continued

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their perilous journey through Persia and Turkestan, round the Caspian Sea and across Mount Caucasus, until at length they settled among the Turks on the borders of Trebizond. Into that province Andronicus, with a body of adventurers, made frequent and successful incursions. While he was absent upon one of them, his castle was sur- prised by the governor of Trebizond, and Theodora with her two children were captured and sent to Constantinople. To obtain their release Andronicus made abject submission to the emperor; and, appearing in chains before him, im- plored pardon. This he obtained, and was allowed to retire with Theodora into banishment in the little town of CEnoe, on the shores of the Black Sea. In 1180 the emperor Manuel died, and was succeeded by his son Alexis II., a youth of twelve or fourteen years, who was under the guardianship of the empress Maria. Her conduct excited popular indignation; and the consequent disorders, amounting almost to civil war, gave an opportunity to the ambition of Andronicus. He left his retirement, secured the support of the army, and marched upon Constantinople. Alexis was compelled to acknowlege him as colleague in the empire. The empress was put to death, and her son soon shared the same fate. His dead body is said to have been insulted by Andronicus, but the authorities for this and similar stories are in all probability prejudiced. An- dronicus, now (1183) sole emperor, married

Agnes, widow of Alexis II., a child eleven years of age. His short reign was characterised by strong and wise measures. He re- solved to check many abuses, but, above all things, to limit the power of the nobles. The people, who felt the severity of his laws, at the same time acknowledged their justice, and found themselves protected from the rapacity of their superiors. The aristocrats, however, were in- furiated against him, and summoned to their aid William of Sicily. This prince landed in Epirus with a strong force, and marched as far as Thessalonica, which he took and destroyed; but he was shortly afterwards defeated, and compelled to return to Sicily. Andronicus seems then to have resolved to exterminate the aristocracy, and his plans were nearly crowned with success. But in 1185, during his absence from the capital, his lieutenant ordered the arrest and execution of Isaac Angelus, a descendant of the first Alexis. Isaac escaped, and took refuge in the church of St Sophia. He appealed to the populace, and a tumult arose which spread rapidly over the whole city. When Andronicus arrived he found that his power was overthrown, and that Isaac had been proclaimed emperor. His offers of a general pardon, and cven of abdication in favour of his son, were rejected; and, after an unsuccessful attempt at escape, he was seized and dragged before the new emperor. Isaac delivered him over to his cnemies, and for three days he was exposed to their fury and resentment. At last they hung hin up by the feet between two pillars. His dying agonies were shortened by an Italian soldier, who mercifully plunged a sword into his body. He died on the 12th September 1185.

ANDRONICUS II. (Patzotocus), Emperor, was born 1260. He was the elder son of Michael Paleologus, whom he succeeded in 1283. During his reign the Turks under Osman conquered nearly the whole of Bithynia; and to resist them the emperor called in the aid of Roger de Flor, who commanded a body of adventurers. The Turks were defeated, but Roger was found to be nearly as formidable an enemy to the imperial power. He was assassinated in 1308. His adventurers declared war upon Andronicus, and after devastating Thrace and Macedonia, settled in the southern part of Greece. From 1320 onwards the emperor was engaged in war with his grandson, Andronicus, in whose favour he was compelled to abdicate, 1328. He retired to a convent, and died about 1334..

ANDRONICUS IIL, grandson of the preceding, was born about 1296. His conduct during youth was so violent, that his grandfather resolved to deprive him of his right to the crown. Andronicus rebelled, and in 1328 compelled his grandfather to abdicate in his favour. During his reign he was engaged in constant war, chiefly with the Turks, who greatly extended their conquests, He died in 1341.

ANDRONICUS oF Cyrruvus, a Greek astronomer, about B.c. 100, built at Athens an octagon tower, with figures carved on each side, representing the eight principal winds.

ANDRONICUS or Ruopss, the eleventh scholarch of the Peripatetics, lived about B.c. 70. His chief work was the arrangement of the writings of Aristotle, the materials for which had been supplied to him by Tyrannion. Besides arranging the works, he seems to have written paraphrases and commentaries, none of which have coinc down to us. Two writings under the name Andronicus are sometimes erroneously attributed to him, one on the Emotions, the other a commentary on Aristotle's Lthics.

ANDROS, or AnpDRo, the ancient Andros, an island of the Grecian Archipelago, the most northerly of the Cyclades, lying 6 miles 8.W. of Eubcea, and about 2 N. of Tenos. It is nearly 25 miles long, and its greatest breadth is 10 miles. Its surface is for the most part mountainous, with many fruitful and well-watered valleys, which produce vines, grain, olives, pomegranates, lemons, figs, and oranges, and supply food for cattle, silk-worms, and bees. At Andros, the capital, a town on the east coast, containing about 5000 inhabitants, there are silk and carpet manu- factures, the former of which gives rise to a considerable export trade; but the harbour doesnot afford accommodation except for vessels of small size, and is much inferior to that of Gaurio (Gaurium) on the west coast, near the ruins of an older Andros, the ancient capital of the island. This Andros, which was situated on the brow of a hill that commands the whole coast, contained a famous temple, dedicated to Bacchus, and a spring that was said to flow with wine during the feast of the god. The island is supposed to contain about 15,000 inhabitants, the bulk of whom belong to the Greek Church. According to the ordinary account, Andros, which is said to derive its name either from Andreus, a general of Rhadamanthus, or from a seer

called Andrus, was colonised by the Ionians about 1000 B.c., and soon became a place of some importance. In 480, after the battle of Salamis, Themistocles made an attempt to take the capital, wishing to punish the in- habitants for their readiness to assist the Persians in their invasion of Greece; and, although he failed in this enter- prise, the island afterwards became for a time subject to the Athenians. In 333 it was added to the Macedonian empire; and after the death of Alexander the Great, became part of Ptolemy's kingdom. In 200 it was taken by the Romans, who handed it over to Attalus I., king of Pergamos; and in 133 it reverted to the Romans, in accordance with the will of Attalus III. On the dissolu- tion of the empire of the East, Andros came under the rule of the Turks; but now, along with the island of Tenos, it forms a government of the modern kingdom of Greece.

ANDUJAR, a town of Spain, in the province of Jaen, Andalusia, situated near the Guadalquivir, 20 miles N.W. of Jaen. Itisa dull, unhealthy place, possessing few build- ings of any architectural beauty; but there is a road lead-

ing to an old bridge over the Guadalquivir which is lined with fine trees. 'The town has an inconsiderable trade in cattle, grain, oil, and fruit. It is most widely known for its porous earthenware jars, called alcarrazas, which possess the property of keeping water cool in the hottest weather, and which are manufactured in great numbers from a whitish clay found in the neighbourhood. The Convention of Baylen was signed at Andujar in 1808; and the decree of the duke of Angouléme, by which all Spanish authorities were subordinated to the French, was published in the same town in 1823. Population, 14,096.

ANDUZE, a town of France, in the department of Gard, situated on the Gardon d'Anduze, about 6 miles S.W. of Alais. It possesses considerable manufactures of serges, stockings, hats, silk, and leather, and has 5303 inhabitants, many of whom are Protestants.

ANECDOTE, a word derived from a privative and éxédé- Swe, to give out or publish, means originally something not published. It has two distinct

significations. First, the primary one is something not published, in which sense it has been used to denote either secret histories, —Procopius, e.g., gives this as one of the titles of his secret history of Justinian's court,—or portions of ancient writers which have remained long in manuscript and are edited for the first time. Of such anecdota there are many collections ; the earliest was probably Muratori's, in 1709. Besides it, there are anecdota by Bekker, Bachmann, Cramer, Boissonade, Matranga, Miller, Wolff, Villoisin, Amaduci, Tischendorf, and, the most recent, Val. Rose, 1864-71. There are also anecdota of more modern writers; some of these are given by Martene and Durand, Thesaurus Novus Anecdotorum (1717), and Pez, Thesaurus Anecdotorum Novissimus (1721). Second, in the popular acceptation of the word, which is to be traced to their being, in the first instance, colloquial, anecdotes are relations of detached interesting particulars. Of such anecdotes the collections are almost infinite; the best in many respects is that com- piled by Byerley and Clinton Robertson, known as the Percy Anecdotes (1820-23).

ANEL, DomrniQvuE, an eminent French surgeon, born at Toulouse in 1679. He is celebrated for his successful treatment of aneurism and fistula lachrymals, and was the inventor of the probe and syringe still known by his name. He wrote several medical works, published at Amsterdam 1707, Turin 1713, and Paris 1822. He died about 1730.

ANEMOMETER, or wind-measurer (from dyepos, Wind, and pérpov, a measure), a contrivance for indicating the rate and direction of the wind. Ever since the birth of true experimental science, it has been recognised as a matter of great importance and interest to man that he should know something of the laws according to which the atmospheric currents and changes are produced. Among meteorological phenomena, none deserve more attention than the elements of the wind; and none have received more. Yet anemometry has been all along the least suc- cessful department of meteorology, partly owing, of course, to the nature of the agent to be dealt with, which is the very type of fluctuation, and partly to a mistaken path of observation that was too long followed. The error which, from the days of Hooke, in the middle of the 17th century, to within a comparatively recent period, misdirected the efforts of inventors, was the idea that the elements to be determined in the case of the wind are its direction and pressure,

whereas practically they are its direction and velocity. If the currents of air were anything like uniform, it would be a comparatively simple matter to deduce the velocity from the pressure ; but their variability is so very great, that the relations between the velocity and the pressure become unworkably complex. We know, from the elementary principles of dynamics, that the pressure at

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any instant will vary as the square of the velocity.

would be impossible to give even the names. tive statical forms of anemometer—that is, such as set against sistance, with some means of indicating the point of balance have been divided by Dr Robinson (7Z'rans. Roy. Irish Acad., vol. xxii. p. 150) into three classes :—First, vertical

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Obviously, therefore, the relative variations of the pressure

will be twice as great as those of the velocity; and the latter are too great, as we find them, to encourage us to double them artificially. It must also be remembered that, from the inertia of the indicating apparatus, errors will in every case arise ; and these also will be doubled if we take the pressure instead of the velocity variations. From all this it will appear that comparatively little importance is to be attached to the earlier and to all statical modes of anemometry.

The essentials of every anemometer are two : (1), a wend-

vane, to show changes of direction; and (2), a wind-gauge, to show changes of velocity, or of force. a distinction which we may have in every kind of meter. They may be either non-recording, as merely exhibiting the variations to the eye; or recording, or marking them per- manently on paper.

There is also

The wind-vane, or weather-cock, is simply a flat sheet of

thin metal, or two sheets in the shape of a thin wedge, at the end of a metal rod, the whole turning freely on a vertical axle. wind itself, the vane is often used to turn the gauge, so as to present the pressure-surface with its face always direct to the wind. |

Besides serving to show the direction of the

Of all the gauges that have been invented or proposed it The primi-

the force of the wind a gradually increasing re-

windmills, kept facing the wind by a vane, and acting by

winding on their axle a string against some form of gradu-

ated resistance. Of this nature were Dr Hooke's aneimo- meter (which is generally considered the first practical attempt in wind-measuring), and those of Wolfius and Martin. The second class consists of those in which the wind acts on a flat plate, usually a foot square, pressing it against the elasticity either of a metallic spring or of a mass of confined air, a previous graduation of the elastic force having been made for each instrument. The first gauge of this type was invented by the celebrated Bouguer about the middle of last century; and since his time there have been many attempts at improvement of this principle, the apparent simplicity of the spring-measure being its recommendation. Modified forms of Bouguer's wind-pressure gauge are in use even at the present day; and about a quarter of a century ago a self- registering adaptation of it was constructed by Osler, and very generally employed. The third class measures the wind-force by the difference of level it is capable of pro- ducing in an inverted syphon, or U tube, containing water or some other liquid. Lind's anemometer, invented in 1775, is the best known of this type, and is still in common use. It is simply a U tube, with one leg bent at right angles towards the upper end, and attached to a vane, so as to have its mouth constantly facing the wind. Tt is about half-filled with water, and a scale gradu- ated to hundredths of an inch is attached. The difference of level in the legs of the syphon indicates the force of the wind; but it is only by experiment that the pressures corresponding to these differences can be laid down. Thus each instrument requires a carefully-constructed reference table of pressures and velocities

corresponding to its read- ings. According to Lind, a difference of level of 1 inch indicates a pressure of 5°2 ib on the square foot, and that corresponds to a velocity of about 324 miles an hour, which is in common language a high wind. A difference of 3 inches would indicate a storm, and one of 6 inches a

hurricane. Rivalling this in simplicity is a fourth class, that may be added to Dr Robinson's, viz., pendulum anemometers, where the pressure-plate is swung as a pen- dulum, and indicates the wind-force by its deviation from the vertical. The first of this form was invented by the Marquis Poleni, and gained the prize of the French Academy in 1733. They are still employed as simple rough-and-ready indicators to the eye of the strength of the wind.

Several other anemometers have been contrived, which, from being essentially non-recording, may be mentioned as more curious than valuable. Among these are—(1.) A musi- cal anemometer, suggested by Dr Hooke, and constructed by Delamanon, in which the wind was caused to sound automatically, in a set of pipes, a particular note corre- sponding to its velocity ; (2.) Leslie's anemometer, or rather anemometric principle, which deduces the velocity of the wind from its effect in cooling a thermometer, it being sup- posed that the rate of cooling is proportional to the velocity of the wind; (3.) Brewster's evaporation anemometer, by which the velocity may be deduced from the amount of water evaporated in a given time from a rough open sur- face, such as sponge or flannel, the two being in proportion.

Osler's anemometer, the last of the pressure-gauges we shall mention, being one of the most trustworthy and most common registering anemometers in this country, merits a more particular description. It traces with pencils on a sheet of paper (which is moved along, either in a vertical or a horizontal position, at a constant rate by means of clock-work) lines which indicate changes of the wind, both in direction and in pressure. Its general principle will be readily understood without a diagram. Changes of direction are recorded in this way. The axle that carries the vane, and turns with it, has keyed on its lower end a pinion which, working in a horizontal rack, moves it backwards or forwards as the axle turns one way or the other ; and a

pencil fixed to the rack traces its movements on the register-sheet. Changes of pressure, or wind-force, are measured by means of springs. A square foot of a light metal plate, placed vertically and turning with the vane-rod, receives the impulse of the wind, and is forced against three springs, so arranged that one, two, or all of them may be pressed on according to the violence of the wind. The extent of compression against the springs is transmitted through the hollow vane-axle, by means of chains and pulleys, to a light spring, which presses a pencil gently against the paper. Variations of motion of the upper plate thus correspond to definite lateral deviations of this second spring pencil, and a wavy line is traced on the paper as it moves along. The register- sheet is ruled across its length into twenty-four equal parts, one of which passes the pencil points each hour; and lengthways it is ruled—first, with lines corresponding to the cardinal points, under the direction-pencil ; and secondly, on the field of the other pencil, with lines spaced by actual experiment so as to correspond to gradations of 5, 10, 15, 20, &c. ib of wind-pressure on the square foot. Thus the pressure-curve, in the same way as on the indicator of a steam-engine, includes between it and the horizontal line of zero-pressure a space proportional to the amount of work done by the wind on the upper pressure-plate. Of course, so long as the wind blows in one direction, the direction- pencil traces a horizontal line ; and if there be no wind at all, both pencils trace the zero horizontal lines.

We have not space to enter particularly into the history of the direct velocity-measuring anemometers. As long ago as 1783, one was contrived on this principle by Mr Edgeworth for the measurement of air-currents ; but to Dr Whewell belongs the credit of first appreciating at its true value the velocity as opposed to the pressure measure. In the Cam. Trans., vol. vi., he describes an instrument of

his own devising, which was afterwards extensively used. Sir W. Snow Harris recommended it strongly to the British Association in 1844, exhibiting results of his own observa- tions with it during three previous years. Owing, however, to some practical defects, such as the great frictional resist- ance of toothed wheels and endless screws, which have more effect on the indications of a gentle wind than of a high one, and to

the want of an arrangement for indicating the temes of the variations, Dr Whewell's instrument has now fallen into disuse. A description of it may be found in Drew's Practical Meteorology. One of the most valu- able contributions to this science was made by Dr Robinson, of Armagh, who between the years 1843 and 1846 con- ducted a number of experiments and calculations on the proper form to be given to the revolving vanes. He found radical defects in the principle of all the vanes previously employed ; either their moving power was not sufficiently great to make the frictional correction inconsiderable, or their velocity, in place of being less, was often three or four times greater than that of the wind, requiring greater complicacy of machinery to reduce the speed of the tracing point ; or, lastly, their results were not identical, though constructed after the same type. The form adopted by Robinson to remedy these defects is that shown in the figure. Though it had been suggested to him by Edge- worth, it deservedly bears the name of Rodinson's Cups (fig. 1), as he was the first to show ex- perimentally and ana- Mm lytically its advan- &

tages. The arrange- * ment consisted of four light metal hemispheres C, of as large a diameter as convenient, extended at the ends of light and strong metal radii, so that they shall be as far from the axis of motion as possible, and so reduce the effect of friction to a minimum. They require no vane to keep them facing the wind, that represented by F, F, in the figure having a movement quite independent of the cups, as will be explained presently. He found that the cups move at almost exactly one-third of the rate of the wind — a happy simplicity of ratio—and this for all instruments made efter one type. Experiments were made with sets of two, three, four, and six cups; but the velocity ratio between the cups and the wind was simplest and most constant with four, the number now universally employed, In the paper already quoted (Trans. Roy. Irish Acad., vol. xxii.), Dr Robinson describes a self-registering apparatus, to which he had fitted the horizontal cups, But we shall describe instead one of the more modern and simple registers, which seems to leave little further to be desired in the way of compactness and accuracy. It is the inven- tion of Mr Beckley, of the Kew Observatory, and is described in full in the Report of the British Association, 1858, p. 306. The outside, or wind-receiving parts are represented in the above figure, and consist of Robinson's cups C, for the wind-velocity, and a double fan F, or windmill governor, for wind-direction. The fans serve as a

vane, turning so as to keep their axes constantly at right angles to the wind, and are more steady than the ordinary vane. They are connected with the outer brass tube B, and carry it round with them on any change of wind-direction. ‘The second figure shows the manner in which the motions of the fans and cups are recorded. R is a cylinder, which carries the scene on which the

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Fig. 1.—Cups and Vane of Anemometer.

two pencils P, Q, press lightly. It is turned round at a uniform rate by clock-work in K, making a complete revo- lution in twenty-four hours, or moving through half an inch per hour. Horizontal lines divide the sheet into hour spaces, marked 1, 2, 3, &c., in the figure. The fan, or direction-axle B (fig. 1), communicates its motions to a mitre wheel M (fig. 2), which, gearing into the bevel wheel T, moves the cylinder D, with its brass pencil P. By

a change of the wind from north to south, the pencil

would trace a line along the cylinder between the verti- cal lines N and 8. In like manner the velocity of the cups is communicated by a shaft passing through the

direction-axle to a mitre wheel W, which moves the bevel

wheel N, the cylinder L, and its pencil Q. Vertical lines

are drawn on the paper, So

i

Fic. 2.—Recording Apparatus. one-third of that distance.

the average rate of the winds.

hours, a matter of only a minute or two. shows a simple brass spiral pencil ;

horizontally.

Anemometry now forms a most important feature in all and many important and re- markable results have appeared since the invention of

meteorological observations,

self-recording apparatus. See METEOROLOGY.

ANET, a town of France, in the department of Eure-

et-Loir, situated between the rivers Eure and Végre, 9 miles N.E. of Dreux.

near it is the plain of Ivry, where Henry IV. defeated the armies of the League in 1590. It has 1418 inhabitants, who carry on a small trade in corn, wood, and fodder.

ANEURISM (from dveipvopa, a. dilatation), a cavity, which contains blood, either fluid or coagulated, and which communicates with an artery; the walls of the cavity are formed either of the dilated artery or of the tissues around the vessel This affection, a malady of middle life and old age, may arise in consequence of injury or disease of the blood-vessels.

ANGARA, Upper and Lower, two rivers of Asiatic Russia, in the government of Irkutsk. The former rises in the mountains to the east of Lake Baikal, and falls into the head of the lake after a course of nearly 300 miles. The latter, which is sometimes called the Upper Tungonska, flows out of Lake Baikal, near its southern extremity, and passing the town of Irkutsk, falls into the Yenisei, after a course of about 1100 miles, The current of the river is very strong, forming several rapids in its progress. The scenery on its banks is frequently extremcly beautiful.

that the pencil moves over one space, while the wind travels 10 miles, or the cups

The velocity range docs not _ extend beyond 50 miles, that being sufficiently high above The sheet requires to be renewed, and the clock-work rewound every twenty-four The figure but the pencil de- vised by

Beckley for the Kew Observatory consists of a strip of brass fixed spirally on edge, so that for equal sncrements of rotation of its cylinder its point of contact with the register-sheet shifts along by equal increments

It contains the ruins of a magnifi- cent castle, built by Henry IL. for Diana of Poitiers, and

ANGARIA (dyyapeia), a sort of government postal

system adopted by the Romans under the empire, bor- rowed from the ancient Persians, among whom, accord- ing to Xenophon, it was established by Cyrus. (angare, dyyapot) on horseback were posted (posite), at cer- tain stages along the chief roads of the empire, for the transmission of royal despatches by night and day in all weathers.

Couriers

The supply of horses and their maintenance were compulsory, constituting under the Romans a burden from which the emperor alone could grant exemption. Hence the word came to mean generally compulsory service in the despatch of royal messages.

ANGEL is a transcription of the Greek deyyedos, & Mes- senger, but in signification corresponds to the special theo- logical sense which the latter word assumed among the Hellenistic Jews (and hence in the New Testament and in Christian writings), by being adopted as the translation of the Hebrew Mal’akh. Thus both name and notion of angel go back to the Old Testament.

The Old Testament belief in angels has two sides, being, on the one hand, a particular development of the belief in special manifestations of God to man; and on the other hand, a belief in the existence of superhuman beings stand- ing in a peculiar relation of nearness to God. These two sides of the doctrine are historically associated and co- operate in the later developments of Biblical angelology, but are not in all parts of the Old Testament fused into perfect unity of thought.

The first side of the belief in angels is expressed in the word Mal'akh, a messenger Or ambassador,—more fully, messenyer of Jehovah |E.V., angel of the Lorp], messenger of God. The whole Old Testament revelation moves in the paradox that God is invisible and inaccessible to man, and yet approaches man in unmistakable self-manifestation. This manifestation takes place in various ways,—in the priestly oracle, in prophecy, in the glory of God within the sanctuary [shekhina]. But in particular the early history represents God as manifesting himself by his messenger. In special crises "the messenger of Jehovah" calls from heaven to Hagar or to Abraham (Gen. xxi., xxii.) Or if God seeks to commune more fully with a man, his mes- senger appears and speaks to him. The narratives of such angelophanies vary in detail. Generally there is but one angel, but Abraham is visited by three (Gen. xviii.) Sometimes the dignity of the heavenly visitor is detected while he is present, at other times he is mistaken for a prophet, and recognised only by something supernatural in his disappearance (Judges vi. 21, fr, xiii, 20). Jacob wrestles all night with a "man," who at length with a touch dislocates his thigh (Gen. xxxii. 24, ff.) At other times no human formis seen. It is the angel of Jehovah who speaks to Moses in the burning bush, and leads the Israelites in the pillar of cloud and smoke (Exod. iii, 2, xiv. 19).

In all this there is perfect indifference to the personality of the angel, who displays no individuality of character, refuses to give a name (Gen. XxXil. ; Judges xiii.), acts simply as the mouthpiece of God. This is carried so far that in his mouth the pronoun J indicates Jehovah him- self ; while the narrative passes, without change of sense, from the statement, "the angel of Jehovah appeared, spoke," &c., to "Jehovah appeared, spoke." (Cf., for example, Exod. iii. ver. 2 with ver. 4; xiii. 21, with xiv. 19.) Those who see the angel say they have seen God (Judges xiii, 22; Gen. xxxii. 30), The angelophany is a theophany as direct asis possible toman. The idea of a full represcu- tation of God to man, in all his revealed character, by means of an angel, comes out most clearly for the angel that leads Israel in the very old passage, Exod. xxiii. 20, f- This angel is sent before the people to keep them in the way and bring them to Canaan. He speaks with divine autho-

rity, and enforces his commands by divine sanctions, “ for my name [z.e., the compass of my revealed qualities] is in him.” The question naturally arises, how the angel who possesses these high predicates stands related to angels who elsewhere appear not representing the whole self- manifestation of God to his people, but discharging isolated commissions. The Biblical data for the solution of this question are very scanty. An essential distinction between the “angel of the Lord,” who speaks in all things with full divine authority, and subordinate angels, is sought mainly in Gen. xviii. and in Exod. xxxii. 30, f,, xxxili. compared with Isaiah lxiii, 9. In the former case, though two of the three angcls leave Abraham, Jehovah goes his way only on the departure of the third. Yet the two angels when they come to Lot are apparently as direct a manifestation of God to him as the third was to Abraham (xix. 18, 7) And in the other passage it has not been clearly made out that there is really a distinction drawn between an angel who represents God’s presence and an angel of a lower kind who does not do so. The notion (long current in dogmatic theology, and which goes back to the earliest controversies between Jews and Christians) that “the angel of the Lord,” as contradistinguished from created angels, is the Logos—the second person of the Trinity—has found defenders down to the present day (Hengstenberg, Keil, &c.), but certainly does not express the sense of the Old Testament writers. And it seems

equally unprofitable to base on such passages as we have’

cited, a controversy whether “the angel of Jehovah” is one special angel charged throughout history with special func- tions towards the covenant people, or is any angel who from time to time has a special commission, or is to be viewed, at least in some cases, not as a hypostatic being, but simply as a momentary sinking of the invisible God into the sphere of visibility. The function of the angel so entirely overshadows his personality, that the Old Testa- ment does not ask who or what this angel is, but what he does. And the answer to this last question is, that he represents God to man so directly and fully, that when he speaks or acts God himself is felt to speak or act. The strongest passage perhaps is Gen. xlviii. 15, 7.

The disposition to look away from the personality of the angels and concentrate attention on their ministry, runs more or less through the whole

Old Testament angel- ology. It is indeed certain,—to pass to the second side of the doctrine,—that the angelic figures of the Bible narra- tive are not mere allegories of divine providence, but were regarded as possessing a certain superhuman reality. But this realityis matter of assumption rather than of direct teach- ing. Nowhere do we find a clear statement as to the crea- tion of the angels [Gen. ii. 1 is ambiguous, and it is scarcely legitimate in Psalm cxlviii. to connect ver. 2 with ver. 5]. That they are endowed with special goodness and insight, analogous to human qualities, appears as a popular assump- tion, not as a doctrine of revelation (1 Sam. xxix. 9; 2 Sam. xiv. 17, xix. 27). Most, characteristic for the nature of the angels is the poetical title "sons of God" (Bné Elohim, or, with a slight modification, Bné Hlim, in English version incorrectly "inighty," "sons of the mighty," Ps. xxix. 1, Ixxxix. 6), which, in accordance with the idiomatic force of the word sons, may be paraphrased, "' Beings who in a subordinate way share something of divine majesty." Perhaps in Psalm lxxxii. the name Elohim itself varies with the more usual " sons of Elohim."

Taken collectively, the angels form the hosts of Jehovah (Ps. ciii. 21, d&c.), or the host of heaven (1 Kings xxii. 19), names correlative to the new title of God which springs up at the close of the period of the Judges, "' Jehovah [God of] hosts." The notion of angels as divine armies is not like that of the individual "messenger" closely connected

with the theophanic history (yet compare Gen. xxxui. 1, 2; Joshua v. 13, sqg.), but belongs rather to the delineation of the majesty of God in poetry and prophecy. As the whole conception of the heavenly palace and throne is obviously symbolical, we must allow for conscious poetic art when the angels are represented surrounding God's throne in the form of an assembly or privy council of holy ones (conse- crated servants), praising his name, or receiving his com- mands, and reporting their execution (Ps. xxix., lxxxix. 6-8; 1 Kings xxii. 19, 7; Jobi.) Similarly much must be allowed for the free play of fancy when in the last judgment against the enemies of his people, Jehovah descends to battle with his heroes (Joel iv. 11), his holy ones (Zech. xiv. 5), or when he triumphantly enters Zion amidst myriads of heavenly war chariots (Ps. Ixvii. 17). Compare Isa, lxvi. 15, Hab. iii., which show

how closely such imagery is connectcd with the physical phenomena of the thunderstorm.

With the development of the idea of countless hosts of divine ministers is naturally associated, in place of the old angelic thcophany, the conception of an invisible agency of angels, who are henceforth seen only in vision or to eyes specially opened (Num. xxii. 31; 2 Kings vi. 17). To the guidance of Israel by the angel of Jehovah succeeds the belief in angelic guidance of individuals (Ps. xxxiv. 7), more or less poetically worked out (Ps. xci. 11). Con- versely, pestilence and other judgments are angelic visita- tions (2 Sam. xxiv.; 2 Kings xix. 35; Ps. Ixxvili. 49, where the “evil angels” of the English version are not wicked angels, but angels of evil). At length this is carried so far that all natural forces that serve God are viewed as his messengers, Ps. civ. 4: ‘“‘He makes winds his messengers, flaming fire his ministers.” This passage clearly shows the elasticity of the whole conception. Similar is the way in which the stars, which share with the angels the name “host of heaven,” appear associated with the latter (Job xxxvili. 7). Hence the later elemental angels.

Angelic interpretation between God and man reappears in Job xxxiii. 23 (cf. iv. 13, 7), and converse with angels forms a large part of the visionary setting of the later prophetical books (Ezekiel, Zechariah). But these visions, to which the prophets do not ascribe objective reality, illustrate rather the religious imagination than the theology of the period.

The idea of ranks and classes of angels, though naturally suggested by the conception of a host (cf. Joshua v. 13, sqq-), Was up to this time undeveloped; for neither the purely symbolical cherubim, nor the unique and obscure seraphim of Isaiah vi., have in the Old Testament the meaning later conferred on them of distinct classes of angels. But the angels of Zechariah present something of a systematic scheme, though it seems unsafe, with Ewald and others, to see in the seven eyes of Jehovah (iii. 9, iv. 10) a developed doctrine of seven chief angels (as in Tobit xii. 15; Rev. viii. 2), parallel to and influenced by the Amesha-cpentas of the Eranian mythology. The book of Daniel shows a much fuller development in a similar line. Israel, Persia, &c., have special angels (princes), whose contests represent those of human history (chaps. x., xii, of Isa. xxiv. 21,7)

‘The great prince who pre- sides over” Israel is named Michael (who is like God), and the angelus interpres is called Gabriel (man of God). The analogy of these notions to those of Zarathustrism 1s less decided than has often been supposed; but the freedom which Old Testament writers allow themselves in matters of imaginative representation, to which these conceptions mainly belong, is such as to render foreign influence quite credible.

The ranks, classes, and names of angels are a favourite topic of post-canonical, and especially of Apocalyptic litera- ture. In the book of Enoch, cherubim, seraphim, and even the wheels of Ezekiel’s vision, become distinct classes

of angels; and Rafael (cf. Tobit xii. 5), Phanuel, Uriel, &c., are added to the names of individual archangels. Specially celebrated is the interpretation which this book gives of Gen. vi 2, where the sons of God are under- stood as angels. ‘This interpretation seems to have in- fluenced Jude, ver. 6 (cf. 2 Pet. ii. 4), was current in the early church as well as in J udaism, and (though the narra- tive so understood is quite unique in the circle of Biblical ideas) is defended on philological grounds by the best recent scholars, the occurrence being viewed as history or as myth according as the interpreter is theosophically or critically inclined. Of other passages in later Jewish litera- ture it may suffice to refer to the full account of the crea- tion of angels of various functions, presiding over various powers of nature, in the Book of Jubilees (¢f: Reensch, Das Buch der Jubilien, p. 259).

The angelology of the New Testament attaches closely to the notions already developed. The ministry of angels is, as in the Old Testament, specially connected with the work of salvation (Heb. i. 14), and with the person of Christ (John i. 51), to whom after the temptation (and at Gethsemane?) angels minister, and who can at will com- mand their aid (Mat. xxvi. 53). As in the later Old Testa- ment books, revelations by angels are given in vision or dream, but even waking eyes see the angel or angels who minister at the resurrection. So an angel delivers Peter (Acts xii.), &c. As in the Old Testament, the figure of angels is human, their raiment white, and their aspect luminous. A multitude of angels appear singing praises at

the nativity (Luke ii. 13), and in general they sympathise with the repentance of sinners and the progress of the divine kingdom (Luke xv. 10; 1 Pet. i. 12). Gabriel reappears in Luke i. The belief in special guardian angels of individuals appears as current (Acts xii. 15), but the words of Jesus (Mat. xviii. 10) hardly go farther than the statements of the Psalms. The angelic hosts of the pro- phetic eschatology are naturally transferred to the second coming (Parusia) of our Lord. The saints after the resur- rection are like the angels (Mat. xxii. 30; Luke xx. 36). In the Apocalypse angels play a great part. Notable features, in addition to the seven highest angels (viii. 2), are the angels of the seven churches (who, however, are by many taken as human figures, church officers), and the association of special angels with cosmical forces, «9, angels of fire and water (xvi. 5, xiv. 18). The same idea appears even more sharply expressed in the writings of Paul, if, as Ritsch] has rendered plausible, the elements (elemental powers) of the world (Col. ii; Gal. iv. 3) are the angels, and specially the angels of the law. This view is connected with the characteristic position of Paul and the Epistle to the Hebrews, that the inferiority of the old covenant is stamped by the fact that the law was given and enforced by angels (Gal. iii., iv.; Heb. ii; ¢f- Acts vii. 53), an idea partly based on Exod. xxiii. 20, f, and partly on a transference to Sinai of the usual poetico-prophetic imagery of a theophany—a transference suggested by Ps. Ixviii. 17, Deut. xxxiii. 2, and actually carried out in the LXX. translation of the latter text,and in the current Jewish theology of the period. Angel worship is condemned in Col. ii. (probably with reference to Essene doctrine); ¢f. Rev. xix. 10. In Heb. ii, and 1 Cor. vi. 3, Christians are superior to angels.

Theological reflection on the doctrine of angels already begins among the Alexandrian Jews; and Philo, who calls them “a chorus of unembodied souls” occupying the air, places them in close parallelism to his speculations on the divine ideas or powers. From this association the transi- tion is easy to Gnostic speculations, where the ranks of angels appear as produced by successive emanation, and thus serve to fill up the interval which Gnosticism puts

AN G—

between God and the world. In this

connection we find also a doctrine of creation by angels (Basilides), and dualistic views of good and evil angels. Against these heresies the early church emphasises the creation of angels and the fall of the evil angels, but Origen tells us that up to his time the ecclesiastical doctrine did not define "quando

isti creati sint vel quales aut quomodo sint." On these topics, however, many subtle questions arose, ¢.g., whether angels have bodies of an ethereal kind, whether they were

created before the world or along with the light, &ec. Gradually angel-worship sprung up, and in spite of the opposition of the best fathers (Theodoret, Augustin, d&c.),

became firmly established, and is still acknowledged in the Roman catechism. An elaborate hierarchy, based on Neoplatonic doctrines, is laid down in the work of Pseudo-Dionysius, De Hierarchia Celesti (Sth

theory of the angelic

century), and exercised much influence on medizval theo-

logy, which accepted the work as a genuine product of the

apostolic age. 'The schoolmen treat of angels under the doctrine of creation, dividing rational creatures into angels,

who are pure spirits, and men (Sent. Lib. ii., dist. i., sqq.),

and the nature and powers of angels form the most notori- ous problems of the misdirected subtlety of the schools (cf. e.g., Duns on the Second Book of Sentences). Protestant theologians have always felt less interest in the subject, and generally reduce the doctrine of angels to a mere appendix to the doctrine of creation or of God's works. Recent writers often go much farther. Thus, Schleier- macher sums up the whole doctrine of angels by saying, that the possible existence of angels should not influence conduct,

and that revelations of their being are no more to be looked for. A reaction, partly rooted on the later philosophy of Schelling, has led several German theologians (Hofmann, &c.) to lay more weight on the doctrine.

The Biblical doctrine of angels must be studied with the aid of the best books on Biblical theology (Schulz, Oehler, Ewald, Weiss, &c.), and of the commentaries on special passages. The book of Enoch is accessible in Dellmann's translation, and other Jewish notions may be found in Eisenmenger. The literature of the subject, theological and theosophic, is immense. (w. B. 8.)

ANGEL, a gold coin, first used in France in 1340, and introduced into England by Edward IV. in 1465. It varied in value between that period and the time of Charles L from 6s. 8d. to 10s. The name was derived from the representation it bore of St Michael and the dragon.

ANGELICA, a genus of plants of the natural order of the Umbellifere. The name Angelica is popularly given to a plant of an allied genus, Archangelica officinalis, the tender shoots of which are used in making certain kinds of aromatic sweetmeats.

ANGELO, Micuet. See Micuet AncELo BuoNaRorti.

ANGELUS SILESIUS, a German philosophical poet, was born in 1624 at Breslau or Glatz, and died at Breslau in 1677. His family name was Johann Scheffler, but he is generally known under the assumed name which marks the country of his birth. Brought up a Protestant, and at first physician to the duke of Wiirtemberg, he embraced, in 1653, the Roman Catholic religion, and took orders as a priest. His peculiar religious faith, founded on his early study of the works of Tauler and Bohme, as expressed in his hymns (Cherubinischer Wandersmann), is a mystical pantheism founded on sentiment. The essence of God he held to be love: God, he said, can love nothing inferior to himself: but he cannot be an object of love to himself without going out, so to speak, of himself, without mani- festing his infinity in a finite form; in other words, by becoming man. God and man are therefore essentially one. A selection of his hymns, which are very popular in Germany, was published in 1820 by Varnhagen Von Ense.

AN G—

- ANGERMANN, a river of Sweden, which rises about lat. 65° N. and long. 15° E., among the mountains that separate Sweden from Norway, and flows in a south- easterly direction through Westerbotten and Westnorrland, entering the Gulf of Bothnia near Hernosand, after a course of about 250 miles, during which it passes through several lakes. It is navigable for upwards of 50 miles from the sea, and the scenery on its banks is sometimes very beautiful.

ANGERMUNDE, a town of Prussia, capital of a circle of the same name in the province of Brandenburg, situated on Lake Miinde, 43 miles from Berlin, by the Berlin-Stettin railway. It contains about 6400 inhabitants, who are chiefly employed in the manufacture of woollen and linen

oods.

ANGERS, an ancient city of France, capital of the department of Maine-et-Loire, and formerly of the old province of Anjou, situated on the Maine, about 4 miles from its junction with the Loire, and 161 miles 8.W. of Paris. The streets of the upper and older quarter of the city, which occupies the slope of a rising ground on the left bank of the river, are narrow and often very steep, and the houses have a sombre, although somewhat picturesque appearance, from the quantity of slate that is used in their construction. Many of these buildings, how- ever, have given place to others of a more modern style, particularly near the site of the old ramparts, now occupied by beautiful boulevards, while on the opposite side of the river a new quarter has sprung up, which is regularly and tastefully built. Among the principal buildings in Angers are the castle, situated on a rock commanding the city, once a place of great strength, but now used as a prison, barrack, and powder magazine; the fine cathedral of St Maurice, rebuilt in 1225, and remarkable for its beautiful stained glass windows; the Hétel Dieu, built by Henry IT. of England; and several of the parish churches. Angers is the seat of a bishop, and possesses schools of different grades, various learned societies, a library of about 40,000 volumes, and a gallery containing a good collection of pictures and statues, including some fine works by the sculptor David of Angers. There was once a university in the town, as well as a military college, at which the Earl of Chatham and the Duke of

Wellington received part of their education; but the former has been abolished, while the latter has been removed to Saumur. The chief manufactures at Angers are sail-cloths, ropes, linen goods, hosiery, sugar, leather, wax, and oil; there is also a con- siderable trade in corn, wine, and fruits, aud in the neigh- bourhood there are extensive slate quarries, which give employment to about 3000 workmen. Population, 58,464. Angers is the ancient Juliomagus, or, as it was latterly called, Andecavia, whence the city is said to derive its present name. It was captured by Odoacer in 464 a.p., and by Clovis in 486; it suffered severely from the in- vasions of the Northmen in 845 and the succeeding years, and of the English in the 12th and 15th centuries ; the Huguenots took it in 1585, and the Vendean royalists were repulsed near it in 1793.

ANGERSTEIN, Joun Juxius, an opulent London mer- chant, and a distinguished patron of the fine arts, was born at St Petersburg in 1735, and settled in London about 1749. His collection of paintings, consisting of about forty of the most exquisite specimens of the art, purchased by the English Government, on his death in 1822, for £60,000, formed the nucleus of the National Gallery.

ANGHIARI, a small town of Italy, in the province of Arezzo, situated 10 miles N.E. of Arezzo, not far from the Sovara, a tributary of the Tiber. The Milanese, under Niccolo Piccinino, were here defeated by the Florentines in 1440, Population of the commune, 6900.

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ANGILBERT, Sr, the most distinguished poet of his age, was the secretary and friend of Charlemagne. After filling the highest offices under that monarch, and receiv- ing the hand of his daughter Bertha in marriage, he retired in 790 to the monastery of Centule, or Saint Riquier, of which in 794 he was made abbot. He left this retreat from time to time when the king required his services, and in 800 assisted at Rome at his coronation. He died in 814. Angilbert was called by Charlemagne the Homer of his time.

ANGINA PECTORIS, a term applied to a violent paroxysm of painful sensations in the chest, arising for the most part in connection with some form of heart disease. An attack of angina pectoris usually comes on with a

sudden seizure of pain, felt at first over the region of the heart, but radiating through the chest in various directions, and frequently extending down the left arm. A feeling of constriction and of suffocation accompanies the pain, although there is seldom actual difficulty in breathing. When the attack comes on, as it often does, in the course of some bodily exertion, the sufferer is at once brought to rest, and during the continuance of the paroxysm expe- riences the most intense agony. The countenance becomes pale, the surface of the body cold, the pulse feeble, and death appears to be imminent, when suddenly the attack subsides, and complete relief is obtained. The duration of a paroxysm rarely exceeds two or three minutes, but it may last for a longer period. The attacks are apt to recur on slight exertion, and even in aggravated cases without any such exciting cause. Occasionally the first seizure proves fatal ; but more commonly death takes place as the result of repeated attacks. Angina pectoris is gene- rally held to be a neurosis, or nervous affection of the heart, but its causation is still a matter of uncertainty. It seems occasionally to manifest itself where no organic heart disease is discoverable, either in life or after death, but in the great majority of cases some morbid condition of the heart's structure is undoubtedly present. A diseased state of the coronary arteries, the nutrient blood-vessels of the heart, has been found in a large proportion of the cases examined post mortem; but, on the other hand, these arteries may be found diseased where no paroxysm of angina had ever occurred; and further, it is well known that various other forms of heart disease may have angina pectoris associated with them as a prominent symptom. Angina pectoris is extremely rare under middle life, and is much more common in males than in females. It must always be regarded as a disorder .of a very serious nature. In the treatment of the paroxysm much relief is obtained by opiates, and by the inhalation, under proper precautions, of anesthetic vapours, such as ether, chloroform, and nitrite of amyl. To prevent the recurrence of the attacks, something may be done by scrupulous attention to the state of the general health, and by the avoidance of mental or physical strain, for it is certain that attacks in those who are the subjects of the disorder are often precipitated by errors in living, and by undue exertion or excitement.

ANGLE, a term employed in different senses, the most common and simplest use of Cc it—to which all the rest may rE be referred, and by

which they F may be explained—being to indicate the inclination of two straight lines to each other. ,

Suppose O F in the figure to 0 turn about O from the posi-

tion O B towards QO C, like the

opening out of the legs of a pair

of compasses, the angle formed

by OB and O F, which is dis- » tinguished as the angle B O F, measures the extent or degree.

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of the turning or opening, being of course entirely inde- pendent of the length of the lines. The ordinary method of measuring angles is based on the division of the circuni- fercnce of a circle into 360 equal parts, called degrees, the angles formed by lines radiating from the centre being proportional to the arcs of the circumference which the lines intercept. If OC makes equal angles with the straight line A O B, each of them is aright angle, or an angle of 90°. In the figure A O E is an angle of 60°, and CQ F and FOB are each 45°; whence EOF is TO» E OB 120°, &. By the angle curved lines make with each other is meant the rectilineal angle contained by the tangents to the curves. See GEOMETRY and TRIGONOMETRY. ANGLES. According to the usual account, which rests on the authority of Bede, the Angles were one of three tribes who passed over from the Continent in the 5th and Gth centuries, and taking possession of different parts of England, formed the main and dominant element in its subsequent population. The Saxons, he tells us, and he is followed by the authors of the Saxon chronicles, were situated in what is now Holstein ; the Angles occupied the district to the north, probably extending across the penin- sula, and beyond the Angles were the Jutes, in (approxi- mately) the modern J utland. Hypothetically they are identified with the Angli of Tacitus, who were seated on the Lower Elbe; and certainly they belonged to the Low German race. Some historians, as Professor Henry Morley, regard the distinction between Saxon and Angle as a mere accidental difference of

name ; the pcople then- selves employing the name of Angles, while Saxon was a foreign designation applied to them by the Romans and Celts ; and this view might be supported by the fact that, while the boys admired by Gregory, according to the well- known tale, were “Angles,” his missionaries were sent to the Jutish kingdom of Kent. It must be admitted, how- ever, that whatever the origin of the words Angle and Saxon may be, they expressed, from the time of the inva- sions downwards, a difference that was, if not radical and of long continuance, at least real and obvious. The Angles were a strong and vigorous people, and not only founded three kingdoms in England,—Northumbria, Hast Anglia, and Mercia (which all, and especially the first, exercised a great influence on our early history),—but also spread through a large part of the Lowlands of Scotland. Their language was soon brought under literary culture, and supplied a groundwork for the later and richer develop- ments of the southern Saxons ; and it is still to be distin- guished in the Northumbrian dialect and the Lowland Scotch. They have left us, though in the form of a rifaci- mento, one of the most remarkable literary legacies we possess—the poem of Beowulf, and claim the honour of producing Czedmon and the venerable Bede. See Thorpe’s Lappenberg ; and Morley, Writers before Chaucer.
ANGLESEA or ANGLESEY (i.¢., the Angle’s Island), the Mona of Tacitus, an insular county of North Wales, sepa- rated from the mainland of England by the Menai Strait, over which Mr Telford’s magnificent suspension bridge was thrown in 1826, followed by the renowned tubular railway iron bridge in 1850. The island contains 193,511 acres. The surface is for the most part flat, and the soil but moderately fertile. The exports consist of barley, oats, cattle, sheep, and hogs ; and a considerable trade is carried on in butter, cheese, hides, tallow, wax, and honey. It contains valuable minerals, and furnishes (though not so abundantly as formerly) copper, lead, silver, marble, asbestos, limestone, marl, and coal. The chief copper mines are at Parys, and were first worked in 1768; and those of coal are at Mal- traeth and Tredfaeth. The stones for the towers of the tubular bridge were quarried at Penmore, A miles north of Beaumaris. ‘There aro no manufactures of importance. The

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herring fishery in some years gives employment to a part of the inhabitants ; and othcr kinds of sea-fish are abundant. Anglesea was anciently famous as the seat of the Druidical pontiff, and a Druidical college; and a number of (so-called) Druidical remains—such as the cromlechs at Plas Newydd— are still to be seen, In 61 A.D. Suetonius Paulinus attacked the Druids in this their safest retreat, and they were utterly subdued by Agricola in 78. About 450 Caswallon, prince of Cambria, chose this island for his seat of government, and it continued to be the residence of the princes of North Wales till the final subjugation in 1277. At present the northern form of Welsh is spoken by the peasantry, but in the towns English is very generally understood. The county is divided into 6 " hundreds," and 76 parishes. 'The number of inhabitants in 1861 was 38,157 ; and in 1871, 35,127. This decrease is ascribed to emigration, occasioned by the depressed state of the mining trades and lack of agricultural employment. The county returns one member to parliament, and one is also returned by the boroughs of Beaumaris, Holyhead, Amlwch, and Llangefni.

ANGLESEA, Arraur ANNESLEY, Hart oF, lord privy seal in the reign of King Charles IL, the son of Sir Francis Annesley, Lord Mount-Norris, and Viscount Valentia, in Treland, was born at Dublin 10th July 1614. He was for some time at the university of Oxford, and afterwards studied law at Lincoln's Inn. In the beginning of the civil war he sat in the parliament held at Oxford; but afterwards became reconciled to the opposite party, and was sent commissioner to Ulster in 1645, to oppose the designs of the rebel Owen Roe O'Neal. He was president of the council of state after the death of Cromwell, and was principally concerned in bringing about the Restoration. He succeeded to his father's titles in 1660, and in 1661 was enrolled in the English peerage as Lord Annesley of Newport-Pagnell, Bucks, and Earl of Anglesea. During Charles's reign he was employed in various important affairs, was made treasurer of the navy, and for some time held the office of lord privy seal. Annesley was a person of great abilities and of very extensive learning, and was well acquainted with the constitution and laws of England. In his lifetime he published several works, chiefly of a polemical and political character. He died in April 1686.

ANGLESEY, Henry Witiiam Pacer, FIRST MARQUIS or, one of the most distinguished British generals of the 19th century, was born on the 17th of

May 1768. He was the eldest son of Henry Lord Paget, first Earl of Uxbridge, of whose family of twelve sons and daughters he was the last survivor. He received his early education at West- minster school, and passed thence to Christchurch, Oxford, where he took the degree of M.A. Quitting the university in 1790, he entered parliament the same year as member for the Carnarvon group of boroughs, for which he sat six years. But to his high-spirited and impetuous nature the soldier's life was most attractive ; and during the excite- ment which was occasioned by the outbreak of the wars of the French Revolution, Lord Paget raised on his father's estate the regiment known at first as the Staffordshire Volunteers, and afterwards as the 80th Foot in the regular army. Of this regiment he was named lieutenant-colonel. Having entered the army, and passed rapidly through the subordinate grades, he obtained his commission as lieu- tenant-colonel on the 12th September 1793. In the fol- lowing year he commenced his career of active service in the campaign of Flanders, under the Duke of York. So greatly did he distinguish himself, especially during the retreat which followed the repulse of Turcoing, that not- withstanding his youthful years, he was appoimted, in the temporary absence of Lord Cathcart, to the command of his brigade. Transferred soon after his return to England

toa cavalry regiment, 16th Light Dragoons, he was theuce- forth attached to that branch of the service which he was to raise to the highest degree of efficiency, and in connec- tion with which he was to achieve his greatest triumphs. About the same time (July 1795), Lord Pagct married Lady Caroline Elizabeth Villicrs, daughter of the Earl of Jersey. Promoted colonel in 1796, he was transferred in April 1797 to the command of the 7th Light Dragoons, and then began to apply himself strenuously to the improve- ment of disciplinc, and the introduction of a new system of cavalry evolutions. In 1799 he took part in the cam- paign, brief and disastrous, of the Duke of York in Hol- land. In the general attack (Oct. 2) he distinguished himself by a dashing and successful charge on a superior body of the enemy's cavalry. On him devolved the arduous task of guarding the rear in the retreat, and while thus engaged, he routed a much larger body of French cavalry 'under General Simon, recovering some captured cannon, and taking five of the cnemy's guns. Devoting himsclf through the

following eight years, with zeal equal to his abilities, to the discharge of his regimental] duties, and to the perfecting of the reforms which he had previously introduced, he attained the rank of major-general in April 1802, and that of lieutenant-general in April 1808. At the close of this year the great war with the French in the Peninsula began, and Lord Paget was scnt, with two brigades of cavalry, to join the division of the army under Sir David Baird, who was then marching to join Sir John Moore in his advance on Salamanca. He landed at Coruiia, and in the face of very great difficulties succeeded in effecting the junction. It was during this march that the first conflict with the French in Spain took place,—a sinall party of French posted at Rueda being surprised and cut off by Lord Paget. In the retreat ordered by Sir John Moore, after the fall of Madrid, Lord Paget was charged with the protection of the rear, and, notwithstanding the frequent harassing attacks of the enemy, the losses of the British were trifling. He especially distinguished himself by brilliant and successful encounters with the French at Sahagun, Mayorga,and Benevente. His spirited repulse of the advanced guard of the French at Benevente, where healso captured the commander of the imperial guard, General Le- febvre Desnouelles, especially contributed to the safe arrival of the British at Corufia. At the battle of Coruiia, fought ou the 16th January 1809, and mournfully memorable for the fall of the brave Sir John Moore, Lord Paget had the command of the reserve ; and while the dying commander was being carried from the field, his lordship, by a swift, courageous movement, repulsed a superior force of the enemy, thus deciding the fate of the day and securing the safe embarkation of the British army. With this action his services in the Peninsular war terminated, and in the autumn he returned to England, where he applied himself to his parliamentary duties as member for Milbourne Port. He sat for that borough six years (1806 to 1812). In 1810 he obtained a divorcee from his wife, by whom he had had eight children, but with whom he had not lived a happy life. The same year he married Lady Cowley, who had about the same time been divorced from Lord Cowley. Lady Paget was soon after married to the Duke of Argyle. In 1812 he succceded his father and took his seat in the House of Lords as Earl of Uxbridge. Three years later his services as general were called for on a grander field, and his reputation was raised to the highest pitch. In the spring of 1815 all Europe was startled by the news of the escape of Napoleon I. from his island prison, Elba, of his reappearance in France at

the head of an army, and of his reassumption of the imperial dignity. Without delay the armies of the allies were sent again into the field, the English under the Duke of Wellington as commander-in-

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chief, and the English cavalry under the command of the Earl of Uxbridge. At the decisive battle of Waterloo (18th June), after twice leading the guards to the charge, he placed himself at the head of the heavy brigade, and, by a third rapid and terrific charge, completely over- whelmed the trusted French guards, led by Count D'Erlon, making 3000 prisoners, and killing most of the rest. Other brilliant feats followed, which won for the Earl of Uxbridge on that day a place of honour second only to that of the great duke himself. In the confusion which followed, Napoleon, from a low rising ground, directed the fire of four guns, and by one of their discharges, almost the last shot that was fired, the earl was struck on the knee, and amputation of the limb was found to be necessary. This was effected in a private house at Waterloo, and the limb was buried in the garden. Visitors are shown the chair in which the earl sat during the operation, the boot taken from the amputated leg, and the monument over its burial-place. A pension of £1200 a year was voted to him on account of the loss of his limb, but he generously declined to accept it. Five days after the battle the ser- vices of the earl were rewarded by the dignity of Marquis of Anglesey, conferred on him by the Prince Regent ; and he was soon after nominated Knight Grand Cross of the Bath. Similar honours were bestowed on him by the emperors of Austria and Russia and the king of Hanover. In 1818 he was clected Knight of the Garter. He attained the full rank of general in the following year. His support of the proceedings against Queen Caroline made him for a time unpopular, and wher he was on one occasion beset by a crowd, who compelled him to shout "The Queen," he added the wish, '" May all your wives be like her." At the coronation of George IV. the Marquis of Anglesey filled the post of lord high steward of England. At the close of April 1827 he became a member of the Canning administration, taking the post of master-general of the ordnance, previously held by Wellington. He was at tho same time sworn a member of the privy council. Under the Wellington administration he accepted the appointment of lord- lieutenant of Ireland (March 1828), and in the dis- charge of his important

duties he greatly endeared himself to the Irish people. The spirit in which he acted, and the aims which he steadily set before himself, contributed to the allaying of party animosities, to the promotion of a willing submission to the laws, to the prosperity of trade, and to the extension and improvement of cducation. On the great question of the time his views were opposed to those of the Government. He saw clearly that the time was come when the relief of the Catholics from the penal legislation of the past was an indispensable measure, and in December 1828 he addressed a letter to the Roman Catholic primate of Ireland distinctly announcing his view. This led to his recall by the Government, a step sincerely lamented by the Irish. He pleaded for Catholic emancipation in parliament, and on the formation of Earl Grey's administration, in November 1830, he again became viceroy of Ireland. The times were changed; the great act of emancipation had been accomplished, and the task of the viceroy in his second tenure of office was to resist the agitation commenced and carried on by O'Connell. He felt it his duty now to demand Coercion Acts for the security of the public peace ; his popularity was diminished, differ- ences appeared in the cabinet on the difficult subject, and in July 1833 the ministry resigned, the viceroy retiring at the same time. To the Marquis of Anglesey Ireland is indebted for the Board of Education, the origination of which may perhaps be reckoned as the most memorable act of his viceroyalty. For thirteen years after his retire- ment he remained out of office, and took little part in the affairs of government. He joined the Russell administra-

tion in July 1846 as master-general of the ordnance, finally retiring with his chief in March 1852. His promotion in the army was continued by his appointment to the com- mand of the horse guards in 1842, and completed by his advancement to the rank of field-marshal in 1846. A life of brave service and faithful devotion to duty was closed by a peaceful death on the 29th April 1854. The charac- ter of the Marquis of Anglesey, appreciated and admired by all classes and parties, was sketched by a contemporary journalist in the following terms :-—*Seldom have bravery, gentleness, and generosity been combined in such noble proportions. In his character there was not a fold, it was all open as the day. His politics were thoroughly liberal,

and with more far-sighted and sound statesmanship in them |

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than the world has perhaps given him credit for… . He had a sound, shrewd understanding, a judgment seldom at fault, often acting like an instinct, and accompanied with a moral courage not inferior to his brilliant physical bravery vn the field of battle.” He strenuously supported every measure of reform in church and state, and, with sagacious forecast anticipating public opinion, earnestly advocated in their days of unpopularity the great measures of Catholic emancipation, parliamentary reform, and free trade. The marquis had a large family by each of his two wives,—two sons and six daughters by the first, and six sons and four daughters by the second. His eldest son, Henry, suc- ceeded him in the marquisate Gw. 1. Re G)

ANGLING

HE art of angling, or of catching fish by a rod and line, T is of very ancient derivation. The earliest writer upon it in our country was the Dame Juliana Berners, who wrote a treatise on it in the Book of St Albans, printed by Wynkyn de Worde in 1496. Between that time and the present there have been nearly a thousand books, or parts of books, written and published upon this subject.

The practice of angling may be arranged under three heads, viz., top or surface, mid-water, and bottom angling. Surface angling includes fishing with an artificial fly, or daping with a live fly or other insect; mid-water fishing includes spinning or trolling with a dead bait and fishing with a live bait; bottom fishing includes angling with worms and other baits, either resting on or travelling with the stream along the bottom. The last is usually the first practised by the angler, and we will therefore take it first.

Bottom Fishing.

The school-boy who comes home for the midsummer holidays, usually commences his apprenticeship to the art of angling by fishing for some of the carp tribe in some pond or river near his residence. For this purpose he provides himself with a rod usually of from 12 to 14 feet long, and generally made of bamboo-cane, which is the best for the purpose. A small reel, with 30 or 40 yards of silk line, a light quill float, a yard or two of fine silk-worm gut, and a hook tied on at the end of it, which for general work

should be either Nos. 6, 7, 8, or 9 in size, and a few split shots pinched on the line for sinkers. He then plumbs the depth of the water by the aid of a plummet, and fixes his float on the line at such a depth that the hook barely or just touches the bottom. His chief baits are worms and gentles or maggots. The worm (the red- dest are the best) is stuck on the hook by being threaded. from head nearly to the tail. The gentles, to the number of two or three, being stuck on as may be convenient. For gentles the smaller hooks are used; and the hook being baited, is cast into the water and hangs suspended by the float. When there is a bite the float bobs under, and the angler jerks the rod up or strikes, hooks his fish, and, if a big one, plays it, —that is, allows it to swim violently about until tired,—when he draws it ashore and lands ts En still-water fishing for carp, tench, roach, &c., the angler uses now and then a handful of what is termed ground- bait to draw the fish round his hook. There are many substances used for this,—worms, gentles, grains, boiled barley or wheat, &c., &c.,—but the best and most general ix a mixture of bran, soaked bread, and a little boiled rice worked up together; if with this is mixed a few handfuls of carrion gentles, usually obtained from horse slaughter- yards, there is no better bait. To ensure sport it is often necessary to bait a spot, or pitch, as it is termed, one or two

evenings previously. In still-water fishing this is all that has to be done. In bottom fishing in running water the same preliminaries are observed in taking the depth of the water, baiting, &c.; but when the tackle is dropped into the water the stream carries it along, and the angler, keep- ing the top of his rod over his float, follows it down his swim, as it is called, until he reaches the end, or as far as he desires to fish, when he pulls his tackle out, and returns to the head of the swim, and recommences striking at every bob or dip of his float. In stream fishing he must either cast his ground-bait in so far up stream that it will find bottom in his swim, or he must knead it into balls with a stone in the middle or mixed with clay, so as to sink it to the bottom at once. In choosing a swim on the banks of a river, if the angler cannot see a good stock of fish any- where, he should choose some spot which fish may be

supposed to haunt,—a spreading root, or bough, or over-

hanging bank with a hole under it, a deep hole near banks of weeds, or a deep eddy off some sharp stream. Here the bottom should be pretty level and free from obstructions, and the stream not too swift nor too slow, so that the float may travel steadily and evenly without hinderance throughout. If he cannot decide on any spot, let him look along the bank for places worn by the angler's feet, or where debris of bran, &c., points out that some angler has previ- ously fished and baited the stream. Having baited a pitch one day, it should never be neglected on the next, as the fish will have had time to find out the bait, and will perhaps be collected together there. Of course the choice of a pitch will be guided very much by the species of fish the angler desires to fish for. The places they frequent are noted hereafter. When the angler has hooked a big fish which he cannot lift out without danger to tackle, he uses a landing-net, that is, a bag-net on an iron ring fastened to the end of a pole, which he slips under the tired fish and lifts securely to the bank. When fishing on a river bank the last words in Walton's Complete Angler are to be strictly observed, viz., "Study to be quiet," for violent disturbance or motion is fatal to sport. Having deliberately chosen a pitch and baited it, the angler should not desert it hastily, or if he leaves it for a time for another, he should return to it and give it another trial. In angling from a punt or boat a shorter rod is used than from the bank, from 10 to 12 feet being the limit. In the Thames plan the punt or flat-bottomed boat is fixed directly across the stream by means of two iron-shod poles which are driven into the bottom. The depth being taken, and the ground-bait thrown in, the angler, sitting with his face down stream, drops his tackle in close to the boat, and allows it to float down stream unchecked as far as the line, which is generally a yard or two longer than the rod, will permit, when he

| strikes, pulls up the tackle, drops it again in close to the

In the | the boat.

punt, and repeats the operation time after time.

The ground-bait is usually thrown in loosely

middle of these punts there is generally a well, so that the | above the punt, and generally consists of chopped worms fish when caught are kept alive in the well until the day’s | or greaves (tallow-melters’ refuse), and as the swim is so

fishing is over. On the Trent the method adopted is different. The punt or boat, if used at all, is fixed diagon- ally and not directly across the stream. A very fine and light silk line is employed, which will float easily and does not sink much at any time. A very easy-going reel or winch is used, which turning on an oiled spindle lets off the line very rapidly, and is set running with the lightest touch of the finger. The rod being held at an angle of 90°, the line is allowed to run freely, until the float and bait go sometimes as far as 50 or 60 yards down the stream,—a plan which has many advantages, as much more ground is covered than in the restricted swim of the Thames method, and the fish are less shy in biting so far from

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adopted. Thc ledger is the chief of these (see fig. 1 in the cut). This consists of a gut line a yard or two long, which runs through a bullet or a lump of lead pierced with a round hole. On the hook side of the line an obstruction is fastened so that the lead cannot slip down to the hook, but the line is free on the rod side of the lead. The hook being baited, the lead is dropped into the water and rests on the bottom, a tight line between the rod top and the lead being kept. The instant a fish bites at the hook, the line being free in that direction, it is felt at the rod top, and the angler, yielding a little line to let the fish get the bait and hook well in his mouth, strikes, lifting the lead, and so hooks the fish. Another method, called the clay-ball, is to tie a bit of stick across the line a little above the hook, which is baited with gentles and greaves, and then to weld a lump of clay and ground-bait on the line round about the bit of stick. This is dropped to the bottom, and the

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long an one the ground-bait is certain to fetch the bottom somewhere within it. In Norfolk a different plan still is adopted. The punt is anchored

lengthwise straight up and down, and the anglers fish on either side of it; but the water being usually very deep the rods are longer and the tackle heavier, and besides the moving float they have another rod, the tackle to which is so heavily weighted that the baited hook rests on the bottom, and is not to be moved by the stream—the fish picking up the bait at leisure, and the float showing the bite. This is termed “tight corking.” These are the chief methods employed in float fishing at the bottom. But other methods of fishing with a stationary bait without a float are often

fish, attracted by the ball of bait, come up to devour, and in time find the baited hook and take it most unsuspect- ingly. Sometimes the baited hook is buried in the ball of bait, and the fish are allowed to dig it out. Sometimes a float is used in conjunction with a small clay ball to show the bites. Another plan of bait fishing at the bottom is with a free line, with only a very light sinker of a split shot or two on the line. The hook is baited with a worm, and allowed to travel along the bottom, the bite being felt or seen in the action of the line on the water or the rod top. This is chiefly employed in trout fishing.

Mid-Water Fishing. Spinning is the first branch of this kind of fishing, and is used chiefly for pike and trout, though salmon and other fish occasionally are fished for and taken thus. It

consists in drawing along through wags 0 a bait so lL—5

disposed on a series of hooks as to revolve rapidly, thus showing its silvery sides constantly to the fish of prey, and attracting them to run after it and capture it, when the hooks which are about it in turn capture them. A small fish—a little trout, dace, gudgeon, or bleak principally, as these are the best fish for the purpose—is hung on a range of hooks called a flight. This flight generally or mostly consists of three triangles, or three hooks welded back to back, tied upon gut or gimp at intervals of half an inch or so, a reversed hook near the tail to keep it bent, and above them a sliding hook working in an eye, called the lip hook (see fig. 2 in cut). A fish is then chosen suitable

to the length of the flight, the lowest triangle is stuck on the middle of the side of the tail, the reversed hook just above it is then stuck into the fish a little below the vent, so as to keep the tail of the fish bent or crooked, The other two triangles are then stuck into the side of the bait in a straight line towards the fish's mouth. The line is then twisted two or three times round the shank of the lip hook, so as to bring it just to the bait's mouth and to keep it firmly there. The hook is then passed through both lips of the bait, and the bait is ready for use (see fig. 3 in cut); then it is hung on to a tackle called the trace. This consists of a yard or two of gut, single or twisted, or gimp, as may be desired; and at intervals of 18 or 20 inches or so, one or more swivels are placed to permit the bait to revolve freely without also turning the line, which would cause the whole running line to snarl and tangle, and a lead or sinker, so disposed as to promote the same object, is put on just above the swivels, and the trace is complete. (The upper part of the tackle in fig. 3 from swivel to swivel shows the trace). The whole apparatus then being looped on to the main or reel-line, is dropped into the water, and being drawn rapidly through it, if the bait be properly arranged on the hooks, spins with wonderful swiftness, often like one long line of flashing silver. If it does not spin well, but "wobbles," as it is termed, the hooks are not properly fastened into the bait, and either do not lie straight and even along the side, or the head or tail of the bait is too slack or too tight. This must be amended as the bait cannot spin too well. The object of its spinning well is not only to attract the fish, but to con- ceal the hooks. The arrangement of the hooks on the flight given above is the one most commonly adopted by Thames spinners, who are the best hands in this branch of fishing, but there are many other arrangements which are sold by tackle-makers, of which the Francis and Pennell tackles are perhaps the chief. The reel-line used in spinning is usually made of plaited silk, dressed with a composition to stiffen it and to prevent tangling; and the line is heavier or lighter according as the bait and tackle to be used is heavier or lighter. In working a spinning-bait, the angler first tries all the nearer water to the spot where he stands, and gradually lengthens his line, allowing it to lie loose on the ground, or in the boat or punt's bottom, in coils at his feet Then with about half as much line as the length of rod hanging down from the rod point, he gently waves the bait backwards to the left or right, according to the side he wishes to cast to, and then suddenly urging the rod forward with a sweep, releases the running line which he has held fast

against the rod, and the impetus the bait has acquired by the swing sends it forward from 20 to 40 yards towards the point the angler desires to cast to; then lowering the point of the rod to allow the bait to sink to mid-water, he holds the rod in the right hand, and draws the line home through the rings with the left hand, allowing it to fall at his feet as before, and raising and dipping the rod at every draw, makes the bait spin and shoot, and rise and fall, as it comes towards him, in a most attractive manner. The line being all drawn in, lies at his feet as before, and lift-

ing the bait out of the water again, he repeats his cast in a new direction, and having fished all the water within reach he moves on. Should a fish run he feels a jerk at the rod point, or sees the line stop, and he strikes smartly and plays his fish, drawing in line by hand, and taking care that no tangle ensues. To avoid this at any time, he must see that there are no twigs or other obstructions about his feet where the line rests between each cast, which may catch in the coils and cause a snarl or knot, as this spoils the cast by preventing the line from running. In trout spinning smaller and lighter tackles, rods, and lines are used than are employed for jack. For the big Thames trout, and for trailing for the great lake trout, similar fashioned but lighter flights and traces are employed; but for spinning the minnow for small river or brook trout a different kind of flight is used. This flight is shown un- baited and baited at figs. 4and 5 inthe cut. The big hook is inserted into the mouth of the minnow, and by a little humouring the point is carried down the body along the back-bone to the tail, where it is brought out, and the lip hook inserted through both lips of the bait; and, if any attention has been paid to the size of the minnow selected, the tail will be nicely bent round on the curve of the hook so as to make the bait spin rapidly. Many anglers do not use any other hooks than these two; but it is so easy for a trout to run and seize such a bait and to miss being hooked, that to make sure, it is usual to employ in addition the little triangle of hooks, which is inserted half way down the side of the bait. Even with this safeguard, when fish are running shyly, the angler will find that he misses from one-third to one-half of the runs which he gets. In spinning for small trout various methods are pursued : some fish down stream, some up; and where it is requisite to wade, and a moderate rod is used, it is best to fish

up, wading in mid-stream, and casting on either hand towards the opposite banks, the angler brings the bait diagonally down towards him, with a curving sweep in front. When, however, he can fish from the bank, it is best to fish down, and to cast across, drawing with a diagonal sweep up stream. Usually it is just as the bait is making the bend round that the fish seizes it, and therefore it behoves the angler to keep a sharp look out then. Some anglers cast the minnow over hand, and some under; the best plan is to cast it under, and, taking hold of the reel-line between two of the rings on the middle joint of the rod with the left hand, to draw a good portion of line off the reel, holding it tight until the cast is made, when it is released, and doubles the length of cast which the angler could make in the ordinary way, —as in minnow fishing the tackle is too light, as a rule, to cast off loose line from coils on the ground, and so, ordinarily, little more line than a yard or so more than the length of the rod can be used; by this means, however, nearly double that length can be got out. Of course the weight or sinkers on a minnow tackle will be proportionate to the requirements of the stream, and though the trace will be of lighter gut than it is customary to use for large trout, the fashion of the tackle is similar. In this case, also, there are many other arrangements of hooks used, but there are none so good as the one figured in the plate. In the north there is another method of spinning practised, called par-tail fishing, which is used chiefly when and where minnows are difficult to obtain, though some persons prefer par-tail as a bait to minnow. For this only two hooks are used similar to the two in the figure for minnow fishing, minus the triangle. A par is taken and cut diagon- ally in two from the front part of the dorsal fin to the middle of the space between the ventral and anal fins. The tail part being taken, and the tail snipped off, the lip hook is put through the root of the tail, and the big hook stuck into the bait so as to curve the broad end of the bait

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on to the hook; the bait, if properly adjusted, spins pretty well. Some anglers, however, cut a slice out of the back from before the dorsal fin down to the tail, leaving a small part of the tail and only part of the belly, and by adjust- ing this on hooks suited to it, it rather more resembles the natural fish. These baits are used exactly like the minnow.

Tn fishing for larger trout, as the large lake trout or the Salmo ferox, the method generally adopted is that of trailing. Here a small trout or par is used on the three- triangle tackle already mentioned above. The line is weighted according to the depth of the water, and the boat is rowed slowly along, some 30 or 40 yards of line being let out, so as to permit the bait to sink and to tow some distance astern. ‘Two rods are chiefly employed for this sport—one being placed at each corner of the stern of the boat, and each having on a different bait, weighted differently, and with a longer or shorter line out, so as to give any fish inclined to feed a double chance. The proper line to take for these large trout when moving along the shores of a lake is just where the water begins to go off between the deep and the shallow; and the bait should travel as near to the bottom as it can, without catching in weeds or stumps; as, though fish will frequently rise some distance to a bait, it is not desirable to compel them to do so. When a big lake trout strikes, he usually runs heavily, and bores down to the very depths of the loch, showing fine sport. They frequently run to a large size, reaching 16 and 18 tb weight, and sometimes heavier. They are, however, better for the table when 4 or 5 ib. The small lake trout are spun for by trailing a minnow in the same way, but in shallower water; and often when the fish are dull at the fly, they take well on the trail. There are various artificial baits used for spinning, some of them imitating fish of different kinds, and made of bone, horn, gutta-percha, mother-of-pearl, glass, and other substances. One of the best and most generally known and used is the “phantom bait,” invented and made by Mr Brown of Aberdeen. It is made of oiled silk, and painted to repre- sent a small trout or par; being cylindrical, when drawn against the stream, it fills with water and plumps out to the size of a fish ; when seized, however, it compresses to a mere rag of oiled silk, leaving nothing but the hooks in the fish’s mouth. There are various other spinning-baits which do not exactly imitate any fish, as spoons, otters, kill-devils, &c.

Live Baiting.—The plan pursued in this kind of fishing for pike is generally to use either what is termed “ live snap or gorge tackle.” In the former, the object is to strike as soon as the pike takes the bait into his mouth ; in the latter, to allow him to swallow or gorge it. In _ both cases a float is used. This is usually a lump of cork nearly as large as a hen’s egg, to carry a good-sized bait. The bait used generally is either a small roach, dace, or

gudgeon ; failing these, any other that can be obtained. The best kind of snap tackle may be seen in fig. 6. Jn the cut it consists of a single hook and a triangle. The single hook is hooked through the root of the dorsal fin of a small roach, dace, or gudgeon, and the triangle hangs down at the side of the bait, as shown in fig. 7. Now, when a pike first seizes a bait he takes it across his mouth, so that while the head and tail appear outside his jaws on either side, the whole of the middle parts of the body are well within them ; and, as will be seen from the position of the hooks, they will most probably be within the pike's mouth also; consequently, as soon as the pike has had time to take the bait so arranged into his mouth, the angler strikes smartly, and very often hooks his fish and lands him. It will of course happen sometimes that the triangle is not well in the fish's mouth, in which case

either the fish is missed altogether, or, being very slightly hooked, he breaks away. Another method of using the live bait is what is termed the "live gorge." In this case a pair of hooks, tied back to back, are used. The loop of the gimp on which they are tied is hooked into a long needle, called a baiting needle. (See fig. 8, which shows the hooks and the needle.) This is inserted under the skin at the shoulder of the bait, and carried down just under the skin, towards the tail, being brought out just behind the dorsal fin. The gimp is drawn through, and the hooks stand as shown in the illustration. (See fig. 9.) In the illustration the loop is hung on to the trace, and the tackle used as in ordinary live bait fishing; only, when a pike takes the bait he is allowed to gorge it before the angler strikes, being permitted to go where he will with the bait, and ten minutes being allowed for him to gorge or pouch, as it is termed. This is a tedious method of fishing, and is only used for pike,—as often the fish runs the line foul of some weed, and leaves the bait ; or, after mumbling it and killing it, refuses to gorge, and the constant waiting whenever there is a run is wearisome. But as there is less show of hooks, more runs are obtained in clear water than with the live snap tackle. Another method of using the live bait is with the paternoster, though this is chiefly used with minnow or small fry for perch fishing. It is, however, sometimes used for pike, when a gimp tackle is preferred and only two hooks used. For perch fishing, the paternoster simply consists of a line of gut about 4 or 5 feet long; at the bottom of this is a leaden bullet or

plummet to sink it to the bottom; about 6 or 8 inches above this a hook, on some 6 inches of gut, is fastened ; a foot above this another hook is fixed on, and a foot above that again, a third. This third hook is often a gimp hook, when pike and perch are found in common, and a rather larger hook and bait are used, so that if a pike should come to the bait, there may be a fair chance of capturing him. A minnow being hooked through the lips on each of the other hooks, the tackle is dropped into an eddy where perch are supposed to be, and the three baits swim round and round the main line; so that, no matter whether the fish are resting at the bottom or searching for their prey in mid-water, they may be attracted. As soon as there is a bite from a perch the angler feels it at the rod-point, slackens line for two seconds to let the fish get the minnow well into his mouth, and then strikes. Should the immediate neighbourhood not afford a bite, the tackle is cast to a distance, and after being allowed to rest for a minute, it is drawn in a few feet, when another cast is made, and then another draw, until the tackle is worked up on the boat or bank, when another cast is made. In the winter, after the floods, very many perch are caught in this way on the Thames, from 100 to 200 in a day being not very uncommonly taken. Trolling with the dead gorge is another way of fishing ; and this is employed chiefly when the water is full of thick weeds and rush-beds, which prevent either spinning or live bait fishing, and solely also for pike. An elon- gated piece of lead is cast on to a bit of twisted brass wire, which has a couple of hooks similar to those on a live bait gorge tackle at the other end (fig. 10) ; a gudgeon (which is the best bait for the purpose) to suit the length of the lead is chosen; the loop of the gimp, to which the brass wire is fastened, is slipped into the eye of a baiting needle. The needle is passed in at the mouth of the bait and down along the spine, out at the tail. The lead being drawn into the stomach of the bait, the two hooks lie on each side of the mouth. ‘The tail is tied tightly on to the gimp with three or four laps of silk, to prevent it from slipping (see fig. 11), and the tackle and bait fastened on to the trace used, which is usually a yard of gimp, with one

hook or spring swivel to loop the tackle and bait on. This bait is then dropped into holes between the weeds or rushes, and is worked up and down by the lifting and falling of the rod-point, the lead within the bait

causing it to shoot and dart along as though the fish were alive. When a pike seizes it, ten minutes must be allowed for him to pouch, when the angler must strike firmly, hold on, and get his fish out as well as he can. It is by no means the pleasantest method of fishing, as the waiting is tedious. The fish constantly runs the line foul of the weeds, &c. ; and often, after a tedious waiting, it is found that the fish has rejected the bait after all. Added to these, there is this objection to all gorge fishing, that the angler must kill every fish he catches, as the hooks are in the fish's throat, aud small under-sized fish, which ought to be returned to the water, are sacrificed, as well as fair takeable ones.

Sometimes grubs and worms are used in mid-water fish- ing, being cast up stream and allowed to float down in mid- water. This is chiefly for trout. The angler uses a long, light bamboo rod, and a single shot for a sinker. Two small worms are generally used ; the brandling or gilt-tail is more frequently used (a worm found in rotten manure, &c.) Some use a single hook, some three small hooks tied one above the other. 'This is called "the Stewart tackle," after the author of the Practical Angler ; and the worms are twined round and impaled on them. Wading up stream, the angler casts before him into every likely stream and eddy, allowing the line and bait to come down towards him in mid-water, and striking the moment he perceives a check. This is a very killing plan, and is adopted with a modification of tackle, to fish with beetles, larvee, palmers, and, in fact, almost any kind of insect ; for the trout is a very omnivorous fish, and will hardly refuse anything that is small enough. The lure is cast overhand, as in fly-fishing, and practice enables the angler to cast nearly twice the length of the rod.

Surface or Fly Fishing.

This method of fishing is conducted with the natural or the artificial fly. The first of these ways is called daping, dibbing, or shade fishing, and consists of using a long light rod with almost 2 yards of fine strong gut, to the end of which is tied a No. 7 or 8 hook, not too coarse in the wire. A fiy, beetle, or insect of some kind is then put on the hook by transfixing the thorax of the insect. Then the angler, having watched the fish rising under some bank or projecting tree or bush, creeps very softly to the place, and, keeping himself

out of sight, pokes the point of his rod through some open spot in the bushes, and allows the insect to drop on the surface, just over or a little above the spot where the fish he wants to catch has been rising. Probably he will not be able to see or to feel the fish rise, and he will have to trust to a third sense—his hearing. He will hear a slight “ plop,” like a bubble coming out of a sub- merged glass. A gentle strike then is required, and a tight hand on the fish, as such places are usually near old roots or boughs, in which the fish will try to shelter him- self and entangle the tackle. The best fish are frequently taken in this way. Another method of using the natural fly or insect is by casting it. In this case a single-hand fly-rod is used, and it requires great care to avoid whipping the insect off the hook. Having cast the bait to the extent required, the line and bait rest on the surface, and the bait floats down quite naturally unchecked, and the fish rise at it in the ordinary manner. What is called the blow- line is another favourite method of using the live fly. A length of light floss silk is fastened on to the running line with about 2 feet of fine gut and a light hook at the end. Baiting the hook with a fly, the angler turns his back to

the wind, holds the rod (a long light cane one) upright,

allows the wind to blow the light floss line as far ont as it

will go, when he gradually lowers the rod and guides the fly till it touches the water a yard above a fish, when he

floats over it. A little wind is required for this kind of fishing. Some insects, beetles, creepers, or larve of the stone-fly, &c., are used in mid-water, as already noted. A word or two as to the method: a couple of shots being fixed on the line, the bait is cast with an underhand swing, as in minnow fishing, up stream, and allowed to travel down towards where the angler stands. At every stop or check of the line it is necessary to strike, for the bait being tender, whether it be a twig, mud, or fish that arrests it, it will be spoilt ; therefore the angler must always strike on every suspicion of a bite. For full particulars of this kind of fishing, as well as for all relating to trouting in the North British streams, the angler cannot do better than get The Practical Angler, by the late Mr Stewart, one of the best works ever

published on such subjects. The best flies used for live-fly fishing are the large ones, as the green and grey drake, the stone fly, known often in Scotland as the May-fly, the big alder, the blue-bottle, and, in- deed, any that are large enough. In casting them the angler must be careful to let his line make rather a sweep or circuit behind him, or he will casily flick off or destroy his bait. In using the artificial fly the angler employs either a single or a double handed rod,—generally he com- mences his apprenticeship with a single one. This 1s usually made either of hickory, green-heart, or split bam- boo tied and glued up in lengths, runs from 10 to 12 feet long, and is tolerably pliant,—more or less so, according to the taste of the angler. The line used is generally twisted or plaited hair and silk, or fine dressed silk. The first is the lightest. A piece of gut, knotted together until it is about 3 yards long, is termed the cast- ing-line, point, lash, or collar. This is fastened to the end of the reel or running-line, and to the other end of it is looped on an artificial fly. Sometimes two or more flies are used; in this case they are called droppers or bob flies, aud are looped or tied' on to the casting-line about 18 inches or 2 feet apart. The end fly is called the tail or stretcher. 'The best way of fastening on the drop flies is to whip the gut round with silk a few times, just above one of the knots, to prevent chafing; then take a fly with only about 5 inches of gut to it, tie a knot at the extreme end of the gut, and then knot on it once or twice, if required, over the whipped silk, and if the gut be moistened and drawn tight to the knot, even when only once knotted, it rarely slips, and the more it is pulled of course the tighter it gets. When it is desired to take the dropper off, a sharp knife slips off the extreme end knot, and the tie comes off easily. The loss of gut is infinitesi- mal, and the fly wears out before the gut is materially shortened. The angler having his rod and line ready, and his cast of flies selected, begins by letting out a little more line than the length of his rod, waves the rod back over his right shoulder, so as to extend the line behind him, and then, making a slight curve, impels it forward towards the point he desires to reach, letting it fall on the water as lightly as possible ; then he allows his flies to float down the stream as far as they will go, when he draws out and repeats the cast, lengthening out line as he does so until he has as much out as he requires, or can cast comfortably. If in casting he does not make a curve with the rod-point belind him, but returns the line too directly, he will crack his fly off, or so crack the gut at the head of the fly that the first good fish will carry it away. When the angler sees a fish rise at

his fly, if he is fishing for small fish, he cannot strike too quickly,—if for large ones, he may be a little more leisurely. In fishing over a

fish that is rising, the best way is to cast a little above, and to allow the flies, with as little of the line as possible, to come over or past him. Some anglers fish up stream and some down. In fishing down stream the angler exposes himself more to the fish, and is more apt to miss his fish when they do rise ; and if his tackle is fine and the fish heavy, having the weight of the stream against him is also more apt to break it than when fishing up ; perhaps the best method is to fish diagonally up and across the stream. The angler pursues one of two systems. He either waits till he sees fish rise and fishes over them, wasting no time on intermediate water when he sees no rises ; or he fishes the water out thoroughly, searching every hollow, bank, weed, and stone, that may hide a trout. In burn fishing for small trout the latter method is generally the one adopted. In larger rivers, where the fish are heavy and few, the former is more often preferred. When a good fish is hooked it will often resist strongly, and rush violently about, seeking to hide itself under weeds and roots, which are dangerous to the tackle. The augler must guide the fish as well as he can until it is tired, letting out line froin the reel when resistance becomes too severe a strain on the tackle, and winding it in again when opportunity serves, but always keeping a tight line on the fish, as a slack line frequently loses it. When tired the fish should be towed gently to a favourable bank, and the landing-net quietly slipped under him. There must be no dashing or hasty movement with the net, lest the fish be frightened and make another effort to escape, as fish frequently do, and successfully, as it is a dangerous moment in the struggle. In fishing with a double-handed rod the rod is longer and the line a little heavier; in otherrespects there is no difference. The rod will vary from 13 to 15 feet for trouting. The left hand grasps it below the reel, and the right hand above ; though, if the angler desires a change, or the necessities of the stream or wind require it, the hands can be reversed. The double-handed rod has several advantages over the single, having more power with big fish, and keeping the line and flies higher above obstructions.

The question of why fish take bunches of feathers tied on hooks, and what they mistake them for, has often been asked; and it is now pretty generally allowed that they take them for flies in the majority of instances, though in others they may mistake them for water-beetles, larvee, or spiders, of which latter insect there are several that inhabit the water. Now, there are two classes of disputants on this matter: one which holds altogether to the fly theory, and therefore strives to imitate each fly that comes out closely ; the other, which inclines more to the general insect theory, and merely gives a few flies of different colours, not caring to imitate anything in particular. Pro- bably the best fishermen recognise both theories, but bind themselves exclusively to neither. But before entering upon the selection of flies it may be well to point out the difference in the practice of the north and south. We may, perhaps, take the late Mr Stewart! as the exponent of the north ; and, perhaps, Mr Francis Francis? may be held as the latest. exponent of the south. Mr Stewart gives a short list of a bare half-dozen of insects, three of which he calls spiders—black, red, and dun—and which are what are known in the south -as “hackle” flies; that is, flies dressed with only a body and hackle.? The hackle is wound on round the hook, over the body, and is supposed to represent the legs of the fly, there being no wings. Mr

1 The Practical Angler. A. & C. Black, Edinburgh.

2 A Book on Angling. Longmans & Co., London.

8 The pointed feathers on a cock’s or hen’s neck are called hackles, Peed small feather with a soft shortish fibre may be used as a ickle.

Stewart also has three flies of three general colours, yellow, brown, and dark bodies ; but as these may be varied with all sorts of wings and legs, the last may embrace in reality any number of flies which the taste of the angler may suggest. Mr Stewart’s standards, however, are dressed thus :—(1.) A woodcock wing, with a single turn of a red hackle or landrail feather, dressed with yellow silk freely exposed on the body. For fishing in dark-coloured waters the fly may be dressed with scarlet thread. (2.) A hare- lug body, with corn-bunting or chaflinch wing. A wood- cock wing may also be put on the same body, but should be made of the small light feathers taken

from the inside of the wing. (3.) The same wing as the last, with a single turn of a soft black hen-hackle, or a small feather taken from the shoulder of a starling, dressed with dark-coloured silk. These, as Mr Stewart says, can be varied to any extent; but he pins his faith ou those mentioned and the spiders: the black spider being a small dark starling feather wound over a brown silk body; the red one, the small feather outside the wing of the landrail, wound on over a yellow silk body; and the dun spider, the small soft ash-coloured feather from outside the dottrel's wing, with hardly any body but the tying of the hook. This is Mr Stewart's repertotre—it is not overburdensome; but in the south Mr Francis says that fish are much less numerous, and are larger and more critical, their feeding-time being much longer and food being more plentiful than in the north, and their taste, therefore, has to be more carefully considered; he therefore gives a list of flies for each month. Space does not permit us to name the whole of them, but we can enumerate a few of the best of them. The duns run through the whole year, and are therefore with the angler the piéce de résistance. These comprise varicties of the blue and yellow dun, and should be varied from the darkest slate-blue to the lightest shade yellow, from almost golden yellow up to the lightest fawn, almost a white, and these, slightly combined, go also to an olive. The earlier duns are the blue dun, which comes in in March, and is one of the best spring flies. It is in the water more or less throughout the season. Then there is the small dark iron-blue dun, which appears in April or May, with wings almost as dark as the body ; and the bright yellow dun, with greenish-yellow body and pale slate-coloured wings. If these three be taken as the darkest of their class, and varieties, each of a shade or two lighter in colour, be made, they will take inthe whole of this important class of flies. These duns are all imperfect insects, and have another change to go through before they are complete and able to propagate, and when they have completed this they usually die. The fly casts its skin and becomes a perfect insect, brighter in colour and more brisk in its motions. In this form they are called by the angler "spinners." Thus the blue dun becomes the red spinner, the yellow dun the brown spinner, the iron-blue dun the jenny spinner, and soon. All these flies belong, with several others, to the class or order Neuroptera, or nerve-winged flies—flies with clear gaudy wings, intersected with a network of veined markings. They form the most important order for the angler; but there is another order, the T'richoptera, or hairy-winged flies, which is

scarcely less important, and which includes a very large number of flies on which fish habitually feed. These flies have soft feathery folding wings, which lie close on the back. They differ from the former order in having one less change to go through, for when they emerge from the pupa state and become flies, they are complete, and have no further change to go through. There are, besides these, which are flies born from water, other orders of land flies, imitations of which are used by anglers, as the cow-dung, hawthorn, and. oak flies, the house-fly, &., but they are comparatively insignificant,

and with the exception of the cow-dung, which is a very useful fly, may be dispensed with. It is impossible here to give the dressing of the various flies ; but if the angler goes to any respectable tackle-maker and mentions the names of the flies he requires he will get them. To com- mence then with the month of—

March, which is early enough for fly-fishing. The earliest fly found on the water is the February red. This, with the blue dun and the March brown, will do well during March, if anything will. The same flies kill well enough also in—-

April, and to them may be added the red spinner, the cow-dung, the red and black hackles, the needle brown, and towards the end of the month, or entering on May, the yellow dun and the iron-blue dun.

May.—In addition to many of these, the angler may use the stone-fly, the sedge-fly, and the orl or alder fly—a very celebrated and general fly—with the little black gnat and the pale evening dun,—a fly which only comes on in

September brings the whirling dun and the willow-fly, and this closes the angler’s fly-fishing for trout.

In the latter months many of the earlier flies reappear, and with the list here given the angler should have no diffi- culty in killing fish anywhere. Most of the smaller trout- flies are dressed on hooks that range from the sizes No.

10 to 17 in the scale of hooks given in fig. 12 in the cut— the larger flies, as the May-flies, stone-fly, the moths, &c., running up to sizes 6, 7, and 8, There are, besides these flies, which are definite imitations of insects, a few of such general make and colour that though they do not strictly imitate one fly, may have a general likeness to several, and which are called general flies, and are often used when the angler is in a difficulty in knowing what to put on his cast. Among the best of these are the Hoffland, the Francis, the governor, the coachman, the soldier palmer, the wren-tail, the grouse and partridge hackles, &c. Asa rule, the smaller flies are used in the day-time, the size being increased as the evening and night come on. In some waters, owing to the excessive fishing, the trout get

the evening towards dusk, when the fish feed ravenously on it.

June.—In this month the standing dish with the trout in most rivers is the green drake, better known as the May fly, though it rarely appears until May is over. This and its transformatious, the grey drake, with the well-known Welsh fly, the coch-y-bondu, otherwise the bracken clock, shorn-fly, &c. ; these, with various light-coloured duns and spinners, may be used through the month with effect, as this is the prime month for fly-fishers.

July, as a rule, is rather an indifferent month. The weather is hot, the water low and clear, and fish do not feed well till the evening, when the white and brown moths may be used. In the day-time the red and black ant flies often kill well, and these, with various light- coloured duns and diminutive green, blue, and grey midges, must make up the bill of fare.

August.—The August dun and the cinnamon now are added to the list, many of the previous flies being still on.

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so wary that after the May-fly there is very little chance, unless the day be particularly favourable, of hooking a trout before the evening, and fishing is often carried on till ten or eleven o’clock at night. Of course at such times the angler has to trust more to his senses of feeling and hear- ing than sight.

In the majority of instances it is the custom to let the tackle soak, and when fishing to allow the fly to sink a little under the surface—to fish with a “wet fly,” as it is called; in others, where the fish are more wary, in order to imitate nature more closely yet, it is the custom to fish with a dry one—that is, to make the fly and line rest on the surface, without becoming sub-merged. To this end, when the fly and line become wet, they are waved to and fro from the rod-point in the air to make them become dry again. The fly should always be allowed to float down stream, as natural flies do, and should not be jerked or “ played,” as it is termed, unless the angler is fishing down stream and drawing his fly against it, when he will allow it to sink under water, and in that position it may be supposed to represent some

quick darting larva. So far, stream fishing only has been dealt with. ‘

Lake Fishing differs in its practice materially from stream fishing, and though some flies which are used ou streams will also kill on lakes, yet, for the most part, there is a fancy repertoire in this respect which differs wholly from that employed in streams. Lake-trout flies, particu- larly in Scotland, are made with wool bodies, the prevail- ing colours being red, claret, orange, yellow, green, and black, with a light spiral up the body of gold or silver tinsel. The hackles are‘chiefly either black or red, or red with a black centre ; the wings are either of teal, mallard, or woodcock. Here and there the white tip feather in the drake’s wing is a favourite wing for flies. They are usually dressed on 7, 8, or 9 hooks ; the same flies a size or two larger do equally well for sea-trout flies,

Lake-trout fishing is conducted either from a boat or from the shore. The best depth of water in which to fish for trout varies from 6 or 8 to 12 or 14 feet, and between these depths the best sport is obtained; and the angler should therefore fish over them for choice, though occa- sionally fish may be caught in both deeper and shallower water. In lake fishing it is always desirable to have a good ruffling breeze, as the fish do not rise or take well in acalm. ‘The best places are in sheltered bays, by rocky points or islands, or where burns flow in; drifting along by these, and casting ahead and shorewards, the angler watches every break in the water. While drifting along in his boat, it may happen that, the wind being high, he drifts too fast

to fish thoroughly and properly over the ground. To obviate this a stone or an anchor is cast over and aliowed to drag along the bottom, so as to check the way of the boat, and to give time to the angler to fish. A good boatman and netsman is here a great desideratum, and much of the chance of sport depends upon him. The great fault of most boatmen is that they go too quickly over the casts ; and it requires a man with a knowledge of the lake, as well as experience in managing the boat, so to conduct matters that the angler has the best chance of sport. When rowing to his ground, or from point to point, the angler should always put out the spinning minnow, and thus he may take one or two of the best fish. As fish do not always lie in the same places, wind and weather have to be sedulously consulted. In fishing from the shore the angler seldom gets the best sport, and often has to wade to reach fishable water, while the best casts are often beyond his reach; and therefore, whenever a boat can be employed, it is to be preferred for lakes.

Salmon Fishing.

The salmon is the noblest and strongest fish on which the angler essays his art, and fish from 40 to 50 ib in weight, and sometimes of even more, are occasionally taken by the rod and line; though for the ordinary pur-

Fic. 21.—The Salmon. poses of sport, fish from 7 or 8 b up to 20 are far more

generally taken. When a salmon in good condition is

first hooked he makes a strong and violent resistance, dashing through the water frequently for a distance of 60 or 70 yards or more at a time, and compelling the angler to let so much line off the reel; springing out of the water, often to a height of several feet, several times during the struggle ; and finding that force is unavailing to break the line or withdraw the hook, he will often have recourse to cunning, and cut the line or rub the hook out of his nose against some rock ; or, hiding himself at the bottom behind big stones and boulders, he will sulk and remain immovable for a long time. Occasionally he will run up or down rapids or falls in his terror and rage. To control all these vagaries, to combat his cunning, the angler, with his

bending rod and practised skill, lets him take out line when his struggles are dangerous, cautiously winding it back again when he is able to do so safely, and thus keep- ing a certain strain upon the fish he gradually tires him out and wears his strength down, and at last, when un- able to resist any longer, he is led in towards the shore, where upon some convenient rock or strand the attendant gaffsman stands or crouches, with a sharp-pointed steel hook attached to a short ashen staff called a gaff, waiting his opportunity. As the salmon is led past or near him, almost on the surface of the water, the hook is extended beyond the fish, the gaffsman makes a short sharp stroke with it, and digging the hook into the side of the salmon, with a sudden and instantaneous pull drags it out of the water to the land; a rap on the skull from a stick or stone terminates the poor salmon's life, and henceforth he be- comes mere provender. Sometimes a large landing-net is used to land the fish, but though this prevents the spoiling of a portion of the fish by avoiding the need for making a hole with the gaff, it is less convenient and of more risk to the safety of the fish, The most favourite plan of fishing for salmon is with the fly, though in many places they will also take both worm and minnow freely, and are thus fished for. The salmon-fly is a most wonderful conglo- meration of feathers, silks, and tinsels, and oftentimes is as brilliant as the most glittering humming-bird. What the salmon mistakes it for is not easy to say, for there is nothing like it in nature. Probably a semi-transparent shrimp or prawn reflecting the gorgeous tints of the sur- rounding sea vegetation may be the nearest approach to it. The manufacture of the salmon-fly is given hereafter. They are made of various sizes,—the longest for the early spring when the rivers are much swollen and very turbid, when hooks of 3 inches in length, and sometimes even longer, are employed; and from this extreme size they diminish gradually to a large sea-trout size, which is about in accordance with the hooks numbered 6 and 7 in the scale given in the illustration. These are used when the rivers have sunk down to their summer level, and are very clear and still, and the flies in the intervening sizes are carefully adjusted to suit the size and clearness of the water. There is a great difference in the method of using the trout and the salmon fly. In salmon fishing there are certain spots in the river upon which salmon are known to rest and to feed, and these are called salmon-casts, throws, lodges, or stands. They may be but a few yards in length, and comprise a favourite ledge, or a rock or two, behind which salmon like to shelter—for a salmon always has his lair or resting-place behind some

projecting rock or stone; or they may extend for 100 or 200 yards, or even more. ‘There are, too, in many rivers plenty of places where salmon may be seen sporting and jumping about, but where, owing to the depth of water or some other reason, they never feed or at least take the fly. The angler, therefore, who knows thoroughly the cast he is about to fish, has a great advantage, for he knows where the big stones and the particular eddies are in which a salmon

may be expected to rise, and how the fly should be drawn over the fish so as to show itself in the most tempting manner ; whereas the angler who has not much knowledge is often apt to dwell upon spots that are comparatively barren, and to pass quickly over those that would perhaps repay particular attention. In fishing a cast, the angler casts diagonally across down stream, and draws the fly up stream towards him, softly raising and lowering the top of the rod so as to check and loosen the fly alternately, and to make all its fibres open and shut so as to counterfeit life. When a salmon rises to the fly he either makes a big bulge or boil in the water, or, if he is unusually eager, he throws his head and half his body above the surface, rolling over like a porpoise in his endeavour to seize the fly; but a salmon very often misses the fly in his eagerness, and when he does, the very worst the angler can do is to pull it away from him, as after such 2 miss it is not at all un-common for a salmon to turn round hastily and to make a second snatch at the fly, which he then rarely misses ; but if the fly is whipped away from him, he is frightened and disgusted, and goes down sulkily, refusing to rise again. It is therefore the safest plan to wait till you feel your fish, and then to strike, and even then it is not desirable to be too rough. A violent stroke is not the best one,—a slight elevation of the rod so as to fix the point, and then a steady sttain, enough to force the barb of the hook home in the next minute, is the best way of getting a firm hold. Many fishers strike the moment they see the boil of the fish, under the belief that the boil is made by the tail of the salmon as he turns to go down, and that they do not see him till he gets the fly in his jaws. This is true, pro- vided he does not miss his aim altogether; if he does (as he certainly often does, for it must be remembered that the fly is constantly in motion, which of course renders it not very easy to see), then to strike is to pull the fly away and to deprive the

salmon of another chance. When he has hooked a fish, the angler should look round and study what dangers there are which may prove destructive to his hopes, and determine if possible so to manage his fish as to avoid them. He must, therefore, always retain his coolness and presence of mind; flurry and confusion are often fatal to success. If a salmon jumps out of water the point of the rod should be lowered, so that the line be slackened, for if it be tight the sudden weight is apt to pull it out of the fish's jaw. If he sulks, the only way is to frighten him out of his hole by poking a long pole into it, or by throwing stones, or by some other device. If he runs for the edge of a fall or rapid, it is often a very good plan to let out a lot of loose line, and the salmon, fancying himself free again, will not go over, but will head round and face up stream again. As the devices of the salmon to escape are numerous, they cannot be dealt with fully here. No two salmon-casts are alike, and therefore no two can be fished in the same way; each one must be fished to suit the particular capabilities it possesses.

The method of casting the salmon-fly is similar to that adopted with the double-hand trout-rod; the only differ- ence being that the rod is larger and heavier, running up to 21 feet, and even more sometimes, and seldom less than 16 or 17 feet. The line is stout, well-dressed, 8-plait silk ; the casting-line a yard or two of treble-twisted gut, and a yard or two of stout single salmon gut. Having mastered his rod well, the angler will find it comparatively easy to cast up to 20 yards of line; from this up to 30 yards every extra yard he can throw proves him more and more a good fisherman, while every yard he can cast beyond 30 shows him to be a master of his craft, The angler should never cast more line out than he can work and fish comfortably ; if he does, he has a slack line when he requires a tight one, and he will often raise and scratch

his fish.

fish, and spoil his own sport and other people's, when a yard or two less of line would have enabled him to catch Very long throws are only necessary under un- usual circumstances; 25 yards will generally cover fully all that the angler really needs to fish.

Salmon-Flies.

We may give a short list of general salmon-flies such as the angler will find it uscful to have always by him, and. which he can employ

if he does not know the general flies used on the river, and every

river has some pet fly, some different combination of feathers and fur from its neighbour. The flies given are all standard flies, and may be had at any respectable tackle-maker's. The method of dressing them is the one which experience has shown to be the best for attracting the notice of the salmon.

The Claret.—One of the most useful general flies. Beginning the dressing at the bend of the hook, which is the tail end of the fly, a turn or two of gold twist and golden-voloured floss silk is taken for the tag; above this is lashed on a tail formed of a golden phea- sant topping and some strips of blue and red macaw. Over the stump of the tail is fastened the but, a sort of ruff made of two or three turns of the herl or strands of a black ostrich feather. 'Then comes the body—first three turns of orange floss silk, then reddish claret pig's wool wound on to the top of the body ; over the wool spirals of stout gold thread; and, beginning halfway down the body, a hackle of reddish clarct to the shoulder, and at the shoulder two or three turns of black hackle. The wing is made first of tippet feather of the golden pheasant, which forms a sort of short under wing ; above that is a mixed wing of fibres from the golden pheasant tail, turkey, bustard, and peacock wing, with a few fibres of green and red parrot ; above all a single topping, with a rib to cither wing, of bluc macaw fibre,—the head of the fly being black, either ostrich, herl, or chenille. This fly may be used of various sizes, and is a very general favourite in most waters.

The Black and Teal.—Another very general favourite, the lead- ing points of which are a black body with silver spirals of twist or tinsel ; a single topping for the tail; black hackle up to the shoul- der, over which either a teal feather or a gallina feather (with the large spots), and a wing of teal or rather pintail, and over it two jungle cock feathers with or without a topping. This fly also may be uscd of all sizes; dressed small, it is good for either lake or sea trout.

The Blue Doctor.—Tag, a few turns of fine gold twist ; tail, a topping ; but, scarlet crewel or wool ; body, pale blue floss silk, with a hackle a shade darker, or a blue jay's feather ; silver tinsel (in large flies with silver twist beside it); grouse, partridge, or bustard hackle at the shoulder ; a blue jay feather or blue hackle over it: The wing is mixed of fibres of the bustard, dark turkey, argus pheasant, claret, blue, and yellow fibres of dyed swan ; some- times a topping over all and a head of scarlet crewel.

The Silver Doctor.—Also a very great favourite. Tag, silver tinsel; tail, a topping; but, a turn of red crewel; body of silver tinsel entirely ; hackle, blue, with brown hackle at the shoulder, and a small speckled gallina feather hackled on over it; wing chiefly pintail, with a few red and blue fibres and a topping ; head, red crewel.

The Butcher.—A very killing fly, and generally used. 'Tag, gold twist and dark orange floss ; tail, a topping; but, blac ostrich herl; body, two or three turns of scarlet. The same of a medium blue, then of red, and lastly of dark blue pig's wool ; broad silver tinsel ; a medium red claret hackle with a gallina at the shoulder ; under wing a tippet and rump feather of the golden phea- sant, and over them strips of brown mallard, bustard, or peacock wing.

The Parson.—If a gaudy fly is required, there are few more showy ones than this. Tag, silver tinsel and mauve floss ; tail, two toppings, a few sprigs of tippet, and a green kingfisher feather ; body, two turns of gold floss silk, golden pig's wool merging into orange; silver twist; golden orange hackle, red orange hackle above it; three or four short toppings tied on at the breast ; wing, a tippet feather of the golden pheasant, a strip of pintail on either side, seven or eight toppings, and a couple of kingfisher feathers at the shoulder on either side ; black head. A more subdued parson may be made by using a jay's hackle at the shoulder instead of the short toppings, by reducing the number of toppings in the wing, and adding some darker fibres of golden pheasant tail, bustard, &c. .

The Drake Wing.—Tail, tippet sprigs and a yellow toucan feather; body, orange red and black pig's wool ; silver tinsel; hackle, a coch-y-bondu stained of a dark orange red ; a lavender hackle at shoulders ; wing, two strips of drake or pintail. Bodies of orange, claret, dark blue, and black pig's

wool graduated up to the head, are very great favourites, and, wedded to various hackles and wings, kill extensively.

The Orange and Grouse. —Flies with orange or golden floss silk bodies, and various hackles and wings, also kill widely. The above

fiy is tied with a tag of silver tinsel. Tail, a topping and king- fisher feather ; but, black ostrich herl ; body, three turns of magenta floss, and the rest of light orange floss; haekle, grouse with the tips snipped off—not on the back —with three or four toppings over the long grouse fibre for wing; blue jay tied sparely at the shoulder ; blue maeaw ribs ; a black head.

A very good series of plain flies, very much used, ean be made thus :—Tag, two turns of tinsel; tail, a topping and some tippet oe ; body, a turn of bright orange brown followed by yellow in

e centre, and the rest of lightish blue pig's wool ; a broadish silver tinsel, the wool rough and picked out, with a black haekle, and wings of peacock wing, sometimes with a tippet in the centre or a topping over. By varying the wing or hackle, a very taking series of flies ean be had.

With this list of flies the angler ought to be able, in default of knowing the special flies suited to the river, to fish any river with eonfidenee, and, if the fish are in the humour to rise, to get sport in . it. The eolour, and particularly the size of the fly, are things to study in catering for a willing salmon. 'Toolarge a fly often causes a false rise ; when this is found to oecur, the size should be reduced.

Sea-Trout Fishing. —

Next to the salmon ranks in value for sport the sea- trout. Of these there are two kinds: Ist, The salmon- trout (Salmo trutta); and 2d, The bull or grey trout (Salmo erwox). The former is much the better fish for sport and for the table, the latter being coarser for the table and rather shy of the angler's lures. Sea-trout abound in several rivers in the north, and many are taken in the tributaries of the Tweed and other northern rivers ; but they are perhaps

more abundant and show better sport to the angler in some of the western Irish waters. The salmon-trout usually average below 4 ib each, perhaps from 1 to 2 Ib being the prevailing size, though now and then much larger fish are taken. The bull-trout often runs up to a far greater size, and fish of above 20 and even up to 30 Ib are not very uncommon. The salmon-trout, called in Ireland the white trout, and on Tweed and the northern rivers the herling or silver white, is a smart, beld-rising fish ; it takes freely at times, and plays with wonderful agility, frequently when hooked springing from the water like an acrobat many times in succession, and trying all the angler's skill to bring it into the basket. In lakes they frequently abound in profusion, and a hundredweight of them, and sometimes more, are or have been often taken in one day. The tackle, of course, is lighter than that used for salmon, and somewhat heavier than is used for the common trout. The flies are also of a size between those used for the other two; bodies of claret, yellow and orange, green, blue, and black, either of silk or fur, are the favourites. In Ireland they prefer a mixed wing, chiefly made up of fibres of yellow, red, and green parrot, with bustard and other dark feathers; the hackles being suitable. In Scotland they prefer plain wings of drake, teal, woodcock, and the black and white tip from the wild drake wing ; but the fashion of the dressing is not a very important matter, so that the colour is right. At times sea-trout rise very badly, and the angler will get a number of rises, but succeed only in hooking a very few fish; but when the fish are taking well, few branches of the sport show better amusement than a day's sea-trout fishing. They also, unlike the salmon, take a spinning bait well while still in the salt water, and many are thus captured in the estuaries and salt-water lochs of Scotland while they are making their way to the mouths of the rivers up which they eventually would run to deposit their spawn.

Trout Fishing.

The trout (Salmo fario) has already been fully dealt with as regards the means employed in capturing him, and very little more needs to be said. He may be caught on the surface by the natural and artificial fly, by spinning a minnow, &c., in mid-water, by a live minnow, by casting a beetle or grub also in mid-water, and by fishing with a

worm at the bottom. There are very few fish that have so wide a range as the trout. From the poles to the outside boundaries of the tropics they are found on every continent, either in running or still waters, for neither comes amiss to them. From the huge lake trout, vying with the salmon in size and strength, the species dwindles down to the

Fic, 22.—The Common Trout.

small burn fish of six or eight to the pound. There is hardly any way of using the rod that is not more or less suitable for their capture; and though salmon fishing is held the nobler pursuit of the two, yet far more skill is required to make an expert trout fisher, so cunning and wary do they become when much fished over.

Greyling Fishing.

The greyling (Salmo Thymallus) is not so widely dis- tributed as the other members of the Salmonide. It is found in comparatively few rivers in England; in only one in Scotland, the Clyde, into which it was introduced some years ago; and not at all in Ireland. Itis a useful fish for the angler, inasmuch as it comes into the best rivers just as the trout is going out. It is a handsome fish, of graceful shape, very silvery sides and belly, with small black spots. It supposed to smell of thyme when first caught, hence its name. It is seldom known to run much above 4 tb in weight, and even that size is not at all common,— from 3 or 1 tb to 14 Ib being the average takeable size. It rises very freely to the fly, and will take other bait; but is less carnivorous than the trout, so that minnow is rarely used as a lure for it, —small insects, as gentles, caddis, &c., may be used with advantage. The flies it prefers are usually small bright duns and spinners, such as are used for trout in clear waters. The longer dorsal fin of the greyling allows it to rise from greater depths more rapidly than the trout, and deep still reaches often hold the best fish. Unlike the trout, a greyling will often rise and refuse the fly four or five or more times in succession, and yet will perhaps take it after all. The mouth being tender, the fish must be treated more gently than the trout, or it may break away. There is one way of fishing for greyling practised in the midland rivers which is worth notice. It is called “grasshopper fishing,” though the lure is totally unlike a grasshopper. A lump of lead of an elongated pear shape is welded or cast on to the shank of

a No. 5 or 6 hook. This is covered with wool or worsted wound on to it in rings of different colours—green, yellow, and sometimes red. ‘To make the bait more attractive, sometimes two or three gentles are put on the hook, and the bait is cast into a greyling eddy, and worked up and down smartly until taken by a fish. The angler strikes at every suspicion of a bite. Large baskets of greyling are taken thus.

Roach Fishing.

The roach (Cyprinus rutilus) is caught principally in bottom fishing with the float, as before described. The roach has been termed the river sheep, from his supposed unsuspiciousness of guile, but that can only be when he is never fished for. About London, where he forms a great attraction to a numerous body of anglers, he is particularly

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sharp; and nothing but the finest tackle, such as a single almost colourless horse hair, will take him, even gut being refused when he is much fished for. A very light quill float and a few sinkers are desirable. Roach weighing 2 ib

Fig. 23.—The Roach.

are not at all common, from 1 ib to 14 b being the usual

limits. The best hook baits for roach are gentles, greaves, red worms, a plain paste made of flour and water or worked up bread crumb or pearl barley. Of course there are a multitude of other baits which are sometimes preferred, but these will rarely fail if the fish are at all inclined to

feed. The best general ground-bait is that already men-

tioned in bottom fishing, though all sorts of other matters—

as grains, barley-meal, pollard, boiled wheat, &c.—are sometimes used. Roach, when feeding near the surface, will sometimes take a fly, as indeed

will most fish. Size of hooks required, 10, 11, and 12.

The Dace.

The dace (Cyprinus leuciscus) is frequently found in common with the roach, though often abounding in trout streams. Where there are no roach, it takes the same baits as the roach in all respects, save that it runs much more freely at the fly. In the months of July, August, and September on the Thames, large numbers of dace are taken with the fly from the water between Isleworth and Paddington with small black and red palmer and other flies tipped with a gentle or a piece of wash leather in imitation, and it is not uncommon for an angler to take ten dozen of them ina tide. The dace runs quickly, and requires very quick striking. The Jews are very fond of dace for their feasts, and pay a high price for them. Size of hooks required, 10, 11, and 12.

The Chub.

The chub (Cyprinus cephalus) is perhaps the least valu- able fresh-water fish for table purposes, though probably the barbel may almost be put on a level with him, albeit Tzaak Walton contrived to make a tasty dish of it; but at best the flesh is rather vapid, watery, and abounding in

Fic. 24.—The Chub or Skelly.

bones. It is a fair sporting fish, however. In addition to his taking all kinds of baits in bottom fishing, he will take both natural and artificial insects on the surface boldly, and many are taken by dressing a eockchafer, humble bee, or small frog, or by casting imitations of the same,

artificially prepared, under the boughs where the chub lies waiting. A big artificial humble bee or eockehafer, or a fly made of a silver tinsel body, coch-y-boudu hackle, and turkey wing, with sprigs of green peacock in it, are about the three best lures for him, though many prefer red and black paliners.) The chub often lies also in deep heavy streams, and will frequently in such cases take a live or a spinning minnow pretty freely.

Among bottom baits cheese and greaves are special favourites. The chub rarely exceeds 6 or 7 tb in weight, though specimens have been known to attain 9 Ib. Size of hooks, 3, 4, and some- times larger.

The Barbel.

The barbel (Cyprinus barbus), so termed from the wattles or beard depending from the sides of the mouth, is a very game fish for the angler, frequenting deep and rapid streams, and often turbulent and broken waters, as at the tail of mill wheels, weirs, &c. They go in large shoals, so that when the barbel are got upon the feed the angler often takes from 20 to 50 or more inaday. They require a good deal of ground-baiting, however,—worms, gentles, greaves, &e., being often used in large quantities two or three nights before fishing to induce them to feed freely, and even then the angler is as likely as not to be disappointed. A clean red lob-worm is, upon the whole, perhaps the best bait for a barbel, and next to that a bunch of gentles or greaves, though they will sometimes take freely a number of things, including fat bacon and raw beef. They are fished for in several ways by the ordinary and travelling float method, by the ledger and the clay-ball principally ; and it often happens that they will take pretty well in one of these ways and refuse the others. The barbel nibbles a little at the still bait before biting, but when a good double tug is felt, the angler may strike firmly. Owing to its great expanse of fins, and its rounded body, the barbel is a very stout fighter, and makes a most prolonged resistance; and though it is not so active as either salmon or trout, it is more troublesome, and takes longer to subdue. In the spring months the large barbel will frequently take a spinning bait freely, and when spinning for large trout in a weir the angler frequently receives severe disappointment by hooking a big out-of- season barbel. They run up to 16 tb weight, but one of 12 1b is not caught every day. On the Thames the average ig from 1 to 4 tb. They are a very curious fish, some years biting freely, and during others hardly at all. Size of huoks for worms, 1, 2, 3; for other baits smaller.

The Bream.

The bream (Cyprinus brama). Itis said that there are two kinds of bream,—the small white bream (flat) and the big olive-coloured bream. Much that applies to the barbel applies also to the bream. The same baits and the same

Fie. 25.—The Bream or Carp Bream.

methods of fishing must be adopted, but if possible finer tackle is required. Perhaps if there is one bait the bream likes better than another, it is two or three brandlings or red worms stuck on the hook. Otherwise his taste re-

sembles the barbel's. Barbel and bream are commonly caught in the same swim, but bream like to have a deep quict eddy to lie in. They are a curious fish, suddenly appearing in places where they have never 'been seen before, and after stopping for a year or two, as suddenly disappearing. They run up to 7 ib, and in the Thames average from 1 fb to 4 th. They are a very fair fish for the table, and fry well. Size of hooks, 4, 5, 6.

The Carp.

The carp (Cyprinus carpio) is described by the Dame Juliana Berners as a "deyntous dish." Unfortunately the decline of knowledge in the matter of fish feeding and rearing in ponds, &c., renders it difficult to realise the dame's assertion, an ordinary carp from an ordinary pond being poor in flesh and muddy in flavour, but it is quite possible that the flesh, which is so susceptible of taking the ngsty flavours exhaled around it, would, under better management, with better food and purer water, be both delicate and ''deyntous." Of all fresh-water fish, the carp is one of the most cunning and difficult to catch where he is much fished for, though, singularly enough, they take much better in rivers than in still water. In still water, even if you can induce a good carp to pay attention to your bait (which you cannot always), he will nibble, and turn it about, until he either sucks it off the hook without touching the hook, or he discovers the hook on the line,

Fia. 26.-—-The Common Carp.

becomes alarmed, and swims away. Very fine tackle, therefore, is required in carp fishing; but as he is big and lusty, it should be round and strong. There are various baits which more or less attract him. Paste sweetened with sugar or honey is one of the best; but he will at times take gentles, grcaves, and red worms. Some affect boiled green peas, some beans, and

many are taken with parboiled potato, which is one of the best of baits in some places for large fish. The best ground-baits are those recommended already, of bran, rice, bread, &c. If the fish are very shy, float tackle is to be avoided, and a very light ledger on a pistol bullet used instead. As the line rests on the ground, the carp does not see it, and takes the bait without suspicion. A clear bottom, however, is desirable. Carp run up to a heavy weight, sometimes between 20 and 30 hb, and they live to a great age. Size of hooks, 5, 6, 7. Tench.

The tench (Cyprinus tinca) very much resembles the carp in his habits, feeding on much the same matters, though neither paste nor any vegetable baits are to be recommended for tench. The best bait that can be put to him is a red worm, or two or three gentles; and for ground-baits, chopped worms and gentles are preferable. Tench bite best in the morning and evening, when there is hardly light enough to see the float ; for float tackle is best for the tench, though he nibbles and mumbles at the bait exactly as the carp does-and often, like him, leaves it

after nibbling off all the tail of the worm that is beyond the point of the hook. When the tench is so shy his eagerness may be stimulated by very gently drawing the float and bait away a few inches, when he will often rush at the bait and seize it at once. Tench are a very quiet, unobtrusive fish, and may exist in a pond for a long time

Fia. 27.—The Teach.

without being known to be there. They are very capri- cious in biting, sometimes biting well for a day or two, and again refusing all baits for weeks without any apparent reason. If taken from clear waters, the tench is a very good table fish—second only to the eel. Size of hooks, 6, 7, and 8.

The Fel.

The eel (Anguilla acutirostris). The eel is scarcely an angler’s fish, but it is often taken in angling, and it is a most excellent and luscious table fish. It takes various baits, as worms, small dead fish, which are the best for it, and

takes them better when they are still than when moving. Thus, night-lines are the best way of capturing the eel. Occasionally float tackle is used for the purpose, when the roughest tackle, with a float-hook and worm, suffices. Sniggling for eels is an amusing way of taking them. A stout needle, lashed toa long string, is concealed in a worm ; the point of the needle is stuck lightly in the end of a long stick. This is then introduced into the mouth of a hole in which an eel is supposed to shelter. As soon as the eel sees it he secures it, pulls it from the stick, and devours it. The string is lashed to the middle of the needle, so that when the angler pulls at it the needle turns crosswise in his gullet. The angler pulls with a steady strain at the line, until at last the eel, unable to resist longer, comes out and is caught. Clotting for eels, by means of a big bunch of worms strung upon worsted and gathered up into festoons, is another way. The eels entangle their teeth in the worsted, aud are lifted out and dropped into a pail. A hundredweight in a night has been caught in this way. They are chiefly caught, however, by baskets, nets, or traps set in mill-weirs, when they are migrating, and in some places, at such times, tons of eels are caught in a night. Fresh-water eels run up to a large size. They have been known to exceed 20 bb, but 4 or 5 bb are more common, and the average is from 1 to 2 tb. Hooks any size that is suitable—from 4 to 8.

The Gudgeon.

The gudgeon (Cyprinus gobio) frequently forms the young angler’s first quarry. This little fish abounds in large shoals in the Thames and other rivers, six or seven dozen, or even more, frequently being taken at one pitch. No ground-bait is required to attract them, but the bottom being disturbed and harrowed by a heavy iron rake, the fish flock to the spot to search for food in the débris, and they will continue to bite for some time, when another rake renews their avidity. A light cork float and a small 10 or 11 hook, with a fragment of red worm, is all that 1s necded : for so eager are the little fellows, that they pull the float down with a dash, so that the angler rarely misses his prey. A dish of gudgeons, gently fried, crisp

and brown, is by no means to be despised. With the gudgeon the pope, or ruffe (Perca cernua), is often found. It is little worth for the angler, and is

not very abundant. All that applies to the capture of the gudgeon applies to the pope. The bleak also (Cyprinus alburnus), a lively little fish, but hardly worth the angler’s notice ; it may be taken either with bait or fly, as is the dace.

The Pike.

The various methods of fishing for the pike (sox lucius) have already been dctailed—spinning, live baiting, pater- nostering, the live and dead gorge, being the principal, though the pike will take a big fly at times made of pea-

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Fie. 28.—The Pike. cock’s feathers and other showy matters. Pike grow to a very large size, where the water is favourable even to 70 or 80 ib; but pike of half that weight are not common, aud one of 20 tb is a prize to a London angler.

The Perch.

The perch (Perca fluviatilis) has also been partially dealt with, paternostering being about the best way of taking perch, though at times a float and worm will take better still, and even the ledger will take them. In big rivers perch in the winter get into the eddies and stiller waters,

> 2 a SS Fic. 29.—The Perch.

out of the floods, in shoals, and here, as the water begins to clear, they may be taken to the number of several dozen ; often two or three at atime. They are excellent fish for the table. They run up to 4 tb weight, though heavier ones are sometimes taken. Hooks, 4, 5, and 6.

On Tackle and Fly-Making.

It is exceedingly desirable that the angler should be able to make and repair his own tackle. This will probably save him quite one-half of his outlay, and has the satisfac- tion of knowing that he can trust to the tackle, which he cannot always when he buys it; while, in case of accident, he can repair

without delay, when the impossibility of doing so might peril his day's sport. The art of tying strands of gut together and of whipping on a hook may be learnt in a minute; and there is scarcely a book on angling that does not thoroughly explain it. Fly-tying, however, requires more notice.

The simplest form of trout-fly is the hackle, or palmer- fly. Having whipped the gut on to the hook with strong

but fine silk, finishing at the bend of the hook, take two or three strands from the peacock's tail, known as harls, lay the ends together at the bend of the hook and whip them on with the silk, wind the silk on two-thirds up the hook, and then tie on the tip of a cock's hackle. Fig. 13 (page 38) shows the position. Should it be desired, however, to run the hackle all over the body,. it may be tied on along with the peacock's harls. In that case, first wind on the harls round the hook side by side, avoiding the hackle, until they reach the head of the hook, when they must be tied down and cut off ; then wind the hackle on likewise up to the head, pressing it down so as to make the fibres point all towards the tail; and having reached the head, tie that down too and snip off the waste, when fig. 14 is finished, and the hackle or palmer-fly complete (see fig. 14). If it be required to produce a winged fly, a little less hackle must be employed, aud two slips of some suitable feather placed together as a pair of wings, and whipped on as in fig. 15 (see fig. 15). Should a tail be desired, two or three wisps of some suitable feather are whipped on at the bend of the hook before tying on the harls, and if tinsel be needed, that is tied on with the harl, and wound on over the body. Fig. 16 shows the complete fly, with tail, tinsel, and all complete. Various matters are used for bodies, as silk, wool, fur, &c. How to put on fur will be told in tying the salmon-fly.

The method of tying a salmon-fly is rather more com- plicated than that used in the trout-fly. Take a short piece of twisted gut or gimp, double it and lash it on so as to leave an eye at the head, as in fig. 17 (see fig. Lh} F then take a short fragment of tinsel or twist, and tie it on as shown; wind this round the bend of the hook two or three times; this forms the tag, and may be seen com- plete in fig. 18 (see fig. 18); over this tie on the tail, composed of fibres or a topping, é&c., also shown in fig. 18! (see fig. 18); then tie in the silk or wool, or whatever the body is made with, also the tinsel, if

needed ; having tied it in, carry the silk on until the spot where the hackle is to commence is reached, then tie that in, and work the silk on to the shoulder. The result of these preparations is shown in fig. 18 (see fig. 18). Then wind on the silk or wool body evenly until it reaches the shoulder, when fasten it off; next, wind on the tinsel in even spirals, and fasten that off in the same way; next, the hackle, which may be stripped on oue side, if it be required, thinly, or prepared by pressing the fibres together, so as to make them point as far as possible in the same direction. Having fastened off the hackle, the fly appears as in fig. 19 (see fig. 19). ‘Then having carefully left a bit of the hook for the purpose, tie on the wing, which is composed of fibres or strips of feathers laid together. This is a nice operation, and requires a delicate but firm hand. After this, if it be needed, a head can be wound on over the stump of the wing, and for that purpose a fragment of chenille is the best substance. A few turns of the silk fixes the loop and finishes off, and a touch of varnish secures it. ‘The complete fly is shown in fig. 20. In using fur or pig’s wool for a body, the long coarse fibres should be picked out and rejected ; the rest should be pulled into fragments, and then laid in a small ridge along the palm of the hand and rolled over and over, as cigarette makers do their tobacco; and having obtained sufficient coherence, it should be laid along the silk, and the silk being twirled round rapidly, is incorporated with the fur, which can then be wound on the hook to form the body of the fly. Various colours may thus be employed in the same fly. (F. F.)

1 Some flies have over this a couple of turns of ostrich harl or other

feather, which is called the but. It is not necessary, and serves no purpose, but it is shown in the complete fly in fig. 20.

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ANGLO-SAXON LITERATURE. See ENGLISH LITERATURE.

ANGLO-SAXONS. See ENGLAND.

ANGOLA, a name that is employed to designate at least three different, although partly coincident, portions of the west coast of Africa, It is often applied to the whole coast-line, from Cape Lopez de Gonsalvo, in lat. 0°

44’ §., to St Felipe de Benguela, in 12° 24’ S.; the Portuguese consider that the entire country lying between the Zaire or Congo and lat. 18° S., and stretching for a considerable but somewhat indefinite distance into the interior, over which they assert that their authority extends, ought to be called Angola; lastly, the name is by most British geographers and travellers applied to that part of the preceding territory which lies between 8° 20’ and 9° 30’ S., and which nearly corresponds to the Portuguese sub-government of Angola. The natives, whose practice seems to harmonise with the third of these applications of the word, also call the country Dongo. With the exception of a flat, sandy, barren plain, that extends from the coast for a considerable distance inland, Angola, using the word in its most restricted sense, is mountainous and well- watered. Its chief rivers are the Coanza, which bounds it on the north, the Danda, which bounds it on the south, and the Benga. Most of the country is very fertile, pro- ducing palms, citrons, oranges, lemons, bananas, tamarinds, mangroves, aud sugar canes in great abundance. Nor is the fauna less extensive ; all the animals common in inter- tropical Africa are found in Angola, as well as some peculiar to the district ; while the sheep, the cow, and the horse have been imported from Europe. Of its mineral productions, lead, sulphur, petroleum, and iron are plenti- ful; and gold, silver, and copper are said to exist in the interior. Gum, wax, and ivory, are now the most im- portant articles of trade ; but formerly the principal traffic was in slaves. The heat is usually moderate, and the climate comparatively mild and salubrious. The religion of the natives of Angola is Fetichism; they believe implicitly in their priests, who pretend to bestow rain, favourable winds, and other blessings upon those who have propitiated them by liberal gifts. In criminal cases much use is made of what our ancestors called “the judgments of God.” The accused is made to swallow poison, to take in his hand burning coals, or to undergo tests of a similar nature, and, unless he escapes unhurt from these trials, is pronounced guilty; of course the priests contrive that those whom they wish to absolve should suffer no harm, The native huts are formed merely of straw or dried leafy plants, in- tertwisted upon a framework of stakes ; containing no aperture for the admission of light, they form not so much dwelling-houses, as dens for sleeping in, while the tenants spend the day and receive company in an open space in front that is covered with a slight roof. The population of Angola is estimated at about 250,000, of whom about 2000 are Europeans. Angola was discovered by the Portuguese under

Diego Cam in 1484; and since that time, with the exception of a short period, from 1640 to 1648, during which the Dutch attempted to expel them, they have maintained their possession of the country undis- turbed by other European powers. It cannot be said, how- ever, that they have done much during this long rule either to develop the resources of the country or to improve the condition of its people; and, while they permitted an active slave trade to be carried on, their influence must have been much more injurious than beneficial. St Paul de Loando, at which the governor resides, is the chief town. They possess a few forts in the interior, but over the greater part of the country their authority is hardly felt.

ANGORA, or Encurt, the ancient Ancyra, a city of Turkey in Asia, capital of the vilayet of the same name,

situated upon a steep hill, near a small stream, which flows into the Angara, a tributary of the Sakaria or Sangarino, about 220 miles E.S.E. of Constantinople. The modern town is not well built, its streets being narrow and many of its houses of mud; but there are a great many fine remains of Greek, Roman, and Byzantine architecture, the most remarkable of which is a temple of white marble, erected by the inhabitants in honour of Augustus. On the walls of this temple is the famous Monwmentum Ancyranum, an inscription in Greek and Latin, detailing the principal events in the life of the emperor, a great part of which is still legible. Angora has long been celebrated for its goats, whose soft silky hair, about 8 inches long, forms the chief article of export from the town. The fineness of the hair may perhaps be ascribed to some peculiarity in the atmosphere, for it is remarkable that the cats, dogs, and other animals of the country are to a certain extent affected in the same way as the goats, and that they all lose much of their distinctive beauty whcn taken from thcir native districts. The other exports are goat and cat skins, gum, wax, honey, yellow berries, and madder root, while the import of British and other European goods is considerable, although the trade is almost entirely in the hands of Armenians. The population is variously estimated at from 20,000 to 60,000. Ancyra originally belonged to Phrygia, and afterwards became the chief town of the Tectosages, one of the three Gallic tribes that settled in Galatia, about 277

B.c. In 189 B.c., Galatia was subdued by Manlius, and in 25 B.c. it was formally made a Roman province, of which Ancyra was the capital. Ancyra was the seat of one of the earliest Christian churches, founded probably by the apostle Paul, and councils were held in the town in 314 and 358 a.p. In 1402 great battle was fought in the vicinity of Ancyra, in which the Turkish sultan Bajazet was defeated and made prisoner by T'amer- lane, the Tartar conqueror. In 1415 it was recovered by the Turks under Mahomet I., and since that period has belonged to the Ottoman empire.

ANGORNO, or Neornv, a town of Bornu, in Cen- tral Africa, near the south-west shore of Lake Chad, from which it is separated by a level plain that is often under water. It is said to have a population of 30,000, which is much increased during the markets, when a large traffic is carried on in cotton, amber, metals, corals, and slaves.

ANGOSTURA, also called Crupap Boxivar, and San

'Tomas DE LA Nurva Guayana, a town of Venezuela,

capital of the province of Guayana, situated on the right bank of the Orinoco, about 240 miles from its mouths, and only 191 feet above the level of the sea. It is the seat of a bishop, and contains a cathedral, a college, and an hospital, while a fort stands on the opposite side of the river, at this point comparatively narrow. Being the centre of a rich and extensive territory, Angostura would before now have probably become a large and flourishing city, had it not been retarded by the war of independence, and by the unsettled state of the country ; for a long period it retro- graded rather than progressed, and although now in a more prosperous condition, it has not yet reached the posi- tion to which it is entitled. The Orinoco is navigable for vessels of 300 tons, and a considerable trade is carried on in cocoa, sugar, cotton, jerked meat, and hides, as well as in the bark that takes its name from the city. In 1819 a congress met at Angostura, which resulted in the union of Venezuela and New Granada into one government under the name of the republic of Columbia ; and in the same year the town began to be called Ciudad Bolivar, in honour of Simon Bolivar, who freed the country from the yoke of Spain, Population, about 8000.

ANGOULEME, a city of France, capital of the depart- ment of Charente, and formerly of the proviuce of Angou-

mois, situated on the left bauk of the Charente, upon an elevated plateau, 221 feet above the river, at the foot of which, in the suburb of Houmeau, there is a station of the Paris and Bordeaux railway, 66 miles north-east of the latter town. The situation of Angouléme is very delight- ful, and the city itself is in general well built, although in the old quarter many of the streets are narrow and irregu- lar. The chief public buildings are the cathedral of St Peter, rebuilt in 1120, but founded at a much earlier period ; the remains of the old castle in the centre of the town, the birth-place of the celebrated Margaret of Valois, sister of Francis I.; the courthouse, and the town-hall. The town is the seat of a bishop, and has a court of primary jurisdiction, a lyceum, two normal, and several ordinary schools, an hospital, a theatre, and a public library. Angou- léme is an important manufacturing city ; its paper-mills produce large quantities of paper that is highly esteemed throughout France; and there are also distilleries, pot- teries, a cannon foundry, a powder mill, linen and serge factories, as well as a considerable trade in grain, fruit, and salt. Angouléme, the ancient Iculisma, was taken by Clovis from the Visigoths in 507 ; it was repeatedly plun- dered by the Normans in the 9th century, and was long subject to the counts of Angouléme, and also for a con- siderable period to the kings of England; but in 1303 Philip the Fair added it to the royal domain of France. In 1360 it was again surrendered to the English, who were, however, finally expelled in 1369. During the war of the Huguenots it was twice taken by the Protestants, in 1562 and 1568. Population (1872), 25,928.

ANGOULEME, Crartes DE Vatois, DuKe or, the natural son of Charles IX. of France and Marie Touchet, was born 28th April 1573, at the castle of Fayet in Dauphiné. His father, dying in the following year, com- mended him to the care and favour of his brother and suc- cessor, Henri III., who faithfully fulfilled the charge. His mother married Frangois de Balzac, marquis d’Entragues, and one of her daughters, Henriette, marchioness of Verneuil, afterwards became the mistress of Henri IV. Charles of Valois was carefully educated, and was destined for the order of Malta. At the early age

of sixteen he attained one of the highest dignities of the order, being made grand prior of France. Shortly after he came into possession of large estates left by Catherine de Medicis, from one of which he took his title of count of Auvergne. In 1591 he obtained a dispensation from the vows of the order of Malta, and married Charlotte, daughter of Henri, marshal d'Amville, afterwards duke of Montmorenci. In 1589 Henri III. was assassinated, but on his death-bed he com- mended Charles to the good-will of his successor Henri IV. By that monarch he was made colonel of horse, and in that capacity served in the campaigns during the early part of the reign. But the connection between the king and the marchioness of Verneuil appears to have been very displeasing to Auvergne, and in 1601 he engaged in the conspiracy formed by the dukes of Savoy, Biron, and Bouillon, one of the objects of which was to force Henri to repudiate his wife and marry the marchioness. The conspiracy was discovered; Biron and Auvergne were arrested, and Biron was executed. Auvergne after a few months' imprisonment was released, chiefly through the in- fluence of his half-sister, his aunt, the duchess d'Angouléme, and his father-in-law. He then entered into fresh intrigues with the court of Spain, acting in concert with the mar- chioness of Verneuil and her father d'Entragues. In 1604 d'Entragues and he were arrested and condemned to death; at the same time the marchioness was condemned to per- petual imprisonment in a convent. She easily obtained pardon, and the sentence of death against the other two was commuted into perpetual imprisonment. Auvergne

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in the Isle de France, and obtained some successes,

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remained in the Bastile for eleven years from 1605 to 1616. In 1606 a decree of Parliament, obtained by Marguerite de Valois, deprived him of nearly all his possessions, in- cluding Auvergne, though he still retained the title.

lin 1616 he was released, was restored to his rank of colonel-

_general of horse, and despatched against one of the disaf- fected nobles, the duke of Longueville, who had taken

Peronne. Next year he commanded the forces collected In 1619 he received by bequest, ratified in 1620 by royal grant, the duchy of Angouléme. Soon after he was engaged on an important embassy to Germany, the result of which was the treaty of Ulm, signed July 1620. In 1627 he commanded the large forces assembled at the siege of La Rochelle ; and some years after, in 1635, during the Thirty Years' War, he was general of the French army in Lorraine. In 1636 he was made lieutenant-general of the army. He appears to have retired from public life shortly after the death of Richelieu in 1643. His first wife died in 1636, and in 1644 he married Francoise de Nargonne, daughter of Charles, baron of Mareuil. She had no children, and survived her husband many years. Angouléme himself died in 1650, in his seventy-sixth year. By his first wife he had three children: Henri, who became insaue ; Louis Emmauuel, who succeeded his father as duc d'Angouléme ; and Francois, who died 1622.

The duke was the author of the following works :—(1.) Alémoires, from the Assassination of Henri III. to the Batile of Arques, published at Paris by Boneau, and reprinted by Buchon in his Choia de Chroniques, 1836, and by Petitot in his Mémoires, Ist series, vol. xliv. ; (2.) Les Harangues, prononeés en Assemblée de MM. les Prinees Protestants d' Allemagne, par Monseigneur le duc d'Angouléme, 1620 ; (3.) A translation of a Spanish work by Diego de Torres. 'To him has also been ascribed the work, La générale et fidele Rélation de tout ce qui cest passé cen UIsle de Ré, envoyée par le Roi & la Royne sa mere, Paris, 1627.

ANGOUMOIS, an old province of France, nearly cor- responding to the department of Charente. Its capital was Angouléme.

ANGRA, a city on the south coast of Terceira, one of the Azores, the capital of the island and of one of the three civil districts into which the Azores are divided, as — well as the residence of the military governor of the whole group, and of the Roman Catholic bishops. It is a well- built, strongly fortified town, containing an arsenal for the Portuguese royal navy, a cathedral, and several churches, monasteries, and nunneries. The harbour is sheltered on the west and south-west by the promontory of Mount Brazil,

and if this natural protection were supplemented by a breakwater on the south-east, the town would possess a secure and commodious anchorage; as it is, vessels during certain seasons are safer in the open sea. The chief exports are wine and grain; but foreign trade is not large. Population, 11,281.

ANGRI, a town of Italy, in the province of Salerno, situated 114 miles N.W. of the town of Salerno, in a country which produces large quautities of grapes, cotton, and tobacco. Narses defeated Teias, the last king of the Goths, not far from Angriin 553 a.p. Population, 10,332.

ANGUIER, Frangois (born 1604, died 1669), and MicHazL (born 1612, died 1686), two brothers, natives of Normandy, were distinguished sculptors in the time of Louis XIV. The chief works of Francis are the monw- . ment to Cardinal de Bérulle, in the chapel of the oratory at Paris, and the mausoleum of the last duc de Montmo- rency at Moulins. Michael executed the sculptures of the triumphal arch at the Porte St Denis. A marble group of the Nativity in the church of Val de Grace, was reckoned his masterpiece.

ANGUILLA, or Syaxr Istanp, a small British West Indian island, one of the Lesser Antilles, situated 8 miles

north of the island of St Martin, in lat. 18° 12’ N., and long. 63° 8’ W. Its chief products are salt, which is manufactured from a lake in the interior, sugar, cotton, maize, and tobacco, but the soil is comparatively barren, and there is a great deficiency of water in the island. Population, 3000.

ANGUSSOLA, or ANGoscIoLa, SoPHONISBA, one of the best portrait painters of the latter half of the 16th century, was born at Cremona in 1533, and died at Genoa in 1620. In 1560, at the invitation of Philip IL, she visited the court of Madrid, where her portraits elicited great com- mendation. Vandyck is said to have declared that he had derived more knowledge of the true principles of his art from her conversation than from any other source. She painted several fine portraits of herself, one of which is now at Althorp. A few specimens of her painting are to be seen at

Florence and Madrid. She had three sisters, who were also celebrated artists.

ANHALT, a duchy of Germany, lying between lat 51° 33’ and 52° 7’ N., and long. 11° and 12° 36’ E., and com- prising an area of about 896 square miles, Except for a short distance on the west, and for a longer distance on the north-east, where it is bounded respectively by Bruns- wick and the Prussian province of Brandenburg, Anhalt is entirely surrounded by Prussian Saxony, which also intersects it, breaking it up into two large and several small portions. The Hartz mountains extend into the western of the large divisions, but the rest of the country is very flat, and even in the mountainous part no eleva- tions rise to any great height. Most of the plain, which is watered by the Elbe and its tributaries, the Mulde and the Saale, is very fertile, producing large quantities of grain, tobacco, flax, hops, and fruits, especially grapes; cattle and sheep are reared in considerable numbers on the rich pasture lands; game and fish are abundant; while the mines in the Hartz mountains yield iron, lead, silver, and other minerals. The chief manufactures of Anhalt are linen, cotton, and woollen goods, metallic and earthen wares, beer, brandy, and sugar; but the principal export trade is in the raw products. Internally, Anhalt is governed by a constitutional and hereditary inonarchy, the legislative body being a diet of 36 members, of whom 10 represent the nobility; 14, the principal towns; 10, the rural districts; and 2 are nominated by the duke, who has the entire executive power in his own hands; while, as a member of the German empire, the duchy has one vote in the Bundesrath, or Federal Council, and two in the Reich- stag. Its income and expenditure for the year 1872 exactly balanced, being each 2,231,000 thalers, or £334,650; the public debt at the end of 1871 was 4,073,026 thalers, or £610,954. Anhalt contained 203,354 inhabitants in 1871, most of whom are Protes- tants. Its capital is Dessau, and the other chief towns are Bernburg, Kothen, and Zerbst. Railways connect these towns with one another, and also with Berlin and the principal cities of Germany. Bernard, son of Albert the Bear, margrave of Brandenburg, was the first upon whom the title of count of Anhalt was conferred. He died in 1212, and was succeeded in the principality of Anhalt by his son Henry I. ; while Albert, a younger son, received his large possessions in Saxony. On the death of Henry in 1252, Anhalt was divided among his family into three parts,—Ascania, Bernburg, and Zerbst,—which

were afterwards united under Joachim Ernest, who reigned from about 1570 to 1586. In 1603, however, the terri- tory was again broken up, on this occasion into four parts, Dessau, Bernburg, Kéthen, and Zerbst, four of Joachim Ernest's sons inheriting one of these divisions each, while the fifth, Augustus, who was the third in point of age, received a cousiderable sum of money, and the promise

that, in the event of any oue of the other lines becoming extinct, he or his descendants should succeed to the princi- pality ; his brother Christian, of Anhalt Bernburg, also gave him the small property of Plétzkau, from which he took his title. This promise was fulfilled in 1665, when William Louis of Anhalt Kéthen died without direct heirs, and was succeeded by Lebrecht of Anhalt Plétzkau, who thereafter laid aside his own title. The Zerbst line becom- ing extinct in 1793, the principality, in accordance with a compact made in 1665, was divided among the three remaining families; next, by the death of Henry duke of Anhalt Kéthen in 1847, that duchy was a second time left without direct heirs, but was ultimately incorporated with Dessau; and lastly, the Anhalt Bernburg family died out in 1863, leaving the whole of Anhalt under a single ruler. The present duke,—the title of duke was conferred upon the counts of Anhalt in 1807,—Frederick, succeeded his father Leopold in 1871, being at that time about forty years old. Several of the rulers of Anhalt have borne a conspicuous part in the affairs of Europe, and not a few of them have been noted for their zeal in the cause of Protestantism. Wolfgang, a prince of the earlier Zerbst line, was present at the diet of Augsburg in 1530, and was one of those who presented the confession to the emperor, Leopold I., of Anhalt Dessau, was one of the most distinguished soldiers of his time.

ANICHINI, Lvtci, an engraver of seals and medals, a native of Ferrara, lived at Venice about 1550. Michel Angelo pronounced his " Interview of Alexander the Great with the high-priest at Jerusalem," "the perfection of the art." His medals of Henry II. of France and Pope Paul II. are greatly valued.

ANIELLO, Tommaso. See MASANIELLO,

ANILINE, or PuenyLamine (C,H,N), is one of the very numerous products of the distillation of coal tar. The substance has been known to chemists since the year 1826, when M. Unverdorben, by the destructive distilla- tion of indigo, produced a liquid of an oily consistence, which he termed crystalline. In the year 1835, Runge, a German chemist, isolated from the oil of coal tar a sub- stance which, having the property of producing a beautiful blue colour on treatment with chloride of lime, he named kyanol. In 1840, another investigator showed that by treating indigo with caustic potash it yields an oil, and he gave to his product the name Aniline, from the specific name of one of the indigo yielding plants, Jndigofera anil, About the same time it was discovered that on treating nitrobenzol with a reducing agent, an organic base is formed, to which the observer of this reaction gave the name benzidam. Professor Hofmann, while a student in the laboratory of Baron Liebig, investigated these variously prepared substances, and found them to be identical in composition and action, and thenceforth they took their place as one body, under the name Aniline or Phenylamine. Pure aniline is a basic substance of an oily consistence, colourless, boiling at a temperature of 182° C. Dropped on paper aniline produces a greasy stain, which, owing to its volatilising at an ordinary atmospheric temperature, quickly disappears. On exposure to air it absorbs oxygen rapidly, and becomes of a deep brown colour; and it ignites readily, burning with a large smoky flame. It is possessed of a somewhat pleasant vinous odour, and a burning aromatic taste. It is a highly acrid poison, and Dr Letheby has pointed out that the poisonous action of nitrobenzol is due to a change of that substance into aniline taking place within the stomach.

The readiness with which aniline, in certain of its re- actions, produces very brilliant colours, was of course known to chemists from the time Runge produced it from coal tar and gave it the name kyanol. Up to year 1858

it, however, possessed nothing beyond a scientific interest. On the 26th of

aniline, Perkin’s purple, as well as by various other names. The discovery of Mr Perkin formed the turning-point in the history of aniline, and was indeed the beginning of a great revolution in the arts and manufactures connected with the dyeing of textile fabrics. The manufacture of aniline dyes was

really first begun in France, the French manu- facturers acting on the information supplied by Mr Perkin's patent specification. It immediately spread to all in- dustrial centres, and became one of the most eagerly investigated of all commercial undertakings. A rapid suc- cession of patents were applied for and obtained ; new processes and combinations were continually being pro-

jected, and a great variety of colours were tried with more:

or less success as commercial substances. The activity of

scientific research kept pace with the energy of manufactur-

ing enterprise, resulting in a rapid improvement of pro- cesses, decrease in the cost of the mauufacture, and a great increase in the beauty and tinctorial effect of the dyes pro- duced. At the present time every colour, and all tints and shades of colours, are produced from aniline ; and, while the processes employed and the combinations formed are very numerous, the names under which the dye-stufis are sold must be said to be endless.

Of the processes by which aniline may be prepared, that only is available in manufacturing which was devised by Zinin, when he prepared it, under the name of benzidam, from nitrobenzol. Aniline is only found in very small quantities as a dicect product of the distillation of coal tar, but a large proportion of light hydrocarbons are among the products when the temperature ranges between 80° C. and 130° C. The chief of these is benzol, with smaller quanti- ties of toluol and other closely allied substances. These hydrocarbons, when acted upon by strong nitric acid, give up an atom of hydrogen, the place of which is taken by one of nitroxyl (NO,), and benzol is thus transformed into nitrobenzol: 4.e., benzol (C,H,) + nitric acid (HNO,)= nitrobenzol (C,H,;NO,) + water (H,O). Nitrobenzol is a yellow oily liquid, with the exact flavour of bitter almonds, for which it has long been used as a substi- tute in fancy soap-making, under the name of essence of mirbane. Its transformation into aniline is now practi- cally effected by submitting it to the reducing influence of nascent hydrogen, by the action of iron and acetic acid. To a mixture of nitrobenzol and strong acetic acid a cer- tain proportion of iron filings is gradually added. Very energetic chemical action is set up with great disengage- ment of heat.

When the reaction is complete the aniline is distilled over by superheated steam. The aniline of commerce thus prepared is not a chemically pure product, but a mixture of aniline and toluidine, just as the com- mercial benzol operated on is a mixture of benzol with toluol, In the manufacture of dyes it is found essential that certain proportions of both aniline and toluidine should be present in the aniline oil operated on.

The method by which Mr Perkin obtains from aniline the violet colour known as mauve, is by mixing a solu- tion of sulphate of aniline and of potassic dichromate in equivalent proportions, and leaving them for several hours till the resulting reaction is complete. A black precipitate is formed, which is washed free from the potassic sulphate it contains, and then treated with naphtha to dissolve out the resinous matter contained in the mass. The residue consists of the mauve dye, and may be dissolved in alcohol. It has been found to be the sulphate of a base, to which the name mauveine has been given.

The greater proportion of aniline dyes manufactured are

August 1858, Mr W. H. Perkin obtained a patent for the production of a dye-stuff derived from which soon became well known as mauve, or

ANILINE

now produced directly or indirectly from another basic body, termed rosaniline. About the time of the F rench-Austrian war in 1859, a second coal-tar dye was introduced into commerce, which became popularly known as aniline red or Magenta, from the battle fought at the period of its intro- duction. Dr Hofmann’s investigations into the nature and composition of this dye have done more to place the entire industry on a satisfactory basis than any other undertaking. He found that it consisted of a salt of a basic substance, to which he gave the name rosaniline (C,,H,,N,H,O). For the preparation of rosaniline, Hofmann found that a certain proportion of toluidine must be present in the commercial aniline employed. Rosaniline is now entirely manufactured by treating aniline of a known composition with a strong solution of arsenic acid in an iron retort, heated to a temperature of not more than 180° ©. The reaction occupies about eight hours ; and at the conclusion of the operation a crude mass, consisting of rosaniline arsenite

and arseniate, is found, which is next dissolved in water acidulated with hydrochloric acid. Common salt is added to this solution, when a double decomposition takes place. Rosaniline hydrochlorate is formed on the one hand, and sodium arseniate and arsenite on the other. For the preparation of the salts of rosaniline, the base is treated directly with acids.

Rosaniline blues are prepared by acting upon commercial aniline with a salt of rosaniline, such as the acetate, under the influence of a heat of about 190° C., kept up for two hours. ‘The reaction which takes place is the substitu- tion of three atoms of phenyl for three of hydrogen, and hence these blues are chemically salts of triphenylrosani- line. Violet colours, such as Hofmann’s violet, are pre- pared by an analogous process to that employed for the blues, by treating rosaniline with the iodides of methyl or ethyl, atoms of these radicals taking the place of hydrogen, and forming ethylic or methylic rosaniline. Aniline green is formed by the action of aldehyd on a solution of aniline red in sulphuric acid, and subsequent boiling in a solution of hyposulphite of soda. Aniline yellow, or yellow fuchsine, ‘5 formed from a base named chrysaniline, a minor product of the formation of rosaniline; but most of what is termed aniline yellow is prepared from picric acid, a different pro- duct of the distillation of coal tar. Various shades of brown and maroon, as well as black colours, are regular commercial products; but they are neither so well under- stood, nor of such consequence as the reds, blues, and greens.

Aniline colours are employed in the industrial arts for numerous other purposes besides their great use as dyeing materials. Violet ink and other fancy coloured inks are prepared from them. They are used by paper manu- facturers for tinting pulps, and for the superficial staining of finished paper. They are likewise used by paper stainers in the printing of wall papers, in the preparation of lithographic inks, and to some extent for water colours. They are largely employed as colouring materials in per- fumery, fancy soaps, and cosmetics, besides having many other minor applications.

Concerning these dyes, Dr Hofmann, to whom the industry is so much indebted, wrote, in 1862, while it was yet in its infancy, “ Instead of disbursing her annual millions for these substances, England will, beyond question, at no distant day become herself the greatest colour- producing

country in the world; nay, by the very strangest of revolutions, she may erelong send her coal-derived blues to indigo-growing India, her distilled crimson to cochineal- producing Mexico, and her fossil substitutes for quercitron and safflower to China, Japan, and the other countries whence these articles are now derived.” It is scarcely needful to say that these bold anticipations have already been fully realised.

ANIMAL KINGDOM

NIMALS, Cuassirication or. The object of classi- fication is to bring together those things which are like, and to separate those which are unlike. ach science has its own classification of the objects with which it deals, the kinds of likeness and unlikeness according to which these objects are grouped varying in relation to the special qualities or properties of matter with which the science is concerned. Thus, the physicist classifies bodies according to their mechanical, electrical, thermic, or other physical properties ; the chemist, regards their composition ; while the zoologist and the botanist group them according to their likenesses and unlikenesses of structure, function, and distribution.

As soon as the labours of anatomists had extended over a sufficiently great variety of animals, it was found that they could be grouped into separate assemblages, the members of each of which, while varying more or less in minor respects, had certain structural featurcs in common, and these common morphological characters became the definition of the group thus formed. The smallest group thus constituted is a MorpHoLocicaL Species. A certain number of species having characters in common, by which they resemble one another and differ from all other species, constitutes a GENUS; a group of gencra, similarly associated, constitutes a Faminy; a group of families, an ORDER; a group of orders, a Ciass; a group of classes, a SuB- KINGDOM ; while the latter, agreeing with one another only in the characters in which all animals agree, and in which they differ from all plants, make up the ANIMAL KINGDOM.

The formation of a morphological classification is there- fore a logical process, the purpose of which is to throw the facts of structure into the

smallest possible number of general propositions, which propositions constitute the definitions of the respective groups. A perfect classification will fulfil this end, and, in order to form it, two conditions are necessary: Firstly, we must have a full knowledge of the adult structure of every animal, recent and extinct ; secondly, we must know all the modifications of structure through which it has passed, in order to attain the adult condition, or in other words, the mode of development of the animal. For it is the sum of all the structural con- ditions of an animal which constitutes the totality of its structure ; and if two animals, similar in their adult state, were unlike in their development, it is clear that the latter circumstance would have to be taken into account in deter- mining their position in a classification.

Linneus, living at a time when neither comparative anatomy nor embryology can be said to have existed, based his classification of animals upon such broad resemblances of adult structure and habit as his remarkable sagacity and wide knowledge enabled him to detect. Cuvier and his school devoted themselves to the working out of adult structure, and the Legons d'Anatomie Comparée and the Regne Animal are wonderful embodiments of the results of such investigations. But the Cuvicrian system ignores development ; and it was reserved for Von Baer to show the importance of developmental studies, and to inaugurate the marvellous series of researches which, in the course of the last fifty years, have made us acquainted with the manner of development of every important group of animals. The splendid researches of Cuvier gave birth to scientific paleontology, and demonstrated that, in some cases, at any rate, extinct forms of life present characters intermediate between those of groups which are at present widely different. The investigations of Agassiz upon fossil

fishes tended in the same direction, and further showed that, in some cases, the older forms preserve, as permanent features, structural characters which are embryonic and transitory in their living congeners. Moreover, Darwin, Owen, and Wallace proved that, in any great area of geographical distribution, the later tertiary extinct forms are clearly related to those which now exist in the area. As Taxonomic investigations increased in accuracy and in extent, the carcful examination of large suites of specimens revealed an unexpected amount of variability in species ; and Darwin's investigation of the phenomena presented by animals under domestication

proved that forms, morpholo- gically as distinct as admitted natural genera, could be produced by selective breeding from a common stock.

Upon the foundation thus furnished, the doctrine of Evolution, first scientifically formulated by Lamarck, has been solidly built up by Darwin, and is now, with various modifications and qualifications, widely accepted. But the acceptance of this doctrine introduced a new element into Taxonomy. If all existing animals are the last terms of a long series of developmental stages, represented by the animals of earlier ages of the earth's history, the starting point of which has beena primordial form of the extremest simplicity consistent with animal life, then every animal has an "ancestral" as well as what may be termed a "personal" embryology; and the same considerations which oblige the Taxonomist to take accouut of the latter phenomena, compel his attention to the former stages of development. Two animals belong to the same group, when they are similar in structure, personal development, and ancestral development, and not otherwise. Hence it follows that a perfect and final zoological classification cannot be made until we know all that is important con- cerning—1, the adult structure ; 2, the personal develop- ment; and 3, the ancestral development of animals. It is hardly necessary to observe that our present knowledge, as regards even the first and second heads, is very imperfect ; while, as respects the third, it is utterly fragmentary.

The only genus of animals of which we possess a satis- factory, though still not quite complete, ancestral history, is the genus Hguus, the development of which in the course of the Tertiary epoch from an Anchitherioid ancestor, through the form of Hipparion, appears to admit of no doubt. And all the facts of geology and paleontology not only tend to show that the knowledge of ancestral development is likely long to remain fragmentary, but lead us to doubt, whether even such fragments as may be vouchsafed to us by the extension of geological inquiry will ever be sufficiently old, in relation to the whole duration of life on the earth, to give us positive evidence of the nature of the earliest forms of animals.

While holding the doctrine of evolution to its fullest extent, and having no doubt that Taxonomy ought to be the expression of ancestral development, or phylogeny, as well as of embryogeny and adult structure, and while con-

ceiving that the attempts at founding a scientific phylo- geny, which have been made by Haeckel and others, are of much interest and importance as guides to and sugges- tors of investigation, the present writer looks upon all such attempts as provisional hypotheses ; and he conceives that, at any rate for the present, it is a mistake to introduce considerations of this purely hypothetical kind into classi- fication, which should be based on verifiable data.

In the case of an existing animal, it is possible to deter- mine its adult structure and its development, and there- fore to assign its place relatively to a animals, the

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structure and development of which are also known ; and, in the case of an extinct animal, it is possible to ascertain certain facts of its structure, and sometimes certain facts of its development, which will justify a more or less positive assignment of its place relatively to existing animals. So far, Taxonomy is objective, capable of proof and disproof, and it should leave speculation aside, until speculation has converted itself into demonstration.

In the present rapidly shifting condition of our knowledge of the facts of animal structure and development, however, it is no easy matter to group these facts into general pro- positions which shall express neither more nor less than is contained in the facts; and no one can be more conscious of the manifold imperfections of the following attempt at such a classification than the author of it.

In certain of the lower animals, the substance of the body is not differentiated into histogenetic elements ; that is, into cells! which, by their metamorphoses, give rise to tissues. In all other animals, on the other hand, the pro- toplasmic mass, which constitutes the primitive body, is converted into a multitude of cells, which become meta- morphosed into the tissues of the body.

For the first of these divisions the old name of Protozoa may be retained ; for the second, the title of Merazoa, recently proposed by Haeckel, may be conveniently employed.

I. THE PROTOZOA.

Haeckel has shown that, among the Protozoa, there are some which are simpler than the rest, inasmuch as they are devoid of both nuclei and contractile vesicles. To these he applies the name of —

1. Monera.—Among the members of this group, which are at present known, three series are distinguishable, in all of which multiplication is effected by division, preceded, or not preceded, by the assumption of an encysted condition. In one state, each of these Monera is a myxopod,? that is, is provided with longer or shorter pseudopodia as locomotive organs, and, in Protameba and Protogenes, the result of the process of division is also two or more myxopods. But, ia Protomonas, the myxopod, after becoming encysted, gives rise by division to bodies provided with long flagelli- form cilia, by which they are propelled, and which may be termed mastigopods ; and in Myzxastrum, the encysted body divides into a multitude of oval particles, each en- closed in its own coat. ‘hese are set free, and each gives rise to a new myxopod of the same character as the parent.

In Protomyxa, the myxopods coalesce into a reticulated plasmodium ; and Vampyrella is parasitic, devouring stalked diatoms, and encysting itself upon the ends of their stalks, the encysted form dividing into new Vam- pyrelle. Most of these interesting Monera have been made known by Haeckel, so that, in all probability, many others remain to be discovered. It is probable that the /ora- minifera, notwithstanding the complexity of the skeletons, belong to this group, but too little is known of the struc- ture of their soft parts to enable any certain conclusion to be drawn respecting them, and the analogy of Gromia leads to the suspicion that they may belong to the next division.

9. Endoplastica.—In these Protozoa a portion of the in- terior protoplasmic body is separated from the rest as a dis- tinct, more or less rounded, body,

which may be termed the endoplast, as a term suggestive of its similarity to the nucleus of a histogenetic cell, without implying its identity there-

aaa 1 The term “cell” is used here in its broadest sense, as equivalent to a nucleated mass of protoplasm. 2 ‘The term “ Rhizopod ” is already employed in a limited and special sense.

juices of their prey.

with. Of such endoplasts there may be one or many, but the protoplasm in which they lie docs not give rise to cells, which become metamorphosed into elements of the tissues. Very often they possess one or more vacuoles, which rhyth- mically dilate and contract, in accordance with the changes in the protoplasm in which they lie, and which are termed contractile vesicles.

In this division of the Protozoa, three groups—the Amebide, the Flagellata (or flagellate Infusoria), and the Gregarinide—closely repeat the forms and mode of reproduction of the Protamebide, Protomonadide, and Myxastride among the MMonera. Among the rest, the Acinetide are distinguished by their pseudopodia being converted into suckers, through which they draw the Tn all these, and in the preceding forms, there is a more or less marked distinction of the pro- toplasm constituting the body into a firmer and denser outer layer, the ectosare, and a more fluid inner substance, the endosarc; and, in some of the Gregarinide, the ectosare becomes differentiated into muscular fibres. In the Flagel- lata there is a permanent oral aperture; and in one member of this group, Woctiluca, additional complications of structure, in the form of a ridge-like tooth and a tentacle, occur. In the Radiolaria, the body is still more clearly differentiated into an inner substance, surrounded by a capsule, and containing nuclei and even cells, and a vacuo- lated ectosare, whence the radiating pseudopodia proceed. Coloured corpuscles, usually yellow, appear in the ectosarc, and have been shown by Haeckel to contain starch and to multiply independently. In the Crliata (ciliated Infu- soria), with which the Catallacta of Haeckel may be included, the differentiation of the protoplasm of the body, without any development of histogenetic cells, goes still further. A permanent mouth and anus may appear, con- nected by a permanently softer and more fluid region of the protoplasm (as is plainly to be seen, for example, in Nyctotherus) foreshadowing an intestinal cavity. The ecto- sarc may be differentiated into a specially modified cortical layer, and well-marked muscular fibres may be developed. Morever, the endoplast, or “ nucleus,” becomes an organ of reproduction, the germs of the young being given off by division from it. Very generally, a small body—the so-called “ nucleolus,” but which has, admittedly, nothing to do with the structure so

named in a true cell, and may be termed the “ endoplastula”—is to be found close to the nucleus, and there is some ground for supposing it to be a testis. The Jnfusoria frequently multiply by fission, which may, or may not, be preceded by encyst- ment; and in many of them, as in the Gregarinde, Acinetide, and some Flagellata, conjugation has been observed. It is yet disputed how far the conjugation is a necessary antecedent of the process of endogenous germ formation.

Ehrenberg concluded, from those remarkable researches which first gave a clear insight into the structure of the ciliated Jnfusoria, that they were animals of complex structure, possessing, on a minute scale, all the organs characteristic of the higher forms of animal life. In opposi- tion to this view, Dujardin started the conception that they are little more than masses of sarcode (= protoplasm) ; and Von Siebold, modifying this view in accordance with the ccll theory, regards them as the equivalents of single cells of the tissues of the higher animals. The result of the long controversy which has been carried on on this subject seems to be, on the one hand, that Ehrenberg was quite right in vindicating for the Jnfusoria a far greater com- plexity of structure than they had been supposed to possess. It is certain that an Infusorium may possess a distinct integumentary layer, muscles, a permanent cesophagus, a permanent anal area, and, in some cases, a persistent tract

of the body substance, more permeable to alimentary matters than the rest, which might be fairly termed a permanent alimentary tract. Moreover, there is much reason for re- garding the endoplast and endoplastula as generative organs, while there is, sometimes, a rather complex persis- tent system of water vessels. But, on the other hand, this complexity of organisation is different from that observed in the higher animals, inasmuch as the various structures enumerated do not result from the metamor- phosis of histogenetic cells, but arise by immediate differ- entiation of the finely granular protoplasm of which the body is composed. And, so far, Von Siebold appears to have been fully justified in regarding a ciliated Infusorium as the homologue of a single cell. This is a view which will present no difficulty to those who are familiar with the morphology of the

lower plants. The complicated my- celium of Mucor Mucedo, for example, is, while young, nothing but a single cell; and, in Cawlerpa, a single undi- vided cell grows, without division, into an organism which simulates one of the higher Algz in the diversity of its parts.

II. THe METAzoa.

The germ becomes differentiated into histogenetic cells, and these cells become arranged into two sets, the one con- stituting the outer wall of the body, or ectoderm, while the other, or endoderm, lies internal to the foregoing, and con- stitutes the lining of the alimentary cavity, when, as is usually the case, a distinct alimentary cavity exists. In the embryo, the representatives of these two layers are the epiblast and hypoblast.

Allthe Metazoa, in fact, commence their existence in the form of an ovum, which is essentially a nucleated cell, sup- plemented by more or less nutritive material, or food yelk. The ovum, after impregnation, divides into cleavage masses, or blastomeres, giving rise to a Morula, in the midst of which arises a cavity, the blastocele (cleavage cavity, “ Furchungshohle” of the Germans), which may be larger or smaller, filled only with fluid, or occupied by food yelk. When it is largest, the blastomeres, disposed in a single layer, form a spheroidal vesicle, enclosing a correspondingly shaped blastoccele. When it isreduced to a minimum, the Morula is an almost solid aggregation of blastomeres, which may be nearly equal in size, orsome may be much larger than others, in consequence of having undergone less rapid division. The next stage in the development of the embryo of a Metazoon consists (in all cases except a few parasitic anenterous forms) in the conversion of the Morula into a body having a digestive cavity, ora Gastrula. The animals in which the embryo takes on the form of a Gastrula, may be termed, as Haeckel has proposed, Gastree.

The conversion of the Jorula into the Gastrula may take place in several ways.

In the simplest, the Morula being composed of equal or nearly equal blastomeres, more or less completely converted into cells, these differentiate themselves into an outer layer, the epiblast, investing the remaining cells, which constitute the hypoblast. The central cells of the

hypoblast next diverge and give rise to a space filled with fluid, the alimentary cavity, which opens at one end, and thus gives rise tothe Gastrula. This is the process generally observed in Porifera, Coelenterata, Turbellaria, Trematoda, and Nematoidea.

In a second class of cases, the Morula becomes converted into blastomeres of unequal sizes, a small and a large set. The smaller rapidly become converted into cells, and invest the larger and any remains of the food yelk, as a blastoderm, which at first represents only the epiblast of the former case. The hypoblast arises either from the epiblast thus formed, or from the included larger blastomeres. This is the process

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observed in certain Zurbdellaria, in the Ctenophora, in the Oligocheta and Hirudinea, in the Arthropoda, and in most Vertebrata.

In a third group of instances, the Morula, whether con- sisting of equal or unequal blastomeres, becomes spheroidal, and encloses a correspondingly shaped blastoccele. One part of the wall of this vesicular Morula then becomes invaginated, and gives rise to the alimentary cavity, with the hypoblast which limits it. This process has been observed in the Chetognatha, Echinodermata, Gephyrea, polycheetous Annelida, Enteropneusta, Brachiopoda; in most Mollusca ; in Amphioxus ; and, slightly modified, in Petromyzon and inthe Amphibia. These various modes in which the two primary layers of the germ may be developed shade off into one another, and do not affect the essence of the process, which is the segregation of one set of cells to form the external covering of the body, and of another set to constitute the lining of the alimentary canal.

In whatever manner the Gastrula is formed, and what- ever be its shape when its alimentary cavity is complete, one of two things happens to it. It becomes provided with many ingestive apertures, distinct from that first formed ; or with only one, which may or may not be distinct from the first aperture. The former division comprises only the Sponges (Porifera or Spongida) in which, as the remark- able researches of Haeckel have shown, the walls of the deeply cup-shaped Gastrula become perforated by the

numer- rous inhalent ostioles, while the primitive opening serves as the exhalent aperture. These may be termed the Metazoa polystomata.

The latter division includes all the remaining forms, which may be grouped together as Metazoa monostomata. Among these, two primary gronps are distinguishable, of which the second exhibits an advance in organisation upon the first. In the first, the aperture of the Gastrula be- comes the permanent mouth (Archwostomata). In the second, the permanent mouth is a secondary perforation of the body wall (Deuterostomata).

1. It is now well established that the aperture of the Gastrula becomes the oral aperture of the adult in the Ceelenterata, which group includes animals differing much in grade of organisation, from the simple Hydra to the complex Ctenophore, but all manifestly exhibiting varia- tions of one fundamental type. Parallel with these may be ranged an asscmblage composed of the Zurbellaria, Lotifera, and Trematoda, which are associated together by the closest resemblances of structure, and which present an even greater range in grade of organisation than the Coelenterata. The lower Rhabdocela come very close to the Infusoria (as close as the multicellular to the unicellular Algz), and are but little superior to Hydra in the degree of their organic differentiation ; while, in the 7rematoda, the land Planarie, and the Nemertide@, we have animals which attain a considerable complexity, and in the case of many Trematoda and of Lineus (Pilidium) undergo remarkable metamorphoses. As a cognate group, the Nematoidea may be enumerated, extremely simple in their lowest forms, considerably differentiated in the higher, and connected with the Turbellaria by such forms as Polygordius. The Oligocheta and the Hirudinea also belong to this division of Scolecimorpha, but they differ from the foregoing in the development of a segmented mesoblast.

In the Celenterata, Nematoidea, Turbellaria, Trematoda, and Rotifera, the mode of origin of the cells which lie between the epiblast and the hypoblast, constitute the meso- blast, and give rise to the connective tissue and muscles of the body wall and of that of the intestine, is not precisely known. ‘They may take their origin in the epiblast, or in the hypoblast, or in both. But in the Olgocketa and

the Hirudinea, after the epiblast and hypoblast are differen-

tiated, the cells of the latter give rise by division to two bands of cells, which lie, one on each side of the long axis of the ventral face of the worm, and constitute the meso- blast. This becomes marked out by transverse constric- tion into segments, and, in each segment, gives rise to all the tissues which lie between the epiblast (epidermis) and hypoblast (epithelium of the alimentary canal). The mouth corresponds with the primitive involution of the Morula ; the anal aperture is a new formation. In the Nematordea and in the lower Rhabdocele Zurbellaria, the intestinal canal is a simple tube or sac. But in some Turbellarva and Trematoda, the alimentary canal gives off diverticula, which ramify through the mesoblast and even unite to- gether. The like takes place in a great many Coelenterata, and the “gastrovascular apparatus,” as it has been well termed, which is thus formed, is highly characteristic of them. The animals just referred to, therefore, have an “ entero- cole” more or less distinct from the proper digestive cavity, but connected with it, and ramifying through the mesoblast.

9. In the remaining members of the animal kingdom, the embryo develops a secondary mouth as a perforation of the body wall, the primary aperture sometimes becoming the anus, and sometimes disappearing. Of these Metazoa

deuterostomata, there are some which follow the mode of

development of the Oligocheeta and Hirudinea very closely, 3o far as the formation and segmentation of the mesoblast

is concerned, though the question, whether this segmented

mesoblast arises from the epiblast or the hypoblast, has

not been exhaustively worked out. These are the Anne-

lida polycheta; and there is the closest resemblance in development between them and the lower Arthropoda

(Crustacea, Arachnida, lower Insecta), while, in the higher Arthropods, the process 1s complicated by the development

of an amnion, and by some other special peculiarities which need not be considered in detail. In all these Metazoa, whatever cavities are developed in the mesoblast, whether a wide perivisceral cavity, or vascular canals, or both combined, they arise from the splitting or excavation of tho mesoblast itself, and are not prolongations of the alimentary cavity. Hence they may be termed Schizoccela.

But, in certain other deuterostomatous Metazoa, the meso- blast becomes excavated, and a " perivisceral cavity" and vessels are formed in quite another fashion.

Thus in the Chetognatha, represented by the strange and apparently anomalous Sagitta, Kowalewsky's researches show, that the vitellus undergoes complete segmentation, and is converted into a vesicular Morula, on one side of which involution takes place, and gives rise to the primi- tive alimentary canal, of which the opening of involution becomes the permanent anus, the mouth being formed by perforation at the opposite end of the body. Before the mouth is formed, however, the primitive alimentary cavity throws out, on each side,a cxcal pouch, which extends as far forwards as its central continuation does, and grows backwards behind the anus. The two sacs, thus prolonged posteriorly, meet, but remain divided from one another by their applied walls in the median line. These lateral sacs now become shut off from the median portion of the primi- tive alimentary cavity (which opens at its anterior end, and becomes the permanent alimentary canal), and are con- verted into shut sacs, the cavity of each of which forms one-half of the perivisceral cavity. The inner wall of each sac, applied to the hypoblast, gives rise to the muscular wall of the intestine; and the outer wall, applied to the epiblast, becomes the muscular wall of the body, and from it the generative organs are evolved. The great ganglia and nerves are developed from the cells of the epiblast. Thus Sagitta is temporarily ccelenterate, but the two gastrovas-

cular sacs, each enclosing an enteroccele, become shut off

from the alimentary canal and metamorphosed into the

walls of the perivisceral cavity. But it is not altogether clear whether the cells of the enteroccele give rise only to the lining of the perivisceral cavity, and whether the muscles and connective tissue are otherwise derived or not. Kowalewsky's evidence, however, is in favour of the origin of the muscles directly from the cells of the mesoblastic diverticula.

In the Echinodermata, the brilliant investigations of Johannes Miiller, confirmed in their general features by all subsequent observers, proved, firstly, that the ciliated embryonic Glastrula (the primitive alimentary canal of which is formed by involution of a vesicular blastoderm), to which the egg of all ordinary Echinoderms gives rise, acquires a mouth, by the formation of an aperture in the body wall, distinct from the primitive aperture of the Gastrula, so that, in this respect, it differs from the embryo of all Oclenterata ; secondly, that the embryo thus pro- vided with mouth, stomach, intestine, and anus acquires a complete bilateral symmetry ; thirdly, that the cilia, with which it is primitively covered, are ultimately restricted to one or more series, some of which encircle the axis of the body, or a line drawn from the oral to the anal aper- tures; and fourthly, that, within this bilaterally sym- metrical larva or Echinopedium, as it may be called, the more or less completely radiate Echinoderm is developed by a process of internal modification.

Miiller believed that the first step in this process was

the ingrowth of a diverticulum of the integument, as a hollow process, which became converted into the ambulacral vascular system of the Echinoderm. He did not attempt to explain the origin of the so-called blood-vascular system, or pseudheemal vessels, nor of the perivisceral cavity. Miiller's conclusions remained unchallenged until 1864, when Prof. Alexander Agassiz took up the question afresh, and, in a remarkable paper on the development of the genus Asteracanthion, detailed the observations which led him to believe that the ambulacral vessels do not arise by 'nvolution of the external integument, but that they com- mence as two primitively symmetrical diverticula of the stomach (the ' wiirstformige Korper " of Miiller), one of which becomes connected with the exterior by an opening (the dorsal pore observed by Miiller, and considered by him to be the origin of the ambulacral vessels), and gives rise to the ambulacral

vessels, the ambulacral region of the body of the Echinoderm being modelled upon it; while upon the other gastric sac, the antambulacral wall of the starfish body is similarly modelled. Both gastric sacs early become completely separated from the stomach of the Echinopedium, and open into one another, so as to form a single horseshoe-shaped sac, connected with the exterior by a tube which is converted into the madreporic canal. Agassiz does not explain the mode of formation of the perivisceral cavity of the starfish, and has nothing to say respecting the origin of the pseudhzemal vessels. Recently, Metschnikoff has confirmed the observations of Agassiz, so far as the development of the ambulacral system from one of the diverticula of the alimentary canal of the starfish larva is concerned, and he has added the important discovery that the perivisceral cavity of the Echinoderm is the product of what remains of these diver- ticula. Moreover, his observations on other Echinodermata show that essentially the same process of development of the peritoneal cavity occurs in Ophiuride, Echinide, and Holothuride.

The precise mode of origin of the pseudheemal system, or so-called blood-vessels, of the Echinoderms is not yet made out. But it is known that the cavity of these vessels contains corpuscles similar to those which are found in the perivisceral cavity and in the ambulacral vessels, and that all three communicate.

ANIMAL KINGDOM

Both Agassiz and Metschnikoff justly insist upon the correspondence in development of the lateral gastric diverticula of the Hchinopedium with the gastrovascular canal system of the Ctenophora ; and, on the ground of this resemblance, the former refers the Echinoderms to the Radiata, retaining under that Cuvierian denomination the Acalephe: (Celenterata) and the Echinodermata. But this arrangement ignores the rcal value of his own discovery, which shows that the Echinoderms have made a great and remarkable step, in passing from their primarily ccelen- terate stage of organisation to their adult condition, And it further ignores the unquestionable fact, admirably brought out by the same excellent observer’s recent investigations into the development of Balanoglossus, that the Hchino- pedium is almost identical in structure with the young of animals,

such as the Gephyrea and Hnteropneusta, which are in no sense radiate, but are, eminently, bilaterally symmetri- eal. In fact, the larva of Balanoglossus (the sole repre- sentative of the Hnteropneusta), was originally described by Miiller, under the name of Zornaria, as an Echinoderm larva; and was subsequently more fully examined by Prof. Alex. Agassiz, who also regarded it as an unquestionable Echinoderm larva; and it is only recently that it has been proved, partly by Metschnikoff and partly by Agassiz himself, to be the larval form of Balanoglossus. In Balanoglossus, as in the Echinoderms, it appears that saccular outgrowths of the intestine give rise to the perivis- ceral cavity and its walls; and, if such be the case, the mesoblast will be chiefly, if not wholly, represented by diverticula of the alimentary canal. Thus in the Cheetog- natha and Echinodermata, and possibly in the Lnteropneusta, the perivisceral cavity is a portion of the alimentary cavity shut off from the rest; and, in contradistinction to the Schizocela, in which the perivisceral cavity is produced by a splitting of the mesoblast, they may be said to be Ln- terocela.

If we endeavour to determine the place of the three remaining great groups of animals, the Mollusca, the T'uni- cata, and the Vertebrata, obstacles arise,—firstly, from a want of sufficiently exact knowledge respecting the JZol- lusca; and secondly, from the difficulty of interpreting certain well-ascertained facts in the Vertebrata.

That the Mollusca, including under that name the Polyzoa and Brachwopoda, as well as the higher Mollusks, are closely allied to the Annelida, is readily deinoustrated. The known forms of Brachiopod, Lamellibranch, Pteropod, and Gasteropod larve all have their parallels among Annelidan larve. The Polyzoa are closely allied with the Gephyrea and Rotifera; and a Mollusk may be said to be a few-segmented annelid with a mantle. But whether the perivisceral cavity is developed in the annelidan or in the echinoderm fashion is not yet clear. In the Polyzoa, the evidence is at present insufficient to justify any conclu- sion. In the Brachiopoda, there is some ground for think- ing that the perivisceral cavity is formed in the same way as in Sagitta and the Lchinodermata; while, in the Lamelli- branchvata and Odontophora, there is every reason to believe that the perivisceral cavity is formed by splitting of the mesoblast, or that they are schizoccelous.

In the lowest Z'unicata, represented by Appendicularia, the recent investigations of Fol have shown, that, in the adult, the body proper is formed almost exclusively by an ectoderm and endoderm, which proceed directly from the epiblast and hypoblast of the embryo. It is only in the caudal appendage that a distinct mesoblast is represented by the notochord and the muscles. The blood channels correspond with the blastoccele, and the "house" in which these singular animals shelter themselves is a cuticular secretion, representing the cellulose coat of the higher ascidians. The Appendicularie have no atrium,

or at most only rudiments of it, hence the branchial clefts open directly on the hemal aspect of the body, which corresponds with the ventral face of a vertebrate animal. In all other Zunzcata, an atrial cavity is formed by involu- tion of the ectoderm, which thus gives rise to a cavity on each side of the branchial sac, into which the branchial clefts of the adult open; and a thick cellulose cuticula, into which cells from the ectoderm usually wander, invests the exterior of the body. The "atrial tunic," or invagi- nated layer of the ectoderm, is reflected, as a visceral layer, over more or less of the outer surface of the alimentary canal, and, as a parietal layer, over more or less of the inner surface of the body wall ; and the space betwcen the two (the blastoccele) becomes converted into the blood passages. Thus, such an ascidian resembles a vertebrated animal, not only in the manner in which its nervous centre is deve- loped, but in the fact that it possesses an atrial cavity, which singularly resembles the pleuroperitoneal chamber of a vertebrate. Yor this cavity is bounded externally by the atrial tunic and the integument, which correspond with the somatopleural layer of the mesoblast and the epiblast of a vertebrate embryo; and it is bounded, internally, by the atrial tunic and the epithelium of the alimentary canal, which, to the same extent, correspoud with the splanch- nopleure and the hypoblast. The primitively double atrial aperture has its parallel in the peritoneal openings which persist in many Vertebrata.

Thus the ascidian has no " perivisceral cavity" formed by splitting of the mesoblast, nor has it any " perivisceral cavity" formed by diverticula from the alimentary canal. It is neither enteroccelous nor schizoccelous, but what,

at first sight, resembles a perivisceral cavity is formed within the body by involution, and the ascidian may therefore be said to be epicelous. If the alate prolongations of the body which lie at the sides of the branchial apertures, in Balanoglossus, were to enlarge and unite round the anus so as to leave but a relatively small opening between their edges, the cavity so formed would answer to the atrial chamber of an ascidian.

In the higher Vertebrata, the pleuroperitoneal' cavity appears to be formed by the splitting of the mesoblast into two layers,a splanchnopleure and a somatopleure, and, there- fore, seems at first to correspond with the perivisceral cavity of the Annelids and Arthropods. But what is now known of the structure and development of the lowest and most embryonic of known Vertebrata, ~~Amphioxus, throws very great doubt upon this interpretation of the facts. One of the most singular of the many peculiarities of Amphioxus is the fact that the branchial clefts open, not on the exterior of the body, as in all other Vertebrata, but into a chamber with a single external aperture, which, on the one hand, curiously resembles the atrium of an ascidian ; while, on the other, it is undoubtedly homologous with the pleuroperitoneal cavity of the higher Vertebrata. Now Kowalewsky's investigations have shown, that, at first, the branchial apertures of the embryo Amphioxus open upon the exterior of the body, but that, after a time, a process of the wall of the body, on the dorsal side of the branchial apertures, grows down over them, and, uniting with its fellow in the median ventral line of the body at all points, except at the abdominal pore, gives rise to the outer wall of the pleuro~~ peritoneal cavity. Thus the lining of that cavity, like the atrial tunic of the ascidian, is a derivative of the epiblast; and Amphioxus is epiccelous. As it can hardly be doubted that the somatopleure of Amphioxus is the homo- logue of the somatopleure in the higher Vertebrata, it becomes

1 Tt must be recollected that the pericardium is also originally a part of this cavity, and that in some fishes, ¢.g., the Rays, it never becomes completely shut off from it.

highly probable that the apparent splitting of the meso- blast in the latter, after all, represents the mode of develop- ment of the pleuroperitoneal

cavity which obtains in the former, and, thus, that the Vertebrata are not schizoccelous, but epiccelous. Whether this suggestion will turn out to be well based or not, must be decided by the embryologi- cal investigations specially directed to this point : but that there should be any essential difference between Amphioxus and other Vertebrata, in the manner in which the pleuro- peritoneal cavity is formed, is highly improbable.

The distance between Amphioxus and other vertebrate animals, which has hitherto been generally supposed to exist, has becn greatly diminished by recent investigations. So far from being devoid of a brain and of a skull, the regions of the cerebro-spinal axis and of the neural canal, which answer to those organs in the higher Vertebrata, are, in proportion, extremely long in Amphiocus, as they are in all vertebrate embryos. But, in Amphioxus, the head retains throughout life a segmentation comparable to that of the rest of the body, while, in the higher Vertebrata, almost all traces of these distinct segments are very early lost. Moreover, in Amphiowus, the renal apparatus, So far from being absent, is represented by a comparatively large structure, and nothing is wanted toequip it with all the organs found in a young Marsipobranch, but auditory sacs, which, however, it must be remembered, make their appearance late in the Lamprey. With all this, the gap be- tween Amphioxusand the Marsipobranchit is undoubtedly more considerable than that between the Marsipobranchit and other fishes, and it may represent a primary division of the class Pisces,—which, from the segmentation of the skull, may be termed the Entomocrania,—as opposed to the rest, in which the primary segmentation of the skull is almost completely effaced, and which may therefore be designated Holocrania.

Tt has been stated above that the great majority of the

Metazoa pass through the Gastrula condition, and belong

division, however, the alimentary canal may be rudimentary, as in sundry male Rotzfera and in the Gordiacet among the Nematoidea, and yet these are so closely allied to other forms possessing fully developed digestive canals, that it is reasonable to regard their rudimentary alimentary appa- ratus as absorbed. In two groups, however, the Cestoidea and the

Acanthocephala, there is no trace of an alimentary canal either in the embryo or in the adult.

From the point of view of phylogeny, this fact may be interpreted in two ways. Either the alimentary canal which once existed has aborted, aud the Cestoidea and Acanthocephala are modified Scolecimorpha, or these parasites have not descended from Gastree, but have passed into their present condition directly from a Morula-like form of Metazoon. In the latter case they will form a division of Agastrew, apart from the other Metazoa.

The subjoined synopsis indicates the general relations of the different groups of the Animal kingdom, in accordance with the views which have been put forward in the pre- ceding pages.

Those who are familiar with the existing condition of our knowledge of animal morphology, will be aware that any such scheme must needs, at present, be tentative and subject to extensive revision, in correspondence with the advance of knowledge. Nor will they regard it as any objection to the scheme of classification proposed, that the divisions sketched out may be incapable of sharp definition the constant tendency of modern investigations being to break through all boundaries of groups, and to fill up the gaps between them by the discovery of transitional forms. In the place of assemblages of distinctly definable groups, which it has hitherto been the object of the Taxonomist to define and co-ordinate in precise logical categories, we are gradually learning to substitute series, in which all the modifications by which a fundamental form passes from lower to higher degrees of organic complication, are summed

to the division of the Gastreaw. In some members of this | up. (Tear ae) ANIMALIA.. I.—PROTOZOA. i. MONERA. Protamebidx. Protomonadide. Myxastride, &c. ii ENDOPLASTICA. Amebide. Flagellata. Gregarinide. Acinetida. Ciliata. Radiolaria. TI.—_METAZOA. A. Gastreee. i. POLYSTOMATA. Porifera (or Spongida). ii. MONOSTOMATA. J]. ARCHHOSTOMATA. a. Scolecumorpha. B. Coelenterata. Rotifera. Nematoidea. Hirudinea. Hydrozoa. Turbellaria. Oligocheta. Actinozoa. Trematoda. 2. DEUTEROSTOMATA. a. Schizoccela. b. Enteroccela. (ae =a. (eee eae => ae °

B. Agastreew (provisional). Acanthocephala. Cestoidea.

ANIME, a resinous exudation from the courbaril tree, which grows in the West Indies and in South America. When imported in the natural state it is infested with vast numbers of insects, and hence the name. It is of a pale brown colour, transparent, brittle, and in consequence of its agreeable odour is much used for fumigation and in perfumery. Its specific gravity varies from 1°028 to 1-004. Tt melts readily over the fire, and softens even with the heat of the mouth, but is insoluble in water. It is dissolved by alcohol, but not completely, unless the spirit be boiling. It is allied to copal in its nature and appearance, and is much used by varnish-makers.

ANIMISM, a term formerly employed in Biology to denote the theory of which Stahl is the chief expositor ; the theory of the soul (anima) as the vital principle, cause of the normal phenomena of life, or of the abnormal phenomena of disease. It is now current in the wider anthropological sense given to it by Dr E. B. Tylor (Primitive Culture, chapters xi.—xvii.), as including the general doctrine of souls and other spiritual beings. This application is not only appropriate, but is even rendered indispensable by the absence of any other suitable word; for spiritualism, though occasionally used in a general sense, has become associated with a particular modern development of animistic doctrine ; anthropomorphism, if less objectionable, is also to some degree inadequate ; while the term theology cannot be extended to include the lower forms of the doctrine of spiritual beings, and indeed many of its higher developments, except by an ill-considered departure from ordinary usage, which raises in many minds a prejudice against the most reliable results of anthropological inquiry.

An animistic philosophy, explaining the more strange or striking phenomena of nature by the hypothesis of spiritual agency, is universally prevalent among savage races; and unless the wide-spread animistic beliefs of savages are to be regarded as but degenerate or corrupted relics of those possessed by more cultured peoples,—a theory which can scarcely be held to account for the essential and native appropriateness of animism as it flourishes among races of low culture, and its less appropriate and apparently deriva- tive character as it survives in higher civilisations,—-

there seems-tenable ground for the inference, that an animistic philosophy must have been that which was earliest de- veloped aniong the prehistoric societies of mankind. In accordance with this view, animism may be described as the distinctive philosophy of primitive culture. It is manifestly the outcome and development of that earliest analogical reasoning, which concludes external objects to be animated with a life essentially similar to our own; it is the expression and application of our first general theory of natural causes,—a theory rude and inadequate, yet marvellously self-consistent and serviceable ; and its history appears primarily to be that of a dominant and pervading philosophy, applied to explain all the phenomena of nature and life, save only those ordinary sequences which the un-civilised man regards as needing no explanation; afterwards, in the progress of culture, that of a system of thought always more or less modified and restricted by the increase of positive knowledge, and surviving only in greatly refined or greatly enfeebled forms, or only reviving at intervals of time.

Of the origin of animism perhaps no perfect account has yet been given. It can hardly be said to be obvious why, in uncultured races or individuals, there should arise that invariable tendency to represent natural forces as conscious and anthropomorphic, There is reason to believe, how- ever, that the type of all the forins in which the tendency manifests itself, is to be discovered in the conception of the human soul. Evidently the notion of an animating, separable, and surviving soul commends itself as the ready

explanation of many familiar phenomena, and the appro- priate instrument of a philosophy which ascribes animation to nature at large ; so that thus, according to the account given by Dr Tylor, primitive animism may be considered to have arisen simply from the evidence of men’s seuses, interpreted by the crude and childlike science of the pre- historic world. From the sight of life and death it was, he conceives, naturally inferred that every man has a life, or vital principle, the departure of which from his body causes death,—this idea being confirmed by apparent temporary departures, such as swoons and sleep. From the appearance of men seen in dreams and visions, it was not less cogently argued that every man has also

a phantom likeness of his body, separable from it so as to appear to others at any distance, and continuing to exist and appear after the bodily death of its proper owner. Accordingly, the definition of the soul in primitive religion would, as in the lower existing religions it actually does, combine these leading qualities in the conception of an “apparitional soul,” which is a thin, unsubstantial human image, the cause of life and thought in the individual it animates, capable of quitting his body for a time or altogether, and so leaving him insensible or dead, and when thus abscnt from the body appearing to other persons asleep or awake. From this conception, then, animism may reasonably be supposed to have had its origin, especially as other animistic doctrines exhibit such a distinct affinity and relationship to this of the apparitional soul, as almost amounts to a proof of direct derivation from it. The hypothesis being correct, it would, for instance, follow that the lower animals ought to be considered as having souls similar to human souls, inasmuch as they have life, and their phantoms are likewise seen. Moreover, though inert objects, such as clothes or weapons, have not life, yet their phantoms appear to men in dreams, and thus they must be considered as having something of the nature of souls, separable from their grosser part, and surviving its de- struction. Now, in fact, both these ideas are recognised in the religions of the lower races. They come into special prominence in the savage and barbaric rite of sacrifice for the dead, where not only are wives and slaves slain to do service to their master’s soul in the world of spirits, but horses and cattle are slaughtered to be spiritually trans-mitted thither, and clothes, ornaments, and other articles are destroyed, that he may wear and use the “object-souls” thus sent to him. The savage doctrine of a future state, presently to be referred to, also strikingly corroborates the theory of the phantom soul as the origin and centre of animistic thought.

There rcmains, however, the difficulty of understanding by what process this rudimentary doctrine of the soul has grown into the great system of developed animism: a system of thought so comprehensive as to hold all nature in a web of vital action and spontaneity ; so multiform as to invent some new spirit-race for almost every fresh order of phenomena ; so coherent as to create a perfect plexus of ideas that mutually support and interpret one another ; finally, so persistent, that even its more extravagant developments can survive for ages in defiance of accurate knowledge. It is

difficult to realise how exceedingly slow and gradual must have been that growth of positive science and its methods of verification, which has allowed a fanciful and little regulated philosophy to take root so firmly and cast its branches so far. Yet only by a great and con- nected development does it seem possible that animism could be so matured and extended. Regarding many, at least, of the varied forms of animistic belief, there is already sufficient evidence to make it probable that they have arisen by one continuous process of evolution, extending through the lower to the higher civilisation.

This evidence of continuity of development Dr Tylor represents as partly historical, and partly turning upon the principle of survival in culture. Thus, as among savage tribes, the soul is actually identified with the shadow or the breath, the use of such words as oxid, rvedpa, wmbra, anima, shade, and spirit, may be held to show the deriva- tion of the civilised conception of the soul from the same primitive and savage idea. The primitive conception of the soul as consisting of a thin, vaporous, material sub- stance, held its place in ancient philosophy and theology, being supported by such writers as Epicurus and Origen, and was only gradually superseded by the more modern belief of the soul's immatcriality. The elves, fairies, goblins, &c., so well known in modern folk-lore, correspond to the nature-spirits and demons of the savage religions. In these cases there has been survival with considerable change ; on the other hand, the continuity of animistic thought is likewise indicated by many instances in which an idea survives with little or no modification, Such instauces are to be found in many old customs, and especially among peasants, whose notions of the spiritual world are often almost savage. Thus the ancient funeral sacrifice of the warrior's horse for him to ride into the other world, which was for the last time in Europe actually and officially done at Treves in 1781, is still kept up in form by leading the dcad soldier's horse to his grave. The piece of money is still put in the hand of the corpse at an Trish wake; and in most countries of Europe may still be seen the pathetic custom of setting out offerings of food for the spirits of the departed. Sacrifices to the deities of wells and rivers, trees and rocks, have continued almost un- changed in the rudest districts of such countries as Russia. As a historical example, the primitive theory of

convulsions, delirium, madness, d&c., being caused by demoniacal possession lasted on among educated people through the Middle Ages, and has only been fairly suppressed by the modern medical schools.

Proceeding on the inference of continuous development, the same writer has attempted a classification of animistic doctrines as they appear in the religious philosophy of the lower and higher culture. The doctrine of souls, as dis- tinguished from that of other spiritual beings, is first considered. It is found possible to trace the conception of the human apparitional soul in varions beliefs concerning ghosts, wraiths, doubles, &c., which survive among civilised societies long after the soul has ceased to be conceived as material or ethereal. The notion of animal-souls, largely prevalent among savage tribes, still faintly survives in our own country. The doctrine of plant-souls seems long to have formed an important element in the religious philo- sophies of India; and even the doctrine of object-souls, which exercises unlimited dominion in savage religions, can still be traced as influencing some of the actions, though not, perhaps, the explicit opinions, of civilised men. Closely allied, like these doctrines, to the primitive notion of the apparitional soul, is the belief in the soul's existence after death, which appears either as a doctrine of transmi- gration, describing the re-birth of souls in successive bodies, or in its more general and more important form as the doctrine of a future life. The latter, as commonly held by savage races, supposes the phantom souls of the departed either to remain here as hovering ghosts, or to be transported to some distant region, there to continue a, life more or less similar to the present, but with little or no trace of moral retribution: in more advanced civilisations, however, this doctrine exercises the most powerful moral influence, by distinguishing the heaven of the good from the hell of the wicked, 'The primary doctrine of souls is next described as leading to the development of the doctrine

of other spiritual beings, from the lowest ranks of demons

fact, personified causes. is accounted for by possession by demons, who are often themselves human souls, and who enter the bodies of their victims, causing all kinds of illness, and especially those

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and elves, up to the highest deities of the Pantheon. The

life and action of the body being ascribed to a soul, all

other phenomena of the universe were in like manner ascribed to soul-like beings or spirits, which are thus, in So disease among the lower races

phenomena of convulsion and delirium in which the patient' seems actually animated by a spirit not his own. Other events and accidents of life are in the same way accounted

for among savages as the acts of the demons, good or evil,

whom they believe to pervade the universe ; and as these

beings are, more often than not, conceived to be souls of

deccased men, the consequent worship of divine Manes is the principal religion of the lower state of civilisation. The doctrine of object-souls, expanding into the general doctrine of spirits conveying influence through material objects, becomes the origin of Fetichism and idolatry. Spiritual beings, under a thousand names, are multiplied upon the earth ; not only those guardian spirits and hurtful demons directly influencing the lives of men, but others, far more numerous, with varied functions to discharge in the economy of the external world. To the lower races all nature being animated nature, every brook and well, every rock and glade, is peopled by nature-spirits; while Heaven and Earth, Sun and Moon, Rain and Wind and Thunder, are either themselves adored, or personified in the character of mighty nature-gods, such as Zeus, Apollo, or Poseidon,— spiritual beings who are, as it were, the great animating souls of their special phenomena. Among the lower races, also, there appears in a rudimentary form that antagonism between a good and evil deity, which forms the fundamen- tal idea of Zoroastrism and Manicheism. Lastly, the couception of a Supreme Deity appears at a very early stage of civilisation, whether one of the great nature-deities, such as Heaven or Sun, is raised to this royal pre-eminence, or whether a being of the nature of a soul of the world, like the Great Spirit of the North American Indians, is venerated as Creator and Lord of the universe. Then, by a natural evolution, Monotheisn is established.

Such, briefly sketched, is Dr Tylor's account of the de- velopment of animism, considered as the main principle of the philosophy of religion, throughout the various grades of civilisation. Whether, having shown many popular superstitions to be undoubted survivals from an ancient state of belief, he has been equally successful in proving a like derivation for doctrines recognised by modern religion, will be questioned by many who perceive the bearing of his conclusions upon the actual validity of theological tenets. It is proper to point out that he has noted one great distinc- tion between the lower and higher animism, which consists in the absence of any distinctly ethical element in the spiritual philosophy of the less cultured races. Only at a comparatively late stage of their development do the moral feelings become associated with animistic beliefs.

The final decay of many forms of animistic belief, much more readily than the process of their development, admits of being traced with the aid of historical evidence. Indeed, the history of each of the sciences is a record of the pro- gressive substitution of matter for spirit aud law for spontaneity ; and we can still witness the process of decay in various stages; for while certain sciences—like astronomy, since the time when Kepler imagined minds in the planets—have wholly exterminated the animism within their borders, there are others that have scarcely yet advanced so far—biclogy, for example, which is still familiar with "vital force" and final causes. Nor is the process commonly a rapid one: in many cases, as a world of illustration has been adduced to prove, a declining

spiritual conception may persist for a length of time, refined and modified into a "principle" or "essence," whose action, though still automatic like a spirit's, is also regular like that of a natural law. Among all civilised races, however, animism has long ceased to be known as the universal philosophy or explanation of nature, and its ,remaining manifestations are in great measure reduced to a secondary or rudimentary form. Thus animism survives in the imperfect theories of childhood; it survives also, as we have seen, in the superstitions of the uneducated ; and as, in primitive societies, language and imagination fostered the development of spiritual myth, so animism, embodied in metaphor, remains in later civilisations as an

important element, if not in truth the very substance of imaginative literature.

The process by which animism comes to be superseded by positive science is therefore familiar, both in its history and results. Regarding its real nature, however, the greatest difference of opinion exists, and there is raised one of the most interesting questions connected with animism—the question of its relation to metaphysics. According to the well-known doctrine of Comte, which, having since his time been expounded and illustrated by several of his followers, would now appear to be accepted by many even of those who do not profess themselves Positivists, animism passes into positive science through metaphysics. In support of this view there is pointed out, what has just been explained, that as knowledge progresses, anthropomorphic and animistic conceptions rarefy and sublimate into so-called essences or principles, with which conceptions metaphysical discussions are shown to be largely conversant. Systems of ontology betray their history by a hundred clinging vestiges of animism ; and all the favourite ideas of the dialectician are to be traced in the symbolism of savage religions. The Platonic zdeas, to take but a single instance, are closely represented by the species-deities of the North American Indians; while, even in the writings of the master himself, how animistic and mythical is the character they maintain. It is, therefore, concluded that metaphysics is little more than decaying animism, and that a large proportion of animistic theory, before being superseded by positive science, passes through the “metaphysical” stage. From this view of the nature of his science, and its relation to animism, the metaphysician, however, dissents. While admitting that degenerate “ metaphysical” conceptions do exist, and that psychology and ontology, more perhaps than other sciences, are confused and retarded by their influence, he refuses to recognise these conceptions as metaphysical in any special or indeed adinissible sense. The facts by which the Positivist seeks to prove that animism, as one inadequate explanation of nature, grows into metaphysics, another system of explanation almost equally unsatisfactory, the nietaphysician rather regards as proving that metaphysics, a legitimate science, grows out of primitive animism by precisely the same process as other sciences. The discovery in savage or other religions, of dialectical ideas mythically expressed and explained, only confirms him in the belief

that there does exist a class of phenomena which it is the business of the science of metaphysics to investigate, since even mythical explanations are seldom formed, unless in the presence of some real problem calling for solution ; and he contends that in this way the subject matter of metaphysical science, though long overgrown and encrusted with animistic conceptions, does gradually shine through and assert itself in the light of positive knowledge. If these arguments then be allowed, metaphysics is no decaying animism, but rather a science in the act of struggling free from animism; and animism itself, though often passing in its decay through a phase misnamed

metaphysical, is quite improperly represented as under- going any transformation into metaphysics.

Reviewing the conclusions countenanced by what evi- dence we possess touching the nature and history of the doctrine of spiritual beings, we find that while it is pos- sible, and even necessary, to regard animism as a system of primitive philosophy extending through various forms into the higher civilisations, yet this view being for the most part unsupported by direct historical evidence, and depending largely on the inference of a close analogy between primitive and savage thought, is in great measure confessedly theoretical, leaving much room for dispute, both as to the extent to which animistic beliefs have been transmitted and modified by a regular, continuous, and uninterrupted process, and as to the conditions which, in special instances, have led to their formation and develop- ment, or disappearance and decay.

ANIMUCCIA, Giovanni, musical composer, was born at Florence in the last years of the 15th century. At the request of St Filippo Neri he composed a number of Laudz, or hymns of praise, to be sung after sermon, which are noteworthy as furnishing the rudimentary form out of which the Oratorio was developed. In 1555 he was ap- pointed ‘maestro di capello” at St Peter’s, an office which he held until his death in 1571. He was succeeded by the more celebrated Palestrina, who had been his friend and probably his pupil. It is impossible to say to what stage Animuccia brought the oratorio form, as no specimens of his daudi are now extant. The manuscript of many

of his other compositions is still preserved in the Vatican Library. His chief published works were Madrigali e Motetti a quattro e cinque voct (Ven. 1548) and Ll primo Inbro di Messe (Rom. 1567). rom the latter Padre Martini has taken two specimens for his Saggio di Contrapunto. Paolo Animuccia, a brother of Giovanni, was also celebrated as a composer.

ANIO, or ANIEN, the modern Teverone, a river of Italy which rises in the Apennines, and, flowing first N.W. and then S. W., joins the Tiber a littleabove Rome. It forms a beautiful cascade at Tivoli. The Anio supplied Rome with water by two aqueducts, the Anio Vetus, constructed about 270 B.c., and the Anio Novus, completed, 48 a.p., by Claudius. The Digentia of Horace is one of its tri- butaries. See AQuEDUcT and Tivox.

ANISE, Pimpinella Anisum, is an umbelliferous plant found in Egypt and the Levant, and cultivated on the Continent of Europe. It is used medicinally as an agree- able aromatic. The officinal part of the plant is the fruit, which consists of two united carpels, called a cremocarp. It is known by the name of aniseed, and has a strong aromatic taste and a powerful odour. By distillation the fruit yields a volatile, oily matter known as oil of anise. It is used as a carminative, and is also employed in the manufacture of liqueurs. The anise of the Bible (Matt. xxiii. 23) is Anethum graveolens, or dill (see fig.), a native of the south of Europe and of Egypt, aud also found near Astracan, at Buenos Ayres, and at the Cape of Good Hope. The name Dill is coe ig an old

Norse word meaning to soothe, referring to its carminative It is one of the garden plants

qualities in allaying pain. of which the Phar- isees were wont to pay tithes. It is used in pickles and soups. The star- anise of liqueur- makers is the produce of a totally different plant, Illictum anisatum, belonging to the Natural Order Mag- noliacese, sub-order Winteree. It re- ceives its name from its flavour, and from its fruit spread- ing out like a star.

ANJAR, a fortified town of Hindustan, and the capital

of a district of the same name in the native state of Cutch,

lies in 23° 6’ N. lat., 70° 3’ E. long. ‘The country is dry

and sandy, and entirely depends on well irrigation for its water supply. The town is situated nearly 10 miles from the Gulf of Cutch. It suffered severely from an_earth- quake in 1819, which destroyed a large number of houses, and occasioned the loss of several lives. In 1820 the population was estimated at 10,000. The town and district of Anjar were both ceded to the British in 1816, but in 1822 they were again transferred to the Cutch Government in consideration of an annual money payment. Subse- quently it was discovered that this obligation pressed heavily upon the resources of the native state, and in 1832 the pecuniary equivalent for Anjar, both prospectively and inclusive of the arrears which had accrued to that date, were wholly remitted by the British Government.

ANJENGO, once a British factory and fortress, now a small sea-port town of India, in Travancore, nearly encircled by a deep and broad river, at the mouth of which it is situated. It lies in 8° 40’ N. lat., 76° 49’ E. long. The fort was built by the English in 1684, and retained till 1813, when the factory was abolished on account of the useless expense attending it. Anjengo is infested with snakes, scorpions, and centipedes, those animals finding shelter in the matted leaves of the cocoa-tree with which the houses are mostly thatched. Anjengo is celebrated for the best coir cables on the Malabar coast, manufactured from the fibre of the Laccadive cocoa-nut. It also exports pepper, cotton cloths, and drugs.

ANJER, a sea-port town of the Dutch East Indian island of Java, situated on the Strait of Sunda, 18 miles W. of Batavia. It is protected by a fort, and besides carrying on a considerable trade in Eastern curiosities, supplies passing vessels with fresh water and provisions. The population is considerable, but its amount is not known.

ANJOU, one of the thirty-six ancient provinces of France, approximately equivalent to the modern depart- ment of Maine and Loire. It was bounded on the N. by Maine, which separated it from Normandy; E. by Touraine ; S. by Poitou; and W. by Brittany. It was, as Mr Freeman has remarked, altogether lacking in geographical individuality, and owed its somewhat

prominent position in history to the character and fortunes of its counts and dukes. By the ancient chronicler of Anjou the origin of the countship is referred to a certain Tertullus, who owed his elevation from an humble rank to Charles the Bald ; but the first person history lays hold of is Ingelgar, who lived about 870, and obtained possession of that portion of the subsequent province which lies between the Maine and the Mayenne. He was followed in succession by Fulk the Red (888); Fulk the Good (938), author of the proverb

that an unlettered king is a crowned ass; Geofirey Grisegonelle, or Grey-Tunic (958) ; Fulk Nerra, or the Black, famous as a warrior, and on account of his pilgrim- ages, by way of penance, to the Holy Sepulchre ; Geoffrey Martel, a vigorous but unsuccessful opponent of William the Conqueror ; his nephews, Geoffrey the Bearded and Fulk Rechin, from the latter of whom we have an interesting historical fragment, giving an account of his ancestors and defending his own conduct (D'Achéry, Spicilegium, folio edition, vol. iii.); Fulk Nerra Il. ; and Geoffrey Plantagenet, who united Anjou and Maine, and —by his marriage with Matilda of England—Normandy also into one dominion. When his son became (1154) king of England, as Henry IL, these various provinces passed. into the power of the English crown, but were forfeited by King John (1204) to Philip Augustus of France. Henry IIL demanded restitution, but did little in support of his demand; and Anjou soon passed into the hands of Philip, son of Louis VIII, and from him to Charles, the brother of Louis, who by his exploits in Italy made the name of Charles of Anjou famous, and established the house of Anjou on the throne of Naples (1266-1285). His son, Charles IL, king of Naples, nicknamed « Zoppo, or the Lame, gave the investiture of Anjou and Maine to his son- in-law, Charles of Valois, younger son of Philip the Bold ; and from 1290 the counts of Valois took the title of dukes of Anjou and counts of Maine. In 1328 the son of Charles of Valois became king of France, as Philip VL, and united the duchy of Anjou to the crown. King John in 1356 bestowed it on his son Louis. The Anjou line ended in the unfortunate Réné (noticed below), who was deprived of his duchy by Louis XI. of France, or, more strictly, in his brother Charles, who died in 1481. Meanwhile old Réné's daughter Margaret, who was made of sterner stuff

than her father, was battling with more than a woman's valour for the rights of her son in England. From this time onward the title of duke of Anjou has been borne, without implying any territorial sovereignty, by Charles VIII. of France, by each of the four sons of Henry IL, by the second son of Henry IV., by the two sons of Louis XIV., by his grandson (Philip V. of Spain), and by his great- grandson (Louis XV.) Charles, a nephew of Charles of Naples, obtained the throne of Hungary in 1308, and was succeeded by his son Louis the Great, who also became king of Poland; but the same fatality of failure in the male line also befell this branch of the house of Anjou. (See Freeman's Norman Conquest, vol. ii. p. 267; D'Achéry, Spicilegium, vol. iii.)

ANJOU, Rint, DuKE or, was the second son of Duke Louis IL, and succeeded his brother Duke Louis ITI. He was born at Angers in 1408, and brought up by his uncle, Louis of Bar, who, in 1419, contracted a marriage between him and Isabella, heiress of Lorraine, and, in 1430, left him in possession of his duchy. On the death of Charles of Lorraine in 1431, Réné was acknowledged as his succes- sor, but he had soon to defend himself against the claims of the count of Vandemont, who was supported by Philip of Burgundy. The battle of Bouligneville decided in favour of the count, and Réné was taken prisoner to Dijon by Philip. In 1432, however, he was conditionally released, and in the following year was confirmed in the duchy of Lorraine by the Emperor Sigismund. In 1435, while again, according to the conditions of his release, in the custody of Philip, he became, by the death of his brother, duke of Anjou and count of Maine, and a little later, received the offer of the inheritance of the queen of Naples. His endeavours to enforce his claims on the Neapolitan kingdom _ were ultimately futile, and he quitted Italyin 1442. Three years afterwards he married his daughter Margaret to Henry VI. of England, and thus increased the influence,

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though hardly the prosperity of his house. On the death of his wife in 1453, he bestowed the duchy of Lorraine on John of Calabria, his only surviving son. He himself retired to Provence, where henceforth, with but occasional inter- ruption, he led a simple quiet life, amusing himself with the writing of

verses and the painting of miniatures, the cultivation of flowers, and the keeping of wild animals. Thus occupied, he exhibited a philosophical submission to the changes brought about by the artful schemes of his less pacific neighbours, until he was at last reduced to an ignoble dependency on the good-will and pleasure of Louis of France, without the liberty of even bequeathing his posses- sions to any une but the king. He died at Aix in 1480, followed by the regret of his subjects, who afterwards held him in remembrance as “ The Good King Réné.”

ANKARSTROM, Jonan Jaxos, the assassin of Gus- tavus III., king of Sweden, was descended from an hon- ourable family, and was born in 1759. After having been for some time at court asa page, he entered the army, but left after a few years with the honorary rank of captain. He is said to have been concerned in some treasonable pro- jects, and to have been pardoned by the king, but the story has not sufficient authority. The Swedish nobles were about this time violently opposed to the king, who, by the aid of the other orders of the state, had wrested their power from them, and was now ruling despotically. This dislike was increased by the coup d’état of 1789, and by the king’s known desire to interfere in favour of Louis XVIII. of France. Ankarstrém, a man of strong passions and violent temper, resolved upon the assassina- tion of Gustavus, and communicated his intention to the disaffected nobles, and among others, to Counts Horn and Ribbing, who would willingly have undertaken the deed themselves. After some ineffectual attempts to seize the king’s person, a favourable opportunity offered itself. A masked ball was held at Stockholm on the 16th March 1792, which the king attended, though he had been warned against doing so by an anonymous letter. By a preconcerted signal, Count Horn indicated his victim to Ankarstrém, who fired and inflicted a mortal wound. The murderer was identified by the discharged pistol, thrown down in the ball-room, and was arrested. He did not attempt to deny his crime, but declared that he had no accomplices. After a long trial he was condemned, was publicly beaten on three successive days, had his right hand cut off, and was finally beheaded and quartered. He endured his sufferings with the greatest fortitude, and seemed to rejoice in having rid his country of a tyrant. His principal accomplices were imprisoned for life.

ANKLAM, or ANcLAM, a town of Prussia, in the province of Pomerania, situated on the Peene, 6 miles from its mouth in the Kleine Haff, and 47 N.W. of Stettin, with which it is connected by railway. The fortifications of Anklam were dismantled in 1762, and have not since been restored, although the old walls are still standing ; formerly, how- ever, it was a town of considerable military importance, which suffered severely during the Thirty Years' and the Seven Years' Wars; and this fact, together with the repeated ravages of fire and of the plague, has made its history more eventful than is usually the case with towns of the same size. It does not possess any remarkable buildings, although it contains several, private as well as public, that are of a quaint and picturesque style of archi- tecture. The Peene is navigable up to the town, which has a considerable trade in its own manufactures, as well as in the produce of the surrounding country, while some ship- building is carried on in wharves on the river. The chief – manufactures are linen and woollen goods, leather, beer, and soap. Anklam formerly bore the names Wendenburg and Tanglim. Population in 1871, 10,739.

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ANKOBAR, or ANKoBER, the capital of the kingdom of Shoa in Abyssinia, situated in lat. 9° 34' N. and long. 39° 35' E., on a mountain about 8200 feet above the level of the sea. The appearance of Ankobar is somewhat peculiar ; its houses, ill-built wooden structures, with conical thatched roofs, are irregularly dotted over the side of the hill; a rude fortification of stakes and branches protects the upper portion of the town, while the palace, a more pre- tentious, but very ugly stone building, crowns the summit. Ankobar enjoys many natural advantages, its climate especially being remarkable for mildness and salubrity. Its population is about 5000, but during the residence of the court it rises to 15,000.

ANNA, Ana, or ANAH, a town of Turkey in Asia, situated on the right bank of the Euphrates, about 160 miles N.W. of Baghdad. It is an open, defenceless place, consisting chiefly of a single street, which extends for several miles along a narrow strip of land that lies between the river and a ridge of rocky hills. The houses are separated from each other by beautiful and fertile gardens filled with fruit trees, and in the river, facing the town, is

a succession of equally productive islands. The most easterly of these islands contains the ruins of the old castle, while the remains of the ancient Anatho extend from this island for about two miles down the left bank of the Euphrates. Coarse cloth is almost the ouly manufacture at Anna,

ANNA CARLOVNA, who for a few months held the position of regent in Russia, during the minority of her son Ivan, was the daughter of Catherine, sister of the Empress Anna Ivanovna, and was born in 1718. In 1739 she married the duke of Brunswick Wolfenbiittel, and their son Ivan was, in 1740, adopted by the empress and pro- claimed heir to the throne. A few days after this procla- mation the empress died, leaving directions regarding the succession, and appointing her favourite Biron as regent. Biron, however, had made himself an object of detestation to the Russian people, and Anna Carlovna, with the assist- ance principally of the able but intractable Munich, had little difficulty in overthrowing his power. She then as- sumed the regency, and took the title of grandduchess ; but she knew little of the character of the people with whom she had to deal, was utterly ignorant of the approved Rus- sian mode of government, and speedily quarrelled with her principal supporters. In December 1741, Elizabeth, daughter of Peter the Great, who, from her habits, was a favourite with the soldiers, excited the guards to revolt, overcame the slight opposition that was offered, and was proclaimed empress. Ivan was thrown into prison, where he soon afterwards perished. Anna and her husband were banished to a small island in the River Dwina, where, in 1745, she died in childbed. Her husband survived her for many years.

ANNA COMNENA, daughter of the Emperor Alexius Comnenus I., was born lst December 1083. She was her father’s favourite, and was carefully trained in the study of poetry, science, and Greek philosophy. With a mind superior to the effeminacy and voluptuousness of the court in which she was educated, she cultivated literature and sought the acquaintance of the more eminent philosophers of the period. But wise and studious as she was, she was also intriguing and ambitious. Having married an accom- plished young nobleman, Nicephorus Bryennius, she united with the Empress Irene in attempting to prevail upon her father during his last illness to disinherit his son, and give the crown to her husband. The affectionate virtue of the father prevailed over female address and intrigue; but this only stimulated

the ambition of Anna. She entered into a conspiracy to depose her brother , and when her husband displayed timidity in the enter

prise, she exclaimed that “nature had mistaken their sexes, for he ought to have been the woman.” The plot being discovered, Anna forfeited her property and her fortune, though, by the clemency of her brother, she escaped with her life. Exclided by her base conduct from the enjoyments of court, she employed her solitude in writing the Alexiad—a history, in Greek, of her father’s life and reign. The production is still extant, and forms part of the celebrated collection of the Byzantine Historians. Her style is extravagantly rhetorical, diffuse, and panegyrical. In her account of the first Crusade she is often at variance with the Latin authorities. The Alexiad, in fifteen books, was first published at Augsburg in 1610; but the best edition is that of Schopen, with a Latin translation (Bonn, 1839, 2 vols. 8vo), and Schiller in his Historic Memoirs gives a German translation.

ANNA IVANOVNA, Empress of Russia, daughter of Ivan, brother of Peter the Great, was born in 1693, and mar- ried in 1710 to the duke of Courland, who died the following year. After the death of Peter II., in 1730, the imperial council offered the vacaut throne to Anna on the following conditions:—She was to govern according to the decisions of the supreme council, and she was not allowed, without its consent, either to declare war or to conclude peace, to impose new taxes, to grant any important office of the state, to dispose of crown lands, to contract a matrimonial alliance, or to nominate a successor to the throne. She was also not to punish any noble, or to confiscate any one’s property without a legal sentence. Anna signed these conditions without any demur; but after her arrival at Moscow, a numerous party, jealous of the authority which this con- stitution, imitated from that of Sweden, gave to the supreme council, or rather to the families of the Princes Dolgorouki and Galitzin, of whose members it was chiefly composed, petitioned the empress to assume the autocracy of her pre- decessors. Anna immediately complied with this request, and the framers of the constitution either were banished to Siberia, or perished on the scaffold. Russia was governed in a most tyrannical and oppressive manner during the whole reign of Anna by her favourite Biren, who was made by her influence duke

of Courland. According to Russian authorities, 20,000 victims of Biren's tyranny perished during Anna's reign of six years, and amongst them persons belonging to the highest ranks in the country. The principal events of Anna's reign were the voluntary restoration, in 1732, to Shah Nadir of the Russian provinces, Shirvan, Ghilan, and Mazanderan, acquired by Peter the Great, but which caused more expense than they yielded revenue to Russia; a Chinese embassy at St Petersburg, the only one that was ever sent to Europe; the assistance given to the elector of Saxony and king of Poland, Augustus III, against his competitor Stanislaus Leszczinski, supported by France; a Russian army sent to the assistance of the Emperor Charles VI. against France; a war with Turkey from 1736 to 1739, which, notwithstanding several success- ful campaigns, gave no advantage to Russia at the conclusion of peace ; and an advance made into Central Asia by the establishment of the Russian protectorate over the khan of the Kirghises, who, with the assistance of Russian officers, conquered Khiva, but failed to maintain himself there. Anna died in 1740. Her reign is considered as a period of transition from the old Muscovite semi-barbarian man- ners to the polish, though not the civilisation, of the West.

ANNA, BALDASARRE D', a painter of some repute, who flourished during part of the 16th and 17th centuries. He was born at Venice, probably about 1560, and is said to have been of Flemish descent. The date of his death is uncertain, but he seems to have been alive in 1639. For a number of years he studied under Leonardo Corona, and on the death of that painter completed several works left

unfinished by him. In the opinion of many judges he surpassed his master in richness and mellowness of colour, though he was inferior to him in design. His own activity seems to have been confined to the production of pieces for several of the churches and a few of the private houses in Venice; and though there exists no accurate list of his works, the old guide-books and descriptions of the city notice a considerable number of paintings by him. Scarcely any of these, however, have survived to the present time.

ANNABERG, a town of Saxony, situated in the Erzge- birge, about 1830 feet above the level of the sea, and at a distance of 18 miles south from

Chemnitz, with which it is conuected by railway. The chief importance of Annaberg is derived from its large lace and ribbon manufactories, the latter of which were first established in the town by Belgian Protestants, who were driven from their country by the tyranny of the duke of Alva. There are also extensive and valuable silver, tin, and cobalt mines in the neighbourhood. Population, 11,693.

ANNALS (Annales, from annus, a year), a concise historical record in which events are arranged chronolo- gically, year by year. The chief source of information in regard to the annals of ancient Rome is a passage in Cicero (De Oratore, ii, 12, 52), which has been the subject of much discussion. He states that from the earliest period down to the pontificate of Publius Mucius Sexvola (circa 131 3.c.), it was usual for the Pontifex Maximus to record the events of each year on a white tablet (album), which was exhibited in an open place at his house, so that the people might read it. These records were called in Cicero's time the Annales Maximi. After the pontificate of Publius, the practice of compiling annals was carried on by various unofficial writers, of whom Cicero names Cato, Pictor, and Piso. The Annales have been generally regarded as the same with the Commentarii Pontificum cited by Livy, but there seems reason to believe that the two were distinct, the Commentarii being fuller and more circumstantial. The nature of the distinction between annals and history is a subject that has received more attention from critics than its intrinsic importance deserves. The basis of dis- cussion is furnished chiefly by the above quoted passage from Cicero, and by the common division of the work of Tacitus into Annales and Historie. Aulus Gellius, in the Noctes Attice (v. 18), quotes the grammarian Verrius Flaccus, to the effect that history, according to its etymology (icropetv, inspicere, to inquire in person), isa record of events that have come under the author's own observation, while annals are a record of the events of earlier times arranged according to years. This view of the distinction seems to be borne out by the division of the work of Tacitus into the Historie, relating the events of his own time, and the Annales, containing the history of earlier periods. It is more than questionable, however, whether Tacitus himself divided his work under these titles. The probability is, either that he called the whole Annales, or that he used neither designation. (See Tacitus.) So far as the dis- tinction between annals and history is real, it seenis to arise out

of the more restricted conditions imposed upon the annalist as compared with the historian. A narrative strictly annalistic must necessarily be a mere register of isolated facts, and not a record of historical processes. Confined at each stage within the narrow limit of a single year, it cannot trace the progress of events or exhibit their connection and interdependence, as is done in history. (See on this subject an ingenious though somewhat fanciful paper by Niebuhr contributed to the Rhewnisches Museum, and translated by Thirlwall in the Cambridge Philological Museum, vol. ii.) In modern literature the title annals has been given to a large number of standard works which

adhere more or less strictly to the order of years. The best known are Grotius's Annales et Historia de Rebus Belgicis (Amst 1557), written in imitation of Tacitus; Baronius's Annales Ecclesrastici, comprising the first twelve centuries of the Christian era; Hailes's Annals of Scotland from the Accession of Malcolm ITT. to the Accession of the House of Stuart ; Chambers's Domestic Annals of Scotland; and the Annales de Chimie, founded in 1789 by Lavoisier and others, and continued, with two interruptions, down to the present time.

ANNAMABOE, or ANAMABOE, @ British fort and town on the Gold Coast of Africa, about 10 miles E.N.E. of Cape Coast Castle. It exports palm oil, ivory, gold dust, pea nuts, and Guinea grains; and in return its imports of manufactured goods are considerable. The town suffered severely during the invasion of the Ashantees in 1807, but the fort, although garrisoned only by a few soldiers, resisted the whole Ashantee host. Population about 4500.

ANNAN, a royal and parliamentary burgh of Scotland, in the county of Dumfries, situated on the river Annan, nearly two miles from the Solway Firth, and about fifteen from Dumfries. It is a well-built town, containing a town hall, a parish church, several dissenting chapels, and an excellent academy. The river Annan which has been embanked, is navigable for vessels of 300 tons up to within half a mile of the town, and for vessels of 60 tons to the bridge, a fine structure of three arches built in 1824. Annan is a station on the G. and §.~~W. Railway, and is connected with the main line of~~

~~the Caledonian Railway, and also with England, by the Solway Junction branch which crosses the firth by means of a very strong viaduct. The principal manufactures are cotton, ropes, and cured hams ; shipbuilding and salmon fishing are also carried on, while there is a considerable trade with England, the chief exports being cnred hams, cattle, sheep, and grain. The town, which is governed by a provost and fourteen councillors, including three bailies, unites with Dumfries, Kirkcud~~ bright, Lochmaben, and Sanquhar, in returning one mem- ber to parliament. In 1871 the population of the royal burgh was 4174, of the parliamentary, 3172.

ANNAN, ariver rising near the source of the Tweed, in the range of hills that lies on the confines of the counties of Dumfries, Lanark, Peebles, and Selkirk. About two miles beyond Moffat it receives two large tributaries, — the Moffat Water, which flows westward from Loch Skene, a mountain lake in the north-eastern corner of Dumfriesshire, and the Evan Water, which flows eastward from the upper part of Lanarkshire. The Annan has a total length of about 40 miles, and below its junction with the Moffat and the Evan it is joined by the Kennel Water from the west and the Dryfe Water from the east. Annan- dale was once the name of a stewartry which comprehended a large portion of Dumfriesshire.

ANNAPOLIS, a seaport town of the United States, the capital of Maryland, situated on the Severn, about 2 miles from its mouth in Chesapeake Bay, and about 25 in a direct line from Washington, with which it is connected by railway. It is a neat, regularly-built place, but the trade which at one time seemed likely to enrich it has been transferred almost entirely to Baltimore, and Annapolis is now little more than the political capital of the state. It contains handsome Government buildings, a college, and the United States Naval Academy, which was established at Annapolis in 1845, aud was for a time removed to Newport, Rhode Island. Providence, as An- napolis was first called, was founded in 1649, but it did not get a charter until 1708, when it also received its present name in honour of Queen Anne. It has been

aA seat of government since 1689. Population in 1870,

4,

ANNAPOLIS, a town of Nova Scotia, capital of Anna- polis county, and up to 1750 of the whole peninsula, situated on an arm of the Ray of Fundy, at the mouth of a river also called Annapolis, 95 miles west of Halifax. Annapolis is one of the oldest settlements in North America, having been founded in 1604 by the French, who called it Port Royal; it was finally captured by the British in 1710, and was ceded to them by the treaty of 1713. It possesses a good harbour, but its trade at present is small. Apples of a very fine quality are grown in the surrounding country. Population, 1500.

ANN ARBOR, a town of the United States, the capital of Washtenaw county, Michigan, situated upon the Huron, about 40 miles west of Detroit, with which it is connected by the Michigan Central Railway. ‘The town, which is healthy and well built, is a place of considerable commercial importance, its chief manufactures being iron, wool, and flour, while the trade in the produce of the surrounding district is large and valuable. It is the seat of the university of Michigan, a liberally-endowed institution, founded in 1837, and at present containing three subsidiary colleges devoted to legal, medical, and literary studies respectively, with a total attendance, in 1870, of 1072 students. The college buildings are large and pleasantly situated, and the university possesses a library, an observa- tory, and a chemical laboratory. The population of Ann Arbor in 1870 was 7363.

ANNATES. As early as the 6th century it began to be customary for those who were ordained to ecclesiastical offices to pay a fee or tax to the ordaining authorities ; and this tax at length amounted to a half or the whole of a year’s income. When, in course of time, the Roman See had appropriated the right of consecration, the money was paid into the Papal treasury, not, according to the defenders of the system, as a remuneration for the benefice conferred, but as a natural contribution to the maintenance of the Pope and his ecclesiastical government. These annates, or first-fruits, were of different kinds, though the chief features were the same in all. Jtrst, When a bishop, archbishop, or abbot received his investiture, he paid to the Pope a year’s revenue of his new benefice (servitia com- munia) ; Secondly, If his benefice was one of those “re- served ” by the Pope, he handed over to the Papal treasury the annates paid to him by those whom he at any time collated to livings in his diocese (annalia, medit fructus,

jus deportuum); Thirdly, According to a bull of Paul IT.

in 1469, if benefices were united to certain communities, the annates were only to be paid every fifteen years, and not at every presentation (quindenia); and, Fourthly, A small addition was made to the servitia communia as a kind of notarial fee (servitia muta). It must not be supposed that this system ever was worked with absolute uniformity and completeness throughout the various parts of the Papal domain. ‘There were continual disagreements and disputes: the central authorities endeavouring to maintain and extend this most important of their financial schemes. and the subordinate ecclesiastics doing their best to get rid of the impost altogether, or to transmute it into some less objectionable form. The subject frequently became one of national interest, on account of the alarming amount of specie which was thus drained away, and hence numerous enactments exist in regard to it by the various national governments. In England the annates, which had previously been paid for the most part to the arch- bishop of Canterbury, were claimed by John XXIT. (1316- 1334) for three years, and permanently usurped by his successors till the time of Henry VIII., when, in 1531, their collection was prohibited. At that time the sum amounted to about £3000 a year. On the completion of the Reformation, the annates were, along with the supremacy,

bestowed on the crown ; but in February 1704 they were appropriated by Queen Anne to the assistance of the poorer clergy, and thus form what has since been known as “Queen Anne’s bounty.” The amount to be paid was originally regulated by a valuation by the bishop of Norwich in 1254, later by one instituted in 1292, which in turn was superseded by the Liber Regis of 1535. In France, in spite of royal edicts,—like those of Charles VI., Charles VIL, Louis XI., and Henry II.,—and even denunciations of the Sorbonne, the custom held its ground till the famous decree of the 4th of August during the Revolution of 1789. In Germany it was decided by the concordat of Constance, in 1418, that bishoprics and abbacies should pay the servitia according to the valuation of the Roman chancery in two half-yearly instalments. Those benefices only were to pay the annalia which were rated above 24 gold florins; and as none were so rated, the annalia fell

into disuse. The Basle Council (1431-1443) wished to abolish the servitia, but the concordat of Vicnna (1448) confirmed the Constance decision. The Congress of Ems (1786) also declared against them; but they continued to be paid till 1803, when, to indemnify the powers that had sustained territorial loss through the recent wars, a very great amount of ecclesiastical property was secularised. In some parts of Germany, the payment of annates is still made under particular concordats. In Scotland annat or ann is half a year's stipend allowed by the Act 1672,

c. 13, to the executors of a minister of the Church of Scot-

land above what was due to him at the time of his death. This is neither assignable by the clergyman during his life, nor can it be seized by his creditors.

ANNE, Queen of Great Britain and Ireland, was born on the 6th of February 1664. She was the second daughter of James Duke of York, afterwards James II. She was only seven years old when her mother, Anne Hyde, died, having previously professed adherence to the Church of Rome, a step which was immediately imitated by her husband. 'The duke, however, had to allow his daughters, the princesses Mary and Anne, to be brought up as Protestants ; and Anne always continued to be attached, zealously and even bigotedly, to the Church of England. In her twentieth year she was married to Prince George, the brother of the King of Denmark. In the establishment then formed for her, a place was given, on her own earnest desire, to her early playfellow Lady Churchill, afterwards Duchess of Marlborough; and this ambitious and imperious woman, acquiring rapidly an irresistible authority over the feeble mind of the princess, thenceforth ruled her absolutely for more than twenty years. Not long afterwards, when the Duke of York had become king, he made repeated attempts to convert the princess Anne to his own creed ; he engaged that, if she would become a Roman Catholic, she should be placed in the line of succession to the throne before her elder sister Mary. Prince George appears to have received those overtures favourably; but he, an indolent and goodnatured man, who cared for nothing but good eating and field-sports, never had any influence over his wife. She remained firm in her Protestantism, lived in retirement during the whole of her father's reign, and

did not allow her opinions or feelings any further vent than that which they found in her private correspondence with the Princess of Orange. When, in 1688, James's queen gave birth to a son, the sisters took a lively interest in the suspicions and inquiries that arose ; and Anne was easily led to believe that the child was supposititious ; though later in her life she niust have been convinced that he was really her brother. Before the landing of the Prince of Orange Prince George was pledged to join him; and his wife and Lady Churchill abandoned King James on the first opportunity.

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From the Revolution till the death of William igs Anne's way of life was as quiet and obscure as it had been during the reign of her father. She did, indeed, on the prompting of her favourite, acquiesce in the act of the convention-parliament, which, postponing her place in the succession, gave the throne to William in case he should survive Mary. But the sisters soon quarrelled, and never were reconciled. The misunderstanding began in trifling questions of etiquette, quite fitted to the calibre of both of the royal minds; but considerations of real import- ance soon compelled the king himself to interfere. The Churchills, traitorous to their new sovereign, as they had been to the old, were known to be intriguing for the restora- tion of James; and they induced Anne to write secretly to her father, and declare repentance for her desertion of him. Even when William dismissed Marlborough from all his places, the princess obstinately persisted in retaining his wife in her household. After Queen Mary's death the king and his sister-in-law went through the forms of a reconciliation ; but there was no confidence on either side ; and indeed the secret correspondence with Saint Germains was still carried on. 'The state of the succession to the crown threatened new difficulties. Anne had seventeen children, but most of them were still-born ; and the Duke of Gloucester, the only one who survived infancy, died in 1700 at the age of eleven. The Jacobites, however, were unable to prevent the passing of the Act of Settlement, which placed the Electress of Hanover after Anne in the succession to the crown.

On the 8th of March 1702, Anne became queen of England by the death of William, being then thirty-eight years of age. Into her short reign there were

crowded events possessing vast importance, both for the British Empire and for the whole of Europe ; and her name is customarily associated with one of the most characteristic epochs in the history of English literature. Marlborough and Peterborough commanded her armies ; her councils were directed in succession by Godolphin and Somers, by Harley and St John; Berkeley and Newton speculated and experimented ; and the “ wits of Queen Anne’s time” were mustered, in poetry and in prose, under such chiefs as Prior and Pope, Swift, Addison, and Steele, Arbuthnot and Defoe. But no sovereign could have exerted less of real and personal influence than Queen Anne did, either on the national polity or on the national enlightenment. A blessed thing it was that she should have been thus powerless. or, beyond her own epicurean comforts, and the petty ceremonial of her court, there were just three ideas which her narrow and uninstructed intellect admitted : each of these ideas was full of danger to the peace and happiness of the state; and each of them was cherished by her with the hereditary stubbornness of a Stuart. She was as eager as any one of her race to enlarge the pre- rogatives of the crown: her father’s devotion to the Church of Rome was not stronger than was her desire to increase the power of the Church of England ; and she never ceased to wish earnestly that her exiled brother should be her successor on the throne. In no stage of Anne’s reign was even the last of these designs impracticable: there were always able statesmen inclined to lead the way; and more than once the tide of public opinion set towards absolutism, both political and ecclesiastical The queen, however, was not only dull and ignorant, but also indolent, fond of flattery, and accustomed from her youth to let herself be guided by stronger and more active minds than her own. Whatever her wishes might be, her actions were ruled by her female favourites. Fortunately the earlier of her two directresses, a woman of extraordinary force of character, was both willing and able to keep in check the queen’s private inclinations : not less fortunate was it that

the sway exercised by the next possessor of the royal favour was speedily cut short by her mistress's death. The course of English history might have flowed less smoothly if the Duchess of Marlborough and her husband had not become convinced that their own interest lay in supporting the principles of the Revolution ; and those principles might have sustained a rude shock, if Mrs Masham and her Jacobite allies had been allowed a few months longer to mature the queen's plans and their own.

The reign of Queen Anne, lasting for twelve years, falls naturally into two unequal periods.

During the first of these, the Duke of Marlborough was paramount in the houses of parliament, and his wife in the royal closet. A ministry of Tories was formed on the queen's accession ; but the leaders of it were Marlborough and Godolphin, who immediately began to edge off from their party. The principal measures were, from the begin- uing, in substantial conformity to the policy of King William : the war with France, hardly resisted then by any part of the nation, was prosecuted with ardour and success ; and the victories of Oudenarde, Ramillies, and Blenheim, gained by the consummate generalship of Marlborough, made England formidable and illustrious throughout Europe. In the internal affairs of the kingdom, Whig principles for a time prevailed more and more; the party acquired a decided majority in the House of Commons; and the ministry came to be composed almost entirely of Whigs, some of the Tories being dismissed, and others, like the two leaders, showing the accommodating flexibility of opinion which was so rife among the statesmen of that slippery age. The union of England and Scotland was carried through in the face of many difficulties ; and, while the proceedings of the ministry in the matter were by no means perfectly pure, the measure vwed its success mainly to the independent and honourable assistance of the best man among the Whigs, the accomplished and patriotic Lord Somers. During several years, in short, barriers were gradually and firmly built up against the old system and the old parties. But other days were at'hand. The domineering favourite of the queen presumed rashly on her power, and offended the self-esteem of her mistress. Mrs Masham, a poor relation of the duchess, whom she had introduced into the royal household, soothed Anne's fretful temper, gratified her vanity, and quickly, though secretly, acquired her confidence and

affection; and, under the guidance of the new favourite, and her prompter Harley, the queen was encouraged to hope for the attainment of all her most cherished aims. The state of public opinion underwent a corresponding change. Even under the masterly government of William, disappointments had been felt by those who expected impossibilities from the Revolu- tion ; discontent now diffused itself very widely, the main cause being the increase of taxation which had been rendered necessary by the Continental war. The Tories andJ acobites, led by some of the ablest of the statesmen, and assisted by some of the most skilful and energetic of the political writers, dexterously used the combustible materials that were accumulating, and made the church also an active engine of mischief. The ministry saw their parliamentary majorities wasting away ; they were personally treated at court with open contumely ; and their ruin was completed when, still relying too boldly on their supposed strength, they impeached Sacheverell for publicly preaching in favour of Jacobitism and the divine right of kings. In August 1710 the Whig administration was ignominiously discarded.

The second period of the queen’s reign began at this point. She was thenceforth governed by Mrs Masham ; Mrs Masham was governed by Harley and St John, the chiefs of the new ministry ; and these able and unscrupulous

men exerted themselves to the utmost of their power in undoing all that had been done by their predecessors. The fruits of the war were immediately abandoned, and the allies of England shamefully betrayed, by the treaty of Utrecht. If open attacks were not made on the con- stitution, it was only because the Parliament could not be trusted in such a case, and because, also, the two ministerial Icaders became jealous of each other, and formed separate intrigues. Harley, the Sinon of the time, corresponded

both with St Germains and with Hanover; St J ohn, more

decidedly Jacobite, plotted with Mrs Masham and the queen to procure the crown for the Pretender, on the ostensible condition of his professing Protestantism. But these cabals oozed out sufficiently to alarm the honourable Tories, and to array them and the bishops against the ministry in Parliament. ‘The time, likewise, during which the danger was growing, proved too short to allow it to become ripe. Harley and Mrs Masham came

to an open quarrel one evening in Anne's presence; after they had squabbled for hours, the poor queen just retained strength enough to insist that the minister should resign on the spot ; she then retired at two in the morning, and lay down on her deathbed. She was seized with apoplexy, and died on the Ist of August 1714. St John's schemes were not ready for execution ; and, by the prompt activity of a few patriotic statesmen, the accession of George J. was imme- diately and peaceably secured. (w. 8.)

(See Earl Stanhope's History of England, comprising the Reign of Queen Anne until the Peace of Utrecht, Lond. 1870.)

ANNEALING is the process of removing the brittle- ness peculiar to glass vessels and metal castings imme- diately after manufacture. Newly-blown glass is so fragile as to be altogether unfit for use; and the common occurrence of the breaking of a lamp-glass on lighting the lamp, or of a tumbler on pouring in hot water, shows the want of proper annealing.

The process consists generally in heating the vessels up to a red*or white heat in a close oven, and allowing them to cool gradually over a space of several hours or even days. The brittleness of rapidly-cooled glass is exhi- bited by the philosophical toy known as Rupert's drops or glass tears, said to have been first brought over to England by Prince Rupert and exhibited at the court of Charles I. They are small tadpole-shaped pieces of glass, which have been formed by allowing fused glass to drop into water. A pretty hard blow may be given with impunity to the thick part or head of the glass tadpole; but the mere breaking off of the tail causes the whole to fly to pieces, or rather to dust, with a sharp explosion. An illustration of the same kind is given by what are known as Bologna phials. These are vessels of thickish glass about half the size of a common Florence oil-flask, with no apparent flaw or cause of weakness. Though they will stand the shaking of a small bullet within them, yet the shaking of a few particles of sharp sand hardly visible will cause the bottom to fly to pieces. It is the mere scratch- ing of the skin that is fatal; and the explanation is easily found. The particles of the glass have a cohesive polarity which dictates a certain regularity in their arrangement, but which requires some time for its development. When the vessels are suddenly cooled, the surface molecules only can have had time to dispose themselves duly, while those within are

kept by this properly formed skin in a highly constrained situation; and it is only so long as the surface film keeps sound that this constraint can be resisted. In the Rupert's drops it is plainly visible that the interior substance is cracked in every direction, and ready to fly to

leces. In the process of annealing the glass is kept for some time in a state approaching fluidity, and admitting of a

uniform molecular arrangement throughout. Of course the thicker the glass the more careful must be the anneal- ing and the longer the process; very thin glass requires little or no annealing, because it is, so to speak, all skin; and glass thread requires no such treatment to make it possess the exquisite flexibility of silk.

The large sheets of plate glass, now used for shop windows require to be very carefully annealed before being ground and polished, otherwise they would be un- able to stand the scratching of the surface. Imperfection in this respect is often revealed by the spreading in every direction of a crack once begun. 'These plates require as long as a fortnight to complete the annealing; and smaller articles from six to sixty hours, according to their thickness and weight

In the manufacture and working of the various metals, annealing is frequently employed to reduce the brittle- ness usually resulting from a rapid or important change of molecular structure, such as is produced by hammering, long-continued _ vibration, rolling, and sudden cooling. The coppersmith who hammers a flat sheet of copper into a vessel of any description he pleases, must leave off ham- mering at intervals, and anneal the piece of metal to pre- vent it going to pieces under his blows. The extreme degree of tenuity to which gold is reduced by heating, is attainable only by very frequent and careful heating and slow cooling at each stage of the processes of forging, rolling, and beating

Perhaps no better example can be given of the import- ance of annealing in metals that have to be subjected to frequent concussion than the art of die-forging. The matrix, from which the die-punches are impressed, is the

product of many months' labour, and the subject of tender care in its manufacture. Being a mass of steel of con- siderable dimensions, it is extremely liable to fracture after the operation of hardening, so mech so that it will not bear even sudden changes of atmospheric temperature. This brittleness is removed by putting it in water, gradu- ally raised to the boiling-point, and then allowed slowly to cool. 'The matrix is used, not so often for the stamping of medals and coins directly, as for the manufacture of die-punches, which shall be used to produce any required number of dies exactly like the original matrix. For this purpose a conical plug of fine soft steel is compressed by powerful machinery against the matrix; but in receiving the impression its texture is condensed and hardened, so that the annealing process has to be repeated after every few blows in the die-press, to prevent cracking of the sur- face Coins, whether gold, silver, or copper, are usually impressed by a single blow, and in their case the blank etal is annealed before coining But in medals, where the design is in bolder relief, a number of blows, some- times as many as thirty, is required; and in this case it is necessary to anneal after every third blow

Wheels and axles of railway carriages, from the constant vibration to which they are subjected, become, in course of time, dangerously brittle; and they require to be re-worked and annealed anew to restore the requisite toughness to the material. Soalso in the processes of metal rolling and wire-drawing, frequent annealing is necessary to allow the cohesive force to produce the most stable arrangement of the particles. The soft metals, such as lead, tin, and zinc, are annealed by immersion in water, which is made to boil and then to cool slowly. Sudden changes of temperature have the effect, almost invariably, of rendering metals brittle. And, as sudden cooling is required to give to steel its peculiar and invaluable hardness, so unfortunately it renders it at the same time brittle as unannealed glass, from the unnatural strain which the inner substance of the metal possesses. Annealing must, therefore, be employed

to reduce this molecular strain, and to give the steel a workable flexibility. This is done by raising it to a red heat within a close vessel, and then

allowing it gradually to cool. Heating in an open fire is very injudicious,

because the carbon which enters the steel as an element

combines with the oxygen of the air to the detriment of the quality of the steel. Usually steel goods are heated in an iron oven with charcoal powder, or placed in the heart of hot cinders, so as to exclude all air and oxy- gen. Large castings, such as are used in the manufac- ture of cannon, are kept covered with hot cinders and allowed to cool down sometimes over a space of about three months.

In proportion as this brittleness and hardness are reduced by annealing, the flexibility is increased, which allows of the employment of steel for an infinite variety of purposes. A bath of oil, which boils at about 600° Fahr., is often used for the annealing of steel tools, when a tem- perature between the boiling-point of water and 500° or 600° Fahr. is required. Annealing is also employed to render cast-iron malleable or less brittle than it is naturally, so that a dozen of small articles—such as buckles and knife-blades—can be manufactured at less cost than a single article can be otherwise.

Annealing may be said to be the inverse process of tempering, which is the fixing of the molecular condition of steel by more or less sudden cooling from a particular temperature.

The real nature of the change which metals undergo by annealing is not thoroughly understood. Most of the malleable metals are susceptible of two distinct forms: one, called the crystalline form, which they assume by slow cooling; and the other, the fibrous, which is acquired by hammering or rolling. When this, however, is carried beyond a certain point, the metal becomes so hard that it is not capable of being bent far without breaking, and recourse must be had to annealing or slow cooling.

On the other hand, if the annealing be long continued the malleability diminishes, and themetal again has a crystal- line fracture. Zinc by wire-drawing becomes very flexible, and possesses a degree of tenacity not inferior to that of copper; but, if it be kept in boiling water for a length of time, it will resume its original brittleness, and show a crystalline

appearance when broken. Thus it appears that little can be said of the theory of the subject; little more, indeed, can be attempted than the enumeration and classi- fication of the facts.

ANNECY, a town of France, in the deparment of Haute Savoie, situated at the foot of the lake of Annecy, 22 miles south of Geneva. The surrounding country pre- sents many scenes of beauty, and the town itself is a pleasant residence, containing a cathedral, a bishop's palace, a church (in which the relics of St Francis de Sales are preserved), and an old castle, formerly the residence of the counts of Geneva. It is the seat of several important manufactures, the chief being linen and cotton goods, glass, cutlery, earthenware, and leather ; linen bleaching is also carried on to a considerable extent, and in the neighbour- hood there are some iron mines. 'There are traces of the Roman origin of the place; at all events Annecy le Vieux, a village a little to the N.E., existed in the time of the Romans. Annecy was once the capital of the counts of Geneva; from them it passed to the counts of Savoy, or, as they ultimately became, kings of Sar- dinia, by whom it was ceded to the French in 1860. Population, 11,581. The lake of Annecy is about 9 miles in length by 2 in breadth, and its surface is more than 1400 feet above the sea. It discharges its waters by means of a canal into the Fier, a tributary of the Rhone.

ANNELIDA

NNELIDA, a class of the sub-kingdom Annulosa, the title being derived from Lamarck's term Annélides (Annellus, a little ring), given to Cuvier's red-blooded worms. 'The latter were in- cluded by Linneus under his Vermes, along with intestinal worms, molluscs, zoophytes, and sponges. The labours of Pallas, Baster, Otho Fabricius, and espe- cially O. F. Miiller, enabled Gmelin, in the © 13th edition of the Systema Nature of the great Swede, to make some improvements and many additions. Cuvier ranged the Annelida under his Articulata, giving them the chief position on account of their red blood ; but they are now generally classified as a separate type below the latter. It would be out of place to enumerate all the ad- vances that have occurred since Cuvier's time, but among those whose names stand prominently forward in this respect are Lamarck, De Blainville, Bosc,

Audouin, Milne-Edwards, Dugés, Moquin-Tandon, and De Quatrefages in France ; Van Bene- den, Morren, and D'Udekem in Belgium ; Gruithuisen, Oken, H. Rathke, Grube, Max Schultze, Hoffmeister, Hering, Kolliker, Schmarda, Keferstein, Ehlers, and Ratzel inGermany ; Claparéde in Switzerland ; Malmgren, Metschnikoff, and Kowalevsky in Russia; Sars in Norway; Kinberg and Lovén in Sweden; Delle Chiaje in Italy ; Stimpson, Leidy, A. Agassiz, and Verrillin North America; and Montagu, Dalyell, G. Johnston, J. R. Johnson, Williams, Huxley, Baird, and Ray Lankester in our own country. The Annelida may be described as

Fig. 1.—WNereis peia- gica. L. (After Crsted.)

bilaterally symmetrical animals, with flat- tened or cylindrical bodies, composed of numerous soft rings, or without such. The locomotive appendages (gene- rally furnished with bristles) are not articulated. or pair of ganglia, connected on each side of the cesophagus with a chain of ganglia running) along the ventral aspect. Mouth ventral ; ali- mentary canal with an anus. Circulatory system with distinct vessels. The majority are small animals, but some reach the length of 6 feet and upwards, and are as thick as a finger. — understood as comprehending the A. Poty- cHmTa, A. Onicocuzta, A. OnycopHora, A. DiscopHora, and A. GrpuHyrea, the first two being often placed together in the sub- class Cheetopoda.

I. In the first order, A. Potycnara, the body (fig. 1) is elongated, segmented, more or less well-marked regions), and almost universally furnished with uniramous or biramous bristle- bearing feet (parapodia, Huxley). The first | segment is modified, so as to form a head or Hid. 9._-Bitatle snout, and has the eyes, tentacles, dc. The of Pionosyllis second or buccal segment bears the mouth and "@"™re"* certain processes. The other segments have foot- tuber-

Nervous system consisting of a cephalic ganglion

In the present article the Annelida will be } cylindrical (certain tubicolous forms having two cles, bearing bristles developed in special sacs (e, fig. 4),

and various appendages, such as elytra, dorsal and ventral cirri, &c. The structure of the bristles (e.g. fig. 2) holds a prominent part in the discrimi-

nation of species and even genera, and the same may be said of the hooks of many of the Tubicola (fig. 3). A curious example of the Opheliide has no bristles, and Zomopteris has only one at the base of each tentacle. Poste- riorly, the diminished body gene- rally terminates in two elongated cirri in the free forms, while in the sedentary such processes are often absent.

Fig. 3.—Hook of Terebella. In Poly-

dora (fig. 21) a curious funnel-like structure exists.

The body in the Polycheta (e.g. fig. 4) is invested by a

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Fic. 4.—Transverse section of Eunice. (After Ehlers.)

finely fibrous, cuticular, or chitinous layer (d), to which the iridescence in many formsisdue. This is perforated at somewhat regular intervals by two series of pores, and cilia are generally present at certain points. In the sedentary anne- lids the cuticle is thinner, a feature probably in connection with their protective tubes. Be- neath the cuticle is a cellulo- granular hypoderm, with tubular glands, bacilliparous and glandu- lar follicles in certain cases, as well as the deposits of pigment. The muscular system is well de- veloped, and the bands variously arranged in the body-wall. A well-marked circular layer is gene- rally present externally, while in others it would seem to be repre- sented only by oblique bands. The longitudinal bundles follow different plans, such as forming an almost continuous coat, or split up into various distinct ribands (a and 4, fig. 4, the former repre- senting one of the dorsal bands, the latter one of the ventral). Schneider thought that the ar- rangement of the muscular sys- tem might form the basis of a classification of this and allied Fic. 5.—ventral See sens groups; but for sound reasons 9/2″ Sirtaedi alan Hthas not been adopted. | There 9%, yur Hoesen is no tendino

segment, though fibres from the a sp pass through

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round the intestine in certain sedentary forms, and great diversity in regard to capillary distribution. The blood is usually reddish in colour, and devoid of corpuscles—the latter, however, being present in Syllida, some of the Ophe- * liide, Cirratulide, and in Staurocephalus. It is colourless in Aphrodita, greenish in Stylaroides and certain Sabellidee. Finally, Glycera and Polycirrus are devoid of a true circula- tory apparatus. This system is compared by Professor Huxley to the water-vascular system of the Echinoderms, Trematoda, and other groups ; but, as formerly mentioned, this is doubtful. Hemoglobin has been found by Ray Lankester in the blood of many of the Polycheeta.

The Annelida composing this group generally possess a special branchial apparatus, and where this is absent (e.g. Lumbriconereis), the skin and ciliated digestive chamber seem to carry on the function. So characteristic are the branchie, that the term Dorsibranchs was aptly bestowed on one section (see fig. 4), and Cephalobranchs on the other (see fig. 6). The branchiz have the form of simple filiform organs, or they are pinnate, bipinnate, pectinate (e, fig. 4), flabelliform, or arbuscular processes. To each the blood is carried by a branch of the dorsal vessel, which traverses the organ to its extremity, and, looping, carries the aerated fluid to the ventral vessel. Vascular loops pass between the two branches in the branchiz, and only very thin cuticular tissues covered with cilia intervene between the water and the blood, so that due oxygenation occurs. In the Ser- pulide the branch from the dorsal vessel is continued directly into the twig going to the ventral, and from their point of union a single vessel traverses the branchia and sends processes into the pinne, the blood, moreover, in these presenting undulatory movements. A cartilaginous framework exists in the branchial processes of the latter group and the Sabellide (fig. 6). According to Fritz Miiller the opercular plug in certain forms is developed by a gradual metamorphosis of the branchia.

The digestive system consists of a rounded alimentary canal, commencing at the second and terminating in an anus at the last or the penultimate segment. The mouth opens in the form of a simple slit or grooved dimple on

the under surface of the second segment. In many the first region is a complex muscular and protrusible pro- boscis (fig. 5, a, pharynx and cesophagus of some, and the

the longitudinal layer, in some cases even to the hypoderm. The muscular fibres have a hyaline connective tissue. In Myxicola and Protula the fibres of the longitudinal coat have a dendritic appearance in transverse section. Besides the foregoing, many have a powerful oblique band on each side, passing down to be inserted near the nerve-cord, or elsewhere ; and the proboscis (4, fig. 5), bristles, branchiz, alimentary canal, and other organs, have a series of special muscles. By the muscles of the body-wall the Polycheta execute all their movements in the water and on land, the feet-papillee with their bristles playing quite a subordinate part. A few progress in addition by special organs, such as the tentacles of the Terebelle.

The cutaneous and muscular tissues enclose a space termed the perivisceral cavity, which stretches from the anterior to the posterior extremity. This chamber is lined by a special membrane, which likewise envelops the ali- mentary canal, vessels, and other organs. It 1s generally divided into various transverse spaces by muscular dis- sepiments or screens (which permit communication), and occasionally there are longitudinal partitions. In this cavity the highly organised perivisceral corpuscles float in a coagulable lymph, which has no relation with sea-water. The lining membrane is ciliated in Aphrodita, Glycera, Polycirrus, Tomopteris, and Zerebella; and it is curious that in these the blood-vessels proper are absent, with the exception of the first and last. Ray Lankester has found that hemoglobin occurs in the perivisceral corpuscles of Glycera and Capitella. Professor Huxley, after M. de Quatrefages, is inclined to think the perivisceral fluid the true blood of the group, but this is doubtful.

The circulation of the blood is effected by a system of closed vessels with muscular walls (fig. 5), the funda-

mental arrangement consisting of a dorsal and a ventral trunk (v), with communicating branches in each segment—the current in the former being directed forwards, and in the latter backwards. Branches from the main trunks ramify on the wall of the ali- mentary canal, body-wall, dissepi- ments, and other parts. Thedorsal gives branches to the branchiz, whence

the blood passes by other twigs to the ventral. Sometimes dilatations, termed “hearts,” occur at the bases of the branchiee —as in Eunice ; and in Arenicola _ and Polyophthalmus similar dila- Fra 6,— Dasychone in- : $3

fracta, Ky (After Mulm- tations existin other parts. Various

gre) modifications of the system take place, such as the bifurcation of the dorsal vessel anteriorly or posteriorly, the presence of blood-sinuses or lacune

numerous sacculations from constrictions Fic. 7.—Tip of proboscis and horny teeth of Polynoéimpatiens. (Af-

ganglia, and a chain of ganglia placed along the ventral aspect of the body (n, fig. 4). The former lie over the cesophagus, and send branches to the eyes, tentacles, and other organs. A cord (buccal) joins them on each side to

the ventral chain, and thus the cesophagus is encircled by a nervous collar. In each segment the ventral ganglia give out branches for the supply of the neighbouring organs and feet. The nerve-cells chiefly occur on the ventral surface and sides of the ganglia. In some (eg., Terebella), while the nerve cords are united in the anterior ‘region, they are separate posteriorly. The eyes are much developed in Alctope, certain Syllide, and others ; but, on the other hand, many are eyeless. Most of the eyes are mere masses of black pigment (sometimes capsulated) situated on the head, destitute of means of accommoda- tion, with certain nerve-threads going to them. In Alciope, sclerotic, lens, retina, and other parts exist. In Branchi- omma the eyes occupy the branchie, and in Fabricia the posterior end of the body. Otolithes are stated to be present in a few (e.g. Avenicola), but on these and other minute points further investigation is required. The sense of touch is extremely delicate in the group; on the sur- face at large, as well as in the tentacles and cirriform processes Lvarne, Nephthys, Ophiodromus, and. others, ex- hibit remarkable irritability. The Polycheta are for the most part dicecious, the sexual glands being variously developed on the inner sur- face of the body-wall or on the dissepiments, and develop- ing in the forms of ruffs round the vascular axes. The pro- ducts are detached into the

perivisceral cavity. The ciliated and looped segmental organs of Dr Willams occur very generally, and may conduct outwards the sexual elements, but they have also been supposed to be excrementitious. In Zomopteris their ciliary current carries spermatozoa in- wards, and the same may occur in other forms. The structure and deposition of the egg, and the changes in its development, agree with those in other classes. Certain Eunicide are ovo-viviparous. Occasionally the ova are ‘borne on the back (Polynoé), or in a ventral pouch (Awto- lytus cornutus), until hatched, while in Spirorbis a modifi- cation of the operculum acts as an ovisac. The young escape as ciliated organisms with a long whip anteriorly ; but, as development progresses, the cilia are confined to certain zones. A few immature forms, again, such as the young of Werine, carry remarkable bristles, which are shed before the adult form is reached. Some have arranged the larval forms according to the zones of cilia and the temporary bristles. In the growth of the young animal the development of the new segments takes place between the first and last. In certain Nereidew, eg. Nereis Du- meruti, at least two sexual forms exist,—viz., a small adult which develops either ova or spermatozoa in the usual way (except that in the male the elements occur in two testicles placed in one segment), and, secondly, another which becomes transformed into a Heteronereis before the sexual clements are developed. Metschnikoff has further found another Nereis which is hermaphrodite. The phenomena of alternate generations is also observed in Autolytus, and fissiparity in Lligrana,—the latter, with Spirorbis and Amphiglena, being alsohermaphrodite. The female Autolytus quite differs from the male, and has its body loaded with ova, which pass into a pouch in A. cornutus, Agass., and the products by-and-by get exit as fiee-swimming embryos. The male is wide in front, and has large tentacles, the sperm- sacs occupying the first five bristled segments. From the young of the foregoing is developed—so as to complete the series—the third kind, viz., the “parent-stock” of A. Agassiz, which differs from both the previous forms. No sexual elements occur in the parent-stock, but the males and females are produced from the body by transverse fission (fig. 8). Regeneration of mutilated parts is common in the Poly- cheeta, even to the reproduction of a head. The tubes formed by many exhibit an amount of pre-

cision and skill not far removed from the powers of the most ingenious insects. In common with the Nemerteans, their skin exudes a tenacious secretion which coheres under water, and this alone forms the protective tube in some; while in others it is strengthened with mud (fig. 9), sand, gravel, shells, and stones. The secretion varies from the most delicate 7 film in the Syllidz, to the tough parch- ment-tubes of Chetopterus, or the rigid crow-quills of Hyalinecia (fig. 10). The eyeless Pectinaria belgica (fig. 11), again, fashions a tube like a straight horn (fig. 12) of minute pebbles or large grains of sand, carefully selected and admirably fixed to each other by a whitish secretion. In placing the grains together in the wall there is no haphazard, but angle fits angle as in a skilfully built wall. Beautiful semi-transparent tubes are constructed by an allied species in the deep sea from the siliceous spicules of sponges. The remark- able arborescent or pectinate processes which ornament the free ends of the tubes of certain Zerebelle are also noteworthy.

Fic. 8. — Parent-stock of Autolytus cornutus. (After A. Agassiz.)

Fia 9.—Clymene amphistoma, Say., with a fragment of tube on the right. : (After Savigny.)

molluscs in the absence of organic connection between the animal and its protective sheath. Lastly, large coherent masses of coarse gravel and sand-tubes are formed on various beaches by Sabvellaria.

The annelids are subject to many para- sitic inroads, as by Gregarine, Opaline, and Nematoids, internally; various vege- table growths, zoophytes, Loxosome, and the crustaceans Selius, Selenium, Nereicola, Terebellicola, Sabelliphilus, Chonephilus, and Sabellacheres, externally. Commen- salism is likewise not uncommon; thus §§ Polynoé scolopendrina haunts the tubes of §% Terebella nebulosa, and it also alternates with Harmothoé marphyse in the tunnels of Marphysa sanguinea; Acholoé astericola frequents the ambulacral rows of Astro- pecten, Malmgrenia castanea, the peri-oral region of Spatangus purpureus, and Nereilepas fucata associates itself with the hermit-crab in Buccinum; while Alcio- pina parasitica lives in the interior of Pleurobrachia, and one of the Amphino- mide in the respiratory cavity of Lepas.

The Polychzta are all marine, and dis- tributed over the whole surface of the globe,—often at very great depths,—as early shown by General Sabine, and recently by the Norwegian dredgings, and Fie. 10—Hyalinecia those of the celebrated “Porcupine” and ‘bicola, 0B. Mulier, “Challenger” expeditions. Many species are common to the entire North Sea, and extend to the south as far as Gibraltar, while some northern forms enter the Mediterranean in considerable numbers. The British species are common to the North Sea, and many range to the shores of North America. The size of some of the

Fig. 12.—Tube of fig. 11, partially shaded.

Fic. 11.—Pectinaria bel- gica,Pall. (AfterMalm- gren.)

mens, especially amongst the Amphinomide. The borers in shell, limestone, coral, and Melobesia, seem cosmopolitan, and the swimming Tomopteris is likewise widely distributed. The forms frequenting the bottom of the sea live in mud or sand, or lurk under stones, in chinks of rocks, shells, and seaweeds. Many specially affect mud or muddy sand, e.g., the Lumbriconereidz, Nephthydidre, Glyceridze, and the Terebellide ; while some prefer hard or stony ground, e.g., the Polynoide and Sigalionide. Between tide-marks they abound in fissures of rocks, under stones in pools, under tangle-roots, and in sand or sandy mud. Many live in captivity several years, but the duration of their exist- ence generally is unknown.

Tubicolar Polychzta occur in various strata, from the Lower Silurian upwards, and Serpulites even appear in the

Fie. 13.—Chloeia,

Fig. 14.—Hesione splen- dida, Say. (After Sa- vigny.)

quartz of Durness. Many of the tracks and burrows re- ferred to the group (Polycheta) are involved in consider- able doubt; but the Hunicttes, Lumbriconereites, and Merin- gosoma, from the Solenhofen rocks, are satisfactory evi- dences of fossil forms. The arrangement of the apertures

of Arenicola didyma, from the Longmynd, in pags is peculiar.

In regard to beauty of form and colour, complex struc- ture and wonderful habits, the Polycheta are not sur- passed by any invertebrate class. ‘The splendid bristles of the Aphroditide, constantly glistening with all the hues of a permanent rainbow, the brilliant tints of the Phyllo- docide, Hesionide,and Nereidz, and the gorgeous branchial plumes of the Terebellide, Sabellidz, and Serpulidz, can only be compared with the most beautiful types of butter- flies and birds.

The class Annelida has been divided into the sections Branchiata and Abranchiata, the former comprehending the Polycheeta, the latter the other groups ; but this does not always hold good, since many Polychzta have no branchie. The latter, again, have been separated into the Dorsibranchsand Cephalobranchs, the former corresponding to the Maricola, Errantia, or Nereidee of others, the latter to the Tubicola orSedentaria. Grube’sdivisions, Rapaciaand Limivora, are based on the nature of their food. In the present state of the department it will suffice to indicate the following families (chiefly after Malmgren) under which the Annelida Polycheta have been ranged, and to refer for further information to the Annélides of De Quatrefages, the Familien of Grube, the Cheetopoda of Ehlers, the Annélides Chétopodes of Claparéde, the British Museum Catalogue by Johnston and Baird, and the various works of Kinberg and Malmgren: — EvpHRosy- nips, AMPHINOMID# (fig. 13), APHRODITIDA, PoLYNoID#, ACE- TIDH, SIGALIONIDZ, NEPHTHY- pIp#, PHyLLopocip#, HEsto- nipm (fig. 14), Aucroprps#, To- MOPTERID (provisionally), S¥t- Lip&, Nererw (fig. 1), StauRo- CEPHALIDA, LUMBRICONEREIDE, Evunicip® (fig. 4), ONUPHIDIDE (fig. 10), GontADID#, GLYCERIDZ, Arictip&, OPHELIIDA, ScALI- BREGMID#, TELETHUSID A(fig.20), SPHZRODORIDZ, CHLOREZMIDA, STERNASPIDA, CHATOPTERIDA, Spronipz# (fig. 21), Crrratv- LID, CAPITELLIDH, MALDANID& (fig. 9), AMMocHARIDa, HERMEL- Lip#, AMPHICTENID# (figs. 11 and 12), AMPHARETIDA, TERE- BELLIDH, SABELLID (fig. 16), ERIOGRAPHIDA, and SERPULIDA Fie. 16.—Sadella vesiculosa, Mont. (fig. 15). ? (After Montagu.)

TL The A. Oxrrcocu#ra are annelids without tentacles, cirri, or specialised branchial processes. Bristles, variously grouped, from two to eight and upwards in each transverse series. They are hermaphrodite, and the young undergo no metamorphosis.

The body is enveloped in a delicate cuticle resembling that of the Polychzeta, and pierced by many pores. Under- neath is a cellulo-granular hypoderm, with numerous glands. The setze are simple, bifid, or hair-like. The muscular layers are an external circular, and an internal longitudinal, marked by the bristle sacs. The foregoing tissues enclose a perivisceral space, with the usual septa and the charac- teristic corpuscles in a coagulable lymph, which performs important functions in the economy.

The circulatory system consists essentially of a dorsal trunk situated over the digestive chamber, carrying the

Fie. 15.—Sptrorbdis nautiloides, La- marck.

blood from behind forwards, and a ventral or sub-intestinal conveying the fluid in the opposite direction. The former is broken up into a plexus of vessels in the anterior seg- ments, and generally gives off a large branch (perivis- ceral) on each side in the others. The periviscerals in certain segments behind the anterior plexus are enlarged, and so evidently contractile as to have received the name of “hearts,” and propel the blood into the ventral vessel. In the other segments the periviscerals pass to the latter, either with or without division into branches—in the form of cutaneous plexuses, which are greatly developed in this group. Branches pass from the ventral to the intestinal wall, invsculating with others from the dorsal, and forming arich capillary network. In the Lumbrict there is also a third longitudinal vessel underneath the nerve-cord, and it is 1 communication with both dorsal and ventral, especi- ally by the cutaneous system. The blood is generally reddish, devoid of corpuscles, and coagulable. Respiration seems to be effected by the cutaneous and special plexuses, aided, probably, in some by the currents of water in the ciliated digestive canal.

The digestive system is in the form of a simple straight, more or less muscular tube, differentiated into cesophagus, crop, gizzard, and sacculated intestine in Lumbricus, and coated internally with the usual glandular elements (certain glands anteriorly being supposed to be salivary), and lined internally with cilia. In the same group a peculiar closed fold of the chamber constitutes the typhlosolis of authors. The anus is situated at the posterior end of the body. In the Limicolous group thestructureis less complex—pharynx, cesophagus, and intestine only being present. The nervous system consists of a pair of cephalic ganglia, from each of which a trunk passes by the side of the cesophagus to join the ventral chain, which gives off branches in each segment to the surrounding parts. In Zumbricus another small gangliated chain lies over the commencement of the ali- mentary tract. The nervous system agrees in intimate structure with that of the Polycheta. Besides touch, and in some sight, the special senses are not much developed. Several have epidermal papilla connected with cutaneous nerves, which probably aid tactile sensibility.

The Oligocheta are hermaphrodite, the sexual elements being developed in certain anterior segments in the form of testicles, deferent canals, receptacles, copulatory papille in some males, and ovaries and accessories in the female. In each segment, with a few exceptions (while there are two in each in Lwmbricus), the segmental organs occur. Claparede thought that in the Limicola the latter are absent from the segments bearing the oviducts and seminal receptacles, but present in those having male organs ; while in Zumbricus they are present in all the segments except the four last. In some, special glands exist for secreting the egg-capsules. A cincture or clitellum occurs in certain segments anteriorly (in Lwmbricus from the eighteenth to the twenty-ninth or thirtieth, and in the others from the tenth to the fifteenth segment). The ova are deposited in chitinous capsules (containing one or more), and the young issue therefrom in a tolerably complete con- dition. Besides the ordinary development by ova, it has long been known that Nats and Chetogaster exhibit fissi- parous reproduction. In Nats, after a certain degree of growth has been reached, budding takes place, so that several tolerably complete young forms may be found at- tached to the adult. The process goes on until the Nazs has been reduced to twelve or fourteen rings ; then a pause occurs, and the animal increases in length to forty or fifty rings, when a new cycle commences by division in the middle of the body

Cheetogaster shows similar features, the budding taking place between the third and fourth segments in the androgynous form—many zoids or buds

being attached in line; but while the second in position is one of the newest, the second in age is near the middle of the series.

Reproduction of lost parts readily takes place in this group. Parasites, such as Gregarine, Opaline, Nema- toids, and larval cestodes, are met with internally, and Vorticelle are common externally. Commensalism is seen in Chetogaster, which lives on the pond-snails (Limneus and Planorbis), and Stylaria is stated also to be ectopara- sitic.

They are distributed over the land and fresh waters (in sand and mud) of the whole world: very few are marine.

Two of the most important classifications are those of D'Udekem and Claparede. The former arranges tle sub- orders according to the gemmiparous, or non-gemmiparous condition of the constituents. The latter group live in earth or mud, are unable to swim or follow their prey, and have always their organs of generation. 'The former are elegant little worms, living in stagnant or running water, able to swim, and their generative organs are devcloped only at certain periods. Claparéde divides them into two families, viz., the O. Zerricola (including the earthworm and its allies), and the O. Limicola, an arrangement much resembling Grube's Lumbricina and Naidea.

IIf. The A. OnycHorHoRa are represented by a single aberrant family, Peripatus. They are hermaphrodite forms (with claws instead of bristles) approaching the Arthropods, and inhabiting land and moist places in Chili, the West Indies, and other parts. The ventral nerve-cords remain separate.

IV. The A. Discopora (leeches) are ringed forms (fig. 17), without lateral appendages (except in Branchellion), but possessing an anterior and posterior E sucker. There is no specialised respiratory system. They are generally hermaphrodite, and often ectoparasitic.

Externally there is a delicate porous cuticle ; beneath lies a thick glandular cutis, which pours out an abundant secretion of mucus, as in the Nemerteans. The mus- cular system consists of an external circular coat of considerable strength, from which various vertical or decussating bands pass | at intervals, powerful longitudinal bundles being held in the intermediate spaces, especi- ally laterally. There are also special muscles connected with the pharynx and other parts. Each end of the body is generally formed into a flattened muscular sucker, consisting apparently of several amalgamated segments. By aid of the latter organs they move from point to point, and they can also progress rapidly by swimming like the Nemerteans. The perivisceral space is quite absent. The circulatory system shows a main dorsal, a ventral, and two lateral trunks, all com- municating by branches in each ring. In Branchiobdella the blood is corpusculated. The blood is probably aerated on the cutaneous, and perhaps, in some cases, on the digestive surface. The digestive system consists of a mouth opening into the anterior sucker, a muscular pharynx, oesophagus, a large stomach with various cecal diverticula, and an anus which opens in front of the posterior sucker, though sometimes into it. In some (e.g. the common leech), the mouth is furnished with three horny serrated teeth. The nervous system is composed of two cephalic ganglia, which supply branches to the eyes when present, and the usual gangliated ventral cord—giving off branches to the surrounding parts. The gullet passes through the connecting trunks as in the former groups. The last ganglion in the ventral cord of Clepsine is larger than the others; and, as in the Polycheta, the ganglia do

Fie. 17.—Hirudo medicinalis, L.

not always correspond in number with the rings. Other nerves occur in several, ¢.g., the leech, which has a trunk running along the dorsal surface of the digestive canal. Eye-specks are present in some, and touch is generally much developed. The cupuliform organs in the cutane- ous tissues of the head and anterior region in certain leeches are supposed to be connected with the latter sense.

The Discophora are hermaphrodite (with the exception of the Malacobdellide and Histriobdellide), with the male organs ranged along the ventral surface in the form of a series of testes, which are connected with a common vas deferens leading into a vesicula seminalis on each side. The latter conveys the fluid into the intromittent organ, and its secretion agglutinates the spermatozoa into a seminal rope or spermatophore. The female organs consist of two ovaries leading to a common duct, opening into the vagina, which receives the spermatophore. The segmental organs are present, but not in direct communication with the reproductive structures, nor do they carry the products to the exterior, since they are often excal. The foregoing diverges from the arrangement in the other Annelida, since the generative products are not extruded into a perivisceral cavity, but pass outwards by a particular apparatus. The ova are deposited in capsules formed by special secretions, those of the leech being called cocoons, No metamor- phosis occurs in the development of the young, which by- and-by, in some cases, attach themselves in crowds to the abdominal surface of the parent.

The Discophora do not possess much power of regenerat- ing lost parts. They are distributed everywhere, chiefly

Fic, 18.—Hirudo medicinalis, L., var. officinalis.

The green leech,

in fresh water and moist places; some are marine. A few attain a large size, ¢.g., a species from Valdivia is described as being two and a half feet long. Many are ectoparasitic, living on fishes, crabs, and even in jelly- (fishes (Bolinide). In swampy ground . in tropical countries certain leeches are often troublesome to travellers. Fossil leeches have been found in the litho- graphic stones of Germany They , have been grouped into five families, J viz., Malacobdellide, Histriobdellide, ; Acanthobdellidz, Branchiobdellide, and

Rhynchobdellidze—the latter including the medicinal leech of Europe, the ¥

green leech (fig. 18), the Bdella niloteca of Savigny (fig. 19), the horse- leech, skate-leech, pond-leech, which is devoid ony of an anterior sucker, and other well- ro. 19—zdetle nitotica known forms. Sav. (After Savigny.) ”

V. The A. GepHyREA seem to approach the Echinoderms through the Holothuroidea. The body is more or less cylindrical, and, though corrugated, is not definitely seg- mented. There is generally a protrusible proboscis, having the mouth at the end or at its base; and the anus is terminal or dorsal.

The cuticle is chitinous, has numerous processes of similar composition, longitudinal and transverse ruge, and many pores. Beneath is a hypoderm containing certain glandular organs or sacs, and, in some, bodies like tricho-

cysts. Bristles occur in Echiurus and Bonellia. The muscular system consists of external circular and internal longitudinal fibres, and special groups of retractor and other muscles of the proboscis. In some the longitudinal layer is arranged in separate bands, stretching from one end of the body to the other. The circulatory system shows a dorsal and ventral vessel, both in the Sipunculide communicating with a circular vessel (ciliated internally) surrounding the cesophagus, and sending prolongations into the ciliated tentacles. The latter contains a corpus- culated fluid. Certain ciliated infundibuliform organs also occur on the intestinal mesentery of Sypunculus, and are thought to be connected with the so-

called water-vascular system. In Hchiwrus there is a more distinct circulation, consisting, according to De Quatrefages, of three longi- tudinal trunks—a dorsal, ventral, and intestinal. The perivisceral cavity is large, with rudimentary dissepiments in some, and contains a corpusculated fluid, which in the living animal shows very lively currents—most marked posteriorly, and generally in a longitudinal direction. In Bonella the respiratory structures open into the latter chamber. Two kinds of excretory organs occur—in some opening into the rectum, and in others into the alimentary cavity anteriorly. The protrusible proboscis is often armed with chitinous processes. The mouth opens at the base of the proboscis in the Echiuride, but at its tip in the Sipuncu- lide, the latter also having short ciliated tentacles sur- rounding the aperture. It is followed by a pharynx and much-convoluted alimentary canal lined with cilia. The anus is either terminal, or situated dorsally at a point near the anterior third of the body. The walls of the alimentary canal are glandular, and there are also muscular fibres. The nervous system consists of a ventral cord giving off various branches, but showing no distinct ganglionic en- largements, nor indication of a fusion of two cords. There is an cesophageal collar, but the cephalic ganglia do not seem to be always distinct. There are no organs of the special senses except those of touch, which is fairly de- veloped, and in a few eye-specks, especially in young forms.

The A. Gephyrea are dicecious, and have structures homologous with the segmental organs of the other groups, in the form of a series of tubes or ceca. In the Sipun- culi, according to Keferstein and Ehlers, there are two testicles, and the ova are developed in ovaries attached to the wall of the body, but they vary in situation in other families. The products fall into the perivisceral cavity. In some the young undergo certain metamorphoses (Acteno- trocha-form), but in others the larval condition differs from the adult chicfly in the possession of ciliated zones.

The Gephyrea are widely distributed on the surface of the globe, generally in muddy regions, and some are common in empty univalves. They are all marine. They have been grouped in three families: (1.) Echiuride, contain- ing forms with bristles, such as the common spoon-worm (Echiurus vulgaris) and Bonellia ; (2.) Sipunculrde, with a dorsal anus, e.g., Phascolosoma Bernhardt of the univalve shells; (3.) Priapulide, with a

terminal anus, e.g., Preapulus caudatus. Sternaspis has lately been removed to the Poly- cheeta, and Phoronis has been included in the group as a tubicolar Gephyrean.

The Cheetognatha and the higher Turbellaria approach the Annelida proper very closely, though from different points of view, and may be regarded as intermediate between them and the Nematodes, Tematodes, and Cestodes. The Nemerreans (the highest group of the Turbellaria) especially come near the Annelida, notwith- standing the condition of the nervous system. They have cilia externally, and a cutis which secretes similar hyaline tubes to those of many Annelida. The muscular system is

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greatly developed, and in definite layers, and many swim as freely as the most active leeches. The digestive system intimately agrees, having cilia on the inner surface of the canal, a muscular cesophageal region, and a sacculated intestine, while the glandular and other elements in the wall are very similar; it differs in not passing through a buccal nervous collar, although it lies beneath the nervous system in this region. The circulatory apparatus is fairly developed, and in some corpusculated. The special plexus, in certain forms, in the cesophageal part of the digestive tract points out not only the true function of the vessels (which have been considered a water-vascular system with- out reference to the cephalic sacs and their ciliated vessels in the Enopla), but shows a close analogy with the anterior plexuses of many Annelida proper and Balanoglossus, and even foreshadows the branchial system of certain verte- brates, as seen, for instance, in the young Petromyzon. The appending of the branchial system to the anterior end of tne digestive is characteristic. Though it is quite in- accurate to say that the Nemerteans have a corpusculated fluid in the

general cavity of their bodies, yet a highly organised corpusculated fluid exists in their muscular proboscidian chamber, and evidently performs important functions in their economy Moreover, the remarkable provoscis and its sheath pass through a ring of nervous tissue consisting of the superior and inferior commissures and their connections with the ganglia. The cephalic ganglia are large, and lie over the digestive system, but the nerve-cords are separated throughout. The Nemer- teans are chiefly dicecious, and the products of their sexual organs, which are developed in the form of a series of sacs on each side between the muscular wall of the body and the digestive canal, find exit by lateral pores, the contents of the male organs being often vented in clouds, as in Hermella The young sometimes undergo a metamorphosis, e.g., the Pylidiwm-development of certain Anopla. To this the Zornaria-condition g of Balanoglossus and the

Finally the Annelida as a whole show certain general features which may be grouped undcr three heads— (1.) The uses of the class to man; (2.) The property of phosphoresence ; and (3.) The power of boring into hard substances.

The Annelida are not devoid of value in an economical sense. All round the British and many other coasts the lob- worn (Arenicola marina, fig. 20) is used as bait; and here and _ there Nephthys ceca and Nereilepas fucata. In the Channel and Channel Islands two of the most plentiful of the Nereide fs (Nereis cultrifera and WN. diversicolor) re. 20. — Arenicola are extensively employed in fishing. sista They are constantly sought for between tide-marks with a pointed instrument resembling a spear, and kept in vessels amongst sand and seaweeds. One of the most esteemed baits in ordinary and in conger fishing in the same regions is the large Marphysa sanguinea. The anterior segments of the living annelid only are preserved, since the posterior region is apt to decay and cause the death of the whole.

‘nection with light or

The natives of the Fiji group much relish a form allied to our Lysidice ninetta, and they predict its annual appearance in their seas by observing the phases of the moon. It is called Palolo by the Samoans and Tonguese, and Mbalolo by the Fijians. Occurring in vast numbers, formal presents of the esteemed food are sent by the fortunate chiefs con- siderable distances to

those whose dominions are not visited by the annelid. If the latter has similar habits to the British Lysidice, it probably leaves its retreats in the coral- reefs and rocks for the purposes of reproduction. The extensive use of the Zumbrec in fresh-water fishing, and that of the leech in medicine, need only be alluded to— the latter forming a considerable item in British importa- tions. chiurus is employed as bait by the Belgian fishermen, and Pallas records that the natives of the same coast formerly considered the muscular proboscis of the sea-mouse good food. Lastly, a Stpunculus is eaten by the Chinese. An examination, again, of the stomachs of our most valuable fishes shows the important part played by the Annelida in their food-supply; and the large number of species of fish which can be speedily captured on arich coast with bait of Nereis cultrifera is ample cor- roboration. The stomachs of cod and haddock, for instance, are often quite filled with sea-mice with Polynoide, Tere- bellidee, Alitta virens, Owenia, Trophonia, Phascolosoma ; and in fresh water those of trout with Lambricv.

The property of phosphorescence occurs in the families Polynoide, Syllide, Chetopteride, and in Polycirrus and Lumbricus. In the first-mentioned, light greenish and somewhat steady scintillations are given off at the attach- ment of each scale, and the separate organ gleams with pulsations of light at the ruptured surface. It was pro- bably the latter appearance which caused M. de Quatre- fages to state that it was emitted in muscular contraction. The synchronous emissions of light by the Italian fire-flies 1s interesting in this respect. Vat ee In the Syllide the light “)) comes from the under surface of each foot; in Cheetopterus the most vivid luminosity is on the dor- sum of the tenth seg- ment ; and Polycirrus is so phosphorescent, that the slightest tremor in the water causes vivid pale bluish fire to gleam along every tentacle. The exact physiology of the luminosity is still open to investigation, though P. Panceri of Naples cun- nects it with certain fatty granules. The luminous emissions have no con-

darkness, with the cap- ture of prey, or the alluring of their enemies, nor with the illumination of the depths of the sea.

Boring and burrowing in sand, mud, and earth are very general in the Annelida. Glycera and Nephthys, for instance, , disappear with great rapidity amongst sand by boring with their proboscides, the former passing

its elon- gated organ through a considerable space in a single thrust. Zteone and Ammotrypane carry their bodies swiftly

Fie, 21.—Polydora ciliata, Johnst.

through moist sand and gravel. Others penetrate muddy | forms are Polydora (fig. 21), Dodecaceria, Subella saxicava, clay and the debris in fissures of rocks. The labours of | and Phascolosoma Johnston. Though such annelids are the earthworm in passing through the soil only require | very abundant in corals, limestone, chalk, and shells, yet indication; and the Gephyrea and some leeches show the their occurrence in large numbers in aluminous shale and same habits in clay and mud. Certain Polycheta and | sandstone shows that their perforations are not necessarily Gephyrea have also the power, in common with cirripedes, | due to an acid. The influence of the boriug annelids in molluscs, Bryozoa, and sponges, of perforating rocks, stones, disintegrating the foregoing substances is consider- shells, and other solid media. The most conspicuous able. (w. Cc. M.)

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ANNESLEY, Artuur. See Ancrzsra, Earl of. Catholic faith. Their chief town, a village on the north-

ANNI, or Ani, the ancient Abnicwm, a ruined city | east of the island, is merely a collection of rude huts, with of Turkey in Asia, in Armenia, situated about 25 | an equally barbarous chapel. The roadstead is tolerably niles E.S.E. of Kars, in a rocky ravine, past which the safe, and passing vessels frequently take advantage of it in Arpa-Chai, a tributary of the Aras or Araxes, flows. | order to obtain water and fresh provisions, of which Anno The private houses of Anni are now little more than | Bom contains an abundant supply. The island was dis- heaps of loose stones, but in the ruins of the public | covered by the Portuguese on the 1st of January 1473, puildings there is still ample evidence of the former size | from which circumstance it received its name, “Dia de and greatness of the city. Several churches, mosques, | Anno Bom,” being the Portuguese term for New-Year’s day. and a building which was probably the palace, as well as | It is

claimed both by Spain and Portugal, but neither of the massive walls of the city, are the most perfect and | these nations exercises any authority in the island, which is conspicuous remains at Anni, and exhibit many points of | governed by a native, or rather it is said by a body of five great architectural beauty. Anni was the capital of the | natives, each of whom holds the office of governor in turn, Pakradian or Bagratian dynasty of Armenian kings, and | during the period that elapses till ten ships touch at the under their rule reached the height of its greatness. Alp | island. Arslan captured it in 1064, and handed it over to a tribe ANNONAY, a town of France, in the department of of Kurds, from whom it was taken by the Georgians. In | Ardéche, irregularly but picturesquely built on several 1319 an earthquake completed the misfortunes of the city, | small hills at the confluence of the rivers Canse and Dedme, reducing it to the state in which it now exists. 37 miles south of Lyons. It contains few buildings that

ANNO BOM, or ANNABONA, a small island off the | are worthy of notice, although an obelisk in honour of the west coast of Africa, situated in lat, 1° 24’ S. and long. 5° | celebrated brothers Montgolfier, inventors of the balloon, 35’ E., 190 miles west of Cape Lopez. Its length is about | who were natives of the place, and the Gothic church of four miles, its breadth two; and, rising in some parts to Trachi, built in the 14th century, deserve to be mentioned. a height of nearly 3000 feet above the sea, it presents a | The manufactures of Annonay are among the most im- succession of beautiful valleys and steep mountains, that | portant in the department, the chief being those of paper, are covered with rich woods and luxuriant vegetation. | long considered to be the best in France, and glove leather, The inhabitants, who probably amount to about 3000, are while cotton, woollen, and silk goods are also produced. negroes, very ignorant, but professing a belief in the Roman | Population, 18,445.

ANNUITIES

Y an annuity is meant a periodical payment, made be entered upon, after » years, or to run from the end of n annually, or at more frequent intervals, either for | years; and if it is payable yearly, the first payment will be a fixed term of years, or during the continuance of a given | made at the end of (n+1) years; if half-yearly, the first life, or a combination of lives, as will be

more fully half-yearly payment will be made at the end of (n+) explained further on. In technical language an annuity | years; if quarterly, the first quarterly payment will be is said to be payable for an assigned status, this being a | made at the end of (n+4) years; and so on. If an general word chosen in preference to such words as “time,” annuity, instead of being payable at the end of each year, “term,” or “period,” because it may include more readily | half-year, &e., is payable in advance, it is called an either a term of years certain, or a life or combination of | annuity-due. lives. The magnitude of the annuity is the sum to be Tf an annuity is payable for a term of years independent paid (and received) in the course of each year. Thus, if | of any contingency, it is called an annuity certain; if it is £100 is to be received each year by a person, he is said to | to continue for ever, it is called a perpetuity; and if in have “an annuity of £100.” If the payments are made | the latter case it is not to commence until after a term of half-yearly, it is sometimes said that he has “a half-yearly | years, it is called a deferred perpetuity. An annuity de- annuity of £100;’ but to avoid ambiguity, it is more | pending on the continuance of an assigned life or lives, commonly said he has an annuity of £100, payable by | is sometimes called a life annuity; but more commonly half-yearly instalments. The former expression, if clearly | the simple term “annuity” is understood to mean a life understood, is preferable on account of its brevity. So we | annuity, unless the contrary is stated. A life annuity, to may have quarterly, monthly, weekly, daily annuities, | cease in any event after a certain term of years, is called a when the annuity is payable by quarterly, monthly, | temporary annuity. The holder of an annuity is called weekly, or daily instalments. An annuity is considered | an annuitant, and the person on whose life the annuity as accruing during each instant of the status for which it | depends is called the nominee. is enjoyed, although it is only payable at fixed intervals. If not otherwise stated, it is always understood that an If the enjoyment of an annuity is postponed until after the annuity is payable yearly, and that the annual payment lapse of a certain number of years, the annuity is said to (or rent, as it is sometimes called) is £1. Of late years, be deferred. When an annuity is deferred for any number | however, it has become customary to consider the annual of years, say , it is said, indifferently, to commence, or to | payment to be, not £1, but simply 1, the reader supplying

whatever monetary unit he pleases, whether pound, dollar, franc, thaler, &c. It is much to be desired that this course should be followed in any tables that may be published in future.

The annuity, it will be observed, is the totality of the payments to be made (and received), and is so understood by all writers on the subject; but some have also used the word to denote an individual payment (or rent), speaking, for instance, of the first or second year's annuity,—a prac- tice which is calculated to introduce confusion, and should therefore be carefully avoided.

The theory of annuities certain is a simple application of algebra to the fundamental idea of compound interest. According to this idea, any sum of money invested, or put out at interest, is increased at the end of a year by the addition to it of interest at a certain rate; and at the end of a second year, the interest of the first year, as well as the original sum, is increased in the same proportion, and so on to the end of the last year,—the interest being, in technical language, converted into principal yearly. Thus, if the rate of interest is 5 per cent., £1 improved at interest will amount at the end of a year to £1:05, or, as we shall in future say, in conformity with a previous remark, 1 will at the end of a year amount to 1:05. At the end of a second year this will be increased in the same ratio, and then amount to (1:05). In the same way, at the end of a third year, it will amount to (1:05)%, and so on.

Let 2 denote the interest on 1 for a year; then at the end of a year the amount of 1 will be 1+2. Reasoning as above, at the end of two years the amount will be (1 +2), at the end of three years (1+7)%, and so on. In general, at the end of m years the amount will be (1+7)*; or this is the amount of 1 at compound interest in n years. The present value of a sum, say 1, payable at the end of nm years, is such a sum as, being improved at compound interest for » years, will exactly amount to 1. We have seen that 1 will in m years amount to (1+2)*, and by pro- portion we easily see that the sum which in » years will

Wee : : amount to 1, must be yee (1+7)-*. Itis usual to

(1+2

put v for , so that v is the value of 1 to be received

1 1+2

at the end of a year, and v” the value of 1 to be received at the end of nm years.

Since 1 placed out at interest produces 7 each year, we see that a perpetuity of 7 is equal in value to 1; hence,

by proportion, a perpetuity of 1 is equal in value to *. At

5 per cent., = ‘05, and == 20; or a perpetuity is worth 20 years’ purchase: at 4 per cent., it is worth 25 years’

purchase, (ar 25) : at 3 per cent., it is worth 33} years’

purchase, (a5 = 334) ;

Instances of perpetuities are the dividends upon the public stocks in England, France, and some other coun- tries. Thus, although it is usual to speak of £100 con- sols, this £100 is a mere conception or ideal sum; and the reality is the £3 a year which the Government pays by half-yearly instalments. The practice of the French in this, as In many other matters, is more logical. In speak- ing of their public funds, they do not mention the ideal capital sum, but speak of the annuity or annual payment that is received by the public creditor. Other instances of perpetuities are the incomes derived from the deben- ture stocks now issued so largely by various railway com- panies, also the feu-duties commonly payable on house property in Scotland. The number of years’ purchase which the perpetual annuities granted by a government or

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a railway company realise in the open market, forms a very simple test of the credit of the various governments or rail- ways. Thus at the present time (May 1874) the British per- petual annuity of £3, derived from the 3 per cent. consols, is worth £93, or 31 years' purchase; and a purchaser thus obtains 3°226 per cent. interest on his investment. Other examples are given in the subjoined tables, the figures in which are deduced from the Stock Exchange quotations of the irredeemable stocks issued by the various govern-

ments :— Interest per

No. of Years'

— WOribighivess..

DODO 4°22 See e ls .. cee eee. 21:20 4°72 Biigeia neyo nraacukenitiiiies «cae 20°40 4:90 ET rem ener… curacuunewecmesee cess atc 19°67 5:08 IS ReWAGTINS., ceca cee nece sere t caiise oma ons 20°00 5:00 IRORGMPUGEC,..0.20..eeeenesreedese scene 15°42 6°48 BPM 5 van p'seia cs esas sec sen crs oes 13°50 7°41 JATIN OG range eimerecssny ca icrerneanie: 13°40 7°46 UDG eultienrd eee ae «ais. vn'sjeqpnisinislentores dears 13°00 7°69 MIKASIWE vtec ccd sec acces ves teers _ O50 10°53 SUaUTISIOSPO. .. scccecceeeeeits… 6°67 15:00 Venezuelan, .. tin… ee 3°50 28°57

The following are a few other examples of perpetui-

ties :— Interest per

No. of Years'

e — Purchase. Ceo Metropolitan Board of Works Stock, 27°50 3°64 London and N.W. Railway Deben- 25-75 3°88

GUE S COC Kener eterna eins, cii

We may mention in passing that the more usual practice of foreign governments when borrowing is not to grant the lender a perpetual annuity,

but to issue to him bonds of say £100 each, bearing an agreed rate of interest, these bonds being usually issued at a discount, and redeemed at par by annual drawings during a specified term of years.

We have seen that the present value of any sum payable at the end of years is found by multiplying it by (1+2)-*; hence the value of a perpetuity of 1 deferred

pee Oli <1) iad m years ig . the difference between the value of a perpetuity to com- mence at once and a perpetuity deferred m years; its value _\— Esl .\— 8 . or = a a a or putting a for the value of the annuity, we have— 1— (1+7)-* By means of this equation, having any two of the three quantities, a, 7, , we can determine the third either exactly or approximately. Thus for » we have— _ _ _ log (lia) es ote sks) There is no means of determining the value of 7 exactly, but it may be found to any degree of accuracy required by methods of approximation which our limits will not allow us to describe.?

Now an annuity for 2 years is clearly

é 1 is therefore a

1 A similar difficulty meets us in many other cases, as, for instance, when we wish to determine the rate of interest, having given the amount of an annuity for a given term, or the value of an annuity or perpetuity deferred for a certain number of years. The reader who wishes to pursue this subject is referred to Francis Baily's Doctrine of Interest and Annuities, 1808, in the appendix to which the formulas of previous authors are examined, and new ones, which are at once simpler and more correct, are demonstrated. Particular cases of the problem are considered in Turnbull's Tables of Compound Interest and Annuities, p. 132, and in various papers in the Assurance Maga- zine, among which may be specified De Morgan's paper " On the Deter- mination of the Rate of Interest of an Annuity," vol. viii. p. 61, and a letter by J. M'Lauchlan in the eighteenth re The analogous

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If the annuity for x years is not to be enjoyed at once,

but only after the lapse of ¢ years, its value will be reduced

in the proportion of 1 to the value of 1 payable in ¢ years, or 1: (1+%)“‘5 continue for » years is therefore—

Cro” a+}.

Tt remains to find the amount at compound interest at the end of n years of an annuity payable for that term. The amount of 1 inn years being (1.7%)”, its increase in that time is (1%)*—1; but this increase arises entirely from the simple interest, 7, of 1 being laid up at the end of each year and improved at compound interest during the remainder of the term. Hence it follows that the amount at compound interest of an annuity of 7 in m years must be (1+7)”—1; and by proportion the amount of an annuity of 1 similarly improved will be Ges +9 by

One of the principal applications of the theory of annui- ties certain is the valuation of leasehold property ; another is the calculation of the terms of advances in consideration of an annuity certain for a term of years. At present a large sum of money is annually borrowed by corporations and other public bodies upon the security of local rates in the United Kingdom. It is sometimes arranged in these transactions that a fixed portion of the loan shall be paid off every year; but it is more commonly the case that, in consideration of a present advance, an annuity is granted for a term of years, usually 25 or 30, but in some instances extending to 50. Landed proprietors also, who possess only a life interest in their property, have been authorised by various Acts of Parliament to borrow money for the purpose of improving their estates, and can grant a rent- charge upon the fee-simple for a term not exceeding 30 years. These are very favourite investments with the life insurance companies of the country, as they are thus enabled to obtain a somewhat higher interest—from 4% to 43 per cent.—than they could obtain upon ordinary mortgages with equally good security ; the reason for this, of course, being that these loans are not so suitable as others for private lenders. In this case, as in all others, the price is determined by the laws of supply and demand; and the number of ordinary mortgages, the terms paid by the borrowers are higher. When a loan is arranged in this way,

it is desir- able for various purposes, and in particular for the ascer- tainment of the proper amount of income-tax, to consider each year's payment as consisting partly of interest on the

outstanding balance of the loan and partly as an instal-

ment of the principal. The problem of determining the separate amounts of these has been considered by Turn- bull, Tables, p. 128; and by Gray, Ass. Mag., xi. 172.

Jn making calculations for these and similar purposes, it is but seldom necessary to use the formulas given above. The computer usually has recourse to one of the tables which have been published, containing values and amounts calculated for various rates of interest. An extensive set of tables of this kind was published in 1726 by John Smart; and many subsequent writers, as Dr Price, Baily, Milne, Davies, D. Jones, J. Jones, have reprinted or abridged portions of these tables. They show the amount and the present value both of a payment and of an annuity of £1 for every term of years not exceeding 100, at the several rates of interest, 2, 24, 3, 34, 4, 5, 6, 7, 8, 9, 10 per cent. ; the five most important tables giving——

nn ne nn ee Enna problem of determining the rate of interest in the bonds of foreign governments above mentioned, debentures, and similar securities, has been fully treated of by Gray, Ass. Mag., xiv. 91, 182, 397; and by Makeham, xviii. 132.

and the value of the deferred annuity to

lenders being less than in the case of

A Wen U I'D 1s

(1.) The amount of £1 in any number of years, n; or

(1 +12)".

(2.) The present value of £1 due in any number of years, n; or (L+%)-". (3.) The amount of an annuity of £1 in any number of oe years, 2; Or Cnr. (4.)

The present value of an annuity of £1 for any

1-(1+%)-”

number of years, 7; or ——~~~—— * (5.) The annuity which £1 will purchase for any num- a ber of years, 2; OF ods .

The scheme would be more complete if we add, with Corbaux, whose tables will be described below—

(6.) The annuity which would amount to £1 in n years;

%

of Geen 1

Smart gives the values of these functions not only for all integral values of » up to 100, but also for the half- years. In this respect, however, he has not been followed by subsequent writers. Some (as Milne) have stated that he “has given the amounts and the present values both of sums and annuities certain, wrong for every odd number of half-years.” This remark requires some explanation. The fact is that Smart’s tables are quite correct, but are not applicable according to the conventions that are usually observed in practice. Thus, for example, he gives the amount of 1 at the end of half a year at 4 per cent. interest as equal to ,/1-04=101980390, this being the strictly correct theoretical value at 4 per cent. interest. But in practice the invariable rule is, when interest is calculated for a shorter term than a year, to take a propor- tionate part of the year’s interest, thus virtually charging a higher rate for the odd time, so that in the above case the amount at the end of half a year will be 1°02. This circumstance renders it undesirable to tabulate the amounts and values for half-years; and this is never now done, ‘The course adopted by Smart of giving the values and amounts of annuities for the odd half-years is open to more serious objection. His figures in these cases are merely the values of the algebraical functions above given, corresponding to the values of 2, 4,14, 24, &c., and do not give the amounts and values of annuities payable half- yearly. In fact, we are unable to see that any practical ‘use could ever be made of his results in these cases.

The following table, on p. 75, in which the rate of in- terest is 5 per cent., will serve to illustrate the nature of the tables in question, as reprinted by Baily, D. Jones, and others.

It will be seen that the figures in the column numbered (2) are the reciprocals of those in (1), and the figures in column (5) the reciprocals of those in (4). Also, that the figures in (4) are the sums of the first 1, 2, 3, &c., terms of (2). Again, the figures in (8) are derived by the successive addition of those in (1) to the first term, 1°000000 ; and the figures in (4) are equal to the product of those in (2) and (3). We have added the column (6) from Cor- baux's tables. These figures are the reciprocals of those in (3), and are equal to the product of those in (5) and (2), while the figures in (5) are the products of those in (1) and (6).

It would perhaps be more convenient in practice if tables (3) and (6) were altered so as to relate to annuities payable in advance (or annuities-due). In that case (3) would give the amount at com- pound interest in 7 years of an annuity-due of 1, and (6) the annuity- due which would, at compound interest, amount to 1 in ~ years ;

F _., epee hae that is to say, the values of the functions ~~~ jj and

a ee (+ae_—1—7? respectively. One very common application of

table (3) is to find the amount of the premiums paid upon a life policy, and these premiums are always payable in advance. If that table were arranged as here suggested, the figures contained in it would be derived from those in (1), in precisely the same way ag

Table of Amounts, Present Values, &c., at 5 per cent. Interest.

a= '05.

| (1) (2) (3) (4) (5) (6)

(—i*—1 1-G+a-” i n Q-+in a+ -* — Ee ee eae | waar 1 | 1:05000000 | -95238095 1-00000000 ‘95238095 | 1°05000000 | 1-0000000 2 | 1:10250000 |. -90702948 2-05000000 | 1‘85941043 ‘53780488 “4878049 3 | 1°15762500 | 86383760 3°15250000 | 2°72324803 36720856 3172085 4 | 121550625 | :82270247 4‘31012500 | 354595050 “28201183 2320118 5 | 127628156 | -78352616 5°525638125 | 4°39947667 23097480 “1809748 6 | 134009564 | 74621540 6°80191281 | 5°07569207 19701747 1470175 7 | 1:40710042 | -71068133 8°14200845 | 5°78687340 “17281982 “1228198 8 | 1:47745544 | 67683936 9°54910888 | 6°46321276 15472181 “1047218 9 | 1:55132822 | -64460892 | 11°02656432 | 7:10782167 “14069008 0906901 0 | 1°62889463 | -61391325 | 12°57789254 | 7:72173498 “12950458 0795050

(4) from (2). It would also be an improvement, for a reason to be mentioned. presently, if the heading of the tables were altered, so that, for example, instead of (1) being called a table of the amounts of “£1” at the end of any number of ‘‘years,” it were called a table of the amounts of ‘¢1” at the end of any number of ‘‘ terms.”

It is not to be understood that the tables are arranged in the, manner here shown. Smart gives, in his First Table of Compound Interest, the values of our (1) for the various rates of interest arranged side by side; in his Second Table he gives the values of our (2) at different rates of interest similarly arranged ; and so for (3), (4),

gum payable in six months’ time? and, in order to find the amount of the annuity in » years, we must first deter- mine what is the amount of a sum at the end of six months. The annual rate of interest being 2, it may be supposed at first sight that the amount of 1 at the end of

six months will be 1+5 ; but if this were the case, the

amount at the end of a second period of six months would

and (5). This arrangement has been followed by most authors, not i 2 2 av? only by those mentioned above as having copied Smart’s tables, but be increased in the same proportion, and be (a = 5s , Or also by Chisholm, who states that the compound interest tables in ‘ees ad B mit Bes 2

his work (Commutation Tables, 1858) have been specially computed OG a ut this is contrary to our original assump-

for it. He gives the tables (1), (2), (8), (4), and (5), at the rates of interest 3, 34, 4, 5, 6 per cent., to any number of years up to 105. Hardy s Doctrine of Simple and Compound Intercst, 1839, contains tables (1), (2), (3), (4), for the rates of interest 4, 4, §, 1, 14, 14, 1%, 2, 24, 24, 29, 3, 34, 34, 38, 4, 44, 44, 49, 5, 6, 7, and 8 per cent., for any number of years up to 100, The arrangement in our speci- men is that adopted by Rance in his Tables of Compound Interest, 1852. He gives tables (1), (2), (8), and (4), at rates of interest proceeding, by steps of } per cent., from } to 10 per cent., for any number of years from 1 to 100. The same arrangement is also fol- lowed in the tables appended to Francis Corbaux's Doctrine of Compound Interest, 1825 ; but this author gives in one opening of the book not only the six tabular results in our specimen, but also the corresponding results when interest at the nominal rate of 5 per cent, is payable half-yearly and quarterly, thus giving in one open- ing 24 tabular results side by side. He gives results for every quar- ter of a year up to 16 years, and then for each year up to 100 ; and his rates of interest range from 3 to 6 percent., at intervals of } per cent. The only other tables we think it needful to mention are Turnbull's, 1863. His work gives tables (1), (2), (3), (4), and (5), for the 'rates of interest 3, 33, 4, 44, 5, and 6, payable yearly ; for 3, 34, 3h, 33, 4, 44, 44, 43, 5, 54, payable half-yearly ; and 3, 33, 4, 44, 5, 6, payable quarterly. The results extend in every case to 80 terms of conversion—that is, 80 years, 80 half-years, and 80 quar- ters respectively. The arrangement of the tables differs from that of all the others mentioned, as each page contains only the results pertaining to one table at one rate of interest. The results are given not only in decimals, but in £ s. @. in addition, which also is unusual,

A few words may be here added as to the practical method of constructing compound interest tables. The formulas we have found above are not directly used for the calculation of the greater part of the tabular results; but these are in practice deduced the one from the other by continuous processes, the values found by the formulas being used at intervals for the purpose of verification. Smart gives, on page 47 of his work, a description of the method he has employed, and the subject has been fully dealt with by

Gray in his Tables and Formule, chap. 2. Since the publication of that work, the Arithmometer of M. Thomas (of Colmar) has come into extensive use for the formation of tables of this kind. Fora descrip- tion of the instrument, and some of its uscs, the reader is referred to the papers in the Asswrance Magazine by Major-General Hannyngton, vol. xvi. p. 244; Mr W. J. Hancock, xvi. 265 ; and by Gray, xvii. 249 ; xviii. 20 and 128.

Hitherto we have considered the annuity payments to be all made annually ; and the case where the payments are made more frequently now requires attention, First, sup- pose that the annuity is payable by half-yearly instalments ; then, in order to find the present value of the annuity, we have first to answer the question, What is the value of a

tion that the annual interest is z, and the amount at the end of a year therefore 1+7, In fact, if we suppose the

interest on 1 for half a year to be . the interest on it for

s . s 12 a year will not be 2, but i473. In order that the amount

at the end of a year may be 1 +2, the amount at the end of six months must be such a quantity as, improved at the same rate for another six months, will be exactly 1+7; hence the amount at the end of six months must be ,/1+7, or (1+7)*. Reasoning in the same way, it is easy to see that, the true annual rate of interest being z, the amount of 1 in any number of years, x, whether integral or fractional, will always be (1+7)”. Hence, by similar reasoning to that pursued above, the present value of 1 payable at the end of any number of years, m, whether integral or frac- tional, will always be (1+7)-* or v*.

It is now easily seen—we omit the demonstrations for the sake of brevity—that the present value of an annuity payable half-yearly for n years (m being integral) is ee =e, and that the amount of a similar

annuity at the end of x years is oy . ees! 5 a It is to be observed, however, that when we are dealing with half-yearly payments in practice, the interest is never calculated in the way we have here supposed. On the contrary, the nominal rate of interest being 7, the rate

paid half-yearly is s so that the true annual rate in prac- paca sinamsae it tice 18 2 A 3 half-yearly, at the rate of 5 per cent. per annum, the true rate of interest is 050625, or £5, 1s. 3d. per £100. Under these circumstances interest is said to be convertible into principal twice a year. Assuming that interest is thus convertible m times a year, the rate of interest for the m”

for instance, if interest on a loan is payable

part of year will be – and the amount of 1 at the end of nm years, that is, at the end of mm intervals of conversion,

wave (1 ” Ja m

Assuming the number m now to in-

crease indefinitely, or interest to be convertible momently, the above amount becomes ¢*, where ¢ is the base of the natural (or Napierian) logarithms.

In consequence of the above-mentioned practice as to half-yearly interest, the values given in Smart’s tables for the odd half-years, though theoretically correct, are prac- tically useless, and they have been superseded by the other tables above mentioned. It is important, however, always to bear in mind that when interest is thus payable half- yearly or quarterly, the true rate of interest exceeds the nominal, From want of attention to this point, the sub- ject has become involved in much confusion, not to say error, in the works of Milne and some other writers.

It is easily seen from the above formula that the amount

: P ie of 1 in mn years, at the rate of interest 7? 18 the same as

that of 1 in years, at the rate of interest 4 convertible m times a year; and a similar property holds good of present values. Hence, the tables calculated at the rate of interest

Es may be used to find the amounts and present values m

at the rate ¢ convertible m times a year ; for example, the tables calculated for interest 2 per cent. will give the results for 4 per cent. payable half-yearly. For this reason it would be an improvement, as remarked above, to use the word “terms” in the headings of the tables instead of “ years.”

We pass on now to the consideration of the theory of life annuities. This is based upon a knowledge of the rate of mortality among mankind in general, or among the particular class of persons on whose lives the annuities depend. Ifa simple mathematical law could be discovered which the mortality followed, then a mathematical formula could be given for the value of a life annuity, in the same way as we gave above the formula for the value of an annuity certain. In the early stage of the science, De- moivre propounded the very simple law of mortality which bears his name, and which is to the effect, that out of 86 children born alive 1 will die every year until the last dies between the ages of 85 and 86. The mortality, as determined by this law, agreed sufficiently well at the middle ages of life with the mortality deduced from the best observations of his time; but, as observations became more exact, the approximation was found to be not suffi- ciently close. This was particularly the case when it was desired to obtain the value of joint life, contingent, or other complicated benefits. Demoivre’s law is now, accord- ingly, entirely a thing of the past, and does not call for any

further notice from us. Assuming that law to hold, it is

easy to obtain the formula for the value of an annuity, immediate, deferred, or teniporary ; but such formulas are entircly devoid of practical utility. Those who are curious on the subject may consult the paper by Charlon, Ass. Mag., xv. 141. In vol, vi. p. 181, will be found an in- vestigation by Gray of the formula for the value of an annuity when the mortality table is supposed to follow a somewhat more complicated law. No simple formula, however, has yet been discovered that will represent the rate of mortality with sufficient accuracy; and those which satisfy this condition are too complicated for general use. The rate of mortality at each age is, therefore, in practice usually determined by a series of figures deduced from observation; and the value of an annuity at any age is found from these numbers by means of a series of arith- metical calculations. Without

entering here on a descrip- tion of the manner of making these observations and de- ducing the rate of mortality, and of the construction of “Mortality Tables,” we append, for the sake of illustration, one of the earliest tables of this kind, namely, that of

Deparcieux, given in his Essai sur les Probabilités de la Durée de ia Vie Humaine, 1746.

Number Number — ae ing i v ing in umber ing in Age. es Poe age. ee te Peat Age. living. ihe scar year. year. year. 3 | 1000 30 34 702 8 65 395 15

4 970 22 35 694 8 66 380 16

5 948 18 36 686 8 67 364 ly 6 930 15 37 678 a 68 347 18 i 915 13 38 671 a 69 329 19 8 902 12 39 664 of 70 310 19

9 890 10 40 657 7 71 291 20

10 880 8 41 650 7 72 OT 20

11 872 6 42 643 7 73 251 20

12 866 6 43 636 ft 74 231 20 13 860 6 44 629 Uf 75 211 19

14 854 6 45 622 7 76 192 19

15 848 6 46 615 8 77 173 is) 16 842 if 47 607 8 78 154 18 Ay 835 i 48 599 9 79 136 18 18 828 if 49 590 9 80 118 17 19 821 a 50 581 10 81 101 16

20 814 8 51 571 11 82 85 14

21 806 8 52 560 lel 83 71 12

22 798 8 53 549 11 84 59 11 23 790 8 54 538 12 85 48 10 24 782 8 55 526 12 86 38 9 25 774 8 56 514 12 87 29 7 26 766 8 57 502 13 88 22, 6 27 758 8 58 489 13 89 16 5

28 750 8 59 476 13 80 ial 4 29 742 8 60 463 13 91 Uf 3

30 734 8 61 450 13 92 4 2

oll 726 8 62 437 14 93 2 I 32 718 8 63 423 14 94 al 1

33 710 8 64 409 14 95 0

Tt is to be understood from this table that the mortality among the persons observed was such that out of every 1000 children alive at the age of 3, 30 died before attain- ing the age of 4, leaving 970 alive at 4; 22 died between the ages of 4 and 5, leaving 948 alive at the age of 5 ; and so on, until one person is left alive at the age of 94, who died before attaining the age of 95.

For the purpose of explaining more fully the method of finding the value of a life annuity, it will be convenient, in the first instance, to establish the two following lemmas.

Lemma 1. Zo find the value of a sum to be received at a future time in the event of the happening of a given contingency. — Suppose that the sum of 1 is to be rc- ceived in n years' time, provided that a certain event shall then happen (or shall have then happened), the probability of which is p. We have seen that the value of 1 to be certainly received in m years' time is 2". In order to introduce the idea of probability into the

problem, suppose that p= —" so that there are a cases

favourable to the happening of the assumed event, and b unfavourable, the total number of possible cases, all of which are equally probable, being (w+). We may sup- pose, for instance, that there are (a+b) balls in a bag, of which a are white and } black; and that 1 is to be received if a white ball is drawn. In order to determine the value of the chance of receiving 1 in consequence of a white ball being drawn, suppose that (a+6) per- sons draw each one ball, and that every ome who draws a white ball receives 1; then the total sum to be received is a, and the value of the expectation of all the («+b) persons who draw is also a. But it is clear that each of the persons has the same chance of drawing a white ball, therefore the value of the expectation of each

of them is —— p. This is the value of the chance of

receiving 1 immediately before the drawing is made in

m years’ time; the value at the present time will there- fore be v*p. We may also arrive at this result as follows : The same suppositions being still adhered to, the present value of the sum a to be distributed at the end of x years is av”; and each of the (a+6) persons having the same chance of receiving 1, the value of the expectation of each

a 1s a5 (i= pu.

Lemma 2. Jo find the present value of 1 to be received in n years’ time, if a specified person, whose age ts now x, shall be then living.—The sum to be received in this case is called an endowment, and the person on whose life it depends is called the nominee. The probability that the nominee will be alive is to be found, as already intimated, by means of a mortality table. Out of the various tables of this nature that exist, that one must be chosen which, it is believed, most faithfully represents the probabilities of life of the class of persons to which the nominee be- longs. Suppose we have reason to believe that Deparcieux’s table, above given, is the most suitable in the case before us,—that the age of the nominee is 30, and the term of years 10. Then, observing that, according to Deparcieux’s table, the number of persons living at the age 30 is 734, while the number at the age 40 is 657, and the difference, or the number who die between the two ages, is 77, we conclude that the chances of any particular nominee of the age of 30 dying before attaining the age of 40 are as 77 to 734, and the chances in favour of his living to the age of 40 are as 657 to 734; or the

probability of his living to 40 is =.

Passing now from figures to more general symbols, we will use /, to denote the number given in the mortality table as alive at any age x; so that, for example, in the above table, /,,=734, /,,=657; and in accordance with what we have just explained, the probability of a nominee of the age «x living to the age +m, will therefore be

Lotn expressed by = Hence, by lemma 1, the value of 1 to be received if the nominee shall be alive at the end of nm years, is beth In the particular case supposed above,

l, the actual value will be, taking the rate of interest at

657 (1-03) = 666035.

34

the question from another point of view. Suppose that 734 persons of the age of 30 agree to purchase from an insurance company each an endowment of £1, payable at the end of 10 years, then the probabilities of life being supposed to be correctly given by Deparcieux's table, we see that 657 of those persons will be alive at the end of 10 years, or the engagement of the insurance company to pay £1 to each survivor amounts to the same thing as the engagement to pay £657 at the end of 10 years, and the present value of this sum is 657 (1:03). The sum that should be paid by each of the 734 persons, so that the company shall neither gain nor lose by the transaction, is

3 per cent., We may look at

therefore aau(1-03)"8, as before. If we suppose the pro-

babilities of life to agree with those of the English Table, No. 3, Males, which is printed at the end of this article, the value of the same eudowment will be—

Re

304,534 03)-? = 664779 .

If now we carefully examine the reasoning of the last paragraph, we see that we have made an assumption that must not be allowed to pass without some further justifica- tion. We have assumed, in fact, that the lives we are

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mortality table. This, however, we know, is not neces- sarily the case. Even if the mortality table correctly represents in the long run the rate of mortality among the lives we are dealing with, we know that the rate of mortality will, from accidental circumstances, be some- times greater and sometimes less than that indicated by the table. If, for example, we have 734 persons under observation all of the age 30, we have no certainty that at the end of 10 years exactly 77 will have died, leaving 657 alive. It is, indeed, within the range of possibility— firstly, that the whole 734 persons may die before the age 40; and, secondly, that none of them may die, or that the whole 734 may attain the age of 40. It appears, there- fore, as if we had used the word " probability" in the second lemma in a different sense from that we attached to it in the first; for, in that case we know that if the whole of the (a+6) balls are drawn, a of them will cer- tainly be white, and 6 black. But the cases will be more parallel if we suppose that each of the balls, after being drawn, is replaced in the bag. If this is done, we see it is no louger certain that when (a + 6) drawings take place, a of the balls will be white, and 6 black. It may, under these altered circumstances, possibly happen that the balls drawn at each of the (2+) drawings will all be white, or on the contrary all black. But when a very large num- ber of drawings are made, we can prove that the ratio of white balls drawn to the black will differ very little from the ratio of a to 6, and will exactly equal it if the number of drawings is supposed to be indefinitely large. In this case we know that the probability of drawing a white ball

is still mai aud passing now to the case of lives undcr

observation, we can say, in the same sense, that the pro- bability of a person of the age of 30 living for 10 years is,

' : 657 according to Deparcieux's table, 734° and that on the

average of a very large number of observations, that frac- tion will accurately represent the number of persons surviving. We shall, therefore, be justified in basing all our reasonings on the assumption that the lives we are dealing with die precisely at the rate indicated by the figures of the mortality table.

We are now in a position to show how the value of a life annuity is calculated. The annual payment of the annuity being 1, which is to be made at the end of each year through which the nomiuec shall live, the annuity consists of a payment of 1 at the end of one year if the nominee is then alive, of the same payment at the end of two years, at the end of three years, &c., under the same condition, and is therefore equal to the sum of a series of endowments. If x is the age of the nominee, the value of the endowment to be received at the end of the nth year bean

is, as we have seen in lemma 2, 7 x

v”, and the total value

of the annuity is therefore

a

l Hy # #t? 12 ae

has Pe

ia a

By means of this formula, taking the values of /,, 2.4,, leis, &e., from the mortality table, and calculating the values of v, v?, v3, &c., according to the desired rate of interest, or taking their values from the compound interest tables previously described, we can calculate the value of an annuity at any age with any degree of accuracy desired. In practice the calculations would be most readily made by the aid of logarithms.

We can arrive at the above formula more readily by availing ourselves of the supposition which we have seen to be allowable, that the lives under observation will

dealing with will die off at the cxact rate indicated by the | die off exactly at the rate indicated by the mortality table.

Thus, suppose that /, persons of the age « buy each an annuity of 1. Then the number of persons who will survive to the age x 1, and claim the first payment of the annuity, will be Z,,. The value of 1 to be paid at the end of a year is v, and therefore the present sum that will be required to provide for all the payments at the end of the first year will be 1,47. The number of persons who will survive two years, so as to claim the 'second year's payment, will be J,,,; and multiplying this into the value of 1 payable at the end of two years, we get /,,,v* as the present sum necessary to provide for the payments at the end of the second year. Proceeding in this way, the total sum that will be required to provide the annuities to the J, persons, will be J,4,0 Ler? + laps + + + Hence the value of an annuity on a nominee of the age #, or the sum that will on the average be required to provide for such an annuity, will be

Lert bepov? + Letgv+

az

(2.)

which is at once seen to be the same as (1) formula under another shape.

If we suppose money to bear no interest, or make v=1 in the formula for the value of an annuity, we shall obtain a quantity which is called the " expectation of life," or the "average duration of life," being the average number of years which persons of the given age will one with another live. Denoting this by e,, and making v= 1 in the formula above given, we get

laiithepetlerst +:

As in the formula for the annuity, no payment is made on account of the year in which the nominee dies, this formula gives the average number of complete years that persons of the given age will live according to the mortality table, and makes no allowance for the portion of the year in which death occurs. The expectation thus found is called the curtate expectation; and in order to obtain the complete expectation of life, which is denoted by @,, half a year must be added to it.

The first writer who is known to have attempted to obtain, on correct mathematical principles, the value of a life annuity, was Johan De Wit, Grand Pensionary of Holland and West Friesland. All our exact knowledge of his writings on the subject is derived from two papers contributed by Mr Frederick Hendriks to the Assurance Magazine, vol. ii. p. 222, and vol. ii. p. 93. The former of these contains a translation of De Wit's report upon the value of life annuities, which was prepared in consequence of the resolution passed by the States General, on the 25th April 1671, to negotiate funds by life annuities, and which was distributed to the members on the 30th July 1671. The latter contains the translation of a number of letters addressed by De Wit to Burgomaster Johan Hudde, bearing dates from September 1670 to October 1671. The existence of De Wit's report was well known among his contemporaries, and Mr Hendriks has collected a number of extracts from various authors referring to it; but the report is not contained in any collection of his works extant, and had been entirely lost for 180 years, until Mr Hendriks conceived the happy idea of searching for it among the state archives of Holland, when it was found together with the letters to Hudde. It is a document of extreme interest, and (notwithstanding some inaccuracies in the reasoning) of very great merit, more especially con- sidering that it was the very first document on the subject that was ever written; and Mr Hendriks's papers will well repay a careful perusal.

_ Jt appears that it had long been the practice in Holland

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for life annuities to be granted to nominees of any age, in the constant proportion of double the rate of interest allowed on stock; that is to say, if the towns were borrow- ing money at 6 per cent., they would be willing to grant a life annuity at 12 per cent.; if at 5 per cent., the annuity granted was 10 per cent.; and soon. De Wit states that "annuities have been sold, even in the present century, first at six years' purchase, then at seven and eight; and that the majority of all life annuities now current at the country's expense were obtained at nine years' purchase ;" but that the price had been increased in the course of a few years from eleven years' purchase to twelve, and from twelve to fourteen. He also states that the rate of interest had been successively reduced from 6} to 5 per cent., and then to 4 percent.

The principal object of his report is to prove that, taking interest at 4. per cent., a life annuity was worth at least sixteen years' purchase; and, in fact, that an annuitant purchasing an annuity for the life of a young and healthy nominee at sixteen years' purchase, made an excellent bargain. It may be mentioned that he argues that it is more to the advantage, both of the country and of the private investor, that the public loans should be raised by way of grant of life annuities rather than per- petual annuities. It appears conclusively from De Wit's correspondence with Hudde, that the rate of mortality assumed as the basis of his calculations was deduced from careful examination of the mortality that had actually pre- vailed among the nominees on whose lives annuities had been granted in former years. De Wit appears to have come to the conclusion that the probability of death is the same in any half-year from the age of 3 to 53 inclusive; that in the next ten years, from 53 to 63, the probability is greater in the ratio of 3 to 2; that in the next ten years, from 63 to 73, it is greater in the ratio of 2 to 1; and in the next seven years, from 73 to 80, it is greater in the ratio of 3 to 1; and he places the limit of human life at 80, If a mortality table of the usual form is deduced from these suppositions, out, of 212 persons alive at the age of 3, 2 will die every year up to 53, 3 in each of the ten years from 53 to 63, 4 in each of the next ten years from 63 to 73, and 6 in each of the next seven years from 73 to 80, when all will be dead. This is the conclusion we have drawn from a careful study of the report; but, in consequence of the inaccuracies above mentioned, some doubt exists as to De Wit's real meaning; and Mr Hen- driks's conclusion is somewhat different from ours (see his note, Ass. Mag. vol. ii. p. 246). The method of calculation employed by De Wit differs much from that described above, and a short account of it may interest the reader. Suppose that it were desired to apply it to deduce the value of an annuity according to Deparcieux's mortality table given above, then we assume that annuities are bought on the lives of 1000 nominees each 3 years of age. Of these nominees, 30 will die before attaining the age of 4, and no annuity payment will be made in respect of them; 22 will die between the ages of 4 and 5, so that the holders of the annuities on their lives will receive payment for 1 year; 18 attain the age of 5 and die before 6, so that the annuities on their lives are payable for 2 years. Reasoning in the same way, we see that the annuities on 15 of the nominees will be payable for 3 years; on 13, for 4 years; on 12, for 5 years; on 10, for 6 years; and so on. Proceeding thus to the extremity of the table,

2 nominees attain the age of 93, 1 of whom dies before the age of 94, so that 90 annuity payments will be made in respect of him; and the last survivor dies between the ages of 94 and 95, so that the annuity on his life will be payable for 91 years. Having previously calculated a table of the values of annuities certain for every number of years up to 91, the value of all the annuities on the

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1000 nominees will be found by taking twenty-two times the value of an annuity for 1 year, eighteen times the value of an annuity for 2 years, fifteen times the value of an annuity for 3 years, and so on,—the last term being the value of 1 annuity for 91 years,—and adding them together; and the value of an annuity on one of the nominees will then be found by dividing by 1000. Before leaving the subject of De Wit, we may mention that we find in the correspondence a distinct suggestion of the law of mortality that bears the name of Demoivre. In De Wit's letter, dated 27th October 1671 (Ass. Mag., vol. iii. p. 107), he speaks of a "' provisional hypothesis" suggested by Hudde, that out of 80 young lives (who, from the context, may be taken as of the age 6) about 1 dies annually. In strictness, therefore, the law in question might be more correctly termed Hudde's than Demoivre's.

De Wit's report being thus of the nature of an unpub- lished state paper, although it contributed to its author's reputation, did not contribute to advance the exact know- ledge of the subject; and the author to whom the credit must be given of first showing how to calculate the value of an annuity on correct principles is Dr Edmund Halley, F.R.S. In the Philosophical Transactions, Nos. 196 and 198 (January and March 1693), he gave the first approxi- mately correct mortality table (deduced from the records of the numbers of deaths and baptisms in the city of Breslau), and showed how it might be employed to calculate the value of an annuity on

the life of a nominee of any age. His method of procedure exactly agrees with the formula (1) above given; and while he confesses that it requires

. a series of laborious calculations, he says that-he had

sought in vain for a more concise method. His papers, which are full of interest, are reprinted in the eighteenth volume of the Assurance Magazine.

Previous to Halley's time, and apparently for many years subsequently, all dealings with life annuities were based upon mere conjectural estimates. The earliest known reference to any estimate of the value of life annui- ties rose out of, the requirements of the Falcidian law, which (40-8.c.) was adopted in the Roman empire, and which declared that a testator should not give more than three-fourths of his property in legacies, so that at least one-fourth must go to his legal representatives. It is easy

to see how it would occasionally become necessary, while

this law was in force, to value life annuities charged upon a testator's estate. iimilius Macer (230 a.p.) states that the method which had been in common use at that time was as follows :—From the earliest age until 30 take 30 years' purchase, and for each age after 30 deduct 1 year. It is obvious that no consideration of compound interest can have entered into this estimate ; and it is easy to see that it is equivalent to assuming that all persons who attain the age of 30 will certainly live to the age of 60, and then certainly die. Compared with this estimate, that which was propounded by the Pretorian Prefect Ulpian— one of the most eminent commentators on the Justinian Code—was a great improvement. His table is as follows :—

Y ? – . Age. re Se Age, facie. Birth to 20 30 45 to 46 14

20 ,, 25 28 46 ,, 47 13

25 ,, 30 25 47 ,, 48 | 12 30 ,, 35 Pye 48 ,, 49 11

385 =, 40 20 49 ,, 50 10 40 ,, 41 19 50 ,, 55 9 41 ., 42 18 55 ,, 60 7

42 ,, 48 17 60 and 43 ., 44 16 upwards 5

44 ,, 45 15

Here also we have no reason to suppose that the element of interest was taken into consideration ; and the assump- tion, that between the ages of 40 and 50 each addition of a year to the nominee’s age diminishes the value of the annuity by one year’s purchase, is equivalent to assuming that there is no probability of the nominee dying between the ages of 40 and 50. Considered, however, simply as a table of the average duration of life, the values are fairly accurate. At all events, no more correct estimate appears to have been arrived at until the close of the 17th century. Fuller information upon the early history of life annuities will be found in the article “ Annuities on Lives, History of,” in Mr Walford’s Insurance Cyclopedia.

Demoivre, in his Treatise on Annuities, 1725, showed that it was unnecessary to go through the whole of the calculation indicated by the formula (1) or (2) for each age, and that the value of an annuity at any age might be deduced by a simple process from that at the next older age. This may be demonstrated as follows :—If it were certain that a person of any age, say 39, would live for a year, then the value of an annuity on his life would be such a sum as would increase at interest ina year to the value of an annuity on a life one year older, say 40, increased by a present payment of 1; that is, putting a for the value of an annuity and ‘a for that on a life one year older, the value would be v (1+!‘a). But it is un- certain that the life will exist to the end of a year, and the value of the annuity must therefore be reduced in the proportion of this uncertainty, or be multiplied by the probability that the given life will survive a year. Putting then p to denote this probability, we have a= vp (1 +!a). This formula may also be demonstrated algebraically. We have seen that

where z is the difference between the age of the given life and that of the oldest in the mortality table. (Assuming the present age to be 39, then in the English Table No. 3, Males, z will be 107 – 39=68.) In the same way, we have

1 2 2 git . 21! EP Ge ee at eT core +4 ij H _ 1 1 2 gil ob srl ence leah | i eye wat ae) ii). 1] =07(1 +‘a) = up(1 +‘2)

—the same result as already proved.

If we suppose the present age to be x, we may put the

formula in the shape

a, = oe + Gey1)} but it will be found preferable to omit the subscript x whenever this can be done without risk of confusion.

This formula has been commonly attributed to Simpson, who in 1742 published his Doctrine of Annuities and Re- versions ; but, although he certainly showed that it is applicable to annuities on the joint duration of two or more lives, the first discovery of it is undoubtedly due to Demoivre. (See Farren's Historical Essay on the Use and early Progress of the Doctrine of Life Contingencies in England, p. 46.) The formula appears to have been in- dependently discovered by Euler, and was given by him in a paper in the Memoirs of the Royal Academy of Scuences at Berlin, for the year 1760.

Mr Peter Gray has shown in his Tables and Formule, 1849, how Gauss's logarithmic table may be advantage- ously employed in calculating the values of annuities by the above formula. That table gives us the value of

log (1 +a) when that of log ais known. In other words, the argument of the table is log a, and the tabular result is log (1+a). When ordinary logarithmic tables are used, the formulas being

log a, =log up, + log (1+ gaa): log dy. = log wps-1+ log (1+ 4s);

we have to find a, by means of an inverse entry into the table before log (1 +a,) can be found ; but when Gauss's table is used (as recomputed and extended by Gray), 'All the entries of the same kind—direct and inverse—are brought together, the whole of the logarithms being found before a single natural number is taken out. We con- sequently proceed right through the table; and as we proceed, we find two, three, four, and even as many as six and eight entries on the same opening. At the close, moreover, the taking out of the numbers may, if necessary, be turned over to an assistant. On the other hand, when the common tables are used, direct and inverse

entries alternate with each other, and involve likewise a continual turning of the leaves backwards and forwards, by which the process is rendered exceedingly irksome.”—Page 165, second issue, 1870.

When the only object is to form a complete table of immediate annuities, the above is the simplest and most expeditious mode of procedure ; but when it is desired to have the means of obtaining readily the values of deferred and temporary annuities, it is better to employ a wholly different method.

The value of a deferred annuity may be found as follows: _If it were certain that the nominee, whose age is sup- posed to be now «, would survive n years, so as to attain the age of «+7, the value of the annuity on his life being then Gy4n) its present value would be va,,,, Butas the nominee may die before attaining the age of +n, the above value

must be multiplied by the probability of his living to that age, which is fess, and we thus get the present value of the

ly “+n

deferred annuity, . ge Qyix We may arrive at this

result otherwise. ‘Thus, as we have seen above, the pre- sent value of the first payment of the annuity, that is, of J to be received if the nominee shall be alive at the end of n+l n+1 years, is an The present value of the next pay-

4-2

ment is similarly seen to be on, and so on. The value

of the deferred annuity is therefore

n+l] nto] ats] ; pnt ae ae gnte att. on Crete 6 ck aR eo #1 Fi n+l] n+2] 2 s+3] P = ag? ae ta ce cern 6 \

=F mas (or a mv tes) :

(We may here mention that this formula holds good, not only for ordinary annuities, but also for annuities payable half-yearly or quarterly, and for continuous annuities; also for complete annuities.)

A temporary annuity is, as explained above, an annuity which is to continue for a term of years provided the nominee shall so long live. Hence it is clear that if the value of a temporary annuity for years is added to that of an annuity on the same life deferred » years, this sum must be equal to an annuity for the whole continuance of the same life; the value of a temporary annuity for 2 years will therefore be equal to the difference between the value of a whole term annuity and that of an annuity deferred » years, or to

calculating the value have seen that the value of an annuity for the life of a nominee whose age is #, is

ANNUITIES

“] L a—-v”. “a, | OF de— ae ae. l s We are now in a position to explain the method of of annuities above referred to. We

Lat ly pot? + ee + lot.” ;

Ls i

which, multiplying both numerator and denominator by the same quantity v*, becomes

Ly vet! + Lp qve te a ae

+ Lge? Lv ;

In the same way, the value of an annuity on the same

life, deferred » years, is

Lodmtt wl # fens typs ne lates ze ze the ~ Lae? SP (eae jae “eee le Uesng ae tLe FC ee + Lguat*

ie

If, then, we calculate in the first instance the values of the product J,0* for all values of 2, and then form their sums, beginning at the highest age, we shall have the means of obtaining by a single division the value of any immediate or deferred annuity we wish.

It is convenient to arrange these results in a tabular form, as shown in the appended tables (3) and (4). The quantity 7,07 is placed in the column headed D, oppo- site the age x, and is denoted by D,; while the sum ee Legge +1,,,”’* is placed in the column headed N, opposite the same age «, and is denoted by N,; so that the value of an immediate annuity on a

life # is equal to S ; the letters N and D being chosen as

the first letters of the words Numerator and Denominator. Then it is easy to see that the value of an annuity on deferred » years is equal to a ;

x

the value of a temporary annuity for » years on the same

N, i. Nae

whence by subtraction

life is if, for example, we wish to find the value of an annuity on a male life of 40 according to the English Table No. 3,

with interest at 3 per cent., we find from table (3) appended to this article, N,.= 1374058, D,, =83406, and

by division we get the value of a = 16-4744, which agrees

4

with the value contained in the table (5), also appended to this article. Next, suppose annuity on a life of 30 to

we wish to find the value of a deferred commence at the end of 10

years. From what precedes, we see that the value of this ‘ey will be equal to the quotient ©! or “ayer annuity will be equal to the quotient 7 jaeae ’

which will be found to be equal to 10-9518. If we wish to find the value of this deferred annuity

| without using the D and N table, the formula for it will

——

1:08″

above that the value of + (1-08)-” = ‘664779, and that

a,,= 16-4744; and multiplying these together, we get the value of the deferred annuity, 10°9518, as before.

We have, in conformity with popular usage, called our auxiliary table a “D and N table.” It is also called a “commutation table,°—a name proposed by De Morgan

L é be Fo OM Atgo, v being equal to But we have seen

in his paper “ On the Calculation of Single Life Contin- gencies,” which appeared in the Companion to the Almanac for the year 1840, and which is reprinted in the Assurance Magazine, xii. 328. His explanation of the term is to the following effect -—Taking any two ages, say 30 and 40, we have, according to the English Table No. 3, Males — see appended table (3),—

D,, = 125464, N,, = 2385610; D,,= 83406, N,,= 1374058.

Transpose the numbers opposite each age to the other age; then whatever may be the present age (less than 30)—

A person might now give up £83,406, due at the age of 30, to receive £125,464, if he live to be 40.

A person might now give up an annuity of £1,374,058, to be granted at the age of 30, to receive in return another of £2,385,610 to be granted at the age of 40, if he should live so long.

“These proportions are independent of the present age of the party, and show that the most simple indication of the tables is the proportion in which a benefit due at one age ought to be changed, so as to retain the same value and be due at another age. They might, therefore, with great propriety, be called Commutation Tables.”

It is clear that this property will not be altered if all the quantities in the D column, and consequently those in the N column, are increased or diminished in a constant ratio.

A“DandN table” may be used, not only to find the value of annuities, immediate, deferred, and temporary, but also to find the annual premium that should be paid for a given number of years as an equivalent for a deferred annuity. If the annuity is deferred m years, and the annual premium of equal value is to be paid for m years, it will be sorte. The table may also be used to find the single and annual premiums for insurances, immediate, deferred, or temporary. The single premiums are— oN, =a N a“,

Pp, e UNetn—1 = Netn,

3

1. For an ordinary insurance,

2. For an insurance deferred 1 years,

x

3. For a temporary insurance for n years,

“WN.-1 —N eo) — Nzp Nice D, i

The annual premiums payable during life for the same benefits are found by substituting N,, *for D, in the denominator; and the annual premiums payable for m years, by putting N*,,-N,i,—; in the denominator instead of D,.

Before quitting this subject, we should mention that in practice other columns are added to the table besides the D and N columns. A column, §, is given for the purpose of calculating the values of increasing annuities; a column, M, for calculating the values of assurances; and a column, R, for calculating the values of increasing assurances. An explanation of the M column belongs to the subject Insurance; for an account of the § and R columns, we refer the reader to the works and papers on life insurance contingencies, in which the D and N (or commutation) method is described; particularly to those of David Jones, Gray, and De Morgan.

The earliest known specimen of a commutation table is contained in William Dale's Introduction to the Study of the Doctrine of Annuities, published in 1772.

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says, "These calculations being made for the use of the societies in particular who commence annuitants at the age of 50, it was not thought necessary to begin the tables at a younger age." He gives, however, another table based on different mortality observations, com- mencing at the age of 40; and in this case he tabulates Lv*—®, His table also differs from the common form in that it is adapted to find the values of annuities payable by half-yearly instalments.

The next work in which a commutation table is found is William Morgan's Treatise on Assurances, 1779. In

this work the values of Bap} are tabulated, and not

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those of 2,0*; but, as above mentioned, the properties of the table are not altered by the change. Morgan gives the table as furnishing a convenient means of checking the correctness of the values of annuities found by the

ordinary process. It may be assumed that he was aware that the table might be used for the direct calculation of annuities; but he appears to have been ignorant of its other uses.

The first author who fully developed the powers of the table was John Nicholas Tetens, a native of Schleswig, who in 1785, while professor of philosophy and mathematics at Kiel, published in the German language an Introduction to the Calculation of Life Annuities and Assurances. This work appears to have been quite unknown in England until Mr F. Hendriks gave, in the first number of the Assurance Magazine, pp. 1-20 (Sept. 1850), an account of it, with a translation of the passages describing the con- struction and use of the commutation table, and a sketch of the author's life and writings, to which we refer the reader who desires fuller information.

The use of the commutation table was independently developed in England —apparently bctwecn the years 1788 and 1811—by George Barrett, of Petworth, Sussex, who was the son of a yeoman farmer, and was himself a village schoolmaster, and afterwards farm steward or bailiff. In the form of table employed by him, the quantity tabulated is not 1,v*, but 1.(1+7)"—*, where w is the last age in the mortality table used. It has been usual to consider Barrett as the originator in this country of the method of calculating the values of annuities by means of a commu- tation table, and this method is accordingly somctimes called Barrett's method. (It is also called the commuta- tion method and the columnar method.) Barrett's method of calculating annuities was explained by him to Francis Baily in the year 1811, and was first made known to the world in a paper written by the latter and read before the Royal Society in 1812.

By what has been universally considered an unfortunate error of judgment, this paper was not recommended by the council of the Royal Society to be printed, but it was given by Baily as an appendix to the sccond issue (in 1813) of his work on life annuities and assurances. Bar- rett had calculated extensive tables, and with Baily's aid attempted to get them published by subscription, but with- out success; and the only printed tables calculated accord- ing to his manner, besides the specimen tables given by Baily, are the tables contained in Babbage's Comparative View of the various Institutions for the Assurance of Lives, 1826. It may be mentioned here that

Tetens also gave only a specimen table, apparently not imagining that persons using his work would find it extremely useful to have a series of commutation tables, calculated and printed ready for use.

In the year 1825 Griffith Davies published his 7aéles of Lafe Contingencies, a work which contains, among other tables, two arranged on the plan we have above explained, the idea of them having been confessedly derived from Baily's explanation of Barrett's tables. ae method was,

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however, improved and extended by the addition of the columns (M and R) for finding the values of assurances. Davies's treatise on annuities, as issued by his executors in 1855, with the explanation that it is an uncompleted work, but that the completed portion had been in print since 1825, contains several other tables of the same kind. In the pre- face to this work it is stated that " the most important dis- tinction between the two methods is, that Mr Davies's method is much simpler in principle than that of Mr Barrett, as the columnar numbers given by the latter must be con- sidered more as the numerical results of algebraical expres- sions ; whereas in Davies's arrangement it will be found, on reference to age 0, that the number in column D represents the number of children just born, and those opposite ages 1, 2,3, 4, &e., to the end of life, the present sums which would be required for the payment of £1 to each survivor of such children at the end of 1, 2, 3, 4, &c., years to the extremity of life ; and the sum thereof inserted in column N, opposite age 0, represents the present fund required to provide the payment of annuities of £1 each for life to all the children given in column D at age 0; and from this method very considerable amount of labour is avoided by multiplying the number living at each age by a fraction less than a unit ; but by Barrett's method, the number living at each age has to be multiplied by the amount of £1 improved for as many years as are equal to the difference between that age and the greatest tabular duration, as already stated, which makes each product a large multiple of the number living." 'This passage, we are informed, correctly represents Mr Davies's own views on the subject. It may be noticed that Davies does not employ the notation used

above, D,, Nz» &¢., but omits the subscript x Thus, ; Now ‘, instead of the formula stm __ he would write Ne—1— Natn-i

ae N,—*“Ny

In some respects this notation is perhaps preferable to that now used, as it is certainly better, when there is no risk of confusion, to omit the subscript # But Davies’s notation cannot be adopted without alteration, as iN, might be mistaken for the number in the column N oppo- site the age 1. We may, however, consistently with the

principles of the notation adopted by the Institute of

‘Actuaries, write the formula =7—~m=ny The notation at

present commonly used is due to David Jones, whose work (mentioned below) was the first that contained an exten- give series of commutation tables.

On a general review of the whole evidence, we cannot help thinking that Barrett’s merits in the matter have been

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somewhat exaggerated. ‘The first idea of a commutation table was not due to him, but (leaving Tetens out of view) to Dale and Morgan; and it is certain that he was familar with the latter’s treatise. ‘The change he introduced into the arrangement of the table, namely, multiplying by a power of (1 +7) instead of by a power of », is the reverse of an improvement ; and accordingly, his form of table has never been in practical use by any person but himself, excepting only Babbage. It is, of course, not to be denied that great credit is due to him asa self-educated man, for perceiving more clearly than his predecessors the great usefulness of the commutation table; but in our opinion he does not stand sufficiently out from those who preceded and followed him, to justify the attempt to attach his name to the columnar method of calculating the values of annuities and assurances. Those who desire to obtain further information on the matter, and to learn the views of other writers, can refer to the appendix to Baily’s

Life Annuities and Assurances, De Morgan’s paper “ On the Calculation of Single Life Contingencies,” Assurance Maga-

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zine, xii. 348-9 ; Gray’s Tables and Formule, chap. viii. 5 the preface to Davies’s Treatise on Annuities ; also Hend- riks’s papers in the Asswrance Magazine, No. 1, p. 1, and No. 2, p. 12; and in particular De Morgan’s “ Account of a Correspondence between Mr George Barrett and Mr Francis Baily,” in the Assurance Magazine, vol. iv. p. 185.

The principal D and N tables published in this country are contained in the following works :—

David Jones, Value of Annuities and Reverstonary Payments, issued in parts by the Useful Knowledge Society, completed in 1843, which gives for the Northampton Table, 3 per cent. interest, columns D, N, 8, M, RB; Carlisle Table, interest 3, 34, 4, AL, 5, 6, columns D, N, 8, M, 8; and interest 7, 8, 9, 10, columns 1D) IS, 3, Volume ii. contains D and N tables for all combinations of two joint lives, according to the Northampton Table, 3 per cent., and the Carlisle, 3, 34, 4, 44, 5, 6 per cent,

Jenkin Jones, New Rate of Mortality, 1848, Seventeen Offices’ Experience, 2%, 3, 34 per cent., columns D, N, 8, M, R.

G. Davies, Treatise on Annuities, 1825 (issued 1855). Equitable Experience, 2$,3, 3h, 4, 44, 5, 6 per cent., columns D, N, 8, M, R; 7, 8 per cent., columns D, N ; also three tables relating to joint lives for the differences of age 19, 20, 21 years, and one relating to three joint lives of equal ages, all giving D and N columns at 8 per cent. interest: Northampton, 3 per cent., columns D,N,98,M, 8; 4 per cent., columns D, N ; also tables for two j oint lives similar to those above mentioned.

David Chisholm, Commutation Tables, 1858 ; Carlisle, 3, 34, 4, 5, 6 per cent., columns D, N, 8, C, M, BR; also columns D, N, for joint lives, and M, R, for survivorship assurances.

Neison’s Contributions to Vital Statistics, 1857. Mortality of England and Wales (males), 3, 34, 4, 44, 5, 6, 7, 8, 9, 10 per cent., columns D and N, with logarithms ; two joint lives, males, 7 per cent., columns D and N ; also D and N columns relating to the mortality of master mariners, and to that among friendly societies, and in particular the Manchester Unity.

Jardine Henry, Government Life Annuity Commutation Tables, 1866 and 1873, single lives male and female, 0, 1, 2, 24, 3, 34, 4, 44, 5, 54, 6, 7, 8, 9, 10 per cent.

Institute of Actuaries Life Tables, 1872. New Experience (or Twenty Offices), males and females separately, H™ and HF, 3, 34, 4, 44, 5, 6, columns D, N, S, M, R, also logarithms ; and similar tables at 3, 84, and 4 per cent. for the table H™©),

R. P. Hardy, Valuation Tables, 1878, gives the same table at 44 per cent. for H™©),

The Sixth Report of the Registrar-General, 1844, contains the English Table (No. 1), 3 and 4 per cent., columns D, N, 8, C, M, R, for males and females separately ; also Day, Nays 3 and 4 per cent., for x male and y female ; also five tables for joint lives, one male and one female, differences of ages — 20, — 1), @, 1, Ab

The Twelfth Report, 1849, contains the English Table (No. 2), males, 3, 4, 5, per cent., columns D, N, 8, C, M, R.

The Twentieth Report, 1857, contains the English Table (No. 2), females, 3 per cent., columns D, N, S, C, M, R.

The English Life Table, 1864, contains columns D, N, at 3, 35, 33, 34, 3%, 4, 5, 5, 7, 8, 9, 10 per cent., also the logarithms ; columns 8, C, M, R, at 3, 4, 5 per cent. ; special tables for half- yearly and quarterly payments, columns D, N, at 3 per cent. ; joint lives at all combinations of ages, columns D, N, at 3 per cent., (1) male and female, (2) two males, (3) two females.

The explanations of the tables in the last four works are by Dr William Farr, F.R. 8.

Very unfortunately, these tables are not all arranged upon the same principle, but those contained in the Reports of the Registrar-General, in the English Life Table, in Chisholm's and in Henry's tables, are so arranged that the column N is shifted down one year, so that in them the ratio

"2 gives, not the value of the ordinary annuity, but the

value of the annuity increased by unity, or the annuity-due. It is very needful to bear this in mind for the prevention of error; and the existence of a difference of this kind is ex- tremely perplexing. for information upon the subject of this confusing change, see De Morgan's paper "On the Forms under which Barrett's Method is represented, and on Changes of words and symbols," Ass. Mag., x. 302.

All the preceding methods require a considerable amount of calculation in order to obtain the value of an annuity on a life of any particular age. We will now explain some methods of approximation, by means of which we can calculate with much less labour the value of an annuity at

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a single age, when we do not require a complete table of annuities. The following method was demonstrated by Mr Lubbock (afterwards Sir J. W. Lubbock) in a paper "On the Comparison of Various Tables of Annuities" in the Cambridge Philosophical Transactions for the year 1829. Instead of calculating the value of each payment of the annuity to be received at the ages #+1, x+2, to the extremity of life, it will be sufficient to calculate the values of the payments to be received at a series of equidistant ages, say at the ages +n, x+2n, x4 3n,

Meee a Then, if V,, denote the payment to be received amencrage aren, and A, A, Ay… . . denote the lead- ing differences of Vy, V,, Vans Vin – - + > © the value of the annuity is approximately nm+1 n?-1 2(Vot Vat Vent Vent… — a or nl (m®—1) (19n?—-1) , _ (a? 1) Gn?=1) , — 720n8 : 480n? "

n] _ any Here V,=1, V,= 7″ ee 7″ &e.

As an example, we will apply this formula to calculate the value of an annuity on a nominee of 40, according to the English Table, No. 3, Males, at 3 per cent. interest.

First, taking »=7, we find

V, =1-0000 — °2654 V, = °7346 + 0521 2138 – ‘0115 Vie “bets “0406 + 0029

1727 0086

Va,= ‘3486 0320

1407

Veg= 2079 Ves= *0990 Vio= 0818 i — 0055 WV, gans0004 Sum=2°9491

Hence A, = — ‘2654, A,=*0521, A;=— ‘0115, Ay—°0029 ; and the value of the annuity is approximately

=7+2°9491 – 4- ; x 2654 —- ; x 0521 — 1808 × 0115 ~ 1283 x ~~0029. = 20°6437 ~ 4°0000 = AUS LZ — +0149 — 0021 — 0004 = 20°6437~~ 41691 =16°4746. Next, taking »=11, we have Vy =1-0000 — °3924 Vn 6076 Te Is;

2809 ~ 0310

Voo= °3267 0805 +0453

2004 + 0143

Veg= 1263 -0948

1056

Vo= 0207 Vss= *0006 2°0819

Hence, the value of the annuity is approximately

10

=11 × 2-0819- 6- T1* 3924 x ‘1115 — -2878 x °0310

11

— 2044 x -0453

= 22°9009 — 60000

— 3567

— 0507

— °0089

— 0093 =22°9009 — 6°4256 = 16°4758.

The value of the annuity calculated in the ordinary way is, as we have seen. (page 80), 16°4744. ,

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An improved form of this method was given by Mr W. S. B. Woolhouse in the Ass. Afag., xi. 321. In order to explain this, we must introduce the reader to a term which is of recent origin, but which the application of improved mathematical methods to the science of life con- tingencies has rendered of great importance—the force of mortality at a given age. This may be defined as the pro- portion of the persons of that age who would die in the course of a year, if the intensity of the mortality remained constant for a year, andthe number of persons under obser- vation also remained constant, the places of those who die being constantly replaced by fresh lives. More briefly, it is the instantaneous rate of mortality. A very full explanation of this term is given by Mr W. M. Makeham, in his paper “On the Law of Mortality,” Ass. Mag., xiii. 325. The value of the function can be approximately found by dividing the number of persons who die in a year by the number alive in the middle of the year. Thus, if 7, denote the

number of persons living at the age 2, d, the number dying between the ages x and «+1, and d,_, the number dying between the ages x — 1 and x, then the number dying

between the ages n> and mea will be approximately

2

| and the force of mortality is approximately dy itd 2L,, value of the force of mortality at age 40 is

= 012853.

This quantity is usually denoted by the Greek letter p, while § is used to denote the quantity log.(1+7), which Woolhouse has called the force of discount. This being premised, Woolhouse's formula for the approximate value

of an annuity is

Thus, in the English Table, No. 3, Males, the

3465 + 3529

544146

=a) yes UVat Vont Vint. – +23 -S (n 4d),

where it will be noticed that, since V,= 1, the two first terms are exactly equal in value to those in Lubbock's formula. Taking the same example as above, we have seen that f4g = 012853 also 6 =-029558 A fo +d =°042411 Making x =7, we have the value of the annuity = 166437 — 4 × 042411 = 16°6437 — 169644

= 16-4741.

Making n= 11, we have the value = 16-9009 — 10 x '042411 = 16-9009 — -4241

= 16-4768.

Comparing the two processes, we see that when we have the values of » and 6 already computed, Woolhouse's is decidedly the shorter. On the other hand, it is easy to see that Lubbock's formula applies, not only to annuities, but to other benefits; and that it will be applicable to find the values of such quantities as contingent annuities, the values of which cannot be found exactly except by a very long series of calculations. (See Davies, p. 354.) The reader who refers to Lubbock's paper (which is reprinted in the Ass. dfag., v. 277), or to the short account of it given in the 7'reatise on Probability, issued by the Useful Know- ledge Society, and often bound up with D. Jones's work on annuities, will see that the terms involving A,, A;, A, are not given there; and it may assist the student who is desirous of working out the formula fully, to be referred to ese Diff, Calc, p. 314, § 184. Lubbock not only considered it unnecessary to calculate the terms involving A,, A;, &c., but thought that

De Morgan's expansion of

the value of the term containing A,, as calculated for one mortality table, might be used without material error im finding the values of annuities by other tables. The above examples show that the formula, as now completed, is capable of giving the values of annuities (and of course of other quantities) with very great accuracy.

So long as we consider the annuity to be payable yearly, no allowance being made for the time which elapses between the death of the nominee and the last previous payment of the annuity, it is, as we have seen, a very simple problem to calculate its value. But in practice annuities are generally payable by half-yearly instalments, and it is the custom to pay a proportionate part of the annuity for the odd time that elapses between the last half-yearly payment and the death of the nominee ; and the value found by the methods described above therefore require to be corrected before they are strictly applicable in practice. Approximate values of the necessary correc- tions are very easily found ; but the strict investigation of their correct values is a problem requiring a considerable knowledge of the

higher mathematics, and it would be quite beyond our present purpose to consider it.

When an annuity is payable half-yearly, the common rule for finding its value is to add -25, or a quarter of a year's purchase, to the value of the annuity payable yearly. When it is payable quarterly, 375 is added ; and when by instalments at 2 equal periods throughout the year (or by

The values thus

found are sufficiently correct for most purposes. More correct methods of finding the values of annuities payable half-yearly, quarterly, &c., are investigated in papers in the Assurance Magazine, by Woolhouse, xi. 327, and by Sprague, xiii. 188, 201, 305. Some authors have assumed that when an annuity is payable half-yearly, interest is also convertible half-yearly, overlooking the circumstance that the true rate of interest is thereby changed, as we have explained in the earlier part of this article. In fact, as we showed, 5 per cent. interest convertible half-yearly is equivalent to a true rate of interest, £5, 1s. 3d. per cent. Tf, then, we have found the value of an annuity when payable yearly at 5 per cent. interest, and require, perhaps, in the course of the same investigation, the value of an annuity payable half-yearly, it is clear that that value should be computed, not at £5, 1s. 3d. per cent. interest, but at 5 per cent.; or if we prefer the rate 2p. ls ad. then the value of the annuity payable yearly should also be calculated at that rate.

The approximate value of an annuity payable up to the day of the nominee's death, or of a "complete " annuity, as it is now usually called, is found in the case of annuities payable yearly by adding to the value of the ordinary annuity the value of 4, payable at the instant of the nomi- nee's death ; in the case of half-yearly annuities, by adding the value of 4; and in the case of quarterly annuities, the value of 4, similarly payable. The more exact value of the correction is investigated by Sprague, Ass. Afag., xiil. 358.

e ° e 1 * thly instalments), the addition is ® = :

The previous remarks refer almost exclusively to annui- ties which depend on the continuance of one life, or to "single life annuities," as they are

commonly called. But an annuity may depend on the continuance of two or three or more lives. It may continue so long as both of two nominees are alive, in which case it is called an annuity on the joint lives; or it may continue as long as either of them is alive, in which case it is called an annuity on the last survivor. Again, if it depends on the existence of three nominees, it may either continue so long only as they are all three alive, when it is called an annuity on the joint lives; or so long as any two of them continue

alive, when it is called an annuity on the last two sur- vivors; or so long as any one of them is alive, when it is called an annuity on the last survivor. In addition to these, we have ‘“reversionary ” annuities, which are to commence on the failure of an assigned life, and continue payable for the life of a specified nominee ; or, more gene- rally, to commence on the failure of a given status, or combination of lives, and continue payable during the existence of another status. There are also “ contingent ” annuities, which depend on the order in which the lives involved fail. Thus, we may have an annuity on the life of a, to commence on the death of y, provided that take place during the life of z, and not otherwise, and to continue payable during the remainder of the life of «. Reversionary annuities are of considerable practical im- portance, but contingent annuities are rarely met with. Lastly, we may mention annuities on successive lives. These are of importance in the calculation of the values of advowsons, and of fines on copyhold property. It does not fall within the scope of this article to treat at any length of annuities on more than one life, and we must refer the reader who wishes for further information with regard to them to the works of Baily, Davies, and David Jones, already mentioned, and Milne’s Treatise on the Valuation of Annuities and Assurances, 1815.

The student who wishes to pursue the subject more thoroughly, and to become acquainted with all the improvements in the theory of annuities that have been introduced of late years, should care- fully study the various articles contributed to the Journal of the Institute of Actuaries, particularly those of Woolhiouse and Make- ham. The Institute was founded in the year

1848, the first sessional meeting being held in January 1849. Its establishment has con- tributed in various ways to promote the study of the theory of life contingencies. Among these may be specified the following : — Before it was formed, students of the subject worked for the most part alone, and without any concert ; and when any person had made an improvement in the theory, it had little chance of becom- ing publicly known unless he wrote a formal treatise on the whole subject. But the formation of the Institute led to much greater interchange of opinion among actuaries, and afforded them a ready means of making known to their professional associates any im- provements, real or supposed, that they thought they had made. Again, the discussions which follow the reading of papers before the Institute have often served, first, to bring out into bold relief differences of opinion that were previously unsuspected, and after- wards to soften down those differences,—to correct extreme opinions in every direction, and to bring about a greater agreement of opinion on many important subjects. In no way, probably, have the objects of the Institute been so effectually advanced as by the publication of its Journal. The first number of this work, which was originally called the Assurance Magazine, appeared in September 1850, and it has been continued quarterly down to the present time. It was originated by the public spirit of two well-known actuaries (Mr Charles Jellicoe and Mr Samuel Brown), and was carried on by them for two years, we believe, at a considerable loss. It was adopted as the organ of the Institute of Actuaries in the year 1852, and called the Assurance Magazine and Journal of the Institute of Actuaries, Mr Jellicoe continuing to be the editor,—a post he held until the year 1867, when he was succeeded by Mr Sprague. The name was again changed in 1866, the words ‘‘ Assurance Magazine” being dropped ; but in the following year it was considered desir- able to resume these, for the purpose of showing the continuity of the publication, and it is now called the Journal of the Institute of Actuaries and Assurance Magazinc. This work contains not only the papers read before the Institute (to which have been appended of late years short abstracts of the discussions on them), and many original papers which were unsuitable for reading, together with correspondence, but also reprints of many papers published else- where, which from various causes had become difficult of access to the ordinary reader, among which may be specified various papers which originally appeared in the Phalosophical Transactions, the Philosophical Magazine, the Mechanics’ Magazine, and

the Com- panion to the Almanac ; also translations of various papers from the French, German, and Danish. Among the useful objects which the continuous publication of the Journal of the Institute has served, we may specify in particular two :—that any supposed improvement in the theory was effectually submitted to the criticisms of the whole actuarial profession, and its real value speedily discovered 5 and that any real improvement, whether great or small, being placed on record, successive writers have becn able, one after the other, to

take it up and develop it, each commencing where the previous one had left off. The result has been, as stated above, that great advances have lately been made in the theory. It may be truly said that the recent advances and improvements in the theory of life contingencies have rendered all the existing text-books anti- quated ; and until a new one shall be produced, bringing the treat- ment of the subject down to the present time, a complete know- ledge of it can only be gained by a diligent study of the Journal of the Institute of Actuarics and Assurance Magazine. 4

As intimated above, our remarks on annuities involving more than one life will be very brief. The methods em- ployed for the calculation of single life annuities are easily extended to the case of joint life annuities. The funda- mental equation

a=vp (1+1a) is true of annuities on two, three, or any number of joint lives, if we consider p to denote the probability that they will all survive for one year; and 1a the value of an annuity on the joint continuance of lives which are severally one year older than those on which the required annuity de- pends. Thus we have—a, y,z, being the ages of the nomi- nees— L l Agy =U ° a dd ee Vept.y tt) = PaPy (1+ gy) ANd Gey, = UP ePy Pe (1 + ayy2)-

The columnar method of calculating annuities admits also of being extended to annuities on joint lives. In the extensive tables contained in D. Jones’s work,

Dy, lJyv, y being the older of the two ages, and N,,=1D,,+?D,, °D,,

where “D,, is used to denote D1, .445- An improved form of the table was suggested by De Morgan, according to which we should have D,, =

a+, Ly? . This would simplify the formulas for the values of contingent annuities, but no tables have as yet been published calculated on this principle. The same method

might be extended to three lives, in which case the most aty te advantageous form would be D,,,=0,J,J,0 3 ; but the ex-

tent of the tables when three lives are involved renders it extremely improbable that such will ever be published. The practical construction of a D and N table for joint lives has been considered by Gray, Zables and Formule, pp. 122-1387, and Ass. Afag., xviii. 26. Mr Jardine Henry has described in the Ass. Mag., xiv. 212, a mechanical method of computing the values of D,, =/,l,v%, by means of which he has calculated the values in his extensive tables mentioned above.

The values of annuities on the last survivor of two or more lives cannot be calculated by the ordinary methods that apply to annuities on joint lives; thus, for example, the equation a = vp (1+*a) does not hold good with regard to them. Their values must be found from those of joint life annuities by means of the following formulas :—

An annuity on the last survivor of two lives, a bas = Ay + Uy — Any and y, An annuity on the last survivor of three ves be Og t Uy + Ug — Cys — Cag — Any + Crys x, ¥, and 2, An annuity on the last two i

survivors of the three

lives, xz, y, 2, j If we have the values of annuities on the last survivor of two lives tabulated, as is the case in the Institute of Actuarves Life Tables, we may find the value of an annuity on the last of three lives by means of the formula az = dz +47; -,, Where w is found by means of the relation Ay =A,,; See Ass. Mag., xvii. 266, 379.

The methods of approximation given by Lubbock and

Cizge” = Oy, + Ger + Ony — Winys y: Y Y

85

Woolhouse also apply to the calculation of annuities on the joint existence of any number of lives; see the latter’s explanation of his method, Ass. Mag., xi. 322, and for an illustration of its application to complicated cases, xvii. 267. They may also be applied to find the value of an annuity on the last survivor of any number of lives; see Ass. Mag., xvi. 375.

The formula usually given for the value of a reversionary annuity on the life of x to commence on the death of y 18 @,—Q,y, But this is not sufficiently correct, being de- duced from suppositions that do not prevail in practice. It assumes the first yearly payment of the annuity to be made at the end of the year in which y dies, and the last at the end of the year before that in which « dies; whereas in practice the annuity runs from the death of y, the first yearly payment being made one year after such death, and a proportionate part being paid up to the date of «’s death. A more correct formula, as given by Sprague (Ass. Mag.,

On — Cney

xv, 126), is es:

If the annuity is payable half-yearly,

Tay

the value will be approximately (a, — a : j and if

en = a) EQFR1- sufficient to deduct half a year’s interest from the value found by the formula a, —a,,, when the annuity is payable yearly, a quarter of a year’s interest when it is payable half-yearly, and an eighth of a year’s interest when quarterly.

In dealing with annuities in which three lives are in- volved, we are met by the difficulty that no tables exist in which the values of such annuities are given to the extent required in practice. Such tables as those computed for

the Carlisle 3 per cent. table by Herschel Filipowski are of too limited extent to be of any practical utility; for the values being given only for certain ages differing by multiples of five years, a considerable amount of labour is required to deduce the values for other ages. When, there- fore, we desire to find the value of an annuity on the joint lives of say x, y, and z, it is usual to take the two oldest of the lives, say # and y, and find the value of a,,, then to look in the table of single life annuities for the annuity which is nearest in value to this,—a,, suppose,—and lastly, to find the value of a,,, and use it as an approximation to that of a,,,. De Morgan, in a paper written for the Philosophical Magazme for November 1839, and reprinted in the Ass. Mag., x. 27, proved that the value of a,,, thus found would be strictly accurate, if the mortality followed the law known as Gompertz's; that is to say, if the number of persons living according to the mortality table at any

quarterly, (a,— In practice, it is often

age, x, could be represented by means of the formula dg*'. Gompertz proved, in the Philosophical Transactions for 1825, that by giving suitable values to the constants, the above formula might be made to represent correctly the number living during a considerable portion of life, say from age 10 to 60; but in order to represent by the same formula the numbers living at higher ages, it is necessary to give fresh values to the constants; and the discontinuity thence resulting has always been a fatal obstacle to the practical use of the formula. It has, however, from its theoretical interest, attracted a great deal of attention from actuaries ; and numerous papers on the subject will be found in the Asswrance Magazine. A claim to the inde- pendent (if not prior) discovery of the formula has been put forward by Mr T. R. Edmonds; but this claim, respecting which many communications will be found in the Assurance Magazine, is generally repudiated by competent judges. De Morgan further showed (Ass. Mag., viii. 181) that if the above property holds good, or , , , =,.:, then the mortality

must follow Gompertz's law; and Woolhouse gave inde- pendently a simple algebraical demonstration of the same property, x. 121. Makeham removed the above mentioned objection to Gompertz's formula by introducing another factor, and showed (Ass. Mag., xii. 315) that the formula dg*s* will

correctly represent the number living at any age x from about the age of 15 upwards to the extremity of life; and this formula has been found very serviceable for certain purposes.

The fact that Gompertz's law does not correctly represent the mortality throughout the whole of life, proves that the above-described practical method of finding the value of an annuity on three joint lives is accurate only in certain cases. Makeham has shown (Ass. Mag., ix. 361, and xiii. 355) that when the mortality follows the law indicated by his modification of Gompertz's formula, the value of an annuity on two, three, or any number of joint lives, can be readily found by means of tables of very moderate extent. 'Thus the value of an annuity on any two joint lives can be deduced from the value of an annuity at the same rate of interest on two joint lives of equal ages; the value of an annuity on any three joint lives, by means of a table of the values of annuities on three joint lives of equal ages; and so on; and Woolhouse has shown (vol. xv. p. 401) how the values of annuities on any number of joint lives, at any required rate of interest, can be found by means of tables of the values of annuities on a single life at various rates of interest. These methods, we believe, have not hitherto been practically employed to any extent by actuaries, and it would perhaps be premature to say which of them is preferable.

'As the reader will have observed, neither Gompertz's nor Makeham's formula represents correctly the rate of mortality for very young ages. Various formulas have been given which are capable of representing with sufficient accuracy the number living at any age from birth to extreme old age, but they are all so complicated that they are of little more than theoretical interest. They are, however, likely to prove of increasing value in the problem of adjusting (or graduating) a table of mortality deduced from observations,—an important subject, which does not fall within the scope of this article. We may mention in particular those given by Lazarus in his Mortaltats- verhtilinisse und thre Ursache (Rates of Mortality and their Causes), 1867, of which a translation is given by Sprague in the eighteenth volume of the Asswrance Magazine, ae CK2"27H2*; and by Gompertz (see Ass. Mag., xvi.

29);

1,=const. A“B-*C*D”, where P= 607”.

If J, represents the number living at any age in the mortality table, the force of mortality, or the instantaneous rate of mortality, mentioned above (see p. 83), is equal

d ; to — Gy lOSele Hence, in Gompertz’s original law the

force of mortality at any age # is proportional to 9g’, or is equal to ag”, where a is a constant; in Makeham’s law the force of mortality is equal to ag*+6, where a and } are constants; and in Lazarus’s law the force of mortality is equal to ag*+6+cp*, where a, 6, and ¢ are constants, or to ae”**+6b+ce**, Dr Thiele has shown (see Ass. Afag., xvi. 313) how to graduate a mortality table, by assuming the formula for the force of mortality, ae + ae PHY + a€8* ; and Makeham has explained (Ass, Mag., xvi. 344) a very convenient practical method for adjustment, which results in assuming that the number living at any age « can be accurately represented by the sum of three terms of the form dg%s*.

The employment of formulas such as those given in the

the introduction of the idea of “ continuous ”

A hiner 1 &

last paragraph,

and the application of the differential calculus to the theory of life contingencies, have naturally

led to an improvement in the theory which is probably

destined to become of very great importance—we refer to annuities

and assurances. If the intervals at which an annuity is

payable are supposed to become more and more frequent, until we come to annuity is made momently as it accrues, the annuity is

the limit when each payment of the

called continuous. Strictly speaking, of course, this is an impossible supposition as regards actual practice ; but if an annuity were payable by daily instalments, its value would not differ appreciably from that of a continuous annuity; and if the annuity be paid weekly, the difference will be so small that it may be always safely neglected. The theory of continuous annuities has been fully developed by Woolhouse (Ass. Jfag., xv. 95). Assuming the number living in the mortality table at any age x to be represented by J,, the value of a continuous annuity on a nominee of the age w is :

i Lv dx = ; Le<-°*dx, putting §=log(1 +7).

x x x x From the nature of the case, J, must be a function that is never negative for positive values of & ; and as a becomes larger, J, must continually diminish, and must vanish when x becomes infinite. It will be noticed here that the superior limit of the integral is «. This is necessary if J, is a continuous mathematical function ; for in that case, however large x be taken, 2, will never become absolutely zero. Makeham has shown (Ass. Mag., xvi. 305) that when the number living, J,, can be correctly

represented by the formula cgte-™, the value of a continu-

1 1

ous annuity is equalto ——:——>—— 10% one y q log q 10~10° , ma 10 0€ . dz,

1

a+ where n=-——, log

10′

given (pp. 312-397) a table, by means of which the value of the annuity can be found when the values of m and z are known. ‘This table requires a double interpolation, and is therefore rather troublesome to use. Mr Emory

M‘Clintock has shown in the eighteenth volume of the Assurance Magazine, how the value of an annuity may be found by means of the ordinary tables of the gamma- function. As Lazarus has pointed out in his above-men- tioned paper, when mortality tables are given in the ordinary form, it is difficult to compare them and define precisely their differences ; but if they can be accurately represented by a formula containing only a few constants, it becomes easy to show wherein one table differs from another ; and the methods of Makeham and M‘Clintock enable us to compare the values of annuities, for any ages desired, according to different tables as determined by such constants, without the labour of computing the mortality tables in the usual form. They can therefore scarcely fail to grow in popularity as they become better known.

and z=« logug + logis a and he has

The principal application of the theory of life annuities +s found in life insurance. (See Insurancz.) At the present time there are upwards of one hundred companies of various kinds transacting the business of life insurance in the United Kingdom. It is only since the passing of the Life Assurance Companies Act, 1870, that it has been possible to form an accurate estimate of the extent of the business transacted by these companies; but, from the returns made under that Act, it appears that the total assets of the com- panies amount to about £110,000,000, which are invested so as to produce an annual income of about £4,000,000, and that the total premiums received annually for insurance amount to about £10,000,000. There is no means at pre- sent of saying exactly what is the total sum assured ; but it is probably about £330 000,000, the average premium

for insurance being about 3 per cent. perannum. The actual transactions at the present time in the purchase and grant of immediate annuities, although small in comparison with the life insurance transactions, are yet of considerable amount. It appears from the returns made under the above-mentioned Act, that upwards of £250,000 is annu- ally paid to insurance companies for the purchase of annui- ties, and that the aggregate amount of their labilities under that head is nearly £420,000 a year. The Govern- ment

competes with the companies in the grant of annui- ties ; and although its terms are on the whole very much less favourable than the companies', still in consequence of the greater security offered, the business transacted by the Government is much in excess of that transacted by the whole of the insurance companies. It appears from recent returns (see Ass. Mag., xv. 23), that the life annuities annually paid by the National Debt Office amount to about £1,000,000, and that about £600,000 is on the average annually invested with the Government for the purchase of fresh annuities. The purchase and grant of life annuities have been carried on to a very considerable extent, apparently at all times. We learn from De Wit's above-mentioned report, that the Governments of Holland and West Fries- land had granted annuities systematically for one hundred and fifty years before any correct estimate was formed of the value of a life annuity. The British Government has at various times granted life annuities, more especially on

when it was difficult to obtain the sums required for the public service by the ordinary methods. Various local bodies have at different times raised money on the security of the local rates in consideration of the grant of life annuities ; and, at the present time, the Manchester Cor- poration grants annuities on favourable terms for the pur- pose of obtaining funds to defray the expense of the water- works belonging to the city. During the existence of the usury laws, it was very common for persons borrowing money upon the very best security to grant annuities upon their lives in consideration of a present advance. Thus, for example, if a country gentleman of the age of 40 wished to borrow £10,000 upon a landed estate, the law forbade him to pay, or the lender to receive, more than 5 per cent. interest, say £500 a year ; but the law did not forbid his granting an annuity of £1000 for his life, secured upon the estate. Speaking roughly, an annual payment of £300 would be required to insure £10,000 upon the borrower's life, and the annuity would therefore return the lender about 7 per cent. interest, in addition to the premium on the insurance necessary to return his capital. In this way the law, which was intended as a protection to the bor- rower, to enable him to obtain a loan at a fixed moderate rate of interest, very often had the directly opposite effect of greatly increasing the cost of borrowing.

The usury laws being now repealed, borrowers and lenders are left at full liberty to make such terms with each other as they

the Tontine principle, for the purpose of raising money | may think best. (@ 3B. 8.)

TABLE (1).—Showing out of 1,000,000 Children born, the Number of Males and Females Surviving at each Age, and the Number Dying in each Year of Life. English Table, No. 3.

Males. Females. Males, | Females, Males. Females. Age. Number Number |] Age. Number Number'|| Age. Number Number dying in) Number dying in Number (dying in! Number {dying in Number idying in] Number alive at |thefol-| alive at | the fol- alive at |thefol-| alive at | the fol- alive at /the fol-} alive at each age. | lowing | eael age. | lowing eaeh age. | lowing | eaeh age. | lowing each age. | lowing | eaeh age. year. year. year. year. year.

x lx Oh Lx ax fe lx dy, G dz te Ik: Qe lx 0 | 511745 | 83719 | 488255 | 65774 || 37 | 282296 | 3352 | 276568 | 3326 74/ 83416 | 7639 93071 1 | 428026 | 27521 | 422481 | 26159 |) 28 | 278944 | 3406 | 273237 | 3350 US || ania || 7ess 85347 2 | 400505 | 14215 | 396322 | 14023 || 39 | 275538 | 3465 | 269887 | 3376 76| 68294 | 7268 77694 3 | 386290 | 9213] 382299 | 9243)] 40 | 272073 | 3529 | 266511 | 3402 771 61026 | 6990 70173 4 | 377077 | 6719) 373056 | 6596] 41 | 268544 | 3596 | 263109 | 3431 78) 54036 | 6655 62844 5 | 370358 | 50383] 366460 | 4866 || 42 | 264948 | 3668 | 259678 | 3459 79} 47381 | 6266 557738 6 | 8653825 | 3953) 361594 | 3815 || 43 | 261280 | 3746 | 256219 | 3490 80; 41115 | 58382 49018 7 | 361372 | 3310] 357779 | 3249 || 44 | 257534 | 3826 | 252729 | 3522 || 81) 35283 | 5361 42636 8 | 358062 | 2734) 354530 | 2724 || 45 | 253708 | 3912 | 249207 | 3555 || 82] 29922 | 4862 36677 9 | 355328 | 2297) 351806 | 2328]! 46 | 249796 | 4001 | 245652 | 3591 83] 25060 | 4349 31181 10 | 353081 | 1983] 349478 | 2045 || 47 | 245795 | 4095 | 242061 | 3627 84; 20711 | 3834 26178 11 | 351048 | 1776] 347433 | 1861 |] 48 | 241700 | 4192 | 288434 | 3665 85] 16877 | 3328 21688 12 | 349272 | 1666) 345572 | 1765 || 49 | 237508 | 4292 | 234769 | 3705 86) 13549 | 2840 17716 13 | 347606 | 1687; 348807 | 1745}; 50 | 233216 | 4895 | 231064 | 3746 87) 10709 | 2384 14258 14 | 345969 | 1679) 342062 | 1789] 51 | 228821 | 4626 | 227318 | 3788 88 8325 | 1965 11296 15 | 344290 | 1781] 340273 | 1888]| 52 | 224195 | 4758 |

223530 | 3832 || 89 6360 | 1590 8802 16 | 342509 | 1928] 338385 | 2029 || 53 | 219437 | 4885 | 219698 | 3876 90 4770 | 1260 6739 17 | 340581 | 2112) 336356 | 2205}; 54 | 214552 | 5013 | 215822 | 4246 Ol 3510 979 5066 18 | 338469 | 2320) 334151 | 2400]| 55 | 209539 | 5144 | 211576 | 4439 || 92 2531 744 3735 19 | 336149 | 2541) 331751 | 2609]! 56 | 204395 | 5281 | 207137 | 4628 938 1787 553 2698 20 | 383608 | 2764] 329142 | 2819] 57 | 199114 | 5428 | 202509 | 4817 94 1234 401 1908 21 | 330844 | 2801) 326323 | 2867 || 58 | 1938686 | 5584 | 197692 | 5009 95 833 285 1320 22 | 328048 | 2836] 323456 | 2912] 59 | 188102 | 5752 | 192683 | 5206 96 548 196 892 23 | 325207 | 2868} 320544 | 2952) 60 | 182350 | 5929 | 187477 | 5409 || 97 352 132 588 24 | 322339 ; 2897| 317592 ; 2989]|| 61 | 176421 | 6118 | 182068 | 5619 98 220 86 378 25 | 319442 | 2926] 314603 | 3024 || 62 | 170803 | 6814 | 176449 | 5835 99 134 55 236 26 | 316516 | 2954] 311579 | 3055 || 68 | 163989 | 6515 | 170614 | 6057 || 100 79 33 144 27 | 3138562 | 2981) 308524 | 3084} 64 | 157474 | 6720 | 164557 | 6282 || 101 46 2il 85 28 | 310581 | 3009| 305440 | 3112] 65 | 150754 | 6921 | 158275 | 6509 |} 102 25) 11 49 29 | 307572 | 3038; 302328 | 3138 |) 66 | 143833 | 7115 | 151766 | 6731 || 103 14 7 2a 30 | 304534 | 38068) 299190 | 3163)) 67 | 1386718 | 7297 | 145035 | 6947 || 104 a 3 15 31 | 301466 | 3100} 296027 | 3187] 68 | 129421 | 7458 | 138088 | 7149 || 105 4 2 8 82 | 298366 | 3134) 292840 | 3209 || 69 | 121963 | 7593 | 130939 | 7332 || 106 2 1 4 33 | 295232 | 3171) 289631 sa 70 | 114870 | 7695 | 123607 | 7489 || 107 1 1 2 292061 |; 3211) 286398 | 3255|| 71 | 106675 | 7756 | 116118 | 7613 || 108 : 1

288850 | 3254] 283143 | 3279:| 72 98919 | 7770 | 108505 | 7698 || 109 a6

285596 | 3300} 279864 | 3301 0s 91149 | 7733 | 100807 | 7736

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TABLE (2). —Showing the Probability of a Male or Female of any Age Dying within a Year. English Table, Ne. 3.

Probability of Dying in a Probability of Dying ina |, Probability of Dying in a – Year Year. A Year. ; Age. az.

Age. zx Gx x. Qa

Gx

Females. Males. Females.

——

034840 | 076748 091570 | 082984 098758 | 089668 106412 | 096812
114544 | 104430 123154 | 112526 132256 | 121112 141844 | 130192
151926 | 139774 162500 | 149855 173564 | 160440 185116 | 171528
197148 | 183115 209604 | 195196 229626 | 207767 236050 | 220814
949914 | 234332 264203 | 248302 278900 | 262710 293987 | 277543
309442 | 292778 325243 | 308397 341367 | 324373 357787 | 340687
374479 | 357309 391411 | 374210

ff | |

163597 134714 7 011873 | 012025 064298 061918 38 012212 | 012262

ee

0

il

2 035494 035383 39 012575 012508 3 023850 024178 40 012968 012766 4
017820 017683 41 013392 0138038

5 013590 013278 42..\ 013845 0138320

6 010820 010554 43 014334 013620

ii 009160 009080 44 014858 013936 8 007636 007684 45 015418 .| 014268

9 006465 006618 46 016018 014618 10 005616 005853 47 016660 014985

ual 005060 005358 |; 48 0173438 015373

12 004768 005108 49 018072 015780 13 004710 005074 50 018844
016210 14 004854 005232 51 020220 016666 15 005173 005548 52
021222 017142 16 005630 005998 63 022263 017646 17 006203 006553
54 023364 019673 18 006854 007184 55 024548 020980 19) 007558
007865 56 025838 022344 20 008285 008563 57 027260 023788

ail 008468 008788 58 028830 025338

22 008645 009004 59 030575 027018 23 008820 009210 60 032518 028850 24 008990 009413 61 034676 030862 25 009160 009610 62 037074 033070 26 009333 009805 63 039733 035500 408556 391353 27 009507 009998 64 042672 038178 425883 408738

28 009688 010190 65 045910 041123 101 | 448358 426301 :

29 009878 010378 66 049470 044354 102 460953 444021 30 010073 010570 67 053370 047898 103 478631 461863

3l 010283 010764 68 057626 051772 104 496361 479793

32 010504 010962 69 062256 055994 105 514109 497777 33 010740 011163 70 067278 060586 106 531839 515777 34 010994 011368 71 072708 065563 107 549520 533760

35 011265 011580 || 72 078556 070946 108 567116 551688

36 011558 011798 .

TABLE (3).—Ausiliary (D and NV) Table for finding the Values of Annuities at 3 per cent. Interest. English Fable,

No. 3, Males. ee er, nee Dz Nz Dz Nz a Dz Na 0 511745 9288491 94564 1635186 74 9360°4 50726°5 | 1 415559 8872932 90720 1544466 75 8255°5 42471°0 2 377514 8495418 87002 1457464 76 7223 °5 35247 °5 3 353510 8141908 83406 1374058 Hi 6266°9 28980°6 4 335028 7806880 79926 1294132 78 5387 °4 23593°2 5 319474 7487406 76559 1217573 79 4586°3 19006°9 6 305953 7181453 73300 1144273 80 38638 15143°1 7 293828 6887625 70145 1074128 81 3219 °2 11923°9 8 282657 6604968 67090 1007038 82 29650°6 9273°3 9 272329 6332639 64132 942906 83 9155°2 7118°1 10 962688 6069951 61267 881639 84 | 1729°3 5388°8 11 953605 5816346 58491 823148 85 1368°1 4020°7 12 244972 55713874 55803 767345 86 1066°4 9954°30 13 236703 5334671 53198 714147 87 818°28 2136°02 14 228726 5105945 50676 663471 88 617°58 1518°44 15 220987 4884958 48205 615266 89 458:06 1060°38 16 213441 4671517

45808 569458 90 333°58 726°80 ale 206057 4465460 43483 525975 91 238°30 488°50 18 198815 4266645 41230 484745 92 166‘83 321°67 19 191701 4074944 39047 445698 93 114°35 207 323 20 184711 3890233 36930 408768 94 76°668 130°655 21 177845 3712388 34877 373891 95 50°225 80°430 22 171203 3541185 32885 341006 96 32°117 48°313 23 164780 3376405 30951 310055 97 20°025 98288 24 158570 3217835 29072 280983 98 12 G1 16°1271 25 152567 3065268 27247 253736 99 7°1856 8°9415 26 146767 2918501 ~ 95472 923264 100 4°1261 4°8154 auf 141162 2777339 23748 204516 101 2:2999 2°5155 28 135748 2641591 22072 182444 102 1°2429 1°2726 29 130517 9511074 20446 161998 103 *6505 “Geez

. 30 125464 2385610 18868 148130 104 3.293 2.928

31 120583 2265027 17341 125789 105 ‘1610 “1318 oo 115867 2149160 69 15866 109923 106 0759 0559

33 111310 2037850 70 14445 95478 107 0345 0214

34 106907 19309438 || 71 13080 82398 108 0151 “0063 35 1026538 1828290 || 72 11776 70622 109 0063 0000

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ANNUITIES 89

TaBLE (4).—Ausxihary (D and NV) Table for finding the Values of Annuities at 3 per cent. Interest. English Table, No. 3, Females.

Ree i) a a ae ee Ms

0 488255 9203701 ov 92644 1647581 74 | 10444 60281°5

1 410175 8793526 38 88864 1558717 AS 9298 °2 50983°3

2 373071 8419955 39 85218 1473499 76 8217°9 42765°4

3 349858 8070097 40 81701 1391798 He 7206°1 35559°3

4 331456 7738641 41 78309 13138489 78 6265°6 29293°7

5 316112 7422529 492 75036 1238453 79 5398°6 23895°1

6 302830 7119699 43 71880 1166573 80 4606°6 19288 °5

a 290907 6828792 44 68836 1097737 81 3890°1 15398 °4

8 279870 6548922 45 65900 1031837 82 3248°9 12149°5

9 269630 6279292 46 63068 968769 83 2681°6 9467-9 10 260044 6019248 47 60336 908433 84 2185°8 7282°1

11 250993 5768255 48 57701 850732 85 175871 5524-0

12 2429377 5525878 49 55159 795573 86 1394°4 4129°6 13 234116 5291762 50 52707 742866 87 1089°5 3040°10 14 226143 5065619 51 50343 692523 88 838°00 2202°10 15 218408 4847211 52 48062 644461 89 633‘94 1568°16 16 210870 4626341 53 45862 598599 90 471°25 1096°91 17 203501 4432840 54 43741 554858 91 343‘92 752°99 18 196279 4236561 55 41631 513227 92 246°18 506°81 19 189193 4047368 56 39571 473656 93 172°68 33413 20 182238 3865130 57 37560 436096 94 118°56 915:574 il 175415 3689715 58 35598 400498 95 79611 135°963 22 168809 3520906 59 33686 366812 96 POL 83°742 23 162417 38358489 60 31821 334991 97 Boley 50°315 24 156234 3202255 61 30003 304988 98 20°858 29°457 25 150256 3051999 62 28230 276758 99 12°672 16°7848 26 144478 2907521 63 26501 250257 100 7°4882 9°2966 27 138894 2768627 64 24816 225441 101 4°2985 49981 28 133501 2635126 65 23174 202267 102 2°3942 2°60389 29 128292 2506834 66 21573 180694 103 1°2924 1°3115

30 123262 2383572 67 20016 160678 104 6752 6363 31 118407 2265165 68 18502 142176 105 *3410 “2953 32 113721 9151444 69 17033 125148 106 1663 “1290 33 109198 2042246 70 15611 109532 107 0782 *0508 34 104835 1937411 71 14238 95294 108 0354 0154

35 100624 1836787 ie 12917 82377 109 0154 0000

36 96562 1740225 73 11651 70726

a ce ee SN Ne TABLE (5).—Showing the Value of an Annuity, at 3 per cent., on the Life of a Male or Female of any Age. Linglish Table, No. 3.

Value of Annuity. Value of Annuity. | Value of Annuity. Age. Ox Age. On Age. Oz a. ee eee x. a See x. ee Males. Females. Males. Females. Males. | Females.

0

1 21°3518 21° 4385 35 17°8105 18°2539 69 6°9284 73469 2 22°5086 22°5391 36 17°5538 18°0218 70 6°6100 7°0162 3 23°0316 23°0668 37 17°2918 17°7841 al 6°2993 66928 4 23°3022 23°3474 38 170245 17°5465 72 5‘9971 6°37738 5 23°4367 23°4807 39 16°7521 17°2910 73 5°7036 6°0702 6 23°4724 23°5106 40 16°4744 17-0353 74 5°41938 5°7721 7 23°4410 23°4742 41 16°1916 16°7733 75 5‘1445: 54832 8 23 °3674 23°3999 42 159037 16°5047 76 48795 5°2039 9 23 °2536 23°2886 43 156108 16°2293 Ui 4-6244 4°9346 10 23°1071 23°1470 44 15°3129 15°9471 78 4°3793 4°6753 11 22°9347 22°9818 45 15:0102 15°6576 79 41442 44962 12 22°7429 22°7987 46 14°7026 15°3608 80 3°9192 4°1872 13 22°5374 22°6032 47 14:3902 15:0563 81 3°7040 3°9583

14 22°3234 22°4000 48 14°0730 14°7439 82 3°4986 3°7895 15 22°1052 22°1933 49 13°7511 14°4233 83 3°3027 3°5307 16 21°8867 21°9867 50 134242 14°0942 84 31162 3°3315 17 21°6710 21°7829 51 13°0925 13°7562 85 2°9388 3°1419 18 21°4604 21°5844 52 12°7636 13°4090 86 2°7703 2°9617

18°1506 18°8502 34 18°0618 18°4807 68 7°2539 7°6842 19 21°2568 21°3928 53 12°4315 13°0522 87 2°6104 2°7904

20 21°0612 21°2093 54 12°0960 12°6852 88 2°4587 2°6278 21 20°8743 21°0842 55 11°7570 12°3279 89 2°3149 2°4737 22 20°6841 20°8573 56 11°4145 11°9699 90 2°1788 2°3277 23 20°4904 20°6782 57 11°0687 11°6107 91 2°0500 2°1894 24 20°2929 20°4965 58 10°7203 11°2505 92

1:9281 2°0586 25 20°0918 20°3120 59 10°3697 10°8892 93 1°8129 1°9350 26 19°8853 20°1244 60 10-0176 10°5274 94 – 17042 1°8181 27 19°6748 19°9334 61 9°6650 10°1653 95 1:6014 1°7078 28 19°4596 19°7387 62 9°3125 9°8037 96 1°5043 1°6036 29 19°2394 19°5401 63 8°9612 9°4431 97 1°4126 1:5052 30 19°0143 19°3374 64 8°6119 9°0844 98 1°3261 1°4123 31 18°7840 19°1303 65 8°2657 8°7284 99 1°2444 1°3245 32 18°5486 18°9187 66 7°9233 8°3758 100 1:1671 1°2415

33 18°3078 18°7022 67 7°5858 8°0275 | 7 = |

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ANNUNCIATION, the announcement made by the angel Gabriel to the Virgin Mary of the incarnation of Christ (Luke i. 26-38). A festival commemorative of the annunciation is kept by the church on the 25th of March.

The first authentic allusions to it are in a canon of the.

Council of Toledo (656 a.p.), and another of the Council of Trullo (692), forbidding the celebration of all festivals in Lent, excepting the Lord’s day and the Feast of the Annunciation. An earlier origin has been claimed for it on the ground that it is mentioned in sermons of Athana- sins and of Gregory Thaumaturgus, but both these docu- ments are now admitted to be spurious.

ANODYNE (a privative, and éSvvy, pain), denotes ety- mologically anything which relieves pain. The common usage of the word restricts it, however, to medicines which lessen the sensibility of the brain or nervous system, with- out acting directly on the cause of pain. The anodynes generally employed are opium, henbane, hemlock, tobacco, stramonium, and chloroform. aan

ANOINTING, the practice of pouring an aromatic oil upon the head or over the whole body, has been in use from the earliest times among Oriental nations, from whom it passed, chiefly in its ceremonial application, to the nations of the west. It served three distinct purposes, being regarded as a means of health and comfort, as a token of honour, or as a symbol of

consecration. Reason- ing from analogy, it seems probable that anointiug was practised for sanative reasons before it became a religious ceremonial, but it is impossible to determine this with cer- tainty. Its adoption as a sanative agent was dictated chiefly by the conditions of climate in the East. Used as it generally was in conjunction with the bath, it closed the pores, repressed undue perspiration, and so prevented loss of strength. It was also regarded as a protection against the heat, of the sun, and the oil, being aromatic, counter- acted disagreeable smells. The anointing of the head as a token of honour paid to guests and strangers is mentioned in Scripture (Ps. xxiii. 5; Luke vii. 46), and was custo- mary among the Egyptians (Wilkinson's Ancient Egyptians, ii, 213), the Greeks, and the Romans. Anointing as a symbol of consecration was practised among the Jews from the time of the exodus from Egypt, as part of the ceremonial investiture with the sacred offices of prophet (1 Kings xix. 16), priest (Exod, xxix. 7), and king (1 Sam. ix ley. it does not seem to have been essential to the consecration of a prophet, and, as each individual holder of the office of priest or king was not anouted, it has been generally inferred that in these cases it was essential only at the consecration of a new line or dynasty. The titles Messeah and Christ, both meaning anointed, are applied to our Saviour as the anti-typical prophet, priest, and king. Anointing has passed from the Jewish into the Christian economy, and finds a place in the rites of baptism, confir- mation, dedication of a church, &c., as these are admin- istered in the Roman Catholic and Episcopalian com- munions. Its use at coronations symbolises the idea of monarchy as a mediate theocracy. The practice of anoiut- ing the sick in the primitive church, and the dying in the Roman Catholic Church, will be found treated in the article ExTREME UNCTION.

ANOUKIS, or Anaka, the name of an Egyptian goddess, one of the contemplar or companion goddesses of Khnuin or Chnoumis. Her name meant "the Clasper" or "Embracer." She belonged to the "triad of Ele- phantine," formed of Khnum or Chnoumis, Sati or Satis ~—the Egyptian Hera or Juno, "the sunbeam "—and her- self. As Sati personified the upper world or hemisphere, and wore the white crown upon her head, so Anoukis wore the red crown, emblem of the lower world or hemi-

sphere. She personified Hestia or Vesta, and had the

an

ments, although it is occasionally seen.

born at Paris, 21st Jan. 1723,

an eminent Oriental scholar, the preceding article, was born at Paris 7th Dec. 1731. He was a distinguished student at the university of that city, and at first intended to enter the church; but his taste for Hebrew, Arabic, Persian, and other languages of

as student of the Oriental languges. received this appointment, when, lighting on some manu- scripts in the Zend, he formed the project of a voyage to India, with the view of discovering the works of Zoroaster.

from the port of L'Orient.

ANQ

crown surmounted by a tiara of feathers, similar to those of the Pulusata, or supposed Pelasgi, and Tsakkaru, or Teucri, as if she had been a goddess of these nations. Some have compared her name to that of the Phoenician goddess Ongd. It rarely appears in the texts and monu- Statuettes of Anoukis are of the greatest rarity, if, indeed, they occur. —Champollion, Panth. Egypt ; Wilkinson, Mann. and Cust., v. p- 26; Rosellini, Jon. d. Cult., ii.; Letronne, /e- cherches, pp. 345-6. ANQUETIL, Louts PIERRE, a French historian, was He was for some time director of the academy at Rheims, and published in 1757 three volumes of a history of that city. In 1759 he was

appointed prior of the abbey de la Roe, in Anjou, and soon after director of the college of Senlis.

In 1766 he obtained the curacy or priory of Chateau-Renard, near Mont-

argis, which he exchanged, at the conmmencement of the Revolution, for the curacy of La Villette, in the neighbour- hood of Paris. prisoned at St Lazare.

During the reign of terror he was im- On the establishment of the

National Institute he was elected a member of the second class, and was soon afterwards employed in the office of the minister for foreign affairs. September 1808. Anquetil left a very considerable num- ber of historical works; many respects, and he appears to have been almost entirely destitute of the critical discernment and philosophical sagacity of a good historian. in the Biographie Universelle.

He died on the 6th of

but his style is censurable in A list of his works is given

ANQUETIL DU PERRON, ABRAHAM HYACINTHE, brother of the subject of

the East, developed into a passion, and he discontinued his theological course to devote himself entirely to them. His diligent attendance at the Royal Library, and his ardour in the prosecution of his favourite studies, attracted the attention of the keeper of the manuscripts, the Abbé

Sallier, whose influence procured for him a small salary He had scarcely

Seeing no other means of accomplishing his plan, he

enlisted as a common soldier ou the 7th of November

1754, in the Indian expedition which was about to start _ His friends procured his dis- charge ; and the minister, affected by his romantic zeal for

knowledge, granted him a free passage, a seat at the

captain’s table, and a salary, the amount of which was to

be fixed by the governor of the French settlement in India.

After a passage of nine months, Anquetil landed, on the 10th of August 1755, at Pondicherry. Here he remained a short time to master modern Persian, and then hastened to Chandernagore, to acquire Sanscrit. Just then

war was declared between France and England ; Chanderna- gore was taken; and Anquetil resolved to return to Pondi- cherry by land. The journey was one of a hundred days, and he had many adventures and suffered many hardships by the way. He found one of his brothers at Pondicherry, and embarked with him for Surat; but, with the view of exploring the country, he landed at Mahe, and pro- ceeded on fuvt. At Surat he succeeded, by perseverance and address in his intercourse with the native priests, in acquiring a sufficient knowledge of the languages to enable him to translate the dictionary called the Vedidad-Sade, and some other works. Thence he proposed going to

Benares, to study the languages, antiquities, and sacred laws of the Hindus; but the capture of Pondicherry obliged him to quit India. Returning to Europe in an English vessel, he spent some time in London and Oxford, and then set out for France. He arrived in Paris in May 1762, without fortune or the desire of acquiring it, but esteeming himself rich in the possession of one hundred and eighty Oriental manuscripts, besides other curiosities. The Abbé Barthelemy procured for him a pension, with the appointment of interpreter of Oriental languages at the Royal Library. In 1763 he was elected an associate of the Academy of the Belles Letters; and began to arrange for the publication of the materials he had collected during his Eastern travels. In 1771 he published in three vols. 4to, the Zend-Avesta, containing collections from the sacred writings of the Persians, a life of Zoroaster, and fragments of works ascribed to that sage. The work was a very im- portant, accession to our stores of Oriental literature. Sir John Maleolm (/ist. of Persia, vol. i. p. 193, note) refers to the Zend-Avesta as the most authentic source of infor- mation on the religion and institutions of the great Persian legislator. In 1778 he published his Législation Orientale, in which he controverted the system of Montesquieu, and endeavoured to prove that the nature of Oriental despotism had been greatly misrepresented. His Recherches His- toriques et Géographiques sur Inde appeared in 1786, and formed part of Thieffenthaler’s Geography of India. The Hevolution seems to have greatly affected him. During that period he abandoned society, and shut himself up in literary seclusion. In 1798 he published in 2 vols. 8vo, Z’Lnde en Rapport avec 0 urope, a work

remarkable for its invectives against the English, and its numerous misrepresentations. In 1804 he published in 2 vols. 4to, a Latin translation from the Persian of the Oupnek'hat or Upanischada, 1.c., secrets which must not be revealed. It is a curious mix- ture of Latin, Greek, Persian, Arabic, and Sanscrit. (See Lid. Rev., vol. i. pp. 412-421). On the reorganisation of the Institute, Anquetil was elected a member, but soon afterwards gave in his resignation. He died at Paris 17th January 1805. Besides the works named above, he was the author of several others on subjects connected with the history and antiquities of the East. See Biographie Unwerselle; Monthly Review, vol. |xi.; Lord Teignmouth's Life of Sir William Jones.

ANSBACH, or Awnspacu, originally ONnoLzBacu, a town of Bavaria, capital of the circle of Middle Franconia, and formerly of the margraviate of Ansbach, situated on the Rezat, 25 miles S.W. of Nuremberg, and 90 N. of Munich. It is a pleasantly-built place, containing a castle, once the residence of the margraves, and still noted for the gardens that surround it; several churches, the finest of which are those dedicated to St John and St Gunibert ; a gymnasium; anda picture gallery. The chief manufactures of Ansbach are woollen, cotton, and half-silk stuffs, earthen- ware, tobacco, cutlery, and playing cards. There is a con- siderable trade in grain, wool, and flax. In 1791 the last mar- grave of Ansbach sold his principality to Frederick William Il, king of Prussia; it was transferred by Napoleon to Bavaria in 1806, an act which was confirmed by the Congress of Vienna in 1815. Population of the town,

12,635.

ANSELM, Archbishop of Canterbury, was born in 1033, at or near Aosta, in Piedmont. His family was accounted noble, and was possessed of considerable property. Gun- dulph, his father, was by birth a Lombard, and seems to have been a man of harsh and violent temper ; his mother, Ermenberga, was a prudent and virtuous woman, from whose careful religious training the young Anselm derived much benefit. At the early age of fifteen he desired to devote himself to the service of God by entering a convent,

but he could not obtain his father's consent. Disappoint- ment brought on an illness, on his recovery from which he seems for a time to have given up his studies, and to have plunged into the gay life of the world. During this time his mother died, and his father's harshness became unbearable. He left home, and with only one attendant crossed the Alps, and wandered through Burgundy and France. Attracted by the fame of his countryman, Lan- franc, then prior of Bec, he entered Normandy, and, after spending some time at Avranches, settled at the monastery of Bec. There, at the age of twenty-seven, he became a monk ; three years later, when Lanfranc was promoted to the abbacy of Caen, he was elected prior. This office he held for tifteen years, and then, in 1078, on the death of Herluin, the warrior-monk who had founded the monastery, he was made abbot. Under his rule Bec became the first seat of learning in Europe, a result due not more to his intellectual powers than to the great moral influence of his noble character, and his loving, kindly discipline. It was during these quiet years at Bec that Anselm wrote his first philosophical and religious works, the dialogues on Truth and Freewill, and the two celebrated treatises, the J/on- ologion and Prostogion. Meanwhile the convent had been growing in wealth, as well as in reputation, and, among other properties, had acquired considerable possessions in England. Anselm paid frequent visits to that country in connection with the convent lands, and by his mildness of temper and unswerving rectitude, so endeared himself to the English that he was looked upon and desired as the natural successor to Lanfranc, then archbishop of Can- terbury. But on the death of that great man, the rul- ing sovereign, William Rufus, seized the possessions and revenues of the see, and made no new appointment. About four years after, in 1092, on the invitation of Hugh, earl of Chester, Anselm, with some reluctance, for he feared to be made archbishop, crossed to England. He was detained by business for nearly four months, and when about to return, was refused permission by the king. In the following year William fell ill, and thought his death was at hand. Eager to make atonement for his sin with regard to the archbishopric, he nominated Anselm to the vacant see, and, after a great struggle, compelled him to accept the pastoral staff of office. After obtaining dis- pensation from his duties in Normandy, Anselm was con- * secratcd in 1093. He demanded of the king, as the con- ditions of his retaining office, that he should give up all the possessions of the sce, accept his spiritual counsel, and acknowledge Urbaii as Pope, in opposition to the anti-pope,

Clement. He only obtained a partial consent to the first of these, and the last involved him in a serious difficulty with the king. It was arule of the church that the con- secration of metropolitans could not be completed without their receiving from the hands of the Pope the Padlium, or robe. Anselm, accordingly, insisted that he must proceed to Rome to receive the pall. But William would not per- mit this ; he had not acknowledged Urban, and he main- tained his right to prevent any Pope being acknowledged by an English subject without his permission. A grcat council of churchmen and nobles, held to settle the matter, advised Anselm to submit to the king, but failed to over- come his mild and patient firmness. The matter was postponed, and William meanwhile privately sent messen- gers to Rome, who acknowledged Urban, and prevailed on him to send a legate to the king, bearing the archiepiscopal pall. A partial reconciliation was then effected, and the matter of the pall was compromised. It was not given by the king, but was laid on the altar at Canterbury, whenco Anselm took it. Little more than a year after, fresh trouble arose with the king, and Anselm resolved to pro- ceed to Rome and scek the counsel of his spiritual father.

92

With great difficulty he obtained a reluctant permission to leave, and in October 1097 he set out for Rome. William immediately seized ou the revenues of the see, and retained them to his death. Anselm was received with high honour by Urban, and at a great council held at Bari, he was put forward to defend the Latin doctrine of the Holy Ghost against the objections cf the Greek Church. But Urban was too politic to embroil himself with the king of Eng- land, and Anselm found that he could obtain no substantial result, He withdrew from Rome, and spent some time at the little village of Schlavia) Here he finished his treatise on the atonement, Cur Deus homo, and then retired to Lyons. In 1100 William was killed, and Henry, his suc- cessor, at once recalled Anselm. But Henry demanded that he should again receive from him in person investi- ture in his office of archbishop, thus making the dignity entirely dependent ou the royal authority. Now, the Papal rule in the matter was plain ; all homage and lay investi- ture were strictly prohibited. Anselm represented this to the king; but Henry would not relinquish a privilege possessed by his predecessors, and proposed that the matter should be laid before the Holy See. The

answer of the Pope reaffirmed the law as to investiture. A second embassy was sent, with a similar result. Henry, however, remained firm, and at last, in 1103, Anselm and an envoy from the king set out for Rome. The Pope, Paschal, reaffirmed strongly the rule of investiture, and passed sentence of excominunication against all who had infringed the law, except Henry. Prac- tically this left matters as they were, and Anselm, who had received a message forbidding him to return to England, unless on the king's terms, withdrew to Lyons, where he waited to see if Paschal would not take stronger measures. At last, in 1105, he resolved himself to excommunicate Henry. His intention was made known to the king

through his sister, and it seriously alarmed him, for it was

a critical period in bis affairs. A meeting was arranged, and a reconciliation between them effected. In 1106 'Anselm crossed to England, with power from the Pope to remove the sentence of excommunication from the illegally invested churchmen. In 1107 the long dispute as to in- vestiture was finally ended by the king resigning his formal rights. The remaining two years of Anselin's life were spent in the duties of his archbishopric. He died 21st April 1109. His canonization appears to have taken place in 1494.

Anselm may, with some justice, be considered the first scholastic philosopher and theologian. His only great predecessor, Scotus Erigena, had more of the speculative and mystical element than is consistent with a schoolman ; but in Anselm are found that recognition of the relation of reason to revealed truth, and that attempt to elaborate a rational system of faith, which form the special character- istics of scholastic thought. His constant endeavour is to render the contents of the Christian consciousness clear to reason, and to develop the intelligible truths interwoven with the Christian belief. The necessary preliminary for this is the possession of the Christian consciousness. " He who does not belicve will not experience ; and he who has not experienced will not understand." That faith must precede knowledge is reiterated by him. "Neque enun quero intelligere ut credam, sed credo ut intelligamn. Nam et hoc credo, quia, nisi credidero, non intelligam." " Chris- tianus per fidem debet ad intellectum proficcre, non per intellectum ad fidem accedere." '' Rectus ordo exigit, ut profunda Christiane fidci credamus, priusquam ea preesum- amus ratione discutere."

But after the faith is held fast, the attempt must be made to demonstrate by reason the truth of what we believe. It is wrong not to do so. “ Negligenti mihi esse videtur, si, postquam confirmati sumus in fide, non studemus quod credimus, intelligere.”

by whom they are. justice, greatness, is God. Anselm was not thoroughly

ANSELM

To such an extent does he carry this demand for rational explanation that, at times, it seems as if he claimed for un- assisted intelligence the powcr of penetrating even to the mysteries of the Christian faith. On the whole, however, the qualificd statement is his real view; merely rational proofs are always, he affirms, to be tested by Scripture. (Our Deus homo, i. 2 and 38; De Fide Trin. 2.)

The groundwork of his theory of knowledge is contained

in the tract De Veritate, in which, from the consideration

of truth as in knowledge, in willing, and in things, he arises

to the affirmation of an absolute truth, in which all other

truth participates. This absolute truth is God himself,

who is therefore the ultimate ground or principle both of

things and of thought. The notion of God comes thus into the foreground of the system ; before all things it is necessary that it should be made clear to reason, that it should be demonstrated to have real existence. This demonstration is the substance of the Monologion and Proslogion. In the first of these the proof rests on the ordinary grounds of realism, and coincides to some extent with the earlier theory of Augustine, though it is carried out with singular boldness and fulness. Things, he says, are called good in a variety of ways and degrees ; this would be impossible if there were not some absolute standard, some good in itself, in which all relative goods participate. Similarly with such predicates as great, Just ; they

involve a certain greatness aud justice. The very existence of things is impossible without some one Being, This absolute Being, this goodness,

satisfied with this reasoning ; it started from a posteriori grounds, and contained several converging lines of proof. He desired to have some one short demonstration. Such a demonstration he presented in the Proslogion; it is his celebrated ontological proof. God is that being than whom none greater can be conceived. Now, if that than which nothing greater can be conceived existed only in the intellect, it would not be the absolutely greatest, for we could add to it existence in reality. It follows, then, that the being than whom nothing greater can be conceived, i.e, God, necessarily has real existence. This proof has rarely seemed satisfactory. It was opposed at the time by the monk Gaunilo, in his Liber pro Insipiente, on the ground that we cannot pass from idea to reality. The same criticism is made by several of the later schoolmen, among others by Aquinas, and is in substance what Kant advances against all ontological proof. Anselm replied to the objec- tions of Gaunilo in his Liber Apologeticus. The existence of God being thus held proved, he proceeds to state the rational grounds of the Christian doctrines of creation and of the Trinity. With reference to this last, he says we cannot know God from himself, but only after the analogy of his creatures ; and the special analogy used is the self- consciousness of man, its peculiar double nature, with the necessary elements, memory and intelligence, representing the relation of the Father and the Son. The mutual love of these two, proceeding from the relation they hold to one another, symbolises the Holy Spirit. The further theo- logical doctrines of man, original sin, free will, are de- veloped, partly in the Monologion, partly in special treatises. Finally, in his greatest work, Cur Deus homo, he undertakes to make plain, even to infidels, the rational necessity of the Christian mystery of the atonement. The theory rests on three positions: that satisfaction is necessary on account of God’s honour and justice; that such satisfaction can be given only by the peculiar person- ality of the God-man ; that such satisfaction is really given by the voluntary death of this infinitely valuable person. The demonstration is, in brief, this. All the actions of men are due to the furtherance of God’s glory ; if, then, there be

sin, 2.e., if God's honour be wounded, man of himself can give no satisfaction. But the justice of God demands satisfaction ; and as an insult to infinite honour is in itself infinite, the satisfaction must be infinite, 2.e., it must out- weigh all that is not God. Such a penalty can only be paid by God himself, and, as a penalty for mau, must be paid under the form of man. Satisfaction is only possible through the God-man. Now this God-man, as sinless, is exempt from the punishment of sin; His passion is there- fore voluntary, not given as due. The merit of it is there- fore infinite ; God's justice is thus appeased, and His mercy may extend to man. This theory has exercised immense influence on the form of church doctrine. It is certainly an advance on the older patristic theory, in so far as it substitutes for a contest between God and Satan, a contest between the goodness and justice of God ; but it puts the whole relation on a merely legal footing, gives it no ethical bearing, and neglects altogether the conscious- ness of the individual to be redeemed. In this respect it contrasts unfavourably with the later theory of Abelard.

Anselm's speculations did not receive, in the Middle Ages, the respect and attention justly their due. This was perhaps owing to their unsystematic character, for they are generally tracts or dialogues on detached questions, not elaborate treatises like the great works of Albert, Aquinas, and Duns Scotus. They have, however, a freshness and philosophical vigour, which more than makes up for their want of system, and which raises them far above the level of most scholastic writings.

A full account of Anselm's life is given by Eadmer, Vita Anselmi. His works have been frequently published ; the best editions are by Gerberon (containing the life, by Eadmer), Paris, 1675, 2nd ed. 1721; and in Migne, Patrologie Cursus Completus, vol. clv.

The Cur Deus homo has becu frequently published in a separate form. The Aonologion and Proslogion have been translated, with notes, by Bouchitté, Ze LRationalisme Chrétien, Paris, 1842. In addition to the copious notices in general histories of theology and philosophy, the follow- ing works may be referred to :—Mohler, Anselm, translated into English, 1842 ; Franck, Anselm von Canterbury, 1842; Hasse, Anselm von Canterbury, I. "Leben,"

1843, IT. ‘Philo- sophie,” 1852; Remusat, Anselm de Cantorbéry, 1855, 2d ed. 1868; R. W. Church, St Anselm, 1870.

ANSELM, of Laon, a famous theologian, was born of very humble parents at Laon before the middle of the llth century. He is said to have studied under St Anselm at Bec. About 1076 he taught at Paris with great success, but not long afterwards removed to his native place, where his school for theology rapidly became the most famous in Europe. He died 1117. His greatest work was an interlinear gloss on the Scriptures, which has been frequently reprinted. Other commentaries apparently by him have been ascribed to various writers, principally to the great Anselm. A list of them, with notice of Anselm’s life, is contained in the Histoire Littéraire de la France, x. 170-189.

ANSON, Grorcx, Lorp, the famous circumnavigator, was born at Shuckborough Manor, Staffordshire, on the 22d of April 1697. He entered the navy at the age of fifteen. By the time he was twenty-one he had been promoted to the command of the ‘‘ Weasel” sloop, and by 1724 to the command of the man-of-war “ Scarborough.” Between this year and 1735 he was engaged in active service, chiefly on the Carolina stations in America, and a town and county, named Ansonborough, in South Caro- lina, commemorate his residence there. He was recalled in 1739, on the outbreak of the Spanish war, and entrusted with the command of a squadron of eight vessels, equipped to annoy the Spaniards in the South Seas, and to co-operate

with Admiral Vernon across the Isthmus of Darien. Ansou sailed in September 1740; doubled Cape Horn in a dan- gerous season; lost most of his men by the scurvy; and with only one remaining ship, the “Centurion,” crossed the Pacific Ocean. If no considerable national advantage resulted from this voyage, Commodore Anson made his own fortune, and enriched his surviving companions, by the capture of a rich galleon on her passage from Acapulco to Manilla. He was no less fortunate in escaping a French fleet, then cruising in the Channel, by sailing through it during a fog. Soon after his return, in 1744, he was appointed rear-admiral of the blue, and one of the lords of the Admiralty. In April 1745 he was made rear-admiral of the

white, and the following year vice-admiral of the blue, when he was chosen member of parliament for the borough of Heydon. In 1747 he intercepted, off Cape Finisterre, a powerful fleet, bound from France to the East and West Indies, taking six men-of-war and four East Indiamen, not one of them escaping. The French admiral, Jonquiére, on presenting his sword to the con- queror, said, Monsieur, vous avez vaincu [Invincible, et la Gloire vous swit—‘Sir, you have conquered the Invincible, and Glory follows you,” pointing to the ships named the “Tnvincible” and the “Glory,” which he had taken. For his signal services he was created Baron Anson, of Soberton, in Hants, and vice-admiral of the red; and, on the death of Sir John Norris, vice-admiral of England. In 1748 he was made admiral of the blue. In 1757 he became first lord of the Admiralty, and in 1761 admiral of the fleet, in which rank he continued, with a very short interval, until his death ; and the last service he performed was to convey Queen Charlotte to England. He died 6th June 1762. No book ever met with a more favourable reception than Lord Anson’s Voyage Rownd the World, which, though printed under the name of his chaplain, was composed by Benjamin Robins under the inspection of, and from materials furnished by Lord Anson.

ANSTEY, CuristoPHErR, poet, was son of the Rev. Christopher Anstey, rector of Brinkley, Cambridgeshire, where he was born in 1724-5. He was educated at Eton and King’s college, Cambridge. He was originally de- signed for the church, but his degrees being withheld from him, he retired into privacy “‘upon a competent fortune.” He was rusticated from the university.

Tt seems to us even more brilliant in its wit, and finely touched as verse. Other productions in verse and prose have long passed into oblivion. The poetical works were collected in 1808 (2 vols.) by the author’s son Johu, himself author of The Pleader’s Guide, in the same veln with the Mew Bath Guide. He died on 3d August 1805. (A. B. G.)

ANSTRUTHER-EASTER, a royal and parliamentary

burgh of Scotland, in the county of Fife, situated on the “rth of Forth, 9 miles 8S. of St Andrews. It is on the whole an ill-built place, containing tanning, shipbuilding, and fish-curing establishments, and carrying on a con- siderable amount of sea-fishing and some coasting trade, to accommodate which a new harbour is in course of con- struction, under the direction of the Board of Fisheries. In 1871 the parliamentary burgh, which, along with Anstruther-Wester, Crail, Cupar, Kilrenny, Pittenweem, and St Andrews, returns one member to parliament, con- tained 1289 inhabitants; the royal burgh had a population of 1169. Dr Thomas Chalmers was born at Anstruther- Easter in 1780.

ANSTRUTHER-WESTER, also a royal and_parlia- mentary burgh in Fifeshire, close to Anstruther-Easter, from which it is separated by a small stream called the Dreal Burn. In 1871 the population was 484.

ANT. The insects included under this name are divisible into two distinct groups, which exhibit important differences not only in structure but also in habits. The familiar ant (Formica), found in Britain and Europe generally, belongs to an order of insects known as the Zymenoptera, of which division the bees, wasps, hornets, are also well-known examples. But.the Termites, or white ants—insects which also live in social communities, and which inhabit tropical regions—belong to a different order, that of the Mewrop- terous insects, and exhibit differences in several important respects from the ordinary ants. To both species or kinds of these forms it will be necessary to direct attention, and the familiar ants naturally fall to be considered first.

The Hymenopterous insects are distinguished by the possession of four membranous wings, although in certain exceptional instances—as among certain members of the ant community—-the wings may be wanting. The organs of the mouth are partly fitted for mastication by the development of jaws, and partly for suctorial purposes by the possession of a proboscis or “antlia.” The females of this order generally possess a terminal abdominal append- age, forming a “sting” (aculeus), or which may be used in the deposition of the eggs, when it is termed an ovipositor. The Hymenoptera, besides, undergo a “complete” meta- morphosis,—that is, in their passage from the egg towards adult or mature existence they appear first as grubs, or larve, then are enclosed in a pupa-case, and finally appear as the perfect,

and generally winged insect, or “imago.” The Hymenoptera exhibit, perhaps, the most remarkable development among insects of the faculty of instinct, and constitute excellent examples of so-called “ social” insects, living in communities regulated by definite laws, each mem- ber of the society bearing a separate and well-defined part in the organisation and arrangement of the colony at large.

From the earliest times ants have attracted the attention not only of naturalists, but of philosophers and poets, The ancients were familiar with many cf the phenomena characteristic of the ant colony. Aristotle and Pliny, for example, inform us that the labours of ants are regulated in a great measure by the phases of the moon. Pliny also makes mention of a species which he alleges is found in Northern India, which were said to equal Egyptian wolves in size, and were supposed to occupy themselves in digging gold from the bowels of the earth, whilst the

viewed as equally incorrect. that observers have been deceived into the supposition that

inhabitants of the country were said to rob the ants in

summer of their accumulated winter treasures. The harvesting and grain-storing habits of ants, so

familiar to the popular reader, were at first supposed to be

common to all species of ants; but this view has been abun- dantly proved to be erroneous, whilst the opposite extreme of asserting that no species practisc these habits is to be In many cases it is probable

certain species of ants really carried grains of corn in their

mouths, whereas the so-called corn grains of these species were in reality the cocoons or pupz-cases young and immature forms. ants are granivorous, OF vegetable feeders, certain species are as decidedly carnivorous.

containing the And whilst most species of

These latter kinds do not, therefore, participate in the frugal and industrious habits of their allies.

The bibliography of Dr King,

ants is very extensive.

in the 23rd number of the Philosophical Transactions, described the form of the eggs and of the larve, and aiso the habits of ants in reference to their care of their young. successive stages of development in the ants, and demon- strated the egg, “larva,” “ pupa,” and “imago,” or perfect insect.

Lecuwenhocck, the Dutch naturalist, traced the

Swammerdam, with the application of the micro- scope, further advanced the knowledge of the development and structure of the ants; and Linneus (Memoirs of the

Royal Academy of Sciences of Stockholm) ascertained many facts relative to the reproduction of these forms, and

determined that the winged ants are those which alone exercise the generative functions. A Mr Gould published An Account of English Ants, of which work a notice by the Rev. Dr Miles is given in the Philosophical Transac- tions for 1747. This account, excclllent in many respects, +s nevertheless erroneous in certain points,—the result of following too closely the analogy presumed to exist between bees and ants. Geoffroy (Histoire des Insectes qui se trowvent aua Environs de Paris), a good naturalist otherwise, is a bad authority on the subject of ants. The most complete series of observations on ants, which appeared among the earlier accounts of these forms, are those of De Geer, a Swedish entomologist (Mémoires pour servir & UHistotre des Insectes), an observer on whose fidelity the utmost reliance may be placed. Olivier, in the Eneyc- lopédie Méthodique (article Fourmi), summarised the know- ledge of his own and of preceding times, and described a few new species of ants ; and Bonnet, in his Observations sur les Insectes (vol.ii.), has given us some interesting,

though by no means extensive information regarding the habits of ants, The “sugar-ant” (?) forms the subject of amemoir in the Philosophical Transactions for 1790, this latter species having caused much havoc among the sugar-plan- tations of Grenada over a period of ten years. Latreille, a famous entomologist, in his special monograph (Histoure Naturelle des Fourmis), published at Paris in 1802, gave the most succinct and accurate account of the ant-tribe which had appeared up to that date. His description of the structure and classification of these insects is remark- ably clear, and he fully describes one hundred species known to himself, and mentions twenty-four species which he was enabled to describe from the reports of others. He distributed these species among nine families, selecting as the bases of his classification the situation and structure of the “antenne” or “feelers,” and the disposition of the abdominal scales.

The habits of ants receive the fullest attention at the hands of Pierre Huber of Geneva, who im a treatise (Lraité des Moeurs des Fourmis Indigtnes) published in 1810, gave a very interesting, lucid, and valuable account of his native ants, drawn from actual observation of the nests and

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communities. This result he achieved by means of an apparatus which enabled him to view the interior of the nest. Many facts have been added to the history of ants since 1810; the list of works and treatises upon this and allied entomological pursuits having been largely increased, especially of late years.

The constitution of an ant-community may be readily appreciated ; but it is, at the same time, important to note the distinctions between the various gruups or sects into which the curious colony is divided. A threefold dis- tinction of sex, resulting in the production of three kinds

of individual forms, is to be perceived in the ant-colony, .

as well as among other hymenopterous insects (e.g. bees). These three grades of individuals are known respectively as males, females, and neuters. The males and females

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Fig. 1.—Wood Ant (Formica rufa). 1, Female; 2, Male; 3, Neuter,

are winged,—the former retaining their wings throughout life, and the latter losing these organs after the pairing is over. During the summer the winged males and females are produced in large numbers, and they soon leave the nest to take their “nuptial flight” in the air, in the course of which the females are impregnated. The function of the male ants having been thus performed, they die; the females, after impregnation, lose their: wings; and whilst in this comparatively helpless state they are conveyed by the neuters to new situations, where they become the founders of fresh colonies.

Each fertile female or “ queen” is carefully attended by a retinue of “‘neuters,” the latter being simply females the sexual organs of which are undeveloped. The curious experiments of entomologists have proved that, in all pro- bability, the cause of this differentiation of sex is dependent upon the nature of the food with which during the larval state the ant is fed. Exempted thus from all sexual functions, the duties of the neuters are confined to the performance of all the offices which contribute to, or are connected with, the welfare and labour of the ant-com- munity. They thus not only construct and build the nest or home, and keep it in constant and assiduous repair, but they are also the providers of food and sustenance for the community ; and they act the part of nurses, in that they carefully attend to the hatching, nutrition, and rearing of the young. They are also the defenders of the colony, in that they protect the nest and its inmates from the attacks and assaults of nearly-related enemies or foreign foes. In connection with the defence of the ant-colony, certain species possess peculiar neuters, termed “ soldiers,” upon which the care and protection of the community more especially devolve. These “soldiers” are provided with large mandibles or biting-jaws, which constitute efficient organs of offence or defence; and they are distinguished from the ordinary neuters by several characteristics in addition to this larger development of the jaws.

Regarding the more intimate structural differences which have been ascertained to exist between the various members of the ant-community, it may be remarked that the antennz of the male ants possess thirteen joints each, and those of the female twelve. The antenne of the neuters are com- posed of twelve joints. The abdomen of the male ant con- sists of seven joints, and that of the female and neuter of six. The mandibles or large jaws of the female and neuter anis are larger than those of the males, and are frequently

found to be serrated or even hooked at their extremities. The external sexual organs of the neuters correspond to those of the females, although, as already remarked, the essential internal reproductive organs are wholly unde- veloped in the neuter ants; and to this most important distinction there is added the absence of wings, the neuters being thus distinguished from the females by a variety of characters, while the near relation is at the same time shown of the one series of truly sexual forms to those in which the sex is undeveloped. The neuters, it may lastly bo remarked, conform to the female characteristics, in having the abdomen provided with a sting, the male ants being destitute of this appendage.

The nervous system of the ants conforms to the ordinary insect-type; but in these and other insect forms, we find the highest development of those faculties to which the general name of Jnstinct is applied. By instinctive acts, in their simplest sense, we mean those acts which an animal per- forms chiefly from impressions made by surrounding objects upon its nervous or sensory apparatus. These are very different in character and origin from the actions of the higher vertebrate animals, in which the independent faculty of mind operates as the direct source of action, in place of the surrounding circumstances of the lower form. Thus, in the case of ants, bees, &c., wonderful as their opera- tions may appear, and regular and methodical as the manner in which they are performed may seem, it will be found that a marked uniformity and likeness of conditions exist, which tend to produce a corresponding similarity of effects. The same external conditions thus tend to induce undeviatingly similar series of phenomena, and under the operation of these acts the animal exercising them may justly be compared

to an automatic machine, or to a piece of mechanism, self-directing only in so far as it is directed by external circumstances and outside conditions. Hence we find certain species of ants or bees invariably constructing similar series of cells or habitations, and engaging in the same labours as their predecessors, which labours or operations will be faithfully and exactly repeated by succeeding generations. And the automatic and me- chanical nature of instinctive acts may be clearly viewed when we contrast them in their essential nature with the directing intelligence and guiding impulse of mind, as we find these qualities exercised in the highest vertebrates. In the latter case, the mental impulse itself directs alike the physical and psychical operations, and so far from the auimal being merely automatic, it assumes the higher phase of nervous action involved in self-originating mental impulse. The actions of the intelligent being' are self- determined : those of the instinctive being originate from the outer world. Through the higher nervous centres the intelligent being first appreciates the outward circum- stances, and then reacts upon them; the nervous centres of the lower being are, in the first instance, acted upon by the outer world, and then in their turn react upon the organism. Lastly, and in accordance with the more per- fect appreciation of external objects through sensations and perceptions, we have to note in the higher being the operation of the educative power we entitle experience. The ant or bee, when first introduced into the special sphere of its labours, assumes its functions, and performs its duties as perfectly as if it had been engaged in their perform- ance for a lengthened period. And the long-continued performance of these duties will in no degree tend to make the ant or bee a more perfect or more skilful worker than when the performance of the duties first commenced. Here, again, we observe the operation of the automatic powers ; the lower animal, like the perfected machine, operates at once and without any previous experience as perfectly as after a lengthened period of working. But,

in the higher operations directed by intelligence, the being acquires in a gradual manner, and only after a lengthened experience, the perfect manner of working. In the one case instinct incites the being automatically, or through the excitory outward impressions, to perform the acts; 1n the other, an intelligent mind first appreciates the impres- sions, and, through the

educative training of experience, 18 enabled to perform the acts, and to understand in a greater or less degree the reasons which prompt and justify them.

Apart from the possession of high instincts, however, we find ants, in common with many other insects, to be pos- sessed of very perfect senses. In addition to the large compound eyes with which most insects are provided, they possess simple organs of vision. The sense of smell also appears to be represented in the ants and insects generally, but the seat of this sense has not been well or satisfactorily determined. Judging from analogy, however, the olfactory apparatus has been supposed to reside in the basal joints of the feelers or antennz. Ants have been long observed to follow accurately the track of their companions. Bonnet concluded that they were enabled to follow up this line of march by their scent, and in proof of this he repeatedly drew his finger at various parts across the line of march. The ants, on arriving at the interrupted spots, seemed to lose scent, and directed their steps in an irregular and hesitating manner, but having once crossed the interrupted space of the finger track, they resumed their journey once more in a regular manner along the line of march. Latreille, with the view of ascertaining if the sense of smell resided in the antenne, cut off these organs in several ants, when he found that they appeared to lose their way, and to be incapable of directing their further steps. It may, how- ever, on obvious grounds be doubted whether this experi- ment may be deemed at all satisfactory or conclusive on the point. In this experiment it was noticed that the neighbouring ants appeared to observe the distress of their mutilated companions, and they seemed to stanch the wounds of the sufferers by an application of the organs of the mouth to the wounded surface.

The antenne in insects are certainly the organs of touch, but in ants these organs appear to subserve some undeter- mined function, in that through their agency communication may be made from one ant to the other. M. Huber was so strongly impressed with this latter fact, that he applied the term langage antennal to the intercourse which he sup- posed took place between ants through the media of the antenne. For example, by each ant striking its head against its neighbour, and by the transmission of this impulse, the whole ant-community appeared to be warned of danger, and in

other ways, but chietly through the antenne, the sense of danger appears to be appreciated by each member of the colony.

The food of ants has formed a debatable point ever since the attention of naturalists was directed to the investigation of their economy. As already remarked, many species are truly carnivorous, and prey upon the soft parts of other insects, and particularly of larvee, which they are enabled to seize and capture with little danger and trouble. The well- known partiality of ants for animal food is taken advantage of by those who wish to obtain the hard parts or skeletons of animal forms ; since by placing an animal body within reach of an ant-colony, the soft parts are gradually eaten away, and the harder portions are left intact. In tropical climates, rats, mice, and poultry, even in a living state, are said to succumb to the attack of these creatures; and man himself, as related by Prévost in his Histovre Général des Voyages, is even subject to the attacks of ants. Prévost relates that an Italian missionary in Congo was awakened from sleep by his negroes, with the intelligence that an immense horde of ants was invading his house. Before he

ant. habitation of this grasshopper.

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could rise they had already covered his legs, and the floor of his house was carpeted by a thick layer of the invading forms. Fire seemed to be the only preventive to their onward march ; and it was stated that cows were known to be devoured in their stalls by these creatures. These remarks may be viewed as applying more particularly to the white ants or termites, of which an account will be given afterwards. For sugar ants seem to have a special pre- dilection; and they appear not only to obtain the saccharine matter from vegetables, but also to abstract it from animal sources. The aphides, or plant lice, become in this way the subjects of very extraordinary attentions on the part of ants. The plant lice possess a glandular structure, situated at the extremity of the abdomen, which communicates with the external surface by two small ducts. This gland secretes a sweet or saccharine liquid of viscous nature, of which ants are extremely fond, and the aphides appear to be literally “milked” by their smaller neighbours. The antenne of the ants in

this case also appear to be the media of intercourse between the aphides and themselves, and by

touching the abdomen of the plant lice with the antennx, a drop of the saccharine liquid exudes from the gland, which is eagerly seized upon by the ants ; and in this fashion the milking process is continued until the ant 18 satisfied. The aphides, in this instance, appear voluntarily to surrender themselves for the purpose of affording the saccharine matter; but it has been also alleged that certain species of ants keep aphides within their nests for the pur- pose of affording the desired matter. Whether or not this alleged domestication of the aphides by ants is to be deemed worthy of belief yet remains to be proved. A single aphis may be occasionally seen surrounded by three or four ants, —the latter ordinarily finding the aphides on the leaves of plants and in their natural habitat. ants and aphides, strange as it may seem, is not, how- ever, without its parallels in the history of the ant-colony. Thus wood-lice are not infrequently found as apparently normal guests within the ant-nest; and Siva of Pisa observed a species of grasshopper, to which he has given the name

The association of

Gryllus myrmecophilus, which inhabits the nest of an Italian The ant-nest, in fact, appears to be the normal

The ant-nest forms a very interesting subject for con-

sideration, and the various groups of ants differ widely in the outward form and internal plan according to which the nests are constructed, as well as in the materials of which

the habitations are built. Clay, earth, and vegetable matters form the chief sources of supply, and excavations in the ground, or erections above ground, in trees, walls, and house- roofs, may be mentioned as the most common situations for the nests. The internal arrangement also varies even to a greater extent than the external appearance or materials. The general plan of the nest shows an arrangement of flats or stories, connected throughout by passages, and supported by definite pillars or partitions. The chief ends and objects in the construction of the nest appear to be directed

to the preservation of the larve, and to their protection from changes of temperature. During the night the larvee are placed in the furthest chambers of the nest, the entrance to the nest being carefully secured for warmth and for ensur- ing protection from the raids of enemies. In the morning the larvee are transferred by the diligent neuters to the outer chambers, to which the sun's heat has access; or they may even be exposed directly to the sun. A change of temperature or weather is sufficient to set the watchful neuters on the alert, and to cause them to hurry the larve to the inner recesses of the abode, where they may be safely protected from the variable effects of the climate.

Some of the most curious and extraordinary traits in ant- character relate tothe acquiring by certain ants (e.g. Amazon-

ants) of the pups or immature young of other species, and the training and subjection of these pup as slaves and servitors. Regular raids and forays appear to be made by the slave-making ants upon the nests of certain species, the pup of which are captured, and when developed brought into bondage and subjection to the captors.

No closer imitation of the ways of man could well be found in the entire animal economy; and the circum- stances of these curious cases have been so thoroughly in- vestigated that the matter is placed above the possibility of doubt or error. 'The relative position of the masters and slaves varies greatly, the extreme of hard servitorship being geen in some cases, whilst in other cases the position of the slaves is much easier. The slaves of Mormica sanguinea are aided by their masters in the work of the colony. But in the case of Formica rufescens the labours of the slaves are greatly increased,—the entire work of the community devolving upon the unfortunate captives, and the neuters, laborious in other species, being merely employed in the duty of capturing fresh servitors. This latter trait also appears among the Amazon-ants, which literally stir neither "hand nor foot," nor make any effort to help themselves, but are waited upon and attended in the most devoted manner by their willing serfs.) The slavemaking forays are by no means invariably destitute of bloodshed or warfare, and frequent and hot combats appear to be engaged in between the would-be masters and the

species of intended slaves. Once captured, developed, and domiciled within the nests of their masters, the slave-ants appear to be thoroughly at home, and no effort at insurrection or attempt to gain their freedom appears ever tobe made. ‘The early state of development in which the pupz are generally captured, would necessarily favour the complete domestication of the captured ants within the home of the slave-making com- munity ; and the ants appear to possess and exhibit the greatest care and solicitation for the welfare of their serfs, —the slaves being carried in the mouths of their owners when the latter shift their abode, or undertake any expedition leading them from home.

From the accounts of Messrs Bates and Belt, we gain some curious and interesting information regarding species of ants peculiar to South and Central America, which ex- hibit marked differences in habits from all British or even other foreign species. Chief among these South American ants are the Yoraging Ants (Hciton), of which there are several distinct species. These ants are truly carnivorous in their tastes, and ravage whole districts, their march being regarded with terror by the natives of Central America. Mr Bates tells us that different species have different modes of marching, by which they may be recog- nised. The Ecitons in Nicaragua are termed “Army Ants,” and they appear regularly to change their hunting-grounds in quest of food. Their community comprises males and females, and two kinds of neuters or workers—a ‘ worker- major,” or large-headed worker, and a small-headed kind, termed the “ worker-minors.” The former kind are noted for their elongated jaws; and in some species these forms are denominated “ soldiers,” their peculiar office being the protection of the community from the attacks of enemies, or the making forays on the nests of other species, or upon other animals. The habit the Ecitons have of hunting in regular organised bands, distinguishes them from other and more familiar British species (e.g., Myrmica, the Red Stinging Ant of Britain), which are predatory, but hunt in an irregular and ill-defined manner. One of the best- defined species of foraging ants is the Ectton predator, a small species which hunts in dense hordes, and marches rapidly over a territory. A moving phalanx of this species will extend over from 4 to 6 square yards ; and any unwary insect meeting with, or falling into the serried ranks, is

soon torn to pieces and devcured. citon hamata hunts both in dense masses or in detached columns. The nature of the prey appears to regulate the mode of march. Thus, when proceeding in columns, Mr Belt found that the Feiton hamata was in search of the nests of another ant (Hypo- clinea), the larves and pupx of which are seized by the Ecitons for the purpose of being brought up as slaves, in accordance with the habits already alluded to. The Hypo- clineas rush out on being attacked, bearing their pupz and larvee in their jaws; but the Ecitons at once seize the young ants, although they never appear to injure the parent Hypoclineas. ‘The latter appear a cowardly race, as they make no effort at self-defence, their habits leading them chiefly to milk apizdes, which they desert at once on seeing another and even smaller species of ant approach. Birds and opossums are terrified, as well as insects, at the Foraging Ants, and frequently fall victims to the deter- mined onslaught of the little furies.

The other species of Ecitons comprise Hciton rapax, the largest of the race, the body of which is half-an-inch in length ; Heiton legeonis, famed for its ravages on other species of atts (Formice); Hciton hamata and EL. drepano-

1, Ecodoma cephalus; 2, Eciton drepanophora; 3, Eciton erratica,

Fig. 2.—Leaf-cutting and Foraging Ants.

phora, nearly related species; and the so-called Blind Ecitons, thus named from the imperfect condition of the eyes. The Z. vastator and LH. erratica, species of blind Ecitons, proceed on their raids by means of covered roads or ways, which are excavated and formed in front at a rate corresponding to the advance of the army.

Some interesting information regarding the senses and instincts of the Foraging Ants appears to corroborate the opinions of some earlier observers, already alluded to, on the subject. About a dozen individuals of Leviton hamata were observed to assemble together, as if in consultation, in a tramway excavation in Nicaragua. One ant suddenly left the assembly, and ran up the perpendicular side of the cutting. The example of this first ant was followed by several others, which ran after the first ant for a short distance, then returned, and again proceeded for a farther distance along the track of the first. The object of this proceeding was to make the track

readily determinable by the succeeding travellers, and the route of the first indi- vidual was unerringly followed by the others, who were at long distances behind. A portion of the trail was removed, when the ants appeared at fault, and occupied themselves in making detours until they again hit upon the interrupted track. On arriving at the top of the excavation, a suitable spot for hunting was descried, when the information appeared to be quickly communicated to those that were below, and the whole army rushed upwards in obedience to the behest of the scouts. All the Foraging Ants are migratory in habits, and appear to possess no fixed place of abode, but shift their camp at intervals of from four to six or more days. The temporary abode is found in hollow trees, or under fallen trunks. An Eciton, intentionally imprisoned beneath a stone, was discovered by a com- panion, who at once informed his neighbours. The other ants then came to the rescue ; and by biting at the stone, trying to move it, and seizing the prisoned ant by the legs, they, by their united efforts, set their companion free. An

ant embedded in clay, with only the ae of the antenns Il. — 13

protruding, was. discovered by his neighbours, and soon disentombed. And in cases where the efforts of one ant have been inadequate to release a comrade placed in peril, the others were duly informed of the fact, and hurried to assist their less fortunate neighbour. In crossing a crumbling slope, which was gradually disintegrating under the passage of the ant- army, @ portion of the band, by adhering to each other, formed a solid pathway, over which the others passed safely. A twig formed a bridge across a small rill; but this proving insufficient and too narrow for the transit of the army, it was widened by ants clinging to each side of the twig, and in this way the track was broadened sufficiently to admit of the easy passage of the mass, Such acts would appear to le beyond the category of purely instinctive processes, since they appear to involve an adaptation of faculties to special cases, and result in special actions being instituted, and thus bear some resem- blance to what we familiarly see involved in the process of reasoning characteristic of man’s mental powers. The more ordinary operations of ant-life are purely instinctive, as has peen already

shown ; but it may be a matter for considera- tion if the theory of some naturalists, that the higher development of instinctive powers is akin to reason itself, may not be tenable. Such instances as these just given of the curious and extraordinary acts of the Foraging Ants may serve to show from what circumstances the theory obtains support. Houzeau, in particular, among recent writers, adopts analogous views to these, and maintains that the ants most nearly approach man in the arrangement and general nature of their social existence and condition.

The Leaf-cutting Ants (@codoma) are noted pests of central and tropical America; and, as is implied by their name, commit fearful havoc among trees, laboriously and persistently carrying off in their mouths, piece by piece, the foliage of trees and shrubs. The orange, lemon, and mango trees in particular have suffered from their attacks, Carbolic acid has been tricd with success as a remedy against these ants, the use of this antiseptic killing large numbers; and corrosive sublimate in powder, sprinkled across their paths, has a deadly effect. upon the leaf-cutters. Coal tar has also been employed against them. Gigantic black ants, averaging an inch in length, are found in Central America. They are notable as being solitary in their habits, and possess well-developed eyes and formidable stings. These forms contrast with the gregarious and social ants, in which the eyes are conl- paratively weak, or may be rudimentary.

Certain curious little ants (Pseudomyrma bicolor) inhabit the hollow thorns of the “ bull’s horn” acacia of Central America. The horn-like thorns form the nest, the aperture being situated near the tip of the thorn. These ants pre- serve the plant from the attack of the Leaf-cutting Ants, and also from mammals feeding upon it. The ants obtain a supply of food from the plant, in the shape of a honey- like secretion, found in a gland situated at the base of the leaflets. Protected by, and at the same time protecting the plant, the intimate relations between the acacia and the ants may be argued to possess a deeper significance than relates to a merely casual or chance connection. The Cecropia, or trumpet tree of Central America, is ten- anted by ants, which obtain a sweet fluid, through the agency of brown scale-insects (Coccide), kept by them in the cells of the trunk. This recalls the case of the aphides, or ordinary plant licc, the ants sucking the fluid from the scale- insects through a dorsal or back-pore. The queen-ant in her royal cell is

attended by a special bevy of Coccide, who supply her with the requisite food. The Coccide in America take the place of the European aphides as ant-cows, but the tropical ants appear to attach themselves to other insects also. Thus, the leaf-

hoppers (Membracis) are attended by ants, for the sake of the honey which the larve exude. Those insects which are attended by ants are protected from the attacks of other animal forms; and the shelter given to the ants thus serves to protect the tree or shrub, and to save it from becoming exterminated.

The “ soldier ants,” referred to in the foregoing account of the Foraging Ants, are not peculiar to that race, many other species also possessing “‘ soldiers.” These forms, as has been already stated, appear to be merely neuters which have the jaws very largely developed, for the protection of the true neuters or workers, and for the defence of the nest generally. This further subdivision of the ant-community would seem to indicate an additional approach to the social arrangements which characterise the human state.

The reproduction and development of the ordinary ants may be very briefly touched upon in the present notice. The impregnation of the females in their aerial nuptial flight has been already alluded to, as also has the death of the males after the congress. The impregnated females are conveyed to the nest, and the deposition of eggs is pro- ceeded with, the young forms being tended through their larvee and pupe stages by the assiduous neuters. Unlike the becs, several female ants may inhabit the same nest ; and the swarming or exodus of the young ants, so far from having for its one and essential object the formation of a new colony, appears to be simply devoted to further reproductive measures. Thus, those that leave the nest are the fresh males and females, the sexual history of which has already been traced ; and the nest thus remains a more or less permanent institution, changing its inmates only in part, and in exceptional circumstances alone giving origin to a new and independent colony.

The stings with which the neuters and females are armed constitute formidable organs of defence. The poison, to which the violent or painful effccts of the sting are due, appears to consist of a definite chemical organic compound, the chief acid of which is known by the appropriate name of formic acid, the formula for this compound being CH,O, Formic acid is also found in the glands attached to the pointed hairs of stinging-nettles. This acid, in itself possessing irritant qualities of a high order, also appears capable of producing even more serious effects when manipulated by chemical means.

The ant-colony, powerful as we have seen it to be, and well protected as it undoubtedly is, is nevertheless subject to the attacks of enemies which wage a successful war against it. Certain species of ants appear to be more subject than others to the attack of such higher forms as the maminalian ant-eaters (Hchidna and A, yrmecophagide) and armadillos, as well as to the onslaught of the insect ant-lion (Myrmeleo). ‘The latter literally digs a pit for his

Fic. 8.—Ant-lion (Myrmeleo formicaleo).

victim, in the bottom of which he lies securely hidden, ready to devour any unwary ant which may chance to tumble in. And even where the victim is not within actual reach of the Myrmeleo, the latter by means of a shower of sand-particles frequently succeeds in causing it to fall into the snare. Several substances which have a

noxious effect upon the ant-colony have been already men- tioned. Thus carbolic acid and corrosive sublimate appear to affect the ant-colouy as poisonous agents; and solutions of tobacco, lime, soot, and walnut leaves, with urine, are also stated to prove effectual in destroying them, although these latter are decidedly inferior to the two first-mentioned substances. Corrosive sublimate, indeed, appears to have a curious and even specific action upon these forms, in rendering them actually maniacal, to use a phrase which is applicable generally to the human subject alone. Under the influence even of external contact with this substance, the ants in Grenada during their ravages of last century, were observed to be singularly affected,

and were seen even to attack each other with outrageous violence,—an effect also corroborated of late years in Central America by Mr Belt, who saw the rabid ants collected into small balls biting one another, and seizing hold of each other in a most extraordinary fashion under the influence of the mercurial poison. The corrosive sublimate, it is stated, can be effectively used only in dry weather.

A brief description of the Zermites, or white ants, may appropriately. conclude the present article. These forms have already been stated to be entirely different from the familiar and true ants, and to belong to the Neuropterous insects, whereas the true ants are classed with the Hymen- optera. They resemble the true ants in living in highly organised social communities, and in being endowed with as high and as specialised instincts. But they differ from them, first, in the fact that they do not undergo a com- plete metamorphosis, that is, the Termite larvee and pup resemble the perfect insect, and do not pass through the defined stages of change and development characteristic of the true ants, bees, and other insects. The young Termite, in fact, differs from the ordinary adult only in the non- possession of eyes, and from the sexual forms in the non- development of wings. The white ants inhabit the tropical regions of the world generally, but are found in the greatest abundance in tropical South America, Their nests form characteristic structures, rising sometimes to a height of 5 or 6 feet, and constructed of earthy particles worked into-a mass as hard and durable as stone. Many species of Termites are known, but they resemble one another in essential structure and habits. As indi- cated by their popular name, they are of a whitish colour and are soft-bodied. The Termite community consists, as in the true ants, of males, females, and workers or neuters. In the true ants the latter are undeveloped females, whereas in the Ter- mites the sex of the neuters is wholly undeterminable ; and in addition the workers are invariably divided into two distinct classes: the “ soldiers,” with largely-developed jaws, whose sole office is to defend the community; and the ordinary “ workers,” on whom devolves the entire labour of the nest. Both classes of neuters are blind; and from a close examination of the eggs, the distinctions, not only between males and females, but also be- tween the soldiers and workers, may be easily seen. ‘The dif- ference in food, so powerful in the development of sex and characteristics in other insects, does not therefore operate in the case of the

Termites. The antire white ant colony and species also exhibits a division into subordinate groups and

Fia. 4.—White Ant (Termes bvellicosus). Male.

Fia. 5.— White Ant (Termes belli- cosus). Soldier.

classes, the recognition and characters of which are very difficult of determination. And on this, as well as upon other grounds, the organisation of the white ant com- munity is generally to be regarded as of a higher type than that of the familiar and true ants.

The nest of the Termites is known as a termitarium, the essential internal arrangement of which consists of a large number and series of chambers, connected by galleries and passages. Entrance to the nest is afforded by con- cealed roads and subterranean passages. A large hillock may be a compound termitarium, formed by and inhabited by different species ; and certain kinds of Termites build their nests of smaller size, sometimes of the consistence of paper. Their structures may be attached to the branches of trees, or they may be entirely subterranean, or concealed under the bark or within the stems of trees. The latter species are those which destroy timber, furniture, and household objects.

Within this curious home an equally curious community is found to reside. The king and queen represent the sexual part of the community, the true neuters or workers form the greater part of the ordinary individuals, and the soldiers and winged Termites complcte the list of inmates, The royal cells, tenanted by the king and queen, exist in the inmost part of the nest, and are closely guarded by a retinue of workers. The king and queen are wingless and much larger than the neuter ants. The qucen Ter- mite when within the royal cell is permanently gravid, the abdomen being immensely distended with eggs, which as they are produced, are seized upon by the workers,

Gravid female.

Fig. 6.—White Ant (Zermes bellicosus).

and conveyed to special cells prepared for their reception. The relations of the winged Termites to the other members of the nest long formed a subject of great difficulty to naturalists; but they appear to be males and females, which are ready to assume sexual relations, and to become the progenitors or kings and queens of new communities. The neuters are, accordingly, quite distinct from the sexual forms, and do not pass through any similar developmental phases, but differ from the others, even in the egg, as has been already mentioned. Occasionally a new termitarium may be found, in which a king and queen are absent, and which contains workers only. These, however, gradually prepare the nest for full completion, by bringing eggs into the cells from a neighbouring termitarium, from which the due population of the colony will be in time produced. The exodus or swarming of the Termites appears to resemble more nearly that of the bees, although like that of the true ants, it is more purely reproductive in its nature, and not so much connected with the departure of fully grown forms from a hive which has become inadequate to the comfortable accommodation of all itsinmates. The larva, prior to the swarming, are fed and tended by the workers, the youngest larve receiving the greatest share of attention. The workers apparently feed the larva: by injecting a fluid from their mouths into the larval cells; and in about a year after the deposition of the eggs the larvae become fully grown, and the period of the exodus arrives. The exodus generally takes place on damp evenings, or cloudy mornings, and many extend over several days, or until such time as all the males and females have emerged from the nest. Having reached the ground, the wings of each ant are shed by a natural effect—-a seam or place of separation existing at the roots of the wings—and after

the throwing off of the wings, the surviving males and females pair, and become the parents of new colonies. Many fall victims to the attacks of enemies, as spiders, bats, lizards, toads, and goat-suckers. The pairs that survive take up their abode in some secluded situation, as under leaves, or under a clod of earth; there the females become impregnated, and by-and-by a new hive and its population are produced. The Termites serve an important purpose, in the particular areas of the world they inhabit, in disintegrating, removing, and destroying decaying wood. _

See Moggridge’s Harvesting Ants and Trap Door Spiders; Bates’s Naturalist on the Amazons; Belt’s Naturalist vn Nicaragua, &c. (A. W.).

ANTAUS, in Greek Mythology, a giant of Lybia, the son of Poseidon and Ge (Terra). He compelled all strangers passing through the country to wrestle with him, and as, when thrown, he derived fresh strength from each successive contact with his mother earth, he proved invin- cible, With the skulls of those whom he had slain he built a temple to his father. Hercules, in combat with him, discovered the source of his strength, and lifting him up from the earth crushed him to death. The struggle between Antzus and Hercules is a favourite subject in ancient sculpture.

ANTALCIDAS, a Spartan politician, who rendered con- spicuous service to his native state at one of the turning- points in Greek history. He comes first into notice as ambassador from Sparta to Tiribazus, the Persian satrap of Ionia, to sue for peace (393-2 B.c.) Upon hearing of this the Athenians, becoming anxious lest they should lose their growing ascendency, also sent an embassy, at the head of which was Conon, to counteract the efforts of the Spartans. Tiribazus favoured the cause of Sparta, and secretly supplied Antalcidas with the means of carrying on war against Athens. Artaxerxes, however, disapprov- ing the conduct of his satrap, recalled him, and appointed Struthas, whose sympathies were on the side of Athens, in his place. But this check to the policy of Antalcidas was only temporary. In a few years circumstances became even more favourable than at first to a successful negotia- tion, Tiribazus having been restored to his satrapy, and accordingly, in 388-7, Antalcidas was again sent upon an embassy to Asia. By skilful diplomacy he succeeded in securing the active assistance of the Persian power against Athens. Appointed on his return admiral of the Spartan fleet, he carried on a naval warfare in a manner so vigor- ous, that the Athenians were glad to accept peace on the terms Artaxerxes chose to dictate. These were made known by Tiribazus to a congress of deputies from Sparta, Argos, and Athens, and formed the basis of “ the peace of Antalcidas,” so called from its being arranged in accordance with the views of the Spartan ambassador. Antalcidas seems to have been engaged in another mission to Persia in 371; but the later incidents of his career are involved in uncertainty. Plutarch states that he committed suicide on the failure of his last mission, but there seems no proof of this.

ANTALO, a town of Tigré, in Abyssinia, capital of the district of Enderta, situated in lat. 13° 17’ N., and long. 39° 28’ E., on a plateau about 8900 feet above the level of the sea, out of which a steep hill rises on the north of the town, while beneath it a wide plain stretches southward. A large part of Antalo is now in ruins, but it still possesses a weekly market of considerable importance, and eontains several churches. Its population was once estimated at

8000.

ANTARA, or, as he is usually called, ANTaR, an early Arabian warrior and poet, famous as the author of one of the poems hung up in the Kaaba at Mecca, and as the hero of a romance which bears somewhat the same

relation to Arabic literature which the Arthurian legend bears to our own. He was the son of Shedad-el-Absi, a warrior in the army of Zoheir, by Zabuba, a negro slave who had been captured in some plundering expedition ; and, if we can trust the Arabian romancist, he bore strong evidence of his negro origin. He spent his youth in servitude and neglect, but soon became known for his strength and high – handedness. Before long, while yet a slave, he fell in love with his cousin, the beautiful Abla, whose praises are still preserved at Mecca, but at the same time had the misfortune to incur the hate of his father’s wife, Shameeah. A number, however, of happy opportunities presenting themselves, he showed such extra- ordinary prowess against some hostile tribes, that his father was constrained to join in the public appreciation of his services, and to recognise him as his son. He now gradu- ally rose in favour, and held for long a position of the greatest influence among his people, filling the surrounding country with the fame equally of his song and his sword. In a great war between two rival tribes, which lasted forty years, he is said to have played a very prominent part. The time and manner of his death are matter of dispute,— Tbn Doreid making him be skain by Wasr-ben-Jaber, while, according to Abu Obeida, he died a natural death when well stricken in years. Wherever the Arabic language is known his fame is still green; and frequent references are made to Chubli Antar, Istabli Antar, Antar’s house and Antar’s stable. By whom the romantic account of his life was

originally written is far from being satisfactorily decided; but it is generally ascribed to Asmai, who lived at the court of Harun-al-Rashid. It is composed in rhyth- mic prose, interspersed with fragments of verse, many of which are attributed to Antar himself, The style is remark- ably pure, and a picture is afforded of early Arabian life that is equally graphic and minute. The romance, which in its fuller form extends to fifty or sixty MS. volumes, was first brought under European notice in 1802 by Von Hammer, who, after repeated perusal, spoke of it as surpassing the Arabian Nights in interest and beauty. Sir William Jones had already written in the highest terms about a part of it which had fallen in his way. In 1820 Terrick Hamil- ton, brother of W. Hamilton, the author of digyptiaca, published a translation of a portion of it from a condensed Syrian manuscript obtained at Aleppo; and this gave occasion for a number of articles on Antar in our periodical literature. (See Von Hammer, Mines de POrient, 1802 ; Arnold's Moallakat, Leipsic, 1850; Ahlwardt's Dwans of Six Ancient Arabic Poets, London, 1870; Kitto's Journal of Sacred Lit., 1850.)

ANTARCTIC OCEAN, a name that should, strictly speaking, be applied only to the ice-bound sea to the south of the antarctic circle; in practice, however, it is usually vaguely extended so as to include more or less of the cold regions round the south pole, without reference to the circle. As compared with the corresponding Arctic Ocean, little is known about this portion of the earth's surface; but it is sufficiently clear that the cold and the dangers to navigation in the southern ocean greatly exceed those of the northern, and that human beings and most other ani- mals cannot, or at least do not, ordinarily subsist within its limits. See Potar REGIONS.

ANTELOPE. The term antelope is applied to denote a genus of Mammalia, included in the Ungulate or Hoofed order of that large class. Of the ungulate or hoofed mammals, the Ruminants, or those that "chew the cud," form a chief subdivision ; and the antclopes, sheep, oxen, and goats, are included and classified together in this division as the family Cavicornia, or " hollow-horned " ruminants. The chief character by which the Cavicornia are distinguished from other families of the Ruminantia

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cousists in the peculiar and characteristic type of structure of the horns. These appendages are essentially processes of the frontal or forehead bone of the skull, and so far from being deciduous,—that is, being shed at stated periods, —as in the deer, the horns in the Cavicornia are permanent and persistent throughout life. The process arising from the frontal bone constitutes the inner shaft, or “core” of the horn; and this bony core is covered by a horny sheath. The horny sheath is purely epidermic in its origin and nature; that is, it consists of a special development of the outer skin or epidermal tissue. When these structures are contrasted with the horns of the deer,—with which group, it may be remarked, the antelopes are frequently confused, but from which they are essentially distinct,—they are at once seen to be different in every particular. The horns or “antlers” of the deer are solid, and consist entirely of bony tissue ; and they are, furthermore, shed annually.

The antelopes, with the other Cavicornia, participate in the following characters, in addition to those furnished by the structure of the horns. Both sexes are generally pro- vided with horns. The dental formula or arrangement of the teeth exhibits a want of incisor teeth in the upper, and six incisors in the lower jaw; canines totally wanting in the upper jaw, and two in the lower jaw; and twelve molars in each jaw. ‘The dental formula, therefore, ruus thus :—

0—0 0-0 3-3 Ls C al PM. oan M. A The feet are cleft; and accessory or supplemental hvofs exist on the back aspect of the feet.

The antelope family (Antilopide), including a great number of different species, is generally distinguished from the allied families of the sheep, oxen, and goats, by the light, graceful, and deer-like form of its members. The horns are chiefly cylindrical in shape, but may be twisted in an annular or spiral manner. The beard, or “ dew-lap,” characteristic of the deer tribe, is generally absent in the antelopes; and of all the Cavicornia, they constitute the only family in which the curious “ tear-pits ” or “ lachrymal sinuses” of the eyes are found. These latter organs are small sacs situated below the eyes, and devoted to the secretion of a yellow substance of a sebaceous or waxy nature.

As regards their distribution, the antelopes are chiefly found in the eastern hemisphere, and Africa appears to be the great centre of distribution of the group. South Africa is especially rich in antelopes, and they may be regarded as representing in that continent the deer of other regions of the world. In habits they are, for the most part, gregarious, and are frequently found in immense herds inhabiting the grassy plateaus and plains; whilst some species are exclusively mountainous in their distribu- tion.

The particular form to which the name of ‘‘ antelope” has been generally assigned is the Antilope cervicapra (Plate I. fig. 5), found in the East, and distinguished by the triple curve of its annulated horns. The gazelle or Barbary ante- lope (Gazella Dorcas) has long been famed in the poetic imagery of Eastern writers. It has two small black horns. The algazel (Gazella Leucoryx) (Plate I. fig. 2), found in Persia and Arabia, has slender limbs, and the horns of the male are horizontal, bent backwards, obliquely annulated, with smooth tips, and nearly three feet long. Several nearly allied species inhabit the northern portions of Africa, the Gazella Corinna (Plate I. fig..3) exemplifying one of these latter forms. The springbok (Gazella Euchore) of the Dutch settlers, or “ springer ” antelope, is a well-known form inhabiting the southern districts of Africa, The horns are simple and annulate, and are curved, so as to

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form a lyrate or lyre-shaped figure. This animal’s activity and powers of leaping have procured for it its familiar names; and travellers have long noted the immense numbers of these forms which congregate in vast herds in the plains of Southern and Central Africa. The bontebok (Gazella Pygarga), and the blesbok (Gazella albifrons), are allied to the springbok, and inhabit the same regions as that form. The other species found in Southern Africa include the rarer blue antelope (Gazella leucophea), and the roan ante- lope (Gazella equina), a large species described by Burchell.

The water bok (Kobus ellipsiprymnus) (Plate I. fig. 1), a well-known African form, is of considerable size. Its familiar name has been derived from its habit of frequent- ing rivers, and from its powers of swimming. The horns are large, curved, and spreading. The klippspringer (Oreo- tragus saltatrix) of South Africa has a close resem- blance in size and habits to the European chamois. ‘The koodoo (Strepsiceros Koodoo) (Plate I. fig. 4), inhabiting South and West Africa, and otherwise widely distributed over the continent, is provided with very long spiral horns, which, however, exist only in the male animals. These latter antelopes represent “solitary” species, that is, they are generally found living in detached pairs, or as solitary individuals. A related species to the koodoo has been described under the name of Antilope Doria.

The pigmy antelopes present examples of singular mem- bers of the family, in that they are of exceedingly diminutive size. The Guevet (Antilope [or Cephalolophus] pygmca) presents two well-marked varieties, and one female speci- men of the smaller variety scarcely exceeded the dimensions of a large rat. The gueveis occur on the Guinea Coast, but are also occasionally found at the Cape of Good Hope. The bush antelope (Cephalolophus sylvicultrix), inhabiting the districts around Sierra Leone, is also of a smaller size than the more typical antelopes, and is nearly related to the preceding forms. The harnessed antelope (Antilope scripta) (Plate II. fig. 1), so named from the white stripes with which its body is encircled, has been described as occurring in Senegal.

The eland or impophoo (Boselaphus Oreas) is one of the largest of the antelopes, and is ox-like in its general pro- portions and appearance. The horns are straight and erect, and the breast possesses a “dew-lap” or tuft. It inhabits the flat lands of Southern Africa. Allied to the elands, but of smaller size, we find the addax (Orya naso- maculata). Of this species there are several varieties ; but the typical form is found in Northern Africa, and is dis- tinguished by the elongated spiral horns.

The gnus of South Africa form connecting links be- tween the antelope and ox families, presenting characters in external aspect which separate them out as singular and somewhat abnormal forms. The gnu proper or wildebeest (Catoblepas Gnu) (Plate II. fig. 5), and the bastard wildebeest

(Catoblepas Gorgon), are the two forms included in this genus. The head is bovine in its appear- ance, and to the ox-like head are added the mane of the horse, the limbs of the stag, and the horns of the buffalo. The horns are possessed by both sexes, and are curved from their broad bases, at first downwards and for- wards, their terminal portions being directed upwards and backwards. These animals resemble a small horse in size, and occur in large herds on the flat steppes of Southern Africa, although they appear to be migratory in habits, and to have a wide range in distribution over the southern half. of the continent.

Having thus indicated the more familiar of the ante- lopes inhabiting the great African or central tract of distri- bution of the family, we may next glance at the species found in the other continents. The Chinese antelope (Antilope gutturosa), or dzerin of the Mongolian Tartars,

possesses short, thick horns, directed backwards, divergent, with their points turned inwards. lying between China and Thibet.

character, and is besides distinguished by a soft glandular swelling above each nostril. It has an abundant woolly coating ; and from the fact of it sometimes appearing with a single horn,—the second horn being rudimentary or un- developed,---the mythical tales of “ unicorns ” are‘supposed to have arisen.

The chicara (Tetracerus quadricornis) (Plate Tl. fig. 4), or four-horned antelope, found in the forests of India generally, and plentifully in Bengal, is of small size, and distinguished by the presence, in the males only, of four horns, the larger pair of which are situated on the upper aspect of the forehead, and are smooth, erect, inclined slightly forwards, divergent, and about three inches long. The smaller horns are situated in front of the first pair, and average in length an inch or more. The nyl ghau (Portaa picta) (Plate Il. fig. 3), found in Northern India, like its African representative, the gnu, appears to unite in itself the characters of the antelopes and oxen. The native name of the creature, nyl ghau, signifies blue ox, and by the inhabitants of India it is regarded as being an ox, although its true place is undoubtedly among the antelopes. In size the nyl ghau resembles a stag ; the tail is tufted; and the horns, occurring in the males only, are curved upwards, and diverge at their extremities. The nyl ghau is susceptible of being partly domesticated, and it has been ascertained to breed freely in a tame state.

The European species of antelope include the chamois (Rupicapra Tragus) (Plate Il. fig. 2), and the saiga (Colus or Antilocapra Saiga). The former is

essentially Kuropean in its distribution, but the latter extends from Poland and Russia into Asia. ‘The chamois inhabits the Alps and mountains of Southern Europe, and occurs in small herds, The horns are present in both males and females, and are of small size, and recurved at their extremities. The chamois may be regarded as tending to link the ante- lope type to that of the sheep. The saiga is distinguished by the large size of the horns, and by the peculiar con- formation of the nose, the opening of which is large, and bounded by a soft cartilaginous margin.

The American continent possesses but two representa- tives of the antelope family. These are the so-called Rocky Mountain sheep or goat—a true antelope—and the prong- buck or cabrit of North American regions. The Rocky Mountain sheep or goat (Haplocerus laniger), possessing a coat of long woolly hair, is closely related to the chamois of Europe; and in this form, as well as in the prongbuck, the connection between the antelopcs and goats may be traced.

The prongbuck(Antilocapra furcifera or americana) (Plate I. fig. 6) presents a singular exception to the other mem- bers of the antelope family, in the deciduous nature of the sheaths of the horns, which are annually shed and deve- loped. Accessory hoofs are wanting in the prongbuck, and the lachrymal sinuses of other antelopes are undeveloped ; as also are the “inguinal pores,” or groin-sacs, found in most members of the family, and which secrete a viscid substance, the function of which is undetermined. The females are devoid of horns, and those of the males are branched in front, or are “ furcate,”’—a conformation of these structures not found in any other member of the antelope family. The chief habitat of the prongbuck appears to be the prairie lands of Central America, and its northern limit would appear to be about the fifty-third degree of north latitude. (A. W.)

Tt occurs in the deserts The chiru (Pantholops Hodgsonti), inhabiting Thibet and the mountainous slopes of the Himalayas, possesses elongated horns of an annulated

ANTEMN &, a small Latian town, of great antiquity, built on the top of a hill that rose above the alluvial plain at the meeting of the Anio and Tiber. Hersilia, the wife of Romulus, was a native of Antemnz ; and the city was one of those that endeavoured to avenge the rape of the Sabine women. In purely historic times it is of the smallest importance. The Samnites were pur- sued thither by Crassus, after the battle of the Colline Gate (82 B.c.), and surrendered there to Sulla. In 409 Ap, Alaric encamped on the hill, which now retains no trace of the ancient city.

ANTENOR, a Trojan elder of great prudence, who advised his fellow-townsmen to send Helen back to her husband, and in various ways showed himself not un- friendly to the Greeks. In the Homeric poems there is no intimation of this disposition having led him into any breach of his natural allegiance ; but in the later develop- ment of the romance he appears as a full-blown traitor, and in the general sack of the city his house, distinguished by a panther’s skin at the door, is spared by the victors in reward of his treachery.. He afterwards, according to varlous versions of the legend, either rebuilt a city on the site of Troy, or settled at Cyrene, or became the founder of Padua Patavium) and several other towns in Eastern Italy.

ANTENOR, son of Euphranor, the native sculptor to whom the Athenians were indebted for the bronze statues of Harmodius and

ANTEQUERA, an ancient city of the province of Malaga, in Spain, supposed to be the Roman Antiquaria, or Anticaria, beautifully situated in a fertile valley on the south of the river Guadaljorce, 28 miles N. of Malaga, and 45 W. of Granada. It occupies a commanding position, while the remains of its walls, and of a fine Moorish castle on a rock that overhangs the town, show how admirably its natural defences were supplemented by art, In 1410 it was recaptured from the Moors by the regent Fernando, and thereafter became one of the most important outposts of the Christian power in Spain. An- tequera possesses manufactures of flannels, paper, leather, silk, soap; it has also a large trade in grain, fruit, and oil, while marble is quarried to a considerable extent in the neighbourhood. Population, 27,201.

ANTHEM is derived from the Greek dvrigpuva, through the Saxon Antefn, and originally had the same meaning as antiphony. (Sce AntipHony.) It is

now, however, generally restricted to a form of musical composition peculiar to the service of the Church of England, and appointed by the rubrics to follow the third collect at both morning and evening prayer, “ in choirs and places where they sing.” Several anthems are included in the English coronation service. The words are sclectcd from Holy Scripture, or in some cases from the Liturgy, and the music is generally more elaborate and varied than that of psalm or hymn tunes. Anthems may be written for soli voices only, for the full choir, or for both, and according to this distinction are called respectively Verse, Pull,and Full with Verse. Though the anthem of the Church of England is analogous to the motett of the Roman Catholic and Lu- theran Churches, both being written fora trained choir, and not for the congregation, it is as a musicalform essentially English in its origin and development. The English school of musi- cians hasfrom the first devoted its chief attention to thisform, and scarcely a composer of any note can be named who has not written several good anthems. Tallis, Tye, Bird, and Farrant, in the 16th century; Orlando Gibbons, Blow, and Purcell, in the 17th ; and Croft, Boyce, Kent, Nares, Cooke, and Samuel Arnold, in the 18th, have composed anthems which are still to be regularly heard in cathedral services.

AN T—ANT

ANTHEMIUS, a Greek mathematician and architect of great genius, who produced, under the patronage of Justinian (532 a.p.), the original and daring plans for the church of St Sophia, in Constantinople, which strik- ingly displayed at once his knowledge and his ignorance. He was one of five brothers—the sons of Stephanus, a physician of Tralles—who were all more or less eminent in their respective departments. Dioscorus followed his father’s profession in his native place; Alexander became at Rome one of the most celebrated medical men of his time; Olympius was deeply versed in Roman jurispru- dence; and Metrodorus was one of the distinguished grammarians of the great Eastern capital. There appears to be good grounds for believing that Anthemius antici- pated Buffon in the invention of burning glasses; he has also been credited, though on very dubious authority, with a knowledge of gunpowder, or some similar compound, and with a certain acquaintance with the force of steam. Some portions of his wept wapaddgwv pynxavyydtwy were published by Dupuy

in 1777, and also appeared, in 1786, in the forty-second volume of the (ist. de ? Acad. des Inscr. (See Gibbon's Dec. and Fall, vol. vii. cap. xl; Procopius, de Aidific.)

ANTHESTERTIA, an Athenian festival held annually in the month of Anthesterion, corresponding nearly to our February, at which time the wine stored at the previous vintage was considered fit for use. The object of the festival was to celebrate the arrival of that season, and the beginning of spring. It lasted three days, from the 11th to the 13th of the month. On the first day, called Pithoigia, or "jar opening," libations were offered from the newly-opened jars to the god of wine, all the house- hold, including servants or slaves, joining in the festivity of the occasion. 'The rooms and the drinking vessels in them were adorned with spring flowers, as were also the children over three years of age. The second day, which was named Choés, or " the pouring," was a time of merry- making. The people dressed themselves gaily, some in the disguise of the mythical personages in the suite of Bacchus, and paid a round of visits to their acquaintances. Drinking clubs met to drink off matches, the winner being he who drained his cup most rapidly. Others did not for- get deceased relations, but poured libations on their tombs. On the part of the state this day was the occasion of a peculiarly solemn and secret ceremony in one of the temples of Bacchus, which for the rest of the year was closed. The Basilissa, or Basilinna, wife of the Archon Basileus for the time, went through a ceremony of marriage to the wine god, in which she was assisted by fourteen Athenian matrons, called Gerar@, chosen by the Basileus, and sworn to secrecy. 'The third day was named xvrpou, or "jugs." Cooked fruit of all kinds was offered to Mercury, in his capacity of a god of the lower world ; re- joicings and games were held; and though no tragedy was allowed to be performed in the thcatre, there was yet a sort of rehearsal, at which the players for the ensuing 'dramatic festival were selected.

ANTHOLOGY. The term anthology, literally denot- ing a collection of flowers, is figuratively applied to any selection of literary beauties, and especially to that great body of fugitive poetry, comprehending about 4500 pieces, by upwards of 300 writers, which is conmmonly known as the GREEK ANTHOLOGY.

Literary istory of the Greek Anthology.—The art of occasional poetry had been cultivated in Grecce from an early period,—less, however, as the vehicle of personal feel- ing, than as the recognised commemoration of remarkable individuals or events, or the accompaniment of votive offerings. Such compositions were termed epigrams, 2.¢., inscriptions. The modern use of the word is a departure

from the original sense, which simply indicated that the composition was intended to be engraved or inscribed. Such a composition must necessarily be brief, and the restraints attendant upon its publication concurred with the simplicity of Greek taste in prescribing conciseness of expression, pregnancy of meaning, purity of diction, and singleness of thought, as the indispensable conditions of excellence in the epigrammatic style. The term was soon extended to any piece by which these conditions were ful- filled. ‘The transition from the monumental to the purely literary character of the epigram was favoured by tlie ex- haustion of more lofty forms of poetry, the general increase, from the general diffusion of culture, of accomplished writers and tasteful readers, but, above all things, by the changed political circumstances of the times, which induced numbers who would otherwise have engaged in public affairs to addict themselves to literary pursuits. These causes came into full operation during the Alexandrian era, in which we find every description of epigrammatic composition perfectly developed. About 90 B.c., the sophist and poet, Meleager of Gadara, undertook to com- bine the choicest effusions of his predeccssors into a single body of fugitive poetry. Collections of monumental in- scriptions, or of poems on particular subjects, had previ- ously been formed by Polemon the grammarian, Alcetas, and others; but Meleager first gave the principle a com- prehensive application. His selection, compiled from forty- six of his predecessors, from Sappho downward, and in- cluding numerous contributions of his own, was entitled The Garland (Xrépavos); and in an introductory poem each poet is compared to some flower, fancifully deemed appropriate to his genius. The arrangement of the collec- tion was alphabetical, according to the initial letter of each epigram.

In the age of Tiberius (rather than of Trajan, as com- monly stated) the work of Meleager was continued by another epigrammatist, Philip of Thessalonica, who first employed the term anthology. His collection included the compositions of thirteen writers subsequent to Mcleager. Somewhat later, another supplement was formed by the sophist Diogenianus, and, under Hadrian, Strato of Sardis compiled his elegant but tainted Motoa zaidixy from his own productions and those of carlier writers. No further collection from various sources is recorded until the time of Justinian, when epigrammatic writing, especially in its amatory department, experienced a great revival at the hands of Agathias, the historian, Paulus Silentiarius, and their circle. Their ingenious but mannered productions were collected by Agathias into a new anthology, eutitled The Curcle (KvxXos) ; the first to be divided into books, and arranged with reference to the subjects of the pieces.

Five Greek anthologies, accordingly, existed at the com- mencement of the Middle Ages. The partial incorpora- tion of these into a single body was the work of a certain Constantinus Cephalas, whose name alone is preserved in the single MS. of his compilation extant, but who probably lived during the temporary revival of letters under Con- stantine Porphyrogenitus, at the beginning of the 10th century. He appears to have merely made excerpts from the existing anthologies, with the addition of selections from Lucillius, Palladas, and other epigrammatists, whose compositions had been published separately. His arrange- ment, to which we shall have to recur, is founded on a principle of classification, and nearly corresponds to that adopted by Agathias. His principle of selection is un- known ; it is only certain that while he omitted much that he should have retained, he has preserved much that would otherwise have perished. The extent of our obligations may be ascertained by a comparison between his anthology and that of the next editcr, the monk Maximus Planudes

(1320 a.D.), who has not merely grievously mutilated the anthology of Cephalas by omissions, but has disfigured it by interpolating verses of his own. We are, however, 1n- debted to him for the preservation of the

epigrams on works of art, which seem to have been accidentally omitted from our only transcript of Cephalas.

The Planudean was the only recension of the anthology known at the revival of classical literature, and was first published at Florence, by Janus Lascaris, in 1594. It long continued to be the only accessible collection, for although the Palatine MS., the sole extant copy of the anthology of Cephalas, was discovered at Heidelberg by Salmasius in 1606, it was not published until 1772, when it was included in Brunck's Analecta Veterum Poetarum Grecorum. This edition was superseded by the standard one of Friedrich Jacobs (Leipsic, 1794-1803, 13 vols.), the text of which was reprinted in a more convenient form in 1813-17, and occupies three pocket volumes in the Tauchnitz series of the classics. 'The best edition for general purposes is perhaps that of M. Dibner in Didot's Bibliotheca (Paris, 1864-72), which contains the Palatine Anthology, the epigrams of the Planudean Anthology, not comprised in the former, an appendix of pieces derived from other sources, copious notes selected from all quarters, a literal Latin prose translation by Boissonade, Bothe, and Lapaume, and the metrical Latin versions of Hugo Grotius. The best edition of the Planudean Anthology is the splendid one by Van Bosch and Van Lennep (Utrecht, 1795-1822). Welcker, Meineke, and other German scholars have written valuable monographs on the An- thology.

Arrangement of the Anthology.—The Palatine MB., the archetype of the present text, was transcribed by different persons at different times, and the actual arrangement of the collection does not correspond with that signalised in the index. It is as follows :—Book 1. Christian epigrams ; 9. Christodorus's description of certain statues ; 3. In- scriptions in the temple at Cyzicus; 4. The prefaces of Meleager, Philip, and Agathias to their respective collec- tions; 5. Amatory epigrams; 6. Votive inscriptions ; 7. Epitaphs; 8. The epigrams of Gregory of Nazianzus ; 9. Rhetorical and illustrative epigrams; 10. Ethical pieces; 11. Humorous and convivial ; 12. Strato's Motca mroudixy ; 13. Metrical curiosities; 14. Puzzles, enigmas, oracles; 15. Miscellanies. The epigrams on works of art, as already stated, are missing from the Codex Palatinus, and must be sought in an appendix of epigrams only occur- ing in the Planudean Anthology. The epigrams

hitherto recovered from ancient monuments and similar sources form another appendix in the second volume of Diibner's edition.

Style and Value of the Anthology.—One of the principal claims of the Anthology to attention is derived from its continuity, its existence as a living and growing body of poetry throughout all the vicissitudes of Greek civili- sation. More ambitious descriptions of composition speedily ran their course, and having attained their complete de- velopment became extinct, or at best lingered only in feeble or conventional imitations. The humbler strains of the epigrammatic muse, on the other hand, remained ever fresh and animated, ever in intimate union with the spirit of the generation that gave them birth. To peruse the entire collection, accordingly, is as it were to assist at the disinterment of an ancient city, where generation has suc- ceeded generation on the same site, and each stratum of soil enshrines the vestiges of a distinct epoch, but where all epochs, nevertheless, combine to constitute an organic whole, and the transition from one to the other is hardly perceptible. Four stages may be indicated :—1. The Hellenic proper, of which Simonides is the characteristic

representative. This is characterised by a simple dignity of phrase, which to a modern taste almost verges upon baldness, by a crystalline transparency of diction, and by an absolute fidelity to the original conception of the epi-

gram. Nearly all the pieces of this era are actual bona

jide inscriptions, or addresses to real personages, whether

living or deceased ; narratives, literary exercises, and sports of fancy are exceedingly rare. 2. The epigram received a great development in its second or Alexandrian era, when its range was so extended as to include anecdote, satire, and amorous longing; when epitaphs and votive inscrip-

tions were composed on imaginary persons and things, and men of taste successively attempted the same subjects in

mutual emulation, or sat down to compose verses as dis-

plays of their ingenuity. The result was a great gain in richness of style and a falling off in purity of diction and sincerity of treatment. The nodification, —a perfectly legitimate one, the resources of the old style being exhausted, —had its real source in the transformation of political life, but may be said to com- mence with and to find its best representative in the play- ful and elegant Leonidas of Tarentum, a contemporary of Pyrrhus, and to close with Antipater of Sidon, about 140 B.C. of the most distinguished of the Alexandrian poets, affects the sternest simplicity in austerity of Simonides with as much success as an imitator can expect. same direction, the Alexandrian passes into what, for the sake of preserving the parallelism with the eras of Greek prose literature, we may call the Roman style, although the peculiarities of its principal representative are decidedly Oriental. Meleager of Gadara was a Syrian ; his taste was less severe, and his temperament more fervent than those of his Greek predecessors ; his pieces are usually erotic, and their glowing Song of Solomon. ally betrays him into far-fetched conceits, and the lavish- ness of his epithets is only redeemed by their exquisite

general interest, counterbalanced by

Tt should be noticed, however, that Callimachus, one his epigrams, and copies the

3. By a slight additional modification in the

imagery sometimes reminds us of the The luxuriance of. his fancy occasion-

felicity. Yet his effusions are manifestly the offspring of genuine feeling, and his epitaph on himself indicates a great advance on the exclusiveness of antique Greek patriot- ism, and is perhaps the first clear enunciation of the spirit of universal humanity characteristic of the later Stoical philosophy. qualities, Mr Symonds docs not overpraise him when he

With respect to his more strictly poetical

says “his poetry has the sweetness and the splendour of

the rose, the rapture and full throated melody of the nightingale.”

His gaiety and licentiousness are imitated and exaggerated by his somewhat later contemporary, the Epicurean Philodemus, perhaps the liveliest of any of the epigrammatists; his fancy reappears with diminished bril- liancy in Philodemus’s contemporary, Zonas, in Crinagoras, who wrote under Augustus, and in Marcus Argentarius, of uncertain date; his peculiar gorgeousness of colouring remains entirely his own. At a later period of the empire another genre, hitherto comparatively in abeyance, was developed, the satirical. Lucillius, who flourished under Nero, and Lucian, more renowned in other fields of litera- ture, display a remarkable talent for shrewd, caustic epi- gram, frequently embodying moral reflections of great cogeney, often lashing vice and folly with signal effect, but not seldom indulging in mere trivialities, or deformed by scoffs at personal blemishes. This style of composition is not properly Greek, but Roman ; it answers to the modern definition of epigram, and has hence attained a celebrity in excess of its deserts. It is remarkable, however, as an almost solitary example of direct Latin influence on Greek literature. The same style obtains with Palladas, an Alexandrian grammarian of the 4th century, the last. of

the strictly classical epigrammatists, and the first to be guilty of downright bad taste. His better pieces, however, are characterised by an austere ethical impressiveness, and his literary position is very interesting, as that of an indig- nant but despairing opponent of Christianity. 4. The fourth or Byzantine style of epigrammatic composition was culti- vated by the beaua-esprits of the court of Justinian. Toa great extent this is merely imitative, but the circumstances of the period operated so as to produce a species of origi- nality. The peculiarly ornate and recherché diction of Agathias and his compeers is not a merit in itself, but applied for the first time, it has the effect of revivifying an old form, and many of their new locutions are actual enrich- ments of the language. The writers, moreover, were men of genuine poetical feeling, ingenious in invention, and capable of expressing emotion with energy and liveliness; the colouring of their pieces is sometimes highly dramatic. The charge of impurity, alleged by Mr Symonds against them as a

body, applies to Rufinus alone in any consider- able degree, and he is purity itself compared with Martial. There is something very touching in the attitude of these last belated stragglers towards the antique culture from which they are hopelessly severed,—their half-conscious yearning for the glorious past, whose monuments still sur- rounded them on every side, but whose spirit had departed for ever. With them the volume of the Greek anthology is closed, for the “Christian epigrams” are totally value- less in a literary point of view.

It would be hard to exaggerate the substantial value of the Anthology, whether as a storehouse of facts bearing on antique manners, customs, and ideas, or as one among the influences which have contributed to mould the literature of the modern world. The multitudinous votive inscrip- tions, serious and sportive, connote the phases of Greek religious sentiment, from pious awe to irreverent familiarity and sarcastic scepticism ; the moral tone of the nation at various periods is mirrored with corresponding fidelity; the sepulchral inscriptions admit us into the inmost sanc- tuary of family affection, and reveal a depth and tenderness of feeling beyond the province of the historian to depict, and which we should not have surmised even from the dramatists; the general tendency of the collection is to display antiquity on its most human side, and to mitigate those contrasts with the modern world which more am- bitious modes of composition force into relief. The con- stant reference to the details of private life renders the Anthology an inexhaustible treasury for the student of archeology; art, industry, and costume receive their fullest illustration from its pages. Its influence on Euro- pean literatures will be appreciated in proportion to the inquirer’s knowledge of each. The further his researches extend, the greater will be his astonishment at the extent to which the Anthology has been laid under contribution for thoughts which have become household words in all cultivated languages, and at the beneficial effect of the imitation of its brevity, simplicity, and absolute verbal accuracy upon the undisciplined luxuriance of modern genius.

Translations, Imitations, &c., of the Anthology,—The best versions of the Anthology ever made are the Latin renderings of select epigrams by Hugo Grotius. They have not been printed separately, but will be found in Bosch and Lennep’s edition of the Planudean Anthology, in the Didot edition, and

in Dr Wellesley's Anthologia Poly- glotta. The number of more or less professed imitations in modern languages is infinite, that of actual translations less considerable. French and Italian, indeed, are ill adapted to this purpose, from their incapacity of approxi- mating to the form of the original, and their poets have usually contented themselves with paraphrases or imita-

tions, often exceedingly felicitous. Dehesme's French prose translation, however (1863), is most excellent and valuable. The German language alone admits of the pre- servation of the original metre,—a circumstance advan- tageous to the German translators, Herder and Jacobs, who have not, however, compensated the loss inevitably consequent upon a change of idiom by any added beauties of their own. Though unfitted to reproduce the precise form, the English language, from its superior terseness, is better adapted to preserve the spirit of the original than the German; and the comparative ill success of many English translators must be chiefly attributed to the ex- tremely low standard of fidelity and brevity observed by them. Bland, Merivale, and their associates (1806-13), are often intolerably diffuse and feeble, from want, not of ability, but of painstaking. Archdeacon Wrangham's too rare versions are much more spirited ; and John Sterling's translations of the inscriptions of Simonides deserve high praise. Professor Wilson (Blackwood's Magazine, 1833-35) collected and commented upon the labours of these and other translators, with his accustomed critical insight and exuberant geniality, but damaged his essay by burdening it with the indifferent attempts of William Hay. In 1849 Dr Wellesley, principal of New Inn Hall, Oxford, pub- lished his Anthologia Polyglotta, a most valuable collec- tion of the best translations and imitations in all languages, with the original text. In this appeared some admirable versions by Mr Goldwin Smith and Dean Merivale, which, with the other English renderings extant at the time, will be found accompanying the literal prose translation of the Public School Selections, executed by the Rev. George Burges for Bohn's Classical Library (1854). This is a useful volume, but the editor's notes are worthless. In 1864 Major R. G. Macgregor published an almost complete translation of the Anthology, a work of stupendous industry and fidelity, which almost redeem the general

mediocrity of the execution. Jdylls and Epigrams, by R. Garnett (1869), include about 140 translations or imitations, with some original compositions in the same style. An agree- able little volume on the Anthology, by Lord Neaves, is one of Collins's series of Ancient Classics for Modern Readers. Two recent critical contributions to the subject should be noticed, the Rev. James Davies's essay on Epigrams, in the Quarterly Review (vol. cxvii.), especially valuable for its lucid illustration of the distinction between Greek and Latin epigram ; and the brilliant disquisition in Mr J. A. Symonds's Studtes of the Greek Poets (1873).

~~The Latin Anrnotocy is the appellation bestowed upon a collection of fugitive Latin verse, from the age of Ennius to about 1000 a.p., formed by Peter Burmann the Younger. Nothing corresponding to the Greek anthology is known to have existed among the Romans, though pro~~ fessional epigrammatists like Martial published their volumes on their own account, and detached sayings were excerpted from such sententious authors as Publius Syrus, while the Priapeia were probably but one among many collec- tions on special subjects. The first general collection of scattered pieces made by a modern scholar was Scaliger's, in 1573, succeeded by the more ample one of Pithceus, in 1594. Numerous additions, principally from inscriptions, continued to be made, and in 1759 Burmann digested the whole into his Anthologia veterum Latinorum Epigramma- tum et Poematum. This, occasionally reprinted, has been the standard edition until recently ; but in 1869 Alexander Riese commenced a new and more critical recension, from which many pieces improperly inserted by Burmann are rejected, and his classified arrangement is discarded for one according to the sources whence the poems have been derived. The first volume contains those found in MSS.,

in the order of the importance of these ange ; those .— 14

106 :

furnished by inscriptions are to follow. Being formed by scholars actuated by no esthetic principles of selection, but solely intent on preserving everything they could find, the Latin anthology is much more heterogeneous than the Greek, and unspeakably inferior. The really beautiful poems of Petronius and Apuleius are more properly in- serted in

the collected editions of their writings, and more than half the remainder consists of the frigid conceits or pedantic professional exercises of grammarians of a very late period of the empire, relieved by an occasional gem, such as the apostrophe of the dying Hadrian to his spirit, or the epithalamium of Gallienus. The collection is also, for the most part, too recent in date, and too exclusively literary in character, to add much to our knowledge of classical antiquity. The epitaphs are interesting, but the genuine- ness of many of them is very questionable. (R. G.)

ANTHON, CHarvzs, an American philologist and pro- fessor of classics, was born in New York city in 1797, and died there 29th July 1867. After graduating with honours at Columbia College in 1815, he commenced the study of law, and in 1819 was admitted to the bar. But in 1820 he was appointed assistant professor of languages in his alma- mater, and he thenceforth devoted himself solely to classical literature. Soon after he commenced his well-known editions of the classics, the best known being that of the Poems of Horace, with extensive notes and comments, pub- lished in 1830. In the latter year he was made rector of the grammar school attached to his college, and in 1835 he succeeded to the chair of Professor Morse.

ANTHONY, Sarnv, the founder of monasticism, was born at the village of Coma in Egypt 251 a.p. Inherit- ing a large fortune, he thought it his duty to distribute it among his neighbours and the poor, and to live a rigidly ascetic life. He spent several years in solitude, where according to tradition he was sorely tempted by the devil. Many disciples flocked to his retreat at Fayoom, and built their cells around his, thus forming the earliest monastic community. (See ABBEY.) Anthony visited Alexandria when upwards of a hundred years old, and took an im- portant part in the controversy with the Arians,—a fact to which we are probably indebted for the record of the life of the saint written by Athanasius. Soon after return- ing to his cell he died (356 a.p.), his last injunction being that the place of his burial should be kept secret. Seven Latin translations of his letters are extant in the Bidliotheca Patrum. Many miracles were believed to have been wrought by his intervention, among others, the cure of what was called the “sacred fire,” and afterwards “St Anthony’s fire” (Erysipelas). For this reason he is usually represented with a fire by his side, as typical of the inflam- matory

disease which he was supposed to relieve. The festival of Saint Anthony is observed on the 17th of January, under which date the Acta Sanctorum of the Bol- landists contains a Latin translation of Athanasius's life of the saint, and other documents giving an account of his miracles. The events of bis life—in particular his tempta- tion by the devil and his meeting with St Paul—form the subjects of celebrated pictures by Caracci, Guido, Velas- quez, and others. For further details of Anthony's con- nection with the monastic system, see MonASTICISM.

ANTHRACITE, Stone Coat, Kitkenny Coal, or Cum, is a variety of coal differing from the common or bituminous kind in containing a larger proportion of carbon in its composition ; that element being present in anthracite to the extent of from 90 to 95 per cent. of its entire mass, while the carbon in bituminous coal usually varies from 75 to 90 per cent. Anthracite is further dis- tinguished by its compactness, high specific gravity, bright lustre, which is frequently iridescent on the natural surfaces, and its conchoidal fracture. It does not soil the fingers

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when handled, like ordinary coal ; it ignites with difficulty, and burns with a feeble, smokeless flame, giving out an 'ntense heat. No sharply defined line of demarcation can be drawn between anthracite and the bituminous varieties of coal, as the one geries merges by imperceptible degrees into the other. This gradation is observable in the coal deposits themselves, anthracite and bituminous coal being frequently found not far removed in different parts of the same seam, and the gradual transformation from a flaming coal to a compact, lustrous, non-flaming kind, being easily traceable. Anthracite has been defined as " the ultimate product of the conversion of vegetable matter into coal ;" and the following table, drawn up by Dr Percy (Manual of Metallurgy), may be taken as indicating the successive stages in the process. In this table the carbon is stated at a constant standard of 100, in order better to exhibit the comparative quantities of the other elements which enter into the composition of the bodies named :—

Carbon. Hydrogen. Oxygen. 1. Wood (mean of 26 analyses) .....- 100 12°18 83°07 D+ Peat es ceweauececasseree rescence se 100 9°85 55°67 3.

Lignite (average of 15 varieties)..... 100 8°37 42°42 4. Ten Yard Coal, South Staffordshire 100 6°12 21°23 5, Steam Coal, from the Tyne…....++- 100 5°91 18°32 6. Pentrefelin Coal of South Wales …100 4°75 5°28 7. Anthracite of Pennsylvania, U.S. ...100 2°84 1°74

The chief deposits of anthracite in Great Britain exist in the great coal-field of South Wales. They extend princi- pally along the north side of the coal basin; and on its western limit, in Pembrokeshire, the coal is entirely an- thracitic. Professor Warrington Smyth remarks, on the disposition of the deposits in South Wales :—“‘ Even within the distance of a few hundred yards the Llanelly beds are seen to be bituminous where they rise to the south, and anthracitic in the opposite side of the trough.” ‘In the neighbourhood of Bideford, in North Devonshire, a series of thin seams of an impure, clayey anthracite are worked, to which properly the name culm ought to be restricted, although the whole of the anthracite exported from this country appears under that designation in the Board of Trade returns. The very meagre coal-bearing strata of Ireland yield anthracite almost exclusively. The name Kilkeuny coal is given to anthracite, because that county is the centre of the South Irish coal-field, which yields no bituminous coal whatever. In the limited patches of coal found in the north of Ireland, however, some bituminous seams occur associated with anthracite. On the European continent anthracite is generally found accompanying the deposits of bituminous coal. In Belgium and Westphalia the lowest or oldest deposits of the series are anthracitic, while in Rhenish Bavaria it is the upper beds which are “dry,” or least bituminous. In North America, where enormous stores of coal exist, anthracite is found in due proportion, the deposits in Pennsylvania being the richest known. ‘The late Professor H. D. Rogers pointed out an interesting relation between the contortion or disturbance of strata in the Appalachian coal-field and the amount of bituminous matter the coal contains. In the western exten- sion of the coal-field, where the beds are horizontal and un- disturbed, the seams are highly bituminous ; and in propor tion as disturbance increases, the volatile compounds decrease, till on its eastern limit, in the Appalachian chain, enormous seams of a compact, pure anthracite are de- veloped. Anthracite is used for iron-smelting and in other metallurgical operations, for lime-burning, for heat – ing kilns, and other purposes requiring a steady, smokeless heat. As it burns with an intense concentrated heat, it is not so

suitable for steam boilers as ordinary flaming coal ; and the difficulty with which it ignites, as well as its dis- agreeable decrepitation, renders it less eligible for house- hold purposes.

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ANTHROPOLOGY

Definition A NTHROPOLOGY (the science of man, dvOpwros, I. Man’s Place in Nature.—It is now more than thirty Relation of

and objects Aoyos) denotes the natural history of mankind. In | years since Dr Prichard, who perhaps of all others merits Man to the

~~_ the general classification of knowledge it stands as the | the title of founder of modern anthropology, stated in the ae ani~~ . Mails.

highest section of zoology or the science of animals, itself the highest section of biology or the science of living beings. To anthropology contribute various sciences, which hold their own independent places in the field of knowledge. Thus anatomy and physiology display the structure and functions of the human body, while psychology investi- gates the operations of the human mind. Philology deals with the general principles of language, as well as with the relations between the languages of particular races and nations. Ethics or moral science treats of man’s duty or rules of conduct toward his fellow-men. Lastly, under the names of sociology and the science of culture, are con- sidered the origin and development of arts and sciences, opinions, beliefs, customs, laws, and institutions generally among mankind, their course in time being partly marked out by the direct record of history, while beyond the historical limit our information is continued by inferences from relics of early ages and remote districts, to interpret which is the task of pre-historic archeology and geology. Not only are these various sciences concerned largely with man, but several among them have in fact suffered by the almost entire exclusion of other animals from their scheme. It is undoubted that comparative anatomy and physiology, by treating the human species as one member of a long series of related organisms, have gained a higher and more perfect understanding of man himself and his place in the universe than could have been gained by the

narrower investigation of his species by and for itself. It is to be regretted that hitherto certain other sciences— psychology, ethics, and even philology and sociology—have so little followed so profitable an example. No doubt the phenomena of intellect appear in vastly higher and more complete organisation in man than in beings below him in the scale of nature, that beasts and birds only attain to language in its lower rudiments, and that only the germs of moral tendency and social law are discernible among the lower animals. Yet though the mental and moral interval between man and the nearest animals may be vast, the break is not absolute, and the investigation of the laws of reason and instinct throughout the zoological system, which is already casting some scattered rays of light on the study of man's highest organisation, may be destined henceforth to throw brighter illumination into its very recesses. Now this condition of things, as well as the accepted order in which the sciences have arranged them- selves by their mode of growth, make it desirable that anthropology should not too ambitiously strive to include within itself the sciences which provide so much of its wealth, but that each science should pursue its own sub- ject through the whole range of living beings, rendering to anthropology an account of so much of its results as con- cerns man. Such results it is the office of anthropology to collect and co-ordinate, so as to elaborate as completely as may be the synopsis of man's bodily and mental nature, and the theory of his whole course of life and action from his first appearance on earth. As will be seen from the following brief summary, the information to be thus brought togetherfrom contributing sciences is widely different both in accuracy and in soundness. While much of the descriptive detail is already clear and well filled in, the general principles of its order are still but vaguely to be discerned, and as our view quitsthe comparatively distinct region near ourselves, the prospect fades more and more into the dimness of conjecture.

following forcible passage, which opens his Vatural History –

of Man, the closeness of man's physical relation to the lower animals :—

*"The organised world presents no contrasts and resemblances more remarkable than those which we discover on comparing man- kind with the inferior tribes. That creatures should exist so nearly approaching to each other in all the particulars of their physical structure, and yet differing so

immeasurably in their endowments and capabilities, would be a fact hard to believe, if it were not manifest to our observation. The differences are everywhere strik- ing: the rescmblances are less obvious in the fulness of their extent, and thcy are never contemplated without wonder by those who, in the study of anatomy and physiology, are first made aware how near is man in his physical constitution to the brutes. In all the principles of his internal structure, in the composition and functions of his parts, man is but an animal. The lord of the earth, who contemplates the eternal order of the universe, and aspires to communion with its invisible Maker, is a being composed of the same materials, and framed on the same principles, as the creatures which he has tamed to be the servile instruments of his will, or slays for his daily food. ‘The points of resemblance are innumerable ; they extend to the most recondite arrangements of that mechanism which maintains instrumentally the physical life of the body, which brings forward its early development and admits, after a given pa its decay, and by means of which is preparcd a succession of similar beings destined to perpetuate the race.”

Referring the reader to the articles Histotoay and Puysiotocy for evidence of the similarity of minute or- ganisation both in structure and function, through the range of animal life upward to man, and to the article ANIMAL Kinepom for the general classification of the series of invertebrate and vertebrate animals, we have here to show in outline the relations between man and the species

most closely approaching him.

that it is essential to determine their zoological resem- blances and differences as a step toward ascertaining their absolute relation in nature. “ At this point,” writes Pro- fessor Owen in a paper on the “ Osteology of the Apes,” “every deviation from the human structure indicates with precision its real peculiarities, and we then possess the true means of appreciating those modifications by which a material organisni is especially adapted to become the seat and instrument of a rational and responsible soul.” (On the ‘‘Osteology of the Chimpanzee and Orang Utan,” in Proc. Zool. Soc., vol. i.) Professor Huxley, in his Man’s Place tn Nature (London 1863), comparing man with order after order of the mammalia, decides “ There

would remain then but one order for comparison, that of the Apes (using that word in its broadest sense), and the question for discussion would narrow itself to this—is Man so different from any of these Apes that he must form an order by himself? Or does he differ less from them than they differ from one another, and hence must take his place in the same order with them?' This anatomist states the anatomical rela- tions between man and ape in untechnical terms suited to the present purpose, and which would be in great measure accepted by zoologists and anthropologists, whether agree- ing or not with his ulterior views. The relations are most readily stated in comparison with the gorilla, as on the whole the most anthropomorphous ape. In the general pro- portions of the body and limbs there is a marked difference between the gorilla and man, which at once strikes the eye. The gorilla's brain-case is smaller, its trunk larger, its lower limbs shorter, its upper limbs longer in proportion than those of man. 'The differences between a gorilla's skull and a man's are truly immense. In the gorilla, the face,

It is admitted that the Apes and higher apes come nearest to man in bodily formation, and Man.

Zoological classifica- tion.

formed largely by the massive jaw-bones, predominates over the brain-case or cranium ; in the man these pro- portions are reversed. In man the occipital foramen, through which passes the spinal cord, is placed just behind the centre of the base of the skull, which is thus evenly balanced in the erect posture, whereas the gorilla, which goes habitually on all fours, and whose skull is inclined forward, in accordance with this posture has the foramen further back. In man the surface of the skull is com- paratively smooth, and the brow-ridges project but little, while in the gorilla these ridges overhang the cavernous orbits like penthouse roofs. The absolute capacity of the cranium of the gorilla is far less than that of man ; the smallest adult human cranium hardly measuring less than 63 cubic inches, while the largest gorilla cranium measured had a content of only 34} cubic inches. The large pro- portional size of the facial bones, and the great projection of the jaws, confer on the gorilla's skull its small facial angle and

brutal character, while its teeth differ from man's 'n relative size and number of fangs. Comparing the lengths of the extremities, it is seen that the gorilla's arm ig of enormous length, in fact about one-sixth longer than the spine, whereas a man's arm is one-fifth shorter than the spine ; both hand and foot are proportionally much longer in the gorilla than in man ; the leg does not so much differ. The vertebral column of the gorilla differs from that of man in its curvature and other characters, as also does the conformation of its narrow pelvis. The hand of the gorilla corresponds essentially as to bones and muscles with that of man, but is clumsier and heavier ; its thumb is " oppos- able" like a human thumb, that is, it can easily meet with its extremity the extremities of the other fingers, thus possessing a character which does much to make the human hand so admirable an instrument ; but the gorilla's thumb is proportionately shorter than man's. The foot of the higher apes, though often spoken of as a hand, is ana- tomically not such, but a prehensile foot. It is argued by Professor Owen and others that the position of the great toe converts the foot of the higher apes into a hand, an extremely important distinction from man ; but against this Professor Huxley maintains that it has the characteristic structure of a foot, with a very movable great toe. The external unlikeness of the apes to man depends much on their hairiness, but this and some other characteristics have no great zoological value. No doubt the difference between man and the apes depends, of all things, on the relative size and organisation of the brain. While similar as to their general arrangement to the human brain, those of the higher apes, such as the chimpanzee, are much less complex in their convolutions, as well as much less both in absolute and relative weight—the weight of a gorilla's brain hardly exceeding 20 ounces, and a man's brain hardly weighing less than 32 ounces, although the gorilla is con- siderably the larger animal of the two.

These anatomical distinctions are undoubtedly of great moment, and it is an interesting question whether they suffice to place man in a zoological order by himself. It is plain that some eminent zoologists, regarding man as absolutely differing as to mind and spirit from any other animal, have had their discrimination of mere bodily dif- ferences unconsciously sharpened, and have been led to give differences, such as in the brain or even the foot of the apes and man, somewhat more importance than if they had merely distinguished two species of apes. Among the present generation of

naturalists, however, there is an evident tendency to fall in with the opinion, that the anatomical differences which separate the gorilla or chim- panzee from man are in some respects less than those which separate these man-like apes from apes lower in the scale. Yet naturalists agree to class both the higher and lower apes

gibbon is as much longer in the arms

from the man, is yet further exaggerated in the lemurs, as

the great toe in these tion.

from lower to higher orders, shows gradations from a brain little higher than that of a rat, to a brain like a small and imperfect imitation of a man's ; break in the series lies not between man and the man-like apes, but between the apes and monkeys on one side, and the lemurs on the other. Huxley, restoring in principle the Linnean classification,

order he divides into seven families: first, the Anthropini, consisting of man only ; World apes ; third, the Platyrhini, all New World apes, except the marmosets ; marmosets; fifth, the Lemurini, or lemurs; sixth and seventh, the Cheiromyint

with other animals on purely zoological grounds, some such tive anatomy, be generally adopted.

logical grounds that the greater difficulty comes into view.

in the same order. This is Professor Huxley's argu- ment, some prominent points of which are the following :— As regards the proportion of limbs, the hylobates or

than the gorilla as the gorilla is than the man, while on the other hand, it is as much longer in the legs than the man as the man is than the gorilla. As to the vertebral column and pelvis, the lower apes differ from the gorilla as much as, or more than, it differs from man. As to the capacity of the

cranium, men differ from one another so extremely that the largest known human skull holds nearly twice the measure of the smallest, a larger proportion than that in which man surpasses the gorilla ; while, with proper allow- ance for difference of size of the various species, it appears that some of the lower apes fall nearly as much below the higher apes. The projection of the muzzle, which gives the character of brutality to the gorilla as distinguished

is also the backward position of the occipital foramen. In characters of such importance as the structure of the hand and foot, the lower apes diverge extremely from the gorilla ; thus the thumb ceases to be opposable in the ‘American monkeys, and in the marmosets is directed for- wards, and armed with a curved claw like the other digits, latter being insignificant in propor- The same argument can be extended to other points what is of more consequence, A series of the apes, arranged

of anatomical structure, and, it appears true of the brain.

and the greatest structural

On these grounds Professor

This

desires to include man in the order of Primates. second, the Catarhini, or Old fourth, the Arctopithecini, or

and Galeopithecinit. It seems likely that, so far as naturalists are disposed to class man

classification as this may, in the present state of compara-

It is in assigning to man his place in nature on psycho- Psycholosi- cal classifi-

The same naturalist, whose argument has just been sum- canner

marised against an absolute structural line of demarcation between man and the creatures next in the scale, readily acknowledges an immeasurable and

practically infinite divergence, ending in the present enormous gulf between the family of apes and the family of man. To account for this intellectual chasm as possibly due to some minor structural difference, is, however, a view strongly opposed to the prevailing judgment. The opinion is deeply rooted in modern as in ancient thought, that only a distinctively human element of the highest import can account for the severance between man and the highest animal below him. Differences in the mechanical organs, such as the perfec- Bodily tion of the human hand as an instrument, or the adapta- structure. bility of the human voice to the expression of human thought, are indeed of great value. But they have not of themselves such value, that to endow an ape with the hand and vocal organs of aman would be likely to raise it through any large part of the interval that now separates it from humanity. Much more is to be said for the view that man's larger and more highly organised brain accounts for those mental powers in which he so absolutely surpasses the brutes.

Senses.

Mental powers,

Swit kOPOLOG Y

The distinction does not seem to lie principally in the range and delicacy of direct sensation, as may be judged from such well-known facts as man's inferiority to the eagle in sight, or to the dog in scent. At the same time, it seems that the human sensory organs may have in various respects acuteness beyond those of other creatures. But, beyond a doubt, man possesses, and in some way possesses by virtue of his superior brain, a power of co- ordinating the impressions of his senses, which enables him to understand the world he lives in, and by understanding to use, resist, and even in a measure rule it. No human art shows the nature of this human attribute more clearly than does language. Man shares with the mammalia and birds the direct expression of the feelings by emotional tones and interjectional cries; the parrot's power of articulate utter- ance almost equals his own; and, by association of ideas in some measure, some of the lower animals have even learnt to recognise words he utters. But, to use words in them- selves unmeaning, as symbols by which to conduct and convey the complex intellectual processes in which mental conceptions are suggested,

compared, combined, and even analysed, and new ones created—this is a faculty which is scarcely to be traced in any lower animal. The view that this, with other mental processes, is a function of the brain, is remarkably corroborated by modern investigation of the disease of aphasia, where the power of thinking remains, but the power is lost of recalling the word corresponding to the thought, and this mental defect is found to accompany a diseased state of a particular locality of the brain (see ApHasta). This may stand among the most perfect of the many evidences that, in Professor Bain's words, "the brain is the principal, though not the sole organ of mind." As the brains of vertebrate animals form an ascending scale, more and more approaching man's in their arrangement, the fact here finds its explanation, that lower animals perform mental processes corresponding in their nature to our own, though of generally less power and complexity. The full evidence of this correspondence will be found in such works as Brehm's Thierleben ; and some of the salient points are set forth by Mr Darwin, in the chapter on "Mental Powers," in his Descent of Man. Such are the similar effects of terror on man and the lower animals, causing the muscles to tremble, the heart to palpitate, the sphincters to be relaxed, and the hair to stand on end. The phenomena of memory, both as to persons and places, is strong in animals, as is manifest by their recognition of their masters, and their returning at once to habits disused for many years, but of which their brain has not lost the stored-up impressions. Such facts as that dogs "hunt in dreams," make it likely that their minds are not only sensible to actual events, present and past, but can, like our minds, combine revived sensa- tions into ideal scenes in which they are actors,—that is to say, they have the faculty of imagination. As for the reasoning powers in animals, the accounts of monkeys learning by experience to break eggs carefully, and pick off bits of shell, so as not to lose the contents, or of the way in which rats or martens after a while can no longer be caught by the same kind of trap, with innumerable similar facts, show in the plainest way that the reason of animals goes so far as to form by new experience a new hypothesis of cause and effect which will henceforth guide their actions. The employment of mechanical instruments, of which instances of monkeys using sticks and stones, and some other similar cases, furnish the only rudimentary traces among the lower animals, is one of the often quoted distinctive powers of man. With this comes the whole vast and ever-

widening range of inventive and adaptive art, where the uniform hereditary instinct of the cell- forming bee and the nest-building bird are supplanted by

multiform processes and constructions, often at first rude and clumsy in comparison to those of the lower instinct, but carried on by the faculty of improvement and new invention into ever higher stages. ‘From the moment,” writes Mr Wallace (Natural Selection, p. 325), “ when the first skin was used as a covering, when the first rude spear was formed to assist in the chase, when fire was first used to cook his food, when the first seed was sown or shoot planted, a grand revolution was effected in nature, a revolution which in all the previous ages of the earth’s history had had no parallel; fora being had arisen who was no longer necessarily subject to change with the changing universe,—a being who was in some degree superior to nature, inasmuch as he knew how to control and regulate her action, and could keep himself in harmony with her, not by a change in body, but by an advance of mind.”

As to the lower instincts tending directly to self-preserva- tion, it is acknowledged on all hands that man has them in a less developed state than other animals; in fact, the natural defencelessness of the human being, and the long- continued care and teaching of the young by the elders, are among the commonest themes of moral discourse. Parental tenderness and care for the young are strongly marked among the lower animals, though so inferior in scope and duration to the human qualities ; and the same may be said of the mutual forbearance and defence which bind together in a rudimentary social bond the families and herds of animals. Philosophy seeking knowledge for its own sake; morality, manifested in the sense of truth, right, and virtue; and religion, the belief in and communion with superhuman powers ruling and pervading the universe, are human characters, of which it is instructive to trace, if possible, the earliest symptoms in the lower animals, but which can there show at most only faint and rudimentary signs of their wondrous development in mankind. That the tracing of physical and even intellectual continuity between the lower animals and our own race, does not necessarily lead the anthropologist to lower the rank of man in the scale of nature, cannot be better shown than by citing one of the authors of

the development theory, Mr A. R. Wallace (op. cit., p. 324). Man, he considers, is to be placed “ apart, as not only the head and culminating point of the grand series of organic nature, but as in some degree a new and distinct order of being.”

To regard the intellectual functions of the brain and nervous system as alone to be considered in the psycho- logical comparison of man with the lower animals, is a view satisfactory to those thinkers who hold materialistic views. According to this school, man is a machine, no doubt the most complex and wonderfully adapted of all known machines, but still neither more nor less than an instrument whose energy is provided by force from with- out, and which, when set in action, performs the various operations for which its structure fits it, namely, to live, move, feel, and think. This doctrine, which may be fol- lowed up from Descartes’s theory of animal life into the systems of modern writers of the school of Moleschott and Biichner, underlies the Lectures on Man of Professor Carl Vogt, one of the ablest of modern anthropologists (English translation published by Anthropological Society, London, 1864). Such views, however, always have been and are strongly opposed by those who accept on theologi- cal grounds a spiritualistic doctrine, or what is, perhaps, more usual, a theory which combines spiritualism and materialism in the doctrine of a composite nature in man, animal asto the body and in some measure as to the mind, spiritual as to the soul. It may be useful, as an illus- tration of one opinion on this subject, to continue here from an earlier page the citation of Dr Prichard’s com- parison between man and the lower animals :-—

Materialis- tic and spi-

ritualistic theories,

Doctrines of ereation and evolu- tion.

“Tf it be inquired in what the still more remarkable difference consists, it is by no means easy to reply. By some it will be said that man, while similar in the organisation of his body to the lower tribes, is distinguished from them by the possession of an Imma- terial soul, a principle capable of

conscious feeling, of intcllect and thought. To many persons it will appear paradoxical to ascribe the endowment of a soul to the inferior tribes in the creation, yet it ‘s difficult to discover a valid argument that limits the possession of an immaterial principle to man. The phenomena of feeling, of desire and aversion, of love and hatred, of fear and revenge, and the perception of external relations manifested in the life of brutes, imply, not only through the analogy which they display to the human faculties, but likewise from all that we can learn or con- jecture of their particular nature, the superadded existence of a principle distinct from the mere mechanism of material bodies.

That such a principle must exist in all beings capable of scnsation, or of anything analogous to human passions and feelings, will hardly be denied by those who perceive the force of arguments which metaphysically demonstrate the immaterial nature of the mind. There may be no rational grounds for the ancient dogma that the souls of the lower animals were imperishable, like the soul of man : this is, however, a problem which we are not called upon to discuss; and we may venture to conjecture that there may be immaterial essences of divers kinds, and endowed with various attributes and capabilities. But the real nature of these unseen principles eludes our research : they are only known to us by their external manifestations. These manifestations are the various powers and capabilities, or rather the habitudes of action, which characterise the different orders of being, diversified according to their several destinations.”

Dr Prichard here puts forward distinctly the time-hon- oured doctrine which refers the mental faculties to the operation of the soul. The view maintained by a dis- tinguished comparative anatomist, Professor Mivart, in his Genesis of Species, ch. xii, may fairly follow. ‘ Man, according to the old scholastic definition, is ‘a rational animal’ (animal rationale), and his animality is distinct in nature from his rationality, though inseparably joined, during life, in one common personality. Man’s animal body must have had a different source from that of the spiritual soul which informs it, owing to the distinctness of the two orders to which those two existences severally belong.” Not to pursue into its details a doctrine which has its place rather in a theological than an anthropological article, it remains to be

remarked that the two extracts just given, however significant in themselves, fail to render an account of the view of the human constitution which would probably, among the theological and scholastic leaders of public opinion, count the largest weight of adherence. According to this view, not onlylife but thought are functions of the animal system, in which man excels all other animals as to height of organisation ; but beyond this, man em- bodies an immaterial and immortal spiritual principle which no lower creature possesses, and which makes. the resemblance of the apes to him but a mocking simulance. To pronounce any absolute decision on these conflicting doctrines is foreign to our present purpose, which is to show that all of them count among their adherents men of high rank in science.

IL. Origin of Man.—Available information on this great problem has been multiplied tenfold during the present generation, and the positive dicta of the older authorities are now more and more supplanted by hypotheses based on biological evidence. Opinion as to the genesis of man is divided between the theories of the two great schools of biology, that of creation and that of evolution. In both schools the ancient doctrine of the contemporaneous appear- ance on earth of all species of animals having been abandoned under the positive evidence of geology, it is admitted that the animal kingdom, past and present, includes a vast series of successive forms, whose appearances and dis- appearances have taken place at intervals during an im- mense lapse of ages. The line of inquiry has thus been directed to ascertaining what formative relation subsists among these species and genera, the last link of the argu-

ment reaching to the relation between man and the lower creatures preceding him in time. On both the theorics here concerned it would be admitted, in the words of Agassiz (Principles of Zoology, pp. 205-6), that “ there isu manifest progress in the succession of beings on the surface of the earth. This progress consists in an increasing simi- larity of the living fauna, and, among the vertebrates espe- cially, in their increasing resemblance to man.” Agassiz continues, however, in terms characteristic of the creationist school: “ But this connection is not the consequence of a direct lineage between the faunas of different ages. There is nothing like parental descent

connecting them. The fishes of the Paleeozoic age are in no respect the ancestors of the reptiles of the Secondary age, nor does man descend from the mammals which preceded him in the Tertiary age. The link by which they are connected is of a higher and immaterial nature; and their connection is to be sought in the view of the Creator himself, whose aim in forming the earth, in allowing it to undergo the successive changes which geology has pointed out, and in creating successively all the different types of animals which have passed away, was to introduce man upon the surface of our globe. Man is the end towards which all the animal creation has tended from the first appearance of the first Paleozoic fishes." The evolutionist school, on the contrary, maintains that ditferent successive species of animals are in fact connected by parental descent, having become modified in the course of successive gencrations. Mr Darwin, with whose name and that of Mr Wallace the modern development theory is especially associated, in the preface to his Descent of Man (1871), gives precedence among naturalists to Lamarck, as having long ago come to the conclusion "that man is the co-descendant with other species of some ancient, lower, and extinct form." Professor Huxley, remarking (Man's Place in Nature, 18638, p. 106) on the crudeness and even absurdity of some of Lamarck's views, dates from Darwin the scientific existence of the development theory. The result of Darwin's application of this theory to man may be given in his own words (Descent of Man, part i. ch. 6) :—

''The Catarhine and Platyrhine monkeys agree in a multitude of characters, as is shown by their unquestionably belonging to one and the same Order. 'he many characters which they possess in common can hardly have been independently acquired by so many distinct species ; so that these characters must have been inherited. But an ancient form which possessed many characters common to the Catarhine and Platyrhine monkeys, and others in an inter- inediate condition, and some few perhaps distinct from those now present in either group, would undoubtedly have been ranked, if seen by a naturalist, as an ape or a monkey. And as man under a genealogical point of view belongs to the Catarhine or Old World stock, we must conclude, however much the conclusion may revolt our pride, that our early progenitors would have been properly thus designated. But we must not fall into the error of supposing that the early progenitor of the whole

Simian stock, including man, was identical with, or even closely resembled, any existing ape or monkey.”

The problem of the origin of man cannot be properly discussed apart from the full problem of the origin of species. The homologies between man and other animals which both schools try to account for; the explanation of the intervals, with apparent want of intermediate forms, which seem to the creationists so absolute a separation between species; the evidence of useless “rudimentary organs,” such as in man the external shell of the ear, and the muscle which enables some individuals to twitch their ears, which rudimentary parts the evolutionists claim to be only explicable as relics of an earlier specific condition,— these, which are the main points of the argument on the origin of man, belong to general biology. The philo- sophical principles which underlie the two theories stand for the most part in strong contrast, the theory of evolution tending toward the supposition of ordinary causes, such as

“natural selection,” producing mniodifications in species, whether by gradual accumulation or more sudden leaps, while the theory of creation is prone to have recourse to acts of supernatural intervention (see the Duke of Argyll, Reign of Law, ch. v.) A theory has been propounded by Mr Mivart (Geness of Species, 1871) of a natural evolution of inan as to his body, combincd with a supernatural creation as to his soul; but this attempt to meet the difficulties on both sides seems at present not to have satisfied either. Anthropology waits to see whether the discovery of inter- mediate forms, which has of late years reduced so many asserted species to mere varieties, will go on till it pro-

ment on the scalp, the tufts of the Bushman contrast with the more equal distribution on the European head. The straight hair of the North American or Malay is recognis- able at once as different from the waving or curling hair of the European, and both from the naturally frizzed hair of the Negro. These marked differences are due to the struc- ture of the hair, which, examined in sections under the microscope, varies from the circular section

proper to the straight-haired races, to the more or less symmetrically oval or reniform sections belonging to races with curled and twisted hair (see Pruner-Bey in Mém. de la Soc. Anthrop., vol. ii.)

Stature is by no means a general criterion of race, and Stature and it would not, for instance, be difficult to choose groups of Propor- Englishmen, Kafirs, and North American Indians, whose 4°?

duces a disbelief in any real separation between neighbour- ing species, and especially whether geology can furnish traces of the hypothetical animal, man's near ancestor, but

Tucture | pa ar-

heement ' hair,

_ the West African.

not as yet man. In the present state of the argument it may here suffice to have briefly indicated the positions held on either side. (Among other works relating to the development theory as applied to man, see Vogt, Lectures on Man; Haeckel, Natiirliche Schipfungsgeschichte, 2d ed., Is7 i

ie Races of Mankind.—The classification of mankind into a number of permanent varieties or races, rests on grounds which are within limits not only obvious but definite. Whether from a popular or a scientific point of view, it would be admitted that a Negro, a Chinese, and an Australian, belong to three such permanent varieties of men, all plainly distinguishable from one another and from any European. Moreover, such-a division takes for granted the idea which is involved in the word race, that each of these varieties is due to special ancestry, each race thus representing an ancient breed or stock, however these breeds or stocks may have had their origin. The anthro- pological classification of mankind is thus zoological in its nature, like that of the varieties or species of any other animal group, and the characters on which it is based are in great measure physical, though intellectual and tradi- tional peculiarities, such as moral habit and language, furnish important aid. Among the best-marked race- characters are the following :—

The colour of the skin has always been held as specially distinctive. The coloured race-portraits of ancient Egypt remain to prove the permanence of complexion during a lapse of a hundred generations, distinguishing coarsely but clearly the types of the red-brown Egyptian, the yellow-brown Canaanite, the comparatively fair Libyan, and the Negro (see Wilkinson, Ancient Hg.; Brugsch, Geogr. Inschr. Aitégypt. Denkm., vol. ii.) These broad dis- tinctions have the same kind of value as the popular terms describing white, yellow, brown, and black races, which often occur in ancient writings, and are stillused. But for scientific purposes greater accuracy is required, and this is now satisfactorily attained by the use of Dr Broca's graduated series of colours as a standard (Mémoires de la Société d' Anthropologie de Paris, ii.) By this table the varieties of the human skin may be followed from the fairest hue of the Swede and the darker tint of the Pro- vengal, to the withered-leaf brown of the Hottentot, the chocolate brown of the Mexican, and the brown-black of The colour of the eyes and hair is also to be defined accurately by Broca's table. This affords, however, less means of distinction, from the extent in which dark tints of hair and iris are common to races whose skins are more perceptibly different ; yet some varieties are characteristic, such as the blue eyes and flaxen hair of the fair race of Northern Europe.

As to the hair, its structure and arrangement is a better indication of race than its tint. The hair differs in quan- tity between scantiness on the body of the Mongol and profusion on the body of the Aino ; while as to the arrange-

mean height should hardly differ. Yet in many cases it is a valuable meaus of distinction, as between the tall Pata- gonians and the stunted Fuegians, and even as a help in minuter problems, such as separating the Teutonic and Keltic ancestry in the population of England (see Beddoe, "Stature and Bulk of Man in the British Isles," in Mem. Anthrop. Soc. London, vol. iii.) Proportions of the limbs, compared in length with the trunk, have been claimed as constituting peculiarities of African and American races; and other anatomical points, such as the conformation of the pelvis, have speciality. But inferences of this class have hardly attained to sufficient certainty and generality to be set down in the form of rules.

The conformation of the skull is second only to the Shape of colour of the skin as a criterion for the distinction of race, ®kull.

The principal modes of estimating the differences of skulls are the following :—The skull being seen from above, the proportions of the two diameters are estimated on the principle employed by Retzius: taking the longer diameter from front to back as 100, if the shorter or cross diameter falls below 80, the skull may be classed as long (dolicho- cephalic); while if it exceeds 80, the skull may be classed as broad (brachycephalic); or a third division may be introduced between these as intermediate (mesocephalic), comprehending skulls with a proportionate breadth of 75 to 80, or thereabout. The percentage of breadth to length measured in this manner is known as the cephalic index; thus, the cephalic index of a Negro or Australian may be as low as 72, and that of a Tatar as high as 88, while the majority of Europeans have an index not depart- ing in either direction very far from 78. The cephalic height is measured in the same way as a percentage of the length. The back view (norma occipitalis) of the skull is distinguished as rounded, pentagonic, &c., and the base view of the skull shows the position of the occipital fora- men and the zygomatic arches. The position of the jaws is recognised as important, races being described as pro- gnathous when the jaws project far, as in the Australian or Negro, in contradistinction to the orthognathous type, which is that of the ordinary well-shaped European skull. On this distinction in great measure depends the celebrated “facial angle,” measured by Camper as a test of low and high races; but this angle is objectionable as resulting partly from the development of the forehead and partly from the position of the jaws. The capacity of the cranium is estimated in cubic measure by filling it with sand, é&c., with the general result that the civilised white man is found to have a larger brain than the barbarian or savage.

Classification of races on cranial measurements has long been attempted by eminent anatomists, such as Blu- menbach and Retzius, while the later labours of Von Baer, Welcker, Davis, Broca, Busk, Lucae, and many others, have brought the distinctions to extreme minute- ness. In certain cases great reliance may be placed on such measurements. Thus the skulls of an Australian

Features.

Constitu- tion and character.

and a Negro would be generally distinguished by their narrowness and the projection of the jaw from that of any Englishman; while, although both the Australian and Negro are thus dolichocephalic and prognathous, the first would usually differ perceptibly from the second in its upright sides and strong orbital ridges. The relation of height to breadth may furnish a valuable test; thus both the Kafir and the Bushman are dolichocephalic, with an index of about 72, but they differ in the index of height, which may be 73 and 71 respectively, in the one case more than the width and in the other less. It is, however, acknowledged by all experienced craniologists, that the shape of the skull may vary S0 much within the same tribe, and even the same family, that it must be used with extreme caution, and if possible only in conjunction with other criteria of race.

The general contour of the face, in part dependent on the form of the skull, varies much in different races, among whom it is loosely defined as oval, lozenge-shaped, pentagonal, é&c. Of particular features, some of the most marked contrasts to European types are seen in the oblique Chinese eyes, the broad-set Kamchadal cheeks, the pointed Arab chin, the snub Kirghis nose, the fleshy protuberant Negro lips, and the broad Kalmuk ear. Taken altogether, the features have a typical character which popular obser- vation seizes with some degree of correctness, as in the recognition of the J ewish countenance in a European city.

The state of adaptation in which each people stands to sts native climate forms a definite race-character. In its extreme form this is instanced in the harmful effect of the climate of India on children of European parents, and the corresponding danger in transporting natives of tropical climates to England. Typical instances of the relation of race-constitutions to particular diseases are seen in the liability of Europeans in the West Indies to yellow fever, from which Negroes are exempt, and in the habitation by tribes in India of so-called “ unhealthy districts,” whose climate is deadly to Europeans, and even to natives of neighbouring regions. Even the vermin

infesting different races of men are classified by Mr A. Murray (Trans. R. Soc. Edin., vol. xxii.) as distinct.

The physical capabilities of different races are known to differ widely, but it is not easy to discriminate here between hereditary race-differences and those due to particular food and habit of life, A similar difficulty has hitherto stood in the way of any definite classification of the emotional, moral, and intellectual characters of races. Some of the most confident judgments which have been delivered on this subject have been dictated by prejudice or wilful slander, as in the many lamentable cases in which slave-holders and conquerors have excused their ill-treatment of subject and invaded races on the ground of their being creatures of bestial nature in mind and morals. Two of the best-marked contrasts of mental type recorded among races are Mr A. R. Wallace's distinction between the shy, reserved, and impassive Malay and the sociable and demon- strative Papuan (Z'r. Eth. Soc., vol iii. p. 200), and the very similar difference pointed out by Spix and Martius between the dull and morose natives of the Brazilian forests, and the lively sensuous African Negroes brought into contact with them (Reise ix Brasilien, vol. i.) In general, however, descriptions of national or racial character are so vitiated by the confusion of peculiarity of natural character with stage of civilisation, that they can only be made use of with the greatest reserve.

The relation of language to race is discussed below. (Section V.) .

Were the race-characters indicated in the foregoing para- graphs constant in degree or even in kind, the classification of races would be an easy task. In fact it is not so, for

every division of mankind presents in every character wide deviations from a standard. 'Thus the Negro race, well marked as it may seem at the first glance, proves on closer examination to include several shades of complexion and features, In some districts varying far from the accepted Negro type; while the examination of a series of native American tribes shows that, notwithstanding their asserted uniformity of type, they differ in stature, colour, features, and proportions of skull. Man; Waitz,

Anthropology, part i. sec. 5.) Detailed anthropological research, indeed, more and more justifies Blumenbach's words, that " innumerable varieties of man- kind run into one another by insensible degrees." This state of things, due partly to mixture and crossing of races, and partly to independent variation of types, makes the attempt to arrange the whole human species within exactly bounded divisions an apparently hopeless task. It does not follow, however, that the attempt to distinguish special races should be given up, for there at least exist several definable types, each of which so far prevails in a certain population as to be taken as its standard. M. Quetelet's plan of defining such types will probably meet with general acceptance as the scientific method proper to this branch of anthropology. It consists in the deter- mination of the standard, or 'typical "mean man" (homme moyen) of a population, with reference to any particular quality, such as stature, weight, complexion, &c. In the case of stature, this would be done by measuring a suffi- cient number of men, and counting how many of them belong to each height on the scale. If it be thus ascer- tained, as it might be in an English district, that the 5 ft. 7 in. men form the most numerous group, while the 5 ft. 6 in. and 5 ft. 8 in. mon are less in number, and the 5 ft. 5 in. and 5 ft. 9 in. still fewer, and so on until the extremely small number of extremely short or tall indi- viduals of 5 ft. or 7 ft. is reached, it will thus be ascer- tained that the stature of the mean or typical man is to be taken as 5 ft. 7 in. The method is thus that of selecting as the standard the most numerous group, on both sides of which the groups decrease in number as they vary in type. Such classification may show the existence of two or more types in a community, as, for instance, the population of a Californian settlement made up of Whites and Chinese might show two predominant groups (one of 5 ft. 8 in, the other of 5 ft. 4 in.) corresponding to these two racial types. It need hardly be said that this method of deter- mining the mean type of a race, as being that of its really existing and most numerous class, is altogether superior to the mere calculation of an average, which may actually be represented by comparatively few individuals, and those the exceptional ones. For instance, the average stature of the mixed European and Chinese population just referred to might be 5 ft. 6 in—a worthless and, indeed, misleading result. (For particulars of Quetelet's method, see his Physique Sociale, 1869, and Anthropométrie, 1870.) The measurement and description of the various races of men are now carried to great minuteness (the tables in

Scherzer and Schwarz, Reise der Novara, and those of Fritsch, Die Eingeborenen Sud-Afrika's, 1872, may be cited as examples of modern method), so that race-classification is rapidly improving as to both scope and accuracy. Even where comparatively loose observations have been made, it is possible, by inspection of considerable numbers of indi- viduals, to define the prevalent type of a race with tolerable approximation to the real mean or standard man. It is in this way that the subdivision of mankind into races, so far as it has been done to any purpose, has been carried out by anthropologists.

These classifications have been numerous, and though, regarded as systems, most of them are now seen at the

(See Prichard, Vat. Hist. of

General

classifica.

tion of races.

Quetelet's

method.

Blumen- bach, Cuvier, &c.

| Huxley's , classifica- 4 tion.

'Schemes of or less based on indisputable distinctions.

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first glance to be unsatisfactory, yet they have been of great value in systematising knowledge, and are all more Blumenbach's division, though published nearly a century ago (17 81), has had the greatest influence. He reckons five races, viz., Caucasian, Mongolian, Ethiopian, American, Malay (see the collected edition of his Treatises, p. 264, published by the Anthropological Society). The ill-chosen name of Caucasian, used by

Blumenbach to denote what may be called white men, is still current ; it brings into one race peoples such as the Arabs and Swedes, although these are scarcely less different than the Americans and Malays, who are set down as two distinct races. Again, two of the best-marked varieties of mankind are the Australians and the Bushmen, neither of whom, however, seem to have a natural place in Blumenbach's series. The yet simpler classification by Cuvier into Caucasian, Mongol, and Negro, corresponds in some measure with a division by mere com- plexion into white, yellow, and black races ; but neither this threefold division, nor the ancient classification into Semitic, Hamitic, and Japhetic nations can be regarded as separating the human types either justly or sufficiently (see Prichard, Vatural History of Man, sec. 15; Waitz, Anthropology, vol. i. part i. sec. 5). Schemes which set up a larger number of distinct races, such as the eleven of Pickering, the fifteen of Bory de St Vincent, and the sixteen of Desmoulins, have the advantage of finding niches for most well-defined human varieties ; but no modern naturalist would be likely to adopt any one of these as it stands. In criticism of Pickering's system, it is sufficient to point out that he divides the white nations into two races, entitled the Arab and the Abyssinian (Pickering, Races of Man, chap. i.) Agassiz, Nott, Craw- furd, and others who have assumed a much larger number of races or species of man, are not considered to have satisfactorily defined a corresponding number of distin- guishable types. On the whole, Professor Huxley's recent scheme (Journal of the Ethnological Society, vol. ii. p. 404, 1870) probably approaches more nearly than any other to such a tentative classification as may be accepted in definition of the principal varieties of mankind, regarded from a zoological point of view, though anthropologists may be disposed to erect into separate races several of his widely-differing sub-races. He distinguishes four principal types of mankind, the Australioid, Negroid, Mongoloid, and Xanthochroic, adding a fifth variety, the Melano- chroic.

The special points of the Australivid are a chocolate- brown skin, dark brown or black eyes, black hair (usually wavy), narrow (dolichocephalic) skull, brow-ridges strongly developed, projecting jaw, coarse lips, and broad nose. This type is best represented by the natives of Australia, and next to them, by the indigenous tribes of Southern India, the so-called

coolies. The Egyptians to some degree approach this type; they are, however, held by good authorities to be a modified African race.

The Negroid type is primarily represented by the Negro of Africa, between the Sahara and the Cape district, in- cluding Madagascar. The skin varies from dark brown to brown-black, with eyes of similar dark hue, and hair usually black, and always crisp or woolly. The skull is narrow (dolichocephalic), with orbital ridges not prominent, prognathous, with depressed nasal bones, causing the nose to be flat as well as broad; and the lips are coarse and projecting. Two important families are classed in this system as special modifications of the Negroid type. First, the Bushman of South Africa is diminutive in stature, and of yellowish-brown complexion; the Hottentot is supposed to be the result of crossing between the Bush- man and ordinary Negroid. Second, the Negritos of the

Andaman Islands, the peninsula of Malacca, the Philippines and other islands, to New Caledonia and Tasmania, are mostly dolichocephalic, with dark skins and woolly hair. In various districts they tend towards other types, and show traces of mixture.

The Mongoloid type prevails over the vast area lying east of a line drawn from Lapland to Siam. Its definition includes a short, squat build, a yellowish brown complexion, with black eyes and black straight hair, a broad (brachy- cephalic) skull, usually without prominent brow-ridges, flat small nose, and oblique eyes. The dolichocephalic Chinese and Japanese in other respects correspond. Various other important branches of the human species are brought into connection with the Mongoloid type, though on this view the differences they present raise diffi- cult problems of gradual variation, as well as of mixture of race; these are the Dyak-Malays, the Polynesians, and the Americans.

The Xanthochroi, or fair whites— tall, with almost colourless skin, blue or grey eyes, hair from straw colour to chestnut, and skulls varying as to proportionate width— are the prevalent inhabitants of Northern Europe, and the type may be traced into North Africa, and eastward as far as Hindostan.

On the south and west it mixes with that of the Melanochroi, or dark whites, and on the north and east with that of the Mongoloids.

The Melanochroi, or dark whites, differ from the fair whites in the darkening of the complexion to brownish and olive, and of the eyes and hair to black, while the stature is somewhat lower and the frame lighter. To this class belong a large part of those classed as Kelts, and of the populations of Southern Europe, such as Spaniards, Greeks, and Arabs, extending as far as India ; while end- less intermediate grades between the two white types testify to ages of intermingling. Professor Huxley is disposed to account for the Melanochroi as themselves the result of crossing between the Xanthochroi and the Aus- tralioids. Whatever ground there may be for his view, it is obviously desirable to place them in a class by them- selves, distinguishing them by an appropriate name.

In determining whether the races of mankind are to be Mixture of classed as varieties of one species, it is important to decide Tces.

whether every two races can unite to produce fertile off- spring. It is settled by experience that the most numer- ous and well-known crossed races, such as the Mulattos, descended from Europeans and Negroes—the Mestizos, from Europeans and American indigenes—the Zambos, from these American indigenes and Negroes, &c., are permanently fertile. They practically constitute sub-races, with a general blending of the characters of the two parents, and only differing from fully established races in more or less tendency to revert to one or other of the original types. It has been argued, on the other hand, that not all such mixed breeds are permanent, and especially that the cross between Europeans and Australian indigenes is almost sterile; but this assertion, when examined with the care demanded by its bearing on the general question of hybridity, has distinctly broken down. On the whole, the general evidence favours the opinion that any two races may combine to produce a new sub-race, which again may combine with any other variety. (See Waitz, Anthropology, vol. i. part i. sec. 3; Darwin, Descent of Man, part i. ch. 7; Prichard, Wat. Hist. of Man, sect. 5; on the other hand, Broca, Phenomena of Hybridity in the Genus Homo, 1864.) Thus, if the existence of a small number of distinct races of mankind be taken as a starting-point, it is obvious that their crossing would produce an

indefinite number of secondary varieties, such as the population of the world actually presents. The working out in detail of the problem, how far the differences among complex nations, II. — 15

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such as those of Europe, may have been brought about by hybridity, is still, however, a task of almost hopeless intricacy. Among the boldest attempts to account for distinctly-marked populations as resulting from the inter-mixture of two races, are Professor Huxley's view that the Hottentots are hybrid between the Bushmen and the Negroes, and his more important suggestion, that the Melanochroic peoples of Southern Europe are of mixed Xanthochroic and Australioid stock.

The problem of ascertaining how the small number of races, distinct enough to be called primary, can have assumed their different types, has been for years the most disputed field of anthropology, the battle-ground of the rival schools of monogenists and polygenists. The one has claimed all mankind to be descended from one original stock, and generally from a single pair ; the other has con- tended for the several primary races being separate species of independent origin. It is not merely as a question of natural history that the matter has been argued. Biblical authority has been appealed to, mostly on the side of the monogenists, as recording the descent of mankind from a single pair. (See, for example, Horne's Introduction to the Scriptures ; the Speaker's Commentary, Gen. i.) On the other hand, however, the polygenists not less confidently claim passages from which they infer the existence of non-Adamite, as well as Adamite races of man. (See, for example, R. 8. Poole, Genesis of the Earth and Man.) Nor have political considerations been without influence, as where, for instance, one American school of ethno- logists have been thought to have formed, under the bias of a social system recognising slavery, their opinion that the Negro and the white man are of different species. (See Morton, Crania Americana; Nott and Gliddon, Types of Mankind.) Of the older school of scientific mono- genists, Blumenbach and Prichard are eminent repre- sentatives, as

is Quatrefages of the more modern. The great problem of the monogenist theory is to explain by what course of variation the so different races of man have arisen from a single stock. In ancient times little difficulty was felt in this, authorities such as Aristotle and Vitruvius seeing in climate and circumstance the natural cause of racial differences, the Ethiopian having been blackened by the tropical sun, &c. Later and closer observations, however, have shown such influences to be, at any rate, far slighter in amount and slower in operation than was once supposed. M. de Quatrefages brings for- ward (Unité de ’Espéce Humaine, Paris, 1861, ch. 13) his strongest arguments for the variability of races under change of climate, dc. (action du milieu), instancing the asserted alteration in complexion, constitution, and char- acter of Negroes in America, and Englishmen in America and Australia. But although the reality of some such modifi- cation is not disputed, especially as to stature and consti- tution, its amount is not enough to upset the counter- proposition of the remarkable permanence of type displayed by races ages after they have been transported to climates extremely different from that of their former home. More- over, physically different races, such as the Bushmen and Negroids in Africa, show no signs of approximation under the influence of the same climate ; while, on the other hand, the coast tribes of Tierra del Fuego and forest tribes of tropical Brazil continue to resemble one another, in spite of extreme differences of climate and food. Mr Darwin than whom no naturalist could be more competent to appraise the variation of a species, is moderate in his esti- mation of the changes produced on races of man by climate and mode of life within the range of history (Descent of Man, part i. ch. 4 and 7). The slightness and slowness of variation in human races having become known, a great difficulty of the monogenist theory was seen to lie in the

shortness of the chronology with which it was formerly associated. Inasmuch as several well-marked races of mankind, such as the Egyptian, Pheenician, Ethiopian, &c., were much the same three or four thousand years ago as now, their variation from a single stock in the course of any like period could hardly be accounted for without a miracle. This difficulty was escaped by the polygenist theory, which, till a few years since, was gaining ground. (See Pouchet, Plurality of the Human Race, 2nd ed., 1864,

Introd.) ‘Two modern views have, however, intervened which have tended to restore, though under a new aspect, the doctrine of a single human stock. One has been the recognition of man having existed during a vast period of time (see sec. IV., Antiquity of Man), which made it more easy to assume the continuance of very slow natural varia- tion as having differenced even the white man and the Negro among the descendants of a common progenitor. The other view is that of the evolution or development of species, at the present day so strongly upheld among naturalists. It does not follow necessarily from a theory of evolution of species that mankind must have descended from a single stock, for the hypothesis of development admits of the argument, that several simious species may have culminated in several races of man (Vogt, Lectures on Man, London, 1864, p. 463). The general tendency of the development theory, however, is against constituting separate species where the differences are moderate enough to be accounted for as due to variation from a single type. Mr Darwin’s summing up of the evidence as to unity of type throughout the races of mankind is as distinctly a monogenist argument as those of Blumenbach, Prichard, or Quatrefages—

‘« Althongh the existing races of man differ in many respects, as in colour, hair, shape of skull, proportions of the body, &c., yet, if their whole organisation be taken into consideration, they are found to resemble each other closely in a multitude of points. Many of these points are of so unimportant, or of so singular a nature, that it is extremely improbable that they should have been independ- ently acquired by aboriginally distinct species or races. The same remark holds good with equal or greater force with respect to the numerous points of mental similarity between the most distinct races of man. ..... Now, when naturalists observe a close agreement in numerous small details of habits, tastes, and disposi- tions between two or more domestic races, or between nearly allied natural forms, they use this fact as an argument that all are de- scended from a common progenitor, who was thus endowed ; and, consequently, that all should be classed under the same species. The same argument may be applied with much force to the races of man.”—(Darwin, Descent of Man, part i. ch. 7.)

A suggestion by Mr A. R. Wallace has great importance Time of

in the application of the development theory to the origin a

of the various races of man; it is aimed to meet the main difficulty of the monogenist school, how races which have remained comparatively fixed in type during the long period of history, such as the white man and the Negro, should have, in even a far longer period, passed by varia- tion from a common original. Mr Wallace's view is sub- stantially that the remotely ancient representatives of the human species, being as yet animals too low in mind to have developed those arts of maintenance and social ordinances by which man holds his own against influences from climate and circumstance, were in their then wild state much more plastic than now to external nature; so that " natural selection" and other causes met with but feeble resistance in forming the permanent varieties or races of man, whose complexion and structure still remain fixed in their de- scendants. (Sce Wallace, Contributions to the Theory of Natural Selection, p. 319.) On the whole, it may be asserted that the doctrine of the unity of mankind now stands on a firmer basis than in previous ages. It would be premature to judge how far the problem of the origin of races may be capable of exact solution; but the ex-

re of

types.

Chronology

deficient.

aN PHROPOLOG Y

perience of the last few years countenances Mr Darwin's prophecy, that before long the dispute between the mono- genists and the polygenists will die a silent and unobserved death.

IV. Antiquity of Man.—It was until of late years commonly held among the educated classes, that man's first appearance on earth might be treated on a historical basis as matter of record. It is true that the schemes drawn up by chronologists differed widely, as was naturally the case, considering the

variety and inconsistency of their docu- mentary data. On the whole, the scheme of Archbishop Usher, who computed that the earth and man were created in 4004 B.c., was the most popular. (See early editions of the Hncyclopedia Britannica, art. “ Creation.”) It is no longer necessary, however, to discuss these chronologies, inasmuch as new evidence has so changed the aspect of the subject, that the quasi-historical schemes of the last century would now hardly be maintained by any competent author- ity of any school. Geology, notwithstanding the imper- fection of its results, has made it manifest that our earth

why man and the several animals whose remains occur in caves and in gravel should not have lived here at some remote time” (see Pengelly, “Literature of Kent’s Cavern,” in Lrans. Devonshire Association, 1868). Especially certain caves and rock-shelters in the province of Dordogne, in central France, were examined by a French and an English archeologist, Mons. Edouard Lartet and Mr Henry Christy, the remains discovered showing the former prevalence of the rein-deer in this region, at that time inhabited by savages, whose bone and stone implements indicate a habit of life similar to that of the Esquimaux. Moreover, the co- existence of man with a fauna now extinct or confined to other districts was brought to yet clearer demonstration, by the discovery in these caves of certain drawings and carv- ings of the animals done by the ancient inhabitants them- selves, such as a group of rein-deer on a piece of rein-deer horn, and a sketch of a mammoth, showing this elephant’s long hair, on a piece of a mammoth’s tusk from La Madeleine (Lartet and Christy, Religuie Aquitanice, ed. by T. R. Jones, London, 1865, &.) These are among the earliest and principal of a series of discoveries of human relics be- longing to what may be termed geological antiquity, with which should be mentioned Mr Boyd Dawkins’s examination of the hyzena den of Wokey Hole, Dr Lund’s researches in the caves of Brazil, those in the south of France by the Marquis de Vibraye and MM. Garrigou and Filhol, those in Sicily by Dr Falconer, and Mr Bruce Foote’s discovery of rude quartzite implements in the laterite of India. Fuller details of the general subject will be found in Sir C. Lyell’s Antiquity of Man, 4th ed., London, 1873; Sir John Lubbock’s Prehistoric Times, 3d ed., London, 1873 ; Dr H. Falconer’s Paleontological Memoirs, London,

1868; the volumes of Proceedings of the International Congress of Prehistoric Archeology; and the periodical Matériaux pour U Histoire Primitive et Naturelle de ’ Homme, edited at first by De Mortillet, and since by Trutat and Cartailhac.

Christol in limestone caverns of the south of France date back to 1828. About the same time Dr Schmerling of Liége was exploring the ossiferous caverns of the valley of

This evidence is now generally accepted by geologists as Antiquity carrying back the existence of man into the period of the of Quater- post-glacial drift, in what is now called the Quaternary “VY Man.

the Meuse, and satisfied himself that the men whose bones he found beneath the stalagmite floors, together with bones cut and flints shaped by human workmanship, had in- habited this Belgian district at the same time with the cave-bear and several other extinct animals whose bones were imbedded with them (Recherches sur les Ossements Sossiles découverts dans les Cavernes de la Province de Liége, Liége, 1833-4), This evidence, however, met with little acceptance among scientific men. Nor, at first, was more credit given to the discovery by M. Boucher de Perthes, about 1841, of rude flint hatchets in a sand-bed containing remains of mammoth and rhinoceros at Menchecourt near Abbeville, which first find was followed by others in the same district (see Boucher de Perthes, De l’ Industrie Primi- tive, ou les Arts & leur Origine, 1846; Antiquités Celtiques et Antédiluviennes, Paris, 1847, &c.); between 1850 and 1860 competent French and English geologists, among them Rigollot, Falconer, Prestwich, and Evans, were induced to examine into the facts, and found the evidence irresistible that man existed and used rude implements of chipped flmt during the Quaternary or Drift period. Further investigations were now made, and overlooked results of older ones reviewed. In describing Kent’s Hole, near Torquay, Mr Godwin-Austen had maintained, as early as 1840 (Proc. Geo. Soc. London, vol. iii. p. 286), that the human bones and worked flints had been deposited indis- criminately together with the remains of fossil elephant, rhinoceros, &c.; a minute exploration of this cavern has since been carried on under the superintendence of Messrs Vivian, Pengelly,

and others, fully justifying Mr Godwin- Austen's early remark, that "there is no a priori reason

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period. That this indicates an antiquity at least of tens of thousands of years may be judged in several ways. The very position in which these rude instruments were found showed that they belonged to a time quite separate from that of history. Thus, at St Acheul flint hatchets occur in a gravel-bed immediately overlying the chalk, which bed is covered by some 12 feet of sand and marl, capped by a layer of soil, which is shown by graves of the Gallo-Roman period to have been hardly altered during the last 1500 years. This distinction between the drift deposits and those containing relics of historic ages is, as a general rule, evident at a glance. Next, the succession of ages to which different classes of remains belong is well marked; the drift implements belong to the paleolithic or old stone age, when as yet the implements were extremely rude, and not ground or polished; above these in deposit, and therefore later in time, come the artistically shaped and polished celts of the neolithic or new stone age; above these, again, relics of the bronze and early iron ages, with which historical antiquity in Europe begins. Again, the animals of the Quaternary period, whose bones are found with the rude stone implements, comprise several species of mammalia which have since become extinct, such as the mammoth, the hairy rhinoceros, and the Irish elk, while others, such as the rein-deer and musk-ox, now only inhabit remote districts. It is generally considered that such a fauna indicates, at any rate during part of the Quaternary period, a severer climate than now prevails in France and England. This difference from the present conditions seems to confirm the view, that the twenty centuries of French and English history form but a fraction of the time

Depth of deposits of human age.

Lake habi- tations.

which has elapsed since the stone implements of prehistoric tribes were first buried under beds of gravel and sand by the rivers now represented by the

Thames or the Somme. Still vaster, however, is the idea of antiquity suggested by the geographical conformation of such valleys as those in which these rivers flow. The drift-beds lie on their sides often 100 to 200 feet, and even more, above the present flood- levels. As such highest deposits seem to mark the time when the rivers flowed at heights so far above the present channels, it follows that the drift-beds, and the men whose works they enclose, must have existed during a great part of the time occupied by the rivers in excavating their valleys down to their present beds. Granting it as possible that the rivers by which this enormous operation was performed were of greater volume and proportionately still greater power in flood-time than the present streams, which seem SO utterly inadequate to their valleys, and granting also, that under different conditions of climate the causing of debacles by ground-ice may have been a powerful excavating agent, nevertheless, with all such allowances the reckoning of ages seems vastly out of proportion to historical chronology. It is not convenient to discuss here Mr Prestwich's division of the drift gravels into high and low level beds, nor Mr A. Tylor's argument against this division, nor the latter's theory of a Pluvial period succeeding the Glacial period (see Quart. Journ. Geol. Soc., vol. xxiv. part 2, vol. xxv. part 1). The geology of the Quaternary or Post-tertiary gravels, on which the geological argument for the high antiquity of man mainly rests, has been especially treated by Prestwich in the Philos Trans., 1860, p. 277, and 1864, p. 247; see also J. Evans, Ancient Stone Impts., ch. 25; references to the writings of other geologists will be found in the already mentioned works of Lyell and Lubbock.

Beside these arguments, which suggest high antiquity rather than offer means of calculation, certain inferences (accounts of which are also given in the last-named works) have been tentatively made from the depth of mud, earth, peat, &c. which has accumulated above relics of human art imbedded in ancient times. Among these is Mr Horner's argument from the numerous borings made in the alluvium of the Nile valley to a depth of 60 feet, where down to the lowest level fragments of burnt brick and pottery were always found, showing that people advanced enough in the arts to bake brick and pottery have inhabited the valley during the long period required for the Nile inundations to deposit 60 feet of mud, at a rate probably not averaging more than a few inches in acentury. Another

argument is that of Professor von Morlot, based on a railway section through a conical accumulation of gravel and alluvium, which the torrent of the Tiniére has gradually built up where it enters the Lake of Geneva near Villeneuve. Here three layers of vegetable soil appear, proved by the objects imbedded in them to have been the successive surface-soils in two prehistoric periods and in the Roman _ period, and which now lie 4, 10, and 19 feet underground; on this it is computed that if 4 feet of soil were formed in the 1500 years since the Roman period, we must go 5000 years farther back for the date of the earliest human inhabi- tants. Calculations of this kind, loose as they are, deserve attention,

The interval between the Quaternary or Drift period and the period of historical antiquity is to some extent bridged over by relics of various intermediate civilisations, mostly of the lower grades, and in some cases reaching back to remote dates. The lake dwellings of Switzerland are perhaps among the more recent of these. They were villages of huts built on piles in the water at some distance from the shore, for security from attack —in fact, fortified water settlements of the same nature as those of Lake Prasias in the time of Herodotus, and as those still inhabited

in New Guinea and West Africa. Swiss villages are 4 ; standing, often imbedded in an accumulation of mud or growth of peat which has preserved a kind of illustrative museum of the arts and habits of the lake men. From examination of the sites, it appears that the settlements are of various dates, from the neolithic or polished stone period, when instruments of metal were still unknown, to the time when bronze was introduced, and beyond this ‘nto the later age marked by the use of iron. A few of the lake villages lasted on till the Roman dominion, as is proved by the presence of Roman coins and pottery, but they were soon afterwards abandoned, so that their very existence was forgotten, and their rediscovery only dates from 1853, when the workmen excavating a bed of mud on the shore of the Lake of Zurich found themselves standing among the piles of a lake settlement. In Germany, Italy, and other countries, similar remains of a long pre-Roman civilisation have been found. (The special works on lake habitations are Dr Keller’s Lake Dwellings, translated by J. E. Lee, London, 1866; and

Troyon's Habitations Lacus- tres). Indications of man's antiquity, extending farther back into prehistoric times, shell-heaps or " kjékkenmédding," "kitchen refuse-heap," has been Anglicised in "kitchen midden" (the word " midden," a dung-heap, being still current in the north of England). Along the shores of nearly all the Danish islands extensive beds or low mounds, like raised beaches, may be seen, consisting chiefly of innumerable cast-away shells, intermingled with bones, &c. Such shell- heaps are found in all quarters of the globe by the sea-shore, and may be sometimes seen in process of formation ; they are simply the accumulations of shells and refuse thrown away near the huts of rude tribes subsisting principally on shell-fish. The Danish kitchen middens, however, are proved to belong to a very ancient time, by the remains of the quadrupeds, birds, and fish, which served as the food of these rude hunters and fishers; among these are bones of the wild bull, beaver, seal, and great auk, all now extinct or rare in this region. Moreover, a striking proof of the antiquity of these shell-heaps is, that the shells of the common oyster are found of full size, whereas it cannot live at present in the brackish waters of the Baltic except near its entrance, so that it is inferred that the shores where the oyster at that time flourished were open to the salt sea. Thus, also, the eatable cockle, mussel, and periwinkle abounding in the kitchen middens are of full ocean size, whereas those now living in the adjoining waters are dwarfed to a third of their natural size by the want of saltness. It thus appears that the connection between the ocean and the Baltic has notably changed since the time of these rude stone-age people. (See the reports by Forch- hammer, Steenstrup, and Worsaae on the kjékkenméddings, made to the Copenhagen Academy of Sciences.) Various other evidence is adduced in this part of the argument, such as that from the Danish peat-mosses, which show the existence of man at a time when the Scotch fir was abundant; at a later period the firs were succeeded by oaks, which have again been almost superseded by beeches, a succession of changes which indicate a considerable lapse of time. For further references to special accounts, the reader may consult the already mentioned general works on the antiquity of prehistoric man.

Lastly, chronicles and documentary records, taken in connection with archzeological relics of the historical period, carry back into distant ages the starting-point of actual history, behind which lies the evidently vast period only known by inferences from the relations of languages and the stages of

development of civilisation. Thus, Egypt affords some basis for estimating a minimum date for its

The remains of these found with the stumps of the piles still

are furnished by the Danish Shell- which term, meaning heaps.

Historical — antiquity i

Time of develop- ment of culture and language.

AN tat O POL OG Y

ancient population. The hieroglyphie inscriptions, the most ancient written records of the world, preserve direct memorials of a time which can hardly be less, and may be much more, than 3000 years before the Christian era. With all the doubt which besets the attempt to extract a definite chronology from the Egyptian names of kings and lists of dynasties (see Ecypt), their salient points fit with the historical records of other nations. Thus, the great Ramesside dynasty, known among Egyptologists as the 19th dynasty, corresponds with the mention of the build- ing of the city of Raamses in Exod. i: 11; Amenophis TIL., called by the Greeks Memnon, belongs to the previous 18th dynasty; while the three pyramid kings, whom Herodotus mentions as Cheops, Chephren, and Mykerinos, and whose actual Egyptian names are read in the hiero- glyphic lists as Chufu, Chafra, and Menkaura, are set down in the 4th dynasty. Lepsius may not be over- estimating when he dates this dynasty back as far as 3124 B.c., and carries the more dubious previous dynasties back to 3892 B.c. before reaching what are known as the mythi- cal dynasties, which probably have their bases rather in astronomical calculations than in history (Lepsius, Kdnags- buch der alten dAigypter, Berlin, 1858 ; compare the com- putations of Brugsch, Bunsen, Hincks, Wilkinson, dc.)

The Greeks of the classic period could discuss the Egyptian chronologies with priests and scribes who per- petuated the languages and records of their earliest dynas- ties; and as the Septuagint translation of the Bible was made at Alexandria, it is not impossible that its giving to man a considerably greater antiquity than that of the Hebrew text may have been

due to the influence of the Egyp- tian chronology. Even if the lowest admissible calculations be taken, this will not invalidate the main fact, that above 4000 years ago the Egyptian nation already stood at a high level of industrial and social culture. The records of several other nations show that as early or not much later than this they had attained to a national civilisation. The Bible, whose earliest books are among the earliest existing chronicles, shows an Israelite nation existing in a state of patriarchal civilisation previous to the already mentioned time of contact with Egypt. In ancient Chaldea, the inscribed bricks of Urukh's temples probably belong to a date beyond 2000 years B.c. (G. Rawlinson, Hive Great Monarchies of the Ancient Eastern World, London, 1862, é&c., vol. i, ch. 8).

The Chinese dynasties, like those of Egypt, begin with an obviously mythical portion, and continue into actual history ; the difficulty is to draw the line where genuine re- eord begins. Those who reckon authentic history only from the dynasty of Chow, beginning about 1100 B.c., during which Confucius lived, will at any rate hardly deny the existence of the earlier dynasty of Shang, previous to which the yet earlier dynasty of Hea is recorded ; so that, though much that is related of these periods may be fabulous, it seems certain that there was a Chinese nation and a Chinese civilisation reaching back beyond 2000 B.c. (see Sir John Davis, The Chinese ; Pauthier, Livres Sacrés de (Orient ; Shu-King, &c.)

Till of late it was a commonly received opinion that the early state of society was one of comparatively high culture, and those who held this opinion felt no difficulty in assign- ing the origin of man to a time but little beyond the range of historical records and monuments. At present, how- ever, the view has become paramount that the civilisation of the world has been gradually developed from an original stone-age culture, such as characterises modern savage life. To hold this opinion necessitates the adding to the 4000 or 5000 years to which the ancient civilisations of Egypt, Babylon, and China date back, a probably much greater length of time, during which the knowledge,

arts, and institutions of these countries attained to their remarkably high level. The evidence of comparative philology corroborates this judgment.

Thus, Hebrew and Arabic are closely related languages, neither of them the original of the other, but both sprung from some parent language more ancient than either. When, therefore, the Hebrew records have carried back to the most ancient admissible date the existence of the Hebrew language, this date must have been long preceded by that of the extinct parent language of the whole Semitic family ; while this again was no doubt the descendant of languages slowly shaping themselves through ages into this peculiar type. Yet more striking is the evidence of the Aryan or Indo-European family of languages. The Hindus, Medes, Persians, Greeks, Romans, Germans, Kelts, and Slaves make their appearance at more or less remote dates as nations separate in language as in history. Nevertheless, it is now acknowledged that at some far remoter time, before these nations were divided from the parent stock, and distributed over Asia and Europe by the Aryan dis- persion, a single barbaric people stood as physical and politi- cal representative of the nascent Aryan race, speaking a now extinct Aryan language, from which, by a series of modifications not to be estimated as possible within many thousands of years, there arose languages which have been mutually unintelligible since the dawn of history, and between which it was only possible for an age of ad- vanced philology to trace the fundamental relationship.

From the combination of these considerations, it will be seen that the farthest date to which documentary record extends, is now generally regarded by anthropologists as but the earliest distinctly visible point of the historic period, beyond which stretches back a vast indefinite series of prehistoric ages.

V. Language.—In examining how the science of language Evidence of bears on the general problems of anthropology, it is not Philology.

necessary to discuss at length the critical questions which arise, the principal of which are considered elsewhere. (See Lancuacr.) Philology is especially appealed to by anthropologists as contributing to the following lines of argument. A primary mental similarity of all branches of the human race is evidenced by their common faculty of speech, while at the same time secondary diversities of race-character and history are marked by difference of grammatical structure and of vocabularies. The exist- ence of

groups or families of allied languages, each group being evidently descended from a single language, affords one of the principal aids in classifying nations and races. The adoption by one language of words originally belong- ing to another, proving as it does the fact of intercourse between two races, and even to some extent indicating the results of such intercourse, affords a valuable clue through obscure regions of the history of civilisation.

Communication by gesture-signs, between persons unable Faculty of to converse in vocal language, is an effective system of ex- language.

pression common to all mankind. Thus, the signs used to ask a deaf and dumb child about his meals and lessons, or to communicate with a savage met in the desert about game or enemies, belong to codes of gesture-signals identical in principle, and to a great extent independent both of nation- ality and education; there is even a natural syntax, or order of succession, in such gesture-signs. To these gestures let there be added the use of the interjectional cries, such as oh/ ugh/ hey/ and imitative sounds to represent the cat's mew, the click of a trigger, the clap or thud of a blow, &c. 'The total result of this combination of gesture and significant sound will be a general system of expression, imperfect but serviceable, and naturally intelligible to all mankind without distinction of race. Nor is such a system of communication only theoretically

Variety of language.

Difference of vocabu- lary and grammati- cal struc- ture.

conceivable ; it is, and always has been, in practical opera- tion between people ignorant of one another's language, and as such is largely used inthe intercourse of savage tribes. It is true that to some extent these means of utter- ance are common to the lower animals, the power of ex- pressing emotion by cries and tones extending far down in the scale of animal life, while rudimentary gesture-signs are made by various mammals and birds. Still, the lower animals make no approach to the human system of natural utterance by gesture-signs and emotional-imitative sounds, while the

practical identity of this human system among races physically so unlike as the Englishman and the native of the Australian bush, indicates extreme closeness of mental similarity throughout the human species. ;

When, however, the Englishman and the Australian speak each in his native tongue, only such words as belong to the interjectional and imitative classes will be naturally intelligible, and as it were instinctive to both. Thus the savage, uttering the sound waow/ as an explanation of sur- prise and warning, might be answered by the white man with the not less evidently significant sh / of silence, and the two speakers would be on common ground when the native indicated by the name bwirrt his cudgel, flung whirring through the air at a flock of birds, or when the native described as a jakkal-yakkal the bird called by the foreigner a cockatoo. With these, and other very limited classes of natural words, however, resemblance in vocabulary practically ceases. The Australian and English languages each consist mainly of a series of words having no apparent connection with the ideas they signify, and differing utterly ; of course, accidental coincidences and borrowed words must be excluded from such comparisons. It would be easy to enumerate other Janguages of the world, such as Basque, Turkish, Hebrew, Malay, Mexican, all devoid of traceable resemblance to Australian and English, and to one another. There is, moreover, extreme difference in the grammatical structure both of words and sentences in vari- ous languages. The question then arises, how far the employment of different vocabularies, and that to a great extent on different grammatical principles, is compatible with similarity of the speakers' minds, or how far does diversity of speech indicate diversity of mental nature? The obvious answer is, that the power of using words as signs to express thoughts with which their sound does not directly connect them, in fact as arbitrary symbols, is the highest grade of the special human faculty in language, the presence of which binds together all races of mankind in substantial mental unity. The measure of this unity is, that any child of any race can be brought up to speak the language of any other race.

To ascertain the causes to which languages owe their unlikeness in material and structure, how far to essential differences of mental type among the races of mankind, and how far to minor causes of variation, which may be called secondary, is a problem of extreme difficulty, towards the precise

solution of which little has yet been done.- One of the most remarkable of linguistic differences is the ten- dency of some languages to isolate their words, and of others to form elaborate inflexions. The extremes may be seen, on the one hand, in an ordinary Chinese sentence of isolated monosyllables, such as “yu tsze nien chiu tsin, tung chu,” &c., t.e., “in this year autumn ended, winter begun,” &c.; and, on the other hand, in one of the mon- strous polysyllables into which the Greenlanders will agglutinate a whole phrase, inzlertorniarpatdlisargérpd, t.e., “he will probably try too much to get it done soon.” Among languages which form grammatical combinations or inflexions, the modes of so doing are as various as possible. Thus, in Africa, the Hottentot noun forms its plural by a suffix, as khoz, “man ;” khown, “men;” while the

Zulu employs prefixes to distinguish its numbers, as wmu-ntu, “a man;” aba-ntu, “men.” The Dinka may supply examples of forming the plural by internal change, van, ‘“‘man;” ror, ‘“‘men.” Nor are the differences of syntax in different tongues less absolute. In non-inflecting languages one of the most vital points is the relative position of two nouns, of which the one stands as substantive, and the other as defining it by an attribute. This may be illustrated by English com pounds, such as work-house and house-work. Here our rule is to place the attribute-noun first, while, of two neighbour- ing languages of Asia, the Burmese and the Siamese, the one settles this question in our way, the other in exactly the opposite. The Siamese expression for sailors, luk rua, means “sons of the ship,” just as the Burmese expression for villagers, rwa tha, means “children of the village ;” but in the first case the construction is “sons ship,” whereas in the second it is ‘‘village children.” Again, for reasons not yet fully explained, some languages place the adjective before the substantive, as Chinese pe ma, “white horse ;” while other languages reverse this construction, as Maori, rakaw roa, “tree long” (z.e., tall tree). These are but examples of possible divergences in linguistic structure, and no prudent ethnologist would assert that racial peculiarities have nothing to do with such various tendencies. At the same time, there is no proof but that they may have resulted from historical cir- cumstances more or less independently of race. Our own Aryan family of nations and languages affords what must always be

prominent evidence in this argument. It is acknowledged that Sanskrit, Russian, Greek, Latin, Welsh, English, &c., are, philologically speaking, dialects of a single Aryan speech, which no doubt at some ancient period was spoken by a single tribe or nation. Yet the languages sprung from this original Aryan tongue, by various courses of development and accretion, are mutually unintelligible. If a Greek sentence be taken at random, such as this, “Od xp” ravvixtov eddew Bovrypdpov dvSpa,” and it be translated even too verbally into English, “ A counsel-bearing man ought not to sleep all night,” the traces of linguistic con- nection between the Greek and English words (phoros, bear; nux, night) are hardly perceptible except to philo- logists. Even the essential character of the two languages is seen to be different, for the construction of the Greek sentence depends mainly on the inflexions of the words, while in English such inflexions are almost discarded, and their effect is produced by the syntax and the auxiliary particles. Moreover, as to some most important points of syntax, Aryan languages differ widely from one another ; thus, to use a familiar instance, French and English take contradictory lines as to the relative position of the adjec- tive and substantive, as also of the object-pronoun and verb,—“ c’est un cheval blanc, je le vois,” “it is a white horse, I see him.” So Hindustani and English, though both Aryan tongues, reverse the positions of the verb and object, as “ghora lao” (“horse bring”), «.¢., “bring the horse !” Thus on the whole, the endless variety in vocabu- lary and structure among the languages of the world affords important evidence as to the mental diversities of the nations speaking those languages. But the unity of the faculty of speech in man stands as the primary fact, while the character of the grammar and dictionary belong- ing to any one nation represents only a secondary fact, such as might be fairly set down as resulting from their parti- cular stage and circumstances of linguistic development. ~

The principles of the development of a family of lan Families of guages from a single parent tongue are laid down elsewhere. languages

(See Lancuacr.) It has here to be noticed that the evidence on which such linguistic groups may be treated as allied by descent is of various degrees of fulness and strength. The most perfect available case is that of the

Romance languages, coniprising Italian, Spanish, French, &c.; inasmuch as not only does the classic Latin remain substantially the representative of their common original, but the very stages of their development from it are pre- served in documents of successive ages. Thus, in compar- ing the vocabularies of Italian and French, it is, in the first place, seen that they to a great extent correspond,— this correspondence extending to words which one lan- guage is least likely to borrow from another, viz., pronouns, the lower numerals, and names of the most universal and familiar objects. It is only, however, by etymological analysis that their depth of correspondence comes fully into view, it being seen that the ultimate elements or roots are largely common to the two languages, as are also the grammatical affixes by which words are formed from these roots, while general similarity of linguistic structure per- vades both tongues. Such intimate correspondence could only result from derivation from a common parent lan- guage, which in this case exists in Latin. In other groups of languages the existence of the common parent may be inferred from correspondence of this highest order. Thus there must have existed, at some period, what may be called the parent Slavonic, whence descend the Russian, Polish, Bohemian, é&c. ; and the parent Keltic, whence descend Welsh, Gaelic, Breton, &c., while behind the various branches of the whole Aryan family are dimly to be dis- cerned the outlines of a primitive Aryan speech. In like manner, a comparison of the Arabic, Hebrew, Syriac, c&c., shows that these must be all derived from a primitive Semitic speech, containing many of the simple root forms, which still exist in its modern descendants, and being already characterised by the principle of internal inflexion. Beyond the limits of these two, the most important lin- guistic families, various others have been satisfactorily made out, though hardly with the same completeness of proof. In the Turanian or Tatar family are included the Turkish, Mongol, Hungarian, Finnish, Ostyak, &.; the Dravidian family takes in the Tamil, Telugu, and various other South Indian dialects ; the Polynesian family comprises the lan- guages of the higher race of the South Sea Islands; the Negro-Kafir family consists of the prefixing languages spoken by most African tribes from the equatorial regions southward ; the Guarani family in South America, the Algonquin and Athapascan families in North America, and the Australian family, each includes a number of tribes ranging over a vast extent of territory, and so on. As to smaller divisions, it is common for languages to occur in groups of several connected dialects, though not forming part of one of the wider

linguistic families ; thus the Aztec and Nicaraguan are.closely related dialects, as are the Quichua and Aymara, while what philologists describe as isolated languages, as the Basque appears to be, are rather isolated groups of dialects, with no known analogues beyond a limited district.

If the present state of the philological classification of mankind be compared with that of half a century ago, it will be seen that much progress has been made in referring groups of languages each to a common ancestral tongue. At the same time, greater cogency of proof is now de- manded in such classification. “The method of comparing a short vocabulary of twenty words or so in two languages is now abandoned, for where an extensive connection really exists, this is much better proved by a systematic com- parison, while a few imperfect resemblances in the two lists might be due to accident, or the adoption of words. Nothing short of a similarity in the roots or elements of two languages, as well as in their grammatical structure, too strong to be explained by any independent causes, is now admitted as valid proof of common descent. This limitation, however, by no means amounts to a denial of

the possibility of such descent. Thus it is often argued, on the strength of some similarities between Hebrew and Indo-European roots, that the two so distinct Semitic and Aryan families of language are themselves sprung from some yet more remotely ancient tongue. Thus also it has been attempted to connect the Malay and Tatar groups of languages. Either or both of these opinions may be true ; but the general verdict of philologists is, that they are not satisfactorily made out, and therefore cannot be recognised.

Under the present standard of evidence in comparing Primitive languages and tracing allied groups to a common origin, languages.

the crude speculations as to a single primeval language of mankind, which formerly occupied so much attention, are acknowledged to be worthless. Increased knowledge and accuracy of method have as yet only left the way open to the most widely divergent suppositions. For all that known dialects prove to the contrary, on the other hand, there may have been one primitive language, from which the descendant languages have varied so widely, that

neither their words nor their formation now indicate their unity in long past ages, while, on the other hand, the primitive tongues of mankind may have been numerous, and the extreme unlikeness of such languages as Basque, Chinese, Peruvian, Hottentot, and Sanskrit, may arise from absolute independence of origin.

The language spoken by any tribe or nation is not of Language This is 2nd race

itself absolute evidence as to its race-affinities. clearly shown in extreme cases. Thus the Jews in Europe have almost lost the use of Hebrew, but speak as their vernacular the language of their adopted nation, whatever it may be; even the Jewish-German dialect, though con- sisting so largely of Hebrew words, is philologically German, as any sentence shows: “ Ich hab noch hojom lo geachelt,” “‘T have not yet eaten to-day.” The mixture of the Israel- ites in Europe by marriage with other nations is probably much greater than is acknowledged by them; yet, on the whole, the race has been preserved with extraordinary strictness, as its physical characteristics sufficiently show. Language thus here fails conspicuously as a test of race, and even of national history. Not much less conclusive is the case of the predominantly Negro populations of the West India Islands, who, nevertheless, speak as their native tongues dialects of English or French, in which the number of intermingled native African words is very scanty: “Dem htt nette na ini watra bikasi dem de fisiman,” “ They cast a net into the water, because they were fishermen.” (Surinam Negro-Eng.) “Bef pas ca jamain lasse poter cdnes li,” “ Le boeuf n’est jamais las de porter ses cornes,.” (Haytian Negro-Fr.) If it be objected that the linguistic conditions of these two races are more artificial than has been usual in the history of the world, less extreme cases may be seen in countries where the ordinary results of conquest-colonisation have taken place. The Mestizos, who form so large a fraction of the population of modern Mexico, numbering several millions, afford a convenient test in this respect, inasmuch as their intermediate com- plexion separates them from both their ancestral races, the Spaniard, and the chocolate-brown indigenous Aztec, or other Mexican. The mother-tongue of this mixed race is Spanish, with an infusion of Mexican words 3 and a large proportion cannot speak any native dialect. In most or all nations of mankind, crossing or intermarriage of races has thus

taken place between the conquering invader and the conquered native, so that the language spoken by the nation may represent the results of conquest as much or more than of ancestry. The supersession of the Keltic Cornish by English, and of the Slavonic Old-Prussian by German, are but examples of a process which has for un- told ages been supplanting native dialects, whose very names have mostly disappeared. On the other hand, the

language of

the population, as the Northman’s was replaced by French,

and modern German gives way to English in the United Judging, then, by the extirpation and adoption of

States. languages within the range of history, it is obvious that to classify mankind into races, Aryan, Semitic, Turanian, Polynesian, Kafir, &c., on the mere evidence of language, is an intrinsically unsound method. From the earliest times in which nations have been classified by languages, its unrestricted use has. vitiated sound ethnology.

Nevertheless, under proper restrictions, speech affords ‘nformation as to the affinities of races only second in value to that derived from physical characteristics. As a rule, language at least proves some proportion of ancestry. Tt could hardly happen that one people should come into so close a relation to another as to supplant its language, without strong intermixture of race in the next genera- tion. ‘This is true in the extreme case of the West Indian coloured population, among whom the majority are now crossed with European blood, so that in each succeeding generation the proportion of absolutely pure Negro families becomes less. Still more fully is it true of coloured races in Mexico or Brazil, whose Spanish or Portuguese language represents at least a large European element of ancestry. Thus in India many millions of people, whose blood is predominantly that of the darker indigenous race, never- theless speak dialects of the languages of the fairer Aryans; but then they are for the most part distinctly mixed races of partly Aryan ancestry. With these facts before us, it is not difficult to determine the principles on which the ethnologist may use language as partial evidence of race. In the first place, it strengthens the evidence of bodily characters. Thus in South Africa the Zulu seems by colour, features, shape of skull, &c., to be, if not an abso- lute Negro, of a mixed and modified Negro type. This view of his origin is strengthened by the fact that the Zulu language belongs to the peculiar prefixing family which extends so widely among the Negro nations farther north. So the Hottentot language, in its evident connec- tion with that of the Bushmen, adds its weight to the physical arguinent, that these two are descendants more or less mixed and varied from a single race, small, yellow, crisp-haired, and speaking an inflectional monosyllabic language, articulated with clicks. In the second place, language may prove race-connection where bodily character- istics, though they do not contradict, do not suffice. Thus, comparing the dark Andalusian with the fair Swede, we ask the question, whether there is distinguishable common parentage between these two varieties of the white

man 1? The anatomist might hesitate here. Nor, indeed, is the physical problem nearly solved, but at least a partial solution is involved in the philologist's proof that the two peoples speak languages inherited at some remote period from a common Aryan tongue, and must therefore have had a common element in their ancestry of at least suffi- cient strength to carry language with it. Thus each linguistic family affords at least partial evidence of race, proving, for instance, the existence of a common ancestry of the Irishman and the Russian, of the Jew and the Maltese, of the Tahitian and the Malagasy, though in such pairs of races the actual amount of common ancestry may be less than that of the different race-elements with which it has combined.

As regards political nationality and the history of civili- sation, the evidence of speech is of still greater weight. In many cases of the mixture of .nations the language of the dominant civilisation prevails, as where Latin dialects superseded the native tongues in Western Europe, and Germanic languages encroached on Turanian in Finland,

the warlike invader or peaceful immigrant may yield, in a few generations, to the tongue of the mass of

'of foreign influence

investigated with accurately-studied tribes are in some respects inferior even to these.

on Slavonic in Russia, and on Keltic in the Scotch High- lands. In other cases, where one nation has received elements of civilisation from another, language is apt to keep record of the process by adopting foreign words and ideas together. Thus the language of the barbarian Turks has absorbed masses of Arabic, which itself had in like manner absorbed Persian, when Persia was the fountain- head of early Moslem culture. In the same manner Dravidian languages of South India have been saturated with words and phrases from Sanskrit and its related dialects, so that a page of Tamil literature is of itself the proof of a non-Aryan race having received from an Aryan race a whole system of religion, philosophy, and social order. 'The

most extreme cases of such verbal indication are to be found in languages of low races of America and the Pacific, which have adopted from European languages not only terms for imported arts aud ideas, but names of such numerals as 6 and 7, pre- viously expressed by more clumsy native combinations. Thus the language of any people, though less effective than was once believed as a means of determining its place in the classified order of mankind, does, to some extent, indicate its physical, and, to a still greater extent, its in- tellectual ancestry.

VI. Development of Civilisation.—The conditions of man Stages of known levels of culture are “ivilisation

at the lowest and highest separated by a vast interval; but this interval is so nearly filled by known intermediate stages, that the line of con- tinuity between the lowest savagery and the highest civilisation is unbroken at any critical point. The Austra- lians and forest Indians of Brazil may be taken as the lowest modern savages whose thought and life have been any thoroughness; while other less

An examination of the details of savage life shows uot only that there is an immeasurable difference

between the rudest man and the highest lower animal, but also that the least cultured savages have themselves advanced far beyond the lowest intellectual and moral

state at which human tribes can be conceived as capable of existing, when placed under favourable circumstances of

warm climate, abundant food, and security from too severe

destructive influences. In fact, the Australian or Brazilian savage has already attained to rudimentary stages In many of the characteristic functions of civilised life. His lan- guage, expressing thoughts by conventional articulate sounds, is the same in essential principle as the most cultivated philosophic dialect, only less exact and copious. His weapons, tools, and other appliances, such as the hammer, hatchet, spear, knife, awl, thread, net, canoe, &c., are the evident rudimentary analogues of what still

remains in use among Europeans. His structures, such as the hut, fence, stockade, earthwork, &c., may be poor and clumsy, but they are of the same nature as our Own. In the simple arts of broiling and roasting meat, the use of hides and furs for covering, the plaiting of mats and baskets, the devices of hunting, trapping, and fishing, the pleasure taken in personal ornament, the touches of artistic decora- tion on objects of daily use, the savage differs in degree but not in kind from the civilised man. The domestic and social affections, the kindly care of the young and the old, some acknowledgment of marital and parental obliga- tion, the duty of mutual defence in the tribe, the authority of the elders, and general respect to traditional custom as the regulator of life and duty, are more or less well marked in every savage tribe which is not disorganised and falling to pieces. Lastly, there is usually to be discerned amongst such lower races a belief in unseen powers pervading the universe, this belief shaping itself imto an animistic or spiritualistic theology, mostly resulting in some kind of

worship. If, again, high savage or low barbaric types be selected, as among the North American Indians, Polyne- sians, aud Kafirs of South Africa, the same elements of cul- ture appear, but at a more advanced stage, namely, a more full and accurate language, more knowledge of the laws of nature, more serviceable implements, more perfect industrial processes, more definite and fixed social order and frame of government, more systematic and philosophic schemes of religion, and a more elaborate and ceremonial worship. At intervals new arts and ideas appear, such as agriculture and pasturage, the manufacture of pottery, the use of metal implements, and the device of record and communi- cation by picture-writing. Along such stages of improve- ment and invention the bridge is fairly made between savage and barbaric culture; and this once attained to, the remainder of the series of stages of civilisation lies within the range of common knowledge.

The teaching of history, during the three to four thousand years of which contemporary chronicles have been pre- served, is that civilisation is gradually developed in the course of ages by enlargement and increased precision of knowledge, invention and improvement of arts, and the progression of social and political habits and institutions towards general

well-being. The conditions of such races as the older Jews, Greeks, and Germans, are known to us by ancient chronicles, and by poetry and myth even more valuable than chronicle in the details they unconsciously preserve of the state of society at the time whence they have been handed down. Starting from the recorded con- dition of such barbaric nations, and following the general course of culture into the modern world, all the great processes of mental and social development may be seen at work, Falling back or decay also takes place, but only to a limited extent destroys the results of growth in culture. It is thus matter of actual record, that the ancestors of civilised nations were barbaric tribes, and the inference seems reasonable that the same process of development had gone on during previous ages outside the domain of direct history, so that barbaric culture itself arose out of an earlier and ruder condition of primitive culture, more or less corresponding with the state of modern savage tribes. The failure of direct record of this passage from savagery upward to barbarism was to be expected from the circumstances of the case. No people civilised enough to preserve history could have watched the age-long process of a savage tribe developing its culture; indeed, experience shows that independent progress could hardly have taken place among an uncivilised in contact with a civilised race. Nor could a barbaric nation, though it had really and independently risen from savagery within some few thou- sand years, give any valid account of this gradual advance- ment, for the very reason of its having taken place while the nation was yet in, or but little removed from, the savage state, one part of the very definition of which is that it has no trustworthy means of preserving the history of events even for a single century, much less for the long period required for so vast a development. This view of the low origin and progressive development of civilisation was already held in ancient times, as in the well-known speculations of the Epicurean school on the condition of the earliest men, who roved like wild animals, seeking their food from the uncultured earth, till arts and social laws arose among them (Lucret., De Rerum Nat., v. 923; Horat., Sat., i. 3); or where the like idea has taken in China the form of ancient legend, recording the time when their nation was taught to use skins for clothing, to make fire, and to dwell in houses (Pauthier, Livres Sacrés de ?Orient, p. 26). In opposition to such views of primeval rudeness, traditions of a pristine state of human excellence have loug been cherished, such as the “golden age”

(Hesiod., Op. et Dies, 108). Till of late wide acceptance has been given to arguments, partly based on theological and partly on anthropological grounds, as to man's incapa- bility of rising from a savage state, and the consequent necessity of a supernatural bestowal of culture on the first men, from whose high level savages are supposed by advo- cates of this theory to have degenerated. The anthropo- logical evidence adduced in support of this doctrine is, however, too weak for citation, and even obviously erro- neous arguments have been relied on (see, for example, Archbishop Whately, Hssay on the Origin of Civilisation, and remarks on its evidence in Tylor, Harly Hist. of Man., p. 163). It has been especially the evidence of pre- historic archeology which, within the last few years, has given to the natural development-theory of civilisation a predominance hardly disputed on anthropological grounds. The stone implements, which form the staple proof of man's existence at the period of the river-drift, are of extreme rudeness as compared even with ordinary savage types, so that it is obvious that the most ancient known tribes were, as to the industrial arts, at a low savage level. The remains in the caverns justify this opinion, especially where in central France more precision is given to the idea of prehistoric life by the discovery of bone weapons for hunting and fishing, which suggest a rude condition resembling that of the Esquimaux (see the preceding section IV., Antiquity of Man). The finding of ancient stone implements buried in the ground in almost every habitable district of the world, including the seats of the great ancient civilisations, such as Egypt, Assyria, India, China, Greece, &c., may be adduced to show that the inhabitants of these regions had at some time belonged to the stone age. This argument goes far to prove that the ancestors of all nations, high and low, were once in that uncultured condition as to knowledge, arts, and manners generally, which within our experience accompanies the use of stone implements and the want of metals. No valid refutation of this reasoning has been offered, and it is corroborated by arguments to be drawn from study of the facts of civilisation, of which some will be here mentioned for their bearing on the theory of development. History shows how development of the arts takes place by efforts of skill and insight, as where Phidias rose above the clumsier sculptors of the time before him, or where the earliest gnomon—a mere staff set up in order to have its shadow

measured—passed into the graduated sun-dial ; or adaptations of old contrivances produce new results, as when the ancient Pan's pipes, blown by a bellows, became the organ, when the earlier block-printing led up to the use of movable types, and when the magnetic-needle was taken out of the mariner's compass to find a new office on the telegraph-dial; or lastly, more absolutely original inventions arise, the triumphs of the scientific imagina- tion, such as the pendulum and the steam-engine. In the evolution of science the new knowledge ever starts from the old, whether its results be to improve, to shift, or to supersede it. The history of astronomy extends far enough back to show its barbaric stages, when the earth was regarded as a flat surface, over-arched by a solid dome or firmament ; and when not only was the sun considered to move round the earth, but its motions, as well as the moon's, were referred to the guidance and even the impulse of personal deities, Beginning with this first stage of the science, there lies before us the whole record of the exacter observation and closer reasoning which have gradually replaced these childlike savage conceptions by the most perfect of physical theories. Thus, again, the history of medicine shows improvement after improvement on the rude surgical appliances and the meagre list of efficient drugs which the barbaric leech had at his en I a

Historic develop- ment of culture.

ewhile its theory has changed even more absolutely than

Prehistoric develop- ment of culture,

Survival in culture.

its practice ; for medical history begins with the ancient world holding fast to the savage doctrine that madness, epilepsy, fever, and other diseases, are caused by demons possessing the patient—a belief which is still that of half the human race, but which it has been the slow but success- ful task of scientific pathology to supersede in the civilised world, In like manner, the history of judicial and admini- strative institutions may be appealed to for illustrations of the modes in which old social formations are reshaped to meet new requirements, new regulations are made, and new officers are

constituted to perform the more complex duties of moder society, while from time to time institu- tions of past ages, which have lost their original purpose, and become obsolete or hurtful, are swept away.

That processes of development similar to these had already been effective to raise culture from the savage to the barbaric level, two considerations especially tend to prove. First, there are numerous points in the culture even of rude races which are not explicable otherwise than on the theory of development. Thus, though difficult or superfluous arts may easily be lost, it is hard to imagine the abandonment of contrivances of practical daily utility, where little skill is required, and materials are easily accessible. Had the Australians or New Zealanders, for instance, ever possessed the potter's art, they could hardly have forgotten it. The inference that these tribes repre- sent the stage of culture before the invention of pottery is confirmed by the absence of buried fragments of pottery in the districts they inhabit (Lubbock, in Report of British Association, Dundee, 1867, p. 121). The same races who were found making thread by the laborious process of twisting with the hand, would hardly have disused, if they had ever possessed it, so simple a labour-saving device as the spindle, which consists merely of a small stick weighted at one end ; the spindle may, accordingly, be regarded as an instrument invented somewhere between the lowest and highest savage levels (Tylor, Zarly ist. of Mankind, p. 193). Again, many devices of civilisation bear unmis- takable marks of derivation from a lower source; thus the ancient Egyptian and Assyrian harps, which differ from ours in having no front pillar, appear certainly to owe this remarkable defect to having grown up through intermediate forms from the simple strung bow, the still used type of the most primitive stringed instrument (Engel, Music of the most Ancient Natuns, pp. 17, 30). In this way the history of numeral words furnishes actual proof of that independent intellectual progress among savage tribes which some writers have rashly denied. Such words as hand, hands, foot, man, &c., are used as numerals signifying 5, 10, 15, 20, &c., among many savage and barbaric peoples; thus Polynesian lima, 1.e., "hand," means 5; Zulu, tatisitupa, te, "taking the thumb," means 6; Greenlandish, arfersanek-pingasut, 2.¢., "on the other foot three," means 18; Tamanac, tevin ttoto, i.e, "one man," means 20, &c., &e. The existence of such expressions demonstrates that the people who use them had originally no spoken names for these num- bers, but once merely counted

them by gesture on their fingers and toes in low savage fashion, till they obtained higher numerals by the inventive process of describing in words these counting-gestures (Tylor, in Journal Royal Inst., March 15, 1867 ; Primitive Culture, chap. vii.) Second, the process of “survival in culture” has caused the preservation in each stage of society of phenomena belonging to an earlier period, but kept up by force of custom into the later, thus supplying evidence of the modern condition being derived from the ancient. Thus the mitre over an English bishop’s coat-of-arms is a survival which indicates him as the successor of bishops

who actually wore mitres, while armorial bearings them- selves, and the whole craft of heraldry, are survivals bearing record of a state of warfare and social order whence our present state was by vast modification evolved. Evidence of this class, proving the derivation of modern civilisation, not only from ancient barbarism, but beyond this, from primeval savagery, is immensely plentiful, especially in rites and ceremonies, where the survival of ancient habits is peculiarly favoured. Thus the modern Hindu, though using civilised means for lighting his household fire, retains the savage “fire-drill” for obtaining fire by friction of wood when what he considers pure or sacred fire has to be produced for sacrificial purposes ; while in Europe into modern times the same primitive process has been kept up in producing the sacred and magica “need-fire,” which was lighted to deliver cattle from a murrain. Again, the funeral offerings of food, clothing, weapons, &c., to the dead are absolutely intelligible and purposeful among savage races, who believe that the souls of the departed are ethereal beings, capable of consuming food, and of receiving and using the souls or phantoms of any objects sacrificed for their use. The primitive philosophy to which these conceptions belong has to a great degree been discredited by modern science ; yet the clear survivals of such ancient and savage rites may still be seen in Europe, where the Bretons leave the remains of the All Souls’ supper on the table for the ghosts of the dead kinsfolk to partake of, and Russian peasants set out cakes for the ancestral manes on the ledge which supports the holy pictures, and make dough ladders to assist the ghosts of the dead to ascend out of their graves and start on their journey for the future world ; while other provision for the same spiritual journey is

made when the coin is still put in the hand of the corpse at an Irish wake. In like manner magic still exists in the civilised world as a survival from the savage and barbaric times to which it originally belongs, and in which is found the natural source and proper home of utterly savage practices still carried on by ignorant peasants in our own country, such as taking omens from the cries of animals, or bewitching an enemy by sticking full of pins and hanging up to shrivel in the smoke an image or other object, that similar destruction may fall on the hated person represented by the symbol (Tylor, Primitive Culture, chap. i., iii, iv., xi, xii; Early Hist. of Man, chap. vi.)

To conclude, the comparative science of civilisation thus General not only generalises the data of history, but supplements lines of d its information by laying down the lines of development velour along which the lowest prehistoric culture has gradually risen to the highest modern level. Among the most clearly inarked of these lines is that which follows the succession of the stone, bronze, and iron ages. The stone age represents the early condition of mankind in general, and has remained in savage districts up to modern times, while the introduction of metals need not at once supersede the use of the old stone hatchets and arrows, which have often long continued in dwindling survival by the side of the new bronze and even iron ones. The bronze age had its most important place among ancient nations of Asia and Europe, and among them was only succeeded after many centurics by the iron age; while in other districts, such as Polynesia and Central and South Africa, and America (except Mexico and Peru), the native tribes were moved directly from the stone to the iron age without passing through the bronze age atall. Although the three divisions of savage, barbaric, and civilised man do not correspond at all perfectly with the stone, bronze, and iron ages, the classification of civilisation thus introduced by Nilsson and Thomsen has proved a guide of extraordinary value in arranging in their proper order of culture the nations of the Old World. Another great

line of progress has been followed by tribes passing from the primitive state of the wild hunter, fisher, and fruit- gatherer to that of the settled tiller of the soil, for to this change of habit may be plainly in great part traced the expansion of industrial arts and the creation of higher social and political

institutions. These, again, have fol- lowed their proper lines along the course of time. Among such are the immense legal development by which the primitive law of personal vengeance passed gradually away, leaving but a few surviving relics in the modern civilised world, and being replaced by the higher doctrine that crime is an offence against society, to be repressed for the public good. Another vast social change has been that from the patriarchal condition, in which the unit is the family under the despotic rule of its head, to the systems in which individuals make up a society whose government is centralised in a chief or king. In the growth of systematic civilisation, the art of writing has had an influ- ence so intense, that of all tests to distinguish the barbaric

ANTHROPOMORPHISM isa term used in theological writings to denote the figure by which words expressing human organs and activities are applied to the divine Being ; in short, it is the conception and representation of God as possessed of corporeal and human properties.

Originally and literally the word implied only the ascrib- ;

ing to God a physical form resembling the human body, and consequently included under it all forms of expression which attribute to Him the exercise of physical organs and senses. But its meaning was soon extended so as to comprehend all representations of God which require Him either to be in himself corporeally extended, or to possess a corporeal body as the necessary condition of His activity. In this wider sense all theories were designated anthro- pomorphic, which identified God with light or the physical universe, or which placed alongside of Him a primeval, uncreated matter,

Primitive ideas of God are necessarily framed by man from the analogy of his own nature. He is, however, able to represent God to himself under the analogy of his mental or spiritual, as well as under that of his material nature. This more refined form was called anthropo- pathism, and is that mode of contemplating the divine attributes founded on the analogy of God to the human spirit All forms of expression which ascribe to God passions, intelligence, or volition, rest ultimately upon this supposed analogy. In modern theology and philosophy, it is this mode of thought that usually receives the name of anthropomorphism.

Anthropomorphism is inseparable from early religion. The first dim intuition of God as the ruler of the universe, on whom we depend, cannot at an early time be seized in all its purity by reason. Sense and imagination are developed before reason, and in semi-barbarous intelli- gences completely overbalance it. The object of their faith is not God himself, but God as manifested in nature and history. Itis only through ideas derived from sensible objects and elevated by the imagination that man can clothe his primitive thought of God with attributes that enable him to realise it, to bring it home to himself. He must represent God as in all respects like himself, superior only in power. The very words by which alone he can give expression to the first workings of his consciousness of God carry with them a sensible meaning, and hence react powerfully on the development of his belief. They imperceptibly fix attention upon the physical facts involved in them, and their merely symbolic use is forgotten. Hence arise myths. Even among peoples in whom the

from the civilised state, none is so generally effective as this, whether they have but the failing link with the past which mere memory furnishes, or can have recourse to written records of past history and written constitutions of present order. Lastly, still following the main lines of human culture, the primitive germs of religious institutions have to be traced in the childish faith and rude rites of savage life, and thence followed in their expansion into the vast systems administered by patriarchs and priests, henceforth taking under their charge the precepts of morality, and enforcing them under divine sanction, while also exercising in political life an authority beside or above the civil law. These illustrations may suffice to make it clear that although the science of culture is still but rudimentary and imperfect, it indicates the one sound and indispensable method for the study of human arts and institutions, that of placing each at its proper stage in a line of evolution, and explaining it by the action of new conditions upon the previous stage whence it was derived. (z. B. T.)

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growth of the religious consciousness was extraordinarily favoured, strong traces of anthropomorphism are to be found. In the Hebrew literature there

is a prevailing anthropomorphic idea of God. He is represented as seeing, hearing, smelling; as having a visible, corporeal presence; as hating, loving, and repenting. Although the pure idea of God as a spirit, as the very essence of being, is distinctly recognised and insisted upon by the prophets and lawgivers, the people demandcd a visible symbol, a sensible emblem of their faith. Great part of the cere- monial law is taken up with the attempt to reconcile this desire for visible symbol with the purer requirements of their faith, Christian thought freed itself completely from the yoke of this crude anthropomorphism by its fundamental axiom that God is a spirit. Theology since then has had to steer its course with care between two opposite tendencies: one striving to attain to a living per- sonal community with God through Christ, and thereby running the risk of introducing foreign elements into the idea of God; the other, from undue fear of anthropo- morphism, tending to reduce the idea of God to a blank negation, a substance without qualities. In the history of the church these tendencies appeared at a very early period. In the Clementine homilies, but particularly in Tertullian (see Adv. Praxean, c. vii.; De Carne Christa, ce. xi.) there is distinct anthropomorphism. Tertullian declares that nothing can have real being that is not extended, corporeal; God, therefore, he seems to identify with an ethereal being of light. An example of the finer form in which human affections are ascribed to God may be found in Lactantius (De Ira Dei, ¢. ii.) The Alex- andrian theologians, from their philosophical training, were specially opposed to anthropomorphism, but in their hands the danger of the opposite tendency is seen. According to some of them, we know God only by negation,—we know what He is not, not what He is. Others (¢g., Irenzus, Novatian) declare that all the predicates of God are only in image; and that, from the finitude of our minds, we must use terms expressing not God’s nature, but our own ignorance. Phrases in Scripture which seemed to be anthropomorphic were explained by the Fathers as revela- tions of God in such a way as to be intelligible to us. This revelation was called (see Chrysostom, Hom. iii. c. 3) con- descension or divine economy.

The church itself was not free from anthropomorphism of the crudest type. In the 2d century Melito, bishop of Sardis, wrote a book concerning the corporeity of God; and in the 4th century Audeus, in Mesopotamia, held

similar views, and had many followers.

is completely philosophical. ceased to concern itself with this very question. phanes mocked the anthropomorphism of his countrymen ;

‘Aristotle denied to the gods ethical virtue and the posses- sion of emotions or passions; he allowed to them only a life The Epicureans thought the

of intellectual speculation. gods lived in complete quiescence, and concerned themselves not at all with the affairs of men (see Lucretius, 1. 646). Philo exhibits very strongly the tendency to reduce the

Deity to a lifeless abstraction, whose attributes are only

negatively known. In modern philosophy, Descartes attempted to settle the problem, by affirming that any attributes in us which involve limitation or imperfection cannot be ascribed to God, but that attributes which do not imply imperfection can be predicated of Him. Spinoza is one of the strongest opponents of any form of anthre- pomorphism, and from him the modern aspect of the question may be said to proceed. He brought clearly to light the fundamental difficulty, the reconciliation of the infinite and absolute nature of God with any attribute whatsoever; for attribute, as such, implies negation, 7.¢., limitation. Spinoza dismisses as anthropomorphic the idea of God as an intelligence, as free to act, and as ruling the world, and thus destroys the ideas of design in nature and of providence. The consequences of this theory on questions relating to the personality of God, miracles, prayer, &c., have been worked out very fully in the most recent times.

Thus the real problem at the root of the question as to the legitimacy of anthropomorphic modes of thought, is the philosophical one of the limits of human intelligence, of the relation between the divine thought in itself and in nature and human intelligence. A long line of philosophic thinkers affirm the impossibility of human intelligence penetrating the nature of the divine, and point out our inability to solve the many contradictions which arise in the attempt to do so. According to them, we can only think of God by analogy; our ideas of Him must be anthro- pomorphic, but they are at the

same time known to be entirely symbolical. The best known representatives of this mode of thought are Bishop Browne and the late Dean Mansel.

ANTIBES, a seaport town of France, on the Mediter- ranean, in the arrondissement of Grasse, which formerly belonged to the department of Var, but which was trans- ferred to the new department of Alpes Maritimes in 1860. The town is situated on the east side of a neck of land called La Garoupe, 10 miles S.E. of Grasse ; it is fortified, and possesses a tolerable harbour, which accommodates a considerable fishing industry. The principal exports are dried fruits, salt fish, and oil. The surrounding country is very fertile, producing abundance of fruit and flowers. Antibes, the ancient Antipolis, was founded by colonists from Marseilles about 340 B.c. Population, 6004.

ANTICHRIST. *Avrixpioros, or 6 dvriypurros. Theword occurs only in the first and second epistles of John. It signifies an opponent or adversary of Christ. The idea expressed by it had its origin in Judaism. According to prophetic anticipations, the Messianic time was to be im- mediately preceded by a great conflict, in which Jehovah would fight out of Zion for His own people, and defeat the concentrated opposition of the world. An Almighty leader on the one side seemed to require an antagonist on the

other, a head of the army of darkness against the Prince

of light. Thus Ezekiel depicts Gog proceeding out of

Magog, to hazard a decisive battle against the Lord and His

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In the Middle Ages the question gradually merged into the more philo- sophical one of the relation between reason and faith. In modern theology the problem again appears, but its aspect Philosophy, indeed, has never Xeno-

saints on the eve of the Messianic age (chapters xxxviil. and xxxix). The idea was subsequently embodied in Antiochus Epiphanes, who tried to eradicate Judaism with savage hatred. When we consider the insane

violence he exhibited against the Jews and their temple, his prohibition of Jehovah's worship, the solemnisation of the Sabbath, and circumcision, it was natural to regard him as the represen- tative of heathenism in its opposition to the true religion. Accordingly, the worshippers of Jehovah termed the small altar erected by him to Olympian Jove in the holy temple at Jerusalem (168 B.c.), the abomination of desolation (Daniel ix. 27, xi. 31, xii, 11; Mat. xxiv. 15). The apocalyptic visions of Daniel exerted an important influence upon the Jews after the time of Antiochus, animating them with hopes of the near approach of a better day, preceded, it is true, by a fearful struggle, in which a powerful prince, the impersonation of heathenism in its fiercest hate, should persecute the chosen people. The future of Israel was brightened by the visions of one whose predictions had been at least partially fulfilled, After this the idea seems to have been in abeyance till the reign of Caligula (40 a.p.), when Greeks in Alexandria and Syria attempted to introduce images of the emperor into the Jewish synagogues. The express command of Caligula addressed to the Jews, to erect his image in the temple at Jerusalem, in the form of Olympian Zeus, excited an intense commotion throughout Palestine, and must have recalled to the Jews familiar with their Scriptures the similar conduct of Antiochus, as though the prophet Daniel had foretold the blasphemy of the Roman emperor. In the discourse of Christ recorded by Matthew (chapter xxiv.), a personal.opponent or antichrist does not appear, but the second advent is preceded by great afiliction, the desecra- tion of the temple, false Messiahs, and false apostles. This

evangelic eschatology, however, appears in its present form

to belong to a late redactor, so that it is difficult to separate Christ's own utterances from other elements probably in- corporated with them. Various sayings of Jesus relative to his second appearing were evidently misapprehended or confused in the reminiscences of the early disciples.

St Paul resumes the idea of antichrist. Whatever Jewish conceptions he laid aside, and he emancipated him- self from the grossest of them, he did not abandon the idea of an antichrist or terrible adversary of the true re- ligion. The prophecies of Daniel, whether in their sup- posed relation to Antiochus or Caligula, and the impious command of the latter in particular to desecrate

the Jewish temple, furnished him with traits for the portrait of Christ's great enemy, whose manifestation in the Roman empire the state of the world led him to suspect, especially as the empire was then identified by the Jews, as well as by Paul himself, with the fourth and last kingdom of Daniel's visions. Blending together the notions of an antichrist and false Christ, the picture which St Paul draws is that of the man of sin, "the son of perdition ; who opposeth and exalteth himself above all that is called God, or that is worshipped ; so that he as god sitteth in the temple of God, showing himself that he is God; the wicked one whose coming is after the working of Satan with all power and signs and lying wonders," &c. (2 Thess. ii. 3-9). Here the epithet 6 &vojos appears to be borrowed from Isaiah xi. 4, the apostle coinciding with the Chaldee interpreter in under- standing the passage of antichrist. The hindrance to the manifestation of the terrible enemy, to which Paul obscurely alludes, seems to be the Roman empire in one or other of its aspects ; for we cannot adopt the ingenious conjecture that Claudius is meant, though the name fits the apostolic expression 6 xatéywv, gut claudit, Claudius. Apart from the fact that the neuter 76 xaréxov is used as well as the masculine it is scarcely probable that one whose reign was

marked by cruel actions and bloodshed should be called the obstacle in the way of antichrist's manifestation. The apostle, not ignorant of Caligula's blasphemous edict, seems to have thought of some Cesar in whom the persecuting power of heathenism should culminate, without pointing at either Claudius as the withholder, or Claudius's suc- cessor as the man of sin. The idea of antichrist was not historically fixed in his mind. Here we differ from Hitzig and Hausrath; though the date of the Thessalonian epistles (about 52 A.D.) presents no obstacle to the hypothesis, as De Wette thinks it does.

The author of the Revelation presents the antichrist idea in a more definite form than St Paul. Borrowing characteristic traits from Antiochus Epiphanes, perhaps too from Caligula, whose blasphemous order to set up his own image in the attitude of Olympian Zeus within the holy temple at Jerusalem created intense excitement through- out Palestine, aware of the fearful persecution which the Christians had suffered from Claudius's

successor on the throne of the Cesars, the apostle John makes the man of sin or antichrist to be Nero returning from the East. accord- ing to a report then current… In his view the vicious cruelty of paganism had its incarnation in the monster who set fire to Rome, torturing the Christians there, and hesi- tating to commit no crime. If the capital of the heathen world had such a head, the character of the great antichrist stood forth in him. Accordingly, the writer describes Nero as the fifth head of the beast that rose out of the sea, 2.e., Rome, who received a deadly wound which was healed, who made war upon the saints and overcame them, who disappeared amid the wondering of the world, to return with renewed power for three years anda half. The number of the beast or head, 666, points unmistakably to Nero, for it is the equivalent of y72-0p Keesar Neron, :=50, >= 200, :=6, » = 50, p= 100, 0 = 60, » = 200. He is the beast that was and is not, the fifth fallen head, one of the seven; the eighth, because he shouldreappear after hisdeadly wound was healed. The succession of emperors is Augustus, Tiberius, Caligula, Claudius, Nero, Galba. Renan has again sanctioned the reckoning of Julius Cesar as the first of the list, on the authority of Josephus, Suetonius, Aurelius Victor,? &c.; but Suetonius's commencement of his lives of the Czsars with Julius, is scarcely a valid proof of his reckoning him to be the first of the line. Tacitus, Aurelius Victor, and Sextus Rufus, not to speak of Hippolytus, favour the opinion that Augustus was the first emperor ; and as the birth of Christ was under him, Christianity has nothing to do with Julius Cesar. In the view of the apocalyptist the latter is of no importance. The apostle writing under Galba (68 a.p.), held the opinion then prevalent among Christians as well as others, that the emperor was not really dead, but was in the East, whence he would return with an army of Parthians to conquer and destroy Rome (Tacitus, Hest. ii. 8; Suetonius, Vero, cap. 57, Dio Chrysostom, Or. xxi.) Such belief had then taken possession of the minds not only of the Jewish Christians in Palestine, but of the Jews themselves, who were in a state of feverish excitement because Jerusalem was besieged. Terror had seized all worshippers of the true God, because of the aspect which the empire assumed (Revelation xiii. 3-8, 18, xvii. 11). The apocalyptist also states that false or antichristian prophetism was to unite with the healed beast, and cause men to worship him or

1 Diisterdieck in vain disputes this fact, believing that the report in the form in which critics put it into the book, had its source in misunderstood passages of the Apocalypse combined with 2 Thess. ii. 3, &c.

2 Aurelius Victor is erroneously cited by Renan for his view of the Cesars. Both in the De Caesaribus and the Epitome the narrative begins with Octavius. Julius Cesar does not appear as emperor.

be put to death (xiii. 14,15). We assume that the second beast, which rises out of the earth as the first does out of the sea, is identical with the false prophet in xvi. 138, xix. 20, xx. 10, and that it is a personification of false or heathen prophesying with its soothsaying and auguries. But though Irenzus sanctions this view, it is not without difficulties, since the second beast ought in consistency to be historically definite like the first. It cannot be that the writer meaus the apostle Paul; for John, with all his Jewish tendencies, and hints unfavourable to Paul, would not speak so strongly against the latter. If John were not the author, as some incline to think, an unknown. writer, with lively Judaic prepossessions, might perhaps describe the apostle Paul in such dark colours, but even then it is highly improbable. Renan supposes that some Ephesian impostor is meant, a partisan of Nero's, perhaps an agent of the pseudo-Nero, or the pseudo-Nero himself. One thing is pretty clear, that a polity is not represented by either of the two beasts in the Apocalypse, or by Paul's man of sin. It is remarkable how long the legend about Nero's revival continued, and how widely diffused it became, though his body was buried publicly at Rome. Not till the 5th century did it become extinct.

The author of John's first epistle has a more general and spiritual conception of antichrist, partly in consequence of the Alexandrian philosophy which had leavened thought in Asia Minor, as is perceptible in the fourth gospel. He finds antichrist within the church in any false teacher who corrupts the true doctrine respecting the Father and the Son through a tendency idealising away the practical basis of Christology. Such developnient of the idea agrees better with the general representation in the discourses of Jesus than the restricted individualising it received from Paul and John outside Christianity, though the latter bears the older and Judaic

stamp. The author of I. John writes : “« As ye have heard that antichrist shall come, even now are there many antichrists. He is antichrist, that denieth the Father and the Son. This is that spirit of antichrist, whereof ye have heard that it should come; and even now already is it in the world” (ii. 18, 22, iv. 3). He that denied the Father and the Son, that did not confess Jesus, was an antichrist in this author’s opinion. Probably Gnosti- cism was in his view more than any other form of error. There was a tendency among the later New Testament writers, as far as we can judge from 2 Peter ii. 15, to find antichrist in erroneous doctrine rather than an individual. False teachers are called followers of Balaam. In the Apocalypse itself certain heretics are termed Nicolaitanes or Balaamites, 7.e., destroyers of the people.

The sibylline oracles agree with the Apocalypse in identifying antichrist and Nero. In those of Christian origin belonging to the earliest centuries, we find the current belief that Nero, having fled beyond the Euphrates, should return with an army to perpetrate farther cruelties in Rome. The descriptions in question are based, in part, on those of the apocalyptist, and the tyrant is directly identified with antichrist or Beliar.2 When the legend about the tyrant’s return from the East ceased, the true interpretation both of the fifth head and his mystic number 666 was lost. Jrenzus himself did not know the interpretation of 666, and has given several conjectural words more or less suitable to the number. The idea of a personal antichrist was retained by the Christian writers of the 2d and 3d centuries who held the sensuous view of Christ’s speedy reappearing to set up his reign on

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8 See book iv. 116, &c., 134, &c.; viii. 140, &c., 70, &., 152, &e. 5 and comp. Alexandre’s Excursus in vol. ii. of his Oracula Sibyltina, 1856. The first vol., containing the poems themselves, with a trans- lation, appeared in 1841.

4 Opp., ed. Stieren, vol. i. p. 801.

carth for a thousand years. The figure of this great adver- sary in connection with the millennial reign was important for such interpreters. The Alexandrian school, however, whose method of interpretation was less literal and gross, generalised the idea in the manner of him who wrote St John's first epistle, making the principle of error or depar- ture from the faith to be personified in antichrist. 'The great opponent of Christ is an abstraction, a sceptical tendency or principle, not an historical person.

The later Jews had also thcir antichrist or anti-Messiah, whom they furnished with peculiar attributes, and termed Armillus, o>-x>x. The name appears already in the Targum of Jonathan on Isaiah xi. 4, where the godless Armillus is said to be slain with the breath of Messiah's mouth. In their description he becomes a terrible giant, golden haired, twelve ells in height, as many in breadth, having the width of a span between his deep red eyes. Born in Rome, he will assume to be the Messiah, and obtain many adherents. The first Messiah, Joseph's son, will make war upon him, but be overcome and slain at Jerusalem. After this the second Messiah, David's son, will defeat Armillus with the breath of his mouth, and then God will reassemble the dispersed of Israel, forming them into a united people, Christians and unbelievers being destroyed.1

In the apocryphal Ascension of Isaiah, published by Laurence, a Jewish-Christian production written in Greek not earlier than the 3d century, the angel Berial, prince of this world, identical with Sammael or Satan, and represent- ing antichrist, is said to descend in the last days, in the form of an impious monarch (Nero), the murderer of his mother. The world will believe in him, and sacrifice to him ; his prodigies will be displayed in every city and country, and his image set up. After exercising dominion for three years seven months and twenty-seven days, the Lord will come with His angels and drag him down into Gehenna. 'The writer's description is evidently moulded on that of the apocalyptist.?

Nor is antichrist unknown to Mohammedan theology, in which he is called al Masth al Dajjal, the false or lying Christ, or simply al Dajjal. He is to be one-eyed, and marked on the forehead with the letters C. F. R., i.e., Cafir, or infidel. Appearing first between Irak and Syria, or, according to others, in Khorasan, he will ride on an ass, followed by 70,000 Jews of Ispahan, and

continue on earth forty days, of which one will be equal in length to a year, another to a month, another to a week, and the rest will be common days; he is to lay waste all places except Mecca, or Medina, which are guarded by angels; but at length he will be slain by Jesus at the gate of Lud, near Joppa, assisted by the Imam Mahedi, after which the Moslem religion will coalesce with the Christian into one.? There is a saying that Mohammed foretold several antichrists, as many as thirty, but one of greater note than the rest.

During the Middle Ages, and those which immediately followed, current opinion discovered antichrist in heretics and sects. The Apocalypse and second epistle to the Thessa- lonians were supposed to point at false doctrine and its leading representatives. In their zeal against such as did not belong to the same church as their own, ecclesiastics mistook the sense of the passages relating to the dreaded adversary of Christ. Thus Innocent IIT. (1215) declared

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1 See Hisenmenger's Entdecktes Judenthum, ii. p. 704, &c.; and Buxtorf's Lexicon Chaldaicum, s.v. oxd-n-w,

2 See Laurence's Ascensio Isaie Vatis, &c., pp. 108, 109, and general remarks, p. 157.

3 See D'Herbelot's Bibliotheque Orientale, vol. i. p. 558, ed. La Haye, 1777 ; Sale's Preliminary Discourse to his Translation of the Koran, sec. 4.

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the Saracens to be antichrist, and Mohammed the false prophet ; and Gregory IX. (1234) pronounced the emperor Frederick II. to be the beast that rose up out of the sea with names of blasphemy on his head (Rev. xiii. 1-6).

As the corruption of the Romish Church increased, and the necessity of reform became more apparent, anti-ecclesiastical thought found antichrist in the Papacy; and that again naturally provoked the church to characterise all

heretics as the collective antichrist. The strong language of the apostles became a polemic weapon, easily wielded against any adversary possessing worldly power inimical to the church's interests, or holding opinions incompatible with traditional orthodoxy. The Church of Rome led the way in misapplying the Apocalypse during her contest with civil powers and heretics; her opponents followed the example in turning the instrument against herself. Anti- christianism could be embodied in the Papacy as well as in Protestantism. It might be in a corrupt church as well as in heretical doctrine outside it. Accordingly, the Wal- denses, Wicliffe, Huss, and many others, found antichrist in the Pope. Luther hurled a powerful philippic adversus execrabilem bullam antichristi; and the articles of Schmal- kald embody the same view, affirming: " Der Pabst aber, der allen die Seligkeit abspricht welche ihm nicht gehor- chen wollen, ist der rechte antichrist."

The history of opinion respecting antichrist, or rather the interpretation of such Scriptures as present the idea, is by no means instructive. Conjectures too often supply the place of sound exegesis. Much error has arisen from mixing up portions of Daniel's vision with those of the Apocalypse, because they refer to different subjects. The apostle borrows characteristic features from Daniel's Anti- ochus Epiphanes to fill out his picture of Nero. The com- bination of St Paul's man of sin with St John's antichristian Nero has also led to misapprehension. The idea is vari- ously developed according to the mental peculiarities and knowledge of those who entertained it. Vague and general at first, it was afterwards narrowed, somewhat in the manner of the Messianic one. Its different forms show that it was no article of faith, no dogma connected with salvation. Less definite in the second epistle to the Thessalonians, it is tolerably specific in the Revelation. The author of John's first epistle gave it a spiritual width, consistently with the pantheistic direction which he follows with feeble footsteps. In each case, how- ever, the writers moved within their own times, their knowledge bounded by the necessary limits of the human intellect, so that their subjective views can hardly be accepted as the emanations of minds projecting them- selves into the world's outer history with full intelligence of its details. Limited to the horizon of their age, they did not penetrate into the future with infallible certainty. What they express about antichrist is their development of an idea which sprang out of Jewish soil and does not harmonise well with the gradual progress of Christ's

spiritual kingdom. It is not unusual, however, for men living in times of peculiar commotion, when the good are oppressed and vice triumphs, to embody rampant opposi- tion to truth and righteousness in a person who concen- trates in himself the essence of antichristian hate. If Christ is to conquer gloriously, a mighty adversary is given Him who must be finally and for ever overthrown. Then commences the universal reign of peace and purity under the benign sceptre of the Victor. Over against Christ as King is set a formidable foe, not an abstract principle,— the latter being an incongruous or less worthy adversary in the view of many. Yet it is the very individualising of the antichrist idea which removes it from the sphere of actual realisation. The extension, indeed, of the divine kingdom will encounter opposition; and the reaction of the

world may appear, if not become, stronger as that extension is more decided ; but the personality and intenseness which the apostles impart to the reaction transfer it to the region

of the improbable. Humanity is not so vicious as to break |

away from God with the extreme insanity which the feel- ings of the sacred writers conjure up in times of fear for the church, (Comp. Gesenius's article " Antichrist" in Ersch and Gruber; De Wette's Kurze Erklirung of the Second Epistle to the Thessalonians and the Revelation ; Liicke's Versuch einer vollstdéndigen Hinleitung m die Offenbarung des Johannes, zweite Auflage; Bleek's Vorles- ungen ueber die Apokalypse ; Ewald's Commentarius m Apocalypsin Johannis, and his Die Johanneischen Schriften uebersetzt und erklért; Limemann, Ueber die Briefe an die Thessalonicher in Meyer's Kommentar weber das Neu Testament ; Davidson's Introduction to the Study of the New Testament, vol. i.; Renan's L'Antechrist; Jowett's Epistles of St Paul to the Thessalonians, &c., vol.i.) (8. D.)

ANTICLIMAX (dvr. and xAipag), in rhetoric, is an abrupt declension on the part of a speaker or writer from the dignity of idea which he has attained, as in the follow- ing well-known distich :—

‘¢ The great Dalhousie, he, the god of war, Lieutenant-colonel to the carl of Mar.”

From its character it is plain that it can be intention- ally employed only for a jocular or satiric purpose. It frequently partakes of the nature of antithesis, as—

‘¢ Die and endow a codlege or a cat.”

From bathos it is distinguished by being much more de- cidedly a relative term. A whole speech may never rise above the level of bathos ; but a climax of greater or less elevation is the necessary antecedent of an anticlimax.

ANTICOSTI, a barren island of British North America, situated in the Gulf of St Lawrence, between lat. 49° and 50° N., and between long. 61° 40’ and 64° 30’ W., with a length of 135 miles, and a maximum breadth of 40. Most of the coast is dangerous, but lighthouses have been built at different points, and there are also provision posts for shipwrecked sailors. The lighthouse keepers and other officials are the only inhabitauts of the island.

ANTICYRA, in Ancient Geography, the name of three cities of Greece. (1.) In Phocis, on the Bay of Anticyra, in the Corinthian Gulf. Its modern namie is Aspra Spitia, where some remains are still visible. It was a town of considerable importance in ancient times; was destroyed by Philip of Macedon; recovered its prosperity; and was captured by Flaminius in 198 B.c. (2.) In Thessaly, on the right bank of the River Sperchius, near its mouth. (3.) In Locris, on the left side of the entrance to the Corinthian Gulf, and not far from Naupactus. All three places are said to have bcen known for their hellebore; but the first was the source of the chief supply. The city was resorted to by those suffering from mental derangement, that they might the more easily obtain the curative herb ; and this circumstance gave rise to a number of proverbial expressions, like Avrixippas oe Set, or naviget Anticyram, and to frequent allusions in the Greek and Latin writers (Suetonius, Cal. 29; Persius, Sat. iv. 16; Juv. Sat. xiii. 97 ; Hellebore was likewise considered beneficial in cases of gout and epilepsy

ANTIETAM, a small river of the United States, which rises in Pennsylvania, and flowing into Maryland, joins the Potomac about 50 iniles from Washington. An indecisive battle between the Federals under M‘Clellan and the Confederates under Lec was fought on its banks on 16th and 17th September 1862, The victory, however, practi- cally lay with the Federals, as the Confederates retreated out of Maryland on the night of the 18th September

ANTIGONE, the daughter of CEdipus, known in Greek legend, first, for the faithfulness with which she attended her father when he, on discovering that Jocaste, the mother of his children, was also his own mother, put his eyes out and resigned the throne of Thebes; secondly, for having, in defiance of a decree, buried with due rites the body of her brother Polynices, for which act she was sentenced to be buried alive ina vault. Her character and these incidents of her life presented an attractive subject to the Greek tragic poets, especially Sophocles, whose plays of Antigone and Gidipus at Colonus still exist ; and Euripides, whose Antigone, though now lost, is partly known from extracts incidentally preserved in later writers, and from passages in his play of the Phenisse. In the order of the events, at least, Sophocles departed from the original legend, according to which the cremation of Polynices took place while Gidipus was yet in Thebes, not after he had died at Colonus. Pos- sibly his having left ‘Thebes at all is an invention of the poet. Again, in assigning Antigone the tragic end of being buried alive, Sophocles differs from Euripides, in whose play that calamity was averted by the intercession of Bacchus, and

| was followed by the marriage of Antigone and Hzmon, the

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son of her persecutor Creon, who had succeeded to the throne. In another version of the legend (Hyginus, Jab. 72), founded apparently (Heydemann, Ueber eine nach Euripideische Antigone, Berlin, 1868) on a tragedy by some follower of Euripides, Antigone, on being handed over by Creon to her lover Hemon to be slain, was instead secretly carried off by him, and conccaled among herdsmen, where she bore him a son Meon. The boy

having grown up, went to the games at Thebes, and being there recognised by the mark of a dragon on his body, the secret was discovered. Hercules pleaded with Creon in vain for Hemon, who now slew both Antigone and himself. On a painted vase (engraved by Heydemann, supra) appears the scene of the intercession of Hercules. Antigone placing the body of Polynices on the funeral pile occurs on a sarcophagus in the villa Pamfili in Rome, and in the description of an ancient painting by Philostratus (Zmag. ii. 29), in which it is stated that the flames consuming the two brothers burnt apart, as indicative of their hostility in life.

ANTIGONE (2), in Greek legend, the daughter of Kury- tion, king of Phthia, who gave her in marriage to Peleus, the issue being a daughter, Polydora. Peleus having acci- dentally killed Eurytion in a hunt, some say the hunt of the Calydonian boar, fled and obtained expiation from Acastus, whose wife in malice, because her affection for Peleus was not returned, informed Antigone that it was, upon which Antigone took her own life.

ANTIGONUS I., called Cyclops, from his having lost an eye, one of the generals of Alexander the Great, was the son of Philip of Elymiotis. In the division of the provinces after Alexander's death, 323 B.c., Pamphylia, Lycia, and Phrygia Major fell to his share. But Perdiccas, having an eye to universal dominion, determined to divest him of his government, and laid plans for his life, by bringing various accusations against him. Antigonns escaped with his son Demetrius into Greece, where he obtained the favour and protection of Antipater, 321 B.C. ; and when soon after, on the death of Perdiccas, a new division took place, he had the province of Susiana added to his former share. He was likewise intrusted with the command of the war against Eumenes, who had joined Perdiccas against the coalition of Antipater, Antigonus, and the other generals, Eumenes was thorouglily defeated, and was obliged to retire with only 600 men to the inac- cessible castle of Nora, and a new army that was marching to his relief was also routed by Antigonus. In the interval Antipater had died (318 Bc.), and the opportunity ex- cited the ambition of Antigonus to possess the whole of

Alexander's empire. Polysperchon succeeding Antipater in the regency, to the exclusion of Cassander his son, Antigonus resolved to set himself up as

lord of all Asia. On account of the great power of Eumenes, he greatly desired to gain him over to his interest ; but that faithful commander, effecting his escape from Nora, raised an army, and was appointed the royal general in Asia. He defeated Antigonus in several engagements, but was at last delivered up to him through treachery, and put to death Upon this the governor of Upper Asia yielded to Antigonus, The latter now seized upon all the treasures at Susa, and directed his march towards Babylon, of which Seleucus was governor. Seleucus fied to Ptolemy, and entered into a league with him, together with Lysimachus and Cassander, in order to check the exorbitant power of Antigonus (315 3.c.) Notwithstanding this Antigonus made a successful attempt upon Syria and Pheenicia, though these provinces were soon after recovered by Ptolemy, who defeated his son Demetrius, while he himself was employed against Cassander in Asia Minor They were again taken by Antigonus, who, flushed with success, sent an expedition against the Nabathean Arabs dwell- ing in the deserts adjacent to Judza. In the first enter- prise his troops were cut to pieces by the Arabs ; but his son commanded the second, and was more successful. Demetrius then expelled Seleucus from Babylon; and, success attending his arms wherever he went, the con- federatcs had to make a treaty with Antigonus, stipulating that he should remain in possession of all Asia, but that the Greek cities should retain their liberty. This agree- ment was soon violated, under the pretence that garrisons had been placed in some of these cities by Antigonus. At first Ptolemy made a successful descent into Asia Minor, and on several of the islands of the Archipelago; but he was at length totally defeated by Demetrius, in a naval engage- ment off Salamis, in the island of Cyprus On gaining this victory Antigonus assumed the title of king, and bestowed the same upon hisson ; and from that time (306 B.c.) his reign in Asia, and that of Ptolemy in Egypt, and of the other generals of Alexander in their respective provinces, properly commence. Antigouus now prepared a large army, and a formidable fleet, the command of which he gave to Demetrius, and hastened to attack Ptolemy in his own dominions. His invasion of Egypt, however, proved a failure; a battle with Ptolemy at Mount Casius gained Antigonus no advantage, and, after a few other fruitless efforts, he was obliged to retire (306 B.c.) Demetrius attempted the reduction of Rhodes; but, meeting with obstinate resistance, he was obliged to make a treaty upon the best terms that he could, in order to join his father in crushing a confederacy that had been formed between

Cassander, Seleucus, and Lysimachus. Father and son ad- vanced with their united forces into Phrygia, and met the enemy at Ipsus. A decisive battle was fought, in which Antigonus fell, in the 81st year of his age, 301 B.o., and with him fell the fortunes of his house.

ANTIGONUS (GONATAS), son of Demetrius Polior- cetes, and grandson of the former Antigonus, was born at Gouni in Thessaly about 319 B.c. On the death of his father in Asia, 283 B.c., he assumed the title of king of Mace- donia, but did not obtain possession of the throne till 277, after it had been successively in the hands of Pyrrhus, Lysi- machus, Seleucus, and Ptolemy Ceraunus. Antigonus repelled the invasion of the Gauls, and continued in undis- puted possession of Macedonia till 273, when Pyrrhus returned from Italy and dethroned him. Pyrrhus fell, 272 B.c., at Argos, and Antigonus was again restored to power. The latter part of his reign was comparatively peaceful, and he gained the affection of his subjects by his mildness of disposition and his cultivation of the arts. He resisted

the formation of the Achzan league, but did not resort to arms to enforce his opposition. He died, leaving his king- dom in peace, in the 80th year of his age, and the 44th of his reign, 239 B.C.

ANTIGUA, one of the West Indian Islands, in the British Leeward group, situated 50 miles E. of St Christu- pher, in lat. 17° 6’ N., and long. 61° 45’ W.; with an area of 108 square miles, and a circumference of about 50 miles, There is often a great scarcity of water in the island, which has also suffered severely from hurricanes; but it is on the whole healthy and its soil is very fertile, producing large quantities of sugar, and usually enough of grain for home consumption, as well as some cotton and tobacco. Its high and rocky coast is much indented by bays and arms of the sea, several of which form excellent harbours ; that of St John’s, the capital, is safe and commodious, but is much inferior to English Harbour, which is capable of receiving vessels of the largest size. Goods to the value of £234,011, and including sugar, molasses, rum, and cotton, were exported in 1870, being an increase of £33,038 as com- pared with 1869 ; the value of the imports, on

the other hand, had increased during the same period from £174,357 to £164,178. In 1870, 422 ships of 25,228 tons entered, and 425 of 24,977 tons cleared the ports of the island. The government of Antigua is vested in a governor and executive and legislative councils, while four of the ten elective members of the general legislative council of the Leeward Islands are chosen from, and by, the legislative council of Antigua, in addition to one non-elective member nominated from the same body by the Queen. In 1870 the revenue amounted to £41,136, the expenditure to £31,315, and the public debt to £52,195. The chief source of revenue is the iniport duty, which amounted to about £20,000 in the same year. Antigua was discovered in 1493 by Columbus, who is said to have named it after a church in Seville, called Santa Maria la Antigua. It however remained uninhabited until 1632, when a body of English settlers took possession of it, and in 1663 another settlement of the same nation was effected under the direction of Lord Willoughby, to whom the entire island was granted by Charles II. It was ravaged by the French in 1666, but was soon after reconquered by the British, and was formally restored to them by the treaty of Breda. Since then it has been a British possession. Population in 1871,

35,157.

ANTILEGOMENA (dvriAeyopeva, contradicted or dis- puted), an epithet applied by the early Christian writers to denote those books of the New Testament which, although sometimes publicly read in the churches, were not for a considerable time admitted to be genuine, or received into the canon of Scripture. These books are so denominated in contradistinction to the Homologowmena, or universally acknowledged writings. The following is a catalogue of the Antilegomena:—the Epistle to the Hebrews, the Epistle of St James, the Second Epistle of St Peter, the Second and Third Epistles of St John, the Eprstle of St Jude, the Apo- calypse, or Revelation of St John. The earliest notice which we have of this distinction is contained in the Lccle- stastical History of Eusebius (iii. 25), who flourished a.p. 270-340 ; but the meaning of the passage is by no means clear, and it has accordingly given rise to considerable controversy.

ANTILLES, a name that is usally, although by no means uniformly, applied to the whole of the West Indian Islands, with the exception of the Bahamas;

it has also, on the one hand, been employed to designate smaller portions of the same group, and, on the other, it has been extended so as to comprehend the whole archipelago, inclusive of the Bahamas. The traditional derivation of the word Antilles itself, from Antilla, a continent supposed

to tie to the west of the Azores, and for which Cuba, or some other West Indian island, was mistaken, is too doubtful and too vague in its application to be of any value in determining the proper use of the term 3 the weight of authority seems to be in favour of the first acceptation. In this sense the Antilles have been divided into two groups :—the Greater Antilles, including Cuba, Jamaica, Hayti, and Porto Rico; and the Lesser Antilles, forming the remainder of the islands. See West Inpins.

ANTIMACHUS, the Colophonian, a Greek poet who was honoured by the Alexandrine grammarians with the second place in their epic canon. Of his works nothing remains to us but the merest fragments 3 and of his life, we know little more than that he was born at Claros ; was beaten by a rival in a poetical competition at Samos; met, either then or in equally discouraging circum- stances, with Plato ; fell in love with a lady called Lyde ; lost her by death; bewailed her in an elegy of extreme erudition, if not of extraordinary pathos ; and celebrated in his epic the seven heroes of Thebes. Schellenberg collected his fragmentary remains at Halle in 1786; and Roll at Dillenberg, in 1845. H. G. Stoll published at Gottingen in 1841 Animadversiones in Antimachi Fragmenta,; and the remains of the Thebats are to be found in Diintzer, Fragm. des Hpisch. Poes. der Griech.

ANTIMONY, a metal found native to a small extent in many of the localities from which its ores are derived. It has been obtained at Sahlberg, near Sahl in Sweden, at Andreasberg in the Harz, at Allemont in Dauphiny, Przibram in Bohemia, besides being brought from Borneo, Chili, Mexico, New Brunswick, &c. It also occurs in nature alloyed with other metals; allemontite being arsenical antimony ; dyscrasite, antimonial silver ; and breithauptite, a native alloy of antimony and nickel. Among the ores of antimony may be enumerated valentinite, or white anti- mony, and cervantite, or antimony ochre, both oxides of antimony ; and kermesite, red antimony, or antimony blende, an oxysulphide of the metal. Various sulph-

antimonites of other metals are also met with, but they possess only a mineralogical interest. The antimony of commerce is derived almost entirely from the sulphide, stibnite, or grey antimony ore (Sb,S,), which is found in great abundance in Borneo, in Nevada, and at Prince William antimony mine, New Brunswick. It is also mined at Schemnitz and Kremnitz in Hungary, at Przibram in Bohemia, at Wolfsberg in the Harz, and at Braunsdorf, near Freiberg, Bavaria. Formerly it was largely produced in Cornwall, but it is no longer worked on a commercial scale in Great Britain. Stibnite occurs generally in veins, and has a leaden grey colour, with a metallic, sometimes iridescent lustre ; it fuses with great facility, and produces a grey streak. It is the oréuc or stibium of the ancients, who applied to it the epithet wAarvépOaApov, from its having been used by women in Eastern countries to give increased lustre to their eyes, by darkening the eye-lashes, a practice still pursued insome parts. The padnt said in the Holy Scriptures to have been used by Jezebel, seems to have been this substance ; for St Jerome, who knew the manners of Eastern women, has, in the Vulgate, rendered the passage “oculos ejus posuit stebio.” Stibnite was the lupus metal- lorum of the alchemists, and Basil Valentin was able to show that it contained sulphur. That famous alchemist was acquainted with metallic antimony, and by him and his successors it was known as regulus, or regulus of anti- mony, from the readiness with which it acted on the royal metal gold. The tradition that the name antimony was given to the sulphide on account of a preparation of it having proved fatal to the monks (hence antt-monachos) in a German religious house will hardly bear investigation. Crude anti- mony of commerce is the ore separated from its associated

earthy gangue—an operation effected by simple fusion. The sulphide is then reduced to an oxide by roasting in a rever- beratory furnace. From this oxide metallic antimony is obtained by fusion with charcoal, which has been saturated with a solution of carbonate of sodium. The metal may also be prepared direct from the sulphur ore by roasting with a mixture of cream of tartar and nitre, or with iron filings. Antimony is a brilliant silver-grey metal, having a foliated texture and a strong tendency to assume a crystalline structure, which causes the cakes of metal to present a

characteristic stellate surface. Its specific gravity is 6°715 ; it melts at 842° Fahr., and when heated to redness takes fire, burning with a brilliant white flame. It is brittle, and can be easily pulverised. Antimony is chiefly valuable for the alloys it yields with other metals. Britannia metal is an alloy largely used, containing usually about 81 parts of tin, 16 of antimony, 2 of copper, and 1 of zine. Type metal contains varying proportions of lead and antimony, ranging from 17 to 20 per cent. of the latter, or even more, according to the hardness desired ; with sometimes small proportions of other metals for stereotype plates, &ec. Babbitt's anti-friction metal for the bearings of machinery is composed of 83°3 parts of tin, 8-3 parts of copper, and 8°3 of antimony. Antimony alloys with lead and tin, sepa- rately or in combination, are also used in place of gun metal for the bushes of heavy machinery. Antimonial prepara- tions are of great value in pharmacy, and for such purposes it is essential that they should be absolutely free from the arsenical and other impurities which commercial antimony and its ores always contain. The principal preparation used medicinally is tartarated antimony, or tartar emetic, a tar- trate of potash and antimony. 'Taken in small doses, from +/;th to 3th of a grain, tartar emetic acts a diaphoretic, renders mucous surfaces moist, and promotes secretion of urine. Jn larger doses it excites nausea, and, as its name indicates, vomiting. It is also prepared in the form of an ointment for external application as a counter-irritant, producing a painful pustular eruption. Antimonial wine is a preparation of tartar emetic, used as a diaphoretic and expectorant. Butter of antimony, or the liquor of chloride of antimony, is used as a powerful caustic, and antimonial powder, or James's powder, is employed as a diaphoretic in fevers and rheumatism. Other officinal preparations con- taining antimony are—oxide of antimony; black anti- mony, or the native sulphide, prepared; sulphurated anti- mony; and compound calomel pills. Crude antimony sulphide is used in the manufacture of black lead pencils. For the action of antimony as a poison, see Poisons. ANTINOMIANS (dv7é, against, and vouos, law), a term first employed by Luther as a designation of the followers of John Agricola, who maintained that the moral law was not binding, as such, upon Christians (see AGRICOLA, JoHANNES). In this, as in many other cases, however, the thing existed long before the name. From the 1st century of the Christian era downwards, there have been those who, on one ground or other, denied that the law was of use or obligation under the gospel dispensation, and the term Antinomian

is, accordingly, applied with sufficient propriety to many who lived at an earlier date than the sect or school to describe whom Luther invented it. It would seem, from several passages in the New Testament (Rom. iii 8, 31, vi. 1; Eph, v. 6; 2 Pet. ii 18, 19), in which the apostles warn their followers against perversions of their doctrine as an excuse for licentiousness, that Antinomianism, in its grosser form, found a place even in the primitive church. It is to be noticed that this first manifestation of the heresy seems to have been due to the same cause as that which operated in the case of Agricola,—a mistaken interpretation of the doctrine of justification by faith. The Gnostic sects, several of whom are classed as Antinomian, seem to have II. — 17

roceeded on the principle, that being spiritual their nature could not be corrupted whatever their moral conduct might be. Gnostic Antinomianism seems, therefore, to have been in this respect analogous to that of the High Calvinists, some of whom went so far as to maintain that an elect person did not sin even when he committed actions in themselves wicked. Such were the Antinomians in England during the Protectorate. A doctrine so extreme, and sanctioning so unmistakably an immoral life, is to be carefully distinguished from the Antinomianism combated by Luther, which was a matter of theory not necessarily affecting con- duct. It isnot easy to apprehend or to state with clearness the precise views of Agricola as to the relation between the Christian and the moral law. His own statements were more than once modified or retracted in the course of discussion, and there can be no doubt that Luther made him responsible for opinions which he did not hold. The exaggeration characteristic of all controversies seems to have prevailed ‘in this case to an unusual extent on both sides, and neither disputant should always be taken literally at his word, whether he speaks for himself or for his opponent. It was probably a desire to establish Luther’s negation of the Roman Catholic doctrine of good works on some firm ground of principle, that first led Agricola to insist as he did on the essential incompatibility between the law and the gospel. The law of Moses, he taught, was for the Jews alone, and was not a rule of life to Christians, who might with safety altogether neglect it. On the other hand, he never denied that the Christian was under a moral govern- ment with an adequate sanction, which laid him

under _ obligation to lead a holy life. What he maintained was that the New Testament furnished all that was necessary for impulse and guidance in the path of Christian duty, not in the form of positive precepts so much as of principles and motives. Thus explained, the difference between the orthodox and Agricola's party reduces itself within a com- paratively narrow compass, though, after the fullest explana- tion, itremains a real difference and a standing subject of controversy.

ANTINOMY is the word employed by Kant, m the Critical Philosophy, to mark the inevitable conflict or con- tradiction into which, according to his view, speculative reason falls with itself, when it seeks to conceive the complex of external phenomena, or nature, as a world or cosmos. Literally the word means a conflict or opposition of laws (Widerstreit der Gesetze). It is used by Kant both in a generic and in a specific sense; the fate that lies upon the

speculative endeavour of human reason taking the form of

four special contradictions. For the generic sense Kant also has the word Antithetic, each antinomy being set forth in the shape of thesis and antithesis, with corresponding demonstrations, the perfect validity of which, in all cases, he most positively guarantees. The conflicting propositions, or the cosmological ideas involved in them, are intimately, though somewhat obscurely, related to the four heads of categories of the understanding in the Kantian system, but this is not the place to enter into such details. Expressed in the shortest form, the theses run thus :—The world (1) is limited in space and time, (2) consists of parts that are simple, (3) includes causality through freedom, (4) implies the existence of an absolutely necessary being. 'To these answer the antitheses :—The world (1) is without limits in space or time, (2) consists of parts always composite, (3) includes no causality but that of natural law, (4) implies the existence of no absolutely necessary being. The theses were taken by Kant from the speculative cosmology of the Wolffian school; the antitheses are the not less dogmatic assertions made or suggested by empirical thinkers. Since, according to Kant, equally valid arguments can be adduced. on each side, while, as mutually contradictory in their

tively, may both be truc. neither of the two sets of cases (though in different ways) ig the contradiction real, however really it has been intended by the opposing partizans, or must appear to the mind without critical enlightenment. impute to Kant, as is often done,

alternatives contradictory of each other.

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dogmatic sense, the two sets of propositions cannot both be true, it is plain that reason must have goue beyond its powers in seeking for a speculative knowledge of that which can be given in no experience. But the function of a true philo- sophy does not stop short with the detection of this internal strife of speculative reason ; the strife must be composed, and Kant, holds that none but his own critical doctrine is equal to the task. The first two antinomics he overcomes

by showing that theses and antitheses, when critically understood of mere phenomena, are both alike false; the

others, by showing that the opposed members, when under- stood, again critically, of notimena and phenomena respec- This amounts to saying, that in

It is wrong, therefore, to the view that human reason is, on ultimate subjects, at war with itself, in the sense of being impelled by equally strong arguments towards

Hamilton’s Law of the Conditioned—that all positive knowledge lies between

two extremes, neither of which we can conceive as possible, but yet, as mutual contradictories, the one or other of which

we must recognise as necessary—while suggested by the Kantian doctrine of the Antinomy of Pure Reason, is dis- tinctly at variance with it. In the realm of phenomenal experience, actual or possible, when it is properly conceived, Kant allows of no conflict ; and, though he denies that we can

have speculative knowledge of a realm transcending experience, he is satisfied of this at least, that knowledge of the one realm may go forward without prejudice to moral conviction of another. (a. ©. B.)

ANTINOUS, a beautiful youth, who was page to the emperor Hadrian, and greatly beloved by him. After his mysterious death by drowning in the Nile (130 a.D.), Hadrian—for whose sake, according to one account, he had offered himself a voluntary victim to destiny—caused the most extravagant respect to be paid to his memory by ceremony and monument. Not only were cities called after him, medals struck with his effigy, and statues erected to him in all parts of the empire, but he was raised to the rank of the gods, temples were built for his worship, festivals celebrated in his honour, and oracles delivered ‘1 his name. ‘The cities that showed most zeal for the new divinity were Bithynium (Antinoopolis) his birth-place, Besa (Antinoopolis) in Egypt, Mantinea in Arcadia, and Athens. It was in Athens that his greatest festivals were held—the Avrwdem év dore (iu the city) and the Avrivéea ev EXevoiv (at Eleusis). A remarkable impulse was given to the art of sculpture by the endeavour to produce an idealised representation of the deified page. ‘We still possess a colossal bust in the Vatican, a bust in the Louvre, a bas-relief from the Villa Albani, a statue in the Capitol, another in Berlin, another in the Lateran, and many more. The medals with his head are equally nume- rous. (Levezow, Ueber den Antinous ; O. Miiller, ‘Hand- buch der Archiologie ; Miiller-Wiescler, Denkmdler der alten Kunst.)

ANTIOCH (’Ayridyeta), a city in Syria,,long. 36°10’E., lat. 36° 11’ N., described as “Epidaphnes” (7 é7t Aadvys, or éxt. Addvy), or as “on the Orontes,” to distinguish it from the fifteen other Greek towns which, like itself, owed their foundation to Seleucus Nicator, and their names to his father Antiochus. While the wide-spread notoriety of Daphne, with its beautiful grove, compared to the vale of Tempe, and with its extraordinary excesses of pleasure, rendered it available as a local designation for Antioch, the river Orontes also seems to have served the same purpose with more than usual interest, owing, per-

haps, to its fabulous history. Originally it had been called Typhon, from the snake-legged giant of that name (Strabo, p- 750), who here struck by the thunderbolt of Jupiter, and seeking escape under the earth, formed the bed of the river by his trail, and its source by his descent. Orontes, it was said, was the name of a man who had built a bridge over the river, and when in Roman times the course of the stream was partly changed, a tomb (sov0s) was found in the old bed containing the bones of a man of colossal size,

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which the oracle declared to be those of Orontes (Pausanias, viii. 29, 3). On the coins of Antioch struck by Tigranes, and frequently on.those of later times, the city is personified as a female figure seated on a high rock or hill, from under which issues the Orontes in the form of a youth in the attitude of swimming. The same representation occurs in a marble statue in the

Vatican, and in a silver statuette in the British Museum ; and in each case there can be little doubt that the original model was the celebrated statue of Antioch by Eutychides, a pupil of Lysippus.

On the dismemberment of the Eastern empire founded by Alexander the Great, it fell to Seleucus to make him- self master of that portion of it included in Syria. It was an age remarkable for the building of new towns more or less on the plan of Alexandria, and accordingly Seleucus, instead of establishing himself at Antigonia, the newly- built capital of his defeated rival, chose a site a little further down the Orontes, about 20 miles from its mouth, for the capital of his new kingdom, the task of laying out and building it being entrusted to the architect Xenzeus, On Mount Silpius was placed the citadel, and on the slope towards the river the town. Seleucus destroyed Antigonia, transferred its inhabitants to Antioch, and perhaps, as has been said, utilised its building material. In addition to this new population there were the old inhabitants of the village of Iopolis or Ione, which had before occupied the citadel, and which traced its origin to Jone, an Argive fugitive from Egypt, in search of whom Triptolemus had been sent from Eleusis. Though this legend appears to have originated simply fromthe name Ione, the people of Antioch yet boasted of a common descent with the inhabit- ants of Attica, struck coins with the head of Pallas and an owl, precisely like coins of Athens, and maintained the traditions of Triptolemus as of a sort of ancestral hero. Besides Lopolis, the villages of Meroe, afterwards a suburb, and Bottia, on the banks of the Orontes, where Alexander dedicated a temple to Jupiter Bottiseus, claimed to have furnished the original inhabitants of Antioch. But the town founded by Seleucus, 300 B.c., soon became insuffi- cient for the influx of population, and a new district had to be enclosed, the original walls being allowed to remain. For the same purpose a third addition was made in the time of Seleucus Callinicus (246-226 .c.), and a fourth under Antiochus Epiphanes (175-164 3.c.), to whom the city owed also many new buildings of great splendour. From its four parts, each separately walled, Antioch was

now called a tetrapolis, and in point of situation, archi- tectural magnificence, and resources of enjoyment, ranked after Rome and

Alexandria as the next city of its time. The chief retreat of pleasure was the cypress grove of Daphne, at a distance of between 4 and 5 miles, but connected with the city by a suburb called Heraclea, the road passing among beautiful villas, gardens with fountains, hot springs, medicinal wells, brooks, and, in short, if we may trust the ancient writers who speak from personal obser- vation, every combination of salubrity and beauty. Seleucus Nicator had laid out the grove of Daphne, and erected in ita temple of Apollo and Diana, to which deities an annual festival was held in August, attended by all the people of the neighbourhood. Round the temple was an enclosure or asylum within which refugees were safe. In the temple of Apollo was a colossal statue of that god, the work, it was said, of the sculptor Bryaxis, of which, appa- rently, there is a copy on the coins of Antiochus Epiphanes. While the emperor Julian was at Antioch preparing for the Parthian war, this temple was burned, but whether the fire was due to the antipathy of the Christians, or to accident, was never ascertained. The city itself, abounding in fine buildings, seems to have been for nothing so remarkable in this direction as for its streets and porticoes, which were styled “golden,” with reference to the splendour of the columns, and perhaps, more literally, to the application of gold as a means of ornamentation. The principal street traversed the entire length of the city from east to west, a distance of about 4 miles, having four parallel rows of columns, forming a broad road in the middle open to the sky, and at each side a narrower covered way or portico. The road in the middle was laid with granite in the time of Antoninus Pius. From this main street others branched off at intervals up to the higher part of the town on the one hand, and down towards the river on the other. Where such junctures occurred, the porticoes of the main street were carried over in the form of arches. Among the buildings of which particular mention is made, are—(1), a temple to Jupiter Capitolinus, in imitation of the temple to the same deity in Rome, situated probably on Mount Silpius ; (2), the theatre, begun by the Seleucide kings, enlarged by Agrippa and Tiberius, and finished by Trajan ; and (3), the great Christian church begun by Constantine and completed by Constantius, which stood until 526 a.p., when it was destroyed by an earthquake and fire. Its dome-shaped roof is said to have been of immense height, while many parts of the building glistened with precious stones and ornaments of gold. The altar within it faced the west. From the description it is thought to have resembled St Vitalis at Ravenna. The necropolis

appears to have been situated on Mount Casius, above Antioch, where are still sepulchres cut in the rock, afterwards used as cells by anchorites, among them Zeno, who died about 420 a.p. With a plentiful supply of water for private pur- poses from the wells and fountains in the city, it was yet necessary t0 maintain the public baths, which in Roman times became numerous, by aqueducts conveying water for some distance. The ruins of one of these aqueducts still remain, admired for the solidity of the masonry and the colossal scale of the structure (see AquEpucT). But with all its charms Antioch was beset by a danger which, often threatening, several times succeeded in laying its fairest aspect waste. The first recorded earthquake occurred 148 3.¢., but the myths of the giants Pagres and Typhon there struck by the thunderbolts of Jupiter seem to refer to similar commotions at a remoter period. A second earthquake, 37 a.p., in the reign of Caius Cesar, caused so much damage that the emperor sent two senators to look to the affairs of the city. A third followed in the time of Claudius. One effect of these disturbances was to

increase the tendency to superstition, of which there was an instance in the magician Dabbonius, who placed a bust on a purple column in the centre of the city, and inscribed it doaota &rrwta, but in vain, for the next earthquake Much more severe was the earthquake 115 A.D., while the city was full of the Roman army which The rivers changed their courses, Mount Casius shook, and it was only by taking shelter for several days in the circus that

cast it down.

Trajan was to lead against the Parthians.

‘rajan himself escaped danger from the falling buildings.

The city being restored partly by the aid of Trajan and Hadrian, was spared any serious calamity of this kind till

526 s.p. when it was entirely destroyed, the loss of life, all the greater because of an assembly of met, being reckoned at 250,000 persons.

with considerable loss. Again, on Nov. 29, 528 a.D.,

occurred another earthquake, through which 5000 lives have been a violent shock, 587 A.D., followed on the last day of October 588 by auother, But the people

were lost. There appears to attended with a terrible destruction of life. of Antioch were not without troubles of their own making, as when, by their disaffection towards the king Demetrius,

they caused him to seek the aid of a body of Jews, with whom he fell upon his subjects, slaying a vast number, and setting fire to the city. In 83 B.c. Tigranes, either by invita- tion or by force, took Antioch, but was compelled to leave who placed on the throne Antiochus Syria became a Roman province in the time of Pompey, who (64 a.p.) enlarged the temple at Daphne, and conceded to Antioch autonomy. In 47 a.p. Cesar visited Antioch on his expedition from Alexandria against Pharnaces, and was regarded as a benefactor, and styled

it by Lucullus, Philopator.

dictator, because he allowed the town to retain its freedom, and added several public works of importance. was no less favourably inclined to the famous Eastern city, which on the news of the defeat of Antony at Actium,

hastened to espouse the cause of the emperor, and even instituted an era from the day of that battle, which, how-

ever, was not long retained. The usual era from which reckonings were made in Antioch, and over a great part of the East, down to the 10th century, was 312 B.c., in which year Seleucus took Babylon. It was known as the era of the Seleucide. Successive emperors showed their favour for the city by visits or the erection of public works. Germanicus died at Antioch 19 a.p.; his body was burned in the forum, and a monument erected over his ashes. Titus, it is said by Malala, placed the cheru- bim which he removed from Jerusalem on one of the gates of Antioch, and there seems to be confirmation of this statement in the fact, that one of the gates continued long to be named after these figures. Hadrian built an aqueduct for the town

with a reservoir (castellum) at Daphne, in the form of a temple to the nymphs and naiads. Under Commodus a new splendour was given to Antioch by the celebration of the Olympic games at Daphne. Buildings were erected for the practice of athletic feats generally, and in particular for the use of those who competed in the games. In 266 a.p. the Persians invaded Antioch, appearing suddenly ou the hills while the people were assembled in the theatre, where many were slain by the enemy's arrows before escape was pos- sible. The Christian church, partly built by Constantine, and finished by his son, has already been mentioned, and from its great size it may be assumed that the Christian population of Antioch was already considerable. In the time of Theodosius the entire population is given by

Chrysostom at 200,000, of which number about the half

were orthodox Christians,—a name which was here first

applied to the disciples of Christ (Acts xi. 26). From 252 to

Christians then There had before been two shocks, 341 and 457-8 A.D., the latter attended

Augustus

ANTI &

380 a.p. ten assemblies of the church were held at Antioch. It had been the residence of the apostle Peter, as it was afterwards that of the Patriarch of Asia. But in the history of Christianity at Antioch no period is so memor- able as the reign of the emperor Julian, whose measures directed against the new religion—such as closing the church and allowing the temple of the Jews to be restored— brought upon himself an amount of odium which was far from being counterbalanced by success in his efforts to revive the old rites of Apollo and Jupiter. Valens, though not orthodox, was yet liberal in the erection of new build- ings in Antioch,—among them a forum surrounded by four basilicas, and with a high column in the centre sur- mounted by a statue of Valentinianus. This he did after having made peace with the Persians, Nov. 10, oil #£D. The reign of 'Theodosius the Great was

signalised by a fierce sedition in Antioch, caused by a tax which he had imposed in 387 or 388 a.D., a year of famine. The statues of the emperor and the imperial family were thrown down, and a tumult raised which was suppressed with difficulty. Many of the offenders were punished with great severity, while the town itself was deprived of its privileges as a metropolis. In the time of Leon a temple was erected in Antioch to Simeon Stylites, whose body was couveyed to the city from the hill, between 30 and 40 miles to the east, where, on the top of a column 40 or 60 feet high, he had lived in self-imposed martyrdom for thirty years. Under Zeno great efforts were made to restore the city to its original splendour before the earthquakes of 526 and 528 A.D. Its name was now changed to Theopolis, but the change was of short duration, as were also the new build- ings ; for in 538 a.p. Chosroes, the king of Persia, took the town, and, after removing all the plunder, even that of the church, gave it over to his soldiers, by whom the greater part of it was set on fire. It was again partly revived by Justinian, but from this time gradually sank from its high position of queen of the East. Under Heraclius (635 A.D.) it fell into the hands of the Saracens, who held it till 969 a.p., when it was restored to the Roman dominion by Michael Burza and Peter the Eunuch, and so retained till 1084 a.p., when it fell into the power of the Turks, from whom again it was captured by the Crusaders, 1098 a.p. In 1268 a.p. it was taken by the sultan of Egypt, and never revived from the destruction which it then suffered. Of the ancient city little now remains except a great aqueduct bridge and part of the massive walls, which are still to be seen scaling step by step the precipitous hills. At one place the wall is carried over a deep ravine with an arch about 60 feet high. Across the Orontes is a bridge of nine arches, with two towers having gates plated with iron, whence the bridge is known as the iron bridge. Neither the harbour nor the ancient walls which divided the four parts of the city can now be traced. As in the case of many other Greek cities in Asia, once famous for their beauty, the site of Antioch is now studded with squalid hovels of mud and straw. The people live by the produce of the mulberry trees and by growing tobacco, which is of a fine quality. It is still called (Antioch) Antakie, and is sometimes, as in 1822, reminded of its ancient calamities arising from earthquakes. In 1835 it contained 5600 inhabitants, with 6000 Egyptian soldiers under Ibrahim Pasha, who had then his head- quarters there. (C. O. Miiller, Antequctates Antiochene, Géttingen, 1839, from which the plan of Antioch has been here

adapted; Bishop Pococke, Description of the Hast, Lond. 1743-5; Taylor, Za Syrie, la Palestine, et la Judeée, Paris, 1855; and Voyage Pittoresque de Syrie.) The ancient writers, from whom most of our information concerning Antioch is derived, are—(1) Malala (Johannes),

| Antiochenus, Historia Chronica, Oxon., 1691; (2) Liba-

nius, the Sophist, who had a school in Antioch in the time of the emperor Julian; and, (3) Chrysostom (John), patriarch of Constantinople. (A. s. M.)

ANTIOCH in Pisipia, another of the many cities founded by Seleucus Nicator, was situated on the south side of the range of mountains between Phrygia and Pisidia Its remains, which were identified by Arundel in 1833, are close to the modern Yalobatch, in lat. 38° 18’ N., and long. 31° 23’ E., and include the ruins of several temples, a theatre, and a magnificent aqueduct. It was against the Jewish inhabitants of this Antioch that Paul and Barnabas “shook off the dust of their feet” (Acts xiii. 51).

ANTIOCHUS I. (Sorer, the Deliverer) succeeded his father Seleucus Nicator, the founder of the Syrian kingdom, in 280 B.c. He maintained fora time his father’s Mace- donian policy, but at length came to terms with Antigonus Gonatas. Successful at first against the Gauls, who had invaded Asia Minor, he was finally slain by them in battle (261 B.C.)

ANTIOCHUS II. (THx0s, the God), the son and succes- sor of Autiochus I. Under him Syria was troubled with a long Egyptian war, and lost Parthia and Bactria, which became independent. He was forced by Ptolemy of Egypt to put away his wife and marry an Egyptian princess, Berenice ; but on Ptolemy’s death Berenice was discarded, and Laodice restored. The latter, however, out of revenge or mistrust, procured the death of her husband, her rival, and their son, 246 B.c.

ANTIOCHUS IIL, surnamed the Great, was the son of Seleucus Callinicus, and ascended the Syrian throne at the age of fifteen, on the death of his brother, Seleucus Ceraunus. His reign embraced a series of wars against revolted provinces and neighbouring kingdoms, in the pro- secution of

which his disasters and successes were equally great. His march to India; his agreement with Philip of Macedonia for the partition of Egypt; his conquest of Palestine and Ccele-Syria ; his occupation of Asia Minor and the Thracian Chersonese; his collision with the Romans ; his expedition into Greece, with the defeat at Thermopyle by Acilius Glabrio, and at Mount Sipylus (in Asia Minor) by Scipio ; and his dearly purchased peace in 188 B.c., are the chief events of his life. He was killed in an attempt to plunder a temple at Elymais, 187 3.c., and was succeeded by his son Seleucus Philopator.

ANTIOCHUS IV. (EprpHanss, the Illustrious, and by parody, Epimanes, the Insane), who had been a hostage in Rome from 187 B.c., ascended the Syrian throne on the death of Seleucus, 175 3.c., and soon made himself famous by his conquest of Ccele-Syria, Palestine, and Egypt itself, with the exception of Alexandria, whigh would likely have also been his if the Romans had not interfered and for- bidden him the country. During his Egyptian campaigns he twice took Jerusalem (170 and 168 3.c.); but he appears to have seen that he could never hope to subdue Judea until he had rooted out the peculiar Jewish religion, He accordingly promulgated a decree, enj olning uniformity of worship throughout his dominions; and, on the refusal of the Jews to obey it, he went in person to Jerusalem and endeavoured to force on them the worship of the Greek deities, This persecuting policy stirred up the successful resistance of the Maccabees; and it was while hastening to quell this revolt that he fell ill of a loathsome disease, and died, raving mad, at Tabs, in Persia, 164. 8.c. His death was thought by the Jews to be an appropriate punishment for his persecution of them.

ANTIOCHUS VIII , king of Syria, was the second son of Demetrius Nicator. During his reign (125-96 B.C.) those discords and wars began between the priuces of the royal house of Syria, which form almost its sole history, till the kingdom was reduced to a Roman colony in 65 3.0.

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ANTIOCHUS, or Ascaton, a philosopher of the 1st century before Christ, who, coming under the influence of Philo the Academic and of Mnesarchus the Stoic, was led to attempt a reconciliation between their antagonistic

doctrines, and thus gave rise to what has been called the Fifth Academy. In regard to the great question of the degree of certainty attainable by man, he held, in opposi- tion to the scepticism of Philo, that the human jintéllect has in itself a sufficient test of truth; and in regard to the question wherein happiness consists, he maintained that, while virtue was the greatest essential, the circum- stances of life were not a matter of indifference. Of his writings none have been preserved to us; and for the greater part of our information we are indebted to Cicero, who had studied under him at Athens, and continued to keep up a friendly intercourse with him afterwards, He visited Alexandria and Rome, and lectured on philosophy in both cities.

ANTIOPE (1), in Greek legend, the mother of Amphion and Zethus,.was, according to the Odyssey (xi. 260), a daughter of the river god Asopus. In later poems, as in the Cypria, she is described as the daughter of Lycurgus, who appears as a king of Thebes. Her beauty attracted Jupiter, who, assuming the form of a satyr, took her by force. After this she was carried off by Epopeus, king of Sicyon, who would not yield his possession of her till com- pelled by her uncle Lycus. On the way home she gave birth, in the neighbourhood of Eleutherx, to the twins Amphion and Zethus, of whom the former, some supposed, was the son of the god, the other the son of Epopeus. Both were left to be brought up by herdsmen. At Thebes Antiope now suffered from the persecution of Dirce, the wife of Lycus, but at last escaped towards Eleuthere, and there found shelter, unknowingly, in the house where her two sons were living as herdsmen. Here she was discovered by Dirce, who ordered the two young men to tie her to the horns of a wild bull. They were about to obey, when the old herdsman, who had brought them up, revealed his secret, and they now carried out the punishment on Dirce instead. For this, it is said, Bacchus, to whose worship Dirce had been devoted, visited Antiope with madness, which caused her to wander restlessly all over Greece till she was cured, and thereafter married by Phocus of Tithorea, ou Mount Parnassus, where at last both were buried. Their tomb is mentioned by Pausanias, ix. 17, 4, x. 32, 7.

ANTIOPE (2), an Amazon who bore to Theseus a son, Hippolytus. As to how Theseus became possessed of her there are various reports. Either she gave herself up to him out of love, when with Hercules he captured

Themiscyra, the seat of the Amazons, or she fell to his lot then as a captive. Or again, Theseus himself invaded the dominion of the Amazons and carried her off, the consequence of which was a counter-invasion of Attica by the Amazons. After four months of war peace was made, and Antiope left with Theseus as a peace-offering. In another account she had joined the Amazons against him because he had been untrue to her in desiring to marry Phedra. Antiope is said to have been killed by another Amazon, Molpadia, a rival in her affection for Theseus. Elsewhere it was believed that he had himself killed her, and fulfilled an oracle to that effect.

ANTIPAROS, the ancient Oliaros, an island of the kingdom of Greece, one of the Cyclades, in the modern eparchy of Naxos, situated on the west of Paros, from which it is separated by a strait about a mile and a half wide at the narrowest point. It is 7 miles long by 3 broad, and contains about 500 inhabitants, most of whom are collected in Kastro, a village on the north coast; their chief employments are agriculture and fishing. The only remarkable feature in the island is a stalactite cavern,

which is situated near the south coast, and is reached by a narrow passage, that is broken by several steep and somewhat dangerous descents. The grotto itself, which is supposed to be about 80 fect high, and more than 300 in length and breadth, presents a scene of the most dazzling brilliance and splendour. M. de Nointel dis- covered it in 1673, but there is reason to believe that it had been known to the ancients.

ANTIPAS, Herop. See HeRrop ANTIPAS.

ANTIPATER, regent of Macedonia during Alexander’s Eastern expedition, 334 B.c. He gained this distinguished position by his faithful attachment and his prudence. In 330 he had to subdue the rebellious tribes of Thrace ; but even before this insurrection was quelled, the Spartan king Agis had risen against Macedonia. Having settled affairs in Thrace as well as he could, Antipater hastened to the south, and in a battle near Megalopolis, gained a complete victory over the insurgents. His regency was greatly molested by the arrogance and ambition of Olympias, the mother of Alexander. The repeated complaints which both parties sent to Alexander

induced the latter to invite Antipater to Asia, and to appoint Craterus regent in his instead. But before this could be effected, Alexander died at Babylon. In the first partition of the empire among the Macedonian generals, Antipater and Craterus had allotted to them the administration of the dominions in Europe with the exception of Thrace, which was given to Lysimachus. The death of Alexander tempted the Greeks to assert their independence, but the prudence and valour of Antipater crushed all attempts in the Lamian war, and established the Macedonian rule in Greece on a firm footing. At the same time Craterus was engaged in a war against the /Ztolians, when news arrived from ‘Asia which induced Antipater to conclude peace with them ; for Antigonus reported that Perdiccas contemplated making himself sole master of the empire. Antipater and Craterus accordingly prepared for war against Perdiccas, and allied themselves with Ptolemy the governor of Egypt. Antipater crossed over into Asia in 321; and while still in Syria, he received information that Perdiccas had been murdered by his own soldiers. Antipater now, as sole regent, made several new regulations, and having commis- _ sioned Antigonus to continue the war against Eumenes and the other partisans of Perdiccas, returned to Macedonia, where he arrived in 320. Soon after he was seized by an illness which terminated his active career 319 B.c. Passing over his son Cassander, he appointed Polysperchon regent, a measure which gave rise to much confusion and ill feeling.

ANTIPHILUS, a painter of the 4th century before Christ, who was placed by the ancient critics in the highest rank after Apelles and Protogenes. He was born in Egypt, taught by Ctesidemus, and patronised by Philip of Mace- don, and Ptolemy, son of Lagus. Jealousy is said to have led him to bring a false accusation against Apelles, which resulted, according to the story, in his being handed over to his rival asa slave. In style the two artists were strongly opposed ; Antiphilus being remarkable for a certain quick- ness of conception, facility of execution, and lightness of treatment.

ANTIPHON, the most ancient of the ten Athenian orators contained in the Alexandrine canon. He was born 480 s.c. at Rhamnus. During the Peloponnesian war he was several times entrusted with the command of detach- ments of the Athenian forces, and took an active part in the political affairs of Athens. He had a hand in the overthrow of the democracy, and the

establishment of the oligarchy of the Four Hundred, 411 3.c.; but as the new govern- ment was soon after changed, Antiphon was accused of high treason, aud put to death. He must be regarded as the founder of political oratory at Athens, for he was the first

that reduced the art of the orator to definite rules and principles. He wrote specches for others, but never addressed the people himself except at his own trial. Seventeen orations bearing his name are extant, but two or three of them may be spurious. They are printed in the various collections of the Greek Orators. From this Anti- phon the orator we must distinguish two others: the one a philosopher, mentioned by Xenophon (Memor., i. 6), who is said to have written about dreams; and the other, a tragic poet, who lived at the court of the elder Dionysius.

ANTIPHONY (dyvré, and g¢wvy, a voice), a species of psalmody in which the choir or congregation, being divided into two parts, sing alternately. The peculiar structure of the Hebrew psalms renders it probable that the antiphonal method originated in the service of the ancient Jewish Church. According to the historian Socrates, its introduc- tion into Christian worship was due to Ignatius (died, 115 A.D.), who in a vision had seen the angels singing in alter- nate choirs. In the Latin Church it was not practised until more than two centuries later, when it was intro- duced by Ambrose, bishop of Milan, who compiled an antiphonary, or collection of words suitable for antiphonal singing. The antiphonary still in use in the Roman Catholic Church was compiled by Gregory the Great (590 A.D.)

ANTIPODES, a word of Greek derivation (avri, against, opposed to, wddes, feet),—from the inhabitants walking feet to feet,—is a relative term applied to any two peoples or places on opposite sides of the earth, so situated that a line drawn from the one to the other passes through the centre of the globe and forms a true diameter. Thus, the North Pole is exactly antipodal to the South. Any two places having this relation—as London and, approxi- mately, Antipodes Island, near New Zealand—must be distant from each other by 180° degrees of longitude, and the one must be as many degrees to the north of the equator as the other is to the south. Noon at the one place is midnight at the other, the longest day corresponds to the shortest, and mid-

winter is contemporaneous with mid-summer. In the calculation of days and nights, mid- night on the one side may be regarded as corresponding to the noon either of the previous or of the following day. If a voyager sail eastward, and thus anticipate the sun, his dating will be twelve hours in advance, while the reckon- ing of another who has been sailing westward will be as much in arrear. There will thus be a difference of twenty- four hours between the two. In this way the Portuguese in Macao are a day before their Spanish neighbours in the Philippine Islands.

ANTIQUE, denoting etymologically anything that is ancient, is conventionally restricted to the remains of Greek and Roman art, such as sculptures, gems, medals, seals, &e. In this limited sense it does not include the artistic remains of other ancient nations, or any product of classical art of a later date than the fall of the Western Empire.

ANTIQUITIES. Inkeeping with its derivation, the word “antiquities” had for long a wide and general acceptation, embracing everything belonging to the knowledge of the remoter past. The range of the term has been gradually lessened, and a distinction has grown up between history on the one hand and antiquities on the other, though the line of demarcation is not of the most definite kind. Dr Arnold made the distinction between the historian and the antiquary to consist in this, that the historian studied the past for the sake of its bearing on the present, while the antiquary was content to investigate it for its own sake alone. It might rather be said, however, that the historian is concerned with the activities of the past, the antiquary with the products—the one with the progress and variation of the creative processes, the other with the perceptible

and permanent results. In the vast range of subjects with which both classes of inquirers have to do,—religious rites, social customs, legal forms, architectural remains, sculptures, paintings, and so on,—it is plain that the more decidedly anything takes outward form the more un- doubtedly it is the property of the antiquary rather than of the historian; and thence it has happened that the anti- quary is not unfrequently thought of as having little con- cern with anything beyond purely material relics.

With respect to its treatment of the past three periods in a nation's history may be roughly distinguished—the period of emotional interest, the period of neglect, and the period of scientific attention. To the last of these the true antiquarian spirit belongs. Of the prevalence of this spirit in the classical ages of Greece and Rome we have but little evidence, though a considerable interest in archeological subjects was manifested by the greater historical intellects, such as Thucydides, Polybius, or Livy. But in the Alex- andrian school there was a great, though somewhat irre- gular, development of antiquarianism, which acquired more of a scientific character from its being rather cosmopolitan than national.

At the revival of learning, when such enthusiasm was felt for everything classical, the relics of Greece and Rome were carefully collected and preserved; but it was sonie time before a transition took place from classical to national antiquarianism; and hence it is that the earliest literature of archxology is almost solely confined to the classical area. Manutius the younger (1511-1574), Sigonius (1520-1584), Meursius (1579-1639), Gruter (1560-1627), Gronovius (1645-1716), Graevius (1632-1703), Pitiscus (1637-1727), &e., kept up the line of laborious scholarship which laid the massive foundations of our present archeological erudition. The discoveries at Herculaneum (1713) and Pompeii (1755) gave a great impulse to such studies in general, besides supplying a special field of inquiry for such men as Venuti, Jorio, Bayardi, Rossini, and Ciampitto, Mazois, Gau, Gell, Barré, Fiorelli, Overbeck, Dyer, Monier, Garrucci, &c. The names of Heeren, Miiller, Niebuhr, Creuzer, Boeckh, Hartung, and Zumpt are well known to all who are familiar with the subject of classical antiquities ; and to these may be added Curtius, Waddington, Braun, Lasaulx, Le Bas, Roulez, Rangabé, Schdmann, Canina, Panofka, Becker, Marquardt, and Lange. The results of their labours have been collected in such books as Pauly's Encyclopidie der classischen Alterthumswissenschaft ; Smith's Dictionary of Greek and Roman Antiquities; and Darem- berg and Saglio's Dictionnaire des Antiquités grecques et romaines. The capitals of Greece and Italy have naturally attracted particular attention to themselves. On Rome we have the special works of Desgodetz (1682), Piranesi (1784), Overbeck, Rossini, Reber, Dyer, Reumont, Nibby, besides the famous Beschretbung by Bunsen, Platner, Gerhard, Réstell, &c.; on Athens those of Leake, Forch- hammer, Wordsworth, Stuart and Revett, Beulé, Laborde,

&c. In connection with Etruscan antiquities, Micali, Dempster, Inglirami, Dennis, Hamilton, Heyne, Lanzi, and Raoul- Rochette are well known. The mysteries of the Egyptian monuments have found interpreters in Young, Champollion, Bunsen, Letronne, Lenoir, Leemans, Sharpe, &c.; while the marvels of Assyria have employed the energies of such men as Botta, Layard, Rawlinson, Munter, Grotefend, Rask, Burnouf, Lassen, Westergaard, Hincks, De Sauley, Holtz- mann, Haug, Spiegel. The autiquities of the northern nations of Europe have been treated by Mallet, Thorlacius, Nyerup, Werlauff, Worsaae, Thomsen, Brunius, Grupen, Heineccius, Roessig; those of France by Montfaucon, Caylus, Martin, Sauvagére, Ramé, Lajard, Renouvier, Didron, Gailhabaud, Gilbert, Beugnot, Cochet, and a multitude of others. The Russian antiquities have been

magnificently represented in a great work issued by order of the Government.

In our own country the names of Leland, Camden, Hearne, Dugdale, Grose, and Roy, are not forgotten in the newer fame of Fosbrooke, Palgrave, Ellis, Wright, Stuart, Wilson, Brand, Lodge, Laing, Bateman, &c. For a know- ledge of American antiquities we are largely indebted to Davies, Squier, Lapham, Haven, Rosny, Stephens; and for those of Mexico to Ranking.

In what are called ecclesiastical antiquities, besides the older works of Ugolinus, Canisius, and Bingham, we may mention Buchon, Bourassé, Martigny, Guenebault. The names of Lubbock and Tylor are especially famous in those inquiries which relate to the general condition of primeval humanity.

Associations of various kinds have naturally been formed by scholars interested in archeological pursuits for the promotion of their favourite studies, and a large number of periodical publications have been established, partly in connection with such associations, and partly as matters of commercial speculation. :

As early as 1572, in our own country, a sort of society was formed by Bishop Parker, Sir Robert Cotton, William Camden, and a few kindred spirits, for the preservation of the national antiquities, and it continued to exist till 1604, when it was broken up by James I., who was afraid that it might degenerate into a political association. Papers on subjects discussed by them have bcen preserved in the Cottonian library, and were printed by Hearne, in 1720, as A Collection of Curious Discourses, and again, in 1771, by Sir Joseph Ayloffe, with considcrable additions. In 1707 Humphry Wanley and a number of other gentlemen began to meet together for a similar purpose, and next year they received the co-operation of the brothers Gale, Dr Stukeley, Rymer, &c. In 1717 they were reconstituted, and in 1750 they obtained a charter from George II. as the Society of Antiquaries of London. In 1780 they were presented by George III. with apartments in Somerset House in the Strand. The council consists of twenty members and a president, who, during his tenure of office, is one of the trustees of the British Museum.

The Society of Antiquaries of Scotland was founded in 1780, and has the management of a large national Anti- quarian Museum in Edinburgh. In Ireland there is a Royal Historical and Archeological Association, which holds its meetings at Kilkenny. The Société des Antv- quaires de France was fornied, in 1813, by the reconstruc- tion of the Académie Celtique, which had been in existence since 1805 In Germany there are a large number of societies that, under the name of Historische Vereine, embrace the study of antiquarian subjects, and keep up a connection with each other through the Correspondenzblatt des Gesammtvereins der deutschen Geschichts- und Alter- thumsvereine, published since 1853 at Stuttgart. There is a well-known Société Royale des Antiquaires du Nord at Copenhagen. Similar associations, far too numerous to mention, have been formed in all countries of European civilisation.

The word antiquarius first appears in the later Roman classics (Tacitus, Suetonius, Juvenal), with the signification of an affecter of old words and phrases. In the Middle Ages it was employed as the designation of one who was skilled in copying ancient manuscripts; and in modern German it has kept, in the form Antiquar, the cognate meaning of a dealer in old books.

ANTISEPTICS (avri, against, and oyrés, putrid, from oymw, to make rotten), substances which have the property of preventing or arresting putrefaction in dead animal or vegetable matter. The access of air, together with a moderate amount of warmth and of moisture, are neces-

sary to the occurrence of the putrefactive changes, which consist essentially in the breaking up of the complex organic material, and the formation of new and simpler combinations among its constituent elements. During the process various gases and vapours are evolved, and the lower forms of animal and vegetable life are observed to grow and multiply in the putrefying substance. The exciting causes of putrefaction have long formed a subject of scientific discussion, two widely-different theories being maintained respecting them. By the one, the changes which occur during the process are held to be from the first the result of chemical decomposition in the organic substance, whose atoms are in a state of motion or activity, which is capable of being communicated by catalytic action to other organic material in contact with it (Liebig) ; while, further, it is asserted that minute living organisms may be evolved from the dead material as the result of these chemical transformations. By the other theory, which is founded mainly upon the researches of Pasteur, the putre- factive changes are ascribed to the agency of organised germs ever present in the atmosphere, which, finding a Suitable nidus in the putrescible material, grow and multiply, producing the chemical decompositions as the result of their action. Putrefaction, it is further maintained, may be entirely prevented by means which exclude the access of germs. ‘The subject derives much interest and importance from its relation to the doctrines of the origin of life, as well as to questions concerning the sources of contagion and epidemic disease, and continues to the pre- sent time a matter of keen inquiry and experiment among physiologists. (See Brorocy.)

Putrefaction may be prevented by removing one or more of the conditions essential to its occurrence. Thus, by exclusion of the atmosphere, dead matter, which would speedily undergo decomposition, may be kept intact for an indefinite length of time, as shown in the method of pre- serving meat by hermetically sealing the Jars after the expulsion of the air by ‘heat.

Again, the preservative influence of a low temperature is well known; and ex- treme cold is a powerful antiseptic, as proved in the case of the frozen mammoths of northern Asia. Furthermore, the abstraction of moisture will prevent corruption in dead matter. In warm and dry climates animal food may be preserved by exposure to the sun. In the ancient practice of embalming the dead, which is the earliest illustration of the systematic use of antiseptics, the moister portions of the body were removed before the preservative agents were added. (See EMBaLMING.) Numerous chemical substances have the power of counteracting the putrefactive process. Many of these have been long known and used for this purpose. In embalming, besides the application of various aromatics and resins, the body was washed with cedar oil and natron (soda), and pitch or tar were used as anti septics. Pitch was used by the Romans in wine-making to control the fermentive process. The fumes of sulphur were largely employed by the ancients for purposes of purification, while common salt has been known and used for ages as one of the best preservatives from decay. The mineral acids possess antiseptic properties, as do also many of the metallic salts—the chloride of zinc, in the form of Sir W. Burnet's disinfecting fluid, being one of the most potent of them. Alcohol is well known for its power of preserving animal substances from decay. Quinine has been found to possess strong antiseptic properties. The tar products, notably carbolic acid, are among the most approved and extensively used of all antiseptic agents.

The various substances named possess the power of pre-

venting putrefaction in dead animal or vegetable matter,

and to a greater or less degree of arresting it where already begun. They likewise exert a similar action on the ana-

logous process of fermentation. They differ from mere disinfectants, which destroy the emanations from putre- scent material, but do not necessarily arrest the progress of decay. (See DisinFEcTANTS.) Some antiseptics, how- ever, such as sulphurous acid, are powerful disinfectants also, while others, such as quinine, have no disinfectant properties at all. Various opinions are entertained regard- ing the modus operandi of antiseptics. By those who

hold the purely chemical theory of putrefaction they are believed to operate in different ways according to their chemical properties; thus, sulphurous acid is said to act by deoxidising the putrescible matter; the mineral acids and metallic salts by combining with the substance, and forming a permanent compound; and the tar acids in a similar manner. On the other hand, the supporters of the germ theory maintain that carbolic acid, and indeed all true antiseptics, produce their effect by acting as poisons to the infusorial organisms which are held to be essential to the occurrence of the putrefactive pro- cess.

One of the most important applications of antiseptics has been their introduction into medical and surgical practice. Although their internal administration, with the view of counteracting diseases believed to be due to morbid poisons, has not hitherto yielded any marked practical result, their employment in the treatment of wounds has, in the hands of Professor Lister of Edinburgh, attracted much interest, and has exercised an important influence on surgical practice during the past ten years. Professor Lister, adopting the germ theory of putrefaction, and regarding many of the evils arising in connection with open wounds as the result of putrid discharges, produced by the agency of atmospheric germs, seeks to exclude the access of these to wounded surfaces by the employment of antiseptics, particularly carbolic acid, the power of which in destroying living organisms is undoubted. Dressings of gauze, made antiseptic by previous treatment with strong carbolic acid, are applied to wounds. The acid well diluted with water is likewise employed as a lotion, and, during the dressing of wounds and the performance of operations, is also ap- plied in the form of spray to the surrounding atmosphere, with the object of preventing all access of germs. Boracic acid is also employed by Mr Lister as an antiseptic. The chief benefits claimed for this method of treatment are, that wounds, however extensive, may heal without the occur- rence of putrefaction in the discharges, and that thereby the risks of blood poisoning (pyemia, &c.) are reduced to a minimum. Although the antiseptic system in surgery is but on its trial, and its practical advantages over the methods of treatment in general use are still questioned by many high authorities, it has already obtained wide repute, and is extensively employed by surgeons both in this and other countries, (s306.)

ANTISTHENES was the earliest Greek expositor of a philosophy and mode of life to which the name Cynicism soon came to be applied. Though a native of Athens, he was the son of a Thracian mother; and it was in the gymnasium of Cynosarges, to which the half-breeds were restricted, that he is said to have taught. From that place he and his followers probably received the name Cynic; but the popular derivation of the word connected it with the dog, whose shamelessness and importunity many of their actions seemed to imitate. In the time of Diogenes the name was firmly fixed as a nickname, and even adopted by the Cynics themselves.

Antisthenes was apparently born some years before the Peloponnesian war began, and from his remark on the rejoicings after the battle of Leuctra (371 B.c.)—that the Thebans were like a pack of schoolboys who had thrashed their master—it may be inferred that he lived on nearly to

AN FHS THPNES

the middle of the 4th century B.c. He may be regarded as an elder contemporary of Plato. In youth he studied rhetoric under Gorgias, perhaps also under Prodicus and Hippias. These studies bore fruit, uot merely in the stylistic ability which made his writings eulogised by later critics, but more especially in the doctrine he after- ward held, that the study of names was the first step in education. He opened a school of ~~his own, and was on the way to distinguish himself in the usual course of oratory, when he met with Socrates, and his views of life underwent a change. From that time he became the inseparable admirer of Socrates, to hear whom he walked every morn~~ ing from Pirzus to Athens, a distance of about 5 miles,

Antisthenes was poor, and lived in the midst of a com- mercial population which had suffered severely from the disasters attending the downfall of the Athenian empire. He became the philosopher of the proletariate, carrying into the haunts of the indigent and the vicious those prin- ciples which had been spreading in wealthier circles, and modifying them to suit altered circumstances. His earlier culture had always been more literary and rhetorical than strictly philosophical, and he never attained a mastery over metaphysical problems. Aristotle speaks of him as un- educated and simple-minded ; and Plato has been under- stood, in more places than one, to refcr to the zeal without knowledge with which he dwelt upon the difficulties of

dialectic. Words and names were to him more important than thoughts The puzzle of the one and the many, which then was so prominent, led him to the strange con- clusion that we can never say that one thing (or name) is another, as that a tree is green, but only that a tree is a tree. Such an adhesion to identical propositions as the sole form of judgment led him to deny the possibility of contradiction altogether. He objected to the Platonic theory of the substantive existence of relative and quali- tative terms, such as good or beauty. The dramatising legend shows him putting out his criticism thus: 'Plato,' he said, "TI can see a horse, and I can see a man sbut humanity and horsehood I cannot see." " True," replied Plato, "you have the eye which sees a horse and a man i but the eye which can see horsehood and manhood you have not." The idea expressed by the so-called abstract term was to Antisthenes merely subjective—a bare concep- tion (YAH vow) in the mind. 'Antisthenes, in short, opposes a crude Realism to the Idealism of Plato The attitude of Antisthenes towards intellectual philosophy is in the main negative, and the general result he comes to is that logical or metaphysical investigations which go beyond name are unfruitful and frivolous.

A certain training is, however, necessary before a man can become what Antisthenes wishes him to be—his own master, independent of all external goods and social ties. This preparation consists in the laborious endeavour (évos) to raise himself above those cxternal circumstances of human life which reflection shows to be useless and vain show (rddos). We must separate what we really are by nature from our artificial surroundings, so as to dis- cover the minimum of real wants in life 3 and then fixing our mind on that standard, we must discard whatever is desirable only because popular opinion calls for it. Seeing that nature needs but littl», and that this little is easily attained, if we do not insist on the delusions which attend it, the wise man will, it is true, gratify the natural cravings, but will not do more. These inevitable appetites of sex and food being satisfied, without the additions and refine- ments which art and fashion require, he will renounce Pleasure as such. In the paradoxical language of Antis- thenes, he would rather plunge into insanity than into pleasure. His aim must be to become, as much as may be, independent of everything outside, using it as needful,

but not desiring it as a gratification. Such a mastery of

self is what is called virtue, and is enough for happiness. It is hard to win, but once attained it can never be lost. The Cynic is one who surrenders the city of human life, with its varied scenes, on account of the difficulty of keeping his ground, and who is content if he can hold out the barren rock of the citadel as a soldier, constantly on the watch and in procinctu. Unfortunately this conception of a minimum of needs is somewhat vague, and allows many degrees. Diogenes could criticise and improve upon Antisthenes, and the Indian gymnosophists pointed out that Diogenes himself exceeded the strict demands of nature,

Antisthenes, though he did not encourage the formality of a school, and drove away the curious or enthusiastic with his staff, taught others by his example and by his caustic words. The Cynic was something of a missionary. He adopted a peculiar garb, at first perhaps for reasons of economy, but subsequently as a symbol of his profession. A rough cloak, which could be doubled to counterfeit an inner garment, and served the purposes of a night covering; a wallet, in which provisions could be carried 3 a staff to support his steps, and perhaps something from which to drink, constituted the property of the bare-footed Cynic ; and to these was afterwards added a long beard. The successors of Antisthenes lived, like mendicant friars, on the alms of the public, and wandered from place to place, sleeping by night on the steps of public buildings, or occupying any vessel or tub which might suit their pur- pose. Antisthenes himself seems not to have been speci- ally extravagant in conduct; but the later Cynics, who were without his early culture, made it a point to disregard all decency and social conventions. Whatever they had to do they deemed it their duty to do in public—at least such is the tenor of many tales. The wise man, they held, would follow another law than that of his city; he was a citizen of the world. Sexual desires he would unquestionably have to satisfy, but in the most convenient way, without regard to sentimental objections or to beauty —the uglier the better. Some, at least, of the Cynics main- tained the advisability of a community of wives. They allowed to no ceremonies more than a relative force. According to Diogenes, the practice of cannibalism among certain tribes shows that the prohibition against eating human flesh is no part of the code of nature.

So far the Cynics taught practically. But they were also great in repartee and sarcasm. The fine touch of Socratic irony, which had given offence by talking occa- sionally about pots and pans, was succeeded by a rough and sometimes gross satire, which scrupled not to deal with matters viler still. Antisthenes, it is said, had some powers of social attraction ; but if it were so, his succes- Sors were more marked by the severity of their rebukes. From the Homeric poems, the Bible of the Greeks, they drew many of the weapons of their warfare, parodying its language, and applying it to suit their own circumstances, Public manners, men, and measures were assailed in no merciful spirit. Antisthenes compared the ery of demo- cratic politicians to the speech in which the hares demanded equality of rights from the lion. He was equally at odds with the esthetic and literary tendencies of his time. Aristippus, Plato, and Isocrates were among his literary enmities. Nor was he less trenchant in his criticisms of popular superstitions, of soothsayers, and mystery-mongers. When the priest dilated in his sermon on the blessedness of the other world for the initiated, Antisthenes interrupted him with the words: “Why don’t you die, then ?”

Antisthenes was a voluminous writer ; his works, accord- ing to Diogenes Laertius, filled ten volumes. Of these scarcely anything is left. They secm te have Bi on

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various subjects, many of them being apparently a moralis- ing interpretation of the poems of Homer. We can base our estimate of Antisthenes only on the sayings attributed to him, aud, above all, to his follower Diogenes.

The great age of Cynicism in Greece is the century from 400 to 300 Bc. Diogenes, who sueceeded Antisthenes,

carried the exaggeration still further , and yet, in the story .

of the education of the children of Xeniades by him, there are traits which anticipate the educational theory of Rabelais and Rousseau. Crates, who succeeded Diogenes, voluntarily abandoned his possessions ; and Hipparchia was so enamoured of Cynical life, that she refused her wealthy suitors, and married the landless and ill-favoured Crates. They were both notable features in the school, which includes the names of Monimus (a slave who was attracted by the fame of Diogenes), Onesicritus, Metrocles, and Menippus. In Menedemus the Cynical succession disappears, perhaps combining with the Megaric. For more than three centuries the name continued a tradi- tion, when in the Ist and 2d centuries of the Christian era it was revived. The majority of the Cynics of that date were a worthless set of vagabonds, who used the garb and the name as a cover for all iniquities. They may be compared to the mendicant orders in the worst days of their corruption. But amongst them two or three names have a brighter light thrown upon them. Demctrius is lauded by his contemporary Seneca, and about a hun- dred years later Demonax is enthusiastically presented to the world by Lucian. There is much of the old Cynic in these descriptions ; but the men were more eclectic, and had in some respects followed the advance of the general culture. Cynicism lasted for a few centuries longer, but never contributed anything to philosophy properly so called. It was a mode of life rather than a theory ; and it sank before the monasticism and asceticism which marked certain directions in the history of the Christian church. (w. w.) ANTITHESIS (dvriGeoxs) is, in rhetoric, the bringing out of a contrast in the meaning by an obvious contrast in the expression, as in the following :—“¢ When there is need of silence, you speak, and when there is need of speech, you are dumb; when present, you wish to be absent, and when absent, you desire to be present ; In peace you are for war, and in war you long for peace; in council you descant on bravery, and in the battle you tremble.” Anti- thesis is sometimes double or alternate, as in the appeal of Augustus :—“ Listen, young men, to an old man to whom old men were glad to listen when he was young.” The force of the antithesis is increased if the words on which the beat of the contrast falls are alliterative, or otherwise similar in sound, as—‘‘The fairest but the falsest of her sex.” There is nothing that gives to expres- sion greater point and vivacity than a judicious employ- ment of this figure ; but, on the other hand, there is no- thing more tedious and trivial than a pseudo-antithetical style. Among

writers in our own language who have made the most abundant use of antithesis, are Pope, Young Johnson, and Gibbon ; and, to an egregious extent, Lily in his Zuphues. It is, however, a much more common feature in French than in English ; while in German, with some striking exceptions, it is conspicuous by its absence. ANTITYPE (avrérvios) denotes a type or figure corre- sponding to some other type. _It is im this sense of copy or likeness that the word occurs in the New Testament (Heb. ix. 24; 1 Peter iii, 21). By theological writers antitype is employed to denote the reality of which a type is the prophetic symbol. Thus, Christ is the antitype of many of the types of the Jewish ritual. By the fathers of the Greek Church antitype is employed as a designation of the bread and wine in the sacrament of the Lord's supper.

passed into the hands of the Volsci.

to Venus, and to Apollo. peror Augustus, and became the birth-place of Caligula and Nero. and it was afterwards indebted to Antoninus aqueduct.

jects are frequently single figures,

ANT—ANT

ANTIUM, a city on the Italian coast, about 33 miles S. from Rome. Its site is now occupied by the village Porto Anzio, or Anzo. Founded, it is supposed, by Pelasgians, it became connected with the Latin League, and about the beginning of the 4th century before Christ As the chief city of this people it continued, in spite of repeated defeat, to carry on, with intervals of peace, a pertinacious war against the Romans till the year 338 B.c., when it was finally sub- dued, and garrisoned by a Roman colony, its ships being

destroyed, and their rostra or beaks sent to ornament the

speaker's platform in the Forum. Towards the close of

the republic it was again a beautiful and flourishing town, greatly resorted to

by the wealthier Romans. There was a maguificent temple to Fortune, and others to Aisculapius, It was patronised by the em- The latter enriched it with a fine artificial harbour, Pius for an It seems to have fallen into decay about the 5th century; and the attempts made in the 17th by Innocent XII. to restore it had only a temporary suc-

cess. It is now the property of the Borghese family, and is a favourite bathing-place Among the ancient remains that have been discovered here are the Apollo Belvedere,

in the early summer mouths.

and the Borghese or Fighting Gladiator. ANTIVARI, or Bar, a town of Turkey, in Albania,

situated on the Adriatic Sea, 18 miles N.W. of Scutari. It possesses a castle that is now of no value as a fortifica- tion, and a good harbour for vessels of light draught, which

accommodates a considerable trade in the products of Albania. It is the seat of a Roman Catholic bishop. Population about 6000.

ANTONELLO pa Messrna. Of the events of this celebrated painter's life we know little more than that he was probably born at Messina about the beginning of the 15th century ; lived and laboured at his art for some time in his native country; happening to see at Naples a paint- ing in oil by Jan Van Eyck, belonging to Alfonso of Aragon, was struck by the peculiarity aud value of the new method; set out for the Netherlands to acquire a knowledge of the process from Van Eyck's disciples; spent some time there in the prosecution of his art; returned with his secret to Messina about 1465 ; probably visited Milan ; removed to Venice in 1472, where he painted for the Council of Ten; and died there about 1493. His style is remarkable for its union—not always successftl—of Italian simplicity with Flemish love of detail. His sub- upon the complete representation of which he bestows his utmost skill. There are still extant—besides a number more or less dubious — twenty authentic productions of his pencil, consisting of "Ecce Homos," Madonnas, saints, and half-length portraits, many of them painted on wood. The finest of all is said to be the nameless picture of a man in the Berlin

Muse. Antonello exercised an important influence on Italian painting, not only by the introduction of the Ficmish invention, but also by the transmission of Flemish ten- dencies.

ANTONIDES, Hans [Jan VAN DER Gos], a Dutch poet, was born April 3, 1647, at Goes, in Zealand, of poor but respectable parents. They removed to Amsterdant when he was about four years old, and he there enjoyed the tuition of Hadrian Junius, and James Cocceius. He was only nineteen when he attracted attention by his tragedy, Trazil, of overrompelt Sina—Trazil, or the Con- quest of China. The venerable Vondel called him his son, and said he would have been proud of being the author of bis Bellone aan Band. THis parents designed him for an

apothecary ; but Buisero, one of the lords of the admir- alty at Amsterdam, defrayed his college expenses, and enabled him to take the degree of doctor of physic. He practised with success, and established his poetic fame by his Y-stroom, an epic on the river Y. He died on the 18th of September 1664. His writings are remark- able for their warmth of fancy and vigour of expression, which sometimes degenerate into extravagance and bom- bast. His complete works were printed at Amsterdam in 1714, 4to, with a sketch of his life.

ANTONINI ITINERARIUM, a valuable register, still extant, of the stations and distances along the various roads of the Roman empire, seemingly based on official documents, which were probably those of the survey organ- ised by Julius Cesar, and carried out under Augustus. The work has plainly undergone various revisions down to the end of the 3d century. What connection any of the Antonines may have had with it is unknown. The whole Itinerary was printed by H. Stephens at Paris, 1512, and by Wesseling at Amsterdam, 1735. The part relating to Britain appeared at London, 1799, as Iter Britanniarum, with a new commentary, by Thomas Reynolds.

ANTONINUS LIBERALIS, a Greek grammarian, who probably lived about 147 a.p. His work, perapopddcewy cwaywyy, consists of forty-one tales of mythical metamor- phoses, and is chiefly valuable for the study of

Greek mythology. One of the best editions is that of Koch, Leipsic, 1832, 8vo.

ANTONINUS, Marcus AvreE ius. Marovs.

ANTONINUS, Titus Avretius Futvus Boronivus ARRIUS, surnamed Prus, was the son of Aurelius Fulvus, a Roman consul, whose family had originally be- longed to Nemausus (Nismes). He was born near Lanuvium, 86 a.p., and, having lost his father, was brought up under the care of Arrius Antoninus, his maternal grandfather, a man of integrity and culture, and on terms of friendship with the younger Pliny. Having filled with more than usual success the offices of questor and pretor, he obtained the consulship in 120 a.p.; was next chosen one of the four consulars for Italy ; greatly increased his reputation by his conduct as proconsul of Asia; acquired much influence with the emperor Hadrian, by whom he was at length adopted as his son and successor in February 138 a.p.; and a few months afterwards, on Hadrian's death, was en- thusiastically welcomed to the throne by the Roman people, who, for once, were not disappointed in their anticipation of a happy reign. For Antoninus came to his new office with simple tastes, kindly disposition, ex- tensive experience, a well-trained intelligence, and the sincerest desire for the welfare of his subjects. Instead of plundering the provinces to support his prodigality, he emptied his private treasury to assist the provinces. In- stead of exaggerating into treason whatever was suscep- tible of unfavourable interpretation, he turned the very conspiracies that were formed against him into opportuni- ties of signalising his clemency. Instead of stirring up the persecution of the Christians, and gloating over the sufferings of their martyrs, he extended to them the strong hand of his protection through all the empire. Rather than give occasion to that oppression which he regarded as inseparable from an emperor's progress through his

See AURELIUS,

Antoninus Pius.

dominions, he was content to spend all the years of his reign in Rome, or its neighbourhood. Under his patronage the science of jurisprudence was cultivated by men of high ability, and a number of enactments were passed in his name that are equally characteristic of his humanity and his justice. Of the public transactions of this period we have but scant information, but, to judge by what we possess, those twenty-two years were not remarkably eventful. No conquests of importance were attempted, and there were no very dangerous attacks to repel, though all round the frontiers a kind of simmering hostility produced a suc- cession of minor invasions and revolts. The one military result which is of interest to us now is the building of the wall of Antoninus from the Forth to the Clyde. In his domestic relations Antoninus was not so fortunate. His wife, Faustina, has almost become a by-word for her lack of womanly virtue ; though, either through his ignorance of her conduct, or in spite of his being aware of it, she seems to have kept her hold on his affections to the last. On her death he did honour to her memory in many ways ; but in none more remarkable than by the foundation of a charity for orphan girls, who bore the title of Alimentarie Paustiniane. He had by her two sons and two daughters; but they all died before his elevation to the throne, except Annia Faustina, who became the wife of his successor, Marcus Aurelius, and deepened the infamy of the name she inherited from her mother. Antoninus died of fever on the 7th of March 161, giving, as we are told, the key- note to his life in the last word that he uttered when the tribune of the night-watch came to ask the password— Aiquanimitas. The only account of his life handed down to us is that of Julius Capitolinus.

ANTONINUS, Watt or, called Granam’s Dyke by the natives of the district through which it passed, is the name given by historians to that series of defensive posts, connected by a rampart and a wall, which at one time extended across the island from the Frith of Clyde on the west to the Frith of Forth on the east. The former of these appellations it has received from the Roman emperor in whose reign it was erected ; the origin of the latter is more doubtful, a probable opinion being that which regards it as a corruption of the Celtic greim, a place of strength, and diog, a trench or rampart.

We are informed by Tacitus that Agricola, during his fourth summer in Britain (81 .p.), occupied himself in consolidating his previous conquests, and that for this purpose he caused a series of detached forts to be built on the isthmus that joins the two friths as a barrier against the still unconquered Caledonians of the. north. It was along, or almost along, the same line, that one of his suc- cessors in the command of the Roman troops in Britain raised the more permanent military work known as Antonine's wall.

The writer of the life of the emperor Antoninus Pius in the Historie Auguste Scriptores Sex, usually supposed to have been Julius Capitolinus, expressly states that Lollius Urbicus, a legate of that emperor, erected, after several victories over the Britons, "another rampart of turf" to check their inroads. No locality is specified, but a frag- ment of a stone, now in the museum of the university of Glasgow, has an inscription in which the name of this Lollius seems to occur. This fragment, and the numerous monumental records bearing the name of Antonine that have been discovered along its course, identify beyond all reasonable doubt the wall between the Forth and Clyde as that spoken of by the annalist, and furnish satisfactory proof of the correctness of its best-known name. And if a small pillar figured by Gordon, and at one time in the library of the university of Edinburgh, was found, as is probable, near the wall, it fixes the year 140 a.p. as the

exact date at which the portion of the work connected with the pillar was executed.

In addition to the annalist just mentioned, several other ancient historians are supposed to allude to Antonine's wall ; but their brief statements are so vague that further refer- ence to what they say is unnecessary. Of medizeval writers Bede is almost the only one who notices it, but he errone- ously ascribes its erection to the natives of the south acting according to advice given them by the Romans. Timothy Pont, who early in the 16th century personally surveyed a large portion of Scotland while gathering materials for his projected Scottish Atlas, drew the atteution of antiquarles to this memorial of Roman times, though to him, as well as to his successors in antiquarian research for nearly a century, +t was known as " Agricola's vallum, or Graham's Dike." It is to Gordon that the merit must be awarded

of having been the first to give to the world a satisfactory account of the “wall of Antoninus Pius.” A chapter of the Itine- rarium Septentrionale is devoted to it, and plans are given of the principal forts, as well as engravings of the legionary tablets and other objects of interest that had, up to the author’s day, been dug out of its ruins. Gordon was fol- lowed by Horsley and Roy, the latter of whom made in 1755 a new survey of it, which enabled him to correct Gordon in some particulars. Lastly, in the Caledonia Romana of Stuart, we have a complete and, on the whole, accurate description of the wall, with figures of all the sculptured stones found near its course up to the date at which he wrote.

The nature and appearance of the wall when perfect have been described by all these writers in very similar terms, though they differ somewhat as to the measure- ment of its several parts. ‘‘It consisted,” says Stuart, “in the first place, of an immense fosse or ditch—averag- ing about 40 feet in width, by some 20 in depth — which extended over hill and plain in one unbroken line from sea to sea. Behind this ditch on its southern side, and within a few feet of its edge, was raised a rampart of intermingled stone aud earth, strengthened by sods of turf, which measured, it is supposed, about 20 feet in height, and 24 in thickness at the base. This rampart was surmounted by a parapet, behind which ran a level platform for the accommodation of its defenders. To the southward of the whole was situated the military way—a regular causewayed road about 20 feet wide—which kept by the course of the wall at irregular distances, approach- ing in some places to within a few yards, and in others receding to a considerable extent.” Along the entire line there were at least eighteen principal stations or forts, with smaller watchtowers in the intervening spaces. The rampart seems to have consisted for the most part of earth or turf, as stated by the annalist ; but stone was, no doubt, employed in the building of the forts and watchtowers as well as in certain portions of the rampart itself.

Although in many parts of its course all traces of Antonine’s wall have long been obliterated, the line along which it stretched has been mapped out by Gordon and others with sufficient accuracy. Commencing in the west on a height called Chapel Hill, near the village of Old Kilpatrick in Dumbartonshire, and now distant from the River Clyde about 150 yards, it ran eastwards, passing in succession Kirkintilloch, Croy, Castlecary, and

Falkirk, and terminated at Bridgeness, a rocky promontory that projects into the Frith of Forth south of Borrowstounness in Linlithgowshire. Its eastern termination was long sup- posed to have been near the kirk of Carriden. In 1869, however, a sculptured legionary tablet, since deposited in the museum of the Society of Antiquaries of Scotland, was found at Bridgeness, in such a position that it is impossible to avoid the conclusion that the wall actually terminated

there. Its entire length may be set down at about 36 English miles.

Of the sculptures found near or on the site of this wall a considerable number are records of the different portions of the work executed by the legionaries employed on it, and who mainly belonged to the second, sixth, and twentieth legions. Some of these tablets are in the museum of the university of Glasgow, and are of much interest, but the fnest of them all is the Bridgeness one already referred to, From the number of Roman paces mentioned on the inscriptions, Horsley and others have attempted to deter- mine the exact length of the work. Unfortunately for their purpose, the paces on the stones already discovered considerably exceed its whole length, and as we cannot suppose that all the monuments of this kind that were erected by the legionaries have been preserved and brought to light, we must conclude with Stuart that they had raised more than one memorial of the same piece of work.

How many years Antonine’s wall continued to be the boundary of the Roman territories in Britain it is impos- sible to say, but there is every reason for believing that it was so for only a brief period.

ANTONIO, Nicorao, a Spanish bibliographer, was born at Seville in 1617. After finishing his studies at Salamanca, he returned to Seville, and shut himself up in the royal monastery of Benedictines, where he devoted several years to writing his Bibliotheca H ispanica, a work in four vols. folio, two of which he published at Rome in 1672. The work consists of two parts: the one containing the Spanish writers who flourished before the end of the 15th century; the other—the part published by Antonio himself—treating of later writers. He was recalled to Madrid by Charles II., and died

in 1684, leaving nothing put a magnificent library of over 30,000 volumes. The earlier volumes of his Bibliotheca were published in 1696 at the expense of Cardinal d'Aguirre, and under the super- intendence of his librarian, Marti, who added notes in the name of the cardinal. An improved edition of the entire work, by F. P. Bayer, was published at Madrid in four vols. folio, in 1783-8.

ANTONIUS, Marcus, the Roman orator, was born 143 z.c. After having filled the office of questor (113), he was appointed praetor in 104, and propreetor in the fol- lowing year, the province of Cilicia being assigned to him. Here he was so successful in the war against the pirates, that a naval triumph was awarded him in 102. He was consul along with A. Postumius Albinus in 99, when he successfully opposed the agrarian law of the tribune Titius. He was censor 97, and held a command in the Marsic war in 90. Belonging as he did to the party of Sulla, he was put to death by order of Marius and Cinna when they obtained possession of Rome (87 8.c.) Antony's reputa- tion for eloquence rests on the authority of Cicero, none of his orations being extant.

ANTONIUS, Marcus [Marx Antony], grandson of Antonius the orator, and son of Antonius Creticus, seems to have been born about 83 B.c. While still a child he lost his father, whose example, however, had he been spared, would have done little for the improvement of his character. Brought up under the influence of the disre- putable Cornelius Lentulus Sura, whom his mother had married, Antony spent his youth in profligacy and extra- vagance. For a time he co-operated with the reprobate Clodius in his political plans, chiefly, it is supposed, through hostility to Cicero, who had caused Lentulus, his stepfather, to be put to death as one of the Catiline con- spirators; but he soon withdrew from the connection, on account of a disagreement which, appropriately enough, arose in regard to his relations to his associate's wife, Flavia. Not long after, in 58 B.c., he fled to Greece, to

escape the inportunity of his creditors; and at length, after a short time spent in attendance on the philosophers at Athens, found an occasion for displaying some of the better features of his character in the wars that were

being carried on by Gabinius against Aristobulus in Palestine, and in support of Ptolemy Auletes in Egypt. A new chapter in his life was opened by the visit which he made to Juhus Cesar in Gaul (54 B.c.) Welcomed by the vic- torious general as a valuable assistant in his ambitious designs, and raised by his influence to the offices of queestor, augur, and tribune of the plebs, he displayed admirable boldness and activity in the maintenance of his patron's cause, in opposition to the violence and intrigues of the ohgarchical party. At length his antagonists prevailed, and expelled him from the euria; and the political contest became a civil war. The Rubicon was crossed; Ceesar was victorious, and Antony shared in his triumph. Deputy-governor of Italy during Czsar's absence in Spain (49), second in command in the decisive battle of Pharsalia (48), and again deputy-governor of Italy while Caesar was in Africa (47), Antony was now inferior in power only to the dictator himself, and cagerly seized the opportunity of indulging in the most extravagant excesses of luxurious hcentiousness, — excesses which Cicero dcpicted in the Philippics with all the elaborate eloquence of political hatred. In 46 he seems to have taken offence at Cesar, because he insisted on payment for the property of Pompey which Antony professedly had purchased, but had merely appro- priated. But the estrangement was not of long continu- ance; for we find Antony meeting the dictator at Narbo the following year, and rejecting the advances of Trebonius, who endeavoured to discover if there was any hope of getting Antony to join in the conspiracy that was already on foot. In 44 he was consul along with Cesar, and seconded his ambition by the famous offer of the crown on the 15th of February, thus unconsciously preparing the way for the tragedy of the 15th of March. To the sin- cerity of his adherence to Cesar the conspirators them- selves bore witness on that memorable day, by the care which they took to keep him engaged without while the daggers were doing their work within. This was the second great epoch in Antony's life. A brighter prospect than ever was then opened to his ambition. By his eloquence —a hereditary gift—he managed to stir up the minds of the populace against the assassins of Cesar, and drove them from the city. He made peace with the remaining repre- sentatives of the senatorial party, and almost scemed to have succeeded to the power and position of his unfortunate patron. But the youthful Octavius, whom Cesar had adopted as his son, arrived from Illyria, and claimed the inheritance of his "father." Agreement was impossible, and war ensued. Octavius obtained the support

of the senate and of Cicero; and the veteran troops of the dic- tator flocked to his standard. Antony was denounced as a public enemy; and the city gave its loudest applause to the tirades of his most eloquent accuser. His cause gradn- ally lost ground, and at last seemed to be totally ruined when his army was defeated in the sicge of Mutina (43 B.C.) But eseaping to Cisalpine Gaul, he formed a june- tion with Lepidus, and they marched towards Rome with 17 legions and 10,000 cavalry. The wily Octavius now betrayed his party, and entered into terms with Antony and Lepidus. It was agreed that they three should adopt the title—so beautifully ironical—of Triumviri reipublice constituende, and share the power and the provinces among them. Gaul was to be Antony's; Spain fell to the lot of Lepidus, and Africa, Sardinia, and Sicily were to belong to Octavius. A conjunct proscription followed, each of the partners in the villanous design bartering the life of his friends for the pleasure of destroying his foes. The

detested author of the Philippics was given up to Antony's revenge; and, according to Appian, the number of the victims amounted to 300 senators and 2000 knights. In the following year Autony and Octavius proceeded against the conspirators Cassius and Brutus, who still maintained themselves in Macedonia; and, in the battles of Philippi, stamped out the last embers of republican Rome. While Octavius returned to Italy, Antony proceeded to Greece, and thenee to Asia Minor, for the sake of reerniting his funds, completing the subjugation of the eastern provinces, and obtaining satisfaction about the conduct of the Egyp- tian queen during the recent contest. On his passage through Cilicia in 41 he was visited by Cleopatra, who came to answer the charges in person. She sailed up the Cydnus in a gorgeous bark, with a fantastie and brilliant equipage, and brought all her allurements to bear on the heart of the voluptuous Roman. Her success was com- plete; and he who was to have been her judge, was lcd captive to Alexandria as her slave. All was forgotten in the fascination and delight of the passing hour; and feast- ing and revelry found perpetual and ever-varying renewal. At length Antony was aroused by the Parthian invasion of Syria, and the report of an outbreak between Fulvia his wife and Lucius his brother on the one hand and Octavius on the other. On arriving in Italy he found that the war was over, and Octavius the victor; and the chief

cause of disagreement being soon after removed by the death of Fulvia, a recouciliation was speedily effected between the triumvirs, and cemented by the marriage of Antony with Octavia, the sistcr of his colkeague. A new division of the Roman world was agreed on at Brundusium, Lepidus receiving Africa, Octavius the west, and Antony the east. Returning to his province, Autony was for a time success- ful; his general, Ventidius, beating the Parthians, and Socius capturing Jerusalem and conquering Antigonus. But after another visit to Italy, during which the trium- virate was prolonged for five years, Antony sent away his wife, yielded himself completely to the evil influence of Cleopatra, indulged not only in licentiousness, but in tyranny, and allowed his affairs to be neglected or delayed. An expedition against the Parthians was a failure; but for this his success against Artavasdes, the Armenian king, in some measure compensated. Octavius at length deter- mined to get rid of Antony, and had little need of invention to bring charges sufficient against him. About two years were spent in preparations and delays on both sides, and it was not till the year 31 that the fate of Antony was decided by the battle of Actium. Defeated and deserted, he once more sought refuge and repose in the society of Cleopatra, but was followed even there by his relentless rival, At first he made a gallant effort to defend himself, and partially succeeded. But convinced of the hopeless- ness of his position, and assured of the suicide of his mis- tress, he followed the example which he was falsely in- formed she had given (30B.c.) Antony had been married in succession to Fadia, Antonia, Fulvia, and Octavia, and left behind him a number of children. A short but vivid sketch of Antony is given by De Quincey in his “ Essay on the Cesars,” see his Works, ix. 57-59. ANTONOMASIA (évrovopzacia) is, in rhetoric, the sub- stitution of any epithet or phrase for a proper name; as “Pelides,” or “the son of Peleus,” for Achilles; “the Stagy- rite” for Aristotle; “the author of Paradise Lost” for Milton; “the little corporal” for Napoleon the First; “ Macedonia’s madman” for Alexander the Great, &c. &c. Besides gratifying the taste for variety, it affords the op- portunity of bringing indirectly into view facts or feelings that it is not considered desirable or expedient to express distinetly by themselves. The opposite substitution of a proper name for some generic term is also sometimes called

antonomasia; as, a ‘“ Cicero” for an orator. In both cases the figure is akin to metonymy.

ANTRIM, a maritime county in the north-east corner of Ireland, in the province of Ulster, situated between 54° 96’ and 5D° 12’ 16” N. lat., and 5° 47’ and 6° 52’ W. Jong. It comprises, without including the 50,803 acres under water, an area of 711,275 statute acres, of which 16,702 belong to the incorporated county of the town of Carrickfergus. ‘There were, in 1871, 257,211 acres under tillage, 373,839 in pasture, 6717 in plantation, and 7 2,065 waste. ‘The county presents a considerable line of coast to the Atlantic Ocean on the north, and to the Irish Channel on the east; while Belfast Lough and the river Lagan divide it from the county of Down on the south : and Lough Neagh and Lough Beg, together with the river Bann, form its boundaries on the west, except towards the mouth of the river, where a small portion of the county of Londonderry lies on the eastern bank.

In area Antrim is exceeded by eight other counties in Ire- land, but in population by Cork and Dublin alone. A large proportion of the surface, especially towards the east, con- sists of mountains and bogs ; and it is computed that about 120,000 acres areirreclaimable. The mountains, occupying ubout one-third of the county, stretch from south to north, and terminate on the northern shore in abrupt and almost perpendicular declivities. Among the principal heights may be mentioned Trostan, 1810 feet; Knocklayd, 1685 ; Divis, 1567; Agnew’s Hill, 1558; and Slemish, 1457. They attain their greatest elevation near the coast, and have a gradual descent inland, so that many of the streams, with their sources near the sea, flow south and west into Lough Neagh. The mountainous region has a gentler in- clination as it approaches the Bann, and is occupied by turf- bogs susceptible of improvement. Some of the valleys, especially that of the Lagan, extend to a considerable width, and are of great fertility. The most extensive level tracts of rich and well-cultivated land lie along the shores of Lough Neagh, and from Belfast to Carrickfergus, and thence to Larne, between the mountain range and the sea, ‘The most remarkable cliffs are those of perpendicular basaltic columns, which extend for many miles along the northern shore, and are most strikingly displayed in Fair Head and the Giant’s Causeway.

Lough Neagh, the largest lake in Europe, with the excep- tion of Lake Ladoga, Lake Wener, and the Lake of Geneva, is principally in Antrim. It is about 20 miles in length, 12 in breadth, and 80 in circumference, with an area of 98,2554 statute acres, of which 50,025 belong to Antrim ; its greatest depth is from 45 to 48 feet, and its surface is 48 feet above the level of thesea. The lower Bann, obstructed by weirs and rocks, being the only outlet for the waters of the lake, which is fed by the Maine, the Six-mile Water, and a number of smaller streams, the surrounding country is in winter liable to be damaged by floods. The waters of the Lough, or at least of the Crumlin, one of the streams flowing into it, have petrifying powers; and some of the petrifactions are very beautiful, take a good polish, and rival those of Antigua. North of Lough Neagh, and connected with it by the river Bann, is Lough Beg, or the “small lake,” containing 3145 acres, partly in Autrim. It is generally 15 feet lower than the larger lake, which it excels in the diversified and pleasing scenery of its banks. The Bann and Lagan, both of which rise in the county of Down, are the only rivers of importance. Of those strictly belonging to Antrim, none are navigable. They are generally rapid streams, of great value for turning machinery. The chief indentations of the coast are Red Bay, Carnlough, Glenarm, and Lough Larne. About 7 miles from the north coast, opposite Ballycastle, surrounded by a wild and troubled sca, lies the island of

Rathlin, 64 miles in length and 1} in breadth, of similar basaltic and limestone formation with the neighbouring mainland. About a fourth of its 3399 acres are arable, and it supports a population of 453. There is a lighthouse on it with a fixed light.

The climate of Antrim is very temperate. annual rain-fall at Belfast is about 33 inches.

The geology of Antrim is of considerable interest, both on account of its peculiar character, and because the arrange- ment and alternations of strata are laid bare with more than usual distinctness. In all its more important features it coincides with the adjoining county of Londonderry. The greater portion of the surface is covered with trap. Along the coast, from a little way to the north of Carrickfergus, aud up the valley of the Lagan, there is a

considerable line of New Red Sandstone. All along from the south of Lisburn to Red Bay there isa chalk formation coming to the surface in narrow lines. It is quarried in many places, and varies in thickness from a few feet to 170, as at Glenarm. The south side of Red Bay and a part of the north are formed of New Red Sandstone, which gives place to porphyry near Cushendall, and is succeeded by Devonian grit northwards. There is a considerable circle of porphyry about five or six miles north-east of the town of Antrim. The lias (except at Larne) is very insignificant, and the greensand still more so. The coal measures are remarkable for their association with the basaltic formation, and differ from all the other coal districts in Ireland in wanting the underlying limestone, and resting directly on mica slate. The workings at the Ballycastle collieries are probably the oldest in the kingdom. In 1770 the miners accidentally discovered a complete gallery, which had been driven many hundred yards into the bed of coal, branching into thirty-six chambers dressed quite square, and in a workman-like manner. No tradition of the mine having been formerly worked remained in the neighbourhood. The coal of some of the beds is bituminous, and of others anthracite. The quantity available was calculated by the commissioners in 1871 to be 16,000,000 tons, at depths not exceeding 4000 feet. Lignite occurs in great abundance round about Lough Neagh, as at Ballintoy, Limincogh, Killymorris. In most places it is covered with columns of basalt; aud in spite of the compressed state in which it is found, the bark and knots are often quite distinct, and the rings of growth may be counted. Basaltic pillars are found in many places besides the famous Giant’s Causeway, as round about Coleraine, near Dunluce, at Ballintoy, Ballycastle, Ballygally Head (near Larne), in the neighbourhood of Carrickfergus, at Shane’s Castle, and the mouth of the Glenavy. Iron ore is obtained at Ardshins, Belfast, Ballycastle, Glenrava, Kilwaughter, and Shane’s Castle—the produce in 1871 being 157,874 tons, of the value of £61,110. Among the other minerals to be met with in Antrim, chalcedony (at Lough Neagh, and known as Lough Neagh pebbles), chrysolite, dolomite, jasper, onyx, . opal, and tale may be mentioned. Very fine rock-salt is got at Duncrue, two miles north-west of Carrickfergus, and at one or two places in the same‘district. The Belfast Salt Mining Company raised during 1871 18,260 tons, and in 1870, 19,450. The mineral (chalybeate) waters of the county are in the neighbourhood of Antrim, Bally- castle, Belfast, Carrickfergus, and Larne.

The chief bathing-placesare Ballycastle, Cushendall, Cush- endun, Glenarm, Port Ballintrae, and Portrush. They are exposed to the easterly winds prevalent in spring, but are de- sirable summer residences. There is much variety of scenery in the county, from the low and somewhat monotonous shores of Lough Neagh, and the dreary bog and mountain land of the interior, to the wild romantic scenery of the northern coast, aud the fantastically beautiful shores about Glenarm.

The soil varies greatly according to the district, being

The average

at Rh EM

in some cases a rich loam, in others a chalky marl, and elsewhere a coating of peat. The chief feature in the tillage of a considerable portion of the county is the potato- fallow. The quantity of potato-land is commonly regulated by the amount of manure that can be collected; and since the use of lime was introduced it has been greatly increased. After potatoes, wheat or oats are sown; if the latter, two or three crops are successively taken. When the ground is exhausted potatoes are again planted, or the land is suffered to rest for a year or two until it is covered with natural grass. The sowing of wheat is chiefly confined to the baronies of Massareene, Belfast, Toome, and Antrim. Flax is also sown after potatoes, except in the lower or northern part of the county. The total area under tillage extended in 1871 to 257,211 acres. The crops are wheat, oats, barley, beans and pease, potatoes, turnips, vetches, rape, &c. Considerable quantities of flax are also grown, as well as grasses and clover. The cattle of Antrim do not belong to any particular stock, but they have been greatly improved by crossing with Dutch, Ayrshire, and other breeds. Pigs are reared in considerable numbers, the small farmers and cottars depending chiefly upon them for making up their rent. Comparing recent with previous years, we find an increase in all kinds of domestic animals, especially in sheep and goats—the former having more than doubled, and the latter increased more than fourfold. The farms are usually small. Extensive woodlands have in great measure been cleared, and there is now but little natural wood in the county. Many thriving plantations of trees have, however, been planted near noblemen and

gentlemen's seats; and orchards have been formed on the Hertford estate, near Lough Neagh.

Cod, ling, pollock, ray, and turbot are caught off the coast in considerable quantities by the fishermen of Ballycastle, Larne, Carrickfergus, Belfast, &c., most of the fish thus taken being sent to Glasgow and Liverpool. Mackerel also appear in periodical shoals off Larne. Oysters of good quality are taken all over Belfast Lough, of the value of £400 or £500 per annum. Besides the fish usually found in fresh- water lakes, the char, a species of trout called dollagher, and the pullan (or fresh-water herring) are found in Lough Neagh. There are extensive salmon fisheries at Carrick-a- Rede near Ballintoy, along the coast north of Glenarm, and in the rivers Bann and Bush; and salmon are found in all the rivers in the county, except the Lagan. All the rivers abound with eels, which are chiefly taken at weirs in the Bann.

Antrim has long been distinguished for its linen manu- facture, which is still the most important in the county. It was formerly carried on by hand-loom weavers, but the introduction of machinery has completely changed the character of the occupation. In 1841 there were about 240,000 spindles in operation, and now there are upwards of 580,000. There were 64 flax factories in 1870, with 9140 power-looms, employing 32,487. Cotton-spinning by jennies was first introduced in 1777 by Robert Joy and Thomas M'Cabe of Belfast; and twenty-three years after upwards of 27,000 people were employed in the cotton manufacture directly or indirectly, within 10 miles of Bel- fast. For many years great part of the yarn was imported from Manchester or Scotland, but now cotton-yarn has long been an article of exportation. In 1870 there were six cotton factories, with 73,000 spinning-spindles, in Belfast, and employing 814 persons. There is one hemp, and one jute factory in the county. A great source of employment for females is the working of patterns on muslin with the needle. Belfast is the centre of this trade, but about 300,000 persons, chiefly women, are employed in various parts of Ireland, and the gross value of the manufactured goods amounts to about £1,400,000. There are also

extensive paper-mills in the county, and various manu- factures-in connection with the trade of the district. The exports are linen, linen yarn, all kinds of grain, pork, bacon, hams, beef, butter, eggs, lard, potatoes, soap, and candles.

The communication by means of roads is good, and there are several important railway lines. About 20 miles of the Ulster Railway, which runs from Belfast to Clones in Monaghan, are in the county. Another line joins Belfast with Carrickfergus and Larne; and the Belfast and Northern Counties Railway—using a portion of the Carrickfergus line—unites Belfast with Antrim, Ballymena, Ballymoney, and Coleraine in Londonderry, &c. A junc- tion, 184 miles long, from Antrim to Knockmore, joins this linc with the Ulster Railway. There are regular steam-ship lines between Belfast and Glasgow, and Belfast and London.

The earliest known inhabitants were of Celtic origin, and the names of the townlands or subdivisions, supposed to have been made in the 13th century, are pure Celtic. Antrim was exposed to the inroads of the Danes, and also of the northern Scots, who ultimately effected permanent settlements. The antiquities of the county consist of cairns, mounts or forts, remains of ecclesiastical and mili- tary structures, and round towers. The principal cairns are—one on Colin mountain, near Lisburn; one on Slieve True, near Carrickfergus; and two on Colinward. The crom- lechs most worthy of notice are—one near Cairngrainey, to the north-east of the old road from Belfast to Temple- patrick; the large cromlech at Mount Druid, near Ballintoy ; and one at the northern extremity of Island Magee. The mounts, forts, and intrenchments are very numerous. There are four round towers: one at Antrim, one at Armoy, one on Ram island in Lough Neagh, and a fragment of one between Lisburn and Moira. Of the eccle- siastical establishments enumerated by Archdall, there are some remains of those of Bonamargy, where the earls of Antrim are buried, Kells, Glenarm, Glynn, Muckamore, and White Abbey. The noble castle of Carrickfergus is the only one in perfect preservation. There are, however, re- mains of other ancient castles, as Olderfleet, Carn’s, Shane’s, Glenarm, Garron Tower, Redbay, &c., but the most interest- ing of all is the castle of Dunluce, remarkable for its great extent and romantic situation.

In 1584 the county was divided by the lord-deputy, Sir John Perrot, into eight baronies; but, by the sub- division of six of these into upper and lower, the number has been increased to fourteen, viz., Antrim, Lower and Upper; Belfast, Lower and Upper; Cary; Dunluce, Lower and Upper; Glenarm, Lower and Upper; Kilconway; Massareene, Lower and Upper; Toome, Lower and Upper. The number of parishes and parts of parishes is seventy-five, all, except Aghalee, in the diocese of Connor. There are seven poor-law unions in the county,—Antrim, Ballycastle, Ballymena, Ballymoney (partly in Londonderry county), Lisburn (partly in Down county), and Larne. The constabulary force has its headquarters at Ballymena, the county being divided into six districts. Antrim is in the Belfast military district, which has its headquarters, as has also the county militia,at Belfast. The valuation of rate- able property in 1872 was £1,039,898. The county sends six members to the imperial parliament: two for the shire, —constituency, in 1873, 10,563; two for Belfast, one for Carrickfergus, and one for Lisburn,—constituencies, 15,000, 1166, and 568. Among the nobility and gentry who have estates in this county we may mention the earl of Antrim, (Glenarm Castle); the marquis of Donegall (Ormeau Park and Carrickfergus); Viscount Templetown (Castle Upton); Lord O'Neill (Shane's Castle); Lord Waveney (Ballymena

Castle); Sir Richard Wallace (Antrim Castle); Macnaughten of Dundarave; Adair of Loughanmore, &c.

The assizes, formerly held at Carrickfergus, are now held at Belfast, the county town. Quarter-sessions are held at Antrim, Ballymena, Ballymoney, and Belfast.

The principal towns are—Belfast, population (1871), 174,394; Carrickfergus, 9452; Lisburn, 77 94; Ballymena, 7628; and Larne, 3343. Antrim, Ballycastle, Ballymena, Ballymoney, Belfast, Bushmills, Carrickfergus, Crumlin, Larne, Lisburn, Portglenone, and Randalstown are market- towns, and fairs are held at forty-eight places in the county. ;

Antrim is one of the most decidedly Protestant counties in Ireland, and of the Protestants a very great proportion are Presbyterians. The greater part of

these are in con- nection with the General Synod of Ulster, and the others are Remonstrants, who separated from the synod in 1829, or United Presbyterians. By the returns of 1871 there were 108,835 Roman Catholics, 88,934 Episcopalians, and 184,144 Presbyterians. The number of children attending school in 1871 was 142,297, of whom 34,637 were Roman Catholics.

In 1813 there were in the county 42,258 dwelling-houses and 231,548 inhabitants. The returns since that year have shown a gradual increase, notwithstanding extensive emigration, and in 1871 the population was 404,015, in- habiting 71,327 houses.

See for geology, Proceedings of Royal Irish Academy, vol. x, article, with map, by John Kelly, C.E., and article by R. Tate, in the 21st vol. of the Quarterly Journal of Geol. Soc. of London, 1868; and for archeology, Zhe Ulster Journal of Archeology, vols. iii, and iv., and Keane's Towers and Temples of Ireland.

ANTRIM, a town of Ireland, in the county noticed above, half a mile from Lough Neagh, on the banks of the Six- mile Water, in a fertile and beautiful valley, 13 miles north- west of Belfast, and 106 north of Dublin. It gives the title of earl to the family of MacDonnell, and prior to the Union returned two members to parliament by virtue of letters patent, granted to the inhabitants in 1666 by Charles II. There is nothing in the town particularly worthy of notice; but the environs, including Shane's Castle and the grounds of Massareene Castle, possess con- siderable interest. About a mile from the town is one of the most perfect of the round towers of Ireland, 95 feet high, and 49 in circumference at the base. Markets are held each Tuesday and Thursday, and fairs on January 1, May 12, and November 12. In 1871 the town contained 427 dwelling-houses, and 2026 inhabitants. The receipts by the town commissioners were £120 in 1872, and their expenditure £127. The manufacture of paper has been carried on here on a small scale for many years, and linen and woollen cloth is also produced in moderate quantity. The Belfast and Northern Counties Railway passes a short distance to the north of the town. A battle was fought near Antrim, between the English and Irish, in the reign of Edward III; and on June 7, 1798, there was a smart action in the town between the king's troops and a

large body of rebels, in which the latter were defeated, and Lord O’Neill mortally wounded.

ANTWERP (Dutch, Antwerpen; French,

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horses ; on the north and north-east, however, there are considerable tracts of morass and heath. The principal rivers, the Scheldt and its tributaries, the Rupel, the Néthe, and the Dyle, are navigable to a large extent, while railways intersect the country in various directions, and there are also several canals. The chief towns are Ant- werp, Mechlin (Malines), Turnhout, Lierre, and Boom. Population in 1870, 492,482.

ANTWERP, the capital of the province of the same name, is situated about 50 miles from the open sea, and

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RULISWE CAPPELLEN ‘Hoceo0u A“ HOEVENEN © é . \ . BRASS! Tey OORDESEN oe Re.

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Plan of Antwerp and Environs.

25 north of Brussels, in a level tract on the right bank of the Scheldt, which is there about 2200 feet broad, and has a depth at ebb-tide of from 30 to 40 feet, with a rise at spring-tides of 12 or 14. Antwerp seems to have been founded by people of Saxon race some time before the 8th century, when the Antwerpians or Ganerbians, as they began to be called, were converted to Christianity by St Willebrod and some Irish monks. A certain Rolingus of that period styles himself prince of Antwerp ; and men- tion is made of a market-toll in force in 726. In 837 the town fell into the hands of the Northmen, who kept pos- session of it for about sixty years. It was erected into a marquisate of the Holy Roman empire by Henry IJ. in 1008, and, as such, was bestowed by Henry IV., in 1076, on Godfrey of Bouillon. About the beginning of the 12th century it had considerable commercial prosperity ; and in the 13th, its municipal institutions took definite shape. It is worthy of notice that the law of 1290 contained provisions identical with those of the Habeas Corpus Act in England, maintaining the inviolability of the citizen’s dwelling, and acknowledging the right of every man to be judged by his peers, and to have a voice in the imposition of taxes. As the result of such security and freedom, the commerce of the city rapidly increased. The English wools for the great manufactories at Louvain, Brussels, Tirlemont, Diest, and Leau, were imported through Antwerp; and the English

merchants, who formed a “factory” there in 1296, received special pro- tection by charters (1305, 1341, 1346, 1349) from ths

Dukes of Brabant, at that time in possession of the marquisate. In 1338, while Edward III. of England was spending the winter in the city with his queen Philippa, she gave birth to Lionel, afterwards Duke of Clarence, and the event was celebrated by a nagnificent tournament. To the king, then in great need of money, the merchants of Antwerp advanced 400,000 florins, The marquisate passed successively into the hands of the counts of Flanders and the house of Burgundy, and returned to Brabant about 1406. In 1474 the town made over a large house in Billinck Street to the English,in 1550 an “English Bourse”

was established, and in 1558 the beautiful Hop van Lyere—.

now a military hospital—was ceded for the accommodation of our merchants. Between 1488 and 1570 was the time of the greatest prosperity which Antwerp was destined to attain for several centuries. The discovery of America in 1492, and of the passage to India in 1497, produced a great change in all European navigation, and permanently altered the old courses of commerce. While, in con- sequence of this, the cities of the Hanseatic League had withered, and Venice, and Nuremberg, and Bruges were sinking into decay, Antwerp was growing daily more worthy of the nanic which she soon acquired, “Dives Antwerpia,” “the wealthy Antwerp.” By contemporaneous writers, such as Guicciardini and Scribanins, the most glowing accounts have been left of her greatness. The annual fairs of Pentecost and St Badon’s—which have now no commercial importance—attracted merchants from all parts of Europe. No fewer than 500 ships would enter the port ina day, and as many as 2500 were to be seen lying in the river at one time. On an average 500 waggons laden with goods daily entered the gates; above 500,000,000 guilders were annually put in cirenlation; and the popu- lation is said to have numbered upwards of 100,000. But from this height of prosperity the city was suddenly cast down by the wars of the 16th century. In 1576 it was taken by the Spaniards, and given up to a three days’ pillage; it was besieged, though in vain, by the duke of Alengon in 1583; and, after a very obstinate defence, it fell before

the assaults of the duke of Parma, whose trium- phal entry took place on the 17th of August 1585. Its glory departed ; its commerce was ruined; its inhabitants were scattered. As the people of Bruges had flocked to Antwerp, so now the people of Antwerp flocked to Hamburg. The Dutch, in their jealousy, endeavoured to complete its ruin by building forts on the river to intercept the passage of ships ; and finally, by the peace of Westphalia, in 1648, the Scheldt was definitively closed. In 1794 the city fell into the hands of the French, who opened the river and made Antwerp the capital of the department of Deux Néthes. Napoleon, who visited the place in 1803, attempted to make ita great military and commercial centre, and spent no less than £2,000,000 sterling in the construction of docks. He was wont to speak of it as wn pistolet chargé que je tiens sur la gorge de V Angleterre. It continued in French possession till 1814, when it was surrendered after the treaty of Paris by Carnot, who up to that time had defended it with great bravery against the allied army under Graham. From 1815 to 1830, Antwerp with the rest of Belgium united with Holland in forming the kingdom of the Nether- lands. In 1830, during the Belgian revolution, the citadel was held by the old Dutch general Chassé, who resolutely refused to surrender. At length, however, in 1832 he was forced to capitulate by the French, under Marshal Gérard, and the city was handed over to the Belgians. All matters of dispute between Belgium and Holland being finally settled by the treaty of 1839, Antwerp has continued peacefully to advance in prosperity ever since, In 1860 the ancient fortifications were destroyed, and new fortifications erected at a considerable distance from the city ; while a line of

detached forts were built towards the south-east, in an are of a circle, which it has been proposed to complete on both sides of the river. The famous “citadel of the south,” which was originally built by the duke of Alva in 1567, has been bought from the Belgian Government by the Société Immo- bilicre and the town of Antwerp, and the site is to be appropriated for new docks and a new quarter of the city —the docks to be for the accommodation of river-boats and lighters. A loan of 60,000,000 franes (£250,000) is to be contracted for the carrying out of the improvements. Since the destruction of the old fortifications, fine boulevards, avenues, and

streets have been laid out, and the town is rapidly and constantly increasing in size. There are now seventeen quays or wharves, and a series of 6 or 8 docks communicating with each other. The two oldest, which were constructed under Napoleon, and preserved when his other establishments were destroyed, are respectively about 574 feet by 492, and 1312 by 574. Since Napoleon's time the city has added the Bassin de Jonction, the large Kattendyk Dock (opened in 1856), the Bassin Sas, the Bassin aux Bois, or timber-dock, the Bassin de la Campine, and the Bassin du Canal. The whole system has an area of nearly 100 acres, affording over 21,000 feet of quay-room. In spite of all this extension of accommodation, the commer- cial traffic is so great that ships are often delayed through lack of sufficient room for lading or unlading. In 1826, 909 vessels entered with a tonnage of 122,221, of which 126 were British, with a tonnage of 16,178; in 1862 the number of vessels was 2292, with a total tonnage of 579,899, of

which 777 were British, with a tonnage of 199,000; and

by 1872 the vessels amounted to 4206, and had a tonnage of 1,656,984, 2172 of them being British, and having a tonnage of 1,007,165. Of the British traffic, a very large proportion is carried on by means of steam-ships. The chief imports arc steel, copper, iron, and other metals, machinery, coals (chiefly froin Britain), salt, soda, grain, cotton (chiefly from New Orleans and Bombay), cotton yarn and goods, wool (mostly undressed), hides (raw and tanned), sugar (chiefly raw), tea, coffee, tobacco, rice, and oil-seeds. The chief exports are flax, woollen goods, refined sugar, metals, glass, and tallow. There is regular steam communi- eation with London, Hull, Liverpool, and other English ports, and, indeed, with all the most important ports in Europe. There are also regular lines to the United States, Brazil, La Plata, and Chil. By the river and several canals there is communication with most of the other Belgian cities. The "Canal de la Campine" is the most important, and joins the Seheldt with the Meuse, throngh the Willem Canal, which was made by the Dutch Government. The railway system with which Antwerp is connected is extensive, but is far from sufficient to satisfy the demands of trade. The manufactures of Antwerp are various aud considerable, the principal being lace, silk, linen, jute, cotton, tapestry, galloon, twine, sugar, white-lead, litmus, starch, printer's ink, and malt liquors. There are about 20 sugar refineries, 7 rice-

mills, 3 sulphur refineries, several cigar manufactories, distilleries, petroleum refineries, stearine candle manu- factories, and wool-mills. The lapidaries of Antwerp are celebrated for their skill in cutting diamonds.

The National Bank of Belgium has a branch in the city, and several other banks transact extensive business. The Exchange, built in 1531, was one of the finest build- ings of the kind in Europe, and is said to have been chosen by Sir Thomas Gresham as a model for the old Royal Exchange in London. Burnt down in 1858, it was re- built in the same Gothic style as before, and opened again for business in 1872. The old magazine of the Hanseatic League (1564), known as the Maison Hanseatique,' still stands a '' massive and venerable" building. The cathedral

of Notre Dame, probably founded about ve middle of the . ae

14th century, but uot completed till 1518, is one of the most beautiful specimens of Gothic architecture 1 Belgium. It is about 500 feet long and 250 broad, and is the only church in Europe with six aisles. Of its two projected towers, the one rises to a height of 403 feet, the other remains unfinished. It contains, besides other remarkable pictures, Rubens's " Descent from the Cross," his " Elevation of the Cross," aud his " Assumption." The cathedral, however, is greatly surpassed in the splendour of its decorations and the profusion of its monuments by the church of St James (15th century), which contains, in addition to other mortuary chapels and shrines, the family-chapel and tomb of Rubens, with a beautiful altar-piece, the workmanship of the great painter. The high altar of the church was also designed by Rubens. Of the remaining churches, the most important are St Paul's, St Audrew's, and the church of the Augustines. The church that formerly belonged to the Corporation of Tanners is now the Anglican place of worship. The Hétel de Ville is a fine building in the Italian style, with a facade that exhibits four orders of architecturc, one above the other; but within, there is not much to attract attention, Antwerp possesses an Atheneum, in which most of the usual branches of literature and science arc taught ; an academy of the fine arts, where the students receive instruction in painting, sculpture, architecture, and engraving ; a " Musewm " or Gallery of over 560 pictures, including some very fine

specimens of Rubens, Vandyck, Titian, Teniers, Jordaens, Quintin Matsys, and other masters ; a medical and surgical college ; a school of naviga- tion; zoological and botanical gardens; a theatre ; and various scientific and literary societies. The town library contains 30,000 volumes. The library of the famous printer, Plantin, his workshop, presses, and printing materials, as left by the Moretus family who succeeded him, and a fine collection of paintings, drawings, manu- scripts, &c., were purchased by the town for about a million and a half of francs (£62,500), and form an interesting typographic museum.

Antwerp is the birth-place of a number of distinguished men in various departments, as the painters Vandyck (b. 1599), Teniers the elder (1582), Teniers the younger (1610), Jordaens (1594), Frans Floris (1520), Gonzales Cocques (1618); the philologist Gruter (1560), the geographer Ortelius (1527), the engraver Edelinck (1649), and, among more modern celcbrities, Vau Meteren the historian, Ogier the dramatist, and Henri Conscience the novelist. Rubens was born at Cologne, but his family belonged to Antwerp, and he was educated, resided, and died in the latter city.

According to the general census of 1846, Antwerp con- taincd 88,487 inhabitants, of whom 85,961 were Roman Catholics, and 1312 Protestants. In 1851 the population was 95,501, and in 1873, 126,663, or, including the suburbs now situated within the fortifications, above 180,000. The majority of the inhabitants speak Dutch or Flemish, and the rest, for the most part, French or Walloon.

See Guicciardini’s Desérittione di tutti + Paesi Bassi; C. Scribanii Origines Antwerpiensium ; Gens, Histoire de la Ville d’ Anvers ; Mertens and Torfs, Geschiedenis van Ant- werp ; Brayssel, Histoire du Commerce, etc., de Belgique ; Consular Reports on British Trade Abroad, 1873, pp. 517- 555; Motley’s Rise of the Dutch Republic.

ANUBIS, an Egyptian deity, called in hieroglyphs Anepu or Anup, and in Coptic, Anob or Anoubd. It appears from the hieroglyphic legends that he was the son of Osiris and Isis, not Nephtlys, as stated by Plutarch. His name has no particular meaning in hieroglyphs, although it resembles the Coptic anebe, the appellation of a particular kind of dog, His worship was of the

judge of Hades, and the heart of the dead is

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oldest period, and is found in tombs at Memphis, of the age of the 4th dynasty, at which period all dedications run

-n his name instead of that of Osiris, which did not appear

till the 6th. At this time he is always styled resident in the sacred abode, and attached to the land of Ut, and lord of the Tascr or Hades.

At the earliest period he presided over the funeral rites and embalming of the dead, on

account of having rendercd these offices to his father Osiris.

In this character he is seen raising the mummy on its feet to receive the sepulchral sacrifices and libations, or else laying it out on the bier, to which the soul flies down to

visit or be reunited to the body. In the great judgment

Anubis, with Thoth, attends to the balance placed in the Hall of the Two Truths, where the soul is tried by Osiris as weighed against the feather of Truth. Besides his sepulchral character, Anubis was also called Ap-herw, “opener of the roads” or “ paths,” which were supposed to lead to heaven. Of these there were two, the “northern and the southern.” As lord of the northern road he was lord of Sais, while as ruling the southern, he was lord of Taser or Hades. In this character he was often represented as a jackal seated on a pylon or gateway, the jackal being his sacred animal or living emblem. This may be considered the type of the celestial Anubis, and as such he was styled lord of the heaven, and opener of the solar disk. Anubis is represented with the head of a jackal, seldom with that of a man, and rarely with any head attire, although at the Roman period his head is surmounted by the pschent, or crown of Upper and Lower Egypt. In other respects his type is that of other Egyptian deities. In the tablets and other monuments of the 18th and later dynasties, ‘Anubis is introduced as

following, or as part of, the cortege of Osiris ; sometimes he is worshipped alone; but he was a subordinate god of the third order, supposed to have reigned over Egypt as one of the kings of the 2d dynasty of gods. The principal site of his local worship was Lyco- polis, or El Siut, the capital of the 13th and 14th (or Lyco- polite) nomes, and at the 17th or Cynopolite nome ; but he appears also as one of the gods of the 18th or Oxyrhynchite nome, and as such is styled lord of Sep. In this character he is said to have defcated the opposers of his father Osiris, which accords with the story of Diodorus, that Anubis was the general of Osiris in his Eastern expedi- tion. ‘The introduction of Anubis into the Isiac worship about the Ist century B.c., gave rise to various esoterical explanations not found in the hieroglyphs. He is stated to have been the son of Nephthys and Osiris, and dis- covered by dogs, and hence had a dog’s or jackal’s head; also that he represented the horizontal circle which divides the invisible world, called by the Egyptians Nephthys, in contradistinction to Isis, or the visible, or to have been like Hecate. He was also supposed to mean time and universal reason. But these explanations are uot found in the hieroglyphs, and the change of his head to that of a dog instead of a jackal, was not Egyptian. On Roman monuments of the Ist and 2d century A.D., his form is combined with that of Hermes, and passed by the name of Hermanubis, in his character of the infernal Mercury. In the days of Tiberius, the seduction of a noble Roman lady in his temple at Rome, with the connivance of the priests, led to the suppression of his worship, but at a later period the Emperor Commodus, infatuated with the Isiac worship, shaved his head like an Egyptian priest, and carried in procession the figure of the god. The idea that his name meant gold, as suggested by the learned, is con- futed by the hieroglyphs; nor are the statucs found of him either gold or gilded, while in the Egyptian paintings he is always coloured black, and never yellow or golden, as the goddesses often are. The jackal was his saered living auimal,

AN V—

and was embalmed after death, and this animal represented, according to Clement of Alexandria, either the two hemi- spheres which environed the terrestrial globe, or the tropics. Figures of Anubis in porcelain are not uncommon in Egyptian collections, having been attached to the outer

network of bugles which covered the mummies, but in other materials they are much rarer. The jackal, his animal and emblem, is, however, often placed on chests, or other sepulchral monuments. His worship commenced at the earliest period of Egyptian history, and continued, in one form or another, till Egyptian paganism was superseded by Christianity. He was, in fact, one of the oldest, if not the oldest deity of the paganism of the world. (Wilkinson, Mann. and Cust. vol. iii. p. 440, #2; Birch, Gallery of Antiquities, p. 43; Bunsen, Hgypt's Place, vol. i. 2d ed. p. 240; Plutarch, De Iside,c. 14; Josephus, Ant. xviii. c. 6; Brugsch, Die Geographie des alten Aigyptens, 1. taf. 23, 25; Jablonsky, Panth. digypt. iii. p. 3, f-) (s. B.)

ANVIL, an iron block, with a smooth flat steel face, on which the malleable metals are hammered and shaped. They are of all sizes, from the tiny anvils used by the watchmaker to the ponderous masses employed in the arsenal of Woolwich. The common blacksmith's anvil is built up of six pieccs welded to a central core, viz., four corner pieces, a projecting end, with a square hole for the reception of a chisel with its edge uppermost, and a conical end for hammering curved pieces of metal. These six pieces are first roughly welded to the core, and the whole is then thoroughly hammered and suitably shaped.

ANWARI, one of the earlier Persian poets, was born in Khorassan, in the 12th century. He enjoyed the especial favour of the Sultan Sandjar, whom he attended in all his warlike expeditions. On one occasion, when the sultan was besieging the fortress of Hazarasp, a fierce poetical conflict was maintained between Anwari and his rival Rasheedi, who was within the beleaguered castle, by means of verses fastened to arrows. Anwari died at Balkh about 1200. The Diwan, or collection of his poems, consists of a series of long poems, and a number of simpler lyrics. His longest piece, Zhe Tears of Khorassan, trans- lated into English verse by Captain Kirkpatrick, appeared in the Asiatic Miscellany.

ANWEILER, or ANNWEILER, a town of Bavaria, in the Rhine Palatinate, situated on the Queich, 8 miles W. of Landau, containing 2734 inhabitants, who are chiefly em- ployed in cloth weaving, brushmaking, tanning, and dyeing. Near it is the castle of Trifels, in which Richard Coeur de Lion was imprisoned in 1193.

ANXENOR, a Greek sculptor, a native of Naxus, knowu only from the inscription on a scpulchral relief in Orchomenus, of which he was the author. From the style of the sculpture, and the form of the letters, it is inferred that he had lived in the early part of the 5th century B.c.

ANZIN, a town of France, in the department of Nord, situated on the Escaut (Scheldt), not far from Valen- ciennes, in the centre of the most valuable coal-mining district in France, a large part of which takes its name from the town, and gives employment to about 6000 persons. Anzin also possesses iron foundries, glass-works, breweries, and distilleries of considerable value. Popula- tion, 7283.

AOSTA, a town of the kingdom of Italy, the capital of a circle of the same name in the province of Turin, situ- ated on the Dora Baltea, at the point where the roads over Great and Little St Bernard meet, 49 miles N. of Turin. It is a tolerably well-built place, containing a cathedral, and a fine town hall, as well as a triumphal arch, an

amphitheatre, and other Roman remains. The inhabi- tants, who number 7669, carry on a considerable trade in wine, cheese, leather, and hemp. Aosta, the ancient Augusta Pretoria, celebrated as the birth-place of Anselm, archbishop of Canterbury, was formerly the capital of a duchy of the same name in Piedmont, which eventu- ally became a province of Sardinia, and was merged in the Italian province of Turin in 1861. The Val d'Aosta, which formed the greater part of Aosta province, produces

~~large quantities of grain, fruit, and cattle, while the moun~~

tains abound in iron and other minerals. Cretinism prevails extensively among the inhabitants.

APAMEA, in Ancient Geography, the name of several Asiatic cities :—1. A large city of Syria, in the valley of the Orontes, so named by Seleucus Nicator, after Apama, his wife. It continued to be a place of importance down to the time of the Crusades, when it was known as Famieh, and is supposed to be represented by the extensive ruins at Kulat-el-Mudyk. 2. A

large commercial city in Phrygia, which owed its existence to Antiochus Soter, and its name to his mother, Apama. It is identified with the modern Denair, where there are still a number of ancient ruins. 3. A city mentioned by Stephanus and Pliny as situated near the Tigris, the identification of which is still un- certain. 4. Now Rum-Kala, on the left of the Euphrates, opposite Zeugma. 5. The name given to Myrlea of Bithynia, by Prusias I., who rebuilt it. The ruins lie near Medania. 6. A Greek city in Parthia, near Rhage.

APANAGE (apanagium, probably from pants, bread), the provision in the form of lands or feudal superiorities made for younger sons by the kings of France. The custom of bestowing apanages was first established under the dynasty of the Capets ; the rule at an earlier period being that the kingdom should be divided as equally as possible among all the members of the family on the death of the sovereign. Hallam (Middle Ages, c. i. part 2) points out how the possession of apanages. made the princes of the blood royal ‘‘a distinct and formidable class of men.” They were generally opposed to the sovereign, and the sovereign on his part endeavoured to check their power as much as possible. From the time of Louis VIII. apanages were held subject to the condition that they should revert to the crown on the extinction of heirs-male. (See Pasquier’s Recherches, ii. 18 ; Henault’s Histoire de France, anno 1283.) In England, where apanage is not a legal term, the word is used popularly in a variety of cognate senses.

APATIN, a town of Hungary, situated on the left bank of the Danube, 125 miles S. of Pesth. It has manufac- tures of woollen cloth and silk, dye-works, and a consider- able trade in raw silk, hemp, madder, and woad. Popula- tion, 11,047.

APATURIA (’Azrarovpia), a Greek festival held annually by all the Ionian towns except Ephesus and Colophon, the reason assigned for their exception being some suspicion of a murder (Herod., ii 147). But, unless at Athens, little is known of the manner in which it was conducted. ‘There it fell in the month of Pyanepsion, corresponding nearly to our November, and lasted three days, the occasion being one on which the various phratric, or clans of Attica, met to arrange matters proper to each, and hence the name has been traced to a form, dzardpua, in the sense of dpazardpia, or

éuomardpia, Meaning “a ceremony for the assertion of relationship.” According to the popular derivation, how- ever, the festival originated 1100 B.c., to commemorate an encounter between the Athenians and Beotians, in which the king of Attica, Thymoetes, having been challenged to single combat by the Bootian king, Xanthius or Xanthus, and, being afraid to meet him, accepted as a substitute Melanthus, an exile, with the condition of his succeeding,

if victorious, to the throne of Attica. When the com- batants met, Melanthus, to throw his adversary off his guard, declared that he was being unfairly assisted by @ man wearing a black goat’s skin. Xanthus turned to look, and while in the act was struck down. This deceit, ararn, was the origin of the festival! The man in the black goat’s skin was believed to have been Dionysus (Bacchus) Melanaigis. On the first day of the festival, called Dorp or Dorpeia, banquets were held towards evening. On

the second, Anarrhysis, a sacrifice of oxen was offercd at the public cost. On the third day, Koupeates, children born since the last festival were presented by their fathers or guardians to the assembled phratores, and, after an oath had been taken as to thcir legitimacy, and the sacrifice of a goat or a shcep offered, their names were inscribed in the registers. On this day also it was the custom for boys still at school to declaim pieces of poetry, and to receive prizes. (A. S. M.)

APE

PE (aap, Dutch; Afe, German ; Affo, Old German ; apa, Swedish and Trish ; epa, Welsh), a word of un- certain, and not improbably African origin, and by some supposed to have originated in an imitation of the animal’s “‘ chatter.”

The zoological group denoted by the term “ape,” when used in its widest sense, includes animals known by the familiar terms of “monkeys” and “ baboons,” as well as others bearing the less known names of ‘sapajous,” “

sakis," and "marmosets." In a more restricted sense the term "ape" is sometimes emphatically applied to those of the whole group which are most man-like in structure, namely, to the orang, the chimpanzee, the gorilla, and the gibbons.

Certain other animals, of very different structure, are generally associated in the same ordinal group with the apes. These other animals are the lemurs, or lemuroids; called also "half-apes," after their German designation of Halbaffen.

By Linnzus these creatures, together with bats and man, were placed in his highest and first order, to which he gave the name " Primates," dividing its contents into the four genera, Homo, Simia, Lemur, and Vespertilio. The bats are now by universal consent removed from the order ; and some eminent naturalists, notably Professor Alphonse Milne-Edwards, are disposed to remove from it the lemurs also ; but in every case there can be no question but that the latter animals must at least rank as a sub-order, for which the term "Zemuroidea" has been proposed.*

The question whether man should or should not be placed in the same zoological order with the apes, must be decided according to the principles of classification adopted. If that classification be purely morphological, 2.¢., be de- termined by form and structure only, he cannot well be separated from them, at least by any naturalist who would also include the lemurs in such order. The Linnean name " Primates" has been retained for the ape order, not only by naturalists who (like Professor Huxley) retain man within its limits; but also by others (e.g., the Professors Isidore Geoffroy St Hilaire and Gervais), who consider that he should be excluded from it. Cuvier, on the other hand, proposed for the ordinal group of apes and lemurs only the term Quadrumanes (or four-handed), giving to that order, within which he placed man alone, the anti- thetical term Bimanes. In this he has been followed by very many naturalists, and in England, amongst others, by Professor Owen; and, perhaps, the majority of writers since Cuvier have bestowed on two distinct orders the names Quadrumana and Bimana respectively.

Priority of use determines our preference for the Linnean name " Primates," but this preference is reinforced by con- siderations derived from anatomy

and physiology.

The whole of the apes, as indeed the whole of the half- apes also, differ from man in having the great toe, or (as it is called in anatomy) the hallux, so constructed as to be

1 See Proceedings of the Zoological Society for 1864, p. 685.

able to oppose the other toes (much as our thumb can oppose the fingers), instead of being parallel with the other toes, and exclusively adapted for supporting the body on the ground. The prehensile character of the hallux is fully maintained even in those forms which, like the baboons, are terrestrial rather than arboreal in their habits, and are quite quadrupedal in their mode of pro- gression. It was this circumstance that led Cuvier to bestow the name Quadrumanes upon the apes and lemurs. Now, if we accept, with Professor Owen, as the definition of the word “foot,” “an extremity in which the hallux – forms the fulcrum in standing or walking,” then man alone has a pair of feet. But, anatomically, the foot of apes (as well as that of half-apes) agrees far more with the foot of man than with his hand, and similarly the ape’s hand re- sembles man’s hand and differs from his foot. Even esti- mated physiologically, or according to use and employment, the hand throughout the whole order remains the speceal prehensile organ; while the predominant function of the foot, however prehensile it be, is constantly locomotive.

Therefore the term Quadrumana is apt to be misleading,

since, anatomically as well as physiologically, both apes and

nen have two hands and a pair of feet.?

Apart then from man, the apes constitute the first sub- order of that which is the most man-like order of the class Mammalia (beasts), and which bears the name “Primates.”

Such being the position of apes as a whole, they are zootomically divisible into a number of more and more subordinate groups, termed respectively families, sub- families, and genera.

The following table exhibits what is believed to be, on the whole, the most natural and convenient arrangement of these groups of apes :—

Simia.

Troglodytes.

Hylobates.

Semnopithecus.

Colobus.

Cercopithecus.

Macacus.

Cynocephalus.

Ateles.

Eriodes.

Lagothrix.

Cebus.

2. WAL COUAEY sc nsec crue: ae eee Mycetes.

Pithecia. Brachyurus. Nyctipithecus. Chrysothrix. Callithrix. Hapalc.

Midas.

The limits of the present article exclude altogether from consideration the half-apes or Lemurs. The whole of the apes may be characterised by the

following zoological definition, the meaning of the terms of which will be explained later :—

Family I. (1. Stmitina, ...-...0eeeee eee

SIMIADA.

Sub-Families. 7 2. Semmnopithecine,..... tecug

3. Cynopithecine,.....-..

Family II. CEBID&.

Cebine,

cence see ee tee eteeene

ae

Sub-Families, 4 2+ Péthecttmet, -...-vesreeeee

4. Nyctipithecine,.....

Hopiapalinwe renee seers

ae further on this subject, Philosophical Transactions for 1867, p- ‘

SIMIAD&. |

Ungurculate, claviculate mammals, with a deciduate, dis- cordal placenta and small allantois; with orbits encircled by and separated of from the temporal fosse by plates of bone ; lachrymal foramen not opening on the cheek; posterior cornua of os hyoides longer than the anterior cornua ; dental formula as in man, save that a true molar may be wanting, or that there may be a premolar in excess, or both; brain with well-developed posterior cornua and with the cerebellum quite covered by the cerebrum, or only very slightly uncovered ; hallua opposable, with a flat nail or none; a well-developed caecum; penis pendulous; testes scrotal; only two mamme, which two are pectoral; uterus not two horned; thumb sometimes rudimentary or absent.

The great group of apes thus characterised is divisible, as the foregoing table indicates, into two great families, which are sharply distinguished by geographical distribu- tion as well as by structural differences. The first of these families, Srmiap&, is strictly confined to the warmer latitudes of the Old World. The second family, Ces, is as strictly confined to those of the New World.

Of the three sub-families into which the Simiade are divided, the first, Srmuwz, contains only the orang, the chimpanzee, the gorilla, and the gibbons. These are the creatures which, anatomically, are the most like man of all the apes, on which account they are often called the ‘“anthropoid” apes. They are also termed, on account of the relative breadth of their breast-bone or sternum, the “latisternal” or “broad breast-boned ” apes.

The orang (S. satyrus) constitutes the genus Siméa, which gives its name to the whole family (Stmiade), as well as to the sub-family (Simin) to which it belongs. Of this genus there is but one certain species, which is, however, subject to considerable variation. The orang is exclusively confined to the islands of Borneo and Sumatra, where it frequents the swampy forests near the coast. It attains a

Fig. 1.—The Orang-outan (Simia satyrus). From Mr Wolf’s sketch at Zoological Gardens.

height of about 4 feet 4 inches; but its bulk is considerable, its legs, however, being exceedingly short. Its arms, on the contrary, are exceedingly long, reaching down to the ankle when the animal is placed in an erect posture. In harmony with this structure the animal rarely assumes, naturally, a truly erect posture, but walks resting on the knuckles of

its hands and the outer sides of its feet, the soles of the latter being turned mainly inwards. Its motions are ordinarily very slow and deliberate, and its demeanour in captivity is languid and melancholy. It is, in a wild state, exclusively a vegetable feeder, and arboreal in its habits, forming in the

trees a sort of nest or shelter of interwoven branches. The animal is covered with long, reddish-brown hair, and there are no naked spaces on the hinder part of the trunk. The forehead is rounded and rather high. Adult males are furnished with a longish beard on the chin, and they may also develop a large warty pro- minence, consisting of fibro-cellular tissue, on each side of the face. There is no vestige of a tail. The hands are very long; but the thumb is short, not reaching to the end of the metacarpal bone of the adjacent (index) digit. The feet have exceedingly long toes, except the great toe (hallux), which only reaches to the middle of the proximal phalanx of the index digit of the foot. The hallux is often destitute not only of a nail, but of the second or distal phalanx also; it nevertheless possesses an opponens muscle. The orang has twelve pairs of ribs, and has, compared with man, an extra wrist bone, or an os intermedium in its carpus. The brain of the orang has the cerebrum greatly convoluted, and is altogether more like the brain of man than is that of any other ape. A prolongation is developed from each ventricle of the larynx, and these processes in the adult become enormous, uniting together in front over the windpipe, and forming one great sac which extends down between the muscles to the axilla. There are, how- ever, no cheek pouches. The canine teeth, especially of the adult males, are very large.

The chimpanzee and gorilla together form the genus Troglodytes. Both of these species agree with the orang in being destitute of any rudiment of a tail, in having no cheek pouches, and no naked spaces at the hinder part of the trunk, as also in possessing tusk-like canines, and in the habit of resting on the knuckles of the hand in walking

Fig. 2.—The Chimpanzee (Troglodytes niger). From Mr Wolf’s Sketchea, vol. i. pl. L. on the ground and of mainly dwelling in trees. The chimpanzee (7’. niger) is found in Western Africa, from the Gambia to the Benguela, and extending inland to 28° E

long. It is the most man-like of the latisternal apes in the proportions of its arins, as these only reach a little below the knees when the body is placed upright. It is of moderate stature, never appearing to excecd 5 feet in height. In disposition it is lively and intelligent, and its

playfulness in captivity contrasts greatly with the lethargy

Fro. 3.—The Gorilla (Zroglodytes gorilla). From Trans. Zool. Soctety, vol. iv. pl. 43.

of the orang. The forchead is not rounded, but a bony,

supra-orbital ridge extends transversely above the eyes. Its ears are very large, and it has distinct eyebrows, eye- lashes, and whiskers. The pollex reaches nearly or quite to the base of the first phalanx of the index of the hand, and the hallux to the proximal end of the second phalanx of the index of the foot. There is no. os intermedium in

the carpus. The laryngeal sacculus may, as in the orang, extend downwards to the axilla. There are thirteen pairs of ribs.

The gorilla (7. gorilla) is also West African, but has a less extended range than the chimpanzee, namely, between the Cameroon and Congo rivers only. It is the largest ape known, attaining a bulk of body considerably exceed- ing that of man, though, on account of the shortness of its legs, it never seems to exceed the height of 5 feet 6 inches. It was first made known to moderns by Dr Thomas Savage, but it appears to have been secn by Hanno of Carthage,) in his voyage south of the pillars of Hercules. The gorilla has not such dark hair as has the chimpanzee, being blackish-dun in colour, and becoming grey when old. Its skin, however, is black. Its arms are longer than those of its congener, reaching half-way down the shin. Its pollex reaches but very little beyond the proximal end of the first phalanx of the index of the hand (slightly further than in the chimpanzee), and its hallux to about the distal end of the proximal phalanx of the index of its foot. The fingers and toes, however, are curiously syndactyle, being bound together by the integument to the ends of the proximal phalanges. The forehead is not rounded, the supra-orbital crest being more prominent than even in the

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1 Seo Pliny, Nat. Hist., ii. 169, v. 8, vi. 200, ed. Sillig.

chimpanzcc; the ears too are sinaller relatively. The larynx is provided with enormous air-sacs, communicating with the ventricles and meeting over the trachea, and extending to the axilla with age. There is no os intermedium in the carpus, and there are thirtcen pairs of ribs.

Fic. 4.—The Entellus-like Gibbon (Hylobates entelloides). From Archives du

Museum, vol. ii. pi. 29.

The gibbons, or long-armed apes, form the genus Hylo- bates, confined in the present day to the south-eastern continent of Asia and the Indian Archipelago. There are several specics, but individual variation and sexual difference in colour are so great that their limits are not yet well defined. One well-marked species, the largest of the genus, is the siamang (H. syndactylus) of Sumatra, which is remarkable as being the ape with the best de- veloped chin and widest breast-bone. It has also the second and third toes united by skin down to the last joint of each. Another well-marked form is the hoolock of Assam (H. hoolock). In the gibbons we first find that part upon which the body rests in sitting provided with naked callous spaces, termed (from that part of the haunch bone to which they are applied, the ischium) ‘ischial callosities ;” they are, however, still small. Though vege- table feeders, the gibbons are probably less exclusively sothan are the yet higher apes before noticed. In captivity their manners are gentle, although their activity is surprising ; especially remarkable are the enormous distances they can swing themselves by their long arms. In spite of this length of arm, which scems to render their bodily proportions so unlike those of man, the length of leg, when compared with the length of the trunk of the body, is more human than in either of the two preceding genera. Another point in which they approach nearest to man, is the quality of voice which at least some of the species (e.g. H. hoolock) possess.

None of the gibbons have any rudiment of a tail, and they have no cheek pouches, but the canines are elongated and tusk-like. When the body is

crect, the arms are SO long that they reach the ground. The hallux is well de- veloped, reaching to the middle or end of the proximal phalanx of the index of the foot, while the pollex only attains to, or reaches a little beyond, the proximal end of the

proximal phalanx of the index of the hand. There is an os intermedium in the carpus. The laryngeal sacs are no longer prolongations of the laryngeal ventricles, but open into the larynx above the false vocal chords. The number of species is, as has been said, doubtful, but the following kinds are often reckoned as distinct,—Syndactylus, Lar, Leuciscus, Agilis, Mullert, Rafflesti, Hoolock, Entelloides, Pileatus, and Funereus.

On leaving the gibbons, which close the series of Anthro- poid apes, we come at once upon animals of very different aspect, and from creatures devoid of any vestige of a tail, we pass at once to monkeys, which have that organ at its maximum of development. These are the two genera Semnoptthecus and Colobus, which so closely resemble each other as to be hardly separable, but for their different geographical distributions. ‘Together they form the sub- family Semnopithecine, and agree in having, as well as the long tail, arms shorter than the legs, and a slender body. They have small ischiatic callosities, but no cheek pouches. Their nails are compressed and pointed. Their stomach is very elongated and exceedingly sacculated, and their hinder- most lower grinding ‘tooth has five tubercles. The laryn- geal sac opens medianly into the front of the larynx, and is an extension of the thyro-hyoid membrane. The thumb is small or absent.

The genus Semnopithecus, in which there is a small thumb, is coufined to South-Eastern Asia from the Hima- laya southwards, the Indian Archipelago being its head- quarters. One species, S. entellus (the hounaman), is an object of religious veneration to the Hindoos. Another very remarkable kind is found in Borneo. It is S. nasalis (the kahau, or proboscis monkey), and, as its name im-

Fig, 5.—The Proboscis Monkey of Thibet (Semnoprthecus roxellane). From Milne-Edwards’s Recherches des Mammiferes, pl. 36. plies, it has an exceedingly long nose, In the young state, the nose is much smaller

relatively, and is bent upwards. No similar structure was known to exist in any other ape whatever till quite recently. Now, however, the Rev. Father David (a Lazarist missionary, who has made many other important discoveries in zoology), has found high up

in the cold forests at Moupin in Thibet, a large well- clothed species, with a small but distinct nose excessively turned up, on which account the name S. rorellane has been bestowed upon it. It is remarkable that a form, reminding us of the young condition of S. nasalis, should have been discovered in a region so remote from the island of Borneo as is Thibet. It is also very remarkable that a monkey of a genus the home of which is the warm Archipelago of India, should be found in forests where frost and snow last several months in the year, when their only food is tree buds, and tender shoots and twigs. The species of the genus to be mentioned, besides Lntellus, Nasalis, and Roxellane, are,—Nemeus, Leucoprymnus, Latibar-batus, Obscurus, Nestor, Cucullatus, Johnii, Priamus, Cris- tatus, Maurus, Femoralis, Auratus, Frontatus, Siamensis, Mitratus, Flavimanus, Rubicundus, Albipes, Nigripes, and Schistaceus.

The genus Colobus is exclusively African, but the species composing it only differ from the Semnogithect, in that the thumb is generally absent or reduced to a small tubercle, which may or may not support a nail. The species are —-Guereza, Verus, Temminckii, Vellerosus, Fuliginosus, Satanas, Angolensis, Ursinus, Ferrugineus, Kirku, and Palliatus.

We now conie to the concluding genera of the apes of the Old World, together forming the third sub-family Cyno- pithecine. This is a very natural group, but one exceed- ingly difficult to subdivide in a satisfactory manner, because the different characters gradually alter as we pass from round-headed, long-tailed, and comparatively slender monkeys to dog-faced, short-tailed, and massive baboons. All the Cynopithecine agree in having pretty well-developed thumbs and a single stomach, as also in having the sides of the face distensible, serving as pockets wherein food may be temporarily stored, and technically called ‘‘ cheek pouches.” The

hair is often annulated. The ischiatic callosities are larger than in the forms hitherto noticed, and in some kinds these parts become greatly swollen at the period of sexual excitement, the enlargement extending sometimes (as in Macacus cycloprs) even to the tail. The male external generative organs tend to assume a bright and varied coloration, which is often accompanied with vivid hues on and about the face. By common consent, the Cynopithecine are divided into at least three genera, and by some naturalists (eg. M. Isidore Geoffroy St Hilaire) they have been divided into as many as seven.

The first genus, Cercopithecus, includes those species of the sub-family, which by their length of tail and compara- tive slenderness, most nearly approach the members of the preceding sub-family. Many of the species (e.g. the Diana and white-nosed monkeys) are very attractive animals. Commonly the Cercopithect have four tubercles to the last lower molar. The talapoin monkey (C. talapoin) has been made the type of a separate genus (Miopithecus), be- cause it has but three such tubercles, while the mangabeys and white-eyelid monkeys (C. ethiops, collaris, and fuligi- nosus) have been separated off into a genus Cercocebus, because in them the last lower molar has five tuber- cles, All the Cercopithect (including Miopithecus and Cercocebus) are African forms. Besides those already mentioned, the following species have been described by authors :— WNictitans, Petaurista, Cephus, Mona, Monoides, Diana, Labiatus, Leucampyx, Pygerythrus, Lalandit, Sa-

| beus, Cynosurus, Ruber, Pyrrhonotus, Callitrichus, Rufo-

viridis, Albigena, Erythrogaster, Werneri, Melanogenys, Ludio, Erythrarchus, Ochraceus, Flavidus, Lunulatus, and Eralebenit,

The next genus, Mucacus, is Asiatic, with the exception of the Barbary ape, or magot (M. inuus), which is found in Northern Africa and on the Rock of Gibraltar. Already,

+1 some of the Cercopithect, notably in the mangabeys, the muzzle has acquired a greater prolongation. This becomes still more marked in the

Macaci. It is this greater pro- duction of muzzle, the greater size in the ischiatic callosi- ties, the frequent shortness of the tail, and the different geographical distribution, which can alone be given as differentiating these animals from the Cercopithect. In some kinds the tail is long. Occasionally (as in the wanderoo, WM. silenus) it is tufted at the end and short. Sometimes, as in M. nemestrinus, it is very short, and occasionally, as in M. inwus, it is absent. On account of this absence of tail, this species has sometimes been made the type of a distinct genus, /nwus.

Another species, M. niger (from Celebes and Batchian), has, on account of the much greater production of its muzzle, been made the type of another genus, termed Cynopithecus.

The Macact present us with the most northern forms of apes, namely, that of Gibraltar, and M. speciosus of Japan. Father David has lately brought from Moupin,~~in Thibet, a new species (I. thibetanus) which inhabits snowy moun~~ tains, and is clothed suitably for such a habitat, in thick and dense fur. In addition to the Macaci already men- tioned, we may name the species Sinicus, Pileatus, Aureus, Cynomolgus, Silenus, Rhesus, N emestrinus, Thibetanus, Ochreatus, Palpebrosus, Brunneus, Rufescens, Rheso-similis, Erythreus, Cristatus, Tcheliensis, Cyclopis, Inornatus, Sanctijohannis, Lasiotus, Assamensis, Maurus, Philippin- ensis, and Nigrescens.

Fia. 6.—The Thibct Macaque (Macacus thibetanus). Recherches des Mammiferes, pl. 34.

From Milne-Edwards’s

The remaining apes of the Old World are the baboons, which are entirely confined to Africa, and to that part of Asia which is zoologically African, namely, Arabia. These animals, which constitute the genus Cynocephalus, have the characters of the Macaci still further developed in having still larger callosities, and a muzzle so extremely produced as to give the head the appearance of that of a dog, whence their generic name. The general form has also here be- come very massive, and the limbs being sub-equal in length, the appearance, like the locomotion, is quadrupedal. But the baboons have not only the muzzle so greatly pro- duced, they have also the nostrils terminal in position like those of a hound and unlike what we have

yet met with. The species C’. gelada of Abyssinia and C. obscurus form exceptions to this condition, as they have the nostrils placed as in the Macaci, on which account they have been made the type of a distinct genus, Theropithecus.

In the other C’ynocephali, the tail may be moderately long, as in C. hamadryas, or very short, as in the man- drill, C. mormon. In the last-named species we again

meet with much bulk of body, as it exceeds the chim- panzee in this respect. It is also remarkable for its bright coloration, the cheeks being brilliant blue, the

Fic. 7.—The Babuin Baboon (Cynocephalus babuin). From Archives du Museum, vol.

ii, pl. 34.

nose vermilion, and the beard golden-yellow. Other species described are Sphinx, Olivaceus, Babuin, Anubis, Obscurus, Doguera, Porcarius, and Leucopheus.

The baboons are the least arboreal and the least frugi- vorous of the Old World apes, some species, eg., the chacma of Southern Africa (C. porcarius), living habitually amidst rocks, and feeding on eggs, large insects, and scorpions, as well as on vegetable food.

In the whole series of Old World apes we find the same number of different kinds of teeth as in man, the dental formula being—

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or thirty-two teeth in all, Again, in the whole series the two nostrils are divided the one from the other by a narrow septum ; and if the skull be examined, a long bony tube (the meatus auditorius externus) is seen to lead in- wards on each side to the internal ear. Moreover, the thumbs, when present, are always more or less opposable to the other fingers.

In passing to the second family of apes—the Cebide, or apes of the New World—we find them to form a very dis- tinct and easily-defined group, and a little experience readily enables an observer to pronounce at a glance that a given ape belongs either to the Old or the New World, as the case may be.

The Cebide are more thoroughly arboreal in their habits than are the Simiade. Ranging over tropical America, they have their headquarters in the forests of Brazil, a region where most animal forms put on a more decidedly arboreal character. Accordingly, it is amongst the Cebide that we meet with, for the first time, a special arboreal organ—namely, a prehensile tail. Such a tail has its free end curled, and capable of grasping with greater

or less tenacity the objects about which ‘it coils. Again, in the Cebide, the septum between the nostrils is broad, instead of narrow, imparting to the physiognomy a markedly different character. In passing to these American apes we entirely lose cheek pouches and ischial callosities ; while the thumb, even where best developed, is capable of but a very partial opposition to the other fingers, bending almost in the same plane with the latter, so as to be more hike a fifth finger than a thumb. We also constantly find an additional premolar tooth on each side of each jaw, and that bony tube, the meatus auditorius externus, is wanting.

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None of the Cebvde attain the bulk of the larger ba- boons, nor have any such promincnt muzzles as have the latter The Cebide are subdivisible into five sub-families :—1. Cebine; 2, Mycetine; 3. Pitheciine; 4. Nyctwithecine ; and, 5. Hapaline.

The first sub-family consists of the four gencra, Ateles, Ervdes, Lagothrix, and Cebus.

The genus Ateles is composed of the spider monkeys, which, as their name implies, have long and slender limbs. They have also a very long tail, which is in the highest degree prehensile, being naked beneath towards the tip, for more secure prehension. So powerful is the grasp of this organ that the whole body can be sustained by it alone. It even serves as a fifth hand, as detached objects, . otherwise out of reach, can be grasped by it, and brought towards the hand or mouth. Their prehension is in other respects exceptionally defective, as the spider monkeys alone amongst the Cebide (like the Colobi amongst the Simiade) have the thumb reduced to a mere tubercle. Their laryngeal sac opens medianly, but from the back part of the trachea, just below the cricoid cartilage.

The spider monkeys are very gentle in disposition, and, by this and by their long limbs and special fitness for tree- life, seem to represent in an

analogous manner in the New World the gibbons of the Old. Nevertheless, in spite of their admirable adaptation for arboreal life, their com- paratively slow progression offers a marked contrast to the vigorous agility of the gibbons. Their hair is long, but not woolly. Species described are—Ater, Pentadactylus, Paniscus, Marginatus, Belzebuth, Melanochir, Hybridus, Vellerosus, Albifrons, Rufiventris, Variegatus, Griescens, Cucullatus, and Fuscipes.

Fic. 8.—The Black-handed Spider Monkey (Ateles melanochir). From Pro, Zvol. Soc. 1871, pl. 14

Three species of ape having much general resemblance to spider monkeys have been erected into the genus Eriodes (E. arachnoides, hemidactylus, and hypoxanthus). These animals, which are from South-Eastern Brazil, have the fur woolly, the thumb more or less rudimentary, the

nails very laterally compressed, and the nostrils more approxunated than in the other Cebide.

Fig. 9.—Humboldt’s Lagothrix (Lagothrix Humbolatii). From Pro. Zovls Soe. 1863, pl. 31.

The woolly monkeys, Lagothrix, differ from the two pre- ceding genera in having the thumbs well developed. Their nails are compressed laterally, as in Hriodes, but their nostrils are not approximated. As their name im- plies, their fur is woolly. Like Eriodes and Ateles, they have the tail strongly prehensile, and naked beneath towards the tip. The species which have been described as distinct are—Canus, Humboldt, Castelnaui, Tschudi, and Geoffroy.

The genus Cebus, the typical genus of American apes, is composed of the sapajous, so commonly scen in captivity, and so much used for the exhibition of tricks of various kinds. Smaller in size, they are more robust in form than are the spider monkeys. They have well-developed thumbs, and

their tail is curled at the end, but, not being naked beneath, is less strongly prehensile than in the three pre- ceding genera. The sapajous have a pleasing voice, a flute-like whistling tone. The different species are very ill-defined, the individual differences being so numerous and so considerable. The species described are the follow- ing :—Capucinus, Hypoleucus, Elegans, Robustus, Apella, Cirrifer, Flavus, Castaneus, Barbatus, Frontatus, Chry- sopus, Variegatus, Versicolor, Leucocephalus, Flavescens, An- nellatus, Subcristatus, Capillatus, Fatuellus, and Vellerosus,

The next sub-family of American apes is very distinct, consisting, as it does, of a single genus, Mycetes, composed of the howling monkeys. These creatures are the most bulky of the American apes, and are those the muzzles of which are the most projecting. If the spider monkeys may be considered the analogical representatives of the gibbons, the howlers may similarly be esteemed those of the baboons. They are sluggish, and apparently stupid animals, but have a wonderful power of voice, facilitated by an enormous distension of the body of the hyoid bone into a large, deep, bony cup, sheltered. between the jaws, which are specially deep for that purpose. Into this cup is received one of the three or five sacs with which the larynx is provided. The thyroid cartilage is very large. The howlers have long, very prehensile tails, naked beneath towards the tips. Their thumbs are well developed. Some

of the species show much brilliance of colour, with bright II. — 20

red or golden hair on the flanks. There is, however, so much individual variation, or So many local varieties, that the species are as yet very little determined. The sexual difference in colour is great in one species—the male being deep black, and the female pale straw colour. Amongst the species described may be named—Seniculus, Ursinus, Caraya, Rufimanus, Ni ager, Villosus, and Palliatus.

The third sub-family of American apes is composed of very peculiar forms, termed Sakis, which are subdivided into two genera, Pithecia and Brachyurus, according as the tail is long or short. They are together distinguished from all the Cebide yet noticed, by not having the tail

prehensile, even when long; also by having the lower incisor teeth inclined forwards, instead of standing up vertically. Great differences as to the hair exist in this group, some having long hair over the whole body, others on the head, and others on the chin and cheeks, while a species of Brachyurus (B. calvus) has the head naturally bald. Of the genus Pithecia, the following species have been de- scribed :—Leucocephala, Rufiventer, Monachus, Satanas, Chiropotes, Albinasa, and Chrysocephala. Of Brachyurus, besides Calvus, only Rubicundus has as yet been described.

The Brachyurt are the only American apes with short tails, and they are the least arboreal, frequenting bushes rather than trees. They are very timid creatures, and gentle, and rather slow in their movements. It is but very rarely that any of the Pitheciine have been brought to Europe alive.

Fic. 10,—The White-eheeked Sapajou (Cebus leucogenys). From Pro. Zool. Soc. 1865, pl. 45.

The next sub-family, Nyctipithecine, contains three genera, which have a long but not prehensile tail, fairly- developed thumbs, and vertical lower incisor teeth. These animals are, in part at least, insectivorous.

The typical genus, Myctipithecus, contains only the night-apes, or douroucoulis (WV. felinus, lemurinus, oseryt, rufipes, and Spixti), which have, in harmony with their noctural habits, enormous eyes. The orbits, though closely approximated, are nevertheless separated by a com- plete bony system. The head is rounded, but greatly drawn out posteriorly. The nostrils are rather approxi- mated.

The beautiful little squirrel monkey, or Saimiri, and three allied species (Ch. ustus, entomophagus, and @rstedi), form the genus Chrysothriz. They are distinguished from ell other apes by the great backward prolongation of the

bony craniwn, the orbits of which, though smaller than those of Wyctipithecus, are, nevertheless, separated, but by an imperfect bony

septum.

A few other kinds of American apes, together forming the genus Callithrix, somewhat resemble the night apes, but

Fia. 11.—The Lemurine Night Ape (Nyctipithecus lemurinus). From Archives du Museum, vol. iy. pl. 2.

that the eyes are much smaller, and the nostrils wider apart. They differ from Chrysothrix in having small canine tecth, and the tail furnished with long hairs. The species of this genus are—Moloch, Personatus, Amactus, Gigo, Melanochir, Discolor, Donacophilus, Ornatus, and Castaneoventris.

There remains now to notice but one more group of apes, those which have been classed as the last sub-family —the Hapalince, marmosets, or oustitis. These animals are so different from all that have gone before that there is probably almost as much to be said for ranking them as a family by themselves as for considering them, as is here done, but a sub-family. Much, however, as they differ from all the other apes, they manifest their affinity to the rest of the Cebide by the absence of the meatus auditorius externus, and by the presence of the extra premolar tooth on each side of each jaw. They have, however, the same total number of teeth as have man and the Sumiade. This is occasioned by their not possessing any third true molar, either above or below; so that their dentition thus differs from that of the Old World apes in two points, instead of only one. In all the apes we have yet noticed, except the orang, the hallux is well developed, while in the mar- mosets it is exceedingly small. The hand, however, is yet more exceptional, as the thumb is not at all opposable, while, in common with all the other fingers, it is furnished with a long, curved, and pointed claw. The tail is not prehensile, but long, and furnished with more or less elongated hairs. In several, and especially the more commonly seen species, a tuft of long hairs projects out- wards and backwards on each side of the head. These animals are very small, the largest being about the size of squirrels. They are, like squirrels, active in their motions, and arboreal in their habits, living in small troops, and eating insects as well as fruit. They are very difficult to keep in captivity in northern climates; but, nevertheless, they have occasionally bred in England, bringing forth as

many as three at a birth, while all the other apes habitu- ally bring forth but one. There are many different species of marmosets, and they have been divided into two genera, according as the lower canine (eye) teeth are or are not

14. 12.—The Moloch Callithrix (Callithrix moluch). Froin Archives du Museum, vol. iv. pl. 3

decidedly larger than the incisors (eutting-teeth) between

them; those kinds in which the inferiorand incisor canines are

almost of equal length being retained in the genus JZapale,

while those in which the lower incisors are much shorter

From Pro. Zool.

Fic. 13.—The Golden Marmoset (Midas chrysoleucus). Soc. 1868, pl. 24.

than the adjacent canines are taken to form the genus Midas. It seems doubtful, however, whether this gencric distinetion can ultimately be maintained, an intermediate condition existing in some forms. The species of the

genus Llapale are—Jacchus, Albicollis, Aurita, Humera- lifer, Penieillata, Leucocephala, Melanura, and Pygmea.

The specics of the genus Midas are—Rosalia, Chryso- melas, Gidipus, Geoffroyi, Bicolor, Ursulus, Rufimanus, Labiatus, Mystax, Rufoniger, Devilli, Nigrifrous, Flavi- frons, Illigeri, Weddellii, Leucogenys, Melanurus, Argentatus, Chrysoleucus, Lagonotus, Graellsi, Pileatus, Hlegantulus,. and Rufiventer.

The characters of the subdivisions of the ape group may be synoptically expressed as follows :—

Family I. Srmrapz. PM. * M. = a bony meatus auditorius externus; pollex oppos-

able, if present; tail never prehensile; internasal septum narrow; often cheek pouches; often callosities; pectoral limbs sometimes greatly exceeding the pelvic limbs in length; pelvic limbs never much longer than the peetoral limbs; Old World habitat.

Sub-Family I. Stmiine.

Pectoral Jimbs mueh longer than pelvie limbs; no tail; no cheek pouches; ereum with a vermiform appendix; sternum broad; sometiines uo os intermedium in the carpus; stomach simple.

1. Simia.—Head vertieally produced; arms reaching to ankle; ribs, twelve pairs; au os intermedium; hallux very small; no ischiatie ecallosities ; hair red; habitat Asiatic.

2. Troglodytes.—Head not vertically produced ; arms not reach- ing more than half down the shin; ribs, thirteen pairs; no os intermedium ; hallux well developed; no isehiatie callosities ; hair black, dun, or grey; habitat African.

8. IZylobates.—Head not vertically produced; arms reaching to the ground; an os intermedium; hallux well developed; small ischiatie callosities; habitat Asiatie.

Sunb-Family II. Semnopithecine.

Pelvie limbs longer than pectoral limbs; tail very long; no eheek pouches ; no vermiform appendix; sternum narrow; an os intermedium ; ischiatie callosities ; stomach complicated by saceula- tions; third lower molar always with five tubercles.

4, Semnopitheews.—Thumb small; habitat Asiatie.

5. Colobws.—Thumb generally absent; habitat African.

Sub-Family III. Cynopithecine.

Pelvie and pectoral limbs sub-equal in length; tail long, or short, or absent; cheek pouches; no vermiform appendix; sternum narrow; an os intermedium; ischiatie eallosities present, often very large; stomach simple; third lower molar sometimes with four tubercles.

6. Cercopithecus.—Muzzle more or less short ; eallosities moderate; last lower molar generally with four tubercles ; tail long; habitat African.

7. Macaeus.—Muzzle more or less elongated; callosities rather large; last lower molar with five tubercles; tail long, short, or absent; nostrils not terminal; habitat Asiatic, North African, or European.

8. Cynocephalus.—Muzzle very long; eallosities very large; last lower imolar with five tubercles; tail more or less short; muzzle swollen by enlargement of maxillary bone; nostrils almost always terminal; habitat African.

Family II. Cesrpa.

P.M. 3; opposable ; tail often prehensile; internasal septum broad; no cheek pouches; no ischiatic callosities ; no vermiform appendix; always an os intermedium; pectoral limbs never more than slightly excecding! in length the pelvie limbs; pelvie limbs sometimes much longer than the pectoral limbs; New World habitat.

no bony meatus auditorius externus; pollex never

Sub-Family I. Ceding. M. incisors vertical; tail long and prehensile; hyoid bone

moderate; thumb present or absent.

9. Ateles.—Form slender; limbs very long; fur not woolly; internasal septum as broad as usual in Cebide ; thumb absent; tail distally naked beneath; nails not much laterally compressed and pointed. ;

10. Eriodes.—Form slender ; limbs very long; fur woolly ; inter- nasal septum narrower than usual in Cebide; thumb rudimentary; tail distally naked beneath; nails exceedingly compressed laterally, and pointed.

1 Only at all so in Adeles,

11. Lagothria.—Form rather robust; limbs moderate; fur woolly; internasal septum as broad as usual; thumb well developed; tail distally naked beneath.

12. Cebus. —Form rather robust; limbs moderate; fur not woolly ; internasal septum as broad as usual; thumb well developed; tail not naked beneath distally.

Sub-Family II. Mycetine. naked beneath distally ; hyoid bone enormous ; form of body massive; thumb well

developed; internasal septum as broad as usual. 13. JMycetes.

M. 4 ; incisors vertical ; tail long and prehensile,

Sub-Family III. Pitheciine. M. 3 incisors inclined outwards distally; tail long or short,

? never prehensile; hyoid bone moderate; thumb well developed ; internasal septum as broad as usual. 14, Pithecia.—Tail long. 15. Brachywrus.—Tail short.

Sub-Family IV. Wyctipithecine.

M. = incisors vertical; tail long, not prehensile ; hyoid bone

moderate; thumb well developed.

16. Nyctipithecws.—Head rounded; eyes enormous; nostrils rather approximated.

17. Chrysothria.—Head exceedingly elongated; eyes large, closely approximated; canines well developed; hair of tail rather short.

18. Callithric.— Head small, depressed, and not elongated ; nostrils widely separate; canines small; hair of tail elongated.

Sub-Family V. Hapaline.

M. + incisors vertical; tail long, not prehensile; hyoid bone moderate; thumb elongated, not at all opposable; hallux very ae a long curved and pointed claw to all the digits, except the rallux.

19. Hapale.—Lower incisors and canines of equal length.

920. Midas.—Lower canines much longer than the lower incisors.

THE ANATOMY OF APES.

To describe generally the anatomy of apes would be, in fact, to describe in an elementary manner the general anatomy of man. It is necessary, therefore, here to assume that the reader has already an elementary knowledge of human anatomy, and to refer such readers as have not such knowledge to the article ANATOMY.

Tue EXTERNAL Form AND CLOTHING.

The difference in bulk between the different members of the group (eg. Troglodytes and Hapale) is extreme, being greater than that between a man and a common squirrel.

The proportions of the body as regards the relative lengths of the two pairs of limbs one with the other, and both with that of the trunk, vary considerably. Both pairs may be much elongated, as in Ateles and Hylobates, and either sub-equally, as in the first of these genera, or with the arms very greatly in excess, as in the second. The legs may be excessively short, and the arms, at the same time, excessively long, as in the orang. Both pairs may be short and sub-equal, as often in the Cynopithecine. Only in the Nyctipithecine and Hapaline does the excess in length of the lower

limbs over the upper exceed or equal that which is found in man. The length of the tail presents some noteworthy points. At its first appear- ance it is found at once at its greatest absolute length and also greatly developed relatively, being about twice the length of the trunk. Its greatest relative length is, how- ever, attained in Ateles, where it reaches three times the length of the trunk. The constancy of the degree of its developinent varies much in different groups. In the greater number of genera it is long in all the species, and in some (Stmia, T'roglodytes, and Hylobates) it is absent in all, In others it may be long or short, or completely

absent, ¢.g., in Macacus. The form of the head presents great differences—it may be rounded, as, eg., in Ateles ; produced vertically, as in Simia; drawn out posteriorly to an extreme degree, as in Chrysothria; or anteriorly, as in Cynocephalus. A production of the muzzle, necessitated by the presence of large teeth, exists already in Z'roglodytes ; but in the baboons, not only is this prolongation carried much further, but the terminal position of the nostrils gives an emphatically dog-like aspect to the face.

The eyes may be small compared with the size of the head, as in the baboons; they may, on the contrary, attain a relatively enormous size, as in JV. yctiprthecus. They are always forwardly directed, and never much more separated one from another than in man. 'They may, however, be much more closely approximated, as notably in Chrysothrix.

The external ears are always well developed, and have very generally their postero-superior angle pointed. They may be large and small in the same genus, as in Troglo- dytes. Only in the gorilla do we find present, even in a rudimentary condition, that soft depending portion of the human ear which is termed the "lobule."

The nose has scarcely ever more than a very slight pro- minence, and yet an enormous development is to be met with in Semnopithecus nasalis ; while

in S. roxellance we find a sharply prominent, though smaller and extremely upturned, nose. The hoolock gibbon also possesses a pro- minent but slightly aquiline nose. ‘The terminal position of the nostrils in Cynocephalus has been just mentioned. These apertures may be closely approximated, as in all the Simiade, or they may be separated one from the other by a broad septum, as in the Cebide, its breadth, however, varying somewhat in different genera, as, ¢g., in Ateles and Eriodes, and in Callithrix and Nyctipithecus.

The lips are generally thin, but may be very extensive, as in Sima.

The hands are generally provided with thumbs, though these organs (as in Colobus and Ateles) may be represented only by small nailless tubercles. The thumb (pollex) is more human in its proportions in the chimpanzee than in any other of the highest apes. As compared with the length of the hand, it is most man-like in the lowest Cebide, e.g., Chrysothria and Hapale. In spite of greater relative length, however, it may but little merit the name of thumb, as it is but slightly opposable to the other digits in any of the Cebide, and is not at all so in the Hapaline.

The hallua (great toe) is never rudimentary like the pollex. It is never, as it often is in man, the longest digit of the foot, but is constantly the shortest one. As compared with the entire length of the foot, it is most human in the chimpanzee and some gibbons, and smallest of all in the orang, and next smallest in Hapale. More detailed proportions will be more appropriately given in speaking of the skeleton.

Every digit is provided with a nail, except the hallux of the orang and those rudimentary tubercles already spoken of as representing thumbs in Ateles and Colobus. The nail of the hallux is flat in every species, but the other nails are never so flat as are the nails of man. The lateral compres- sion of the nails becomes more strongly marked in some Cebide, e.g., in Eriodes, but attains its extreme in the Hapaline, where every nail, except that of the hallux, ae the form of a long, curved, and sharply-pointed claw.

All the apes, without exception, differ from man in having the body almost entirely clothed with copious hair, and especially in never having the back

naked. In the gibbons, the Semnopithecine, and the Cynopithecine, naked spaces (ischiatic callosities) are present on that part of the

body which is the main support in the sitting posture. These naked spaces increase in size as we descend through the series of Cynopithecine, and are subject to a tumefaction (sometimes excessive and extending to parts adjacent) at the season of sexual excitement. Such naked spaces are never found in any of the Cebide. No ape has so exclu- sive and preponderating a development of hair on the head and face as exists in most men. As to the head, long hair is found thereon in Hapale edipus and in some of the Semnopithect, whilst certain of the Macaci (as, eg., the Chinese bonnet monkey, Mf. sinicus) have the hair of the head long, and radiating in all directions from a central point on the sinciput. A beard is developed in the male orang, and Cercopithecus Diana has long hair on the checks and chin. The wanderoo (Macacus silenus) has the face encircled by a kind of mane of very long hairs, and many of the marmosets have a long tuft of hairs on each side of the head. The American apes cxhibit some extremes respecting hair development. Thus in some of the howlers (as in some of the Colobi of the Old World) the hair of the flanks is greatly elongated. Some also have an elongated beard, but the latter structure attains its maximum of development in the couxio (Pithecia satanas). Some of Pitheciine have the hair of the whole body and tail very long, others have the head of the female furnished with elongated hair, while another species (Brachyurus calvus) has the head bald. Long hair may be developed from the shoulders, as in Cynocephalus hamadryas and Hapale humeralifer; or may form a tuft at the end of the tail, as in Macacus silenus, Cynocephalus hamadryas, and Cynocephalus gelada.

The direction of the hair may sometimes vary in nearly allied forms. Thus the hairs on the arm and forearm respectively may be so directed that the apices converge towards the elbow. Such is the case in most of the lati- sternal apes, yet in Hylobates agilis all the hair of both these limb segments is directed towards the wrist.

The hair presents generally no remarkable character as to its structure. It may, however, assume a very silky nature, as in Hapale rosalia, or assume

the character of wool, as in Hriodes, and as in that remarkable form recently discovered by Father David, Macacus thibetanus. The last named species inhabits the snowy ranges of the Thibet mountains, and is provided for this habitat by a modifica- tion in its hairy clothing similar to that which suited the extinct mammoth for the severity of its Siberian home. This fact as to M. thibetanus has an interesting bearing on fossil forms, which we shall have to consider later.

Great brilliance of colour is sometimes found in the naked parts of the body, particularly in the Simiade, and especially in the regions of the face and sexual organs. In some of Cercopitheci and Cynocephali, rose colour, turquoise blue, green, golden yellow, and vermilion appear, in vari- ous combinations, in one or other or‘both of these regions, and become especially brilliant at the epochs of sexual excitement.

THE SKELETON.

The skeleton of apes generally, if we except the tail, consists of but few more bones than that of man. The proportions of its parts, except as regards the relative length of the limb bones, are also much as in man; nor are their shapes, except those of the jaws and haunch bones, greatly different. The same general resemblance may be predicated of their minute structure, though the osseous tissue is generally rather dense, and the medullary cavity in the long bones small.

The Axial Skeleton.—The Skull. The axial skeleton consists of the skull and the verte-

bral column, and the general shape of its more anterior portion, the skull, has already been indicated when speak- ing of the head as part of the external form. It is scarcely ever so evenly balanced on the occipital condyles as in man.

The artificial division of the skull into a cranial and a facial portion may be here conveniently adopted from human anatomy. The proportion of the latter portion to the former varies greatly from age and sex, owing mainly to the differences produced through the development of large and powerful canine teeth in the adult males of most species. This proportion also varies in an irregular manner as we descend (through the series of apes) from those which are most like man. Thus the facial part is already very large in the orang and chimpanzee, much more so than in Semnopithecus, where most of the ape cranial characters are moderately developed, or even than in many Cercopitheci; but it attains its maximum of rela- tive size in the Cynocephali, above all in C. porcarwus. In the Cebide the facial part is relatively smaller than in the Simiade, with the exception of Mycetes, while in Chryso- thriz the facial portion of the skull is relatively smaller than even in man himself. The relation of the face to the cranium (or brain case) is best shown by the cranio- facial angle, which is estimated by means of two lines, one drawn parallel to the base of the skull (from the front margin of the occipital foramen to the anterior end of the

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Fig, 14.—Side view and base of the skull of the Douce (Semmnopithecus nemeut). From De Blainville.

cerebral surface of the presphenoid), the other drawu from

the front end of that base to the middle of the lower

margin of the upper jaw.

No ape, especially no ape of the Old World, presents so elevated and rounded a contour in the frontal region as does man. It is in American forms, especially in the genus Pithecia, that we find the greatest resemblance to man in this respect; but the skull is lofty in the orang. —

The convexity of the occiput is well marked in Sima, Troglodytes niger, and Hylobates, while in the inferior Simiade it is flat. Its maximum of

production, however, is met with in the genus Chrysothrix.

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Ridges for muscular attachment, or other bony proml- nences, more or less disguising the rotundity of the cranium, are very generally developed, except in the smallest species. Such ridges are met with at once at their very maximun. of extent in Zroglodytes gorilla, In that animal an

Fig. 15.—Side view of the skull of adult Orang (Sumia satyrus). From Trans. Zcol. Soc. vol. i. pl. 53.

ridge traverses the middle of the sinciput joining at its hinder end a prodigious lambdoidal crest for the insertion of the muscles of the neck, A very largely developed supra-orbital ridge runs transversely above the orbits, which it obliquely overhangs. The orang has no supra-orbital ridge, but in the other large Simiade all these ridges are more or less developed, and moderate sagittal and lambdoidal ridges are found in Mycetes, Cebus, Pithecia, and some other of the Cebide.

The mastoid process never attains in apes the large rela- tive size it has in man; but it is prominent in the baboons and larger Macaci, as well as in Troglodytes, its develop- ment bearing relation to the size and weight of the head. As the mastoid diminishes we find that the under surface of the petrous bone assumes a swollen or “ bullate” condition.

The orbits are in 7. gorilla much as in man, but in the orang they are more rounded. They become very large in Hylobates, but attain an enormous size in Nyctipithecus. The extent to which each orbit opens into the adjacent temporal fossa, 7.¢., the size and shape of the spheno- maxillary fissure, varies considerably. It is narrow and much elongated in the gorilla and in C’ynocephalus; it is short in the Semnopithecine and in Ateles, but opens widely so as to expose the vidian foramen. It is most completely closed of all in Mycetes, where it sometimes all but disappears entirely. The olfactory chamber is narrow and deep in the lower Stmiadew. The cribriform plate of the ethmoid is generally separated from the presphenoid by the junction of the orbital plates of the frontal. Such,

enormous sagittal antero-posteriorly,

however, is not the case in the orang and chimpanzee, |

though it is so in the gorilla and in Hylobates.

The plane of the foramen magnum, as compared with the basi-cranial axis, varies with the projection of the occiput. It generally forms a less open angle with that axis than in man, but in Chrysothrix the angle is yet more open than in the human skull.

The zygomata are arched both outwards and upwards in the gorilla and some baboons, but decrease in relative as well as absolute size in the smaller forms,—notably in

Chrysothriz. No long slender styloid process is normally attached to the skull, though such may be the case in C'yno-

cephalus. The vaginal process never attains the size it does

in man, though it is considerable in the gorilla, and some- times noticeable inStmia. A bony meatus auditorius externus exists in all the Simzada, and is absent in the whole of the Cebide. In Nyctipithecus the ali-sphenoid is almost shut out fromthe parietal by the close approximation of the squamosal to the malar. In Cebus there is often a large malar foramen.

The premaxillary bones have throughout the apes a dis- tinctness of development and a relative size not found in man, the sutures separating them from the maxillaries remaining visible, with the exception of the chimpanzee, after the adult dentition has been attained. The maxil- laries themselves develop great swollen tuberosities in the Cynocephali, and a similar structure is developed even in Macacus niger.

The nasal bones are small, and generally flatter than in man. In the orang they are quite flat. They are convex in some of the Semnopithect and in the

Cynocephali, but the proboscis monkey has its nasal bones no more developed than have other species of its genus. The nasals seem to attain their maximum of relative size in Mycetes.

The lower jaw, or mandible, is always in one piece in adults. It is most man-like in the siamang, since we there alone find a slight chin. On the other hand, in Hylobates the angle is produced downwards and backwards, and we find the same in Hapale. Its maximum of relative size is attained in Mycetes, where the very broad ascending ramus serves to protect and shelter the enormously developed body of the hyoid.

Air cells may be developed, as in the gorilla, in the parts adjacent to the mastoid. Frontal sinuses are generally absent in the Siméade, being replaced by a coarse diploé. We find them, however, in the Cebédw, and in Cebus

Fic. 16.—Side views of skull and hyoid bone of Howling Monkey (A/ycetes seniculus). From De Blaimville. they are often larger than they are in man. The total length of the cerebral cavity is never so much as 21 times the length of the basi-cranial axis.

The sutures of the skull become entirely obliterated with age. In the gorilla the sutures assume a more dentated structure than is found in any other ape or in man. The internasal suture becomes early obliterated in most of the Simiade. The tentorium is sometimes

ossified, as in the Cebine and Mycetes. downwards there is a small cerebellar fossa on the inner surface of the petrosal.

The Vertebral Column.

The vertebral or spinal column in all apes consists of the same regions as it does in man, and, with the exception of the coccygeal or caudal portion, these regions bear more or less the same proportions one to another as they do in him. That beautiful sigmoid curvature which exists in the human spine is not found in any ape; but the nearest approximation to it is found, not in the Simine, but in the Cynocephali. In the latisternal apes the spinous pro-

cesses are directed as in man, but in the rest their apices converge towards a single point in the back.

The cervical region is relatively more elongated than in man in Hylobates, Cynocephalus, and Ateles. The atlas is very man-like in Z’roglodytes and Simia, except that its transverse process is rather smaller and shorter relatively, and more curved dorsally. Except in Ateles and the Simiine, it is almost always perforated by the vertebral artery, instead of being merely grooved by it. In Cyno- cephalus the atlas is exceedingly massive, and may, by very rare exception, develop a spinous process. The spines of the cervical vertebra do not bifurcate beyond the second, and generally the spine of the seventh vertebra is the longest, at least with the exception of that of the axis. In the gorilla and orang, however, the spines of the third, fourth, fifth, and sixth vertebree are exceedingly elongated and longer than that of the seventh. The cervical neural lamine are wider antero-posteriorly, the vertebral column being supposed horizontal, in Z/ylobates and Ateles than in other forms. Beneath the anterior articular process (prezygopophysis) a marked prominence—the metapophysis —may be developed, and is particularly conspicuous in Ateles. The costal plate of the sixth cervical is almost always larger than the homologous part in the other cervicals; but it predominates least in the chimpanzee and Nyctipithecus. The length of each centrum, compared with its breadth, is already greater in Z’’roglodytes and Simia than in man. In others the dimensions are about equal, except that in Cynocephalus, Ateles, and Mycetes the length slightly exceeds the breadth.

The dorsal vertebre vary in number from eleven, as sometimes in Cercopithecus and Macacus, to fourteen, as sometimes in Mylobates, or even tc fifteen, as in Myct2- pithecus. In the Cebidw, above the Hapaline, the number rarely falls below thirteen. In the orang the number is, as in man, twelve; in Z’roglodytes itis thirteen. The pro- portion of this region does not increase regularly with the number of its vertebre. It attains its greatest relative length in Ateles, where it is over nine-twentieths of the total length of the spine without the tail; while in Vyct- pithecus it is relatively shorter thar in Zroglodytes or Simia. The increase in transverse diameter of the bodics of the vertebrae, as we proceed from before backwards, is exceptionally great in Lylobates and Cynocephalus The

lumbar region contains from four to seven vertebrae In the Simiine and Cebine there are four or five, though in Cebus the number is often six Its relative length is greatest in Myctipithecus, Chrysothriz, the Semnopithecine, and Cynocephalus. It is least in the Simine and Ateles. The number of dorsal and lumbar vertebre, taken together, is seventeen in T'roglodytes and Sima, eighteen (mostly) in Ateles and Hylobates, and nineteen in the rest. In most forms the dorsal and lumbar regions are about equal in length, but the lumbar region is the shorter in the Simiine, and less than half the length of the dorsal in the gorilla. The lumbar spinous processes are vertical, or project backwards in the Szmine@ and in

From Hylobates | Ateles ; in the other forms they project strongly forwards,

especially in the lower Cebide. The lumbar transverse processes always project outwards, more or less at right angles to the axis of the spine, or else forwards. In the Simiine and Ateles they are never inclined ventrally, but in some of the lower Simiade they begin to be so; in the lower Cebide they are so very decidedly. Only in Z'roglo- dytes and Simia are they inclined somewhat dorsally. In the last two genera the lumbar vertebree are broader than their length; in most other forms length is in excess. The length of the individual lumbar vertebre, compared with the dorsal (e.g., the longest lumbar with the ninth dorsal), is greatest in the lower Cebide, rather less in the lower Simiade, and least in the Simine.

The sacrum attains its greatest absolute length in the gorilla, but it is relatively longer than in man in all the Simiine. Of all the inferior apes, Hylobates has the relatively longest sacrum. The number of vertebrae in-included in the sacrum varies more or less with age. In the apes below the Simiine there are generally only two or three sacral vertebre. In Ateles, Hylobates, and Brachy- urus, there may be four; while in the Simiine there are always five, and sometimes six sacral vertebre. In most apes the sacrum and lumbar vertebre appear to lie in one slightly curved line. 'roglodytes presents in this respect a great contrast to the human structure. In Sima the sacro-vertebral angle is rather more marked; but sometimes in

Cynocephalus it is so much so as almost to rival that. of man. The same may be said of the concavity of the anterior surface of the sacrum. It is most marked in the Cyno- cephali, and is more so in Simia than in Z'roglodytes. The sacrum gradually tapers posteriorly in Z'roglodytes and Simia, and more or less so in Hylobates. In the other Simiade, however, the sacrum is very wide at its anterior end, and it then very rapidly contracts backwards, so that the transverse diameter of the third sacral vertebra is very much narrower than that of the first. In the Celide generally, and especially in Ateles, the contraction is not so marked.

The caudal vertebre are always more than four in number, except in the Simiine and in Macacus inuus. In Cyno-

Fic. 17.—Skeleton of Ateles Belzebuth. From De Blainviile.

cephalus mormon (the mandrill), however, there are solme- times only five vertebre. The short-tailed Macaci and Brachyurit have from about fifteen to seventeen caudal vertebra, the shortness of the tail being occasioned rather by a diminution in the size of the component vertebree than by a decrease in their number. In the other forms the number varies between twenty and thirty-three, the latter being the number attained in the genus Ateles. The

proportion borne by this region of the spine to all the more anterior parts is greatest in Ateles, almost three to one ; in the other longest-tailed genera it is rarely so large as two to one. The absolute length of the tail is greatest in the Semnopithecine, where also the individual caudal vertebree attain their greatest length, namely, two inches. The caudal vertebrae generally increase in length as we proceed backwards from the sacrum, till about the seventh, eighth, or ninth, which, with the tenth and eleventh, are the longest caudal vertebree in most long-tailed forms. In Ateles, however, it is the eleventh, twelfth, thirteenth, and fourteenth vertebrae that are the longest. In the Simzine and in Znuus the caudal vertebrae decrease in length as we proceed backwards. Except in the forms just named, all the first four caudal vertebrae possess a complete neural arch, sometimes six are so provided, but only in Ateles does the number attain eight. With the same exceptions,

again, the first four caudal vertebrae unite by articular processes, while transverse processes (single or antero-posteriorly

From

Fic. 18.—Skeleton of Chacma Baboon (Cynocephalus porca) tus). De Blainville.

double) exist in a great part of the tail. In Ateles the caudal vertebra are (as might be expected from the very prehensile character of the tail) exceptionally provided with bony processes serving as points of muscular attachment. Chevron bones and processes for their attachment are altogether want- ing only in the Stmiine and in Macacus inuus. They attain their maximum in A¢eles, where they present almost every variety of development in one or other part of the caudal region.

_ Certain vertebral processes, which in man are generally inconspicuous, and which are but little developed in the Simiune, attain in lower forms a marked development. These are the metapophyses and anapophyses. The first of these generally appear about the cighth or ninth dorsal vertebra, and may thence be traced backwards into the auterior caudal vertebrae, where they end by coalescing with the prezygopophyses. In Ateles these processes may sometimes be traced as far forward as the third cervical vertebra. The anapophyses become, below the Simiine, very conspicuous, projecting outwards and backwards from one vertebra, and embracing the prezygopophysis of the vertebra next behind. Generally they may be traced from the cighth or ninth dorsal vertcbra to the penultimate lumbar vertebra. – They attain their maximum of relative size in the lower Cebide. They may (as sometimes in Ateles and C’ynocephalus) be traced on to the posterior cervical vertebre, while they appear to coalesce with the transverse processes in the tail, and thus they may be developed almost throughout the vertebral column. The Cebide often develop hyperapophyses in the last dorsal and in the lumbar vertebra. These processes are some-

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what similar to anapophyses, but are placed much higher, and each pair embraces the spinous process of the vertebra next behind.

In most apes the sternum is quite narrow, and consists of a more or less enlarged manubrium, followed by a chain of sub-equal and antero-posteriorly elongated bones from three to six in number. In the Stmiine alone do we find a broad sternum, or one consisting of a manubrium, followed by one bone only, as in Hylobates. The orang presents a singular peculiarity, in that the breast-bone long remains made up of ossifications arranged in pairs, side by side, successively. The total number of ribs has already been indicated in speaking of the dorsal vertebrae. The true ribs are seven in number on each side in the highest forms, but in Hylobates there are some- times eight. In Afeles there are sometimes nine pairs. In Hapale the number varies from six to eight, and it is seven or eight in the other genera. The “angles” of the ribs are never so marked asin man. They are most marked in Hylobates. Pithecia is distinguished by the greater relative breadth of the ribs. In no ape is the thorax half as broad again as it is deep from back to breast. Never- theless, in the Simzine, its transverse diameter exceeds its depth by from about one-fourth to a little under one-third of the latter. In Ateles (and sometimes also in Mycetes) the thorax is wider than it is deep, but in all the rest it is narrow, being deeper than it is wide.

The Appendicular Skeleton.

The development of this part of the skeleton has been indicated in a general manner in speaking of the external form. ‘The length of the pelvic limb compared with the pectoral one—the foot and hand being removed—attains in no ape the proportion that it does in man, te., 145 to 100; the nearest approximation being made by Nycti- pithecus and Callithriz, namely, about 137 to 100. The length of the foot, compared with that of the hand, is exceptionally small in the Simine, namely, from 84 up to 115 to 100. Its greatest relative length is in Chrysothrix, viz., about 177 to 100. In man it is about 134 to 100. The entire pectoral limb (measured from the summit of the head of the humerus to the distal end of the longest digit) is absolutely longest in the gorilla and orang. Its proportion to the spine is greatest in Hylobates, where it may attain the proportion of 222 to 100. Next come Ateles 174, Simia 170, the gorilla 150, and the chimpanzee 152. The rest

vary from 121 to a little shorter than the spine, except certain of the lower Cede, thus in Chrysothri« and Hapale it is less than 84 to 100. Only in the Simiine and in Ateles is the pectoral limb, without the hand, shorter than the spine.

The scapula of the gorilla presents a remarkable likeness to that of man, but that of its congener, the chimpanzee (the posterior vertebral angle being so acute), is less like man's than is that of the orang. The size of the supra-spinous fossa, as compared with the infra-spinous one, attains its maximum in the gorilla and Mycetes. In Sima and the Pitheciine the supra-spinous fossa is exceptionally small. The margin, corresponding with the superior margin of man's scapula, is generally convex in the forms below the Simine (except Ateles and Pithecia), and attains its maximum of convexity in aged C'ynocephalt. A supra- scapular notch is not well defined in the great majority of the Simiade, but in some of the Cebrde (Ateles and Mycetes) it is constantly, and in others often, so enclosed as to become a foramen. In Mycetes a remarkable flat pro- cess springs from the bridge of bone encircling this foramen. This process exists in no other genus. The surface for the teres major muscle projects out very strongly in the Cyno- prihecine and in Cebus and Chrysothriz. The acromon

and coracoul processes are short in the lower Simiade ; both are long in the Stmzine and in Ateles.

The clavicle is well developed in every species of the order, and that of the orang is absolutely the largest ; and it is longest, compared with the spine, in that animal and in JTylobates, being as 28 or 32 to 100, while in the lower Cebuke it may be less than 12 to 100. This bone is exceptionally slender in Mycetes, and is broadest in Z'roglo- dytes and the Cynopithecine. In the lower Simtade a fossa is excavated beneath the acromial end of the bone. Rarely, as in Simia, there is a very prominent deltoidal ridge.

The humerus presents in all apes the same fosse and prominences as in man. Its length, as compared with the spine, is in Lylobates 70 or 80 to 100; but in most apes its length, thus compared, is between 45 and 30 to 100.

The articular surface of the head is directed backwards and inwards, instead of almost exclusively inwards, as in man. In this respect man is most resembled by the Simiine. The tuberosities may project upwards slightly above the articular head, as in Cynocephalus. Generally they are about on a level with its top, but may be decidedly below it, as in Ateles, Hylobates, and Simia. The radial border of the bicipital groove may be very prominent, as in Cynocephalus. The groove may be spanned by a bridge of bone, as sometimes in the chimpanzee. The position of the nutrient foramen varies even in different individuals. The supinator ridge is especially developed in Cynocephalus, Cebus, and IJapale. In the Simiine it is only slightly developed. The external condyle is distinct in the Simiine , in the othcr genera it is closcly applied to the capitellum. A supra-condyloid foramen is never present normally in the Simiade, but is present more or less constantly in the Cebule, from Cebus downwards, being perhaps most frequently absent in ZZapale. Through this canal the brachial artery and median nerve pass. The projection of the radial margin of the trochlea is most prominent in the Simiine and Hapale. It almost disappears in the Cyno- pithecine. The radiws and ulna are never ankylosed together in apes. They diverge most, medianly, one from another in the gorilla. The radius is four-fifths the length of the spine in Hylobates, and three-fifths in Simia and Ateles. Mostly it is between three-tenths and two-fifths of the length of the spine, but may, as in Hapale, be only a quarter. The total length of the radius rather more fre- quently falls short of, than exceeds, that of the humerus. Tt exceeds it in Simia, Hylobates, Ateles, Cynocephalus, and sometimes in the Semnopithecine. In all the others it falls short—in none, however, so much so as in man, Brachyurus approximating most to the human proportion. The radius is stoutest in Cynocephalus, slenderest in Ateles, and, above all, in Hylobates. The ulna varies, like the radius, in length and breadth. The olecranon is broad in the Semune, but in the lower apes it is relatively larger, especially in Cynocephalus and Mycetes. The styloid pro- cess is very long in Jylobates, where it develops a pro- minence, on its hinder side, for the internal lateral ligament of the wrist. In Ateles this process is extremely long, having, as it were, a rounded articular head placed at the end of a peduncle. The ulna articulates with the carpus in all the apes except Zroglodytes and Simia.

The skeleton of the hand attains its greatest bulk in the gorilla, but its greatest length in the orang. It may be more than half the length of the spine in Hylobates, and hardly less in Simia and Ateles. It may be but a fifth, as in Chrysothriz.

The carpus consists, in Troglodytes, of the saine eight bones as in man, In all the other genera there is a ninth bone, the intermedium. Only in Hylobates docs the length of the carpus considerably exceed its breadth—as 100 to

82. The nearest approach to this is made by Ateles, where the length is to the breadth as 100 to 107. The scaphoides may, as in the gorilla and lower Simiade, develop a large tuberosity. The imtermedium has a flattened proximal surface, which joins the ulnar part of the concave distal articular surface of the scaphoides. Its distal surfacc is in general deeply concave antero-posteriorly, and embraces the radial side of the head of the magnum. The bone appears to answer to part of the scaphoid of man. The cunerforme, except in Zroglodytes and Sinua, articulates directly with the ulna. The pisiforme is small (as in man) in Semia and Ateles ; it is very large in the gorilla and Cyno- cephalus, and long but slender in Hylobates. Commonly it contributes to form, with the cuneiforme, a cup for the reception of the end of the styloid process of the ulna. The trapezium has sometimes, as, e.g., in the gorilla and Hylobates, a very large radial tuberosity. The surface for the reception of the first metacarpal is convex from the dorsal to the palmar surface of the bone, and sometimes it is more or less concave in the reverse direction, but this concavity is never so strongly marked asin man. In the highest apes there appears to be much irregularity as to its development. In Hylobates there is no trace of any concavity, but a strongly convex and rounded tubercle receives the articular cup of the base of the first metacarpal. In the lower Stmiade the concavity is sometimes present, and some- times in the Cebide (as, ¢g., occasionally in Cebus and Brachyurus) a small saddle-shaped surface may be found. In Ateles the trapezium is large in spite of the rudi- mentary condition of the pollex, but there is no saddle. The trapezium is always so placed that the

axis of the convexity of the saddle forms a marked angle with a line drawn across the articulations of the four outer metacarpal bones with the proximal row of carpals. In the gorilla this angle is, as in man, very open; but in the chimpanzee and lower Stmiade it is smaller, the trapezium being, as it were, somewhat more pressed inwards, at its radial end, towards the middle of the palm. In the American apes the trapezium is well set out; and this, no doubt, contri- butes to produce that very feeble opposition and palmad ficxion of the pollex which have becn noticed as existing in them. The magnum is not generally the largest carpal bone, but rather the unciforme, which latter has its palmar process sometimes very much produced, as is the casc in ITylobates. The metacarpus attains its greatest absolute length in the third metacarpal of Simia. This segment may, as in //ylobates, attain the proportion of one-fifth the length of the spine. The metacarpals are longer and nar- rower proportionally in apes than in man,

The phalanges are the same in number in apes as they are in man, except that in Ateles and Colobus the pollex may have but one small nodular phalanx or none. The phalanges are generally more curved than in man, and, except in the Hapaline, the ultimate phalanges are always flattened from dorsum to palm. In the Hapaline they are laterally com- pressed, curved, and pointed to support the peculiar claws of that sub-family. The length of the pollex with its meta- carpal bears a much greater proportion to that of the spine in Hylobates and Simia than in man. With the exception of Ateles and Colobus, the shortest thumb, thus estimated, is found in Myctipithecus and Chrysothriz, namely, 11 to

100.

The pollex without its metacarpal, compared in length with the manus, is shortest (viz., as 17 to 100) in Hylo- bates, and longest (viz., as 32 to 100) in Hapale. The pollex, when brought beside the index digit, rarely extends so far as in man, and does so only in the Celrde, where, in the Hapaline, it may reach nearly to the distal end of the proximal phalanx of the index. In Cyno- cephalus it may reach the middle of that ane while in

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Troglodytes it reaches but very little beyond its proximal end.

The entire pelvic limb, measured from the summit of the femur to the distal end of the longest digit, is absolutely greatest in the gorilla, and then in the orang and the chimpanzee. If the pes be removed, then the leg of the chimpanzee is longer than that of the orang.

Compared with the length of the spine, the entire pelvic limbs of Hylobates and Ateles are longest, namely, as 162 or 169 to 100. That of Hapale is the shortest, being but as 110 to 100. Without the pes, the leg of Hapale is also shortest relatively com- pared with the spine, namely, as 77 to 100; while that of Hylobates is longest, namely, as 125 to 100. The os innominatum is in every species strikingly different in form from that of man. In absolute size this bone attains its maximum in the gorilla, where it is much larger than in man, and where the ilium is very broad. The external surface | of the ilium is generally more or less concave, and concave only. In Troglo- dytes and Simia, however, it . is more or less convex, but not as in man, and therefore there is no sigmoid curva- ture of the crest of the ilium, and there are no distinct oy i gluteal lines. The internal Fic. 19.—Skeleton of the Gorilla (Zro- surface of the ilium is gene- glodytes gorilla). From De Blainville. rally narrow and flat, or only slightly concave, except in the gorilla. The tuberosity of the ischium is always a marked and more or less rugose enlargement of the bone ; but in the Simiade below Troglodytes it is flattened and very much developed, and so much everted that sometimes (in Cynocephalus) its transverse exceeds its antero-posterior diameter. In the Cebide it again becomes small, and more or less rounded.

_The spine of the ischium is generally very small, yet distinct. Only in Siméa does it attain a considerable sharpness and prominence. The great sciatic notch is never very deep and concave, as in man. It is most concave in the gorilla, the orang, and in Cynocephalus. The lesser sciatic notch is generally represented by a margin which is so slightly concave as to be almost or quite straight save through the eversion of the tuberosity. The projection of the spine of the ischium produces in man a deep notch such as exists in no ape. The cotyloid notch, and the excavation continuous with it, are constantly present, even in Simia, where, however, it is very small and narrow, in harmony with the absence of the ligamentum teres.

The femur’s length, compared with that of the spine, is as 67 to 100 in Hylobates, 61 in Ateles, 54 in the gorilla 47 in Simia. It is shortest in Chrysothrix, 40, and Hapale, 37. In the Stmiine it is shorter than is the humerus, its proportion to which in Simia is as 73 to 100. Only in some of the Semnopithecine does its length exceed that of the humerus more than it does in man. The shaft of the femur is sometimes nearly straight, as in Hylobates and in most Cebide. The femur is stoutest, relatively as well ag absolutely, in the gorilla, It is slenderest in Hylo-

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The neck of the femur is longest in Simia and © Hylobates; shortest in Hapale. Except in the Simune and in Mycetes, the great trochanter is pointed at its upper end. ‘The trochanteric fossa is shallow in the gorilla, but is in most forms deep. The lesser trochanter is at its mini- mum of relative size in the Simiine, and is largest relatively in Hapale, and the posterior surface of the femur is in that genus wide and flat between the trochanters. The pit for the insertion of the ligamentum teres is always present, except in the orang and gorilla, where it is absent almost con- stantly in the first ape, occasionally in the second. In the Simtine, Ateles, and Lagothria the internal condyle pro- jects considerably further backwards than does the external one. The angle formed by the neck of the femur with the shaft varies from about 155° (Simia) to 128° (the gorilla).

The tbia and fibula never become ankylosed together. The tibia is absolutely longest in the gorilla. Its length, compared with that of the spine, is never so great as in man, except in Hylobates, in which it is slightly longer relatively. It is shortest in Mycetes, about as 37 to 100. Its length is generally less than that of the femur, but sometimes, in Hapale, it slightly exceeds it. It is never, however, so short compared with the femur as in man. The crest of the tibia is not so sharp as in man. The shaft is sometimes straight, as in Lagothrix and Pithecia, sometimes considerably curved, as in

the gorilla and lower Cebide. The malleolus is generally well-developed, but sometimes, as in the orang, very short. Its articular sur- face is sometimes nearly at right angles with the inferior surface of the shaft of the tibia, as in the chimpanzee ; sometimes it forms an obtuse angle with that surface, as in the gorilla, and still more in the orang. The distal articular surface of the shaft of the tibia is rarely hori- zontal, as in Ateles and Lagothrix. In the Simiade and lower Cebide the outer portion rises so that the articular surface slopes upwards and peronead. The fibula has its malleolus much produced outwards, projecting only about as much as, or rather less than, the tibial malleolus, where- as in man the fibular malleolus is much deeper than the tibial one. :

The length of the pes (or foot) is absolutely greatest in the orang and gorilla. Estimating the spine as 100, the length of the pes is as much as 53 in the orang ; it approximates to man (35 to 100) most in the lowest Simiade, and in Chrysothrian—36 to 100. The propor- tional length of the pes to the rest of the pelvic limb is greatest in Simia (58 to 100), then in Myctipithecus and Hapale (50 to 100), but never falling quite so low as in man, where it is 30 to 100. Its length, as compared with that of the tibia, is greatest in Simia (122 to 100). In all the rest it is more than four-fifths, except sometimes in Hylobates, which however is never 80 small as in man, 7.e., as 67 to 100. The length of the pes, compared with that of the manus, is greatest in Chrysothria (177 to 100). In Ateles it sinks to 113 to 100, and in Hylobates to 85 or 84 to 100.

The absolute length of the tarsus ‘is never so great as in man, though that of the gorilla is nearly as long. The rest of the foot is so much longer relatively in apes than in man, that, whereas in him the proportion of the tarsus to the whole pes is as about 46 to 100, it is only 39 to 100 in the gorilla, which in this respect approaches nearest to man. The proportion sinks to 26 to 100 in Simia and Ateles, and 27 or 28 to 100 in Hylobates. Only in Simia and Hylobates is the tarsus ever less, or only a very little more, than twice the length of the carpus. The tarsus consists constantly of the same seven bones as in nian, and these bones are so arrauged, or bound together by ligaments, as to form a transverse and an antero-posterior

bates.

arch. In no ape, however, do the distal ends of the inner metatarsals form the anterior point of support of the antero- posterior arch, as in man. The os calcis is always, except in the gorilla, shorter compared with the spine than in man. The tuberosity may be produced upwards or down- wards, or both, and is concave or grooved behind, except in the gorilla. In no ape are the long axis of the heel or the peroneal and tibial surfaces of the os calcis so vertical as they are in man ; but the boue is always more or less twisted, so that the sustentaculum tali forms a more or less acute angle with the long axis of the tuberosity instead of a right angle,as in man. The twisting of the os calcis is very slight in Semea and Pithecia, and not great in Ateles and /fylobates. It is more marked in the lower Simiade, and more so still in 7’roglodytes. A narrowing of that part, which answers to the plantar surface of man, accompanies this in-twisting. In the gorilla that part of the os calcis which is behind the articular surface. for the astragalus exceeds in length all the bone anterior to the hinder border of that surface; and in this respect the gorilla may be said to have the longest heel of any ape, and a longer heel than man. The head of the astragalus is generally united to its body by a tolerably long neck. This neck is, however, in the gorilla shorter than even in man. The upper surface of this bone is less convex than in man, in Simia, Ateles, and the gorilla; generally it is more convex than in man. The surface for the external malleolus forms, with the upper surface of the astragalus, almost a right angle in Hylobates (as in man), and an obtuse one in Afeles and Lagothriz. In most other apes (including Z’roglodytes) it forms an acute angle. The angle formed by the upper surface of the astragalus with that for the tibial malleolus, instead of being a right angle, as in man, is generally more or less obtuse, especially in the gorilla. The naviculare has sometimes its tuberosity greatly developed; this is especially the case in Hylobates. The surfaces for the three cuneiform bones are generally more convex and concave respectively than in man. The ento-cuneiforme generally has its plantar and distal surfaces considerably longer than its dorsal and proximal surfaces respectively. These are exceptionally equal (asin man) in the orang and gorilla. The surface for the hallux is always strongly convex. The long axis of this articular surface always forms a more or less acute angle with a line drawn across the articular surfaces for the four outer metatarsals. In the lower Simiade this angle is as acute as in man. In Troglodytes it is a little

more open, but not nearly so open as is the homotypal angle in the hand even of the same species. The surface is never saddle-shaped in apes. In all apes, even in the chimpanzee, the distal tarsal segment is capable, as a whole, of a considerable degree of motion upon the proximal part,—z.e., upon the astragalus and os calcis,—and this mobility is extreme in the orang. The absolutely longest metatarsal bone is the second of Svmia. The metatarsus often exceeds the tarsus in length, but it may, as in the gorilla, fall much short of it, thus resem- bling man. The four outer metatarsals and the inner- most one diverge instead of being parallel, as in man. The former, except in the Simizne and in Afeles, are more rounded than in man, and their distal articular surfaces are less bent downwards, and are limited poste- riorly by a deeper transverse groove. The first metatarsal, compared in length with the spine, is longest in Hylobates (10 or 12 to 100), and shortest in Hapale (about 6 to 100). It is always longer than the first metacarpal, except in Simia. Its proximal surface is generally more concave than in man, and its long axis is different. It is as if the metatarsal of man had been removed, softened, and then, after being turned, so that the dorsum looks inwards as well as upwards, reapplied to the convex ento-

cuneiforme, and thus stamped with an oblique depression. The angle formed by this surface, with a line traversing the articular heads of the four outer metatarsals, approxi- mates to a rectangle instead of toa straight line, as in man.

The phalanges are always the same in number as in man, except that the hallux of Simia has often but one. They are very like their homotypes in the manus, and are convex above, concave and flattened below. Only in the Hapaline are the last phalanges laterally compressed instead of flattened. The pedal digits are never nearly so short relatively in apes as they are in man; yet the pro- portion borne by the hallux, with its metatarsal, to the spine closely approximates in the gorilla to the proportion existing in man, and the proportion is exceeded in Hylo- bates and Ateles. It is much in defect in Hapaline, where it is little more than one-tenth. Its proportion to the whole pes in Hylobates (as in man) is nearly half, while in Simia it is

but a quarter, and but little more in the Hapaline and the Semnopithecine. The hallux, when brought beside the second digit, never reaches so far as in man, but at most (as in the chimpanzee) to the proximal end of the second phalanx, or to the middle of the proximal phalanx (as in most Cebide), or a little beyond its base (as in Hapale and the Semnopithecine), or not nearly even to the distal end of the metatarsal (as in Simia). Except in Simia and some Cebide, notably Hapale, the hallux pro- jects further than does the pollex of the same individual when applied to the second digit of the manus. The hallux also always exceeds the pollex in absolute length, except in Hapale and Simia. The length of the hallux, without its metatarsal, compared with that of the spine, is as 25 to 100 in the chimpanzee (as in man), 19 in the gorilla, and but 8 in Sima. The second digit of the pcs is always longer than that of the manus except in the Simiine, which so far resemble man. The index digit, with its metatarsal, compared with the spine, is as 38 to 100 in Sima, and it varies thence dawn to 21 in Cercopithecus. The longest digit of the pes always exceeds that of the manus, except in the Stmiine and Ateles.

THE MUSCLES.

The muscles of apes are very similar in number, dis- tribution, and form to those of man, except that in the long-tailed forms (e.g., Semnopithecus) the muscular bundles answering to the coccygeal muscles of man are so greatly developed as to form eight sets of caudal muscles. The latissimus dorsi commonly sends on a slip, called the dorso- epitrochlear, as far as the olecranon. Often there is a rhomboideus capitis, and a muscle, called levator clavicule, almost always descends from the cervical transverse pro- cesses to the outer part of the clavicle. The flexor longus pollicis and the flexor digitorum profundus are always more or less united. The extensor indicis commonly sends a tendon to the third digit as well as to the index, and at the same time the extensor minimi digiti sends a tendon to the fourth digit as well as to the fifth. An extensor primi internodit pollicis is never developed, but the extensor ossis metacarpt pollicis is often doubled, even in the chim- panzee. In the orang the flexor longus pollicis sends a tendon only to the index. In Hylobates the supinator longus is inserted into the middle of the radius, and there is an abductor tertii internodii indicis going from the meta- carpal of the index to its ungual phalanx. Often the extensor

brevis pollicis and the abductor longus become more or less united. In spite of the rudimentary condition of the thumb in Aedes, its muscles exist, though in a rudi- mentary condition, but in Hapale the opponens pollicis 1s wanting.

The lower limb in the orang generally wants the

ligamentum teres, which seems to be sometimes absent in the gorilla also. The glutei muscles of apes are feeble and small, and are inserted low down on the femur. Only in the gorilla are they large enough to cause a small buttock to protrude over the ischiatic tuberosities, but even in this ape the buttocks do not meet so as to conceal the anus, Apes have an extra muscle, called the scansorius, which passes down from the edge of the ilium to the great trochanter of the femur, and must act as a powerful rota- tor of the thigh inwards. The gracilis is much broader than in man, and is inserted lower down on the tibia than in him, as is also the case with the semi-membranosus and semi-tendinosus. The short head of the biceps femoris 1s generally wanting. The gastrocnemei and soleus are flatter than in man, and the latter has only a fibular origin. In the lower Simiadew the plantaris passes over the pulley-like end of the os calcis, and goes to the plantar fascia. No ape seems to have any peroneus tertius, but we may find even in Semnopithecus a slender peroneus quinti digitt passing behind the outer malleolus, and going to the metatarsal of the fifth digit, while in the Cebsdw we may also have a peroneus quart digiti going similarly to the fourth digit. The tdbialis anticus may be divided, as even in the chimpanzee, like its homotype the eatensor ossis metacarpt pollicis. The muscles of the foot, with the exception of the interossei, resemble the muscles of the foot of man, and not those of his hand. As regards the inter- osset even, the difference is very slight. It consists in the insertion of the tendon of that dorsal interosseous mass which is interposed between the second and third meta- tarsals, into the proximal phalanx of the third digit (as in the human hand), instead of into that of the second digit (as in the human foot), The hallux in the orang is, in spite of its imperfect development, provided with an opponens muscle. The flexor brevis digitorum pedis does not, in apes, arise exclusively from the os calcis, and the flexor accessorius arises from

the surface of the deep flexor tendons. The last named muscle may be wanting, as sometimes at least in Hylobates. A muscle, called the abductor ossis metacary quinti, exists even in the chim- panzee. In the lower Cebidew, and especially in the Hapaline, the interossei become true jlexores breves, and altogether cease to be visible on the dorsum of the foot.

Tue BRAIN.

The absolute size of the brain never in any ape ap- proaches that of man. Thus the cranial capacity is never less than 55 cubic inches in any normal human subject, while in the orang and chimpanzee it is but 26 and 274 cubic inches respectively. The relative size of the brain varies inversely with the size of the whole body, but this is the case in warm-blooded vertebrates generally. The extreme length of the cerebrum never exceeds, as it does in man, two and a quarter times the length of the basi-cranial axis. The proportion borne by the brain to its nerves is less in the apes than in man, as also is that borne by the cerebrum to the cerebellum. In general structure and form the brain of apes greatly resembles that of man. Each half of the cerebrum contains a triradiate lateral ventricle, and though in some Simiade the posterior cornu is relatively shorter than in man, it again becomes elongated in the Cebidew, and in many of the latter it is actually longer relatively than it isin man, The posterior lobes of the cerebrum are almost always so much developed as to cover over the cerebellum, the only exceptions are the strangely different forms, A/ycetes and LHylobates syndactylus. In the latter the cerebellum is slightly uncovered, but it is so considerably in the former. In Chrysothrix the pos- terior lobes are much more largely developed relatively than they are in man. The cerebrum has almost always

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a convoluted external surface. In this group, however, as in mammals generally, a much-convoluted cerebrum is correlated with a considerable absolute bulk of body. Thus in Hapale (and there only) we find the

cerebrum quite smooth, the only groove being that which represents the Sylvian fissure. In Sima and Troglodytes, on the contrary, it is very richly convoluted.

THe TEETH.

The teeth of apes consist, as in man, of incisors, canines, premolars, and molars; but the series of teeth no- where forms so perfect an arch as in man, the opposite series of grinding teeth tending to become more parallel. No ape has the teeth placed in one uninterrupted series in each jaw, as is the case in the human species, but there is always a small interval (diastema) between each upper canine and the adjacent incisor, and between each lower canine and the adjacent premolar. This condition is due to the excessive size of the canines, the interspaces giving passage to the apices of these teeth. This prolongation of the canines into tusk-like weapons of offence and defence (especially developed in the males), makes a great difference between the aspect of the dentition in apes and man. The number of the teeth is the same as in man in the Simiade. The Cebide have an additional premolar on each side of each jaw, and the Hapaline, besides this, have a true molar the less. The incisors are always nearly vertical, save in the Pithecinw, when their apices project strongly forward. The canines are always considerably longer than the incisors, except in the genus Hapale, where the lower incisors equal the canines in length. The pre- molars differ structurally from the molars much as in man, save that the first lower premolar may be modified in shape to give passage to the upper canine, as is specially to be seen in Oynocephalus. The grinding surface of the molars consists generally of two transverse ridges, each end of each ridge projecting more than the intermediate part, and so giving rise to four tubercles. In Sima and Troglodytes, however, we find in the upper molars an additional structure, which also exists in man. This is a ridge which runs obliquely from the front inner tubercle (or cusp), outwards and backwards to the hind outer

tubercle. In the rest of the Simiade this ridge is waut- ing, but it reappears in Ateles and Mycetes amongst the Cebide. In the Hapaline the tubercles of the molars are more produced and sharp-pointed, in harmony with their

decidedly insectivorous habits. The last lower molar may be reduced or much enlarged as compared with the others. Thus in Cercopithecus talapoin it has but three tubercles, while in the Macaci and Cynocephali it is very large, and has five well-developed cusps. The number of milk teeth is as in man, save that the Cebide@ have an additional milk molar. In general the canines are the last teeth to be cut of the permanent dentition. Their cutting sometimes causes such constitutional disturbance as to produce convulsions and death. In the gibbons, however, the canines accompany, if they do not precede, the appearance of the hindmost molar, while in the orang they at least sometimes make their appearance before that grinder.

ORGANS oF NUTRITION AND EXCRETION,

The alimentary, circulating, and excretory organs of apes closely resemble those of man. The mouth is always guarded by lips, which, though generally thin, are often very mobile and extensible, the lower lip having no freenum in the orang, and this is also absent in Cebus, though it may be present in other forms, as, e.g., in Troglodytes and Cynocephalus.

The tongue is much longer relatively in most apes than in man; but it may closely resemble his, as does that of the orang, in which the circumvallate papille are collected in a' V-shaped aggregation, while there may be only two such papille, as in Cynocephalus and Ateles. In Hylobates the tongue is in this respect man-like; yet in that genus we first meet with a sub-lingual process (which becomes much larger in the lower apes), in the form of a little conical bifid membrane. This structure is formed by the union of the processes upon which open the sub-maxillary ducts—processes much elongated in the chimpanzee, though man-like in the orang,

The wvula is generally present, but becomes rudimentary in the Cebide generally, though it exists as a relatively thick, short structure in Hapale. It is long and pointed in Semnopithecus, and plainly visible in Hylobates and Troglodytes. On the other hand, in Simia it is disguised by the extensive development of the membranous edge of the velum palati on each sidc of it.

The stomach is simple in all the apes except the Semno- pithecince. It is especially human in shape in Hylobates, except that the pylorus is somewhat more elongated and distinct. Itis of a rounded form in Pithecia,

and in Hapale the cardiac orifice is exceptionally near to the pylorus. In the Semnopithecine the stomach is extremely sacculated, especially at the cardiac end, being, in fact, very like a colon spirally coiled. It is in the stomach of these apes that the oriental Bezoar stones are found.

The intestine in apes is devoid of walvule conniventes, but is always provided with a well-developed caecum, though it is short and conical in Cynocephalus. Only in the Simiine do we find a vermiform appendix.

The colon may be much longer relatively than in man, as in Simea and T'roglodytes. It may be greatly sacculated, as in Hylobates; or devoid of sacculations, as in Cebus. As in foetal man, so in the lower apes, only the right extremity of the mesocolon is involvcd in the formation of the great omentum, the middle and left parts of the meso- colon lying behind, and independent of the omentum. This is not, however, the case in the Simiine, which are more like adult man in this respect.

The diver may be very like man's, especially in Hylobates, the orang, and the chimpanzee; but in the gorilla both the right and left lobes are cleft by a fissure almost as

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much as in Cynocephalus. In the Semnojithecine the liver is much divided, and it is placed obliquely to accom- modate the sacculated stomach. 'The lateral lobes of the liver are in Hapale very much larger than the central lobe. The caudate lobe is very large in the Cebidce, especially in Ateles, and above all in Pithecia. There is always a gall- bladder. .

The larynx is in many apes furnished with sac-like appendages. These are different in different species as regards number, size, and situation. They may be dilata- tions of the laryngeal veutricle (opening into the larynx below the false vocal chords), as in Simda and 7'roglodytes. They may open above the false vocal chords so as to be, in fact, extensions of the thyro-hyoid membrane, as in ITylobates. There may be but a single median opening in the front part of that membrane at the base of the epi- glottis, as

in the Simiade@ below the Simiinw. There may be a single median opening at the back of the trachea, just below the cricoid cartilage, as in Ateles. There may be but a single sac, or there may be five, as sometimes in Mycetes. These may be enormous, meeting in the middle tne in front, and extending down to the axille, as in the gorilla and orang. A sac may occupy the cavity of the expanded body of the hyoid bone, as in ALycetes.

The os hyoides has its basilar part generally somewhat more convex aud enlarged than in man; but in Aycetes it becomes greatly enlarged and deeply excavated, so as to form a great bony bladder-like structure.

The cornua of the hyoid are never entirely absent, but the anterior or lesser cornua may be so, as in Afycetes. The anterior cornua never exceed the posterior coruua in length ; but they may be (eg., in Cercopithecus) more largely developed relatively than in man, and they may even be jointed structures, as in Lagothrix.

The lungs have generally the form of those of man; but the right lung may have four lobes, as, ¢.g., in Hylobutes.

The great arterial trunks in Simia aud Troglodytes are arranged as in man. In Hylobates and the lower apes, however, the left carotid may take its origin from the innominate artery.

THE GENERATIVE ORGANS.

The generative organs are, in common with the other parts of the body, formed on the same model as in the human species. The penis is pendulous, ¢.e., hangs freely, instead of being (as in the dog) bound to the ventral surface of the abdomen. The prepuce, however, is without a frenum. The festes are relatively large, and descend into a scrotum. In some species, however, they do not descend so much as they do in man, but remain just outside the inguinal ring, and are thus placed rather beside than beneath the penis. These parts, as has been said, are brightly coloured in some of the lower Simiadwe. The penis is furnished with a bone in all the apes below the Anthro- poid ones, and probably in the latter also, since the chim- panzee has one about one-third of an inch long and gristly ateach end. In all apes the wterus is single, and not two- horned; but it is more elongated relatively

in monkeys than in the human species. The clitords is well-developed, but boneless in the Stmiadw, and is large even in 7’roglo- dytes niger. In the Cebide it contains a bone; and in some genera, especially in the Cebinew, it is enormously developed, so as to be very easily mistaken for a penis. In Ateles, however, its length is mainly due to its extremely elongated prepuce.

The placenta of apes is discoidal and deciduate, and is generally bilobed. Sometimes, however, as in AZycetes, it is single. It is especially thick in proportion in the Hapaline. In the Simiade there is but one umbilical vein, but in the Cebide there are two.

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Gestation in the lower Simiadee lasts about seven months,

but in the Hapalinw only three months. Menstruation occurs periodically, less sanguineous than in the human species.

adjacent, and even beneath the tail.

Lactation lasts, in the better known forms, for an average of six months, and the young are carried at the breast 1n

a very human attitude,

DISTRIBUTION IN TIME.

There appears as yet to be no evidence of the existence of apes earlier than during the Miocene period. This absence of evidence must by no means be taken as a con- clusive proof of their non-existence, since, as Dr Falconer has pointed out, we ought not to expect to find ape fossils often. We ought not to expect this, because the agility and arboreal life of these animals enable them to escape local inundations, and other causes of destruction and speedy burial, to which more sluggish and terrestrial animals are exposed. When they fall dead they are almost immediately devoured by carnivorous animals and feeders ou carrion, and it is owing to this that their remains are

so rarely found in India, on which account the Hindoos believe that they bury their dead.

Two teeth found in Suffolk were at first described by Professor Owen as those of apes, under the title Macacus eocenus. This opinion, however, he has since withdrawn.?

A fragment of a right maxilla, from Soleure in Switzer- land, was described by Rutimeyer in 1862, under the name Cwnopithecus lemuroides. But the recent discovery of fossil lemurs in France renders the ape character of this fragment (which was always doubtful) still more un- certain.

When we enter upon Miocene deposits we find plentiful and unquestionable remains of apes now extinct. In India, in the Sewalik hills, the astragalus of a Semnopithecus (resembling S. entellus) has been found. Also jaws and teeth of other forms allied to Semnopithecus and Macacus have been discovered, one with an upper jaw nearly as large as that of the existing orang. These fossils, how- ever, exhibit no remarkable difference in form from the bones of existing apes.

In Europe a very remarkable ape fossil, named Dryo- pithecus fontant (Lartet), has been found at Saint Gaudens in France. A lower jawand humerus were there obtained,

but isolated teeth have also been met with in the Suabian .

Alps. This creature was an ape belonging to the highest sub-family, Simiinee, and was allied to Hylobates, but of greater bulk than any existing gibbon.

Two other species of ape have been found allied to Hylo- bates, but of smaller size than Dryopithecus, and show- ing some probable affinity to Semnopithecus. These are Pliopithecus antiquus (Lartet), and P. platyodon (Bieder- mann). Of the former, two imperfect lower jaws were found in fresh-water deposit at Sansan, near Auch, in France; while of the latter, an upper jaw has been found in Zurich at Elgg, in the upper fresh-water Molasse there. Another ape (probably of the Stmine), of which a lower jaw

has been found in the lignite bed at Monte Bamboli in Tuscany, has been named by G. M. Gervais, Oreopithecus bambolii.

M. Gaudry has also found a rich deposit of ape relics at Pikermi in Greece. He has sent thence to Paris parts of as many as twenty-five individuals, while other remains are preserved in Munich, and no less than five crania at Milan. These remains have been placed by Wagner in a new

1 Ann. and Mag. of Nat. Hist. 1862, p. 240.

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but the excretion is In the lower Simiadw it is chiefly manifested by a turgescence of the external organs, which may extend widely in the parts

[DISTRIBUTION.

genus, Mesopithecus. They are very interesting, as show- ing a somewhat intermediate structure compared with living apes. The cranium and dentition bear affinity to Semnopithecus, but the limbs are rather those of Macacus.

Certain fragments found at Eppelsheim (in strata of the same geological age as the Pikermi deposits) have also been attributed to the former genus; while five mandibula, found at Steinheim in Wiirtemberg, have received the name, from Fraas, of Semnopithecus grandevus.

Amongst the rich paleontological treasures which have recently been found in the North American Miocene deposits are certain teeth and fragments, which, it has been sug- gested, may be those of apes. At present, however, their nature is quite problematical, though the presence of apes at that period in America would be a fact of extreme interest, if sufficient remains could be found to determine whether such apes were Simiade or Cebide, or forms inter- mediate betwecn the two.

The Pliocene deposits have not yet yielded much in the way of ape remains. Some teeth from Montpellier (found in fresh-water marl) have been named Semnopithecus Monspessulanus by M. Gervais, while part of a lower jaw

from the same locality has been called Macacus priscus. Other fragments of jaws, and some teeth of Macacr, have been found in the Val d'Arno, and are preserved at Pisa, Turin, and Florence. A single tooth from Grays, Essex, has been described by Professor Owen as Macacus plio- ceenus.

In America, besides the Miocene fragments before re- ferred to, numerous bones of Mycetes and other genera have been found in the caves of Brazil. These, however, appear to be, geologically speaking, quite recent, and they closely resemble the bones of apes now living in that region.

For further details as to fossil apes, an article may be referred to (a translation from the Italian) by Major Forsyth, in the Annals and M agazine of Natural History,

for the month of September 1872.

GEOGRAPHICAL DISTRIBUTION.

The apes are, as far as is yet certainly known, at present almost confined to tropical latitudes. Their most northern limits in the Old World are Gibraltar (Macacus inwus), Moupin, in Thibet (Macacus thibetanus and Semnopithecus roxellane), and Japan (Macacus speciosus). In the New

World the highest northern latitude certainly known to be

attained is 18° or 19° (Ateles melanochir) in Southern Mexico, but they possibly reach even latitude 23°. Father David, however, sees no reason (considering the severity of the climate of Moupin) why apes should not also be found in the mountains of Northern China, and the natives have repeatedly assured him they are to be found there. Southwards, apes are found to near the Cape of Good Hope, and the island of Timor (Afacacus cynomolgus), in the Indian Archipelago, in the Old World, and to about 30° in Brazil and Paraguay, in the New World. As to vertical extent, a Semnopithecus has been seen near Simlah, at a height of 11,000 feet; Dr Hooker saw monkeys in the Himalaya at an elevation above 8000 fect; and Semnopt- thecus roxellane and Macacus thibetanus were found by Father David inhabiting the Snowy Mountains of Moupin, in Thibet, at an elevation of about 3000 metres, where frost and snow last several months.

In Miocene times the ape range was more extensive—namely, to Greece, Tuscany, the South of France, Zurich, Wiirtemberg, and even to Essex.

Some of the localities richest in monkeys are islands, such as Ceylon, Borneo, Sumatra, and Java; and apes are also found in Trinidad, and the island of Fernando Fo.

AFFINITIES. |

There are, however, certain islands which seem eminently well suited to support an ape population, where apes, nevertheless, are conspicuous by their absence. Such are the West Indian Islands, Madagascar,! and New Guinea ; moreover, no ape inhabits tropical Australia. These facts become the more remarkable, if, as Father David suspects, apes exist in Northern China to-day. Evidently it is not climate which prevents their cxisting in Central Europe now. The continents of Africa, south of the Sahara; of Asia, south of the Himalaya; and of America, from Panama to the southern part of Brazil, are, with the islands before mentioned, the special ape regions of the existing fauna.

There is a remarkable difference between the ape popu- lation of the New and the Old World, the latter being inhabited exclusively by Simiade, the former as exclusively by the Cebidew. Europe has but a single ape species; and Asia, north of the Himalaya, has but the few found in Thibet, China, and Japan. Africa, north of the Sahara, is zoologically a part of Europe, and there also Macacus inuus is found, which is the only African specics of the genus. African apes are the chimpanzee and gorilla of the west coast, the former extending eastwards to 28° E. long.; the Colobi (which are, in fact, but the African form of Semnopithecus), the long-tailed Cercopithect, including mangabeys (or white-eyelid monkeys); and, lastly, the baboons, Cynocephali. The genus Cynocephalus extends into Arabia ; but that, zoologically speaking, is a part of Africa. The Asiatic regions possess the orang (Simia) (in Borneo and Sumatra), the long-armed apes (/Zylobates), the Semnopithect, and Macaci.

One form of Macacus, and a very peculiar one (M. niger), is found in the islands Batchian and Celebes; and it is a noteworthy fact that this, the most baboon-like of all the Macaci, should only exist in a region so extremely

remote from Africa. The genus Macacus is the most widely spread of any existing genus—namely, from Gibraltar, North Africa, Thibet, and Japan (perhaps even from Northern China), down to the island of Timor, and from the north-west of Africa in the west, to Batchian, Japan, and the Philippine Islands in the east. In ancient times this genus secms to have extended to France, and even to Essex. It is interesting to note that, in the Miocene period, the geographical range of the apes of India was much greater. Gibbon-like monkeys existed in the south of France, while forms intermediate between Sem- nopithecus and Macacus abounded in Greece.

In America, north of Panama, the genera as yet known to be represented are Chrysothriz, Nyctipithecus, Cebus, Ateles, Mycetes, and Hapale, in Veragua; Nyctipithecus, Cebus, Ateles, and Mycetes, in Costa Rica and Nicaragua ; Ateles and Mycetes, in Guatemala; and Ateles, in Southern Mexico. Brazil is, of course, the headquarters of the American apes ; but different portions of that vast region have a somewhat different ape fauna. Thus the genus Eriodes appears in South-Eastern Brazil to represent the species of Ateles inhabiting the more northern and western parts of the empire. Southwards, the genera Cebus, Mycetes, Chrysothriz, and Callithriz extend furthest ; but they do not probably all extend to the furthest limit yet known, namely, 30° 8. The species found farthest south are MMycetes caraya, Cebus fatuellus, and Callithrix per- SONATUS.

ZOOLOGICAL POSITION AND AFFINITIES OF APES.

By universal consent apes are placed in the highest rank of all brutes, and, excepting man, are generally taken to i

- Madagascar is the special home of the half-apes or lemurs.

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be the most perfect animals of the mammalian class. It may be questioned, however, whether, if the animal mau had never existed, this place would be assigned them by any observing intelligence. The half-apes, or lcinurs, commonly placed in the same order with them, are cer- tainly inferior

mammals; and it might be contended that the perfection of the mammalian type is rather to be found in the Melide (or cat family), by reasoning analogous to that by which it might also be contended that birds (with their differentiated limbs, perfect circulating and respira- tory systems, acute sense organs, complex instincts, and teachableness) are really the highest of all vertebrate animals, and represent the vertebrate type of structure carried to the highest degree of perfection yet attaincd.

The question as to which animals are most nearly allied to apes is one by no means easy to answer. Leaving man aside (whose close anatomical resemblance to apes is so obvious), it is at present extremely difficult to say what are the apes' true zoological affinities. It is to be hoped that future paleontological researches may afford us materials for tracing these out; but at present a chasm separates the apes from every other group of animals. The half- apes, or lemurs, were generally considered to lead down from the apes towards the inscctivora, and thence to the implacental mammals; but the differences between the apes and lemurs arc so many and great, that it cannot be considered otherwise than in the highest degree improbable that (on the Evolution hypothesis) they took origin from any common root-form that was not equally the progenitor of other mammalian orders.

But if the apes cannot be considered to show evidence of genetic affinity with any other mammalian order, do they constitute so homogeneous a group as to suggest the former existence of one ancient root-form common to them all? To this question it may be answered that the differ- ences between the Simeadee and C'ebide are such as to render it doubtful whether they may not have had respectively quite different origins, and whether their resemblances may not have been superinduced by similarity of needs and conditions. The differences referred to are as to— (1), dentition ; (2), nasal septum; (3), tail—the Cebide showing a teudency to a curled tail-end, while the Simiade never manifest any such tendency ; (4), cheek pouches ; (5), ischiatic callosities; (6), general form and habit of body ; (7), opposability of the thumb ; (8), bony meatus auditorius externus. All these characters, taken together, seem to make it probable that the Cebide and Simiade are not diverging offshots from some common ape parent, but that they have arisen in an independence as complete as that between the origin of either of them and the origin of the lemuroids or carnivores. Possibly

further discoveries in the Miocene deposits of North America will reveal to us transitional forms between the Old and the New World apes, but the existence of such forms cannot certainly as yet be affirmed. It may be asked, however, Can the genera, which possess so many points in common as Cebus and Cercopithecus, have come to resemble each other independently? To this it may be replied, that the number of similarities of structure which must have had an inde- pendent origin is so great that it is difficult to see why those of the two genera named may not also have had such an origin, As examples of such similarities of independent origin, the following structures may be referred to :—The bony covering of the temporal fossa in Chelonia, Pelobates, and Lophiomys; the compound tooth structure of Orycte- ropus and Myliobatis; the coexistence of a certain form of dentition with a saltatory habit in Macropus and Macrosce- lides ; the presence of but eight carpal bones in 7roglodytes and Jndris; the course of the vertebral artery in Auchenta and Myrmecophaga ; the flying menibrane in certainsquirrels

and phalangers; the canines and premolars of Canis and Thylacinus; the grinders of Peromeles and Urotrichus ; the external form and habit of body of Mus, Sorex, and Antechinus; and the peculiar dorsal shields in tortoises and certain frogs. But if some naturalists are disposed to admit that the common origin of the Cebide and Simiadce may be very doubtful, can they be even sure of that of Cercopithecus and Hylobates? It has been recently sug- gested, that the Artiodactyla and the Perissodactyla (the even and the odd-toed ungulates) may be genetically independent (their common characters being merely ad- aptive, functional ones), as also with the Balenoidea _ (whales), and Delphinoidea (dolphins). The response of

organisation to need being such as it is (structure and function manifesting themselves so simultaneously), the discrimination between genetic and adaptive characters must always be a work of extreme delicacy. In the presence of the various genealogical trees of animal descent which have been so hastily put forward of late, a judicious scepticism seems the attitude best warranted by the evidence yet obtained. If so many similar forms have arisen in mutual independence, then the affinities of the animal kingdom, or

even of the mammalian class, can never be represented by the symbol of a tree. Rather, we should conceive the existence of a grove of trees, closely approximated, greatly differing in age and size, with their branches interlaced in a most complex entanglement. The great group of apes is composed of two such branches ; but their relations one to another, to the other branches which represent mammalian groups, and to the trunks from which such branches diverge, are problems still await- ing solution.

There can, however, be no doubt that the Simiade and Cebide together form a most natural group, and are closely allied with man in structure. Moreover, as man is the highest animal, and, zoologically considered, differs less from even the lowest ape than such ape differs from any other animal, man and apes must be placed together in one order, which may well bear its primitive Linnean name, “ Primates.” Whether any other animals (and, if any, what) should also be included in this order, are ques- tions for the consideration cf which the reader is referred to the heading MAMMALIA.

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APELDOORN, a flourishing town in the Netherlands, in the province of Guelderland, 17 miles N. of Arnheim, with large paper-mills, and a population of upwards of 12,000. A short distance off is the Castle of Loo, the favourite residence of King William I.

APELLAS, a Greek sculptor, mentioned by Pausanias (vi. 1, 6) as the author of a group at Olympia, representing a quadriga, with the statues of a charioteer and of Cynisca, the sister of Archelaus. This group having been executed to commemorate the chariot victory gained by Cynisca at the Olympic games, 420 3.c., the date of the artist is ob- tained. A bronze sculptor of the same name, and probably the same person, occurs in Pliny (Wat. Hist., xxxiv. 86).

APELLES, the most celebrated of ancient Greek painters. The date assigned to him by Pliny (Wat. Hist., xxxv. 79) is 332 B.c., and with this agrees the fact of his having been the court painter of Alexander the Great, who it was said would allow no one else to paint his portrait, though, in point of fact, portraits of him by other artists are known (Pliny, vii. 93 and 125 ; Horace, Hpist., ii. 1, 239 ; Cicero, Ad Fam., v.12, 13). Apelles had worked before then for Philip, the father of Alexander, and with a career of nearly half a century, was at work after in the time of the first successors to Alexander’s empire. He was born at Colophon, where it appears his father Pytheas, also a painter, resided. His first instructor was a certain Ephorus, of Ephesus, which was then the centre of the Asia Minor school of painting; the rival school being that of Sicyon in Greece proper, whither Apelles next proceeded, apparently to undergo the stricter discipline in drawing for which that school was renowned, and perhaps also, as is said (Plutarch, Arat., 13), to win a share of the good fortune and fame of its leaders. He

was here in the neighbourhood of Corinth, and it was probably then that he was taken by the beauty of the young Lais, on seeing her drawing water at the fountain of Peirene. Another incident, that of his having seen the notorious Phryne bathing at Eleusis, and from this conceived the design of his picture of Aphrodite Anadyomene, would also fall about this time, for the two reasons that Phryne's celebrity occurred in the period before Alexander, and that Apelles is not known to have made a second stay in that district of Greece. From Sicyon he went to the Macedonian court, and was there employed until Alexander departed on his expedition into Asia, on which the painter accompanied him as far as Ephesus, where he settled. Of the intimacy between him and his royal patron there are a number of stories, which, however, from the variety in the telling, may be without foundation in fact. According to Pliny (xxxv. 85), Alex- ander having betrayed ignorance by some remark about painting, was told by Apelles to be silent, lest the boys

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who were rubbing down colours in the studio might laugh at him. But the version of the same story given by Plutarch (De Adul., 15) has, in the place of Alexander, the Megabyzos, or priest of Diana at Ephesus ; while in lian (Var. Hist., ii. 2) the story is told of Zeuxis, not of Apelles. Again, Ailian (Var. Hist., ii. 3) relates, that while Alexander was inspecting a painting of a horse by Apelles, a horse neighed towards the picture, upon which the painter remarked that the horse knew more of art than the king. But Pliny

(xxx. 95) instances the neighing of a horse, only as having decided a competition between Apelles and some other painter. Still, so far as the painter's readiness of rebuke is concerned, these stories are confirmed by other incidents, as when he told an artist, who boasted of his speed in work, that the wonder was why he could not produce more of such stuff in the same time; or, when having once accepted correction from a shoemaker about a wrongly painted boot in one of his pictures, he declined further criticism from him, with the observation which has since become a proverb, Ve supra crepidam sutor judicaret (Pliny, xxxv. 84). Of an opposite kind were his relations with Protogenes, the Rhodian painter, whose abilities he readily recognised, and whom he brought into notice by spreading a report that he intended to purchase his friend's pictures, and sell them as his own. Finding Protogenes not at home on one of his visits, Apelles, instead of leaving his name, drew with a brush an exceedingly fine line on a prepared tablet. Protogenes knowing the hand, and accepting the challenge, drew within the line a still finer one in another colour. But Apelles returning, divided the line a third time, and was confessed the victor. Though Ephesus continued to be his home, Apelles worked also elsewhere, as in Smyrna, Samos, and Rhodes, but princi- pally in Cos, where he received the rights of a burgess, and where probably he died. For an account of his works and style, see ARCHMOLOGY (CLASSICAL). (A. 8. M.)

APENNINES, an extensive range of mountains tra- versing the entire extent of the Italian peninsula, and forming, as it were, the backbone of that country. The name Apennines is probably of Celtic origin, and derived from pen, properly signifying a head, or mountain height. By the Greek and Latin writers the name is generally used in the singular, as Apenninus Mons, 6 'Amévwos, 76 Arévywov 6pos. The name may have been originally applied only to a particular mountain, and afterwards extended to include the whole chain.

The Apennines may be considered as a southern branch of the great Alpine system of Europe. Both the mountain systems have a general resemblance as regards the age and lithological character of the rocks and strata which com- pose them. Geographers have differed an to the point:

where the Apennines are to be distinguished from the Alps. Some have placed it at the pass of Bocchetta ; others at the Col di Tenda ; and others at the low pass which runs from Savona to Cairo. Strabo, who gives a very accurate account of the general features and direction of this chain, considers it as beginning in the vicinity of Genoa. From Col di Tenda the Apennines run in a semicircle round the Gulf of Genoa, in'a general direction from west to east ; they afterwards turn to the south, and traverse the whole of the Italian peninsula to the Strait of Messina. The entire length of the chain is about 600 miles measured in a direct line, and about 800 miles if measured along the windings. The chain lies between 38° and 44° 30' N. lat., and 7° 40' and 18° 20'E. long, The mountains are divided into the Northern, Central, and Southern Apennines.

The Northern Apennines include what are usually designated the Ligurian and Tuscan Apennines. The Ligurian Apennines extend from the Maritime Alps past Monte Gisa to the borders of Tuscany. The principal passes here, between Piedmont and the duchy of Genoa, are through the valleys of the Tanaro, the Bormida, and the Lemma. The pass of Pontremo leads up the Magra Valley from Spezzia to Parma. The Tuscan Apennines extend from Monte Pellegrino to Monte Cornaro, in 12° 3' E. The Alpi Appuani form an outlying mass of mountains between the valley of the Magra and the Secchio. The chief passes are those of Bratello, Fiumalbo, Monte Carelli or Pietra-Mala, and that proceeding from the valley of the Sieve, over Borgo di San Lorenzo, through the valley of the Lamone, and on towards Faenza.

The Central or Roman Apennines comprehend that part of the chain between Monte Cornaro, in which the Tiber rises, and Monte Velino, north of Lake Fucino. Its general direction is from N.N.W. to $.S.E. or nearly parallel to the Tiber. The descent towards the Adriatic is continuous and direct, but towards the Mediterranean it forms two distinct inclined planes. The principal passes from the north are at the village of Scheggia, where the Cantiano rises; at Serravalle, south-east of Monte Pennino, at the head of the valley of the Chienti; at Castellucio, between Norcia and Arquata; and the chief pass of all between Rieti and the valley of the Pescara.

The Southern Apennines include the remaining portion of this chain. From Monte Velino they proceed in a south- easterly direction to the valley of the Ofanto, which cuts through the range. South of that limit, one short branch extends eastward towards Altamura, another runs westward to the neighbourhood of Salerno, while the main chain is prolonged nearly due south to the heights of Aspromonte overlooking the Strait of Messina. Inthe upper part of the Southern Apennines a number of sharp pyramidical points raise themselves above the mountain chain. Among these are Monte Forcone at the source of the Sangro, Monte Sant' Angelo, above the sources of the Volturno and Trigno, and Monte Calvello north-east of Salerno. The principal pass over this part of the Apennines is that of Sulmona, near the sources of the Volturno, so called from the town of Sulmona, where the roads from Rome, Pescara, and Aquila unite. The passes above Castel Franco and Ariano are the highest points of the roads over the ridge, from Benevento to Troja, and from Avellino to Foggia.

The geology and palzontology of the Apennines have been fully investigated by Savi, Meneghini, Pareto, Lavini, Orsini, Bianconi, Mortillet, and others. As a general rule, the same formations occur here as in the Alps, and the system usually consists of a central ridge having secondary and lower ridges running parallel with the main range, the intervening country being formed of but slightly disturbed newer Tertiary deposits. Thus, in that portion of the Apennines which borders on and extends

into Tuscany and Bologna, the system consists of two parts. The one which is most distant from the Mediter- ranean forms the Apennines proper ; here the Eocene beds prevail, and are covered, especially on the north flank, by Miocene and Pliocene beds; the axes of elevation are numerous and parallel to each other, following strikes which run from W.N.W. to E.S8.E., and from N.W. to8.E. The other part is nearer the Mediterranean, and is remarkable for its richness in metalliferous ores ; the rocks prevalent in it belong to the Paleozoic and Oolitic periods, and have a N.N.W. to SSE. strike. Between Spezzia and Civita Vecchia it is represented by numerous outliers of verrucano (probably of Carboniferous age), and trias surrounded by Oolitic rocks. The district of Carrara abounds in marbles belonging to

the Liassic and Oolitic periods. Nearly all the mountains between Carrara and Monte Sagra have beds of marble, which sometimes acquire considerable thickness, as for instance in the vertical escarpments of Monte Corchio. The mountains between the meridians of Genoa and Parma form but one chain, composed of parallel ridges striking W.N.W. to E.N.E. Thestrata consist of Eocene formations flanked by Miocene and Pliocene beds, pierced by numerous ophiolitic masses. Towards Genoa the mountains con- form to the §.8.W. and N.N.E. directions of the Western Alps; the rocks are of Eocene age, but are much meta- morphosed by the serpentines of Pegli, Voltri, and Varagine. In the Central Apennines there is a large development of secondary beds from the trias to the upper chalk, and of the Tertiary formation, which is represented by strata of the Eocene, Miocene, Pliocene, and Post-Pliocene periods. The main axis of the chain is chiefly formed of the Secondary rocks, while the minor ranges are formed of Tertiary beds. The mountains, as a whole, rise from N. to &., culminating in Monte Corno, 9593 feet high, beyond which their height again decreases. Mount Amaro is 8960 feet, and Mount Velino 7910 feet high. The oldest rock seen in this part is a dolomite; it is unfossiliferous, and acquires its greatest massiveness in the mountains of Cesi, Spoleto, and Ventosa. Above it follows a limestone, which is in places many hundred yards thick. Fossils are rare in it as a whole, though locally abundant in a few places. The strata which next succeed are ferruginous limestones and marls, abounding in Middle Liassic fossils ; then red limestones, yielding ammonites and other shells of the Upper Lias ; then a vast series of limestones, marls, and siliceous beds, which compose a large part of the flanks and summits of the Apennines, and which represent the Oolitic period. The hippuritic chalk is largely developed, and in places it forms the mass of the Apennines, as in the Rossa Chain, and the lofty ranges of the Abruzzi. Fossils are abundant in this limestone. ‘The Upper Cretaceous beds are repre- sented by massive limestones with comparatively few fossils. Above these follow a nummulitic limestone, marly schists, arenaceous macigno, &c. The Miocene beds are varied in their lithological nature and rich in fossils. The more recent strata seldom occur at any great height above the sea.

(See D’Achiardi, Mineralogia della Toscana, 2 vols. 1872 ; W. P.. Jervis, in Zhe Mineral Resources of Central Italy, 8vo, 1868; and papers by Lavini and Orsini, in Bull. Soc. Geol. France, 2d series, xii. 1202-1232; Pareto, in

Bull. Soc. Geol., xix. 239-320; Bianconi, [bid., xxiv. 482 ; and Ponzi, Giornale Arcadico, new series, vol. xxiii.)

APENRADE, a town of Prussia, in Schleswig, beauti- fully situated on the Apenrade fiord, an arm of the Little Belt, 38 miles N. of Schleswig. It is connected by a branch line with the main railway of Schleswig, and possesses a tolerably good harbour, by means of which it carries on a considerable transit trade, while there are also several manufactures, as well as some shipbuilding and sea-fishing. Population, 5932.

APH—

APHASIA (from a and ¢dois; synonyms, Aphemia, Alalia, Aphrasia, Aphthongia, Aphthenxia), a term applied to indicate a condition in which the function of express- ing ideas by articulate sounds is arrested, perverted, or destroyed, in consequence of lesion of the brain. Loss or perversion of the power of expressing ideas by written signs is often associated with this condition. The term Aphasia is generally held to comprise two great varieties: (1), Amnesic Aphasia, in which the memory of words is lost or perverted ; and (2), Ataxic Aphasia,in which the function of articulation is lost or perverted. Although this broad distinction is very properly made, it very rarely happens that a case occurs in which the two conditions are not to a greater or less extent coexistent.

Amnesic (a, pvqows) aphasia is symptomatised very variously. The earliest and most common indication con- sists in—(a.) The loss of the memory of substantives and names, other parts of speech being properly applied; in such cases a periphrasis is employed to express the term. (B.) The memory of a language with which the patient had been thoroughly conversant may become lost. (y.) Terms are persistently misapplied ; for instance, in recorded cases “pamphlet” has been used for “camphor,” “ hogshead ” for “sugar,” “horse” for “man,” &., &. This symptom has been named Heterophasia (érepos, dacis). In atazic (a, rags) aphasia—(a.) the function of articulation is com- pletely lost, the patient being only able to indicate by signs that he is conscious of the idea conveyable by the term ; thus an ataxic aphasic, who had been an engine-driver, when asked what had been his trade, could only express himself by imitating the sound made by an engine when starting, ‘‘Hish, hish, hish.” In many instances even this power of

imitation is in complete abeyance—assent to the fitness of a spoken word to indicate the object exhibited being given by a nod or other gesture. (@.) The function of articulation is modified; thus a word may be only half articulated ; for instance “watch” can only be pronounced as “ wa,” no prompting, or effort on his own part, enabling the patient to complete the word. (y.) Only automatic phrases can be articulated, oaths, “yes,” “no,” “aye,” &c. (8.) The patient makes use of a set phrase, which may consist of actual words, but more frequently of confused sounds, such as “tan tan,” “ta ta,” “ didoes doe the doe,” &c.; but such phrases do not appear to satisfy him as expressive of ideas, although only one is persistently employed. In almost all cases of ataxic aphasia there is a well-marked desire and effort to enunciate words, the muscles of articulation often working strongly but con- vulsively. The great diagnostic point between amnesic and ataxic aphasia is, that in the former the patient can always articulate the forgotten word when it is suggested to him; in the latter, no prompting or assistance can enable him to enunciate the proper sound. Closely associated with both forms of aphasia is the luss of the power of expressing ideas by written signs. To this condition the term agraphia (a, ypdédew) has been applied. Most fre- quently this power is completely lost, the effort of putting pen to paper being only followed by a confused scribbling ; occasionally a strong effort is made to write; for instance, the patient makes a feeble endeavour to make his signature, which results in the production of a badly-formed initial letter, the subsequent ones being either quite unformed, or represented by a confusion of wrong signs. In the most slightly-marked cases of agraphia, ¢. ¢., those in which the patient is able to produce actual graphic signs, the general character of the handwriting is completely changed from that which had existed during health.

Aphasia, whether amnesic or ataxic, may, but seldom does exist disassociated from absolute insanity.

Great interest has centred around the question of the

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pathology of aphasia, as many observations have been adduced which appear to connect with this condition lesion of a specific portion of the brain, and from this it has been sought to deduce the absolute localisation of

the function of speech in the hemispherical ganglia. The large proportion of cases of ataxic aphasia occur in association with right-sided hemiplegia, although others are on record in which it has appeared in connection with left- sided hemiplegia in left handed persons. Bouillard, Andral, and Dax placed on record a series of cases which bore upon the association of disease of the frontal lobes of the brain, with loss of the faculty of articulate speech. In 1861 Broca of Paris enunciated the theory, founded on the clinical and pathological observation of two carefully reported cases, that the portion of the cerebrum which is necessarily diseased in aphasia is the posterior third of the third or inferior left frontal convolution. A large number of cases have since been published which appear to support this theory ; but an almost equally large number have been recorded in which disease of this portion of the above- named convolution has been found without material impair- ment of speech, in which it has been found intact in cases of aphasia, or in which disease of other convolutions has been accompanied by similar symptoms. Broca's positive localisation of the function of speech has been disproved by several well-authenticated cases ; it is, nevertheless, held by many prominent pathologists, that, although his deduction is not absolutely correct, it is in the main true, as lesion of the portion of the brain indicated by Broca may affect neighbouring convolutions of the frontal lobes, in which their observations lead them to believe the function of speech is localised, although its seat cannot be exactly indicated. Another.section of pathologists hold that the nutrition of the whole encephalon is effected by lesion of this particular convolution, the locality of which, by its anatomical relations to the middle cerebral artery, is peculiarly liable to embolus and apoplexy, and that as a consequence, the faculty of speech is affected in common with other cercbral functions ; and they further argue, that, as destruction of other portions of the cercbrum has been known to be accompanied by similar symptoms affecting speech (the left inferior frontal convolution being intact), it is in no wise proved that localisation of function can be fairly deduced from the occasional association of lesion of this convolution with aphasia.

(See Dr Bateman, On Aphasia ; papers by Drs Tuke and J. Fraser in the Journal of Mental Science, 1870; Dr Ferrier "On the Localisation of Brain

Function," West Fiuding Reports; and for bibliography, Dictionnaire Encyclopédique des Sciences Médicales.) (5, Ber.)

APHORISM (ddopicpés, from aopi~w, to define) is a terse and definite statement of a principle or important doctrine in science or philosophy. The word has been used as the title of some well-known works—as the Aphorisms of Hippocrates, the Aphorisms of the School of Salerno, and the Aphorisms of Boerhaave, which repre- sent respectively the medical doctrines of the 5th century B.c., and the 12th and 17th centuries of the Christian era. One of the best specimens of a philosophical treatise wholly written in aphorisms is the Novum Organum of Lord Bacon.

APHRODITE [Venus]. From the accepted meaning of the name Aphrodite, "born in the foam of the sea," (appés), together with Hesiod's (Vheog., 187-206) ac- count of her appearing first in the waters round Cythera, and finally landing on Cyprus; and from the further explanation of her principal title Urania, to the effect that she derived her being from the maimed Uranos, this goddess might appear to have been of pure Greek origin, as indced would also be gathered from the fact of Homer placing her

amoug the Olympians, and calling her a daughter of Zeus and Dione. But her connection with Cyprus, which even Homer admits, calling her Kypris (Iliad, Vv. 330, 422, 760), and in the Odyssey (viii. 362), speaking of her visit to Cyprus, where were a temple and an altar for her, has provoked an inquiry as to how far her worship may have been based on that of Astarte, the patron goddess of the Pheenician settlers in that island, the more so since the worship of Aphrodite Urania flourished mainly in the track of the Pheenician factories in the islands and in Greece proper. The obvious facts are—first, that Aphrodite was not associated with any of the legendary families of the mainland of Greece, her mortal favourites—Adonis, Pygmalion, Anchises, Aineas, Paris—being all non-Hellenic, and more or less Asiatic in origin ; secondly, that her wor- ship in Cyprus, as Herodotus was told (i. 105), had been transplanted from Ascalon, where was the oldest temple of a goddess whom the Greeks translated into Aphrodite Urania, and identified with the Alitta of the Arabians, the Mylitta of the Assyrians, and the Astarte of the Phoenicians ; thirdly, that this Astarte or Mylitta was a

goddess of the heavens (Urania), or better, of the heavenly bodies, and, though the details are unknown, doubtless personified the harmony of their movements while controlling their sup- posed influence on human affairs, not least their influence on the sea, in which respect her worship would commend itself toa seafaring and trading people like the Phoenicians. As the universal goddess of love, her province embraced. every phase of nature. While this, which was the basis of the character of Astarte, was the basis also of the character of Aphrodite; and while, through commercial ascendency, the alphabet of the Phcenicians,and their system of numbers, weights, and measures were adopted by the Greeks, there is nothing in the way of assuming that the idea of their goddess Aphrodite was borrowed under similar circum- stances, If the 15th century B.c. be correctly assigned as the period of the Phcenician settlements in Greece, there would be interval enough before the time of Homer to admit of the new goddess becoming Hellenised and obtain- ing a place in Olympus; and this would be brought about with the greater facility if, as is supposed, the Oriental goddess really supplanted a cruder form of a goddess of love previously existing in the Greek system. How widely the scope of love was interpreted in the last days of Greece, may be seen, on the one hand, from the manner in which the unseemly account of the birth of Aphrodite in Hesiod was elevated into a scene at which all the higher deities were present, as rendered by Phidias on the base of the statue of Zeus at Olympia; and, on the other hand, from the fact that the philosophers, particularly the earlier thinkers in natural philosophy, conceived heaven, earth, and sea as bound into an harmonious whole by the power of love. A very different interpretation was put upon it in later times when sensual indulgence was the master feeling, and Aphrodite became the patroness of hetere. For these two different characters she bore the titles of Urania and Pandemus. Under the former title she was not only a goddess of the heavens, in respect of the fertility which they produce on earth, but was also a goddess of victory, either herself armed or occupied with the arms of Ares (Mars). Her power extended to the sea, but only to soothe it, and hence she was worshipped in seaports with the epithet of e’aAou. Where her influence, however, was mostly felt was in the gardens among the flowers in spring- time. It was then that her principal. festivals occurred, and in such places and at such a time the full charm of her character as goddess of love was appreciated. The Graces (Charites) and the Seasons (Hore) worked her garments with

flowers, from which a scent came as in nature. The sweetness of her smile, her persuasive voice,

the wife of Hephestos (Vulcan), and if in that capacity she was unfaithful with

the two were caught in the cunning net

and her entire beauty were then irresistible. From being the goddess of beauty and love throughout nature, she became goddess of love in the hearts of gods and men ;

either inspiring a passion for herself, as in the case of Pygmalion and Anchises, or herself inflamed with love, as

for Adonis and Cinyras, the reputed founder of her worship in Cyprus; or again inspiring a passion between two other persons, as between Paris and Helena, and between Phaon

and the women of J.esbos. When the subjects were women, her power was frequently carried to a desperate issue, as in the cases of Medea, Pasiphaé, Pheedra, and many others. But she gave also the pleasures of love, and while this led

to the degradation of her character finally, it was differently

viewed in earlier times, in which she was in this matter simply the goddess of domestic life and of the relations between families, being in some places associated with Eileithyia, the goddess of childbirth, or elsewhere regarded, like Artemis, as a guardian of children and young maidens. It seems, indeed, as if it had been for the protection of family love that she was made to assume after Solon’s time the protection of the institutions for hetere. Among the other deities her power and also—after the rivalry of Hera (Juno) and Athene (Minerva) had been set aside by the judgment of Paris—her surpassing beauty were acknow- ledged. Eros (Cupid), the male personification of love, who at one time is called her son, at another is present at her birth, is the chief of her companions, the others being Himeros, Pothos, Anteros, Peitho, the Graces, and the Seasons. She was

Ares, as in the ludicrous incident when

made by her husband, there yet ap- pears some ground for the invention , |

of this myth, in the fact of her being pees ‘ha Bue associated in worship with Ares at Mus (enlarged). Thebes. Her connection with Ares may have originated in the character of Areia, which she derived from the Oriental goddess, her prototype. As an armed goddess she appeared at Cythera and in other of the earliest seats of her worship. It was only as Charis, the personifica- tion of grace and refined skill, that she could have been the wife of Hephstos, and this is the name which in that capacity she bears in the J/iad. In the Trojan war she was opposed to the Greeks, and protected tneas, Hector, and Paris. The chief seats of her worship were Cyprus, Cythera, Cnidus, Corinth, Thebes, Sicily, and Athens. Her usual symbols were the tortoise, dove, swan, hare, dolphin, and goat. In Paphos, where was the oldest form of her religion, she was worshipped under the image of a ball or pyramid surrounded by burning torches. In the best days of art every charm of beauty was exhausted for her statues, culminating in the Aphrodite at Cnidus by Praxiteles, Of existing statues, the Venus of Milo and the Venus of Capua are the best examples. With regard to the native Roman goddess Venus, as distinguished from the Venus who through contact with the Greeks was after- wards identified with Aphrodite, it is known that her worship did not exist in the time of the kings, and that it was introduced into Rome from Lavinium, Ardea, and

Gabii, where she was connected with Aineas and his

advent into Italy. But for the rest, whether she was the goddess called Venilia, or a native goddess of gardens, is uncertain. Doubtless her functions were in important instances exchangeable with those of Aphrodite ; and this being so, it was an obvious gain to incorporate with their own goddess another whose relations with Marsand Anchises, the founders of the Roman race, were cxpress and distinct.

API—API

In her sway over the productivity of the fields Venus was associated with Priapus; in the spring time with its flowers she was sacrificed to by young

maidens; in war she was Victrix ; in peace, Concordia and Conciliatrix ; on the sea shewas Marina; as Libentina(Lubentina) she was goddess of desires; as Libitina, goddess of death; and as Genetrix, the founder of families, especially of the Julian family. The de- rivation of her name given by Cicero (De Nat. Deor., ii. 27, lii. 24) is Venus quod ad omnes veniat. (A. S. M.)

APICIUS. ‘There were three Romans of this name, all celebrated as epicures. The second, M. Gabius Apicius, who lived under Tiberius, is the most famous. He in- vented various cakes and sauces which bore his name, and rival schools of cookery claimed their descent from him. A treatise, De Re Culinaria, sive de Obsoniis, &c., bearing the assumed name of Czelius Apicius, was compiled at a later period.

APION, a Greek grammarian and commentator upon Homer, son of Posidonius, was born at Oasis in Libya, but called himself a native of Alexandria, where he studied. He taught rhetoric at Rome about 30 a.p. With extensive knowledge and great oratorical power he combined an unbounded vanity, as the epithet cymbalum mundi applied to him by Tiberius seems to imply. Mere fragments of his works remain ; the stories of Androclus and the lion and of the dolphin at Puteoli—the largest of these frag- ments—are preserved in Gellius. Apion headed the em- bassy sent by the Alexandrians to Caligula complaining against the Jews, 38 a.p, Josephus refutes his misrepre- sentations of the Jews in the second of his two books “ Against Apion.”

APIS, a sacred bull worshipped at Memphis from the earliest period, having probably been introduced into the religious system as early as the 2d dynasty by the king Kaiechos, who instituted the worship of Apis and the bull Mnevis. His name in hieroglyphs was Hapi, and meant “the hidden,” as he had to be discovered amidst the cattle, which was done by certain diacritical marks. According to the hieroglyphic inscriptions which accompany his form, he was the second birth or living incarnation of the god Ptah, the Egyptian Hephestos or Vulcan. Apis is first mentioned and appears in the monuments of the 4th dynasty. The two bulls Apis and Mnevis are considered to have respectively represented the moon and sun, and seem both to have been buried at Memphis. He was supposed to have

been born of a virgin cow, rendered pregnant by a moonbeam or a flash of lightning. The mother of Apis, according to Strabo, had a part of the temple of the Apis reserved for her use; and the hiero- glyphic inscriptions record a prophet or priest attached to her service. On the monuments she shares the honours of the bull, and is represented under the attributes of Athor as a goddess with a cow's head. This cow had her especial name, these animals having each a separate appellation. According to the Greek writers Apis was the image of Osiris, and worshipped because Osiris was supposed to have passed into a bull, and to have been soon after manifested by a succession of these animals. The hieroglyphic inscriptions identify the Apis with Osiris, adorned with horns or the head of a bull, and unite the two names as Hapi-Osor, or Apis Osiris. According to this view the Apis was the incarna- tion of Osiris manifested in the shape of a bull. But besides this title, the monuments style Apis the son of Ptah, who was supposed to be his father by the sacred cow, or the second life of Ptah. Other monuments, indeed, declare him to have had no father, and to have been Onnophris or Osiris, but this conflict of ideas must have arisen from his material and spiritual nature, uniting the soul of Osiris or Ptah mystically with the sacred animal. Besides the mother of the Apis, a cow was annually

exhibited to him decorated with the same insignia—that is, a disk between the horns and a housing on the back, to judge from the insignia found on the bronze figures of the Apis—and then slaughtered the same day, for no issue of the divine animal was permitted to exist. According to other authorities several cows were kept in the Apeum. On the announcement of the birth of an Apis, the sacred scribes and priests proceeded to verify the characters of the calf. The marks of the Apis were a black coloured hide, with a white triangular spot on the forehead, the hair arranged in the shape of an eagle on the back, and a knot under the tongue in shape of a scarabzeus, the sacred insect and emblem of Ptah, a white spot resembling a lunar crescent at his right side. These marks have been supposed to be for the most part certain arrangements of the hairs of the hide as seen in some animals, A house was built to the calf Apis facing the east, in which for four months he was nourished with milk. When he had grown up he was conducted, at the time of the new moon, to a ship by the sacred scribes and prophets, and

conducted to the Apeum at Memphis, where there were courts, places for him to walk in, and a drinking fountain. According to

Diodorus, he was first led to Nilopolis, and kept there 40

days, then shipped in a boat with a gilded cabin to Memphis, and he was there allowed to be seen for 40 days only by women, who exposed themselves to him. Like all the sacred animals his actions were oracular, and he had two chambers, his passage into one of which was deemed fortunate, and into the other unlucky. Thus the licking the garments of a visitor was supposed to prognosticate a tranquil but short life, and his refusal of the food offered to him by the hand of Germanicus, the approaching death of that hero. The actions of the children who played around his shrine or accompanied his processions were also con- sidered oracular. The day of his birth was kept as an annual festival. His life was not allowed to exceed 25 years, and should it have attained that maximum reckoned

| from the date of his enthronisation, the Apis was killed

and thrown into a well, in which the priests asserted he had precipitated himself. This well was known to no one, and no one was allowed to reveal the place of burial. If the Apis died before the 25 years he received a splendid burial at Memphis in the Serapeum, for after death he was called the Osor-hapi, or Serapis. ‘This funeral was expen- sive; his body was placed in a barge, and accompanied by a procession of a Bacchanalian character, passing through the brazen doors of Memphis. As universal joy prevailed at his discovery, so his death threw all Egypt iuto a gene- ral mourning, and every one shaved off his beard. This mourning continued till the discovery of another Apis. His birthday was celebrated by an annual feast, the natales Apidis, of seven days’ duration, during which it was supposed the crocodiles were innocuous, and a silver cup was thrown on the occasion into a certain part of the Nile, which was considered a flux of Apis. This festival coincided with the rise of the Nile. On the mummy coffins an Apis is often seen on the foot-board of those of the 7th and 6th centuries B.C., bearing on the back the mummy of the deceased to the sepulchre. The discovery by M. Mariette of the Serapeum at Memphis described by Strabo has thrown great light on the worship and history of the

Apis, the mode of burial, and the sequence of the bulls. (See SzRAPEUM.) ‘The oldest Apis mentioned was one of the reign of Amenophis III., and he was followed in the 18th dynasty by bulls which had died in the reigns of Tutank- hamen and Horus. There was a succession under the 19th dynasty, commencing with Seti or Sethos I., besides three which died in the 16th, 26th, and 30th years of Rameses a and three others, the dates of whose deaths are unknown. Under the 20th dynasty there was an Apis which died in tho

26th year of Rameses III., one in the reign of Rameses IX., others of the date of Ramcses XI. and XIV., and four others whose dates are not determined, besides three more which died under the 21st dynasty. Of bulls deceased in the 22d dynasty, there is one of the 23d year of Osorkon iam another of the 14th year of Takellothis L., and a third of the 28th year of Sheshank or Shishak Ill. It is not till the reign of this monarch that the dates connected with the Apis become of chronological importance. On the sepulchral tablet of the Apis which was born in the reign of Shishak IIL, is found the formula of the date of the birth and inau- guration of the bull. It was born on the 20th of the month Payni, in the 28th year of the king’s reign, and en- throned on the lst of Paophi of the same year, having died in the 2d year of the king Pamai, and been buried on the Ist of the month Mechir of the same year. It had attained the age of 26 years. Three other bulls died in the 4th, 11th, and 37th years of Shishak IV. Important statements like these show the intervals of time which elapsed between the regnal years of different kings, and check the chronology of the 22d and subsequent dynasties, but owing to unfortunate lacunee the chronology of Egypt is conjectural, and not positive till the reign of Tirhakah. The dates of the other Apis are, one which died on the 5th of the month Thoth, in the 6thyear of Bekenrenf, or Bocchoris, another of the 2d year of Shabak or Sabaco, and that buried on the 23d Pharmouthi of the 24th year of Tirhakah, 730 B.c. The dates of the other bulls prior to the conquest of Egypt by Alexander the Great, 332 B.C. are—one born in the 26th year of Tirhakah, enthroned on the 9th Pharmouthi, the same year deceased, in the 20th year of Psammetichus I., and buried on the 25th Paophi, of the 23d year of Psammetichus ; another deceased in the 52d year of the same king; a third

born in the 53d year of Psam- metichus L, enthroned on the 12th of Athor of the 54th year, deceased on the 6thof Paophi, and buried on the 10th Choiak of the 16th year of Necho, having lived 16 years 7 months and 17 days; another born on 7th Paophi of the 16th year of Necho, enthroned 9th Epiphi of the lst year of Psammetichus I., died on the 12th Pharmouthi of the 12th year of Apries, and buried the 21st Payni of the same year, aged 17 years 6 months and 5 days; another born in the 5th year of Amasis, inaugurated on the 18th Payni of the same year, died on the 6th Phamenoth, was buried on the 15th Pashons of the 23d year of the same king, aged 18 years and 6 months. The Apis which died after this, and of which a sarco- phagus was found dated in the 4th year of Cambyses, is the one supposed to have been killed by Cambyses on his return from ASthiopia. Another born in the month Pharmouthi of the 5th year of Cambyses, died in the 4th year of Darius, and was buried on the 2d Pashons of the 5th year of Darius, and had lived upwards of 7 years. It is the Apis of Darius, alluded to by Polyzenus, for the suc- cessor of which Darius offered 100 talents as a reward to the fortunate discoverer. Another Persian king Ochus is said to have killed and eaten an Apis, 338 Bc. The death of au Apis soon after the death of Alexander the Great, 323 B.c., is also recorded. The sepulchral tablets in the demotic characters, according to M. Brugsch, record the birth of an Apis in the month of Phamenoth, in the 20th year of Ptolemy Euergetes I., 231 3.c., which died in the 51st year, 179 B.c.; and another older, probably of Ptolemy Philadelphus II., 253 B.c.; another of the 14th year of Ptolemy Epiphanes IV., 211 3B.c.; another in the 20th year of Ptolemy IV., 185 B.c.; another in the 17th year of Ptolemy Philometor VIL, 164 3B.c.; and another born in the 53d year (118-117 B.c.) of Ptolemy Euergetes II., died 15 years old, 103 B.c., in the reign of Ptolemy XI. In the Roman times the discovery of an

Apis in the reign of Hadrian, 121 a.p., caused a tumult at Alexandria; and the last known Apis is that brought to the Emperor Julian II., 362-363 a.p., after which the Apis disappears from Egypt altogether. The Apis was embalmed at great cost, but the operation consisted in pre- paring with bitumen the skull and a few of the principal bones of the bull made up into an appropriate shape. The second genius of the Karneter, or Egyptian

Hades, was also called Hapi or Apis, but he was quite distinct from the bull god and the son of Osiris. His type was that of a human mummy with the head of a Cynocephalus ape. Bronze native figures of the Apis are not uncommon, and those of stone are occasionally found, but porcelain ones are extremely rare.

Lepsius, “Ueber den Apiskreis,” Zedtsch. d. Morgent. Gesellsch. vii. Bd. 1853; Brugsch, bid. ; Mariette, Le Séra- péum de Memphis, 1857; Jablonski, Pantheon, ii. (8. B.)

APOCALYPSE, a designation under which the last book of the New Testament is frequently referred to. It is the title the book has in the Greek, ’AzoxaAvyis, which in the English version is rendered “ Revelation.” See REVELATION or St Jonn. ‘The name is applied generally to predictions relating to the growth and triumphs of the Messiah’s kingdom, especially as revealed in visions or ex- pressed by means of symbols. The more important extra- biblical writings of this kind are noticed in the article which immediately follows.

APOCALYPTIC LITERATURE. This branch of later Jewish literature took its rise after the older prophecy had ceased, when Israel suffered sorely from Syrian and Roman oppression. Its object was to encourage and com-

fort the people by holding forth the speedy restoration of

the Davidic kingdom of Messiah. Attaching itself to the national hope, it proclaimed the impending of a glorious future, in which Israel, freed from her enemies, should enjoy a peaceful and prosperous life under her long wished for Deliverer. The old prophets became the vehicle of these utterances. Revelations sketching the history of Israel and of heathenism are put into their mouths. The prophecies take the form of symbolical images and mar- vellous visions. As the old remained unfulfilled in the progress of events, and doubts arose about their truth- fulness, it was necessary to give them a new turn and a more correct interpretation. Working in this fashion upon the basis of well-known writings, imitating their style, and artificially reproducing their substance, the authors natur- ally adopted the anonymous. The difficulty was increased by their having to paint as future, events actually near, and to fit the manifestation of a personal Messiah into the

history of the times. Hence apocalyptists employed obscure symbols and mysterious pictures, veiling the mean- ing that it might not be readily seen. The artificial imitative character of their productions caused certain peculiarities ; and the main object was attained by fastening the spirit of their contemporaries on the immediate fulfilment of their highest aspirations. From the intentionally dark imagery enfolding the ideas, it is difficult to discover the exact times of their appearance and the historical interpretation.

The earliest of such apocalypses is the canonical book of Daniel, in which an old seer in the Chaldean captivity is employed to portray the oppressions of the Jews under Antiochus Epiphanes. This was the model for all later ones. ‘The literature in question was not confined to the Jews. Christians not only used the productions in which the Messiah was described after the Jewish fashion, but composed similar ones themselves,—Jewish Christians in particular. Here the Apocalypse of John is the noblest example, and deserves the honour of naming the entire range of literature.

The most obvious division of apocalyptic works is that

founded upon authorship, Jewish or Christian. This, how- | perhaps to the first century ;

ever, cannot be carried out with exactness because of later interpolations, proceeding from Christians who used the Jewish prophecies with the object of making them more suitable. But it is not easy to trace the extent of sub- sequent elaborations ; and we have only to rely on probable conjecture.

I. Jewish APOCALYPTIC.

1, Hnoch.—Under the name of this antediluvian patri- arch a book exists which is quoted in the epistle of Jude. After it had disappeared, except the fragments preserved by ecclesiastical writers, it was found in Ethiopia among the Abyssinians, and published by Laurence in 1821; subsequently by Dillmann in 1851, to which the latter scholar added a German translation in 1853. The book has been divided into five parts, exclusive of an intro-

duction and a conclusion. The first contains an account of the fall of the angels, and their intercourse with the daughters of men producing a race of giants, with the consequences of such apostacy ; followed by a description of Enoch's travels through heaven and earth under the guidance of holy angels, who explain to him the mysteries of the visible and invisible world (chapters vi.xxxvi.) The "second vision of wisdom" is occupied with a description of the mysteries belonging to the heavenly kingdom, the angel-world, the Messiah, the growth and completion of His kingdom, the blessedness of the elect, and the condemnation of the unbelieving (xxxviii —Ixxi.) The third part is astro- nomical and physical, including an account of the movements of the stars, the sun, and the moon; of the four winds, and various earthly objects (Ixxii.—lxxxii.) The fourth part describes two dream visions shadowing forth the history of man, from his origin to the completion of the Messianic king- dom (lxxxiii-xci.) The fifth contains a series of admoni- tory discourses addressed by Enoch to his own family in the first place, and then to all inhabitants of the earth (xcii.—cv.) Several appendices are subjoined containing a narrative of the wonders which happened at Noah's birth, and a writing of Enoch's about the future retribution of the just and unjust (cvi.—cviii.)

The work contains much curious matter about the secrets and powers both of the visible and invisible world. Besides its historical views which relate mainly to the past, present, and future of the Jewish people, as also to heathen kings and potentates, much of the legendary and hagadic is interspersed, Daniel's seventy weeks, reaching down to the Messianic age, are changed into seventy periods of heathen rulers. The writer has withal a religious spirit. He is a strict moralist, warning and threatening. His imagination is vivid, but incapable of sublimity. The sweep of his prophetic vision is extensive. He has poetic force and vigour. The work is an interesting product of pre-Christian Judaism, multifarious, artificial, rabbinising.

The document consists not only of the prophecy of Enoch, but of extracts from a Noah-prophecy interspersed. The latter are found in places often unsuitable, consisting of chapters liv. 7—ly. 2, Ix., lxv.—Ixix. 25; perhaps also of xx. and Ixx. In cvi., cvii. the same hand may be partly traced. Setting aside these insertions, the book of Enoch itself seems to be composed of

three documents, the oldest of which is chapters xxxvii.Ixxi. The other two are not easily collected, but the chapters xci. 3-cv. have the clearest claim to belong to the second, and xxxiii._xxxvi., Ixxxv.—xc. to the third. The rest is all uncertain. The first was written about 144 8.c, as Ewald! acutely remarks; the other two fall some years later, ¢.e., within the reign of John Hyrcanus (136-106 3.c.) The Noah-document is posterior, belonging

1 Abhandlung ueber des Ethiopischen Buches Henokh Entstehung Sinn und Zusammenhang, p. 73.

and all were subsequently put together, forming the present heterogeneous composition. Hilgenfeld contends that chapters xxxvii.—Ixxi. proceed from a Christian Gnostic,? but his arguments are insufficient. Still more improbable is the hypothesis of Volkmar, that the entire Apocalypse was written 132 4.0.2 We believe, how- ever, in opposition to Dillmann, that theyhave been interpo- lated by a Jewish Christian, since the christology is higher than what Judaism produced ; while the eschatology and angelology are developed in a manner which savours of Christianity. Thus, in the 51st and 62d chapters the Messiah is described as sitting on the throne of His glory and taking part in the judgment, while He is also called the Son of woman, the Son of man. To make Messiah the judge of mankind, either as the delegate of the Father, or together with Him, is not a Jewish, but a Christian idea. This differs from the representation in the 90th chapter, where he is symbolised by a white bull with great horns, whom all the beasts of the field and all the birds of heaven feared and entreated at all times. All races are to be changed into white bulls; the first among them became a great animal ; and the Lord of the shcep rejoiced over them and all the bulls. Here Messiah is simply the chief of God’s people, elevated above the rest, but still of the same nature with them, having no share in the judgment, or in founding the new church of God. He comes into the description by way of appendix, as it were, as though the author could not well omit all notice of Him. His part is entirely subordinate. In the 105th chapter, which, with the next three, show traces of Christian influence, the Messiah is called Son of God,—an appellation which seems to carry the idea of His person beyond Judaism, especially in connection with that in the

62d chapter, Son of woman, for the two come very near the idea of an incarnation. The whole work presents no trace of Rome as a power dangerous to Israel, so that the latest parts cannot be brought down far into the lst century. The book had a very limited circulation among the author's countrymen. They do not quote it. It proceeded from a private individual, who may have belonged to a small circle or sect such as the Essenes. But Jude cites it. It has been translated into English by Laurence ; into German, but chiefly from Laurence's English, by Hoffmann ; and much more correctly by Dillmann in 1853. The translation of the last mentioned scholar has superseded those of his predecessors. See also Ewald's Abhandlung, u.s.w. ; Liicke's Versuch einer vollstindigen Einleitung in die Offenbarung des Johannes, w.s.w., zweyte Auflage, § 11; Koestlin, "Ueber die Entstehung des Buches Henoch" in the Tiibingen Journal of Baur and Zeller for 1856 ; Hilgenfeld's Die Jiidische Apokalyptik ; Davidson in Kitto's Cyclopedia, article "Enoch ;" Hilgenfeld's Zeitschrift fiir wiss. Theologie,

1860, 1861, 1862.

2. Another apocalyptic production is the so-called Fourth Book of Esdras, or The Prophecy of Ezra, originally written in Greek, but known now oulyin versions,—Latiu, Ethiopic, Syriac, Arabic, and Armenian. ‘The whole consists of a series of visions, which Ezra, who is put unchronologically into the 30th year of the Babylonian captivity, is supposed tohave had. The questions that troubled the seer arose out of the state in which the Jews were at the time. They were deeply oppressed and afflicted. The heathen had trodden them down tothe ground. Why had the promises of God to His own people been unfulfilled? Was not Israel still the chosen race, though often sinning? Were they not better than the heathen? The Romans had

2 Die Jidische Apokalyptik, p. 148, &c.

3 “Beitrige zur Erklarung des B. Henoch nach dem Aithiop. Text.” in the Zeitschrift der deutschen morgenlindischen Gesellschaft, 1860 p. 87, &., and Hilgenfeld’s Zettschrift, 1861, 1862.

destroyed Jerusalem, and the Jews were scattered to the four winds; so that the writer was deeply perplexed by the establishment of a heathen power over the Jews, involving an indefinite delay of the Messianic kingdom, or an apparent hopelessness as to its inauguration. Heathen- ism triumphed over Judaism, rending it to pieces. What had become of the divine faithfulness? The first vision (ch, iv.-v. 20) contains an angelic answer to the questions which the seer had painfully pondered, as in the 3d chapter. After being reininded of his inability to comprehend God’s ways, the signs of the end are given. The second vision (v. 21-vi. 34) is similar. The third vision (vi. 35-ix. 25) and the fourth (ix. 27—x. 59) refer to the Messianic future. The fifth, relating to an eagle coming up out of the sea (x. 60-xii. 59), describes the Roman empire, its destination and period of duration ; the sixth (ch. xiii), the setting up of Messiah’s kingdom; and the seventh (ch. xiv.), an account of Ezra’s re-writing the holy books. It is very difficult to discover the date of this singular book, and the question is not yet

satisfactorily settled, though many critics have investigated it. One thing is pretty clear, that the destruction of Jerusalem had taken place, and that Christianity had passed its incipient stage, exercising some influence even upon Judaism. Original sin, a dying Mes- siah, a general resurrection, éc., point to a Christian origin; so that the passages in which these features appear, and others too, were probably interpolated. Hilgenfeld even thinks that vi. 18-vii. 45 were interpolated by a Christian at the commencement of the 3d century,} but his arguments are not cogent, as Langen has shown. As the data for determining the time lie chiefly in the interpretation of the eagle's wings and heads, the diversity of opinion is increased. Perhaps the 30th year after the ruin of the city (iii. 1) points to the like time after the Roman conquest of Jerusa- lem. The six wings of the eagle on the right side are the six Julian emperors ; the six on the left, are Galba, Otho, Vitellius, Vindex, Nymphidius, Piso ; and the three heads, the Flavian emperors. Either Titus's or Domitian's reign should be fixed upon; probably the latter, about 96 a.D. Hilgenfeld assigns 30 3.c.; Volkmar seems nearer the truth who gives it to 97 a.p.,? though some of his ingenious interpretations are far fetched. It is impossible to tell whether the author lived at Rome or in Egypt. The few internal evidences bearing on the point favour the latter.

The poetic excellence of this production is much greater than that of Enoch. It is, indeed, below the Apocalypse of Daniel ; but its merit is considerable. In modern times Messrs Frere and Irving gave it a place beside Daniel and St John,—strangely combining the prophecies of the three into one, as though all were formed upon the same plan, and referred to the same events. Chapters 1., ii., and xv., xvi, which need not be separated, seem to have been written by Egyptian Christians; the first two chapters about 201 a.p; the last two about 263 a.D., according to Gutschmid.2 Like the Fourth Book of Esdras, these were also written in Greek, but exist only in a Latin transla- tion.

The literature and numerous opinions about the date may be seen in the Prolegomena to Hilgenfeld's Messias Judco- rum ; the same work contains the different texts of it. The Latin text alone is presented by Fritzsche in his Libri Apocrypht Veteris Testamenti Greece, 1871; and by Volkmar in his Handbuch der Kinleitung in die Apocry- phen, 2 Abtheil., 1863. It is in the

English Apocrypha, translated, no doubt, from the Vulgate. Luther left it out of his version, and De Wette followed him. The chief

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1 Messias Judceorum, p. 49, &c.

2 Das vierte Buch Esra und apokalyptische Geheimnisse ueberhaupt,

1858.

8 Zeitschrift fir wissenschaft. Theologie, 1880.

writers on the book in recent times are Volkmar and Hilgenfeld ; but the list since Whiston and Semler is very copious.

3. The Book of the Jubilees, or the Little Genesis, 7 erry yeveois, parva Genesis.—This work is apocalyptic only in part, though called the Apocalypse of Moses in the notices of it by George Syucellus and George Cedrenus. In the form of a revelation made to Moses during his stay on Mount Sinai, it professes to be intended for future races, and to contain prophetic admonitions relating to coming times. It is predominantly historical and chrono- — logical, beginning with the old histories of the creation. From the commencement of the world till the entrance into Canaan is divided into 50 jubilee years; and every event is arranged according to jubilees, years of weeks, and years. Later Jewish ideas are transferred to earlier times, especially to the patriarchal ; and difficult questions con- uected with the ancient worship are solved. Traditional views and hagadic materials appear with Jewish ritual and exclusiveness. The author was an energetic Palestinian Jew, conversant with the history of his people, and conser- vative, who meant to confirm them in attachment to the faith, by narrating their past fortunes over again, and keeping them alive to their principles. Amid the multi- farious contents it is not easy to trace the precise origin of the book, though it is easy to see that the author was a patriotic Jew, whose object was to keep his countrymen firm in their religion at a time when it was in great peril both from without and within. It

has been assigned to an Alexandrian, an Essene, and a Samaritan source, none of which opinions can be maintained. The writer has respect to different sects and parties in Judaism, to the various tendencies existing within the old religion when he wrote; and he endeavours to mediate between them by making concessions in this direction and that,—to conciliate and blend them together, that they may be more united against anti-Jewish influences. Hence Samaritan, Essene, Sadducean, and Pharisean peculiarities are found in the work, There is little doubt that he was an orthodox Jew, who had in view the consolidation of Judaism against heathenism and Christianity—the uniting of all sects and shades of belief in the common faith of Levitical mono- theism.4 It is worthy of remark that the Hebrew text he used agrees with the Samaritan more than the Masoretic, though he himself was not a Samaritan, else he would not have mentioned Zion among the four holy places, to the exclusion of Gerizim. ‘The date is the Ist century of our era; and before the destruction of the temple, as may be inferred from the first chapter. The writer seems to have used the book of Enoch, for he speaks in the fourth chapter of Enoch writing out the signs of heaven according to the order of their months. ‘There are also coincident passages which go to prove the same thing. And there is evidence that the writer of the Testaments of the patriarchs em- ployed our book ; though this does not necessarily take the latter’s origin into the Ist century. So, too, the Fourth Book of Esdras was used, as we infer from what is said in relation to Abraham, Esdras iii. 14, &c., and Jubilees xil. The date cannot be fixed nearer than about 50 a.p.° The Little Genesis was soon forgotten, and no trace of it appears among the Jews, except perhaps in the title of Bereshit Rabba. Yet its Midrash is of an older type than the other Midrashim ; mystic and supernatural in its tendency ; its angelology less developed. Jerome refers to it twice by name, and Syncellus thought highly of it. It had been rendered into Greek before the time of Jerome. Dillmanu has published the Ethiopic version from two MSS., and

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- See Roensch’s Das Buch der Jubilien, p. 523, &e. 5 Ibid., p. 528.

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translated it into German.!_ The original was Hebrew or Aramean, as all critics allow, except Frankel, who is refuted by Langen.2— A Greek version existed carly, and was subsequently lost. From it the Ethiopic was made. In 1861, Ceriani published from a palimpsest in the Ambrosian library at Milan, considerable fragments of an old Latin version.2 This has been reprinted in a revised state by Roensch, together with a Latin version of Dillmaun's text. The work of this meritorious scholar is accompanied with learned notes and exhaustive disserta- tions ; aud Dr Sal. Rubin has taken the trouble to translate it into Hebrew, with an introduction and notes, Wien. 1870. See Treuenfels in the Literaturblatt des Orients, 1846 ; Beer's Das Buch der Jubiliien und sein Verhaltniss zu den Midraschim, 1856; Jellinek, Bet ha-Midrasch Sammlung kleiner Midraschim und vermischter Abhand- lungen aus der dilteren Jiidischen LInteratur, 1853-1855 ; Frankel in the Monatschrift fiir Geschichte und Wissenschaft des Judenthums, 1856 ; Roensch, Das Buch der Jubilden oder die kleine Genesis, u.s.w., 1874.

The Life of Adam, adduced by Syncellus three times with the words 6 Neydpevos Bios 'ASd., seems to have been identical with the book of Jubilees, or perhaps a part of it. If the latter, it may have been another recension, enlarged and modified in various respects.4

The Book of Adam's Daughters, Liber (qui appellatur) de jiliabus Ade sive Leptogeneseos, mentioned in Gelasius's decree about authentic and apocryphal books, also appears to be the same as the Jubilees.®

4. The Assumption or Ascension of Moses, 'Avddyns Movoéws, is a prophecy of the future relating to Israel, put into the mouth of Moses, and addressed to Joshua just before the great lawgiver died. Founded upon the book of Deuteronomy, it is brief and unpoetical. But it seems to have been large at first, for according to Nicephorus, it

_ consisted of 1400 stichs, while the Jubilees had only 1100.6 The work is an appropriate sequel to the Jubilees, but it seems to have proceeded from a different writer, though he lived at the same time. Internal evidence points to its com- position after the death of Herod the Great, and before the destruction of Jerusalem. In the third chapter Pompey the Great is clearly depicted; but there is no trace of Jerusalem's overthrow. The author was a Jew who wrote in Hebrew or Aramzan, and his production was afterwards

translated into Greek and Latin. We need not assign him to any other place than Palestine, though Fritzsche conjectures that Rome was his abode. Fragments of the Latin version were first edited from a palimpsest at Milan by Ceriani. The version is by the same hand as that of the Jubilees, for both are found in one MS. and agree in character. The translator may have, therefore, taken the two for the work of the same author. After Ceriani, it has been published by Fritzsche. Hilgenfeld has tried to put it into Greek. The same has been done by Volkmar, Schmidt, and Merx. The ancients believed that Jude borrowed from this work his statement as to the dispute between Michael and the devil about the body of Moses. See Ceriani, Monumenta Sacra et Profana, tom. i. fascic. 1; Hilgenfeld, Novum Testamentum extra canonem receptum, fascic. 1. 1866; Messias Judeorum, 1869 ; Volkmar, Handbuch zu den Apokryphen, Band 3, 1867; Schmidt and Merx in Archiv fiir wissenschaftl. Lrforschung des A. T., 1868; Fritzsche, Libri Apoeryphi Veteris Testamenti Greece, 1871.

1TIn Ewald's Jahrbb., Nos. 2 and 3. The original not till 1859 in a separate volume.

2 Das Judenthum in Palestina, u.s.w., p. 94, &e.

3 Monumenta sacra et profana, tom. i. fase. 1.

- Roensch, p. 468, &c.

5 Sacrosancta concilia, tom. v. ed. Colet, p. 389.

° Chronogr. Compendiar., p. 787, ed. Dindorf.

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5. Apocalypse of Moses, whose proper title is Aupynots xal moditeia 'Addp, drroxadupbeioa mapa Ged Mivon re Oeparovrt airod, SidaxGeioa rapa rod apxayyéAov MuyaxA, contains an account of the formation of Adam and Eve, their fall, Seth's dialogue with his mother about Adam, and the disposal of the latter's body beside that of Abel. This work was first published in Greek by Tischendorf from four MSS. It was afterwards accurately edited from one of these (D in the Ambrosian library at Milan)

by Ceriani. But this text is incomplete, wanting chapters xviii.— xxxv. ‘Tischendorf thinks that Greek is the original, and that its date is about the time of Christ, but it is pro- bably later, though certainly not medizval, as Dillmann supposes. The Aerr) yéveous was thought by some, perhaps also by Syncellus and Cedrenus, to have been the same as the Apocalypse of Moses, and was so called, but it is not. Both, however, are of like character. The revelation is said to have been made to Moses when he received the tables of the law and was instructed by the archangel Michael. Tischendorf, Apocalypses Apocryphe, 1866 ; Ceriani, Monu- menta Sacra et Profana, v. i.; Roensch, Das Buch der Jubilien, 1874.

6. Lhe Sibyllines.—The rise of Jewish apocalyptic litera- ture of a sibylline character probably dates soon after Alex- ander the Great, when Judaism began to look with a spirit of philosophic inquiry into Greek and Oriental literature, attaching itself to such elements as seemed congenial. A composite product was the result. The Alexandrian Jews were the first to adopt this course by fusing the remnants of Greck sibyllism with their native prophecy. The former seemed to them an indication of an Adamic or Noachic religion which had filtered into heathenism not- withstanding its polytheism. It was a species of natural prophetism, distinct from the priestly oracles, of a more ancient and higher type, in which Jewish gnosis could discover a point of contact, amid its endeavours to trace the pre-Abrahamic religion in the most enlightened Hellen- ism. As Noah was thought to be the second great pro- genitor of humanity, who represented the primitive theocratic religion before its division and corruption, the sibyl was his daughter, prophesying of the tower of Babel, and exhorting the people to worship the true God. Her voice was predominatingly threatening, like that of the heathen sibyl, foreshadowing the downfall of paganism. Anti-theocratic kingdoms and cities must be overthrown. There is but one religion, the old Noachic one, which even the heathen sibyl darkly echoed, and her utterances can only be interpreted aright in their relation to the world’s history by the Jewish sibyl. Thus Jewish gnosis found support in Hellenism. After using the method and form of the latter in the sibylline oracles, it drew them into a higher region. Uniting them with theosophy and history, it spiritualised them. The prophetic spirit was discerned in the cultus of heathenism, stripped of priestly and poly- theistic phenomena. But it was still the main object of the sibyllines to combat heathenism itself, by

exposing its idolatry and opposition to the truth, to anticipate its total destruction at the advent of Messiah.

Under this general name there exists a collection of oracles said to proceed from the sibyl, in which Jewish ideas are promulgated and recommended to the Gentiles. The contents, however, are of a mixed character. Instead of a connected whole written by one person at a specific time, we have a heterogeneous assemblage of materials, Jewish, Christian, and heathen, of earlier and later origin, which must be separated and sifted before they can be assigned to their respective origins.

Books i., i1., iii. 1-96 are late. The first begins with the creation and fall of man, enumerates the six races, and characterises them, the first after Noah falling in the

golden age. Christ is described in His miracles, sufferings, death, resurrection, and ascension ; the apostles, and the cessation of prophets. The Hebrews will be oppressed by a Roman king, and be scattered abroad after the destruction of Solomon’s temple. The description is continued in the second book. The world will be shaken throughout, and especially will heathen Rome be destroyed at the time of the tenth race. The whole piece is evidently Christian, for the eschatological ideas rest upon Matthew xxiv., XXV. Hellenic mythology and Hebrew tradition are intermixed with the author’s utterances. The date is obscure. Bleck, with whom lLiicke agrees, assumes the 5th century. There are, indeed, late views in the books, such as Christ’s descent into hell to preach the resurrection, the worship of the Virgin, the intercession of the saints for a class of the condemned. It is also true that millennarianism does not appear, and that no Christian writer of the first four centuries cites them. Stillthe 5th century is too late. We prefer the second half of the 4th. Ewald assigns about 300 A.D.

The third book, taken as a whole, is the oldest portion, at least verses 97-828. It enumerates the kingdoms of the world that followed one another, emphasising the Hebrew one in particular, and mentioning the Roman.

Woes are pronounced upon various cities and lands, and the appearance of Messiah is depicted, accompanied with the punishment of the wicked, the downfall of all worldly kingdoms, the conversion of the heathen, and the restora- tion of Judah to more than former splendour. As the destruction of Carthage by the Romans is alluded to, the date must be after 146 B.c. Various indications point to 124. There is little doubt that the writer was an Alexan- drian Jew, whose hopes of a personal Messiah were feeble and vague, for after touching upon a king sent by God from the sun who will put an end to war, and under whose sway Israel will enjoy abundant prosperity, he paints the golden age again without mentioning the king.!

The fourth book, which is but a short poem of less than two lundred lines, arranges history according to twelve ages, terminating in the Messianic one. The writer's descriptions are general, He evinces no decided Jewish sympathies, nor does he utter ideas distinctively Christian. Sinful heathenism in an indefinite way is the chief object of his veiled descriptions. Hence Friedlieb makes him a Jew; Ewald, a Christian. The passages which have been supposed to show either his Christian or Jewish tendencies? are hardly decisive as to the one or the other ; and the interpretations of them by Liicke are somewhat strained in support of the strong statement about the Christian character of the contents generally, with which he begins his sketch of the fourth book. Probably he was a Jewish Christian who came out of an Essene circle. The date of his oracle is somewhat later than that of the Apocalypse, since the destruction of the temple is presupposed as well ag the eruption of Vesuvius, 79 ap. The return of a matricidal emperor from beyond the Euphrates to over- throw Rome is also expected. Such allusion to Nero, which is a prominent feature in the Apocalypse, and a few other particulars, incline us to assume Christian author- ship, though the absence of evangelical ideas marks a stage not far beyond Judaism. Yet the writer rejects sacrifices. The date may be about 80 a.D.

The fifth book presents great difficulty both in separating the component parts, and in assigning them to Jewish or Christian authorship. The absence of ideas characteristic of Judaism or of Christianity marks the poem. Nor is it

1 See verses 652-660, and 702, &c., 766, &c.

2 See lines 160, &c., where Christian baptism is apparently referred to; 174, &c., where the resurrection and last judgment are indicated. At 25, &c., sacrifices are spoken of in an anti-Jewish way. Hd. Alexandre,

casy to discover any internal connection, so that the whole might be attributed to the same authorship. The religious views of the author or authors are vaguely expressed. The first part, 2.¢., 1-51, appears to be of Christian, the rest, i.e, 52-530, of Jewish origin. The former describes in prophetic language the series of Roman emperors from Julius Cesar to Hadrian. In this way we are brought to the end of Hadrian's reign as the date, about 138 a.pD. The second part, which expresses among other things the hope of a temple to be erected in Egypt, in which sacrifices should be offered, and the people of God should enjoy Messianic happiness, points to a Jew of Alexandria living after the destruction of the temple at Jerusalem, about 80 A.D.

The sith book contains a short hymn to Jesus the Son of God, touching upon His doctrine, miracles, and death, with a curse on the Sodomite land which platted His crown of thorns. It is curious that the fire at Jordan on the occasion of the baptism of Jesus, and the representation of the, dove, vary from the canonical Gospels, though the former appears in the Gospel of the Hebrews. Something of a Gnostic element shows itself here.

The seventh book isa fragmentary collection of oracles loosely connected. The contents are varied. Several pieces treat of Christ ; several of the oracles are threat- ening, some are of the nature of hymns. The baptism at Jordan is mentioned in a peculiar way ;? and a strange sacrificial rite is reeommended.+ 'The allusion to the Per- sians reigning is indefinite ; but it is all the historical evi- dence that bears on the date, which seems about 160 a.p. ; though Alexandre puts it between 233 and 235 a.p.6 As there is a tinge of Gnosticism in the book similar to

that of the sixth, they may have proceeded from the same

person. He was a heretical man, as Alexandre supposes;

but whether he was a Jewish Christian is uncertain.

The eighth book contains a prophecy of the judgment of the world. Rome is coming at length to an end. There is also a summary of the history of Jesus, His life, suf- ferings, and resurrection. The writer commences with Hadrian, to whom he gives three successors of his house. He is also acquainted with the king of another house, Sep- timius Severus, in whose days, 948 of Rome, the end comes. The date is therefore 211 a.p. It is curious that Antichrist Nero is here made to come with the third from Hadrian, viz., Commodus. In this oracle occurs the cele- brated sibylline acrostic, the initial letters of thirty-four lines (verses 217-250) representing “Incods Xpeiotds Oeod vids curip otavpds. Verses 361-500 are of earlier origin. They contain various fragments of prior poems. It is noticeable that a historical insertion about the birth of Jesus Christ from the Virgin occupies an unsuitable place, having been the product of a late time, when the dogma about the mother of God was developed. With this exception the second part of the book belongs to the 2d century. The whole is thoroughly Christian.

Books xi—xiv. were discovered in MSS. at Milan and Rome, and published by Mai, in his Veterum Seriptorum nova collectio, tom. iii. p. 202, e¢ seg. They are of Christian origin, and from Egypt. It is true that the Christian element appears but little. The writer used the preceding books and heathen oracles besides. The date is uncertain, but cannot be earlier than the 5th century. The eleventh book surveys the history of kings and people, till the death of Cleopatra and the end of the Egyptian kingdom ; the twelfth recounts the Roman emperors from Augustus till the death of Alexander Severus ; the thir- teenth continues the history from Alexander Severus tilk

3 Ver. 66, &c. 4 Ver. 76, &e. 5 Oracula Sibyllina, vol. ii. p. 386.

the reign of Odenatus ; and the fourteenth brings down the sketch to Aureolus. The names of the emperors and rulers are partially disguised, and eventually become unre- cognisable. See Friedlieb, Oracula Sibyllina, 1852;

Alexandre, Oracula Sibyllina, 1841, 1856; and Ewald, Ueber LEntstehung, Inhalt, und Werth der sibyllinischer Biicher, 1858.

7. The Apocalypse of Baruch.—In this rhetorical produc- tion Baruch receives revelations respecting the future of Israel. Though Jerusalem has been destroyed by the Romans, and the calamities of the chosen people seem excessive, the prophet is comforted with the hope of better times, since the Messiah will come shortly to set up his kingdom after the Roman one has been destroyed. Then will be the judgment and the consummation ; sinners will be punished, and the righteous rewarded. Part of this production, viz., the epistle of Baruch to the nine tribes and a half (chapters Lxxviii.—lxxxvi.), was published in the Paris and London Polyglotts in Syriac and Latin. The Syriac was again edited more correctly by De Lagarde. Whiston translated the Latin into English; and he has been followed by Jolowicz, 1855. The whole book was pub- lished from a Syriac MS. in the Ambrosian library by Ceriani, first in a Latin translation! and then in the Syriac itself? The Latin is reprinted with a few emendations by Fritzsche. It was written after the destruction of Jeru- salem, how long it is difficult to say. The author was acquainted with the Book of Enoch and the Apocalypse of Esdras, for he has many passages which are echoes of sentiments contained in them. He has also later Jewish legends, which point to the 2d century of the Christian cra as that in which he wrote; and there is little doubt that Greek was the original. Langen? thinks that the author was a Palestinian. From its length and wordiness, with the absence of poetic spirit, the perusal of the docu- ment becomes wearisome.

II. Curistran APOCALYPTIC.

Christians followed the example of the Jews in using the sibyl as a vehicle of their ideas. Besides referring to the past, which they did mainly with reference to the person and work of Jesus Christ, they looked forward to the destruction of the world-power, and the consummation of all things at the second coming of Christ. They employed to a considerable extent both Jewish and heathen documents, interpolating or modifying them not very strongly. Often content with non-Christian sources, they adapted them but slightly, so that the ideas peculiar to Christianity shine forth dimly. The prophetic form of the Apocalypse does not demand the enunciation of

doctrine, but rather a general indication of historic events, or the threatening announcement of destruction to the enemies of God. It deals with the utterance of principles exempli- fied by kingdoms and their rulers.

1. The Sibyllines.—We have already seen that books i., iL, il, 1-96, iv., v. 1-51, vi., vii., viii, xii—xiv., belong to this head, though they incorporate Jewish as well as heathen pieces with small adaptation.

2. The Apocalypse of Esdras.—This Greek production resembles the more ancient fourth book of Esdras in some respects. The prophet is perplexed about the mysteries of life, and questions God respecting them. The punishment of the wicked especially occupies his thoughts. Since they have sinned in consequence of Adam's fall, their fate is considered worse than that of the irrational creation. The description of the tortures suffered in the infernal regions

1 Monumenta Sacra et Profana, tom. i. fasc. 2, p. 73, &e 2 Tbid., v. fasc, 2.
8 De Apocalypsit Baruch, etc., commentatio, pp. 8-10.

is tolerably minute. At last the prophet consents to give up his spirit to God who has prepared for him a crown of immortality. The composition is feeble and tame, a poor imitation of the ancient Jewish one. 'There arc no internal marks of date in it. It may belong, however, to the 2d or 3d centuries of the Christian era. Tischendorf published the Greek text for the first time in his Apo- calypses Apocryphe.

3. The Apocalypse of Paul.—This work contains a description of the things which the apostle saw in heaven and hell. The text, as first published in the original Greek by Tischendorf, consists of fifty-one chapters, but is imper- fect. The narratives descend to minute particulars, and possess no force or poetic power. Imitated from the Revelation of St John, their great inferiority is apparent. Internal evidence assigns it to the time of Theodosius, 7.c., about 390 a.p. Where the author lived is uncertain. Dr Perkins found a Syriac MS. of this Apocalypse, which he translated into English, and printed in the Journal of the American Oriental Society, vol. viii. This

version is an enlarged and exaggerated edition of the Greek, which it supplements and illustrates. See Tischendorf's Apocalypses Apocryphe.

4, The Apocalypse of John contains a description of the future state, the general resurrection, and judgment, with an account of the punishment of the wicked, as well as the bliss of the righteous. It appears to be the work of a Jewish Christian, for the bodily appearance of Antichrist is derived from Jewish sources ; and there are numerous quotations from the Old Testament, especially from David. The date is late, for the writer speaks of the " venerable and holy images," as well as "the glorious and precious crosses and the sacred things of the churches,"* which points to the 5th century, when such things were first introduced into churches. We cannot put it earlier than the 5th. This Apocalypse was first published by Birch,! but incorrectly ; afterwards by Tischendorf. The Greek appears to be the original. It is a feeble imitation of the canonical Apocalypse, devoid of literary value, and with the marks of a corrupted Christian age on its face.

5. The Apocalypse of Peter contains a narrative of events from the foundation of the world till the second advent of Christ. The book is said to have been written by Clement, Peter's disciple. This Arabic work has not been printed, but a summary of the contents is given by Nicoll in his catalogue of the Oriental MSS. belonging to the Bodleian.® There are eighty-eight chapters. It is a late production ; for Ishmaelites are spoken of, the Crusades, and the taking of Jerusalem.

6. The Revelations of Bartholomew.—In the year 1835, Dulaurier' published from a Parisian Sahidic MS., sub- joining a French translation, what is termed a fragment of the apocryphal Revelations of St Bartholomew, and of the history of the religious communities founded by St Pachomius. After narrating the pardon obtained by Adam, it is said that the Son ascending from Olivet prays the Father on behalf of His apostles ; who consequently receive consecration from the Father, together with the Son and Holy Spirit—Peter being made archbishop of the universe. The late date of the production is obvious.

7. The Apocalypse of Mary, containing her descent into hell, is not published entire, but only several portions of it from Greek MSS. in different libraries, by Tischendorf in his Apocalypses Apocryphe.

4 Tischendorf, ch. xiii.

5 Auctarium Codicis Apocryphi N. T. Fabriciani, p. 261, &c.

8 Bibliothece. Bodleian codd. MSS. Orientalium catalogt partis secunde vol. primum, etc., p. 49, xlviii. ;

7 Fragment des Revelations Apocryphes de Saint Barthelemy, &e. Paris, 1835.

8. The Apocalypse of Daniel has been published only in part (a little more than the half), by Tischendorf from Greek MSS., in St Mark's, Venice, and in Paris. The date of the document is determined by the monarch going to Jerusa- lem to deliver up his kingdom to God, and being succeeded. by his four sons, who reside in different and distant cities.

9. The Ascension and Vision of Isaiah.—The first portion of the work called the Ascension of Isaiah in the Ethiopic text, gives an account of Isaiah's being put to death by the saw, under the reign and at the command of Manasseh. The prophet had had a vision respecting Christ, His crucifixion and ascension, as well as of the general apostacy which should take place in the early churches, of the descent of Berial in the form of a matricidal king, the duration of his reigu, the descent of the Lord from heaven to destroy the wicked, and cast the ungodly into the fire. For this vision and prophecy Isaiah is condemned, and dies the death of a martyr (chapters i—v.) The second part (chapters vi-xi.) is essentially the same as Tsaiah's vision in ill, 14-iv. 22. The prophet is transported in an ecstatic state into the seven heavens successively, and describes what he sees in each, the chicf object being Christ himself. It is not the future of Christianity and of the world which fills the mind of the seer, but the past, the first advent of Christ. 'The two divisions form distinct works. The first is based on the Jewish legend of Isaiah's martyrdom, and may be merely the Christian expansion of a Jewish writing embodying it. Indeed, with the exception of the Christian interpolations (i. 5, iii. 13-iv. 22), the whole is J ewish. Both Tertullian and Origen knew the martyrdom part of the document. The date must, therefore, be the 2d century. The second, or the

Vision of Isaiah, properly so called, has a Gnostic colouring. Its christology bears a Docetic stamp. As it presupposes an acquaintance with the first it may have originated in the early part of the 3d century. Epiphanius speaks of it, and gives an extract.' Laurence published the Ethiopic text, with a Greek and Latin version, in 1819. The Greek original is lost ; and the Latin version, published at Venice in 1522, and again by Gieseler in 1832, is of late origin. Fragments of an older one were printed by Mai in his Veterum Scriptorum nova collectio, p. ii. 1828. Jolowicz translated it into German, 1854. See Liicke's Versuch einer vollstiindigen Einleitung in die Offenbarung des Johannes, etc., das erste Buch.

10. The Shepherd of Hermas.—This production belongs in a certain sense to the present class of writings, and is usually reckoned among the apostolic fathers. [It is not, however, apocalyptic in the proper acceptation of the epithet, because it wants the form. The apocalyptic idea has a different phase. (Sce Apostoric Farners.) The same remark applies to—

1l. The Testaments of the Twelve Patriarchs.

Many apocalyptic writings, both Jewish and Christian, are mentioned in ancient works of which nothing is now known. 'Time has swept them away beyond recovery. It would be useless to collect the scattered notices of them. Such as wish to see these notices may consult the articles of Dillmann and Hofmann, in the 12th volume of Herzog's Encyklopedie, Liicke's Hinleatung, and the Prolegomena to Tischendorf's Apocalypses Apocryphee, where he will find references to other works. Since the very able treatise of Bleek and the valuable publications of Gfrérer, which were followed by the masterly review of the whole subject in Liicke's second edition, the literature has greatly increased. Hilgenfeld and Volkmar, Ewald and Dillmann, Ceriani and Langen, Fritzsche, Gutschmid, Merx, and others, have thrown welcome light upon it.

The line between Apocryphal and Apocalyptic literature

1 Heres., 67, 8, vol. ii., p. 175, ed. Migne. Sce also Heres., 40, 2.

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is not exact. ‘ properly belong to the latter, and are extant, or have been

published, if not entire, at least partially. Notices of many others lost or hidden occur in various sources and catalogucs of MSS. belonging to public libraries.

idea passed into the life and belief of, became an elemeut of dogma and of morals, finding expression in works somewhat different from the proper apocalyptic. typical extensively, developing eschatological ideas more or less fantastic, the apocalyptic element receded before other

A wP-O

The works now described are those which

The apocalyptic the church. It

Taking a millennarian direction, using the

conceptions to which it had given rise. These, indeed, did

not suppress it; they merely shaped and developed it into

other forms, widening the sphere of its action, and giving it more realisin. (s. D.)

APOCRYPHA. This term is a Greek word meaning hidden, secret. It occurs, for example, in Col. ii, 3, “In whom are hid all the treasures of wisdom and knowledge,” and elsewhere in the New Testament. It is first found ap- plied to writings in Clemens Alexandrinus, Stromata, il. c. 4. When applied to writings (dadxpuda se. BiBdia) the name may be supposed to have first expressed the nature of their contents ; the writings were secret, embodying an esoteric teaching, profounder than that contained in the ordinary books of the system, and unknown to the ordi- nary people who professed it. Such writings were held to exist in connection with almost all the ancient systems of religion.

From the nature of the case, the same word might very well describe such writings further, either in respect of their wse or in respect of their origin. In

use these writings were, of course, like the doctrines they contained, private and secret; they were not read in general meetings, and. did not belong to the publicly recognised books of the system. Only some were admitted to the knowledge of them. That which formed the subject of public reference and instruction was the general doctrines of the system, while these peculiar and more recondite works were at most brought forward on rare occasions. And naturally the same secrecy which hung over their use generally also shrouded their origin. In some cases this might be a real mystery ; the books were sometimes of ancient and uncertain date, and their authorship unknown. But oftener the mystery was fictitious, created for the purpose of securing respect for the doctrines inculcated in the writings, which themselves were forgeries of very recent times. Works of this kind were of very common occurrence in the East during the centurics immediately preceding and following the birth of Christ. In order successfully to. float them and give them impulse, they were generally launched under some ancient and famous name; and books existed, bearing

_to be the productions of almost every renowned. patriarch

or sage from Adam downwards. Even when sent out anonymously, and of an historical rather than a doctrinal character, the scene of their narratives was laid in far back times, and famous personages were introduced acting and speaking, the design being to recommend to the living generation the conduct pursued or the sentiments expressed by the ancient hero or saint.

The term Apocrypha appears in this way to have passed through several stages of meaning, and from expressing a meaning good, or at least neutral, it came at last to have a very bad sense, differing very little from spurious. From the use of the word in ancient writers it does not appear that this progress from a good or indifferent to a bad seuse was a matter of time, for the indifferent and bad meanings of the word seem to have existed side by side. Some ecclesiastical writers divide the sacred books into three classes, —recognising first, some that are canonical; second, some that are not canonical, but of inferior value, profitable

to be read for moral uses, but not to be founded on for doctrine—to this class the name ecclesiastical was some- times given; and third, some that are apocryphal. Other writers know of only two classes, embracing both the second and third classes of the former division under the name apocryphal. This difference indicates a milder and a severer use of the term.

Besides those books known distinctively as the Old Tes- tament Apocrypha, a very large number of apocryphal writings were in existence in the early centuries of our era. Some of these are still extant, but many of them have perished, or are known only through MS. translations lying in our great libraries. Our only information regarding many of them is derived from references to them in eccle- siastical writers. These references are sometimes so general that we cannot be sure whether the book referred to was a Jewish or a Christian production. By far the largest number even of those bearing Jewish titles were works by Christian writers. Of the extant writings of this class the most iinportant are fully treated in the article APOCALYPTIC LITERATURE immediately preceding. In addition to those discussed there may be mentioned the very interesting col- lection of hymns called the Psalms of Solomon. This sinall work consists of eighteen poems of varying length, to appearance all by one writer, and existing now only in Greek, though in all probability originally written in a Shemitic dialect. These poems arose in a time of trouble to the Jewish people, most probably in the Greek persecu- tion, and they were designed to sustain the nation under its trials, partly by moral considerations, but chiefly by picturing the certain glories of the Messianic kingdom. The hymns are remarkable no less for the vigour of their poetry than for the fervid theocratic hopes and dis- tinct faith in the resurrection and kindred doctrines which find expression in them. O. F. Fritzsche has appended this little work, along with other select Pseudepigraphi of the Old Testament, to his edition of the Old Testament Apocrypha. P

APOCRYPHA OF THE OLD TresTAMENT.—The books bear- ing this name are not contained in the Jewish or Palestinian Canon, 2.¢., in the Hebrew Bible, but in the Alexandrian Canon, 7.e.,in the Greek translation known as the Septuagint. Considerable obscurity hangs over the date and the circum- stances of the close of the Hebrew Canon, and the principles which guided the collectors in their selection of books to be embodied. It is

most probable that the three divisions referred to in the New Testament, of law, prophets, and writings (Psalms) are of ancient origin; that the first two divisions were closed while prophetic men were still living, that is, considerably anterior to the close of the Persian period, while the third still remained open ; and that at whatever time the third was closed, the books added to it were added under the impression that they were books composed before the succession of Prophets had ceased. This is the view expressed by Josephus (Con. Ap., i. 8), and may be considered the general Jewish tradition regard- ing all books in the Hebrew Canon.

With the Greek or Alexandrian Canon the case was very different. This was, properly speaking, not an eccle- siastical, but a literary collection at first, for the tradition that it was commenced under the auspices of Ptolemy Philadelphus cannot be altogether set aside. At first only the books of Moses and perhaps Joshua were translated, the interest felt in the book being confined to the law. Only gradually and at intervals other books were added, for the translations are not only by different hands, but of very different dates. But it is evident that the collection was formed under the guidance of a principle quite different from that which guided the Palestinian collectors. The feeling in Palestine was that prophecy had ceased (1 Mace.

ix. 27, comp. ch. xiv. 41), and no books were held worthy of a place in the Canon which were composed after the succession of prophets had come to an end. In Egypt this theory did not prevail, or rather another theory seems to have prevailed. The doctrine of the Wisdom which appears in Proverbs, ch. i—viii., received a fuller development in successive ages even in Palestine, and naturally much more in Alexandria, where the speculative Jews came under the influence of Greek thought. This Wisdom is spoken of in a way which at times almost identifies it with the Spirit of God, and at other times almost with the Logos or Word. But at any rate this divine Wisdom is all-pervading, and subject to no interruption in the constancy of its influence. The famous passage, Wisdom of Solomon, ch. vii. 22, f, in which the attributes of wisdom are counted up to the number of twenty-one, speaks of her as “ going through all things by reason of her pureness,” and

at last says of her, that “in all ages entering into holy souls she maketh them friends of God and prophets.” The particularism of Judaism gave way in Alexandria before the universalistic principles of Western speculation. Prophecy was the pro- duct of the Wisdom, and Wisdom was like a subtle element, all-pervasive and incessant in its influence ; and consequently a break in the line of prophets, or any distinction between the productions of one age and those of another except in degree, was hardly to be conceived. Thus to the Alex- andrian the varied Jewish literature of the post-prophetic times was precious as well as the books that were more ancient, and he carefully gathered the scattered fragments of his national thought, as far as they were known, within the compass of his Canon.

The following books form the Apocrypha of the English Bible. They are given in the order in which they stand there :—1. I. Esdras, 2. II. Esdras. 3. Tobit. 4. Judith. 5. The additions to the Book of Esther. 6. The Wisdom of Solomon. 7. The Wisdom of Jesus, the son of Sirach, or Ecclesiasticus. 8. Baruch. 9. The Song of the Three Holy Children. 10. The History of Susanna. 11. The History of the Destruction of Bel and the Dragon. 12. The Prayer of Manasses, king of Judah. 13. The First Book of Maccabees. 14. The Second Book of Maccabees,

A few statements may be made regarding the general characteristics of the Apocrypha.

1. These books are of very great interest and value as a reflection of the condition of the fragments of the scattered nation, and of the feelings and aspirations which they cherished for a period of several hundred years, and in all the chief countries of the world. Some of the books, such for example as Yobrt, belong to the Persian period, and were composed in the East, in Babylon or Persia, and describe the external life as well as the feelings and hopes

.of the exiles there; others arose in Palestine, such as

Fcclesvasticus, and reflect the condition of life and the shades of religious speculation in the home country ; while others, such as the Wisdom of Solomon, originated in Egypt, and afford means of estimating the influence of Greck thought upon the native doctrines of the Old Testa- ment ; and

perhaps in the 2d Esdras there may even be detected traces of Christian influence. The broad undivided stream of Old Testament doctrine and hope breaks at the era of which we are speaking into three channels. The largest, and that which best preserves its primary direction, continues to run in Palestine, diverging to some extent, and widening under the contributions which time and a very chequered experience and reflection made to it; while on each side of this another runs, one on the east and one on the west, directed and partly fed by the ideas of Persia and Greece respectively. To a certain extent the streams reunite further on, and pour their united contributions into the great sea of Christian thought. The central stream

is, of course, the most interesting, although to estimate it properly the books of the English Apocrypha are quite insufficient, other works belonging to the same region must also be taken into account, such as the great Book of Enoch, and several more. The two collateral currents are also of extreme interest, although it is far from casy to analyse their waters, and say with assurance what elements belong to the primary Old Testament sources and what are local contributions. Many have discovered traces of Persian ideas even in the canonical books of the Old Testament, particularly in the doctrine of angels in the later books, but the trustworthiness of such discoveries may be very fairly questioned. At the same time, there either is, in the book of obi, an advance absolutely on the Old Testament doctrine of angels and demons, or there are traces of a method of interpreting the history in Gen. ch. vi., and a carrying out of the method to further consequences, which are both unknown to the canonical Scriptures (below No. 3). And if in the Alexandrian Wisdom of Solomon a progress directly in advance of what is found in Prov. viii, on the doctrine of Wisdom, may be justly contested, there is certainly what may be called a progress round about, the ideas about Wisdom are ex- panded and placed in new lights, and made to enter into new relations, in such a way that a general approximation to the New Testament doctrine of the Logos is the result. But in general, as a means of estimating the changing shades of feeling, the rise and fall of hopes, or rather the steady glow of a hope which no hardship could extinguish, the efforts to accommodate faith to circumstances and hold it fast in spite of all that was against it, in a word, as a means of

estimating the inner life of a most interesting people in the very crisis of their history, the apocryphal books are invaluable. No more beautiful picture of piety and disin- terested benevolence and patriotic warmth could be seen than is presented in the book of Tobit; neither could religious zeal and courageous, even almost reckless, patriot- ism, easily find higher expression than in the first book of Maccabees, or even in the unhistorical tale of Judith ; while the under current of observant thoughtfulness, that contemplates but hardly mixes in life, runs in a deep, if calm and passionless stream in the proverbs of the Son of Sirach. At no time was the nation idle. A people that had conceived such hopes, hopes which at last culminated in Christianity, could not be idle or even anything less than restless and turbulent. There is no form of deed celebrated in the ancient history of the people that they did not try to reproduce, and no form of literary composi- tion which, in those mournful centuries so full of oppression, they did not strive to imitate, with an inextinguishable life and hopefulness. This last fact, perhaps, might furnish the means of a classification of the books different from that suggested above, and similar to the division usually adopted in the Old Testament Scriptures. (1.) Historical, such as lst Maccabees, although most that assume the historical form, such as Judith, are simple romances, and can be used only as an index of ideas and feelings, not in proof of facts; while others, like Bel and the Dragon, are com- pletely fabulous. (2.) Prophetical, such as Baruch and 2d Esdras. In these the religious hopes of the people are most fully exhibited; for example, the Messianic expecta- tious. Fully to understand these, however, other works, such as the book of Enoch, not contained in the recognised Apocrypha, have to be included. The prophetic literature almost always assumes the form called apocalyptic. (3.) Philosophical, or books coming under the Hebrew name of Wisdom. Here belong the Son of Sirach, the Wisdom of Solomon, to which must be added others not included in the English Apocrypha, eg., the Psalter of Solomon and 4th Maccabees.

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2. It has already been said that the Hebrew or Palestinian Canon was formed ou the feeling that, before the close of the Persian period, the succession of prophets ceased. It is too evident that this feeling was a true one. The restoration from exile was little more than an external form with

almost no real life within. The new community was feeble in the extreme. It had no productive power of itsown. It must fall back entirely upon the past. The most and the best it could do was to conserve the forms and, if possible, the spirit of what was ancient. But the spirit, which should also have been its own, was lacking. Hence everything in the new state was mechanical and rigid. Even the canonical writings of this epoch, such as Chronicles, are mere compilations. And the further off from the ancient times the people removed, the stiffer and more mechanical they grew. No doubt a certain energy was infused into the people at various epochs, particularly in the Maccabean struggles, yet even then there is a certain stiffness and awkwardness both in the acts and writings of the time, as when old age girds itself up for deeds to which it is no longer equal. This loss of the prophetic and productive power, and the con- sciousness of the loss, explains most of the characteristics of the apocryphal literature. For example, there is want- ing in it, even where most genial and natural, that original freshness which is so charming in a book like Ruth; and even the proverbial philosophy of the Son of Sirach, instead of bubbling up in living springs, as in Solomon, often appears forced and unwilling in its flow; while in others of the philosophic books there is an elaborate redundancy of language, and a floridness of rhetoric, most unlike the simplicity and terseness of the ancient Wisdom.

Again, the consciousness of the loss of real creative power and complete dependence on the past explains another peculiarity of these books—their pseudonymous character. They do not come forth as the products of their own time, and with the authority of their real authors; they are transferred into the distant past,.into the stirring times of living Israelitish history, and their authors are made to be the great historic names of the nation. The Alexandrian philosopher calls his work the Wisdom of Solomon. The author of Judith pitches his romance in Assyrian times. In this way effect is sought, and truths and actions are commended by an authority that is felt no longer to cxist.

A defective sense of truth very naturally becomes more serious. ‘To compose a work in what is believed to be the spirit of some ancient sage or hero, and put it forth under his name, may seem a venial wrong. Yet in an uncritical age it often led to very unfortunate results. Neither might it seem

greatly amiss to advocate a cause and recom- mend an action by exhibiting ancient names uttering similar sentiments, or following the saine course, and in an age like our own little evil might follow. Yet the next step downward is the direct forgery of documents, such as the Letters of Artaxerxcs, which we find in the additions to Esther, or the Epistles at the beginning of 2 Maccabees. The apocryphal books everywhere demonstrate that all true historic consciousness was deserting the people ; and though we may gather truth out of the Apocrypha, it is rarely truth directly stated, but reached by our own infer- ences from the character of the writings and the objects the author plainly enough had in view.

3. One of the most interesting inquiries connected with the Apocrypha is, as to the advance in doctrine and opinion over the Old Testament to be found in it, and its nearer approach to the New Testament. This is a very delicate inquiry, although the existence of a certain advance can- not be denied, and is most ccrtainly to be expected. For the church did not cease to exist in these centuries, and if she was to appearance barren, yet in fact she was maturing into life the seed which she had already conccived.

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Parallel to this inquiry, or almost a part of it, runs another, viz., that as to the origin and development of the parties which figure so prominently in the pages of the New Testament. All these parties date in their germs from the times of the Restoration, or those not greatly posterior, and may roughly be divided into two—those who rigidly adhered to their native Judaism, of whom the Pharisees may be considered the chief representatives ; and those who ethnicised, either attaching themselves exclu- sively to Gentile culture, or combining elements of foreign thought and worship with their native faith, the most prominent sect in this class being the Sadducees. We may expect to come in the Apocrypha upon many traces of such diverging opinions. A specimen here and there will illustrate the position of things in these books,

The want of real life at the time of the Restoration, and the consequent mechanical adherence to ancient forms, was the direct parent of the Pharisaic morality so well known. Already this appears in Tobit. The Pharisee, who went up to the temple to pray, might almost have gathered

the elements of his prayer from this book. ‘Prayer is good with fasting, and alms, and righteousness. . .. . For alms doth deliver from death, and shall purge away all sin” (ch. xii. 8, comp. ch. xiv. 11, and Judith viii. 6, xi. 11,7) On the other hand, traces of quite a different morality, allied to asceticism, appear elsewhere, as in the statement of Wisdom ix. 15, regarding the body: ‘“ For the corruptible body presseth down the soul, and the earthly tabernacle weigheth down the mind that museth upon many things.” On the general doctrine of God no advance perhaps was possible. Very lofty things are said by the author of jicclesiasticus, ¢.g., ch. xliii. 30, and in many places, but nothing to surpass or even equal what is said in the Old Testament. Perhaps a certain effort is discernible to emphasise the spirituality of God, both directly and by avoiding anthropomorphic images. This effort is far less discernible in the Apocrypha than in the other productions of the same and succeeding ages, such as the Septuagint, the Targums, &c., which are apt to use circumlocutions like the Word of God, the Shekinah, &c., for God.

As to the doctrine of the Wisdom there is no doubt a cer- tain development of itin these books. But it is doubtful if Wisdom be anything more anywhere than a personification, to which attributes are given that sometimes make it closely resemble the Spirit, and sometimes the Word or Messiah of the New Testament. Certainly the Wisdom is nowhere in these books identified with the Messiah, although the predicates of Wisdom are applied to the Messiah in the New Testament. (Comp. Wisdom vii. 26, with Hebrews i. 3, and the general descriptions of Wisdom, Wisdom ix. 4, 9, f:, vil. 12, f., &c., Ecclesiasticus, ch. i.) The doctrine of the existence of spirits intermediate between God and man, through whom God’s providence is often executed, is certainly found in the Old Testament. These spirits seem mostly benevolent, although there is one whose office it is to accuse and detract, called Satan, whose character seems evil. This spirit appears formally in the prologue to Job, and in Zech. ch. iii; comp. 1 Chron. xxi. 1. And some have found traces of the belief in evil spirits in the word ‘“ Azazel” (Lev. xvi.), as well as in the “ satyrs” of Isaiah (xxxiv. 14), In the book of Daniel the doctrine of angels receives a certain addition, inasmuch as—first, the general activity and superintendence of these spirits is indicated by the name given to them of “watchers” (ch. iv. 10, 7); and second, it is intimated that every kingdom has its guardian spirit (Dan, x. 13, 20), The Apocrypha

repeats this last idea, Eccles. xvii, 17, and so does the Septuagint on Deut. xxxii. 8. But the angelology of the book of Tobit makes a double step forward—first, in the direction of teaching a hierarchy among angels—“ the seven

holy angels,. . . . . which goin and out before the glory of the Holy One” (ch. xii. 15, though comp. Dan. x. 13); and second, in assigning special functions to angels, they “pre- sent the prayers of the saints,” and assume the care of indi- viduals (ch. v. #) And demonology receives even a more striking though grotesque development. A wicked spirit, named Asmodeus, is represented as falling in love with Sara, daughter of Raguel, and slaying out of jealousy the seven young men to whom she had been successively married, but is at last put to flight by the fumes of the heart and liver of a fish, and bound in chains in the utmost parts of Egypt (ch. iii. 8, vi. 14, viii. 3).

Even more instructive is it to trace the advance towards clearness of the doctrines concerning the state of man. Many times what is implied in the Old Testament is stated with explicitness. For exaniple, “ God created man to be immortal, and made him to be an image of his own eter- nity ; nevertheless, through envy of the devil, came death into the world, and they that do hold of his side do find it” (Wisdom ii. 23.) Again, “Of the woman came the beginning of sin, and through her we all die” (Ecclesiasticus xxv. 24). The references given above will suffice to indicate what lines of study may be pursued in the Apocrypha, aud what advantages may be expected to be derived from them.

4, The degree of estimation in which the apocryphal books have been held in the church has varied much according to place and time. As they stood in the Septua- gint or Greek Canon, along with the other books, and with no marks of distinction, they were practically employed by the Greek fathers in the same way as the other books; hence Origen, Clement, and others, often cite them as “Scripture,” “divine Scripture,” “inspired,” and the like. On the other hand, teachers connected with Palestine, and familiar with the Hebrew Canon, rigidly exclude all but the books contained there. This view is reflected, for example, in the canon of Melito of Sardis, and in the prefaces

and letters of Jerome. Augustine, however, De Doct. Christ. ii. 8, attaches himself to the other side. Two well-defined views in this way prevailed, to which was added a third, according to which the books, though not to be put in the same rank as the canonical Scriptures of the Hebrew col- lection, yet were of value for moral uses and to be read in congregations,—and hence they were called " ecclesias- tical." Notwithstanding the decisions of some councils held in Africa, which were in favour of the view of Augus- tine, these diverse opinions regarding the apocryphal books continued to prevail in the church down through the ages tillthe great dogmatic era of the Reformation. At that epoch the same three opinions were taken up and congealed into dogmas, which may be considered characteristic of the churches adopting them. In 1546 the Council of Trent adopted the Canon of Augustine, declaring " He is also to be anathema who does not receive these entire books, with all their parts, as they have been accustomed to be read in the Catholic Church, and are found in the ancient editions of the Latin Vulgate, as sacred and canoni- cal." The whole of the books in question, with the ex- ception of lst and 2d Esdras and the Prayer of Manasses, were declared canonical at Trent. On the other hand, the Protestants universally adhered to the opinion that only the books in the Hebrew collection are canonical, Already Wycliffe had declared that " whatever book is in the Old Testament besides these twenty-five (Hebrew) shall be set among the Apocrypha, that is without authority of belief." Yet among the churches of the Reformation a milder and a severer view prevailed regarding the Apocrypha. Both in the German and English translations (Luther's, 1537; Coverdale's, 1535, &c.) these books are separated from the others, and set by themselves; but while in some con-

fessions, e.g., the Westminster, a decided judgment is passed on them, that they are not "to be any otherwise approved or made use of than other human writings," a milder ver- dict is expressed regarding them in many other quarters, e.g.,in the "argument" prefixed to them in the Geneva Bible; in the 6th Article of the Church of England, where it is said that "the other books the church doth read for example of life and instruction of manners," though not to establish doctrine; and elsewhere.

Somewhat bitter controversies have raged over the Apocrypha in recent times. One was carried on in Scotland in 1825 and following years, which had the effect of induc- ing the British and Foreign Bible Society to employ its funds for the circulation of the canonical Scriptures only. Abundant materials for a history of this controversy may be found in the pages of the Christian Instructor for the years just named. More recently a similar controversy has been waged in Germany, where Stier and Bleek and Hengstenberg were found on the side of the Apocrypha, and Keerl with others against. See Die Apokryphen- frage, mit Beriicksichtigung der darauf beztiglichen Schriften Dr Stier's und Dr Hengstenberg's, aufs Neue beleuchtet, von P. F. Keerl, Leip. 1855. Useful works on the subject are—Fabricii Codex Pseudepigraphicus Vet. Test., Hamb. and Leip. 1713 and 1741; Libri Apoeryphi Vet. Test. Greece, recensuit et cum Commentario critico edidit Otto Frid. Fritzsche, Lipsie, 1871; Kurzgefasstes Exegetisches Hand- buch zu den Apok. des Alt. Test., bearbeitet von Dr O. F. Fritzsche u. Dr C. L. W. Grimm, in 6 Lieferungen. Com- pare also, Ewald, Zistory of Israel, vol. v. (traus.) Lond. 1874, Schiirer, Lehrbuch der Neutest. Zeitgeschichte, Leip. 1874; Langen, Das Judenthum in Palestina zur Zeit Christi, Freiburg, 1866; Nicolas, Des Doctrines Relr- gieuses des Juifs, pendant les 2 siécles antérieurs a Vere chrétienne, Paris, 1860. Much information may also be found in the Introductions to the Old Testament, ¢.g., Davidson's, vol. iii, and in the articles " Apocrypha," "Canon," and those on the individual books in Smith's and Kitto's Bible Dictionaries and Herzog's Hncyklo- padie. (A. B.D.)

ApocrypHAL Books oF THE New TEstaMEnT.—These may be divided into two classes—those books which were actually held as inspired by some portion of the Christian church, and those which were never acknowledged as canonical. Among the first are some of the writings ascribed to the apostolical fathers. The First Epistle of Clement was read in the churches, is quoted in the same manner as Scripture by Irenzeus, and is found in the Codex Alexandrinus. The Pastor of Hermas was also read in the churches, is mentioned as inspired by Irenzus, Clemens Alexandrinus, and Origen, and is found in the Codex Sinaiticus. Somewhat similar respect was paid to the Epistle of Polycarp and the Epistle of Barnabas. Besides these books there were different gospels in use in the early period of Christianity. The most famous of these was the Gospel according to the Hebrews, Some

critics regard it as the earliest gospel of which we know anything. Its relation to our Gospels thus becomes a very important ques- tion, the discussion of which, however, must be reserved for the article on the GosPELs (q.v.) The Ebionites used this gospel. It was written in Aramaic. It goes sometimes by the name of the Gospel of the Nazarenes, or by the Gospel according to the Apostles; and some think that it was also called the Gospel of Peter. This gospel no doubt under- went alterations; and Hilgenfeld, in his Vovum Testa- mentum extra Canonem Receptum, gives the fragments of what he considers the earliest form of the Gospel according to the Hebrews, then those of the Gospel of the Ebionites, which he considers very late, and then those of the Gospel of Peter, which he thinks occupied an intermediate place.

APO—APO

We know very little more of the other gospels and apocryphal books the Acts of Peter, the Preaching of Peter, and the Revela- tion of Peter; the Acts of Paul, and the Doctrines of the Apostles. the Egyptians, according to Thomas, and according to Matthias. in addition to these, notices the Gospel according to Bartho- lomew, and the Gospel of Apelles.

than their names. Eusebius mentions

Origen mentions also the Gospel according to the Gospel of Basilides, and the Gospel Jerome,

Marcion also used a special gospel for his sect, but whether it was the Gospel of Luke, entire or mutilated, is keenly debated. And the book of the Prophet Elxai was held in high estimation by some sects. All these works have perished, and criticism can only conjecture, from a few scattered hints and frag- ments, what was their nature. The other set of apocryphal books consists of works that have come down to us relating to Christ and his apostles, but which were never regarded as inspired by any sect. Some of these had a wide circulation in the Middle Ages, were translated into various languages, and, as might be expected, were subjected to all kinds of interpolations and alterations. Several of them refer to the infancy and boyhood of Jesus; such as the Prot- evangelium of James, the Gospel of Thomas, the Arabic Gospel of the Infancy; and some deal with his death, as

the Gesta Pilati or the Gospel of Nicodemus, and the narrative of Joseph of Arimathea. There seems reason to believe that the first form of the Protevangelium of St James and the first form of the Gesta Pilati were written in the second century; but there can be no reasonable doubt that the forms in which we now have them belong to a much later date. There are also apocryphal Acts of Apostles and apo- cryphal Revelations of Apostles. These seem all to belong to a later date than the earliest of the apocryphal gospels. The fragments of the gospels used by the early church and the sects are given in Hilgenfeld's Novum Testamentum extra Canonem Receptum (Lipsiz, 1866). The extant apocryphal Gospels, Acts, and Revelations have been edited in three separate volumes by Tischendorf, and have been translated by Mr Walker in vol. xvi. of Clark's Ante- Nicene Christian Library. These works contain references to the extensive literature on the subject. Special mention may be made of Michel Nicolas's work, Htudes sur les Evangiles Apocryphes (Paris, 1866), but almost all works on the Canon contain an account more or less full of the apocryphal books of the New Testament.

APOLDA, a town of Germany, in the grand-duchy of Saxe Weimar, situated near the river Ilm, 9 miles east of Weimar, with which it is connected by railway. Hosiery and cloth are the chief manufactures of the town, besides which it contains pin and button factories, and bell foun- dries. There are mineral springs in the neighbourhood. Population in 1871, 10,507.

APOLLINARIS SIDONIUS, Carus Soxtrvs, an emi- nent Christian writer and bishop, was born in Lyons about 430 a.p. Belonging to a noble family he was educated under the best masters, and particularly excelled in poetry and polite literature. He married Papianilla, the daughter of Avitus, who was consul, and afterwards emperor, by whom he had three children. But Majorianus, in the year 457, having deprived Avitus of the empire, and taken the city of Lyons, Apollinaris fell into the hands of the enemy. The reputa- tion of his learning led Majorianus to treat him with the greatest respect ; in return for which Apollinaris composed a panegyric in his honour, which was so highly applauded, that he had a statue erected to him at Rome, and was honoured with the title of Count. In 467 the Emperor Anthemius rewarded him for the panegyric which he had written in honour

of him, by raising him to the post of governor of Rome, and afterwards to the dignity of a patrician and senator. But he soon quitted these secular

employments for the service of the church; and, in 472, was chosen to succeed Eparchius in the bishopric of Cler- mont. On the capture of that city by the Goths in 480 he was obliged to retire, as he had taken an active part in its defence ; but he was soon restored by Evaric, king of the Goths, and continued to govern the church as before. He died 482 or 484 a.p. His extant works are his Pane- gyrics on different emperors, and a collection of Letters and Poems, and their chief value consists in the light they shed on the political and literary history of the 5th century. The best edition is that by Sirmond, published in 1614, and republished in 1652.

APOLLINARIS, Suuricius, a learned grammarian of Carthage, lived in the 2d century, under the Antonines. He is the reputed author of the poetical arguments prefixed to the comedies of Terence. He had for his pupils Helvius Pertinax, who afterwards became emperor, and Aulus Gel- lius, who speaks of the acquirements and character of his master in terms of the highest praise.

APOLLO. The iufluence of the sun on nature in a country like Greece, either brightening the fields and cheering mankind, or scorching and destroying with a pestilence, or again dispelling the miasma collected from marshes by night, was taken by the Greeks to be under the control of a divine being, to whom they ascribed, on human analogy, a form and character in which were reflected their own ensations. That divine being they called Apollo, a name which applied to him in two ways, either as droAAvwr, from dardAAvp, “the destroyer,” or as dréANwv, from dréAAw = dareipyw, the “ repeller of ills.” Apellon is both the Doric and the old Roman form of his name. Under the frequent title of Phoebus, he was hailed as god of the streaming light of the sun. Next to its daily course, which, however, was under the guidance of a special subordinate deity, Helios, the most obvious and invariable phenomenon of the sun was its withdrawal in winter and return in summer, and accordingly on this was based one of the principal features in the character of the god, which was also recog- nised in annual festivals in his honour, and made more explicit by the myth, in

which after his birth, amid the splendid summer light of Delos, he is carried off ina cardrawn f by swans to the fabulous region of the RES ~~Hyperboreans, where the sun was be~~ Baageear lieved to tarry during the winter. The Wee other class of solar phenomena, being ‘ variable in their occurrence, appeared to See be directed by a precarious will, and pono, From silver coin from this was evolved for Apollo the ofClazomene. Brit. Mus. double character of a god possessed of power over the sun, anda the same time guided in the exercise of it by the con- duct of mankind. Hence the prominence of expiatory offer- ings in the worship of a god whom no act of wrong escaped. By his knowledge of what transpired on earth and in the councils of Olympus, he was prepared to be the god of oracles, which threw light on the future and banished the monsters begotten of terror at its obscurity. From observing the jubilant voice of nature greeting the sunshine, it was an easy step to regard Apollo as the god of music; while again the function of a god of medicine was peculiarly appropriate to a deity who, if he destroyed life, also saved it. In many ways the sun gladdened the herdsman and favoured his flock. Hence both Apollo and Helios (Sol) had sacred herds of cattle of their own, while the former when in exile on earth himself acted as a herdsman.

The honour of having been the birth-place of Apollo was claimed by many districts, but chiefly by Xanthus in Lycia, and the island of Delos, the latter being at last generally agreed upon. In Lycia his worship was of high antiquity, and its extent is vouched for by the

identity of the name of that country with one of the favourite epithets of the god, Avxetos, from root Avk, as in Avxddws, Lat. luc-s=lux. There also his mother Leto (Latona) appears to have been widely worshipped, and thither the solar hero Bellerophon goes to accomplish his labours, showing a community of religious belief between Lycia and Argolis, the home of Bellerophon, for which there is also other evidence. But when the myths concerning Apollo came to be shaped by the poets, his worship had acquired an independent standing in Delos, and had estab- lished for that island a claim to the honour of being his birth-place. The belief was that Leto, pursued by the jealous Hera (Juno), after long wandering, found

shelter in Delos, and there bore to Zeus (Jupiter) a son, Apollo. To this it was added, after the time of Pindar, that Delos had before been a barren rock floating about in the sea, but had been for this purpose and for ever after fastened down by pillars, as also happened to the island of Rhodes, the centre of the worship of Helios. The labour of Latona lasted nine days and nine nights. Then she seized hold of a palm tree, and when the boy was born all the island was dazzled with a flood of golden light. Sacred swans flew in a circle round the island seven times. The day was the 7th of the month Thargelion (May). The 7th of every month was sacred to him. He was styled ‘E@dopuayerys, and otherwise the num- ber seven played a part in his worship. His first step was to seize a bow and to announce his will to found an oracle. To this end his father Jupiter gave him, besides a lyre, and a mitra to bind his hair, a car drawn by swans, with which to proceed to Delphi. But the swans carried him off to their home among the Hyperboreans. Returning with the summer to Delphi, he slew with an arrow the Python, a monster dragon, which was then laying waste the district, established his oracle, and took the title of Pythios. Gzea (Terra) first, and next Themis had previously given oracles there. But this, though the current belief, is at variance with the Homeric Hymn to Apollo, which describes him as selecting Delphi for its site alone, and then relating how, after a temple was built, the difficulty of finding priests was over- come. Seeing a trading ship from Cnossus in Crete, under way for Pylus, the god threw himself on board in the form of a dolphin and guided it to Crissa, the harbour of Delphi, where, like the flash of a star, he resumed his divine form, appointed the traders his priesthood, and with his lyre led the first pean there. Hence his title of Delphinios. But here a confusion has been effected ; for, while in one sense Apollo Delphinios was god of the sunny voyages, in another sense he may have derived that epithet from having slain the dragon, the proper name of which was Delphine. Except on the latter theory, there seems to be no explanation of this, among other facts, that his sanctuary at Athens, the Delphinion, was a court for the trial of bloodshed. It may then be supposed that the Dorians from Crete, who had in early times established themselves on the coasts of the Peloponnesus and at Crissa, having an Apollo whose symbol was a dolphin, and finding at Delphi an Apollo styled Delphinios for another reason, combined the two in the new myth which is found in the Homeric Hymn. Besides at Delphi, which however retained the first place, Apollo gave oracles also at

Colophon, and at Didymi near Miletus ; in the latter place through the priestly family of the Branchide. To certain mortals he communicated the prophetic gift, as to Cassandra, the Cumzan sibyl, and the seer Epimenides. With his oracular power was associated his function as god of music (Citharcedus), and leader of the Muses (Musagetes), in which capacity he caused Marsyas to be flayed alive because he had boasted superior skill in playing the flute, or again, caused the ears of Midas to grow long because he had decided in favour of Pan, who contended that the flute was a better inate than the .— 24

lyre. But that which brought Apollo most closely home to the hearts of the people was his character of a destroying but yet an appeasable god. Pestilence and death by an unseen cause, or in the beauty of youth, were traced to him, and to prevent doubt as to his having a good reason in each case, there were the myths which told how, for example, he sent a pestilence on the Greeks before Troy, because Chryseis, the daughter of his priest, was retained in captivity by Agamemnon ; or again, how with the aid of his sister Artemis (Diana) he slew the children of Niobe, because she had boasted of their beauty. A typical instance of his causing death undesignedly is that of his favourite, the beautiful: young Hyacinthus, who was killed by the dise (a symbol of the sun) which Apollo had thrown in play. Besides accepting atonement in such cases, he was the god of the penitent generally, but especially of those, like Orestes, guilty of a crime which required years of expiation. For such he was himself the prototype, having been twice banished from Olympus, and compelled first to act fora period as herdsman to Admetus, the king of Phere, and next to assist Poseidon (Neptune) in building the walls of ‘Troy for Laomedon. While thus the power of the sun god was recognised with varying feelings according to occasion, it was, on the other hand, always kept in view as an active principle in nature by the regular system of festivals. Of these the most remarkable was that called Carneia, which was annually held at Sparta in August, the whole population withdrawing from the town for several days, and living in tents to avoid the effect of intense heat. In July, also, the Spartans held a festival of nine days in his honour, called Hyacinthia, the burden of the ceremony being the transi- toriness of life mingled with trust

in its return. In Athens the festival of Thargelia was held in his honour in May, to celebrate the ripening of the fruits of the field; while in the Metageitnia, in August, he was regarded as the god of plenty, and as the source of neighbourly feeling. At Delphi, umong a constant round of ceremonies, two festivals were conspicuous: at the beginning of winter, when the god was supposed to go away to the Hyperborean region, and at the beginning of summer, when he was believed to return ; the latter event being hailed with every expression of delight in music and song. At Thebes was held every eighth year a peculiar ceremony, Daphnephoria, in honour of Apollo Ismenios, consisting of a procession in which was carried a branch of olive, hung with wreaths and repre- sentations of the sun, moon, planets, and stars, the number of wreaths being 365. This object was called the Kopo. In May the ancient national festival at Delos was celebrated. It remains to notice the very prevalent association of Apollo as sun-god with Artemis (Diana) as moon-goddess, the aspect of these two luminaries having readily suggested that their presiding deities were twins. But Apollo and Diana resembled each other also in many attributes of their character as well as in appearance. Just as he was god of the influence of the sun on nature, with a subordinate deity Helios (Sol) to guide the orb, so she personified the power of the moon, delegating its course to the goddess Selene (Luna). In Rome the worship of Apollo was not intro- duced until 320 B.c., in which year the city had been visited with a pestilence. The most frequent symbols of Apollo are the bow and the lyre ; the tripod, suggesting his oracular power ; the laurel, which was carried by penitents as well as worn by victors, and into which Daphne was changed for not yielding to his love; the palm, the wolf, the deer, and the raven. In the ripe period of art Apollo appears in a form which seeks to combine manhood and eternal youth. His long hair is usually tied, like that of his sister Diana, in a large knot above his forehead. As leader of the Muses, he wears long ample drapery girt at the waist, his tresses falling on his shoulders. (A. 8. M.)

APO—APO

APOLLO BELVIDERE, a marble statue of Apollo, found towards the end of the 15th century near Antium (Capo d’Anzo), a favourite resort of Roman emperors. Julius II., while yet a cardinal, purchased it; and on becoming Pope allowed it to be placed, through Michacl Angelo, in the

Belvidere of the Vatican, whence it was taken by the French in 1797, but restored in 1815. The marble some believe to be Greek, though perhaps the best authorities call it Carrara. In any case the statue is not an original work, but a copy apparently from a very fine Greek statue of about the beginning of the 3rd century B.c., of which another copy has been identified in a bronze statuette now in St Petersburg, known as the Stroganoff Apollo. Lately also a marble head has been found at Rome, corresponding closely in measurement and in style, confirming what is suggested by the statue, viz., that the original was of bronze. From the bronze statuette it is found that the Apollo Belvidere held forward in his left hand, not a bow as was thought, but the egis, in the attitude of spreading consternation among an enemy, as he did among the Trojans, and it is usual to adopt as the occasion for the production of this statue the invasion of the Gauls, whom, in 278 B.c., the god drove in alarm from his sanctuary at Delphi. The extraordinary praise be- stowed on it by Winckelmann secured for this statue a fame from which the discovery of true Greek sculptures since then has gradually detracted, to this extent, that even its original cannot now be placed in the best period of Greek art.

APOLLODORUS, a celebrated painter of Athens who lived about 408 B.c. From the improvements he intro- duced into the art of mingling colours, and the use he made of shading, he obtained the surname, Sxtaypddos.

APOLLODORUS, an Athenian grammarian, son of Asclepiades, and disciple of Aristarchus, lived about 140 B.c, His most famous production is his Bibliotheca, which treats of the gods and the heroic age; and though the extant work is possibly only an abridgment by another hand of the original, it is of great value in mythological inquiries. The best edition is that of Heyne, 2 vols. 8vo, published in 1803.

APOLLODORUS (60-130 a.p.), an architect, born at Damascus, a favourite of Trajan, for whom he constructed the stone bridge over the Danube (104 a.D.), which was esteemed the most magnificent of all the works of that emperor. He also planned a gymnasium, a college, public baths, the Odeum, and the Forum Trajanum, within the city of Rome ; and the triumphal arches at Beneventum and Ancona. The Trajan column in the centre of the Forum is celebrated as being the first triumphal monument of the kind, and

the model of many others in different cities, as Paris, London, St Petersburg, &c. On the elevation of Hadrian to the throne, Apollodorus was banished from Rome, and shortly afterwards, being charged with imaginary crimes, was put to death (Dion Cassius, lxix.)

APOLLONTIA, the name, derived from the god Apollo, of several cities of antiquity. The most important are— 1. An Illyrian city on the right bank of the Aous, which owed its foundation to the Corinthians and Corcyreans. It soon became a place of commercial prosperity, was at a later period regarded as of military importance, and towards the close of the Roman republic acquired fame as a scat of literature and philosophy. It seems to have sunk with the rise of Aulon, and few remains of its ruins are to be found. 2. A Thracian city (afterwards Sozopolis, and now Sizeboli), colonised by the Milesians, and famous for its colossal statue of Apollo, which Lucullus removed to Rome. 3. The port of Cyrene (afterwards Sozusa, now Marsa Sousah), which at length outgrew the greatness of Cyrene itself, and has left ample evidence of its magnificence in the ruins of its public buildings. It was the birth-place of Eratosthenes, usually known as of Cyrene.

a: Ob kONITUS

APOLLONIUS, surnamed Moto, a distinguished Greek rhetorician, the instructor of Cesar and of Cicero. Born at Alabanda, he settled at Rhodes, and in the dictatorship of Sulla, was sent as ambassador from the Rhodians to Rome. He was the first Greek who addressed the senate without the aid of an interpreter. Cicero renewed his studies under him when he afterwards visited Rhodes on his return from Asia. The works of Apollonius have perished.— Another rhetorician of the same name, likewise a native of Alabanda, and an inhabitant of Rhodes, was surnamed The Effem- inate (6 MaAaxds). Both are mentioned by Cicero with high respect.—Cicero, Brutus, 89, 90, 91; De Inv. i. 56 ; De Orat. i. 17, 28 ; Quintil. iii. 1, § 16; xii. 6, § 7, &.

APOLLONIUS, surnamed Dyscotus (Avoxodos), or The Crabbed, was a native of Alexandria, and lived in the reigns of Hadrian and Antoninus Pius, He was the first systematic writer on grammar, and is styled by Priscian “Grammaticorum Princeps.” Of his extant grammatical works the principal

one is the treatise On Syntax, the best edition of which is that of Bekker, Berlin, 1817.

APOLLONIUS, a Greek epic poet, surnamed Ruopivus, from his long residence in Rhodes, though he is supposed to have been a native of Alexandria. He is known to us as the author of the Argonaulica, a poem which he began while in youth, studying under the poet Callimachus. His master is supposed to have slighted the production of the youthful Apollonius, and their connection ended in the most violent enmity, though we are ignorant of the parti- culars of their quarrel. The disappointed youth retired to Rhodes, where he is conjectured to have polished and completed his work, supporting himself by the profession of rhetoric, and receiving from the Rhodians the freedom of their city. He was at length recalled to Alexandria to succeed Eratosthenes in the care of the great library about 194 B.c., in the reign of Ptolemy Euergetes, who had been educated by Aristarchus, and rivalled his predecessors in the munificent cncouragement he gave to learning. The only extant work of Apollonius is his poem above mentioned, in four books, on the Argonautic expedition. Both Longinus and Quintilian have assigned to this work the mortifying character of mediocrity. It was first printed at Florence in 1496, with the ancient Greek Scholia, in a 4to volume, now exceedingly rare. An excellent edition was published by Brunck in 1780, and another by Beck, in 1797; but the best is that of Professor Schafer (Leipsic, 2 vols. 8vo, 1810-13). The poem was translated into English verse by Fawkes and Green in 1780; another translation in English verse, with critical notes, was pub- lished by W. Preston in 1803.

APOLLONIUS of Trauuzs and his brother TauRIscus were the sculptors of the famous Farnese Bull, a group representing Zethus and Amphion tying the revengeful Dirce to the tail of a wild bull. This work is now at Naples. There were several other sculptors named Apol- lonius.

APOLLONIUS, a grammarian of Alexandria, author of a Homeric Lexicon, Aéfets “Opyptxai, which was first pub- lished by Villoison, in two vols. fol., at Paris, in 1773.

APOLLONIUS of Perea (PERGmuUS), next to Archi- medes the most illustrious of the ancient Greek geome- tricians, was born probably about

250 B.c., and died during the reign of Ptolemy Philopater (222-205 z.c.), flourishing thus about forty years later than Archimedes. He studied at Alexandria under the successors of Euclid, and is one of the brightest ornaments of that famous mathematical school.

But few of the mathematical works of Apollonius have escaped the ravages of time. Of the greater part we have merely the names and general description given by Pappus in his preface to book vii. of the Mathematical Collections.

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His treatise on the Conic Sections gained him the title of The Great Geometer, and is that by which his fame has been transmitted to modern times. It is not, indeed, to be for a moment supposed that Apollonius discovered all, or even the greater part, of the demonstrations which he gives, any more than that Euclid devised the propositions that go by his name. Pappus mentions several treatises on conics known to have existed previously—in particular the five books of Aristeeus ‘‘ The Ancient ” (350 3.c.) on Solid Loci ; and there can be little doubt that Apollonius availed himself of these, as well as of the discoveries of Conon, Euclid, Eudoxus, Menechmus, Nicoteles, Thrasidzus, and others, who had explored the way before him. At this distance of time we cannot distinguish the original from the borrowed propositions ; but, though it is certain that he both added to and improved upon the existing theory of conics, the mere embodying in a complete and logical treatise of a number of miscellaneous theorems was in itself a work of great mathematical genius. Eutocius informs us that Apollonius was the first to show that all the three sections may be cut from the same cone, by varying the position of the intersecting plane; for previous authors had supposed the plane of section always perpendicular to the slaut side of the cone,—an hypothesis which requires that the three sections be cut from cones of dif- ferent species, namely, the parabola from a right-angled cone, the ellipse from one with an obtuse, and the hyperbola from one with an acute vertical angle. But Archimedes, as Ubaldus shows in his commentary on the Mqupon- derantes, had been acquainted with this fact. Pappus ascribes to Apollonius the names by which the three sections are now distinguished ; the term Parabola, however, occurs in the writings

of Archimedes. Of the Conicorwm Libri Octo of Apollonius, unfortunately only four have reached us directly through the original Greek. Three more have been preserved in an Arabic version, but the eighth has never been found. Though many attempts had been made to discover the last four books, they continued to be regarded as lost till 1658, when Borelli, the celebrated author of the treatise De motu Animalium, discovered in the Medici library at Florence an Arabic manuscript, entitled Apollonit Pergat Conicorum Libri Octo. With the assistance of Abraham Ecchellensis he translated and published in 1561 the fifth, sixth, and seventh books ; but the eighth, notwithstanding the title, was wanting. Some years previously Golius, Oriental professor at Leyden, had returned from the East with an Arabic version of the whole seven books, and had projected the publication of a transla- tion ; but it never appeared. A note appended to the MS. of Golius stated that the eighth book had never been translated into Arabic. It was long a favourite problem with geometers to attempt to restore the lost books of Apollonius, that is, to infer from the general nature of their contents, as described by Pappus, the propositions they had contained. Maurolycus, a Sicilian geometer of the 16th century, Viviani, the last favourite pupil of Galileo, Fermat, Halley, Simson, and a number of others, all attempted this with more or less success. Halley, guided by the descriptions of Pappus, and the assertion that his preliminary lemmas to the seventh book really belonged to the eighth, as well as by the statement of Apollonius him- self that the eighth was a continuation of the seventh book, restored this book for the edition issued by the Oxford Press in 1710, the only edition of the Greek text that has as yet appeared. The last four books of the conics of Apollonius formed the chief part of the higher geometry of the ancients ; and they present some elegant geometrical solutions of problems, which offer considerable difficulty even to the modern analytical method. For example, the fifth book treats of the greatest and least lincs that can be

drawn from given points to the peripheries of conics, and contains the chief properties of normals and radii of curva- ture.

The other treatises of Apollonius mentioned by Pappus are—Ist, The Section of Ratio, or Proportional Sections ; 2d, the Section of Space ; 3d, the Determinate Section ; 4th, the Tangencies ; 5¢h, the Inclinations ; 6th, the Plane Loci. Each of these was divided into two books, and, with the Data of Euclid and the Porisms, they formed the eight treatises which, according to Pappus, constituted the body of the ancient analysis. ;

lst, De Rationis Sectione had for its subject the resolution of the following problem : Given two straight lines and a point in each to draw through a third given point a straight line cutting the two fixed lines, so that the parts intercepted between the given points in them and the points of inter- section of this third line, may have a given ratio.

2d, De Spatii Sectione discussed the similar problem, which requires that the space contained by the three lines shall be equal to a given rectangle.

Dr Halley published in 1706 a restoration of these two treatises, founded on the indications of their contents given by Pappus. An Arabic version of the first had previously been found in the Bodleian library at Oxford by Dr Edward Bernard, who began a translation of it, but broke off on account of the extreme inaccuracy of the MS.

3d, De Sectione Determinata resolved the problem : Ina given straight line to find a point, the rectangles or squares of whose distances from given points in the given straight line shall have a given ratio. Several restorations of the solution have been attémpted, one by Snellius, another by Alex. Anderson of Aberdeen, in the supplement to his Apollonius Redivivus (Paris, 1612), but by far the most complete and elegant by Dr Simson of Glasgow.

4th, De Tactionibus embraced the following general pro- blem: Given three things (points, straight lines, or circles) in position, to describe a circle passing through the given points, and touching the given straight lines or circles. The most difficult case, and the most interesting from its historical associations, is when the three given things are circles. This problem, though now regarded as elementary, was proposed by Vieta in the 16th century to Adrianus Romanus, who gave a very clumsy solution. Vieta there- upon proposed a simpler construction, and restored the whole treatise

of Apollonius in a small work, which he entitled Apollonius Gallus (Paris, 1660.) Both Descartes and Newton have discussed this problem, though they failed to give it that simplicity of character which it has since been shown to possess.

5th, De Inclinationibus had for its object to insert a given straight line, tending towards a given point, between two given (straight or circular) lines. Restorations have been given by Marinus Ghetaldus, by Hugo de Omerique (Geometrical Analysis, Cadiz, 1698), and elegantly by Dr Horsley (1770).

6th, De Locis Planis is merely a collection of properties of the straight line and circle, and corresponds to the con- struction of equations of the first and second degrees. It has been successfully restored by Dr Simson.

The great estimation in which Apollonius was held by the ancients, and the great value attached to his productions, are manifest from the number and celebrity of the commentators who undertook to explain them. Among these we find the names of Pappus, the learned aud unfortunate Hypatia, Serenus, Eutocius, Borelli, Halley, Barrow, and others. Various discoveries in other departments of mathematical

science were also ascribed to him by the ancients. Pappus says that he made improvements on the modes of re- presenting and multiplying large arithmetical numbers. The invention of the method of projections has been attri- buted to him; and he has the honour of being the first to found astronomical observations on the principles of geometry.

The best editions of the works of Apollonius are the following :— 1. Apollonti Pergei Conicorwm libri quatuor, ex versione Frederici Commandint. Bononie, 1566, fol. 2. Apollonit Pergei Coni- corum libri v. vi. vii. Paraphraste Abalphato Asphanensi nwne primum editi: Additus in calce Archimedis Asswmtorum Liber, cu Codicibus Arabicis Manuser.: Abrahamus Ecchelicnsis Latinos reddidit: J. Alfonsus Borellus curam in Geometricis Versiont contulit, et Notas uberiores in universum opus adjecit. Florentiz, 1661, fol. 38.

See Bayle’s Dictionary ; Bossut, Essai sur l’ Hist. Gén. des Math., tome i.; Montucla, Hist. des Math., tome i.; Vossius, De Scient. Math. ; Simson’s Sectiones Conic, preface ; and Hutton’s Mathe- matical Dictionary.

APOLLONIUS, surnamed Tyanazus, a Pythagorean philosopher, born at Tyana, the capital of Cappadocia, shortly before the Christian era. According to his bio- grapher Philostratus, he studicd grammar and rhetoric at Tarsus under Euthydemus, but he soon left that gay and luxurious city for the quiet town of A&ge in the vicinity, where he spent his time in the company of philosophers and pricsts within the temple of /sculapius. Among these he met Euxenus, one of the followers of Pythagoras, and from him he learned with enthusiasm the doctrines of the Samian sage. While yet a mere youth he renounced ‘all the ordinary pleasures of life. Abjuring the use of flesh and wine, he lived on the simple fruits of the soil, wore no clothing but linen and no sandals on his feet, suffered his hair to grow, and slept on the hard ground. He strictly observed the Pythagorean penance of five years’ silence, suffering often the most painful trials of his patience without a murmur. Philostratus relates so many wonderful stories of his hero—how on one occasion, for instance, he awed an excited populace to silence by the mere waving of his hands, how he performed many miracles with a word, and how he knew all tongues without ever having learned them—that some have questioned the very existence of Apollonius ; while others, admitting with reason the fact of some such ascetic having lived about this time, regard him as a compound of magician, impostor, and religious fanatic.

After spending some time in the cities of Cilicia and Pamphylia, Apollonius extended his travels into the East, and wandered on foot over Assyria, Persia, and India, con- versing with Magi, Brahmins, Gymnosophists, and priests, visiting the temples, preaching a purer morality and religion than he found, and attracting wherever he went admiration and reverence. At Nineveh he met with Damis, who became his adoring disciple and the companion of his journeyings, and left those doubtful records of his life which Philostratus made use of, and probably improved upon. The account of his exploits during his wanderings in India reads like the tales of the Arabian Nights; and where Damis cannot vouch for having seen the prodigies he mentions, he unhesitatingly adduces in support of them the

authority of his master. From his visit to the Hill of Sages (described in the third book), Apollonius returned an accomplished sage himself, able to foretell earthquakes and eclipses, to cure the plague, to summon spirits from the unseen world, and to restore the dead to life.

On his return from the East he-had the greatest reverence

paid him everywhere by Grecian priests and oracles. He visited Crete and Rome, where he astonished the magis- trates by raising to life the dead body of a noble lady. Spain, Sicily, Egypt, Ethiopia, Greece, and Asia Minor became in time the scenes of his wanderings and his wonder-workings; and so distinguished had he become that even during his life he was raised almost to the rank of a divinity.

He is supposed to have died at Ephesus at a very great age, but his biographer finds it convenient to represent his end as involved in mystery, in order to heighten the reverence due to his hero. The words of the biographer are: “Here ends the history of Apollonius the Tyanzan, as written by Damis. Concerning the manner of his death, ¢f he did die, the accounts are various.” Like Pytha- goras, his master, ‘he left no indication of his age ; and Philostratus could not ascertain whether he died at Ephesus, or vanished at Lindus, or in Crete.

After his death Apollonius was worshipped with divine honours for a period of four centuries. A temple was raised to him at Tyana, which obtained from the Romans the immunities of a sacred city. His statue was placed among those of the gods, and his name was invoked as a being possessed of supcrhuman powers. The defenders of pagan- ism, at the period of its decline, placed the life and miracles of Apollonius in rivalry to those of Christ; and some moderns have not hesitated to make the same comparison. There is no reason to suppose, however, that Philostratus entertained any idea of this sort in composing his life of Apollonius. That biography was undertaken by order of Julia, wife of the Emperor Severus, more than a century after the death of the subject of it; and it is extraordinary that Apollonius, if so renowned and widely known in his day, found no place in history for 120 years after his decease. The preamble of Philostratus, in

which he pro- fesses to set forth things with which men were before unacquainted, is in striking contrast with the commence- ment of the Gospel of Luke.

Apollonius is not to be looked upon as a shallow and vulgar impostor, though to influence men's minds he had recourse to artifices and pretensions unworthy of a true philosopher. With some of the spirit of a moral and rcligious reformer, he appears to have attempted, though vainly, to animate expiring paganism with a new and purer life. See PuiLosrratvs.

APOLLOS, a Jew of Alexandria, who came to Ephesus during the absence of St Paul at Jerusalem (Acts xviii. 24). Apollos was a learned man (Aoyios, in the authorised version translated eloquent), "mighty in the Scriptures," and preached "boldly" in the synagogue the doctrine of a Messiah, knowing as yet "only the baptism of John." Aquila and Priscilla having heard him, instructed him more fully in the doctrines of the gospel. Some time after this he went to Corinth, and was there very useful in con- vincing the Jews out of the Scriptures that Jesus was the Christ. Thus he watered what St Paul had planted in that city (1 Cor. iii. 6). The division in the church at Corinth, in which one of the parties called itself by his name (1 Cor. i. 12), was not prompted by him, and did not disturb the friendly relations that existed between him and St Paul. Apollos hearing that the apostle was at Ephesus, went to meet him, and declined to return to Corinth, though St Paul "oreatly desired" him to do so (1 Cor. xvi. 12). St Jerome says that Apollos was so dissatisfied with the division at Corinth, that he retired into Crete with Zenas, a doctor

of the law; and that the schism having been healed by St }

Paul's letter to the Corinthians, Apollos rcturned to the city, and became its bishop. Less probable traditions assign to him the bishopric of Duras, or of Iconium in Phrygia, or of Czesarea.

APOLOGETICS is, properly speaking, that part of theology which vindicates the right of theology in general, and of Christian theology in particular, to exist as a science, and is occasioned by the presence of anti-

theo- logical and antichristian speculation. Apologetics is there- fore the scientific representation of the grounds on which Christian theology, in so far as it is a part of human knowledge, rests and may be vindicated. So long as Christianity lies hid, as it were, in the mind of man or in the consciousness of the church, without assuming an external or objective form, so long as it remains only in the form of a force impelling men to action, so long as it is content to manifest itself on the active or practical side only, there is no great need of Apologetics ; but whenever Christian dogmatics arise, whenever Christianity objectifies itself on its intellectual side, and begins to force its way into the circle of the sciences, its entrance is disputed, it has to face hostile criticism, and begins to form an apologetic.

Apologetics is therefore the logical antecedent but the historical consequent of dogmatics ; it is the introduction to dogmatics, it prepares the way for it logically by justifying its claim to exist, but it actually comes after dogmatics in the history of the intellectual manifestation of Christianity, because, as a matter of fact, men do not feel called on to justify Christian theology until it actually exists in a dog- matic form. Thus, Apologetics may be compared to psycho- logy, and in some respects is to dogmatics what psychology is to metaphysics. Just as psychology is the link between physics and metaphysics, just as in psychology the two spheres of impersonal and personal life touch each other, and the two sets of natural and spiritual laws are seen in conjoint action, so Apologetics lies between human and superhuman science, in it the two spheres of human life and revelation meet, and the various and different laws which regulate each adjust themselves to each other’s varying action; and psychology, which is historically consequent to metaphysics, is logically its antecedent and introduction. The position of Apologetics necessarily gives it a somewhat changeable nature. All sciences change, but they do so according to an inward development of their own, and their change is so far orderly and progres- sive; but the course of Apologetics must always be more or less erratic, because it has to do with the varying relations of the two spheres of human life and revelation, and has to adjust itself afresh at each change in these rela- tions. The special form, too, which Apologetics has for the most part assumed—a defence or vindication of Christi- anity—has made it more changeable. It has been com- pelled to change its front from time to time to meet the altered form of attack.

In one aspect the general science of Apologetics and the number of treatises upon the subject mark the imperfec- tion of dogmatics and the neglect of its study ; for with the advance of theology, general Apologetics tends to disappear, and in its stead comes an apologetic introduction, justifying each of the fundamental doctrines of dogmatics; or, in other words, with the advance of theology, Apologetics gives place to speculative theology, which shows the various relations in which each particular dogma stands to all other dogmas, whether theological or other.

Apologetics, as the justification and vindication of Christian theology, has to deal with two great questions: (1), Can man know God? and (2), Does man know God? Is a theology possible ? and if so, is Christianity true, and the theology which it gives, the true theology ?

Under the first question are discussed all the various topics concerning man and his natural capacities for a knowledge of God and the things of God, the natural crav-

_ ing for a knowledge of the supernatural, the intimations more

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or less obscure of a higher than merely natural life.

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Under this head comes every discussion concerning the capacities in man for the knowledge of God, and concerning the actual amount of knowledge which man has had of God apart from revelation The apologist endeavours to show from psychology, metaphysics, and other sources of knowledge capable of aiding him in his research, that man is a religious as well as an intelligent being, that theology on its formal side has a real basis in the human inind, and that whenever the objects of theological science are presented to the mind, they may be assimilated by these faculties. Many delicate questions arise here—the whole question of anthropomorphism, for example. It is argued that because our knowledge of God and of divine things must pass through and be assimilated by human faculties, it must necessarily be as much human as divine, and in this way the divine is more

or less transformed into the human, and becomes anthropomorphic. The doctrine of the personality of God is often instanced as a notable example of anthropomorphism in theology. Apologetics vindicates theology from this charge by ascertaining from psychology whether the human factor tends to vitiate all human knowledge, and what is the precise influence of the formal element, or that element which the mind supplies, upon the material of human kuowledge ; and in this way tries to show that theology, while it is knowledge which passes through the mind of man, is not necessarily anthro- pomorphic.

But man has not mierely capacity to know God and divine things, he actually does know something about these things ; they have actually become objects or material of human knowledge. This brings us within the range of natural theology, which is just the sum of the knowledge which man, apart from revelation, has about God. Natural theology may be studied and its results presented in two different ways. Paley, Butler, and Chalmers, for example, have endeavoured, from an analysis of the human mind and character, to describe the kind and amount of knowledge which man has of the being and attributes of God, of the moral government of the world, of the immortality of the soul, and of the future state of reward and punishment. This method of inquiry is open to the objection, that it is very difficult to separate between what man has acquired by revelation and what he possesses without revelation, if the mind analysed be one already impregnated by Christi- anity. Hence it is well to supplement and correct the knowledge obtained in this way by an historical survey of what man has actually known and taught concerning God and divine things in the great natural religions which have existed, and still exist. Natural theology, in this sense of the word, is the result of a comparative history of religions, and contains a methodical summary of all the various religious ideas which have been evolved in the religious experience of mankind. The historical method is useful to correct the analytic, and the analytic gives order and method to the historical. This historical method is as yet in its infancy, but few historical sciences are engaging more attention than the new science of religions, and its growth cannot fail to have a considerable effect upon the future course of Apologetics. It looks upon all religions as more or less related to each other, and seeks to find the real course of the development of religious ideas, and natural theology becomes in this way the orderly

statement of the various religious truths which each natural reli- gion has contributed to the sum of the religious knowledge of the race ; and every great religion is conceived to leave behind it a residuum which is its contribution to natural theology. But while Christian Apologetics thankfully acknowledges the contributions made by natural theology to our knowledge of God and His relations to us, it is always much more disposed to regard them as of indirect

than of direct value. They are of more use in show- ing that man has capacities whereby he may arrive at a knowledge of theology, that he has aspirations which can only be satisfied by theology, than in furnishing actual and reliable information about God and His relations to us. They serve to prove that man is able to learn truths about God if the true materials of information were pre- sented to him; or, in other words, in Apologetics natural theology has a formal rather than a material value.

2. Does man know God? Is the Christian theology true? Christianity is founded on certain presuppositions, can these be vindicated? The most important of these is the presupposition of the possibility and actual existence of a divine revelation, or a superhuman source of knowledge of God and His relations to us, and the most important task of Apologetics is to vindicate the possibility and exist- ence of the Christian revelation. It is because it possesses this revelation that Christianity claims for itself a position altogether different from other religions, and hence the possibility and fact of a revelation have always been attacked by antichristian speculation. The precise point of attack has varied coutinually, but in the present day the chief objection to a revelation, in the Christian sense of the word, is based upon the fact, that an historical study of religions shows that every religion has professed to be founded upon a divine revelation, and claims for itself the same supernatural sanction which the Christian theologian declares to be the exclusive possession of Christianity. To this the apologist answers, that the fact that numberless false claims have been made is not a sufficient ground for summarily rejecting the claim of Christianity, which has to be judged upon its own merits ; he then proceeds to point out, that just as Christianity professes to be different in kind, and

not in degree only, from other religions, so the Christian revelation is one generically distinct, even in the external form which it assumes, from all other supposed revelations. While most pretended revelations claim to be the promulgation of divine truths, the Christian revelation is the manifestation of a divine life in the world, the intrusion into human history of a divine force, which, flowing on from generation to generation, at last condenses itself in the presence and person of the Lord Jesus Christ, the perfect revelation of God. It is sufficient to disprove the claims of any pretended revelation, to show that the truths it teaches might have been reached without any special and supernatural communication ; but before the Christian revelation can be discredited, it must be shown that the divine life in the world, which reached its most perfect development in Jesus Christ, is not specifically different from the life of man,—that Jesus Christ was a mere man, not different in kind from other men. The great difference, then, between the Christian and other so- called revelations is, that it ends and is summed up in the person and work of Christ, and so is a consistent whole ; while they do not end in a life like that of Christ, and lacking this to bind them together into a unity, are merely a more or less disjointed series of statements—not even the record of supernatural manifestation, still less that manifestation itself.

The first thing, therefore, that Apologetics has to do, in this its second and most important division, is to describe the character and meaning of revelation, discuss the pos- sibility of the thing from all sides,—logical, metaphysical, and moral,—show that it can be known by man, and prove its necessity for the religious life of mankind.

The apologist must describe carefully the character and course of this divine life which has entered into history for the purpose of redemption, explaining it both on its objective side of manifestation and on its subjective side of inspiration. He has to show how it appears in

miracle, and 1s apprehended by the mind specially fitted for this apprehension; and he points out that such a conception as that of the Christian revelation, such an idea as that of the continuous manifestation of God in the world, does not belong to any pagan religion or theology.

This manifestation of God, which is miracle in the proper sense of the word, and the special apprehension of it, which is inspiration in the more limited meaning, have happened, and have been recorded, and the apologist has therefore as much to do with the record of the reve- lation as with the revelation itself; and hence, after the preliminary investigations into the nature of revelation and its twin sides, manifestation and inspiration, comes an investigation of the sources from which we derive our knowledge of this revelation. The whole question of the Canon of Seripture must, therefore, be looked into and settled, the character, historical or other, the authenticity, and the credibility of the various books of the Old and New Testaments must be discussed, and whatever assistance in this task can be obtained from contemporary history must be taken advantage of. Connected with this inquiry, several difficult and delicate questions arise, about the relation between inspiration and perfect historical accuracy in every point, the questions of plenary and non-plenary inspiration, whether plenary inspiration requires perfect accuracy in minute details of history, whether it demands scientific accuracy of description, &c., none of which can be entered into here. ,

From the records of the revelation the apologist turns to the revelation itself. We have already distinguished the Christian from other pretended revelations, by saying that it is a revelation which has Christ, while other revelations have not Christ, and in our day the whole attack and defence have centred round the doctrine of our Lord Jesus Christ. The opponents of Christianity, feeling that the core of the system which they are attacking is the supernatural life of Christ, set themselves to attack that conception, and they do so by attempting to show, either that there was no such life as that of the Jesus Christ of the Gospels, or else that it was not supernatural—there was no such man as Jesus Christ, or if there was, He did not differ wholly from other men. ‘The first mode of attack is that adopted by D. F. Strauss, and the second that of Ernest Renan and others. Strauss’s position is somewhat of this kind: the historical and the supernatural are so inextricably mixed the one with the other that they cannot be separated, but the supernatural is on general grounds impossible, and therefore the historical is impossible also. He accordingly sets himself to show that the Gospels are not credible as history, and he resolves the Gospel life of Jesus of Nazareth into a poeni, the poem of the Jewish nation and, indeed, of the

human race. This is the basis of his celebrated mythical theory. Renan, on the other hand, cannot admit the thorough-going destructive criticism of Strauss. There must have been such a life as that of Jesus of Nazareth, although the account we have of it is a highly coloured picture. He admits the life, but denies the supernatural

element in it, and explains it by saying that it was created .

round about the historical life by the enthusiasm of the early disciples ; in short, he separates the historical from the super- natural, and while he admits the one he rejects the other. The apologist answers such attacks as these very much by pitting the one antagonist against the other. He asserts with Strauss that the historical and the supernatural are inseparably blended, and he takes from Renan the general idea, that, according to all laws of historical research, the Gospel narratives are truly historical. In this way he tries to show, specially against Strauss, that there is no time, even if the Gospel narratives are brought down to the latest possible date, for the growth of the poem into which

he resolves the life of Christ ; and specially against Renan, he points out that if the historical be granted even only to the length to which Renan goes, it is so blended with the supernatural that the miraculous cannot be separated from it. This defence of the historical and supernatural character of the life of Christ, and of Christianity because it has the life of Christ as its centre and essence, widens into a general description of His position and character as these are shown in the Gospels. Apologetics tries to show that Jesus Christ is, as it were, the sum of all the previous revelation of God contained in the Old Testament. It traces the broadening down of revelation, in order to show how perfectly the life of Christ came as the conclusion and perfection of all that went before, and that it fulfilled both Jewish prophecy and pagan aspiration. It attempts to show that Jesus is not merely the actual and _ perfect fulfilment of every previous theophany, but that He is and must be the Perfect Revelation of God. It does this in various ways: by describing the character of Jesus, unique intellectually and unique morally; by describin g the teaching of Jesus, and its marvellous similarity and yet dissimilarity with the doctrines of Jewish revelation and Gentile

philosophy; by describing the actual work of Jesus, by showing that in Him miracle or manifestation and prophecy or inspiration came to their culmination ; and by pointing to the mission of the Holy Ghost and the victorious spread of Christianity throughout the world. Such is a short outline of Apologetics and the field of investigation which it occupies: we shall now proceed to give a short summary of the history of the study.

The historical course of Apologetics may be divided into five great periods :—

The first period, extending from the beginning of the 2d century to the end of the 5th, may be subdivided into two: (1.) From the beginning of the 2d to the beginning of the 3d century ; and, (2.) From the beginning of the 3d to the end of the 5th. The first of these is marked by the writings of Justin Martyr, Athenagoras, Tertullian, and Minucius Felix. The two Apologies of Justin were directed, the one against the Jews, and the other against the pagans. In both he follows the same method of justifying the Christian religion from the charges which were then commonly brought against it, and then attack- ing his opponents severely. All the apologists of this age follow the same course, and we see from their writ- ings that the common attacks upon Christianity were charges of atheism, immorality practised at their Agape, the Thyestzean banquets, and the like. The second of these periods is marked by the writings of Origen, Arnobius, Lactantius, Eusebius, Cyril of Alexandria, Augustine. These names show the course that Apologetics was taking. It had raised itself far above the position of a mere defence against vulgar prejudice and polished sarcasm; and Origen, when he opposed Celsus, was giving a philosophical defence against a philosophical attack upon the principles which lay at the basis of Christianity (cf. Pressens¢’s Hist. de UEglise, 2° série, ti. pp. 104-142). With Arnobius begins the study of Christian evidences; and he tries to show that Christianity is not merely probable, but certainly true ; while Lactantius proceeds upon the idea that, if Christianity be only clearly understood, it must be accepted, that its best defence is a clear statement of the principles on which it rests. Kusebtus, on the other hand, jis the first of the learned apologists, and proves the truth of Christianity by an elaborate comparison between it and all that was best in the various systems which went before it, and so far prepared the way forit. Cyril opposes Julian as Origen had

opposed Celsus, Julian had directed his attack against the claims of Christianity to universal dominion; he admitted that it was one form, but denied that it was the only form of

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truth, and Cyril’s defence is interesting, inasmuch as it is | warrant for the mysteries in Christianity, for its superior the first answer of the Christian apologist to the objections morality, for its historical position and influence, and of the pure Theist. Augustine’s great work, the De | so English Apologetics has been mainly concerned with Civitate Det, is apologetic in so far as it endeavours to show | the doctrine of the evidences of Christianity; and the that Christianity and the church are the only ark of safety | general line of argument commonly taken has been, that in presence of the dissolution of the empire and human there is as much evidence for Christianity as for some society which then seemed ‘mminent. In this second | ordinary set of opinions generally admitted. Thus Bishop division of the first period, Christianity has become | Berkeley’s Alciphron, or the Minute Philosopher, among triumphant, and the duty of Apologetics has not been to other things, aims at establishing the existence of God defend it from the coarse attacks of passion and prejudice, | by showing that the evidence is as strong as the evidence but to give a philosophical answer to philosophical objec- | for the existence of our fellow-men ; Locke’s Reasonableness tions, and then to show how Christianity adapts itself to | of Christianity shows that the Christian theology attacked the intellectual, moral, and political requirements of men | is in all points able to be satisfactorily explained in accord- and nations. ance with human reason, if the same methods of investiga- The second period dates from the 6th to the middle of | tion and adjustment be allowed, which are usually permitted the 15th century. It is that period in the history of the- | when testing the reasonableness of any common statement ology in which the church attempted to rule thoroughly | or opinion; and in the Analogy of Bishop Butler the the intellectual life of mankind ; when the ecclesia salvans | whole argument rests upon the basis:—the Deists make had become an ecclesia docens, and the ecclesie patres had | certain statements about religion ; if these be true they given place to the ecclesie scholastici. It embraces the | contain as many difficulties as are to be found in erowth, life,

and decline of scholasticism. In this period | Christianity, and difficulties of the same kind, therefore there are no direct attacks upon Christianity, and so no Christianity is as reasonable, at least, as deism or any system direct defences of it; but still Apologetics, although for of mere natural theology. In the French scepticism, the the most part absorbed into the sum of Christian doc- | principal charge made against Christianity was that it trine, and recognisable only in the attempt to assimilate | rested on imposture and was maintained by trickery. An philosophy and theology, is to some extent visible in the | attack of this kind is answered, not so much by special jealous defence of particular doctrines against the attacks | defence, as by a silent appeal to historical testimony and of Nominalism, and reveals itself more prominently in | to the character of man, and it is not to be wondered at if the attacks made by Christian theologians upon the Jewish | the French Church has not produced any very valuable and the Mahometan religions. Such works as Abelard's apologetic writings defending Christianity from the special Dialogus inter Philosophum Judeum et Christianum, and | attacks of this school. The German rationalism began Thomas of Aquin's De Veritate Catholice Fidei contra Gen- | with Lessing's publication of the Wolfenbiittel Yragments, tiles, are the best examples of the Apologetics of this second | (extracts from a work by Reimarus, a schoolmaster at period. Hamburg), and ended with Kant. In its earlier form it The third period extends from the middle of the 15th | was little else than an importation of the ideas of the to the middle of the 17th century. This was the age of | English Deists, but latterly it assumed a special form by the Renaissance and of the Reformation, An age of inquiry, | upholding the authority of the individual reason. The doubt, and change. Along with the Reformation, keeping | replies to the ordinary arguments of the English Deists with it as long as it was merely destructive, and abandon- | were very numerous (cf. Lechler's Geschichte des Engl. ing it as soon as it became constructive, was a spirit or | Deismus), but do not deserve further notice. The authority tendency, best described by the term Humanism. The | of the individual reason may be vindicated, either in the umanists were men who were thoroughly imbued with the | province of criticism or in that of dogma; the one effort spirit of the old classical poets of Greece and Rome, and | gave rise to the critical rationalism of Eichhorn and Paulus, had imbibed many of the old pagan ideas with reference | and the other to the dogmatic rationalism of Wegscheider. to Christianity. Humanism, which was at first

learning | The critical rationalism of Eichhorn and his school has been revived, contained within it two tendencies which after- gradually answered by the advance of criticism itself, wards showed themselves hostile to Christianity: the first | which shows a progressive tendency towards higher and was embodied in literary criticism, and mainly displayed | more spiritual ideas, if not to a recognition of the inspired the antagonism between literature and dogma, while the | authority of Scripture. The dogmatic rationalism of other took the form of a pantheist philosophy founded on | Wegscheider has fallen before the new impulse given to the divinity of Nature. The most notable of the apologe- | dogmatic theology by Schleiermacher and Neander. tical works of this period are those of Marcilius Ficinus At the present time Apologetics seems to be in a transi- (De Religione Christiana), Eugubinus Steuchus (De Perenni | tion state. Since the time of Kant the historical method Phalosophia, from which Bishop Berkeley has borrowed | of investigation has become all powerful in almost every largely in his Siris), and Johannes Ludovicus Vives (De | department of human knowledge, and at the present the Vervtate Religionas Christiane). * | chief attacks made upon the supernatural and unique The fourth period extends from the middle of the 17th | character of the Christian religion and theology are based to the end of the 18th century. During this period, anti- | upon the comparative science of religions. It is held that christian speculation assumes distinct forms, and Apologe- | the Christian religion is the highest and most perfect tics undergoes corresponding changes. The period has | development to which the religious spirit of man has yet three divisions, which are to some extent successive, but | reached, but that it simply differs in degree of development are best distinguished by the form of unbelief then | from any other religion. It is said that the Christian prevalent—the English deism, the French scepticism, and | theology contains, like all other theologies, a great many the German rationalism. The English deism, which | elements of truth, but that it is simply a natural religion began with Lord Herbert of Cherbury and Hobbes, and | like any other. This mode of attack has not yet been ended with Hume, called forth an innumerable number of | thoroughly faced by Christian apologists, but it must be replies from Christian theologians, and the special nature of | the work of the Apologetics of the future to vindicate the the attack then made upon Christianity still gives their | supernatural character of Christianity by arguments which special form to English works upon

Apologetics. ‘The | are based upon historical investigation and comparison of general tone of English Deists was that there was no | the different religions of mankind. For the general out-

line of Apologetics see Hagenbach’s Encyclopaedie, and Heubner’s article on “Apologetik” in Ersch and Gruber’s Allg. Encycl. For natural theology cf Paley’s Natural Theology, Chalmers’s Natural Theology, Bishop Butler’s Analogy, and Hegel’s Philosophie der Religion. The Bamp- ton Lectures discuss many of the particular problems of Apologetics, and A. 8. Farrar’s Critical History of Free Thought (the Bampton Lectures for 1862) gives a very good history of Apologetics. (Taf 1.)

APOLOGUE. This word was originally, in Greek and Latin (déAoyos, apologus), employed loosely for any kind of story, but has now become synonymous with moral fable. See Fase,

APOPHTHEGM (drép6eypo., from pbéyyopat, to speak), a short, sententious, instructive utterance, as “‘ Knowledge is power,” “True greatness always wills.” Of such sayings Plutarch made a famous collection in his Apo- phthegmata Laconica, and the biblical book of Proverbs abounds with examples. very apophthegm is a possible proverb ; to pass into a proverb it requires age and cur- rency.

APOPLEXY (azé, tAjcow, to strike down, to stun), a term in medicine which, though now also employed with other significations, is commonly understood to apply to a fit of sudden insensibility occurring in connection with some diseased condition of the brain.

Apoplectic attacks vary both as regards their intensity and their attendant phenomena, but well-marked cases present the following symptoms: The person attacked becomes, more or less suddenly, deprived of consciousness and all power of voluntary motion. He lies as if in a deep sleep, with a flushed face, a slow pulse, stertorous breathing, accompanied with puffing of the cheeks during expiration, and with the pupils of the eyes insensible to light, and contracted or unequal. This state in many respects re- sembles the coma of narcotic poisoning, and is unfortunately too often mistaken by

unskilled persons for alcoholic intoxi- cation, The symptoms and history of the case, however, are usually sufficient to enable a medical man to form a correct diagnosis. In this condition of insensibility death may occur within a few hours, or there may be a gradual return to consciousness, in which case iti s frequently observed that some trace of the attack remains in the form of paralysis of one side of the body, while occasionally there may also be noticed some impairment of the mental powers, pointing to damage done to the brain. (See Paratysis.)

Although thus generally sudden in its onset, it is seldom that an attack of apoplexy occurs without some previous warning. Persistent headache of a dull throbbing character, a sense of fulness in the head, vomiting, giddiness, noises in the ears, slight confusion of mind, and numbness of a limb or of one side of the body, are among the more important premonitory symptoms ; and these may exist for a variable length of time' before the fit comes on. Such symptoms, more particularly the association of them, when occurring in a person at or beyond middle life are to be regarded with anxiety, as indicating danger of an apoplectic seizure. Various morbid conditions of the brain are capable of giving rise to fits of apoplexy. Hence different forms of apoplexy have been described by medical writers, such as the congestive, where the cause appeared to lie in an engorge- ment of the blood-vessels of the brain and its membranes ; and the serows, where sudden effusion of fluid into the ventricles or substance of the brain seemed to have brought on a fit. But by far the most frequent and important occasion of apoplexy is hemorrhage into the brain by the rupture of blood-vessels. Indeed, by many modern writers the term apoplexy is applied only to cases of cerebral heemor- rhage. The blood-vessels of the brain, like those in other parts of the body, are liable to undergo degenerative changes

after middle life. These changes affect the minute capil- laries, as well as the larger vessels, rendering their texture fragile, and at the same time impairing their function in carrying on the healthy nutrition of the brain. Hence, in the immediate vicinity of the diseased blood-vessels, the substance of the brain itself undergoes degeneration, and becomes softened. The capillary vessels having thus lost the natural support of the surrounding

tissues, and being themselves weakened by disease affecting their walls, are liable to give way, and blood escapes into the brain. The hzmorrhage may be slight in amount and in parts of the brain where its presence gives rise to little disturbance ; but where a large blood-vessel has ruptured, and more especially where the blood has been extravasated in or around the important structures at the base of the brain, the result is a fit of apoplexy as above described, and death not unfrequently follows within a short period. In favour- able cases where a certain measure of recovery takes place, the effused blood undergoes gradual absorption, or becomes enveloped in a sort of capsule formed by the surrounding brain substance, and ceases to cause further disturbance. But even in such cases some degree of paralysis remains at least for a time. Moreover, the nutrition of the brain is so impaired as to render probable a recurrence of the hemor- rhage, and thus the danger to life, as is well known, increases with each successive attack.

From what has been above stated, it will be observed that apoplexy is to be regarded as a disease of advanced life. Hippocrates states that it is of most frequent occur- rence between the ages of forty and sixty, and all medical experience confirms the truth of this observation. Never- theless it may occur at any period of life, and cases are not wanting of true apoplexy in very young children. It is said to be more common in men than in women, but this is denied by many observers, and appears at least doubtful. What has from early times been described as the apo- plectic habit of body, consisting in a stout build, a short neck, and florid complexion, is now generally discredited, it being admitted that apoplexy occurs about as frequently in thin and spare persons who present no such peculiarity of conformation. A hereditary tendency is acknowledged as one of the predisposing causes of apoplexy, as are also diseases of the heart and kidueys. With respect to the exciting causes of a fit of apoplexy, it may be stated generally, that whatever tends directly or indirectly to increase the tension within the cerebral blood-vessels may bring on an attack. Hence, such causes as immoderate eating or drinking, severe exertion of body or mind, violent emotions, much stooping, overheated rooms, ex- posure of the head to the sun, sudden shocks to the body, and the sudden suppression of evacuations, such as the menstrual discharge, may precipitate the fit.

A knowledge of these facts is of the utmost importance in the treatment of apoplexy, as obviously much can be done in the way of warding off fits where they appear to threaten, and of preventing a recurrence in cases where there have been previous attacks. With respect, further, to the treatment of apoplexy, it must be admitted that little can be done during the state of unconsciousness. The practice of blood-letting, once so common in this disease, is now almost entirely abandoned, although there are physicians who still recommend its employment, especially where the attack occurs in stout, plethoric persons. Where death appears to threaten from failure of the heart's action, warm applications to the surface of the body, and, should there exist any power of swallowing, the cautious adminis- tration of stimulants, are to be recommended. The case must be anxiously watched, and symptoms treated as they arise. When consciousness returns, the utmost care and quietness are to be observed to prevent the occurrence of

inflammatory action, so apt to be developed, as a result of hemorrhage into the brain. The term Apopley is also applied in modern medica] nomenclature to an extravasation of blood within the sub- stance of any organ in the body, as for instance, pulmonary apoplexy, where blood has been effused into the tissues of the lung. This use of the word, however, is altogether objectionable. (J. 0. A.) APOSTASY (émdéoracis), denoting in classic Greek (Herodotus, Thucydides) a defection or revolt from a mili- tary commander, is generally employed to describe a complete renunciation of the Christian faith. In the first centuries of the Christian era, apostasy was most commonly induced by persecution, and was indicated by some outward

act, such as offering incense to @ heathen deity or blas-

pheming the name of Christ. The Emperor Julian, who is known in history as The Apostate, abandoned Christianity

for paganism soon after assuming the purple, though it is

questionable whether he had ever really embraced the Christian faith. In the Roman Catholic Church the word apostasy is also applied to the renunciation of monastic vows (apostasis a monachatu), and to the abandonment of the clerical profession for the life of the world (apostasis a clericatu). Of the latter class a celebrated instance was Talleyrand.

APOSTLE (Greek décroAos, one who is sent forth) is in the New Testament, and in Christian literature, a technical term—apostle of Jesus Christ. It appears from Mat. x., Mark vi., that the name was originally applied to the twelve disciples in reference to the special mission to preach and work miracles in Israel, on which our Lord sent them forth during His ministry on earth. Luke alone of the evangelists uses the word in a technical sense out of con- nection with this mission. After the resurrection the eleven, who again become twelve by the election of Matthias in the room of Judas, are regularly designated apostles. The precise prerogative of the apostolate is not defined. The apostles themselves feel that their distinguishing qualification is their personal fellowship with Jesus through all his ministry, their main office to witness to the resurrec- tion (Acts‘i) They do not act hierarchically (Acts xv.), and decline to be withdrawn by administrative cares from the ministry of the word and prayer (Acts vi.) Their cen- tral and unique position is, in truth, too universally allowed to call for precise definition. Nevertheless, the question, What is an apostle? soon became a burning one in the church. How far a lax use of the name extended it ina lower sense to others than the twelve is a question of little importance (Acts xiv. 4, 14; Rom. xvi. 7%); but when Paul claims to be an apostle, and especially the apostle of the Gentiles, his claim is to preach the gospel with the authority of one who is equal to the twelve, and responsible only to Christ. He is not an apostle (sent) from man or through man, he received his gospel not from man, but by revelation of Jesus Christ, whom he has seen as well as the twelve, and his apostleship is confirmed by miracles, and sealed by his success in founding churches (Gal. 1.; 1 Cor. ix. 1, #7, xv. 8, f.; 2 Cor. xii. 12). The last mark is acknowledged by the twelve as decisive (Gal. ii.) Never- theless, Paul’s Judaising opponents continue to deny his apostolic authority (2 Cor.) The exact relation of parties which this controversy presupposes is a leading subject of debate in recent criticism. Here we have only to observe that the notion of apostleship now appears as that of evangelical authority derived direct from Christ and irresponsible to

man. This authority is not properly administrative, though it is sometimes brought to bear on administrative questions. The apostleship is not a church office, but a charisma, similar to prophecy, but superior (1 Cor. xii. 28), and having its fit exercise in the founding of

churches by direct testimony to Christ. Thus, the church

is said to be built on the foundation of the apostles and

prophets (Eph. ii. 20), not because they are the basis of the hierarchy, but because their activity lay at the root of the growth of the Christian society.

Very early, however, the notion that the apostleship is essentially an hierarchical office found entrance in the. church. Irenzus and Tertullian regard the episcopate as a continuation of the apostolic functions, especially connect- ing this position with the idea of an authoritative tradition of apostolic doctrine. his view is further developed by Cyprian, and so becomes the foundation of the episcopal system of the Catholic Church, which regards all church power, especially disciplinary power, as entrusted*by Christ to the apostles, from whom the bishops derive their authority by apostolic succession. This notion of the apostleship is based on an uncritical interpretation of Mat. xvi. 18, f.; John xx. 21, 7. The later Papal system goes still farther, so that Bellarmine and others teach that Peter alone was ordained bishop by our Lord, and all the other apostles by Peter.

Of the history of the apostles we have almost no authentic knowledge beyond what is stated in the New Testament. The names of the twelve are given in Mat. x., Mark iii, Luke vi, Acts ii With regard to these lists it is to be observed that the Lebbeus of Matthew is identical with the Thaddeus of Mark, and that both these titles must probably be viewed as surnames of the Judas whom Luke calls either son or brother of James (‘TovSas “YaxdBov). Bartholomew, too, is probably a patronymic of John’s Nathanael. The history of the Acts tells little about any of the apostles except Peter and Paul ; and precisely with regard to these names the statements of the book have been made subject of critical controversy. (See Acts or AposrtEs.) ‘The

later history of Peter has an artificial interest from the importance attached by the Roman Church to his episcopate at Rome, and the history of John is involved with the question of the genuineness of the Johanuine writings. Pretty early tra- dition associates Philip with Phrygia, Thomas with Parthia, Andrew with Scythia, Bartholomew with India. Later traditions make the apostles divide the various countries between them by lot, and assert (against earlier tradition) that all except John were martyrs. The form ultimately assumed by the legendary history of the apostles may be seen in the Latin work which bears the name of Abdias, in Fabricii Codex Apocryphus N. T.. (Ww. B. 8.)

APOSTLES' CREED, one of the earliest and most generally accepted symbols of the Christian faith, so called from the fact that its authorship was attributed to the twelve apostles. See CREEDs.

APOSTOLIC or APOSTOLICAL, a name assumed at different times by various churches and sects on the ground of some special connection with the apostles. It was applied in the first centuries of the Christian era to certaill churches that claimed to be founded by individual apostles and especially to Rome, Alexandria, Antioch, and Jerusa- lem. 'The title was also borne by the bishops of these. churches as the successors of the apostles.

APOSTOLIC CANONS. These are rules to regulate Christian life and the discipline and government of the Christian church, which, it is supposed, have come down to us from the apostles. Several collections of rules claiming apostolic origin and authority have descended to us, and of these the two most important are the canons of the Apostolic Synod of Antioch and the collection now described, which bears the title Canones qui dicuntur Apostolorum (Kavoves trav &yiwv kat raveértov 'AroaTdAwv). The Apostolic Canons consist of a series of eighty-five rules, of which the first fifty are held to be the most impot-

tant. These rules contain a tolerably complete directory for the guidance of the clergy in their daily life and usual round of duties. It is somewhat remarkable that the life of the ordinary layman is for the most part left

unnoticed; four Canons only deal with the laity, the rest of them speak of the clerical life and that alone. The authority of these Canons varies in the Eastern and in the Western Church. The Eastern Church, following the guidance of John of Damascus, has received as authoritative the whole eighty- five, and makes them of equal authority with the Epistles of St Paul, z.¢., acknowledges that they possess plenary authority. The Western' Church has always hesitated to receive more than the first fifty, and has received them more on the recommendations of such distinguished popes as John IL, Stephen IIL, and Urban IIL. than because of their own intrinsic value; and it was only when they were incorporated in the decretals that they obtained a real authority.

According to some authors, they are first quoted in the Acts of the Synod of Constantinople, in 394 a.D., and in those of the Synods of Ephesus and Chalcedon, in 431 and 451 a.p. Some have said that they are mentioned in the Decretum de libris recipiendis, issued by Pope Gelasius (492-496 a.p.), while others have pointed out that the name occurs in those MSS. only which have the decree of Hormisdas (514-523). Perhaps the soundest decision is, that the collection is not mentioned in history until about the end of the 5th century ; it is undoubted that it was in existence before the beginning of the 6th, for the Latin trans- lation of the first fifty Canons dates from the year 500 a.p.

A great deal of criticism has been expended upon this collection of ecclesiastical rules. It was once commonly received that the Apostolic Canons were the authoritative decisions upon church life and discipline enacted by the first council of Jerusalem, whose proceedings are recorded in the Acts of the Apostles. Since the 16th century juster views have prevailed. The Canons themselves contain statements which are almost identical with many passages in Holy Scripture, and with many of the decisions of the earlier synods and councils, more especially those of Antioch, Nicea, and Laodicca; it is also evident that much that they include is but the description of the tradi- tion and practice of the church then existing. The follow- ing questions then arise :—(1.) Are the passages which resemble what we find in Scripture taken therefrom, or from contemporary independent oral tradition? and, (2.) Have the rules, which are almost literally identical with the decisions of the earlier councils,

suggested and formed the basis of these decisions, or are they themselves suggested by the decisions of the councils? When we bear in mind the fact that the historical existence of the Holy Scriptures and of the councils is well assured, and that we have no trustworthy evidence of the existence of this collection until the end of the 5th century, the conclusion forces itself upon us that the Apostolic Canons must be based upon the Acts of the earlier councils, not these upon the Canons, Critics have differed about the precise date of the compila- tion. The Magdeburg Centuriators think that it was some time in the 3d century ; while Dalleus is of opinion that it was not until the middle of the 5th century ; others. place it between these dates. Perhaps the best conclusion we can come to is that the so-called Apostolic Canons are a compilation of practical rules for the guidance of the clergy made from holy Scripture, the decisions of the earlier councils, and existing ecclesiastical usage, by an unknown ecclesiastic belonging to the Syrian Church, who lived in the 4th or 5th century.

_See Dalleus, De Pseudepigraphis Apostolorum ; Franciscus Tur- manus, Pro Canonibus Apostolorum, who asserts their apostolic origin ; Bickrell, Geschichte des Kirchenreehts. (T. M. L.)

APOSTOLIC CONSTITUTIONS are a collection of eight books of directions and prescriptions on ecclesiastical aud theological matters, for which apostolic origin and authority have frequently been claimed. It is probable that the first six books form the earliest part of the whole, and it is certain that they were known and quoted as a separate treatise, under the title ra dudacxadia tov Arocrddwv; the seventh book was also separately known, and in many parts bears a curious resemblance to the Epistle of St Barnabas ; the eighth is also an independent work, and is more legislative than the others. Historians have differed as to the first mention of the collection. Some, without much warrant, think that the work is mentioned by Euse- bius and Athanasius, under the title ddayy or didaxal rdv ’AzrooroAwv ; while others, with more justice, think that it is not alluded to by any well-known writer until Epiphanius (d. 402), quotes it under the name d&udragis tov ’Azo- otoAwv didackadia. It was well known in the 6th and 7th centuries. The book as a whole has never been received as an authority in the church, and its influence has been greater in the East than in the West. The prin- cipal defenders of its apostolic origin and authority have been such English Episcopalian writers as Stapleton, Whiston, and Pearson.

See Whiston, Primitive Christianity Revived, 1711; Baur, Ueber der Ursprung des Episcopats in der Christlichen en

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APOSTOLIC FATHERS. The apostolic fathers is a name given to certain writers in the earliest period of Christianity, who were believed to have been the disciples of the apostles, and to have had intercourse with them. Those generally included under the title are Clemens Romanus, Ignatius, Polycarp, Barnabas, and Hermas. Sometimes the name is extended to Papias of Hierapolis and the writer of the Epistle to Diognetus. A critical examination of the writings attributed to these men, and a critical sifting of the traditions which we have in relation to their history, bring out the circumstance that the name is unsuitable. Clemens Romanus, Barnabas, and Hermas were supposed to be persons mentioned in the New Testa- ment; but criticism proves conclusively that this is a mistake in regard to Barnabas

and Hermas, and possibly also in regard to Clemens. Polycarp, in all probability, and according to the best testimony, had intercourse with apostles, but it was in his early youth; and his Letter belongs to a period considerably later than that of the apostles. The Epistles of Ignatius, as well as the personal history of that martyr, are involved in great obscurity, and critics differ widely in regard to both. At the same time, the writings assigned by most critics to these men with some degree of certainty belong to a very early age of Christianity. They are among the earliest utterances of the Christian faith which have come down to us. All of them are of the nature of occasional productions, with perhaps the exception of the Pastor of Hermas. All of them breathe a spirit of deep piety. There is no attempt to formulate the truths of Christianity. There are very few references to the books of the New Testament, and very few quotations from them. All of them are written in Greek.

Clemens Romanus.—According to the statement of Irenzeus, Clemens was the third bishop of the Roman Church ; this seems to have been the tradition among the Greek writers. ‘Tertullian, on the other hand, seems to have believed that he was the first bishop, and that he had – been ordained by St Peter. Origen regarded him as the Clemens mentioned in the Epistle to the Philippians, and Clemens Alexandrinus often calls him an apostle. Nothing is known of his death. Very late fictions represented him asa martyr. Eusebius gives as the date of his episcopate from 93 to 101 a.p. The only writing which can in any

satisfactory manner be ascribed to Clemens Romanus is an epistle from the Roman Church to the Corinthian. Quarrels had arisen in the Corinthian Church, most pro- bably in the reign of Domitian, as to some of the office-bearers of the church. And the Roman Church sent a letter to the Corinthian Church urging it to pursue a peaceful course, to shun envy and jealousy, and to do all things in order. The writing of this letter is ascribed to Clemens by Dionysius, bishop of the Corinthian Church, in a letter to Soter, bishop of the Roman Church (166-174 A.D.), and all subsequent testimony is in favour of this authorship. The letter was found at the end of the Codex Alexandrinus. Its position there is in harmony with the cir- cumstance noted

by several of the ancients, that it was read in the churches on the Sunday. Clemens Alexandrinus also frequently quotes it as the work of the “ Apostle Clemens,” and the mode of quotation is such as to lead one to believe that he regarded it as Scripture, though some have maintained that he did not regard it as canonical. The genuineness of the epistle has been generally acknow- ledged. ‘There is strong external testimony for it, and the internal evidence is at least not against it. But as Dionysius of Corinth (166 «..) is the first to mention Clemens as the author, there is a considerable interval between the date usually assigned to the epistle and the time of Dionysius, during which no one testifies to the epistle. Accordingly some critics have refused to recognise Clemens as the author, and they put the letter well on into the 2d century. The date usually assigned to the letter is 96 or 97 A.D. Some critics have assigned it to the year 68 a.D., but the arguments are not satisfactory. Some writers have taken exception to a few chapters in the letter which they regard as interpolations, but their opinions have not been generally adopted. The letter is defective. A whole leaf of the MS. is supposed to be wanting. The best edition of the epistle is by Professor Lightfoot (London and Cambridge, 1869). A whole literature arose around the name of Clemens in subsequent times. Of this literature the following‘portions have come down tous. 1. A second Epistle to the Corinthians, found along with the first in the Codex Alexandrinus. As far as one can judge from the writing itself, this work is rather a homily than a letter. In all probability its author belonged to Egypt. Various suppositions have been made as to its authorship, but none that commands the assent of a considerable number of critics. It seems to have been written towards the middle or end of the 2d century. 2. Two letters on Virginity, found in Syriac. There is no external testi- mony that Clemens was the author of these letters, and they breathe a spirit of asceticism and dislike of marriage different from that prevalent in the early times of Christi- anity. They also refer to customs of a later date. Notwith- standing this, some critics, especially some Roman Catho- lics, have keenly defended their genuineness. 3. The Clementines. These appear in two forms: the Recognitions in Latin, and the Homikes in Greek. They are a fiction. The writer attempts to represent the state of the church as it was during the period between the ascension of Christ and the entrance of St Paul on his work as anapostle. St Peter is accordingly the hero of the work, and his great enemy is Simon the magician. The doctrines of the book are peculiar,

and are most nearly allied to those that are reckoned to be the doctrines of the Ebionites. The ques- tion arises, Did the writer wish to represent the doctrines as the merely temporary doctrines of that period of transi- tion? Or did he regard the doctrines which he has put forth in the work as the only true doctrines, and the sub- sequent doctrines of the Catholic Church perversions of the true and aberrations from them? Baur and the Tiibingen school have regarded the book as giving a

genuine picture of the state of the early church and of Ebionitic doctrine, and a great part of their theory of the origin and rise of Christianity is bascd upon it. They suppose that in Simon the magician the writer has attacked the apostle Paul. Many critics suppose that the work was written at a very early period, but that it received numer- ousadditions. As the work now exists, it seems to belong to the end of the 2d or beginning of the 3d century. 4. The Apostolical Constitutions. This work is a series of regula- tions in regard to the management of the church, such as the functions and character of bishops, presbyters, and deacons (see last article). In all probability the work was the result of one addition after another made to an origin- ally small nucleus. Some assign portions of it to the apostolic age. Whiston thought that it was inspired. Most probably the main portion of it belongs to the 3d century. There is no reason for connecting with it the name of Clemens, though this was done by ancient writers. We should add to this list that some ascribed the canonical Epistle of the Hebrews to Clemens Romanus. Ignatius.—The information we get in regard to Ignatius up till the time of Eusebius is exceedingly scanty. He is mentioned in the epistle of Polycarp. Origen speaks of him in two passages, which, however, may possibly be interpo- lations. Eusebius in his Chronicon, at the year 70 or 71 A.D., states that he was appointed bishop of Antioch, and at the year 109 a.p., that he suffered martyrdom. He repeats the same statements in his Xcclesiastical History, introducing his account of the martyrdom with the words, “The story goes.” After the time of Eusebius our information becomes much more precise and minute. The birthday of the martyr (i.c., the day of his martyrdom) was celebrated in the church of Antioch. Speeches were delivered in his praise. Wonderful stories were told, of him. He was one of the children whom Christ took up in his arms and blessed.

He introduced antiphonal chants into the service of the church, because he had seen a vision of angels praising God in antiphonal hymns. The details of his martyrdom are given in a document devoted to the purpose. Of this document there are eight forms; but one is generally believed to be better than the rest. This one states that Trajan, in the ninth year of his reign, was in Antioch, that Ignatius was brought before him, and that the emperor condemned the bishop to be sent to Rome, and to be exposed to the wild beasts. The writers then describe the journey of Ignatius to Rome, mention various letters which he wrote on the way, and then narrate his exposure to the wild beasts, and how they saw him afterwards in a vision. The letters of Ignatius cause great difficulty to the critic. Eight of the letters ascribed to him are now universally rejected. There remain seven others. These seven appear in two Greek forms, a longer and a shorter. Latin translations of these forms are found, and they differ somewhat from the Greek. And of the seven letters three are found in Syriac, and the Syriac form is much shorter than the shortest of the Greek. Which are the original letters? Or have we the original letters at all? Unfortunately before the time of Eusebius there is no external testimony to these letters that can give us any clue to the true nature of the text. And the testimony of Eusebius is of little value. He states distinctly that there were seven letters. But the critics who maintain that the seven shorter Greek letters are largely interpolated, have no hesitation in agreeing to the opinion that these interpolations were made before the time of Eusebius. The shorter form unquestionably belongs to the 2d or 3d century, most pro- bably to the 2d. A few critics have maintained that the longer form is the genuine. A very large number of critics regard the shorter Greek form as the original form, though almost all allow that there are some traces of interpolation

even in the shorter epistles. Other critics maintain that the shorter Syriac forms are alone genuine, that they are not epitomes, but the original letters, and they appeal to the circumstance that all the references to the epistles up to the time of Eusebius belong exclusively to the three Syriac epistles. The question is embittered by a keen controversy in regard to Episcopacy, the Ignatian letters being supposed to afford strong evidence of the early institu- tion of that form of church government. The longer text was first

known to scholars. Usher discovered a Latin version of the shorter form, and Vossius the Greek original of this version. Tattam found the Syriac translation in an Egyptian monastery, and Cureton edited it in 1845. Cureton's services in connection. with Ignatius deserve the highest praise; and his Corpus Ignatianum contains almost all the evidence that can be brought to bear on the subject. The contest in regard to Ignatius's writings has been keen in various periods of the church's history; and since the Syriac version appeared, the subject has been discussed by a host of writers, among whom may be mentioned Bunsen, Baur, Dusterdieck, Denziger, Hilgen- feld, Lipsius, Ritschl, Merx, Nirschl, Jahn, and Newman,

Polycarp was bishop of Smyrna. The principal part of the information we have in regard to him is derived from Irenzeus, and may be accepted with confidence. Irenzus knew Polycarp personally, and remembered how Polycarp "related his intercourse with John and the rest who had seen the Lord." The apostles appointed Polycarp a bishop of the church in Smyrna, and he remained there a long time teaching the truth. In the time of Anicetus, Polycarp came to Rome, and showed a strong spirit of love and charity, which was fully reciprocated by the Roman bishop. They differed in regard to the celebration of the day of the passover, but their differences did uot interfere with their love for each other. A special ducument describes the martyrdom of Polycarp. There are good reasons for doubting the minute accuracy of this work, but the main circumstances have the appearance of being true. A persecution had arisen in Smyrna against the Christians, and naturally a demand was made for Polycarp, the chief of the Christians. At first he fled, but finding that this was of no use, he allowed himself to be apprehended and brought back. He was led before the proconsul, and urged to swear by Cesar and revile Christ. " Highty and six years," said Polycarp, "have I served Him, and He has done me no ill, and how can I blaspheme my King who has saved me?" 'The multitude wished the Asiarch to expose the bishop to the lions, but the Asiarch refused, as the time for lions was over. So the people gathered wood and lighted a fire. And Polycarp was placed in the fire, and ultimately also stabbed. The date of his martyrdom has been matter of keen discussion. Eusebius fixed it at 166 a.p. The Martyrium mentions that it took place in the proconsulate of Statius Quadratus. Recently Wadding- ton has tried to show that Quadratus was proconsul in 154-5, and Lipsius has based on this result the con-

clusion that Polycarp suffered martyrdom in 155. This date, however, is open to serious objections; and even Waddington's reasons for placing the proconsulate of Quadratus in 154-5, are not of a satisfactory nature. The only writing that can be now attributed to Polycarp is a letter to the Philippians. This letter is mentioned by Irenzeus and by subsequent writers. Jerome mentions that it was read in the churches. It isa simple outpouring of ordinary Christian thonght and feeling. The Tiibingen School deny the genuineness of the epistle on internal evidence. Ritschl has tried to show that it is largely interpolated, and there are strong reasons for believing the thirteenth chapter an interpolation.

Barnabas.—There has come down to usa work called the

Epistle of Barnabas. This work is unanimously ascribed to Barnabas, the companion of St Paul, by early Christian writers. Clemens Alexandrinus quotes the letter seven times, and speaks of it as the work of the apostle Barnabas. Origen, Eusebius, and Jerome mention it. The internal evidence is conclusive against its genuineness. The writer regards the Jews as entirely wrong in having practised the ceremonial law. He thinks that Moses never intended that the precepts of the law should be carried out literally. They were to be understood from the first spiritually. By this literal interpretation the Jews had forfeited all claim to the covenant. The covenant belongs only to Christians who obey the law in spirit. The writer applies this prin- ciple to sacrifices, circumcision, and the Sabbath. It is difficult to imagine that Barnabas could have adopted such a mode of viewing the law. In all probability he adhered to some of the Jewish practices to the end of his days. Moreover, the writer commits such mistakes in relation to the Jewish ritual as no Jew would commit who had had practical experience of it. Some of the opinions in the lette1, and the whole tone of thought indicate that the writer had strongly felt the influence of Alexandrian Judaistic speculation. Accordingly, some critics have maintained that it was writtenin Alexandria. There is no clue to a date; but there are various indications which have been differently interpreted by different critics. Some, as Weizsiicker, have assigned it to the reign of Vespasian ; others, as Wieseler, to the reign of Domitian ; but the great majority of critics assign it to the

reign of Hadrian, some time between 119 and 126 4.p. The letter consists of two parts. The latter part is somewhat different in style and purport from the former, and, accordingly, doubts have been entertained as to its genuineness. But there is no good reason for doubt, and external testimony is in favour of it. The first five chapters were extant only in the Latin translation until Tischendorf discovered the entire Greek of the first part in the Codex Sinaticus. The letter is interesting, as throwing light upon a peculiar phase of theological speculation in the early church. Hermas.—The Pastor of Hermas is one of the most interesting {books of Christian antiquity. The name Hermas occurs several times in the work, and it was there- fore natural for the ancients to suppose that this was the name of the author. The book at a very early period became widely known in the East, and was regarded as inspired. TIrenzus, Clemens Alexandrinus, and Origen speak of it and quote it as Scripture, and Eusebius uses somewhat similar language in regard to it. Origen asserts his belief that the author was the Hermas mentioned in the Epistle to the Romans. The African Church held a different opinion in regard to it. Tertullian speaks slight- ingly of it; and the story became current that it was written by a Hermas, who was brother to Pius, bishop of Rome from 140 to 155 a.p. It may be doubted whether the author has really given his name. The work is ficti- tious in form, and there is no good reason for supposing that he has introduced any real characters into it. There is no clear indication of a date; but various circumstances lead to the inference that it was written towards the end of the reign of Hadrian, or the beginning of the reign of Antoninus Pius. Internal evidence points strongly to Italy as the place in which it was written. The book is divided into three parts: visions, commandments, and similitudes. It was very popular with the ancient church, and deservedly so. It presents Christian truth in an attractive manner. Its tone is high and noble, and it breathes the spirit of the gospel of love. The name of Christ does not occur in it, and as the references to the Son of God are few, some have characterised the book as strongly Judaistic. Indeed, various heresies and heretical tendencies have been dis-

covered in it by keen-eyed critics ; but as Clemens Alex- andrinus and Origen failed to see them, and as the great mass of the early church

accepted it as cminently fitted to edify, we cannot but think that the critics are wrong. The Pastor of IZermas has come down to us in several Latin translations. Simonides was the first to give us any por- tion of it in Greek. He brought three leaves of a codex of it from Mount Athos, with a copy of a considerable portion of the rest. The remainder of the Athos MS. has not been discovered. ‘Tischendorf found a large portion of the Pastor of Iermas in Greek at the end of the Codex Sinaiticus. The Greek is very nearly the same as the Greek of Simonides.

There are numerous editions of the works of the apostolic fathers, but special mention may be made of those of Cotelerius, Hefele, Dressel, Hilgenfeld, and Jacobson. Professor Lightfoot’s Clemens Romanus is the first part of what promises to be the most satisfactory edition of the apostolic fathers. Translations of all the works mentioned in this article, including the writings attributed to Clemens, are given in Clark’s Ante-Nicene Christian Library; and the works are discussed in Hilgen- feld’s Apostolische Viiter, 1853, and Donaldson’s Apostolical Fathers, 1874. (sD)

APOSTOLICI, or Aposronic BRETHREN, a name assumed by three different sects, which professed a close adherence to the doctrines and practice of the apostles. The earliest, known also as the Apotactict, were a branch of the Encratites, and came into existence in the 3d century. According to Epiphanius, their principles were communistic. he second sect of the name was formed in the district surrounding Cologne about the middle of the 12th century. Its members were zealous reformers, rejecting the authority of the Pope and the rites and ceremonies of the church. Tt is not certain that they absolutely rejected marriage, though they preferred celibacy. Founding on the authority of St Paul, the celibates took spiritual sisters, with whom they lived in concubinage. Bernard of Clairvaux wrote against the sect, and some of its most prominent members being brought before the archbishop of Cologne were con- demned to the flames. The third sect of Apostolici in chronological order was founded by Gerhard Segarelli, a mechanic of Parma, towards the close of the 13th century. Segarelli, who had sought admission unsuccessfully to the Franciscan order, was much impressed, it is said, by a picture of the apostles which hung in the Franciscan chapel at Parma. Becoming convinced that the much-needed reform of the church could only be effected by a return to the apostolic

practice, he sought to establish a community in which the life of the apostles should be imitated as closely as possible. By slow degrees he gathered a con- siderable number of followers, chiefly from the lower orders, who weut about from place to place clad in white robes, with long beards, dishevelled hair, and bare heads, accom- panied by women whom they called their spiritual sisters. Like the other two sects of the same name, they established a community of goods. Though their practice was thus peculiar, their doctrinal teaching did not fora considerable period seriously diverge from the orthodox standard. The arrest of their leader by the bishop of Parma (1280), and condemnatory decrees issued by Honorius IV. (1286) and Nicolas IV. (1290), changed their position into one of open hostility to the Church of Rome. Accepting the predictions of the Abbot Joachim of Flora, they looked for the down- fall of the papacy, which they described as the Babylon of Scripture, and the establishment of a new and purer church upon its ruins. Segarelli was accused of heresy in 1294, but escaped for the time by recantation. In 1300, how- ever, he was condemned asa relapsed heretic to the flames. His place was immediately taken by Dolcino of Novara,

the natural son of a priest, under whom the sect became still larger and more formidable. He seems to have been a man of superior power to Segarelli in all respects, and especially to have had considerable talent as a military leader, having succeeded in carrying on a war for two years against Raynerius, bishop of Vercelli. In 1307 he was defeated, taken prisoner, and put to a cruel death at Ver- celli. The name “ Dolcinists,” frequently applied to the sect, marks the extent of Dolcino’s influence, as does also an allusion to him in Dante’s Jnferno. The sect of the Apostolici maintained its existence in spite of continual persecution until the beginning of the 15th century, when it became extinct or was merged in other sects. (See Muratori’s “Historia Dulcini,” in his Rerum Italicarum Scriptores, 1x. § 425; Mosheim’s Geschichte des Apostelordens, 1748 ; Neander’s Church History, vol. viii. ; Mariotti’s Fra Dolcino and his Times, 1853 ; Milman’s Latin Christi- anity, vol. vil.

APOSTOLIUS, Micwazrt, a Greek theologian and rhetorician of the 15th century. When, in 1453, the Turks made themselves masters of his native city, Con- stantinople, he fled to Italy, and there obtained the pro- tection of Cardinal Bessarion. But engaging in the great dispute that then raged between the upholders of Aristotle and Plato, his zeal for the latter led him to speak so dis- respectfully and contemptuously of the more popular philosopher and his defendcr, Theodorus of Gaza, that he fell under the severe reprehension of his patron, who was too thoroughly a follower of Plato to wish his cause to be maintained by weapons so unworthy. He afterwards re- tired to Crete, where, with a ‘‘ proud humility,” he earned a scanty living by the teaching of children and the copy- ing of manuscripts. Many of the productions of his pen are still to be found in the libraries of Europe. One of them, a copy of the Jcones of Philostratus at Bologna, bears the inscription : “‘ The king of the poor of this world has written this book for his living.” Of his numerous works a few have been printed :— Ilapouuia, Basle, 1538, now exceedingly rare; a collection of proverbs in Greek, of which a fuller edition appearec at Leyden, ‘‘ Curante Heinsio,” in 1619; Oratio Panegyrica ad Fredericum ITI. in Freher’s Scriptores Rerum Germanicarum, vol. iL, Frankfort, 1624; Georgii Gemisthi Plethonis et Mich. Apostolii Orationes funebres duce in quibus de Immortali- tate Anime exponitur, Leipsic, 1793; and a work against the Latin Church and the Council of Florence in Le Moine’s Varia Sacra. Apostolius died about 1480, leav- ing two sons, Aristobulus Apostolius and Arsenius. The latter became bishop of Malvasia (Momembasia) in the Morea.

APOTHECARY. This name is derived frém the Greek ’AzroOn«y, a word used by Galen to denote the repository where his medicines were kept. In Scotland the term is often applied to one who compounds and sells drugs, but: this class is now defined in the language of some recent Acts of Parliament as pharmaceutical chemists, and chemists and druggists, both in England and Scotland. In England the name indicates a general practitioner in medicine who supplies drugs to his patients. The Apothecaries’ Society of London is one of the corporations of that city, and both by Royal Charters and Acts of Parliament exercises the power of granting licences to practise medicine. The members of this society do not possess and never have pos- sessed any exclusive power to deal in or sell drugs; and until very lately (1868) any person whatever might open what is called a chemist’s

shop, and deal in drugs and poisons. In that year, however, the Pharmacy Act was passed, which prohibits any person from engaging in this business without being registered.

From early records we learn that the different branches

of the medical profession were not regularly distinguished till the reign of Henry VIII., when separate duties were assigned to them, and peculiar privileges were granted to each. In 1518 the physicians of London were incorporated, and the barber-surgeons in 1540. But, independently of the physicians and the surgeons, there were a great number of irregular practitioners, who were more or less molested by their legitimate rivals, and it became necessary to pass an Act in 1543 for their protection and toleration. As many of these practitioners kept shops for the sale of medicines, the term “apothecary” was used to designate their calling.

In April 1606 James I. incorporated the apothecaries as one of the city companies, uniting them with the grocers. On their charter being renewed in 1617 they were formed into a separate corporation, under the title of the “Apothe- caries of the City of London.” These apothecaries appear to have prescribed medicines in addition to dispensing them, and to have claimed an ancient right of acting in this double capacity; and it may be mentioned that Henry VIIL., after the grant of the charter to the College of Physicians, appointed an apothecary to the Princess Mary, who was delicate and unhealthy, at a salary of 40 marks a year, “pro meliore curd et consideratione sanitatis suc.” During the 17th century, however, there arose a warm contest between the physicians and the apothecaries,—the former accusing the latter of usurping their province, and the latter continuing and justifying the usurpation until the dispute was finally set at rest by a judgment of the House of Lords in 1703, when it was decided that the duty of the apothecary consisted not only in compounding and dispensing, but also in directing and ordering the remedies employed in the treatment of disease. In 1722 an Act was obtained empowering the Apothecaries’ Com- pany to visit the shops of all apothecaries practising in London, and to destroy such drugs as they found unfit for use. In 1748 great additional powers were given to the company by an Act authorising them to appoint a

board of ten examiners, without whose license no persons should be allowed to dispense medicines in London, or within a circuit of 7 miles round it. In 1815, however, an Act of Parliament was passed which gave the Apothecaries' Society a new position, empowering a board, consisting of twelve of their members, to examine and license all apothecaries throughout England and Wales. It also enacted that, from the Ist of August of that year, no persons except those who were so licensed should have the right to act as apothecaries, and it gave the Society the power of prosecut- ing those who practised without such license. But the Act expressly exempted from prosecution all persous who were then in actual practice, and it distinctly excluded from its operation all persons pursuing the calling of chemists and druggists. It was also provided that the Act should in no way interfere with the rights or privileges of the English Universities, or of the English College of Surgeons or the College of Physicians; and indeed a clause imposed severe penalties on any apothecaries who should refuse to compound and dispense medicines on the order of a physician, legally qualified to act as such. It is therefore clcar that the Act contemplated the creation of a class of practitioners who, while having the right to practise medicine, should assist and co-operate with the physicians and surgeons. —

Before this Act came into operation the education of the medical practitioners of England and Wales was entirely optional on their own part, and although many of them possessed degrees or licences from the universities or col- leges, the greater number possessed no such qualification, and many of them were wholly illiterate and uneducated. The Court of Examiners of the Apothecaries' Society being

empowered to enforce the acquisition of a sufficient medical education upon its future licentiates, specified from time to time the courses of lectures or terms of hospital practice to be attended by medical students before their examination, and, in the progress of years, regular schools of medicine were organised throughout England.

As it was found that, notwithstanding the stringent regulations as to medical acquirements, the candidates were in many instances deficient in preliminary education, the Court of Examiners instituted, about the year

1850, a preliminary examination in Arts as a necessary and indis- pensable prerequisite to the medical curriculum, and this provision has been so expanded that, at the present day, all medical students in the United Kingdom are compelled to pass a preliminary examination in Arts, unless they hold a university degree. An Act of Parliament, passed in 1858, and known as the Medical Act, made very little alteration in the powers exercised by the Apothecaries' Society, and indeed it confirmed and in some degree amplified them, for whereas by the Act of 1815, the licen- tiates of the Society were authorised to practise as such only in England and Wales, the new measure gave them the same right in Scotland and Ireland.

A still more recent Act, passed in 1874, relates exclu- sively to the Apothecaries' Society, and is termed the Apothecaries' Act Amendment Act. By this measure some provisions of the Act of 1815, which had become obsolete or unsuited to the present times, were repealed, and powers were given to the Society to unite or co-operate with other medical licensing bodies in granting liceuces to practise. The Act of 1815 had made it compulsory on all candidates for a licence to have served an apprenticeship of five years toan apothecary, and although by the inter- pretation of the Court of Examiners of the Society this term really included the whole period of medical study, yet the regulation was felt as a grievance by many members of the medical profession. It. is accordingly repealed, and no apprenticeship is now necessary. The restriction of the choice of examiners to the members of the Society is also repealed, and the Society has moreover the power (which it did not before possess) to strike off from the list of its licentiates the names of disreputable persons. As a question was raised, under the Act of 1815, whether women were admissible as candidates for the medical licence (owing to the ambiguous wording of the measure), and as the society, acting under legal advice, had adniitted a woman to the licence, the Act of 1874 refers to the point, but leaves it stil] undecided, merely specifying that the new Act does not deprive the Society of any right or obligation they may have tv admit women to examina- tion, and to entcr their names on the list of licentiates if they acquit themselves satisfactorily.

APOTHEOSIS, deification, the enrolment of a mortal among the gods. In its most rudimentary form, this practice may be regarded as an offshoot of

the universal belief of primitive mankind in the existence of disembodied spirits, and their continued agency in human affairs. (Tylor, Primitive Culture, ch. xi—xvii.) An invisible being thus invested with beneficent or malefic attributes, and capable of being offended or propitiated, virtually becomes a local or tutelary divinity. The cultus of such genii cou- stitutes a large part of the religion of most negro nations. In China it takes the shape of a respectful veneration of ancestors, accompanied by a species of liturgical service. In India it is apparently excluded by the tenet of incarna- tion, according to which the individual either resumes a rank previously held by him, or enters upon a cycle of transmigrations admitting of no fixity of condition and, consequently, of no absolute deification. The Egyptian, Persian and Pheenician theologies seem to offer no trace of

the idea ; shown to have Assyria and Babylon. of its prevalence among a

but there is reason to expect that it will be been a leading feature of the religions of For perfectly unequivocal examples highly cultivated people, we must resort to Greece and Rome. In Greece the worship of deified heroes was universal. A distinction, however, must be observed between the imaginary patriarchs of the golden age, who, after their decease, according to Hesiod (Op. et Dies, 121), became by the counsel of Zeus beneficent demons, guardians of mortal men, but who seem to have enjoyed only a vague and general veneration, and the mythical heroes, definite objects of worship, who may have been equally apocryphal, but whose legends were none the less regarded as authentic history. The reputed founders of cities were especially honoured with sacrifices by their descendants, and the practice extended to such indubitably historical personages as Lycurgus, Brasidas, Harmodius, Aristogiton, and Ptolemy Lagus. Tnstances of the origina- tion of such worship in the.historical period are nevertheless rare, and the veneration paid to the hero was in all cases merely local. The religious honours subsequently bestowed in their lifetime on Lysander, Alexander the Great, and other illustrious persons, were merely the extravagance of flattery, devoid of any influence on the national theology. The same cannot be said of the apotheosis of the Ceesars, the germ of which already existed in the veneration paid to the legendary founder of

Rome. To the Roman the emperor appeared as the visible manifestation of the genius of the state, long the object of his reverence. (Friedlander, Sittengeschichte Roms, vol. iii. p. 455.) The people, says Suetonius, fully believed in the divinity of Julius Ceesar, hinting at the same time that this was by no means the case with the majority of the apotheoses subsequently decreed by the senate. (Jul. Cas. c. 88.) The honour was indeed not only conferred upon almost every emperor who transmitted the sceptre to his descendants, but fre- quently upon deceased members of his family, or even his personal favourites, as in the case of Antinous. Sixty persons altogether are recorded as having been thus raised to divine honours from the time of Cesar to that of Con- stantine. The majority of such apotheoses would be regarded as mere inatters of official form; in some instances, however, it was otherwise. We learn from Capitolinus that Marcus Aurelius was still worshipped as a household divinity in the time of Diocletian, and was believed to impart revelations in dreams. (Vit. M. Ant. o 18.) Antinous was adored in Egypt a century after his death (Origen, Contra Celsum, iii. 36). The ceremonies attendant on an imperial apotheosis are very fully described by Herodian (lib. iv. c. 2) on occasion of the obsequies of Severus, which he appears to have witnessed. The most significant was the dismission, at the moment of kindling the funeral pyre, of an eagle which was supposed to bear the emperor’s soul to heaven. Sharp-sighted persons had actually beheld the ascension of Augustus (Suet., August. c. 100), and of Drusilla, sister of Caligula; the latter eye- witness took the public incredulity exceedingly amiss (Seneca, Apocolocyntosis.) The ludicrous side of the deifi- cation of a bad or indifferent emperor could escape no one, and is pungently illustrated by Seneca in the witty lampoon just quoted: even here, however, it is laid down that principes pietate et justitia dei fiunt. Representations of apotheoses occur on several works of art; the most important are the apotheosis of Homer on a relief in the Townley collection, and that of Augustus on a magnificent cameo in the Louvre. The establishment of Christianity put an end to apotheosis as an avowed belief and a public ceremony, although the principle on which it rested is still conspicuous in the adoration and invocation of saints by the Latin, Greek, and African Churches. The commemo-

ration of Auguste Comte by his followers may be cited as another instance in point. The worship of Ali and his sons by some Persian sects, and that of the Caliph Hakem by the Druses, are not properly examples of apotheosis, being rendered to them not as deified mortals, but as incar- nations of the Deity. (R. G.) APPALACHIAN MOUNTAINS, the general name given to a vast system of elevations in North Aimerica, partly in Canada, but mostly in the United States, extending for 1300 miles, from Cape Gaspé, on the Gulf of St Lawrence, south-west to Alabama. The whole system may be conveniently divided into three great sections: the Worthern, from Cape Gaspé to New York ; the Central, from New York to the valley of the New River; and the Southern, from the New River onwards. The first of these includes the Adirondacks, the Green Mountains, and the White Mountains, and the irregular elevations towards the north: the central contains a large portion of the Blue Ridge, the Alleghanies proper, and a great number of lesser ranges: and the southern consists of the prolongation of the Blue Ridge, the Black Moun- tains, the Smoky Mountains, and the Unaka Mountains. The whole range, and especially the central portion, is remarkable for the parallelism of the various ridges, the uniform height of the summits in the same part of the chain, the absence of a central axis of elevation, and the presence, instead, of a central valley or axis of depression.

The typical arrangement of the system—most distinctly

visible in the central division—might be represented in diagram thus : first, a stretch of country, gradually sloping, with slight undulations and irregularities, upwards from the Atlantic, and attaining a height of 300, 500, or 1000 feet ; then, a lofty ridge rising like a rampart, and suc- ceeded by other ridges separated from each other by longi- tudinal valleys ; next, the great central valley or axis of depression; and lastly, a new succession of ridges breaking off into table-land with transverse valleys and a gradual decrease of elevation. The Atlantic slope varies in breadth from 50 miles, as in New England, to 200 miles, in the south, and in the neighbourhood of New York has almost altogether subsided. The central valley may be traced from Lake Champlain in the north, along the course of the Hud- son, down through the Cumberland Valley, in Pennsylvania, and the Great Valley of Virginia and Tennessee ; it varies in breadth from 15 miles in the north to

50 or 60 miles in the south. The elevation of the valley rises towards the south in keeping with the elevation of the neighbouring ranges. None of the summits of the system reach the region of perpetual snow, but a large number of them attain a considerable altitude. In the Adirondacks the highest point, Mt. Tahawus or Mt. Marcy, reaches 5379 feet. In the White Mountains, Mt. Washington, in the main chain, has a height of 6288 feet; Mt. Adams, 5794; Mt. Madison, 5365 ; Mt. Jefferson, 5714; Mt. Clay, 5553; Mt. Monroe, 5384; Lafayette, 5290; and a great number of summits attain a height of more than 4000 feet. In the Green Mountains the highest point, Mt. Mansfield, is 4430 feet ; Lincoln Mount, 4078; Killington Peak, 4221; Camel Hump, 4088; and a number of other heights upwards of 3000 feet. In the central division the hypsometric surveys are imperfect; but the general elevation of the higher chains is from 1000 to 2500 feet. As we approach the south, the complexity of the system and the altitude of the individual mountains increase together, and the chains which have run parallel and distinct begin, as it were, to gather and fold themselves into an irregular coil. The peaks of Otter in Virginia are about 4000 feet high ; and in the Black Mountains, the Black Dome (Clingmann), which is the culminating point of the whole system, attains the height of 6707 feet; Balsam Cone (also known as

Guyot, from the hypsometrical explorer of the region) has 6671; Black Brother, 6619; and Mt. Hallback (Sugarloaf), 6403; besides a large number of summits varying from 3000 up to 6000 feet. In the Smoky Mountains we have Clingmann’s Dome, 6660 feet high ; Guyot (in Tennessce), 6636; Mt. Alexander, 6447; Mt Leconte, 6612; Mt Curtis, 6568 ; several others upwards of 6000, and a great many of more than 5000. In the whole Appalachian system, Lake Champlain is almost the only lake of any importance ; but a multitude of rivers, and some of them of considerable size, find their sources in its recesses. The watcrshed does not lie along any one continuous axis, but shifts its position several times along the line. In the north it is found in a stretch of country, called the Height of Land, that lies between the White and the Green Moun- tains, and gives birth to the Connecticut and a number of smaller streams ; next, it is formed by the Adirondack Mountains, which supply the sources of the Hudson River; and,

further south, by the high plateaus of Pennsylvania and New York, which give origin to the Delaware and the Susquehanna, with their numerous tributaries. These rivers, flowing south and east, have thus to cut their way through the successive ridges of the whole Appalachian range. The watershed is next situated in the Alleghanies proper, which send a number of affluents to the Ohio on the west, and give rise to the James River on the east; and lastly, it runs along the terminal cluster or coil composed of the Black, the Smoky, and the Unaka Mountains. Here a tributary of the Ohio, called the Red River, a number of the affluents of the Tennessee, and various less important streams, have their sources. The Appalachian Mountains are a vast storehouse of mineral wealth. Magnetite, hema- tite, limonite, and other iron ores, are found in great abundance. The first is best exhibited in what is fre- quently called the Champlain Iron District, where it is now largely manufactured ; and it also attains remarkable development in various parts of New York and New Jersey. The extensive deposits of this ore in Virginia, North Carolina, and Georgia, have hitherto been turned to comparatively little account. It is frequently con- taminated by phosphate of lime, sulphur, and titanium. Red hematite is found in New York, Pennsylvania, Ten- nessee, and Georgia, and is usually known as Clinton ore, from a place of that name in Madison County, New York, while in Tennessee it is called Dyestone ore. It is of great commercial importance, though, on account of the amount of phosphorus which it contains, it is worthless for the manufacture of steel. Limonite, or brown hema- tite, which, from its fusible character, is usually worked along with the more crystalline ores, occurs in a serics of beds all along the flanks of the Appalachians, from Maine in the north to Georgia in the south. The earthy carbonate of iron“ clay ironstone ore,” “shell orc,” “kidney ore,” —is found in most parts of the system in connection with the Carboniferous strata, and has been very largely manu- factured. In the northern district alone—that is, in the eastern part of New York, in New Jersey, and Eastern Pennsylvania—the number of furnaces is about 200, and the gross production of iron 900,000 tons per annum, or one-third of the entire production of the United States. This abundance of ore would have been almost useless had it not been for the equally abundant supplies of fuel ; and the coal measures are among the most extensive in the world, the bituminous coal alone covering an area of 56,000 square miles, without counting the unrivalled beds of anthracite in Pennsylvania and New York, which cover an area of between

400 and 500 miles. While the supply of gold, silver, copper, and lead is of comparatively no importance, marble, limestone, fire-clay, gypsum, and salt are extremely abundant. Many of the ranges are richly

covered with forest, and yield large quantities of valuable timber, consisting chiefly of sugar maple, white birch, beech, and ash, in the north, and oak, cherry-tree, white poplar, white and yellow pine, towards the south. The dark foliage of the pines, balsam-firs, hemlock-trees, and cedars, gives colour and name to many of the districts. Rhododendrons, kalmias, azaleas, and other flowering shrubs, often grow in almost impenetrable thickets; and in some parts the botanist is at once delighted and be- wildered by the profusion and variety of the smaller plants. Bears, “ panthers,” wild cats, and wolves haunt the forests in large numbers.

The Appalachian system has a history which is of great interest, as it affords the clue to the causes of its forma- tion; but a few points only can be touched on here. The earliest strata in the range are of Upper Cambrian age, and during the later portion of this period the Potsdam sandstone was deposited, the nature of which demonstrates that a large portion of the United States was then a shallow. sea. Upon this were superimposed strata of Silurian, Devonian, and Carboniferous age, but these deposits were by far the thickest along the broad band now occupied by the Appalachians, and where thickest they have the general character of shallow water-beds. Beds of the same age occupy the valley of the Mississippi; there they are largely composed of limestones and deep water-beds, and have an aggregate thickness of about 8000 feet, usually horizontal or only slightly inclined. In the Appalachian Mountains their aggregate thickness is 40,000 feet, and the beds are thrown into complicated folds and contortions. At the close of the Carboniferous Period the beds were deposited in shallow water, and hence there must have been a subsid- ence along the band whereby the Potsdam sandstone and its associated rocks were depressed from 30,000 to 40,000 feet below the sea-level. This depression threw the strata into one gigantic synclinal basin, to conform to which the beds were necessarily crumpled up, and at the same time more or less metamorphosed. Then the beds began to rise above the sea-level, and the valleys and ridges to be formed, a

process which may have been one of slow development, but which had made considerable advance prior to the Triassic age, when sandstones were deposited in the Appa- lachian valleys. The elevation has continued until the Potsdam sandstone is now a few hundred feet above the sea. If the strata had retained their original character and planes of deposition relatively to the horizon, the highest mountains would have reached 40,000 feet ; but, as we have seen, they actually attain but 6707 feet. The elevation was not confined to the line of the Appalachians, but was continental in extent. During the process of elevation denudation was in operation, and by this agency the surface features of the range generally have been moulded. From this brief summary some idea may be conceived of the numerous operations and circumstances involved in the formation of a mountain chain like the Appalachians, which are intermediate in nature and in age between the older Laurentides, which are now worn down almost to a stump, and the Rocky Mountains, which have an air of comparative freshness. (For fuller details on this subject, consult the references given below and the separate articles on the States in this work :—Pctermann's Mittheilungen, 1860, p. 263; The American Journal of Science, vol. xxxi. p. 157, and p. 392, 1861; Roger's Report on the Geology of Pennsylvania, 1858 ; a paper by Dana in the American Journal of Science, vol. xxxvi. p. 227, 1863; Hall, Paleontology of New York, vol. 11. ; Sterry Hunt's "Geognosy of the Appalachian System," in his presidential address, Proceedings of American Association for the Advancement of Science, for 1872,

APPARITIONS

PPARITIONS, in the ordinary acceptation of the word, can scarcely be better defined than in the terms used by Defoe: "They are the invisible inhabitants of the unknown world, affecting human shapes or other shapes, and showing themselves visibly to us." In this definition no account is taken of "spectral illusions, 1n- voluntarily generated, by means of which figures or forms, not present to the actual sense, are nevertheless depicted with a vividness and intensity sufficient to create a tem- porary belief of their reality." Theories of apparitions generally deal with these hallucinations,

and no doubt they are the foundation of many of the stories of superstition, but they scarcely suffice to account for the universality of the belief inthe possible appearance of disembodied spirits. These figures, kind or threatening, are probably the first objects that meet the vision of primitive men, when they begin to reflect on the unseen powers around them, and “to explore these coasts which our geographers cannot describe.” Ghosts are almost the first guess of the savage, almost-the last infirmity of the civilised imagination ; on these forms, shadowy and unsubstantial as they are, solid superstructures of ritual and morality have been based, and apparitions, with the consequences of the belief in them, have a literature and a history of their own.

In the first place, the belief has had an immense effect on the religious and moral development of our race. Though it is as yet impossible to analyse to its first elements the con- fused mass of fear and custom which makes up’‘the faith of savages, there can be little doubt that their religion, with the later and refined heathenism of Greece and Rome, sprang in part fromthe propitiation of thespirits of ancestors. Again, it would no longer be true to say, as Scott did forty years ago, that ‘the increasing civilisation of all well-con- stituted countries has blotted out the belief in apparitions.” The visionaries who found their religion on a pretended intercourse with the dead, and who consider the highest function of their clergy to be “the serving of tables”— tables that rap and move—may be counted in America by millions. Many causes have combined to bring about this return to what a short time ago seemed a forlorn superstition. First, there was that reaction against the somewhat commonplace scepticism of the last century which took in literature the form of Romanticism and of the Gothic revival, and brought back in a poetical shape the fairies and spectres of medieval fancy. Again, the lofty morality and pure life of Swedenborg (1688-1771) won a hearing for his extraordinary visions, and minds influenced by him were ready to welcome further additions to the marvellous. He declared that “the spirit of man is a form;” and added that it had been “given to him to converse with almost all the dead whom he had known in the life of the body.” Last of all came what is called spiritualism, inspired by an impatient revolt against the supposed tendencies and conclusions of modern science. Inquirers who live in constant fear that science is trying to demonstrate the truth of materialism, and to rob them of their dearest hope, that of a future

life in the society of their departed friends, turn eagerly to what they think ocular evidence of another existence. There is scarcely any literature, not even the records of trials for witch- craft, that is more sad and ludicrous than the accounts of “spiritual séances,” with the persistence of the bereaved in sceking a sign. The attempt of the Alex- andrian Platonists to substitute the visions of trances for the conclusions of intellect has been called the despair of reason; and modern spiritualism, when it is not a

drawing-room amusement, is too often a moment in the despair of faith.

The belief in apparitions, we have said, has its history, a history contained in ancient laws and literature, in the customs and superstitions of savages, and in the fireside ghost-stories of our own homes. By a comparison of all these we shall try, first, to show how the notion of the existence of spirits and of the possibility of their appear- ance arose; next, to trace several of the shapes in which it is most powerful and general; lastly, to point out how modern theories and marvels are connected with primitive and savage ideas, and we shall probably arrive at the con clusion that there is either some substratum of unexplained facts, or that the human imagination is subject to laws which have not been sufficiently investigated.

It would be rash to say, with Mr Herbert Spencer, that Primitive the propitiation of the spirits of ancestors is the first germ beliefs.

of all religion, and it would be premature to deny that there may be races which have no conception of the exist- ence of the spirit after death. But it is safe to assert that there are very few savage peoples who do not believe that their dead ancestors appear to them in dreams, and in what they think the clearer vision of trances, and who do not prove their belief by sacrifice of food, by prayers for help, by hymns, and by offerings made to show love or de- precate anger. The wide-spread graves of extinct races, with the weapons and vessels buried along with the dead, demonstrate that these nameless and vanished hordes also held that the life of the dead persists, with its old needs and desires. The literature of cultivated peoples shows clearly that the Greeks and Romans held the same opinion, and practised no very different rites. It would be tedious and superfluous to state all the facts so carefully collected by Mr Tylor in his Primitive Culture. Enough to say that when the Athenians condemned the generals who neglected to bury the

men who fell at Arginuse, when Odysseus built a tomb in deference to the threat of the dead Elpenor—“ lest I become a curse to thee, sent by the

ods ”—they acted from the same motive as the Australian “ black fellow” who holds that his deceased tribesman, if left uninterred, will haunt him as an imgna, or mischievous spirit. If we wanted to state the savage theory of appari- tions, we could scarcely do it better than in the words of Apuleius —“The human soul, after it has quitted the body, is called Lemur; that which undertakes the guardianship of the family is called Lar ; those which wander without fixed homes are named Larve.” The Lemurs then, we may say, are with us still as churchyard ghosts ; the Lar, after becoming the venerated hero of Grecian religion, has departed with the advance of Christianity. An able account of the Greek worship of the dead will be found in La Cité Antique, by M. Fustel de Coulanges.

Taking it for proved that the credence in the apparitions and the power of the dead is a fact as good as universal in the beginning of thought, we must ask, How was the notion arrived at? Discarding for the moment the possi- bility that it was founded on actual apparitions, we observe several causes which might, indeed which must, have given rise to it. The savage, like the child, is full of question- ings, and his reasonings are, so to say, perfectly rational. His hypotheses colligate and explain the facts, as far as he knows them. One of the earliest mysteries to him is the mystery of death—how is he to explain the sudden and eternal stillness of the warriors slain in battle? Now the savage philosopher knows of another state, namely, sleep, in which he seems as quiet as the dcad, but is really active

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in dreams, Has he then two selves? The problem is that which Hartley Coleridge resolved when a child—“ There is a dream Hartley,’a shadow Hartley, a picture Hartley, a hold-me-fast Hartley.” ‘ When I sleep,” then the savage may conclude, “one of my selves leaves the other to rest, and goes about its business. And in death, also, one self flies away, but it will not return—it is homeless, hungry, wandering. Above all, it is a very strange thing, and, as strange, to be feared.” A priori reasoning goes as far as this, and then confirmatory facts support the hypo- thesis. In dreams he meets the dead warrior, and some of his friends have the same experience. And

there is one of the tribe, the diviner or shaman, whose opinion they revere in these matters. He is thus described by a Zulu con- vert—“ When he is awake he sees things which he would not see if he were not in a trance.” He knows how to produce trances by fasting, by inhaling the smoke of herbs, and by the use of strange oils. He sees things before they happen, and tells how, when awake, he beheld the slain warrior, and promised to appease his hunger with sacrifice of cattle. There can scarcely be any other conclusion from these facts, as far as they are known to the savage, except that the dead yet live, and appear to the living, and keep their old passions and their old wants.

Now this belief in apparitions, thus stated, is capable of much development. The favourite ancestral spirit of the strongest tribe will tend to absorb the lion’s share of sacri- fice and hymns, and to become such a hero as Theseus was to the Athenians. Many other influences produce a still higher religion, a circle of Olympian gods, a philosophic and intellectual monotheism. The family of the seer will perhaps become a sacred caste, like the Eumolpide at Athens. An early civilisation is formed, with its philoso- phers, holding in secret a monotheism of their own, with its city population pleased by stately temples and hieratic splendours, but we must remember that all this time the pagant, the rural people of the hills and the coast, come very little under the influence of philosophy or of ritual. They still retain the old dread of the ghosts of the departed, and still people the woods and wells with wandering spirits. As slaves and nurses they enter the cultivated families, their old wives’ fables impress the awakening imagination of childhood, and the earliest of all forms of belief in the supernatural finds its way back into the circle of culture. At last there comes a time of decadence, when the abstract notion of Deity seems too vague and distant, when the Olympian gods are no longer credible, and philosophy falls back in despair on the traditional ghosts of the nursery and of the Oriental slaves. Thus Neo-Platonism reinstated apparitions as demons, angels, powers; and thus Henry More and Joseph Glanvil combated the scepticism of the seventeenth century with stories of haunted houses, and of the mysterious drummer of Tedworth.

If this theory of the origin of the belief in apparitions be correct, it tends to explain what certainly is a difficulty— the identity of ghost stories in all lands and times, the conservatism of that great majority, the dead. For the

further we go back in the history of civilisation, as in the works of nature, the simpler, the more identical, the more widely diffused are all its productions. The earliest im- plements for lighting fires, the earliest Weapons, are not more alike than the earliest guesses of speculation and the earliest efforts of fancy. These oldest fancies dream of apparitions of the dead, and are preserved below the level of advancing culture, and insinuated into the ideas of the cultivated classes by the classes which are unprogressive, unaffected on the whole by religious or social changes. It is for this reason that magical rites are everywhere the same, as M. Maury has observed—that the Scotch witch had the same spells as the Kaffir witch, that Balzac's

description of a Parisian sorceress in Le Cousin Pons might serve as an account of a Finnish wise-woman. It is not strange that superstition and ignorance should always tell the same baseless tale if they have always treasured and still repeat the earliest and crudest fancies of the race. Nothing shows more clearly the purity of ancient culture than the absence of superstition in the Greek as compared with our Teutonic classics.

Supposing the origin of the belief in apparitions, and its identity in different peoples, to be thus accounted for, it remains to ask if the surviving forms of the creed can be traced back to a primitive source. In entering the cloud-land of folk-lore it is impossible to advance too cautiously. This is a realm where nothing is fixed and definite ; where all is vague, floating, confused. He who would call up and try the spirits here must not place himself within too narrow a magic circle, but extend his view as far as pos- sible to the beliefs of the most alien and distant races. The apparitions of popular superstition fall into classes which always tend to be merged in each other, but which are not so indistinct that they cannot be considered apart. No form is better known than the belief in fairies. over Europe fireside tradition tells of women who haunt lonely places, where they are seen to dance, to spin, to comb their long hair. They cause inexplicable nervous diseases—epilepsy and St Vitus's dance ; they have a king- dom underground, whither they allure their lovers ; they appear with fatal gifts at children's birth ; they steal the children of mortals away, and leave changelings of their own. Our

fathers dreaded them as the goad folk, in Tweeddale and Ettrickdale; the Highlanders call them the folk of peace ; in Greece they are nereids ; in Servia, wilis ; in Bretagne, korrigans ; in Russia, rusalkas. They ought, if our hypothesis is correct, to be traceable to the lower spirits who in pagan times informed woods and wastes, and dwelt by the hearth ; who had no temples to be overthrown or changed into Christian churches. The forests sheltered them when the fane of Jupiter fell, and the house of Theseus became the church of St George. The women concealed the hearth-spirit, as Rachel did Laban's gods, in the furniture of their houses. Rude and rustic people kept up the traditional belief, and the scant offering by the haunted well that the Highlanders of Perthshire still do not care to withhold. The capitularies of Liutbrand for- bade such sacrifices; a series of councils repeated the prohibition. The result of these ecclesiastical allusions to "the lesser people of the skies" is that we can trace the French jées back to the fata of classical mythology. Fées in old French is faés ; faés is the fadw of Gervase of Til- bury in his Otta Imperialia (1220) ; fade is a corruption of fata, who are named with bone, les bonnes dames (the good ladies) among the superstitions of the Gauls. Such is the pedigree of the fées, as traced by M. Maury in his interesting tract, Les Fées du Moyen Age. Further infor- mation, to show the identity of the superstition, will be found in Scott's essay in the Border Minstrelsy, in Bern- hard yon Schmidt's Peasant Life in Modern Greece, in Pashley's Travels in Greece, in Ralston's Folk-Songs of Aussia, and in the Barzaz Breiz of the Marquis de la Villemarqué. Now turn to Kaffir superstition. Dr Call- away, in the Religious System of the Amazalu, p. 226, writes thus :—"It may be worth while to note the curious coincidence of thought among the Amazalu regarding the amatongo or abapansi (ancestral spirits), and that of the Scotch or Irish regarding the fairies or ' good people.' For instance, the 'good people' of the Irish have ascribed to them, in many respects, the same motives and actions as the amatongo. 'They call the living to join them, that is, by death ; they cause diseases which common doctors cannot understand nor cure. The common people call

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them their friends or people, which is equivalent to the term, abakubo, given to the ancestral spirits. In the funeral procession of ‘the good people ’ are recognised the forms of those who have just died, as Umkatshana, in the Zulu tale, saw his relations among the ancestral spirits. So also in the Highland tales. A boy who had been carried away by the fairies, on his return home speaks of them as ‘our folks,’ which is equivalent to abakwetu, applied to the ancestral spirits. The fairies are also called ancestors. ‘The Red Book of Clanranald is said not to have been dug up, but found on the moss,’ says Mr Camp- bell in the Tales of the West Highlands ; ‘it seemed as if the ancestors sent it.” All these coincidences cease to be strange if we suppose that the Celtic people retain as subordinate and childish traditions the primitive beliefs which make the religion of the Kafiir. ;

Jt would be easy to trace the belief in brownies (lubber spirits, who tend the house) to the lar, or hearth spirit of the ancients. The domovoy, or Russian brownie, “ lives behind the stove;. but he, or the spirits of the dead ancestors whom he represents, were held to be in even more direct relations with the fire on the hearth. In some districts tradition expressly refers to the spirits of the dead the functions which are generally attributed to the domovoy; and they are supposed to keep careful watch over the house of a descendant who honours them and provides them with due offerings. In some families a portion of the supper is always set aside for the domovoy ; for if he is neglected he waxes wroth, and knocks the tables and benches about at night.” This is the account of Mr Ralston, which tallies with the Scotch stories of brownies, as with those of the Lithuanian kanka, the Finnish paara, the French lutin, and the humble Northumbrian bogie, who “flitted” with the farmer when he removed his furniture, All these are ares ; and the ghastly supersti- tion of the vampire, still prevalent in Greece as once in Scotland, may be traced to the unsatisfied ingna, or male- volent spectre of the Australian savage, the tw of Poly- nesia, the wpir of Russian folk-lore.

We now come to almost the most universally credited class of apparitions—namely, the subjective visions, coin- ciding with real facts and events

occurring at a distance, beheld by persons possessing the Celtic taishitaraugh, or gift of second-sight. The second-sight is described by a believer as “a singular faculty of seeing an otherwise invisible object, without any previous means used by the person that beholds it for that end.” The name of second- sight is the Scotch one under which the reputed pheno- mena excited the curiosity of Dr Johnson, and “made him wish to have some instances of that faculty well authenti- cated.” In Scott’s opinion, “if force of evidence could authorise us to believe facts inconsistent with the general laws of nature, enough might be produced in favour of the existence of the second-sight.” All history, all tradition, abounds in instances. A well-known anecdote tells how St Ambrose fell into a comatose state while celebrating the mass at Milan, and on his recovery declared that he had been present at St Martin’s funeral at Tours, where, indeed, reports from Tours afterwards declared that he had been seen. A similar experience of Swedenborg’s (who described at Gottenburg a fire which was actually raging at Stockholm) is reported by Kant. The wide distribution of the belief is shown by the fact that Mr Mason Browne’s exploring party on the Coppermine River was met by Indians, sent by their medicine man, who predicted the coming of the party, just as a seer in the Hebrides described even the livery of Dr Johnson’s servant before his arrival. In a remote age and country we find Njal, the hero of the Njal’s saga, credited with forspan, or the gift of beholding such shadowy apparitions of future

events—a power carefully distinguished from ordinary clear-sighted wisdom. Returning to savage life, a com- plete account of the morbid nature and of the initiation of a diviner is given from the mouths of Kaffir converts in Dr Callaway’s Religion of the Amazulu. A peculiar organisation, a habit of haunting the desert, and of fasting, combine to produce the imyanga, or second- sighted man ; what Reichenbach calls der sensitiv Mensch, and franker Zulus “a soft-headed one.” This part of the subject may be concluded with a quotation from the Odyssey, showing the similarity of these prophetic and warning apparitions in the islands of western Greece and of western Scotland. Theoclymenus speaks to the doomed wooers at their latest feast—‘ Ah, wretched: men, what ails you? Your knees, and

faces, and heads are swathed in night, and a wailing sound has arisen, and all cheeks are wet with tears, and the walls and the fair spaces of the ceiling do drip with blood, and the porch is full of ghosts, and the court is filled with shadows—the shadows of men bound hellwards—and the sun has perished out of heaven, and an evil mist has overspread the world." Compare Martin in his Description of the Western Isles—‘‘ When a shroud is perceived about one, it is a prognostick of death. The time is judged according to the height of it about the person ; for if it is seen about the middle, death is not to be expected for the space of a year; and as it is frequently scen to ascend higher towards the head, death is concluded to be at hand within a few days or hours, as daily experience confirms." These modern and ancient instances scarcely serve to increase "the force of evidence" that Scott speaks of, but rather to prove that the superstition is a fragment of the most primitive specu- lations on the facts of trance and coma.

The apparitions which play a part in all the records of trials for witchcraft admit of some explanation, though scarcely an adequate one, in known laws of human nature. It is easy enough to understand how in primitive times the diviner who beheld spirits was also believed to be able to command them to do his bidding and to injure his enemies. The belief persisted under the civilisation of ancient Rome, and Apuleius tells a very impressive story of how the apparition of "a woman of hideous aspect, marked by guilt and extreme sorrow, whose haggard face was sallow as boxwood," was evoked by a witch to slay her foe. No instance of the survival of savage superstitions is stranger than the fact that men like Henry More and Glanvil, Bodin, the great French publicist, Sir Thomas Brown, and Wesley, could still maintain that disease and death might be caused' by such malevolent apparitions. We can only say in their defence that the amount of concurrent evidence and confession, corresponding as it did with the prohibition of witchcraft in the Bible, constrained them to share the cruel superstition of their age. Nor is it impossible to assign causes, besides the inadequate one of conscious imposture, for the confessions of the unhappy creatures accused of witchcraft. First we must try to conceive how entirely and implicitly the faith of the middle ages accepted the existence of an omnipresent army of evil spirits. The world was the battlefield of devils and angels, and there was a constant tendency in men's minds to Manicheanism,

to crediting the devil with frequent victories. Perhaps no single work enables the modern reader so vividly to imagine this state of terror, this agony of patients who believed that they were in conflict with visible powers of evil, as the autobiography of Guibert de Nogent, the contemporary historian of the first crusade. He has left, in the character of his mother, a most gracious picture of womanly piety, and yet this excellent lady supposed her- self to be the nightly prey of Satan, whom she saw in tangible form! Then we must remember that the church

everywhere declared that mortals could enter into compact with the fiends; and recalling how subject the middle ages were to imaginary epidemics, fevers of terror and fanaticism, it is not so hard to see how both accusers and accused believed the truth of their charges and confessions. In such an epidemic every one's fancy is inflamed, and people are found to accuse themselves, as they still do when a mysterious murder has excited the morbid brains of foolish persons. At these times we may almost reverse the French proverb, and say gui s'accuse s'excuse. Dreadful tortures, too, such as "the most severe and cruel pain of the boots," and "that most strange torment called in Scottish a turkas" (7.¢., pincers), want of sleep, and hunger, oftcn made confession and death preferable to life in such misery. But these considerations do not explain away the obvious belief and remorse of many victims, nor account for the similarity in detail of all the confessions. For the better understanding of these points we may briefly trace the ordinary course of a witch epidemic, as we gather it from the reports in Pitcairn's Criminal Trials in Scotland, from the Salem witchcraft trials recorded by Cotton Mather (1692), and from such proces as that against Urbain Grandier at Loudun (1632-34), as well as the stories collected by Glanvil in his Sadducismus Trium- phatus. Generally it happcned that some nervous patient, like the girls who used to meet and make what spiritualists now call a circle, in Parris's house at Salem, or the novices who accused Urbain Grandier, or the daughter of Richard Hill of Stoke-Trister in 1664, or Adam Clark of Preston- pans.(1607), suffered from some hysterical complaint. In the case of Mistress Hill this malady took the form of stigmata or sudden prickings and swellings of the hands, like those of Louise Lateau, the Belgian ecstatic, whose name has recently

become notorious. Living in a Pro- testant land, Mistress Hill, like all the other patients, referred her sufferings to the machinations of a witch, just as the Australian savage now supposes his ailment to be caused by magic. In the cases we have named, as in most others, the witch was said to appear in visible fori, or to send “the devill in likeness of ane blak man efter ane feirfull manner,” and so to torment the sufferer. The witch was then charged, examined, tortured, if necessary, in the witch’s bridle or otherwise, and as a rule confessed, implicating many of her neighbours. The confessions were frequently recanted, like those made under torture by the Templars. They generally ran to the effect that the accused, in a despairing moment, “ making heavy fair dule with herself,” like poor Bessie Dunlop, who was “ convict and brynnt” in 1576, met an apparition. It might be the ghost of Thom Reid who fell at Pinkie fight, or it might be the devil, as in most confessions, or the king of elf-land, but he always offered wealth and happiness in return for the soul of his victim. The bargain was closed, and the witch was taken at night to some spot, often a church, where she met a great number of her neighbours. Here she was made to swear fealty to Satan, who sometimes took the form of a buck in France, or of “a deer or roe ” in Scotland. The same revolting ceremonies and travesties of the church service followed as were attributed to the Templars, and the worshippers received power to do evil, raise storms, bewitch cattle, and so on, after which there ensued a licentious revel. Sometimes the witches would fall into trances when under examination, and declare on waking that they had been spiritually present at the joys of the Sabbat. Their victims, when confronted with them, frequently became subject to convulsions, and were aware of their presence though walls and doors were between them. Both these facts point to the presence of the phenomena of hypnotism or mesmerism, and the abnormal state pro- duced by concentrated attention and abeyance of the will.

. his own hallucinations to the academy of Berlin.

The ceremonies of this pretended Sabbat can be accounted for if we suppose that the Scotch peasants, like those of France, retained the traditions of those vast nocturnal gatherings, with their revival of pagan

rights, their mockery of the church, their unnatural licentiousness, in which the popular misery of the 14th century found relief and expression, An account of these orgies is given in M. Michelet's book La Sorciére. He does not appear to have consulted the records of the Scottish trials for witchcraft, which makes the very close resemblance betwecn the Scottish and French confessions even more striking.

In attempting to explain this resemblance, as well as the multitude of well-attested apparitions which the annals of witchcraft report, we have to remember the following facts. The manner of producing these abnormal nervous states, in which the patient is impressed exactly as if he heard and saw what he is commanded to hear and see, has always been familiar to peoples in a low state of civilisation. The witchcraft trials attribute to diabolical influence phenomena which we may now see performed on willing patients by strolling professors of mesmerism and magnetism. The constantly reviving intercst in these phenomena, which to-day takes the shape of matter for gossip, in the middle ages swelled into a frenzy of fear and of excited imagination. The church encouraged this fear by its doctrines, and did little to check it by its exor- cisms, All classes believed that the power which produces hypnotism could be hurtfully exercised, and all classes attempted the impossible crime of slaying by magic. The rural population retained the memory of pagan orgies, of the worship of heathen gods, now declared to be devils ; they also retained the harmless tradition of the fairy world, and when tortured into confession they reproduced, with convincing identity, fragments of folk-lore. Isobel Gowdie was burned in Nairn in 1662 for telling tales which would nowadays make her invaluable to the collector of Marchen or nursery stories (Pitcairn, iii. 603). Survivals of belief out of an uncivilised stage of progress, attested by the facts of nervous diseasc, heightened by fear and imagination, interpreted by unsciehtifie theology, go far to constitute the familiar apparitions of witchcraft. It onght to be added that modern believers in spiritualism claim the witches as martyrs of their own faith, and recognise in their reported performances, especially in their power ot floating in the air, anticipations of their own puerile miracles.

The species of apparitions we have discussed may all be Ghosts.

traced to the traditions of the non-progressive classes, and connected with the earliest ideas about the supernatural. But the spirits which are most familiar to us, the spectres of ghost stories and fireside tales, rest their claims to exist- ence on the evidence of the eyes and ears of people we meet every day. True, the evidence is of the hearsay class ; it is almost as rare to find a witness who has seen a ghost as to encounter a person who does not know some one who has had this experience. As a rule, the deceased friend is said to have appeared at the moment or about the time of his death to an acquaintance at a distance. The belief is now more widely spread and more firmly held among the educated classes than it has been for

centuries, and the arguments on both sides are worth con-

sideration. The sceptics do not deny that people have been subjectively affected, in the same way as they would have been if the dead friend had been objectively present.

But they bring forward several well-authcnticated instances

to prove that some people have been subject to dJlusory appearances, of which they could only test the reality by the attempt to handle them. Perhaps the best known case is that of Nicolai, a Berlin bookseller (1790), who repeated “ They

were generally phantasms of his friends and acquaintances ; or, in other words, copies of his past impressions and per- ceptions, so renovated and verified as to create an illusion of reality.” Another example is the case of a Mrs A., attested by Sir David Brewster in his Natural Magic, and repeated by Professor Huxley in his Elementary Physiology. Mrs A.’s illusions were often grotesque and terrible, and she could not always connect them with any past 1mpres- sion. Different philosophical explanations are given of these cases of disordered vision. Dr Hibbert, in his Philosophy of Apparitions, conceives that the organs of sense are the actual medium through which past feelings are renovated ; or, in other words, that when, from strong mental excitement, ideas have become as vivid as past impressions, or even more SO, this intensity 1s induced by, or rather

productive of, an absolute affection of those par- ticular parts of the organic structure on which sensations depend, in the same way precisely as the salivary glands are known to be occasionally as much excited by the idea of some favourite food as if the said body itself were actually present, stimulating the papille of the fauces. It would have been more simple if Dr Hibbert had said that imagination, in some states, reacts upon the organ of sense and renovates past feelings or sensations, the natural antecedents or necessary concomitants of certain percep- tions, with an intensity sufficient to create an illusion of reality.

A further explanation is given by Sir David Brewster, who has remarked as a physical fact that, ““when the eye is not exposed to the impressions of external objects, or when it is insensible to these objects in consequence of being engrossed with its own operations, any object of meutal contemplation, which has either been called up by the memory or created by the imagination, well be seen as distinctly as if it had been formed from the vision of a real object, In examining these mental impressions,” he adds, “J have found that they follow the motions of the eye-ball exactly like the spectral impressions of luminous objects, and that they resemble them also in their apparent im- mobility when the eye-ball is displaced by an external force. If this result shall be found generally true by others, it will follow that the objects of mental contemplation may be seen as distinctly as external objects, and will occupy the same local position in the axis of vision as if they had been formed by the agency of light.” This goes to the very root of the theory of apparitions, all the phenomena of which seem to depend upon the relative intensities of the two classes of impressions, and upon the manner of their acci- dental combination. In perfect health the mind not only possesses a control over its powers, but the impressions of external objects alone occupy its attention, and the play of imagination is consequently checked, except in sleep, when its operations are relatively more feeble and faint. But in the unhealthy state of the mind, when its attention is partly withdrawn from the contemplation of external ob- jects, the impressions of its own creation, or rather repro- duction, will either overpower external objects, or combine themselves with the impressions of them, and thus generate illusions which in the one case appear alone, while in the other they are seen projected among those external objects to which the eye-ball is directed, in the manner explained by Dr Brewster. To these

physical causes of subjective apparitions, the forces of the imagination, of long desire, of strained attention, are supposed to contribute their influence.

“ Enthusiastic feelings of an impressive and solemn nature,” says Sir Walter Scott, “ occur both in private and public life, which seem to add ocular testimony to an inter- course betwixt earth and the world beyond it. For example, the son who has been lately deprived of his father feels a

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sudden crisis approach, in which he is anxious to have recourse to his sagacious advice—or a bercaved husband earnestly desires again to behold the form of which the grave has deprived him for ever—or, to use a darker yet very common instance, the wretched man who has dipped his hand in-his fellow-creature’s blood, is haunted by the apprehension that the phantom of the slain stands by the bedside of his murderer. In all or any of these cases who shall doubt that imagination, favoured by circumstances, has power to summon up to the organ of sight spectres which only exist in the mind of those by whom their apparition seems to be witnessed ? If we add that such a vision may take place in the course of one of those lively dreams in which the patient, except in respect to the single subject: of one strong impression, is or seems sensible of the real particulars of the scene around him, a state of slumber which often occurs—if he is so far conscious, for example, as to know that he is lying on his own bed, and surrounded by his own familiar furniture, at the time when the supposed apparition is manifested, it becomes almost in vain to argue with the visionary against the reality of his dream, since the spectre, though itself purely fanciful, 7s inserted amidst so many circumstances which he feels must be true beyond the reach of doubt or question. That which is undeniably certain becomes in a manner a warrant for the reality of the appearance to which doubt would have been other- wise attached. And if any event, such as the death of the person dreamt of, chances to take place, so as to corre- spond with the nature and the time of the apparition, the coincidence, though one which must be frequent, since our dreams usually refer to the accomplishment of that which haunts our minds when awake, and often presage the most probable events, seems perfect, and the chain of

circum- stances touching the evidence may not unreasonably be considered as complete.”

Now this is the point—namely, the possibility of fre- quent coincidence—where the advocates of the reality of apparitions join issue with the sceptics. They do not deny that some people have been subject to hallucinations. They say with De Foe, “ we have, we believe, as true a

‘notion of the power of imagination as we ought to have.

We believe that we form as many apparitions in our fancies as we behold with our eyes, and a great many more. But it does not follow from thence that there are no such things in nature.” It is when apparitions of men dying are seen at a distance from the place of their death, or when different witnesses, at different times, behold the same apparition in a certain place, that the explanation of mere fancy or subjective illusion becomes hard to accept. It is unfair of Scott to say that the coincidence between death and distant apparition in dream or waking vision is one which “must frequently happen.” Mankind has agreed with Dr Johnson to consider the event not fortuitous. Nothing is explained, if the multitude of such storves are sup- ported by evidence, by speaking of a coincidence. As Joab says in Voltaire’s play, cest Jd le miracle. Again, to con- vert Nicolai’s visions into genuine apparitions, or to make Mrs A. what Professor Huxley calls a mine of ghost stories, what they saw should have been also seen by others, or should have been followed by some significant event. To give an example of a genuine ghost story as contrasted with a hallucination :—It happened to a lady, a distant relative of the writer, to waken one morning in Edinburgh, and see, as she thought, her father standing by her side. He was dressed in his full uniform as a general in the Hast India Company’s army, and seemed to her to press his hand on his side with a look of pain, and then to dis- appear. The lady mentioned what she supposed she had seen to the clergyman with whom she was residing. He took a note of the date of the occurrence, which happened

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in a time, as was supposed, of profound peace. The next news from India brought tidings of the mutiny, and that the lady's father had gone out in full uniform to address his native troops, and had been shot down by them. Now granting, for the sake of argument, that the evidence for this story is sufficient, believers in apparitions would be justified in saying that a coincidence so odd must have some unexplained cause. Two explanations of appear- ances of this kind suggest themsclves to the savage and the scientific spiritualist respectively. The former believes that all real objects have their shadowy doubles in the next world; the weapons buried with the dead chief send their doubles to join him in the happy hunting-grounds. The latter holds that the seer is subjectively affected in the manner desired by the person whose apparition he be- holds, who naturally assumes some familiar raiment, "'his habit as he lived." To take another example. The writer once met, as he believed, a well-known and learned member of an English university who was really dying at a place more than a hundred miles distant from that in which he was seen. Supposing, for the sake of argument, that the writer did not mistake some other individual for the extremely noticeable person whom he seemed to see, the coincidence between the subjective impression and the death of the learned professor is, to say the least, curious. Pursuing this line of thought, the whole question becomes one of evidence. Does the number of well-attested coincidences between the time of death and the moment of apparition exceed the limits that the laws of chance allow 1 Till people who have seen such spectres can give up the habit of adorning their stories with fanciful additions, and can make up their minds to attest them with thcir names, the balance of argument is on the side of the sceptics. These reasoners seem, however, to lay too much stress on the effect of " expectant attcntion." It is not as a rule the anxious mourner who beholds the spectre of the be- loved dead. No sorrow is more common than the afflic- tion of Margaret as described by Wordsworth :—

""Tis falsely said That there was ever intercourse Betwixt the living and the dead, For surely then I should have sight Of him I wait for day and night With love and longings infinite."

Tt may be addcd that hallucinations, or whatever we are to call the impression of beholding objects of supernatural horror, are not confined to

the human race. A remarkable example of superstitious horror shown by a dog, at the moment of a supposed apparition to his owner, is given in the Hdinburgh Medical and Surgical Journal, vol. lxiv., pp. 186-187. In the same way, during the mysterious disturbances at the house of the Wesleys, " the mastiff was more afraid than any of the children." Popular superstition has used this belief. When the dogs howl, in the Danish ballad, or in its Provencal counterpart, the cruel stepmother is afraid of the apparition of the dead mother, and treats the children kindly. In the same way, when Athene, in the Odyssey, appears to Odysseus, Telemachus cannot see her, but the dogs crouch and whine in fear. The case of Balaam's ass is sufficiently well known.

The latest and the most important development of the belief in apparitions is that known as spiritualism. The believers in a religion based on pretended communications from the dead are numbered in America by millions. Their opponents say that their faith and practice help to fill the lunatic asylums, to which they easily reply that theirs is not the only creed that gives occasion to religious madness. Men of sense and experience are numbered in their ranks, and even in England it would be easy to name

persons of eminence in art and literature, and some branches of science, who are puzzled by the phenomena they suppose themselves to have witnessed. Thus the late Augustus de Morgan writes in the preface of From Matter to Spirit —'JT am perfectly convinced, in a manner which should make unbelief impossible, that I have secn things called spiritual which cannot be taken by a rational being to be capable of explanation by imposture, coincidence, or mistake."

Modern spiritualism arose from one of the commonest superstitions in the world—the belief in haunted houses. What the Germans call the Poltergeist (the noisy spirit that raps and throws about furniture) is not peculiar to any country. We find it in Japan (see Zales of Old Japan), in Russia, in Egypt. Pliny tells of the haunted house of Athenodorus, the philosopher, in Athens. In Iceland the ghost of the dead thrall Glam raps on the roofs in the Gretti's saga; and "the Dyaks, Singhalese, and Siamese agree with the Esths as to such routing and rapping being caused by spirits." Such disturbances,

accompanied with apparitions, haunted the house inhabited by Mrs Ricketts, a sister of Earl St Vincent. Scott says in reference to this case that “no one has seen an authentic account from the earl;” but his sister’s report has recently been published (see the Gentleman’s Magazine for May 1872). Every one has heard of the rappings in the house of the elder Wesley. Glanvil, in his Saddu- cismus Triumphatus, has left well-authenticated reports of many cases, notably that of the drummer of Tedworth. The house of Mr Mompesson of Tedworth, in 1651, was disturbed by continual noises —furniture moving of its own accord, raps that could be guided by raps given by the spectators. Precisely the same phenomena occurred in the house of a Mr Fox, in West New York, in 1847-48. It was discovered by his daughter, Miss Kate Fox, a child of nine years old, that the raps replied to hers. An alpha- bet was then brought, the raps spelled out words by knock- ing when certain lettcrs were pointed to, and modern spiritualism was born. It has again and again attracted notice in England ; medium after medium has crossed the Atlantic; impostures have been exposed and defended ; and opinion continues to be divided on the subject. The views of a believer, though not a fanatical one, may be quoted from Mr Dale Owen’s book, The Debatable Land :—

‘1, There exists in the presence of certain sensitives of highly nervous organisation a mysterious force, capable of moving ponder- able bodies, and which exhibits intelligence. Temporary forma- tions, material in structure and cognisable by the senses, are pro- duced by the same influcnee —for example, hands which grasp with living power.

“2, This force and the resulting phenomena are developed in a greater or less degrce aceording to the conditions of the sensitive, and in a measure by atmospherical conditions,

‘*3. The intelligence whieh governs this force is independent of, and external to, the minds of the investigator and of the medium. For cxample, questions unknown to either (sic), and in language unknown to either, are duly answered.

“4, The origin of thesc phenomena is an open question.”

Now, as a rule, these phenomena are exhibited in the presence of ‘‘sensitives,” who are paid for exercising their profession, and who prefer to do so in a dark room. Men of science who have attended these exhibitions have not always met with interesting results, and the conclusions at which some of them have arrived may be stated thus :—

1. As a rule, nothing worth notice has occurred at séances where competent observers have been present. Spiritualists reply that the spiritual kingdom can only be entered aftcr long and patient attendance at many séances, and that the presence of the sceptic destroys the force of the spiritual influences.

2. When strange phenomena have been witnessed, they have often been traced to conscious imposture and leger-

demain. Belicvers answer with sorrow that imposture 1s

ouly too common on the part of mediums diffident of their.

powers ; but the aim of science ought to be to detect the realities that co-exist with the imposture.

3. Where conscious imposture docs not come in, wncon- scious cerebration and unconscious muscular action, super-

vening on a state of expectant attention, are just as deceit- | y) _ change in character or knowledge, and agree with Plato, in

ful. ‘That the mediums are in a morbid condition is proved by the feeling of a cold air passing over the hands, like the aura epileptica. Unconscious muscular action may be defined as the involuntary response made by the muscles to ideas with which the mind may be possessed when the directing power of the mind is in abeyance. The response given by rapping on the part of the agitated furniture is due to unconscious cerebration—that 1s, to ideational changes taking place in the cerebrum—of which we may be at the time unconscious through a want of receptivity on the part of the sensorium. The answer

given, though not present in conscious thought, may exist | ‘influence in the healthy tide of things.

in latent thought, and that latent thought may stimulate muscular action towards producing the unconsciously- desired result. In thcir reply, spiritualists depend on evidence which science hesitates to accept. They say that they have seen such phenomena as no consciously exerted muscular power could produce, and heard replies that did not exist even in their latent consciousness. Hence they insist on the presence of “a new force.”

4. The received spiritualist theory belongs to the philo-

sophy of savages. A savage looking on at a spiritual séance in London would be perfectly at home in the proceedings. It is answered that the savage’s evidence and belief is an undesigned coincidence of great confirmatory strength.

5. The reported doings and sayings of the spirits are trivial, irreverent, useless, and shocking. Spiritualists reply, with Swedenborg, that death works no immediate

the Phado, that the lowest and idlest souls are precisely the most likely to revisit earth. But with perseverance they look for better things.

We must leave the question sub judice. No one can be surprised that men of science hold back from devoting valuable time to the investigation of phenomena asso- ciated with darkened rooms, hysterics, and confessed imposture. On the other hand, believers will insist on crediting their eyes and ears, and being influenced by hopes and love and fears. Apparitions must be allowed to be an exception to the general ordinance—a disturbing It is more pro- bable that the ordinary laws of nature will hold their sway than that a revolution is about to be effected in all human and divine relations. This is what spiritualists expect, and their attitude has its interest for the student of Man. Perhaps the principal lesson to be gained from the study of the theories of apparitions is that human nature remains essentially the same, beneath the shifting surface of erceds and customs.’ (A. L.)

APPEAL, in its usual modern sense, is the act by which a decision is brought for review from an inferior to a supe- rior court. In Roman jurisprudence it was used in this and in other significations ; it was sometimes equivalent to prosecution, or the calling up of an accused person before a tribunal where the accuser appealed to the protection of the magistrate against injustice or oppression. The derivation from the word appello, naturally shows its earliest meaning to have been an urgent outcry or prayer against injustice. Hence it inferred a superior power capable of protecting against petty tyranny. In its mean- ing of seeking a higher tribunal for recourse against a lower, it does not seem to have been a charactcristic of the Republic, where the magistrate was generally supreme within his sphere, and those who felt themselves outraged by injustice threw themselves on popular protection by provocatio, instead of looking to redress from a_ higher official authority. The Empire, however, introduced grades of jurdisdiction, and the ultimate remedy was an appeal to the emperor; thus Paul, when brought before Festus, appealed unto Cesar. It must be understood that the appeal was actually dealt with by a supreme judge repre- senting the emperor, not by the emperor in person. In the Corpus Juris, the appeal to the emperor is called indis- criminately appellatio and provocatio. A considerable portion of the 49th book of the Pandects is devoted to appeals ; but little of the practical operation of the system is to be deduced from the propositions there brought together.

The ecclesiastical hierarchy, aud the gradations of the feudal system, naturally afforded scope in the Middle Ages for appeals from the lower to the higher authority. In matters ecclesiastical, including these matrimonial, testamen- tary, and other departments which the church ever tried to bring within the operation of the canon law, there were various grades of appeal, ending with the Pope. The Eu- ropean princes in general struggled against this assumption of authority by the court of Rome, and it was the source of many contests between the ecclesiastical and the regal power.

It became customary for ambitious sovereigns to encou- rage appeals from the courts of the crown vassals to them- selves as represented by the supreme judges, and Charle- magne usually enjoys the credit of having set the example of this system of centralisation, by establishing mssi domt- nici. ‘The great vassals, however, sought recourse against the decisions of

the royal courts in their own order, embodied as the great council or parliament of the nation, and hence arose the appeal to the House of Lords as the court of last resort.

When the progress of civilisation and the art of self- government render judges no longer amenable to the charge of tyranny or fraud, an appellate system changes its character and objects. It in some measure certainly tends to preserve that judicial integrity which renders it unnecessary as the immediate refuge of the persecuted suitor. But its ostensible object is the preservation of uniformity in the law. ‘The attainment of this object renders it unfortunately necessary, In such a country as ours, that no tribunal shall give, in the first instance, in any important question, a decision which is not open to appeal. ‘The process has the double advantage, that it has a tendency to bring every legal difficulty ultimately to one tribunal, where a uniformity of principle may be expected in the application of the law, and, at the same time, stimulates the exertions of the subordinate judge, who knowing that his proceedings will be revised, is care- ful to bring them as close as he can to those uniform prin- ciples of law, which he knows that the court of appeal

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1’The most eminent defender of modern spirituatism, Mr Alfred Wallace, reports a novel kind of apparition in the Fortnightly Review for May 1874. It seems that a young lady medium has the power of sending a semblance of herself into one room, while she is bound hand and foot in another. The pleasing peculiarity of this apparition is thet it is no mere shadow, like the mother of Odysseus, whom he could not embrace in Hades. Mr Crookes, a Fellow of the Royal Society, has inspected it with a phosphorus lamp, and clasped it in his arms within the medium’s sight. In M. Gautier’s romance Spirite, the lover was not permitted to touch his airy mistress. Truth is

‘ indeed stranger than fiction.

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will apply. To accomplish this function of an appellate system, it is right that the investigation of the question at issue should have been exhausted in

the inferior court, and that the court of appeal should have nothing before it which has not been there considered; for if the inferior court decide on one representation of circumstances, and the court of appeal on another, the public will lose the advantage of having the principle which was applied in the inferior reversed or affirmed in the superior tribunal.

The House of Lords has hitherto been a court of appeal from the chief civil courts in the United Kingdom. The origin of the appellate jurisdiction of the House of Lords was undoubtedly of that partly feudal and partly popular character already alluded to, which made the suitor seek justice from the high court of Parliament, when it was refused in the baronial court, or even by the king's judges. Hence the lords exercised the mixed func- tion of jurymen and judges, and, as in judgments on impeachment, the house might be influenced by private or party considerations, debating and dividing on the question before them. A revolution was silently accomplished, however, by which the function of reviewing the decisions of the courts fell entirely to the lawyers raised to the peer- age, or to other judges brought in to give their aid; and the unprofessional lords only attended to give the sanc- tion of a quorum to the proceedings. The letters and memoirs, so late as Queen Anne's reign, show that party or personal influence and persuasion were employed to procure votes on appeals, as they have in later times on railway or other local bills. The last instance probably in which a strong division of opinion was manifested among the unprofessional lords was the celebrated Douglas canse in 1769, when the house was addressed by the dukes of Newcastle and Bedford, but was led by the authoritative opinion of Lord Mansfield on the effect of the evidence,— an opinion which, being treated rather as that of a political partisan than of a judge, was sharply commented on in a work of great ability written by Mr James Stuart, who had a deep personal interest in the cause. The case of O'Connell and others, brought up on writ of error from the Queen's Bench in Ireland, in 1844, may be said to have finally established the precedent, that the judgments of the House of Lords were to be given solely by the law lords. On that occasion there was a difference of opinion among the law lords themselves. The judgment of the majority was strongly against the political feeling of the Government and of the peers as a body, while the law lords who carried the decision had been appointed by previous Governments opposed in politics to the existing cabinet. But all these temptations to a party vote by

the unprofes- sional members were resisted. It has been the constant practice of the House, in cases of difficulty, to consult the judges of the inferior courts, and the decision of the House is usually determined by their opinion.

Of old, in Scotland, there was something anomalous in an appeal to Parliament, as the Court of Session was in its original constitution a committee of Parliament, for the performance of its judicial functions. In the reign of Charles II., however, the courts grew so intolerably cor- rupt that a determined effort was made to have their judg- ments overturned, by an appeal which was strictly of the old character of a cry for protection against flagrant injustice. It was called a “protest for remeid of law,” and was inserted as one of the national claims in the Peti- tion of Right at the Revolution. There was no allusion to an appeal system in the Treaty of Union; but the House of Lords, when appealed to against the judgments of the Court of Session, acted without hesitation. Many attempts were made, but without effect, to carry appeals from the supreme criminal courts in Scotland to the House of Lords.

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The appeal system of this country previous to the Judicature Act of 1873 was constituted in the following manner. ‘The House of Lords sat during the parliamentary session to hear appeals from the superior Courts of Equity and Common Law, from the corresponding courts in Ireland, and from the Court of Session in Scotland. In none of these cases, however, was the appeal directly from the judge of first instance to the final court. In the Com- mon Law Courts, an appeal, under the name of a writ of error, was given from the decision of any one of the Common Law Courts to the decision of members of the other two, sitting in what was called the Court of Exchequer Chamber, and from that court to the House of Lords. In Equity the decisions of the Vice-Chancellors were subject to review before an appeal court, composed of the Lord Chancellor and two Lords Justices of appeal. The same procedure was observed in Ireland. In Scotland the appeal began by a reclaiming note from the Lord Ordinary to one of the divisions of the Court of Session, from which it passed to the House of Lords, The Judi- cial Committee of the Privy Council served as a court of final appeal

for admiralty, ecclesiastical, and colonial cases. Established in 1833 to hear complaints by way of appeal addressed to her Majesty in Council, it was reconstituted in 1851, and again in 1870. At first it was a court com- posed entirely of ex officio judges, but in 1870 four paid judges were appointed—the composition of the court being varied from time to time by the addition of other members specially qualified to consider the special cases in hand. Thus, in ecclesiastical appeals the attendance of certain qualified prelates was provided for. The inconvenience of having two independent courts of final appeal, the unsatis- factory character of the intermediate process, and the uncertain composition of the appeal court in the House of Lords, were among the chief considerations which suggested the recent judicature reform. By the 36 and 37 Vict. ¢. 66, the several supreme courts are united and consolidated together under the name of the Supreme Court of Judica- ture in England. The Supreme Court is divided into two great tribunals, the first of which is called the High Court of Justice, and the second the Court of Appeal. The latter is invested with all the powers of the superior appeal courts previously existing, but it may be briefly described as a court of appeal from the High Court of Justice. Power is given to her Majesty to transfer by order all appeals and petitions which ought to be heard by the Judicial Committee of the Privy Council to the Court of Appeal. In ecclesias- tical cases it is provided that the Court of Appeal “ shall be constituted of such, and so many judges thereof, and shall be assisted by such assessors, being archbishops or bishops of the Church of England,” as her Majesty, by any general rule, may think fit to direct. Appeals from inferior tribunals (County Courts, Petty, or Quarter Sessions) are to be determined by the divisional courts of the High Court of Justice, and no further appeal is possible unless by special leave of the divisional court. Appeals may be heard either by the full court of appeal, or by divisional courts thereof, consisting of not less than three Judges, and any number of such courts may sit at the same time. The Court of Appeal shall consist of five ex officio and not more than nine ordinary judges; her Majesty may also appoint as additional judges, from time to time, persons who have held certain high judicial offices in the United Kingdom or in India. The Lord Chancellor is President of the Court of Appeal, and the ordinary or additional judges are to be styled Lords Justices of Appeal.

The Judicature Act of 1873 made no provision for trans- ferring the Scotch and Irish business of the House of Lords to the new Appeal Court, and it is worthy of mention that a successful motion to that effect i the ae of

Commons was treated by the other house as a breach of its privileges, and was finally abandoned. The Amend- ment Bill of 1874 (withdrawn for want of time at the close of the session) supplied this deficiency, and made some changes in the divisional arrangements of the Appeal Court. Although under the Act of 1873 there was nominally only one appeal, yet as the court was to sit in division, it was feared that there might be some danger of these divisions gradually developing independent and con- tradictory principles of jurisprudence. It was therefore proposed that one division of the Appellate Court should sit to hear Scotch and Irish and important colonial cases, the rest of the court sitting in sections according to con- venicnce. Should there be a disagreement of opinion among the judges of these lower sections, a rehearing before the first division was to be permitted. a

The large proportional amount of the judicial work in the House of Lords, caused by appeals from Scotland, has often been noticed. It proceeds from two causes. In England there was a virtual appeal for writ of error from one of Common Law Courts to the other two, not exemplified in Scotland. But there have always appeared to the dis- appointed Scotch litigant chances in his favour from his appealing to English judges against the Scotch judges who have decided against him; and the House of Lords being not only a court of law, but a House of Parliament, was believed to be at liberty to take wider views of legal questions than the constitution permitted to the inferior courts. Under the new system, proposed in the Bill of 1874, appeals for Scotland will only be allowed when the cause involves money to the amount of £500, or points of law relating to the right of property. It may be doubted whether the principle of such restriction can in any case be defended, and it is clear that the limit fixed by the bill would exclude many causes of great commercial importance. No express provision is made for the presence of a Scotch judge in the Court of Appeal, but Scotch advocates and judges are to be eligible for appointments to that tribunal, and there

would probably always be one, at least, of its members selected for his acquaintance with the law of Scotland.

In France the adoption of the nomenclature of the civil law has made the term, in its French shape of appel, of more comprehensive use to express references from a lower to a higher tribunal, than in this country.

The United States, in adopting the structure of the English law, brought with it the practice of appeal and writ of error, but the federal constitution and the jealousy of central power have practically restricted the operation of the system. By the constitution, the Supreme Court of the United States is vested with “appellate jurisdiction, both as to law and fact, with such exceptions, and under such regulations, as Congress should make.” It appears to have been held, however, that this does not confer appel- late jurisdiction, but only authorises Congress to create it. In the words of Mr Kent, “If Congress had not provided any rule to regulate the proceedings in appeal, the court could not exercise an appellate jurisdiction : and, if a rule be provided, the Court could not depart from it. In pursuance of this principle, the Court decided in Clarke v. Bazadone, that a writ of error did not lie to that court from a court of the United States territory north- west of the Ohio, because the act had not authorised an appeal or writ of error from such a court.”—(Commentaries, i. 324.) It was urged that the constitution itself had vested appellate jurisdiction in the Supreme Court, but that Congress may introduce such exceptions as it thinks proper. The action of Congress, it was said, is not re- quired to create the jurisdiction, but is sufficient at any time to remove any part of it. The Court, however, has

adhered to the view that its appcllate jurisdiction is limited by the judiciary statutes, which are to be understood as making exceptions, and implying a negative on the exercise of such power in every case but those in which it is affirmatively given.

A peculiar and pernicious process which existed until a late period in English criminal law, received the name of appeal. It was a rightof

prosecution possessed as a per- sonal privilege by an injured party, of which the Crown could not deprive him, directly or indirectly, since he could use it alike when the prisoner was tried and acquitted and when he was convicted and pardoned. It was chiefly known in practice as the privilege of the nearest rclation of a murdered person, and was generally employed when the public passions were roused against the accused, on account, not so much of the evidence against him as the atrocity of the crime. Thus, after Colonel Oglethorpe's inquiry and report on the London prisons, when, in 1729, Banbridge and the other jailors were acquitted on indict- ments for deficiency of evidence, they were hotly pursued by appeals of murder. In the case of Slaughterford, in 1708, the public indignation was roused by the atrocity with which the accused was charged with murdering the woman he had seduced. The evidence was very imperfect, and he was acquitted on indictment; but an appeal was

brought, and on conviction he was hanged, as his execution

was a privilege belonging to the prosecutor of which the Crown could not deprive him by a pardon. In 1818 a parallel case occurred, when the appeal was ingeniously met by an offer of battle, since if the appellee were an able-bodied man, he had the choice of the two ordeals, combat or a jury. 'This neutralising of one obsolete and

barbarous process by auother, called the attention of the

Legislature to the subject, and appeal in criminal cases, along with trial by battle, was abolished by 59th Geo. III., cap. 46.

APPENDINI, Francesco Marta, historian and philo- logist, was born at Poirino, near Turin, on the 4th Nov. 1768. Educated at Rome, he took orders and was sent to Ragusa, where he was appointed professor of rhetoric. When the French seized Ragusa, Napoleon placed Appen- dini at the head of the Ragusan Academy. After the Austrian occupation he was appointed principal of the Normal Institution at Zara, where he died in 1837. Appendini's chief work was his Votizie Istorico-critiche sulle Antichita, Storia, e Letteratura der Raguscz (1802-8).

APPENZELL (for derivation see below), one of the twenty-two cantons of the Swiss Confederation, is an alpine region, with an area of about 152 square miles, entirely surrounded by the canton of St Gall. The mountains in the south attain a considerable elevation, the highest, Mount Sentis, being 8215 feet in height, and reaching the region of perpetual snow ; but towards the north the surface is composed of mere hills and hollows, some of the hills being rather remarkable for their conical shape. The canton is watered by a tributary of the Thur, the Sitter, which takes its rise from a glacier on Mount Sentis, its affluent the Urniisch, and a number of mountain streams. It was at one time almost covered with forests of fir and pine; but in consequence of the extension of the population, these have been greatly diminished. Peat and wood for fuel are abundant. ‘The climate is cold and variable, but not unhealthy. Subject like the rest of Switzerland to the Franks in the 8th century, Appenzell gradually passed into the hands of the abbots of St Gall; in 1401 it rebelled against what had become an ecclesiastical tyranny ; and in 1513 it was admitted into the Swiss Confederation. The violent struggles which followed the Reformation led to its division, in 1597, into two parts—the Inner Rhodes (a word of military origin, like the German Aofte), in the

south, being appropriated to the Roman Catholics, and the Outer Rhodes, in the north, to the Protestants. This distinction has continued to the present day; the census of 1870 giving the number of Protestants in the Catholic district as only 188, and of Catholics in the Protestant, 2358. Until 1848, indeed, no Protestants, or even Catho- lic aliens, were allowed to settle in Inner Rhodes. The chief town of that division is Appenzell, and of the other, Trogen. Each district has its own democratical constitution, consisting of a Landesgemeinde, or General Assembly, where every freeman above 18 years is bound to appear, and a Great Council, chosen by the people, the mem- bers of which must submit their acts to the general approval for their ratification. Outer Rhodes sends two members to the Vationalrath, or House of Representatives of the Confederation, and Inner Rhodes one, besides the two members which the canton sends to the Standerath, or Senate. Appenzell has taken the civil code of Zurich for its model, and has instituted a court of appeal. The value of real and other property in Outer

Rhodes is estimated at £59,028, and in Inner Rhodes at £9600; the revenue of Outer Rhodes at £12,699, and its expenditure, £12,800 (1868); and the revenue of Inner Rhodes at £6031, and its expenditure at £6011. In 1837 the population of the canton was 50,876 ; in 1860, 60,624, of whom 48,604 belonged to the Protestant division; and in 1870, 60,635, of whom 48,726 belonged to Outer Rhodes. This division, therefore, is far more populous and wealthy than the other part of the canton. Its inhabitants are industrious, and carry on large manufactures of cotton and linen goods and embroidery, while the inhabitants of Inner Rhodes are chiefly engaged in the rearing of cattle and the making of cheese. Since railway communication has made the district more accessible, a great number of strangers come to take advantage of the whey-cure establishments at Gais, Weissbad, Gonten, Urnisch, &c.

APPENZELL, the chief town of Inner Rhodes, in the canton of Appenzell, derives its name (Abbatis Cella, Abtenzelle), like Bischofszell and St Peterzell in the same region, from its ancient ecclesiastical connection. It is situated in the beautiful valley of the Sitter, and has a church with an old Gothic choir, two convents, and a council- house. The Landesgemeinde holds its meetings in the open square. In the Archiv are preserved a number of ancient banners, and among them one captured from the Tyrolese, with the grotesque inscription, Hundert Tausend Teufel. The inhabitants, who are almost entirely Roman Catholics, are largely employed in the production of embroidery, and number about 3700.

APPERLEY, Crartzs Jams, a sportsman and sporting writer, better known as “Nimrod,” the nom de plume under which he published his works on the chase and the turf, was born at Plasgronow, near Wrexham, in Denbighshire, in 1777. During the period of his education at Rugby he paid more attention to field-sports than to classics; and between the years 1805 and 1820 he devoted himself almost wholly to fox-hunting, so that he was by early training well fitted for the position of authority he after- wards acquired in the sporting world. About 1821 he began to contribute to the Sporting Magazine, under the pseudonym of “ Nimrod,” a series of articles, which from their racy character did the magazine admirable service. Its circulation doubled within two years; and the proprie- tor, Mr Pittman, with great liberality, kept for “Nimrod ” a stud of hunters, and defrayed all

expenses of his tours, besides giving him a handsome salary. The death of Mr

Pittman, however, led to a law-suit with the proprietors of the magazine for money advanced to “Nimrod ;” and the latter, to avoid imprisonment, had to take up his residence near Calais (1830), where he supported himself by his writings. He died in London, 19th May 1843. The most important of his works are—(1.) Remarks on the Con- dition of Hunters, the Choice of Horses, &c., Lond. 8vo, 1831; (2.) The Chase, the Turf, and the Road (originally written for the Quarterly Review), Lond. 1837; (3.) Memoirs of the Life of the late John Mytton, Lond. 1837 ; (4.) Nimrod’s Northern Tour, Lond. 1838; (5.) Nimrod Abroad, 2 vols. 12mo. Lond. 1842; (6,) The Horse and the Hound (a reprint from the seventh edition of the Zn- cyclopedia Britannica), 1842; (7.) Hunting Reminiscences, Lond. 1843.

APPIA VIA, the most celebrated of the ancient Roman roads, connecting the capital with Brundusium. It was commenced by Appius Claudius Cecus (312 3B.c.), who carried it from the Porta Capena to Capua (Livy, ix. 29). Its extension to Beneventum, and ultimately to Brundu- sium, making its total length about 350 miles, was com- pleted before 30 B.c. The pavement, which rested upon several prepared substrata, was formed by large blocks of hard stone (séles) fitted to each other with great exactness. Its breadth was from 14 to 18 feet, excluding the foot- paths. The course of the Appian Way is described by Horace, and Statius calls it the Queen of Roads (Regina Viarum). From a statement in Procopinus, it appears that the road was in perfect repair in his time (500-565).

APPIAN, an eminent writer of Roman history in Greek under the reigns of Trajan and Adrian. He was a native of Alexandria in Egypt, whence he went to Rome, where he became a distinguished advocate, and was chosen one of the procurators of the empire. He did not treat of the history of the Roman empire as a whole, but gave separate accounts of the various provinces as they were attached to the empire. Of his voluminous work there remains only what treats of the Punic, Syrian, Mithridatic, and Spanish wars, with those against Hannibal, the civil wars, and the wars in Illyricum, and some fragments of the Celtic and Gallic wars,—in all about

one-half of the original twenty-two books. An excellent edition of Appian was published by Schweighaduser at Leipsic, in 1785, 3 vols. 8vo, in which the extracts from the lost books are collected. The best edition of the text is that of Bekker, 1853.

APPIANI, Anprea, the best fresco painter of his age, born at Milan in 1754, died in 1817. He was made pensioned artist to the kingdom of Italy by Napoleon ; but having lost his allowance after the events of 1814, he fell into poverty. Correggio was his model, and his best pieces, which are in the church of the Virgin and the royal palace of Milan, almost rival those of his great master. He is also said to have painted Napoleon and the chief personages of his court. Among the most graceful of his oil paintings are his " Venus and Love," and "Orlando in the garden of Armida."

APPIUS CLAUDIUS. See Cravprvs.

APPLE. The apple (Pomme, Fr.; Apfel, Ger.) is the fruit of Pyrus Malus, belonging to the Sub-order Pomacee, of the Natural Order Rosacew. It is one of the most widely cultivated, and best known and appreciated of fruits belong- ing to temperate climates. In its wild state it is known as the crab-apple, and is found generally distributed throughout Europe and Western Asia, growing in as high a latitude as Drontheim in Norway. The crabs of Siberia belong to a different species, and are named Pyrus baccata and P. prunifolia. The apple-tree as cultivated is a moderate sized tree with spreading branches, ovate, acutely serrated or crenated leaves, and flowers in corymbs. The fruit 1s too well known to need any description of its external

characteristics. The apple is successfully cultivated in higher latitudes than any other fruit tree, growing up to 65° N., but notwithstanding this, its blossoms are more susceptible of injury from frost than the flowers of the peach or apricot. It comes into flower much later than these trees, and so avoids the night frost which would be fatal to its fruit bearing. 'The apples which are grown in northern regions are, however, small, hard, and crabbed, the best fruit being produced in hot summer climates, such as Canada and the United States. Besides in Europe and America, the fruit is now

cultivated at the Cape of Good Hope, in Northern India and China, and in Australia and New Zealand. “7

Apples have been cultivated in Great Britain probably since the period of the Roman occupation, but the names of many varieties indicate a French or Dutch origin of much later date. In 1688 Ray enumerated 7 8 varieties 1n cultiva- tion in the neighbourhood of London, and now it 1s calculated that about 2000 kinds can be distinguished. According to the purposes for which they are suitable, they can be classed as—lst, dessert; 2d, culinary ; and 3d, cider apples. The principal dessert apples are the Pippins (pepins, seedlings), of which there are numerous varieties. The most esteemed of all apples is the American Newtown Pippin, a globular, juicy, sweet, and highly aromatic fruit ; other American varieties of note are Williams’s Favourite, Astrakhan, and Gravenstein, and for winter use. the Baldwin, Spitzenberg, and Roxbury Russet. As culinary apples, besides Rennets and other dessert kinds, Codlins, and Biffins are cultivated. In England, Herefordshire and Devonshire are famous for the cultivation of apples, and in these counties the manufacture of cider is an important industry. Cider is also extensively prepared in Normandy and in Holland. Verjuice is the fermented juice of crab apples.

Apples for table use should have a sweet juicy pulp and rich aromatic flavour, while those suitable for cooking should possess the property of forming a uniform soft pulpy mass when boiled or baked. In their uncooked state they are not very digestible, but when cooked they form a very safe and useful food, exercising a gentle laxative influence. According to Fresenius their composition is as follows:—

Fido Albuminous Apple. Water. Sugar. acid. sabaierees. Salts. c, English Rennets, ... 82°04 6°83 0°85 7°92 0°36 White Dessert, ... 85°04 7:58 1°04 2°94 0°44 ee English Golden Pippin, 81°87 10°36 0°48 511

A large trade in the importation of apples is carried on in Britain, the amount of which is not, however, separately stated in the Board of Trade returns. Our imports come chiefly from French, Belgian, and Dutch growers, and from the United States and British North America. Dried and pressed apples are imported from France for stewing, under the name of Normandy Pippins, and similarly prepared fruits come also from America.

Many exotic fruits, having nothing in common with the apple, are known by that name, e.g., the Balsam apple, Momardica balsamina ; the Custard apple, Anona reticu- lata; the Egg apple, Solanum esculentum; the Rose apple, various species of Hugenia ; the Pine apple, Anan- assa sativa ; the Star apple, Chrysophyllum Cainito ; and the apples of Sodom, Solanum sodomeum.

APPLEBY, a market and borough town of England, capital of Westmoreland, situated on the Eden, 13 miles S.E. of Penrith. The greater part of Appleby, consisting of a broad, irregularly built street, from which smaller ones branch off, occupies the slope of a hill on the left bank of the river, in the parish of Appleby St Lawrence; but on the opposite bank, in the parish of Appleby St Michael, is the

suburb of Bongate, which is connected with the rest of the town by a fine old stone bridge. Appleby contains an

Seal and Arms.

ancient castle, two parish churches, as well as Wesleyan places of worship, a town and a county hall, a jail, an hospital for thirteen poor women, and a grammar school. There is a municipal corporation, and previous to the Reform Act of 1832 the town returned two members to parliament. It has for a long time been a place of small importance, with little trade, and hardly any manufactures. Population of the Improvement Commissioners' District in 1871, 1989.

APPRAISER (from ad and pretwwm, value), one who sets a value upon property, realor personal. By 46 George III. c. 43, appraisers must possess a license, the duty pay- able for which is at present £2 annually. By a statute of William and Mary, two sworn appraisers must be employed by the sheriff to value any goods taken under distress for rent. 'The business of appraiser is usually combined with that of auctioneer.

APPRENTICE— APPRENTICESHIP. Apprentice- ship (from apprendre, to learn) is a contract whereby one person, called the master, binds himself

to teach, and another, called the apprentice, undertakes to learn some trade or profession, and to serve his master for a certain time. The contract is generally created by indenture, but any writing properly expressed and attested will suffice.

The Civilians are silent on the subject of this contract, nor does it seem to have had any connection with the. division of the Roman citizens into tribes or colleges. So far as can be seen it arose in the Middle Ages, and formed an integral part of the system of guilds and corporations by which skilled labourers of all kinds sought protection against the feudal lords, and the maintenance of those exclusive privileges with which in the interests of the public they were favoured. In those times it was believed that the arts and sciences would not flourish unless such only were allowed to practise them as had given proofs of reason- able proficiency and were formed into bodies corporate, with certain powers of self-government and the exclusive monopoly of their respective arts within certain localities.

Tt has sometimes been supposed that these medizval corporations were confined to such occupations as are now followed by artisans. This, however, is a mistake. The word universitas is the correct Latin name for any corpora- tion whatsoever ; and in medisval parlance it was just as proper to speak of the university of smiths or tailors, as of the university of Paris or Oxford. It is, indeed, very probable that, at the dawn of returning civilisation, the humbler arts first received the ‘attention and the fostering care of the state; but it is certain that as each lost art or science was recovered, its professors were formed into a university or corporation, composed of such as were entitled to practise and teach, and such as were in course of learning. The former were the masters, the latter the apprentices. Hence the term Apprentice was applied indifferently to such as were being taught a trade or a learned profession, and even to undergraduates or scholars who were qualifying themselves for the degree of doctor or master in the liberal

arts. When barristers were first appointed by Edward I. of England, they were styled apprenticiz ad legem—the serjeants being servientes ad legem; and these two terms corresponded respectively to the trade names of

apprentices and journeymen. During the middle ages the term of apprenticeship was seven years, and this period was thought no more than sufficient to instruct the learner in his pro- fession, craft, or mystery, under a propcrly qualified master, teacher, or doctor—for these names were synonymous— and to reimburse the latter by service for the training received. After this the apprentice became himself a master and a member of the corporation, with full rights to practise the business, and to teach others in his turn ; so also it would seem that undergraduates had to pass through a curriculum of seven years before they could attain the degree of doctors or masters in the liberal arts. On the Continent of Europe these rules were observed with considerable rigour, both in the learned professions and in those which we now designate as trades. In England they made their way more slowly, and did not receive much countenance from our ancestors, who were always jealous of anything savouring of interference with the freedom of trade. Nevertheless the formation of guilds and com- panies of tradesmen in England dates probably from the 12th century, and it is almost certain that the institution of apprenticeships cannot be of much later date. In 1388 and 1405 it is noticed in Acts of Parliament. By various subsequent statutes provisions were made for the regulation of the institution, and from them it appears that seven years was its ordinary and normal term in the absence of special arrangement. By the 5th of Eliz. c. 4, this was nade the law of the land, and it was enacted that no person should exercise any trade or mystery without having served a seven years' apprenticeship. In no place did the appren- tices become so formidable by their numbers and organisa- tion as in London. During the great rebellion they took an active part as a political body, and were conspicuous after the Restoration by being frequently engaged in tumults. It was probably owing to this circumstance, quite as much as to economical considerations of freedom of trade, that the Act of Elizabeth never found much favour with the courts of law. Soon after the great rebellion we find the apprentice laws strongly reprobated by the judges, who endeavoured, on the theory that the Act of Elizabeth could apply to no trades which were not in existence at its date, to limit its operation as far as possible. Such limitation of the Act gave rise to many absurd anomalies and inconsistencies, ¢.g., that a coachmaker could not make his own wheels, but must buy them of a wheel-wright ; while the latter might make both wheels and coaches, because coachmaking was not a trade in England when the Act of Elizabeth was passed. For the like reason

all the great manufactures which have arisen in Manchester and Birmingham in modern times were held exempt from the operation of the statute. Concurrently with the dislike to the apprentice laws which such anomalies generated, the doctrines of the celebrated Adam Smith, that all monopolies or restrictions on the freedom of trade were injurious to the public interest, had gradually been making their way, and notwithstanding much opposition, an Act was passed in 1814 (54 Geo. III. c. 96), by which the statute of Elizabcth, in so far as it enacts that no person shall engage in any trade without a seven years' apprenticeship, was wholly repealed. The effect of this Act has been to give every person the fullest right to exercise any occupation or calling of a mechanical or trading kind for which he deems himself qualified. Appren- ticeship, therefore, which was formerly a compulsory, has now become a voluntary contract. It is still, however, the usual avenue to such avocations, because experience has

such a knowledge of the mechanical arts as shall enable a man to exercise them with advantage. In the case of the learned professions, the principles and theories which gave birth to corporations with monopolies, and required appren- ticcship or its equivalents, have—contrary to what has taken place in trade—been not only maintained but intensified ; that is to say, not only have such bodies retained and even extcnded in some cases thcir exclusive privileges, but in general no one is allowed to practise in such professions unless his capabilities have been tested and approved by public authority. Thus, no man is allowed to practise law or medicine in any of their branches who has not undergone the appropriate training by attendance at a university or by apprenticeship—sometimes by both combined. Entrance to the church is guarded by similar checks ; and even in the case of education great advances have been made to bring the practice of that art under the like restrictions. In such instances the old principle—now abandoned in trade—of granting a monopoly to those possessing a certain standard of qualification is maintained in greater vigour than ever.

As already noticed, Dr Adam Smith and most of his school strongly disapproved of apprenticeship, but only as it would seem when applied to trade and manufactures. They urged that the institution interfered with the

property which every man has or ought to have in his own labour, and interfered not only with the liberty of the workman, but with that of such as might choose to employ him, and who were the best judges of his qualification. They further argued, that such laws tended to restrain competition to a much smaller number than would otherwise enter a trade ; that a long apprenticeship, or indeed any at all, was unnecessary even for the nicest mechanical arts ; that a few weeks or even days were sufficient to enable a man to set to work in such trades as clock and watch making ; and that if the workman was from the outset paid the full price of his work, under deduction of such materials as he might spoil from carelessness or inexperience, he would learn his art more effectually, and be more apt to acquire habits of attention and industry, than by working under a master who had a right to share in the produce of his labour. It was further contended that the whole system of appren- ticeship, like that of the corporations of which it formed an integral part, was a mere devicc by which masters sought to limit the number of entrants into their respective trades, and so enhance their monopolies at the expense of the general public. That there is considerable truth in much of this reasoning is undeniable. At the time when Dr Smith began to attack the trade corporations, the narrow and vexatious rules of apprenticeship by which they sought to guard their exclusive privileges were, like their privileges, grievous restraints on the freedom of trade. But taking all this in its worst view will hardly justify the sweeping charges brought against the institution of apprenticeship. It is not conceivable that an institution, which for centuries found acceptance in every part of Europe, should have no better justification than the greed of master workmen. The abolition of the laws which rendered apprenticeship com- pulsory has not,as Dr Smith and his followers thought, led to its disuse. On the contrary, it or its equivalents have been voluntarily submitted to by such men as desired to exercise a trade to 2 profit; for the public were not long im discovering that the regularly traincd artisan was the only one whose work could be relied on. It is not very easy to see why those principles of monopoly, based on ascertained proficiency, which are so rigorously enforced in the learned professions, should not at least have some application in the case of skilled artisans. Itis also worthy of notice that the rise of trades’ unions has been coincident

shown that it is the only effectual means of acquiring | with the fall of the old trade corporations — thus indicating

that artisans feel the necessity for some more powerful and orderly protection than the mere operation of the blind principle of supply and demand. For these and similar reasons, it is believed that few practical men will in the present day deny the advantages of apprenticeship. No one would probably advocate the restoration of the old guilds with their exclusive privileges; but many would perhaps incline to advise the institution of some order or degree by which, in certain trades, the workman who has passed through a regular apprenticeship may be distin- guished from the man who is not so qualified. (F. W. ©.)

APRICOT, the fruit of Prunus armeniaca (Linn.) or Armeniaca vulgaris, according to others. Under the one name it is a species of the genus to which the plums belong, the other establishes it as a distinct genus of the natural order Rosacee. ‘The apricot is, like the plum, a stone fruit, cultivated generally throughout temperate regions, and used chiefly in the form of preserves and in tarts. The tree is said to be a native of Armenia (hence the name Armeniaca), and it is found commonly in mountainous countries throughout Asia. It flowers very early in the season, and is a hardy tree, but the fruit will scarcely ripen in Britain unless the tree is trained against a wall. A great number of varieties of the apricot, as of most culti- vated fruits, are distinguished by cultivators. The kernels of several varieties are edible, and in Egypt those of the Musch-Musch varicty form a considerable article of com- merce, The French liqueur Hau de Noyausx is prepared from bitter apricot kernels.

APRIES (’Azpins), the name by which Herodotus and Diodorus designate Pharaoh-Hophra, the eighth king of the twenty-sixth Egyptian dynasty. See Ecypt.

APRIL was, in the old Roman reckoning, the second month of the year, but is counted in the Julian calendar as the fourth. The derivation of the name is unknown, though as far back as Varro we find the traditional etymology, omnia aperit, “it opens everything,” which is supported by comparison with

the modern Greek use of dvovéis (opening) for spring ; while some would make out a connection with Aphrodite (Venus), and Grimm suggests the name of a hypothetical god or hero, Aper or Aprus. Among the Romans this month was sacred to Venus, the Festum Veneris et Fortune Virilis being held ou the first day. On the fourth and the five following days, games (Ludi Megalenses) were celebrated in honour of Cybele; on the fifth there was the Festum Fortune Publice ; on the tenth (?) games in the circus, and on the nineteenth, equestrian combats, in honour of Ceres; on the twenty-first—which was regarded as the birthday of Rome—the Vinalia urbana, when the wine of the previous autumn was first tasted; on the twenty-fifth, the MRobigalia, for the averting of mildew; and on the twenty-eighth and four following days, the riotous Floralia. Im many coun- tries of Europe, as England, France, and Germany, the first of April has for long been appropriated to a face- tious custom, for which no very satisfactory origin has been assigned. To send an unsuspecting or ignorant person on some bootless errand is the great endeavour of the day. In Scotland the unfortunate subject of the trick is called a gowk—which has now, though the words were probably at one time different, the meaning both of “fool ” and “cuckoo,”—and the mischievous errand-sending is “hunting a gowk.” In France the dupe is called potsson @ Avril, or April-fish. One remarkable theory traces the custom to Noah, as sending out his dove on such a quest; it is also referred either to the miracle plays represent- ing the sending of our Saviour from Annas to Caiaphas and from Pilate to Herod, or to the change, in France, in 1564, of New Year’s day to the first of January, which left the first of April destitute of anything but a burlesque

of its former festivities ; and more recently an identification has been attempted with the Hindoo festival of Huh, which is celebrated in a similar manner on the 31st of March. No references to all-fools’-day have been found in our earlier literature ; and it seems that both England and Germany have derived the fashion from France. St George’s day is the twenty-third of the month ; and St Mark’s Eve, with its superstition about those who were doomed to die, falls on the twenty-fifth. In China the symbolical ploughing

of the earth by the emperor and princes of the blood takes

place in their third month, which frequently corresponds to

our April; andin Japan a pleasant domestic festival, called

the feast of Dolls, is celebrated in the same month. The

days of April (jowrnées d'Avril) is a name appropriated in

French history to a series of insurrections at Lyons, Paris,

and elsewhere, against the government of Louis Philippe in 1834, which led to violent repressive measures, and toa

famous trial known as the Procés d'Avril. (See Chambers's Book of Days ; Grimm's Geschichte der Deutschen Sprache,

cap. " Monate.") A PRIORI and A POSTERIORI. The philosophical distinction expressed by these terms is to be explained by

referring to the phraseology of Aristotle. According to him there may be a double starting-point in knowledge. When

our individual progress in learning is chiefly considered, the things with which we are first and best acquainted may be termed earlier and prior; whereas the truths of a more general, primary, and fundamental character, to which we

are subsequently led, have a later and posterior position. But if we lose sight of our personal interest in knowledge,

then the priority may be more justly claimed by whatever is the cause or principle from which something else springs.

In this sense the causal, original, and primary in the objec-

tive world is by nature prior (pérepov pvcret) ; whilst the secondary and derivative existence is posterior. Priority

in the first acceptation is only relative to us, and for

general purposes may be called accidental ; in the second acceptation, the priority is absolute, and without qualifica-

tion. It is the second acceptation which Aristotle laid down as the properly philosophical one, and which regulates the usage of the phrases @ priori and a posteriori by the schoolmen. In that sense of the term there can evidently

be no a priori demonstration of first and fundamental

principles. According to Aquinas, for example, there can be no a priori knowledge of God ; because He, as uncaused and uncreated, cannot be deduced from anything prior in causation to Himself, and can only be apprehended ration- ally by means of that which is consequent upon His action, viz., the creatures of the natural world. In other words, our knowledge of Him must be a posteriort. It is obvious that science in the highest sense must be a priori, if vere scire est per chusas scire ; 2.¢., the knowledge must spring from an insight into causes, which are the true primaries. By an extension of this usage an argument is said to follow an @ priori path, when from the basis of some conception it proceeds to evolve by analysis all or some of the logical consequences; whereas, the mode of reasoning, which endeavours to gather into a single formula the various facts of observation, is described as a posteriort. The argument of Anselm, which, from the mere conception of God, pro- poses to deduce his existence, is an example of a priort reasoning. An a priort reasoner has to predict what is or will be, by considering what ought to be in accordance with certain presuppositions. He tries by argument to assign beforehand the place of a fact which may not yet have been discovered by observation. From the analysis of certain given conditions, or by constructing the total product from some given elements, he seeks to anticipate experience. Of course, if the original conception be bad or defective, the conclusions will be false or inadequate. Often too, what

claims to be the mere deduction from a conception, is secretly and perhaps unconsciously supplemented by more efficient elements of proof. It is this circumstance, that imperfect knowledge is taken as the ground for further

conclusions, which has brought a priori reasoning into dis- eredit. Apart from these defects, however, this style of argumentation merely expresses the natural and blameless tendency of the mind to make every acquired truth a sort of lever and fulcrum from which to move the yet undis- covered and untried ; and error is introduced only where there is a failure to correct this tendency by constant recurrence to the processes of verification. The a prior argument is based upon what was originally given through experience ; but before this experiential truth becomes a priori, it must lose its first and empirical character, and be invested with the attributes of universality and necessity. In this sense, which since the time of Kant has been com- monly given to the word, the a priori is the opposite of the empirical and contingent. Any truth which is rela- tively universal and necessary may in its own sphere form the basis of an a priori argument ; and if there be anything which is absolutely universal and necessary throughout the whole range of knowledge, it will be in a supreme sense a priort. Such, according to Kant, is the self-contained and original faculty of mind, the forms and powers of the intellect and senses, as contradistinguished from the mate- rials presented by the senses and elaborated by the under- standing. To ascertain the special constitution of this a priori region, thus marked out by the criteria of universality and necessity, to determine the features of thought when it is independent of and prior to all experience, was the theme of the Critique of the Pure Reason. The general or universal form and faculty of knowledge, thought in its native purity, constitutes the a priori element: whilst the particularising data of experience, drifting in from the unknowable thing-in-itself, make up the region of the a posteriori. An example of an a priori science, according to Kant, in this sense of the term, as not dependent upon experience, is seen in pure mathematics; and there may also, according to him, be a pure or a priori philosophy of nature ; but there can be no pure or @ priori doctrine of the ultimate ideas which regulate experience,—that is, metaphysics in the older sense is impossible. (w. w.)

APSE (Gr. ais ; Lat. absis, tribuna, concha ; Fr. abside, chevet, rond-point; Ital. apside, tribuna ; Ger. Ablauf), the semicircular or polygonal termination to a church. These forms were no doubt derived from the concha or bema, in the classic and early Christian basilica. In both cases it was the place appropriated to those who administered justice, the przetor’s

chair in the one being represented by the bishop's throne in the other. The altar stood not within the apse, but on the chord of its arc. Sometimes the apse is a simple semicircle ; sometimes in large churches out of this a smaller semicircle springs, as Becket's Crown at Canterbury, and at Sens, Langres, and in many other churches abroad. Sometimes the choir finishes with three apses—one to the central aisle, and one to each side aisle, asat Autun, Sometimes the plan is a semicircle, each bay of which has a projecting semicircular apse, forming a sort of cluster of apses, as at Beauvais, Troyes, Tours, &c. The later choir at Mans is encircled by no less than thirteen apses, the centre one being twice the depth of the others, and forming the Lady-chapel. In some small churches of the Norman period, there is a sort of double chancel, one square, and the other an apse projecting eastward, each of which has its own arch, as at Sutton, East Ham, Darent, &e. Large circular and polygonal apses generally have radiating chapels within, as at Westminster Abbey. The earliest cathedral at Canterbury had an apse at each end, if we may trust the old plan; and there are several instances

of the same kind in France and Germany. Apses project from the north and south ends of the transepts, and from their east sides in a few cases abroad, the only example of this in England being at Norwich.

APSHERON, a peninsula of Asia, in Georgia, extending from the eastern extremity of the Caucasus range for about 40 miles into the Caspian Sea, and terminating in Cape Apsheron. It produces naphtha, salt, and saffron in great abundance ; and has long been celebrated among the fire- worshippers of Asia for the sacred fires that issue from its soil. On its southern coast is the port of Baku.

APT, the Roman Apta Julia, a town of France, in the department of Vaucluse, situated on the left bank of the Calavon, a tributary of the Durance, 30 miles east of Avignon. It is surrounded by ancient and massive walls, and is well built, although several of its streets are narrow and irregular. The chief object of interest is the cathedral, a building combining different styles of architecture, founded about the year 1050 on the site of a much older edifice, but not completed until the latter half of the 17th

century. There are many Roman remains in and near the town, including a fine bridge, which is said to have been con- structed by Julius Cesar. The chief manufactures of Apt are those of woollen and cotton goods, silk, confectionery, earthenware, candles, leather, and brandy ; and there is besides a considerable trade in fruit, grain, and cattle. Apt was at one time the chief town of the Vulgientes, a Gallic tribe; it was destroyed by Julius Cesar, who sub- sequently restored it, conferring upon it the title Julia; it was much injured by the Lombards and the Saracens, but its fortifications were rebuilt by the counts of Provence. Population (1872), 5892.

APULEIUS, Lucius, celebrated as a philosopher and a writer of romance, was born at Madaura in Numidia, about 125 a.p. As the son of one of the principal inhabi- tants, he received an excellent education, first at Carthage and subsequently at Athens. After leaving Athens he undertook a long course of travel, principally with the view of obtaining initiation into religious mysteries. On a journey to Alexandria he fell sick at Cia (Tripoli), and was received into the house of Sicinius Pontianus, a former fellow-student. The widowed mother of Pontianus, Puden- tilla, became enamoured of the handsome young philo- sopher, who, at her son’s request, as he affirms, consented to marry her. The lady’s wealth rendered this step distasteful to the other members of her family, by whom, after the premature death of Pontianus, Apuleius was indicted on a charge of having gained her affections by magical arts. He easily established his innocence, and his spirited, highly entertaining, but inordinately long defence (Apologia, sive de Magia), is our principal authority for his biography. From allusions in his subsequent writings, and the mention of him by St Augustine, we gather that the remainder of his prosperous life was devoted to literature and philosophy; that he exercised the priestly office, and frequently declaimed in public; and that statues were erected in his honour by Carthage and other cities. Many errors have found their way into his biography, from the supposition of his identity to a certain extent with Lucius, the hero of his romance. The contrary appears from the introduction of Lucius as a Greek, who professes to have only with great difficulty acquired Latin, Apuleius’s own mother tongue. Lucius also takes a vow of poverty and chastity, which must have been but ill observed by the spouse of the opulent and amorous Pudentilla.

There is little of Apuleius's own invention in the work on which his fame principally rests. The Jfetamorphoses or Golden Ass (which latter title seems not to be the author's own, but to have been bestowed in compliment), was founded on a narrative in the Jetamorphoses of

Lucius of Patra, a work extant in the time of Photius. From Photius's account (impugned however by Wieland and P. L. Courier), this book would seem to have consisted of a collection of marvellous stories, related in an inartistic fashion, and in perfect good faith. The literary capabilities of this particular narrative attracted the attention of Apuleius's contemporary, Lucian, who proceeded to work it up in his own manner, adhcring, as Photius seems to indicate, very closely to the original, but giving it a comic and satiric turn. Apuleius followed this rifaccimento, making it, however, the groundwork of an elaborate romance, interspersed with numerous episodes, of which the beautiful story of Cupid and Psyche is the most celebrated, and altering the denouement to suit the religious revival of which he was an apostle. There is no reason to conclude with Warburton, that he wrote in direct antagonism to Christianity ; or with Thomas Taylor, that " his intention was to show that the man who gives himself toa voluptuous life becomes a beast." The book is, nevertheless, a remark- able illustration of the contemporary reaction against a period of scepticism, of the general appetite for miracle and magic, and of the influx of Oriental and Egyptian ideas into the old theology. It is also composed with a well-marked literary aim, defined by Kretzschmann as the emulation of the Greek sophists, and the transplantation of their towrs de force into the Latin language. Nothing, indeed, is more characteristic of Apuleius than his versatility, unless that it be his ostentation and self-confidence in the display of it. The dignified, the ludicrous, the voluptuous, the horrible, succeed each other with bewildering rapidity ; fancy and feeling are everywhere apparent, but not less so affectation, meretricious ornament, and that effort to say everything finely which prevents anything being said well. The Latinity has a strong African colouring, and is crammed with obsolete words, agreeably to the taste of the time. Few books accordingly suffer less by translation. When these defects are mitigated or overlooked, the Golden Ass will be pronounced a most successful work, original in treatment though not in invention, invaluable as

an illustra- tion of ancient manners, and full of entertainment from beginning to end. The most famous and poetically beauti- ful portion is the episode of Cupid and Psyche, adapted from a popular legend of which traces are found in most fairy mythologies, which explains the seeming incongruity of its being placed in the mouth of an old hag. As observed by Friedlander, this discriminating recognition of the beauty of a wild flower of folk lore is as much to the credit of Apuleius's taste and feeling as the invention of it could have been to his imagination. The allegorical purport he has infused into it is his own, and entirely in the spirit of the Platonic philosophy. Don Quixote's adventure with the wineskins, and Gil Blas's captivity among the robbers, are palpably borrowed from Apuleius; and several of his humorous episodes, probably current as popular stories long before his time, reappear in Boccaccio.

Of Apuleius's other writings, the Apology has been already mentioned. The Florida are a collection of excerpts from his declamations, ingenious but highly affected, and in general perfect examples of the sophistical art of saying nothing with emphasis. The pleasing little tract On the God of Socrates expounds the Platonic doctrine of beneficent demons. Two books on Plato treat of his life, and his physical and ethical philosophy; a third, treating of logic, is generally considered spurious. Apuleiusinforms us that he had also composed numerous poems in almost all possible styles, and several works on natural history, some in Greek. In the preparation of these he seems to have attended more closely to actual anatomical research than was customary with ancient naturalists.

The character of Apuleius, as delineated by himself, is

attractive ; he appears vehement and passionate, but devoid of rancour; enterprising, munificent, genial, and an enthu- siast for the beautiful and good. His vanity and love of display are conspicuous, but ate extenuated by a genuine thirst for knowledge, and a surprising versatility of attain- ments. His place in letters is accidentally more important than his genius strictly entitles him to hold. He is the only extant example in Latin literature of an accomplished sophist in the good sense of the term. The loss of other ancient romances has secured him a peculiar influence on modern fiction ;

while his chronological position in a transi- tional period renders him at once the evening star of the Platonic,and the morning star of the Neoplatonic philosophy. The most complete edition of Apuleius is Oudendorp's (Lugd. Bat. 1786-1823) ; the best modern edition is Hildebrand's (Leipsic, 1842). The translations and imitations of the Golden Ass in modern languages are innumerable. The episode of Psyche has afforded the subject of a drama to Thomas Heywood, and of narrative poems to Shakerley Marmion, and Mrs Tighe. Thereare good English ver- sions by Sir G. Head, and in Bohn's Classical Library. The style of Apuleius has been thoroughly investigated by L. Kretzschmann, De Latinitate L. Apulei Madawrensis (Regimonti, 1865). (R. G.) APULIA, the name applied to a district of southern Italy, the limits of which were not very definitely or per- manently marked. It is usually regarded as having been bounded by the country of the Frentani on the N., Sam- nium on the W., Calabria and Lucania on the S., and the Adriatic on the E. The northern portion comprised the district sloping eastward from the Apennines, but did not take in any part of the mountains themselves ; while the southern portion was occupied by a rocky off-shoot of the main chain, which left only a narrow but fertile strip of land along the sea. On the northern part of the coast was the remarkable mountain-mass of Garganus, forming an enormous promontory. Apulia was watered by the Tifernus (Biferno), the Frento (Yortore), the Cerbalus (Cervaro), the Aufidus (Qfanto), and a number of inter- mittent mountain streams. The soil for the most part was calcareous and arid, but in winter afforded abundant pastur- age for the sheep, that in ancient times as now were driven during the summer to the neighbouring highlands of Samnium. Of the mingled population of Apulia, the Apulians proper (of Oscan race, it is supposed), the Daunians (pethaps of Pelasgian origin), and the Peucetians or Peediculi (likewise Pelasgian), seem to have been the principal elements. The prevalent language, according to M ommsen's investiga- tions, was distinct from the Oscan and related to the Greek. Direct Greek influence—probably emanating from Taren- tum—is evident in the workmanship and inscriptions of the coins and vases and other remains which have been discovered throughout the region. The more important towns were Larinum (1), Teanum, Luceria, Arpi, Salapia, Sipontum, Canusium, Barium, Egnatia, and Venusia. Reduced under Roman dominion in the 4th century B.c., Apulia for the most part continued true to the Roman cause till the time of the second

Punic war, when it was greatly distracted and suffered grievously from the hostile opera- tions of both the belligerents. It belonged to the second region of Augustus, and from the reign of Constantine was governed along with Calabria by a “ Corrector.” For several centuries after 476 it was alternately under the power of the Lombards, the Goths, the Saracens, and the emperors of the East; and about the 10th century was regularly governed by the last by means of a “ catapan” or deputy, who has left the designation of his office, Cata- panata, in the modern corruption Capitanata, applied to the northern portion of the present Apulia. It was con- quered by the Normans under William Bras-de-Fer, who took the title of Comes Apulie in 1042, was raised along with Calabria to a dukedom by Robert Guiscard in 1057, and in 1127 was united to the Sicilian monarchy. The name

Apulia is still employed as a geographical, but no longer

as an ethnological or political designation.

APURE, a river of Venezuela, formed by the confluence of

the Orivante and the Sarare in 7° N. lat., and 71° W. long., and joining the Orinoco, after a course of about 500 miles. Its chief tributaries are the Caparo and the Portuguesa.

APURIMAC, or Tampo, a Peruvian river which rises in the lagoon of Villafro, near Caylloma, flows in a generally northward direction, and, receiving the waters of the Velille, the San Tomas, the Mamara, the Pachachaca, the Pampas, the Mantaro, and the Perene, falls into the Ucayali, an affluent of the Amazon. The river formed by the Tambo— or Catongo, as it is called in this part of its course—and the Mantaro receives the name of Ene, and is joined by the Perene, a river large enough for the passage of steamers. About 30 miles further down it forms a great cataract, which breaks the navigation. After receiving the Muyupu and the Vileamayu or Urubamba, the stream, under the name of Ucayali, flows north to join the other head-streams of the Amazon near Nauta. The navigation of the Apurimac below the falls is greatly hindered by its strong and rapid current. The whole length of its course is about 600 miles.

AQUAMBO or AKUAMU, a country in the interior of the Gold Coast of Africa, extending along both banks of the Rio Volta or Aswada. The portion to the west of the river is under British protection; and that on the east, with the exception of a narrow strip along the bank, is sub- ject to the king of Dahomey.

AQUAPIM, a country of considerable extent in the interior of the Gold Coast of Africa, immediately behind Accra. It is watered by the Densu, Dinskoi, or Seccoom, and is finely diversified with cultivated valleys and wooded hills of considerable elevation. The most important place is Akropong.

AQUARIANS, a name given to various sects of Chris- tians in the primitive church who substituted water for wine in the communion service. This they did on principles of abstinence and temperance, or because they thought it unlawful under any circumstances to eat flesh or drink wine. Epiphanius calls them Hneratites, from their abstinence ; Augustine, Aquarians, from their use of water; and Theo- doret, Hydroparastate, because they offered water instead of wine. Entirely distinct from those Aquarians upon prin- ciple, were others who used water at morning communion in order that they might not be discovered by the smell of wine.

AQUARIUM. This word is used to denote a vessel, or collection of vessels, in which marine or fresh water animals may be kept, and in which marine or sweet water plants may be grown. The invention or rather growth of the modern aquarium cannot, in the absence of precise data, be accurately traced. The aquarium, as we find it at Ham- burg or Brighton, has, like many other things now in daily use, been elaborated from small beginnings. It is known that more than two centuries ago marine animals were, for the purposes of study and observation, removed from tae sea and kept in confinement; and there is extant a drawing, of the date of 1742, which represents the form of an aquarium containing zoophytes. Esper, a distinguished entomologist, a century ago kept aquatic insects in water for observation. Sir John Graham Dalyell, the author of fare and Remarkable Animals of Scotland, 2 vols. Ato, 1847-48, The Power of the Creator displayed in the Creation, 3 vols. 4to, 1851-58, and numerous other works, was during his lifetime a keen student of marine animals ; and, at his house

in Edinburgh, he had constructed for the purposes of observation an aquarium of a very humble kind indeed, but quite sufficient for his purpose. It is well known that some of the animals which he kept for the purposes of study lived for a very long period in

confinement: one sea anemone is mentioned on good authority as having been taken from the sea in the year 1828, and being alive and well in 1873 (W. A. Lloyd). Sir John's tanks, as has been stated, were of the humnblest description, and never contained any of that vegetation which forms so beautiful and interesting a feature of the modern aquarium, and which, as Priestley had discovered long before, purifies the water in which it is kept growing. About the year 1839 a movement was made towards the construction of aquariums of a more elaborate description, which lasted for more than twenty years, during which time a large number were made, and many descriptive works published on the subject. Agencies were during that period established in London and elsewhere for the supply of animals ; and some at the same time made it a busi- ness to purvey sea-water—the obtaining of this, and keep- ing it fresh, being with many persons who lived far from the sea a great difficulty. Indeed the difficulty was so great that an artificial compound was in numerous in- stances resorted to for lack of genuine sea-water. A solu- tion of this difficulty came tardily, in 1841. Mr Ward at that time constructed in London a fresh-water aquarium, in which aquatic plants were very successfully grown for the purpose of keeping the water pure and the animals healthy; and a year later, Dr George Johnston of Berwick- on-Tweed, accidentally discovered, in the course of making an experiment for another purpose, that the animal and plant life of the sea could also be made to support each other. For a period of sixty days he kept some animals in a jar without once changing the water, and thus solved the problem. arly in 1847 Mrs Thynne of London suc- cessfully investigated the problem, whether it was possible to keep the animals in good condition of health without changing the water. In 1849 Mr R. Warington, also of London, and afterwards Mr P. H. Gosse, conducted suc- cessful experiments having for their object the balancing of vegetable and animal life, which afterwards came to be thoroughly recognised. Sea-weeds, however, do not bear transplanting, but sea-water is so impregnated with the

seeds or germs of vegetable life, that when a few stones or fragments of rock are taken from the ocean, marine vegeta- tion speedily commences and proceeds. Mr Price, Mr Lankester, Mr Bowerbank, and others, also made experi- ments in the same direction; and in 1853 a fish-house or aquarium of considerable size was constructed by the Zoological Society of London in their garden in the Regent's Park. This erection gave such an impetus to the popular aquarium movement as rendered it almost a mania, and for a year or two these scientific toys, some of them of large size, became much appreciated household orna- ments. The movement was further accelerated by Mr Gosse and Mr Warington, who published formule for the manu- facture of artificial salt water, in which sea animals would thrive as well as in their native element. Many large public aquariums have been erected since the example was set by the Zoological Society of London. A great aquarium has been usually a popular feature of the numerous Continental fishery-exhibitions held since 1860, particularly at those of Amsterdam, Boulogne, Havre, Arcachon, and the Hague. These, of course, were temporary aquariums, ending when the exhibition of which they formed a part came to a close ; but permanent aquariums are now a feature of seve- ral large towns and cities. In England there is a very large aquarium at Brighton ; while at the Crystal Palace there is one on a smaller scale, as also at Manchester and Southport, and preparations are being made [1874] for the erection of similar edifices in other towns and cities of Great Britain. The aquarium at Hamburg has already been mentioned ; there are others at Berlin and Vienna ; and the aquarium at Naples affords o— acoomunnatae . —2

their contents, myriads of minute bubbles of air, which present an enormous oxidising surface to the water, rendering it bright and sparkling.

It does not answer very well, even when an aquarium is at the sea-side, to be constantly changing the water, as the new supply is so disturbed and impregnated with impuri- ties as to be fatal to delicate animals, besides not being in a proper state for exhibition. Some of the inhabitants of an aquarium foul the water very much more than others, notably the flat fish family, and provision has to be made for this by putting such other animals

in the same tank as will aid in purifying the water. Various small animals have of course to be provided as food for the larger marine specimens ; others of them act as scavengers, help- ing to keep the water constantly sweet and clean, The light admitted to the fish in the tanks is also a matter of careful adjustment. As the animal life and vegetable life mutually support each other, the kind of material necessary for maintaining the “ compensating system ” must be watch- fully supplied. Mr W. R. Hughes of Birmingham recom- mends the growth of sea-lettuce (Ulva latissima) in tanks, as suitable both for oxygenating the water and for food for the fishes ; the stock plants being introduced in the autumn months, when they are loaded with spores. Now that such excellent aquariums as those at Brighton, Manchester, Southport, and Sydenham are in full working order, the construction of others will not be difficult, even when pro- jected on a larger scale. Distance from the sea is of no consequence, as sea-water may be obtained by railway, and can be kept stored as already suggested.

Scientific discovery, or the promotion of experiments in natural history, is usually no direct part of the plan of modern aquariums, except in so far as this may be incidental to the daily conduct of the collection. Never- theless, it is not too much to expect that the aquariums already in existence, and those which are projected, may be made useful in determining many questions connected with the life and growth of our food fishes, in regard to which naturalists and econontists are alike ignorant. The fish of which we know most is the salmon, and our knowledge of that “monarch of the brook” arises from the fact of its being accessible to constant observation. It would tend to the better regulation of our fisheries, and to the augmen- tation of our food supplies, if we knew as much about the herring or the haddock as we know about the salmon. Were a large marine observatory erected by the State, say at Brighton, or were the present aquarium there consider- ably extended, the best results might follow. Precise in- formation might be obtained as to the period of spawning of the common herring, the length of time which the ova require to come to life, and the age at which the fish be- comes reproductive. The conditions under which fish grow and remain in good health, the best kinds of food on which to feed them, the best methods of protecting them from their numerous enemies, are all questions which a properly conducted aquarium would aid our naturalists to study. It is well known that very uneconomical modes of fishing are at present resorted to, and that the largest portion of our fish is captured at a time when fish ought not to be cap- tured—at a time, indeed, when they are most unfit for use. It is only by studying the habits of these denizens of the ocean, in some place where they can be constantly under observation,—such as a great aquarium, where the condi- tions of their captivity should resemble as much as possible their native Aabitat,—that we can ever hope to fathom the mysteries of the great deep, and ultimately have at our com- mand the treasures of the sea. (See Gosse, The Aquarium, 1856; the Guide-Books of the Crystal Palace and Brighton Aquariums; Hughes, On the Principles and Management of the Marine Aquarium, 1874.) (J. G. B.)

and opportunity for skilled naturalists pursuing delicate scientific investigations.

The modern aquarium is essentially different from the vivaria or fish-stews of ancient times. These were con- structed for every day kitchen use, for the purpose of sup- plying the tables of their wealthy possessors with various kinds of fish; some of those kept being of great value. Wonderful stories are told by ancient authors of the pains taken to procure fine breeds of fish, and the care with which they were fed and fattened for use. Fish were bor- rowed and returned ; the keeping of them became a fashion, and extravagant sums of money were expended on the pur- chase of rare kinds. The remains of vivaria and fish-stews are still to be found in the neighbourhood of Naples, and at other places in Italy.

The dimensions of the great aquarium at Brighton are as follows:—Its area is 715 feet in length by 100 feet in breadth. It contains many tanks, some of them being of

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Ground Plan of Brighton Aquarium. A, entrance court § B, entrance-hall and reading-room; C, restaurant; D, D, western corridor; E, E, castern corridor; F, F, tanks (all shaded in plan); F 6, the large tank, No. 6; G, conservatory; H, rockwork, fernery, and cascadc ; 1, I, space with tanks on table; J, J, engine, stores, &.; K, rockwork with ponds for seal, &c.; L, grotto; M, heating apparatus. vast capacity ; there is one in particular (No. 6) which con- tains 110,000 gallons of water, and has a plate-glass front 130 feet long, through which the habits of very large fish may be studied. The rock-work of the tanks is entirely artificial, and admirably adapted to afford shelter to the fish and crustaceans which disport in them, The management of a large aquarium, such as that at the Crystal Palace or at Brighton, involves constant anxiety and daily trouble: the fish must of course be fed so that they may enjoy good health, and to ensure this they must live under condi- tions as nearly as possible the same as they have been accustomed to in the waters from ‘vhich they have been taken. At one time much difficulty

was experienced in keeping the inhabitants of sweet-water tanks in good health; in numerous instances the fish died in a day or two after their places of residence had been changed ; and it was not till after many different plans had been tried, that safe modes of keeping them in a healthy state were found out, Thousands of fish died in ornamental fresh-water tanks from over- attention, from a too frequent changing of the water, and from lack of a supply of those elements of growth which are essential to all animated nature.

The aquariums at Brighton and the Crystal Palace exemplify two distinct systems of construction and manage- ment. At the former there is no actual circulation of water from one tank to another—but it can, if necessary, be renewed from the sea; the mass of the water in the reserve cisterns is small as compared with that in the show tanks and aeration is effected by pumping air into the tanks through tubes of large diameter. Purification of the water is also assisted by the presence of large bivalve molluscs in the tanks. At the Crystal Palace aquarium, a constant circulation is maintained from one tank to another; the bulk of water in the reservoir is five times as much as that in the show tanks, while aeration is accomplished by carrying a main over their entire length, from which, under pressure, a small stream of water pours from a tap into each, break- ing the surface of the water, and carrying down to the bottom of the tanks, and distributing over the body of

QUEDUCT, a conduit or channel for the conveyance

of water (Lat. aguaeductus), but commonly a structure

of masonry erected to conduct water across a valley at a high level, though structures of this kind would be more pro- perly termed aqueduct bridges. This distinction it is necessary to bear in mind, more particularly when dealing with the undertakings of this class carried out by the Greeks and Romans respectively, because, from the fact of the former having apparently seldom if ever constructed aqueduct bridges, it has been usual to institute a very unfavourable comparison between them and the Romans,

who, with imperial disdain of obstacles, furnished the cities of their immense empire with a series of constructions of this kind for the supply of water, which still in their ruins excite our astonishment. True to the difference in national genius the Greeks, following the analogy of nature, in which in their own country they saw the water collected in the hills passing for miles along subterranean courses, and issuing in cool fountains at the coast, adapted their system of conduits to the physical formation of a district, cutting tunnels and canals, rather than bridging over valleys, and as a consequence no conspicuous monument of their system now remains. But even if what they did was so little as to justify Strabo (v. p. 235) in charging them with neglect in this matter as compared with the carefulness of the Romans, it is still clear from the records that they accomplished much, and that in this, as in other respects, they were the instructors of the Romans. It is here to be premised that the term aqueduct applies only to the conveyance of such water as was used for drinking or other useful purposes, and not to the draining of marshes, though in both cases the works may often have been of the same kind. The insufficiency of water, supplied by natural springs and cisterns hewn in the rock, which in an early age had satisfied the small communities of Greece, had become a pressing public question by the time of the Tyrants, of whom Polycrates of Samus and Pisistratus of Athens distinguished their rule by extensive works to meet the exigencies of their states. For this purpose the former obtained the services of Eupalinus, an engineer celebrated for the skill with which he had carried out the works for the water supply of Megara, under the direction of the Tyrant Theagenes (ci7ca 625 B.c.) At Samus the difficulty lay in a hill which rose between the town and the water source. Through this hill Eupalinus cut a tunnel 8 feet broad, 8 feet high, and 4200 feet long, building within the tunnel a channel 3 feet broad and 11 ells deep. The water, flowing by an accurately reckoned declivity, and all along open to the fresh air, was received at the lower end by a conduit of masonry, and so led into the town, where it supplied fountains, pipes, baths, cloace, &c., and ultimately passed into the harbour. In Athens, under the rule of Pisistratus (B.c. 560), a similarly extensive, if less difficult, series of works was completed to bring water from the hills Hymettus, Pentelicus, and Parnes. From Hymet- tus were two conduits passing under the bed of the [lissus, and most part of the course cut in the rock. Pentelicus, richer in water, supplied another conduit, which can still be traced from the modern village of Chalandri by the air shafts built

several feet above the ground, and at a dis- tance apart of 40-50 metres; the diameter of these shafts is 4-5 feet, and the number of them still preserved is about sixty. Tributary channels conveyed into the main stream the waters of the district through which it passed. Outside Athens, those two conduits met in a large reser- voir, from which the water was distributed by a ramification

of underground channels throughout the city. These latter channels vary in form, being partly round, partly square, and generally walled with stone; the chief one, that under the bazaar, is sufficiently high and broad to allow two men to pass in it. Sometimes pipes of baked clay were laid within them. The conduit from Mount Parnes appears to have been reconstructed in later times. Some of these aqueducts continue to supply Athens to this day, and are described as marvels of enterprise and skill (EK. Curtius, tiber die Wasserbauten der Hellenen, in the Archdol. Zeit. 1847, p. 19). In Sicily, the works by which Empedocles, it is said, brought the water into the town of Selinus, are no longer visible ; but it is probable that, like those of Syracuse, they consisted chiefly of tunnels and pipes laid under ground. The system of conduits in Syracuse which Thucydides says (vi. 100) the Athenians partly destroyed on the Sicilian expedition, still supplies the town with an abundance of drinkable water; and at one point, where the tunnel passes under the sea to the island of Ortygia, presents what has long been regarded as a remarkable achievement for early times. An example of what appcars to have been the earliest form of aqueduct in Greece has been discovered in the island of Cos (Ross, Inselretse, iii. p. 131), beside the fountain Burinna on Mount Oromedon. It consists of a bell-shaped chamber, built underground in the hill side, to receive the water of the spring and keep it cool; a shaft rising from the top of the chamber supplied fresh air. From this reservoir the water was led by a subterranean channel, 35 metres long and 2 metres high.

Of the constructions for the conveyance of water in Italy in early times, there is an exainple at Tusculum, consist- ing of an oblong basin, divided into several chambers, which received the water of a spring, and then distributed it by pipes (tubz, fistule) or canals. The basin is built of blocks of stone, which, along the sides, overlap each other, till they meet and form a roof—a principle of building which was afterwards supplanted by

vaulting, and which occurs also in the earliest Greek masonry. The pipes were either of lead or baked clay. When the course lay in soil, gullies were cut and conduits of masonry built within them. When rocky ground intervened, tunnels were pierced, and in both cases shafts (spiramen, lumen) were made at intervals of about 240 feet, to admit light and fresh air. The inside of the walls of these channels received a coating impervious to water, composed of chalk and crushed fragments of tile. Where the course was interrupted by an inequality in the ground, a vertical pipe (venter) was placed reaching to the surface or above it. The water rushing up this pipe was freshened by contact with the air, and again fell back to the new course which it had to take. Works of this kind, undertaken for the public convenicnce, were paid for out of the public purse, a tax being levied for the use of the water.

If, to obtain a proper incline, the water-course had to be carried above ground, the simple plan was to support it on a stone wall, and in this case the conduit itself was also built of blocks of stone, coated with a stucco impervious to water. But since a solid wall across a valley would have cut off the usual traffic, is was found necessary to break up the wall, by means of arches, into a series of pillars, and with this commenced the system of aqueduct bridges, which have proved to be the most striking monuments of the Roman empire. As perhaps the best known instance of this double purpose, of an archway under which traffic might pass, and over which water might be conveyed, there is the Porta Maggiore at Rome (Plate III.) The waters

conveyed over it in two separate channels, are the Aqua Ciaupta and the Anio Novus, and from the three inscrip- tions above the arches it appears (1.)—that the Emperor Claudius had constructed the so-called Aqua Claudia Aque- duct from the springs Czeruleus and Curtius, 45 miles from Rome; (2.) that the same emperor had constructed the so-called Anio Novus Aqueduct from the 62d milestone from Rome; (3.) that the Emperors Vespasian and Titus had restored these splendid undertakings of Claudius. Both aqueducts had been begun by Caligula, 38 4.D., and were completed ten years after by Claudius. — The two springs from which the Aqua

Claudia took its rise were in the Sabine hills near the 35th milestone, on the Via Sub- lacensis. It was augmented by part of the Aqua Martia, famous for the goodness of its water, and, owing to bends in the course, reached the length of 45 miles, as stated in the inscription, 35 miles of it being under and 10 above ground. The Anio Novus, so called to distinguish it from an older aqueduct, the Anio Vetus, took its rise in the river Anio at the 62d milestone, on the road just named, the water being first collected in a large basin, where it was allowed to purify itself. At the 32d milestone it was augmented by the clearer water of the spring, rivus Hercu- laneus, The entire length of 62 miles was partly above and partly below ground. About 6 miles from Rome it approached the Aqua Claudia, and from that point the two waters travelled together to the city in two distinct channels, one above the other, and supported by a chain of arches, which at one place reached the height of 109 feet. But in height these arches must yield to those of the aqueduct at Nismes, the ancient Nemausus, erected in the time of Augustus, which rose to 130 feet. The Pont du Gard, as the aqueduct at Nismes is now called, consists, as will be seen from Plate IV., of three rows of arches striding across the valley of the river Gardon. In the lowermost row are six arches, of which one has a span of 75 feet, the others each 60 feet. In the second row are twelve arches, each with a span of 75 feet. In the third row are thirty-six smaller arches, immediately above which was the water-course. As a bridge, the Pont du Gard has no rival for lightness and boldness of design among the existing remains of works of this class carried out in Roman times.

Besides the two principal aqueducts at Rome already described, there remain to be noticed twelve more which assisted in the supply of water for the city. These are (1.) Aqua Appta, which took its rise at the foot of the Alban mountains on the Preneste road, between the 7th and 8th milestones, and measured from its source to the Porta Trigemina 11,180 paces, of which 11,130 were below ground. It appears to have been the first important enter-prise of the kind at Rome, and was the work of the old Censor Appius Claudius, from whom ‘it derived its name. The date of its construction was the year of Rome 442, according to Frontinus, an overseer of aqueducts (curator aquarum) under the empire, whose work De Aqueduct. urb. Rome we still possess. (2.) ANIo VETUS, constructed forty years after the last-mentioned aqueduct, by the Censor Manlius Curius Dentatus, with the help

of L. Papirius Censor, who finished it. From its source near Tivoli, on the left side of the Anio, it flowed 43,000 paces, of which 42,779 were below ground, and 221 above. At the dis- tance of 2 miles from Rome (Frontinus, i. 21) it parted into two courses, one of which led to the horti asinzanz, and was thence distributed; while the other (rectus ductus) led by the temple of Spes to the Esquiline gate, the site of which was near the modern Villa Negroni, where, in 1861, was found a subterranean conduit and an inscribed stone, which left no doubt as to its having been one of the stones set up to mark the distances of the Anio Vetus.

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(3.) Aqua Marmia, rising on the left side of the Via Valeria, traversed 61,710 paces, of which 54,247 were underground, and the remaining distance carried partly on solid wall and partly on arches. It was the work of Quintus Martius Rex, not of Ancus Martius the fourth king of Rome, as Pliny (W.H., xxxi. 3) fancied, and took its name from its constructor. Its waters were celebrated for their coolness and excellent quality. (4.) Aqua TEPULA, from its source in the district of Tusculum, flowed 10,000 paces, mostly above ground, and on the same series of arches as carried the Aqua Martia, but at a higher level. Tt was the work of the Censors Cn. Servilius Cepio and L. Crassus Longinus, and was completed in the year 126 B.c. Again, partly on the same structure of arches, and with a still higher channel, flowed—(5.) Aqua JULIA, from a source near that of the last-mentioned aqueduct to within 7000 paces of the walls of Rome, where the joint waters were received in a reservoir, and thence distributed

in various channels to the city. Its entire length was

15,426 paces. It was constructed in the year 34 B.C. by Marcus Agrippa, to whose zeal to meet public wants in this direction were due the two other aqueducts— (6.) Aqua Virco, and (7.) Aqua CraBra or DaMNATa, the former as well known for the goodness of its water as was the latter for the inferiority which procured it the designation of Damnata. The Aqua Virgo, from its origin at a copious spring in a marsh on the Collatine way, not far from the ancient Gabii, measured 14,105 paces, along which it was conveyed in pipes, partly under and partly above ground, on a solid substructure or on arches. It was completed in the year 48 B.C. (8.) Agua

ALSIE- TINA or AUGUSTA rose in Etruria, on the Via Claudia, and travelled 22,172 paces, of which 358 were on arches. It was the work of Augustus, whose object was to furnish by it water for gardens and other than drinking purposes. (9.) Aqua TRasanNA, rising in Lake Sabatinus (Bracciano), was constructed by Trajan. (10.) Aqua ALEXANDRINA, rising in the district of Tusculum, was the work of Alex- ander Severus. (11.) Aqua Seprmiana seems to have been only a branch led from the Aqua Julia to supply the baths of the emperor from whom it takes its name, Septi- mius Severus. (12.) AquA ALGENTINA rose on Mount Algidus ; at whose instance it was made is unknown. Of the fourteen aqueducts which supplied ancient Rome, three remain in use at the present time, furnishing the modern city with abundance of water. The first of the three is the Aqua Virgo, now known as Fontana di Trevi, supplying the best water in Rome. It was restored by Pope Pius IV. The next is the Aqua Claudia, known as the Aqua Felice or di Termini, which was restored by Sixtus V. The third is the Aqua Trajana, called, from the Pope who restored it,

viz., Paul V., Aqua Paole.

At regular intervals along the course of an aqueduct were built reservoirs (castella), to enable repairs to be made at any point, and also to let off water for the popula- tion of the district through which it passed. It was the law that material necessary for repairs should be supplied from the private property nearest to where the damage was, and should be conveyed at the cost of the owner of such property. Castella of smaller dimension were also required in many parts of the city. Of these, it was said, there were 247 in Rome. To allow the water to purify itself before being distributed in the city, large basins (piscine limaric), were built outside the walls. For the process of purification salt was used (Vitruvius, viii.) These piscinze were covered in with a vaulted roof, and were usually on a colossal scale, as in the example still pre- served at Fermo, which consists of two stories, each having three oblong basins communicating with each other; or the Piscina Mirabile at Baise, which is covered in by a vaulted

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roof, supported on forty-eight pillars, and perforated to permit the escape of foul air. Two stairs lead by forty steps to the bottom of the reservoir. In the

middle of the basin is a sinking to collect the deposit of the water. The walls and pillars are coated with a stucco so hard as to resist a tool. The oversight of aqueducts was placed, in the times of the republic, under the ediles and censors, though the latter appear to have taken part in work of this kind rather from thcir financial interest in the matter. Under the empire this task devolved on special officials styled Curatores Aquarum.

Among aqueducts outside of Italy, constructed in Roman times and existing still, the most remarkable, next to the Pont du Gard at Nismes already described, are—(1.) The aqueduct bridges at Segovia and Tarragona in Spain, the former being 2400 feet long, with 159 arches of greatly admired masonry, in two tiers, and reaching the height of 102 feet. The bridge at Tarragona is 876 feet long, and 83 feet high. (2.) At Mayence are the ruins of an aqueduct 16,000 feet long, and carried on from 500 to 600 pillars. Similar witnesses of Roman occupation are to be seen in Dacia, Africa, and Greece. (3.) The aqueduct at Metz (figured on Plate IV.), which originally extended across the Moselle, here very broad, conveyed to the city an abundance of excellent water from Gorsa. From a large reservoir at the source of the aqueduct the water passed along subterranean chaunels built of hewn stone, and sufficiently spacious for a man to walk in them upright. Similar channels received the water after it had crossed the Moselle by this bridge, at the distance of about 6 miles from Metz, and conveyed it to the city. The bridge con- sisted of only one row of arches. The middle arches have given way under the force of the river, but the others are still perfectly solid. (4.) On Plate IIT. is figured one of the principal bridges of the aqueduct of Antioch, 700 feet long, and at the deepest point 200 feet high. The lower part consists almost entirely of solid wall, and the upper part of a series of arches with very massive pillars. The masonry and design are rude. The water supply was drawn from several springs at a place called Battelma, about 4 or 5 miles from Antioch. From these separate springs the water was conducted by channels of hewn stone into a main channel, similarly constructed, which traversed the rest of the distance, being carried across streams and valleys by means of arches or bridges. (5.) At the village of Morea, about an hour’s distance N.W. from the town of Mytilene, is the bridge of an aqueduct, figured on Plate III. ‘The water-course is carried above massive pillars built of large hewn blocks of grey marble, and connected by means of three rows of arches, of which the uppermost is of

brick. The bridge extended about 500 feet in length, and at the deepest was from 70 to 80 feet high. Judged by the masonry and the graceful design, it has been thought to be a work of the age of Augustus. Remains of this aqueduct are to be seen at Larisson Lamarousia, an hour's distance from Morea, and at St Demetri, two hours and a half from Ayasso, on the road to Vasilika.

The aqueduct near Spoleto, which now serves also as a bridge, is deserving of notice as an early instance of the use of the pointed arch, belonging as it does to the 7th or 8th century. It has ten arches, remarkable for the elegance of their design and the airy lightness of their proportions, each over 66 feet in span, and about 300 feet in height. (See Plate IV.)

The aqueduct of Pyrgos, near Constantinople (figured on Plate III.),is a remarkable example of works of this class car- ried out in the later times of the Roman empire. It consists of two branches, of which only one is seen in elevation on the plate. The other branch stood nearly at right angles to this, and is seen partiy on the plan. From this circum-

stance it was called the Bcnded or Crooked Aqueduct, to distinguish it from another termed the Long Aqueduct, situated near the source of the waters. The branch seen in elevation extends 670 feet in length, and is 106 feet in height at the deepest part. It is composed of three rows of arches, those in each row increasing in width from the bottom to the top—an arrangement very properly intro- duced with the view of saving materials without diminishing the strength of the work. The two upper rows consisted of arches of semicircles, the lower of Gothic arches ; and this circumstance serves to fix the date of the structure, as these last were not introduced until the 10th century. The breadth of the building at the base was 21 feet, and it diminished with a regular batter on each side to the top, where it was only 11 feet. The base also was protected by strong buttresses or counterforts, erected against each of the pillars. The other branch of the aqueduct was 300 feet long, and consisted of twelve semicircular arches.

This aqueduct serves to convey to Constantinople the waters of the valley of Belgrade, one of the principal sources from which the city is supplied.

These are situated on the heights of Mount Hemus, the extremity of the Balkan Mountains, which overhangs the Black Sea. The water rises about 15 miles from the city, and betwecu 3 and 4 miles west of the village of Belgrade, in three sources, which run in three deep and very confined valleys. These unite a little below the village, and then are collected into a large reservoir. After flowing a mile or two from this reservoir, the waters are augmented by two other streams, and conveyed by a channel of stone to the Crooked Aqueduct. From this they are conveyed to another which is the Long Aqueduct; and then, with various accessions, into a third, termed the Aqueduct of Justinian, From this they enter a vaulted conduit, which skirts the hills on the left side of the valley, and crosses a broad valley 2 miles below the Aqueduct of Justinian, by means of an aqueduct, with a double row of arcades of a very beautiful construction. The conduit then proceeds onward in a circuitous route, till it reaches the reservoir of Egri Kapan, situated just without and on the walls of the city. From this the water is conducted to the various quarters of the city, and also to the reservoir of St Sophia, which supplies the seraglio of the grand signior. The Long Aqueduct is more imposing by its extent than the Crooked one, but is far inferior in the regularity of design and disposition of the materials. It is evidently a work of the Turks. It consists of two rows of arcades, the lower being forty-eight in number, and the upper fifty. The whole length was about 2200 feet, and the height 80 feet. The Aqueduct of Justinian is a very excellent work, and without doubt one of the finest monuments which remain to us of the Middle Ages. It consists of two rows of large arcades in the pointed style, with four arches in each. Those of the lower story have 52 feet of span, the upper ones 40 feet. The piers are supported by strong buttresses, and at different heights they have little arches passing through them, which relieve the deadness of the solid pillar. The length of this aqueduct is 720 feet, and the height 109 feet. This aqueduct, though it bears the name of Justinian, was probably erected in the time of Constantine.

Besides the waters of Belgrade, Constantinople was supplied from several other principal sources, one of which took its rise on the heights of the same mountains, 3 or 4 miles east of Belgrade. This was conveyed in a similar manner by an arched channel, elevated, when it was necessary, on aqueduct bridges, till it reached the northern parts of the city. It was in the course of this aqucduct that the contrivance of the sowterasi or hydraulic obelisks,

described by Andreossy (in his voyage to the Black Sca and account of the Thracian Bosphorus) was

constructed, which excited some attention, an improvement on the method of conducting water by aqueduct bridges. “‘ The souterasi,” says Andreossy, “are inasses of masonry, having generally the form of a truncated pyramid or an Egyptian obelisk. To form a conduit with souterasi, we choose sources of water, the level of which 1S several feet higher than the reservoir by which it is to be distributed over the city. We bring the water from its sources in subterranean canals, slightly declining until we come to the borders of a valley or broken ground. We there raise on each side a souterasi, to which we adapt vertically leaden pipes of determinate diameters, placed parallel to the two opposite sides of the building. These pipes are disjoined at the upper part of the obelisk, which forms a sort of basin, with which the pipes are connected. The one permits the water to rise to the level from whence it had descended ; by the other, the water descends from this level to the foot of the souterasi, Where it enters another canal under ground, which conducts it to a second and to a third souterasi, where it rises and again descends, as at the last station. Here a reservoir receives it and distributes it in different directions by orifices of which the discharge is known.” Again he says, ‘it requires but little attention to perceive that this system of conducting tubes is nothing but a series of syphons open at their upper part, and communicating with each other. The expense of a conduit by souterasi is estimated at only one- fifth of that of an aqueduct with arcades.” There seems to be really no advantage in these pyramids, further than as they serve the purpose of discharging the air which collects in the pipes. Thcy are in themselves an evident obstruction, and the water would flow more freely without any interruption of the kind. In regard to the leaden pipes, again, they would have required, with so little head pressure as is stated, to be used of very extra- ordinary dimensions to pass the same quantity of water as was discharged along the arched conduits. There is some- thing, therefore, which would require explanation in the account Andreossy gives of these pyramids, if, indeed, he did not misunderstand the nature of them.

The other principal source from which Constantinople is supplied, is from the high grounds 6 or 8 miles west of the town, from which it is conducted by conduits and arches, in the same manner as the others. The supply drawn from all these sources, as detailed by Andreossy, amounted to 400,000 cubic feet per day, The charge of the water-works at Constantinople belongs to a body of 300 Turks and 100 Albanese Greeks, who form almost an hereditary profession.

In ancient Egypt and Babylonia a different problem of water supply was presented, both countries being flat and traversed by great rivers, from which they were subject to regular inundations. Hence canals with large basins took the place of the aqueducts of Greece and Rome, and the stupendous scale on which in Egypt the waters of the Nile, and in Babylonia the waters of the Tigris and Euphrates, were utilised, was a marvel to ancient travellers.

In France various aqueducts have been formed after the manner of the Romans. The most remarkable are those constructed in the reign of Louis XIV., at vast expense, for conducting water from Marly to Versailles. The famous aqueduct bridge of Maintenon, which was erected for con- veying the waters of the river Eure to Versailles, is without doubt, in point of magnitude and height, the most magni- ficent structure of the kind in the world. In Plate IV. a view is given of a portion of this work, on the same scale as the others there represented. Had the whole

been delineated on the same scale, it would have extended

to four times the breadth of the plate. It extends about 4400 feet in length, that is, about five-sixths

as being

290 feet in the upper part.

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of a mile, is upwards of 200 fect in height, and con- tains 242 arcades, each divided into three rows, forming in all 726 arches about 50 feet span. Of the

subterranean aqueducts in France the finest is that of Arcueil, which serves to conduct water to that village. It is 44,300 fect in length, or upwards of 8 miles, extending from the valley of Arcueil to the castle at the gate of St Jaques, all built of hewn stone. It is about 6 feet in height, and has on each side a foot-path 18 inches wide; it has a declivity of 1 foot in 1300. Another aqueduct of this kind is that of Rocquancourt, part of the system which

brings water to Versailles ; it is 11,760 feet in length, or upwards of 2 miles, and has a declivity in its whole course of only 3 feet. In some parts of its course it was necessary to make excavations 80 or 90 feet deep, which rendered the execution very difficult.

The great waterworks that supply the city of Marseilles

with the water of the Durance, by a canal about 60 miles in length, are among the boldest undertakings of the kind in modern times. pleted in 1847, is conveyed through three chains of lime- stone mountains by forty-five tunnels, forming an aggregate length of 84 miles, and across numerous valleys by aque- ducts; the largest of which, the Aqueduct of Roquefavour,

This canal, begun in 1839, and com-

over the ravine of the River Arc, about 5 miles from Aix, surpasses in size and altitude the ancient Pont du Gard.

The immense volume of water, which passes at the rate of

198,000 gallons per minute, is carried across as in the old Roman aqueducts by a channel of masonwork. The height of this aqueduct is 262 feet, and its length 1287.

One other aqueduct of modern construction is worthy of notice. In those parts of British India where the fall of rain is scanty and uncertain, recourse is had to artificial irrigation, and the waters of many of the rivers of the country have been rendered available for this purpose by means of public works constructed by the Government. Of these the most important is the Ganges Canal, which traverses the North-Western Provinces of Bengal, and dis- tributes over their vast area nearly the whole volume of the waters of

the Ganges. The canal begins at the point where the river issues from the mountains, and enters the plains of Bengal. About 20 miles from its source, the line of the canal crosses the: valley of the Solani river, and the works for effecting the transit are designed on a scale worthy of the undertaking. The valley is between 2 and 3 miles in width. An earthen embankment is carried across, raised on an average between 16 and 17 feet above the surrounding country, and having a width of 350 feet at its base, and This embankment forms the bed of the canal, which is protected by banks 12 feet in depth, and 30 feet wide at the top. To preserve these banks from the effects of the action of the water, lines of masonry formed into steps extend on each side throughout their entire length. The Solani river is crossed by an aqueduct 920 feet long, having side walls 8 feet thick and 12 deep, the depth of the water being 10 feet. The water of the canal passes through two separate channels. That of the River Solani flows under fifteen arches, having a span of 50 feet each, constructed in the. most substantial manner, and springing from piers resting on blocks of masonry sunk into the bed of the river. The cost of the aqueduct was upwards of £160,000. In grandeur of design, solidity of construction, and, above all, in extensive utility, it may challenge competition with any similar work in the world.

Within the last century, the invention and improvement of the manufacture of cast iron has completely changed the mode of conducting water into cities, by the introduction of cast-iron pipes instead of the stone conduits of former times. These pipes can now be formed of almost any

dimensions, and united together into a continued series so closely as to prevent the escape of the water even under a violent pressure, arising from the altitude of the fountain- head. They enable us, therefore, to take advantage of and give effect to the fundamental principle of hydrostatics, that the fluid tends continually to a level, even though it be confined in the smallest or most complicated system of pipes; so that however low it be carried in any valley, or to whatever distance, still it will rise on the opposite side to the original altitude of the fountainhead—a principle which is most important indeed in such works, seeing that by it we are not restricted, as the Romans were, almost to a perfect level in the line of the

conduit. We have seen that, for the purpose of attaining this level or very gentle declivity all along the conduit, they were under the necessity of raising it by arcades continued in one unbroken series, frequently 30 or 40 miles in extent ; and, in addition to this, they had often to prolong the length of the track by a circuitous route, turning and winding for miles out of its course, for the very purpose of increasing its length.

But the use of pipes enables us to dispense with these long arcades all raised nearly to the same level with the fountainhead ; because the conduit may be varied in its level to any extent, and still will rise at last to its original altitude. The pipes, therefore, are merely laid all along the surface of the ground, with a cover of 2 or 3 feet of soil to place them beyond the reach of frost. To prevent, however, the frequent or abrupt alternations of rise and fall, any sudden inequalities in the ground are equalised by cuttings and embankments, but not to anything like the extent that would be required to raise the whole to a level, This, therefore, forms a very great improvement in the method of conducting water, the greatest indeed which has ever been made in this important branch of practical mechanics. That it was not introduced by the Ronians, is not to be ascribed, as.many have supposed, to their ignor- ance of the hydrostatic principle that the fluid would rise to a level in the opposite branches of the same train of pipes. They were well acquainted with this principle, and a portion of a leaden pipe, supposed to have been used in the baths of Caracalla, has been found, which sets this matter at rest; but, from the low state of the arts at that period, they were unable to give effect to the principle. They had not the means of fabricating pipes of such a magnitude as would have been required for the enormous quantities of water consumed in Rome, and at the same tie, of strength sufficient to withstand the pressure from the fountainhead. Lead was the only material that could be used by them for the purpose ; and besides the enormous thickness that so weak a material would have required, and the imprac- ticability of their forming pipes, and uniting them together endwise, they were too well acquainted with the tendency

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of lead to render the water unwholesome by its poisonous impregnation. The use of cast iron was quite unknown. There remained, therefore, no resource but in the aque- ducts, which, though attended no doubt with vast expeuse, and requiring great enterprise, skill, and patience, were yet attainable by these means, and formed when completed a simple and very perfect mode of effecting the object. Now, however, when the manufacture of cast iron has been brought to such perfection, and methods contrived for uniting perfectly together all the pipes into one con- nected train, this improved system has been universally adopted.

In former editions of this work (under this heading) the works of the Edinburgh Watcr Company, undertaken in 1819, and designed by Mr Jardine, civil engineer, were described ; but as there is little which can properly come under the popular definition of Aqueduct, they will be more consistently referred to in the article WATERWORKS.

Croton Aqueduct, New York.

The Croton Aqueduct, by which the city of New York is supplied with water, was justly regarded at the time of its execution, from 1837 to 1842, as one of the most magnificent works of the kind in modern times (figs. 1 to 5)

32_MILES FRom CROTON DAM ! Nu)

Harlem river Bridge

Fia. 1.—Part Section of Croton Waterworks.

Its length from the Croton Lake to the receiving reservoir is 38} miles. The original reservoir, called Croton Lake, is formed by an embankment across the Croton Creek, a small stream of wholesome water falling into the Hudson. It covered 400 acres, and contained about 500,000,000 gallons of water. To the valley of the Har- ,

lem River, a distance of 33 miles, the aqueduct (fig. 2,) is built of stone, brick, and cement, arched over and under, 6 feet 3 inches wide at the bottom, 7 feet 8 inches at the top, and 8 feet 5 inches high, and capable of

discharging 60,000,000 gallons per day. It is carried over the Harlem Valley in iron pipes, laid upon a magnificent bridge (figs. 3 and 4) 1460 feet long, constructed of arches 114 feet above

Fic. 2.—Tunnel in soft ground.

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Seale for Elevation of Bridge

Fig. 3.

high-water mark at Yorkville. These pipes passed into a receiving reservoir capable of holding 150,000,000 gallons, and from thence the water was conducted for 24 miles to a distributing reservoir, containing 20,000,000 gallons, by a double line of iron pipes, 3 feet in diameter. From this reservoir the water was distributed to the city.

The Croton water was originally introduced into New York in 1842, when the population was about 450 000

persons, and from that time to 1848, 18,000,000 gallons per day gave an abundant supply. In 1872, with a popu- lation of 1,000,000 persons, the quantity required was 88,000,000 gallons per day. Thus, between 1848 and 1872, while the population little more than doubled, the consumption of water increased nearly five times. This fact, coupled with severe droughts in 1870 and 1871, when the natural volume of the Croton River fell to 27,000,000

gallons per day, caused great anxiety, and shewed the necessity of largely extended works. It was estimated that the basin above the Croton Dam, 339 square miles in area, would give 300,000,000 gallons per day on the average, if the water could be impounded, aud that, therefore, abundant water could be obtained by increasing the number or capacity of the

impounding reser- voirs. New reservoirs were therefore projected, one of which, to contain 3,000,000,000 gallons, was expected to be completed in the autumn of 1872. With this the gross storage would be 4,670,000,000 gallons, in addition to the daily produce of the Croton River, which, at its minimum as stated, is 27,000,000 gallons per day. Another reservoir to contain 3,700,000,000 gal- lons was also projected, and will, it is presumed, be con- structed when necessary (fig. 5). ‘To meet the growing de-

Fic. 4.—Cross sec- tion of bridge.

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Distributing Reservoir Union Square

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Fig. 5.—Part section of Croton Waterworks.

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mand for water, the reservoirs were not only increased as described, but the means of distribution were largely ex- tended, and in one part of the city six lines of pipes 4 feet in diameter were laid side by side.

Manchester Waterworks.

The works by which the city of Manchester and its suburbs are now supplied with water, and which have been in course of construction from the year 1848 to the present time (1874), are perhaps, in some respects, the most stupendous works of the kind which have ever been constructed, in which difficulties of no ordinary char- acter have been successfully overcome. These remarks, however, relate especially to the impounding reservoirs, which are seven in number, with embankments varying from 70 to 100 feet above the level of the valley in which they are constructed, and cannot, therefore, be properly alluded to here. As the conveyance of the

water to the city is, however, by aqueduct, a few words explanatory of the general scheme will be necessary.

The water is collected from the river Etherow and its tri- butaries, which, rising on the westerly slope of the Pennine chain of hills, flow into the river Mersey, and so into the Irish Sea. The drainage ground from which the water is collected lies nearly midway between Manchester and Sheffield. Its area is about 19,300 acres. It rises in parts to an elevation of about 1800 feet above the level of the sea, and about 1200 or 1300 feet above the deep and romantic valley of Longdendale, in which the main collecting reservoirs are situated. The district consists of the shales and sandstones which constitute the lower portion of the Coal Measure formation—the upper millstone grit forming the cap of the steep escarpments on each side of the valley, while the lower millstone grit, which may be said to separate the Coal Measure shale from the limestone shale, is found in

the bottom. The waters produced by this geological forma-

tion are among the purest in the world. The spring water is especially brilliant, highly aerated, containing little or

no foreign matter, and extremely soft. It is at all times very abundant, the district yielding much more spring water than the usual quantity, in proportion to the area from which the springs issue. The quantity of water flowing from the drainage ground would, if wholly stored, afford a gross supply of about 40,000,000 gallons per day, of which about 13,000,000 gallons per day have to be delivered as compensation to the mills on the stream, leaving about 27,000,000 gallons per day as the supply available for the city and its suburbs.

The water of heavy rains and wet seasons is collected in large impounding reservoirs, the gross capacity of which is 4,233,000,000 gallons. In some of these reservoirs the turbid and coloured water is impounded, where it is allowed to settle and purify, and is subsequently given as conipen- sation to the stream; and in others, the pure water, when more than sufficient for the wants of the city, is collected. Here it is stored till required, and then given

in addition to the spring water, when that is in itself deficient in quantity. The spring water is separately collected, and conveyed to the city by aqueducts specially constructed for the purpose. In heavy rains, which swell the streanis, and especially in autumn, the water is discoloured, but by a simple and ingenious contrivance, every stream is made to separate its coloured water from its pure water—the coloured water being passed to reservoirs set apart for the storage of such water, and the pure water being sent at once to Manchester, or passed to reservoirs in which it is stored for future use.)

The aqueducts by which this water is conveyed from the springs and from the reservoirs, consist for the most part of tunnel and covered conduit, 6 feet in diameter, with a fall of 5 feet in a mile, with cast-iron syphon pipes of large dimensions across one valley, which has to be passed before the highest service reservoir is reached. From this reservoir to the city, about 8 miles distant, cast-iron pipes are laid along or under the public roads, to convey the water to various other reservoirs at lower elevations, from which the city and its suburbs are conveniently supplied.

In the main valleys in which the spring water is col- lected, or the flood and turbid waters conveyed by separate channels, the aqueducts are chiefly open, and are, to a great extent, formed of concrete 6 inches thick on the sides and bottom, faced with dry stone pitching 9 inches in thickness. They are cheap, easily constructed, and per- fectly successful.

The area and capacities of all the reservoirs are as follows :—

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Name. Area. Capaeity. Depth. Acres, Gallons. Feet. Woodhead, ...0:000 135 1,235,000, 000 72 MOPSIGE,,

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Loch Katrine Aqueduct, Glasgow.

_ The Loch Katrine Aqueduct of the Glasgow Waterworks is the modern aqueduct which has most probably attracted the largest share of public

attention.

= Our D UCT

The appropriation of the beautiful waters of Loch Kat- rine—rendered classical by Sir Walter Scott—the romantic, rugged, and almost impassable Highland country through which the aqueduct had to be constructed, and the distance from Loch Katrine to Glasgow, all contributed to lend a special interest to the undertaking. It is, however, a very simple work in itself, for, with but little artificial addition, Loch Katrine, Loch Venachar, and Loch Drunkie were converted into impounding reservoirs, the first for the supply of the city, and the two latter for compensation.

The area and capacity of these reservoirs are as follows -—

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Loch Venachar, 865 | Raised 5 9 | 269 2,656,250,000 21,500 123,544 Drawn 6 0

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Loch Drunkie, 83 |Raised 250 416| 750,000,000; 1,500 | 500,000 Totals, 3,948 9,093,750, 000.45, 800

gow is about 35 miles, of which 27 may be considered as the aqueduct proper. The remaining 8 consist of two lines of cast-iron pipes, by which the water is conveyed from the large service reservoir at Mugdock to the city of Glasgow. The aqueduct is principally in tunnel or covered conduit, but there are three valleys which are crossed by iron syphon pipes of large diameter, and there are numerous aqueduct bridges of varied character, suited to the peculi- arities of the districts in which they had to be constructed. The tnnnels and covered conduits are 8 feet high and 8 feet wide, with an

inclination of 10 inches in a mile, and are capable of conveying about 50,000,000 gallons of water in twenty-four hours. The syphon pipes across the valleys have an inclination of 1 in 1000, or about 5 feet in a mile, and it requires two pipes of 4 feet in diameter and one of 3 feet in diameter, to convey the quantity of water in a day which the aqueduct will deliver.

The work required the greatest engineering accuracy and skill, and so perfectly have the lines and levels been kept, that it was only upon the closest examination that the joinings in the tunnels could be detected.

The work was commenced.in the spring of 1855, opened by her Majesty the Queen in October 1859, and finally completed in the course of 1860.

The cost of the engineering works of the aqueduct, in- cluding the conversion of the various lochs mentioned into reservoirs, and exclusive of land, and of the distribution of the water in the city of Glasgow and its neighbourhood, was £668,000; but the gross cost of the water supply, in- cluding the purchase of two water companics, distribution, and everything, has been, to May 1873, £1,756,793.

The following description of the aqueduct was given by the engineer at a banquct given to him in Glasgow after the completion of the works :—

“It is impossible to convey to those who have not per- sonally inspected it, an impression of the intricacy of the

TS —_—_ ! one continuous tunnel. The length of the aqueduct from Loch Katrine to Glas-

wild and beautiful district through which the aqueduct passes for the first 10 or 11 miles after leaving Loch Katrine. From the narrowest point at which it was found the ridge between Loch Katrine and Loch Chon could be pierced, the country consists of successive ridges of the most obdurate rock, separated by deep wild valleys, in which it was very difficult in the first instance to find a way. There were no roads, no houses, no building materials,—nothing which would ordinarily be considered essential to the

successful completion of a great engineering work for the conveyance of water; but it was a considera- tion of the geological character of the material, which gave all the romantic wildness to the district, that at once determined me to adopt that particular mode of construc- tion which has been so successfully carried out. For the first 10 miles, the rock consists of mica schist and clay slate—close, reteutive material, into which uo water per- colates, and in which, consequently, few springs are to be found. This rock, when quarried, was unfit for building purposes; there was no stone of a suitable description to be had at any reasonable cost or distance, no lime for mortar, no clay for puddle, and no roads to convey material. Ordinary surface construction, therefore, was out of the question ; but I saw that if tunnelling were boldly resorted to, there would be no difficulty, beyond the cost and time required in blasting the rocks, in making a perfectly water-tight and all-enduring aqueduct ; there would be uo water to hamper and delay us in the shafts and tunnels, and little would require transporting through the country but gunpowder and drill iron. This course was therefore determined upon, and my expectations have been realised to the very letter. The aqueduct may be considered as As long as the work continued in the primary geological measures, we had no water; and even after it entered the Old Red Sandstone, and where it subsequently passed through trap rock, there was much less than I expected ; so that our progress, at no part of the work, was ever materially interfered with by those incidents which usually render mining operations costly and uncertain.”

The rock, however, especially the mica slate, proved extremely hard and difficult to work. At several points along the side of Loch Chon the progress did not exceed 3 or 4 lineal yards in a month at each face, although the work was carried on day and night. The average progress through the mica slate was about 5 yards ina month. In drilling the holes for blasting, a fresh drill was required for every inch in depth on the average, and about sixty drills were constantly in use at each face. The cost of the gunpowder alone, consumed in the first 74 miles of the aqueduct, was £10,540, and there were about 175 miles of fuse burned in firing it. The average cost per yard of this length of the aqueduct was over £13, or £23,000 per mile. (Figs, 6 to 11, are cross sections of the aqueduct, showing the general construction in various kinds of ground.) The built and tunnelled part is all capable of passing 50,000,000 gallons per day.

The aqueduct bridges over the ravines are somewhat peculiar, varying in character according to the circumstances of the district. In the wilder and more inaccessible parts there are five extensive iron ones, varying in length from 124 to 332 yards, all of similar construction. (See fig. 12.) At the ends of these bridges, in the shallowest parts of the ravines, the aqueduct has a cast-iron trough supported on a solid dry stone embankment of the stone of the district, carefully set by hand ; the stone embankment being 9 feet wide at top, witha batter of 3 inches to the foot on each side. The deeper parts of the ravines or valleys are crossed by malleable iron tubes 8 feet wide by 64 feet high

inside, supported by piers at intervals o 50 fect. The – — 29

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bottoms and sides of these tubes are 2 inch thick, and the tops 7% inch thick, strengthened by angle and J iron. The cast-iron

Fig. 13 shows a section of these tubes.

in rock.

made for adding 24 feet to the height of the sides when additional water was required, and this has since been done. The bottoms of the malleable-iron tubes are 3 feet below

Fig. 12.—Iron Aqueducts at Culegarton.

the bottoms of the troughs, so that they should always be full of water, for the purpose of securing the same tempe- rature both in the bottom and top of the tubes, and so pre-

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Fia, 13.—Section through

Fic. 14.—Section through Tron Tube.

Cast-iron Trough.

venting unequal expansion and contraction. The aqueduct at the crossing of small mountain streams (of which there were many) was carried in cast-iron troughs similar to those already described, supported upon cast-iron beams over the space left for the stream.

The first deep valley which required to be crossed by piping is that of the Duchray water, about 55 chains wide. The pipes first laid down were 4 feet diameter in 9 feet lengths, with spigot and faucet joints, run up with lead in the usual way. At the lowest point the pipes are under a pressure of 165 feet. The river itself is crossed by cast- iron arched girders of 60 feet span ; and here, as well as at the small basins at each end of the piping, and at all other places where masonry was required, provision was made for laying two additional lines of pipes, one 4 feet and the other 3 feet in diameter. These pipes have since been laid. After passing through the ridge of Old Red Sandstone conglomerate by the Clashmore tunnel, the aqueduct for 5 miles is for the greater part in open cutting, with masonry sides, and a dry rubble arch covered with 2 feet of puddle, and then covered in.

The Endrick valley, like that of the Duchray, is crossed by cast-iron syphon pipes for 2} miles in length. Where they cross the river Endrick at the bottom of the valley, the pipes are 13 inches thick, and have to sustain a pres- sure of 235 feet. The pipes are carried across small depressions in the valley by resting them upon stone piers, and at the crossing of two roads, and of the Forth and Clyde railway, they are further supported by cast-iron

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troughs (fig. 14) are 8 fect broad and 4 feet deep, and 5 inch thick, and were capable of passing at this depth upwards of 20,000,000 gallons a day. Provision was

—Open cutting Fic. 9.—Aqueduct above Fic. 10.—Tunnel Fic. 11.—Tunnel

surface of ground. lined. through water-

tight rock,

brackets. The pipes at these exposed places have flange joints, and they have been covered with woollen felt to prevent expansion and contraction. There is a short tunnel 110 yards long on this length of piping of dimensions sufficient to carry the three lines of pipes. The construction of the aqueduct, for the 5 miles extending from the valley of the Endrick to the valley of the Blane, presents the same general features as those already described. Good building stone was abundant in this district, and the bridges are all

Fria. 15.—Duntreath Aqueduct.

of masonry. Fig. 15 is an elevation of one of the aque- duct bridges near Killearn at 19 miles from Loch Katrine ;

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Fra. 16.—Section through

Fra. 17.—Section through Arch.

Pier.

and figs. 16 and 17 are details of the Ballewan Aqueduct bridge (fig. 18).

Fic, 18.—Ballewan Aqueduct.

The piping across the Blane is about 54 chains long, with a depression of 125 feet. The Blane water itself is crossed by a stone bridge, and there are basins at each end of the pipes as before. The last piece of the aqueduct isa tunnel 2640 yards long, through a ridge of amygdaloidal trap, separating the

valley of the Blane from the valley of the Allander. The tunnel is 250 feet below the summit of the hill,

Mr Bateman, at the banquet referred to, summarised the works along the line of aqueduct in nearly the follow- ing words :—“ There are in the whole work eighty distinct tunnels, upon which forty-four vertical shafts have been sunk for facilitating and expediting the completion of the work.” Besides the tunnel at the commencement of the aqueduct, called the Loch Katrine Tunnel, 2325 yards in

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length, and upwards of 500 feet below the summit of the hill, and the Mugdock Tunnel at the end of the aqueduct, 2640 yards in length, there are “‘ others, 700, 800, 1100, and 1400 yards in length. Not to speak of smaller con- structions, there are twenty-five important iron and masonry aqueducts over rivers and ravines, some 60 and 80 feet in height, with arches of 30 feet, 50 feet, and 90 feet in span. The number of people employed, exclusive of iron-founders

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Fia. 19.—Part Section of Loch Katrine Aqueduct.

and mechanics, has generally been about 3000; and for the greater part of these, huts and roads and all other accommodation had to be provided, the country for the most part being of the wildest and most inaccessible description.”—. . . . . “At the picturesque, ‘turf and timber’ village of Sebastopol, as the miners called it, at the head of Loch Chon, several hundreds of work-people were accommodated. Provision stores, reading-

rooms, a school- house and church, and a resident medical man and school-master were provided for them.”

The aqueduct from its commencement at Loch Katrine to the Mugdock reservoir, is 253 miles long, 13 of which were tunnelled, 3? miles are iron piping across valleys, and the remaining 9 miles consist of “cut and cover” conduit and bridges. Where the ground was cut open the conduit was covered in, and the surface restored after the aqueduct was built. At the bridges the aqueduct is covered with timber to prevent its being choked by snow. Most of them are furnished with grooves in the masonry to receive stop planks, and with discharge sluices to facilitate the emptying of the aqueduct, when it is necessary to inspect or make repairs. Overflows are constructed at a number of the bridges, to discharge the water if it should be necessary to stop the flow suddenly at any point. The total cost of the aqueduct at the time the water was introduced into the city, was £468,000, or an average of £18,000 per mile.

It has been already stated that the 4-feet pipes across the valleys on the line of aqueduct were intended to deliver 20,000,000 gallons a day. By the well-known modification of Hytelwein’s formula, deduced from Du Buat’s experiments and more elaborate formule, the com- puted discharge is 21,500,000 gallons a day nearly, and by Weisbach’s formule, 21,750,000 gallons a day. These pipes, however, have discharged 24,000,000 gallons a day without their being completely gorged, and their ultimate discharge has therefore yet to be determined. The whole of the pipes used in the works were coated with coal pitch and oil, according to the process patented by Dr R. A. Smith of Manchester, and first used by Mr Bateman in the Manchester Waterworks. This coating, when well done, imparts a smooth glassy surface to the pipes, and prevents, at least for a number of years, the usual, and it may be said, inevitable oxidation. Weisbach found that for wooden pipes 24 and 44 inches diameter, the coefficient of resist- ance was 1°75 times as great as for “metallic pipes,” giving a discharge about 14 per cent. less; and M. Morir. has shown, in a paper which it is believed is published in detail in the Mémoires des Savants Etrangers, the influence the state of the surface has upon the discharge of a pipe,

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amounting, in cast-iron pipes coated with pitch, and in glass pipes, to an increase of nearly one-third in the discharge.

It has also been pointed out by M. Morin, whose deduc- tions are principally from observations by M. Darcy director of the waterworks of Paris, that for large sizes the diameters of the pipes seem also to exercise a more decided influence on the discharge than has been hitherto assigned to them. Late observations on the fiow of gas through pipes by M. Arson, engineer of the Paris Gas Company, tend to confirm the views of M. Morin.

At the Mugdock Service Reservoir, 7 or 8 miles from Glasgow, the water is first discharged into a basin, from which it passes over cast-iron gauge plates, 40 feet wide, brought to a thin edge. The depth of water passing over these plates is regularly recorded and the discharge com- puted, From the basin the water falls into an upper division of the main reservoir, about 2 acres in extent, and from this it is discharged into the reservoir. The reser- voir has a water surface of 60 acres, and a depth when full of 50 feet ; it contains 548,000,000 gallons, and is 317 feet above ordnance datum. It admits of repairs being made upon the aqueduct without interrupting the supply of water to the city. Two earthen embankments were necessary to form the reservoir; the main embankment is 400 yards long and 68 feet high, and the easterly embankment 240 yards long and 50 feet high, each with a puddle wall in the centre, and pitching on the front slope in the usual way. The water is drawn from the reservoir by pipes laid in a tunnel through the hill between the two embankments, there being no pipes through the embankments themselves,

At the end next the reservoir there is a stand-pipe so arranged that water can be drawn at various heights, and about 50 yards from the reservoir, the water passes into a circular well cut out of the rock, 40 feet in diameter and 63 feet deep, and is strained by passing through copper wire-cloth, 40 meshes to the inch, arranged in oak frames, forming an inner well of octagonal shape 25 feet diameter ; and from this latter the water finally passes into the two lines of pipes leading to the city. Water can also be drawn direct from the gauge basin, and from the upper compartment of the reservoir into the straining well, by a line of 4-feet pipes through the bottom

of the reservoir. These works, including road and stream diversions, cost about £56,000.

The two pipes leading from the straining well are each 42 inches diameter, and are intended to deliver the whole 50,000,000 gallons a day; but on emerging from the tunnel, which is 440 yards in length, they are diminished to 36 inches, and they are continued of this size to the city. Provision was made for additional pipes, which have since been laid. The different lines of pipes are laid side by side for about 3 miles, after which they diverge—one line being carried by the Great Western Road for the supply of the low districts of the city, and the other by Maryhill for the supply of the high districts. These pipes come together again, and are arranged so as to communicate when necessary at St George's Road near the commencement of the city, up to which point their respective lengths from the straining well are 7 miles for the low district main, and 64 miles for the high. Each of these lines of pipes crosses the River Kelvin and the Forth and Clyde Canal, and at these places provision was made for additional pipes. Eleven feet were added to the width of the Kelvin Bridge on the Great Western Road, by cast-iron girders, to carry the low district mains. The two middle spans are each 93 feet, and the two side arches 37 feet span.

The total cost of the works at their completion, in 1860, was as follows :—

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Work at the Lochs, .2.cc.cene- sec nene-+ 8 00,000 Aqueduct, 25$ miles long, ... 468,000

56,000

Mugdock Reservoir, Main Pipes, 36 inches diameter,..... 123,000

Distribution in the city, ... 78,000 Motaltior Works, <.2…:.<0-+

Vienna Waterworks.

A still more recent work, consisting mainly of aqueduct construction, is the enterprise for supplying the city of Vienna with water. The water is obtained

from the springs of Kaiserbrunn and Stixenstein, both situated at the foot of the Styrian Alps, which separate Austria from Styria. The Kaiserbrunn spring is situated 1146 English feet above the Danube at Vienna, and the Stixenstein spring 996 feet. The water is conducted by aqueduct to a receiving reservoir at Rosenhugel, 277 feet above the Danube, and distant 2 miles from Vienna. The length of the aqueduct from Kaiserbrunn to the receiving reservoir on the Rosenhugel, is 564 English miles. A branch of 3°9 English miles conducts the Stixenstein spring to this aqueduct. The gradients of the aqueduct vary much in the upper or early parts ; but towards the end they become more regular. The gradients have been thus varied for the purpose of keeping the canal as much as possible along the level of the ground, so as to avoid high embankments. In order to keep the water cool in summer, and to secure it from freezing in winter, the water is always 6 feet below the surface; and in places where embankments were un- avoidable, the aqueduct has been covered to the same extent. The size of the aqueduct varies from 4 feet 6 inches in height, by 2 feet 6 inches in width, to 6 feet 6 inches in height, by 4 feet in width. In order to facilitate the discharge, and to reduce friction, the inside of the aqueduct has been plastered with a coating 2 inches thick of Portland cement and sand, in the proportion of one of cement to two of sand. ‘This coating was laid on in three layers, the last being a very thin layer of pure cement, which, when hardened, was rubbed with iron plates till it became perfectly smooth and polished. The work was commenced in the winter of 1869-70, and com- pleted in the month of September 1873. The aqueduct is constructed for the purpose of supplying about 3,200,000 cubic feet per day, or 20,000,000 gallons. There are

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Fra. 20 —Baden Bridge, Vienna Waterworks (7 out of 43 arches).

several iniportant aqueduct bridges along the line of works. Of these the principal is the aqueduct of Baden, which consists of forty-three large arches, with spans varying from 5 klafters to 8} klafters, and the greatest height 15 klafters 5 feet 5 inches, or 96°6 English feet, from the foundation of the pier to the top of the aqueduct. The arches are of brickwork, as well

as the vaulting of the canal, The piers, together with the backing of arches and the sides of the canal, are faced with ashlar, and filled up with rubble masonry. ‘The canal is covered on the top with earth, which is then covered with 9 inches of paving in rubble masonry

The Modling Aqueduct is, although one of the shortest, perhaps the finest on the whole line of the works. It is situated in a very narrow gorge, with high rocks rising on

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the side. The canal or aqueduct passes through a tunnel on one side, and after crossing the aqueduct enters imme-

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Fria. 21.—Médling Bridge, Vienna Waterworks.

diately into another tunnel on the other. This aqueduct — bridge consists of spans of 9 klafters, or 55°98 English feet, in width, and is built entirely of bricks, with the exception that the piers are pointed with ashlar. The abutments, the foundations of which are excavated in the rock, are built of rubble masonry, faced with ashlar. The other chief aqueducts are—the one at Liesing with forty- six arches, very sinilar to that of Baden, and that of Mauer with thirteen arches, built of bricks, and making a fine curve across the valley.

The receiving reservoir on the Rosenhugel, where the aque- duct ends, is divided into two parts, capable together of holding 80,000 cubic feet English. From this reservoir the water is taken to two other distributing reservoirs, from which the city is supplied. The cost of the work, together

with the network of pipes in Vienna, has been about 25,000,000 florins or £2,000,000 sterling. The chief engineer of the work was Herr Carl Junker of Vienna, and the contractor Mr Antonio Gabrielli of London. The works were completed and opened in the autumn of 1873.

Water Supply of Paris.

The question of improving the water supply of this city was the subject of minute and careful investigations, extending over a period of four or five years, (from 1854 to

1859.)

Many projects were submitted to the Prefecture of the Seine, but the one finally adopted was that studied by Mr Belgrand and the engineers of the municipality of Paris. The scheme consisted in appropriating the waters of the Sonne and the Soude, together with the Soudon and the Dhuis, all being tributaries of the Marne, and flowing through chalk districts.

The population of Paris, for the supply of which the scheme was laid out, was taken at 2,000,000, and the waters from the sources selected were intended for the domestic supply only—the existing supplies to Paris, which have become gradually polluted and unfit for domestic use, being made available for all the other general wants of the population. The quantity of water which it was estimated would be required for the domestic purposes of such a population was taken at 100,000 cubic metres per diem, or about 22,000,000 gallons per day; and the works have been laid out for conveying this quantity. Gaugings of the various streams selected, showed that in 1855, when the flow was at the lowest, the produce of the Sonne and the Soude was 1081 litres per second, the Soudon 100, the Dhuis 315 ; making a total of 1496 litres per second, or about 28,000,000 gallons per day. At the time of lowest water in 1857, however, the Sonne and the Soude together only yielded 880 litres per second, or 16,762,000 gallons per day, while in 1858, which was an exceptionally dry year (indeed the driest year on record in this locality), they yielded together only 285 litres per second, or 5;417,280 gallons per day ; while in both these years the Soudon and the Dhuis gave almost the same quantities as in the year 1855.

In order to meet the contingency of such a dry season as 1858, Mr Belgrand’s project contemplated sinking wells or adits in the chalk, and obtaining therefrom what he

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terms “the subterranean reservoirs of water therein con- tained,”—artificial supplics, which would supply any defici- ency in the quantity yielded bythe streams.. The works com- prised what are termed conduits of derivation, being sub- sidiary conduits for collecting the waters from the various streams, and conducting them to the commencement of the main aqueduct that conveys the waters of the combined sources to Paris. The main aqueduct commences at a level of about 105 metres above the sea. It is a little over 180 kilometres in length (about 110 English miles), and ter- minates at Paris in service reservoirs at Belleville, at a level of 834 metres above the sea. The subsidiary conduits are about 80 kilometres in length, and upon these and the main aqueduct there are seventeen bridges, 6 kilometres of conduit constructed upon arches, 7 kilometres of syphon piping, and 28 kilometres of tunnel. The estimated cost of the ordinary works was about 19,000,000 francs, or £760,000, to which must be added about 24 million francs, or £100,000, for special works, where the aqueduct had to be constructed through difficult ground, and 44 million frances, or £180,000, for compensation to riparian owners on the streams which were selected as the sources of the supply, as well as to the owners of mills who might be injured by the abstraction of the water, and for the pur- chase of the lands through which the aqueduct had to be constructed ; making a total estimated outlay on the works at the sources of the supply, and for the subsidiary and main aqueducts up to the distributing at Belleville, of 26,000,000 francs or £1,040,000.

The commission, to whom were referred all the projects which had been suggested, in their report, considered on the 18th of March 1859, recommended that the sum to be voted for the works should be 30,000,000 franes, or £1,200,000, thus increasing the estimate by 4,000,000 francs, or £160,000, with the view of providing ample means to cover any unforeseen works or difficulties which might be encountered during the carrying out of the pro- ject. The works have since that time been carried out sub- stantially

in accordance with the ideas and designs of Mr Belgrand, and under his direction and supervision ; but they are notyet(1874)completed. The water from these sources is naturally very hard, but it is bright, fresh, and well aerated.

Although the system of pipes has superseded the use of stone channels all raised to a level in the conveyance of water, there are still cases, such as those of canals, where the water must be kept on a perfect level, and where, therefore, aqueduct bridges are still necessary in conveying it over the valleys ; and of these we have long had examples in France, on the Languedoc canal. The first aqueduct bridges for canals in this country were those made by the Duke of Bridgewater, under the direction of the celebrated Brindley, and which, being quite new here, excited no small degree of astonishment. The first and largest was the aqueduct at Barton Bridge for conveying the canal across the Irwell, 39 feet above the surface of the water. It consisted of three arches, the middle one 63 feet span, and admitting under it the largest barges navigating the Irwell with sails set. It was commenced in September 1760; and in July of the following year the spectacle was first presented in this country, of vessels floating and sailing across the course of the river, while others in the river itself were passing under them. Since that period canal aqueducts have become more common ; and many excellent exauiples are to be found both in England and Scotland. Of these are the aqueducts over the river Lune on the Lancaster canal, designed by Rennie,—a very excellent and splendid work of five arches, each 72 feet span, and rising 65 feet above the level of the river ; and the Kelvin aque- duct, near Glasgow, which conveys the Forth and Clyde

canal over the valley of Kelvin, consisting of four arches, each 70 feet span, and rising 70 fect above the level of the river. Plate IV. contains views of two other principal aqucducts, viz., those of Pont-y-Cysyllte and Chirk in Wales. Of these the Pont-y-Cysyllte aqueduct by Mr Telford is justly celebrated for its magnitude, simplicity of design, and skilful disposition of the parts, combining lightness with strength in a degree seldom attempted. This aqueduct serves to convey the waters of the Ellesmere canal across the Dee and the vale of Llangollen, which it traverses. The channel for the

water is made of cast-iron, supported on cast-iron ribs or arches, and these resting on pillars of stone. The iron being much lighter than stone arches, this in one reason why the pillars have been reduced apparently to such slender dimensions. They are quite strong enough, however, as experience has proved. The whole length of the aqueduct is about 1000 feet, and consists of nineteen arches, each 45 feet span. The breadth of the pillars at the top is 8 feet, and the height of the four middle ones is 115 feet tothe springing. The pillars have a slight taper, the breadth of the middle ones at the base being 15 feet. The height from the surface of the water in the Dee to that in the canal is 126 feet 8 inches, The channel for the water consists of cast-iron plates, cast with flanches, and these screwed together with bolts; they are represented in the drawing, between the arched ribs and the railing. The lines there show the joinings of the different plates. In order to preserve as much water-way as possible, the channel is made the full width of the canal and towing-path, and the latter projected over one side, and supported inside by posts resting on the bottom of the canal. The aqueduct of Chirk was designed by the same able engineer, and serves also to convey across a valley the waters of the same canal. This aqueduct was the first in which iron was employed. Hitherto the channel for the waters had been constructed of stonc, or partly of stone and partly of clay puddle, which it was generally found very difficult to keep water-tight for a length of time. It was determined, therefore, by Mr Telford, to try the effect of cast-iron, and to lay it at first only on the bottom. The plates were accordingly laid directly over the sprandril walls, which they served to bind together, and united by flanches and screws. The sides of the channel were built with stone facings and brick hearting laid in water-lime mortar. This plan succeeded completely, and the quantity of masonry in the aqueduct was thereby greatly reduced. The aqueduct itself is 600 feet long, and 65 feet high above the river, consisting of ten arches, each 42 feet span. The piers are 10 feet thick.

An aqueduct near Edinburgh, conveying the waters of the Edinburgh and Glasgow Union Canal across the valley of the Water of Leith at Slateford, is an elegant struc- ture, similar in plan to that of Chirk, only that the water-channel is composed entirely of cast-iron, which is more- over built in with masonry. It is about 500 feet in length, and consists of eight arches, each 45 feet span; and the height of the canal is about 70 feet above the level of the

river. On this canal another aqueduct of the very same construction occurs in crossing the valley of the Almond, and having several more arches. There are, in different parts of the country, various other aqueducts, but, excepting the formation of the water-way, these structures differ in no respect from bridges, particularly those undertaken not so much with the view of crossing rivers as of raising the level of the road entirely out of the valley,—an object now become of great importance, from the improvements in modern modes of conveyance. For the principles and mode of construction of these works, as well as of the aqueduct bridges, so far as the arch is concerned, see articles Arc and Bripce.

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For further information on the subject of ancient aque- ducts, sce E. Curtius, der Hellenen," in Archiiologische Zeitung, Julius Froutinus, De Agueductibus Urbis with the Commentaries of Polenus (Patav. 1722) and

Rondelet (Paris, 1820); Raphael Fabretti, De Aquis et |

Aqueeductibus Veteris Rome Dissertatio; Plinii Hist. Nat. lib. xxxvi. cap. xv.; Montfaucon, Antiquité Expliquée, tome iv. tab. 128 ; Governor Pownall's Votes and Description of Anti- guities in the Provincia Romana of Gaul ; Belidor's Archi- tecture Hydraulique, containing a drawing of the aqueduct of Maintenon; also Mém. Acad. Par.; Andreossy, Voyage & 'Embouchure de Mer Noire, ow Essai sur le Bosphore ; Philosophical Transactions Abridged, vol. i.; and Link's Travels in Portugal. And for modern aqueducts, see

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: Rickman's Life of Telford, 1838; Schramke's New York '"'Ueber Stadtische Wasserbauten |

1847 ; Sextus | Rome Libri IL,, |

Croton Aqueduct ; Second Annual Report of the Department of Public Works of the City of New York in 1872 ; Mémoires sur les Eaux de Paris, presentés par le Préfet de la Seine au Conseil Municipal, 1854 and 1858;

Recherches statistiques sur les sources du Bassin de la Seine, par M. Belgrand, Ingénieur en chef des ponts et chaussées, 1854. ‘‘Descrip- tion of Mechanical arrangements of the Manchester Waterworks,” by John Frederic Bateman, F.R.S., Engineer- in-chief, from the Minutes of Proceedings of the Institution of Mechanical Engineers, 1866 ; The Glasgow Waterworks, by James M. Gale, Member Inst. C.E., 1863 and 1864 ; The Report of the Royal Commission on Water Supply, and the Minutes of Evidence, 1867 and 1868. (A. S. M.—J. F. B.)

AQUILA, a town of Italy, capital of the province of Abruzzo Ulteriore IL., beautifully situated on the Aterno, about 56 miles from Rome. It is a well-built place, con- taining a citadel, which dates from 1534, a cathedral (S. Bernardino du Siena), as well as numerous other churches and religious establishments, a theatre, a fine town-hall, and a number of ancient mansions, such as the Palazzo Torres, with its picture-gallery, and the Palazzo del Governo, the residence of Margaret of Austria. Its chief manu- factures are paper, linen, and wax; and it has a large trade in saffron, the principal product of the surrounding district. Aquila was founded about the year 1240, by the emperor Frederick II. who peopled it with the inhabi- tants of the ancient Amiternum, the birthplace of Sallust, the ruins of which are still to be seen about 3 mules from the town. It soon became a very flourishing city; but war, pestilence, and especially earthquakes (1703, 1705), have done much to reduce its importance. Population, 16,607.

AQUILA (’AxvAas), a native of Pontus, who flourished about 130 «.D., celebrated for his translation of the Hebrew Scriptures into Greek. His history is involved in much obscurity ; but, according to Epiphanius (De Pond. et Mens., c. 15), he was a kinsman of the Emperor Hadrian, who employed him in rebuilding Jerusalem (Atlia Capi- tolina), and was converted to Christianity, but on being reproved for practising the pagan astrology, apostatised to Judaism. This account, however, is more than doubtful. Aauila’s version of the Scriptures was exceedingly close and accurate, and is said to have been used in place of the Septuagint in the synagogues. Though the Christians generally disliked it, alleging without due grounds that it rendered the Messianic passages incorrectly, Jerome and Origen speak in its praise. The few fragments that remain are published in the Hexapla of Origen, and in Dathe’s Opuscula, Lips. 1746.

AQUILA, Caspar, the Latin name of Kaspar Adler, a celebrated German theologian who espoused the cause of the Reformation. He was born at Augsburg in 1488, and after studying there as well as at Berne and Leipsic, and for several years in Italy, he was appointed pastor of Jenga, a village near Augsburg. Here he embraced the doctrines of Luther; but his boldness and zeal in the cause of the reformed faith led the bishop of Augsburg to order his arrest. prison of Dillingen, and was only liberated through the influence of Isabella of Denmark, sister of the emperor Charles V. From Dillingen he went to Witteuberg, where

he became personally acquainted with Luther ; and thence : IL, was led in derision through its streets on an ass, and

he went as tutor to the family of Franz von Sickingen, in the castle of Ebernburg. After a short stay at Eisenach, Aquila was appointed professor of Hebrew at Wittenberg, where he rendered valuable assistance to his colleague

Luther in his translation of the Old Testament. In 1527 he became pastor, and the following year Protestant bishop at Saalfeld; but his vehement opposition to the Interim of Charles V. in 1548, obliged him to flee from the place, and accept the offer from the countess of Schwarzburg of a temporary asylum in her castle of Rudolfstadt. He was appointed to the deanery of Schmalkalden in 1550, and restored two years after to his office at Saalfeld, where, without further molestation, he continued to discharge his duties till his death, 12th November 1560. ‘The writings he has left arc chiefly sermons and controversial works. AQUILA, SeRraFINo DELL’, a famous Italian poet and improvisatore, was born in 1466 at the town of Aquila, from which he took his name, and died in the year 1500. He spent several years at the courts of Cardinal Sforza and Ferdinand, duke of Calabria; but his principal patrons were the Borgias at Rome, from whom he received many favours. Aquila seems to have aimed at an imitation of Dante and Petrarch ; and his poems, which were extrava- gantly praised during the author’s lifetime, are occasion- ally of considerable merit. His repntation was in great measure due to his remarkable skill as an improvisatore and musician. His works were printed at Venice in 1502, and there have been several subsequent editions. AQUILEIA, an ancient city, at

the head of the Adriatic, founded or at least colonised by the Romans about 181 B.¢., which, on account of its commanding the north-eastern entrance into Italy, soon rose into importance as a comimer- cial centre and as a military post. Connected by the Zmilian way with the capital and the south, it was also the starting-place of the roads to Rheetia, Pannonia, Istria, and Dalmatia. The surrounding territory was highly fertile, and yielded abundance of wine; while gold was found in considerable quantities in the neighbourhood. Aquileia was chosen by Julius Cesar as headquarters for his forces in Cisalpine Gaul, and was frequently the point d'appui of imperial campaigns. It was strongly fortified by Marcus Aurelius in 160, and was able in 238 to frustrate the long-continued siege of Maximin. About this time it was one of the most important and flourishing cities of all Italy. It was recognised as the capital of Venetia, and allowed to have the altogether exceptional privilege of

: s 'a mint. In 361 the city was captured by Jovinus; and Aquila passed the winter of 1519-1520 in the |

in 381 it was the seat of a council, in which St Ambrose obtained the excommunication of Falladius. In 388 it

| surrendered to Theodosius the Great his antagonist Maxi-

mus; and in 425 Joannes, the rebel against Theodosius

then beheaded in its circus. In 425 it was taken and destroyed by Attila, and though restored by Narses in 552, it never recovered its former prosperity. At the

council of 556 its bishop—whose predecessors cau be

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traced back to the 3d century—separated from the Church of Rome, and took the title of Patriarch, which was recog- nised by Pope Sergius I. at the council of 698, when the schism was brought to a close. By 924, under the rule _of its patriarchs, it was strong enough to extend its autho- rity over Friuli; and it continued to enjoy considerable prosperity, until it was at

length deprived of most of its possessions by Venice in 1420. Its patriarchs had indeed already removed their residence to the castle of Udine, and the Venetian conquest only hastened the decay that had previously begun. The patriarchate was abolished in 1758, and the territory divided into the two bishoprics of Udine and Gorizia. It is now a small fishing village of 1956 inhabitants, containing a number of interesting remains of its ancient splendour, and often rewarding the researches of the antiquary with relics of value. (Gian. Dom. Bertoli, Le Antichite di Aquileja, profane e sacre, Ven. 1739.) AQUILLIUS, Manrus, was Roman consul in 101 B.c., and successfully reduced a revolt of slaves in Sicily. He was afterwards accused of receiving money illegally, but was acquitted by an artifice of his counsel, who exhibited to the people the scars of wounds received by his client in war. In 88 B.c. he acted as legate against Mithridates, by whom he was defeated and taken prisoner. Mithridates treated him with great cruelty, and finally put him to death by pouring molten gold down his throat. AQUINAS, Tuomas [Tuomas or AQuin or Aquino], was of noble descent, and nearly allied to several of the royal houses of Europe. He was born in 1225 or 1227, at Rocca Sicca, the castle of his father Landulf, count of Aquino, in the territories of Naples. Having received his elementary education at the monastery of Monte Cassino, he studied for six years at the University of Naples, leaving it in his sixteenth year. While there he in all probability came under the influence of the Dominicans, who were then the rising order in the church, and were doing their utmost to enlist within their ranks the ablest young scholars of the age, for in spite of the opposition of his family, and especially of his mother (an opposition which was over-come only by the intervention of Pope Innocent IV.), he assumed the habit of St Dominic in his seventeenth year. His superiors, seeing his great aptitude for theological study sent him to the Dominican School in Cologne, where Albertus Magnus, the most famous thinker of his age, lectured on philosophy and theology. In 1245 Albertus was called to Paris, and there Aquinas followed him, and remained with him for three years, at the end of which he graduated as bachelor of theology. In 1248 he returned to Cologne with Albertus, and was appointed second lecturer and magister studentium. This year may be taken as the beginning of his literary activity and public life.- Ere he left Paris he had thrown himself with ardour into the controversy raging between the University and the Begging Friars respecting the liberty of teaching, resisting both by speeches and pamphlets

the authorities of the University ; and when the dispute was referred to the Pope, the youthful Aquinas was chosen to defend his order, which he did with such success as to overcome the arguments of the celebrated William of St Amour, the champion of the University, and one of the most celebrated men of the day. In the year 1257, along with his friend Bonaventura, he was created doctor of theology, and began to give courses of lectures upon this science in Paris, and also in Rome and other towns in Italy. From this time onwards his life was one of incessant toil, and we marvel at the amount of literary work he was able to do, when we remember that during his short public life he was con- tinually engaged in the active service of his order, was fre- quently travelling upon long and tedious journeys, and was constantly consulted on affairs of state bythe reigning pontiff.

In 1263 we find him at the chapter of the Dominican order held in London. In 1268 he was lecturing now in Rome and now in Bologua, all the while engaged in the public business of the church. In 1271 he was again in Paris, lecturing to the students, managing the affairs of the church, and consulted by the king, Louis VIIL, his kinsman, on affairs of state. In 1272 the commands of the chief of his order and the request of King Charles brought him back to the professor’s chair at Naples. All this time he was preaching every day, writing homilies, disputations, lectures, and finding time to work hard at his great work the Summa Theologice. Such rewards as the church could bestow had been offered to him. He refused the archbishopric of Naples and the abbacy of Monte Cassino. In January 1274 he was summoned by Pope Gregory X. to attend the council con- vened at Lyons, to investigate and if possible settle the differences between the Greek and Latin churches. Though suffering from illness, he at once set out on the journey; finding his strength failing on the way, he was carried to the Cistercian monastery of Fossa Nuova, in the diocese of Terracina, where, after a lingering illness of seven weeks, he died on the 7th of March 1274. After his death the highest honours which the church could bestow were awarded to the memory of Thomas. He was canonised in 1323 by Pope John XXIL, and in 1567 Pius V. ranked the festival of St Thomas with those of the four great Latin fathers, Ambrose, Augustine, Jerome, and Gregory.

Still higher is the honour implied in the fact, that no theologian save Augustine has had the same influence on the theological thought and language of the Western Church, and that no man has better fulfilled the ideal of the monkish life than Thomas of Aquin.

The writings of Thomas are of very great importance for philosophy as well as for theology, for he is the spirit of scholasticism incarnate, and has done more than any other writer save Augustine to fashion the theological language of the Western Church. The medieval spirit, in all its various manifestations, aimed at universal empire by way of external and visible rule. Its idea of the State was the Holy Roman Empire actually embracing and dominating over all the countries in Europe ; its idea of the Church, that visible and tangible catholicity which existed before the great Reformation ; and in the department of know- ledge it showed its characteristic quality in its desire to embrace in one system, under one science, the whole of human thought. It so happened that, in the break between the old world and the new, the sole institution which survived was the church, and the only science which was preserved was philosophy. Hence, when scholasticism arose, the science which it found ready to its hand was theology, and its task became that of bringing all departments of knowledge under the dominion of this one sovereign science. All through the period of scholas- ticism, from its beginning under Scotus Erigena down to its decline under Gabriel Biel, this aim of establishing an empire of science was kept in view, and no fresh advance in knowledge in any fresh field of investigation was ever held to be made or taken possession of until its results had been brought under the influence of the master science, and made to occupy their proper and subordinate place. Aquinas occupies the central point in the history of scholasticism, because he, more than any other, was trained by nature and education to do the most that could be done to realise the scholastic ideal, and present a con- densed summary of all known science, under the title of Summa Theologic.

The principles on which the system of Aquinas rested were these. He held that there were two sources of know- ledge—the mysteries of Christian faith and the truths of

human reason. The distinction between these two was made emphatic by Aquinas, who is at pains, especially in his treatise Contra Gentiles, to make it plain that each is a distinct fountain of knowledge, but that revelation is the more important of the two. It is important to mark what Aquinas means by revelation and by reason. Revelation is a source of knowledge, rather than the manifestation in the world of a divine life, and its chief characteristic 1s that it presents men with mysteries, which are to be believed even when they cannot be understood. Revelation is not Scripture alone, for Scripture taken by itself does not cor- respond exactly with his description ; nor is it church tradition alone, for church tradition must so far rest on Scripture. Revelation is a divine source of knowledge, of which Scripture and church tradition are the channels ; and he who would rightly understand theology must fami- liarise himself with Scripture, the teachings of the fathers, and the decisions of councils, in such a way as to be able to make part of himself, as it were, those channels along which this divine knowledge flowed. Aquinas's conception of reason is in some way parallel with his conception of revelation. Reason is in his idea not the individual reason, but fountain of natural truth, whose chief channels are the various systems of heathen philosophy, and more especially the thoughts of Plato and the methods of Aristotle. Reason and revelation are both of them separate sources of knowledge, which have their appropriate channels ; and man can put himself in possession of each, because he can bring himself into relation to the church on the one hand, and the system of philosophy, or more strictly Aristotle, on the other. The conception will be made clearer when it is remembered that Aquinas, taught by the mysterious author of the writings of the Pseudo-Dionysius, who so marvellously influenced medieval writers, sometimes spoke of a natural revelation, or of reason as a source of truths in themselves mysterious, and was always accustomed to say that reason as well as revelation contained two kinds of knowledge. The first kind lay quite beyond the power of man to receive it, the second was within man's reach. In reason, as in revelation, man can only attain to the lower kind of knowledge ; there is a higher kind which we may not hope to reach.

But while reason and revelation are two distinct sources of truths, coming to men by two distinct means of convey- ance, the supernatural and the natural means for the delivery of truth, and apprehended by two distinct facul- ties,

reason and faith, the truths which each reveal are not in themselves contradictory ; for in the last resort they rest on one absolute truth—they come from the one source of knowledge, God, the Absolute One. Hence arises the compatibility of philosophy and theology which was the fundamental axiom of scholasticism, and the possibility of a Summa Theologiz, which is a Summa Philosophiz as well. All the many writings of Thomas are preparatory to his great work the Summa Theologiw, and show us the progress of his mind training for this his life work. In the Summa Catholice Fidei contra Gentiles he shows how a Christian theology is the sum and crown of all science. This work is in its design apologetic, and is meant to bring within the range of Christian thought all that 1s of value in Mahometan science. He carefully establishes the necessity of revelation asa source of knowledge, not merely because it aids us in comprehending in a somewhat better way the truths already furnished by reason, as some of the Arabian philosophers and Maimonides had acknowledged, but because it is the absolute source of our knowledge of the mysteries of the Christian faith ; and then he lays down the relatious to be observed between reason and revelation, between philosophy and theology. This work, Contra Gentiles, may be taken as an elaborate exposition of the

other pyschological aud master,

preparation, Aquinas

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method of Aquinas. That method, however, implied a careful study and comprehension of the results which accrued to man from reason and revelation, and a thorough grasp of all that had been done by man in relation to those two sources of human knowledge; and so, in his preliminary writings, Thomas proceeds to master the two provinces. The results of revelation he found in the Holy Scriptures and in the writings of the fathers and the great theologians of the church ; and his method was to proceed backwards. He began with Peter of Lombardy (who had reduced to theological order, in his famous book on the Sentences, the various authoritative statements of the church upon doctrine) in his In Quatuor Sententiarum P. Lombardi libros. Then came his deliverances upon undecided points in theology, in his XII. Quodlibeta Disputata, and his

Quees- tiones Disputate. His Catena Aurea next appeared, which, under the form of a commentary on the Gospels, was really an exhaustive summary of the theological teaching of the greatest of the church fathers. This side of his preparation was finished by a close study of Scripture, the results of which are contained in his commentaries, Jn omnes E'pistolas Divi Apostoli Expositio, his Super Isaram et Jeremiam, and his In Psalmos. Turning now to the other side, we have evidence, not only from tradition but from his writings, that he was acquainted with Plato and the mystical Pla- tonists ; but he had the sagacity to perceive that Aristotle was the great representative of philosophy, and that his writings contained the best results and method which the natural reason had ag yet attained to. Accordingly Aquinas prepared himself on this side by commentaries on Aristotle's De Interpretatione, on his Posterior Analytics, on the Metaphysics, the Physics, the De Anima, and on the physical writings of the great each commentary having for its aim to lay hold of the material and grasp the method contained and employed in each treatise. Fortified by this exhaustive began his Summa Theologice, which was to be for human thought what the Holy Roman Empire was for the bodies, and the Holy Catholic Church was for the souls of men. It was to be a visible empire of thought, exhaustive, all-embracing, and sovereign. The Summa Theologie was meant to be the sum of all known learning, arranged according to the best method, and subordinate to the dictates of the church; that was the intention of the book; practically it came to be the theological dicta of the church, explained according to the philosophy of Aristotle and his Arabian commentators. The Summa is divided into three great parts, which shortly may be said to treat of God, Man, and the God-Man. The first and the second parts are wholly the work of Aquinas, but of the third part only the first 90 queestiones are his; the rest of it was finished in accordance with his designs. The first book, after a short introduction upon the nature of theology as understood by Aquinas, proceeds in 119 questions to dis- cuss the nature, attributes, and relations of God; and this is not done as in a modern work on theology, but the ques- tions raised in the physics of Aristotle find a place alongside of the statements of Scripture, while all subjects in any way related to the central theme are brought into the dis- course. The second part is divided into two, which are quoted as Prima Secunde and Secunda Secunde. This second part has often been described as ethic, but this 1s scarcely true. The subject is man, treated as Aristotle does, according to his réAos, and so

Aquinas discusses all the ethical, psychological, and theological questions which arise; but any theological discussion upon man must be mainly ethical, and so a great proportion of the first part, and almost the whole of the second, has to do with ethical questions. In his ethical discussion Aquinas distinguishes theological from natural virtues and vices : the theological

virtues are faith, hope, and charity; the natural, justice, prudence, and the like. The theological virtues are founded on faith, in opposition to the natural, which are founded on reason ; and as faith with Aquinas is always belief in a proposition, not trust in a personal Saviour, conformably with his idea that revelation is a new knowledge rather than a new life, the relation of unbelief to virtue is very strictly and narrowly laid down and enforced. The third part of the Swmma is also divided into two parts, but by accident rather than by design. Aquinas died ere he had finished his great work, and what has been added to complete the scheme is appended as a Supplementum Tertue Partis. In this third part Aquinas discusses the person, office, and work of Christ, and had begun to discuss the sacraments, when death put an end to his labours.

The best edition of the works of Aquinas is the Veniee one of 1787, in twenty-eight 4to vols. It eontains the useful dissertations of Bernhard de Rubeis. The Abbé Migne has published a very useful edition of the Summa Theologie, in four 8vo vols., as an appendix to his Patrologus Coneursus Completus. See Acta Sancet., vii. Martii; Touron, Za vie de St Thomas d' Aquin avee un ecaposé de sa doetrine et de ses ouvrages, Paris, 1737; Dr Karl Werner, Der Heilige Thomas von Aquino, 1858; and Dr R. B. Vaughan, St Thomas of Aquin, his Life and Labours, London, 1872. For the philosophy of Aquinas, see Albert Stéckl, Gesehiehte der Philosophie des Mitteldlters, ii.; Hauréau, De la Philosophie Scholustique, tome ii,; and Ueberweg's History of Philosophy, vol. i. (T. M. L.)

AQUITANIA. This was, in the time of Julius Cesar, the name given to that part of Gallia which lay between the Garumna and the Pyrenees, and was inhabited by a race distinct from the Celte. According to Bial and Bello-guet, Aquitani is probably a form of Auscetani, a Hispanic lengthening of

Ausces (Ausks, Wasks, Basques), and Aquitania would thus be radically identical with Gascony (Wasconia), a word of much later introduction into geo- graphical nomenclature. Though the greater proportion of the Aquitanian tribes made submission to Caesar, it was not till 28 B.c. that the region was fairly brought under the Roman yoke by M. Valerius Messala. In keeping with the imperial policy of denationalisation, the term Aquitania was extended, in the division of Gallia under Augustus, to the whole stretch of country south and east of the con- tinuous course of the Loire and the Allier, and thus ceased to be of ethnographical import. In the 3d century after Christ this extended Aquitania was divided into three parts. Aguitania Prima consisted of the eastern portion of the district between the Loire and the Garonne ; Aqui- tania Secunda, of the western part of the same district ; and Agwitania Tertia or Novempopulania, of the region between the Pyrenees and the Garonne, or the original Aquitania Like the rest of Gaul, Aquitania absorbed a large measure of Roman civilisation which continued to distinguish the district down to a late period. In the 5th century the Visigoths established themselves in Aquitania Secunda, and in some cantons of Narbonensis Prima and Novempopulania. As their power also included Spain, it was usual to speak of their Gallic possessions as Spain likewise. The Merovingian kings extended their authority nominally to the Pyrenees ; but as Guizot has remarked (Hssais, No. ii.) “the conquest of Aquitania by Clovis left it almost as alien to the people and king of the Franks as it had formerly been’ For a time indeed, about 630, the Aquitanians rallied round Haribert (Charibert), the brother of Dagobert, in hope of national independence, even under a Frankish ruler; but the usual story that their ducal family was descended from him rests on a forgery (». Henri Martin, Hist. de France, vol. ii. p. 137). About the end of the 7th century, an adventurer named Eudes or Eudon had made himself master of the region. Attacked by the Saracens, he inflicted on them a crushing defeat but, on

their reappearance, was obliged to call in the aid of Charles Martel, who, as the price of his assistance, claimed the homage of his ally. He was succeeded by his son Hunald, who, after carrying on a war against the aggressions of Pepin the Short, retired to a convent, and left the conflict and

the kingdom to Guaifer (Waifer). For nine years he strenuously maintained the hopeless strife, till his assas- sination in 768. With him perished for a time the national independence, but not the national individuality, of the Aquitanians. The kingdom of Aquitania was bestowed by Charlemagne on the infant Louis in 781; and from him it was transmitted to his son Pepin, on whose death the Aquitanians loyally chose Pepin the younger, but were opposed by L.ouis, who gave the crown to Charles the Bald. Hence ensued a long period of confusion and conflict, which resulted in the comparative success of Charles, who granted the Aquitanians a nominal separation from Neus- tria, and gave them his son Charles, eight years old, to be their nominal king (855)—-nominal, not only because he was a child, but because his kingdom was in a state of anarchy through domestic faction and foreign invasion. On his death (866), Louis the Stammerer succeeded to the titular sovereignty. About 886 Guilhem (William) the Pious, count of Auvergne, the founder of the abbey of Cluny, obtained the title of Duke of Aquitania, and transmitted it (918) to Guilhem II. He was followed in succession by Raimond Pons, count of Toulouse (d. 950), Guilhem Téte d'Etoupes, count of Poitiers (d. 963), Guilhem Fier-a-Bras, whose sister was married by Hugh Capet (970), and Guilhem the Great (977-1030), who had hard work to maintain his ground, but at last changed his title into an effective lordship. His duchy almost reached the limits of the I. and II. Aquitania of the Romans, but did not extend south of the Garonne, that district having been ever since the 6th century in the possession of the Gascons. Guilhem refused the empire offered him by the Italians, and died at Maillezais. Meanwhile civilisation and refinement were gradually increasing. The names of Guilhem VI. (d. 1038), Guilhem VII., who joined Gascony and Bordeaux to his duchy, and married his daughter to Henry the Black, and Guilhem VIII. bring us down to Guilhem IX., who suc- ceeded in 1086, and made himself famous as crusader and troubadour. Guilhem X. (d. 1137) married his daughter to Louis VII. of France, and Aquitania went as her dowry. On her divorce from Louis and marriage with Henry II. of England (1152), her possession passed to her new husband, and from that time continued to follow the fortunes of the English territories in France. The name Guienne, the modern corruption of Aquitania, seems to have come into use about the 10th century. An interesting literary relic of the struggle between the Franks and the Gallo-Roman inhabitants of Aquitania exists under the title of Walther d' Aquitaine (see Fauriel's Poésie

Provencale), but the his- torical value of this work has been questioned. ARABESQUE, a term to which a meaning is now ecom- monly given that is historically incorrect. We apply it to the grotesque decoration derived from Roman remains of the early time of the empire, not to any style derived from Arabian or Moorish work; the term is therefore a mis- nomer. Arabesque and Moresque are really distinct; the latter is from the Arabian style of ornament, developed by the Byzantine Greeks for their new masters, after the conquests of the followers of Mahomet ; and the former is a term pretty well restricted to varieties of cinquecento decoration, which have nothing in common with any Arabian examples in their details, but are a development derived from Greek and Roman grotesque designs, such as we find them in the remains of ancient palaces at Rome, and in ancient houses at Pompeii. These were reproduced by Raphael and his pupils in the esa of some of . — 30

the corridors of the Loggie of the Vatican at Rome : grotesque is thus a better name for these decoratious than Arabesque.

This technical Arabesque, therefore, is much more ancient than any Arabian or Moorish decoration, and has really nothing in common with it except the mere symme- trical principles of its arrangement. Pliny and Vitruvius give us no name for the extravagant decorative wall-painting in vogue in their time, to which the early Italian revivers of it seem to have given the designation of grotesque, be- cause it was first discovered in the arched or underground chambers (grotte) of Roman ruins—as in the golden house of Nero, or the baths of Titus. What really took place in the Italian revival was in some measure a supplant- ing of the Arabesque for the classical grotesque, still retaining the original Arabian designation, while the geu- uine Arabian art, the Saracenic, was distinguished as Moresque or Mvorish. So it is now the original Arabesque that is called by its specific names of Saracenic, Moorish, and Alhambresque, while the term Arabesque is applied exclusively to the style developed from the debased classical grotesque of the Roman empire.

There is still much of the genuine Saracenic element in Renaissance Arabesques, especially in that selected for book-borders and for silver-

work, the details of which consist largely of the conventional Saracenic foliations. But the Arabesque developed in the Italian cinquecento work repudiated all the original Arabian elements and devices, and limited itself to the manipulating of the classi- cal elements, of which the most prominent feature is ever the floriated or foliated scroll ; and itis in this cinquecento decoration, whether in sculpture or in painting, that Arabesque has been perfected.

We will first briefly describe the Saracenic, as the elder sister of the two styles, which was ingeniously developed by the Byzantine Greck artists for their Arabian masters in the early times of Mahometan conquest. Every natural object. was proscribed ; the artists were, therefore, reduced to making symmetrical designs from forms which should have no positive meaning ; yet the Byzantine Greeks, who were Christians, managed to work even their own ecclesi- astical symbols, in a disguised manner, into their tracery and diapers; as the lily, for instance. The cross was not so introduced; this, of course, was inadmissible; but neither was the crescent ever introduced into any of this early work in Damascus or Cairo. The crescent was itself not a Mahometan device till after the conquest of Constan- tinople in 1453 a.p. The crescent, as the new moon, was the symbol of Byzantium ; and it was only after that capi- tal of the Eastern empire fell into the hands of the Turks that this symbol was adopted by them. The crescent and the cross became antagonist standards, therefore, first in the 15th century. And the crescent is not an element of original Moorish decoration.

The Alhambra diapers and original Majolica (Majorca) ware afford admirable specimens of genuine Saracenic or Moorish decoration. A conventional floriage is common in these diapers ; tracery also is a great feature in this work, in geometrical combinations, whether rectilinear or curvili- uear ; and the designs are rich in colour: idolatry was in the reproduction of natural forms, not in the fanciful com- bination of uatural colours. These curves and angles therefore, or intcrlacings, chiefly in stucco, constitute the prominent elements of an Arabian ornamental design combining also Arabic inscriptions ; composed of a mass of foliation or floral forms conventionally disguised, as the exclusion of all natural images

was the fundamental principle of the style in its purity. The Alhambra displays almost endless specimens of this peculiar work, all

in relief, highly coloured, and profusely enriched with gold. The mosque of Touloun, in Cairo, 876 a.p., the known work of a Greek, affords the completest example of this art in its early time; and Sicily contains many remains of this same exquisite Saracenic decoration.

Such is the genuine Arabesque of the Arabs, but a very different style of desigu is now implied by the term—the Arabesque of the cinquecento, a purely classical ornamenta- tion. This owes its origin to the excavation and recovery of ancient monuments, and was developed chiefly by the sculptors of the north, and the painters of Central Italy ; by the Lombardi of Venice, by Agostino Busti of Milan, by Bramanti of Urbino, by Raphael, by Giulio Romano, and others of nearly equal merit.

Very beautiful examples in sculpture of this cinquecento Arabesque are found in the churches of Venice, Verona, and Brescia; while in painting, the most complete speci- mens are those of the Vatican Loggie, and the Villa Madama at Rome and the ducal palaces at Mantua. The Vatican Arabesques, chiefly executed for Raphael by Giulio Romano, Gian Francesco Penui, and Giovanni da Udine, though beautiful as works of painting, are often very extravagant in their composition, ludicrous, and sometimes ssthetically offensive ; as are also many of the decorations of Pompeii. The main features of these designs are balanced scrolls in panels ; or standards variously composed, but symmetrically scrolled on either side, and on the tendrils of these scrolls are suspended or placed birds and animals, human figures and chimeras, of any or all kinds, or indeed any objects that may take the fancy of the artist. But he is limited by the laws of esthetics; his designs must be symmetrical or they will want harmony, and they must not offend against mechanical possibility or the principle of gravitation, or they will be ridiculous : nothing that outrages ssthetic sensibility can ever be beautiful. The most perfect specimens of cinquecento Arabesque are certainly found in sculpture. As specimens of exquisite work may be mentioned the Martinengo tomb, in the church of the Padri Riformati at Brescia, and the facade of the church of Santa Maria dei

Miracoli there, by the Lombardi; and many of the carvings of the Chiteau de Gaillon, France—all of which fairly illustrate the beauties and capabilities of the style.

This kind of decoration need not, however, be limited to architectural panels and pilasters ; it is applicable for large surface decoration, and for manufactures, whether in wood or metal, or textile. It affords as much room also for the display of colour as of form: some of the surface decora- tious of Geertner, in Munich, are splendid examples of delicacy of colour, showing how much may be effected by harmonious combinations in scroll-work of the most delicate gradations and tints. Good specimens of Arabesque, in manufactures, in casts, and in copies in colour, may uow be seen in the South Kensington Museum. For fuller details of styie, see Wornum, Analysis of Ornament, ke., Ato edition, 1874, illustrated. (R. N. W.)

ARABGIR, or ARABKIR, a town of Turkey in Asia, in the vilayet of Sivas, situated in a deep ravine near a srnall tributary of the Euphrates, 150 miles 8.8.W. of Trebizond. The inhabitants are enterprising and prosperous, many of them leaving their native city to push their fortunes else- where, while of those that remain the greater part are employed in the manufacture of silk and cotton goods, or in the production of fruit. The present town was built at a comparatively recent date, but about 2 miles to the north- east is the old town, now called Eski Shehr, containing the ruins of a castle and of other buildings. Arabgir con- tains about 6000 houses. About three-fourths of the population are Turks, and the remainder Armenians.

ARABIA

given by European travellers; amongst whom Niebuhr, Burckhardt, Wallin, Welsted, and Palgrave have been on this occasion chiefly consulted ; and to their works the reader must necessarily be referred for a variety of details

Sources of UR information in regard to the physical character of | thickly studded with small islands, some of which— ; anf Arabia must be chiefly derived from the accounts | Kotembel and Pebel Tar in particular—are of volcanic tion.

origin.

The south-eastern coast, extending from Bab-el-Mandeb South- up to Ras-el-Hadd, is not less dreary than that of Hejaz eastern in appearance, and, like it, presents a low and barren °#*

impossible to compress into a summary like the present. Arabia is a peninsula stretching from north-west to south-east, between 30° and 12° 45’ N. lat., and between

Extent of Arabia.

32° 30’ and 60° E. long. Its form is that of an irregular parallelogram, almost a triangle indced, bounded on the W., 8., and E. by the Red Sea, the Indian Ocean, and the Persian Gulf respectively; on the N., where runs its narrowest limit, it joins on to the mainland of Syria. Its correct boundary in this direction would be assigned by a line drawn trausversely, west and cast, from Suez to the head of the Persian Gulf. But some writers, Burckhardt

‘included, add to this extent all the Syrian desert behind

Palestine, and the valleys of the Jordan and Orontes up to the village of Anah, on the Euphrates, 34° N. lat.; and then down again by the right bank of that river to where, joined by the Tigris, it takes the name of Shatt-el-Arab, and

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so to the Persian Gulf again. Roman geographers make Arabia the further present of Mesopotamia; and Abul- Feda, an Aleppine of the 13th century, would even bring its denomination so far north as to include Aleppo. We will, however, accept the first-mentioned as the most correct line of demarcation. According to this, the extreme length of the Arabian peninsula, from the head of the gulf of Akabah to the straits of Bab-el-Mandeb would be about 1300 miles; its greatest breadth, in 23° N. lat., from the Red Sea coast, west, to Ras-el-Hadd, east, 1500 miles; and its apex, where it joins on to the continent of Asia, rather under 900 miles.

The western coast is washed by the Red Sea. It exhibits a range of low mountains, seldom excecding 2000 feet in height, abrupt in outline, and generally barren; between them and the sea is a narrow and sandy strip fringed along the margin with coral reefs. Its aspect from the sea is almost everywhere desolate in the extreme. Nor does the entire coast-line present a single harbour, properly speak- ing, where anything larger than an ordinary schooner could

find entry; only roadsteads, the approaches to which are

often rendered difficult by shoals and reefs. The Arab side of the Red Sea, especially in the southern half, is

mountain range, diversified only by jagged rocks amid tracts of sand ; but it possesses several good harbours—that of Aden in particular, now a British coaling station, about 100 miles east of Bab-el-Mandeb; that of Dafar, further up; and that of Keshum; though the two last, owing to the want of traffic with the interior, now serve as mere ports of refuge. Along this shore lie several islands, the largest being that of Mozeyrah, near Ras-el-Hadd, but they are only the haunts of a few half-savage fishermen, or are wholly desert.

The third coast, reaching from Ras-el-Hadd to the top Persian Its Gulf coast.

of the Persian Gulf, is of a more cheerful character. easterly half, from Ras-el-Hadd to Cape Musandam, is in general fertile, well-cultivated, and backed up by the lofty forest-sprinkled chain of Jebel Akhdar, or the “

Green Mountain.” Here is situated the excellent harbour of Mascat, one capable of admitting the largest vessels to an almost land-locked shelter ; besides other sinaller but secure ports. Passing Cape Musandam to the west and north, the coast, though low and sandy in some places, is in others palm-fringed and cultivated ; and the neighbourhood of the shallow harbour of Kateef, opposite Bahreyn, is especially fertile. Near the head of the gulf is the harbour, a very good one, of Koweyt, called also Grane. It furnishes the best ships and sailors of these seas. Many islands stud the Gulf Ormuz, famous in Persian and, later, in Portuguese history. Near the narrow entrance, by Cape Musandam, not far off, extends Tishm, a large and fertile island ; higher up lie side by side the sister islands of Bahreyn, Menaneh, and Moharrik, where commence, and continue eastward all along the neighbouring coast of Katar, the most productive pearl fisheries in the world, But countless shoals and reefs render the navigation of the Persian Gulf scarcely less dangerous than that of the Red Sea; storms, too, often arise suddenly on its waters, and shipwrecks are of frequent occurrence.

Arabia, taking it as a whole, cannot be called a fertile General Its general features are those of an elevated features.

country. table-land, backed up by low mountains to the west, and gradually rising in the direction of the east and south, where we find it bordered by a second and loftier mountain range. The mountains, if we except Jebel Akhdar in Oman, are almost wholly barren on their sea side; but are occasionally fertile enough on their inner ranges, especially in Yemen and the southerly districts. Their outlines are rugged and precipitous to a degree that, joined with the refraction of an over-heated atmosphere, gives them from a distance an appearance of being of a much greater height than they really are. Behind them lies an uninterrupted ring of sterile desert, broadest on the south and east, hts it expands into a huge waste of burning sand; narrower towards the west and north, where it is more rocky in its character. Within this belt rises a series of table-lands, undulating in long slopes, and intersected with deep valleys; the former rich in pasturage, the latter in field and garden produce. This central plateau constitutes about one-third of the total superficies of the peninsula; the desert ring another third; the coast ranges make up the rest.

Divisions of Arabia.

Sinaitic peninsula.

Geology.

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In describing Arabia, the aucients,

qualities

boundaries to these regions. More modern geographers,

Eastern and European, have, with better but still inade- quate information, either multiplied or confounded the main Much indeed of its surface is even now unknown to us, except by the uncertain hearsay

divisions of the peninsula.

of Arab narrators. However, the ground-plan laid down by Niebuhr, the most accurate and painstaking of travellers, is substantially correct, and has been so often confirmed,

never invalidated, by later discoveries, that we may safely

follow its indications. Pm Beginning from the north-west, the first district we meet with is that of the Sinaitic peninsula,

Akabah on the east. It is a mere collection of naked rocks and craggy precipices, intersected by long uarrow defiles and sandy valleys, in which tamarisk bushes, dwarf acacias, thorny shrubs, and some kinds of euphorbia, are almost the only vegetation; in a few favoured spots a cluster of wild date-palms may occasionally be met with; and the scanty soil after the spring rains becomes sprinkled over with thin blades of grass that the summer suns soon wither. Running water, except a few rivulets, the result of the spring or autumn rains, none of which outlast the summer,

there is none; but in its stead the traveller meets with

a stagnant and brackish pool here and there under the shelter of some overhanging rock, or a not less brackish well. In the centre of this dreary district rises the famous

mountain group, one particular summit of which, though not

the highest, is conjectured to have been the Biblical Sinai. At its foot lies Wadi Feyran, a valley several miles in extent, and the only tolerably fertile piece of ground in the whole region. The climate, allowing for the increase of heat consequent on a southerly latitude, resembles in the main that of Syria,—rainy in the winter and early spring, with passing storms in autumn; at other times it is uniformly dry and clear, The summer temperature reaches in the valleys, and particularly in the great deso- late gully called the “ Ghowr,” which ig a continuation of the Dead Sea hollow, a height of 118° Fahr. in the shade; during the night it often falls to 7 0°, or even lower. Winter is cold, but ice and snow seldom occur except upon the heights, where the Sinai group in particular becomes snow-capped every year for a period varying from a few days to over two months. The atmosphere is healthy, except in autumn and in early spring.

Between the gulfs of Akabah and Suez the geological formations are almost exclusively plutonic or volcanic,— the latter occupying in general a lower range than the former; metamorphic belts, chiefly of gneiss and slate, are also to be met with. Basalt and greenstone are the most usual volcanic forms, and the subterraneous action that once produced them does not yet seem to be wholly exhausted, for hot springs are of frequent occurrence throughout the region, and earthquakes, accompanied by loud underground noises, are by no means uncommon. The hot wells near Suez, called “ Eyoon Moosa,” or the ‘“‘ Fountains of Moses,” are well known; as also are those entitled ‘“‘ Hammam Pharaoon,” or the ‘‘ Bath of Pharaoh,” the waters of which resemble in their constituents those of the Dead Sea. These volcanic phenomena cease, however, in the zone to the east of Akabah, where rises the great and

barren mountain range of Shera (the “Seir” of the Bible), a

whose knowledge | system wholly jurassic in its composition, though its strata on the subject was slight, were accustomed to lay down an imaginary tripartite division, founded on the natural of those districts with which they were more OT less acquainted; and accordingly portioned off Arabia into Petra, Deserta, and Felix, or the Stony, the Desert, and

the Happy; without, however, assigning any very distinct

a small triangle having its apex on the Red Sea, its base on Palestine, and ts sides formed by the Gulf of Suez on the west, and that of

lie at various and often at abrupt angles.

The plants and animals tenanting this district are, with

slight modifications, common to the next, where, howcver,

they in general obtain a fuller development, and under which they may accordingly be more appropriately

described.

The second geographical district is that of the Hejaz, Physical and 21° N. lat. along the eastern shore description of the Red Sea, and extending inland for a distance =

; ‘ 4 ej varying from sixty to a hundred and fifty miles. It con- sists of a continuation of the Shera mountain range, with a narrow sandy slip of level ground towards the sea, and

a hilly plateau on the inland side, broken by bare and

lying between 28°

fantastic rocks. Its surface is, with few exceptions, barren; stony to the north, sandy to the east and south ; what little irrigation it possesses is wholly from wells, deep sunk and brackish; the spring rains supply a few streams that soon dry up in summer. Along its length lie the great Syrian and Egyptian pilgrim-routes, mere camel tracks, of which the direction is

determined by the scanty wells and a few villages. Medinah alone, 25° N. lat., and at the station of Kholeys, a few days' journey north of Mecca, is any considerable cultivation to be found, the result of springs; elsewhere all is drought and sterility.

The southernmost extremity of this region,

characteristics identical with the rest, contains the town 0 Mecca. South-east of this tract rises the upland district called " Icbel Kora," or " Mountain of Villages," fertile and copiously watered ; celebrated too for the excellence of its fruits and the salubrity of its climate ; Hejaz, particularly along its western or seaward slope, has the reputation of being unhealthy and feverish. Due south of Mecca the mountains rise still higher, up to the precipitous fastnesses of J ebel Aseer, intersected by count- less narrow but fertile valleys.

With Hejazwe may also reckon, topologically speaking, Geological the oases of Jowf and Douma, situated to the north-east, character.

both formed by broad and abrupt depressions in the inland plateau, and surrounded by a wide-spread wilderness of rock and sand. The geological formation of this region is chiefly calcareous and jurassic, though isolated traces of volcanic outbursts are seen near Medinah and Mecca ; some also of the wells in the Hejaz—that of Zemzem, for example, at Mecca—are tepid ; and one distinct eruption of lava is stated to have occurred in the neighbourhood of Medinah as recently as the middle of the 13th century.

Of plants there known, for Arab botany has yet to be investigated. "' Samh," a small mesembryanthemum, from the grain of which the Bedouins prepare a sort of porridge that serves them in lieu of bread; " Mesaa," a thorny bush that bears a subacid berry not unlike a currant in appearance and flavour; " Nebek," the Rhamnus lotus of botanists; many kinds of euphorbia, absinthium, and the bitter colocynth, used by the Arabs for medicine, grow wild everywhere. The tamarisk or " Talh," the southern larch or " Ithel," the chestnut, the sycamore, and several other trees, the wood of which is, however, too porous and brittle for use as timber, are natives of Hejaz; so also is the wild dwarf date-palm, the almond, the pomegranate, and the " gum- arabic" tree, a graceful and delicate acacia.

Fine grass, intermingled with various aromatic herbs, springs up in patches between the stones and among the sand; but the want of sufficient rainfall and the dryness of the atmo- sphere prevent any really profitable vegetation, except in the few oases already mentioned. Taking it as a whole, the Hejaz is, with the exception of the actual and recog-

[GENERAL FEATURES—

In the neighbourhood of

marked off The

as the “Haram” or Sacred Territory, but in its physical “Haram” f of Mecca.

whereas the

is an endless variety, but insufficiently Vegetation

az.

Yemen.

_ Tehamah,

Vegetation,

COAST REGION. |

nised desert alone, the most hopelessly sterile district in the whole Arabian peninsula.

Following the Red Sea coast down to its southernmost extremity at Aden, we have im view the third great geographical section, that of Yemen. It includes two regions, sea-shore and inland, the former of which is commonly called the “‘Tehamah.” This is a wide strip of coast left by the mountain chain, which, continuing on from the Hejaz, runs down as far es Aden, but hereabouts recedes somewhat to the east, thus forming an arc, in the curve of which lies the Tehamah. The mountainous district extends far

inland, and gives out several minor branches, some of which reach about three hundred miles to the east.

Tehamah is, as might be expected from its topical and geographical conditions, a very hot region; it is one also of but moderate fertility, though the soil, an agglomeration principally of coral debris, is less absolutely. barren than that of the Hejaz. The rains here are periodical, their fall coinciding with the epoch of the Indian monsoon ; they give rise to numerous torrents, that traverse the plains, and some of which hardly dry up throughout the year. The coast-line is indented by several small harbours and road- steads ; intricate coral reefs render the approach everywhere difficult, often dangerous.

Yemen, under which name the whole south-western quarter of the peninsula is popularly included, possesses mauy advantages, both of climate and soil, denied to the greater portion of Arabia. It is a highland country, formed by a labyrinth of precipitous hills and fertile valleys. The air is pure and even cool ; the seasons are as regular as those of eastern India, and succeed each other in much the same order. No accurate survey has yet been made to determine the elevation of its mountains, some of which have been roughly, but perhaps incorrectly, estimated at five thousand feet in height; their general direction is from north-west to south-east. The largest plains, or rather plateaus, inclosed by them are that of Nejran on the north, that of Sana4 to the south, and that of Mareb to the east, on the frontier of the great desert. The oasis of the southern Jowf, a basin-like depression occurring in the sandy waste that reaches inland from the high grounds of Yemen up to Oman, on the other side of Arabia, may also be reckoned as belonging to Yemen.

Though the mountains are well supplied with water, no considerable rivers or streams find their way from them to the Red Sea, tropical evaporation combining with the light and porous quality of the soil to dry up the torrent beds ; nor do any natural lakes exist, though artificial pools and tanks, in which water is preserved all the year round, have been constructed in plenty. Indications of volcanic action, long since extinct, abound throughout Yemen, where basalt formations compose a considerable and the most fertile portion of the coffee-bearing district; in other places jurassic rock

predominates, while granite occurs in patches here and there. Spar, agate, onyx, and carnelian are exported from Yemen; silver and gold are reported to have been found on its hills, but on doubtful authority.

It is in this region that Arabian vegetation obtains its most varied, as also its most valuable development. North of Medinah the parched and niggard soil, chiefly composed of marl, flint, and sand, with a supply of rain alike scanty and uncertain, produces little more than Varieties of acacia, euphorbias, and thorny shrubs,—a valueless crop. But in the neighbourhood of Medinah commences the great date-palm belt that crosses the peninsula, and extends southward as far as lat. 23° in full vigour. A hundred and more varieties of this tree are said to grow in the immediate vicinity of Medinah alone: the quality of the fruit varies for each kind, as also do its size, colour, and flavour. The poorest of all, the

“sihanee” date, a yellow, stringy fruit, is much eaten by the Bedouins ; the “ birnee” is red and succulent; the “ jebelee,” an uplaud datc, is a staple article of export. Nejd is, however, the favoured land of date-palms : every valley that intersects its vast plateaus waves with them ; and the fruit, which often attains a length of two inches, with a proportionate thickness, far surpasses the best products of Hejaz in lusciousness as in size. Eaten fresh or stewed with butter, they form the staff of Arab food ; and the pulp, after the kernels have been extractcd, close- pressed and half dried, is exportcd under the name of ajweh to almost every part of the East. In general a latitude varying from 27° to 22° N., and a sufficient distance from the sca to preclude its atmospheric influences, seem to be the most favourable circumstances for bringing this frnit to perfection ; and hence it comes that the produce of the Jowf and of Hareek—which, though inland, lie too far, the one to the north, the other to the south,—of the Hejaz on the Red Sea, and of Rateef on the Persian Gulf coast, is decidedly inferior to that of the inland districts of Kaseem and Nejd. Yet an exception must be made in favour of the “ kholas” date, as it is called, that grows in Hasa, an antber-coloured date of exquisite flavour, the king of dates: the tree itself that bears it is readily distinguished from every other species by the delicacy of its

stem and foliage. But in the greater number of instances, whatever the variation in the fruit, the palm trees themselves are to an unpractised eye undistinguish- able the one from the other.

Besides the date tree, the “ doom,” a fan-leaved palm Other fruit. bearing a large fibrous and sweetish fruit, is not of trees.

uncommon growth in the central and southern districts ; while the cocoa-nut and betel are planted, though not to such an extent as to reckon among the articles of ordinary cultivation, along the southern and eastern coast. So are also the banana, the papay, and the Indian fig; but all these are of recent importation from the opposite coast of India. been so from time immemorial; and though since the well-known prohibition of the Koran the grapes are no longer pressed for wine, they are in great request as an article of consumption, both fresh and dried. The best fruit is that of Yemen ; Oman, where the heat is such that the vintage is gathered in April, comes next, both for the quantity and the quality of its produce.

near Mecca, excels all others. used by the Arabs in their rough medicine, grows in the southern Hejaz and the Tehamah ; so also does the balsam tree, the best of which is indigenous to the district of Safra, near Mecca; its gum is sold even within Arabia itself at a high price. The incense tree, said to be a native of Hadramaut, in the extreme south, has, strange to say, never yet been exactly identified, though its gum is a constant article of export ; and the henna tree (Law- sonia inermis), uscd in dycing, grows abundantly on the western coast. The cotton shrub springs up, seemingly wild, in the gullies of Nejd; but owing to the dryness of the soil and climate, does not repay extensive cultivation. Indigo is grown in many places, chiefly in the low districts bordering on the Persian Gulf.

But although the Arabs themselves consider the date- Coffee.

palm the special pride and ornament of their country, a more general verdict would probably be given outside of Arabia itself in favour of the coffee plant. This shrub is by some supposed to be indigenous to Abyssinia ; it has, however, for several centuries attained its most extensive distribution and its highest standard of produce in Yemen, where it is cultivated

throughout about half of the upland district, the best quality of berry being that which ripens

Vines are cultivated throughout Arabia, and have Vines.

In peaches, Other apricots, pomegranates, and oranges, the district of Taif, vegetable Senna, an article much Products,

Kaatshrub.

Hadra- maut.

Oman.

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on the western slopes of the mountains in the neighbour- hood of Sanaa. ;

The plant itself is too well known to require deserip- tion; it is cnough here to remark that its principal flower- ing scason in Yemen is in March. The first crop of the berries ripens in May ; a second and a third crop succeed in the course of the year. The diffused atmospheric heat of an equatorial region is requisite for the growth of the coffee plant ; yet it needs also a large supply of moisture, and even of shade, to protect it from the too direct action of the sun. In order to obtain these conditions, large trees are often planted here and there among the shrubs, which are arranged on rock terraces, onc above another, ampli- theatre-wise, along the slopes, and are densely crowded together. The processes of gathering and drying the berries, of separating the husks, and of picking the kernels, are all performed by manual labour of the simplest kind. How the drink is prepared las been often and minutely described by travellers ; the method employed is tedious, but the result infinitely surpasses that obtained in any other country or by any other method. A slightly acid and very refreshing beverage is also made from an infusion of the “kishr” or outer husk. Its use is almost confined to the Yemen ; it is esteemed a febrifuge.

A small shrub, called “kéat,” is common throughout the coffee plantations ; it resembles verbena in scent and growth ; its leaves are chewed by the

natives, much as those of tobacco are by some Europeans ; the effect is that of a gentle stimulant and anti-narcotic. This plant is only found in the south-western regions, and its use is limited to them.

Next to Yemen, and lying along the coast of the Indian Occan, from Aden to Cape Ras-el-Hadd, a distance of 1200 miles, are situated the provinces of Hadramaut and Mahrah, the former mentioned in Genesis under the name of Hazarmaveth, and more celebrated in ancient Arab chronicles, and in the notices of Strabo and Ptolemy, than it has been in later times. This coast has been visited and even partially explored by Captain Wellsted and other navigators. It presents everywhere much the same dreary appearance as that of the Hejaz and Tehamah,—a narrow tringe of sand or of equally sterile shore; beyond this rises a mountain range, varying, so far as any tolerably accurate calculations have been made, from 1000 to 3000 feet in height ; its formation appears to be in many places voleanic ; behind this comes a second and loftier mountain belt, jurassic in its general character, resembling the high- lands of Yemen; while far beyond stretches away the great sandy desert, varied, however, where it approaches the mountain-foot, by oases of considerable fertility, among which that of Wadi Doan is said to be the most extensive. Several barren islands and reefs fringe the waste. The mountains of Hadramaut form one system with those of Yemen, but, unlike the latter, seem to be of an almost mouotonous sterility. Torrents descend from them, but no rivers; nor, though lakes are mentioned in the very apocryphal records of the Arabs, has any sign of their existence been verified. The climate is intensely hot, and is said to be unhealthy, at least to strangers ; the vegeta- tion is scanty. No part of the peninsula has been less explored than this, even by the Orientals themselves; and European travellers have supplied few reliable data for what regards the physical characteristics of the interior, any more than of its inhabitants and products.

From Ras-el-Hadd to the extreme northern limits of Arabia, at the head of the Persian Gulf, the provinces of Oman and Hasa complete the sea-coast. Oman is a mountainous district, its principal range, that of Jebel Akhdar, or the “Green Mountain,” so called from the abundant vegetation that covers its sides, reaches an

ascertained height of 6000 feet; several other minor chains yun parallel with it and with the coast; the plains beneath them are well watered and fertile, though, like every other part of Arabia, destitute of running rivers or streams, the want of which is here atoned by copious wells and springs, running over into large pools, and supplying an extensive system of irrigation. The rocks are chiefly granite on their upper, limestone on their lower level; but here, too, as on the Red Sea coast, indications of volcanic action, though at a comparatively remote period, are frequently to be observed ; hot springs, too, such as those known by the title of Imam Alee, near Mascat, are not uncommon. The only good harbour on this part of the coast is that of Mascat, with which the immediately contiguous part of Matrah may be reckoned. By the sea-shore the climate is intensely hot, rivalling in this respect that of Aden, and far from wholesome ; among the mountains inland the air is cool and pure.

Near Cape Musandaim, at about 400 miles north-west Coast of (which, averaging in this the Persian promontory from 2000 to 3000 fcet in height, come down Gulf.

of Ras-el-Hadd, the mountains

in precipices to the sea edge), arc indented with numerous deep creeks and bays, several of which afford good anchor- age and shelter,—only they are cut off by the steepness of the surrounding cliffs from inland communication. West of Musandam, and following the sweep of the great bay of Sharjah and Katar, within the gulf itself, the coast be- comes low and sandy, and henceforth offers no harbours, but mere roadsteads, often dangerous of approach by reason of the numerous banks and shoals in the sea. A few palm trees line the shore, which has a desolate appearance. Further still to the north-west, along the region of Hasa, and up to the head of the gulf, the coast continues low, but is enlivened by extensive green tracts of palm-groves and other semi-tropical vegetation. The mountains, situated a good way inland, and not exceeding 3000 feet in their extreme height, are of jurassic formation. Copious springs, some of which are hot and others tepid, break out in many places’ at their base, but are again

absorbed in the sand, or are dissipated by field irrigation before reaching the sea. The extreme northern angle of the gulf is com- paratively desert.

Owing to the rapid interchange of heat and cold occa- Physical sioned by the peculiar situation of the gulf betwcen the character of torrid levels of Arabia on the one side, and the high, not the coast.

unfrequently snow-capped, mountains of Persia on the other, the climate of this coast is remarkably irregular in its seasons, and subject to sudden storms of great violence, with heavy rains. It is also decidedly unhealthy ; and low fevers, sometimes of an intermittent, sometimes of a typhoid type, are never absent from the villages.

Indeed the whole of the Arabian sea-shore, which we have now thus summarily surveyed, partakes more or less of the same unhealthy character, one often noticed by travellers, and experienced by some of them with fatal effect. We have seen, too, that in general outline it offers little variety, being mostly mountainous, especially in its southern part, with a narrow and rarely fertile shore-fringe ; while the mountains themselves vary in height and extent, being at their loftiest and widest in Yemen and Oman, where their rich vegetation, jomed to a pure air, and a climate tempered by the elevation, offers an agreeable contrast to the dissimilar qualities of the coast itself, narrower and more barren elsewhere.

an important region, regarded by the Arabs themselves as peculiarly their own—the stronghold of their vigorous nationality, and the birthplace of their most cherished traditions and institutions.

It is girded in on every side by a broad desert belt,

We have now to consider the central plateau, or Nejd, Central

The north- ern desert.

The simoon.

Mountains of Shomer,

which the traveller must of necessity cross before he reaches the inner region. It is this very desert that, having been often witnessed on its outer rim, but never traversed from one side to the other by Greek or Roman, or even, in the greater number of instances, by modern explorers, has given occasion to the belief that central Arabia was itself little better than an expanse of uninhabitable waste,—an idea expresscd by the Arabia Deserta of the ancients, and often repeated by later writers.

This desert, on the north and north-east, where it extends from Syria and the Hejaz inwards, is a region of hard gravelly soil, from which circumstance it has derived the elastic title of “Petraea.” It is diversified here and there by belts of sand, with occasional patches of stunted bush and thin grass, indicative of moisture at some depth below; the sand, too, affords rooting for a feathery cuphorbia, the “ ghada” of the Arabs, a favourite browse of camels. The general height of this tract, backed up as it is by the Syrian plateau on the north, and the Sherd mountains on the west, appears to vary from 1000 to 2000 feet above the sea. Eastward it slowly slopes down to the level of the Persian Gulf. A long serpentine depres- sion, beginning in the Syrian territory near Palmyra, traverses it in a south-easterly direction; this is Wadi Seihan, or the “ Valley of the Wolf,” leading to the deep oval hollow of Jowf, with its oasis of palms and gardens. A more extensive but shallower depression to the west forms the oasis of Tcyma, known to Hebrew chroniclers. South of Jowf and Teyma the desert changes its stony to a sandy character, and its surface is heaped up by the winds into vast ridges, called the Nefood or “ passes,” not to be crossed without some danger ; for, besides the almost absolute want of water, a few scanty and brackish wells of which, separated one from the other by intervals of 60 or more miles, alone exist, it is here that the “simoom,” or poison wind, often blows—a phenomcnon entirely distinct from the customary “shelook,” or sirocco, of the south, much as a hurricane differs from an ordinary gale, though the two have been occasionally confounded in popular writings. The simoom is a peculiar condi- tion of the atmosphere, resembling in all essential points a cyclone. As in the cyclone, the central space, or the simoom itself, is calm, but is occupied by a gas unfit for respiration ; while round this as a centre, slowly travel- ling on, there cddy violent gusts of

heated air, like those of a furnace, though it is not to them, but to the compara- tive vacuum which thcy surround, that the simoom owes its suffocating qualitics. It approaches slowly amid the whirl of air currents that precede it for some distance; its violet colour announces it when actually near. Durin its presence the only chance of preserving life till the mephitic vapour has passed over, is found in covering the face with a cloth and lying prone on the sand, thus to inhale what little atmospheric air still exists in the upper ground stratum, and thus to maintain the breath till the period, varying from two to ten minutes, of the poison column be gone by ; meanwhile the feeling in the chest is that of suffocation, and that in the limbs as if molten iron were being poured over them. Camels instinctively bury their muzzles in the sand during the simoom; but horses are said not to possess the same preservatory instinct, and to perish in consequence. ‘The precise nature of the phenomenon, and its origin, are subjects of conjecture ; but its general character, that of an eddy of heated atmo- sphere around a central space occupied by a deleterious gas, the whole travelling at a slow rate, and generally from south or east to north and west, is not to be mistaken.

South of the Nefood begins a series of granite hills, at first cropping up as mere isolated rocks through the sand, then increasing in extent and height till they coalesce and

form the two parallel chains of Jebel Aja and Jebel Solma, both of which cross two-thirds of the peninsula from N.N.E. to 8.S.W. The highest peak of either does not secm to exceed 4000 feet above the sea-level, Between them and around their base extend broad and well-peopled valleys. The irrigation is wholly artificial and from wells, which here yield an abundant supply. The water is brought up from an average depth of 20 or 30 feet, The chmate of this region, though heatcd by the neighbouring desert, is remarkably healthy, and the air cxtremely pure.

Passing this mountain-belt, we find a second depression, still following the same general dircction, namely, from N.N.E. to 8.8S.W., wide and fertile, a

land of palm-trees, gardens, and wells; the soil is here and there streaked with sand, but uo mountains or even rocks of considerable size occur anywhere. Towards the east the level of this region gradually rises upwards to the Toweyk range, by which it is ultimately shut in. Westward it slopes down- wards, and at last opens out on the Hejaz near Medinah. The general level is low, not exceeding 1000 feet above the level of the sea, and the temperature hot; it is altogether the most productive, but at the same time the least healthy region of central Arabia. Water abounds throughout the greater part of its extent, at a level of only a few feet below the ground, and occasionally collects on the surface in perennial pools, none of which are, however, large enough to descrve the name of lakes. The most thickly peopled section of this valley is called Kaseem.

North-east of it rises the mountain chain of Toweyk, running almost due south, and keeping at a distance vary- ing from 100 to 200 miles from the Persian Gulf. This constitutes the backbone of the Arab peninsula, which rises up to it first by a rapid ascent from the coast, and then by a succession of morc gently graduated plateaus and valleys from the east and west. Thus the wider half of the peninsula itself lies, not, as has been erroneously stated, to the east, but to the west of the principal water- shed. The Toweyk or “complication” chain, so called from the labyrinthine character of its numerous gullies and gorges, is a broad limestone tablc-land, and at no point exceeds, so far as has bcen roughly estimated, the limit of 5000 feet in height; it covers an extent of 100 and more miles in width ; its upper Icdges are clothed with excellent pasturage; and its narrow valleys shelter in their shade rich gardens and plantations, usually irrigated from wells, but occasionally traversed for some short distance by running streams. Except the date-palm, the “ithel” or larch, already described, the “ markh,” a large-leaved spreading tree, the wood of which is too brittle for con- structive purposes, and some varieties of acacia, the plateau produces no trees of considerable size; but of aromatic herbs and bright flowers, among which the red anemone or “shekeek” is conspicuous, this region is wonderfully productive,—so much that Arab writers justly praise the sweet scent no lcss than the purity and coolness of its breezes. The simoom or poison wind of the low lands and deserts is hcre unknown; even the sirocco, when it occurs, is comparatively bearable. No signs of volcanic action or hot springs are found within this region, and the mountain strata are ordinarily horizontal ;

the sides of the plateaus are, however, very abrupt, often forming precipices of 200 to 300 feet in height, cut out in chalky rock, These are duc to water action from torrential rains that frequently fall in spring and autumn.

Imniediately at the foot of the eastern slope, which is much steeper than the westcrn, lies a slip of desert, separ- ating the highlands from the coast regions of Hassa and Kateef. The northerly part of the Toweyk plateau contains the great province of Sedeyr, the healthiest district in all Arabia: the western slope is occupied by the pro-

The Kaseem,

Mountain chain of Toweyk.

Physical character of the central watershed.

The great southern desert.

The Dahna, ©

The Akhaf.

vince of Woshem, running down to Kaseem. South of Sedeyr is the province of “ Ared” or ‘‘ The Broad ;” it in- cludes the highest and widest tablelands of Towcyk. Thence the range trends away, taking the ordinary 8.8. W. direction of the alternate elevations and depressions that furrow the Arab peninsula ; here,

geographical character, it changes its name into that of “ Ared,” and, like a long limestone wall, stretches almost to Mecca. Parallel to it, on the south, extends the long and barren valley of Dowasir, ending in the district of Kora, Shahrem, and Soley-yel ; broken ground,—the passes of which lead to Nejran and Yemen, The upland laby- rinth of Aflaj, south of Ared, forms the extreme elbow of this mountain formation. Just below it, and constituting its south-castern slope, comes Yemamah, a hot but fertile province, with numerous wells and copious irrigation. Further yet to the

south rise the fantastic peaks of the Hareck mountains, granite ridges, not over 2000 feet in height, but making up to the eye for their want of elevation by their strange abruptness : they crop out like the moun- tains of Shomer on the north, from the first sands of the Great Desert, and form an island, as it were, of irrigation and tillage, though both comparatively scant, and scarcely able to maintain themselves against the excessive heat amid the desolation around.

Beyond Hareek, or “ Burning,” as the name means, to the south, as also behind Wadi Dowasir and its neighbour- hood, lies the great Arab desert or Dahna, “ The Red” as the Arabs call it,—a vast extent of sand, said to cover nearly 50,000 square miles, and only jotted here and there at far intervals by a few clustered bushes or dwarf palms, indicative of moisture below the surface, else wholly deso- late. Its surface is ribbed into huge sand waves, the principal ones being from north to south,—that is, at right angles to the prevailing wind, which is here the east ; but these main waves are again crossed, intersected, and jumbled with other less regular undulations, the work of more variable breczes.

But neither here nor elsewhere in Arabia do those

clouds or columns of moving sand, the terror of caravans, appear, that have been fabled by travellers and poets. Tracks are indecd speedily covered and effaced, to the great annoyance and occasional danger of the wayfarcr ; but neither he uor his beast run the least risk of being thus buried alive. Hunger, and, still more, thirst, are sufficient guardians of a region, to which, however, Arab fancy has attributed the additional protection of evil spirits and monsters of death. This greater desert, the “ Roba el Khaliyeh ” or “ Empty Space” of geographers—the “ Dahna” or “ Crimson ” of modern Arabs, so called from the prevailing colour of its heated sands,—extends to Yemen and Hadramaut on the south-west, south, and south-east, and to Oman on the east. It is separated, however, from the northern half of the waste-ring that girdles Nejd by the continuation of Wadi Dowasir and Shahran, up to the mountains of Tayef, near Mecca ; and this is the only line by which the plateau of Nejd can be reached from the coast without actually crossing the sandy or stony wilderness. Lying as it does on or within the tropics, the heat of this great desert is said to be fearful by day, and, owing

to the general low level, to be scarcely mitigated at night. But it is never traversed in its full width, not even by Bedouins; and little or no credit can be attached to the relations of those who pre- tend to have explored it, and to have found wonders in its recesses.

Fast of Hareek rises a succession of lofty ridges, covered by a deep layer of sand, through which black rock occa- sionally pierces. This region bears the name of Akhaf, and connects the watershed of Toweyk with the high

though keeping the same |

within Nejd. Between Yemamah and Hareek runs the

valley itself is not from west to east, but in the reverse

the sea it is absolutely closed in by the sand-heaped ridges

mountains behind Oman. It is, like the Dahna, unre- claimed desert; but the recesses of its valleys conccal a

few wells and springs, so that travellers from Nejd some- times take this route, the most difficult but the shortest, when on their way to Oman. Immediately north of the Akhaf commences the lesser Dahna, a desert resembling Little in every way its homonym of the south, only narrower ; Dabna. its breadth in many places not exceeding 50 or 60 miles.

This long and dreary strip runs up the whole way along

the easterly side of the Toweyk plateau, till it merges in

the northern or stony waste land at the head of the Persian Gulf.

Throughout the highlands of Nejd the climate, though Climate ot often hot by day, is cool and pleasant at night ; the spring Neid. and the autumn rains seldom fail in their seasons; and the soil, where not artificially irrigated,

produces excellent pasture,—where irrigated, it renders very tolerable garden produce and field crops. Storms of thunder and lightning are of rare occurrence, and the tornadoes that from time to time visit the Arabian coasts are here unknown. The prevailing, as also the most refreshing winds, are from the east and north-east ; the south and west winds are heated and unwelcome. Epidemic diseases are rare, and only one visitation, and that not a severe one, of cholera is on record

valley called Aftan, which appears in some maps as the Valley of bed of an imaginary river flowing nearly across Arabia Aftan. ‘nto the Persian Gulf. But the downward slope of the direction, and at a distance of more than 100 miles from of Akhaf. Did the mountains of central Arabia furnish a water supply sufficient for-a river, large or small, its course would of necessity be directed, not towards the Persian Gulf, but the Red Sea. The copious springs that break out at the foot of the Toweyk mountain range above Hasa, not far from the gulf, are all of subterranean origin ; and though they are evidently the off-drainings of the rainfall of Nejd, they have no connection with the very scanty running or standing waters of the surface of the great plateau.

Summing up,—Arabia may roughly be divided, as to its surface extent, into a third of coast-ring and mountains, en ee part barren, part either cultivated or susceptible of being Gin. so; another third of central platcau, also tolerably fertile; proper. and a third of desert circle, intervening, with only one gap. that in the latitude of Mecca, between the first and the second. ‘The central space, whether plateau or desert, varying in height from 1000 to 3000 feet above the sea, possesses three important mountain ranges,—two trans- verse, namely, Jebel Shomer and Jebel Ared, and one vertical, that commences with Toweyk, and is continued by the Akhaf,—these latter being the watershed of the peninsula, the gencral rise of which is from west to east. The highest mountain peaks—those, namely, of Jebel Akh- dar in Oman—do not apparently excecd 6000 feet.

In a description of the animals of Arabia the first place Animals. is undoubtedly due to the horse, which, though the opinion is unsupported by scientific evidence, has by some been Horse. supposed to be indigenous to the peninsula. As a fact, it is here that this animal attains its highest perfection : not, indeed, that of size ; for a true Nejdee of the best and purest

brecd seldom reaches and never perhaps exceeds fifteen hands in height; nor that of mere speed, for a trained European racer would easily distance a thorough- bred Arab on any ordinary course ; but for perfection of form, symmetry of limb, cleanness of muscle, beauty of appearance—for endurance of fatigue, for docility, and for speed maintained to distances so long as to appear in- credible, the Nejdee horse acknowledges no equal. The

Summary

‘ Origin and) number.

ANIMALS. |

animal is too well known to require minute description on the present occasion ; but it is important to have a clear idea of the principal divisions of its race and kind, which have been strangely and even injuriously confused by many writers.

Tradition assigns the origin of the present Arab stock to Yemen, but historical records, dating as far back as the 5th century, show that the best quality and the greatest number of horses were then to be found exactly in the same district where they now exist, namely, iu Nejd. Yet, even there a horse is by uo meaus an article of everyday possession, or of ordinary and working use. War and parade are in fact almost the only occasions ou which it is employed; and no genuine Arab would ever dream of mounting his horse for a mere peaceful journey, whcther for a short or a long distance. Hence horses are the almost exclusive property of the chiefs, who keep them for themselves, and often for the equipment of their armed retainers, and of a few wealthy or distinguished individuals, who regard them as an investment of capital or an orna- ment of social rank. Thus, no motive tempts the horse- owner to encourage the production of coarse and infcrior breeds ; while, on the other hand, every circumstance tends to render the greatest purity of blood and perfection of wind desirable; hence it is not strange that the Nejdee horse has to all appearance undergone no degeneration, though he has also probably received uo improvement within historic times. Military enterprise and the cen- tralisation of wealth and power enabled the Wahhabee chiefs of recent date to collect and rear a greater number of horses than had perhaps ever before been possessed by a

single Arab potentate ; and the stables and pastures of the sultan of Derey'seah may well have, as has been stated, contained 10,000 horses, since those of his much- enfeebled successor at Riad are told off at nearly half that amount. But if we allow 20,000 for the total census of pure breeds in Nejd, a full allowance, and assign an equal number to the rest of the peninsula, thus making 40,000 in all, we shall still be rather in danger of an over than of an under statement.

No distinction of breed is recognised in Nejd itself ; each animal is classed according to its individual merits. Nor is a horse, nor, a fortiort, a mare, ever disposed of by sale ; gift, war-capture, or legacy being the only recognised methods of transfer where a genuine full-blood is con- cerned. Consequently, no commercial export of Nejdee horses has ever becn established ; and whoever professes to sell. or boasts of having bought onc, may be unhesitatingly set down as either deceived or deceiving. In three man- ners, however—two occasional merely, and one customary— has the Nejdee breed been to a certain extent transplanted beyond the actual limits of Arabia.

The first of the occasional or chance means by which the horses of Nejd have from time to time found their way to foreign stables is the fortune of war. Thus, for instance, Tbraheem Pasha, after overrunning Arabia in 1817, carried away to Egypt with him several hundreds of the best Nejdees, both horses and mares; so that Egypt, though only for a while, became next to Arabia the most fortunate land in this possession ; and even now, after the purity of the stock has long since been lost in the Nile valley, the effects of its transitory infusion may be distinctly traced. Next, Ibraheem's vicegerent, Khoorsheed Pasha, followed his master's example; the Ottoman Turks have been, though not often, equally lucky, and the distinctive points of Nejdee blood may now and then be observed in more than one stable at Constantinople.

Secondly, a few thorough-bred Nejdees have crossed the frontier as presents. In this manner, Teysul, the late inonarch of Nejd, sent forty head from his own stable as

an honorary tribute to the reigning Ottoman sultan, Abd- el-Azeez ; and similar offerings have been now and then made, as fear or other motives may have dictated, to different other governments, and even to distinguished individuals. But mares are never given away thus; only stallions.

The third and customary method is by admixture of Mixed Nejdee stallions are yearly hired out by their breeds.

the race. owners, and sent into the pastures of Jebel Shomer, of Syria, and even of Mesopotamia, there to breed with the mares of those countries, belonging to the Arabs of Shomer, or to the Anezeh, or the Rwalah tribes of Syria, and the like. These mares are themselves of Arab though not of Nejdee stock; the proportion of good blood varying in. them from a half up to three-fourths nearly, but none are of absolutely pure race. It is to the offspring of such by Nejdee stallions that the divisions of breed much insisted on by several European writers, and actually recognised throughout Mesopotamia and Syria, but almost, often wholly, unknown even by name in Nejd itself, apply. These divisions are principally five,—the Koheylee (said to be the purest of all), the Toweysee, the Manekee, the Sak- lawee, and the Julfawee; besides which, and branching out from them, there are infinite minor subdivisions. Again, these are the breeds often authenticated for pur- chase by written pedigrees and witness-papers of descent, as described in books; and which may occasionally be seen in Syria, but never in Arabia, or even elsewhere, when the bargain is to be concluded between two Arabs themselves. The only use of such documents is for strangers. These, too, are the breeds from which European stables, even regal and imperial, have often obtained a supply of noble but never absolutely pure-blooded animals, frequently at prices proportioned to the imagined diffi- culties of the purchase, or the affected unwillingness of the cunning owner —(Arabs are very cunning)—to part with his beast. The best market for these mixed breeds is at Baghdad ; the second is in the neighbourhood of the town of Hama in Syria; inferior animals are sent to the port of Koweyt, on the Persian Gulf, whence they are shipped for India.

To return to the genuine Nejdee. open shed, and early habituated to the sight of men, to the sound and glittcr of weapons, and to all the accessories of human life, the colt grows up free fron vice or timidity, and even acquires a degree of intelligence that surprises a stranger. Barley and dates arc the chief stall provender ; but the grass of the pasture-grounds, in the selection of which much care is taken, is the ordinary nourishment of an Arab horse. Of water the allowance is always kept purposely scant. A good Nejdee will canter for four- and-twenty hours in summer-time, and eight-and-forty in winter, without once requiring drink. Raw meat, dried, is occasionally given in small quantities when extra exer- tion is required ; lucerne grass is employed for lowering the tone. Geldings are very rare. The colour that most frequently occurs is grey ; then comes chestnut ; then white and sorrel; mottled grey and black are now and then to be found ; dark bay never.

Colts are ridden early—too carly, indeed—in their third or even second year, and are soon broken in to a steady walk, to a canter, and to the ambling pace which is a special favourite with Arab riders ; racing, an Arab amuse- ment from time immemorial, and the game of “ jerzed,” a kind of tournament or mock fight with blunt palm-sticks, highly popular throughout the peninsula, complete the training both as to wind and pace. Saddles are seldom used in Nejd, and stirrups never, but both are occasionally employed in the Hejaz and Yemen. So it is also with bits, the place of which is taken in Nejd y halter-ropes,

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Reared under an ‘Training.

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the real guidance of the effected by the pressure of the rider’s leg and knee. Shoes, too, are of rare occurrence, light and sand-mixed soil of the central provinces ; other hand, the hoofs are often counteract the drying effects all niceties of grooming, docking and clipping excepted, Arabs are masters ; and their natural kindness to animals,

a quality which they share with most Orientals, together

with the care which every reasonable man bestows on a valuable article of property, ensures to an Arab horse a good treatment at the hands of his owner. But Arab horses do not commonly enter tents, nor play with women and children, nor, in a general way, do they share family meals, nor are they habitually kissed and cried over, as the imagination or credulity of some narrators has suggested. An Arab, flying for his life, has indeed been known to give the only morsel of dry bread about him to his horse vather than eat it himself,—an act in which self-preserva- tion had probably as large a share as affection. Lastly, the standing prohibition of horse-selling from Nejd has really nothing more romantic in it than a narrow-minded appli- cation of the principles of protective monopoly ; in other cases, reluctance to conclude a bargain simply indicates that the offer made was considered insufficient.

Below the horse in popular estimation and market value, but far above him in general utility so far as Arabia is concerned, comes that eminently Arab animal the camel. Of this there are many varieties: the best, swiftest, slimmest in form, and most docile to guidance, is the “ hejeen,” or dromedary, sometimes also called “ delool,” or “ facile.” It is almost exclusively employed for riding, whereas the “ibl,” or ordinary camel, readily distinguished from the other by a coarser build, a slower pace, and a less tractable disposition, is a beast of burden, and indeed is employed for all purposes. This species is very commonly, too, kept and reared for the sake of its flesh and milk, precisely as horned cattle are elsewhere ; in fact, boiled camel’s meat is the most ordinary article of animal food throughout the peninsula,—it is a flabby, tasteless dish, not unlike the poorest sort of beef; any flavour that it may possess is musky and disagreeable. The milk, on the contrary, is excellent, equal in quality and in sanitary properties to that of the she-ass, but neither butter nor cheese are made from it. The wool, which in the camels of Nejd and Oman is remarkably soft and fine, serves for making articles of dress, into which it is woven, sometimes alone, sometimes mixed with wool; it is much superior to sheep’s wool in every respect. The ordinary colour of the animal in the northern Arab provinces is a reddish brown, but in Nejd and throughout the south, lighter tints, varying from grey to white, are more cominon ; black is extremely rare, and highly esteemed. The least valuable breeds are those of the north and west,—that is, those of the Jowf, of Shomer, of the Hejaz, and of Yemen; in Nejd, which region, from the number of its herds, is sometimes called “ Omm-el-

Ibl,” or “ the Mother of Camels,” the species improves; but all agree in assigning the palm to the dromedaries of Oman. In fine, all over Arabia, whether among the Bedouins or the villagers, camels are the prin- cipal staple of traffic, the favourite investment of wealth and the ordinary standard of property. Qualities of Camel or dromedary, the Arabian animal has only one the camel. hump, which increases or diminishes in size according to

the general good or bad condition of the beast. On this hump the saddle— called, if a riding one, “‘ ghabeet;” if one for baggage, “‘ shedad ”—is placed ; a halter is the only rein employed, though even this is more commonly dispensed with by the Arabs, who simply direct the animal by a kick of the heel or a blow about the neck with the

The camel.

AE ASBTS

animal being almost wholly

nor are they needed in the on the rubbed with grease, to of the heated ground. Of

[ANIMALS.

“ mihjan,” a small crooked stick carried in the rider’s hand. The average travelling pace, an amble, is between five and six miles an hour, and this a good dromedary will continue for fifteen hours out of the twenty-four during a week together. Six days in the summer, ten in the winter, form the longest period that the dromedary can continue his pace without a fresh supply of water; and hence an “ ashavee” or “ tenner” is the title given to the best of the kind. Two hundredweight is the average load of the Arab carrying camel.

No animal puts its owner to less expense for its keep: the thorns of the desert, dry grass, cactuses, euphorbias,— nothing comes amiss to a camel’s appetite ; a ball of paste weighing about a pound, and made of barley-meal and water, is given every evening when extra work has to be done.

The average duration of a camel's life is thirty years, that of the dromedary somewhat less ; the price of either varies from about £4 to £80, according to quality, those of Oman commanding the best market, But although the camel, whether as an article of use or of sale, is far more important to Arabia than the horse, it is in intelligence and docility immeasurably inferior to the latter animal, never becoming attached to, or even, seemingly at least, acquainted with its owner; and never obeying except perforce and under protest.

Next to camels, sheep and goats form an important item Sheep. of Arab wealth. 'The best sheep are the piebald and large- tailed ones of Yemen; those of Nejd, too, are in great request on account of their flesh, which is excellent, though their wool is confessedly less fine in quality. Some districts of Oman produce a silky-haired breed not unlike that of Angorah, The least esteemed sheep are those of Hejaz and the north; but, in compensation, the goats of these provinces are longer-haired and generally better than those of the south; they are black, with long drooping ears. Spring is the shearing season in Nejd, but the wool is seldom exported, being mostly bought up for local use. From the milk of these animals butter and a white insipid kind of cheese are made: both are articles of daily consumption in Arab households.

Cattle are reared throughout Arabia, but owing to the Cattle. prevailing deficiency of deep and succulent pasturage their number is not so considerable as that of the camel. Cows and oxen, throughout Nejd, Oman, and Yemen, bear on their shoulders a hump analogous to the well-known one of the so-called " Brahminee" bull; the ordinary colour is dun ; their legs are slender, the horns short, and the whole stature diminutive. The kine of the northern provinces are stouter and yield more milk; they have no hump. Buffaloes also are kept in the marshy districts that occur in Yemen and Oman. 'They differ in no respect from the Indian breed; but, unlike oxen, these animals cannot be reckoned in the ordinary list of Arab farm stock, as they exist only under exceptional circumstances, whereas a few kine may be found in almost every village, and the irrigation of the fields and gardens is mostly done by means of oxen.

Like the horse, the ass attains its greatest excellence in Asses. Arabia, where it is more often employed for riding than for loads; indeed, in some provinces, especially in Hasa, it is the usual mount even of the wealthy. The best species is that reared in Hasa and eastern Nejd, where these animals are generally of the purest white in colour, and stand from eleven to thirteen hands high. In pace they scarcely yield to an average horse. They are often exported and sold at high prices in Egypt or at Con- stantinople, a single animal fetching from £40 to £80. They are ridden in Arabia with side-saddles. Good asses are to be found also in the other districts of Nejd, in

Mules.

Dogs.

Cais.

_ Wild animals.

ANIMALS. }

Yemen, even in the Hejaz; their ordinary colour is grey. The same animal runs wild in many of the open and mountainous regions of Arabia, and is hunted for the sake of its skin by the Bedouins; but the onager or zebra of Cutch is not met with in this peninsula.

Mules and hinnies, common throughout Syria and Meso- potamia, are extremely rare in Arabia proper, where a prejudice exists against their use.

The Arab dog differs very little from a jackal in appear- ance as in habits ; its muzzle is pointed, its colour sandy, and its long and somewhat bushy tail is curled over the back. When domesticated, the breed improves, approaching the European wolf-dog ; these animals, by training, become very tolerable indoor and outdoor guardians, both of flocks and herds and of dwellings, and in this capacity they are to be found everywhere, both in the towns and villages and in the open country, where they are not less useful to their masters than annoying to strangers. Another kind of dog, belonging to the greyhound species, and evidently of exotic origin, is often reared in

Arabia ; the swiftest and most enduring of this kind are from the province of Hasa. They are in great favour as harriers,

Arab cats differ in no respect from their congeners in Europe except in being rather smaller. The house-mice too are absolutely the same ; but the rat is more akin to the old black species of England, now nearly extinct.

Wild animals are not very numerous in any part of Arabia proper, a fact which is sufficiently accounted for by the want of running streams and open pools, as also by the thinness of cover and forest growth ; yet the records of the country make mention of the existence of some kinds of beasts which have subsequently disappeared altogether. Thus the long-maned lion, and, it would appear, a large kind of ape resembling the African gorilla, often mentioned by the early writers, are no longer to be found in the peninsula. But a small tiger, formidable from its ferocity even to man, is still met with in the wild hilly regions north of Nejran, and again in the inland recesses of the Oman mountains ; while the “ fahd,” or panther, belongs to no particular province; it haunts the neighbourhood of vil- lages, and devours the smaller stock. Lynxes have been seen in the Hejaz and Nejd; wolves are common in the lountains, and sometimes descend to attack the flocks in the open plains.. There are foxes too, but small and greyish in colour. The Arab hyena is large and fierce ; it is said, when pressed with hunger, to be dangerous even to men, and figures in many a story of Arab adventure. Jackals are more numerous in the northern than in the southern districts. Small black-faced long-tailed monkeys are to be met with by herds in Yemen, and even, though less often, in Nejd. A pretty little beast, the “ yerbooa,” jerboa, or kangaroo-rat, burrows in the sand, and comes out to look with great curiosity on passers-by; its hind legs, long, and provided with equally long feet and toes, are out of all proportion to the shortness of its fore-paws; its motion, especially when pursued, is like that of the kangaroo, and is performed with the help of its long sinewy tail. Its colour, partly fawn, partly white, is very agreeable to the eye. The Arabs eat its flesh, which resembles that of the rabbit.

Of the deer tribe the gazelle is the most common; it abounds not only in the open grounds, but even among the villages and near the towns. It is sometimes, but not often, hunted by the natives. Chase is more often given

to the mountain goat, partly on account of its flesh, which is excellent, partly for the sake of its long recurved horns, which are like those of the Alpine steinbock, only larger. But the hare, which is coursed with dogs, and which reseinbles the European animal in every respect except size, for it is smaller, is the favourite game of the Arabs,

who, unlike the Persians and Turks, have no scruple as to the use of the meat.

The ornithology of Arabia is copious, but has been little Birds.

studied. Birds of prey, grey eagles, vultures, bustards, and sparrow-hawks, abound in the open lands ; while partridges, especially of the mottled kind called “ kata,” are to be seen crossing the desert in quest of water by flocks; quails frequent the mountain districts in immense numbers, so also do rock-pigeons, wood-pigeons, and a species of wild guinea fowl ; wild ducks are met with in plenty along the coast. Cranes, larks, sparrows, finches, and the like, frequent the cultivated lands ; so also does the hoopoe, a bird held in high honour by the Arabs on account of its traditional services as messenger between Solomon and the Queen of Sheba or Belkeys. A large mottled thrush, also considered to be of good omen, is seen everywhere. Flocks of swallows, the flight of which is invariably from the east, pay annual visits to Arabia, where they are very useful in diminishing the swarms of locusts, their favourite food ; one species of this bird appears, however, to be indigenous to Yemen. Peacocks and parrots are also found in the southern provinces, and in Nejd, Hasa, and Oman; hawks are kept by many, and are carefully instructed for the purpose of falconry.

But the most remarkable bird of Arabia, and the only The one which forms a regular object of chase among the ostrich.

natives, is the ostrich. Its extreme timidity, joined to the swiftness of its pace—for although it does not fly, it assists its running by the movement of its extended wings—renders it in vain for the hunter to attempt overtaking it

on horse- back ; he therefore seeks to approach it generally when on its nest by artifice, and kills it by a long shot; sometimes he snares it by a running noose. The feathers, the best of which belong to the male bird, are sold at Damascus or Baghdad ; the eggs are eaten, and the shells are used for ornament. The finest ostriches are those of the neighbour- hood of Shomer and the uplands of Toweyk; they are often to be secn, but at a safe distance, scudding across the sands in a file of twenty or thirty at a time.

Reptiles, except those of the lizard species, are com- Reptiles.

paratively rare in Arabia, though serpents are occasionally met with ; but, except the “ afai” and the “ rukta,” both * snakes of the viper class, the former brown and the latter banded, and considered the deadlier of the two, none are venomous. Boa-constrictors, resembling the Indian rock- snake, have been also seen,—none, however, large enough to warrant the wonderful stories told about them by the Arabs themselves, whose love of the marvellous often leads them beyond the limits of truth.

Insects are, however, numerous enough : little scorpions, Insects.

scarce an inch in length, but capable of inflicting by their sting extreme pain, swarm in the desert sands; and large ones, four or even six inches long, infest the houses. Centipedes, too, are common ; wasps and wild bees tenant the rocks ; flies are troublesome everywhere, and mosquitoes on the coasts ; ants of all kinds, some enormous in size and venomous in bite, are to be found here; and a very poisonous spider, called, from its double pincers, ‘“ aboo hanekein,” inhabits the crevices of old walls on the western coast, and is much dreaded by the natives. Scolopendras, too, are not rare. It is some compensation, however, for these serious yet ouly occasional inconveniences, that no fleas or bugs exist in any part of Arabia. But—a serious drawback—the “ arda,” or white ant, the Zermes fatalis of Linnzeus, is hardly less troublesome and destructive in the southern provinces than in India itself. Lastly, vast

swarms of locusts, larger and darker in colour than those Locusts.

commonly seen further north, often infest the peninsula, and commit great ravages, especially when, as too frequently happens, their visit is in the

spring or early summer. Their

Soil.

Agricul- ture.

Crops.

course is usually from east to west. by converting these insects into an article of food, make up to themselves in some measure for the damage suffered by the crops and pastures ; indeed, locusts, boiled and slightly salted, are a favourite article of sale in every Arab market, but particularly in Nejd and the eastern districts.

The soil of Arabia varies according to the character of its rocky substratum. All round the coast, and to a distance corresponding with the breadth of the girding mountain chain to the interior, it is formed of volcanic and metamorphic detritus, with patches here and there of a calcareous character, due to the upheaval and decom- position of old coral banks. Such a soil cannot but be tolerably fertile, and it would be more so were the scanti- ness of rain made up for by a more systematic artificial irrigation. A second @nconvenience is caused by the encroachments of the sand, which is at times drifted by the winds from the desert inland in such quantities as to become seriously injurious to cultivation. Behind the mountains the surface of the desert to the north and west is that of a gravelly expanse, thickly sown over with flint and quartz; while to the east and south it is an almost unalloyed waste of fine sand. Everywhere the rock under- lies it, and there exists, of course, no possibility of utilising a space like this. But the whole of the central plateau— that is, of Nejd, Kaseem, Shomer, Yemamah, and the adjacent lands—is covered with a tolerably deep layer of calcareous earth, mixed with loam, well adapted for culti- vation ; the best is naturally to be found in the valleys and sheltered spots.

Whether, however, the soil be rich or poor, agriculture is, all over Arabia, very primitive in its conditions, and, above all, in its implements. The plough used by the peasants is wholly of wood and without wheels, an

instru- ment fit for scratching rather than furrowing the ground ; while in many places the earth is merely turned over with a pitchfork, which is sometimes worked by two men at a time. More skill is shown in irrigation, for whatever crop is intended, its success cannot be safely entrusted to the uncertain rain supply alone. Accordingly, the slope of the ground, whether field or plantation, is carefully calculated, and the surface divided into compartments and traversed by furrows, each communicating with the other, and all with some large well, or, in favoured situations, cistern ; while in still more fortunate but rarer spots a running stream is turned to profit. But in far the greater number of instances the irrigation is from a well, with an orifice varying from six to twenty-five feet in diameter, whence the water is drawn up in large leathern buckets, to which are attached ropes passing over pulleys, and worked by mules or oxen; these buckets, on reaching a cross-beam, turn over and empty their contents into a sloping trough that runs down to the main channel of the field or garden. Green crops, vegetables, and the like, are watered, when it is possible to do so, twice a day ; date-palms only once: the porous soil soon absorbs any superfluous liquid that may have overpassed the bounds assigned to it. In ascer- taining the right spot for sinking a well, in digging and coating it, as also in the construction of the small cisterns often connected with the source, the Arab peasants have by long practice acquired a not contemptible skill.

The crops most common in Arabia are, first, the date, a fruit already sufficiently described ; it may, however, be remarked here that the fecundation of the female trees from the male is usually perfected by art. The produce is annual: the earliest dates ripen in May, others not till July or even August. This fruit, and the dishes made of it by pressure or with butter, are to the Arabs what corn is to more northern or rice to southern nations. Next in importance, though much more limited in extent, is coffee :

K REV BIS

However, the Arabs, } very little, and out of Yemen.

in detail. rare and not a very remunerative crop; barley, also in small quantity ;—these two growths are hardly distinguish- able the one from the other by the eye, the colour and shape of the ear and beard being almost

identical in each. Millet is, abundant return ; there are several species of it ; the grain, coarsely ground, is made into a sort of gruel, which appears as a daily dish in Nejd. Rice is looked on as a delicacy : it does not grow in the central uplands, but succeeds well enough in the watered coast districts, especially Hasa,

[AGRICULTURE.

that of inferior quality only, is cultivated This growth has also been already described Next come the following :—Wheat, a somewhat

on the contrary, largely sown, and gives an

Kateef, and Oman. Beans and pulse are favourite crops ; they are reared in almost every part of the peninsula. Other garden plants—melons, gourds, cucumbers, salad, cabbages, onions, garlick, parsley, cumin, and the like,—are cultivated. Orchards are planted and tended in most districts ; but of pruning the Arabs have little idea, though they are not unacquainted with grafting. .

There being no true winter in any part of Arabia, the Hus- crops, such as they are, succeed each other all the year bandry. round; many lands bear twice, an early and a latter harvest, though of different produce. Of manuring, of the scientific rotation of crops, of weeding even, and cleaning, the Arabs have little knowledge. Reaping is generally done with the sickle, —in some places the ripened grain is torn up by the hand ; threshing is performed by oxen,— winnowing by the wind, grinding by the hand-mill. To sum up, though the agriculture of Arabia is sufficient to supply its comparatively scanty population with food, it gives almost no surplus for traffic or exportation, that of coffee and dates alone excepted.

In pasture-land Arabia is, on the other hand, singularly Pasture. fortunate. The very desert supplies through the greater part of its extent sufficient browse for camels; while the pasture-grass for horses, kine, and, above all, for sheep, on the upper hill slopes, and especially in Nejd, is first-rate. The only drawback is the occasional failure of the spring rains and autumn showers ; when this occurs great distress is the result, and no commoner cause of contention and bloodshed arises between the Arab shepherds or “‘

Bedouins” than the struggle to obtain, each for his own herd, the use of some yet undried well or exceptional oasis of green pasturage left fresh among the brown and withered herbage around.

In mineral products of a valuable description the Arabia Minerals. of our days is singularly poor, so much so as to suggest the idea that the Arabian gold and jewels, often mentioned by classical writers, must have been brought from Yemen as from a mart or depot, not a place of production. Yet even so late as 600 a.p. the exiled monarch of Sanaa, Seyf of Yezen, could in his interview with the Persian despot Chosroes, describe southern Arabia as “ a land the hills of which are of gold and its dust silver.” Nowadays nothing is found to justify or even to account for such gorgeous statements. Agates, onyxes, carnelians, and, though rarely, topazes alone are to be met with ; of gold mines and precious ores not a trace. Lead is, however, more common. The richest ores of this mineral come from the mountains of Oman; it is brought down to Mascat, and exported thence by sea. A small quantity of silver is also extracted from the same mines. Cinnabar and iron occur in the Sinaitic peninsula, and sulphur has been observed here and there in the long volcanic range that reaches from Palestine to Mecca. Rock-salt is extracted from many parts of the coast range; it exists, too, in the central dis- tricts of the peninsula, where of metals, a little iron excepted, not a vestige appears.

The Arab coasts are much frequented by fish, many

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Fisheries.

Pearl fisheries.

Manufac- tures,

ARTS AND TRADE. |

of unknown species. Mackarel, mullet, sole, ray, and perch swarm in the Red Sea and Persian Gulf; nor are the sheltered spots on the long line that

fronts the Indian Ocean less well provided. Sharks, too, abound along the coast, and are used as food by the poorer classes ; crabs and oysters occur almost everywhere. Hence fishing forms the occupation of a large proportion among the littoral popu- lation, but ignorance of salting and curing deprives its products of export value.

The pearl fisheries of Arabia alone add to the commercial riches of the country. They commence at the islands of Bahreyn, which lie immediately off the Arab shore, near the centre of the Persian Gulf, and continue east and south along the district of Katar for a distance of nearly 200 miles, after which the banks are lost in decp soundings. The most productive shoals are those between the islands of Halool and the coast of Katar; the fishing season com- mences with the spring, and lasts all through the summer. Most of the villages along the coast are wholly inhabited by divers, Arabs and negroes, who by long practice can remain under water a space of two minutes at a time; the depth they reach does not exceed fifteen fathoms, and generally falls much short of it. The oysters are opened on shore, and the pearls carefully sorted and counted by officials stationed for the purpose, as a heavy duty, equalling 20 per cent. of their value, is levied on the spot, though no further dues are taken on exportation. Some of the pearls are of great size and value. The total annual produce is roughly estimated at about £250,000, but probably exceeds that sum-; a portion goes to India; another portion up gulf to Baghdad, whence it is distributed over Syria, Turkey, and Persia. The divers themselves are the worst off, as their occupation induces various congestive diseases and premature old age.

Pearls are found, too, in other bivalve shells of these seas, and are extensively sold, though at a lower price than those of the oysters. Mother-of-pearl is also common, and is an ordinary article of export, especially to Syria and Egypt; so are also occasionally the corals and ornamental shells with which these seas abound.

In mechanical arts the Arabs are, as a rule, extremely deficient, though favourable exceptions exist in some dis- tricts. The Bedouin or pastoral population know little else than the tanning of leather and the weaving of coarse fabrics, such as articles of overdress, tent coverings (which the women generally make of goat-hair), headbands, and the like. In most

villages and towns of Nejd, one or more blacksmiths, whose work is of the rudest possible description, are to be found; occasionally an armourer, a few sandal-makers and workers in leather, with several weavers,—none skilled. Throughout the Hejaz these pro- fessions exist, but at a still lower standard ; but in Yemen greater nicety of workmanship is to be met with; and gold and silver smiths, often, however, not Arabs but strangers by race, get a living in the towns. Formerly Yemen was celebrated for its woven stuffs; this manufacture is now, however, in anything approaching to excellence, the exclu- sive pride of Oman. In this last-named province, weaving, silk and gold thread embroidery, silver work, gold filigree, and even steel implements, are wrought to a degree of perfection seldom attained by the workmen even of Damas- cus or Baghdad ; and the labours of the Oman loom or forge, when exported, as they are, though not in large quantities, are eagerly purchased abroad. But even here the extreme simplicity, or rather rudeness, of the tools employed, and the deficiency of mechanical contrivance, dwarf the results of patient and otherwise ingenious labour into compara- tive insignificance.

In wood the Arabs are not unskilful artificers ; and their drinking-bowls and platters, manufactured chiefly from the

“ithel” or larch tree, and studded with small silver knobs, make a good appearance. As masons they deserve little praise; their constructions are clumsy and unstable, the details coarse and ill-fashioned. There is not a single building, public or private, built by the Arabs themselves, of any merit either in regard of utility or of beauty, within the whole of Arabia.

Backward in manufacture, and even showing, on the Trade.

whole, little capacity for it, the Arabs are singularly alive to the advantages of commerce and trade, and fond of exercising them. No Arab undertakes a journey, were it only from one village to another, without taking with him some object for exchange or sale; and he will sooner chaffer away the handkerchief on his head or the camel on which he rides, than return

without having effected something in the way of business. In this respect, Bedouin and townsman, rich and poor, are all alike; and their history shows that this propensity is no less ancient than universal in the race. Owing, however, to the want of variety in its productions, and the remarkably uniform habits of its inhabitants, combined with the scarcity of local manufactures, the trade of Arabia, whether export or import, is soon catalogued. Camels and sheep, hair and wool, come first on the export list; next coffee; then dates, then horses; a very little rice and a few cloaks from Yemen or Oman close the chapter of commerce so far as land produce is concerned; pearls sum up that of the sea. Nor is the import much more diversified or extensive. Cotton cloth, Indian prints, sugar, a little hardware, a few arms, powder and shot, and trinkets of no great value— such are the customary requisitions of the land. Nor has any single Arab, the Imam or Prince of Mascat alone excepted, sufficient available capital for extensive traffic, out or in; while the Mahometan prohibition of interest, and consequently of credit, joined to the illegality of insurance, would, even in a richer land, restrict enterprise within very unsatisfactory bounds. It is owing, indeed, to these narrow-minded laws, introduced by the Koran and co-existent with its observance, that what commerce exists at the seaports of Hejaz, Tehamah, and Yemen, has mainly fallen into the hands of Jews and Banians—that is, Indian merchants; though in Oman, where a more liberal spirit prevails, Arab merchants of considerable capital and with extensive connections are to be found. The custom-duties in the ports of Oman and the Persian Gulf, whether export or import, are 10 per cent., except on pearls ; in the har- bours of Yemen they are capricious, and often very high. The shereef or governor of Mecca used formerly to carry on, through Jiddah, a trade hardly inferior to that of the Imam of Mascat himself; but the devastations committed by the Wahhabees, and in later times the oppression of the Egyptian and Turkish governments, have considerably reduced this source of Arab income.

The origin of the Arab race, like that of most others, Origin of can only be matter of conjecture; no credit can be attached Arab race,

to the assertions, evidently unbased on historical facts, of those authors who, building on the narrow foundation of Hebrew records, have included the entire nation under the titles of Ishmael and Joktan; and Mahometan

testimony on these matters can have no more weight than the Jewish, from which it is evidently derived. Setting, therefore, these vague and half-poetical traditions aside, the first certain fact on which to base our investigations is the ancient and undoubted division of the Arab race into two branches, the “ Arab,” or pure; and the “ Mostareb,” or adscititious. The geographical limits of both branches have already been sufficiently indicated. A second fact is, that everything in pro-Islamitic literature and record—the only reliable authorities in such a case, as preserved to us in the /lamasa, the Kitab-el-Aghanee, the writings of Musdoodee and Abul-

Feda, the stories of Antarah or Mohalhet, and the like— concurs in representing the first settlement of the “pure” Arabs as made on the extreme south-western point of the peninsula, near Aden, and thence spreading northward and eastward over Yemen, Hadramaut, and Oman. A third is the name Himyar, or “ dusky,” given now to the ruling class, now to the entire nation; a circumstance pointing, like the former, to African origin. A fourth is the Him- yaritic language—now, indeed, almost lost, but some words of which have been preserved either in proper names OF even in whole sentences handed down. They are African in character, often in identity. Indeed, the dialect com- monly used along the south-eastern coast hardly differs from that used by the Somawlee Africans on the opposite shore; but later intcrmixture of blood and constant inter- course may have much to do with this. Fifthly, it 1s remarkable that where the grammar of the Arabic, now spoken by the “ pure” Arabs, differs from that of the north, it approaches to or coincides with the Abyssinian. Now, it is well known to philologists that grammatical inflections are a much more abiding and intimate test of origin than separate nouns or even verbs. Sixthly, the pre-Islamitic institutions of Yemen and its allied provinces—its mon- archies, courts, armies, and serfs—bear a marked resem- blance to the historical Africo-Egyptian type, and even to the modern Abyssinian. Seventhly, the physical confor- mation of the pure-blooded Arab inhabitants of Yemen, Hadramaut, Oman, and the adjoining districts—the shape and size of the head, the slenderncss of the lower limbs, the comparative scantiness of hair,

and other particulars— point in an African rather than an Asiatic direction. Eighthly, the general habits of the people,—given to sedentary rather than nomade occupations, fond of village life, of society, of dance and music; good cultivators of the soil, tolerable traders, moderate artisans, but averse to pastoral pursuits—have much more in common with the inhabitants of the African than with those of the western Asiatic continent. Lastly, the extreme facility of marriage which exists in all classes of the southern Arabs with the African races; the fecundity of such unions; and the slightness or even absence of any castc feeling between the dusky “pure” Arab and the still darker native of modern Africa—conditions different from those obtaining almost everywhere else—may be regarded as pointing in the direc- tion of a community of origin. Further indications are afforded both by local tradition and actual observation ; but they are of a nature to be scarcely appreciable, except by those whom long familiarity has rendered intimate with the races in question; besides, the above are, for average criticism, sufficient.

It is harder to determine with precision the origin of the “ adscititious” or “Mustareb” Arabs, and the circumstances under which they first: peopled their half of the peninsula. Though in physical, mental, and lingual characteristics they offer too marked an affinity with the Arabs of the south to allow of any supposition except that of ultimate unity, so far as the stock is concerned; yet they present many and important divergences from them, and these divergences, whatever their nature, have all an Asiatic impress of their own. Such are their pastoral tendencies and proneness to nomade life; such the peculiarities of their idiom, drawing near to the Hebrew; such the strong clannish feeling, joined with a constant resistance to any- thing like regal power or settled comprehensive organisa- tion ; such even the outward and physical type. Time after time we may observe—in their history, their litera- ture, their institutions or the absence of them, their past,

their present—traits now Hebrew, now Syrian, now Chal-.

dan, now even Tatar ; though the groundwork of the whole is undoubtedly identical with the Arab of the south. The

probability, faintly indicated by tradition, is that at an early, indecd an absolutely pre-historic period, this branch of the Arab race, emigrating eastward, passed into Asia— not like their congeners, at the southern, but at the north- ern or isthmal extremity of the Red Sea; then pursued their inland way to the plains of Mesopotamia and Chal- dea, and perhaps even further; and after a long sojourn in these lands, during which they acquired the modifica- tions, mental and physical, which distinguish them from their southern and more unchanged brethren, returned westward to the land already partly occupied by their kins- men. This return would not be effected all at once, but by band after band, according to the pressure exercised on them by Iranian or Turanian neighbours, a fact wit- nessed to by many of the northern pre-Islamitic traditions, as found in Ibn-Atheer, Tabreezec, and others ; while the well-known Ishmaelitic mythos, recorded alike in Hebrew and in Arab chronicles, probably points to the last batch of "'adscititious" Arab immigrants, the special clan from which the family of Koreysh and the Prophet had origin.

Once established on the same soil, the two branches would naturally early manifest a tendency to unite, sufii- cient in time to produce a tolerable identity both of lan- guage and of usages; while the superinduced modifications of character and manners may well have originated the rivalry and even enmity between the Arabs of the north, or " Keysees," and those of Yemen, which, under various forms, has never ceased down to our own time.

At present, however, the most important, as also the Actual best known division of the Arab race is that which sepa- divisions of rates them into "Ah! Bedoo," or "dwellers in the open land," a whence the common appellation of Bedouin; and " Ahl 5, aouinal Hadr," or " dwellers in fixed localities." The former class, living under tents, and occupying the waste country which lies in a vast circle between the coast and the central plateau, while to the north it joins on to the Syrian desert, are the best known to European travellers, with whom they often come in contact, and by whom they have sometimes been described with considerable exaggeration both as

to their numbers and in other respects. The most trustworthy authorities regarding them are Niebuhr and Burckhardt.

The Bedouins, then, are shepherds and herdsmen, reduced Mode of to an out-of-doors and roving life, partly by the intrinsic life. nature of their occupations, partly by the special charac- teristics of the country they belong to. For, while land, unsuited to all purposes except pasture, forms an unusually large proportion of the surface in the Arabian territory, the prolonged droughts of summer render considerable portions of it unfit even for that, and thus continually oblige the herdsmen to migrate from one spot to another in search of sufficient herbage and water for their beasts. The same causes also involve the Bedouins in frequent quarrels with each other regarding the use of some particular well or pasture-ground, besides reducing them not unfrequently to extreme want, and thus making them plunderers of others in self-support. Lastly, the loneliness of the desert, far removed from the vigilant control of fixed law, order, or police, has, combined with the other circumstances, continued during generation after generation to leave a peculiar impress on a naturally bold, hardy, and enterpris- ing race, till the terms Bedouin and brigand have, in the opinion of many, become synonymous.

This opinion is, however, unjust. Professionally, and in Habits the ordinary course of their lives, Bedouins are only shep- herds and herdsmen : their raids on each other, or their exploits in despoiling travellers and caravans, are but occa- sional, though welcome and even exciting, exceptions to the common routine. Besides, their wars or forays among themselves,—for they very rarely venture on a conflict with the better. armed and better organised sedentary

Brigand- age.

Tribes.

population,—are rarely bloody; the object being most often with the one party to carry off, and with the other to protect, a flock of sheep ora herd of camels: booty is aimed at, not slaughter. If positive hatred or a desire to kill

exist, such feelings are usually limited to two or three individuals at most, one of whom has perhaps been ridi- culed in satirical verse, to which they are very sensitive, or had a distant relation killed in some previous fray. Bloodshed, too, is expensive, as it must be made up for either by more bloodshed or by paying the price,—the ‘deeah,” as it is called, and which varies, according to the importance of the person killed, from ten to fifty camels, or even more. Previous to Mahomet’s time it was left optional to the injured tribe either to accept this kind of compensation or to insist on blood for blood; but the Prophet, though by his own account despairing of ever reducing the nomade portion of his countrymen to any fixed observances, succeeded on this point in establishing among them the rule, that a fair “ deeah,” if offered, must of necessity be accepted : a merciful regulation, tending to cut short otherwise interminable feuds.

Instances are, however, not wanting in Arab history of fiercer and more general Bedouin conflicts, in which the destruction, or at least the complete subjugation, of one tribe has been aimed at by another, and when great slaughter has accordingly taken place. Such were the wars of Pekr and Thagleb in the 6th century, of Kelb and Howazin in the 8th, of Harb and Oteybah in the 18th, with others. But these are comparatively rare events.

The Bedouins regard the plundering of caravans or travellers, whether on business or otherwise, simply as a supplementary measure that takes the place of passports or custom dues exacted elsewhere. The land is theirs, they say, and trespassers on it without leave must pay the forfeit. Hence whoever can show anything equivalent to a permission of entrance into their territory, has, in the regular coursé of things, nothing to fear. This permission is obtained by securing the protection of the nearest Bedouin sheykh, who, for a politely-worded request and a small sum of money, will readily grant the pass, in the shape of one or two or more men of his tribe, who accompany the wayfarers as far as the next encampment on their road, where they hand their charge over to fresh guides, equally bound to afford the desired safeguard. In the interior of the peninsula the passport is given in writing by one of the local town governors, and is respected by the Bedouins of the district ; for, however impudent and unamenable to law these nomades may be on the frontiers of the impotent Ottoman government in Syria or the Hejaz, they are quiet and submissive enough in other and

Arab-governed regions of the peninsula. But the rash traveller who ventures on the desert strip without the pre- cautions above mentioned is likely enough to atone for his negligence by the loss of his luggage; and should he resist, perhaps his life also.

Utterly ignorant of writing and unacquainted with books, the Bedouins trust to their memory for everything; where memory fails, they readily eke it out with imagina- tion. Hence their own assertions regarding the antiquity, numbers, strength, &c., of their clans are of little real worth; even their genealogies, in which they pretend to be eminently versed, are not to be much depended on; the more so that their own family names hardly ever exceed the limits of a patronymic, whilst the constantly renewed subdivisions of a tribe, and the temporary increase of one branch and decrease of another, tend to efface the original name of the clan. Few tribes, accordingly, now preserve their ancient, or at least their historical titles 3; and the mass of the Bedouin multitude resembles in this respect a troubled sca, of which the substance is indeed always the

same, but the surface is continually shifting and changing. As, however, no social basis' or ties are acknowledged among them except those of blood and race, certain broad divisions are tolerably accurately kept up, the wider and more important of which may here be noted.

First, the Anezah clan, whose pasture-grounds extend Anezah.

from Syria southward to the limits of Jebel Shomer. It is numerous, and, for a Bedouin tribe, well armed. Two- thirds of the Arab horse trade, besides a large traffic in sheep, camels, wool, and similar articles, are in the hands of these Anezah Bedouins. Their principal subdivisions are the Sebad on the north, the Woold-Alee on the west, and the Rudla on the south; these are generally on bad terms with each other. If united, they could muster, it is supposed, about 30,000 lances. They claim descent from

Rabeéah. Second, the Shomer Bedouins, whose pasturages Shomer.

lie conterminous to those of the Anezah on the east. Their numbers are about the same. Thirdly, in the northern

desert, the Howeytat and Sherarat, comparatively small Howeytat.

and savage tribes, Also the Soleebee clan, which, however, is disowned by the Arabs, and seems to be of gipsy origin.

Next follow, in the western desert, the Benoo-Harb, a Harb.

powerful tribe, supposed to muster about 20,000 lances, Their origin is from Keys-Eylan. They are often trouble- some to the Meccan pilgrims, In the eastern desert are the

Moteyr, the Benoo-Khalid, and the Ajmans, all numerous Moteyr.

clans, often at war with each other. To the south, in

Nejd itself or on its frontiers, are the Hodeyl, Oteybah, and Others.

others. Arabs.

These all belong to the “ Mustareb,” or northern

The Bedouins of southern or “pure Arab” origin are Southern comparatively few in number, and are, it seems, with few Bedouins.

exceptions, even poorer and more savage than their northern brethren. Al-Morrah, on the confines of Oman, Al-Yam and Kahtan, near Yemen, and Benoo-Yas, between Hareek and the Persian Gulf, are the best known. The total number of the Bedouin or pastoral population throughout Arabia appears, including men, women, and children, not to exceed.a million and a half—it may even fall short of it.

Whatever be the clan, the only authority it submits to Organisa. is that of its “elder,” or “ sheykh,” a title which, however, tion.

does not necessarily imply advanced age, but is given to any one who, on account of birth, courage, wealth, liberality, skill, prudence, or some other

fortunate quality or accident, has been chosen to the leadership. Descent has something to do with rank, but not much, as every individual of the tribe considers himself equal to the others; nor are the distinctions of relative riches and poverty greatly taken into account. This is natural in a state of things where property itself, consisting alinost wholly of live stock, is of an essentially uncertain and fluctuating character, and the Bedouins have no other. To the “sheykh” all disputes are referred ; he is consulted, though not necessarily obeyed, on every question which regards the general affairs of the tribe, whether in peace or war; there is no other magistrate, and no law except what he and the other chief men of the clan may consider proper. But in fact, for most personal and private affairs, every man does pretty much what is right in his own eyes.

Nominally Mahometan, most of the Bedouins pay slight Religion.

attention to the ceremonial precepts of the Koran; the five daily prayers and the annual fast of Ramadhan are not much in favour among them ; and however near a tribe may be to Mecca, few of them visit it as pilgrims. Wahhabee influence exercised, sword in hand, has, however, of late enforced some degree of Islamitic observance among the Bedouins of Nejd and the adjoining districts: elsewhere nomade Mahometanism is pretty nearly confined to the profession of the Divine Unity; among the remoter and wilder tribes sun-worship, tree-worship, and no worship at

Morals.

‘contempt.

Personal appearance,

Dress.

ig sometimes thrown over the shoulders; a handkerchief,

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all, are not uucommon. Some clans even omit the rite of circumcision altogether; others, like the tribe of Hodeyl, south of Mecca, perform it after

a fashion peculiar to them- selves. Nor are the social and moral injunctions of Islam better observed. Marriages are contracted without any legal intervention or guarantee ; the consent of the parties, and the oral testimony of a couple of witnesses, should such be at hand, are all that are required; and divorce is equally facile. Nor is inutual constancy much expected or observed either by men or women ; and the husband is rarely strict in exacting from the wife a fidelity that he himself has no idea of observing. Jealousy may indeed occasionally bring about tragic results, but this rarely occurs except where publicity, to which the Bedouins, like all other Arabs, are very sensitive, is involved. A maiden's honour is, on the other hand, severely guarded; and even too openly avowed a courtship, though with the most honourable intentions, is ill looked on. But marriage, if indeed so slight and temporary a connection as it is among Bedouins deserves the name, is often merely a passport for mutual licence. In other respects, Bedouin morality, like that of most half-savage races, depends on custom and public feeling rather than on any fixed code or trained conscience, and hence admits of the strangest contradic- tions. Not only are lying and cxaggeration no reproach in ordinary discourse, but even deliberate perjury and violation of the most solemn engagements are frequent occurrences. Not less frequent, however, are instanccs of prolonged fidelity and observance of promise carried to the limits of romance. "The wind," "the wood," and ‘‘ the honour of the Arabs," are the most ordinary oaths in serious inatters; but even these do not give absolute security, while a simple verbal engagement will at other times prove an inviolable guarantee. Thus, too, the extreme abstemi- ousness of a Bedouin alternates with excessive gorgings; and, while the name and deeds of " robber" are hardly a reproach, those of "thief" are marked by abhorrence and Patience, or rather endurance, both physical and moral, few Bedonins are deficient in; wariness 1s another quality universally developed by their mode of life. And in spite of an excessive coarseness of language, and often of action, gross vice, at least of the more debasing sorts that dishonour the Kast, is rare among them, Of their hospitality, as also of many other points common between them and the town Arabs, we shall speak further on.

In person most Bedouins, men or women, are rather undersized, the result probably of hardships endured through uncounted generations ; their complexion, especially in the south, is dark; their hair coarse, copious, and

black; their eyes dark and oval; the nose is commonly aquiline, and the features well formed; beard and moustache are apt to be somewhat scanty. The men are active, but not strong; the women, rarely otherwise than plain.

Their dress is simple enough; that of the men consist- ing in a long cotton shirt, open at the breast, and often girt with a leathern girdle; a black or striped cloak of hair

folded but once, and generally black, more seldom striped yellow and red, covers the head, round which it is kept in its place by a piece of twine ora twisted hairband. To this costume a pair of open sandals is sometimes added. No other article of dress is worn,—neither trousers nor turban; but under the shirt, round the naked waist, a thin strip of leather plait is wound several times, not for any special object, but merely out of custom. In his hand a Bedouin almost always carries a slight crooked wand, commonly of almond-wood; with this he guides his camel when on the road, and ainuses himself by playing with it at other times. Among the Bedouins of the south a light

wrapper takes the place of the handkerchief on the head,

drawers, though these are sometimes dispensed with; next dress. a long shirt, and over it a wide piece of dark blue cloth

woman wear a veil, or even cover her face with her over- cloak, contenting herself with narrowing the folds of the latter over her head on the approach of a stranger. wrists and ankles are generally adorned with bracelets and rings of blue glass or copper or iron, very rarely of silver ; her neck with glass beads; earrings are rare, and nose- rings rarer. A few comparatively rich women indulge in more elegant ornaments and fuller dress. puberty, usually go stark naked; girls up to six or seven.

Arab nomade, and the one in the use of which he shows the greatest skill, throwing it, at need, to a considerable distance with unerring aim. Frequently, too, he girds on, or rather suspends from a kind of

gun; this is still in almost every instance a matchlock,

nan. Flint-guns may here and there be met with now-a-

‘and sareastic turn of mind, may be said to be the base

in to explain a fact which a little reflection would have

[ARAB RACE—

and a loin-cloth that of the shirt. A woman’s attire is hardly more complicated ; wide loose Women’s

cnveloping the whole figure, the head included, and trail- ing on the ground behind. Very rarely does a Bedouin

Her

Boys, till near

On a journey a Bedouin invariably bears with him a Weapons, light sharp-pointed lance, the stem of which is made of Persian or African cane; the manner in which this is carried or trailed often indicates the tribe of the owner. The lance is the favourite and characteristic weapon of the

shoulder-belt, a sword, straight or crooked as may be; the blade is often of little value, rusty, and not over sharp; the scabbard of wood. The weapon which comes third in frequency is a

clumsy and foul, taking from five to ten minutes to load and fire, when, indeed, it can be fired at all, which is not always the case. Yet with such wretched implements at his disposal, a Bedouin is seldom other than a good marks-

days; but percussion or breech-loaders never. Nor are pistols any part of a Bedouin’s war equipment. But whether in peace or war, he is seldom without a knife: this in the north is only a large clumsy clasp or sheath knife; but in Yemen, Oman, and the intervening regions it develops into a broad and crooked dagger, a truly formidable weapon, on the ornamentation

of which the Bedouin of the south bestows what skill or wealth he may happen to possess.

For defensive armour a Bedouin on a foray, or preparing Armour, for a serious engagement, sometimes puts on a coat of mail, the manufacture of Yemen or Baghdad; its links are thin, but closely plaited, and often are two or even three deep. To this he adds a helmet, a mere iron head-piece, without visor or crest. Pennons and banners are rarely used by the nomades, whose chief tactics consist in surprise, as their main object is plunder, both of which require, not display, but secrecy. For though the Bedouins are undoubtedly brave and reckless enough of life, their own as well as that of others, where a cause requires it, they have the good sense never to venture blood unnecessarily or on insufficient grounds. Indeed on all points and in all their dealings, shrewd, calm, good sense, joined with a humorous

of their character; their passions, strong and lasting, are kept in habitual control; and in these regards, as in a lively and poetical imagination, and a wonderful power of untaught eloquence, they resemble their more settled countrymen of the towns and villages. In their principal faults, too— instability, restlessness, envy, rancour, untruth- fulness, and sensuality— they resemble them also.

Much has been said and written of the independence of Indepent- the Bedouins, and of their having never submitted them. ene selves to a foreign yoke; and prophecy has been called

shown to imply nothing marvellous or excepticnal what-

A Bedouin camnD,

| Settled Arabs.

Family

Koreysh,

rank— Sheykh,

ever, but to be merely the uatural result of condition and circumstances. A nomade population, thinly scattered over a large and open space of meagre pasture-land, will always be unconquerable, because it offers next to nothing to conquer. When in camp, a Bedouiu's tent consists of a few coverings of the coarsest goat-hair, dyed black, aud spread over two or more small poles, in height from 8 to 9 feet, gipsy fashion. If it be the tent of a shcykh or man of consequence, its total length may be from 30 to 40 feet; if of an ordinary person, it will oftener fall short of 20. Sometimes a partition separates the quarters allotted to the women and children; sometimes they are housed uuder a lower and narrower covering. A piece of rough carpet or an old mat may or may not be spread on the sandy floor; while camel-saddles, ropes, halters, and the like, constitute the entire furniture of the dwelling; orna- ment there is none. 'To the list two or three cauldrons for cooking, one or two platters, and a wooden drinking bowl, must be added; and with these, including the master's arms in one side of the tent, and his spear stuck in the ground at the door, the household valuables are complete. When the time comes for moving, all these several articles are easily fastened in bundles on the backs of one or more caniels; the men mount their saddles, the women their litters; and in an hour the blackened stones that served for a cooking hearth remain as almost the only sign where the encampment has been. When the tribe is once on its way across the desert, pursuit is difficult; and were the fugitives overtaken, they would offer nothing to repay the trouble of their pursuers. It may be worth the while of nomades such as these occasionally to plunder each other, but it can hardly be worth the while of any foreign power to plunder, still less to attempt to subdue them, and in this lies the whole secret of their imagined independence.

From the Bedouins, or "' Ahl Bedoo," we now turn to the " Ahl Hadr," or the dwellers in fixed abodes. These constitute about six-sevenths of the population of Arabia proper, and it is from them alone that a just appreciation of the Arab character and customs can be formed.

Though the clan and the family form the basis and are the ultimate expression of the civilised Arab society, they do not, as is the case among

the Bedouins, sum it up altogether; local feelings and duties, the consequences of settled life, having deeply modified the character alike of the individuals and the race among all Arabs, town or country. Still, blood is the first thing taken into account; and, indeed, the possession of written records, and habits of order and reflection, enable the settled Arabs to acquire and retain a more accurate knowledge and nicer distinction of pedigree and race than could be expected or found among the unreflecting and half-barbarous Bedouins.

Throughout the peninsula, but especially on the western side, the family of Koreysh is even yet regarded as the noblest of Arab races, indeed of the world ; and its members, on the strength of their connection with the Prophet, all bear the title of “Shereef,” sometimes also, as in Yemen, that of “ Seyyid,” or “lord.” Besides the advantages which naturally follow popular respect, they hold in several districts of Arabia—in Mecca itself, for exainple, in Aboo- Areesh, and in some parts of Yemen—the positions and emoluments of local hereditary governors. But they do not assume any regular distinctive mark, like the green turban so often worn in Turkey or Persia; nor in private life do they enjoy any immunity, either explicit or pre-scriptive, from the ordinary obligations of law.

“Sheykh,” or elder, “‘Emeer,” or ruler, “Imam,” or preceder, and “Sultan,” or monarch, are personal and often, though not necessarily, hereditary titles of rank. “Walee,” or governor, is a word the use of which is limited

to Yemen and Oman. “Sheykh,” on the contrary, is universal; every village, however small, every separate quarter of a town, has a “sheykh,” in whom is lodged the executive power of goverument—a power loosely defined, and of more or less extent according to the personal character and means of the individual who wields it. A village ‘‘sheykh” is a sort of head magistrate and chief of police, or like a sheriff of old times. His power is, how- ever, occasionally limited, particularly in towns, by that of the “kadee,” or “ judge,” whose duty consists in the official, though rather arbitrary, interpretation of the law, and whose sentence ought, in theory at least, to

pre- cede the action of the sheykh. But as the Koran, the sole authentic authority in all matters, legal or civil, throughout Arabia, never accurately distinguished between the two classes, and its phrases, besides, are vague and capable of admitting different and even opposite interpretations, the administration of law and justice has in consequence always remained extremely irregular, and dependent much more on the personal good sense and integrity of the officials, or too often on their want of those desirable qualities, than on any methodised system. The sheykh has no fixed income; he is usually a landed proprietor, sometimes a merchant ; many sheykhs, however, abuse their power for their own private advantage. Nor is his office strictly hereditary, though it may become accidentally so.

Emeer is a higher title, restricted to a governor of a Emeer.

district or province, especially in Shomer, Nejd, and the rest of the central region. An emeer is in most respects nothing but a magnified sheykh; he has, however, the advantage of drawing a considerable portion of his income from the country he administers. Thus in Nejd the emeers receive and retain, partially in Wahhabee governments, wholly in others, the “ zekat,” or tithes, varying from one- twentieth up to one-fifth of the value of property, besides other occasional dues, fines, éc.; in Hasa, Bahreyn, Katar, Mahrah, and Hadramaut the emeer can also claim the fishery tax and customs. Beyond Wahhabee limits he has the ordinary, within them the extraordinary, power of life and death; in all cases he can punish by imprisonment and fine. Part of his office is to hold public audiences daily, on which occasions every one who chooses, of what- ever rank or condition, has the right of coming forward and of presenting any complaint or petition. Some- times the emeer takes the matter thus brought before him into his own hands at once; sometimes he refers it to the radee, or to the elder and more respectable inhabitants, who in these meetings take seat near the emeer, and form a kind of improvised council. The emeer himself wears about him no distinctive badge of office; nor is he approached with any ceremony beyond that of ordinary Arab polite- ness. In the Wahhabee provinces, or those where Wahha- beeism, though no longer dominant, has made a permanent impression, as in Shomer for instance, the emeer commonly takes on himself the duties of the Friday “imam,” not unlike those of precentor in Presbyterian worship, in the public mosque; now and

then he preaches a sermon. His fen is generally hereditary, but not always in direct ine.

The title of “sultan,” or king, one of doubtful antiquity, Sultan.

has been assumed by the hereditary Wahhabee ruler of Riad, the capital of Nejd; it is also often applied to the sovereign of Oman, and to some petty princes in the south of the peninsula. In practice it adds little or nothing to the dignity of emeer, but implies a larger territorial range of authority.

Where the Wahhabee doctrines have definitely estab. Religion.

lished themselves, as in Nejd, Yemameh, Hareek, Aflaj, and Jebel Aseer, the Mahometan code, as laid down in the

Koran, is observed more strictly perhaps men in any other ~— 32

Orthodox sects.

Khowarij.

250

part of the Eastern World. Besides the principal mosque, or “jamia,” for Friday prayers, indispensable in every town or village, smaller praying-places, or mesjids, are erected in every quarter. These buildings are mere oblong rooms, flat-roofed, supported on numerous rough pillars placed close to each other, and with no architectural or decorative beauty whatever; but are kept scrupulously clean, and laid down partly with mats, partly gravel. In most cases there is no minaret attached, the times of prayer being merely announced by the “mueddin,” or crier, from the roof itself. Punctuality in attendance is enforced by the

“ mutowwas,” or “ compellers” of “obedience,” a set of

self-elected zealots, who parade the towns and villages with sticks in their hands, take note of the defaulters

from prayers, or transgressors otherwise of the letter of

the law, and punish them with reproaches or even blows. Marriage, divorce, inheritance, purchase, life is regulated in exact accordance with the Koran; even conversation is liable to censure unless thickly interlarded with words of religious import; while after night-prayers talking is a luxury prohibited altogether. Yet, though these Wahhabee Arabs are bigoted even to fanaticism among themselves and with their fellow-countrymen, they are remarkably tolerant towards strangers, and often unite with the extreme of theoretical exclusiveness a good deal of the practical scepticism and indifference common to their race.

These Wahhabees all belong to the orthodox sect of Ebn-Hanbal, and are in fact its most exaggerated expres- sion. In the eastern provinces, Hasa, Katee, Bahreyn, and Katar, the Malikee sect is more common; as also, it is said, in Hadramaut, and in some parts of Yemen. But in Yemen generally, and throughout the Hejaz, the Shaféyee sect, orthodox like the two others, predominates. There are no Hanefees in Arabia, except a few Turks or Indians settled on the western coast. ‘‘Shedah,” too, or votaries of Ali and his family, in the Persian sense of the word, are by no means common in the peninsula, and where found are often of foreign origin.

But all along the Persian Gulf, in Hasa, Bahreyn, and Katar, a considerable proportion of the inhabitants are not Mahometans at all, that is, in the ordinary acceptation of the word, but “ Khowarij,” or “ seceders,” belonging to the Karmathian school already mentioned; while in Oman, the little peninsula or cape of Ras-el-Rheymah excepted, where Wahhabeeism has made good its footing, the bulk of the people belong to the Beyadee or Abadee sect, a Karmathian offshoot nearly allied in doctrines and in practice to the ‘‘Ismaileeyah” of Syria. For a detailed account of either the reader may with advantage consult Silvestre de Sacy’s admirable treatise on the “ Batineeyah,” or secret sects of the Mahometan East, prefixed to his History of the Druses. Somewhat akin to these, but of a less marked divergence from orthodox Islam, are the Zeydees, of whom great numbers exist in Yemen. Lastly, paganism, or rather the fetichism that takes for its scope a stone, tree, or some other natural object, appears to exist in Mahrah, in the southern Jowf, and in various small half-isolated spots on the borders of the great desert or Dahna. Vestiges of Sabaism, or the worship of the heavenly bodies, are said to linger among the wilder Bedouin tribes, who

even yet compute the year from the rising of Soheyl or Canopus, and prostrate themselves to the morning sun. It is also noticeable that even such of the southern Arabs as are professedly Mahometan, are far less zealous and much laxer in their ways than the Arabs of the north; in fact, the Islam of the latter was indigenous, that of the former acquired or compulsory.

Except in a few places on the west coast long exposed to Egyptian, Turkish, and Indian influences, no dervishes

every detail of

are to be met with, or are even tolerated, in Arabia proper. Absence of The Wahhabees all hold them in the utmost contempt and superia abhorrence. Nor are Arabs, generally speaking, super- a stitious in other respects: of dreams and omens they make

little account; nor does the apprehension of ghosts, spectres, apparitions, demons, and the like often disquiet their hours

of loneliness or darkness; stories of such a character, though embodied here and there in Arab literature, in the Thousand and One Nights for example, are less frequently

of Arab than of foreign origin, generally Persian. Nor do

Arabs often seek to convert others, except it be their own purchased negro slaves, a facile acquisition, to Mahometan-

ism, or molest those of other religions. Jews exist undis- turbed in great numbers near Teyma and in the south; Hindoos worship cows aud burn their dead without inter- ference in Oman; only old custom, it would seem, and the memory of long and bitter wars, prohibits the practice of

the Christian religion in Arabia proper,—Aden alone, of course, where the British flag proclaims absolute tolerance, excepted.

Slavery is still, as of old times, a recognised institution Slavery. throughout Arabia; and an active traffic in blacks is carried on along the coasts of the Persian Gulf and the Red Sea, but especially the former.

The slaves themselves are chiefly brought from the east African coast districts down as far as Zanzibar, and from the Galla tribes in the interior; a few Abyssinians, too, are sometimes imported. Slaves are usually employed in Arabia as herdsmen or as domestic servants, rarely in agricultural works; they also form a considerable portion of the body- guards with which Eastern greatness loves to surround ‘tself. Like their countrymen elsewhere, they readily embrace the religion of their masters, and become zealous Mahometans, though rarely according to knowledge. Arab custom enfranchises a slave who has accepted Islam at the end of seven years of bondage ; and when that period has arrived, the master, instead of exacting from his slave the price of freedom, generally, on giving him his liberty, adds the requisite means for supporting himself and a family in comfort. Further, on every important occasion, such as a birth, circumcision, a marriage, or a death, one or more of the household slaves are sure of acquiring their freedom. – Hence it comes that Arabia is densely sprinkled with a free black population ; and these again, by intermarriage with the whites around, have filled the land with a mulatto breed of every shade, till, in the eastern and southern pro- vinces especially, a white skin is almost an exception.

This has taken place all the more readily that in Arabia

there exists no prejudice against negro alliances ; no social

or political line separates the African from the Arab. A

negro may become a sheykh, a kadee, an emeer, or what-

ever his industry and his talents may render him capable

of being. ‘This occurs frequently, particularly in Nejd, Yemen, and Hadramaut; in the Hejaz and the north, on

the contrary, a faint line of demarcation may be observed between the races.

Both town and village Arabs are, as a rule, serious in Character. gait and demeanour, and very observant of politeness, not only in the manner, but even in the substance of their conversation. In temper, or at least in the manifestation of it, they are studiously calm ; and an Arab rarely so much as raises his voice in a dispute. He prides himself on an unruffled exterior, and will bear much with careful seeming calm that would drive a European to the extreme of impatience and rage. But this outward tranquillity covers feelings alike keen and permanent , and the remem- brance of a rash jest or injurious word, uttered years before, is too often the cause of violence and bloodshed.

Besides, however, the individual shades of character, there exist marked tribal or almost semi-national diver-

Arab towns,

. Interior of an Arab dwelling,

ARA

sities, among the Arabs. Thus, the inhabitants of Hejaz are noted for courtesy and blamed for fickleness ; those of Nejd are distinguished by their stern tenacity and dignity of deportment; the nations of Yemen are gentle and pliant, but revengeful ; those of Hasa and Oman cheerful and fond of sport, though at the same time turbulent and unsteady. Anything approaching to a game is rare in Nejd, and in the Hejaz religion and the yearly occurrence of the pilgrim ceremonies almost exclude all public diversions ; but in Yemen the well-known game of the “‘jereed,” or palm-stick, with dances and music—the latter very barbarous, it must be allowed —is not rare. In Oman such amusements are still more frequent. Again, in Yemen and Oman, coffee-houses, where people can resort for conversation, and where public recitals, songs, aud other diversions are to be met with, stand open all day; while nothing of the sort is tolerated in Nejd. So it is also with the ceremonies observed on occasion of circum- cision or marriage—occasions of gaiety and pastime on the coast, but passed over with little of the like observ- ance in the central provinces.

An Arab town, or even village, except it be the merest hamlet, is invariably walled round ; but the ramparts are low, and scldom of any stronger material than dried earth; they are occasionally flanked by towers of like construction, such as befit a country where cannon are unknown and fire-arms are yet at the matchlock stage. A dry-ditch often surrounds the whole. The streets are utterly irregular— some broad, some narrow, all tortuous; the houses are of one or two storeys, very rarely of three, with flat mud roofs, little windows, and no external ornament. If the town be large, the expansion of one or two streets becomes a market-place, where are ranged a few shops of eatables, drugs, coffee, and, very rarely, cottons or other goods. Many of these shops are kept by women. The chief mosque is always near the market-place; so is also the governor's residence, which, except in size and in being more or less fortified Arab fashion, does not differ from a private house. Drainage is unthought of ; but the extreme dryness of the air obviates the inconvenience and disease that under other skies could not fail to ensue, and which in the damper climates of the coast make themselves seriously felt. But the streets are roughly swept every day, each householder taking care of what lies before his own door. Whitewash and colour are occasionally used in Yemen, Hejaz, and Oman; elsewhere a light ochre tint, the colour of the sun-dried bricks, predominates in an Arab town or village, which looks at a distance like a large dust-heap in the centre of the bright green ring of gardens and palm-groves all around. Baked bricks are unknown in Arabia, and stone buildings are rare, especially in Nejd. Palm branches and the like, woven in wattles, form the dwellings of the poorer classes in the southern districts. Many Arab towns possess watch- towers, like huge round factory chimneys in appearance, built of sun-dried bricks, and varying in height from 50 to 100 feet, or even more. Indeed, two of these construc- tions at the town of Birket-el-Mawj, in Oman, are said to be each of 170 feet in height, and that of Nezwah, in the same provinee, is reckoned at 140; but these are of stone. Some of these watch-towers are so built as to serve also for citadels or places of refuge; but none could offer a minute's resistance to any kind of artillery, though formidable obstacles to men whose only means of attack are lances and matchlocks.

The principal feature in the interior of an Arab house is the "kahwah," or coffee-room, as from its destination it is commonly called. It is a large

apartment spread with mats, and sometimes furnished with carpets and a few cushions. At one extremity is a small furnace or fire- |

place, for preparing coffee. In this room the men congre- gate ; here guests are received, and even lodged; women rarely enter it, except at times when strangers are unlikely to be present. Some of these apartments are very spacious, aud supported by pillars; one wall is usually built trans- versely to the compass direction of the kaabeh ; it serves to facilitate the performance of prayer by those who may happen to be in the kahwah at the appointed times. The other rooms are ordinarily small, and appropriated to the use of the females of the family aud to domestic life.

In hospitality the Arabs of our time have in no degree Hospi-

degenerated from their former reputation, though Shomer, Nejd, Yemamah, and Hasa excel in this respect the other provinces. A stranger’s arrival is often the occasion of an amicable dispute among the wealthier inhabitants as to who shall have the privilege of receiving him ; and though three days are often popularly spoken of as the limit of such entertainment, practice sets no precise bounds to its length ; and an Arab host always carefully abstains from putting any question to his guest as to when he is going, or where. Indeed, if the guest be discreet and acceptable in his manners, he will soon find himself on the footing of one of the family; and even the women of the house will come in to sit and converse with him not less freely than they would with their own relations.

Arab cookery is of the simplest. Roughly-ground wheat Cookery.

cooked with butter; bread, in thin cakes, prepared on a heated iron plate or against the walls of an open oven; a few vegetables, generally of the leguminous kinds ; boiled mutton or camel’s flesh, if the circumstances of the host allow of such luxuries; dates and fruits,—this is the menu of an ordinary meal. Roast meat, fried, stewed—in a word, anything but boiled—is rarely seen, such dishes exceeding the skill of the cooks, who, as a rule,

are the women of the household. Rice is eaten in wealthy houses, and fish is common on the coasts. Among the Bedouins, millct-cakes, half-cooked in ashes, or a broth prepared from the gritty seeds of the “samh” (a species of Mesembry- anthemwm), often take the place of bread ; and their meat cookery is equally wretched. Game, such as venison, partridge, and hare, is served up on rare occasions. Camel meat is a favourite, but to a stranger a very insipid dish, in southern Nejd, Yemamah, Hareek, and Aflaj. Spices are freely employed in town cookery; butter much too largely for a European taste.

After eating, the hands are always washed with soap, or Entertain- some substitute for it, commonly the ashes of an alkaline ment.

plant. A covered censer with burning incense is then passed round, and each guest perfumes his hands, face, and sometimes his clothes ; this censer serves also on first receptions, and whenever special honour is intended. In Yemen and Oman scented water often does duty for it. Coffee, without milk or sugar, but flavoured with an aro- matic seed brought from India, is served to all. This, too, is done on the occasion of a first welcome, when the cups often make two or three successive rounds ; but, in fact, coffee is made and drunk at any time, as frequently as the desire for it nay suggest itself ; and each time fresh grains are sifted, roasted, pounded, and boiled—a very laborious process, aud one that requires in the better sort of estab- lishments a special servant or slave for the work. Among the Bedouins the use of coffee is rare, though they are fond of it when they can get it. Arabs in general make only one solid meal a-day—that of supper, soon after sunsct ; nor even then do they eat much, gluttony being rare among them, and even daintiness esteemed disgraceful. Wine, like other fermented drinks, is prohibited by the Koran, and is, in fact, very rarely to be met with, though the inhabitants of the mountains of Oman are said to indulge in it. On the coast spirits of the worst quality

Smoking.

Dress.

Personal appearance and quali- ties.

are sometimes procured; opium and hasheesh have also but few votaries in Arabia. On the other hand, wherever Wahhabeeism has left freedom of action, tobacco-smoking prevails, the manner of smoking varying considerably, according to the district. Among the Bedouins and the poorer classes of the upland regions a short prpe of clay, called a "'sebeel," red or black, is in vogue. The wealthier townsmen prefer long pipes with large open bowls ; but the most frequent use is made of the water-pipe, or "narghileh," of which implement every form, kind, and dimension imaginable may be found in Arabia. The tobacco smoked is generally strong, and is either brought from the neighbourhood of Baghdad or grown 1n the country itself. The strongest quality is that of Oman ; the leaf is broad and coarse, and retains its green colour even when dried; a few whiffs have been known to produce

absolute stupor. The aversion of the Wahhabees to tobacco is well known ;

they entitle it ""mukhzee," or "the shameful," and its use is punished with blows, as the public use of wine would be elsewhere.

In dress much variety prevails. The loose cotton drawers, girded at the waist, which in hot climates do duty for trousers, are not often worn, even by the upper classes, in Nejd or Yemamah, where a kind of silk dressing-gown is thrown over the long shirt; frequently, too, a brown or black cloak distinguishes the wealthier citizen ; his head-dress is in its character the same as that of the Bedouins — namely, a handkerchief fastened round the head by a band—only of better materials, But in Hejaz, Yemen, and Oman, turbans are by no means uncommon ; the ordinary colour is white; they are worn over one or more skull-caps—sometimes fifteen—till the head is rather burdened than protected. Trousers also form part of the dress in the two former of these districts; and a voluminous sash, in which a dagger or an inkstand is stuck, is wrapped round the waist. Meanwhile the poorer folk and the villagers often content themselves with a broad piece of cloth round the loins, and another across the shoulders. In Oman trousers are rare, but over the shirt a long gown, of peculiar and somewhat close-fitting cut, dyed yellow, is often worn. 'The women in these provinces commonly put on loose drawers, and some add veils to their head-dresses ; they are fond of

ornaments (gold and silver), and over- charge themselves with them; their hair is generally arranged in a long plait hanging down behind. All men allow their beards, whiskers, and moustaches full growth, though none of these are much to speak of, particularly among the Arabs of the south, who are a thin-haired race. Most shave their heads, and indeed all, strictly speaking, ought by Mahometan custom to do so; but many, peasants especially, Bedouins, and the like, neglect it. An Arab seldom or never dyes his hair. Sandals are worn more often than shoes, but the heat of the ground in the day- time allows none except the very poorest to go wholly barefoot. Lastly, though no class or occupation lays claim to any particular style or article of dress, legists, writers, imams, and others connected with the service of the mosques, generally affect greater amplitude and less variety of colour in their turbans and vestments than other people.

In person the Arabs are a remarkably handsome race,— tall, lithe, well-formed, dark-eyed, and dark-haired. De- formed individuals or dwarfs are rare among them ; nor, except leprosy, of which frequent instances may be met with throughout the peninsula, does any disease seem to be hereditary among them. The frequency of ophthalmia, though not in the virulent Egyptian form, is evidently attributable to the nature of the soil and the climate. They are scrupulously clean in their persons, adding to the prescribed ablutions of the Mahometan code frequent

supererogatory washings of their own ; and take special care of their teeth, which are generally fine, though tooth- ache is by no means unknown in Arabia. Simple and abstemious in their habits, they often reach an extreme yet healthy old age; nor is it common among them for the faculties of the mind to give way sooner than those of the body. To sum up, physically and morally they yield to few races, if any, of mankind; mentally, they surpass most, and are only kept back in the march of common progress by the remarkable defect of organising power and incapacity for combined action which they share with many other nations of the East, and some, it would seem, of the West also. Lax and imperfect as are their forms of government, it is with impatience that even these are borne ; and we have already seen that of the four caliphs who alone reigned—if reign theirs could be called—

in Arabia proper, three died a violent death ; and of the Wahhabee princes, the most genuine representatives in later times of pure Arab rule, almost all have met the same fate.

Of the revenues of Arabia it would be difficult to form Revenues. anything like a correct estimate. Palgrave has stated the yearly receipts of the Nejdean treasury, inclusive of the tribute then (1862) paid into it by Bahreyn and the west of Oman, to be nearly £106,000 sterling—no very large sum,

The revenues of Oman itself, then in a comparatively prosperous condition, are estimated by the same author at nearly ten times the amount, but may possibly have

been overrated by him, as those of Yemen were perhaps by Niebuhr.

Certainly the general condition of these provinces—the restricted character of the cultivation and the evident poverty (not absolute want, indeed, for that is rare) of the greater number of the inhabitants—do not convey to the visitor the idea of large national wealth or extensive resources. There can, however, be no doubt that both the coast districts of Arabia, in their varied and valuable products, and the central plateau, with its palm- groves, well irrigation, and wide pasture-lands, might, under a judicious administration, become the sources of much greater revenues, both public and private, than is now the case. ‘The mines, too, in the metamorphic dis- tricts of Yemen and Oman, remain yet to be properly worked. As for the desert proper, which, as we have seen, occupies about one-third of the peninsula, it must, like the ocean of Childe Harold, remain what it is to the end of time.

In the 7th century Arabia sent forth armies that Defence. attacked and conquered nearly half the then known world. But the secret of her conquests lay not in the number of her warriors, but in a resolute purpose, a unity of aim, and an enthusiasm which concentrated in itself and intensified every motive of human action. In later ages she has been reduced to the defensive, and has shown herself not always equal even to that: witness her conquest by the Turks in the 16th, and by the Egyptians in the pre- sent century. Once only, at the moment when Wahhabee union and zeal half restored for a few years the energy of early Islam, did her armies go forth to invade the neigh-

bouring territories of Mesopotamia and Syria ; but it was to plunder rather than to conquer, and the results lasted no longer than the invasions themselves.

Yet on the defensive Arabia had much in her favour, and that from many causes. The first is, that there is little to defend, since, the coast of Yemen and the districts of Bahreyn and Oman excepted, there is very little to excite the cupidity of an invading, and nothing to satisfy the exigencies of an occupying force. The second is, that the mountainous nature of Yemen and Oman themselves, and the narrowness of their labyrinthine defiles added to

Military tactics.

Military | force.

Arab women,

Courage of –

MILITARY RESOURCES. |

the extreme heat of the climate, and the scarcity of avail- able provisions, would make even those provinces hard to attack, harder to retain. A third cause is in the broad strips of desert that gird the central districts as with a moat of sand, and send long arms of barrenness here and there into the heart of the cultivated or pastoral regions, so as to render military operations on a large scale in the interior almost impossible. A fourth and a very serious obstacle to invasion is the character of the inhabitants. Personal courage, wonderful endurance of privation, fixity of purpose, and a contempt of death rare even in the bravest Europeans, are qualities common to almost every race, tribe, and clan that compose the Arab nation; and though their undisciplined troops are unfitted to meet a better trained enemy in a regular battle, in skirmishing and harassing they have few equals, while at close quarters their individual impetuosity often disconcerts the more mechanical fortitude of organised regiments. To this our own troops gave testimony in the engagements of Shenaz, 1810, and of Ras-el-Hadd, 1819 and 1820, when, with swords and spears alone, the Arabs of Oman maintained a desperate struggle against guns and bayonets, neither giv- ing nor receiving

quarter. Nor are they wholly ignorant of tactics, their armies, when engaged in regular war, being divided into centre and wings, with skirmishers in front, and a reserve behind, often scrcened at the outset of the engagement by the camels of the expedition. These animals, kneeling, and ranged in long parallel rows, form a sort of entrenchment, from behind which the soldiers of the main body fire their matchlocks, while the front divi- sions, opening out, act on either flank of theenemy. This arrangement of troops may be traced in Arab records as far back as the 5th century, and has often been exemplified during the Wahhabee wars in our own day.

The military contingent of Nejd, including that of all the adjoining provinces that constitute central Arabia, Jebel Shomer excepted, is reckoned by Palgrave at 47,300 from among the settled, and at about 8000 from among the nomade inhabitants. That of Shomer is estimated by the same authority at 14,000 of the first, and at about 16,000 of the second category. Oman, including the neighbouring and allied districts, is said to supply about 112,000, all from towns or villages.

We thus obtain a total of about 197,300 fighting men for what represents a full half of the Arab peninsula. If, therefore, we calculate the entire military force of the land from Suez to Aden, and from the Red Sea to the Indian Ocean, at 400,000 fighting men, we shall probably be not far from the truth. But while remembering, on the one hand, that this is no standing army, nor composed of regular and disciplined soldiers, it should not be forgotten that, in case of invasion, their energy, and, it may be, their numbers, would be doubled by the enthusiasm of patriot- ism; and that not every male only, but every woman would, in the excitement of the struggle, take part in the national defence. ;

Indeed, at all times Arab women have distinguished themselves by their bravery hardly less than Arab men. Records of armed heroines occur frequently in the chronicles or myths of the pre-Islamitic time; and in authentic history the Battle of the Camel, 656 a.p., where Ayeshah, the wife of Mahomet, headed the charge, is only the first of a number of instances in which Arab amazons have taken, sword in hand, no inconsiderable share in the wars and victories of Islam. Even now it is the custom for an Arab force to be always accompanied by some courageous maiden, who, mounted on a

blackened cainel, leads the onslaught, singing verses of encouragement for her own, ofinsult for the opposing tribe. Round her litter the fiercest of the battle rages, and her capture or death is the

signal of utter rout; it is hers also to head the triumph after the victory of her clan.

There is little education, in our sense of the word, in Education,

Arabia. Among the Bedouins there are, of course, no schools, and few, cven of the most elementary character, in the towns or villages. Where they exist, little beyond the mechanical reading of the Koran, and the equally mechanical learning of it by rote, is taught. On the other hand, Arab male children, brought up from early years among the grown-up men of the house or tent, learn more from their own parents and at home than is common in other countries ; reading-and writing are in most instances thus acquired, or rather transmitted ; besides such general principles of grammar and eloquence, often of poetry and history, as the elders themselves may be able to impart. To this family schooling too are due the good manuers, politeness, and self-restraint that early distinguish Arab children. In the very few instances where a public school of a higher class exists, writing, grammar, and rhetoric sum up its teachings. Law and theology, in the narrow sense that both these words have in the Islamitic system, are explained in afternoon lectures given in most mosques ; and some verses of the Koran, with one of the accepted commentaries, that of El-Beidawce for example, form the basis of the instruction,

Great attention is paid to accuracy of grammar and Dialects.

purity of diction throughout Arabia ; yet something of a dialectic difference may be observed in the various districts. The purest Arabic, that which is as nearly as possible identical in the choice of words and in its inflections with the language of the Koran, is spoken in Nejd, and the best again of that in the province of Sedeyr. Next in purity comes the Arabic of Shomer.

Throughout the Hejaz in general, the language, though extremely elegant, is not equally correct ; in Hasa, Bahreyn, and Oman, it is de- cidedly influenced by the foreign element called Naba- thean, that removes it still further from its original cha- racter. In Yemen, as in other southern districts of the peninsula, Arabic merges by insensible degrees into the Himyaritic or African dialect of Hadramaut and Mahrah. The Arabic spoken by the nomade or Bedouin tribes, especially those of the north, is tolerably correct, but the pronunciation is often inexact.

The principal territorial divisions of Arabia have been already Territorial They divisions,

indicated, but a detailed list may here not be out of place. are, accordingly, on the western side—

.The Hejaz, subject in great measure to Ottoman authority, and Hejaz

extending from 28° to 21° N. lat. Its principal towns are YAMBO and J1DDAu on the sea-coast, MEDINAH and Mecca in the interior ; all of which are separately described in the articles under these head- ings. The inhabitants are partly nomade, partly settled, in about equal proportions. The Hejaz includes the Beled-el-Haram, of sacred territory, immediately adjoining Mecca; and the Taif, a mountainous but fertile district to the 8.E. of that town.

Jebel Asecr, a mountainous tract along the coast immediately Jebel south of the Hejaz. Its inhabitants are of the Wahhabee sect, and are Aseer,

governed by their own sheykhs, with an emeer residing at Kolakh, the principal town or rather village of the region. The Turks have lately invaded it, but to no great purpose.

Aboo Areesh, along the coast, from 17° 40’ to 15°50’ N. lat. This Aboo district, now occupied by the Turks, detached itself from Yemen Areesh.

about a century ago. Its inhabitants live in villages: the soil is poor, but the fisheries abundant.

Tehamah. This name is given to the shore strip from 15° 50’ to Tehamah,

Aden, 12° 47’ N. lat. Its principal towns are Loheya, Hodeydeh, and Mokha; the two former of these are seaports, of 4000 or 5000 souls each ; the last is celebrated for its export of coffee, but its popula- tion does not exceed 8000 souls at most. There are numerous fish- ing villages along the coast, and some inland hamlcts; the district is now partially occupied by the Turks.

Yemen. : dependent on the ‘“‘imam” or prince of Yemen, who resides at Sanaa, the capital, a town which is said, in the extent of its edifices and gardens, to have once rivalled Damascus, but which at present scarcely contains 20,000 inhabitants. It is surrounded by turreted

| walls, with seven gates: the mosques, public baths, and market-

Under this title are included thirty mountain districts, Yemen.

Jowt.

Nejran.

Adjacent districts.

Hadra- maut.

Mahrah.

Northern.

Jowf.

Teyma.

Kheybar.

Jebel Shomer.

Upper Kaseem.

Bedouins.

Nejad.

Ared.

Sedeyr.

place are all modern. Inland there are several small independent states, accurately cnumerated by Niebuhr, the best, or rather the only authority for what regards this part of Arabia. In extent Yemen constitutes about one-tenth of the superficies of the peninsula. It is thickly peopled throughout, with countless villages; the nomades are few in number. It has been recently invaded by the Turks.

Jowf, a large oasis in the desert, adjoining Yemen on the east. It contains the ancient capital of south Arabia, Mareb, with the ruins of the famous dyke that bears its name, besides many villages. The inhabitants are warlike; the country is said to be fruitful, but little is known of it with certainty, nor has any European ever visited it.

Nejran, an independent province on the north-east of Yemen. It is fertile and thickly peopled; the inhabitants are mostly villagers, and belong to a sect allied to that of the Beyadees in Oman. The principal town, situated on the highroad of Sanaa, bears the same name as the district.

Kaldéat-Bisha, Shahran, Kahtan, Taslees, Belad-el-Kobeyel, and others—small districts, each governed by its own sheykh, except the last named, of which the inhabitants are chiefly nomade ; the others are agricultural. They are situated to the east and north of Yeinen, on the confines of Nejd.

Hadramaut, an extensive region, occupying the south-east coast and inland. Niebuhr, our best authority for this part of Arabia, as for Yemen, describes it as being divided into several small prin- cipalities, of which Shibam on the south, and Ainad further north, are the chief. The only towns really known are Dafar and Kesheen, ports of the coast; they are both small and

unimportant. The inhabitants are all governed by their own chiefs. Of their race and language mention has been made before; their mode of life is partly nomade, partly settled.

Mahrah, a continuation of Hadramaut northwards, up to Ras-el- Hadd. Its inhabitants, who appear to be the least civilised among all the Arab races, pay an irregular allegiance to the sultan of Oman. ‘The country is said to be sandy, and thinly peopled; the Bedouin tribes of Al-Morrah and Aboo-Alse frequent its pasturages.

Returning inland, we find the north and centre of Arabia thus divided :—

Jowf, an oasis south of the Syrian frontier. It contains scven principal aud some smaller villages. The population is set down at 40,000 souls; they are governed by an emer, who depends on the prince of Shomer.

Teyma, a thinly-peopled district west of Jowf. Its inhabitants are mostly Bedouin, and each clan obcys its ownsheykh. The total population is 12,000.

Kheybar, a collection of small villages and encampments on the north-west of the Hejaz; several of the tribes inhabiting it are of Jewish origin. The population is given at 25,000.

Jebel Shomer, an important province, including the mountain ranges of Aja and Solma south of Jowf. Its capital, Hayel, stands on the highroad between Bosrah and Medinah ; it possesses a public market-place, and may contain about 15,000 or 16,000 souls. The villages of the province are forty ; the total population 162,000, who are given to agricultural and pastoral pursuits in about equal proportions. The emeer or prince is hereditary, and allied with, though not dependent on, the government of Nejd.

Upper Kasecm, an oblong strip of land, lying between the moun- tains of Shomer and the valley of Lower Kaseem, which latter belongs to Nejd. The soil is sandy, but not unfertile. It contains about twenty villages, besides many hamlets. The population is stated at 35,000. This district is subject to the emeer of Shomer.

The principal Bedouin tribes of this part of Arabia are the Shomer, who indeed have given their name to the province; the Sherarat ; the Howeytat; the Benoo-Ateeyah; the Maaz; the Téy, a very ancient and famous tribe, of southern origin, whose emigration hither dates from many centuries before Mahomet ; and the Wah- hideyah. The total population is estimated at 166,000 souls; but this does not include the Bedouins of ‘‘eyma and Kheybar, who together, it is said, muster an equal number.

There remains Nejd, a name including the whole central inhabit- able district of Arabia, and which is divided into nine provinces. They are as follows :—

Ared, the centre province, in which the present Wahhabee capital, Riad, is situated. ‘The town is very ancient, and has a population of 30,000. It possesses a palace, where the sultan of Nejd resides, and many other considerable buildings. The fortifi- cations are extensive, but of unbaked brick only, as are also the dwellings of the town; near Riad may still be seen the ruins of the ancient capital, Dereyéeah, demolished by Ibrahim Pasha in 1817. Besides Riad, Ared contains many villages so large as to merit the name of towns; the land is generally fertile, cultivation abounds, and the total population exceeds, it is said, 100,000.

Sedeyr, an extensive province, north of Ared, and situated in the highlands of the Toweyk mountain chain. Its principal town, Mejinaa, is fortified, Arab fashion; the ancient towns, Jelajib, Toweym, and others are situated here:- The number of large villages

as the district.

is twenty-five; the entire population is 140,000. They are a brave and intelligent race, and furnish the choicest contingent to the Wahhabee armies.

Yemamah, a fertile district, south of Ared, celebrated in all ages Yemamah, of Arab history for the bravery of its men and the beauty of its women. It

forms an important part of the Wahhabee empire. Its principal town is Manfoohah ; but it includes many others, such as Khorj, the neighbourhood of which, from its fertility, is called the paradise of Nejd; the number of inhabitants is said to equal that of Sedeyr.

Hareek, a mountainous oasis on the extreme southern verge of Hareek. Nejd, at the commencement of the great desert, or Dahnd. Prin- cipal town, Hootah. The inhabitants are all zealous Wahhabees ; their number is stated at 14,000. The villages are 16 in number.

Aflaj, a small and hilly district south-west of Ared. The in- Aflaj. habitants are Wahhabees, and number 16,000; the villages, of which Kharfah is the chief, are twelve in all.

Wadi Dowasir, a long shallow valley, reaching down from Aflaj Wadi in the direction of Yemen; the soil is sandy and unproductive. It Dowasir. contains fifty small villages, besides hamlets, and the population is estimated at 100,000, all Wahhabees. They have a bad reputation for illiberality and meanness of disposition.

Soleyel, also a Wahhabee province. It forms the junction between Soleyel. Wadi Dowasir and Yemen; its principal town bears the same name Its villages are given at tweuty-five, its inhabitants at 30,000.

Woshem, a small, compact, but important district west of Ared, Woshem., of which it is the key. Its principal town, Doramah, offered a determined resistance to Ibraham Pasha in 1817. Here, too, is Shakrah, a large commercial centre; Kowéy, near which was fought the decisive battle between the Egyptian and Wabhabee troops ; and other villages, twenty in all. Inhabitants, 80,000, all Wahhabees.

The country is well supplied with water, and the ground productive.

Kaseem, a wide fertile valley west of Woshem, and belonging to Kaseem, the Wahhabee government. . It possesses three large towns—Onezzah, Bereydah, and Rass—besides about 60 villages and numerous hamlets. The inhabitants arc a busy and thriving, but not a very warlike race ; they are

computed at 300,000. These districts con- stitute Nejd proper, and form the bulk of the present Wahhabee monarchy.

Coming now to the east coast, we find Hasa, a large province Hasa, occupying almost the whole region conterminous with the upper half of the Persian Gulf. Its principal town, Hofhoof, possesses a re- markable fortress, said to be of Karmathian construction, besides a large market-place and several handsome buildings. Close by is the more modern town of Mebarrez, almost equalling the capital itself in size. The province is in general well-watered and fertile ; the number of villages about fifty, that of the population 160,000.

This region belongs to the Wahhabee government, but has lately been occupied by the Turks.

Kateef, asmall, marshy, but fertile district on the shores of the Kateef. Persian Gulf, directly opposite to Bahreyn. It belongs, like Hasa, to the Wahhabees; the principal town, also called Kateef, was once the residence of the dreaded Karmathian princes. The climate is unhealthy ; the population is estimated at about 100,000 souls.

The most considerable nomade tribes in this district are the Bedouins. Ajman, Benoo-Hajr, Benoo-Khalid, Meteyr, Oteybah, Sebad, Kahtan, Harb (a numerous and warlike clan), Anezeh, and Al- morrah. heir whole number docs not probably exceed 80,000; the nomade population of central Arabia bearing no proportion to the settled, whereas a reverse condition exists on the northern frontier, and above all in the Syrian desert.

Continuing our review of the eastern districts, we next find—

Bahreyn, a name given to the two large islands of Menameh and Bahreyn. Moharrek, both celebrated for pearl fisheries off their shores. They are governed by a chief of their own, of the family name of Khaleefah; but pay an uncertain allegiance, sometimes to the government of Baghdad, sometimes to that of Oman. Numerous villages cover the islands, of which the soil is fertile ; but the chief resources of the inhabitants are maritime and commercial. Popula- tion, 70,000.

Katar, the pearl-fishery coast east of Hasa. Its inhabitants, said Katar. to be 135,000 in number, find an almost exclusive occupation in the pearl trade ; inland the region is barren and desert. This province aes on the chiefs of Bahreyn, but it also pays tribute to

man.

Sharjah, a coast strip, with a seaport of the same name, east of Sharjah. Katar. It belongs to Oman, but has been often occupied by the Wahhabees. Sharjah is a great depot for slaves brought from the east African coast; the inhabitants are mostly concerned in the trade. The province counts thirty-five villages and 85,000 inhabit- ants. The present governor, Khalid-ebn-Sakar, whose authority also extends over the two next districts, is almost independent of the sultan of Mascat.

Roos-el-Jebal, also known as the Jowasimah, or Private Coast. Roos-el- The chief village, Rds-el-Kheymah, was destroyed by the English in Jebal. 1810, and again in 1819 ; although since rebuilt, it has ceased to be

MISTORY. |

ants, mostly Wahhabees, are savage in the extreme. Thcir numbcr is said not to exeeed 10,000; they speak a dialect of their own, almost unintelligible to the Arabs of the neighbourhood.

Kalhat, the coast region east of Cape Mesandom. Its principal village is the small seaport of Leemah ; the other hamlets are about

forty in number. The population, a rough seafaring set, is stated at 60,000. Batinch. This district includes the whole plain between the

mountains of Oman and the sea-coast as far as Ras-Heyran, cast of Mascat. It is the richest, best-watered, and most thickly populated in all Arabia, and contains several considerable towns, of whieh Mascat is the chief; and where the sultan, or, as he is sometimes ealled, imam, of Oman resides. The other principal towns are Matrah, ‘Barkah, Sohar, and Shenaz, all scaports of some activity ‘along the coast ; more than seventy other small towns and

villages are reported to be scattered through the interior. The population, all Biadeeyah, and mortal enemics of the Arabs of Nejd, is said to be 700,000.

Dahirah, the north-western province of Oman, having for its principal town that of Bereymah, besides several places of less im- portance. It is the only district where the nomade population bears any proportion to the settled : the total population is given at 80,000. fi. Walked of Nejd have often oceupied and still con- tinue to harass this part of the country.

Jebel Akhdar. This province, including the great fertile and well-peopled chain of the ‘‘ Green Mountains,” is to the kingdom of Oman what the province of Ared is to that of Nejd, the back- bone of the land. Here are the two towns of Nejwah and Bahhileh, formerly residenees of the sultan ; besides Zekee, Minah, and about seventy villages. The inhabitants are warlike, the women stately and beautiful ; all belong to the sect of the Biadceyah. The popula- tion is stated at about 600,000.

Belad Soor, a coast district, said to be moderately fertile from Mascat to Ras-el-Hadd. The port of Soor is the only place of any note, but scveral small villages are said to exist near the coast. Population about 100,000 ; among them are the Benoo-Aboo-Alee Arabs, famous for their brave resistance to our own troops in

1819-20.

Lastly, Jaylan, a wild region of which little is known, except that the inhabitants are uncivilised, and resemble in all respects those of Mahrah, with which province theirs is conterminous.

The entire population of Arabia proper has been vari- ously estimated ; some authors make it reach 12,000,000, others reduce it to 7,000,000. Taking the approximate statistics above given, we find for the whole of central Arabia, including Jowf, Shomer, and Nejd, about 1,500,000 settled inhabitants, with 500,000 Bedouins or nomades ; thus 2,000,000 may perhaps fairly represent the com- plete number. The east coast—Hasa, Bahreyn, Oman, and their adjoining districts—furnishes 2,500,000 more. Yemen is said to contain over 1,000,000: Hadramaut and Mahrah cannot be very populous: the Hejaz cer- tainly is not. 3,000,000 is the maximum

estimate of both taken together, nomades or villagers. To these must be added the tribes of the Sinaitic peninsula, and of the northern frontier. These may possibly bring the sum of the Arab population to 8,500,000, or even 9,000,000, with a quota of about one-fifth Bedouin to four-fifths of settled Arabs; to such small numerical proportions has the nation shrunk that once ruled by land and sea from the Indus to the Atlantic, and that even now, by its religion and institutions, gives the law to one-eighth of the human race.

History, The history of Arabia and its inhabitants naturally divides itself into two distinct and even dissimilar periods, that, namely, which preceded the era of Mahomet, and that which followed it. Each of these two periods, though comprising in its extent several Minor phases and fluctuations, now of advance, now of retro- gression, bears, however, a well-marked general character of its own. The first of the two periods is distinguished as one of local Monarchies and federal governments ; the latter commences with theocratic eentralisation dissolving into general anarchy.

The unrestrained imagination of Arab chroniclers has indeed added to their annals a third or pre-historic traet, peopled with heroes and giants, men of renown, sons of Anak, much resembling those who figure in early Jewish records, and, it may be not unfairly presumed, of analogous authenticity. ‘To such belong the fabulous tribes of ’Ad in the south, of Thamood in the north, and of Tasm and Jadis in the centre of the peninsula. Very gorgeous arc the descriptions given of ‘‘Irem,” the “city of pillars,” as the Koran

Dahirah.

Jebel | Akhdar.

Belad Soor.

| Jaylan.

_ Population.

| |

. Prehistoric _ Inyths,

a nest of robbers. This coast is very mountainous, and the inhabit- | styles it, sup

oe to have been erected by Shedad, the latest despot of “Ad, in the regions of Hadramaut ; and which yet, after the annihilation of its tenants, remains entire, so Arabs say, invisible to ordinary eyes, but occasionally, and at rare intervals, revealed to some heaven-favoured traveller. Vague reports of the colossal. ruins of aoa Thebes and Karnak probably originated the fancy. To Thamood are ascribed the more substantial traces of rock excavations in the north-western Hejaz ; while Tasm and Jadis are described as more scenite or Bedouin-like in their manners and mode of living. _Mahometan tradition, a mere travestie of the Jewish, and mostly derived from rabbinical sources, has attempted to construct a pseudo-genealogy of a Noachian character for every one of these imaginary or vanished elans. Further yet, it has, in its eagerness to find a confirmation of its own central idea, every- where ascribed their extinction to supernatural wrath, brought down on them, now by the rejection of some apocryphal prophet of the Divine Unity, now by atrocious misdeeds like those recorded of the inhabitants of Canaan or the Cities of the Plain. he sober historian, however, will, in the absence of any reliable evidence, documentary or monumental, abstain from pronouncing either on the character of these aboriginal tribes, or on the manner and causes of their disappearance. The first dawning gleams of anything that deserves to be called Old Arab

history disclose Arabia wholly, or nearly so, under the rule of a race monarch-

| of southern origin ; the genuine, or, as they are sometimes termed ies, .

from a mythical ancestor Kahtan, the Kahtanee Arabs. These, again, we find subdivided into several aristocratic monarchical governments, arranged so as to form a broad framework or rim round the central wilds of the peninsula.

Oldest and chiefest among the Arab monarchies was that of Kingdom of Yemen ; its regal residence is said to have been in the now aban- Yemen. doned town of Mareb, in the extreme south. After a devastating inundation, referred with some probability to the first century of the Christian era, the seat of government was removed from the ruins of Mareb to Sanaa, a city which has continued the metropolis of Yemen to the present day. The Yemenite kings, descendants of Kahtan and Himyar ‘‘the dusky,” a name denoting Afriean origin, and each adorned with the reiterated surname of ‘‘Tobba,” a word of African etymology, and signifying ‘‘ powerful,” are said to have reigned, with a few dynastic interruptions and palace revolutions, for about 2500 years ; during which long period they commanded the direct obcdicnce of the entire southern half of the peninsula ; while, by their tribute-collectors, and by chiefs of kindred or dele- gated authority, they indireetly governed the northern. One of these monarchs is asserted, though historical criticism will hardly admit the assertion for fact, to have subdued the whole of central Asia, and even to have reached the boundaries of China; while another antieipated, so runs the story, the later and more authentic conquests of his race on the north African continent. In both these cases Arab chroniclers seem to have appropriated for their own rulers, not without some additional exaggerations, the glories and exploits of the Egyptian kings. But that theirs was a vigorous and in some respects a civilised government, is attested alike by the literary and architectural relics of their time. Their sovereignty was at last overthrown, 529 a.D., by an Abyssinian invasion, and was re-established 603 A.D. as a dependency of the Persian empire, till in the year 684 it was finally absorbed by Mahometan conquest.

Next in importance to the kingdom of Yemen came the subsidiary Kingdomof monarchy of Hira, or, more correctly, Heerah, situated in the north- Hira. easterly province of Arabian Irak. Its kings, a eollateral branch of the royal race of Sanad, governed the western shore of the lower Euphrates, from the neighbourhood of Babylon down to the con- fines of Nejd, and along the coast of the Persian Gulf. The duration of their empire, fonnded in the second century after Christ, was 424 years. This kingdom paid an uncertain allegiance to their more powerful neighbours, the Persian despots ; and from time to time exercised considerable. influence over the

turbulent tribes of Central Arabia, till, like Yemen, it sank before the rising fortunes of Mahomet and his followers.

A third monarchy, that of Ghassan, lorded it on the north-west Kingdomof over lower Syria and the Hejaz: its independence was somewhat (Ghassan. tempered by unequal alliances with the Roman, and subsequently the Byzantine empire. It was founded in the first century of the Christian era, shortly after the flood of Mareb; and its duration, till subdued by the all-conquering prophct, exceeded 600 years.

A fourth government, that of Kindeh, detached itself from Irak Kingdomof early in the fifth century, and united under its sceptre the tribes of Kindeh northerly Nejd and even those of Oman, for about 160 years. Its kings were, like those before mentioned, of Yemenite origin ; but their rule was weak and disturbed by frequent wars.

Much has been written by Arab authors regarding the great inun- Flood of dation, as they term it, of Arem or Mareb, possibly a tropical cyclone Arem, of more than ordinary destructiveness, like that of 1867 in the West Indies ; and this event they love to assign as the proximate cause whieh dispersed the familics of Yemen over northern Arabia, and led to the foundation of the kingdoms of Irak and Ghassan. But the reality of the events, physical or political, symbolised by the

Prosperity of Yemen.

The “ Mus-

tareb” or northern Arabs,

Revolt of the north- ern Arabs.

Rise of Koreysh.

‘flood of Arem,” a counterpart, after its fashion, of the biblical flood, cannot uow be well deciphered. ,

This is, however, certain, that the Yemenite Arabs, and especi- ally those who tenanted the sonth of the peninsula, had during the period now cursorily sketched, attained a very fair degree of civilisa- tion ; that arts and commerce flonrished, that wealth was accumu- lated, literature cultivated, and talent held in esteem. On all these points we have not only the uncertain and distorted testimony of foreign authors, such as Strabo, Pliny, Diodorus, Ptolemy, and the like, but the more positive though fragmentary evidence afforded by the national writings, chiefly verse, that have survived to our day. In its general character and institutions the kingdom of Yemen seems to have borne a considerable resemblance to the neighbouring one of the Nile valley, on the other side of the Red Sea, and, like it, to have reached at a very early epoch a relatively high degree of prosperity and social culture, from which, however, it had long declined before its final extinction In the 7th century. But the daughter-kingdom of Hira had, as was natural, something of a Persian tinge ; while that of Ghassan took a more Byzantine colouring. Lastly, the nomadic element predominated in the ill- cemented monarchy of Kindeh. ;

But while the sccptre of Yemen was yet, In one form or other, outstretched over the length and breadth of the land, and its chil- dren, the genuine or African Arabs, formed a complete and dense eircle of population all around, the centre of Arabia remained the stronghold of a different though kindred race, composed of tribes almost wholly scenite, in their mode of living wild and ferocious ; less susceptible of culture, but gifted with greater energy and eoncentration of purpose than their southern cousins. The latest recorded emigration of this branch of the Arab stock had been not from the south but the north; and instead of the mythical Kahtan, they claimed a no less mythical Adnan, or his supposed grandson Nezar, for their ancestor ; their language, though ra ically identical with that spoken by the genuine Arabs, was yet dialectically different in several respects, and nearer to the Syriac or Hebrew. Lastly, unlike the Arabs of the south, they had little disposition for agriculture, and even less for architecture and the fine arts; their instincts leading them to a pastoral and consequently a nomade life. The almost infinite ramifications of these ‘‘ Mustareb” or ‘“adscititious Arab” tribes lead ultimately up to five principal stocks. Thesc were Rabeéah, which, however, laid some claim to a Yemenite kinsmanship in

the east centre of the peninsula; Koreysh, on the west; Keys, or Keys-Eylan, and Hawazin, on the north; and Tameem in the middle.

History has left unrecorded the exact date of their arrival in Arabia; nor has she defined the period during which they remained tributaries, though often refractory, of the kings of Yemen. But in the 5th century of the Christian era there appeared among the Mustareb tribes a leader of extraordinary talent and energy named Koleyb, sprung from the tribe of Rabeéah, who having, in the fashion of William Tell, slain with his own hand the insolent and licentious tax-gatherer sent them from Sanaé, raised the banner of

eneral revolt in Nejd; and, in the battle of Hazaz, 500 A.D., broke or ever the bonds of Yemen from off the neck of the northern or scenite Arabs. This done, Koleyb aspired to unite his countrymen inte one vast confederacy, over which he himself exercised for a time an almost kingly power; but the scheme was prematurely broken off by his own assassination. Left now without a master, but also without a ruler, the ‘‘ Mustareb”’ tribes found themselves involved in a series of wars that lasted during the whole of the 6th century, their heroic period. Yet in spite of severe losses sustained in battle by this or that particular clan, their power as a whole went on increasing, till at the dawn of the 7th century they had wholly absorbed the feeble kingdom of Kindeh, and encroached yearly more and more on the narrowing bounds of Yemen, Irak, and Ghassan. Nor, probably, would they have stayed till they had become absolute lords over the whole, or nearly the whole, of the peninsula, had there not developed itself from among them- selves a still more energetic element which, before many years had passed, reduced both northern and southern Arabs alike to common obedience, then raised them to an unexpected height of common glory, and at last plunged them, along with itself, into one comprehensive decline and ruin. This new and potent element was the well-known clan of Fihr or Koreysh. Its families, of Mustareb descent, had at an early period, which subsequent and Mahometan chroniclers have tried to identify with the fortnnes of the mythical Ismael, established themselves in the southerly Hejaz, near the town of Mecca, a locality even then the principal religious and commercial centre of Arabia. Already, at the beginning of the 5th century, the chiefs of Koreysh had, by a mixture of violence and craft very characteristic of their racc, rendercd themselves the masters and the

acknowledged gnardians of the sacred ‘‘Kaabeh.” This square stone temple, or rather shrine, itself of unknown antiquity, was situated within the precincts of the town of Mccca; and to it the Arabs were in the habit of bringing yearly offerings, and of making devout pilgrimages, for centuries before Mahomet had adopted it into the new ritual of Islam as the house of the true God. The

keys of the consecrated building had originally becn in possession of delegates appointed by the monarch of Yemen, but the Koreyshi Arabs, having once obtained them, held them fast for ever after, and successfully repelled every effort, both of their own pagan competi- tors and of the invading Christian Abyssinians, 570 a.D., to recap- ture or to seize them. ‘Their possession of the temple-keys not only gave the tribe of Koreysh a semi-religious pre-eminence over all the other clans of Arabia, but also placed at their disposal the treasures of gold, silver, jewels, aud other offerings accumulated by the pagan piety of ages in the temple of Mecca. |

A more important, as also a morc creditable, source of wealth to Trade with | the Korcysh clan was their Red Sea coast traffic, particularly with Yemen, | the ports of Yemen and Abyssinia. Jiddah has been always the chief westerly seaport, and Mecca, which is only a few leagues distant, the principal inland emporium of Arab trade; and under the dominating influence of the clever and active merchants of Koreysh, both placcs acquired special prosperity and importance.

Lastly, ouly a day’s journey distant from Mecca, was held, in the Fairof pre-Islamitic times, the great yearly fair and gathering of Okad, so Okad. ealled from the name of the plain where it used to assemblc,—a national meeting, frequented by men of all conditions, from all quarters of the Arab peninsula, and lasting through the entire month of Dhoo-l-kaadeh, which in pagan, as subsequently in Mahometan reckoning, immediately preceded the ceremonies of the annual pilgrimage. Here horse-races, athletic games, poetical recitals, and every kind of public amusement, diversified the more serious conimercial transactions of an open fair, that, in its compre-

hensiveness, almost assumed the proportions of a national exhibi- tion ; here, too, matters of the highest import, questions of peace aud war, of treaty and alliance, of justice and revenge, were habitually treated by the chiefs of the northern Arabs ; the “children of Mezar, ’ to give them their favourite ‘‘ Mustareb” patronymic, assembled in a sort of amphictyonic council, not less ancient, but, while it lasted, much more influential throughout Arabia than that of ‘Thebes ever had been in classic Hellas. In this assembly the immediate local proximity of the Koreysh chiefs, joined to their personal wealth, courage, and address, assigned them a predominant position.

Of their pedigree, which, as is well known, includes that of Origin of Mahomet himself, we have a carefully—too carefully, indeed, for Koreysh, authenticity—constructed chronicle, bringing the family tree up in dne form to Ishmael, the son of Abraham, of whom the Koreysh firure as the direct descendants. In the same artificial annals the

emenite or gennine Arabs appear under the cousinly character of the children of Joktan, the son of Heber. On these points all Mahomctan annalists are cqually positive and distinct; all other Arab testimony equally adverse or silent. That a fable so utterly defiant of rcasonable chronology, and even of the common sense of history itself, should have been adopted as matter of fact by Arab vanity and ignorance, is less surprising than that it should have found favour in the eyes of not a few, indced of most, of our own European writers. Enough here to say that Mahometan chroniclers, by adopting as irrefragrable historical authority the Jewish records, and then retouching them here and there in accord- ance with their own special predictions and tenets, have succeeded in concealing the truth of their own national identity and story from themselves and even from others, under an almost hopeless incrustation of childish fiction. A correcter version of Arab history and pedigree will, so far as possible, be given towards the end of the present article. To sum up, at the opening of the 7th century of our era, and coincidently with the first appearance of the pro- phetie antocrat and destined remodeller of Arabia, the overteeming life and energy of the great peninsula was, broadly taken, thns divided :—Foremost stood the tribe of Koreysh, with their allies, a powerful confederacy composed of tribes belonging to the Mustareb or northern stock, and occupying the upper half

of the westerly coast and region. Next in importance came the countless inde- pendent and, thus far, uncentralised clans of the centre of the peninsula; they, too, mostly are of Mustareb origin, though a few claimed the more ancient and aristocratic kinsmanship of Yemen ; but without, however, paying any allegiance to its rulers. Lastly, to the south, east, and north, still existed the noble but enfeebled relics of the old Yemenite kingdoms of Sanaa, Hira, and Ghassan, half-sunk into Persian or Byzantine vassalage, and exerting little authority, even within their own ancestral limits.

But, however important to the country itself and in their ulti- Contact mate results to the world at large, might be the events that took with place within Arabia during the pre-Islamitie epoch, they had small foreign bearing on the nations outside the peninsula. The Yemenite queen nation of Sheba's ambassage to Solomon, even if an historical event, led at least to no historical results; and with other coeval rulers and nationalities, Greek, Persian, and Macedonian, the Arabs rarely came into any other contact than that of distant and desultory traffic. Nor do the frontier skirmishes by which an Antigonus or a Ptolemy attcmpted, without success, to gain a footing in Arabia, deserve more than a passing notice ; and Pompey himself, victorious elsewhere, was foiled on its frontiers.

At. last, during the reign of Augustus, Hlius Gallus, the Roman

Heraclius, who, unaware at first of the importance of the crisis, Battle of had hitherto remained almost inactive in Antioch, his north-Syrian Yamook,

a ABT A

prefect of I'gypt, undertook a military expedition against Yemen itself, with the view of annexing that region, which report enriched

HISTORY. |

Rxpedition of Atlius

Gallus.

with immense treasures, to the Roman empire. With an army composed of 10,000 Roman infantry, 500 Jews, and 1000 Naba- theans, he crossed the Red Sea in 210 galleys, and landed at Moilah, or Leuce Come, in 25° N. lat., near the modern Yambo. After some delay, the consequence of disease and disorganisation among his troops, he marched southward until he reached the inland district and city of Nejran, on the nearer frontier of Yemen. The town of Nejran he is said to have taken by assault, as well as a few neighbouring places, probably mere villages, of little note. Meanwhile a large force of Arabs had assembled to oppose him, but Gallus easily defeated them, and advanced to Mareb itself, then, we may suppose, the capital of Yemen. But the Roman soldiers, unaccustomed to the heat of the tropical climate, and much reduced in numbers, were incapable of laying sicge to that town; and their general found himself thus forced to retreat, and recrossed the sea

residence and capital, now, roused to exertion, collected an army of 80,000 men, the greater number of whom, reinforced by 20,000 auxiliaries from among the Ghassanide Arabs, were led at first by the emperor himself, then by Manuel, a tried Byzantine general, to meet the ever-advancing Mahometans. These last, under the standard of Khaled, had already added Homs or Emesa, Baalbec or Heliopolis, and Hama, the Hamath of Scripture, to their list of conquests. They now fell back on a strong position behind the windings of the Yermook or Hieromax, a small stream issuing from the southern slopes of Mount Hermon, which now bears the name of Jebel-esh-Sheykh. The battle, in which Manuel took the offensive, Khaled the defensive part, raged for several days, and ended in the total defeat of the Greeks, 636 A.D., who are said to have lost upwards of 100,000 men, including Manuel himself, while at least 5000 of the victors remained on the

to Egypt without having effected any permanent settlement on the Arab side. Later attempts made by Roman governors or generals under Trajan aud Severus were restricted to the neighbourhood of the Syrian frontier; and the ruined cities of Bosrah and Petra yet indicate the landmarks of the extreme southerly limits reached by

field. Syria was uow open to the Arabs; and Jerusalem, which, Conquest of with the difficult and mountainous district of south-eastern Pales- Palestine, tine, had hitherto been prudently neglected by Mahometan strategy, Syria, and capitulated, 637 a.D., to the caliph Omar, who, apprehensive lest Mesopo- Khaled, if left to himself in Syria, should establish a semi-inde- tamia.

Abyssinian _ invasiou of Yemen.

imperial dominion over Arab territory.

More serious, and more lasting in its consequences, was the great Abyssinian invasion of Yemen in 529, when Aryat, son or lieutenant of the king of Abyssinia, landed in Aden with an army of 70,000 men, to avenge his co-religionists, the Christians, who had been eruclly persecuted by Dhow-Nowas, king of Yemen, himself a proselyte to, and an ardent propagator of, the Jewish code. The expedition was successful; Dhow-Nowas perished ; Christianity was proclaimed ; and for seventy-six years the Ethiopian conquerors retained subject to their rule the southern and richer half of the peninsula, Their king Abraha even advanced, in 569 A.D., the year of the birth of Mahomet, as far as Mecca; but beneath its walls suffered a repulse, which has been magnificd by the Koran and Mahometan tradition into the proportions of a miracle. Persian assistance, furnished by the great Chosroes, ultimately enabled the Arabs under Seyf, son of Yezen, the last direct lineal descendant of the old kings of Sanaa, to liberate their territory from its dusky usurpers, 605 A.D.

The 7th century had now eommenced, and before long the wonderful successes of Mahomet, or, in more correct orthography, Mohammed, 622-632 a.p., while they closed in one great centralis- ing effort the era of Arab progress and development within the Tan, opened a marvellous phase of new activity and almost bound- less extension without. The story of the great prophet and of his book, the obstacles he encountered and overcame, his lahours, his reverses, his wars, his final and decisive success, belong to the separate article that bears his name. Here it may suffice to state that at his death, 632 a.p., the eleventh year of the Islamitic era of the Hejrah or flight, which he himself had founded, Mahomct left the entire Arab peninsula, with the sole and transient exception of the tribe of Tameem, and

a few Yemenite clans, who for a short while preferred the revelations of his rival Moseylemah, the “‘ false prophet” of Nejd, united under one sceptre, and in one creed.

After the disputes which might naturally be expected from a general election and turbulent electors, and which, fomented by the ambitious and intriguing Ali, nephew and son-in-law of the prophet, ran so high between the ‘‘ Ansar,” or chiefs of Medinah, and the ‘‘ Mohajireen,” or those of Mecca, as to threaten the pre- mature disruption and extinction of the Islamitic empire, Abu- Bek, father of Ayeshah, the favourite wife of Mahomet, was chosen to be the great man’s caliph,—‘‘ Khalecfah” is the Arab word— or successor, His reign lasted only two years; but it sufficed for the subjugation of the rebel tribes of Nejd and Yemen, the conquest of Damascus, and the commencement of the long career of victory that carried the arms, the language, and the institutions of Arabia over half the old world, from the banks of the Indus to the shores of the Atlantic, and from the burning sands of the mid-African desert to the green vineyards of pleasant France. These events we will now pass in cursory review.

Syria, distracted by long sedition and the bitter rivalry of ecclesi- astical sects, fell a first and comparatively easy prey to the hardy invaders. Led by Khaled, the boldest and most talented among the early Mahometan generals, the Arab troops occupied Bosrah, overran the region of Hauran, and advanced against Damascus. The Byzantine army hurriedly sent by the Greek emperor Hcraclius to the telief of the besieged town, was defeated with tremendous slaughter on the plains of Eznadin, where fifty thousand men are said to have fallen on the Christian side alone; and Khaled, following up his victory, instantly invested the capital of southern Syria. After a Seventy days’ siege, and in spite of the brave defence made by the Christian garrison under the leadership of Thomas the patrician, son-in-law of the emperor himself, Damascus was taken, half by storm, half by capitulation, on the 3d of August, 634 a.p., 13 a.n.; and amid all the vicissitudes of succeeding eenturies has remained ever since, not only a Mahometan, but an Arab city.

pendent principality of his own, came thither in person to receive the keys of the holy city. Aleppo, and Antioch itself, soon followed

last the sea-coast, with Jaffa, Beyrout, Tripoli, and its many othe1 towns and ports, was overrun; and within six years from the death of Mahomet the entire Syrian region, from Mount Taurus to the Red Sea, had become what, so far as language and usages are eon- cecrned, it has never since ceased to be, an Arab province. Within a short time after, Mesopotamia underwent the same fate ; and the conquests of Tarsus and Diar-Bekr brought the Arabs in immediate contact with the uplands of Armenia and Koordistan, which for all succeeding times remained the ultimate limits of their permanent occupation.

With so much fighting on their hands to the west of the Euphrates, Conquest of the Arab conquerors had for awhile refrained from attacking the Persia.

great Persian empire to the east of that river, except by a few desultory and for the most part unsuccessful raids. Nor did the battle of Hira, in which the Arab armies under Jereer destroyed a large body of Persian troops, and avenged the previous losses of their countrymen, more than restore the apparent balance between the two empires. But Yezdegird, the last of the Persian monarchs, rashly provoked the extreme chances of a decisive war by sending his best general, Rustum, across the Euphrates with an army of 120,000 men, to offer battle to the Arabs, then commanded by Saad, a native of Yemen, in the open plains of Kadcseeyah or Cufa, not far from the site of ancient Babylon. After four days' hard fighting, the Persians gave way, having lost the greater number of their men, besides the imperial standard, once the apron, so tradition said, of an Ispahan patriot blacksmith, and for many ages the palladium of Iran. 'The Arab general, profiting by the utter discomfiture of his opponents, crossed the Euphrates and the Tigris, took possession, almost without resistancc, of the royal capital of Medain or Ctesiphon, where spoils of immense value were found, and pushed on to the more ancient metropolis of Susa, in Chusistan. But the completion of the work of conquest was reserved to his successor in the field, Néoman Ebn-Mekran, who in the battle of Mahavend, 641 a.p., near Ecbatana or Hamadan, destroyed the last hopes of Persian independence. Yezdegird fled, to fall soon after by the hand of an obscure assassin; and his daughter, carried away captive, was taken in marriage by Hasan, the son of Alse—an ill-omened marriage, that, by its dower of Persian pretensions and

sympathies, contributed not a little to the disunion and subsequent downfall of the Arab empire. The whole of Persia, from the Caspian and the Euphrates to the Indian Ocean, now re- ecived the religion and the rule, though not the language, of Arabia; Khorasan, Kerman, Mekran, Seistan, and Balkh, were next subdued, and for a while the Oxus became the eastern limit of Arab doniinion. Thus before a century had clapsed the entire region west of the Indus obeyed the Arab and Mahometan caliph of * Dainascus.

Westerly the first Arab conquest was Egypt.

armah, or Pelusium, the easterly key of Egypt, was first reduced, and the conquerors, proceeding inland, assured their communica- tions with Arabia and the Red Sea by the occupation of the Delta and Cairo. Thence, after much hard fighting, they reached and invested the city of Alexandria, and a fourteen months' siege was rewarded by the capitulation of that city, December 22, 640 a.p. No further resistance was offered; the Coptic population gladly exchanged the polished but heavy Greek yoke for the barbarous but lighter rule of the Arabs; and Egypt, like Syria, has remained socially, though not politically, a dependency of Arabia to the pre- sent day. The subjugation of northern Africa, including Tripoli, Carthage, Tangier, and the entire coast from the Nile to the Atlantic, occupied sixty years more; but in the battle of Utica,

This important Conquest of acquisition was made by Amroo, a man alike distinguished as a Egypt and ee and_a statesman, during the reign of the caliph Omar. Africa.

Conquest of

Spain.

Invasion of

France.

Extent of the Arab empire.

Internal organisa- tion.

Internal history. The first four caliphs.

258

698 A.D., the last remnants of the Byzantine empire were obliterated from the southern shores of the Mediterranean, and Africa was no less closely and permanant semesee to the Arab empire than Svria and Egypt had already been.

vat last, Cae opening ot the 8th century, Musa, the talented and ambitious administrator of these vast provinces, received the well-known message of the traitor, Count Julian, that brought on the invasion of Spain. At the order of Musa, his lieutenant, Tarik, crossed the straits which yet bear his name, 711 A.D.; and soon

after disembarking in Andalusia, met and defeated the armies of

Spain in the decisive battle of Keres, where Roderick, last of the Gothic kings, lost his crown and life. Tarik, 16,000 of whose goldiers are said to have remained on the field, requested and re- ceived fresh troops, with which he speedily reduced Malaga, Granada, Cordova, Seville, and finally the Spanish capital, Toledo, itself. Musa now followed in person, took the command somewhat abruptly from his lieutenant, received the submission of Saragossa and Barcelona, reached the Pyrenees, and reduced the whole of Spain, Galicia excepted, to an Arab dependency. His own recall and disgrace, the result of court intrigue and royal ingratitude, stayed awhile the further spread of the Arab torrent.

But in 731 A.D. the celebrated Mahometan general, Abd-er- Rahman, at the head of a numerous army, crossed the Pyrenees, and by the victorics, or rather massacres, of Arles and Bordeaux, re- duced the whole of France south of the Loire. But at Tours he met the main French army, commanded by Charles Martel, mayor of the palace, and founder of the Carlovingian dynasty. Here, in a bloody battle of seven days, the tide was turned. Abd-er-Rahman himself fell, and his troops were dispersed, and fled, never to return. Not long after, 759 a.D., Pepin, son of Charles, delivered France

from the lingering vestiges of Mahometan rule. Spain, however, remained for more than five centuries an Arab settlement ; and her language, literature, and usages bear even yet the imprint of those who ruled her so long. Sicily too, Candia, Rhodes, Cyprus, Malta, Sardinia, and even Corsica, with other islands of less note in the Mediterranean, became each in turn, though none for long, Arab possessions. In Asia Minor, on the contrary, on the shores of the Black Sea, and east of Samarkand, the Arab invaders, in spite of brave and reiterated attempts, two of which, 670 and 717 A.D., were directed against Constantinople itself, were never able to make good their footing. But at the close of the Benoo-Omeyyah dynasty, 755 A.D., their empire comprised the whole basin of the Mediter- ranean, with the exception of its northern side; in Africa its only limits were the great central desert, in Asia the plateau of Kobi and the Indus, and throughout almost all these regions the Arab element either remained absolutely predominant down to our own time, or has at least left distinct traces of its existence.

We must now give a brief glance at the internal condition and institutions of this vast empire, which were such as to afford from the very first no favourable omen of political stability. Mahomet, when dying, not only omitted to name a successor, but, worse still, designated no electors; and through all the centuries of Arab rule the conditions both of elective and of hereditary right were never accurately defined. Hence the early rivalries, already alluded to, between the ‘‘ Ansar” and the ‘‘ Mohajireen ;” and hence, not long after, the yet more dangerous contention between the family of Omeyyah, from which Othman, the third Mahometan caliph, descended, and the kindred house of Hashim, the more immediate relatives of the prophet. Meanwhile, within the ranks of Hashim itself, Ali, nephew of Mahomet, and husband of Fatimah, his only daughter, denying every right of free election, advanced his own special title to the throne by the presumed claim of nearness of blood, a title persistently urged by his descendants, and for centuries a constant source of dissension and weakness in the empire. Nor, whilst the nomination of the caliph himself, the centre and keystone of the Arab political edifice, was thus left un- defined, were the remaining details of the construction at all preciser in their character. No accurate line of demarcation separated the executive from the judicial, or these again from the financial depart- ment; no municipal organisations

were established or even acknow- ledged ; absolute despotism was the only form of government, whether primary or delegated, in the capital as in the provinces; actual resistance and revolt the only remedies against its abuse. i an empire might conquer, but could not govern, at least for

ong.

These inherent evils manifested themselves by their unmistake- able bad effects from the very first. Once only, when Abu-Bekr died, 634 A.D., after only two years of reign, the elective accession of Omar, the austerest, but also the most capable of all the early Arab rulers, was sanctioned by an almost unanimous approval ; though even then the restless intrigues of the ambitious and un- principled Ali made themselves manifest. After a glorious reign of ten years, the conqueror of Syria, Persia, and Egypt, perished, 644 A.D., assassinated by a Persian slave, Firooz by name; and Othman, son of Affan, of the noble family of Abd-esh-Shems, was elected in his place. The twelve years of his administration were ceaselessly disturbed by the insubordination of Ali and his

partisans, who at last, impatient of delay, broke into the residence of the ancient caliph at Medinah, and murdered him there, 656 A.D. Stained with blood, Ali usurped the throne; while Ayc- shah, daughter of Abu-Bekr, and widow of the prophet, collected round her the avengers of the blood of Othman, and the first civil war of Islam was inaugurated by a hard-fought battle, known as the “ Day of the Camel,” near Bosrah, 656 A.D. Ayeshah was de- feated ; but the cause of Othman was soon after taken up by his talented kinsman, Muawwiyah, governor of Syria, who in the pattle, or rather series of battles, fought near Sofeyn, on the upper Euphrates, 658-9 A.D., broke the strength of Ali’s faction. Driven from Syria, Egypt, and Arabia, Ali retired to Cufa, where an assassin’s dagger avenged on his own person the crime by which he had opened the way to ill-gotten and precarious power, 660 A.D.

Muawwiyah, left by his rival's death sole though not undisputed Ommiade emeer-el-moomeneen, or ‘“‘rulcr of the faithful,” fixed his seat of caliphs, government at Damascus, where he and the fourteen succeeding princes of his line ruled for eighty-nine years. Victorious abroad, his dynasty, generally called by European authors the ‘ Ommiade,” from the name of Omeyyah, father of the race, was for its first forty years harassed by frequent insurrections within the limits of the empire. The initial disturbances from which all that succeeded directly or indirectly took rise, were due to the intrigues of the two sons of Ali, Hasan and Hoseyn, both of whom were deeply imbued with Persian superstition, and who thereby soon gave the schism that they headed a religious as well as a political character.

After the death of the lazy and contemptible Hasan, his younger Revolt of

and more active but equally faithless brother Hoseyn, raised the Hoseynan standard of revolt in the eastern provinces, where he hoped to the Ali gather round him his Persian auxiliaries ; but before he could draw family. his followers to a head he was met at Kerbela, on the Euphrates, by the well-organised troops of the caliph Yezced, son of Muawwiyah, and perished miserably, 680 A.D. His descendants and kinsmen, for there were many, continued, however, now one of them, now another, to revive the pretensions of their family; and for more than a century they disquieted the empire, especially on its eastern and southern frontiers, with sedition and rebellion. At last their evident defection from orthodox belief, joined to the extravagance. and liceutiousness both of their teaching and practice, so disgusted the Arab race that scarcely any adherents were left them, except among the Moorish tribes of northern Africa, where their influence, founded on the strangest impostures, predominated for a time, and in the still more congenial soil of Persia. There indeed the sect obtained a permanent footing and ultimate supremacy. Thus originated and thus was perpetuated the first and widest spread of Mahometan schisms; the adherents of the legitimate caliphate and the orthodox doctrine assuming the name of ‘‘Soon- nees” or ‘ Traditionalists,” while the sectaries of Ali are known as ‘‘Sheéah” or ‘‘ Separatists”” to this day.

More formidable, however, to the Damascus princes, though sooner Revolt of extinguished, was the revolt of Abd-Allah, son of Zobeyr, a brave Abd-

Alla but uarrow-minded leader, and nearly connected by blood with Ebn-Mahomet himself. Supported by the townsmen of Mecca and Zobeyr. Medinah, besides a great proportion of the northern or “ Mustareb 4 tribes, he was for more than ten years acknowledged as caliph by half the Arab world, till slain by Hajjaj Ebn-Yousef, the greatest of the Syrian generals, during the storming of Mecca by the Damascene troops, 692 A.D. The intrepid but ferocious Mukhtar, at first a supporter of Abd-Allah but afterwards his rival, and head of the ‘‘ Khowarij ” or ‘sceders,” maintained a separate revolt on his own account in Cufa, till slain in battle by Musaab, son of Zobeyr, brother of Abd-Allah. The ‘* Khowarij,’”’ however—brave and well-meaning though visionary men, some of whom were nothing else than over-zealous Mahometan priests or reformers; others, sectaries of Ali and his fantily ; others, again, free-thinkers of repub- lican tendency—found a new and successful leader in the couragcous Shebeeb, a native of Hasa, who for several years maintained their cause on the upper Euphrates, while the revolt of a large portion of the Ommiade army itself, in the extreme east of the empire, where the caliph’s own general, Abd-er-Rahman, headed the insub- ordination, shook the empire to its foundations. But over these and other encmies triumphed the military and administrative skill of Hejjaj ; and it was only under him, the scourge of rebels, and pillar of the Ommiade caliphs, 705 a.p., that anything like real internal tranquillity was even for a brief period given to the empire.

Half hereditary, half elective, the family of Omeyyah numbered Decline of fifteen successive princes on the throne, mostly men of talent, able Ommiade administrators, and sone of them distinguished authors and poets. dynasty But their personal merits were unavailing against the downward progress of disorganisation, the necessary result of an essentially defective system of government, and rapid territorial extension out of all proportion with the means of consolidation ; and the latter years of their dynasty present a melancholy scene of turbulence and confusion. Then appeared a new enemy, more dangerous than any of the preceding, to the Damascus sceptre, in the person of Ibrahim, great-grandson of Abbas, the uncle of the Prophet, who after lon and secret intrigues, now gave himself out as the acknowledge

head of the family of Hashem, from old time the hereditary enemics of the no less noble family of Abd-esh-Shems and Omeyyah, and consequently the legitimate claimant of sovereign power. His cause was upheld by the terrible Abu-Muslim, a gloomy but talented fanatic, native of Khorassan, who raised on Ibrahim's behalf the standard of revolt in Kerman. Soon Persia and its adjoining provinees, despairing of pare themselves a worthy leader among the frivolous deseendants of Ali, joined the kindred ranks of the children of Abbas. Ibrahim, indeed, perished; but his younger brother, Abd Allah Abu-Abbas, more known in history as '' Es Saffah," or ''the Bloodshedder," took his place, and was proclaimed caliph everywhere to the west of the Euphrates. Syria, Arabia, and Egypt still held out for Merwan, tlic last of the Ommiade ealiphs ; but the great military talents, stained by remorseless eruelty, of Abu-Muslim, turned the seale. The decisive battle was fought on the banks of the river Zab, near Irbcel (the Arbela of classic history), 749 A.D., and the whole of Syria was soon after overrun by the black-turbancd armies of Persia. Merwan himself, after much unavailing display of personal courage, ficd to Damaseus, and

ants of Abbas held for a century the substance, and for four centuries more the shadow of a seeptre. Some of their names, and that of Haroon-el-Rasheed, 768 to 809 a.D., in particular, are con- neeted with great events and famous memories, but the records of their reigns belong to Perso-Asiatie rather than to Arab history. Indeed, from the death of the eighth caliph of the race, El-Mostd- sim, 842 a.D., to the aceession of the last of their dynasty, El- Mostasim, 1242 a.D., these prinees were mere puppets in the hands of the Persian, Koord, Turkoman, or Turkish mereenaries, by whom they surrounded themselves as a protection against their own Arab subjects. Meanwhile provinee after provinee separated itself from their empire, and reasserted its own native character and in- dependence, till in 1258 a.p. the pagan and Tatar chief Holagoo, grandson of Genghis-Khan, stormed Bagdad, and extinguished the decrepit dynasty of Abbas in the blood of the last caliph. Yet Arab genius, though deprived of political support, maintained by its plulosophieal and literary vigour through all those dreary cen- turies, nor has even in our own time wholly lost, a certain intel- lectual ascendancy in Baghdad and its vieinity.

thence to Egypt, where he was overtaken aud killed by his pursuers, 750 A.D. Urged on by the pitiless Abu-Muslim, who shortly after himself

Meanwhile the Arabian peninsula itself, neglected or despoiled Kar- by the Abbaside ealiphs, had sunk year by year more deeply into mathian

| Fate of the clannish disorganisation, till the revolt of the Karmathians, about revolt.

- Omeyyah family.

Decline of

fell a vietim to the suspicions of his own equally eruel but more treacherous master, the victorious Saffah sought out everywhere the members, however remote, of the Omeyyah family, and put them to death under eircumstances of the most infamous barbarity. The very tombs of the dead were broken open, and the bones of the great Muawwiyah and his noble sueeessors dispersed. One youth of the doomed house alone, Abd-er-Rahman by name, effeeted his eseape to the still friendly provinces of Africa, and thenee to Spain, where he founded the illustrious dynasty that ee in Cordova over the Iberian peninsula for two centuries and a half.

But with the fall of the Benoo-Omeyyah dynasty and the caliphate of Damascus fell the prosperity of Arabia herself, never again to rise. Arabs of the noblest, wealthiest, and most gifted stoek, deseendants of the prineely Abd-Shems, the head of Koreysh in pre-Islamitic times, the Ommiade princes had established the centre of their government in a eity intimately connected by land and by sea, by commerce and by nationality, with Arabia proper and the Hejaz, and in steady adherenee alike to the feelings and policy of their race, they always regarded their native country as

the end of the 10th and the beginning of the 11th ceutury, de- tached Arabia definitely from the overgrown empire that she herself had founded. This revolt had been long preparing. Hatred of cen- tralised rule, a strong attaehment to loeal, tribal, and even in some places semi-municipal organisation, both joined to a deep under- lying seeptieism, had from the very first originated and fostered throughout Arabia a wide-spread, though

eovert opposition to the establishment of Islamitic despotism, and jealousy of the pre- dominanee conferred by Mahomet and his successors on their kins- men of the northern and western tribes, and on Koreysh in par- ticular, had united in secret antagonism to Islam and the caliphate the other tribes of the peninsula, but especially those of the centre, east, and south. Hence the Karmathian outbreak soon took the form of an Arab reaetion against foreign and uncongenial in- fluences and institutions, and being sueh, could hardly fail of substantial suecess. As to the special tenets professed by the Karmathians—so called from Karmath, their mystic founder, cire. 890 A.D. —they were, in their ultimate expression, panthcistic in theory and socialist in practice.

the choicest jewel in their own imperial crown. They were Arabs first and caliphs afterwards. Hence it was from Arabia that they drew almost exelusively the officials of their world-wide administra- tion, both for peace and war; the provincial governors, generals,

From the sea-coast provinces of Bahreyn and Katar, its first Dis- avowed eentre, the uprising, headed by its terrible leader Suleyman organisa- Abu-Jahir, spread rapidly over the rest of Arabia; and in the year tion of 929 of our era Mecca itself was stormed, and the Kdéabeh ruined by Arabia.

| Policy of the Abba-

Decline of

eolleetors, judges, administrators of their nomination were all, or nearly all, of Arab blood ; and the improvement or enrichment of Arabia herself, the facilitation and extension of Arab trade and commerce, and the encouragement of Arab talent, literary and artistic, were the foremost of their cares. Meanwhile the peninsula, obedient indeed to the caliph as to its supreme head, but retaining in great measure the local institutions of its hereditary government by chiefs and in tribes, enjoyed a degree of general tranquillity, and even of comparative unity, that it had never realised selec? nor has ever sinee. Even the hereditary rivalry between the northern or “¢ Mustareb”’ Arabs, who about this time assumed the title, which they still bear, of ‘‘ Keysee,”—a title derived from the numerous and influential stoek of ‘‘ Keys-Eylan,” and thence communicated to the rest—and the southern

or ‘‘ Yemenee” Arabs, a rivalry founded in diversity of race, fostered by long and bloody wars, and con- tinued, though under certain modifications, to our own time, might, and often indeed did disquiet, but could not overthrow, the beneficial order of prevailing tranquillity.

With the aecession, however, of the Abbaside caliphs, 750 a.p., the good days of Arabia eame to an end, Though they also were, like their Ommiade predecessors, Arabs by origin, and indeed of the purest Arab blood, they owed their place on the throne, not to Arab partisans, but to the influence and the arms of the anti-Arab and eastern provinecs, Persian, Tatar, and Turkoman, beyond the Tigris ; whilst the Arab half of the empire had almost unanimously deelared for their supplanted rivals. Hence the Abbaside policy rested on a non-Arab base ; and its representatives, although de- scendants of Koreysh and Hashim, systematically negleeted or even depressed the Arab element of their rule, while they strengthened and elevated the Irano-Turanian or eentral Asiatic. Their throne, at first transferred from Damaseus to Hashimeeyah, the newly- founded residenee of Abd-Allah Es Saffah, on the Euphrates, was soon after removed further east to the banks of the Tigris. Here, close to the ruins of the old Persian eapital of Madain, the seeond Abbaside caliph, Almansur, laid, 766 a.D., the foundations of that great city which, under the Persian name of Baghdad, still remains a monument of his personal energy and of the policy of his raee.

Within its walls, surrounded by Persian ministers or slaves,

his troops, while the sacred black stone itself was earried off to Hasa, where it remained twelve years. The feeble attempts of the Abbaside caliphs to check the movement proved utterly ineffectual ; all was confusion, and for two centuries more a bloody partisan war, or rather an ever-recurring series of petty wars, devastated the peninsula. When this at last gave placc to the quiet, not of peace but of exhaustion, Arabia, from Syria to Aden, was, with the sole exception of the narrow Hejaz eoast-strip, detached in faet as in name from the pseudo-Arab empire of Baghdad, and had returned to its primitive independenee. But by the same process the land had relapsed, hopelessly this time, into the semi-barbarism that in- variably follows a prolonged vieissitude of petty tyrants, vicinal wars, interrupted

communications, waste of life and property, and the fatal insecurity of universal lawlessness. Ease, wealth, trade, seicnce, literature, all had perished from Arabia, till after a long anarehy, of which little memory is preserved, and that little of less interest, the country subdivided itself into the provineial seetions that, with slight modifications, it has retained ever sinee.

of the Nebhan and subsequently of the Yaarebah elan; while its rulers, in opposition to the orthodox head of Islam at Baghdad or elsewhere, assumed the half spiritual title of Imam, and have since retained it. Yemen, the wealthiest and most populous territory of Arabia, split up into an infinity of petty provinecs, governed each by a distinct prinee, while some one or other would from time to time assert a transient sovereignty over the rest. The barbarous districts of Mahrah and Hadramaut on the south-east, with the mountain fastnesses of Nejd and Shomer, were abandoned to the anarehy of elannish allianees or feuds. The Hejaz alone, with the saered territory or Haram of Mecea, under the headship of the ‘‘shereefs” or ‘‘nobles,” the lineal descendants of Koreysh, re- tained some kind of eonstituted authority conneeted with the outer world, and paid a respeetful but distant allegianee, sometimes to the government of Baghdad, more often to that of Egypt.

For, on the ruins of the Aghlabite dynasty, founded by Ibrahim Fatimite | Ebn-Aglab, the general of Haroon-el-Rasheed in North Africa, 797 dynasty in A.D., With the inland city of the Keyrawan for eapital, there had Egypt.

arisen, 909 A.D., a new kingdom, that of the Fatimites, so designated

the Abba- amongst whom the family of Barmek has attained a tragieal | from one Obeyd-Allah, its originator, a real or pretended deseend- = eelebrity, and by an armed body of Turkish or Turkoman guards, | ant of Ali and Fatimah. These Fatimites, able but tyrannical caliphs, at first their servants, but before long their masters the descend- mysties, having united under their rule the whole of the north

Oman, Rearrange- with the adjoining regions of Katar and Hasa, was organised into a ment of the semi-eleetive monarchy of a limited charaeter, under the leadership provinces.

Turkish occupation.

African coast, invaded Egypt; and Moezz-Allah, their caliph, hav- ing, 972-8 A.D., driven the Abbaside governor from the shores of the Nile, established his own throne in the city of Cairo, which his victorious general Jowher had founded the year previous. From this capital he and his descendants ruled for two centuries more, not only over Egypt, lower and upper, but, though at the price of frequent wars, over Syria to the east and Tripoli to the west, till the last of the Fatimite caliphs, Adhid-Billah, was, 1171 a.D., de- throned by the Koordish conqueror Salah-ed-Deen, better known in history and romance as Saladin, the chivalrous opponent of our own Richard I. But though no Arab prince has ever since reigned in Egypt, the Hejaz with its sacred cities remained annexcd to that country, and Yemen in part followed suit. ‘

At last, 1517 A.p., the Turkish sultan, Selim I., conquered Egypt, and obtained from the last real or supposed surviving Abba- side kinsmen of the prophet a formal investiture of the Mahometan caliphate, which thus definitely changed the character of that office from national to politico-religious. On this occasion the shereef of Mecea presented the sultan with the keys of the city; and the Arab tribes in general, those of the east excepted, proffered their allegi- ance to the Ottoman government. This subjection, real in Hejaz and Yemen, neminal elsewhere, the country continued for half a century, till the shereef Muttahir, impatient of a foreign yoke, attacked and routed the Turkish force of occupation, then com- manded by Murad Pasha, and for a short time re-established Arab independence. Selim II. sent fresh troops, who at first gained some advantages over the Arabs; but in 1630 the Yemenite chief Khasim expelled the Turks from the whole of his native province, and restored a shadow of the old Himyarite throne at Sanaa. Here, 1761 A.p., the celebrated Danish traveller, Niebuhr, found the

Kingdom of Imam, as he was styled, of Yemen, governing thirty provinces, six

Yemen.

Hejaz.

Other pro- vinces,

Rise of Wahhabus or Abd-el- Wahhab,

Wahhabee reform.

on the coast and twenty-four inland, besides several smaller states ; and possessed of an income, chiefly derived from the custom-dues of Loheya, Mokha, and other seaports, equalling, it was thought, £1,000,000 sterling per annum. The standing army was reckoned 4t 5000 men, mostly infantry. Subsequently, Wahhabec encroach- ments on the north, the British occupation of Aden to the south, and Egyptian invasion under Mehemet Ali and his successors, con- siderably weakened the power of the Imam of Sanaa, till in 1871 a Turkish army, sent from Syria, took the capital, and put an end to the Arab dynasty of Khasim. At the present date Yemen is a proviuce of the Ottoman empire, though with every prospect of not long remaining so.

Between the Hejaz and the Ottoman government the yearly pil- grimage, with the accompanying largesses of the Ottoman sultans, ormed a more enduring link; one interrupted, indeed, from time to time by occasional rebellions, but as often renewed by Arab neediness, till the province, with its sacred cities, was definitely annexed, though only for a time, by the great Egyptian usurper Mehemet Ali.

But in the rest of the peninsula, in Nejd, Oman, Mahrah, Had- ramaut, and the other adjoining districts, the Ottoman claims were from the beginning of the 17th century absolutely ignored, and no collision was possible, because no point of contact existed. This state of things was, however, at last modified by the Wahhabee movement, onc of the most important in the history of Arabia, and the end of which we have not yet seen. Of this a brief account must now be given.

Born at the town of Horeymelah, in the centre of Nejd, 1691 A.D., Abd-el-Wahhab, or the ‘Servant of the Bountiful,” had in early life travelled far in Mesopotamia and Syria, report even adds India, seeking knowledge in

observation and the conversation of the learned, to whom his own superior intelligence gave him recom- mendation everywhere. Returning in mature life to the secluded quiet of his native land, he gave himself up to thought and study, mostly theological. Convinced by the comparison between what he read and what he had seen in his travels, and continued to see around him in Nejd itself, where hardly a vestige of Mahometanism remained, that the primitive faith of Islam had become consider- ably corrupted in theory and totally so in practice, and that Turks Persians, and Arabs, were all of them in fact, though after different fashions, no longer true Muslims, but mere idolaters and _poly- theists, he determined himself to inaugurate a reform that should reassert the doctrine and practice of the Koran as they had been at the beginning.

The invocation of saints, including Mahomet himself, i borrowed by Mahometanism from foreign example ; ae Hey Pe paid at the shrines and tombs of the dead ; the use of intoxicating liquors ; the wearing of silk and gold—to sum up, every belief or practice directly or indirectly condemned by the Koran, or even not sanctioned by it—with all these Abd-el-Wahhab declared open war. His special and notorious prohibition of tobacco, a prohibi- tion rigorously observed by his followers, and which subsequently became in a manner their distinctive badge, must be attributed to an excess of sectarian puritanism; nor can it be doubted that hatred of foreigners, and of the Turks in particular, had a large sliare in the zeal manifested by himself and his disciples for what they, not

altogether wrongly, considered as in a peculiar sense the national or Ara itself.

about forty years of age, and, like the himself the persecution of those he failed to convert. Eyaneh, where he had established himself, by the hostility of its chiefs, by the far-sighted Arav, governor of the neighbouring province of

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religion ; it was a view that had the sanction of the Koran Like Mahomet, Abd-el-Walhab commenced his preaching when prophet, soon drew down on Driven from

themselves stirred up to persecution of the rigorous doctrines

Hasa, he found refuge with the sheykh Mohammed Ebn Saood, the

warlike chief of Dercyceyah, who put his sword and that of his

clan at the disposal of the new apostle. The reform thus supported goon extended itself, partly by persuasion, partly by force; and when Abd-el-Wabhab died in 1787, at the advanced age of ninety- six, he had already scen his doctrines dominant from the coast of Bahreyn to the confines of Mokha and Aden.

His disciple and patron, Ebn Saood, after many victories gained Ebn Séood, over the governor of Hasa and other enemics or rivals, died in 1765, Conquest leaving the whole of Nejd, now consolidated into one government of Nejd. under one head, to his son and successor Abd-el-Aziz, who, on his Abd-el accession, now assumed the titles of Imam and Sultan. Under this “V0 °” chief the important provinces of Abu-Areesh, south of Mecca, and we F, of Nejran, on the frontier of Yemen, were added to the Wahha- von bee dominions. These conquests, or rather annexations, naturally the Ti enough excited the alarm of Ghalib, the shereef or governor of Mecca, who by his representations succeeded in at last awakening the long negligent Turks to the danger which threatened their frontiers from the national and religious union of the Arab race.

- Orders were issued from Constantinople, and in 1797 an army of

5000 Turks, with an equal number of allied Arabs, advanced into

Hasa, which had already become Wahhabee territory, and laid

siege to Hofhoof, the capital of the province. But harassed by the Wahhabees and fearful of risking a general engagement, they retired

without having effected anything except to provoke the bitter resent-

ment of an encmy who had now learned not only to hate but to

despise them. The consequence was that the Wahhabees before Storming long took the initiative; and in 1801 their collected armies invaded of Kerbela. the territory of Baghdad, and laid siege to Kerbela, a locality famous for the tomb of Hoseyn the martyr, son of Ali, and a centre of popular Mahometan superstition. The town was stormed, the inhabitants massacred, and spoils of immense value were transferred from its shrines to the Walihabee treasury. Victorious on the east, the Wahhabee arms were next directed westward; Taif, the well- known pleasure-ground of Mecca, was invaded and subdued with great bloodshed in 1802; and in the April of the following year Mecca Taking ef itself, though not till after a brave resistance, came into Wahhabee Mecca. possession. Ghaleb fled to Jiddeh, the only place in Hejaz that

held out against the invaders; and Sdood, son of Abd-cl-Aziz formally assumed the government of Mccca, whence he dictated

to the Porte the terms on which alone he declared that he would henceforth permit the observances of the yearly pilgrimage from all

parts of the Mahometan world. Shortly afterwards he succeeded in

person to the Wahhabee imamate, his father having been assassin-

ated by a Persian in the mosque at Deréyeeyah.

Under Sdood the Nejdce kingdom attained its greatest extension Séood’s and_ prosperity. Internally its government was such as that of reign. ‘Arabia had been under the first caliphs and their Ommiade suc- cessors, —namely, a despotism regulated by the prescriptions of the Koran; and the revenues at Saood’s dispesal fluctuated betwcen £200,000 and £300,000 yearly. This sum he expended chiefly for military purposes. In 1804 he conquered Medinah, plundering the rich offerings accumulated by the superstition of ages round the prophet’s tomb, besides treating the inhabitants of the town with great severity.

From this date till 1811, open war, in which the Wahhabees were

generally successful, was waged between them and all their neigh- bours on every side, but especially against the Turks, whose Syrian possessions were ravaged sometimes by Sdood's best general Abu- Noktah, sometimes by his gigantic negro lieutenant Hark, up to Anah on the Euphrates, and within sight of the walls of Damascus. At this time, too, the inhabitants of Bahreyn and the adjoining coast having embraced Wahhabee doctrincs, combined them with profitable piracy on the Persian Gulf, till the British expeditions sent from Bombay in 1810 and 1819 broke up the robber nest of ep and set bounds to the insolence of the piratical zealots.

For during these events the customary pilgrimage of Mecca and Medinah had been interrupted, the Wahhabecs allowing none but such as conformed to their own doctrines aud habits to approach the sacred cities. Thus the whole extra-Arabian Mahometan world was roused to indignation against the new and exclusive reform; and the Ottoman Porte, after some futile efforts of its own, con- sented to entrust the chastisement of the Arabs to its doubtful and already over-powerful Egyptian vassal, Mehemet Ali.

In 1811 this cruel and treacherous but highly began the work, and, in spite of many difficulties and never faltered in it till it was fully accomplished.

talented man War with even reverses, Egypt. The details of

Tousoon Beg's cam- paign.

the campaign that reduced Arabia, though only for a few years, to an Egyptian province, being well known, a very summary mention may here suffice. Tousoon Beg, son of Mehemet Ali, commanded the first expedi- tion. It was directed against the northern Hejaz, and landed in 1811. at Yembo, which town the Turks took and made a base of further operations. A severe check inflicted on then by the Arabs in January 1812 retarded their advance, but by the end of the year Tousoon stormed Medinah, and his troops made a frightful massacre of the Wahhabee garrison and inhabitants;

to which atrocity the treacherous murder of 1500 more, who after holding out long and

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The Egyptian government, by this time at open war with the Ottoman, niade several unavailing attempts to put down the revolt ; but the wars between Mehemet Ali and the Porte in Syria and Anatolia diverted its serious attention from the less important, because poorer, acquisitions made by Ibrahim in Arabia, till in 1842 Khoorshid Pasha, the last representative of Egyptian rule, was, partly by force, partly by craft, for Feysul was a master in both, compelled to quit his frontier residence in Kaseem; and this populous province was re-annexed to the Walhabee empire, while Aseer, throwing off foreign rule, returned to Wahhabeeism and independence.

bravely in the town castle, had surrendered on terms of safe-conduct, was soon added. Meantime the intrigues of Mehemet Ali detached the shereef Ghaleb from the Wahhabee cause; and Jiddeh was treacherously surrendered to the Turks in 1813. Mecca and the Taif

Hasa, Hareek, the whole of Nejd, Kaseem, and the provinces Present adjoining Yemen on the north, with Asecr, were now re-united condition under the sceptre of Feysul, and a broad belt of Wahhabee rule of central thus again stretched across the centre of the peninsula, from the Arabia,

Mehemet Ali’s cam- paign,

Tbrahim Pasha.

} Fall of the

Wahhabee

| kingdom,

Egyptian

district were immediately occupied by Ottoman troops. Mchemet Ali now came over in person ; and his troops having been reinforced by those of his son Tousoon, he felt himself strong enough to break his promises to the sheykh Ghaleb, whom he arrested, dis- possessed of power, and sent to die in exile. ;

For a year and a half Mehemet Ali remained at Mecca, collecting his forces for a dscisive blow. Meanwhile, in 1814 Saood had died, leaving as successor his son Abd-Allah, a chief equal to his father in every respect except prudence, in which he was unfortunately deficient. Mehemet Ali having completed his preparations, left Mecca early in 1815 with a large army, and advanced towards Yemen; while the Wahhabees, who are said to have been 30,000 strong, occupied the mountain pass of Bisha on the way, and rashly hazarded a general engagement. The battle, in which Mehemet Ali displayed much personal courage, was desperate, and ended in the utter discomfiture of the Arabs, several thousands of whom were killed on the field. Mehemet Ali followed up his victory, and in a few months had reduced the entire mountainous district north of Yemen, besides taking alive as prisoners Bakrooj and Tami, two of the most renowiied Wahhabee chicfs, both of whom, in violation of his promises, he miade be put to death with atrocious tortures. But the exhaustion of his own soldiers obliged him to relinquish his further march south; he returned to Mecca, and in the summer to Egypt; Tousoon Pasha, left to conduct the war, concluded peace with the Wahhabees, and shortly after himself died of the plague. The treaty he had sigued was disavowed both at Cairo and Constan- tinople; and in September 1816 the cclebrated Ibrahim Pasha, adopted son of Mehemet Ali, landed at Yembo, and commenced the final campaign. For more than a year he exercised his troops in frequent but well-timed and generally successful skirmishes with those of Abd-Allah, who in person commanded the Wahhabee armies; while his crafty diplomacy, equal to that of Meliemet Ali hinself, won over tribe after tribe to the Mgyptian cause. Well supplied with provisions, and his flanks covered by his Arab allies, Ibrahim, in spite of a severe repulse beneath the walls of E1-Rass, subdued the entire province of Kaseem, entered Nejd on the north- west by the pass of Shakrah, aud in April 1818 appeared beneath the walls of the capital, Deréyeeyah, on which Abd-Allah with his forces had retreated.

The siege lasted five months, and was conducted with great ability by Ibrahim, whose military skill at last triumphed over the deter- mined courage of the garrison and inhabitants. Not, however, till the town had been gradually reduced to a confusion of ruinous heaps did Abd-Allah consent to surrender, and then only on honourable terms, which, as usual, the conqueror granted freely, but with no intention of observing. The Wahhabee chief was sent under strong guard to Egypt, and thence to Constantinople, where, December 19th, 1818, he was beheaded in the public square in front of St Sophia.

Deréyeeyah was razed to the ground by the conqueror, and

his family had fled to the mountainous fastnesses of Toweyk, soon organised guerilla bands, that, aided by the peasants, succeeded in rendering the central and eastern provinces of the land untenable by the Turks. The inhabitants of Hareek and Hasa were the first to throw off the yoke; and the town of Riad, celebrated as the birthplace, 1400 years before, of the prophet Museylemah, now became the restored Wahhabee capital. Turkee, like so many other Arab rulers, fell the victim of an assassin, but his son Feysul succeeded to his ability as well as to his popularity and power.

Red Sea to the Persian Gulf. But over Bahreyn, Oman, and Yemen, the Wahhabees, though they have frequently attempted it, have never been able to re-establish their former dominion; and in Shomer and Jowf to the north, between Nejd and Syria, a new kingdom of a different and much more liberal character, that of the brave and clever Telal, sprung up, and has since maintained its independence. Nor have the often-repeated Wahhabee inroads on Mecca and the Hejaz been attended with their former success. Still, within its actual though narrowed limits, the Walihabee government has remained well-organised and strong,—a constant menace to its neighbours, and a genuine specimen, nor a wholly unfavourable one, of Arab autonomy. But in 1870, Feysul, already aged and blind, was assassinated, as his father had been before him, and the dissensions of his two sons, Abd-Allah and Sdood, the former of whom advanced the rights of first-born, the latter those of popularity to the throne, led to a civil war, and gave occasion to Ottoman interference. An armed force was sent, and advanced along the shore of the Persian Gulf into the province of Hasa,

where it occupied the capital, Hofhoof. With this, however, its suceess terminated, and the difficulties of crossing the ‘‘ Dahn4” desert strip seem likely to place an effectual barrier to any further progress. Aseer, however, a stronghold of Wahhabeeism, has been mvaded by the Turks, who have gained there some temporary and superficial advantages, while the new kingdom of Shomer, weakened by the untimely death of its accomplished prince Telal, has also offered facilities for Turkish interference, though not of a military description.

To these varied changes the kingdom of Oman has for many Oman.

generations remained in great measure a stranger. But its eapital, Mascat, was occupied by the Portuguese in 1508, who retained it till the middle of the 17th century. It was then retaken by the Yaarebah princes, who had all along maintained their power in the interior, and now for a century more became the sole though not the undisputed rulers of Oman, which was at this time often harassed by Persian invasion. In 1737 the country was formally attacked by the armies of Nadir Shah ; the principal towns were at last taken, the inhabitants massacred, and for four years Oman groaned under the Persian tyranny.

occupation remains at this day, like Eyaneh, a formless heap, The provinces of | Persian, and a long strip of African sea-shore, south of Cape of Arabia. Hareck and Hasa submitted after slight resistance; and the whole | Guardefui, with the islands of Socotraand Zanzibar. Sultan Sdood

| of Arabia, Oman excepted, now lay at the mercy of Ibrahim, who | was killed in 1804, but his son, of the same name, proved his not | showed none. After a bloody series of executions and massacres, | unworthy successor; and though unable to prevent considerable f he placed garrisons in all the strongholds that he permitted to | encroachments of the Nejdee Wahhabees on the north and west of | remain standing; and Arabia had to submit to the military con- | his dominions, saved Oman itself from conquest and annexation. scriptions aud other exactions and oppressions that have ruined, and | He consolidated the Arab power in Zanzibar and the east African still ruin, every other province of the Ottoman empire, aggravated | coast ; and when he died in 1856, after reigning fifty-two years, he

in this case by the licentiousness of the conquerors and the long | left the kingdom of Oman the most flourishing state in the entire

outstanding mutual hatred of Turk and Arab. Arabian peninsula. Its proximity to India has often involved this

Revival of | Ibrahim returning to Egypt, left Khaleel Pasha as vice-regent of | government in relations, sometimes amicable, sometimes hostile, Wahhabee Arabia, who for a while maintained despotic rule over the country. | with ourselves; but a dctail of them need not detain ushere. Suffice power, But Turkee, the younger son of Abd-Allah, who on the downfall of | it to say, that on the death of Sultan Siood, Zanzibar was, partly by

British influence, detached from the Arab empire ; while the death of the late Imam, Thoweynee, son of Saood, who perished, assas- sinated by his own son, in 1866, inaugurated a period of civil wars, from which Oman is still suffering. Her Wahhabee neighbours, too, continue their restless attempts at encroachment on her western frontier, while Katar and Bahreyn, with their pearl fisheries, have been wholly lost to the Mascat sceptre.

Lastly, the Hejaz is at the present date absolutely under the Turkish government, while Aden has, ever since its first capture in

Ottoman power in Arabia.

Future prospects.

A nti “ quities,

Destruc- tion of antiquities by the early Ma- hometans.

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1839, remained a British possession. Thus Nejd itself, with the inland districts immediately adjoining, and the desolate coast distriets of Mahrah and Hadramaut, are now the only parts of the peninsula where Arab independence ean be said fully to maintain itself; though with this

difference, that in the last-named pro- vinees it is merely the independence of barbarism and poverty, while in the former it is that of organisation and not eontemptible resources. Nor can it be well doubted that the reeent encroach- ments of the Ottoman government, or rather misgovernment, will prove equally ephemeral with those of ‘Sultan Selim or Mehemet Ali, and that Arabia will in a short time, probably within a few years, regain its previous autouomy. Arab institutions are far from perfect, yet they are better than Ottoman oppression, and the ‘Wahhabee empire might easily, under a judieious head, relax from its intolerance and “become a centre, not of strength only, but of order, prosperity, and even civilisation, for the whole Arab nation, restoring, not, indeed, for external conquests, the days of by, but for internal wellbeing, the better dynasty.

eee

on same scala

Sketch, showing relative size of Arabia.

Arabia proper is singularly destitute of antiquities, in the ordinary sense of the word, the northern or “ Adscititious ” Arabs having been, so long as they remained within their own territory, a remarkably unconstructive race, and the “pure” or southern Arabs not much better in this respect. Niebuhr, in his justly celebrated Travels through Yemen, mentions the ruins of Ghamdan, the ancient palace of the Himyarite kings, near Sana4, as well as the remains of several other fortresses in adjoining villages; but these ruins, like those subsequently visited by Palgrave in Jowf, bore no distinctive traces of architecture or date, beyond a barbaric coarseness of material and great thickness of wall. More remarkable, because better defined in history, are the remains of the great dyke of Mareb already mentioned : its vestiges, said to be colossal in their dimensions, extend across a ravine of about 2 furlongs in breadth ; they are in part of hewn stone, and testify, if not to the skill, at least to the diligence of the Himyarite Arabs. A few Himyaritic inscriptions have been discovered, some in Yemen, more in the provinces of Hadramaut and Mahrah, but have been too carelessly copied to afford proper materials for philo- logical investigation. When decipherable, they indicate a dialect resembling the Abyssinian or Amharic; but throw no real light on the history of the country or the condition of its inhabitants.

It is true that in addition to the non-constructive character of the early Arab race, account must be taken of the destructive policy, aggravated by iconoclastic zeal, pursued by the conquering Mahometan tribes of the north, who within their own territory, even more than in the acquired lands of Egypt, North Africa, and elsewhere, carried out the plan of establishing their own religion and system, not merely on the ruins, but, so far as possible, on the effacement of whatever had preceded it. Hence, of the old idol temples which once covered Arabia, nothing now remains except the megalithic vestiges of an enormous stone circle, resembling those found in some parts of Europe, and consisting of large boulders, each about 14 feet high, placed

‘| original pagan shrine. almost a trapezium, though the sides and angles are slightly

from 35 to 40 feet. entrance door is placed 7 feet above the ground ; the entire

on end, and originally crowned by a similar horizontal series. This was visited by Palgrave when travelling in the province of Kaseem, near Bereydah ; two others are reported to exist in the same district. Nor, the Meccan relics apart, had any of the numerous idols once worshipped throughout the peninsula been discovered till the Swiss Munzinger, three years since, found among the heaps of

deserted village near Aden a small bronze statue repre senting a naked hermaphrodite figure, over the head of which rises an ornament resembling the Egyptian pshent.

The black stone of the Meccan Kaabeh, said to be of The black volcanic formation, and perhaps an aerolite, had, however, stone and been an object of popular adoration long before Mahomet Kaabeh. preserved it from destruction by giving it a place in a new and more enduring superstition ; and the Kaabeh itself, though ruined and rebuilt again and again, the last

time in 1627, till not a vestige probably of the original structure now remains, has yet, it appears, certainly preserved the outline, and, in all essential respects, the dimensions of the It is an oblong massive structure,

unequal; its length 18 paces, its breadth 14, and its height There are no windows, and the only

building is of large, irregular, and unpolished blocks of ordinary stone. Its ornamentation is wholly modern.

Lastly, several wells, jotted with seeming capriciousness Wells.

over the desert, are said to be, and probably are, of great antiquity ; certainly they are works which much exceed the skill of the Arabs of our own day. One such, “ Beer Shekeef” by name, in the north-west of the peninsula, presents a cylinder of ebout 5 feet in diameter at top, but gradually enlarging till it reaches the water at a depth of nearly 200 feet, and is lined with hewn stone throughout. The Arabs declare it to be a work of pre-Islamitic times. Less remarkable in its proportions, but not less ancient, is the holy well called of Zemzem, at Mecca, But this and the great mosque of that city, as also the famous mosque of Medinah, which encloses the tomb of the prophet, and other buildings of the same category, will find their proper place in other articles. So will also the celebrated excava- tions of Petra, which, besides their being beyond the limits of Arabia proper, are not in themselves Arab but Graeco- Roman in their character. With regard to the numerous mosques and other buildings, some of great beauty, erected by Arab architects in conquered countries, as in Syria, Egypt, Africa, or Spain, they are in fact nothing more than adap- tations of the various local styles, and often of the very materials that the conquerors found ready to their hand.

But if poor in architectural, Arabia is superabundantly Literature, rich in literary monuments. Passing over as of more than Pre-Islam- doubtful authenticity the verses ascribed to kings and heroes itie poe of Yemen, especially at dates of a thousand years or more before the Christian era, we find undeniable specimens, at least two full centuries before Mahomet, of poems which in vigour and polish yield to few ever composed in the Arab or in any other language. To give at length the names and stories of the

authors, many of them men, and even women, no less distinguished in their day by the sword than by the pen, would be, in a brief review like this, merely to note a dry and unmeaning catalogue. Suffice it that, even at this early date, we find the metrical and rhythmical laws, simple yet susceptible of the highest art, which have ever since regulated Arab poetry, already laid down in their completeness, and exemplified, the former by a scansion of almost Horatian elegance and variety, the latter by a severe nicety that Pope himself might have admired, but could hardly have imitated. Divided into sixteen classes, each class including several variations, the metres are based, like the Greek and Roman, on long and

_ Public re- _ citatious.

short vowels, irrespective of accent, but admitting caxsura, elision, and every prosodiacal delicacy. Some are adapted to gay, some to serious topics : love, war, description, moral precepts, philosophical speculation, elegy, satire—all find here their appropriate expression. The rhyme, which often involves not one but two syllables, isin every picce deter- mined by that of the opening line. Alternate rhymes, choruses, and accentuated instead of quantitative metre, did not appear till later, and were imitated from extra-Arab models.

Yearly, at the festival of Okad, the best masters of the art used to meet for the purpose of reciting their com- positions, and receiving the reward, not of applause only, but also of more tangible advantages. Eulogies of chiefs, rulers, and distinguished men, formed a considerable portion of the poctry of those days ; and a single ode or “ kaseedah,” as it was called, has been known to be rewarded, according to the means or liberality of the person eulogised, with a hundred valuable camels, or scveral thousand gold pieces. Love and war had also their inevitable share in the domain of verse, and descriptions of manner and scenery occur, though rarely in comparison. Lastly, elegies—some of them very touching in their deep and tender melancholy —and didactic pieces, chiefly ethical, take rank among the most carefully finished productions of the early Arab muse. Meanwhile, the greater number of poets had each his special patron, whose generosity took charge of the remuneration that in our days is looked for from the press;

while a greater degree of publicity was given to a few chosen works of genius by the custom of suspending in some place of common resort (the Kaabeh, it is asserted) such pieces as in the yearly gatherings of Okad had obtaincd the highest palm of acknowledged excellence. Seven of these, known in Arab literature by the title of the Miallakat or “ Sus- pended,” as being emphatically the best of their kind, and all of them belonging to the 6th century, have become for succeeding ages the accepted and classical standards of Arab poetical composition.

Written prose up to the date of Mahomet’s appearance

- there was absolutely none ; and spoken eloquence, though

always highly esteemed and diligently cultivated among the Arabs, had never been embodied in the permanence of writing. The irregular, half-rhythmical, half-rhyming sentences of the Koran were the first attempt in the direction of prose, which afterwards came into general use, and was applied to history, biography, philosophical treatises, romance, and every other description of subject. But prose never emancipated itself wholly from its original trammels of a misapplied cadence, to which was also too often added a redundant phraseology, the latter partly due to Persian literary influence ; this florid style being, how- ever, with many authors varied by breaks, as it were, of writing as excessive in its plainness as the other in its ornamentation.

But if unsuccessful in prose, the Arabs were not so in poetry. This, even before the era of the prophet, had, as we have seen, attained no ordinary degree of excellence ; and it reached its highest point during the following century, under the Ommiade dynasty, when Omar Ebn Rabeeyah, of the tribe of Koreysh ; Jameel, of the Benoo Adbrah ; Jareer and Farazdak, both of Tameem; and Noseyyeb, a negro by birth—the first and second masters of erotic, the third and fourth of satirical, and the fifth of descriptive poetry —with a cloud of lesser celebrities, lived and sang in the sunshine of the Damascene court. The 8th and 9th centuries, agitated by civil dissensions or oppressed by the tyranny of the Abbasides, were less favourable to the Muses, till the reaction of the Greek and Persian minds, with which the Arab spirit was now yearly brought into more intimate contact, gave rise to a new and

brilliant school, less true to the simplicity of nature or the purity of Arab diction, but richer in imagery and deeper in philosophic thought, illustrating, too, the transition from the objective to the subjective which has accompanied and half veiled decline in the literature of every nation, turn after turn, Abu-Teman, of the tribe of Tai, known not as a poet only, but also as a critic and the compiler of the celebrated anthology, the Hamasa, the “ Golden Treasury ” of the Arabs, first came forward in this field. His

suc- cessor, the well-known Mutenebhe, is still esteemed by many the greatest of Arab poets'; in range of thought and polish of diction he certainly excels all besides. Later still, in the 11th century, appeared Toghrai, who in his Lameyyah, the title of his principal piece, entered the lists against Shanfarah, the most brilliant of pre-Islamitic poets, and, it scems, furnished our own Tennyson with the model of his " Locksley Hall ;' while a little later, Ebn Faridh, in Egypt, composed the mystico-erotic volume that has never in its kind been surpassed, or even equalled, by the poets of any land.

With the decline of the Arab race, however, their muse Decline of drooped also, and for many centuries maintained but a literature.

languishing existence, which in our own time has been galvanised rather than invigorated into a kind of revival by the modern literary schools of Beyrout, Damascus, Baghdad, and the Hejaz. In Nejd, Yemen, and Oman, rough poems on the primitive Arab model, besides others modulated with alternate rhymes, and in which accent takes the place of prosody, a species commonly called " Nabtee " or Naba- thean verse, are yet in vogue. The Hispano-Arab poets, mostly mere imitators, and in bad taste too, need not detain us here. Epic and dramatic poetry were never even attempted by the Arabs.

Romance, analogous though not similar to the European Romance.

novel, was always a favourite branch of Arab literature ; and in the Thousand and One Nights it obtained a world- wide celebrity and success. The original of this enter- taining work appears to have been composed in Baghdad about the 11th century; another less popular but very spirited version is probably of Tunisian authorship, and somewhat later in date. The stories of Antarah, of the Benoo Hilal, of Mohalhel, of Barakat, and countless others, belong to the same class of writings, though cast in more of a biographical form, not unlike that adopted by the great Defoe. Strictly objective in character, the Arab novel, though often a vivid portraiture of the outside of men and customs, has never portrayed, or attempted to portray, the inner workings of the human mind.

With memoirs, biographies, collections of anecdotes, and Biography.

the like, Arab literature is stored in excess, the bulk of such works being, as might be supposed, of somewhat superficial interest ; while not a few of them are, on the contrary, possessed of great merit and value. Thus the Book of Songs, or “ Kitab el Aghanee,” composed in the latter part of the 10th century by Abu-Faraj, of Ispahan, and containing, in twenty successive volumes, short but entertaining notices of all the principal Arab poets or singers, with specimens of their compositions, is, in addition to its speciality, a perfect treasure of the most varied information regarding the men and the times ; and the Life of Mahomet, by Abul-Feda, of Aleppo, displays considerable critical acumen as well as narrative power. Nor should we forget the judiciously-selected biographies of Mahometan celebrities by Ebn Khallikan, in the 12th century, or those of Koteybah of an earlier date; but of such compositions as these the Arab namc is legion.

History, however, proved from first to last an effort History,

beyond Arab skill, which contented itself with the less intellectual task of multiplying chronicles to an almost unparalleled amount. In this the voluminous work of Ebn

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writings.

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Atheer, which, after commencing the Arab annals, along with those of the world from the creation itself, earries them down to the overthrow of the Abbaside caliphate in the 13th century ; that of Musa’oodee, containing a pre- Islamitic summary of the geography and history of the world in general, till the birth of Mahomet, after which the chronicle confines itsclf exclusively to the fortunes of the Arab empire ; and that of Abul-Feda, especially intercst- ing by its curious notices of pagan Arabia, may be mentioned as favourable specimens in their line. In particular, Egypt was amply

chronicled by Makreezee and Siyootee ; Spain by Makkaree ; Africa by Ebn Kateeb ; Syria and Baghdad by writers out of number. A more voluminous,

and, it must be added, a more childish collection of writings

could scarcely be found in any language.

We may imagine (for it would be a waste of time to catalogue) the theological writings, glossaries, commentaries, discourses, and so forth, which, from the first century of Mahometanism to the extinction of Arab empire, have illustrated or obscured the great book on which that empire was founded—the Koran. Beydawee in the 10th, Jelal-ed- deen and Bokharee in the 11th, and FE] Ghazalee in the 12th century of our era, each was in his day considered a master in Islam, and their treatises are still reverentially studied in its schools. Legal dissertations by Malek, Ebn Haubal, Shafeyee, Hanefee, and their disciples, load the shelves of every Arab bookcase; but the authors them- selves were mostly of extra-Arab origin, and often reflect the Persian, the Turkoman, and even the Byzantine, rather than the genuine Arab mind.

From the fancies of astrology, in which the early Arabs _—-not wiser than their neighbours, but favoured with clearer skies—seem to have indulged freely, and which, though discountenanced by the practical good sense of Mahomet himself, have never been wholly abandoned by their descendants, a not unnatural transition led to the more useful study of astronomy. Specially patronised by the Abbaside caliph Al-Mamun, the Augustus of his race (813-833 a.p.), this science made great and rapid progress. The obliquity of the ecliptic, the diameter of the earth, and even the precession of the equinoxes, were then caleulated with commendable accuracy; and shortly after, Abul- Mezar’s Introduction to Astronomy and his Treatise on the Conjunction of the Planets, with the Elements of Al- Furjanee (though this last author was largely indebted to the Egyptian labours of Ptolemy), proved that the caliph’s liberality had been well bestowed. But Al-Batinee, a native of Syria (879-920 a.p.), surpassed all his pre- decessors in the nicety alike of his observations and eom- putations, Geber, at Seville, eonstrueted (1196 A.D.) the first astronomical observatory on record ; and Ebn-Korrah in Egypt proved by his example that the Arabs could be even

better astronomers than the Greeks had been before them. Yet although the doctrine of attraction seems to have been dimly surmised by some of them, none ever succeeded in emancipating themselves from the clumsy and erroneous Ptolemaic geocentric system.

In mathematics the Arabs based themselves on what they had acquired from the Greek and Indian originals; the former gave them geometry, the latter algebra. Satisfied at first with translations of Euclid, Apollonius, and others, they ultimately left their masters behind. They reached in the 10th century the limits of spherical trigonometry, and solved quadratie and even cubic equations. In these studies the astronomers Geber and Ebn-Moosa ehiefly dis- tinguished themselves. Optics, too, and hydrostatics were investigated by the professors of Baghdad ; but no special progress or remarkable discoveries are recorded as having been made in these sciences, In mixed as well as in pure mathematics the leading-strings of the Greek became the

‘ fetters of the Arab mind. Their practical application,

preacher.

however, of hydraulics in the construction of wells, water. works, reservoirs, sluices, canals, and the like, does them great eredit ; and of this peculiar skill ample traces, ill maintained by succeeding governinents, remain in Spain, North Africa, Egypt, Syria, and Mesopotamia.

Debarred by religious scruples from the representation Fine arts, of animated forms in sculpture or painting, Arab decorators (for they are no more) found themselves restricted to vegetable or fantastic patterns and colour combinations, and in these, as the Spanish Alhambra and other buildings ean testify, showed themselves no mean proficients. They ; made great use of glazed tiles and stucco, and possessed the art—one that they have lost long ago—of staining glass. Lastly, music, as the handmaid and enhancer of Music. poetry, was a favourite and honoured pursuit among the ~ Arabs, who, with comparatively rough instruments,—the rudiments of the

flute, harp, tabor, and guitar, rather than the instruments themsclves,—and with a scale, carefully and scientifically elaborated, but essentially differing from our own, produced results that real excellence alone could have merited or obtained. The voluminous “ Book of Songs” already alluded to contained the history and points out the distinctive characteristics of a hundred airs, each estecmed a masterpiece by competent judges. For one alone its composer received from the Caliph Al-Nathik Billah (842 A.D.) a sum equivalent to nearly £2300 sterling. It is notice- able that though the best voices were furnished by the Hejaz, the instrumental and scientific part was perfected by Persian instruction under the Abbaside caliphs of Baghdad.

More widely recognised, however, are the Arab claims to Medicine proficiency in medicine, an art which Mahomet himself and appears to have dabbled in, showing himself, if tradition SU”8°Y- speaks true, by no means so good a physician as he was a Under the ealiphs, however, regular schools of the therapeutic science were established in Damascus, Baghdad, and Cairo, where the works of Hippocrates and Galen, translated from their originals in Greek, were adopted as the basis of instruction. Hence the great medical treatise entitled Kl-Melekei, or “The Royal,” of Ali-Ebn-Abbas, which appeared in Aleppo towards the end of the tenth century, was cssentially an enlargement of and appendix to the Galenic teaching. Shortly after Er-Razi, the Baghdad professor, published his writings on pathology, containing the first authentic description of exanthematons diseases. The Canon of Ebn-Sina, commonly known as Avicenna, born 980 a.p., with his Materia Medica, which preluded in some respects that of Paracclsus, ultimately, however, superseded every other work in the Arab schools. But the neglect of anatomical study, with a superstitious horror of the practice of dissection, rendered the surgery of the Arabs imperfect and their medicine empirical. The invention of the probang and some improvements in the lancet and the eouching needle are due, nevertheless, to Arab surgeons.

Botany was ehiefly studied as subsidiary to medicine ; Botany and nor did chemistry ever attain the dignity of a separate chemistry. science ; as, however, an adjunct to the old herbal pharma- eopeeia, it received elose and not unsuccessful attention. The principal mercurial and arsenical preparations of the materia medica, the sulphates of several metals, the pro-

perties of acids and alkalies, the distillation of alcohol,—in fine, whatever resources chemistry availed itself of up toa very recent date—were, with their practical application, known to Er-Razi and Geber, already mentioned. In fact, the numerous terms borrowed from the Arabie language— alcohol, for instance, alkali, alembic, and others—with the signs of drugs and the like, still in use among modern apothecaries, have remained to show how deeply this science is indebted to Arab research.

| Grammar and rhe

“Mechanical javentions. their invention and skill to most of the more complicated

Finally, aud as though to counteract any foreign in- | while the popular words ‘‘ morocco ” and “ cordovan ” attest

fluence that the cultivation of these exotic sciences might correlatively introduce, Arab grammar and rhetoric were, from tle days of the first Ommiade to those of the last Abbaside caliph, considered an indispensable item of respectable cducation. Every nicety of the language was investigated in the 8th, 9th, and 10th centuries by the rival schools of Cufa and Bosrah; and the Alfeeyah, a gram- inatical treatise of the celebrated Kbn-Malek, a native. of the latter city, who flourished in the 9th century, is even now the standard work in the hand of every professor. But for absolute mastership, joined with exquisite taste, in the use of the subtlest refinements both of rhetoric and grammar, the palm must be assigned to Hareeree, the author of the celebrated Makamat or Stations, a work esteemed by many as hardly less wonderful in the talent it displays than the Koran itself. It belongs to the 11th century, and though it has had many imitators, has never yet acknowledged a rival.

Industrious and enterprising, the Arabs led the way by

manufactures of our own times. In metallurgy, their art in tempering and enamelling has become justly famous ; nor did any sword-blades ever rank higher than those of Damascus, nor any coppersmiths excel those of Baghdad, or gold and silver workmanship that of Oman. Specimens of their skill in porcelain yet remain in Spain and Syria ;

their cleverness in preparing and dyeing leather. The pendulum and the semaphoric telegraph, if not invented, as some think, by the Arabs, were certainly introduced by them into Europe, as was also the manufacture of silk aud of cotton, and an invention of the highest value—the mariner's compass. As early as 706 a.p, writing-paper was made at Mecca, whence it spread through all the Arabian dominions, and ultimately reached the Western world. In the discovery or use of gunpowder, so far back as the 11th century, the Arab claim to priority is contested by the Byzantines alone.

In a word, the literature, arts, and sciences of the Arabs Influence of formed the connecting-link between the civilisations of the Arab ancient and modern times; and the culture which they ™2=¢

introduced into the countrics they conquered has in almost every instance outlasted the rule of the conquerors them- selves. To them, directly and indirectly, we owe the revival of learning and philosophy in Western Europe, and the first awakening of the critical and inquiring spirit that has in great measure rescued Europe from the lethargy of monkish ignorance and ecclesiastical bigotry ; to them also, at least indirectly and by deduction, are due most of the useful arts and practical inventions laboriously perfected by later nations. Wide-spread as was the empire of the Arab sword, it has been less extended and less durable than the empire of the Arab mind. (Ww. G. P.)

ARABIAN PHILOSOPHY owed to Arabia little more |

than its name and itslanguage. It was a system of Greek thought, expressed in a Semitic tongue, and modified by Oriental influences, called into existence amongst the Moslem people by the patronage of their more liberal princes, and kept alive by the intrepidity and zeal of a small band of thinkers, who stood suspected and disliked in the eyes of their nation. The

Arabian philosophers have but a secondary interest in the history of their own lands. Their chief claim to the notice of the historian of speculation comes from their warm reception of Greek philosophy when it had been banished from its original soil, and whilst Western Europe was still too rude and ignorant to be its home. In the annals of philosophy the period from the beginning of the 9th to the close of the 12th century may be styled the "Flight into Egypt." During these four centuries free thought found a refuge under Mahometan princes until her oppressors were dead. In the course of that exile the traces of Semitic or Mahometan iufluence gradually faded away; and the last of the line of Saracenic thinkers was a truer exponent of the one philosophy which they all professed to teach than the first. The whole movement was little else than a chapter in the history of Aristotelianism. That system of thought, after passing through the minds of those who saw it in the hazy light of an Orientalised Platonism, and finding many laborious but narrow-purposed cultivators in the monastic schools of heretical Syria, was then brought into contact with the ideas and mental habits of Islam. But those in whom the two currents converged did not belong to the pure Arab race. Of the so-called Arabian philosophers of the East, Al-Farabi, Ibn-Sina, and Al- Ghazali were natives of Khorassan, Bokhara, and the outlying provinces of north-eastern Persia; whilst Al-Kendi, the earliest of them, sprang from Basra, on the Persian Gulf, on the debatable ground between the and the Aryan. In Spain, again, where Ibn-Badja, Ibn- Tofail, and Ibn-Roshd rivalled or exceeded the fame of the Eastern schools, the Arabians of pure blood were few, and the Moorish ruling class was deeply intersected by Jewish

colonics, and even by the natives of Christian Spain.

Thus, alike at Baghdad and at Cordova, Arabian philosophy

represents the for a time victorious reaction of exotic ideas and of subject races against the theological one-sidedness of Islam, and the illiterate simplicity of the early Saracens,

Islam had, it is true, a philosophy of its own. There were Schoolmen amongst the believers in the Koran, not less than amongst the Latin Christians. At the very moment when Mahometanism came into contact with the older civilisations of Persia, Babylonia, and Syria, the intellectual

habits of the new converts created difficulties with regard to its very basis, and showed themselves a prolific source of diversity in the details of interpretation, The radical questions on which these disputes turned were two. The first dealt with the possibility of ascribing manifold attributes to God—to a Being who was absolute unity. The other referred to the bearing of God's omnipotence upon the freedom of the human will. Ere the second century of the Hegira, sturdy adherents of the literal truth of the Koran taught a gross anthropomorphism, applying to the Creator the very bodily attributes of his creatures. These were the Sefatites, or partisans of the attributes. Another sect represented Mahomet as the teacher of an unqualified fatalism. Opposed to these narrow-minded exponents stood the comparatively liberal sect of the Motazalites, the Dissidents, who first appeared about 750. As they maintained, on one hand, that man was in some degree a free agent, and on another, elevated the unity of the divine nature far above the diversity of attributes, they came to be styled the partisans of justice and unity. It was with them that the Mussulman

theology—the science of the word (Caldm)—first came 'into existence.

Its professors, the MJotecallemin (known in Hebrew as Medabberim, and as Loquentes in the Latin versions) may be compared with the scholastic doctors of

Semite | the Catholic Church. Driven in the first instance to ' speculation in theology by the needs of their natural reason, | they came, in after days, when Greek philosophy had been | naturalised in the Caliphate, to adapt its methods and

They employed a

doctrines to the support of their views. II. — 34

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quasi-philosophical method, by which, according to Maimo- nides, they first reflected how things ought to be in order to support, or at least not contradict, their opinions, and then, when their minds werc made up with regard to this imaginary system, declared that the world was no otherwise

constituted. ‘The dogmas of creation aud providence, of divine omnipotence, chiefly exercised them; and they sought to assert for God an immediate action in the making and the keeping of the world. Space they looked upon as pervaded by atoms possessing no quality or extension, and time was similarly divided into innumerable instants. Each change in the constitution of the atoms is a direct act of the Almighty. When the fire burns, or the water moistens, these terms merely express the habitual connec- tion which our senses perceive between one thing and another. It is not the man that throws a stone who is its real mover : the supreme agent has for the moment created motion. If a living being die, it is because God has created the attribute of death ; and the body remains dead, only because that attribute is unceasingly created. Thus, on the one hand, the object called the cause is denied to have any efficient power to produce the so-called effect ; and, on the other hand, the regularities or laws of nature are explained to be direct interferences by the Deity. God is the sole cause or agent in the universe: it is He who, directly, or by the mediation of His ministering angels, brings everything to pass. The supposed unifor- mity and necessity of causation is only an effect of custom, and may be at any moment rescinded. In this way, by a theory which, according to Averroes, involves the negation of science, the Moslem theologians believed that they had exalted God beyond the limits of the metaphysical and scientific conceptions of law, form, and matter ; whilst they at the same time stood aloof from the vulgar doctrines, attributing a causality to things. Making the uniformity of nature a mere phantom due to our human customary experience, they deemed they had left a clear ground for the possibility of miracles.

But at least one point was common to the theological and the philosophical doctrine. the principles of the Neo-Platonists, they kept the sanctuary of the Deity securely guarded, and interposed between him and his creatures a spiritual order of potent principles, from the Intelligence, which is the first-born image of the great unity, to the Soul and Nature, which come later in the spiritual rank. Of God the philosophers said we could not tell what He is, but only what He is not. The highest point, beyond which strictly philosophical inquirers did not penetrate, was the active intellect,—a sort of soul of the world in Aristotelian garb—the principle which inspires and regulates the development of humanity, and in which lies the goal of

perfection for the human spirit. In theological language the active intellect is described as an angel. The inspirations which the prophet receives by angelic messengers are compared with the irradiation of intellectual light, which the philosopher wins by contem- plation of truth and increasing purity of life. But while the theologian incessantly postulated the agency of that God, whose nature he deemed beyond the pale of science, the philosopher, following a purely human and natural aim, directed his efforts to the gradual elevation of his part of reason from its unformed state, and to its final union with the controlling intellect which moves and draws to itself the spirits of those who prepare themselves for its influences. The philosophers in their way, like the mystics of Persia (the Sulfites) in another, tended towards a theory of the communion of man with the spiritual world, which may be considered a protest against the practical and almost prosaic definiteness of the creed of Mahomet. ,

Carrying out, it may be, |

ARABIAN PHILOSOPHY

Arabian philosophy, at the outset of its carccr in the 9th

century, was able without difficulty to take possession of those resources for speculative thought, which the Latins had barely achieved at the close of the 12th century by the slow process of rediscovering the Aristotelian from the commentaries and versions of Boéthius. What the Latins painfully accomplished, amid many senseless disputations and blind gropings after light, owing to their fragmentary philosophy, scholars of Syria. era, both within and without ‘the ranks of the church, the Platonic tone and method were paramount throughout the Kast. lated the orthodox dogmas in regard to the Trinity and the Incarnation. But in its later days the Neo-Platonist school came more and more to find in Aristotle the best exponent and interpreter of the philosopher whom they thought divine. It was in this spirit that Porphyry, Themistius, aud Joannes Philoponus the treatises of the Peripatetic system which, modified often unconsciously by the dominant ideas of its expositors, became in the 6th aud 7th centuries the philosophy of the

logic

and unintelligent acquaintance with ancieut was already done for the Arabians by the In the early centuries of the Christian

Their influence was felt in the creeds which formu-

composed their commentaries on

Eastern Church. But the instrument which, in the hands

of John of Damascus, was made subservient to theological interests, became in the hands of others a dissolvent of the doctrines which had been reduced to shape under the pre- valence of the elder Platonism. Peripatetic studies became the source of heresies; and conversely, the heretical sects prosecuted the study of Aristotle with peculiar zeal.

The

church of the Nestorians, and that of the Monophysites,

in their several schools and monasterics, carried on from

the 5th to the 8th century the study of the earlier part of

the Organon, with almost the same means, purposes, and

results as were found among the Latin schoolmen of the earlier ceuturies. Up to the time when the religious zeal of the Emperor Zeno put a stop to the Nestorian school at

| Edessa, this “ Athens of Syria” was active in translating

and popularising the Aristotelian logic. Their banishment

from Edessa in 489 drove the Nestorian scholars to Persia,

where the Sassanidae gave them a welcome; and there they continued their labours on the Organon. A new seminary of logic aud theology sprung up at Nisibis, not far from the old locality ; and at Gandisapora (or Nisabur) in the east of Persia, there arose a medical school, whence Greek medicine,

and in its company Greek science and philosophy, ere long spread over the lands of Iran. Mean- while the Monophysites had followed in the steps of the Nestorians, multiplying Syriac versions of the logical and medical science of the Greeks. Their school at Resaina is known from the name of Sergius, one of the first of these translators, in the days of Justinian ; and from their monasteries at Kinnesrin (Chalcis) issued numerous ver- sions of the introductory treatises of the Aristotelian logic. To the Isagoge of Porphyry, the Categories and the Herme- neutica of Aristotle, the labours of these Syrian schooimen were confined: these they expounded, translated, epito- mised, and made the basis of their compilations ; and the few who were bold enough to attempt the Analytics, seem to have laid down the pen with their task unaccomplished.

The energy of the Monophysites, however, began to sink with the rise of the Moslem empire ; and when philosophy revived amongst them in the 13th century, in the person of Gregorius Barhebrzeus (1226-1286), the revival was due to the example and influence of the Arabian thinkers. It was otherwise with the Nestorians. Gaining by means of their professional ~~skill as physicians a high rank in the society of the Moslem world, the Nestorian scholars soon made Baghdad familiar with the knowledge of Greek philo~~ sophy and science which they possessed. But the narrow

limits of the Syrian studies, which added to a scanty know- ledge of Aristotle some acquaintance with his Syrian com- mentators, were soon passed by the curiosity and zeal of the students in the Caliphate. During the 8th and 9th centuries, rough but generally faithful versions of Aristotle’s principal works were made into Syriac, and then from the Syriac into Arabic. ‘The names of some of these transla- tors, such as Johannitius (Honein ibn-Ishak), were heard even in the Latin schools. By the labours of Honein and his family the great body of Greek science, medical, astro- nomical, and mathematical, became accessible to the Arab- speaking races. But for the next three centuries fresh versions, both of the philosopher and of his commentators, continued to succeed each other.

To the Arabians Aristotle represented and summed up Greek philosophy, even as Galen became to them the code of Greek medicine. They adopted

the doctrine and system which the progress of human affairs had made the intel- lectual aliment of their Syrian guides. It was a matter of historical necessity, and not an act of deliberate choice. Just as the early poets of Rome, when they tried to naturalise the drama, reproduced the works of Euripides, the popular tragedian of their time, so the Arabians, when the need of scientific culture awoke amongst them, accepted Aristotle. From first to last Arabian philosophers made no claim to originality; their aim was merely to propagate the truth of Peripateticism as it had been delivered to them. In medicine and astronomy, as well as in philosophy, they entertained an almost superstitious reverence for their Greek teachers. It was with them that the deification of Aristotle began; and from them the belief that in him human intelligence had reached its limit passed to the later school- men, 'The doctrine is fixed: truth has been ascertained: all that is needed is a faithful and skilful interpreter. Hence, their perpetual labour of exposition and illustration: their epitomes and paraphrases of Aristotelian doctrine. The progress amongst the Arabians on this side lies in a closer adherence to their text, a nearer approach to the bare exegesis of their author, and an increasing emancipa- tion from control by the tenets of the popular religion.

Secular philosophy found its first entrance amongst the Saracens in the days of the early caliphs of the Abbaside dynasty, whose ways and thoughts had been moulded by their residence in Persia amid the influences of an older creed, and of ideas which had in the last resort sprung from the Greeks. The seat of empire had been transferred to Baghdad, on the highway of Oriental commerce; and the distant Khorassan became the favourite province of the caliph. Then was inaugurated the period of Persian supremacy, during which Islam was laid open to the full current of alien idcas and culture. The incitement came, however, not from the people, but from the prince: it was in the light of court favour that the colleges of Baghdad and Nisabur first came to attract students from every quarter, from the valleys of Andalusia, as well as the upland plains of Transoxiana. Al-Manstir, the second of the Abbasides, encouraged the appropriation of Greek science; but it was Al-Mamtin, the son of Harfin al-Rashid, who deserves in the Mahometan empire the same position of royal founder and benefactor which is held by Charlemagne in the history of the Latin schools. In his reign (81 3-833) Aristotle was first translated into Arabic. Legend told how Al-Mamtin had

been induced to send to the Byzantine emperor for Greek books on philosophy, in consequence of a vision in which a venerable personage, who made himself known as Aristotle, had excited without gratifying the cunosity of the caliph. Orthodox Mussulmans, however, distrusted the course on which their chief had entered, and his philosophical proclivities became one ground for doubt- ing as to his final salvation.

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In the Eastern provinces the chief names of Arabian philosophy are those known to the Latin schoolmen as Alkindius, Alpharabius, Avicenna, and Algazel, or under forms resembling these, or under other names derived from various parts of their complex Arabic designations. The first of these, Alkindius (Abu Jusuf Jacub ibn-Ishak al- Kendt), wrote in the reigns of Al-Mamin and Al-Motassem (813-842). His claims to notice at the present day rest upon a few works on medicine and the astrological astro- nomy of his age,—the only remnant left of the 200 treatises which he is said to have composed on all the themes of science and philosophy. With him begins that encyclopzdie character—the simultaneous cultivation of the whole field of investigation which is reflected from Aristotle on the Arabian school. Towards the close of the 10th century the presentation of an entire scheme of knowledge, begin- ning with logic and mathematics, and ascending through the various departments of physical inquiry to the region of religious doctrine, was accomplished by a society which had its chief seat at Basra, the native town of Al-Kendi. This society—the Brothers of Purity or Sincerity—divided into four orders, wrought in the interests of religion no less than of science; and though its attempt to compile an encyclopedia of existing knowledge may have been prema- ture, it yet contributed to spread abroad a desire for further information. The proposed reconciliation between science and faith was not accomplished, because the com- promise could please neither party. The fifty-one treatises of which this encyclopedia consists are interspersed with apologues in true Oriental style, and the idea of goodness, of moral perfection, is as prominent an end in every dis- course as it was in the alleged dream of Al-Mamtn. Tho materials of the work come chiefly from Aristotle, but they are conceived ina Platonising spirit, which places as the bond of all things a universal soul of the world with its partial or’fragmentary souls. Contemporary with this

semi- religious and semi-philosophical society lived Alfarabius (Abou-Nasr Mohammed ben-Mohammed ben-Tarkhan al- Farabi) or Abunasar. From Turkestan, the place of his birth, he passed southward to Baghdad where he studied, and died at Damascus in 950, after living for some time at Aleppo on the invitation of its prince. The legendary accounts of Al-Farabi describe him as a man of vast erudi- tion, the master of seventy languages, and accomplished both in the thcory and the practice of the musical art. Of his numerous writings on all the branches of science only a few remain in Arabic or Hebrew versions, but his para- phrases of Aristotle formed the basis on which Avicenna constructed his system, and his logical treatises produced a permanent effect on the logic of the Latin scholars. He gave the tone and direction to nearly all subscquent specu- lations among the Arabians. His order and enumeration of the principles of being, his doctrine of the double aspect of intellect, and of the perfect beatitude which consists in the aggregation of noble minds when they are delivered from the separating barriers of individual bodies, present at least in germ the characteristic theory of Averroes. But Al-Farabi was not always consistent in his views ; a cer- tain sobriety checked his speculative flights; and although holding that the true perfection of man is reached in this life by the elevation of the intellectual nature, he camre towards the close to think the separate existence of intellect no better than a phantasm and delusion.

Unquestionably the most illustrious name amongst the Oriental Moslems was Avicenna (980-1037). His fame in Europe rested more upon his medical canon than on his philosophical works ; but even in logic and metaphysics his influence on the West was considcrable. With him the encyclopsedic tendencies of the school of Baghdad reached their culmination. He was followed by Algazel (Abon-

Hamed Mohammed ibn-Mohammed al-Ghazali), whose name was the last that attained a European reputation. Born near Tas in 1058, he studied there and at Nisabur ; and

having left his native province of Khorassan at the age of

36, he was appointed to a high educational post at Baghdad. There, as well as at Damascus, J erusalem, and Alexandria, his lectures attracted crowds of eager listeners. Suddenly he withdrew from active life, assumed the habits of the Sufite mystic, and devoted himself to contemplation of reli-

gious truth ; and although he was persuaded to resume for 2 while his dutics in the college of Baghdad, he soon returned to seclusion, and passed his last days in a monastery which

ne had himself founded at Tas (1111). To Algazel it seemed that the study of secular philosophy had resulted in a general indifference to religion, and that the scepticism which concealed itself under a pretence of piety was destroy- ing the life and purity of the nation. With these views he carried into the fields of philosophy the aims and spirit of the Moslem theologian. In his Tendencies of the Philosophers (Makécid al-Faldsifa) he gave a resumé of the contemporary state of the speculative sciences as ‘a pre-liminary work to his Destruction of the Philosophers (Tehafot al-Faldsifa), in which the contradictions and errors of these sciences were pointed out, as well as their divergence from the orthodox faith. This indictment against liberal thought from the stand point of the theological school was afterwards answered in Spain by Averroes ; but in Baghdad it heralded the extinction of the light of philosophy. Moderate and compliant with the popular religion as Alfarabius and Avicenna had always been, as compared with their Spanish successor, they had equally failed to conciliate the popular spirit, and were classed in the same category with the herctic or the member of an immoral sect. The 12th century exhibits the decay of liberal intellectual activity in the Caliphate, and the gradual asccndency of Turkish races animated with all the intolerance of semi-barbarian pro- selytes to the Mahometan faith. Philosophy, which had only sprung up when the purely Arabian influences ceased to predominate, came to an end when the sceptre of the Moslem world passed away from the dynasty of Persia. Even in 1150 Baghdad had seen a library of philosophical books burned by command of the Caliph Mostandjed ; and in 1192 the same place might have witnessed a strange scene, in which the books of a physician were first publicly cursed, and then committed to the flames, while their owner was incarcerated. Thus, while the Latin Church showed a marvellous receptivity for ethnic philosophy, and assi- milated doctrines which it had at an earlier date

declared impious, in Islam the theological system entrenched itself towards the end of the 12th century in the narrow orthodoxy of the Assarites, and reduced the votaries of Greek philo- sophy to silence. .

The same phenomena were repeated in Spain under the Mahometan rulers of Andalusia and Marocco, with this difference, that the time of philosophical development was shorter, and the heights to which Spanish thinkers soared were greater. The reign of Al-Hakem the Second (961- 976) inaugurated in Andalusia those scientific and philoso- phical studies which were simultaneously prosceuted by the Society of Basra. From Cairo, Baghdad, Damascus, and Alexandria, books both old and new were procured at any price for the library of the prince; 27 free schools were opened in Cordova for the education of the poor; and intelligent knowledge was perhaps more widely diffused in Mahometan Spain than in any other part of Europe at that day. The mosques of the city were filled with crowds who listened to lectures on science and literature, law and religion. But the future glory thus promised was long postponed. The usurping successor of Hakem found it a politic step to request the most notable doctors of the sacred law to

exaniine the royal library; and every book treating of philosophy, astronomy, and other forbidden topics, was condemned to the flames. But the spirit of research, fostered by the fusion of races and the social and intel- lectual competition thus engendered, was not crushed by these proceedings; and for the next century and more the higher minds of Spain found in Damascus aud Baghdad the intellectual aliment which they desired. At last, towards the close of the 11th century, the long-pent spiritual ener- gies of Mahometan Spain burst forth in a brief series of illustrious men. Whilst the native Spaniards were narrow- ing the limits of the Moorish kingdoms, and whilst the generally fanatical dynasty of the Almohades might have been expected to repress speculation, the century preceding the close of Mahometan sway saw philosophy cultivated by Avempace, Abubacer, and Averroes. Even amongst the Almohades there were princes, such as Jusuf (who began his reign in 1163) and Jactib Almansor (who succeeded in 1184), who welcomed the philosopher at their

courts, and treated him as an intellectual compeer. But about 1195 the old distrust of philosophy revived ; the philosophers were banished in disgrace ; works on philosophical topics were ordered to be confiscated and burned ; and the son of Almansor condemned a certain Ben-Habib to death for the crime of philosophising.

Arabian speculation in Spain was heralded by Aviccbron, a name under which the schoolmen conceived an Arab thinker, whereas modern scholars have shown that he was identical with Salomon ben-Gcbirol, a Jewish sacred poet of no mean order, and still popular in the synagogue. Born at Malaga, and educated at Saragossa, he seems to have written most of his works between 1045 and 1070. His philosophical essay, known as the Fountain of Life (Fons Vite), although, in a Latin version made about 1150, it acted like a ferment amongst the seething mass of hete- rodox Christian theology, found no immediate acceptance among his own philosophical compatriots, or amongst the Arabian thinkers who succeeded him. His speculations were drawn from sources other than those which supplied the dominant school of the 12th century in Spain, and found a congenial home amongst those who had drunk deeply from the ideas of Scotus Erigena. The doctrine of Avicebron attributed matter to everything, even to the soul, and to simple substances, and held that ultimately there was one universal matter. Thus, while intelligible and sensible substances differ in their forms, they are at one in matter. The doctrine became important in the dis- putes as to the principle of individuation ; where Duns Scotus, in opposition to Aquinas, reverted to the position of Avicebron, whom he also resembled in his doctrine of the superiority of the will to the intellect.

Such questions in the present age would seem to fall strictly within the sphere of logic. But it was the charac- teristic of the thinkers of the medieval period, both Arabian and Christian, to magnify the power of abstract ideas, and to give a deep reality to logical and metaphysical ideas, The earlier schoolmen exaggerated the value of genera and species, till everything else grew faint i com- parison ; and the Arabian thinkers similarly took in awful earnest the distinction of material and formal. Abstrac‘ions were first realised with uncommon distinctness and became alniost palpable ; and then they were introduced into the world of popular conception. An irresistible attraction drew thinkers of different classes to

apply their metaphy- sical subtleties to the religious ideas of a celestial order of beings, and the results of this application not unnaturally gave rise to heresies.

The ideas of Avicebron are the one-sided consequences of principles which had an influence, but a secondary one, on the whole Arabian school. They descend in the last

instance from the Alexandrians,—particularly as Alex- andrian ideas are presented in the book De Causis, and in the Apocryphal Theology of Aristotle. Both of these works (which passed under a variety of other names) belong to a class of writings of Neo-Platonic tone and contents, which were accredited by their ascription to Pythagoras, Empe- docles, Plato, and Aristotle, and circulated amongst the Arabians before the canon of Peripatetic scriptures had been definitively fixed by the school of Baghdad. The Theology known as Aristotle's did not appear in Latin before 1519, when it was translated from an Arabic manuscript of the 9th century; whereas the De Causis, although unknown to the Moslem world, was familiar to the Latins of the 13th century. The Theology was an exposition of the theory of Plotinus; the De Causis was extracted from the Theological Elements of Proclus ; and both works presented the usual Alexandrian system of emanation and hypostases,—the graduated series of exter- nalisations and manifestations of the first cause or absolute unity, firstly, in Intelligence; secondly, in the Soul of the universe ; thirdly, in Nature and the region of mutability. These sucessive spheres of being, where the central unity expands into the circumference without losing its simplicity, and the circumference is instinctively led towards its controlling centre, lay at the basis of the conception of the universe held more or less by all the Moslem philosophers. The first of creatures, says Avicenna, is the Intelligence, in which are contained soul and life. The first cause is above all intelligence. The principles exert a causal influence according to their degree of elevation.

About a generation after Avicebron the rank of Moslem thinkers proper was introduced by Abou-Bekr Mohammed ben-Jahya, surnamed Ibn-Badja, and known to the Latin world as Avempace. He was born at Saragossa, and died

comparatively young at Fez in 1138. Besides commenting on various pliysical treatises of Aristotle's, he wrote some philosophical essays, notably one on the Republic or Régime of the Solitary. In its general character, and in several peculiarities, it resembles the Republic of Plato. The Solitary of whom Ibn-Badja speaks is the stranger who seeks for a better commonwealth than the common vul- garity of the world,—who, like some rare plant that springs up unsown in a bed of ordinary flowers, would fain regain his native air. Ibn-Badja proposed to trace the steps by which such an one taken alone, rising above his animal nature, might by abstraction and reflection elicit the universal forms of material things from the data of sense, and thus finally apprehend the pure intelligences or specu- lative forms. As against Algazel, he maintained the right of the intellect to rise by scientific contemplation to the philosophical heaven,—to a union with the ever-active intellect which moves the spheres. The consciousness of this union is the commonwealth of the solitary,—the enduring commonwealth of intellect in which the philoso- pher abides.

The same theme was developed by Ibn-Tofail in his.

philosophical romance, called Hayy cbn-Jakdhin (the Living, Son of the Waking One), best known by Pococke's Latin version, as the Philosophus Autodidactus. Ibn- Tofail, the Abubacer of the schoolmen, was born at Guadix in Andalusia, and died at Marocco in 1185. At the court of Jusuf he combined the offices of vizier and physician, and employed his influence to introduce younger students to the notice of the prince. Ibn-Tofail wrote on medicine and astronomy, as well as philosophy, but his romance, which has been translated into Hebrew, Latin, English, and other European languages, is his only extant work. It describes the process by which an isolated truth-seeker detaches himself from his lower passions, and raises himself above the material earth and the orbs of heaven to the

forms which are the source of their movement, until he arrives at a union with the supreme intellect. The experi- ences of the religious mystic are paralleled with the ecstatic vision in which the philosophical hermit sees a world of pure intelligences, where birth and decease are unknown.

It was this theory which Averrocs (1126-1198), the last and most famous of the thinkers of Moslem Spain, carried out to his doctrine of the unity of intellect. The whole doctrine will be discussed under the heading AVERRoEs ; but its general purport is this. Reproducing, on one hand, the customary psychology of Aristotle as it rises gradually from the mere sense to the understanding, it emphasises, on another hand, the permanent subsistence and action of intellect apart from all materiality and from the individuals who share in the intellectual power. In the active intellect it finds the motive principle, and the full fruition of human reason. Sometimes this intellect is invested with the supremacy of the sphere beneath the moon, and connected with a more universal intelligence through a hierarchy of spiritual principles in the celestial system. Such a mind is the sole actual intellect in which the generations of thinking men live and move. In complete union with it lies their perfect beatitude ; and, save as a temporary participant in the blessings of this universal form, the intellectual soul is a nonentity.

The philosophers thus charactcrised were in almost every case physicians ; and with their medical knowledge they frequently combined studies in mathematics, astronomy, and alchemy. In all these departments they were the pupils of Greeks, whose text they accepted almost as a revelation. Their talent lay in the elaboration of details, and in correcting certain mistakes of their guides ; but they never introduced any comprehensive change. Still their conjunct prosecution of physical and metaphysical studies gave them an advantage over their Latin contemporaries, with whom the schools of dialectic grew into exaggerated prominence, whilst few traces were left, as at Salerno, of the medical and scientific pursuits of the ancient world. Their acquaintance with art was another feature in favour of the Arabians. AJl-Kendi, Al-Farabi, and Ibn-Badja were musicians of note: Ibn-Tofail and Ben-Gebirol were famous as poets. Their studies in the sacred law and in theology did not unduly dominate their philosophical investigations, and they combined much practical work as physicians and statesmen with an almost incredible industry in appro- priating and systematising the wisdom of Greece. But the great educational value of Arabian philosophy for the later schoolmen consisted in its making them acquainted with an entire Aristotle. At the moment when it seemed as if everything had been made that could be made out of the fragments of Aristotle, and the compilations

of Capella, Cassiodorus, and others, and when mysticism and scep- ticism ‘seemed the only resources left for the mind, the horizon of knowledge was suddenly widened by the acquisi- tion of a complete Aristotle. Thus the mistakes inevitable in the isolated study of an imperfect Organon could not henceforth be made. The real bearing of old questions, and the meaninglessness of many disputes, were seen in the new conception of Aristotelianism given by the Meta- physics, and other treatises. The former Realism and Nominalism were lifted into a higher phase by the principle of the universalising action of intellect—(Jntellectus in formis agit universalitatem). The commentaries of the Arabians in this respect supplied nutriment more readily assimilated by the pupils than the pure text would have been.

Arabian philosophy, whilst it promoted the exegesis of Aristotle and increased his authority, was not less notable as the source of the separation between theology and philo-

sophy. Speculation fell on irreligious paths. In many cases the heretical movement was due less to foreign example than to the indwelling tendencies of the dominant school of Realism. But it is not less certain that the very cou- siderable freedom of the Arabians from theological bias served indirectly to intensify the prevailing protest against Sacerdotalism, and prepared the time when philosophy shook off its ecclesiastical vestments. In the hurry of first terror, the church struck Aristotle with the anathema

launched against innovations in philosophy. The pro- vincial council of Paris in 1209, which condemned Amal- ricus and his followers, as well as David of Dinant’s works, forbade the study of Aristotle’s Natural Philosophy, and the Commentaries. In 1215 the same prohibition was repeated, specifying the Metaphysics and Physics, and the Commentaries by the Spaniard Mauritius (i.e, probably Averroes). Meanwhile Albertus Magnus and Thomas Aquinas, accepting the exegetical services of the Arabians, did their best to controvert the obnoxious doctrine of the Intellect, and to defend the orthodoxy of Aristotle against the unholy glosses of infidels. But it is doubtful whether even they kept as pure from the infection

of illegitimate doctrine as they supposed. The tide meanwhile flowed in stronger and stronger. In 1270 Stephen Tempier, bishop of Paris, supported by an assembly of theologians, anathe- matised thirteen propositions bearing the stamp of Arabian authorship; but in 1277 the same vicws and others more directly offensive to Christians and theologians had to be censured again. Raymond Lully, in a dialogue with an infidel thinker, broke a lance in support of the orthodox doctrine, and carricd on a crusade against the Arabians in every university ; and a disciple of ‘Thomas Aquinas drew up a list (De Lrroribus philosophorum) of the several delusions and errors of each of the thinkers from Alkindius to Averroes. Strong in their conviction of thetruth of Aristotelianism, the Arabians carried out their logical results in the theological field, and made the distinction of necessary and possible, of form and matter, the basis of con- clusions in the most momentous questions. They refused to accept the doctrine of creation because it conflicted with the explanation of forms as the necessary evolution of matter. They denied the particular providence of God, because knowledge in the divine sphcre did not descend to singulars. They excluded the Deity from all direct action upon the world, and substituted for a cosmic principle the active intellect,—thus holding a form of Pantheism. But all did not go the same length in their divergence from the popular creed.

The half-legendary accounts which attribute the intro- duction of Arabian science to Gerbert, afterwards Pope Sylvester II., to Constantinus Africanus, and to Adelard of Bath, if they have any value, refer mainly to medical science and mathematics. It was not till about the middle of the 12th century that under the patronage of Raymond, archbishop of Seville, a society of translators, with the archdeacon Dominicus Gundisalvi at their head, produced Latin versions of the Commentaries of Avicenna and Algazel, of the Mons Vite of Avicebron, and of several Aristotelian treatises. The working translators were con- verted Jews, the best known among them being Joannes Avendeath. With this effort began the chief translating epoch for Arabic works. Avicenna’s Canon of Medicine was first translated into Latin by Gerard of Cremona (d. 1187), to whom versions of other medical and astro- nomical works are due. The movement towards intro- ducing Arabian science and philosophy into Europe. however, culminated under the patronage of the Emperor Frederick IJ. (1212-1250).

Partly from superiority to the narrowness of his age, and partly in the interest of his struggle with the Papacy, this Malleus ecclesice

Romane drew to his court those savanuts whose pur- suits were discouraged by the church, and especially students in the forbidden lore of the Arabians. He is said to have pensioned Jews for purposes of trans- lation. One of the scholars to whom Frederick gave a welcome was Michael Scot, the first translator of Aver- roes. Scot had sojourned at Toledo about 1217, and had accomplished the versions of several astronomical and physical treatises, mainly, if we believe Roger Bacon, by the labours of a Jew named Andrew. But Bacon is appa- rently hypercritical in his estimate of the translators from the Arabic. Another protegé of Frederick's was Hermann the German (Alemannus), who, between the years 1243 and 1256, translated amongst other things a paraphrase of AlL-Farabi on the Rhetoric, and of Averroes on the Poetics and Ethics of Aristotle. Jewish scholars held an honour- able place in transmitting the Arabian commentators to the schoolmen. It was amongst them, especially in Maimo- nides, that Aristotelianism found refuge after the light of philosophy was extinguished in Islam ; and the Jewish family of the Ben-Tibbon were mainly instrumental in making Averroes known to southern France.

See Munk, Mélanges de philosophie juive ct arabe, Paris, 1859 ; Renan, De Philosophia Pertpatetica apud Syros, 1852, and Averroes et l Averroisme, Paris, 3™° ed., 1867 ; Jourdain, Recherches ertiiques

sur Page et Vorigine des traductions Latines d' Aristote, Paris, 2™¢

ed., 1843; Hauréau, Philosophie Scolastique, Paris, 17 ed., 1850, tome i. p. 359 ; Vacherot, Ecole d Alewandrie, 1%¢ ed., 1851, tome iii. p. 85; Abulfaragius, Historia Dynastiarum, ed. Pocoeke, Oxon., 1663 ; Sehmolders, Doewmenta philosophiae Arabum, Bonn, 1836, and Essai sur les écoles philosophiques chez les Arabes, Paris, 1842 ; Shahrastani, History of Religious and Philosophical Scets, in Ger- man translation by Haarbriicker, Halle, 1850-51 ; Dieterici, Strett zwischen Mensch und Thier, Berlin, 1858, and his other translations

of the Encyclopedia of the Brothers of Sinecrity, 1861 to 1872;

Prantl, Geschichte der Logik, 1861, vol. il. pp. 297-396 ; and the His-

tories of Philosophy, ¢.g., Erdmann's, vol. i. (2d ed.), p. 295, and

Ueberweg's, vol. i., English translation, London, 1872. (W. W.)

ARABIAN SEA, the name applied to the large sheet of water, really a portion of the Indian Ocean, bounded on the E. by Hindustan, on the N. by Beloochistan, on the W. by Arabia and the Gulf of Aden, and on the S. by an

imaginary line stretching between Cape Guardafui, in the

N.E. of Africa, and Cape Comorin in Hindustan. This is the Arabian Sea proper, but under the name Gulf of Aden it penetrates between Africa and Arabia, connecting itself with the Red Sea through the Straits of Bab-el-Mandeb ; while on the N.W. the Gulf of Oman, with its continuation the Persian Gulf, separates Arabia from Beloochistan and Persia. Besides these larger ramifications, there are the Gulfs of Cambay and Cutch in the N.W. of India. An interest and importance belong to this sea as forming part of the chief highway between Britain and India. The islands it contains are few and insignificant, the chief being Socotra and the Laccadives. The Arabian Sea is more or Jess coextensive with the Mare Hrythraum or Rubrum of the aucients, although these terms seem to have been applied with considerable vagueness. ARABICI, a sect originating about the beginning of the 3d century, which is mentioned by Augustine (De Heeres., c. 83), and called also Thnetopsychite by Johannes Damascenus (De Heeres., c. 99). Its founder is unknown, and its history brief and obscure. Its distinctive doctrine was a form of Christian materialism, showing itself in the belief that the soul perished and was restored to life along with the body. According to Eusebius, the Arabici were convinced of their error by Origen, and renounced it ata council held about 246 A.D. ARACATI, a town of Brazil, in the province of Ceara, situated un the Jaguaribe, about 10 miles from its mouth. It is well built, and carries on a considerable export pas i hides and cotton. 'The population is stated at

ARACHNIDA

HE Arachnida, or, popularly speaking, the Spiders and their allied forms—from dpéxvy, a spider, and «idos, the form or outward appearance—constitute a well-defined group within the great branch “ Articulata” of the animal kingdom, though on one side its boundary lines melt almost insensibly into the Annelides, through the family of acarids—Pentastomides. Jinneeus and others of the older systema- tists included all Arachnids (as then recognised) under the class Insecta, Lamarck first scparating them into a distinct class. A few general remarks, therefore, on the branch Articulata, and its subordinate groups, may be uscful, to show the general relations of that under consideration.

As distinguished from the Vertebrata, the animals of the branch Articnlata may be characterised generally as having (besides the marked and uniformly different position of the chief organ of circulation and the nervous chords) an ex- ternal skeleton, the different parts of which, of more or less solid consistency, are articulated, or jointed to each other, and contain within their hollows the vital and other organs. Internally, threads of nervous matter, springing from enlarge- ments or knots (ganglia) upon two or more central longitu- dinal nervous chords on the ventral side of the body traverse the different parts of it; these chords, however, end in no one special mass, corresponding to the brain in the Vertebrata; and the nervous systems composed by these ganglia vary con- siderably in their special structure and arrangement in the different subordinate groups.

This being the distinctive plan of structure in the Aré?- culata, a review of the whole group shows us that this plan is carried out in two well-marked leading ways—first, without, and secondly, with, articulated legs, or organs of locomotion and touch. Those without articulated limbs constitute the Annelides of Lamarck, which, for our present purpose, it is sufficient to characterise as having the arti- culate plan of structure carried out in the gencral form of a more or less cylindrical, lengthened body, composed of a number of rings, segments, or transverse folds, of which the first forms the head, but destitute of articulated limbs. Those with articulated legs constitute the Condylopa of Latreille, or the Znsecta of Linnzeus; but the

term Insecta being now in general use to define a subordinate group, it will be better to adopt here the name given by Latreille. In the “ Condylopa,” then, the articulated plan of structure is carried out in the form of a more or less hard body composed of different pieces, of which one, two, three, or more, are generally leading ones ; to this body (in general to the anterior portion of it) are attached articulate organs of locomotion various in nuinber, but never, or at least very rarely, less than six. The organs of sight (when present) are always in the head, and vary in number, position, and kind. To these two leading divisions of the branch Articulata—the Annelides of Lamarck, and the Condylopa of Latreille—we may give the designation of CLassEs, since they are each respectively composed of animals which thus primarily and markedly differ in the way in which their common articulate plan of structure is carried out.

Leaving now the class Annelides, to which has been given

the “Condylopa,” or “Condylopoda” (equivalent to the “‘ Arthropoda” of more modern authors), we find that the latter contains the four following groups—‘ Insecta,” “ Myriapoda,” “ Arachnida,” and “Crustacea.”

These all agree in the way in which, as above explained, their general articulated plan of structure is carried out, but they differ in the further modifications of this plan, that is

| to say, in the number, division, and size (both absolute and

relative) of the different articulations of the body (including

the organs of locomotion, of manducation, and of touch), and

in the respective value and relation of these to each other, as well as in the modifications of their respiratory and other in- ternal systems, and also in other important points. Differing thus from each other, these four groups, usually (three at least of them) ranked as distinct classes, yet appear to be entitled only to the rank of sub-classes, being each mercly an equally subordinate group of the class “‘ Condylopoda.”

The four sub-classes of Condylopoda (or articulate-legged

Annulosa) may be separately and briefly characterised thus :—

Sub-class I.—Insecra: subject in general to metamor- phosis, more or less complete, during the progress to maturity; organs of locomotion, six ; body divided into three principal parts—caput, thorax, and abdomen, respira- tion wholly tracheal.

Sub-class II.—Myriapopa: not subject to metamorphosis, properly so-called; organs of locomotion above six in num- ber (twenty-four and more) developed by degrees, and affixed to the abdominal as well as to the other (numerous) segments into which the body is divided. Although occa- sionally some of the anterior segments coalesce, and the head is stated to be formed by five or more modified seg- ments, yet no one or more parts of the body can be said to be principal ones ; respiration is tracheal.

Sub-class ITI.—Aracunipa : not subject to metamorphosis, properly so-called, though, as with the Myriapoda, some portions of structure among certain acarids, and to a small extent even among the Aranedea, are progressively de- veloped at the various moultings of the skin. Organs of locomotion, eight ; body in general divided into two prin- cipal parts, cephalo-thorax and abdomen ; but where (as in some groups) the abdomen is divided into more or less distinct segments no organs of locomotion are ever attached to them; respiration, where distinct organs exist, is either tracheal, pulino-branchial, or the two coexistent.

Sub-class [V.—Crustacea: without metamorphosis; organs of locomotion various in number (not less than eight or ten), and attached to some or all of the many segments, abdominal as well as others, into which the body is divided; although in numbers of crustaceans no one part of the body can be called a principal part, yet in some very large and leading groups, the portion covered by the carapace (corresponding to the cephalo-thorax in Arachnids) may well be termed the one principal part ; the abdomen being in this case more or less rudimentary or subordinate. Respiration in the Crustacea, where distinct organs are present, is branchial.

In this view the following diagram shows the relative

the name “ Anarthropoda,” and confining our attention to | positions of the several leading groups of the Articulata:—

ANIMAL Kinepom.

| Branch |, Radiata, Il. Mollusca.

| Class 1. Annelides or Anarthropoda.

| | Sub-class 1. Insecta. II. Myriapoda.

III. ArTIcuLaTa. IV. Vertebrata. | IJ. ConpYLOoPopA or ARTHROPODA.

III, ARACHNIDA. IV. Crustacea.

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In this diagram the Myriapoda are placed, in the position ordinarily assigned to them, between the Insects and Arachnids ; but perhaps a more natural position would be after the Crustacea, for they appear to connect the Insecta and Crustacea more than they do the Insccta and Arach- nida. The point, however, of the special position of any large group in a linear series is tolerably unimportant. A linear arrangement is of course the only oue possible on paper, but it cannot express the numerous cross relationships that become evident when the affinities of special groups are closely studied. By placing the Myriapoda after the Crustaceans, we seem to get an ascending series in respect to the organs of locomotion: in the Insecta, six—always attached to the thoracic segments; in the Arachnida, eight—almost always attached to the thoracic segments ; in the Crustacea, eight, ten, and upwards—frequently attached to the abdominal as well as to the thoracic seg- ments ; in the Myriapoda, twenty-four and more—always attached to the abdominal as well as other segments. The relation of the Myriapoda to the Crustacea through the attachmeut of limbs to the abdominal segments is thus expressed ; and by the meeting of the two ends of the line, the always acknowledged affinity of the former to the Insecta is also expressed.

Having thus briefly explained the most obvious relation- ships of the Arachnida, let us now proceed to a more detailed, though still general,

diagnosis of this group. And first, in respect to their external organisation, Arachnids are articulate animals,! with eight articulated legs, each in general consisting of seven joints ; the head and thorax are soldered together into one piece (cephalo-thorax), from

which with few exceptions the legs invariably spring. In,

one group of the Arachnida (Solpugidea) the cephalo- thorax is separately segmented, as it is also in one family of the Thelyphonidea (Tartarides); the rest of the body forms also one more or less homogeneous piece (abdomen). The abdomen is always more or less closely attached to the cephalo-thorax ; in some instances it is soldered to the thorax, and forms with it one undivided piece, in other cases it is only joined to it by a narrow pedicle. At times, also, the abdomen constitutes a simple unsegmented portion, at other times a segmented or annulate portion of the body, occasionally, as in the true scorpions, prolonged into a segmented tail: in one small but very distinct group (Thelyphonidea), the abdomen is prolonged into either a simple button, a short jointed, or a more or less long setiform tail; in another large group (Araneidea) the abdo- men terminates with organs (spinners and spinnerets) for spinning threads. The eyes (when present) are simple, always sessile, and placed on the fore part of the cephalo- thorax ; they seem to represent the simple ocelli of the Insecta; the large compound eyes of that order having here no representation, the caput of Arachnids appearing to begin at a point posterior to that which bears the antennse and compound eyes of insects. In Arachnida the number of eyes varies from two to twelve. In front of and articulated beneath the fore part of the cephalo-thorax, and moving in different planes in different groups, are two independent, variously modified, organs for seizing and compressing the insects or other substances on which Arachnids in general prey; these organs are often called mandibles, but more generally, and very appropriately, falces : these are considered by some systematists to be the true homologues of the antennz? in insects, and to have

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1 Embryology shows that the first pair of legs in arachnids are homologous to the labial palpi of insects (Claparéde, 7. c. post). This is strictly true according to their use in one order—Thelyphonidea ; and in many of the

Araneidea also these legs are chiefly used for feel- ing and exploring the obstacles in their way.

2 Hence their name among French arachnologists, ‘‘ Antennes- Pinces.”

AR ACHR ID a2

[GENERAL

been derived from those portions of the insect organisation by long and unceasing modification ; when, however, the caput of an Arachnid (scorpion or spider, for instauce) is compared with that of a coleopterous or hymenopterous insect, in which the mandibles are well developed, there seems far more reason to conclude that the anxtennce of the insect have no homologue at all in the Arachnid (Claparéde, lc. post), but that the falees of the latter are the true representatives of the mandibles of the former. Behind the falces (and also used in manducation) are two other large movable portions of structure called maxille; these vary in shape and size, and form in fact lateral and hinder boundaries to the mouth, as well as an apparatus for com- minuting and squeezing the food substances ; from each of these maxillee, on the outer side, springs a palpus of four or five joints, varying in structure and use. Between the maxille most Arachnids have also a fixed piece (/abium) of various form, completing the hinder limits of the mouth organs, and in some (perhaps in most) there is, within the parts already named, another portion (tongue), not yet suffi- ciently observed either in regard to its form or use, but probably acting so as to hinder choking. In some Arachni- dans these different parts of the mouth are soldered together and form a tolerably simple sucking apparatus, analogous to the mouth of some insects (Hemiptera, &c.) As observed above, Arachnids are not, in a proper sense, subject to meta- morphosis : in most of them there is little real change after they leave the egg; though, in some of the lowest forms, in- deed, there are after-changes by moultings of the skin, which approach the incomplete metamorphoses of some insects.

With respect to the internal organisation of the Arach- nida, it might perhaps be enough here to refer to the more detailed accounts given further on, where the separate orders are under consideration; but the following

summary will probably make our general view of the whole sub-class more complete.

Muscular Systen.—Of this it is enough to say that it is similar to that of the rest of the Articulata, consisting of flexor and extensor muscles, situated within the hollows of the limbs, besides groups of fibres by which the epider- mis aud parts within it are connected and held together. On the outer surface these groups frequently show, at their points of uniou, boss-like marks or fover, or im- pressed spots of various forms and sizes, often presenting by their position distinctive peculiarities of form ; it is probable that many others of the external specific markings are dependent on the course and position of the muscular fibres, as well as of the heart and other organs.

Circulatory System.—The vital fluid is circulated by means of an elongated muscular vessel or heart, varying in form, and, instead of being placed, as in the Vertebrata, on the ventral side of the body, extending along the back of the ab- domen. This vessel is often divided into chambers? or com- partments by valves, having also valvular orifices on its upper side for the flowing in of the fluid (Newport), and giving off vessels (arteries) for its distribution to the rest of the body. In the lower forms, however, of Arachnids (among the Aca- ridea) no such principal muscular vessel is found, the vital fluid being in such cases supposed to circulate gencrally in the body, and to be distributed irregularly into different portions by the muscular movements of the intestinal canal.

Respiratory System.—Arachnids breathe by means of trachec (spiracular tubes, as in the Insecta), as well as by pulmo-branchie, said to be a kind of compound of the gill of fish and the lung of mammals, though in reality there seems better reason, as we shall see further on (p. 293), to consider the pulmo-branchiz as merely peculiarly modified trachez;

_ 2 L. Dufour (Savants étrangers, xiv. pp. 594-609) controverts this in respect to the Scorpionides, and apparently with success, establish- ing the fact of the dorsal vessel being simple and unchambcred.

DESCRIPTION. |

situated, but commonly in some part of the abdomen. In some Arachnids (certain groups of the Aranezdea) respira- tion is effected by both of the above organs; while in others (certain of the Acaridea) no distinct organs of respiration exist.

Digestive System.—Digestion is effected by a simple ali- mentary tube or canal running from the mouth to the anus. This tube is various in its form, as well as in the intestines

issuing from it ; in some groups, as the Aranezdea and Aca- j

ridea, the above canal has large lateral caecal appendages; in others (Scorpronedes and Thelyphonides) the alimentary canal has no such lateral enlargements. In some Arachnids there have also. been found a liver (or mass of substauce in the abdomen exercising the functions of a liver), an organ performing the part of kidneys, and salivary glands, often of large size, while in others no distinct organs of digestion exist.

Nervous System.—This consists of ganglia or nerve-knots, formed by enlargements of longitudinal nervous cords (gen- erally two in number), differing in position and in the nerves issuing from them. In one large group (Acaridea) where the abdomen usurps, as it werc, the place of all the rest of the body, there is no longitudinal nerve cord; a single nerve mass occupies the interior of the abdomen, and sends forth nerves to the various surrounding parts.

Generative System.—Generation is effected by two dis- tinct and separate sexes, the single exception known being the Tardigrada, a group of Acaridea approaching nearly to the Entozoa, and said to be hermaphrodite. In females the parts of generation consist of two sacs (ovaria), one on each side of the alimentary canal. These have a common exter- nal orifice (vulva), various in its shape, beneath the anterior extremity of the abdomen; and connected with this opening there is frequently an epigyue, or ovipositor, often of some length, and of characteristic form. In males (except among the phalangids and scorpions) there is no intromittent organ, —the generative parts consisting of two long tubes, similarly situated to the ovaria in females, in which the seminal fluid is secreted; these tubes end in

a simple external, very minute orifice, in a similar situation to the vulva of the female.

Arachnids are either oviparous or ovo-viviparous. As before observed, they undergo no proper metamorphosis, but as growth takes place there are more or fewer successive moultings of the skin; and complete development of all the parts does not occur until the last moult, when the creature becomes adult, and so fitted to perpetuate its kind.

With regard to the position held by Arachnids in the

both these organs have external orifices (stigmata) variously |

great scheme of nature, it seems, from the considerations shortly entered into above, undeniable that they are very closely linked to the rest of the Articulata by much, both of external and internal structure, common to the whole branch. The office they subserve is evidently the keeping down of the superabundant supply of the insect world : some even operating to check the too rapid advance of higher animals.

Assuming that the operation, in some shape or other, of evolution has brought the different groups of Articulata to the varied forms and conditions they now respectively present, it is plain that the higher, at least, of the arachnidous orders must, in all probability, have been modified fromi some one or more of the other groups, perhaps in the main from the Insecta and Myriapoda,— certainly not the Insecta, for instance, from the Arachnida. Thus, we should define Arachnids, generally, to be insects modified for the purpose of preying upon their congeners ; whilc some of the lower forms of Arachnids, such as Demodex, Tardigrada, and Pentastoma, carry us back to the remote past, before the branch Articulata, in any of its great groups, had attained more than a very slight progress towards its present dignified and highly organised forms.

The above being a general summary of the external and internal organisation of the Arachnida, an examination of the whole group shows us that their different characters, and the ways in which their articulated plan of structure is carried out, are variously correlated and modified, form- ing structural complications of several marked kinds, whence we get the different orders, being the next subor- dinate groups, into which Arachnids are divided. These

| orders are seven in number, and form so many well-defined

groups, but of very different extent. Advancing from the more simple to the more highly organised, we begin with the Acaridea, comprising the mites and ticks, and including also the Tardigradides, Pentastomides, as well as Demodex. The sccond order is that of the Pycnogonidea, marine parasites, which, in a certain plane, appear to connect the Acaridea with the next or third order, Phalangidea ; these last are popularly known as “Harvest-men.” Next to them, and forming the fourth order, come the Solpugidea, a small but very distinct group, constituting a link in one plane between the Phalangidea and Scorpiomdea, which last, including the Chelifers, or False Scorpions, form the fifth order. Not far removed from these is the sixth order, Uhelyphonidea, comprising groups which partake of the characters both of the Scorpionidea and of the next— the seventh and last—order, Araneidea, or true Spiders.

Sub-Class.—ARACHNIDA.

| Orders.—I. Acaridea. II. Pycnogonidea. III. Phalangidea. IV. Solpugidea. V. Scorpionidea.

VI. Thelyphonidea.

VII. Araneidea.

The following abstract shows the chief ordinal characters of these seven groups of Arachnids :—

Order I. Acartpza.—Cephalo-thorax and abdomen united so as to form one piece, generally without mark of union ‘ palpi and falces variable in

structure ; the several parts of the mouth often united ; legs terminating variously, generally cight in number, sometimes only six in the immature statc, and in one or two instances but four, even when adult; eyes, when present, variable in number (2 to 6), and placed on the cephalo-thorax ; respiration, when proper organs for it exist, wholly tracheal ; nervous matter gathered into one large mass, or ganglion; reproduction ovo-viviparous as well as oviparous. Maturity is reached by quasi, or imperfect, metamorphoses in some of the groups.

Order II PycnoconrpEa.—Cephalo-thorax segmented, linear ; abdomen redimentary, forming merely a small terminal segment to the cephalo-thorax; the mouth consisting of the termination of a tubular article forming the head, sometimes accompanied by some more or less distinct parts; legs eight, multi-articulate; in females a supernumerary pair, between the first two and used for bearing ova; organs of respiration, none ; metamorphosis imperfect, as in the last order.

Order III. PxHatancrpra.—Cephalo-thorax and abdomen of tolerably equal size, and united throughout their whole breadth, but the junctional line evidently marked; abdomen annulate or segmentate, caused by transverse folds in the epidermis; falecs two-jointed, didactyle ; legs in general inordinately long, and very ed ; the two

ioe

terminal joints multi-articulate, and ending with claws : eyes two, on the vertex of the cephalo-thorax; respiration tracheal ; reproduction oviparous ; no metamorphosis of even an imperfect kind.

Order IV. SoueucipEs.—Cephalo-thorax distinct from the abdomen and segmented, the first segment forming the head ; abdomen annulate ; falees one-jointed, didactyle ; palpi terminating with a capsule containing a peculiar organ, the use of which isnot yet known; eyes two, on a smiall eminence at the fore part of the head in the medial line ; respiration tracheal ; legs terminating with two curved fingers ; manner of progressive growth unknown.

Order V. ScorrionrtpEA.—Cephalo-thorax formed of one undivided piece, united to the abdomen throughout its entire breadth; abdomen annulate, prolonged (in one of the families) into a segmented tail, ending with a poison bulb armed with a sharp perforated point, through which the poison is emitted; falces didactylous ; palpi terminating with a didactyle claw; eyes variable in number, two to twelve, variously grouped on the fore part of the cephalo-thorax ; respiration, in one family, tracheal, in another, pulmo-branchial; ganglia several, distri- buted along the nervous chord; reproduction, in some oviparous, in others ovo-viviparous; organs for spinning beneath the fore part of the abdomen in one family; no metamorphosis.

Order VL. TuetypHonrpEa.—Cephalo-thorax undivided, but its segmental structure generally visible in grooves and furrows, following the course of the soldered joints; abdomen annulate, joined to the cephalo-thorax by a pedicle; palpi very strong, didactylous (in a modified form); falces monodactylous ; legs of the first pair exces- sively long, antenniform, the last joints very fine, multi- articulate, and devoid of a terminal claw; eyes, when present, eight, disposed in three groups on the fore part of the cephalo-thorax ; abdomen either terminating with a button like segment, a short two-jointed tail, or a multi-articulate setiform one; respiration pulmo-branchial ; manner of progressive development unknown. In one family, ganglia two, closely united; in others unknown.

Order VII. ARANEDEA.—Cephalo-thorax undivided, but traces of segmentation commonly more or less visible, united to the abdomen by a narrow pedicle ; abdomev without segments or annuli, ending with organs for spin- ning; falces monodactylous ; palpi more or less filiform in males, with the last joint more or less complicated in structure, and used in copulation, terminating in females (but not invariably) with a claw or claws, some- times pectinated; legs terminating with two or three curved claws, and, except the third (which is rarely so), generally more or less pectinated; ganglia two or three in number; respiration tracheal, as well as pulmo-branchial; reproduction oviparous.

We have thus far obtained a general view of the leading groups of the sub-class Arachnida, both in respect to its relation to collateral groups of equal

value, and the relation of its own members to each other, and also a synoptical view of the leading characteristics of the seven orders into which Arachnids may be divided. We now propose to touch shortly, but in greater detail, upon each of those orders, and, as far as our limits will permit, upon the families and genera comprised in them, adding a few general remarks upon each group.

Order I.— ACARIDEA.

The inclusion in this order of such aberrant forms as Demodex, Pentastoma, and Tardigrada, somewhat destroys its homogeneity; undoubtedly they indicate a passage from the Annelides (Anarthropoda) to the Arthropoda, but

whether it would not be more consistent with a strict scientific method to separate the two latter, at least, from the Acaridea, and make each the type of a distinct order, is a point for the future consideration of systematists. At present the balance of opinion appears to be for includ- ing them as the lowest transitional forms of the lowest order of Arachnids. With regard to the position of Tardi- grada, see Packard's Guide to the Study of Insects, p. 668, where Claparéde is quoted from his Studien an Acariden ; also Introduction to the Classification of Animals, Huxley, pp. 123-124, where the position of Pentastomides is also considered. See likewise on this, Cobbold's ntozoa, part iii. pp. 393-402, where reference is made to Leuckart's Baw- und Entwicklungsgeschichte der Pentastomiden.

Owing to the excessively small size of most of the Aca- ridea, and their obscure mode of existence, much of their economy and internal structure is yet unknown. The follow- ing is an endeavour to present their characters in somewhat greater detail than in the short abstract given above.

ExTERNAL StRucTURE.—In their general form the Acaridea are more or less round, oblong, or oval; the integu- ment in some is soft, in others coriaceous, and some are quite hard, like a Coleopterous insect.

The cephalo-thorax and abdomen are consolidated into one piece devoid of articulations ; not only is the head, as in other Arachnids, soldered to the thorax, but the portion (ccphalo-thorax) formed by this union is generally joined invisibly to the abdomen, which is consequently merged in the general covering of the body. In the family Bdellides, . however, and also in some other instances, the junctional points of the different parts of the body are visible enough. The legs are eight in number in the mature acarid, except in Pentastoma, which in a state of maturity has none (fig. 1)— the four abnormal-looking legs visible in the young state disappearing in the adult (fig. 2). Many other Acaridea have six legs only until the last moult, when maturity is attained, one or two, even in the adult state, being said to have but four. Each leg consists in general of seven joints, and the tarsi end, in some, with two movable hooks ; in others the tarsus is dilated at its extremity as if for feeling with, while in some of those whose habits are aquatic it is expanded; in short, the structure of this part is very various, and adapted to the habits of the different genera.! Duges distinguishes the different kinds of legs as follows :—l. Palpatorii ; 2. Gressorii; 3. Remigantes ; 4, Cursorit ; 5. QLextorit; 6. Carunculati.

The parts of the mouth consist of two movable pieces, or falces, in front of which is another piece (labium) ; on each side of the labium is a strong piece (maxilla), and from the outer side of each of the maxille springs a palpus of four or five joints. The different forms and structure of these parts give good characters for the subordinate divisions of the Acaridea. ‘The mouth parts in the species of Acaridea present greater variety than is to be found in any other order, no doubt owing to the greater variation in their mode of existence. In some instances the falces, maxille, and labinm form, by their union, a sort of tube or pro- boscis fitted for piercing, holding on to, and sucking the juices of their prey; when not so united, the falces are terminated variously by a didactyle claw, somewhat like the claw of crab, or by a movable fang (sometimes two- fold) as in the true spiders (Araneidea), or they consist of “two long styles, which by moving backwards and forwards alternately, perforate the substance of their prey.”

The palpi of Acaridians are also variously formed, and, like the legs, have been minutely and well distinguished by Dugés, who (.c.) divides them into seven kinds.— 1. Rapaces, armed with hooks for seizing hold with. 2.

; ace s “Recherches sur l’ordre des Acariens,” Ann. Sc. Nat., 2° ser. i ed. 2.

Anchorari, found in aquatic species, and used for retaining their position by means of terminating points. 3. Fusi- formes, without any claw on the last joint. 4. Filiformes, as their name implies, filiform, or not at all tumid. 5. Antenniformes, chiefly differing from the last in their greater length. 6. Valuwformes, flattened, or excavated, or sheathed in form. 7. Adnati, or united throughout the greater part of their length to the labium, and always slightly developed.

The eyes in very many Acaridians are entirely wanting; When present they vary in number, being generally two, four, or six, and are placed on the cephalo-thorax ; some- times, as in the family Hydrachnides, they apparently con- sist of mere spots of pigment beneath the cuticle; in some other cases there is but one eye, which is composed of a varying number of small facets.

INTERNAL StRucTURE.—The Organs of Digestion con sist, in many species, of a short intestinal canal, which branches out into lateral ceca, “a sa partie stomachale,” and has an anal orifice on the lower side of the abdomen, more or less near to its posterior extremity (Walck., Ins. Apt., iii, 135). The researches of Dujardin (Ann. Sc. Vat. 1845, tom. iii, p. 14) show in two families (Hydrachuides and Trombidides) a curious modification of these organs. In this, the juices upon which these creatures exist are sucked in, apparently, into simple cavities in the substance of the body ; these cavities are without walls of any kind, and from them the juices circulate through the body, and thus form its support.

The Organs of Respiration consist generally of trachee, communicating outwardly with the air by means of minute orifices, “stigmata,” which, in the genus Oribates, are situated between the first and second pairs of legs. In one numerous family (Acarides) no special organs for breathing exist, respiration being apparently effected by the general surface of the body. Different genera exhibit these two modes of respiration in various forms of union. M. Dujardin (/.c., p. 17) speaks of tracheew, in the family Trombidides, having an external orifice at the base of the falces on their

upper side,—the use of these trachee being for expiration, while inspiration is performed through the general surface of the body and the plumose hairs attached to it, or, as in the family Hydrachnides, by “ stomata,” d.e., apertures covered with very delicate membrane.

The Wervous System in Acarids is ganglionic, as in the rest of the Articulata ; and, as we should expect from the simple form of the body (occasioned, as we have seen, by the almost complete fusion of the head and thorax in the abdomen) extremely simple. In the families Trombidides and Acarides, and probably in the rest also, the nervous apparatus consists of “one large globular ganglion, from which nervous filaments are given off, both before and behind,”

With regard to the Circulatory System in the Acaridea too little, apparently, is yet known to make it possible to speak certainly. It is highly improbable but that, in some of the higher groups, distinct organs exist, though such do not yet appear to have been discovered. The results hitherto are negative ; no traces of circulatory organs have been found in such of the lower acarids as have been subjected to minute dissection, and hence the supposi- tion* that the intestinal canal, by means of muscular move- meuts and contractions, operates in the irregular propulsion of the vital fluid to various parts of the body.

The Reproductive System of the Acaridea is very simple.

The external organs consist of an opening on the ventral surface, generally between the coxze of the hinder pair of legs. Acarids are both oviparous and ovo-viviparous ; in the

1 Rymer Jones, An. King., 2d ed. p. 411. ? See Packard’s Guide to the Study of Insects, p. 627.

latter case the young are produced through a large orifice or vulva nearly one-third of the length of the body, and closed by two valves. Some are

supposed to be herma- phrodite, but this, though true of the Pentastomides, is uncertain in respect to others of this order. Partheno- genesis, however, certainly exists in some species. The ova appear commonly to be produced in the substance of the general tissue of the body without the presence of any ovarian apparatus with distinct walls; it is certain, how- ever, that ovaries are present in some species—in the family Trombidides, for instance, in which a tubular double branched ovarium was discovered by Dujardin. Some of the Acaridea, as Tetranychus, produce silk, and spin webs, but the silk-secreting organs have yet to be discovered ; neither do any external organs, such as spinnerets, appear yet to have been noticed. The development of Acaridians from the egg is a subject of great interest and importance, for which, see Claparéde's Studies on Mites (Studien an Acariden), and Siebold in Kéllcker's Journ. Sc. Zool., 1868, part iv.

GENERAL OBSERVATIONS.—Acaridians are universally distributed ; they are to be found under stones, dead leaves, or bark of trees, in the ground, in water, in unrefined sugar, upon dried meat, fruits, cheese, and putrid animal matters, upon all of which they feed. Some are parasitic, both externally and internally, in the flesh of different animals, living upon the juices of the creatures they infest. One species, Sar'coptes Scabiei, is the cause of the disease called the "itch;" another is our troublesome '"Harvest-bug." Some are parasitic upon insects of different kinds ; others are said to have been found in the brain and eyes of man. Allare small, great numbers almost microscopic ; the smaller kinds, particularly of the Acarides, are very difficult to preserve as cabinet objects, and from this, as well as from their minuteness, the order, generally, does not receive that attention to which, from their diversified forms and modes of life, Acaridians are certainly entitled.

From various considerations of structure, the Acaridea may be divided into ten families, each containing one or more genera. These families may shortly be characterised as follows :—

Fam. 1. Pentastomides.—Body annulate, vermiform, lancet-shaped ; the segments of the cephalo-thorax continuous with the body, and furnished with four strong claws or rudimentary legs; this appears (Rolleston, Forms of Animal Life, p. 118) to be the larva or imma- ture state, the adult form

being destitute of limbs (which are replaced by four hooks—two on each side of the mouth), and reversing the ordinary progress of many acarids, from a fewer to a larger number of legs ; organs of respiration and circulation, none (Huxley). On this abnormal family, of which one genus and eighteen species have been described, see Cobbold's Entozoa, pp. 393-402, and authorities there quoted. (See figs. 1, 2.)

h % May

Fig. 2.—The same, in the immature

Fic. 1.—Pentastoma : form; under side. a…a, legs.

tenioides, Rud,

family is Demodex folliculorwm, Simon (fig. parasite found in the follicles of the

human nose—hence its specificname. q---.-----4 ew It is long and slender; the abdo- q….__.: Se inen drawn. out into a wormlike q----------3))(G---——- a tail; the fore part or cephalo-thorax G-------))\ Qi a

has in the adult state four pairs of rudimentary legs, in the immature state three pairs. This is one of the lowest forms of acaridians, and pre- sents in its adult state the immature vermiform appearance of the higher genus Typhlodromus (Packard, /. C.) Fam. 3. Yardigradides. — Body cylindrical, vermiform, but with no ye. 3.— Demoder folliculorum,

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distinct abdomen; it is furnished Simon; under side. 4…a, rudi-

throughout its whole length with mentary legs; 6, ti la ’ four pairs of rudimentary limbs, of which the fourth pair is quite at the posterior extremity; eyes, two ; falces, style-like. These animals are microscopic in size and aquatic in habits; they are hermaphrodite, and are now generally held to be acarids of a very low grade (Packard, /.c., p. 668). Several genera have been char- acterised. Fig, 4 represents Milnesiwm tardigradum, Schrank.

Fam. 4. Acarides.—We now come to the more typical forms of Acaridea.

The family Acarides have a soft, thin-skinned body, with the thoracic junction often visible ; falees either scissor-like or styliform ; maxille obsolete; legs of the two first pairs often widely distant from those of the hinder ones; in some lowly organised forms, “ face-mites,” four legs only are found ; perhaps these are the immature form of some other species (2); eyes, none. In this family are included the chcese, itch, and sugar mites, with numerous others parasitic on various animals. Some forms, as Heteropus ventricosus (Newport), Dermaleichus, and Typhilodromus, particularly in the immature state, exhibit an evident link between the last two families and the higher acarids ; on the agamic reproduction of a species of this family (Cheyletus) F1s-, 4—Milnesium tardignadim, see R. Beck in Q. J. Microse. Se., April ag ey of Sane u Pe onielh 1866; also Newman’s Zoologist, 2 canal; ¢...e, legs (rudimentary). ser., i. p. 236.

Fam. 5. Oribatides.—Body hard and horny ; the thoracic junctions visible ; form of the abdomen, round, globular, oval, quadrangular, or hemispherical; palpi, short ; maxille, large and toothed ; eyes, almost obsolete ; cephalo-thorax, generally with two wing-like pro- jections and two or three cup-shaped pedicellated stigmata on the edge, leading to the respiratory tubes. The Oribatides in general live on vegetable matter, and several genera have been characterised. The immature forms of many species vary greatly from the adults, so that numbers have been described as distinet species. See on this family an elaborate paper by M. H. Nicolet, in the Arch. du Mus., t. vii. pp. 383-482, pls. 24-33.

Fam. 6. Gamasides.—Body, oval, flattened ; epidermis, dense ; falees, scissor-like ; maxilla, free ; legs, equal in size and of similar form ; eyes, obsolete. There are several genera of this family para- sitie on various animals.

Fam. 7. Txodides.—Body, round, oval, or somewhat oblong, of a leathery eonsistency ; palpi, short, three or four jointed ; falces, saw-like, and, with the other parts of the mouth, joming in the for- mation of a beak for thrusting into and holding on to their prey. Kayes, often obsolete; legs weak. On the generation of Ixodes, see a paper by Prof. Gené, eommunieated by A. Tulk to Ann. and Mag. N. H., No. 188, Sept. 1846, p. 160. When gorged with the juices of their victim the abdomen attains an enormous size, and appears almost to obliterate all the rest of the body. In this family are comprised the " tieks" (Ixodes), whieh are often so tormenting to mankind, and domestie and other animals (figs. 5, 6). Among these ticks is included also the noted genus Argas, of which a species, A. reflecus (Latr.), has lately been found at Canterbury, England. Some of the largest known acarids are eontained in this family.

Fam. 8. Hydraehnides, or water-mites.—Body, oval, or almost globular ; palpi, short; legs, ciliated for the purpose of swimming ; eyes, two. These acarids are found in salt as well as in fresh water. Some are parasitic, when immature, on water-bugs and water-beetles ; others, through life, on the gills of the fresh-water mussel.

Fam. 9. Trombidides.—Body, stout, round, or oval, and often somewhat oblong ; frequently broader before than behind ; some- times clothed densely with a kind of pubescence. The two hinder

Fam. 2. Tanurides (ravaés, long, odpd, a tail}.—The type of this 3), a@ very curlous

pairs of legs far removed from the two fore pairs. Eyes, two. The colour of the species of this family is generally of a bright red,

Fig. 5.—Izxodes xgyptius, Savigny. a, falces; 6, 6, palpi; c, caput; ¢, cephalo- thorax, e, abdomen.

searlet, or yellowish, Among them is the red mite, T'etranychus

telarius (Linn.), popularly called the "red-spider," which infests

hothouses.

Fic. 6—The same; underside. a, falces; 8, 6, palpi; c, genital aperture; d, anal orifice; ¢, e, 7, maxille and labium soldered together; g, sternum.

Fam. 10. Bdellides.—Body, oblong-oval, showing the junctions of eaput, thorax, and abdomen ; palpi, long; eyes, two to 81x, gometimes obsolete ; legs, long and strong; parts of the mouth forming a tapering pointed beak of greater or less_length, and looking like a prolongation of the caput. The Bdellides live in damp places, under moss, &c., and on the floors of eaverns. _

The above eharacters of the Acaridian Families are abridged chiefly from A. 8S. Packard's Guide to the Study of Inseets. Besides Claparéde's Studien an Acariden, and Nicolet's Mémoire on Oriba- tides, and other works above noted, may be mentioned Dr C. Heller on the anatomy of Argas persicus, Sitewngsb. d. K. Akad. d. W. Math. Naturw. Cl. Bd. xxx. No. 16, 1858, pp. 297-326, Taf. i.—iv.; Charles Robin's Mémoire zoologique et anatomique sur diverses especes @ Acariens de la Famille des Sarcoptes, 1860, with 8 plates; also by same author, " Mémoire sur les Sareoptes avieoles, et sur les metamorphoses des Acariens," Comptes Rendus, tom. lxvi. pp. 776- 786; H. A. Pagenstecker, Beitrage zur Anatomie der Milben, Heft 1, " Trombidium," 2 Taf. 82 pp., Leipsic, W. En Iman, 1860; P. J. van Beneden, " Recherches sur l'histoire naturelle et la développe- ment de l' Atax Ypsilophorus (Hydraehna eoncharum)," Nouv. Mém. del Acad. de Belge., tom. xxiv. 1850 (24 pp. ed. 1. pl.) Of the older works on Acaridea may be mentioned that of Hermann, Mémoire Apterologique, in fol., Strasbourg, 1804 ; and P. Gervais, in Walcke- naer's Ins. Apt., tom. iii. pp. 182-288, pls. 31-36 and 88, 1844; Doyére, "Mémoire sur les Tardigrades," Ann. Se. Nat., 2 ser. " Zool.," tom. xiv. 1840, pp. 269-861 ; Suite, Zdzd., tom. xvii. 1842, pp. 193-205, and tom. xviii. 1842, pp. 5-35, with 8 plates; P. J. van

Beneden, "' Recherches sur |' organization et la développement des Linguatules (Pentastoma, Rud.) suivies," &., 39 pp. with 1 pl, in Nouv. Mém. del Acad. de Belge., tom. xxiii. 1849.

Order IIT.— PYCNOGONIDEA.

_ The creatures of this order form a small group which it appears now necessary to receive among the Arachnida,

PYONOGONIDS. |

though their true position has been hitherto (and to some extent still is) a matter of much difference of opinion among naturalists. They seem to connect the more typical Arachnida with the Crustacea, and also to form a passage from the Acaridea to the Phalangidea. It appears, however, when their peculiar structure, both external and internal, is considered, impossible to include them within either of those orders; it is therefore proposed here to constitute them a separate order between the acarids and phalangids. The characters of the order are—

EXTERNAL STRucTURE.— Body, linear, composed of four segments ; caput, tubular, in form of a beak or proboscis, and either simple, or ending with palpi and mouth organs ; abdomen, rudimentary ; legs, eight (each thoracic segment bearing a pair), very long, and consisting of eight to nine joints, terminating with a claw or claws. In the immature (so-called larval) state the legs are four only in number.

The females have a supernumerary pair between those of

the first pair, used for carrying the ova. Palpi, when

present, filiform, and composed of five to nine joints ter-

ininating with a claw. yes, four.

With regard to their internal structure, the Pyenogonidea have a dorsal vessel (circulatory apparatus) divided into chambers, a stomach sending forth cecal prolongations into the legs and palpi, an abdominal intestine

with dilated cloaca, and a nervous system, consisting of a cephalic and opththalmic ganglia, closely united together and joined by the cesophagian fillet to the abdominal ganglia, which are four in number, of large size, sessile, and emitting from their lateral extremities nerves into the legs (Cuvier's kégn. An., edition cited post, pl. 22), but no organs of

respiration (Huxley, /.c., and Cuvier's Régn. An., lc.)

Fig. 8. Fig. 7.—Pycnogonum littorale, Miller. a, parts of mouth, forming a beak; B Caput; c…c, thoracic segments; d, rudimentary abdomen; e, cyes. Fic. 8—The Same; under side. a, a, supernumerary pair of legs.

This order contains but one family, Pyenogonides, divided into several genera—Pycnogonum, Phoxichilus, Nymphon, and Ammo- thea. Some of the species are parasitic on cetaceous animals, others

are found seereted among seaweed along the sea-shore, and feed on

short, strong ; without either falees or palpi. genus are parasitic on the eetacca.

body and long legs, which are also slender, as well as in hav- ing falees; but in the present genus there are also two palpi, each of five joints. Nymphon coceinewm (Johnston).

small marine animals. Some are British, and others exotic.

The gencra may be thus shortly characterised.

Genus Pyenogonum (Brunnich).—Body short and thiek ; legs, The speeies of this Figs. 7, 8, P. littorale (Miiller). Genus Phowichilus (Latr.)—Body narrow; legs of great length ;

falees present, but no palpi.

Genus Nynwhon (Fabr.)-—-Resembles Phoxichilus in the narrow

Fig. 9,

Genus Ammothea (Leach).— Body short and rather broad ; legs long ; beak of great size and length; much longer than the falces, which are short. Palpi 9-jointed, the third joint much the longest; terminal tarsal claws double, and of unequal size. Supernumerary legs 9- jointed, and inserted under the first pair of legs behind the beak.

The latest authority in regard to their systematie position, i.c., whether Crustacean or Arachnidan, is Dr Anton Dohru, who says in a memoir, " Ueber Entwicklung und Bau der Pycnogoniden " (contained in a publication, entitled Untersuchungen tiber Baw und Entwicklung der

Fic. 9.—Nymphon coccineum, Johnston 3 under side. a, head; 6, 6, palpi.

Order I7I.—PHALANGIDEA.

The Phalangidea present a very well defined and compact group, though the transition, in one plane, from the Acaridea, through the families Cyphophthalmides and Trogulides, is tolerably apparent, while in another plane they show evident affinity to the Pycnogonides. The following are more detailed characters of the order :—

EXTERNAL StructURE.—The body is of a more or less round, oval, or oblong, and sometimes quadrangular form; the integument is either hard and horny,. or coriaceous, and generally destitute of hairs, but often tuberculous and armed with spines.

The cephalo-thorax and abdomen are united throughout their whole breadth, the junction frequently shown by a slight constriction, but always visible from a strongly- marked groove or ridge; the upper side of the cephalo- thorax, and sometimes of the abdomen, is frequently furnished with spines, sharp teeth, or tubercles. The abdomen is articulate, or segmented in a modified form, from several more or less strongly developed transverse foldings in the epidermis.

The mouth organs are rather complex (fig. 11), consisting of three pairs of inaxillze, above which is a tonguc (Janguette) ; and below the maxille is a membranous lip (labiwm). From the first pair of these maxille there issue two five- jointed palpi, the intermediate joints of which often exhibit processes or branches, the last or digital joints ending with a claw. The other two pairs of maxille support the basal joints of the two first pairs of legs. The presence of these supernumerary, or crural, maxillee strongly supports the idea long since advanced by Savigny and others, that the palpi are but modified legs (see, however, note 1, p. 272 supra); the same idea being also raised in regard to the Thely- phonidea and Solpugidea by the use as palpi of the first pair of legs, which are in fact completely palpiform, and differ markedly from the rest in their structure. Above these parts, directly in front of the upper extremity of the cephalo-thorax, are two falces, each of which consists of two, or (in Cyphophthalmides, G. Joseph) three joints ;

the second joint terminates with a didactyle claw or pair of pincers, formed by a movable claw acting in opposition to

a fixed one.

The falces vary greatly in their size and development The terminal joint is sometimes articulated to the basal one at the extremity of its longer axis or at its end; at other times it is attached by its shorter axis, or more or less near the middle. In some species they are furnished with pro- cesses or horny prolongations, differing in size and form in different species ; this is, however, only a modification of the last mentioned mode of articulation.

The legs are, in most species, very long and slender; in some groups they are, however, shorter and stronger, while in others they are of extreme length aud tenuity. They are eight in number; the seven normal joints, of which each is composed, may be more properly described as con- sisting of five invariable and two variable ones ; the sixth (or metatarsus) being divided into several immovable divi- sions, and the seventh (or tarsus) subdivided into a greater or less number of minute movable articulations, the ter- wminal one furnished with one or two fine claws. The legs are often

armed (some, at least, of their joints) with strong spines and spiny processes; this is particularly the case in the family Gonyleptides. The first joint (coxa) of each leg is immovable, being fixed to the side and under part of the cephalo-thorax. Between the fixed (or basal) joints of the legs is an oblong, or at times somewhat obtusely triangular, sternal plate, divided at its base from the abdomen by a transverse groove ; the anterior extremity is free, and beneath it is concealed (according to the sex) the penis of the male, or the ovipositor of the female ; in some species of Phalangides these organs are of great length and varied in form; this sternal plate forms the lower side of the cephalo-thorax. The eyes, two or eight! in number, are generally of large size, and situated on the sides of a common eminence on the upper side of the cephalo-thorax ; this eminence is often armed with spines and tubercles.

INTERNAL STRUCTURE.—Muscular System.—Every one who has seen the mode in which the Phalangides run would naturally suppose that the muscles required to keep the body raised and balanced between their long slender legs in rapid course must be exceedingly strong; and this is found to be the case. The muscles are of large size, consisting of numerous strong ‘“‘fasciculi,” which arise from the interior of the basal joints (cox) of the legs, and, almost entirely filling up their hollows, pass on into the next joint (trochanter), and so on to the end of the second part of the tibiee; thence two long delicate tendons, continuing forwards, traverse the whole length of the tarsal joints, running along their under surface. The muscles by which the falces and palpi are worked consist of an elevator and a, somewhat larger, depressor foreach. Other muscles and muscular fibres connected with other parts and organs are minutely described by A. Tulk,? whose descriptions, however, cannot be usefully abridged, and are too extensive and detailed for our present space.

Organs of Digestion.—These consist of a simple longitudinal pouch forming the stomach or main intestinal canal, contracted. at each end, enlarged in the niiddle, and giving off on all sides numerous lateral pouches or ceca of different sizes, to the number, in Phalangiwm opilio (Latr.), of thirty. These are minutely detailed by Tulk, who divides them into—(1), those on the dorsal surface of the main canal; (2), those on its ventral surface ; (3), those on its sides. The pharyngeal tube and cesophageal canal are modified

so as to be qualified not only for the passage of simple fluids, but also for solid substances; these first, however, having undergone a process of quasi-mastication by means of the external parts of the mouth. At the opposite end of the alimentary canal a simple, short intestine connects it with the anus, the external aperture of which is situated at the hinder extremity of the abdomen. With regard to the office of the lateral ceca, an examination of their contents has led to the suggestion that they secrete a peculiar granular substance, which is thence discharged into the stomach, and " agelutinates the particles of food together," covering them with a membranous integument which serves to protect the delicate coats of the intestine from laceration by the sharp and spiny nature of their food-contents (Tulk, Z.c. p. 248). Biliary tubes have been

1H. ©. Wood, in Trans. Amer. Phil. Soc., xiii. p. 440. 2 "Upon the Anatomy of Phalangium opilio (Latr.)," Ann. N. H., Nos. 76, 77, and 78, Oct. 1843.

described by Treviranus ; but it seems probable that the anterior pair of these, at least, are trachese connected with the stigmata ou each side of the fore margin of the cephalo-thorax. These stigmata were mistaken by Tulk for eyes (/.c. p.156). The Organs of Respiration are tracheal. The stigmata in Phalan- ium (and Gonyleptes ?) are four in number,—two beneath the fore part of the abdomen, situated one at the base of each of the posterior legs, but usually concealed by the coxal joints, and one on each side of the fore margin of the cephalo-thorax ; each of the former pair opens into a large obliquely longitudinai tracheal trunk; these two trunks give off various smaller branches and tubes, which convey the air to all parts of the body. With two of these tubes, probably, the cephalic stigmata are connected.

The Organs of Circulation are very simple, consisting, in Phalan- gium, of an elongated dorsal vessel acting as a heart, lying in a groove upon the upper surface of the alimentary canal, and divided into three chambers. Ramifications from this vesscl serve to carry the vital fluid to every portion of the body 'Tulk), From researches since made by M. Blanchard,® it

appears that this fluid is re- collected from the general circulation into two large lateral vessels (vascular sinuses), from which it is returned by other channels to the dorsal vessel, or heart itself. The structure of the heart consists of a series of transverse, curved, and muscular bands, leaving between them light and membranous intervals (Tulk).

The Nervous System of phalangids is very similar in its type to that of some other arachnids. 'Iwo large ganglia (cephalic and thoracic) occupy the cephalo-thorax, and from these nerves issue to the various parts, some of them leaving ganglionic enlargements in their course, whence again finer nerves distribute themselves to the adjacent structures, Tulk mentions a striking peculiarity connected with the nervous system of phalangids, which is a power possessed by them to move the nervous centres backwards or forwards at will; this is effected by means of several large transversely striated mus- cular fasciculi radiating from the sides of the thoracic ganglion, to which they are attached by short tendons (Tulk, J.c. 326).

The Organs of Generation in the Phalangidea (which are oviparous), are different from all other arachnids in the large external parts connected with them. In the female, the internal parts consist of an ovisac and ovarium (Tulk) ; whence, by means of the oviduct, the ova are conducted into the ovipositor. This is a long membranous tube; the first or basal part of it is surrounded by annuli or rings of hairs or bristles; towards the extremity it is scaly, and also furnished with some hairs, and the extreme point has two small lateral tufts of hairs. The ovipositor is pore: at the will of the animal, from the vulva, which is situated at the fore margin of the sternal plate, or else it is, when at rest, withdrawn into its sheath, leaving no out- ward trace of it visible. In the male, the seminal vessels consist of a cluster of "slightly tortuous cecal tubes," whence the spermatic fluid is passed by a duct into a penis of enormous length compared to the size of the animal (fig. 12, d, e, f). This organ isa slender curved tube, furnished at its extremity with a recurved hook, and contained in a sheath; both the sheath and penis when at rest lie in a longitudinal direction beneath the ventral surface, of the thorax, but can be protruded at will from the external aperture, which is similar, and similarly situated, to that ofthe female. The form of the penis varies in different species, as also does the ovipositor of the femaie. The organs of generation, both male and female, of Phalan- gium opilio, are

detailed a great length by Tulk, Z.c. Both the penis and ovipositor may be made to protrude by a slight lateral pressure beneath the fore margin of the sternal plate.

GENERAL OBSERVATIONS.—The Phalangidea have been found in all parts of the world, but though often very numerous in individuals, the number of species as yet discovered is comparatively small. In the British Islands, where about sixteen species have been observed, they are popularly known by the name of " Harvest-men," pro- bably because most numierous at the time of harvest. They run with great rapidity over and among grass and low herbage, and many live among the leaves and mossy covering of trees, among moss on the ground, heath, and stems of herbage; also under stones, and among rubbish and debris. Their prey is small insects, the young of the true spiders, and some species of Acaridea, The small size of the body, compared with the inordinate length of the legs, in some genera is exceedingly striking. In an undescribed species of Leiobunus, from the Brazils, the length of the body is but a line and a half, while that of*

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3 " De l'appareil circulatoire et des organs de respiration dans les Arachnides," Ann. Sc. Nat. 3 scr. " Zool.," xii. 318-852, pls. 6-8.

4 " Monograph on the British Species of Phalangiide or Harvest-men," by R. H. Meade, F.L.8., Ann. NV. H., June 1855, pp. 393-416.

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the longest legs exceeds fifty lines ; being in the proportion of about 1 to 32. Phalangids part easily with their legs, or with portions of them; and when detached these legs retain the power of motion for a considerable time, due probably to sustained nervous energy. The order may be divided into about four well-marked families.

Fam. I. Cyphophthalmides.—Characterised by an oval, flattened body, short legs, with undivided tarsi ; falces projecting far in front of the fore part of the caput, and three-jointed (Joseph). Eyes on pedicles, one on each

side of the cephalo-thorax near the lateral margin. One genus only, Cyphophthalmus (Joseph), aud two species, C. duricorius (Joseph), and C. corsicus (Simon), have as yet been discovered, both of very small size, and both South European. They have an exceedingly acaridian appearance, and seem evidently to connect the acarids with the more typical Phalangidea. Joseph (Berl. Ent. Zettschr. 1868, pp. 241-250 and 269-272), who speaks of but two tracheal stigmata; probably the thoracic stigmata were overlooked. The form of the maxille appears to be peculiar.

Fam. II. Trogulides.—Somewhat similar in general appearance to the former family, but differing in the parts of the mouth being con- cealed beneath a kind of hood, which projects beyond the fore margin of the cephalo-thorax ; and in the eyes, which are placed, well separated, in a transverse line at the constriction, where the hood joins the caput. Two genera,? Cryptostemma (Guérin) and Trogulus (Walck.), have been characterised; of the former one species only is yet known. C. Westermanni (Guer.), Guinea. Of the latter genus the species are few, and little appears to be known of their habits or economy; one only, of small size, Trogulus Cambridgii (Westwood '), has been found in England (at Bloxworth, among moss, by the Rev. O. P. Cambridge), remarkable from the dense clothing of short squamose hairs on the body, and hooked spine-like bristly hairs on the legs.

Fam. III. Phalangides (figs. 10, 11).—Characterised by their small,

Fig. 10.—Phalangium copticum, Savigny. a, a, falcex; b, eyes; ¢, cephalo-thorax; d, abdomen; ¢, ée, palpi; #, junctional line of cephalo-thorax and abdomen.

round, oblong, or oval body ; exceedingly long, slender legs, with multi-articulate tarsi; eyes close together, one on each side of a tuberculous eminence on the vertex of the cephalo-thorax (fig. 12, a) ; the eminence, as well as other parts of the body, often armed with 1 Since the above was written, Professor Westwood has founded a new genus—Stylocellus—on S. swmatranus (Westw.) Thesaurus Entomologicus Oxoniensis, Oxford, 1874, p. 200, plate 37, fig. 7.

® Professor Westwood (l.c. p. 201) separates Cryptostemma, and (with Cryptocellus, a new genus founded on C, Jedus, Amazons, I.c. fig. 5) forms a new family CRYPTOSTEMMLDES, between Cyphophthal- mides and Trogulides.

® L.c., p. 202, fig. 6.

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See G, ;

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spines. Falces (fig. 18) often of great size and length, the terminal joint articulated sometimes at its end, sometimes further on. Several gencra of this family have been characterised, and numerous species recorded, mostly European, but our space will not permit of further details, which may be found in the work of Hermann before noted,

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f f Fig. 11.—Phalangium egyptiacum, Savigny; under side, with legs and palpi tran- cated, and without abdomen. a, a, palpi: 0, 6, maxille; c, tonguc; d…d, first one of legs; ee, 7, f, supernuznerary maxille, supporting first two pairs of egs, and used in eating (?); g, membranous lip (labium) ; k, sternal plate

*(sternum); m, fore-margin of sternal plate, under which (at *) are sexual organs.*

under Acaridea ; also in those of Latreille, Sur? Histoire des Insectes connus sous le nom de Faucheurs (Phalangium) (pub. 1802), and

Fig, 12.—Harvest-man (Phalangium cornutum, Linn.); profile, with legs and palpi truncated. a, eye eminence; 6, falces, c, portion of mouth apparatus; d, sheath of penis protruded; ¢, penis; /, the glans,

Herbst ; in Natursystem der wngefliigelten Insekten, 1798-99 ; P. Gervais, in Walck. /ns. Apt., vol. iii. p. 94; and Koch, in Die Arachni- den, 1831-1848; and in numerous iso- lated papers by various later authors. Most of the anatomical details known of the order Phalangidea have been obtained from species of this family.

Fam. IV. Gonyleptides.—This dif- fers from the last in the generally nore or less quadrangular form, or roughly diamond shape; the cephalo-thorax is proportionally larger, often appear- ing almost entirely to overwhelm the abdomen; it is also more spinous and tuberculous; the palpi are longer, some joints often of great strength and length, and armed with strong spines, sometimes assuming, with the strong terminal movable claw, a raptorial appearance. The legs are shorter and stronger, and those of the hinder pair are usually armed with spiny processes, tubercles, and spines ; the coxal joints being often inordinately developed, reaching to the extremity of the abdomen, to which, as well as to the cephalo-thorax, they are im- movably attached. The tarsi are not multi-articulate. The species are tolerably numerous, and all exotic. Several genera have been cha- racterised, on the species of the chief and typical one of which, Gony- leptes (Kirby), a Synonymic List, with descriptions of some new species, has been published by Mr A. G. Butler, in Ann. and Mag. N. H., Feb. 1873, pp. 112, 117, pl. 8., continued in Jour. Linn. Soc. 1874, vol. xii. pp. 151-155, pl. 8. Some of the works quoted on Phalangides also treat of this family. H. C. Wood, jun., considers the order generally in Trans. Amer. Phil. Soc., U.S., vol. xiii. pp. 435-442, pl. 24.

Fic. 13.—Falces and palpi of Pha- langium copticum,

Order IV.—SoLPUGIDEA.

This order constitutes a small but very distinct and remarkable group of tropical and semi-tropical Arachnids. At first sight they remind us a good deal of the true spiders (Araneidea), but their position, when we examine their structural details, seems to be more naturally assigned between the Phalangidea and the next order (Scorpionidea) (figs. 14, 15),

Fic. 14.—Galeodes aranecicdes, Pallas. a, a, falces; b, eyes; ¢, head; d, d, thorax; f, abdomen; g, g, palpi; A, A, palpiform legs; k, digital joint (capsule); 0, 0, shear-like points of falx; 7, anus.

EXTERNAL CHARACTERS,—The body is elongated and clothed with hairs; it is divided, as in other arachnids, into two main portions (cephalo-thorax and ab- domen), but each of these portions is composed of several segments or articu- lations. The caput forms the first segment of the cephalo-thorax; and this is followed by three others closely united to each other, and of a somewhat quadrangular form. Close behind each coxal joint of the legs of the second pair is a small transverse slit or stigma leading to trachez.

The eyes are two in Fic. 15.—Under side of Galeodes araneordes,

with legs and palpi truncated. number, and seated on a maxille; ¢...e, basal leg 'joints; tuberculiform eminence on #7) !°e iar bodnecee 'e" external the fore part of the caput ; oritice of sexual organs; k, tongue, m,m, this eminence is furnished Peckn fair of loge, pp, selfless leading with two long slender co ber eee at fore-margins of second and

' e gments of abdomen; 7, anus; i, ¢ spines, placed in a trans- fixed upper fangs or claws of falecs; 'w, 2, verse line between the Vere ower ditto. eyes, and projecting forwards.

The legs, articulated by a fixed joint to the lower surface of the thoracic segments, are long and strong, furnished with hairs (some of which are remarkably long), bristles, and spines, varying in length and strength. The legs of the first pair are palpiform and not used in running, probably having the sole office of feelers. The number of joints of those of the first and second pairs is seven, while

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those of the third and fourth pairs have eight, an extra joint being inserted between the basal and next adjoining. joints ; the tarsi of the first pair are

simple, or undivided, and terminate with two small curved claws, while those of the other three pairs are often divided into two, three, or more articulations, besides a small terminal or heel joint, from which spring two long curved finger-like claws, each ending with a curved (apparently movable) nail or talon. The number, however, of the tarsal joints appears to differ in some species from others, and even in the different legs – of the same species. The legs of the second, third, and fourth pairs belong to the three thoracic segments respec- tively, while those of the first pair are closely united (and even soldered) by their basal joints to the basal joints of

| the palpi beneath the caput, thus furnishing an additional

reason for supposing them to be more of a palpal than of a crural nature; between the bases of the first pair is a small triangular piece (with its apex directed forwards), unnoticed by authors hitherto (?) and which may be regarded as a rudimentary sternal lip (labium); on the under sides of the three basal joints of each of the fourth pair of legs is a longitudinal row of five curious scale-like or lamelliform appendages, of a subtriangular or somewhat fish-tail form, cach articulated to a separate foot-stalk, which is again articulated to the surface of the leg joint; beginning from the basal joint the form of the last two of these appen- dages differs a little from that of the rest. That these remarkable portions of structure have some special office is scarcely to be doubted, but as yet their part in the animal economy has not even been conjectured. They appear to differ slightly in structure in different genera.

Articulated immediately below the fore-margin of the caput are two enormous, massive falces, each consisting of a single joint, and ending with a didactyle claw or pair of toothed jaws, the upper fixed, the lower movable, and articu- lated horizontally with a vertical movement, closing upon each other like scissors or shears ; these falces are projected in a line almost parallel with the caput, and are generally equal in length to the whole of the cephalo-thorax. From the fore part of the upper side of each of the falces are often seen one or two curious elongate styliform appen- dages varying in size and form; their use, if any, which may be doubted, is unknown ; they are probably distinc- tive of sex, and appear to be characteristic of species. Underneath the caput, and forming the basal

joints of two long strong five-jointed palpi, are the mazdle ; these are strong, cylindrical, and have a more or less strong blunt- pointed apophysis at the extremity on the inner side. Like similar parts in other Arachnids, these maxillee, in conjunction with the affixed basal joints of the first pair of legs, form the lower boundaries of the mouth, the labium (mentioned above) being apparently too rudimentary to subserve any practical purpose. The palpi are furnished with hairs, spines, and bristles similar to the legs, and the last (digital) joint consists of a kind of capsule containing a peculiar organ, said to be protruded only when the animal is in a state of irritation, the use of which does not appear to be known ; doubtless it has some special function beyond that of a mere palpus, and the analogy of the use of the palpi in the males of the Araneidea would lead us to sus- pect a similar use in the present instance, 7.¢., as connected in some way with the process of generation. Between and within the maxille is a portion of the mouth organs, com- posed of several parts of a peculiar shape, and furnished with two slender feather-like appendages ; this is called by Walckenaer the lip (/évre); but its place and_ office is undoubtedly more that of the tongue (/anguette), though probably in the rudimentary state of the true labium it partly performs the duty of a sternal lip. Dugés and M. Edwards in Cuvier's Régne Animal (Arachnides, p. 83),

speak of the "labre," but it is evident from their descrip- tion that a portion of the languette is alluded to, not the part mentioned above as representing the labium. The abdomen is oblong, oval, or somewhat elliptic in its form, about equally convex above and below, and composed of nine or ten articulations, which decrease in breadth from the fore to the hinder extremity ; it is closely united to the cephalo- thorax throughout its entire breadth. The external orifice leading to the organs of generation is situated at the pos- terior margin of the first articulation, and besides the two stigmata before alluded to, behind the basal joints of the second pair of legs, there are two other stigmatic openings! at the hinder margin of each of the second and third arti- culations of the abdomen ; these stigmata are protected by a kind of comb-like fringe, and the anal orifice consists of a long vertical slit situated at the extremity of the terminal articulation,

INTERNAL STRUCTURE.—The Muscular System of Solpu- gids appears to be very similar to that of other Arachnids ; it has been fully displayed by Dr M. Kittary in the work quoted in note, of the present page.

The Lespiratory System is tracheal and complicated. Five (according to Dr Kittary) openings at the hinder margins of the second, third, and fourth sub-abdominal articulations, lead to the abdominal trachew ; these consist of three longitudinal parallel tubes, into the outer one of which the short branches from the external openings lead, and with these are connected various other branches supply- ing air to the different parts of the body. The abdominal trachez also lead into those of the cephalo-thorax, which have their outer openings (two in number) behind the basal joints of the second pair of legs. The thoracic trachez send branches into the legs, palpi, and falces.

There is probably some variation in different species in the details of their respiratory organs. Galeodes Aranevides, for instance, does not appear to have the fifth outward opening in the abdomen (fig. 15).

The Circulatory System consists of an elongated dorsal vessel or heart, running from the middle of the cephalo- thorax backwards through the connection between the thorax and abdomen, but does not reach the hinder ex- tremity of the latter. The thoracic portion is of an oval form, but it contracts in passing into the abdomen, enlarg- ing again gradually as it runs backwards. Dr Kittary does not appear to have traced the various vessels which, no doubt, exist to convey the vital fluid from the heart to the different parts of the body.

The Organs of Digestion consist of an elongated stomach in the cephalo-thorax, with lateral caeca; this stomach is con- tinued backwards into the abdomen in the form of a long single intestinal canal, leading into a cloaca at its posterior extremity. A kind of branching network of minute vessels secrete urine, and convey it from the whole abdominal mass by several main branches into the hinder part of the intes- tinal canal. Beneath the stomach is an organ described as probably the liver, and another answering to the pancreas.

The Nervous System is not particularly complicated, but bears great resemblance to that of other Arachnids, espe- cially of the Araneidea. It consists of one large principal ganglion, or united pair of ganglia, from which branch herves are sent off in all directions to the different parts and extremities of the body ; that which runs to the hinder extremity of the abdomen has an enlargement or kind of ganglion in its course.

The Organs of Generation are highly developed in the

1 Dr Kittary in "Anatomische Untersuchung der Gemeinen (Galeodes araneoides) und der furchtlosen (Galeodes intrepida) Solpuga,"' Bull, Afosc. 1848, No. iv. tab. vi. fig. 2, 6, 6, b, indicates in G. intrepida, a fifth stigmatic opening at the hinder margin of the fourth abdominal articulation,

female, consisting of ovaries, and an oviduct leading to the

external orifice. The male organs do not appear to be

knowu. The Solpugidea are probably oviparous.?

The order Solpugidea comprises a singlc family, Galeodides, divided

into five genera, characterised principally according to the number of the subdivisions of the tarsal joints of the second, third, and fourth pairs of legs :—1. Rhax (Hermann), the tarsi all onc-jointed.3

2. Aellopus (Koch), tarsi two-jointed; those of the hinder pair

destitute of claws (Koch). 3. Galeodes (Olivier), tarsi of the second and third pairs two-jointcd, and of the fourth pair three-jointed.

4, Solpuga, tarsi of the second and third pairs four-jointed, and of the fourth pair seven-jointed. 5. Gluvia (Koch), all the tarsi undivided, 7.e., consisting of a single long thin joint.

Fifty-two species (of all the gencra) have been described. Scea recent paper, List of the Species of Galeodides, by A. G. Butler ; also the older work of Koch, Die Arachniden. All the species, though varying considerably in size, are remarkably similar in general form and appearance, and nearly all are of sombre colouring.

GENERAL Remarks.—The Solpugidea are nocturnal in their habits, living by day secreted under stones, among debris and rubbish, and in old ruined walls and buildings, in dry sandy places; from such retreats they come forth at night, and run with great swiftness. A recent traveller in Palestine relates, that when living in tents on the plains of the Jordan, near Jericho, each night, as nearly as possible between half-past nine and ten o'clock, several Solpugids entered the tent-door, running and racing with great speed over everything—tables, chairs, and beds—just like mad creatures, but apparently with no definite object, perhaps only attracted by the lights burning in the tent. When dis- turbed in their diurnal hiding-places they showed fight and were extremely pugnacious ; but their being venomous is doubtful, though the Arabs seemed to dread them quite as much as they dreaded the true scorpions, which were also numerous under the large stones lying about. Some inter- esting details of the voracity and habits in confinement of a species of Galeodes, are given by Captain T. Hutton, Ann. and Mag. N.H., 1843, vol. xii. p. 81. Like the Phalang- idea, it swallowed the solid parts of insects, and even of a lizard five inches long. Captain H. assumes, as one use at all events, of the palpal organ mentioned above, that it is "a retractile sucker," to enable it to ascend smooth surfaces. This, however, is very questionable.

Order V.—ScoRPIONIDEA.

In spite of differences in their internal anatomy, which appear to ally the Pseudo-Scorpionides more to the spiders than to the true scorpions, some leading features of ex- ternal structure seem to stamp them at a glance as most nearly related to the latter. The impression inevitably created on a comparison of the true and false scorpions is that the latter are little scorpions without tails. Including them, therefore, here in the same ordinal group as the true

. Scorpions, we may shortly characterise the order as follows:

-——Body elongated-oval; cephalo-thorax of one undivided piece, hard, horny, and often tuberculated or granulose, while traces of thoracic segments soldered together are generally more or less perceptible. Abdomen united to the cephalo- thorax throughout its entire breadth, and composed of several segments formed by articulated transverse coriaceous plates on the upper and under sides, united by two lateral cartilaginous membranes, Jalces didactyle; palpi ter- minating with a didactyle claw or pair of pincers; the coxal joints of the legs, fixed to the lower side of the thoracic segments, form a kind of sternum, the sternal

plate, properly so-called, being either wanting or very

? A more recent work on Solpugidea than that of Dr M. Kittary,

is by L. Dufour, Mem. Acad. Sc., tom. xvii. pp. 338-446, 1862.

3 According to Koch, and also to Savigny, in his excellent figures.

Dufour, who, l.c., says Rhax has two-jointed tarsi, evidently had a species of some other genus before him, probably Aellopus (Koch), or else reckoned the metatarsus as a part of the tarsus.

rudimentary. yes various in number, two to twelve. So far the true and false scorpions run together, but when compared more closely, differences, especially of internal structure, appear, which necessitate their subdivision into two groups or sub-orders. Menge and others, on account of these differences, separate the two groups more widely still; but one chief ground of this wider separation, the respiratory system, being in one tracheal, in the other (so-called) pulmonary, seems scarcely sufficiently well estab- lished to warrant it. Not that there is not a wide difference in their respective respiratory systems, but that the whole question of the respiration of Arachnids is hardly so settled as to justify any broad lines of classification being based upon it. In some groups of the first order, Acaridea, and also in the second (Pyenogonidea), no traces have been yet

found of a distinct respiratory system, though perhaps this arises from the minuteness of the creatures themselves and the extreme delicacy of the membranous walls of the air- vessels. This latter especially, as has been lately observed in regard to some obscure Myriapodous insects,—Peripatus (H. N. Moseley, "Challenger " Expedition, 1874, Ann. and. Mag. N. H., 4 ser. vol. xiv. p. 225),—would make it almost impossible, by any means, to discover these tracheal tubes, when once the air had been expressed from them. Then, again, the so-called pulmonary organs of the true scorpions appear to be, simply, modified trachex, en- tirely destitute of that which specially stamps the true lung, that is, the presence of blood-vessels bringing the vital fluid together, and carrying it through the respiratory organs for aeration. The Araneidea, moreover, have both the tracheal ard so-called pulmonary systems combined , and also in this (more extensively worked than any other) order—Araneidea—the researches lately published on their organs of respiration by Philipp Bertkau (Arch. f. Wat., xxxvili, 1872, Heft. 2, pp. 208-233, pl. 7), show how much has yet to be learnt concerning this part of their internal structure. Considering, therefore, that the difference between the respiratory systems of the true and false scor- pions should not separate them from the same ordinal group, these with other differences yet appear to necessitate a division within the order. We propose, therefore, to distinguish them under two sub-orders :—I. Pseudo-Scor- piones; 2. Scorpiones.

Sub-Order I.—Pseudo-Scorpiones.

These are distinguished from the Scorpiones chiefly by the absence of a tail and by their mode of respiration (figs. 16, 17,18). The body is of an oblong-oval form ; the cephalo- thorax is coriaceous; the abdomen sessile and, generally, com- posed above of eleven, underneath of ten segmental rings or articulations, usually covered above and below with a double longitudinal series of transverse corneous plates, united later- ally by a membrane, the folds of which correspond to the trausverse plates. In the second sub-abdominal segmental plate, on each side of the median line, there is (in some species) a small spiracular opening, and in the lateral con- necting membrane of the third segment, opposite to the end of the third sub-abdominal plate, on either side, is another similar opening. These four stigmata are the external aper- tures to the tracheary system (fig. 18);

behind and between the two first mentioned stigmata is a spinning organ, furnished with minute tubes for the emission of the silken threads; and close to this spinner, at the fore margin of the first abdominal segment, is the genital aperture.

The legs are closely affixed by the coxal joints to the lower side of the cephalo-thorax, and sit closely to each other, having a very small longitudinal space between them analo- gous to a sternal plate, of which, however, there is not even a rudimentary one, properly so-called. The number of joints in the legs is seven (Menge), but there appears to be

a variation in this respect in some species. Each tarsus ends with two curved finger-like claws terminating with a short nail, antl beneath them is another claw, inodified at its extremity, gradually enlarging into a kind of conical form, probably acting as a sucker for the purpose of adhesion to smooth objects (fig. 18, d). 'The tarsal claws spring from a small beel or claw-joint.

Fig. 17.

Fig. 16.—Chelifer sesamoides, Savigny. 4, eephalo-thorax; b, abdomen; ¢, ¢ falces; d, d, eyes; ¢, hinder segment of cephalo-thorax; f, front ditto; h, h, palpi.

Fie. 17.—The same; portion of under side, a, rudimentary sternum; 6, 6, maxille; ¢, palpus; d, digital joint; ¢, movable fang ; J, labium; 0, 0, falces.

The palpi are five-jointed, long and strong, terminating with a digital joint of large size, more or less bulbous at its base, and drawn out at its extremity into a jaw-like claw, furnished with hairs and bristles, and generally serrated along its inner edge. Against this claw another, arti- culated to the extremity of the bulbous portion, acts in opposition like the pincers of a crab. Sup- porting the palpi on either side are the max- ille, forming the lower side of the mouth, the upper side being formed Fis. 18.—Chelifer

cancroides, Linn ; pare by two didactyle falces 5 as eee, “a genital apertures a sucker besides the movable jaw like tarsal claw; ¢, e, superior tarsal claws. of the falces, there are connected with theia some denti- culate spines, or other spiny processes and bristles. Within the mouth is a tongue, which also serves as a sternal

labium, and differs in its form in different species. The eyes, two or four in number, are situated on each side of the fore part of the cephalo-thorax, but there are none in the medial line. In some instances eyes are wanting alto- gether.

With regard to internal structure, the Pseudo-Scorpi- ones are very similar in their muscular system to the spiders (Araneidea) (Menge). The digestive apparatus is simple ; a large stomachal pouch contracted a little in the middle lies in the thoracic cavity, and from it the alimentary canal runs through to the hinder extremity of the abdomen, with a double crook in the course of its passage; this canal is imbedded on all sides in a mass of substance serving the function of a liver. The external spinning organs have already been mentioned ; the internal apparatus resembles that of spiders, consisting of a number of small elongated pear-shaped sacs, communicating outwardly with the spinning tubes.

Nothing certain appears to have been discovered in regard to the circulatory system of the pseudo-scorpiones, except that a simple vessel runs along beneath the middle of the abdominal ridge ; the vital fluid being found free among all the other organs of the body, so that the air is conveyed to the blood by numerous air-tubes, and not the blood to the air.

The tracheal character of the vespiratory system has been just mentioned. The spiracular openings vary in number in different species, two or four. From the two hindermost of the abdominal apertures, when four are present, there issue more or less numerous thread-like tubes, which convey the air to the different parts of the abdomen. From each of the two foremost stigmata a main tube runs obliquely through the thoracic region, and from this tube finer ones issue to the rest of the cephalo-thorax and its adjacent parts—legs, palpi, and falces. When two spiracular open- ings only are

present a large tube runs from each forwards into the thorax, and finer ones backwards into the abdominal

arts.

. The reproductive organs are simple. The external parts in both sexes are situated in the second (?) segment be- neath the fore part of the abdomen, and consist of two small oval openings close together. Into each of these there opens in the male a curved horn-like sac, with a ' lateral direction, as well as a smaller longitudinal duct, the latter leading from a common seminal receptacle. In the female a two-branched oviduct leads from the ovaria into the external apertures; the mode of reproduction is ovi- parous, and the eggs are carried by the female beneath the fore part of the abdomen, somewhat like those of certain of the Araneidea.

GENERAL OBSERVATIONS.—The Pseudo Scorpiones are all of very small size; they do not appear to form more than one family group, Psewdo-Scorpionides, of which several genera and numerous species have been described by various authors. They are widely distributed, being found in tropical as well as in temperate climates. Europe possesses many species, and even England has several— these being the sole representatives of the Scorpionidea in this more northern latitude. Their habitat is under stones, beneath the decaying bark of trees, on the damp soil, among moss and herbage; some are found amongst old papers in houses, and in herbaria, and others are said to be parasitic on the common house-fly. For more minute details of structure and other particulars, see A. Menge, Ueber die Scheerespinnen, Chernetide, who separates them from the scorpions under the above name, as a family group, more nearly allied by their internal structure to the true spiders than to the former. Menge gives also a list of works on this sub-order. A paper lately published by Dr Ludwig Koch, at Nuremberg, 1873, pp. 68, describes and

gives analytical tables of all the European genera and species at present known.

Sub-Order IT.—-Scorpionidea.

Between the solpugids and the scorpions (figs. 19, 20) the last group (Pseudo-Scorpiones) gives us an evident connect ing link.

In the present sub-order, Scorpionidea, or true scorpi:

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Fria. 19.—Scorpion (Buthus heros, Koch). a, a, palpi, of which A, A, are the digital or fourth joints, and 7, ¢, the movable fingers; 6, }, falces, with two movable fangs, k, k, and two fixed ones, k, k*- d,cyes; ¢...¢, upper segmental plates of abdomen; /...f, articulated cartilaginous membrane, connecting upper and under plates of abdomen; m, buibous sting.*

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Scaleliais ts

ons, the EXTERNAL STRUCTURE consists of a more or less elongated-oval body, covered with a coriaceous, or hard and

a7)

Fie. 20.—Scorpio Amoreurti, Sav.; under side, with legs, palpi, and falces truncated. a, a, maxille; 6, 6, supernumerary or second pair of maxilla, supporting first pair of legs; ¢,c, third pair of ditto supporting second pair of legs; d…d, basal joints of two hinder pairs of legs; f, orifice of sexual organs; h, A, comb-like appendages (also figured separately, enlarged) ; 4…f, eight spiracles lesding to breathing organs; k, rudimentary sternal

plate ; 0, 0, portion of third pair of supernumerary maxille acting as a sternal labiun.

horny integument. The cephalo-thorax is tuberculate or granulose, and marked with various seams, or grooves, and ridges, no doubt indicating the union of the caput and thoracicsegments. Onelongitudinal, and, ingeneral, strongly

marked groove always divides the caput longitudinally,

dividing also the tubercle on which the central pair of eyes

is placed. 'This groove possibly represents the union of the two segments of a kind of duplex caput analogous to the duplex generative system noted poste (p. 285). The abdomen is sessile, ¢.e., united to the thorax throughout its whole breadth, and composed of twelve segments, of which the five posterior ones form a tail ; these latter are segments in the strictest sense, while those of the abdomen proper are, more correctly speaking, articulations covered above and below with transverse horny plates. Articulated to the fifth joint of the tail is a bulb terminating with a sharp curved sting. Poison secreted in the bulb is injected into wounds through two minute perforations near the extremity of the sting. The legs are not very robust, nor long, nor very unequal in length ; each consists of seven joints, of which the basal ones (cox), are fixed to the under side of the cephalo-thorax, and act partly as a sternum ; the only portion which can be said to represent a real sternal plate being a very small sub-triangular, or in some genera, quad- rangular piece immediately behind the first segment of the abdomen between the extremities of the coxe of the fourth pair of legs (fig. 20, 4). These latter are soldered to those of the third pair, the junction being visible as a more or less distinct groove. The coxe of the first and second pairs have angular pieces attached to them, used in manducation, and hence called supernumerary maxille (fig. 20, 0, 0, 6, b); but while the pieces of the first pair might perhaps be so named, those of the second pair, closing together as they do on their inner margins, rather form a kind of sub-triangular sternal appendage representing the labiwm, of which there is none properly so-called. Each tarsus ends with two rather long curved

superior, and one short straight tooth-like inferior, claws. The first and second segments of the abdomen underneath are almost rudimentary; between them and the anterior edge of the first segment is situated the external aperture to the organs of generation, the horny plate pro- tecting it being divided longitudinally by a more or less distinct groove. From the second segment, and articulated to it, spring two very conspicuous, curious, comb-like appen- dages (fig. 20, 2, h), composed of a longitudinal shaft of several distinct joints, with a number of slightly curved, bluntish tooth-like processes, fitting closely together, and articulated to their hinder edge, nearly at right angles, like the teeth of a comb. The shafts and teeth of these appen- dages vary in the details of their form and structure ; their use has not yet been certainly ascertained, but their position points to some connection with the process of generation, which is also the opinion of L. Dufour and others ; while they have also been thought to be intended to brush away obstructions from the spiracular orifices and other parts ; but as in no case are they long enough to reach more than the first pair (out of four) of these orifices, and every con- sideration of structure is against their being used to clean other parts, this conjectured use is scarcely probable. The spiracular orifices are situated on the under side of the abdomen in four pairs—one pair in a transverse line on each of the third, fourth, fifth, and sixth segmental plates, and are in general easily seen,

The eyes (six, cight, ten, or twelve in number) are placed on the fore part and upper side of the cephalo-thorax,— two, generally large ones, in a transverse line near the middle of the upper part of the caput, the rest (much smaller and varying in size in different genera and species) in two symmetrical groups, one on each side near its fore corners. The falces form, as in other Arachnids, the upper side of the mouth; they are strong, cylindrical, and didactyle, the outer jaw-like terminal claw being articulated in oppo- sition to the inner one; both are toothed, the denticulations varying in number size and form. Below the falces (and

forming with the before-mentioncd coxal appendages a complete lower boundary to the mouth) are two strong maxille, from each of which (as a

basal joint) springs a long strong palpus of four joints, the last (digital) joint being more or less bulbiform at its base and didactyle at its extremity. The outer claw is movable, and (like the fixed one) scrrate or denticulate on its inner edge. The size and form of this didactyle joint vary in different species and gencra ; in some it is of enormous size, and its denticulations very strong, while in others it is scarcely larger than the joint which precedes it. Itis the possession, the position, and the office of the exact counterpart of this palpus, which, apart from other considerations, so plainly stamp the affinity of the two sub-orders of the Scorpionidea, in spite of the differences of their respective internal anatomy. Within the mouth parts above noted isa pointed tongue (languette) tipped with hairs.

INTERNAL STRUCTURE.—The Muscular System of scor- pions is similar to that of other Arachnids. It is well detailed by L. Dufour (Savants étrangers, xiv. pp. 609- 611), who divides the muscles into thoracic, abdominal, and caudal; those of the abdomen being also subdivided into teyumentary, perforant, and cardiac.

The Organs of Digestion consist of a straight narrow intestine, with little or no dilatation, running from the mouth to the anus, which has its external opening at the lower extremity of the fifth or last segment of the tail. At the junction of the stomachal and intestinal portions the biliary vessels are inserted, and from each side of the former (stomachal part) there issue five narrow ceca run- ning into a mass of fatty matter on either side.

The Respiratory Organs, or pulmo-branchiz, have their ex- ternal orifices or stigmata (as before mentioned) in four pairs on the veutral surface of the abdomen; the pulmo-branchie, of which one is connected with each stigmatic opening, are hollow sacs, the walls of which are folded into delicate lamin, each being duplex,! and all lying one upon an- other like the leaves of a book; the air is admitted to these through the external openings, which are closed by movable horny lips as in insects. (Jones, Animal Kingdom, 2d ed., 416.) According, however, to L. Dufour (i.c., p. 617), the lips of the stigmata are immovable, and have a varied direc- tion in different species. The air is admitted to the pulino- branchie by the action of a linear opening in a supple membrane or diaphragm within the space between the lips and the lamine (L. Dufour, /.c.)

Organs of Circulation.—These, according to Newport (Philos. Trans. 1843, pp. 286-298), consist of an elongated, dorsal muscular vessel (or heart) divided into eight cham- bers, separated from each other by valves, and with auri: cular openings or valvular orifices, at the division of each chamber, on its dorsal surface. From both sides, and at each end of the dorsal vessel, artcries convey the vital fluid for distribution to different parts of the body.

This dorsal vessel apparently acts in a manner analogous to that of the heart in vertebrate animals. The vital fluid is conveyed back tothe " heart" from the pulmo-branchiz, where it has been oxygenated by means of a great number of slender canals, formed by the collection together of vessels that have their origin at the hinder part of the inner side of the pulmo-branchiz. These canals pass round the sides of the body in the hinder part of each segment, and pour their contents into the dorsal vessel through the valvular orifices above mentioned. The conveyance of the fluid from the general circulation to the pulmo-branchiz is effected by means of an intricate system of anastomos- ing pulmonic and capillary vessels, situated chiefly below the nervous chord on the ventral surface of the body.

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1 L. Dufour, Zc.

SCORPIONS. |

From the above L. Dufour (/.c.) dissents. According to his researches, which appcar to have been pursued under the great advantage of having fresh as well as living examples to observe and dissect, the heart (or dorsal vessel) is not divided into chambers at all; its chambered appearance, which misled Newport and others, arising from inevitable changes in the form of the organ after death, and long immersion in spirit of wine. Dufour gives very exact figures and descriptions of these changes. Aceording to him the heart is a simple, undivided vessel running throughout the whole body, only narrowing at the fore part of the caput, and in its passages through the tail ; and from this tube various lateral veins and arteries issne, those from the hindcr or tail portion being pro- fusely branehed. He dissents entirely from Newport, Blanchard, and others, with regard to the mode above mentioned

in which the vital fluid is eonveyed to and from the pulmo-branehize, but he con- fesses that he has not been able to find out how it is actually effected, though he believes that the pulmo-branchial lamins are permeated by vascular ramifications spread out over every one of their leaves, and that in these ramifications the fluid receives the benefit of the air adinitted to the Jaminew. Siebold, however, says that no traces of blood-vessels have been found in the pulmonary lamelle of another order, Araneidea; and it is hard to believe but that, if such details as those given by Newport in regard to the scorpion actually existed, Dufour, with the advantage of fresh examples to dissect, shonld have been unable to discover it. Ou the whole, it seems too soon, even yet, to dogmatise on the position of the scorpions from their respiratory and circulatory systems. That they have these two systems, the first by means of a dorsal vessel, with lateral branches, the latter by a kind of pouch containing a modification of trachex, is certain ; and that their system is different from that of some other groups is also certain, but in the absence of a more perfect know- ledge of the real nature of the difference, its true value cannot well be yet ascertained.

Nervous System.—A longitudinal row of nine—according to Newport, eight —ganglia, connected by a double nervous chord, is situated in the median line of the body, below the intestinal canal. 'The first ganglion consists of two lobes, the upper one of which, occupying a position some- what analogous to that of the brain in the Vertebrata, is so called (cerveaw) by Dufour. From these lobes the optic and other nerves issuc, some of them being connected with the various parts of the mouth and thelegs. A nervous collar, according to some authors, surrounds the cesophagus. Dufour, however, disputes the existence of this collar, and explains how the idea of it arose, l.c., pp. 556, 557. Of the remaining ganglia four are, according to Dufour, situated in the abdomen, and from these four there spring on each side and underneath, branching nerves, which run to each of the pulmo-branchiz respectively and their adjacent parts, as well as to the viscera and tissues of the abdomen. 'The first abdominal ganglion is in close con- nection with the large thoracic one, and is in some instances so little developed that Newport and others, overlooking it, derived the nerves running to the first pair of pulmo- branchize from the thoracic ganglion itself, and thence allowed but three to the abdomen.

The caudal ganglia, four in number, do not correspond to the number of segments, which are five, or counting the terminal bulb, six. From each caudal ganglion two lateral nerves oly issue, except from the last, whence there issue three pairs; the extra ones, running back, and branching out into the muscles of the poison bulb, doubtless add greatly to its sensibility and irritability.

The Organs of Reproduction occupy, both externally and internally, a similar position in both sexes. The ex- ternal aperture is duplex, situated between the first and second segments of the abdomen, in front of and, in a manner, between the comb-like appendages, and covered by an operculum. Internally those of the male consist of a duplex set of vessels for the elaboration, collection, and conveyance of the seminal fluid to the external orifices, each orifice having its own set. The vessels, answering to testes, in which the seminal fluid is secreted, consist each of a tube forming three large quadrilateral, flexuose, and free, anastomosing meshes placed longitudinally ; those of one set sometimes communicating with the other at the

lower mesh by a short, strong connecting tube. According to Treviranus the three meshes on either side anastomose with each other, having, in fact, a common connection throughout, but this L. Dufour considers to be an abnor- mal case ; the vessels for the collection of the seminal fluid, vesiculee seminales, are three for each set, and all open into the channel of emission; this is produced backwards in the form of a long, fusiform, sheath-like channel, lying along the flanks of the abdominal cavity, and attenuated at both extremities ; within this channel is another slender, corneous sheath-like organ, prolonged to the genital aper- ture, where it is exceedingly fine. This is "le fourreau et Yarmure de la verge" (Dufour), and within it is the intromittent organ itself, having a whitish cartilaginous, thread-like appearance. No recorded observations have yet decided the mode in which these parts of generation are used : the Scorpionides being nocturnal in their habits wnakes such observations very difficult, but all analogy is in favour of copulation by the exsertion and introduction of the

thread-like organs above described into the female parts of generation. These cousist of two ovaria, each composed of a membranous tube, forming four large quadrilateral meshes in a longitudinal linc on each side, anastomosing with each other and with those of the other side; each of these ovaria ends in a simple oviduct (sometimes with, sometimes without ovisacs) leading to the vulva or exter- nal orifice. The general similarity of these female organs with those of the male is at once apparent. A curious point noticeable in these parts in the Scorpionides is their duplex character, and hence the question as to their mode of operation becomes of greater interest. It is remarkable that the only other-Arachnids in which an intromittent organ is as yet known are among the Phalangides, a group widely separated from the Scorpionides in other characteristic details, though approaching much nearer to the pseudo- scorpions. Scorpions are ovo-viviparous, and, according to Dufour (/.c.), their period of gestation is of great length, extending even to fifteen or sixteen months ; but for five of these months, which occur in the winter season, Dufour concludes, from frequent observations, that the whole genital apparatus is, like the animal itself, in a dormant state, and that therefore no progress in the development of the ova tukes place during this period. On the very important branch of this subject—the embryology of the scorpion— reference only cau be made to the works of Heinrich Rathke, Reisebemerkungen aus Taurien (contained also in Burdach's Physiology, Bd. ii. p. 242, et seg.) and to that of Dr Elias Metschnikoff, "' Embryologie des Scorpions," Z. Wiss. Zool., Bd. xxi. pp. 204-232, taf. xiv.—xvii. ; also sepa- rate, Leipzig, 1870.

GENERAL OBSERVATIONS.—The sub-order Scorpiones forms a remarkably homogeneous group. It has been divided, however, into several families by Koch (Die Arachn.) ; and various genera, based principally on the num- ber and distribution of the eyes, the form of the fore margin of the cephalo-thorax, and the structure of the comb-like appendages attached to the under side of the abdomen, have been characterised. The species are tolerably numerous, but the whole group greatly needs revision, both in respect to its family and generic divisions, as well as in regard to the identification and determination of the species. Those found in Europe are of comparatively small dimensions, and are confined to the southern parts of the Continent ; the majority are tropical, attaining their greatest size—nine or ten inches in length—in Central Africa and South America. They

are nocturnal in their habits, living by day underneath stones, behind the loose bark of trees, among the ruins and debris of old walls and buildings, and preying upon insects and other Arachnida ; they are said to be very partial to the eggs of spiders and insects. It

does not appear that they are able to inflict any great injury with the, often formidable looking, crab-like claw with which their palpi terminate, though they can gripe and hold on firmly with them. The wound inflicted by the sting at the end of the tail is certainly more or less venomous; the amount of venom is probably dependent on the age of the scorpion, and the season of the year; and the effect of the sting is no doubt dependent upon the state of health, constitution, or predisposition of the person injured. Experiments, tried by Maupertuis, upon poultry and dogs stung by exasperated scorpions, resulted in their almost entire immunity from bad effects, while in Redi's experiments, the sting proved fatal in some instances to pigeons. 'These experiments were tried with European species of scorpion, which would probably be less veno- mous than those living in tropical couatries. For a recent memoir on the poison of the scorpion, and the mode in which it acts, see Dr Jousset, Ann. Lnt. Soc. France, 1872, p. 151; also Comptes Rendus, 1870, pp. 407-411. Accord- ing to Jousset, the venom acts directly upon the red globules of blood, paralysing them, so that becoming agglutinated together, they obstruct the entrance to the capillaries and stop circulation. The peasant inhabitants of Tuscany are said to handle scorpions without fear ; but this may be chiefly from a skilful mode of handling them. A scorpion does not appear to be able to move its tail or its sting in a lateral direction, nor does it strike downwards. The present writer has seen natives of Egypt handling large, and it is believed very deadly ones with impunity, but then they always held them tightly by the last joint of the tail. It was a common practice so to catch these creatures, and after breaking off the tip of the sting, to let them loose again ; but this infliction generally appeared to produce a kind of paralysis of the whole tail, and probably the poor animal would soon die.

Though the well-known tale of the scorpion, when surrounded by fire, stinging itself to death, has been perpetually repeated, and has even been

related to the present writer with some very minute and extraordinary details, it must be held to be merely a " traveller's story." Cross-examination, in the special instance noted, very much nettled the narrator at the incredulity which led to it, but it threw more than a doubt over the conclusive- ness of the experiment narrated. Probably in some in- stances the poor scorpion has beeu burnt to death ; and the well-known habit of these creatures, to raise the tail over the back and recurve it so that the extremity touches the fore part of the cephalo-thorax, has led to the idea that it was stinging itself. Perhaps, under the pain of scorching, there may have been convulsive efforts and movements of the highly nervous aud seusitive tail in this position, and the point of the sting may even have been inserted between the articulation of the cephalo-thorax and abdo- men; and what more would be wanting to make a wou- der-loving traveller believe that it had really committed suicide? The progress of scorpions is neither rapid uor graceful; they are unable to run without elevating the tail to an erect position, which seems to be necessary to enable them to preserve their balance.

CLASSIFICATION OF THE ScorPIONES.—The following is

. es 8 to} Koch's systematic division of the scorpions.?

Order SCORPIONES.

Fam. I. With six eyes, Scorpionidcs.—One genus only, Scorpius (Ehrb.)

Fam. II. Eight eyes, Buihides.—Five genera: Buthus (Leach) ; Opistophthalmus (Koch) ; Brotheas (Id.); Telegonus Id.) ; and Ischnurus (Id.)

1 L. Koch, Uebersicht des Arachniden Systems, Nuremberg, 1850, pp. 86-92,

ARACHNIMO&

[THELYPHONIDS.

Fam. III. Ten eyes, Centrurides.—Two genera: Centrurus (Ehrb.) ; and Vaejovis (Koch). Tam. IV. Twelve eyes, Androctonides.—Three genera: Andro-

ctonus (Ehrb.); Tithyus (Koch); and Lychas (Id.)

One hundred and twenty-two species, distributed variously among the above eleven genera, have been described by Koch (Die Arachn.) ; but many others also have since been added to these, in isolated papers by other authors. For another systematic arrangement, as well as on the group generally, with descriptions of seventy-eight species, see Walckenaer, Ins. Apt., iii. pp. 14-75, where other works are also referred to. Scorpions have been found in a fossil state, as well as in amber, in which substance a species of Tithyus (7. eogenus) has been described by Menge.

Order VI.—THELYPHONIDEA.

The last group, Scorpiones, seems to be the culminating point of the Arachnids in a certain plane, and it presents the arachnidous type in its highest and most complex state of development. The group now to be considered gradually lowers, so to speak, this type again through its

‘three well-marked families, to the last order Araneidea.

As has been before observed, there is seldom or never in nature exactly the same hiatus between one group and another, as there may be between either of them and others; or, in other words, some groups are far more nearly allied to the one next to it than others are to that next to them, although, perhaps, all of those groups bear the same apparent value in a systematic arrangement. ‘Thus, for in- stance, the groups A, B, C, D may all be equal in a systematic arrangement, and yet A and B may be far more nearly allied than B and C; or again, C and D may be more closely united than either B and C or A and B. So the two orders of Arachnids—Scorpionidea and Thelyphonidea —are certainly far more nearly allied to each other than, for instance, the Solpugidea and Scorpionidea, or the Thelyphonidea and Araneidea are to each other respectively. So obvious is the affinity of the family Thelyphonides of the present order to the Scorpiones, that Walckenaer and others have included them in the same order, making a

separate order of its other family, Phrynides ; but the latter family certainly seems nearer to Thelyphonides than even the Thelyphonides to the Scorpiones; and so, while the Thelyphonides and the Phrynides must go together, these last could scarcely with any propriety be included in the same order as the scorpions. This will, we think, be evident when we consider presently their structural char- acters. From these and other considerations, it has there- fore been thought best to separate the Thelyphonides from the Scorpionides, and include them in another order with Phrynides.

In the order Thelyphonidea, the cephalo-thorax is similar in the general nature and condition of its integument to that of the scorpions, being hard, granulose, and sometimes tuber- cular, bearing also visible traces of its soldered segments.

The abdomen is segmented, and united to the cephalo- thorax by a pedicle of greater or less strength, but never, as in the Scorpiones, throughout its entire breadth ; it terminates in one family (Thelyphonides) with three post-abdominal segments, to which is attached a long multi- articulate setiform tail; in another (Tartarides) with a short tail of different form according to the species; and in the third family (Phrynides) the abdomen terminates with a simple button-like segment.

The legs of the first pair are much longer than the rest (in the Phrynides of most inordinate length) and antenniform ; the tarsi, and generally the metatarsi, multi-articulate, ending without any terminal claw; the legs of the other three pairs are seven-jointed, with the last, or tarsal joint, subdivided.

_ The eyes when present (as in two families), are eight in number, placed on the fore part of the cephalo-thorax

THELYPHONIDS. |

in three groups, and forming a triangle with the apex (more or less acute) directed forwards; the base of the triangle is formed by two lateral groups, each of three contiguous eyes; the apex by the third group of two eyes near to- gether, but not generally contiguous to each other.

The falces are monodactylous, or terminating with a simple movable fang. The palpi are four-jointed, mono- dactylous, or rather didactyle in a modified form. The sternum is more developed than in the scorpions, but not so fully as in the next order, Araneidea. The labium is either entirely wanting or very rudimentary in one family, in another fairly developed, and in another altogether absent.. In any case, it is probably of small economic importance compared to the labium in the Araneidea.

Such knowledge as is at present attainable in regard to the internal anatomy of this order will be noted in the sepa- rate descriptions of each family. These families are three in number,—TZhelyphonides, Tartarides, and Phrynides,—and being very distinct, it will be well to give a short diagnosis of each.

Family I.—TZhelyphonides.

EXTERNAL STRUCTURE (figs. 21, 22).—The cephalo-thorax is sometimes of a tolerably regular oval form, more or less

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p) ? 2 a <2 3 Qa GSS Ses Ee Ds Rie Se fs Fia, 21.—Thelyphonus geganteus, Koch. a, paipus; b, movable fang or elaw, form- ing with ¢, elaw on fourth joint, a didactyle claw; d, claw on third joint; F Segmental elongation of abdomen, supporting tail; g, tail; h, h, falees; m, eyes; 0, 0, first palpal joint, with charactcristic denticulations,

blunt-pointed before, but often it is of an oblong quadrate shape, also pointed in front, and making not only the hinder part but also the fore part somewhat angular,—the latter having two obtuse lateral angles, and one acute and apical ; it is of a flattened form, and destitute of hairs and spines, but is generally granulose, and sometimes covered with more marked, but still minute, tubercles. Marks of segmental soldering are visible, as also a longitudinal groove in the medial line of the caput, similar to, but less marked than, that noted in regard to the scorpions. Beneath the cephalo-thorax are two pieces, which may be Tegarded as small sternal plates, perhaps the terminal Temains representing the complete sternum of the

Araneidca, or anticipating its complete form in that order; One of these sternal plates is of a somewhat triangular form, and

has its longest or apical angle directed backwards between the basal joints of the first two pairs of legs; the other, more heart-shaped, and with the apical angle reversed, is situated between the basal joints of the legs of the fourth pair. In some species a minute corneous patch may be seen between the cox, or basal joints, of the third pair of legs, affording still further evidence of the remains of a sternal plate. At the centre of the fore margin of the foremost of these sternal plates is a small point which seems to represent the labium. Beneath the fore part of the cephalo-thorax are two not very powerful falces, termi- nating with a long, powerful, movable, curved fang, some- what resembling what we find in the Araneidea, and hinting at a transition to that order from the didactylefalces of the Scorpiones. Beneath, and opposed to, this fang is a fixed tooth-like claw; these parts of the mouth are thickly clothed and fringed with hairs. Immediately in front of the fore sternal plate, beneath the anterior part of the cephalo-thorax, are articulated two enormous maxille of a subtriangular form, the apex being at the articulated part, and the inner basal angle prolonged into a larger or smaller tapering, pointed apophysis, which is now and then denticulate. From the extremity of each of the maxille springs a proportionately strong and massive four-jointed palpus, powerfully armed with spines, denticulations, and claw-like projections ; the inner extremity of the last, or digital, joint terminates like the radial (or the joint next before it), with a strong, claw-like, sharp-pointed projection, in imperfect opposition to which there is a stronger movablo claw, of the same nature, articulated to the outer extremity ; the fixed claw of the digital joint, with the joint itself, appears capable of being opposed at will to the fixed claw of the radial joint, thus giving the palpi a duplex kind of didactyle claw,—didactyle, that is, in a modified sense, dif- fering as it does considerably from the terminal claw of the scorpion's palpus, which is more properly spoken of as didactyle. The movable finger of this claw would, perhaps, be more correctly reckoned as a substantive joint, terminat- ing

with a more or less sharp corneous nail; and this joint, opposed to a pointed apophysis of the one to which it is articulated, forms the so-called didactyle claw ; in fact, the terminal palpal claw of the Scorpiones (including the Pseudo- Scorpiones) as well as that of the Phalangidea, appears to be similarly constructed. In the present family, however, the basal portion of the joint, bearing the fixed claw, being far less developed (seldom stronger or more bulbous than the other joints), and the two fingers being always of unequal length, the didactyle nature of the whole is less real, and less apparent ; while in the scorpions its bulbous form is generally apparent, and often inordinate, the equal length of the two fingers and their evidently purposed opposition to each other making the claw, in the fullest sense, didactyle.

If this view (that the movable finger of this claw is a substantive joint) be correct, the palpi in the present order, as well as in the orders Phalangidea and Scorpionidea, must be considered to have five instead of four joints, thus bringing them to an equality in this respect with the

Fic. 22.—Thelyphonus —— ? portion of under side, a, movable claw of palpus; b, fixed ditto; ¢, law on third palpal joint ;. d, d, maxille supporting palpi; e,f, sternal plates; g, orifice of sexual organs; f, place of labiuin; 0… 0, orifices of respiratory organs.

Araneidea. The palpi in the third family of this order— Phrynides—bear out this idea strongly.

The legs are long, slender, and seven-jointed, except those of the first pair, which have but six, the genual, or fourth, joint being absent. 'The tarsi of the first pair are divided into eight short articulations, while those of the rest have but three. There is probably some variation in the number of these articulations in different species, since Walckenaer describes the tarsi of the three hinder pairs as five-jointed ; the first pair are far more slender than the rest, palpiform, and without any terminal claw; they appear, as it were, to be thrust out of their position by the great size of the maxillz, and their basal joints seem to be jammed in over those of the second pair. The tarsi of

the three hinder pairs terminate with three claws, of which those of the superior pair are the strongest and curved.

The abdomen is of a long-oval form, composed of nine quasi segments, formed by a covering, both above and below, of so many transverse articulated corneous plates; while the cartilaginous membrane on each side, between the lateral margins of the upper and lower plates, is continuous, not folded or articulate as in the Scorpionidea. This is a point to be noted, as it marks a transition to the abdominal type of the Araneidea. The first plate on the upper side forms a protective covering to the pedicle by which the abdomen is united to the cephalo-thorax, and makes the pedicle look broader than it really is. There is a double longitudinal row of impressed circular spots on the upper side, two (in a transverse line) on each corneous plate, except the first and last ; these impressed spots are perhaps points of attachment for muscular fibres.

Beneath the abdomen, on the fourth and three following segmental plates, are eight stigmata in as many largish, shallow, circular impressions; they are, however, imperfor- ate, and are probably, like those mentioned above, points for the attachment of muscles. The spiracular stigmata are four in number, two being placed beneath the hinder margin of each of the first and second sub-abdominal plates, one on each side of the median line; the genital aperture is under the hinder margin of the first plate, between the first two spiracular openings. Joined to the posterior extre- mity of the abdomen are three small cylindrical, post- abdominal segments, to which is attached a long setiform tail, variable in length, composed of a number of small articulations, and, like the legs and palpi, sparingly fur- nished with hairs ; at the extremity of the third post-abdo- minal segment, beneath the tail, is the anal opening.

The eyes are eight in number : two placed transversely,

near to each other, on the fore niargin of the caput in the.

medial line, and three others in a triangular group on each side at its lateral angles, just above the insertion of the legs of the first pair.

With regard to the INTERNAL StRucTuRE of the Thely- phonids but little appears to have been ascertained. The respiration is pulmo-branchial ; the spiracular apertures being, as above stated, four in number, and situated in the position already mentioned. Their mode of reproduction is probably like that of the scorpions, ovo-viviparous, but this is conjecture only.

GENERAL OBSERVATIONS.—The family Thelyphonides is exceedingly homogeneous, and comprises but a single genus, Thelyphonus (Latr.), of which twenty-nine species only have been recorded and described,—twenty-six in one of the latest works upon them, by A. G. Butler, Ann. and Mag. N. H. 1872, vol. x. pp. 200-206, and Cistula Ento- mologica, 1873, part vi. pp. 129-132; and three others in a still more receut paper by the late Dr Stoliczka, Journ. As. Soc. Beng., part ii. No. 2, pl, xii.

All the species of this small but remarkable group are confined to the tropical regions of Asia, America, and

Australasia, no species having yet been recorded from Africa. In size they vary from rather more than half an inch to 2 or 3 inches in length. Among other characters useful in the identification of the species, are the number and dif- fcreutial development of the various processes and denticu- lations of the palpal joints. Of their habits little is known, and much of that little is of a very recent date. Dr Stuliczka (/.c.) gives a short account of them, from which it appears that they are nocturnal or crepuscular, living by day in damp places under the bark of old trees; when disturbed they hold up the palpi, as if for defence, and beat a rapid retreat, with the tail in an erect position. In this position of the tail we see a curious relationship to the scorpions, but apparently without the samc necessity, in the present instance, for such a position. They lie still when uncovered, evidently simulating (though of course unconsciously) a fragment of old bark or fungus. The first pair of legs act more as feelers than as organs of locomo- tion. In the presence of a sternal plate, the mode in which the abdomen is united to the cephalo-thorax, and the struc- ture of the falces, Thelyphonids approach nearer than the scorpions to the structure of the true spiders, and,

as we shall see, the family Phrynides is a transitional group bridging over some part of the gap between the two, while in the massive palpi (though imperfectly didactyle), and in some other respects, they show an unmistakable alliance to the scorpions.

Family I1.—Zartarides.

This family is nearly allied to the former—Thelypho- nides—but has a more elongated form. The cephalo- thorax is beak-like in front, and is also divided into two parts or segments ; the first comprises the caput, and the coalesced thoracic segments belonging to the first two pairs of legs; the hinder part is the smallest, and comprises the second thoracic segments belonging to the third and fourth pairs, but no grooves or indentations mark the union of the segments, its surface being smooth and glossy. The abdomen is united to the cephalo-thorax by a stout pedicle, and is covered above and below, as in Thelyphonides, with eight or nine transverse, corneous, articulated plates, the upper series separated from the lower by a narrow divisional space, covered with a continuous cartilaginous integument. Beneath the fore part, at the hinder margin of the first sub-abdominal segment, a line-like fissure in the median line probably represents the opening to the reproductive organs ; near the fore margin of each of the fourth, fifth, and sixth plates, in a transverse line, are two small elongated stigmata, thought at first to belong to the respiratory apparatus, but further examination seems to prove them to be, like the eight analogous stigmata in Thelyphonides, imperforate, and probably due to the same cause conjectured in regard to them. Two (or four) narrow slits, placed two and two symmetrically on each side of the genital aperture at the fore margin of the first and second segments, but very difficult to be correctly ascer- tained, are probably the external openings to the respiratory organs ; these points, however, can hardly yet be said to be satisfactorily determined. Two or three very narrow corneous rings, or post-abdominal articulations, support a caudal appendage, either slender, cylindrical, and bi-arti- culate, or of a largish, peculiar, sub-triangular form, articulated to a small foot-stalk. Hyes none, no traces even of eyes being visible. The falces are strong, of a flattened cylindrical form, decper than broad, projecting in the plane of the cephalo-thorax, and terminating with a sharp, curved, movable fang at their upper extremity, the lower extremity being rather pointedly prominent.

The palpi are very strong, five-jointcd, aud each issues from a long, strong, nearly cylindrical basal joint or

THELYPHONIDS. |

maxilla, the inner fore corner of which is prolonged into a sharp, strong point ; the other joints are armed variously with teeth, and the final, or digital, joint in one species has a longish, but not very strong, spine beneath it, terminating with a small, apparently movable, curved claw. In these palpi we see a marked transition from the more apparent didactyle nature of those of Thelyphonides to those of the Phrynides, removing them further than the former, in this respect, from the Scorpiones.

The legs appear very similar to those of Thelyphonus ; they are sevenjointed; those of the first pair are slender and evidently palpiform ; their tarsi are composed each of several (apparently ten) minute articulations, and devoid of terminal claws. Those of the other three pairs are apparently inarticulate, and each ends with three simple curved claws, of which the inferior one is the smallest and most sharply bent; the femora of these three pairs are all strong, those of the fourth pair inordinately so. The ster- nal plates are very similar to those of Thelyphonus, but the hinder one is not so much developed, and the central corneous spot is not visible.

This family, of small but exceedingly interesting blind Arachnids, contains but one at present known genus— Nyctalops (Cambridge), and two species —N. crassicaudata (Id.) and MW. tenwicaudata (Id.); both are of a uniform pale yellow-brown colour, differing from each other, among other characters, in the markedly different form of the tail : the length of the largest (probably, but not certainly ascertained to be, in the adult state) is but 24 lines. They are found under decayed leaves in Ceylon ; but nothing is yet known of their habits, nor of their internal structure and anatomy ; analogy, however, points to a similarity in this latter respect to Thelyphonus.

Family IIL.—Phrynides.

This is also a remarkably homogeneous family, and although, undoubtedly, a near ally of the Thelyphonides, yet in its form it presents many typical characters of the Araneidea (figs. 23, 24, 25),

With respect to Exrurnat Srrucrurs, the body is short and broad instead of elongated, as in Thelyphonus and Nycta- lops. The cephalo-thorax is flattened, of a round oval form, hollowed on the hinder margin, and often of

a short heart or kidney shape; its integument is hard, horny, granulose, and often tuberculose ; near the centre is a deep fovea, or pit- like indentation, from which other grooves and indentations radiate, showing the, now soldered up, junctional lines of the caput and thorax, and thoracic segments. In these characters of the cephalo-thorax the affinity of Phrynides to the Araneidea is very plainly indicated, as it is also in the sternal plate, around which the legs are articulated.

The falces are strong and somewhat cylindricalin form. They project in a line parallel to that of the cephalo-thorax, and each terminates with a strong curved denticulated fang, which is articulated to its upper extremity. The falces are toothed also on their under sides ; the denticulations of the falces and their fangs differ a good deal in different species, and form one of the best and most tangible characters for the determination of the species (see a paper on "Phrynus," by A. G. Butler, in Ann. and Mag. N. H., Aug. 1873, pp. 117-125, pls. 6, 7). In the usual position are two strong divergent maxille, each with a broad obtusely rounded apophysis at the fore extremity on the inner side 3 from the extremity of each maxilla springs a long, strong palpus, in some species of great length, consisting of four or (reckoning the large terminal movable claw as a substan- tive joint) five joints. This palpus is armed variously with tubercles, spines, and denticulations, especially on the cubital and radial joints, where several long, strong spines, opposed by the terminal claw (or digital joint), form a

powerful grasping or raptorial. organ, but one considerably further removed than the analogous portion of structure in

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0 f 2 3 Sit). a ee oe = nckes Fig. 23.—Phrynus medius, Koch. @, a, movable fangs or claws on fourth joint of palpi; %, &, forming, with claws, cc, on third joint, modified didactyle claw; 0, cephalo-thorax; d, falces; e,

abdomen; 7, button at end of ditto; hh, eyes; t, 4, long palpiform legs. Thelyphonus from the didactyle claw of the Scorpionidea. Between the maxille, and issuing from the fore margin of

Fie. 24—Phrynus ——? portion of under side. a, labinm; 2, 8, maxilla; c, sternum; d…d, orifices of respiratory organs; e, genital aperture.

the sternum, is a narrow, elongated tapering labéwm, in

some species bifid at its extremity ; the presence of a dis-

tinct sternal lip, or labium, is

another mark of affinity to the

Araneidea.

*The legs (seven-jointed) are long and generally slender, though the coxal joints of the three hinder pairs are long and strong, and arti- yy. 95.—Falx and fang of culated laterally to the sternum. PA*rynus reniformis, Pallas. The legs of the first pair are palpiform, a of ne length*

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and tenuity, the three terminal joints forming one long slen- der tapering portion, which is however subdivided into a great number of minute homogeneous articulations without any terminal claw; each tarsus of the remaining three pairs is divided into three articulations, ending with two curved claws ; and in some species the tibial joint of the fourth pair is also tri-articulate. Probably the subdivision of the fourth pair of legs varies in other species also. The coxal joints of the first pair are, as it were, crushed in behind the maxilla and above the coxe of the second pair, as in Thelyphonus. The extreme articulation of each tarsus has a peculiarity never (it is believed) noticed before; its upper side being covered, throughout its length, with a sepa- rate integumental plate, prolonged at its fore extremity into a corneous, slightly bent, claw-like apophysis, forming a kind of third claw above and between the two ordinary ones. These latter

spring from a supernumerary or heel joint, which has a short, conical, tooth-like spur beneath it, representing the usual third claw in other groups.

The eyes, eight in number, are placed in three groups, forming a very obtuse angled triangle on the fore margin of the caput. Two eyes, seated transversely, and near together in the medial line, constitute the apex of the triangle, which is directed forwards; the other two groups are of three eyes each, closely grouped in a triangular form, one on each side, about parallel with the second pair of legs.

The abdomen is oval, of a somewhat flattened form, and joined to the cephalo-thorax by a narrow pedicle, showing, in this also, a near approach to the Araneidea; it consists of ten quasi-segments, or articulations, formed, as in the other families of the order, by a series of upper and lower transverse corneous plates, having an, apparently continuous, cartilaginous integument between the two series of plates, and terminating with a button-like joint, or process, at its extremity. On the under side are two parallel rows of impressed spots, two, in a transverse line, in each of the fourth and three following sub-abdominal plates; but, apparently, like the corresponding marks in Thelyphonus, imperforate. The organs of generation have their exter- nal orifice beneath the posterior margin of the first sub- abdominal plate; and the external openings to the re- spiratory organs, four in number, are situated, two beneath the posterior margin of the first, and two others beneath that of the second of these plates, The sternum is oval, and often superficially divided into several portions by various ridges and indentations.

With regard to the Internat Structure of the Phry- nides, the respiratory system is pulmo-branchial, the orifices to these organs being four in number, and placed as above mentioned.

The nervous system, aceording to Van der Hoeven, appears to be very simple, consisting of a large thoracic bi-lobed ganglion, from which four pairs of lateral nerves issue, while a double nervous chord runs back through the connecting pedicle into the abdomen, where it divides into two divergent branches, from which the various nerves are distributed to the different parts of the abdomen.

GuneRAL Remarks.—The family Phrynides comprises but one genus, Phrynus (Olivier), which, according to the most recent publication upon it (A. G. Butler, /.c. supra), includes twenty species only, all confined to the tropical regions of the world. The individuals of most of these species appear to be of rare occurrence, or, at least, but rarely observed, and the family has, comparatively speaking, received but little attention. It is, however, one of great interest and importance, and deserves more elaborate and careful treatment, especially in regard to its habits and internal anatomy, for it undoubtedly forms a plain passage from the Scorpionidea (through Thelyphonus and Nyctalops) to the true spiders (Araneidea). The main external marks

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of affinity with this order have been noticed in speaking of

the different portions of external structure of the Phrynides. Order VIT.—ARANEIDEA.

We have come now, by an easy transition from: the Phrynides, to the last order of Arachnids—Araneidea or True Spiders (figs. 26, 27,28). And first, with regard to

Fie, 26.—Spider (Cambridgea Sasciata, Koch). Adutt male.

their ExteRNAL STRUCTURE, they consist, like others of the sub-class Arachnida, of a body divided into two parts —cephalo-thorax and abdomen ; but these are united only

Fig. 27.

Fig. 28.

Fig. 27.—Cambridgea fasciata; adult male, under side, with legs and one palpus truncated. f, sternum; g, g, maxilla; h, labium; k, &, falces, with « fangs of ditto; m, one of ordinary spiracular orifices (the corresponding one

on opposite side not lettered); , genital aperture, leading, in the male, only to spermatic vessels; 0, 0, spinners; p, anal orifice; ¢, ¢, extra pair of spiracular openings;

1, digital joint of palpus; 2, palpal organs; 3, radial joint; 4 cubital; 5 humeral. 6, axillary. _ Fic. 28.—-The same , upper sideof cephalo-thorax. 4…a, coalesced thoracic seg-

ments; 0, caput; ¢, ¢, falees; d, eyes; €, central indentation.

by a slender pedicle, and neither is segmented, ringed, or articulated, nor (in respect to the abdomen) covered with

horny plates, except in two instances—Lzphistius desultor (Schiédte) and (but partially only) Tetrablemma mediocula- tum (Cambridge), both exceedingly rare and remarkable species. Thé cephalo-thorax, though undivided, yet shows by its various, and more or less strongly marked, converging grooves and indentations, that it is composed of the ordinary cephalic and thoracic segments soldered together ; and although these segments form but one undivided por- tion of structure, it is necessary to speak of it frequently by the names of its two portions—caput and thorax. The caput is almost always easily traced, forming a kind of wedge-shaped portion, jammed (as it were) into the first of the thoracic segments, and giving one the idea, in most cases, of its fore part having been to a greater or less extent truncated or lopped off (fig. 28,6). Similarly the last of the four thoracic segments has the appearance of having been driven in to meet the caput, all the segments thus converg- ing, on the upper side, towards a common fovea, or more or less deep central indentation (fig. 28, e), and on the under side forming a sternum (or sternal plate), in which, however, no appearance of segmentation is generally visible beyond small eminences opposite to the articulation of the legs, with which the number of the thoracic segments, as seen above, agrees. The integument of the cephalo-thorax is either hard, horny, or coriaceous, generally more or less clothed with hairs and bristles, and sometimes, though more rarely, with tubercles and spines; occasionally it is perfectly smooth and glabrous. The eyes, when present, are two, four, six, or eight, and are very variously, but always

symmetrically, disposed on the fore part of the caput (figs. 28, 29, 30). The number and general position of the eyes form valuable characters for the for- mation of genera; while their rela- ee tive size is strongly characteristic of

species. The eyes of spiders, like

those of other Arachnids, are always

simple.

The degs, eight in number, are arti-

culated to the sternal plate (mentioned

above) which forms the under side

*of the cephalo-thorax ; in one genus, Fic. 29.—Caput of Attus —? however (Miagrammopes, Cambr.), * Wie Position of eves found in Ceylon and Australia, no sternum properly so called exists, the legs being articulated to the continuous under side of the cephalo-*

thorax. Except in one or two .

species the legsareseven-jointed, are

and variously furnished with ”

hairs, bristles, and spines. Many

spiders have a kind of pad of . closely set papille-form hairs

beneath the extremity of the

tarsi of some or all the legs, and

often extending along the whole

of the under side of the joint.

This pad enables the spider to

Tun over smooth vertical sur-

faces, acting as a kind of sucker,

partly by atmospheric pressure,

and partly (Mr Blackwall thinks

wholly) by means of a viscid

secretion from the papille-form

hairs. Each tarsus ends with Gute Rhee ak either two or three more or less
_ position of eyes.

curved or bent claws, commonly (but not always) pectinate or finely denticulated ; these (with other opposed serrated claws, in some groups) are used in traversing their webs, and as hooks to give a tension to the line of their snares by alternately pressing and straining upon them ; the spines and bristles are used also in many cases in the actual

construction of the silken snares in which spiders entrap their prey. The spines on the legs of some spiders which excavate cylindrical holes in the earth (lined with silk and closed with a hinged lid) are very strong, and well suited for digging out the soil. The males of some species, again, have a curious row of short, closely set, curved, spiny bristles along a portion of the upper side of the metatarsi of the fourth pair of legs; the use of this row of bristles (called the calamistrum) is alluded to further on. The length of the legs in spiders (both actual and relative) is very various ; and the differences between them, as well as their armature and terminal claws, furnish valuable charac- ters, often generic, and always important in the determina- tion of species.

The falces, two in number, are articulated immediately below the fore margin of the caput; their direction is various, ranging from a line parallel to the plane of the cephalo-thorax to one perpendicular to it; they are in general opposed to each other, and in most cases are armed with teeth on their inner surface, especially towards the extremities ; each also terminates with a movable curved fang, which, when not in use, is (according to its mode of articulation) folded down either across the inner side of the extremity of the falx, or (as in one extensive family, Theraphosides) backwards along its length ; by means of these fangs, which are internally channelled and perforated at their extremities, a poison secreted within the caput is instilled into the wound made by them, proving, no doubt, fatal to the spider's prey, and often nearly so to human beings. Not to dwell upon the, probably exaggerated, accounts of the Tarantula, there are' well-authenticated instances of recent date in regard to the very deadly nature of the poison of quite a small spider, Lathrodectus Katipo (Ll. Powell), found in New Zealand (Trans. NV. Z. Instit. iii, p. 56;also Jd. ii. p. 81, and iii, p. 29), A larger European species of the same genus, LZ. oculatus (Walck.), also bears the reputation of being venomous.

The maxille are a conspicuous, as well as an important, portion of structure in the Araneidea ; they are two strong pieces situated immediately behind the falces, exceedingly varied in form and strength, and articulated to the fore side of the sternum between the basal joints of the first pair of legs. Their real direction is always divergent, 7.c., outwards from each other, but as in most cases the inner extremity is produced into an apophysis of greater or less size (sometimes following the direction of the maxilla, sometimes curved so that its extremity almost touches that of the opposite maxilla), the maxilla itself often seems lost in the part which projects from it. Owing to this, the palpus which springs from each maxilla, although really always springing from tts extremity, appears more frequently to issue from zts outer side; and, in fact, it can hardly in

those cases be described (without leading to some con-

fusion) as issuing in any other way. The form of the maxille, together with the apparent point of palpal issue, constitutes one of the most valuable characters for the establishment of genera.

The palpi, issuing from the maxille as just described, are two (in both sexes of many, and in the female sex of most species, leg-like) limbs, of five or (counting the basal joint—maxilla—to which each is articulated) six joints; in the female spider the palpi generally end with a single, and sometimes denticulate, curved claw; in some instances, however, there is no terminal palpal claw ; but in the male, the third (cubital) and fourth (radial) joints of the palpi are (the former often, the latter always) characterised by prominences, spiny apophyses, or protuberances, which furnish some of the strongest, as well as most tangible, specific characters of that sex; the last (or digital) jomt cf each palpus (in the male spider) is gencrally more or less

concave, and always includes, either within its concavity or articulated to its under side, a (frequently complex) congeries of corneous lobes, spines, and spiny processes, in some instances articulated to each other so as to be capable of being opencd out as by hinges. These are not developed until the spider arrives at maturity. Up to that period the digital joint has a tumid and somewhat semi-diaphanous appearance, and, although commonly smaller, bears the same general form that it has after maturity. These processes, or, as they are called, palpal organs, are connected with the process of reproduction—the fecundation of the female. This subject, however, we shall have occasion to refer to again. The palpi are generally furnished more or less with hairs, bristles, and spines, like the legs ; and like them, also, are reproduced after accidental loss.

The labium is also another important portion of structure ; itis situated at the fore extremity of the sternum, between and in front of (or rather beneath) the maxille; it is of varied form and size, and stopping the gap between the maxille, it completes with them the inferior and lateral boundaries of the mouth, the falces forming its upper limits. The labium is always present, except in a new and very remark- able Brazilian spider, Aphantochilus Rogersii (Cambr.), in which the labium is wanting, and yet not wanted, because the maxille, in this instance, close up to each other, leav- ing no gap between them.

Between the labinm and falces is another portion of structure, the tongue ; it is, no doubt, by the aid of this that the act of swallowing the juices of insects, when expressed by the falces and maxille, is effected; that, in fact, the spider eats without being choked. No use hitherto has been made of the tongue in spiders for purposes of classification, but the form of the labiwm is very useful for the characterisation of genera. These parts —falces, maxille, labium, and tongue—thus complete the mouth-parts of a spider.

The sternwm has already been mentioned; its form varies from oval to heart-shaped, and sometimes somewhat pentagonal ; its convexity also varies considerably; its use in classification is rather limited, but with its clothing of hairs, bristles, or pubescence, or its sometimes glabrous nature, it generally has some specific importance. In one known genus only, as mentioned above, is the sternum wanting.

The abdomen is exceedingly varied in form in different families ; it is united to the cephalo-thorax by a short narrow pedicle, and generally terminates with organs for spinning ; in one species, Liphistius desultor (1) (Schiddte), the spinners are placed near the anterior part of the under side of the abdomen; and in another, Mutusca mammosa (Cambr.), one pair only are so placed, the rest occupying the ordinary position. The number of spinners varies— two, four, six, or eight ; they are placed in pairs, and when a fourth pair is present it is, usually as a single one, united throughout its length (but with often a line of division visible), and occupying a transverse position in front of the rest. It is but very lately that spiders have been observed with two spinners only; see "Spiders of Palestine and Syria," O. P. Cambridge, Proc. Zool. Soc. 1872, p. 260; Ann. and. Mag. N. H. 1870, pp., 414-417, Lbid.

The spinners consist of from one to three joints, and vary greatly in size and structure, as well as in number, but their use in classification has not hitherto been as great as might have been expected; generally they are separate, but in Z"etrablemma (Cambr.) they are enclosed in a kind of corneous sheath. Those of the fourth pair when present (which they are in both sexes) are correlated, but in general only in the female sex, with the calamistrum, or double series of curved bristles before mentioned, on the metatarsi of the fourth pair of legs. The function of the

calamistrum has been proved by Mr Blackwall to be the carding, or teasing and curling, of a peculiar kind of silk, secreted and emitted from the fourth pair of spinners ; when thus prepared this silk becomes adhesive, from its minutely divided and elastic fibres; and, disposed about the lines of the spiders' snares, it renders more easy the entanglement and capture of their prey. Immediately above the spinners is a small nipple-like prominence which indicates the anal orifice. ;

The abdomen is covered with a continuous integument neither annulate nor segmentate ; in one species, however (before mentioned), Liphistivs desultor (Schiddte), the upper side has a longitudinal series of transverse corneous plates, like those of the Phrynides ; and something of a similar kind, but less marked, is observable in Z'etrablemma medioculatum (Cambr.), a very rare and remarkable little spider found in Ceylon. The epidermis of the abdomen is of various kinds and consistency in different groups, sometimes excessively thin and tender, at other times tough and coriaceous, and sometimes hard and horny, with a varied armature and clothing of hairs, bristles, pubescence, tubercles, and spines, sometimes being, however, perfectly bare and glabrous; its colours, also, and the patterns produced by their distribution, vary exceedingly. Under- neath the fore extremity of the abdomen are placed the external openings to the respiratory organs ; these apertures consist of a narrow slit or orifice under the fore edge of round or oval scale-like plates, placed on each side of the median line; such plates are in some spiders four in number, but for the most part only two. Other spiracular openings also exist in many spiders, both at the anterior part of the under side (fig. 28, ¢,) and near the spinners (Siebold), but these are usually far less perceptible than the others before mentioned, and often discoverable with great difficulty. The ordinary pair of spiracular plates are in general very conspicuous, commouly differing in colour from the surrounding surface, and sometimes slightly pubescent. They occupy each side of the median line at the extreme fore part of the under side of the abdomen; and between them is, in the male spider, a very minute orifice which leads to the seminal organs; while in the

same situation in the female is an aperture usually rather conspicuous, always of characteristic form, and often furnished with a corneous process of greater or less development. This aperture is the vulva, and the process (when present) probably has the function of an ovipositor. The form and structure of this aperture is of great use in the determination of species, but until the female spider attains maturity no aperture at all is visible. The orifices to the breathing organs are fringed with hairs or lashes, and open and close by an internal muscular arrangement. The other pair of spiracular plates, when present, are in some cases close behind those just above mentioned, but more commonly at some distance further towards the hinder extremity of the abdomen.

On the upper side of the abdomen may be seen in many spiders several impressed spots or dots, differing in number and position in different genera and species, but always placed symmetrically. These, considered by Treviranus as stigmatic openings, are probably indicated points of fixture for muscles beneath the integument, being apparently imper- forate. Smaller puncture-like marks are also often visible on the under side, and are perhaps similarly caused. The hairy clothing of the abdomen (as well as of the cephalo- thorax and other parts), variously tinted and coloured, gives the specific pattern to the spider from its diversified distribution ; and when such clothing is absent, the pattern is often equally distinct and varied, arising in such cases from a pigment in the coats of the integument itself.

INTERNAL ORGANISATION.—The Muscular System of

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spiders is very similar to that of the rest of the Arti- culata. The muscles are formed of numerous parallel fibres traversed by very marked strie ; these muscles are attached to the different portions of the tegumentary

system, and move the various parts of the body by the

contraction of their fibres. Those which set in motion the falces, the maxillz, and the coxee of the legs, are attached to the thorax, and radiate to all these parts from a centre, inarked externally by what has been before spoken of as the thoracic indentation, or fovea. The other joints of the legs niove, one

after the other, by means of small and exceedingly fine muscles, of the two kinds ordinarily known as extensors, to raise the joint, and flexors, to lower it. All these muscles act with great rapidity, and enable the legs to move in every direction according to the mode in which the various joints are articulated. The differences in the relative strength and volume of the muscles are very great ; those, for instance, by which the fangs of the falces are moved are exceedingly powerful ; the abdomen being generally soft, its integument does not furnish such firm points of attachment as that of the thoracic region, and yet the spider can move its abdomen with the greatest ease in every direction. Beneath the integument, at the fore part of the under side, two ligaments are attached to a membranous plate, situated under the branchial operculum, and at the hinder part, round the ring which encircles the spinners and the anus. The fore half of these ligaments is cartilaginous, while the hinder half is composed of con- tractile muscular fibres, and by means of those muscles the spider moves its abdomen. 'Two other pairs of muscles may also be particularly mentioned,~~—one pair inserted under the membrane in the junctional pedicle, the other leading round the respiratory organs: the office of these is to open or close the branchial opercula, and to draw the sexual organs back~~ wards or forwards. The spinners are moved by special muscles similar to those of the legs. (Simon, Hist. d. Araign.)

The Organs of Digestion consist of a large sac, or stomach placed in the cavity of the cephalo-thorax, and fastened to its arch by a strong muscle ; this muscle passes round and through the stomachal sac ; tnto the stomach a tube (cesophagus) leads from the mouth, and from it ten lateral branches or ceca (five on either side) issue, passing down the sides to the origin of the legs, and, curving round, end in a reservoir placed below the stomach. This reservoir is connected with the stomach by the muscle mentioned above, and divided froin it by a solid plate into which this muscle is inserted ; it, in fact, forms a kind of second or lower stomach into which the juices form- ing the spider's food are forced from the upper one by muscular action.

Out of the stomach the alimentary juices go into a tube or intes- tine, which is much contracted in size in passing through the junc- tional pedicle into the abdomen, but enlarges a little within the latter ; this tube curves over

for some distance in a line parallel with the dorsal integument ; it then drops down suddenly, forming a large loop, and so passes into a large rounded pouch (rectum), in which the undigested portions of food collect, and thence pass out through the anus, situated, as before observed, at the extremity of the abdomen just above the spinners. The abdominal intestine is imbedded in a mass of fatty globules, from which bile is secreted ; the bile passing by means of biliary ducts (into which urinary organs also pour their contents) into the rectum. Digestion is effected by means of a gastric juice secreted by appropriate glands between the oo" and thence poured into the stomach (Simon, J.c., after

ugés).

Walckenaer, Ins. Apt., following Treviranus, gives a slightly different account of the digestive apparatus of Tegenaria domestica (Walck.) Probably a certain amount of variation would be found in the details of form and structure of the stomach and intestinal canal, and other organs of digestion, in different species; but the general plan of the digestive arrangement is the same. It isan undecided question whether the cesophagus of spiders can pass any substance except the juices of their prey. See O. P. Cambridge in Entomolo- gist, May, 1870, pp. 65-67; and Ann. and Mag. N. H., Dec. 1872; and F. Pollock, Zd., Oct. 1872.

Organs of Circulation.—As in some other groups of Arachnids a strong muscular tube or vessel (divided into four chambers)! runs

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? Claparéde (Etudes sur la circulation du sang chez les Aranées du genre Lycosa), in describing the dorsal vessel of a young Lycosa, says

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along beneath the dorsal integument of the abdomen, following the integumental curve ; this dorsal vessel (or heart) varies in form in different species, and is enveloped in a fine fibrous tissue, which forms a

*pericardium.? The several chambers of the heart communicate with the pericardium by means of small elongated orifices (auriculo- ventricles) placed at the constrictions where the chambers are separated from each other; through these orifices the vital fluid passes tnto, but cannot pass owt of, the heart. This latter operation is effected by the contraction of the heart, which forces the fluid forwards into a tube or artery issuing from the first chaniber ; this tube—aorta—passes through the junctional pedicle, and entering the thorax, divides into three pairs of arteries. The upper pair follow the dorsal line and give off blood-vessels to the eyes, the falces, and other parts of the mouth ; the second pair, intended to give nourish- ment to those parts, pass over the stomach ; and the third are imbedded beneath that organ, and emit arteries to the legs, extend- ing to the very extremity of each. These three pairs of arteries reunite forwards and form a collar round the cerebral ganglion ; and from thence a tube *—abdominal or posterior aorta—passes back- wards under the ganglia through to the abdomen, continuing quite to the spinners; this tube furnishes numerous branches to the organs which it passes in its course. From the general circulation the vital fluid is bronght into two large longitudinal reservoirs within the lower face of the abdomen, by means of sinuses or canals formed by the interstices of the muscles; these anastomose and pour their contents into the reservoirs just above mentioned; from them the fluid‘ penetrates the branchial organs, and being there reoxygenated, is carried back to the pericardium by four brancho- cardiac vessels ; from thence it passes into the dorsal vessel or heart through the auriculo-ventricles®> above named. Muscular contrac- tions and dilatations appear to be the means by which the fluid is propelled through the sinuses that bring it to the branchial organs for oxygenation (Simon, /.c., after Emile Blanchard, and Dugés).*

As has been already observed in several notes, there is some difference between the above account of the circulatory system and that given by Claparéde ; probably the organs of circulation vary somewhat in different species. One point of difference, however, between the above and Claparéde’s description is of importance, that is, the difference which is mentioned in note (4) below. The idea that the blood ‘ penetrates” the branchial organs may have been led up to by the apparently unfounded, but confidently pronounced opinion that these organs were true analogues of the lungs of the Vertebrata ; whereas, if the blood does not penetrate them,*

but is merely oxygenated in its general passage by and round them, their real tracheary nature (as seems to be the better opinion now) is strongly confirmed ; and hence the hitherto widely-received division of Arachnids into pulmonary and trachcary, based upon the idea of the distinct nature of the pulmo-branchie from the trachee, falls to the ground ; the more especially since, whatever the difference may be between the ordinary trachew and the pulmo-branchie, both are found in the same individual, in the order we are now considering —Araneidea.

Organs of Respiration.—From what has just been said, it seems hardly proper to base any definition of the respiratory organs of spiders on the supposed essential distinction between the pulmo- branchie and trachee. Such difference as there is, and it is indeed an important one, seems to be this, that whereas the trachee are lengthened tubes, which convey the air in very small volumes to different parts of the body, and so oxygenate the vital fluid in its passage, the pulmo-branchiz are modified trachez, localising, so to speak, within a peculiarly furnished sac, a considerable volume of air in the immediate course of the large sinuses, in which the used- up vital fluid is re-collected previous to its return to the dorsal vessel. This arrangement, no doubt, marks a higher state of organisa- tion than is possessed by those Articulata furnished with merely simple trachee ; it is a progress froma diffused to a localised system, but still it seems essentially distinct from the lungs of vertebrates, in which the blood zs carried to the atr and permeates every portion of the atr-vesscls, and not the air to the blood, as is really the case in regard to both the pulmo-branchie and trachew of spiders. Itis not a matter, perhaps, of prime importance, but if the above views be correct, it would seem better to relinquish the name of pulmo- branchiz, since there is not only no real analogy to the lungs of a

eee ee ee that at that age no such chambers exist, and questions whether or not the chambered form such as Newport and Blanchard have described in the scorpion, does or does not exist in the adult Lycosa. Vide supra, p- 285, on the heart of the scorpion.

® The existence of this is also questioned by Claparéde, who speaks of the heart as placed " not ina distinct organ—pericardium—but in a certain indefinite space—lacune péricardique," (J.c.)

° Claparéde could not find this in Lycosa, (J. c.)

4 Claparéde (Z. c.) says, on the contrary, that the blood "never peue trates between the leaves (fewtilats) of the respiratory organs," but is reoxygenated in its close passage by them.

5 Claparéde says that aid the fluid which comes from the respiratory organs passes into the heart through the foremost pair of these openings.

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mammual, but just as little to the gills ofa fish. We would propose, therefore, to distinguish these modified and localised tracheal sacs by the name of sac-trachee, the ordinary ones being designated tube-trachce. ;

*In some spiders, Theraphosides (including the giant spiders of the family better known as Mygalides), the respiratory organs are solely sac-trachee; these are in this case four in number, and placed in two pairs on the lower side of the abdomen. Their external orifices are protected by spiracular plates (as before noticed) ; in other spiders there is, close in front of each of tle fore-pair of sac- trachex, an orifice leading to tube-trachex. In some few spiders a kind of supernumerary spiracular slit or opening is visible near to the ordinary one, but not always similarly placed. A pair of others are also visible close behind the sexual aperture in Cambridgea fasciata (L: Koch) (fig. 27, 4, t). These openings probably lead to other tube trachez. We have also noticed slit-like openings similar to those above mentioned in some undescribed species of Drassides, and some also exist in the well-known European spider, Argyroneda aquatica.' Tracheal openings also exist, according to Siebold, near the spinners. The sac-trachez of spiders arc of the same construction as the organs described as pulmo-bran chix in the family Scorpionides. The following short description is abstracted from E. Simon, Z.c., following Emile Blanchard :—'*The respiratory apparatus is con- tained in sacs beneath the stigmata ; these sacs are globular and flattened, formed by a silvery white membrane. Each of them con- tains a body not fastened to the walls of the sac, but lodged as in a chamber ; this body is composed of sixty or seventy plates (lamellz) lying one upon another like the leaves of a book. Each one of these apparent plates is in fact itself a flattened sac, with an opening on sts lower side communicating*

with the outer air admitted through the spiracular orifices. The walls of these numerous sacciform lamelle consist of two membranes of different composition, the inner one hard, the other soft, and between them is a very fine strong network analogous to the spiral thread of the trachex of insccts.”

The inspiration and expiration of air in these sac-trachee are effected in a very simple mauner. ‘To the outer wall of the sac a broad and strong ligament is attached ; this ligament ascends across the abdomen, and is fixed to the walls of the heart. Each move- ment of this organ, diastole or systole, strains or slackens the ligament, which in its turn raises or lowers the tracheal sac, and by these means the air is either drawn into or expressed from it (E. Simon, J.c., after E. Blanchard). ;

According to Treviranus, l.c. (vide Jones, Anim. Kingdom, p. 416), who, however, makes them four pairs on each side, there are, in the Araneidea, four pairs of spiracles (four on each side of the cephalo-thorax) situated immediately above the insertions of the legs. He also notes four stigmata (in two pairs) on the upper side of the abdomen, and a pair on the under side ; the former un- doubtedly exist, in some species at least, but the latter appear to be imperforate, and are probably only points of muscular attachment. It does not appear that the trachee leading from the thoracic spiracles have ever been traced; they are, perhaps, exceedingly delicate in their walls, and probably of no great length, and hence after death, when the air has left them, they would be exceedingly difficult to detect. ‘There remains much, doubtless, to be yet dis- covered in regard to these and other minute details of the internal organisation of spiders. sae

The Nervous System.—In the order Acaridea, as it has been above observed, the nervous matter is concentrated into one large mass or ganglion, whence it branches out to the rest of the body. In the Pycnogonidea the nervous system consists of a lopgitudinal series of large ganglia, of which the four abdominal ones are sessile. In the Scorpionides, also, it consists of a longitudinal series of eight ganglia distributed throughout the whole body, and united by a triple nervous chord; and now in the Araneidea (as in the Solpu- gidea, Thelyphonidea (Phrynides), and indeed in the Phalangidea also), we seem to have a compound of these two

modifications. Thus, in the Araneidea the nervous matter is, in general, concentrated into two mmasses, one plaeed within the fore part of the cephalo-thorax, just above the esophagus ; this (the cephalic or so-called cerebral) ganglion sends out fine nervous threads to the eyes, falces, and Jabium ; the other mass (thoracic ganglion) is situated just behind the former, and occupies a large portion of the thoracic cavity; it is of a flattened disc shape, and is united to the cephalic ganglion by. short but broad connectors, forming a narrow collar round the esophagus. 'This thoracic ganglion is formed by an approximation and soldering together of the different ganglia which exist sepa- rately in the scorpions. A proof of this is furnished by the fact,

1 In a recent paper, "Ueber die Respirationsorgane der Araneen," by Philipp Bertkau," Arch. f. Nat, xxxvili, pp. 208-233, pl. 7, recorded, Zool. Record., ix. p. 206, whieh the present writer has not had an opportunity of studying, the author appears to have come to the same general conclusions on the respiratory system of spiders as those above mentioned, and also to have diseovered, in some spiders, other orifices leading to tube-trachex in front of the spinners.

that in the young of some of the Araneidea, furrows of greater or less depth show the junctional points of the different ganglia.

From the thoracic ganglion lateral nerves issue to the legs and palpi; besides which a fascia of nerves runs backwards through the pedicle into the abdomen, and these subdividing, branch out to all its different organs (Simon, J.c.) A modification of the above exists in the Theraphosides, where there is a special enlargement, or ganglion, just within the fore part of the abdomen, before the nervous fascia subdivides and branches out into that part of the body; pro- bably this modification would be met with also in many other spiders Ce An. Kingdom, pl. 2, Arachnides ; and Treviranus, /.c., pl. 5, fig. 45).

The Organs of Reproduction in the female cousist of two long ovaria placed longitudinally within the ventral surface of the abdo- men; these unite and form a short broad oviduct, having an external opening of various form beneath the upper end of the abdomen betwcen the spiracular orifices, as before noted under the head of external structure.

In the male the organs for the secretion of the seminal fluid consist of two long narrow convoluted tubes, occupying the same relative situation as the ovaria in the female, and also opening out- wardly through a common but exceedingly minute orifice in a similar position. No intromittent organ has been discovered in any instance ; and it is not long since that the probable way in which the impreg- nation of the female takes place (at least in some cases) has been at all certainly noted. It has been before remarked that the peculiar corneous lobes and spiny processes connected with the digital joint of the palpi—palpal organs—in the male, are used in the course of copulation ; but araneologists were not (and probably are not now) agreed as to their real office in generation. A distinguished author, Mr John Blackwall, went so far as to prove, as he believed, by a series of carefully conducted experiments, that the seminal organs of the male spider, above described, are in some cases wholly unnecessary for the impregnation of the female—at least so far as any external use or application is concerned—and that the palpal organs are the efficient agents in the impregnation of the female spider (Keport of Brit. Assoc. 1844, pp. 68, 69). This, however, seemed to be coutrary to all reason and analogy, aud led to the hypothesis that there was some communi- cation by a duct or ducts between the spermatic vessels in the ahdo- men and the palpal organs (Hermann, 1868; Verhandlung d. Zool, Bot. Gescllsch. in Wien, xviii. pp. 923, et seg.) This idea, however, appeared to be negatived by the failure of Dugés and other eminent anatomists to discover any duct in the palpus, where, if present, it would be comparatively easy to find. Another hy pothesis— grounded on the fact that the palpal organs have in some cases been observed to be applied repeatedly to the mouth between their numerous applications to the vulva—was, that there might be some duct through which the spermatic fluid could pass into the alimen- tary canal, and so be conveyed to the esophagus, aud thus be taken from the mouth by means of the above-mentioned application to it of the palpi. The discharge of the spermatic fluid in birds into the lower intestine appeared to support the possibility of*

this hypothesis being true (O. P. Cambridge, rans. N. Z. Instit., vol. vi. 1878, p. 190). Another opinion, long since, and even now, held by some arachnologists, is that the male spider collects the seminal fluid with its palpal organs into the concavity of the digital joint fron the minute orifice above noted; but no instance has ever been noticed in which a spider has been detected in such an employment of its palpi. An instance has been recorded in which there were during copulation (2) repeated embraces, and at each embrace a perfect apparent coition was effected between the sexual apertures of the male and female spider, the palpi not being used at all (0. P. Cam- bridge, Z.c., p. 191). Other arachnologists, again, have recently observed that the male spider before the act of copulation "' emits from the sexual aperture a drop of sperma on a kind of small web made for the purpose, which drop he then takes up in the genital bulb of the palpi" (A. Menge, Ueber die Lebensw. d. Arachn. p. 36; and A. Ausserer, Beob. weber die Lebensw. der Spinnen, p. 194). This would appear to settle the question ; but while, at the same time, it is remarkable that an observer so accurate in observation and so painstaking as Mr Blackwall should never have observed male spiders taking the spermatic fluid from the abdominal aperture, as stated by Menge some thirty years ago, it is also remarkable that Mr Blackwall should unconsciously afford the strongest evidence in favour of the facts mentioned by Menge and Ausserer.

Duges, in suggesting, long since, that the male spider took the seminal fluid from the aperture in the abdomen with its palpi, asked whether the palpal organs may not alternately act as an absorbin siphon and an cjaculatory organ. MrBlackwall (Jour. Linn. Soc., vid mentions this question of Dugés, and then states a fact which at once answers the first part of it in the affirmative, and tends to confirm (CE oe. wl

- *These organs are not developed until the last moulting of the spider's skin, and their development (unmistakable when complete), is an unerring sign of the spider's sex and maturity. Until this period the digital joint is more or less rounded and tumid, but it can even then seldom be mistaken for that of a female spider.*

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Menge's and Ausserer's statement: "A male Agelena labyrinthica confined in a phial, spun asmall web, and among the lines of which it was composed I perceived that a drop of white milk-like fluid was suspended; how it had been deposited there I cannot explain, but I observed that the spider, by the alternate application of its palpal organs, speedily imbibed the whole of it."

hat the spermatic fluid is conveyed to the female parts of genera- tion by the male palpi is thus pretty certain; and it seems not improbable that there are more modes than one by which the palpi are supplied with the fluid. See also critical observations on this subject by Dr. T. Thorell, 1873, Synonyms of Hurop. Spid. pp. 591-

595.

Before concluding our remarks on the internal structure of the Araneidea, two of their special properties must be shortly noticed—the secrction of the poison injected into the wounds made by the fangs of the falces, and the secretion of the matter emitted as silken threads through the spinning organs.

The poison is secreted in two small elongated sacs (one for each of the falces), situated within the cephalo- thorax on either side of the alimentary canal; the sacs are connected with a membranous channel in each of the falces, the channel running completely through the fang, from an orifice near the end of which the poison is pressed out by the spider in the act of wounding its prey. On the venomous nature of the poison some remarks have already been made. As to its venom in British spiders, see " Blackwall's Experiments," Trans. Innn. Soc,, xxi. pp. 31-37. The result of these interesting experiments is contrary to the generally received idea as to the great virulence of spider poison.

The external spinning organs have been mentioned above; they are usually called spenners, and are various in size, both actual and relative, in form and in structure, as well as in number. From the extremity of each of these organs the silk matter issues through numerous movable papilla, or spinnerets, which are similar to hollow bristles with enlarged bases; the papillee vary both in form and number in dif- ferent species, and from each spiuneret or papilla issues an exceedingly fine thread; this, uniting with

threads from all the other papille, fornis the ordinary silk line, which though to ordinary observation simple, is composed of num- berless threads from some one, or all, of the spinners. The matter from which the silk is formed is secreted in organs (silk-glands) situated within the ventral surface of the hinder part of the abdomen. These glands vary in number, size, and form in different species ; they differ also in size and shape in the same species, for the secretion of different qualities of silk-matter; and each gland has a distinct duct terminating at the extremity of the spinners. The emission of silk matter appears certainly to be a voluntary act on the part of the spider ; but it is a disputed question among arachnologists, whether spiders have the power forcibly to expel it, or whether it is merely drawn from the spinnerets by some external force or other. Mr Blackwall (Trans. Linn. Soc., xv. p. 455 ; Researches in Zoology, pp. 242-248, and History of Spiders of Great Britain and Ireland, p. 12) is of the latter opinion ; while Mr R. H. Meade (of Bradford, Yorkshire), in Report of British Assoc., 1858, pp. 157-164, pl. 16, thinks that (from microscopic anatomical investigations which he has himself made) there is good evidence of spiders having the power to expel it, for he finds a certain muscular arrangement which would apparently suffice to give this power, and observers have actually seen the lines propelled. Mr Meade, however, need not be assumed to assert an indefinite power to expel threads of silk to any indefinite distance. The truth probably is, that spiders have, and do exercise, a general power not only of emitting silk matter from the secreting glands merely to and from the external orifices of the silk- tubes, but also of propelling it when necessary to some short distances; and that external causes (such as the movement

of the spider while the end of its line is fixed, or when a current of air takes an emitted line and carries it in a direction contrary to that of the spider) also serve to draw the threads out. In all these ways, no doubt, are produced the gossamer lines which often cover the surface of the ground and herbage in autumn. In the formation of their snares spiders use the hinder or fourth pair of legs for drawing the threads tight, and apparently for ascertaining their power of tension. The third, or inferior tarsal claw,

being usually strongly bent, no doubt enables spiders to perform these operations very readily. Some large groups of spiders do not spin any snares, and in them we usually find this third claw absent; while in one group, Epeirides, whose snares are marvels of beauty and ingenuity, the third claw is very highly developed.

The snares of spiders have becn made the basis of some of the primary divisions of the order. Characters, however, taken merely from habits and modes of life, can hardly be considered those on which systematic classification should be based, not to mention that those characters fail when we come to extensive groups spinning no snares at all. Short of such a use of the snares of spiders, this part of the subject is of extreme interest and importance. The Latreillian divisions of snares is fairly and generally accurate; by this method they are divided into—Orbitelarve, where the plan is that of a circle or a portion of one, with lines radiating from a centre; Retitelarie, where a thin sheet of web is suspended among the branches of shrubs or in angles of buildings, and held up and down by lines in all directions above and below; Tubitelarice, where the snare is a silken tube, inserted in crevices, and fissures, and casual holes, and with an open mouth more or less guarded or armed with insidious lines ; and Zermitelarie, in which a tube is spun in a hole formed by the spider itself, and closed sometimes by a close fitting cork-like, or sometimes by a scale-like or wafer lid, some- times left open, and at other times closed by the falling over of a portion of the tube which protrudes from the sur- face of the ground (see Z'rapdoor Spiders, by J.T. Moggridge, Lovell Reeve, London, 1873-4). With respect to the econo- mic or mercantile value of spider silk, the idea seems to have been entertained, from a remote period, that it might not only be turned to practical use in the manufacture of silk fabrics, but also be made to pay as a mercantile specu- lation. The possibility of making it into articles of wear is undoubted, as instances of it are on record. Upwards of 150 years ago-Le Bon of France (Languedoc) obtained, from spiders, silk which was afterwards woven into gloves and stockings; but Réaumur, appointed by the French Academy to investigate the matter, reported unfavour- ably, doubting the possibility of rearing the spiders together owiug to their voracious and cannibal propensities. In 1777 and 1778 a Spaniard, Raimondo Maria de Termeyer, published, in Italian periodicals, two memoirs on the subject ; and afterwards, 1810, at Milan, another

called fucerche e Sperimenti sulla Seta de Ragne, in which he takes an opposite view to that of Réaumur. The latter work is of great rarity (wide B. G. Wilder in Harper's New Monthly Mag., xxxiv. p. 455). Termeyer constructed a small kind of stocks, in which the spider was fixed by the body, while with a little winding-machine he drew out and wound up the silk threads from the spider's spinnerets; but evideutly nothing came of -this further than an additional proof of the possibility of procuring and making use of spider silk, as well as of its strength and lustre; this last, however, as well as other qualities of the silk, would probably be found, as with that of various silk worms, to vary according to the species. Other experiments, with a similar general result, have been made since (Zoologist, 1857, p. 5835), the latest being those made by Dr B. G. Wilder, professor of anatomy in the

Cornell University at Ithaca, United States (J.c., supra), with Wephila plumipes (Koch), a large epeirid abundant in South Carolina. His experiments appear to have been unconsciously, though surprisingly, similar, and with a similar result, to those of Termeyer ; but the question as to the mercantile importance of spiders' silk appears to have hitherto elicited only an unfavourable answer. Dr Wilder, however, is still sanguine upon the point (wide BoeG: Wilder, d.c., and also in Proc. Boston. NV. H. Soc., October 1865, with other references there noted, as well as in Zhe Galaxy, July 1869, pp. 101, 112). In Zoologist, 1858, p. 5922, a correspondent, speaking of the strength of the silk threads of Nephila clavipes, says that small birds are sometimes entangled in its webs, and that the ladies of Bermuda use the threads for sewing purposes. See also Phil. Trans. 1668.

_ Before leaving this part of the subject, we must notice the office of the calamistrum, mentioned before in speak- ing of the armature of the legs of spiders. This instru- ment is found in the females of various genera and families; it consists usually of a closely set double row of curved spine-tike bristles on the upper sides of the metatarsi of the fourth pair of legs, forming a kind of comb, whence Mr Blackwall, by whom it was first discovered and its use perceived, gave it the name it bears. Its office is to

card, or curl, or tease a particular kind of silk emitted from the supernumerary spinners, mentioned above as always, in the female, correlated with this instrument ; the silk so curled and carded is, owing to the fineness of its fibres, exceed- ingly prehensile, and being disposed about the lines of the spider's snare, serves to entangle the Insects which come in contact with it (vide Blackwall, Linn. Trans., vol. xvi. p. 471, pl. 31,1831). Amaurobius similis (BL) and A. feros (Koch) are common house spiders whose webs are thus furnished with carded silk from the supernumerary spin- ners. Doubts have been entertained quite lately by an eminent araneologist as to whether the supernumerary spinners are indeed true spinning organs (T. Thorell, Synonyms of European Spiders, p. 595, 1873). It is therefore interesting to find in Science Gossip (Hard- wicke, London, Sept. 1874), a short article by H. J. Under- hill, in which the anatomy of these spinners is described and figured from original microscopic investigations, proving the recorded observations of Mr Blackwall, and others also, as to their being true spinners, to be correct.

The white flake-like flocculi often seen floating in the air on a calm autumnal afternoon are composed of spider silk emitted by numerous immature spiders, of many species and genera, passing through the air on their lines, which being so much lighter than the atmosphere, serve to bear them away with every breath of wind. The flocculi ap- pear to be agglomerations of fine lines, adhesive from their fineness and fibrous nature. In this respect they differ from the ordinary gossamer lines, which are merely the threads left by small and immature spiders (chiefly of one or two families) as they pass from blade to blade and plant to plant. It seems probable that nearly all spiders leave a line or lines, which proceed from one or more of their spinners, whenever and wherever they move about; and the setting in of fine weather being the signal for a spon- taneous restlessness, we can hence better understand the almost sudden appearance of myriads of lines stretching over the surface of the earth, and often extending high up into the air. Numerous papers have been written on gossamer, chiefly by German and French writers, with the latter of whom the subject has been sometimes treated on the basis of the marvellous and superstitious. These lines are called by them jils de la Vierge.

Our space does not permit of any great detail respecting the various kinds of snares, nor regarding the way in which

different spiders construct them. Accounts may be found, by Mr Blackwall, in Zool. Journ. 1830, pp. 181-189; as well as in the Jteport of the British Association for the Advancement of Science for 1844, pp. 77-79; Researches in Zoology, 1st ed. 1834, pp. 253-284; Linn. Trans. 1831, pp. 471-479; and A History of the Spiders of Great Britain and Ireland, 1861-64, all by the same author; and the exccedingly interesting details on this subject in Kirby and Spence's Entomology, pp. 227-267 (7th ed.), are within every one's reach. The following notes, however, gathered from the works of Mr Blackwall and others, as well as from the writer's own observations, may be of interest :—

The geometric spiders (Orbitelarie) are almost the only ones whose method of forming a snare have been at all minutely recorded. When the situation for the snare has been chosen, the area intended to be filled up by it is en- closed by various circumferential boundary lines, fixed to adjacent objects, the exact shape of the area being in- fluenced by the situation and surrounding circumstances. A diagonal thread is then spun across it, and from about the central point of this thread another is carried to the marginal line; returning to the central point along the line just spun from it, the spider carries another line to the margin, and fixes it at a short distance from the first. In this way the whole area is gradually filled up, the spider always returning to the centre along the last line spun, and starting again thence fixes a fresh one to the boundary line of the snare. The form of the snare is now that of a wheel; the next operation is to cross the radii of the wheel with ladder-like lines; this the spider does, begin- ning from the centre and working towards the circumfer- ence, with a single spiral line, which is fixed, or glued, with a minute portion of viscid matter, to each of the radii as it crosses by an application of the spinners; at some distance from the centre this spiral line is discontinued and another is begun; this is formed of quite a different kind of silk matter, being viscid, and retaining its viscidity in the form of " minute dew-like globules closely studding the

line." It appears that when the viscid lines, intended for the capture of its prey, are completed, the spider cuts away the first, or unadhesive line, which is of no service in the entanglement of insects, its office appearing to be chiefly to strengthen the snare while the viscid line is being spun, and to enable the spider to traverse the parts with greater ease. Modifications of the above method are, no doubt, adopted by some species, but, substantially, it is believed that most orbicular snares are thus constructed.

The mode of formation of the snares of the Fetitelarie does not appear to have been observed, probably owing to their being made almost wholly during the night. The snare of one of these spiders, Linyphia marginata (BI.), is an exceedingly perfect one of its kind, and abundant in most localities ; it consists of a thin horizontal sheet of web, suspended among the branches of low evergreen trees and shrubs, by a maze of intersecting lines above, and held down firmly, on the under side, by some short, tightly-strained perpendicular lines, fixed below to others, which traverse each other in all directions; beneath the horizontal sheet of web, head downwards, the spider remains patiently watching for such insects as may become entangled in the upper maze of lines. The mode in which the horizontal web is suspended and braced down, would, without doubt, if it could be observed, prove to be a point of great in- terest.

Among the Zubitelarie we have the observations of Mr Blackwall, directed chiefly to the formation by Amau- robius atrox of the peculiar fibrous and adhesive flocculus, drawn from the fourth pair of spinners by the " calamis-trum," and disposed about the irregularly intersecting lines

of the snare which is spun in the angles of walls, in crevices, between portions of detached rock, and other sunilar situations. The adhesive flocculus serves to en- taugle insects, and makes them an easy prey to the spider who lies in wait not far off, having formed a funnel-shaped tube of slight texture from its place of concealment to its snare.

With regard to the formation of the snares of the Territearia, Mr Gosse has an interesting passage in A Naturalist's Sojourn in Jamaica ; it is, however, too long for quotation here. Mr Moggridge also (.c. infra) has some details

respecting the formation and repair of their nests by trapdoor spiders in confinement. The chief point of interest, however, in regard to trapdoor snares, is whether the hinged lid is formed in one continuous piece with the tube, and then cut out, leaving a portion unsevered to form the hinge, or whether the lid is made separately, except in that part intended for the hinge. Neither Mr Gosse nor Mr Moggridge enter into this question, though Mr Moggridge indeed speaks ((.c, p. 118) of his belief that, when all is completed, the spider cuts away certain threads by which the door is supported on either side of the hinge. The present writer was once told by a gentleman who had formerly resided in the West Indies, that trapdoor spiders there invariably make the tube and lid of one continuous, solid, homogeneous piece, and then cut out the lid with the falces. This account, especially as coming from a non-naturalist, seemed improbable—a spider's falces being in no way, apparently, fitted for such an operation ; if, however, the fact be that the lid, instead of being of one solid piece with the tube, is merely connected with it by a few supporting threads (in accordance with Mr Moggridge's belief), these could easily be torn away by the spider's falces, and the lid would be left free, except at the point where the hinge is formed.

CLASSIFICATION.—It is impossible within our remaining space to go into detail upon this wide portion of the subject ; it must suffice to say that the order Arancidea may at present be divided into about thirty-two families. These are — Theraphosides, Colophonides, Filistatides, C&cobiides, Tetrablemmides, Dysderides, Drassides, Palpimanides, Dictynides, Agclenides, Hersilides, Seytodides, Pholcides, Theridiides, Phoroncidides, Epeirides, Gasteracanthides, Uloborides, Miagrammopides, Poltides, Thlaosomides, Arcydes, Stephanopides, Eripides, Thomisides, Podophthalmides, Lycosides, Sphasides, Dinopides, Salticides, Myrmecides, Aphantochilides, In these families are comprised about two hundred and sixty genera based upon special details of structure ; principally the position of the eyes, the form of the maxilla and labium, the number and structure of the spinners, and some other details. The specics are very numerous; probably not a tithe of the existing ones are yet described. In one family alone, Salticides, nearly a thousand are known.

As in all other creatures, differences of colour and markings, as well as integumental clothing and armature, serve to distinguish the species—the latter, too, are at times of generic value ; but with regard ty spiders particularly, in order to determine their species, it is very essential to obtain comparative dimensions from different Portions of structure ; thus the position of the eyes on the fore part of the caput furnishes us with the Jacial space (or the space between the margin of the caput just above the falces and the posterior eyes nearest to the medial line), and the clypeus, or the space between the same (fore) margin of the caput and the anterior cyes nearest to the medial line. The comparative extent of these parts is of great importance as specific characters, and they are easily observed ; that part of the facial space occupied by the eyes 1s concisely described as " the ocular area." The relative and com- parative lengths, again, of the legs, and of their different joints, are strong specific characters, the first also generic. Male spiders when adult may, with few exceptions, be certainly distinguished in regard to their species, by the form and structure of the palpi and palpal

1 No general work exists in which the families and genera of spiders are brought down to the present time, or in any degree near to it. The works of Walckenaer, Ins. Apt., and Koch, Die Arachniden, are out of date altogether in this respect, though still of great value and im- portance in themselves. The work of Dr Thorell, On the Genera of Huropean Spiders, Upsala, 1870, is exceedingly valuable, but it only touches incidentally upcn the exotic groups.

organs, the development of the latter being an infallible criterion cf maturity. Female spiders, again, may, in numerous cases, be as cer- tainly distinguished by the form and structure of the genital aperture, situated in the medial line beneath the fore extremity of the abdo

men ; this aperture is never externally " perforate" until the last moult of the spider, and its full development is therefore an unerring criterion of the maturity of the female sex. With respect to the senses of spiders—smell and

hearing—nothin appears to have been certainly ascertained ; but the late Mr Ricard! Beck has an interest- ing paper upon the subject in Entomologist, Lond. 1866, vol. iii. Dp. 246. He suggests that the fine and delicate hairs of some spiders' legs may convey sounds to them. With regard to the sense of taste we may well conclude that spiders have this sense in considerable perfection, in the possession of a well-developed membranous tongue,

GENERAL Remarks.—Spiders are to be found more or less abundantly in every part of the world and in almost every conceivable position; even subterranean caves, such as those of Adelsberg and the Island of Lesina, are tenanted by species peculiarly adapted by the absence of eyes to their dark and gloomy abodes, Less repulsive and forbidding in appearance than most others of the Arachnida, the Araneidea are often extremely interesting in their habits. Being almost exclusively feeders on the insect tribes, they are consequently endowed with proportionate craftiness and skill ; this is shown remarkably in the construction of their snares and dwellings. The "trapdoor spider" has always been one of note in popular works on spiders' habits, and certainly the details of several different types of the trapdoor tubular nest, with the habits of the several species to which they belong, lately published by Mr Traherne Moggridge,? are of the greatest interest and importance. The typical trap- door nest is a cylindrical hole in the earth excavated by the spider itself, lined with silk and closed by a lid, which fits like a valve or cork into the opening at the surface and opening by a strong elastic silken hinge, the spring of which closes it again with some slight force. Many spiders, however, live a vagabond life, and capture their prey without the aid of a snare, by springing on it unawares, or, in some cases, running it fairly down in open view; yet craft and skill are equally apparent, whatever be their mode of life and subsistence.

To say that spiders are less repulsive and forbidding in appearance than other Arachnids, is to do them but scanty justice, for numbers of species of various genera—notably among the Salticides, or jumping spiders—are unsurpassed by insects of any order, in respect both to briliiancy of colouring and the designs formed by its distribution, Some of the curious and delicate little species of the genera Argyrodes and Ariamnes are perfect marvels of metallic brilliancy and beauty. These little spiders are found

living as quasi parasites, in the outskirts of the webs of the larger exotic epeirids, and appear to live on the smaller insects caught in them; probably also spinning irregular snares of their own among the lines of the larger snare. In external appearance the young of spiders do not differ greatly from the adults, except in being generally more distinct in colour and markings; in some species the characteristic mark- ings can seldom be well traced except in immature examples. The cocoons or nests in which some spiders deposit their eggs are very beautiful, as well as varied and characteristic in form; that of Ero variegata (B1.), a little spider not uncommon in England, would arrest the attention of even an indifferent person; it is of an elegant pear shape, formed of a strong yellow-brown silk network, and attached by a long elastic stem, of the same material, to stalks of dead grass, sticks, or other substances, in shady places. An- other, made by a larger spider, Agroéca brunnea (BL), is of a truncated pear shape, formed of a continuous white silk fabric, and attached to blades and stalks of living grass and rushes, by a short pedicle; it must, however, be seen

- *Harvesting Ants and Trapdoor Spiders, Lovell Reeve, 1872, with supplementary vol. 1874, illustrated with numerous plates.*

soon after it is made, for the maker, as if prescient of the attraction of such a beautiful little object, hastens to daub it over thickly with a coat of mud or clay, which completely conceals its structure and beauty.

Spiders vary greatly in their relative fertility ; probably many species are rare owing to a limited fecundity. The egg sac of Agroéca brunnea (Bl.) contains about forty or fifty cggs, that of Xysticus claveatus (Walck.) about twenty, that of Hro vartegata (BI.) not so many, while that of Oonops pulcher (Templ.) contains usually no more than two. Some spiders, however, perhaps most, construct more than one cocoon.

From their mode of life spiders attain (as we should naturally suppose) their largest size, and are found in their greatest profusion, in the tropical regions ; while in more temperate climates, where the members of the insect

tribes are smaller and their specics fewer, we find spiders in general of comparatively smaller dimensions and less numerous in specics. One of the largest known spiders, Eurypelma Klugit (Koch),—Fam. Theraphosides—found in Brazil, measures upwards of two and a half inches in length, with legs nine inches and upwards in span ; while the smallest known spider, Walckenaéra diceros (Cambr.), found in England, is but »/sth of an inch in length. Tropi- cal countries, however, although some of their spiders are giants, have numbers of small size. Numerous species have been procured from Ceylon measuring no more than from sth to gsth of an inch in length.

Spiders, besides being skilful and crafty, are very cleanly ; one of our common Saltici, Zpiblema histrionica (Koch), may often be seen brushing and cleaning its forehead and eyes with its hairy palpi, as @ cat uses its paws for a similar pur- pose. Probably most spiders, like the Crustacea, have the faculty of reproducing a lost limb. Instances of this are numerous(see Mr Blackwall's experiments, Meport of British Association before cited), but a reproduced limb is seldom or never cqual to the original one in size; this accounts for the frequency of cxamples captured with one or more legs, or a palpus, of dwarfed and stunted dimensions. Many spiders show great attachment to their eggs and young. The female Lycosa will seize her egg sac again and again if it be taken from her, only relinquishing it at last when appar- ently convinced of the hopelessness of retaining it. A pretty little spider, not rare among weeds and garden plants, Theridion carolinum (Walck.), carries its egg cocoon within its legs, and searches for it anxiously if compelled to

'drop it. Many also of the genus Clubiona, as well as others, brood over their eggs and tend upon their young until they disperse to find their own means of subsistence. The food of very young spiders is probably wholly derived from the moisture of the atmosphere. Spiders are great drinkers, and suffer severely from drought. Mr Blackwall relates that an eniaciated, half-dead example of Jficaria nitens (Bl.) grew immediately plump and strong after a draught of water.

In speaking of the better qualities of spiders, their attachment to their young, and the frequent fondness for each other evidenced by the apparently happy life of the male and female of some species in the same

web, we must not overlook the other side of the picture. It has been well authenticated that in some species of Epeirides the female will seize and devour the male even immediately after the exercise of his natural office, which indeed he has to undertake with great circumspection and care to be able to accomplish at all. From this propensity of the female, we may account for the gradual lessening in size of some male spiders in comparison with that of the females, by a kind of sexual selection, since it is obvious that the smaller the male the better his chance of escape (see O. P. Cambridge in Zoologist, 1868, p. 216, and in Pro-

ceedings Zool. Soe. Lond., 1871, p. 621, and also Vinsou's Spiders of Bourbon and Mauritius), and thus sclection would operate until the males became so small as only

just to be able to fulfil the office of impregnating the

female. The male, nearly always the smallest, is in the case of some epeirids and Thomisids not 7'5th or even sth of the length of the female, and sometimes not more than +zlsath part of her weight, and less then yz!ypth part of her volume (A. W. M. Van Hasselt, Arch. Neerland, tom. viii.) As a rule, however, the difference in size between the male and female spider is not nearly so great. Spiders are unable to fly, and the mode adopted by many species, and myriads of individuals, to make up for this by sailing away on their silken lines, has been mentioned ; but lately a beautiful species of Salticides, Attus volans (Cambr.), Ann. and Mag. N. H., September 1874, found at Sydney, N.S.W., has been described and figured, with large flaps or lateral extensions of the abdominal integument, by means of which the spider can sustain itself in leaping from plant to plant; it has power to elevate and depress these flaps at will.

The voracity of spiders is well known, and the propensity above noticed of the female to devour the male is but one instance of general voracity; but though thus voracious, spiders can endure extreme fasting with impunity. A small spider enclosed in a glazed case, lived and appeared healthy for

eighteen months without food ; if it had any nourish- ment at all during this time, it could only have been the very slight moisture that might exude from the skin of a lately stuffed bird in the case, Zoologist, 1853, p. 3766. Other instances are also on record of fasts, almost or quite as long, and borne equally well.

ENEMIES oF SPIDERS.—Preying upon all the insect tribes, and occasionally upon lizards (F. Pollock, Ann. . i. October 1872) and earth-worms (E. Simon in Ann, Soc. Ent. France, 1873, 5 sér. tom. iii. p. 114—and Zoologist, 1856, p. 5021), spiders are also themselves preyed upou by both lizards and insects. More than one species of parasitic hymenoptera tend to keep spiders within due bounds ; but little has yet been done towards working out these parasites. Three species are figured in Blackwall's Spid. Great Britain and Ireland, pl. xii. ; two of them prey upon Agroéca brunnea (Bl.); while the third, Pompilus sepicola (F. Smith), pierces large spiders, paralysing, but not killing them; they are then dragged to its nest, in a hole in the earth ; eggs are laid in the spider, which retains sufficient vitality to furnish fresh food to the parasitic larve until the time for their change to the pupa state arrives. Full grown females of Lycosa campestris (Bl.) have been found by the writer in the grasp of this powerful ichneumon. From the outskirts of a single web of Hpeira opuntice (Duf.), on the shores of the Sea of Galilee, the writer collected, in April 1865, many truncated pear-shaped egg cocoons belonging to the beautiful little Argyrodes epeircee (Sim.) ; and from each of these cocoons a single hymenopterous parasite shortly issued. The egg cocoons of various epeirids in England are likewise often preyed upon by numerous minute parasites of the same order. Several species of Theridion—T. simile (Koch) especially —are subject to a larval parasite, often as large as the spider itself, adhering to the outside of the abdomen. Various attempts to rear the perfect insect from this para- site have hitherto failed. A wide field of great interest is open to any one who should take up the investigation of the various insect parasites of spiders, with their mode of attack and subsequent victory.

Other foes, common to all the Articulata, spiders also have in abundance—birds, small mammals, and reptiles. Doubtless we are indebted to such enemies for the development, through natural selection, of many spiders

protected by horny integuments, and often armed with spines to an extent that would make them a painful meal to any bird or other creature that should sct itself to dine upon them. Phoroncidia Thwaites (Cambr.), found in Ceylon, and Pycnacantha Meadii (Bl.), found in Africa, and indeed all the Gasteracanthides, are notable examples of this protective armature. Protective " mimicry" is also seen in spiders, some so exactly resembling ants, that placed side by side with species of ants found in the same localities, even a practised eye would not detect the spider at first sight. Of this nature are the Myrmecides (fig. 31) and some of the Saltici, and, notably, Aphantochilus

Fig. 31—Ant-spider (Myrmecia fulva, Latreille). a, cephalo-thorax; b, abdomen.

Rogersii (Cambr.), found in Brazil. Othcr spiders, again (Genus Hurysoma, Koch, and Cyrtarachne Thor.), closely resemble some species of phytophagous coleoptecra; one of the latter genus found in Ceylon, but yet undescribed, resembles a small mollusc. Of the former some are very like a minute crab (fig. 32). And lastly, to sum up the enemies of spiders, they prey on each other, and are preyed upon also by other Arachnids; but on the whole they have, as by their office they should have, the best of it, for they are against all the Articulata, but only comparatively a few of the Articulata are against them.

Spiders are not creatures which "S,j)70 Capen" ona belong solely to the present geo- thorax; 6, abdomen, logic era of the earth, for fossil spiders, with other Arach- nids, as well as spiders in amber, have been found; the oldest in the coal formation. See on this subject a late résumé by Dr T. Thorell, On European Spiders, pp. 220- 233, with other works there quoted.

PRESERVATION oF SPIDERS.—Beautiful as are the col- ours and markings of numbers of spiders, especially of those found in the tropics, and elegant and curious as are mauy of their forms and structures, it has yet been found a matter of difficulty to make them good-looking, sightly, cabinet objects. By ordinary care and skilful manipula- tion, however, most of them can be preserved and dis- played very satisfactorily. So much of the

comparative neglect of Arachnids in general is owing to this difficulty, that it may perhaps be worth the space of a few lines to remark, that many whose abdominal integument is strong, or pretty thickly clothed with hairs and pubescence, may be pinned, set out, and dried like insects. Others may have the abdomen opened from below, and after the

contents are carefully extracted, be stuffed with fine cotton wool. Others again have been most successfully treated by inflating the abdomen (after the contents have been pressed out) with a blow-pipe, and then subjecting them to a process of rapid desiccation, which in general preserves the colours and markings very well indeed. But the best and most useful way for all purposes is to immerse and keep them in tubes filled with spirit of wine. To make spiders in spirit sightly objects, they should, when drugged with chloroform, or sonic other stupifying agent, be secured, but not transfixed, by pins to a piece of cork, sunk in a vessel of spirit, in a natural position, until ren- dered rigid by the action of the spirit, which will be in a fortnight or so; the pins are then removed, and the spiders are placed in glass test tubes, large enough to re- ceive them without too much compression of the legs. A bit of white card is slipped in under the specimen to keep it in position, the tubes are filled with spirit, stopped firmly with a pledget of cotton wool, and inverted round the inner side of a wide mouthed glass-stoppered bottle; this bottle is filled also with spirit, and the spider is then seen in its natural position, and with all its colours and mark- ings perfectly visible. It is also capable of examination with an ordinary pocket lens, even without removal of the tube from the large bottle. Large spiders with a largely developed abdomen should be kept in pill-boxes for a fort- night or so before being placed in spirit; during this time the crudities of their food contents are discharged, and preservation without injury or obliteration of colours and markings is thus rendered far more certain ; the beauty of many of ou large and handsome epcirids can only be cer- tainly retained, even in spirit, when treated aftcr the above method. See further on this subject, as well as on the mode of search and capture of spiders (O. P. Cambridge, Trans, Neu Zeal. Instit., vol. vi. pp. 194-200).

It is not necessary to give here a list of works on Arachnids, many having been already quoted in speaking of the different orders. The following, however, on Ara- nevdea may be mentioned :—

N. Westring, " Aranee sucewe,' Gothenburg, 1861 ; EK. Ohlert, Die Araneiden oder Echten Spinnen der Provinz Preussen, Leipzig,

1867; A. Menge, "Preussiche Spinnen," in Schr. Ges. Danz. (NV. F.), 1866-1873, Danzig (still in course of publication); H.

| Lucas, in Exploration de ? Algéric, Paris, 1849; H. Nicolet, in

Gay's Hist. Fis. Pol. de Chili, vols iii. iv., Paris, 1847 ; Eugene Simon, Les Arachnides de France (vol. i. only is yet published), Paris, 1874; L. Koch, Die Arachniden Australiens, Nuremberg, 1871-74 (still in continuation). Nothing has been said in the foregoing pages respecting the "Embryology" of spiders; for information in regard to this important and interesting but re- condite part of Araneology, it must suffice to refer the reader to Herold, De Generatione Aranearum in Ovo, Marburg, 1824, and Edouard Claparéde, Recherches sur [evolution des Araignées, Utrecht, 1862.

These, with other works quoted on the different points that have arisen in the course of the foregoing article, will be found sufficient to guide the student and collector. The general works on Arachnida, or on any of its separate orders, are exceedingly few, and none, except that of M. Simon, Hist. des Araignées, Paris, 1864, are of recent date, beyond the merest abstracts. The literature on the sub- ject is scattered up and down, in isolated papers, in numberless Transactions and Proceedings of various socie- ties, and in scores of periodical volumes and journals for the record of natural and scientific investigation. It has been attempted to give in the foregoing pages as fair a general view of the whole subject as the limited space, and great difficulty of getting access to important papers treating upon it, would permit. 'The object of such articles as the present is rather to excite an appetite for the obtaining more detailed information, than to satisfy fully the appetite already excited. (0. P. G)

ARAD, OLp, a city of Hungary, in the county of Arad, situated on the Maros, 145 miles S.E. of Pesth. Itisa well-built town, with a fortress of considerable strength, erected in 1763, which occupies an advantageous position between two branches of the river. It is the seat of a Greek bishop, and has a Greek theological seminary. Its chief manufacture is that of tobacco; and, besides carrying on a large trade in corn, it possesses one of the most celebrated cattle fairs in Hungary. In 1849 the fortress of Arad was captured by the Hungarian rebels, who made it their head- quarters during the latter part of the insurrection. _ It was from it that Kossuth issued his famous proclamation, and it was here that he handed over the supreme military and civil power to Gérgey. The fortress was recaptured shortly after the surrender of Gérgey to the Russians at Vilagos. The population of Old Arad is 32,725, many of whom are Jews, while many belong to the Greek Church. NEw ARAD, situated on the left bank of the Maros, opposite to Old Arad, is a place of some trade, with a population of about 4000, including many Germans.

ARAFAT, or OrpHat, a mountain near Mecca, a visit to which constitutes a necessary part of the great Mahometan pilgrimage. (See Mecca.) It consists of a granite rock about 200 feet high, which is ascended by staircases partly cut in the rock, and partly composed of solid masonry. On this hill Adam is said to have met his wife Eve after being separated from her for 120 years, and it is thence called Arafat, z.e., Gratitude. On the summit is a chapel, which the Mahometans believe to have been built by Adam. 'The interior was destroyed in

1807.

ARAGO, Francots JEAN DomIn1QuE, one of the most popular physicists belonging to the first half of the present century, was born on the 26th February 1786, at Estagel, a small village near Perpignan, in the department of the Eastern Pyrenees. His father was a licentiate in law, and, being appointed treasurer of the mint for the department, removed with his family to Perpignan about the beginning of the century. Arago has left an autobiographical sketch, drawn with great vivacity, though touched occasionally with somewhat high eolouring ; and to this we are indebted for the incidents of the earlier portion of his life. From boyhood he had decided

military tastes, inspired by constant contact with troops at his native village, which was a halting station for soldiers on their way to Perpignan, or to the army of the Pyrenees. Francois was sent as an out- door pupil to the municipal college of Perpignan, and began to study mathematics with an eye to the entrance examina- tion to the Polytechnic school. Here he was soon beyond the depth of his master's knowledge; but, with that undaunted spirit which carried him through many hard- ships and difficulties in after life, he sent to Paris for the works of Legendre, Lacroix, and Garnier, and studied them assiduously in private. Within two years and a half he had mastered all the subjects prescribed for examination, and a great deal more; he had read Euler's Jntroduction a VAnalyse Infinitesimale, Lagrange's Théorie des Fonctions Analytiques and Mécanique Analytique, and Laplace's Mécanique Céleste. He does not indeed pretend to have understood at the time all he read in these works, but he had been early encouraged by D'Alembert's maxim, " Go on, and the light will come to you," and he had carried it into practice. On going up for examination at Toulouse he completely astounded his examiner, M. Monge, by his knowledge of Lagrange, and received the highest eom- mendation from him. Towards the close of 1803 he entered the Polytechnic school, with the artillery service as the aim of his ambition. We have in the autobiography many amusing instances of the inefficiency of some of the Polytechnic professors at that time, of the peculiarly French

familiarity existing between professors and pupils, as well as of the political passions absurdly allowed to distract the school. In 1804, through the advice and recommendation of Poisson, with whom he had become very intimate, Arago received the appointment of secretary to the Observatory of Paris, a valuable post for a young man of science, as it brought him in contact with the most eminent philosophers of the day. He now became acquainted with Laplace, and he had as fellow-worker in the laboratory the celebrated Biot. Through the influence of Laplace with the Government, Arago and Biot were commissioned to complete the meri- dional measurements which had been begun by Delambre, and interrupted since the death of Méchain in 1804. The object of this survey was to determine, with as great nicety as possible, the ten-millionth part of a quadrant of the

meridian through Paris, which had been agreed upon by the National Convention as the standard unit of length, and named the métre. To measure an actual quadrant from the north pole was, of course, an impossibility ; but the plan adopted was to measure the arc of the meridian from Dunkirk to Barcelona, and from their known difference of latitude to deduce the length of the quadrant. For this purpose they left Paris in 1806, to commence operations among the mountains of Spain—operations attended with the greatest personal privation, fatigue, and danger. Biot returned to Paris after they had determined the latitude of Formentera, the southernmost point to which they were to carry the survey, leaving Arago to make the geodetical connection of Majorca with Ivica and with Formentera. The adventures and difficulties of the latter were now only beginning. The political ferment caused by the entrance of the French into Spain extended to these islands, and the ignorant populace began to suspect that Arago's movements and his blazing fires on the top of Mount Galatzo were telegraphic signals to the invading army. They became ultimately so infuriated that he was obliged to cause himself to be incarcerated in the fortress of Belver in June 1808. On the 25th July he managed to escape from the island in a fishing boat, and after an adventurous voyage he reached Algiers on the 3d August. Under the disguise of a strolling merchant he procured a passage in a vessel bound for Marseilles. A journey, however, of eleven months was before him ere he was destined to reach that port, for the vessel fell into the hands of a Spanish corsair on the 16th August, just as it was nearing Marseilles. With the rest of the crew, Arago was taken to Rosas, and imprisoned first in a windmill, and afterwards in the fortress of that seaport, until the town fell into the hands of the French, when the prisoners were transferred to Palamos. After fully three months' imprisonment they were released on the demand of the Dey of Algiers, and again set sail for Marseilles on the 28th Nov., but when within sight of their port they were driven back by a southerly wind to Bongia on the coast of Africa. 'Transport to Algiers by sea from this place would have occasioned a weary stay of three months; and with his usual courage, Arago set out for it by land under conduct of a Mahometan priest, reaching it on Christmas day, after encountering many perils from lions, and having uncomfortable squabbles with natives on the way. A six months' stay in Algiers gave him opportunity to note the manners and habits of the people, of which he gives some amusing and graphic accounts. Once again, 21st

June 1809, he set sail for his native land ; and, as by some strange perversity of fortune, he had to undergo a monotonous and inhospitable quaran- tine in the Lazaretto at Marseilles before his difficulties were over. The first letter he received, while in the Lazaretto, was from Humboldt at Paris, sympathising with him, and congratulating him on the termination of his laborious and perilous enterprise ; and this was the origin of a connection

which, in Arago's words, "lasted over forty years without a single cloud ever having troubled it."

Through all the vicissitudes of this long campaign Arago had succeeded in preserving the records of his survey ; and his first act on his return home was to deposit them in the Bureau de Longitude at Paris. As a reward for his adventurous conduct in the cause of science, he was shortly afterwards (17th Sept. 1809) voted a member of the Academy of Sciences, in room of the deceased Lalande, at the remarkably early age of twenty-three, being, to the vexation of Laplace, elected by a large majority of votes over his friend Poisson. Before the close of the same year (1809) Arago was chosen by the council of the Polytechnic school to succeed M. Monge in the chair of analytical geo- metry; and about the same time he was named by the emperor one of the astronomers of the Royal Observatory, which was accordingly his residence till his death. He was also made one of the examiners in counection with the

cole d Application for engineers and artillery at Metz. In all these situations he rapidly attained very great popu- larity, gainmg the esteem of his pupils by the charming clearness of his style in lecturing and the personal interest he showed in their progress.

In 1816, along with Gay-Lussac, Arago commenced a monthly journal of science, the Annales de Chimie et de Physique, which soon acquired that high scientific reputa- tion which it has always maintained. In the same year the two philosophers visited England, and made the per- sonal acquaintance of some of the most eminent men of that country, meeting among others Dr Thomas Young, a memoir of whom was afterwards written

by Arago. In 1818 or 1819, Arago proceeded along with Biot to execute, on the coasts of France, England, and Scotland, the geodetic operations which the Board of Longitude had directed. They also measured the length of the seconds' pendulum at Leith, and in Unst, one of the Shetland isles ; the results of the observations being published in 1821, along with those made in Spain. He was elected a member of the Board of Longitude immediately afterwards, and proved a valuable addition to the society, contributing to each of its Annuals, for about twenty-two years, most important scientific notices on astronomy and. meteorology, aud occasionally on civil engineering, as well as interesting memoirs of members of the Academy.

After his appointment to the Observatory, Arago had commenced, at the request of the Board of Longitude, a series of popular lectures on astronomy, which were con- tinued from 1812 to 1845. His success as a lecturer was almost unparalleled, and can only be compared to that of Faraday. All ranks flocked to hear him, fascinated by his graceful eloquence and his crystalline clearness of explana- tion. He used to remark, what many lecturers often forget, that "clearness is politeness in public speakers." His manner in lecturing is said to have been to fix his eye on some one of his audience, whose intellect had apparently the minimum of development, and to keep it fixed till the face should brighten up with intelligence.

When Buonaparte's hopes of empire in Europe had begun to wane, and he was turning to America as a land of refuge, where he might still have scope for his ambition, he suggested to M. Monge that, with a scientific guide, he should explore the new continent from Canada to Cape Horn, study the great physical wonders of that territory, and leave behind him works and discoveries worthy of himself. Monge named Arago as the proper associate and assistant in the enterprise, and had even negotiated with Napoleon for a handsome allowance to be granted to Arago, and for a fund to be devoted to the purchase of a complete set of astronomical and physical instruments. But Arago would not for a moment entertain the proposal.

He pointed the emperor to the march of the English and Prussian armies on his capital as a matter demanding more pressing consideration, and

declined to leave the Old World to study science in the New, "when France might perhaps lose its independence and disappear from the map of Europe." Subsequent events prevented a renewal of Napoleon's scientific negotiations and projects.

After the Restoration Arago took no very prominent part in the politics of the day, though he at all times maintained with boldness and ardour liberal opinions of the extreme republican type. By the revolution of 1830, however, he was summoned from the studies of the obser- vatory and the laboratory to the field of political strife in the Chamber of Deputies, and in the Municipal Council of Paris. Elected a member of the Chamber of Deputies for the Lower Seine, he employed his splendid gifts of elo- quence and scientific knowledge in all questions connected with public education, the rewards of inventors, and the encouragement of the mechanical and practical sciences, Many of the most creditable national enterprises, dating from this period, are due to the advocacy of Arago—such as the reward to Daguerre for his wonderful invention of photography, the grant for the publication of the works of Fermat and Laplace, the acquisition of the museum of Cluny (one of the sights of Paris), the development of railroads and electric telegraphs, the improvement of the navigation of the Seine, and the boring of the Artesian wells at Grenelle.

The year 1830 was a remarkable epoch in his life on account of several other offices to which he was appointed. He now received the chief direction of the Observatory, and from his position in the Chamber of Deputies he obtained grants of money for the rebuilding of part of the Observa- tory and for the addition of magnificent instruments, which raised it to be a model, in place of a public disgrace, as it had been before. In the same year, too, his zeal in the cause of science was rewarded with the highest honour any philosopher might aspire to—the perpetual secretaryship of the Academy of Sciences, in room of the distinguished Fourier. On the 7th June (1830) he was elected by 39 out of 44 votes. This appointment inspired new life into the Academy. Arago threw his whole soul into its service, and by his pleasing faculty of securing friendship and life-long attachments, he gained at once for himself and for the Academy a world-wide reputation. As perpetual secre- tary it fell to him to pronounce historical éloges on the decease of resident or foreign members of the

Academy ; and for this duty his rapidity and facility of thought, his happy piquancy of style, and his extensive knowledge peculiarly adapted him. Some of his éloges are master- pieces of elegant biography. When M. Flourens pronounced Arago's own funeral enlogy, he said, "In the eulogies of the eloquent secretary are found all the qualities of his spirit, d'une verve brillante, de la vigueur, de Velan, un certain churme de bonhomie." (Comptes Rendus de ? Academie, t. xxxvu. p. 513.

In 1834 Arago visited England for the second time, to attend the third meeting of the British Association, held that year in Edinburgh. From this time till the stirring events of 1848, Arago led a life of comparative quiet,—not the quiet of inaetivity, however, for his incessant labours within the Academy and the Observatory produced a multitude of eontributions to all departments of physical science, which make him one of the most voluminous of authors in this subject. But the change came. Louis Philippe, having failed to satisfy the extreme republican party, and to grant them those social advantages that they imagined a republic alone could yield, was swept from his throne, and Arago left his laboratory to join in forming an extempore government. His popularity was so great

that he was entrusted with the discharge of two most important functions, that had never before been united in one person, viz., the Ministry of War and of Marine. Energetically and faithfully the philosopher of forty years' standing applied himself to his new duties ; and however ignominious may have been the ultimate failure of the Provisional Government, there can be little question that Arago struggled honestly in the cause of social liberty and improvement. While Minister of Marine he effected some salutary reforms, such as the improvement of rations in the navy and the abolition of flogging; he abolished political oaths of all kinds, and, against an array of monied interests, he succeeded in procuring the abolition of negro slavery in the colonies.

During the insurrection of June, Arago's courage was conspicuously displayed in his entreaties to the mob to stop their murderous outrages. For the first time in his life Arago failed, and he himself narrowly escaped with lis life. With his mental and physical energies shattered by fatigue and

disappointment, he terminated here his active political carecr, though he continued to the last to take an interest in the affairs of his country, and to watch for the dawn of a brighter future. Failing eye and trembling hand could now be of little use in the service of science; but warucd by the disease (diabetes) that had attacked him, he determined to occupy his few remaining years in preparing for the press some MSS. of original researches which his political duties had prevented his communicating to the Institute.

In the beginning of May 1852 proclamation was made that the oath of allegiance to the Government of Louis Napoleon would be required from all its functionaries, including the Board of Longitude. Arago peremptorily refused, choosing to sacrifice his office and home of nearly half a century rather than violate the dictates of his con- science, which he would be doing if he complied, seeing that, as a member of the Provisional Goverument of 1848, he con- tributed to the abolition of all political oaths. In a letter to the Minister of Public Instruction, he intimated his resigna- tion of his post as astronomer at the Bureau de Longitude, at the same time stating the services he had rendered to his country in the cause of science, and the grief which this separation from the scene of his labours of so many years would impose. To the credit of the Prince President, he respected the sentiments so boldly declared by the half- blind old philosopher, and made "an exception in favour of a savant whose works had thrown lustre on France, and whose existence his Government would regret to embitter."

The tenure of office thus granted did not prove of long duration. Arago was now on his death-bed, under a complication of diseases, induced, no doubt, by the hard- ships and labours of his earlier years. In the summer of 1853 he was advised by his physicians to try the effect of his native air, and he accordingly set out for the Eastern Pyrenees, accompanied by his affectionate niece, Madame Langier. But the change was unavailing, and he returned to Paris to die. After a lingering illness, in which he suffered first from diabetes, then from Bright's disease, and lastly from dropsy, he breathed his last on the 2d Oct. 1853, at the age of 67. The day before his death he had been visited by Lord Brougham, his old and intimate friend, and the interview had excited him much. M. Biot also had an interview with him only three hours before his death. Arago said to his veteran colleague

and collaborateur, “I intend to resign my situation of per- petual secretary to the Academy, since I can uo longer discharge its duties.” Biot’s reply must have smoothed the pillow of the dying savant, “If you do, we will all come to you in a body to bring it back to you, and

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reproach you for your ingratitude.” A public funeral was, with good taste, decreed to Arago by the emperor, notwithstanding his refused allegiance to the Imperial Government, aud it took place on the 5th Oct. with all the pomp and parade of an Imperial act. A beautiful and eloquent eulogy was pronounced over his tomb by the distinguished M. Flourens, who succeeded him as per- petual secretary of the Academy, while M. Barral per- formed the duty entrusted to him by the young philo- sophers of the public schools of the metropolis of giving utterance to their last adicu.

Thus closed perhaps the most singular career in the annals of science. Of Arago’s moral character it is difficult to form a true estimate, extolled as it is on the one side by his countrymen, and too severely criticised as it often is ou the other side by British writers. Allowance must be made for the Spanish blood that flowed in his veins. ‘The ardour of his temperament, his quick and far darting intellect, the powerful love of country which his youthful vicissitudes had only inten- sified, all combined to produce a consciousness of power, which, in the Academy of Sciences or in the management of the Observatory, might stamp his bearing as dictatorial, and which, m questions of national priority of invention, might render his judgment partial. With the imperious- ness, perhaps, of a powerful intellect, Arago was free from that selfishness that has so often been exhibited by men who have enjoyed such high offices of trust during times of national disorder. He cared for money only as it supplied the wants of his experimental researches and the means of educating his family; he lived a simple and a frugal life ; his income never exceeded £500 a year; and, refusing to accept any reward for his four months’ services as Minister of Marine, he sacrificed fortune for the sake of his country and of science.

From the personal history of Arago we turn to his literary and scientific labours and discoveries. It has been already shown that, as editor of the Annuaire or Almanac of the Board of Longitude, he commenced, in 1822, a

series of regular contributions of scientific articles to that Annual, remarkable for their lucidity of style, united with mathematical accuracy of detail; that, as perpetual secretary of the Academy of Sciences, his éloges alone would have secured him lasting reputation ; and that, as director of the Observatory, he rapidly restored its efficiency and completely remodelled it. He has, indecd, been often accused of doing little or nothing for the practical advancement of astronomy ; aud of shrinking from the steady and regular drudgery of observation as too tame to be congeuial to his versatile mind. 'To reproach a man who has done much, because he has not done more, or because he has not followed in the beaten track, is, to say the least, far from generous criticism. His applications of physics to astronomical research—such as to his photometric measurements of lunar and stellar brightness, of the polar snows of Mars, and of the belts of Jupiter and Saturn, to the structure of the sun as revealed by his spots, to the effect of atmos- pheric refraction on astronomical observations, to irradia- tion and variable stars—are surely in themselves not despicable contributions to the science. But apart alto- gether from his labours in the Observatory, he has reudered vastly greater service to astronomy by his popular expositions of it than hundreds of the most assiduous observers put together. Few have had, in such a degrec as he, the gift of reducing the abstract conceptions of pure science to the level of the popular apprehension without descending to the puerile and frivolous.

In 1820, when the subject of steam boilers was attracting attention, Arago was employed by Government to execite,

wong with Dulong, a series of experiments on the elastic force of steain at different temperatures. This difficult and most hazardous task, where they were exposcd to the bursting of a boiler at any moment, they accoinplished with the greatest ability and coolness. Of these experi- ments, as well as of others,—on the density of air, on the velocity of sound, on the pressure of gases being propor- tional to their density, &c.,—there will be found elaborate memoirs in the Comptes Rendus of the Academy, and in the Annales de Chimie et de Physique.

It is, however, on his contributions to Magnetism and Optics that Arago's fame as an experimenter and discoverer rests. By employing the method of oscillating needles, he established the universal influence of magnetism on all substances, though it was left to Faraday to make the grander generalisations of diamagnetism. Arago found that a magnetic needle, made to oscillate over non-fcrru- ginous surfaces, such as water, glass, copper, &c., falls more rapidly in the extent of its oscillations according as it is more or less approached to the surface. Over ice, for example, an oscillation of 53° on each side of the magnetic meridian, fell to 48° after 60 oscillations at a distance of 523 millimetres from the ice ; while, at a distance of 7 muin., it fell by the same amount after 26 oscillations. Over glass there was a fall from 90° to 41° in 221 oscillations, at a distance of 4:01 mm., and in 122 oscillations at a distance of '91 mm. For this discovery Arago was awarded the Copley medal by the Royal Society of London in 1825 ; and he has the honour of being the first foreigner to whom this distinction was accorded. This discovery was followed by another. It occurred to him to try, cou-

. versely, the effect of oscillating or rotating a plate of non- ferruginous metal near a magnetic needle at rest. He caused a platc of pure copper to revolve by clock-work, which was also of copper, under a magnetic needle within a glass-receiver, and with a sheet of paper between the needie and the revolving plate to prevent air currents. Gradually the needle was drawn from the magnetic meridian, till finally, on a very rapid rotation of the plate, it fairly swung round and continued in constant rotation. An account of these experiments he read before the Academy of Sciences, on the 7th March 1825, and they were exhibited in London in the following April by Gay- Lussac, exciting universal interest among the philosophers of this and other countries. This phenomenon of rotatory magnetism, as it is termed, is indissolubly linked with the name of Arago ; but it was reserved for the genius of Faraday to offer the true explanation of it, after it had long occupied the attention of Herschel, Babbage, Barlow, Nobili, and other distinguished men, as well as of its dis- coverer.

Arago is also fairly entitled to be regarded as having proved the long suspected connection between the aurora borealis and the variations of the magnetic elements. He established, too, the fact of an hourly variation of

these, traceable, no doubt, to the influence of the sun as an enor- mous magnet at a distance. It is worth mentioning that Arago was the first to employ the galvanic current for the permanent magnetisation of steel, though in the field of electro-magnetisin his discoveries and researches as a whole are not to be compared with those of the profounder Ampere.

It is, however, his investigations in Optics that form the most marked feature and the crowning glory of Arago's scientific career. We owe to him not only important optical discoveries of his own, but the credit of stimu- lating the genius of Fresnel, with whose history, as well as with that of Malus and of Young, this part of his life is closely interwoven. Shortly after the. beginning of the present century the labours of the three philosophers

last named were shaping the modern doctrine of the undu- latory theory of light. Malus had madc in 1808 his discovery of the polarisation of light by reflection, identi- fying it with the effects of double rcfraction; Young had devised his beautiful theory of interferences; and Fresnel had been simultaneously conducting elegant experiments in the very same field as the English philosopher. It was the communication to the French Academy of Sciences of a paper on this subject by Fresnel that led to his intimacy with Arago. Fresnel's arguments in favour of the undu- latory doctrine found little favour with Laplace, Poisson, aud Biot, the champions of the emission theory ; but they were ardently espoused by Humboldt and by Arago, who had been appointed by the Academy to report on the paper. This was the foundation of an intimate friendship between Arago and Fresnel, and of a determination to carry on together further researches in this subject. These investigations were rewarded by a remarkable discovery, in 1811, the very year that Malus terminated his career su auspiciously begun. After Huyghens's time, when Iceland spar and rock crystal were alone supposed to have the pro- perty of double refraction, mineralogists had suspected the same property to exist in a number of other crystals, though it was often almost impossible to determiue its existence. But Arago discovered that a plate of any doubly refracting crystal, such as selenite or mica, when interposed between two similar polarising prisms or piles of glass plates, displays splendid tints, varying in colour with the thickness of the plate and

with its inclination to the transmitted beam, and varying in intensity as the plate of mica or selenite is turned round in its own plane. By this simple means double refraction may be detected in the smallest plate of a crystal, The explanation of this remarkable phenomenon was a difficult problem, and for some time perplexed both English and Continental investi- gators. Dr Young, in 1814, ascribed the cause generally to interference; but Arago saw that this explanation was incomplete. 'Thc clue to it was, however, found in the law, cstablished by the joint labours of Arago and Fresuel, that two polarised rays cannot interfere unless polarised in the same or parallel planes. This involved the idea of transverse vibrations of the ether across the direction of propagation, an idea which at first seemed a stuimbling-block to the theory of undulations, and which Fresnel and Arago did not venture for some time to embrace. Once expressed, however, this theory of transverse vibra- tions reduced the whole phenomena of polarisation to a simple mechanical effect, a resolution of rectilinear motion into two rectangular components; and so far from upsetting the wave theory, it has by its very simplicity and com- prehensiveness but helped to establish it on a sure founda- tion.

Arago apphed his discovery to the construction of a polariscope, for estimating the feeblest amount of polarisa- tion; and he used this instrument for some very intcrest- ing experiments on the polarisation of the light of the sky (which is sunlight polarised by reflection from the atmos- phere), and on that of different incandescent and reflecting surfaces. He also found that the moon and the tails of comets send light to the eye which is slightly polarised, thus betraying its borrowed origin. But that of the sun, being absolutely neutral, is only comparable (according to Arago) to the light arising from incandescent vapours, thus distinguishing the sun from a solid or liquid globe.

We cannot do more than allude to Arago's other optical papers and experiments. He was, probably, the only Frenchman of his time who was well acquainted with Young's discoveries. The explanation by the doctrine of interference of the colours of Newton's rings received an important confirmation from an experiment of Arago's,

which proved them to arise from the mixture of the pencils of light reflected at the two neighbouring surfaces. He pressed a lens of glass against a plate of metal, in which case the central spot is white or black when light polarised perpendicularly to the plane of incidence is reflected at an angle greater or less than the polarising angle for glass; and the rings vanish altogether at the polarising angle — results which Airy subsequently proved conformable to the undulatory theory.

To Arago is also due the discovery of the power of rotatory polarisation exhibited by quartz. He found that a beam of polarised light transmitted along the axis of a crystal of quartz becomes depolarised, and produces colours varying with the thickness of the crystal. If the polarised light be homogeneous, and the analysing plate be placed athwart this polarised beam so as to reflect none of it, the interposing of a quartz crystal will turn round the polarised beam in its passage, so that when it falls on the analysing plate it is no longer athwart it, and the light is partly reflected. The researches in this field were taken up by Biot, Fresnel, Her- schcl, Seebeck, Airy, and others; and the phenomenon was first explained by Airy to be due to the fact that along the axis of a quartz crystal the beam consists of two circu- larly polarised portions, while in other directions it consists of two clliptically polarised portions. In some substances the rotation is to the right hand, and in others to the left.

Last of all, among the many contributions of Arago to the support of the undulatory hypothesis, comes the expert- mentum crucis which he proposed to carry out for comparing directly the velocity of light in air and in water or glass. On the emission theory the velocity should be accelerated by an increase of density in the medium; on the wave theory, it should be retarded. Wheatstone's experiment, in 1835, of measuring the velocity of the electric discharge had sug- gested the idea to Arago ; and in 1838 he communicated to the Academy the details of his apparatus. Owing to the great care required in the carrying out of the project, and to the interruptions to his labours by the events of the revolution, it was the spring of 1850 before he was ready to put his idea to the test. But, as fate would have it, just at that time his eye-sight suddenly gave way. With a melan- choly resignation he consoled himself with having merely laid down the problem and having indicated the means of its solution, and with the hope

that other experimenters would follow in his steps and add a new proof in favour of the undulatory system. Arago lived to see his wishes realised in the beautiful experiments of Fizeau and Foucault, which, with improvements of detail in the apparatus, were based on the plan proposed by him. These, as all the scientific world knows, confirmed the deductions from the wave theory, and established the retardation of the velo- city of light in denser media. With this ended those brilliant labours which have in no small degrce contributed to render the arguments in favour of the undulatory doc- trine all but unanswerable.

Arago's (Zwvres were published after his death under the direction of Medi, vAg Barral, in 17 vols., 8vo, 1854 to 1862; also separately his Astronomie populatre, in 4 vols.; Notices biographiques, in 3 vols.; Notices seicntifiques, in 5 vols.; Voyages scientifiques, 1 vol.; Mémoires scientifiques, in 2 vols.; Mélanges (Miscellanies), in 1 vol.; and Tables analytiques et documents importants (with por- trait), in 1 vol, English translations of the following portions of his works have appeared :— T'reatise on Comets, by C. Gold, O.B., London, 1833 ; also translated by Smyth and Grant, London, 1861; Hist. éloge of James Watt, by James Muirhead, London, 1839 ; also translated, with notes, by Lord Brougham; Popular Lectures on Astronomy, by Walter Kelly and Rev. L. Tomlinson, London, 1854 ; also translated by Dr W. H. Smyth and Prof. R. Grant, 2 vols., London, 1855 ; Arago's Autobiography, translated by the Rev. Baden Powell, London, 1855, 1858; Arago's Meteorological Essays, with introduction by Humboldt, translated under the superintendence of Colonel Sabine, London, 1855 ; and Arago's Biographies of Scientific Men, translated by Smyth, Powell, and Grant, 8vo, London, 1857.

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ARAGON, a captaincy general, or, as it is usually called by the Spaniards, a kingdom, of Spain, situated

'between lat. 40° and 42° 51' N., and between long. 2° 10'

W. and 1° 45’ E., is bounded on the N. by the Pyrenees, which separate it from France, E. by Catalonia and Valencia, S. by Valencia, and W. by Navarre and the two Castiles. It hasan area of 14,726 English square miles, and a population of 925,773—calculated for 1867 on the basis of the census of 1860. It is divided by the river Ebro, which flows through it in a south-easterly direction, into two nearly equal parts, known as 77ans-ibero and Cis- ibero. The north is occupied by a portion of the Pyrenees, which here attain in Monte Perdido, or as it is variously called Mont Perdu, Las Tres Sorores, almost their highest altitude (11,430 feet); and in the south and west are various sierras of considerable elevation. The whole sur- face, indeed, is very irregular. The large and fertile plain in the middle, bordering on the Ebro, is broken by offshoots from the north and south, while the mountain ranges, on the other hand, are interrupted by numerous valleys of great beauty. The central pass for carriages over the Pyrenees is on the line between Saragossa and Pau, and bears the name of Port de Confrane. The Ebro is the principal river, and receives from the north in its passage through the province, the Arba, the Gallego, and the united waters of the Cinca, the Essera, the No guera Ribagorzana, and the Noguera Pallaresa—the last two belonging to Catalonia ; and from the south the Xalon and Xiloca and the Guadalupe. The Imperial Canal of Aragon, which was commenced by Charles V. in 1529, but remained unfinished for nearly two hundred years, extends from Tudela almost to Sastago, a distance of 80 miles ; it has a depth of 9 feet, and an average breadth of 69, and is navigable for vessels of about 80 tons burthen. The Royal Canal of Tauste, which lies along the north side of the Ebro, was cut for purposes of irrigation, and gives fertility to the district. Two leagues N.N.E. of Albarracin is the remarkable fountain called Cella, 3700 feet above the sea, which forms the source of the Xiloca; and between this river and the Sierra Molina is an extensive lake called Gallo- canta, covering about 6000 acres. The climate of Aragon is, as might be supposed, of a very varied charactcr, rigor- ous in the north and among the sierras, but mild and even oppressive in the south, especially towards the Medi- terranean. Its vegetable products are necessarily affected by a similar variety. The hills are clothed in many places with oak, pine, and beech, which, if utilised, would furnish a good supply of timber. The flora is exceedingly rich, but has been slightly explored. Wheat, maize, rice, wine, oil, flax, and hemp, of fine quality, are grown in con- siderable quantities ; as well as saffron, madder, liquorice,

sumach, and a variety of fruits. Swine and sheep are reared in considerable numbers, the merino wool supplied by the latter being one of the chief productions of the province ; but little attention is paid to other descriptions of cattle. The manufactures are comparatively insignifi- cant, being in great measure supplementary to the agricul- tural and pastoral pursuits of the people. The silk manufacture has declined, and woollen and linen cloth is only produced in small quantities. The mineral resources of the country consist of iron, lead, copper, sulphur, cobalt, asphalt, lignite, alum, rocksalt, jet, marble, and jasper, which are all found in abundance, but they are very inadequately wrought. Aragon is divided into three pro- vinces, Huzsca, Trerunt, and Saracossa, accounts of which will be found under these headings. The capital is Saragossa, and the other towns of importance are Jaca, Huesca, and Barbastro to the north of the Ebro, and Tara- zona, Calatayud, Daroca, Calamocha, Albarracin, Montalban, Teruel, and Alcafiiz to the south. Saragossa is an arch-

bishopric, and Huesca, Tarazona, Barbastro, Jaca, Teruel, and Albarracin are episcopal sees. In 1867 there were 2257 priests in the kingdom.

Previous to the reign of Ferdinand and Isabella the political constitution of Aragon was the most liberal in Europe. Formally mouarchical, its genius and maxims were purely republican. The kings, who were long elec- tive, retained only the shadow of power ; while the real exercise of it was in the hands of the Cortes, an assembly consisting of the nobility, the equestrian order, the repre- sentatives of the cities and towns, and theclergy. No law could pass without the assent of every member who had a right to vote. Without the permission of the Cortes, no tax could be imposed, war could not be declared, nor peace concluded. Besides these, and other extraordinary privileges enjoyed by the Cortes, the Aragonese possessed another safeguard against despotic power in the election of a Justicia, or supreme judge, who acted as the guardian of the people, and the controller of the prince. He was the supreme interpreter of the laws, and was accountable to the Cortes alone for the manner in which he discharged the duties of his office. See Robertson's History of Charles V. vol. i. § 3. .

The history of Aragon before its union with Castile by the marriage of Ferdinand and Isabella, when it was merged in the kingdom of Spain, will be found in the general history of that country. It had, before this epoch, a suc- cession of twenty sovereigns, from the year 1035 to 1516. See Zurita, Annales de Aragon; Viaje de Ponz; Geografia de Don Isidoro de Antillon; Historia de la Economia Politica de Aragon, por Don. Ignacio de Asso.

ARAGONA, a town in Sicily, 74 miles N.N.W. of Girgenti. It has an old castle with a fine collection of paintings and antiquities. Almonds are largely grown in the neighbourhood; and not far off is the famous mud voleano of Maccaluba. Population, 11,424.

ARAGUAYA, or ARacuta, a river of Brazil which rises in the Sierra Sciada, and flows north between the provinces of Matto Grosso and Goyaz till it joins the Tocan- tins at San Joao das duas Barras, about lat. 6° S. It divides into two branches in lat. 18° 30', and unites again about lat. 9° 30', thus forming the large island of Santa Anna or Bannanal. The eastern branch, called the Furo, is the one principally navigated. The most important tri- butaries are the Cristalino, the das Mortes, and the Caja, on the west, and the Claro, the Vermelho, the Cruxas, and the Chavantes, from the east. The whole course of the river is about 1000 miles, and it is navigable a long way up.

ARAHAL, a town in Spain, 7 miles from Seville. Situated on the level summit of a hill, it enjoys a beautiful prospect. In the wars against the Moors, it assisted the mother-city of Moron, and received its civic independence in 1555 by charter from Charles V. Its church is of Gothic architecture. The country around produces wheat, beans, pease, tares, and olives. Population about

287.

ARAKAN, a division of British Burmah, and within the jurisdiction of the chief commissioner of that province. It consists of a strip of country running along the eastern seaboard of the Bay of Bengal, from the Naf estuary, on the borders of Chittagong, to Cape Negrais. The division is situated between 16° 2' and 21° 33' N. lat., and between 92° 10' and 94° 50' E. long. It is bounded on the N. by the Bengal district of Chittagong; on the E. by the Yumadoung mountains, which separate it from indepen- dent Burmah and the British district of Pegu; and on the S. and W. by the Bay of Bengal. Length from northern extremity to Cape Negrdis, about 400 miles; greatest breadth in the northern part, 90 miles, gradually diminish-

ing towards the south, as it is hemmed in by the Yumia- doung mountains, until, in the extreme south, it tapers away to a narrow strip not more than 15 miles across. The coast is studded with islands, the most important of which are Chedub4, Ramri, and Shahpurd. The division has its headquarters at Akyab, and consists of four dis- tricts — namely, Akyab, Northern Ardkdn hill tracts, Ramri, and Sandoway. Total area estimated at 18,530 square miles, of which only 740 square miles were actually under cultivation in 1871-72. The population at the time of the British accession in 1826 did not exceed 100,000. In 1831 it amounted to 173,000; in 1839 to 248,000; and in 1871 to 461,136, or 24-9 souls per square mile. It consisted of 365,131 Buddhists, 53,289 Mahometans, 9029 Hindus, 33,337 aborigines, and 350 Christians— total, 461,136. The principal rivers of Ardkén are—(1.) The Naf estuary, in the north, which forms the boundary between the division and Chittagong ; (2.) the Myu river, an arm of the sea, and running a course almost parallel with the coast for about 50 miles; (3.) the Koladyne river, rising near the Blue mountain, in the extreme north-east, and falling into the Bay of Bengal a few miles south of the Myu river, is navigable by vessels of from 300 to 400 tons burden for a distance of 40 miles inland ; and (4.) the Lemyu river, a considerable stream falling into the bay a few miles south of the Koladyne. Further to the south, owing to the nearness of the range which bounds Ardkd4n on the east, the rivers are of but little importance. These are the Talak and the Aeng, navigable by boats; and the Sandoway, the Toungoop, and the Gwa streams, the latter of which alone has any import- ance, owing to its mouth forming a good port of call or haven for vessels of from 9 to 10 feet draught. There are several passes over the Yumadoung mountains, the easiest being that called the Aeng route, leading from the village of that name into independent Burmah. The staple crop of the province is rice, along with cotton, tobacco, sugar, hemp, and indigo. The forests produce abundance of excellent oak and teak timber. During 1871-72 the sea-borne trade of Ard4kdn amounted to £1,345,417, the exports of rice alone being returned at £105,894. The three maritime ports of the division are Akyab, Kyoukphoo, and Sandoway; and since June 1871 steam communication has been kept up once a fortnight between all these ports and Calcutta, except in the south- west monsoon, when communication is maintained with Kyoukphoo only. The revenue of Ardk4n Division in 1871-72 amounted to £199,756, of which 37-29 per cent., or £74,490, was derived from the land revenue. Through- out the

whole division there were only two Government and three other schools in 1870-71, attended by 251 pupils. The police force, for the protection of person and property, consisted of a total of 115 of all ranks, the proportion being one man to every 15 square miles, or one to every 385 of the population. The only town in the division with a popu- lation exceeding 5000 souls is Akyab, which has 15,281 inhabitants,

The natives of Arakdn trace their history as far back as 701 A.D., and give a lineal succession of 120 native princes down to modern times. According to them, their empire had at one period far wider limits, and extended over Ava, part of China, and a portion of Bengal. This extension of their empire is not, however, corro- borated by known facts in history. At different times the Mughuls and Pegus carried their arms into the heart of the country. The Portuguese, during the era of their greatness in Asia, gained a temporary establishment in Ardkdn ; but in 1783 the province was finally conquered by the Burmese, from which period until its eession to the British in 1826, under the treaty of Yandaboo, its history forms part of that of Burmah. The old city of Arakan, formerly the capital of the province, is situated on an inferior branch of the Koladyne river. Its remoteness from the ports and harbours

of the country, combined with the extreme unhealthiness of its situation, have led toits gradual decay ciel to the formation

of the comparatively recent settlement of Akyab, which place is now the chief town of the province. The old city of Arakan lies about 50 miles north-east of Akyab, in 20° 42’ N. lat., and 93 24’ EB. long. The Maghs, who form nearly the whole population of the province, follow the Buddhist doctrines, which are universally professed throughout Burmah. The priests are selected from all classes of men, and one of their chief employments 1s the education of children. Instruction is consequently widely diffused, and few persons, it is said, can be found in the province who are unable to read. The qualifications for entering into the priestly order are good con-

duct and a fair measure of learning—such conduct at least as is good according to Buddhist tenets, and such learning as is esteemed among their votaries.

ARAL, a vast lake or inland sea, in the west of Asia, situated between lat. 43° 42’ and 46° 44’ N., and long. 58° 18’ and 61° 46’ E. It was known to the Persian geo- graphers as the Sea of Khuwarizm or Khwarezm, from the neighbouring district of the Chorasmii, and derives its pre- gent name from the Kirghese designation of Aral Denghis, or Sea of Islands. Its length, from north to south, is 265 miles, and its breadth, from east to west, about 145. It is the greatest body of water in the steppes of Asia, next to the Caspian Sea, and is one of the largest lakes in the world, Its level is 117 (or, according to recent explora- tions, which, however, require verification, 250) feet above the Caspian, which is 84 feet above the Black Sea. It is bounded on the N. by the Ural steppes; on the W. by the rocky plateau of the Ust-Urt, which separates it from the Caspian; on the S. by the alluvial district of Khiva ; and on the E. by the Kysyl-Kum, or Red Desert, and the Kara-Kum, or Black Desert. In the north the shore is comparatively low, and the coast-line is broken into a number of irregular bays, of which the most impor- tant are those of Sary-Chaganak and Paskevitch; and on the west an almost unbroken wall of rock extends from Chernycheff Bay southwards, rising towards the middle to a height of 500 feet. The southern coast is occupied by the delta of the Oxus (Jihtin, Amu-Daria, El-Jiryan), which divides into a number of channels, the most important of which, beginning from the west, are the Aibugir or Laudan, the Ulu- or Ulkun-Daria (Great River), and the Kuvan- Jarma, Kuk, or Yangy Su (New River), as it is variously called. The Laudan forms a vast swamp, 80 miles long, and about 20 broad, before it disembogues into the sea ; and the whole of the neighbouring reaches are extremely shallow. The only other tributary of any size is the Jax- artes (Sihin, Syr-Daria, Shash), which enters towards the northern extremity of the east coast, and is suspected to be shifting its course and embouchure more and more to the north. The whole eastern coast is fringed with multi- tudes of small islands, and a number of considerable size are situated in the open towards the north and west. Kug- Aral, which is the largest of all, lies across the northern portion opposite the mouth of the Syr-Daria, and cuts off what is called the Kitchkine Dengis, or Little Sea. Pro- ceeding south we find in succession, Barsa-Kilmas, Nicholas Island, Bellinghausen, Lasaroff,

and, near the mouth of the Taldyk, Takmakdty. Upon some of these islands the Russian explorers found large numbers of antelopes, which showed by their perfect fearlessness, combined with their curiosity, that they had hitherto been undisturbed by man. For the most part the Sea of Aral is comparatively shallow, the depth towards the west coast being 37 fathoms, and towards the centre only 15. Navigation is rendered dan- gerous by the frequency and violence of the storms, and the almost total absence of shelter for ships. The north- east wind is the most prevalent, and sometimes blows for months together. The only other craft, except the steam- ships of the Russians, that venture on the waters, are the flat-bottomed boats of the Kirghese. The first vessel ever known to have been launched on the Aral was conveyed across the desert in pieces bythe Russian Admiral Boutakoff,

about 1848. The sea abounds with fish of various kinds, as the sturgeon, silurus, carp, and especially a species of herring ; thus agreeing in its ichthyology with the Cas- pian, from which it is distant 150 miles. The water is only slightly brackish. During winter the northern portion is completely frozen, but towards the south it is very seldom that ice is formed to any cxtent. The Aral has no visible outlet; and to account for there being no increase in its size, it was supposed that there might be a subter- raneous communication with the Caspian Sea or the Sea of Khuzar ; but the evaporation is so great as not only to maintain an equilibrium, but even, it has been thought, to produce, as in the case of the Caspian, a gradual diminution. In regard to the period of the formation of the Aral there are two theories, each supported by high authority. Accord- ing to Sir H. Rawlinson (Proceedings of the Royal Greogra-

phical Society, March 1867) the disturbances which pro-

duced the present lake took place in the course of the Middle Ages; while Sir Roderick Murchison contends (Jour- nal of Roy. Geog. Soc. 1867, p. cxliv., &c.) that the Caspian and Aral have existed as separate seas before and during all the historic period, and that the main course of the rivers Jaxartes and Oxus was determined in a prehistoric period. The former bases his opinion largely on historical evidence, and the latter trusts

principally to geological data. The whole subject has been recently reviewed in Die Aralsee-

frage, by Robert Roesler, Associate of the Imperial

Academy of Sciences, Vienna, 1873.

ARAM, EvcEnE, was born of humble parents at Rams- gill in Yorkshire, in 1704. He received little education at school, but manifested an intense desire for learning. While still young, he married and settled as a schoolmaster at Netherdale, and during the years he spent there, he taught himself both Latin and Greek. In 1734 he removed to Knaresborough, where he remained as schoolmaster till 1745. In that year a man named Daniel Clark, an inti mate friend of Aram, after obtaining a considerable quantity of goods from some of the tradesmen in the town, suddenly disappeared. Suspicions of being concernedin this swindling transaction fell upon Aram. His garden was searched, and some of the goods found there. As, however, there was not evidence sufficient to convict him of any crime, he was dis- charged, and soon after set out for London, leaving his wife behind. For several years he travelled through parts of England, acting as usher in a number of schools, and settled finally at Lynn, in Norfolk. During his travels he had amassed considerable materials for a work he had projected on etymology, to be entitled, a Comparative Lexicon of the English, Latin, Greek, Hebrew, and Celtic Languages. In February 1759 a skeleton was dug up at Knaresborough, and some suspicion arose that it might be Clark's. Aram's wife had more than once hinted that her husband and a man named Houseman knew the secret of Clark's disappear- ance. Houseman was at once arrested and confronted with the bones that had been found. He affirmed his innocence, and, taking up one of the bones, said "' This is no more Dan Clark's bone than it is mine." His manner in saying this roused suspicion that he knew more of Clark's disappearance than he was willing to admit. He was again examined, and confessed that he had been present at the murder of Clark by Aram and another man, Terry, of whom nothing further is heard. He also gave information as to the place where the body had been buried in St Robert's Cave, a well-known spot near Knaresborough. A skeleton was dug up here, and Aram was immediately arrested, and sent to York for trial. Houseman was admitted as

evidence against him. Aram conducted his own defence, and did not attempt to overthrow Houseman's evidence, although there were some discrepancies in that; but made a skilful attack on the fallibility of circumstantial evidence in general, and parti-

cularly of evidence drawn from the discovery of bones. He brought forward several instances where bones had been found in caves, and tried to show that the bones found in St Robert's Cave were probably those of some hermit who had taken up his abode there. He was found guilty, and condemned to be executed on the 6th August, three days after his trial, While in his cell he confessed his guilt, and threw some light on the motives for his crime, by asserting that he had discovered a criminal intimacy between Clark and his own wife. On the night before the 6th August he attempted to commit suicide by opening the veins in his arm; but he was discovered before life was extinct, and suffered the last penalty of the law. The story of Eugene Aram has been made the subject of a powerful ballad by Hood, The Dream of Eugene Aram, the Murderer, and of a romance by Bulwer Lytton, entitled Eugene Aram.

ARAMAIC LANGUAGES are so called from Aram, a geographical term, which in old Semitic usage designates nearly the same districts as the Greek word Syria. Aram, however, does not include Palestine, while it comprehends Mesopotamia (Heb. Aram of two rivers), a region which the Greeks frequently distinguish from Syria proper. Thus the Aramaic languages may be geographically defined as the Semitic dialects originally current in Mesopotamia and the regions extending 8. W. from the Euphrates to Palestine. Philologically these dialects form a distinct group of Semitic languages (North Semitic), separated by gram- matical and lexical peculiarities alike from the Middle Semitic (Hebrew, Phcenician) and from the South Semitic (Arabic, Ethiopic). Babylonia is not part of Aram, and the Semitic language of the Assyrian and Babylonian arrowhead inscriptions is not Aramaic.

Ail Aramaic dialects are characterised by poverty of vowels, by the disappearance of many of the forms of internal declension so characteristic of the original genius of Semitic speech, and by a tendency to analytical

con- struction by the aid of relative particles in place of the earlier usage of the construct state. Along with these marks of degradation they retain some antique features lost in Hebrew and Arabic, and in particular, generally present the oldest consonantal forms, having mutes instead of sibilants and aspirates, in a way quite analogous to the relation of Low to High Dutch. A special Aramaic peculiarity is the enclitic use of the article as in modern Danish.

The tribes of ancient Aram never possessed political unity, their settlements being intersected by strips of desert with Arabian population. Thus, there must have been from an early time considerable diversity of dialect within the group, and apart from differences due to the very various ages of the extant literature, we are able to divide Aramaic into two main branches, commonly known as Chaldee and Syriac respectively, and distinguished partly by differences of pronunciation and vocabulary, but more conclusively by differences of grammatical flexion, especially in the verb. In comparison with the great age of this branch of Semitic, the whole Aramaic literature is of comparatively late date, and presents the languages in an advanced and in some sense exhausted stage of development.

The historical and geographical relations of Syriac and Chaldee respectively are involved in some obscurity. As the entire Chaldee literature is of Jewish origin, Hupfeld and others have attempted to refer the whole difference of this language from Syriac to an infusion of Hebrew elements. This view, however, is now generally given up, and it is agreed that Chaldee is no corrupt dialect, but a genuine Aramaic development. But where and when did the Jews give up their old language and adopt a foreign tongue? The explanation formerly adopted and embodied

in the name Chaldee, which from the days of Jerome has been commonly used to designate the Jewish Aramaic, is that the change took place in Babylon. That the so- called Biblical Chaldee, in which considerable portions of the books of Ezra and Daniel are written, was really the language of Babylon, was supposed to be clear from Dan. ii. 3, where the Chaldeans are said to have spoken to the king in Aramaic, and accordingly the writer in the fol- lowing verse passes from Hebrew to that language. But

the cuneiform inscriptions show that the proper language of the Chaldeans was not Aramaic; and an examination of the very large part of the Hebrew Old Testament written later than the exile seems conclusively to prove that the substitution of Aramaic for Hebrew as the vernacular of Palestine took place very gradually. Under the Persian empire Aramaic was a sort of official language for the western provinces, and the Hebrews were in constant contact with Aramaic populations, so that the lan- guage of the many could not fail ultimately to supersede the language of the few. Hence most scholars are now agreed in holding that the term Chaldee is a misnomer, and that the dialect so called is really the language of the South- Western Arameans, who were the immediate neighbours of the Jews. Probably this doctrine would be no longer disputed but for the connection between the question before us and that of the date and authorship of Daniel. In any case, the substitution of Aramaic for Hebrew as the vernacular of Palestine was completed before the time of Christ, and it is this dialect (not the language of the Old Testament Scriptures) which is designated in the New Testament as "Hebrew." The old Hebrew Scriptures were understood only by the aid of interpretations, which, at first oral, were set down in writing in the early centuries of our era, and form after the Biblical Chaldee the second main element of Chaldee literature, the so-called Targums. These versions or paraphrases arose partly in the Pales- tinian, partly in the Babylonian schools, and accordingly display considerable variety of dialect —the Palestinian Targums approaching most nearly to the Aramaic of Daniel and Ezra. But the Aramaic of the Targums is again very different from the language of every day life, as presented in the Talmuds of Babylon and Jerusalem. The Talmudic dialects show extreme phonetic and grammatical decay, but have hitherto been very inadequately investi- gated. The Aramaic of the Babylonian Talmud is more nearly allied to the Aramaic of the East than to the language of Palestine.

Of much greater historical importance than these Jewish dialects is the Aramaic of the north and east, which rose to a literary language under the name of Syriac, in the Chrstian schools of North Mesopotamia. Like so many other languages, the Syriac first received stable literary form by the translation of the Bible, the so-called Peshito. On this basis the language was assiduously cultivated for many centuries, especially in the renowned schools of Edessa and Nisibis, and possesses a very large literature, in

which theology has a leading place, but which is also strong in other forms of composition, as history and poetry, and even extends into the domain of Occidental philosophy and science. 'The treatment of the latter subjects in a Semitic speech was rendered possible by the very great infusion of Greek elements (not merely technical terms, but even particles and the like) brought into the language by long centuries of Greek domination and culture. ~The period during which Syriac literature was most flourishing extends from the 4th to the 10th Christian century. From the later date onward, the language began to give way to Arabic, though some very distinguished authors, ¢.9., Barhebreeus, wrote as late as the 13th century. Even now the Syriac is used to some extent as the ecclesiastical

language of various bodies of Christians, Jacobites, Nes- torians, and Maronites. The systematic study of Syriac by grammars and lexicons was commenced pretty early. Of native grammarians, may be mentioned Jacob of Edessa (7th century) and Barhebreus ; of lexicographers, Bar-Ali and Bar-Bahlul (9th and 10th centuries respectively). By the Maronites the study of Syriac was transplanted to Europe in the 16th century. A corrupt dialect (Neo- Syriac) is still spoken in some districts near Mosul, in Antilibanus, &c., and has been grammatically handled by Stoddart, Ndldeke, and others. Besides the two main branches of Aramaic already discussed, several minor Aramaic dialects claim to be noticed. The Samaritan dialect, spoken by the mixed population introduced into Northern Palestine after the deportation of the Ephraim- ites, has long been superseded as a living tongue by Arabic, but is still the sacred language of the Samaritan communt- ties. The most important literary monument of this dialect is the Samaritan translation of the Pentateuch ; but we possess also Samaritan liturgies and other remains. Another written dialect is the Mandean, the language of a mystical sect on the Euphrates and Tigris, whose Book of Adam has been edited by Norberg. Other dialects are known only from inscriptions, as the dialect of the Hauran, and that of certain Egyptian monuments.

Helps to the Study of the Aramaic Dialects.—There is as yet no good Grammar of the Chaldee dialects. That most commonly used is Winer's

Grammatik des biblischen und targumischen Chaldaismus, which has passed through several editions, and of which there is an American translation by Riggs. Luzzato's Elementi grammaticali del Caldeo Biblico ¢ del dialetto Talmudico Babilonese (Padua, 1865) is in some respects preferable to Winer. The Chalddische Grammatik of Fuerst (Leipsic, 1835) is unfinished. The best Chaldee Lexicon is still the old Lexicon Chaldaicum Talmudicum et Rabbinicum of Buxtorf (Basil, 1640). The worthless modern reprint by Fiseher is to be avoided, but the Chalddisches Wéorterbuch of J. Levy, 2 vols. Leipsic, 1867-68, may be used with caution. On the controversy as to the real character of the Chaldee dialects, the student may be re- ferred to the books of introduction to the Old Testament, especially to Sehrader's edition of De Wette, whieh gives full references to rele- vant literature. Of recent Syriac Grammars may be mentioned those of Hoffmann (Grammatice Syriace Libri TII., Hale, 1827) and Uhlemann (Grammatik der Syrischen Sprache, 2 Aufl., Berlin, 1857) in Germany, and of Cowper (London, 1858) in English. An elaborate and pretentious reeonstruction of Hoffmann's Grammar by Professor Merx of Tiibingen, treats all the Aramaic dialects, but is not yet finished (part i. 1867, part ii. 1870). The Grammar of Amira (Rome, 1596) is still referred to. There is no complete Syriae Lexieon adequateto modern requirements. Michaelis's edition of Castellus (Gottingen, 1788), and Sehaaf's Lexicon Concordantiale to the New Testament (Leyden, 1708), are valuable ; and a great Thesaurus, compiled from numerous sources, and from the collections of several seholars, is now being published by the Clarendon Press under the editorship of Dr Payne Smith. On the Samaritan litera- ture see the introduetion to Nutt's Fragments of a Samaritan Targum, London, 1874. There is a Samaritan Grammar by Uhlemann (.cipsie, 1837), and an Essay on the Mandean dialect by Noldeke (Gottingen, 1862). The Aramaie inscriptions have been in- vestigated by Gesenius, De Vogiié, Néldeke, and others. (W.R. 8.)

ARAN ISLANDS, Soutu, three islands of carboniferous limestone, which lie across Galway Bay, on the west coast of Ireland, in a south-easterly direction, forming a kind of natural breakwater. They are called respectively —begin- ning with the most northern—Inishmore (or Aranmore), the Great Island ; Inishmaan, the Middle Island ; and Inisheer, the Eastern Island. The first has an elevation of 304 feet, the second of 259, and the third of

209, These islands are remarkable for a number of architectural remains of a very early date. In Aranmore—-which has been sung by Moore—there stand, on a cliff 220 feet high, large remains of a circular cyclopean tower, called Dun- Aengus, ascribed to the Fir-bolg or Belge; and seven other similar structures are found in the group. Aran- more also bears the name of Aran-na-naomh, Aran-of-The- Saints, from the number of religious recluses who took up their abode in it, and gave a celebrity to the holy wells,

| 6th of September.

altars, and shrines, to which many are still attracted. No less, indeed, than twenty buildings of ecclesiastical or monastic character have been enumerated in the three islands. The total area is 11,287 acres.

ARANDA, PEpro Pasito ABarca y Borza, Count of, a descendant of a noble family in Aragon, was born at Saragossa, 21st Sept. 1718. He served for several years in the army, and, after retiring with the rank of lieutenant-colonel, spent some time in travelling through France, Italy, and Prussia. He seems to have fallen under the displeasure of Ferdinand VI, but on the accession of Charles IIT. in 1759, he was appointed ambassador to the court of Poland, an office which he held for several years. On his return he took the command of the army sent against the Portuguese, and gained some successes. He was then appointed captain-general of Valencia, from which place, two years later, in 1765, he was summoned to Madrid to assist .in quelling an insurrection. His success was rewarded by the appointment to the Presidency of the Court of Castile. While holding this office he induced the king to give his consent to an order for the banish- ment from Spain of all the Jesuits. His further intention of abolishing the Inquisition was prematurely disclosed, and great indignation was excited against him. He was dis- missed from the presidency of the council, and sent as ambas- sador to Paris. Here he was instrumental in bringing about peace between Spainand Britain. The presidency from which Aranda had been dismissed was held for a short time by his political adversary, Grimaldi, who was succeeded by the count of Florida Blanca. On the dismissal of the latter in 1792, Aranda was recalled to his former position, but from it he was again

quickly driven by the influence of Godoy, the queen's favourite. Soon after he obtained permission to retire to his own estates, where he died in 1799.

ARANJUEZ (Ara Jovis?), a town in Spain, in the province of Madrid, situated 1640 feet above the sea, in a beautiful valley on the left bank of the Tagus, near its junction with the Jarama, 28 miles 8.S8.E. of the capital, and 22 E.N.E. of Toledo, and united by rail with both these cities. The master of the Order of Santiago had a country seat at Aranjuez in the 14th and 15th centuries, which passed, along with the mastership, into the possession of the crown of Spain in the reign of Ferdinand and Isabella (1522). It became a favourite resort of the Spanish court during the spring months; and its successive occupants, from the Emperor Charles V. down to Ferdinand VIL, modified it according to their respective tastes. The larger palace, a building in the French style, due to Philip V., stands at the meeting of the rivers, and is surrounded with the luxuriant foliage of oaks and sycamores and elms. Many of the elms, which were originally brought from England in the reign of Philip II., have attained an extra- ordinary size. The Casa del Labrador, or Farmer's House, as it is called, is a smaller palace built by Charles IV., and full of elaborate ornamentation. The inhabitants of the town continued to live for the most part in troglodytic fashion in excavations in the hill-sides, till the reign of Charles III. (1759-1788), whose minister, Grimaldi, laid the town out in imitation of the Dutch style, with straight wide streets, and uniform two-story houses. It contains two parish churches-—S. Antonio and del Payés—an hos- pital, a Franciscan convent, a bull-ring, and a theatre. The manufactures are flour, chocolate, leather, and glass ; but most of the inhabitants are dependent on agricultural pursuits. A yearly fair is held on the 4th, 5th, and Great attention is given to the rearing of horses and mules, and the royal stud used to be remarkable for the beauty of its cream-coloured breed. The ordinary population is between 3000 and 4000, but during the residence of the court, the number of inhabi-

tants used to rise to 20,000. The place suffered severely from the French during the Peninsular War. The treaty of 1772 between France and Spain

was concluded at Aranjuez; and there the insurrection broke out in 1808, which ended in the abdication of Charles IV.

ARARAT. This name, originally designating a whole district of Asia (Gen. viii. 4), has long been appropriated by the uniform usage of Europeans to the lofty Armenian mountain which stands on the confines of the Russian, Turkish, and Persian dominious, in lat. 39° 42' N., long. 44° 35' E., known to the Armenians as Masis, to the Turks as Ak-Dagh, and to the Persians as Kuh-1-Nuh, or Noah's Mountain. Whether the tradition, which makes it the resting-place of the ark, is of any historical value or not, there is at least poetical fitness in the hypothesis, inasmuch as this mountain is about equally distant from the Black Sea and the Caspian, from the Mediterranean and the Persian Gulf. Another tradition—accepted alike by Christians and Mahometans—fixed on Mount Judi, in the south of Armenia, as the ark's resting-place. There so- called genuine relics of the ark were exhibited, and a monastery and mosque of commemoration were built ; but the monastery was destroyed by lightning in 776 A.D., and the tradition has declined in credit. Mount Ararat is the culminating point of the Armenian plateau, which reaches at its base a height of 3000 feet. From this it rises in a graceful isolated cone (having at its side the more perfect but less lofty cone of Little Ararat) far into the region of perennial snow. It was long believed by the Armenian monks that no one was permitted to reach the "secret top" of Ararat with its sacred remains. The summit, however, has been frequently reached in the course of this century. Tournefort had failed in 1700; the Pasha of Bayazeed had been equally unsuccessful; but on Sept. 27, 1829, Dr Parrot of Dorpat, a German in the employment of Russia, set foot on the "dome of eternal ice." Ascents have since been made by Antonomoff (1834 and 1843); Wagner and Abich (1845); Chodzko, Chanykoff, Moritz, and a party of Cossacks in the service of the Russian Government (1850); Major Stuart (1856); and Colonel Monteith (1856). Mr Freshfield, who reached within about 800 feet of the summit in 1868, thus describes the moun- tain:—"It stands perfectly isolated from all the other ranges, with the still more perfect cone of Little Ararat (a typical volcano) at its side. Seen thus early in the season (May), with at least 9000 feet of snow on its slopes, from a distance and height well calculated to permit the eye to take in its true proportions, we agreed that no single mountain we know presented such a magnificent and impressive appear-

ance as the Armenian Giant." It has been ascertained that the higher peak, or Ak-Dagh, is 17,112 (1331 higher than Mount Blanc), and the lower, or Ad/ah-Dagh, about 13,085 feet above the level of the sea. That the mountain was of volcanic origin was well known, but all eruptive activity was supposed to have long ceascd. Reineggs was discredited, it may be justly, when he spoke of seeing it in eruption in 1785. But in 1840 there was a vast eruption of sulphurous vapours from its sides, and a tremendous earthquake shook the surrounding country. The village of Arguvi and the monastery of St James were destroyed, and great damage was done to Nakhchevan, Sharur, and Ardubad. Major Voskoboinikoff's Report (Atheneum, 1841, p. 157) was, as Wagner has pointed out, erroneous in some of its details, but in the main trustworthy. There are a number of glaciers in the upper portion, and the climate of the whole district is very severe. The greater part of the mountain is destitute of trees, but the lower Ararat is clothed with birches, The fauna and flora are both comparatively meagre.

(Parrot, Reise zum Ararat, Berlin, 1834; Wagner, Reise nach dem Ararat, de., Stuttgart, 1848; Abich, in Budletin de la Soc. de

Geogr. de Franee, 4 ser. part i., and in Monatsberichten der Ges. Sir Erdk. zw Berlin, 1846, and his Dée Besteigung des Ararat, St Petersburg, 1849; Dubois, Voy. autour du Cauease ; Morier's Second Journey ; D. W. Freshfield, Travels in the Central Caucasus and Bashan, 1869.)

ARAS, the ancient Arazes (Turk. and Arab. Ras, Armen. rash, Georg. Rashki), a river which rises south of Erze- roum, in the Bingél-Dagh (Mountain of the Thousand Wells), and flows east through the province of Erzeroum and Russian Armenia, passing between Mount Ararat and Erivan, till it joins the Kur (Cyrus) coming from the north, and falls with it into the Caspian Sea. Its separate course is about 500 miles long, and it receives a number of tribu- taries, of which one of the chief is the Zenghi, which passes by Erivan and drains lake Goukcha or Sivan. A number of towns are situated on the banks of the Aras, as Hassan- Kaleh, Kagisman, and Abbasabad. It forms the boundary between Russia and Persia from 44° to 48° E. long. The Araxes was known by hearsay to Herodotus, and is the

Phasis of Xenophon. It is a rapid and muddy stream, dangerous to cross when swollen by the melting of the snows in Armenia, but fordable in its ordinary state.

ARATUS, one of the rulers of Sicyon, was born in that city, 271 B.c. His father, Clinias, was slain by Abantidas; and Aratus, then seven years of age, only escaped a similar fate through the kindness of Soso, the sister of Abantidas, who had him conveyed secretly to Argos. At the age of twenty he regained without blood- shed his native city of Sicyon, and induced the citizens to join the Achzan League. He obtained assistance in money from Ptolemy, whom he visited, and soon after (245 B.c.) he was elected general of the League. Two years later, when again general, he took Corinth from the Macedonians, and united it to the League. About the same time he defeated the Aitolians at Pellene, and his success drew many other cities into the League, which, under the careful management of Aratus, was rapidly becoming a powerful confederation. Its power, however, roused the jealousy of Cleomenes of Sparta, and in 226 war broke out between the Spartans and Achzans. Cleomenes was victorious at Lyceum, Megalopolis, Hecatombeum, and Dyme, and completely broke the power of the League. As a last resource, Aratus entered into negotiation with Antigonus of Macedonia, and, by promising to deliver up Corinth, secured his assistance. Antigonus was made general of the League, and in 222 totally defeated Cleomenes in the battle of Sellasia. The general peace which now ensued was broken by the turbulent tolians, who invaded Achea. Aratus having marched against them, suffered so severe a defeat at Caphe that he was accused and tried for mismanagement ; his former great services alone saved him from suffering the penalty of failure. Philip of Macedonia, who was then called in to the assistance of the Achzans, succeeded in establishing peace, but his ambition was roused by the hope of obtaining supre- macy in Greece. The counsels of Aratus became dis- tasteful to him, and Plutarch does not hesitate to ascribe the death of Aratus, a few years later (213 3.c.), to poison administered by the command of his royal master. The body was conveyed to Sicyon, where a monument was erected as a memorial of his services. Aratus is one of the few great names in later Greek history. He had an intense hatred of tyrants, and devoted his whole life to the attainment of liberty for Greece. His talents as a statesman were

great, but their effect was marred by his incompetence and want of success as 2 general.

ARATUS, a Greek poet, was born at Soli, in Cilicia. The date of his birth is uncertain, but it is known he lived about 270 B.c., and as he was court-physician to Antigonus Gonatas, king of Macedonia, he must have been contem- porary with several of the great Alexandrian writers,—

Aristophanes of Byzantium, Aristarchus, and Theocritus. Though not an Alexandrian, Aratus has all the character- istics of that school of poetry. He was learned, and verse furnished him with a vehicle for conveying scientific instruction. His only extant works are two poems, or two fragments of one poem, the first, called Dawdpeva, in 732 lines, the second, Acoonpeta, in 422 lines. The Pheno- mena iS a versified imitation or modification of a prose work on astronomy by Eudoxus. It contains little of any value, but one verse has become famous through being quoted by St Paul in his speech from Mars Hill (Acts xvi. 28). The Diosemeia or Prognostics is a treatise on the signs of the weather, accompanied with practical rules. It +s jmitated to some extent by Virgil in his Georgics. The poems of Aratus were very popular, particularly among the Romans, who produced three translations, one by Cicero, another by Cesar Germanicus, the third by Festus Avienus. The best modern editions of Aratus are those of Buhle, Buttmann, and Bekker.

ARAUCANIA, a territory of South America, between lat. 37° and 39° 50’ S., and long. 70° and 75° 20’ W. It is bounded on the N. by the river Biobio, which separates it from Chili, S. by the Valdivia, E. by the Andes, and W. by the Pacific Ocean. See AmErtca, vol. i. p. 701, and PATAGONIA.

ARAUCARIA, a genus of Coniferous trees included under the tribe Abietinee, and the sub-tribe Araucarie. The sub-tribe has been thus defined :—Leaves flat, often four-angled, arranged more or less in a spiral manner ; male flowers in cylindrical terminal spikes, anthers six or more in two rows ; female flowers in cones, which are large and globose ; scales of the cone linear, arranged in a spiral manner, deciduous (falling off) ; seeds solitary, pendulous, usually without wings ; cotyledons two, entire or

divided into two. The species of the genus are magnificent ever- green trees with whorled branches, and stiff, flattened, pointed leaves, found in Brazil and Chih, Polynesia and Australia. The name of the genus is derived from Araucania, the district of South America where the trees grow. Araucaria imbricata, the imbricate-leaved pine, or the Chili pine, was introduced into Britain in 1796. It is largely cultivated, and usually stands the winter of Britain ; but in some years, when the temperature fell very low, the trees have suffered much. On Christmas 1860, the temperature in the Edinburgh Botanic Garden fell to —8° Fahr., and some fine Araucarias, 24 and 25 feet high, were killed. Care should be taken in planting these trees to select a spot somewhat elevated and well drained. The tree grows to the height of 150 feet in the Cordilleras of Chili. The cones borne by the trees are from 8 to 83 inches broad, and 7 to 74 inches long. The wood of the tree ishard and durable. This is the only species which can be cultivated in the open air in Britain. Araucaria brasiliana (A. Rich.), the Brazil pine, is another species of the genus. It is a native of Brazil, and was introduced into Britain in 1819. It is not so hardy as A. imbricata, and requires protection during winter. It is grown in con- servatories for half-hardy plants. Arawcaria excelsa (R. Br.), the Norfolk Island pine, receives also the names of Altingia eacelsa, Hutassa and Hutacta excelsa. It is a native of Norfolk Island and New Caledonia. It was introduced into Britain in 1793. It cannot be grown in the open air in Great Britain, as it requires protection from frost. It is more tender than the Brazilian pine. It isa majestic tree, sometimes attaining a height of more than 920 feet. The scales of its cones are winged, and have a hook at the apex. Araucaria Cunningham, called also Eutacta Cunninghami, the Moreton Bay pine, is a tall tree found on the shores of Moreton Bay, Australia. It requires protection in this country during the winter.

trunk and white wood.

ARA—ARB

Araucaria Bidwilli (Hook.), the Bunya-Bunya pine, found on the mountains of Eastern Australia, between the rivers Brisbane and Burnett, at 27° S. lat, is a noble tree, attaining a height of 100 to 150 feet, with a straight It bears cones as large as a man's head. Its seeds are very large, and are used as

food by the natives. Araucaria Rule (Muell.) is another species. Tt is a tree of New Caledonia, which attains a height of 50 or 60 feet. Araucaria Cookii (R. Brown) is another coniferous tree of New Caledonia, attaining a height of 150 feet. It is found also in the Isle of Pines, and in the New Hebrides.

ARAVALLI HILLS, a range of mountains in India, running for 300 miles in a north-easterly direction through the R4jputand states and the British districts of Mairwara and Ajmir, situated between 24° and 27° 10' N. lat., and between 72° and 75° E. long. They consist of a series of ridges and peaks, with a breadth varying from 6 to 60 miles, and an elevation of 1000 to 3000 feet, the highest point being Mount Abu, rising to 5655 feet, near the south-western extremity of the range. (See Anu.) The geology belongs to the primitive formation—granite, com- pact dark blue slate, gneiss, and sienite. Colonel Tod remarks the dazzling white effect of their peaks—an effect produced, not by snow, as among the Himalayas, but by enormous masses of vitreous rose-coloured quartz. On the north their drainage forms the Luni and Sakhi rivers, which fall into the Gulf of Cutch. To the south, their drainage supplies two distinct river systems, one of which debouches in comparatively small streams on the Gulf of Cambay, while the other unites to form the Chambal river, a great southern tributary of the Jamné, flowing thence, vid the Ganges, into the Bay of Bengal on the other side of India. The Aravalli hills are for the most part bare of cultivation, and even of jungle. Many of them are mere heaps of sand and stone ; others consist of huge masses of quartz heaped upon each other. The valleys between the ridges are generally sandy deserts, with an occasional oasis of cultivation. At long intervals, however, a fertile tract marks some great natural line of drainage, and among such valleys Ajmir city, with its lake, stands conspicuous. The hills are inhabited by a very sparse population of Mairs, an aboriginal race. For long these people formed a difficult problem to the British Government. Previous to our accession they had been accustomed to live, almost desti- tute of clothing, by the produce of their herds, by the chase, and by plunder. But Ajmir having been ceded to us in 1818, the Mair country was soon afterwards brought under British influence, and the predatory instincts of the people have at the same time been controlled and utilised by forming them into a Mairwarda battalion. As the peace- fal results of British rule developed, and the old feuds between the Mairs and their Rajput neighbours died out, the Mair battalion was transformed into a

police force. The Aravalli mountaineers strongly objected to this change, and pled a long period of loyal usefulness to the state. They have accordingly been again erected into a military battalion, and brought upon the roll of the British army. The Aravalli hills send off rocky ridges in a north-easterly direction through the states of Alwar and Jaipur, which from time to time reappear in the form of isolated hills and broken rocky elevations to near Dehli.

ARBACES, the founder of the Median empire in 876 B.C., was one of the generals of Sardanapalus, king of Assyria, and had command of the contingent from the province of Media. He conspired with Belesys, a Chaldean priest, who commanded the troops from Babylon, and having gained over several other officers of the king, they revolted. After a short contest Sardanapalus was defeated,

and committed suicide. The dynasty founded by Arbaces lasted till its overthrow by Cyrus, 559 B.c. This account of the Median empire rests on the authority of Ctesias, as given in Diodorus (ii. 24, 34), and cannot be reconciled with what is stated by Herodotus, who is probably re- ferring to another event. Arbaces, the Mede, is to be distinguished from the satrap of the same name who commanded a division of the army of Artaxerxes in his war with his brother Cyrus.

ARBELA (7a "ApByAa), now Arbil or Erbil, a small town in the province of Shehrezur, situated to the west of the Tigris, in the plain between the Greater Zab (Zycus) and the Lesser Zab (Caprus), and on the route between Mosul (Nineveh) and Baghdad, about 40 miles from the former. The greater part of the town, which seems at one time to have been very large, is built on an artificial hill about 150 feet high. Arbela has given its name to a battle fought (331 B.c.) between Alexander the Great and Darius Codomannus,—though, in fact, the scene of the conflict was Gangumela, and it was only in the subsequent pursuit that the conquerer arrived at Arbela, where Darius had left his baggage and treasure. It became the seat of the Eyubide Sultan Saladdin, in 1184, was bequeathed in 1233 to the caliphs of Baghdad, was plundered by the Mongols in 1236 and in 1393 by Timour, and was taken in 1732 by the Persians under Nadir Shah. The

popula- tion, which varies from 2000 to 6000, is chiefly composed of Koords.

ARBITRAGE (from the French ard:trer, in the second- ary sense of comparing and settling accounts, derived in its turn from the primary sense of arbitrating disputes), is a term that is applied both to a calculation and to a trade: 1st, To the calculation of the relative simultaneous values at any particular moment of any particular merchan- dise, on one market, in terms of the quotations on one or more other markets, taking, of course, the exchanges into account; and 2d, To the business. founded on such calculations, of buying (or vice versd) wholesale in the cheapest market for the time being, and simultaneously reselling (or vice vers) equal amounts in the dearest market, or if not simultaneously, at least as nearly simultaneously as post and telegraph will permit. Arbitrage proper is a separate, distinct, and well-defined business, with three main branches. Two of these, viz., arbitrage or arbitra- tion in bullion and coins, aud arbitration in bills, also called the arbitration of exchanges, fall within the busi- nesses of bullion dealing and banking respectively. The third, arbitrage in stocks and shares, is arbitrage properly so called, and so understood, whenever the word is mentioned without qualification among business men, and it is strictly a Stock Exchange business. A few of the great financial firms outside the Stock Exchange combine the three arbitrations ; they are dealers in bullion, in bills, and in stocks and shares all over the world; but, as a rule, the arbitrage properly known as such, is the business of an arbitrageur, who is almost always a member of a Stock Exchange or "Bourse," and his arbitrations with very few exceptions are neither in bullion nor in bills, but in Government and other stocks and shares. In this strict and accurate sense, arbitrage may be defined to be a traffic, consisting in the purchase (or sale) on one Stock Exchange, and simultaneous or nearly simultaneous, re-sale (or re-purchase) on another Stock Exchange, of the same amount in the same stocks or shares, which at any moment are found, on telegraphic or other advices, to be quoted and negotiable on two or more markets at a difference in price (arising from whatever temporary cause), sufficient to cover the cost of transmission, commission, interest, insur- ance, and leave an adequate profit over and above to be divided by the operators at both ends, The benefit to the

various communities at large resulting from the operations of the arbitrageur consists— first, in the general and constant process of equalisation, equilibration, and the consequent stability in the prices of a large number of stocks and shares, and of an enormous amount of capital throughout the world ; and second, in the greater inducement thus afforded for the economy of idle capital, by means of temporary investment in interest-bearing securities with a minimised risk of fluctuation. The great Government loans are, in the first instance, the natural subject-matier of arbitrage ; and then, in a minor degree, a variety of other securities. British Consols, however, form one great excep- tion to the rule, inasmuch as, from one cause or another (but mainly because they are almost entirely held in one country), no arbitrage business is done in these Consols, notwithstanding that they can be now dealt in "To Bearer." On the other hand, there is an enormous arbitrage business in the new French Five per cents., which, with the United States " Five-Twenties," covering between them a round jive hundred millions sterling, probably stand first in the present list of arbitrage stocks. Indeed, but for the system of arbitrage, it is not easy to see how the great French loans of 1871-72 could have been carried at all without convulsing the financial world. Arbitrage, however, by making the new security universally negotiable, enabled all the great bankers and capitalists of the world—Euro- pean, American, and East Indian—to join hands simul- taneously in concluding an operation gigantic even for modern times. Next to 'French Fives" and "U. S. Five-Twenties," on the arbitrageur's list would come, in various order, according to the men and the circumstances, "Turkish," " Egyptian," '" Italian," "Spanish" "Russian," some South American stocks, and to a very considerable extent, the shares and obligations of the great Lombardo- Venetian Railways. And these stocks, if we add some East Indian securities, cover perhaps the widest area of international arbitrage. But a vast variety of minor securities constitute financial flora, so to speak, with minor and local areas of distribution, known only to particular localities, or to financial specialists. It has been stated above that some great financial houses do each kind of arbitration themselves. Similarly, one or two great firms of arbitrageurs do their own bDill-broking; but although arbitrage business is carried on by a considerable number of the leading Stock Exchange firms, there are

perhaps only two that arbitrate their own bills—this arising from certain regulations that were passed by the London Stock Exchange in 1829 not having a retrospective effect. With these exceptions, the arbitrageurs do not undertake the banking part of the business themselves, but pay their bankers a margin to do it for them. The details of the system of arbitrage, and all the combinations with other business that may arise, constitute a special profession.

The literature of the subject is extremely meagre. Mr Goschen's Theory of Foreign Exchanges, London, 1866, is general and theoretical, but throws great light upon particular aspects of the philosophy of arbitrage, without touching specially on the details of the subject itself. The principal other works are—Kelly's Cambist, 1811, 1835 ; Otto Swoboda, Die Kaufménnische Arbitrage, Berlin, 1878, and Bérse und Actien, Cologne, 1869 ; Coquelin et Guillaumin, Dictionnaire de I' Economie politique, Paris, 1851-53 ; Ottomar Haupt, London Arbitrageur, London, 1870; Charles le Touzé, Traité Théorique et Pratique du Change, Paris, 1868; Tate, Modern Cambist, London, 1868; Simon Spitzer, Veber Miinz- und Arbitragenrechnung, Vienna, 1872; J. W. Gilbart, Principles and Practice of Banking, London, 1871.

ARBITRATION, a term derived from the nomenclature of the Roman law, and applied to an arrangement for taking, and abiding by, the judgment of a selected person in some disputed matter, instead of carrying it to the established courts of justice. Arrangements for avoiding the delay and expense of litigation, and referring a dispute to friends

or neutral persons, are a natural practice, of which traces may be found in any state of society; but it is to the Justinian jurisprudence that we owe it as a system which has found its way into the practice of European nations in general, and has even evaded the dislike of the English common lawyers to the civil law. The eighth section of the fourth book of the Pandects is devoted to this subject. Almost all the advantages, as well as the defects of the system in modern practice, seem, to have been anticipated by the Roman jurists. Some of the civilians make a distinction between the arbitrator, the name applic- able to a person voluntarily chosen by parties

to decide disputes, and the arbiter, an officer to whom the pretor is supposed to have remitted questions of fact as to a jury. In this sense arbiters appear to have been employed as a substitute for jury trial in some of the old provincial laws of France; and hence, perhaps, it comes that, by a very remarkable provision in the French code of commerce, all questions between partners touching the partnership must be referred to arbitration. In the code of civil procedure the title des arbitrages is treated so fully and minutely, as very forcibly to convey the impression of a separate system of voluntary jurisdiction, being created for performing what ought to be accomplished by the ordinary tribunals in a well-regulated judicial system. In Scotland the practice of arbitration has been imported from the Roman law without requiring, as in England, statutory interven- tion. It is one of the advantages of the Scottish system of registration that the decree-arbitral, or decision of the arbiter, when recorded in pursuance of the consent of the parties in their contract of arbitration or submission, can be enforced as the decree of a court.

ARBITRATION IN Scotch Law.—This term is applied to the contract whereby a dispute is referred to one or more persons by the parties interested, and so withdrawn from the cognisance of the ordinary tribunals. When one person only is chosen he is called sole arbiter or arbitrator ; when more than one, an umpire or oversman is appointed either in the contract or by the arbiters themselves, and his award is final if the arbiters differ in opinion. The contract is properly entered into by deed, duly attested and stamped, and is termed a submission. Submissions are either general or special; the former including all disputes sub- sisting at the time, the latter restricted to certain specified matters. The judgment when promulgated is termed the award or decree-arbitral. The deed of submission contains a clause authorising registration for execution, under which, on registration in the books of a competent court, witnesses may be cited and the decree-arbitral put to execution. The procedure may be by written pleadings, and a formal record may be made up if the arbiters deem that desirable. If the determination of the matter falls on the oversman, he may order further debate before deciding. Unless the submission provides otherwise, the powers of the arbiters fall on the expiry of one year; but if it contain a power of prorogation, the arbiters may prorogate from year to year; and in all cases the parties themselves may renew the reference after

it has fallen. By Act of Regulations, 1695, c. 25, decrees-arbitral are declared not to be reducible except on the grounds of bribery, corruption, or falsehood ; this has, moreover, been so interpreted as not to exclude reduction when the arbiters have plainly travelled out of the powers conferred on them by the submission, or where their procedure has been grossly irregular, e.g., taking evi- dence in absence of one of the parties. An arbiter has the power of awarding costs, even though the deed contain no such provision. It is the general rule that a reference is ineffectual where the arbiters are not named, or where an arbiter is merely designated as the holder of an office, eg., the Lord Advocate. To this there is, however, an excep-

tion, where in a contract the parties bind themselves to refer, and where a reference is necessary to work out the contract. A rule in friendly societies to refer disputes is binding. Arbiters having once accepted, cannot renounce their office at pleasure ; and if they do so, become liable in damages.

Judicial References have been long known to the law of Scotland. When an action is in court the parties may at any stage withdraw it from judicial determination, and refer it to arbitration. This is done by minute of reference to which the court interpones its authority. When the award is issued it becomes the judgment of the court. The court has no power to compel parties to enter into a reference of this kind, and it is doubtful whether counsel can bind their clients in such a matter. A judicial refer- ence falls like the other by the elapse of a year; and the court cannot review the award on the ground of miscarriage. By 13 and 14 Vict. c. 36, § 50, a provision is introduced whereby parties to an action in the Supreme Court may refer judicially any issue for trial to one, three, five, or seven persons, who shall sit as a jury, and decide by a majority. The Consolidation Acts in reference to the acquisition of lands, &c., for public undertakings, such as railways, also contain provisions for settlement of disputes by arbitration.

ARBITRATION, in the Law of England, is described by Blackstone as an arrangement by which "the parties injuring and injured submit all matters in dispute con- cerning any personal chattels or personal wrong to the judgment of two or more arbitrators, who are to decide the controversy ;

and if they do not agree, it is usual to add that another person be called in as umpire, to whose sole judgment it is then referred; or frequently there is only one arbitrator originally appointed." Pro- ceedings in arbitration were regulated by the Act 9 and

-10 Will. III. ¢« 15, which allowed the submission to be

made a rule of any of the courts of record and subsequent statutes. It may be said in general that all questions relating to civil rights may be referred to arbitration, eg., personal damages, disputes about real property, and pure questions of law. How far questions involving matters of criminal law may be made the subject of arbitration is not quite clear. In many cases the aggrieved person, having a remedy by indictment as well as by action, may compro- mise the criminal process by referring his civil rights to an arbitrator ; but the more serious criminal offences of course could not be dealt with in this way. An arbitrator ought to have no personal interest in the subject of dispute, but this is almost the only restriction recognised by the law. Idiots, lunatics, infants, and married women, who are under a general rule of disqualification in law, may all be arbitrators, for it is said, the parties have selected their own judges and must abide by their choice. In certain cases of arbitration under a statute, the arbitrator must be taken from some special class, ¢.g., in settling disputes about the proportional expense of county prisoners in a borough gaol, the arbitrator must bea barrister. Under the Common Law Procedure Act of 1854, the reference is to the master of the court. The submission to arbitration may be by agreement between the parties, by order of a court or judge, or by compulsion under the Common Law Act, 1854, or under special statutes. A verbal submission, besides other obvious disadvantages, cannot be made a rule of court. The statute 9 and 10 Will. III. provided that persons might agree that their submission should be made a rule of court, but the insertion of the consent clause in the sub- mission was necessary. The Common Law Procedure Act, 1854, § 17, provides that every agreement or submission to arbitration by consent, whether by deed or instrument In writing, not under seal, may be made a rule of any one of the superior courts of equity or law at Westminster, on tho

application of any party thereto, unless such agreement or submission contain words purporting that the parties intend that it should not be made a rule of court; or if any particular court is specified, the submission shall be made a rule of that court only. The court has no jurisdic- tion until the submission has been actually made a rule of court, and that is seldom done until it is necessary to enforce or set aside the award. The courts are very jealous of any attempt to "oust their jurisdiction," by agreements to refer differences not yet risen, or covenants not to sue in respect of such differences. The 11th section of the Common Law Procedure Act, however, enables a defendant to take advantage of an agreement to refer by applying to the court to stay proceedings in the actions, and compel the plaintiff to resort to arbitration. In a pending action the matters in dispute may by consent of th> parties be referred to arbitration, before or after the

action is called on trial, by a rule of court, or by order of

a Judge at the trial. If it should be made to appear, at any time after the issuing of the writ, to the satisfaction of a court or the judge that the "matter in dispute consists wholly or in part of matters of mere account," the court or

judge may order such matter to be referred to an arbitrator

or an officer of the court (Common Law Procedure Act, § 3). At the trial of any issue of fact, matter of account therein arising may by order of the judge be similarly referred (section 6). In the latter case the power cannot be exercised after the jury is sworn. Among the statutes authorising reference to arbitration in cases of dispute the most important are the Land Clauses Consolidation Act, 1845, the Railway Clauses Act, 1845, and the Companies' Clauses Act, 1845—statutes which consolidate the "com- mon clauses" usually inserted in Acts relating to the sub- jects named in their respective titles.

The powers of the arbitrator are very various. He may have the power of a jury or a judge at Nisi Prius, of a court in banco, of the Lord Chancellor, or of a master. The time for making the award is usually fixed by the submission ; in other cases the legal period is three months, The time, however, may be enlarged by a rule of court, or by order of the arbitrators

themselves. The award or decision of the arbitrators ought to decide finally all the questions in dispute, and ought to be certain and definite ; it ought to be " mutual," ¢.e., it should ascertain the rights and duties of both partics, and it must be possible and consistent with itself. It isa general rule that an award cannot be impeached for a mistake in law or in fact, although it is to be regretted that the practice of the courts on this point is by no means uniform. Where a demurrer, 1.¢., an issue in point of law, was referred to arbitration, it was held that a mistake in law was no ground for setting aside the award. On the other hand, it has been held that a clear gross mistake affecting the whole award may be a good ground for having it set aside.

ARBITRATION, in International Law, is one of the recog- nised modes of terminating disputes between independent nations. Vattel calls it "a reasonable and natural mode of deciding such disputes as do not directly interest the safety of a nation." Heffter mentions six cases in which the judg- ment of the arbitrators would not be binding on the contend- ing parties, viz., when the agreement has been insufficient, when the arbitrators have been incapable, when they have acted on bad faith, when the parties have not been under- stood, when the award is in excess of the reference, and when it is contrary to natural justice. Arbitration is Sometimes spoken of as a universal substitute for war, but hitherto there has been no inclination, on the part of inde- pendent states, to submit any but secondary questions to the decision of neutral parties. The king of Prussia acted as arbitrator between England and France in 1843, in

Syrkar, or farthings.

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what were known as the Portendic claims. In the case of the "General Armstrong" privateer, between the United States and Portugal, the president of the French Republic (afterwards the Emperor Napoleon) acted as arbitrator. The most formal experiment in arbitration, however, was the Geneva Convention' in 1872. The United States having for many years urged upon England the settlement of what were called the "Alabama" claims, a treaty was con- cluded by which the case was referred to five arbitrators named by England, the States, the Swiss Republic, the king of

Italy, and the emperor of Brazil, respectively. Three new rules were at the same time drawn up for the arbitrators to follow in deciding on the liability of England. The award was in favour of America, and the English representative (Lord Chief-Justice Cockburn) was the only dissentient.

Arbitration, is frequently employed to settle differences not of a legal character, e.g., disputes between masters and workmen as to the rate of wages, hours of labour, é&c.

ARBOGA, an ancient town in Sweden, in the govern- ment of Westeris, 30 miles §.W. of Westeris, on a river of the same name as itself, near its junction with the canal which joins the Malar and Hielmar Lakes. It was formerly a place of great trade, and contained five churches, three monasteries, and four chapels; but, though there is still some traffic in woollen, iron, and wooden wares, its pros- perity has greatly decreased. It is well known as the seat of several important assemblies; particularly the parliaments of 1434, 1440, and 1471; and that of 1561, when the cstates accepted the "Arboga articles," by which Eric XIV. restrained the power of his brothers. The town gives its name to the coinage of 1625 and 1627, which consisted of klippingar, or square copper pieces, and In the neighbourhood there are mineral springs. Population, 3269.

ARBOIS, a town in France, lat. 46° 54' N., long. 5° 47' E., in the department of Jura, and arrondissement of Poligny, situated in a deep vallcy, on the Cuisance, 940 feet above the level of the sea. It has long been famous for its wines, which as early as 1493 were exempted from taxation in Burgundy and the German empire by Maxi- milian I. The rest of its trade consists in brandy, oil, fruits and flowers, grain, cattle, saltpetre, leather, cheese, earthenwarc, and paper. It was the seat of a commandery of the knights of Malta, had two monasteries and three nunneries, and still possesses a college and the ruins of a castle. The church of St Just is famous for its magnificent carvings in wood. Population, from 6000 to 7000.

ARBOR VIT AS (Zee of Lise), is a name applied to species of Thuja and Biota. The name was given by Clusius, and its origin is uncertain. The plants belong to the Coniferous order, and have been placed in the tribe Abietinex: and the sub-tribe Cupressinez (Cypresses), in which the anthers

are 3 to 5, rarely 2; scales of the cones 4 or more, usually placed opposite to each other in a decussate manner, persistent (not falling off), seeds having usually 2 to 3 wings; cotyledons 2. Thuja or Thuya occidentalis (Li.), is the Western or American Arbor Vite. The name Thuja seems to be derived from the Greek word Ovos, signifying sacrifice, probably because the resin procured from the plant was used as incense. The plant is the Cupressus Arbor Vitce of old authors, It is a native of North America, and ranges from Canada to the mountains of Virginia and Carolina. It is a moderate sized tree, and was introduced into Britain in 1596. In its native country it attains a height of about 50 feet. The leaves are small and imbricate, and are borne on flattened branches, which are apt to be mistaken for the Ilcaves. When bruised the leaves give out an aromatic odour. The

resin obtained from the plant has been used as a remedy II. — 40

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+n rheumatic affections. The flowers appear early in spring, | ‘ | «tree of life.” This is the Eastern or Chinese Arbor Vite.

and the fruit is ripened about the end of September. In Britain the plant is a hardy evergreen, and can only be looked upon as a large shrub or low tree. It does not furnish timber of good size. It is often cut so as to form hedges in gardens. The wood has been used for posts. Another species of Arbor Vite is the Thya orientalis (Linn.), Biota ortentalis (Endlicher). The latter generic name is derived from the Greek adjective Birds, formed

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from ios, life, probably in connection with the name It is a native of Japan and China. It was introduced ‘to Frauce in the reign of Francis I. It has roundish cones, with numerous scales and wingless seeds. The leaves, which have a pungent aromatic odour, are said to yield a yellow dye. There are numerous varieties of this plant in cultiva- tion, one of the most remarkable of which is the Cupressus pendula of Thunberg. (3; Me B:)

ARBORICULTUGSs

RBORICULTURE comprises all that relates to the A culture of trees, and is one of the great divisions of agriculture ; it is a branch of rural economy of much more recent date than either the culture of grain and herbage plants, or the breeding and rearing of cattle. The culture of those plants which supply the food of man or nourish the domestic animals must have exclusively occupied his attention for many ages; whilst the timber employed in houses, ships, and machines, or for fuel, was found in the native woods. Hence, though the culture of fruit-trees, and occasionally of ornamental trees and shrubs, was prac- tised by the Egyptians, Grecks, and Romans, the cultivation of timber-trees on a large scale only took place in modern times. In the days of Charlemagne, the greater part of France aud Germany was covered with immense forests ; and one of the benefits conferred on France by that prince was the rooting up of portions of these forests throughout the country, and substituting orchards or vineyards. Artificial plantations appear to have been formed in Germany sooner than in any other country, apparently as early as the 15thcentury. In Britain planting was begun, though sparingly, a century later. After the extensive transfers of property on the seizure of the church lands by Henry VIIL, much timber was sold by the new owners, and the quantity thus thrown into the market so lowered its price, as Hollingshed' informs us, that the builders of cottages, who had formerly employed willow and other cheap and common woods, now built them of the best oak. The demand for timber constantly increased, and the need of an extended surface of arable land arising at the same time, the natural forests became greatly circumscribed, till at last timber began to be imported, and the proprietors of land to think, first of protecting their native woods, after- wards of enclosing waste ground, and allowing it to become covered with self-sown seedlings, and ultimately of sowing acorns and mast in such enclosures, or of filling them with young plants collected in the woods,—a practice which exists in Sussex and other parts of England even now. Planting, however, was not general in England till the beginning of the 17th century, when the introduction of trees was facilitated by the interchange of plants by means of Botanic Gardens, which, in that century, were first established in different countries. Evelyn's Sylva, the first edition of which appeared in 1664, rendered an ex- tremely important service to Arboriculture ; and there is no doubt that the

ornamental plantations, in which England surpasses all other countries, are in some measure the result of his enthusiasm. In consequence of a scarcity of timber for naval purposes, and the increased expense during the war of obtaining supplies from other countries, planting received a great stimulus in Britain in the early part of this century. Since the peace of 1815 the rage for planting with a view to profit has subsided; but there is a growing taste for the introduction of trees and shrubs from foreign countries, and for their cultivation for ornament and use. The profusion of trees and shrubs planted around suburban villas and country mansions, as well as in town squares

and public parks, shows how much arboriculture is an object of pleasure to the people. The progress of the Arboricultural Society of Scotland, founded in 1854, and now containing 600 members, is a further indication of the national taste. Again, it may be remarked, that while isolated trees and old hedgerows are disappearing before steam cultivation, the advantages of shelter from well- arranged plantations are more fully appreciated ; and more atteution is paid to the principles of forest conservancy both at home and abroad. In all thickly peopled countries the forests have long ceased to supply the necessities of the inhabitants by natural reproduction; and it has become needful to form plantations either by Government or by private enterprise, for the growth of timber, and in some cases for climatic amelioration. In British dependencies the Government of India have acted with greatest vigour, having formed a State Forest Department, one object of which is the culture of the most valuable timber trees, as the teak in Malabar, Central Provinces, and Burmah, the Deodar in the Himalayan valleys, and Babool (Acacta arabica), &c., which covers large tracts both in South and North India, for the supply of railway fuel. The successful growth of Australian acacias and gum trees on the Nilgiri hills, mahogany in Bengal, and the spread of the cinchona cultivation on various mountain ranges, testify to the energy and skill with which the culture of exotic trees is carried on in British India. Before giving a sketch of the present practice of arboriculture, it is necessary to premise that this article is confined to well-known and hardy British trees, to a few valuable foreign species, and to plantations made with a view to timber produce.

General View of the Trees cultivated in Britain.—Trees differ from one another in regard to magnitude ; slowness or rapidity of growth ;

suitableness for particular soils, and for elevated exposed situations, or low and sheltered places ; texture, colour, and durability of the timber ; delicacy or hardiness ; ease or difficulty of propagation and rearing ; production of showy flowers or fruits; and in other re- spects. In regard to magnitude, those trees which, in Britain, and in the same parallels of north latitude attain the greatest height, are the spruce and silver fir, the larch, and Scotch pine; and these also are the trees which, in most parts of Britain, produce the greatest quantity of timber in their trunks relatively to that contained in their branches, and in the shortest time. Poplars, willows, and some species of elm, are rapid-growing trees ; their timber is rarely contained in one straight trunk, as in the case of pines, a considerable portion being distributed among the branches. Hence, where the speedy production of timber is the main object, pines are the preferable trees for planting. Where landscape effect is more desired than the production of timber, some of the poplars and elms, the Huntingdon willow, in some situations the birch, and in others, such as on the sea-shore, the sycamore and tamarisk, are suitable trees. Where the object is to clothe a sterile surface of dry sand, the birch, Scotch, Austrian, and cluster pines are among the best trees we have; and if the situation be

exposed to the sea-breeze, the common and the Norway |

maple may be substituted; in the warmer parts of the island, the evergreen oak (Quercus Ilex); and for the marshes of the warmer parts, Zaxodium distichum or deciduous cypress. For moist soils which cannot be drained, the white, trembling, and Ontario poplars have the property of sending their roots along the surface of the ground. Some species of willow and some poplars will grow near water in situations where their roots can enter into it, but will not grow in undrained soil. All the known species of trees and shrubs may be successfully grown in almost any kind of soil not beyond average moisture, dryness, or tenacity. In some soils, however, they thrive better than in others, and the timber produced generally varies in quality according to the soil. Thus, a rich soil, while it contributes to the rapid growth of the coniferous tribe, renders their timber less durable ; and the same law holds, more or less, with every other species of tree.

The influence of climate on trees is much greater than that of soil; for, whilst many trees grow on any soil, every tree may be said to have its particular climate ; that is, a climate in which, the soil and other circumstances being suitable, it will produce the largest and most enduring timber. Hence, when we take the geographical range of any species, we find what may be called a central climate, where it attains its largest size ; and as it recedes from this climate, by latitude or elevation, into one either colder or hotter, it gradually diminishes in size, till it at last appears in the form of a shrub. Thus the common oak, which in Britain attains its largest size in Sussex and Hampshire, dwindles into a shrub on the mountains of Scotland and in the north of Africa ; its degeneracy being occasioned in the one case by extreme cold, and in the other by extreme heat. Even within Britain the absolute character of trees, relatively to climate, is obvious. The English or narrow-leaved elm, supposed to be a native of Asia Minor and of China, attains a large size near London, producing a great bulk of timber in a short period, and ripening its seeds; while in Scotland it is considered only an ornamental tree. The Lombardy poplar, which in the central counties of England attains 125 feet in height in fifty years, is seldom seen of timber size in Scot- land. The sweet chestnut and walnut, cultivated both for fruit and timber in many parts of England, can rarely be grown with profit for either purpose north of Newcastle.

Climate may be considered in regard to the average yearly and monthly temperature, and the degree of atmo- spheric moisture. A high annual temperature is no proof that a climate is suitable for trees; but a high summer temperature is suitable for many kinds, though the winter temperature may be very low. Thus the oaks and other trees of North America, attaining there a prodigious size, survive a winter as cold as that of St Petersburg, where no native oaks are found; but North America enjoys a very high temperature during summer, which rapidly develops the foliage, and matures the young shoots, enabling them to withstand the most rigorous winter. The much larger rainfall of that portion of America, as compared with St Petersburg, has doubtless important bearings on the ques- tion. In England the average temperature of the year is as great as that of the oak countries of the United States ; but summers in the former country are comparatively cold, moist, and more cloudy; and though its winters are much milder than those of the latter, the spongy, unripened,

young shoots are always more or less injured by frost. Again, in a mild climate, the trees of those countries which have a severe winter come into leaf earlier in the spring than the indigenous trees, and frosts often occurring at that season, they are liable to injury.

Evergreen trees form an important division of the vegetable kingdom; and of these there are two classes,

distinct relatively to climate and temperature. The first comprises the conifers, which endure a degree of cold as great as that in which any deciduous tree thrives; and the second, the broad-leaved evergreen trees, such as the holly, box, laurustinus, laurel, evergreen oak, cork-tree, and the evergreen magnolia, trees of comparatively mild climates, and always indigenous on islands or on continents at low elevations, and at no great distance from the sea: hence the large number of evergreen trees which grow well in Britain, compared with those which survive the winter in the same latitude on the Continent.

A small proportion only of the trees cultivated in Britain are indigenous. Some are natives of other parts of Europe, and about two-thirds of the whole are from North Amcrica. Of these North American trees there are scarcely any worth cultivating in Britain for their timber, the sumnier not being sufficiently hot and light to bring the timber to maturity. The most useful trees of Britain are those which are indigenous, such as the oak, ash, broad-leaved elm, Scotch pine, &c. ; or those found in the same hemisphere and in the same parallels of latitude, such as the larch, spruce, silver fir, &c. Of all trees cultivated in Europe, the most valued for the strength and durability of its timber is the common oak; and next perhaps to it, the larch. The trunk of the oak, when freed from the soft or outer wood, and thoroughly seasoned by exposure to the air, will last an unknown period of time in buildings and machines. The common European oak is more durable as timber than any of the American oaks, even when grown in America, unless we except the live oak (Quercus virens); and no timber equals it for ship-building, cxcept the teak of India. The most generaily useful timber grown in Britain is the Scotch fir; but as this is imported from the north of Europe, and a substitute for it from North America, it is not planted in

Britain so extensively as it otherwise would be. The timber of the larch is more durable than that of the Scotch fir; but being apt to warp, and not so easily worked, it is less convenient for house-carpentry and joinery. The timber of the common ash is valuable in the construction of agricultural instruments and machines, and it is one of the few woods which are almost as valuable when young as when mature. The wood of the broad-leaved elm is strong and durable, but that of the English and Dutch elms is less so. The wood of the poplar and of the willow, when exposed to constant atmospheric changes, speedily decays ; but when thoroughly seasoned, and kept perfectly dry, it is very durable.

TREES SUITED FOR PARTICULAR PURPOSES.

1. Conifers or resinous trees ; 2. Hard-wood trees: and 3. Soft-wood trees.

1. Conifers.

Coniferous trees are characterised by straight erect trunks, with branches in regular tiers, which do not acquire the size of timber. They never send up shoots from the stool when cut over at the ground. The leaves are generally linear or needle-shaped, without veins, and evergreen. The seeds are produced in cones, and the whole plant is more or less resinous. They belong to the Gymnosperms, a family of the Dicotyledons.

The Larcu (Larix europea, D.C.) produces the most valuable timber, which is of great durability. Young larches, 6 or 8 feet high, are useful for sheep stakes, rustic palings, or dead fences. Young trees from 10 to 15 fect in height are found to form excellent hop-poles.1 The

1 For the durability of the mature timber, both in civil and naval architecture, we may refer to the Transactions of the Highland Society of Scotland, vol. xi. p. 165, and Loudon's Arboretum Britannicum, vol. iv. p. 2887.

bark of the larch is of considerable value in tanning ; and as the leaves are deciduous, grass grows better under its shade than under any other species

of pine. The larch is readily increased by seeds, which ripen abundantly in Britain; it prospers best in cool argillaceous soil, moist rather than dry, and at a considerable elevation above the sea. In certain soils, it is subject to decay of the heart- wood; and of recent years disease has seriously affected many of thie finest plantations in this country, especially those beyond the age of fifty years. The larch is indigenous in the alpine region of Central Europe, and is a striking cxample of the successful introduction of an exotic, having been completely naturalised in Scotland for more than a century. Other species of Zavix, natives of Siberia and North America, are inferior as forest trees.

The Scorcu Pine (Pinus sylvestris, L.) is, next to the larch, the most valuable coniferous tree grown in Britain. It furnishes the yellow deal of the Baltic and Norway, which is unequalled by any other pine in Europe or North America. The best grown in Britain is produced in the native Highland forests ; but there is reason to believe that artificial plantations, in similar soils and situations, would produce timber of nearly equal value. This tree is readily increased from seeds, which, unfortunately, are produced in the greatest abundance on stunted or inferior trees. It is very desirable to select secds from the best varieties, as is now systematically done by nurserymen. The Highland variety with horizontal branchesis that of highestrepute. The Scotch fir is a native of Europe and Asia, but not of America.

The Cruster Pine (Pinus Pinaster, Sol.) is not adapted for general culture in Britain, and therefore scarcely merits to be ranked among British timber-trees. In some parts of the east coast of England, however, plantations of this tree have been raised ; and in deep sandy soil it produces a considerable bulk of timber in a short time, thriving better when exposed to the sca-breeze than any other pine. The wood is not so durable as that of the Scotch pine; but it may be employed in the joinery of ordinary apart-ments. In general, however, it is not sufficiently strong for the roofing, joists, and other carpentry of dwelling- houses. In France, and particularly in the neighbourhood of Bordeaux, it is extensively grown on the sandy wastes, for the production of resin, tar, and pitch, which are obtained by incisions made in the trunk, and by subjecting the wood to the action of fire. The seeds are ripened in England. The young plants require more care in trans- planting than those of most other pines, being furnished with a

stronger tap-root. The cluster pine is a native of the south of Europe aud Algeria.

The Spruce Fir (Abies excelsa, D.C.) is, as a British timber-tree, next in value to the Scotch pine. The young plants and the spray are durable; and the trunk grows straighter, more erect and slender, than the larch. The trunk is seldom sawn into boards; the great value of the tree being for poles of every kind, from those fit for the hop up to masts for smaller ships. It is often used with the bark on, for poles or fence-wood. In most parts of Europe, the poles used in the scaffolding employed in erecting buildings are formed of this tree, the wood being light and elastic. The spruce fir ripens seeds abundantly in Britain, from which plants are as easily raised as the Scotch pine and the lavch. It prefers a rather moist soil, and only attains a great height in sheltered situations ; but it grows anywhere to a size fit for hop-poles or fencing in a short time. Like the Scotch pine, it is subject to few diseases. The spruce is a native of Germany, Sweden, Russia, and Norway, but nut of Britain or of North America.

The Siiver Fir (Abies pectinata, D.C.) the largest of the European conifers, in various soils and situations produces a great bulk of timber in a comparatively short period ;

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the timber is considered less strong and durable than that of the spruce fir or the Scotch pine, but it does not warp, and is adapted for all kinds of carpentry. The timber is white, and when not exposed makes excellent flooring. The tree is of slow growth for the first ten or twelve years ; nevertheless, even in the north of Scotland it attains the height of 100 feet in sixty or seventy years. It ripcus seeds in Britain, but more sparingly than the spruce fir, and plants are easily raised. It is in general healthy, but its cultivation is more difficult than that of the spruce, as the shoots of young trees are liable to be killed by frost. This species is also very subject to the attacks of an insect, Eriosoma, which often causes the death of the tree. The silver fir is a native of Central Germany, and of the mountains of Italy and Spain. Nearly allied is the Abves balsamea, balm of Gilead fir, a native of North America, which produces the Canada balsam, but it cannot be recommended for cultivation, as it is short lived.

Many conifers might be mentioned which, though not pro- ducing timber in Britain, are worthy of cultivation. Of the American pines we have the Pinus Strobus, L., Weymouth pine, which furnishes the white wood of Ameri- can commerce. Several Californian pines have been introduced; of these Abies Douglasii is the most promising. Cupressus Lawsoniana is a beautiful tree, and also Seguova gigantea, the mammoth tree, a general favourite in pleasure grounds, but a considerable period must elapse before we can judge of their being adapted for general culture as timber trees in this country. Of Asiatic conifers, Cedrus Deodara and Libani are much grown for ornament. Pinus exceisa, which resembles the Weymouth pine, and Abves Smithiana and Webbiana grow fairly in many parts of Britain; the Smithian pine being apparently the best adapted to the climate.

The Yew Tree (Taxus baccata, L.) attains its full per- fection in this its native country; but on account of its slow growth it cannot be recommended to the planter, whose main object is profit.

Broad-leaved Trees (bois feuillus) in contradistinction to needle-leaved, are classed, according to their timber, in two subdivisions, hard and soft wood trees. They are character- ised by large trunks and widely spreading woody branches, and broad leaves with branching veins; they send up shoots from the stool when cut over by the ground ; and they are deciduous. They belong to the Dicotyledons.

2. Hard-wood Trees.

The hard-wood Timber-trees of Great Britain are charac- tcrised by the comparative hardness and durability of their wood, and comprise the oak, ash, elm, beech, sweet chestnut, walnut, and Robinia or false acacia. The British oak includes two sub-species, the stalked fruited or most com- mon oak, Quercus pedunculata, and the stalkless fruited or less common oak, Quercus sessiliflora. The latter grows more erect and more rapidly than the other, particularly if the soil be good. In England and the lowlands of Scotland, Q. pedunculata is the commoner of the two oaks; but in North Walcs and the hill parts of northern England, Q. sessiliflora is more frequent. Intermediate forms betwecn these two oaks are found in England and elsewhere, and the leading botanists of the day unite them under the old name of Q. Robur. The wood of the oak is the strongest and most durable of

all British timber-trees ; but on account of the slowness of its growth it is not always the most eligible for planting. Oak plantations are more valuable than others when in a young state, on account of their bark. From the demand for oak as ship-timber, the price of trees fit for that purpose is always considerable; but the largest trunks employed in naval architecture do not

afford an adequate return for the number of years they have stood on the ground. Accordingly, we find that the Governments both of France and England grow this descrip- tion of timber largely in national forests. The wood of the oak is applicable to a greater number of uses than that of most other trees. Houses, ships, furniture, and machines may be formed almost entirely of oak, and consequently there is a ready sale for this timber almost everywhere. Hence there is more inducement to plant it in Britain than any other hard-wood tree. It is easily raised from acorns, which ought to be collected from the most vigorous trees. The British oak is a native of most parts of Europe, but uot of Asia, Africa, or America.

The Asu (fraxinus excelsior, L.) is in Britain next in value to the oak as a timber-tree. It requires a good deep loam with gravelly subsoil, and a situation naturally sheltered, such as the steep banks of glens, rivers, or lakes; in cold and wet clay it does not succeed. As the value of the timber depends chiefly on its toughness and elasticity, it is best grown in masses where the soil is good ; the trunk is thus drawn up frce from large side-branches. The tree is a native of Central Europe, and is easily propagatedfrom seeds. It throws up strong root shoots, The ash requires much light, but grows rapidly, and its terminal shoots pierce easily through thickets of beech, with which it is often associated. Unmixed ash plantations are seldom satisfac- tory, because the foliage does not sufficiently cover the ground; but when mixed with beech it grows well, and attains great height and girth. Coppice shoots yield excellent hop-poles, crates, hoops, whip-handles, &c. The timber is much used for agricultural implements, and by coach-builders and wheclwrights. The supply of this valuable timber is annually becoming more limited on account of the decreasing use of hedgerow trees,

Of the Ei there are two species, the common or narrow- leaved elm (Ulmus campestris, L.), and the Wych or broad- leaved elm (Ulinus montana, L.) There are many varieties, such as the Dutch elm and the smooth-leaved or Huntingdon elm, the latter much valued for its timber. The narrow- leaved elm is not very common in Scotland, but in the ecntral districts of England it becomes a handsome tree ; and the timber is used for important purposes in ship- building, as well as in the construction of machines and agricultural buildings. The Wych elm is a hardy tree, of rapid growth; but, unless planted in masses, it seldom produces a straight handsome trunk. It strikes from layers with great facility, and when a branch touches the ground it is sure to take root. Few trees are more difficult to uproot than Ulmus montana, and it is rare to see it thrown over by the wind. It has a wide-spreading head, often sloping to one side, and lashing its neighbours with such force that it is sometimes interdicted in mixed plantations. Its timber is more durable than that of the English elm, or of any of the hybrids. It is much used in agricultural carpentry, in rural machinery, and in household furniture. The Wych elm produces abundance of seeds, which, if sown as soon as they are gathered, often come up the same year ; but the English elm and the hybrids produce seeds spar- ingly, and are usually propagated by layers or by grafting on the Wych elm. One remarkable difference between the English and Wych elms may be noticed, viz., that the latter never throws up suckers from its roots; and it is therefore peculiarly valuable as a stock for the English elm, and for those varieties which do throw up suckers. There are other Species and varieties of European elms, and several kinds of American elms, but none are deserving of culture in Britain as timber-trees. The elm is subject to the ravages of several insects, especially Scolytus destructor.

The Bezcu (Fagus sylvatica, L.) is one of the largest British trees, particularly on chalky or sandy soils. It is a

handsome tree in every stage of its growth, but is more injuri- ous to plants under its drip than other trees, so that shade- bearing trees, as holly, yew, and thuja, suffer. Its leaves, however, enrich the soil. In England and Aimerica the beech has a remarkable power of holding the ground where

the soil is congenial, and the deep shade prevents the growth of other trees. It is often and most uscfully mixed with oak and Scotch fir. The timber is not remark- able either for strength or durability. It was formerly much used in mill-work and turnery ; but its principal use at present is in the manufacture of chairs, bedsteads, and a variety of minor articles. It is a native of the south of England, and of various parts of the continent of Europe. There are some varieties, particularly the purple and weep- ing beech; and there are one or two species natives of North America, but none of then deserve notice as timber- trees. It is propagated by its mast, which is produced plentifully in fine seasons,

The HornBEAM (Carpinus Betulus, L.) is an indigenous, moderate-sized, slow-growing tree, bearing a general resem- blance to the beech, though of less value. It coppices well, and along with beech is valued for making hedges, as these trees retain their leaves a great part of the winter. The hornbeam is propagated by its nuts, which are produced in abundance. 'The wood is used for tool-handles, cog- wheels, and screws. Selby (British Forest Trees) recom mends the use of the hornbeam as a nurse-tree.

TheSweet CuEstnut(Castaneavulgaris, Lam.)is alarge, long-lived, deciduous tree, of rapid growth while young, and attaining a vast size in South Europe (e.g., the renowned chestnut of Mount Etna), It was early introduced to Eng- land, and is one of its most ornamental trees. The timber bears a striking resemblance to that of the oak, which has been mistaken for chestnut; but it may be distinguisbed by the numerous fine medullary rays. Unlike oak, the wood is more valuable while young than old. When not more than fifty years old it forms durable posts for fences and gates; but at that age it often begins to deterioratc, having ring-shakes and central hollows. Ina young state, when the stems are not above 2 inches in diameter at the ground, the chestnut is found to make durable hoops for casks and props for vines; and of a larger size it makes good hop-poles. It is a native of Asia, North Africa, and North America. In Spain and Italy it is grown for its fruit, in Britain, for ornament. In the south of England in warm seasons it ripens its fruit, from which plants are easily raised. None of the other Continental or American species are cultivated in Britain for their timber.

The Common Sycamore or false plane (Acer Pseudo- Platanus, L.), the plane-tree of Scotland, isa large tree naturalised in Britain, though seldom attaining the height of those already mentioned. It withstands the sea and mountain breezes better than most other timber trees, and is often planted near farm-houses and cottages in exposed localities for the sake of its dense foliage. Its wood is valued in turnery, for cups, bowls, and pattern blocks. It produces abundance of seeds, aud is easily raised, but it requires good and tolerably dry soil; it will not thrive on stiff clays nor on dry sands or chalks. The Norway maple (A. platanoides, L.) is a hardy tree, used as a brcakwind in exposed situations on the east coast ; but neither it nor the other species from Europe or America seems to deserve cultivation for the sake of its timber. The sugar maple (A. saccharinum, I.) forms extensive forests in North America, It has been introduced into Britain for a cen- tury, but is rather tender, and requires a dry sheltered situation. It is propagated by imported seeds, and it is doubtful if it can be profitably cultivated in this country.

The Common Bircu (Betula alba, L.) is a tree of the second rank, worthy of culture in inferior soils and situa-

tions, especially as coppice-wood. The spray, in some parts of the country, is sold to the besom-maker, and gives afair return. 'The tree seeds freely, and is easy of manage- ment. It is often planted in poor soil as a nurse for oak and sweet chestnut. It yields excellent fuel. The wood ig used for carving, furniture, and agricultural implements, and in the Highlands of Scotland and Sweden for building material. The bark, covered with a layer of carth, is used in roofing, and baskets and boxes are made of it. The weeping birch forms onc of the most beautiful features in Highland scenery. None of the American or Himalayan birches have yet been planted with a view to profit as timber-trees, though cultivated for many years.

The Common WaLnut (Juglans regia, L.), is mentioned in the earliest British botanical writings, and is supposed to have been introduced by the Romans. It grows well, and ripens its fruit in the southern and midland counties of England; but large trees may be scen as far north as Ross-shire in sheltered places. The fruit is in some years plentiful, but ripens only in

the hottest summers. The timber is excellent, and held the first place for the manu- facture of furniture till the introduction of mahogany, and on this account the tree merits more attention. It is raised from the nuts, like horse chestnuts; the seedlings should be protected from frost during the first winter. The rate of growth is not rapid, and a deep soil is essential to success, If cultivated for the fruit, the seedlings should be transplanted once or twice.

The Rosrnia or false acacia (Robinia Pseud-Acacia, L.) is a tree of unquestionable beauty, and much has been written of the value of its timber. It was introduced from North America in the 17th century, and has been extensively cultivated as an ornamental tree. In 1825 Cobbett strongly recommended the planting of it for its timber. It has been used largely in England for hop-poles, and in France for vine-props. In America it is much used for trenails or wooden pins for bolting ship timbers. It is now planted sparingly, the English summer not being sufficiently long and warm to ripen theshoots. The tree is readily produced from imported seeds, and occasionally from suckers, which are abundant. It should be planted in sheltered situations in dry friable loam. It grows rapidly the first few years, but the trunk in Britain rarely exceeds 1 foot in diameter.

Amongst hard-wooded trees of the third rank, the timber of which is useful, are Cerasus sylvestris, the wild cherry or gean; Orategus Oxyacantha, white thorn ; Pyrus aucu- paria, mountain ash or rowan; P. Aria, white beam tree; P. Malus, crab-tree; P. communis, wild pear; Ile Aqua- folium, holly; and Cytisus Laburnum, laburnum. A plantation formed solely of any of these trees is not to be recommended, but when they are self-sown or introduced by way of variety or ornament, it is well to know that their timber is of some value; the laburnum, yew, and holly are the most valuable of the trees of the third rank.

3. Soft-wood Trees.

The soft-wood trees are remarkable for the rapidity of their growth, the lightness and whiteness of the wood, and often for their early decay. Among those worthy of culti- vation in Britain for timber, are the poplar, willow, alder, lime, and horse chestnut ; the two first being those that are generally recommended with a view to profit.

Of the PorLar (Populus, L.) there are numerous species, aud several deserve culture for their timber in situations where the soil is good and deep, and where the roots can reach running water; but they do not thrive in stagnant marshes. The following are the best adapted to our climate :—P. alba, abele or white poplar, is widely distri- buted over Europe, and is extensively cultivated in Britain. P. canescens, the grey poplar, is classed by Hooker as a

sub-species. These trees attain a large size, giving long clean, straight timber, which induces planters to grow it, especially near factories, where the wood is used for flooring, machinery, d&c., as it does not easily ignite. The timber is soft, white, and light. The root throws up strong suckers, which always replace trees cut down. LP. tremula, the aspen, produces a white wood, which is much sought after for the manufacture of paper, and on that account it is rising in value. P. nigra, the black or Lombardy poplar, is much planted on the Continent in hedgerows, and also in Kashmir—where the pyramidal variety is common, The wood, which is white, soft, and light, is used for sabots, but is not good for fuel. The bark is used by the tanner. The black Italian poplar (P. monilifera) is always propagated by cuttings of the young wood. It pol- lards well, and is a rapid grower. Poplars should not have large branches pruned off, and they do not coppice well, because moisture enters cracks in their wood.

The Wittow (Salix, L.) is an extensive genus, found in Europe, Asia, and North America, including all the shrubby osier species used for basket-work, as well as a few trees. The arborescent willows are most useful trees, and well merit the attention of planters. They are invaluable for fixing the banks of rivers and canals, and are successfully used for that purpose. As coppice woods with short rotation, they are grown in osier beds, and cut annually for basket- work, or when three or four years old, for hoops, &c., and in this way they yield a good return. The laying down and treatment of osier beds may be seen in great perfection on the banks of the Thames. The wood is used for carving and other purposes. In North America, fishing nets aud lines are made of the inner bark. All the species are easily propagated by cuttings, and require to be grown in damp soil, There are three species

attaining the size of trees— S. alba, the white or Huntingdon willow, reaches a larger size in twenty or thirty years than any other British tree except . Populus alba, and often yields 1 foot of solid timber for every year of growth. JS. caprea, the goat willow or sallow, occurs generally as a large shrub, but attains 40 or 50 feet in height. It forms a good protection in maritime situations, but often by its exuberant growth injures more valuable trees. The third tree is S. fragilis, the crack willow, and its sub-spccies S. Russelliana, the Bedford willow. Another tree willow, S. babylonica, or weeping willow, a native of Russia and China, is very ornainental on islands and river banks. The larve of several nocturnal Lepidoptera feed upon the leaves of the willows, and the trunk of the sallow is often injured by the perforations of the Trochilium crabroniforme (Lunar Hornet Sphinx).

The ALDER (Alnus glutinosa, D.C.) is an indigenous tree met with commonly on the banks of streams, but of smaller size than the poplars and tree willows; it often, however, attains to 40 or 50 feet. It is readily propagated by seeds, but throws up root suckers abundantly. The alder is important as coppice-wood on marshy ground. The wood is soft, white when first cut, and turning to pale red; the knots are beautifully mottled. Tt is adapted for piles in embankments and bridges ; and charcoal of alderwood is valued in the manufacture of gunpowder.

The Lime Trex (Tilia europea, L.), is a beautiful leafy tree with wing-like bracts, much prized for ornament, and suitable for avenues. It is much planted along streets and promenades, affording a pleasant shade during summer; the blossoms are fragrant, and yield most delicate honey. The lime is generally propagated by layers. Its wood, which is very light and soft, is used by saddlers, shoemakers, glovers, and toy-makers; and for carving and modelling purposes, it is superior to all other British trees. Several American lime trees have been introduced, and appear well deserving of a place in our arboricultural collections.

ARBORICULTURE

The Common Horse Cuustnut (Msculus HLippocastanum, L.), cultivated in Europe since the 16th century, is an ornamental tree of quick growth in good soil. Its hand- some blossom surpasses that of all other British trees, and its massive foliage is effective, but the timber is of an inferior quality,

only used for boarding and packing-cases, linings of carts, and wheel-barrows. It is rarely planted in mixed plantations where profit is an object ; it interferes with its neighbours, and occupies too much room. It is generally introduced near mansion-houses for ornament and shade, and the celebrated avenues at Richmond and Bushy Park are at the time of flowering objects of great beauty. From the crop of nuts which ripen in October seedlings are easily raised, and should be placed in rich loam, and transplanted before being finally planted out.

RoapsipE TREES AND HEDGES.

Little attention is paid to the planting of trees along road- sides, and in such situations healthy or well-shaped ones are seldom seen. A pit should be made of sufficient size (2 to 3 feet square), and filled with good soil mixed with rot- ten duug. The plants require to be fenced, and for the first summer occasionally watered, and the earth dug and kept clear of weeds. In forming avenues on boulevards, the trees should be planted 30 feet apart, and if space allows of it, there should be a double row to form a shady arch for pedestrians. The oversight of these is sometimes given to the surfaceman, or to a man appointed for the purpose, aud it should be his duty to maintain the avenues complete. Trees, especially in or near large towns, are sub- ject to injuries which disfigure their appearance or retard their growth, and not unfrequently destroy the plants. To prevent this it is customary to surround the stem with a cradle, or matting, or thorny branches.

Hedge-plants are of great importance both for shelter and protection of plantations. By far the best for outside hedges are the common hawthorn and the wild crab. The sloe or black thorn makes an excellent hedge; but it throws up many suckers, and requires constant attention to keep it within bounds. It forms, however, an excellent barrier for picturesque plantations, where it is allowed to spread itself in every direction. Holly and yew hedges are suitable for inner enclosures. The holly forms an excellent hedge, both for gardens and fields, as its leaves are rarely injured by insects; and, being an evergreen, it harbours neither weeds nor vermin at its roots. Birds are also much less apt to build in it than in deciduous hedges. It has two disadvantages, viz., the slowness of its growth, and imperviousness to wind in the winter season. Were holly hedges occasionally introduced among

those of the common thorn, they would add greatly to the beauty of the country in winter. The comnion furze sown on the top of a bank forms an effective hedge in a short period, but it is not durable. In moist soils, willows or poplars, and in situations exposed to the sea-breeze the elder, may be planted; but such hedges can be hardly considered as fences from want of compactness and density of foliage. The land for hedges should be carefully prepared and freed from weeds before planting, and the expense of doing this will be well repaid by the growth of the hedge afterwards. The ground should be cleared of weeds two or three times a year until the plants have reached some height. Hedge plants should not be pruned till after three years, or they will become stunted ; after that pruning should take place once a year. A hedge one-third beech and two-thirds haw- thorn is excellent for high and cold situations.

CopPlice.

Coppice or Copse consists of self-sown or planted trees periodically cut before they attain the size of timber.

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This system of wood cropping was more extensively adopted thirty years ago than it is now, as the value of oak bark is much reduced owing to the introduction of foreign bark and other substances for tanning. One requisite for copse woods is that they should spring up freely from the cut root. Most of the broad-leaved trees and shrubs may be cultivated as coppice wood ; in soft, wet soils, birch, alder, and various willows are amongst the most useful trees, and in drier soils the oak, chestnut, and ash are valuable for this mode of cultivation.

ORNAMENTAL TREES AND SHRUBS.

As already observed, we exclude from consideration in this article flowering and fruit-bearing trees and shrubs. We also exclude all those that require special protection, and confine ourselves to trees and shrubs considered orna- mental from their general form, aud suited for

introduction into plantations in most parts of Britain. 'These are arranged under the heads of evergreen and deciduous.

Evergreen Ornamental Trees and Skrubs.—The climate of Britain enables us to cultivate many evergreens ; new species are imported, and varieties are produced by accident or experiment, so that the number is always increasing. All the pine tribe may be described as highly ornamental, and many of them endure the open air in the coldest parts of Britain. 'The Deodar (Cedrus Deodara) naturally grows in compact forests, clearing itself of side branches like the larch ; in this country single specimens have been exten- sively planted of late years for ornament. Large quantities of seeds are annually imported from the Himalaya, and it is also raised from cuttings. The Lebanon and Atlas cedars (Cedrus Zibani and atlantica) are closely allied to the Deodar ; and it is proved by Hooker that they cannot be separated by constant specific characters. The Atlas cedar is distinguished by a stiff erect leader, and the foliage is generally dark, that of the Deodar being light or bluish green. Cryptomeria japonica, the Japan cedar, is a beauti- ful evergreen tree, attaining 100 feet in height, with a pyramidal head; it yields cones abundantly. Sequoia gigantea, the Wellingtonia or mammoth tree, remarkable as the loftiest tree known, attains 300 to 330 feet in height, and 80 to 100 feet in girth, and is a handsome and sym- metrical tree. S. sempervirens, the redwood of California, is another giant tree, though of smaller size. Both species are hardy in England, and are easily raised from cuttings.} The Weymouth pine (Pius Strobus) is a hardy ornamental tree, introduced in 1705, suited for cold situations; and still more so is the Pinus Cembra, which is of slow and erect growth and long retains the beauty of youth. Pinus excelsa is a hardy and ornamental species, from the Hima- laya ; but when exposed to wind it does not thrive. It is inclined to seed rather too early and freely in this country. Some of the Californian and British Columbian pines are hardy and ornamental, particularly P. ponderosa, the heavy wooded pine; but it is easily blown over by the wind. Other species are P. Sabiniana, inops, and Murrayana. The Douglas fir (Abies Douglasti, Lindl.) is a handsome tree, as hardy as the common spruce, differing in the dark green colour, and apparently intermediate between the common spruce and the silver fir. It was introduced in 1827, and is of very rapid growthin England and Scotland. At Dropmore there is a tree which, at the age of 44 ycars, was 100 ft. high,

with 9 ft. 7 in. girth at 3 feet above the ground. Mauy specimens in Perthshire raised from layers and cuttings since 1846, are 50 to 70 fect high. The

- An interesting paper "On the Wellingtonia gigantea," containing a table of the growth of this tree on various soils in different paris of Britain, by Mr Hutchison, is published in the Trans. High. Soc. of Scot. 1873.

black and white spruces (Adies nigra and alba) of North America are well-known ornaments in our pleasure grounds ; and there are some Californian species, such as Abves Menziesti, nobilis, and others, which are hardy, and pro- mise to be valuable additions to our ornamental trees. The Hemlock spruce of Canada (Abies canadensis) is hardy throughout North Europe. The Cephalonian fir (Adves cephalonica, Loudon), closely allied to and probably only a variety of the silver fir, is a handsome tree, readily pro-pagated by cuttings and from cones imported from the Mediterranean. A. Nordmanniana, Link, a stately tree with dark, compact foliage, and ovoid cones, of late years much cultivated in England, forming forests in the Crimea and the Caucasus, is regarded as a variety of the silver fir by Parlatore and Grisebach. A. Pinsapo, Boissier, is a beautiful tree with rigid whorled branches, introduced from Malaga and Algeria; it is much cultivated in England, and thrives well. Abies Smithiana, the Himalayan spruce, closely resembles the common spruce, and is hardy in England and Scotland, where it grows with great vigour ; it is readily propagated by cuttings, and by grafting, and British trees already produce cones. Abies Webbiana, Tindl, the Himalayan silver fir, suffers in spring in North Europe, because it starts into growth too early: it is grown in Ireland and the south-west of England. The Chili pine (Araucaria imbricata), a noble tree in its native country, and a conspicuous object in a park from the pecu- liarity of its whorls of rigid branches, is hardy in many situations in Scotland as far north as Dunrobin. C'upres- sus Lawsoniana, introduced in 1854 from California, is hardy, and rapidly becomes a handsome tree, ripening its cones. The common cypress (Cupressus sempervirens, L.) grows vigorously in the central districts of England, but scarcely thrives in the northern counties. Cupressus glauca or lusitanica, L., is a beautiful evergreen, with

glaucous foliage, but tender; nevertheless, in Ireland it attains a great size. The Ginkgo or maidenhair tree (Salsburia adiantifolia, Sm.) is remarkable for the singularity of its foliage; it isa native of China, but is hardy in many parts of England, Biota orientalis, Endl. (syn. Thuja orientalis, Linn., the Arbor vite), isa small evergreen tree, indigenous in Japan and China, much cultivated in Europe, with foliage similar to that of the Cypress. The red cedar (Juniperus virginiana, L.), the Phcenician, and other species of juniper, are hardy and ornamental. The holly, boxwood, evergreen oak, and Portugal laurel are universally known and admired, and their glossy foliage makes them specially beautiful in winter.

Deciduous Ornamental Trees.—We can name only a few of the most prominent deciduous trees planted solely for ornament. Jfagnolia grandiflora is grown chiefly on walls, as it suffers from wind. Its flowers and foliage are very beautiful. The tulip tree (Liriodendron tulipifera, L.) forms a tree of the first rank in the climate of London, and attains a large size in the milder parts of Scotland ; for the beauty of its foliage and flowers, it deserves a place in every collection. Pavia indica, the Himalayan horse chestnut, is smaller than the common horse chestnut, but extremely beautiful from its large panicles of variegated blossoms. There is a fine specimen in the Edinburgh Botanic Garden. Kelreuteria paniculata, a native of China, is a hardy tree, very ornameutal from its foliage as well as its flowers. There are fine specimens both in Eng- land and Ireland, yet the tree is not generally met with in pleasure-grounds. The ailanto (Adlanthus glandulosa), a Chinese plant, is hardy in England. It forms a stately tree with a straight trunk and magnificent foliage, the leaves being sometimes 3 feet in length. In some parts of France it is planted as a timber-tree, and thrives well on chalky soils. The bladder-nut tree (Staphylea, L.) may be

trained to be a handsome low tree, ornamental from its –

foliage, white flowers, and curious bladder-like capsules. There are two specics—S. trifolia and S. pinnata. The com- mon spindle tree (Huonymus europeus) and the broad-leaved spindle tree (#. latzfolius), wheu trained up to single trees on a deep loamy soil, with ample space, form in autumn, when their capsules are ripe, remarkable and striking objects. The winter-

berry (Prinos glaber) is a deciduous shrub, a native of North America, which, like the holly, produces fine scarlet berries, and retains them through the winter. There are several species, all hardy, and worthy of a place in our collections. Sophora japonica forms a splendid tree in the climate of London, and a pendulous- branched variety is very ornamental, In dry and warm seasons, when the leaves of most other trces become of a paler green than usual, those of this tree assume a darker hue. Vérgilia lutea is a North American tree, with fine large foliage, hardy in most parts of Britain; and, in America, valued for the yellow colour of its wood. The laburnum has already been mentioned as a useful and ornamental tree. The genus Crataegus cousists of many species and a vast number of varieties, among which are many beautiful small trees, remarkable for an irregular picturesque outline even at an earlyage. They flower and fruit profusely ; the flowers are generally white and fra- grant, but some varieties are tinged with red and purple ; they appear from March to July, and the Glastonbury thorn blooms at Christmas. Cotoneaster frigida, bacillars, acuminata, microphylla, and nummularia are small trees of great beauty, both on account of their foliage and their fruit. They are from the Himalaya, and hardy in England. They are cultivated in a variety of forms, some of which have been described as distinct species. The wood is hard and elastic. There are many ornamental species and varicties of the genus Pyrus, which now includes species formerly grouped under Sorbus, Mespilus, &c. From the Himalaya we have (P. variolosa), a remarkable tree, with leaves sometimes like tliose of the common pear, and at other times lobed or pinnatifid. P. Aria, the white-beam tree, and all its varieties, deserve culture, as compact small trees, remarkable for their large woolly foliage, which dies off a fine yellow, their white blossoms, and showy red fruit. The service tree (Pyrus Sorbus) and its varietics are very ornamental, Pyrus japonica, L., is well known as one of the most ornamental spring-flowering plants in cultivation. I/amamelis virginica, the Wych hazel, is valuable from its beginning to flower in November, and retaining its blossoms till February or March: though rarely seen in collections, it is hardy, and forms a hand- some smalltree. The snow-drop tree (Z/alesia tetraptera) is one of the hardiest of North American trees, and, when in flower, one of the most beautiful: it ripens abundance of seeds in this country, by which it is readily propagated ; in some parts of England it is, like the American bird-cherry, natu- ralised in the copses. It is rarely met with in Scotland, though few ornamental trees

are so well adapted for the climate. The date-plum (Diospyros Lotus) though it ripens fruit as a standard near London, is tender in the northern counties, The Virginian snow-flower or fringe tree (Chion- anthus virginica) is nearly as hardy as the snow-drop tree ; and when plauted in a moist soil and trained to a single stem, its head is ornamental from its large deep-green foli- age, independently of the fine, white, fringe-like flowers, which are suspended from the axils of the leaves, The common purple and white lilacs (Syringa vulgaris and S. vulgaris alba) are hardy, and make ueat small trees when trained toa single stem. The weeping-ash (fraxinus excelstor, var. pendula) is well known. It suffers much from cattle or sheep browsing on the pendulous branches, disfiguring the plant, which should always be enclosed.

ZePonilicu L'T.\U RRB

The flowering or manna ash (Fraxinus Ornus), a native of the mountains of South Italy, is a handsome tree, de- serving a place in ornamental plantations. It has a fine effect standing singly on a lawn. The medicinal manna it yields is obtained by making incisions in the stem. Catalpa syringefolia is a splendid tree when in flower: it attains the height of 30 or 40 feet, and sometimes ripens its seeds in the climate of London; but in the northern counties it seldom does much good. It bears a very severe cold in winter, provided there has been heat and sunshine enough in summer to ripen its wood. Of the genus Quercus, 281 species, European, American, and Asiatic, are described in De Candolle's Prodromus, and a great variety are procurable in British nurseries. The best known European species are Q. Suber, the cork oak ; Q. Cerris, the Turkey or mossy cupped oak; Q. yilops, the Vallonea oak ; and Q. lusitanica infectoria, the gall or dyer's oak. The Lucombe and Fulham oaks are believed to be hybrids between Q. Cerris and Suber. @Q. Ilex, the evergreen or holm oak, a native of South Europe, Persia, and the North-West Himalaya, but introduced into Britain in 1581, and commonly planted, attains a large size, and frequently ripens its acorns. The oaks of North America are very numerous and interesting, but they do not ripen their shoots sufficiently to be frost-proof. None of the deciduous Himalayan species have yet been successfully introduced.

PROPAGATION AND CULTURE IN THE N URSERY.

Nursery Culture.—A nursery is a plot of ground devoted to the propagation and rearing of trees; it should as far as possible be exempt from the influence of frost, which pre- vails in low situations, and it ought to contain a variety of soils. As a general principle, all seeds will germinate in any soil provided it contains vegetable matter, and is friable, free of stones, and well drained, with a convenient supply of water. If a nursery therefore contains the three leading soils, sand, loam, and peat, it will suffice for all required purposes. With regard to climate, all deficiencies which occur in Britain may be met by glazed frames for raising the more tender kinds. It is the interest of the nursery- man to have his nursery in a fine climate, and in deep fer- tile soil, that he may raise large vigorous plants in the shortest period ; but it is the interest of the purchaser to have the plants reared in a climate and soil inferior to that into which they are to be transplanted, because, when this is done, instead of the plants receiving a check, as is usually the case, they will be improved by transplanting. The strength of a plant and its suitableness for successful trans- planting consists in all its parts being developed, in the thorough ripening of its wood, and in the dormant state of its fibrous roots. If by any mode of culture these requisites can be obtained, together with the long and thick shoots which are produced by growing the plants in deep rich soil, so much the better ; but in the climate of Britain trees reared in nurseries with inferior and unmanured soil are likely to prove most hardy. Those who plant in moun- tainous districts will always find it better to have their nurseries on the sides of mountains than in the valleys.

Propagation.—Trees are chiefly propagated by seeds, but also by cuttings, layers, budding, and grafting. The timber-trees of all countries are raised from seeds, with a few exceptions, such as the poplar and willow, which are raised from cuttings, and some species of elm, lime, and a few others, which are raised from layers or by grafting. Most ornamental trees are raised by some of these artificial methods, because in this country they seldom ripen seeds. Thus, all the American oaks may be grafted on the common British oak. Most of the foreign maples and birches are raised by layers, most of the ornamental thorns by budding

aud grafting, and willows and poplars by cuttings. All plants which do not ripen seeds readily are propagated artificially, and that mode is preferred by the nurseryman, which experience has proved will produce the largest and most vigorous plants in the shortest time. Thus, though more suitable plants would be produced by raising the plane and poplar from cuttings, because in that case nature would adjust the tops to the power of the roots, yet as much larger plants are produced by layers, that mode is preferred in commercial nurseries. The lime tree and English elm ripen their seeds in Britain, but large plants are much more rapidly procured in the first case by layers, and in the second by grafting: the mode by which the largest plants are most rapidly produced need not always give way to the slower method; but in most cases, it would be advantageous to the purchaser that the slower mode should be adopted. According to some writers seedling plants are of greater durability than those raisel in any other way; but though this may be true in some cases it is not universally applicable, as we know that a ud pro+ duces as perfect a plant as a seed; the only difference being that the bud seems more.fully imbued vith the peculiarities of the individual which produced it than the seed. The poplar, willow, vine, éc., have been propagated by cuttings from time immemorial, and appear to possess respectively the same properties now that they did in the days of the Romans. Seeds should be collected when mature from the best specimens; and should either be sown immediately, or preserved in a place where they will undergo few atmospheric changes till the proper sowing season, which in most cases will be the following spring. Nature, it may be observed, sows all her seeds soon after they are matured; that is, they drop from the tree upon the ground in autumn or the beginning of winter, or, in the case of some trees, such as the conifers, not till spring ; but when seeds are thus left to sow themselves many are destroyed by animals, many fall in unfavourable positions for germination, and only a small proportion produce plants. It is for the arboriculturist to study nature's mode of sowing, and to imitate only her favourable features. The greater number of seeds may be stored till the following spring, that is, till February or March, and then be com- mitted to the soil. Poplar and willow seeds, however, ripen early, and when sown immediately on dropping from the tree, often come up in the course of a few weeks 4 whereas, if they are kept till spring, the greater number do not come up at all; and seeds which lie two years in

the ground before coming up, such as those of the hawthorn, the holly, &c., may be kept till the second spring before they are sown.

In order to show the treatment required for different kinds of seeds, and the plants raised from them, it will be convenient to throw them into the following groups :— Trees producing (1) cones; (2) nuts, acorns, masts, or keys ; (3) cottony or feathery seeds; (4) fleshy fruits; or (5) leguminous seeds.

Coniferous Trees.—Coniferous trees ripen their seeds from October till January, and if the cones remain on the tree throughout the winter the seeds do not gene- rally drop out till April or May; such as drop into favour- able soil come up in five or six weeks. The cones should be collected immediately after they are ripe, and laid in a dry place. The seeds are extracted by exposing the cones to the heat of the sun under glass, or by subjecting them to artificial heat before an open fire, or on a kiln. The seeds are sown in April, in soil dug over and finely raked ; and then covered with a thin coating of soil. The beds, after the sowing is completed, should be shaded from the sun by branches of tree. In cold moist climates, such as that of Aberdeen, this shading may a Reamer with ;

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but in the climate of London it is in most seasons neces- sary, and may be effected by mats, straw, or evergreens. For convenience, the seeds are generally sown in beds, a slight excavation being made by drawing some of the earth to the sides; and in order that the seeds may be evenly deposited on a somewhat firm surface, the bottom of this excavation is lightly rolled. After the seeds are scattered over the beds they are again rolled, and the covering of earth thrown over them. It is found that the rolling of the beds before and after sowing, by bringing the seeds into close contact with the soil, accelerates germination. The more tender pines are sown in pots or flat earthen pans, for the convenience of making them germinate under glass, and to facilitate future transplantation; but the pro- cess of sowing is exactly the same. The seedlings require nothing but the usual culture of the nursery for two summers; after which they should be transplanted where

they are finally to remain; or they should be planted in the nursery in lines, or scattered over beds ; in either case they should be 3 to 6 inches apart, according to their height and the length of the leaves. For the Scotch pine and spruce fir, which grow slowly when young, 3 inches are sufficient ; for the larch, which grows rapidly, and for the pinaster, which has long leaves, 6 inches are required. Here the plants may remain two years, and afterwards be again transplanted; unless they are in the meantime removed to where they are to remain, which, to ensure good timber trees, should be done before young conifers exceed four years' growth.

Trees bearing Nuts, Acorns, Masts, Keys, &c.—These ripen from October to December. Acorns usually in November; but the beech, horse chestnut, walnut, and hazel, ripen their fruit in October, and most of the syca- mores and maples in September. All these ought to be gathered as soon as ripe, because the best are liable to be picked up by wild animals as soon as they drop. They may be sown immediately or kept till February, as in neither case will they come up till April or May. The seeds should be sown in a sandy loam, in drills, at such a distance from each other that the leaves of the seedlings may not touch at the end of the first season; they should be gently pressed down into the soil, and covered to twice the depth of the seed. Drills are recommended for this description of tree-sceds that a spade may be inserted obliquely between the rows, so as to cut the tap-root of the plants, and force it to throw out lateral roots. This is comnionly done in the spring of the second year, and, by increasing the lateral roots and their fibres, renders the tree better adapted for transplanting. At the end of the second year plants so treated may be taken up, and either planted where they are to remain, or transplanted into nursery lines, at distances suited to the habit of the species. Here they may remain two years longer, and be again replanted. The larger and stronger broad-leaved tap-rooted trees are, up to a certain point, before they are removed from the nursery, the more vigorously will they grow where they are finally to remain. The size to be attained in the nursery must depend on the condition of the soil into which they are to be transplanted. If moisture be so abundant as to supply the fibrils with water during the first summer, even if the removed plant has a stem an inch in diameter, so much the better; it being understood that it has been transplanted in the nursery every two years, and is therefore well supplied with fibrous roots, and has its wood perfectly ripe. If, on the other

hand, the soil into which the plant is to be transplanted is dry and poor, the plants should be removed there at the end of the second year, because such plants, being of small size, have few leaves to exhale moisture, and before they grow large they will have adjusted their roots and annual growths to the locality.

pods generally ripen in

ARBORICULYTVUEEL

Trees with Cottony, Feathery, and other soft Seeds.—The seeds of the genera Populus, Salix, Alnus, Betula, Ulmus, &c., ripen from May to November ; poplars in May ; wil- lows and elms in June; alders in November; and birches in October. The seeds of the alder and birch may

be kept in a cool, dry, airy situation till spring, or sown

immediately after they are gathered. 'They come up in the May or June following; but the seeds of the elm, poplar, and willow should be sown immediately. Many will come up the same autumn, and the remainder the following

April and May. The seeds may be dried and preserved in.

bags for a year; but in this case the greater part will not vegetate. Poplar and willow seeds require to be sown on

a surface rendered level and slightly firm by rolling. After the seeds are equally distributed over it, they should be covered with light sandy soil, or vegetable mould, no

thicker than barely to conceal the seed. After this the bed should be watered and shaded and kept uniformly moist by occasioval watering when the plants make their

appearance. Of all seedling trees raised in British nur-

series, none grow with so much vigour the first year as the common elm; and, therefore, the seeds of this tree require to be placed at a greater

distance from each other than those of any other kind. The seeds of the elm keep better till the following spring than those of the poplar and willow.

Trees with Fleshy Fruits.—The fruit of the genera Pyrus,

Cotoneaster, Viburnum, Crataegus, Ilew, Prunus, Cerasus, Rhamnus, &c., ripens from August to December. It should be gathered when ripe, heap till the pulp rots away. With some species the seed may be sifted from the February, the seedlings being treated as the seedlings of the conifers. years, and many of the seeds will not germinate till the third spring.

mixed with sand, and laid in a sand and sown in the following

In others the heap may be left for two

Trees with Leguminous Seeds.—These include the genera Cytisus, Acacia, Robinia, Gleditschia, Caragana, &c. The September or October, but some not till November or December. The seeds may be kept in the pods till February, and then sown in beds, as described. At the end of two years the young trees may be trans- planted.

Tur FoRMATION AND MANAGEMENT OF PLANTATIONS.

Whether plantations of forest trees should be sown or planted, is a question which has been much discussed. It is readily allowed, that sowing is the natural mode; but man tries by art to supplement nature, and to obtain a higher rate of production by skill and labour. Some indecd have asserted that the timber of transplanted trees is never so valuable as that of sown ones, the reason alleged being, that the transplanted trees have lost their tap-roots. On examining the roots of full-grown trees, however, no tap- root is ever found; on the contrary, those roots which proceed either directly or obliquely downwards from the base of the trunk, are uniformly much smaller than those which proceed horizontally, a few inches below the surface of the ground. The tap-root, therefore, is chiefly of use to the tree whilst young, and is larger in proportion to the part of plant above ground, in the first year, than in any succeeding year; and as the top of the tree and the lateral roots increase in size, the tap-root ceases to increase, till in ten or twelve years' growth, it is found to be the smallest of the main roots of

the tree. We assume, therefore, that a transplanted tree, other circumstances being the same, 18 in all respects as good as a seedling. Hence we conclude, that all artificial plantations ought, in the first place, to be made by planting, and at regular distances. We would

carefully prepare the soil for the trees, removing the weeds afterwards for two or three years till the branches begin to cover the ground; in which state we should leave it during the growth of the plantation, only taking care to remove large weeds. 'This kind of tree culture, however, can only take place with advantage, on a tolerably level surface, where the soil is of the same nature throughout. Not to speak here of grounds destined for ornamental plan- tations, the great majority of plantations formed with a view to profit are necessarily on hilly and unculturable surfaces, and where there is probably a variety of soil, even in a limited space. The preparation to be given in such cases is under-draining ; for to dig or trench the sur- face would render it liable to be washed away by heavy rains and thawing snow. Plantations under such circum- stances must be formed by digging pits for each tree, and by selecting such kinds as are best adapted to the locality. This frequently occasions the use of a variety of trees in the same plantation, causing a more picturesque effect in the landscape and a more advantageous result in the pro- duction of timber. We have already stated that coniferous trees should be transplanted before they are four ycars old; but that broad-leaved trees may be moved at four, six, eight, or ten years' growth; provided they have been transplanted every two years in the nursery, and that the soil is sufficiently deep and moist to bring the fibrous roots into full action the first summer. When strong plants of this kind are used they overcome the natural herbage immediately ; and, if carefully planted in good soil, not one in a score will fail. Smaller plants, on the other hand, are apt to be choked by herbage, and to have their leaves and young shoots injured by insects. In a dry soil and subsoil, plants with a mass of roots cannot subsist the first year ; and therefore smaller plants, once transplanted, are preferable. There are circumstances under which sowing is perhaps the only mode of forming plantations that can be adopted: as for example, in the dunes of Gascony, which by nearly a century of regularly continued sowings have been almost entirely

transformed from drifting sandy wastes into forests of the cluster pine. In making planta- tions of this pine we should prefer sowing several seeds in every place where a plant was intended to remain, unless we could procure a sufficient number of plants of two years old in pots. If more than one came up, the rest should be removed the second or third year; and while the plants are young care must be taken that they are not choked by herbage. When steep rocky cliffs or stony hill-sides are to be covered with wood, sowing is the only mode that can be resorted to; the kinds of seeds to be sown may be selected according to the nature of the debris or the soil in the clefts of the rocks. Where the soil is good, broad- leaved trees may be introduced; but where it is poor, the Scotch fir, larch, birch, mountain ash, and white beam tree are most suitable. Where there is no visible soil, two or three seeds, enveloped in a composition of moss, cow-dung, and loam, may be deposited in crevices, or among loose stones ; acted upon by the rain, the seeds will vegetate, and find nourishment in the fragments of the ball in which they were enveloped.

Two important points connected with the formation of plantations are the distances-at which trees should be planted, and the use of nurse-trees. As the strength of a plant depends on the number of its leaves, and their full ex- posure to light, it follows that the strongest young trees will be those which are clothed with branches and leaves from the groundupwards, and which have their leaves fully exposed on every side to light. The distance from each other at which trees should be placed in a plantation depends on the size and nature of the plants, and the soil, and situation. To have tall and straight stems, the trees are planted thickly

(conifers more so than other kinds), about 4 to 6 feet apart; but when the lower branches of the plants interfere with one another, thinning should be commenced and con- tinued from time to time. When the lower tier of branches shows symptoms of decay they should be removed by cutting close to the stem. This process of pruning has been condemned by many, particularly in soft-wood trees; but if practised early and judiciously it may be attended with benefit, especially when the part removed does not exceed an inch in diameter, or as long as the operation can be performed with an

ordinary pocket-knife ; the wound will heal quickly, and leaves no mark. If branches are allowed to remain till they are 3 or 4 inches in diameter, and are then cut off at some distance from the bole (snag- pruning) the timber deteriorates, the wound heals over in time, but the timber is either knotty or unsound, Close- pruning is performed by sawing off a branch close to the trunk or a leading branch, When the wound is large, a dressing should be applied to exclude air and moisture. For this purpose linseed oil, or three parts cow-dung and one part powdered lime, will be found useful. In the Royal Forests of England the branch of an oak is never renioved unless special circumstances require it. Long experience has justified this system. Lateral branches which are growing with over luxuriance, and attracting too much of the sap of the plant, should be foreshortened, just as the lateral branches of a hedge are clipped when they extend too far. The only objection to this method of pruning is the amount of labour it entails. Mr M'Nab of the Royal Botanic Garden, Edinburgh, has recently urged the advantage of stem-pruning of conifers, on the grounds that it encourages a free growth, and tends to make the trees hardy by exposing the bark of the stems to the freer action of the air. Stem-pruned trees also are less likely to be broken by a weight of snow lying on the branches. For pruning, the following tools are required,—a pocket knife, hand-saw, chisel, and pruning shears; the two last are fixed on long poles. Thinning, carried out with care from time to time, is of the greatest consequence. The removal of weak and crooked supernumeraries prevents unnecessary exhaustion of the soil, while it admits the essential agents, air and light, which favour the expansion of lateral branches. If, however, the trees be thinned out too widely, the side branches become robust and the stem is not drawnup. The rule in thinning should be, to keep the trees clear of each other, so that the branches do not interlace, and the air circulates all round. The time when thinning should commence depends on local circumstances, and the species under cultivation. In a well-managed plantation the proceeds of thinnings in twenty years should go far to cover the expense of culture and interest of capital. The next point to be considered is that of introducing nurse-plants into plantations. That these have a tendency to accelerate the upward growth of trees for a number of years there can be no doubt, but it is at the expense of the side branches and leaves. Evergreen nurses, such as the Scotch, silver, and spruce firs, improve the condition of a plantation by preventing the radiation of heat from the ground, by checking the growth of

herbage, and by pro- tecting the principal trees from high winds until they are thoroughly established in the plantation. The kind of tree which is to form the main crop having been fixed on, and the number that when full grown will stand onan acre or any given surface, they should be planted in their proper places, and the intervals filled up with the nurse-plants. As the nurses grow, and their branches touch the princi- pals, let them be thinned, so as not to prevent the free growth of the principals: this should be done gradually. For example, it is customary to plant oak with coniferous nurses, and in the course of seven to ten years the nurses

require a partial thinning to make way for the principal trees; at this date the pines will be fit for poles or rails. It often, however, happens that the nurses are allowed to remain too long, and the principal crop consequently suffers from the evils of overcrowding.

We have now alluded to some of the chief points con- nected with arboriculture, but the subject is of such extent that it could not be fully treated in the limits of this article. Our object has been rather to direct attention to general principles; and for fuller information we would refer those who desire a more practical and detailed acquaintance with the subject to the following works :—

The classic Sylva of Evelyn and the exhaustive Arboretum et Fruticetum Britannicwm of Loudon should be in the hands of all students of Arboriculture. Selby's History of Forest Trees, 1842 ; The Forester, by James Brown, 4th ed., 1871; Grigor's Arbori- culture, 1868; Du Breuil's Cours Elémentaire o& Arboriculture, Paris ; Parad"s Cours Elémentatre de Culture des Bois, Paris ; Mathieu's Flore Forestiére, Nancy, 1860; and, Hartig's Lehrbuch fir Forster, Stuttgart, 1861, are all useful books. Prize essays on special subjects are contained in the Transactions of the Highland and Agricultural Society, and instructive papers on various practical details are to be found in the Transactions of the Scottish Arbori- cultural Soctety. The Forest Flora of Northern India, by Stewart and Brandis, 8vo, with 4to volume of illustrations, London, 1874, contains a great amount of information on the culture of trees in India and the Himalayan region. For American trees see the North American Sylva, by

Michaux, Paris, 1819; Trees and Shrubs of Massachusetts, by ¥imerson, Boston, 1846; and Trees of America, by D. J. Broune, New York, 1846. (ie)

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TABLE

Showing the number of Trees required to plant an Imperial or Scotch Acre, at distances of one to thirty feet.

IMPERIAL ACRE. ScotcH ACRE.

ae Number. |; ae Number. ||, nee Number. al Number. 1 43,560 12 302 i 54,760 12 380 14 | 19,360 | 124] 270 || 14 | 24,888 | 124) 350 2 10,890 1133 257 2 13,690 ils} 824 24 6,970 | 134 239 2h 8,761 | 134 800 3 | 4,840 | 14 992 || 3 | 6,084 | 14 279 33 | 3,556 | 14| 207 || 34] 4,470 | 144 | 260 4 | 2792 | 15 193 || 4 | 3,499 115 | 248 4} 2,151 | 158 181 4h 2,704 | 154 228 5 |i, me \ae i7o | 5 | mae 116 | 214 541 1,440 | 165| 160 || 54/ 1,810 | 163] 201 6 1,210 17 150 6 P52 iy 189 64 | 1,081 |178| 142 || 6& | 1,296 | 174| 178 ZL 889 | 18 134 7 Tala, as 169 1 774 | 184 | 197 || 74 973 | 18} | 160

8 680 19 120 8 855 19 151

8h 603 | 193 | 114 || 83 758 | 194 | 148 9 537 | 20 108 9 675 | 20 Wey

94 482 22, 90 94 606 2 1138

10 435 | 24 75 10 547 | 24 95 103 395 | 26 64 104 496 | 26 81 iil 360 | 28 55 lal 452 | 28 70 114 329 | 30 48 113 414 | 30 60

ARBROATH, or ABERBROTHOCK, a seaport and manu- facturing town of Scotland, in the county of Forfar, 17 miles N.E. of Dundee and 60 N.N.E. of Edinburgh, in lat. 56° 33’ N. and long. 2° 35’ W. Of its origin we have no information, but it is probable that the shelter of the river Brothock, from which it derives its name, early attracted a settlement of seafaring folk. It was certainly in existence before the Tyronensian monks came from Kelso to take possession of the beautiful abbey dedicated to Thomas.a- Becket,

which King William the Lion had just founded in 1178. Whether the town was created a royal burgh in 1186, as has been stated, is uncertain ; but it still preserves its charter of 1599. By King John of England it was exempted from "toll and custom" in every part of the southern kingdom except London. In 1320 a parliament was held in the abbey by Robert I, and a letter—one of the most remarkable documents of our early history— was addressed to the Pope in regard to the relations between Scotland and England. In 1394 the burgesses of Arbroath entered into an agreement with John Gedy, the abbot, by which he and his successors were bound to maintain a sufficient harbour at their own expense. The abbacy was held in succession by Bishop Beaton of Glas- gow, and his nephew, Cardinal Beaton, afterwards Arch- bishop of St Andrews. It was abolished by Act of Parliament, and erected into a temporal lordship of the Hamilton family in 1541. There is a tradition that the abbey was burned by a neighbouring "laird" in conse- quence of a private quarrel with the commendatary; but it is more generally believed that it merely fell into ruin from neglect. There is no evidence that it suffered from the attacks of the Reformers. The vestry, the south tran- sept, part of the chancel, the south wall of the nave, part of the entrance towers, the fine Norman gateway, and part of the sccular buildings are still standing, and the abbot's house, now called the abbey house, is still inhabited. At the beginning of the 18th century Arbroath was a place of but little importance, but has since gradually risen. It is now the principal seat of the sail-cloth manufacture, has about thirty spinning-mills, and seventeen factories, several

considerable foundries, tanneries, and other works. During the course of last century the abbot's harbour was super- seded by one more commodious a little to the west, which was enlarged and improved, about 1844,at a cost of £50,000. More recently, by means of a Government loan and other funds, amounting together to £35,000, the entrance and bar have been much deepened, and a wet dock is (1875) in course of formation. A neat signal tower, 50 feet in height, with an excellent telescope, communicates with the Bell-Rock lighthouse ; and on the north pier is a fixed red light, at an elevation of 24 feet, visible 8 miles off. The imports are flax, hemp, coal, &¢.; and the exports, paving-stones, grain, potatoes, fish, &c. At the first of December 18738 the number of vessels registered at the port was 64, with an aggregate burden of 9242 tons. The customs receipts that year amounted

to £15,861, 13s. 1d; the tax on British spirits to £6767, 1ls.; total, £22,629, 4s. ld., showing an increase on the previous year of £604, 14s. 1d. Among the public buildings are the town-hall, a trades' hall, the new hall, the parish church, with a spire 150 feet high, three guoad sacra churches, five Free, three United Presby- terian, one Episcopalian, one Roman Catholic, and two Independent. There are six branch banks, a savings bank, a public library, an excellent museum, a high school, five other public and a number of adventure and denominational schools, with an aggregate attendance of 3000 children, an 'infirmary, and a considerable number of charitable endow- ments. The municipal government is vested in a provost, three bailies, a treasurer, a dean of guild, and twelve coun- cillors ; and there are seven incorporated trades. In the year 1873-74 the expenditure for general public purposes — including paving, lighting, cleansing, but excludmg im- provements, water, and sanitary expenditure—was £6773, 15s. 3d. Thetown has been drained and well paved ; an additional though somewhat small supply of water has been recently obtained, and the sanitary condition is on the whole satisfactory. Arbroath unites with Forfar, Montrose, Brechin, and Bervie, in sendinga member to parliament. By the census of 1871 it contained 2359 inhabited houses, and, including

179 within the royalty but beyond the parliamentary boundary, 20,170 inhabitants. Of these 3723 are engaged in manufacturing linen fabrics. Arbroath is a station on the Caledonian Railway. The market day is Saturday ; and fairs are held on the last Saturday of January, the first Saturday after Whitsunday, the 18th of July, if that day is a Saturday, or on the first Saturday thereafter, and the first Saturday after Martinmas. About a mile from the town, at St Vigeans Church, is one of the most interesting of the Scottish sculptured stones, containing what has been held to be the only legible inscription left us in the Pictish language (Sculptured Stones of Scotland). See Statistical Account of Scotland, vol. xi., and local histories. ARBUTHNOT, Joun, a celebrated physician, wit, and man of letters of the age of Queen Anne, was born at Arbuthnot, near Montrose. The date of his birth is some: what uncertain; many authorities give 1675, which is scarcely reconcilable with his first appearance in London ; it should probably be 1665 or 1667. His father was a clergyman of the Scotch

Episcopal Church, who was com- pelled by the Revolution to resign his charge, and whose family were consequently dependent on their own exertions. Young Arbuthnot studied at the University of Aberdeen, where he took the degree of M.D. He proceeded soon after to London, and for a time supported himself there by teaching mathematics. His first published work was a translation, with considerable additions, of a treatise by Huyghens, called Of the Laws of Chance, or a Method of Calculation of the Hazards of Game, 1692. About this time there was much speculation concerning the geological formation of the earth, and Dr Woodward published an Essay towards a natural history of the earth, in which some curious views were propounded with regard to the deluge. This essay Arbuthnot attacked with great success in his Lxamination of Dr Woodward's Account of the Deluge, &c., London 1695. By this work he was brought into prominent notice, and not only gained means to extend his practice, but at the same time brought himself into connection with the circle of wits and literary men who formed the chief glory of the age. He followed up the work on Dr Woodward by another on the usefulness of

mathematical learning, and contributed to the Royal

Society an interesting memoir, called dn Argument for Divine Providence drawn from the Equal Number of Births of both Sexes, which procured him, in 1704, admission as a Fellow to the Royal Society. A year later appeared the first edition of a larger work, Z'ables of the Grecian, Roman, and Jewish Measures, &c. This is still a work of some value, though in many parts superseded. It was held in considerable estimation on the Continent, and was trans- lated into Latin. About this time a happy accident. intro- duced Arbuthnot to Prince George of Denmark, who was seized with sudden illness when on a visit to Epsom. Arbuthnot, who chanced to be there at the time, was called in, and ever afterwards continued to be physician to the prince. In 1705, at the especial request of the Queen, he was made her physician extraordinary, and four years later he became Royal Physician in ordinary. In the same year he was elected a Fellow of the Royal College of Physicians. He was now in the very centre of the literary society of the time, and in it his great talents, massive learning, and brilliant wit enabled him to take a prominent place. He was on terms of close intimacy with Pope, Swift, Gay, and Parnell, and quickly became one

of the foremost literary men of the Tory party. In 1712 appeared the celebrated political allegory, called the History of John Bull. The object of this admirable piece of satire was to throw ridicule on the duke of Marlborough, and to excite among the people a feeling of disgust at the protracted war then being carried on against Louis of France. The nations

at war are represented as tradesmen involved in a lawsuit : the origin of the dispute is traced to their selfish and narrow views ; their national characteristics are skilfully hit off, and the various events of the war, with the accom- panying political intrigues, are symbolised by the stages in the progress of the suit, the tricks of the lawyers, and the devices of the principal attorney (Marlborough) to pro- long the struggle. There have been many imitations of this famous allegory, but few of them have been so happily conceived, or so well sustained. Its immediate effect was very considerable, and it is even now of interest for the lively picture it presents of the politics of the period. At the time of its appearance it was generally attributed to Swift, but passages in Swift's own letters make it quite clear that Arbuthnot was the sole author.

The death of the Queen in 1714 was a severe blow to Arbuthnot. He lost his post as court physician, and was much impaired in his means. He appears about this time to have paid a short visit to Paris, and on his return took up his residence in Dover Street. His correspondence shows that after the Queen's death he was at first disposed to be despondent and gloomy, but he soon recovered his natural buoyancy of spirits, and entered with eagerness into the \ proposed work of the Scriblerus Club. The principal members of this club were Pope, Gay, Swift, Arbuthnot, Parnell, Harley, Atterbury, and Congreve. The work pro- jected by them, a comprehensive satire on the abuses of human learning, was never completed. One brilliant frag- ment, the first book of the Memoirs of Martinus Scriblerus, published in Pope's Works, is undoubtedly the work of Arbuthnot, though it is not. improbable that some portions are due to Pope and Swift. It is an admirable combination of wit and learning, and is certainly one of the finest pieces of sarcastic humour in the English language. Arbuthnot still continued practice as a physician, and attained great eminence in his profession. In

1723 he was made one of the censors of the Royal College of Physicians, and in 1727 had the honour of delivering the Harveian oration. In 1731 he published an Assay concerning the Nature of Aliments, which has been frequently republished, and has been translated into German. In 1733 he wrote an Essay on the Effects of Air on Human Bodies. He died in February 1735. The scattered writings of Arbuthnot, on which his reputation as a wit rests, are so interwoven with the works of Swift and Pope, that it is difficult to discover what is absolutely his. A collected edition, Miscellaneous Works of the late DrArbuthnot, Glasgow, 1750-51, contains many pieces that were expressly disclaimed by the author's son.

ARC, Joan or. See Joan or Aro.

ARCADE (Fr. arcade, arcature, Ital. arcata, Ger. Bogen- gang), in street architecture a covered way or passage, either open at the side with a range of pillars, or completely covered over. The finest arcades of this description are to be found in Paris. Some have open sides, such as those in the Rue de Rivoli, Palais Royal, and Old Place Royal ; others, such as the Passages des Panaromas, Jouffroy, and de Princes, are covered passages, and form convenient thoroughfares. A few, like the Passages Choiseul and de POpera, are favourite lounges. They are all more or less lined with elegant shops. There are two specimens of covered passage-arcades in London, the Burlington and Lowther, but they are very inferior in style to those in Paris. The arcade which runs round three sides of the Square of St Mark at Venice is the finest of its kind) In Goilic architecture the term signifies a range of arches, supported on columns or piers, and either open or attached to a wall. The word is used in contradistinction to colon- nade, which is a range of columns carrying level entabla- tures. The oldest known in England is probably that of

the old refectory in Westminster Abbey, the work of the Confessor (fig. 1). Examples of attached arcades may be seen at St John's, Devizes (fig. 2), at Canterbury and Amiens, and at Notre Dame, Paris; of detached arcades, at Wells, Lucca, and Pisa ; of arcades over piers and arches, at Lincoln ; of arcades, the openings of which form seats or canopied stalls (which is very

common in chapter-houses), at Lichfield. Arcades are found both inside and out- side medieval buildings. If under the windows inside a

Fia. 1.—Areade, Westminster

Fie. 2.—Arcade, St John's, Abbey.

Devizes.

building, their columns generally rest on a stone seat or bench table. Sometimes the arcades are pierced here and there to form windows. Sometimes the triforium is a series of arcades, as in parts of Canterbury, Exeter, Beverley, St John's, Chester, and many other examples. In detached arcades, a very pleasing effect is often produced by placing the columns, which are attached to the wall, opposite the centre of the opening instead of immediately behind the front column, so as to alternate and enhance the effect of the perspective, as at Wells. The intersections of arcades of interlaced circular arches, as at St John's, Devizes, and at Canterbury, were at one time supposed to have been the origin of the Gothic or pointed arch. Many of the cathedrals abroad have arcaded fronts, as at Pisa. That at Lucca has a range of double arcades, one behind the other, the columns alternating, as may also be seen at Wells and Lincoln. (For examples of arcades, see Parker's Glos- sary of Architecture, and Viollet le Duc's Dictionnaire, vol. i.)

ARCADIA, an inland and mountainous country of ancient Greece, bounded on the N. by Achaia, on the W. by Elis, on the 8S. by Messenia and Laconia, and on the E. by Argolis, and almost shut in from the neighbouring states by a natural rampart. Its most important heights were Cyllene, the birth-place of Hermes, in the north-east, Erymanthus in the north-west, Artemisium and Parthe- nium in the east, and Menalus and Lyczeus in the south. It was watered by the Alpheus, the largest river of the Peloponnesus, the Helisson, the Ladon, the Erymanthus, and a number of smaller streams which cut their way, in many cases by underground passages, through the lime- stone rocks. In the east there were several lakes, as those of Orchomenos and Stymphalus ; and in the north-east, near Nonacris, was the great waterfall of the Styx, which produced suck a deep impression on the ancient Greek mind. Arcadia seems to have been inhabited from the earliest times of

Grecian history by the same race of people, which down to the days of Roman dominion con- tinued to be distinguished from the neighbouring states by greater simplicity and inertness of life. Deprived by their position of the quickening influence of commerce, broken up into small and almost independent communities by the physical character of their country, and thus having hardly any proper national existence, the Arcadians acquired a certain awkwardness in dealing with their more vivacious neighbours, who laughed at Arcadian stupidity, while they were pleased with Arcadian hospitality, and almost envied Arcadian repose. Like other mountain-

dwellers they were determined defenders of their liberty, and their history is chiefly taken up with united or sporadic conflict against Spartan invasion. About the time of the foundation of Megalopolis (370 B.c.) a certain unity and consequent power were attained, but it was not long ere matters fell back to their former condition. Ulti- mately the whole country joined the Achzan League, and was afterwards incorporated with the Roman province of Achaia. The most important towns in Arcadia were Tegea, Stymphalus, Cleitor, Pallantium, Pheneus, Caryz, Nonacris, Methydrium, Herza, Mantinea, Lycosura, accord- ing to Pausanias, the most ancient town in Greece, and Megalopolis, one of the most recent. The Greek and Roman poets celebrated the simplicity of Arcadian life and character, not without a certain touch of satire ; but by moderns, such as Sannazar and Sydney, the country and its inhabitants have been idealised and elevated into a type of pure pastoral happiness.

ARCESILAUS, a Greek philosopher, and founder of the New or Middle Academy, was born at Pitane in Atolia, about 316 B.c. He received careful training in his youth from the mathematician Autolycus, and then proceeded to Athens, where for some time he studied under Theophrastus. He was gained over to the Academy by Crantor, with whom he continued to live on terms of the closest intimacy. After the death of Crantor, Arcesilaus continued to study under Polemo and then under. Crates, whom he succeeded as leader of the school. There is a little doubt as to the philosopher's mode of life. According to some he lived in extravagant, even profligate style, and Diogenes Laertius tells us that he died in his 75th year

of excessive drinking. But the testimony of others, eg., Cleanthes, seems to show that he practised extreme moderation ; and some of his practical precepts tend to confirm this view. He was much beloved and respected by the Athenians, and is celebrated for his acuteness, eloquence, and learning, His philosophical opinions can only be gathered from scattered notices in Cicero, Sextus, and others. He advocated the Socratic or colloquial method of discussion, although he depreciated dialectic proper, and seems to have carried out thoroughly the sceptical element in the Platonic school. His theory of knowledge was developed in direct antagonism to that of the Stoics. He especially opposed their favourite doctrine, that the criterion of truth was to be found in the irresistible or irresistibly convincing impression, which served as a mean between science and opinion, and was common to the wise man and the foolish. Arcesilaus denied that such a mean was possible, and showed further, that as conviction implied approval or judgment, it could not apply to impressions but only to thoughts. Moreover, the mere force of conviction could not be a test of truth, since a false conception might be quite as irre- sistible as a true one. Arcesilaus brought forward no new arguments against knowledge in general ; he appears to have thought that by overthrowing the theory of knowledge which rests on the truth of the senses, he had destroyed all possibility of rational.conviction. The final result of his speculation was accordingly, that he could not know any- thing, not even his own ignorance. It was the part of a wise man to despair of certainty. To the ordinary argu- ment against scepticism, that it destroys the power of acting, Arcesilaus replied by pointing out that impressions or ideas affect the will and produce actions, whether they are true or not. Men can act upon their ideas with or without a conviction of their truth. In practical matters probability is a sufficient guide. We have no certain information as to how this doctrine was applied to the questions of morals. (See Brodeisen, De Arcesila philosopho, 1821; Geffers, De Arcesila, 1842; Zeller, Philosophie d. Griechen, iii. 1, 448, sq.)

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ARCH

RCH, in building, a portion of mason-work disposed in the form of an arc or bow, and designed to carry the building over an open space. The simplest and oldest expedient for supporting a structure over a door-way is to use a single stone or lintel of sufficient length. On account of the difficulty of procuring stones of great size, this expedient can only be used for moderate apertures ; nor can it be applied when there is to be a heavy superstructure, because the weight resting on the lintel would cause a compression of the upper, and a distension of the under side. Now, no kind of stone can bear any considerable distending strain, and thus stone-lintels are liable to fracture. The ancient Greek temples afford instances of the use of horizontal lintels of considerable size, but these architraves carry only the cornice of the building. The employment of a colonnade with flat architraves to support an upper story is contrary to sound principles, and, even in the case of ordinary houses, we see that the builder has been fain to relieve the pressure on the lintel by means of a concealed arch. In stone-work we must depend on compression alone. When a lintel had been accidentally broken in two, we may suppose that the masons had set the ends of the halves upon the door-posts, and brought the broken ends

Fig. 1, Fig. 2.

together. In this way there would be formed a support for the upper building much stronger than was the stone when entire; only there is a tendency to thrust the door- posts asunder, and means must be taken to resist this out-thrust. The transition from this arrangement to that of three or more wedge-shaped stones fitted together was easy, and thus the gradual development of the arch resulted. .

So long as such structures are of small dimensions no great nicety is required in the adaptation of the parts, because the friction of the surfaces and the cohesion of the mortar are sufficient to compensate for any impropriety of arrangement. But when we proceed to construct arches of

large span we are forced to consider carefully the nature and intensity of the various strains in order that provision may be made for resisting them.

Until the laws of the equilibrium of pressures were discovered, it was not possible to investigate these strains, and thus our knowledge of the principles of bridge-building is of very recent date ; nor even yet can it be said to be perfected. The investigation is one of great difficulty, and mathematicians have sought to render it easier by introducing certain pre-supposed conditions; thus, in treatises on the theory of the arch, the structure is regarded as consisting of a course of arch-stones resting on abut- ments, and carrying a load which is supposed to press only downwards upon the arch-stones. Also cohesion and friction are put out of view, in other words, the investigation 1s conducted as if the stones could slide freely upon each other. Now, if the line of pressure of one stone against another cross their mutual surface perpendicularly, there is

no tendency to slide; and if this condition be adhered to throughout the whole structure, there must result complete stability, since the whole of the friction and the whole consistency of the cement contribute thereto. But if, in any case, the line of pressure should cross the mutual surface obliquely, the tendency to slide thereby occasioned must be resisted by the cohesion, and so the firmness of the structure would be impaired. Hence an investigation, conducted on the supposition of the non-existence of cohesion, must necessarily lead us to the best possible construction. But we can hardly say as much in favour of the hypothesis that the load presses only downwards upon the arch-stones. In order to place such a supposition in accordance with the facts of the case, we should have to dress the inner ends of the arch-stones with horizontal facets for the purpose of receiving and transmitting the downward pressure. But if, as is

usually the case, the inner surfaces be oblique, they cannot transmit a vertical pressure unless in virtue of cohesion, and then this hypothesis of only downward pressure on the arch-stones is not in accordance with the fundamental principle of stability. In a thorough. investi- gation this hypothesis must be set aside, and the oblique pressure on the inner ends of the arch-stones must be taken into account. Since the depth of the arch-stones is small in comparison with the whole dimensions of the structure,

and since the line of the pressure transmitted from one to another of them must always be within that depth, it is admissible to suppose, for the purpose of analysing the strains, that the arch-stones form an exceedingly thin course, and that their joints are everywhere normal to the curve of the arch. Eventually, however, the depth of the arch-stones must be carefully considered.

We may best obtain a clear view of the whole subject by first assuming that the load presses only downwards on the arch-stones, or that the inner ends of these are. cut with horizontal facets.

Let. Q'P'APQ (fig. 4) represent a portion of such an arch

Fig. 3.

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H 9 EE

placed equally on the two sides of the crown A, then the whole weight of the structure included between the two vertical lines P'H' and PH must be supported at P' and P, so that the downward pressure at the point P must be the weight of the building imposed over AP. This pressure downwards is accompanied by a tendency to separate the

supporting points P' and P. Now, as this tendency is horizontal its intensity cannot be changed by the load acting only downwards, and must remain the same throughout the structure, wherefore the actual pressure at P must be found by combining this fixed horizontal thrust with the downward pressure equal to the weight of the bridge from A to P. If, then, we draw ah horizontally to represent this constant thrust, and ap upwards to represent the weight of this portion of the arch, the line ph moust, according to the law of the composition of pressures, indicate both in direction and in intensity the actual strain at the point P. 'This pressure must be perpendicular to the joint of the stones, and must therefore be parallel to the straight line drawn to touch the curve at P.

Hence, if the form of the inside of the arch, or the intrados as it is called, be prescribed, we can easily discover the law of the pressures at its various parts ; thus, to find the strain at the point Q, we have only there to apply a tangent to the curve and to draw hg parallel thereto ; hq represents the oblique strain at Q; aq represents the whole weight from the crown A to Q, and therefore pg is proportional to the weight imposed upon the position PQ of the are.

Using the language of trigonometry, the horizontal thrust is to the oblique strain at any part of the curve as radius is to the secant of the angle of inclination to the horizon; also the same horizontal thrust is to the weight of the superstructure as radius is to the tangent of the same inclination. And thus, if the intrados be a known curve, such as a circle, an ellipse, or a parabola, we are able without much trouble to compute, on this hypothesis, the load to be placed over each part.

If we use the method of rectangular co-ordinates placing x along OH and z vertically downwards, so that Pa may be the increment of x, rQ that of z, the tangent of the inclina-

tion at P is s , and therefore if A stand for the horizon-

ba tal strain, and w for the weight of the arch, we have— bz v= he ;

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while the oblique strain is h / © an . Also the

change of weight from P to a proximate point Q is Sw = hd (=) ;

Let RST be the outline which the mason-work would have if placed compactly over the arch-stones, in which case RST is called the extrados, then the weight supported at P is proportional to the surface ARSP, and the incre- ment of the weight is proportional to PSTQ, hence if the weights and strains be measured in square units of the vertical section of the structure, and if y be put for PS, the thickness of the mason-work, we have—

dw = ydx, whence y=h – ,

When the curve APQ is given, the relations of z and of its differentials to x are known, and thus the configuration of the extrados can be traced, and we are able to arrange the load so as to keep all the strains in equilibrium.

But when the form of the extrados is prescribed and that of the intrados is to be discovered, we encounter very great difficulties. Seeing that our hypothesis is not admissible in practice, it is hardly worth while to engage in this inquiry ; it may suffice to take a single, and that the most interesting case.

If the whole space between the arch-stones and the road- way be filled up, the extrados becomes a straight line, and

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when this is horizontal we have y=z, so that the form of the arch must be such as to satisfy the condition—

oz

=e

da

that is to say, z must be a function of x such as to be pro- portional to its own second derivative or differential coefficient. Now this character is distinctive of the cate- narian functions, and therefore ultimately

xz 4 x Wh co Al Mt +6 \,

where A is AO, the thickness at the crown of the arch, and e the basis of the Napierian system of logarithms. In this case, since dw = zd2,—

w= Ji | eh —-e % \, so that the form of the arch and also its weight may readily be computed by help of a table of catenarian func- tions.

Let us now consider the case when the ends of the arch- stones are dressed continuously, while the imposed load is formed of stones having vertical faces. The weight of the column PSTQ resting on the oblique face PQ is

prevented from sliding by a resist- ance on the vertical surface QT, which resistance goes to partly oppose the horizontal strain transmitted by the preceding arch-stone ; and thus the out-thrust of the arch, instead of being entirely resisted by the ultimate abutment, is spread over the whole depth of the structure. In this case the horizontal thrust against QT is to the weight of the column as Qzr, the increment of z, is to Pz, the increment of x; wherefore, putting H for the hori- zontal thrust at the crown of the arch, and / for that part of it which comes down to P, the decrement of h from P to Q is proportional to the rectangle under PS and Qrz, that is to say,

z=h

Fig. 5.

dh = yoz.

Now, the whole decrement from the crown downwards is the sum or integral of all such partial decrements, and therefore the horizontal thrust transmitted to P is expressed by the symbol—

h=H —fy&, while the whole weight supported at P is the analogous int integral ope

But the resultant of these two pressures must be perpendi- cular to the joint of the arch-stones, or parallel to the line of the curve ; wherefore ultimately we obtain, as the con- dition of equilibrium in such a structure, the equation —

82(H — /y8z) = 8xfyda.

Since the vertical pressure at P is w, while the horizontal strain is h, the intensity of the oblique strain at P must be ,/{w?+h?}. Now, in passing to the proxi- mate point Q, w becomes w+dw, while A is reduced to

h- Bue", so that the oblique strain at Q must be—

Js (w+ 8w)? + ni hoe F oz : or, neglecting the second power of the infinitesimally

small increment Sw, ,/ { w+ p?+ Qwdw — ohdw's- } , but

ARCH

w ~he, wherefore the strain at Q is ,/(w? +2), or exactly He

the same as that at P. This result might have been obtained from the consideration that the thrust upon. the surface PQ is perpendicular to the oblique strain, and can tend neither to augment nor to diminish it. Hence, as a characteristic of this arrangement, we have the law that the tension across the joints of the arch-stones is the same all along, and therefore is equal to H, the horizontal tension at the crown of the arch.

From this it at once follows that if r be the radius of curvature at the point P, y being the vertical thickness of the mason-work there, H=ry, so that if R be the radius of curvature at the crown of the arch, and A the thickness there, the horizontal thrust there, or the strain transmitted along the arch-stones, is H =RAH, being measured in square units of surface; hence also A:y::r:R, or the thickness at any place, is inversely proportional to the radius of curvature there.

When the form of the intrados is given, its curvature at any point is known, and from that the thickness of the stone-work and the shape of the extrados can be found. The most useful case of the converse problem is, again, that in which the extrados is a horizontal straight line.

Let OH, figure 6, be the horizontal extrados, and A the crown of the arch; make also AB such "@ that its square may represent the hori- zontal thrust there; then, having joined OB and drawn BC perpendicular to it, p and meeting the con- tinuation of OA in C, C is the centre of 5 curvature for the crown of the arch, Or, if the radius of curvature and the ¢ thickness of the arch at the crown be pre- scribed, we may obtain the horizontal thrust by describing on CO a semicircle, cutting a horizontal line through A in the point B, then the horizontal thrust is equal to the weight of the quantity of the stone-work which would fill up the square onAB. The conditions of the

problem require that the curve APQ be so shaped as that the radius of curvature at any point P shall be inversely proportional to the ordinate HP.

Resuming the general equation of condition—

84H — fy8e) = Bxfy8x and observing that in this case y=2, we have— 62(H — /28z) = 82/28e .

Now the integral /28z is 32, but as it must be reckoned

only from A where z= A, the equation becomes 62(H + 4A? — }22) = Safsdz.

The coefficient of 82 becomes less when z increases, and when 32? = H? +4A2 this coefficient becomes zero, at which time dx also becomes zero in proportion to 82 ; that is to say, the direction of the curve becomes vertical. Wherefore, if we make OD=D such that D? = A?+42H?, we shall obtain that depth at which the curve is upright, or at

which the horizontal ordinate DQ is the greatest, and then the equation takes the form—

82(D? — 2?) = 28x/28z ,

by help of which we should be able to find z in terms of z. The computation, however, is attended with considerable

Fig. 6.

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difficulty, and therefore it may be convenient to attempt

a graphical solution. Since, for any vertical ordinate

HP(=z), the horizontal thrust is 2(D? — 2), while the oblique

strain is $(D?— A®), the obliquity of the curve at P has for

its cosine the value a , wherefore the angle at which

the curve crosses the horizontal line pP is known. Let then a multitude of such lines be drawn in the space between BA and DQ, and let the narrow spaces thus marked be crossed in succession from A downwards by lines at the proper inclination, and we shall obtain a representation of the curve, which will be nearer to the truth as the intervals are more numerous. 'The beginning of the curve at A may be made a short are of a circle described from the centre C.

*Since the minute differentials thus obtained are pro- portional to the sides of a triangle whose hypotenuse is D? — A?, and one of whose sides is D?— z?, we must have— 8 a 5 * {DAR (Day? and the integration of this would give the value of x. If we put ¢ for the inclination of the curve at any point P,*

D?— 2 = (D? — A®) cos ¢, .. = {D? —(D?— A") cos d}}, and taking the differential, 82 = }(D? = A") sin {D2 — (D?— A2) cos $} d¢, 3 H.cos 0.30 a o=" /{D?— 2H cos QP}?*

where 2H is put for its equivalent D?—A%, The integral of this expression may be obtained by developing the radical in terms arranged according to the powers of cos 4, and then integrating each term separately. The result is a series of terms proceeding by the powers of cos ¢, the coefficient of each power being itself an interminate series ; and the rate of convergence is so slow as to make the labour of the calculations very great. Such expressions belong to the class of elliptic functions, for which peculiar methods have been devised. Fortunately the actual calculation is not required in the practice of bridge- building, and therefore we shall only refer the reader to the above-named subject.

If the horizontal thrust and the thickness at the crown of the arch be prescribed, the radius of curvature there must be the same whichever of the two hypotheses be adopted ; now, if we sweep an arch from the centre (with the radius CA, the catenarian curve lies outside of it, while the curve which we have just been considering lies inside. Each of these is compatible with sound principles: the one if the inner ends of the arch-stones be dressed

with horizontal facets, the other if the ends be dressed to a continuous curve ; wherefore, between these two limits we may havea vast variety of forms, each of which may be made consistent with the laws of equilibrium by merely dressing the inner ends of the arch-stones at the appro- priate angles. Hence an entirely new | field of inquiry, in which we may find | the complete solution of the general problem :—

“The intrados and extrados of an arch being both prescribed, to arrange / Pp the parts consistently with the laws 7 of equilibrium.”

Let PQ represent the inner end of one of the arch-stones, the part Qg being vertical, and Pg being sloped at some angle which is to be found ; put ¢ for the tangent of the inclina- tion of the joint P to the vertical, 6 . for that of Pg to the horizontal line, sag the horizontal

Il. — 42

Fig. 7.

The ability of a substance to resist a crushing pressure is generally measured by the length of the column which it is able to support, without reference to the horizontal section ; but it may be questioned whether this mode of estimation be a sound one, for it does seem natural to suppose that a block three inches square should bear a greater load than nine separate blocks each one inch

strain at P is = while the corresponding strain at Q is

w + dw

t+¢t ’ but the obliquity of Pg causes the load Sw which is placed on it to generate a horizontal pressure 68w, wherefore—

and if Pg were horizontal these would be alike ;

- ut = 68w, whence square, seeing that the centre block in the entire stone is protected on all sides; and thus it is possible that we

ja 1 or Qt ua | under-estimate the greatest practicable span of a stone 2 iw ¢ bw t arch. This difficult subject belongs to the doctrine of

Now, when the forms of the intrados and extrados are | "Strength of Materials."

both given, the values of w, ¢, Sw, St, are thence deducible, so that the value of @ may always be computed by help of differentiations only ; excepting, indeed, that integrations may be needed for determining the value of w, which is the area included between the two curves.

In this very simple investigation we have the com- plete solution of the principal problem in bridge-building. The data needed for determining the shape of the inner end of the arch-stone are already in the hands of the architect, who must know, from his plans, the weight of each part and the inclination of each joint ; so that, with a very small addition to the labour of his calculations, he is enabled to put the structure completely in equilibrium, even on the supposition of there being no cohesion and no friction; that is to say, he is enabled to obtain the greatest stability of which a structure having the prescribed outlines is susceptible. Even although he may not care to have the stones actually cut to the computed shape, and may regard their usual roughness and the cement as enough, he may judge, by help of the above formula, of the practi- cability of his design ; for if at any place the value of 00¢ come out with the wrong sign, that is, if w.d¢ be' less than t.5w, the building is unstable, whereas if w.dot be greater than ¢.5w everywhere, the design, as far as these details go, is a safe one.

Arc, SKEWED. —In the earlier days of bridge-building the road was led so as to cross the river or ravine perpen- dicularly, but in modern engineering we cannot always afford to make the detour necessary for this purpose, and must have recourse to the skewed or oblique arch, having its plan rhomboidal, not rectangular. 1f AB, CD, figure 8, represent the roadway, and EF,

In every possible arrangement of the details, the hori- zontal thrust at the crown of the arch is transmitted to and resisted by the ultimate abutments. The only effect, in this respect, of varieties in the form of con- struction is to vary the manner of the distribution of that strain among the horizontal

courses. Hence one great and essential element of security,—the first thing, indeed, to be seen to,—is that the ground at the ends of the pro- posed bridge be able to resist this out-thrust. Another, and not less important one is,.that the arch-stones be able to withstand the strains uponthem. In this respect much depends on the workmanship ; it is all important that the stones touch throughout their whole surfaces: if these surfaces be uneven the stones must necessarily be subjected to transverse strains, and so be liable to fracture. The practice, too common among house-masons, of cheaply obtaining an external appearance of exactitude, by confining their attention to a chisel-breadth around the outside, is not permissible here, nor should any reliance be placed on the layer of mortar for making up the inequalities.

The limit to the span of an arch depends primarily on the quality of the material of the arch-stones. At the crown of the arch the horizontal thrust is the weight of as much of the masonry as fills a rectangle whose length is equal to R, the radius of curvature, and whose breadth is A, the effective thickness there; now this strain has to be borne by the arch-stones, whose depth we shall denote by d, and therefore these stones must be subjected, as it were, to the

Fig. 8.

GH, the boundaries of the abutment walls placed obliquely, we easily perceive that the thrust cannot be perpendicular to the abutments, for then it would go out on the side walls which have no means of resistance; the thrust can only be resisted in the direction of the road. Hence if the structure be divided into a multitude of slices by vertical planes parallel to the parapet, the strains belonging to each slice must be resisted within that slice, and each should form an arch capable of standing by itself. The abutment, therefore, cannot have a continuous surface as in the common or right arch, but must be cut in steps to resist the oblique pressure ; wherefore also the ultimate founda- waar stones must present surfaces perpendicular to the road.

Attending for the moment to one only of these divisions, say to a thin slice contiguous to the side wall EG, let us study the manner in which the arch-stones in it must be shaped. At the crown I the pressure is horizontal in the

plane EIG, and therefore the joint of the stones there must be perpendicular to AB, and so also must be its projection on the horizontal plane.

Proceeding along the line of the curve to the point R, we observe that the pressure there must be in the direction of a tangent to the curve, wherefore the surface of a joint at R must be perpendicular to that tangent, and the

direct. pressure of a vertical column whose height is =

This column must be much shorter than that which the stone is actually able to bear.

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exposed face of the stone must be right-angled. Now, the projection upon a horizontal surface of a right angle placed obliquely is not necessarily right ; in this case it cannot be right, and therefore the course of a line of joints repre- sented in plan must bend away from being perpendicular to the side wall towards being parallel to the line of the abutment. Thus a continuous course of joints beginning at I must be shown in plan by some curved line such as IPp.

In many of the skewed bridges actually built, the out- line of the arch is divided into equal parts, as seen on the ends of the vault; the curved joint-lines IPp thus become portions of screws drawn on an oblique cylinder, and, although the arch-stone at the crown be rectangular, those on the slope cease to be so. The bearing surface is thus inclined to the direction of the pressure, and the tendency is to thrust out the arch-stones at the acute corners F and G. The fault is exactly the same as if, in ordinary building, the mason were to bed the stones off the level. The consequence is that skewed stone-bridges have not given satisfaction, the fault being attributed to the principle of the skew, whereas it should have been assigned to the unskilfulness of the design.

Let figure 9 be an elevation projected on a vertical plane parallel to AB, EIG, FSH, being the outlines of the ends

Fig. 9.

of the arch, and the sections taken at equal intervals along the crown line being also shown ; then, since the projection of a right angle upon a plane parallel to one of its sides is always right, the joint at R, as seen on this elevation, must be perpendicular to the curve at R, and thus the curve IP», representing one of the joint-courses, must cross each of the vertical sections perpendicularly. In this way each of the four-sided curvilinear spaces into which this elevation is divided must be right-angled at its four corners. This law is general, and enables us to determine the details of any proposed oblique arch.

If we draw, as in figure 9, the end elevation of the vault as intersected by numerous parallel planes, and lead a curved line crossing all these intersections perpendicu- larly, we obtain the end elevation of one of the joint- lines, and are able from it to prepare any other of its projections. The form and character of this end elevation IPp depends entirely on the nature of the curve EIG, but is the same whatever may be the angle of the skew. In order to examine its general character, let us take in the crown line two closely contiguous points I, K, and from these lead the joint-lines IP, KQ, of equal length, then the straight line PQ is equal and parallel to IK, on any of the projections.

If in the end elevation, figure 9, we continue the joint IP to meet the vertical section OQ in p, we may regard PQp as a small rectilineal triangle, right angled at p, while PQp is the inclination to the horizon. Now, PQ:Qp:: R: cos PQp, while PQ is equal to KI, the breadth of the arch-stone at the crown, wherefore the breadth of the course at the crown is to the breadth of the same course at any other place as radius is to the cosine of the inclination there. Hence it follows, as is shown in the end elevation, figure 10, that the arch-stones gradually diminish in breadth from

ddl the crown downwards, being halved in breadth at an inclination of 60°. Ata greater inclination they become

Fig. 10.

still narrower, and an infinity of them would be needed to reach the abutment of a semicircular or semi-elliptic arch, because the cosine of the inclination there is zero. In no properly-built skewed bridge can the arch-

stones show equal divisions ; and it is impossible to continue the arch to the complete half circle or half ellipse.

Passing from the end elevation, figure 9, to the plan, figure 8, we observe that Qp on the plan is less than' the actual Q p of the elevation in the ratio of the cosine of the inclination to radius, and, therefore, on the plan, the breadth at the crown is to the apparent breadth of the course at any other place as the square of the radius is to the square of the cosine of the inclination there; so that, at the inclina- tion of 60° the apparent breadth will be quarter of that at the crown.

Again, in figure 11, which is the side elevation of the vault, or its projection on a vertical plane per- pendicular to the road, the apparent distance Qp is to the actual dis- tance Qp of figure 9 as the sine of the in- clination is to radius, wherefore, the apparent breadth Qp on this pro- jection is proportional to the product of the sine by the cosine of the inclination, that is, to half the sine of twice the inclination. The width on this projection is therefore greatest at an inclination of 45°, being there just one-half of the actual breadth at the crown of the arch.

This reasoning is founded on the supposition that the distance IK is excessively small, and the resulting con- clusions are strictly true only of an infinitely narrow course of arch-stones; they are, indeed, differential equations which must be integrated in order to be applied to actual practice. Thus we have seen that the curved line IP, figure 9, crosses the section NP perpendicularly at P, but then it does not continue in this direction for any perceptible distance. The draughtsman may attempt to trace it by making the sections very numerous, and by drawing perpen- diculars across the successive intervals; but however nume- rous he may make these sections, he can thus only effect an approximation to the true curve. We must integrate, that is, we must obtain the aggregate of an infinite number of infinitely small portions in order to reach an absolutely true result.

These conclusions hold good whatever may be the out- line of the arch. The most common, and therefore the most interesting case, is when the longitudinal section is circular, the cross section taken perpendicularly to the abutment being then an ellipse with its shorter diameter placed

horizontally, the vault being an oblique cylinder. Figure 9 is actually drawn for the circular arch. If then O be the centre of the circular arc NP, the curve IP must

Fig. 11. –

at P tend towards Q, so that the draughtsman, while mak- ing the step across one of the intervals, has only to keep his straight edge up to the corresponding place of the centre. If we place the paper horizontally, fix a small heavy round body at P to the end of a thread OP, and then draw the end O of that string along the straight line HEF, P would always move towards the then position of the point O, and would trace out the curve of which we are in search. The projection, then, of the joint of an oblique circular arch upon a vertical plane parallel to the road, is always the curve known by the name of the Tractory. All tractories have the same shape, the size merely is regulated by the length of the thread OP, that is, by the radius of curvature of the circular arch. Hence, if the delineation of it have been accurately made in one case, the curve for another case may be obtained by mere enlargement or reduction ; or, still better, in all cases it may be traced by help of a table of co-ordinates, such as that subjoined, which shows the dimensions of the tractory as represented in figure 12, in decimal parts of the radius of curvature of

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{| ~------ – —, 0

Fig. 12.

the arch. The computations have been made for equal motions of the point O, corresponding, therefore, to equal dis- tances measured along the crown-line of the arch. The head- ings of the columns sufficiently explain their contents. By help of these the form of the tractory may easily be obtained, and with a piece of veneer or of thin metal cut to this shape, the architect may obtain all the details of the intended structure, first working

out the said elevation, figure 9, and transferring the several points therefrom to the other projections.

If we put s for the angle of the skew, v for the distance IN measured along the crown of the vault, and 7 for the inclination at the point P, r being the radius of the arch, the distance IN or 2O of figure 10 is clearly v sin s, and as the result of the integration, we obtain—

v sin s y

—_— = Nap. log tan (45° + 3%), by help of which equation we can readily determine 7 when v is known, or v when zis given. The table of Napierian logarithmic tangents being very scarce, it is convenient to convert these into denary or common logarithms. Putting, as is usual, M for the modulus of denary logarithms, that is, for 43429 44819, the above equation becomes—
.

MO, Ko 72. sin s=log tan (45° + 32),

from which it is quite easy to tabulate the values of 7 cor- responding to equidifferent values of v, because the constant factor— M.sins T

3

has to be only once computed; 7, that is, the number of degrees in the are NP being thus computed for each of the successive sections of the vault, we have only to divide a tape-line so as to show degrees and minutes of the actual circle in order to be able at once to mark the course of the

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joints upon the centering of the arch ; or better still, instead of the degrees, we may write upon the tape the successive values of NP, and then the cominonest workman will be able to lay off the lines.

sin? cos ¢ (-sin ¢

*0 “00000 1:00000 *00000*

‘1 09967 “99502 00033

2 “197388 98033 “00262

*o *29131 95663 “00869 “4 *87995 92501 02005*

*5 *46212 88682 03788 6 “53705 84355 06295 74 *60437 79670 09563 8 66404 74770 “13596*

*9 ‘71630 69779 “18370 1:0 ‘76159 64805 *23841 jhe “80050 59933 “29950*

*12 *833865 55229 36635*

*1°3 “86172 50738 *43828 1°4 *88535 46492 “51465 ns, 90515 42510 59485*

16 92167 38798 57833

*ner, ‘93541 35357 *76459 1°8 “94681 32180 *85319 1°9 95624 29259 *94376 2°0 96403 26580 1:08597 2°1 97045 24129 1°12955 2°2 – “97574 21892 1°22426 2°3 ‘98010 19852 1°31990 2°4 98367 17995 1°41633 2°5 ‘98661 16307 1°513839 2°6 989038 14778 1°61097 27 99101 13381 1°70899 2°8 99263 12117 1°80737 2°9 99396 10971 1:90604 3°0 “99505 09933 2°00495 OT | Te. iT*

The only other kind of skewed arch likely to possess any interest is the elliptic. In right arches the semi-ellipse is sometimes used on account of the grace of its form, but this reason for its adoption disappears in the case of the skew, because then we can only use a portion of the semi-ellipse. The end elevation of a joint in an elliptic skewed arch is a modified form of the tractory, and the general features of the arrangement are analogous to those of the circular arch.

The arch-stone of a common bridge is wedge-shaped, having two flat faces AacC, BddD, inclined to suit the breadth of the course, but in the skewed bridge the corre- sponding faces are twisted, Cc not being parallel to Aa,

and thus the dressing of them requires both skill and care. The dimensions of the stone and the inclinations of its four

Fig. 13. edges may easily be computed when its intended position is known, and thus the degree of twist on each of its faces may be ascertained, and the lines may then be marked off on the ends of the stone.

_ The theory of the skewed arch was given for the first time in the Z'ransactions of the Royal Scottish Society of Arts for 1833 ; from which it was copied into the Civil Engineer and Architect's Journal for July 1840, which see.

(For the history and various forms of the arch see ARCHI- TECTURE.) (z. 8.)

RCHAOLOGY, from dpxaios, ancient, and Adyos, a description. The term Archeology, like that of Antiquities, has been employed, until a very recent period, in a seuse so restricted and arbitrary as strikingly to con- trast with the latitude admissible according to the original derivation of the word. Literally it signifies the study of antiquity or ancient things; but its precise significance has been determined from time to time by the range of study and research most in favour. To some extent it has always been recognised as embracing whatever pertained to the early history of any nation, but in its details it was applied almost exclusively to the study of Greek and Roman art, or of classical antiquities generally. The pro- gress of geology, and the application of sound principles of induction to the study of primitive antiquities, have wrought a great revolution, and few studies now rival archeology in comprehensive interest.

In looking at the succession of strata of the earth's crust it was assumed till recently that the student of man and his remains is limited to the latest superficial formation of post-tertiary strata. To the paleontologist was assigned all ancient animal life of the fossiliferous strata, while the archeologist treated of man and his works as things essen- tially distinct.

The diverse functions of the two sciences are still clearly recognised; but the archeologist is no longer supposed to be excluded either from quaternary or tertiary strata in his search not only for the remains of human art, but for the osteological evidences of man's pre- sence contemporaneous with the fauna of such geological periods. One class of archeologists, accordingly, confi- dently anticipate the recovery not only of works of art, but of the fossil remains of man himself, in the pliocene, or even the miocene strata. So far, however, as any reliable evidence can guide opinion, it scarcely admits of question that neither has hitherto been found in older deposits than the later tertiary, or quaternary.

The actual remains of man, the specific form of his osseous structure, and above all of his skull, now receive the minutest attention; and the department of anthropo- logy to which such investigations are specially assigned has latterly acquired a fresh interest from the inquiries suggested by novel theories as to the possible evolution of man from lower animal organisations. Nevertheless, the researches of the paleontologist and of the archeologist are based on essentially distinct evidence. The life of geological periods is investigated by means of the fossil bones and teeth which alone survive. Or if to these have to be added such illustrations of habits, food, and struc- ture as are furnished by means of footprints, coprolites, and the like subsidiary evidence, still all are traceable, directly or indirectly, to the living organism. Man, on the contrary, in times altogether preceding history, is chiefly studied by means of his works. Archeology thus forms the intermediate link between geology and history, though the reaction, at the revival of learning in the 16th century, which tended for a time to subordinate arts and science alike to classical authority, reduced it within greatly nar- rower limits. Nevertheless, the fitness of the term for the most comprehensive definition in relation to all which per- tains to the past could not be entirely overlooked, and it is even employed repeatedly by Dr Prichard as nearly synonymous with paleontology. In this, however, he has not been followed, and the name is now universally adopted

to designate the science which deduces the history of man-

from the relics of the past. So comprehensive a subject necessarily admits of great subdivision. The most im-

portant general division will be treated of separately in the article on CLassicaL ARCHRoLOGY (p. 343, sgq.), while in- teresting branches of the study will be reviewed under the heads of Egyptian, Etruscan, Assyrian, Mexican, and Indian antiquities. Numismatics, pottery, heraldry, hieroglyphics, palzography, and other subdivisions in like manner deal with important details, and help to illustrate the compre- hensiveness of the subject.

The innate cravings of the human mind for an insight into the future have shaped themselves into many forms of divination and astrology. But this desire is not more uni- versal than that which prompts man to aim at a recovery of the secrets of the past. The question Whence? even more than that of Whither? is found to give shape to the mythic legends of the rude barbarian, and to constitute an im- portant element in the poetry and mythology of every nation's oral and written history. With the progress of society such indices of the past are subjected anew to critical analyses; aud we accordingly find abundant traces of an archeological spirit in the literature of every civilised nation. The influence of the same craving for a mastery of the past is seen adapting itself to the spirit of the age at every epoch of great progress. The revival of art and letters in the 14th and 15th centuries was signalised by a renewed appreciation of Greek and Roman models; and while the progress of opinion in the 16th century was accompanied by an abandonment of medizval for classic art, the tendency of Europe in our own day, amid many elements of progress, has been singularly consentaneous in the return not merely to medieval art, but to medieval modes and standards of thought, and in the attempt to attain to higher excellence than has been yet achieved by a more perfect development of the ideal of the niddle ages.

The alliance of archeology with geology, and the direc- tion of geological research to the evidences of the antiquity of man, have largely contributed to its expansion, until in its comprehensive unity it embraces the entire range of human progress from the infantile stage of primeval arts to the earliest periods of written records. It has thus been developed into a

systematic science, by which the intelli- gent investigator is enabled to pursue his researches with the aid of evidence older than all written chronicles, and to recover chapters of national infancy and youth heretofore deemed beyond recall. The geologist, with no aid from written records, follows out his inquiries through succes- sive periods of the earth's history, and reveals the changes it has undergone, and the character of the living beings which animated epochs of the globe ages before man was called into being. Beginning with the traces of life in the primary fossiliferous strata, he passes on from system to system, disclosing a vast succession of long extinct life, until in the Jatest diluvial formations he points to the re- mains of animals identical with existing species, and even to traces of human art—the evidence of the close of geo- logical and the beginning of archeological periods. Here archeological science ought to be ready to take up the narrative, and with a more comprehensive minuteness of detail and greater certainty as to the conclusions arrived at. Such, however, until very recently, has not been the case. The geologist himself long confused the records of the transitional period by his mistaken reference of all diluvial traces to the Noachian deluge; and when, pausing, as he thus believed, at the dawn of the historic period, he turned to the archeologist for the subsequent chapters of the history of life on our globe, it was only to receive a record of Roman traces at best but meagrely supplementing the

minuter details of the historian. Nearly the same was the case with all historic antiquity, with the single exception of the wonderful monuments of Egypt, which preserve to us the records of a civilisation in which we can recognise the origin of arts, letters, and all else to which the culture of the oldest historical nations may be traced.

Nevertheless, the evidences of the primitive arts, and the traces of a native civilisation originating among the prehistoric races of Europe, had been long familiar to the antiquary, though he failed to form any intelligent concep- tion of their significance as historical records. Their inter-pretation on an intelligent and systematic principle is mainly due to the archeologists and ethnologists of Den- mark and Sweden, who from their very geographical position were happily freed from the confusing element

of classical prejudices, and were compelled to seek in other than Roman sources an origin for the abundant traces of metallurgic art. Zealous British coadjutors speedily caught the hint, and freed themselves from the trammels which had so long narrowed their aim; the remains of primitive art were referred to true sources, or at least arranged under an intelligent system of chronological sequence ; and thus the desultory and often misdirected labours of the anti- quary have given place to researches characterised by scientific accuracy.

The system of primitive archzology thus introduced has since been modified and carried out into ampler details, as the fruit of more extended discoveries, chiefly effected in France and England; but the three primary divisions, the Stone, the Bronze, and the Iron Periods, are still retained. The arrangement is warranted alike by evidence and by its practical convenience, though later research has given to the stone period a comprehensiveness undreamt of before, and so led to its subdivision into two ages of prolonged duration, with distinctive characteristics of primi- tive art. (1.) The Stone Period, as the name implies, is that in which the rude aboriginal arts, which the com- monest necessities of man call into operation, are assumed to have been employed entirely on such available materials as stone, horn, bone, &c. (2.) The Bronze Period may in like manner admit of subdivision, though the term is con- veniently employed, in its most comprehensive sense, for that era of progress in which the metallurgic arts appear to have been introduced and slowly developed—first, by the simple use of native copper, followed by the application of fire, the construction of moulds, and the discovery of such chemical processes as the alloying of copper and tin, and the consequent production of the beautiful and useful alloy which gives name to this the earlier metallurgic era. (3.) The Iron Period marks the era of matured metallurgic arts, and the accompanying progress consequent on the degree of civilisation which is the inevitable con- comitant of such a state of things. While, however, those divisions hold good in their general application, they must not in every case be applied too rigidly. The archeologist is constantly recalled to the distinction between the re- searches of the paleontologist, as dealing with the traces of organic life, and his own study of the works of a rational being marked by all the diversities traceable to the reason- ing and volition of the individual workman. Local facili- ties have also modified the arts of

primitive man in various ways. Insome localities, as in North America, pure native copper abounds ; while on the other hand, in certain districts of Africa iron occurs in such a condition that it appears to have been wrought by the primitive metallurgist from very remote times.

All those periods embrace eras concerning which no con- temporary written records exist; and in relation to most of them nearly as little is known directly as of the older periods with which the geologist exclusively deals. It

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need not therefore excite surprise that the process of in- duction established on this basis has been challenged by historical writers of high standing, but whose exclusive labours on the records of periods admitting of documentary evidence and charter proof render them little disposed to sympathise with a course of reasoning relative to the history of man, such as has, in the hands of the geologist, revealed go much in relation to more ancient life. The further, however, that research is pursued, alike into the habits of living races of savages, and into the characteristics of the oldest traces of primitive art, the more clearly does such a process of development, from the first rude working in stone to the highest arts of the skilled metallurgist, become manifest.

The Australians, the Maories of New Zealand, and the whole widely-scattered races of the Polynesian Islands, the Caribs and other natives of the American archipelago, with all the nomade tribes of the New World, from Patagonia to the Arctic circle, were, when first discovered, without any knowledge of the metals as such, and supplied their wants by means of implements and weapons of stone, shell, bone, or wood. 'The civilised Mexicans and Peruvians, on the contrary, when first visited by the Spaniards in the 16th century, were familiar with the working of copper as well as gold,—though totally ignorant of iron, and also retaining for common purposes many of the primitive stone weapons and implements, only substituting the abundant obsidian of their volcanic region for flint. Greece passed from its bronze to its iron age within the period embraced in its literary history ; and the mastery of the art of working the intractable iron ore is traceable with tolerable clearness in the early history of Rome,

not very long before it came in contact with the trans-Alpine barbarians. Among most of the Germanic and Celtic tribes iron appears to have been already known when they first came in contact with the aggressive civilisation of the south ; and from one of them, the Norici (in whose country, in the Austrian valleys of the Danube, this metal is still wrought with the highest skill), there is reason to believe that the Romans acquired the art of making steel. .

If history is only to begin, as that of Britain has been made to do, with the date of the first collision with invading Rome, then, no doubt, stone and bronze periods are as meaningless as are eocene and miocene periods to the geologist who assigns the Mosaic deluge as the source of the earliest phenomena of his science. To those, however, who are willing to follow inductive reason- ing to its legitimate conclusions it must be apparent that it is no visionary theory, but a system founded in well- established truth, which arranges the archeological records of primitive history and the remains of human art into stone, bronze, and iron periods. Even here, however, an important distinction in the employment of such materials as a basis of inductive reasoning indicates the greatness of the revolution involved in the introduction among the living creatures inhabiting this earth of a being endowed with intelligence, and supplementing the natural resources of animal life by arts even of the most primitive kind. It must indeed be borne in remembrance that geological and historical chronology are very different things, and that the idea implied in the contemporaneousness of strata bears a very slight approximation to the coincidence of contemporaneous events and productions of an historical era. The doctrine of geological continuity is indeed challenged in certain respects; but on the whole, the geological formations, with their included organic remains, may be assumed to obey a natural and unvarying order ; and so, within the compass of geological periods, to be of contemporaneous origin. But, notwithstanding certain extreme assumptions, based on the theory of evolution, and

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involving the consequent existence of man in remote geolo- gical eras, so far as all actual evidence can yet guide us, it is correct to say that, geologically speaking, the entire history of man is embraced in one period. But in the works of art, which form the bases of archeological induction, a new element—that of mind, or the reasoning faculty, along with the imitative and social arts—is introduced, and greatly complicates its subdivisions. The stone period of Britain or Denmark is analogous to that of the Polynesian Islands. So ¢losely do their tools and weapons resemble each other that it requires a practised eye to distinguish the stone axe or flint lance-head found in an ancient British barrow from implements brought by some recent voyager from the islands of the Southern Ocean. Nor could the most experienced archeologist undertake in every case to discriminate between the flint arrow-head dug from some primitive barrow of undated centuries before the Christian era, and the corresponding weapon brought by some recent traveller from Tierra del Fuego or regions beyond the Rocky Mountains. The inference is therefore legitimate, that in those Polynesians, Fuegians, or Indians of the North-West, we have examples of tribes in the same primitive stage as were the aborigines of Europe during its stone period. Chronologically, however, the stone period of Europe and that of the Pacific islands or the American continent are separated by thousands of years. In like manner, the bronze age of Mexico was undisturbed by all later elements when first brought into contact with the matured civilisation of Europe in the 16th century, while the close of that of Britain preceded the Ist century of our era. The same rule is applicable to the primitive archeology of all countries ; and a fertile source of error and misconception has already had its rise in the assump- tion that because Greece and Italy, Germany, Gaul, Scandinavia, and Britain, have all had their primitive stone and bronze periods, therefore the whole must have been contemporaneous. It cannot therefore be too strongly enforced as one of the most essential points of variance in the reasoning of the geologist and the archeologist, that the periods of the latter, though synonymous, are not neces- sarily synchronous ; but that, on the contrary, nearly all the phenomena which pertain to the natural history of man, and to the historic development of the race, may be witnessed in their various stages in contemporary races of our own day—from rudimentary barbarism, and the absence of all arts essential to the firt dawn of civilisation, to a state of greatest advancement in the knowledge and employment of such arts.

Some progress has already been made in an approxi- mation to certain chronological data of much importance relative to such primitive periods of the history of nations. But the archeologist, as well as the geologist, is learning to deal with periods of time which cannot always be measured either by years or centuries, but rather must be gauged by those chronological stages in the history of our planet in which epochs and periods take the place of definite subdivisions of solar time. Nevertheless, geological evidence of changes which are known to have occurred within the historic period supplies an important key to the approximate duration of certain eras characterised by traces of human art ; and while by the intelligent observation of such remains in the superficial strata, mingling with the fossil evidences of extinct and familiar species of animal life, the link is supplied by which man takes his place in an unbroken chain of creative existence, sweeping back into so remote a past, the evidences of matured art pertain- Ing to periods unrecorded by history supply later links of the same chain, and reunite the present with all former ages,

The system of primitive archeology which is found appli-

cable to British antiquities so closely corresponds in all its essential features to that of Europe prior to the era of authentic history, that the purpose of such an abstract as this will be most conveniently accomplished by presenting its leading points as examples of the whole, illustrating these in passing by the analogous remains discovered in other countries. The apparent simplicity of a primitive stone period has been considerably modified by recent research ; and the careful study of the remains of ancient art, in their relation to accompanying geological phenomena, or of the evidences of artificial deposition in caves, barrows, chambered cromlechs, cairns, or other sepulchral structures, suggests the subdivision of prehistoric archzology into a succession of epochs included within the period of non-

-metallurgic arts.

But before defining the archeological subdivisions of time it is indispensable to glance at the paleontological elements of the question, and the evidences they supply in relation to comparative chronology. One of the most re- markable phenomena affecting the conditions of life in Europe in

recent geological epochs is the existence of a period, of long duration throughout the northern hemi- sphere, of a temperature resembling that of the Arctic regions at the present time. After a period more nearly approximating in its conditions the heat of the tropics at the present day, though otherwise under varying states to- wards the end of the tertiary epoch the temperature of the whole northern hemisphere gradually diminished, until the mountainous regions of Scotland and Wales—then pro- bably of a much higher elevation—resembled Greenland at the present time; and this Arctic temperature gradually extended southwards to the Alps and the Pyrenees. The glaciers formed under the influence of perpetual frost and snow descended from those and other mountains into the valleys and plains over the greater portion of central Europe and northern Asia ; and this condition of things, pertaining to what is known as the glacial period, was one of greatly prolonged duration.

After some partial modifications of this low temperature, and a consequent advance and retrocession of the glacial influences in France and elsewhere, along what was then the border lines of a north temperate zone, the glacial period drew to a close; a gradual but persistent rise of temperature carried the lines of ice and perpetual snow further and further northward, excepting in regions of great elevation, as in the Swiss Alps. This was necessarily accompanied by the melting of the vast glaciers accumu- lated in the mountain valleys throughout the protracted period of cold. The broken rocks and soil of the highlands were swept into the valleys by torrents of melted ice and snow; the lower valleys were hollowed out and re-formed under this novel agent; and the landscape received its present outlines of valley, estuary, and river-beds from the changes wrought in this diluvian epoch. The enormous power of the torrents thus acting continuously throughout a period of prolonged duration, and the vast deposits of sand, gravel, and clay, with the embedded remains of con- temporaneous animal and vegetable life with which they everywhere covered the plains, were viewed till recently solely in relation to the Mosaic narrative of a universal deluge, and were referred implicitly to that source. But recent though the epoch is when compared with older geological periods, its antiquity is enormous in relation to historic chronology ; and instead of being the product of a sudden cataclysm of brief duration, it represents pheno- mena which required a period of long protracted centuries for their evolution.

Within this late tertiary, or quaternary, period are found the remains of animal life contemporary with primeval man and his earliest arts. The very characteristics of some of

the fossil mammals of the period, so diverse from all that we have been accustomed to associate with man, help to suggest ideas of even an exaggerated antiquity for the era to which they are assignable, and to relegate it to the remotest conceivable antiquity consistent with all other evidence of the oldest traces of man or his arts seemingly contemporaneous with them. Of those now wholly ex- tinct, the mammoth or Elephas primigenius, the Llephas antiquus, the Rhinoceros tichorinus, the Hippopotamus major, and such great cave carnivora as the Ursus spelceus and the Felis spelea, are most noticeable for their great size, and in some cases for their enormous destructive powers, in striking contrast to the seemingly helpless condition of primitive man. Yet even some of those formidable mammalia probably owed their extinction fully as much to the presence of man as to any change in temperature and consequent alteration in the required conditions of climate and habitat. We are accustomed to regard the lion, tiger, leopard, panther, and others of the great Felide as per- taining exclusively to tropical countries. They are in reality limited to tropical jungles and uncultivated regions of great extent, where the abundance of wild vegetable- feeding animals supplies their food. The existence of neither is compatible with the presence of man in any great numbers; but in his absence those beasts of prey greatly extend their range. The Indian tiger not only follows the antelope and deer in the Himalayan chain to the verge of perpetual snow, but the tiger, leopard, panther, and cheetah hunt their prey beyond that mountain range, even into Siberia.

The influence of man in the extirpation of the wild fauna is illustrated by another class of extinct animals of many historical regions, which yet survive in more favour- able localities. The discovery of abundant evidence of a period in the history of central and southern France when the reindeer (Cervus tarandus) formed one of the chief sources both for the food of man and for the materials from which his weapons and implements were made, seems to carry us back to an era, inconceivably remote, when central

France was in the condition of Lapland in medizval or still earlier centuries. But the climate of North Britain is not even now incompatible with the existence of the reindeer, and its favourite moss abounds in many parts of the Highlands. It need not therefore surprise us to learn that traces of the reindeer are by no means rare in Scot- land ; and numerous examples of its horns have recently been recovered in more than one Caithness locality, with the marks of sawing and cutting for artificial use, and lying among other remains in stone-built structures of a primitive population of North Britain. How old they are may not be strictly determinable, but they help us to the acceptance of a very modern date for the presence of the reindeer there ; for Torfeeus states that so recently as the twelfth century the Jarls of Orkney were wont to cross the Pentland Firth to chase the roe and the reindeer in the wilds of Caithness. At the same date also we find the skin of the beaver rated for customs duties amongst articles of Scottish export specified in an Act of the reign of David I.

Another very characteristic animal pertaining to the pre- historic era of European man is the Megaceros Hibernicus, or gigantic Irish elk. Its bones occurred with those of the Elephas primigenius, the Rhinoceros tichorinus, the Ursus speleeus, and other extinct mammals, alongside of human remains and works of art, in the famous Aurignac cave of the Pyrenees; and in the recently-explored Brixham cave, on the Devonshire coast, similar remains of the fossil rhinoceros, horse, and reindeer, as well as of several extinct carnivora, lay embedded in the same breccia with flint knives. And not only haye the horns and bones of the

Megaceros Hibernicus been recovered from Irish bogs and marl – pits, with marks of artificial cutting, but a rude Trish lyre, found in the moat of Desmond Castle, Adare, has been pronounced by Professor Owen to be made from the bone of this extinct deer.

So is it with the ancient Bovide, not only adapted for the chase, but suitable for domestication ; such as the Bos primigentius, the Bos longifrons, and the Bison priscus. Their remains have been found in submarine forests, or mingling in the drift or cave deposits with the Hlephas primigenius, the Felis spelea, and others of the most gigantic fossil mammals; while

abundant traces reveal their existence not merely contemporaneous with man, but within definite historical periods.

The great alluvial valley of the river Forth has yielded another class of relics connecting the gigantic fossil mam- malia of a prehistoric epoch with man. The disclosures of the Carse of Falkirk have repeatedly included remains of the Elephas primigenius: and in at least one case its tusks were found in such perfect condition as to be available for the ivory-turner, though lying embedded at a depth of 20 feet in the boulder clay. But in the neighbouring valley of the Forth the fossil whale (Balenoptera) has not only been repeatedly found far inland, buried in the alluvial soil, at levels varying from 20 to 25 feet above high-water mark, but in at least two instances the rude lance or harpoon of deer's horn lay alongside of the skeletons; and near another of them were found pieces of stag's horn, artificially cut, and one of them perforated with a hole about an inch in diameter. Flint implements, an oaken quern, and other ingenious traces of primitive art, recovered from the same alluvial soil, all tell of a time when the British savage hunted the whale in the shallows of a tide at the base of | the Ochil hills, now between 20 and 30 feet above the highest tides and 7 miles distant from the sea.

There is no doubt that the disappearance of the whale from the British shores, like the reindeer from its northern valleys, is due far more to the presence of man than to any change of temperature so greatly affecting the con- ditions of life as to involve their extinction. Nevertheless it is convenient to recognise in the disappearance of such emigrant species from the historic areas the close of the paleontological age. The Urus, the Aurochs, the Bos longifrons, or native ox of the Roman period, and others of that important class of animals which man first began to turn to account for domestication, have also ceased to exist among European fauna ; but this is clearly traceable to the destructive presence of man. Within three or four centuries the Urus (Bos primigenius) was still known in Germany ; the Aurochs (Bos priscus) is even now preserved under special provection in Lithuania ; and herds of British

~~wild cattle in Cadzow forest, Lanarkshire, and at Chilling~~

ham Park, Northumberland, perpetuate varieties otherwise extinct.

Reverting, then, to the classification which prehistoric archeology admits of, in the light of its most recent dis- closures, it appears to be divisible into four distinct epochs, of which the first two embrace successive stages of the age of stone implements.

1. The Paleolithic Period is that which has also been designated the Drift Period. The troglodytes, or cave dwellers, of this primitive era were to all appearance contemporaneous with the mammoth, the woolly-haired rhinoceros, and the great cave carnivora already named. In England, France, Belgium, and other countries of Europe, numerous caves have been explored which were undoubtedly the habitations and workshops of the men of this period. These caverns vary in character and dimen- sions according to the geological features of the localities where they occur; but all alike involve the simple feature

of recesses, more or less ample, affording comparatively dry aud commodious shelter, and so being resorted to as places of habitation alike by wild animals and by man himself. But the most valuable for the purposes of the archeologist are a class of caverns which occur in limestone districts, and which, from the combined mechanical action of the water opcrating on a rock easily eroded, and its chemical action when charged with a certain amount of carbonic acid in dissolving the calcareous rock, are found expanded into long galleries and chambers of large dimensions. There the same chemical agents, acting under other cir- cumstances, have dissolved the limestone rock, and sealed up the ancient flooring at successive intervals, thereby fur- nishing a test of the duration of long periods of alternate action and repose, and yielding evidence of the most in- disputable kind as to the order of succession of the various deposits and their included bones and implements,

In Belgium, at Dordogne, and in some parts of the south of France, the caves and rock-recesses are of a much simpler character. Yet there also favouring circumstances have preserved contemporary deposits of the ancient cave- dwellers, their works of art, the remains of their food, and even their cooking hearths.

The caves of the drift period accordingly present peculiarly favourable conditions for the study of the post- pliocene period. Some of these caverns were evidently first occupied by the extinct carnivora of that period, as in the case of the famous Kent's Hole Cave of Devonshire, of which the lowest deposit is a breccia of water-worn rock and red clay, interspersed with numerous bones of the Ursus speleus, or great cave-bear. Over this a stalag- initic flooring had been formed, in some places to a depth of several feet, by the long-protracted deposition of car- bonate of lime held in solution in the drippings from the roof. Above this ancient flooring, itself a work of cen- turies, later floods had superimposed a thick layer of "cave-earth," in some cases even entirely filling up exten- sive galleries with a deposit of drift-mud and stones, within which are embedded the evidences of contempo- raneous life—bones and teeth of the fossil elephant, rhinoceros, horse, cave-bear, hyena, reindeer, and Irish elk ; and along with these, numerous weapons and imple- ments of chipped flint, horn, and bone —the unmistakable proofs of the presence of man. These, again, have been sealed down, in another prolonged period of rest, by a new flooring of stalagmite ; and thus the peculiar circumstances of those cave deposits render them specially favourable for the preservation of a coherent record of the period. Here are the evidences of the animal life contemporaneous with the men of the caves during the drift period; here also are many of their smaller flint implements—the flint-cores and the chips and flint-flakes, showing where their actual manufacture was carried on ; and the lances, bodkins, and needles of bone, which could only have been preserved under such favouring circumstances.

But besides the actual deposits in the caves, the river gravels of the same period have their distinct disclosures, The spear-heads, discs, scrapers, and other large implements of chipped flint are of rare occurrence in the cave breccia. Their size was sufficient to prevent their being readily dropt and buried beyond reach of recovery in the muddy flooring of the old cave dwelling; and the same cause preserved them from destruction when exposed to the violence involved in the accumulation of the old river drifts. In the north of France, and in England from Bedfordshire southward to the English Channel, in beds of ancient gravel, sand, and clay of the river valleys, numerous dis- coveries of large flint implements have been made—

from the year 1797, when the first noted flint implements of the drift were discovered in the same stratified gravel of Hoxne,

in Suffolk, in which lay bones of the fossil elephants and other extinct mammalia. The characteristics of the river-drift implements, as well as of the whole art of the stone age, have been niinutely described and illustrated in various works, but especially in Evans's Ancient Stone Implements, Weapons, and Ornaments of Great Britain. It is sufficient, therefore, to refer to such authorities for details.

But besides the numerous specimens of the manufactures in flint, horn, and bone, illustrative of the mechanical ingenuity of this primitive era, special attention is due to the actual evidences of imitative and artistic skill of the sculptors and draughtsmen of the same period.

Different attempts have been made, especially by French savans, to subdivide the paleeontologic age of man into a succession of periods, based chiefly on the character of the mammalian remains accompanying primitive works of art ; and the two great subdivisions of the elephantine or mammoth age and the reindeer age have been specially favoured. Among the works of art of the cave-men of Perigord, in central France, contemporary with the rein- deer, various drawings of animals, including the reindeer itself, have been found incised on bone and stone, apparently with a pointed implement of flint. But the most remark- able of all is the portrait of a mammoth, seemingly executed from the life, outlined on a plate of ivory found in the Madelaine Cave, on the river Vezére, by M. Lartet, when in company with M. Verneuil and Dr Falconer. If genu- ine—and the circumstances of the discovery, no less than tle character of the explorers, seem to place it above suspicion—this most ancient work of art is of extreme value. The skulls and other remains of five individuals have been found to illustrate the men of this period. The cerebral development is good, and alike in features and form of head they compare favourably with later savage races, Their drawings embrace animals, single and in groups, including the mammoth, reindeer, horse, ox, fish of different kinds, flowers, ornamental patterns, and also ruder attempts at the human form. They also carved in bone and ivory. Some of the delineations are as rude as any

recent specimens of savage art, others exhibit con- siderable skill; but the most remarkable of all is the representation of the mammoth. It has been repeatedly engraved, and as, to all appearance, a genuine contem- porary effort at the portraiture of that remarkable animal, its worth is considerable. But this sinks into insignificance in comparison with its value as a gauge of the intellectual capacity of the men of that remote age. It represents the extinct elephant, sketched with great freedom of hand, and with an artistic boldness in striking contrast to the laboured efforts of an untutored draughtsman. Whatever other in- ference be deduced from it, this is obvious, that in intel- lectual aptitude the paleolithic men of the reindeer period of central France were in no degree inferior to the average Frenchman of the 19th century.

2. This first or palzeolithic period, with its characteristic implements of chipped flint, belonging to an epoch in which man occupied central Europe contemporaneously with the mammoth, the cave-bear, and other long-extinct mammals, was followed by the second or Weolithic Period, or, as it has been sometimes called, the Surface-Stone Period, in contradiction to the Drift Period, characterised by weapons of polished flint and stone. The discovery and exploration of the ancient Pfahlbauten or lake villages of Switzerland and other countries, including the crannoges of Ireland and Scotland, and of the kjokken-méddings or refuse-heaps of Denmark, Scotland, and elsewliere, have greatly extended the illustrations of this period, and given definiteness to the evidences of its antiquity. But while it thus includes works of a very remote epoch, it also

embraces those of later regular sepulture, with the sepul- chral pottcry of rudest type, the personal ornaments and other remains of the prehistoric races of Europe, onward to the dawn of history. It even includes the first traces of the usc of the metals, in the employment of gold for personal adornment, though with no intelligent recognition of its distinction from the flint and stone in which the workmen of this ncolithic period chiefly wrought. The nearly indestructible nature of the materials in which the manufacturers alike of the palzolithic and the neolithic period chiefly

wrought, helps to account for the immense number of weapons and implements of the two prolonged ages of stone-working which have been recovered. The specimens now accumulated in the famous collection of the Christiansborg Palace at Copenhagen amount to several thousands. The Royal Irish Academy, the Society of Antiquaries of Scotland, the British Museum, and other collections, in like manner include many hundreds of specimens, ranging from the remotest periods of the cave and drift men of western Europe to the dawn of definite history within the same European area. They include hatchets, adzes, gouges, chisels, scrapers, discs, and other tools in considerable variety ; axes, lances, spear and arrow heads, mauls, hammers, and other weapons and implements of war and the chase; besides a variety of utensils, implements, and ornaments, with regard to which we can but vaguely guess the design of their construction. Many of these are merely chipped into shape, sometimes with much ingenuity, in other cases as rudely as the most barbarous and massive implements of the paleeolithic period. But from their association, in graves or other clearly-recognised deposits of the later period, with ground and polished implements, and even occasionally with the first traces of a time when the metals were coming into use, there is no room to question their later origin. In part they may be legitimately recognised, like the whole ele- ments of archeological classification, to mark different degrees of rudencss in successive steps towards civilisation ; in part they indicate, as in manufactures of our own day, the economy of labour in roughly-fashioned implements designed only for the rudest work, or for missiles the use of which involved their loss. To the same primitive period of rude savage life must be assigned the rudiments of architectural skill pertaining to the Megalithic Age. Everywhere we find traces, alike throughout the seats of oldest civilisation and in earliest written records, including the historical books of the Old Testament Scriptures, of the erection of the simple mono-lith, or unhewn pillar of stone, as a record of events, a monumental memorial, or a landmark. 'There is the Tanist Stone, or kingly memorial, like that set up in Shechem when Abimelech was made king; the Hoar Stone, or boundary-stone, like "the stone of Bohan, the son of Reuben," and other ancient landmarks of Bible story ; the Cat Stone, or battle-stone, a memorial of some great victory; and the stone set up as the evidence of some special treaty or agreement, like Laban and Jacob's pillar of witness at Galeed. To the same primitive stage of architecture belong the cromlech,

the cairn, the chambered barrow, and other sepulchral structures of unhewn stone ; as well as the weems, or megalithic subterranean dwellings common in Scotland and elsewhere, until, with the intro- duction of metals and the gradual mastery of metallurgic art, we reach the period of partially hewn and symmetrical structures, of which the great temple of Stonehenge is the most remarkable example. But it is in Egypt that mega- lithic architecture is seen in its most matured stage, with all the massiveness which so aptly symbolises barbarian power, but also with a grandeur, due to artistic taste and refinement, in which the ponderous solidity of vast mega-

lithic structures is relieved by the graces of colossal

sculpture and of an inexhaustible variety of architectural detail. Therc appears to be a stage in the development of the human mind in its progress towards civilisation when an unconscious aim at the expression of abstract power tends to beget an era of megalithic art. The huge cromlechs, monoliths, and circles still abounding in many centres of European civilisation perpetuate the evidence of such a transitional stage among its prehistoric races. But it was in Egypt that an isolation, begot by the peculiar conditions of its unique physical geography, though also perhaps ascribable in part to certain ethnical characteristics of its people, permitted this megalithic art to mature into the highest perfection of which it is capable. There the rude unhewn monolith became the graceful obelisk, the cairn was transformed into the symmetrical pyramid, and the stone circles of Avebury and Stonehenge, or the mega- lithic labyrinths of Carnac in Brittany, developed into colonnaded avenues and temples, like those of Denderah and Edfu, or the colossal sphinx avenue of Luxor.

Elaborately-finished axes, hammer-heads, cups, and vases of the late neolithic era serve to illustrate the high stage to which the arts of a purely stone period could be advanced, in the absence of any process of arrestincnt or change. But long before such a tendency to development into orna- mental detail and symmetrical regularity of construction could be brought to bear on the megalithic architecture of the same era, the metallurgic sources of all later civilisation had begun to supersede its rude arts. To such reniote eras we strive in vain to apply any definite chronology.

At best we work our way backwards from the modern or known into the mysterious darkness of remotest antiquity, where it links itself to unmeasured ages of geological time. But by such means science has been able to add a curious chapter to the beginnings of British and of European story, involving questions of mysterious interest in relation to the earliest stages in the history of man. The very char- acteristics which distinguish him in his rudest stage from all other animals have helped from remotest times to per- petuate the record of his progress.

The evidences of the various acquirements and degrees of civilisation of the prehistoric races of Britain are derived not only from weapons, implements, pottcry, and personal ornaments found deposited in ancient dwellings and sepul- chres; but from still older traces supplied by chance dis- coveries of the agriculturist, miner, and builder, such as the implements of the ancient whalers of the Forth, or the monoxylous oaken canoes dug up from time to time in the valley of the Clyde, or even beneath some of the most ancient civic foundstions of Glasgow. Both alike pertain to areas of well-defined historical antiquity, from the very dawn of written history, or of literate chronicles in any form; and both also have their geological records, pre- serving the evidence of changes of level in unrecorded centuries subsequent to the advent of man, when the whales of the Forth and the canoes of the Clyde were em- bedded in the alluvium of those river-valleys, and elevated above the ancient tide-marks of their estuaries. Another change of level, possibly in uninterrupted continuance of the ancient upheaval, has been in progress since the Roman invaders constructed their military roads, and built their wall between the Forth and the Clyde, in the Ist and 2d centuries of the Christian era.

By evidence such as this a starting-point is gained whence we may confidently deduce the colonisation of the British Islands, and of the north of Europe, at periods separated by many centuries from that in which our island first figures in history. The researches of the ethnologist add to our knowledge of this unrecorded era, by disclosing some of the physical characteristics of the aboriginal

races, derived from human remains recovered in cave-drifts, aucient mining shafts, bogs, and marl-pits, or found in the most ancient sepulchres, accompanied by rudest evidences of art; and the researches of Nillson, Eschricht, Gosse, Rathke, Broca, and other Continental ethnologists, along with those which have been carried on with minute care in the British Islands, disclose characteristic cranial types indicating a succession of prehistoric races different from the predominant types belonging to the historical period of Europe; and some of them probably contemporaneous with the changes indicated in the periods of archeological time. j

The very latest stage of archeological antiquity, when it seems to come in contact with the dawn of historic time, was unquestionably one of complete barbarism, as is suffi- ciently apparent from its correspondence to that which the intercourse with European voyagers is bringing to a close among tke islands of the Pacific. The ancient Scottish subterranean dwellings termed weems (Gaelic wamhah, a cave), or " Picts' houses," have been frequently found, apparently in the state in which they must have been abandoned by their original occupants; and from those we learn that their principal aliment must have been shell- fish and crustacea, derived from the neighbouring sea-beach, along with the chance products of the chase. The large accumulations of the common shell-fish of our coasts found in some of those subterranean dwellings is remarkable ; though along with such remains the stoue quern or hand- mill, as well as the ruder corn-crusher or pestle and mortar, repeatcdly occur; supplying the important evidence that the primitive nomade had not been altogether ignorant of the value of the cereal grains.

The source of change in Britain, and throughout Europe, from this rude state of barbarism, is clearly traceable to the introduction of metals and the discovery of the art of smelting ores. Gold was probably the earliest metal wrought, both from its attractive appearance, and from its superficial deposits, and the condition in which it is fre- quently found, rendering its working an easy process. Tin also, in the south of Britain, was wrought at the very dawn of history: and, with the copper which abounds in the same district of country, supplied the elements of the new and important compound metal, bronze.

3. This accordingly indicates the transition from the later stone age to the third or Bronze Period, which, begin- ning apparently with the recognition of the native copper as a malleable metal, and then as a material capable of being melted and moulded into form by the application of heat, was followed up by the art of smelting the crude ores so as to extract the metal, and that of mixing metals in diverse proportions so as to prepare an alloy of requisite ductility or hardness, according to the special aims of the artificer.

Along with the full mastery of the working in copper and bronze the skill of the goldsmith was correspondingly developed ; and the ornaments of this period, including torques, armlets, beads, and other personal decorations and insignia of office, wrought in gold, are numerous, and often of great beauty. The pottery of the same period exhibits corresponding improvement in material, form, and ornamentation ; though, considering the mimetic and artistic skill shown in the drawings and carvings of the remotest periods, it is remarkable that the primitive pottery of Europe is limited, alike in shape and decoration, to purely arbitrary forms. This in its crudest conventional- ism consists almost exciusively of varieties of zigzag pat- terns scratched or indented on the soft clay. This primitive ornamentation seems so natural, as the first esthetic promptings of the human mind, that it is diffi- cult, if not in some cases impossible, to distinguish between

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the simple pottery of comparatively reccnt origin, recovered on the sites of old American Indian villages, and primi- tive pottery obtained from British barrows pertaining to centuries long prior to the Christian era. But the fictile ware exhibits an improvement in some degree cor- responding to that of the metallurgic art, which every- where throughout Europe furnishes weapons, implements, and personal ornaments of the bronze period, characterised by much grace and delicacy in form, and by an ornamenta- tion peculiar in style, but not unworthy of the novel forms and material.

It was long assumed, alike by historians and antiquaries, that the beautiful bronze swords, spear-heads, shields, torques, armille, &c., so frequently discovered, were mere relics of foreign conquest or barter, and they were variously assigned to Egyptian, Phcenician, Roman, or Danish origin. But this gratuitous assumption has been disproved by the repeated discovery of

the moulds for making them, as well as of the refusc castings, and even of beds of charcoal, scorie, and other indications of metallurgy, on the sites where they have been found. It has not escaped notice, however, that the transition appears to be an abrupt one from stone to bronze, an alloy requiring skill and experience for its use; and that few examples are recorded of the dis- covery of copper tools or weapons, though coppcr is a metal so easily wrought as to have been in use among the Red Indians of America. The inference from this fact is one which all elements of probability tend to confirm, viz., that the metallurgic arts of the north of Europe are derived from a foreign source, whether by conquest or traffic; and that in the beautiful bronze relics so abundant, especially in the British Islands and in Denmark, we see the fruits of that experience which the more ancient civilisation of Egypt and Pheenicia had diffused. The direct intercourse between the countries on the Mediterranean and the Cassi-

_terides, or Tin Islands,—as the only known parts of the

British Islands are called in the earliest allusions which are made to them by Herodotus, Aristotle, and Polybius,— abundantly accounts for the introduction of such knowledge to the native Britons at a very remote period. Pheenician and Carthaginian merchant ships traded to Cornwall cen- turies before the white cliffs of Albion were first seen from the Roman war-galleys. Greece also, not improbably, proved a mediator in this all-important transfer. It is at least to be noted that the forms of weapons, and especially of the beautiful "'leaf-shaped sword," as figured on the most ancient painted Greek vases, closely correspond to the most characteristic relics of the bronze period in the north of Europe and the British Isles.

In reviewing the characteristics of this bronze period, the disclosures of native art on the American continent supply some singularly interesting and suggestive illustrations. There, throughout the whole northern regions of the North American continent and in the ruder areas of South America, as well as in the West Indian archipelago, a

. population was found consisting exclusively of rude nomad

hunters, in a pure stone period of primitive savage art. Nor does it at all conflict with this that they were to a certain extent familiar with the

resources of the rich copper regions of Lake Superior, where that metal is found in enormous masses in a malleable state. This they procured, and not only themselves employed it in the manufacture of weapons, implements, and personal ornaments, but dis- tributed it by barter far down the Ohio and Mississippi valleys, and eastward to the great lakes, to the St Lawrence valley, and to the Hudson river. Silver and lead are also found in the same rich mineral region in metallic crystals, and were not unknown to the native tribes. But every- where those metals were cold-wrought, as a mere malleable stone capable of being hammered into any desired shape,

but in total ignorance of the influence of fire or the use of alloys.

But wholly distinct from its rude Indian tribes, North America had its semi-civilised Mexicans aud South America its more highly civilised Peruvians, who had learned to mine and smelt the ores of the Andes, and make metallic alloys wherewith to fashion for themselves bronze tools of requisite hardness for quarrying and hewing the solid rock. With these they sculptured the statues of their gods, and reared palaces, temples, and pyramids, graven with elaborate sculptures and hieroglyphics by a people wholly ignorant of iron, which have not unjustly suggested many striking analogies with the megalithic art of ancient Egypt. The huacas, or tombs of the Incas of Peru, and also their royal depositories of treasure, have disclosed many remarkable specimens of elaborate metal- lurgic skill,—bracelets, collars, and other personal orna- nents of gold ; vases of the same abundant precious metal, and also of silver; mirrors of burnished silver, as well as of ohsidian ; finely-adjusted silver balances ; bells both of silver and bronze; and numerous common articles and tools of copper, or of the more efficient alloy of copper and tin,—all illustrative of the arts and civilisation of a purely bronze age.

4, The fourth or Jron Period is that in which the art of smelting the ores of the most abundant metal had at length been mastered ; and so iron superseded bronze for arms, sword-blades, spear-heads, axes, daggers, knives, &c. Bronze, however, continued to be applied to many pur- poses of personal ornament, horse furniture, the handles of swords and other weapons; nor must it be overlooked that flint and stone were still employed

for lance and arrow-heads, sling-stones, and other common purposes of warfare or the chase, not only throughout the whole bronze period, but far into the age of iron, The discovery of numerous arrow-heads, or flakes of black flint, on the plain of Marathon, has been assumed with good reason to point to the use of such rude weapons by the barbarian host of Darius; and the inference is confirmed by the facts which Herodotus records, that Ethiopian auxiliaries of the army of Xerxes, ten years later, were armed with arrows tipped with stone.

The essential change resulting from the maturing of the .

iron period lies in the unlimited supply of the new metal. Had bronze been obtainable in sufficient quantity to admit of its application to the endless purposes for which iron has since been employed, the mere change of metal would have been of slight significance. But the opposite was the case. The beautiful alloy was scarce and costly; and hence the arts of the neolithic period continued to be practised throughout the whole duration of the age of brouze. But iron, though so abundant in its ores, requires great labour and intense heat to fuse it; and it needed the prolonged schooling of the previous metallurgic era to prepare the way for the discovery of the properties of the ironstone, and the processes requisite to turn it to account. Tron, moreover, though so abundant, and relatively of comparatively recent introduction, is at the same time the most perishable of metals. It rapidly oxidises unless protected from air and moisture, and hence few relics of this metal belonging to the prehistoric period have bcen preserved in such a state as to illustrate the skill and artistic taste of the fabricators of that last pagan era, in the way that the implements of the three previous periods reveal to us the habits and intellectual status of those older times.

But the iron is the symbol of a period in which pottery, personal ornaments of the precious mnetals, works in bronze, in stone, and other durable materials, supply ample means of gauging the civilisation of the era, and recognising the

progress of man iu the arts, until we come at length to connect their practice with definite historical localities and nations, and the names of Egypt and Pheenicia, of Gadir, Massilia, the Cassiterides, and Noricum, illuminate the old darkness, and we catch the first streak of dawn on a

definite historical horizon. Thus, with the mastery of the metallurgic arts is seen the gradual development of those elements of progress whereby the triumphs of civilisa- tion have been finally achieved, and man has advanced to- wards that stage in which the inductive rcasonings of the archeologist are displaced by records more definite, though not always more trustworthy, as the historian begins his researches with the aid of monumental records, inscriptions, poems, and national chronicles.

Within the later iron period, accordingly, we reach the era of authentic history. There is no room for doubt that, whatever impetus the Roman invasion may have given to the working of the metals in Britain, iron was known there prior to the landing of Julius Czsar. Within this archeological period, however, the examples of Roman art and the influences of Roman civilisation begin to play a prominent part. To this period succeed the Saxon and Scandinavian eras of invasion, with no less characteristic peculiarities of art workmanship, as well as of sepulchral rites and social usages. In these later periods definite history comes to the aid of archeological induction, while those intermediate elements of historical re-edification, the inscriptions on stone and metal, and the numismatic series of chronological records, all unite to complete a picture of the past replete with important elements for the historian.

The connection between archeology and geology has been indicated, but that between archeology and ethnology is of much more essential significance, and is every day being brought into clearer view. By the investigation of the tombs of ancient races, and the elucidation of their sepulchral rites, remarkable traces of unsuspected national affinities are brought to light; while a still nore obvious correspondence of arts in certain stages of society, among races separated alike by time and by space, reveals a uni- formity in the operation of certain human instincts, when developed under nearly similar circumstances, such as goes far to supply a new argument in proof of the unity of the human race.

The self-evident truths confirmatory of the principles upon which this system of primitive archeology is based, may be thus briefly summed up :— Man, in a savage state, is to a great extent an isolated being; co-operation for mutual and remote advantage, except in war and the chase, is scarcely

possible; and hence experience at best but slowly adds to the common stock of knowledge. In this primitive stage of society the implements and weapons which necessity renders indispensable are invariably sup- plied from the sources at hand ; and the element of time being of little moment, the rude workman fashions his stone axe or hammer, or his lance of flint, with an ex- penditure of labour such as, with the appliances of civilisa- tion, would suffice for the manufacture of hundreds of such implements.

The discovery of the metallurgic arts, by diminishing labour and supplying a material more susceptible of varied forms as well as of ornamentation, and also one originating co-operation by means of the new wants it calls into being, inevitably begets social progress. The new material, more- over, being limited in supply, and found only in a few localities, soon leads to barter, and thence to regular trade ; and thus the first steps towards a division of labour and mutual co-operation are made. So long, however, as the metal is copper or bronze, the limited supply must greatly restrict this social progress, while the facilities for working

it admit of that isolation so natural to man in a rude state; and these, added to the frequent discovery of copper, in its natural condition much more nearly resembling a ductile metal than the ironstone, abundantly account for its use having preceded that of the more abundant metal.

Great experience must have been acquired in earlier metallurgy before the iron ore was attempted to be wrought. In this, co-operation was indispensable; but that once secured, and the first difficulties overcome, the other results appear inevitable. The supply is inexhaustible, widely diffused, and. procurable without excessive labour. The material elements of civilisation were thereby rendered available, and all succeeding progress might be said to depend on the capacity of the race.

The simplicity which characterises the archeological disclosures of Scandinavia, Germany, Ireland, aud other regions of trans-Alpine Europe lying outside of the range of ancient Greek or Roman influences, has contributed some important aids to the study of prehistoric arts; but the full significance of their teachings has yet to be tested by com- parison with the

primitive arts pertaining to Egypt, Greece, Asia Minor, and other ancient centres of earliest civilisa- tion. To this certain singularly interesting disclosures of very recent date, which some have regarded as at variance with the foregoing classification of archzeological epochs, help to furnish the desired materials. The researches of Dr Heinrich Schliemann on one of the most memorable sites which epic poetry has selected for the mythic begin- nings of history, have brought to light what he believes to be actual remains of the Troy of the Ziad. Dr Schlie- mann began his systematic explorations in 1871, and pur- sued them, during the available seasons, till the month of June 1873. . With patient assiduity the accumulated debris on the scene of ancient civic settlement was sifted and opened up by regular excavations, till the natural rock was exposed at a depth of upwards of 50 feet. Throughout the whole of this, abundant traces of former occupation were brought to light; and so great an accumu- lation of debris and rubbish upon an elevatcd site affords undoubted evidence of the vicissitudes of a long-settled centre of population. To this specific evidence lent addi- tional confirmation. The foundations of a temple, sup- posed to be that of the Ilian Athena of the time of Alexander, along with coins, inscriptions, and numerous remains of architecture and sculpture, combined to fix the era of an ancient, but strictly historical, period. At a fur- ther depth of upwards of 6 feet, broken pottery, imple- ments of bronze, and charred wood and ashes, showed the traces of an older settlement which had perished by fire. But the artificial character of the debris encouraged further research; and when the excavations had been carried to about double the depth, Dr Schliemann came upon a deposit rich in what may be styled neolithic remains: axes, hammers, spear-heads, and other implements of polished diorite or other stone, weights of granite, querns of lava, and knives and saws of flint abounded, associated with plain, well-executed pottery, but with only two pins of copper or bronze to indicate any knowledge of metal. Continued excavations brought to light additional stonc implements and weapons; until at a depth of some 33 feet, well-wroughtimplements and weapons of bronze,and pottery of fine quality and execution, revealed the traces of an earlier civilisation on the same ancient site.

In all this, while there is much to interest, there is no- thing to surprise us. Here, ncar the shores of the Helles- pont, at a point accessible to the oldest known centres of civilisation,—to Egypt, Pheenicia, Assyria, Greece,

Carthage, and Rome,—a civilised community, familiar with the arts of the bronze period of the Mediterranean shores, appears to have yielded to vicissitudes familiar enough to the

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student of ancient history. After a time the desolated locality tempted the settlement of some barbarian Asiatic horde, such as the steppes of that continent could fur- nish even now. They were ignorant of metallurgic arts; though probably, like the savage tribes of the New World at the present time, not wholly unaware of the manufac- ture of unplements and weapons of bronze or other metals. Such a local alternation of bronze and stone periods in a region lying in close proximity alike to vast areas of Asiatic barbarism, and to the most important centres of ancient civilisation, in no degree conflicts with a general system of succession of archeological periods. Mexico and Peru, while in a purely bronze age, were overthrown by Spanish invaders. Large portions of their ancient territories were abandoned to utter barbarism, and even now are in the occupation of savage tribes. But the ancient city of Montezuma has been made the capital of a civilised state ; the beds of its canals have been filled up, burying therein obsidian, stone, and bronze implements, pottery, sculptures, and much else pertaining to its ante-Columbian era; and it only requires such a fate as its modern history renders conceivable enough, to leave for future ages the buried strata of a civic site revealing similar evidences of the alternation of semi-civilised, barbarian, and civilised ages, on the same long-inhabited site of Toltecans and Aztecs, Indian savages, and modern Mexicans and Spaniards.

That man has everywhere preceded history is a self- evident truth. So long as no scientific evidence seemed to conflict with a long-accepted chronology in reference to the antiquity assigned to the human race, it remained unchallenged, though the like computation had been uni- versally rejected in reference to the earth as the theatre of his history, and we were content to regard the prehistoric era of man as no more than a brief infancy of the race. But the investigations and disclosures of recent years in reference to the whole prehistoric period have involved of necessity a reconsideration of the grounds on which a definite antiquity of

comparatively brief duration has been assigned to man; and the tendency at present is rather to exaggerate than to diminish the apparent antiquity of the race. The nature and extent of the evidence which has thus far rewarded intelligent research have been suf- ficiently indicated above; and as it is still far from com- plete, the student of archeology will act wisely in pushing forward his researches, and accumulating and comparing all available evidence, without hastily pronouncing any absolute verdict on this question. But, without attempting to connect with any historic chronology the men of the English drift, or the troglodytes of the mammoth or rein- deer periods of France, it may be useful, in concluding this summary of primitive archeology, to glance at the origin of civilisation, and the evidences of the antiquity of what appear to constitute its essential elements.

Everywhere man seems to have passed through the same progressive stages: First, that of the savage or purely hunter state ; a condition of precarious instability, in which man is most nearly in the state of a mere animal subsisting on its prey. It is the condition of nomad life, incompatible with a numerous or settled population ; exhausting the resources of national being in the mere struggle for existence, and therefore inimical to all accu- mulation of the knowledge and experience on which human progress depends. In this primitive state, man is disclosed to us hy the cvidence with which the archeologist now deals. He appears everywhere in this first stage as the savage oceupant of a thinly-peopled continent, warring with seemingly inadequate means against gigantic carni- vora, the contemporary existence of which is known to us only by the disclosures of geological strata or ossiferous

caves, where also the remains of still more gigantic herbi- vora confirm the idea of man's exhaustive struggle for exist- ence, . The nearest analogy to such a state of life is that of the modern Esquimaux, warring with the monstrous polar bear, and making a prey of the gigantic cetaceze of Arctic seas. Through how many ages this unbistoric night of European man may have preceded the dawn of civilisa- tion it is at present vain to speculate. But this is notice- able, that there is no inherent element of progress in a people in the condition of the Esquimaux. To all appear- ance, if

uninfluenced by external impulse, or unaffected by any great amelioration of climatc, they are likely to prolong the mere struggle for existence through unnumbered centuries, armed, as now, with weapons and implements ingeniously wrought of bone, ivory, and stone, the product of the neolithic arts of this 19th century.

To this sueceeds the sccond or pastoral state, with its flocks and herds, its domesticated animals, and its ideas of persona] property, including in its earlier stages that of property in man himself. It pertains to the open regions and warmer climates of the temperate zone, and to the elevated steppes and valleys of semi-tropical countries, where the changing seasous involve of necessity the wan- dering life of the shepherd. This accordingly prevents the development of the arts of settled life, especially those of architecture; and precludes all idea of personal property in the soil. But the conditions of pastoral life are by no means incompatible with frequent leisure, reflection, and consequent intellectual progress. Astronomy has its origin assigned to the ancient shepherds of Asia; and the con- templative pastoral life of the patriarehs Job and Abraham has had its counterpart in many an Arab chief of later times.

The third or agricultural stage is that of the tillers of the soil, the Aryans, the ploughers and lords of the earth, among whom are devcloped the elements of settled social life involved in the personal homestead and all the ideas of individual property in land. The process was gradual. The ancient Germans, according to the descrip- tion of Tacitus, led the life of agricultural nomads; and such was the state of the Visigoths and Ostrogoths of later eenturies. But this was in part due to the physical con- ditions of trans-Alpine Europe in those earlier eenturies. Long ages before that, as the ancient Sanscrit language proves, the great Aryan family, of which those are offshoots, had passed from the condition of agricultural nomads to that of lords of the soil among a settled agricultural people. They had followed up the art of ploughing the soil with that of shipbuilding and "ploughing" the waves. They were skilled in sewing, in weaving, in the potter's art, and in masonry. Their use of numbers was carried as high at least as a hundred before they settled down from their nomad life. They had domesticated the cow, the sheep, the horse, and the dog; and their pdsw or fecders already constitutcd their pecus, their wealth, before the pecunia

assumed its later forms of currency. They had also passed through their bronze and into their tron period; for their language shows that they were already acquainted with the most useful metals as well as with the most valuable grains.

The whole evidence of history points to the seats of earliest civilisation in warm climates, on the banks of the Nile, the Euphrates, the Tigris, the Indus, and the Ganges. The shores of the Mediterranean succeeded in later centuries to their inheritance, and were the seats of long-enduring empires, whose intellectual bequests are the life of all later civilisation. But trans-Alpine Europe, which is now yield- ing up to us the records of its prehistoric ages, is entirely of modern growth so far as its historic civilisation is con-

cerned, and wherever it exteuds towards the northern verge of the temperate zone it is even now 1n its infancy. Here, then, we trace our way back to the first progressive efforts of

reason, and find man primeval, in a state of nature, in the inidst of the abundance pertaining to a genial and fertile climate, whieh rather stimulates his esthetic faculty than enforces him by any rigorous necessity to cultivate the arts for the purposes of clothing and building. Thus em-ploying his intellectual leisure, he begins that progressive elevation which is as eonsistent with his natural endow- ments as a rational being as it is foreign to the instincts of all other animals. He increases and multiplies, spreads abroad over the face of the earth, clears its forests, drains its swamps, makes its rivers and scas his highways, and its. valleys and plains his fertile fields and pasture-grounds. Cities rise, with all the fostering influences of accumulated wealth and settled leisure, and with all the stimulating influences of acquired tastes and luxurious desires. The rude pictorial art—not ruder on the graven ivory of the troglodytes of the Madelaine cave than on many a hiero- glyphic drawing of the catacombs and temples of Egypt— employed in picture-writing, passes by a natural and inevitable transition from the literal representations of objects to the symbolic suggestion of ideas, to a word- alphabet, and then to pure phonetic signs. The whole process is manifest from the very infancy of Egyptian picture-writing, as crude as that with which the Indian savage still

records his dceds of arms on his buffalo-robe, or carves the honours of the buricd warrior on his grave-post. Letters lie at the foundation of all high and enduring civilisation, yet we can thus trace them back to their in-fantile origin; and so onward in thcir slow transformations, as in the mingled pictorial and phonetic writing of the Rosetta stone hieroglyphics of the age of the Ptolemies. Through Phoenician, Greek, and Roman modifications, they have come down to us as the arbitrary symbols of sounds which the voice combines into articulate speech.

And as it is with letters so it is with man's arts,—his drawing, carving, sculpture, architecture, weaving, pottery, metallurgy ; and so with his sc/ence,—his astrology, astro- nomy, geometry, alchemy, and all else. The beginnings of all of them lie within our reach. We can trace back the measurements of solar time to the crudest beginnings of more than one ancient nation, with a year of 360 days. This, corrected to the definite approximation to the true solar year of a period of 365 days, became the vague year of the Egyptians, with the great Sothiac cycle of 1460 ycars, clearly pointing to a system of chronology which could not have been perpetuated through many centuries without conflicting with the most obvious astronomical phenomena as well as with the recurring seasons of the year.

Man is, after all, according to the boldest speculations of the geologist, among the most modern of living creatures. If indecd the theory of evolution from lower forms of animal life is accepted as the true history of his origin, time may well be prolonged through unnumbered ages to admit of the process whieh is to develop the irrational brute into man. But regarding him still as a being ealled into existence as the lord of creation, endowed with reason, the demonstration of a prolonged existence of the race, with all its known varieties, its diversities of language, and its wide geographical distribution under conditions so diverse, tends to remove greater difficulties than it creates. No essential doctrine, or principle in morals, is involved in the acceptance or rejection of any term of duration for the human race; and the idea of its unity, which for a time was scornfully rejected from the creed of the ethnologist, is now advocated by the evolutionist as alone consistent with the physical, :nental, and moral eharacteristics common to savage and eivilised man, whether we study him amid

the traces of palzolithic osteology and arts, or among the most diverse races of living men.

The process of rescarch and inductive reasoning thus applied by the archeologist to the traces of primitive art and the dawn of civilisation, is no less applicable to all periods. The songs and legends of the peasantry, the half- obliterated traces of ancient manners, the fragments of older languages, the relics of obsolete art, are all parts of what has been fitly styled " unwritten history," and furnish the means of recovering many records of past periods which must remain for ever a blank to those who will recognise none but written or monumental evidence.

Proceeding to the investigation of this later and, in most of the higher requirements of history, this more important branch of historical evidence, the archeologist has still lis own special departments of investigation. Tracing the various alphabets in their gradual develop- ment through Phcenician, Greek, Roman, and other sources, and the changing furms which followed undcr the influences of Byzantine and medieval art, a complete system of paleography has becn deduced, calculated to prove an important auxiliary in the investigation of monumental and written records. Paleography has its own rules of criticism, supplying an elemicnt of chrono- logical classification altogether independent of style in works of art, or of internal evidence in graven or written inscriptions, and a test of genuineness oftcn invaluable to the historian.

Architecture, sculpture, and pottery have each their historical valuc, their periods of pure and mixed art, their successions of style, and thcir traces of borrowed forms and ornamentation, suggestive of Indian, Assyrian, Egyptian, Phoenician, Punic, Greek, Etruscan, Roman, Arabian, Byzantine, Norman, or Renaissance influences. Subordinate to those are the pictorial arts combined with sculpture and pottery, from carliest Egyptian, Greck, or Etruscan art to the frescoes and paintings of medieval centuries; and the rise of the art of the engraver, traccable through ancient chasing ou metals, medizval niello-work, graven sepulchral brasses, aud so on to the wood blocks, whence at length the art of printing with movable types originated. Aud as in the Old World so in the New, the progress of man is traceable

from rudest arts of stone and copper to the bronze period of Mexico and Peru, where also architecture, sculpture, and pottery preserve for us invaluable materials for the elucidation of that prehistoric time which only came to an end there in the year 1492 a.p.

Heraldry is another element by means of which archezo- logy provides trustworthy canons of criticism in relation to written and unwritten medieval records. The seals and matrices, sepulchral sculptures, and engraved brasses, along with an extensive class of the decorations of ecclesiastical and domestic architecture, all supply evidence whereby names and dates, with confirmatory collateral evidence of various kinds, are frequently recoverable. From the same sources also the changing costume of successive periods can be traced, and thus a new light be thrown on the manners and customs of past ages. 'The enthusiastic devotee is indeed apt at timcs to attach an unduc importance to such auxiliary branches of study; but it is a still greater excess to pronounce them valueless, and to reject the useful aids they are capable of affording.

No less important are the illustrations of history, and the guides in the right course of rescarch, which numis- matics supplics, both in relation to early and medieval times. But on this and other sections into which the study of antiquities is divided, the requisite information will be found under the several heads of research. On many of those points the historian and the archeologist necessarily occupy the same field; and indeed, when that prunitive period whercin archeology deals with the whole elements of our knowledge regarding it, as a branch of inductive science, and not of critical history, is past, the student of antiquitics becomes to a great cxtent the pionecr of the historian. He dcals with the raw matcrials: the charters, deeds, wills, grants of land, of privileges or im- munitics, the royal, monastic, and baronial accounts of expenditure, and the like trustworthy documents; by means of their paleography, seals, iluminations, and other evidence, he fixes their dates, traces out the genealogical relationships of their authors, and in various ways prepares and sifts the evidence which is to be employed anew by the historian in revivifying the past. Architecture and all departments of the fine arts, in like manner, supply much evidence which, when investigated and systematised by a similar process, adds valuable materials to the stock of the historian, and furnishes new sources

for the illumination of past ages. Such is a sketch of the comprehcusive in- vestigations embraced under the name of archeology, which, carried on by many independent labourers, and in widely varied fields of research, have contributed im- portant chapters of human history, and revivified ages long buried in oblivion, or at best but dimly seen through distorting media of myth and fable. (D. W.)

CLASSICAL ARCH AOLOGY.

The province of classical archeology is to investigate and determine the results of artistic activity among the Greeks and Romans, so far as that activity mauifestcd itself in works of form and substance as opposed to the artistic expression of thought by unsubstantial means, as in the case of poetry or music. It ranges from the Greek temple as the highest form of artistic expression in this sense to the other extreme of the simplest object shaped for a pur- pose by human hands. A stone, rudely hewn with some design, an artificial tumulus, and common clay utensil, each represent, in a humble fashion, a thought artistically expressed in substance, and each reflect more or less accu- rately the artistic spirit of the time at which they were made. It ranges also from the earlicst examples of work- manship down through the historical periods of develop- ment and decline. So far classical archaeology may properly be called a section of the general history of art. It owes 1t8 independent position entirely to the peculiar circum- stances under which its investigations are conducted. For

exainple, when called upon to determine the date of an inscription from the forms and disposition of its letters, which, as works of art, must reflect the taste of the period in which they were incised, it has to bring to bear on the question a knowledge of paleographical eccentricities. Or when the date of a coin has to be fixed, the standard on which it has been struck and the historical circumstances connected with it must be taken into consideration. Such, at least, is the practice of journals and societies devoted to classical archeology. On the other hand, recent writers desire to confine these collateral inquiries to within the narrowest possible limits. They have agreed to dismiss altogether mythological researches, which in Gerhard's time formed one of the principal occupations of arche- ologists. Most of them consent to epigraphy being classed under philology. With regard to

numismatics, however, opinions are still divided as to whether it should be in- cluded under archeology, on the ground of the immense importance of coins as monuments of art, or whether, on

account of their historical value, the study of them should be classed under philology. A similar question has been raised regarding topography. (See Conze, Veber die Bedeu- tung der classichen Archdologie, Wien, 1869 ; Preller, Ausgewthlte Aufsdtze, pp. 384-425, tiber die wissenschafe- liche Behandlung der Archdologie ; Stark, in the Phalologus, xiv. p. 645, and xvi. p. 85.)

The material for the study of classical art consists of literary records and actual remains, among the former being included, though from another point of view be- longing to the latter class, the inscriptions which have been found incised on sculptures, or more frequently on the bases left behind in Greece as worthless by the plunder- ing Romans. The literary records have been collected by Overbeck, Antike Schriftquellen, Leipzig, 1868, and the inscriptions alone more recently by Hirschfeld, Zitule Statuariorum Sculptorumque, Berlin, 1871. The actual remains may be arranged under the three classes of archi- tecture, sculpture, and painting, with the first mentioned being included the industrial arts, in which principles of construction were applied, eg., the furniture of temples and dwelling-houses, as opposed to the imitative arts. In the case of architecture proper, owing to the immovable nature of its monuments, dependence has to be placed on the trustworthiness of drawings and descriptions made on the spot by travellers. Sculpture, on the other hand, being comparatively easy of transport in all cases, and having been for centuries the object of extraordinary avidity among cultivated people, is now fairly represented in all its important stages in any one of the principal museums of Europe. Painting, in its highest sphere, may be said to exist only in the record supplied by the occasional statements of ancient writers. But these statements em- body the opinions of those whose judgment in regard to sculpture we have the means of verifying, and unless there were reason to suppose that persons accustomed to exact the greatest refinement in sculpture were lightly gratified in the matter of painting, their desultory

remarks will furnish some idea of the ancient manner for which the remains of wall painting at Pompeii will serve as a founda- tion, though apparently executed by workmen rather than artists, and that at a time when the art had sunk to its lowest ebb. The skill in drawing attained by ordinary workmen is amply displayed in the painted vases.

Without attempting to subject the history of art to systematic study, the Greeks and Romans nevertheless devoted much attention to special branches of it. The fruits of their labours have in great part perished; but from what remains, and from the notices of what is lost, it appears that their researches took the direction either of explaining the principles of art, and especially those of architecture, or of collecting facts concerning artists and their works, or of deseribing the works of art which existed in this or that place, as in a catalogue. Of the first class of works we have lost all—and they were many— except Vitruvius. Of the second the losses are known to have been great, and, poor though the substitute for them undoubtedly is, we are still fortunate in possessing such in the notices collected by Pliny in his Historia Naturalis. We have besides a long series of epigrams, for which there was no dearth of point, in the works of well-known artists. For a similar purpose the rhetoricians chose frequently to draw comparisons from or to describe works of art; but owing to the object they had in view, they have left little that is of much practical good for the history of ancient art.

The same applies to the epigrammatists. (See O. Benn- dorf, De Anthologie Grace Hpigrammatis que ad artes spectant, Bonn, 1862.) With regard to Pliny, it seems that, though hiniself destitute of all critical faculty in matters of art, he frequently drew his notices from excellent

authorities. The third class of ancient writers on works of art were the Periegetz, of whom only Pausanias survives (A.D. 160-180), his "EAAdSos Tepuyynors, in ten books, being of the highest value from an autiquarian point of view. For the criticism of art it brings little benefit.

As to the fate of works of art during the early centuries of Christianity, the first record we possess is that of Nicetas Acominatus, of Chone in Phrygia, who died in 1216 (Narratio de Statuis Antiquis quos Franct post captam, anno 1204, Constantinopolim destruxerunt, Leipzig, 1830). In 1460 we have an anonymous description of Athens (Ta Géatpa Kai didackarcia tov 'AOnvav, see L. Ross, Archdo- logische Aufséitze, i. p. 245), from which may be gathered a tolerable idea of the deep ignorance of the times. In Rome the rule was to destroy as far as possible all ancient sculptures, except such as were in some way identified with Christianity. The reaction against this manner of proceed- ing at first took the form of collecting ancient sarcophagi for the modern purposes of burying-grounds. By the 15th and 16th centuries this taste had developed into an enthu- siasm, which spread even into the south of Germany, for the possession of ancient sculptures as models for the study of artists. In the beginning of the 17th century this enthu- siasm gave way to a habit of viewing ancient works of art only as so many illustrations of ancient beliefs and modes of life, a habit in which the French and the Dutch were distinguished, and of which the results are nowhere more apparent than in Montfaucon's L'Antiquité expliquée et representée en figures, Paris, 1722, with its uncritical text and inaccurate engravings. The taste of the times pre- ferred literature to art, and accordingly the collection of ancient monuments, adapted to the illustration of classical writers, and especially the poets, was assiduously followed. A typical example of the one-sidedness of this tendency is to be seen in Spence's Polymetis, or an Enquiry concerning the Agreement between the Works of the Roman Poets and the Remains of the Ancient Artists, London, 1755, fol. A really valuable work of the period, however, was the collec- tion of passages in the ancient writers bearing upon artists, entitled Catalogus Artificum, by Fr. Junius (Francois Dujon), which retained the position of a standard work until supplanted by Sillig's Catalogus Artijicum, Dresden, 1827, which in turn held its ground until the appearance of H. Brunn's Geschichte der Griechischen Kiinstler, 2 vols., 1853 and 1859.

Up to the middle of the 17th century no steps had been taken to visit and explore the mouuments of Greece. The pioneers in this work were J. Spou, a physician of Lyons, and George Wheler, an Englishman, who travelled together in 1675-76 through Italy, Dalmatia, aud Greece, and pub- lished

each a separate account of their journey (J. Spon, Voyage d'Italie, de Dalmatia, de G'réce, et du Levant, Lyon, 1678; G. Wheler, Journey into Greece, Loudon, 1682). In the year previous to their arrival in Greece, the Marquis de Nointel, French ambassador at the Porte, had paid a short visit to Athens, and set Carrey, a French artist, to work to draw the sculptures of the Parthenon and some of the buildings of the town. These drawings are now in the Bibliothéque at Paris, and though mostly sketched hurriedly, or from an awkward point of view, form an invaluable record of the sculptures of the Parthenon, destroyed shortly after (1687) by the bombardment of Athens by the Venetians under Morosini.

The discovery of Herculaneum in 1720 and of Pompeii in 1748 opened a new era in the history of archeology. The antiquarian spirit gave way to an historical and scientific method, of which Count Caylus (Recueil dAn-tiquités, Paris, 1752-54,7 vols.) may be regarded as the forerunner, and Winckelmann (1717-1768) as the actual founder. The fame of the latter rests on his two great

works—(1.) the Geschichte der Kunst des Alterthums, Dresden, 1764, and with additions, 1767; and (2.) Monumenti Antichi Ineditit, Rome, 1767, 2 vols. fol. It was in the former that he elaborated his two theories—first, that the quality of artistic productions is always in harmony with the character and the events of the times; and, secondly, that ideal beauty originates in the union of individually-beautiful forms observed singly and apart in nature. Whatever may be said of the narrowness or want of precision in his artistic and philosophical speculations, it still stands to his great praise and renown that he was the first to undertake a vigorous examination of the terms, beauty and ideal, in their relation to nature. It was through his influence that the history of ancient art was introduced into the course of academical study by Heyne, that Goethe, Lessing, and Herder turned each the force of his consummate genius to ancient art, and that the publication of ancient monuments with critical apparatus received a new impulse. Among the immediate disciples

of Winckelmaun were Zoéga (1755-1809), Visconti (1751- After Winckelmann, the next history of ancient art that appeared was Meyer's

Geschichte der

1807), and Millin.

bildenden Kiinste bei den Griechen und Rémern, Dresden, 1824-36, 3 vols.; contemporary with which the only important contributions to the subject were those of C. A. Bottiger and Hirt.

While German activity was engaged on theories of art based principally on the monuments existing in Italy, a practical view of the subject was taken in England, the first issue of which was that Stuart and Revett went to Athens in 1751, and spent nearly three years in exploring and drawing its remains, the result appearing in the work Antiquities of Athens, vol. i., 1762; vol. ii, 1787; vol. iii., 1794; and vol. iv., 1816. The task begun by them was taken up by the Society of Dilettanti (founded 1734), whose first expedition under Dr Chandler, Revett, and Pars, an artist, in Greece and Asia Minor, was productive of two works—(1.) Jonian Antiquities (published in 1769, and again, largely increased by the researches of William Gell, in 1797); and (2.) Unedited Antiquities of Attica, 1817. At this time, Lord Elgin, then British ambassador at the Porte, had a large force of workmen employed in removing the sculptures of the Acropolis of Athens, which, after years of tossing hither and thither in London, at last, in 1816, found a resting-place in the British Museum, of which they continue to form the greatest ornament. In 1811-12 a number of English, German, and Danish travellers (Cockerell, Forster, Stackelberg, Haller, Linckh, and Brénstedt) undertook the exploration of AEgina at their own expense, and were fortunate in the recovery of the sculptures of the temple of Athene, now in Munich.

In 1812 the temple of Apollo Epicurius at Phigalia was explored by Cockerell, its sculptured frieze recovered and obtained for the British Museum, and its architecture elucidated in the still unapproached work of Cockerell, The Temples of Jupiter at Zigina, and of Apollo at Basse, near Phigalia, 1860. Among the other researches under-

_ taken about this period were—(1.) The French Expédi-

tion scientifique de la Morée, the chief result of which was the discovery of some fragments of the metopes of the temple of Zeus at Olympia. (2.) The

excavations on the Acropolis of Athens, directed by L. Ross, in 1834-36. (3.) The excavations of Angell and Harris on the Acropolis of Selinus in Sicily in 1822-23, resulting in the recovery of three sculptured metopes of a very archaic style, and fragments of three more metopes (Samuel Angell and Thomas Harris, Sculptured Metopes of the Ancient City of Selinus in Sicily, London, 1826, fol.) (4.) The exploration of the same site by the duke of Serradifaleo (L'Antichité della Sicilia, Palermo, 1834), with the further gain of four

metopes sculptured in a more advanced style (O. Benndorf, Die Metopen von Selinunt, Berlin, 1873). These sculptures are in the Museum of Palermo. (5.) The extensive opera- tions in Etruria from 1828 onwards, the enormous spoils of which, consisting of painted vases, bronzes, &c., led to the foundation of the. Instituto di Corrispondenza Arche- ologica at Rome, which has continucd uninterruptedly, with the support of the Prussian Government, its publication of Annali, Bullettno, and Monumenti, furnishing a com- plete repertory of archzological research up to the present day. (6.) The removal of the sculptures on the Acropolis of Xanthos (Fellows, Asia Minor, 1839, and Travels in Lycia, 1841), and the remains of the Mausoleum at Hali- carnassus (Newton, History of Discoveries, &c., 1862, and Travels in the Levant, 1865), have been the principal additions of that class to our national collection, which, however, has been immenscly enriched in objects of minor artistic importance, but of great archzological interest, from excavations in Greece, at Camirus and Jalyssus in Rhodes, in Sicily, in the Cyrenaica, and in Cyprus. In the Crimea the excavations of the Russian Government have brought very important treasures to light (Antiquités du Bosphore Cimmérien conserves au Musée Impérial de l Ermitage, Petersburg, 1854; Comptes Rendus de la Commassion Archéologique, from 1859).

The rapid and vast accumulation of new material afte the time of Winckelmann required a new informing spirit. The first to assume this functicn was Thiersch, in three articles, 'Ueber die Epochen der bildenden Kunst unter den Griechen," 1816, 1819, 1825, in which he endeavoured to

prove the influence of the Egyptians and Pheenicians on early Greek art. Against him appeared K. O. Miiller, denying altogether an exoteric influence, and comparing the development of Greek art to the organic development of plants, its various periods being coincident with the marked periods of political history. These opinions he propounded first in a series of articles (Kleine Schriften, ii. pp. 315-398), and afterwards in the celebrated Handbuch der Archiologie (1830 ; 2d ed. 1835; 3d ed. 1848, with additions by Welcker), which, with the plates by Oesterley (Denkmiler der alten Kunst), is still unsurpassed in its kind. Miiller's view has continued to be adopted by all the leading archeologists since his time, among whom may be here mentioned Gerhard, Welcker, Otto Jahn, and the historians of art generally, Schnaase, Kugler, and Liibke. Besides the Zandbuch, however, with its additional volume of Denkmiiler by Wieseler, it is necessary, for the most recent information, to consult Brunn's Geschichte der Griechischen Kiinstler, 2 vols.; Overbeck's Geschichte der Griechischen Plastik, 2d. ed., 1872; Friederichs's Bausteine, Berlin, 1868 : Kleine Kunst und Industrie, Berlin, 1871, by the same author ; G. Semper, Der Stil in den technischen und tektonischen Ktin- sten, Munich, 1860-63; C. Bétticher, Die Tektonik der Hellenen, 2d. ed., Berlin, 1872-3; Helbig's Wandgemdlde Campaniens, 1868 ; vol ii. of Schnaase's Geschichte der bil- denden Kiinste ; Helbig's Untersuchungen tiber die Wandge- malde Campaniens, 1873; the publications of the Instituto di Corrispondenza Archeologica of Rome, and the Archdolo- gesche Zeitung of Berlin. It is not assumed that this list exhausts the number of books that may be consulted with profit ; but it is hoped that no essentially important work has been overlooked.

First Period.

The oldest remains of workmanship in Greece, if we Earliest except the series of stone implements discovered witlin the Greek re- last few years in various localities, are the ruined walls of ™® Tirynth and several other ancient citadcls, the stupendous masonry of which, together with the primitive manner of construction by means of unhewn polygonal blocks of*

Connection Greeks at this time must have been strongly influenced by

and Orien- pildenden Kiinsten, ii.,

immense size, led the later Greeks to believe that they had been the work of a mythical race of giants, Cyclopes, and to designate such masonry as Cyclopean. It was further said that these Cyclopes had come from Lycia, between which and Argolis, where the most remarkable of these walls are, there existed (whatever may be the value of this belief) a very frequent intercourse in the heroic times. Pausanias (ii. 25, 8), speaking of the walls of Tirynth, which still, apparently, present the same aspect as when he saw them, remarks that the smallest of the blocks would be more than a load for a yoke of mules. Again (ix. 36, 5) he compares them with the pyramids of Egypt as regards the difficulty of the task of building and their colossal dimensions. Instead of the unsatisfactory Cyclopes, the Pelasgians, who preceded the Greeks in the occupation of the soil, are now accredited the authors of this primitive masonry, to which accordingly the much-abused term Pelasgic is applied. Pausanias (i. 28, 3) describes the oldest part of the walls of the Acropolis at Athens as the work of Pelasgic settlers there. In what relation of blood this race may have stood to the Greeks who succeeded them cannot be determined, but it is known that the Greeks adopted from them, among other religious beliefs and rites, those of Dodona; and since even this primitive style of masonry commended itself to them for a time, the Pelasgians must be regarded as having in some degree assisted in the artistic progress of their successors. 'The walls of Mycenz furnish an example of the fine skill with which the Greeks afterwards employed the Pelasgic construc- tion, the blocks of stone being carefully jointed and hewn on the outer surface, while the interior of the wall is filled up with mortar and small stones. Mycenz claimed to be one of the very oldest towns of Greece, and its walls may fairly be regarded as the oldest known monument of Greek workmanship. A considerable advance of skill is notice- able in the masonry of the treasure-houses (thesauri), or dome-shaped and partly subterraneous buildings, which occur in several districts of Greece, and of which the treasury of Atreus (so named by Pausanias) at Mycenz is a typical example. It is built of circular courses of evenly hewn and jointed stones, the courses narrowing towards the top, and there held together by a keystone. It is not, however, au instance of vaulting in the true

sense. The most remarkable features in the building are— first, the pilasters and tablets of coloured marble, decorated with a peculiar style of ornament, the elements of which are spirals and zigzags ; and secondly, the sheets of bronze with which the interior walls were plated. Of the latter little more than the nails have been found with which they were attached. Of the former a number of fragments, some of which are now in the British Museum, have come to light. The disposition, and especially the profusion of ornament which they display, differ strikingly from the simplicity of Greek work as we know it, and have given rise to a theory which is now accepted as proved, that the

the example of Oriental artists (Schnaase, Geschichte der fig. 28, Diisseldorf, 1866). Mean- 'ime, it is a fact of the first importance that this building, which Pausanias appears to have had good grounds for naming the treasury of Atreus, and thus assigning it to the heroic age before the time of Homer, furnishes a remarkable illustration of the descriptions of princely palaces given by the poet, according to whom the walls were plated with dazzling bronze, and the cornices, pillars, aud doors enriched with work in other metals. When, therefore, a building in the remains of which a complete absence of Greek simplicity and a powerful suggestion of Oriental influence have been unanimously recognised, was found to correspond accurately with the descriptions of

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Homer, it was both time to inquire whether the frequent notices of works of art in his pages also point in the same direction, and reasonable to assume that his testimony elsewhere in matters of art was equally reliable. From the poet's evidence on the condition of art in his time we gather that the various processes of working in gold, silver, iron, tin, and bronze:were known, with the exception of casting and soldering im the last-mentioned material, and of welding irou. Wood and ivory were carved and jointed, the art of pottery was known, and weaving and embroidery, the foundation of pictorial art, were practised. We hear of richly-ornamented articles of furniture, armour, and dresses. We read of the réxrwv, xaAxevs, and oxvTordpos. Occasionally the names of particular artists are mentioned, as of Tychius, who madc the

shield of Ajax (Iliad, vii. 222), and of Icmalius, who made Penelope's chair (Odyssey, xix. 60). On the other hand, the work of amateurs is often praised, as the couch made by Odysseus (Odyssey, XX1il. 189), and the figured garments worked by Andromache and Helena (Jliad, iii. 125, and xxii. 441). When the workmanship of an object is of surpassing beauty and the artist unknown, as in the case of the Sidonian crater (Odyssey, iv. 617), it is ascribed to the artist god Hepheestus, to whom also the same honour is done when the work, as in the case of the shield of Achilles, was a poetic creation. That Homer should in the same breath speak of an object as Sidonian and the work of a Greek god, is a singular mistake, which would hardly have been committed had the articles imported from the Pheenicians differed in style from articles of the same class produced by native work-men. So far, artistic feeling seems to have been directed exclusively to the decoration of objects of daily use. It had not yet aspired to the production of one object which could rest on its merits as a mere work of art,—as, for example, a statue. We have, indeed (Jliad, vi. 301), mention of a statue of Pallas at Troy; but the fact that women are described as placing drapery on its knees is sufficient proof of its having been a mere rude Xoanon, such as we find frequently represented on the painted vases. The same phenomenon occurs in the remains of Assyrian art, among which, with all the wealth of sculpture in relief and of the highest excellence, there are only three or four statues, and those of such exceeding rudeness that we are compelled to suppose that they were intended to be draped like the figure of Pallas just mentioned. We have seen that the ornaments of the treasury of Atreus at Mycene: pointed clearly to an Oriental origin. It is agreed that the relief of two rampant lions from above the gateway to the citadel of Mycenz (Miiller's Denkmiiler der alten Kunst), which is the solitary existing instance of Greek sculpture from abcut Homeric times, is of an Oriental character in the composition, in the flatness of the relief, and in the design of the pillar which stands between the lions. We find further, as was pointed out by Layard (Nineveh, Appendix), among the many remains of the inferior arts from Nineveh, illustra- tions of the references to such matters in Homer, which are admirable in themselves, and are found nowhere else, ex- cept occasionally in the oldest Etruscan tombs. Now, as Assyrian art reached its culmination by about the 9th cen- tury B.c., we may assume that, contemporary with Homer, it was being practised with great activity. On the testi- mony of Herodotus we know that Assyrian wares were imported into

Greece by the Phcenicians and sold in the heroic times; and, on the testimony of Homer, these same Phcenicians were in the habit of selling costly articles of furniture and dress to the Greeks of his time. Of early Pheenician art, however, we have no authentic remains, nor indeed any proof of its having had an independent existence at any time. We know the Pheenicians mainly as traders, and it is highly probable that in matters of art their

trade lay chiefly between the Assyrians on the one hand and the Greeks on the other. "It was the Phcenicians," says Brunn (Die Kunst bet Homer, Munchen, 1868), "who brought from the East to the Greeks au alphabet which they modified and employed for a language peculiar to them- selves; and it was the Phoenicians who brought to them from the same quarter an alphabet, so to speak, of art, which they also modified and employed for a language of art equally their own." He proceeds to define this alpha- bet of art as consisting of a knowledge of the processes of weaving and embroidery, of working in wood, ivory, and the various metals, with the exception of casting in bronze —with which and with sculpture in marble, which he also excludes, commenced the art of statuary, and commenced, therefore, the independence of truc Greek art. Besides these processes of working, the Greeks derived from the same source at least some of the decorative patterns which we find in use in later times, though greatly modified. But, above all, they obtained from the Assyrians that manner of sculpture in low flat relief, and in parallel hori- zontal bands, which they appear to have practised almost exclusively down to the 7th century B.c.,— that is, down

the two countries. Among the Greeks who visited Egypt at that'time were Thales, Cleobulus, Solon, and Pythagoras.

Of the connection which is assumed to have existed Remains in between the earliest monuments of Greek art and the con- 48! Minor.

temporary art of Assyria, evidence is cited from remains of undoubtedly early workmanship in the countries of Asia Minor, Lycia, Lydia, and Phrygia, of which the two latter were intimately associated with the oldest traditions and religious beliefs of Greece. The peculiar feature of Lycian art is its tombs cut in the rock, of which the oldest class are direct imitations of wooden structures such as we may conceive the primitive temples of an Oriental race to have been. In Phrygia we have another class of rock-cut tombs of very remote antiquity, of which that of Midas (Semper, Der Stil, i. p. 429) is the best preserved example. Here the style of decoration is obviously derived from Assyrian tapestry. In Lydia we have tombs again, but they are in the form of immense tumuli,—as, for instance, that of Alyattes near Sardis, which astunished Herodotus by its size, being 1300 feet in diameter at the base, and over 250 feet high. Similar tumuli occur among the old Chaldeans.

With the immigration of the Dorian race commenced Progress of the development of an independent style of architecture in Atchitec- Greece, the first step apparently being the invention of a ‘”

to the collapse of the Assyrian empire,—and after that to have retained as one of the charms of their architecture. If, then, an intercourse such as is assumed actually took

place in Homer’s time between the Greeks and the Assyrians, who were then artistically in a very advanced condition, it will be necessary, before lightly calling the shield of Achilles a poetic dream, as has frequently been done, to see whether the poet may not have had before his mind some manner of a counterpart for it in Assyrian art, We need not suppose that such a shield ever existed. But a poet cannot create out of nothing; and it is clear from his division of the shield into five concentric bands, resem- bling the large bronze shields found at Czere some years ago in a tomb of very high antiquity, that he had be- fore his mind the customary arrangement of ornaments in works of this kind. Now, on an Assyrian bronze bow] in the British Museum (Layard, plate 61), which exactly resembles in shape and is of about the same size as a boss of a shield, we have a representation of the earth and heavens which very strikingly recalls the decoration of the boss on the shield of Achilles; while in the com- paratively few remains of

Assyrian sculpture we have cities at war, cities at peace, and many scenes from daily life, which vividly illustrate the Homeric description of the shield (see Brunn Die Kunst bei Homer, who decals with the various subjects in detail). It should be observed, however, that though the evidence of the Homeric poems and the remains of Greek art from the Homeric age both point to an Assyrian influence, the Greeks of later times looked rather to Egypt as the land whence their ancestors had experienced their first impulse both in religion and in art. They believed that Deedalus, the first Greek sculptor who knew how to give movement to his figures, and was regarded as the father of Greek sculpture, had learned his art in Egypt. Diodorus of Sicily asserted that Telecles and Theodorus of Samus had visited Egypt, and on their return executed a statue of Apollo in the Egyptian style for a temple in Samus, each having made a half of it, and that apart from the other. Strabo (p. 806) compares the old Greek sculpture with the Egyptian; while Pausanias in several places Gi 19, 3; iv. 32, 1) speaks of Egyptian statues in Greek temples, or Cs 42, 3; vii. 5, 5) of statues resembling the Egyptian in style. According to another theory, the influence of Egypt on Greek art, though admitted, is relegated to the time of Psammetichus, in whose service it is known many Greek mercenaries were employed, and through whose inclination towards the Greeks an active intercourse sprang up between

house supported by columns as the design for a temple. From the description given by Pausanias (v. 16) of one of these early Doric temples—that of Hera at Olympia, erected shortly after the Dorian immigration—we gather that it had the form of a temple iz antis, surrounded by columns, and with not only a pronaos led into by two columns, but also a similar chamber at the back. One of the two columns of this latter chamber was of wood, apparently a reminis- cence of a former style of construction in that material. About the same time originated also, it is supposed, the Ionic order, which though presenting a certain Asiatic richness of ornament strongly opposed to the severe sim- plicity of the Doric, was still a pure Greek invention. The fact of it having first appeared among the Greeks of Asia Minor is enough to account for its admission of a greater softness and flow of lines than was admitted in the Doric. With the new movement in architecture a fresh impetus was given to the art of sculpture. the reports sound somewhat fabulous,—as, for example, that in which Butades the

Corinthian potter is described as having hit on the idea of modelling a face in clay and baking it along with his vases. Butades himself, however, is an historical person, and Corinth is known to have been a flourishing seat of potters and other artists as early as the time of the tyraut Cypselus (650 B.c.), through whose oppression it is said the artists, Eucheir, Diopus, and Eugrammus emigrated to Etruria, which afterwards became celebrated for its sculptures in terra-cotta. At the com- mission of Cypselus, or of his successor Periander, a colossal statue of Jupiter was executed at Corinth, and dedicated at Olympia. But the most remarkable specimen of early sculpture, presumably Corinthian, was the chest in which the infant Cypselus was concealed, and of which a detailed description is given by Pausanias (v. 17, 5, fol.) The chest, itself of cedar, was ornamented with a wealth of figures in gold and ivory, arranged in parallel horizontal bands, and representing heroic legends and scenes from daily life, the names of the individual figures being in- scribed boustrophedon, that is, in the manner characteristic of early times, and in what Pausanias calls very ancient letters. The Francois vase in Florence (Afonumenti dell' Instituto di Correspondenza Archeologica, vol. iv. pls. 54-58) gives a tolerable notion of what the composition must have been, Artistic activity was not then confined to Corinth. A school of sculpture in marble existed in Chius as early

as 660 B.c., and there also Glaucus is said to have dis- covered the art of welding iron (692 B.c.), the substitute for which had previously been nails. At this period we have frequent mention of splendid metal utensils, as, for instance, the enormous cauldron (Herodotus, iv. 152), with projecting gryphons' heads and a support formed of kneel- ing figures, seven ells in height. As the oldest example of sculpture in bronze which he had seen, Pausanias (iii. 17, 6) describes a statue of Jupiter at Sparta, the work of Clearchus of Rhegium, whom some called a pupil of Dedalus. It was made of plates of bronze, beaten out to express the whole figure, and then fastened together with fine nails, the arts of soldering and of casting being still unknown. Of sculpture in this manner we possess only one example, the

bronze bust found at Polledrara, near Vulci, and now in the British Museum. © Throughout this early period the statues or images of deities seem to have retained their helpless primitive form, feelings of piety and gratitude being apparently expressed rather in gifts of metal utensils to the temples than in statues' of the gods as in later times. No such statues exist now, but we have sufficient evidence of their want of artistic merit in the numerous representations of them which occur on the painted vases of a later period, when the sanctity of a spot is frequently indicated by such a figure. Apparently to this early and as yet barely historical period belongs a

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*MATT, WERS= PEE**

Brit. Mus. on drab ground.

Fia. 1.—-Fictile be From Athens. Design in black,

class of painted vases decorated with figures of animals and flowers arranged in parallel horizontal bands, and there- fore both in the choice and disposition of the decorations presenting a marked instance of Assyrian influence. From their shape it appears that many of these vases were made to hold precious liquids, such as perfumes ; and it is very probable that they were imported from the East with those perfumes, the names of which in the Greek language have an obvious Oriental origin. A considerable advance is noticeable in a second class of these vases, in which

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the human figure is introduced as the principal subject in the decoration, the designs being in general chosen from the heroic legends of Greece. These vases still retain the shape of the former class, the method of disposition in parallel bands, and the choice of sub- ordinate ornaments. The names of the heroes are frequently written beside them, and sometimes the artist adds his own name. 'The alphabet in which these names are written is the old Corinthian, and hence the vases in question are also

styled Corinthian. As to their date, it is agreed that they cannot be later than 620 B.c. With the introduction of the human figure as the subject most worthy of artistic rendering, conmenced in vase painting also the independence of the potter's art in Greece (Brunn, Probleme in der Geschichte der Vasenmaleret).

Second Period.

From the date of the earliest historical notices of sculp- tors, backward to that usually assigned to the Homeric poems, there is an interval of several centuries, during which it would at first sight appear that the art of sculpture had made no sensible advance, if indeed it had not declined. This being improbable, an explanation must be sought for, either with Ulrichs (Die Anjange der Giriech- ischen Kiinstlergeschichte, Wiirzburg, 1871) in the con- fusion which seems to reign among the dates of the earliest sculptors, or with Brunn (Die Kunst bei Homer) in the theory that the art of sculpture in Greece during that interval was, like the contemporary art of Assyria, strictly confined to working in relief, and that in this direction it may well have made steady progress, though particular artists are not singled out for praise. It is with sculpture in the round, and with some particular invention, as that of welding iron or casting bronze, or with some new technical procedure, as the working of marble, that the first records of artists begin. With regard to the confusion in the dates of these records, it is true that in ancient times the artistic faculty was handed down in certain families, among whom there was also a partiality for certain names. But te assume on the strength of this, as Ulrichs does, that later writers, finding a recurrence of the same name, generally identified it with the most distinguished and hence pro- bably the latest of the artists who bore it, is a means of peopling an apparent void which ought to be supported with better evidence than that which Brunn has contro- verted at almost every point. For example, in treating of Theodorus of Samus, of whom it is said that he invented the process of casting in bronze, and supposed that he was a contemporary.of Polycrates, Ulrichs argues that there must have been two artists of that name (and suggests that there may have been several), because the one who invented bronze-casting must have lived before 576 B.c., previous to which date this art may be inferred to have been known from the remark of Herodotus (v. 82), that the Epidaurians were ordered by

an oracle to obtain figures of Damia and Auxesia, not xaAxod 7 AiMov, but dAov. Why xadkod should not refer to hammered as well as to cast bronze, Brunn is unable to see. Again, it was Theodorus of Samus who built the substructure of the temple of Diana at Ephesus, and Ulrichs is at a loss to conceive how the people of that town could have remained till 576 B.c. without a temple worthy of their goddess. That the previous temple was unworthy of Diana cannot be proved by us, who are ignorant of the feelings of the Greeks in these matters, and who are aware that Jupiter himself had not even in his favourite Olympia a great temple till 456 B.c.

The view taken by Brunn is, as has been said, that until the invention of casting in bronze the Greek sculptors con- tinued to work in relief except when images were required for the purposes of worship, and that in these cases, whether

the figure was of wood, stone, or bronze, the rude helpless form of ancient times was preserved. Stimulated, it may be supposed, by the achievements of the newly-inventcd art, sculptors now began to look to the possibility of pro- ducing in marble also a resemblance to the human figure in its substantial roundness. The scene of the first success in this direction was Chius, where a family which for three generations (Melas, Micciades, and Archermus) had been celebrated for its workers in marble, was at this time represented by the brothers Bupalus and Athenis. Works from their hands were to be seen in their native place, in Delus, Iasus, and Smyrna, and consisted, so far as we know, of draped figures of goddesses, with the one memor- able exception of a statue by Bupalus intended as a carica- ture of the poet Hipponax, which was set up in Clazo- men. The poet took his revenge by circulating some verses which stung the sculptor so severely as to drive him to suicide ky hanging. The school of Chius had a rival in that of Magnesia on the Meeander, at the head of which was Bathycles, whose fame is associated with the reliefs and figures on the colossal throne of Apollo at Amyclz (Pausanias, iii. 18, 9; Overbeck, Gesch. d. Griech. Plastik, i, p. 86). He and a number of his pupils or assistants had been purposely invited to the task, and what they accomplished was probably the best that could then be done, however short of the standard of later times it

may have fallen in the eyes of Pausanias. One noticeable fact is, that after completing their work, they left bchind portraits of themselves, and this, in connection with the portrait of Hipponax, may serve to show that sculptors had already begun to direct their attention to the individual features of the human face. As to the date of Bathycles, Pausanias was uncertain and modern critics are divided, some supposing him to have left Magnesia before its de- struction, 636 B.c., others on the occasion of its capture by the Persians, 546 B.c. In favour of the latter date is the statement (Pausanias, iii 10, 8) that the gold received from Croesus (563-549 B.c.) by the Lacedeemonians was made a gift of by them for the decoration of the figure of Apollo at Amyclee.

The new phase of art thus entered on, according to tradition, by the Ionians, was now taken up vigorously by the Doric sculptors, among whom the first to attain dis- tinction were Dipcenus and Scyllis, natives of Crete, and members of the ancient guild of sculptors there, which took its name from the mythic Dedalus. Leaving Crete, they settled in Sicyon, probably on the invitation of the tyrant Clisthenes, and were there commissioned to execute at the public cost a group of statues of deities. Their work was, however, interrupted by a disagreement which ended in the artists having to leave the town. They estab- lished themselves in AEtolia, and were allowed to remain there until, a plague having fallen on Sicyon, the oracle traced it to the wrath of the gods at seeing their statues incomplete. Dipcenus and Scyllis were recalled, and finished their work at a greatly increased price, from which it may be inferred, perhaps, that the original dispute lay in the matter of payment. Among the many sculptures which they executed in Sicyon and other Greek towns, as Cleon, Argus, Tirynth, and Ambracia, some, it is said, were of wood and ivory, a combination of material which may be regarded as having suggested the chryselephantine sculpture of later times (Pliny, xxxvi. 4,9, 14 ; Pausanias, ii. 15,1; 22,5; Brunn, @esch. d..Griech. Kiinstler, i. p. 43). For determining their date, we have a passage of Pliny in which he says, "Primi omnium inclaruerunt marmore sculpendo ;" adding, "' Before Cyrus ascended the throne of Persia, about 576 3.c." From their school proceeded Doryclidas and Dontas, who executed several figures and Stoups of deities in cedar and gold at Olympia for the

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Hereum and the treasuries of the Epidaurians and Megareans ; Clearchus of Rhegium, who worked in bronze ; and Tectzus and Angelion, from whom Callon, the celebrated A°ginetan sculptor, learned his craft. As a work of Tectzeus and Angelion, Pausanias (ii. S2Ss ise 35, 3) mentions a figure of Apollo at Delus, representing the god in a rigid attitude, the upper arms close to the sides and the fore-arms advanced, in his right hand a bow, and in his left a diminutive group of the three Graces. Contemporary with Doryclidas were Smilis of gina and Gitiades of Sparta, the former of whom is known to have executed a group of the Hora, to be placcd with a figure of Themis by Doryclidas. From his hand was also a figure of Hera at Samus. Glitiades, who was at once sculptor, architect, and poet, erected the temple of Athene Chalkioikos, and made'the figure of the goddess for it. The temple was coated with plates of bronze, on which were reliefs representing scenes from the legends of Hercules and Perseus, and from mythical incidents, among them being the birth of Athene.

Turning now to the remains of Greek sculpture, Remaining which may with more or less certainty be assigned to Sculptures.

the period in which the foregoing sculptors were at work, we begin with the three metopes from the oldest of the temples on the Acropolis of Selinus, in Sicily, which up to now have been regarded as furnishing the first authentic, and as yct the clcarest, glimpse of that early stage of Greek art when the foreign elements with which it had grown up were being fast eliminated, and the basis laid of a perfectly independent art. It is not within the range of absolute proof, though it is nearly so, that these metopes belonged to the temple erected by the Selinuntians soon after their settlement as colonists, 651 B.C., or, as others prefer, 628 (Benndorf, Die Metopen von Selinunt.) They are sculptured in tufa, and represent —(1), Perseus cutting off the head of Medusa in the presence of Athene; (2), Hercules carrying the Cer-copes, bound by the heels, over his shoulders; and (3), a quadriga to the front. In the first two, while the move- ment proceeds from left to right, the faces are all turned broadly to the front, as if looking to the spectator for applause. It may be that the artist, in thus rendering the grimness and grotesqueness of his subjects with a more staring and vivid cffcct, had

recourse, as is argued, to an iumovation on the older manner of representing the figures altogether in profile. This much appcars to be certain, from the minute attention which he has devoted to the

| Structure of the knees, the lower parts of the legs, the feet,

and the movement of the flesh on the shoulders, that the loss of half a face, entailed by a position in profile, would have grieved him. The drapery is stiff, and studiously arranged in neat folds, which are not always produced by the manner in which it is worn. The hair is disposed in a system of circular locks independent of each other. The proportions of the figures vary considerably, though uni- formly characterised by a solidity and heaviness which, from the similar appcarance of Doric columns, has been designated as Doric in style. The remains of colour found on these sculptures showed that the gis of Athene had been sketched on the breast with a reddish brown, and that the same colour had been applied to the ground of the relief. The meander pattern on the broad fold of Athene's chiton was painted brown, her eyes and eyebrows black. The eyes of the Gorgon were red. The folds of the short chiton worn by Hercules were partially left to be indicated by colour. The muscles are strongly exaggerated, so aS to mark the extraordinary physical strength attri- buted to the heroes of the subject.

Markedly contrasting with these metopes is a marble

relief found in Samothrace in 1790, and now in the Louvre,

distinguished for the flatness of the figures, which present the appearance of sections of men (Friederichs, Bausteine, i, p. 18). The subject, as we learn from the names in- scribed by each figure, consists of Agamemnon seated, with the herald Talthybius, and Epeius, the sculptor of the wooden horse, standing behind him, The figures are lean and spare compared with those of Selinus ; the folds of the draperies are merely indicated, and appear to have been completed in colour. The character of the inscrip- tions, which are in the old Ionian dialect, corresponds with that of the early vases. That this

relief cannot be later than 500 zc. there is no doubt; but all means of determining its date beyond that period fail. Nor is it safe to assign it higher antiquity than the Selinus metopes, on the ground that the figures are all in profile; for a position in profile was by no means an invariable characteristic of early sculpture, as may be seen by reference to fig. 2, in which are given two examples of the ex-

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Frd- 2.—Gold ornaments. tremely early gold ornaments from Camirus in the British Museum, in all of which the figures are placed full to the front (Millingen, Ancient Unedzted Monuments, ii. pl. 1; Miiller, Denkmdiler, pl. 11, No. 39). From the sacred way leading up to the temple of the Branchide at Miletus there are ten marble statues of seated figures now in the British Museum, for which they were obtained by C. T. Newton. Apart from their importance as works of art assignable to this early period, one of them possesses the additional interest of being, as we learn from the inscrip- tion on it, a portrait of Chares, a ruler of the neighbouring Teichiousa. The other important examples of sculpture in this period are—(1), the architrave of the temple at Assus, in the Troad (Friederichs, Bausteine, i. p. 9); (2), three statues of Apollo—one found at Thera, and now in Athens, the second found at Tenea, and now in Munich, the third in the British Museum, where it is known as the Strang- ford Apollo. All three stand in the Egyptian manner, resting the weight of the body on both legs. The head sits rigidly on the shoulders, the brow retires, the eyes pro- ject and slope inward towards the nose, the lips are close, and the corners of the mouth turned up, producing some- thing like a smile. The hair appears to have been completed with colour (Overbeck, Gesch. d. Griech. Plastik, 9d ed., i. fig. 8; Friederichs, Baustedne, i. p. 5).

In the course of our notice of this early period certain facts have assumed a prominence which calls for remark. First, it is to be observed that the

earliest important schools of sculpture arose in the islands, particularly the islands of Chius, Crete, and Aigina. To what circumstance

Brit. Mus. From Camirus.

this was due—whether, for example, to a more active intercourse with Oriental nations—remains unexplained. Next to the islands, the coast of Asia Minor, Magna Grecia, and Sicily were productive of artists. From Crete the new impulse spread to the Peloponnesus, Sicyon, Argus, and Corinth. Secondly, for some reason, the sculptors then mostly worked in pairs. Thirdly, the various materials—bronze, marble, wood and ivory, and gold and ivory—were already in use as in later times. Fourthly, the subjects were—(1), religious and mythologi- cal, the epos being the main source; and (2), portraits and statues of successful athletes. Individual artists had at last begun to assert their peculiarities in the conception of the human form. They had begun to give up those general types which bear the same resemblance to a man as does his shadow cast by the sun. In the infancy of art, as in the early morning, the shadows are grotesque. As it advances they improve, till at noon the shadow is lost in the living figure.

In the earlier part of our period it is to be observed that School of

the Dorian race still continued to furnish the sculptors of Sicyon. distinction, but the main centres of the art were now in the Peloponnesus instead of the islands. In Sicyon the reputation acquired by Dipcenus and Scyllis was enlarged by Canachus, whose works were spoken of in later times (Cicero, Brut. 18, 70) as models of the severe restrained style of the early schools. Statues of deities were his favourite subjects. His material consisted sometimes of wood, as in the figure of Apollo Ismenius at Thebes (Pau- sanias, ix. 10, 2); sometimes of gold and ivory, as in the figure of Aphrodite at Sicyon (Pausanias, ii, 10, 4); and sometimes of bronze, as in his celebrated statue of Apollo Philesius at Miletus, which is said to have differed from the Apollo at Thebes only in the material. A figure of Apollo answering in general terms to the description of this statue, occurs on

certain coins of Miletus and in a remarkable bronze statuette in the British Museum. The attitude of the statuette is stiff, but less pervaded with rigidity than, for example, the Apollo of Tenea. The form, which is quite nude, shows an advance in the study of proportions. The shoulders are still square, but the chest is much fuller, and apparently rendered as if with a reminis- cence of its expansion and heaving after athletic exertion. Canachus worked with his brother Aristocles, also a sculptor of high reputation, though of his works all we know is that he took part with Ageladas in the execution of three statues of Muses.

The schools of Argus and gina appear to have mostly School of confined themselves to working in bronze. At the head Argus. of the former stood Ageladas, whose principal reputation consists in his having been the instructor of the three great masters, Myron, Polycletus, and Phidias. Nine of his works are mentioned, including two statues of Zeus, but no description of his style is added, nor is anything regarding it to be inferred from the very diverse manner of his three great pupils. His date falls between 508 and 452 8.c, Argus had also Aristomedon, Glaucus, and Dionysius. In Agina, School of where the quality of the bronze (Aiginetica aeris tempera- Aegina. tura—Pliny, V. H., xxxiv. 2, 5, 10; 8, 19, 75), as well as the artistic excellence of its sculptors, obtained a wide recognition, the first name of importance is that of Callon,

a pupil, as has been said, of Tectaus, and Angelion of Sicyon, and a contemporary of Canachus (Pausanias, vii. 18, 10), with whom, in respect of the severity of his style, he has been compared. Of his works we know only of a statue of Athene at Trcezene, and a tripod with a figure of Cora at Amycle. Possibly, like his contemporaries, his chief study was that of the finely-developed forms of suc- cessful athletes. Greatly beyond him in distinction was Onatas, under whose hands the art of /®gina achieved a

SECOND PERIOD. |

reputation which was perhaps only surpassed by that of Athens, and, owing to the political collapse of the island, was never obscured by the inferiority of later schools. His works, which appear to have been mostly of bronze, con- sisted of large compositions as well as of single statues of gods and heroes. After Onatas we have Anaxagoras, who was employed by the united

Greek states to execute the bronze statue of Zeus (15 feet high) for Olympia, in com- memoration of the battle of Plataz. On the same occa- sion the Greeks dedicated two other works of art—a bronze statue of Poseidon (104 fect high) for his temple on the Isthmus; and a golden tripod, standing on a bronze support formed of three serpents, for the entrance of the temple at Delphi. In both cases the names of the artists are unrecorded, and probably it will not be wrong to assume that they also were of Aigina. The golden tripod was melted down during the Phocian war; but the sup- port remained wm situ till the time of Constantine, by whose orders it was removed to Constantinople and placed in the Hippodrome, where it still stands. In 1855 the earth which had accumulated round its base was removed by C. T. Newton, and the names of the Greek states inscribed on it revealed. (Newton, Zravels in the Levant, ii. p. 25. For the discussion raised on the antiquity of this monument, see Friederichs, Bausteine, i. p. 64.)

In Athens we find in this period Endcus, of whom the scanty records permit us to know almost nothing, and Antenor, the author of a bronze group representing the Tyrannicides, Harmodius and Aristogiton, and erected in the Agora at the foot of the Acropolis. That these figures were executed shortly after the incident which they were intended to commemorate, 550 B.c., is very probable. It is recorded that Xerxes carried them off to Susa in 480 B.c., and that they were restored to Athens by Alexander, or Seleucus, or Antiochus. In the meantime, to repair the loss, two sculptors, Critius and Nesiotes, were employed to re- place the group (Pausanias, i 8,5; Arrian, Haped. Alex. iii, 16, 7; vii. 19, 2; Pliny, xxxiv. 19, 70). Whether the new sculptors were expected to reproduce the composition and the style of the lost figures—as, for example, Onatas did in replacing the figure of the black Demeter at Phigalia— cannot be ascertained. On the other hand, if the two marble statues in the museum of Naples (Mus. Borbon., viii. pls. 7, 8) have been rightly described as copies of the new group, and if it is right to conjecture that the group represented on certain tetradrachms of Athens, and, we may add, on a Panathenaic prize vase in the British Museum, was copied from the older group, on the ground that they were executed about the time when it was recovered from Susa, and therefore probably to commemorate that event, this much at least will be clear, that the composition of both groups was very much the same. On the other hand, the frequency with which statues and groups of statues of various kinds occur

on the late tetradrachms of Athens, would equally perhaps require to be explained on the same hypothesis of a restoration, and for this we are not prepared. With respect to the marble statues just mentioned, it is to be observed that the expression of physical energy in them, side by side with a spareness and sinewiness, recalls the characteristic of Myron, and accordingly may be better ascribed to the later artist Critius, than to his predecessor Antenor. As comparable in many respects with one of the statues in Naples we give fig. 3.

At Rhegium, in lower Italy, the mantle of Clearchus had fallen on Pythagoras, unless it be true, as is also stated, that he had reccived his instruction from an otherwise unknown artist, Euchirus of Qorinth. A list of the sculptures by Pythagoras (Overbeck, Antike Schriftquellen, 8.v. Pythag.) shows that he worked exclusively in bronze, that his subjects, with the exception of a group of Europa

on the bull, in Tarentum, consisted of male figures, and these of a ki

Fic. 3.—Bronze statuette.

Brit, Mus. Mr Woodhouse, Corfu.

From the collection of the late

muscular action, or a marked capacity for it, must have been expressed. The most famous of them was his statuc of Philoctetes at Syracuse, of which the epigram writers declared that the expression of pain in jt was such as to move™the spectator. To disprove the conjecture that the pain might have been expressed in the face alone, there is a gem in the Berlin Museum (Overbeck, Gesch. d. Griech. Plastik, 2d, fig. 42) bearing what there is little doubt is a copy from the statue, from which Philoctetes appears to be suffering contortion through every limb from the wound in his foot as he tries to walk. And this, it may be added, while itself an accurate observation of the effect of such a wound, is an admirable illustration of the talent of

Pythagoras for strained, and, what is more, a concentrated straining of, muscular action. From a statement of Pliny, it appears that he was the first to express the veins and sinews of the human form, and from Diogenes Laertius we gather that he was the first to apply rhythmus and sym- metry to his figures. The precise meaning of these latter words it is difficult to understand, with nothing better before us than a gem copy of one of the artist's works. It will not, however, be far wrong if we take them to refer to that concentration of the entire action of the body upon one point which has been recognised in the figure of Philoctetes, and which we assume to have been the key to the composition of his groups. This interpretation is further in harmony with the statement of Pliny, seeing that an artistic purpose of this kind could not be carried out without the studious expression of veins and sinews (Brunn, Gesch. d. Griech. Kunstler, i. p. 132).

We have seen how few of the existing monuments can — be traced even conjecturally to the artists of this early %™P'™UTs

period, whose names and praises have been handed down to us. Monuments of sculpture there are, manifestly assignable to this period, and some of them worthy of the fame of a great master. But whether the men who executed them were unhonoured in their time, or whether from the insufficiency of our literary records names well known in antiquity may have escaped us, or whether, in fact, the best of these works at least may really have come from the hands of men otherwise well known, remains un-

Sculptures from fagina,

Bas-reliefs.

'artists Callon and Onatas of Aigina.

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explained. The last-mentioned possibility has been placed in a strong light by Brunn's discussion on the sculptures from the temple of Athene at Aigina, now in Munich. Not that he would trace them directly to the hands of the What he aims at is to connect the characteristics of the sculptures intimately with the style recorded of these two men, and to leave the rest for

conjecture. (Die Aginetische Giebel-Grup- pen, Bayer. Akad. 1869; and Ueber das Alter der Aigine- tischen Bildwerke, Bayer. Akad. d. Wissenschaft, 1867.) Of the figures in the western pediment, in which the combat over the dead body of Achilles was represented, only one is lost. From the eastern only five complete figures remain. The subject of it was a combat corre- sponding in its main features with that of the other pedi- ment. In both the central object of the strife is a fallen hero; in both the goddess Athene appears on the scene. In the one group her figure is entire ; in the other only ler head remains. In the eastern pediment the only recognisable figure is that of Hercules, and from his presence it has been supposed that the subject of the com- position was the combat of that hero and Telamon against Laomedon of Troy. The statues of this pediment are of a bolder and more advanced style than the others, from which it has been inferred that they may have been the work of a younger man, carried away by a new movement in art, while the others may have been the work of an older artist, hardened in the traditions of his school. One thing, however, is plain from the remarkable uniformity which reigns among the figures of both groups, that the artist or artists had hitherto been limited in their study to one type of the human form, and that the nude form of finely- developed athletes. Nowhere is there individuality, but everywhere an excessive carefulness in rendering the forms. The goddess Athene has all the rigidity of the ancient figures intended for a worship which little brooked inno- vations. 'The expression on the faces is throughout the same, and the hair is always rendered in one conventional manner. 'The figures are spare and hard, with as little flesh as possible. In both pediments the scene—a combat over a fallen hero-—is intended to stir our sympathy, but entirely fails. There is no straining of muscles, no expres- sion of grief, and no sense of the emergency. We turn from the figures as a whole to the pleasing truthfulness with which the parts are rendered. To give them a greater air of vitality, the lips and eyes of the statues, with such accessories as drapery, sandals, and weapons, were origi- nally coloured blue and red, while many small holes remain to show that part of the armour and egis on the breast of Athene had been attached in metal, a fact which bears with great importance on the question of the polychromy of ancient statues. With regard to the date of these sculp- tures, the opinion is, that they could hardly have been executed more than fifty years before the time of Phidias (engraved, Miiller, Denkmdler, i. pls. 6-8).

Among the other existing examples of sculpture assign- able to this period we would select as most characteristic— (1.) A marble stele found (1838) in the east of Attica, and now in the Theseum at Athens (Friederichs, Bausteine 1. p- 26), representing an armed warrior standing in profile, whose name, as appears from the inscription, was Aristion. The sculptor's name, which is also inscribed, was Aristocles. The relief is low and flat, and executed with the greatest care and attention to details, particularly those of the armour. The ground of the relief was painted red and the armour blue, the ornaments on it being picked out with red. Remains of colour were also found on the lips and eyes, while the crest of the helmet appears to have been added in metal. Altogether, Aristion presents a touching picture of the old upright and severe warrior who

fought at Marathon. (2.) Another marble stele in Orcho- menus, inscribed with the sculptor's name, Anxenor of Naxus, and representing, in low flat relief and in profile, a man of years wearing a mantle, staff, holding a beetle towards the dog at his feet (Overbeck,

Bausteine, i. p. 29).

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and standing, resting on his

Gesch. d. Griech. Plastik, 2d ed., i. fig. 23; Friederichs, (3.) Another marble stele in Naples (Mus. Borbon., xiv. pl. 10; Friederichs, Bawstecne, i. p. 28),

in which the drapery and the forms are still archaic, though showing a considerable advance on the stele of Aristion. (4.) Part of a metope from one of the temples of Selinus in Sicily (Benndorf, Die Metopen von Selinunt, pl. 5), repre-

senting a goddess, either Athene or Artemis, trampling on

an armed male figure, probably a giant, whom she has hurled to the ground, As an example of the archaic

manner of relief in this period, this fragment has no equal among existing monuments. The anguish on the face of

the giant is depicted with déep feeling ; nor is our emotion

interrupted by observing that the beard retains its formal trimness, and that the hair remains in graceful ringlets, in no way partaking of the confusion. (5.) Marble relief

found on the Acropolis of Athens, and preserved there, representing a female figure, possibly a goddess, stepping

into a car (Friederichs, Bausteine, i. p. 25). This relief has

been supposed, but without sufficient reason, to be a fragment of the frieze of the older pre-Periclean Parthenon.

With more justice has it been compared in point of style with (6), the reliefs of the so-called Harpy tomb discovered at Xanthus in Lycia in 1838 by Sir Charles Fellows, and now in the British Museum (Friederichs, Bausteine, i. p. 37). (7.) From Xanthus the British Museum possesses another archaic frieze of higher merit, representing a procession of chariots, in which the horses are modelled with extra- ordinary care(Prachov, Antiquissima Monumenta Xanthraca, 1872). (8.) Marble relief in Thasus representing Apollo, Hermes, and nymphs (Overbeck, Gesch. d. Griech. Plastik, 2d ed., i. fig. 28). The figures have an onic slimness, such as we found on the architrave from Assus, but with finer proportions than that early work. (9.) Three small reliefs in terra-cotta from Melus (Overbeck, Gesch. d. Griech. Plastik, 2d ed.,i. figs. 27, 26a, and 260), representing Orestes and Electra at thetomb of their father; Perseus mounted on Pegasus and carrying off the head of Medusa; and Sappho,

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Fic. 4.—Terra-cotta. Peleus [PE[AJEV2] and Thetis. Brit. Mus. From Camirus. seated, resting from her lyre and looking up towards Alceus, as at the moment when he said, “ You sweet, black-haired, modest Sappho, I have something to say to you.” A fourth relief of this style is given in fig. 4.

Gem-en- | graving,

Painting.

SECOND PERIOD. |

The trimness and grace of these early reliefs had a charm for the artists and patrons of later times, especially the times of the first emperors, such as has been exercised in our day by the paintings of the pre-Raphaelite masters, and between the imitations then produced and the original models it is frequently difficult to draw a clear distinc- tion. A critical list of these imitations—whether sculp- tured in relief or in the round—is given by Friederichs, Bausteine, i. pp. 71-95 ; and, with illustrations, by Overbeck, Gesch. d. Griech. Plastik, 2d ed., i. pl. 14. As examples of early sculpture in its inferior walk may be mentioned (10), a series of bronze statuettes which have served as stands of mirrors or otherwise as decorations of furniture. Those which have been or are still stands of mirrors are generally female figures, and it is to be observed that the oldest of them, as distinguished from the later examples, wear a heavy under-garment or chiton, apparently of worsted material, and over this again an ample and by no means light peplos. :

If we are to credit the Greeks with having been intro- duced by the Assyrians to one branch of art more than another, we should say it was the art of gem-engraving. Not that we possess Greek gems which compare in style and antiquity with those of Assyria, but, if for no other reason, because we find a technical process of so great difficulty existing at all in Greece at an early period. Perhaps the earliest examples of the art in Greece possessed of artistic merit are two scarabs from Aigina, one with the figure of a bowman in pure Aiginetan style, and the other bearing the inscription Kpeovrida cipé (Bullettino d. Inst. Arch. 1840, p. 140); three from Asia Minor, two of them being inscribed, the one Sijpovos, the other ’Apurroretyys (Brunn, Gesch. d. Griech. Kiinstler, ii. pp. 633 and 604). The

only glyptic artist mentioned in this early period is Mnesarchus of Samus, the father of Pythagoras. In con- trast with the paucity of early gems from Greek soil is the immense number of scarabs yielded by the tombs of Etruria, which at least reflect the style of this period. The material consists principally of rock-crystal, carnelian, and banded agate, and the subjects, it is worthy of remark, are mostly taken from the heroic legends of Greece, figures of deities being exceedingly scarce, as indeed is also the case on the Etruscan bronze mirrors, which, however, are obviously of a later date.

Painting, orrather colouring, as it would be more properly described in its earliest phase, in which it was entirely subservient to architecture and ceramography, is said to have been first elevated to an art by Cleanthes of Corinth, who introduced the drawing of figures in outline; by Telephanes of Sicyon, who improved on this by indicating the principal details of anatomy ; and finally by Ecphantes of Corinth or Craton of Sicyon, by the introduction of colours (Pliny, WV. H., xxxv. 3, 15). Again we have Eumarus of Athens, who is said to have first distinguished in his paintings men from women, probably by the means adopted in the early vases, that is, by painting the flesh white in the case of women. The historical truth of these statements may be doubted; not so, however, those that refer to Cimon of Cleonz, who made an unquestion- able advance in the treatment of draperies, and in exchang- ing the conventional manner of rendering the human form for an approach to truthfulness to nature (lian, Var. Hist., viii. 8; Pliny, WV. #., xxxv. 8, 6). Cimon appears to have been the founder of the early Peloponnesian school of painting. As the task imposed on painters at that time was mostly the decoration of the cella walls of temples, we must suppose that they executed their paintings on the prepared stucco of the wall either when it was fresh (al fresco), or when it was dry, by means of some binding material, a tempera. Like their followers down to the

time of Apelles, they used only the simple colours, white, yellow, red, and bluish black, in the mixing of which to obtain other shades they seem to have advanced very little, greater attention being directed to the drawing than to the colouring. From the school of Asia Minor, which, from the

proximity of the Lydians, Phrygians, and Pheenicians, with their long practice in working in colours, may have arisen earlier than that of the Peloponnesus, the first name we hear of is that of Bularchus, who, according to Pliny (WV. H,, vii. 38, 126 ; xxxv. 8, 55), produced a large painting of the taking of Magnesia, which he sold to Candaules, king of Lydia, for its weight in gold. From the coast of Asia Minor our records of painting pass to Samus, an island which was conspicuous in early times for the grand scale of its undertakings. There Mandrocles, who made the bridge of boats across the Bosphorus by which Darius crossed with his army 515 B.c., executed a large historical painting of this passage of the Persians across the bridge, with Darius seated, enthroned, on the shore. This picture, according to Herodotus (iv. 88), was placed in the Hereeum of Samus. To the Samian school belonged Calliphon and Agatharchus. It is also not unlikely that it had exercised some influence on Aglaophon of Thasus, the father and instructor of Polygnotus. From Corinth the art of painting, coupled with that of modelling in clay, passed to Etruria, lower Italy, and Sicily. At present the

only examples of early Greek painting which we can adduce Painted are furnished by the vases, a branch of the art which the vases.

ancients themselves regarded, it appears, with sufficient disrespect. For us, the vases, which have been preserved in great numbers, have this special value, that they present in an unbroken line, if in a comparatively degraded form, the various stages of Greek painting from its first beginnings under Oriental influence to its decline. The class which belongs to the period now before us is distinguishable from the others by the fact that the figures upon them are first scratched in outline on the red ground of the vase, and then filled in with black, the whole being covered with a varnish which seems to have lost nothing of its brilliancy. The other colours employed are white for the flesh parts of women and the hair of old men, white and a dark purple for the details of draperies and other acccssories. The eyes arc always placed full in profile, and the drawing of the figures is excecdingly stiff and angular. By far the greater part of this class of vases have been found in the tombs of Etruria, and for this reason they were called Etruscan, a designation which they retained till the fre- quency of Greek inscriptions, recording the artists' names upon them, contrasted with the total absence of

Etruscan inscriptions, led to their being correctly traced to Greek workshops. As to their date, it has recently been argued by a high authority (Brunn, Probleme in der Geschichte der Vasenmalerei) that the greater part of these vases—in fact, all that have been found in Etruria, with at inost two or three exceptions—are the production of Greek vase painters at a period not earlier than the end of the 3d century B.c., when a taste for the archaic manner must have revived. This theory has encountered much opposi- tion. Applying it to the large collection of vases of this class from Etruria in the British Museum, one vase alone remains as a genuine example of the work of an carly period. Whether we regard these vases as spontaneous productions or as imitations, they will serve to couvey at best a dim idea of early Greek painting asa fine art. Of the next class of vases—those with red figures on black ground—some appear, from the severity of the drawing, to belong to the end of this period. The whole question of ancient vase-painting has been very fully and ably dis- cussed by Otto Jahn in his Introduction to the Vasen-

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Architec- ture.

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In temple architecture the principles of both the Doric and Tonic orders were already fully established, the latter in Asia Minor and the former in Greece proper ; and it is characteristic of the national importance attached to this branch of art, that not only was the best available talent of the time procured, irrespective of local connec- tion, but also that architects appear to have found a public for the writings in which many of them narrated their proceedings, and described the appliances used by them in building, as did Chersiphron and his son Metagenes in regard to the temple of Diana at Ephesus; or laid down the principles they had followed, as did Theodorus with regard to the temple of Hera at Samus. Among the remains of Doric architecture assignable to this period, the first to be mentioned are the two temples at Peestum (Major, Les Ruines de Peestum ou de Posidonie, 1768; cf. Schnaase, Bildende Kiinste, ii. fig. 36), of which the larger derives a special interest from the two rows of columns, one above the other, with which it is furnished in the interior, for the purpose of supporting, as it

appears, a hypethral roof. Differing in many details from the Pestum temple is that of Selinus, the sculptured metopes of which have already been described, and assigned to the commence- ment of this period. The columns are here slimmer, being 44 times the lowest diameter in height; but the archi- trave has gained in height and heaviness. A transition from the heaviness of the old Doric temples—of Pzestum and Selinus, for example—to the graccful proportions of the Doric order in Attica is presented by the temple of Athene in Agina, the columns of which, however, are still too short, being a little over 5 times the lowest diameter in height, and the architrave and frieze too high for the Attic-Doric style. Of the Ionic order during this period the principal example was the temple of Diana at Ephesus, the construction of which, begun by Theodorus of Samus, was carried on by Chersiphron of Crete and his son Metagenes, and completed by Demetrius and Pzonius about the time of Croesus, 565-551 3.c., 120 years having, it is said, from first to last been consumed on the work (Strabo, xiv. 640; Vitruvius, vii praef.; Pliny, WV. H., xxxvi. 14, 95). This temple having been burned by Herostratus, was re- stored under the direction of Alexander's architect Dino- crates. The oldcst instance of the Ionic order in Greece proper, so far as we know, was found in the treasury erected at Olympia by Myron, the tyrant of Sicyon, after his chariot victory, 658 B.c. This building consisted of two chambers, the walls overlaid in the ancient manner with bronze plates, and the one executed in the [onic, while the other was of the Doric order. The architects of this early time were not, however, restricted to the erection of temples, but had other problems to solve, as, for example, in the Scias of Sparta, a round building with tent-shaped roof, used originally for musical performances and after- wards for public assemblies. Theodorus of Samus was the architect of the Scias. Probably the Odeum erected at Athens by Solon or Pisistratus had the samc round form, and was intended for meetings of the same kind. 'Then followed the construction of theatres, that in Athens, which was of stone, having been commenced shortly after 500 B.c.

Third Period.

The splendid victories of Salamis, Plateeze, and Mycale, gave an immediate and powerful impulse towards public undertakings, and especially, so far as we are at present concerned, towards the erection of templcs and

monuments worthy of the just pride of the nation. A sense of freedom and relicf from long and troublous fears must have been the ruling feeling of the time; and of the efforts, both intellectual and artistic, which such new-born feelings engender, history has its examples. Of all the Greeks,

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the Athenians had in that crisis patriotic emotions, and in Athens, the aspirations were highest.

to second the boldest designs. loitered in the great conflict with the Persians, and in sharing the new impulse they loitered also. invasion had not, however, of fortune, but, on which disciplinc and severe habits of life gave to the Greek forces; and in the same way the men who thereafter achieved the first triumphs in art, who diffused freedom throughout its realm, were men who had been trained in

Accordingly,

-highly praised (Pliny,

{CLASSICAL—SECOND

earned the best title to above all Greece besides, Nor were means wanting The Peloponnesians had

The Persian been hurled back by a stroke

the contrary, by the united action

severe schools, where close study, no less than respect for popular feeling, restrained the exercise of the imagination. before we can appreciate the artistic freedom established by Phidias, we must see how far his early training prepared him to fight the battle. This can only be done by examining the works of other sculptors, either pupils of the same master, as were Myron and Polycletus, or probably contemporary, though more hardened in the traditions of their school, as was Calamis the Athenian, with whom we begin, remarking that the only known approximate date in

his lifetime is from 468 to 464 B.c. The works of Calamis extended over a tolerably wide field of subject, and were executed partly in marble and partly in bronze; but with the exception of two copies of his statue of Hermes Criophorus at Tanagra, on the coins of that town, and in a marble figure in Wilton House, none of our remains of ancient sculpture have as yet been identified with his style. Cicero (Brut., 18, 70) and Quintilan (xii. 10, 7) speak of him as less rigid and hard in his rendering of the human form than Callon and Canachus; but the real advance with which his name is associated was in the rendering of expression in the female face, and in the treatment of draperies. A figure of Alemene by him was N. H., xxxiv. 19, 71), while his statue of Sosandra, on the Acropolis of Athens, is spoken of in the highest terms by Lucian (Jmag., 4, 6; Dial. Meretr., 3, 2) for its chaste and tender expression,-for its taste in dress, and for the noble bearing of the whole figure. His horses were always incomparable. To have attained the power of expressing modesty and mobile character in a figure was to have laid the foundation for idealism in its true sense ; and Calamis was therefore on the same path with Phidias.

We come now to Myron, a native of Eleutherz in Attica, and a pupil of Ageladas of Argus. With rare exceptions, he worked in bronze, and that of the Aiginetan kind, while Polycletus employed the bronze of Delus. His works, which were numerous, and scattered from Asia Minor to Sicily, may be divided into the four classes of deities, heroes, athletes, and animals, with a considerable variety ranging within each of the classes. He avoided female figures almost throughout ; and though he was the author of statues of Dionysus and Apollo, it should be remembered that these deities had not become soft of form till Praxi- teles made them so. He preferred the well-knit figures of athletes, or of Perseus or Hercules. His animals were marvels to the ancients; and the human figures in which he succeeded best were those in which purely physical quali- ties were pronounced. ‘“Corporum tenus curiosus, animi sensus non expressit,” says Pliny of him. But, according to the same authority, he was careless in rendering the hair, from which it is to be inferred that his study of the human form did not lead him, as it did Pythagoras, to an anxious reproduction of all its details. Then we have the further statement of Pliny—‘ Primus hie multiplicasse veritatem videtur, numerosior in arte quam Polycletus, et in sym- metria diligentior.” As we understand ‘“multiplicasse veri- tatem,” it would mean

that he exaggerated the truth of nature to give effect to the momentary attitude of his

Calamis,

Myron,

Phidias,

AND THIRD PERIODS. |

figures. ‘“ Symmetria” we take to refer to the manner in which every member and part of the body was made to work together for the expression of one moment of action. Such a style at least presents a very obvious contrast to that of Polycletus, and would answer our expectations when we read that Myron’s statue of Ladas seemed about to leap from its base to seize the victor’s wreath, the last breath leaving his lips. (For a different interpretation see Brunn, Gesch. d. Griech. Kiinstler, sub Pythagoras). Among his figures of animals, that of a bronze cow which stood on the Acropolis of Athens, and was afterwards removed to the temple of Peace in Rome, was celebrated by numerous epigrams. Of his other works, some have been preserved in copies down to our own time. A copy of the figure of Marsyas (from his group of Athene and Marsyas) has been recognised in a marble statue in the Lateran Museum (Mon. d. Inst., vi. pl. 23; Annali, xxx. p. 374). Of his bronze statue of a Discobolus, famous in antiquity (Quintilian, ii, 13, 10; Lucian, Philops., 18) for the boldness of its movement and the carefulness of its execution, we have several copies, of which the best is the marble statue in the palace Massimi at Rome (Miller, Denkméiler, i. pl. 32, No. 139, 5). Another marble copy in the British Museum has not only had its head (if original) placed on the shoulders the wrong way, but has been made sinooth on the surface by a vigorous rubbing down, which has destroyed the original lines. A third copy of bronze, about a foot high, is in Munich. (For a list of his other works, known only by name, see Overbeck, Ant. Schriftquellen—Myron.) From the few copies of his statues which we possess, and the few ancient remarks as to his style, it seems impossible to frame a conception of his work which would justify the extraordinary reputation he enjoyed. We can picture the action of his figures, but we cannot estimate the equivalents for actual life and organ-

ism which he must have employed to have almost com- pletely satisfied eyes accustomed to the work of Phidias. This, however, we gather from the remarks on his statue of Ladas and the Discobolus, that he seized for his repre- sentation the moment when the whole breath was held back for a final effort of strength—that moment, in fact, when the human figure is most truly statuesque. Tor an instant the body is then lifeless, so to speak, like the statue itself : the spectator suspends breathing, in sympathy.

We have reached the time of Phidias, and have now done with imperfections in sculpture, so far at least as they originated in want of knowledge either of the human form or of technical means. Phidias, the son of Charmides, was an Athenian, and must have been born about 500 B.c., or a little before, if we can trust the statement (Plutarch, Pericl., 31) that in the portraits of himself and Pericles, which he placed on the shield of Athene Parthenos, he appeared a bald-headed old man, while Pericles appeared handsome and full of vigour (K. O. Miller, De Phidice Vita et Operibus Commentationes Tres, Gotting. 1827 ; Brunn, Gesch. d. Griech. Ktinstler, i. p. 157). A fragment of a marble shield in the British Museum, found on the Acropolis of Athens, and representing a combat of Greeks and Amazons, in which a bald-headed old man appears, has been recognised as a rough copy of the shield in question. Phidias began his career as a painter; then turning to sculpture, studied first under his townsman Hegias, and afterwards under the Argive master Ageladas. It may have been due to his training in this school that his first two important works were executed in bronze. The first was a large group, commissioned by the Athenians to be paid for out of their booty from the Persian war, and to be dedicated at Delphi. The second was a colossal statue of Athene, the Promachos, also commissioned by the Athenians out of the Persian booty, and when finished

remains (Pausanias, v. 15).

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erected on the Acropolis, between the Propylea and Erech- theum, the top of the spear which she held, and the crest of her helmet being visible at sea from Cape Sunium (Pausanias, i. 28, 2). On certain coins on which the

Acropolis is figured occurs a statue which seems to corre- spond with the description, except that the goddess there stands placidly, an attitude that does not suit the idea of a Promachos. This idea is finely embodied in a small bronze statuette (fig. 5), found on the Acropolis and now in the British Museum, representing the goddess striding forward. Otherwise it has little of Phi- dias init. Possibly the Pro- machos statue was wrongly ascribed to Phidias in ancient times. Again profiting by the Persian spoils, he was em- ployed by the Platzans to execute a figure of Athene Areia for their new temple (Pausanias, ix. 4, 1). The figure was of wood, covered with gold; the face, hands, and feet, of Pentelic marble ; the whole being of colossal proportions. He had pre- viously made a figure of Athene in gold and ivory for a temple at Pallenein Achza, and this must be regarded as the first of his works executed me in the material in which he ~ sf. afterwards achieved his "= greatest triumph (Pausanias, vii. 27, 2).

We must suppose that his faculties were now at their best, that he was fully aware of the peculiarities of treatment required by the different materials in which sculptors then worked, and had found the best scope for his own talent in chryselephantine sculpture. The two works with which his fame was chiefly associated were in gold and ivory,—the colossal statues of Athene for the Parthenon at Athens, and of Zeus for the temple at Olympia. After the completion of the former statue, Phidias accepted the invitation of the people of Elis to exert his highest power in fashioning for their temple of Zeus at Olympia a statue worthy of the majesty and grandeur of the supreme god of Greece. His workshop was near the Altis or sacred grove, where through succes- sive ceuturies down to the 2d a.p. it was preserved and pointed out with feelings of reverence. The finished work was over 40 feet high, and represented the god seated on his throne, his right hand holding forward a figure of Victory, and his left resting on a sceptre on which the eagle was perched. On his head was a wreath of olive. The drapery was of gold, richly worked with flowers and figures in enamel, in the execution of which he was assisted by his brother or cousin Panenus. On the footstool was inscribed the verse—

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Fic. 5.—Bronze statuette. Brit, Mus.

From Athens.

*Peidias Xapuldov vids *“A@nvaios p> éwolnce*

(Pausanias, v. 10, 2). The throne was mostly of ebony and ivory, inlaid with precious stones, and richly sculp- tured with reliefs, and in parts painted. Of this, the greatest work of Phidias, nothing but the description now The figure of Zeus seated on a throne, which occurs on coins of Elis struck in Roman times, may have been intended as a reminiscence of it. On the other hand, there is in the British Museum a silver coin of Elis, struck in the best period of Greck art, on

Sculptures of the Par- thenon.

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which is a head of the god so singularly powerful in type that we are tempted to believe it to be a copy from the head of the statue of Phidias, appealing to the analogy of the coins of Argus with what is accepted as a copy of the head of ihe figure of Hera by Polycletus. Among the existing examples of Greek sculpture there is only one which claims to be a direct work of Phidias, and that is one of the two colossal marble statues on the Monte Cavallo at Rome, inscribed respectively “opus Phidize” and “ opus Praxitelis” (Clarac, Musée de Sculpture, pl. 812 A, No. 2043). Grand as both are, the marking of the pupils of the eyes and the treatment of the armour prove them to have been executed in Roman times, probably as copies of celebrated statues. The originals must clearly have been the work of one master, and the inscriptions being thus wrong 1n ascribing them to two, must be held as worthless. On the other hand, we possess in the sculptures of the Parthenon a large series of works in marble at least designed or modelled by Phidias, and executed under his immediate care, if not in many cases finished by his own hands. These sculptures consist of figures in the round from the pedi- ments, the metopes in high relief, and the frieze in low flat relief. The statues of the pediments have suffered most, and that mainly from two causes—the antipathies or necessi- ties of the early Christians, who converted the temple into a church; and the fatal explosion produced by the falling of a shell among the powder stored in it during the Venetian bombardment under Morosini, 1687. The extent of the mischief on

this occasion is known from the drawings pre- viously made of the temple as it stood, 1674, by Carrey, an artist:in the employment of the French ambassador at the Porte. In 1805, Lord Elgin, then British ambassador at the Porte, removed all the sculptures that could be removed with safety to the building, shipped them to London, where, after a long dispute as to their merits, they at last, in 1815, found a permanent resting-place in the British Museum. (For a narrative of these proceedings, but especially for an exhaustive work on the Parthenon, see Michaelis, Der Parthenon, Leipsic, 1871; the sculptures are best engraved in Musewm Marbles, vol. vi. ; the fragments in Athens, in Laborde, Le Parthénon, pls. 26-28). The subject of the eastern pediment was the birth of Athene; of the western, her contest with Poseidon for supremacy over Attica; but beyond the simple statement of Pausanias to this effect, we have no ancient record to enable us to identify the personages before whom these events took place. Hence the many different names which have been proposed from time to time for the surviving figures, especially for those of the eastern pediment, from which all the principal statues had disappeared before Carrey's time. Assuming, however, with the most recent authority (E. Petersen, Die Kunst des Pheidias, 1874), that the birth of Athene took place in Olympus, aud that the deities assembled at the birth of Aphrodite, as represented by Phidias on the base of the statue at Olympia, were the recognised Olympians of his time, we obtain, beginning from Helios on the left, Dionysus, Demeter, and Core, Tris [Apollo, Artemis, Hephezstus, Athene, Zeus, Hera, Poseidon], Nike [Ares, Hermes], Hestia, Peitho, Aphrodite, and Selene, those in brackets being missing. The western pediment has suffered a much harder fate, though the difficulty of recalling the lines of the original composition is less, owing to the preservation of drawings made by Carrey before the bombardment which destroyed it. The metopes were ninety-two in number; those of the east and west only remain on the building, but have suffered sevcrely from malicious destruction. Those of the north side, which survived the explosion, remain in Athens in bad condition; those of the south were removed by Lord Elgin, with the exception of one now in the Louvre and

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some fragments in Copenhagen. The subject—a favourite one in the decoration of Greek architecture—was a combat between Centaurs and Lapithe. 'Traces of red colour

were found on the ground of the relief and of green on the drapcries. ~~as is proved by the existing holes for that purpose. Dif~~

The armour had been attached in metal,

ferences in style as well as in execution prove the variety of hands employed in the work, though everywhere is apparent the oneness of design which bespeaks the oversee- ing master. The variety of hands is equally manifest in the frieze, but here it takes the form of insufficiency of execu- tion, which no doubt arose from the difficulty of super- vising work which had to be done up on the building. The subject of the frieze is a long festal procession, in which, though every variety of movement of horse and foot, of young and old, of men and women, perhaps of gods and goddesses, is introduced, the calm dignity of national pride and the knowledge of national worth reign supreme. Its entire length is 524 feet, its height from the ground 40 feet, its relief very low and flat. About two-thirds of it is preserved, nearly the half being in the British Museum. As to the procession itself, there are two opinions: either it is the procession with which it was usual to accompany annually the newly-made robe for Athene Polias, or it is the procession in which the victors at the Panathenaic games advanced to the Parthenon to receive their prizes and to attend a sacrifice in honour of Victory.

The mantle of Phidias fell on his pupil Alcamenes Alcamene

(Pausanias, v. 10, 8), an Athenian, or, as others said, a Lemnian, the lofty conception in his figures of deities being highly praised (Quintilian, xii. 10, 8), while in point of gracefulness in womanly forms he appears to have excelled his master. His most celebrated work was a statue of Aphrodite for her temple, év «jos, of which, however, the merit of the last touch was ascribed to Phidias (Pliny, xxxvi. 5, 16). Her cheeks, hands, and fingers were specially admired; but as to the attitude and general effect we have no information, and are not justified in accepting the Aphrodite of Melus in the Louvre as a copy of it, much less the original work. How far he may have been possessed of the power of creating new ideal types is not expressly

recorded, except in the instance of his statue of a triple Hecate, probably such as we know her in later works. On the other hand, there was doubt- less scope for extending the new influence of Phidias in such types as those of Aisculapius, Hephzstus, and Ares, and it has been conjectured that in his statues of these deities he succeeded in infusing the spirit of his master.

the master's style that two marble statues of deities by him were sometimes ascribed to Phidias. The one was a figure of Nemesis in Rhamnus; the other, a statue of Rhea in the Metroon at Athens (Pausanias, i. 3, 5). From his hand were also the bronze statues of Athene Itonia and of Zeus, in the temple of that goddess between Alal- comenze and Coronea (Pausanias, ix. 34,1). Next we have Colotes and Thrasymedes of Parus, both of whom occasionally aspired to retain the chryselephantine technique of the master; and finally, Theocosmus of Megara.

How far the immediate successors of Phidias remained, whatever their peculiarities or eccentricities, still faithful to the general sentiment and manner of the master, merely varying but always preserving essentially the theme struck by him, caunot be ascertained, unless we take the sculptures of the temple of Athene Nike at Athens, or of the Hrech- thcum, as typical examples of their work. And indeed they are well calculated to produce the impression of having been executed during the lull which must have followed his great impulse. (For the relief on the frieze

Scarcely less famous was another pupil of Phidias, Successors f Agoracritus of Parus, who so far identified himself with of Phidias.

Polycletus.

THIRD PERIOD. |

and balustrade of the temple of Nike, compare Friederichs, Bausteine, i. pp. 187-193; Ross, Der Niketempel ; Kekulé, Die Balustrade des Niketempels.) The treatment of the draperies has entirely lost the stiffness and formality of an early period, and become flowing, as in the style of the best times, but with the addition of a studied grace which seems due to a desire to elaborate more and more the sim- plicity of the draped figures of the Parthenon. The most probable date as yet suggested for this temple is 407

B.c. As to the Erechtheum, we have 406 B.c., on the authority of an inscription, as a year in which a report was made concerning the amount of work that remained to be done upon it. Of its sculptures the chief remains are the statues of the Caryatides, and certain fragments of the frieze, which had this peculiarity, that the reliefs were executed in Pentelic marble, and then attached to a ground of black Eleusinian stone. Of the original six Caryatides which supported the portico, five were in position in the time of Stuart and Revett in the first half of last century; the sixth, having been broken to pieces, was recovered in 1837. One of the five was removed by Lord Elgin, and is now in the British Museum. In the arrangement of the draperies vertical lines prevail; but only enough to show the architectural purpose of the figures, not to destroy their character as robes, or to affect their gracefulness. It is usual to compare with the sculptures of these two temples another series of reliefs which, though not found in Attica, are stated to have been the work of Ictinus, the architect of the Parthenon. We refer to the frieze from the temple of Apollo at Phigalia which was discovered in 1812, and is now in the British Museum. The subjects represented are combats between Greeks and Amazons and between Centaurs and Lapithe. In the composition the old ethos has given way to pathos; but the figures are still large in conception, and obviously studied with a view to truth as well as effect, though in the execution probably by provincial hands, many minor details have been over- looked. The energy of action throughout is not equalled in any other ancient sculpture now in existence, while the sense of pain in the wounded, or of fright in the helpless wonien who run with their infants in their arms, makes the spectator shudder. From the fact that such vigour of action and intensity of pathetic expression have not been found in the metopes of the Parthenon or the frieze of the Theseum which are devoted to the same subject, but recur in a less degree in the frieze of the Mausoleum, there is an inclination to place the Phigalian reliefs by Ictinus in as late a period as possible after the erection of the Parthenon. (Engraved, Museum Marbles, vol. v.; Stackelberg, Der Apollotempel zu Basse, 1828; see Friederichs, Bausteine, i. pp. 178-181.)

The difference of temperament between the Athenians and Peloponnesians was strongly marked in the schools of sculpture peculiar to each. Political rivalry had its exact counterpart in artistic rivalry, in which Phidias

represented Athens, and Polycletus the Peloponnesus. The works of the latter appear to have been always chastened with an hereditary severity, to have been attractive by the purity of their style and the finish of execution, but not commanding in aspect. 'Non exple- visse deorum auctoritatem videtur," the judgment of Quintilian (xii. 10, 7) is endorsed by the statement, that his great work, the chryselephantine statue of Hera at Argus, yielded to the statue of Zeus at Olympia by Phidias in grandeur and imposing aspect, but out- rivalled it in finish (Strabo, viii. p. 372). Copies of the head of this statue have been identified on coins of Argus, and in three marble heads of colossal size. The first, in Naples, is severe in style, and may have been executed about the time of Polycletus; the second, in

the British Museum, has more freedom, but is still chas- tened by a severe expression; the third, in the Villa Ludovisi, bears the marks of having been executed at a still later period. It was not, how- ever, in producing statues of deities that Polycletus delighted most; and if surpassed by Phi- dias in that instance, he was quite without a rival in his own province, the rendering of the form of ideal athletes. Of this class were his Diadumenus, his Doryphorus, and a third figure (unless the Doryphorus was meant by Pliny) known as the Canon. Of the first, several pre- sumed copies in marble exist, two of them in the British Mu- seum (fig. 7), but in no case furnishing an adequate illustra- tion of his style. The same may be said of the copies of the Doryphorus, More in the nature of genre work was his bronze group of boys playing with ' knuckle-bones (aorpayandiLovres), Museum. From the collection of which afterwards stood in the the late Mr Woodhouse, Corfu.

palace of Titus in Rome, and was by some regarded as the most perfect work of the master. This motive occurs in several existing sculptures, in no case characterised by a trace of the hand of Polycletus. Among them are, in the British Mu- seum, a small group in terra-cotta of two women playing at this game, and a marble figure of a boy, part of a group, biting his companion's hand. Coupled with his statue of Hera, that of an Aima- zon, executed by him for Ephesus, in competition with the foremost of his contemporaries, and ad- judged the prize, will prove that the range of his

talent was by no means confined to figures of ath- letes; and this is made further apparent by his bronze statues of maidens carrying sacred vessels on their heads, afterwards in the possession of Heius the Mamertine, from whom they were taken by Verres (Cicero, In Verr., iv. 8, 5), as also by his statue of the Samian, Artemon, nicknamed 6

mepiupdopyros.

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Marble statue. Found at Vaison (Vasio), Dept.

None of the pupils of Vaucluse, France.

Fic. 7.—Diadumenus. Mus.

Polycletus arrived at distinction. style appears to have been closely followed by his younger contemporary, Naucydes of Argus, who executed a chrys- elephantine statue of Hebe, to accompany that, of the same material, by the master already described (Pausantas, ll. 17, 5; Kekulé, Hebe). A pupil of Naucydes was Poly-

On the other hand, his Pupils of

Gem- engraving.

Painting.

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cletus the younger, of Argus, who is known as the author of several statues of victors at Olympia, and of a statue of Zeus Philius (Pausanias, vill. 31, 4), in which the expres- gion resembled that of Dionysus.

In addition to the existing sculptures already mentioned in connection with one or other of the ancient masters, there are others which, though their authorship has not been ascertained, undoubtedly belong to the period now before us. From these we select—(1.) A marble relief in Athens, found at Eleusis in 1859, and representing Demeter, Cora, and boy, for whom the name either of Triptolemus or Jacchus would be applicable (Monument, vi. pl. 45.) With the exception of a marked severity both in the composition and in the details, which-may be due either to archaism or to a studied solemnity, this relief compares adinirably with the frieze of the Parthenon. (2.) From Eleusis also comes the upper part of a female figure supporting a basket on her head (Calathephorus), now in Cambridge, in a large fine style (Wieseler, Denkméler, ii pl. 8, No. 92). (3.) Marble relief of Orpheus and Eurydice, in the Villa Albani, with its two replicas in Naples and Paris. (4.) Fragments of the metopes from the temple of Zeus at Olympia, found in 1829, and now in Paris. Doubtless these reliefs were executed at the time when Phidias was at Olympia engaged on the statue for this temple, and when his pupil Alcamenes was at work on the figures for the western pediment of it. In style, however, they differ considerably from that of the Attic sculptors; nor are there any means of identifying them with the style of Peonius of Mende, who executed the statues for the eastern pediment (Ewpédit. Scientifique de la Morée, i. pls. 74, 78.) (5.) The metopes and inner frieze of the temple of Theseus at Athens are still in their original place, the style being compared with that of the mctopes of the Parthenon, though the temple itself is usually believed to have been built by Cimon (Stuart's Antiquities of Athens, 2d ed., ii pl. 19)

Examples of what may be called a lower branch of sculpture (gem-engraving) are exceedingly rare in this period. So far as Athens is concerned, this will appear less remarkable if we suppose that gem-engraving and die-sinking were one profession, and remember that at least the latter must have been, with few exceptions, unpractised there in the best period, the coins being allowed, probably for commercial reasons, to retain the old stamp with which people were familiar. Possibly also the high ideal

of the times was above the grasp of such artists, though it was seized pretty generally by the sculp- tors of stele, who could hardly have been men of note. In the British Museum is a carnelian (fig 8) repre- /) senting a youthful figure, seated, and S playing on a harp-shaped instrument, which, with a little severity, admir- ably reflects the style of the Parthenon frieze. Of the coins of Sicily, the large piece known as the Demaretion, €~ 7, and struck in the year 479 B.c., fur- ~< p Zh i)

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nishes an example of the rendering of 7 horses, which compares finely, if more Vwi advanced, with the archaic frieze from = \V <<" \\ Xanthus. Similarly worthy of study are the coins of Gelon, which are pro- F164 8.— Camelian —o bably as early as 470 B.c., and certainly ichtaa ot he 'Yate: Mr are anterior to 410 B.o. WaeemmcnGae:

In the records of painting during the previous period it was noticeable that painters even then, in what ap- peared to be one of the earliest stages of the art, were accustomed to execute large compositions, such as battle scenes, The essentially decorative character of the art

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required that it should be so, just as in carly sculpture, in which also the decorative element prevailed, our principal records are those of large compositions, such as the chest of Cypselus or the shield of Achilles. While the epos flourished, and the country was full of heroic legends, there can be little doubt but that the principal pleasure derived from works of art lay in the variety of the subject and the manner in which it was presented, that is, in the composition, and not in the truthful rendering of individual forms. To heighten the interest of the spectator, it was usual to write the name beside each of the persons that appeared in a picture, as we see it done on the early vases. The same was the case with the sculptured reliefs on the chest of Cypselus, which on this account presents a remarkable contrast to the

shield of Achilles, on which, as in Assyrian sculptures, there is no prominence of individuals, and therefore no accurate study of the human form. It is not to be supposed that in the early stage of Greek painting individual forms were studied with any other view than that of rendering the characters more intelligible ; but with this a beginning was made to lift the art into a higher sphere. At this stage appeared

Polygnotus, a native of Thasus, and a son of the painter Poly- Aglaophon, of whose probable connection with the early gnotus.

Samian school mention has already been made. Attracted to Athens by the opportunity presented by the new build- ings which were then being erected, Polygnotus, either owing to some family tie or through the recommendation of his own ability, found favour with Cimon, to whose zeal and taste the new impulse for the improvement of the city was due. In company with, or perhaps rather with the assistance of, the Athenian painters Micon and Panzenus (the brother or cousin of Phidias), he was em- ployed to execute wall paintings for the Stoa Peecile, the Theseum, and the Anaceum, or temple of the Dioscuri, at the northern foot of the Acropolis. For his services, and especially for the disinterestedness of his character, Polygnotus received what was then regarded as the highest distinction—the freedom of the city of Athens, His friendship with Cimon was intimate, and led, it was said (Plutarch, Cimon, 4), to an affectionate acquaintance with Cimon's half-sister, the beautiful Elpinice. From Athens he was called to Delphi to execute a series of paintings for the two long walls of the Lesche, a building erected there by the people of Cnidus. The paintings, however, appear to have been commissioned by the Amphictyonic council, if it is right to be guided to that conclusion by the state- ment that the painter was rewarded with the rights of hospi tality throughout the states included in the Amphictyonic league. On the wall to the right after entering the Lesche were painted scencs illustrative of the old epos of the taking of Troy (IAtéov zépots). On the left was the visit of Ulysses to the lower world, as described in Book xi. of the Odyssey. The names of most of the persons were written by the side of the figures. The various groups and incidents depicted we know from the description of Pausanias (x. 25-31); and with the help of existing works of art in which the same subject recurs, we can form an idea of the composition (O. Jahn, Die Gemidilde des Polygnotus in der Lesche

zu Delphi, 1841; Welcker on the same subject in the Abhandlungen of the Berlin Academy, 1847; Watkiss Lloyd, in the Musewm of Classical Antiquities, i. p. 44). Heydemann (Jliupersis, Berlin, 1866) republishes, for the illustration of his other figures, the famous Vivenzio vase in Naples (Mus. Borbd., xiv. pls. 41, 43), which, pregnant with pathos as no other vase in existence, cannot well be identified with the style of Polygnotus, unless perhaps as regards the composition. He was employed at Thespiz on a stoa or temple, but from some defect his work had perished so far within a century after it was

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THIRD PERIOD. |

finished that it had to be restored by Pausias of Sicyon. At Plates he painted for one of the walls of the pronaos of a temple the scene in which Ulysses appeared with the dead suitors at his feet. The companion picture was by an otherwise unknown artist, Onasias, the subject of it being the Expedition of the Seven against Thebes (Pau- sanias, ix. 4, 2). Lastly, Pausanias (i. 22, 6) ascribes to Polygnotns a series of paintings in the so-called Pinako- theke on the Acropolis of Athens. If he is right, the painter must then have been full seventy years of age. The subjects were—(1.) Ulysses carrying off the bow of Philoctetes ; (2.) Diomede carrying off the Palladium of Troy ; (3.) Orestes and Pylades slaying Aigisthus and the sons of Nauplius, who had come to his aid; (4.) Polyxena about to be sacrificed to the manes of Achilles; (5.) Achilles in Scyrus ; and (6.) Ulysses meeting Nausicaa and her maids. The other pictures had become unrecog- nisable through the cffects of time. This second mention of the decay of his works reminds us of the fleeting nature of the material with which the fame of the great painter was bound up. It was well that high honours were paid him in his lifetime. The enduring marble in which Phidias worked has preserved his fame to our times, to mock the indignities which he suffered in life. As regards the style of Polygnotus, we have the distinction drawn by Aristotle (Poet., 2, 6 ; Polit, viii. 5) between it and that of Zeuxis—a distinction which he expressed by the words ethos aud pathos. By ethos, as applied to the paintings of Polygnotus, we understand a dignified bearing in his figures,

and a measured movement throughout his com- positions, such as the Parthenon frieze presents, compared with the pathetic rendering of scenes in the frieze from the temple of Apollo at Phigalia, or in the frieze of the Mausoleum at Halicarnassns. It was also said (Pliny, N. H., xxxv. 35, 58) that in place of the old severity and rigidity of the features he introduced a great variety of expression, and was the first to paint figures with the lips open; and further, he was accredited (Lucian, Zmag., 7) with great improvements in the rendering of drapery, so as to show the forms underneath. He painted in mono- chrome on a white ground ; so that, in fact, the principal charm of his work must have been in the drawing. His brother Aristophon appears to have also inherited an elevated conception and a power of carrying out large compositions. Among the younger contemporaries of Polygnotus were Dionysius of Colophon, laboriously accu- rate, and Pauson, the butt of Aristophanes (Zhesmoph., v. 949, and elsewhere), remarkable for his talent of cari- cature and animal painting.

The works of these painters have entircly perished, nor in what remains of the work of their humble imitators, the vase painters, is there much that can be justly regarded as reflecting their style. Besides the Athcnian lecythi, which give some sort of an idea of the effect of colours as em- ployed by Polygnotus, there is a class of vases, with red figures on a black ground, which, by the treatment of the drapery as a transparent substance, recall the statement to the same effect made in respect of the great painter. In many cases, also, the figures are large in conception and measured in their movement.

The history of architecture during this period is an unexampled record of great undertakings throughout Greece, but more especially in Athens, which, if it had suffered most from the Persian invasion, had also in the end acquired the most ample means of repairing its ruins and adding fresh lustre to its aspect. Themistocles having been banished, the administration and the carrying out of works begun by him—such, for example, as the long walls connecting the city with the harbonr—fell to Cimon. The city walls on the south side of the Acropolis were rebuilt,

and a tower erected to command the entrance, which, however, being afterwards rendered useless by the erection of the Propylea, was removed to make way for the temple of Athene Nike. Among the new temples the first to be mentioned is the Theseum, which is not only well pre- served still, but is also the oldest existing example of the Attic-Doric order (Stuart and Rivett, Antiquities of Athens, ii. pl. 7). The other temples, the erection of which may with great probability be traced to Cimon, are the Anacenm, or temple of the Dioscuri, at the foot of the Acropolis, on the north side; and a small temple, now quite destroyed, on the left bank of the Ilissus, which existed in Stuart's time, and, from his drawing (Antiquities of Athens, i. pl. 7), is seen to have been of the Ionic order, differing from the Attic-lonic in wanting the dentils of the cornice, in having the base of its columns composed of a trochilus between two spirals, and in having its architrave quite plain. Cimon was succceded by Pericles, under whose administration the resources of the city, not only in means, but in the talent of using the existing means, were applied with the greatest judgment and energy, foremost among his advisers being Phidias. According to Plutarch (Percl., 133), Phidias exercised a general supervision over all the public works then going on. Apparently at this time was erected the Odeum, a building intended for musical performances, circular in form, and, as appcars from the records of it (Vitruv., v. 9; Pausanias, i 20, 4), brilliantly decorated with numerous columns in the interior, and with a tent-shaped roof of wood. It was the Acropolis, however, that was reserved for the crowning effort of architecture in this period. Within the space of probably not more than five

or six years there rose on the site of an old temple of Athene, which had been destroyed by the Persians, the Parthenon, a model for all time of the Doric order, pure and perfect in its architectural forms and pro- portions. The architect was Ictinus, who was assisted by Callicratidas (Stuart, Antiquities of Athens, ii. pl. 7 ; Penrose, An Investigation of the Principles of Athenian Architecture, 1851; Beulé, LZ' Acropole d'Athénes ; Botticher, Bericht tiber die Untersuchungen auf der Akropolis von Athen, 1862 ; Michaelis, Der Parthenon, 1871). The next undertaking was the so-called Propylea, a building which, though practically serving as an entrance to the Acropolis, aspired to a highly decorative character (Stuart, Antiquities of Athens, ii. pl. 42). The architect was Mnesicles. Contemporary with the building of the Pro- pylea, it appears, was that of the small temple of Athene Nike, on the Acropolis, which, on the removal of a Turkish structure in 1835, was recovered in almost all its parts, except some slabs of the frieze, brought by Lord Elgin to England, and now in the British Museum (Beulé, LZ' Acro- pole, p. 124; Kekulé, Die Balustrade des Niketempels). Outside of Athens the cxample of the Periclean activity was felt at Eleusis, where a great temple for the Mysteries was commenced, from desigus by Ictinns, and carricd to completion by the three successive architects, Corcebus, Metagenes, and Xenocles. The small temple, 7x antis, of Artcmis Propylea at Eleusis probably belongs to this period, as does also the temple of Nemesis at Rhamnus, of which we have still important remains. There is yet to be men- tioned the Erechtheum, or temple of Athene Polias, on the Acropolis of Athens, which, thongh the only date we possess of it falls after the death of Pericles, bears the strongest impress, both in its architectural and sculptured fomns, of the great age. The date referred to is the tweuty-third year of the Peloponnesian war, and occurs in an inscrip- tion found on the Acropolis in several pieces, in which is given the report drawn up by a commission appointed to inspect the progress of the works (Inwood, Zhe Hrechtheum of Athens, 1827; Rangabé, Ant. Hell., Nos. 56-60; Corpus

Inscript. Gree. No. 160). In the British Museum, besides part of this inseription, are several specimens of the archi- tectural decoration, and one

of the Caryatides (or draped female figures who supported the portico), in which the simplicity of the drapery and the dignity of the pose are quite in the spirit of the Parthenon sculptures. The temple of Apollo Epicurius at Phigalia, in Arcadia, the work of Ictinus, the architect of the Parthenon, necessarily belongs also to this period (Cockerell, Temples of Jupiter at digina and Apollo at Phigalia). The great temples at Olympia and Delphi, though begun earlier, may also be reckoned among the works of this period, to which also belongs a large series of Doric temples in the Greek towns of Sicily and Magna Grecia, particularly those of Syracuse, Agrigentum, Selinus, Egesta, and Metapoutum. Of these the most remarkable are the southern temple in the lower town of Selinus, and the somewhat more recent temple of Zeus at Agrigentum.

Fourth Period.

Since the beginning of our last period, the political and social circumstances of Greece have suffered a marked change. More or less it was then accepted as a dogma that, provided the state was flourishing, the prosperity of individuals mattered little. All were for the state, and by their union in the state's emergency had achieved a glorious freedom, the sense of which filled the national mind, and prepared it to respond with a fostering sympathy to the efforts of artists, whom it also inspired. Yet, conscious as they must have been of their own services, the men of that generation turned rather in pride to the deeds of their ancestral heroes, and in humility to the assistance of the gods. They sought to frame their conduct on the traditions of the past. They were rigorous and strong in thought. Passion was a thing to deplore, not to study, analyse, and represent. The national history was still unchequered. Nor was the house of Hellas as yet to any degree openly divided against itself. There was no need of artists—whcether poet, as /Nschylus, or sculptor, as Phidias—to depict the struggles of passion or other condi- tions of the mind. Now this is all changed. The nation has lost its unity, and the Peloponnesian war has made havoc of its resources. Adschylus has given way to Sophocles and Euripides, Phidias to Scopas and Praxiteles. Poets and sculptors of the new generation have chosen as their theme the representation of pathos and of the condi- tions of the mind generally. That such was the character of what is called the second Attic school of sculpture is known principally from the records of

artists. Of works directly from the hand of any of the masters of this school there is no example in existence, so far as we know at present. On the other hand, there are many copies of their works, from which, with the aid of records, some idea may be formed of their style.

The first of the artists of this school was Scopas, a native of Parus, and, as it would seem, the son and pupil of Aristandrus, a worker in bronze, in which material the son appears to have commenced his career as a sculptor. An example of his work in bronze was the statue of Aphrodite sitting on a goat, in Elis (Pausanius, vi. 25, 2). This subject occurs on a fragmentary cameo in the British Museum. Marble, however, was a material more congenial to his style. The first years of his activity were spent in the Peloponnesus, and particularly at Tegea in Arcadia, where the erection of a temple, in honour of Athene Alea, in the place of one that had been burned 395 B.c., was under his direction as regards both the architecture and the sculpture. About 380 z.c. he settled in Athens, where for nearly thirty years he iwaintained a reputation for an unparalleled power of rendering the human or divine figure, not imposing, but

attractive by the charm of bearing, and the expression of that feeling which for the moment the person was most sensitive to. Sometimes this feeling was one of exeited pas- sion accompanied by great bodily agitation, as for example, in the case of his statue of a Menad at Athens, in the attitude of rushing with head thrown back and streaming hair, and holding a slain kid in her hand. times the passion he sought to express was one of peace-

At other

ful inspiration, as in the statue of Apollo Citharcdus, with long flowing robe and head thrown back as in a dreamy enjoyment of the strains from his lyre. When considerably advanced in life, possibly over sixty years of age, Seopas was invited by Artemisia, the queen of Caria, to assist or direct the sculptures for a monument which she was erecting at Halicarnassus in memory of her hus- band Mausolus. Accompanied by Bryaxis, Leochares,

and Timotheus (or Praxiteles, as others said), he pro- ceeded thither, but as to what part he had in the work we have no information. The site of the Mausoleum was discovered and excavated by Mr C. T. Newton in 1856-7, the result being the recovery of an important part of the sculptures, which, with the slabs of the frieze previously known, now constitutes the principal illustration of the art of that time (Newton, Discoveries at Halicarnassus, Onidus, and Branchide, 1862). While occupied on the Mausoleum, or after its completion, Scopas executed several sculptures for other towns in Asia Minor, as at Cnidus, Ephesus, and Chryse in the Troad. Jn a temple of Neptune, erected in Rome by Cn. Domitius Ahenobarbus, was a large com- position by Scopas, representing Poseidon, Thetis, and Achilles, attended by nereids riding on dolphins and hippocamps, and by tritons and other marvellous creatures of the sea. Not asa copy of this work, but as reflecting vividly the manner of this sculptor, has been accepted the large marble relief in Munich (O. Jahn, Berichte der Scichs. Ges. d. Wiss., 1854, pls. 3-8), representing the marriage of Poseidon and Amphitrite. How far the merit belongs to Scopas of having introduced into Greek art the ideal types of those marine beings who personified the element of the sea, is unknown. In a temple of Apollo at Rome there was further a large composition, representing the slaughter of the children of Niobe, about the authorship of which there were two opinions,—the one ascribing it to Scopas, the other to Praxiteles. While this dubiety is itself proof that the two artists were rivals in the power of expressing pathos and suffering, there is a considerable probability that the composition in question was more adapted, of the two, to the genius of Scopas. Of this work there exists what is believed to be a more or less complete copy in the series of marble statues in the gallery of the Uffizi at Florence. The work is very uneven throughout, as night be expected in Roman copies; but the dramatic character of the action, and the powerful rendering of pain and suffering in the faces, still bespeak the style of the original seulptor, who, whether Scopas, Praxiteles, or another, was certainly an Athenian artist of the first half of the 4th century B.c. (Fricderichs, Bausteine, i. pp. 280- 246). Another example of the style of this period, in the combination of beauty with a lovable and touching expres- sion of face, is the so-called statue of Leucothea, in the Glyptotheke of Munich, which there are grounds for assigning to Cephisodotus, the father, it would seem, of Praxiteles, who is recorded to have made for Athens a statue of Irene with the boy Plutus in her arms, which, as it

appears on the coins of Athens, closely resembles the Leucothea. This Cephisodotus, standing as he did in the period between the old and the new Attic schools, seems to have shared the qualities of both, but to have inclined rather to the latter.

That Praxiteles was directly a pupil of Scopas is not Praxiteles.

proved even by the fact that he worked in the same irtistic vein and spirit, with a result which rendered his style undistinguishable from that of the older master to the eyes of Roman connoisseurs. Still, it will be safe to assume that he was largely influenced in his youth by the then favourite sculptures of Scopas. The scene of his labours was mostly Athens and the neighbouring towns. That he accompanied Scopas to Halicarnassus to assist with the sculptures of the Mausoleum, as is stated, is probably true ; but from the fact that elsewhere in place of his name occurs that of Timotheus, it has been inferred that he may there have abandoned his original intention, and confined himself to the execution of those statues for towns in that district of which we have records. About 340 B.c. he returned to Athens, and there remained till his . death, studying, with Phrync as his model, the expression of sensual beauty in its highest type. Like Scopas, he had little taste for bronze in comparison with marble, with its surface finely sensitive to the most delicate modulation. Unsatisfied with even this, he endeavoured to soften the asperity of the marble in the crude parts by a process of eucaustic, in which, or perhaps rather in the colouring of the draperies, he employed in difficult cases the contem- porary painter Nicias (Pliny, V. H., xxxv. 39,122). That he was peculiar in thus tinting the marble, and an excep- tion among other Greek sculptors, cannot be meant, in the face of so many instanccs as we now have of the applica- tion of the circumlitio in the remains of Greek sculpture and architecture (Semper, Der Stil, i. pp. 498 and 514). The fact, however, of his being mentioned in conncction with it may be taken as a proof that the process was an exceedingly refined one, since his favourite subjects were those of youthful or feminine ideal beauty, in which it is to be supposed that the tints corresponding to those in nature would appear almost evanescent in their delicacy. Of his works, the number of which was unusually large, the most

celebrated were—(1.) The marble statue of Aphrodite at Cnidus, of which the more or less modified copies, as the Venus of the Capitoline Museum and the Venus de Medicis, together with the ancient records, show that the goddess was represented standing nude at the moment when she has left her bath, and, being sensitive to the air, presses her left leg against her right, and looks towards the drapery which she has already laid hold of with her left hand. Originally commissioned by Cos, but declined on account of its nudity, this statue was replaced by another of Aphrodite, with which the marble statue in the Louvre, found in Melus in 1820, has frequently been compared. But before accepting it as an illustration of the type of Aphrodite by Praxiteles, or of the more highly praised figure of the goddess by Scopas, it is necessary to bear in mind that on a base found with it, which, though now lost, is vouched for on creditable authority, was inscribed the name of the artist, Alexandrus, son of Menides of Antioch, who must have lived after Alexander the Great (Friederichs, Bausteine, i. pp. 331-334). (2.) A statue of Aphrodite at Thespiz ; beside which was placed (3) a portrait statue of Phryne; and (4), a statue of Eros, in Parian marble, of which there are two accounts,—either that it was given by him to Phryne in token of his admiration, or that she contrived to obtain it by a ruse, and then dedicated it at Thespiz. 'The figure of Eros was here not that of a boy, as in later art, but was taken from the period of youth at which love is purely ideal, and the whole being is per- vaded by an elevating ardour. Apparently exhibiting the same refinement of youthful form was his statue known as the "Celebrated Satyr," in Athens. Of his Apollo Sauro- ctonus several copies of inferior merit exist. His statue of emis Brauronia at Athens had a mouth inviting toa kiss. The ablest of the contemporaries of Scopas and Praxi-

teles were Bryaxis, Timotheus, and Leochares, of who the last worked chiefly in bronze, and travelled over a wide field of couceptions, including deities, portraits, mythological and allegorical subjects. Another new type which belongs to this period is that of Serapis by Bryaxis. From the time of Philip and Alexander the Great, portrait statues furnished a large part of the occupation of sculptors, and in this they were not confined to living models, as we gather, for example, from the portraits of Sappho and Corinna by Apollodorus, a sculptor of this time,—a fact from which it may be inferred that portraiture was still inclined to idealism, though doubtless a strong tendency to realism had already set in.

The development of the art of sculpture in the Argive- Argive- Sicyonian school, corresponding to that just described in Sicyonian the second Attic school, was begun by the Corinthian S°2°°- Euphranor, whose principal study was directed with the view of modifying the hitherto canonical proportions of Polycletus, to suit the changed tastes with which he had probably become impregnated during his long stay in Athens. To this end he introduced a smaller head and a slimuess of the arms and legs which gave a greater light- ness to the figure, and which, under the hand of his fol- lower Lysippus, became the favourite type of ideal athletic statues. Lysippus, a native of Sicyon, and originally employed as an ordinary worker in bronze, rose by dint of study to the position of a sculptor of the first order. Nor was the quality of his work more surprising than the quantity. About 1500 statues and groups in bronze were counted as having been produced in his workshop, and among them two at least of colossal size—the statue of Jupiter at Tarentum, 60 feet high, and that of Hercules in the same place. The masterpieces which he appears to have studied most were those of his townsman Polycletus,

Like Euphranor, however, he was compelled to seek a new system of propor- tions,—to exchange the immovable dignity and repose by which the old masters suggested the pos- session of physical power, for new attitudes, in which the exercise of physical power should be made /\ apparent by its effect on / the body and on the face. The colossal frame of Hercules was a- favourite study with Lysippus, for this reason especially, we presume, that of all the ancient heroes he was re- presented in the legends as bearing about with him always the effect of the arduousness of his labours. There was no gaiety or | elasticity in his composi- tion. A figure of an athlete in the act of scraping the sweat and dust from his body, Apoxyomenus, which enjoyed a high re- putation in Rome, where it stood before the baths : of M. Agrippa, has an Fie. 9.—Bronze figure, originally applied as additional interest for us arelief. Brit.Mus. Found at Tarentuin. in the fact that a marble peeeerenn ty pips oe drsin es, copy of it still exists, which, though of inferior work, forms an admirable illustration of the patie gs- re- I].— 4

Silver- smiths.

Die-sink- ing.

garding the proportions adopted by Lysippus, viz., | there is a general feeling for beauty throughout the Greek _ 2 small head and comparatively long slim arms and | coinage of this period, the specimens most deserving of legs (Monumenti d. Inst. Arch. v. pl. 13; Friederichs, a Bausteine, i. p. 286). That he was also equal to the times > re in the production of allegorical figures may be gathered from the description (see Overbeck, Schriftquellen, Lysip- pus) of his bronze statue of Cairus, a personification of what is vulgarly called the "nick of time." It remains to point out, with reference to the style of Lysippus, that he confined himself mostly to the rendering of male forms, and that in regard to the few female figures by him there is no mention of the charm of sensual beauty which cha- racterised the second Attic school; nor, again, do we find that other characteristic of theirs, the expression of pathos, in the male figures by him. His animosa signa must be taken as expressing physical life—anima, not animus. Among the remaining sculptures which belong to this period the most remarkable are—(1.) The sculptures of the so-called Nereid monument discovered at Xanthus, in Lycia, by Sir Charles Fellows, and now in the Bnitish Museum. These sculptures consist of (a) a series of female figures in the round, about the size of life, wearing a thin long drapery through which the forms are entirely visible ; (6 and c) a broad and a narrow frieze, both representing battle scenes. While the design of the narrow frieze is singularly Assyrian in conception, that of the broader frieze and the statues in the round is purely Greek, at one time suggesting the style of the Parthenon sculptures, at another the refining and movement of the second Attic school :) P (Fell ows, An Account o yf the Ionic Trop hy Monument exca- Fic. 10.—Colossal bronze ee ey to have been found at

vated at Xanthus, London, 1848; W. W. Lloyd, The | study beg those of Arcadia, of the Opuntian Locri, of Nereid Monument, London, 1845). (2.) The reliefs on | the Macedonian kings Philip and Alexander, of the Chalci- the monument of Lysicrates, a round building in Athens, | deans of Thrace, of Cydonia in Crete, where the name of popularly known as the Lantern of Demosthenes. The =< SSO MWA victory which it was erected to commemorate was gained in the year 334 Bc. The subject is Bacchus and his suite transforming the Tyrrhenian pirates into dolphins. The figures are

powerful, but light of foot and tall. The unusually large spaces between the groups and figures is suggestive of the lonely distances on the sea-shore, and in this respect the frieze seems to encroach on the province of painting (Marbles of the British Museum, ix. pls. 22-26). (3.) A series of portrait sculptures, for which reference 1s made to Friederichs, Bausteine, i. pp. 290-308. The great bronze head (fig, 10) placed here may, on further con- sideration, require to be moved to an earlier period, though the many carelessnesses in details which it exhibits seem at present to render such a step unadvisable.

Besides sculptors, otherwise famous, who applied them- selves to toreutic art, there were others who made this their principal occupation. Of these we know Mys, who executed the designs on the shield of the bronze Pallas of Phidias on the Acropolis of Athens; and, more celebrated, Mentor, who worked chiefly on silver bowls and cups, for which fabulous sums were afterwards paid by Roman collectors. He must have lived before the time of Alexander the Great, since some of his works perished in the burning of the temple of Diana at Ephesus. Two other czelatores apparently of this period were Acragas and Beethus.

'A branch of art allied to the celatura is that of die-sink- ing and gem-engraving. Of the former the finest examples during this period are the silver coins of Syracuse, espe- cially the decadrachms with the head of Arethusa on the obverse and a quadriga on the reverse. The presence of the engraver's name on many of these coins is testimony of the value attached to their work. From this source we know the engravers Cimon and Euenetus. Other names, such as Euclides, Eumenus, Eumelus, Phrygillus, and

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Fic. 11.—Marble nead of 'Alexander the Great. Brit. Mus. From Alexandria.

Sosion, also occur on smaller silver coins. With the ex- | the engraver Neuantus occurs, and of Lesbus. In gem- Gem: | : ception of Athens, where

the archaic type was preserved, | engraving during this period the fame of Pyrgoteles 1s engravi®

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known, but of all the existing gems which bear his name it may be questioned whether one reflects adequately his style. It may be taken as certain that some of them are from his hand. He was the court engraver of Alexandcr the Great, whose portrait he made on an emerald. The marble head here given (fig. 11) shows a distinctly realistic tendency, compared with the head on the coins. Pos- sibly the portrait of Alexander which appears on the coins of his successor Lysimachus was in some way drawn from the gem (Brunn, Gresch. d. Gricch. Kiinstler, ii. p. 629). Among the few examples of genis that can be unhesitat- ingly assigned to this period is the chalcedony with the figure of a crane found in Kertch, and now in the Hermit- age, St Petersburg, bearing the signature of Dexamenus of Chius, AEZAMENOS ENOIE X10 (Compte Rendu de la Comm. Arch. pour Vann. 1861, p. 147, pl. vi. 10).

In painting, the transition from the style of Polygnotus to that of the new school was again, as has been said, a transition from ethos to pathos, from character and noble bearing to beauty and effect. The change, as elsewhere, was in harmony with the spirit of the times; but of the steps by which it was brought about two deserve attention ; the first is the exigencies of scene-painting, on which

Sophocles, and, after his example, his older contemporary

Aaschylus, laid great value. In this direction the artist of the day was Agatharchus of Samus, who also wrote an account of the decorations

executed by him, and by this led to the investigation of the principles of perspective in paint- ing by Democritus and Anaxagoras. The second step was the gradation of light and shade and of colours introduced by Apollodorus, who for this service is regarded as the founder of the new school. At the door opened by Apollo- dorus entered Zeuxis, as he himself is reported to have said, into the sanctuary of art. Not that Zeuxis was directly a pupil of the older master. All that is known of their relations to each other consists of mutual compli- ments. That the charm of Zeuxis's popularity was in great part due to novelty of situation and effect might be inferred from the statement regarding his picture of a ccntauress suckling her young, the spectators of which forgot the painter in the subject. On the other hand, the story of his having constantly before his eyes five of the most beautiful maidens of the town of Croton while he was painting his fignre of Helena, suggests that he must have been a close student of form and perhaps also of colour. His figures were of a large mould, as in the earlier school, and for this reason his heads and limbs appeared a little coarse to Roman connoisseurs accustomed to the elegance of a later time. In this direction a great step in advance was made by his contemporary Parrhasius of Ephesus, who like Zeuxis also lived some time in Athens, eujoying the society of Socrates, and vaunting his personal appearance as well as his artistic powers. The dominant faculty of drawing in Parrhasius led him to choose his subjects from male heroic figures, and led him also, it will be charitable and not. without analogy to conjecture, to produce the im- moral scenes with which his name is connected. From excellence in drawing and colouring the next step was towards a just conception of the subject on hand, and this step was taken by Timanthes, of the islaud of Cythnus. One of his great pictures was the tragic scene of the sacrifice of Iphigenia, in which the expression of sorrow was rendered with a masterly gradation, from the bystanders (Calchas, Ulysses, Ajax, and Menelaus) up to Agamemnon, in whom the deep grief of a father was expressed by his covering his face and turning it away from the spectator. This subject, with various modifications, and particularly with the absence of the gradation of grief among the by- standers, but still obviously preserving the profound pathos of a great original, occurs in Pompeian paintings, and

on a Greek relief in the gallery of Florence (O. Jahn, Archiol. Betrdge, p. 378). Whether or not a resident at Ephesus, the centre of Asiatic painting, it is clear that Timanthes stood in close relation to the school there. Con- temporary with the Asiatic school existed in Greece proper two schools of painting, of which the one, with its seat in Sicyon, seems to have studied most drawing and a system of form and proportions; while the other, centred at Athens, but including some Theban painters, looked rather to the expression of pathos and the emotions of the mind.

The founder of the Sicyonian school was Eupompus (401— school of 381 B.c.) It was, however, to his pupil Pamphilus that Sicyon.

it owed most of its reputation, and became a school for practical instruction which attracted students from remote quarters. From his distinction in mathematics and geo- metry, and from the fact of his having introduced drawing as a general element of instruction for youth, it is inferred that his teaching was mainly directed to the reproduction of form. On the other hand, it is also known that his researches led to an improvement in the colours em- ployed in encaustic painting, and further that this art was carried to its highest perfection by his pupil Pausias. In a middle position between the Sicyonian and Attic schools stood Euphranor the Corinthian, of whom as a sculptor mention has already been made. His subjects were of the higher grade of historical painting, being mostly large compositions of mythological scenes or histori- cal events, of which an example was to be seen on thc portico of Zeus Eleutherius in the Agora of Athens. In Thebes, where since the recovery of freedom from the Lacedemonians a new impulse for art as well as politics had been felt, a school of painting was formed, apparently at first under the influence of that of Sicyon. At its head was Nicomachus, a son and pupil of Aristizus. A greater fame was achieved by his son Aristides, as an example of whose work, Pliny (VW. #., xxxv. 36, 98) quotes a picture from the capture of a town in which a mother appeared mortally wounded, and with a harrowing expression of dread on her face lest the child clinging to her breast should suck blood instead of milk. His activity extended to portraiture and to genre subjects; but he worked by preference in the encaustic process, the credit of inventing which has been

wrongly ascribed to him. | Among the other painters of note who followed the manner of the second Attic school of sculpture there remains only Nicias, a son of Nicomedes of Athens, and a pupil of Antidotus, from whom he learned the extreme care of execution originally taught by Euphranor.

In the person of Apelles, the son of Pytheas, a native of Apelles.

Colophon, were combined, if we may judge from his reputation, all the best qualities of the hitherto existing schools of painting. It shonld, however, be remembered that what we know of him comes entirely from Roman and late Greek sources, and represents rather the taste of these times than a critical judgment on his works. He was a pupil of the otherwise unknown painter Ephorus of Ephesus, which town, already celebrated as a centre of painting, he adopted as his home. But so high was then the reputation of the Sicyonian school, headed by Pam- philus and Melanthius, that on completing his studies at Ephesus he repaired to Sicyon, either to sec for himself or to profit by the fame of these masters. From Sicyon he proceeded, perhaps through the influence of Melanthius, to the court of Macedonia, where he was employed, first by Philip, and afterwards, under circumstauces of the greatest intimacy, by Alexander, whom he accompanied as far as Ephesus on his expedition into Asia. Of the figures of deities painted by him the most renowned was that of Aphrodite Anadyomene, originally in the temple of Aiscu- lapius in Cos, represented rising out of the sea, and wring-

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With the close of the Periclean period in Athens the Archite, public desire for more temples seems to have ceased; so ture,

ing the wet out of her hair, with swelling bosom and an |

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expression of desire in her eyes. A second figure of the goddess, also intended for Cos, remained unfinished at his death. Of personifications and allegorical figures or groups, such as delighted the age in which he lived, we have examples—of the former in his group of Bronte, Astrape, and Ceraunobolia; and of the latter in his famous picture of Calumny. Partly of this character also were his two pictures of Alexander grouped with Castor, Pollux, and Victory; and Alexander in a triumphal ear, beside a personification of war, in the form of a captive with hands bound behind baek and seated on armour. The execution of subjects of this nature, for whieh thought and reflection are mainly required as opposed to the poetie and spontane- ously creative faculty of a true artist, has becn urged as detracting from the greatness of Apelles, and to this extent, no doubt, he was subjeet to the weakness of his times. Like Correggic, with whom he has been compared, he lived at a time when the great ereative spirit had passed away, and it remained for him, as for the Italian master, to dis-

eover the last resources of his art for the attainment of –

powerful effect and absolute finish simultaneously. To refine the harmony of his light and tones, as well as to protect his paintings from dirt, he employed a peculiar black glaze which broke the sharp contrasts of colours (Pliny, NV. H., xxxv. 97) required for such powerful effects as the appearance of Zeus hurling lightning. With regard to his colours little is known. The statement that he used only four (Pliny, WV. H., xxxv. 50, 92) may or may not be correct (Cicero, Brut., 18). Of his mere skill we have an example in the figure of Hercules, after- wards in Rome, of which it was said that the face, though turned away from the spectator, was suggested almost as vividly as if it had been actually painted (Wustmann, Apelles Leben und Werke, 1870). In technical skill Apelles confessed himself equalled by his contemporary Protogenes the Rhodian, claiming, however, as his own special superiority, that he knew when to stop. The fault of Protogenes was over-elaboration. On one painting he is said to have worked seven or eleven years, finishing it with four separate glazes to protect it from injury. Of the painters of this period there are still to be mentioned Antiphilus, a native of Egypt, and a pupil of Ctesidemus ; Theon

of Samus, who was praised for his happy choice of the right moment at wlrich to seize an action ; and Aetion.

Though the works of the masters of this period have wholly perished, there remain two sources from which some idea may be gathered of their manner, —first, a number of Pompeian paintings, which, though exeeuted in a later age, and often intentionally varied from the originals, are still copies of the spirit and manner of the works of this time ; and secondly, a large series of painted vases, whieh, though the produetion of inferior workmen, display a wonderful facility of execution, a splendour of glaze, and an application of eolours whieh show that the example of the great painters had not been negleeted. The figures stand out in red from the blaek ground of the vase ; for the accessories, red, yellow, violet, blaek, blue, green, and gilding are employed. It is not, however, alone from their possession of certain traits which are assumed to have characterised the style of painting in this period that these vases are assigned to it. There exists a small but increas- ing series of painted vases which had been gained at the Panathenaic games at Athens, on several of whieh is in- scribed the name of the archon for the year in which they were obtained. We have thus the exact years in whieh these vases were made, and at the same time specimens of the art of the time, from which a comparison is easily made with the larger series of undated vases (see Catalogue of the Vases of the British Museum).

that the architecture of the period now before us is to be traced rather in works of utility, whether public or private. Of the former class are—(1), the stadium at Agree for the athletie competitions at the Panathenaic festival ; (2), the gymnasium ; (3), the store-house at the Pireus, built to contain the equipments of 1000 ships. Froin private sources were (4), the temple of the Muses, said to have been erected by Plato, in the Academy; and (5), the choragic monument of Lysicrates, which is the only existing example of Athenian arehitecture of this time (Stuart, Antiquities of Athens, i. pls. 23-30). A greater arehitectural activity prevailed in the Peloponnesus. At Tegea was erected, under the direction of Scopas, a temple which scareely yielded in splendour to that of Zeus at Olympia. The laying out and building of new towns which followed upon the recovery of freedom by Thebes under Epaminondas, gave abundant seope for architects. A remarkable example of this was Megalopolis in Arcadia, which was built in an elliptical form, on

the principle laid down by Hippodamus of Miletus, and carried out in the Pireeus, Thurium, and Rhodes. A more magnificent cx- ample of a new town erected in tlris period was Alexandria, founded by Alexander to be the first city of the world of which he was master, and built in that spirit by his favourite architect Dinverates. The model of Alexandria was adopted by the successors of Alexander for the many new towns raised by them, as, for example, Antioch on the Orontes, the architect of which was Xenzns. The temples of Asia Minor erected in the time of Alexander may be judged from the ruins of those of Athene Polias at Priene, of Artemis at Magnesia on the Meeander, and of Arteiis at Ephesus, of which last the site has lately been excavated, with the result of confirming the few existing statements regarding its dimensions and style. The Mausoleum at Halicarnassus, and the Nereid monument of Xanthus, are instances of temple architecture modified for the purposes of a tomb.

Fifth Period.

The conquests of Alexander had opened to the Greek gaze the East, gorgeous in its personal attire and equip- ments, and unlimited in its resources for the encourage- ment of personal vanity. Alexander appeared in Asiatic eostume, and what became the monarch was shortly found becoming to the subject. Under his successors, in what is called the Macedonian, or, better, the Hellenistic period, the opulence and taste for luxury of the times led artists to aim at producing works conspicuous for picturesqueness ; not, however, that picturesqueness which is born of a fine fancy, but that which originates in a studied effort to throw a gleam of romanee over a plain historical incident. The creation of ideal types of deities ceased, and the production of allegorical figures, which had found acceptance in the preceding age, took its place. These figures were simply studies of character, and implied a faculty of observation which the existing portraits of this period on coins and in marble warrant us in estimating highly. To this, no doubt, was added a power of generalisation which enabled the artist to deduce a type from a number of individuals, as, for example, in the type of Gauls introduced by the school of Pergamus. In figures of deities or heroes the old types were retained. It was in portraiture that the essential characteristic of the time consisted. With art in this con- dition Greecia Capta enthralled her Roman captors, and the further

development of this phase of art was transferred to Rome. For this reason we shall here follow the unusual plan of classing the Hellenistic and Roman art under one period.

The two principal schools of sculpture of the last period

are represented in this by the sons of the two great masters | been, it is impossible to look upon it without pain. The of each,—the Athenian school by the sons of Praxiteles, | same feeling, it may be imagined, was awakened in the soy spectator by the bronze group of Athamas seized with insanity after slaying his son Learchus, by Aristonidas, another artist of the Rhodian school. From the instances of subjects in which cruelty and deep emotion were com- bined, it has been argued that the group of Laocoén, which was the work of three Rhodian artists—Agesander, Atheno- dorus, and Polydorus—may properly be assigned to the Rhodian school of this period. On the other hand, it is argued by critics of seemingly equal competence, that the subject of the Laocoén is too harrowing for the Greek taste even then, and must have been executed under the influ- ence of the favourite cruelties practised in the Roman circus. The decision between these two opinions is left entirely to taste, owing to the ambiguity of the words of Pliny. From Rhodes we pass to Pergamus, where, under Schoo} of the courtly influence of Attalus J. (241-197 3.c.) and Pergamus.

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Brit. Mus. of Brindisi (Brundusium),

Fie, 12.—Bronze statuette of a Philosopher. Found in harbour

Cephisodotus and Timarchus, who worked together. The former appears to have been the more gifted of the two, if we may judge from the pains bestowed on certain statues of deities by him aloue. Of their contemporaries little is known beyond that their chief occupation was in portrait sculpture. The traditions of the Sicyonian school were left in the hands of the sons and pupils of Lysippus, of whom the ablest was Euthycrates, who preserved the severity of the older schools in opposition to the tastes of his times. The effect of this upon his pupil Tisicrates led to so close a reproduction of the manner of Lysippus, that in many cases it was difficult to distinguish his work from that of the old master. In the same spirit, and with greater success, worked Eutychides of Sicyon, and Chares of Lindus in Rhodes. From the hands of Eutychides we know of a bronze statue of the river Eurotas, in which the mobility of water was finely suggested in the human form (Pliny, V. H., xxxiv. 8, 78), and a highly-praised statue of Tyche (Pausanias, vi. 2, 7) for the town of Antioch, of which several copies exist, including a small one in silver in the British Museum. Chares is known mainly as the author of the bronze Colossus of Helius at Rhodes, a statue 105 feet high, which after standing a marvel to all for fifty-six or sixty-six years, was broken across the knees and thrown to the ground by an earthquake. The rising im- portance of Rhodes encouraged the foundation of a school of sculpture which adopted the manner of Chares, and aimed at effect by colossal proportions and picturesque situations. To this school belonged Apollonius and Tau- riscus, the authors of a colossal marble group which has been identified with that in the museum of Naples, known as the "Farnese Bull," and representing Amphion and Zethus in the act of binding Dirce to the horns of a bull in presence of their mother Antiope, and, whether copy or original, an admirable illustration of the Rhodian school. The moment seized by the artists is one of profound pathos ; but, justly deserved as the punishment of Dirce may have

Eumenes II. (197-159 8.0.), was formed a school of sculp

'ture which derived a vigorous impulse as of a new life

from the strange class of subjects it was called upon to undertake. It was called upon to glorify the decisive victory of Attalus over the Gauls (239

3.c.) by groups and large compositions of battle scenes, in which the first diffi- culty was to produce the type of these barbarians, and to carry it out consistently in the various attitudes and in- cidents of a battle ; as, for example, in their dogged sub- mission under captivity, or their grim expression under pain ; or, again, the abject misery of their wives when a battle had been lost. Nor was Attalus content to adorn his own capital with artistic productions. To Athens he made a present of four groups representing battles between gods and giants, between Athenians and Amazons, between the Greeks and Persians at Marathon, and between his own army and the Gauls in Mysia, showing in each case the defeat of a barbarous race. The height of the figures was 3} feet, and that there must have been a considerable number of them is clear from this, that the occurrence of Bacchus in the group of the Gigantomachia presupposes the existence of the other superior deities, Of the entire series nine figures have been identified in various museums (Engraved, Monwmenti dell' Inst. Arch., ix. pls. 19-21; Brunn, Annali del? Inst. Arch. 1870, pp. 292-323; and Bullettino, 1871, pp. 28-31; Clarac, pl. 280, No. 2151); while to the same school belong the dying Gaul in the Capitoline Museum, known as the " Dying Gladiator," and the group of a Gaul and his wife in the Villa Ludovisi (Miller, Denkmdiler, i. pl. 48, No. 218).

After the loss of national independence little remained New Attic for the Greeks to do but to profit by the liberal patronage School.

of their Roman masters, whose cupidity in matters of art was by no means satisfied with carrying off as many as possible of the existing sculptures. The increased demand led to a new energy, of which Athens was at first naturally the centre, whence the term "New Attic" is applied to the sculpture of this period. As, however, this new energy was chiefly directed to the reproduction of the favourite types of the old masters, the result was not, as under other circumstances it might have been, the formation of a new school properly so called. At this time the principal sculptors were Polycles of Athens, his son Timarchides, his grandson Dionysius, and another Dionysius, all of whom, after earning a reputation by their work in various parts of Greece, appear to have followed Metcllus to Rome, which now became the artistic centre of the world. Towards the end of the republic there lived in Rome a sculptor, Pasiteles, who, if not superior to the artists

of the new Attic period in point of creative power, was certainly more gifted than they with skill and carefulness in the execution of his work, which ranged over statuaria, sculptura, and

Arcesilaus.

Silver- smiths.

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celatura, including chrysclephantine figures, for which a taste had revived. As, however, none of his works exist now, we can only judge of his manner by that of his pupil Stephanus, from whose hands we have the statue of Orestes in the Villa Albani (Annali dell' Inst. 1865, pl. D; Friede- richs, Bausteine, i. p. 112). It is called Orestes from its resemblance to the male figure in the group of Orestes and Electra in Naples, with which, as an imitation of the archaic style, it may be compared. In both, however, it has been observed that the archaism is limited to the proportions, attitude, and general aspect, but that the details of anatomy have been worked in from the living model, This, which constituted the peculiarity of Stephanus, is assumed to have characterised the school of Pasiteles, first, because Stephanus, in an unusual manncr, describes himself on the base of the statue as a pupil of Pasitcles ; and secondly, because the same peculiarity to some extent is found in the group of Orestes and Electra in the Villa Ludovisi by the sculptor Mcnelaus, who again describes himself as a pupil of Stephanus (Friederichs, Bausteine, i. p. 427). Doubtless this affectation of archaism was to meet the taste of the time, for which also archaic works were collected from Greece. By the extreme claboration of his work, Arcesilaus, who lived in Rome in Ceesar's time, obtained considerable fame, but, on the other hand, limited greatly: his productivity. Of ~~his two principal statues, the Venus Genctrix and the Felicitas, the latter was never finished. Copies of both exist, but they are of too mean a kind to suggest a proper estimate of the sculptor's merit. While in ideal sculpture the artists of this time were con~~ tent to copy, with trifling varieties of detail, the works of the old masters, they appcar to have disclosed consider- able original talent in realistic sculpture, that is, in por- traiture and in the historical representations with which triumphal arches and other like buildings were decorated, though here again they had models ready to hand in portraits,

battle scenes, and triumphs of the Hellenistic period. A sculptor who had to celebrate a Roman victory over barbarians had his model in works of the same class by the school of Pergamus. When he introduced an ideal figure, as that of Victory writing on a shield, he adopted an old type. In the grouping of his figures there is this peculiarity, that they are frequently arranged on the prin- ciples of painting rather than of sculpture, and it is sup- posed that this originated in the earlier Roman custom of celebrating victories by paintings hung up in public places, which paintings appear to have becn based on those of the Alexandrian period, and, at any rate, were some- times executed by Greek artists. (For a thorough investiga- tion of this subject see Helbig, Campanische Wandmalerer, Leipzig, 1873.) .

**. When public encouragemeut of art takes the form of a desire for reproduction from ancient masterpieces, it is natural that such minor arts as those of calatura and gem- engraving should flourish. The production of silver vases adorned with subjects in relief had become a profitable occupation in the wealthy times of Hellenism. It was not, however, till the latter half of this period that truly fabulous sums came to be paid for work of this kind, in which Pasiteles and Arcesilaus, already mentioned as sculp- tors, achieved great success. Besides them we hear of Posidonius of Ephesus, Zopyrus, Pytheas, and Teucrus. Among the many existing examples of silver work of this period, one—a vase found in 1761 at the Porto d'Anzo, and belonging to the Corsini family—has been identified as a copy of the silver vase by Zopyrus representing the acquittal of Orestes before the Areopagus. The im- mense number of existing statuettes, vases, utensils of various kinds in bronze and silver, dating from this period, are evidence of its artistic activity, and at the*

same time of the closeness with which Greek models were adhered to.

Under the infinence of the luxurious tastes in the times Gem-en of the Ptolemics, gem-engravecrs aimed mostly at effect, graving.

and to this end sought out specimens of onyx and sardonyx which from their own splendour would lend a charm to the work. A gem was now a thing to be worn flauntingly. Hence the chief examples of the art are the cameos, of which from the latter half of this period we have still some magnificent examples. Of these, the most important, artistically, is the large cameo, now in Vienna, represent- ing, in a partly allegorical and partly literal fashion, the suppression of the Pannonian revolt by Tiberius and Ger- manicus (Miller, Denkmiiler, i. pl. 69, No. 377). Larger and richer in figures, but much inferior in work, is the cameo in the cabinet of medals in Paris (Miiller, cid. No. 378). Besides producing cameos for personal orna- ment, the gem-engravers of this period «were also em- ployed on the production of drinking-cups of onyx and other precious stones, of which the tazza Farnese in Naples is the best existing example (Mus. Borb., xii. pl. 47). When stones were too costly, glass was used, as in the famous Portland vase in the British Museum, and in numerous cameos. Comparcd with the cameo-engravers, who, as if conscious of the inferiority of their work, with- held their names from it, the engravers of intaglios very frequently asserted their merit by adding their names. Among the names thus handed down are those of Dioscu- rides, his son Eutyches, Athenion, Protarchus, Solon, Euodus, and others of lesscr note.

In the history of painting during this period few names Painting,

of importance occur. In the earlier part of it the tradi- tions of the school of Sicyon were maintained by Nealces, from whose hands we know of a picture of Venus, and of a naval engagement between Persians and Egyptians on a river which was localised as the Nile, by the presence of a crocodile and an ass drinking at the edge ; and Timanthus, who painted a battle between the troops of Aratus and the Aftolians. In the Athenian school, Athenion, though dying young, produced some works which were favourably compared with those of the older master, Nicias. About this time the production of painted vases, driven ont of fashion by vases in silver and other metals, so far ceased to attract skilled workmen, that it can hardly be fair to regard the large number of so-called Apulian vases belonging to this period as evidence of the coutemporary style of painting, The ornament and the colours are always florid, the figures are drawn mechanically as from a set design, and the dimensions are very frequently large. According to the

theory advanced by Brunn (Probleme in der Gesch. der Vasenmalerei), almost the whole of the vases found in Italy with black figures on red ground, which previously were considered archaic, were produced about this time, aud are but fecble imitations of the early style made to please the Roman taste for archaic work. As to the general fecbleucss that prevails among them there can be litte question. It remains to be seen, however, whether Brunn has not placed them at too late a period.

With the scauty records of paintcrs, and the depreciatory Painting remarks in regard to the art of their time made by Phny ™ Italy.

and Petronius, we have to compare the immiense series of paintings from this period still existing in Italy, aud particularly those of Pompeii and Herculaneum, an exami- nation of which will show 'that the painters then, like the contemporary sculptors, drew their inspiration, and ap- parently to a tolerably close extent their models, from more ancient works. Had they been gifted with original geius, they could not have excluded, when painting landscapes, the views of the immcdiate neighbourhood; and yet on all

the walls of Pompcii or Herculaneum there is perhaps not

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more than one subject which can be positively identified as local. Nor would they have avoided so systematically as they have done subjects from the national Roman legends, which were then in high favour, and attracted poets like Virgil and Ovid. But while a complete dearth of imagina- tive power may be denied them, these painters were pos- sessed of a finc eye for pictorial effect, and of a refined taste in the management of thcir colours (Helbig, Wandge- milde Campamens, to which is prefixed an claborate in- quiry into the technical processes employed ; and Helbig, Campanische Wandmaleret, 1873, where the sources from which these painters drew are fully pointed out).

Closely allied to painting is the art of mosaic-working, which, though occasionally employed for the pavements of the earlier temples, as in the pronaos of the temple at Olympia (Lxpédition de la Morée, i. pl. 63), did not till after the time of Alexander assume an importance which entitled it to be ranked as an independent art. The first mosaic artist of consequence whom we hear of is Sosus of Pergamus, celebrated as having introduced the practice of decorating floors of houses with imitations of characteristic objects, such, for example, as the accompaniments of a feast in a dining-room, From Pergamus, Ephesus, Alex- andria, and the chief towns of the Macedonian period, the art was afterwards transferred to Rome, where the nume- rous villas and palaces furnished it with abundant occu- pation. As an example of the work of this later time we have the large mosaic found on the Aventine in 1833, and now in the Lateran, which bears the name of Heraclitus as its author, and which, with its representations of all manner of remains from a feast, is an illustration of the class of subjects introduced by Sosus. We still possess a splendid example of their rendering of historical subjects in the mosaic found in 1831 in the Casa del Fauno at Pompeii, representing a battle between Alexander and the Persians (Miller, Denkmdiler, i. pl. 55, No. 273).

What was said of the progress of architecture at the close of last period should be here borne in mind, as it continues to apply to the first half of the period now before us. While the building of Alexandria supplied a model and an impulse, which the successors of Alexander availed themselves of, in

the construction of new towns, the example of boundless luxury, in the decoration of even temporary monuments, which was set by Alexander in the erection of a funeral pyre for Hephestion in Babylon, was also eagerly followed by his successors. From the work of Callixenus on Alexandria we have (Athenzus, v. p. 196) a description of the tent erected by Ptolemy Phila- delphus for a Dionysiac festival, and of the splendid colossal barge of Ptolemy Philopator on the Nile (bid. p. 204,d). Still more magnificent and stupendous in its dimen- sions was the ship of Hiero of Syracuse, with its granaries, dwelling-houses, towers, gymnasium, and park, for the construction of which Archimedes and the Corinthian Archias were employed. Greece proper, however, shared little in this prodigality. Thebes was, indeed, restored after its destruction by Alexander; and Athens, still the eye of Greece, obtained many marks of favour from the princes of the time, who sought to identify their names a her glory by erecting public monuments of various

inds. .

The presence of countless specimens of Greek art in Roxae, carried off by plunderers like L. Mummius, pro- duced a general craving for Greek architecture also. The first step in this direction was taken by Q. Cecilius Metellus, who brought a Greek architect, Hermodorus of Salamis, to Rome to build a temple to Jupiter Stator in the pure Greek style. The public favour with which this was viewed may be gathered from the fact, that shortly after we find D. Junius Brutus employing Hermodorus to

build a temple to Mars. Of the Roman architects who during the republic adopted the Greek style, the most distinguished were Cossutius and C. Mutius. The Greek had either supplemented or become blended with the native Roman architecture when the extraordinary activity in building, of which Pompey and Cesar were the leaders, set in, not only in Rome, but throughout the' provinecs of the empire. The building of temples and monuments, which under Augustus had been the chief occupation of architects, gave way under his immediate successors to constructions of a

more useful and sometimes of a colossal type, such as bridges, canals, aqueducts, and harbours. The enlargement of the imperial palaces on the Palatine, particularly the construction of the golden house of Nero, gave scope to the boldness of design and extravagance of execution possessed by the architects Celer and Severus. In the following times those of Vespasian, Titus, and Domitian were characterised by a series of buildings which had not their equal in the architcctural history of Rome, as, for example, the Colisseum, a building erected to con- tain 87,000 spectators, and still in its ruins the most striking monument of imperial Rome. While the chief interest of Trajan was in the construction of roads, bridges, and harbours, his successor, Hadrian, was not only himself ambitious as an architect, but gave a new impetus to the erection of splendid buildings throughout the empire. [rom this time onward Roman architecture began to sink rapidly, its original tendency to florid decoration obtaining more and more free rein, till finally discrimination was abandoned. The ruins of Palmyra' and Baalbec (R. Wood, London, 1827), the arch of Severus, the baths of Caracalla and Diocletian, and the arch of Constantine, are evidence of this. For Etruscan Archeology, see Errurta. Summary of Contents.

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ARCHANGEL, a government of European Russia, lying between lat. 61° and-71° N., and long. 29° and 68° E. It is bounded on the N. by the White Sea and Arctic Ocean, on the W. by Finland and Olonetz, on the 8. by Vologda, and on the E. by the Ural Mountains. It comprehends the islands of Nova-Zembla, Waigatz, and some others. Its area is estimated at 286,739 square miles, and its population in 1867 was 275,779. The climate is for the greater part of the year intensely cold. That part of Archangel which lies within the arctic circle has a very desolate and sterile aspect, presenting little to the eye but extensive plains of sand and moss. 'The winter is long and severe, and even in summer the soil is frozen at a little depth below the surface. The rivers are closed in September, and scarcely thawed before July. South of the arctic circle the greater part of the country is covered with immense forests, with extensive lakes and morasses, while other parts afford excel- lent pasturage. The spring is moist, with cold, frosty nights ; the summer, a succession of long foggy days ; the autumn moist; and the rivers are closed from October to April. The northern districts are incapable of being cultivated, and the inhabitants support themselves by fishing and the chase. In the southern districts considerable quantities of hemp and flax are raised, but grain crops are little attended to, and the bark of trees is ground with corn to eke out the scanty products of the harvest. Potatoes are grown as far north as 65°. The principal wealth of the

government con- sists in its immense forests, furnishing materials for ship-building, which is carried on to a considerable extent. The horses and cattle are diminutive, except in the district of Kholmogory, where excellent cattle are reared. The calves are sent to the St Petersburg market, where the veal is especially prized. Gold is found in the circle of Cola, naphtha and salt in those of Kem and Pinega, and coal, or rather lignite, in several places in Mezen. The preparation of pitch and tar is an active branch of industry ; and in the districts around Archangel coarse linens are manufactured to a considerable extent, as well as cordage, mats, leather, tallow, turpentine, and potash. This government is divided into eight circles, viz—Archangel, Shenkursk, Mezen, Cola, Onega, Pinega, Kholmogory, and Kem. Its chief rivers are the Onega, Pinega, Dwina, Mezen, Petshora, and Ousa.

Sulphurous springs are found in the circles of Kholmogory and Shenkursk. The population was originally Finnish, but it is now chiefly Russian, with some Samoides and Laplanders.

ARCHANGEL, the chief town of the Russian government of the same name, is situated at the head of the delta of the Dwina, on the right bank of the river, in lat. 64° 32' 8" N., and long. 40° 33' E. As early as the 10th century the Norsemen had commercial settlements in the district; but the modern town may be said to date from the visit paid by the English voyager, Chancelor, to the monastery of St Nicholas, whither he was driven by stress of weather in 1553. An English factory was soon after erected there by consent of Ivan II., and in 1584 a fort was built, and a town gradually gathered round it, which received the name of Arkhangelskoi-Gorod, from a monastery dedicated to the archangel Michael. The town long remained the only seaport of Russia, and enjoyed remarkable prosperity. Czar Boris Godunoff (1598-1605) made the trade through Archangel to Moscow open to all nations, and Holland and Germany took advantage of the permission. In 1655 the exports amounted to 600,000 roubles. In 1668 the great bazaar, or " Gostinnoi-Gorod,' a strong building of stone, was commenced at the command of Alexei Michaelovich, and employed the labour of thousands of Tatar prisoners for 16 years. In 1693-94 Peter the Great visited the town, which was then at the height of its prosperity ; the average annual value of the exports from 1691-1700 to England alone amounting to £112,210. When, in the beginning of the 18th century the czar was establishing St

Peters- burg, he did all he could to divert the population and prosperity of Archangel to the new metropolis, causing many of the wealthier inhabitants to remove, and impos- ing heavy taxes on the commerce. As a natural conse- quence, the northern city declined. In 1762 it received the same immunities as St Petersburg, and since that time has gradually recovered its former prosperity. It is the seat of an archbishop and of a civil and a military governor, and has one Protestant and ten Greek churches, an ecclesiastical seminary, a gymnasium, academies for navi- gation and engineering, a naval hospital, and a Government bank. The manufactures are linen, leather, canvas, cordage,

mats, sugar, and beer. The exports are flax, flax-tow and codilla, oats, linseed, wheat, deals, tar, pitch, rosin, mats, beef and pork, calf and seal skins, train-oil, cordage, feathers, and linseed cakes. Flax, in large quantity, is used in the spinning factories in the interior. The imports are coal, oil, wine, coffee, sugar, tea, logwood, furs, lead, salt, and fish. The total value of the exports in 1874 amounted to £1,234,390 in 472 ships, of which 62 were steamers and 220 coasting vessels, a large proportion being carried to Great Britain. The coasting trade between Archangel and Norwegian Finmark is extensive. The domestic trade consists chiefly in meat, fish, train-oil, game, and furs. By river and canal Archangel is in connection with a large part of European Russia, and a telegraph line unites it with St Petersburg. The harbour is at the island of Solombaly, about a ntile below the town, and is open only from June to October. A bar at the month of the Dwina, with only 13 or 14 feet of water,

obliges vessels of greater draught to load and unload out- About 12 miles below the town there is a Government dockyard, with slips for build- ing vessels, and also some warehouses belonging to merchants in the city. The best season of the year in Archangel is from the middle of June to the middle of

side by means of lighters.

August. After that period the nights become cold; and in September it is often stormy. The shortest day has only 3 hours 12 minutes, the longest 21

hours 48 minutes. Population in 1867, 19,936.

ARCHBISHOP, the title of a church dignitary of the first class. Archbishops were not known in the church before the 4th century after Christ, when the term "Archbishop " was introduced in the East as a title of dignity, which did not necessarily imply any supcriority of jurisdiction over a bishop. Athanasius, bishop of Alexandria, appears to have been the first who made use of the term in applying it as a mark of personal honour to Alexander, his predecessor in the see of Alexandria, and Gregory Nazianzen applied the term in like manner to Athanasius. In the following century the title of arch- bishop seems to have been applied to the bishops of the more important sees, as the names of several archbishops are recorded in the list of church dignitaries, who were assembled in the Council of Chalcedon in 451 a.p. In the Latin Church the title was hardly known before the 7th century after Christ. Isidore of Seville (Hispalensis) is the first writer who speaks of archbishops, distinguishing them as a class from patriarchs, metropolitans, and bishops. Archbishops in the present day are for the most part either patriarchs or metropolitans; but an archbishop is not necessarily a patriarch or a metropolitan, and there are metropolitans who have only the title of bishops. The ecclesiastical government of the Church of England is divided between two archbishops,—the archbishop of Canterbury, who is primate of all England and metro- politan of the province of Cauterbury, and the archbishop of York, who is primate of England, and inetropolitan of the province of York. The jurisdiction of the archbishop of Canterbury as primate of all England extends in cer- tain matters into the province of York. He exercised the jurisdiction of legatus natus of the Pope throughout all England before the Reformation, and since that event he has been empowered, by 25 H. VIII. c. 21, to exercise cer- tain powers of dispensation in cases formerly sued for in the court of Rome. Under this statute the archbishop continues to grant special licences to marry, which are valid in both provinces; he appoints notaries public, who may practise in both provinces; and he grants dispensations to clerks to hold more than one benefice, subject to certain restrictions Which have been imposed by recent statutes. The arch- bishop also continues to grant degrees in tho faculties of

theology and law, which are known as Lambeth Degrees. His pewer to grant degrees in medicine, qualifying the reci- pients to practise, has been practically restrained by 21 and 22 Vict. c. 90. The province of Canterbury consists of twenty-one dioceses—St Asaph, Bangor, Bath and Wells, Canterbury, Chichester, St David's, Ely, Exeter, Gloucester and Bristol, Hereford, Lichfield, Lincoln, Llandaff, London, Norwich, Oxford, Peterborough, Rochester, Salisbury, Winchester, and Worcester. The bishops of the above-mentioned dioceses constitute the Upper House of Convocation of the prelates and clergy of the province of Canterbury. The archbishop is president ex officio of this Convocation, which is summoned by him pursuant to a royal writ whenever the Parliament is called together (see Convocation), and it is prorogued and dis- solved whenever the Parliament is prorogued or dissolved.

The archbishop of Canterbury exercises the twofold jurisdiction of a metropolitan and of a diocesan bishop. As metropolitan he is the guardian of the spiritualities of every vacant see within the province, and he presents to all benefices which fall vacant during the vacancy of the see, and through his special commissary exercises the ordinary jurisdiction of a bishop within the vacant diocese. He exercises also an appellate jurisdiction over each bishop, which in cases of licensed curates he exercises personally under | and 2 Vict. c. 106; but his ordinary appellate juris- diction is exercised by the judge of the provincial court of appeal, which from the circumstance of its having been held in former days in the church of St Mary of the Arches (Bow Church), which was a peculiar of the archbishop, has come to be called the Arches Court of Canterbury. The judge of this court, who is appointed by the archbishop, is properly styled the Official Principal of the Arches Court, but he is commonly called the Dean of the Arches, from a peculiar jurisdiction, now abolished, which he formerly exercised in the name of the archbishop over fifteen churches in the diocese of London. The archbishop had formerly exclusive jurisdiction in all causes of wills and intestacics, where parties died having personal property in more than one diocese of the province of Canterbury, and he had concurrent jurisdiction in other cases. This jurisdiction, which he exercised through the judge of the Prerogative Court, has been transferred to the Crown by 20 and 21 Vict. c. 77. The Arches Court was also the court of appeal from the consistory courts of the bishops of the province in all

testamentary and matrimonial causes. The matri- monial jurisdiction has been transferred to the Crown by 20 and 21 Vict. c. 78. The Court of Audience, in which the archbishop presided personally, attended by his vicar- general, and sometimes by episcopal assessors, has fallen into desuetude. The vicar-general, however, exercises jurisdiction in matters of ordinary marriage licences and of institutions to benefices. The Master of the Faculties regulates the appointment of notaries public, and all dis- pensations which fall under 25 H. VIII. ec. 21.

The first archbishop of Canterbury was Augustine the monk, whose preaching converted King Ethelbert. Augus- tine was consecrated a bishop for England in 597 a.v., and received the palliwm, which is the distinguishing mark of the metropolitan's office, from Gregory the Great in tho following year. He was subsequently constituted legatus natus of the apostolic see, and his successors enjoyed various jura regalia by grant from the Crown. They had also precedence over all subjects of the Crown not of royal blood, and the archbishop still retains such precedence over every Peer of Parliament. It is also his privilege to crown the kings and queens of England. He is entitled to con- secrate all the bishops within his province, and was formerly entitled, upon consecrating a bishop, to select a benefice within his diocese as his option for one of his chaplains,

but this practice has been indirectly abolished by 3 and 4 Vict. c. 111, § 42. He is entitled to nominate eight chaplains, who had formerly certain statutory privileges, which are now abolished. He is ea officio an ecclesiastical commissioner for England, and has by statute the right of nominating one of the salaried ecclesiastical commis- sionets.

The archbishop exercises the ordinary jurisdiction of a bishop over his diocese through his Consistory Court at Canterbury, the judge of which court is styled the Com- missary-General of the city and diocese of Canterbury. The archbishop holds a visitation of his diocese personally every three years, and he is the only diocesan who has kept up the triennial visitation of the dean and chapter of his cathedral.

The province of York consists of six dioceses in England, Carlisle, Chester, Durham, Manchester, Ripon, and York, to which may be added the diocese of Man, which was annexed under that title by 33 Henry VIII. c. 31, to the province of York. The latter diocese has been entitled in recent Acts of Parliament the diocese of Sodor and Man, and it is now generally so designated. The bishops of the above seven dioceses constitute the Upper House of Con- vocation of the prelates and clergy of the province of York, of which the archbishop is ex officio president, and which is convened, prorogued, and dissolved under the same con- ditions as the Convocation of the province of Canterbury.

The archbishop of York has immediate spiritual juris- diction as metropolitan in the case of all vacant sees within the province of York, analogous to that which is exercised by the archbishop of Canterbury within the province of Canterbury. He has also an appellate jurisdiction of an analogous character, which he exercises through his pro- vincial court, whilst his diocesan jurisdiction is exercised through his consistorial court, the judges of both courts being nominated by the archbishop. His grace's ancient testamentary and matrimonial jurisdiction has been trans- ferred to the Crown by the same statutes which have divested the see of Canterbury of its jurisdiction in similar matters.

The first archbishop of York was Paulinus, to whom Pope Honorius I. sent the palliwm in 634 A.D. in fulfil- ment of the intention of Pope Gregory the Great. The suc- cessors of Paulinus exercised metropolitan jurisdiction over the bishops of Scotland until the latter part of the 15th century, when Pope Sixtus IV. raised the bishopric of St Andrews into an archbishopric, and constituted the archbishop of St Andrews primate of all Scotland, and legatus natus of the apostolic see in Scotland. The arch- bishop of York takes precedence over all subjects of the Crown not of royal blood, next to the lord high chancellor of England, who is preceded by the archbishop of Canter- bury. He is ex officio an ecclesiastical commissioner for England.

The first archbishop of St Andrews was Patrick Graham, who successfully disputed the superiority of the see of York, and was constituted metropolitan over all the diocesan bishops of Scotland in 1474 a.D. His successors continued to exercise metropolitan jurisdiction throughout Scotland until

1491 a.p., when Pope Innocent VIII. sent the palliwm to the bishop of Glasgow, and constituted him metropolitan over the dioceses of Argyle, Dunblane, Dunkeld, Galloway, and Glasgow, whilst the archbishop of St Andrews continued to exercise metropolitan jurisdiction over the dioceses of Aberdeen, Brechin, Caithness, Edinburgh, Moray, Orkney, Ross, and St Andrews, until the Episcopal form of church government ceased to have any legal authority in Scotland.

1 The Court of Peculiars is no longer held, inasmuch as the pecu- liars have been placed by Acts of Parliament under the ordinary juris- diction of the bishops of the respective dioceses in which they are situated.

their respective provinces.

ARC—ARC

The Church of Ireland was united, by the fifth article of the Act for the Union of Ireland with Great Britain, into one Protestant Episcopal church with the Church of England, and it had at that time four archbishops, who took their titles from Armagh, Dublin, Cashel, and Tuam. The archbishop of Armagh was primate of all Ireland and metropolitan of the province of Armagh, and the other archbishops were primates of Ireland and metropolitans of By 3and 4 Will. IV. c. 37, and 4 and 5 Will. IV. c. 90, the metropolitans of Cashel and

of Tuam were reduced to the status of diocesan bishops, and,

with the then existing eighteen bishops, were reduced in

number to ten bishops by the consolidation of their dioceses, s0 that each of the two archbishops had five diocesans sub- ject to his metropolitan jurisdiction. By 32 and 33 Vict. c. 42, the union between the Churches of England and of Treland was dissolved, and the Church of Ireland has ceased to be established by law.

(1.x) 4 ARCHDEACON. The office of archdeacon is of ancient

institution in the Christian church, as archdeacons are mentioned in the 4th century after Christ. originally given to the chief deacon in each diocese, who had the charge of the temporal affairs of the church, and the supervision of all matters which appertained to the order and decency of divine service. archdeacons encroached upon the episcopal jurisdiction, but their. encroachments were restrained in England by the Council of London, 1237 A.D, and in other countries by ecclesiastical councils held in the 13th and 14th centuries.

The title was

In the course of time the

There was originally one archdeacon in every English

diocese, but there are at present by statute 6 and 7 Will. IV. c. 97, at least two archdeaconries in each diocese, and in some dioceses there are four archdeacons. deacons are appointed by their respective bishops, and they are by 3 and 4 Vict. ¢. 27,§ 27, required to have been six full years in priest's orders. deacon are in the present day ancillary in a general way to those of the bishop of the diocese. sometimes styled " Oculus Episcopi," and it is his especial duty to inspect the churches within his archdeaconry, and

The arch-

The functions of the arch- The archdeacon is to hold annual visitations of the clergy and churchwardens

of each parish, for the purpose of ascertaining that the clergy are in residence, of admitting thenewly-elected church-

wardens into office, and of receiving the presentments of

the outgoing churchwardens. It is his privilege to present all candidates for ordination to the bishop of the diocese. It is his duty also to induct the clergy of his archdeaconry into the temporalities of their benefices after they have been instituted into the spiritualities by the bishop or his vicar-

general. Every archdeacon is entitled to appoint an official to preside over his archidiaconal court, from which there is an appeal to the Consistory Court of the bishop. The archdeacons are ex officio members of the Convocations of their respective provinces. See CoNVOCATION.

It is the privilege of the archdeacon of Canterbury to induct the archbishop and all the bishops of the province of Canterbury into their respective bishoprics, and this he does in the case of a bishop under a mandate from the archbishop of Canterbury, directing him to induct the bishop into the real, actual, and corporal possession of the bishopric, and to install and-to enthrone him; and in the case of the archbishop, under an analogous mandate from the dean and chapter of Canterbury, as being guardians of the spiritualities during the vacancy of the archi-episcopal see. (cme)

ARCHDUKE, a title borne during the Middle Ages by the dukes of Austria, Lorraine, and Brabant. All three archduchies having devolved to the imperial family of Austria, the sons of that house are styled archdukes, and the daughters archduchesses,

ARCGC—ARCG 371

ARCHELAUS, a Greek philosopher, was a native most probably of Athens, though some say he was born at Miletus. Nothing is known of his life, but as he was a pupil of Anaxagoras, he must have lived about 450 B.c. By several writers he is said to have been the teacher of Socrates, but this report has no support from Plato, Aristotle, or Xenophon, and probably has no foundation save the wish to connect Socrates closely with preceding philosophy. So far as the opinions of Archelaus are known, he seems to have followed with some deviations his master, Anaxagoras. With him he admitted a primi- tive matter, consisting of infinite particles similar in nature to the bodies formed from them. He further admitted a ruling mind; but he attempted to overcome the dualism of Anaxagoras, and in so doing, more nearly approached the older Ionic physical philosophers. He thought that matter was mingled with mind, and identified the primitive matter with air. His first principle was thus air endowed with mind. Out of this air, by the processes of thickening and thinning, arose cold and warm, or water and fire, the one passive, the other active. From the action of fire on water are formed the atmosphere and the mud, out of which the earth and the

heavenly bodies are devcloped. Living, organised beings, at first of a low type, spring out of this mud, and gradually the races of animals are formed. Man is superior to other beings by his moral and artistic powers. To Archelaus are attributed some ethical doctrines, such as, that right and wrong are not by nature but by custom. This is a well-known proposition of his contemporaries, the Sophists, and in all probability it is attributed to Archelaus erroneously, Ethical teaching was no doubt ascribed to him merely to explain the completely ethical character of the philosophy of his supposed pupil Socrates. No frag- ments of Archelaus remain ; his doctrines have to be ex- tracted from Diogenes Laértius, Simplicius, Plutarch, and Hippolytus.

ARCHELAUS, natural son of Perdiccas, king of Macedonia, seized the throne in 413 B.c., after having murdered his uncle, his cousin, and his half brother, the legitimate heir. His reign was remarkable for the many improvemcnts he introduced. He fortified cities, constructed roads, and thoroughly organised the army. He endeavoured to spread among his people the refinements of Greek civilisa- tion, and invited to his court many celebrated men of the time—as Zeuxis, Timotheus, Euripides, and Agathon. In 399 B.c. he was killed by one of his courtiers, Craterus ; according to some, designedly, according to others, acci- dentally while engaged in hunting.

ARCHELAUS, a general of Mithridates, commanded his army in the war against the Romans. He was sent into Greece with an army of 120,000, and after three days' fighting with Bruttius Sura, occupied the Pireus. Here he was attacked by Sulla, and after a hard struggle was compelled to withdraw into Beeotia. Sulla followed, and at Cheronea, 86 B.c., completely routed him. A fresh army was sent by Mithridates, but at Orchomenos, after a two days' battle, Archelaus was again defeated. Peace was soon afterwards concluded, but as Archelaus found that he had incurred the displeasure of Mithridates, he fled over to the Romans, by whom he was well received. He is not heard of again in history, but several of his descendants of the same name held high posts under Pompey, Antony, and Augustus.

ARCHELAUS, son of Herod the Great, had the king- dom of Judza left him by the last will of his father, though @ previous will had bequeathed it to

his brother Antipas. He was proclaimed king by the army, but declined to assume the title until he had submitted his claims to Augustus at Rome. Before setting out, he quelled with the utmost cruelty a sedition of the Pharisecs, slaying nearly 3000 of

them. At Rome he was opposed by Antipas and by many of the Jews, who feared his cruelty, but Augustus allotted to him the greater part of the kingdom with the title of Ethnarch. He married Glaphyra, the widow of his brother Alexander. This violation of the Mosaic law and his con- tinued cruelty roused the Jews, who complained to Augus- tus. Archelaus was deposed (7 a.D.) and banished to Vienne. The date of his death is unknown.

ARCHELAUS, son of Apollonius, a sculptor of Priene, is celebrated by his bas-relief representing the apotheosis of Homer. From the style of the work, and from its having been found in the palace of the Emperor Claudius at Boville, it may be concluded that it belongs to the Ist century of the Christian era. For some time the bas-relief was in the possession of the Colonna family, but in 1819 it was pur- chased for £1000, and placed in the British Museum.

ARCHENA, a town of Spain, in the province of Murcia, of interest on account of its hot mineral springs and old Roman baths. Itis fairly built, and contains a palace of the Corbora family. Population about 2000.

ARCHERY, the art or exercise of shooting with a bow and arrow. The origin of the bow as an instrument of war is lost in obscurity. With all the ancient peoples, both civilised and barbaric, the bow was a favourite weapon, and skill in the use of it was regarded by the Scythians as a princely accomplishment. The Greeks and Romans employed archers to draw the enemy into action, and the exploits of the ancient Egyptians rivalled those of the archers of the Middle Ages.

There is no record of the use of the bow in France until the reign of Charlemagne, in the beginning of the 8th century, although we have evidence that in England both

_the Anglo-Saxons and the Danes employed it in the chase,

as well as in battle against the primitive inhabitants of England, many years before the Conquest. The probability is that it was first introduced as a military weapon into Britain by the Romans ; but it was under the Norman rule that the practice of archery in this island was not only greatly improved, but generally diffused throughout the country, so that England soon became famous for its archery, and her archers took precedence of those of every other nation. To preserve this superiority by constant practice appears to have been the study of many of our monarchs ; and numerous statutes for enforcing and regulating the use of the bow among the people were enacted from early times until after the invention of firearms. Many laws were also made for securing the presence in distant and obscure parts of the country of persons skilled in the manufacture of bows and all the apparatus appertaining to archery, for guarding against fraud by those artificers, and also for the procuring of a constant supply of bow-staves from abroad. These laws appear to have been absolutely necessary, for in the olden time the English chiefly depended for their success in battle upon the bravery and expertness of their archers, whose appearance in the field generally led to success, William the Conqueror is reputed to have been so admirable an archer that few could bend the bow he used, and his victory at Hastings was certainly due to the skill and intrepidity of his archers. Richard I. performed great exploits with his archers in the Holy Land, where, according to Gibbon, 300 archers and 17 knights, headed by the king, sustained the charge of the whole Turkish and Saracen army. It was in his reign that the renowned Robin Hood flourished in Sherwood Forest. Edward II. levied a com- pany of "Northumbrian archers " in the year 1314, for the invasion of Scotland.

The battles of Cressy and Poitiers were gained by the English archers in the ycars 1346 and 1356 respectively. Edward III. was extremely jealous of the honour of the bow, and anxious that its glory should be maintained. In

the early part of his reign it was ordered that most of the sheriffs of England should each provide 500 white bows and 500 bundles of arrows for the then pending war with France. In the following year this order was reissued, with the difference that the sheriff of Gloucester should furnish 500 painted

bows in addition. This king embodied a company of soldiers, whom he called the "Archers of the Guard." Edward III. also, in 1363, commanded the general practice of archery on Sundays and holidays by the people in lieu of the ordinary rural pastimes, which were forbidden on pain of imprisonment. In this reign the price of bows was regulated by Government ; a white bow was 1s., a painted bow Is. 6d.,a sheaf (24) of sharp arrows ls. 2d.,and a sheaf of blunt arrows 1s. Richard Mesaner3o2, directed that none of his servants should ever be unfurnished with bows and arrows, and that they should avail themselves of every opportunity of practising archery. At the same date an Act of Parliament compelled all persons employed as servants to shoot with bows and arrows on Sundays and other holidays. In the year 1402 the English archers won the battle of Homildon; and in 1403, at the battle of Shrewsbury, where Hotspur was slain, the most terrible havoc was created by the archers ou both sides. In the reign of Richard IIL, it was enacted that for every ton of Malmsey or Tyne wine brought into England, ten good bow-staves should also be imported, under penalty of 13s. 4d. for every deficient stave ; and to encourage the im- port of bow-staves, those above 64 feet long were freed from duty.

For the manufacture of bows yew was generally preferred to all other woods, but to prevent a too rapid consumption of yew, bowyers were ordered to make four wych-hazel, ash, or elm bows, to one of yew; and no person under 17 years of age, except those possessed of portable property worth 40 marks, or the sons of parents owning an estate of £10 per annum, was allowed to shoot with a yew bow, under penalty of 6s. 8d. for each offence. That distant counties might be properly supplied with bows and arrows, the king claimed and exercised the prerogative of sending, if necessary, all arrow-head, bow-string, and bow makers, not being freemen of the city of London, to any part of the realm that required the scrvices of such artificers ; and neglect of an order to visit a place after the receipt of instructions to repair thereto, was punishable by a fine of 40s. for every day the workman remained away.

- *In the reign of Henry IV. it was enacted that all arrow- head¢ should be well brased and hardened at the points with steel, and stamped with the name of the maker, under penalty of fine and imprisonment, and forfeiture of the arrows, &c., in default ; and by another statute passed*

in the same reign, it was enacted that persons from places whence bow-staves were derived, should import four bow- staves for every ton of merchandise taken on board, under penalty of 6s. 8d. for every bow-stave deficient. In this reign the highest price permitted for a yew bow was 3s. 4d. In the reign of Edward IV. it was enacted that every Englishman, and every Jrishinan living with an Englishman, should have an English bow of his own height ; and also that in every township shooting butts should be set up, at which the inhabitants were commanded to practise on holi- days, under the penalty of one halfpeuny for each neglect, In the same reign the king, in preparing for a war with France, directed all sheriffs to procure a supply of bows and arrows for the service of the state. In 1405, it was made penal to use bad materials in the manufacture of bows and arrows. In 1417 the archers of the army of Henry V. won the battle of Agincourt. This king directed the sheriffs of counties to take six wing-feathers from every goose for the feathering of arrows. In 1478 archery was encouraged in Ireland by statute. In the year 1424 James

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I. of Scotland, who was himself an excellent bowman, revived the practice of archery among his subjects. Richard III. lent 1000 archers to the duke of Bretagne. The same troops afterwards fought at the battle of Bosworth. In 1485 Henry VII. instituted the yeomen of the guard, who were then all archers, and in the 19th year of his reign the use of the cross-bow was forbidden by Act of Parliament, because the long bow had been of so much greater benefit to the nation. In this reign archery occupied an important position in. the fashionable pastimes of the kingdom, and upon the occasion of the marriage of Henry with the Princess Elizabeth it formed a great feature among the nuptial festivities, the king himself joining in the shooting with heartiness and glee.

Several Acts were passed in the reign of Henry VIII. for the encouragement and promotion of archery; one ordered that butts should be erected and kept in repair in all townships, and that the inhabitants should practise shooting at them on holidays, 'The same Act directed that every able-bodied man, not being an ecclesiastic or a judge, should practise shooting with the long

bow ; and the guar- dians and employers of youth were ordered to bring up the boys in their charge to the practice of archery, neglect being punishable by fine. In this reign the practice of archery was strongly advocated from the pulpit by Bishop Latimer ; and so jealous were the English of rival nations competing with them, that aliens were forbidden to use the long bow. The English victory at the battle of Flodden Field was due to the skill and courage of the archers. Edward VI. devoted much of his time to the practice of archery as an amusement, and his Journal, in which are many allusions to his successes and disappointments at matches, is still preserved in the British Museum.

Archery continued to be an object of attention and solicitude with the Legislature during the reign of Elizabeth,

-and the price of bows was again regulated by statute ; also,

bowyers were commanded to keep in hand always a suffi- cient stock of bows. Charles I. issued commissions to prevent the enclosure of fields near London, so "as to interrupt the necessary and profitable exercise of shooting with bows and arrows," and also for the restoration of all shooting-marks that had been already removed. And the earl of Essex, at the beginning of the civil war, raised a company of archers for the defence of the king. In the time of Charles IJ. archery was a highly fashionable and popular recreation with all classes of society, and the "' Merrie Monarch" used frequently to take part with the ladies and gentlemen of his court in toxophilite meetings. Queen Catherine also showed deep interest in the fascinating pastime, and in the year 1676 she presented a silver badge to the 'Marshal of the Fraternity of Archers." Both the king and queen frequently reviewed the numerous associa- tions of archers then existent. In the spring of 1682 a grand féte was given by the London Artillery Company at the Artillery Grounds, at which there were present upwards of 1000 archers, and it is said that the gala outshone anything of its kind that had previously been seen in England; but from that time until the beginning of the present century, the attractions of archcry appear to have been overlooked, and its practice neglected. In the Lnglish Bowman, a small book published in the year 1801, we find the following reason given as the cause of its revival in London :—

‘“‘ About the year 1776, Mr Waring, who then lived with Sir Ashton Lever at Leicester House, and who may justly be styled the father of modern archery, having, by continual business, contracted an pie upon his chest (arising principally from sitting too closely at his desk and pressing his breast too much against it, and which the most eminent in the faculty had in vain endeavoured to remove), resolved to try the effects of the bow in affording relief. He accordingly made it a regular exercise, and in a short time

derived great benefit from the use of it, and ascribed his cure, which was perfect, to the practice of archery. Sir Ashton Lever, perceiving the good effects which so engaging an amusement had upon the constitution, followed Mr Waring’s example, and took up the bow; he was soon joined by several of his friends who, in the year 1781, formed themselves into a society, under the title of the Toxophilites, and met regularly at Leicester House, having butts erected in the gardens belonging to it.

That society was the parent of the numerous societies of archers known about that period (7.e., 1790). “‘ The enthu- siasm,” says Hansard, in his Book of Archery, “can only be compared with that which animated the admirers of Shakspeare and the drama generally during the Garrick era.”

There is now no means of ascertaining precisely the period at which the bow was relinquished entirely in these king- doms as a weapon of war. Grose informs us that it was commonly used by the English soldiery for more than two centuries after the introduction of fire-arms, and indeed, long subsequently to the adoption of guns, the bow remained the favourite weapon of the army,—a fact which is not surprising when we learn, on the authority of Neade, a celcbrated archer of Charles I., that the ordinary range of the bow was from 16 to 20 score yards, and that so rapid was the shooting of the archers, or so slow the firing of the musketeers, that an archer could shoot six arrows in the time occupied in charging and discharging one musket.

But although the bow has long been disused as a military weapon, it has ever been cherished in Great Britain, and particularly among the upper

classes of society, as an instrument of delightful and healthful recreation ; and it would be impossible to overrate the physical and moral advantages accruing from the regular practice of archery —one of the few "out-door' amusements that are as suit- able for delicate ladies as for strong men. "There is," remarks Mr H. A. Ford, " no excercise more healthy or more rational, or which returns more true and genuine gratifica- tion to the man who practises it." As an exercise for ladies it brings all the muscles generally into healthy action, and is, in Mr Ford's opinion, admirably suited to meet the requirements of the fair sex,—" general and equal, without being violent—calling the faculties, both of mind and body, into gentle and healthy play, yet oppressing none—withal most elegant and graceful."

Another era in the annals of the art may be dated from the year 1844, when a national meeting of the archers of Great Britain and Ireland was held at York, since which time archery has assumed much importance as a national pastime, and year after year the wider competition which such assemblages have secured has brought forward bowmen and bowwomen, who, by their persistent efforts in carrying off honours, and that by the most remarkable achievements, have carried the art as nearly as possible to perfection. Under the auspices of the "Grand National Society" archery has been conducted through all the stages of actual revival and establishment as a favourite British pastime. Rapid progress has, in every respect, marked its modern career. It was only in the year 1845 that ladies began to compete publicly with men for the prizes offered at "The National," but at some of the matches, which have, without interruption, annually taken place since then, as many as 130 archeresses have participated in match-shooting, whilst at least an equal number of gentlemen have competed with them on some occasions, with a guaranteed prize list of about £400. These anniversaries have been held four times at Leamington and at Cheltenham; thrice at York and at Derby; twice at Shrewsbury, at Exeter, and at Bath; once at Edinburgh, Liverpool, Worcester, Oxford, the Alexandra Park (London), Clifton, Nor- Wich, Birmingham, Hereford, Brighton, and Winchester. After the establishment of the Grand National meeting it

was found necessary to fix an order of shooting ; hence the origin of 'The York round," on which all public competi- tions by archers are now

conducted, and which, for gentle- men, consists of 6 dozen arrows at 100 yards, 4 dozen at 80 yards, and 2 dozen at 60 yards; and for ladies, 4 dozen arrows at 60 yards, and 2 dozen at 50 yards, By this arrangement archers living in various ports of the three kingdoms can ascertain their relative proficiency. It is upon two days' shooting, or the result of a 'double round," that the Grand National prizes are awarded on " value" alone, as the best criterion of good and central shooting. The principal of these prizes are the champion's gold medal for gentlemen, and the challenge silver bracer and brooch for ladies. These much coveted honours are awarded by a majority of points only; and the points for the cham- pion's medal are reckoned as follows :—Two for the gross score, two for the gross hits, one for best score at 100 yards, and one for the best hits at ditto, and the same at 80 and 60 yards—making ten pointsinall. The ladies' challenge bracer (presented by the West Norfolk Bowmen) is awarded on the same principle, namely, for the greatest number of points—eight in all. The highest score ever made by a champion was 1251, with 245 hits, at Cheltenham in 1857, by Mr Horace A. Ford, the author of The Theory and Practice of Archery, who won the medal of Great Britain as many as eleven times, aud is, without doubt, the finest shot England has seen since the days to which legends and distance lend a somewhat doubtful glory, his scores being absolutely without parallel. He has now retired from public life as an archer. The nearest approach to any of his victories has been made by Major Hawkins Fisher, who carried off the medal in 1871 with 955, and has been champion in the years 1871—72-73-74. Mr Peter Muir, the greatest archer, probably, that Scotland has produced, at any rate in modern days, was the champion in 1863, scor- ing 845. Mrs Horniblow became the possessor of the lady champion's bracer no less than ten times, and the highest score she ever made in obtaining it was 764, at Leamington, in the year 1873. To this lady is due the honour of having ignally demonstratcd that the bow really was a weapon adapted to woman's use, and capable of evidencing, in their hands, not the perfection of grace only, but that of skill and talent also. To the Grand National Society, in the first instance, is this great increase of skill mainly owing, but beyond this, increased skill has led to increased taste and liking for the amusement, till, in an ever widening' circle, nearly every county of England has become included within it. This has led to the establishment of other great meetings, till, at the time the present article is written, besides numberless meetings of private clubs, there are several

public matches open to all, where formerly there were none. Thus we have the Grand National itself, the Leamington and Crystal Palace meetings, the Grand Wes- tern (where two handsome challenge prizes reward the shooting both of the champion and championess of the west of England), and a Scotch national meeting, where a cham- pion gold medal, presented by Mr T. Macfarlane of New Zealand, and exclusively confined to Scotland, is annually shot for, being awarded to the successful bowman, accord- ing to the rules for the champion medal of Great Britain. There are several societies of archers in the three king- doms, but the most noted of the kind now existing are the following :—.

Tue Royvat Company or ARCHERS.

The king's hody guard for Scotland was first constituted in its present form in the year 1676, by an Act of the privy council of Scotland. An earlier origin has been claimed for the company, it being said by some that it was

originally formed by the commissioners for enforcing the exercise of archery appointed by James I. of Scotland, who picked out the most expert bowmen in the various countics, and constituted them into a body of guards to defend the king's person, in which distinguished station they displayed great devotion and bravery at the battle of Flodden, the body of the king being afterwards found surrounded by those of his attached archers' guard. This, however, is mere tradition, uo authentic record of their existence being found until the above-mentioned year 1676, when the minutes of the Royal Company begin by stating, that owing to "the noble and usefull recreation of archery being for many years much neglected, several noblemen and gentlemen did associate themselves in a company for encouragement thereof. ... – and did apply to the privy council for their approbation, and after several meetings, did adjust and concert several articles and regulations of the said company, and did further apply to the privy council for their approbation, which was granted." The minutes of the company have been kept with great regularity from that time down to the present, with the exception of a period of about twenty years at the end of the 17th century, during which time there are no records. It is not supposed that the company was extinct at that time from what can be gathered from the

succeed- ing minutes. It is probable, however, that during the Revolution the Royal Company was principally composed of upholders of the house of Stuart, and that on this account their existence was for a time suspended. This may be true, as we find that the company was subsequently a strong Jacobite body ; but whether it is the case or not, it is certain that the records recommence in 1703 by informing us of the election of a captain-general to succeed John, second earl of Argyle, who held that office from the formation of the company in 1676, aud who had just died. The new captain-general was Sir George Mackenzie, Viscount Tarbat, afterwards created earl of Cromarty. Owing to his exertions while principal secretary of state for Scotland in 1703, he procured for the company a new charter from Queen Anne, renewing all their former rights and privileges, and conferring others, all which were to be held of the Crown for the reddendo of a pair of barbed arrows. This reddendo was paid to George IV. at Holy-rood, when he visited Scotland in 1822, and to the present sovereign, Qucen Victoria, on a similar occasion in 1842.

The history of the Royal Company since 1703 has been one of great prosperity. Large parades were frequently held, and were attended by numbers of archers dressed in the uniform of the body, which, in the last century, consisted of a green tartan coat and white knee-breeches. On such occasions the whole population of Edinburgh and the surrounding districts turned out to view the procession, as the company, with music and colours, marched down the Canongate to Leith Links, there to shoot for a prize. Many distinguished men marched in their ranks, and, both at their competitions and at the mess table, the utmost hilarity and good fellowship prevailed. Several of the leading insurgents in 1745 were members, but the com- pany was not at that time suspended in any way, and a few years later no subjects more loyal or more attached to the constitution could be found in Great Britain.

In 1777 the Royal Company erected a large and handsome hall in the vicinity of their shooting-ground in the Meadows, Edinburgh. They meet there periodically for the transac- tion of business and to dine. The hall is decorated with several very fine portraits of eminent members of the body, in various uniforms, according to the rank which they held in the company

and the time in which they lived. Among them are some masterpieces of Raeburn, Watson, Gordon, Grant, P R.A., Macnee, &c.

‘for the day, is next the sovereign’s own person.

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In 1822, when king George IV. visited Scotland, it was thought appropriate that the Royal Company should act as his Majesty’s body guard during his stay. Consist- ing as the company did, and still does, of representatives of almost all the noble families of Scotland, together with a large proportion of landed gentry, professional men, and others, it was considered that no fitter body could be chosen, especially as there was a tradition, as we have seen, that the Royal Company had at a former period acted in a similar capacity. On the landing of the king he was reccived by a detachment of the body, who surrounded his carriage inside the cavalry escort and marched up with it to Holyrood. They occupied the same position in subse- quent state processions ; while at the levee and drawing- room held by his Majesty they lined the staircase and presence chamber, performing the duties usually assigned to the band of gentlemen-at-arms. When Queen Victoria visited the Scottish capital in 1842, the Royal Company again did duty, and the last time they were called out in their capacity of royal body guard was in 1860, on the occasion of the great volunteer review in the Queen’s Park, Edinburgh.

King George IV., besides authorising the company to take, in addition to their former name, that of “The King’s Body Guard for Scotland,” presented to the captain-general a gold stick, thus constituting the company part of the royal household. In virtue of this stick the captain-general of the Royal Company takes his place at a coronation or similar. pageant immediately behind the gold stick of England, who, with the exception of the officers on guard The lieutenants-general of the company have silver sticks ; and the council, which is the executive body of the company, possess seven ebony ones. George IV., in addition to the grant of a gold stick, appointed a full dress uniform to be worn by members of the company at court, when not on duty as guards, in which latter case the ordinary field dress is used. The court dress was scarlet and gold, but was changed in 1831 to a green coat with green velvet facings richly embroidered with gold

thistles and arrows, gold epaulettes, crimson silk sash, gold-laced trousers, and cocked hat with green plume. The officers wear a gold sash in place of a crimson one, and an aiguillette on the left shoulder. All ranks wear swords. The shooting uniform has been frequently changed. We are not told what colour the coat was at the formation of the company, but there was a distinctive dress introduced about that time. In 1715 a green tartan was adopted (now the 42d tartan), which continued, with several modifications and alterations, to be the uniform down to 1829, when it was changed to green cloth. The present field dress consists of a dark green tunic with black braid facings, with a narrow stripe of crimson velvet in the centre ; shoulder wings and gaunt- leted cuffs similarly trimmed; dark green trousers with black and crimson stripe ; a bow-case worn as a sash, of the same colour as the coat, with a centre ornament of two arrows crossed saltierwise in a garter tie, surmounted by a crown; a black leather waist-belt, with richly chased gold clasp ; a short sword, gilt hilted, made after the fashion of a Roman gladius ; Balmoral bonnet, with thistle orna- ment and eagle's feather. The mess uniform consists of a dark green dress coat with velvet collar and gilt but- tons, with a crown on them, white waistcoat, and black trousers.

The Royal Company possess two sets of colours. The first banner was got in 1714, and bears a representation of the common seal of the company, viz., a yew tree proper, supported dexter and sinister by an archer with a bow 10 one hand and an arrow inthe other. The second was pro- cured in 1732, and bears on one side a lion rampant gules,

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on a field or, with the motto "pro patria dulce periculum," and on the other a St Andrew, with a large thistle above his head, with the motto, "' Vemo me impune lacessit." King William IV. presented the company with a new stand of colours in 1832. The one banner combines the old ones, and the other has the Royal Scottish arms, with the words " King's Body Guard for Scotland."

The following are the noblemen who have held the office of captain-general since 1676 :—

1676-1703, John, second earl of Atholl.

1703-1714, Sir George Mackenzie, first earl of Cromarty. 1715 1720, David, third earl of Wemyss.

1724-17438, James, fifth duke of Hamilton and Brandon. 1748-1756, James, fourth earl of Wemyss.

1756-1778, Charles, third duke of Queensberry. 1778-1812, Henry, third duke of Buceleuch. 1812-1819, Charles, fourth duke of Buccleuch. 1819-1823, John, fourth earl of Hopetoun.

1824-1830, James, third duke of Montrose.

1830-1838, George, ninth earl of Dalhousie.

1838- The present duke of Buceleuch.

Most of the prizes shot for by the Royal Company are held for a year by the winner, and in some cases he receives a grant of money to enable him to affix a silver or gold medal with his name and crest inscribed thereon to the prize. The only prize which becomes the winner's absolute property is one of £20, presented annually by her Majesty to be expended in the purchase of a piece of plate. This prize was first given by the Scottish privy council at the very beginning of the company. It was not, however, con- tinucd for many years, but was revived by his Majesty George III. in 1788, and has since been shot for regularly. The following is a list of the principal prizes shot for by the company :—

1. Musselburgh Silver Arrow, given by the magistrates of that town, and first shot for so far back as 1608. Now the competition is confined to members of the Royal Company, but at that time it was probably open to all comers. 2. Peebles Silver Arrow, shot for at that town. This arrow bears medals extending back to 1626, but it was not shot for by the Royal Company until 1786. 3. Silver Arrow presented to the company by tle

magistrates of Edinburgh in 1709, and shot for from that time. 4. Selkirk Silver Arrow, first shot for by the company in 1818, but in itself a very ancient ei 5. Silver Punch Bowl and Ladle, subscribed for by mem-

ers in 1720, and having the gold medal of the winner of each year attached. 6. Dalhousie Sword, a richly ornamented Indian aword, presented by captain-general the earl of Dalhousie, in 1833. 7. The Hopetoun Royal Commemoration Prize, a handsome silver vase and gold medal, presented by captain-general the earl of Hopetoun, to commemorate George IV.'s visit to Scotland in 1822. 8. Spens Anniversary Medal, shot for in honour of the memory of Dr Nathaniel Spens, an old and favourite member in the end of last century. 9. Prize given by the town of Biggar. 10. Silver Arrow, presented by the magistrates of Montrose. All these prizes are shot for in the field at a distance of 180 yards. There is, how- ever,—11. St Andrew's Cross, presented in 1801 by Sir George Mackenzie of Coul, Bart.; shot for at 200 yards. There are two prizes shot for at 100 yards, namely, 12. A Gold Medal made out of "pagodas," being part of the money paid by Tippoo Sultan at the treaty of Seringapatam, presented by MajorJames Spens in 1793; and 13. A Silver Bugle Horn, presented in its present shape in 1830, by Sir Henry Jardine, Knt., but shot for for some time previously in a less handsome form. There are three prizes shot for at butts, at a cireular piece of card-board four inches in diameter, ata distance of 100 feet. The most ancient of these is—14. The Goose Medal, or the Goose. The old mode of competing for this was by building a live goose in a turf butt, the head only being exposed to view, and he who hit the head and killed the goose was entitled to have her. Of course, this barbarous practice has been long discontinued, though It remained till after the middle of last century. In place of the goose's head, a small glass globe is put into the centre of the card-

board mark on the butt, and he who breaks the globe with his arrow .

Teceives a gold medal, to be worn for the ensuing year. 15. Papingo or Popinjay Medal, presented in 1831, and originally competed for by shooting at a stuffed bird, a parrot or popinjay, fixed to the top of a high pole. He who brought the bird down was adjudged victor. It having been found inconvenient to shoot for the prize in this manner, it is now competed

for in the ordinary fashion at butts. 16. A Gold Medal, hold for a year by the person making the greatest aggregate score on three appointed days.

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The affairs of the eompany arc managed by a council of seven, who are elected by the whole company annually. Although the eompany has a right, as a body, to elect tlicir own officers and admit new members, yet both those powers have for many years been left in the hands of the couneil. 'The fees of entry to the Royal Com- pany are £25, and the entrant has also to be balloted for by the council. There are several "uniform" dinners held in the course of the year, which are very popular both with members and their friends. Smaller aud less pretentious, though not less pleasant, are the "match" dinners held onee a month by the shooting members, after a friendly match shot at rovers or butts. The average number of members belonging to the Royal Company is between 500 and

600.

The Roya. ToxoPHILITE SociETY is now established at the Archers' Hall, Inner Circle, Regent's Park, London, where it has a handsome building for the use of its mem- bers, and ample shooting ground. It was foundedin 1781 by Sir Ashton Lever, and represents the two ancient bodies, "The Finsbury Archers" and "The Archers' Company of the Honourable Artillery Company," and possesses, among other plate, the large silver shield given to the Archers' Company by Queen Catherine of Braganza (consort of Charles II.), and also silver arrows of the same and of earlier periods. The Royal Toxophilite Society have occu- picd their present ground (about six acres in extent) since 1832, when they obtained posscssion of it from the Woods and Forests, and erected on it their " Archers' Hall." The entire cost of the building, laying out the grounds, furnish- ing, and finishing, amounted to £4548, 9s. 6d. The society has for many years enjoyed special royal patron- age. King George IV., who was fond of archery, shot, when Prince of Wales, with the members in their gardens at Leicester House, and on his becoming patron of the society in 1787, it assumed the title of '" Royal," by which it has ever since been distinguished. King William IV. was also its patron, as was the late Prince Consort. The Prince of Wales is at the

present time the patron of the society, of which the earl of Dudley is the president.

The WoopMEN oF ARDEN hold thcir meetings at Meriden, in Warwickshire. The society was revived, after a long interval, in the year 1785. The number of members is limited to 80; but the standing rules relating to the election of a member were, by general consent, suspended in the case of the late Sir Robert Peel. This occurred at the jubilee festival in 1835. The earl of Aylesford is lord warden of the society, whose shooting grounds, which are in the forest of Arden, consist of about 12 acres of land. A forest hall was erected in 1844. The Woodmen, exer- cising a nominal, as their predecessors did a real authority, over vert and venison, give appropriate designations to their officers. Of these, the lord warden is chief; and they have likewise master foresters and verderers. At the grand target, or annual wardmote, whoever hits the gold first is styled (for the year ensuing) Master Forester ; and whoever gains the second gold becomes the Senior Verderer for the same period. In 1787 the silver bugle horn of Arden was presented to the society by the earl of Aylesford; it is never shot for at a less distance than nine score yards, which may be extended to twelve score. In 1788 the countess of Aylesford presented to the society the " silver arrow, " to be annually shot for at nine score yards, Gold and silver medals are also presented to the master forester and senior verderer ; and there are the Digbean gold medal, optime merenti, the possessor of which ranks as Captain of Numbers, he having gained the greatest number of prizes at the grand target; and the Digbean silver medal, bene merenti, which confers the Lieutenancy of Numbers upon the member who gains the next greatest number of prizes. The winners of these medals, which are shot for at 100 yards, take rank, for the year thereafter, next to the senior verderer.

Implements for the practice of archery are principally made in London and Edinburgh, and are of various degrees of excellence. It cannot be too strongly impressed upon archers that they should select their gear from a maker of undoubted "good report." In the choice of a bow pre- ference should be given to one which is under, rather than over, the strength which

an archer can use without difficulty. The power required to draw an ordinary bow, for a gentle- man, ranges from 40 to 60 Ib (<.e., power to draw the arrow to the point)—46 to 50 ib being the average power used for the "York Round." The "Royal Archers" at Edin- burgh and the " Woodmen of Arden" are the only clubs shooting longer distances than are recognised by "the York." These longer distances are 180, 200, and 220 yards, requir- ing bows of from 56 to 64 ib power. Gentlemen's bows are 5 ft. 10 in. and 6 feet long. Ladies' bows, of course, are lighter, and can be drawn by a power of from 24 to 32 tb, the length being from 5 ft. 3 in. to 5 ft. 6 in. Bows ure made of various kinds of wood, such as lancewood, anakewood, washaba, and yew,—the last being generally preferred for sweetness of material and steadiness of cast, though lance and other woods are found to be more durable, much cheaper, and quite as well adapted for practice. Bows are made of three pieces, two pieces, and one piece, and are called three-woods, two-woods, and self. usually follow the string. ('Two-wood and three-wood bows being made a little reflex, should retain their shape. It is important that all bows should be preserved from damp, especially those constructed of two or three pieces, as, not only does moisture affect the wood and cause it to warp, but it also dissolves the glue by which the parts are united, and renders the implement useless. or correct and pre- cise shooting an archer must possess himself of the best arrows he can procure. These should be of a weight adapted to the power of the particular bow for which they are intended, and must be alike in thickness, shape, and stiffness. The standard length of an arrow used by gentle- men is 28 inches, and its weight is equal, in standard silver coin, to from 4s, to 5s. ; those weighing from 4s. 6d. to 4s. 9d. being used with bows of from 46 ib to 50 tb. The lady's arrow is 25 inches long, and weighs, in silver coin, from 3s. to 3s. 6d. Arrows are manufactured generally of red-pine timber, and the best are footed with a piece of hard wood—usually bullet-tree—glued on one end, upon the point of which the iron pile is fixed, and into the other end is inserted a wedge-shaped piece of horn, called the nock, in which a notch is made for the reception of the bow-string when the archer is shooting. The feathering of arrows depends in some measure upon the taste of the shooter. An arrow has three feathers—now generally taken from a turkey's wing—affixed edgewise at the nock end, about an inch from the end, equi-distant from each other, and parallel to the flight. The wings are much shorter than they were formerly, ranging from 1? to 24 inches in

length, as the shooter may desire. One feather on each arrow is of a different colour from the rest, and is placed perpendicularly to the line of the nock ; it is called the guide-feather (or ‘ cock-feather”), as it enables the archer more readily to place the arrow on the bow-string. By using feathers of the right or left wing for the same set of arrows, the natural curve of the feather is sufficient to impart to the arrow in its passage through the air a rotatory motion equivalent to the flight of a rifle ball. The best shaped arrow is nearly the same thickness from the pile to the under end of the feathers, from which it tapers off slightly to the nock. The full-shouldered, or nearly parallel- shaped pile, is to be preferred.

In addition to his bow and arrows an archer, to be fully

Self bows

ARCHERY

equipped, must have a drawing-glove to protect the fingers of the right hand; an arm-guard made of stout calf, morocco, or other leather, to shield the left arm from the stroke of the string after the discharge of an arrow; a waist-belt in which to carry the arrows when shooting, and to which are attached a green worsted tassel for the removal of dirt, &c., from the points of discharged arrows ; and an ivory grease-pot, containing grease for the drawing fingers of the glove, of which there are various kinds, every archer using that which suits him best. A doeskin glove, with the first three fingers tipped with smooth, firm calf or pig skin, about 14 inch long, upon the fingers, and having a strap to buckle round the wrist, is about the easiest and best for use. The flat tab covering the three fingers allows them perfect freedom; but the ordinary draw-glove, with cylindrical points and straps up the back of the hand and around the wrist is perferred by many archers, whilst others again prefer screw tips, fitting each finger separately, and with a strap on the front. Then there is the quiver, which is generally made of Japanned tin. It is used to preserve the arrows from damp, &c., also for keeping the reserve arrows in, as only three are used when shooting in company; it is never worn except when roving.

Targets consist of straw basses with painted canvas faces sewed on them. ‘The “ National” targets are 4 feet in diameter, and they have on their faces

five circles or divisions, the centre one being gold, and scoring 9; tho red scores 7; blue, 5; black, 3; and the white or outer circle, 1. These targets are placed on stands constructed of three ribs of iron jointed at the top; the two side ribs have spikes on the front edge on which the targets rest ; the centre rib is thrown behind, as a spur to support the triangle. There should always be a pair of targets provided by an archer in practising, in order to save time and trouble; and a young archer has always been advised to practise at a short distance, and to lengthen it as he pro- gresses—commencing at 20 yards, till he is able to hit the smallest mark, which will prove that he has attained com- mand over his bow.

To enable an archer to keep a record of his shooting the following scoring-card will be found useful (the marks may be made with the point of a pin or pencil) :—

Shooters. || Gold. | Red. | Blue. | Black. White. | Hits. Value.

eoeece l[eseee [ee #08

see ee

There is no "royal road" to archery, and more real progress towards proficiency in the bow may be gained in a few hours under the practical guidance of an adept in the art, than can possibly be imparted by all the treatises upon the subject that ever were written; yet, for those who would master the rudiments of tLe science, a few words may be useful upon what have ever been considered the "five points of archery," which Ascham in his cele- brated work describes as "standing, nocking, drawing, holding, and loosing."

- 1. Roberts, in his English Bowman, remarks upon the difficulty of conveying by verbal description so accurate a representation as the pencil can give of an archer drawing his bow. It is a model of gracefulness, the attainment of which is so pointedly recommended by Ascham. Mr Ford in his disquisition, says the "heels

SRCHE BY

should be about six or eight inches apart… .. . The feet must be flat and firm on the ground, both equally inclining outwards from the heels, the position of the feet being such that a straight line drawn from it would intersect both heels… .. The knees must be perfectly straight, not bent in the slightest degree. The weight of the body should be thrown equally on both legs… . . In short, the footing must be firm, yet at the same time easy and springy, and the more natural it is the more likely it is to pos- sess these qualities." The accompanying woodcut will best illustrate the attitude which an archer should assume.

2. To string a bow, take it by the handle in the left hand, with the flat side (or back) towards the wrist ; place the horn of the under end in the ; hollow of the left foot; Fig. 1. then put the palm of the right hand on the back of the upper end of the bow, below the loop of the string, with the thunib on the one side, and the forefinger bent on the other side of the bow, and with the left hand fixed as the fulcrum. Then with the right hand press the string up- wards until it reaches the notch in the horn, and the bow is strung, and should exhibit a space of about 54 inches between the string and the interior of the handle.

"Honora Spencer (Mrs Sharpe), who wrote specially upon archery from a lady's point of view, in alluding to the stringing of the bow, remarks :—' Whilst the right wrist is pressing the bow downwards the other hand should be pulling your bow towards you, each hand with equal pressure, each hand with equal strength. At the same moment that you press and pull, you must use your first two fingers (of course of the right hand) in slipping the string into the groove intended for its reception.' Another mode is recommended, and we are told 'to press the thumb and forefinger closely against the sides of the bow, whilst you pull smartly at the handle.' This, I believe, is the accepted method among gentlemen ; but a lady has not often sufficient , power in herthumb ' and forefinger to bend the bow and string it at thesame moment; _ besides this, the pressing of the bow. with the wrist is far more graceful for a lady. The same remark and advice apply to the unstringing of the bow, only that the string has to be slipped out of thegroove. Ifyou find,aftersome half. dozen attempts that this method of stringing strains neither the right nor left wrist, you may safely conclude that your bow is suited to your strength."

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3. The bow being now ready to receive the arrow, the archer must "nock," or place it on the string at a spot prepared for it (which should be about gths of an inch above the upper end of the handle) with the guide feather furthest from the bow, catching the string with two or three fingers, and the arrow between the first and second.

4. He must then take a firm position with his left shoulder towards the target, turning his head only from his neck, and looking over his left shoulder. He must then raise the bow with his left hand, keeping the upper end inclined one or two degrees from his body, and with his right hand draw the arrow to the level of his chin, and below his ear, to which point the arrow should always be drawn while the left hand and arm should be elevated or depressed, according to the distance to be shot, or the strength of the bow.

5. When the arrow is fully drawn, dwell for 2 moment or two to steady the aim; then " quit" or discharge the arrow, by allowing the string to pass smoothly over the finger points with- out jerking. The position which a lady should as- sume whilst in the act of discharging her arrow is illustrated by the annexed figure, the correctness of which might have been in- creased by the elbow of the left arm, in which there should not be the slightest bend, being held straighter.

Except for line there is no accepted theory of tak- ing aim. Due regard must be paid to the weather. When itis calm, the archer must fix the position of the tar- get in his vision, and experience will soon tell him how to find the line and degrees of elevation. In wind, the line and degrees must be varied to suit the conditions of the atmosphere ; in a cross wind there must be an adaptation to the direction of the wind; whilst in an up and down wind more or less elevation must be taken according to the strength of the current. :

The following is a summary of points well worthy of being remembered by every shooter:—Have the string straight on your bow. Always nock on the same place. Place the arrow over the string, not between it or the bow. Do

not have the arrow too tight on the string. Draw slowly and evenly. Turn your elbow a little upwards. Slant the bow a little to the right. Always draw the arrow the same length. Draw a little below the right side of the chin. Always, while drawing, keep the elbow of your right arm level with the shoulder. Keep the "point of aim" always directly in view. Look along the whole length of the arrow. Be careful to point it perfectly straight. Do not shut the left eye; yet do not aim with it. Make the /eft arm always that by which you change the elevation. Do not hold the bow long fully drawn. Never let the fingers of your right hand follow the string. Do not jerk, but loose smoothly. Be certain that your bow-arm does not move when loosing. on

" Flight " and " clout" shooting has ceased, and " roving " is now practised only in Britain by the two clubs pre- viously mentioned. They use a target 3 feet in diamater, and count arrows four bow lengths from the target ; the nearest arrow counts two. Shooting at butts is still practised, the butts being from 80 to a? feet spare the

-— 4

Fig. 3.

mark is a round picce of pastcboard 4 inches The shooting is nearly point blank.

in diamcter. (3. SH.)

A Glossary, or Explanation of Terms, &c., made use of in Archery. A

AtLow, ALLOWANCE.—An archer ig said to allow, or make allow- ance for the wind, when he shoots somewhat wide of the mark, and on that side of the mark nearest the wind, in order that the wind may bring his arrow into the line of the mark.

Arrow, BEARING.—An arrow which possesses @ steady flight.

Arrow, Bos-TAILED.—An arrow increasing in bulk, in a regular proportion, from the nock to the pile.

AscHuam.—A sort of cupboard, or case, to contain bows, and some- times arrows, and other implements of archery.

B

Back or A Bow.—The extcrior, or flat side.

Bruty oF A Bow.—-The interior, or rounded side of a bow Bow-ARM.—The arm employed in holding the bow.

Bow, SELF.—A bow made of one entire piece of wood. Bow-Suot.—The distance which an arrow flies from the bow. BowyeEr.—A maker of bows.

Burr.—A mound of earth, upon which a mark to shoot at is placed.

C.

Cast, To.—To become warped.

Cast, ThE.—The right of shooting the first, by winning at the last shot, which is called getting the cast.

CurysaAL, or CrysaL.—A kind of pinch or crack in a bow.

CLout.—A small white target, placed near the ground.

CrLout-Sn00Tmnc.—Shooting at clouts.

Cocx-FraTuEr.—That feather on the arrow which is uppermost, and of the darkest colour.

Compass, To Krxup.—To observe a due elevation.

Cur THE Marx, To.—An arrow is said to cut the mark, when it flies straight towards it, but falls under it.

D

DrRawixe trroven tHE Bow.—This signifies drawing so far that

the point of the arrow comes within the belly of the bow. E.

Evzvation.—The act of raising the bow in shooting at the mark.

Ewp.—The place where a mark is fixed.

Evr oF THE STRING.—That part of it which occupies the upper horn of the bow. –

Fasr.—A word used to caution persons from passing between the shooter and the mark, and to Ninett them to stand still.

Fiercuzr.—An arrow-maker.

Fiicut.—The distance or path in which an arrow flies.

FoLow THE Srrinc.—A bow is said to follow the string, when, by its use, it has lost its original straightness, and has obtained a curve or inclination forward.

G.

Goxx.—An arrow is said to be gone, when it may from its flight be judged to fall wide of, or far from, the mark.

GRrarrep Bow.—One made of two picces of wood joined at the handle. :

H.

Hx! He !—This exclamation is said to have been an archer's word of call, handed down from very ancient days.

Hrr.—A stroke in the target or mark. :

Home.—An arrow is said to be drawn home when it is drawn as far as it ought to be.

aia or Tue Bow.—The ends of the bow, which are tipped with

orn. i

IncuEs.—A distance allowed round the butt-mark, within which an arrow must fall to count.

KS

Kerpine A Lenctu.—Shooting the exact distance, although not straight. L.

Lenoru.—The distance to be shot. Limps.—The part of the bow above and below the handle.

M. Mark.—Any object shot at. N

Nocx.—An ancient word still used by archers for notch ; nocks, therefore, are the notches in the horns of bows and arrows.

Nocxina Pornt.—That part of the string on which the arrow is plaecd.

ARC—ARC

Noosr.—The end of the string which oceupics the lower horn.

O. Over-BowED.—An archer is said to be over-bowed when the power

of his bow is above his command. Ovrer-Hanp.—Shooting over-hand is to shoot at the mark over the

bow-hand.

12,

Parr of Annows.—In archery three arrows are termed a pair, on account of the liability of one to break.

PerricoatT, ok Sroon.—The ground of the target beyond the white.

Prte.—The head of an arrow, usually made of steel or iron.

Porrnsay.—A wooden bird, used as a mark, particularly in Scot- land.

Q.

Qurver.—A case in which arrows are kept or deposited, generally made of tin.

R.

Rovinc.—Shooters at rovers, which are casual marks, of uncertain distance. s. SxuLF-Bow.—One made of a single piece of wood, or grafted. Siarr.—An arrow, so called when it wants only the head. SHAFTMENT.—That part of the arrow occupied by the feathers. Snoot, A.—An arrow shot. Sinkinc A Bow.—Reducing its force or stiffness. SNAKE.—An arrow is said to snake when it works itself under the grass. StanDING Bow.—A bow that stands well without sinking. STELE,—An arrow without feather or head. a

Tap.—-A piece of flat leather, used instead of the fingers of the shooting glove. TARGET._A mark to shoot at, consisting of divers coloured circles. TarcET-CARD.—A card coloured in the same manner as the target, containing the names of the shooters, and used for scoring their respective hits. U

Unprr-BowEp.—Using a bow that is too weak to shoot well with.

W

*Wereur or A Bow.—The weight or power which a bow requires to draw it proper*y up.*

Wuurrinc, THE.—The material used to enwrap the nocking point.

Wipr Arrow.—One that falls wide of the mark.

Winp, Down.—When the wind blows directly from the shooter down to the mark.

Winn, S1pz.—When it blows directly across the line of mark.

Wiyp, Up.—When it blows directly from the mark to the shooter.

ARCHES, Court or tue. This court derives its name from its ancient place of judicature, which was in the church of St Mary of the Arches (de Arcubus), the modern repre- sentative of which is now called ordinarily Bow Church. The modern church is on the south side of Cheapside, in the city of London, and stands on the site of a very ancient church, which was burnt down in the great fire of London in 1666, and which had a very fine arched crypt, whence it derived its name. 'The ecclesiastical tribunal, which has passed for a long time by the name of the Arches Court, is the court of appeal of the archbishop of Canterbury, as metropolitan of the province of Canterbury, and the proper designation of the judge is the Official Principal of the Arches Courts, but by custom he has come to be styled the Dean of the Arches, from the circumstance that the office of dean has been in modern times usually united in the same person with that of the official principal of the court of appeal. The office of the dean of the Arches may now be regarded as extinct, or at least as purcly titular, like that of the dean of Bocking in Essex, inasmuch as the peculiar jurisdiction which he exercised as dean (decanus) over thirteen churches, locally situated within the diocese of London, but exempt from the bishop's jurisdiction, has been abolished, and the churches have been placed by statute under the ordinary jurisdiction of the bishop of London. It was, no doubt, owing to the circumstance that. the Arches church was exempt from the bishop of London's jurisdiction that it was selected originally as the place of

judicature for the archbishop's court. After the College of Advocates was incorporated and had established itself in Doctors' Commions, the archbishop's court of appeal, as well a3 his prerogative court, were usually held in the hall of

-the College of Advocates, but since the destruction of the

buildings of the college, the court of appeal has had no settled place of judicature, and the official principal appoints from time to time its sittings, which have been held for the most part in Westminster Hall. The appeals from the decisions of the Court of Arches were formerly made to the king in Chancery, but.they are now by statute addressed to the king in Council, and they are hcard before the Judicial Committee of the Privy Council. By 23 Henry VIII. c. 9, the Arches Court is empowered to hear, in the first instance, such suits as are sent up to it by letters of request from the consistorial courts of the bishops of the province of Canterbury ; and by the statute 3 and 4 Vict. c. 86 (the Church Discipline Act) this jurisdiction is continued to it, and it is further empowered to accept letters of request from the bishops of the province of Canterbury after they have issued commissions of inquiry under that statute, and the commissioners have made thcir report. The official principal of the Arches Court is the only ecclesiastical judge who is empowcrcd to pass a sentence of deprivation against a clerk in holy orders. (cB) ARCHIDONA, a town in the province of Malaga, in Spain, situated on the slope of a hill, about 10 miles W.N.W. of Loja. It seems to have been a flourishing place under the Romans, to judge by the statues, columns, and other remains which are found, but it is now, in the words of O'Shea, a "wretched village with nothing to visit." The inhabitants, about 7600 in number, are employed in fruit-growing, weaving, oil-pressing, and bacon-curing. ARCHIL, or Orcutt (Orseille, Fr.),a purple dye yielded by various species of lichens. The name is supposed to originate from the Portuguese rocha, a rock, in allusion to the source from which the raw material is derived. Archil can be extracted from many species of the genera Roccella, Lecanora, Umbilicaria, Parmelia, and others, but in practice two species of Moccella,—RK. tinctoria and fl. fuciformis, are almost exclusively used. These, under the name of ' Orchclla Weed," are imported from the Portu- guese colony of Angola, on the west coast of Africa, where the most valuable kinds are gathcred; from Cape de Verde Islands ; from Lima, on the west coast of South America ; and from the Malabar coast of India. They grow on maritime rocks and on trees along sea-coasts, and it will be seen that the species are very widely distributed. The colouring properties of the lichens do not exist in them ready formed, but are developed by the treatment they receive at the hands of manufacturers. Small proportions of a colourless, crystalline principle, termed orcine, is found in some, and in alla series of acid substances, which

on treatment split up into orcine and other products. Orcine in presence of oxygen and ammonia takes up nitrogen and becomes changed into orceine, which is essentially the basis of all lichen dyes. Archil is prepared for the dyer's use in the form of a " liquor" and a " paste," and the latter when dried and finely powdered forms the "cudbear" of com- merce, a dyc formerly manufactured in Scotland from a native lichen, Lecanora tartarea. The manufacturing pro- cess consists in washing the weeds, which are then ground up with water to a thick paste. If archil paste is to be made this paste is mixed with a strong ammoniacal solution, and agitated in an iron cylinder heated by steam to about 140° Fahr. till the desired shade is developed—a process which occupies several days. In the preparation of archil liquor the principles which yield the dye are separated from the ligneous tissue of the lichens, agitated with a hot ammoniacal solution, and exposed to the action of air.

When carbonate of potassium or sodium is added, a blue dye known as litmus, much used in chemical testing, is produced. French purple or lime lake is a lichén dye prepared by a modification of the archil process, and is a more brilliant and durable colour than the other. The dyeing of worsted and home-spun cloth with lichen dyes was formerly a very common domestic employment in Scotland ; and to this day, in some of the outer islands, worsted continues to be dycd with "crottle," the name given to the lichens employed. Stale urine is the form of aminoniacal liquor used in these localities, and that in carly days was the recognised source of ammonia in the manufac- ture.

ARCHILOCHUS, one of the first Greek lyric pocts, was born at Paros, one of the Cyclades. The date of his birth is uncertain, but he flourished between 720 and 680 B.c. His father, Tclesicles, was of noble family, and had been selected to consult the Delphic oracle relative to sending out a colony from Paros. His mother, Enipo, was a slave. While still young, Archilochus gained a prize for a hymn to Demeter; he soon after left Paros aud proceeded to Thasos, according to some authorities, as leader of a colony. But his chief reasons for leaving his native place seem to have been personal disappointment and disgust. Lycambes had promised him his daughter Neobule in marriage, and had afterwards withdrawn his consent. Archilochus, taking advantage of the licence allowed at the feasts of Ceres,

poured out his wounded feelings in verses of unmerciful satire. Lycambes he accused of perjury, and his daughtcrs of leading the most abandoned lives. Such was the effect produced by his verses, that Lycambes and his daughters are said to have hanged themselves. 'The satire was written in iambics, a measure introduced for the first time, and from its structure admirably adapted for light sarcastic poetry. At Thasos the poet passed some unhappy years, and incurred the great dishonour of throwing away his shield and fleeing from the field of battle. He does not seem to have felt the disgrace very keenly, for, like Alczeus and Horace, he commemorates the event in his verses. After lcaving Thasos he is said to have visited Sparta, but to have been at once banished. from that city on account of his cowardice. His works, owing to their licentious character, were also prohibited by the Spartans. He next visited Siris, in lower Italy, a city of which he speaks very favourably. He then returned to his native place, and was slain in a battle against tlic Naxians by one Calondas or Corax, who was cursed by the oracle for having slain a servant of the Muses.

The writings of Archilochus consisted of elegies, hymns, —one of which used to be sung by the victors in the Olympic games,—and of pocms in the iambic and trochaic measures. To him certainly we owe the invention of iambic poetry and its application to the purposes of satire. The only previous measures in Greek poetry had been the epic hexameter, and its offshoot the elegiac metre ; but the slow measured structure of hexameter verse was utterly unsuited to express the quick, light motions of satire. Archilochus made use of the iambus and the trochee, and organised them into the two forms of metre known as the iambic trimeter and the trochaic tetrameter. The trochaic metre he generally used for subjects of a serious nature; the iambic for satires. He was also the first to make use of the arrangement of verses called the epode. Horace in his metres to a great extent follows Archilochus. All ancient authorities unite in praising the poems of Archilochus, in terms which appear to be somewhat exaggerated. His verses seem certainly to have possessed strength, flexibility, nervous vigour, and, beyond everything else, impetuous vehemence and energy. Horace speaks of the "rage" of Archilochus,and Hadrian calls his verses "raging iambics." By his country-

men he was reverenced as the equal of Homer, and statues of thesg two poets were dedicated on the same day. The fragments of Archilochus are to be found in the collections of smaller Greek poets by Jacobs, Bergk, and Gaisford, and have been published separately by Liebel, Archalochi Reliquie, Leipsic, 1812, 1818.

ARCHIMANDRITE (from pévdpa, a fold, cloister, or convent), is a title in the Greek Church applied to a superior abbot, who has the supervision of several abbots and cloisters. The name has sometimes been applied generally to superiors of large convents. In Russia the bishops are selected from among the archimandrites. Although the title is peculiar to the Greek Church, it has found its way into Western Europe. It is used in Sicily, Hungary, and Poland, and has even been applied to bishops of the Latin Church.

ARCHIMEDES, the greatest mathematician and the most inventive genius of antiquity, was born at Syracuse, in Sicily, about 287 B.c. In his youth he went to Alexandria, and completed his education there under Conon, at the royal school of the Ptolemies, of which Euclid had becn the ornament some half a century before. On his return to his native city he devoted himself to gcomctrical investigations, and by his great energy and inventiveness carried the science far beyond the limits it had then attained. Combined with his remarkable faculty of analysis was a power of practical application which enabled him to establish the science of engineering upon a solid mathematical basis. Of the facts of his private life we have but a few disconnected notices. He was the devoted friend, and, according to some accounts, the relative of Hiero, king of Syracuse; and he was ever ready to exercise his ingenuity in the service of his admirer and patron. Popularly, Archimedes is best known as the inventor of ingenious contrivances, though many of the stories handed down about these are probably fabulous. He devised for Hiero engines of war, which almost terrified the Romans, and which protracted the siege of Syracuse for three years. There is a story that he constructcd a burning mirror which set the Roman ships on fire when they were within a bow-shot of the wall. This has becn discredited because neither Polybius, Livy, nor Plutarch mention it; mirrors may, however, as Buffon showed, be so arranged as to burn at a considerable distance, and it is probable that Archimedes had constructed some such burning instrument,

though the connection of it with the destruction of the Roman fleet is more than doubtful. Among the most celebrated of his contributions to practical scicnce are his discoveries in hydrostatics and hydraulics. The account usually given of onc of these is remarkable. Hiero, it is said, had set him to discover whether or not the gold which he had given to an artist to work into a crown for him had been mixed with baser metal. Archimedes was puzzled till one day, as he was stepping into a bath and observed the water running over, it occurred to him that the excess of bulk occasioned by the introduction of alloy could be measured by putting the crown and an equal weight of gold separately into a vessel filled with water, and observing the difference of overflow. He was so over- joyed when this happy thought struck him that he ran home without his clothes, shouting, "evpyxa, et'pyxa,'—I have found it, I have found it. It may have been this that led to his establishing the fundamental principle still known by his name, that a body immersed in a liquid sustains an upward pressure equal to the weight of the liquid displaced. Among a number of other mechanical inventions ascribed to him, the water-screw may be mentioned, which still bears his name. His estimate of the capabilities of the lever is expressed in the saying attributed to him, Ads zod of, Kal tiv ynv KWijoo,

ARC—ARC

" Give me a fulcrum on which to rest, and I will move the earth."

The life of this philosopher ends with the capture of Syracuse by Marcellus, 212 3.c. In the general massacre which followed the fall of the city, Archimedes, while engaged in drawing a mathematical figure on the sand, was run through the body by a Roman soldier. No blame attaches to the Roman general, Marcellus, since he had given orders to his men to spare the house and person of the sage ; and in the midst of his triumph he lamented the death of so illustrious a person, directed an honourable burial to be given him, and befriended his surviving relatives. In accordance with the expressed desire of the philosopher, his tomb was marked by the figure of a sphere inscribed in a cylinder—the discovery of the relation between the volumes of a sphere and its circumscribing cylinder being regarded by him as his most valuable achievement. When Cicero was questor in Sicily (75 B.c.), he found the tomb of Archimedes, near the Agrigentine gate,

overgrown with thorns and briers. ‘ Thus,” says Cicero (usc. Disp. v. 23), “ would this most famous and once most learned city of Greece have remained a stranger to the tomb of one of its most ingenious citizens, had it not been discovered by a man of Arpinum.” The range and importance of the scientific labours of Archimedes will be best understood from a brief account of those writings which have come down to us; and it may be remarked that though some useful and important works may have perished, it is probable that these are chiefly details of his mechanical inventions, and that all his most valuable mathematical discoveries have been preserved. The follow- ing treatises have escaped the ravages of time :—

(1.) On the Sphere and Cylinder (rept rijs opatpas Kat Tov kvAivspov). This treatise consists of two books, dedi- cated to Dositheus, and containing a number of propositions relative to the dimensions of spheres, cones, and cylinders, all demonstrated in a strictly geometrical method. The first book contains fifty propositions, the most important of which are :—Prop. XIV. on the measure of the curve surface of a cylinder; Props. XV. and XVI. on the surface of a cone; Prop XVII. of a frustrum of a cone ; Prop. XXII. of a circle; Prop. XXXV. of the surface of a sphere ; and Prop. XXXVII. of the relation between a sphere and its circumscribing cylinder. The second book contains ten propositions, which chiefly relate to plane spherical sections.

(2.) The Measure of the Circle (xixrov pérpyows) is a short book of three propositions. Prop. I. proves that the area of a circle is that of a triangle whose base is equal to its circumference, and height equal to its radius; Prop. IL shows that the circumference of a circle exceeds three times its diameter by a small fraction, which is less than +° and greater than $9; and Prop. III. that a circle is to its circumscribing square nearly as 11 to 14. He arrived at these wonderfully accurate results by inscribing in and circumscribing about a circle two polygons, each of 96 sides; and, assuming that the perimeter of the circle lay between these of the polygons, he obtained by actual measurement the limits he has assigned.

(3.) Conoids and Spheroids (epi xwvoed€éwv Kat rpapoet- Séwv) is a treatise in forty propositions, on the superficial and solid dimensions of the solids generated by the revolu- tions of the conic sections about their axes.

(4.) On Spirals (zepi EXikwv), is a book, in twenty-eight propositions, upon the properties of the curve now known as the spiral of Archimedes, which is traced out by a radius vector, whose length is proportional to the angle through which it has turned from the initial position.

(5.) Equiponderants and Centres of Gravity (aept

exiréduv icoppomiay } Kévtpa Bapav éxumédwv). This con-

sists of two books, and may be called the foundation of

theoretical mechanics, for the previous contributions of | by the turning of the machine.

Aristotle were comparatively vague and unscientific. In the first book there are fifteen propositions, with eight postulates ; and demonstrations are given, much the same as those still employed, of the centres of gravity—(1) of any two weights, (2) of any parallelogram, (3) of any triangle, (4) of any trapezoid. The second book is devoted to the finding the centres of gravity of parabolic segments.

(6.) The Quadrature of the Parabola (Terpaywvicpds mapaBoAjs) is a book in twenty-four propositions, demon- strating that the area of a parabola is 4 of the triangle having its double ordinate for base and abscissa for height. His method of arriving at this result is most interesting, as being a sort of rude approximation to the modern process of area summation by integration. The expedients to which he resorted to avoid the idea of infinity are no less curious than they are admirable.

(7.) On Bodies floating in Liquids (Iept rév Bare éfictapévov), is a treatise in two books, on the principles of floating, and the positions of equilibrium of floating parabolic conoids.

(8.) The Psammites (6 Wappirys, Lat. Arenarius, or sand counter), a small treatise, dedicated to Gelo, the eldest son of Hiero, on arithmetical

numeration, applied to reckoning grains of sand, is curious as containing the germ of the modern system of logarithms.

(9.) A collection of Lemmas, consisting of fifteen pro- positions in plane geometry. This has come down to us through a Latin version of an Arabic manuscript, and its authenticity has been questioned.

In the edition of Archimedes, published by Revault at Paris in 1615, the following works are said to be lost :— On the Crown of Hiero ; on the Cochleon, or Water-Screw ; on the Helicon, or Kndless Screw ; on the Trispaston, or Com- bnation of Wheels and Axles ; on the Machines employed at the Stege of Syracuse; on the Burning Mirror ; on the Machines moved by Air and Water ; and on the Material Sphere. We do not know, however, that he ever committed accounts of his mechanical inventions to writing.

The Edito princeps of the works of Archimedes, with the commen- tary of Eutocius, is that printed at Basil, in 1544, in Greek and Latin, by Hervagius. A Latin translation of them was published by Isaac Barrow in 1675 (London, 4to). Nicholas Tartalea (a celebrated algebraist), published in Greek and Latin the treatises on the Centre of Gravity, on the Quadrature of the Parabola, and on Floating Bodies (Venice, 1543). Frederic Commandine edited the beautiful Aldine edition of 1558, 4to, which contains Cireuli Dimensio, De Lineis Spiralibus, Quadratura Paraboles, dée., Conoidibus et Spheroidibus, and De numero Arene ; and in 1565 the same mathematician published the two books De iis que vehuntur in Aqud. The most complete and magnificent edition of the works is that edited by Torelli, and published with the com- mentaries of Kutocius at Oxford, in 1792, folio. The most valuable edition of the Arenarius, which is also the first. modcrn translation of any part of Archimedes, is that published in English by Anderson (London, 1784), with useful notes and illustrations. The first modern translation of the works is the French edition published by F. Peyrard (Paris, 1808, 2 vols. 8vo). A German translation, by Nizze, was published at Stralsund in 1824, and another by Gutenacker, at Wurzburg, 1828, 8vo. See Quart. Rev., vol. iii. p- 89; Plutarch's Life of Marcellus ; Pope Blount's Censura Celebriuin Authorum (London, 1690) ; the

Arenarius of Archimedes, Oxford, 1837; Ed. Rev., vol. xi. p. 185; Powell's History of Natural Philo- sophy (Lardner's Cycl.), p. 40.

ARCHIMEDES, Screw or, a machine for raising water, said to have been invented by Archimedes, for the purpose of removing water from the hold of a large ship that had been built by King Hiero. It consists of a water- tight cylinder, enclosing a chamber walled off by spiral divisions running from end to end, inclined to the horizon, with its lower open end placed in the water to be raised. A section of it is shown in the accompanying woodcut. The water, while occupying the lowest portion in each suc-

cessive division of the spiral chamber, is lifted mechanically Another form of the

Screw of Archimedes,

screw has the spiral revolving free in a fixed cylinder, but neither of the machines is now much used.

ARCHIPELAGO, a name which, though it is now applied to any island-studded sea, was formerly the distinctive designation of what, though still known as the Archipelago, is often distinguished as the Grecian Archipelago, namely, that part of the Mediterranean which lies between Greece and Thessaly on the W. and Asia Minor on the E.—the Aigean Sea ('Atyaiov Tféda-yos) of the ancients. Several etymologies of the name have been proposed, as—(1), It is a corruption of the ancient name; (2), it is from the modern Greek, 'Ayto IleAayo, the Holy Sea ; (3), it arose at the time of the Latin empire, and means the Sea of the Kingdom (Arche); (4), it is a trans- lation of the Turkish name, Ak Degniz, Argon Pelagos, the White Sea ; (5), it is simply Archipelagus, the Chief Sea.

The Grecian Archipelago abounds in islands, of which the following are the chief :—Thaso, near the Rumelian (Thracian) coast, opposite the mouth of the Karasu (Westus) ; Samothraki, fronting the Gulf of Saros ; Imbro and Lemnos, in prolongation of the peninsula of Gallipoli (Chersonesus Thracica) ; Skiathos, Skopelo, Celadroni, Peristeria, &c., running out from

the southern extremity of the Thessalian coast ; Negropont (Hubea), the largest of all, along the east coast of Greece; Skyros, with its satellites, east of Negropont ; Mitylene (Zesbos) and Chios, off Asia Minor ; Samo and Nikari (Jcaria), in prolonga- tion from Cape St Maria (Mycale Pr.) ; Stancho (Cos, éc- tav-Ka), in the Gulf of Cos, with Kalymno to the north ; and finally, the great group of the Cyclades, of which the most important are Andros, Tenos, Myconos, and Delos, in prolongation of Eubcea, Zea (Cos), and Cythnos, running out from the south of Attica, and Melos, Kimolos, Siphnos, Antiparos, Paros, Naxos, Amorgos, Astynactea, forming a curve, from west to east, with its convexity to the north, while to the south are a number of smaller islands. This profusion gives beauty and picturesqueness to the sea, but renders its navigation difficult and dangerous, notwith- standing the large number of safe and commodious gulfs and bays. Many of the islands are of volcanic formation ; while others, as Paros, are mainly composed of pure white marble. The Jarger islands have some very fertile and well- watered valleys and plains. The chief productions are wheat, wine, oil, mastic, figs, raisins, honey, wax, cotton, and silk. The people are employed in fishing for coral and sponges, as well as for bream, mullet, and other fish. The men are hardy, well built, and handsome; and the women are noted for their beauty, the ancient Greek type being well preserved. 'The Cyclades belong to Greece ; most of the other islands to Turkey.

The other Archipelagoes, portions of ocean with numerous islands in close contiguity, as the Indian, Caribbean, Patagonian, &c., will be described in their respective places.

Elements of architec- tural per- fection.

Size.

ARCHITECTURE

RCHITECTURE (Latin architectura, from the Greek dpyiréxtwv, a master-builder) is the art of building according to principles which are determined, not merely by the ends the edifice is intended to serve, but by con- siderations of beauty and harmony. It cannot be defined as the art of building simply, or even of building well. The end of building as such is

convenience, use, irrespec- tive of appearance; and the employment of materials to this end is regulated by the mechanical principles of the constructive art. The end of architecture as an art, on the other hand, is so to arrange the plan, masses, and enrich- ments of a structure as to impart to it interest, beauty, grandeur, unity, power. Architecture thus necessitates the possession by the builder of gifts of imagination as well as of technical skill, and in all works of architecture properly so called these elements must exist, and be harmoniously combined. 'The combination of technical with imaginative features removes architecture from the precise position occupied by painting, sculpture, and music, but does this more in appearance than in reality, since the greatest works of the architect must always be those in which the imagination of the artist is most plainly seen.

Like the other arts, architecture did not spring into existence at an carly period of man's history. The ideas of symmetry and proportion which are afterwards embodied in material structures could not be evolved until at least a moderate degree of civilisation had been attained, while the efforts of primitive man in the construction of dwellings must have been at first determined solely by his physical wants. Only after these had been provided for, and materials amassed on which his imagination might exercise itself, would he begin to plan and erect structures, possess- ing not only utility, but also grandeur and beauty. Before proceeding 1

to inguire into the history of architecture, it may be well to enumerate briefly the elements which in combination form the architectural perfection of a build- ing. These elements have been very variously determined by different authorities. Vitruvius, the only ancient writer on the art whose works have come down to us, lays down three qualities as indispensable in a fine building, viz., Firmitas, Utilitas, Venustas, stability, utility, beauty. In an architectural point of view the last is the principal, though not the sole element ; and, accordingly, the theory of architecture is occupied for the most part with cesthetic considerations, or the principles of beauty in designing. Of such principles or qualities the following appear to be the most important: size, proportion, harmony and sym- metry, ornament, and colour. All other elements may be reduced nnder one or other of these heads.

With regard to the first quality, it is clear that, as the feeling of power is a source of the keencst pleasure, size, or vastness of proportion, will not only excite im the nind of man the feelings of awe with which he regards the sublime in nature, but will impress him with a deep sense of the majesty of human power. It is, therefore, a double source of pleasure. The feelings with which we regard the Pyramids of Egypt, the vast monoliths at Rome, the massive temples of Sicily and the Parthenon, and the huge structures of Stonehenge, sufficiently attest the truth of this principle.

The qualities in the general disposition of the parts of a building which are calculated to give pleasure to the beholder, are proportion, harmony, and symmetry. To obtain a clear idea of the general plan in order to appre- ciate these qualities, the best method is to contemplate the building under conditions that prevent the mind from

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being disturbed by the consideration of the details—at a distance, for instance, or by moonlight, when its out- lines may be seen standing boldly out against the sky. Thus the mass of a Gothic cathedral, the proportion of its parts, the outline of tower, nave, choir, and lady-chapel, the deep shadows which show the projection or recess of its various parts, are in themselves beautiful even when there is not light enough to distinguish mouldings, carvings, or tracery.

Proportion itself depends essentially upon the employ- Proportion ment of mathematical ratios in the dimensions of a building. It is a curious but significant fact that such proportions as those of an exact cube, or of two cubes placed side by side dimensions increasing by one-half (e.g., 20 feet high, 30 wide, and 45 long)—or the ratios of the base, perpendicular, and hypotenuse of a right-angled triangle (¢g., 3, 4, 5, or their multiples) — please the eye more than dimensions taken at random. No defect is more glaring or more unpleasant than want of proportion. The Gothic architects appear to have been guided in their designs by proportions based on the equilateral triangle.

By harmony is meant the general balancing of the several Harmony, parts of the design. It is proportion applied to the mutual relations of the details.

Thus, supported parts should have an adequate ratio to their supports, and the same should be the case with solids and voids. Due attention to proportion and harmony gives the appearance of stability and repose which is indispensable to a really fine building. Sym- Symmetry. metry is uniformity in plan, and, when not carried to excess, is undoubtedly effective. But a building too rigorously symmetrical is apt to appear cold and tasteless. Such symmetry of general plan, with diversity of detail, as is presented to us in leaves, animals, and other natural objects, is probably the just medium between the excesses of two opposing schools.

Next to general beauty or grandeur of form in a building Ornament. comes architectural ornament. Ornament, of course, may be used to excess, and, as a general rule, it should be con- fined to the decoration of constructive: parts of the fabric ; but, on the other hand, a total absence or a paucity of orna- ment betokens an unpleasing poverty. Ornaments may be divided into two classes—mouldings and the sculptured representation of natural or fanciful objects. Mouldings, no doubt, originated, first, in simply taking off the edge of anything that might be in the way, as the edge of a square post, and then sinking the chamfer in hollows of various forms; and thence were developed the systems of mouldings we now find in all styles and periods. Each of these has its own system ; and so well are their characteristics under- stood, that from an cxamination of them a skilful architect will not only tell the period in which any building has been erected, but will even give an estimate of its probable size, as professors of physiology will construct an animal from the examination of a single bone. Mouldings require to be carefully studied, for nothing offends an educated eye like a confusion of mouldings, such as Roman forms in Greek work, or Early English in that of the Tudor period. The same remark applies to sculptured ornaments. They should be neither too numerous nor too few, and, above all, they should be consistent. The carved ox skulls, for instance, which are appropriate in a temple of Vesta or of Fortune, would be very incongruous on a Christian church.

Colour must be regarded as a subsidiary element in Colow. architecture, and although it seems almost indispensable and has always been extensively employed in interiors, it is doubtful how far external colouring is desirable. Some

contend that only local colouring, 7.¢., the colour of the materials, should be admitted ; but there seems no reason why any colour should not be used, provided it be employed with discretion and kept subordinate to the form or out- line. This subject is of too much importance to be dis- missed summarily here, and will be treated in a supple- mentary notice at the end of this article.

As has been already pointed out, the origin of the art is to be found in the endcavours of man to provide for his physical wants. A picturesque account of the early stages in its progress is given by Vitruvius. According to him, man in his primitive savage state began to imitate the nests of birds and the lairs of beasts, and constructed arbours with twigs of trees. 'To these arbours succeeded huts with walls composed of dried turf, strengthened with reeds and branches. [From huts to houses the progress is gradual and easy. Other writers have endeavoured to trace three orders of primitive dwellings—the cave, the hut, and the tent—constructed severally by the tribes who devoted themselves to hunting and fishing, to agriculture, and to a pastoral and nomadic life. There can be no doubt that climate and surrounding circumstances affected not only the form of the primitive, buildings but also the materials employed. Thus, where trees abounded, stone was probably a material seldom used, as it entailed a much greater amount of labour than timber; but as stone would ucither burn nor rot, it was preferred for all durable pur- poses. Where wood was plentiful, as in Greece and in Lycia, stone architecture exhibits traces of an original timber construction. The columns were originally posts, and the architraves and triglyphs beams resting on each other. The Lycian tomb in the British Museum furnishes a strong proof that there the art of the carpenter preceded that of the mason, and suggested forms, which became con- ventional, and from which the latter could not venture to depart. On the other hand, in the plains of Egypt, where building timber is scarce, and where there is abundance of large stone in the mountains, the mason element scems to have prevailed. In such plains as those of Nineveh and Babylon artificial stone was made from lumps of dried or burnt clay. Finally, in vast sandy deserts, where there are neither trees nor stones, the skins of beasts, sewed together and supported by sticks, formed the earliest

shelter. This goon grew into the tent, and its form still influences the architecture of the Chinese and the Tartars. Much in- genuity has been expended in the inquiry whether it was timber or stone that first gave birth to the art of archztec- ture; the probability is, that the hut, the cairn, and the tent, all contributed their share in different countries.

No traces remain of the steps by which the beautiful temples of Egypt or the magnificent halls of Persia and Assyria were developed from these rude beginnings. The earliest known structures of those countries belong to an age already considerably advanced in civilisation and in the art of construction. And the history of architecture from its earliest specimens in Egypt is not one continuous line of progress. We can indeed show how from these early structures sprang the art of Greece ; how that was modi- fied by the Romans; and finally, how the Pointed archi- tecture of the 13th century arose. But the development is not gradual; it proceeds by a series of steps, and one style does not shade imperceptibly into another. No doubt the architects of each country borrowed somewhat (in detail more especially) from the designs of the adjacent countries; but, nevertheless, each country originated forms peculiar to itself, and in all its artistic efforts continued to repeat and elaborate them. So definite are the charac- teristics of the styles of different nations, that from the mere form, carving, or decoration of any structure, its age and its architects can, usually, be fairly determined.

PREUISTORIC. |

ECTURE

PREHISTORIC STRUCTURES.

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The numerous relics of structures left by primeval man have generally little or no architcctural value. The only interesting problem regarding them, the determination of their date and purpose, and of the degree of civilisation which they manifest, falls within the province of archeology.

The principal specimens of such prehistoric erections may be classified thus —

(1.) Monoliths (Maenhir, from Maen, a stone, hir, high), or single upright stones (fig. 1). The best example is at Carnac, in Brittany. This huge stone, when perfect, was 63 feet high, and 14 feet in diameter at its widest part. It is rudely shaped to a circular form, and weighs about 260 tons.

(2.) Cromlechs, table-stones, generally consisting of one large flat stone supported by others which are upright (fig. 2). The cromlech is also named Dolmen, from Taal, or Daul, a table, and Maen, a stone A good example of the cromlech is the structure known as " Kit's Coity House," near Maid-stone. Other ex- amples occur in different parts of Great Britain and Treland, and numerous specimens are found in Algeria, in India, in the country east of the Jordan, in Guernsey, and near Saumur, on the Loire.

(3.) Circles of Stone.—The most important specimen of

Fia. 1,—Maenhir and Trilithon.

Fia. 2.—Dolmen.

From Waring's Stone

Fic. 4.—Circles of Avebury (restored). Monuments.

these in Britain is Stonehenge (fig. 3). Others are found at Avebury, in Wiltshire (fig. 4); at Stanton Drew, in Soniersetshire; at Stennis, in Orkuey ; and at Callernish, in Lewis; and several have becn discovered in the districts around Mount Sinai and Aden. In some circles, as at

Stonehenge, as well as separately, are found trilithons (fig. 1), which appear to be a modification of the dolmen.

(4.) Zwmaulr.—These include the beehive huts, so called from their shape, found scattered throughout Cornwall, Wales, and Scotland (fig. 5). Similar, but superior, edifices are to be met with in Ireland; and of these, New Grange, near Drogheda, ap- parently a burial

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Fia. 5.—Beehive Hut, Lewis. From Waring.

mound, is the finest specimen (fig. 6). The design of the

Fic, 6.—Seetion of chambered Burial Mound, New Grange, Ireland. From Waring.

Fic. 7.— Nurhag," near Isili, Sardinia. From Waring.*

"nurhags" (fig. 7), which are found in great numbers in the island of Sardinia, has greatly puzzled archeologists. It has been conjectured that they were sepulchres, the dead

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Fra. 8.—Section of Piet's House, Pierowall, Orkney. From Archeologia, vol. xxxiv. pl. 17.

being exposed on their summits, Of the so-called " Picts' houses" of the Orkney Islands, some are chambered tumuli, while others may be more properly described as under- ground dwellings (fig. 8). (5.) Wooden huts, the sub- merged remains of which have been recently discovered in the lakes of Switzerland, as well as in Sweden, in Italy, and in Ireland. These erections, which rose on piles just above the surface of the water, present no features of architectural interest.

Fia. 9.—Lake Dwellings, or Crannoges, Lake Ardakillin, Rosccmmon. From Troyon's Hab. Lacustres, 1860.

prehistoric sculpture, on stone, taken

A specimen of

Fig. 10.—Aneient Swiss Lake Dwellings. From Troyon's Hab. Lacustres, 1860.

from ruins in the island of Gozo, in the Mediterranean, is given in fig. 11.

Prehistoric remains are separated by a wide gulf from those which now fall to be noticed, inasmuch as, whether or not they led, by improvement in their forms, to any- thing really architec- tural, no evidence re- mains of such progress, and they must therefore be re- garded as practically dissociated from anything that we have now to describe.

Fria, 11.—Omaments on stone, Gozo. From Waring.

EcypTiAN ARCHITECTURE.

For the beginnings of the art—its earliest efforts, grand even in their infancy—we must turn to Egypt.

A short description of the general configuration of the country may be useful here. Its habitable land is a narrow strip a few miles wide, extending from the Nile, on one or both its banks, to the rocks or desert. About 100 miles up the river is Cairo, and close to it Memphis, the old capital of Lower Egypt, Heliopolis, and the great pyramids of Ghizeh, Abooseer, Sakkara, and Dashour ; 450 miles higher up the river is the site of the great Thebes, with Karnak and Luxor on the right or eastern bank, and Medinet Haboo on the west. Beyond this in succession are Esne, Edfoo, Elephantina, Syene, and Philz, close to the first cataract. Higher up (in Nubia) are the great caves of Aboosimbel, and at a still greater distance the pyramids of Meroé, or Dankelah. The rock is generally limestone up to Thebes, sandstone and breccia to Syene, where the well-known variety of granite, with hornblende, is found ; these with the addition of unburnt brick, are the chief materials used in the construction of the Egyptian architectural monu- ments, The granite was principally supplied by the quarries at Elephantina and Syene, for which the Nile offered a ready mode of conveyance, although it appears that the obelisks and other enormous blocks were sent by land. Some species were brought down the river from Ethiopia, but we do not find that the materials were brought from any other foreign country. It may be remarked, too, that in the earliest. structures the common grés or sandstone

is principally employed. Excepting the obelisks and some few of the propyla, all the temples at Thebes are of that material. In Lower Egypt, on the contrary, and in the works of later date generally, almost everything is con- structed of granite.

It seems quite certain that Egyptian art is original and not derived from that of India; and it may be concluded

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with great probability that the structures of Egypt are the oldest specimens of architecture in the world. The origin of the structures themselves has been matter of some discus- sion. By several writers it has been thought that the rock- cut caves of Upper Egypt were the earliest efforts of archi- tectural design, and furnished models for the enormous piles raised along the banks of the Nile. An examination of these caves, however, will show clearly that the very reverse is the case, and that the carvings of the excavations are imitated from the above-ground buildings.

The oldest works of the Egyptians, according to Hero- dotus, were the embankment of the Nile by Menes, the foundation of the city of Memphis, and the commencement of a temple to Vulcan. Next we learn from Manetho, as cited by Eusebius, that Venephes, the fourth king of the first dynasty, built some pyramids at a place called Cocho- men, but this is all we know of them. Eusebius further records that Tosorthus, or Sosorthus, the second king of the third dynasty, found out how to build with polished or smooth stone (kal riv dia geordv ALGwv oikodopnv evpero).

The next structure of which we have notice is the Great Pyramid, the most gigantic work in the world—oue which never has been, and perhaps never will be surpassed. At this time the Egyptians must have reached a proficiency in the mechanical arts of which we can form no conception. They seem to have been able to quarry rocks of the hardest stone, even granite—to transport them to great distances —to raise huge blocks, vast monolith obelisks, that would puzzle our engineers with their best tackle—and, more wonderful still, they appear to have had the power not only of polishing granite, but of carving on that most stubborn material with the utmost facility, large surfaces and even huge statues being covered with

hieroglyphics of the most minute kind and of the highest finish. It is impossible to discover how this was done, for though Herodotus (ii. 124, 125) tells us they had iron tools, it was long before the con- version of that metal into steel had been found out; and with all the best modern tools of steel, it is difficult and costly to carve even plain letters in granite. According to the account of Herodotus,.the occasion of the erection of this great work was the caprice of a king, Cheops, who is sup- posed to be the Suphis of Syncellus, and the Chembes of Diodorus. This king was a tyrant of the very worst kind ; he closed all the temples throughout Egypt, forbade every sort of religious observance, and forced all his subjects to labour for him as he pleased. Among other whims, he determined to build this pyramid as a tomb for himself. The stones were quarried in the Arabian mountains, and none were less than 30 feet long. They were then con- veyed by the Nile to a newly-constructed road, three-quar- ters of a mile long, 60 feet broad, and in a cutting of 48 feet. This road, of polished stone, and carved with figures, took ten years to complete. Twenty years were spent in building the pyramid itself.

The site of this extraordinary structure is at Ghizeh, in the neighbourhood of Cairo. The base was, Herodotus tells us, 8 plethra (about 808 English feet) square, and the height the same. This, however, is not the case, the Greek author having probably measured the sloping edge. The dimensions are variously given by the various persons who have measured it. M. Nouet, who was of the French commission in Egypt, and had perhaps the best means of ascertaining the truth, states its base to be a square whose side is 716 French or 768 English feet, and gives the height as 421 French or 452 English feet. The dimen- sions of the pyramid in its original state, as given by Colonel Vyse, are 764 feet length of base, 720 feet slant side, and 480 feet high. According to Sir Henry James (Notes on the Great Pyramid, 1869), the side of the base is 760 feet; while Professor Piazzi Smyth gives this as 763°81, and

the height as 486°2567. The pyramid thus covers upwards of 13 acres, and is about 150 feet higher than St Paul's As compared with the largest

building in the

cathedral.

Qo 80 100 300 400 500 FEET + ———— 4

Fia. 12.—Section of Great Pyramid. From Vyse's Pyramids of Ghizeh.

world, St Peter's, Rome, the Great Pyramid covers an area which is as 58 to 22, or nearly three times as much, and is 50 feet higher. Like almost all the other pyramids, its sides face the cardinal points, and it is entered from the north by a descending passage, which leads to a few small chambers or cells, the largest of which is anni) wal ih a but 17°7 feet wide. In : Wi Rec one of these a solitary [#4] a sarcophagus was found. The pyramid appears to be a solid mass of stone, and is built in regular courses or lay- ers, which vary in thick- ness from 2 to 5 feet, each receding from the one below it to the ¢ incl number of 202; though age

even this is variously stated from that number to 260, as indeed the height is given by various modern tra- vellers at from 444 to 625 feet. And the ancient writers differ as widely both among themselves and from the moderns. On the top course the area is about 10 English feet square, though it is be- lieved to have been originally two courses higher, which would bring it to the smallest that in regular gradations it could be. This vast erection, on which the labours of 100,000 men were bestowed for twenty years, and which con- '

Fie. 138.—Entrance to Great Pyramid

tains 85 millions of sy «6 20 FEET

*cubic feet of stone, must oy | ea * IG. os wh ectlon oO*

have cost (reckoning Pyramid. From Vyse.

quarrying, transport—-

twice by land and once by river—squaring, hoisting, and setting at 2s. per foot) something like 84 millions of Eu glish money.

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Other pyramids.

Design and construc- tion of the pyramids,

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A second pyramid, close to the first, was built by the successor of Cheops, whom Herodotus calls Chephren ; the inscriptions on the stones, however, give the name Shafra. The side of its base is about 60 feet less than that of the former. Aboutforty years later, Myccrinus, or Men- cheres, built a third; but the side of the base is only about 364 feet, or less than half that of the Great Pyramid. It was, however, entirely faced with polished granite, while the others were of limestone. A statue of King Chephren has recently been found in a temple close adjacent to the pyramids, and now forms one of the most remarkable objects iu the museum at Cairo. Canina (Archi- tectura Antica, part i.) has described altogether twenty large and twenty-seven small pyramids, some not more than 30 feet square. But the researches of Lepsius and others prove that the number is much greater than this, and on the range of cliffs overlooking the Nile, from Abooroash in the north to Ulahoon in the south, the number is probably not under

100.

A great deal of trouble has been taken to discover the principles on which the Egyptians planned these erections. The most reasonable theory is that each gide was meant for an equilateral triangle, four of which, laid sloping and brought to a point, would compose the pyramid; but neither the dimensions nor the angles agree with this. It is true that the sides of the

three great pyramids have an angle with the horizon of from 514° to 524° or thereabouts ; but those at Abooseer and at Sakkara, as given by Canina, measure 55°, while at Barkal, near Meroé, the angle is no less than 72°. At Dashour the pyramid has a slope about half way up of 53°, which afterwards is flattened to 44°. At Meydoum there is a pyramid in three great steps. as.

Fra. 15.—Pyramid of Meydoum. From Vyse.

therefore, the Egyptians had begun to work on the above theory, they departed from it in many notable instances. The following seems to have been the manner in which the pyramids were generally constructed. A level platform was cut in the rock, a portion of which was, however, left in the centre above the general level to serve as a sort of core to the pyramid. A deep chamber was then sunk in the rock, with a passage leading from it always on 'the north side, and usually at an angle of 26°-to 28°, to the surface of the ground. It is curious that these passages were almost always of one dimension, viz., 3 ft. 5 in. wide, and 3 ft. 11 in. high. Over the chamber was built a mass of masonry, which was gradually added to at the side and top, according to the power, or the wealth, or the length of life of the founder. Finally, the angles of the stones were cut off to the proper slope, or a casing added, and the pyramid thus completed from the top. Some of the casings were highly finished. Those of the first and second pyramid were of polished stone ; that of the third was of polished granite. Occasionally, as in the Great Pyramid, and in the southern one at Dashour, there was a chamber built above

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the one which was cut in the rock. Their entrances were carefully con- cealed,and even the doors of the chamber de- fended by gi- gantic portcul- lises of granite, some 8 to 10 feet square, weigh- ing 50 to 60 tons, so as to render the se- curity of the chambers as

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Fic. 16.—Section (facing east) of South Stone Pyramid at Dashour. From Vyse.

Yet cvery chamber in the chief pyra- mids, ” at Meydoum, has been rifled ages ago, erection utterly set at nought. which they once con- f tained have also been carried away. One, that of Mycerinus, was lost in its passage to England; but the mummy-case and mummy which it con- tained aré now in the British Museum. The sarcophagus of the Great Pyramid still rests in its jij chamber. An extra in- | terest belongs to the third pyramid (of Mycerinus) owing to its chamber being ceiled with a point- ed arch. But it is not a true arch, the stones being merely strutted against each other, as over tlie entrance to the Great Pyramid (see fig. underside cut to the above form. The chamber of a pyramid at Sakkara was lined with blue and white tiles like the Dutch style; and at the false one at. Meydoum there is, about two-thirds up, @ band about 12 feet wide, left rough all round, and it has been sup- posed that this may have been left as a ground for decoration. But there is nothing to prove this. Herodotus, however, expressly says that the ex- terior was richly sculptured, and a ait, en ewe model of a pyramid that is to be seen ; so at the Museum of Cairo bears out his statement. The con- struction of pyramids seems to have ended in Lower Egypt ata very early date, with the old dynasty of Memphis. But some of crude brick, and containing arched chambers, are found at Thebes, and are supposed to be of date about 1200 Bc. Many similar structures, but on a very much smaller scale, were erected in Ethiopia and Meroé down to about 700 B.c.

Many theories have been stated as to the purposes for which these gigantic monuments were erected, but the opinion of M. Mariette, the latest, as well as one of the most learned writers, may be taken as correct, viz., that every pyramid was a tomb and the gigantic enclosure of a mummy. It is certain that every pyramid is on the western bank of the Nile, the region of the setting sun, and thus associated by the Egyptians with the regions of death, and that cach group of pyramids is the centre of a necropolis.

Pyramid.

13 supra), and the

From Vyse.

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Fic. 18.— Section of Sepulchral Cham- ‘per, Third Pyra-

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Sphinxes.

Serapeum.

- the Serapeum, near the

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Next to the pyramids in massive grandeur comes the Great Sphinx, and an additional interest has lately been asso- ciated with this statue, from the finding of an inscription, which seems to prove that it was sculptured before the time of the builder of the first pyramid. The Egyptian sphinx was quite different from the Greek, which usually had a female head on the body of a winged lion; whereas the Egyptian was wingless, and had usually the head of a man, bearded and capped, and thus represents strength and wisdom. ‘Those with the head of a ram, or crio-

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sphinxes, are supposed to be dedicated to Amen (Jupiter Ammon); those with the head of a hawk are called hieraco-sphinxes, and are sacred to Ra, or the sun. The

oa Fa 2h)

Fie. 19.—Sphinxes at Thebes.

Great Sphinx at Ghizeh has the body of a lion crouch- ing close to the ground ; the height from the floor, or plat- form on which it lies, to the top of the head is 100 feet ; the total length is 146 feet ; across the shoulders it measures 34 feet. The head, from the top to the chin, is 28 feet 6 inches, and is calculated to be 40,000 times the bulk of an ordinary human head. A small temple or sanctuary was built between its paws. With the cxception of

this, and the paws them- selves, which are of. ma- | sonry, the whole appears to be carved out of the solid rock. Indeed, it may safely be assumed to be solid; for Colonel Vyse drilled a hole 27 feet deep into the shoulder, and found that, so far at | least, it was so.*

Another grand memo- rial of the old dynasty must be mentioned, viz.,

Fie. 20.—Temple between paws of Great Sphinx. From Vyse.

pyramid of Sakkara, dis- covered in 1851 by M. Mariette, and excavated 30 feet deep in the solid rock. It contains the mummies of the sacred bulls, placed in gigantic sarcophagi, 11 feet high, 7 to 8 feet wide, and 13 to 18 feet long, each of

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which is placed in a chamber. The chambers, forty in num- ber, are excavated on each side of galleries about 12 feet wide, the ceilings being cut (not buzlt) to the form of an arch.

_ No great distance beyond Sakkara, in the district called Labyrinth,

the Fayoom, was the famous Labyrinth, an immense mass of buildings mentioned by Herodotus as the palaces built for the twelve kings. From his description of it this appears to have been as great a work and as great a wonder as the pyramids themselves. It was close to Lake Meeris, and con- tained in the time he wrote 3000 chambers, half above and half below ground, besides immense halls, corridors, courts, gardens, &c. The roofs were wholly of stone, and the walls covered with sculpture. On one side stood a pyramid 40 orgyize, or about 243 feet high. It appears from the ruins that huge masses of buildings once occupied three sides of an open quadrangle, about 200 yards square in the inside— the two wings being about 300 yards long, and the third side about 400, measured on the outside. The pyramid, as stated by the various authorities, occupied the greater part of the fourth sjde, and measured about 348 feet square. There area multgtude of small chambers in two stories, as described by Herodotus ; and Canina supposes there was @ third story above these supported on columns—a sort of open gallery.

Tomps.—The great reverence paid by the Egyptians to Tombs.

the bodies of their ancestors, and their careful preservation of them by embalmment, necessitated a great number and vast extent of tombs. Some of these, erected long after the building of pyramids had ceased, are built up above ground; others are caves cut in the sides of rocks; others are passages tunnelled under ground to a great extent. The tombs above ground have been for the most part destroyed. But some very interesting ones are found near the Great Pyramid. They are of well-squarcd stone, in the form of truncated pyramids; the tops are level, and they show no appearance of anything having been built above them. But there must have been ac vering of some kind, as pits, leading to sepulchral chambers ‘ beneath, are cut down directly fram the sur- face level. The most curious tomb at Ghizeh is known as Campbell’s, of the supposed date of about 660 B.c. It is an

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Yy

YYW

YW

Judd

YW

open excavation, 53 ft. \ N

*6 in. deep, 30 ft. by ~ *

26 ft. 3 in. on plan, \ NSS

*with niches, &., lead- *

ing out of it. In these \ \ were found four sarco- \G

S&S KA CG

phagi, one of which, of basalt, is in the British Museum. This exca- vation is supposed, from some indications left of a springing stone, to have been covered by an arch. If so, this would be the oldest known stone arch of a large size. In fact, it is difficult to imagine any other way in which this large excavation could have been covered. But the special object actu- ally found was a tomb built up in the centre of the excavation, of good masonry,

opera

NB TTT

D°o°0gx»o9 ALN

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Fra. 21.—Campbell's Tomb ; section

looking west. From Vyse.

covered by three stones as struts, over which was a per- fectly formed voussoired arch. This arch was destroyed not long ago by the Egyptian Government, in order to build a mill. Outside the whole ex- cavation was a deep trench 5 ft. 4 in. wide, and 73 feet deep, from which branch out a num- ber of chambers, This excava- tion was probably finished above with some such trun- cated pyramid as we have al- ready described.

Even more interesting are the tombs at Beni Hassan and Thebes. There is little attempt at architectural decor- ation in these, except the facade and some columns cut in the rock inside; but they are filled with the most inter- esting paintings, representing even the minutest incidents of private life. A model of one was exhibited in London by Belzoni; and there is a valuable series built up, and painted in fac-simile, in the Vatican at Rome. It appears that as soon as a king succeeded to the throne, the excava- tion of his tomb commenced, and proceeded year by year till his death. Canina has given

plans and sections of several of the royal tombs, extending from 250 to 400 feet direct into the solid rock. Several of these tombs' at Beni Hassan have external facades high up in the cliffs, consist- ing each of two columns in antis, to which we shall have again to refer when treating of the origin of the Grecian Doric. Others, as at Ghizeh and Sakkara, have their entrances level with or below the ground, and without external decoration; whilst others, as at Thebes, have their entrances high up in the face of the cliffs, and not only without ornament of any kind, but closed up as if for purposes of concealment. But each, no matter of what size or description, had one or more chambers or corridors, in the floor of some one or other of which was sunk a deep pit. Leading out of this pit, again, were other cham- bers, in one of which was deposited the sarcophagus. When this was done the pit was filled up so as to render the concealment of the place of sepulture as complete as possible. One of the grandest at Thebes is that of a priest, otherwise unknown to fame, which comprises a series of halls, passages, and chambers, at various levels, branching off in one place three different ways. In all, it is 862 feet long, and the part actually excavated occupies an area of 23,000 feet.

Many of the paintings already alluded to are often simply executed in colour, but others are emphasised by being sculptured also in slight intaglio. This came into use, it would seem, about the 14th century B.c., the earlier work being in relief. The stone was usually prepared for paint- ing by being covered with a very thin fine stucco. Even the fine granites were so covered sometimes, and the wood- work also. Imitations of costly woods, &c., are to be found even at this early time.

TrmpLes._—The Egyptian temples range from the time that Thebes became the capital (about 2000 B.c.) down to the time of the Cesars.

Of all the temples, the most remarkable is perhaps the rock-cut one of Aboosimbel, in Nubia, supposed to have been excavated in the 14th century B.c. The facade was cut in the steep face of a rock, the entrance doorway being flanked by two gigantic statues (66 feet high) on

Fic. 22. Building in Campbell's Tomb, From Vyse.

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each side. The main fcature internally was a grand hall supported by two rows of detached piers, in front of each of which is a statue 17’ft. 8 in. high. Another remarkable temple exists at Ghizeh, built up within a great excavaticn in the rock; here was found the statue of Chephren before mentioned. The temple is lined with immense blocks of polished granite, as are also the piers, each of these being of one stone about 15 feet high, 5 feet wide, and 3-2 thick. Over this structure there was clearly another, above ground, as extensive remains of fine stone- . walling still exist. This singular edifice is without inscrip- tion of any kind, and evidently was connected in some way with sepulture, as tomb-chambers lead out of it. The apparently great antiquity of these and other excavations lent countenance to the theory to which we have before alluded, viz., that the origin of Egyptian art is to be found in them. But the evidence before us distinctly shows that all the forms used in the great excavations at Aboosimbel, Thebes, Beni Hassan, and other places, are clearly copied from built buildings. Thus, we have the ceilings arched out of the solid rock, or formed with clear imitations of beams, squared or round, also cut out of the rock, just as square beams or round logs were used in ordinary buildings ; and so with the other parts of the excavations. ;

The grandest architectural efforts of the Egyptians are shown in their built temples, whose construction ranges from the time at which Thebes became the chief capital (about 2000 8.c.) down to so late even as the time of the Cesars. Sir Gardner Wilkinson, in his Architecture of Ancient Egypt, gives a very full account of these edifices, and classifies them thus :—1. Sanctuary Temples, or those with only one single chamber. 2. Peripteral Temples, or the like, but surrounded with columns. 3. Temples in Antis, with a portico of two or four columns in front. 4. Those with porticos of many columns, as Esne, Dendera, &c., and many inner chambers. 5. Those with large courts, and with pyramidal towers or propylons in front. The earliest temples were small, consisting of a simple chamber to hold the statue of the deity, with one openiug or door- way in front, through which the votary might look, and with an altar for sacrifice. They were sanctuaries into which only priests might enter. The building was sur- rounded with a wall of brick forming a court or temenos, which was entered by a tall stone gateway or

propylon, and was often planted with trees. In process of time theso temples were enlarged, and there were added chambers for the priests, and large doorways flanked by towers with sloping sides (Plate VII. fig. 5), and sometimes by a portico or pronaos (fig. 2) supported by columns. The vestibule, or court-yard, was surrounded by a colonnado (fig. 4) ; the propylon was of gigantic proportions, and full of chambers (figs. 1, 4). The sanctuary, adytum, or ovKos (fig. 4), still contained the idol and its altar. Across the court, and, in fact, sometimes for an immense distance outside, there was a dpdpos, or avenue of sphinxes, through which processions defiled. At the commencement of this avenue there was frequently an open or hypzthral build- ing, or peristyle of columns, where it is supposed the processions assembled and were marshalled. This building is called a canopy by Sir Gardner Wilkinson.

The pyramidal form of the propylea, peculiar to Egyptian temples, may have been suggested by the pyramids, as neither that form nor those adjuncts to a temple appear to have been used before the period at which it is supposed the former were constructed. The grandeur and dignity inherent in that form would indeed hardly be suspected till its appearance in the pyramids themselves ; and certainly the impression of its effect must have been strong, to induce men to seek it in a truncated pyramid under a very acute angle, as in the propylea, relying on the cffect of

Temple of Edtoo. Plate VII.

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its outline alone. It was gradually, too, that this ten- dency was generally applied, for in the earliest Pharaonic structures the vertical outline is most common, except in the propylea, where they exist ; and in the structures of the Ptolemies the inclined outline pervades everything. The larger and more perfect structures do not externally present the appearance of being columned, a boundary wall or peribolus girding the whole, and preventing the view of any part of the interior,—except perhaps the tower-

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ing magnificence of some inner pylones; of the lofty

tops of an extraordinary avenue of columns, with their superimposed terrace; of the tapering obelisks which occupy, at times, some of the courts ; or of a dense mass of structure, which is the body of the temple itself, enclos- ing the thickly columned halls. The immense magnitude of these edifices may perhaps have made them, in their per- fect state, independent of considerations which have weight in architectural composition at the present time, and on which indeed its harmony depends. The various portions of the same temple differ in size and proportion ; whence it happens that the cornices of the lower parts abut inde- finitely against the walls of the higher, while the latter are not at all in accordance among themselves.

The structure selected here to exemplify Egyptian archi- tecture, and figured in elevation, plan, and details in Plate VII, though not ranked among the Pharaonic monu- ments, is perfectly characteristic of the style and arrange- ment of Egyptian temples, and is a more regular specimen than any other possessing the national peculiarities. It is known as the temple of Apollinopolis Magna, or of Edfoo, in Upper Egypt, on the banks of the Nile, between Thebes and the first cataract. It has recently been cleared out, and its magnificent ruins now stand forth grandly and clearly.

The plan of the enclosure behind the propylaa is a long paralielogram, the moles or propylaa themselves forming another across one of its ends. The grand entrance to the great court of the temple is by a doorway between the inoles, to which there may have been folding gates, for the notches, as for their hinges, are still to be seen. Sinall cham- bers, right and left of the entrance, and in the core of the propyleea, were probably for the porters or guards of the temple : a staircase remains on each side, which leads to other chambers at different heights. To furnish these with light and air, loop-holes have been cut through the external walls, disfiguring the front of the structure. The grand doorway (fig. 4) is about 50 feet high, and is flanked by two massive towers 110 feet high. The whole facade measures about 250 feet, or about 70 feet longer than that of St Paul's. The propylon is covered with numerous figures, all of colossal proportions, and some as high as 40 feet. The court is 160 feet by 140, and is surrounded on three sides by columns 32 feet high, forming a covered gallery. The pronaos, or covered portico, measures 110 feet by 44, and consists of three rows of six

columns, each 34 feet high, parallel and equidistant, except in the middle, where the intercolumniation is greater, because of the passage through. The front row of columns is closed by a sort of breastwork or dado, extending to nearly half their height, in which moreover they are half-imbedded ; and in the central opening a peculiar doorway is formed, consist- ing of piers, with the lintel and cornice over them cut through, as exhibited in the elevation of the portico. From the pronaos another doorway leads to an atrium or inner vestibule, consisting of three rows of smaller columns, with four in each, distributed as those of the pronaos are. Beyond this vestibule there are sundry close rooms and cells, with passages and staircases which were probably used for storing the sacred utensils. The insulated chamber within the sixth door was most probably the adytum, or

shrine of the deity or deities to whom the temple was dedicated. It measures only about 33 feet by 17 feet, while the whole edifice within the walls covers about as much ground as St Paul's, London.

The longitudinal section of the edifice (fig. 3) shows the relative heights of the various parts, and the mode of con- structing the soffits or ceilings, which are of the same material as the walls and columnar ordinances ; that is, in some cases granite, and i others freestone. The elevation of the pronaos (fig. 2) shows also a transverse section of the colonnades and peribolus. It displays most of the general features of Egyptian columnar architecture ; the unbroken continuity of outline, the pyramidal tendency of the coinposition, and the boldness and breadth of every part. The good taste with which the interspaces of the columns are covered may be remarked. Panels standing between the columns would have had a very ill effect, both internally and externally; and if a continued screen had been made, the effect would be still worse, as the columns must then have appeared from the outside absurdly short ; but as it is, their height is perfectly obvious, and their form is rendered clear by the contrast of light and shade occasioned by the projection of the panels, which would not exist if they had been detailed between the columns. The lotus ornament at the foot of the panels is particularly simple and elegant; and nothing can be more graceful and effective than the cyma above their cornice, which is singularly enriched

with ibis mummy-cases (figs. 6 and 7). The jambs forming a false doorway in the central inter- space are a blemish in the composition; they injure it very much by the abruptness of their form, and their want of harmony with anything else in it. The front elevation of the moles or propylea (fig. 1) with the grand entrance between them, is peculiarly Egyptian; and very little variety is discoverable between the earliest and latest specimens of this species of structure. It is an object that must be seen to be appreciated ; simplicity and an inherent impressiveness in the pyramidal tendency are all on which it has to depend for effect, with the exception of its magni- tude. The projecting fillet and coving which form a cornice to the structures, though large and bold, appear small and inefficient when compared with the bulk they crown; and there is nothing particularly striking in the torus which marks the lateral outline and separates the straight line of the front from the circular of the cornice, Neither are they dependent for their effect on the sculp- ture, for their appearance is as impressive at a distance, which makes the latter indistinct, as when they are seen near at hand.

A portion of the portico is given on a larger scale (fig. 5), to show more clearly the forms and arrangement of Egyptian columnar composition. The shaft of the column in this example is perfectly cylindrical. It rests on a square step, or continued stylobate, without the intervention of a plinth or base of any kind ; and it has no regular ver- tical channelling or enrichment, such as fluting, but is marked horizontally with series of grooves, and inscribed with hieroglyphics. The capitals are of different sizes and forms in the same ordinance. In this example the capital, exclusive of its receding abacus, is about one diameter of the column in height. Its outline is that of the cyma, with a reversed ovolo fillet above, and its enrichment con- sists principally of lotus flowers. The capital of the column next to this (fig. 2), in the front line, is much taller, differently formed, and ornamented with palm leaves ; the third is of the same size and outline as the first, but differently ornamented ; and the corresponding columns on the other side of the centre have capitals corresponding with these, each to its fellow, in the arrange- ment. Above the capital there is a square block or

Temple at Karnak.

Statues.

reeeding abacus, which has the effect of a deepening of the entablature, instead of a covering of the columns, when the eapitals spread, as in this case. In the earlier Egyptian examples, however, in which the columns are swollen, and diminished in two unequal lengths, the result is different, and the form and size of the abacus appear perfeetly eonsistent. The height of this column and its eapital, without the abacus, is six diameters. The entablature consists of an architrave and corniee, there being no equivalent for the frieze of a Greek entablature, unless the eoving be so considered, in whieh case the cornice beeomes amere shelf. The arehitrave, ineluding the torus, is about three-quarters of a diameter in height, whieh is half that of the whole entablature. The arehitrave itself is in this example sculptured in low relief, but otherwise plain. The torus, which returns and runs down the angles of the building, is gracefully banded, something like the manner in whieh the fasces are represented in Roman works. The coving is divided into compartments by vertical flutes, which have been thought to be the origin of triglyphs in a Doric frieze; but these are arranged without reference to the columns, and are in other respects so totally different from them as to give but little probability to the suggestion. The compartments are beautifully enriched with hiero- glyphies, except in the centre, where a winged globe is seulptured, surmounting another on the architrave, as shown in the elevation of the pronaos. The crowning tablet or fillet is quite plain and unornamented. Angular roofs are unknown in ancient Egyptian buildings, and consequently pediments are unknown in its architecture.

The temple at Edfoo, though its dimensions are con- siderable, is small when eompared with that at Karnak. This covers about 420,000 feet, or five times as much as St Paul's, London, and more than twice as much as St Peter's at Rome. The propylon is 370 feet long, or twice as mueh as that of St Paul's. The hypostyle hall, a parallelogram of about 342 feet long, and 170 feet wide, is the most wonderful apartment in the world. It has fourteen rows of columns, nine in each row, and 43 feet high ; and two rows, six in each, of the enormous height of 62 ft., 11 ft. 6 in. in diameter, and carrying eapitals whieh measure 22 feet across. This hall (with the two gigantic pylones) is said to cover 4000 superficial feet more than St Paul's. Beyond

itis the adytum or shrine, a small apartment, measuring only 26 feet by 16 feet.

In many cases the temples want the peribolus and propylea, the edifice eonsisting of no more than the pronaos and the parts beyond it. In others, particularly in those of Thebes, this arrangement is doubled, and there are two pairs of the colossal moles, and another open court or seeond vestibule intervening between them and the portieo. The central line aeross the courts is formed by a eovered avenue of eolumns, of mueh larger size than ordinary ; and the galleries around are of double rows of columns instead of one row with the walls. The obelisks indicated in the plan and section of Edfoo (Plate VII), before the propylea, oeeupy the situation in which they are generally found, though in this case there are none. Colossal seated figures are sometimes found before the piers of the gateway; and from them, as a base, a long avenue of sphinxes is frequently found ranged like an alley or avenue of trees from a mansion to the park gate, straight or winding, as the case may require.

SratvuEs.—Connected with the temples, and forming an important part of their decorative features, were gigantic

1 So called by Diodorus Siculus, because the middle ranges of columns, with the roof, &c., are higher than the side parts, and admit light' by a range of windows opening over the side roofs, something like the clerestories of our cathedrals.

statues and obelisks. The statues are of enormous pro- portions. The sitting figure of Memnon is about 53 feet without the pedestal; and that in the sepulehre of Osy- mandyas (the Memnonium) is nearly 60 feet high. The face of Memnonis 7 feet high, and the ear 3 feet 6 inehes long, and the shoulders mea- sure nearly 26 feet across.

OBELIsks.—The obelisks of Egypt are generally huge monoliths of red granite or syenite. Theiruse originated, no doubt, in the custom of setting

upstones to commem- orate particular events. The Egyptians embellished these stones, first, by working them to a fine face, and afterwards by covering them with carv- ings. They stand frequently in pairs before the propylon of the temples, as at Karnak and at Phile. After the conquest of Egypt the em- perors transported many of these monuments to Rome. At the time the celebrated Regioniaries (accounts of eaeh of the wards or Regiones of Rome) were written, there were six great obelisks, and forty-two small ones at Rome. Of these twelve only are now left, varying in height from over 100 feet to 84 feet. The first, whieh now stands close to the chureh of St John Lateran, is 148 Roman palms in height, or a little over 108 English feet, is about 8 feet square at the base, and weighs, as is estimated, nearly 450 tons. It is covered with hieroglyphics, from which we gather it was erected in honour of Thothmes IV. It stood originally before the temple of Amen Ra, and was brought over by Caligula. Each obelisk diminishes equally towards the top—that near the Lateran, '253 part of tho base; that at St Peter's, 261 ; two at Thebes, °3 ; and the one near 8. Maria Maggiore, °307, or nearly one-third. The diminution from the base may therefore be estimated roughly at from one-quarter to one-third.

The Barberini obelisk is about 7? times as high as tho diameter of the base; Cleopatra's needle, 84; the one at St Peter's 9 times, at Luxor 10 times, at the Lateran 11 times; while two at Thebes, and one in the Piazza Navona at Rome, have an altitude of no less than 12 times the diameter of the base.

The obelisks have no entasis or swell from top to bottom like a column, but in almost all cases there is a slight convexity on the horizontal seetion of each face. The one in the Place de la Concorde at Paris has the peculiarity of being convex on one side, and slightly eoncave on an- other.

In all ancient examples, the small pyramid whieh covers the obelisk is at least 14 times as high as the diameter of the top of the obelisk in which it is placed. In modern examples the pyramidion is almost always too flat, whieh gives a bad effeet. Obelisks appear to have been used in con- trast with the long horizontal lines of the temples; so that we are unable to judge of the effect produced by these gigantic monoliths, when placed in their original positions, for the few examples in Rome, Paris, &e., are isolated and have nothing near them to contrast them with. The enormous labour and eare

expended upon the Egyptian obelisks may be judged from the fact, that the largest one at Karnak, which weighs 297 tons, must have been lifted out of the quarry, lowered into a ship, raised out of this into a ear- riage, transported more than a hundred miles on land, and

Fia. 23.—Sitting Figure of Memnon.

Obelisks,

Columns.

EGYPTIAN. |

then raised upright, and to a considerable height, to its pedestal.

CoLtumns.—lIn the rock-cut tombs aud temples we come to the earliest forms of columnar architecture now ex- isting ; and Sir Gardner Wilkinson considers that he can trace the process by which the plain, square, uncarved pier was gradually developed into the ornamental column of the complete Egyptian style. Thus in the case of a plain pier, the first thing was to cut off the angles, making it an octagon ; a second cutting produced a 16-sided column. The sides slightly curved formed flutes, and a large slab on the top brought the whole to much the appearance of a rude Doric column.

Suppose, however, that the pier was painted on each side with the stem and bud or flower of a plant, ¢.g., the lotus. The figure would be cut in intaglio; the plain spaces between being then cut away, the column would represent 4 or 8 stalks, supporting buds in flower conjoined. These would be united together by sculptured bands, and the whole would form one column of 4 or 8 stalks, support- ing a capital.

Sir G. Wilkinson has classed Egyptian columns into eight orders. First, The square pillar, or post of stone. This often has a line of hieroglyphics running down it verti cally. Second, The polygonal column, plain or fluted. This is sometimes painted, or otherwise ornamented with devices. Third, The bud capital, or one formed like the bud of the papyrus. Of this there are three varieties. The oldest, from Beni Hassan, is composed of four plants bound

together by a sort of necking of fine bands under the buds, the columns coming down straight to the plinth. Then there are columns of eight similar shafts, and these gene- rally turn in at the bottom. After the reign of Amenoph III. simple round shafts came into use. The second variety is composed of similar shafts, capitals, and neckings; but there are similar bands or necking on the bud itself, and a sort of short rods or reeds, descending vertically from the neckings on the sides of the column. The third variety has a single circular shaft, without any indication of the united water plants, but still with bands round the necking, and the capital itself. In these two last varieties the lower part of the shaft is generally ornamented with a sort of sheath or spathe, resembling the lower part of a water plant.

In the fourth order the capital is like an enverted bell. It formerly was called the lotus capital, but in reality it has no resemblance to that flower. The capital is so much undercut that the ornaments on its edge are not visible, except to a spectator who is immediately beneath them.

The fifth order is the palm tree column, and resembles the head of that tree, with the lower or drooping boughs cut off. The neckings are composed of five bands, but have the peculiarity of a piece hanging down like a knot at the end. These columns are found as early as the time of Amenoph III. Inthe time of the Ptolemies the shafts came straight down to the plinths, and were not drawn in at the bottom as in the earlier periods.

The szath order is called the Jsis-headed order, the capital being formed of one or more heads of that deity, surrounded by a representation of a doorway, or small shrine with an image, and sometimes a votary worshipping placed over it. At Dendera the faces, exclusive of the head-dress, are five feet across. Sometimes the Isis head is formed on a square or polygonal column. Sometimes the head is that of Athor, the Venus of the Egyptians. In this order also are included the capitals at the tomb of Rhamses III. at Thebes. These are the heads of cows painted blue and red, and with long reverted horns.

The seventh is called the composite order. The shafts are generally round, and the capitals, as the name imports,

are a mixture of styles. The bell and palms, or the palm and the Isis head, are frequently found in combination. A most curious instance is ranked under this style, of columns of the third order with inverted shafts, and also inverted capitals, taken from Karnak, the work of Thothmes III.

The eighth order is called the Osirtde, from containing statues of the deity Osiris. This order is something like the Persian, or the Caryatides of the Greeks and Romans; but it differs, inasmuch as the figure does not support the entablature, but stands in front of a square pier which dis- charges that duty. This order is sometimes used in the. courts and sometimes in the halls. Grotesque figures of Typhon are found in a building called the Typhonium at Barkal. These, however, partly support the entablature with their odd-shaped caps.

The following list of heights, diameters, and distances between the columns, selected from those given by Canina and Sir G. Wilkinson, shows at one view the peculiarities of the various styles :-—

Inter- |

Height. Diameter. | .ojymniation J te etl Stig abt ft., An? Beni Hassan, square, ... 18 4 3 3 Ge Do., polygonal, ../ 16 8 oF ee LO aa 0., four reeds, ...| 15 2 6 7 2 Karnak, bud capital, ..} 18 11 3 4g 6 6 Do., side colonnades, do.,}| 39 9 6 9 4 Do., central, fourth order,) 60 8 11 8 1 6 Memnonium, do., do, ...; 29 4 A PO ua Wommsidodo.udo:, —.|) 29) 10 5 84 Sg Dendera, sixth order, ... 438 2 8 8 5

Esne, seventh order, ... 29 Il fy) 8

Edfoo, do., ene) Geo 2 8 8 5

PruasTERS.—These are employed in all ages, though Pilasters.

they do not always accord with the order of the columns. For instance, at Thebes the pilasters of the Temple zn antis of Dayr el Medeeneh are of the sixth or Isis-headed order, while the columns between are of the seventh or composite order. They are generally square, and without diminution.

'ENTABLATURES.—These are nearly alike in all orders, Entabla- and may be described as a cornice and architrave without tures.

a frieze. The former consists of a fillet or regula, beneath which is what is generally called a large hollow or cavetto; but in reality the upper half is a quarter round, and the lower nearly straight. Under this moulding is a bold torus which separates the cornice from the architraves, and runs down the sloping sides of the angle of the building to the ground. The cornice is generally ornamented with divisional vertical lines, like triglyphs. Between these the cartouches or ovals of the reigning monarch, or other devices, are carved. The centre is generally occupied by the winged globe, or emblem of the Good Demon. The torus is often vurnamented as if strings were bound round a bundle of sticks, like the fasces of a Roman lictor. On the upper part of the smaller cornices there is often a row like the antefixee of a Greek temple, but their form is peculiar, and is supposed to represent the pots in which the mummies of the sacred cats and ibis were preserved. The architraves are plain, without being broken into fascie, and are generally covered with hieroglyphics.

Fortirications.—Next to the temples, the grandest Fortifica- We know that tions.

buildings were perhaps the fortifications. the temples themselves were often used as citadels, few of the towns being fortified. Even Thebes seems not to have been so. Of the actual citadels we have a few remains, as at Dakkeh. But several are shown on the drawings, and bear a curious resemblance to medizval works, the ramparts of the walls and towers having battle-

Private Dwellings.

Résumé,

ments which overhang like our machicolations, while, in the centre of the enclosure formed by the walls, was generally a high square tower or keep. Of the further details we know little.

PrivaTE DweEtiines.—Of these little is known, except from paintings found in the tombs. One noted ruin at Medinet Haboo has, indeed, been supposed to be that of a palace; but one of the latest authorities, M. Mariette, throws doubt on this, considering that it was erected partly for defence and partly as a triumphal monument. The ordinary dwellings seem, like the houses in the Labyrinth, to have been in two stories, with an open gallery at the top, supported by columns probably of wood. The larger houses consisted of rooms ranged round three sides, and sometimes four, of a large court-yard planted with trees, and with a tank, and perhaps a fountain, in the middle. There was an entrance porch, on which are hieroglyphics, being, as Sir G. Wilkinson supposes, the name of the inhabitant. Larger houses are supposed to have had two courts—the outer, in which to receive vistors, the inner for the females of the family. Smaller houses, particularly in the country, had a similar court, with granaries and store-rooms below, and living apartments above, like those of the modern Fellah in Egypt, or the small wgna houses in Italy. The roofs seem to have been flat, like those of the modern Egyptians; and the houses appear, from a painting found at Thebes, to have been ventilated in the same way asat present, by the contrivance called a mulkuf, or wind-shaft, over which are two screens, like Jarge square fans back to back, bending forward each way to catch any air that may chance to be stirring, and direct it down the shaft into the house.

Although we have only ruins to guide us (for no man living has seen an Egyptian temple as it appeared to the old Egyptians), yet we can gather that to the Egyptians we owe the earliest examples of columnar architecture, and at the same time that they had not got beyond the rudi- ments of it. The stable effect of their massive columns disappears when we notice that scarcely any, except those of very recent date, have the wide-spreading base which we know so well in every other style; that the massiveness of the column is in fact wasted, as the lower part is rounded off and cut away so as to render 4th of it simply useless; and that the bold projecting capital carries no weight, and adds nothing to the strength of the stone beam above it, for that beam rests on a small block of stone above the capital,

borrowing no strength whatever from it. It will also have been noticed, that nearly every Egyptian work is rectan- gular in plan, and that in exceptional cases, as, e.g., the buildings at Phile, Kalabsche, and Luxor, no attempt has been made to soften down the harshness of the lines. With the elevation it wasthe same. The square was never changed into the circle or the octagon. Nearly every form is bounded by the rectangle, and the only varieties found in the grandest of the buildings in Egypt are the slope of the massive pylon and the tapering obelisk. The minaret and the dome, which give such charming variety of outline, and the varied mouldings, without which it now seems to us that no building could be perfect, were unknown to the Hgyptians.1_ But of all things, the neglect of the arch is the most curious. Crude brick arches are found at least as early as the 16th century B.c., and others have been found of the same date, it is thought, as the pyramids. Yet the Egyptians of later times systematically employed enormous stones for their coverings and lintels, and left

1 One example, apparently, of a cupola occurs in a painting at Bayr el Bahree (Thebes), but no trace of an actually built cupola exists,

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the arch unused. We must remember, in justice to the Egyptians, that their efforts in art were fettered, to an extent which we are perhaps unable to appreciate, by the restrictions imposed upon them by conventionalities connected with their religion. That they were so fettered in sculpture at least is abundantly clear from many examples. The freedom which characterises one of their earliest statues, that of King Chephren, the exquisitely bold yet delicately graceful sculptures in the Serapcum and in the tomb of Tih at Sakkara, and other examples, show clearly that the Egyptians had a power for design and execution which only such a cause as that referred to above could have suppressed.

[EGYPTIAN.

JEWISH ARCHITECTURE.

The long sojourn of the Jews in Egypt, and the fact that their chief employment there scems to have been the manufacture of bricks, must have

made them acquainted with the architecture of that country. On the conquest of Canaan, the Israelites seem to have taken possession of the dwellings of the vanquished people ; and we have no re- cord of any important building constructed by the Jews till

the days of Solomon. The piety of this prince scems to have Solomon's induced him to carry out his father's wishes with regard to temple.

the temple, but at so low an ebb was the art of building that the Jews did not even know how to hew timber properly (1 Kings v.6). The king therefore applied to Hiram, king of Tyre, with whom he was on friendly terms, and that monarch sent an architect and staff of skilled workmen. Materials were collected for the building, and careful accounts of the whole work are given in the books of Kings and of Chronicles.

The early temple is described (1 Kings vi. vii.) as a build. ing of stone, roofed and floored with cedar. It appears to have been rectangular, with a single roof, and divided into two parts by a wall. It was 60 cubits' long, 20 wide, and 30 in height, or about 110 feet by 36 feet, and 55 fect high. In front was a porch the same width as the temple (20 cubits), but only 10 cubits in depth.

Round the house— which, of course, must mean on three sides only, as the porch occupied the front—were the priests' chambers, in three stories, one over the other, the lowest 5 cubits broad, the middle 6, and the upper 7,—a passage which has puzzled most commentators, but which will be considered presently. On the right side was a winding-stair leading to the upper stories of chambers. The walls of the house, as well as the ceiling, were lined with boards of cedar. The joists of the floor seem also to have been of cedar; but the floor itself was of planks of fir. Thecedar was carved with " knops" and open flowers.

The house was, as has been said above, divided crossways into two parts— the outer temple and the oracle, or Holy of Holies. The one was 40 cubits long, by 20 broad ; the other was 20 cubits square. The oracle had doors aud door-posts of olive-wood. The temple door-frames were of olive, and the doors of fir, all being hung folding. Both doors were carved with cherubim, palm trees, and open flowers. The entire fabric, even the floors,

were gilt — overlaid with gold." The account in the Second Book of Chronicles (ch. iii iv. &c.) is substantially the same, except (a difference easily to be accounted for) that it describes the greater house, 7.¢., the outer temple, as ceiled with fir tree ; and we gather also from the description, that the whole was roofed with tiles of gold: the nails were also of gold, and weighed 50 shekels. At the door of the porch were two columns of bronze, or " pillars of brass," each 18 ee ee Se ee

2 Canina makes the sacred cubit = 554 of a French metre, v.¢., 21°31 English inches, or not quite 1 foot 10 inches.

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cubits, or 33 feet high, and 12 cubits round, or about 7 feet in diameter. They had capitals (chapiters) also of molten brass, five cubits high, decorated with lily work, chain work, and pomegranates. In front of the porch was the altar, surmounted by a low wall three courses of stones in height. The whole building was enclosed by a walled court, called the inner court, or that of the priests. In front of this was another, called the lower court ; and the whole of this area was enclosed by a circumscribed court going round the whole of the other courts and buildings ; and this was called the outer court, or that of the Gentiles. It will be noted that in the careful descrip-

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have been so large that it took three men with extended arms to span their circumference. The outer court was elevated six steps above the basement level; the inner courts stood on a sort of plateau, with retaining walls and parapets round it, which was ascended by fourteen steps ; this was on the level of the women's court. Be- tween this and the inner court was a gate called that of Nicanor, in front of which was a semicircular flight of fifteen steps. The temple itself was entered by a flight of twelve steps, so that its

floor must have been between 20 and 30 feet above the ground-level of the surrounding city. The whole was built of the most beautiful white marble.

*We read in the First Book of Kings (vii. 2, 8), that House of Solomon built "the house of the forest of Lebanon," ae "his house where he dwelt," and "a house for Pharaoh's° "°"**

tion of the pillars, &c., no mention is made either of base or of moulded cornice.

Canina (Tempio di Gerusalemme, Rome, fo.) conceives the =.

style of the building to have been Egyptian ; that the temple was lighted like the hypostyle halls, by a range of windows over the roofs of the cells or priests' chambers ; that these windows were like those of the clerestory of a church splayed at the bottom and sides ; that the walls of the temple itself sloped towards the top on the outside, or, to use the technical language, were built " battering," while the walls of the priests' chambers were built perpendicular, and for this reason each story measured a cubit more than the room below. He also supposed that the capitals of the columns, which are described as of lily work, were in fact the lotus (water lily) capital of Egypt. The porch itself he considers to have been like the propylon, containing other chambers like those of Egypt.

Mr Fergusson's restoration, as given both in his History of Architecture and more at length in Smith's Dictionary of the Bible, is different. He assumes that the plan was somewhat analogous to that of the still existing building known as the palace or temple of Darius at Persepolis, which has a range of chambers on each side. The difficulty as to the upper chamber being wider than the lower he solves in a very satisfactory way, by supposing that there was a set-off in each story on which the flooring just rested, so as not to cut into the walls of temple.

In the prophecy of Ezekiel (ch. xl. sqg.) we have a very full and interesting account of what the temple was in his time. The house itself and the oracle do not appear to have been altered, but the old courts seem to have been swept away and succeeded by vast atria, and a mass of halls and chambers.

In the time of Cyrus the temple was rebuilt, but this second temple was demolished by Herod, who constructed a new one of the same dimensions as that of Solomon. The outer house was 40 cubits long, and the Holy of Holies 20 cubits; but it was nearly double the height of the first temple. The porch also, instead of being the width of the house, 20 cubits, was 100 cubits long and 100 high, crossing the temple in the form of a T, and forming a magnificent facade much longer than that of St Paul's in London. Round the house were three stories of priests' chambers. The court had three entrances on each side, which were called respectively the water-gates, the fire-gates, and the oblation-gates. But the peculiar difference between Herod's temple and the earlier building was that there was, in front of the court last described, another of about the same size, surrounded by a colonnade and chambers, which was the place set apart for the women. These courts were surrounded by an outer court, having a species of cloister on the north, east, and west sides, composed of a double row of columns. On the south side was a similar con- struction a furlong in length. It consisted of three rows of columns, forming with the outer wall, three aisles—the two outer being 30 feet wide and 50 feet high ; the centre being 45 feet wide and 100 feet high—no doubt with a species of clerestory. 'These columns are described to

daughter." Some have supposed these to have been three distinct palaces, but Canina considers them as all connected, and as three parts of one large structure. The house of the forest of Lebanon—so called, in all probability, from the cedar of which it was constructed— is described as being 100 cubits long, 50 wide, and 30 high (180 feet by 90 by 54). Its horizontal area was thus very nearly equal to that of Westminster Hall. It had four rows of cedar pillars, or, as the Vulgate more cor- rectly renders it, four corridors (deambulacra) formed by three rows of cedar columns, fifteen in each, or forty-five in all, with cedar architraves, and covered with cedar. This Canina restores as an Egyptian hall, lighted, as described by Vitruvius, with a portico in front, of 50 cubits by 30. The great hall, he supposes, led on one side to the palace occupied by the king, in which was the hall of judgment and the throne, and on the other side, to the queen's palace and the women's apartments, or, as it has been called in later times, the harem. The porticoes and hall seem to have been of cedar, but the houses were "of costly stones" (1 Kings vil. 9).

ne excavations recently made, at the expense of the Palestine Exploration Fund, have disclosed considerable remains of the massive ancient masonry, and of the cisterns, conduits, &c. But, with these exceptions, no part of old Jerusalem appears to be extant. There are, however, some objects, formerly considered to belong to Jewish times, that should be mentioned. There are, first, what are

called the tombs of the kings of Judah. 'These are a Tombs of

number of sepulchral chambers hewn out of the solid rock, and containing sarcophagi. They vary from 10 to 20 feet square, and are entered, exactly like the tombs of Beni Hassan, by a portico in antis, about 40 feet wide. There are two columns and two pilasters in front, of Greek Doric

character, about 13 feet high. The most curious feature of

these is, that a broad band, about 3 feet wide, richly sculp-

| tured with foliages, runs down on each side 4 or 5 feet }and over the columns horizontally.

Above this last, quite independent of the lower construction, is a regular Doric architrave and frieze, of a character between Grecian and Roman; this is ornamented with triglyphs, pateree, and foliage. In front of the portico is a large court-yard, about 100 feet square.

In the Valley of Jehoshaphat, near Jerusalem, are three extremely curious relics; two stand alone, on platforms excavated from the rock, and the third is scarped into the rock itself. The first is called the tomb of Absalom. It is a square building with a solid wall, in which are engaged Ionic columns, about 13 feet high; over this is a Doric entablature with triglyphs, and an altar, surmounted by a very curious sort of hollow-sided cupola of trumpet-mouth section, and a terminal. The whole, including the flight of steps, is about 60 feet high.

Another similar building, of about the same size, is com- II. — 50

Topes.

monly called the tomb of the prophet Zechariah. This is surmounted by a simple pyramidal roof. Beneath it is a handsome doorway leading to a sepulchral chamber. Over the ordinary classic entablature is the regular Egyptian cornice or torus, surmounted by a bold quarter hollow and fillet exactly like those on the propylous of Egypt, which have been already described.

The third building is entirely rock-cut, and consists of a large fagade, about 90 feet wide and 100 feet high. This is reported to be the place to which the apostles retired before the siege of Jerusalem. Below is a plain face, about 45 feet high, on each side of which are wings with two pilasters, both running up to the top of the building. Between these is a species of portico, about 40 feet wide, with columns and pilasters, of nearly pure Grecian Doric. There are also several other rock-cut tombs or sepulchres scattered about in the neighbourhood of Jerusalem, but none of them possess much architectural interest. One is called the sepulchre of Jehoshaphat.

From the character of the architecture it is incredible that these buildings can have anything like the age as- cribed to them. The Tonic capitals are evidently Roman, and therefore cannot date earlier than the conquests by that people; probably they are of the time of Herod ; while the Egyptian cornices show that the traditional orna- ments of that people had not been entirely forgotten. Besides this, the general plan of a temple, wm antis, scarped into a rock, so entirely resembles the work at Beni Hassan, that it is impossible to deny that these very interesting remains strongly corroborate the views of Canina, that the architecture of the early temples was at least based on the architecture of the Egyptians.

InpIAN ARCHITECTURE.

Considerable light has been recently thrown upon the history of architecture in the East. The traditions as to the extremely remote antiquity of the rock-cut temples, the caves of Ellora, and the wonderful pagodas, have dis- appeared before the searching eye of critical investigation. In the time of Herodotus the Persians had no temples ; and even in that of Tacitus, the great Indo-Germanic races “ would not confine their gods within

walls." The early religion, which appears in the Vedas, was Brahminism, but in the 6th century B.c., the first of the Buddhas seems to have commenced a perversion of the ancient faith. The struggle appears to have gone on for years, till three-quarters of a century after the time of Alexander the Great, about 250 years before the Christian era, when a powerful ruler named Asoka, a grandson of Chandragupta, who is supposed to be the Sandracottus of the Greek writers, abjured Brahminism, and made Buddhism the religion of the state. Certain Lats, or pillars, erected by him, and in- scribed with his edicts, are the earliest extant architectural remains of India.

The Buddhist topes are supposed to have been erected at first to com- memorate some event, or to show that the spot

ENTRANCE FALLEN

Fic. 24.—Plan of Tope at Sanchi.? was sacred; but after a time they were employed to contain

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1 Figs. 24 to 38 are taken from Fergusson's History of Architecture, by the kind permission of the author.

relics, such as the tooth or collar-bone of one of the Buddhas. 'The relics seem in some cases to have been preserved in a sort of box or case at the top of the tope, called a tee ; in others, in regular relic chambers. Where

there were relics, the place was called dagoba, or relic

shrine, of which, perhaps, our term pagoda is a corrup- tion. A great number of these topes were built in the form of large towers, others in the form of hemispheres. Onc of these, the Sanchi tope, is described and figured by Mr Fergusson. The diameter is 106 feet. It has a curious species of gate

entrance, and is surrounded by a stone fence. Others are partly cylindrical, and are finished with either a flat circle, or pointed terminals like a dome at the top. A fine example has recently been discovered at Bharhut by General Cunningham.

Of the next two classes of Buddhist architecture, the Rock-cut temples (Chaityas) and monasteries (Viharas), no bualt temples.

examples exist in India. They are, in fact, rock-cut caves. At least one - thousand temples are known—one-tenth pro- bably Brahminical or Jain, the rest Buddhist. They are

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Fia, 25.—Section of Tope at Sanchi.

said to form an uninterrupted series, from the first, in

Behar, by the grandson of Asoka, 200 years before Christ,

to those at Ellora, which, instead of being of an almost diluvian antiquity, as has generally been reported, have been proved to date from the 7th or 8th century of our era,

while the most recent is the work of Indra-dyumna, as late

as the 12th century. One of these cave-temples at Karli,

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Fic. 26.—Cave at Karli; section.

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Fic. 27.—Cave at Karli; plan.

near Bombay, presents exactly the features of a Roman basilica, or early Christian church. It has a circular end or apse, and is divided into three aisles by two rows of columns. Others are simple square buildings, with a circular or oval chamber at the end entered by @ small door. The monasteries, which exceed the temples in num ber, seem generally to have been square caves supported

Ellora caves,

Kylas.

INDIAN. |

by pillars of the natural rock left in their places, and surrounded by a number of small sleeping-places or cells.

Fia, 28,—Cave at Baugh, on the Nerbudda ; plan.

The most wonderful excavations are those at Ellora, near Aurangabad. These are a series of hypogea or caves sunk in the solid rock, extending a distance of 3 or 4 miles. Canina has given plans and interior views of six of them. Those called Parasova Rama and Diajannata are simply halls supported on massive piers with level architraves. The piers are richly

carved with figures and friezes, and have a sort of cushion capitals, and square abaci, and stand round, forming a kind of atrium. That called Indra has a court open to the sky, in which is a small shrine or temple. In the solid rock are two halls similar to those above described, a larger and smaller. The piers of the Tin Tal are quite plain. In the Viswakarma is a quadrangle, open to the sky and surrounded by pillars. This leads into an atrium with three aisles and an apse, and exactly like a basilican church. The most magnifi- cent of the Ellora caves, and indeed of the native Hindu works, are the chambers and halls called the Kylas, or Kailasa. These are sunk into the rock, and occupy a space of 270 feet deep and 150 feet wide. The roofs are solid rock, supported by pillars, or rest on the walls, or on the divisions of the as- semblage of cham- bers. There is a porch, on each side of which are two columns, This con- ducts into a hall, supported on 16 such columns, and leading into a sort of adytum. Round this is passage space and five chambers. The whole forms a temple, with its usual appendages, just such a one as would be built on the ground, and round this a wide open space, with a

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Fia, 29.—Kylas, Ellora ; plan.

colonnade or cloister encircling the whole. Great part is open to the sky, for the sake of light and air, but the work is entirely cut out of the solid rock.

The date of the construction of the Kylas is about 1000 a.p.

The earliest existing work of the Jains seems to be of the Jain work, 10th century. They were a sect which arose in the endea- vour to re-establish Brahminism, and which first seems

to have acquired importance about 450 a.p. This sect rejects the doctrines of Buddhism, as also the practice of monasticism. The famous temple at Somnauth belongs to them. Mr Fergusson has given a description of that built by Vimala Sah, on Mount Abu, as a type of the ordinary Jain temple. In the centre is a cell in which is a cross- legged figure of one of the twenty-four saints worshipped by this sect; in this case it is that of Parswanath. The cell is always terminated by a pyramidal roof. In front of this is a portico of 48 pillars, disposed much like a cruciform church with a dome at the intersection of the transepts. The whole is surrounded by a species of cloister formed by double rows of columns, and a series of small chambers like the cells of a vihara. But as the sect abjure monasticism, each cell is used not as a dwelling, but as a kind of small chapel, and contains one of their cross-legged deities. One of the peculiarities of this style is that richly-carved brackets spring from the pillars at about two- thirds of their height, and extend to the architraves, forming a sort of diagonal strut to strengthen and support them.

The Jains probably adopted the dome at a very early period, and it is doubtful whether the Buddhists ever used this species of construction. 'No tope," Mr Fergusson observes, "has the smallest trace of such a structure, though of domical shape outside, and the design of the rock-cut temples, with the upright supports, the raking struts, and the level architraves, has manifestly been deduced from timber construction." The Indian dome has no voussoirs radiating from the centre, as in European architecture. The courses are all horizontal; and the domes are therefore necessarily pointed in section, for they would not stand if circular. The Indian dome, however, has this merit, it requires no abutments, and has no lateral thrust. The pressure is entirely vertical; and if the foundation be sound, and the pillars stout enough, there can be no failure.

The leading idea of the plan of the Jain temple is that of a number of columns arranged in squares. Wherever it was intended to have a dome, pillars were omitted, so as to leave spaces in the form of octagons. By corbelling over the pendentives in level courses the dome was gradually formed. The plan and view of the temple at Sadree

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exhibit a building as large as most cathedrals. It has the | which measures 945 by 700 feet, is from his work on great number of 20 domes, varying from 36 fect to 24 feet in diameter, and supported by 420 columns.

*Like most architectural peoples, the Jains were also fond | of tower-building. The Jaya Sthamba, a tower of victory erected by Khumbo Rana, to commemorate the defeat of Mohammed of Malwa, in 1439, is nine stories high, the two topmost stories being open. The general outline is not unlike that of an Italian campanile, with pilasters at the angles, and an overhanging corbelled top. It is richly ornamented from bottom to apex, and affords a very favour- able idea of Indian art. **

Hindu architccture has been divided into that of the | | Aryan or Sanscrit races of North India, that of the South i or of the Tamul races, and that prevalent in the Panjab and Cashmere. Of the first and last we have compara-

[INDIAN.

Fic. 33.—Hall in Palace, Madura.

Hindu Architecture. The remains of the buildings are numerous, as the Tamul races were perhaps the greatest temple builders in the world; and the whole subject has been so well elucidated by the author last referred to, that its principles may be considered to be clearly ascertained and settled. S31 Fe L The great pagoda at Fria. 31.—Temple at Tiravalur, near Tanjore. Tanjore (fig. 32), by far the grandest temple in India, resting on a base 83 feet square, rises in fourteen stories to a height of nearly 200 feet. The interior , represented in fig. 33 —a hall in the palace at Madura—illustrates a comparatively recent ‘ style.

The architecture of the north-east is known J chiefly from the draw- ° ings in Vigne’s T’ravels » in Cashmere, and in General Cunningham’s Memoir to the Asiatic Society of Bengal. The temple of Martund (fig. 34), reduced from the latter work by Mr Fergusson, shows a cloistered court surrounded by pillars and cells, and entered byaporch. Inthe middle of this is a temple with

a species of naos and pronaos. But the most curious feature is a series of doors with acute pediments over them shaped very

an much like Gothic gablets, and containing trefoil arches. A ze similar feature occurs (fig. 35) at Pandrethan, in a temple built about 1000 a.p., or 250 years later than Martund. It seems by no means improbable that these pointed domes,

tively little knowledge, but South Hindu work is treated of at great length by R4m Raz,! a native author. The accompanying view of the temple at Tiravalur (fig. 3l \s

Fra, 84.—Temple of Martund ; plan.

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also cites several others, one of which he calls Casydpa, In an epitome of the Ménasdra he states that the first chapter treats of the

; , ; —_——— | various measures in use in the country ; che second describes the 1 We are told by Ram Raz that many treatises on architecture, | sthapati, or architect—the sdtragrahi, or measurer, probably the some say sixty-four, existed in India. The coliection he calls the | surveyor or clerk of works, and then the various bnilders; while

Silpa Sdstra Of these he mentions that the most perfect is the | others treat of pillars, bases and pedestals, halls, 2nd the Vimana or Mdnasdra, of which forty-one chapters were in his possession. He ! temple itself.

Fria. 32.—Temple at Tanjore.

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gablets, and trefoiled arches may have strongly affected the architecture of the Saracens.

Of the style of North India Mr Fergusson gives remark- able, and by no ; means elegant, examples; is the Black Pagoda at Kannaruc, and temples at Ba- rolli and at Be- nares. The chief features are a sort of entrance porch,

sometimes walled and some- times carried on pillars, called the nuptial hall, leading into a great pagoda, square in plan, and finishing with a sort of tub-shaped dome.

INDIAN. |

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Fia, 85.—Temple at Pandrethan.

The ornamentation is profuse, so much

Fic, 36.—Ghoosla Ghat, Beuares.

so as to detract from the greatness of the design. There

Fic. 27. Shoemadoo Pagoda, Pegu. are no buildings in this style anterior to the Mahometan

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ECTURE 307

conquest The date assigned to the temple of Jugernath is 1198, and to the Black Pagoda, 1241 AD. The ghats, or landing – places (fig. 36), that line the banks of the rivers of Northern India, are often of great architectural merit. The pagoda forms a very prominent feature in the archi- tecture of Further India. A specimen of the Burmese style 7 of temples is pre- ~ sented in the Shoé- madoo (i.e., " golden great god") Pagoda of Pegu (figs. 37, 38).

quarter of plan.

ASSYRIAN ARCHITECTURE.

Assyria and Babylonia or Chaldea may be shortly defined as the countries watered by the Euphrates and Tigris, lying between Armenia and the Arabian desert, and reaching down to the Persian Gulf.

The capital, Ninus or Nineveh, was taken by the Medes under Cyaxares, and some 200 years after Xenophon passed over its site, then mere mounds of earth. It remained buried until 1845, when Botta and Layard discovered the ruins of the Assyrian cities. The principal remains are those of Khorsabad, 10 miles N.E. of Mosul; of Nimroud, supposed to be the ancient Calah; and of Kouyunjik, in all probability the ancient Nineveh. In these cities are found fragments of several great buildings which seem to have been palace-temples. They were constructed chiefly of sun-dried bricks, and all that remains of them is the lower part of the walls, decorated with sculpture and _paint- ings, portions of the pavements, a few indications of the elevation, and some interesting works connected with the drainage, de.

The structures were built usually on artificial mounds, and approached, it is supposed, by great flights of steps (of which remains composed of black basalt have been found at Khorsabad). They consist of series of halls and chambers of no great size, the largest hall in Sennacherib's palace at Kouyunjik being only 200 feet by 45 feet, where- as Westminster Hall is 268 feet by 68 feet. In their proportions they are utterly unlike Egyptian structures, and they display the striking peculiarity of being elongated beyond anything known in other styles of architecture ; e.g., one of the Kouyunjik halls is 122 feet long by 27 wide, another is 218 feet long by 25 wide. The great hall at Nimroud, though 162 feet by 62, was divided lengthwise in the centre by a wall 12 feet thick, leaving each side only 25 feet wide. Another peculiarity of these struc- tures is the immense thickness of the walls. Those of the Kouyunjik hall (27 feet wide) were 15 feet thick, and those of Nimroud (32 feet wide) were 26 feet thick. It has, indeed, been reckoned by Mr Fergusson, that in some of the palaces the area of the walls is as great as that of the chambers. The reason he suggests for this is that these thick walls supported a double row of columns as a clerestory under the roof, so arranged as to give light and air, while excluding the rays of the sun. He covers the halls with flat roofs, supported on columns, which being of wood have rotted or been burnt. An entirely different theory is that of M. Flandin, who studied the sub- ject on the spot. He believes that the halls were vaulted

and had small windows at the springing. M. Victor Place has found at Khorsabad several vaults, and also terra cotta tubes, through which he believes that the vaults were lighted, just as domes were in Persia. in later times. But no vault has been found large enough to span any of the wide Assyrian halls. Of their elevations there are few traces remaining. At Nimroud, what is supposed to be the tomb of Sardanapalus has its lower part, which is about 20 feet high, of solid masonry, and the rest of burnt bricks. It has slightly projecting piers, but no ornaments or mouldings. At Khorsabad and the S.E. palace of Nimroud there is some attempt at decoration, by rude semi-columns, without capitals or bases, arranged in clusters of seven, side by side, the groups being separated by recesses. A few detached pieces of moulding have been found at Khorsabad, but of the very simplest kind, and we have no vestiges of capital or entablature. Were our knowledge limited to these and a few similar remains, we should have to form but a poor idea of Assyrian art. But the sculptures have revealed to us a degree of refine- ment which had been previously looked for only in Greece. These sculptures lined the sides of the halls to a height of 10 feet. In them we see columns with both base and capital, and surmounted by entablatures. Sometimes the columns are combined with pilasters, as in the Greek por- ticos in antis. In one specimen the columns were carried on the backs of bulls, as is shown by one of the bas-reliefs, and, more conclusively still, by the beautiful small model of a winged buil brought to England by Mr George Smith, which has carved upon its back a base, just as is shown on the slabs.

In these bas-reliefs we have further—1l. The facade of a palace, having at top a grand row of window openings divided by Ionic columns; 2. A small building on the banks of a river, having two columns with bases and a kind of Ionic capital, between two plain pilasters, and with rude indications of a cornice; 3. Another facade of two columns, with bases, and Corinthian capitals, between two pilasters, likewise with capitals. Over these is an entablature, some- what rudely worked, but clearly showing architrave, frieze, and cornice, and antefixee over. The latest of these slabs must have been carved many years before the earliest date assigned to any known Greek work. In view of these and similar remains the following words of Niebuhr are memor- able :— There is a want in Grecian art which no man living can supply. There is not enough in Egypt to account for the peculiar

art and mythology of Greece. But those who live after me will see on the banks of the Tigris and Euphrates the origin of Grecian mythology and art.”

The plans of all the Assyrian buildings are rectangular, and we know that long ago, as now, the Eastern architects used this outline almost invariably, and upon it reared some of the most lovely and varied forms ever devised. They gather over the angles by graceful curves, and on the basis of an ordinary square hall carry up a minaret or a dome, an octagon or a circle. That this was sometimes done in Assyria is shown by the sculptures. Slabs from Kouyunjik show domes of varied form, and tower-like structures, each rising from a square base. The resemblance between the ancient form of the dome and those still used in the Assyrian villages is very striking. Whether sloping roofs were used is uncertain. Mr Bonomi believes that they were, and a few sculptures seem to support his view. Of the private houses nothing, of course, remains; but they are repre- sented on the slabs as being of several stories in height, the ground floor as usual having only a door and no windows. All have flat roofs, and we gather from one of the bas-reliefs, which represents a town on fire, that these roofs were made, just as they now are, with thick layers

of earth on strong beams. These roofs are well-nigh fire proof, and the flames are represented as stopped by them, and coming out of the windows. No remains of a window, or, so far as we are aware, of an internal staircase, have been found.

Of the fortifications we know much more. In the north wall of Nimroud fifty-eight towers have been traced, and at Kouyunjik there are large remains of three walls, the lower part being of stone, and the upper of sun-dried bricks. At Khorsabad there are the remains of a wall, still 40 feet high, built of blocks of stone 3 to 4 feet thick, and the evi- dences wanting as to the finishing of these is completely sup- plied by the sculptures, which show an extraordinary resem- blance to medieval works of the same class. Tier upon tier of walls are represented, enclosing a great tower or keep in the centre.

The entrances are great arched gateways flanked by square towers. These and the other towers have overhanging parapets just like the medisval machi- colations, and are finished at top with battlements, remains of which have been found at Nimroud and Kouyunjik, and at Kalch Shergat, the supposed capital of Assyria before Nineveh.

Of temples distinct from the palace we have a few sup- posed remains, but little is absolutely known as to their general form.

But in Chaldea there are some enormous masses of ruins, evidently remains of the vast mounds which formed the substructure of their temples. The grandest of all these and the most interesting is the Birs Nimroud, near Babylon, which has been identified as the temple of the Seven Spheres at Borsippa. This was reconstructed by Nebuchadnezzar, as appears by a well-known inscription. Another example is at Mugeyer, which was 198 feet by 133 feet at the base, and is even now 70 feet high, and it is clear that both it and the Birs were built with diniinish- ing stages, presenting a series of grand platforms, decreas- ing in length as they ascended, and leaving a comparatively small one at top for the temple cell. This has been found, it is supposed, at the Birs Nimroud, of vitrified brick.

The most interesting parts of the Assyrian edifices are the finishings. The pavements were sometimes of sun-dried bricks, at other times of baked bricks, or of alabaster slabs laid in bitumen. At Khorsabad there was one in a single block 13 feet square, and 3 ft. 11 in. thick, and at the Nim- roud temple there were two slabs, one 19 ft. 6 in. by 12 feet, and the other 21 feet by 16 feet, and 1 ft. 1 in. thick, both sides covered with inscriptions. Of ornamental pavements there are admirable examples from Kouyunjik at the British Museum, and from Khorsabad at the Louvre, both covered with delicate carving in alabaster of nearly the same pattern. Tt is difficult to conceive how such delicate work could have been used as paving, and still retain its beautiful sharpness; for it was not filled in to protect the pattern. Directly above the pavement came the sculptured slabs, which are so numerous that at Kouyunjik alone there are some 2 miles in length of them. They are generally about 10 feet high from the ground, and are carved in alabaster. Many of them show traces of having been decorated with colours. Connected with these sculptures were the great winged animals which stand

one on each side of the portals of the palaces, Some of the grandest have the body and legs of a bull, with an enormous pair of wings projecting from the shoulders, high over their backs, and covering the breast. They have human heads, bull's ears with large ear-rings, and horns, winding from the brows upwards, and encircl- ing a coronet of leaves, bound by a fillet of roses. They stood in pairs on each side of the palace doorways, and it is thought by some that generally there were no doors or lintels, all being open to the roof and enclosed with curtains. But doors were sometimes used, as the places or

recesses for the bolts, hinges, pins, or sockets have been found; and Mr Smith has discovered a doorway with its actual lintel, now in the British Museum.

Above the sculptured slabs decorations have been found of various kinds. The most lasting seem to have been of baked bricks richly coloured and glazed. At the city gate of Khorsabad blue glazed tiles with yellow reliefs have been found. Victor Place found also that the lower part of the walls near the gate were faced with coloured enamelled bricks, having human figures, lions, &c., within an ornamental border. The arch over the gateway was also richly decorated with glazed tiles. Large remains of coloured decoration in plaster have also been found at Nimroud, de. They were of figures outlined in black on a blue ground, and below the outer coat of plaster more extensive decora- tions have been found on an earlier coat. They were of various colours on a pale yellow ground. In other cases they had merely a black outline and were uncoloured. Now the difference of age between the several structures is some centuries, and it is curious to find that the earliest art works, viz., those in the N.W. palace, are the best in point of variety of detail and ornament, in severity of style and purity of outline. The later have extreme delicacy and minuteness, truth to nature and vigour of treatment, particularly in the animals, but they want, in the opinion of Mr Layard, the vigour of the old decorations. Of exter- nal decorations we have a striking account in the inscrip- tion relating to the Birs Nimroud, in which the several stages are described as being coloured as follows:—the lowest, black; the others in succession, orange, red, yellow,

green, and blue. This vivid colouring may be explained by a discovery made by Mr Loftus at Warka of a wall which

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was richly decorated in geometrical patterns by means of small earthenware cones, the wide ends outwards and en-

Fic. 40.—Terra-Cotta Cone, reduced by one-seventh.

amelled in different colours; also by Victor Place's dis- covery at Khorsabad of four stages of a temple coloured in succession white, black, red, and blue.

In the Assyrian and Chaldean buildings little use was made of marble, granite, or stone, the greater part of the edifices being built with bricks,—the lower parts with burnt bricks put together with bitumen, and the rest with crude bricks and slime. Sometimes the walls were faced with burnt bricks. One wall has been found with 10 feet in thick- ness of burnt brick facing, and 28 feet of crude bricking,

_In Assyrian art generally there is little analogy to that of

1 Figs. 39, 40, and 41 are from Loftus's Chaldwa and Susiana, by the kind permission of Messrs Nisbet, the publishers.

| orange, silver, and the innermost gilt. been discovered at Warka (see above), it is possible that

Egypt. There is some slight resemblance in the mouldings and in a few of the ornaments, but in Assyria there are no forests of columns, nu grand pylons, no enormous cloistered court, and nothing to equal the gigantic pyramids or tombs of Egypt. The sphinx is superseded by the winged bull, and the slightly cut intaglio by the magnificently sculptured slab. In these early Assyrian structures there is art at a high stage of perfection, but we have no means of discover- ing the steps by which it was attained.

PerRsIAN ARCHITECTURE.

Persia was one of the greatest of ancient nations. At one time it embraced all Upper Asia, and Asia Minor, Pheenicia, Egypt, Thrace, and Macedonia, and though the greatness of its glory has departed, it was still a great living nation even in the 18th century when its king Nadir Shah invaded India. Compared thus with Egypt, Assyria, and Babylonia, long since extinct, it has had a wonderful existence, reaching down from Cyrus to our own time.

We know little of its early history. It cannot be doubted, that long before the rise of the Persian power, mighty kingdoms existed in these regions, and particularly in the eastern part of Bactria, yet of those kingdoms we have by no means a consistent or chronological history-— nothing but a few fragments. It is probable that from dynasties which ruled in Media properly so called, imme- diately previous to the Persians, the style of architecture may have been in some measure derived, though indeed we know of no remains of earlier date than those which are properly called Persian.

Of the early times of the empire no authentic remains Tomb of exist, except those of the tomb of its founder, Cyrus, at Cyrus Murgab or Pasargade (east of the head of the Persian Gulf), and some of the walls, &c., of the ancient capital, Ecbatana, in North Media. The former is still in a wonderful state of preservation, but it can scarcely be reckoned amongst Persian edifices, as it is clearly a work designed by some architect from a Greek colony of Asia Minor. The tomb stands on seven bold steps of white marble, the lowest being 43 feet by 37 feet. The tomb itself is 21 feet by 16 ft. 5 in. outside, with bold mouldings to the door; it has a sloping roof of marble, with a pediment at each end, enriched with mouldings. The chamber itself is only 7 feet by 10, the walls being built up with thick blocks of marble. Near the tomb was the famous inscription, "I am Cyrus the king, the Achemenian," and though

this is now wanting, recent discoveries seem to have disinterred the stone which had borne it, and which had been torn away. Round the tomb outside had evidently been a colonnade of 24 columns, fragments of which, with the bases, alone remain. They resemble those commonly used by the Greeks. This sin- gular structure seems to have been unique in Persia. It is evidently the work of a foreigner, although the outline may represent, as is supposed, a temple. The famous walls of Ecbatana, the ancient capital, are said to have been 75 Remains at feet broad and 105 high, its stones 9 feet by 4 ft. 6 in., and Ecbatana. its gateways 100 feet high and 60 wide. The remains, how- ever, show walls only 12 feet wide, stones only 2 feet by 1 ft. 2 in., and a gateway only 12 feet high and 10 feet wide. They deserve particular mention on account of their being among the earliest examples of constructive colouring on a grand scale. The walls are said to have been seven in number, one over the other on the sides of a conical hill, and coloured in succession, white, black, scarlet, blue, From what has

this gorgeous description may have been founded on fact ;

and we know that the Easterns in early times were pro-

fuse in their employment of glazed coloured bricks.

Buildings at Perse- polis.

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Of the domestic structures of the same early time we have no remains, but it would appear that the grander buildings had courts, surrounded by colonnades, somewhat in the Egyptian style, the columns and beams being of wood, coloured, and sometimes gilt, or coated with metal. Above was a sloping roof. We learn particularly from this that the Persian or Median architects were thoroughly well used to a wooden construction.

Some 50 years after Cyrus, the chief buildings at Perse- polis and Susa were constructed ; large portions still remain, and form some of the grandest ruins in existence. Of these we have measured drawings worked out by Messrs Texier and Flandin, from which we derive the chief part of our knowledge, although we have very interesting accounts by Sir R. K.

Porter, Mr Rich, Mr Morier, Mr Loftus, &c. The existing buildings at Persepolis occupy a remarkable position on an elevated platform (partly, it would seem, artificial) at the foot of a steep rock in the face of which were cut out the tomb chambers of the Persian kings. The platform was 1425 feet on the west side, and 926 feet on the north, about the size of the Horticultural Gardens in Lon- don, including the areades and conservatory. It was raised about 40 feet above the level of the adjoining country, and faced with a wall, built with stones of an immense size. The platform was approached by the grandest flight of steps in the world, each step being 22 feet long. Having scaled these, the stranger would pass through the first building, viz., the Propyleum of Xerxes, a building whose remains have given rise to several theories as to its original plan and purpose. There remain two grand gateways 24 feet apart, with portions, more or less perfect, between these, of four columns 45 feet high. The gateways had openings of 13 feet, and each of their piers was partly composed of bulls, admirably executed, and strikingly like the Assyrian sculptures at the Louvre from Khorsabad. The human heads of these animals are crowned with coronets of leaves, and from the top of the coronets to the hoofs, the animal measures 19 feet. Nothing further has been discovered which would throw light on the general plan of the building. Mr Fergusson believes that it was enclosed and roofed, and served as a justice hall, or place of assembly at the entrance of the palace. M. Flandin's idea is, that the structure was a mere open portico roofed, but without walls, except perhaps for a few feet in height. Through this structure was the entrance to the grand palace, the Chehil Minar, «e., hall of 40 columns, an Eastern mode of expressing a great many, as there were really 72. It was approached by a magnifi- cent staircase, each step of which served as a pedestal to a figure (1 ft. 9 in. high) in bas-relief, the whole representing a procession, and of great value as giving the varied costumes, é&c., of the period. The columns of the palace are arranged in four divisions, viz., one of 36 columns in the centre, and thuee each of 12 columns in two rows, divided from the centre by a space of about 60 feet. Of all these only 10 are standing, but the bases of most remain, and the whole ground is covered with the ruins of the columns that have fallen. Their height varied from 60 feet (includ- ing capital and base) in the front division, to 67 ft. 4 in. in the centre one. In these columns there is an advance upon the architecture of Egypt, for they have bases, richly carved, and capitals of a form unknown to our art, before

or since. The typical form is that of the double-headed bull with a deep cavity between the heads, evidently in- tended to holda beam. There is a quaint grandeur about these columns, from their design and their gigantic size. The capitals of one division, the western, are 7 feet high, and 12 ft. 2in. wide, whilst the shafts, 54 ft. 10 in. high, are each composed of only four great marble blocks. Unfortunately we have only fragments of these buildings, with no history or tradition to guide us as to their perfect forms. There are no

ing, the hall of 100 columns, has also

walls, no doorways, and no roofs: Mr Fergusson in his restoration places walls between the several divisions, and thus forms them into one grand, enclosed structure, with a mass of columns in the centre, and three porticoes at the sides. He also believes that there was an upper story, to which, indeed, some Persian writers have alluded. Sir R. K. Porter's restoration, with that of Messrs Flandin, Coste, and Texier, is quite different. They believe that the four groups of columns were isolated and had no enclosing walls, but were simply screened by curtains ; that the centre divi- sion had a flat roof with an opening in the centre, protected by an awning, for light and ventilation ; that the roof, cor- nices, and superstructure of all kinds, were of wood, as no fragment of a stone cornice, lintel, or tile has been found.

Now it so happens that at Susa there was another great Remains at palace, similar, or nearly so, in size and plan to that at Susa.

Persepolis, and with an inscription showing it to have been built by Artaxerxes Mnemon, son of Xerxes. The height of the columns is unknown, but the capitals and bases correspond closely with those at Persepolis. The capitals have singular volutes under the double bull's heads, the whole being 28 feet high, the capitals alone being thus as high as the columns and bases together of St Martin's, Lon- don. Mr Loftus examined this struc- ture carefully, and satisfied himself that no walls had ever existed. In addition to

this an ancient drain has been found at Persepolis, in the very line which one of the main walls must have occupied. Mr Loftus therefore agrees with Sir R. K. Porter and the others in their restoration. The de- scription in Esther i. 6, has been sup- posed to refer to this palace. Two other structures at Persepolis were really enclosed—viz., the palaces of Darius and Xerxes. Each has the four divisions of columns, as at the Chehil Minar and Susa; but the jambs to the doors and other por- tions of the enclosure still remain. These were clearly places for habita- tion. A still larger enclosed build-

Fic. 41. —Compound Capital and Base of

left gigantic fragments. The size Column at Susa.

and arrangement are unknown ; but it must have been about 225 feet square, and enclosed by walls, some of the doorways and blank windows of which remain. The excavated tombs of the kings, high up in the face of the mountain, just as described by Diodorus, are the only other important remains of ancient Persia.

To sum up as to our knowledge of Persian art, the greater part of the remains are columnar, not an edifice is built on the Assyrian plan, and there is little to remind us of Assyria except the human headed bull. The doors and windows somewhat resemble those of Egypt. They have the same plain architrave, the large roll, cavetto, and fillet at top. But the sides of the portals are straight; there are no massive pylons, and the whole character of the columns, bases, and capitals is utterly unlike any known remains of Egyptian or Assyrian art. By what stages the Persian architects arrived at the singular work at Persepolis and Susa we cannot now judge. All we know is that Persian art was developed contemporaneously with that of Greece, though with utterly different results. The elegant form of the Greek temples, the curve of the Assyrian arch, would seem to have been unknown to the Persians, who, it appears likely, worked out their latest forms by gradual

GRECIAN. |

stages, from the early structures of wood, and thus ori- ginated a style, grand, picturesque, and in its ruins beauti- ful, but well-nigh isolated in the

history of art, there being nothing from which it was quite copied, and nothing which seems quite to have sprung from it.

The few remains which exist of a later date are sepa- rated from the above as widely in architectural forms as in chronology. Neither the Greek Seleucid nor the Par- thian Arsacide have left any buildings (of importance at least) which can be identified ; and the well-known edifices at Scrbistan, Firouzabad, and Ctesiphon, are latc in the time of the Sassanide. The two former edifices have domes rising from square bases and lighted by small aper- tures, as Victor Place suggests was the case at Khorsabad, and each is approached, as was the Khorsabad palace, through a deep vaulted entrance. At Ctesiphon this vault is 115 feet deep, 72 wide, and 85 high. Of the famous palace at Dastagcod (Artemita), 60 miles north of Ctesi- phon, described by the Byzantine writer, Theophanes, no remains are known to exist; but Dr Tristram has dis- covered at Mashita, in the land of Moab, a palace with its enclosing walls, richly decorated with carving, &c., which Mr Ferguson considers to have been built by Chosroes shortly before the Arab invasion. The edifice is minutely described and illustrated in Tristram's Land of Moab.

ARCHITECTURE OF ASIA MrNnor.

Little was known of the antiquitics of Asia Minor until, in 1838 and 1840, Sir C. Fellows discovered in its north- western corner eleven ruined and desertcd cities. It was reasonable to think that in these we should have the miss- ing link between Assyrian and Greek art. But although a few of the sculptures show traces of Assyrian influence, and though the later structures are very similar to those of Greece, ths productions of native art seem quite isolated and peculiar. The most ancient remaius are considcrably later than such masterpieces of skill as the tomb of Aga- memnon at Mycenz, and the great works of later times were erected long after the Parthenon.

The earliest works remaining are singularly like the Etruscan graves so often found in Italy. Perhaps the first of these is the tomb at Tantalais near Smyrna, which has simply a square chamber, ceiled with a pointed arch, formed with oversailing courses, and all covered with a tumulus. Like to it is the tomb of Alyattes, king of Lydia, on the bank of the Hermus, near

Sardis. It has also one chamber, 11 feet by 8, and 7 feet high, in the centre of a circular pyramid, not sloping directly from the ground, as in Egypt, but having a high moulded stereobatc, at the starting, some # mile round. This structure would create no surprise if found in Tuscany; and still more to increase the resemblance to Etruscan work, it appears to have been surmounted by five stone pillars. Of the tombs which belong to the races between the above and the time when Greek art was introduced or was invented, the rudest are, perhaps, to be found in Caria. They are sarcophagi, and those at Olinda, eg., are of enormous size, ranged on each side of the street leading to the city. In the simplest form a cavity was made in a great stone for the body, and a heavy lid put over it, coped, or rising as a pediment in centre. Generally they were plain and oblong in shape. In Lycia, chiefly on the banks of the Xanthus, are found other sepulchres of remarkably singular form. We look in vain for their prototypes, or anything copied from them. The most simple are cut in the steep rocks which invariably overhang the cities, and are often curiously like Elizabethan windows, with mullions and panels. Some have a Gothic shaped top, which is also peculiar to Lycia, and many are finished with a pediment. Many of

them show evident traces of having been copied in stone from wooden originals. For they are shown with joints put together with dovetails and pins, and with cornices like the ends of round trees; not actually so constructed, but all carved out of one solid mass. The designs of thesc rock-cut tombs were then still further elaborated in the detached monuments. The earlier ones, indeed, are much more simple, and are known as the obelisk tombs, being merely great high blocks of stone or marble, standing on a square base and surmounted by a cornice. They have not the real obelisk form, and have got the name merely on account of their height. In the grander works, the obelisk is surmounted by a sarcophagus of great size, coped with the pointed arch, with mullions and panels as above detailed, and all bearing signs of a wooden origin. Some are of enormous size, the stones weighing 50 to 80 tons. The different parts of the edifice were hollowed out for coffins, a plan of sepulture little known elsewhere.' These

singular tombs are found all through Lycia, but a beautiful variety of them, found only at Xanthus, has the ridge stone grooved to receive an ornamental crest, some- times richly sculptured. These singular structures are separated by a wide interval from the forms of Greek art ; but that their design was, to some extent, adopted and used by the Greeks, we have various signal proofs. The Harpy tomb, whose sculptures are in the British Museum, is supposed to have been erected so late even as after the capture of Xanthus by the Persians in 547. It has the

'chief Lycian peculiarities, a base 6 feet high, carrying a

square shaft 17 feet high in one block, weighing some 80 tons, and surmounted by a cap stone of 15 tons weight. Near the top, on each face, was carved the famous Harpy frieze. Near this was another, known as the Chimera tomb, having the Gothic headed sarcophagus, and with a sculptured crest. And near to this again, was another of a similar kind, called the Winged Horse tomb. Doubtless these and other works, both in Lycia and Caria, were wrought by Lycian workmen under Greek guidance, but they seem to have made no lasting impression upon the architecture of the Greeks.

GRECIAN ARCHITECTURE.

Hitherto, we have found that, in each country, the artistic forms used in the earliest periods descended to later times, which embodied to some extent the traditionary forms bequeathed to them. Even the Egyptian pyramids, unarchitectural as they are, were copied down to the 7th or 8th century in Nubia, and the earliest columnar architecture clearly shows itself as simply the beginning of a series of works extending from 2000 B.c. even to the Cesars. But in Greece the earliest works are entirely separated from the later by an absolute break both in architectural forms and construction. In various parts of Greece and of Italy, specimens of rude walling are found of such remote antiquity, that they are,as by common con- sent, referred to the fabulous ages, and, for want of a more distinctive term, are called Cyclopean. Now it appears, from the concurring evidence, in the opinion of most antiquaries, that a people who have been called Pelasgi, or sailors, migrated from Asia Minor, or the coast of Syria, at a very early period, and possessed themselves

‘of various countries, some of which were unoccupied, and

1 The following inscription, though belonging to Greek times, shows how this was done:—“ In the sarcophagus I buried Barilla my wife ; and I wish myself to be put into the sarcophagus, and nobody else. In the first compartment lying under it I wish my second wife and Polychromas my son to be buried; in the othcr are to be put my other children. Nobody else is to be put either into the sarcophagus or the compartments.”

others inhabited by Celtic tribes. Professor Heeren, who affixes dates to the various migrations, expressly says that the Pelasgi were of Asiatic origin. “ Their first arrival in the Peloponnesus was under Inachus, about 1800 B.c., and according to their own traditions,” he says, “ they made their first appearance in this quarter as uncultivated savages. They must, however, at an early period have made some progress towards civilisation, since the most ancient states, Argos and Sicyon, owed their origin to them; and to them, perhaps with great probability, are attributed the remains of those most ancient monuments generally termed Cyclopic.” He adds, that the Hellenes, a people of Asiatic origin also, expelled the Pelasgi from almost every part of Greece, about 300 years after their first occupation of it; the latter keeping their footing only in Arcadia and in the land of Dodona, whilst some of them migrated to Italy, and others to Crete and various islands. The arrival of the Egyptian and Pheenician colonies in Greece, Professor Heeren thinks, was between 1600 and 1400 B.c. Cyclopic walling is found at Tiryns, near Mycenex. It is is composed of huge ; ;

masses of rock roughly hewn and piled up to- gether, with the inter- stices at the angles filled up by small stones, but without mortar or ce- ment of any kind. The next species is in stones of various sizes also, shaped polygonally, and fitted with nicety one ‘ to another, but not laid

in courses, Specimens conti of this are found at Fia, 42.—Wall at Tiryns, Greece; from

Tulis and Delphi, as Waring's Stone Monuments. well as at the places already mentioned, in Greece, and in various parts of Italy, particularly at Cossa, a town of the Volsci. This also was constructed without mortar. The mode of building walls, which took the place of that, is not called Cyclopean ; it is in parallel courses of rect- angular stones, of unequal size, but of the same height. This was, however, often used in combination with the polygonal, as in one very beautiful specimen at Rham- nus. The parallel masonry is common in the Phocian cities, and in some parts of Boeotia and Argolis. To that succeeded the mode most common in, and which was chiefly confined to, Attica. It consists of horizontal courses of masonry, not always of the same height, but composed of rectangular stones.

The oldest existing structure in Greece of regular form is of far superior construction to the Cyclopean walling, and must be referred to early colo- nists. It is at Mycene, and consists of two sub- terranean chambers, one much larger than the other. The outer and larger one is circular, and is entered by a huge doorway at the end of a long avenue of colossal walls, built in nearly parallel courses of rect- angular stones, roughly hewn, however, and laid without

Fra. 43.—Treasury of Atreus, Mycene ; section. From Waring's Stone Monuments.

ARCHITECTURE

The most ancient specimen of

[GRECIAN—

mortar. Its external effect is that of an excavation, though the structure of the front is evident ; and inter- nally it assumes the form of an immense lime-kiln; its vertical section being of a conical form, with nearly para- bolic curves, like a pointed arch. The construction of this edifice was thought to afford clear evidence that the Greeks were acquainted with the properties of the arch; but in the most material point this was destroyed on finding that it consisted of parallel projecting courses of stone in horizontal layers, in the manner called by our workmen battering, or perhaps more correctly, cor- belling. It proves, however, that its architect understood the

principle of the arch in its horizontal position; for Mr Cockerell discovered, by excavations above it, that the diminishing rings of which the dome is composed were complete in themselves for withstanding outward pressure; the joints of the stones being partly wrought radiating, and partly rendered so by wedges of small stones driven tightly into them behind. The apex is formed, not by a key-stone, for the construction does not admit of that, but by a covering stone, which is merely laid on the course immediately below it. It may be added, that internally the lower projecting angles of the stones are worked off to follow the general outline. Though this is the largest and most perfect, its internal diemeter at the base being 48 ft. 6 in., and its height from the floor to the covering stone 45 feet, yet edifices exhibiting similar structure are found in many other places in Greece itself, in Egypt, in Sicily, and in Italy. They all, however, tend to prove, that the principle of the construction of the vertical arch was unknown at the time of their erection in all those countries; and their erection is evidently of the most remote antiquity. But neither could the mechanical powers have been unknown to their constructors. In the edifice which we have described, and which is thought by some to be the treasury of Atreus, or the tomb of © his son Agamemnon, mentioned by Pausanias as existing among the ruins of Mycene in his time, the inner lintel of the doorway is 27 feet in length, 16 feet deep, and nearly 4 feet thick, weighing, it is computed, up- wards of 130 tons; and the lintel of the Gate of the Lions in the Acropolis of the same city, is, from its immense magnitude, also strongly illustrative of the great mechanical skill of the people of those times.

As no nation has ever equalled the Egyptians in the extent and magnitude of their architectural monuments, neither have the Greeks been surpassed in the exquisite beauty of form and proportion, in the extreme simplicity and perfect harmony, which pervade every part of their structures. Unfortunately these monuments are known to us only by their ruins, for there is not a Grecian building remaining in a perfect state. In Greece proper, at least, this was not so until a comparatively recent date, viz., that of the war between the Venetians and Turks. The Par- thenon itself was nearly perfect until that time, when it was shattered by an explosion of gunpowder (1687).

First in importance in Grecian architecture is the use of the three orders, Doric, Ionic, and Corinthian, with the peculiar mouldings, &., connected with each. The Doric and Ionic columns, rudely drawn, appear on the early Etruscan or Greek vases. They are very slender, with large projecting capitals and with entablatures, which indicate pretty clearly copies from a construction of wood. Buildings, much as these, and all of wood, are described by Sir GC. Fellows as still being constructed in Lycia. That columns of wood were used in the ancient temples of Greece we know from such notices as we have, ¢.g., of an old wooden column which was preserved in the temple of Juno at Olympia, as having been one of those of a former temple. But a doubt ie thrown on the theory that in

Doric. |

these light wooden structures we see the origin of the orders, by the earliest stone columns known being the most massive and if we turn to Egypt, the mother of the arts and sciences, we shall find many things in some of the most ancient structures which may have furnished an idea of the Doric arrangements to the fertile imagination of the Greek. Allusion has already been made to the well-known facade at Beni Hassan, on the Nile, as giving us a very likely prototype of the Grecian Doric column.

Of the triglyph, the most distinguishing part of the Doric entablature, there are many indications in the early works of Upper Egypt; and in the structures of the Ptolemies they are still more evident, though it may be objected that in them the indications were borrowed from the Greeks after the Macedonian conquest. But it must be borne in mind that the Egyptian nation did not change its character, religion, or usages by the change of its governors; and the Egyptians were, through the whole period of their existence as a uation, an originating and not an imitative people ; whereas the Greeks seized on a beauty wherever they found one, and made it their own by improving it. To the question, why the Grecks cannot be allowed to have originated that beautiful style of archi- tecture which they brought to the perfection it displays in their works, it may be sufficient to answer, that it would be against the common course of events if it were so. It is remarkable that, in Greece, the earliest specimen of columnar architecture that presents itself displays the chief characteristics which are found in

works of periods when learning and civilisation were at their acme in that country.

It will be convenient to give here at the outset a list of the principal Greek buildings.

Tabular List of Principal Greek Temples, &c.1

Cols.

Site of Temple, &c. a Bl 4| Order. S| 8 Bl ie IASEOBlesesss-ceeeeendedces 8/13\ Doric …... Peripteral Goninth <2: «css ceseecemeees OX schason Selinus (3d Temple) . : 6/14} Do. .....|Peripteral Do. T. of Jupiter | 8/16) Do. ..... Dipteral SYQEG 1G) coommnnrrosonancce ¢.600) [Minerva ...- 6]14| Do. ..... Peripteral SV RACUBG) Nesteccsesseese= e DOA ners 6/14] Do. .....| Do. DROIT) .ctisdasensccosee nee 500 SUpIFeH <...5- GITZO: toececl) DOs Peestum (Hypethral) 6/14; Do. .....! Do. JOE 9 opgecraas QUIS DO. as... Pscudodipteral| ; IDO. eesesoone 6/13] Do. .....|Peripterai Agrigentun .....66 NOM lccscescns Gila Don ee... Do. VOW, Necstessccoss Concord ..... L179 F:) a Yo Smee ee Be 1, ceseereccnee oat } Jupiter ..... 7/14] Do. ..... Engaged PAINT OTS ies es osnsicsaics saa 480 [/OnthelIlissus. 4)../Tonic ..... Amphiprostyle OOM Genstses:sacsscecee 470 |Victory ..... ee Oster ence Do. IOS ieresccnceses sss 460 |Theseum 6'13|Doric ..... Peripteral Do. (finished) ..... 438 {Parthenon ...| 817} Do. .....| Do. 12> eepagocenodocconne 435 |Propyleum…|...|...| Do. ..... Do. ae erik Jupiter …... Oe DE 2a Do. Basse (Phigalia) ....| 420 j|Apollo …..... 6/15] Do. .....{ Do. Brar.chide, Jonia…... se WD Osmwsssccecrs 10/21|Ionie …...|Dipteral Erechthcum (Athens)! 410 aes .J.-| Do. .....)lrregular PYieN€ ....seseeeeseeeees | 336 ©6|Minerva …... 6)... see 3 IEPGSUS) .00.00-cses-u20 336 {Diana …..... 8|20\Tonic …... Dipteral Ifalicarnassus …..... | 853 (Mausoleum …!...]...| Do. ....0 | Se a ee oe Corinthian

The Grecian Doric (Plates VIII., IX., X.)

Vitruvius gives several accounts of the origin of the Greek Doric order. He states first that " Dorus (the son of Hellenus and of the nymph Orseis), king of Achaia and of all the Peloponnesus, having formerly built a temple to

Juno in the ancient city of Argos, this temple was found by chance to be in that manner which we call Doric." In

1 The angle columns are counted each way.

another place he deduces the arrangements of the order from those of a primitivelog hut, settling with the utmost precision what, in the latter, suggested the various parts in the former. But he also tells us that the Doric column was modelled by the Grecian colonists in Asia Minor in the proportions of a human. figure, and was made six diameters in height, because a mau was found to be 6 times the length of his foot. But this story, even supposing it to be rational, does not coincide with the Greek Doric at all, but, if with anything, with the Roman.

In the Greek examples, this order may be divided into three parts, stylobate, column, and entablature (Plate VIII. fig. 4). The stylobate is from two-thirds to a whole diameter of the column in height, in three equal courses, which recede gradually the one above from the one below it, and on the floor or upper step the column rests. That graduation, it may be remarked, does not appear to have been made by the ancients to facilitate the access to the floor of the stoa or portico, but on the principle of the spreading footings of a wall, to give both real and apparent firm- ness to the structure, both of which it does in an eminent degree.

The column varies in height in different examples, from four diameters, as at Corinth, to six diameters, as at Sunium. Of this the capital, including the necking, is rather less than half a diameter: in those cases in which a necking does not exist, the capital itself occupies nearly the same proportion (Plate VIII. figs. 4 and 9; Plate IX. fig. 4). The shaft diminishes in a slightly curved line, called an entasis, froin its base or inferior diameter upwards to the hypotrachelium, where the diameter is from two-thirds to four-fifths of that at the base. It is the in- ferior diameter that is always intended when the term is used as a measure of proportion. The capital consists of a necking, an echinus or ovolo, and an abacus; the

necking is about onc-fifth of the height of the capital, and the other two members equally divide the remaining four- fifths ; when there is no necking, the ovolo occupies the greater proportion of the whole height. The abacus is a square tablet, whose sides are rather more than the inferior diameter of the column. The corbelling of the ovolo adapts it to both the diminished head of the shaft and the extended abacus, flowing into the one, and forming a bed for the other by means of a graceful cyma-reversa ; but its lower part is encircled by three or four rings or annulets, which are variously formed in different examples, and which give the echinus form to the great moulding, although it is, as we have said, part of a cyma-reversa. (Figs. 6 and 7 of Plates VIII. and IX.) The shaft is divided generally into twenty flutes ; but there are several examples with sixteen, and there is one with twenty-four. The flutes are sometimes segments of circles, sometimes semi-ellipscs, and sometimes eccentric curves (Plate VIII. fig. 12; Plate IX. figs. 8, 14.) They always meet in an arris or edge, and follow the entasis and diminution of the column up through the hypotrachelium to the annulets, under which they finish, sometimes with a straight and sometimes with a curved head. At the base they detail on the pavement or floor of the stylobate. In one ex- ample at Segesta the columns are not fluted at all, and in two others, at Cnidus and Delos, the flutes are marked at top and bottom only, but in these examples the columns were possibly not finished.

The third part of the order, the entablature, ranges in various examples from one diameter and three-quarters to rather more than two diameters in height, of which about four-fifths is nearly equally divided between the architrave aud frieze, while the cornice occupies the remaining one- fifth : this is in some cases exactly the distribution of the entablature. (See Plate VIII. fig. 5; Plate IX. fig. 5.)

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The architrave is in one broad face, four-fifths, and sometimes five-sixths of its whole height; and the remain- ing fifth or sixth is given to a projecting continuous fillet called the tenia, which occupies one-half the space, and a regula or small lintel attached to it, in lengths equal to the breadth of the triglyphs above in the frieze. From the regule six small cylindrical drops, called guttz, depend. There are examples to the contrary, but it may be

taken as a general rule, that the architrave is not in the same vertical line with the upper face of the shaft, or its circumferential line, at the superior diameter, but is projected nearly so much as to impend the line or face of the column at the base. In one example only is the architrave known to be sculptured, viz., at Assos, where it has bas-reliefs of bulls fighting. The frieze, vertically, is plain about six-sevenths of its whole height, and is bounded above by a fascia, slightly projecting from it,which occupies the remaining seventh. Horizontally, however, it is divided into triglyphs and metopes, which regulate the intercolumniations; the former being nearly a semidiameter in width, and the latter (the space interposed between two triglyphs) generally an exact square, its breadth being equal to the whole height of the frieze, including the fascia. This latter breaks round the triglyphs horizontally, and is a little increased in depth onthem. These metopes are shown on the vases to be holes between the ends of beams, and that the metopes were, at one time, open, seems to be proved by a passage in Euripides, who lived during the construction of the Parthenon. No example, how- ever, early or late, remains to support this view. Each glyph, of which there are two whole ones and two halves to every tablet, is one-fifth of the width of the whole, and the interglyphs are each one-seventh of the whole tablet or triglyph. The glyphs detail on the tenia of the architrave, but are variously finished above. In some examples they are nearly square-headed, with the angles rounded off; in others the heads are regular curves, from a fiat segment: to a semi-ellipse. The semiglyphs are finished above in a manner peculiar to themselves, with a turn or drop; but hardly two examples correspond in that particular. The tablets in which the glyphs are cut are vertical to the face of the architrave, the metopes recede from them like sunk panels; these are often charged with sculptures, and indeed almost appear contrived to receive them. The third and crowning part of the entablature, the cornice, in what may be considered the best examples, projects from the face of the triglyphs and architrave about its own height. Vertically, it is divided into four equal parts, one of which is given to a square projecting fillet at the top, with a small congeries of mouldings, different, and differently proportioned to each other, in various examples. Two other parts are given to the corona, and the remaining fourth to a narrow sunk face below it, with the mutules and their gutte. These latter form the soffit or planceer of the cornice, which is not horizontal or at right angles to the vertical face of the entablature generally, but is cut up inwards

at an angle of about 80°. The width of the mutules themselves is regulated by that of the triglyphs over which they are placed, to which it is exactly equal. They are ornamented each with three rows of six small cylinders, similar to those which depend from the regule under the triglyphs and on the architrave. There is twice the number of mutules that there is of triglyphs, one of the former being placed over every metope also in the manner the examples indicate.

This completes the Greek Doric order according to the generally received sense of the term; but there are other parts necessary to it. In the front or on the ends ofa temple, or over a portico, a pediment is placed (Plate IX. fig. 1), Its intention is to enclose the ends of the roof, but

it forms no less a part of the architectural composition. In reason, it should be raiscd as much as the roof required ; but when the span is great that would be unsightly ; and reference appears to have been made to the common standard of proportion, as the pediments of most Doric temples are found to be about one diameter and a half in height at the apex of the tympanum, which in a hexastyle arrangement makes an angle at the base of about 14°, and in an octastyle about 12}°. The pediment is covered by the cornice, without its mutules, rising from the point of its crowning fillet, so that no part of it is repeated in pro file. Another moulding, however, is superimposed : some- times this is an ovolo with a fillet over it, and sometimes a cymatium. It varies much in its proportion to the cornice, but in the best examples it is about one-half the depth of the latter without its mutules. Ornaments of various kinds, statues or foliage, are. believed to have been placed on the apices and at thefeet of pediments as acroteria. Of these, however, we have the remains of one only (a very beautiful one), viz, at /igina; but indications of the plinths or blocks which may have re- ceived them exist, and such things appear represented on ancient coins and medallions. The tympana of pediments are well known as receptacles of ornamental sculpture. On the flank of a Doric temple, the cornice supported a row of ornamented tiles called antefixe. These formed a rich and appropriate ornament, but they rather belonged to the roof than to the

columnar arrangement or order. The antefixee covered the ends of the joint-tiles as the pediments did those of the roofs; and corresponding ornaments called stelai rose out of the apices of the joint- tiles, forming a highly enriched ridge (see Plate VIII. fie. 1).

A secondary Doric order arises in the disposition of a Grecian temple, from the columns of the pronaos and the inner part of the external entablature continued and repeated, Of this the frieze is generally without triglyphs, though there may be regule and gutte on the architrave. The fascia of the frieze is either moulded or enriched on the face ; and, instead of a cornice, the beams of the ceiling are laid at equal intervals to support sunk panels or coffers, in which there may be flowers or other enrichments (Plate VIII. fig. 8).

Propriety in the composition and arrangement of ante is as necessary to the perfection of the Doric order as to that of the columnar ordinance itself, especially if the latter be in antis. Slight projections are made on the end and side faces of a wall, so as to form a species of pilaster, whose front shall be nearly equal to the diameter of the columns to which it is attached, exactly equal indeed to the soffit of the entablature, whose faces have been described as impending the circumferential line of the column at a little above its base. This rests on the stylobate in the same manner as the columns do, with sometimes a small continuous moulding as a base ; andits capital is a congeries of mouldings, about the depth of the abacus, with a plain fascia corresponding to the ovolo of the columnar capital. The entablature of the order to which it is attached rests on it, and, continuing along the flank of the building, is received by a similar combination at the otherend. These, it may be remarked, were seldom diminished or fluted, an example at Pzestum being about the only exception. Being projections from and upon the euds and faces of walls, they could not be diminished without involving an absur- dity, and fluting on a straight surface must be productive of monotony, as the flutes can only project aseries of equal and parallel shadows. Not so, however, with columns, on whose rotund surface fiuting produces a beautiful variety of light and shade in all their gradations, which it could not possess without that enrichment; for on a plain

column neither are the lights so bright nor the shadows so dark as in the former case, nor are they so finely diffused over the whole surface in the one as in the other.

In the Parthenon the ante, as well as the columns, are without bases. In all other examples the base line of the ante is marked by a few small mouldings. In the only ex- ample which occurs in the ancient architectural remains of attached Doric columus—that of the pseudo-peripteral temple of Jupiter Olympius at Agrigentum—the stylobate is peculiarly arranged. The upper gradus is grooved, and detailed round the columns and along the walls be- tween them; and a congeries of vertically arranged mould- ings and fillets rests on it, and receives the base of the column.

As before stated, the earliest cxamples of columns are the heaviest; they are also the most tapering, and there are some other details which help us in identifying the date of a Doric edifice in Greece proper. The hypotrache- lium in early examples, as at Corinth, has three grooves ; in later, as the Parthenon, only one. The contour also of the chief member, the echinus, varied at different dates. In the earliest it was full and round, as at Corinth, and at Assos (the latter having the greatest curve of any known example); sometimes possibly, as at Segesta, struck with the compass, but almost always part of a conic section (parabola). In later times it became less curved, and in the finest examples almost flat, as in the Propyleum and Par- thenon, but still forming part of a very delicate curve (hyper- bola). In one case, at Selinus, where, to an inexperienced eye, the whole temple would appear to be of the same date, the differences alluded to contrast very strongly with each other. In the very late times of Greek work, when art became debased, the coarse round form of earlier work is exhibited, as in the Agora. The width of the abacus in early examples, as Corinth, is as much as two-sevenths the height of the shaft and cap. In later examples it dinu- nishes to one-fifth. And as the column, so the entabla- ture was nore massive in the early examples, except in the colonies, where the old proportions continued to a late period. At Pestum the proportion of entablature to column is as 1 to 2-4; A®gina, 1 to 2°53 ; Theseum, 1 to 3 nearly.

Such are the materials of which the Greeks composed those beautiful temples, whose peculiar effect and character arise from their simplicity and harmony. These qualities are visible in the long unbroken lines which bound their forms, and the breadth, boldness, and fitness of every part. The entablature, though massive, is fully upborne by the columns, whose spreading abaci receive it, and transmit the weight downwards by the shafts, which rest on a horizontal and spreading basement,—the magnitude of every part, as before remarked, being determined by the capacity of the sustaining power. Besides graceful and elegant outline, and simple and harmonious forms, these structures exhibit a wonderful variety of light and shade, arising from the judicious contour and arrangement of mouldings, every one of which is rendered expressive. The effect is heightened by the fluting of the columns and the peculiar form of the columnar capital, with its broad square abacus, which pro- jects a deep shadow on the bold ovolo. The play of light aud shade about the insulated columns is strongly modified by the deep shadows on the walls béhind them; and in front, where the inner columns appear, the effect is enchanting. For all the higher effects which architecture is capable of producing, a Greek peripteral temple of the Doric order is perhaps unrivalled.

The Grecran Ione (Plate XI.)

Of this beautiful and graceful order it is as difficult to determine the origin as of the Doric. The explanation of

Vitruvius is that the Ionian colonists, on building a temple to Diana, wished to find some new manner that was beauti- ful. Following the method which they had pursued with the Doric (proportioning the column according to the dimen- sions of a man), they imparted to this the delicacy of the female figure—in the first place, by making the diameter of the column one-eighth of its height, then by putting a base to it in twisted cords, like the sandals of a woman, and forming the capital with volutes, like the hair which hangs on both sides of her face. To crown all, he says that they channelled or fluted the column to resemble the folds of female garments, by which it would

appear that Vitruvius did not know that the Greeks never executed the Doric order without fluting the columns. "Thus," he goes on to say, "they invented these two species of columns, imitating in the one the naked simplicity and dignity of a man, and in the other the delicacy and the ornaments of a woman."

From the recent discoveries in Assyria, however, there can be no reasonable doubt that the Greek colonists of Tonia at least obtained their idea of the Ionic capital from Nineveh. As to its earliest forms great differences of opinion exist. An extremely plausible theory, originated and ably worked out by Mr Skidmore, suggests that the delicate Ionic curls were copied from the curved ornamental wire-work of the goldsmiths. On the other hand, a recent French author has found in Sicily a rudely carved capital which is little more than a block of stone with the ends rounded off, the curve being continued, and thus forming a volute ; and it is very possible that a crude idea like this might have been worked out, with some help from Assyria, into one of the many forms of the Ionic capitals.

Of this graceful and elegant style we take the propor- tions and peculiarities from the perfect examples of the Athenian Acropolis. This order may also be considered in three similar parts, stylobate, column, and entablature.? The stylobate is in three receding equal courses or steps, whose united height is from four-fifths to one diameter. The column, consisting of base, shaft, and capital, is rather more than nine diameters in height ; of which the base is two-fifths of a diameter, and the capital, including the hypotrachelium, is in one case three-fourths, and in the other seven-eighths of a diameter high. As shown in the vases, it is invariably very long and slender, and without bases ; but no actual example remains to us without a base. The base consists of a congeries of mouldings extending gradually from a diameter and a third to a diameter and a half, and its height is in three nearly equal parts, two equal fillets separating them. The lowest, a torus, rests on the top of the stylobate or floor of the portico, a fillet divides that from the scotia, a second fillet intervenes between the scotia and a second torus, and a third fillet bases the apophyge or escape' of the shaft. The upper torus of the base is, in one example, fillet-fluted horizontally ; and in the other, the same member is euriched with the guillochos. The shaft diminishes with entasis from its lower or whole

diameter to above five-sixths of it immediately under the hypotrachelium. It is fluted with twenty-four flutes and alternating fillets, which follow the diminution and entasis of the column. The flutes in plan are nearly semi-ellipses, and they finish at both ends with the same curve ; a fillet is in thickness nearly one-fourth the width of a flute. The difference in the height of the capital is in the length of the necking, which in one case is separated from the head of the shaft by a carved bead, and in the other by a plain fillet. Above the necking, a height of about one-third of a diameter is occupied by a congeries of three spreading or corbelling mouldings—a bead, an

1 For explanation of terms see Plate IX. figs. 5 to 8, and glossary.

ovolo, and a torus—which are all appropriately carved. On these rests the parallelograinic block, on whose faces are the volutes, and whose ends are concayed into what is technically termed a bolster to connect them. This part is about one-third of a diameter in height, and includes a

rectilinear abacus, whose edges are moulded to an ovolo-

and carved with the egg and tongue ornament. The volutes are three-fifths of a diameter in depth, and extend in front to one diameter and a half; and they are nearly a semi- diameter apart. The volutes and the flowing lines which connect them are represented in figs. 5 and 9, Plate XI. The bolsters are fluted vertically with alternate fillets, on which are carved beads. An ornament composed of the honeysuckle with tendrils encircles the necking of the column It must be remarked, that as the capitals are parallelogramic, and present but two similar fronts, to preserve the appearance of volutes externally on all sides, the capitals of the columns at the external angles of porti- coes are differently arranged (compare.figs. 15 and 16). The outer volute is bent out at an angle of 45°, and volutes are put on the end or side-front of the capital also, the outer one being the other side of the angular volute of the front. To suit the angle internally, the two volutes of the inner face are placed at right angles to each other: this is, however, at best but an awkward expedient, and need not be employed when a portico projects only

one intercolumniation. All the Greek volutes are flat on the surface, except at Basse, where the volutes are curved.

The entablature, which is rather more than two diame- ters in height, is also divided into three parts,—architrave, frieze, and cornice,—-which may be proportioned by divid- ing the whole height into five parts, four of which, as in the Doric, may be again equally divided between the architrave and frieze. The cornice, however, in the example referred to, does not occupy one-fifth of the entablature ; but if it had a fillet over the upper moulding, which it appears to want, that would be just its proportion. If the archi- trave (fig. 8) be divided into nine parts, seven of them may be given to three equal fascias, which slightly project the one before the other , the first or lowest, which is ver- tical to the circumferential line of the inferior diameter, being covered by the second, and the second by the third. The remaining two-ninths form a band of mouldings cor- belling a broad fillet, which separates the architrave from the frieze; these mouldings are enriched. The frieze (fig. 7), which does not project quite so much as the lowest fascia of the architrave, is, in the Athenian examples, quite plain ; but it may be enriched with foliage, or made the re- ceptacle of sculpture in low relief. In two examples (one at Selinus, and another at Agrigentum) the frieze has the Doric triglyph, The cornice (fig. 6) projects from the face of the frieze rather more than as much as its whole height, and is composed of bed-mouldings, a corona, and crown-mouldings The first are a carved bead and carved cyma-reversa, the former of which only occupies a portion of the height of the cornice, as the planceer is cut up inwards, in the manner represented by dotted lines in the figure, to a sufficient depth for it ; the crown mouldings, which consist of a carved ovolo above a carved bead, are rather more than one-fourth of the whole cornice ; and the corona occupies the rest of its height, except that small portion given to the bead of the bed-mould. A fillet above the crown-mouldings, as already intimated, is cer- tainly necessary to complete the order and receive the antefixe, as described in the Doric, for the flank of a temple,

The pediments in the examples of Jonic are flatter than in those of the Doric, the angle made by the covering cornice with the base being, in a hexastyle, less than 14°. A vertical fillet, with a small moulding, equal in depth to

the two crown-mouldings of the cornice, covers them in the pediment, in the place of the cyma-recta or ovolo used in the Doric order. The intercolumniation differs in these examples; in the one it is two diameters, and in the other three diameters and one-sixth.

A inuch greater variety is found in the composition of the Ionic than of the Doric order. Indeed, the examples of the Athenian Acropolis alone have neckings.' In all the others the shaft runs up to the corbelled mouldings which bed the block of the volutes, and the flutes finish under them. Neither have they a torus in that congeries, but a bead and ovolo alone, the latter projecting inconveniently under the pendent lines that connect the volutes, and thus the capital is not more than half a diameter in height.

The Asiatic or the truly Jonian examples of this order are far inferior to those above referred to. Their bases are differently, and certainly lcss elegantly composed. They are without hypotrachelia, as may have been inferred ; they want the torus in the capital; and, in most cases, instead of flowing, pendent lincs, they have straight lines connecting the volutes. Their entablatures are not so finely proportioned, nor so delicately executed. The coronas want breadth, and the bed-moulds of the cornice are as much too heavy as those of Athens are perhaps too light. Indeed, upon the whole, they have more of the grossness of Roman architecture than of the delicacy and elegance of Grecian, though the Ionian examples are sup- posed to be the models of those of Athens. In the cele- brated temple of Diana at Ephesus the columns present an almost unique example of the lower parts being sculptured. Fine specimens of these are now in the British Museum. The only instance known of sculptured columns is at Narga in Nubia.

The width of the ante of the Ionic order is determined, as in the Doric, by the soffit of the entablature ; and it will, of course, be exactly the same as, or rather less than, the inferior diameter of the column. It is slightly raised, too, from the face of the wall at the ends of which it stands. The base of the ante is, in one of the two examples of the Acropolis, a little deeper than that of the column, having a small projecting moulding between the lower torus

and the floor ; and the lower torus itself is reeded. In the other example there is no difference in the form and pro- portion of the antz and columnar bases, but both the tori are fluted horizontally, with beaded fillets between the flutes. The ante cap consists of a congeries of corbelling mouldings, nearly one-third of a diameter in height. It is divided into three nearly equal parts, the lowest of which is composed of a bead and an ovolo ; the second of another bead and a cyma-reversa, all carved ; and the third of a plain flat cavetto, with a narrow fillet and small crowning cyma-reversa, forming an abacus (fig. 11.) The necking is like that of the capital, and is enriched in the same manner. The cap or cornice thus formed breaks round the projection of the ante, and is continued along the wall under the entablature the whole length of the building, or till it is impeded by some other construction ; and the base is continued in like manner. Attached columns have the voluted capital, but their base is that of the ante ; and it is detailed round them and along the wall to which they belong, as with the ante. -JIt must be remembered, however, that the attached columns in the triple temple are about one-ninth less in diameter than those which are insulated, though they are similar in other respects, and have the same entablature. .

a —Ee——— Ee

1 A curious example of the use of the beautiful necking ornament (as at the Erechtheum) occurs in the gigantic monument in Algeria, called the tomb of the Christian Lady, whose date is supposed to be the Ist century B.c. It is evidently a rude copy of some such original as the above. é

CORINTHIAN. |

The back of the triple temple, between the attached columns, presents one of the only two examples in Greek architecture of windows, the other being that of the temple of the Giants at Agrigeutum. These are rather more than twice their width in height, and are narrower at the top than at the bottom. They rest on a broad, bold sill, which is equal in depth to two-sixths of the opening, and are surrounded externally by a congeries of mouldings, which, with a plain fascia, constitute an archi- trave. This architrave is one-fourth the opening in width ; it diminishes with the window, and in the same proportion, and is returned above in two knees, which are made verti- cal to its extreme point at the base.

The Grecian Corinthian (Plate XII.)

The traditionary tale Vitruvius relates regarding the in- vention of the Corinthian capital (about Callimachus and the basket on the grave of the Corinthian virgin), is the ouly reason for the name it bears. His account of the origin of this third species of columnar composition is even more absurd than what he gives of the other orders. He says that it-was arranged 'to represent the delicacy of a young girl whose age renders her figure more pleasing and more susceptible of ornaments which may enhance her natural beauty." With much more reason might the Doric be called the Corinthian order ; for, as previously stated, the oldest existing example of that style is at Corinth ; whereas there is nothing, either in ruins or authentic records, to prove that the latter was ever known in that city. Columns with foliated capitals are not of very early date in Greece ; earlier examples exist in Asia Minor, and foliage adorns the capitals of columns in some of the Pharaonic monu- ments of Egypt. In the Assyrian sculptures, however, the Corinthian capital is clearly shown. 'The interior of the temple of Apollo Didymeus, at Miletus in Ionia, exhibits the earliest cxample of the acanthus leaf arranged round the drum of a capital in a single row, surmounted by the favourite honeysuckle ; but that edifice was con- structed about a century before Callimachus is understood to have lived. The ouly perfect columnar example in Greece itself of this species of foliated capital is of later date than, and is a great improvement on, that of Miletus ; it is the beautiful little structure called the choragic monument of Lysicrates at Athens. (Plate XII. figs. 1, 2,3.) Specimens of square or ante capitals enriched with foliage are less uncommon in Greece than of circular or columnar capitals; but they are almost invariably found to have belonged to the interior of buildings, and not to have been used externally. In considering Greek architecture, it is necessary to bear in mind that it ceases almost immediately after the subjection of Greece to the Roman power; for though there are many edifices in that country in the style of columnar arrangement of which we are now speak- ing besides those referred to, they belong to Roman, not to Greek architecture. The earliest of them, perhaps, and certainly the least influenced by Roman taste, is the structure called the tower of the Winds, or of Andronicus Cyrrhestes, at Athens. The Agora, or Doric portico, as it is sometimes designated, in the same city, is a spurious ex- ample of Greek Doric, evidently executed under the Roman domination.

The importance which the Greeks attached to a graduated stylobate, and the necessity of giving it a relevant proportion in a columnar ordinance, are shown in the building above mentioned, which is the only example of this order of Grecian origin remaining to us. Unlike the Doric and Ionic in its application, this order is represented in a small circular structure, resting on a lofty square basement ; and yet, like those orders, it has a stylobate in receding courses (see Plate XII. fig. 3), and in plan, too, corresponding with

the arrangement of the columns, and not with that of the substructure,—this furnishing further proof that the stylo- bate was considered a part of the columnar ordinance. The Corinthian column is ten diameters in height. The base is composed of a torus and fillet ; a scotia and another similar fillet, rather less than the former; and a second torus or reversed ovolo, on which rests a third fillet basing the apophyge of theshaft. The shaft diminishes with entasis to five-sixths of its diameter at the hypotrachelium, and, like that of the Ionic order, has twenty-four flutes and fillets. The flutes are semi-ellipses, so deep as nearly to approach semi- circles, terminating at the head in leaves, to which the fillets are stalks. The fillets are rather more than one-fourth the width of the flutes. The hypotrachelium is a simple channel or groove immediately undcr the capital. The capital itself is rather more than 1} diameters in height; its core is a perfect cylinder, in bulk rather less than the superior diameter of the shaft. This is banded by a row of water leaves, whose profile is a flat cavetto, one-sixth of the whole height, and another of leaves of the acanthus, with flowered buttons attaching them to the cylinder. The latter have the contour of a cyma-recta, and occupy one-third of the whole capital. Rather more than another third is occupied by calices and tendrils, which latter support a honeysuckle against the middle of the abacus. This member is in plan a square whose angles are cut off at 45°, and whose sides are deeply concaved. In profile it consists of a narrow fillet, an elliptical cavetto or reversed scotia, and another fillet surmounted by a small ovolo, or rather a moulding whose profile is the quadrant of an ellipse. In the entablature (which is 2? diameters in height), the architrave is divided, like that of the Ionic order,

into three equal fascias, which are not perpendicular, but incline inwards, so that their lower angles are all in the same vertical line; this impends the surface of the shaft about one-third of the height from the base. The frieze is one plain band, slightly inclining inwards like the fascias of the architraves, and slightly projected beyond them. The cornice consists of a deep congeries of bed- mouldings, and a corona, with the accustomed small crown- mouldings and fillet. As in the Ionic cornice, additional height is given to the bed-moulds by undercutting the planceer. The cornice is surmounted by a cut fascia sup- porting honeysuckle antefixe, which may indeed be taken as a part of the order, as the solitary example in question presents it.

Of Corinthian ante we have no examples, nor indeed have we of insulated columns; but as we find in the Tonic examples quoted that the attached columns are less in. proportion to the entablature than those which are insulated, we may conclude that it would be the saime with this,—thus reducing the entablature to two diameters, the ordinary average of that part in Greek columnar archi- tecture.

The Caryatides, or Caryatic Order (Plate XII.)

Besides the three species of columnar arrangement enu- merated above, the Greeks employed another in which statues of women occupied the place of columns. The origin of this order is furnished by Vitruvius in a story which is as usual totally unsupported by history or ana- logy. Nevertheless it has fixed the nomenclature, such figures being called Caryatides, and the arrangement the Caryatic order. The use of representations of human and other figures with or instead of columns is, however, common in Egypt and India; and to the former the Greeks were doubtless indebted for the idea, though they appear to have restricted its application to human female figures. Mr Gwilt infers from various facts connected with the worship of Diana Caryatis, "that the statues

called Caryatides were origmally applied to or used about the temples of Diana; and instead of representing cap- tives or persons in a state of ignominy (according to the Vitruvian story), were in fact nothing more than the figures of the virgins who celebrated the worship of that goddess."

Of these Caryatides there is but one existing example. It is the third portion of the triple temple in the Athenian Acropolis, and is a projection from the flank of the prin- cipal Ionic structure, formed by a stereobatic dado raised on the stylobate and antz-base mouldings, with a sur-base consisting of a carved bead and carved ovolo covered by a broad listel, with a narrow projecting fillet above it. On this rests a square plinth, supporting a draped female figure, on the head of which there is imposed a circular moulded block, with a deep rectangular abacus, two-thirds of whose face is vertical, and the other third is a cavetto fillet, and small cyma-reversa. The stereobate, including the moulded base of the temple, is about three-fourths the height of the statue pillar with its base and capital. The entablature is rather less than two-fifths of the same, but it consists of architrave and cornice alone, between which parts the height is nearly equally divided. Details will be understood by reference to Plate XII. figs. 4, 5, 6. This Caryatidean portico displays very clearly the arrange- iment of the ceiling, with its coffers or cassoons. Internally the architrave is plain two-thirds of its height; of the remaining third rather more than one-half is a plain, slightly projected fascia; the other half is occupied by a carved bead and ovolo. In the absence of a frieze the ceiling rests on this, and is divided by carved beads into panels, which are deeply coffered, and diminished by three horizontal moulded fascias.

Of Grecian Mouldings and Ornaments.

Greek architecture is distinguished for nothing more than for the grace and beauty of its mouldings; and it may be remarked of them generally that they are eccentric, and not regular curves. (Plate XIII.) They must be drawn, for they cannot be described or struck ; so that though they may be called circular, or elliptical, it is seldom that they are really so, and if they are, it is evidently the result of chance, and not of design. Hence all attempts to give rules for striking mouldings are worse than useless; the hand alone,

directed by good taste, can adapt them to their purpose, and give them the spirit and feeling which render them effective and pleasing. ’

The leading outline of Greek moulding is the gracefully flowing cyma. ‘This will, indeed, be found to enter into the composition of almost everything that diverges from a right line; and even combinations of mouldings are frequently made with this tendency. It is concave above and convex below, or the reverse; and though a long and but slightly flected line appears to connect two quickly-curving ends, it will always be found that the convexity and the concavity are in exactly the same curve, so that if the moulded surface were reversed, and the one made to assume the place, it would also have the appearance, of the other, and the effect would be the same. It is, in fact, the Hogarthian line of beauty; and it is not a little singular that Hogarth, in his well-known Analysis of Beauty, although he did not know, and indeed could not have known, the contours of Greek architectural mouldings, has given the principle of them, and, under his line of beauty, has described many of the finest Greek forms. The Roman and Italian mouldings were called Greek in his day, and he assumed them to beso; but they evidently do not agree with his theory, whereas, in principle, the now well-known Greek forms do most completely.

The cyma-recta is generally found to be more upright

ARCHITTELTURE

{GRECIAN—

and less deeply flected than the cyma-reversa; it is almost always the profile of enrichments on flat surfaces, of foliage, of the covering moulding of pediments, of the undercut or hooked mouldings in ante caps, the overhanging not affect-

ing the general principle ; and it pervades, as we have said,

flected architectural lines generally, whether horizontal or vertical. The cyma-reversa has all the variety of inflection that its opposite possesses, but the line connecting its two ends is, for the most part, more horizontal, and its curves are deeper. It pervades many architectural combinations, but is

most singularly evinced in the composition of the Greck Doric capital, which is a perfect cyma-reversa, with the ends slightly but sharply flected, as it flows out of the shaft below, and turns in under the abacus above. This may not be obvious, from the annulets dividing the cyma into an ovolo and a cavetto, but the principle is clear.' The cyma is the governing outline in the congeries of mouldings in bases also, as may be noticed in the Ionic and Corinthian examples quoted and referred to.

An ovolo is but the upper half of a cyma-reversa, even when it is used as a distinct moulding, and unconnected with the waving form. The name expresses its apparent rather than its real tendency ; for its contour is not that of an egg in any section, though the ornament which is carved on it, when used as a running moulding, is formed like an egg; and from that the moulding was named.

Thc upper torus of a base forms, with the escape or apophyge of the shaft, a perfect cyma, and the scotia and lower torus do the same; so that the torus and scotia are

referable to the same principle when in composition, and they are not found together except in the combination

referred to. The bead is an independent moulding, varying in con-

tour; but it is generally the larger segment of a circle. It is used, however, sometimes to mask the waving form, and

sometimes to separate it.

The cavetto, or simple hollow, is part of a cyma also, as has been shown; but it is also applied independently to obviate a sharp angle, or to take from the formality of a vertical line, as in the abaci of Ionic ante caps, Its form, nevertheless, is not the segment of a circle, for the upper part of a cavetto is the most flected, and it falls below almost into a straight line.

There is a hooked moulding common in Greek archi- tecture, particularly in the Doric ante caps, which is tech- nically called the hawk's-beak. It is a combination of curves which cannot be described in words; but it has been

already referred to in speaking of the cyma-recta, which is brought into its composition. This hawk's beak is a completely Gothic moulding, and throws a very bold, clear shadow. It is used generally to the ante; and the fact that these were for the most part under the shadow of the peristyle, furnishes good reason for the employment of such a moulding.

The cyma-recta is never found carved, nor sunk within itself; but it sometimes has the honeysuckle, or some other ornament of the kind, wrought on it in relief, particularly when used as the covering moulding—the cymatium—or a pediment. The enrichment of the cyma-reversa consists of a contrasted repetition of its own contour meeting in a broad point below, and joining by a circular line above, making a sort of tongued or leafed ornament, whose surface is inflected horizontally also. Between the leaves a dart-formed tongue is wrought, extending from the circular flexure above to the bottom of the moulding, whose contour it takes in front alone. As this would not mitre or join well on the angles of the cyma, a honeysuckle is

1 The presence of the cyma in the Doric capital was, we believe,

first pointed out by Mr T. L. Donaldson, in a supplementary volume to Stuart's Athens.

gracefully introduced in the manner shown in Plate XIII. This enrichment is not wrought in relief on the mould- ing, but is carved into it, so that the surfaces of the parts of the ornament alone retain the full outline of the cyma. The ovolo is enriched with what is called the egg and dart ornament. 'This will be best understood by reference to the plate. Its angles also are made with a honeysuckle, and the inflections are made in the moulding itself. The torus is sometimes enriched with the interlaced ornament called the guillochos; this, too, is cut into the moulding itself. We have no Greek example of an enriched scotia, and from its form and position, which, to be effective, must be below the eye, it hardly seems susceptible of ornament which could operate beneficially. The bead is carved in spheres or slightly prolate spheroids, with two thin rings or buttons, dilated at their axes, placed vertically between them. A cavetto is not enriched at all, nor is the hawk's beak, except by painting, which does not appear to have been an

uncommon mode of enriching mouldings among the Greeks; that is, the ornament was painted on the moulded surface instead of being carved into it. Fascias are also found enriched by painted running ornaments, such as the fret or meander, the honeysuckle, and the lotus. Sometimes plain colour was given to a member, to heighten the effect it was intended to produce. Ornaments were also painted and gilt on the coffered panels of ceilings.

The few examples which exist of sculptured ornament – on straight surfaces exhibit varieties of nearly the same com- biuations as those last mentioned, —the honeysuckle, with the lotus, and sometimes a variety of itself, on scrolls, either throwing out tendrils, or plain. This is found on the necking of the Ionic columns of the Athenian Acropolis, and on those of their ante, continuing along under the congeries of mouldings, as previously described. The varieties of foliage used in the enrichments of Greek architecture are few, and will be found generally exemplified in the Corinthian capital of the choragic monument of Lysicrates, and in the rich acroteral pedestal or stem of the same edifice, than which we possess no more elaborate specimen of foliated enrichment of the Greek school. There exist many specimens of architectural ornament on vases and fragments, in marble and terra-cotta, in which human figures, both male and female, are composed, with a greater variety of foliage than is generally found in Greek architectural works; and many of the beautiful marble and bronze utensils discovered in Herculaneum and Pompeii have enrichments obviously of Greek origin, from which, as well as from the specimens of ornament on positive architectural monuments, we may judge of their productions generally, as well as acquire or imbibe some- thing of the fine taste which originated them. It will be remarked at once that Greek ornamentation is quite con- ventional, and that the plain scroll forms its main feature. The leaf-work is clasped round it, and helps to fill up the surface, and pleasingly vary the outline, but the scroll is prominent throughout. Then there is a peculiarity in the mode of carving the ornamentation. The scroll is not rounded off, as in the Roman, like the branch of a tree, but stands squarely and sharply out from the surface, so as to throw a well-defined sharp shadow. So with the foliage, whose leaves also, in place of having the rounded section used by the Romans, are cut sharply either with a square or triangular section, giving again a strong contrast of light and shade.

It may be inferred from some existing edifices, particu- larly the choragic monuments, that the Doric columnar style was not used by the Greeks except for the temples of the gods and some of their accessories. But whether this arose —if the feeling really did exist—from the

sanctity of its character, in consequence of that appropria- tion, or from the difficulty of moulding it to general purposes, cannot be determined. It is very certain, however, that the few structures which do exist of Greek origin, not of a religious character, are either Ionic or Corinthian, or a mixture of one of them with some of the features of the Doric; and in all Greece and the Grecian colonies, except Ionia, there are very few examples of religious edifices not of the Doric order, and none which are of the Corinthian.

Like the architecture of Egypt, that of Greece is known to us principally by means of its sacred monuments, and from them is deduced almost all we know of its principles. The Doric temples of the Greeks are uniform in plan, and differ only in arrangement and proportion, according to their size; for every part depends on the same modulus. It has been said that if the dimensions of a single column, and the proportion the entablature should bear to it, were given to two individuals acquaintcd with the style, with directions to compose a hexastyle peripteral temple, or one of any other description, they would produce designs exactly similar in size, arrangement, features, and general propor- tions, differing only, if at all, in the relative proportions of minor parts, and slightly, perhaps, in the contour of some of the mouldings. This can only be the case with the Doric, and it arises from the intercolumniation being determined by the arrangement of the frieze with triglyphs and metopes ; the frieze bearing a certain proportion in the entablature to the diameter of the column, and so on, in such a manner that the most perfect harmony is preserved between all the parts. Thus (Plate IX. fig. 1) the column is so many of its diameters in height ; it diminishes gradually from the base upwards, with a slightly convexed tendency or swelling downwards; and is superimposed by a capital proportioned to it, and coming within its height. The entablature is

so many diameters high also, and is divided, according to slightly varying proportions, into three parts —architrave, frieze, and cornice.

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Regularity of the Doric

style.

Columnar arrange- ment of temples.

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rendering the quoins more infirm, or perhaps less stable than the Greek architects judiciously thought they should be, Besides contracting the intercolumuiation, the Greeks also made the corner columns a little larger than the rest, thus counteracting in every way the danger that might accrue to them, or to the structure through them, from their exposed and partly unconnected situation. The graduated pyramidal stylobate on which the structure rests also bears a certain proportion to the standard which is measure of all the rest ; and so every part is determined by the capacity of the sustaining power.! Though the Doric order thus possesses, as it were, a self-proportioning power, which will secure harmony in its composition under any circumstances, yet skill and taste in the architect are necessary to determine, in every instance, the number of diameters the column shall have in height, and to assign according to that the height of the entablature. Accord- ing to Vitruvius the colonnades were spaced out according to one or other of the following arrangements of the inter- columniations :—

Pycnostyle, 14 diameters apart and 10 high.

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Systyle, 2 >? 9 2 >? Eustyle, 2} a ,», about 84 ,, Diastyle, 3 a is 84 ,, Arzostyle, 4 Ay a SF is

But these rules, like many others of this author, seem to have been imaginary.

The temples are described, according to their external arrangement, as being either in antis (i.e., with two columns between two ante), prostyle (with coluinns in front), amphi- prostyle (with columuas both in front and rear), peripteral (with a single row of columns at flanks as well as at ends), dipteral (with a double row of columns at flanks), or pseudo-dipteral (in which the inner range of columns in the peripteral is omitted). The columnar arrangement i antis is not common in Greek architecture, though there are examples of it, generally of the Doric order. The inner porticoes, or pronaoi, of peripteral temples are, for the most part, placed im antis, as may be seen by reference to the examples in which columns stand between the ante. The Ionic temples of Athens are the principal examples of the simple prostyle. They may be called apteral, if it be necessary to distinguish them from peripteral, as the latter are prostylar; but the former term alone is sufficient. Neither does Greek architecture present more than one example, and that is at Athens also, of an amphiprostyle, except in the same peripteral structures, which are also amphiprostylar. Almost all the Doric temples are peri- pteral, and being peripteral, they are, as a matter of course, amphiprostylar, as has been just remarked ; so that the former term alone is used in describing an edifice of that kind, with the numeral which expresses the number of columns in each of its prostyles. There are but two known examples of Greck antiquity of a pseudo-peri- pteral structure—the gigantic fane of Jupiter Olympius at Agrigentum, and the nine-columned edifice at Pzestum. The former is not even prostyle, for the columns on its fronts are attached, as well as those on its flanks. The dipteral arrangement is found at Selinus, in an octastyle temple; and in some cases the porticoes of peripteral temples have a pseudo-dipteral projection, though no per- fect example of the pseudo-dipteral exists.

The Doric order was never used by the Greeks in mere prostyles ; consequently there is no Doric temple of the tetrastyle arrangement, for it is incompatible with the peri- ia cg

1 We cannot discover that the elevation of the pediment depended so immediately on the common standard, though in the best examples the tympanum will be found to be about one diameter and a half in height.

pteral, the tetrastyle examples which do exist being all Ionic. Athens itself, containing a Doric tetraprostyle, may seem to contradict this; but in speaking of Greek architecture, we exclude all the examples, executed under the Roman Roman impress ; and among to. the Greeks are hexastyle. unmatched Parthenon, is octastyle ;

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even in Greece itself, which were dominion, for they bear the these is the portico referred few exceptions, all the Doric temples of Their queen, however, the and the pseudo-peri- pteral fane of Jupiter Olympius at Agrigentum, just referred to, presents the singular arrangement, heptastyle. The misshapen monument called the Basilica, at Paestum, the Thersites of its style, has a front of nine columns, or an enneastyle arrangement. The temples of Jupiter Olympius at Athens, and of Apollo at Branchide, had each a front of ten columins.

It may be here remarked in support of the opinion we have given as to the authority of Vitruvius, that, accord- ing to him, peripteral temples have on each flank twice the number of intercolumniations they have in front,— thus giving to a hexastyle eleven, to an octastyle fifteen columns, and so on,— whereas in the Greek temples this is never the case, for they always have more. The best examples have two, some have only one, but many have three, and in one instance there are four, more intercolumniations in flank than in front. The famous temple at Ephesus, re- cently disinterred by Mr Wood, has seven intercolumnia- tions in front, and nineteen on the flanks. Again, he limits the internal hypethral arrangement to those structures which are externally decastyle and dipteral, though an example, he says, existed in Greece of an octastyle hype- thros, and that was a Roman structure. Now the Parthe- non is an octastyle hypzethros ; but all the other hypeethra! temples, both in Greece and her colonies, are hexastyles, except, perhaps, the octastyle-dipteral at Selinus, and there is no evidence that the Greeks ever constructed a decastyle- dipteral temple, except that of Apollo Didymzeus at Bran- chide.

A Greek temple, whose columnar arrangement is simply in antis, whether distyle or tetrastyle, consists of pronaos and naos or cella. A tetraprostyle may have behind ita pronaos and naos. An amphiprostyle has, in addition to

the preceding, a posticum, but is not understood to have a second entrance, The porticoes of a peripteral temple are distinguished as the porticus and posticum, and the lateral ambulatories are incorrectly called peristyles. It may, indeed, be here suggested, that as the admixture of Latin with Greek terms in the description of a Grecian edifice cannot be approved of, it would, perhaps, be better to apply the term stoa to the colonnaded platform or ambitus altogether, and distinguish the various parts of it by the addition of English adjectives ; or the common term portico would be quite as well with front, back, and side, or latcral, prefixed, as the case may be. Within the back and front stoas or porticoes, then, a peripteral temple has similar arrangements in antis, which are relatively termed the pro- naos and opisthodomus, with an entrance only from the former ; unless there should exist, as there does in the Parthenon, a room or chamber within the opisthodomus, supposed to be the treasury, in which case a door opens into it from the latter. Besides these, a Greek temple consists only of a cell in those which are cleithral, and of a naos, which is divided into nave and aisles, to use modern ecclesiastical terms, in an hypethral temple.

In comparing the Greek temple with the Egyptian, a marked difference at once appears. The cella is the nucleus of both. But whereas the Egyptian was almost hidden with- ina series of chambers for the priests, and surrounded by enormous enclosed courts, the Greek was made the one pro- minent object, and the subject of the highest efforts of art.

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Nothing was allowed to interfere with it or to abate its predominance. The tympan was the place in which the highest efforts of the sculptor were placed, the purest example of it being at the Parthenon. At Aigina the figures were entirely detached. Above the pediment at the top, and at the sides, were some very beautiful orna- ments——the acroteria. ‘These were in so prominent a position, and so delicately carved, that very few remains of them are left to us. The roofs were covercd with thin slabs, or tiles, of marble, and the ends of the ribs, which covered their joints, were ornamented with antefixee, form- ing a graceful finish to the flanks. These were mostly of marble, but at Adgina they were of terra-cotta. Further, in

order to discharge the water from the gutters, were lions' heads, the original of our gurgoyles. The gutters them- selves were made on the top member of the cornice. It is singular that we have no accurate description of the interior of a temple, nor any information as to how it was ceiled or lighted. We know that the cella had often a row of columns round it internally, and that upon this row was a second, as at the temples of Ceres at Eleusis, Minerva at Tegea, Neptune at Pzstum, and Jupiter at Aigina. At the temple of the Giants at Agrigentum a row of figures took the place of the upper columns. We may fairly sup- pose, then, that the first row supported a gallery much as jn our Triforia. But as to the roof there is more dif- culty. The span would be too great for flat marble beams, and would have a very poor and depressing effect.

To obviate this difficulty Mr Fawkener suggests that the |

ceilings were arched, and a medal which shows the temple of Juno at Samos certainly appears to favour this theory. But another difficulty remains, viz., as to the light, for there were no windows; and the only light, therefore, if no other access for it were made, would have been through the doorway itself, deeply buried behind a massive portico. Vitruvius alludes to this in his third book, where he de- scribes a hypzethral temple as being " sine tecto et sub divo." But he states himself that this arrangement was rare, and if the cella was really in any case open to the sky, one can scarcely imagine how the delicate statues of ivory and gold could have been protected from the weather. At Bassze gome remains of roof tiles have been found, the centre part of which were open, and might thus have formed small openings for light. But the difficulty as to the statues remains. Mr Fergusson's solution of the problem is very ingenious, and so satisfactory that it seems to require only some reference to his arrangement in any of the old sculptures or writers to make it generally received. He supposes that the inner colunins supported a sort of clere- story, formed by a channel on each side along the roof. This would give an excellent light, and the statues could easily be protected. This theory does not fulfil Vitruvius's description " sine tecto," but he is generally so inaccurate in his references to Greek work that this objection does not seem to be very formidable.

According to the rules of Vitruvius, all temples should face east and west, and the door should be to the west ; but in reality the doors in Ionia, Attica, and Sicily were to the east. The temple at Bassze faces north and south, but it has a side door also. The temple was usually approached by a flight of steps, of an uneven number, so that the worshipper might place his right foot on the first step, and again on the temple floor. The ceilings of the porticoes and colonnades were formed by great beams of marble, and the spaces of the intercolumns were thus limited. This appears to be the reason for the closed colonnade of the temple of the Giants at Agri- gentum, as the spaces between the columns, if open, as usual, would have been too wide to be spanned by a flat beam.

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The only pure Greek architectural works besides temples Propy tira.

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that remain to us, and of which we have certain informa- tion, are propylea, choragic monuments, and theatres. The propyleum, or propylaa, as applied to the Acropolis of Athens, is the entrance or gateway through the wall of the peribolus. It consists of a Doric hexaprostyle portico internally, with a very singular arrangement of its columns, the central intercolumniation being ditriglyph. 'This was done, probably, to allow a certain procession to pass, which would have been incommoded by a narrower space. Within the portico there is a deep recess, similar to the pronaos in a temple, but without columns in antis ; a wall pierced with five doorways, corresponding to the intercolumnia- tions of the portico, close to the entrance ; and beyond it is a vestibule, divided into three parts by two rows of three Ionic columns, and forming an outer portico, fronted exter- nally by a hexaprostyle exactly similar to that on the outside. Right and left of it, and setting out about one intercolumnia- tion of the portico from its end colunins, at right angles, are two small triastyle porticoes in antis, with chambers behind them. These have been called temples, but most probably they were nothing more than porters' lodges or guard-houses. The whole structure, though extremely elegant and possess- ing many beauties, is not a good architectural composition : the unequal intercolumpiation detracts from its simplicity and harmony. The use of Ionic columns in a Doric ordinance is equally

objectionable ; and their elevation from the floor of the portico on insulated pedestals is even worse, though their intention is obvious ; and without raising them, the ceiling might have been too low, or they must have been made taller. The uneven style of the small temples or lodges is not pleasing, even though they be taken as flank and not as front compositions; and, moreover, their entablature abuts indefinitely against the walls of the larger structure, both internally and externally, to the total destruction of the harmony of the general composition. Indeed, the unequal heights of the entablature of the greater ordinance involves a fault which would require more than all the beauties of detail and harmony of proportion to countervail, if it were not. impossible to embrace them in one view.

The choragic monument of Lysicrates (or Lantern of Choragic

Demosthenes), at Athens (Plate XII.), is a small structure, al ments.

consisting of an elegant quadrangular basement or podium, which is more than two-fifths of the whole height, sur- mounted by a cyclostyle of six Corinthian columns, attached to, and projecting rather more than one-half from a wall which perfects the cylinder up to the top of their shafts, where it forms a stand for tripods the height of the capital. A characteristic entablature rests on the columns, and receives a tholus or dome, which is richly ornamented, and terminates in a foliated and heliced acroterium. To this Stuart has added dolphins as supporters, and has placed on the suminit a tripod, which was the prize in the choragic festival; thus completing, perhaps, the most beautiful composition in its style ever executed. In Vitruvian language, the arrangement of this edifice would be called monopteral ; but it is more correctly cyclostylar, or, perhaps, because of the wall or core, it may be termed a pseudo or attached cyclostyle. The basement of this monument is eminently bold and simple, admirably proportioned to the rest of the structure, and harmonising perfectly with it. The columuar ordinance is the only perfect specimen of the style in existence of pure Greek origin. It has never been surpassed, and is, perhaps, unequalled. The most exquisite harmony reigns through- out its composition ; it is simple without being poor, and rich without being meretricious.

Totally different in style and arrangement, and far inferior in merit, is the choragic monument of Thrasyllus,

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The Erech- theum.

Tombs.

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It bears, however, the impress of the Grecian mind. This composition is merely a front to a cave, consisting of three pilasters, proportioned and moulded like Doric antz, and supporting an entablature similar in style, but too shallow to harmonise with them. Above the entablature there is an attic or parapet, divided into three compartments horizontally. The two external form tablets, with a cornice or impost on them ; and the central is composed of three receding courses, on the summit of which is seated a draped human figure, whether male or female, in its mutilated state, is not determinable. The entablature has laurel wreaths instead of triglyphs in the frieze, and it would appear as if the absence of the triglyph had deranged the whole composition. The two outer pilasters are of good proportion, and the architrave is well proportioned to them ; but the frieze and cornice are both too narrow, and the spaces between the pilasters, equivalent to intercolumnia- tions, are too wide. The third pilaster, itself inharmonious, is absurdly narrow, and, standing immediately under the statue, evidently to support it, its meagreness is the more obvious and striking. In spite of all this, the general out- line of the structure is simple and pleasing; the detail is elegant, and the execution spirited and effective. This little monument is, however, a proof that the Greeks were not at all times so excellent in architectural compositions as in the self-composing Doric temples, and in the choragic monument of Lysicrates; and to this evidence may be added that of the triple temple in the Acropolis of Athens, already described.

In concluding this notice as to temples, we must now allude to one example, very beautiful in itself, but an excep- tion to all rules—the Frechtheum at Athens. It consists of an Ionic hexaprostyle in front (Plate XI. fig. 1), resting on a bold, continuous, and well-proportioned stylobate, and forming the

entrance to a parallelogramic cella, but, from all that has yet been discovered, without a pronaos in antis. The back front consists of four columns, like those of the portico, attached zm antis ; and the flanks are broad and bold, crowned by the well-proportioned and chaste entab- lature, with the enriched congeries of mouldings and running ornament of the antz under it. In the absence of a pronaos to give depth to the portico, the composition was defective, but otherwise simple and harmonious. It was enlarged by the attachment of a tetraprostyle to one of its sides, Ionic certainly, like that in front, but different both in manner and in size; beautiful in itself, but a blot on the main building, with which it harmonises in no one particular, for the apex of its pediment only reaches to the cornice of the other. In a similar situation, against the other side, is attached a similar arrangement of Carya- tides, a tetraprostyle of female figures raised on a lofty basement, and yet not reaching to the entablature of the main building —according in no one particular either with it or with the portico on the other side, and altogether forming one of the most heterogeneous compositions to be found in ancient art.

Tomps.—These, the grandest structures next to the temples in Egypt, present little worthy of notice in Greece proper; but in the colonies there are several of considerable importance. The grandest are in Caria and Lycia, to some of which, constructed much after the ancient outlines of the Lycian, &c., reference has already been made. The most singular of the pure Greek tombs are cut in the face of the solid rock, not in the forms of the ancient rock-cut tombs, but much resembling those of the temple.

The rock-cut tombs, as, e.g., at Telmissus (Lycia), usually have a portico of columns 7 antis, with one or more chambers behind. In one example these are about 12 feet by 9 feet, and 6 feet high.

Most of the columus are Ionic, few being Doric. In one

case, the whole tomb, which is 18 feet 6 inches deep, has been quite detached, the whole excavation being 26 feet

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deep from the face of the rock. Many of these tombs present

curious amples of wood- en details iuni- 3 tated in stone, fail e.g., the doors | are often exactly fi! like those of | wood, the panels, | nails, knockers, | é&c., being copied “ in stone.

Of a_ totally different class is atomb at Cni- dus, in Caria, dis- covered by Mr C. T. Newton. It consists of a square, low base- ment resting on ° four steps, and carrying four en- gaged Doric columns, with a cornice over the whole, being about 31 feet square on the basement. Above the cornice are gradini, forming a sort of pyramid of steps, having at the summit a lion, Z now in the British Museum. “Inside was a beehive- shaped chamber, with vaulting simi- lar to that of the treasury of Atreus at Mycene, and with eleven smaller cells radiating from its circumference ” (Newton). Its sup- posed date is about 396 B.C.

More beautiful in detail is the tomb known as_ the Trophy, discovered by Sir C. Fellows, at Xanthus. It consists of a peri- style of fourteen Ionic columns, standing on a high basement about 33 feet by 22, which has, to all appearance, no access to it. In the centre, behind the columns. is a cella apparently solid also. The date usually given to this is about 540. But the edifice seems to be somewhat too refined in detail for this time, and another date assigned to it, viz., about 385, appears to be more likely. This would be about half-way, in point of time, between the Erechtheum and the temple at Priene.

More curious, though less elegant, is another tomb at Mylasa, in Caria, which has a high, square basement with

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Fic. 44.—Rock Tomb at Myra, Lycia.!

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1 Figs. 44 and 45 are taken from Newton's Travels and Discoveries in the Levant, by kind permission of the author.

Theatres.

_ Private

houses.

Fortifica- tions,

Building Mhaterials,

GRECIAN. |

a chamber in it. Over this, on each face, are two columns in antis, with entablature, the space between the columns being quite clear. Over the cornice are placed great stone beams, anglewise ; on these, others, again, crosswise ; so that the bearing is rapidly diminished, and a rough sort of dome formed, resembling those so often found in India. But of all Greck tombs the grandest was that of Mausolus, at Halicarnassus, in Caria, one of the seven wonders of the ancient world, which has given its name to all succeeding great tombs. Its date is about 352 B.c., Mausolus having died in 353. It was erect until the 10th century. Since theu it has been so utterly ruined that there was doubt as to its actual site. This was indicated by Professor Donald- son; and in 1857, Mr Newton discovered the actual remains. 'It consisted of a lofty basement, on which stood an oblong Ionic edifice surrounded by thirty-six Tonic columns, and surmounted by a pyramid of twenty- four steps. The whole structure, 140 feet in height, was crowned by a chariot group in white marble, on which, probably, stood Mausolus himself" (Newton). The size of the basement was 114 feet by 92. A considerable number of the fragments are now in the British Museum, The name of the architect was Pythius, and the sculpture, with which the edifice was richly adorned, was executed by four celebrated sculptors, of whom we may especially particu- larise Scopas, as he was also the architect of the celebrated temple of Tegea.

THEATRES.—The Greek theatre deserves a short notice. It was entirely different from ours, having neither pit, boxes, nor roof, except the usual velarinm, as a protection from the sun. Its plan was somewhat more than a semicircle, having seats cut out of the side of some hill convenient for the purpose. Round the top was a colonnade, and at the back of the stage was the scena. This and the colonnade combined in an artistic way, must have formed a very effective composition. At first the theatres were of wood; the first of stone, at Athens, having been built, it is said, about the middle of the 4th century. Vitruvius makes some very singular statements as to the acoustic details of the theatres, but they have not been verified, and are not, in fact, quite understood. The theatres at Argos and Ephesus were 450 and 600 feet in diameter respectively, whereas Covent Garden Theatre, London, including the corridors, is only 100 feet.

Hovsss, &c.—No reinains exist of the domestic structures of the Greeks. It may be taken for granted that the houses were less extensive than those of the Romans, as they were a poorer and less luxurious people; but the exquisite beauty of form and decoration, which pervades every article of Greek origin, whether coin, medallion, vase, implement of war or husbandry, or even the meanest article of domestic or personal use, is evidence of the fine taste with which their mansions must have been furnished.

FortiricaTions.—We have large remains of fortifica- tions in Lycia, though few in Grecce proper. They are not so picturesque as the medizval, nor, we may say, as the Assyrian. They were massively built of masonry, with square towers at intervals, furnished sometimes with a pediment, sometimes with battlements. The doors and windows on the upper floor are still found at Alinda, in Caria. The Greek shield was often sculptured as hung on the walls. A bas-relief from Pinara, in Lycia, gives a complete sketch of the walls, with circular-topped battle- ments, a postern gate, and various openings, all square- headed ; and a door is shown panelled, like our doors.

In the construction of their edifices the Greeks seldom, if ever, had recourse to foreign materials—the stone used in their temples being almost

invariably from the nearest convenient quarries which supplied it of sufficiently good

quality. The structures of Athens are built of marble, from the quarries of Pentelicns, and those of Agrigentum, of a fossil conglomerate which the place itself furnished.

Resumt.—Taking now a rapid view of what we owe to Résumé.

the Greeks as architects, we may assume that the invention of columnar architecture is due to the Assyrians; but how far this had advanced before the Greeks began to practise it, we cannot as yet exactly determine. There is no doubt, however, that it owed to the Greeks the greater part of its beautiful and delicate details. Some of the finest examples of these are to be found at Athens in the Theseum, Parthenon, Propylea, and Erechtheum, ranging in date from 469 to 409 Bc. Not only do we find there the most beautiful mouldings and other orna- ments, but the most refined methods of ubviating the minute defects in outline supposed to be caused by optical illusion. The lines of the shafts, for instance, in place of being perfectly straight, were slightly expanded between the base and necking, so as to form a very delicate curve (entasis). The apparent depression of the top of the cornice, supposed to be caused by the extra weight in the centre of the pediment, was obviated by curving the cornice so that the centre part was the highest. The steps were curved in a similar way. Then the whole of the columns of the peristyle sloped towards the centre. The architrave and frieze in the Parthenon followed the same slope of about 1 in 80, but its boldly overhanging cornice and antefixze sloped forwards about 1 in 100.

We owe also to the Greeks one new form in art—the pediment. It is not found in Egypt; some slight sugges- tions as to its use may, perhaps, be found in the sculptures of Assyria, but in Greece it forms the crowning feature of every temple; and simple as the invention may seem, it led the way to a succession of others, which resulted in the grand gables of our Gothic architecture.

The details of the Grecian temples were heightened by colour and gold. Of the former, Dr Faraday detected many traces on the sculptures of the British Museum ; and clear

indications of it have becn found in many of the ruins both

in Greece proper and in the colonies. In fact, colour, or tinting of some kind, seems to have been absolutely requi- site in order to relieve the monotonous and dazzling effect of new white marble. A striking example of this occurred recently when the palace of the king was built at Athens. The newly-worked marble had much the appearance of a smooth stucco or brilliant whitewash. But this would serve (and doubtless did serve in ancient times) as an admirably delicate base for decorative work in colour and gold.

What the effect was of a Greek temple, in all its glory, we can no more judge than we can in the case of one of ancient Egypt. For there is not one that is not a mere wreck ; and even the most ambitious of modern copies, the Walhalla, wants the exquisitely delicate material out of which the Parthenon was wrought, and the sculpture which no modern Phidias was living to supply. But in Greece proper there was but this one type, viz., that of the pedimented temple with its colonnade. There was no arch, as in Assyria, to span an opening too wide for a stone beam ; no dome to vary the outline by its bold and grace- ful form ; no curved outline, as at Mycenze, to vary that of the rectangle.

The form adopted by the Greeks was worked out ina manner which leaves all others of ancient art, wrought in the same likeness, far behind; and the details which adorned that form charm the eye with their exquisitely chaste beauty. But in our admiration of them we must not forget that numerous other forms, beautiful in them- selves, and familiar in their beauty to the Assyrians and Pelasgi, as they are to us, were unknown to, or neglected by, the Greeks.

Little of the history of Etruria is as yet known, for accounts of Roman historians are not to be relied on, and the Etruscan language is as yet unread. Our acquaintance with its architecture, too, is very meagre, for the compara- tively few remains show us simply the forms used by the Etruscans in their tombs ; and even these have been as yet imperfectly explored, owing to the nature of the climate, and the desolation of those parts of the country in which they are chiefly found. Little was, in fact, known of them at all until the careful descriptions of Sig. Canina and Mr Dennis appeared, from whose works the principal ascer- tained facts are derived. The sites of the Etruscan towns are nearly all on or near a line, curving slightly from the sea, extending from Fiesole, near Florence, through Arre- tium, Cortona, Volsinii, and Falerii, to Rome. The only sites of much importance near the sea were Cossa and Tar quinii, The towns were generally planted on the tops of high hills, as if for the purpose of defence. Much of the town-walling remains in various places, as at Fiesole, Cor- tona, Cossa, and Volterra, and furnishes grand examples both of the polygonal and of the squared masonry, which has been described as belonging to the early period of Greek architecture.

The tombs were of two classes, the first being nearly of the same external form as that described at Tantalais, viz., with a massive stereobate, circular in plan, having one or more chambers in the centre of it, and above it a tumulus of earth, Of these, hundreds of specimens of various sizes remain. At Volci there was one 240 feet in diameter. The grandest of all is, perhaps, that at Cervetri, drawn by Canina, and known as the Regulini Galeassi. The chambers here, and in other instances, are ceiled with oversailing courses of stone, cut into an arched form as at Mycene. A completely voussoired arch exists over a tomb chamber, known as the Grotto of Pythagoras, at Cortona, but the date of this is very doubtful. In these tombs have been found some of the beautiful specimens of jewellery which adorn the museums of Europe. The mouldings used are very few and simple, but of a section which is quite peculiar to Etruria. They occur in two places only, viz., as a base, and as a capping to the basement. In none of the tombs of the kind above described are found any of the paintings which form so characteristic a feature in the second and better known class of tombs, viz., those cut in the face of the rock in the vicinity of most of the Etruscan towns. The apparent entrances to these tombs are by doorways of a peculiar

form, and often placed very high up the rock. But these are false, and merely carved in it, the real entrance being often 40 to 50 feet below. This leads into one or more chambers, which are mostly square, but in some few instances are circular, as at Chiusi, where there ig one 25 feet in diameter, supported by a pillar in the centre. Whatever their shape, they are cut out of the solid rock ; and, apparently, bore some resemblance to the house which the occupant of the tomb had inhabited during life. None of the chambers are domed or vaulted, all the ceilings being cut in the shape of flat beams or sloping rafters supported by pillars,—another instance of the con- struction of built edifices being copied in rock-cut caves. One of these, at Cervetri, is given in D'Agincourt's work. There is another chamber at Tarquinii, 50 feet square, supported by four pillars, each 6 to 7 feet square.

The manner in which the chambers were fitted up depended on the mode of burial. Cremation was sometimes used, and then, as at Veii, Sutni, and Toscanella, we find niches for urns. But usually there was a bench cut in the rock round the sides of the chambers, and on them were ranged the sarcophagi, of which specimens are so well

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husband's walking-stick. Even the kitchen utensils appear

King Porsena, but the descriptions are too vague to allow of

had three ranges of pillars, the lowest one 150 feet high

junction, it would agree tolerably well with what we read

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known in most of the museums of Europe. In some instances, which seem of a late date, the bodies were placed in recesses.

The paintings which decorated the chambers were very peculiar, being of the same character, and with figures of divinities, &«, of the same well-known attenuated forms as are found in the earlier vases. The colouring is as peculiar as the drawing, ¢.g., at Veii there is a horse depicted with a red

neck, yellow mane and tail, one leg yellow spotted with red, and the rest of the horse black. 'At Tarquinii is another horse with blue mane and hoofs, white tail, and all the rest red. All these paintings were executed, much as were thosc of the Greeks and Egyptians, on a very thin coating of fine stucco over the rock. Inthe later tombs domestic scenes appear to have taken the place of the allegorical ones formerly used.

One of the best examples, though of very late (Roman) date, is a tomb at Cervetri. The chamber was supported on two pillars. In each side of it were recesses, 2 feet in height, each having a bed, with cushion for the head, tassels, &e., all sculptured and painted. The sides and pillars were decorated with painting and sculpture, representing the helmets, shields, swords, and other accoutrements of the officer whose tomb it was. But there were also depicted in the same way the personal ornaments of his wife, her mirrors, jewellery, &c. Her slippers are marked on the floor, and by the side of the recess near, is carved her

in effigy, so as to give the whole fittings of the house of a Roman officer.

Another class of funeral monument is described to us by some writers, the most noted example being that of the great even this being restored with certainty. It is said to have and 75 feet square, standing ona basement 300 feet square. There were five sets of these pillars, viz., one at each angle and one in the centre, and they are said to have been enriched with bronze ornamental work at the top of each division. This class of tomb was probably somewhat like one of late date, near Rome, which has been known by various names (the tomb of the Horatii and Curiatii, of Aruns, of Pompey, &c.), and if there were two ranges of pillars above, all tied in with metal rings at the point of

of Porsena's tomb.

Of Etruscan temples no remains exist, and the accounts of them are so conflicting that any restoration of them must be very uncertain.

Roman ARCHITECTURE.

We have taken it for granted that the Greeks were Use of the ignorant or neglectful of the properties of thearch. If the arb. great sewer at Rome, called the Cloaca Maxima, belongs to the time of Tarquinius Priscus, it must be conceded that the properties of the arch were known, and the arch con- structed in that city. But it is contended that the Cloaca Maxima, as it now exists, is a work of much more recent date, and that it may have succeeded the sewer constructed by the first Tarquinius, who was, moreover, himself a Greek. It is, however, now certain that the construction of the arch was known to the Egyptians, and used by them at a very early date, although, for some reason which we do not quite understand, they neglected it in their greatest works. That it was known to and made great use of by the Assyrians is also certain. Whoever it was that invented it, and at whatever date, the Romans made extensive practical use of it, and by its means they succeeded in doing what their predecessors in civilisation had never effected. It enabled

Compari- son of Greek and Roman architec- ture.

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them to carry secure and permanent roads across wide and rapid rivers, and to make a comparatively fragile material, such as brick, more extensively useful than the finest marble was in the hands of the Greeks. To the Greeks, however. the Romans were indebted for their knowledge of the more polished forms of columnar architecture. Before the con- quest of Greece the structures of Rome appear to have been rude and inelegant, and from that time the existing style of architecture either gave place to the superior merit and beauty of what the Romans fonnd in that country, or was combined with it, though frequently the combination tended to destroy the beauty of both.

In the transference of Greek columnar architecture to Rome, a great change was effected independently of those combinations, for the Romans could not appreciate the simple grandeur and dignified beauty of the Doric, as it existed in Greece. They appear to have moulded it on what we suppose their own Tuscan to have been; and the result was the mean and characterless ordinance exemplified in the lowest story of the theatre of Marcellus at Rome, and in the temple at Cora, between 30 and 40 miles south of that

city. Not less inferior to the Athenian examples of the Ionic order, than the Doric of Cora is to the Doric of Athens, are the mean and tasteless deteriorations of them in the Roman temples of Fortuna Virilis and Concord. It was different, however, with the foliated Corinthian, which became to the Romans what the Doric had becn to the Greeks—their national style. But though they bor- rowed the style, they did not copy the Greek cxamples. In Rome the Corinthian order assumed a new and not less beautiful form aud character, and was varied to a wonderful extent, but without losing its original and distinctive features. The temple of Vesta, at Tivoli, differs from that commonly, but erroneously, named the temple of Jupiter Stator, in Rome, as much as the latter does from the choragic monument of Lysicrates at Athens ; all three are among the most beautiful examples of the Corinthian order in existence,—if indeed they are not pre-eminently so,— and yet they do not possess a single proportion in common. It must be confessed, moreover, that if the Romans had not good taste enough to admire the Doric and Ionic models of Greece, they had too much to be fond of their own; for they seldom used them. Both at home and abroad, in all their conquests and colonies, wherever they built, they employed the Corinthian order. Corinthian edifices were raised in Iberia and in Gaul, in Istria and in Greece, in Syria and in Egypt ; and to the present day, Nismes, Pola, Athens, Palmyra, and the banks of the Nile, alike attest the fonduess of the Romans for that peculiar style. We cannot agree with the generally received opinion, that Greek architects were employed by the Romans after the connection between the two countries took place; for the difference between the Greek and Roman styles of archi- tecture ig not merely in the preference given to one over another peculiar mode of columnar arrangement and com- position, but a different taste pervades even the details though the mouldings are the same; they differ more in spirit and character than do those of Greece and Egypt, which certainly would not have been the case if Roman architecture had been the work of Greek architects. Indeed, were it not for historical evidence, which cannot absolutely be refuted, an examination and comparison of the archi- tectural monuments of the two countries would lead an architect to the conclusion, that the Corinthian order had its origin in Italy, and that the almost solitary perfect example of it in Greece was the result of an accidental communication with that country, modified by Greek taste ; or that the foliated style was common to both, without either being indebted to the

other for it. If, however, Greck architects were employed by the Romans, they

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must have made their taste and mode of design conform to those of their conquerors much more readily than we can imagine they would as the civilised slaves of barbarian masters ; and it cannot be disputed that the Roman archi- tecture is a style essentially distinctfrom the Greek. This is apparent from the fact that many of the minor works of sculpture in connection with architecture, such as can- delabra, vases, and various articles of household furniture, discovered at the villa of Adrian, near Tivoli, and at Herculaneum and Pompeii, are fashioned and ornamented in the Greek style, while others are as decidedly Roman in those particulars,— rendering it evident that such things were either imported from Greece, or that Greek artists and artisans were employed in Italy, who retained their own national taste and modes of design. It is probable that both the architects and the artists, natives of Rome, modified their own less elegant productions by reference to Greek models; but that the Romans derived their architec- ture entirely from the Greeks, may certainly be disputed.

Much of the extent and magnificence of the architectural Building works of the Romans is attributable to their knowledge materials.

and use of the arch, which enabled them to utilise inferior materials. Almost all their structures were of brick— aqueducts, palaces, villas, baths, and temples. Of the present remains, only a few columns and their entablatures are of marble or granite, and two or three buildings are of Travertine stone, — all the restare brick. The Colosseum, the mausoleum of Adrian, the tunnel sewer, the temple of Fortuna Virilis, and the ancient bridges on the Tiber, are of Travertine stone ; the remaining columns of the more splendid temples, the internal columns, and their accessories, of the Pantheon, the extcrior of the imperial arches, and the cenotaph columns of Trajan and of Antonine, are of marble ; but the Imperial Mount of the Palatine, which

holds the ruins of the palace of the Cesars, is one mass of brick; the Pantheon, except its portico and internal columns, &c., is of brick; the temples of Peace, of Venus and Rome, and of Minerva Medica, are of brick ; and so, for the most part, were the walls of others, though they may have been faced with marble or freestone. The baths of Titus, of Caracalla, and Diocletian, are of brick; the city walls are of brick ; so are the extensive remains of the splendid villa of Adrian, and those of the villa of Mzecenas at Tivoli; the palaces of the Roman emperors and patricians at Baim and in other parts of Italy ; and so, it may be said, are the remains of Herculaneum and Pompeii, for the houses in these cities are generally built of alternate double courses of brick and courses of stone or lava. In most cases, at Rome and in the provinces, stucco formed the surface which received the decorations. From the above enumcra- tion, it will appear how much more variously the Romans built than any of their predecessors. In Egypt we find no indications of edifices of real utility or convenience, nothing but temples and tombs,—and in Greece there is buta small addition to this list; but in Rome are found specimens of almost every variety of structure that men in civilised com- munities require.

The Roman Corinthian.

Like the Greek orders the Roman Corinthian may be said to consist of three parts,—stybolate, column, and entablature; but, unlike them, the stylobate is much joftier, and is not graduated, except for the purposes of access before a portico. Its usual height is not exactly determinable, in consequence of the ruined state of most of the best examples; but it may be taken at from two and a half to three diameters. In the triumphal arches the height of the stylobate sometimes amounts to four, and even to five diameters. It is variously arranged, moreover, having, in the shallower examples, simply a congerics of

mouldings to form its base, with, perhaps, a narrow square member under it, a plain dado, and a covering cornice or coping, on the back of which the columns rest. In the loftier examples a single and sometimes a double plinth comes under the base mouldings; and a blocking course rests upon the coping, to receive the bases of the columns. This last is only necessary when

the height of the stylobate is such as to take the columnar base above the human eye, when the coping cornice would intercept it if a blocking course did not intervene.

The column (Plate XIV.) consists of base, shaft, and capital, and varies in height from nine and a half to ten diameters. 'The base has, ordinarily, in addition to the diminishing congeries of mouldings which follows the circular form of the shafts, a square member or plinth, whose edges are vertical; with this the whole height of the base is about half diameter. of the column is variously composed, but it generally con- sists of two plain tori and a scotia, with fillets intervening, as in Greek examples of this order, but differently propor- tioned and projected, asthe examples indicate. Sometimes the scotia is divided into two parts by two beads, with fillets, as in the Jupiter Stator example, in which also a bead is placed between the upper torus and the fillet of the apophyge. 'The spread of the base varies from a diameter and one-third to a diameter and four-ninths. In the best Roman examples, as well as in the Greek, the shaft diminishes with entasis; the average diminution is one- eighth of a diameter. The shaft was always fluted when the material of which it was composed did not oppose itself ; for the Romans often used granites, and sometimes an onion-like marble, called therefore cipollino, for the shafts of columns ; the former of which could not be easily wrought and polished in flutes, and the latter would scale away if it were cut into narrow fillets. Like the Greek Corinthian and Ionic orders, the Roman Corinthian has twenty-four fillets and flutes. The flutes are generally semicircles, and they terminate at both ends, for the most part with that contour. Dividing the space for a fillet and a flute into five parts, four are given to the latter, and one to the former. The hypotrachelium isa plain torus, about half the size of the upper torus of the base, or half the width of a flute, as these nearly correspond ; it rests on a fillet above the cavetto at the head of the shaft.

The ordinary height of the capital is a diameter and one- eighth ; but there is a very fine example, in which it barely exceeds a diameter, and another in which it is not quite so much. It is composed of two rows or bands of acanthus leaves, each row consisting of eight leaves ranged side by side, but not in contact ; of helices and tendrils trussed with foliage; and an abacus, whose faces are moulded and variously enriched. The lower row of

acanthus leaves is two-sevenths the whole height of the capital ; the upper row is two-thirds the height of the lower above it, and its leaves rest on the hypotrachelium below, in the spaces left between the others. They are placed regularly, too, under the helices and tendrils above, which support the angles, and are under the middle of each side of the abacus. The construction and arrangement of the next compartment above must be gathered from the examples, for a competent idea cannot be conveyed in words. The abacus is one-seventh of the height of the capital ; in plan it is a square whose angles are cut off, and whose sides are coucaved in segments of a circle, under an angle at the centre of from 55° to 60°. Its vertical face is generally a flat cavetto, with a fillet and carved ovolo corbelling over at an angle of about 125°. The cavetto is sometimes enriched with trailing foliage, and a rosette or flower of some kind overhangs the tendrils from the middle of each side of the abacus. .

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Every example of this order differs so much from others in the form, proportion, and distribution of the various parts of its capital particularly, that it cannot be described in general terms like the Greek Dorie and Ionic. The example referred to in the definition is that of the so- called Jupiter Stator, the most elegant, perhaps, of all the Roman specimens (Plate XIV. ex. 1).

The entablature varies in different examples from one diameter and seven-eighths to more than two diameters and a half in height. Perhaps the best proportioned are those of the portico of the Pantheon (Plate XTV. ex. 4) and of the temple of Antoninus and Faustina (Plate XIV. ex. 3), the former being rather more than two diameters and a quarter, and the latter rather less than that ratio. The entablature of the Jupiter Stator example is more than two diameters and a half in height, of which the cornice alone occupies one-sixth more than a full diameter, leaving to the frieze and architrave somewhat less than one diameter and a half between them. In this latter par- ticular it nearly agrees with the other two quoted examples,

so that the great difference in the general height is in the cornice almost alone, the cornices of the others being about a sixth less, instead of as much more, than a diameter in height. The Roman Corinthian entablature may be taken, then, at two diameters and a quarter in height. Rather more than three-fifths of this is nearly equally divided between the architrave and frieze, the advantage, if any, being given to the former; the cornice, of course, takes the remaining two-fifths, or thereabouts. The architrave is divided into three unequal fascisze and a small congeries of mouldings, separating it from the frieze. The first fascia is one-fifth the whole height ; one-third of what remains is given to the second, and the remainder is divided between the third fascia and the band of mouldings,—two- thirds to the former, and one to the latter. A bead, some- times plain and sometimes carved, taken from the second fascia, which is itself enriched in the Jupiter Stator example, marks its projection over the first ; and a small cyma-reversa, carved or plain as the bead may be, taken from the third fascia, marks its projection over the second. The band consists of a bead, a cyma-reversa, carved or plain according to the general character of the ordinance, and a fillet. In non-accordance with the practice of the Greeks, the face of the lowest or first fascia of the archi- trave, in the Roman Corinthian, impends the face of the column at the top of the shaft, or at its smallest diameter ; and every face inclines inwards from its lowest face up. The whole projection of the architrave, that of the covering fillet of the band, is nearly equal to the height of the first fascia. 'The frieze impends the lowest angle of the architrave. Its face is either perpendicular, or it slightly inclines inwards, like the fasciv of that part of the entab- lature: in some cases it is quite plain, and in others is enriched with a foliated composition, or with sculptures in low or half relief. The cornice consists of a deep bed- mould, variously proportioned to the corona; but it may be taken generally, when it has modillions, at three-fifths, and when it has none, at one-half of the whole height. It is composed of a bead, an ovolo or cyma-reversa, and a fillet, a plain vertical member, sometimes dentilled, another bead, and a cyma-reversa, with fillet or ovolo, as the lower may not be; this is surmounted, when modillions are used, by another plain member, with a small carved cyma-reversa above it. On this the modillions are placed, and the cyma breaks round them. They are about as wide as the mem- ber from which they project, and are about two thicknesses apart. In form they are horizontal trusses or consoles, with a wavy profile, finishing

at oue end in a large, and at the other in a small volute; and under each there is generally placed a raffled or acanthus leaf. In proportion-

ame RAT ing the parts of this bed-mould in itself, one-third of its height may be given to the modillion member, and the other two-thirds divided nearly equally, but increasing upwards into three parts, one for the lowest mouldings, one for the plain or dentil member, and the third, and rather largest portion, forthe mouldings under the modillion member. The mouldings of this part of the cornice arc carved or left plain, according to the character of the ordinance ; and its greatest projection, except the modillions themselves, that of the modillion member, is about equal to half its height. The upper part of the cornice —the corona, with its crown-mouldings—consists of the vertical member called the corona, which is two-fifths the whole height ;—this, in the examples of the temples of Jupiter Stator and Antoninus aud Faustina, is enriched with vertical flutes ;—a narrow fillet, an ovolo, and a wider fillet, occupy one-third of the rest, the other two-thirds being given to cyma-recta, with a covering fillet which crowns the whole. Its extreme projection is nearly equal to the whole height of the cor- nice

The ordinance of the temple of Vesta, or of the sibyl, at Tivoli (Plate XIV. ex. 2), whose entablature is the very low one mentioned, is not generally in accordance with the scale we have given, and it must be referred to for its own peculiar proportions.

Pediments with the Roman Corinthian order are found to be steeper than they were made by the Greeks, varying in inclination from 18° to 25°; but they are formed by the cornice of the entablature in the same manner. Antefixe do not appear to have been used on flank cornices as in Greck ordinances, in which the cymatium is confined to pediments; but in Roman works it is continued over the horizontal or flank cornice, as we have described ; and frequently it is enriched with lions' heads, which were at the first introduced as waterspouts. The planceer or soffit of the corona is, in the Jupiter Stator example, coffered between the modillions, and in every coffer there is a flower. The soffit of the entablature in this order is generally panelled and enriched with foliated or other ornament. The intercolumniation is not the same in any two examples. In the temple of

Vesta, in Rome, it hardly exceeds a dia- meter and a quarter ; in the Jupiter Stator example it is a fraction less than one diameter and a half, in that of Anto- ninus and Faustina, nearly a diameter and three quarters ; in the portico at Assisi, rather more than that ratio; in the portico of the Pantheon, almost two diameters ; and in the Tivoli example, a fraction more than that propor- tion.

The ante: of the Roman Corinthian order are generally parallel ; but pilasters are mostly diminished and fluted as the columns. Of two of the existing examples of antz, in one—that of the temple of Mars Ultor—they are plain, to fluted columns; and in the other—that of the Panthcon portico —they are fluted, to plain columns. The capitals and bases are transcripts of those of the columns, fitted to the square forms.

Ceilings of porticoes are formed, as in the Grcek style, by the frieze returning in beams from the internal archi- trave to the wall or front of the structure, supporting coffers more or less enriched with foliage or flowers. This, how- ever, could only have been effected when the projection was not more than one, or at the most two, intercolumnia- tions, if stone was used; and it is only in such that examples exist. Porticoes ordinarily must have bad arched ceilings, as that of the Pantheon has, or the beams must have been of wood ; in the latter case the compartments of the ceiling would probably be larger. How it was arranged in the former we cannot tell, as the arches only remain, and they may not be of the date of the rest of the portico.

CORINTHIAN. |

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The Roman Composite.

The ancient examples of what is called the Composite order (Plate XV. ex. 2) do not differ so much from the ordinary examples of the Corinthian as the latter do among themselves, except in the peculiar conformation of the capital of the column. In other respects, indced, its arrangement and general proportions are exactly those of the Corinthian. The Composite was used in triumphal arches, and, in the best ages of Roman architccture, in

them alone. The difference in the capital consists in the enlargement of the volutes to nearly one-fourth the whole height of the capital, and in the connection of their stems horizontally under the abacus, giving the appearance of a distorted Ionic capital. The central tendrils of the Corinthian are omittcd, and the drum of the capital is girded under the stem of the volutes by an ovolo and bead, as in the Ionic. Acanthus leaves, in two rows, fill up the whole height from the hypotrachelium to the bottom of the volutes, and are consequently higher than in the Corinthian capital: this difference is given to the upper row. Besides this Composite, however, the Romans made many others, the arrangements and proportions of the ordinances being generally those of the Corinthian order, and the capitals corresponding also in general form, though in themselves differently composed. In these, animals of different species, the human figure, armour, a variety of foliage, and other peculiarities are found. Shafts of columns also are some- times corded or cabled instead of being fluted: those of the internal ordinance of the Pantheon are cabled to one-third their height, and the flutes of the ante of that ordinance are flat, eccentric curves. There are fragments of others existing, in which the fillets between the flutes are beaded ; some in which they are wider than usual, and grooved ; others, again, whose whole surface is wrought with foliage in various ways ; and it would be no less absurd to arrange all these in different orders, than to make a distorted and hybrid capital the ground-work of an order.

The Roman Ionic.

The only existing example of Ionic in Rome, in which the columns are insulated, is in the temple of Fortuna Virilis (Plate XV. ex. 3; Plate XVI. fig. 12), for the temple of Concord is too barbarous to deserve considera- tion. Its stylobate, like that of the Roman Corinthian, is lofty and not graduated, having a moulded base and cornice or surbase. In the column the base consists of a plinth, two tori, a scotia, and two fillets; the shaft has twenty fillets and flutes, and diminishes one-tenth of a diameter ; the capital is two-fifths of a diameter in height ; the volutes, however, dip a little lower, being themselves about that depth without the abacus ; the corbelling for the volutes is formed by a bead and large ovolo,—the latter being carved. A straight band connects the generating lines of the volutes, whose ends are bolstered and enriched with foliage; and a square abacus, moulded on the

edges, covers the whole. In the entablature the architrave is unequally divided into three fascie and a band consisting of a cyma-reversa and fillet ; the lowest angle impends the upper face of the shaft of the column. The frieze is in the same vertical line, and is covered with a fillet which receives the cornice ; it is also enriched with a composition of figures and foliage. The cornice consists of a bed-mould, two-fifths of its height, and a corona with crown-mouldings. The cymatium is enriched with acanthus leaves and lions' heads, and the mouldings of the bed-mould and architrave band are carved. The soffit of the corona is hollowed out in a wide groove, whose internal angles are rounded off in a cavetto, but without ornament of any kind, forming indeed a mere throating. Like the angular oo, of the Greek

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Tonic, the external volute of this is turned out and repeated on the flank: either that or the abuse of it in the Compo- site capital gave rise to distortions of this order, in which all the volutes of the capital are angular, and consequently all its four faces are alike. In other respects, however, it does not differ generally from the ordinary Roman examples of Ionic, The temple of Fortuna Virilis is pseudo-peri- pteral, and consequently has ncither antz nor pilasters, nor do ancient examples exist of either.

The Roman Doric.

The Roman Doric is even a ruder imitation of the Grecian original than the mean and tasteless deterioration of the voluted Ionic is of the graceful Athenian examples. The specimen of it which is considered preferable to the others is that of the theatre of Marcellus, in Rome (Plate XV. ex. 4). The column is nearly 8 diameters in height:

it consists of shaft and capital only. The shaft is quite with escape and The

arrangement of the capital, composed of a torus, the

plain, except fillets above and below, cavetto; and it diminishes one-fifth of its diameter.

fillets, with a semitorus, sur-

necking, and three deep is shown in Plate XV. ex. 4.

mounted by the abacus,

The corona and crown-mouldings of the cornice being destroyed, the whole height of the entablature cannot be

correctly ascertained ; but from analogy it may be taken,

with the bed-mould, part of which exists, at about two-

thirds of a diameter, making, with the architrave and frieze, an entablature nearly the architrave is exactly half a diameter. Three-tenths of its depth are unequally occupied by the tenia, regula, and gutte, the last of which are six in number, and truncated semicones in form. 'The rest of the surface of the archi- trave is plain and vertical, impending a point rather within the superior diameter of the column. A fascia, one-eighth of its own height, bands the frieze above the triglyphs ; the rest of its surface is plain vertically, but horizontally it is divided into triglyphs, half a diameter in width, and placed over the centres of the columns. The space between the triglyphs is equal to the height of the frieze without its plat-band or fascia, making in effect perfectly square metopes. All that can be traced of the cornice is a small cyma-reversa, immediately over the frieze, and a square member with dentils on it. In the example, the cornice is completed from that of the Doric of the Colosseum.

The temple at Cora presents a singular specimen of the Doric order, evidently the result of an examination of some Greek examples, but moulded to the Roman proportions and to Roman taste, The columns are enormously tall, but the shafts are partly fluted and partly chamfered for fluting, like the Greek. The capital is ridiculously shallow, but the abacus is plain, and the echinus of a somewhat Hellenic form, The entablature is very little more than a diameter and one-third in height, and the architrave of it is shallower even than the capital; but the frieze and cornice are tolerably well proportioned, though the tri- glyphs in the former are meagre, narrow slips, and the latter is covered by a deep widely-projecting cavetto, that

would be injurious to even a better composition. Instead of regular mutules with gutte, the whole of the planceer of the cornice is studded with the latter; but, like the Greek, the triglyph over the angular column extends to the angle of the architrave, which does not appear to have been the practice of the Romans; yet the reason for this does not appear to have been understood, for the external intercolumniations are the same as the others.

‘As far as we have the means of judging, the Romans made the ante of their Doric similar to the columns, only that they were, of course, square instead of round ; though,

ARGMITERECTO RE

2 diameters high. Of this

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indeed, an attached column appcars to have been generally preferred.

It is, however, to be remembered, that these two orders, the Ionic and Doric of the Roman school, ought hardly to be considered as belonging to the architecture of the Romans. They are merely coarse and vulgar adaptations of the Greek originals, of which we now possess records of the finest examples. Yet their meanness and. tastelessness, when compared with the Grecian models, more strikingly evince the superiority of the latter, and show to what ex- tent the architects of the Italian school must have been blinded by their system, when they fancied such wretched examples to be beautiful.

Roman Mouldings and Ornament (Plate XIII.)

The mouldings used in Roman architectural works are the same as the Grecian in general form, but they vary materially from them in contour. The Roman cyma-recta is projected much more than the Greek, with a deeper flexure. The ovolo is represented in the Roman style by a moulding whose outline is nearly the convex quadrant of a circle, or a quarter round, and sometimes it is nearly that of the quadrant of an ellipse. The Roman torus is either a semicircle or a semi-ellipse; and the bead is a torus, except in its

application, and in being smaller, and generally projected rather more than half the figure whose form it bears. The cavetto, in Roman architecture, is nearly a regular curve, being sometimes the concave quadrant of a circle, or the reverse of an ovolo, and sometimes a smaller segment. A Roman scotia is more deeply cut, and is con- sequently less delicate than the same member in a Greek congeries: its form frequently approaches that of a concave semi-ellipse.

The enrichments of Roman mouldings are, for the most part, similar to those of the Greek, but less delicate and graceful both in design and drawing. Those of the cyma and ovolo are particularly referred to, but the Romans used others besides. Raffled leaves form.a favourite enrichment in the architecture of the Romans ; indeed these are hardly less frequent in their works than the honeysuckle is in those of the Greeks. Mouldings were enriched with them; and a raffled leaf masks the angles of carved cymas and ovolos in the former, as a honeysuckle does in the latter. Nevertheless, the honeysuckle and lotus are both found in Roman enrichments, particularly the latter, and perhaps even more than in Greek. It is not uncommon to find examples of Roman architecture completely overdone with ornament,—every moulding carved, and every straight sur- face, whether vertical or horizontal, sculptured with foliage or with historical or characteristic subjects in relief.

Particular Roman Structures.

TEMPLES.—Whatever forms were adopted from the Temples Greeks by the Romans were rapidly altered by the latter. The temples, for example, were, no doubt, constructed, in the main, after the Greek model. But we find three- quarter columns used in the flanks, as at the temple of Fortuna Virilis at Rome and at Nismes, in place of the open peristyle or the plain flat wall. These three-quarter columns were, it is true, used at the rear of the Erechtheum and at the temple of the Giants at Agrigentum. But these were quite exceptions. 'Then, in the portico of the Pan- theon (Plate XVI. fig. 4) the Romans availed themselves of the properties of the arch to effect an immense change in the internal design and appearance.

From the forest of columns, as at the Parthenon, all placed at equal distances, or nearly so, the Romaus boldly removed four rows (two in centre

and one at each side, as at the Pantheon, Plate XVI. fig. 5), arched over the space thus left, and so obtained a picturesque effect quite un-

ROMAN. |

known to the Greeks.

and Rome. conformed almost entirely to the outlines of the Greeks. But we now come to the circular edifices, as the temple of Minerva Mcdica, 110 feet in diameter, and the Pantheon, 139. As to the age of these and their purpose there is some doubt; but there can be none as to the temples of Vesta at Tivoli and Rome, which have an external peristyle of columns, and thus present an entirely new form. Whether these temples were finished with domes or not is doubtful. In any case the exterior would probably have shown merely a sloping roof, as has been common enough in Italy down to late times.

TuEaTRES. —The best remaining specimens of Roman theatres are those of Pompeii and Herculaneum. Like those of the Greeks, they rest on the side of a hill, but instead of being hewn out of the hill they are built on it. Others ina more or less ruined state remain in Italy, France, Sicily, &c.,¢.g., at Rome, Verona, Pola, Taormina, aud Arles. At first they were of wood, and one by Aimilius Scaurus, 58 B.c., is said to have held 80,000 spectators. That they were copied mainly from the Greeks there can be no doubt. In fact, one built by Pompey is expressly stated to have been copied from another at Mytilene, and their general form is very similar to that of the Greek theatre. But the Roman theatre received a greater degree of architectural decoration than the Greek. Of this the theatre of Marcellus, in Rome, is au example ; for though otherwise destroyed, its external wall remains and presents columnar ordinances, with intcrvening arches in stories, according to the practice of the Roman school.

AMPHITHEATRES.—These are altogether Roman in gene- yal design. The first is said to have been built by Julius Cesar, and others were afterwards built by Caligula and Nero. The first of stone is said to have been the Colosseum, built by Vespasian and Titus, and so called from the Colossus of Nero which stood near. It was injured and then restored under Severus and Decius, in whose time it is probable that the upper row was added. As to the

awning, we know that the main portion at least of the audience was protected from the fierce rays of the sun by a strong velarium. This was supported on the outside by heavy masts, which passed through holes still existing in the top cornice, and stepped down on to the corbels, which show so conspicuously in the top order. Recent excava- tions have disclosed the original arena, about 20 feet below the present level of the ground. Evidence has also been obtained that the arena was sometimes a movable platform. 'To obtain an approximate idea of the size of this enor- mous structure, we must remember that the Albert Hall (the largest diameter of which is 276 feet) could have been placed in the arena alone of the Colosseum, the exterior of which measures 622 feet by 528 (Plate XVI. fig. 1). Other amphitheatres of great size were constructed in the various towns of the empire. Amongst them we may mention that at Verona, 500 feet by 404, and Nismes (still uscd for public shows), 434 by 340. Extensive remains of another, 376 feet by 220, have been discovered recently at El-Djemm, in Tunis. (See AMPHITHEATRE, vol. i pp.

774-776.)

TomBs.—Some very grand examples of tombs of circular forms remain, as well as many others of great beauty. Tt must be remembered that with the Romans both burial aud cremation were uscd. The columbaria (vaults lined with small recesses for the urns, which contained the ashes of the dead) prescnt the most ordinary specimens of archi- tectural forms adapted to cremation. The sarcophagus, of which that of the Scipios is the best known example, pre- sents the ordinary form used in connection with burial.

ARCHITECTURE

Then the ends were rounded off into apses, and the same was done at the temple of Venus In each of the above cases the exterior still

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But when the family of the deceased was rich or dis- tinguished, the ashes or the sarcophagi were enclosed in buildings of the most magnificent kind. The tomb of Cecilia Metella, so well known to all by Byron's beautiful lines in Childe Harold, commencing—

‘¢ There is a stern round tower of other days,”

is a bold tower 90 feet in diameter and 62 feet high, so solidly built as to contain only a chamber 19 feet in diameter. Much grander was the mausoleum of Augus- tus, which has perished. Of the mausoleum of Hadrian the skeleton only remains. But it shows that the base was 170 feet square, supporting a circular edifice 115 feet in diameter. It would seem that this mass, now formed into the castle of St Angelo, and showing the naked brick- work, had, in its glory, two ranges of marble columns and probably a domed roof. From its position on the banks of the Tiber, near the bridge, it must have formed one of the grandest architectural compositions of the Romans.!

Forums.—At first these great buildings were used for Forums.

merchants, and were open spaces with porticoes, shops, counting-houses, &c., all round. The best example existing is, perhaps, that of the Forum of Pompeii. In later times these erections expanded into grand architectural ranges of porticoes, with statues, &c. Leading out of them, in various positions, were temples, law courts, theatres, &e. It was in Trajan’s Forum that his famous column was erected.

The AquEDUcts show little of the skill of the architect, but they are very picturesque as they stretch along the Campagna and other places. Across a valley, at Tarragona, one rises to a height of 100 feet, and another, the Pont du Gard, at Nismes, to 180. But they do not reach the level of true architectural beauty, and derive their chief value from their immense length and size. (See AQUEDUCT, pp. 219-221 of the present volume.)

The TrrumpHaL Arcu is peculiarly Roman, and it is in this form that the arch appears to have been most boldly used as an external feature. The arch is, in fact, the form to which all other parts of the structure are mere decorative adjnnets. The principal examples are the arches of Titus, Severus, Janus, and Constantine at Rome, and that of Trajan at Ancona.

DweELLincs.—The still extensive remains of the villa of Dwellings.

Hadrian, near Tivoli, bespeak its original magnificence. Everything appears to have been directed to internal splen- dour and effect alone; and, indeed, all collateral evidence tends to the conclusion, that the exterior of Roman palaces and mansions was not heeded, being merely plain brick walls. This is the case at Pompeii, and the ruins of man- sions in various parts of Italy, from that of Sallnst on the Benacus or Lago di Garda, to those of other Roman nobles on the shores of the Bay of Bais, present no indications whatever that their exteriors were subjected to architectural decoration. The palace of Diocletian at Spalatro, aud the splendid remains of Baalbec and Palmyra, some of which, perhaps, belonged to secular structures, offer evidence to the contrary of this, if they are correctly restored in the works which treat of them. Notwithstanding the extent of the structure and its general magnificence, however, the ee eee ee,

1 Singular enough, mausoleums, though they have been destroyed in Greece and Rome, have been preserved in Africa. There we have a singular structure, the Medricen, in Algeria, 180 feet in diameter, with a row of engaged columns of a rude Doric type as a stereobate, and ou these a series of gradini. The whole outline greatly resembles that of the circular Etruscan-built tombs already described. Much grander and more ornate is the Koubr, also in Algeria, which is of the same form, but 200 feet in diameter, and 108 feet high to the platform at top. The order is a curious imitation of the Erechtheum Jonic. The Medricen has not becn entered, at least, in modern times. The Koubr has a singular arched passage, entered from below the ground-level, and winding all round to a chamber in the centre, The rest is solid.

mouldings and ornaments in the interior of the villa of Hadrian, though in themselves classical and elegant, are small, and have a general air of littleness, especially when compared with the apartments to which they belong,—not that the apartments are generally large, but they are for the most part lofty. The ceilings appear to have been formed by vaulting ; there are no indications of windows, and none of stairs of any magnitude—so that the rooms must have been nearly, if not quite, open at one end to admit light and air; and the probability is that there were seldom apartments above the

ground floor, though it is likely enough that terraces formed on the vaulted roofs were used for the purposes of recreation and pleasure. Of the floors, which were of mosaic, several are prescrved entire in the museum of the Vatican; where also are deposited many fine specimens of ornamental sculpture in vases and cande- labra, besides busts, statues, and groups in bronze, marble, porphyry, and granite, of various styles, remains of the noble collection Hadrian made during his progress through his extensive dominions, which have been found ainong the ruins of the villa.

In Pompeii we may see the domestic as well as public architecture of ancient Rome, although it must be remem- bered that Pompeii was a Greek colony, and that it was destroyed as early as 79 a.p. We have, therefore, pro- bably to expect more Greek character than would be met with elsewhere.

The streets of Pompeii are very narrow, their average width being uot more than 12 or 15 feet; frequently they are not more than 8 feet wide, and very few in any part exceed 20. The principal excavated street in the city, that leading from the Forum to the gate towards Hercu- laneum, and the street of the tombs, is, at the widest, 23 feet 6 inches, including two footways, each 5 feet wide. The streets are all paved with lava, and almost all have side pavements or footways, which, however, are for the most part so narrow, that, with few exceptions, two per- sons eannot pass on them. That the cars or carriages of the inhabitants could not pass each other in most of the streets, is proved by the wheel-ruts which have been worn on the stones, and the recesses made here and there for the purpose of passing. They are lined on both sides with small cells, which served for shops of various kinds; and they are strikingly like the ordinary shops in towns in the south of Italy and in Sicily at the present time (Plate XVII. fig. 1), They resemble these, too, in this respect, that there appear in very few cases to be accommodations in connection with the shops for the occupiers and their fainilies, who must have lived elsewhere, as modern Italian shopkeepers very commonly do. They present no archi- tectural decoration whatever; the fronts are merely plain stuccoed brick walls, with a large square opening in each, part of which is the door, and part the window, for light- ing the place and showing the goods.

Whenever a private house or gentleman's inansion was situated in a good place for business (like the ground floor of many modern Italian noblemen's palaces), the street-front, or fronts, were entirely occupied with shops, a comparatively narrow entrance to the house being preserved in a convenient part between some two of them (Plate XVII. fig. 3). The door to this is sometimes quite plain, but at times is decorated with pilasters When the site permitted such an arrangement, the entrance door being open, a passer- by could look compietely through the house to the garden, or, in the absence of a garden, to the extreme boundary- wall, on which was painted a landscape or other picture. An arrangement, it may be observed, not unlike this, is common in some of the Italian cities at the present day ; but the mansions being now built in stories, and the upper storics alone being occupied by the families, a merely

pleasing effect is produced; whilst in the former, persons crossing from one apartment to another were exposed to view, and domestic privacy thus completely invaded, to produce a pretty picture. Inside the entrance passage, which may be from 10 to 12 feet in depth, there is a space, the atrium, generally square, or nearly so, on which different rooms open, that vary in size from 10 feet square to 10 feet by 12, or even 12 feet square; they have door- ways only, and were probably used as sleeping-chambers by the male servauts of the family. In the centre of this court there is a sunk basin or reservoir for receiving the rain, called the impluvium, rendering it likely that this was roofed over, with a well-hole to admit light and air, and allow the rain to drop from the roof into the reservoir. Connected with this outer court was the kitchen and its accessories. If the site allowed the second court to be placed beyond the first in the same direction from the entrance, the communication was by a wide opening not unlike folding doors between rooms in modern houses, generally with a space intervening, which was variously occupied ; or a mere passage led from one to the other. The second or inner court is generally much larger than the first, and is for the most part a parallelogram, but variously proportioned. It forms a tetrastodn, being open in the middle and arranged with a peristyle of

columns, colounading a covered walk all round. On this the best and most finished apartments open; but they are of such various sizes, and are so variously arranged, that it is not easy to determine more than that they included the refectory, the library, and sleeping-rooms. Some of them, indeed, are such as must have been useless except for the last purpose ; these, perhaps, were the apartments of the female branches of a family, at least in most cases. Some houses, however, have a nest of small cells in an inner corner or secluded recess, which may have been the gyneceum ; but that is far from being common. Exhe- dree or recesses, open in front to the atrium, are common, and are often painted with more care and elegance than any other part of the house; but generally the walls are everywhere painted—in the more common places flat, with a slight degree of ornament, perhaps, and in the best rooms, with arabesques and pictures in compartments. The architectural decorations are mostly painted; the ornaments are not uufrequently elegant, but the architecture itself of the mansions is bad in almost every sense. The rooms being windowless, would, when covered, be necessarily dark; the doors are arranged without any regard to uniformity, either in size or situation. The street-fronts of those houses which, not being in a good business situa- tion, were not occupied with shops, were not merely un- adorned, but were actually deformed by loop-holes, to light some passage or inner closet which had no dour on one of the courts. (Plate XVII. fig. 8.) The columns of the second courts are generally in the worst style possible: those which have foliated capitals, and may be considered com- positions of the Corinthian order, are the best; but the imitations of Doric and Ionic are both mean and ugly. From the uses to which they were put, and the wideness of their intercolumniations, together with the fact that none of them have been found in Pompeii, it is probable that the entablatures were of wood, and were consequently burnt at the time of the destruction of the city, and broken up by the inhabitants, almost all of whom certainly escaped, and who, it is very evident, returned, when the fiery shower and the conflagration had ceased, to remove whatever they could find of their property undestroyed ; for it must be remembered that the roofs and ceilings all over the city are entirely gone, and the uncovered and broken walls remain, from 8 to 10 feet only in height. Everything, indeed, clearly demonstrates that great exertions were used

to recover whatever was valuable; and it is very probable, moreover, that the place was constantly resorted to by treasure-seekers for perhaps centuries after the ealamity occurred. It may also be remarked that the loftier edifices, which would have been unburied by the ashes, had been thrown down by an earthquake about sixteen years before the volcanic shower fell, and, therefore, were the more casily covered. Other showers must have fallen since that which destroyed the city, to produce the complete filling up of every part and the general level throughout. Hence we are still uninformed as to the structure and disposition of the roofs and ccilings of the houses of the ancients. The doors, too, of whatever materials they were composed, are entirely gone: there remain, however, liere and there indications—and even charred fragments—of wooden door-posts, but they belong to outer or street doors, leaving it probable that a matting of some kind, suspended from the lintel, formed the usual doors to rooms. It is, in fact, supposed that curtains answered the purposcs of doors to the interiors. In these particulars, unfortunately, Herculaneum affords but little assistance, as the mode of its destruction was similar to that of Pompeii, though, upon the whole, Herculaneum is more likely to furnish information on these particulars than its sister in_misfor- tunc. Although it has been ascertained that the Romans understood the manufacture of glass, it must not be sup- posed that they were accustomed to apply it as freely as we do to exclude the weather and transmit light. It was, however, sometimes used; one wooden frame with four small squares of glass has been found ; another brass frame with the glass movable ; and one piece of glass of considerable size was found in one of the walls of a bath. The floors of the houses of Pompeii and Herculaneum are all of mosaic work, coarser and simpler in the less import- ant parts, and finer and more ornate in the more finished apartments: the ornaments are borders, dots, frets, labyrinths, flowers, and sometimes figures. In this, too, the superior advantages the moderns enjoy are evident. The ancients did not understand how to construct wooden floors, or, at least, they did not apply timber to that use. A few rude and narrow staircases are found in Pompeii, which, it is very probable, were to afford access to the terraces or flat roofs, for they are not common, and no portion of an upper story remains in any part. Sufficient remains have, however, been found to show that the upper stories often

overhung the lower front, as in medizval houses; the fronts being made of woodwork, supported on a prolongation of the floor joists. In one part of the city the houses on one side of the street are on a declivity: there a commodious flight of stairs is found to lead from the atrium in front to another lower court and rooms, not under the houses but behind them; for we do not find an underground story in the Pompeian houses. On the shores of the Bay of Bais, and at Cicero's Formian Villa on the Gulf of Gaeta, however, there are crypts or arched chambers under the level of the mansions, the sites requiring substructions; but it may be questioned whether even these were used as parts of the house, and as we use cellars, for they present no indications of stairs, and have no regular means of intercommunication.

Numerous remains of Roman houses are found in all the colonies, and notices of many in England will be found in the Archeologia, and other archeological publications. They are not of sufficient importance to be quoted here, but they serve to show that the Romans carried with them into other lands the same habits, and even practised the same mode of construction which they adopted at home. One very remarkable exception exists, viz., in the Hauran in Syria. The edifices there were first, we believe, noticed by Humboldt. They have since been described in

detail by Mr Cyril Graham and others, and have been admirably illustrated by Count Voguc. The country was conquered by the Romans at the end of the Ist century A.D., and the houses, &c., seem to range in date from that time, or, perhaps, earlier, to the end of the 4th. They are contained within stone walls, forming small towns, and so numerous that sixty of these walled cities have been counted, all now desolate, but in many cases remain- ing almost perfect even to the doors, shutters, and paving of streets. The remains are chiefly of houses whose walls are of basalt. The rooms are 12 to 20 or 25 feet square, with strong, arched ribs thrown across, supporting a ceiling of thick slabs of basalt. Some of thesc are as much as 18 by 12 feet, and 6 inches thick. The doors and shutters are of the same

material, often panelled as though of wood. Aspecimen of these, and also some of the carvings, are in the British Museum.

Bastricas.—We have left these to the last, as they are Basilicas. more intimately connected than any other ancient architec- tural forms with those of the Christians. They seem to have been at first much the same class of building as our Royal Exchange, both as regards use and plan; open in the centre, with porticoes round. Then all was roofed over, and a sort of triforium or gallery formed over the por- ticoes. At one end was a recess, often circular and parted off from the rest by a screen of columns. This, with the space in front of it, formed the Tribunal. In Trajan's, there seems to have been an apse at each end. Remains are found at Pompeii and Herculaneum, Treves, &c. A complete exception to the ordinary form is found in the Basilica of Maxentius (formerly known as the temple of Peace) at Rome.

Resumi.—Roman architecture, as we know it, dates Résumé. only from about the Christian era, and the rapidity with which it spread from that time is something marvellous. Through nearly the whole extent of the Roman empire, through Italy, Asia Minor, Sicily, Britain, France, Syria, Africa,—with one great exception, Egypt,—all was Roman in mouldings, ornaments, details, the very style of carving and the construction. No matter what the country or the architect, all seem to have lost their nationality when the Roman came, and to have adopted implicitly his system of design and decoration. It has been seen that he copied the orders and much of the leading forms of his buildings fromthe Greeks. But he speedily added others. The apse and the circle on plan were his ; so were the dome and the arch in elevation; and thus he enlarged at once the whole range of the architect's powers, and whilst utterly disre- garding the delicate refinements of the Greeks, secured a freedom of design which resultcd at length in our Pointed architecture.

But great as the advance was, it seems to have been arrested just when opportunities were offered, on the grandest scale, for bringing about the noblest results. The Roman architect seems to have been unable to reach the highest effort of art, viz., to bring the whole of any grand edifice into one splendid mass, to concentrate the detailed parts into one grand whole. But

in reflecting on what the Roman did not do, we must not forget that we owe to him some of the grandest forms to which we too arc now accustomed.

We now come to a complete change in the structures which we have to describe. Henceforth we shall find no Forum, no public bath, theatre, temple, or house. All these forms disappear, and for nearly 700 years, until the time when the Norman castle arose, well-nigh every building of architectural merit was in some way Or other ecclesiastical. But with our Christian faith there arose forms of beauty utterly unknown to the Pagan, which culminated in the glories of Lincoln and Canterbury.

In those countries which received the Christian religion from Rome, but which did not contain such mines of archi- tectural material in temples, amphitheatres, and palaces, as Italy did, and, indeed, in the remoter parts of Italy itself, which did not contain them as Rome did, churches were constructed in imitation of those of the metropolis of the Christian world. These being the work of a semi- barbarous and unpolished people, were of necessity com- paratively rude, and from them arose the Gothic archi- tecture of the Middle Ages,—not from any previously existing style of architecture among the northern nations who overran Italy and subverted the Roman power, the rude Celtic monuments being the only specimens of archi- tecture they possessed. The transitional style of archi- tecture referred to will be found in what are called the Saxon and Norman buildings of England, and to a greater or less extent in all parts of Europe in which the Romans had been masters, and particularly in those which adhered to the Roman communion in the great divi- sion of the churches. The general forms and modes of arrangement peculiar to Roman architecture may be traced throughout; in some specimens they are more and in others less obvious, but the leading features are the same. This is more evident in Italy than elsewhere. In the early Roman basilicas and churches, some of which are of the age of Constantine, and which were constructed in the Roman style, the first divergencies occur; in those which are later they are still greater, and distance of time and place appears still to have increased them, till what may be called a new style was formed,

having peculiari- ties of its own, but even more clearly deducible from its origin than Roman is from Greek or Greek from Egyptian. The variation in the development from the parent stock is great, but in all cases there is more or less evidence of the descent. It must be noted, however, that there was one important modification of Roman art, and this was the Roman art modified by contact with the East, and known commonly as Byzantine. Its influence was felt first and most strongly in St Mark's, Venice, a building which is entirely Byzantine in style as opposed to Romanesque. From Venice it was copied in Périgueux in the church of St Front, and this copy influenced the style of a vast number of buildings in the south-west of France. St Mark's, again, had a great influence on the Lombard works of Northern Italy, aud these were the originals from which Germany, by way of the valley of the Rhine, derived all its medieval buildings. To the greater part of France and to England the stream of art was much more purely Romanesque, being the result of knowledge of genuine Roman art, with little, if any, influence from the East. In Spain we see the direct influence of the Romans, the direct influence of the Arab, and the indirect Byzantine influence of the south-west of France, all materially affecting the development of the national architecture. As might be expected, this style was not the same in all the countries which practised it ; it was derived, in them all, from the same source, as we have shown, but was materially influenced by the habits, manners, and state of civilisation of the various nations, and much, too, by their means of communication with Rome. This, in strictness, may be called Gothic architecture, as it was partly induced by the Gothic invasions of Italy, and was invariably practised by the nations to whom that term may with propriety be applied. It arose in the 4th century, and was subverted in the 12th by the invention or introduction of the pointed arch, which niarks a new era, and was destined to give birth to a new style in architecture.

Where, when, and with whom the pointed form origin-

ated has been more discussed and disputed than the dis- covery of the properties of the arch itself. Some have contended that it was suggested by

the intersections of semicircular arches, as they were employed in ornament- ing the fronts of edifices in the preceding style; some, that groined arches of the same form gave the idea ; others have referred it to the interlacing of the branches of trees when planted in parallel rows,—to an imitation of wicker- work,—to a figure used on conventual seals,—to the principle of the pyramid, —to N oah's ark,—to chance. Such a mass of conflicting opinions, almost all supported by some show of reason, and more or less by evidence, may be called a proof of the impossibility of determining the question. There is one striking fact, however, which has been overlooked by many of the theorists in the discussion of the question; it is, that the pointed arch made its appearance almost at the same moment of time in all the civilised countries of Europe. This is proved by the controversies of those who claim its invention for their respective nations; for none of them can produce genuine specimens of it before a certain period, to which they can all reach. Now, if it had been invented in any of the European nations, that one would certainly have been able to show specimens of it of a date considerably anterior to some of the others; for though it might by chance have been soon communicated to any one of them, the impro- bability is great that it would immediately have reached them all, and have been at once adopted by all, to the subversion of their previously practised forms of construc- tion. The infrequent and imperfect modes of communl- cation between the different countries of Europe at the period referred to, furnish another reason why it is not probable that a discovery of the kind should travel rapidly from one to another. Considering these things, and particularly the fact of the almost simultaneous introduction of the pointed arch to the various nations of Europe, as it appears by their monuments immediately after the first Crusade, in which they all bore a part, connected with existing evidence that it was commonly used in the East at and anterior to that period, the most rational and satisfactory theory seems to be that a knowledge of it was acquired by the Crusaders in the Holy Land, and brought home to their respective countries by them. In Europe there are found rude approaches to the pointed form in some of the earlier Gothic structures; but we believe it may be safely asserted that nothing can be indicated of a date beyond that of the first Crusade, approaching the simple but perfect lancet arch, which, it is not denied, came into use immediately after that period ; whereas tolerably well- authenticated examples of it are found in the East, of sufficient

antiquity to induce the opinion that it was at that time imported thence. It is, moreover, indisputable that the Saracenic or Mahometan nations, who were never known in those times to adopt any European custom or invention of any kind, do use, and have used, the pointed arch. It was very extensively employed in various parts of Asia, and nowhere in more sumptuous edifices or with greater effect than in the structures erected by the Maho- metan conquerors of India. With what nation of the East, and in what manner, the pointed arch originated, are prob- lems equally difficult to solve. We have not been able to discover that the properties of the arch were known to the Egyptians or to the Greeks, and there is no evidence to show that they were known to the Persians or to the Indians of ancient times; but structures are found in the countries of those nations in which chambers are domed, and apertures covered with a pointed arch, produced, however, by gathering or corbelling over, and not by arched structure. It is not improbable, therefore, that, such things existing, when the properties of the arch be-

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came known, that form would be repeated upon it, and the result would be the lancet arch,—the prototype, the germ of the style. The pointed arch, on its introduction into Europe, was not accompanied by any of its ordinary acces- sories in after-time,—its light clustered pillars, its mullions, foliations or featherings, and graceful tracery. These de- velopments resulted from its adoption ; so that whether the arch itself was invented in Europe or imported from the East, to the European nations must be assigned the credit of developing the beautiful style of architecture whose distinguishing feature it is.

Before proceeding further with this subject, it is neces- sary to determine by what name this style is to be desig- nated. There have been only too many arguments and discussions on the name which is most appropriate to the style. By common consent the word Gothic is used all over Europe to designate it, and it now hardly matters whether or not there was originally good reason for the use of such a term. One of the first in England to use the term was Sir Henry Wotton. It was continued by Evelyn, who applied it more directly ; and the authority of Sir Christopher Wren finally settled its application. But they used the term as one of reproach for what they thought

a savage and uncivilised sort of art, though it was in vain that, by the use of a bad name, they attempted to deny the merit of that which was after all the only nationally de- veloped style of their own country as well as of the whole of Northern Europe. In the last century, through the influence and enthusiasm of Horace Walpole, and afterwards of John Carter, an eminent artist and architect, a better taste was formed, and this led to the appreciation of that which is, indeed, the English national style. Many at- tempts were made to explode the totally irrelevant appel- lation of "Gothic" which had been applied to the style, but without effect. Some writers have called it Italian, others German, others Norman or French, others British, and many have contended for the exclusive term English. To this last the Society of Antiquaries lent its influence, but with equal inefficiency, for the term Gothic still pre- vails. Mr Britton, than whom perhaps no man possessed a greater right to affix an appellation to the pointed arch style, from the splendid services he has done it in the pub- lication of his Cathedral and Architectural Antiquities, wished to introduce a term which is not at all unlikely to succeed, as it is equally appropriate and independent of national feeling and hypothetic origin. He called it Chris- tian architecture, and in this he was followed by the younger Pugin and many others. This, as a generic term, would admit each nation possessing specimens of it to dis- tinguish its own species or style ; and as the varicties of Hellenic architecture are known by the names of the tribes or nations who are presumed to have originated them,—Dorian, Ionian, and Corinthian,—somight Christian architecture be English or British, German, French, &c., for each has its peculiarities. These species would again in- dividually admit of classification, according to the changes each underwent in the course of its career. One objec- tion, however, has been taken to Mr Britton's distinctive appellation. It is, that "Christian" applies as well to what may also properly be called the Gothic style—that which arose on the extinction of Roman architecture, and was subverted by the introduction of the pointed arch, and which, indeed, owed its diffusion and progress, if not its origin, to the Christian religion. Weare therefore still left to seek a suitable appellation ; and in the absence of a better, are inclined to use the term Pointed, which is not only distinctive, but descriptive ; it has, too, the merit of being general, so that it may mark the genus, while the national species and their varieties may be distinguished by their peculiarities as before.

The pointed arch was a graft on the Romanesque, Lom- bard, and Byzantine architecture of Europe, just as the circular arch of the Romans had been on the columnar ordinauces of the Greeks; but with a widely different result. The amalgamation in the latter case destroyed the beauty of both the stock and the scion ; while in the former the stock lent itself to the modifying influence of its para- sitical nursling, gradually gave up its heavy, dull, and cheerless forms, and was eventually lost in its beautiful offspring, as the unlovely caterpillar is in the gay and graceful butterfly.

We all know that architecture has had its origin in religious feelings and observances—that its noblest monu- ments among the pagan nations of antiquity were temples to the gods—-whilst the rude nations of the north in the Middle Ages devoted their energies, after their conversion to Christianity, to the construction of suitable edifices for the worship of the Almighty ; and we find, again, that the most extensive and most splendid structures raised by the same people, when the light of learning had begun to shine upon them, and a new and more beautiful style of architecture had been developed, were dedicated to the same purpose. In addition, however, many, hardly less magnificent, and not less beautiful, were raised for the purposes of education, and became the nurseries of science and literature. Kings and nobles also employed archi- tecture in the composition, arrangement, and decoration of their palaces and castles; and though for domestic purposes its aid was not so largely required, it was equally used. The remains which have come down to us from the earlier portion of the Middle Ages are comparatively small, but there is ample evidence to show that the style was uni- versal in its application, and so full of life and vigour that every implement, every piece of furniture, and every detail of dress or ornament, was governed then, just as in the best period of classic art, by the rules of art which were observed in the largest and stateliest of the public build- ings of the time,

When the practice of building houses in stories com- — menced cannot be correctly ascertained, though it was usual among the Romans, as we know by the example of Pompeii, and it appears to have been usual during the

Middle Ages. We frequently, indeed, find an apparent equivalent for the term story used by the ancient writers, both sacred and profane ; but it must be remarked that none of the ancient remains, whether of public or private structures, afford evidence that it was a common practice even among the Romans to build more than one story above the ground floor ; and it was less likely to be com- mon among the Eastern nations, with whom the practice is not very general, even at the present day. Indeed, with- out considerable proficiency in the art of construction, it is hardly practicable to erect buildings in stories with such slight materials as were used by the Romans in some of their domestic edifices. We find, however, in the oldest existing works of the Middle Ages, and particularly in some of the secular structures of Venice, a degree of in- telligence evinced in this respect far surpassing anything found in ancient remains. Possibly the skill was princi- pally acquired in that city from the necessity of making artificial foundations, which consequently required a super- structure not unnecessarily cumbrous ; and again, to make slight walls sufficiently strong, they must be skilfully bonded in themselves, and bound together, which could only be done by means of a material possessing cousider- able length and great fibrous tenacity—whence arose framed floors of timber. These, by their strength, their obvious utility and convenience, added to the want of space which existed in a thriving and populous community on a very restricted spot of dry land, superinduced, in the second

soon be imitated in other places. But in whatever man- ner the improvement took place, the fact that it was made is certain; and we find it applied in all the works of the European nations, both ecclesiastical and civil, from the 9th and 10th centuries downwards. The com- bination of masonry and carpentry in building tended greatly to the advancement of both ; for, it being required at times to make them act independently of each other, additional science and art were neccssary, as the propor- tions must be retaincd that were given to similar works in which they co-operated. To this is to be traced the skill displayed in the vaulted roofs and ceilings, in the towers and lofty spires, of some of our Pointed cathedrals for the one, and such splendid examples of construction as the roof of Westminster Hall for the other. On this point Sir William Chambers, who was certainly no

*depreciator of the merits of the Romans in architecture, says: "In the constructive part of architecture the ancients do not seem to have been great proficients " (Gwilt's Chambers's Civ. Arch., p. 128) ; then having referred many of what he calls the * deformities observable in Grecian buildings" to want of skill in con- struction, he continues, "neither were the Romans much more skilful; the precepts of Vitruvius and Pliny on that subject are imperfect, sometimes erroneous, and the strength or duration of their structures is more owing to the quantity and goodness of their materials than to any great art in putting them together. It is not, therefore, from any of the ancient works that much information can be obtained in that branch of the art. To those usually called Gothic architects we are indebted for the first considerable im- provement in construction, There is a lightness in their works, an art and boldness in their execution, to which the ancients never arrived, and which the moderns compre- hend and imitate with difficulty. England contains many magnificent specimens of this species of architecture, equally admirable for the art with which they are built, the taste and ingenuity with which they are composed." To this Mr Gwilt, in his edition of Sir William's work, adds, with much truth, in a note, " There is more constructive skill shown in Salisbury, and others of our cathedrals, than in all the works of the ancients put together."*

Pointed architecture took root and grew with almost equal vigour, though under different conditions, in almost every part of Europe. But the honour of having developed the style to the very highest perfection must undoubtedly be adjudged to France, or rather to the small portion of the country, including Paris, which formed the old Ile de France. In Germany there was much less natural develop- ment. For a long period after the Lombard style had been perfected on the Rhine no variation of moment was adopted, until German architects attempted at Cologne to outvie and rival the magnificence of Amiens. In Spain

the architects of some of the finest buildings were French-

men, and the style can hardly be said to have been deve- loped there at all. In England, on the contrary, though our earliest Pointed buildings were undoubtedly to a great extent French in their origin, the developments of the art were soon entirely national, and were but little modified even by the

influence of the foreign religious orders, which (as at Fountains Abbey) had so much power over many of our ecclesiastical foundations. From England the style was carried by Englishmen to Scotland,—a poor country, with no style of its own, and no cultivation such as is necessary to produce an order of architects, and to Ireland, where the English architects followed the footsteps of the invading armies ; and finally, if we may trust the evidence of the

stones themselves, to the coast of Norway, where the cathe-

dral of Trondhjem is as unmistakably English in much of

its style and detail as any English cathedral. In England the |

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place, the building of additional stories, which would

in architecture.

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development of the style is plainly marked, and its advances are easily traceable. We find in various portions of the same edifice, according to the period of its construction, exemplifications of the style, from the ingrafting of the simple lancet arch on the Norman piers in the time of Henry IL, to the highly enriched groinings and ramified traceries of the age of Henry VIL; but the changes are so gradual, and are so finely blended, that the one in advance appears naturally to result from that which comes before it. Although the nations of the Continent never borrowed from us, but were themselves originators, it is very clear that after the first we did not borrow ; for our structures bear the strongest possible marks of originality, as the

‘gradual advances can be traced from one feature to another

in a way which is quite peculiar to this country. This, however, will be explained more in detail further on.

The Pointed Architecture of Europe generally.

There are so many local and national varieties of this style that it is quite impossible to dismiss it with an account of its features in one district or country only. To do this would be to give an entirely wrong and inadequate conception of the subject. It must be treated generally under the heads of the scveral countries in which it has flourished most—as England, France, Germany, and Spain. It must certainly not be forgotten in talking of Italy. And in most of these countrics it might properly be sub- divided according to the local varieties caused either by changes in the political geography, or by physical conditions which so largely affect the details and variations of style For the origin of all these developments of the style we must go back to Rome. It is not only

that in the Roman states we see the origin of Romanesque architecture gradually developed outof the Roman buildings.

The same process was going on at the same time all over

Europe wherever the Roman empire extended. We have only to look at the Roman occupation of the south of France, as evidenced by the still magnificent remains of theatres and tombs at Arles, of the amphitheatre at Nismes,

of the theatre at Orange, or the aqueduct of Pont de Gard ; or at the similar works on the coast of Spain, at Tarragona, or in its very centre at Segovia ; or at the basilica, gateway, and theatre at Treves; or in our own country at the remains of Roman buildings in various directions, of which Silchester is surpassed in interest by none ;—we have only to look at all these in order to see that, erected as they were in countries which at the time were little better than barbarous, they must of necessity have prepared men all over Europe for the same sort of development. The Romans had shown them the use of the arch, the column, and the vault ; the conversion to Christianity gave them a great want to satisfy ; and finally, the revulsion of feeling when the supposed mystical year of our Lord 1000, with all its apprehended accompanying dangers, had passed in safety, gave such an impetus to buildings for religious purposes as the world had never before seen. It was a time for development, therefore, and nearly everywhere the development proceeded from the same premisses. Roman art, pure and simple, was the general foundation of all Romanesque building, and it was only slightly

modified in certain districts by the introduction of the Byzantine influence from Constantinople to Venice, and thence in some degree to some other cities and towns, or, as in Pisan buildings, and in those of the south of Italy and south of Spain, by the Greek and Arab influence which was so great down to the end of the 13th century. An examination of the earliest European churches—such, for instance, as San Clemente and San Lorenzo at Rome—will show how entirely they were constructed on Roman models. From them we go in Italy to Ravenna or Toscanella, to

San Miniato at Florence, to the cathedral of Torcello, to San Zenone, Verona, and San Michele, Pavia, and see how gradually but surely the plan and details were being deve- loped into what soon became a new style ; and from these examples we nay follow the stream of art from the south to the centre of France, and thence to this country and Germany. Or looking at other developments in Italy, we nay in the same way trace a succession of circular build- ings, in which the connection and sequence is clear, leading us as it does from the Pantheon, and other circular Roman temples, through the old cathedral of Brescia and the 'grand church of San Vitale, Ravenna, to the cathedral at Aachen, and so to our own circular churches, and to many of those which, like the Marien Kirche, Treves, though not really circular in appearance, are yet so planned as to fall properly within the same class.

The course of progress of European art was to a great extent first of all geographical and political. For, in addi- tion to the influence exercised by conquest or the political connection of one district with another, it is remarkable how much particular styles are limited by geographical divisions and boundaries, by the courses of rivers, the occurrence of convenient building materials, and other such secondary causes. And with so many causes for variations of style in existence, it will be quite neces- sary, in order to give any intelligible account of the whole course of Gothic architecture, even in the shortest compass, to treat separately each of the great national divisions. We will take England first, only premising that, following strict order, we ought to have begun with Italy, were it not that, in spite of the origin of all northern art having to be looked for there, as soon

as it came to be a question of development, almost all the life and vigour of architecture in the Middle Ages is to be seen north and not south of the Alps; and whatever was borrowed, in the first instance, from Italy was paid back again with interest afterwards. And in taking England first, we have the advantage of speaking of a national art, of which every oducated Englishman knows some of the examples, so as to be more able to follow the course of our arguinent than would be the case were all the examples of its application foreign and unknown to him.

English Gothic Architecture.

The history of the development of Gothic architecture is, perhaps, more easily read on the buildings themselves here than it isin any other part of Europe. The Roman build- ings in England were never of very great importance, and were not always standing as evidences of the existence of an older style, which might be looked back and up to with respect and admiration, even where they did not harmonise with popular customs, Such art, nevertheless, as did exist in this country before the llth century, was, no doubt, derived from Roman examples existing in the country, and copied in a rude and unskilful fashion by native workmen. The existing Roman remains show that there was quite enough architectural and decorative art introduced into the country by the Romans to have formeda school of masons, sculptors, and builders, if the civilisation of the people had been sufficienttomakethem desireit. Such a school can hardly be said to have been formed if we look at the few and comparatively rude remains of buildings certainly erected be- fore the Norman Conquest. In such work as the beautiful archway recently discovered in Britford church, Wilts, where carving of stone-work is joined with brick or tile and stone in a very elegant fashion, we see the immediate effect of cultured Roman influence and example. At a later date, in such fine works as the steeple of Earl's Barton, Northants, we see only the rude grandeur of compara- tively uncivilised workmen cognizant only at a distance of

good Roman work. In upwards of a hundred churches, dispersed in various parts of England, fragments more or less complete of these early buildings, erected before the Norman Conquest, still remain. They are numerous enough to enable us to classify their features in a general way, and they agree in certain definite points of difference from the architecture which prevailed after the Norman Conquest. It is probable that a considerable proportion of these buildings were erected after the year 1000, when we recollect the influence which the expected end of the world had in discouraging building shortly before that date, and how enormous the zeal for building was as soon as it was safely passed. The leading features of the buildings erected before the Conquest are as follows :—(a.) Quoins at angles alternately long and short, the difference being so marked as to be seen on the most casual inspection; (b.) Arrange- ment of wall faces into panels by means of vertical strips or pilasters of stone; (c.) Arches built not only in semi- circular form, but frequently (and especially for arcading) with straight sides; (d.) Rude balusters, generally bulging outwards in the centre, used to divide openings of more than one divison (as, e.g., belfry windows); (e.) Introduc- tion of rudely moulded, chamfered, or plain square abaci at the springings of arches ; (7.) Towers, in several cases of some importance, adorned with arcading, formed by pilasters and round or straight sided arches. These features are all represented in illuminated MSS. of the same period, and are not seen in works executed after about the date of the Conquest. It is this fact that makes the year 1066 a convenient year for dealing with as the assumed commence- ment of anew epoch. But in fixing this date, we must remember that, though the Conquest of William would ac- count satisfactorily for the changed style of building which is universally seen after this time, there can be no doubt that Edward the Confessor's Norman education led naturally to the introduction of many Norman features into English work. The considerable remains of that king's foundation at' Westminster Abbey afford good evidence of the fact, that the so-called Saxon style had been abandoried by the workmen employed by him, and that the way was being prepared for the adoption of all the Norman architectural features even before the imposition of the Norman rule.

The succeeding periods of English architecture have been generally divided upon similar systems, the main dispute among antiquaries and architects

being as to the nomenclature of the various styles which followed each other in a regular course of development, rather than as to the exact period of change. Between the complete styles there is always a period of transition, during which the features of the styles were not so well marked, and during which the progress of the art was by no means uniformly rapid in all parts of the country. The following chrono- logical table gives the main divisions :—

Style.

From the reign of William Norman ; or Romanesque.

I. to the end of Stephen, NOGGRTO MGA Ree ee… .— an Henry Il., 1154 to 1189…..... Transitional from Norman to Pointed. Richard J. to Henry III.,) Early English; First Pointed; or TS OMORIT 2 ccss..6.0 cs ace Lancet. , . 7 Transition from Ear ointed to Edward]., 1272 to 1807 … Complete, or Gkonect rival Pointed. Edward II., 1307 to 1327…... Geometrical Pointed. Edward IlI., 1827 to 1377 … Flowing; or Curvilinear Style. These two are generally treated as one style, called by Rickman Deco- rated, by others Middle Pointed. Transition from the flowing lines of Decorated or Middle Pointed to the stiff and hard lines of the suc- ceeding style. ; Third Pointed; or Rectilinear (Sharpe) ; or Perpendicular (Rick-

Richard II., 13877 to 1399

Henry IV. to Henry VIII., 1899 to 1546

Il. — 54

Norman,

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admit of their being classified with the same precision as those which obtained from about the year 1066 to 1546. For that period of just 500 years so regular was the development, that it is not too much to say that a well-in- formed architect or antiquary ought always to be able to give, within ten or at most twenty years, the date of any, however small a portion

of medizval architecture, with almost absolute certainty of being correct when his judg- ment can be tested by documentary evidence. With this preface we will now describe, in as concise a manner as possible, the features of the various divisions given in the foregoing table.

The characteristics of the Norman style are, no doubt, generally known. The works executed during this period

were on so colossal a scale, and so many of them are still

perfect, that every opportunity is afforded for studying them in all parts of England. It may be observed, too, that there is less variety in the character of the style in different dioceses or counties than there is in the case of subsequent works. The earlier works, as, e.g., Walkelyn's transepts at Winchester Cathedral, are comparatively simple and rude. the simplest form of cushion capital; and grand and solemn as the work is, it cannot, for refinement and beauty of detail, be compared to the later Norman work in which, instead of minute directions being given to the workmen, they were encouraged to develop their own taste and ingenuity in the decorative sculpture with which they so elaborately covered their architectural mouldings. But still, the principles of construction, and of the decoration of it, were identical throughout the whole period. The ground-plan of most Norman churches was cruciform, with a central tower, the east end being very frequently apsidal. The aisles were divided from the naves by columns of vast size, sometimes circular, sometimes octagonal, and sometimes simply clustered. The arches were for the most part semicircular, save towards the end of the period when the pointed arch was often used where much strength was required, though the round arch was still used everywhere for ornament. The windows in small buildings were mere narrow slits in the wall, probably not meant to receive glazing, and opening out with a wide splay on the inside; in larger buildings they were much more impor- tant features, being of large size and adorned with columns, with capitals and bases both inside and outside. The treatment of mouldings was accurate and scientific. As large arches are naturally constructed with a series of orders or layers of stones, the masons wrought each of these with a separate moulding, so as to define them well, and provided capitals whose upper surface was ingeniously planned, even where it fitted a circular

column below, so as to fit exactly the several orders of the arch. This is one only out of many features which prove how skilful the Norman architects were. All their best works are in no sense haphazard works of art, but carefully ordered and arranged with almost classic attention to regularity, The masonry is at the same time unusually beautiful and well executed. There is probably not a finer piece of masonry in England than the late Norman central tower of Win- chester Cathedral,—the stones being all uniformly wrought, close jointed, and regularly coursed. The doorways are the great glory of many of these buildings. Sometimes the mouldings are continuous round jamb and arch (as in the well-known examples at Malmesbury Abbey and at Iffley), but more usually they are adorned with a series of columns, sometimes carved or diapered, and carrying on their capitals a grand succession of enriched arch mouldings. These doorways do not occur only in large and important churches,

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Even after this period many buildings were erected in a debased imitation of Gothic, but their features do not

The arches are unmoulded, the capitals are of

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but are to be seen also in out-of-the-way country churches in all parts, even the most remote, of England. 'The walls were often arcaded with single or intersecting arches, treated in the most elaborate manner. They were usually of so great a thickness that no buttresses were required, even where, as in the aisles of large churches, stone vaulted roofs rested against them. The Norman buttress, wherever intro- duced, is consequently only a slight development of a pilaster, used for the purpose of defining the divisions or panels of an elevation, and not introduced for the sake of giving support to the wall. The walls are frequently en- riched with moulded or carved string-cornices, and with a cornice supported on corbels under the eaves of the roof, and in the best works are entirely of wrought stone, and built in regular courses. The roofs which surmounted the walls were usually of steep pitch, showing the whole of the cross framing of the timbers used in them ; and sometimes, as in the case of Peterborough Cathedral, boarded

on the under side so as to form a flat or slightly canted ceiling, which was then decorated with colour. At Adel, near Leeds, are remains of a richly-moulded Norman roof, in which every pair of rafters seems to have been furnished with a tie-beam. But it need hardly be said that not many wooden roofs of this period exist; and the stone roofs which, as time wore on, were more and more often erccted, were not only more permanent in their character, but, no doubt, played the most important part in the gradual de-velopment of the style and the introduction of the pointed arch. The succession of vaults was the same here and on the Continent, First of all the plain barrel vault, then one formed by the intersection of two such vaults at right angles ; and finally, this vault with well-defined arches

'between the bays, and mouldings or ribs under the angles

of the intersecting vaults. It was impossible for men to go on long forming such vaults as these without realising, not only that apointed arch might be built, but, at the same time, that its form enabled a builder to overcome many practical difficulties in the formation of vaults, which could only be got over otherwise, and then badly, by the expedient of stilting the round arch. The Norman vaults were seldom applied to any but the aisles of churches at no great height from the ground. They were very heavy, and exerted more thrust on the wall than the later Gothic vaults, and the Norman masons shrank consequently from venturing to put them on their lofty clerestories.

It was in the next period—that of the transition to Transition Pointed—that the science of vaulting received a great ' Pointed.

impetus, whilst the whole architectural construction at the same time tended to assume more graceful and elegant lines. In so general a view of the case as this, it is im- possible to do more here than point to salient examples which illustrate generally the progress of the art. Just as the cathedrals of Peterborough, Durham, Norwich, and Ely illustrate, on the grandest scale, the features of the best Norman art in England, the eastern part of Canter-bury illustrates the whole period of the transition from that to Pointed, and is consequently one of the most valuable buildings that we have for the purpose of study, as well as one of almost unrivalled beauty and magnificence. Professor Willis has made this church classical ground to the

archeologist who, under his guidance, and with the advantage of the description of the work written by the monk Gervase, who saw it in process of building, examines its many curious evidences of gradual development. Ger- vase himself describes the changed mode of workmanship and design, as he chronicles the difference between the new work and that older Romanesque choir which had before his time been called " the glorious choir of Conrad." He says,—' The pillars of the old and new work are alike in form and thickness, but different in length; for the new

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pillars were elongated by almost twelve feet. In the old capitals the work was plain, in the new ones exquisite in There the arches and everything else was plain or sculptured with an axe and not with a chisel, but here No marble

sculpture.

almost throughout is appropriate sculpture.

columns were there, but here are innumerable ones. There,

in the circuit around the choir, the vaults were plain, but here they are arch-ribbed and have key-stones." " There

was a ceiling of wood decorated with excellent painting,

but here is a vault beautifully constructed of stone and light tufa. There was a single triforium, but here are two in the

choir, and a third in the aisle of the church," &c. This

great work was begun under a French architect, William of

Sens, inthe year 1175; he was killed by injuries received in a fall from the scaffolding in 1179, and was succeeded by his assistant, William the Englishman ; and to these two men is due the credit of the design as we now see it.

One of the most noteworthy points in its history is the obvious and simple mode of accounting for the French character and state of much of the work, which it presents ;

and looking at it, no one can be surprised at the enormous

development which immediately took place throughout the country. The change from heavy piers, with carving

rather elaborate than beautiful, to delicate columns carry- ing on exquisite capitals lofty and graceful pointed arches and vaults, was so great that it was impossible not to prefer it to the stately but comparatively rude work which it supplanted ; and so the tide of change having set in, further improvements were soon desired. Mouldings became much more delicate and subtle in their contour. Groining was then more tastefully planned and disposed, windows and doorways were made far more graceful, whilst the system of construction was largely improved upon. Instead of thick, massive walls without buttresses, the walls were re- duced in thickness, and the material saved was transferred to the buttress, where it could most effectually fulfil its office of supporting the vaults and walls above. From buttresses conceived in this view the transition to flying buttresses was easy; then to stiffen these, pinnacles were added. And in the same way one lancet window led the way to groups of lancets; and these in their turn, by combinations with pierced circular windows, to completely developed traceries.

The First Pointed, Lancet, or Early English style to which the transitional work thus led up, may fairly be considered to be a purely English variety of Gothic. It is more con- sistently graceful and delicate in its details, as well as in its general character, than any foreign work of the same period. There was no longer any observable foreign influ- ence brought to bear as there had been at Canterbury. Intelligent artists all over the country were rapid in seizing the best features of executed works, and carrying them farther with as little delay as possible. There were various centres from which distinct local varieties of style were sent out. If we compare York (transepts), Lincoln, and Salis- bury Cathedrals, we shall find that, though there are certain general similarities of treatment, the distinct mark of the one presiding individual architect or artist is found in each. Compared to

the architect of York Minster, the one who built Salisbury was altogether inferior. This feature of local varieties in style, the result of the influence of indi- viduals, is from this period one of the most noteworthy features in English art; and generally one man influenced the work in his own diocese or district, and no further. Throughout the period before us—1189 to 1272 —the de- velopments were all in the same direction as during the pre- vious time of transition. The tendency was always to greater lightness and elegance ; skilful combinations were touch thought of; and, towards the end of the period, there was even too great a display sometimes of the cleverness

of the artist. But with work so really beautiful as it all was, and so uniformly good in the smallest nearly as much as in the largest building, it is ungracious, if not conceited, to affect to criticise the spirit in which the artist worked. The use of delicate shafts of polished marble (obtained in great part from the Isle of Purbeck) for doorways, windows, and arcades, is one of the distinguishing features of the style at this time. Generally they are treated with great beauty, but there were structural inconvenienccs about them which soon began to be felt. The columns were of necessity set out of their natural bed, and so began very soon to decay. It was necessary also to combine them together in groups, and to trust to the capitals, bands, and bases holding them together; and such construction not only looks dangerously slight, but is so. A radical defect also in engaged marble shafts is that, though they seem to be intended to do all the work and carry all the weight, they do in point of fact, wherever it can be contrived, carry no weight at all; and it was, no doubt, when and as this was discovered, that the medieval builders gradually lost their liking for them, and returned to safer, if less brilliant, construction in stone, with piers formed with mouldings instead of shafts detached from the wall.

The characteristic elegance of the general architectural design was carried out in all the details. The mouldings were delicately rounded and alternated with hollows so drawn as to give here delicate and there most forcible effects of light and shade. Thus the dark line produced by marble in a pier

was continued by means of a dark shadow in the arch; and without considerable knowledge of the science of moulding, it is impossible to do justice to this part of the English Early Pointed work, which has never been sur- passed, if, indeed, it has ever been equalled at any period elsewhere, The groined roofs were still simple in design, but a ridge rib was often added to the necessary transverse and diagonal ribs of the previous period. This gave a certain hardness of line to the vault; it was the first step to the more elaborate and later systems of vaulting, and was soon followed by the introduction of other ribs on the surface of the vaulting cells, Few works are more admirable than some of the towers and spires of this period, but space will not allow of mention even of many of its best features. Probably the greatest excellence ever attained in English art was reached in this period by the architects of the great Yorkshire abbeys. No buildings in Europe surpass them in purity of general design, excellence of construction, beauty of detail, or suitability for their purposes. And it isa mis- fortune of the gravest kind for future generations, that their ruined condition forbids the possibility of our descendants appreciating as we can these consummate works of the most golden period of English art.

The transition from the simplest Early Pointed to a more Later advanced style can be seen as well in Westminster Abbey as Styles. anywhere. Here traceries began to take the place of simple lancet openings, and led to that system of window tracery which was, in fact, the distinguishing feature of the suc- ceeding style. When the invention of tracery was com- plete, everything in Gothic architecture rapidly changed. The art of masonry and stone-cutting was rapidly developed. Moulded stones, from being made continuous round the intricate combinations of window traceries, came naturally to be used much more largely than before in place of simple bearing shafts. So columns came to be formed of clusters of mouldings; and, in the case of groined buildings, each moulding of the shaft was developed into more mouldings above the capital, or even frequently carried on to the vault without any capital at all. Traceries were first of all com- menced by merely piercing geometrical patterns or circles through the thickness of the walls. Then these patterns were combined under one enclosing arch; and then, when

this sort of tracery had reached perfection, it was found

possible to vary it indefinitely by making use of double

curves (or ogee lines); and then, when these had been used for a short time, flowing lines, wandering gracefully over the space to be filled, and sometimes drawn by hand, sup- planted the more formal outlines of the earlier work. The difference was great between an opening which was made (as the earlier examples were) with a sole view to the opening for glass, and one which was the accidental result only of the pretty lines and curves made by regarding the monial of the window, and not the light, as the thing to be considered. The tendency of the modification was to make men think lines of more importance than masses ; and, whether consciously or not, this was just what happened : not only window traceries but mouldings, carvings, and every other feature, were entirely changed in character. The soft gradations of the early mouldings were given up for combinations of more hardly defined and thinner lines of light and shade, and, in harmony with this change, a crisp and sharp imitation of natural foliage was devised,

which supplanted the rich and round forms of the earlier

sculpture. The whole practice of art was becoming more scholarly, perhaps, but at the same time it was more con- scious, and the cleverness of the architect was almost as often suggested as the noble character of his work. Merton College chapel, Oxford, the nave of York Minster, the choir of Selby, the whole of Exeter Cathedral, are a few among the many examples of this period of which this country can boast, and it will be seen that the change in character which is evident between the earliest and latest Middle Pointed works is enough to justify those who would again subdivide the nomenclature. The difficulty is that, where progress was so constant, it will be necessary, in order to be exact, to subdivide each century five or more times in order to be really definite.

Towards the end of Edward the Third's reign, the last great change was made. The first example of this is seen in the western end of the nave of Winchester, followed soon after by William of Wykeham's magnificent (if somewhat cold) reconstruction of the rest of the nave. It may fairly be held that the moving cause for the change was a sense of disgust at the vagaries

into which the votaries of curvi- linear window traceries had been led. There was something weak and effeminate about their work, and Edyngton and Wykeham, when they built the nave of Winchester, were evidently endeavouring to return to a simpler and more dignified style of building. The first thing they found to amend was the exuberant tracery which was ruining archi- tecture. They did not return to earlier forms, but they corrected this exuberance by introducing vigorous, straight, vertical, and horizontal lines. 'These, combined with sub- arcuation, gave their work at first a vigour which had lat- terly been wanting; and no one can look at Wykeham's great work without feeling that he succeeded in his effort to impress a sense of vigour and manliness on the whole of it. Unfortunately, the love of display and of the exhibition of skill which was so strong before was in no degree lessened, and the change in style did nothing permanently to check it. The fondness for straight in place of flowing lines was more and inore developed. Doorways and arches were enclosed within well-defined square outlines, walls were divided by panelling into rectangular divisions; vertical lines were emphasised by the addition of pinnacles, and buttresses used more for ornament than strength, whilst horizontal lines were multiplied in string-courses, parapets, and transomes to windows. Groined roofs, which in the 14th century had been enriched by the multiplication of surface ribs, were now most elaborately enriched by cross ribs subdividing the simple spaces naturally produced by the intersection of necessary ribs into small panels; these,

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the same course of change at the same time, much has been

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again, were filled in with tracery, and finally, the key-stones were formed into pendants, and the branching ribs so radiated as to produce the really beautiful and very English variety of groining called fan-tracery. The amount of skill shown in the construction of these vaults was very great, and most of them have proved their authors' science by the perfect way in which they have endured to the present time. In other respects the architects of the 15th century were very successful. Few things can be seen more beautiful than the steeples of Gloucester Cathedral, or of St Mary's,

Taunton. The open timber roofs, as for instance that of St Peter, Mancroft, Norwich, are superb. And, finally, they left us a large number of enormous parish churches all over the country, full of interesting furniture and decoration, and also a store of interesting examples of domestic architecture which are still the ornaments, and are associated with all the most interesting historical localities, of the country.

After the middle of the 16th century the practice of Gothic architecture practically died out, though traces of its influence, especially in rural districts, were hardly lost until the end of the 17th century. Good, sound, solid, and simple forms, well constructed by men who respected themselves and their work, and did not build only for the passing hour, were still popular and general, so that the vernacular architecture to a late period was often good and never absolutely uninteresting. But it presents none of the characteristics of a school, and cannot be treated of here.

The history of the development of Gothic architecture in England has been gone into at rather greater length than will be desirable in the case of other national developments. And this for two reasons: the examples which illustrate it are more generally known; and as the developments in other countries north of the Alps went through very nearly

said which need not be repeated in treating of them.

A few words will suffice for the necessary notice of the progress of Gothic architecture in Scotland and Ireland. In point of fact, most of what was done in the best period— that is, during the 13th and 14th centuries—was done by English artists, and is in no way more distinct in character than their work was in different dioceses or counties. The Gothic of Lincolnshire, of the eastern counties, of Kent and Sussex, of Somersetshire and South Wales, of Devon and Cornwall, and of Yorkshire, were distinct varieties of style full of local peculiarities. In the case of Scotland, the Scotland, best buildings which remain did not grow up in the same way by the efforts of local architects, but appear to have been the work of architects brought for the purpose from England, north of the Humber. There is a broad distinc- tion between English art north and south of the Humber; and though it is easy to point to evidences of similarity between Scotch buildings and those north of the Humber, it is not possible to show the same connection with any

buildings to the south of it. The evidences of general similarity are to be seen everywhere; it will suffice to mention one or two examples of particular similarity. The beautiful 13th century transept of Hexham Abbey church has some of its most marked features repeated in the also very beautiful transept of Pluscardine Abbey near Elgin. The architect of Lanercost in Cumberland was certainly responsible also for Dryburgh Abbey, either as actual archi- tect, or as having inspired the architect. The buildings generally have, on both sides of the border, the same details, the same general disposition of plan, the same traceries ; and there is nothing to indicate that those to the north of the border are not English. In truth, until the end of the 14th century the two styles are identical. Then Scotch art became more national, because it separated itself from

English, and, borrowing some of its inspiration from abroad, developed in a certainly picturesque and interesting line. Melrose Abbey is one of the most national, as it certainly is one of the most charming, of Scotch buildings ; but its in- fluence does not seem to have been extensive, and it must be classed as a variety of the latest English Middle Pointed, executed by Scotchmen who knew something of English work, and as much of French (if not of Iberian) art, but who were determined to leave the mark of their own hands and minds on their buildings. The other most remarkable late ecclesiastical building is the famous chapel at Rosslyn ; but the art of this is in no sense whatever Scotch, and we must look again, probably, to Portugal as the country of whose artit isan example. Scotland has been unfortunate, in that ecclesiastical changes have involved the disuse and ruin of so many of her ecclesiastical buildings. But still enough remains to make the country a most interesting field of study in regard especially to the art of the 13th century. Glasgow, St Andrews, Kirkwall, Dunblane, and Elgin Cathedrals, and the Abbeys of Pluscardine, Sweetheart, Kelso, Dryburgh, Jedburgh, Holyrood, Dundrennan, and Melrose, afford a series as beautiful as any that can be uamed elsewhere, though most of them are on a moderate scale in their dimensions.

The domestic remains in Scctland are far more numerous, and full of picturesque beauty and magnificence. They are a distinctly national class of buildings of great solidity, and a great deal was sacrificed by their builders to the genius of the picturesque. They can only be classed with the latest Gothic buildings of other countries, but the mode of design shown in them lasted much later than the late Gothic style did in England. The vast height to which their walls were carried, the picturesque use made of circular towers, the freedom with which buildings were planned at various angles of contact to each other, aud the general simplicity of the ordinary face of the walling, are all distinct features in them, and make them more worthy of admiration than most works of the corresponding period in England

In Ireland the progress of Gothic was very similar to that which we have seen in Scotland ; but here may be seen art carried in the train of an invading army to the advantage of the country conquered, just as in England a similar benefit had been conferred by the Normans. Strongbow's inva- sion may be said to have been the introduction to Ireland of Gothic art. He went from South Wales to the south of Ireland. The art in his time in South Wales was to a great extent the development of the monks of Glastonbury. Their influence is visible plainly not only over their own district, but equally at Llandaff and at St David's. It was a very English influence. The Norman art of Canterbury hardly reached or touched them in a very direct way; and their art was taken directly and unmodified to Ireland. Among the buildings erected by the English in Ireland, Kilkenny Cathedral and the two 13th century cathedrals of Dublin— Christ Church and St Patrick's—are the most remarkable, but there are many others. Their style is most plainly that of the Englishmen who followed Strongbow, with no con- cession to, or consideration of, previous Irish forms of art. That these forms deserved respect cannot be doubted by those who have examined the existing remains. Cormac's chapel, which still stands uninjured by the side of the ruined English cathedral on the rock of Cashel, is one of the most interesting relics left. It is a much decorated Romanesque chapel, of two stages in height, groined in stone, and covered with an ingeniously and admirably constructed, lofty stone roof. For ever is a long time, but few buildings have ever been built which seem more likely to defy eternally the ordi- nary wear and tear of time than this. It is still perfect;

and where beautiful design and perfect construction are com- bined as they are here, the highest excellence of which archi-

tecture is capable has been achieved. The round towers of Treland are well-known and remarkable erections, but they can hardly be said to have any architectural character. In a mastery of the finer kind of decorative work few workmen have ever equalled the Irish; none have surpassed them, Their ornaments in metal-work and in illuminated MSS. are truly exquisite and marvellous in their ingenuity. But in masonry, the only works in which the same mastery is shown are the beautiful memorial or churchyard crosses which are so well known and so characteristic.

Gothic Architecture in France.

The remarks which have already been made as to the variation in style visible in various parts of the same country, apply with more force, perhaps, in what we now call France than to any other part of Europe. For the purposes of com- plete study it would be necessary to keep entirely distinct from each other in the mind the following important divisions :— (1.) Provence and Auvergne ; (2.) Aquitaine ; (3.) Burgundy ; (4.) Anjou and Poitou; (5.) Brittany ; (6.) Normandy ; (7.) the Ile de France and Picardy; (8.) Champagne ; and, finally, (9.) the eastern border-land (neither quite Germau nor quite French in its character), the meeting-point of the two very different developments of French and German art. Speaking generally, it is safe to say that Gothic architecture was never brought to its highest perfection in any portion of the south of France. Aquitaine, Auvergne, and Provence were too wedded to classic traditions to excel in an art which seems to have required for its perfection no sort of looking back to such a past. Hence there is no Gothic work in the south for which it is possible to feel the same admiration and enthusiasm as must be felt by every artist in presence of the great works of the north. In Anjou this is less the case; but even there the art is extremely inferior to that which is seen in Normandy and the Ile de France. Brittany may be dismissed from consideration, as being, like our own Cornwall, so provincial and so cut off from neighbours,

that its art could not fail to be very local, and without much influence outside its own borders. The interest felt by the student of the history of the art need not, however, be less in the south than in the north. The Romanesque churches of Aquitaine and the south had immense influence. The church of St Front at Périgueux was built by a Venetian colony, in imitation (as far as its plan and section) of St Mark's at Venice. Its plan, a simple Greek cross, covered with four cupolas, is as essentially Venetian and Byzantine as it was possible to be; and the Venetian church was essentially Byzantine as opposed to Romanesque. This Byzantine or Venetian example spread far and wide over the great province of Aquitaine, and beyond its limits. A long series of churches might be named in all of which the domical character of the roofing is remark- able; and it need hardly be said that such a system of roofing cannot be adopted without a great influence on the form of the ground-plan. Sometimes these domes were treated, as at Loches, like great cones; and nearly always one of the objects of their constructors was to finish them with masonry, inside and out, in what might be held to be an indestructible manner.' At the same time that these churches were rising, we see that in the valley of the Rhone churches were being built, strictly Romanesque in style, founded on the Roman traditions developed from the basilica, and without any evidence whatever of Byzantine influence. Ere long each of these two schools reacted on the other, and the result is seen in the extraordinarily interesting churches of the Puy de Dome and of Auvergne, where the Romanesque plan is adopted, with the addition of domical vaults at the crossings, and domically roofed chapels round the domical apses. But in these examples the plan is not that of the Greek, but distinctly that of

the Latin cross. The architects of Aquitaine, again, influ- enced those of Poitou and Anjou. The church at Fontevrault, for instance, has a nave covered with a series of domes, but is of the long form of the Latin cross ; and the churches of the Gothic period along the banks of the Loire, as at Saumur and elsewhere, have domical vaults entirely unlike the Gothic vaults which were being constructed at the same time to the north ofthem. So, too, the cathedral at Angers, where the domes are carried on pointed arches, and date from the 13th century. And it is not a little strange,

considering the connection which existed between this part of France and England for so considerable a period, that absolutely no architectural influence should be traceable of one upon the other. In plan, in detail, and, above all, in systems of vaulting, the English and the Angevine schools are as distinct and as unlike each other as they well could be. The mode of roofing adopted by the Romanesque architects of France was generally quite different from the Byzantine plans just referred to. Their favourite mode was to cover the nave with a waggon vault, and to support this by a quadrant vault over the aisles, which gave, in fact, a con- tinuous flying buttress along the whole length of the vault. These vaults were covered with flat stone roofs ; there was no timber in their construction, and they have generally been preserved perfect to the present day. In all these churches the distinguishing feature is the plan of the eastern arm of the cross, a circular-ended apse with an aisle round it, and small apsidal chapels at intervals projecting beyond the aisle. What the exact origin of this beautiful termination was it is difficult to say certainly. Butit is obvious that such a plan at that of the temple of Minerva Medica at Rome—a decagon surrounded by apsidal recesses—led naturally to that of the Christian church of San Vitale, Ravenna, and this to the almost similarly planned termination of the great abbey church at Cluny in Burgundy. But in whatever way these early chevets (as the French term them) grew up, there is no doubt that they contained the germ of the magnificent chevets of the complete Gothic churches of the north of France. A point to be noticed, in comparing these build- ings with those in England, is the much greater frequency of stone vaults all over France from the first. The wooden roof to the nave, so common in England, was very rare in France; and the variety of early stone roofs was much greater there than here. As has been seen, the earliest forms were the waggon vault and the dome; the former constructed on aisled churches, the latter upon aisleless buildings. One of the earliest examples of a quadripartite vault (i.e, one formed by the intersection of two barrel vaults at right angles to each other), is that over the nave of the grand abbey of Vézelay in Burgundy. This was erected in the middle of the 12th century; it was a hazardous experiment, and though it still stands, the wonder of all who see it for its magnificent size and archi- tectural character, its construction was not satisfactory, and the thrust of its vaults had to be met by the erection of rude flying buttresses soon after its foundation. But the covering of so vast a building with such a vault was an

achievement sure to be imitated, and it is easy to see how the influence of such an example could be felt all over the country at the time that the pointed arch was coming into use, with all its convenient aids for the construction of such vast vaults. At Vézelay there is no triforium ; the space against which the roof of the aisles abuts is a plain wall, and the example of many Romanesque churches, in which the double aisles of Roman buildings (e.g., St Agnese) were imitated, soon suggested the intro- duction of the triforium gallery between the arcades and the clerestory ; whilst the necessity for light in northern climates developed of necessity the lofty clerestory. Here, therefore, the French architects found themselves in pos-

session of all the elements of design, out of which they developed their magnificent Gothic works. There were difficulties, however, with their ground-plans, which were hardly ever quite surmounted ; but as English architects were wedded to the square east end, Frenchmen were devoted to the apsidal. And it was in the planning of the apse, with its surrounding aisles and chapels, that all their ingenuity and science were displayed. A simple apse is easy enough of construction, but directly it is surrounded by an aisle or aisles, with chapels again beyond them, the difficulties are great. The bays of the circular aisle, instead of being square, are very much wider on one side than the other, and it is most difficult to fit the vaulting to the unequal space. In order to get over this various plans were tried, At Notre Dame, Paris, the vaulting bays were all triangular on plan, so that the points of support might be twice as many on the outside line of the circle as on the inside. But this was rather an unsightly con- trivance, and was not often repeated, though at Bourges there is something of the same sort. At Le Mans the aisle vaulting bays are alternately triangular and square; and this is, perhaps, the best arrangement of all, as the latter are true and square, and none of the lines of the vault are twisted or distorted in the slightest degree. The arrange- ment of the chapels round the apse was equally varied. Usually they are too crowded in effect; and, perhaps, the most beautiful plan is that of Rouen Cathedral, where there are only three chapels with unoccupied bays between, affording much greater relief and

variety of lighting than the commoner plan which provided a chapel to every bay.

Space will not admit of carrying this point farther, but it has been necessary to say thus much, because the plan- ning and design of the chevet is the great glory of the French medizeval school, When the same thing was attempted, as by us at Westminster, or by the Germans at Cologne, it was evidently a copy, and usually an inferior copy, of French work. No English works led up to Westminster Abbey, and no German works to the cathedral at Cologne. When once the Gothic style was well established, the zeal with which the work of building was pursued in France was almost incredibly great. A series of churches exists there within short distances of each other, so superb in all their features, that it is impossible to contest their superi- ority to any corresponding group of buildings. The old Domaine Royale is that in which French art is seen in its perfection. Nétre Dame, Paris, is a monument second to nothing in the. world; but for completeness in all its parts it would be better to cite the cathedral of Chartres, a short description of which must suffice as an explanation of what French art at its zenith was. The plan has a nave with aisles, transepts with aisles on each side, a choir with two aisles all round it, and chapels beyond them. There are two immense steeples at the west end, two towers to each transept, and two towers at the junction of the choir with its apse. The doorways are triple at the west end, whilst to each transept is a vast triple porch in front of the three doorways. The whole of these doorways are covered with sculpture, much of it refined, spirited, and interesting in the highest degree. You enter and find the interior surpassing even the exterior. The order of the columns and arches, and of all the details, is so noble and simple that no fault can be found with it. The whole is admirably executed; and, finally, every window throughout its vast interior is full of the richest glass coeval with the fabric. Thisisa French cathedral at its best, but Amiens and Bourges, and Rheims and Laon, and Caen, Troyes, Le Mans, and a host of other churches, might be named only inferior to this. As compared with English churches of the same class, there are striking differences. The French architects aimed at greater height,

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greater size, but much less effect of length. Their roofs were so lofty that it was almost impossible for them to build steeples which should have the sort of effect that ours have. The turret on Amiens Cathedral is nearly as lofty as Salisbury spire, but is only a turret ; and so through- out. Few French churches afford the exquisite complete views of the exterior which English churches do; but, on the other hand, their interiors are more majestic, and man feels himself smaller and more insignificant in them than in ours. The palm must certainly be given to them above all others.

Later French architecture ran a very similar course to that which has been already described in England. The 13th century was that in which it was seen at its best. In the 14th the same sort of change took place as elsewhere ; the art was beautiful, but it was too much an evidence of skilfulness and adroitness. It was harder and colder also than English work of the same age; and when it fell, it did so before the inroads of a taste for what has been called Flamboyant architecture,—a gay and meretricious style which trusted to ornament for all its effect, and, in spite of many beauties, had none of the sturdy magnificence of much of our English Perpendicular style.

There is no country richer in examples of architecture than France. It has been seen how infinitely varied they are in the different provinces ; but the student who wishes to understand what it was possible for a country to do in the way of creating monuments of its grandeur, would find in almost every part of the country, at every turn and in great profusion, works of the rarest interest and. beauty. The 19th century may be the consummation of all, but the evidences of its existence to posterity will not be one-tenth in number of those which such a reign as that of Philip Augustus has left us, whilst none of them will come up to the high standard which in his time was invariably reached.

Gothic Architecture in Germany.

It is impossible to say so much in praise of the German examples of Pointed architecture as has been said of both French and English. 'The history of the development of the art is very different, but in many respects very curious. We have first certain absolutely Roman works, such as those at Tréves; then others, of which the convent at Lorsch is a conspicuous. example, which are in the truest sense Romanesque, 7.¢., works directly

founded on the Roman buildings of the country. Then comes a great group of churches, of which those in Cologne and the Rhine- land are the best known examples, which are evidently founded on the Lombard churches of the north of Italy. The earlier of these churches date from the beginning of the 12th century, and the same style is continued on with but little serious alteration down to the end of the 13th century, when the strange spectacle is seen of a style which is completely Romanesque in its general character being suddenly supplanted by a style which in no way grew out of it, but which was rather an imitation of a foreign style, and which is distinguished by the perfect and complete form which it at once assumed. 'This style, the complete Gothic of Germany, in its tum retained its sway much longer than the corresponding styles elsewhere, and was finally supplanted by a very national German style, answer- ing in point of date to our own late Third Pointed and to French Flamboyant. The question naturally arises, whether these styles, which are so wanting in evidence of natural growth, are to be looked at as sudden German inventions, or whether they are not illustrations of the conservative char- acter of a people not fond of change, resisting it as long as possible, and at last, when obliged to take it at all, com- pelled to accept it in the most decided form. In illustra- tion of what has been said, the following dates will be use-

ful :—St Gereon, Cologne, was begun in 1200, and vaulted in 1227; St Cunibert, also in Cologne, was building from 1205 to 1248 ; Naumburg Cathedral has a nave of 1200; Limburg is but little later; Gelnhausen was begun in 1250, and Munster-Maifeld about the same time. All these churches are of such a character, that if we were to see them in France we should, no doubt, put them down as works of the end of the 12th century, and should look for another class to fill up the gap between that time and the commencement of the cathedral at Cologne in 1270. In short, transitional works are as rare in Germany as they are common in England and France. There is compara- tively little evidence of natural growth, and a very practical refutation, therefore, of the claim which has been advanced

by some German writers on behalf of their country, for the honour of being the real mother and inventor of northern Gothic.

The ground-plans of German Gothic churches have a character of their own. 'The apsidal termination of the east end is usual, though not quite universal; but it is to be noted that German apses are very rarely surrounded by aisles and chapels. Cologne Cathedral, which is the grandest exception to the rule, was notoriously inspired by, and in a way copied from, Amiens, and St Godehard at Hildesheim, Magdeburg Cathedral, and the Marien-Kirche, Liibeck, are inferior to French examples of the same ages. The German churches were either simply apsidal, or parallel triapsidal, or transverse triapsidal ; and the main difference between early and late examples is that the former were circular, the latter polygonal in outline. Another feature peculiar to Germany is that of double choirs, ze, churches with apses both at the east and west ends. Examples of this are seen in Laach, Bamberg, Naumburg; in St Sebaldus, Nuremberg; and in Augsburg Cathedral. Even when the ground-plan shows a disposition of aisles and chapels like the French chevet, the design is treated very differently, the whole being generally covered in by one vast roof, instead of a series of roofs, and the aisles being of the same height as the choir. 'This class of building is very striking inter- nally, owing to the vast height of the piers and arches ; there is no triforium or clerestory, and the windows are extravagantly lengthened out. Still the examples of this kind of design—St Stephen, Vienna ; Miinster ; the Wiesen- Kirche, Soest; St Laurence, Nuremberg ; and Munich Cathe- dral, among a host of others —are very grand. The details of the earlier churches are evidently borrowed from the north of Italy. The walls are arcaded, and almost always finished under the eaves with open galleries, which were the beautiful substitutes of the Lombard architects for the classic cornice. 'The steeples of the same period are very peculiar, They are either square or octangular in plan, arcaded or pierced with windows regularly all over their face, and roofed with gables, or with spires rising out of the gables, Tho early groining was very simple, but always more or less domical in section. 'The windows were plain and rude, and the mouldings very simple and unskilful. In the interior the most marked feature of these churches is the great height of the triforium, which is still generally in use as a gallery, and is groined in the same way as the aisle. On the exterior the peculiarity of the plan and the

large number of generally rather small, though lofty, steeples of picturesque outline are the most striking pecu- liarities.

The German Complete Gothic is essentially national in its complete character. It has a similarity to English and French Middle Pointed, but no more than this. It has many and obvious defects. From the first there is con- spicuous in it that love of lines, and that desire to play with geometrical figures, which in time degenerated into work more full of conceit and triviality than that of any

school of medieval artists. These conceits are worked out most elaborately in the traceries of windows and panel- ling. The finest early examples are in the cathedral at Minden; a little later, perhaps, the best series is in the cloister of Constance Cathedral ; and of the latest descrip- tion the examples are innumerable. But it is worth observing that they rarely at any time have any ogee lines. They are severely geometrical and regular in their form, and quite unlike our own late Middle Pointed, or the French Flamboyant. In sculpture the Germans did not shine. They, like the English, did not introduce it with profusion, though they were very prone to the representations of effigies of the deceased as monuments.

In one or two respects, however, Germany is still pos- sessed of a wealth of medieval examples, such as is hardly to be paralleled in Europe. The vast collection of brick buildings, for instance, is. unequalled. If a line be drawn due east and west, and passing through Berlin, the whole of the plain lying to the north, and extending from Russia to Holland, is destitute of stone, and the medieval archi- tects, who always availed themselves of the material which was most natural in the district, built all over this vast extent of country almost entirely in brick. The examples of their works in this humble material are not at all confined to ecclesiastical works; houses, castles, town-halls, town walls, and gateways, are so plentiful and so invariably picturesque and striking in their character, that it is impos- sible to pass a harsh verdict on the architects who left behind them such extraordinary examples of their skill and fertility of resource. Then, again, in regard to the furni- ture which before the period of the Renaissance of art and the Reformation of religion filled the ancient buildings, the Germans

*have more than any other people been happily conservative. 'There are still churches in Germany in which it may be said that nothing has been changed since Luther's day except the use of the buildings. St Katharine's at Liibeck is turned into a museum, but is full of its old furniture. The choir of Halberstadt is unused, but every- thing, even to the hangings on the walls, remains as of old. In Nuremberg all the altars are preserved, and decked with altar-cloths and candles, though they are never used ; and when so much toleration as to these externals has been shown, and so little desire for change exists, it may well be imagined that the opportunities for the study of the works of German Gothic architects in*their completeness are unusually plentiful. During the last few years a vast number of books have been published on the subject of their national antiquities by German writers, and the amount of detailed information on the subject, which may be obtained by those who care for the study, is unbounded.*

Gothic Architecture in Spain.

That which strikes the architectural student most forcibly in Spain is the concurrent existence of two schools of art during the best part of the Gothic period. The Moors in- vaded Spain in 711 a.p., and were not finally expelled from Granada until 1492 a.p. During the whole of this period they were engaged, with more or less success, in contests for superiority with the Christian natives. In those portions of the country which they held longest, and with the firmest hand, they enforced their own customs and taste in art almost to the exclusion of all Gothic work. Where their rule was not permanent their artistic influence was still felt, and even beyond what were ever the boundaries of their dominion, there are still to be seen in Gothic buildings some traces of acquaintance with Arabic art not geen elsewhere in Europe, with the exception, perhaps, of the southern part of the Italian peninsula, and there differing much in its development, 'The mosque of Cordova in the 9th century, the Alcazar and Giralda at Seville in the 13th,

believe that some remains still exist. ing of these is Sta Maria de Naranco, near Oviedo, a building whose details are founded on Roman, but whose , plan has all that adaptation to special requirements which 'is so distinct a mark of medieval work. The buildings

in style will at once be seen.

old cathedral at Lérida.

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the Clourt of Lions in the Alhambra in the 14th, several houses in Toledo in the 15th century, are examples of what the Moors were building during the period of the Middle Ages in which the best Gothic buildings were being erected. Some portions of Spain were never conquered by the Moors. These were the greater part of Aragon, Navarre, the Asturias, Biscay, and the northern portion of Galicia. Toledo was retaken by the Christians in 1085 D., Tarragona in 1089, Saragossa in 1118, Lérida in 1149, Valencia in 1239, and Seville in 1248. In the districts occupied by the Moors Gothic architecture had no natural

growth, whilst even in those which were not held by them

the arts of war were of necessity somuch more thought of than those of peace, that the services of foreign architects were made use of to an extent unequalled in any other

part of Europe.

Of early Christian buildings, erected probably from the 8th to the 11th centuries, there is every reason to The most interest-

which come next in point of date to these are all evidently derived from, or erected by the architects of those which were at the time being built in the south of France. These churches are uniform in plan, with central lanterns and three eastern apses. The nave has usually a waggon or barrel

vault, supported by quadrant vaults in the aisles, and the steeples are frequently polygonal in plan. If these churches are compared with examples like that of the cathedral at

Carcassonne on the other side of the Pyrenees, their identity A still more remarkable evidence of similarity has been pointed out between the church

of St Sernin, Toulouse, and the cathedral of San- tiago. The plan, proportions, and general design of the two churches are identical. Here we see a noble ground-

| plan, consisting of nave with aisles, transepts, central lan-

tern, and chevet, consisting of an apsidal choir, with a surrounding aisle and chapels opening into it at intervals.

This example is the more remarkable, inasmuch as the ‘ early Spanish architects very rarely built a regular chevet,

and almost always preferred the simpler plan of apsidal chapels on either side of the choir. And its magnificent scale and perfect preservation to the present day combine

-to make it one of the most interesting architectural relics

in the country.

Among the more remarkable buildings of the 12th and the beginning of the 13th century are San Isidoro, Leon ; San Vicente, Avila; several churches in Segovia ; and the They are much more uniform in character than are the churches of the same period in the various provinces of France, and the developments in style,

: where they are seen at all, seldom have much appearance of – being natural local developments. This, indeed, is the most

marked feature of Spanish architecture in all periods of its history. In such a country it might have been expected that many interesting local developments would have been seen ; but of these there are but one or two that deserve notice. One of them is illustrated admirably in the church of St Millan, Segovia, where beyond the aisles of the nave are open cloisters or aisles arcaded on the outside, and opening by doors into the aisles of the nave. It would be difficult to devise a more charming arrangement for buildings in a hot country, whilst at the same time the architectural effect is in the highest degree beautiful. The . universality of the central tower and

lantern has been already mentioned. This was often polygonal, and its use led to the erection of some lanterns or domes of almost unique beauty and interest. The old cathedral at Sala-

manca, the church at Toro, and the cathedral of Zamora, all deserve most careful study on this score. Their lanterns are almost too lofty in proportion to be properly called domes, and yet their treatment inside and outside suggests a very beautiful form of raised dome. They are carried on pointed arches, and are circular in plan internally, and octagonal on the exterior, the angles of the octagon being filled with large turrets, which add much to the beauty of the design, and greatly also to its strength. Between the supporting arches and the vault there are, at Salamanca, two tiers of arcades continued all round the lantern, the lower one pierced with four, aud the upper with twelve lights, and the vault or dome is decorated with ribs radiat- ing from the centre, On the exterior the effect is rather that of a low steeple covered with a stone roof with spherical sides than of a dome, but the design is so novel and so suggestive, that it is well worth detailed description. Nothing can be more happy than the way in which the light is admitted, whilst it is also to be noted that the whole work is of stone, and that there is nothing in the design but what is essentially permanent and monumental in construc- tion. The only other Spanish development is the introduc- tion, to a very moderate extent, of features derived from the practice of the Moorish architects, This is, however, much less seen than might have been expected, and is usually confined to some small feature of detail, such, ¢7., as the carving of a boss, or the filling in of small tracery in circular windows, where it would in no way clash with the generally Christian character of the art.

The debateable period of transition which is usually so interesting is very sterile in Spain. A good model once adopted from the French was adhered to with but little modification, and it was not till the 13th century style was well established in France and England that any introduction of its features is seen here ; and then, again, it is the work of foreign architects imported for the work and occasion, bringing with them a fully developed style to which nothing whatever in Spain itself led up by a natural or evident

development. The three great Spanish churches of this period are the cathedrals of Toledo, Leon, and Burgos. Those of Siguénza, Lérida, and Tarragona, fine as they are, illustrate the art of the 12th rather than of the 13th century, but these three great churches are perfect Early Pointed works, and most complete in all their parts. The cathedral of Toledo is one of the most nobly designed churches in Europe. In dimensions it is surpassed only by the cathedrals of Milan and Seville, whilst in beauty of plan it leaves both those great churches far behind. The chevet, in which two broad aisles are carried round the apse with chapels alternately square and apsidal opening out of them, is perhaps the most perfect of all the schemes''we know. It is as if the French chevets, all of which were more or less tentative in their plan, had culminated in this grand work to which they had led the way. The architectural detail of this great church is generally on a par with the beauty and grandeur of its plan, but is perhaps surpassed by the somewhat later church at Leon. Here we have a church built by architects, whose sole idea was the erection of a building with as few and small points of support as possible, and with the largest possible amount of window opening. It was the work of men whose art had been formed in a country where as much sun and light as possible were necessary, and is quite unsuited for such a country as Spain. Nevertheless it is a building of rare beauty and delicacy of design. Burgos, better known than either of the others, is inferior in scale and interest, and its character has been much altered by added works more or less Rococo in character, so that it is only by analysis and investigation that the 13th century church is still seen under and behind the more modern excrescences,

The next period is again marked by work which seems to be that of foreigners. The fully developed Middle Pointed or Geometrical Gothic is indeed very uniform all over Europe. Here, however, its efforts were neither grand in scale nor interesting. Some of the church furniture, as, e.g., the choir screens at Toledo, and some of the cloisters, are among the best features. The work is all correct, tame, and academical, and has none of the dignity, power, and interest which marked the earlier Spanish buildings.

Towards the end of the 14th century the work of Spanish architects becomes infinitely more interesting. The country was free from trouble with the Moors; it was rich and prosperous, and certainly its buildings at this period were so numerous, so grand, and so original, that they cannot be too much praised. Moreover, they were carefully designed to suit the requirements of the climate, and also with a sole view to the accommodation conveniently of enormous congregations, all within sight of the preacher or the altar. This last development seems to have been very much the work of a great architect of Majorca, Jayme Fabre by name. The grandest works of his school are still to be seen in Catalonia. Their churches are so vast in their dimensions that the largest French and English buildings seem to be small by comparison, and being invariably covered with stone vaults, they cannot be compared to the great wooden-roofed churches of the preaching orders in Italy and elsewhere, in which the only approach is made to their magnificent dimensions. The cathedral of Gerona is the most remarkable example. Here the choir is planned like the French chevet with an aisle and chapels round it, and opens with three lofty arches into the east wall of a nave which measures no less than 73 feet in the clear, and is covered with a stone vaulted ceiling, In Barcelona there are several churches of very similar description ; at Manresa another, but with aisles to its nave; and at Palma in Majorca one of the same plan as the last, but of even much larger dimensions. Perhaps there is no effort of any local school of architects more worthy of study and respect than this Catalonian work of the 14th and 15th centuries. Such a happy combina- tion of noble design and proportions with entirely prac- tical objects places its author among the very greatest architects of any time. It is one thing to develop patiently step by step from the work of one's fathers in art, quite another to strike out an entirely new form by a new com- bination of the old elements. In comparison with the works just mentioned the other great Spanish churches of the 15th century are uninteresting. But still their scale is grand, and though their detail is over-elaboratcd and not beautiful, it is impossible to deny the superb effect of the interior of such churches as those of Seville, Segovia, and Salamanca (new cathedral). They are very similar in their character, their columns are formed by the prolongation of the reedy mouldings of the arches, their window traceries are poorly designed, and their roofs are covered with a complex multitude of lierne ribs. Yet the scale is fine, the admission of light, generally high up and in sparing quantity, is artistic, and much of the

furniture is either picturesque or interesting. The tout ensemble is generally very striking, even where the architectural purist is apt to grumble at the shortcomings of most of the detail.

The remarks which have been made so far have been confined to the fabrics of the churches of Spain. It would be easy to add largely to them by reference to the furniture which still so often adorns them, unaltered even if uncared for ; to the monuments of the mighty dead, in which Spain is a worthy rival of our own country; to the sculpture which frequently adorns the doorways and screens; and to the cloisters, chapter houses, and other dependent buildings, which add so much charm in every way – them. Besides

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this, there are very numerous castles, often planned on the grandest scale, and some, if not very many, interesting remains of domestic houses and palaces ; and most of these, being to some extent flavoured by the neighbourhood of Moorish architects, have more character of their own than has been accorded to the churches, Finally, there are considerable tracts of country in which brick was the only material used ; and it is curious that this is almost always more or less Moorish in the character of its detail. The Moors were great brickmakers. Their elaborate reticulated enrichments were easily executed in it, and the example set by them was, of course, more likely to be followed by Spaniards than that of the nearest French brick building district in the region of Toulouse. The brick towers are often very picturesque ; several are to be seen at Toledo, others at Saragossa, and, perhaps the most graceful of all, in the old city of Tarazona in Aragon, where the proportions are extremely lofty, the face of the walls everywhere adorned with sunk panels, arcading, or orna- mental brickwork, and at the base there is a bold battered slope which gives a great air of strength and stability to the whole. On the whole, it must be concluded that the medieval architecture of Spain is of less interest than that of most other countries, because its development was hardly ever a national one. 'The architects were imported at one time from France, at another from the Low Countries, and they brought with them all their own local fashions, and

carried them into execution in the strictest manner ; and it was not till the end of the 14th century, and even then only in Catalonia, that any buildings which could be called really Spanish in their character was erected.

Gothic Architecture in Italy.

The history of the development of Gothie architecture in Italy brings out, more clearly than anywhere else, of course, the gradual transition from simple Roman work to Romanesque and Byzantine, and thence, finally, to Gothic. But the first portion of the history is, perhaps, the most important, since, owing to various causes, the Gothic archi- tecture of Italy never achieved the same brilliant effects which marked its career in other parts of Europe. Something therewas in the climate, something in the constant knowledge of grand works in the Eastern influence which was so marked in Venice, and in the Greek as well as Moorish or Arab influence which equally affected the whole southern half of the penin- sula.

There can be no doubt whatever that the first buildings used for Christian worship in Italy were in no way whatever more suited for its functions than they were for the Pagan rites which had preceded them. The form of architecture used was the Roman art of the day ; and to a considerable extent Roman buildings, and particularly basilicas, were converted, from the time of Constantine, into Christian churches. The early Christian policy was not unfrequently one which softened off the transition from the old worship to the new. And when the bishop took his seat in the centre of the apse, with his clergy on either side, and the Christian altar was placed in front of the apse, very much in the position of that which had been used for the Pagan sacrifice, the whole change required to convert the basilica into the church had been made. The basilica was usually a long nave with one or more aisles on either side. These aisles were frequently double in height, a second row or order of columns being placed above the first. At one end was a tribune sometimes square, but usually apsidal in plan, round which a series of steps led to seats formed against the wall. The central seat was that of the principal officer, the others those of his assessors, and the altar stood in front of the tribune. The central nave was either open to the sky,

some hundreds of years.

of classic times, and finally, something

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or covered with a wooden roof or with a vaulted ceiling. The basilica at Pomypeii, still so perfect as to be quite intelligible, has a single aisle on each side, and a square- ended tribune, and was probably not covered over the centre. This, however, like all the early buildings in Pompeii, is rather Greek than Roman in its character. such buildings. as this and the basilica of Trajan at Rome with the earliest existing churches built on the basilican

If we compare

type, we shall see how very slight the difference was for There is still the long unbroken nave with an apsidal head. Over the aisles are sometimes, as in St Agnese and St Lorenzo in Rome, second aisles or galleries opening to the nave. And the principal alteration or adaptation is one entirely of church furniture and screens, ambons and altars under baldachins, which, as if with a scrupulous regard to the old basilican arrangement, are planned independently altogether of the structure, being emphatically nothing but furniture. If we examine San Clemente in its present condition, we shall find a choir having no constructional peculiarities, but formed entirely by low screens built on the floor of the church, with a passage-way between them and the columns, and with ambons or pulpits projecting from their sides. In front of the church was an enclosed court-yard or atrium, from which access was gained to the church. The arrangements of San Clemente are probably not so old as they were once supposed to be. One, if not two, older churches exist beneath it; but, nevertheless, there is every reason for believing that the arrangements now visible are those at latest of the 9th century. The ancient basilica of St Peter was on the same sort of plan, with the addition of a cross nave or transept between the nave and its aisles and the apse, an arrangement which is still to be seen in the famous church of St Paul, without the walls, and in the basilica at Aquileia. At St Paul's the altar stands on the west side of the transept, the bishop's seat is separated from it by the transept, and the whole arrangement is unmeaning and unsatisfactory, but it is probably not old. The number of early churches

on the basilican plan is very great, and they are of all sizes. The charming church of Sta Maria in Cosmedin, Rome, is a quite small building, but graceful in its general proportions, and interesting to the architect, like most of the early Roman churches, for the beautiful inlaid work, the Opus Alexandrinum, of its screens, pave- ments, and pulpits. Out of Rome, also, there are many examples of the same type, but space does not permit the mention here of any but those of Ravenna. The two most remarkable of these are St Apollinare in Classe, two or three miles out of the city, a forlorn and deserted build- ing, and St Apollinare Nuovo, within the walls, a church whose mosaic decorations, being nearly perfect, give an admirable impression of the sumptuous character which the early church knew how to give and loved to give to its temples. Here, however, none of those old ritual arrangements remain, which give so much interest to the basilicas of Rome, Torcello, Toscanella, and Aquileia. The decoration of St Apollinare Nuovo is mainly on the space of wall between the arches opening to the aisles and the clerestory. It is a mosaic picture of an almost endless procession of white-clad saints on a golden ground. Few things in the whole realm of Christian art are more beautiful or more touching. The other St Apollinare, in Classe, has lost almost all its old decorations, and is merely painted in bad taste and in modern times. The Roman love of circular recesses or circular plans was very great. In the baths of Caracalla, for instance, we have themat every turn. The Pan- theon is a vast circular building, with recesses in its walls (now used as chapels) alternately square and apsidal in

plan; and in the temple of Minerva Medica these apsidal

projections round the building are even more distinctly

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marked. This last cxample paved the way for the similarly planned church of San Vitale at Ravenna, which even now, overlaid as it is with meretricious decoration, affords us most interesting evidence of the way in which the construc- tional arrangements of Pagan Rome were copied and utilised by the Christians. But, usually, there was little to admire in the way in which this was done. The architect built up his church with fragments of classic columns, unequal in size or height, married to the wrong capitals and. bases, and altogether as rudely put together as was possible. And so

little development was there that, in the nave of the basilica of Aquileia, we have this done absolutely in the same way so late as the 14th century, the only differ- ence being that in it the classic columns carry pointed arches and a clerestory of Gothic windows.

From these simple imitations of Roman buildings let us go to the 12th century church of St Ambrogio at Milan, and we shall see how much had by that time been done in the way of modification, The whole building is, of course, round arched. It has a western atrium or court- yard, and it has a nave and aisles, with an eastern apse to its nave. At first sight no alteration seems to have been made, but on further examination it will be found that the columns are alternately piers and clusters (at St Agnese every third column was made into a pier), that the arch orders have a proper connection with the plans of the columns, and that the church is vaulted. Let us now go back for an instant to the introduction of Byzan- tine plan and details in the church of St Mark at Venice. Here we have brought back again to Italy the product of the developed skill of the succession of artists, who, after con- structing the mighty vaults of the Roman buildings, had removed to Constantinople with the empire, and had 'here grafted their knowledge on the art and practice of the East. It was there that they began to build domes, erected not on circular, but on square bases, the angles being supported on what are technically called pendentives. So fond of this construction were they that their buildings became almost always combinations of domes, instead of the simple nave, ended with a semi-dome, of the Roman architects of the day. This Byzantine style was developed with a skill and delicacy to which the decaying art of Rome was at the time quite a stranger, and it is less wonderful that so beautiful a church as St Mark should have had some influence, than that it should have had so little. But it is to the example of this and other Eastern churches, no doubt, that we owe the raised central lantern or dome which became a feature of so many churches from this time forward. A parallel may well be drawn here between two well-known and typical examples. These are the churches of San Zenone, Verona, and of San Michele, Pavia. In the former we still see the great simple and uniform plan of the wooden roofed basilican church, adorned with much that is Byzantine in feeling and character, but still emphatically a Romanesque building. In San Michele, on the contrary, we see a build- ing which, if it owed something to Rome (as it

did), owed at least as much to the East. Its plan was the distinctly cruciform plan, with a central lantern, not the Roman makeshift of a long nave with an Eastern transept, whilst its whole space being covered with vaulted roofs, instead of the Roman wooden ceiling to the nave, marks it as belonging to a different class. Besides this, the whole building is subdivided and constructed in so scientific a way as to show that its architcct was in the path of a development leading far away from simple Roman theories of construction and plan. Here one of the most observable features is the fine open gallery under the external eaves of the roof, a device repeated constantly in the Lombard buildings, and transfcrred from them, with much else, to the valley of the Rhine, where it is the great feature of

most of the llth and 12th century churches, and of some even of the 13th century.

It is impossible here to make any lengthened refer- ence to the buildings of Italy south of Rome. It must suffice to say that Rome herself seems to have had no influence on them during this early period. Their designs and decorations are full of a character which speaks of contact at times with Grecce, at other times with the southern coast of the Meditcrrancan. Their walls are arcaded, and then adorned with square and circular panels, the details of which afford ample evidences of their origin. The arcades are sometimes, as at Foggia, of horse-shoe shape, and the extremely elaborate carving of foliage with which they are adorned is quite Byzantine in character. A comparison of the west fronts of Foggia or Troja, with the arcading of the church at Ani, in Armenia, will show much more similarity than with any Roman work ; whilst the front of Sta Maria, Ancona, is planned in just the same fashion as that of the cathedral at Zara in Dalmatia. The one great North Italian church in which there was an attempt to fuse these two fashions of design is the cathedral at Pisa, where all the walls are arcaded and panelled, the mouldings mainly copied from the ancient forms, and the whole trust of the architect put, very much as it was in the South Italian and Byzantine works, in covering the walls with

decoration. But these churches did nothing by way of paving the way for Italian Gothic, and need not there- fore be further referred to.

Italy is poorer than any other country in examples of the transition from round arched to pointed arched buildings. The use of the pointed arch was accepted at last as a necessity, and cannot be said ever to have been welcomed. The first buildings in which it is seen worked out fully in detail are those of Nicola Pisano, and but few examples exist of good Gothic work earlier than his time. The claborately arcaded and sculptured west front of Ferrara Cathedral is a screen to an early building. The cathedral and other churches at Genoa are certainly exquisite works, but they appcar to owe their internal design rather to the influence of (perhaps) Sicilian taste than North Italian, and the exquisite beauty of the west front owes a good deal, at any rate, to French influence, softened, refined, and decorated by the extreme taste of an Italian architect. The feature which most marks all Italian Gothic is the indifference to the true use of the pointed arch. Everywhere arches were constructed which could not have stood for a day had they not been held together by iron rods. There was none of that sense of the unities of art which made a northerner so jealous to maintain the proper relations of all parts of his structure. In Nicola Pisano's works the arch mould rarcly fits the capital on which it rests. The proportions of buttresses to the apparent work to be done by them are bad and clumsy. The window traceries look like bad copies of some northern tracery, only once seen in a hurry by an indifferent work- man, There is no life, or development, or progress in the work. If we look at the ground-plans of Italian Gothic churches, we shall find nothing whatever to delight us. The columns are widely spaced, so as to diminish the number of vaulting bays, and to make the proportions of the oblong aisle vaulting bay very ungainly. Clustered shafts are almost unknown, the columns being plain cylinders with poorly sculptured capitals. There are no triforium galleries, and the clerestory is generally very insignificant. In short, a comparison of the best Gothic works in Italy with the most moderate French or English work would show at once how vast its inferiority must be allowed to be. Still there were beauties which ought not to be forgotten or passed over. Such were the beautiful cloisters, whose arcades are carried on delicate coupled shafts. Of these the first examples are in Rome, but they

are to be seen all over Italy. Such, again, were the porches and monuments, of which some of the best are in Verona, of almost unsurpassed elegance; such the campaniles, both those of Rome, divided by a number of string-courses into a number of stages, and those of the North, where there are hardly any horizontal divisions, and the whole effort is to give an unbroken vertical effect; or that unequalled campanile, the glory of Florence, of Giotto, of art, the tower of the cathedral at Florence, where one sees in ordered proportion, accurately adjusted, line upon line, and stage upon stage, perhaps the most carefully wrought out work inall Europe. The Italian architects were before all others devoted to the display of colour in their works. St Mark's had led the way in this, but, throughout the peninsula, the bountiful plenty of nature in the provision of materials was only seconded by the zeal of the artist, and on this point a few notes may be added at the con- clusion of this summary. 'They were also distinguished for their use of brick. Just as in parts of Germany, France, Spain, and England, there were large districts in which no stone could be had without the greatest labour and trouble; and here the reality and readiness which always marked the medieval workman led to his at once availing himself of the natural material, and making a feature of his brickwork. This is a subject which, however, cannot well be treated save at the same time as other developments of brick building in other districts similarly situated. In conclu- sion, it must be said that the Gothic of Italy has no such grand works to show as more northern countries have. The buildings were seldom thoroughly beautiful as complete works of architecture. Allowance has to be made at every turn for some incompleteness or awkwardness of plan, design, or construction. There is no attempt to emulate the beauties of the best French plans. Milan Cathedral, magnificent as its scale and material make it, is clumsy and awkward both in plan and section, though its vast size makes it impressive internally. San Francesco, Assisi, is only a moderately good early German Gothic church, converted into splendour by its painted decorations. At Orvieto a splendid west front is put, without any proper adjustment, against a church whose merit is mainly that it is large and in parts beautifully coloured. The later Pisan buildings are far finer, the altered baptistery especially being a magnificent work, though words can hardly describe the architectural defects of such work as that of the Campo

Santo, where, again, it is the painter, not the architect, who has worked such wonders. The finest Gothic interiors are of the class of which the Frari at Venice and Sta Anastasia at Verona are examples. They are simple vaulted cruciform churches, with aisles and chapels on the east side of the transepts. But even in these the designs of the various parts in detail are poor and meagre, and only redeemed from failure by the picturesque monuments built against thcir walls, by the work of the painter, and by their furniture. In fine, Gothic art was never really understood in Italy, and, consequently, never reached to perfection.

If the architecture of Italy never fell away so much from the more classic style of imperial Rome as that of the northern nations did, neither did the Italian ever possess that more than equivalent, whose splendid course we have been describing. Whilst the Pointed style was almost exclu- sively known and practised in Northern Europe, the Italians were but slowly improving in their Gothic style ; and the improvement was more evinced in their secular than in their ecclesiastical structures. Florence, Bologna, Vicenza, Udine, Genoa, and, above all, Venice, contain palaces and mansions of the 12th, 13th, 14th, and 15th centuries, which for simplicity, utility, and beauty far excel most of those in the same and other places of the three following

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The contemporary churches do not exhibit the style that is conspicuous

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in these domestic works, for there are no works in Europe more worthy of study and admiration than the Ducal

Palace at Venicc, and some of the older works of the same

class, and even of earlier date. The town-halls of Perugia, Piacenza, and Siena, and many houses in these cities, and

at Corneto, Amalfi, Asti, Orvieto, and Lucca, the fountains

of Perugia and Viterbo, and the monuments at Bologna, Verona, and Arezzo, interest which the national art affords to the architectural student even in Italy, as late as the end of the 14th cen- tury; but after this it gradually gave way to, though in some instances its influence may be traced even when it had been overborne by, the new style.

may be named as evidence of the

MopERN ITALIAN ScHoon oF ARCHITECTURE.

The opening of the Italian school of architecture on the

resuscitated dogmas of Vitruvius was coincident with the gradual decay of the ever, its effects were a full century in reaching England, and during that period many most elegant structures were erected, and many of those of earlier date which had been commenced before or during the wars of the Roses, and left unfinished, were completed. The first indication we

Pointed style. Fortunately, how-

have of the presence of the C'inquecentist in England, is in the tomb of Henry VII., which was exccuted by Tor- regiano, an Italian artist, who, it would appear, was obliged to have some respect to the style of the edifice in which his work was to rest; but his preconceived ideas 'of pro- priety and beauty were too strong to allow him to omit the characteristics of his school, and the result is a strange mixture of the two.

From that time the Pointed style rapidly deteriorated, being overborne by the taste of the On the Continent the latter was already during the whole of the 15th century, the current had been setting from Italy over every part of Europe which received its religion from Rome, and this country was only the last to be overwhelmed by it.

The first step taken towards the revolution of architec- ture was by Filippo Brunelleschi, a Florentine architect, who was employed to finish the cathedral of his native city early in the 15th century; a work which had been

‘commenced more than a century before on the design of

Arnolfo, a Florentine also, but which still required the cupola when its completion was intrusted to Brunelleschi. The edifice is in the Italian Gothic style, which his affecta- tion of superior taste and talent induced him to attempt to supersede, so as to bring the world back to the classic style of ancient Rome. The construction of the cupola gained him great reputation and the confidence of the public, which he employed to advance his favourite scheme. To use the words of an Italian writer on the subject, “ On the example of so wise and skilled a man, other architects afterwards devoted themselves to free architecture from the monstrosities introduced by barbarism and excessive licence, and to restore it to its primitive simplicity and dignity.” But to what did they have recourse to effect this? Did they examine and study the remains of antiquity in Greece and Rome, in Italy and elsewhere? No! they referred to the writings of an obscure Latin author, who professed to give the principles and_ practice of architecture among the Greeks and Romans, but paid no more attention to the existing architectural works of those nations than if they had never been, although one could hardly walk the streets of any of the old cities in the south of Italy without seeing Roman edifices, whilst Rome and its vicinity was, as it still is, full of them, All the use, however, that these self-called “restorers” of architecture made of the works of the

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aneients, was to use them as lay-figures, or framework, to model on, aecording to the proportions and direetions given by Vitruvius; and the cffect was formality and mannerism in those who adhcred to the dogmas of the sehool, and wild grotesqueness in those who allowed themselves to wander from them, whilst simplicity, and its consequence good taste, were effeetually banished from the works of them all.

It may be necessary to remark here that the works of Vitruvius are of value mainly as records of the arehitectural practice and the opinions and aequirements of an architect of a distant age. His fables about the origin of building, the invention of the orders, and the arrangements whieh grew out of certain modes of construction, prove his total ignorance not only of the architeetural works of the more aneient Eastern nations, but of those of Greeec itself, which he professes to describe. His classieal taste, in eonsequence of his knowledge of antiquity, is vaunted by Perrault, one of his eommentators, and given by him as a reason why Vitruvius was not much employed by the whimsieal Ro- mans, who loved variety, to whieh he would not administer. But the extent to whieh his knowledge of antiquity, that is, of the works of the Greeks, extended, may be readily determined by eomparing the designs of Greek struetures, made by Perrault and others, aceording to the direetions of Vitruvius, with the Greek structures themselves as they exist even at the present time. Not a single example of Greek arehiteeture will bear out any of the rules whieh Vitruvius lays down, professedly on its authority ; and not an existing edifiee, or fragment of an edifice, is in form or proportion in perfect accordanee with any law of that author, nor indeed are they generally in harmony with the prineiples he enunciates.

The adoption of the Vitruvian laws by the Italian arehi- tects of the 15th eentury led to the formation of the so-ealled " Five Orders." In speaking of the course of Greek and Roman arehiteeture, mention has been made of the Dorie, Ionic, and Corinthian styles. Vitruvius deseribes, in addition to these, another, which he ealls Tuscan---possibly a style of eolumnar arrangement peeuliar to Italy, and most likely of Etrurian origin ; but, in the absenee of delineations, the Oinguecentists eould only apply the proportions he laid down for it to what appeared to approximate them in the aneient remains ; and henee arose a fourth, or "the Tusean Order." It is, however, a mere modifieation of the Roman debasement of the Dorie, and muy be eonsidered, in its present form, as of purely modern Italian origin. The same " Revivers," on looking among the ruins of ancient Rome for the forms of their Vitruvian orders, found specimens of a foliated ordinanee, which the bad taste of the Romans had compounded of the foliated and voluted styles of the Greeks. This was seized upon as a fifth style, subjeeted to certain rules and proportions, and ealled "the Composite Order." The

very poor Roman speeimens of Dorie and Ionic fitted themselves without mueh diffieulty to the Vitruvian laws ; but the examples Rome afforded of the Corinthian were less traetable, and being as various in detail as they are generally beautiful, they were all passed over, and their plaees supplied by a mere ehangeling—an epitome of the Vitruvian theory. Thus we have the ‘ Five Orders” of the Italo-Vitruvian school, viz.:—/irst, the Tuscan, of which there is no reeog- nised example of antiquity, but whieh owes its form to the deseriptions of Vitruvius and the fancies of the revivers ; second, the Doric, a poor and tasteless arraugement of the general features of the style on a Roman model; third, the Ionic, whieh is almost as great a debasement of the Grecian originals, and was produeed in the same manner as the last-mentioned ; fourth, the Corinthian, a something totally unlike the ancient examples of both Greeee and Rome in beauty and spirit; and, 7ifth, the Composite, an

inelegant variety of the Corinthian, or a hybrid mixture of the horned or angular-Ionic volutes, with a deep neeking of the foliage of the preeeding order. The first to publish this system was Leon Battista Alberti, a pupil of Brunel- lesehi. He has been followed by many others, the most distinguished of whom are Palladio, Vignola, Scamozzi, Serlio, and De Lorme, arehiteets, and Barbaro, a Venetian prelate, and an esteemed translator of, and commentator on, Vitruvius. None of these, it must be understood, agreed with any other of them, but each took his own view of the meaning of their common preeeptor ; and yet none of their productions evince the slightest approach to the elegance of form and beauty of proportion whieh distinguish the elassic models of the columnar arehiteeture of antiquity. Palladio and Serlio were the first to publish delineations and admeasurements of the Roman arehiteetural remains in Italy ; but the total absence of verisimilitude to the originals, and, in many eases, the absolute misrepresc nta- tions, in both works, prove how incompetent the authors were to appreciate their merits; and the exaggeration of their defeets proves with equal elearness the general bad taste of the sehool in which they are masters. The worst quali- ties of the

Roman school of architeeture were embraeed and perpetuated by the Cinqueeento artists, The inhar- monious and unpleasing combinations which arose out of the eollocation of arches with columnar ordinances beeame the charaeteristies of the Italian; unequal intercolumnia- tions, broken entablatures and stylobates, enter alike into the productions of the best and of the worst of the Cinque- eento arehiteets. The style of this school is marked, too, by the eonstant attachment of columns and their acces- sories to the fronts or elevations of buildings; by the infrequeney of their use in insulated (their natural) posi- tions to form portieoes and colonnades ; by the thinness or want of breadth in the smaller members of their entabla- tures, and the bad proportions of the larger parts, into which they are divided; by the general want of that degree of enrichment whieh fluting imparts to eolumns; by the too great projection of pilasters, and the ineonsistent praetice of diminishing, and sometimes fluting them; by the use of circular and twisted pediments, and the habit of making breaks in them to suit the broken ordinance they may crown; and by various other inconsistencies and deformities, whieh will be rendered more evident when we eome to treat of the style in detail, The merit of the Italian school consists in the adaptation and eolloeation of the prolate hemispheroidal cupola, whieh appears to have grown out of its opposite in the Roman works during the Gothic ages, as we find it in the early cathedrals ; though it is highly probable that the idea was brought from the East, in the forms exhibited by the eupolas of St Mark's at Veniee, and of Pisa Cathedral. A very imposing style of palatial arehiteeture also was practised by many of the Italian arehiteets. It consists of the use of a grand erown- ing corniee, running in one unbroken line, unsurmounted by an attic or anything of the kind, superimposing a broad, lofty, and generally well-proportioned front, made into graceful compartments, but not storied, by massive bloek- ing courses or otherwise. Not unfrequently, however, the faults of the school interfere to injure a composition of this kind; for, to produce variety in the decorations of the windows, some of them have been made like doors, with distyle arrangements of columns, surmounted by alternations of eireular and angular pediments, and sometimes with all the vagaries which deform the front of an Italian chureh, It is indeed the ecclesiastical architecture of the school in which its faults are most rife and its merits most rare. An Italian Renaissance ehureh possesses nothing of the stern | simplieity and

imposing grandeur of an Egyptian sacred | structure—nothing of the harmonious beauty and elassic

St Peter's, Rome.

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dignity of a Grecian fane—nothing of the ornate and attractive elegance of a Roman temple—and nothing truly of the glittering grace and captivating harmony of a Pointed cathedral. No other style of architecture presents so great a contrast, in any two species of its productions, as the Italian does, in one of its ordinary church fronts, with the front of a nobleman's mansion or palazzo, in the manner already referred to; and in no city of Italy is the contrast so strong, by the egregiousness of the examples it contains of both, as Rome. The stately portico is hardly known in Italian architecture; and in the rare cases in which insulated columns are found, they are for the most part so meagre in themselves, and so widely sct, according to the Vitruvian

laws, that the effect produced by them is poor and wretched

in the extreme. 'This applies most particularly to Italy itself : in some other countrics, and especially in this, those

architects who have been of the Italian school have generally

preferred the proportions and arrangements which they

found in the Roman examples of antiquity, to those laid Still, Italian church archi- tecture of this period availed itself largely of the cupola,— certainly its redeeming feature; and the architects of Italy

down by their Italian masters,

must have full credit for the use they have made of it,

both internally and externally. Perhaps no two edifices display more, and in a greater degree, both the merits and

defects of the school which produced them, than the Farnese palace and the basilica of St Peter in Rome. The principal front of the former edifice is noble in its proportions, but frittered in its details. It has an immense crowning cornice, whose general effect is certainly grand; but the mouldings are too much projected, and its vertical parts want the breadth which the blocking courses possess. The lowest of its three tiers of windows is characterised by ex- treme simplicity and good taste in almost every particular; but the other two are crowded with sins against both those qualities, in the dressings of the windows. The cortile and back front, though very differently arranged from the front and from each other, are filled with contrarieties, and the same may be said of the structure throughout. The front of St Peter's is not more distinguished by its magnitude than by its littleness and deformity. It contains the materials of a noble octaprostyle, and consists of an attached tetrastyle. It is divided into three unequal stories, within the height of the columns, whose entablature is surmounted by a windowed attic. In length it is frittered into a multitude of compartments, between which not the slight- est harmony is maintained, while tawdriness and poverty are the distinguishing characteristics of its detail. A total absence of everything which produces grandeur and beauty in architecture, marks, indeed, the whole of the exterior of the edifice, except the cupola, than which, if its bad connection with the building out of which it grows is over- looked, architecture seldom produced a more magnificent object. Internally, the structure is open to sunilar praise and similar dispraise. Gorgeousness in matter and mean- ness in manner characterise the interior of St Peter's, except the sublime concave which is formed by its redeem- ing feature without. It must be said also that, probably, no building was ever erected in which the eye is so successfully deceived as to the actual dimensions. Its architect raised enormous walls, arches, and vaults, but gave every one the impression that they were on a very moderate scale. The tawdry and inappropriate sculptured decorations of the Renaissance school can nowhere be criticised with more advantage than in St Peter's. It is not too much to say that, throughout the interior, there is scarcely an ornament which is not offensive; whilst not one of them has the slightest natural connection with, or use in, a sacred building. Perhaps sculpture never reached so profound a bathos as in the hideous cherubs which are stuck, like

petrified acrobats, against all the piers of St Peter's; and when we hear of such a building being treated as a model for our guidance in the completion of St Paul's, we arc driven devoutly to hope that St Paul's may never in that sense be completed at all. Few people ever secm to trouble themselves to look at any part of St Peter's except the entrance front and the dome. If they would examine the rest of the exterior they would find it to be a building without one other rcdeeming feature, or a single grace of outline or detail, and so absolutely unscientific in its con- structional arrangements as to be beneath contempt as a complete work of architecture.

The Cinquecento architects of Italy were extreme man- nerists ; but besides the manner of the school, each had his own peculiarities ; so that there exists in their works what may almost be called monotonous variety. Brunel- leschi's designs are distinguished by a degrce of simplicity and comparative good taste, which causes regret that he had not referred more to the remains of antiquity in Italy, and sought out those of Greece, and attended less to the dogmas of Vitruvius ; for then his works would have been more elegant and the school he founded would have done him much more honour. The works of Bramante possess a more classical character than those of any other architect of the school. Bramante's design for St Peter's was preferred by Pope Julius II. to a great many others by the most celebrated men of the time. He it was who suggested the cupola; but, unfortunately, after his death men of less taste and ability were allowed to alter the design, and the edifice is very different from what it would have been had Bramante been adhered to. This we judge from his works generally, and not from any positive knowledge of the design, which indeed does not exist. The elder Sangalle was far inferior to his contemporary and rival Bramante, and his works are full of the faults of the school. Michel Angelo Buonarotti was a man of great genius, but of coarse taste in architecture ; and to him may be attributed many of the coarser qualities of the Italian style. His principal works are the buildings of the Capitol and the College della Sapienza in Rome, and the Laurentian Library at Florence ; and these are all distinguished for their singular want of architectural

beauty and propriety in every par- ticular, Taffaelle, too, had a very bad style in archi- tecture, and so indeed had almost all the painters after Giotto, who professed to be architects also. They gene- rally carried to extremes all the faults of the school, Sansovino and Sanmicheli were men of considerable talent ; their works display more originality and less servility than those of most of their contemporaries. Peruzzi was less employed than many who had not half his merit ; his pro- ductions are with reason considered among the most classical of the Italian school. Vignola had a more correct taste than perhaps any other Italian architect of the 16th century ; his works are indeed distinguishable by their superiority in harmony of composition and in general beauty of detail. Palladio very much affected the study of the antique, but his works do not indicate any apprecia- tion of its beauties. He appears to have been very well qualified by nature for an architect, but spoiled by education. He did not look at the remains of antiquity with his own eyes, but with those of Vitruvius and Alberti, and he seems to have been too much influenced by the admired works of some of his predecessors. Palladio made greater use of insulated columns than the Italian architects generally, but his ordinances are deficient in every quality that produces beauty; his porticoes may be Vitruvian, but they certainly are not classic; and all his works show that he studied the Colosseum, the theatre of Marcellus, and the triumphal arches, more than the columns of Jupiter Stator and Mars Ultor, the temple of Antoninus and

Faustina, the Pantheon, the portico at Assisi, and the other classic models, which he drew, but clearly did not appreciate. His columns upon columns, his attached and clustered columns, his stilted post-like columns, his broken entab- latures, his numberless pilasters, straggling and unequal intercolumniations, inappropriate and inelegant ornaments, circular pediments, and the like, are blemishes too numerous and too great to be passed over because of occasional elegance of proportion and beauty of detail. Scamozzi did not improve on the style of his master, which, however, he very much affected. Indeed, the term Palladian was long used as

synonymous with beautiful and excellent archi- tecture, so that it cannot be wondered at that Palladio's pupils and successors should have imitated him; nor is it surprising that they did not surpass, or even equal him, for they were taught to look to his works as the ne plus ultra of excellence. Giacomo della Porta, a contemporary of Palladio, followed Michel Angelo in several of his works, and imbibed much of his manner, on which he certainly improved; but still his own is far from being good. Della Porta was much employed in Rome; and it fell to him, in conjunction with Domenico Fontana, to put the cupola on St Peter's. Fontana's style of architecture is not particularly distinguished for its good or bad ' quali- ties: he obtained more reputation as an engineer than as an architect, having been engaged in removing and setting up most of the obelisks which give so much interest to the architectural scenery of Rome. The Lunghi, father, son, and grandson, the Rainaldi, Maderno, Borromini, Bernini, Carlo Fontana, Fuga, Vanvitelli, and many others in the course of the 17th and 18th centuries, carried the pecull- arities of the Italian school to the greatest extremes. Of those enumerated, Bernini was perhaps the least offensive, and Borromini the most extravagant ; but throughout that period, except in extreme cases, individual manner is less distinguishable, and that of the school more strongly marked.

It may be gathered from the preceding remarks, that the secular architecture of the Italian school is generally preferable to the ecclesiastical, and that the architects of the 15th and 16th centuries were generally superior to those who followed them. In Italy the school has not yet ceased to exist, nor indeed has its style ceased to be studied. Designs are still made by the students of the various academies in the manner of the Cinquecento, and on the models with which the country abounds. The pre- cepts of Vitruvius are yet inculcated, and the men whose names have just been mentioned are looked up to as masters of architccture in the country which contains the Roman Pantheon and the Greek temple of Neptune at Pzestum, and has access to the more exquisite works of Greece herself.

As has been already stated, Italian architecture, though professedly a revival of the classical styles of Greece and Rome, was formed without reference to the existing specimens of either, but on the dogmas of an obscure Roman author, and the glosses of the "revivers" on his text,

Vitruvius described four classes or orders of columnar composition ; and on the principles which governed him in subjecting to fixed laws all the varieties with which he appears to have been acquainted, they formed a fifth, of a medley of two of his, thus completing the Italian orders of architecture. 'The school which was founded on the Vitruvian theories has systematised everything to an absurd extent, and laid down laws for collocating and proportioning all the matter it furnishes for architectural composition and decoration, It teaches that columns are modelled from the human figure; that the Tuscan column is like a sturdy labourer—a rustjc; the Doric is somewhat trimmer though equally masculine—a gentleman, perhaps ;

the Ionic is a sedate matron; tho Corinthian a lascivious courtesan; and the Composite an amalgam of the last two! In a composition which admits any two or more of them, the rustic must take the lowest place; on his head stands the stately Doric, who in his turn bears the comely matron, on whose head is placed the wanton, and the wanton again is made to support the lady of doubtful character | With- out commenting on this, we proceed at once to point out the general features of the Italian style, premising only, that according to the practice of the school everything is confined to an exclusive use and appropriation; such columns may be fluted, and such must not ; such a moulding may be used here, but not there ; and soon. 'The propor- tions and arrangements of an order, of any part of one, or of anything that may come within an architectural composi- tion, are fixed and unchangeable, whatever may be the purpose or situation for which it is required ; whether, for instance, an order be attached or insulated, the column must have exactly the same number of modules and minutes in height. Itis true that the masters of the school are not agreed among themselves as to those things in which they are not bound by Vitruvius ; but every one not the less contends for the principle, each, of course, pre- scribing his own doctrine as orthodox and final on these unsettled points.

Mouldings are considered by these authorities as con- stituent parts of an order, and are limited to eight in number, strangely enough including the

fillet. They are the cyma-recta, the cyma-reversa (or ogive or ogee), the ovolo, the torus, the astragal or bead, the cavetto, the scotia, and the fillet, They are gathered from the Roman remains, but reduced to regular lines or curves, which un- like all good artistic work may be drawn with a rule or struck with a pair of compasses, By their arrangement according to certain proportions, with flat surfaces, modil- lions, and dentils, a profile is formed ; no two conjoined mouldings may be enriched, but their ornaments, as well as the modillions and dentils, must be disposed so as to fall regularly under one another, and, when columns occur, above the middle of them.

An order is said to be composed of two principal parts, the column and the entablature; these are divided into base, shaft, and capital in the one, and architrave, frieze, and cornice in the other, and are variously subdivided in the different orders. The Tuscan column must be mado seven diameters in height, the Doric eight, the Tonic nine, and the Corinthian and Composite ten. The height of tho entablature, according to some authorities, should be one- fourth the height of the column, and, according to others, two of its diameters. The parts of the entablature of all but the Doric may be divided into ten equal parts, four of which are given to the cornice, three to the frieze, and three to the architrave ; and in the Doric, the entablature being divided into eight parts, three must be given to the cornice, thrce to the frieze, and the remaining two to the architrave. For the minor divisions a diameter of the column is made into a scale of sixty minutes, by which they are arranged ; but this is obviously irrelevant if the whole height of the entablature is determined by the height of the column, and not by its diameter ; in this case, therefore, they must be proportioned from the general divisions already ascertained. Columns must be diminished, according to Vitruvius, more or less as their altitude is less or greater,—those of about fifteen feet high being made one-sixth less at their superior than at their inferior diameter, while that proportion is lessened gradually, so that columns fifty feet high shall be diminished one- eighth only. On this subject, however, many of his disciples controvert the authority of their master ; and some of them have fixed the diminution at one-sixth of a diameter for

columns of all sizes in all the orders. The entasis of columns is disputed also, some authorities making it consist in preserving the cylinder perfect one-quarter or one-third the height of the shaft from below, diminishing thence in a right line to the top ; while others, following Vitruvius, make the column increase in bulk in a curved line from the base to three-sevenths of its height, and then diminish in the same manner for the remaining four-sevenths, thus making the greatest diameter near the middle.

It being difficult to determine among the masters of the Italo-Vitruvian school whose designs of the various orders are to be preferred, we have selected those of Palladio, certainly not for any superior merit they possess, but because he is more generally esteemed than any other, and becatse he the most strictly adhered to the precepts of Vitruvius, as far as he could understand them. It should be remarked however, that although Palladio recommended fluting all but the shaft of the Tuscan column, he very seldom fluted columns in his own practice ; and indeed it was the custom of the Italinn school not to flute, whatever their doctrine may be to the contrary ; for fluted columns in Ttalian archi- tecture are exceptions to the general practice. Swelled or pillowed friezes are not peculiar to Palladio ; they are more or less common to the works of most of the masters of the game school. Prostyles being almost unknown in Italian architecture, ante are not often required ; but when they are, the meanest succedaneum imaginable is recurred to. Of this Palladio's Villa Capra near Vicenza and Lord Burlington's Palladian villa at Chiswick afford striking examples, Pilasters, however, are very common, so common, indeed, that they may be called pro-columns, as they are often used as au apology for applying an entablature. They are described as differing from columns in their plan only, the latter being round, and the former square ; for they are composed with bases and capitals, are made to support entablatures according to the order to which they belong, and are fluted and diminished with or without entasis, Just as columns of the same style would be. When they are fluted, the flutes are limited to seven in number on the face, which, it is said, makes them nearly correspond with the flutes of columns ; and their projection must be one- eighth of their diameter or width when the returns are not fluted ; but if they are, a fillet must come against the wall. Pedestals are not considered by the Italo-Vitruvian school as belonging to the orders, but they may be employed with them all, and have bases and surbases or cornices to

corre- spond with the order with which they may be associated, The dado of a pedestal must be a square whose side shall be equal to that of the plinth of the colunm or pilaster which rests on it, or a parallelogram a sixth or even a fourth of a diameter taller. The intercolumniations of columns are called pycnostyle, systyle, eustyle, diastyle, and arewostyle, and are strictly adhered to in Italian archi- tecture when columns are insulated, which is not very often; when they are attached, the interspaces are not limited, except when a peculiar arrangement called arzostyle isadopted. This consists of two systyle intercolumniations,

the column that should stand in the mid-distance between |

two others being placed within half a diameter of one of them, making, in fact, coupled columns or pilasters. It is applied to insulated columns as well as to those which are attached. Following Vitruvius, the Italian school makes the central intercolumniation of a portico wider than any of the others. The height of arched openings, in arcades or elsewhere, is generally about twice their width ; if, however, they are arranged with a columnar ordinance, having columns against the piers, they are made to partake of the order to which the columns belong, being lower in proportion to their width with the Tuscan than with the Doric, and so on; and the piers are allowed to vary in the

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same manner, from two-fifths to one-half of the opening. With columnar arrangements, moulded imposts and archi- volts are used ; the former being made rather more than a semi-diameter of the engaged columns in height, and the latter exactly that proportion. Variously moulded key- stones are used, too, projecting so that they give an appear- ance of support to the superimposed entablature. Smaller columns with their entablature are sometimes made to do. the duty of imposts, and sometimes single columns are simi- larly applied; at other times, columns in couples are allowed to stand for piers to carry arches. In plain arcades the masonry is generally rusticated, without any other projection than a plain blocking course for an impost, and a blocking course or cornice crowning the ordinance. Niches and other recesses are at times introduced in the plain piers, which are in that case considerably wider than usual, or in the spandrels over wide

piers. Very considerable variety ig allowed in these combinations. Doors and windows, whether arched or square, follow nearly the same propor- tions, being made, in rustic stories, generally rather less than twice their width in height, and in others either exactly of that proportion, or an eighth or a teuth more. If they have columned or pilastered frontispicces, these are sometimes pedimented; and, except in rustic stories, whether with or without columns, a plain or moulded | lining called an architrave is applied to the head and sides | of a door or window. 'This architrave is made from one- | sixth to one-eighth the width of the opening it bounds, ' and it rests on a blocking course or other sill, as the case may be. In the absence of columns or pilasters in the frontispiece, their place is frequently supplied by consols | or trusses of various form and arrangement, backed out by i anarrow pilaster, which may be considered as the return of | the frieze of the entablature, and which supports the cornice. i It is not uncommon for the architrave lining to project | knees at the upper angles, and this is sometimes done even | with consols and their pilasters. With columned frontis- pieces to gateways, doors, and windows, arose the custom, so frequent in Italian architecture, of rusticating columns, by making them alternately square and cylindrical, accord- ing to the heights of the courses of rustic masonry to which they are generally attached, and with which they are less offensive than in other collocations. The practice of the Cinquecento school of piling columns on columns with their accessories is warranted by the doctrine of its master ; but his precepts not being practicable, recourse has been had to the inferior works of the Romans, which i present examples of it. The difficulty of preserving anything like a rational arrangement is acknowledged on all hands to be great, if not insurmountable ; for if the first or lowest order be at an intercolumniation fitting its pro- portions, the second or next above it, though diminished ever so little, is already deranged, for it has the same distance from column to column that the inferior order has whilst the columns themselves are smaller in diameter, and their entablature consequently shallower. This de- rangement must, of course, increase with every succeeding ordinance, rendering it indeed impossible to make such a coniposition consistent. The most approved practice in arranging order above order appears to be, that the upper column shall take for its diameter the superior diameter of the one below it; that when the columns are detached their axes shall be in the same perpendicular line; but when attached or engaged, the plinth of the

pedestal of tho upper shall impend the top of the shaft of the lower column. The most rational mode, however, for diminishing, if reason can be applied to such compositions, is to carry the diminution through, the outlines of the columns of the lowest order being drawn up in the same direction, and so the columns of every story would take up their place and

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be diminished in regular gradation. When columns are

attached, or pilasters are used, in Italian architecture, the

almost invariable custom is to break thé entablature over.

every column or pilaster, or over every two when they are in couples. Because of the great length of the intercolum- niation, this would appear to have been done at first; but it has frequently been done by some of the most distinguished practitioners of the school, even without that excuse, so that it may be held as approved by them. A basement is either a low stereobate or a lofty story, according as it is intended to support a single ordinance the whole height of the main body of the structure, or indeed the lowest of two or more orders; or as it occupies the ground story of a pbuilding, and supports an ordinance, or the appearance of one, above. In either case much is necessarily left to the discretion of the architect ; but in the latter the height of the order it is to support is the generally prescribed height of the basement. A basement may be rusticated or plain ; if it be low, and is not arranged like a continued pedestal, it must have neither cornice nor blocking course ; but if lofty, a deep bold blocking course is indispensable. An attic may vary in height from one-quarter to one-third the height of the order it surmounts ; attics are arranged with a base, dado, and coping cornice, like pedestals, and gene- rally have pilasters broken over the columns below. The rule for the form, composition, and application of pediments in Italian architecture, if it may be gathered from the practice of the school, appears to be to set good taste at defiance in them all. We find pediments of every shape, composed of cornices, busts, scrolls, festoons, and what not, and applied in every situation, and even one within another,

to the number of three or four, and each of these of different form and various composition, The proportion laid down for the height of a pediment is from one-fourth to one-fifth the length of its base, or the cornice on which it is to rest. Balustrades are used in various situations, but their most common application is in attics, or as parapets on the summits of buildings, before windows, in otherwise close continued stereobates, to flank flights of steps, to front terraces, or to flank bridges. Their shapes and proportions are even more diversified than their application ; that of most frequent use is shaped like an Italian Doric column, compressed to a dwarfish height, and consequently swollen in the shaft to an inordinate bulk in the lower part, and having its capital, to the hypotrachelium, reversed to form a base to receive its grotesque form, The base and coping cornice of a balustrade are those of an ordinary attic, or of a pedestal whose dado may be pierced into balusters. The general external proportions of an edifice, when they are not determined by single columnar ordi- nances, appear to be uusettled. The grand front of the Farnese Palace in Rome is in two squares, its length being twice its height ; the length of each front of Vignola's cele- brated pentagonal palace of Caprarola is two and a quarter times its height above the bastions. In Palladio's works we find the proportions of fronts to vary so considerably as to make it evident that he did not consider himself pound by any rule on that point. In some cases we find the length to be one and a sixth times the height, in others one and a fourth, one and a half, two, two and a sixth, and even three and a sixth; and elevations by other masters of the school are found to vary to the same extent. The pro- portions of rooms, again, range from a cube to the ratio of one to two, though it is preferred that the height should be a sixth, or even a fifth, less than a side when the plan is a square ; but the sesquialteral form, with the height equal to the breadth, and the length one-half more, is considered the most perfect proportion for a room. There is consider- able variety and beauty in the foliate and other enrich- ments of an architectural character in many structures in

Italy, but very little ornament enters into the columnar composition of Italian architecture. Friezes, instead of being sculptured, are swollen; the shafts of columns, it has been already remarked, are very seldom fluted, and their capitals are generally poor in the extreme ; mouldings are indeed sometimes carved, but not often; rustic masonry, ill-formed festoons, and gouty balustrades, for the most part supply the place of chaste and classic enrichment. "This refers more particularly to the more classic works of the school; in many of the earlier structures of Italy, and especially on monuments of various kinds, we find what may be called a graceful profusion of ornament, of the most tasteful and elegant kind ; few carved mouldings, however, and very few well-profiled cornices, are to be met with in Italian compositions of any kind. In many of the later architectural works of that country we find again a profusion of ornament of the most tasteless and inelegant description, chiefly in the gross and vulgar style, which is distinguished as that of Louis XIV. of France.) In the 15th century such was the reverence of men for the revived works of ancient literature and science, that the pretence of the Italians, that they had restored ancient classical architecture on the precepts of an architect of the Augustan age, was sufficient to open the way for them all over civilised Europe. In the course of that and the fol- lowing century Italian architecture was adopted and Italian architects employed in France, Spain, Germany, Great Britain, and their respective dependencies ; and now, in the 19th century, Vitruvius and Palladio are as predominant on the shores of the Baltic as on those of the Mediterranean ; though in England and in some parts of the Continent their influence is considerably diminished since the time of Inigo Jones and Claude Perrault. It has been already remarked, too, that the Cinquecento was later in gaining a footing in Britain than on the Continent, in consequence of the love of the beautiful national style of architecture, which our ancestors do not appear to have been induced to resign to the barbarian innovators of the South, as readily as most other nations were to give up theirs. The French, though they received the Vitruvian architecture from the Italians, were patriotic enough, as soon as they had acquired its principles, to confine the practice of it almost entirely to native architects, in whose hands it assumed a differ- ent character from that which it possessed in Italy, and became what maybe called the French style of Cinquecento. Its ecclesiastical structures are less faulty than are those of the corresponding period in Italy, but its secular edifices are as far inferior

to those of that country. The grand palatial style, which is exemplified in the Farnese Palace in Rome, never found its way into France; but instead, there arose that monstrous and peculiarly French manner, of which the well-known palaces of the Tuileries and Luxembourg are egregious examples. In the age of Louis XIV. the French appear to have reverted to the Italian manner in a certain degree; for the palace of Versailles" includes almost all the extravagances of that school in its worst period, and contains, moreover, architectural defor- mities which Italy never equalled till it imitated them. They consist in the style of enrichment which is distin- guished by the name, and is due in part to the gross taste, of the monarch in whose reign it had its origin. 'The same period produced one of the most classical architects of the French school—its Palladio or Inigo Jones—Perrault, whose design for the buildings of the Louvre was preferred to that of Bernini, though, indeed, the preference was no compliment to the one nor discredit to the other, consider- ing to whom the decision was of necessity referred. The Hotel des Invalides is of the same age: it exhibits the graces of the Italian cupola, gurmounting a composition which includes more than all the faults of St Peter's in II. — 56

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2ome. The church of Sainte Genevieve, or the Pantheon,

a work of the following reign, was intended to be in the ancient Roman style, and of Roman magnificence ; but it is rather papally than imperially so. Ancient [tome was regarded in the columnar ordinance, but modern Rome in the architectural composition. In it the ecclesiastical style of the Cinquecento is commingled with the simple beauties of Roman architecture, almost, indecd, to the destruction of the latter; and it is crowned by a too lofty cupola. More recently the works of the ancients have been studied by the architects of France, greatly to the amelioration of their style, although many of then still appear to disregard the peculiaritics of real Greek architecture, and to retain their devotion to Vitruvius and the 15th century. Spain received but soon modified the Italo-Vitruvian architecture, and has never recovered from the architectural excesses 'nto which her architects plunged when the wealth of their countrymen in the 16th and 17th centuries enabled them to accomplish such enormous works. Of these, the man of the

greatest fame out of his own country is Herrera, the architect of the Escorial, a vast palace built upon the ingeniously rural plan of a gridiron. It is a vast but bare, cold, and repulsive building. Not less is the cathedral at Valladolid a grand failure, though Herrera must be eredited with much more sclf-restraint and reserve in the usc of omament than the Italian architects of his own time, and some of his contemporaries and successors in Spain. One of the most famous of these, Churriguerra, gave his name to a fashionable style which was neither more nor less than the most rococo travesty of Italian Renaissance that could be invented ; and another school of architects, imitating the delicate chasing of silversimiths' work, produced another variation of the style, which was christened " Plateresque." If this is less cold than Her- rera's work, and less offensive than Churriguerra's, it con- tains at the same time none of the elements of a really great and lasting style of architecture, and is only interest- ing as a local variety of style. The Italian revival was the ineans of extinguishing the Pointed style of architecture in Germany, and certainly without affording it an equivalent. Italian architects were employed in Germany, and Germans acquired their manner ; but they did not improve it, nor did they make it productive of so many good effects as the Italians themselves did. 'The change in religion which followed the change in arclritecture in so large a part of Germany may have tended to prevent the latter from acquiring that degree of exuberance there which it reached in Italy; but even in Catholic Germany the splendid Pointed cathedrals have never given way to modifications of the pseudo-classic St Peter's. In the use of Cinquecento architecture for secular structures, it may be truly said that the Germans have not excelled the Italians, nor, on the other hand, have they equalled them in the absurdities and extravagances which are so frequently observable in the works of some of the latter. The Germans also have turned their attention to the works of the ancients, and the fruit of this is evident in many parts of the country, particularly in Prussia ; still, however, they have yet to show that it is possible to apply the Greek models to modern uses, and to exhibit a proper sense of the exquisite perfection of their detail, as well as to emancipate themselves from the tram- incls of the Vitruvian school. The northern Continental nations have been dependent for their architecture on Ger- many, France, or Italy, and can produce nothing that gives them a claim to consideration in such a review as the present. St Petersburg is exclusively the work of archi- tects of the nations just enumerated, and

presents a mass of the merest common-places of Italian architecture, in structures calculated by their extent only, like Versailles, the Escorial, and St Peter's, to impose on the vulgar eye.

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MovERN ENGLISH ARCHITECTURE.

We have already more than once had occasion to refer incidentally to the introduction of Cinquecento architecture into Britain; and in noticing it more particularly, and tracing its course, we are saved the trouble of keeping up a distinction between the different parts of our triple nation, because at the time it actually crossed the Channel the union of the kingdoms had taken place.

When the Pointed style reccived its dcathblow in England, in the reign of Henry VIII., it did not immedi- ately cease to exist; nor was it immediately succeeded by the Italian when it became extinct. It was gradually declining through all the 16th century, during the latter part of which period what has been called the Elizabethan style became somewhat permanent. It consists of a singular admixture of the Italian orders with many peculiarities of the Pointed style, and in many examples the latter appears predominant. With such difficulty, indecd, did that fascinating manner give up its hold on the minds of men in this country, that the Cinquecentists appear to have relinquished the hope of effecting its destruction, unfortunately, however, not until the injury was done ; and for some time we were left without a style of any kind, unless that may be called by the name which marks the edifices of the reign of James I., and of which the oldest parts of St James's Palace are a specimen.

The destruction of the Pointed style has been referred by some to the change in religion which took place under the Tudor line of English monarchs, but certainly with- out sufficient reason. It was the " Reformation " of archii- tecture in Italy, and not that of religion in Great Britain, that effected it ; and it may be doubted whether the change would not have taken place sooner in this country if its connection with Italy had

not been so materially affected by the moral change here ; for it was Germany and France that supplicd us with architectural reformers during the reigns of Henry VIII. and his children, and not Italy, whose professors might possibly have obtained more credit than their disciples did.

So dilatory were we, indeed, in the cultivation of the Italian style, that the first professor of it who was actually employed on edifices in this country came to it from Denmark! It is true he was an Englishman ; but so little hope did he appear to have of success at home, that he accepted an invitation from the king of that country. He had gone to Venice to study painting; but becoming enamoured of architecture, as he saw it in the works of Palladio, he had made that his study instead, and had already acquired considerable reputation in that city when Christian IV. of Denmark invited lim to his court te occupy the post of his first architect. A train of circum- stances brought him to England afew years after James I. came to the English crown, and he was appointed architect at first to the queen, and subsequently to Henry prince of Wales. But this does not appear to have then obtained employment for him, since after the death of the prince he went again to Italy, where he remained till the office of surveyor-general, which had becn promised him in rever- sion, fell vacant. This was the celebrated Inigo Jones, who has been called the English Palladio ; and, indeed, he succecded so well in acquiring the pecuhar manner of that architect, that he richly deserves whatever credit the appel- lation conveys. It is unfortunate, however, for his own reputation, that he had not looked beyond Palladio and their common preceptor Vitruvius to the models the latter pretends to describe ; in which case he might have been the means of solving the question whether the truly classical architecture of the ancients could ever be intro- duced here with any advantage. But instead of that be

brought nothing home but Italian rules and Italian pre- judices. Jones commenced the truly Gothic custom of thrusting Cinquecento fittings into our Pointed cathedrals, by putting up an Italian screen in that of Winchester ; and he barbarised the ancient cathedral of St Paul in London, by repairing it according to his notions of Pointed architecture, whilst at the same he defaced its exterior by affixing to it an Italian front. Of the

Palladian style, however, he was a complete master. He designed a royal palace, which was to have been built at Whitehall, in a manner as far superior to those of Versailles and the Escorial as the works of Palladio are to those of Borromini. The ouly part of Jones's design ever ex- ecuted is the structure called the Banqueting House, whose exterior is an epitome of many of the faults, and most of the beauties of the Palladian school. It rises boldly from the ground with a broad, simple, and nearly con- tinuous basement, or stereobate, and the various compart- ments of its principal front are beautifully proportioned ; but though the circular pediments to the windows, the attached unfluted columns, with broken entablatures and stylobates, the attic and balustrade, be the materials of Palladian, it may be confidently denied that they are con- sistent with classical, architecture. Another well-known work of this architect is the Italo-Vitruvian Tuscan church of St Paul, Covent Garden, whose eastern portico is well-proportioned in general, but grossly deformed in detail, and whose interior was left to take care of itself, having absolutely no charm either of proportion or detail. Architecture was in abeyance in this country, again, from the troublous times of Charles I. till the restoration of the monarchy in the person of his son, whose French taste would have completely Gallicised the architecture of the uation, if the genius of Sir Christopher Wren had not been present to avert the infliction, or rather to modify it; for it cannot be denied that the influence of the French manner had an effect on the architecture of this country from that period down to the middle of the last century. Indeed, Wren himself knew the style he practised mainly from books and the structures of France; and, in consequence of his visit to France, the peculiarities of the French style are obvious in many of his less esteemed works. Fortunatcly, however, he was proof against the grosser peculiarities of the Cinquecento, whether in the books of the Italians or in the edifices of the French ; and his own productions show that he had imbibed much of the spirit of the antique monuments of Italy, which he could have known only from engravings, and those very imperfect ones. 'The field that was opened to his genius by the great fire of London in 1666,~~and its result, are equally well known. It is true that the general absence of taste and feeling with regard to the Pointed style extended even to him. Wren was guilty of many offences in that respect, besides giving authority to the opprobrious term Gothic ; and in no case more so than intheconstruction of the towersadded to Westminster Abbey, which are a~~

~~lasting proof of his ignorance of its most obvious principles. Nevertheless, to the influence of our beautiful native style on his mind the architecture of his period is indebted for some of its best works. If Wren had not been accustomed to contemplate the graceful and elegant pyramids or spires of his native country, he would never have originated the tapering steeple, in the composition of which with the materials of Italian architecture he still stands as unrivalled as he was original. Witness the steeples of Bow Church and St Bride's in London, the former of which is hardly surpassed in grace and elegance by the pointed spires themselves. It must remain a con~~ stant subject of curious speculation, what effect would have been produced on this great head of the English school of Cinquecento architecture if he had known the remains of

ancient Greece and Rome from personal observation, With his splendid genius and fine taste, if he had not been imposed on by the specious pretence of the Italo-Vitruvian school, his works might have been models for imitation and study, as they are objects of admiration ; as it was, he avoided many of the faults of that school, and improved on many of its beauties. Although he did not know the Greek style at all, and knew the Roman only through imperfect mediums, and, indeed, had never seen an example of either, whenever he has varied from the Italian practice it has been towards the proportions and peculiarities of the Greek! The great west front of St Paul's, though it is said to be imitated from that of St Peter's in Rome, or rather from what it was proposed to be, with the two towers to form its wings, is a mucli finer, a more imposing, and more classical specimen of architecture than its pro- totype ; for the advantage the latter should have in being of columns in one height is lost entirely in their poverty, and in the miserable arrangement of the whole front, whereas that of St Paul's is in two noble pseudo-prostyle and recessed porticoes, with the columns fluted, and gene- rally conceived and executed in much better taste than those of St Peter's. The entablatures, though massive, are finely proportioned, and sufficiently ornate to be elegant ; they are, too, quite continuous, and the upper one is sur- mounted by a noble pediment, whose

pyramidal form gives at the same time dignity and a finished appearance to the whole front. The coupling of the columns, however, and the putting of one columnar ordinance over another, can only be defended by the practice of the Italian school ; though, in the present case, both are rendered less offensive by the judicious management of the architect. Nothing shows more strikingly the superiority of St Paul's to St Peter's as an architectural composition, than a parallel of their flanks. The great magnitude of the latter may strike the vulgar eye with admiration in the contrast ; but the rudest taste must appreciate the surpassing merit of the former in the form and arrangement of the cupola, and the noble peristyle, with its unbroken entablature and stylobate, out of which it rises, when compared with the sharper form and depressed substructure of that of St Peter's. The superiority of St Paul's in the composition of the main body of the edifice is not less in degree, though, perhaps, less obvions, than in the superstructure. In the one it is broken and frittered, and in the other almost perfectly continuous, in broad, bold, and effective masses.

The history of the works of Sir Christopher Wren is the history of the architecture of the period in this country; and as it must be admitted that he was not so successful in the composition of the architecture of secular structures as of ecclesiastical, it will follow that our secular edifices of that time are of inferior merit. If it were not indeed an historical fact, it would hardly be credited that Chelsea College, the old College of Physicians in London, and the halls of some of the city companies, are' by the architect of Bow Church and St Paul's.

The style introduced by Sir John Vanbrugh, who may be said to have succeeded Sir Christopher Wren in the direction of architecture in England, was distinguished by massiveness unsuited to the style in which he built, which was, of course, Italian. It was, however, free from the extravagances which characterise that style generally in other countries at the same period, but was certainly more suited to the soberer character of ecclesiastical than of secular structures, whereas his principal works were uoblemen's mansions. Vanbrugh's faults were generally those of Michel Angelo; he was a painter architect, and did not understand beauty of proportion and detail so well as the pictorial arrangement of lights and

shadows,—to produce which in the Cinquecento it is almost necessary to part with all the

higher beauties of architecture. style of his mastcr that noble ornament in which Italian works are so very deficient—a prostyle portico. positions are marked by severe simplicity, and only want to be absolved from a few faults and enriched with a few elegances to be among the best of modern times. Not the

least distinguished architect of the same age (the first half

of the 18th century) was the earl of Burlington, who was a passionate admirer of the style of Palladio and Inigo Jones. Many of the edifices erected by Kent are asserted to be from the designs of that nobleman, who, with consider- able talent, was, however, a somewhat bigoted devotee to Vitruvius and the Cinquecento generally, as well as to Palladio in particular; for he frequently used columns representing half-barked trees in conformity with the silly tales of Vitruvius, and the sillier whims of his disciples. The portal of his own house in Piccadilly, and that of the King's Mews, were special examples of this bad taste, and of other faults of the school besides. Lord Burlington built for himself at Chiswick a villa on the model of the Villa Capra, or Rotonda, near Vicenza—a structure which has been called the master-piece of Palladio. In form and proportion it is certainly elegant, but its details strongly exhibit the poverty of Italian columnar architecture, when unaided by the frittering which is its bane, and almost its only element of effect. Gibbs, a contemporary, had, like Hawksmoor, imbibed a taste for the classic prostyle portico, which he evinced in St Martin's Church in London ; but that he also was in the trammels of the Italian school is no less evident, in the same structure, to a considerable extent, and still more so in the church of St Mary in the Strand, which is a mediocre specimen of architecture, though a favourable one of its style. During the following half- century (the latter half of the 18th) Sir William Chambers and Sir Robert Taylor were the most distinguished architects of this country. They were both men of genius and skill, who had availed themselves of the remains of Roman antiquity to good purpose (for as yet those of Greece were either unknown or unappreciated),

and the former has left us, in the Strand front of Somerset House in London, perhaps the best specimen of its style in existence. Other parts of the same edifice, however, are far from deserving the same degree of praise; indeed, as an architectural composition, the river front is altogether inferior in merit to the other, though of much greater pretence. The inner fronts to the great quadrangle, though exhibiting good parts, are, as a whole, not above mediocrity. An air of littleness pervades them ; and the general effect of the fronts themselves is made still worse by the little clock towers and cupolas by which they are surmounted; and to this may be added the infinity of illarranged chimneys, which impart an air of meanness and confusion that nothing can excuse. While Sir William Chambers and afew others were applying the best qualities of Italian architecture, indced, improving its general character, and, it may be said, making an English style of it, there were many structures raised in various parts of the country in a manner hardly superior to that of the time of James I.,—structures in which all the meanness and poverty of the Cmquecento are put forth, without any of its elegance of proportion, or that degrce of effectiveness which men of talent contrived to give it. During the same period, too, the seeds of a revolu- tion were sown, which almost succeeded in ejecting the Italian style and its derivative from this country, without perhaps having furnished a complete equivalent.

In the year 1748 James Stuart and Nicholas Revett, two painters pursuing their studies in Rome, having moreover paid some attention to architecture, issued ‘ Pro- posals for publishing an accurate description of the Antiqui- ties of Athens, &c.” These proposals met with general

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approbation, and in consequence they determined on prose- cuting their plan; but various hindrances prevented their arrival in Athens till March 1751, when they commenced measuring and delineating the architecural

monuments of that city and its environs. In this work thcy were unre-mittingly employed (as far as their own exertions went, for they were frequently interrupted by the Turks) for several years, so that they did not reach England with the result of their labours until 1755; and, by a series of almost unaccountable delays, the first volume of their work did not appear until the year 1762. Sixteen years more expired before the second issucd from the press ; and the third was not published until 1794, being nearly fifty years from the time the work was first announced! In the meantime a Frenchman of the name of Le Roy, who was at Rome when our countrymen issued their proposals, had gone to Athens, and collecting in a very short time some loose materials, had published at Paris, in 1758, a work which he called Les Ruines des plus beaux Monumens de la G'réce, déc., in which he makes not the slightest mention of Stuart and Revett, or of their labours or intentions, with all of which he was well acquainted. This work is, moreover, notoriously and grossly incorrect,—so incorrect, indeed, as to make it difficult of belief that its author ever saw the objects of which he professes to give the representations. It was, however, from M. le Roy's work that the public had to judge of the merits and beauties of Greek architecture ; for the first volume of Stuart and Revett's Antiquities did not appear for several years after it, and that does not contain any pure specimen of the national or Doric style: the second, which does, was not published for twenty years after Le Roy's. Considering, therefore, the source of information on the subject, it can hardly be wondered at that Greek architecture was vituperated on all sides ; and by none with greater acrimony than by Sir William Chambers, whose apology must be ignorance and the prejudices of education. He really did not know the style he carped at; and his education in the Italo-Vitruvian school had unfitted him for appreciating its grand, chaste, and simple beauties, even if he had known it. Notwithstanding the mis- representations of Le Roy, the vituperations of Chambers, the established reputation of Italian architecture, and the trammels which Vitruvius and his disciples had fixed on the public mind, when Stuart and Revett's work actually appeared, the Greek style gradually advanced in esteem, by its intrinsic merits alone—for it has had no factitious aids; and since that period, Greece and all her colonies which possess remains of her unrivalled architecture have been explored, and we now possess correct delineations of almost every Greek structure which has survived, though in ruins, the wreck of time and the desolation of

barbarism. To our country and nation, then, is due the honour of opening the temple of Greek architectural art, of drawing away the veil of ignorance which obscured the beauties it contains, and of snatching from destruction, and consequent oblivion, the noble relics of ancient architecture which bear the impress of the Grecian mind. Not only, indeed, were we the first to open the mine, but by us it has been prin- cipally worked ; for among the numerous treatises on the Hellenic remains which now exist, by far the greatest number, and indisputably the most correct, are by English- men, and have been published in England. It required, however, a generation for the effects of ignorance and pre- judice in some, and imperfect knowledge in others, to wear away before any effects of the study of the Greek style could be obvious in our structures. The works of the Adams, who were the contemporaries and immediate successors of Sir William Chambers, evince a taste for the beauties of Greek architecture, but a very imperfect know- ledge, indeed, of the means of reproducing them. The

architects who. had the direction of our principal works during the earlier part of this century had the disadvantage _of being pupils of those who were themselves, as we have shown, incompetent to appreciate the Greek style ; and at a time, too, when the state of Europe prevented all access to the remains of Greece and Rome, so that no great improve- ment could perhaps be expected from them. Personal study of the monuments they wish to rival is the absolute duty of all architects, and it is possible that study even of the older examples may in all cases teach them some useful lesson. The structures of Egypt may show us how to arrange large masses harmoniously and effectively, those of Greece and Rome how to impart grace and dignity. The struc- tures of Italy show us how far the materials of ancient archi- tecture may be moulded to modern uses, while at the same time they give practical warning of what may result from the abuse of the most obvious principles of the art, and from the neglect of our national style or the requirements of our own country and climate, with which it is almost unnecessary to say it is quite impossible to harmonise the works of so entirely different a climate as that of Greece.

The difference between the representations of the Athe- nian antiquities by Stuart and his colleagtte, and the misrepresentations of them by Le Roy, appears to have opened the eyes of the world to those of ancient Rome, to see if they too had not been dealt with unjustly ; for much more correct delineations of them had appeared than those of Palladio and Desgodets,—delineations of them as they exist, exhibiting the spirit of the ori- ginals, and not warped to the Vitruvian precepts, and thereby stripped of their best quality, truth. The ex- cavation of the ancient cities of Herculaneum and Pom- peii has opened to us much interesting and instructive matter, and their ruins have now been correctly de lineated.

It is an argument in proof of the classical beauty of the Pointed style, that when the eyes of men were opened to the perfections of Greek architecture, they began to discover its merits also. Pointed architecture, under the opprobrious name Gothic, had long been a subject of discussion among antiquaries,—that is, essays were written by them to prove how the pointed arch originated, but none appreciated its beauties. Our Pointed cathedrals and churches were, after the example of Inigo Jones, ruthlessly barbarised in course of repairing and fitting them up. If an architect were employed to do anything about one of them, he appears to have thought it incumbent on him to convert it to the doctrines of his own faith—to Italianise it. Deans and chapters for the most part entrusted their commissions to country masons and plasterers, who also operated according to the laws of the " five orders." About the middle of the 18th century one Batty Langley endeavoured to draw the attention of the world to Pointed architecture, by reducing it to rules, and dividing it into orders. Fortunately he was only laughed at, and both he and the book he published on the subject were soon forgotten. One of the first men in rank and influence of his time, in matters of taste par- ticularly, Horace Walpole, patronised Pointed architecture, but ineffectually. He had himself neither taste nor feeling to appreciate its beauties, as his Strawberry Hill clearly shows. Delineations were indeed put forth from time to time, but generally so rude and imperfect, that they did more harm than good. The Society of Antiquaries, how- ever, at length took up the subject, engaged Mr John Carter, an ardent and judicious admirer of our national architecture, and commenced the publication of a series of splendid volumes, containing engravings of its best speci- mens,

from drawings and admeasurements by him. The . Antiquities of Athens had already done much to dispossess

men of their prejudicies, by showing that Greek architec- ture, though neither Vitruvian nor Palladian, was never- theless beautiful; and the great work of the Society of Antiquaries did the same' for Pointed architecture. Since the death of Mr Carter our national buildings have been studied, catalogued, drawn, and published by an infinity of admirers, who have done their work with zeal which has been thoroughly enthusiastic. The works of the elder Pugin were the first to show how architecture ought to be drawn, whilst the work of Mr Rickman was the first to show how it ought to be studied. From the time of these two pioneers in the work, it would be impossible to catalogue a hundredth of the works which have be2n devoted to the subject. Nor have they been written by architects only. On the contrary, a large number of them are the work of amateurs, and it may be truly asserted that never since art has been written upon at all have so vast a num- ber of publications, on cvery branch of it, been given to the world as within the last thirty years have been devoted to the illustration and history of our national Gothic architecture. Germany and France have been equally prolific on the same subject, and the only diffi- culty now is, out of the mass of materials how to select that which is useful and to the point. In Spain and Italy no such zeal has been shown, and the elucidation of their medizval antiquities has been left almost entirely to foreign hands.

SARACENIC ARCHITECTURE.

The beautiful forms by which Saracenic or Arabian architecture is best known were wrought into a style, if they were not invented, by the descendants of the wild Arab tribes who accepted Mahomet as their leader and prophet. In estimating their influence upon architecture,

Fic. 46.—Plan of Mosque of Tooloon, Cairo, From Coste's Architecture Arabe en Caire.

the first point to be considered is whether the Arabs, as they emerged from their deserts and overran the rich

countries of Syria, Persia, and Egypt, brought with them any art of their own, or whether they formed their style after their conquests were secured, when they had become

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great, and had consequently leisure and power to form it by the aid of foreigners. Now, in the Koran no notices are found that would lead us to suppose that any definite

[SARACENIC.

Fic. 47.—Court of the Mosque of Tooloon, Cairo.

forms of art were known to the Arabs in early times.

We gather also that the minaret, one of the most promi- rouni and with a prayer niche

nent and beautiful forms of their architecture, could not have been used in early times, since we are told that the call to prayers was then made from the roofs of the mosques. ;

The earliest example of a mosque in Arabia itself is supposed to have been that at Mecca, 705 a.p. But this was rebuilt in the 15th century, and that of Medina in the 16th, and we have no definite account of the original structures. The earliest of those which still exist are the Mosque of Amrou at Cairo (about 642 a.».), and that of Damascus (705). Both of these were built of columns, &c., obtained by the destruction of Roman work.

In the Mosque of Tooloon at Cairo we find for the first time anything original. It was constructed about 879, and is said to have been designed by a Christian architect. Indeed, numerous passages in the early history of the Saracens seem to show that their architects and art workers generally were foreigners, attracted from Baghdad, Byzan- tium, and other places. It was the same throughout their progress in Spain as well as in Egypt; and however that style was eventually formed, which has given to us the beautiful domes and minarets of Cairo, the Alhambra in Spain, and the

houses of Algiers, there can be little doubt but that it was based upon the art of Persia and Byzantium.

Ultimately it developed into two very distinct forms,— the Arabic of Cairo and the Moorish of Spain. But these still showed themselves, both in general form and in details, to be members of the same great family which we now call Saracenic. The chief structures in this style are the mosques and tombs. The former are very simple in plan,

From Coste.

| consisting, usually, of a mere open space with colonnades (mehrab) in the side

Fia. 48.—Exterior view of Kaid Bey Mosque, Cairo. From Coste.

towards Mecca. Near this was a pulpit (mimbar), and as this part of the edifice was of course the most frequented,

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the colonnades were made of extra depth. In the centre

of the court was a fountain, just as in the atrium of the Christian basilicas ; and conspicuously, sometimes at each corner of the mosque was placed a minaret. The size of the whole and the number and richness of the columns might

Fic. 49.—Interior view of Kaid Bay Musque. From Coste.

vary, but the general arrangement was nearly always the same, the really essential parts being the prayer niche, the pulpit, the fountain, some protection against the burning noonday heat, and some elevated place from which the priest could call to prayers. A remarkable exception to the ordinary plan occurs in the celebrated Mosque Soultan Hassan at Cairo, which is in the form of a cross, the four arms being arched over, whilst the centre is left open and contains the usual fountain. Closely connected with

the mosque is, often, the tclap of its founder. This is nearly always covered with a dome which, when on a large scale, was almost invariably a sign of a sepulchral edifice.

In these mosques and tombs we meet with general forms and details unknown elsewhere in Western art at the time of their erection. First of all we meet with the pointed arch. Very early in the style, and long before the era of Pointed architecture, this arch was used by the Saracens. But peculiar to their art are the beautiful minarets. Springing from a square base, they were gradually brought to an octagon or a round with a corbelled gallery at every change, and each part ornamented by diaper work of the most elaborate kind. 'The domes are equally varied and beautiful. They sprig from a square base, and are gathered into the usual circular form in the most graceful manner. Quite opposite also to the Western mode, the external surfaces of the domes are sometimes decorated with diaper or other work, beautiful in itself and equally so in

its application, and never is the Saracenic dome concealed outside by a conical roof. The want of a crowning cornice to the long lines of the walls was to some extent supplied by a peculiarly bold crest ornament often filled in with rich scfoll or other work. A variety of these adorns many of the medizval palaces of Venice. The ornamentation was almost entirely conventional, as the strict rules of the Koran forbade the copying of any natural objects. That this rule was not always followed may be seen in the Alhambra ; but it, nevertheless, was in general attended to, and wonderfully beautiful were the results of this absence of all copying. Intricate scrollwork, flat in appearance on the surface, but really in various planes and intertwining, formed the usual basis. And from the scrolls came a sort of leafwork certainly like nothing in nature, but most graceful and varied in its elegant curves. The whole is utterly conventional—as entirely the creation of the artist's mind as the most conventional work of a Gothic architect. The capitals of the columns were usually some adaptation of the classic. But in Spain, as specially seen in the Alhambra, they were of quite an original type, somewhat like that which we have described as being the

germ of the Ionic, but with long leaves under the block, tied together with a band at the top of the shaft.

*One of the ornaments peculiar to the Saracens, and constantly used by them, was the honey-comb by which they brought the square base, which they almost always used on plan, into the cir- * ; cular dome or niche-head. It was, in fact, the Saracenic pendentive. Jn its simplest form it occurs very early in the style, as, eg., at the Mosque of Tooloon at Cairo, and was composed of a series of small niches, the pointed head of each of which bent forward at the top and formed the springing point of two others. The repetition of a few rows of this pro- duced a pendentive in which it is impossible to detect any harsh point of junction between the square baseand the circular finish. Sometimes this honey-comb work was ex- ceedingly intricate, and formed niche-heads, roofs, &c. Good examples of this occurs at the Zisa, Palermo, and at the Alhambra. The entrance doorways were often grandly composed in a very high square recess ; but the Saracens were as careful as the Gothic archi- tects not to dwarf the size of the interior of their buildings by making the actual openings large, and thus the recess was brought down in height by elaborate work in the upper part, and the actual doorway thus reduced to just the size required for use. The windows were, of necessity, small, in order to guard against the heat; they were fitted up with thick bars of marble or of plaster, in elaborate diaper patterns,*

Fic, 50.—Capital and Springing of Arch, from the Hall of Abencer- rages, Alhambra.

these being filled in with pot metal glass, brilliantly coloured. The ceilings, when not domed, were flat, show- ing the timbers, which, in the finest cxamples, were richly painted and gilt, the wood being first canvased over, and then covered with a fine thin stucco to receive the deeoration. The pavements were of marble mosaic, in some cases lighted up in colour by enamelled earthenware tessere. The walls were often lined with still more elaborate mosaic, the out- lines being in some cases marked out with mother-of-

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CHINESE ARCHITECTURE.

The buildings of the Chinese are very inferior in character to those of India ; in fact, Mr Fergusson goes so far as to say, “China possesses scarcely anything worthy of the name of architecture.” Sir W. Chambers has described one of the Buddhist temples, that at Ho-nang, which is not unlike those of India in arrangement. There is an extensive court, with avenues of trees, leading to a

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Fra. 51.—Pendentive, from the Court of the Lions, Alhambra.

woodwork were of the most exquisite workmanship, and the bronze hinges, &c., often chased in a manner scarcely to be paralleled in any other style, and we have a com- bination of outlines and details which could scarcely be surpassed in design or execution in buildings of a size comparatively so small. Admirable descrip- tions of Saracenic architecture in Spain have been given by the late Mr Owen Jones and M. Coste; of that in Egypt, also by M. Coste, and in India by Mr Fergus- son. Of the houses in Egypt the best descriptions, pro- bably, are those given in The Modern Hgyptians, by Mr Lane, who has illustrated his work by numerous de- tails of the carved wood aud other work in which the Arabs excelled. Of the houses in Algiers, a peculiar class, an account-is given by Professor Lewis in the Transactions of the R. Institute of British Archatects,

1868-9.

It remains only to say that the present successors of the Saracens seem now to have lost nearly all claim to individuality in art, and to be unable even to copy or imitate the iluminated MSS., the mosaics, the carv- ing in wood or

in ivory, which lend so great a charm to the old work. What is now done is mercly a copy, and a bad copy, of the work of their European neigh- bours.

Add to this that the pulpits, doors, and other

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Fig. 52.—Temple of Confucius, Shanghai, China.

flight of steps and portico of four columns. In a second vestibule behind this are four colossal figures bearing various emblems. Beyond this is a very large second court, entirely surrounded by colonnades and small sleeping cells for the priests or bonzes; in other words, a huge cloister, much like the Indian viharas. In the same ranges are four pavilions filled with idols, and large rooms for refectories, behind which are the kitchen, courts, &c. At the extreme corners of the grand court are four other pavilions, the dwellings of the higher order of priests. At equal distances behind each other, down the centre of the court, are three larger pavilions, called tings, entered on each side by a flight of steps, and a fourth engaged in the cloister itself, and having a front portico and one flight of steps only. The first three are square, two stories in height, the lowest surrounded by fourteen columns, each face or front showing six. They have rude caps, composed of eight brackets, projecting various ways. Sir William Chambers says there are four species of tings,—three used for temples and the fourth for gardens; some having a gallery and fretted railing round the first floor on the outside, the upper story being set back. The roofs all have the peculiar hollow dip, which leads one to suppose their prototype was the tent, the sag of the cloth of which would suggest the form. They are frequently

surmounted with a sort of cresting and finial, and each angle is turned up sharply, and ornamented with a dragon. Sometimes the columns have a frieze perforated in the form of frets; sometimes the same is also under the eaves of the upper roof. Examples are also given of smaller octagonal ¢ ¢ngs, intended to cover the large vessels in which the Chinese burn gilt paper to their idols.

Mr Simpson has given an interesting account of the temple of Heaven at Peking. It lics in an open space of about one mile square, surrounded by a triple enclosure. In this space were kept the animals destined for sacrifice. The temple proper consisted of several detached structures, the most sacred being to the south, and consisting of a

raised platform approached by three terraces, and bearing | arches, with festoons of drapery. The resemblance of simply an altar unscreened by any building and open to the | these to the famous Sanchi tope is evident, as is also their

sky. The northern structure was roofed but not enclosed.

Fia. 58.—Temple of Heaven, Peking.

Four pillars supported the main roof, which was 99 feet high, and lower roofs round the higher one were upheld by 24 columns of less height, all richly sculptured and gilt. ;

The accompanying illustrations (figs. 52 to 54) represent Chinese temples of different types.

The most striking buildings in China are, however, the tapering towers which they call taas, and our old writers pagodas. These are of brick covered with marble, or most generally with glazed tiles; and are built in stories, one over the other, from three, four, or five, to as many as nine in number. Each story is reduced in width, and has a gallery round it. The roofs are hollow or sagging, like those formerly described. They project a great deal, the corners being turned up sharply. On these light bells are suspended, which make a constant ringing when the wind blows. The roofs are covered with glazed tiles of various colours, and the summit ornamented with a species of spire and finial. The most celebrated of these was that known as the porcelain tower at Nanking. It had nine stories, and was about 200 feet high, exclusive of the iron spire. At each angle was a bell, making seventy-two in all ; and there were eight chains hanging from the top of the finial to the angles of the spire, and carrying nine bells each, or seventy-two more. This celebrated building was destroyed by the Taepings in 1853. The ¢aa is not a pagoda or temple, but a memorial of some event 'or of some great personage. At Peking is one used as an observatory, and 'a Nanganfoo one was erected simply to bring good

uck.

Buildings called Zoov Tang, or halls of ancestors, are found in all considerable towns. These much resemble temples, but instead of idols, memorial tablets are placed in the niches to record the transactions and deeds of the oe! " or celebrated inhabitants of the neighbour-

ood.

The Pai Loo, or Pai Fang, is another common object in China. These are monumental memorials, though they have been mistaken for triumphal arches. Quatremére says, the Chinese annals reckon 3636 of these, erected in honour of literary men, philosophers, princes, generals, &c. The smaller are of wood, forming a sort of doorway. The larger have three openings side by side, and over these are several broad panelled fascias for inscriptions and carving, which is often very bold and in high relief, and over all is @ projecting cornice carrying a tiled roof. Chambers has given one, the side gateways of which have semicircular

Fic. 54.—Temple of Agriculture, Peking.

being adaptations from wooden originals, for the stones are put together with mortices and other joints just as a wooden framework would be. The Chinese gateways are, however, very poor in comparison with those of India.

There is not much variety of design about the houses of the Chinese, as every one must be on a scale corresponding to the rank of the inhabitant. Le Comte mentions a case where a mandarin was obliged to pull down one that he had constructed of a somewhat better quality than those of the others. Chambers has given a plan of a house which he says is of very common design. It is about 260 feet from front to back, and about 65 feet wide. It is entered at the front by a passage nearly 20 feet wide, which goes nearly through the entire building. On each side of this, fronting the street, is a shop, with its back shop. It should be stated, that the divisions on the two sides of the central passage exactly correspond with each other. First we have two studies and two small bedrooms ; then two saloons or reception rooms, about 24 feet by 18, looking into open courts or gardens, with fish ponds, fountains, flowers, &c., divided by walls ; then two more saloons with bedrooms, and then the great dining-hall, which runs right across the house. This is about 60 feet by 30, and is carried on eight columns. Behind this is the kitchen and other offices. The first floor has two bedrooms, one on each side of a passage, for the shop-keeper ; then on each side is a saloon and the bedrooms for the family. Between these last, and also carried on columns, is the hall where the family idol is worshipped. This overlooks the open gardens before mentioned. At the further end of these courts are two more saloons and bedrooms, and then a hall, said to be devoted to the use of strangers or visitors, which is over the ground floor dining-hall, and of the same size. Chambers tells us every house has a number of movable partitions kept ready, to be put up to subdivide the larger rooms.

The tombs are as singular as the rest of the Chinese edifices. The grandest of them, viz., those of the Ming dynasty, which ended in 1628, have been well described by Mr Simpson in the Transactions of the R. I. B. Ag 1873-4. One of these tombs is at Nanking, but the chief are about 40 miles north of

Peking. ‘The entry is by a grand Pai Loo of five gateways in white marble, and then through several other gateways to a singular dromos, nearly a mile long, of 32 colossal figures (ranged in pairs), some human, others of camels, griffins, elephants, &c. Such a dromos exists also at Shanghai. The es thirteen in

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number, are ranged round the base of a hill and extend for several miles. Each consists of an earthen mound about half a mile in circuit, having, at its base, a crenellated retaining wall 20 feet high. The mound has no entrance, nor any indication of the exact place of burial. To the south of the tomb is a temple in an open court, about 1200 feet by 500. The plan is just the ordinary one of a palace, and the names, “The House of the living and the House of the dead,” seem to show clearly that this resemblance was intended.

The Chinese method of construction is very peculiar. Their roofs are put up first, supported on wooden posts, which are removed as the permanent fabric is built. The walls of the grand edifices are of stone, but the ordinary material is brick, and the work is often executed with beautifully close joints. In palaces and temples the whole was often gor- geously coloured with glazed tiles, or the bricks themselves were coloured and glazed. A magnificent example of this is a temple near the summer palace at Peking, all of which is of bright majolica, except its marble base. As with all structures belonging to the emperor the colour was yellow, it being a capital offence for any other person to use that colour.

The Chinese never use square timber when they can get round trees of a suitable size, probably on account of the lightness, strength, and convenience of the bamboo. The roofs are of very peculiar construction, and all timbers are left visible. The windows are filled in with the lining of the oyster shell, which looks like tale, and is quite as transparent ; and the main door is frequently a perfectly round aperture. The old buildings of the Chinese, like those of the Saracens, are fast going to decay, and the streets

of even their grand capital, Peking, now exhibit immense ranges of ruined buildings.

ANoIENT AMERICAN ARCHITECTURE.

It was not long before the exhumation by Mr Layard, in Central Asia, of the wonderful remains of fine art entombed in earthen mounds, that Mr J. L. Stephens, when engaged on a mission from his Government—that of the United States of North America—to some of the mutable states

Fic. 55.—Ruins of Teocallt or Temple at Palenque.

of Central America, heard of and tracked ont in the forests of Yucatan! the remains of a bygone time, exhibited in sculptural and architectural monuments of a coarse charac- ter, affording a strange counterpart to those which Mr

1 Lord Kingsborough's great work, The Antiquities of Mexico, con- tains, in some of the later volumes, representations of monuments which would almost appear to be the same as some of those subse- quently explored by Mr Stephens.

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'They are chiefly built on massive stone basements and

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Layard describes as having existed in and about the valleys of the Tigris and Euphrates. The remains of fifty or sixty cities have been discovered, the most interesting being those of Chololu, Palenque, Uxmal, Tescuco, and Mitla, The chief structures were evidently temples (Teocallis), raised high above the surrounding buildings on grand basements, square on plan, and rising by huge steps to the summit, so as to have the general outline of a low truncated pyramid. One at Palenque is 280 feet square at the base, and about 60 feet high to the platform, on which stands the temple, the latter being oblong on plan, measuring about 76 feet by 25. It was a low building, with a roof formed by stone gradini, so as to be, in fact, a continuation of

the pyramid. Other structures, supposed to be palaces, are described by Mr Stephens, Mr Catherwood, Lord Kingsborough, &c., and copiously illustrated in their works. Many of them are very extensive, but of no great elevation,

surmounted by cornices, the friezes of which are adorned with evident imitations of logs of wood in upright rows. The greater part of the roofs were of wood, but among the objects represented in Mr Catherwood's Views of Ancient Monuments in Central America, Chiapas, and Yucatan, are several examples of vaults having the arch form, but not being arched vaults,—that is to say, of vaults presenting the appearance internally, or upon the soffit, of arches, but formed by the gathering over of horizontally-coursed masonry, with the inner and lower angles worked away— or cleaned off, as it is technically expressed —to the appear- ance on the inside which ar arched vault would present.

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Fia. 56.—Plan of Temple at Palenque.

(See fig. 59.) The circumstance that the arch form pre- sented in the American monuments is produced by the gathering over of horizontally-ranged masonry, and not by means of arch structure, would seem to show clearly that if the builders ever had intercourse with the Old World, it was before the properties of the arch were known and exemplified in it. These remains show an advance on the

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Mexico) was in some degree influenced by Eastern Asia, yet the discrepancies are so great as to carry back the communi- oo a ee – wor cation to a very remote period, so remote that this foreign influence has been too feeble to interfere materially with the growth of what may be regarded, in its esscntial features, as a peculiar and indigenous civilisation ;" and this opinion the monuments, as presented by Mr Catherwood, would seem fully to ustify. But Mr Catherwood adds to this, as the ground, it would appear, for coinciding with Mr Prescott's opinion, that the results arrived at by Mr Stephens and himself "are briefly, that they (the American monu- ments) are not of immemorial antiquity, the work of un- known men; but that, as we now see them, they were occupied and probably erected by the Indian tribes in possession of the country at the time of the Spanish con- quest, that they are the production of an indigenous school of art, adapted to the natural circumstances of the country, and to the civil and religious polity then prevailing ; and that they present but very slight and accidental analogies with the works of any people or country in the Old World."

Less artistic, but more vast and massive, are the struc- tures in Peru, which have been as yet imperfectlv explored.

Pelasgic and Celtic monuments of the Old World, and

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Frc. 60,—Stone Circles (Zntihuatanus) at Sillustani. From Squier's Peru.

Referred by Mr Prescott to the reigns of the Incas, they are now considered to have been the works of a far earlier race,

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Fic. 58.—Bas-relief, Palenque. From Stephens and Catherwood.

take the general character of the stoneworks of Egypt and India; but like those works, they exhibit ae the vaulted form by 9 jul gathering over and not by arching. at Mr Catherwood 9 —:1b states that he and . Mey Mr Stephens concur le ie in the opinion ex- ~! ye pressed by Mr Pres- > cott, in his History of the Conquest of Mexico, — " that though the coinci- dences are suffici- ently strong to authorise a belief that the civilisation of Anahuac(Ancient =' Fic. 59 .—Horizontally-Coursed Arch.

Fic. 61.—Chulpa or Burial Tower, Peru. From Squier.

of whom the Incas were the conquerors. The rudest of these early works are sepulchral, and much of the same kind as the cromlechs and stone-circles already referred to (p. 383). One circle at Sillustani is 90 feet diameter, another 150 feet, and they have a massive paved platform all round them outside, which is not found in similar remains in the Old World. The cromlechs are not covered

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merely by a flat stone, but are rudely domed over by overlapping stones. A much more artistic class of tombs is built of stones in

Fria. 62.—Square Chulpa or Burial Tower, Bolivia. From Squier.

the form of a tower, but increasing in width towards the top, and domed as above described. Most of them are round on plan, but some are square and two stories high, the upper being covered with overlapping stones cut to the arch shape. Many of these are of hard stone, beautifully fitted together, and the cham- bers are lined with a peculiar stucco still in good preserva- tion.

Some other sepulchral re- mains are on a much grander scale, being immense mounds held up by huge retaining walls. One of these mounds is 108 feet high, and 276 yards by 75 atthetop. None seem to have been as yet ex- plored. Of the fortresses one Fic. 63.—Section of Tower, of the grandest examples is at fig. 62.

Cuzco, 760 fect above the level of that city. It has three lines of fortifications in terraces 1800 feet long, the lower terrace having a retaining wall now 25

feet high, the second

Fra. 64.—Cyclopean Wall at Chanchan. From Hutchinson's Peru,

(30 feet behind the first) 18 feet, and the third (18 feet be- hind the second) 14 feet high. The walls are of cyclopean masonry, accurately fitted, one stone being 27 feet by 14

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by 12, and many are 15 by 12 by 10 feet. The plan shows considerable skill, as the walls are not straight, but built with recesses and re-entering angles, evidently for giving the garrison command of the ground close to the walls. The most interesting remains in Peru are those called Huacas ; but whether they were forts, or palaces, or tombs, is not as yet clearly ascertained, They are described as being enclosed by walls (in various examples 100 to 180 yards long, and 60 or 70 yards broad), and divided by cross walls, thus forming enclosures or chambers, many of which are still lined with stucco. In some of these are considerable remains of staircases, but the upper parts are destroyed. The chambers and enclosures are almost invari- ably filled with clay, which presents great difficulties in their examination. This filling in may, possibly, be accounted for by the construction of the walls, which are immensely thick (some at Chanchan are 15 feet), and usually of sun-dried bricks, either small (adobes), viz., about two-thirds the size of ours, or very large (adobines), some being 1 to 2 yards long.

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We have, in conclusion, a few remarks to make upon the present position of architecture. 'The increase of commerce and of wealth in the United Kingdom of late years, has thrown into the hands of the architect and engineer a vast amount of work, both for public and private edifices. Not only has there been an increase in the number of build- ings, but the old parts of very many towns are being rebuilt on a larger and grander scale,

and new, wide streets are being formed through their busiest and most densely peopled quarters. In London, in the great manufacturing towns of the north, in the universities, in the seaport towns, north and south, and in the pleasure-seeking cities on the sea-board on every coast, this process is going on at a rapid rate ; and we look with interest and anxiety as to what are replacing the old buildings (many of them land- marks in our art) which have been destroyed, or what is to range beside those which are left. And besides these reconstructions, there are rising up, in every part of the country, railway stations, colossal hotels, baths and wash- houses, working men's dwellings, and such other edifices as the Crystal and Alexandra Palaces, of a kind entirely unknown to the past generation. In addition to these we have the altogether new towns of Swindon, Wolverton, Crewe, Fleetwood, Barrow-in-Furness, Middlesborough, &e. These last afford, perhaps, the least encouraging view of modern work as contrasted with the old. Our old towns were usually picturesquely placed on the margin of a river for trade, or ona hill for defence; gradually increased round some nucleus of importance—a church or monastery or castle ; and comprised the mansions of the rich as well as the shops of the trader and dwellings of the poor. But the modern town is all built at once, on some sudden call, on a site selected, perhaps, simply from its being at the junction of two railways. It shows only long straight streets of small dwellings for artisans, unbroken, except, perhaps, by a church, or an assembly-room, or more forcibly by the long, unpicturesque lines of railway sheds. Neither the architect nor the engineer has had much to do with this, and the result is about as wretchedly uninteresting a series of streets as it is possible to conceive. Horace Walpole's satirical description of London, "a gigantic mass of little- ness," would apply well to them. . It has been better with the extension of the old towns. At first this gave us such long, bald lines of streets as Bath shows in stone, and Baker Street, &c., in London, in brick. These led by a natural result to a more ornate class, and we had the Regent's Park, and Regent Street, London, wherein a number of houses are grouped together into one

mass, abounding with Roman columns and cornices, and receiving something of the massive appearance and light- ness of stone from being covered with stucco, just as most of Palladio's buildings in Italy were. But

whilst they were far better in general effect than the class which pre- ceded them, the columns and their long unbroken lines of cornices often sadly interfered with the requirements of

the dwellings, and in the new streets and terraces of our'

towns we see but few imitations of Roman porticoes and pediments, and the speculating builder mostly limits himself to putting a portico to the door, a few mouldings (in stucco) to the windows, and a slight cornice as a finish to the tops.

On the Continent the usual style of living—in flats —enables the builders to produce, with the same number of rooms, a more massive external effect than with us. One large entrance doorway suffices for the whole,

and thus four or five separate houses (as they are in reality) Still more is this

have the effect of one large mansion. the case when a courtyard, requiring a carriage entrance, occupies the centre of the building.

Of a far higher class than the private dwellings are many of the places of business recently erected in our great

towns. In the new banks, exchanges, insurance offices,

&e., many of our most noted architects have produced good results; and if we cannot congratulate ourselves upon much that is being done, we can, at least, say that the new

work ig an improvement upon the old. In no instance,

perhaps, is the advance more to be noted than in the club- houses and the great warehouses for storing the lighter

class of goods. A fagade having long lines of windows, in many stories, each story of considerable height, and with only one main entrance doorway, affords the materials, of course, for forming a massive and pleasing effect much as that of the Continental houses above described. And

the opportunity has certainly not been lost. Our plan, too, of letting each owner build to a considerable extent accord- ing to his own design, results in a more picturesque arrangement of our streets than those of a Continental town, which usually present lines of uninteresting houses, all of much the same design.

As a.still further mark of progress we must mention the town-halls and other civic structures at Bradford, Hali- fax, Leeds, Liverpool, Manchester, Plymouth, Preston, &c., and the local museums and picture galleries, as at Cam- bridge, Edinburgh, Exeter, Leeds, Liverpool, Oxford, Salis- bury, &c. Not only do these great civic buildings give importance by their magnitude to the towns, but they lead to other works in rivalry or imitation, just as a medizval building of note did in olden times, and the goodness of their design is therefore a matter of prime importance. The museums are gradually helping to fill up a void most painfully felt by every stranger in our towns, and will help to preserve many local pieces of antiquity which would otherwise have been lost.

Of a higher class still are the colleges at Edinburgh, Glasgow, London, Manchester (Owens), &c., and many of the additions to those of the old universities. In these colleges the number of rooms of varying size, the entrance tower, and the internal quadrangles, allow of picturesque effects, but seldom present any one very grand mass. This has, however, been produced at University College, London, by the central portico (probably the finest in England), which rises high above the rest of the edifice.

In the civic buildings a bolder effect can be produced by their actual requirements, viz., a grand hall of large area and height, with spacious corridors and staircases, and a high clock tower, which seems to furnish the natural com- plement to such structures. If we have not rivalled Ypres or Louvain, we have at least improved on the wretched civic buildings of the last century.

Larger and grander than any of the above works are the Houses of Parliament in London. However much of the detail may be open to criticism, it must be readily acknow- ledged that the architect had in his mind, and steadily carried out, the idea of combining the whole into one grand mass, in place of leaving it as a mere series of fronts, as in the Bank of England or Somerset House ; and the variously designed steeples and towers culminating in the one grand tower at the royal entrance form the whole into one of the grandest buildings of the age.

Of a class unknown to the last generation are the railway stations, some of the largest edifices of the time, but usually almost hidden by another new class of buildings, viz., the colossal hotels. The stations themselves are in the main mere great vaults of glass on iron ribs, whose curved outlines are disfigured by the iron ties which the safety of a great extent of such roofing requires, and thus the only beauty, viz., the curved form, is to a large extent obscured. It is a fortunate circumstance that this form is the best adapted to the purpose, and when, as in many notable instances, the skill or good taste of the engineer has allowed of the ties being dispensed with, the vast size and lightness of the vault have a very impressive look. The hotels, which in most cases form the frontage of the stations in our country, are, for the most part, worthy of the striking positions which they occupy; but they are chiefly by living architects, and so beyond the scope of our criticism. No one, however, can study the way in which most of them are attached to the station buildings which they front without wishing most heartily that the engineer of the one and the architect of the other had worked somewhat more in harmony with each other.

Of an entirely novel design and construction was the Crystal Palace, admirably adapted, no doubt, for the pur- pose for which Paxton designed it, or for any other purpose for which a flood of light without impediment is required. But the manner in which the second, at Sydenham, has been altered is instructive. Where a grand orchestra was required the top was covered as a great sounding board, and when pictures or art works were to be exhibited the sides were closed,—the result showing plainly that the top lights are of the chief value, the side ones being little required except for the prospect through; and even for picture galleries a much smaller amount of light is required than in the Crystal Palace roof. Its curved form is, how-

ever, very pleasing, and the brilliancy of the light glass roof will ensure its being adopted in many buildings where a vivid light is required.

We have now passed hurriedly in review most of the forms of modern architecture, and we need scarcely add that it is developed in every conceivable style. If a church is to be built we may, indeed, pretty safely predict that it will be in one of the many pointed styles, but even then it may be English, French, or Italian. But of any other kind of edifice no one could safely predict the style. Probably it might be safe to assert that a theatre would not have (as Covent Garden in London had) a Grecian Doric portico, or an Egyptian pylon be made to do duty (as in Piccadilly, London) for a couple of shops. One might also be tolerably sure that a monument to a distin- guished person would not be a granite column with a stair- case up the middle, and a statue almost out of sight, with a lightning conductor through the head at top, as at the duke of York's column, London. But short of this, almost any prediction as to the style might come true ; and as nearly every building of note throughout the world is brought to the eyes of the public by means of engravings or photographs, there seems little chance of its being otherwise.

In the United States the architects of the public build-

ings appear to be of much the same feeling as were English architects some years ago. but the other great edifices are in the main Italian, such as the capitols of Ohio, New York (Albany), and Washington. The last is a building of great size and picturesque outline, depending for its chief effect on the lavish use of porticoes and. colonnades.

In Canada very much the same state of things exists as in the United States, the art in each being much the reflex of that in the old country.

The adoption of Greek, Roman, or Italian architectural details, little modified by climate and customs, is, in fact, to be noted in almost every country—any form of art pecu- liarly national being now abandoned in their favour ; and if the houses in Paris were to be transported to Berlin or Cairo, they would simply agree with what has already been done in those

cities. And if, further, the Bourse or the Pantheon at Paris, the Museum at Berlin, the Glyptothek at Munich, or the great church of St Isaac at St Petersburg, were to

The churches are often Gothic, |

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be severally changed to any of the other cities, it would be fairly in harmony with the modern works around it, though the nationality and language of the peoples in those cities are utterly distinct from each other. This abandon- ment of natural and peculiar styles is now producing another result quite foreign to anything known in art history before. From the earliest period known until the 17th century almost every nation had its own peculiar forms of art, and practised it (modified, perhaps, by the conditions of climate) in every part of the world which it colonised or conquered ; and the result was the interesting remains of Roman art, clearly to be identified as such in Europe, Asia, and Africa ; of Norman in France, England, Italy, and Sicily; and of Saracenic from Spain to India. This clear identification of a nation by its art works is as valuable to the historian as to the artist. But we can look for this no longer. We ourselves build Greek, Roman, or Italian palaces in our great towns of India, whilst close

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by, perhaps, is a church or cathedral in our English style

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Fic. 65.—The Capitol at Washington.

of Gothic, and a college in the style of the Saracens, who themselves, centuries back, brought it with them as the art of foreign conquerors from Egypt or Persia. And the French in Algiers, to celebrate the triumph of their religion, erect a splendid church copied from the mosques of the people whom they have conquered, and whose religion they detest.

On THE APPLICATION OF CoLoUR TO ARCHITECTURE.

On none of the subsidiary arts connected with architec- ture has there been in modern practice so little agreement with all ancient rules or customs as on this. It is only of late years that any one has conceded that the duty of architects is to give the best possible combination of form and colour, and that the completest form of architecture is that which affords examples of such a combination.

For the last three centuries architects have shown almost a contempt for colour, to such a degree, indeed, that the world till lately was taught to believe that purity of style and absence of colour always went together; and that it was only a vulgar and uneducated eye which saw the greatest evidence of good and matured taste in the harmonious application of colour and form. Our sculptors

encouraged this feeling by their dislike to the application of colour to their work, even when it was purely archi- tectural. Both architects and sculptors found it. con- venient, apparently, to disencumber themselves of one- half of the responsibilities of their calling, and escaped all obligation of studying the laws of colour, or: of enter- ing on the large field of its application to architecture ; whilst our painters, partly because they lacked the oppor- tunity, partly, it is true, because their art had ceased to be exercised for the public benefit in the old sense, had ceased to regard wall-painting as their legitimate work, and had so completely sunk into the habit of treating only small subjects in a small way, that it will take an age to develop in them the power of dealing properly with those large wall spaces which present them with the grandest opportunity of achieving real distinction. It is abundantly clear that those who argue against the applica- tion of colour to architecture, do so without the weight which the authority of their ancestors would have given them. Of late years much attention has been devoted to this point; there has been considerable discussion, and in the end, though there has been much difference of opinion as to the extent to which colour was applied by the Greeks

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and Romans, there has been none as to the fact that, at any rate, some introduction of colour was well-nigh invariable in their work. Mr Owen Jones's Apology for the Colowring of the Greek Court at the Crystal Palace

con- tains, in a small compass, quite sufficient evidence to show how strong is the ground of those who maintain the necessity of colour in classic buildings; and equally valuable is the report, drawn up by the Committee of the Institute of British architects, on the colouring of the Elgin marbles, with Professor Faraday's analyses of portions of the coatings of marbles brought from several ancient buildings in Athens, upon all of which he makes it per- fectly clear that colour was extensively and generally applied. Professor Semper of Berlin, in treating of the origin of architectural polychromy, proves that the Syrians, Persians, Egyptians, Chinese, Indians, Jews, Phoenicians, and Greeks all used colour in their architecture and sculp- ture ; and we may safely conclude, therefore, that there is no country which has been in any way remarkable for its architectural monuments in which the necessity of the com- bination has been ignored or forgotten. This statement is sufficient on the subject so far as it affects all ancient schools of art.

Tf we turn to later times we shall discover in all the schools of medieval artists a still greater and more pronounced adhesion to the same principle. It seems, indeed, almost superfluous to say that there are most abundant evidences of the fact that the architects of the Middle Ages were seldom satisfied until they had covered their walls with colour; in one place with that in which nature has been so lavish in marble and precious stones ; in another with the artificial tints of tiles and bricks; in another with the bright stencilling of gay diapers over entire walls; or, lastly, in the teaching of Scripture story, or legend or history, by the aid of the greatest painters of the day.

If we look for an instant to Italy we shall see what a lesson these artists have left us there. There is, for in- stance, the Arena chapel at Padua, designed by Giotto, and then painted by him with his own hands in such fashion that, to the present day, this simple little room—some 20 feet by 40 in its dimensions—is one of the greatest pilgrim- age places in Europe for all lovers of Christian art ; and again, in that far grander work—the noble church so finely stationed on the steep slopes of the Apennines at Assisi—we see how Cimabue, Simone Memmi, Giotto, and many others, helped to cover with pictures, conceived in a really divine spirit, the walls which would otherwise, no doubt, have been resplendent with the less artistic, but

still most effective labours of the patient stenciller. The same lesson is taught if we look at the Campo Santo of Pisa, and see how Andrea Orcagna, that great architect, painter, sculptor, and poet, and beside him a succession of artists, among whom we count Buffalmacco, Simone Memmi, Giotto, and Benozzo Gozzoli, helped each in their turn in this illumina- tion of architecture ; or at the church and refectory of Sta Croce, and the church and chapter-house of Sta Maria Novella, and the crypt of San Miniato, Florence; or at that masterpiece of decorative art—St Mark's at Venice—where precious marbles and mosaics rich in gold and bright colour almost dazzle the eye with their magnificence, but combine to make an interior in which none can fail to admit that the effect of the mere architecture of the building has been extraordinarily enhanced.

_ Nor was such practice as this peculiar to medieval artists; for the earlier Renaissance men had the same feeling in some degree, and Benozzo Gozzoli has shown us in his exquisite paintings in the chapel of the Riccardi Palace at Florence, and Perugino and Raffaelle in the Stanze of the Vatican, how their work might be best adorned.

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But it was not only in Italy—the land par excellence of colour—that men had a true appreciation of its value. It need hardly be told how St Louis, in the palmiest days of the French kingdom, covered the walls of the Sainte Chapelle of Paris with gold and colour and mosaic, and filled its windows with stained glass of the richest hues, so that to the present day it is an example of the most gor- geous colouring it is possible to conceive; or how, in England, when our monarchs wished to rival the zeal and enthusiasm of St Louis, they gave, in St Stephen's Chapel at Westminster, an example equally sumptuous and rich in colour; whilst at the same time, not only in our cathedrals, but in almost every parish church throughout our country, traces of more or less colouring are found to have existed over nearly the whole surface of the walls. Taking for granted, therefore, that every one will allow that it was, at any rate, the intention of all architects, as far as

possible, to combine colour with form, it remains to be seen how this was accomplished.

There were two great and distinct orders of architectural colourists, the constructional and the decorative. The first were those who built their walls partially or alto- gether with coloured materials ; the second those who so built them that colour might afterwards be added, and with an especial view to its introduction. It is of the works of the former of these two classes that it is right to speak first, because the way in which they did their work was, on the whole, a more thoroughly enduring and proper way than that of the other school. It was also more definitely the work of architects.

The works of the constructional school of architectural colourists must be subdivided into two classes :—l1st, Those in which the coloured materials were part of the substance of the walls, and necessary for the stability of the whole fabric; and 2dly, Those in which the walls were covered with decoration, such as mosaic, or tiles, or thin veneers of inarble, which had nothing whatever to do with their structural requirements.

The first class was that which was, on the whole, both the best and the most frequently adopted. The few examples which we see in this country, and, indeed, generally throughout the north of Europe, belong to it. The poverty of England in coloured stones or marbles will account sufficiently for the comparative rarity of the examples we can adduce. Among them are many of the Northamptonshire churches,—as Irchester, Strixton, and St Peter's, Northampton,—which are built with horizontal bands or courses of dark red and light stones used alter- nately ; in other districts we find courses. of stones and flint alternated, as in the church at Penton Mewsey, near Andover, and ina gateway at Rochester. In others flint and stone are used, but with inferior effect, in a regular chequer- work over the whole surface of the wall. In the church standing close to the north side of Rochester Cathedral, a course of chequer-work in flint and stone is introduced under one string-course, and two courses of flint separated by one of stone under another. The churches of Essex, Suffolk, and Norfolk abound in examples of tracery, and other devices formed by cutting out patterns in the stone, and filling them in with carefully-cut and faced flints of very dark colour, so as to produce a very elaborate system of decoration in two tints. In the

cloisters of Westmin- ster Abbey the groining is executed in chalk, with occa- sional lines of dark stone at regular intervals. Our red brick buildings are constantly diapered with patterns in black. The interiors of our churches, when not painted, were usually left with the natural colour of all the stone work—whether wrought or not—visible on the interior, an arrangement which, though rough and rugged in character, certainly gives a great amount of natural colour in a low

key, but infinitely more agreeable to the eye than the cold expanse of plaster generally visible in new public buildings. Finally, throughout the 13th century the use of polished marble columns, of a colour much darker than that of the materials of the wall, is one of the most marked features in all the best English work, and cannot properly be omitted in any catalogue of modes of coloured construction. Every one of these arrangements is noticeable as having been introduced intentionally, and with a sole view to variety of colour. In France examples are much more numerous than in England, and the very interesting church at Vézelay is an early instance of the alternated use of dark and light stones in the interior as well as the exterior. Sta Maria in Capitolio, at Cologne, has some good remains of the same kind; and St Anne's Kloster, at Liibeck, is built with alternate courses of red brick.and stone. It is in Italy, however, that we find the most plentiful store of examples of this kind of work, of which a few may be mentioned. The cathedral, baptistery, and the buildings generally in Pisa and Lucca are built, both inside and out, with white stone courses, with thin courses of black marble occurring at about every fourth course. This is a very delicate and effective mode of dividing the wall space. The baptistery and campanile of the cathedral at Pistoia, and the campanile of Siena, are built in almost equal courses of black and white. In Genoa we find the same equal division of the courses in the fagades of the cathedral, and of the churches of San Matteo and San Stefano. At Bergamo the porch of Sta Maria Maggiore is executed in red, white, and grey marble. It is of three divisions in height, the highest stage being entirely of grey marble ; the middle stage has all the moulded parts of red, and the arches and their spandrils of grey marble ; the space at the back of the porch and over its main arch are built in equal courses of red and white marble; the groining is in black, red, and white

marble, fitted to diamond-shaped panels, and all the shafts are of red marble. The whole design depends for effect almost entirely upon the arrangement and counter-changing of the three primary colours, the white becoming by age sufficiently yellow to take its place very well as one of them. Similar to this in the colours of its marbles is the 13th century front of the Broletto or town-hall at Como ; but here the courses are very irregular in their height, and not arranged upon any symmetrical rule. The campanile of the cathedral at Florence is the last example of this class that need be mentioned, and it is the very finest of all; here the component colours are red marble of Perugia, green serpentine, and white marble (the two latter have the effect at a slight distance of being black and yellow), but these colours are further varied by the introduction of very elaborate patterns inlaid in delicate marble mosaic on almost every available space, whilst glass mosaic is introduced behind sculpture in the stages near the ground, in order to make the figures as distinct as possible. It is important to observe that, in this unsurpassed work, Giotto showed not only his sense of the value of colour, but equally his feeling for true architectural proportion. No building was ever more care- fully designed in this way; and the result is so great a success in outline, in detail, and in colour, as to make it one of the most worthy of study of any work in Europe. Here it may be observed, that in the doorways of St Mark's, Venice, we have examples of exquisite beauty, of sculp- ture of foliage and figures in marble set off by a ground filled in entirely with mosaic, similar in idea to the way in which figures are set upon a mosaic ground in Giotto's work at Florence.

In"the great church of San Petronio at Bologna, the flat space between the two stone moulded plinths is of red marble, and above the plinths the walls are all of red brick.

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This coloured plinth is very fine in its effect, and dignifies the whole building. The upper part of the Ducal Palace and the house called the Ca' d'Oro, at Venice, are examples of a coloured chequer-work over the whole surface of the wall. regular diaper divided by lines of white and grey marble. The monument of Can Signorio, one of the Scaliger family, in the

churchyard of Sta Maria l'Antica at Verona, is a good example of the successful application of coloured

In the Ducal Palace this is arranged so as to form a

materials to works of delicate detail. It isa lofty erection, composed of a great canopied monument in the centre, with a number of smaller canopied niches rising out of it, or standing upon shafts around it. The base is all of red marble, the niches have red marble columus, white gables, and red pyramids above them. The central mass is mainly of a yellowish tint, with white marble niches and pinnacles of red marble, and, owing to the extent to which the colours are counterchanged, the effect is very good. The west doorway of Sta Anastasia, and the north doorway of San Fermo Maggiore, both at Verona, are beautiful examples of the simple alternation of white, red, and grey marbles in the jamb and arches; and in both these cases the extreme beauty of the effect appears to be owing to the delicacy and harmony of the tints of the marble employed, and to the absence of the very violent contrasts of colour which are sometimes seen.

There are other examples of buildings decorated with inlaid ornaments which belong to this class; such are some of the French churches, as, ¢.g., those throughout the Puy de Dome, of which we may select as a typical example Notre Dame-du-Port, Clermont Ferrand. Here the lower part of the walls is of uniform colour, the windows have alternate voussoirs of light and dark stone, and the wall above them is entirely covered with a mosaic diaper; the walls are crowned by a heavy cornice supported on corbels, between each of which the space is filled in with a star in mosaic. Similar examples occur at S. Etienne, Nevers, in Poitou, on the banks of the Loire, and frequently in volcanic districts where dark and light materials, tufa and scorie, abound, and suggest the treatment which has been adopted. Some of the churches at Pisa are very beautifully and delicately enriched with inlaying. The little church of San

Matteo has round all its arches inlaid chevrons, diamonds,

or triangles, and a line of inlaying under the moulded eaves cornice of the aisle. The front of San Michele, also in Pisa, is covered with inlaid patterns filling in the spandrils, or following all the architectural lines of the

arcading with which the whole upper portion is covered; similar inlaid patterns are to be seen between corbels under the tympanum of the south door of San Paolo, Pistoia. An inlaid pattern is carried along under the string-course below the aisle windows of the Cathedral of Lucca, and here, as in the other examples which have been given, the inlaid material is dark, on the white ground of the stone wall, and the object of its introduction was, no doubt, to give as much emphasis as possible to important features. In the case of the windows at Lucca the label is of dark marble, whilst the rest of the head of the window is white. In the church of San Domenico, Perugia, a window arch is built of grey stone, with occasional voussoirs of red, and on these, in order to make them as conspicuous as possible, small rosettes are carved. Another window in the same church has alternate voussoirs of red and white stone, and a red shaft for a monial. In the Palazzo Publico of Perugia the cornices and strings have ranges of corbels, the spaces between which are filled in with red marble to make the shadow deeper and more effective; in the windows, the shafts are of red marble; and in the doorway the tympanum is of red marble, with figures in white in front of it. The west front of Lucca Cathedral is inlaid in the most

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field sports, and the lower part with geometrical patterns. Here, too, and in Giotto's campanile at Florence, the shafts themselves are inlaid in the same way as the rest of the work.

In the arcades outside the walls of San Fermo Maggiore, and in the windows of the little church opposite the cathe- dral, at Verona, great effect is produced by the ingenious combination of brick and stone; and throughout the north of Italy examples of this sort of arrangement of colour occur, and there is none more easy of imitation or repro- duction with good effect at the present day and in our own country. In Sant' Antonio, at Padua, an arcade of brick and stone in the west front has all its spandrils filled in with red marble; and the case of the east end of the church at Murano will be remembered by all who have read Mr Ruskin's Stones of

Venice. Here the substance of the walls is red brick for a few feet from the ground, and above that a rather coarse yellow brick ; red brick is used in place of labels, &c., to define the arches ; the shafts are of various marbles; and courses of marble, cut in triangles and alternately coloured and carved, are also introduced. The examples here given are enough to show, at any rate, the general prevalence of a love of colour in the Middle Ages throughout Europe.

It would be somewhat beyond the scope of the exami- nation of such a subject from its architectural side to go at any length into the mode of decorative painting, which was almost universally adopted at the same time. In this application of colour all countries agree, and there is hardly room to doubt the beauty and expediency of the practice. The passage to the chapter-house at Salis- bury, the early church of St Mary at Guildford, the chapels at the east end of Winchester Cathedral, are interesting English examples of early work. The Norfolk screens and roofs are still more interesting and beautiful works of the richest description, and so numerous were these that at one time no church seems to have been thought furnished which had none of this kind of decora- tion. These had every portion of their moulded surfaces adorned in the richest way with gold and colours, whilst their solid panels were covered with pictures of single figures or subjects. English roofs were decorated in the same fashion, and of these the finest examples are in Peter- borough Cathedral and St Alban's Abbey. If we turn to the pages of illuminated manuscripts we shall find views of towns in which whole houses are decorated with masses of colour on the outside to distinguish them from their neighbours. And in rather later times, as we see in Florence, in Brescia, at Augsburg, at Meran, and often else- where, most brilliant effects were produced by painting subjects on the external walls of palaces and houses. But, generally speaking, beautiful as this sort of decoration was, it erred rather in ignoring to a considerable extent the architecture which it adorned,—unlike the earlier works, where the effort of the colourist was usually and rightly to make all the mouldings or members of the work decorated more distinct and intelligible than they can be in the absence of colour. Without coloured illustrations of an elaborate description it would be impossible to explain any or all the features of architectural polychrome. But enough has been said to show that the subject is one not only of interest to architects, but of importance to all who

care for architecture, for it is hardly possible that works such as those which have here been shortly referred to should be passed over by the student or amateur of architecture as though they had no interest for us, and it may be confidently asserted that modern schools of archi- tecture cannot with safety ignore so interesting a develop- ment of the art. (rT. H. L. —G. E. 8.)

elaborate manner, the upper part with illustrations of

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GLOSSARY OF ARCHITECTURAL TERMS (ESPECIALLY CLASSICAL AND MEDIAVAL).

Asaciscus, diminutive of Abacus, applied to the chequers or squares

of a tessellated pavement.

Asacus, from the Gr. &aé, a tray, taillotr, the upper part of the capital ofa column, pier, &c.

separate article, and CAPITAL.)

ABATED, a term for such work in medixval masonry

down or sunk.

AssEy (Fr. abbaye, Ital. abbadia, or contracted, badia, Ger. Abiei, Kloster), a term for the church and other buildings used by conventual bodies presided over by an abbot or abbess, in contradistinction to cathedral, which is presided over by a bishop, and priory, the head of which was a prior or prioress.

(See separate article.)

AcRoTERIUM (Gr. dxpwrhp ornament of any kind p

term is often restricted

merely for the acroterium.

AISLE, sometimes written Isle, Yle, and Alley (Lat. and Ital. ala, Fr. aile, bas-coté, Ger. Scitenschiff, Seitenchor), in its primary sense the wing of a house, but generally used to describe the alleys or passages at the sides of the naves and choirs of churches.

separate article.)

ALCOVE, a recess in a room usually screene

balustrade, or drapery.

Auten-HovuseEs, religious hous ecclesiastics, or under their control. where property had been left by the donors to foreign orders to

They were frequently regular priories, but and even granges, with smal] chapels

n cities, seem to have been a sort

than 100 in England.

Many alien-houses were suppressed by Henry V., and the rest by

pray for their souls. sometimes only cells,

attached. Some, particularly i

of mission-houses.

Henry VIII.

ALLEY, also called Ambulatory (Lat. deambulatorium), the covered passages round a cloister. AumERY, also Aumery, Aumbrie, armario), a recess in the wa

There were more

(See also ALURE.)

or flat board, Ital. abaco, Fr.

tov, the summit or vertex), a statue or laced on the apex of a pediment. to the plinth, which forms the podium

d off by pillars,

es in England belonging to foreign They generally were built

and Ambry (Fr. armoire, Ital. ll ofa church, sometimes square-headed, and sometimes arched over, and closed with a door like a cup- board—used to contain the chalices, basins, cruets, &c., for the use of the priest ; many of them have stone shelves. sometimes near the piscina, but more often on the opposite side.

as is worked

(See

The

(See

amples are— Preaching Cr ALTAR, anciently written Auter, Fr. autel), the elevated table Eucharist. AwuRE (Lat. alwra passage, the water way or

AMPHIPROSTYLE (Gr. A temple with a portico at eac ANGEL-LIGHTS, the outer upper next to the springing ; proba lights, as they are nearly triangular. ANNULET (Lat. annulus, or bands which encircl immediately above the ne Anta (probably from the Gr. dyios, the preposition ayz{, opposite to), walls of a building, as in the portico of a Greek temple. A

portico is said to be in antis when columns stand between ante,

(See separate article.)

that at St Cross, near Winchester, and that near the oss of the Black Friars at Hereford.

or Awter (Lat. and Ital. aliare, devoted to the celebration of the

—alloriwm, probably from alatorium), an alley, flat gutter behind a parapet, the galleries of a clerestory, sometiincs even the aisle itself of a church. The term is sometiines written valure, or valoring.

aupt, around or about, and prostyle, qg..) h end is said to be amphiprostylar. lights in a perpendicular window, bly a corruption of the word angle-

a ring), a term applied to the small fillets e the lower part of the Doric capital ck or trachelium.

or some other derivative of the pier-formed ends of the

as in the temple of Theseus, supposing the peristyle or surround-

ing columns removed.

An’rE-CHAPEL, a small chapel forming the entrance to another.

lobby.

They are

Oxford, and at King’s College,

The ante-chapel to the Lady ¢

called the Presbytery. AnTE-Cuorr, the part un

ANTEFIX (Lat. an ornamente

There are examples at the Cathedral and at Merton College, Canibridge, besides several others. hapel in cathedrals is generally

der the rood loft, between the doors of the choir and the outer entrance of the screen, forming a sort of It is also called the Fore-Choir. ante, before, and fiwus, fixed), upright blucks with d face placed at regular intervals on a cornice. Antefixe were originally adapted to close and hide the lower ends of the joints. of the covering ti Apopuyce (Gr. aropuyh, a flying off), of an Ionic or Corinthian column, or the highest member of its base if the column be considered as a whole. the inverted cavetto or concave sweep, the diminishing shaft rests. Arse (Gr. apts, Lat. absis,

les on the roof of a temple. the lowest part of the shaft

The apophyge is

on the upper edge of which

tribuna, concha, Fr. abside, rond-

The word also seems in medieval times to be used commonly for any closed cupboard, and even bookcase.

AtMonRY (Lat. eleemosinarium, Fr. awmonerie, Ger. Almosenhaus), the place or chamber where alms were distributed to the poor in churches, or

other ecclesiastical buildings. At Bishopstone Church, Wiltshire, it is a sort of covered porch attached to the south transept, but not communicating with the interior of the church. At Worcester Cathedral the alms are said to have been distributed on stone tables, on each side, within the great porch. In large monastic establishments, as at Westminster, it seems to have been a separate building of some importance, either joining the gatehouse or near it, that the establishment might be dis- turbed as little as possible.

ALMSHOUSES, small buildings for the residence of the aged poor, generally endowed with some yearly stipend. The greater portion were built after the Reformation. 'Iwo interesting early ex-

point, Ital. apside, tribuna, Ger. Ablauf), the semicircular or polygonal termination to the chancel of achurch. (See separate article.)

ApreERAL (Gr. a priv., and wrepdy, a wing), a temple without columns on the flanks or sides.

ARMOSTYLE (Cir. dpatos, rare or weak, and ordAos, a column), a wide intercolumniation. (See Evsryiz.) The space assigned to this term by Vitruvius is uncertain ; the moderns assign to it four diameters.

AROSYSTYLE (compounded of arcostyle and systyle, g.v.) expresses the arrangement attendant on coupled columns, as in the western front of St Paul's Cathedral.

Arcave (Fr. arcade, arcature, Ital. arcata, Ger. Bogengang), a range of arches, supported either on columns or on ee and detached or attached to the wall. (See separate article.

| ARcHITRAVE (Gr. apxh, chief, and Lat. érabs, a beam), the chief

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beam—that part of the entablature which rests immediately on the heads of the columns and is surmounted by the frieze ; it is also called the cpistylium or epistyle. The moulded enrichment on the sides and head of a door or window is called an architrave.

ARCHIVOLT, a contraction of the Italian architrave voltato, is applied to the architrave moulding on the face of an arch, and following its contour.

ARMATURE, the French temn for the iron stays by which the lead lights are secured in windows. (See Srancuions and SADDLE Bars.)

Arnis, the sharp edge or angle in which two sides or surfaces meet.

ASHLAR, also written Ashler, Ashelere, &c., (probably from the Lat. assella), squared stones, generally applied to those used for facing walls, In a contract of date 1898 we read—" Murus erit exterius de puro lapide vocato achilar, plane iucisso, interius vero de lapide fracto vocato roghwall." "Clene hewen" ashler often occurs in medixval documents; this no doubt means tooled or finely scappled, in contrailistinction to rough-axed, faces.

AsuLin Pieces, upright pieces of wood going from the common rafters so as to cut off the lower angleof the roof in the attic story.

ASTRAGAL (Gr. dorpdyados, a bone of the anele), a convex moulding. This term is generally applied to small mouldings, torus to large ones of the same form. (See Torvs.)

Artic, a low story above an entablature, or above a cornice which limits the height of the main part of an elevation, Although tlie term is evidently derived from 'Arrixds, we find nothing exactly answering to it in Greek architecture; but it is very common in both Roman and Italian practice. What are otherwise called tholobates in St Peter's and St Paul's Catliedrals are frequently termed attics.

BacK-Cuorr, a place behind the altar in the principal choir, in which there is, or was, a small altar standing back to back with the former.

Bauut, the French term for a wall of plain masonry on which there is some superstructure.

BarLzy, said to be a corruption of Balliwm by some, and derived by others from the French " baille," a corruption of " bataille,"' because there the

soldiers were drilled in battle array; the open space between the inner and outer lines of a fortification. Some- times there were more than one, as the Inner and Outer Bailey ; we have the Old Bailey at London and at York, and the Upper and Nether Baileys at Colchester.

BALDAQUIN, BALDACCHINO. See CIBORIUM.

BaLL-FLOWER, an ornament in the form of a ball inserted in the cup of a flower, which came into use in the latter part of the 18th, and was in great vogue in the early part of the 14th century. It is generally placed in rows at equal distances in the hollow of a moulding, frequently by the sides of mullions. 'The earliest known is said to be in the west part of Salisbury, where it is mixed with the tooth ornament. It seems to have been used more and more frequently, till at Gloucester Cathedral, in the south side, it is in profusion.

BALusTEeR, a small column or pier supporting the coping in a pierced parapet : the parapet itself when pierced is hence called a Balustrade.

BaustTeR SHAFT, the shaft dividing a window in Saxon architec- ture. At St Alban's are some of these shafts, evidently out of the old Saxon church, which have been fixed up with Norman capitals.

Banp, a sort of flat frieze or fascia running horizontally round a tower or other parts of a building, particularly the base tables in perpendicular work, commonly used with the long shafts character- istic of the 13th century. It generally has a bold, projecting moulding above and below, and is carved sometimes with foliages, but in general with cusped circles, or quatrefoils, in which fre- quently are shields of arms.

BAND OF A CoLuMN (Fr. bague), a series of annulets and hollows going round the middle of the shafts of columns, and sometimes of the entire pier. They are often beautifully carved with foliages, &c., as at Amiens. In scveral cathedrals there are rings of bronze apparently covering the junction of the frusta of the columns. At Worcester and Westminster they appear to have been gilt; they are there more properly called Shaft Rings.

BaAptTisTERY, a separate building to contain the font, for the rite of baptism. They are frequent on the Continent—that at Rome near St John Lateran, and those at Florence, Pisa, Pavia, &c., are all well-known examples. The only examples in England arc at Cranbrook and Canterbury —the latter, however, is supposed to

- *have been originally part of the treasury.*

BARBICAN, an outwork for the defence of a gate or drawbridge; also a sort of pent-house or construction of timber to shelter warders or sentries from arrows or other missiles.

Bares Boarp. See VERGE Boarp.

Bartizan, supposed to be derived from the Ger. Bartizene (Fr. échauguette), a small turret, corbelled out at the angle of a wall or tower to protect a warder and enable him to see around him. They generally are furnished with oylets or arrow-slits.

ARCS EMEC USB

[GLOSSARY.

Base (Gr. Bdows, Lat. spira, basis, Fr. and Ital. base, Ger. Fuss), that part of a column on which the shaft stands. The only pase used by the Egyptians was a mere square plinth. The Assyrians evidently understood the value of a base as an archi- tectural accessory, and soine bases shown on the bas-reliefs are strongly moulded. But all actually remaining are like the one recently placed in the British Museum, which consists merely of a large torus. The Persian bases were finely moulded, elegant in outline, and more richly ornamented than in any other style. The chief mouldings are a torus, and a large reversed cyma. In pure Greek work a base is never used in the Doric, but always in the Ionic and Corinthian. The plainer sort is that well known as the Attic, consisting mainly of a hollow between two tori ; but the tori are, in other instances, deeply channelled, so as to have a very complicated appearance. The Romans had bases to all their orders, the more usual form being like the Attic. The Romanesque and Norman bases were evidently copies, for the most part, from classic forms; but were often

adorned with leaves at the angles of the square plinths, thereby leading them into the round in a very pleasing way. This was done still more elegantly in the Early English style, whose most characteristic base was much like the Attic, but with the hollow prolonged up- wards in a deep water-holding section. The Perpendicular were mostly very high, formed with two or more plinths and bold mouldings, chiefly reversed ogees.

BaszE Court (Fr. basse cour, 2.e., the lower court), the first open space within the gates of a castle. It was used for exercising cavalry, and keeping live stock during a siege. (See ENCEINTE.)

BASE OF A WALL, or GrounD TABLE, mouldings round a building just above ground; they mostly consist of similar members to those above described (BAsE), and run round the buttresses. The flat band between the plinth and upper mouldings is frequentiy panelled and carved with shields, as in Henry VIJ. Chapel at Westminster.

BASEMENT. A basement story is a story placed wholly or partly below the level of the ground on the outside of and about tho building. Basement, applied specially, as architects apply it, means the compartment in the elevation of a building upon which any columnar pilastered or arcaded ordinance may rest ; as in the Strand front of Somerset House, of which the basement begins at the level of the floor of the vestibule, being about that of the street pavement, and extends upwards to half the height of the adjoining building east and west.

Basriica (Gr. Baruch, z.e., the royal house), a term given by the Greeks and Romans to the public buildings devoted to judicial purposes. (See separate article.)

Batement Licurs, the lights in the upper part of a perpendicular window, abated, or only half the width of those below.

Barrer (Fr. battre, to beat). Building over in projecting courses like inverted steps is termed battering, gathermg, or corbelling over. The term is often applied to the converse operation cf throwing back, as in a revétement or retaining wall.

BATTLEMENT (Fr. bretesse, Ital. merlo, Ger. Zinne), a parapet with a series of notches in it, from which arrows may be shot, or other instruments of defence hurled on besiegers. The raised portions are called merlons, and the notches embrasures, or ere- nelles. The former were intended to cover the soldier while dis- charging his weapon through the latter. Their use is of great antiquity ; they are found in the seulptures of Nineveh, in the tombs of Egypt, and on the famous Frangois vase, where there is a delineation of the siege of Troy. In ecclesiastical architecture the early battlements have small shallow embrasures at some distance apart. In the Decorated period they are closer together, and deeper, and the mouldings on the top of the merlon and bottom of the embrasure are richer. During this period, and the earlier part of the Perpendicular, the sides or cheeks of the em- brasures are perfectly square and plain. In later times the mouldings were continued round the sides, as well as at top and bottom, mitring at the angles, as over the doorway of Magdalene College, Oxford. he battlements of the Decorated and later periods are often richly ornamented by panclling, as in the last example, In castellated work the merlons are often pierced by narrow arrow-slits. (See OyLET.) In South Italy some battle- ments are found strongly resembling those of old Rome and Pompeii; in foreign ecclesiastical architecture the parapets are very rarely embattled.

Bay (Fr. travée, Ital. compartimento, Ger. Abtheilung), any division or compartment of an arcade, roof, &c. Thus each space from pillar to pillar, in a cathedral, is called a bay, or severey.

Bay WINpow, any window projecting outwards from the wall of a building, either square or polygonal on plan, and commencing from the ground. 1f they are carried on projecting corbels, they are called Oriel windows. Their use seems to have been confined to the later periods. In the Tudor and Elizabethan styles they are often semicircular on plan, in which case some think it more correct to call them Bow Windows. For those in medisval halls, see Dats, HALL.

GLOSSARY. |

Bean, a small cylindrical moulding vf frequent use.

Bep-MovLp, the congeries of mouldings which is under the pro- jecting part of almost every cornice, of which, indeed, it is a

art.

pos (Fr. clocher—if applied to a church, beffroi—if to the tower of a hotel de ville; Ital. campanile, Ger. Glockcnthurm), properly speaking, a detached tower or campanile containing bells, as at Evesham, but more generally applied to the ringing room or loft of the tower of a church. (See Tow=Er.)

Bet or ACarrraL. In Early English and Decorated work, imme- diately above the necking isa deep, hollow curve ; this is called the bell of a capital. It is often enriched with foliages.

Beti-Cot, Beni-GaBLE, or Brenu-Turret. The place where one or more bells are hung in chapels, or small churches which have no towers. Bell-cots are sometimes double, as at Northborough and Coxwell; a very common form in France and Switzer- land adniits of three bells. In these countries also they are frequently of wood, and attached to the ridge. Those which stand on the gable, dividing the nave from the chancel, are generally called Sanctus Bells. A very curious, and it is believed unique, example at Cleves Abbey juts out from the wall. In later times bell turrets were much ornamented ; these are often called Fléches.

Boma (Gr. Baya, Lat. tribunal), the semicircular recess or hexedra, in the basilica, where the judges sat, and where in after times the altar was placed. It generally is roofed with a half dome or concha. The seats, @pdvot, of the priests were against the wall, looking into the body of the church, that of the bishop being in the centre. The bema is generally ascended by steps, and railed off by Cancelli.

Bencu TABue, the stone seat which runs round the walls of large churches, and sometimes round the piers ; it very generally is placed in the porches.

BezANnriig, a name given to an ornamented monlding much used in the Norman period, resembling bezants, coins struck in Byzan-

tium.,

Bituer (Fr. billcttc), a species of ornamented moulding much used in Norman, and sometimes in Early English work, like short pieces of stick cut off and arranged alternately.

Buiockrxc-Coursz, a deep but slightly projecting course in an elevation, to act as cornice to an arcade, or to separate a basement from a superior story. (See Srrinc-CoursE.)

Boss (Fr. clef de vodte, tal. bozea, Ger. Buckcl), an ornament, generally carved, forming the key-stone at the intersection of the ribs of a groined vault. Early Norman vaults have no bosses. The carving is generally foliage, and resembles that of the period in capitals, &e. Sometimes they have human heads, as at Nétre Dame at Paris, and sometimes grotesque figures. In later vaulting there are bosses at every intersection.

Bowrrtt (supposed to be akin to Jottle), the medieval term for a round moulding or torus. When it follows a curve, as round a bench end, it is called a Rovinc BowTELL, 9.v.

Brace Mout, two ressaunts or ogees united together like a brace in printing, sometimes with a small bead between them.

Bracket (Fr. corbeau, cul-dc-lampe, Ital. mensola, Ger. Kragstcin), a projecting ornament carrying a cornice. 'Those which support vaulting shafts or cross springers of a roof are more generally called Corbels.

Bratrisuinc or BRANpDIstING, is no doubt derived from the French breteche, a sort of crest ridge on a parapet, or species of embattlement. The term, however, is generally employed to describe the ranges of flowers which form the crests of so many parapets in the Tudor period.

Broacu (from broche, a spit), now used to designate a particular form of spire, the sides of which, with the angles of the tower, finish with a sort of haunching. (See SPIRE.)

Burrress, anciently written Botrasse, or Boterasse (Ital. puntedlo, Fr. contrefort, Ger. Strebepfeiler), masonry projecting from a wall, and intended to strengthen the same against the thrust of a roof or vault. Buttresses arc no doubt derived from the classic pilasters which serve to strengthen walls where there is a pressure of a girder or roof timber. In very early work they have little projection, and in faet are "strip-pilasters." In Nor- man work they are wider, with very little projection, and generally stop under a cornice or corbel table. Early English buttresses project considerably, sometimes with deep sloping weatherings in several stages, and sometimes with gabled heads, as at Beverley. Sometimes they are chamfered, and sometimes the angles have jamb shafts, as in the last example. At Wells and Salisbury they are richly ornamented with canopies and statues. In the Decorated period they became richly panelled in stages, and often finish with niches and statues and elegantly carved and crocketted gablets, as at York. In the Perpendicular period the weatherings became waved, and they frequently terminate with niches and pinnacles.

Burrress, Frying (Fr. arc-boutant, Ital. puntello arcuato, Ger. Strebebogen), a detached buttress or pier of masonry at some

distance from a wall, and connected therewith by an arch or portion of an arch, so as to discharge the thrust of a roof or vault on some strong point.

Burrress SHarFts, slender columns at the angle of buttresses, chiefly used in the Early English period.

CaBLING. The flutes of columns are said to be eabled when they are partly oceupied by solid convex masses, or appear to be refilled with cylinders after they had been formed.

Carsson. See CAssoon.

CAMPANILE, a name given in Italy to the bell tower of a town hall or church. In that country this is almost always detached from the latter. (See

BELFRY.)

Canopy, the upper part or cover of a niche, or the projecting orna- ment over an altar or scat or tomb. The word is supposed to be derived from conopwum, the gauze covering over a bed to keep off the gnats (kévey), a mosquito curtain. Early English eanopies are generally simple, with trefoiled or cinquefoiled heads; but in the later styles they are very rich, and divided into compart- ments with pendants, knots, pinnacles, &c. The triangular ar- rangement over an Early English and Decorated doorway is often called a canopy. The triangular canopies in the north of Italy are pecnliar. Those in England are generally part of the arrangement of the arch mouldings of the door, and form, as it were, the hood- moulds to them, asat York. The former areabove and independent of the door mouldings, and frequently support an arch with a tym- panum, above which is a triangular canopy, as in the Duomo at Florence. Sometimes the canopy and arch project from the wall, and are carried on small jamb shafts, as at San Pietro Martire at Verona. An extremely curious canopy, being a sort of horse- shoe arch, surmounting and breaking into a cirenlar arch, from Tournay is given. Similar canopies are often over windows, as at York Minster over the great west window, and lower tiers in the towers. 'These are triangular, while the upper windows in the towers have ogee canopies.

Cant. When the corner of asquare is cut off octagonally, it is said to be canted. Thusa bay window with octagonal corners is called a canted bay.

CaprraL (Gr. xepdaaoy, Lat. capitulum, Ital. capitello, Sp. chapitel, Ger. Knauff, Kapital, Fr. chapitcau), the upper part of a column, pilaster, pier, &c. Capitals have been used in every style down to the present time. That mostly used by the Egyptians was bell-shaped, with or without ornaments. The Persians used the double-headed bell, forming a kind of bracket capital. The Assyrians apparently made use of the Ionic and Corinthian, which were developed by the Greeks, Romans, and Italians, into their present well-known forms. The Doric was apparently an invention or adaptation by the Greeks, and was altered by the Romans and Italians. But in all these examples, both ancient and modern, the capitals of an order are all of the same form throughout the same building, so that if one be seen the form of all the others is known. 'The Romanesque architects altered all this,

and in the carving of their capitals often introduced such figures and emblems as helped to tell the story of their building. Another form was introduced by them in the curtain capital, rude at first, but afterwards highly decorated. It evidently took its origin from the cutting off of the lower angles of a squarc block, and then rounding them off. The process may be dis- tinctly seen, in its several stages, in Mayence Cathedral. But this form of capital was more fully developed by the Normans, with whom it became a marked feature. In the Karly English capitals a peculiar flower of three or more lobes was used, spread- ing from the necking upwards in most graceful forms, In Decorated and Perpendicular this was abandoned in favour of more realistic forms of crumpled leaves, enclosing the bell like a wreath. In each style bold abacus mouldings were always used, whether with or without foliage.

Carrets (Lat. carola), small chapels or oratories enclosed by screens ; also sometimes the rails of the screens themselves ; and sometimes the separate seats or pews for monks near the windows. It was at one time supposed that the scrolls on which inscriptions of texts, &c., are formed were called carrels, but this seems a mistake.

Caryatipes, human female figures used as piers, columns, or supports. Caryatic is applied to the human figure generally when used in the manner of Caryatides.

CasEMENT, a deep hollow moulding, sometimes filled with foliage, and then called a Vignette; also thé frame which holds the lead lights of a quarrel-glazed window. m

Cassoon, or CAISsoN, a deep panel or coffer in a soffit or ceiling. This term is sometimes written in the French form, caisson, Some- times derived directly from the Italian cassone, the augmentative of cassa, a chest or coffer.

CATHEDRAL (Ital. duomo, cattedrale, Fr. cathédrale, Ger. Dom- Kirche), the principal church where the bishop has his seat (cathedra) as diocesan. (See separate article.)

Carnetus (Gr. xd@eros, a perpendicular linc). The eye of the volute is so termed because its position is determined, in an Ionic

or voluted capital, by a line let down from the point in which the – olute generates.

CavLicuus (Lat. a stalk or stem), the inner scroll of the Corinthian capital. It isnot uncommon, however, to apply this term to the larger serolls or volutes also.

CAvETTo (Ital. cavare, to dig out), a moulding whose form is a simple concave, impending.

CEILING (Ital. sofito, soppalcho, Fr. plafond, lambris, Ger. Stuben- decke), that covering of a room which hides the joists of the floor above, or the rafters of the roof. Most churches have either open roofs, or are groined in stone. At Peterborough and St Albans there are very old flat ceilings of boards curiously painted. In later times the boarded ceilings, and, in fact, some of those of plaster, have moulded ribs, locked with bosses at the intersection, and are sometimes elaborately carved. In the cloisters at Lincoln, the nave and choir at York, the side aisles of the choir at Winchester, the church at Warmington, and several other places, there are ceilings formed of oak ribs, filled in at the spandrils with narrow thin pieces of board, in exact imitation of stone groining. In the Elizabethan and subscquent periods, the ceil- ings are enriched with most elaborate ornaments in stucco. (See GRoINED VAULTING.) |

CrLLs, small monastic houses, generally in the country, belonging to large conventual buildings, and intended for change of air for the monks, as well as places to reside in to look after the lands, vassals, &c. Thus Tynemouth was a cell to St Albans ; Ashwell, Herts, to Westminster Abbey. (See GRaNncE.) Also the small sleeping apartments of the monks; also a small apartment used by the anchorite or hermit.

CHAMFER, CHAMPFER, or CHAUMFER. When the edge or arris of any work is cut off at an angle of 45° in a small degree, it is said to be

chamfered; if to a large scale, it is said to be a canted corner. (See Cant.) The chamfer is much used in mediseval work, and is sometimes plain, sometimes hollowed out, and sometimes moulded.

Cuamrer Stor. Chamfers sometimes simply run into the arris by a plane face; more commonly they are first stopped by some ornament, as by a bead; they are sometimes terminated by trefoils, or cinquefoils, double or single, and in general form very pleasing features in medizval architecture.

CHANCEL, a place separated from the rest of a church by a screen (cancellus). The word is now generally used to signify the choir of a small church.

Cuanrry (Lat. cantuaria, Fr. chantrerie, Ger. Kantorci), a small chapel generally built out from achurch. They generally contain a founder's tomb, and are often endowed places where masses might be said for his soul. The officiator, or mass priest, being often unconnected with the parochial clergy, the chantry has generally an entrance from the outside.

Cuapen (Lat. and Ital. capella, Fr. chapelle, Ger. Kapelle), a small, detached building uscd as a substitute for a church in a large parish ; an apartment in any large building, a palace, a nobleman's house, an hospital or prison, used for public worship; or an attached building running out of and forming part of a large church, generally dedicated to different saints, each having its own altar, piscina, &c., and screcued off from the body of the building.

CHAPITER, the old English name for a CAPITAL.

Cuaprer House (Lat. capitolium, Ital. capitolo, Fr. chapitre, Ger. Kapitelhaus), the chamber in which the chapter or heads of the monastic bodies assembled to transact business. They are of various forms; some are oblong apartments, as Canterbury, Exeter, Chester, Gloucester, &c.; some octagonal, as Salisbury, Westminster, Wells, Lincoln, York, &c. That at Lincoln has ten sides, and that at Worcester is circular; most are groined over, and some, as Salisbury, Wells, Lincoln, Worcester, &c., depend on a single slight vaulting shaft for the support of the massive vaulting. This picturesque plan is almost exclusively English.

CHARNEL HousE (Med. Lat. carnarium, Fr. osswaire), a place for depositing the bones which might be thrown up in digging graves. Sometimes, as at Gloucester, Hythe, and Ripon, it was a portion of the crypt; sometimes, as at Old St Paul's and Worcester (both now destroyed), it was a separate building in the church- yard ; sometimes chantry chapels were attached to these build- ings. M. Viollet-le-Duc has given two very curious examples of ossuaires,—one from Fleurance, the other from Faouet.

Cuorr (Lat. chorus, Ital. coro, Fr. cheur, Ger. Chor, Old English, quire, querc), that part of a church or monastery where the breviary services or " hore " are chanted. (See separate article.)

Crporium (Fr. baldaguin, Ital. baldacchino), a tabernacle or vaulted canopy supported on shafts standing over the high altar. Gervase of Canterbury calls every bay of the quire there a ciborium, probably because the groining rose and formed a sort of canopy over each bay.

CinquEFoIL, a sinking or perforation like a flower of five points or leaves, as a quatrefoil is of four. The points are sometimes in a circle, as in the lower windows at Lincoln, and sometimes form the cusping of a head.

ARCHUPECTURE

' [GLOSSARY.

CLEITURAL (Gr. KAe?@poy, an enclosed or shut-up place), is applied to a covered Greek temple, in contradistinction to Hypethral, which designates one that is uncovered ; the roof of a cleithral temple completely covers or encloses ie

CLEREsTORY, CLEARSTORY (Ital. chzaro piano, Fr, claircvoie, claire étage, Ger. Lichtgaden). When the iniddle of the nave of a church rises above the aisles and is pierced with windows, the upper story is thus called. Sometimes these windows are very small, being mere quatrefoils, or spherical triangles. In large buildings, how- ever, they are important objects, both for beauty and utility. The window of the clerestories of Norman work, even in large churches, are of less importance than in the

later styles. In Early English they became larger ; and in the Decorated they are more important still, being lengthened as the triforium diminishes. In Perpendicular work the latter often disappears altogether, and in many later churches, as at Taunton, and many churches in Norfolk and Suffolk, the clerestories are close ranges of win- dows.

CLorsTER (Lat. claustrum, Ital. chiostro, Fr. cloitre, Ger. Kloster), an enclosed square, like the atrium of a Roman house, with a walk or ainbulatory round, sheltered by a roof generally groined, and by tracery windows, which were more or less glazed. (See separate article.)

Cuosx, the precinct of a cathedral or abbey. Sometimes the walls are traceable, but now generally the boundary is only known by tradition.

CoFFER, a deep panel in a cciling.

CoLuMN (Lat. columna), a tapering cylindrical mass, placed vertically on a level stylobate, in some cases with a spreading congeries of mouldings called a base, and having always at its upper and smaller end a dilating mass called a capital. Columns are either insulated or attached. They are said to be attached or engaged when they form part of a wall, projecting onc half or more, but not the whole, of their substance. For the columns of different styles and orders of architecture, see the general article, supra.

Conson or CoNsOoLE, a bracket or truss, generally with scrolls or volutes at the two ends, of unequal size and contrasted, but con- nected by a flowing line from the back of the upper one to the inner convolving face of the lower.

Copine (Ital. coperto, corona, Fr. chaperon), the capping (whence the name is probably derived) or covering of a wall. This is of stone, weathered to throw off the wet. In Norman times, as far as can be judged from the little there is left, it was generally plain and flat, and projected over the wall with a throating to form adrip. Afterwards it assumed a torus or bowtell at the top, and became deeper, and in the Decorated period there were generally several sets-off. The copings in the late Perpendicular perio assumed something of the wavy section of the buttress caps, and mitred round the sidcs of the embrasure, as well as the top and bottom.

Corset (from the low Latin corbeyus, a basket, Ital. mensola, Fr. corbcau, cul-de-lampe, Ger. Kragstein), the name in medieval architecture for a piece of stone jutting out of a wall to carry any superincumbent weight. A piece of timber projecting in the same way was called a tassel or a bragger. 'Thus the carved ornaments from which the vaulting shafts spring at Lincoln are corbels. Norman corbels are generally plain. In the Early English period they are sometimes elaborately carved, as at Lincoln above cited, and sometimes more simply so, as at Stone. They sometimes end with a point apparently growing into the wall, or forming a knot, as at Winchester, and often are supported by angels and other figures. In the later periods the foliage or ornaments resemble those in the capitals. (See CAPITAL.)

CorBEL TABLE, a projecting cornice or parapet, supported by a range of corbels a short distance apart, which carry a moulding, above which is a plain piece of projecting wall forming a parapet, and covered by a coping. Sometimes small arches are thrown across from corbel to corbel, to carry the projection.

Cor3BIE Steps, a Scottish term for the steps formed up the sides of the gable by breaking the coping into short horizontal pieces.

Cornice (Fr. corniche, Ger. Kranz), the projection at the top of a wall finished by a blocking-course, common in classic architecture. In Norman times, the wall finished with a corbel table, which carried a portion of plain projecting work, which was finished by a coping, and the whole formed a Parapet. 1n Karly English times the parapet was much the same, but the work was executed in a much better way, especially the small arches connecting the corbels. In the Decorated period the corbel table was nearly abandoned, and a large hollow, with one or two subordinate mouldings, substituted ; this was sometimes filled with the ball flowers, and sometimes with running foliages. In the Perpen- dicular style, the parapet frequently did not project beyoud the wall-line below ; the moulding then became a string (though often improperly called a cornice), and was ornamented by a quatrefoil or small rosettes set at equal intervals immediately under the battlements. In many French examples the moulded string is very bold, and enriched with foliage ornaments.

GLOSSARY. |

Corona, a term applied to the deep vertical face of the projected part of the cornice between the bed-mould and the covering mouldings.

Cove—Covine. The moulding called the cavetto,—or the scotia inverted,—on a large scale, and not as a mere moulding in the composition of a cornice, is called a cove or a coving.

CRENELLE, a word generally considered to mean an embrasure of a battlement, but latterly proved to apply to the whole system of defence by battlements. In medizval times no one could " crenel- late" a building without special licence from his supreme lord. (See BATTLEMENT, EMBRASURE.)

CRESTING, an ornamental finish in the wall or ridge of a building, which is common on the Continent. An example occurs at Exeter Cathedral, the ridge of which is ornamented with a range of small flewrs-de-lis in lead.

CrockeT (Ital. wncinetto, Fr. erochet, crosse, Ger. Hiklein, Knollen), an ornament running up the sides of gablets, hood-moulds, pin- nacles, spires; generally a winding stem like a creeping plant, with flowers or leaves projecting at intervals, and terminating in a finial.

Crop (Ang.-Sax. crop), the top of anything. A word anciently used for a Frnrau, which see.

Cross. This religious symbol is almost always placed on the ends of gables, the summit of spires, and other conspicuous places of old churches. In early times it was generally very plain, often a simple cross in a circle, as at Beverley. Sometimes they take the form of a light cross crosslet, or a cross in a square. In the Decorated and later styles they became richly Horiated, and assumed an endless variety of forms. Of memorial crosses the finest examples are the Eleanor crosses, erected by Edward I. Of these a few yet remain, one of which has recently been re- erected at Charing Cross. Preaching crosses were often set up by the wayside as stations for preaching; the most noted is that in front of St Paul's. The finest remaining

sepulehral crosses are the old elaborately-carved examples found in Ireland.

Cross-AISLE, an old name for a transept.

Cross-SPRINGER, the transverse ribs of a vault.

Crow-Srers. See Corsi STEPS.

Crow Stons, the upper stone of a gable ; see also as last.

Crypt (Lat. erypta, Ital. volto sotterraneo, Fr. eryptc, Ger. Gruft), a vaulted apartment of greater or less size, usually under the ehoir. (See separate article.)

CuPoLA (Ital. ewpo, concave, profound), a spherical or spheroidal covering to a building, or to any part of it.

Cusp (Fr. fewille, Ital. ewspide, Ger. Knopf), the point where the foliations of tracery intersect. The earliest example of a plain cusp is probably that at Pythagoras School, at Cambridge, —of an ornamented cusp at Ely Cathedral, where a small roll, with a rosette at the end, is formed at the termination of acusp. In the later styles the terminations of the cusps were more richly decor- ated ; they also sometimes terminate not only in leaves or foliages, but in rosettes, heads, and other fanciful ornaments.

CycLosTYLe (Gr. «d«ados, a circle, and ordAos, a column). A struc- ture composed of a circular range of columns without a core is eyclostylar ; with a core the range would be a peristyle. This is the species of edifice called by Vitruvius Monopteral. (See Monopreros.)

CyMa (Gr. xiua, a wave), the name of a moulding of very frequent use. It isa simple, waved line, concave at one end and convex at the other, like an Italic 7. When the concave part is upper- most it is called a cyma-recta ; but if the convexity appear above, and the concavity below, it is then a cyma-reversa.

Cymatium. When the crowning moulding of an entablature is of the cyma form, it is termed the Cymatium.

Cyrro-prostyitx. An alternation of CyRTOSTYLE (q.v.), but in- ee more clearly than Cyrtostyle does an external projec-

ion.

CyRTOSTYLE (Gr. xuprds, convex, and orddos, a column), a circular projecting portico. Such are those of the transept entrances to St Panl's Cathedral.

Davo or Dr, the vertical face of an insulated pedestal between the base and cornice or surbase. It is extended also to the similar part of all stereobates which are arranged like pedestals in Roman and Italian architecture.

Dars (Fr. dais, estrade, Ital. predelia), a part of the floor at the end of a medixval hall, raised a step above the rest of the building. On this the lord of the mansion dined with his friends at the great table, apart from the retainers and servants. In medieval halls there was generally a deep recessed bay window at one or at each end of the dais, supposed to be for retirement, or greater privacy than the open hall could afford. In France the word is understood as a canopy or hanging over a seat ; probably the name was given from the fact that the seats of great men were then surmounted by such an ornament.

DECcASTYLE (Gr. déxa, ten, and ordAos, a column), a portico of ten columns in front.

Dentin (Lat. dens, a tooth). The cogged or toothed member,

common in the bed-mould of a Corinthian entablature, is said to be dentilled, and each cog or tooth is called a dentil.

DEPRESSED ARCHES or Drop ArvtrEs, those of less pitch than the equilateral.

Desicn. The plans, elevations, sections, and whatever other draw- ings may be necessary for an edifice, exhibit the design, the term plan having a restricted application to a technical portion of the design. (See PLAN.)

Deratt. As used by architects, detail means the smaller parts into which a composition may be divided. Itis applied generally to mouldings and other enrichments, and again to their minutie.

Diameters. The diameters of the lower and upper ends of the

shaft of a column are called its inferior and superior diameters respectively ; the former is the greatest, the latter the least diameter of the shaft.

Diarer (Ital. diaspro, Fr. diaspré, Ger. Geblumte), a method of decorating a wall, panel, stained glass, or any plain surface, by covering it with a continuous design of flowers, rosettes, &c., either in squares or lozenges, or some geometrical form resembling the pattern of a diapered table-cloth, from which, in fact (drap d'Ypres), the name is supposed by some to have been derived.

DiasTyLe (Gr. Sid, through, and oriaos, a column), a spacious intercolumniation, to which three diameters are assigned. (See EvsTYLt.)

Dirreros (Gr. dfs, twice, and mrepdy, a wing), a double-winged temple. The Greeks are said to have constructed temples with two ranges of columns all round, which were called dipteroi. A portico projecting two columns and their interspaces is of dipteral or pseudo-dipteral arrangement.

DisciARGInNG ARCH, an arch over the opening of a door or window, to discharge or relieve the superincumbent weight from pressing on the freestone.

DisTEMPER. See FRESCO.

DisryLeE (Gr. dfs, twice, and orvAos, a column), a portico of two columns. This term is not generally applied to the mere porch with two columns, but to describe a portico with two columns i antis.

DirriciyPH, an intercolumniation in the Doric order, of two triglyphs. (See TRIGLYPH.)

DopECASTYLE (Gr. ddédexa, twelve, and ariaos, a column), a por- tico of twelve columns in front. The lower one of the west front of St Paul's Cathedral is of twelve columns, but they are coupled, making the arrangement pseudo-dodecastyle. The Chamber of Deputies in Paris has a true dodecastyle.

Doc-ToorH, a favourite enrichment used from the latter part of the Norman period to the early part of the Decorated. It is in the form of a four-leaved flower, the centre of which projects, and probably was named from its resemblance to the dog-toothed violet.

Dome (Gr. déua, a structure of any kind, Lat. domus, a house or temple), a cupola or inverted cup on a building. The goes of this term to its generally-received purpose is from the Italian custom of calling an archiepiscopal church, by way of eminence, Il duomo, the temple ; for to one of that rank, the cathedral of Florence, the cupola was first applied in modern practice. The Italians themselves never call a cupola a dome: it is on this side of the Alps the application has arisen, from the circumstance, it would appear, that the Italians use the term with reference to those structures whose most distinguishing feature is the cupola, tholus, or (as we now call it) dome. (See Cupo.a.)

Donson, the principal tower of a castle. (See KEEP.)

Dormer BEAM or DormMAnr BEAM, said to be a tie-beam, but mure probably, as its name imports, a sleeper.

DormMER Winpow (Fr. lwearne, Ital. abbaino, Ger. Daehfenster), a window belonging to a room in a roof, which consequently pro- jects from it with a valley gutter on each side. They are said not to be earlier than the 14th century. In Germany there are often several rows of dormers, one above the other. In Italian Gothic they are very rare ; in fact, the former have an unusually steep roof, while in the latter country, whcre the Italian tile is used, the roofs are rather flat.

Dormitory (Fr. dortoir, Ital. dormitorio, Ger. Sehlafgemach), the place where the monks slept at night. It was sometimes one long room like a barrack, and sometimes divided into a succession of small chambers or cells. The dormitory was generally on the first floor, and connected with the church, so that it was not necessary to go out of doors to attend the nocturnal services. In the large houses of the late Perpendicular period, and also in some of the Elizabethan, the entire upper story in the roof formed one large apartment, said to have been a place for exercise in wet weather, and also for a dormitory for the retainers of the house- hold, or those of visitors.

DossEt or DorsaLt. See REREDOS.

Dripstonr, the moulding or cornice which acts as a canopy to doors and windows. Horizontal running mouldings are some- times called tablets, and sometimes dripstones.

Drop Arcues. See DEPRESSED ARCIIES.

DuNnGEON, the prison in a castle keep, so called because the Norman name for the latter is donjon, and the dungeons or prisons are generally in its lowest story. (See Kuxp.)

EculaucuettTe. See BArrizan.

Ecuinus (Gr. éxivos, au egg), a moulding of eccentric curve, gene- rally cut (when it is carved) into the forms of eggs and anchors alternating, whence the moulding is called by the name of the more conspicuous. It is the same as OVOLO, g.¥.

ELEMENT, the outline of the design of a Decorated window, on which the centres for the tracery are formed. These centres will all be found to fall on points which, in some way or other, will be equimultiples of parts of the openings. Before any one can draw tracery well, or understand even the principles of its com- position, he must give much attention to the study of the element. (See TRACERY.)

ELEVATION, the front facade, as the French term it, of a structure, a geometrical drawing of the external upright parts of a build- ing.

Ta naseon the opening in a battlement between the two raised solid portions or merlons, sometimes called a crenelle, (See BATTLEMENT, CRENELLE.)

EncEINTE, a French term for the close or precinct of a cathedral, abbey, castle, &c.

ENTrABLATURE, or INTABLATURE (Lat. im, upon, and tabula, a tablet), the superimposed horizontal mass in a columnar ordinauce, which rests upon the tablet or abacus of a column. It is conven- tionally composed of thee parts, architrave, frieze, and cornice.

EnraiL, ENTAYLE, sculptured ornaments, generally of rich design, most probably derived from the Italian intaglio.

Entasis, the swelling of a column, &c. In medisval architecture, some spires, particularly those called " broach spires," have a slight swelling in the sides, but no more than to make them look straight; for, from a particular " deceptio visus," that which is quite straight, when viewed at a height, looks hollow.

frt, the French term for a light finial, generally of metal, but sometimes of terra cotta, forming the termination of a pointed roof or spire,

EpisTyLium, or Episry.e (Gr. érf, upon, and o7dAos, a column). This term may with propriety be applied to the whole entabla- ture, with which it is synonymous; but it is restricted in use to the architrave or lowest member of the entablature.

EscaPE, an equivalent for the term APoPuYGr, q.v.

EscuTcHEON (Lat. scutwm, Ital. scwdo, Fr. écusson, Ger. Wappen- schild), a term for the shields used on tombs in the spandrils of doors or in string-courses. Also the ornamented plates from the centre of which door-rings, knockers, &c., are suspended, or which protect the wood of the key-hole

from the wear of the key. In medieval times these were often worked in a very beautiful manner.

EsTrabE, a French term for a raised platform. (See Da1s.)

Evsty.z (Gr. ¢8, well, and orddAos, a column), a species of inter-columniation, to which a proportion of two diameters and a quarter is assigned. This term, together with the others of similar import—pycnostyle, systyle, diastyle, and areostyle— referring to the distances of columns from one another in composi- tion, is from Vitruvius, who assigns to each the space it is to express. It will be seen, however, by reference to them indivi-dually, that the words themselves, though perhaps sufficiently applicable, convey no idea of an exactly defined space, and by reference to the columnar structures of the ancients, that no atten- tion was paid by them to such limitations. It follows, then, that the proportions assigned to each are purely conventional, and may or may not be attended to without vitiating the power of applying the terms. Eustyle means the best or most beautiful arrangenient ; but as the effect of a columnar composition depends on many things besides the diameter of the columns, the same proportioned intercolumniation would look well or ill accord- ing to those other circumstances, so that the limitation of eustyle

‘ to two diameters and a quarter is absurd.

Fagapr. See ELEVATION.

Fairt, the French term for the ridge of a roof.

FaiTrire, the ornament running along the ridge of a building. (See CRESTING.)

Fan Tracery. “ See GRoINED VAULTING.

Fascia (Lat. a band.) The narrow vertical bands or broad fillets into which the architraves of Corinthian and Ionic entablatures are divided are called fasciz ; and the term is generally applied to any similar member in architecture.

FEATHERING. See Cusp.

FEMERELL, properly FUMERELL, a sort of lantern in the ridge of a hall (when the fire was in the middle of the floor and not ina chimney) for the purpose of letting out the smoke.

FENESTRAL, a frame or "chassis," on which oiled paper or thin cloth was strained to keep out wind and rain when the windows were not glazed.

FERETORY, a sort of parclose which enclosed the fcretrum, shrine, or tomb, as in Henry VII.'s chapel.

ARCHIVECPURE

[GLOssARY.

Fruuet (Fr. filet, listel, Ital. listello, Ger. Binde), a narrow vertical band or listel, of frequent use in congeries of mouldings, to separate and combine them, and also to give breadth and firmness to the upper edge of a crowning cyima or cavetto, as in an external cornice. The uarrow slips or breadths between the flutes of Corin- thian and Iouic columns are also called fillets. In medizval work, the fillet is a small, flat, projecting square, chiefly used to sepa- rate hollows and rounds, and often found in the outer parts of shafts and bowtells. In this situation the centre fillet has been termed a keel, aud the two side ones wings ; but apparently this is not an ancient usage.

Frniau (Fr. flewron), the flower or bunch of flowers with which a spire, pinnacle, gablet, canopy, &c., generally terminates. Where there are crockets, the finial generally bears as close a resemblance as possible to them in point of design. They are found in early work where there are no crockets. The simplest form more resembles a bud about to burst than an open flower. They soon became more elaborate, as at Lincoln, and still more, as at West- minster and the Hotel Cluny at Paris. Many Perpendicular finials are like four crockets bound together. Almost every known cxample of a finial has a sort of necking separating it from the parts below. (See EPt.) p

FLAMBOYANT, a naine applied to the Third Pointed style in France (ogive tertiale), which seems to have been developed from the Second, as our Perpendicular was from the Decorated. The great characteristic is, that the element of the tracery flows upwards in long wavy divisions like flames of fire. In most cases, also, every division has only one cusp on each side, however long the division may be. The mouldings seem to be as much inferior to those of the preceding period, as our Perpendicnlar mouldings were to the Karly English, a fact which seems to show that the decadence of Gothic architecture was not confined to one country.

Ficus (Ital. aguglia), a general term in French architecture for a spire, but more particularly used for the small slender erection rising from the intersection of the nave and transepts in cathedrals and large churches, and carrying the sanctus bell.

FLUTE, a concave channel. Columns whose shafts are channelled are said to be fluted, and the flutes are collectively called flutings.

FouaTion. See Cusp.

Font, the vessel used in the rite of baptism. The earlicst extant is supposed to be that in which Constantine is said to have been baptised; this is a porpliyry Jabrwm from a Roman bath. Those in the baptisteries in Italy are all large, and were intended for immersion; as tine went on, they seem to have become smaller. What they were in Saxon times is uncertain, though it is not improbable that some of the plain examples, called Norman, may have been of earlier date. Norman fonts are sometimes mere plain, hollow cylinders, generally a little smaller below than above; others are massive squares, supported on a thick stem, round which sometimes there are smaller shafts. In the Early English this form is still pursued, and the shafts are detached , sometimes, however, they are hexagonal and octagonal, and in this and the later styles assume the form of a vessel on a stem. Norman fonts have frequently curious carvings ou them, ap- proaching the grotesque; in later times the foliages, &c., partook absolutely of the character of those used in other archi- tectural details of their respective periods. The font is usually placed close to a pillar near the entrance, generally that nearest but one to the tower in the south arcade, or, in large

buildings, in the middle of the nave, opposite the entrance porch, and sometimes in a separate building. (See BAPTISTERY.)

Foot-STaLL, a word supposed to be a literal translation of piéde- stal, or pedestal, the lower part of a pier. (See Basz, Pat1N.)

FormeEret, the half ribs against the walls in a groined-ceiling.

Fratery, Frater House, supposed to be the hall where the friars met for dinner or other purposes; the same as refectory among the monks.

FREE-STONE (Fr. pierre de taille, Ital. pietra molle), stone used for mouldings, tracery, and other work required to be executed with the chisel. The oolitic stones are generally so called, although in some countries the soft sandstones are so used, and in some churches an indurated chalk called clunch is employed for inter- nal lining and for carving.

Fresco, the method of painting on a wall while the plastering is wet. The colour penetrates through the material, which therefore will bear rubbing or cleaning to almost any extent. The trans- parency, the chiaroscuro, and lucidity, as well as force, which can be obtained by this method, cannot be conceived unless the frescoes of Fra Angelico or Raffaelle are studied. The word, however, is often applied improperly to medizval delineations in ancient churches, which are only painted on the surface in disteniper or body colour, mixed with size or white of egg, which gives them an opaque effect.

FRixEzE (Ital. fregio, from the Lat. Phrygionius, enriched or embroidered), that portion of an entablature between the cornice above and the architrave below. It derives its name from being the recipient of the sculptured enrichments either of foliage or

figures which may be relevant to the object of the structure. The frieze is also called the ZooPHORUS, q.v.

FronTISPIEcE, the front or principal elevation of a structure. This term, however, is generally restricted in application to a Decorated entrance,

FUMEREL. See FEMERELL.

GABLE, sometimes Gavil (Fr. pignon, Ital. colma, Ger. Gebel). When a roof is not hipped or returned on itself at the ends, its ends are stopped by carrying up the walls under them in the triangular form of the roof itself. This is called the gable, or, in the case of the ornamental and ornamented gable, the pediment. Of course gables follow the angles of the slope of the roof, and differ in the various styles. In Norman work they are generally about half pitch ; in Karly English, seldom less than equilateral, and often more. In Decorated work they become lower, and still more so in the Perpendicular style. In all important buildings they are finished with copings or parapets. In early times the copings were nearly flat. In the later styles gables are often surmounted with battlements, or enriched with crockets ; they are also often panelled or perforated, sometimes very richly. The gables in ecclesiastical buildings are mostly terminated with a cross; in others, by a finial or pinnacle. In later times the parapets or copings were broken into a sort of steps, called corbie steps. In buildings of less pretension, the tiles or other roof covering passed over the front of the wall, which then, of course, had no coping. In this case the outer pair of rafters were concealed by moulded or carved verge boards. (See BaTri1- MENT, CoPinG, CORBIE STEPS, PARAPET, VERGE BoaRrD, &c.)

GABLE WINDow, a term sometimes applied to the large window under a gable, but more properly to the windows in the gable itself.

GABLED Towers, those which are finished with gables instead of parapets, as at Sompting. Many of the German Romanesque towers are gabled. ;

GaABLETSs, triangular terminations to buttresses, much in use in the Early English and Decorated periods, after which the buttresses generally terminate in pinnacles. The Early English gablets are generally plain, and very sharpin pitch. Inthe Decorated period they are often enriched with panelling and crockets. They are sometimes finished with small crosses, but oftener with finials.

GALILEE. This name is said to be derived from the Scriptural expression, " Galilee of the Gentiles." Galilees are supposed to have been used sometimes as courts of law, but chiefly for

enitents not yet admitted to the body of the church. At urham the galilee is a chapel at the main entrance into the nave.

GALLERY, any long passage looking down into another part of a building, or into the court outside. In like manner, any stage erected to carry a rood or an organ, or to receive spectators, was latterly called a gallery, though originally a loft. In later times the name was given to any very long rooms, particularly those intended for purposes of state. (See Lorr, TriFoR1UM.)

GARGOYLE or GURGOYLE (Fr. gargowille, canon, lanccur, Ital. doccia di gronda, Ger. Ausguss), the carved termination to a spout which conveyed away the water from the gutters, supposed to be called so from the gurgling noise made by the water passing through it. Gargoyles are mostly grotesque figures.

GARRETTING, properly GALLETTING, from gallet, a small piece of stone chipped off by the chisel. A method of protecting the mortar joints in rough walls by sticking in chips of stone while the mortar is wet.

GATE-HOUSE, a building forming the entrance to a town, the door of an abbey, or the enceinte of a castle or other important edifice. They generally had a large gateway protected by a gate, and also a portcullis, over which were battlemented parapets with holes (machicolations) for throwing down darts, melted lead, or hot sand, on the besiegers. Gatehouses always had a lodge, with apart- ments for the porter, and guard-rooms for the soldiers; and generally rooms over for the officers, and often places for prisoners beneath. They are sometimes open in the rear, as at Cooling Castle, and often have doors with portcullises, &c., on both sides, in case the enemy should scale the walls, and attack them both in front and rear. In this case, the space between, on the ground floor, was generally groined over, with holes for missile weapons.

GLYPH, a vertical channel in a frieze. (See TRIGLYPH.)

GRADINO (Ital. dim. of gradus, a step). Architects frequently apply the plural of this term, gradini, to such series of great steps as are found at the mausoleum at Halicarnassus.

GRANGE, a word derived from the French, signifying a large barn or granary. They were usually long buildings with high wooden roofs, sometimes divided by posts or columns into a sort of nave and aisles, and with walls strongly buttressed. In England the term is applied not only to the barns, but to the whole of the buildings which formed the detached farms belonging to the monasteries; in most cases there was a chapel either included

among these or standing apart as a separate edifice.

GRIFFE, a French term for an ornament at the angles of the base ot early pillars, for which we have no proper equivalent. It first

consisted of a single leaf, which became more claborate, and was, no doubt, the origin of the foliated bases.

GRILLE, the iron work forming the enclosure screen to a chapel, or the protecting railing to a tomb or shrine ; more commonly found in France than in England. Our best example, perhaps, is that round the tomb of Queen Eleanor in Westminster Abbey. They are of wrought iron, ornamented by the swage and punch, and put together either by rivets or clips.

Groin, by some described as the line of intersection of two vaults where they cross each other, which others call the groin point; by others the curved section or spandril of such vaulting is called a groin, and by others the whole system of vaulting is so named.

Groin Arcu (Fr. arc doubleau), the cross rib in the later styles of groining, passing at right angles from wall to wall, and dividing the vault into bays or travées.

GROIN CEILING, a ceiling to a building composed of oak ribs, the

‘ spandrils of which are filled in with narrow, thin slips of wood. There are several in England ; one at the Early English church at Warmington, and one at Winchester Cathedral, exactly resembl- ing those of stone.

GROIN CENTERING. In groining without ribs, the whole surface is supported by centering during the erection of the vaulting. In ribbed work the stone ribs only are supported by timber ribs during the progress of the work, any light stuff being used while filling in the spandrils.

GRoIN tone the name give by workmen to the arris or line of intersection of one vault with another where there are no ribs. Groin Ris (Fr. nerf d’aréte, Ital. costola, Ger. Rippe), the rib which conceals the groin point or joints, where the spandrils

intersect.

GROINED VAULTING (Lat. fornix, testudo, Fr. vodte d’aréte, Ital. Jornice), the system of covering a building with stone vaults whieh cross and intersect each other, as opposed to the barrel vaulting (voite de berceau), or series of arches placed side by side. The earliest groins are plain, without any ribs, except occasionally a sort of wide band from wall to wall, to strengthen the construction. In later Norman times ribs were added on the line of intersection of the spandrils, crossing each other, and having a boss as a key common to both; these ribs the French authors call nerfs en ogive. Their introduction, however, caused an entire change in the system of vaulting; instead of arches of uniform thickness and great weight, these ribs were first put up as the main con- struction, and spandrils (remplissage) of the lightest and thinnest possible material placed upon them, the haunches ‘only being loaded sufficiently to counterbalance the pressure from the crown. Shortly after, half ribs against the walls (formerets) were intro- duced to carry the spandrils without cutting into the walling, and to add to the appearance. ‘The work was now not treated as continued vaulting, but as divided into bays (travées), and it was formed by keeping up the ogive or intersecting ribs and their bosses ; a sort of construction having some affinity to the dome was formed, which added much to the strength of the groining. Of course the top of the soffit or ridge of the vault was not hori-

zontal, but rose from the level of the top of the formeret-rib to the boss and fell again; but this could not be perceived from below. As this system of construction got more into use, and as the vaults were required to be of greater span and of higher pitch, the spandrils became larger, and wanted more support. To give this another set of ribs was introduced, passing from the springers of the ogive ribs, and going to about half-way between these and the ogive, and meeting on the ridge of the vault; these inter- mediate ribs are called by the French tiercerons, and began to come into use in the transition from Harly English to Decorated. About the same period a system of vaulting came into use called hexpartite, from the fact that every bay is divided into six com- partments instead of four. It was invented to cover the naves of churches of unusual width. The filling of the spandrils in this style is very peculiar; and, where the different compartments meet at the ridge, some pieces of harder stone have been used, which have rather a pleasing effect. The arches against the wall being of smaller span than the main arches, cause the centre springers to be perpendicular and parallel for some height, and the spandrils themselves are very hollow. As styles progressed, and the desire for greater richness increased, another series of ribs called Jiernes, was introduced ; these passed cross-ways from the ogives to the tiercerons, and thence to the doubleaux, dividing the spandrils nearly horizontally. These various systems increased in the Perpendicular period, so that the vaults were quite a net- work of ribs, and led at last to the Tudor, or, as it is called by many, fan tracery vaulting. In this system the ribs are no part of the real construction, but are merely carved upon the vous- soirs, which form the actual vaulting. Fan Tracery is so called because the ribs radiate from the springers, and spread out like the sticks of a fan. These later methods are not strictly groins, for the pendentives are not square on plan, but circular, and there is therefore no arris intersection or Groin PornT (which see).

Groins, WELSH, or UNDERPITCH. When the main longitudinal

vault of any groining is higher than the cross or transverse vaults which run from the windows, the system of vaulting is called underpitch groining, or,

as termed by the workmen, Welsh groin- ing. A very fine example is at St George's Chapel, Windsor.

Grounp TaBLE. See BASE or A WALL.

GUILLOCHE or GUILLOcHOS (Gr. yutov, a member, and Adxos, asnare), an interlaced ornament like network, used most frequently to enrich the torus. A

Gurra (Lat. drops). The small cylindrical drops used to enrich the mutules and regula of the Doric entablature are so called.

Gurrer, the channel for carrying off rain-water. The medizval gutters differed little from others, except that they are often hollows sunk in the top of stone cornices, in which case they are generally called channels in English, and ehéneaua 1n French.

HAGIOSCcOPE, a term derived from the Greek, improperly used to describe certain oblique openings in the medieval buildings for the purpose of seeing the altar. (See SQUINT.) sane.

Hatt (Fr. salle, salon, Ital. sala, salone, Ger. Saal), the princi- pal apartment in the large dwellings of the Middle Ages used for the purposes of receptions, feasts, &c. In the Norman castle the hall was generally in the keep above the ground floor, where the retainers lived, the basement being devoted to stores and dungeons for confining prisoners. Later halls, indeed some Norman halls (not in castles), are generally on the ground. floor, as at Westminster, approached by a porch either at the end, as in this last example, or at the side, as at Guildhall, London, having at one end a raised Dats (which see) or Estrade. The roofs are generally open, and more or less ornamented. In the middle of these was an opening to let out the smoke (see LOUVRE, FEMERELL), though in later times the halls have large chimney places with funnels or chimney shafts for this purpose. At this period there were usually two deeply recessed bay windows at each end of the dais, and doors leading into the withdrawing- rooms or the ladies' apartments; they are also generally wain- scoted with oak, in small panels, to the height of five or six feet, the panels often being enriched. Westminster Hall was origi-

nally divided into three parts, like a nave and side aisles, as are some on the Continent.

Hewix (Gr. dc, a wreath or ringlet), used synonymously with "CAULICULUS, g.v. Its plural is Helices.

Herrinc-Bont Work, bricks or other materials arranged diagon- ally in building. ; HeEXxAsTYLe (Gr. ¢, six, and oridos, a column). A portico of six columns in front is of this description. Most of the churches in

London which have porticoes have hexaprostyles.

Hic Avtar, the principal altar in a cathedral or church. Where there is a second, it is generally at the end of the choir or chancel, not in the Lady Chapel. At St Albans it stood at the end of the nave, close to the choir screen.

Hip-Knos, the finial on the hip of a roof, or between the barge boards of a gable.

Hoop-Moutp, a word used to signify the drip-stone or label over a window or door opening, whether inside or out; but it seems more properly to be applied to the mouldings at the arris of the arch at the inner side of such opening. Sometimes these assume the form of a label, and have jamb-shafts. Frequently the soffit ts slightly hollowed and finishes with an arris. (See DRIPSTONE,

ABEL.)

HoreEL DE VILLE (Ital. broletto, palazzo, communale), the town-hall or guild-hall, in France, Germany, and Northern Italy. The build- ing in general serves for the administration of justice, the receipt of town dues, the regulation of markets, the residence of magis- trates, barracks for police, prisons, and all other fiscal purposes. As may be imagined, they differ very much in different towns, but they have almost invariably attached to them, or closely adjacent, a large clock-tower (beffrot), containing one or more bells, for calling the people together on_ special occasions.

Horen Dieu (Fr. maison dieu, Ital. ospedale, lo spedale), the name for an hospital in medieval times. In England there are but few remains of these buildings, one of which is at Dover ; abroad there are many. The most celebrated is the one at Angers, described by Parker. arrangement of plan from those in modern days—the accommoda- tion for the chaplain, medicine, nurses, stores, &c., being much the same in all ages, except that in some of the earlier, instead of the sick being placed in long wards like galleries, as is now done, they occupied large buildings, with naves and side aisles like churches. The reader is referred to the works of Parker, Viollet-le-Duc, and Verdier and Cattois, for further details.

Hypaxturos (Gr. iad, under, and aiéfp, the air), a temple open to the air, or uncovered. The term may be the more easily under- stood by supposing the roof removed from over the nave of a church in which columns or piers go up from the floor to the ceiling, leaving the aisles still covered.

Hyvocea (Gr. oro, under, and yi, the earth), constructions under the surface of the earth, or in the sides of a hill or mountain.

HyporracnEnium (Gr. ord, under, and tpaxndos, the neck), the

They do not seem to differ much in.

moulding or the groove at the junction of the shaft with the capi- tal of a column. In some styles the hypotrachelium is a project- ing fillet or moulding, and in others, as the Doric, it is composed of a channel or groove, and sometimes of more than one.

IcunoGRAPuy (Gr. txvos, a footstep or track, and ypaph, a descrip- tion or representation), the drawing of a plan, or representation of the site of an object on a horizontal plane.

Impost, a term in classic architecture for the horizontal mouldings of piers or pilasters, from the top of which the archivolts or mouldings which go

round the arch spring. The word is scarcely applicable to medieval architecture, as the mouldings in general spring from the capital of a shaft, or from a corbel ; or they con- tinue without breaking down to the base, or till they are stopped by a chamfer or a regular base moulding, or they die into a plain shaft, or at any rate one of different section.

INTERCOLUMNIATION, the distance from column to column, the clear space between columns.

INTERLACED ARCHES, arches where one passes over two openings, and they cousequently cut or intersect each other.

Iron Work, in medizval architecture, as an ornament is chiefly confined to the hinges, &c., of doors and of church chests, Xe. Specimens of Norman iron work are very rare. Early English speciniens are numerous, and very elaborate. In some instances not only do the hinges become a mass of scroll work, but the surface of the doors is covered by similar ornaments. In both these periods the design evidently partakes of the feeling exhibited in the stone or wood carving. In the Decorated period the scroll work is more graceful, and, like the foliage of the time, more natural. As styles progressed, there was a greater desire that the framing of the doors should be richer, and the ledges were cham- fered or raised, then panelled, and at last the doors became a mass of scroll panelling. 'his, of course, interfered with the design of the hinges, the ornamentation of which radually became un- usual. In almost all styles the smaller ame less important doors had merely plain strap hinges, terminating in a few bent scrolls, and latterly in flewrs-de-lis. Escutcheon and ring handles, and the other furniture, partook more or less of the character of the time. On the Continent the knockers are very elaborate. Atall ee doors have been ornamented with nails having projecting

eads, sometimes square, sometimes polygonal, and sometimes ornamented with roses, &c. The iron work of windows is gene- rally plain, and the ornament confined to simple fleur-de-lis heads tothe stancheons. The iron work of screens enclosing tombs and. chapels is noticed under GRILLE, q. ¥.

Jams, the sidc-post or lining of a doorway or other aperture. The jainbs of a window outside the frame are called Reveals.

Jaup-Suarr. Small shafts to doors and windows with caps and bases; when in the inside arris of the jamb of a window they are sometimes called Esconsons.

JAMBETTS, a French term for the upright ashlar piece between the inside of the plate and the rafters.

Juse, one of the names of the ambo or reading desk in the early Christian church. In later times, a term especially applied to the rood-loft or gallery over the screen, whence the words " Jube, Domine, benedicere," &c., were read.

KxEL-MovuLDING, a round on which there is a small fillet, somewhat like the keel of a ship. It is common in the Early English and Decorated styles.

Keer (Fr. donjon), the inmost and strongest part of a medieval castle, answering to the citadel of modern times. The arrange- ment is said to have originated with Gundulf, the celebrated bishop of Rochester. The Norman keep is generally a very massive square tower, the basement, or stories partly below ground being used for stores and prisons. The main story is generally a great deal above ground level, with a projecting entrance, approached by a flight of steps and drawbridge. This floor is generally supposed to have been the guard-room or place for the soldiery ; above this was the hall, 'which generally extended over the whole area of the building, and is sometime separated by columns; above this are other apartments for the residents. There are winding staircases in the angles of the buildings, and passages and sinall chambers in the thickness of the walls. The keep was intended for the last refuge, in case the outworks were scaled and the other buildings stormed. There is generally a well in a medieval keep, ingeniously concealed in the thickness of a wall, or in a pillar. The most celebrated of Norman times are the White Tower in London, the castles at Rochester, Arundel, and Newcastle, Castle Hedingham, &. The keep was often circular, as at Conisborough and Windsor.

Kry-Srong, in classic architecture, the centre youssoir of an arch, often ornamented with carving. In Pointed architecture there is often no key-stone. For those to groined arches, see Boss.

sar Knot, the bunch of flowers carved on a Corbel, or on a

oss.

LABEL, the outer projecting moulding over doors, windows, arches, &c., sometimes called Dripstone or Weather Moulding, or Hood- Mould. The former terms seem scarcely applicable, as this mould-

ing is often found inside a building where no rain eould 'come,

and consequently there is no drip. The Jatter term is desertbed under Hoop-Mou.p. In Norman times the label frequently did

not project at all, and when it did it was very little, and formed part of the series of arch mouldings. Jn the Early English styles they were not very large, sometimes slightly undercut, sometimes deeply, sometimes a quarter round with chamfer, and very fre- quently a "roll" or 'scroll moulding,' so called because it resembles the part of a scroll where the edge laps over the body of the roll. Labels generally resemble the string-courses of the periods, and, in fact, often return horizontally and form strings. They are less common in Continental architecture than in English. (See Drirstong, Hoop-MouvLp, SrRinc-CouURSES.)

LABEL TERMINATIONS, carvings on which the labels terminated near the springing of the windows. In Norman times these were fre- quently grotesque heads of fish, birds, &c., and sometimes stiff foliage, as at Shoreham. In the Early English and Decorated periods they are often elegant knots of flowers, or heads of kings, queens, bishops, and other persons supposed to be the founders of churches. In the Perpendicular

period they often finished with a short, square mitred return or knee, and the foliages are generally leaves of square or octagonal form.

Lacunar (Lat.), a panelled or coffered ceiling or soffit. The panels or cassoons of a ceiling are by Vitruvius called lacwnaria.

LANTERN (Lat. laterna), a turret raised above a roof or tower, and very much pierced, the better to transmit light. In modern practice this term is generally applied to any raised part in a roof or ceiling containing vertical windows, but covered in hori- zontally. The name was also often applied to the louvre or femerell on a roof to carry off the smoke ; sometimes, too, to the open constructions at the top of towers, as at Ely Cathedral, Boston in Lincolnshire, probably because lights were placed in them at night to serve as beacons.

LANTERNS OF THE DEAD, curious small slender towers, found chiefly in the centre and west of France, having apertures at the top, where a light was exhibited at night to mark the place of a cemetery. Some have supposed that the round towers in Ireland may have served for this purpose.

Lavaso (Fr. lavoir, Ital. lavatoio), the lavatory for washing hands, generally erected in the cloisters of monasteries. Those at Glou- cester, Hemaich, and Lincoln are best known. A very curious one at Fontenay, surrounding a pillar, is given by Viollet-le-Duc. In general it is a sort of trough, and in some places has an almery for towels, &c.

Licn GATE, a covered gate at the entrance of a cemetery, under the shelter of which the mourners rested with the corpse, while the procession of the clergy came to meet them. There is a very fine one at Ashwell, Herts.

Lizrve Ri, a rib crossing nearly horizontally from the ogive ribs to the tiercerons or the arcs doubleaux, or forming patterns in fan and stellar vaulting. (See GROINED VAULTING.)

Lip MovLp, a moulding of the Perpendicular period like a hanging

ip.

ez, the highest room in a house, particularly if in the roof; also a gallery raised up in a church to contain the rood, the organ, or singers.

Loop Hote (Fr. archiére, meurtriere, Ital. feritoia), an opening in the wall of a building, very narrow on the outside, and splayed within, from which arrows or darts might be discharged on an enemy. They are often in the form of a cross, and generally have round holes at the ends. (See OYLETS.)

Louvre, a lantern upon the roof of a hall for the passage of the smoke, when the fire was made on the pavement in the middle. (See FEMERELL, LANTERN.)

Lucarng, a French term for a garret window ; also used to signify the lights or small windows in spires.

Lurrers (probably the same as Louvres), pieces of board, slate, or stone, placed slanting so as to exclude the rain, but to allow the passage of smoke, the sound of bells, &c.

Lunerre, the French term for the circular opening in the groining of the lower stories of towers through which the bells are drawn

up.

MAcHICOLATION (Fr. machicoulis), an opening between a wall aud a parapet, formed. by corbelling over the latter, so that the defen- ders of the building might throw down darts, stones, and some- times hot sand, melted lead, &c., upon their assailants below.

Manor Housg, the residence of the suzerain or Jord of the manor ; in France the central tower or keep of a castle is often called the manoir. (See KEEp.)

Merton, the solid part of a parapet between the embrasures of a battlement, sometimes pierced by loop-holes.

Merore (Ur. perdwn, a middle space), the square recess between the triglyphs in a Doric frieze. It is sometimes occupied by sculptures.

MEZZANINE (Ital. mezzanino, dim. of mezzo, the middle), a low story between two lofty ones. Itis called by the French entresol, or inter-story.

Minster (Ger. Minster), probably a corruption of monasterium— the large chureh attached to any ecclesiastical fraternity. If the latter be presided over by a bishop, it is generally called a Cathe- dral; if by an abbot, an Abbey; if by a prior, a Priory.

MISERERE (Fr. miséricorde, Ital. predella), a seat in a stall of a large church made to turn up and afford support to a person in a position between sitting and standing. The under side is generally carved with some ornament, and very often with strange grotesque figures and caricatures of different persons. (See STALL.)

Mirre. A moulding returned upon itself at right angles is said to mitre. In joinery the ends of any two pieces of wood of eorre- sponding form cut off at 45° necessarily abut upon one another so as to form a right angle, and are said to mitre.

Mopiuion (Lat. modulus, a measure of proportion), so called because of its arrangement in regulated distances, the enriched block or horizontal bracket generally found under the cornice of the Corinthian entablature. Less ornamented, it is sometimes used in the Jonic. (See also MuTULE.)

MopuvLe (Lat. modulus, from modus, a measure or rule). This is a term which has been generally used by architects in determining the relative proportions of the various parts of a columnar ordi- nance. The semidiameter of the column at its base is the module, which being divided into thirty parts ealled minutes, any part of the composition is said to be of so many modules and minutes, or minutes alone, in height, breadth, or projection. The whole diameter is now generally preferred as a module, it being a better rule of proportion than its half.

MoNASTERY, a set of buildings adapted for the reception of any of the various orders of monks, the different parts of which are de- scribed in the separate article ABBEY.

Monorrrros (Gr. pdévos, one, or single, and mrepdv, & Wing).

This term is used by Vitruvius to describe a temple composed of a circular range of columns supporting a tholus, cupola, or dome, but without walls. (See PEripreros.) Such an edifice would be more correctly designated as Cyelostylar. (See CYCLOSTYLE.)

MonorrichyPu (Gr. pévos, one, or single, and TRIGLYPH, g.v.) The

intercolumniations of the Doric order are determined by the number of triglyphs which intervene instead of the number of

diameters of the column as in other cases; and this term desig- nates the ordinary intercolumniation of one triglyph.

MonvuMENT, a name given to a tomb, particularly to those fine

structures recessed in the walls of mnedieval ehurches.

Mosaic (Lat. opus musivwm, Ital. musaico, Fr. mosatque),

pictorial representations, or ornaments formed of small pieces of stone, marble, or enamel of various colours. Jn Roman houses the floors are often entirely of mosaic, the pieces being cubieal.

There are several fine specimens in Westminster Abbey, parti- cularly the pavement of the choir.

Movutpine (Lat. modulus, Ital. modanatura, Fr. moulure, Ger.

Simswerk). When any work is wrought into long regular chan- nels or projections, forming curves or rounds, hollows, &e., it is said to be moulded, and each separate member is called a mould- ing. In medieval architecture the ptincipal mouldings are those of the arches, doors, windows, piers, &c. The remains of Saxon work are so few, that we can tell but little about these mouldings. The arches have sometimes a simple rib on them, sometimes are chamfered, and sometimes are quite plain. Early Norman work is much the same. By degrees, however, the arrises were finished by around or bowtell. Later, hollows and rounds together became

common, and the arches were set back one behind another, each being frequently supported by a jamb-shaft or column, though very often the arch mouldings continued down the jambs without any break. In the Early English style, the mouldings, for some time, like those of the receding period, formed groups set back in squares ; they are oriiailes: lighter, more graccful, and frequently very deeply undercut. The scroll moulding is also common. Small fillets now became very frequent in the outer parts of the rounds. This has often been called the keel moulding, from its resemblance in section to the bottom of a ship: sometimes also it has a peculiar hollow on each side like two wings. Later in the Decorated style the mouldings are more vavied in design, though hollows and rounds still prevail. The undercutting is not so deep, fillets abound, ogees are more frequent, and the wave mould, double ogee, or double ressaunt, is often seen. In many places the strings and labels are a round, the lower half of which is cut off by a plain chamfer. The mouldings in the later styles in some degree resemble those of the Decorated, flattened and extended; they run more into one another, having fewer fillets, and being as it were less grouped. One of the principal features of the change is the substitution of one, or perhaps two (seldom more), very large hollows in the set of mouldings. These hollows are neither circular nor elliptical, but obovate, like an egg cut across, so that one-half is Jarger than the other. The brace mould also has a small bead, where the two ogees meet. Another sort of moulding, which has been called a lip mould, is common In para

ts, bases, and weatherings. For the ancient mouldings see the general article, supra.

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MovuLprines, ORNAMENTED. The Saxon and early Norman mould- ings do not seem to have been much enriched, but the complete and later styles of Norman are remarkable fora profusion of orna- mentation, the most usual of which is what is called the zig-zag. This seems to be to Norman architecture what the meander or fret was to the Grecian ; but it was probably derived from the Saxons, as it is very frequently found in their pottery. Bezants, quatrefoils, lozenges, crescents, billets, heads of nails, are very common ornaments ; besides these, battlements, cables, large ropes,

round which smaller ropes are turned, or, as our sailors say, “wormed,” scallops, pellets, chains, a sort of conical barrels, quaint stiff foliagcs, beaks of birds, heads of fish, ornaments of almost every conceivable kind, are sculptured in Norman mould- ings ; and they are used in such profusion as has been attempted in no other style. The decorations on Early English mouldings are chiefly the dog-tooth, which is one of the great characteristics of this style, though it is to be found in the Transition Norman. It is generally placed in a deep hollow between two projecting mouldings, the dark shadow in the hollow contrasting in a very beautiful way with the light in these mouldings. In this period and in the next the tympanum over doorways, particularly if they are double doors, is highly ornamented. Those of the Decorated period resemble the former, except that the foliage is more natural, and the dog-tooth gives way to the ball-flower. Some of the hollows also are ornamented with rosettes set at intervals, which are sometimes connected by a running tendril, as the ball-flowers are frequently. Some very pleasing leaf-like ornaments in the labels of windows are often found in Continental architecture. In the Perpendicular period the mouldings are ornamented very frequently square four-leaved flowers set at intervals, but the two characteristic ornaments of the time are running patterns of vine leaves, tendrils, and grapes in the hollows, which by old writers are called “ vignettes in casements,”’ and upright stiff leaves, generally called the Tudor leaf. Ox the Continent mould- ings partook much of the same character.

Mu.iion, Munton, often corrupted into munting, monyal (Fr. meneau, Ital, regolo, Ger. Fensterpfoste). The perpendicular pieces of stone, sometimes like columns, sometimes like slender piers, which divide the bays or lights of windows or screen work from each other. In all styles, in less important work, the mullions are often simply plain chamfered, and more commonly have a very flat hollow on each side. In larger buildings there is often a bead or bowtell on the edge, and often a single very small column with a capital; these are more frequent in foreign work than in English. Instead of the bowtell they often finish with a sort of double ogee. As tracery grew richer, the windows were divided by a larger order of mullion, between which came a lesser or subordinate set of mullions, which ran into each other. x

MorTuLeE (Lat. mutulus, a stay or bracket), the rectangular impend- ing block under the corona of the Dorie cornice, from which gntte or drops depend. Mutule is equivalent to modillion, but the latter term is applied more particularly to enriched blocks or brackets, such as those of Ionic and Corinthian entabla-

- *tures.*

Naos (Gr. vads, a temple). This term is sometimes used instead of the Latin cclla, as applied to the interior ; strictly, however, it sl the body of the edifice itself, and not merely its interior or cell.

Narruex (Gr. vdp@nt, a ferula or rule), the long arcaded porch forming the entrance into the Christian basilica. Sometimes there was an inner narthex or lobby before entering the church. When this was the case, the former was called exo-narthex, and the latter eso-narthex. In the Byzantine churches this inner narthex forms part of the solid structure of the church, being marked off by a wall or row of columns, whereas in the Latin churches it was usually formed only by a wooden or other tem- porary screen.

Nave (Lat. navis, Ital. navata, Fr. nef, Ger. Schiff), the central part between the arches of a church, which formerly was separated from a chancel or choir by a screen. It is so called from its fancied resemblance to a ship. In the nave were generally placed the pulpit and font. Abroad it often also contains a high altar, but this is of rare occurrence in England. Instances of this, however, are to be found at Durham and St Albans.

Neckin¢, the annulct or round, or series of horizontal mouldings, which separates the capital of a column from the plain part or a shaft. In Norman work they are often corded.

Newe. (Fr. noyau, Ital. albero duna scala, Ger. Spindel), in medieval architecture, the circular ends of a winding staircase which stand over each other, and form a sort of cylindrical column.

Nicue (Fr. niche, Ital. nicchia, Gr. Nische), a recess sunk ina wall, generally for the reception of a statue. They sometimes are terminated by a simple

label, but more commonly by a canopy, and with a bracket or corbel for the figure, in which case they are often called tabernacles.

ARUCRIPL CUR SE

[GLOSSARY.

OcTASTYLE (Gr. éxré, eight, and ordAos, a column), a portico of eight columns in front.

OcEE (Lat. cyma reversa, Ital. gola dritta, gola a rovescio, Fr. cimaisc, doucine, gorgc, gueule, gueule renversée, talon, Ger. Hohl- leisten), the name applied to a moulding, partly a hollow and partly a round, and derived no doubt from its resemblance to an O placed overa G. It is rarely found in Norman work, and is not very common in Early English. It is of frequent use in the Decorated, where it becomes sometimes double, and is called a wave moulding ; and later still, two waves are connected with a small bead, which is then called a brace moulding. In ancient MSS. it is called a REssAunNT, q.v.

OctvE, a term applied by the French to the pointed arch. OciIvE Ris, the main ribs which cross each other on the interscction of the vaulting. (See GROINED VAULTING.)

Oratory (Fr. oratotre), a small chapel or place for prayer for the use of private individuals, generally attached to a mansion, and sometimes to a church. The name is also given to small chapels built to commemorate some special deliverance.

OrpreR, A column with its entablature and stylobate is so called. The term is the result of the dogmatic laws deduced from the writings of Vitruvius, and has been exclusively applied to those arrangements which they were thought to warrant. For the different details of an order, see Plate XXIV., fig. 1.

ORDER, the name given to the subordinate mullious and tracery which are of smaller size than others in the same window, &c. Itis also applied to the groups of mouldings arranged on square faces set back behind one another

in Norman and Early English work, and not cut in on the splayed faces of the jambs and arch moulds as in subsequent periods.

ORDINANCE, a composition of some particular order or style. It need uot be restricted to a columnar composition, but applies to any species which is subjected to conventional rules for its arrange- ment.

ORIEL or ORYEL. See BAY WINDOW.

OntHocRrarny (Gr. ép0és, straight or true, and ypaph, a description or representation), a geometrical elevation of a building or other object, in which it is represented as it actually exists or may exist, and not perspectively, or as it would appear.

ORTHOSTYLE (Gr. ép6és, straight or true, and ordAos, a column), any straight range of columns. This is a term suggested to designate what is generally but improperly called a PERISTYLE, q.v., that is, columns in a straight row or range, but not forming a portico.

OssUAIRE. See CHARNEL House.

Ovoto (from the Ital., meaning egg-formed), the name most com- monly applied to the moulding which appears to have originated in the moulded head of the Doric column, and which, with an abacus, formed its capital.

OYLEMENTS, a word used in the Beauchamp Roll, signifying the small quatrefoil lights in the head of a Perpendicular window. OYLETS, or OIELLETS, a name sometimes applied to the arrow-slits in towers, &c.; but it seems more probable its strict meaning is

the round hole or circle with which these terminate.

Pace, the landing on a broad step in a stair; also any stage raised above the floor.

Pan or Pang. See Post AND PANE Work.

PANE, probably a diminutive of panneau, a term applied to a bay ofa window, compartment of a partition, side of a tower, turret, &c. (See Bay.)

PANEL (Fr. panneau, Ital. quadretto, formello, Ger. Feld), ppey the piece of wood framed within the styles and rails of a door, filling up the aperture, but often applied both to the whole square frame and the sinking itself ; also to the ranges of sunken compartments in cornices, corbel tables, groined vaults, ceilings, &c. In Norman work these recesses are generally shallow,

and more of the nature of arcades. In Early English work the square panels are ornamented with quatrefoils, cusped circles, &c., and the larger panels are often deeply recessed, and form niches with trefoil heads and sometimes canopies. In the Decorated style the cusping and other enrichments of panels become more elabo- rate, and they are often filled with shields, foliages, and some- times figures. Towards the end of this period the walls of important buildings were often entirely covered with long or square panels, the former frequently forming niches with statues. The use of panels in this way became very common in Perpendi- cular work, the wall frequently being entirely covered with long, short, and square panels, which latter are frequently richly cusped, and filled with every species of ornament, as shields, bosses of foliage, portcullis, lilies, Tudor roses, &c. Wooden panellings very much resembled those of stone, except in the Tudor period, when the panels were enriched by a varied design, imitating the plaits of a piece of linen or a napkin folded in a great number of parallel lines. This is generally called the linen pattern. Wooden ceilings, which are very common, are composed of thin oak boards nailed to the rafters, collars, &c., and divided into panels by oak mouldings fixed on them, with carved bosses at the intersections.

*GLOSSARY.]_*

PARADISE, ParvisE, PARvycr, a word of uncertain origin, but supposed to be a corruption of paradisus, an enclosed garden. Paradises were open places surrounded with an enceinte or stone parapet in front of cathedrals or other great buildings, and probably were used to keep the people from pressing on and confusing the marshalling of the public processions. That at Notre Dame, at Paris, is of irregular shape; that at Amiens was round. Nothing of the kind is left in England, though, from a passage in Chaucer, it is supposed there was one in the front of Westminster Hall. The Promptoriwum Parvulorum calls a par- vise parlatoriwm, a place for conversation. The small chambers over porches have also been named parvises. The irregularly- shaped cloister at Chichester is still called a paradise.

ParaPer (from the Italian parapetto, something which comes against the breast, ¢.¢., to lean against, Fr. parapet, Ger. Brust- wehre), a dwarf wall

along the edge of a roof, or round a lead flat, terrace walk, &c., to prevent persons from falling over, and as a protection to the defenders in case of a siege. Parapets are either plain, embattled, perforated, or panelled. The last two are found in all styles except the Norman. Plain parapets are simply portions of the wall generally overhanging a little, with a coping at the top and corbel table below. Embattled parapets are some- times panelled, but oftener pierced for the discharge of arrows, &c. Perforated parapets are pierced in various devices—as circles, trefoils, quatrefoils, and other designs—so that the light is seen through. Panelled parapets are those ornamented by a series of panels, either oblong or square, and morc or less enriched, but are not perforated. These are common in the Decorated and Perpendicular periods.

PARASCEN1UM, in a Greek theatre, the wall at the back of the stage.

Parastas (Gr. wapaords, standing before), an end pilaster, the — a for which the Latin aniw is generally used. (See

NT.

PARCLOSE, a word used for any enclosure to a chantry, tomb, &c.

PAREMENT, a French term for the outside ashlar or casing of a rubble wall, which is tied together by through or bond stones. (See PERPENT.)

PARGETTING, a species of plastering decorated by impressing patterns on it when wet. These seem generally to have been made by sticking a number of pins in a board in certain lines or curves, and then pressing on the wet plaster in various directions, so as to form gcometrical figures. Sometimes these devices are in relief, and in the time of Elizabeth represent figures, birds, foliages, &c.; fine examples are to be secn at Ipswich, Maidstone, Newark, &c. The word (which is Latinised gypsacio in the Promptorium) may be derived from the old French giter, to cast, to throw, as outside plastering is often thrown against the laths to make it adhere better. (See RovcH Cast.)

PARVISE. See PARADISE.

Patin, PATAND, from the French patin, a wooden sole, clog, or patten. The sills in timber-framing are thus named in some old works, though modern French authors call them sabdiéres.

PEpEsTAL, An insulated stylobate is for the most part so called. The term is, moreover, generally applied to any parallelogramic or cylindrical mass, used as the stand or support of any single object, as a statue or vase.

PED1MENT, that part of a portico which rises above its entablature to inclose the end of the roof, whose triangular form it takes. The cornice of the entablature, or its corona, and part of the bed- mould only, with the addition of a cymatium, bounds its inclined sides, and gives it an obtuse angle attheapex. In Pointed arclii- tecture, however, the angle of a pediment is for the most part acute.

PENDENT, a name given to an elongated boss, either moulded or foliated, such as hang down from the intersection of groins, especially in fan traccry, or at the end of hammer beams. Sometimes long corbels, under the wall pieces, have been so called. The name has also been given to the large masses depending from enriched ceilings, in the later works of the Pointed style.

PENDENT Posts, a name given to those timbers which hang down the side of a wall from the plate, and which receive the hammer braces.

PENDENTIVE, a name given to an arch which cuts off, as it were, the corners of a square building internally, so that the super- structure may become an octagon ora dome. In medieval archi- tecture these arches, when under a spire in the interior of a tower, are called SquincHEs (which see).

Prripoius (Gr. wept, around or about, and BdAdw, to throw), an inclosure. Any inclosed space is a peribolus; but the term is applied more particularly to the sacred enclosure about a temple. The wall forming the enclosure is also called the peribolus.

PeRipTEros (Gr. wepf, around or about, and mrepdy, a wing), a temple or other structure with the columns of its end prostyles, or porticoes, returned on its sides as wings at the distance of one intercolumniation from the

walls. Almost all the Doric temples ofthe Greeks were peripteral. The term is applied by Vitruvius to peristylar structures.

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PrERISTYLE (Gr. wept, around or about, and ordAes, a column), a range of columms encircling an edifice, such as that which snr- rounds the cylindrical drum under the cupola of St Paul's. The columns of a Greek peripteral temple form a peristyle also, the former being a circular, and the latter a quadrilateral peristyle.

PERPENT STONES (Fr. parpaing), bond or " through stones," the diardvor of the Greeks and Romans. Long stones going right through walls, and tying them together from face to face.

Perron, the grand flight of external steps entering the mansions of the medizval nobility or high officials, and considered in itself as a mark of jurisdiction, as it is said that sentence was there pronounced against criminals, who were afterwards executed at the foot of the steps—as at the Giant Stairs at Venice. One of the finest later examples is the flight in the Horse-shoe Court at Fontainebleau.

Prws, a word of uncertain origin, signifying fixed seats in churches, composed of wood framing, mostly with ornamented ends. They seem to have come into general use early in the reign of Henry VI., and to have been rented and "well payed for" (see Bale's Image of Both Churches) before the Reformation. Some bench ends are certainly of Decorated character, and some have been considered to be of the Early English period. They are some- times of plain oak board, 24 to 3 inches thick, chamfered, and with a necking and finial generally called a poppy head; others are plainly panelled with bold cappings; in others the panels are ornamented with tracery or with the linen pattern, and sometimes with running foliages. The divisions are filled in with thin chamfered boarding, sometimes reaching to the floor, and some- times only from the capping to the seat.

Piers, the solid parts of a wall between windows and between voids generally. The term is also applied to masses of brickwork or masonry

which are insulated to form supports to gates or to carry arches,

PicNon, a French term for the gable of a roof. (See GABLE.)

Pitaster (from Lat. pila, a pillar), an inferior sort of column or pillar; a projection from or against a pier, with the form and decorations of ante, but frequently (always in Roman examples) having capitals, like those of columns, assigned them.

Priuar, or PYLLER (Fr. pilier, Ital. pilastro, colonna, Ger. Pfeiler), a word generally used to express the round or polygonal piers or those surrounded with clustered columns, which carry the main arches of a building. Saxon and early Norman pillars are generally stout cylindrical shafts built up of small stones. Some- times, however, they are quite square, sometimes with other squares breaking out of them (this is more common on the Conti- nent), sometimes with angular shafts, and sometimes they are plain octagons. In Romanesque Norman work the pillar is sometimes square, with two or more semicircular or half columns attached. In the Early English period the pillars become loftier and lighter, and in most important buildings area series of clustered columns, frequently of marble, placed side by side, sometimes set at inter- vals round a circular centre, and sometimes almost touching each other, These shafts are often wholly detached from the central, pillar, though grouped round it, in which case they are almost always of Purbeck or Bethersden marbles. In Decorated work the shafts on plan are very often placed round a square set angle- wise, or a lozenge, the long way down the nave; the centre or core itself is often worked into hollows or other mouldings, to show between the shafts, and to form part of the composition. In this and the latter part of the previous style there is generally a fillet on the outer part of the shaft, forming what has been called a keel moulding. They are also often as it were tied together by bands formed of rings of stone and sometimes of metal. About this period, too, these intermediate mouldings run up into and form part of the arch moulds, the impost not being continuous ; or rather there is no impost, but the shafts have each their own separate cap. (See Impost.) This arrangement became much more frequent in the Perpendicular period; in fact it was almost universal, the commonest section being a lozenge set with the long side from the nave to the aisle, and not towards the other arches, as in the

Decorated period, with four shafts at the angles, between which were shallow mouldings, one of which in general was a wide hollow, sometimes with wave moulds. As the pillar altogether by the arrangement was wider than the wall above, the shafts facing the nave ran up to the roof, and served in place of the vaulting shafts of the previous periods. The small pillars at the jambs of doors and windows, and in arcades, and also those slender columns attached to pillars, or standing detached, are generally called Suarts (which see.)

PittowEp. A swollen or rounded frieze is said to be pillowed or pulvinated. ;

Pinnacte (Fr. pinacle, finoison, Ital. pinacolo,—literally a little feather—Ger. Pinnakyl), an ornament originally forming the cap or crown of a buttress or small turret, but afterwards used on parapets at the corners of towers and in many other situations. Some writers have stated there were no Norman pinnacles; but conical caps to circular buttresses, with a sort of finial, are not

‘uncommon in France at very carly periods. Viollet-le-Duc gives

examples from St Germer and St Remi, and there is one of siniilar form at the west front of Rochester Cathedral. In the later Norman period, two examples have been cited, one from Bredon in Worcestershire, and the other from Cleeve in Glou- cestershire. In these the buttresses run up, forming a sort of square turret, and crowned with a pyramidal cap, very much like those of the next period, the Early English. In this and the following styles the pinnacle seems generally to have had its appropriate uses. It was a weight to counteract the thrust of the groining of roofs, particularly where there were flying buttresses ; it stopped the tendency toslip of the stone copings of the gables, and counterpoised the thrust of spires ; it formed the piers to steady the elegant perforated parapets of later periods; and in France especially served to counterbalance the weight of overhang- ing corbel tables, huge gargoyles, &c. In the Early English period the smaller buttresses frequently finished with GABLETS (which see), and the more important with pinnacles supported with clustered shafts. At this period the pinnacles were often sup- ported on these shafts alone, and were open

below ; and in larger work in this and the subsequent periods they frequently form niches and contain statues. About the Transition and during the Decorated period, the different faces above the angle shafts often finish with gablets. Those of the last-named period are much richer, and are gencrally decorated with crockets and finials, and sometimes with ball-{lowers. Very fine groups are found at Beverley Minster and at the rise of the spire of St Mary's, Oxford. Perpendicular pinnacles differ but little from Decorated, except that the crockets and finials are of later character. They are also often set angle-ways, particularly on parapets, and the shafts are panelled. In France, pinnacles, like spires, scem to have been in use earlier than in England. There are small pinnacles at

' the angles of the tower in the Abbey of Saintes. At Roullet there are pinnacles in a similar position, cach composed of four small shafts, with caps and bases surmounted with small pyra- midal spires. In all these examples the towers have semicircular headed windows.

PiscINm, one or more hollows or cwvettes near the altars, with drains to take away the water used in the ablutions at the mass. They seem at first to have been mere cups or small basins, supported on perforated stems, placed close to the wall, and afterwards to have been recessed therein and covered with niche heads, which often contained shelves to serve as aumbries. They are rare in England till the 18th century, after which there is scarcely an altar without one. 'They frequently take the form of a double niche, with a shaft between the arched heads, which are often filled with elaborate tracing.

Prrou or A Roor, the proportion of the height of a roof to its span. (See GABLE.)

PLAN, a horizontal geometrical section of the walls of a building ; or indications, on a horizontal plane, of the relative positions of the walls and partitions, with the various openings, such as windows and doors, recesses and projections, chimneys and chimney-breasts, columns, pilasters, &c. This term is often incorrectly used in the sense of DEsIGN, q.v.

PLANCEER is sometimes used in the same sense as soffit, but is more correctly applied to the soffit of the corona in a cornice. PLASTERING (Fr.

pldtre, Ital. intonaco, Ger. Putzarbeit), a mixture of lime, hair, and sand, to cover lath-work between timbers or rough walling, used from the earliest times, and very common in Roman work. In the Middle Ages, too, it was used not only in private but in public constructions. On the inside face of old rubble walls it was not only used for purposes of cleanliness, rough work holding dirt and dust, but as a ground for distemper painting (tempera, or, as it is often improperly called, fresco), a species of ornament often used in the Middle Ages. At St Alban's Abbey the Norman work is plastered and covered with lines imitating the joints of stone. The same thing is found in the Perpendicular work at Ash in Kent. On the outside of the like walls, and often of wood-framing, it was used as rough cast; when ornamented in patterns outside, it is called

pargetting.

Puintu (Gr. wAlvdos, a square tilc). In the Roman orders the lowest member of the base 'of a column is square and vertically faced; this is called a plinth.

Popium, strictly something upon or against which the foot may be placed ; and in this sense, probably, it was applied to the wall which bounds the arena of an amphitheatre, and is thereby at the feet of the most advanced of the spectators.

PoLYTRIGLYPH, an intercolumniation in the Doric order of more than two triglyphs. (See Monorrictypn, Dirrictyru, and TRIGLYPH.)

PoMMEL, a name given to any round knob, as a boss, a finial, &c.

Popry Heaps, probably from the French powpée, the finials or other ornaments which terminate the tops of bench ends, either to pews or stalls. They are sometimes small human heads, sometimes richly-carved images, knots of foliages, or finials, and sometimes

ARC HETSACYrUERE

[GLOSSARY.

fleurs-de-lis simply cut out of the thickness of the bench end and chamfered.

Porcu (Gr. vdpént, Lat. porticus, Fr. porche, Ital. portico, Ger. Vorhalle), a covered ereetion forming a shelter to the entrance door of a large building. The earliest known are the long arcaded porches in front of the early Christian basilicas, called NARTHEX (which see). In later times they assume two forms—one the projecting erection covering the entrance at the west front of cathedrals, and divided into three or more doorways, &c., and the other a kind of covered chambers open at the ends, and having small windows at the sides as a protection from rain. These generally stand on the north or south sides of churches, though in Kent there are a few instances (as Snodland and Boxley) where they are at the west ends. Porches are of very early use. Those of the Norman period generally have but little projection, and are sometimes so flat as to be but little more than outer dressings and hood-moulds to the inner door. They are, however, often very richly ornamented, and, as at Southwell in England and Kelso in Scotland, have rooms over, which have been erroneously called parvises. (See Parapisu.) Early English porches are much longer, or project much further from the faces of the churches to which they are attached, and in larger and more important buildings have very frequently rooms above ; the gables are generally bold and high pitched. In larger buildings also, as at Wells, St Albans, &c., the interiors are very rich in design, quite as much so, in fact, as the exteriors. Decorated and Per- pendicular porches partake of much the same characteristics, the pitch of roof, mouldings, copings, battlements, &c., being of course influenced by the taste of the time. As a general rule, however, the later porches had rooms over them more frequently than in earlier times; thcse are often approached from the lower story by small winding stairs, and sometimes have fire-places, and are supposed to have served as vestries ; and sometimes there are the remains of a piscina, and relics of altars, asif they had been used as chantry chapels. It is probable there were wooden porches at all periods, particularly in those places where stone was scarce ; bnt, as may becxpected from their exposed position, the earliest have decayed. At Cobham, Surrcy, there was one that had ranges of semicircular arches in oak at the sides, of strong Norman character, which is now unfortunately destroyed. It is said there are several in which portions of Early English work still are tracexble, as at Chevington, in Suffolk. In the Decorated and later periods, however,

wooden porches are very common, some plain, and others with richly carved tracery and barge boards ; these frequently stand on a sort of half story of stone work or bahut. The entrance porches at the west end of our cathedrals are generally called portals, and where they assume! the character of separate buildings, are designated galilecs. Both these are more common on the Continent than in England. Many of the French cathedrals have the doors so deeply recessed as to be almost like open porches. 'These are called portatis or portcs abrités, Many, however, have detached porches in front of the portals themselves. The noblest example of an open projecting western porch in England, and probably in the world, is at Peterborough, of the Early English period, attached to the Early Norman nave.

PorraL (Fr. portatl, Ital. portone), a name given to the deeply recessed and richly decorated entrance doors to the cathedrals on the Continent.

Porrov.iis (M. Lat. cataracta, Fr. herse, coultsse, Ital. saracinesca, Ger. Fullgatter), a strong-framed grating of oak, the lower points shod with iron, and sometimes entirely made of metal, hung so as to slide up and down in grooves with counterbalances, and intended to protect the gateways of castles, &c. The defenders having opened the gates and lowered the portcullis, could send arrows and darts through the gratings, and yet the assailants could not enter. One of these constructions was in existence until modern times in a gateway at York ; they are said not to be older than the 12th century, and were probably (as their Italian name imports) invented as a defence against the sudden attacks of the Saracens on the coasts of that country.

Porrico (an Italicism of the Lat. porticus), an open space before the door or other entrance to any building fronted with columns. A portico is distinguished as prostyle or tn antis according as it projects from or recedes within the building, and is further designated by the number of columns its front may consist of. (See DistyLE, TETRASTYLE, HEXASTYLE, OcTASTYLE, &c.)

Porticus. In an amphiprostylar or peripteral temple this term is used to distinguish the portico at the entrance from that behind, which is called the posticum.

Post AND PANE Work, a name given to the carpentry framing of old wooden houses, panne in old French signifying any hori- zontal piece of timber, as a head, sill, or purlin, though its use now is confined to the latter, sills and plates at present being called sablizres. Where timber was abundant, and stone scarce and dear to work, timber-framed houses naturally abounded. The posts or uprights seem in early times to have been con-

structed of small oak trees, 6 or 7 inches square, roughly trimmed

by the axe; the girders, &c., are larger, but seldom seem to have

beensawn. The framing of the lower story generally stands on

a sort of plinth or bahué of stone or brick, sometimes as high as

the window sills, and the other fronts are each framed separately;

and as the joists of each story project over those of that below, each story also projects, till, in narrow streets, it is said the houses almost touched each other at the top. To strengthen the framing, it was customary to tie the angles together with circular braces cut out of the crooked boughs of trees, and to fill in under and sometimes over the window openings with cross struts, sometimes like the St Andrew's cross, and sometimes in circles and various designs. The main posts also were streng- thened inside and out with a sort of projecting corbels, called in French Liens or décharges, and by us spervers, which helped to carry the projecting plates above. In the better sort of work these timbers are chamfered and sometimes carved, and the gables have rich barge boards ; the roofs invariably have great projec- tions to throw off the wet, and the jutting of the stories, one over the other, no doubt was intended for the same purpose. post and pane work is put together with mortices and tenons pinned with pins or trunuels of hard wood ; very often there is not a nail in the whole construction. The intermediate upright posts or quarters were called prick posts. All these

houses are plastered, rough cast, or pargetted between the timbers, sometimes in handsome designs ; and as the old oak gets black with age, or as the timbers are often rubbed over with oil, and the laster whited, they are called in England black and white houses. See PARGETTING and PLasTERING.) Several churches in Essex have post and pane work.

POsTERN, a siatlentotay in the enceinte of a castle, abbey, &c., from which to issue and enter unobserved. They are often called Sally Ports.

Posticum (Lat.) A portico behind a temple. Portico.)

PREcEPTORY, a small establishment of the Knights Templars, managed by a preceptor, a subordinate officer to a master, in the same way as a priory was by a prior, and not an abbot.

PRESBYTERY (Lat. presbyterium, Ital. presbiterio, Fr. presbytére), a word applied to various parts of large churches in a very ambiguous way. Some consider it to be the choir itself; others, what is now named the sacrarium. Traditionally, however, it seems to be applied to the vacant space between the back of the high altar and the entrance to the lady chapel, as at Lincoln and Chichester ; in other words, the Back or Retro Choir.

Prick Posts, an old name given sometimes to the queen posts of a roof, and sometimes to the filling in quarters in framing. (See Post and PANE.)

Priory, a monastic establishment, generally in connection with an abbey, and presided over by a prior, who was a subordinate to the abbot, and held much the same relation to that dignitary as a dean does to a bishop. (See ABBEY.)

Procession Pats (Lat, ambitus templi), the route taken by proces- sions on solemn days in large churches—up the north aisle, round behind the high altar, down the south aisle, and then up the centre of the nave.

Pronaos (Gr. mpd, before, and vads, a temple), the inner portico of a temple, or the space between the porticus, or outer portico, and the door opening into thecella. This isa conventional use of the term ; for, strictly, the pronaos is the portico itself.

PropyLaum (Gr. mpd, before, and mvAn, a portal), any structure or structures forming the entrance to the peribolus of a temple ; also the space lying between the entrance and the temple. In common usage this term in the plural (propylea) is almost restricted to the entrance to the Acropolis of Athens, which is known by it asa name. The form propylon occurs in the Latin of Vitruvius.

ProscenruM, the stage in ancient theatres.

PROSTYLE (Gr. apd, before, and orvAos, a column), a portico in which the columns project from the building to which it is attached.

Psrvupo-DiPrERAL (Gr. wevdhs, false, and Dipreros, qg.v.), false double-winged. When the inner row of columns of a dipteral arrangement is omitted and the space from the wall of the building to the columns is preserved, it is pseudo-dipteral. The portico of University College, London, is pseudo-dipterally arranged, the returning columns on the ends or sides not being carried through behind those in front.

Psxupo-PERIPTERAL (Gr. Pevdqs, false, and PERIYTEROS, g.v.), false-winged. A temple having the columns on its flanks attached to the walls, instead of being arranged as in a peripteros, is said to be a pseudo-peripteral.

Puurir (Fr. chaire de Véglise, Ital. pulpito, Ger. Kanzel), a raised platform with enclosed front, whence sermons, homilies, &c., were delivered. Pulpits were probably derived in their modern form from the ambones in the early Christian church. There are many old pulpits of stone, though the majority are of wood. Those in

(See Porricus and

ARenpilirVEcTURE

Old |

churches are generally hexagonal or octagonal ; and some stand on stone bases, and others on slender wooden stems, like columuis. The designs vary according to the periods in which they were erected, having panelling, tracery, cuspings, crockets, and other ornaments thenin use. Some are extremely rich, and ornamented with colour and gilding. A few also have fine canopies or sounding-boards. 'heir usual place is in the nave, mostly on the north sidc, against the second pier from the chancel arch. Pulpits for addressing the people in the open air were common in the medieval period, and stood near a road or cross. Thus there was one at Spital Fields, and one at St Paul's, London. External pulpits still remain at Magdalene College, Oxford, and at Shrewsbury. Pulpits, or rather places for reading during the meals of the monks, are found in the refectories at Chester, Beaulieu, Shrewsbury, &c., in England; and at St Martin des Champs, St Germain des Prés, &c., in France; also in the cloisters at St Dié and St Lo. Shortly after the Reformation the canons ordered pulpits to be erected in all churches where there were none before. It is supposed that to this circumstance we owe so many of the time of Elizabeth and James. Many of them are very beautifully and elaborately carved, and are eyi- dently of Flenish workmanship. 'The pulpits in the Mahometan mosques are quite different in form, being usually canopied and approached by a straight flight of steps. These have a doorway at the foot, with an architrave, and boldly moulded head ; the whole of the work to this and to the stairs, parapet, and pulpit itself being of wood, richly inlaid, and often in part gorgeously painted and gilt.

PULVINATED (Lat. pulvinus, a cushion or bolster), a term used to express the swelling or bolstering of the frieze which is found in some of the inferior works of the Roman school, and is common in Italian practice. It is used indifferently with pillowed.

PycNosTyLE (Gr. muxvds, dense, and orddos, a column), having columns thickly set. The space or intercolumniation implied by this term is one diameter and a half. (See Eusry.e.)

QUARREL, Quarry (from the French carré, square), any squarc- shaped opening ; applied in the Beauchamp Roll to the quatre- foils in

Perpendicular windows, sometimes to squares of paving, but most commonly to the lozenge-shaped pieces of glass in lead casements,

Quarters, the main upright posts in framing, sometimes called studs ; the filling in quarters were formerly named prick posts. QUATREFOIL, any small panel or perforation in the form of a four- leaved flower. They are sometimes used alone, sometimes in circles, and over the aisle windows, but more frequently they are in square panels. They are generally cusped, and the cusps

are often feathered. (See CINQUEFOIL.)

Quorns, large squared stones at the angles of buildings, buttresses, &c., generally used to stop the rubble or rough stone work, and that the angles might be true and stronger. Saxon quoin stones are said to have been composed of one long and one short stonc alternately. Early quoins are generally roughly axed; in later times they had a draft tooled by the chisel round the outside edges, and later still were worked fine from the saw.

Rac-SToNE, a name given by some writers to work done with stones which are quarried in thin pieces, such as the Horsham sandstone, Yorkshire stone, the slate stones, &c. ; but this is more properly flag or slab work, By rag-stone, near London, is meant an excellent material from the neighbourhood of Maidstone. Itisa very hard limestone of bluish-grey colour, and peculiarly suited for medieval work. It is often laid as uncoursed work, or random work, sometimes as random coursed work, and sometimes as regular ashlar. The first method, however, is the more picturesque.

Ranpom Work, a term used by the rag-stone masous for stones fitted together at random without any attempt at laying them in courses. Random Coursed Work isa like term applied to work coursed in horizontal beds, but the stones are of any height, and fitted to one another.

Rrar VAULT, a name sometimes applied to the inner hood-mould of a window or doorway, but no ancient authority for the use of such a term has been cited.

Rerecrory, the hall of a monastery, convent, &c., where the

religious took their chief meals together. It much resembled the

great halls of mansions, castles, &c., except that there frequently was a sort of ambo, approached by steps, from which to read the legenda sanctorum, &c., during meals. (See PuLrit.)

Reevuta (Lat.), a rule or square, the short fillet or rectangular block,

under the tenia, on the architrave of the Doric entablature.

Rerevos, Dorsal, or Dossex (Fr., retable), the screen or other ornamental work at the back of analtar. Insome large cathedrals, as Winchester, Durham, St Albans, &c., this is a mass of splendid tabernacle work, reaching nearly to the groining. In smaller churches there are sometimes ranges of arcades or panellings behind the altars ; but, in general, the walls at the back and sides of them were of plain masonry, and adorned with hangings or paraments. In large churches abroad, the high altar usually stands under a sort of canopy or ciborium, and the sacrarium is

hung round at the back and sides with curtains on movable rods. (See Crportum.) Iu private houses the iron plates beliind the fire, where there are andirons, are sometimes called reredoses.

Responp, the half pier or pillar at the end of a range of piers and arches, or other arcades; they are generally exactly half the other piers, with a short piece of wall finishing at right angles to the end or cross wall.

RESsAUNT, a sort of flat ogee.

Retro Cnorr. (See BAcK CHoIrR, PRESBYTERY.)

Rrp (Fr. nerf d'aréte, nervure, Ital. costola, Ger. Rippe). (See Groin Rip, and also GRroINED VAULTING.) The earliest groining had no ribs. In early Norman times plain flat arches crossed each other, forming Ogive Ribs. These by degrees became narrower, had greater projection, and were

chamfered. In later Norman work the ribs were often formed of a large roll placed upon the flat band, and then of two rolls side by side, with a smaller roll or a fillet between them, much like the lower member. Sometimes they are enriched with zigzags and other Norman decorations, and about this time bosses became of very general use. (See Boss.) Asstyles progressed, the mouldings were more undercut, richer and more elaborate, and had the dog-tooth or ball-flower or other characteristic ornament in the hollows. In all instances the mouldings are of similar contours to those of arches, &c., of the respective periods. (See Mounpines.) In Perpendicular work the ribs are broader and shallower, and almost always have two great hollows of elliptic shape, one on cach side. In those churches of the Early English and Decorated periods where there is a groining of wooden ribs filled in between the spandrils with their narrow oak boards, these ribs resemble those of stone, but are slighter, and the mouldings not so bold. (See Ce1LInG.) Later, wooden roofs are often formed into cants or polygonal barrel vaults, and in these the ribs are generally a cluster of rounds, and form square or stellar panels, with carved bosses or shields at the intersections.

Rivce (Fr. fatte, fattage, Ital., comignolo, Ger. Riicken), a flat piece of board running from the apex of principal to principal, to which the heads of the common rafters are nailed; also the lead or tile covering to the same. (For ornamental ridges, see Crust- ING.)

Roiu Mov.prne or Scrott Mov.pine, a moulding so called because it resembles the section of half a scroll or flexible book rolled up so that the edge projects over the other part. (Sve LABEL.)

Roop, a name appmed to a crucifix, particularly to those which were placed in the rood. loft or chancel screens. These generally had not only the image of the crucified Saviour, but also those of St John and the Virgin Mary, standing one on each side. Sometimes other saints and angels are by them, and the top of the screen is set with candlesticks or other deccrations.

Roop-Lorr, Roop-ScrEEN, Roop-BeaM, JuBE GALLERY, &c., the arrangement to carry the crucifix or rood, and to screen off the chancel from the rest of the church during the breviary services, and as a place whence to read certain parts of those services. (See Jusr.) Sometimes the

crucifix is carried simply on a strong transverse beam, with or withouta low screen, with folding-doors below but forming no part of such support. The general con- struction of wooden screens is close panelling beneath, about 3 feet to 3 feet 6 inches high, on which stands screen work com- posed of slender turned balusters or regular wooden mullions, supporting tracery more or less rich with cornices, crestings, &c., and often painted in brilliant colours, and gilded. These not only enelose the chancels, but also chapels, chantries, and some- times even tombs. In mansions, and some private houses, the great halls were screened off by a low passage at the end opposite to the dais, over which was a gallery for the use of minstrels or spectators. These screens were sometimes close and sometimes glazed, There are many of these in England, generally more or less mutilated : one of the most perfect galleries is that at Charlton-on-Otmoor, in Oxfordshire.

Roop-Statr, a small winding stair or vice leading to the gallery. (See Roop-Lorr.) In England they generally run up in a small turret in the wall at the west end of the chancel. This also often leads out on the roof. On the Continent these stairs often lead out of the interior of churches, and are enclosed with exquisitely perforated tracery, as at Rouen, Strasbourg, &c.

Roop-TowEr, aname given by some writers to the central tower, or that over the intersection of the nave and chancel with the transepts.

Rose Winpow (Fr. rosace), a name given to a circular window with radiating tracery, called also wheel window.

Roveur Cast, a sort of external plastering in which small sharp stones are mixed, and which, when wet, is forcibly thrown or cast from a trowel against the wall, to which it forms a coating of pleasing appearance. Some of the rough cast at St Albans is supposed to be coeval with the building itself. This material was also much used in timber houses, and when well executed the work is sound and durable.

Rovinc, anything following the line of a curve; thus the bowtell or torus going up the side of a bench end and round a finial is called a roving bowtell. (See BowTELL.)

RvuBBLE Work, a name applied to several speciesof masonry. One kind, where the stones are loosely thrown together in a wall between boards, and grouted with mortar almost like concrete, is called in Italian muraglia di getto, and in French blocage. Work executed with large stones put together without any attempt at courses, or random work, is also called rubble.

SacristTy (Lat. sacrarium, Fr. sacristie, Ital. sagrestia), a small chamber attached to. churches, where the chalices, vestments, books, &c., were kept by the officer called the sacristan. In the early Christian basilicas there were two semicircular recesses or apsides, one on each side of the altar. One of these served as a sacristy, and the other as the bibliotheca or library. Some have supposed the sacristy to have been the place where the vestments were kept, and the vestry that where the priests put them on; but we find from Durandus that the sacrariwm was used for both these purposes. Sometimes the place where the altar stands enclosed by the rails has been called sacrariwm.

SappDLE Bars (Fr. traverses), narrow horizontal iron bars passing from mullion to mullion, and often through the whole window from side to side, to steady the stone work, and to form stays, to which the lead work is secured. When the bays of the windows are wide, the lead liglits are further strengthened by upright bars, passing through eyes forged on the saddle bars, and called stanchions (see STANCHION and ARMATURE). When saddle bars pass right through the mullions in one piece, and are secured to the jambs, they have sometimes been called stay bars.

Sanctus BELL-CoT or TURRET, a turret or enclosure to hold the small bell sounded at various parts of the service, particularly where the words " Sanctus," &c., are read. This differs but little from the common bell-cot, except that it is generally on the top of the arch dividing the nave from tle chancel. At Cleeve, however, the bell seems to have been placed in a cot outside the wall, Sanctus bells have also been placed over the gables of porches. On the Continent they run up into a sort of small slender spire, called jléche in France, and guglio in Italy. (See BELL-CoT.)

ScAPPLING, reducing a stone to a rough square by the axe or hammer ; in Kent, the rag-stone masons call this knobbling.

Scotia (Gr. cxoria, shadow or darkness), a concave moulding most commonly used in bases, which projects a deep shadow on itself, and is thereby a most effective moulding under the eye, as in a base. It is like a reversed ovolo, or rather what the mould of an ovolo would present.

ScrEEN, any construction subdividing one part of a building from anotler—as a choir, chantry, chapel, &c. 'The earliest screens are the low marble podia, shutting off the chorus cantantiwm in the Roman basilivas, and the perforated canceldi enclosing the hema, altar, and seats of the bishops and presbyters. The chief screens in a church are those which enclose the choir or the place where the breviary services are recited. This is done on the Continent, not only by doors and screen work, but also, when these are of open work, by curtains, the laity having no part in these services. In England screens were of two kinds, one of open wood work, generally called rood-sercens or jubes (which see), aud which the French call gridlcs, clétures du cheur; the other, massive enclosures of stone work enriched with niches, tabernacles, canopies, pinnacles, statues, crestings, &c., as at Canterbury,

. York, Gloucester, and many other places both in England and abroad.

ScROLL, synonymous with VoLuTE, g.v., but commonly applied to ordinary purposes, whilst volute is generally restricted to the scrolls of the Ionic capital.

ScuTcHEon. (See EscuTCHEON.)

SECTION, a drawing showing the internal heights of the various parts of a building. It supposes the building to be cut through en- tirely, so as to exhibit the walls, the heights of the internal doors and other apertures, the heights of the stories, thicknesses of the floors, &c. It is one of the species of drawings necessary to the exhibition of a DESIGN, q.v.

SEDILIA, seats used by the celebrants during the pauses in the mass. They are generally three in number, for the priest, deacon, aud sub-deacon, and

are in England almost always a species of niches cut into the south walls of churches, separated by shafts or by species of mullions, and crowned with canopies, pinnacles, and other enrichments more or less elaborate. The piscina and aumbry sometimes are attached to them. Abroad, the sedilia are often movable seats: a single stone seat has rarely been found as at Lenham ; butsome have considered this to be a confessional chair, and others a frith-stole, or place to which criminals fled for salictuary.

SEPULCHRE, EASTER, a recess in the wall of a church, generally in the north side, often ornamented with a canopy, finials, &c., for the crucifix to stand in during certain rites from Good Friday to Easter Day.

GLOSSARY. |

Sxrr-orF, the horizontal line shown where a wall is reduced in thick- ness, and consequently the part of the thicker portion appears projecting before the thinner. In plinths this is generally simply chamfcred. In other parts of work the set-off is generally con- cealed by a projecting string. Where, as in parapets, the upper part projects before the lower, the break is gencrally hid by a corbel table. The portions of buttress caps which recede one behind another are also called sets-off.

SrveRY (probably connected with the English word sever), any main compartment or division of a building. (See Bay.) 'The word has been supposed to be a corruption of Ciborium, as Gervase of Canterbury uses the word in this sense; but he probably alludes to the vaulted form of the upper part of the groining of each severy. (See CrBoR1UM.)

Suarr (Fr. colonnette, Ital. eolonnetto, Ger. Schaft), in classical architecture that part of a column between the necking and the apophyge at top of the base. In later times the term is applied to slender columns either standing alone or in connection with pillars, buttresses, jambs, vaulting, &c.

SHED Roor or LEAN-TOo, a roof with only one set of rafters, falling from a higher to a lower wall, like an aisle roof.

SHINGLE (Med. Lat. scandula, scindula, Fr. bardeaw, essente, Ital. scandola, Ger. Schindel), a sort of wooden tile, generally of oak, nsed in

places where timber is plentiful, for covering roofs, spires, &c. In England they are generally plain, but on the Continent the ends are sometimes rounded, pointed, or cut into ornamental form.

Supine (Med. Lat. feretorium, scrinium, Fr. chdsse, écrin, Ital. scrigno), a sort of ark or chest to hold relics. Sometimes they are merely small boxes, generally with raised tops like roofs ; sometimes actual modcls of churches ; sometimes large construc- tions like that at St Albans, that of Edward the Confessor at Westminster, of St Geneviéve at Paris, &c. Many are covered with jewels in the richest way; that of San Carlo Borromeo, at Milan, is of beaten silver.

Sinz or SouE (Lat. solwm, a threshold, whence the Fr. scwil), the horizoutal base of a door or window-frame. A technical distinc- tion is made betwecn the inner or wooden base of the window- frame and the stone base on which it rests,—the latter being called the sill of the window, and the former that of its frame. This term is not restricted to the bases of apertures; the lower horizontal part of a framed partition is called its sill. The term

_ is sometimes incorrectly written cill.

SLEEPER (Fr. dormant), a piece of timber laid on low cross walls

asa plate to receive ground joists.

SLYPE, a name for the covered passage usually found in monasteries

. between the end of the transept and the chapter-house.

Sorrir (Ital. sofitta, a ceiling), the inverted horizontal face of anything, as, for example, of an entablature resting on and lying open between the columns or the underface of an arch whiere

- its thickness is seen.

SoLar, Souter (Med. Lat. solarium, Fr. galetas, Ital. solato), a room in some high situation, a loft or garrct, also an elevated chamber in a church from which to watch the lamps burning before the altars.

SoLE. See SILL.

SomMER (Fr. sommier), a girder or main-beam of a floor; if supported on two story posts and open below, it is called a brace-swmmer. Sounp BoarpD (Fr. abat-voix), the covering of a pulpit to deflect

the sound into a church. (See TESTER.)

Span, the width or opening of an arch between the walls, &c., from which it springs, also the width of a roof between the plates.

Span Roor, a roof having two sides inclining to a ceutre or ridge, in contradistinction to a SHED RoorF (whicli see).

SPANDRIL or SPANDREL, the space between any arch or curved brace and the level label, beams, &c., over the same. The spandrils over door-ways in Perpendicular works are generally richly decor- ated. At Magdalene College, Oxford, is one which is perforated, and has a most beautiful effect. The spandril of doors is some- times ornamented in the Decorated period, but scldom forms part of the composition of the doorway itself, being generally over the label.

Spire (Fr. aiguille, fléche, Ital. guglio, Ger. Spitze), a sharply- pointed pyramid or large pinnacle, generally octagonal in England, and forniing a finish to the tops of towers. In this country, in Norman times, the only attempt at anything like a spire consisted in the termination of some turrets, as those at Rochester, at St Peter's, Oxford, &c.; but these are rather PINNACLEs (which see) than spires. Later Norman spires are supposed to have becn

_ merely low pyramidal roofs. In the Early English period they appear at first to have been low, as the remains of the one at Christ Church, Oxford, show; but afterwards they become much more lofty and sharply pointed. The probability is that the sight of the high domes and aspiring minarets of the Holy Land had suggested the erection of these lofty monuments to the Crusaders. At this period the spires generally covered the whole tower top, and had hauuchings where the square broke into the octagon. In the

Decorated period the spires became still slenderer and sharper; the broach spire gradnally gave place to those rising at once in octagon form from the flat of the towers surrounded with parapets, often richly perforated, and with pinnacles at the angles. The spires themselves often are decorated with ball-fiowers and crockets, and sometimes have broad horizontal bands of tracery at intervals. In both these styles spire lights or lucarnes are common. Perpendicular spires partake also of most of these characteristics, except that they scarcely furnish an example of a broach spire. It is remarkable with how little material some of the loftiest spires have been erectcd, that at Salisbury being barely 9 inches thick for a great part of its hcight. On the Continent the spire seems to have been used carlicr than with us. That at Brantéme is a mere low pyramid. At Saintes it is a low carved cone, with something of domical character. At Roullet it is a sharp cirenlar cone, with four open pinnacles at the base. At Isomes it is octagonal, and as sharp as many of our Early English spires. In all these examples the windows below are semicircular. Timber spires are very common in England. Some are covered with lead in flat sheets, others with the same metal in narrow stripes laid diagonally. Very many are covered with shingles. Abroad there are some elegant examples of spires of open timber work covered with lead.

SprrE-Licuts. See LUCARNE.

SpreuncER, the stone from which an arch springs; in some cases this is a capital, or impost, in other cases the mouldings continue down the pier. The lowest stone of the gable is sometimes called a springer.

Spur, SpERVER. The word spur is often applied to the carved wooden brackets or hanses which support the penthouse of a door, the level part being called a sperver.

SquincHEs, small arches or corbelled scts-off running diagonally, and, as it were, cutting off the corners of the interior of towers, to bring them from the square to the octagon, &c., to carry aspire. (See PENDENTIVE.)

Squint, an oblique opening, often a mere narrow, square-headed slit, piercing the walls of the chancel arch, and evidently intended to afford a view of the high altar. Squints are often without any ornament, but are sometimes arched and occasionally en- riched with open tracery. Sometimes they look from the rooms over porches, sometimes from side chapels, but in every instance are so situated that the altar may be secn. The most probable use of them was to let the acolyte appointed to ring the sanctus bell see the performance of mass, and enable him to sound the bell at the proper time.

SraGx, an elevated floor, particularly the various stories of a bell-tower, &c. The term is also applied to the plain parts of buttresses between cap and cap where thcy set back, or where they are divided by horizontal strings and panelling. It is used, too, by William of Worcester to describe the compartments of windows between transom and transom, in contradistinction to the word bay, which signifies a division between mullion and mullion. (See Srory.)

STALL, a fixed seat in the choir for the use of the clergy. In early Christian times the thronzs, eathedra, or seat of the bishop, was in the centre of the apsis or bema behind the altar, and against the wall; those of the presbyters also were against the wall, branching off from side to side round the semicircle. In later times the stalls occupied both sides of the choir, return seats being placed at the ends for the prior, dean, precentor, chancellor, or other officers. The seats are very peculiar, (See MISERERE.) In general, in cathcdrals, each stall is surmounted by taber- nacle work, and rich canopies, generally of oak, of which those at Winchester, Henry VII.'s Chapel, and Manchester, may be quoted as fine instances. (See ''ABERNACLE, Canopy.) The word is sometimes used to express any chief seat, as in a dining hall.

SrancHion, a word derived from the French éfancon, a wooden post, and applied to the upright iron bars which pass through the eyes of the saddle bars or horizontal irons to steady the lead lights. The French call the latter traverscs, the stanchions montans, and the whole arrangement armature. Stanchions frequently finish with ornameutal heads forged out of the iron.

Sray Bars, saddle bars passing through the mullions in one length across the whole window, and secured to the jambs on each side. (Sce SADDLE Bar.)

SrEePLE (Fr. clocher, Ital. campanile, Ger. Glockenthurm), a general name for the whole arrangement of TowER, BELFRY, Spire, &c. (See under those headings.)

SretE (Gr. orfan, Lat. eippus, a smal] monument), the ornament on the ridge of a Greek temple, answering to the antefixe on the summit of the flank entablatures.

SruREOBATE (Gr. orepeds, solid, and Bdows, a base), a basement, distinguished from the nearly equivalent term STYLOBATH, q.v., by the absence of columus.

SriLTED, anything raised above its usual level.

Sroa (Gr. orod, a portico), the Greek equivalent for the Latin Porticus, and the Italo-English Portico, Le 2

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Srory (Lat. tabulatwm, Fr. étage, Ital. piano, Ger. Geschoss). When a house has rooms one over the other, each set of chambers divided horizontally by the floors is called a story. They are thus named in the different languages : —

English. Freneh Italian. German.

—

|Sotterraneo. | Kellergeschoss. Piantcrreno. | Bodengesehoss. Mezzanino. |. ete

Lowest story. | Basement. Souterrain—Cave. Ground do. Ground floor. |Rez de echaussée.

Half story or|Mezzanine. (|Entresol. intermediate.

First story. First floor. |Premier étage, {Primo piano,| Hauptgeschoss. also Bel étage. also piano, nobile. Seeond story. | Seeond floor. As their/numbers. “oe | Upper story. | Garret, Mansard. Solaio. Dachgeschoss.

Pm cal a

Srouvp (Fr. bénitier), a vessel placed close to the entrance of a church to contain the holy water. They are generally small bowls fixed against acolumn, or onastem. In the north of Italy they are larger, and often carried on the back of a lion, and sometimes they are elegant tazze of exquisite workmanship.

SrRING or STRING-CoURSE, a narrow, vertically-faced, and slightly projecting course’ in’an clevatiou. If window-sills are made continuous, they form a string-course ; but if this course is made thicker or deeper than ordinary window-sills, or covers a set-off in the wall, it becomes a blocking-course.

Srring-Courses, horizontal mouldings running under windows, separating the walls from the plain part of the parapets, dividing towers into storics or stages, &c. Their section is much the same as the labels of the respective periods ; in fact, these last, after passing round the windows, frequently run on horizontally and forin strings. . Like labels they are often decorated with foliages, ball-flowers, &c.

Srrip PiLasTER, a very narrow pilaster.

Srups, an old name for upright quarters or posts; thus door-studs are door-posts or jambs.

SryieE (Gr. orbAos, acolumn). The term style in architecture has obtained a conventional meaning beyond its simpler one, which applies only to columns and columnar arrangements. lt is now used to signify the differences in the mouldings, gencral outlines, ornaments, and other details which exist between the works of various nations, and also those differences

which are found to exist between the works of any one nation at different times.

Sry.LoBaTE (Gr. ordAos, a,column, and Bdois, a base), a base- ment tocolumns. (See STEREOBATE.) Stylobate is synonymous with pedestal, but is applied to a continued and unbroken substruc- ture or basement to columns, while the latter term is confined to insulated supports.

SuRBASE (Lat. super, whence the Fr. sur, above or upon, and BAsr, g.v.), a upper base is the term applied to what, in the fittings of a room, is familiarly called the chair-rail. It is also used to distinguish the cornice of a pedestal or stereobate, and is separ- ated from the base by the dado or die.

SysTYLE (Gr. ody, together with, and oriaos, a column), having columns rather thickly set,—an intercolumniation to which two diameters are assigned. (See EusTyLE.)

TABERNACLE, a species of niche or recess in which an image may be placed. In Norman work there are but few remains, and these generally over doorways. They are shallow and comparatively plain, and the figures are often only in low relief, and not detached statues. In Early English work they are deeper, and instead of simple arches there is often a canopy over the figure, which was placed on a small low pedestal. Later in the style the heads of the tabernacles became cusped,either as trefoils or cinquefoils, and they are often placed in pairs, side by side, or in ranges, as at Wells Cathedral. Decorated tabernacles are still deeper and more ornamented, the heads are somctimes richly cusped and sur- mounted with crocketed gables, as at York, or with projecting canopies, very much like the arcade at Lichfield. In this case the under side of the canopy is carved to imitate groin ribs, and the figures stand either on high pedestals, or on corbels. Perpen- dicular tabernacles possess much the same features, but the work is generally more elaborate; the figures generally stand on rich pedestals, but sometimes on corbels, and the canopies generally project, sometimes in a triangular form, and sometimes with a sort of domical top. (See Corset, Canopy, Nicuz, &c.) 'The word tabernacle is also often used for the receptacle for relics which was often made in the form of a small house or church. (See SHRINE.)

TABERNACLE-WorK. ‘The rich ornamental tracery forming the canopy, &c., to a tabernacle is called tabernacle-work; it is common in the stalls and screens of cathedrals, and in them is generally open or pierced through.

TABLE, TABLET, a name for various mouldings, as string-courses, cornices, &c.

TerMINAL. Figures of which the upper parts only, or perhaps the head and shoulders alone, are carved, the rest running into a

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parallelopiped, and sometimes into a diminishing pedestal, with feet indicated below, or even without them, are called terminal figures.

T’ESSELLATED PAVEMENTS, those formed of fessere, or, as some write it, tessellcee, or small cubes from half an inch to an inch square like dice, of pottery, stone, marble, enamel, &c. (See Mosalc.)

TrsTER, anything placed horizontally over the head, as the sound- board of a pulpit, the flat boards over an old-fashioned bed, &e.

Terrastoon (Gr. rérpa, four, aud orda, a portico). An atrium or rectangular court-yard, having a colonnade or projected orthostyle on every side, is called a tetrastoon.

TErRASTYLE (Gr. tézpa, four, and o7dAos, a column), a portico of four columns in front.

THOLOBATE (Gr. @éAos, a dome or cupola, and Bdows, a_base or substructure), that on which a dome or cupola rests. This is 4 term not in general use, but itis not the less of useful application. What is generally termed the attic above the peristyle and under the cupola of St Paul’s would be correctly designated the tholobate. A tholobate of a different description, and one to which no other name can well be applied, is thé circular substructure to the cupola of the University College, London. ,

TuRovGH CARVING, a.term supposed to signify such as is much

undercut, as the tendrils, stalks, &c., in Decorated, and the vignettes in Perpendicular work. In the Durham roll:it clearly means perforated work, as it-is " to giue ayre." ~-

TinEs, Roor (Lat. tegula, imbrea, Fr. twile; Ital. tegola), flat pieces of clay burned in kilns, to cover roofs in place of slates or lead. ° In England, in medieval times, the flat or planetile seems only to have been used, judging from what we find now left. From MS. and remains abroad, a kind of plane tile, with ornamented ends, forming a sort of scale covering, seems to have been in vogue.

Torus (Lat.), a protuberance or swelling, a moulding whose form is convex, and generally nearly approaches a semicircle. It is most frequently used in bases, and is generally the lowest moulding in a base.

Tower (Gr. Wdpyos, Lat. turris, Fr. towr, clocher, Ital. torre, Ger.

Thurm), an elevated building originally designed for purposes of

defence. Those buildings are of the remotest antiquity, and are,

indeed, mentioned in the earliest Scriptures. In medieval times they are generally attached to churches, to cemeteries, to castles, or are used as bell-towers in public places of large cities. In churches, the towers of the Saxon period are generally square, the only round example being supposed to be that of Tasburgh.

They are not very lofty, and are of strong, rude workmanship.

Two only, Brigstock and Brixworth, have staircases supposed to

be original; both these are on the west front of the tower.

The masonry partakes of the usual character attributed _to

Saxon work, as strip pilasters, long and short work, &c. The

upper windows are generally circular-headed in two lights,

separated by a shaft much resembling a turned baluster sometimes with heavy projecting caps. Norman towers are also generally square. Many are eutirely without buttresses ; others have broad, flat, shallow projections, which serve for this purpose. The lower windows are very narrow, with extremely wide splays inside, probably intended to be defended by archers. The upper windows, like those of the preceding style, are generally separated into two lights, but by a shaft or short column, and not by a baluster. Sometimes these towers have arcades round them, and are ornamented, as at St

Albans, in some cases very richly, as at Norwich, Winchester,

Tewkesbury, Southwell, Sandwich, &. They frequently have

stone staircases at one of the angles. In many of our churches

the Norman tower is placed between the chancel and nave, and is of the full width of the latter. For the covering of these towers abroad, see SPIRE, PINNACLE, PARAPET. A few round towers of this period (and also of the next) are found on the coasts of Norfolk and Suffolk; as these mostly have no external doors, and are accessible only from the church, and as some have chimneys, they are supposed to have been built as places of refuge in case of invasion. arly English towers are generally taller, and of more elegant proportions. They almost always have large projecting buttresses, and frequently stone staircases.

The lower windows, as in the former style, are frequently mere

arrow-slits ; the upper are in couplets or triplets, and some-

times the tower top has an arcade all round, as at Middleton

Stoney. The spires are generally Broacu Spires (which see) ;

but sometimes the tower tops finish with corbel courses and plain

parapets, and (rarely) with pinnacles. Some of the towers and spires, particularly in the midland counties, are richly orna- mented; a very good specimen is at Raunds, A few Karly

English towers break into the octagon from the square towards

the top, and still fewer finish with two gables, as at Brookthorpe

and Ickford. Both these methods of termination, however, are common on the Continent. At Venddme, Chartres, and Senlis, the towers have octagonal upper stages surrounded with pinnacles, from which elegant spires arise. Decorated towers differ but

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little from these last, except that they are often lighter in effect ; tle buttresses, too, are set angularly; the parapets are also fre- quently embattled, or perforated in elegant designs, and these generally have pinnacles. The spires, also, now generally arise at once from the octagon, and are not broach spires; those that are of this latter character have the haunchings much smaller. There is a fine example of a Decorated tower and spire at Ellington, in Huntingdonshire. Most Perpendicular towers are very fine, particularly the great central towers, as at Canterbury and Gloucester. They are generally richly panelled throughout; the buttresses project boldly, and are sometimes set anglewise, and sometimes square, not close to each other, but showing a small portion of the angle of the tower where they otherwise would have intersected. 'The pinnacles are often richly canopied and the battlements panelled, and often perforated ; sometimes a pinnacle, and sometimes a canopied niche, is placed in the middle of the parapet. At Boston, and in several other places, there are fine lanterns at the tops of the towers. Taunton, Evesham, Louth, Magdalene College, Oxford, and very many other places, have very fine Perpendicular towers. In the north of Italy, and in Rome, 'they are generally tall, square shafts in four to six stages, without buttresses, with couplets or triplets of semicircular windows in each stage, generally crenellated at top, and covered with a low pyramidal roof. The well-known hanging tower at Pisa is cylindrical, in five

stories of arcaded colonnades. In Ireland there arc in some of the churchyards very curious round towers.

TRACERY, the ornamental filling in of the heads of windows, panels, circular windows, &c., which has given such characteristic beauty to the architecture of the 14th century. Like almost everything connected with medieval architccture, this elegant and some- times fairy-like decoration seems to have sprung from the smallest beginnings. The circular-headed window of the Normans gra- dually gave way to the narrow-pointed lancets of the Early English period, and as less light was afforded by the latter system than by the former, it was necessary to have a greater number of windows ; and it was found convenient to group them together in couplets, triplets, &. When these couplets were assembled under one label, a sort of vacant space or spandril was formed over the lancets and under the label. To relieve this, the first attempts were simply to perforate this flat spandril, first by a simple lozenge-shaped or circular opening, and afterwards by a quatrefoil. By piercing the whole of the vacant spaces in the window head, carrying mouldings round the tracery, and adding cusps to it, the formation of tracery was complete, and its earliest result was the beautiful geometrical work such as is found at West- minster Abbey. When this style had reached perfection the usual decline followed; and the architects of the Decorated period designed tracery, beautiful in itself, but which wants the vigour of the geometrical, and appears more as if the stonework had been twisted than if it had been cut out of the solid. Never- theless, however fanciful the design may be, the whole element is really gcometrical—that is, it is formed of portions of circles, the centres of which fall on the intersections of certain geometrical figures. The great east window at Carlisle is composed of 86 distinct pieces of stone, and is struck from 263 centres ; and the glorious west window at York is probably produced from a still greater number. Probably asa reaction against the weakness of the Decorated, the flowing tracery gradually admitted upright straight lines into its element. This change was perhaps made to afford, as it were, rectilineal frames to suit the glass painter, the foliages and medallions of the preceding styles having given way to single figures, standing on pedestals under rich canopies. Be this as it may, these have given a name to the style of the 15th and 16th centuries. The mullions then, as at King's College Chapel, at St John's, Oxford, and in several other examples, had

more flow, and fewer perpendicular lines, till at last plain, upright, and transverse bars took their place, and held casement lights, which were at last superseded by our modern sash windows. On the Continent, the windows of the first period, or ogivale primitive, were very much like our own Early English. So in like manner those of the early part of the ogivale secondaire were very much like our own Geometrical Decorated. Later, however, in France and Germany, two styles prevailed, the Rayonnant and Flamboyant, the one having tracery assuming the character of stars or rays, and after this another coeval with our Perpendicular, resembling flames of fire.

TRACHELIUM (Gr. tpdxnAos, theneck). In Doric and Ionic columns there is generally a short space intervening between the hypotra- chelium and the mass of the capital, which may be called the trachelium or neck.

TRANSEPT (Med. Lat. crus, Fr. transept, Ital. crociata, Ger. Kreuz- gang), that portion of a church which passes transversely between the nave and choir at right angles, and so forms a cross on plan.

Transom (Fr. traverse, Ital. traversa, Ger. Querbalken), the

horizontal construction which divides a window into heights or Transoms are sonietimes simple pieces of mullions placed

stages.

transversely as cross-bars, and in later times are richly decorated with cuspings, &c.

TRAYLE. See VIGNETTE.

TREFOIL (Lat. érifoliwm), a cusping, the outline of which is derived from a three-leaved flower or leaf, as the quatrefoil and cinquefotl are from those with four and five.

TRiFORIUM, the arcaded story between the lower range of piers and arches and the clerestory. The name has been supposed to be derived from éres and fores—three doors or openings—that being a frequent number of arches in each bay. Professor Willis, however, believed that the word is to be traced to a monkish latinisation of " thoroughfare."

TrIGLyPH (Gr. rpe?s, three, and yAvpf, an incision or carving). The vertically channelled tablets of the Doric frieze are called triglyphs, because of the three angular channels in them, two perfect and one divided, —the two chamfered angles or hemi- glyphs being reckoned as one. The square sunk spaces between the triglyphs on a frieze are called metopes.

Tupor FLOWER, or CRESTING, an ornament much used in the Tudor period on the tops of the cornices of screen work, &c., instead of battlements. It is a sort of stiff, flat, upright leaf standing on stems.

Turret (Fr. towrelie) a small tower, especially at the angles of larger buildings, sometimes overhanging and built on corbels, and sometimes rising from the ground.

Tympanum (Gr. rUumavov), the triangular recessed space enclosed by the cornice which bounds a pediment. The Greeks often placed sculptures representing subjects connected with the pur- poses of the edifice in the tympana of temples, as at the Parthenon and gina.

Unpoer-Crort, a vaulted chamber under ground.

VALURE, VAMURE. See ALURE.

VaNnE (Fr. girouette, ltal. banderuola, Ger. Wetterfahne), the weathercock on a steeple. 'They seem in early times to have been of various forms, as dragons, &c. ; but in the Tudor period, the favourite design was a beast or bird sitting on a slender pedestal, and carrying an upright rod, on which a thin plate of metal is hung like a flag, ornamented in various ways.

Vautt (from Ital. voléato, turned over), an arched ceiling or roof. A vault is, indeed, a laterally conjoined series of arches, The arch of a bridge is,

strictly speaking, a vault. Intersecting vaults are said to be groined. (See GRoINED VAULTING.)

VAULTING SHAFT, a smal] column or series of clustered shafts, rising from above the capitals of the pillars of an arcade, and generally supported on a corbel, and thence rising and finishing with a capital, from which the various groin ribs spring.

Vercr, the edge of the tiling projecting over the gable of a roof; that on the horizontal portion being called eaves.

Vercr Boarp, often corrupted into Barge Board, the board under the verge of gables, sometimes moulded, and often very richly carved, perforated, and cusped, and frequently having pendents and sometimes finials at the apex.

Vesica Piscis (Fr. amande mystique), panels, windows, and other ornaments of the form of a species of oval with pointed end, but in reality struck from two centres, and forming part of two circles cutting each other.

Vestry. See SACRISTY.

VIGNETTE, a running ornament, representing, as its name imports, a little vine, with branches, leaves, and grapes. It is common in the Tudor period, and runs or roves in a large hollow or case- ment, It is also called Zrayle.

Vo.ure (Lat. volutwm, from volvo, to roll up or over), the convolved or spiral ornament which forms the characteristic of the lonic capital. The common English term is ScRoLL, g.v. Volute, scroll, helix, and cauliculus, are used indifferently for the angular horns of the Corinthian capital.

VoussoiR, a name in common use for the various wedge-shaped stones of an arch.

Waccon-CEILine, a boarded roof of the Tudor time, either of semicircular or polygonal section. It is boarded with thin oak, and ornamented with mouldings forming panels, and with loops at the intersections. (See PANEL.)

Warp, a name for the inner courts of a fortified place. At Windsor Castle they are called the upper and lower wards. (See BalLey, Base Court, ENCEINTE, &c.)

WEATHERING, a slight fall on the top of cornices, window sills, &c., to throw off the rain.

Wicket (Fr. gutehet, Ital. portello), a small door opening in a larger. They are common in medieval doors, and were intended to admit single persons, and guard against sudden surprises.

Winp Braces, diagonal braces to tie the rafters of a roof together and prevent racking. In the better sort of medizval roofs they are arched, and run from the principal rafters to catch the purlins.

ZospHorts (Gr. (ov, an animal, and épw, to bear). This term is used in the same sense as frieze, and is so called because that part of the entablature frequently bore sculptures representing various animals. .

ARCHIVES (Greek dpyefov, Lat. archiwwum), a room or building in which are kept the records, charters, and other papers belonging to any state, community, or family. Very frequently the name is applied to the documents themselves. Thearchives of Britain are now superintended

festivals of the greater Dionysia and of the Thargelia, the arrangement of the tragic choruses, and the conduct of certain sacrifices. As a special department of civil adininis- tration, he had under his care all orphans, particularly heiresses, all widows, and others who were left without

by the Public Record Office.

ARCHON (épxov), the title of the highest magistrates in Athens. The last king of Athens, Codrus, having given up his life for the advantage of the state, it is said that the people, out of gratitude for his noble act, passed a resolution that in future none of their rulers should bear the ancient and venerated title of king (Gacwevs). The holder of supreme power in the state

received from that time the name of archon or ruler. This is the popular account of the change, but it is not improbable that, on the death of Codrus, disputes arose with regard to the succes- sion, and that the nobles took advantage of the opportunity to gain an addition to their own power. For the archon appears to have been in all respects equal to the king, and his office was hereditary, but he was made responsible for his acts to the Eupatride or nobles. Thirteen descendants of Codrus successively held the office. In 752 B.c., during the archonship of Alcinzon, the time of office was reduced to ten years, though the office itself remained hereditary. Seven decennial archons are enumerated, extending from 752 to 684. But during this timc, about the year 714, a very important change had been introduced into the

archonship. 'The office at that date ceased to be hereditary ;_

the exclusive right of the Medontidz was abolished, and the whole body of nobles became eligible for the magistracy. In 684 a further change was effected ; the office was made annual, and the supreme power was distributed among nine officials, each of whom received the title of archon. This arrangement of the magistracy continued till the time of Solon, who introduced the classification of the citizens according to property and not to birth, and threw the office open to all who possessed an income of the first class, apparently calculated as five hundred measures of corn, wine, and oil (Plutarch, Aristides, 1). The most extensive

and important change was introduced by Aristides, who-

after the battle of Plataea threw open the highest magistracy to all citizens, whether of the propertied class or not. ~~The mode of election to the archonship, after the office was taken from the family of Codrus, was by the suffrage (xetporovia) of the nobles; and this continued to be the case even after the reform effected by Solon, for it is expressly stated that though he altered the qualification he made no change in the manner of election. The great reform in this respect was probably due to Clisthenes, who in 508 introduced the election by lot, and who further, by his distribution of the people into tribes and appointment of generals, seriously impaired the power of the archons. To secure that the office and honours were not conferred on unworthy persons, the newly elected archons were subjected to~~

~~a double scrutiny, before the senate and in the agora, in which they were required to show that they were true Athenian citizens, whose ancestors had been citizens for three gene~~ rations, and to swear that they would obey the laws and revere the religion of their country.

Of the nine archons to whom in conjunction were entrusted the duties of the supreme magistracy, the first was called specially "The Archon" (6 dpxwy); there was also attached to his name the epithet eponymus (éévupos), because the year in which he held office was named after him, just as at Rome it was named after the two consuls. At first this archon had the general adminis- tration of state affairs, but gradually the expansion of democratic power reduced his authority, and at the period of which we have accurate information his duties were not very extensive. He had the superintendence of the

protection, provided they were citizens of Athens; and had, in short, the charge of all matters in which questions of inheritance were involved. When his power was still further reduced, there remained to him the privilege of bringing disputed cases of succession into the proper courts, aud of casting lots for the dicasts who were to try the cause. 'The second archon had the title of king (BactAevs) ; to him had been handed over the name, as well as the sacred duties of priesthood which formerly belonged to the supreme ruler. He was the rex sacrorum, and to his province pertained all that concerned the religion and public worship of the state. In conjunction with his wife, who was called Bactdwcoa (or queen), he offered up certain state sacrifices ; and he had specially intrusted to him the superintendence of the mysteries, the festival of the Lenza, the torch races, and the gymnic contests. He acted as public prosecutor in matters of religion; and, in cases of murder or offence against the gods, he brought the indictment into the Areo— pagus, and voted with its members. In later times he acted as president of the court in all cases concerning the rights and duties of priests. The third archon bore the title of polemarch (zoA¢uapxos), which indicates that originally he was the supreme commander of the Athenian forces. As late as the battle of Marathon we find the polemarch Callimachus marching along with the ten generals, and taking the command of the right

wing. But after this we no longer hear of the polemarch as actively engaged in leading the army. Doubtless the introduction of the ten generals by Clisthenes tended to limit the military func- tions of this archon. His duties in later times seem to have been the superintendence and protection of the per- sonal and family rights of the resident aliens and foreigners. To these he stood in the same relation as the archon eponymus stood to citizens. He had also the arrangement of the funeral games in honour of those who had fallen im battle, and the offering up of the annual sacrifice to Artemis in commemoration of the battle of Marathon. Tach of the three superior archons was allowed to select two assessors or assistants (adpedpor), who were sanctioned after examina- tion by the senate. The remaining six archons were called thesmothete (OecpoOérar), a name which is sometimes applied to the whole body of archons. The six formed a college of justice, whose jurisdiction seems at first to have extended to all cases not directly under the cognisance of other magistrates. They received information against parties for various offences, brought the cases to trial in the proper court, appointed the juries, and gave public notice of the days of sitting. They revised every year the body of laws to see that no discrepancies were allowed to creep in, and they were required to enter all new laws. They also drew up and ratified the treaties with foreign states. Their assessors were called symbuli (ovpPovdAor). After the introduction of popular courts by Solon, the archons seem to have lost their special juridical powers; they then acted simply as presidents of the courts and some- times as a grand jury.. During their year of office the archons were exempt from all state burdens, and at its close they were required to give an account of the manner in which they had discharged their duties; if found blameless, they became members of the Areopagus.

The name archon is frequently applied by Greek authors to magistrates in general; it was also used as a title under the Greek empire, and the Jews sometimes applied it to members of their Sanhedrim. It was even given meta- phorically by the Gnostics to their mystic «ons.

ARCHYTAS, of Tarentum, son of Mnesagoras or Histi- sous, was onc of the most celebrated men of antiquity. He was. distinguished as a

mathematician, a philosopher, a statesman, and a general; nor was he less remarkable for the purity and intcgrity of his life and the mildness and benevolence of his disposition. The time at which he flourished can be settled approximately from the fact that he was contemporary with Plato, whom he knew per- sonally, and whose life he saved by interceding with the tyrant Dionysius. He took a prominent part in the admin- istration of the state, and was seven times made general of the army, although by a law it was forbidden that any citizen should hold the command more than once. It is said that he was never defeated in battle. He was also intrusted with the charge of many important civil affairs. There seems to have been a tradition (see Horace, Odes, i. 28) that Archytas was drowned while crossing the Adriatic, but of this there is no certain information. Archytas belonged to the Pythagorean school of philosophy, and is said by some to have been the teacher of Philolaos. This, however, must certainly be an error. According to others, he was the eighth leader of the Pythagorean school. Frag- ments of writings, said to be his, on various points of ethical and metaphysical philosophy, are given by Stobeeus, Simplicius, and others. To portions of these Aristotle has been supposed to owe his doctrine of the Categories aud some of his principal ethical theories. But it seems quite clear that scarcely any of these fragments are genuine, and that they belong to the Ist or 2d century A.D., a period during which Eclecticism, and a consequent desire to find traces of later doctrines in old writers, were the prevailing influences. Such fragments as do appear genuine are of no philosophical value, and are generally on special subjects. Archytas is particularly celebrated as a mathe- matician. To him are ascribed a solution of the problem of the duplication of the cube, and the application of analysis to the resolution of geometrical problems. He was also a skilled mechanician, and was one of the first to apply mathe- matics to mechanics and music. On the fragments of Archytas see Hartenstein, De Archy. Taren. frag., Leipsic, 1833; Gruppe, Ueber d. Frag. d. Archy., 1840 ; and Beck- mann, De Pythagor. Reliquiis ; also Zeller, Phil. d. Griech. 2d ed. iii. 2, 88, sgq.

ARCIS-SUR-AUBE, the chief town of the arrondisse- ment of the same name, in the department of Aube, in France, is situated, in long. 4° 9’ E, lat. 48° 31’ N., about 17 miles (28 kilometres) N. of Troyes, on the left bank of the river, just at the point where it becomes navigable. It is mentioned in the Itinerary of Antoninus ; but successive fires (1719, 1727, and 1814) have

destroyed the ancient buildings, and it is now a town built in modern style, with wide and regular streets. An old castle, where Brune- haut and afterwards Diaua of Poitiers resided, looks down on it from a height, the only other building of interest being the church, which dates from the 16th century. A battle was fought here on the 20th and 21st of March 1814 between Napoleon and the Austro-Russian army under Schwarzenberg, which led the former to retire upon Vitry, leaving the way open to Paris. There are important hosiery manufactures in the town, and it carries on a large trade in grain and coal, besides being an emporium for the wooden wares of the Vosges. Arcis-sur- Aube is on the highway between Troyes and Chalons-sur- Marne, and by means of the Aube it has intercourse with Paris. It isa subprefecture, and in 1872 had a population of 2845.

ARCOS DE LA FRONTERA, a Spanish town in the province of Cadiz, on the river Guadalete, which flows past Santa Maria into the bay of Cadiz. It is built upon a high and precipitous rock, and commands magnificent views. The

special designation "of the frontier" is due to its position as a berder town after its capture from the Moors by Alphonso the Wise. Its horses, reared in the plains below, are famous in the ancient ballads of Spain. It contains two parish churches, a number of convents, and 15,378 inhabitants.

ARCOT, two districts and a city of British India, within the presidency of Madras, and under the jurisdiction of the governor of that province. The district of NortH Arcot lies between 12° 22' and 14° 11' N. lat.; and between 78° 17' and 80° 12' E. long. It is bounded on the N. by the districts of Cuddapah and Nellor; on the E. by the district of Chengalpat; on the S. by the districts of South Arcot and Salem; and on the W. by the Mysor territory. The area of North Arcot, according to the Annals of Indian Administration for 1871-72, is 15,146 square miles; the population, as ascertained by a ceusus taken in July 1871, being 2,007,667 souls. The aspect of the country, in the eastern and southern parts, is flat and uninteresting; but the western parts, where it runs along the foot of the Eastern Ghats, as well as all the country northwards from Trivellam to Tripali and the Karkambadi Pass, are mountainous, with an agreeable diversity of scenery. 'he elevated platform in the west of the district is

comparatively cool, being 2000 feet above the level of the sea, with a maximum range of the thermometer in the hottest weather of 88°. The hills are composed principally of granite and sienite, and have little vegetation. Patches of stunted jungle here and there diversify their rugged and barren aspect; but they abound in minerals, especially copper and iron ores. The narrow valleys between the hills are very fertile, having a rich soil and an abundant water- supply even in the dryest seasons. The principal river in the district is the Palar, which rises in Mysor, and flows through North Arcot from west to east past the towns of Vellor and Arcot, into the neighbouring district of Chen- galpat, eventually falling into the sea at Sadras. Although a considerable stream in the rainy season, and often im-passable, the bed is dry or nearly so during the rest of the year. Other smaller rivers of the district are the Paini, which passes near Chittur and falls into the Palar, the Sond4mukhi, and the Chayaur. These streams'are all dry during the hot season, but in the rains they flow freely and replenish the numerous tanks and irrigation channels. The principal roads in the district of North Arcot are the Trunk road from Madras to Bangalor, running from east to west; a road from north-east to south-west from Madras through North Arcot to Coimbator; and a road running north and south from Chittur to Arcot. The Madras Railway, and the Great Southern Indian Railway, also pass through the district. Grain of many species and cotton are largely grown throughout North Arcot, as well as sugar-cane and indigo. A part of the latter is sent to the Madras market. Cotton cloth is largely manufactured, and oil is prepared in considerable quantities for local con- sumption and for export. For fiscal purposes, the district is divided into the following fifteen td/uks:—(1.) Chittur,

2.) Tripali, (3.) Kaveri Pak, (4.) Sholingarh, (5.) Trivellam, 6.) Sdtgarh, (7.) Caddapanatam, (8.) Arcot, (9.) Vellor, (10.) Trivatur, (11.) Polur, (12.) Wandiwash, (13.) Sat- waid, (14.) Penmari, and (15.) Venkatagiri Kota.

Arcot, SouTs, lies between 11° 0' and 11° 39' N. lat., and between 78° 42' and 80° 4' E. long. The district of South Arcot is bounded on the N. by the districts of North Arcot and Chengalpat; on the E. by the French territory of Pondecherri and the Bay of Bengal; on the S. by the British districts of Tanjor and Trichinopoly ; and on the W. by the British district of Sélem. It

con- tains an area, according to the Annals of Indran Admin- stration for 1871-72, of 4779 square miles; and a popu-

lation, as ascertained by a house census in July 1871, of 1,762,525. South Arcot is divided into thirteen fiscal divisions or tdluks, as follows:—(1.) Tindevanum, (2.) Trivadi, (3.) Vilup-puran, (4.) Bhawangiri, (5.) Managudi, (6.) Chilambram, (7.) Trinsméli, (8.) Vardhdchalam, (9.) Elovansa, (10.) Trikalor, (11.) Kalakurchi, (12) Chaitpet, and (13.) Cuddalor. The aspect of the district resembles that of other parts of the Coromandel coast. It is low and sandy near the sea, and for the most part level till near the western border, where ranges of hills form the boundary between this and the neighbouring district of Sdlem. These ranges are in some parts about 5000 feet high, with solitary hills scattered about the district. In the western tracts, dense patches of jungle furnish covert to tigers, leopards, bears, and monkeys. The principal river is the Coleroon or Kaleruu, which forms the southern boundary of the district, separating it from Trichinopoly. This river is abundantly supplied with water during the greater part of the year, and two irrigating channels dis- tribute its waters through the district. The other rivers are the Vellaur, Ponndr, and Gadalum, all of which are used for irrigation purposes. Numerous small irrigation channels lead off from them, by means of which a consider- able area of fresh land has been brought under cultivation. Under the East India Company, a Commercial Resident was stationed at Cuddalor, and the Company's weavers were encouraged by many privileges. The manufacture and export of native cloth have now been almost entirely superseded by the introduction of European piece goods. The sea-ports of the district of South Arcot are Cuddalor or Fort St David, with a population, in 1855, returned at 36,686; and Porto Novo, with a population estimated, in 1855, at about 12,000 souls. The other places of import- ance in the district are Chilambram, Vardhdchalam, Tri- vadi, Tiagdr, Ginji or Chenji, Trinomdli, Chaitpet, Mer- kanam, and Verdur. The number of villages in South Arcot was returned, in 1850, at 3376. The total revenue of the district in that year amounted to £284,708, of which £234,055, or 82 per cent., represented the land revenue.

Arcot Crry, the principal town in the district of North Arcot, is situated on the south bank of the Palar river, in 12° 54’ N. lat., and 79° 24’ E. long. It is a station on the line of railway from Madras to Beypur, and is also a military cantonment. The population of the town, in 1862, was returned at 53,474 souls, inhabiting 10,042 houses. Arcot occupies a very prominent place in the history of the British conquests of India. In the middle of the last cen- tury, during the war between the rival claimants to the throne of the Carnatic, Muhammad Ali and Chanda Sahib, the English supported the claims of the former and the French those of the latter. In order to divert the atten- tion of Chandé Sdéhib and his French auxiliaries from the siege of Trichinopoly, Clive suggested an attack upon Arcot, and offered to command the expedition. His offer was accepted; but the only force which could be spared to him, was 200 Europeans and 300 native troops to attack a fort garrisoned by 1100 men. The place, however, was abandoned without a struggle, and Clive took possession of the fortress. The expedition produced the desired effect; Chanda Sahib was obliged to detach a large force of 10,000 men to recapture the city, and the pressure on the English garrison at Trichinopoly was removed. The siege of Arcot, in 1751, was conducted with great vigour by Raja Sdhib, son of Chanda Sahib, and is thus described by Macaulay :-—

‘Raja Sahib proceeded to invest the fort, which seemed quite incapable of sustaining a siege. The walls were ruinous, the ditches dry, the ramparts too narrow to admit the guns, and the battle- ments too low to protect the soldiers. The little garrison had been

greatly reduced by casualties. It now consisted of 120 Europeans and 200 Sepoys. Only four officers were left, the stock of provi- sions was scanty, and the commander who had to conduct the defence under circumstances so discouraging was a young man of five-and-twenty, who had been bred a book-keeper. During fifty days the sicge went on, and the young captain maintained the defence with a firmness, vigilance, and ability which would have done honour to the oldest marshal in Europe. The breach, how- ever, increased day by day. Under such circumstances, any troops so scantily provided with officers might have been expected to show signs of

insubordination ; and the danger was peculiarly great in a force composed of men differing widely from each other in extrac- tion, colour, language, manners, and religion. But the devotion of the little band to its chief surpassed anything that is related of the Tenth Legion of Cesar, or the Old Guard of Napoleon. The Sepoys came to Clive, not to complain of their scanty fare, but to propose that all the grain should be given to the Europeans, who required more nourishment than the natives of Asia. The thin gruel, they said, which was strained away from the rice would suffice for them- selves. History contains no more touching instance of military fidelity, or of the influence of a commanding mind. An attempt made by the governor of Madras to relieve the place had failed; but there was hope from another quarter. A body of 6000 Marhattas, half soldiers, half robbers, under the command of a chief named Murari Réo had been hired to assist Muhammad Ali; but thinking the French power irresistible, and the triumph of Chand4 Sahib certain, they had hitherto remained inactive on the frontiers of the Carnatic. 'The fame of the defence of Arcot roused them from their torpor; Murari Rao declared that he had never before believed that Englishmen could fight, but that he would willingly help them since he saw that they had spirit to help themselves. Raja Sahib learned that the Marhattas were in motion, and it was necessary for him to be expeditious. He first tried negotiations,—he offcred large bribes to Clive, which were rejected with scorn; he vowed that if his proposals were not accepted, he would instantly storm the fort, and put every man in it to the sword. Clive told him, in reply, with characteristic haughtiness, that his father was a usurper, that his army was a rabble, and that he would do well to think twice before he sent such poltroons into a breach defended by English soldiers. Raj4 Sahib determined to storm the fort. The day was well suited to a bold military enterprise. It was the great Mahometan festival, the Muharram, which is sacred to the memory of Husain, the son of Ali. Clive had received secret in- telligence of the design, had made his arrangements, and, exhausted by fatigue, had thrown himself onhisbed. He was awakened by the alarm, and was instantly at his post. The enemy advanced, driving before them elephants whose foreheads were armed with iron plates. It was expected that the gates would yicld to the shock of these living battering-rams. But the huge beasts no sooner felt the Eng- lish musket balls than they turned round and rushed furiously away, trampling on the multitude which had urged them forward. A raft was launched on the water which

filled one part of the ditch. Clive perceiving that his gunners at that post did not understand their business, took the management of a piece of artillery himself, and cleared the raft in afew minutes. Where the moat was dry, the assailants mounted with great boldness; but they were received with a fire so heavy and so well directed, that it soon quelled the courage even of fanaticism and of intoxication. The rear ranks of the English kept the front ranks supplied with a constant succession of loaded muskets, and every shot told on the living mass below. The struggle lasted about an hour; 400 of the assailants fell; the garrison lost only five or six men. The besieged passed an anxious night, looking for a renewal of the attack. But when day broke, the enemy were no more to be seen. They had retired, leaving to the English several guns and a large quantity of ammunition."

Arcot was afterwards captured by the French; but in 1760 was retaken by Colonel Coote after the battle of Wandiwash. It was also taken by Haidar Ali when that in- vader ravaged the Carnatic in 1780, and held by him for some time. The town of Arcot, together with the whole of the territory of the Carnatic, passed into the hands of the British in 1801, upon the formal resignation of the government by the Nawdb, Azim-ud-daul4, who received a liberal pension.

ARCTIC OCEAN. 'The Arctic Circle (66° 30') being taken as a boundary, the whole of the ocean lying to the north is called the Arctic Ocean. From a physical point of view this limit is hardly satisfactory, since between Green- land and Europe the Atlantic, with its Gulf Stream, makes an inroad on the Arctic territory, and the southern extremity of Greenland brings down the Arctic region beyond the Arctic limit; but the other parallel of latitude (70°) which has been chosen as a southern limit is perhaps still more

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objectionable. The Arctic Ocean washes the north of |

Europe, Asia, and America. It communicates with the Atlantic by a broad opening on the east of Greenland, and a narrow but important channel on the west, which has been traced as far north as 84°, and is known in the

various parts of its extent by special names—Davis' Strait, Baffin's Bay, Utlak Soak, Smith Sound, Kennedy Channel, Robeson Channel, Lincoln Sea,—but might conveniently be distin- guished by some such general designation as the West Qreenland Channel. With the Pacific there is communication between Asia and America through Behring's Strait. The coast line of all the three continents is for the most part exceedingly irregular, though this is less the case with Asia than with the other two. Europe sends down the Onega, Dwina, Pinega, Mezen, and Petchora; Asia the Obi, Yenisee, Lena, Indigarka, and Robima; and America the Mackenzie River. The most important of the numerous islands are Spitzbergen and Nova Zembla, with the multitudinous adja- cent islets, to the north of Europe; the Liakhov Islands, or New Siberia, off the coast of Asia; and the vast irre- gular Archipelago into which the north-eastern portion of America is split, which extends to the quasi-continent of Greenland. While for human habitation the regions of the Arctic Ocean are the most desolate that can well be conccived, there is extraordinary abundance of the lower forms of animal life; and while for centuries men have only visited them to gather their living harvests, or for purposes of exploration, traces are in many places to be found of human inhabitants in a distant age. At a still remoter period the islandsof the Arctic Archipelago have been covered with forests, and Barrow's Straits have been the habitat of coral and sponge (Markham, in the Journ. Roy. Geogr. Soc. 1865, p. 88). A very large portion of the area included by the Arctic Ocean is still unexplored; but almost every year diminishes the extent of the unknown. The nearest approach to the Pole has been made up the West Green- land Channel ; the passage along the eastern coast away to the north of Spitzbergen being the next in order of suc- cess. For information regarding the various Arctic ex- peditions, see the article PoLAR REGIons. ;

ARDEA, a Latian city, probably of Pelasgian origin, famous chiefly for its accidental connection with the semi- mythical rape of Lucretia and the expulsion of the Tar- quins from Rome. It lies 24 miles almost due 8. from Rome, and 4 miles from the coast, on a small stream. It seems at one time to have been a place of great wealth and power; but the little hamlet which still preserves its name hardly numbers 200 inhabitants. A few fragments of tufa-built fortifications are the only remains of its ancient architecture.

ARDEBIL, or ARpaBIL, one of the chief towns of Azerbijan in Persia, situated in 38° 15’ N. lat., and 48° 19’ E. long., on the Karasu or Balulk, a tributary of the Aras, in a fertile plain about 40 miles from the Caspian, seems to have been built out of the ruins of a former city. It is surrounded with a mud wall and towers, has a square castle with bastions at the corners fortified after European fashion, and contains the tomb of Shah Ismael Sufi, the founder of the Sufi dynasty of Persia. It is an emporium in the trade of Tiflis, Derbend, and Baku with Ispahan and Teheran. By a great council of the Persian empire, which met in 1736 in the neighbouring plain of Chowal- Mogam, Nadir Shah was chosen king, and his corona- tion took place next year at Ardebil. In the vicinity there are a number of warm mineral springs, and to the west stands the great mountain Sevilan, of volcanic origin, forming the eastern extremity of the water-shed between the Aras and the Tigris. From its remarkable salubrity Ardebil has acquired the Persian title of Abadan a Firuz, the abode of happiness.

ARDECHE, a department in the south of France,

bounded on the N.W. by the department of Loire, on the

E. by Isére and Dréme, on the S. by Gard, and on the W.

by Lozére and Haute Loire. It extends 72 miles from N. to S., and 45 from E. to W., at the widest points ; and its area is 2134 square miles. The surface of Ardéche is almost entirely covered by the Cevennes Mountains; the

main line forming the western boundary of the department, and sending out the Boutiéres, Coiron, Tanargue, and other branches, for the most part in an easterly direction. Several of the summits, of which the highest, Mount Mezenc, is 5972 feet above the sea, are evidently extinct volcanoes. The Rhone bounds Ardéche on the east, and receives most of its rivers, including the Cance, the Ay, the Doux, the Erieux, and the Ardéche. A few rivers, however, belong to the Atlantic side of the water-shed, the chief being the Loire, which rises on the western borders of the department, and the Allier, which for a short distance separates it from Lozére. ‘The climate in the valley of the Rhone is warm, and sometimes very hot; but westward, as the elevation increases, the cold becomes more intense and the winters longer. Some districts, especially in summer, are liable to sudden alterations in the

temperature. Grain and pulse are produced, but not in quantities sufficient for the popula- tion, a large part of the fare of the peasants consisting of potatoes and chestnuts. The latter, besides, form one of the main articles of export, another being oil extracted from nuts. Wine is. produced in considerable quantities along the valley of the Rhone. The rearing of the silk- worm, however, is of all the industries the most important and remunerative. Goats and sheep are kept in large numbers, Ardéche being one of the chief sources of the supply of skins for glove-making. The number of horscs is small, asses and mules being the beasts of burden mainly employed. Iron, coal, lignite, marble, limestone, and porcelain clay are among the mineral products. Hot springs are numerous, and some of them, as St Laurent, Cclles, and Neyrac, are largely resorted to. Natural curiosities are the Pont d'Arc over the Ardéche, and the Chaussée des Géants, near Vals. The country people adhere to their pro- vincial habits and dialect, go barefoot, and wear tall hats and long blouses. Among the celebrated men of the depart- ment may be named Cardinal Tournon and the brothers Montgolfier. The chief town is Privas; the arrondisse- ments are Privas, Largentiére (which derives its name from its ancient silver mines),and Tournon. Population, 380,277.

ARDELAN, a province of Persia, forming the eastern division of Kurdistan, and lying south of Azerbijan. Its capital Senna, in long. 40° E., and lat. 35°12' N., is built in a deep valley, which is well tilled and rich in orchards. The north part presents a succession of great table-lands, inhabited in the summer by wandering shepherds, who migrate in winter to the vicinity of Baghdad. The soil in the valleys is good, and abundauce of wheat, barley, and the oil-plant (Sesamum orientale) is grown, besides a little tobacco. The oak forests of the mountains to the west yield fine timber, which is floated down the Tab into the Tigris, and gall-nuts, which are sent to India. The inhabi- tants, mostly Kurds, are greatly given to war and robbery, and many of the tribes are subjects of Persia only nominally.

ARDENNES, a department on the N.E. frontier of France, which derives its name from the famous forest, is bounded on the N. and N.E. by Belgium, on the E. by the department of the Meuse, on the S. by that of Marne, and on the W. by that of the Aisne. In shape it is an irregular pentagon, with a cape-like prolonga- tion into Belgium on the north. It has a superficial

extent of 523,000 hectares, or 1,291,810 acres, of which 300,000 hectares, or 741,000 acres, are arable land, while 154,000 hectares, or 383,800 acres, are occupied with

forest, wood, and heath. The wooded plateaus which begin in the department of the Meuse are continued in a north-west direction, and divide the basin of the Meuse from the basin of the Aisne, till they form a junction with the Ardennes proper. At one time this was a very inacces- sible region, and formed a strong defence, as Dumouriez showed in 1792, against invasion from the east. The Meuse (Maas), flowing in a northern direction, enters obliquely from the east, and cuts off a narrow and irregular strip along the Belgian side of the department, which it leaves at the extreme uorth, to flow through Belgium and join the western branch of the Rhine. The Aisne enters near the south-east corner and leaves at the south-west ; its course through the department skirting the base of the Argonne range, and forming an irregular are with its convexity to the north. The chief wealth of Ardennes consists in mineral productions, wood, cattle, and sheep The number of cattle in 1872 was 82,975, of sheep 393,044, of horses 49,748, and of pigs 51,809. The sheep are small, but are valued for the quality of their mutton. Agricul- ture has recently made considerable advances in the depart- ment. There are upwards of 150 iron-mines, as at Grandpré, Champigneulle, Raucourt, Brevilly, Monthermé, and Flize ; a great number of excellent slate-quarries, as at Deville, Monthermé, Rimagne, and Fumay; while copper also is obtained in considerable quantities, and there is an abun- dant supply of building-stone, limestone, and marl. Peat is very common in the north, and coal is worked near Sedan. 'The people are well educated, active, and indus- trious, and can boast of having furnished from their ranks such men as Gerson, Robert de Sorbon, Mabillon, Corvisart, Marshal Macdonald, de Wailly, Léon Renier, H. Taine, and the publisher Hachette. It is said that they are marked by a special aptitude for the exact sciences. The department has about 240 miles of imperial road and 131 of departmental. Its two great rivers are united by the Canal des Ardennes. A branch of the Paris and Strasburg railway runs through it in a north-east direction, joining Rheims (in Marne) with Réthel and Méziéres, and holding north along the valley of the Meuse to Namur (in

Belgium). At Mézitres this branch meets almost at right angles with a line running north-west, and connecting Thionville (in the district acquired by Germany) with Montmédy, Sedan, Maubert, &c. The department is divided into five arrondissements : Méziéres, towards the centre; Rocroy, in the N.; Rethel, in the W. and 8. ; Vouziers in the S.; and Sedan in the E. Mézicres is the capital, and a pre- fecture. Ecclesiastically the department, which has 46 cures, is part of the diocese of Rheims. It contains com- munal colleges and normal schools, and has 720 free public schools. The population in 1872 was 320,217, the falling off from 331,296 in 1851 being due to the war of 1870-71. See Elizé de Montagnac, Les Ardennes Illustrées (Prance et Belgique) 4 vols. fol. 1873.

ARDFERT, a small village in Kerry, in the S.W. of Ireland, about 4 miles N.N.W. of Tralee, and nearly as much from the coast. It had at one time a university, and was the seat of a very ancient bishopric ; but both it and Aghadoe, with which it was combined, are united to the see of Limerick. The cathedral, a very old building, was the church of St Brendan's monastery. A pillar tower, which stood near it, and was one of the finest and loftiest in the kingdom, fell in 1780. Population, 192.

ARDGLASS (the green height), a town of Ireland in Down county, Ulster, at the head of a small bay about 8 or 9 miles S. of the entrance of Strangford Lough, and 7 miles §.S.E. of Downpatrick, was a place of great import- ance soon after the Norman invasion. It had a considerable trade, was a royal burgh, and sent a representative to the Irish parliament. It is still remarkable for the ruins of

five Anglo-Norman castles. Its permanent inhabitants, who are chiefly engaged in the fisheries, numbered only 613 in 1871; but its population during the bathing" season is considerably increased by visitors. Ships of 500 tons may enter the harbour at all tides, and its inner cove admits vessels of 100 tons. There is a lighthouse at the end of the pier, in lat. 54° 15' N., long. 5° 36' W. ARDOCH, a parish in Perthshire, famous for its Roman military antiquities, which are situated in the grounds of Ardoch

House, about 24 miles N. of Greenloaning, on the Caledonian Railway. They consist of—(1), a strong fort or station, surrounded by a series of ramparts and ditches ; (2), vestiges of an intrenched outwork of considerable ex- tent at the north side of this station; and (3), traces of two camps, still further to the north, capable, according to General Roy, of containing 28,800 and 14,000 men respec- tively. the smaller camp being partly included within the limits of the larger. See Gordon's Jtiner. Septent., p. 41 ; Pennant's Zour, iii. 102 ; Roy's Military Antiquities, pp. 62, 226; Stuart's Caledonia Romana, pp. 187-194. ARDRES, a French town, in the department of Pas de Calais, and arrondissement of St Omer, on a canal joining Calais and St Omer, to which it gives its name. The "Field of the Cloth of Gold," where Henry VIII. of England and Francis I. of France tried to outdazzle each other in 1520, was in the immediate neighbourhood. The town contains several distilleries and breweries. Population, about 2200. ARDROSSAN, a sea-port in Ayrshire, Scotland, 31 miles by rail from Glasgow, in N. lat. 55° 38', and W. long. 4° 49'. It dates from an early period, as there seems to have been a castle and a small fishing village in existence for several centuries. The name of Arthur of Ardrossan is found in connection with a charter dated 1226; and Sir Fergus of Ardrossan accompanied Edward Bruce in his Trish expedition in 1316, and in 1320 signed the appeal to the Pope, by the barons of Scotland, against the aggressions of Edward I. of England. The castle, famous for its capture by Wallace, was finally destroyed by Crom- well, who is said to have used part of its masonry for the construction of the fort at Ayr. The family of the barons of Ardrossan is now merged, by marriage, in that of the earl of Eglinton and Winton. The rise of Ardrossan into commercial importance is due to the exertions of Hugh the twelfth earl of Eglinton, who commenced the construc- tion of the present town and harbour in 1806. The harbour was intended to be in connection with a canal from Glasgow to Ardrossan, but this was only completed as far as Johnstone. Owing to the stoppage of the canal works, and the death of Lord: Eglinton, the construction of the harbour was suspended till 1845, when it was partially completed and placed in connection with the Glasgow and South-Western Railway by a branch railway which joins the main line at Kilwinning. The cost of the harbour up to 1874 has been upwards of £200,000. The works now consist of a wet dock of 4 acres in area, with 19 feet at high water over the lock sill, and of two tidal harbours— one 18 acres, and the other 6 acres in area.

There is a lighthouse on the north-west point of the outer breakwater, with a white flashing light. The works are well supplied with steam cranes, and all modern appliances for discharging and loading vessels. The exports consist principally of coal and iron from collieries and ironworks in the neighbourhood, and the imports of timber, ores, and general goods. There are lines of steamers plying to Glasgow, Arran, Belfast, Newry, and to various ports in Spain. In 1874 the number of vessels entering and leaving the port was 2044, with a registered tonnage of 296,690; the number of vessels belonging to the port was 114, with a registered tonnage of 15,611, and there were exported 276,081 tons of coal, and 80,516 tons of iron. Iron founding and ship-

building are carried on to a considerable extent ; and for the repair of vessels there are a graving-dock, which can take in vessels of 1500 tons, aud a floating dock and patent slip, which can each accommodate vessels of 500 tons. In 1846 an Act of Parliament was obtained, erecting the town into a burgh, with a corporation consisting of a provost, two bailies, and five town councillors. The public buildings consist of a townhall, the property of the cor- poration, and of five churches, belonging to the Established Church, the Episcopal, the Free, the United Presbyterian, and the Evangelical Union denominations respectively. There are three branch banksin the town. The population in 1851 was 2071; it was 3929 in 1871; and in 1874 it is estimated to be 4228.

AREMBERG, a small market-town of Prussia, in the government of Coblentz and circle of Adenau. It is situated not far from the river Ahr, and has a castle which was formerly the residence of the dukes of Aremberg. About the year 1298 the earldom of Aremberg, which had previously belonged to a branch of the house of Hostaden, came by his marriage with Matilda to John of Engelbert, earl of Mark (Westphalia), and continued in his fanrily till 1547, when John of Barbangon, of the celebrated house of Ligne, by marrying the only sister of the childless Robert III., obtained possession of the lands, which were raised by Maxiniilian II. to a principality, and ranked among the German states. John, who is remembered as the leader of troops from the Netherlands to serve against

the Huguenots, having fallen (1568) in the battle of Heiligerlee, was succeeded by his son Philip Charles, admiral of Flanders, who greatly increased his possessions by marrying Ann of Croy, heiress of Croy, Arschot, Chimay, &e. He died in 1616, and was followed by his eldest son, stadtholder of Namur, who, having informed the Spanish government of a conspiracy, was rewarded by arrest (1634) and imprison- ment at Berdessillas, where he died in 1640. Under his son, Philip Francis, Aremberg was raised to a dukedom (1644). Alexander Joseph and Philip Charles Francis both fell in battle against the Turks, the former in 1663, and the latter in 1691. Charles's widow, Maria Henrietta, left her country and possessions rather than recognise the duke of Anjou as king of Spain, and lived in dignified poverty till the battle of Ramilies gave back the Netherlands to their right- ful possessor. She died in 1744. Her only son Leopold is known in history as a military leader (at Malplaquet, Belgrade, Ettinghen, &c.), and as the patron of Rousseau and Voltaire. His son and successor, Gharles Leopold, was distinguished in the Seven Years' War as an Austrian field-marshal, and increased his possessions by marriage with Margaret of Mark. By the peace of Luneville (Feb. 1801), the next duke, Engelbert, lost the greater part of his ancestral domain, but received in compensation Meppen and Recklinghausen. On the establishment of the con- federation of the Rhine, his son Prosper-Louis (to whom, becoming blind, he had ceded his domains in 1803) became a member (1807), and showed great devotion to the interests of France ; but in 1810 he lost his sovereignty, Napoleon incorporating his dukedom with France and the grand duchy of Berg, and indemnifying him by a rent of 240,702 francs. In 1815 he received back his pos- sessions, which were mediatised by the Congress of Vienna, part falling to Prussia and part to Hanover. On account of the one portion he became a peer of the Westphalian estates, and by the other, a member of the House of Lords in Hanover. George IV. of England, on 9th May 1826, elevated the duke's Hanoverian possessions to a dukedom under the title of Aremberg Meppen. His territory extended over 780 geographical square miles, with 94,000 inhabitants , of which, 544 square miles, with 50,000 inhabitants, were in Hanover ; besides which he had large estates in France,

and extensive tracts of forest in the Pyrenees. His brother Augustus-Raymond (b. 1753, d. 1833) became famous, under the title of Count of

Mark, for his connec- tion with the French Revolution and his friendship with Mirabeau. Duke Prosper-Louis died in 1861, and was suc- ceeded by his son Engelbert.

ARENDAL, a sea-port town of Norway on the Skager- rack, 35 miles north east of Christiansand. It is built at the mouth of the river Nidelf, on a number of small islands and rocks, the houses in many places being erected on piles. From its situation, and the number of canals by which it is traversed, it has acquired the name of Little Venice. There is a considerable shipping trade, particularly in iron and timber; and ship-building, distillation, and iron-mining are carried on. The neighbourhood is remarkable for the number of beautiful and rare minerals found there; one of these, a variety of epidote, was formerly called Arendalite. Louis Philippe lived here a long time during his exile. Population in 1855, 4456 ; in 1865, 5800.

AREOPAGUS ("Apetos za-yos), a small barren hill to the west and within bowshot of the Acropolis of Athens, for an attack upon which it would form a natural base. It was so used (480 3.¢.) by the Persians (Herodotus, viii. 52). For the same purpose it had been occupied also in the legendary age by the Amazons, when in the time of Theseus they menaced Athens, and from the circumstance of their having then sacrificed to Ares, the hill, accord- ing to A'schylus (Lumenides, 685, jf.), derived its name. Assuming the occupation by the Amazons to have been typical of what frequently happened during the hostilities of early times, it is easy to understand how the hill came to be associated with the war god (Kohler, in the Hermes, 1872, p. 105). To the popular mind the Areopagus was always the "hill of Mars." But the popular mind required a more definite account of the origin of the name, and to supply this, there took shape the legend of Ares having been here called before a court of the twelve gods to answer for the murder of Halirrhotius (Pausanias,i. 285). This explains at once the origin of the name of the hill and of the court which held its sittings there. Aischylus, how- ever, gives in the Humenides a different origin to the court, declaring it to have been first appointed by Athene to try Orestes for the murder of his mother Clytemnestra. In later times both legends were dismissed, and the explanation of the name referred to the nature of the cases—cases of murder—tried before the court (Suidas, s. v., "Apetos ma-yos éret ra*

hovixa Suxdle 6 8 “Apns emt tdv ddvev). The four legendary cases of murder tried before this court were those in which Ares, Cephalus, Dedalus, and Orestes appeared as the accused. But the selection of this hill as the site of a criminal court, in the first instance, is to be sought for in the sacred relation in which it stood to the worship of the Erinnyes, or Eumenides, and not in its con- nection with Mars, for whom it had no sanctity, and between whose worship and that of the Erinnyes K. O. Miller (Zumenides, p. 178) has not succeeded in proving any community. On the top of the hill towards the east is an artificial plateau accessible from the south by steps cut in the rock. In several places are still to be traced the rock-hewn seats on which the court sat in the open air, so that the judges and the accusers might not be under the same roof with a polluted criminal. The sittings were held by day, not by night, unless the authority of Lucian be accepted (Hermot., 46; De Domo, 78). Raised upon two unhewn stones (épyot AéGor) the accuser and the accused made their pleadings, the stone used by the former being called \éOos éva8edas, “ stone of implacability,” not of “impudentia” as translated by Cicero (De Leg., ui. 11), or “impudence,” as given by Dyer (Athens, p. 451); the other was called diOos vBpews, or “ — a crime.”

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Within the boundary of the court stood also an altar to Atlrene Areia, believed to have been dedicated by Orestes, and blocks of marble (é£oves), on which were inscribed the laws defining the powers of the judges. On another part of the hill stood one of the most revered of Athenian sanctuaries, that of the Erinnyes, containing statues of these three goddesses, but not in the hideous aspect in which they were usually conceived, and also statues of those other deities connected with the lower world, Pluto, Hermes, and Ge. Within the boundary of this temple was the tomb of C&dipus, and very close to the boundary, if not within it, was the herodn or sanctuary of Hesychus, the founder of the priestly line in whose hands were the rites of the Erinnyes. Near the temple was the KvAwveuy, a memorial of the pollution of the spot caused by the treach- erous slaughter of those who, having failed in the con- spiracy of Cylon, had taken refuge there as suppliants (Herod. v. 71; Thucyd., i. 126). Towards the north-east

foot of the hill was a temple of Ares containing statues of that god, of Enyo, Aphrodite, and Athene, while outside were statues of Hercules, Apollo, Pindar, and a poet named Caladas. On the north-cast side there is a chasm in the rocks with a spring of dark water, which may have been associated with the worship of the Erinnyes.

The court and council of the Areopagus (7 BovAy H e&

'Apecov mé&you or } dvw Bovdy), with a legendary history which distinctly pointed to it as an institution of primitive origin and intrusted with functions of the first importance, was yet in regard to the period of its history before Solon (594 B.c.) so little known that most people in later times had come to believe it to have been created by him (Plutarch, Solon, 19). As proof that the court had not existed before the time of Solon, it was urged that in the legislation of Draco (620 .c.) there is no mention of the Areopagus, he having referred all such cases as in later times came within the powers of that court to a class of judges called the Ephete. But there is no reason why "' Epheta" may not have been previous to Draco the title applied to the judges of the court of Areopagus, instead of « Areopagites," just as it was the title borne even after Solon by the judges of the other four Athenian courts which tried cases of bloodshed, unless we accept the statement of Pollux (viii, 18) that the appointment of the Ephetz to all these courts, including the Areopagus, was the work of Draco. For then, these courts having admittedly been in existence before his time, there is no help but to assume that the judges had previously borue other titles, and that in the case of the Areopagus the title used could only have been Areopagites. But it is quite within fair criticism to throw aside this statement of Pollux, as has been done by the most recent writer on this subject (Philippi, Rheinisches Museum, 1874, p. 12), and to assume, with K. O. Muller, that the Ephete had acted from time immemorial as judges in all the five courts. There would remain for the fame of Draco the organisation of the courts, and possibly the limitation of the number of Ephetz to 51. We must then conceive Solon as having found the Ephetz acting as judges in the Areopagus and in the other four courts. He set himself to alter the constitution of the Areopagus by adding to the Ephetz already in office there the nine Athenian archons on their retiring from public duties, and provided that they had rendered a satisfactory account of their administration. It is

probable that from this new source alone a sufficient number of judges was supplied, and that, therefore, the original Ephetez were allowed to die out, though in that case the number of Areopagites could scarcely have been a fixed one (given at 51 by the scholiast to the Humenides, v. 743), considering the liability of an archon to be rejected. The new judges retained their office for life subject to dismissal only by their own

Its decisions were quoted as models of justice. petency was limited to cases of wilful murder (¢dvos

the jurisdiction of one and the same court.

ABEBQ@PAGUS

body. For the most part they were advanced in years

and necessarily always men of integrity and experience

qualifications which were demanded in the highest degree from a court which, instead of administering strictly defined

laws, had to base its verdicts on a careful investigation of

the life and circumstances of parties arraigned before it. Its com-

éxovowos Or ék mpovotas), bodily injury with intent to kill (rpatpa ék mpovoias), incendiarism (avpxaia), and poisoning (pdppaxa, edy Tus daroxreivy Sovs). Other degrees of homi- cide were referred, according to their nature, to the other four Athenian courts, viz., accidental homicide (¢dvos dxovcos) to the Palladium, justifiable homicide (dovos Sixatos) to the Delphinium ; at the Prytaneum was heard the formal indictment of inanimate objects, such as wood or stone, which by falling had caused the loss of life ; while before the court of Phreathys at the Pirzeus appeared those who having been banished for accidental homicide had during their banishment committed wilful murder. There were, however, cases of a complicated nature in regard to which the records are far from explicit as to the courts to which they were referred. Of this kind was a case in which the actual perpetrator (xeupt épyacdpevos) was found to have been only a tool

in the hands of a third person. It was with the latter that the prosecution had principally to deal, and against him was issued a charge of Bovtrevors, or premeditation of murder. Obviously, such a person was equally guilty whether his victim died or not (Harpocration, s.v. BovAevoews), and therefore equally within Still it has been usual to follow Schémann (Griech. Alterthiimer, i.

449) in drawing this distinction, that when death ensued the case went before the Areopagus, and before the Palladium when the victim survived. But this distinction has been made for the sake of admitting both authorities to be correct,

when, on the one hand, Iseus and Aristotle (as quoted by Harpocration) refer BovAevors to the Palladium, while Dinarchus (sce Harpocration) on the other hand refers it to the Areopagus. It would be better to dismiss the authority of Dinarchus altogether, the more so since in a speech of Antiphon, admittedly in a case of BovAevors (Choreutz), a form of address is employed, 3 &vSpes(once, ddvdpes Stxacrat), which would not have been proper for the Areopagus, where the form was & BovAy (Philippi, Der Areopag, p. 32). The punishments inflicted by the Areopagus were—(1.) For wilful murder, death, the execution of which was witnessed by the accuser. It is probable that confiscation of the criminal's property was included in the sentence, but this point is obscure. His property was certainly confiscated when it happened that he escaped before sentence was pronounced. (2.) For injury with intent (tpatpa é mpovoias) the sentence was confiscation of property and banishment, but not for life. If the victim of either of these crimes was a p2¢rouxos, or alien, the punishment, it has been supposed, was less severe, but of this there is no real evidence. 'The procecdings, in eases that came before the Areopagus, began, as did all Sica: povexat, with a charge (ypad%) nrade before the archon king sitting in his chambers in the agora. It was his business to take down the charge and to make such a preliminary inquiry into the facts as would guide him in sending the case for trial. For this purpose he appointed three separate occasions in three successive months, but whether he was contented to search into the facts alleged by the accuser, or whether he examined also the accused, is a point on which there is no evidence. It is only known in general terms that the inquiry was conducted with great care, and, it is not improbable, in

presence of members of the Areopagus, who would thus obtain a mastery of the evidence before the trial took place.

AREHEOPAGUS

The accuser was required to prove his relationship to the murdered person as giving him the right to prosecute he had to take an oath in pledge of his sincerity, and to denounce the accused. A denunciation (xpéppnors) having been publicly made, the accused was regarded as polluted, and durst enter neither temple nor markct-place on peril of his life. Some have thought that the practice was to make a formal denunciation three times, first at the grave of the deccased, next in the market-place, and then before the archon as just stated (Schémann, Antiguitates Jur. Pub., p. 289), but it is probable that only the last men- tioned, if the others were actually made, was regarded as legal. In the fourth month, after detcrmining that the case was to go before the Areopagus, the archon king in his capacity of president of the court laid the case before it. The court sat on the last three days of every month (Pollux, viii. 18). Of the first part of the proceedings (apoduxdorar) the principal feature was the adininistration of an oath to the parties and the witnesses ; the ceremony consisting in

the sacrifice of a wild boar, an ox, or a ram, before which those who took the oath called on the Erinnyes to destroy

them and their family if they failed to speak the truth. When the evidence had been gone through (évé«ptors) there followed the Sky proper, consisting of the speeches. Each

party was allowed 1o speak twice, once, it is said, on each of

the first two days, the third day being reserved for judgment. They were charged to avoid everything irrelevant to the issue. After the first speech, the accused might choose voluntary exile unless the charge against him were that of the murder of a parent. In exile, beyond the boundarics af the Athenian state, he was entitled to the full protection of law, and if himself murdcred could be avenged as if he had then been a true Athenian citizen. Should the trial go its full length, he could only be convicted by a majority of the judges. If the votes were equal he was acquitted, and when acquitted

he offered a sacrificc to the Erinnyes and the other deities of the lower world. When it happened that the person entitled to prosecute had missed the regular occasions of making his charge, it was still competent for him to take the summary proceedings of an draywy? fovov, that is, to. lay his case before the Eleven who presided over the prisons, and have the case tried by a Heliastic court. But this could not well be done unless the accused had been caught in the act, or failed to give a reasonable account of himself. When the victim survived he himself was the proper prosecutor ; but when in the contrary event the task devolved on his relatives, it was necessary for them to be within the prescribed degree of cousinship (aveyrdrys), as may be seen from the formula in Pseudo-Demosthenes (Adv. Macartatum, p. 1069, § 57), which again has been strikingly confirmed by the decree (Kohler, Hermes, ii. p. 27), discovered at Athens in 1843, and setting forth part of the laws of Draco in regard to murder. This decree, inscribed on marble and in a very fragmentary condition, bears date 409-8 n.c. A slave having in the eyes of the law no relatives, could not prosecute the murderer of one of his class, but he could appear against the murderer of his master if empowered in writing to do so before the master's death. The master was the lawful accuser when a slave was mur- dered, and similarly only the legal patron could appear in the case of a freedman or other who had not the rights of citizenship. The theory of the prosecution being to obtain, as had been the custom from time immemorial, vengeance for the relatives of the deceased, and being therefore more of a religious than political character, it becomes a question whether, in the event of the relatives refusing to prosecute, or of there being no relatives, the state permitted a foul crime to pass unpunished. On this point there is no infor- mation.

Besides being a court of justice (Sxacrnpiov), the Areo-

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pagus was also a council (BovAyj), empowered to interfere in matters affecting religion and morals, and, previously to the time of Pericles, in the administration of public affairs. With powers of this order honestly exercised, it is not sin- gular that Isocrates (Areopag., 39) in his picture of Athens in the happy times gonc by, should point to the action of the Areopagus as one of three great sources of this happiness (cf. Plutarch,

Solon, 22 ; Themist., 10; and Bockh, Staatshaushaltung, i. p. 208). Nor is it against the view of Isocrates that Pericles and his party should have becn opposed to the Areopagitcs. The mere fact of their being strongly conservative, and of their having the power of opposing, if not with a veto, at least with enormous official influence, his uew schemes of administration, would be sufficient excuse. And it appears certain that the scope of the measure proposed by his friend Ephialtes, and carried during the absence of Cimon the conservative leader, was only to withdraw from the Areopagus this power of interference. Its criminal jurisdiction remained as be- fore, though so much would hardly be gathered from the tone of Aischylus in the Humenides, which appeared as a protest, it has usually been thought, at the time. "Equda- mys pova xatéume TH e& 'Apetov mé&you BovAy ra taép Tov odparos, says Philochorus, while Demosthenes (Adv. Aris- tocrat., p. 644 § 66) states that no tyrant, oligarchy or democracy, had ever ventured to withdraw from that court its jurisdiction in high crimes. Only a passage in a speech of Lysias (Hratosth. 30) really favours the opposite view.

Among the many other functions which the Areopagites retained after the measure of Ephialtes were—(1.) those pertaining to religion, They appointed the fcporo.ot for the temple of the Eumenides, and took care of the sacred olives (uopia), which existed partly in large plantations near the academy, and partly on private lands, such trees being the property of the goddess Athene, against whom it was a crime to injure one of them. The Areopagus could oppose the introduction of new deities or foreign rites, as in the case of St Paul, who had to appear before it (Acts xvii. 19, #f.); but it does not seem that it could, as has been assumed, prohibit such a step if once approved of by a public decree. It saw that no object of public sanctity was violated. (2.) In education and morals little positive is known of its action. It seems to have appointed the masters in the gymnasia, and brought to punishment vagabonds and spendthrifts under the law entitled vojos dpyias. (3.) Its business was to see that public spaces were not occupied or built on by private persons, as in the case of Timarchus (Aischines, Adv. Timarch., § 80), who had put it to the public assembly whether the deserted Pnyx might not be built on. Many inscribed bases of statues in Athens, though mostly of a comparatively late date, bear witness that the consent of the Areopagus, if not indispensable, was very frequently obtained for the

erection of statues. (4.) It protected the standards of weight and measure from falsification. (5.) It exercised an inquisitorial power, partly sua sponte (aur) mpocdow.évn), and partly by mandate from the public assembly (rod dyou mpootagavros airy). In the latter case it merely investi- gated the facts (fjryow roveio bax), and laid them before a Heliastic court… Work of this kind, depending as it did on the public assembly, necessarily varied greatly at different times. From about 350 to 320 Bo. it seems to have been of a very grave character. (6.) The Areopagus re- viewed the conduct of magistrates and the administration of the laws, a function which was relegated, probably by the measure of Ephialtes, to the Nomophylaces, who, though they do not become conspicuous till the time of Demetrius of Phaleron (317-307 B.c.), had yet existed doubtless long before. . =,

Tf now it is true that the Areopagites as a criminal court

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were created and organised by Solon to supersede the Ephetze in the trial of certain crimes, what is to be said of their origin as a state council (BovAy) t Obviously most of their duties as a council were such as must have grown up gradually upon an institution of very high anti- quity, such an institution, for example, as the Homeric Bovdy yepovrwv. Yet there is no direct evidence of the existence of the Areopagus as a council before the time of Solon. It has therefore been suggested that the Areopagitic council appointed by Solon took upon itself the duties of a differently constituted council, which also may have held its sittings on the hill of the Areopagus. This superseded council it was first thought by K. O. Miiller consisted of Ephetz, who, according to tho most recent derivation of the name (émi and érns=€érys, Férns), were the heads of clans. The opinion of Miller has been adopted by Philippi (Der Areopag, p. 208). With less probability Wecklein (Bericht. d. Miinch. Akad., 1873, p. 38, #7.) had suggested the Naucrari. From the time of Solon, except for the change introduced by Ephialtes, the powers of the Areo- pagus seem to have remained much the same down to the Roman period, its position in point of respect and influence apparently increasing the longer it continued, though clearly it is too much to say as Cicero does (De Nat. Deor. ii. 29, 74) Atheniensium rempublicam consilio regi Areopagi. But its constitution Lad been changed by Plutarch's time,

possibly long before. It was then presided over by an emioratns with a kypvé by his side, and was no louger composed of the retiring archons. The principle of election is not known. (A. 8. M.)

AREQUIPA, one of the 18 departments of Peru. It lies along the Pacific from lat. 15° to 17° 20'S. Its chief productions are silver, alpaca and other wools, sugar, wine, and brandy. 'The population is stated at 200,000, which is probably in excess. The district is volcanic, and con- tains several volcanoes, which appear, however, to be mostly extinct. Of these Misti, otherwise known as the Arequipa, one of the most perfectly cone-shaped of moun- tains, occasionally throws out smoke or vapour. It rises to the height of 20,320 feet above the sea. An eruption of Ubinas, a mountain on the eastern boundary of the depart- ment, occurred in 1839.

AREQUIPA, the chief town of the department, stands at the foot of Misti, in the fertile valley of the Chile, 7775 feet above the level of the sea, in lat. 16° 16' S., long. 72° 31' W. It is divided into five districts—Santo Domingo, San Francesco, La Merced, San Augustin, and Miraflores—- contains 2064 houses, and has a population of about 30,000. In each of the districts there is a monastery and a church ; and besides there are three nunneries in the city. The cathedral is quite modern, the former building having been destroyed by fire in 1849. Solidity rather than beauty is the principal characteristic of Arequipan architecture, as might be expected in a city so liable to suffer from earth- quakes. These occur with great frequency, and are some- times of great severity; in 1582, 1609, 1784, and 1868 the city was greatly damaged. In general the streets run at right angles, and are wide and well paved. The better houses are all built in the Spanish style, with two or three courts; the walls are massive, and the ceilings vaulted. The material used is a soft magnesian limestone. The town has a faculty of medicine which rivals that of Chu- quisaca in Upper Peru, a university, two academies, a college founded by Grand-Marshal de la Fuente, a public library, established in 1821, two printing-offices, each pub- lishing a small newspaper, an hospital, and a foundling asylum. Arequipa is united to Mollenda on the,coast by a railroad completed in 1870, 107 miles in length, nearly the whole of which is over a waterless desert. An iron pipe, which supplies Mollenda with water, runs along the line for

85 miles. The railway has now been extended across the Andes, reaching a height of 14,660 feet, to. Puno, which is connected with Bolivia by steam navigation across Lake Titicaca.

ARES [Mars], in Greek Mythology, the god of war, not, however, of war in its wide sensc, including campaigns, the disposition and command of forces, but in its more primitive meaning of a fierce encounter between bodies of men. Neither the causes nor the ultimate effects of war were ascribed to him. He was simply a personification of the wild impetuous spirit with which battles were fought,

Aves. From brass coin of the Bruttii. Brit. Mus.

and as such he was conceived as the model of a hero, splendidly armed with cuirass, helmet, shield, and spear, swift, of great size (meAdpuos), raging (wowdmevos), mur- derous (Bporodovyds), unsatiable of war (&ros woA€pov0). Enyo, the furious war goddess, Eris (Strife), Deimos and Phobos (Dread and Alarm), were usually by his side. Even his mother Hera denounces him (Jliad, v. 761) as senseless, and knowing no bounds. It was doubtless only as an illustration of the habitual strife between Hera and Zeus that Ares was accounted their son. When wounded by Diomedes assisted by Athena (Ziad, v. 853, J), he fell with a noise like that of nine or ten thousand men in battle; and again (Jliad, xxi. 400, 7), when Athena wounded him with a stone, he fell, and covered with his fall seven acres of ground. On this latter expres- sion it is to be observed, that, while it conveys a picture of broad-strewn carnage consistent with the usual character of Ares, it suggests also, from the measurement given, thoughts of the destruction of cultivated land in war, the more so when taken in connection with the story of Otus and Ephialtes, which reads in the Jliad (v. 385) like a reminiscence from an carlier time, when war was the dread of the husbandman. These two giants, sons of Aloeus, – the planter, born very small, but grown by being fed on grain to immense size, and occupied, as their names imply, with husbandry (Otus = w#éw, and Ephialtes = éridé)Xopat), had seized Ares and confined him in a large brazen jar for thirteen months, so that for one year there was entire peace over the fields. If, as is not improbable, the first conception of a war god originated in

connection with invasion from non-Hellenic tribes, it would be natural to regard him perhaps more as a ruthless destroyer of fields than of human life, and equally natural that this view of his character should die out when war became, so to speak, a trade, as it had become by the time of the Iliad. Even then he was still recognised as a god whose home was among the warlike Thracians (Jliad, xiii. 298; Odyssey, vill. 361). This, it is true, may have been nothing more than another instance of the Greek tendency to assign a northern or Hyperborean home to deities in whose character something analogous to the stormy elements of nature was found. On the other hand, it appears that the Thracians and Scythians in historical times (Herodotus, i. 59) wor- shipped chiefly a war god, and that certain Thracian settlements, formed in Greece in prehistoric times, left behind them traces of the worship of a god whom the Greeks called Ares. At Thebes, for instance, had been such a settlement, and there, above all the rest of

Ares. From brass coin of the Mamertini. Brit. Mus.

Greece, were aftcrwards found the oldest traditions of the worship of Ares, and that not altogether in the character of a war god. The fountain of Ares guarded by a dragon, and the legend of the Spartee, who sprang from a field

sown with dragon's teeth, seem rather to symbolise some

destructive influence in nature, such as that of the sun in summer scorching the fields. That influence of this kind was ascribed to the Thracian god follows from the identifi- cation of him with the Sabine and Roman Mars, to the latter of whom the Arval brethren in Rome made annual sacrifice of a red dog to avert the calamity of the ripe grain taking fire. Apollo is the god who in Greek mythology, as we know it, discharged such functions. But itis argued that in this matter he may have superseded Ares, who on assuming the Thracian character of war god may have gradually resigned his original office. In one of the Homeric hymns Ares is described as a sun god who makes courage and valour stream into the hearts of men, and again, Aletes, king of Colchis, though a son of Helios, was yet the guardian of the

grove of Ares, where was the golden fleece. Meleager, whose valour was displayed against the Calydonian boar, a pest to the fields of Aitolia, was a son of Ares and the fostering nymph Althea. (Enomaus was a son of Ares and a daughter of the river god Asopus. The dog, which had originally referred to the dog star, remained his symbol, but could only be accounted for by the constant presence of that animal on battle-fields. From the destruction of crops by summer heat to similar destruction by war-like invasion seems a natural step. The next step was to take the point of view of the invader, and to magnify the exploits of war. By the time of Homer this had been done effectually, though traces of an older form of belief remain both in the Iliad and Odyssey. Besides those already mentioned, there is the remarkable incident in the Odyssey (viii. 266, ff.) where Hephestos, informed by Helios of the infidelity of his wife Aphrodite with Ares, captures them together in a net, and there holds them for the ridicule of the gods. 'In what appears to be a very early development of her char- acter, Aphrodite was a war goddess, and was styled Areia. But it is scarcely possible that a phase of character sharcd also, for example, by Athena, could have suggested such a relation between Ares and Aphrodite, though Hesiod's state- ment (Theogony, 934) that Deimos and Phobos were their offspring points in that direction. Again, though Ares and Aphrodite were worshipped togéther at Thebes, it is not known that they were worshipped there as deities of war. Harmonia, the wife of Cadmus, the founder of that town, was regarded as their daughter. Possibly the connection originated in some other approximation between Ares and Aphrodite in an earlier form of their worship. Women were excluded from the festivals of Ares except at Tegea, in Arcadia, where he was called yuvaixofoivas. But that exception appears to have been based only on an instance in which that town was successfully defended by its women. While honoured here and there with festivals and sacrifice, us at Sparta, where young dogs, and apparently once mcn, were offered to him under his title of Enyalios and Theritas, there were yet wanting in his case those local beliefs and traditions which gave vitality to the worship of a god. Next to Thebes, already mentioned, it was at Athens that this vitality obtained most, through the legend attaching to the Areopagus ("Apevos wayos). The nymph Agraulos had born him a daughter Alcippe, whom Halirrhotius, a son of Neptune, had seized with violence, and for this was slain by Ares, who was tried by a council of the gods sitting on the Areopagus and acquitted. At the foot of the Areopagus was a temple

of Ares, with a statue of the god from the hands of Alcamenes. To judge now of the fluctuation in the conception of Ares from works of art, it

is found that previous to the 5th century B.c., he was figured bearded, grim, and heavily armed. From that time, apparently under the influence of Athenian sculptors, who had to render his form in some harmony with their local war goddess Athena, he was conceived as the ideal of a youthful warrior, and for a time associated with Aphrodite and Eros, as in the group of the villa Borghese at Rome, where Eros plays with his weapons, and in many other groups of Ares and Aphrodite in marble and on engraved gems of Roman times. But before this grouping had recommended itself to the Romans, with their legend of Mars and Rhea Silvia, the Greek Ares had again become under Maccdonian influence a bearded, armed, and powerful god. The Romans, however, though they readily adopted the Greek Mars and Venus, yet retained the former deity in his native character as a god representing the influence of the sun on cultivated fields, resembling the Mamers of the Mamertines in Sicily, with a wolf as his symbol (Conze, /Zeroen und Cotter Gestalten, p. 22, Vienna, 1874; Preller, Griechische Mythologie, i. pp. 251-259 ; Welcker, Griechische Gétterlehre, i. pp. 413-424). (A. 8. M.)

ARESON, Jon (or Hans), a poet, and the last Roman Catholic bishop in Iceland, was born in 1484. He endured many privations in his youth, and at the age of twenty took holy orders, and was attached as priest to the parish of Helgastad. Here he was taken under the protection of Gottskalk, bishop of Holum, who twice sent him on missions to Norway. He acquitted himself so well that in 1522 he was appointed successor to Gottskalk. To many his election wes displeasing, chiefly on account of his ignorance of Latin ; and Ogmund, bishop of Skalholt, the other diocese, drove Areson with violence from his bishopric. He was reinstated in 1524, and spent some rather stormy years till 1540, when Frederic IIL, king of Denmark, wrote to the bishops of Iceland desiring them to take measures for the introduction of Lutheranism. This Areson declined to do, and he even denied the king's power as head of the church. The greater part of the island, however, became Protestant. In 1548 the Lutheran bishop of Skalholt died, and

Areson made an armed excursion into his suc- cessor's territory. For this he was in 1549 declared an outlaw. He again sent an expedition against Skalholt, and captured the bishop, whom he treated with indignity. In 1550 his forces were defeated ; he was taken, and executed along with two of his sons. Areson is celebrated as a poet, and as having been the first to introduce print- ing into Iceland. Several of his poems are collected by Harboe in his History of the Reformation in Iceland.

ARETAUS, a Greek physician of Cappadocia, who lived, according to some, in the reign of Augustus ; accord- ing to others, under Trajan or Hadrian. He was one of the class of Pneumatic physicians, who made the heart the seat of life and of the soul. He wrote, in the Ionic dialect, several treatises on acute diseases and other medical subjects, some of which are still extant. The best editions of his works are—that of Boerhaave, in Greek and Latin, with notes, 1731 ; that printed at Oxford in 1723, in folio ; and that by C. G. Kiihn, Leipsic, 1828.

ARETHUSA, a fountain at Syracuse, in Sicily, famed among the ancients for the abundance of its waters and the number of its fishes, but still more so for the connec- tion which was fabled to exist between it and Alpheus, the river of the Peloponnesus, "who stole under seas to meet his Arethuse." According to the anthropomorphic legend, Arethusa was a daughter of Nereus and Doris, who was changed into the fountain by her mistress Diana (Artemis), to deliver her from the pursuit of her lover Alpheus. There is still a copious supply of water in the modern fountain, but the taste is brackish, and it can

only be used for washing ; while the fish are no longer to be found. There was a fountain of the same name in Ithaca (Homer), and another at Chalcis in Eubea, which supplied the city with water, but, according to Leake, has now disappeared. There was also a lake Arethusa, through which the Tigris flowed, identified by Ritter with L. Nazuk.

ARETHUSA was also the name of two cities: Arethusa in Macedonia, famous for the tomb of Euripides, aud Arcthusa in Syria (Rastan), which

gives its name to Marcus, a bishop who was persecuted by the Arethusans, and is honoured as a martyr by the Greek Church.

ARETINO, Prerro, an Italian writcr of the 16th century, was born in1492 at Arezzo in Tuscany, from which place he took his name. He is said to have becn the natural son of Luigi Bacci, a gentleman of the town. He received little education, and lived for some years poor and neglected, pick- ing up such scraps of information as he could. When very young he was banished from Arezzo onaccount of a satirical sonnet which he composed against indulgences. He went to Perugia, where for some time he worked as a bookbinder, and continued to distinguish himself by his daring attacks upon religion. Aftcr some years' wander- ing through parts of Italy he reached Rome, where his talents, wit, and impudence commended him to the Papal Court. This favour, however, he lost in 1523 by writing a set of obscene sonnets, to accompany an equally immoral series of drawings by the great painter, Julio Romano. He left Rome and was received by John de Medici, who took him to Milan and introduced him to Francis He gained the good graces of that monarch, and received hand- some presents from him. Shortly after this Aretino attempted to regain the favour of the Pope, but, having come to Rome, he composed a sonnet against a rival in some low amour, and in return was assaulted and severely wounded, He could obtain no redress from the Pope, and returned to John de Medici. On the death of the latter in December 1526, he withdrew to Venice, where he afterwards continucd to reside. He spent his time here in writing comedies, sonnets, licentious dialogues, and a few devotional and religious works. He led a profligate life, and procured funds to satisfy his needs by writing syco- phantish letters to all the nobles aud princes with whom he was acquainted. This plan proved eminently success- ful, for large sums were given him, apparently from fear of his satire. So great did Aretino's pride grow, that he styled himself the " divine," and the "scourge of princes." He died in 1557, according to some accounts by falling from his chair in a fit of laughter caused by hearing some indecent story of his sisters. The reputation of Aretino in his own time rested chiefly on his satirical sonncts or burlesques; but his comedies, five in number, are now considered the best of his works. His letters, of which a great number have been printed, are also commended for their style. The dialogues and the licentious sonnets have been translated into French, under the title Académie des Dames.

AREZZO, the ancient ARRETIUM, a Tuscan city on the Chiana (Clanis), which is now an affluent of the Arno, but formerly flowed into the Tiber. Arretium was one of the twelve citics of the ancient Etruscan Confederation, and continued after its incorporation with the Roman dominion to be a highly important military post. Having sided with Marius in the civil war, the Aretines were deprived by Sulla of their Roman citizenship; but the city received a colony under Augustus, and seems to have had a peculiar municipal constitution. In the time of Pliny it was known for its pottery, and many specimens of the bright red ware, with ornaments in relief, differing from the productions of Southern Etruria, have been preserved to

the present day. Among the relics that have been discovered here are the bronze statues of Minerva and the Chimera, now in the Florentine Gallery. In modern history Arezzo is chiefly remarkable for the obstinate opposition it main- tained against the pertinacious encroachments of the Florentines, to whom, however, it had finally to submit. Tt is now a clean, well-built, well-paved, and flourishing town of 10,000 inhabitants, the seat of a bishop and a prefect, with a theological seminary, a surgical school, a library, and a museum. In its cathedral are the tombs of Guido Tarlati, its warlike bishop, who died in 1327, Gregory X. (1276), and Redi the naturalist (1698). Few citics can show such a list of remarkable men as Arezzo—Meecenas (1), Guido, famous for his musical discoveries, Guittone the poet, Petrarch, Leonardo Bruno the historian, Cesalpini the botanist, Marghcritone and Spinello the painters, Alberghotti the jurist, Pope Julius ITI., Pietro Aretino the satirist, Vasari the author of Lives of the Artists, Redi already mentioned, Fossombroni the mathe- matician and engineer.

ARGAM, a village of Haidartbid, in the Niztm's dominions, situated in 21° 2'N, lat., and 77° 2' E. long., 40 miles south-west of Elichpur, and 135 miles north- east of Aurungdbid. The village is rendered memorable as the site of an action which took place on the 28th November 1803 between the British army, commanded by Major-General Wellesley (afterwards Duke of Welling- ton), and the Marhattis under Sindhia and the Raja of Berar, in

which the latter were defeated with great loss. A mcdal struck in England in 1851 commemorates the vic-

tory.

ARGELANDER, Frreprico Wirnerm AvcusT, a distinguished German astronomer, was born at Memel, 92d March 1799; and died at Bonn, 17th February 1875. He studied at the university of Koénigsberg, where his attention was attracted to the study of astronomy by Bessel, whose assistant he became in 1821. In the follow- ing year he published an essay on the path of the great comet of 1811, the period of which he determined with great accuracy. In 1823 he was made superintendent of the observatory at Abo; and in 1832 was transferred to the university of Helsingfors, where he remained for five years. In 1837 he published an admirable essay upon the proper motion of the solar system, and in the same year was appointed professor of astronomy at Bonn, where he spent the remainder of his life. Argelandcr's fame rests principally on the extensive and accurate observations he undertook in continuation of the plan laid down by Bessel. His results were published in the Observationes Astronomice Abo facte, 3 vols., 1830-32 ; DLX Stellarum Fixarum Positiones Medic, 1835, Durchmusterung des nord. Him- mels zwischen 45° und 80° nérdl. Breite, 1846; and in the Sternverzeichniss, containing upwards of 210,000 stars, in the '3d and 4th vols. of the Astron. Beobacht. auf der Sternwarte zu Bonn. The Neue Uranographie, 1843, and the Atlas des nérdl. gestirnten Himmels, 1857, are also valuable works. For several years before his death, Argelander was engaged in observations on stars of vari- able magnitude and brilliancy, and the results of his labours will probably be put forth in a collected form.

ARGENSOLA, the name of two Spanish poets, brothers, who are sometimes called the "Spanish Horaces." The elder, Lupercio Leonardo y Argensola, was born in 1565 and died in 1613. He was educated at the universities of Huesca and Saragossa, and became secretary first to his patron, the duke of Villahermosa, and afterwards to the ex-Empress Maria of Austria. In 1599 he was made historiographer of Aragon, and a few years later historio- grapher royal, In 1610 he accepted the office of secretary to the Count of Lemos, then viceroy of Naples, at which place

he died. His works consist of three tragedics, highly praised by Cervantes, and lyric poems, published along with those of his brother. Some historical writings of his have uot been published. The younger brother, Bartolomeo Leonardo, was born in 1566 and died in 1631. He entered the church, and in 1588 received the rectory of Villahermosa. Empress Maria. Sometime after the death of his brother he succeeded to the office of historiographer. His principal works are—a history of the Conquest of the Molucca Islands (Conquista de las Islas Molucas, 1609), which has

been translated into English, a continuation of Zurita's |

Annals of Aragon, and a translation from the English, called Regla de Perfeccion. His fame rests chiefly on his poems, which are highly esteemed by competent critics. ARGENTAN, a town in the department of Orne, in France, situated in the midst of a fertile plain at the junction of the Ure and Orne, about 31 miles from Alencon. a sub-prefecture, and the chief town of an arrondissement, and has an ancient castle, now used as a court-house and prison, several important churches, and a handsome town-

It is |

house. Its manufactures are a coarse kind of lace called after its name, gloves, leather, and fine cloth. Cattle and horses are reared. Argentan was a viscountship from the 11th century downwards; it has been often taken and

| destroyed; and during the religious wars it remained attached | to the Catholic party. Frangois-Eudes de Mézeray, the He afterwards acted as chaplain to the |

historian, was boru at Rie, in the neighbourhood. Popula- tion in 1872, 5725.

ARGENTEUIL, a market-town of France, in the department of Seine-ct-Oisc, and arrondissement of Versailles, on the Seine, in lat. 48° 56' N.,

long. 2° 15’ E. It gathered round a monastery, which, dating from 656 A.D., was by Charlemague changed into a nunnery, after- wards famous for its connection with Heloise, and on her expulsion in 1129, was again turned into a monastery. Francis J. surrounded the town with walls and a ditch. The Chateau du Marais was once possessed by Mirabeau, aud the parish church dates in some portions from the time of Clovis. Vinegar and an indifferent kind of wine are manufactured, and in the neighbourhood therc are fine quarrics of gypsum. Population, 8176.

ARGENTINE REPUBLIC

Plate HE ARGENTINE REPUBLIC comprises the greater | of which it follows, and then that of the Iguazu, or Rio

XXY. part of what was formerly the Spanish viceroyalty of

Buenos Ayres.

authority of the government established at Buenos Ayres, and formed the three important republics of Bolivia, Paraguay, and the Banda Oriental del Uruguay, commonly called either the Oriental Republic or Uruguay. The city of Buenos Ayres, the capital of the province of the same name, then became the seat of the national government of the United Provinces of the Rio de la Plata,—so named in the treaty with England, by which their independence was recognised, and since termed the Argentinc Republic. Including the Indian tribes, who are in almost undisputed possession of half its territory, the country does not con- tain half so many inhabitants as the city of London, though it extends over an area as great as all Central and Western Europe combined ; and the fertility of its vast plains, together with the yet undeveloped wealth of its mineral resources, indicate that it is well able to sustain as numerous a population as that of the part of Europe just

On the separation of the country from > Spain the remainder of the viceroyalty seceded from the –

_ Grande de Caritiba, an important tributary of the Parana. The Parana, down to its junction with the Paraguay, and the latter upwards as far as the mouth of the Pilcomayo, form the boundary with the Republic of Paraguay.

South of the 22d degrec of latitude the country between the Pilcomayo and the Paraguay is disputed by the Argen- tinc Republic and Paraguay. The boundary with Bolivia lies along the 22d degree of latitude between the Pilcomayo and the Vermejo, and then, leaving important tributaries of the latter to Bolivia, it follows the course of that river to its source, whence it takes a devious course westwards among the mountains which form spurs to the Andes. On reaching the latter it follows the main chain south- wards to latitude 25° 30', where it passes to a more westerly ridge of the Andes on which the boundaries of the three neighbouring republics unite. The boundary we have described with Bolivia cannot be considered as permanently settled; andthe boundary between Bolivia and Paraguay to the north of the Argentine Republic has not been deter- mined. The boundary questions with all these republics

alluded to. Its extent in latitude is greater than that of | are in an unsatisfactory state. any other existing country, if we except the comparatively The most remarkable feature of the country is its plains, Physical useless forcign regions of British America and those of the | which may be said to extend over more than three-fourths of geography. Russian empire, though it only slightly exceeds that of | it. The plains of Patagonia in the south, the Pampas Plains. the comparatively narrow slip of land which forms the | across the extending central part of the country, and the Boundaries neighbouring Republic of Chili. It is bounded on the W. | Chaco in the north-east, have no very definite natural boun-

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by Chili; on the S. by the Strait of Magellan; on the

.E. by the Atlantic Ocean, the Oriental Republic, the

Empire of Brazil, and the Republic of Paraguay ; and on the N. by the Republic of Bolivia. The boundary to the W. is formed by the mountain chain of the Andes. The southern limit is at present a question in dispute with the Government of Chili, who claim the entire extent of the Strait of Magellan ; but it is probable that the Argentine Government will make good its claim to the eastern por- tion. The broad stream of the Uruguay below its tribu- tary, the Guarey, or Cuareim, divides it from the Oriental

Republic, except that the small but important island of Martin Garcia, close to the Oriental shore of the Uruguay at its junction with the Parana, belongs to the Argentine Republic. The boundary with Brazil is then formed by the Uruguay and its tributary, the Pepiri Guazu, from the head waters of which it crosses the Sierra de los Missiones to the head waters of the San Antonio Guazu, the course

daries. The two latter arc, in fact, the same continuous formation, in which a slight undulation divides the streams of the Chaco, which join the Parana, from those of the Pampas, which either flow into the Atlautic south of the mouth of the latter river, or disappear by absorption into the soil, and evaporation as they spread over the plains. The best parts of these plains are covered with a rich alluvial soil from 3 to 6 feet in thickness, formed by the constant decaying of the luxuriant vegetation which grows upon it, and this soil rests upon a sedimentary deposit of earth, which appears to have been scoured away from the Andes and the high lands of the central part of the continent. A great part of Patagonia and the western Pampas consists of gravel and coarse detritus from the Andes, and, though apparently sterile, only requires irrigation to become pro- ductive. Other parts of the plains are dry, saline wastes or brackish marshes, which probably mark the former position of aninland sea. Excepting the hills in the south

Mountains. of the province of Buenos Ayres and those of Cordova,

Mr Dar- win's re- searches.

the mountain districts of the country consist of the eastern slope of the gigantic range of the Andes and its branches, which latter make all the north-western part of the country 4 mountainous region. The great chain of the Andes con- sists of a confused mass of broken and contorted strata, piled upon an elevated ridge of granite, through which numerous volcanoes, many of them still active, have ejected vast quantities of lava and scorie. Along most parts of the great mountain chain there are three subsidiary and more or less parallel ridges, between which fertile valleys are formed in many places, whilst in other parts the separation between them is not very clearly defined. In the north-west the boundary with Bolivia lies along the

most eastern of the ridges just mentioned, so that the valleys to the west of it are within that republic, but the boundary with Chili lies along the western ridgc, so that the central and eastern ridges, with the fine valleys which lie between them, belong to the Argentine Republic. The great chain of the Andes, as described by Mr Evan Hopkins, who made extensive explorations in various parts of it, is formed of innumerable varieties of granite, gneiss, schists, hornblende, chloritic slates, porphyrics, &c., and these rocks alternate with each other in great meridional bands. The crystalline rocks follow no particular order in the alternation. For miles only granite and gneiss are found, and again schist, quartz, gneiss, &c., intervening. The whole of the crystalline rocks, especially the micaceous variety, pass insensibly from the crystalline to the laminated structure. We have first the granite base, in which the crystals are somewhat confusedly mixed ; these gradually become arranged upwards into parallel lines, and the rock is then called gneiss; by degrees the felspar is decomposed, and the mass becomes schistose, with enclosed veins of the predominating element of the compound below. This is the general character of the primary structure of the Andes, and upon it there are many bits of sandstones, limestones, d&c., especially on the eastern chain.

The most careful and elaborate researches into the geological conformation of the country were made by Mr Darwin, who published the results in his work on the geology of South America. He points out evidences of a gradual upheaval of the plains of Patagonia and the Pam- pas, to the extent of 400 feet in the southern part of the former, and 100 feet in the latter district. The Pacific and Atlantic Oceans were once connected through what is at present the basin of the Santa Cruz river, in latitude 50° S. This latter district appears to have been upheaved at least 1400 feet before the period of the gradual upheaval above mentioned, as indicated by the present position of gigantic boulders, which have been transported on icebergs 60 and 70 miles from their parent rock. The enormous layers of gravel and sand, on the plains and even on the hills of eastern Patagonia, give evidence of its having at one time formed the bed of an ocean which rolled against the Andes or intervening ranges of moun- tains. The characteristic feature of the plains of Patagonia is gravel, whereas that of the Pampean formation, which includes the Chaco, is earth which, according to Mr Darwin's lucid arguments, has been deposited in the form of sand in the

estuary of the River Plata, the position of which has been continually changing in consequence of the gradual upheaval of the country. This formation extends to the south-west and north-west from the present estuary, over an area at least 750 miles long and 400 miles broad, and the thickness of the deposit is from 30 to 100 feet. The hills of Tapalquen, Tandil, and Vulcan, composed of unstratified granular quartz, project through the eastern part of this Pampean formation. The higher range of the Sierra Ventana further south is also quartz. South of the

the Antarctic regions to

ARGENTINE REPUBLIC

Sierra Ventana, for a distance of 380 milcs, crystalline rocks are scldom if ever met with on the east coast ; and beyond that a porphyritic formation is found resembling the lowest stratificd formation of the Andes.

"The highest peaks of the Cordillera, " says Mr Darwin, " appear to consist of active, or more eommonly, dormant voleanoes—such as Tupungato, Maypu, and Aconeagua, which latter stands 23,000 feet above the level of the sea, and many others. The next highest peaks are formed of the gypseous and porphyritie strata, thrown into vertieal or highly inclined positions. . . . This grand range has suffered both the most violent dislocations, and slow, though grand, upward and downward movements in mass: I know not whether the spectacle of its immense valleys, with mountain masses of once- liquefied and intrusive rocks now bared and intersected, or whether the view of those plains, composed of shingle aud sediment henee derived, which streteh to the borders of the Atlantie Ocean, is best adapted to exeite our astonishment at the amount of wear and tear which these mountains have undergone."

We commend Mr Darwin's work to the attention of readers desirous of becoming better acquainted with the geological conformation of the Argentine Republic.

The great extent of this country in latitude makes its Climate. climate range through all diversities of temperature from that of Northern Europe and Canada to that of Egypt and Arabia. The climate of Southern Patagonia is

less intem- perate than that of Labrador at the same distance from the equator in the northern hemisphere, but colder than the Atlantic shores of Europe in the samme latitude. As the difference of climate in the same latitude in the northern hemisphere is in a great measure attributed to

the fact of thc warm water from the equatorical regions drifting towards the shores of the north of Europe, whilst the cold water from the Arctic regions is constantly flowing southwards along the coast of Labrador, so also the intermediate nature of the climate of Patagonia is doubtless,

in some measure, due to the tendency of the cold water of flow northwards through the cen- tral parts of the Atlantic Ocean, as pointed out by Maury, thus throwing the warm water southwards along the coasts of Brazil and Patagonia. Argentine Patagonia might, not inaptly, be termed the Sweden, and Chilian Patagonia the Norway of the southern hemisphere. In the north of Patagonia and the southern part of the province of Buenos Ayres the climate, as regards temperature, resembles that of England; and northwards of this is the broadest part of the republic, which contains the city of Mendoza in the far west, and Buenos Ayres in the east, and enjoys one of the finest climates in the world, rivalling that of Southern France and Northern Italy. North of this the summer heat becomes too oppressive, and in the extreme north the climate is thoroughly tropical. In some parts of the north- west the altitude of the country gives it a cooler climate than that of the Chaco in the same latitude. Along the Argentine slopes of the Andes and the adjacent country the climate is remarkable for its dryness, because the pre- valent westerly winds lose the moisture which they bring » from the Pacific before crossing the mountains. This peculiarity is most marked in the southern part of the continent, where Chilian Patagonia is deluged with almost incessant rain, whilst Argentine Patagonia is dry and arid. In the east, as at Buenos Ayres, there is more rain, which, with southerly winds and occasional north-westerly storms, is often very heavy. The oppressive humidity which is characteristic of the northerly and north easterly winds forms the most disagreeable and unhealthy weather experi- enced in that part of the country. The climate of Cordova, and also that of some of the more westerly districts, is found very suitable for consumptive patients.

The first Europeans who visited the River Plate were a History. party of Spanish explorers in search of a south-west passage to the East Indies. Their leader, Juan Dias de Solis, landed, in 1516, with a few attendants on the north coast

etween Maldonado and Monte Video, where, according to Southey, they were treacherously killed, and then cooked and eaten by the Charrua Indians in sight of their com- panions on board the vessels. The survivors at once abandoned the country and returned to Spain, reporting the discovery of a fresh-water sea, In 1519 Magalhaens, in the service of the king of Portugal, entered this fresh- water sea, or Mar Dulce, as it was then called, but finding no passage to the west, he left it without landing, and then achieved his famous voyage to the East Indies, passing through the strait which bears his name in 1520. After this Sebastian Cabot, already a renowned navigator, who, in the service of Henry VII. of England, had attempted to find a north-west passage to the East Indies, entered the service of Charles I. of Spain, and sailed in command of an expedition fitted out for the purpose of colomsing the discoveries of Magalhaens in the East Indies. He, how- ever, entered the River Plate in 1527, and anchored off the present site of the city of Buenos Ayres. He then ascended the Parana, and established a settlement, named San Espiritu, among the Timbu Indians in Santa Fe; and he succeeded in bringing that tribe of Indians to friendly terms with the colony. He continued the ascent of the Parana as far as the cataracts in Missiones, and after- wards explored the Paraguay, from which he entered the Vermejo, where his party suffered severely in a savage fight with the Agaces, or Payagu4 Indians. Of this tribe a subdued remnant now lives on the delta of the Pilco- mayo, opposite Asuncion, amalgamating neither with the Spaniards nor with the wild Guaycurus of the surround- ing parts of the Chaco. The profusion of silver ornaments worn by these Indians, as well as by the Timbus and Guaranis, led him to give the name of Rio de la Plata, or Silver River, to the splendid stream which he had thus far explored. This name, rendered in English River Plate, is now applied only to the estuary below the junction of the Parana and Uruguay. One of Cabot's lieutenants, detached on a separate exploring expedition up the Uruguay, was killed, together with a great part of his crew, by the Charrua

Indians. And subsequently at San Espiritu, an attempt of the chief of the Timbus to obtain possession of one of the Spanish ladies in the settlement led to a treacherous massacre of the garrison. Before this latter occurrence Diego Garcia arrived in the river with an expedition fitted out in Spain, for the purpose of continu- ing the explorations commenced by De Solis; and Cabot returned to Spain, where he applied to Charles I. for the means of opening communications with Peru by way of the Vermejo. But the resources of the king were absorbed in his struggle as emperor (under the name of Charles V.) with Francis I. of France, so that he was obliged to leave the enterprise of South American discoveries to his wealthy nobles. In August 1534 Mendoza left Cadiz for the River Plate at the head of the largest and wealthiest expe- dition that had ever left Europe for the New World. In January 1535 he entered the River Plate, where he followed the northern shore to San Gabriel, and then crossing the river, he landed on the Pampas. The name of Buenos Ayres was given to the country by Del Campo, who first stepped ashore where the city of that name now stands, and where, on the 2d February, the settlement of Santa Maria de Buenos Ayres was founded ; the smaller vessels having been safely harboured in the Riachuelo, half a league south of the settlement. Mendoza's captains then explored the country between Paraguay and Peru, in which latter country Pizarro had, in 1535, founded the city of Lima. Of one of these expeditions consisting of 200 men, who left Paracuay in February 1537, and are said to have

northern part of the Chaco whilst the expedition was returning laden with plunder. Ayolas had, on his way up the river, built and garrisoned a fort named Corpus Christi among the Timbus in Santa Fé, near the deserted settlement of San Espiritu ; and in Paraguay, after three days' fighting with the Guarani Indians, as narrated by Du Graty, he had, on the 15th August 1536, established a settlement where the city of Asuncion now stands. In the meantime the settlement of Buenos Ayres was attacked and burnt by the Indians; and after terrible sufferings from famine as well as attacks of the Indians, jaguars, and pumas, the Spaniards abandoned the place on the arrival of a fresh expedition from Spain, in company with which they ascended the river, first to Corpus Christi, and then to Asuncion, where, in 1538, Irala was elected captain-general. In 1542 Buenos Ayres was re-established by an expedition sent out from Spain for the purpose under

Cabesa de Vaca. This able leader landed at Santa Cathe- rina, in Brazil, and marched overland to Asuncion, from which he sent vessels to join the new expcdition at Buenos Ayres, reaching that place, according to Southey, just in time to save the new comers from extermination by the Indians. Here the Spaniards again found themselves unable to withstand the incessant attacks of the savages, and the place was a second time abandoned on the 3d February 1543. At Asuncion the Spaniards were more successful in establishing themselves among the Guarani Indians, who, after much severe fighting, finding themselves unable to vanquish the Spaniards, made alliance with them both offensive and defensive, and also intermarried with them. The events which transpired at Asuncion belong, however, to the history of Paraguay. In 1573 Garay, at the head of an expedition despatched from Asuncion, founded the city of Santa Fé near the abandoned settle- ments of San Espiritu and Corpus Christi. The expulsion of the Spaniards from the latter place had, according to the Historia Argentina, resulted from a wanton attack made by them on the Caracara Indians, slaughtering the men, and taking the women captive,—a mode of procedure which all Pampa Indians adopted, and have ever since acted on. It is unfortunate, both for the Indians and for the Spaniards, that the bold conqguistadores were not always under the guidance of such high principled men as Cabot and Cabesade Vaca. In 1580, when the new colony had been firmly established, Garay proceeded southwards and made the third attempt to establish Buenos Ayres, under the name ‘ Cuidad de la Santissima Trinidad, Puerto de Santa Maria de Buenos Ayres;” and notwithstanding the determined hostility of the Querandi Indians, who were encouraged by the success of their two preceding wars, the Spaniards succeeded in holding the place. The settlement prospered, and the cattle and horses brought from Europe multiplied and spread over the plains of the Pampas. Whilst the Spaniards of the River Plate were thus engaged, Pizarro had effected the conquest of Peru ; and his heutenant, Almagro, had extended the conquest to the south of Chili, from which, in 1559, Hurtado de Mendoza crossed the Andes, and, having defeated the Araucanian Indians, founded the city of Mendoza. It is interesting to observe, that up to the present day the giant chain of the Andes has been a less effective barrier to trade than the rich plains of the Pampas. This state of affairs will, however, now soon be altered by the railway, for which Mr Clark has just obtained a concession, direct from Buenos Ayres to Mendoza. In 1550 the

Spaniards from Peru entered the north-western provinces by way of Catamarca, and founded the city of Tucuman in 1565, and that of Cordova in 1573. It was only in 1873, just three

reached the south-east districts of Peru, under Ayolas, | hundred years after the cities were founded, that the every man was killed by the Payagud Indians in the | boundary between the jurisdiction of Cordova and that of

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Santa Fé was determined by the intervention of the national Government. In 1620 Buenos Ayres was separated from the authority of the Government established at Asuncion, and was made the scat of a Government cxtending over Mendoza, Santa Fé, Entre Rios, and Corrientes, but at the same time remained, like the Government at Asuncion and that of Tucuman, which latter included Cordova, subject to the authority of the viceroyalty of Peru.

After the vast expenditure of blood and treasure which was incurred by the Spaniards in establishing themselves on the River Plate as just described, the restrictive legisla- tion of the home Government became a more effective hindrance to the development of its resources and the spread of civilisation over the country than the hostility of the Indian tribes. Cabot had urged the feasibility of opening an easier channel for trade with the interior of Peru through the River Plate and its tributaries than that by way of the West Indies and Panama; and, now that his views seemed about to succeed, the interests of the trade, which had in the meantime been established by the northern route, combined to crush the threatened development of that of the River Plate. Spanish legislation endeavoured to exclude all European nations except Spain from the trade by way of the West Indies, and to prevent any trade from being transacted by way of the River Plate, thus enacting most flagrant injustice towards the people it had encouraged to settle in the latter country. The hardy pioneers of European civilisation in these regions so far overcame the pernicious influences which acted upon Spanish legislation, that in 1602 they obtained permission to export two ship- loads of produce a year. But, to prevent internal trade with Peru, a custom-house was established at Cordova, to levy a duty of fifty per

cent. on everything in transit to or from the River Plate. In 1665 a relaxation of this system was brought about by the continued remonstrances of the people; and in 1774 free trade was permitted between several of the American posts. In 1776, with a view to better maintaining the country against the encroachments of the Portuguese in their colonies in Brazil, Buenos Ayres was decreed the capital of a viceroyalty, with jurisdiction over the territories of the present republics of Bolivia, Paraguay, Uruguay, and the Argentine Con- federation. All this country was then opened to Spanish trade, even with Peru, and the development of its resources, so long thwarted, was allowed comparatively free play. From this time a succession of viceroys exercised jurisdic- tion over the whole of these territorics. Velasco, however, was made governor of the semi-civilised Indians in the Jesuit settlements of Missiones on the Riyers Parana and Uruguay, subject only to the direct authority of the home Government; and in 1806 he became also governor of the province of Paraguay, under the authority of the vice- royalty of Buenos Ayres, and these offices he still held when the independence of the country was declared.

The authority of the viceroys was interrupted in the lower part of the River Plate during the wars between England and Spain. On the 27th June 1806 General Beresford landed with a body of troops from a British fleet under command of Sir Home Popham, and obtained possession of the city of Buenos Ayres. The viceroy, Sobremonte, retired to Cordova, where Limiers collected an army from all parts of the country, with which, on the 12th August, he assaulted the city, and Beresford with his troops surrendered. In the mreantime Sir Home Popham had taken Maldonado ; and in February 1807 Sir Samuel Auchmnuty stormed and took the city of Monte Video. In May 1808 General Whitelock, with 8000 men, endeavoured to regain possession of Buenos Ayres; but the inhabitants had made great preparations for resistance, and as all the

houses were at that time built with their windows open- ing on the streets, protected with strong iron railings like prison bars, and with flat roofs, each one was of itself a fortress; so that after suffering terrible slaughter in the

long straight streets of the city, the invading army capi- tulated, agreeing to abandon both banks of the River Plate within two months. Whitelock was brought before a court-martial appointed to inquire into the cause of the failure of the enterprise entrusted to him; the indig- nation excited against him in England, in consequence of his want of success, was as great as that excited on the River Plate against the viceroy, Sobremonte, in consequence of the first success of the English. The events which we have narrated tended to give self-con- fidence to the people of Buenos Ayres, who, on applying to the home Government for assistance against the English, had been told that they must protect themselves. But the disturbances which ultimately led to the separation of the country from Spain were initiated by the refusal of the Argentines to acknowledge the Napoleonic dynasty estab- lished at Madrid. Liniers, who was viceroy on the arrival of the news of the crowning of Joseph Buonaparte as king of Spain, was deposed by the adherents of Ferdinand VIL; and on the 19th July 1809, Cisneros became viceroy in the name of Ferdinand. In compliance with the urgent appeals of the people, he opened the trade of the country to foreign nations; and on the 25th May 1810, a council was formed, with his consent, under the title of the Pro- visional Government of the provinces of the Rio de la Plata. This has since been regarded as the commencement of the era of the political independence of the country. Of this council Mariano Morino, the secretary, was the most pro- minent member, and the people of the city of Buenos Ayres were for some time its only effective supporters. An attempt of the Spanish party to make Cisneros presi- dent of the council failed, and he retired to Monte Video. On the 31st January 1813 a congress was assembled at Buenos Ayres, aud Posadas was elected dictator of the republic. Monte Video still supported the cause of Spain, put was besieged by the revolutionary army of Buenos Ayres, and capitulated in 1814. A sanguinary struggle between the party of independence and the adherents of Spain spread over all the country of the River Plate; but on the 25th March 1816, a new congress of deputies elected by the people was assembled at Tucuman, where Payridon was declared president of the republic; and on the 9th July the separation of the country from Spain was formally declared, and a state of comparative order was re-esta- plished, Buenos Ayres was then declared the seat of government. The whole of the viceroyalty did not, how- ever, acknowledge this Government. Bolivia, Paraguay, and Uruguay, established themselves each as a separate

republic, after passing through scenes of disorder, whilst the city of Buenos Ayres was itself the scene of sanguinary disturbances. From this time, however, the struggle for independence became, as regards the Argentine Republic, more of a foreign than a domestic war. The combined forces of Buenos Ayres and Chili defeated the Spaniards at Chacabuco in 1817, and at Maypu in 1818; and from Chili the victorious General San Martin led his troops into Peru, where, on the 9th July 1821, he made a triumphal entry into the city of Lima, which had been the greatest stronghold of the Spanish power, having been, from the time of its foundation by Pizarro, the seat of government of the viceroyalty of Peru. A general congress was assembled at Buenos Ayres on the Ist March 1822, in the presence of ambassadors from all the liberated states, and a general amnesty was decreed, though the war was not ended until the 9th December 1824, when the republican forces gained the final victory of Ayacucho, in the Peruvian

districts of the Amazon. The Spanish Government did

not, however, formally acknowledge the independence of On the 23d January

the country until the year 1842. 1825, a National Constitution for the federal states which form the present Argentine Republic was decreed ; and on the 2d February of the same year, Sir Woodbine Parish, acting under the instructions of Mr Canning, signed a com- mercial treaty in Buenes Ayres, by which the British Government acknowledged the independence of the country. For details of the history of the country up to the time of independence the reader is referred to the work of Sir Woodbine Patish, and to the Historia Argentina, published in Buenos Ayres. These works have been followed in this short narrative, except when otherwise stated, or in unquestionable matters to which they do not allude. Whilst the events already described were in progress, Buenos Ayres was involved in a war with Brazil, in conse- quence of the Government of the country having, in 1817, taken possession of the Banda Oriental, which, under the rule of Artigas, had become a scene of anarchy. Buenos Ayres, unassisted by the northern provinces, waged war with Brazil for the possession of the Banda Oriental, until, in the year 1827, by the mediation of England, that country

was made independent of both powers. The origin and progress of that war are more connected with the history of the Oriental than with that of the Argentine Republic. Under the new régime, inaugurated as above described in 1825, Rivadavia, who was elected president, endeavoured to establish a strong central government ; and his party obtained the name of Unitarians in contradistinction to their opponents the Federals, who endeavoured to keep each state or province as independent as possible of the National Government. At the expiration of Rivadavia's term of office his opponents triumphed in the election of Vicente Lopez as president ; and he was followed in 1827 by Dorrego, another represen- tative of the Federal party. The Unitarians, under the leadership of General Lavalle and his troops, relieved from the war in the Banda Oriental, rebelled against the admini- stration, and in 1828 they defeated the Federals, under Dorrego and Gcneral Rosas, in a battle im which Dorrego was taken prisoner and afterwards shot. General Rosas then became chief of the Federal party. In 1829 he defeated Lavalle; and obtaining from Congress, during a "reign of terror,' such extraordinary powers as enabled him to rule as dictator, he became as hostile to many members of the Federal party as to the Unitarians. In 1838, a dispute between Rosas and the French Government led to a blockade of the port of Buenos Ayres by the French fleet; and, encouraged by this occurrence, Lavalle, in 1839, returned to the country to rally the Unitarian party. In 1840 he invaded the province of Buenos Ayres at the head of troops raised chiefly in the province of Entre Rios ; but he was routed by the Federal army under Geueral Pacheco, and was chased as far as the city of Jujuy, where he was overtaken and shot by troops under the command of Oribe. The rule of Rosas was now one of terror and almost inces- sant bloodshed in Buenos Ayres, whilst his partisans, General Oribe and Colonel Mazza, endeavoured to exter- minate the Unitarians throughout the province. This scene of slaughter was extended to the Banda Oriental by the attempt of Oribe, with the support of Rosas, and of Urquiza, governor of Entre Rios, to establish himself as president of that republic, whose existing Government was hostile to Rosas, and sheltered all political refugees from the country under his despotic rule. The siege of Monte Video by the forees of Rosas led to a joint intervention of England and France, and in 1845 the English minister

plenipotentiary declared Buenos Ayres blockaded, and deter-

mined to establish direct communications with the Republic of Paraguay by ascending the Parana, the right of navigat-

ing which was denied to foreign flags by Rosas, who had always refused to acknowledge the separation of the Govern- ment of Paraguay from the authority of Buenos Ayres. At Point Obligado, just above the delta of the river, a severe fight occurred, in which the men of the combined squadrons landed and carried the batteries by storm, after Captain Hope of the "Firebrand" and his crew had succeeded in cutting a heavy iron chain which closed the river under their fire. The allied forces then proceeded to Paraguay, and proclaimed the navigation of the mighty river which forms the highway to that country free to all nations. Ineffectual attempts were made by the allies to induce the people of the River Plate, and more especially Urquiza, to rise against the despotic rule of Rosas ; and finding the accomplishment of this impracticable without an army, they withdrew their several forces, and raised the blockade of Buenos Ayres in 1847. Brazil, whose alliance England and France had rejected in consequence of the opposition of that country to the English policy in the suppression of the slave trade, now came to terms with Urquiza ; and the forces of Brazil, under Caxias, allied with those raised and commanded by Urquiza, invaded the province of Buenos Ayres, and routed the army of Rosas on the 3d February 1852 at Monte Caseros, about 10 miles from the city. Rosas escaped from the battlefield in disguise, and sought protection at the house of the English chargé @affaires, by whom hewas conveyed on board H.B.M. steamer " Locust," leaving the city in a delirium of joy at its sudden emancipation from his tyranny. A provisional Government was formed under Urquiza, and the Brazilian and Oriental troops retired. Urquiza then assembled all the provincial governors at San Nicholas, in the province of Buenos Ayres, and on the 3lst May they proclaimed a new constitution, with Urquiza as provisional director of the Argentine nation. This constitution gave each province two representatives in the Senate or Upper Chamber of a Congress of Representatives, which was duly elected and met at Santa Fé; but the people of Buenos Ayres, consider- ing that their political and commercial pre-eminence were not duly represented in the Congress, rose in rebellion against it on the 11th September. Alsina then became governor

of Buenos Ayres ; and in the new civil war which was now inaugurated might be regarded as the representa- tive of the city, which was his chief support, in opposition to the peasantry, who throughout the country districts were chiefly partisans of Urquiza, or of Rosas. Alsina resigned office in facc of a rising of the country districts, under Colonel Lagos, in favour of a restoration of Rosas; but Pacheco, who had defeated the Unitarian General Lavalle in 1840, rallied the city party, and with the support of the most influential citizens, proclaimed the aged General Pintos provisional governor, and the influence of the leading members of the foreign community was actively exerted in his favour. The defence of the city, now besieged by Lagos, was entrusted to General Hornos ; and Urquiza, having been duly elected president by the other thirteen provinces, came to terms with Lagos, and took command of the army of the besiegers; and in April 1853 his fleet blockaded the port. In July the besiegers suddenly dis-appeared without awaiting an expected sally of the city forces under General Paz, now commander-in-chief. Urquiza signed, on board H.B.M. steamer " Locust," as representative of the thirteen provinces, a treaty with Sir Charles Hotham, by which the free navigation of the rivers was confirmed. The province of Buenos Ayres then became established as an independent state, and inaugurated an era of commercial and political development, with Obligado as constitutional governor, whilst Parana became the capital of the thirteen provinces under Urquiza. Differential duties imposed by

'the Confederation for the purpose of preventing the foreign

trade of the confederated states from taking its ordinary course through Buenos Ayres caused great irritation in the latter province ; but peace was, nevertheless, maintained until 1859, when Alsina again became governor of Buenos Ayres, and the numerous questions in dispute soon led to active hostilities between the Government at Parana and Buenos Ayres. The army of the latter, under General (then Colonel) Mitre, was defeated by the Confederate forces at Cepeda, in the province of Buenos Ayres, in October 1859; and Urquiza re-entered the city, when Alsina resigned his office of governor to Ocampo, and Buenos Ayres rejoined the Confederation, of

which Urquiza resigned the presidency. Derqui was then elected president of the fourteen provinces, with the seat of government at Parana; whilst Urquiza became governor of Entre Rios, and Mitre governor of Buenos Ayres. Hostilities, however, recommenced in 1861, and the armies of the opposite parties, under Generals Urquiza and Mitre respectively, met at Pavon, in the province of Santa Fé. Mitre this time was victorious, and in 1862 he was elected president of the Argentine Confederation, of which, with the consent of the provincial Legislature, the city of Buenos Ayres became provisionally the capital. Urquiza retired to the province of Entre Rios, of which he continued to be governor. The history of these struggles is ably told by Mr Latham from a Buenos Ayrean point of view; and also, from the opposite side, by M. De Moussy, in his able and elaborate work dedicated to Urquiza.

In 1864 the Republic of Paraguay commenced war against Brazil, and on the 5th February 1865, President Lopez sent a despatch to the Argentine Government, requesting permission for the passage of a Paraguayan army through the province of Corrientes. This Mitre refused, the neu- trality of the country having previously been declared, On the morning of the 13th April a Paraguayan fleet entered the port of Corrientes, and, without any previous warning of belligerent intentions, fired into and took pos- session of two vessels of the Argentine navy which were lying at anchor in the port, and also fired on the crew as they cndcavoured to swim ashore to escape the unexpected slaughter. In the course of the following day a detach- ment of Paraguayan troops tcok possession of the city, whilst the main body of an invading army marched across the province, and, crossing the Uruguay, invaded Brazil. The sudden seizure of the vessels in the port of Corrientes was the first notification of war which reached the Argentine Government. The official declaration of war, which was dated the 29th March, and was based on a declaration passed in Congress on the 18th, did not reach the Argentine Government until the 3d May. The people of Buenos Ayres were thrown into a frenzy of indignation on the receipt of the news of the above- mentioned hos- tilities ; and on the lst May a treaty was signed between the Argentine Government, Brazil, and the Oriental Re- public, by which these powers mutually bound them- selves not to lay down their arms until they had abolished the Government of Lopez, but at the same time guar- anteeing the independence of Paraguay. Thus the National Government

established at Buenos Ayres was launched into a war which sorely tried its resources, both for the prosecution of the war itself, and for the suppression of the opponents of its policy in some districts. The war was soon carried into Paraguay ; but the withdrawal of the main body of the Argentine army, under Generals Paunero and Arredondo, was necessitated by a rebellion in the north-west (January 1867), where the rebels, under Saa and Videla, had obtained control of several of the Provincial Governments. The rebel army was not able to cope with the veterans fresh from the battlefields of Paraguay, who drove them across the Andes into Chili, where they laid

down theirarms. These internal troubles made it requisite for Mitre to retire from the post of commander-in-chief of the allied forces in the field, which then devolved upon the Brazilian General Caxias. Urquiza, though nominally under the order of the National Government, having, on the outbreak of the war accepted from them the appoint- ment of commander-in-chief of the forces of Entre Rios, virtually held that province in a state of neutrality through- out the war, which was ended by the shooting of Lopez on the lst March 1870, after the extermination of his army and a large majority of the inhabitants of the country. Urquiza, at the outbreak of the war, was the most renowned and powerful chieftain in the country, and doubt regarding the course he might take was a source of anxiety in Buenos Ayres. He had accumulated immense estates and wealth in Entre Rios; and he was doubtless actuated by an earnest desire to preserve to his province the blessings of peace and commercial prosperity in the midst of the sur-rounding disturbances. The hope of obtaining support from him is, however, supposed to have encouraged the rebcllion of the north-western provinces, which neutralised the reckless audacity with which the Argentine troops fought their first battle in Paraguay. In 1868, whilst the war was going on, Mitre's term of office as president expired, and Sarmiento was peaccfully elected in his place. The close of the Paraguayan war did not bring permanent peace to the country ; for, on the 12th April 1870, Urquiza was assassinated at his family residence by some well-known officers of his army, and the provincial Legislature immedi- ately elected Lopez Jordan as

governor in his place. The new governor, in his address to Congress on his installation, took upon himself the responsibility of the assassination, and the National Government refused to acknowledge him as governor of the province, on the ground of undue influence having been brought to bear on the members of the Legislature by which he had been elected. The National troops accordingly invaded the province, for the avowed purpose of affording protection for the free expres- sion of opinion in a new election. This became the com- mencement of a civil war, which materially interfered with the former prosperity of the province, but which was fortunately brought to a conclusion in the end of January 1873, by the Entre-Riano army being completely routed by the National troops, armed with Remington rifles, under Colonel Gainza. The Entre-Riano leader, with about 40 followers, escaped across the Uruguay. Tranquillity has since that time prevailed in Entre Rios.

Whilst these events were in progress, a rupture between the Argentine Republic and Brazil regarding the settlement of the boundaries of Paraguay, was at one time imminent ; but, by the influence of Mitre, who went as special envoy to Rio on the occasion, the friendly relations of the two Governments haye, it is hoped, been placed on a secure basis.

The prosperity of the country received a temporary check in 1874, from a brief revolution initiated when President Avellanda was declared elected. The unsuccess- ful party, under Brigadier-General Mitre, incensed at their defeat, asserted that the elections had been gained by corrupt and fraudulent practices, and resolved to appeal to arms to overthrow the president-elect. The revolution was declared on 24th September. President Sarmiento, whose tenure of office was just expiring, took active mea- sures to repress the revolt; and no collision of forces had taken place when the new president, Don Nicolas Avellanda, was constitutionally installed on the 12th October. The president followed up with energy the measures of his predecessor to suppress the revolution, and his efforts were crowned with success in two decisive victories over the insurgents by the Government troops ;

Political divisions and popu- lation.

ARGENTINE REPUBLIC

whereupon Generals Mitre and Arredondo, with their forces, surrendered at discretion, and were made prisoners (Dec. 2). The revolution had lasted but seventy-six days. On the 17th December a state holiday was declared, and dedicated to rejoicings on the restoration of peace. The complete and absolute crushing of this revolution has great siguificance, as it has brought about the dissolution of a powerful and ambitious party, whose movements might have seriously affected the onward march of the country. Those who know the country believe that it will be long before any similar revolutionary attempts can be made with the slightest hopes of success, or the welfare of one of the most favoured countries in the world jeopar- dised by internal commotion.

The following table gives the names of the fourteen provinces which form the Argentine Republic, together with the superficial area of the country as given by the Statistical Department of the National Government, and the population according to the census of the year 1869, the numbers given as the population of the Indian territory being the official estimate of that year. As regards the area, it must be observed that, according to the Almanach de Gotha, an estimate by the Geographical Institute of G. Perthes at Gotha, reduces that given in this table by about

one-fourth ;—

Area insquars Population in i 1869.

miles. The RivERINE PRovINGES— BICTOSPAWTESteyscs csc cnsinctovarswaeseins ae 80, 400 495,000 Santa Bey c.cccc.ss. 0. Pate euice i ioies 43,700 89,000 FESTNGPOWNITOS chescccdscaseens ces ssee sede 48,100 134,000 (COMIOMEES). occccssciscctsceseeeiinc souesccte 47,700 129,000 The Upper Provinces— WontonaMmertin tec stse esses: csoasescavset 83, 500 211,000 RMERLUTR UO Pretest ove chien e'selern nisi veces «sit 42,000 133,000 PINT CIID ATI coterie re. ata asassa dees 59,900 109,000 SALOME 2 2's ashe «osaaniee tee Rabe re raise 24,000 89,000 SEVP: eoneieeciaceseses Sonnooesonpcsee Oy NY 40,000 Catamarca…..... SSaanradanrnt Gocar arene 92,900 80,000 IDG) ASU) 2) ocldp en eeSROrOREEE SpcaRE ene cea 42,000 50,000 The Provinces or Cayo— PSBMMIGUZeen wete onsets sige wrestaicensa eens 48,500 53,000

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INDIAN TERRITORIES— Hbves OPAC Otten, «neesrivangasuenes 240,000 45,000 The Central and Western Pampas, } PNGPPOMBOMIA,..... 2… .s.seencens j — pale

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_ The Indian The most remarkable features of the present state of the

_ territories and the frontier districts,

country, as shown by the foregoing table, are the vast extent of the Indian territory and the small number of its inhabitants. Excepting a comparatively narrow tract of land stretching from the southern part of the province of

‘ Santa Fé into that of Cordova, and dividing the Indians

of the Chaco from those of the Pampas, the dominions of the Indians may be said to extend from the extreme south of the republic, over all the plains of Patagonia, the central parts of the Pampas, and through the Chaco, into the terri- tories of Paraguay and Bolivia. The civilised districts of the west and north-west, which we have seen were settled, the former by way of Chili, and the latter by way of Peru, have now established means of communication with those of the east, except through the district just mentioned. In that district civilisation, of which the Central Argentine Railway is the chief representative, is rapidly establishing and extending itself; but even during the last few years warfare with the Indians on both sides of the line of railway has been almost incessant. In the neighbourhood of Frayle Muerto or Belleville, many Englishmen possessed of some

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amount of capital established themselves some years ago as cattle farmers, under the protection of modern rifles ; but they have been obliged to turn

their attention to sheep and agriculture, as offering less tempting plunder to the Indians. It is interesting to record that the city of Cordova, on the west of the Chaco, was founded on the same day, in 1573, as the city of Santa Fé, on the east of that region; and an exploring party from the latter city was saved from being exterminated by the Indians by the timely and unexpected assistance of another party of explorers from the city of Cordova. To the north of Belleville, the land lying between the cities just mentioned is now being peopled by families of Swiss, German, French, Italian, English, and Anglo- American immigrants, who are encouraged by liberal grants of land and assistance from the Provincial Government of Santa Fé; and they appear to be gradually establishing themselves in the country, notwithstanding the hardships they have suffered from the ravages of locusts and the hostility of the Indians. Some of the tribes of the Chaco are among the most savage and intractable in the territory of the republic, though even before the arrival of the Spaniards they supported themselves to some extent by agriculture, and were not so nomadic as the hunting tribes of the south. On the Pampas the Indians appear to be in larger tribes, and their warfare is more formal, since power- ful chiefs of the different tribes have considerable control over them, and they in general conform themselves to the policy of peace or war determined on by their chiefs. For many years past the border lands between the Indians and the European settlers in the province of Buenos Ayres have been a sceue of constant bloodshed ; and some of the Indian invasions haye been made on a very extensive scale by a combination of the different tribes. The relations of the Argentine Government with the Indians, it will thus be seen, are in a very unsatisfactory state; and in the midst of all this the condition of the Argentine peasant, or Gaucho, is most deplorable. He has constantly been subject to conscription for service in the army engaged in foreign or civil wars, leaving in the frontier districts his home defenceless against the depredations of the savages. It is true that the Gauchoes may be said to be the primary cause of the civil wars which have devastated the country; for, despising, or at least not appreciating, their constitu- tional influence, they have been accustomed to regard war as a normal means of subsistence, and to be used as such for its own sake. Nevertheless, in face of the peculiar hardship of the condition of these men, even though in the aggregate self-inflicted, it is scarcely surprising that immi- grants are occasionally subjected to annoyances and dangers through a spirit of hostility

engendered by feelings of envy, as the Gaucho is subjected to the conscription, whilst the foreigner is undisturbed in his industrious occupations. Families have fallen victims to the sudden outburst of animosity on the part of the Gauchoes, who when once roused have been as cruel as the Indians ; and, though the arguments which might be pleaded in extenuation for the latter cannot be applied to the former, their condition is a practical evil, and enlightened legislation for these frontier districts is one of the most urgent necessities of the country. The war with Paraguay, and subsequently the war in Entre Rios, have exhausted the resources of the Government, leav- ing the Indian frontier almost undefended. The tribes of the Pampas have established settlements, from which they scour the country in pursuit of game; and it is not improbable that some of their recent raids upon the civilised districts have been forced upon them by the immediate necessities of their position, resulting from their improvident mode of living and the absence of agricultural pursuits among them. On the slopes of the Sierra Ventana, north of Bahia Blanca, many Englishmen have established themselves as

Govern- ment.

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shecp farmers, where the land stretches away into the Indian territories, without an armed force or a barrier of any sort intervening, and their protection from the savages lies in the respect the latter have for the Snider rifle, combined with the greater attraction which the cattle farms of the north have for the plunderers. On the Rio Negro English settlers are engaged in agricultural pursuits on a soil whose fertility for the production of wheat and other ccreals may be said to be unrivalled. To the south of this the country to a great extent accords with the de- scription erroneously applied to all the country south of the River Plate by Gucrara, who says that it is a barren land without timber for building, without firewood, without water, without soil to receive seed, and without anything that a city requires for its maintenance. Nevertheless, in the country thus described, a Welsh colony has estab- lished itself on the Chupat River; and, though at first they suffered severe hardships, and were saved from starva- tion only by food supplied by the Tehuelche Indians in the fitst instance, and

afterwards by similar supplies from the Argentine Government, there appears no reason now why it should not become a prosperous colony. In the far south, on the Santa Cruz River, the Argentine Government have a military establishment. The tribes of Patagonia do not appear to have any settled villages, but make the whole country a vast hunting ground. The different parties meet in their excursions either as friends or as foes, just as ac- cident, the humour of the moment, or any occasion of enmity between the chieftains determines. The game on which they live is superabundant, and the chief impediment to an increase of the population seems to be the remorscless butchery which ensues on the meeting of hostile hunting tribes, which sometimes results in the extermination of one party or the other; and also the incessant slaughter result- ing from sudden quarrels among members of the same party. Lieutenant Musters, of the Royal Navy, has recently traversed the country from the Strait of Magel- lan to the Rio Negro with one of the hunting tribes ; his book may be commended to those who desirc to be better acquainted with that wild country and itsinhabitants. The Tehuelche Indians, with whom he travelled, average about 5 feet 10 inches in stature, but he describes the Arau- canians as somewhat taller and equally athletic. All the Indian tribes have more or less of the peculiar character- istics of the red or copper-coloured race, and analogies in the languages of the numerous tribes also indicate an iden- tity of origin. According to their traditions at the time of the discovery of the country by the Spaniards, as recorded by Guerara, their ancestors came from the north, and they also held confused traditions of the disasters of the deluge.

The foregoing historical sketch will have given the reader some insight into the government of the country. The framers of the Constitution professed to be guided by that of the United States of North America, and freely adopted the liberal principles there embodied. The president is elected for a term of six years, and the president of the Senate, elected to that office by his fellow-senators, becomes ex-officio vice-president of the republic. The government is conducted by a ministry responsible to Congress, and an adverse vote of the Senate and deputies on any important question leads to the formation of a new ministry. The number of senators and deputies returned by each province is in proportion to the number of its inhabitants. Each province has its own independent form of government for all matters

not expressly delegated to the National Gover- ment, and is supposed to have irresponsible jurisdiction in its own affairs so long as the articles of the National Con- stitution are not contravened. 'The city of Buenos Ayres, Lesides being the seat of the Government of the province,

ARGENTINE REPUBLIC

is also the seat of the National Government, having been so declared by the Constitution, until such time as a suitable site for a new capital for the republic may be determined on by the Legislature. Not only the Constitution itself,

but also the spirit in which its enactments are carried

out, is thoroughly liberal, and worthy of the magnificent country over which civilisation, under its enlightened regulation, is struggling successfully against barbarism. Fresh arrivals from Europe are not only cordially wel- comed, but every effort is made by the authorities to induce foreigners to settle in the country. They are free either to naturalise themselves as Argentines, or to maintain their foreign nationality; in the latter case they have not the privilege of a vote in the government of the country, nor are they liable to the conscription for service in the army. In other respects the law is the same for all. Every one born in the country is by law an Argentine.

The population of the city of Buenos Ayres is almost Inhabi- tants.

thoroughly European, nearly one-half being, in fact, foreigners born in Europe. But on passing from that city into the country the Mestizo race becomes more prominent , and in the northern provinces, as in Paraguay and Peru, the Mestizoes, with Indian blood predominating, form the majority of the population. 'The Negroes, or Mestizoes in whom Negro blood can be traced, do not form an impor- tant part of the population as they do in Brazil. The difference between the two countries in this respect is, in fact, very striking. Slavery was abolished during the war of independence ; and the importation of Negroes, which had never been an extensive trade, then ceased; and the constant stream of immigration from Europe, which of late years has been steadily augmenting, is gradually changing the aspect

of the population of the country. In 1858 the arrivals amounted to only 4600 persons; but they increased every year till they amounted to 29,000 in 1868, 37,000 in 1869, 41,000 in 1870, 20,000 in 1871, 40,000 in 1872, 80,000 in 1873, and about 90,000 in 1874. This constantly increasing stream of immigration has been absorbed into the various industries of the country as fast as the new arrivals reach its shores. As regards the nationalities of the immi- grants, the Italians are the most numerous, then the French, Spaniards, Germans, English, and Swiss. During the above-mentioned years the new arrivals have almost always found their services eagerly sought for at wages of 8 to 10 shillings a day for the most ordinary employments, and at proportionally higher rates for skilled workmen. 'The com- paratively small amount of the immigration in 1871 is due to the occurrence of the epidemic of yellow fever which decimated the population of the city of Buenos Ayres in the early part of that year, and caused the bulk of the emigrants from Europe on their way to the country to stop at the ports of Brazil and at Monte Video, and turned the tide of emigration from Europe in other directions at the close of the year. Though this terrible pestilence is said to have been imported from Brazil, its rapid spread in the city can clearly be ascribed to temporary causes which even the unrivalled salubrity of the climate was insuffi- cient to neutralise. In the absence of any artificial drainage the cleanliness of the city had depended on its occasional scouring by the heavy rains, whilst an ever increasing number of cesspools have been accumulating filth beneath the houses ; and up to the year 1870 the consumption of water, beyond the amount of rain water accumulated in tanks in the houses of the wealthy, was limited by the cost of cartage from the river ; but in that year new water-works were opened, by which a supply is pumped up from the river, and conveyed by pipes to all parts of the city, and the increased waste of water may, by leading to an unusual disturbance of the cesspools, have partly contributed to

the spread of the epidemic. Though frightfully contagious in the city, the disease was not so in the country; and uo instance could, it is believed, be recorded in which it was communicated to those who nursed patients that

took the disease from the city, and sickened and died in the suburbs. It is hoped that the extensive drainage works which the Provincial Government is having constructed under the superintendence of Mr Bateman will obviate the risk of another outbreak of a plague, which whilst it lasted put a stop to commercial pursuits and almost disorganised society. The total number of foreigners in the Argentine Republic at the time of the last census, was, according to the Almanach de Gotha, 212,000. A recent writer, who has given particular attention to the subject, says, " There are about 40,000, between Irish, Scotch, and English settlers and their families, in quiet and undisputed posses- sion of about two millions of acres of land in the province of Buenos Ayres alone ; in the full enjoyment of all religious and social liberty. They own upwards of 35,000,000 sheep, besides horned cattle, horses, and valuable build- i The bulk of this vast property has been acquired in the country by men who on their arrival did not possess a sixpence."

Excepting the mining districts in the north-west of the republic, the agricultural district of Chivileoy, in the north of the province of Buenos Ayres, the agricultural colonies of Santa Fé, and the establishments of the English settlers in the north of Patagonia, the Argentine Republic is at present a pastoral country. The manufacturing and agricultural pursuits of the north-western provinces are not important items in the general wealth of the republic. The development of its vast resources as a mining and agricultural country has scarcely commenced; and its greatest wealth is at present represented by the herds of cattle and sheep which graze upon its fertile plains. The manufactures and luxuries imported into the country are paid for with the annual increase of these flocks and herds, though the latter are uot so numerous as in an equal area of Central and Western Europe. The number of herd cattle in the country may be roughly estimated at from 15 to 18 millions; of which, in the year 1866, the province of Buenos Ayres contained 6,800,000; Entre Rios, 2,500,000 ; and Corrientes, 2,000,000. In the same year Buenos Ayres contained 60,000,000 sheep ; aud Entre Rios and Corrientes together, 7,000,000. The number of sheep in the whole country is estimated at 100,000,000.

The extent of the trade which the Argentine Republic carries on with different foreign countries is indicated in the subjoined tabular statement of

values of the imports and exports of the whole country, for 1873. The amounts are given in hard dollars, of which the sterling equivalent is about 49 pence.

Argentine Trade Report for 1873.

Imports. Exports.

Greate BritaiMs …0.2.0s ce ceansce $19,344,143 $9,894,007 PHILA COR. Ces nio. tania vaianseiseite wae 18, 255,138 8,677,819 Co rr 2,967,586 13,891,508 WimitedtSitates? sc. c.2.cce.cce es 5,167,616 8,032,945 bilenens eaenet se 3,784,384 1, 487,925 Spalllenmsststssiees scsi cecsoess 2,952,600 1,231,697 (CLINI paaneeenSccdnaaddencertrcet ser 1,444,182 2,365,475 Brazil… 2,968,953 769,464 Tamayo… aoe. Abe. 2,735,299 992,949 (Clennam Yaracenecsacnns senses 8,228,015 449,597 VOM ANC csccpae cette ses. «eet 1,611,616 226,204 Other COUNtLIES:.....0.+.00en6 1,999,341 2,100,515 Hard dollars. .....$66, 458, 873 $45,122,105 Orebout…....-.~~20~~ £13,568,000 £9, 200,000

The principal items of the import trade from Great Britain are as follows (the figures representing hard dollars as before):—Cotton goods, 2,359,000; woollen, 904,000 ;

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other textures, 3,364,000; clothing, 1,367,000, besides 951,000 in shoes; iron, 2,757,000; and railway materials, 1,706,000. France sends wines to the value of 44 millions; textile fabrics, 24; clothing, shoes, &c., 24; hardware, fancy goods, &c., 64. More than half the value of the United States imports (2,769,000) is in lumber. The whole import trade of the country in 1873 exceeded that of 1870 by 49 per cent.

The following table exhibits the amount, values, and principal destinations of the more important articles of export for 1873 :—

WiOOlsce:ccsees 185,000,000 tb $19,600,000 whereof $10,000,000 to Belgium.

TalloWs…<<.5. $8,000,000 Ib = 5,500,000 Fs 2,632,000 to England.

Sheepskins… 55,000,000tb 4,300,000 on 1,854,000 to England.

Dry Hides… 1,700,000 5,140,000 3 1,333,000 to United States, . Salted, do. ... 1,300,000 4,900,000 s 2,720,000 to England.

Jerked Beef. 88,000,000 Ib 1,400,000 mostly to Brazil and West Indies.

Gutter. ccccess 180,000 2,700,000 to other South American countries.

Other items of export are metals (copper and silver) of the value of 420,000 dollars; grain, 120,000; ostrich feathers, 150,000. The entire export trade of 1873 shows an increase of 55 per cent. on the trade of 1870.

The tonnage of the vessels that arrived and cleared during the four years 1870 to 1873 was as follows :—

Steamers. Sailing Vessels. Gross Tonnage. NSO emer estes cic 808, 000 712,000 1,520,000 Ci, ire 863,000 662,000 1,525,000 Siigheecasvarone .. 1,190,000 960,000 2,150,000 WS RS. «sce cecsiscs 1,135,000 753,000 1,888,000

Of this tonnage the proportion returned for English vessels is no less than 30 per cent.; French vessels rank next, with 16 per cent.; then Argentine and Italian, 12 per cent. each. There are twelve lines of steamers constantly plying between Europe and Buenos Ayres. The passage occupies about twenty-nine days.

The advancement of the Argentine Republic has received a great impetus from the introduction of steam communica- tion and telegraphy. The first railway was opened in 1857 ; and in 1874 there were more than 800 miles open for traffic, with about 1000 miles more in course of con- struction. A system of tramways was commenced in the city of Buenos Ayres in 1869. There are now about 80 miles within the city and suburbs, and this means of transit is being extended to all the smaller towns. There are in use within the republic above 7000 miles of tele- graphic wires. Complete communication is now established with Europe, the first telegrams having been exchanged with London on 4th August 1874.

The province of Buenos Ayres is, in wealth and general importance, far in advance of all the other provinces of the Confederation. Under the enlightened administra- tion of Sefior Castro, the late governor, great improvements have been made in the means of communication throughout the province, which is the first step requisite for the due development of its resources. Besides railway extensions a great number of iron bridges have been imported from England and erected under the superintendence of Mr Coghlan, by order of the Provincial Government of Buenos Ayres. The National and Provincial Governments estab- lished in the city of Buenos Ayres are rivals in their efforts to promote the true welfare and prosperity of the country. Sefior Acosta, the governor of the province, may be relied on to continue the policy of assisting the development of the resources of the country, which may almost be said to have been inaugurated by his predecessor. And his Excellency Sefior Sarmiento, whose term of office as president of the republic expired in October 1874, must, from his unceasing exertions in the cause of education, be regarded as one of the greatest benefactors of the country.

The following are the returns of the national revenue Finance.

collected in the years 1866 and 1872 respectively, the ; ment of the national debt of the republic at the end of

figures representing hard dollars as before:—

1866. 1872.

Tinpert DOS. wrer…ogeetteesaeee 6,686,000 14, 464,827 1 Db 400) tac mmbanepnprbernpnerenidooséenouc 2,164,000 2,621,353 Wanchousingtas.sascseeneeer cst er 263,000 504,212 StampaDibiess,..3.ue..~~.nsseee: 127,000 310,806 Post Oiitensan~~ sce teacieceeo 57,000 137,434 Property dake… eran css dances: 196,000 62,226 SIVA Ui? Ser gsecussnsococedeossoroosdaas 68,000 71,512

9,561,000 18,172,379

The revenue, as shown by the above tables, is obtained chiefly from the Custom-House ; and of the duties on the foreign trade of the country more than four-fifths are col- lected in Buenos Ayres. The ordinary expenditure for 1872 is returned as 7,419,832 dollars; but to this the interest of the national debt has to be added, with other extraordinary expenditure, raising the whole amount to 23,992,975 dollars. The deficit in 1872 was thus 5,820,596 dollars. Besides the expeuscs of the National Government, each province has its separate revenue. That of the province of Buenos Ayres amounted in 1871, as shown by the Report of the provincial minister of finance, to morc than 5,000,000 hard dollars. The following state-

1872, is taken from the Almanach de Gotha for 1875 :-— Hard Dollars.

English Loan of 1824, 6 and 3 £1,770,100 8,672,590 Per CONE... eeeeeeeeneeee ees Foreign Loans…….....ccereeeeeeeeeseeeeeseeeeeeees 1,757,645 i English Loan of 1868…..... £2,209,100 10,824,590. English Loan of 1871, 6 per cent. interest, and 24 per > £5,885,900 28,840,910 cent. amortisation…..... Total amount of coe Paves saelenis 50,095, 735 Home debt, 6 per cent., and 1 per cent. AMOTUSWHON.. cc.ces-0+- cesaeesoeneencherace ee 18055880 Home debt, 6 per cent., and 2% per cent. amortisation…..... a ee 1,602,898 Roads and Bridges, 8 per cent. interest…... 1,033,000 Total tof iNational "debt. t…-.7-es2c5c=e 70,986, 711 Buenos Ayres Provincial Debt :— 6 per cent. interest, and 3 per cent. amor- PISAEION 5 ..000000. a ee = 9 per cent. interest, and 3 per cent. amor- 910,000 (25121010) Uppnepoodadepnencnpsogooscondadoacoctacs

Total (about £14,800,000 sterling)... 72,532,711

Further information respecting the republic will be found under BuENos Ayres and other headings. =—S_ (F. P.)

ARGOL, the conimercial name under which the crude tar- ; variety of adventures, for which other and better known

tar of commerce is known. It is a semi-crystalline deposit which forms on wine vats, and is either grey or red according to the colour of the wine from which it separates. ARGONAUTS, in Greek Legend, a band of heroes who sailed in the ship "'Argo" from Iolcus, in Thessaly, to Ma, in Colchis, on

the further shore of the Black Sea, to fetch the golden fleece, which was there guarded by a dragon in a grove sacred to Mars. This task had been imposed on Jason that he might prove himself by a peril- ous adventure worthy of the throne of Iolcus, which he claimed from the usurper Pelias, at whose hands he and

| heroes had to be added. Of these the chief were Hercules,

Castor and Pollux, Orpheus, Mopsus, and the sons of Boreas, Calais and Zetes. The outward course of the "Argo" was the same as that of the Greek traders, whose settle- ments as early as the 6th century B.c. dotted the southern shore of the Black Sea. The first landing-place was Lemnus, which the Argonauts found occupied only by women who, at the instigation of Aphrodite, had slain their husbands, fathers, &c. Here some stay was made, and Hypsipyle bore Jason a son, Euneos, who afterwards traded with the Greeks before Troy and with the Phoeni-

his father Aison had suffered persecution. To accompany | cians. That the Minyz had at a very early period formed him, Jason, when the "Argo" was ready, called upon the | settlements in Lemnus is known from Herodotus (iv. 145).

principal herocs of his own race, the Minyz, whose distant

| They landed at Cyzicus next, and here occurred the in-

voyages and colonisation in very early times seem to have | cident of Hercules and Hylas. The former having broken suggested the legend of this expedition. Of these Acastus | an oar after they started, went into a wood to cut a new

the son of Pelias, Admetus of Phere, Euphemus (repre- sented as connected with the colonisation of Thera and Cyrene), Periclymenus, Erginus, and Tiphys the steers- man, joined him. So far the crew appears well fitted to conduct the "Argo" to Colchis, leaving Jason to reserve his strength for the culminating act, in which also they had mostly, apart from their friendship for Jason, a special interest, because of previous events connected with the golden fleece, the story of which was as follows. Jason's uncle Athamas had

by his wife Nephele two children, Phrixus and Helle. The mother died, and her place was taken by Ino, a daughter of Cadmus, who from hatred of her stcp-children persuaded Athamas, by means of a false oracle, to offer his son Phrixus as a sacrifice, in consequence of a famine which she had caused by having the grain secretly roasted before it was sown. But before the sac- rifice the shade of Nephelc appeared to Phrixus, bringing a ram with a golden fleece, on which he and his sister Helle were to escape over the sea. Helle fell off and was drowned in the strait, which thence took the name of Hellespont. Phrixus reached the other side, and proceeding on land to Colchis, sacrificed the ram, and hung up its fleece in the grove of Mars. With the family of Athamas the original crew of the "Argo" were more or less connected. But in the later versions of the story it is clear that such a voyage could not in after times be conceived without a

one, Hylas accompanying him to fetch water. Some nymphs admiring the beauty of the youth carried him off. Hercules followed his cries, but could not find him. Nor was he | ever found, though the hero exacted hostages till this ' should be done. On reaching the modern Scutari, they again landed to get water, and were challenged by the | king, Amycus, to match him with a boxer. Pollux came forward, and in the end overpowered his adversary, and bound him to atree. At the entrance to the Black Sea they met Phineus, the blind and aged king whose food was being constantly polluted by the Harpies. He knew the course to Colchis, and offered to tell it, if the Argonauts

winged sons of Boreas, and Phineus now told them their course, and that the way to pass through the Symplegades —two cliffs which moved on their bases and crushed whatever sought to pass—was first to fly a pigeon through, and when the cliffs, having closed on the pigeon, began to retire to each side, to row the "Argo" swiftly through. His advice was successfully followed. The next place they landed at, and the last before reaching Colchis, was Hera- clea, where the steersman Tiphys died. To the early Greeks Colchis was the eastern extremity of the earth, as the Pillars of Hercules were the western. Behind both was the Oceanus, into which the river Phasis flowed at Colchis. At Colchis was the rising of the sun, and Aletes the king was a stn

i would free him from the Harpies. ‘This was done by the

of Helios; while his daughter Medea was, by her know- ledge of witchcraft, connected with the worship of the moon. Aetes required of Jason that he should first yoke to a plough his bulls which snorted fire and had hoofs of brass, and with them plough the field of Mars. That done, the field was to be sown with dragons’ teeth, from which armed men were to spring. Successful so far by means of the mixture which Medea had given him as proof against fire and sword, Jason was next allowed to approach the dragon which watched the fleece; Medea soothed the dragon with another mixture, and Jason became master of the fleece. Then the voyage homeward began, Medea accompanying Jason, and ®etes pursuing them. To delay him and obtain escape, Medea dismembered her young brother Absyrtus, whom she had taken with her, and cast the limbs about in the sea for his father to pick up. In another report Absyrtus had grown to manhood then, and met his death in an encounter with Jason, in pursuit of whom he had been sent. Of the homeward course various accounts are given. In the oldest existing account, the “Argo” sailed along the river Phasis into the Oceanus, thence to the mythical lake Tritonis, after being carried twelve days over land through Libya, and thence again to Iolcus) Hecatzus of Miletus suggested that from the Oceanus it may have sailed into the Nile, and so to the Mediterranean. Others, like Sophocles, described the return voyage as differing from the outward course only in taking the northern instead of the southern shore of the Black Sea. Some supposed that the Argonauts had sailed up the river Tanais, passed into another river, and by it reached the North Sea, returning to the Mcditerranean by the Straits of Gibraltar. And again, others laid down the course as up the Danube (Istros), from it into the Adriatic by a supposed mouth of that river, and on to Corcyra, where a storm overtook them. Next they sailed up the Eridanus into the Rhodanus, passing through the country of the Celts and Ligurians, and reaching the Tyrrhenian Sea and the island of Circe, who absolved them from the murder of Absyrtus. Then they passed safely through Scylla and Charybdis, past the Sirens, through the Planctz, over the island of the Sun, Trinacria, and on to Corcyra again, the land of the Phzeacians, where Jason and Medea held their nuptials. They had sighted the coast of the Peloponnesus when a storm

overtook them and drove them to the coast of Libya, whre they were saved from a quicksand by the local nymphs. The "Argo" was now carried twelve days and twelve nights to the Hesperides, and thence to lake Tritonis, whence Triton conducted them to the Mediter- ranean. At Crete the brazen Talos, who would not permit them to land, was killed by the Dioscuri. At Anaphe they were saved from a storm by Apollo. Finally they reached Iolcus, and the "Argo" was placed in a grove sacred to Neptune on the isthmus of Corinth. Jason's death, it is said, was afterwards caused by part of the stern giving way and falling upon him. (A. S. M.)

ARGONNE, a rocky and forest-clad plateau in the north-east of France, extending along the borders of Lorraine and Champagne, and forming part of the depart- ments of Ardennes and Meuse. The famous defence of the French frontier by Dumouriez in 1792 is called the Argonne Campaign.

ARGOS. The most important city of this name was situated in the eastern part of the Peloponnesus, about 3 miles from the sea. By the Greeks themselves it was regarded as the most ancient of all their cities, and as the local habitation of many of their earlier heroes. Here Inachus and his descendants had reigned for many genera- tions, until the arrival of Danaus the Egyptian, with his fifty daughters, whose dynasty, glorious with the names of Perseus the Gorgon-slayer, and Eurystheus the master

of Hercules, held sway over Argos, and Tiryns, and Mycene, till it, in its turn, was succeeded by the still more important dynasty of Pelops) The Dorian invasion and conquest followed, and Argos became the head of a Dorian confederation, extending its authority over a large portion of the neighbouring territory. Between this region (Argolis) and Sparta, however, there were no natural boundaries, and a conflict arose between the two states about the border land of Cynuria. For a time, under the despotic management of Pheidon, Argos maintained its ground ; but Sparta ulti- mately established its claim in spite of the dubious result of the famous ducl of the 600, which was fought for the decision of the dispute, and the strength of the Argives was completely crushed by Cleomenes at the battle of Tiryns. A temporary ascendency of the serfs in Argos, an extension of the franchise, and a permanent adoption of a more democratic constitution,

seem to have been the consequences of this national exhaustion and the subse- quent reaction. During the Persian war Argos was indifferent and neutral, but in the contest for power which ensued between Athens and Sparta, the old antipathy against the latter was sufficient to make the Argives stanch allies of the former. In the 4th century B.c., the demo- cratic constitution of the city degenerated into a reign of terror (SxvraAvcpds), which in its turn gave place to a series of tyrannies, from which escape was ultimately found in the Achzean League and the Roman domination. Pyrrhus perished in an unsuccessful attack on the city in 272 B.c. In the 13th century of our era, Argos fell into the posses- sion of the Franks, from whom it passed into the hands of the Byzantine despots ; and in 1463 it was taken by the Ottoman troops. Here in the darkest period of Greek ignorance lived one of the few representatives of the ancient learning, Theodosius Zigomali (Crusius's Z'urcogrecia). In i the time of Pausanias the number of temples in Argos and | its neighbourhood was remarkable, the most important of | them being the Herzum, or temple of Hera, the ruins of | which, visible from the acropolis of Argos, but nearer to | Mycen, were discovered in 1831 by Colonel Gordon of Cairness (see plan in Leake's Peloponnesiaca, 1846), With- in the city the greatest was the temple of Apollo Lyceus. Remains still exist of the cyclopean architecture of the acropolis, of the theatre, which was of great extent, and of an aqueduct which can be traced for miles to the north-west, In the 5th century B.c., Argos was the seat of a great school of statuary under Ageladas, but it. did not contribute to the long roll of Greek literature more than the names of Telesilla and Sacadas, of whom the latter was better known as a musician. The limits of Argolis varied at different times, but it was.only under the Romans that they were understood to embrace the districts of Phlius, Cleon, Epidaurus, Troezen, and Cynuria.

ARGOSTOLI, the capital of Cephalonia, one of the Ionian islands, and the seat of a bishop of the Greek Chureh. It possesses an excellent harbour, a quay a mile in length, and a fine bridge. In 1870 the imports were of the value of 8,347,522 drachmas, or £296,941. Near at hand are the ruins of Cranii, affording tine examples of 'the military architecture of the Greeks; and at the west side of the harbour there is a curious stream, flowing from ' the sea, which is employed to drive mills. (Sir C. Fellows's Journal of an Excursion in Asia Minor in 1838, and Wiebel's Die Insel Kephalonia und

die Meermiihlen von Argostol, Hamburg, 1873.) Shipbuilding and silk-spinning are carried on. Population, 9000.

ARGOVIE (Lat. Argovia), the French form of Aargau, the name of one of the Swiss cantons. See AARGAU.

ARGUIN, an island, perhaps Hanno's Cerne, off the west coast of Africa, in lat. 20° 25' N., long. 16° 37' W. It produces gum-arabic, and is the oe t, a turtle

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fishery. There are two fairs held every year. Off the island, which was discovered by the Portuguese in 1452, are extensive and very dangerous reefs, There is a town ' of the same name on the neighbouring coast.

ARGUS, in Greek Legend, the son of Agenor or Arestor, or, according to others, an earth-born hero (Autochthon). He was called Panoptes (xavéqrys), All-seeing, from having a hundred eyes. After performing several feats of valour, he was appointed by Juno to watch the cow into which lo had been transformed. While doing this he was slain by Mercury, who, according to one account, stoned him to death, according to another, put him to sleep by playing on the flute, and then cut off his head. His eyes were transferred by Juno to the tail of the peacock.

ARGYLL, Earts anD DUKES OF, The rise of this family of Scottish peers, originally the Campbells of Lochow, first ennobled as Barons Campbell, and still retaining the family name Campbell, is referred to in the article ARGYLL- SHIRE (q.v.)

ARCHIBALD, the eighth earl and first marquis, was born in the year 1598, and educated in the principles of the Reformation, of which his ancestors had been zealous promoters. His father, however, renounced Protestantism, whereupon the young earl was put in possession of his patrimonial estates by order of Government, and quickly promoted to places of trust and power. From the com- mencement of his political career he espoused the cause of

the Presbyterian party, and defended the Covenanters when summoned to London to give his opinion of their proceedings before the king. In 1638 he remained with the General Assembly after it had been dissolved by the king's commis- sioner, and with other nobility and gentry signed the Solemn League and Covenant. Having thus openly committed himself to the Presbyterian cause, he became its recognised leader both in political negotiations and in the field. He was created a marquis during the king's visit to Scotland in 1641. This mark of favour, intended probably to conciliate a powerful subject, did not prevent Argyll from leading an army against «he royal troops in 1644. The campaign ended in his signal defeat by Montroseat Inverlochy on the Ist February 1645. In 1651 he placed the crown on the head of King Charles II. at Scone, having, like the rest of his party, been alienated from the republicans of England by the execution of Charles I. Having gone to London at the Restoration in 1660, he was arrested and thrown into prison. In the following year he was tried at Edinburgh for high treason, and, principally on ground of alleged treasonable correspondence with Monk, he was con- demned to death, and executed on the 25th of May, dying with great firmness and calmness. He was the author of Instructions to a Son, and Maxims of State (1661).

ARCHIBALD, the ninth earl, son of the preceding, from his youth distinguished himself by his loyalty and attachment to the royal family: Though his father headed the Covenan- ters, he attached himself to the king's party. On the establishment of the Commonwealth he was committed to prison, and was jealously watched till the Restoration, when the king remitted his father's forfeiture, and created him earl of Argyll. He continued in high favour with the king and court till the passing of the Test Act in 1681, when, by opposing the exemption of princes of the blood from the oath, he drew down on himself the indignation of the duke of York. When called to take the test, Argyll refused, except with an explanation, which he believed to have been approved by the duke, to the effect that he took it only so far as it was consistent with itself and with the Protestant religion. The duke accepted the qualification, and Argyll was admitted to sit in council; but a few days afterwards he was committed to prison, and indicted for high treason. On being tried, three judges did not scruple to convict him

of treason; a jury of fifteen noblemen gave a verdict against him; and the king ordered sentence to be pronounced, but the execution of it suspended till further orders, Argyll, however, seeing no reason to trust to the justice or mercy of his enemies, made his escape from prison, and concealed himself for some time in London, afterwards escaping to Holland, where he remained during the remaining part of the reign of Charles I]. On the accession of James II. he took part in the rising of the duke of Monmouth, and returned to Scotland to command the forces raised there ; but after a few unsuccessful skirmishes he was taken prisoner and carried to Edinburgh, where he was beheaded on his former sentence, June 30, 1685, submitting to death with heroic firmness.

ARCHIBALD, the first duke, son of the preceding, was an active promoter of the Revolution. He came over with the Prince of Orange, and was admitted into the Convention as earl of Argyll, though his father's attainder had not been reversed. Having been deputed, along with Sir James Montgomery and Sir John Dalrymple, to present the crown in name of the Scottish Convention to the Prince of Orange, and to tender to him the coronation oath, he was admitted a member of the Privy Council, and, in 1690, made one of the lords of the Treasury. In 1701 he was created duke of Argyll. He died in 1703.

Joun, the second duke (also duke of Greenwich), son of the preceding, was born on the 10th October 1678. He entered the army in 1694, and in 1701 was promoted to the command of a regiment. On the death of his father in 1703, he was appointed a member of the Privy Council, and at the same time captain of the Scotch horse guards, and one of the extraordinary lords of Session. In return for his services in promoting the Union, he was created a peer of England, by the titles of baron of Chatham and earl of Greenwich, and in 1710 was made a knight of the Garter. He first distinguished himself ina military capacity at the battle of Oudenarde, where he commanded as brigadier-general ; and was afterwards present under the duke of Marlborough at the sieges of Lisle, Ghent, Bruges, and Tournay, and did good service at the battle of Mal- plaquet in 1709. Soon after this action he was sent to take the command in Spain; but being seized with a violent fever at Barcelona, and disappointed of supplies from home, he returned to England. Having a seat in the House of Lords, he censured the measures of

the ministry with such freedom that all his places were disposed of to other noble-

/men; but at the accession of George I. he recovered his

influence. On the breaking out of the Rebellion in 1715 he was appointed commander-in-chief of the forces in North Britain, and was principally instrumental in effecting the total extinction of the rebellion in Scotland without much bloodshed. He arrived in London early in March 1716, and at first stood high in the favour of the king, but in a few months was stripped of his offices. This disgrace,

| however, did not deter him from the discharge of his par-

liamentary duties; he supported the bill for the impeachment of Bishop Atterbury, and lent his aid to his countrymen by opposing the bill for punishing the city of Edinburgh for the Porteous riot. In the beginning of the year 1719 he was again admitted into favour, appointed lord-steward of the household, and, in April following, created duke of Greenwich. He continued in the administration during the remaining part of that reign, and, after the acces- sion of George IL, till April 1740, when a violent speech against the Government led again to his dismissal from office. He was soon restored, however, on a change of the ministry, but disapproving of the measures of the new administration, he finally resigned all his posts, and spent the rest of his life in privacy and retirement. He died on the 3d September 1743. A monument, executed by

Roubillac, has been erected to his memory in Westzninster Abbey.

ARCHIBALD, the third duke, brother of the preceding, was born at Ham House in Surrey, in June 1682. On his father being created a duke, he joined the army, and served for a short time under the duke of Marlborough. In 1705 he was appointed treasurer of Scotland, and in the following year was one of the commissioners for treating of the Union ; on the consummation of which, having been raised to the peerage of Scotland as earl of Islay, he was chosen one of the sixteen peers for Scotland in the

first parliament of Great Britain. In 1711 he was called to the Privy Council, and commanded the royal army at the battle of 'Sheriffmuir in 1715. He was appointed keeper of the privy seal in 1725, and was afterwards intrusted with the principal manage- ment of Scottish affairs. In 1734 he was made keeper of the great seal, an office which he held till his death. He succeeded to the dukedom in 1743. The duke was eminent not only for his political abilities, but foi his literary accomplishments, and had collected one of the most valuable private libraries in Great Britain. He died suddenly on the 15th of April 1761.

ARGYLLSHIRE, or ARGYLESHIRE, a county on the west coast of Scotland, comprehending a large district on the mainland and a number of the Hebrides or Western Isles. The mainland portion lies between lat. 55° 15' and 56° 55' N., and between long. 4° 32' and 6° 6' W.; its greatest length being 115 miles, and its greatest breadth about 36 miles. It is bounded on the N. by Inverness- shire ; on the E. by the counties of Perth and Dumbarton, Loch Long, and the Firth of Clyde ; on the S. by the North Channel ; and on the W. by the Atlantic. Its sea coast has been stated at 600 miles. If the various islands are in- cluded, the greatest breadth of the county is 68 miles, and its total area amounts to 3255 square miles, or 2,083,126 acres, which is more than a tenth part of the whole area of Scotland. It contains forty parishes, and has been variously divided at different times into a number of dis- tricts. The names of these at present in use are North and South Argyll, Cowal, Dunoon, Kintyre (or Cantyre), Tarbert, Lorn, Mull, Ardnamurchan, Morven, Islay, &c. The principal towns are Inveraray, Dunoon, Campbeltown, Oban, and Tobermory.

There are numerous mountain streams, but no navigable rivers. The two principal are the Orchy and Awe. The former flows from Loch Tulla through Glen Orchy, and falls into Loch Awe at its northern extremity ; and the latter forms an outlet for the loch across the neck of land which lies between it and Loch Etive. The other streams are the Add, Aray, Coe or Cona, Creran, Douglas, Echaig, Etive, Euchar, Feochan, Finart, Fyne, Kinglas, Kinloss, Large, Leven, Nell, Ruel, Shiel, Shira, Strae, Talaken, Uisge-Dhu, &c. Most of these yield excellent salmon and trout fish- ing. There are also some good fishing streams in the islands. The county is remarkable for the numerous inlets of the sea with which it is deeply

indented, the principal of them being Loch Long, with its branch Loch Goil ; Loch Fyne, with Loch Gilp; Loch Etive; Loch Linnhe, with its branches Loch Creran, Loch Leven, and Loch Eil ; and Loch Sunart. There is also a large number of inland lakes, the total area of which is about 25,000 acres. Of these the principal are Loch Awe, Loch Avich, Loch Eck, Loch Lyndoch (partly in Perthshire), and Loch Shiel.

The principal islands are Mull, Islay, Jura, Colonsay, Lis- more, Tiree, Coll, Gigha, Muck, Rum, and Canna. Besides these there are the two small but interesting islands of Staffa and Iona—the one famous for its basaltic caves and rocks, and the other as the earliest seat of Christianity in Scotland.

The whole county is rugged and mountainous, and many of the peaks are among the loftiest in the kingdom ; as

Ben Cruachan (3689 ft.), Ben More, in Mull (3172), Ben Ima (3318), Buchael Etive (3345), and Ben Arthur, "The Cobbler" (2891), on the borders of Dumbartonshire. To the tourist it offers a rich variety of Highland scenery, culminating in the gloomy grandeur of Glencoe.

The situation and conformation of Argyllshire tend to produce a very abundant rainfall. At Oban, the average annual amount is 64°18 inches; in Glen Fyne, 104°11 inches ; at the Bridge of Orchy, 113°62 inches; and at Upper Glencoe, 127°65 ; while at Edinburgh the average quantity is only 26°40 inches. The prevailing winds, as observed at Callton-More, near Crinan, are the S.W. and S.E., and next in frequency are the N.W. and N.E. The average temperature is 48° Fahr.

Geologically, the mainland consists principally of the metamor- phic or so-called primary strata, covered in part by newer formations. In the portion west of Lochs Linnhe and Eil—the districts of Sunart, Ardgower, and Morven—gneiss is the prevalent rock, broken through by granite near Strontian, and by trap rocks in Ardnamurchan and Morven. In the other portion east of Loch Linnhe, the lower rocks are chiefly mica slate and clay slate, the continuation of the strata forming the great range of the southern Grampians. Mica slate is the most important and oldest of these formations,

rising up into the wild and rugged mountains so conspicuous near Loch Long and Loch Fyne. In Appin it is partly replaced by quartz rock, remarkable for bare sterility, and on Loch Fyne by chlorite slates running down into Knapdale or the upper portion of the promontory of Kintyre. These slates form a good building stone, being readily cut even with a saw, and are the material of which the ducal castle at Inveraray is built. Mica slate again forms most of Kintyre south of Tarbert, with occasional beds of dark coloured limestone.

Clay slate is far less common on the mainland, but occurs near Dunoon and Toward Point on the Clyde. It has been long quarried extensively at Ballachulish, and again appears near Oban and further south, often as a dark coloured carbonaceous-looking rock. From this it extends into Kerrera, Seil, Easdale, Luing, and the other so called slate islands. It has everywhere a very marked cleavage, distinct from the stratification, and some of the beds furnish a very durable roofing slate, which has been long wrought in Easdale, and with which many houses in Scotland are covered. Cubical crystals of iron pyrites abound in all these slates, which, though no organic remains have yet been found in them, are probably the equivalents of the lowest Silurian formations.

To the same period may also be referred the quartz rock mentioned as occurring in Appin, specially near the lower part of Glencoe, aud more extensively in Jura and Islay, along with the clay slate. From its hardness and indestructibility it would form a valuable building stone, but is little used. These properties also cause it to project in singularly sharp ridges and conical summits, of which the Paps of Jura are the best known. :

The limestone associated with these older strata, though seldom in large masses, is yet widely spread. It has been wrought near Ballachulish and in various parts of Appin, in several places near the Crinan Canal, and along the whole peninsula of Kintyre as far as Campbeltown. The largest masses are found in some of the islands. Thus it covers the whole of Lismore and a large tract in the centre of Islay near Bowmore. A magnesian variety found on Tona, associated with serpentine, takes a good polish, and the red or flesh coloured marble of Tiree, often with embedded crystals of green hornblende, occurs in beds in the gneiss of that island.

Red sandstones, probably belonging to more than one period in the history of the earth, are found in different parts of Argyllshire. Some portions, resting conformably on the mica slate of Kintyre, may belong to the Torridon sandstone or Cambrian of the north-west coast, whilst other portions are of Devonian age. Some beds near Oban and on the Sound of Mull are probably Trias. True coal, a continuation of that in Ayrshire, has been wrought near Camp- beltown. At various points on the coast of Mull, Morven, and Ardnamurchan, beds belonging to the Lias, Oolite, and even perhaps the Cretaceous formations, appear underlying the trap rocks. Though of much interest in a scientific point of view they have little influence on the general character of the county. More recent formationsare the leaf beds, with remains of Miocene plants discovered in the trap tufa at Ardtunhead, in Mull, by the duke of Argyll in 1850. Raised beaches with fossil shells are also known on several parts of the coast, ¢.g., at the Sound of Kerrera.

Of the igneous rocks, granite chiefly occurs in a large mass round the upper end of Loch Etive, extending south to Ben Cruachan near Loch Awe. Smaller masses appear near Ballachulish and at the Ross of Mull. In the latter place it has been extensively quarried and used for the magnificent lighthouse erected on the Skerry Vohr. Veins are common near these masses and in other places. Felspar porphyries, in great variety of forms and colours, abound in Glencoe,

in large masses in the mountains north of Loch Fyne below Inveraray, and again in Davar Island, and at other points near Campbeltown. Trap rocks—greenstones, dolerites, basalts, claystone porphyries, amygdaloids, and tufas—cover great cxtents both of the mainland and islands. In the west of Lorn they enclose the lower part of Loch Etive, stretching north to Loch Creran, and south nearly to Loch Awe and Loch Melfort From this place, running westward through Kerrera, they form nine-tenths of Mull and a wide tract on the opposite coast of Morven and Ardnamurchan. The islands of Muck, Eig, Rum, and Canna are more remote outlicrs of these formations to the north-west, which also form the Treshinish Islands —Ulva, Gometra, and Staffa, with its far-famed caves and beautiful columnar cliffs. From

their relation to the stratified beds, these rocks evidently belong to a recent period in the history of the earth, many of them not older than the upper tertiary. At that time the west of this county, and especially the island of Mull, had formed the site of active volcanocs, rivalling in extent and activity any now known at least in Europe. 'he trap rocks in Kintyre connect them with those in central Scotland and the north of Ireland, whilst those in Skye are thcir continuation to the north.

Argyll is not rich in mineral produets possessing an economic value. The iead mines of Strontian, in Sunart, produced in 1872 about twelve tons of lead ore. A vein of arsenical nickel was discovered in 1849 by the duke of Argyll near Inveraray. Fine specimens of the harmotome or cross-stone occur at Strontian, of the heliotrope or bloodstone in Rum, and of natrolite, siolezite, stilbite, and other zeolites in the trap-rocks of Mull, Morven, and Lorn.

Argyllshire was formerly interspersed with natural forests, remains of which —consisting chiefly of oak, ash, pine, and birch—are still visible in the mosses. But, owing to the clearance of the ground for the introduction of sheep, and the neglect of planting, the county is now remark- able for its want of wood, except in the neighbourhood of Inveraray, where there are extensive and flourishing planta- tions.

The chief branches of industry are the rearing of cattle and sheep, and the herring fishery. The cattle, though of small size, are equal, if not superior, to any other breed in the kingdom, and are in great demand in the markets of the south, to which they are sent in-immense num- bers. Dairy husbandry is practised to some extent in the southern parts of Kintyre, where there is a large pro- portion of arable land. In the higher tracts shecp have very advantageously been substituted for cattle. The black- faced is the species that is now almost universally reared.

Argyllshire is an attractive field for the sportsman, its deer forests, grouse-shootings, and salmon-fishings being among the best in Scotland. The rents derived from these sources have greatly increased during the last half century. As examples of these it may be stated, that the deer-forest of Blackmount is let for about £3000 a year, and the salmon-fishing of Ardnamurchan for upwards of £600. Loch Fyne is celebrated for its herring

fishery ; but during 1873 and 1874 the shoals have not advanced beyond the Sound of Kilbrannan.

The manufactures of Argyllshire are very limited, con- sisting solely of whisky and gunpowder ; the former is produced at Campbeltown and in Islay, and the latter at Kames (Kyles of Bute), and at Melfort, Furnace, &c.

There were originally only military roads in Argyllshire, but these were gradually supplemented by others formed at the joint expense of Government (by a grant and mainten- ance) and the county, by means of assessment under the Road Coimmissioners—consequently there have never been any tolls. The Government grant was withdrawn about 1860, and the roads are now maintained solely by assess- ment, which is levied equally on landlords and tenants. By means of steamers there is regular intercourse between various parts of the extensive coast and the Western metropolis. In order to avoid the circuitous passage round the Mull of Kintyre the Crinan Canal was con-

structed, extending across the isthmus from Ardrishaig to Loch Crinan, a distance of 8 miles; and another canal unites Campbeltown with Dalavaddy. The Crinan is decp enough for vessels drawing 12 feet of water; its breadth at the surface is 66 feet, and at the bottom 30, and the passage is interrupted by fifteen locks. There are about twenty bank branches in the county. There are (1875) four weekly newspapers published in Argyllshire.

The antiquities of the county comprise monoliths, circles of standing stones, crannoges, and cairns. In almost all the burying grounds—as at Campbeltown, Keil, Soroby, Kilchousland—there are specimens of sculptured crosses and slabs, many of which are figured in The Sculptured Stones of Scotland, vol. 11., published by the Spalding Club, and Archeological Sketches in Kintyre, by Capt. T. P. White. For other subjects of archeological interest see The Proc. of Antig. Soc. of Scotland, vols. iv. vi. viii. Besides the famous ecclesiastical remains at Iona, there are ruins of a Cistercian priory in Oronsay, and of a church founded by Somerlid at Saddel. Among castles may be mentioned Dunstaffnage, Ardtornish, Skipness, Kilchurn, Ardchonnel, Dunolly, Dunderaw, and Carrick.

The earliest recorded event in the history of Argyllshire is the settlement in the 4th or 5th century of a body of Trish Scots, under the leadership of Erc, who soon ex- tended their power and established a dynasty. The most famous of their kings was Aidan, the friend of Columba. In the 8th century the district fell into the hands of Nor- wegian adventurers, and continued for five or six hundred years under Norwegian control, till the rise of a deliverer called Somerlid. Along with the Hebridean Isles, all the western parts of Argyll came to the Scottish monarchs by conquest in the 14th century. Some time after, Mac- donald, the representative of this region, obtained leave from the Scottish crown to hold his possessions as a feudatory to that kingdom ; but his turbulent spirit involved him and his family in repeated rebellions. These were at last punished by the forfeiture of the estates, which, along with the titles, were bestowed on the Campbells of Lochow, who have ever since retained them. Colin, second Lord Campbell, was created earl of Argyll in 1457 ; Archibald, second earl, fell at Flodden ; Archibald, fourth earl, was the first nobleman in Scotland who declared him- self a Protestant ; Archibald, fifth earl, is famous as the supporter of Queen Mary ; Archibald, the eighth earl, and other prominent holders of the titles, are noticed in the article immediately preceding. The tenth earl was raised to the dukedom of Argyll in 1701. The title is now (1875) held by a member of the same family, George Douglas Campbell, eighth duke.

Like other parts of the Highlands of Scotland, this county was the seat of several clans, of which the princi- pal were the Campbells, the Macleans, the Stewarts of Appin, the Macdonalds of Glencoe, the Macquarries, and the Macdougalls ; and the number of Campbells is still a striking feature of the personal nomenclature of the county. Gaelic is still to a considerable extent the verna- cular dialect. The chief proprietors are the duke of Argyll and earl of Breadalbane, whose estates are respec: tively 168,000 and 179,000 acres in extent. The other principal estates, according to extent, are those of Poltal- loch (183,900 acres), Islay (67,000), Jura (55,000), Ard- namurchan (55,000), Sunart (54,418), Kildalton (54,250), and Ardkinglass (51,670). The total number of owners of land possessing one acre or upwards was, in 1872-73, 581, and of owners who had less than one acre, 2283.

The valued rent of the county for 1874-75 is (exclusive of burghs and canals) £416,543. The valuation of the burghs is—Campbeltown, £20,624; Oban, £11,763; In- veraray, £3323. The county returns one member to parlia-

ment, and had in 1873-74 a constituency of 3010. Inver- aray, Campbeltown, and Oban are contributory burghs to Ayr. It is governed by a lord-lieutenant and high-sheriff, about 48 deputy-lieutenants, a sheriff, and four substitutes. The justiciary circuit-court for the counties of Argyll and Bute is held at Inveraray in spring and autumn. Sheriff- courts are held at Inveraray, Tobermory, Campbeltown, and Fort-William ; and courts for small-debt actions, four times a year, at Oban, Lochgilphead, Dunoon, and Bow- more, inIslay. There are three prisons (at Campbeltown, Inveraray, aud Tobermory), five poorhouses, an asylum at Lochgilphead for the Argyllshire and Bute district, sea- side homes for convalescents at Dunoon and at Kilmun, and a county militia barracks at Campbeltown. The ecclesi- astical statistics of the county are as follows :—The Lstab- lished Church of Sectland has a synod, 6 presbyteries, 40 parish and 18 quoad sacra churches, and 14 chapels of ease. The Free Church has a synod, 5 presbyteries, and 46 churches. The United Presbyterians have 8 churches counected with 2 presbyteries. The Episcopalians have a bishopric (Argyll and the Isles), a dean, and 17 clergy- men ; and the Roman Catholics have 5 priests. In 1871 there were 79°18 per cent. of the children between 5 and 13 years of age receiving education—Argyllshire in this respect standing above ten counties, but 7°36 below the highest, Perth. The population of Argyll has been de- creasing since 1831, from the extensive emigration that has been going on, principally to Canada. The following is the state of its population since the commencement of the present century—1801, 81,277; 1811, 86,541; 1821,

97,316; 1831, 100,973; 1841, 97,371; 1851, 89,298 ; 1861, 79,724; 1871, 75,679.

ARGYRO-CASTRO (Zrgir Castri), a town in the valley of the Drino, in the province of the Avlona, in Albania (Epirus). It has been variously identified with Hadriano- polis and Antigonea, and is supposed to, preserve the name

of the ancient Argyrini. It is the focus of the Mussulman aristocracy of Epirus, and contains the ruins of an imposing castellated fort. There is a consider- able manufacture of a fine kind of snuff, called Puli. Hobhouse and Holland estimated the inhabitants at 20,000 ; but in 1814 the town was almost depopulated by a plague, and the number has sunk to 6000.

ARGYROPULUS, or ArcyropuLo, JoHN, a learned Greek who lived during the 15th century. He appears to have crossed over to Italy about 1434, and in 1442 was made rector of the university at Padua. About 1456 he was invited to Florence by some of the Medici, and was there appointed professor of Greek in the university. Tifteen years after he removed to Rome, where he continued to act as professor of Greek till his death, which took place probably soon after 1489. His principal works were trans- lations of the following portions of Aristotle:-—Categories, De Interpret., Analyt. Post., Physics, De Colo, De Anima, Metaphysics, Nicom. Ethics, Politics. His only original published writing is an Expositio Hihicorum Aristotelis. Several of his writings exist still in manuscript.

ARIADNE (Apiddvn=’Apidyvn, the Cretan form of dyvos being aévés), in Greek Mythology, a personification of the return of Spring, at which period took place, it was believed, Ariadne’s marriage with Dionysos (Bacchus), who also, after an absence throughout the winter, was thought to return amid the rejoicings of spring. This marriage was the great feature in her worship, which appears to have originated in Crete, and to have been mostly confined to that island and to Naxus, where annually it was celebrated by the people with dances and a festival called Theodaisia. But though married to Dionysos, and sometimes called his wife (dkotrts, Hesiod, Theogony, 948), she did not generally appear in this character. On the contrary, in the Odyssey

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(xi. 321-325), it is said that Artemis slew her, with the consent of Dionysos, at Dia (near Cnossus), before she could reach Athens with Theseus. Her death wonld thus seem a punishment for her infidelity. But in the current legend her connection with Dionysos did not begin till he found her asleep

in Naxus after her despair at being abandoned by Theseus, with whom she had escaped from Crete after assisting him against her father, the fierce Minos, to slay the Minotaur. She had given Theseus a clue by means of which, while she retained the other end, he could find his way through the labyrinth, in which he had to fight that monster with human body and bull's head. In the Ziad (xviii. 591) she is spoken of as the fair-haired Ariadne, for whom Deedalus had skilfully made a dancing-place (xopés) in Cnossus, and it is probable that the reference here is to the dances with which her marriage was celebrated in Crete. Possibly also the description of her as a daughter of Minos, which is as early as the Odyssey (xi. 321), was not founded in the belief of the Cretans, to whom she was a goddess, but arose elsewhere from observation of her pecu- liarly local character. Another form of her name in Crete, 'ApidjAa (= davepa), refers to her as a being connected with the return of a bright season in nature. In works of art her marriage with Dionysos, and her abandonment by Theseus in Naxus, are known to have been frequently the subject of representation. Examples of both still exist on the vases and in mural paintings. The scene where she holds the clue to Theseus occurs on a very early vase in the British Museum.

ARIANO, a town of Italy, in the province of Avellino, about 38 miles N.E. of Naples, situated 2500 feet above the level of the sea, on a steep and rocky hill, between the riversCalore and Tribaldo. Founded by the Greek governors of Apulia, it continued to be an important military post for several centuries, and was frequently taken and retaken during the various dynastic struggles of southern Italy. A parliament was held here by Roger I. in 1140, ard in 1648 the town was pillaged by the duke of Guise. It is still a bishop's see, and the chief town of a circondario, with a cathedral, and a large number of churches. Earthen- ware is manufactured, and there is some trade in wine and butter. The most peculiar feature of the town is the multitude of troglodytic dwellings, in which the poorer classes reside. The district is highly volcanic, and the town has suffered severely from earthquakes (1456, 1732), and only 7 miles distant is the lake of Amsanctus (Mofete), remark- able for its suffocating exhalations. Population, 14,347. (See Vitate, Storia della Citta d Ariano, Rome, 1794.)

ARIANS. See Artus.

ARIAS MONTANUS, BEnepictus, one of the most learned Oriental scholars of his time, and the editor of the Antwerp Polyglott, was born at Frescenal de la Sierra, in Estremadura, in 1527. After studying at the university of Alcala, he joined the Benedictine order. In 1562 he accompanied the bishop of Segovia to the Council of Trent. After a few years spent in retirement at Aracena he went to Antwerp, at the request of Philip IT., to edit the Polyglott Bible that had been projected by Plantin the printer. The work appeared in 8 volumes folio, between 1568 and 1573. The Jesuits founded on it several charges of heresy against Arias, from which he succeeded in clearing himself, though only after several visits to Rome. He declined the offer of a bishopric from the king, but after some time spent in retirement at Aracena, became librarian at the Escorial. The closing years of his life were passed at Seville, where he died in 1598.

ARICA, a sea-port of Peru, in the department of Moquegua, in lat. 18° 28' S., and long. 70° 10' W. It was at one time a city of 30,000 inhabitants, and had a large export trade in wool, copper, and silver; but in con-

sequence of civil war (1821) and earthquakes (1832, 1868), it has greatly declined ; of late, however, it has shared in the general revival of Peru. The Government has taken measures for the improvenient of the port, which is con- nected by railway with Tacna, about 38 miles inland, where many of the merchants reside. Population, about 4000. ARIEGE, a department of France, bounded on the S. by Spain, W. by Haute-Garonne, N.E. by Aude, and S.E. by Pyrénées Orientales. It embraces the old countship of Foix, and a portion of Languedoc and Gascony, and has an area of 1889 square miles. The southern part is occupied by the Pyrenees, which here contain some of the highest peaks in France ; as, Pic d'Estats (which is 10,811 feet above the level of the sea), Montcalm (10,512), Font- argente, and Montleon. Conmunication with Spain is afforded by a large number of ports or cols, which are, however, for the most part difficult paths, and only practi- cable for a few months in the year. The northern portion consists of a kind of plateau, broken by beautiful and fertile valleys. Ariége belongs to the Garonne basin, and is watered by the Salat, the Arize, and the Ariége, with their tributaries. The climate is mild in the south, but naturally very

severe among the mountains. The country affords excellent pasture, and a considerable number of cattle, sheep, and swine are reared; but there is little arable land, and what exists is broken up into small crofts. There is abundance of minerals—lead, copper, manganese, and especially iron, being largely obtained. Alum is found at Mas-d'Azil, alabaster among the mountains, building- stone at Pamiers, marble at Belesta, &c. Warm mineral springs are common. The preparation of woollen cloths, the forging of iron, and manufacture of steel are the principal industries ; while soap, paper, and wooden wares are likewise produced. Among the celebrated men of the department are Gaston de Foix, Pope Benedict XII., and Pierre Bayle. The chief town is Foix; the arroudissements, Foix, St Girons, and Pamiers. Population, 244,798. ARION (pronounced Arv'on), a celebrated poet and cithara player, a native of Methymna, in Lesbos. As he is said to have been the friend of Periander, tyrant of Corinth, he must have flourished about 625 B.c. Several of the ancients ascribe to him the invention of the dithyramb and of dithyrambiec poetry; it is probable, however, that his real service was confined to the organisation of that verse, and the conversion of it from a mere drunken song, used in the Bacchic revels, to a measured antistrophic hymn, sung by a trained body of performers. Nothing more is known of the life of Arion, with the exception of the beautiful story first told by Herodotus, aud afterwards elaborated and embellished by many subsequent writers. According to Herodotus, Arion had become desirous of exhibiting his skill in foreign countries, and, leaving Corinth, had travelled through Sicily and parts of Italy, where he gained great fame, and amassed a large sum of money. At Tarentum he embarked for his homeward voyage ina ship belonging to Corinth. The sight of his treasure roused the cupidity of the sailors, who resolved to possess themselves' of it by putting him to death. In answer to his entreaties that they would spare his life, they insisted that he should either die by his own hand on shipboard, or cast himself into the sea. Arion chose the latter, and as a last favour begged permission to sing a parting song. The sailors, desirous of hearing so famous a musician, consented, and the poet, standing on the deck of the ship, arrayed in the rich garments in which he was accustomed to be habited, sang a dirge accompanied by his lyre. He then threw himself overboard ; but instead of perishing, as the sailors imagined, he was miraculously borne up in safety bya dolphin, supposed to have been charmed by the music. Thus he was conveyed to Tzenarus, whence

he proceeded to Corinth, arriving before the ship from Tarentum. Inimediately on his arrival Arion related his story to Periander, the tyrant of Corinth, who was at first incredulous, but eventually learned the truth by a strata- gem. Summoning the sailors, he demanded what had become of the poet. They affirmed that he had re- mained behind at Tarentum; upon which they were sud- denly confronted by Arion himself, arrayed in the same garments in which he had leapt overboard. 'The sailors confessed their guilt, and were punished. Herodotus and Pausanias both refer to a brass figure at Tzenarus, which was supposed to represent Arion seated on the dolphin's back. But this story is only one of several in which the dolphin appears as saving the lives of favoured heroes. Among others, it is curious that Taras, the mythical founder of Tarentum, is said to have been conveyed in this manner from Tenarus to Tarentum. On Tarentine coins a man and dolphin appear, and hence it may be thought that the monument at Tzenarus represented Taras, and not Arion. From the frequent appearance of the dolphin in mythical stories of voyages, it has been conjectured that it was looked upon as in some way the preserver of those at sea, and votive offerings would therefore be given to it by those who had escaped the perils of the deep. At the same time, the connection of Apollo with the dolphin must not be forgotten. Under this form the god appeared when he founded the celebrated oracle at Delphi, the name of which commemorates the circumstance. He was also the god of music, the special preserver of poets, and to him the lyre was sacred. The story of Arion seems, therefore, to be but one of the many and varied forms of the wide-spread myth of Apollo. Among the numerous modern versions of it, particular mention may be made of the pretty Romanze " Arion" by A. W. Schlegel.

ARIOSTO, Lopovico, one of the greatest poets of Italy, was born at Reggio, in Lombardy, on the 8th Sept. 1474. His father was Niccolo Ariosto, commander of the citadel of Reggio. He showed a strong inclination to poetry from his earliest years, but was obliged by his father to study the law —a pursuit in which he lost five of the best years of his life. Allowed at last to follow his inclina- tion, he applied himself to the study of the classics

under Gregorio da Spoleti. But after a short time, dur- ing which he read the best Latin authors, he was de- prived of his teacher by Gregorio's removal to France as tutor of Prince.Sforza. Ariosto thus lost the oppor- tunity of learning Greek, as he intended. His father dying soon after, he was compelled to forego his literary occupations to undertake the management of the family, whose affairs were embarrassed, and to provide for his nine brothers and sisters, one of whom was a cripple. He wrote, however, about this time some comedies in prose and a few lyrical pieces. Some of these attracted the notice of the cardinal Ippolito of Este, who took the young poet under his patronage, and appointed him one of the gentlemen of his household. This prince usurped the character of a patron of literature, whilst the only reward which the poet received for having dedicated to him the Orlando Furioso, was the question, " Where did you find so many stories, Master Ludovic?" The poet himself tells us that the cardinal was ungrateful; deplores the time which he spent under his yoke; and adds, that if he received some niggardly pension, it was not to reward him for his poetry, which the prelate despised, but to make some just compensation for the poet's running like a mes- senger, with risk of his life, at his eminence's pleasure. Nor was even this miserable pittance regularly paid during the period that the poet enjoyed it. The cardinal went to Hungary in 1518, and wished Ariosto to accompany him. The poet excused himself, pleading ill health, his

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love of study, the care of his private affairs, and the age of his mother, whom it would have been disgraceful to leave. His excuses were not received, and even an interview was denied him. Ariosto then boldly said, that if his emin- ence thought to have bought a slave by assigning him the scanty pension of 75 crowns a year, he was mistaken and might withdraw his boon—which it seems the cardinal did,

The cardinal's brother, Alphonso, duke of Ferrara, now took the poet under his patronage. This was but an act of simple justice, Ariosto having already distinguished himself as a diplomatist, chiefly on the occasion of two visits to Rome as ambassador to Pope Julius I]. The fatigue of one of these hurried journeys brought on a com- plaint from which he never recovered ;

and on his second mission he was nearly killed by order of the violent Pope, who happened at the time to be much incensed against the duke of Ferrara. On account of the war, his salary of only 84 crowns a year was suspended, and it was with- drawn altogether after the peace ; in consequence of which Ariosto asked the duke either to provide for him, or to allow him to seek employment elsewhere. A province, situated on the wildest heights of the Apennines, being then without a governor, Ariosto received the appointment, which he held for three years. The office was no sinecure. The province was distracted by factions and banditti, the governor had not the requisite means to enforce his autho- rity, and the duke did little to support his minister. Yet it is said that Ariosto's government satisfied both the sovereign and the people confided to his care ; and a story is added of his having, when walking out alone, fallen in with a party of banditti, whose chief on discovering that his captive was the author of Orlando Furioso, humbly apologised for not having immediately shown him the re- spect which was due to his rank. Although he had little reason to be satisfied with his office, he refused an embassy to Pope Clement VII. offered to him by the secretary of the duke, and spent the remainder of his life at Ferrara, writing comedies, superintending their performance, as well as the construction of a theatre, and correcting his Orlando Furioso, of which the complete edition was published only a year before his death. He died of con- sumption on the 6th of June 1533.

That Ariosto was honoured and respected by the first men of his age is a fact ; that most of the princes of Italy showed him great partiality is equally true ; but it is not less so that their patronage was limited to kind words. It is not known that he ever received any substantial mark of their love for literature: he lived and died poor. He proudly wrote on the entrance of a house built by himself,

' Parva, sed apta mihi, sed nulli obnoxia, sed non*

Sordida, parta meo sed tamen zre domus ;" which serves to show the incorrectness of the assertion of flatterers, followed by Tiraboschi, that the duke of Ferrara built that house for him. The only one who seems to have given anything to Ariosto as a reward for his poetical talent was the Marquess del Vasto, who assigned him an annuity of 100 crowns on the

revenues of Casteleone, in Lombardy ; but it was only paid, if ever, from the end of 1531. That he was crowned as poet by Charles V. seems uutrue, although a diploma may have been issued to that effect by the emperor.

The character of Ariosto seems to have been fully and justly delineated by Gabrielle, his brother :—

‘¢ Ornabat pietas et grata modestia Vatem, Sancta fides, dictique memor, munitaque recto Justitia, et nullo patientia victa labore,

Et constans virtus animi, et clementia mitis, Ambitione procul puls4, fastfisque tumore.”

His satires, in which we see him before us such as he was. show that there was no flattery in this portrait. In

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*these compositions we are struck with the noble inde- pendence of the poet. He loved liberty with a most jealous fondness. His disposition was changeable withal, as he himself very frankly confesses in his Latin verses, as well as in the satires. * Hoc olim ingenio vitales hausimus auras, Multa cito ut placeant, displicitura brevi. Non in amore modo mens hee, sed in omnibus impar*

Ipsa sibi longa non retinenda mora.” Hence he never would bind himself, either by going into orders, or by marrying, till towards the end of his life, when he espoused Alessandra, widow of Tito Strozzi. He had no issue by his wife, but he left two natural sons by different mothers.

His Latin poems do not perhaps deserve to be noticed : in the age of Flaminio, Vida, Fracastoro, and Sannazzaro, better things were due from a poet like Ariosto. His lyrical compositions show the poet, although they do not seem worthy of his powers. His comedies, of which he wrote four, besides one which he left unfinished, are avowedly imitated from Plautus and Terence ; and although native critics may admire in them the elegance of the diction, the liveliness of the dialogue, and the novelty of some scenes, few will feel interest either in the subject or in the characters, and none

would now approve the immoral passages by which they are disfigured, however grateful these might be to the audiences and patrons of theatrical representations in Ariosto's own day.

Of all the works of Ariosto, the most solid monument of his fame is the Orlando Furioso, the extraordinary merits of which have cast into oblivion the numberless romance poems which inundated Italy during the 15th, 16th, and 17th centuries.

The popularity which an earlier poem on the same theme, Orlando Innamorato, by Boiardo, enjoyed in Ariosto's time, cannot be well conceived, now that the enthusiasm of the Crusades, and the interest which was attached to a war against the Moslems, have passed away. Boiardo wrote and read his poem at the court of Ferrara, but died before he was able to finish it. Many poets undertook the difficult task of its completion ; but it was reserved for Ariosto both to finish and to surpass his original. Boiardo did not, perhaps, yield to Ariosto either in vigour or in richness of imagination, but he lived in a less refined age, and died before he was able to recast or even finish the poetical romance which he had written under the impulse of his exuberant fancy. Ariosto, on the other hand, united toa powerful imagination an elegant and cultivated taste. He began to write his great poem about 1503, and after having consulted the first men of the age of Leo. X., he published it in 1516, in only 40 cantos (extended afterwards to 46) ; and up to the moment of his death never ceased to correct and improve both the subject and the style. It is in this latter quality that he excels, and for which he had assigned him the name of Divino Lodovico. Even when he jests, he never compromises his dignity ; and in pathetic descrip- tion or narrative, he excites the reader's deepest feelings. In his machinery he displays a vivacity of fancy with which no other poet can vie; but he never lets his fancy carry him so far as to omit to employ, with an art peculiar to himself, those simple and natural pencil-strokes which, by imparting to the most extraordinary feats a colour of reality, satisfy the reason without disenchanting the imagination. The death of Zerbino, the complaints of Isabella, the effects of discord among the Saracens, the flight of Astolfo to the moon, the passion which causes Oriando's madness, teem with beauties of every variety. The supposition that the poem is not

connected throughout is wholly unfounded ; there is a connection which, with a little attention, will become evident. The love of Ruggero

and Bradamante forms the main subject of the Purioso ; every part of it, except some episodes, depends upon this subject; and the poem ends with their marriage.

The first complete edition of the Orlando Furioso was published at Ferrara in 1532, as noted above. The edition of Morali (Milan, 1818) follows the text of the 1532 edition with great correctness. Of editions published in England, those of Baskerville (Binniugham, 1773), and Panizzi (London, 1834), are the most important. The indifferent translations into English of Harrington and Horle have been superseded by the spirited rendering of Rose.

ARISTAUS (from dpicros, best), a divinity whose worship was widely spread throughout Greece, but con- cerning whose origin and career the myths are somewhat obscure. The account most generally received connects him specially with Thessaly. Apollo carried off from Mount Pelion the nymph Cyrene, daughter or grand- daughter of Peneus (Peneius), and conveyed her to Libya, where she gave birth to Aristzeus. From this crrcumstance the town of Cyrene took its name. The child was at first handed over to the care of the Hours, or, according to another version, to the nymph Melissa and the centaur Chiron. . He afterwards left Libya and came to Thebes, where he received instruction from the Muses in the arts of healing and prophecy, and married Autonoe, daughter of Cadmus, by whom he had several children, among others, the unfortunate Actzon. He is said to have visited Ceos, where, by erecting a temple to Zeus Icmeus (the giver of moisture), he freed the inhabitants from a terrible drought. The islanders worshipped him, and occasionally identified him with Zeus, calling him Zeus Aristzeus. After travelling through many of the A®gean islands, through Sicily, Sardinia, and Magna Grecia, everywhere conferring benefits and receiving divine honours, Aristzus came to Thrace, where he was initiated into the mysteries of Dionysos, and finally disappeared near Mt. Heemus. While in Thrace he is said to have caused the death of Eurydice, who was bitten by a snake while fleeing from him. Aristeeus was essentially a benevolent deity ;

he was worshipped as the first who introduced the cultivation of bees, and of the vine and olive ; he was the protector of herdsmen and hunters (and was therefore called véusos and dypevs) ; he warded off the evil effects of the dog-star ; he possessed the arts of healing and prophecy. In ancient sculptures and coins he is represented as a young man, habited like a shepherd, and sometimes carrying a sheep on his shoulders. Occasionally he is accompanied by a bee or a dove.

ARISTANDER, the favourite soothsayer of Alexander the Great, who consulted him, on all occasions. After the death of the monarch, when his: body had lain unburied for thirty days, Aristander procured its burial by foretelling that the country in which it was interred would be the most prosperous in the world. He is probably the author of a work on prodigies, which is referred to by Pliny and Lucian.

ARISTARCHUS, of Samothrace, the most famous of the Greek grammarians and critics, flourished about 160 B.c. He spent the greater part of his life at Alexandria, where he studied in the school of Aristophanes of Byzan- tium. Heacquired the highest reputation for critical skill, and founded a school for philology, which long flourished at Alexandria and afterwards at Rome. Ptolemy V. (Epiphanes) and Ptolemy VII. (Physcon) are said to have been among his pupils. During the reign of Physcon, who exer¢cised great cruelty towards the learned men in his capital, Aristarchus withdrew to the isle of Cyprus, where, it is said, he suffered from dropsy, and voluntarily starved himself to death. Aristarchus commented on Pindar, Archilochus, A'schylus, Sophocles, Aristophanes, and Ion ; but his great fame rests on his recension of Homer. His

principal object was to secure a thoroughly accurate text, and he carefully removed all supposed interpolations, marking with an obelus lines considered by him to be spurious, and with an asterisk those that seemed particu- larly beautiful. His edition was highly valued, and has been the basis of all subsequent recensions. The cri- ticism of Aristarchus was not merely verbal ; he attended carefully to metre; he arranged the Iliad and Odyssey in books, as we now have them; and he wrote elaborate commentaries, entering into all questions of mythology and geography. He

is also said to have been the first to apply accents to the Homeric poems, Of his numerous commentaries, and his longer treatises, particularly that On Analogy, only a few fragments have come down through the later scholiasts. See Matthesius, Disputatio de Aris- tarcho Grammatico ; Villoisson, Proleg. ad. Hom. Il.; F. A. Wolf, Proleg. in Hom. ; Lehrs, De Aristarchi Studirs Homericis.

ARISTARCHUS, a Greek astronomer of Samos, who lived about 280-264 B.c. He is famous as being the first to maintain that the earth moves round the sun. No mention, indeed, is made of this doctrine in his only surviving work, Ilepi peyeOdv cal éroornpdtov, which treats of the Magnitudes and Distances of the Sun and Moon ; but Archimedes, in his Arenarius, quotes from a work written by Aristarchus as a refutation of astrology, which renders it certain that the Samiau astronomer had clearly anticipated the grand discovery of Copernicus. That the latter was unacquainted with the doctrine of Aristarchus is equally certain from the fact that the editio princeps of Archimedes had not appeared till after Copernicus's death. The method given by Aristarchus of estimating the relative lunar and solar distances is geometrically correct, though the instrumental means of observation at his command rendered his data erroneous. His work has been published in Latin by G. Valla, Venice, 1498, folio; in Greek and Latin, with the commentary of Pap- pus, by Wallis, Oxford, 1688 ; and in a French translation by Fortia d'Urban, Paris, 1823, 8vo. See Delambre, Hist. de Vastronomie ancienne.

ARISTEAS, a somewhat mythical personage, said to have been a native of Proconnesus, an island in the Pro- pontis. He travelled extensively, under the inspiration of Apollo, through the countries north and east of the Eux- ine, and visited the Hyperboreans, Issedines, and Arimaspi. His date is uncertain ; Suidas places him in the period of Croesus and Cyrus, others before the time of Homer. Herodotus and those who write of him regarded him as a magician, whose soul could enter and leave his body at pleasure. At Proconnesus he is said to have entered a shop and died there. While the owner of the shop was informing his family of the event, a stranger from Cyzicus told them that he had met and spoken with Aristeas. On going to the shop they did not find him, either dead or alive. Seven years after, he returned, wrote his poem, the Arimaspea, and again disappeared; 340 years

later, he is said to have appeared at Metapontum, and com- manded the inhabitants to raise an altar to Apollo, and a statue to himself. Of his poem, about a dozen lines are preserved by Longinus and Tzetzes. It appears to have contained geographical details. Some writers—Dionysius of Halicarnassus, for instance—do not believe that Aristeas was the author of this poem.

ARISTIDES, surnamed the Just, was the son of Lysimachus, a native of Athens, of the tribe Antiochis. His family appears to have been of noble descent ; at least it is known that Callias, the torch-bearer at the Eleusinian mysteries, and reputedly the wealthiest man in Athens, was a cousin or near kinsman. Plutarch maintains, in opposition to Demetrius Phalereus, that Aristides was

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very poor, and never enriched himself at the expense of the state. His poverty, however, seems scarcely reconcilable with the fact that he was made archon at a time when the pos- session of a certain amount of property was an indispensable qualification for that office. But extremely little is known of his early life. So far as political tendencies went, he had been a companion and follower of Clisthenes, and it is also told that he had a great veneration for the character and legislation of Lycurgus. He, therefore, naturally took the aristocratic side in questions of state policy, and conse- quently found himself incessantly opposed to the great democratic leader, Themistocles. Plutarch relates many anecdotes of the constant opposition between the two, but in several points his account must be inaccurate. ‘

The first certain appearance of Aristides in history was at the battle of Marathon, 490 3.c., where he was one of the ten generals, and led his own tribe, Auntiochis. He is said to have been second in command to Miltiades. Accord- ing to custom each of the ten generals had supreme com- mand of the whole army for one day; Aristides saw the disadvantages of this system, which totally prevented any fixed plan being carried out, and by his advice and example prevailed on the other generals to relinquish their right in favour of Miltiades. This prudent measure contributed largely to the success of the battle, in which also, according to Plutarch, much was due to the

valourof Aristides. He was left with one tribe to collect the spoil from the field of battle, while Miltiades marched to Athens to protect the city from the Persian fleet. He discharged the duty intrusted to him with the most scrupulous honesty. Next year he was made archon eponymus, and his reputation for justice appears to have been increased by the manner in which he performed the duties of his office. But his great rival, Themistocles, who had been meanwhile increas- ing his own power, grew jealous, and gradually raised a strong feeling against him by representing how dangerous it was for a democracy that any individual should be allowed to gain such influence as that of Aristides. The Athenians, uneasy at this idea, banished him by ostracism in 483. It is said that, on this occasion, an ignorant fellow, who did not know Aristides, came up to him, and, giving him his shell, desired him to write upon it the name of Aristides. The latter asked in surprise if Aristides had done him any wrong. "No," was the reply, "and I do not even know him, but it irritates me to hear him everywhere called the just." Aristides made no answer, but took the shell and wrote his own name on it.

On the night before the battle of Salamis, Aristides, who was still in exile, made a perilous journey through the enemy's fleet, and reached the tent of Themistocles. He told him that he had come to bury in oblivion their former differences ; that he had learned his plan for giving battle to the Persian fleet in the narrow straits of Salamis, and highly approved of it; and that he would assist him to the utmost of his ability. By his influence the other generals were induced to assent to the plans of Themistocles, of whom they were somewhat jealous. On the day of battle, Aristides collected some Athenian volunteers, and made a descent on the little island of Psyttalea, which was filled with the forces of the enemy. These he routed and almost annihilated. After the victory of Salamis he dissuaded Themistocles from his ambitious plan of con- quering Asia by destroying the bridge which the Persians had built over the Hellespont, and thereby cutting off their communications.

About this time his sentence of exile appears to have been revoked, for in 479 he was general of the Athenians in the campaign against Mardonius, and shared with Pausanias the glory of the victory at Platea. By his prudent counsels before the battle, he settled a dangerous

dispute with the Tegetz ; and after the victory, when the Athenians and Lacedzemonians were contending as to the right of erecting the trophy, he prevailed on the Athenians to give up their claim. The Lacedemonians immediately followed this example, and the honours of the day were given to the Platzans. He also instituted yearly sacrifices and quinquennial games at Platza, to celebrate the victory over the barbarians and the liberation of Greece. On his return to Athens, Aristides introduced the famous measure by which the archonship was thrown open to all classes of citizens. In 477, he was sent along with Cimon, over whom he had great influence, to take command of the Athenian contingent, under the general command of Pausanias the Lacedzemonian. The haughtiness and oppressive conduct of the Spartans had disgusted the allies, who were completely won over by the mildness and prudence of Aristides and Cimon. In a body the allied Greeks threw off the hegemony of Sparta, and formed a confederation under the Athenians. To Aristides was committed the task of drawing up the laws for this confederacy, and settling the amount of tribute which should be paid by each state. This duty he discharged to the complete satisfaction of the allies, who were delighted to be assessed at only 460 talents. The first instalment of the tax was paid into the national treasury, then situated on the sacred island of Delos, but afterwards transferred to Athens, a measure which Aristides is said to have declared unjust but expe- dient.

The time and place of his death are uncertain. It is known, at least, that he survived the banishment of Themi- stocles, for his generous conduct towards his fallen rival is commemorated by Plutarch. He died, probably, about 468 B.C., according to some at Athens, according to others at Pontus. He is said to have died in such poverty that he did not leave enough to defray his funeral expenses, but had a tomb erected to him with funds from the public treasury. This tomb at Phalerum was still to be seen in the time of Plutarch. His daughters received marriage portions from the state, and his son, Lysimachus, was granted a sum of money and a portion of land. Such was the respect of the Athenians for the memory of their great statesman, that even his remote descendants are said to have received assistance from the public treasury.

ARISTIDES, A‘trus, surnamed Theodorus, a distin- guished Greek rhetorician or sophist, was the son of Eude- nion, a priest of Zeus, and was born at Adriani, in Mysia. The date of his birth is given by some as 129 a.p., by others, with more probability, as 117. He studied with great assiduity, and early manifested an uncommon aptitude for all that pertained to the art of rhetoric. He travelled extensively through Greece, Italy, Egypt, and Asia, and acquired such renown for eloqueuce that monuments were erected to him in several of the towns through which he passed. A record of his journeys has been preserved by himself, and his vanity appears to have been increased to an inordinate extent by his success. Shortly after his return to Italy, he was seized with a peculiar illness, which lasted for 13 years, and the nature of which has been the subject of some speculation. It is described very fully in his six Sacred Discourses, along with a mass of details regarding visions, dreams, and wonderful cures. His account of these cures has excited considerable attention, from the similarity between them and the effects produced by Mesmerism or Hypnotism, 7.e., nervous sleep. Aristides meanwhile had settled at Smyrna, whither he had gone for the sake of his health. In 178, when the city was partially destroyed by an earthquake, he wrote au eloquent account of the misfortune to the Emperor Aurelius, with whom he was a great favourite, and prevailed on him to give assist- ance to the citizens. The Smyrneans, out o a for

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this service, called Aristides the founder of their city, and erected a brazen statue to him. He declined the other honours which they would have heaped upon him, and would only accept the office of priest of Ausculapius, which he held till his death, about 189 a.D.

The extant works of Aristides consist of two small and unimportant treatises on rhetoric, and of fifty-five orations or declamations. In several of these he selects the same subjects as had been treated by Demosthenes and Isocrates, and puts himself in direct competition with them. His contemporaries ventured to compare him with Demosthenes, but modern criticism does not confirm this judgment. The style of Aristides is good, sometimes terse and elegant, but occasionally laboured, and there is a total

want of the vigorous energy of thought and practical skill that give so much power to the orations of Demosthenes. No doubt this is in great measure due to the fact that the subjects selected by Aristides were to him fictitious, and that, couse- quently, his whole attention must have been concentrated on the diction and manner of treatment ; in the cause itself he could have had no living interest. A complete edition of his works was published by Dindorf, Aristedis Opera, 3 vols., Leipsic, 1829.

ARISTIDES of Tuepes, a celebrated Greek painter, was an older contemporary of Apelles, and flourished about 350 B.c. He is said by Pliny to have been the first to express in his paintings character and passion; but this is probably an exaggeration. Several of his paintings are recorded in which there was manifested extraordinary mas- tery of expression. His colouring is said by Pliny to have been hard.

ARISTIDES, Qurintin1aNvs, author of a valuable treatise on music, lived probably in the first century of our era. According to Meibomius, in whose collection (Antig. Musicce Auc. Septem, 1652) this work is printed, it contains every- thing on music that is to be found in autiquity.

ARISTIPPUS, the founder of the Cyrenaic school of philosophy, was the son of Aritadas, a wealthy merchant of Cyrene, in Africa. Nothing is known of the early part of his life, but he appears to have been sent by his father on @ voyage to Greece, and while there, attending the Olympic games, he was attracted by the fame of the Socratic teaching. He immediately proceeded to Athens, united himself to the circle of followers who surrounded Socrates, and continued with him till his death in 399. He did not, however, accept without essential modification the teaching of his master, and his conduct, in many points, was displeasing both to Socrates and to other members of the Socratic band. He had probably brought with him from the wealthy city of Cyrene habits of luxury and osten- tation, which contrasted forcibly with the homely and temperate life of his master. Xenophon, in the Memorabila, reports his conversation on the nature of temperance, in which he defends his life of ease and self-indulgence. Plato also somewhat significantly states that he was absent in the island of Aigina on the day when Socrates died. Another feature of his character, which rendered Aristippus objectionable to the other Socratics, was his tendency to adopt the theory and practice of the

Sophists, among whom he is expressly included by Aristotle (Afet., ii. 2). It is more than probable that in Cyrene he had been already introduced to the doctrines of Protagoras, of whose influence his own theory shows manifest traces. We are further told that he opened his school before the death of Socrates, who blamed him for receiving payment from his scholars. This story is probably inaccurate as to the time when he began to teach, but it is undoubtedly true that he took money for his lectures, and defended the practice. Aristippus resembled the Sophists in another particular; like them, he avoided the duties and ties of citizenship by wandering

from city to city. He wasa professed cosmopolitan. The records of his travels, particularly of his visit or visits to the court of Syracuse, and his hostile relations with Plato there, are not in all points consistent, and rest on but slender authority. He appears to have settled finally in his native city, and seems to have died there. Although nothing is known with certainty as to the dates of his birth and death, 435 B.c. for the one, and about 356 B.c. for the other, may be accepted as probably accurate. The life of Aristippus is the best exemplificatiou of his principles. True temperance, according to him, consists not in abstaining from pleasure, but in being able to enjoy it with moderation. He therefore indulged in good living, rich clothing, splendid dwellings, and in the society of the accomplished hetere. But in all these pleasures he remained thoroughly master of himself ; he possessed them, and was not possessed by them. At any moment he could relinquish pleasure, for he had attained an equanimity that rendered him happy under any circumstances. To make the most of life, reasonably to enjoy the present moment, and to drive off care, reflection, and forethought, were the practical precepts by which he guided himself. As might naturally be expected, Aristippus left no definite system of philosophy ; indeed, according to some accounts, he wrote nothing at all. Diogenes Laértius certainly gives a list of works ascribed to him, but some of these were no doubt spurious, and none have survived. His daughter Arete, who had received the spirit of his teaching, continued the school after his death, and in turn instructed her son, the younger Aristippus (hence called pyrpodiSaxros), to whom is attri- buted the systematic representation of the

Cyrenaic doc- trines, the fundamental principles of which, however, are due to the elder Aristippus.

In the Socratic theory of morals, virtue had appeared as the only human good, and reason as the indispensable condition of right action; but there was at the same time an utilitarian side to this teaching. Ethical virtues had been tested by their consequences ; proof of the virtuous quality of an action had been drawn from its tendency to give pleasure ; happiness or utility had been, in a certain sense, laid down as the end of action.. This one-sided aspect of the Socratic theory was accepted by Aristippus, and by him carried out to its full extent. He refused altogether to consider those speculative elements, which, though in some degree rejected by Socrates himself, were nevertheless inherent in the Socratic system. Logic and Physics he thought unnecessary, for they contained nothing which bore upon the end of action, and for the same reason, as Aristotle tells us, he rejected mathematical study. But although Logic and Physics, as separate disciplines, received no attention from the Cyrenaics, yet they were admitted as supports to their ethical theory. According to Aristip- pus, knowledge is sensible perception ; all that we know of anything is the impression made by it on us. These impressions are motions,—changes in our mental states ; and each mental state is a purely subjective phenomenon, from which we can deduce nothing as to the constitution of external reality. Nor can we compare our knowledge with that of others ; each one's sensations are peculiarly his own, and can be known only by himself. General names or conceptions, and, consequently, general proposi- tions or truths, are meaningless and absurd. Individual feeling is the sole criterion of truth. From this it follows at once that such feeling is the only means by which we can determine our actions; feeling becomes the standard both of truth and of action. Now the only difference among feelings, in their relation to action, is their pleasurable or painful quality.- The change effected in us by any object is either a violent, a gentle, or a perfectly tranquil motion. The first is painful, the second pleasant, the third in-

different. The end of life, as is manifest also from expe- rience, is the attainment of pleasure, which must be positive or real, not merely absence

of pain, as the Epicureans afterwards held. Further, future pleasure, as a gentle motion not yet effected, and past pleasure, as a gentle motion completed and dons, cannot possibly enter into our estiniate of happiness. Immediate gratification, the pleasure of the moment (uovdxpoves), is the end of life; real happincss consists of a succession of moments of intense pleasure. The conception of a life in which, on the whole, pain is over-balanced by pleasure, may certainly be formed, but can never furnish a satisfactory end of action. Varieties of pleasure were, of course, admitted by Aristippus, but his decided opinion seems to have been that bodily pleasures and pains are the most potent factors in human happiness or misery. As to the causcs of pleasure, the means by which it was to be attained, these are in themselves indifferent ; an action which gives pleasure is good, whether or not it be opposed to the religion or laws of the country. The predicates, good and bad, attached to actions indepen- dently of their consequences, are merely conventional, and not founded in nature. Yet Aristippus was compelled to admit that some actions which give immediate pleasure entail more than their equivalent of pain. This fact, he thought, was the true ground of the conventional distinc- tion of right and wrong, and in this sense regard ought to be had to custom and law. But there is quite another side of the Cyrenaic doctrine, which appears as strongly in the theory as in the practice of Aristippus. Man must not give up himself as a slave to pleasure ; he must be superior to it. True happiness can only be obtained by rational insight, prudence (dpdvyorts), or wisdom. Ouly through this prudence, which is in truth virtue, can man make a proper use of the good things in his power, and. free himself from those superstitions and violent passions that stand in the way of happiness. Through this wisdom we are enabled to preserve the mastery of pleasure, to rise superior to past, future, or even present happiness, and make ourselves independent of circumstances. True free- dom of soul, real self-sufficiency, is given by wisdom, by mental cultivation. It is evident that at this point Aristippus approximates more closely to Socrates and the _ Cynics ; and it is a suggestive fact that his followers, who pushed his principles to their logical consequences, landed ina theory of the negation of pleasure, nearly identical with the later Cynic views.

(Wendt, De Phil. Cyrenatca, 1841; H.v. Stein, De Phil. Cyren., pt. i., "De Vita Aris.," 1855; Mullach, Frag. Phil. Greec., ii. 897-438.)

ARISTO, or Artston, of Chios, a Stoic philosopher and pupil of Zeno, flourished about 250 B.c. He differed from Zeno on many points, and approximated more closely to the Cynic school. He was very eloquent (and was therefore sometimes called the Siren), but was controversial in tone. He despised logic as useless, and rejected the philosophy of nature as beyond the powers of man. Ethics alone he cousidered worthy of study, and in that only general and theoretical questions. He rejected altogether Zeno's doctrine of things desirable and intermediate between virtue and vice. According to him, there is no medium ; everything that is not virtuous (e.g., external conditions, fortune, health), is absolutely indifferent. There is only one virtue—a clear, intelligent, healthy disposition of mind. Aristo is frequently confounded with another philosopher of the same name, Ariston of Julis, in Ceos, who, about 230 B.c., succeeded Lyco as scholarch of the Peripatetics. He appears to have been a man of no weight or originality of mind.

ARISTOBULUS of Cassanprta, one of the generals who accompanied Alexander the Great, and who after- wards, when very aged, wrote a history of the expedition.

This work was much used by Arrian, who praises it highly. Only a few fragments remain ; these are given in Miiller's Hist. Grec. Frag.

ARISTOBULUS, a Jew of Alexandria, and a philoso- pher of the peripatetic school, flourished about 160 B.c., in the reign of Ptolemy Fhilometer. He is the first repre- sentative of the Jewish-Alexandrian philosophy, the aim of which was to reconcile and identify Greek philosophical conceptions with the Jewish religion. Only a few frag- ments of his work, entitled Commentaries on the Writings of Moses, are quoted by Clement, Eusebius, and other theological writers, but they suffice to show its object. He endeavoured to prove that early Greek philosophers had borrowed largely from some parts of Scripture which had become known to them; in support of this view, he quoted from Linus, Orpheus, Muszeus, and others, passages which strongly resemble the Mosaic writings. These pas- sages, however, were mere forgeries, and it is surprising that any of the Alexandrian scholars should have been deceived by them.

ARISTOPHANES. The birth-year of Aristophanes is uncertain. He is known to have been about the same age as Eupolis, and is said to have been "almost a boy" (ox

Plato's Symposiwm-—in which Aristophanes has a place at the side of Socrates—shows that Plato bore no more ill- will than his master would have borne to the author of the Clouds. At the end of that banquet, " Aristodémus said that Eryximachus, Phedrus, and others went away; he himself fell asleep, and as the nights were long, took a good rest; he was awakened towards daybreak by a crow- ing of cocks, and when he awoke, the others were either asleep or had gone away; there remained awake only Aristophanes, Socrates, and Agathon, who were drinking out of a large goblet which they passed round, and Socrates was discoursing to them. Aristodémus did not hear the beginning of the discourse, and he was only half awake ; but the chief thing which he remembered was Socrates insisting to the other two that the genius of comedy was the same as that of tragedy, and that the writer of tragedy ought to be a writer of comedy also. To this they were compelled to assent, being sleepy, and not quite under- standing his meaning. And first of all Aristophanes fell asleep; and then, when the day was already dawning, Agathon."

Although tragedy and comedy had their common origin in the festivals of Dionysus, the regular establishment of tragedy at Athens preceded by half a century that of comedy. The Old Comedy may be said to have lasted about 80 years (470-390 3.c.), and to have flourished about 56 (460-404 no.) Of the forty poets who are named as having illustrated it the chief were Cratinus,

Eupolis, and Aristophanes. The Middle Comedy covers a period of about 70 years (390-320 B.c.), its chief poets being Antiphanes, Alexis, Plato Comicus, Theopom- pus, and Strattis. The New Comedy was in vigour for about 70 years (320-250 B.c.), having for its foremost representatives Menander Philemon, and Diphilus. The Old Comedy was possible only for a thorough democracy. Its essence was a satirical censorship, unsparing in person- alities, of public and of private life—of morality, of statesmanship, of education, of literature, of social usage— in a word, of everything which

had an interest for the city or which could amuse the citizens. Preserving all the freedom of banter and of riotous fun to which its origin gave it an historical right, it aimed at associating with this a strong practical purpose —the expression of a democratic public opinion in such a form that no miscon- duct or folly could altogether disregard it. That licen- tiousness, that grossness of allusion which too often disfigures it, was, it should be remembered, exacted by the sentiment of the Dionysiac festivals, as much as a decorous cheerfulness is expected at the holiday times of other worships. This was the popular element. Without this the entertainment would have been found flat and unsea- sonable. But for a comic poet of the higher calibre the consciousness of a recognised power which he could exert, and the desire to use this power for the good of the city, must always have been the uppermost feelings. At Athens the poet of the Old Comedy had an influence analogous, perhaps, rather to that of the journalist than to that of the modern dramatist. But the established type of Dionysiac Comedy gave him an instrument such as no public satirist has ever wielded. When Moliére wished to brand hypocrisy he could only make his Tartuffe the central figure of a regular drama, developed by a regular process to a just catastrophe. He had no choice between touching too lightly, and using sustained force to make a profound impression. The Athenian dramatist of the Old Comedy worked under no such limitations of form. The wildest flights of extravagance were permitted to him. Nothing bound him to a dangerous emphasis or a wearisome insistence. He could deal the keenest thrust, or make the most earnest appeal, and at the next moment—if his instinct told him that it was time to change the subject— vary the serious strain by burlesque. He had, in short, an incomparable scope for trenchant satire directed by sure tact.

Aristophanes is for us the representative of the Old Comedy. But it is important to notice that his genius, while it includes, also transcends the genius of the Old Comedy. He can denounce the frauds of a Cleon, he can vindicate the duty of Athens to herself and to her allies, with a stinging scorn and a force of patriotic indignation which make the poet almost forgotten in the citizen. He can banter Euripides with an ingenuity of light mockery which makes it seem for the time as if the leading Aristo- phanic trait was the art of seeing all things from their prosaic side. Yet it is neither in the denunciation nor in the mockery that he is most individual. His truest

and highest faculty is revealed by those wonderful bits of lyric writing in which he soars above everything that can move laughter or tears, and makes the clear air thrill with the notes of a song as free, ay musical, aud as wild as that of the nightingale invoked by his own chorus in the Birds. The speech of Dikaios Logos in the Clouds, the praises of country life in the Peace, the serenade in the Zccleziazuse, the songs of the Spartan and Athenian maidens in the Lysistrata, above all, perhaps, the chorus in the Frogs, the beautiful chant of the Initiated,—these passages, and such as these, are the true glories of Aristophanes. They are the strains, not of an artist, but of one who warbles for pure gladness of heart in some place made bright by the

presence of a god. Nothing else in Greek poetry has quite this wild sweetness of the woods. Of modern poets Shakespeare alonc, perhaps, has it in combination with a like richness and fertility of fancy.

Fifty-four comedies were ascribed to Aristophanes. Forty-three of these are allowed as genuine by Bergk. Eleven only are extant. These eleven form a running commentary on the outer and the inner life of Athens during 36 years. We will notice them briefly in the order of their dates. They may be ranged under three periods. The first of these periods, extending to 420 B.c., includes those plays in which Aristophanes uses an absolutely unrestrained freedom of political satire. The second period ends with the year 405. Its productions are distinguished from those of the earlier time by a certain degree of reticence and caution. Thethird period, down to 388 B.c., comprises two plays in which the transition to the character of the Middle Comedy is well marked, not merely by disuse of the parabasis, but by general self-restraint.

1. First Period.

(1.) 425 B.c. The Acharnians.—Since the defeat in Beeotia the peace party at Athens had gained ground, and in this play Aristophanes seeks to strengthen their hands. Diczo- polis, an honest countryman, is determined to make peacv with Sparta on his own account, not deterred by the angry men of Acharne, who crave vengeance for the devastation of their

vineyards. He sends to Sparta for samples of peace; and he is so much pleased with the flavour of the Thirty Years' sample that he at once concludes a treaty for himself and his family. All the blessings of life descend on him; while Lamachus, the leader of the war party, is smarting from cold, snow, and wounds.

(2.) 424 B.c. The Knights.—Three years before, in his Babylonians, Aristophanes had assailed Cleon as the typical demagogue. In this play he continues the attack. The Démos, or State, is represented by an old man who has put himself and his household into the hands of a rascally Paphlagonian steward. Nicias and Demosthenes, slaves of Démos, contrive that the Paphlagonian shall be supplanted in their master's favour by a sausage-seller. No sooner has Démos been thus rescued than his youth-fulness and his good sense return together.

(3.) 423 B.c. The Clouds (the first edition ; a second edition was brought out in 422 B.c,)—This play would be correctly described as an attack on the new spirit of intel- lectual inquiry and culture rather than on a school or class. Two classes of thinkers or teachers are, however, specially satirised under the general name of " Sophist" (v. 331)— 1, The Physical Philosophers—indicated by allusions to the doctrines of Anaxagoras, Héracleitus, and Diogenes of Apollénia. 2. The professed teachers of rhetoric, belles lettres, &c., such as Protagoras and Prodicus. Socrates is taken as the type of the entire tendency. A youth named Pheidippides—obviously meant for Alcibiades—is sent by his father to Socrates to be cured of his dissolute propen- sities. Under the discipline of Socrates the youth becomes accomplished in dishonesty and impiety, The conclusion of the play shows the indignant father preparing to burn up the philosopher and his hall of contemplation.

(4.) 422.3.c. The Wasps.—This comedy, which suggested Les Plaideurs to Racine, is a satire on the Athenian love of litigation. The strength of demagogy, while it lay chiefly in the ecclésia, lay partly also in the paid dica- steries. From this point of view the Wasps may be regarded as supplementing the Knights. Philocleon (admirer of Cleon), an old man, has a passion for lawsuits, —a passion which his son, Bdelucleon (detester of

Cleon) fails to check, until he hits upon the device of turning the house into a law-court, and paying his father for absence

Sita roPHANES

from the public suits. The house-dog steals a Sicilian cheese; the old man is enabled to gratify his taste by trying the case, and, by an oversight, acquits the defendant. In the second half of the play a change comes over the dream of Philocleon; from litigation he turns to literature and music, and is congratulated by the chorus on his happy conversion. ‘

(5.) 421 B.c. (Curtius, Hist. of Greece, vol. iil. p. 275, transl. Ward.) The Peace.—In its advocacy of peace with Sparta, this play, acted at the Great Dionysia shortly before the conclusion of the treaty, continues the purpose of the Acharnians. Trygeus, a distressed Athenian, soars to the sky on a beetle’s back. There he finds the gods engaged in pounding the Greek Statesin a mortar. In order to stop this, he frees the goddess Peace from a well in which she is imprisoned. The pestle and mortar are laid aside by the gods; and Trygeus marries one of the handmaids of Peace.

IL. Second Period.

(6.) 414 B.c. The Birds.—Peistheterus, an enterprising Athenian, and his friend Euelpides persuade the birds to build a city—“Cloud-Cuckoo-borough”—in mid air, so as to cut off the gods from men. The plan succeeds; the gods send envoys to treat with the birds; and Peistheterus marries Basileia, daughter of Zeus. Some have found in the Bids a complete historical allegory of the Sicilian expedition ; others, a general satire on the prevalence at Athens of headstrong caprice over law and order; others, merely an aspiration towards a new and purified Athens— a dream to which the poet had turned from his hope for a revival of the Athens of the past. In another view, the piece is mainly a protest against the religious fanaticism which the incident of the Herm had called forth. It can hardly be doubted that both this fanaticism and the part taken by Alcibiades in promoting the Sicilian expedition were present to the mind of Aristophanes; but in what proportions, and tempered with what other elements, the very form of the comedy makes it idle to inquire.

(7.) 411 Bc. The Lysistrata.—This play was brought out during the earlier stages of those intrigues which led to the Revolution of the Four Hundred. It appeared shortly before Peisander had arrived in Athens from the camp at Samos for the purpose of organising the oligarchic policy. The Lysistrata expresses the popular desire for peace at any cost. As the men can do nothing, the women take the question into their own hands, occupy the citadel, and bring the citizens to surrender.

(8.) 411 B.c. The Thesmophoriazusce.—This came out three months later than the Lysistrata, during the reign of terror established by the oligarchic conspirators, but before their blow had been struck. The political meaning of the play liesin the absence of political allusion. Fear silences even comedy. Only women and Euripides are satirised. Euripides is accused and condemned at the female festival of the Thesmophoria.

(9.) 405 B.c. Zhe Frogs.—This piece was brought out just when Athens had made her last effort in the Pelopon- nesian war, eight months before the battle of AUgospotami, and about fifteen months before the taking of Athens by Lysander. It may be considered as an attempt to distract men's minds from public affairs. It is a literary criticism. /Hschylus and Euripides were both lately dead. Athens is beggared of poets ;" and Dionysus goes down to Hades to bring back a poet. Aschylus and Euripides contend in the under-world for the throne of tragedy; and the victory is at last awarded to Aschylus.

IIL Third Period.

(10.) 393 B.c. The Ecclesiazusce.—The women, disguised as men, steal into the ecclesia, and succeed in decreeing a

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new constitution. At this time the demagogue Agyrrhius led the assembly; and the play is, in fact, a satire on the general demoralisation of public life.

(11.) 388 B.c. The Plutus.—The first edition of the play had appeared in 408 B.c., being a symbolical representa- tion of the fact that the victories won by Alcibiades in the Hellespont had brought back the god of wealth to the

treasure-chamber of the Parthenon. In its extant form the Plutus is simply a moral allegory. Chremylus, a worthy but povr man, falls in with a blind and aged wanderer, who proves to be the god of wealth. Asclépius restores eyesight to Plutus; whereupon all the just are made rich, and ali the unjust are reduced to poverty.

Among the lost plays, the following are the chief of which anything is known :—

1. The Banqueters (Aaradcis), 427 B.c.— A satire on young Athens.

2. The Babylonians, 426 8.c.—Under this name the subject-allies of Athens are represented as "Babylonians" —barbarian slaves, employed to grind in the mill. The oppression of the allies by the demagogues—a topic often touched elsewhere—was, then, the main subject of the piece, in which Aristophanes is said to have attacked especially the system of appointing to offices by lot. The comedy is memorable as opening that Aristophanic war upon Cleon which was continued in the Knights and the Wasps.

The Merchantmen, The Farmers, The Preliminary Contest (Proagén), and possibly the Old Age (Géras), belonged to the First Period. The Géras is assigned by Siivern to 422 B.c., and is supposed to have been a picture of dotage similar to that in the Knights. A comedy called The Islands is conjectured to have dealt with the suffer- ings imposed by the war on the insular tributaries. The Triphales was probably a satire on Alcibiades; the Storks, on the tragic poet Patrocles.

In the olosicén—produced by his son Ararés in 387 B.c.—Aristophanes probably parodied the Molus of Euri- pides. The Cécalus is thought to have been a parody of the legend, according to which a Sicilian king of that name slew Minés.

A sympathetic reader of Aristophanes can hardly fail to perceive that, while his political and intellectual tendencies are well marked, his opinions, in so far as they colour his comedies, are too indefinite to reward, or indeed to tolerate, analysis. Aristophanes was a natural conservative. His ideal was the Athens of the Persian wars. He disapproved the policy which had made Athenian empire irksome to the allies and formidable to Greece; he detested

the vul- garity and the violence of mob-rule; he clave to the old worship of the gods; he regarded the new ideas of educa- tion as a tissue of imposture and impiety. How far he was from clearness or precision of view in regard to the intellectual revolution which was going forward, appears from the Clouds, in which thinkers and literary workers who had absolutely nothing in common are treated with sweeping ridicule as prophets of a common heresy, Aristo- phanes is one of the men for whom opinion is mainly a matter of feeling, notof reason. His imaginative suscepti- bility gave him a warm and loyal love for the traditional glories of Athens, however dim the past to which they belonged; a horror of what was ugly or ignoble in the present ; a keen perception of what was offensive or absurd in pretension. The broad preferences and dislikes thus generated were enough not only to point the moral of comedy, but to make him, in many cases, a really useful censor for the city. The service which he could render in this way was, however, only negative. He could hardly

be, in any positive sense, a political or a moral teacher for Athens. His rooted antipathy to intellectual progress, while it affords easy and wide scope for his wit, must, after all, lower his intellectual rank. The great minds are not the enemies of ideas. But as a mocker—to use the word which seems most closely to describe him on this side—he is incomparable for the union of subtlety with riot of the comic imagination. As a poet, he is immortal. And, among Athenian poets, he has it for his distinctive characteristic that he is inspired less by that Greek genius which never allows fancy to escape from the control of defining, though spiritualising, reason, than by such ethereal rapture of the unfettered fancy as lifts Shakespeare or Shelley above it,—

"Pouring his full heart In profuse strains of unpremeditated art."

Best recent editions, &c.—(1.) Teat.—Bergk, 2 vols., Teubner, 1867 ; Holden (expurgated edition), Bell, 1868. (2.) Commentaries. — Acharnenses, Equites, Nubes, Vespe, W. C. Green, in the Catena Classicorum, Rivingtons, 1870; Nubes and Rane, A. Sidgwick (for beginners), Rivingtons, 1872. (3.) Translations. —Mitchell (Acharn., Knights, Clouds, Wasps), 2 vols., 1822; J. H. Frere (Acharn., Knights,

Birds, Frogs, Peace) being 2d vol. of his works, Pickering, 1871; B. H. Kennedy, The Birds (with an excellent introduction), Macmillan, 1874. (R. C. J.)

ARI—ARI

| ARISTOPHANES of Byzantium, one of the most famous of the Alexandrian critics, flourished about the middle of the 3d century 3.c. He studied under Erato- sthenes and Zenodotus, and himself founded a school for grammar and criticism, of which the most distinguished pupil was the great Aristarchus of Samothrace. He was afterwards appointed to the superintendence of the Alexan- drian library. Aristophanes, like his great pupil, was cele- brated as an Homeric critic, but little is known of the results of his labours on that poet. He seems, however, to have been particularly occupied with the consideration of questions of authenticity. He arranged and commented on the works of Hesiod, Alcweus, Pindar, Anacreon, Calli- machus, Plato, and Aristotle ; he also explained and wrote arguments to the plays of Aristophanes and the tragic poets. | He is justly celebrated as the inventor of the Greek sys- | tem of punctuation, accent, and breathing. To him, also, is due in great measure the foundation of the well-known Alexandrian Canon.

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The fragments of his works have been collected and published by A. Nauck, Aristophanis Byzantit Fragmenta, 1848. See also, Kreuser, Griech.

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iy, the history of European thought and knowledge, down to the period of the revival of letters, the name of Aristotle was, without a rival, supreme ; and this supre-

macy arose from no false estimate or unwarranted prefer- |

ence, Aristotle, speaking generally, treated of every subject which came within the range of ancient thought, and if we regard matter, and not form or literary style, he treated of each of these subjects better than any one

else. He also initiated many new branches of inquiry, dependent on observation and induction, and thus not only represented in himself the culmination of Greek speculative philosophy, but was also, as far as possible, the forerunner of modern science. Therefore, the sense of mankind recognised him gradually (after many vicissitudes of appreciation) as the strongest of the ancients. It eveu came to pass that, for a long period, all secular writings but those of Aristotle had dropped out of notice in Europe. His works may almost have the credit of having saved men from relapsing into barbarism. All sought in Aristotle the basis of knowledge. Universities and grammar schools were founded in Aristotle. Dante only justly expresses this predomin- ance, when he speaks of Aristotle! as "the master of those that know," and depicts him as centre and head of the philosophic family. Of the influence which he has exercised over the minds of men we have evidence, not only in the vast literatures connected with his system, which exist in all great libraries, but also in the traces which that system has left in all the modern languages of Europe. The number of Aristotelian "fossils"? existing in-our everyday

language is quite remarkable. If it had not been for the

1 Inferno, canto iv. 130, sqq.

2 Ihe Aristotelian words in modern use come chiefly through Latin renderings of his phraseology. Some of them are :—Maxim = a major premiss ; principle, from principiwm, the translation of Aristotle's épx7h, has the same meaning. Subject (rd tmoxerpévoyv) comes from the doctrine of the four causes. So does matter from materies (timber), the Latin for ¥An. So form, end, final cause, &c. Motive is a

fossilised confusion, as it should stand for the efficient cause (apx7 |

xivhoews), Whereas it really denotes the final cause of action. Faculty (in Universities) represents Aristotle's d¥vauis = art. Energy is of purely Aristotelian origin, though not quite keeping its philosophic sense. Actually is from the Latinised form of the same term. So, too, in category and predicament (¢.g., "an unpleasant predicament") we preserve both the Greek and Latin form of an Aristotelian term. Habit (in morals) varies a little in meaning from és. We have also

| system of Aristotle, we should have had to express many | of our ordinary thoughts differently.

The thought of Aristotle takes its start out of two separate sets of elements previously existing in Greece: | the one purely philosophical, the other scientific. In

Plato were summed up and remoulded all the former

results of logical, metaphysical, psychological, ethical, and political speculation in Greece. And Aristotle was,

in the first place, thoroughly imbued with Plato, and all the purely philosophical side of his writings was con- ceived in close relation to Plato's works, the results of which he may be said to have codified, reducing into ex- pository form what Plato had left scattered up and down, rather as hints and suggestions, in his brilliant dramatic dialogues. Partly, then, Aristotle adopted the results of Plato, and made them available for the world in general ; partly he dissented from some of the Platonic doctrines, and carried on a polemic against them. To compare the Pla- tonic dialogues with the works of Aristotle, and to trace the agreements and disagreements between them, forms au interesting study in the history of philosophy. But on the whole, the difference between Aristotle and Plato is one of aims rather than of doctrines. Aristotle's aim, almost from first to last, is to be scientific, and to reduce even philosophy to science. He wishes to deal with what can be known for certain, and to express this in exact language.

Plato's aim was, in one sense, greater than this ; in another sense it was inferior to it. Plato stood apart from dog- matic systematising ; he seems to have regarded truth as too great and many-sided to be capable of being submitted

to such a process; he was content to develop various aspects of the truth, on all the highest questions, as they appeared to different minds, or to the same mind at | different periods. To do this he chose the vehicle of the dramatic dialogue, in which nothmg was positively an- nounced beyond the views arrived at for the moment by the particular speakers. He was a poet at the same time

another habit (i.e., “dress”) from &xetv (see note 2, p. 515). The mean and the extremes stilllive in modern parlance, and so does the quintessence, or fifth substance beyond the four elements of which the outer heaven, according to Aristotle, was composed. Afetaphysics is derived from the name given by his followers to his last treatise, and natural hrstory from his “‘ Histories,” or investigations “ about animals.”

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that he was a philosopher, and his works exhibit that true uote of poetry which consists in constant attention to form, so that no part is a mere means to a final result ; but each part is treated as an end in itself, and contains its own His dialogues are thus masterpieces

beauty and perfection. of consummate literary art, though somewhat indefinite in

their conclusions, and not without a tinge of imaginative mysticism. To all these Platonic tendencies in the treat-

ment of philosophy Aristotle was totally opposed. He

disregarded form in all his extant works; he thought of matter alone, and his main care was to be definite and

exhaustive. In adopting results from Plato he first stripped them of the poetry with which they had been surrounded. We shall revert below to some of the points on which he controverts Plato, but the real contrast between them is in

their attitude; the one is essentially a dialectician, though

of the highest and noblest type, the other more and more tends to be a man of science. bent, Aristotle, in many of his works, strikes on a path in which Plato had not been his precursor. In these works he lays the foundation for the sciences of Natural Philosophy, Mechanics, Physiology, and Natural History. In these branches of thought he stands related, not to Plato, but to the early Greek writers on physical subjects, the inquirers on special

questions, the medical writers, and the travellers, whose works he often men- tions,! though they are all now lost. If we possessed them, we should probably only see how meagre had been these beginnings of science, and what great things Aristotle achieved in the accumulation and systematising of knowledge, and in preparing the way for its future development.

Aristotle's complete neglect of artistic form (in his ex- tant works), and his adherence "to essential naked truth," induced Wilhelm von Humboldt? to say that Aristotle was un-Greek in the character of his mind; that he was deeper and more earnest than the Greeks, but was wanting in Greek fancy and grace, and spiritual freedom of treatment. This may be so; but in point of descent Aristotle was purely Hellenic.? His family, however, had been settled for some generations on the Macedonian frontier, and it was there that Aristotle was born, at the town of Stageira, a Greek colony, on the Strymonic gulf. This place was not far from Pella, the residence of the Macedonian king, Amyntas, whose physician Nicomachus, the father of Aris- totle, became. Intercourse with the Macedonians may lave, to some extent, influenced the manners of this family. But it is to be remembered that they belonged to the race of the Asclepiads, or supposed descendants of Asculapius, and it is more natural to attribute the scientific tendencies of Aristotle's mind to the inherited character and traditions of this race than to any influence which he can have received from the Macedonians. Among those traditions it is said® to have been one, that "from father to son they*

1 See Bonitz's Index to Aristotle, in the 5th vol. of the edition of the Prussian Royal Academy (Berlin, 1870), under the words voids, ovotordyos, Philosophus Incertus, wepfodo: (books of travels), feropia, 'Inmoxpdrns, &c., where the references to passages are given.

2 In a letter to F. A. Wolf, dated 15th June 1795. ¥. L20.

8 See Aristotle, by George Grote, &c. (1872), vol. i. p. 3, note.

" Hence his frequent appellation by the Greek commentators of 6 Srayeipiryns. This in English is often mis-spelt as "Stagyrite."

5 Galen, De Anatomicis Administr., ii. 1. It is a doubtful and inter- esting question whether Aristotle ever dissected the human subject. This would

have been much opposed to Greek prejudices. See Aristotle: a Chapter from the History of Science, &c., by George Henry Lewes (London, 1864), pp. 159-170. We know that the school of Galen contented themselves with dissecting the lower animals ; the same may generally have been the case with Aristotle. But he appears to have dissected the human fcetus, and in one place, at all events, he seems to indicate acquaintance with dissections of the adult human subject (De

Following out his proper

See his works, –

dil

learned the art of dissection, as regularly as others learn to read and write." The best biography of Aristotle, hitherto written, is that given by Grote in his posthumous work referred to in note 3. The chief ancient authority on the subject is Diogenes Laertius, a compiler® and anecdote-monger, perhaps of the 3d or 4th century a.p. His life of Aristotle contains, amid many worthless, gossiping state- ments, two fragments of antiquity which are of the greatest value. One of these is an extract from the chronology (xpovexd) of Apollodorus (140 B.c.), giving the dates of the chief events of Aristotle's career; the other is a cata- logue of " the books which he left behind him," to the number of 146. The following are the statements of Apollodorus:—That Aristotle was born 384 B.c. That he joined Plato and passed twenty years with him, thirteen of them consecutively, and that he came to Mitylene 345 B.c. That in the first year after the death of Plato he went to Hermeas, and abode with him three years; that he came to Philip 343 B.c., when Alexander was fifteen years ola; that he came to Athens 335 B.c. That he held a school in the Lyceum thirteen years, and then went to Chalcis 322 B.c., where he died of a disease, about sixty-three years old. This skeleton of the life of Aristotle is probably authentic ; and if so, we know as much about him as could possibly be expected. It is easy to fill up, to some extent, the details: he must have been in his seventeenth year when he came to Athens to put himself under Plato; twenty years afterwards, when Plato died, he was, on account of his great divergencies of mind from Plato, not appointed head of the school, and he, therefore, retreated to the court of his philosophical friend,*

Hermeas, ruler of Atarneas, in Asia Minor ; he married the niece of Hermeas, who was a eunuch, and had been a slave. On his death Aristotle went to live in retirement in Mitylene, whence, in his forty- second year, he was summoned by Philip of Macedon to undertake the tuition of Alexander the Great, then fifteen years old. Seven years later Philip was assassinated and Alexander became king of Macedonia, and was immediately absorbed in plans for the conquest of the East. Aristotle now came to Athens and spent the last thirteen years of his life there, and it is these years which have the most interest for us, for in them, in all probability, he composed all those of his works® which still remain. In rivalry to the Platonic school which had been established in the gar- dens of the " Academia" on the west side of Athens, he set up his own school in the covered " walks" (mepémarou) round the temple of the Lycean Apollo, on the east side of the city, and from this circumstance his philosophy got the appellation of "Peripatetic." His mind and the general features of his system were now mature ; he had before him the task, on the one hand, of reducing to writing for the world the results of his reflections in philosophy, on the other hand, of accumulating fresh materials for those sciences of observation of which he was laying the founda- tion. He set himself simultaneously to writing and to teaching, and there is reason to believe that he employed

Part. Animal,i.v. 7). But his knowledge of anatomy, as compared with that of modern times, was superficial.

6 See his Lives of the Philosophers, v. i.

7 Niebuhr considered Apollodorus to be a trustworthy chronologist. Valentine Rose, however, De Aristotelis Librorum Ordine et Auctoritate Commentatio (Berlin, 1854), pp. 112-119, thinks that the date of Aristotle's death can alone be relied on, and that all the other particulars are filled in, going backwards from this, on conjecture. Rose believes that the account of Aristotle's connection both with Plato and with Alexander is a mere fiction, and, in short, that we know nothing about the life of Aristotle. This is an extreme of scepticism.

8 These works all seem to belong to the same epoch of the author's mind. They all presuppose a certain generally completed system of philosophy and a certain previously settled phraseology. But consider- able

development of particular thoughts can be traced as having occurred during the actual writing of the books.

his school to some extent, in co-operation with himself, to work out details, and to assist in a subordinate way in the construction of the great philosophical and scientific edifice which he had in view. The period of the zenith of Aris- totle was coeval with the astonishing career of his pupil, Alexander. Thereisa tradition that Alexander! furnished him with funds for his physical and zoological researches. However this may have been, it appears certain that Aris- totle was identified in Athens with the Macedonian cause, and that when, in the summer of 323 B.c., the startling news of the sudden death of Alexander was spread through Greece, Aristotle was involved in the temporary fall of a political party, and those who, from different causes, were his enemies, made an attack upon him which caused him to flyfrom Athens. Grote has well drawn out the various elements of enmity existing against Aristotle, and to his account we refer. Aristotle retired to Chalcis in Eubea, a place garrisoned by the Macedonians, and there shortly afterwards closed, in an illness, his life of unsurpassed activity and achievement. His will, preserved by Diogenes, would seem to indicate a kind, just, and generous disposi- tion ; of the genuineness of this document we cannot be sure, but there is nothing recorded of Aristotle with any certainty which would lead us to think of him personally otherwise than with respect.?

After his death his works had a strange and remarkable history. His library, containing all his own autographs, many of them being MSS. of unpublished and unfinished treatises, was bequeathed to Theophrastus, his chief disciple, who, dying thirty-five years later, bequeathed them in turn, together with his own books and writings, to Neleus, a Peripatetic scholar. Neleus took the whole precious collection with him to his home at Scepsis, in Asia Minor, and his heirs concealed it in a vault to prevent its being

seized by the king of Pergamus, who was then levying.

contributions for his royal library. The Aristotelian MSS. were thus lost to the world for 187 years. About the year 100 z.c. they were brought out of

their hiding-place and sold to a wealthy book-collector, named Apellicon, who carried them back to Athens. In the year 86 B.c., on the taking of Athens by Sulla, the library of Apellicon was seized and brought to Rome. There some learned Greeks obtained access to it; Tyrannion, the friend of Cicero, arranged the MSS.; and Andronicus of Rhodes undertook the task of furnishing a correct text, and a complete edition of the philosophical works of Aristotle, out of the materials at his disposal. He arranged the different treatises and scattered fragments under their proper heads, and published what was henceforth received as the authorised edition of the works of Aristotle? It seems reasonable to believe with Grote that 'our Aristotle," that is, the collection of writings which under this name has come down to modern times, is none other than the edition of Andronicus, and thus dates from about the year 50 B.c. For the first generation after the death of Aristotle, his scholars,° Theophrastus, Eudemus, Phanias, Straton, &c.,were engaged partly in editing, partly in paraphrasing, sometimes in endeavouring to improve upon his mostly unfinished works. But the Peripatetic school very rapidly declined ; all the philosophic ability round the shores of the Aigean threw itself into one or other of the two new rival schools

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1 Athenus, ix. 398. Pliny, H.W., viii. c. 16.

2 See some remarks in the Hdinburgh Review, No. 278, page 525.

3 The authorities for this story are Strabo (who was the pupil of Tyrannion), xiii. 609 ; Plutarch, Sulla, c. xxvi.; Porphyry, Vita Plotini, p. 117. It has been much criticised by Stahr, Brandis, Zeller, Bernays, Rose, &c. For the last remarks on the subject see Grote (J. c.), and Sir A. Grant's Ethics of Aristotle, illustrated with Essays and Notes, 3d edition (London, 1874), essay i. pp. 5-18.

4 Aristotle, vol. i. pp. 57-62.

5 See Brandis, Scho'ia in Arist., p. 28, note.

which had arisen, the Stoic and the Epicnrean. The Peripatetics could not keep up to their master's level; they soon lost interest in the higher parts of his system; they took to writing monographs® on small separate questions, and moral platitudes' dressed up in rhetorical form. We may hesitate to affirm that, during 187 years, there were absolutely no copies of Aristotle's greatest works extant besides those hidden in the vault of Scepsis, for the Stoical ethics and logic both bear traces of a knowledge of Aristotle. But, at all events, for the time, the world had lost its interest in all that we most prize in Aristotle's thought. Strabo says expressly that "all his writings, except a few of a more popular character," had been lost; and in accordance with this, Cicero® says that "even philosophers know nothing of Aristotle, though they ought to have been attracted by the incredible sweetness of his diction." The latter part of this remark may seem sur- prising, for it is not in the least applicable to any of the works of Aristotle which have come down to us. But Cicero is evidently referring to the Dialogues,' which were read, admired, and attributed to Aristotle in the days before the edition of Andronicus became known. The question has been raised, especially by Valentine Rose," whether these dialogues, and other short, unsystematic works which passed under the name of Aristotle, were all forgeries, or were in any case genuine. On the one hand it is urged that the dialogic, or artistic, mode of exposition, was alien from Aristotle's turn of mind. On the other hand, it may be said that Aristotle in his youth may very probably have tried his hand at imitating the Platonic dialogues. And, indeed, unless he had done so, it is diffi- cult to understand how even the forgers could have ven- tured to publish dialogues bearing his name. Very likely, after his death and the loss of the main bulk of his works by their removal to a vault in Asia Minor, a crop of forged Aristotelian writings sprung up, and imitations of his earlier and more popular works were among the number. But still, it appears safest to believe that Aristotle did at one time endeavour to make the dialogue his vehicle for philo- sophy. In the years that followed the death of Plato, he probably felt within himself a reaction and repugnance against this mode of writing, and when he returned to Athens as the leader of a school, he utterly renounced it, and set himself henceforth to the statement of the naked truth in the directest and most scientific terms which he could find. Whether the dialogues which Cicero and his contemporaries read and admired were early works of Aristotle himself, or were forgeries, there is no means of knowing. But the*

fragments!? of these works, which a search of all ancient literature has brought together, show us nothing worthy of Aristotle in his best days, nothing that contributes any light to his philosophy. And it is remarkable that all works of this kind seem to have been excluded from the edition of Andronicus. Owing to that exclusion they are all now lost, and thus the tables are turned, for whereas before the edition of Andronicus the

6 See Rose, Aristoteles Pseudepigraphus (Leipsic, 1863), pp. 20-22, where a list of many such productions falsely ascribed to Aristotle is given.

7 Strabo, xiii. 609, says that all they did was @¢dcers AnxuOl Ce.

8 Tbidem.

® Topica, i. 1-3.

10 See Cicero, Epist. ad Famil., t. ix. 28, where he speaks of his three books De Oratore as "a dialogue in the style of Aristotle," and Epist. ad Atticum, xiii. xix., where he says that he has copied Aristotle " who in his dialogues always assigns to himself the leading part in the con- versation." This shows that the dialogues of Aristotle were very different from those of Plato, and were probably expository and dog- matic, and not at all dramatic.

1 Arist. Pseudepigraphus, pp. 23-26.

12 These fragments are given collectively in the 5th volume of the Prussian Royal Academy's edition of Aristotle (Berlin, 1870).

world had forgotten all about Aristotle, except so far as he was represented by his own youthful and lighter pro- ductions, or by spurious imitations of these, it came to pass later that all except his solid and great philosophical treatises passed into oblivion.

Turning now to the catalogue of the works of Aristotle which has been preserved by Diogenes Laertius, we find that it contains 146 different names, not one of which! seems to correspond with any of the forty works

which make up " our Aristotle." This is very striking, and sug- gests the question, Did Aristotle really write all these works enumerated in the catalogue, and if so, how is it that they are all lost? Did he really write ever and over again on the same subject, as the catalogue, taken together with our edition, would indicate? Or is the catalogue virtually a list of forgeries, published under the name of Aristotle at the time when the unique MSS. of many of his greatest works were shut up underground and forgotten ? Neither hypothesis can be accepted absolutely, but the last mentioned contains, probably, by far the nearest approxi- mation to the truth, It seems credible that the catalogue in question was taken from the backs of rolls in the Alexandrian library, and that it was made by Hermippus, pupil of Callimachus, the chief librarian, between the years 240 and 210 B.c.2 It found its way into some bio- graphy, and was thence mechanically copied by Diogenes. If this be so, it represents the kind of books which were being received by the world as Aristotle's at atime when the real Aristotle was buried out of sight. The books enumerated in the catalogue strike us at once as peculiar in character: first we meet with the names of several dialogues (such as " Nerinthus," " Gryllus, or on Rhetoric," "'Menexenus," "Symposium," "the Lover," &c.); afterwards there are the names of apparently short treatises or mono- graphs on separate subjects, without any trace of that organic unity of each of the great branches of philosophy which we find in Aristotle as we knowhim. This organic unity has not been superinduced by the editorial labours of Andronicus, for we see by the openings of the Meta- physics, Ethics, Politics, and other existing works, taken in connection with their succeeding parts, that Aristotle con- ceived a grand and compreheusive plan for each main branch of philosophy and science; that he proposed to follow this out so as to produce in each case a complete whole, but that most of his multifarious designs were arrested by death, so that much that he has left bears the character of a mighty fragment. But the Peripatetic school seem to have abandoned his comprehensive views, and to have only followed him in that other side of his method which consisted in working out the details of special and subordinate questions. This tendency resulted in the production of small separate treatises and essays, and it is the names of such as these that are recorded in the cata- logue. The Peripatetic school seem to have worked on a sort of co-operative principle. Aristotle, during his own lifetime, probably encouraged them to work up separate*

1 With the exception of " Categories, in one book," and " On Interpretation, in one book." " Great Posterior Analytics, in two books," may stand to the Post. Anal. of Aristotle as the Great Ethics do to th. Nicomach, Titze, Michelet, and other writers, have endeavoured to identify some of the monographs of the catalogue with parts of Aristotle's extant works, ¢.g., works On the Voluntary, On Friendship, On Pleasure, with parts of Eth. Nic.; the book On the Various Senses of Words, with part of the Metaphysics, &c. But, as Grote says, vol. i. p. 61, note, " the identification is not convincing." In fact, the theory 1s untenable.

- *Heitz, Die Verlorenen Schriften des Aristoteles (Leipsic, 1865), pp. 45-52 ; Grote, Ar., vol. i. pp. 48, 49.*

- *£.9., On Suffering (wep) roi mdoxew), one book; On Contraries, one book ; On Science, one book ; Feelings, one book; Art, one book is On Unproductiveness, one book; Signs of Storms, one book ; Proverbs, one book ; Select Dissections, one book, &c.*

points for incorporation into his philosophy; and if so, they would have less scruple in affixing his name to works written after his death, but which they conceived to represent, or, perhaps, a little to improve upon, his views, Whatever may have been the literary morality of this procedure, we can hardly doubt that it existed as a fact. Even the works of Aristotle, as we possess them, show clear traces of it. Take, for instance, the four different ethical treatises which are found among these works. Of these the first is the Vicomachean Ethics, the main bulk of which is the genuine writing of Aristotle. It is conceived on a comprehensive plan, and the beginning and end are complete, but the middle part was probably never written. The name of this treatise was, perhaps, given to it for the sake of distinguishing it from the other ethical works in the Peripatetic school library, the MS. of this having been to some extent revised and edited by Nicomachus, the son of Aristotle. The second is the Ludemian Ethics, a para- phrase of the work of Aristotle, written by Eudemus, one of his scholars, with a slight divergence in some points from the original doctrines. Three books from the Hudemian treatise, on Justice, on the Relation of the Intellect to Morality, and on Weakness of the Will, were afterwards incorporated by some editor

into the WVicomachean Ethics, so that in modern times they have always formed part of both treatises, and their authorship has been much disputed. The third is called the Great Lthics,6 and is the work of a later Peripatetic; it is a réswmé of morals, made up chiefly out of the work of Eudemus, but with some of its conclusions taken directly from that of Aristotle, and with some matter introduced from another source, perhaps the ethical writings of Theophrastus. The fourth is a little tract On Virtues and Vices, which is not even Aristo- telian in doctrine, though it shows an acquaintance with the Aristotelian system. It is chiefly characterised by some small points of physiognomical observation, such as are found in the characters of Theophrastus. These four works well illustrate the growth of an ungenuine Aristotelian literature. We begin with a genuine work of Aristotle himself, though even into this a spurious element has been introduced ; we go on to a paraphase, and then to the paraphrase of that paraphrase; we end with a light essay written for the sake of one or two observations on character which the writer had made; and yet all stands under the name of Aristotle.' This instance which we have before our eyes, and the proportion of the ungenuine to the genuine which it presents, may enable us to form a conception of the nature of those works, the 146 names of which make up the catalogue of Diogenes. Far be it from us to say that none of the works so enumerated were written by Aristotle himself, but probably much the greater portion of them were not written by him. And without denying that many works of Aristotle, and even some works by him of interest and value, have been lost, we may say with confidence that the "lost works "® of Aristotle were of no importance in comparison with what has been preserved,

4 See Grant's Zthics of Aristotle, vol. i. essay 1.

5 See Spengel, "Ueber die unter dem Namen des Aristoteles erhaltenen ethischen Schriften' (in Abhandl. der Philos.-philol. Klasse der K. Bay. Akad., 1841), and Grant's Ethics, l.c.

6 This name may have been due to the vanity of the compiler. We have seen in the Catalogue of Diogenes the name Great Postertor Analytics. See above note 1.

7 Whether all stood thus in the edition of Andronicus, or whether some of these works were added in subsequent editions, we have no means of knowing. If the former, Andronicus must have aimed at giving a collected body of Aristotelian doctrine, rather than an edition of Aristotle's own undoubted writings. We know that Andronicus pronounced the treatise On Interpretation to be spurious, and yet we find it in our edition of Aristotle. 5

8 See above, note 1, and compare Valentine Rose, Arist. Peeud- epigraph., where the fragments are commented upon.

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and that the greatest and most valuable of his achieve- ments, incomplete as he left them, but subsequently edited to some extent and touched up, remain for us, and contain the essence of his thought.

In eight passages of the works which we possess under his name, there is a reference to "exoteric discourses" (éwrepixol Adyor).1 This phrase has attracted a wonderful amount of notice, and a whole literature? has been com- posed in support of the different meanings which have been attributed to it. But the question is now reduced to a very small one. The word "exoteric" suggests the opposite term " esoteric," in the sense of secret; and the writers of the later empire,' who were accustomed tc the idea of mystical and hierophantic teachings, as professed by the neo-Pythagorean and neo-Platonic schools, took up the notion that Aristotle had two forms of doctrine: the one " esoteric," —containing his real opinions, and confined to the circle of his initiated scholars,—the other "exoteric," containing superficial truth with which the profane vulgar might be put off and satisfied. After the Renaissance the idea of a double doctrine in Aristotle was exploded, and it. was acknowledged that " exoteric " in the passages above mentioned is not opposed to "esoteric" or " secret," but denotes the external, non-philosophical, non-scientific treat- ment of a subject, as opposed to the strictly scientific treat- ment of it (oixetos Adyos). The only question, then, which remained is this,—Does Aristotle, when he refers to "the exoteric discourses," mean to refer directly to his own more popular writings, or does he make general reference to popular discussions on

philosophical subjects, including not only his own and other people's popular writings, but also the ordinary debates and discussions on such subjects, rife enough in Athenian society, and, of course, unscientifically conducted? Powerful supporters are to be found for either view, and Bernays especially, in an elegant and learned monograph, has endeavoured to prove that each of the passages in which " the exoteric discourses" are mentioned refers especially to some one of the lost dialogues of Aristotle, the character and contents of which Bernays sceks to gather from the scanty fragments of them preserved by the ancients. It appears to us, however, that this attempt is infelicitous in its results, and that there are many reasons for thinking that Aristotle did not appeal to his own popular writings for conclusions in philosophy, but merely said, occasionally, that the popular views on some questions of philosophy were sufficiently accurate and might be accepted.*

Of the works that have come down to us as Aristotle's, the following are undoubtedly genuine :—1l. Topics. 2. Prior Analytics. 3. Postertor Analytics. 4. On Sophis- tical Refutations. 5. Art of Rhetoric. 6. Nicomachean Ethics.5 7. Politics. 8. On the Art of Poetry. 9. A Physical Discourse. 10. On the Heavens. 11. On Genera- tion and Destruction. 12. Meteorologics. 13. Researches' about Animals. 14. On Soul. 15. Appendices to the preceding work—(a.) On Sense and Sensible Things. (b.)

1 See Bonitz's Index, sub voce, for the references.

© All recent German commentators have touched upon the question. Most of the leading opinions upon it have been referred to by Grote Ar., vol. i. chapter 2. See also Grant's Zthics, vol. i. appendix B. '

: ee Gellius, xx. 4.

te Dialoge des Aristoteles, in ihrem Verhdltnis. inen tibrt Werken, von Jacob Bernays (Berlin, 1863). ee

5 With the exception of books v. vi. vii. See Grant's Zthics.

§ The title cannot with certainty be attributed to Aristotle. In some MSS. it stands as Svoiwxh axpdacis, wept apx@y. 'Axpdacrs indicated a scientific,

as opposed to a popular, lecture or discourse.

7 Tlept ra (Ga ioroplar. ‘loropia means a “ record of investiga- tions.” Aristotle sometimes uses the word simply in the sense] of “history,” but it was a mistranslation to call his work on animals Historia Animalium. Out of this the term “ Natural History” has grown into modern usage.

ARISTOTLE

On Memory and Recollection. (c.) On Sleep and Waking. (d.) On Dreams and Prophesying in Sleep. (e.) On Longevity and Shortlivedness. (f.) On Youth and Old Age. (g.) On Life and Death. (h.) On Respiration. 16. On Parts of Animals. 17. On Locomotion of Animals, 18. On Genera- tion of Animals. 19. The M etaphysics.®

The following works attributed to Aristotle are almost undoubtedly spurious :—l. On Rhetoric ; addressed to

Alexander. 2. Eudemian Ethics. 3. Great Ethics. 4. On Virtues and Vices. 5. Economics. 6. On Colours.

8, On Plants. 9. On Strange State- 11. On Indivisible Lines. 12. 13. On the Universe ; Lb,

7. Physiognomucs. ments. 10. Mechanics. On Xenophanes, Zeno, and Gorgias. addressed to Alexander. 14. On Motion of Animals. On Breath. 16. Problems.®

The following two works are of doubtful genuineness :— 1. Categories; 2. On Interpretation. None, however, of the so-called works of Aristotle have been more commented on or studied than these two. They stand as the two first of the six logical treatises, or Organon,” of Aristotle, and thus had particular attention directed to them in the Middle Ages,!! when the logical writings were solely or chiefly studied. The separate way in which these two short treatises are written, without any preface or other connec- tion with the main body of analytic (7.¢., demonstrative logic), seems peculiar and unlike Aristotle. We may safely say that they were not composed at the same time as the Analytics, to which they have been prefixed. Hither they were

earlier works written before the time of Aristotle's final residence in Athens, or else they are the productions of unknown and probably later Peripatetics. 'There is an important difference of doctrine between the Categories and works known to be by Aristotle. For in the Categories! it is laid down that "the first essence " (xpaéry otcia) is the individual, and that the class, genius, or species, is a " second essence," that is, that it has an existence derived from and secondary to the individuals of which it is composed. In the Metaphysics, on the other hand, we are told that the "first essences" are universals, genera, or species. The former is the doctrine of nominalism, the a a a gr

8°TR pera Ta Hod. The name merely means "The writings which come after the Physics." It was given not by Aristotle himself, but by his posthumous editors. Out of it the name of "Metaphysics" grew for that science, which Aristotle hiinself called " First Philosophy," "Wisdom," or "'Theology." See Bonitz, Metaphysica (Bonn, 1849), 2d part, pp. 83-6. The work is composite, with a spurious admixture. See below.

9 An interesting paper by Karl Prantl (Abhandl. der Philosoph.-

philol. Klasse der K. Bayer-Akad. 1852) discusses the thirty-eight books of "Problems" attributed to Aristotle, in which questions on all conceivable subjects are proposed and answered. Prantl] shows the contradictory and often anti-Aristotelian character of many of the answers given. His conclusion is that, though Aristotle certainly se the example of starting and endeavouring to answer " problems' as a contribution to science, and though there may be a small nucleus of Aristotle's own writing here, yet the great mass of the contents of these books is the production of the Peripatetic school, after the time of Aristotle. The Problems, among other characteristics, exhibit strongly the materialistic tendencies of the Peripatetics. '0 This name is said to have been given to the collective logical treatises by Andronicus, to indicate that they were not a part of philosophy, being neither "practical," "* productive," nor ' ' speculative," but that they contained the organ or instrument of philosophy, in the theory of reasoning. Aristotle himself uses the phrase about Dialectic, —od pinpoy Bpyavov mpds waa, Topics, viii. 14, 3. See Grote, vol. i. p. 78, and Brandis, Scholia, p. 140, a. 47, p. 259, a. 48.*

11 During the 9th, 10th, and 11th centuries, a war was furiously waged between Peripatetics and Platonists, #.e., between Nominalists and Realists. But all this time the Peripatetic library of Western Europe seems to have been restricted to Latin translations (by Boéthius) of the Categories and Interpretations, together with a Latin translation of Porphyry's Jntroduction to the Categories. The whole question of Nominalism and Realism was started by Porphyry's Introduction. See Hauréau, Histoire de la Philosophie scolastique, 2d. ed., i. (Paris, 1874).

12 Cite, eV.

18 Metaph., vi. 7, 4; 11, 18, &e.

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latter that of realism. If Aristotle wrote the Categories long prior to the Metaphysics (which, if he wrote the book at all, he must have done), then we must suppose that at the outset of his independent career as a philosopher he began with an exteme reaction against the realism of Plato, and that in later life he returned from this to approxima- tion towards Plato's views. The other hypothesis possible is, that a bias towards physical research and experiment and the collection of facts naturally led the Peripatetic school in the direction of nominalism, till at last some member of that school gave expression to this tendency by writing this little treatise called the Categories, derived, indeed, mainly from Aristotle's doctrines and teaching, but laying it down far more dogmatically than he would have done that the concrete individual is the unit of knowledge.} Considerations of style are insufficient to enable us to pro- nounce in favour of one hypothesis or the other. For the school of Aristotle copied, and obtained a close resemblance to, their master's style. But whether this treatise was written by Aristotle or not, it has had a great influence. It led the world not only to think that Aristotle was a decided nominalist, but also that he classified existence under ten "categories" or summa genera. But this doctrine would hardly have been gathered from the undoubted writings of Aristotle. In his logical researches he natur- ally much busied himself with the different relations which the predicate of a sentence can bear to the subject. And in the earliest of his extant works (Zopics, i. 9), he enumerates "the classes of predications" (rd yévy rév karyyopiav) as ten,? and gives

the same list as that given in the Categories; but the object of this enumeration is merely logical, in order to show what must be meant by the word "same" when it is predicated of any subject. Elsewhere, Aristotle does not adhere to the number ten ; he mentions? in one place eight, in another six, in another five, in another four, and very often three, xaryyopiat, or modes of predication. There is no trace of his mapping out to himself the "' Cosmos" under the divisions of ten or any other number of categories. In De Anima, i. 1, 7, he says that "it will be necessary, in discussing the soul, to define which of the categories it belongs to, and again whether it is a potentiality or an actuality." But, having said this, Aristotle does not further advert to the cate- gories, while he obtains his whole definition of the soul by considering it as an "actuality." In fact, " Potentiality and

lin De An.,i. 1, 7, there is an apparent assertion of Nominalism 7d 5& (Gov Td KabdAov Fror ovbevy eorw 4 Uorepov), but Torstrik points out (Ar. De An., p. 113) that Aristotle is here referring to the views of others, not stating his own.

2 Substance, quantity, quality, relation, place, time, posture (xeta@a:), habit (or dress, éxe), action, passion. Such a list would form a strange classification of all things in the universe. Some of these categories have an easily traceable affinity with the parts of speech, thus showing the relation between logic and grammar. But this is not their only source. As the individual man may sometimes be the subject of predication, his "dress" and "posture" were admitted among the classes of categories. Habit, from the Latinised form of yew, survives in modern languages, eg., to be "habited" is to be dressed,a lady's riding-" habit," habit (in French) =a coat.

- 8 See Bonitz's Index to Aristotle, in the Berlin edition (1870), sub voce xarnyopta:, where the references are given.

philosophers, from the Stoics+ to Kant and J. 8. Mill, to endeavour to frame an ultimate classification of all that exists or can be thought.

The treatise On Interpretation (i.e., the expression of the thoughts in language) was pronounced spurious by Andronicus Rhodius. This we learn from some interesting discussions given by Brandis in his Scholia to Aristotle, p. 97. The opposite view seems to have been taken by Am- monius, Alexander of Aphrodisias, and Boethius. The arguments, however, both pro and con are inconclusive. Whether this treatise was by Aristotle or not, it contains a very full statement of the Peripatetic logic, so far as the Proposition, with its various characteristics, is con- cerned. It quotes the treatise On Soul,> and, therefore, was written later than Aristotle's undoubted logical works, more probably by one of his school than by himself. It is the source of much of the matter of the elementary logic of modern times, and contains many distinctions, at one time novel, but essential to clearness of thought,— on Affirmation and Negation, the Different Ways in which the Negative Particle may be used, Contrary and Contradictory Opposition, the Truth or Falsehood of Pro- positions, Modality of Assertion, &c. Grote's® account of the contents of this work has opened. it for the English reader.

We now come to the undoubted works of Aristotle. These, as before said, were probably all actually written during his last thirteen years, but they must have, to a great extent, been prepared during the previous course of his life, during which he had thought out the divisions, the method, and the terminology of philosophy and science. The order of composition of these works, so far as it can be determined at all, must be determined by internal evidence. This internal evidence does not consist merely in references from one book to another (for these are not always re- liable—in some cases they are almost certainly interpolated), but still more in comparison of the thought in different books, and the various degrees of maturity exhibited by the same conception occurring in different books. For instance, in the first chapter of the Analytics the Topics are referred to; therefore, either the Z'opics were written first, or else this reference is spurious. But the doctrine of the syllogism is worked out with far more precision in the Analytzes than in the Topics, therefore the former hypothesis must be accepted. A similar combination of verbal and real internal evidence would seem to show? that the Topics (with the exception of the eighth book) were first written of all the extant works of Aristotle, next the Analytics (Prior and Posterior), next the eighth book of the Z'opics, next the Rhetoric, and then the Sophistical

Refutations ; and the same canon of criticism would lead us to believe that Aristotle next in order wrote the Wicomachean LHthics, and then (perhaps after an interval) the Politics and the treatise on Poetry. The above order of books may be considered as established with tolerable certainty. But the reasons seem rather far fetched which induce Valentine Rose® to lay down that Aristotle, in his 55th year, com- menced a second series of writings with the Physical Lectures, which were followed by the works On the Heavens, On Generation and Destruction, and the Meteorologics ; and afterwards a third series, with the Researches about Animals, followed by the work On Soul, and his other psycholo-

4 See Grote's Aristotle, vol. i. p. 144. 'Trendelenburg, Kategorien- lehre. 5 De Interpret., i. 3. 6 Ar., vol. i. pp. 155-199. 7 See Aristotle on Fallacies ; or, the Sophistict Elenchi, with a Translation and Notes, by B. Poste (London, 1866), page 103, note 4. 8 Arist. Pseudepigraph. p. 3; of. De Ar. Lib. Ord. et Auct., p. 204, sqg.

gical and physiological writings. Granting that the work On Soul was written later than most of the other works of Aristotle, it seems to us safest to say that, in all proba- bility, many of his works were simultaneously "on the stocks" up to the time of his death, and this makes their precise order difficult to assign.

We shall now proceed briefly to indicate, we cannot attempt more, the leading features of the contents of Aristotle's un- doubted works, as they have come down tous. The books of the Organon (see note 10, p. 514) form together a connected whole. Of these the Topics appear to have been written first, but the sequence of thought between the books is that the Prior Analytics stand first, as containing the theory of the syllogism, a necessary preliminary to reasoning of all kinds ; and then growing out of this root we have two divergent treatises: the Posterior Analytics, on demonstrative reason- ing, or the logic of science ; and the Z'opics, on dialectic, or the art of discussing subjects in which demonstration is impossible. or the details contained in these treatises we must refer the reader to Grote's (see note 3, p. 511) generally! excellent account. The matter of the Prior Analytics has become the common property of all modern books on logic. And scarcely

anything? has had to be detracted from or added to what Aristotle wrote upon the syllogism. His was the proud distinction of having discovered and fully drawn out the laws under which the mind acts in deductive reasoning. 'That in deduction the mind proceeds from some universal proposition, and how it proceeds—these were the first things which Aristotle had to tell the world. The modern attempts to impugn these principles, and to show that the mind does:not reason from universals, are a failure. They confuse inductive with deductive reasoning, and ignore both the case of a science like geometry, which is all deduction, and also the numerous cases where the mind, having unduly assumed a universal principle, rests in it afterwards and makes deductive applications of it. Grant- ing that there is such a thing as deductive reasoning (and surely life is full of it), it is a great matter to have the laws of this so clearly ascertained, that about the process itself there can no longer be doubt, and any flaw in the process can instantly be detected. This was the service that' Aristotle rendered in drawing out the laws of the syllogism. Men, of course, reasoned deductively by means of "the syllogism" before Aristotle had appropriated this name® to indicate the formula for deductive reasoning, and before he had discovered and stated the laws under which the mind acts in deductive reasoning. They did so, how- ever, unconsciously and by instinct, just as men wrote and talked grammatically before any idea of a science or an art of grammar existed. In Aristotle deductive reasoning became conscious of itself. Unfortunately for his reputa- tion, this merely preliminary part of his labours, in which the principles and rules of syllogistic inference were drawn out, occupied almost exclusively the minds of thinkers in the Middle Ages. The errors of modern Aristotelians were imputed to Aristotle, and hence arose the notion that Aris- totle explained nature by means of the syllogism, Nothing could be further from the truth ; Aristotle was not only one of the most inquiring and encyclopedical, but also one of the most thoroughly sensible, of all writers, and no one would have repudiated more strongly than himself the idea that the formula of the syllogism can be used to test or

1 See some criticisms upon Grote's account of the Organon, Edin- burgh Review, No. 278, pp. 546-9.

2 “Both Kant and Hegel acknowledge that from the time of Aristotle to their own age, logic had made no progress” (Stahr, in Smith’s Dict. of Greek and Roman Biography). The fourth figure was added to the syllogism (uselessly); and Sir W. Hamilton introduced the quantifica- tion of the predicate. Voila tout,

8 In Plato ovaAdoyiouds meant. a “computation” generally. Aristotle a special and technical mcaning was given to the word.

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explain anything beyond the process of reasoning from certain premisses possessed or assumed, and he is never tired of telling us that the only means of obtaining premisses is by experience and observation of facts. While discussing the syllogism itself, he says,4—“ This is the case in astro- nomy, which is based on the observation of astronomical phenomena, and it is the case with every branch of science or art. When the facts in each branch are brought toge- ther, it will be the province of the logician to set out the demonstrations in a manner clear and fit for use.” It is true that Aristotle did nothing towards the logic of Induc- tion, that is to say, towards elucidating the methods by which the mind legitimately arrives at general facts or laws of nature. This was leftto be worked out by the moderns, by Galileo, and Bacon, and Whewell, and J.S. Mill. Aris- totle, indeed, made a cursory attempt® to put the inductive process into syllogistic form, thus : —‘“‘A, B, and C draw iron; A, B,and C are (or represent) all magnets ; therefore all magnets draw iron.” It is clear that this syllogism does not explain the inductive process, it only records in the minor premiss a previous induction. The real question is, do A, B, and C here properly represent all magnets} To answer this, verification would be required. The syllo- gism, then, does not explain the inductive process, but only calls attention to what is implied in it. Leaving unat- tempted the question how :the minor premiss in the Inductive syllogism is to be obtained, and how tested,—-. what Aristotle really works out is the logic of Deductive Science (in the Post. Analytics) and the logic of Deductive Probability (in the Zopics). Under the former head he draws the ideal of a perfect science, and recounts the con- ditions necessary to its existence. Interesting

discussions® are introduced by him. on Causation, Hypotheses, Axioms, Ultimate Laws, Definition, and the Apprehension of Pri- mary Truths. In all this there is little which might not be accepted by a man of science of the present day. The Topics, on the other hand, treat of a subject which pos- sesses rather an antiquarian than a living interest, namely, the conduct and regulation of Dialectic as practised in Athenian society.

In the Middle Ages men made a business' of propounding, attacking, and defending theses, but this was a lame imita- tion of the spontaneous disputations of lively Athens, and from its utter profitlessness has long fallen into desuetude. The Dialogues of Plato may serve to give us an idea of a society possessed with an insatiate appetite for discussion and controversy, and always delighted to take part in, or assist at, an intellectual game or fencing match between two opponents. And it is the objeet of the Topics of Aristotle to lay down the rules for the game of Dialectic, and to establish it as a highly salubrious and necessary intellectual art. Dialectic, properly speaking, is discussion with a view to probable truth, and so far is worthy of the attention of a philosopher. But it may easily emerge into Eristic, which is discussion with a view to victory. Even under this aspect Aristotle does not think it ought to be neglected. Drawing on his vast and methodised observation of life, he gives rules and hints for the conduct of Enristic. The name Zopics means " On Common- places ;" the chief contents of this treatise consist of "heads" useful in arguing for or against a proposition. All this is wearisome to read in eight books. Much more readable are the Sophistical Refutations, which form a conclusion to the

4 Analyt. Prior., i. 30, 3. ve

5 sbid., ii. 23, 2-4. See a criticism on this in Professor Bains Inductive Logic (London, 1870), chap. i. § 2.

§ See The Logic of Science; a Translation of the Post. Analyt. of Aristotle, with Notes and Introduction, by E. Poste (Oxford, 1850).

7 See, e.g., the achievements, in this way, attributed to "The admirable Crichton," so late as about 1580 4.D.

Topics. The intellectual tendencies of Athenian society had given scope to a class, which gradually arose, of profes- sional and paid disputants, or professors and teachers of the art of controversy. This professional class, under the name "Sophists," got a bad name in antiquity,' and Aristotle treats them disparagingly as mere charlatans. Thus, while Eristic is arguing for victory, he describes Sophistry as arguing for gain. The Sophist, according to Aristotle, tried to refute by means of fallacy, in order that he might be thought clever, and so get pupils and make money. Aristotle collects, classifies, and exposes these fallacious refutations ; and so exhaustive is he in one short book, that the human mind has hardly invented any falla- cious argument since which may not be brought under some head of the Sophistical Refutations. The theory of fallacy was a proper wind up to the Organon, as containing the theory of reasoning in all its branches. cludes this part of his system with words full of a just pride in his achievements. It is almost? the only place in his writings in which any reference to his own personality can be traced. Hesays,® "In regard to the process of syllo- gising I found positively nothing said before me; I had to work it out for myself by long and laborious research." Greece at this time was full of Dialectic and Rhetoric, and the two were closely connected; and it was quite natural for Aristotle (whose aim was to take up and carry out to perfection all that the intellect of his countrymen had assayed), next in order after Logic and Dialectic, to deal with Rhetoric. We have already seen (p. 515) that he probably wrote his [hetoric immediately after the main books of the Organon, but before the Sophistical Refutations. But a distinction must here be added, for it seems pretty plain that, after he had written the two first books of his Rhetoric, there was an interval, and that he did not add on the third book? for some time afterwards. Many treatises on the same subject had previously been composed, an account of which has been given by Spengel in his Artium Scriptores,®> or Writers of Arts of Shetoric, a work professing to replace, as far as might be, the lost book called Swaywy) texvdv, attributed, rightly or wrongly, to Aristotle. It is a curious fact that one of these earlier systems of Rhetoric has been preserved for us among the works of Aristotle, having been long attributed to him on account of a spurious letter prefixed to it, and purporting to be from Aristotle to his former pupil, Alex- ander the Great. Hence the treatise got

its name of Rhetoric, addressed to Alexander. But the investigations of scholars® show conclusively that this work could not have been written by Aristotle, that with great proba- bility it may be attributed to Anaximenes, the historian and rhetorician, and that it was written between 340 and 330 B.c., only a few years before the composition of Aris-

1 A controversy on the justice of the reproaches of Xenophon, Plato, Aristotle, &c., against the Sophists, was initiated by Grote in vol. viii. of his History of Greece, and continued in his subsequent works on Plato and Aristotle. On the other side, see Prof. Jowett's Dialogues of Plato translated (vol. iii. p. 449, sqq.)

2 Another exception is in Eth, Nic. i. 6, where he refers to the fact of Plato having been his friend. F

3 Mr Poste, in his Aristotle on Fallacies, p. 95, translates the words, mept TOD avAAoylCecGa:, as if they meant "'on dialectic" generally. But the general opinion is, that Aristotle was here referring to his having worked out the forms of the syllogism.

4 Book iii. opens with the same words with which book ii. had concluded. This looks as if Aristotle had returned to the subject after an interval, having forgotten the exact form of what he had before written. This book (c. i. § 10) quotes the treatise On Poetry, which must have been written in the meantime.

5 L. Spengel, Surwywy) Texvav, sive Artium Scriptores, &c. (Stutt- gart, 1828).

6 See An Introduction to Aristotle's Rhetoric, by E. M. Cope, &c. (London, 1867), pp. 401-414, where the evidence on this point is briefly summed up.

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totle's treatise. The work itself is representative of the school of the Sophistical Rhetoricians, and abounds in those tricks of procedure' which

gained their bad name for the Sophists, and which drew forth the reprobation both of Plato and Aristotle. Plato,' indeed, identified rhetoric with trickery, and refused to countenance the study of it. Aristotle, who often exhibits less moral earnestness, but greater intellectual breadth than Plato, thought it necessary that this, like other intellectual fields, should be exploited. He thought,? amongst other reasons, that unless this were done, truth and justice would sometimes be left deprived of proper representation and support. He repudiates the practice of the earlier rhetoricians, who had based their " Arts" entirely on appeals to the passions ; and in a large and manly way he proceeds to develop all the various points which an orator must keep in view, and to indicate all the kinds of knowledge which he must acquire in order to be master of his profession. In so doing, Aristotle has displayed his extraordinary power of exhausting any sub- ject to which he gave his mind. Hardly anything of importance on the subject of Rhetoric has been added to what he wrote. 'Take the most powerful and subtle speci- mens of modern oratory,—for istance, Shakspeare's speech of Mark Antony over the body of Cesar,—and you will find the rationale of every telling point set forth by anticipation in the Ihetoric of Aristotle. His work con- tains some few Greek technicalities,—for instance, the doctrine of the Enthymeme,!® or rhetorical syllogism,—on the precise nature of which commentators are not agreed. But the main bulk of the treatise consists of a rich collec- tion of remarks on human nature and life, applicable to all periods. In the wisdom and knowledge of the world which it exhibits, Aristotle's Rhetoric might be compared with the Essays of Lord Bacon. And it might be compared with them also in this respect, that a bad and Machiavelian use might certainly be made of some of the suggestions which it contains, though Aristotle professes only to give them to be employed in the interest of truth and justice. The third book, on Style, is excellent so far as it goes, but it is less exhaustive and universally applicable than the former books, which treat of the matter of speeches.

Rhetoric was said by Aristotle to be allied, on the one hand to Dialectic, on the other hand to Ethics ; and, accord- ingly, he seems to have gone next to the exploration of the latter subject. At all events he wrote the Mecomachean Ethics later than the Rhetoric. When we compare the two treatises together we are struck with the growth of mind which has taken place between them. The Rhetoric is full of ethical definitions of happiness,

pleasure, virtue, friend- ship, and the like. But in the Ethics these are all remodelled, and made far deeper and more exact.

The Nicomachean Ethics was, perhaps, the first of Aris- totle's extant works which entered upon the matter of know- ledge, as distinct from the theory of the reasonings by which knowledge is obtained, and from the theory of the state- ment by which knowledge may be best set forth. The moral system herein contained differs from the ethics of Plato, first, in its more accurate psychological analysis, in distinguishing the will from the intellect, and in making virtue to consist in a formed state of the will, rather than eS ae

7 Ib., p. 457, sqq-

8 Gorgias, p. 465, &c.

9 Rhet., i. 1, 12.

10 The Enthymeme is a rhetorical (7.¢., non-demonstrative) syllogism. Its premisses are "signs" and " probabilities." Its province is to show likelihood, not certainty. The question with scholars is, whether it is essential to the Enthymeme that one of its premisses should be Jeft unexpressed. See Sir W. Hamilton, Lectures on Logic, vol. i. p. 386, sqq.; Mr Cope's Introduction, p. 108, sqq- + and Grote's Ar., vol. i. p. 291, sgq.

11 Rhet., i. 2, 7.

in wise insight ; secondly, in being disconnected from any assumption, or theory, of the immortality of the soul,—from all that we should call "Faith." Whether or not Aristotle denied a future life is another question to be considered later. But atall events he constructed ethics independently of such a doctrine. On the other hand, his system differs from the modern point of view, in that he asks, not, What is right? what is our duty? or what is the ground of moral obligation? but, What is the chief good for man? In order to answer this question, he calls in the aid of his metaphysical forms of thought,) such as the doctrine of the Four Causes, and of Actuality and Poten- tiality. From these he deduces thet the chief good for man must

consist in something which is an End in itself, and that it must be found in the actuality of the human powers. It is a weak point in the system that, instead of at once recognising the law of moral obligation as the deepest thing in man, it introduces? the idea of virtue and morality in a dry logical way, saying that the chief good for man must be the actuality of his powers according to their own proper law of excellence (kara tiv oixeiav dperny). Having in this colourless and neutral way brought in the term dpery=excellence or virtue, Aristotle divides it, in relation to man, into moral and intellectual. The part of his work which treated of intellectual excellence is lost, or was left unwritten. His discussion on moral excellence or virtue is full of interest. Its salient points are—/irst, the doctrine of the formation of habits or states of mind; second, the doctrine of "the mean," as the essential deter- minator of virtue; third, a brilliant analysis of the qualities and characters which were reckoned either as cardinal or secondary virtues in Greece. On Aristotle's doctrine of "the mean" a word must be said. Objection has been made to it in modern times, on the ground that it sets up a merely quantitative difference between virtue and vice. But Aristotle's point of view was thoroughly Greek, it was based on the analogy of Art. Wheu we speak of actions being "right" or "wrong" the Greeks spoke of them as being "beautiful" (xaAd) or "ugly "(aicxpa). In all Greek art and literature the great aim was to avoid the "too much" and the "too little," and in this way to attain perfection. Aristotle only followed Greek feeling, and the lead of Plato,' in applying the same idea to morals. It might, indeed, be urged that this idea of "the mean," of "neither too much nor too little," is a negative and merely regulative conception, and that it does not suffice to explain the moral beauty of the phenomena which Aristotle had in view. For instance, he describes the brave man consciously meeting death for a worthy object, and con- sciously sacrificing life and happiness, and much that he holds dear, because he feels that it is " beautiful" to do so. But, so far as we can learn from Aristotle, the 'beauty " here consists in exhibiting neither too much nor too little boldness, but the exact mean. In this there is obviously something inadequate ; but the fault seems to lie, not so much in laying down "the mean" as the law of beauty, but rather in not going beyond the identification of the morally admirable with the beautiful. This leaves each moral action, or course of conduct, to be judged of as a work of art. The proportions in each case are relative, but he who can judge aright will feel the harmony or otherwise of the details.*

With this artistic and somewhat superficial conception of morality, Aristotle is, in his own way, an intuitionist. He thinks' that we have a sense

1 See Grant's Ethics, vol. i. essay 4.

2 Eth. Nic., i. 7, 15.

3 Plato's term for the law of the beautiful was perpidrns. Philebus, pp. 28-27, and Grant's Ethics, essay 4. |

4 Bth. Nic., iii. 9, 4.

5 See Politics, i. 2, 12.

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(aicOnors) for moral beauty, but that this sense exists in perfection in the wise man (dpdvimos), to whom in all cases must be the ultimate appeal.

But the whole question of man's moral nature is really subsidiary in the Lthics of Aristotle. His question is, What is the chief good for man? and the answer to this question is, It must consist in the evocation and actuality of man's highest faculty, namely, the Reason. Thus, the highest happiness is to be found in contemplation and speculative thought; the joys of the philosopher are beyond compare. A satisfaction of an inferior kind is to be found in the exercise of the moral virtues. Such is, in brief, the view which Aristotle gives of humanlife. He excludes religion from his consideration of the subject, though his disciple, Eudemus,® in restating his conclusions, tries to introduce it. The same question, What is the summum bonum for man? has been answered in somewhat similar terms, in modern times, by Spinoza.'

The concluding paragraphs of the Wicomachean Ethics form the prelude and introduction to the Polztics of Aris- totle. Neither virtue nor happiness,' he says, can be attained by the individual separately. Moral development and the realisation of our powers (évépye) require as external conditions a

settled community, social habits, the restraint and protection of laws, and a wisely-regulated system of public education. Man is by nature a political creature; he cannot isolate himself without becoming either less or more than man (7 @ypiov 7 Geds). Thus the state is a prime necessity to man, and, indeed, the state is prior in idea to the individual, that is to say, the normal conception of man is of man in a state of civilisation, and this implies beforehand the conception of a state. On these grounds Aristotle went on from his Hthics to the composi- tion of his Politics. Some little time,® however, may have elapsed between the two works, This is suggested by the mature and free handling given to ethical questions when they occur in the Politics. Aristotle, with his usual ten- dency to seek a solid basis of experiences for his theories, may, in this interval, have been engaged in making that remarkable collection called the Constitutions (IloAcretas), which, according to Diogenes Laertius (v. 27), contained a description and history of the constitutions, manners, and usages of 158 states, and of which numerous fragments! remain. However this may be, the Politics, as we possess them, are full of learning and information. After a preliminary dissertation on the family as a unit in the state, they give a critical history of previous philosophical theories of politics, and an examination of some of the chief existing constitutional systems, before proceeding to the statement of Aristotle's own view. The treatise is unfinished ; in Bekker's edition it breaks off in the middle of Aristotle's theory of education (book viii.) Some have thought that this unfinished book was put last by some editor because it was unfinished, but that it originally stood earlier in the treatise, and that the commonly received order of the books should be transposed as follows :—i. ii. iii. vii. viii. iv. vi. v. It is forcibly argued! that a better

6 See Fritzschius, Hudemt Rhodii Ethica (Ratisbon, 1851), p. 40, note, p. 261, note; and Grant's Ethics, essay 1.

7 De Intellectus Emendatione, ii. 18, 14. The highest good (says Spinoza) is to arrive at a state consisting in knowledge of the union which the mind has with the whole of nature, and to be able to enjoy that state in common with other individuals.

8 Eth. Nic., x. 10, 8-23; Pol.,i. 2, 8, 9.

9 Spengel thinks that "the Politics were written long after the Ethics."

10 These, as collected and annotated by C. F. Neumann, are given in Bekker's Oxford edition of Aristotle.

11 See M. Barthélemy St Hilaire's Politique d' Aristotle (Paris, 1837) ; Spengel, " Ueber die Pol. des Ar." (Abhand. der Bayerisch. Akad., 1849); Nickes, De Arist. Polit. Lib. (Bonn, 1851) ; and Mr Congreve's Pol. of Ar. (London, 1855, 1874).

logical order for the subject matter of the entire treatise is thus provided ; book i. being preliminary on the family, book ii. being critical of previous theories and existing constitutions, books iii. vii. viii. giving Aristotle's own con- ception of an ideal state (unfortunately not concluded in the most interesting part of all), books iv. vi. v. forming a return from the ideal point of view to practical states- manship, and suggesting remedies for the different evils apparent in the actual Governments of Greece. Suffice it, however, to say that the Politics of Aristotle have come down to us in a fragmentary condition, not carrying out all that their author had intended, and probably never having received his last hand. The contents of this work are interesting, first, from an antiquarian point of view, as throwing a flood of light on Grecian history ; secondly, from the knowledge of human nature and the wise remarks applicable to all times with which they abound. On the other hand, Aristotle's considerations are too much confined to Greek states, that is, to states on an extremely small scale, to allow of his political theories being very useful in modern times. Owing to this his Politics have been com- paratively little studied, It is said' that in the Italian republics, from their resemblance to the Greek states, more attention than elsewhere was paid to this treatise. Aristotle had no political ties; he lived at Athens as a metic, or foreigner, without the rights or duties of a citizen, and thus he was in a position to write, with the utmost impartiality, of political questions. But his states- manship does not appear to have extended to what we should call the "balance of power," by which national existence might be preserved and guaranteed. He limited his view to the well-being of each little state within itself, though he probably would not have objected to, and

perhaps even contemplated, the hegemony of Macedonia, provided that under this each Greek city were left to carry on its own civic life.

His ideal state contrasts favourably, from a scientific point of view, with that of Plato, For while giving, as we have seen above, great and predominant weight to the idea of the state, he refuses to allow the individual and the family to be absorbed by the state. He thus resists all approaches to that communism? which was carried to so great extravagance in the Republic of Plato. 'The form of government which, ideally speaking, he prefers, is a wise monarchy or aristocracy,—some government, in short, in which neither wealth nor numbers shall be permitted to determine everything. In some points it must be confessed that he exhibits a narrow and conservative spirit, and a belief in the divine right of things as they are, which puts him at a disadvantage in comparison either with Plato or with modern views. 'hus, despite counter opinions in his own day, he maintains the institution of slavery as based on nature, and even lays it down? that it is justifiable to make war upon and reduce to slavery those races who were evidently intended by nature to be subject. In accordance with his physiological system, he treats woman' as stunted man, fixed by nature in a position of inferiority; and, therefore, he resists Plato's proposals for the emancipation and improved education of women. And by a third mis- application of his favourite conception of "nature," he denounces interest® as unnatural, money being a mere instrument of exchange, whereas interest unnaturally increases it. These specimens of backwardness of thought all occur in the first book of the Politics, and may serve to

1 See Mr Congreve, Pol. of Ar., introduction, p. xxiii.

BOM iily O15. 0, 20.

3 Pol., i. 8, 12.

4 Pol., i. 13, 7-11. Cf. A celebrated passage on the characteristics of females, Hist. Animal., ix. 1.

> Pol., i. 10, 4.

show how much “ “Truth is the daughter of Time,” and into what weaknesses the strongest individual minds may fall on questions not yet sufficiently ventilated and sifted by time. From his unfinished theory of education’ in the eighth book of the Politics, Aristotle was led on to the composition of his work On Poetry. This also is a frag- ment, and while promising’ to treat of tragedy, comedy, and epic poetry, it treats only of tragedy, adding a few brief remarks on epic poetry, and omitting comedy alto- gether. Aristotle, when he wrote it, had not yet written the third book of his Rhetoric,’ and he had not yet got the division of the two subjects clear in his mind; for he intro- duces into his fragment On Poetry observations on style, and even on grammar, which would have been more appro- priate elsewhere.

His account of tragedy is a profound piece of esthetic philosophy. By implication he defends tragedy against Plato, who had wished to banish the drama from his ideal republic, as tending to make men unmanly. In his celebrated definition of tragedy,® Aristotle says that, “by pity and fear, it effects the purification of such feel- ings.” On the exact meaning of these terms a lively discussion!” has taken place in Germany. ‘The question is, whether “purification” («é@apors) has a moral signi- ficance, such as was associated with the term in the Greek “ mysteries,” or whether it is a purely medical metaphor, and means simply “ purging.” In the Politics (viii. 7, 3) Aristotle has used the same term (xd@apors) in reference to the effect of certain kinds of music, and had promised to give a fuller explanation of it in his treatise On Poetry ; but this promise is unfulfilled, and we have rather to go back to the Politics”! as affording most light on the subject. The result of the discussion seems to be that xéGapors is a medical term, and that Aristotle’s meaning is that tragedy, by causing the feelings of pity and fear to “ operate , pleasurably, relieves!” the moral nature of a certain burden. We must regret, however, that the fuller disquisition on this subject, which he had promised, has not been given. Much stress has been laid, especially by the French, on “ the unities” of the drama, as supposed to be prescribed by Aristotle On Poetry. But in reality he attaches no importance to the external “ unities” of time and place. In enumerating the differences between tragedy and epic poetry, he says,!5 that “ the one generally tries to

limit its action to a period of twenty-four hours, or not much to exceed that, while the other is unlimited in point of time." But he does not lay this down as a law for tragedy. 'The peculiarity of the Greek drama, in which a chorus remained constantly present and the curtain never fell, almost neces- sitated "the unities," but Aristotle only concerns him- self with internal unity, which he says that tragedy must have in common with every other work of art,' and which consists in making every part bear an organic rela- tion to the whole, so that no part could be altered or omitted without the whole suffering. 'This principle, much more valuable than that of "the unities," is habitually*

6 See an interesting summary of Aristotle's views on this subject, National Education in Greece, inthe 4th Century B.c., by A. 8. Wilkins, (London, 1873), pp. 185-167,

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8 See note 4, p. 517.

2. Pog, viee2!.

10 See Aristoteles tiber Kunst, besonders tiber TragGdie, von Dr J. H. Reinkens (Vienna, 1870), pp. 78-167, in which the controversy is summarised.

11 Besides the passage above quoted, there is another place in the Pol. where the terms iatpefa and %xos are used to express the relief of the passions procured by indulging them, Pol., lie pmlel es

12 Pol, viii. 7, 5, waar ylyverOal rive xdbapow Kat KovplCerbat ped' 7Sovijs.

33 Poet., v. 8.

14 Poet., viii. 4.

violated by all but the few first-rate works of fiction of the present day.

The Lhetorte, the Nicomachean Ethics, the Politics, and the fragment On Poetry, make up the sum of Aristotle's extant contributions to " practical" and " pro- ductive " philosophy. We have now to follow him into the "speculative " part of his system, consisting of a rich scries of physical and physiological treatises. In this department the results arrived at 2200 years ago by Aris- totle come into sharp contrast with the achievements of modern science 'up to the present day. Those who enter upon the comparison are apt to run into one of two extremes,!—either to pass undiscriminating eulogies on Aristotle, and to credit him with impossible anticipations of future discovery, or to treat him with undue disparage- ment, as'utterly false in method and puerile in his views of nature. It is only owing to Aristotle's real greatness that such a comparison could for a moment be made,— for what, comparatively speaking, could be expected of a philo- sophy 2000 years old in respect of the sciences of observa- tion and experiment, whose very essence consists in gradual advance from one new vantage point to another? 'To do personal justice to Aristotle, we must conceive, as a matter of fancy, what it would have been if he could have had one of the great modern discoveries imparted to him,—the Copernican system, or the law of gravitation, or the circula- tion of the blood, or the analyses of air and water, or the conservation of energy ; if he could have had any modern instrument of observation, such as the telescope or micro- scope, or even the thermometer or barometer, placed in his hands. How swiftly would he have used such an advan- tage! what new and ramifying deductions and inductions he would have made! how radically he would have had modified many of his views! But all this was, of course, impossible. Physical knowledge was in its infancy; Aristotle could only start where his predecessors left off ; he laid the foundation of many sciences, and wherever simple observation was adequate,—as, for instance, in politics and in some parts of natural history,—his achievements were com- plete and surprising. But for the greater realms of science he had no starting point and no appliances ; he could only slightly modify the almost childlike views of the Greeks, and rest content with such unverified hypotheses? as seemed to him best to cohere together, and to explain the nature of things. Thus, it is not to be wondered at that he con- sidercd the earth to be stationary and the centre of the world, with the seven planets (including as such the sun and moon) moving round it in oblique courses to the left, while the outer heaven or sphere of the stars—composed not of

perishable matter, but of divine ether—he thought to move from left to right, with perfect and regular motion returning on itself, deriving its motion from the encom- passing Godhead,—that essence which moves things, but is not moved itself. Such was, according to the belief of Aristotle, the framework of the universe ; and the order? of his physical treatises corresponds with the filling up of this framework. Of his method it may be said, in one word, that no one was ever more keen than he to make "fact " (7d drt) the basis of every theory. It is not to be

1 This subject may be studied in Mr Lewes's Aristotle, a Chapter Srom the History of Science, referred to in note 5, p. 511. Mr Lewes quotes some of the principal eulogies upon Aristotle's scientific merits. He himself affords an instance of the opposite extreme, being in many points too hard upon Aristotle.

2 There are some interesting remarks on the position of a Greck philosopher of the 4th century B.c. in relation to physical science, in Professor J owett's Dialogues of Plato, translated (Oxford, 1871), vol. ii. p. 503, sgg. in the introduction to the " Timeus."

3 See Dr Leonhard Spengel's paper on this subject, Abhandlungen der Philos.-philol. Klasse der Bayerischen Akademie, 5th vol. 2d div. p. 142 (Munich, 1849).

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supposed fora moment that he attempted to explain nature by means of the syllogism. But, ou the other hand, the art of experimenting, and the exact quantitative record of observations had not been developed. So Aristotle was often quite destitute of the appropriate "facts" for a particular inquiry, and sometimes deceived in the " facts" upon which he founded. And his training as a dialccti- cian was in some respects a disadvantage to him, as it Iced him to depend too much on the evidence of language in forming his theories of nature.

The logical order of the physical treatises, and, probably to a great extent, the actual order of their composition, is as follows :—Ilst, The Physical Discourse, in eight books, forms an introduction tothe entire subject. It is,

as Hegel called it, ‘a Metaphysic of Physic.” It treats of the Prin- ciples of Existence, Matter and Form, Nature, Motion, Time, Space, the Unmoved First Mover, and the Ever- moved, z.¢., the sphere of the outer heaven. 2d, The treatise On the Heavens, in four books, naturally succeeds ; and Aristotle, thus beginning with the periphery and divinest part of the universe, descends gradually to the region of the material and perishable. In so doing it becomes necessary to him to consider the causes of those changes,~~— that passing into and out of existence,—which had no place in the higher region. Therefore, 3d, the treatise On Generation and Destruction, in two books, gives us Aris~~ totle’s theory of the Hot and the Cold, and the Wet and the Dry,—pairs of opposites, the first pair active, and the second pair passive, which by their combinations and mutual workings produce the four elements (Hot and Dry = Fire, Hot and Wet=Air, Cold and Dry=Earth, Cold and Wet= Water), and form the ground for all natural changes. 4th, The Meteorologics, in three books, treat of the region of the planets, comets, and meteors,—a region ever full of change and alteration. The fourth book of this treatise does not logically belong to it, for in it Aristotle develops his theory of two exhalations—the steamy or wet, and the smoky or dry—which, being imprisoned within the earth, produce, the former the metals, and the latter the rocks, and such other minerals as are incapable of being melted. This theory, which scems to be a dim fore- shadowing of the doctrine of crystallisation, takes us out of the mid-air below the surface of the earth. It is, therefore, out of place ; but almost everything in Aristotle must be looked upon as unfinished. 5th, The treatise On the Parts of Animals, in four books, leads the way to the investiga- tion of organic life. It contains Aristotle’s physiological distinction between homogeneous and unhomogeneous sub- stances (6jovopepy and dvopotopepy), 2.¢., tissues and organs. This distinction, which is recognised still as perfectly valid, gives a scale of ascension from the inorganic to the organic world. First, Heat and Cold, &c., form the simple ele- ments ; out of the elements are formed the homogeneous substances or tissues ; out of these are formed the organs, out of the organs the organised being. As a principle of method, Aristotle lays it down‘ that all which is common to the various species of living beings should be discussed before entering upon their specific differences. Therefore, 6th, the treatise On Soul follows next in order, which, as Spengel observes (see note 3), is not to be regarded as a work on psychology in the modern sense, but as a physi- ological treatise

on the soul or vital principle common to all living-beings. And next follow, 7th, the so-called Parva Naturalia, which form appendices to the three books On Soul, and treat physiologically of sense and sensation, youth and age, sleep and waking, and other phenomena attaching to life in general. 8k, The short essay On Locomotion of Animals shows how various organs in the

4 De Part. Anim., i. 1, 4-7.

various creatures are adapted by nature for this purpose. 9th, The elaborate treatise, in five books, On Generation of Animals, works out this subject with astonishing fulness. And, 10th, the great work entitled Researches about Ant- mals, in ten books, in which Aristotle exhibits an acquaint- ance, more or less intimate, with about 500 species,! crowns the series of his physical writings, and certainly constitutes one of his greatest achievements.

There were two other treatises which Aristotle had proposed? to himself to write, as belonging to this zpay- pareta, or department, namely, one On the Physiology of Plants, and one On Disease and Health, so far as belongs to Physical Philosophy. But neither of these intentions, so far as we know, was executed by him.

Last of Aristotle's extant and undoubted works, we have to deal with the Metaphysics. We cannot accept the opinion expressed by Valentine Rose that this work was written before the Physical Discourse and the other kindred books which have just been enumerated. Doubtless many of the metaphysical conceptions were pretty complete in Aristotle's head before he wrote on physics, but that is another question. Theveryname "Metaphysics" (see before, note 8, p. 514) embodies a strong tradition that the work to which it has been applied came "after the physical works." Secondly, There is another tradition* that this treatise was sent to Eudemus for revision, and that while Eudemus was suggesting some improvements in the arrange- ment, Aristotle died. Thirdly, there are four placcs® in the physical writings which put off the discussion of certain questions as belonging to "'first philosophy," just as in the Lthics® other questions are put off as belonging*

to physics. Fourthly, The Metaphysics are quoted in no genuine work of Aristotle's, but only in the book On the Motion of Animals,' now generally attributed to a later Peripatetic. Fifthly, The doctrine of causes seems to be handled in a more mature way in the Afetaphysics than in the physical writings. Sixthly, In no less than twelve places® of the Metaphysics the physical treatises appear to be referred to. There is good ground, then, both external and internal, for believing that the Aletaphysics were among the latest of Aristotle's works, and they were certainly not finished by hin.

As the work stands in Bekker's edition, it consists of thirteen books, exclusive of the brief fragment which suc- ceeds book i., and is marked as A EAATTON, or I. Minor. This fragment was attributed by ancient® tradition to Pasides, and is probably un-Aristotelian. It merely contains

1 See Die Thierarten des Aristoteles, von der Klassen der Sdéiugethiere, Vogel, Reptilien, und Insecten, von Carl J. Sundevall, Uebersetzung aus dem Schwedischen (Stockholm, 1863). Prof. Sundevall estimates the total number of mammals indicated and described by Aristotle to have been about 70; of birds, 150; of reptiles, 20; and of fishes, 116; making altogether 356 species of vertebrate animals. Of the invertebrate classes, about 60 species of insects and arachnids seem to have been known to Aristotle; some 24 crustaceans and annelids, and about 40 molluscs and radiates. See The Natural His- tory Review for 1864, page 494.

3 De Sensu, iv. 14; De Gen. Animal., i. 2,1; De Long. Vit., i. 4, vi. 8. In Hist. Anim., v. 1, 4, dowep efpnrat ev TH Oewpla ti meph Tay puTav, elpnrat is probably a misreading for eiohoerat.

3 De Ar. Lib. Ord. et Auct., pp. 185-232.

4 See Brandis, Schol. in Arist., 519, b. 38.

5 Quoted by Bonitz, Ar. Metaphysica (Bonn, 1849), p. 4.

6 Kth. Nic., viii. 1, 7, &.

7 This little treatise bears all the marks of being a monograph in

. which the conclusions out of various parts of Aristotle's physical, psychological, and metaphysical writings are amplified and brought together. Rose gives arguments to show that the physiology of this book, and of the treatise On Breath, belongs to a medical school (Praxagoras, Erasistratus, &c.) later than the time of Aristotle. He admits the De Motu Animal. to have been compiled by soime very able Peripatetic, De Ar. Lib. Ord. et Auct., pp. 162-174.

8 See Bonitz, p. 5.

® See Brandis, Schol. in Arist., p. 589, a. 41.

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some very general remarks on the search for principles. Book iv. is a sort of glossary of the various meanings in which certain philosophical (but not exclusively metaphysi- cal) words are used. It may have been jotted down by Aristotle himself, and have been found among his papers ; but it is only through injudicious editing that it can have been inserted in this work. Book x. is quite peculiar ; the first half of it (chapters 1-7) is a brief restatement (by Aristotle himself, as Bonitz thinks) of the conclusions of books ii. iii. v.; the second half is an un-Aristotelian epitome of part of the Physical Discourse. Even making these deductions, the remainder of the work is not homo- geneous, but is resolvable into two separate treatises: the first being intended to set forth Aristotle's system of meta- physic, and consisting of books i. ii. iil. v. vi. vil. viil., which give the history of former systems and the ground- work of his own. The second treatise is contained in book xi, which, after a short sketch of the nature of substance in general, ends in a dissertation upon the nature of God. Books ix. (on Unity) and xii. xiii. (on the Pythagorean and Platonic systems of numbers and ideas), appear to have been intended for the first treatise, but they remain as mere materials for a magnum opus which was never achieved. We see, then, out of what desjecta membra the Metaphysics of Aristotle, as they stand in our editions, are composed. How far the making up of them into their present form is due to Eudemus and the earlier Peripa- tetics, how far to the editorial hand of Andronicus, we can- not tell.

Among the many-sided merits of Aristotle must be mentioned the example set by him of making the history of opinion on each subject the prelude to a scientific considera- tion of the subject itelf. In the first book of his Jfeta-physics he sketches the leading doctrines of his predecessors on the first principles of existence. He thus becomes the father of the history of philosophy, a study which has been taken up anew and much developed during the pre- sent century. His brief and masterly sketch is, however, open to the charge of not doing sufticient justice to the different points of view of former philosophers. And his polemic against Plato's doctrine of Ideas, which is several times repeated'® in his extant writings, has the appearance of captiousness, and of misrepresenting the doctrine which it impugns. Aristotle himself never discarded idealism. He declared that universals, and the truths apprehensible by the highest reason, were " by nature more known"? than individual concrete phenomena, and the facts appre- hended by sense. But yet he had the strongest bias to- wards physical research and empirical observation. A modern physical philosopher might have been content to follow out his own special inquiries without seeking a general scheme for the universe. But Aristotle had to form a theory of the whole, leaving scope, afterwards, for the separate physical sciences. The idealism of Plato did not do this; it left no place for matter, motion, or change ; when followed out it reduced all but the Ideas to the category of the non-existent. Aristotle, to rescue all nature from theoretical annihilation, introduced a term between the existent and the non-existent, namely, the potential" (Svvayis). On the one hand, the potential does not exist, for as yet it has no qualities ; on the other hand, it does exist, for some change brings the "actual "

10 See a critical examination of all the places in Zeller's Platonische Studien (Tubingen, 1839), pp. 199-300.

1 Plato by no means consistently maintained the doctrine of Ideas, as commonly attributed to him. In the Parmenides he himself draws out the objections which may be urged against the system. And, wonderful to relate, Aristotle uses some of these very objections in attacking Plato !

12 Tonics, vi. 4, 1-10, and see note 18, p. 514. AL

(évépyea) into existence, and this could not be without implying the previous existence of the potential. The universe, according to Aristotle, is a continuous chain ; at the one end is the purely potential—matter without form or qualities; at the other end is pure unconditioned actuality, the ever existent, or God.

Reflection upon the relations of the potential and the actual shows the world to have been etcrnal, for the actual must always have preceded the potential ;1 the seed is the potentiality of the plant, and the plant must always have preceded the seed," the fowl the egg, &c. Thus, all the system of cause and effect, which makes up what is called "nature," has been and will be, according to Aristotle, of eternal duration, and is only slightly modified and altered by two uncalculable elements' of causation,—chance and the will of man.

"Nature," or the system prevailing from the earth up- wards through the planetary sphere, is full of reason; it does nothing in vain. The formal cause, the form, or per- fection, of each thing, is generally to be identified with the final cause, or end, at which nature aims. Matter, rising from the merely potential, through the four elements into various substances, is the material cause; and the efficient, or motive cause is supplied by the active powers of heat and cold. Nature, however, is impersonal, and to speak of it as pervaded by reason, has all the appearance of pantheism. But yet in the system of Aristotle there was a God who was not part of nature. Aristotle's utterances on this subject are obscure; he speaks of the unmoved Mover of all things at one time® as if He supplied motion to the periphery of heaven, at another as if He moved things by desire, under the form of the Good. But, at all events, He is personal: He enjoys for ever that bliss which we can only at brief moments attain to; His life is the thinking upon thought. In all this there is something incomplete, and the different points of view are not reconciled. Aristotle argues that® God could not, as thought, have any object of thought inferior to himself, else the divine thought, by thinking upon an inferior object, would suffer change and degradation. God, there- fore, can only think upon himself. This argument would seem to foreclose the possibility of either Providence or prayer. 'There is something Eastern in this idea of a God absorbed in self-meditation; and, on the other hand, we observe that Aristotle, while considering no trouble too great to obtain

excellence in any little point of art, or science, or morals, or politics,—still, in comparison with the great universe, makes human affairs of relatively little importance. But yet, within the sphere of nature, man is, according to him, the highest product—indeed, the one end for which all the arrangements of nature are but means." Nor does man himself fall wholly within the sphere of nature. Every natural soul is the ultimate expres- sion (évreAéxera) of a corresponding physical body. But in the human soul there is something which has no physical substratum, which came in from without. And, if not physical, this something must belong to the ethereal essence

1 Metaphys., viii. 8, 1-11.

2 A similar doctrine to this was stated by Sir W. Thomson in his address to the British Association, 1871. He said, "I am ready to adopt as an article of scientific faith, true through all space and through all time, that life proceeds from life, and from nothing but life." His

suggestion as to our own globe was "that life originated on this :

earth through moss-grown fragments from the ruins of another world."

3 Hth. Nic., iii, 3, 7, &e. "

4 See the whole of book ii. of the Physical Discourse =

5 See the dissertation on the nature of God, Metaph., xi. c. 6-10.

8 Metaph., xi. 9, 4.

7 See Polit., i. 8, 11, where it is said that '" plants are evidently for the sake of animals, and animals for the sake of man; thus nature, which does nothing in vain, has made all things for the sake of man."

8 De Gen. Animal., ii. 3, 9, 10.

matter.

ARISTOTLE

of which the outer heavens and the self-conscious, happy stars are composed. Thus man, by his reason, has a direct connection with the sphere of the eternal and the blessed. The question then arises whether the individual man can look forward to immortality. On this, regardless of Plato's elaborate pictures of a Hell, a Purgatory, and a Heaven, Aristotle says nothing. makes reason twofold, the active and the passive, of which the active reason, and it alone, is indestructible; but if this be incapable of receiving impressions, it would seem that all our memory,—in short, all that constitutes human individuality,—is doomed to extinction. never says so in express terms, and therefore has given scope for much controversy in modern times as to his

In one celebrated passage' he

But Aristotle

opinion.!° Returning to his psychology, we find that" he considers

knowledge to imply a certain similarity, if not identity, between the subject and the object.

Therefore, the higher reason in apprehending universals, apprehends something

homogeneous with itself,—something, in short, ethereal,

This would bring the Aristotelian universals very near to the Platonic ideas, but that he maintains!? that the univer- sals are always immanent in the individuals, never tran- scendental, or existing by themselves. But this doctrine widely separates Aristotle from the modern experimental school, though, on the other hand, there is no trace of his

having believed in "innate ideas" upon any subject.

Aristotle, like Locke, considered each human mind to be originally a blank tablet, but he would not agree with

Locke that this tablet is written upon by external objects, he would rather say that, by the joint action of the active and the passive reason, the tablet writes upon itself, and that there is much in our knowledge which comes from the

nature of the intellect itself. Two doctrines lie at the

foundation of his system: Ist, the principle of contradic-

tion,—that a thing must be either A or not A; 2d, the dualistic opposition, throughout the universe, of reason and In modern times we have been long accustomed to think of this world as having had a beginning, and recent theories of "development" are attempts at a speculative history of nature gradually arriving at its pre- sent condition. Such theories have nothing to correspond to them in the system of Aristotle, for in his view the pre- sent fabric of the world has had an eternal existence, and nature is fixed, being only slightly varied by the element of chance. He admits, indeed, a process of development in human society, but in order to adapt this process to a fixed and eternal frame of things he announces!® the curious opinion, that the human race has repeatedly brought to perfection all art, science, and philosophy, and has on each occasion been swept away by some wide-spread catastrophe or convulsion of nature, leaving only a few individuals to repropagate the race, and to begin again the development of civilisation out of the merest rudiments.

In endeavouring to bring forward, in a brief space, some of the salient characteristics of Aristotle, we have been led to mention chiefly those points on which he differs most

9 De Anima, iii. 5, 2.

10 Averroes made for himself a bad name by pushing the words of Aristotle to their logical conclusion. On the other hand, St Thomas Aquinas argued in favour of Aristotle's belief in immortality. Spengel, apparently, takes the latter view (see note 3, p. 520); he quotes with

*: approval an anonymous ancient—'O7: TAdtwr, pyc, Ka *ApioToreAns HAdvarov duotws Aéyouer thy woxhy, Klv Twes cis Tov "ApiororeAous*

voov ovk éuBaddvoyres Ovnthy voulCovow aitoy Aéyew. See some criticisms on Grote's view, Ed. Rev., No. 278, pp. 5538-556.

11 See Die Erkenntnisstheorie des Aristotles, von Dr F, Kampe (Leipsic, 1870), p. 316, sgq.

12 Post. Analyt., i. 11, 1, &e.

13 Metaphys., xi. 8, 19.

widely from the modern point of view, and which, there- fore, are his points of weakness. Much that the world has accepted from him, many a solid mass of wisdom and good sense, to be found in his writings, we have been obliged to pass over in silence. On most subjects Aris- totle is no longer an authority, but yet, for many reasons his works are well worth study. rst, on account of the important part they have borne in the history of the world. No one who aspires to cultivation can dispense with a historical knowledge of the thought of Europe, and Aris- totle is one of the great fountain-heads of that thought. Secondly, if cultivation consists, as has been said, in an acquaintance with all the best productions of the human mind, Aristotle's works, despite their want of style, certainly come among the number. Hegel advocated the study of these works as " the noblest problem of classical philology." The University of Oxford, during the present century, has made a renewed study of Aristotle one of its chief instruments of education,—and with great success, as was especially testified to by the late Dr Arnold! of Rugby. Aristotle's great knowledge of human nature, exhaustive classification, and clear methods of disentangling a question and dealing with what is essential in it, render many of his works an excellent curriculum for training young men, and fitting them for all the superior business of life. There is a certain dynamical impulse to be derived from Aristotle, independent of all his results and conclu- sions. The Aristotelian element in thought and knowledge may, perhaps, be summed up as 'analytic insight ;" and this insight arises out of concentration of the mind upon the subject in hand, marshalling together all the facts and opinions attainable upon it, and dwelling on these, and acrutinising and comparing them till a

light flashes on the whole subject. Such is the procedure which may be learnt, by imitation, from Aristotle.

The history of the study of the Aristotelian philosophy, since the time of Andronicus, falls under various heads, dealt with elsewhere. It is contained, —/irst, under such names as those of the Greek commentators, Boethus, Nicolas Damascenus, Alexander of /®ge, Aspasius, Adrastus, Galenus, Alexander of Aphrodisias, Porphyry, Iamblichus, Dexippus, Themistius, Proclus, Ammonius, Damascius, David the Armenian, Asclepius, Olympiodorus, Sim- plicius, and Johannes Philoponus ; secondly, under the history of the caliphs of Baghdad, and their encourage- ment of the translation into Arabic of Greek philo- sophical works ; thirdly, under the names of Avicenna (of Baghdad), and Averroes, and Moses Maimonides (of Cordova), and the history of the controversies to which they gave rise; fourthly, under the name of Thomas Aquinas, and the history of Scholasticism generally ; jifthly, under the history of the Renaissance, and of the manifold editions of Aristotle to which the first age of printing gave birth ; s¢xthly, under the names of Ramus and Bacon, and the history of the reaction against scholastic Aristotelianism ; seventhly, under the names of Lessing, Hegel, and other great Germans who, within the last hundred years, have revived a genuinely philosophical and critical study of Aristotle.

For the bibliography of Aristotle's works we must refer to the first volume of Buhle's (Bipontine) edition (1791-1800), which contains an enumeration of all the earlier editions, translations, and commentaries, All pre- vious editions of the text of the entire works give way to the recension of Immanuel Bekker (1831-1840), which being supplemented by a volume of Scholia upon Aristotle,

1 See The Life and Correspondence of Thomas Arnold, D.D., &c., by A. P. Stanley, &c., vol. ii., letter 274.

phical circles. treatises, and many monographs on special points, have

a few less important works.

edited by Brandis (1836), and a complete index to all the works, compiled by Bonitz (1870), constitutes the great edition of the Prussian Royal

Academy. Within the last forty years much admirable work has been done in Ger-

many in the way of clearing up special questions relating

to Aristotle, and introducing correct judgments about his philosophy generally. Perhaps the scholar who, by a mix- ture of rich learning and penetrating good sense, has deserved best of Aristotle is Dr Leonhard Spengel, to whose

papers, contributed to the Royal Bavarian Academy of

Munich, we have often previously referred. 'The historians of philosophy, beginning with Hegel's " Lectures," and going

on to Brandis, Zeller, Schwegler, and Ueberweg, reflect the

progressive opinions about Aristotle of critical and philoso- Many excellent editions of the separate

performed a subsidiary function. And a good German translation, executed by Stahr, Bender, Karsel, &c., of the works of Aristotle, now nearly complete, has been pub- lished at Stuttgart, by Krais and Hoffmann.

No other nation can compare with Germany in recent services. towards a knowledge of Aristotle. France has contributed translations of the Physics, De Anima, Parva Naturalia, Organon, Politics, and Ethics, by Barthélemy St Hilaire, an essay on the Metaphysics, by Ravaisson, and The translations are read- able, but cannot be relied on for accuracy in any difficult point. In England the contributions to Aristotelian litera- ture have borne no sort of proportion to the extent to which minds have been educationally imbued with certain of Aristotle's works. The unproductiveness of Oxford in this respect is certainly a matter of reproach to that university. Sir W. Hamilton exhibited great learning in all that con- cerned Aristotle rather than a true insight into Aristotle himself. Grote's work was conceived in a German spirit, but it was begun far too late in life to have any chance of success. The problem how to translate Aristotle into English has not yet been solved. We have had a transla- tion of the entire works by the not very sane, and

very unscholarlike, Thomas Taylor (10 vols., London, 1806-12), which exists only as a curiosity for book collectors. And we have had the not uncreditable versions of Bohn's Classical Library, but these latter were done to order, and cannot be expected to perform what is in itself so difficult. Mr Poste, perhaps the most thorough of present English Aristotelians, in his Aristotle on Fallacies, gives us rather a condensed paraphrase than a translation, and is often as difficult as the original Greek. The problem is, how to convey, in readable English, a philosophical style, full of technical terms for which we have no exact representatives. Circumlocution, or paraphrase, becomes necessary ; the question is, how to use this with the greatest tact, so as, while conveying Aristotle's exact meaning, to retain some- thing of his manner. Perhaps this problem may, in course of time, be solved, if in the meanwhile the study of Greek is not altogether abandoned in England.

The following are works relating to Aristotle which are worthy of consultation, but have not been mentioned in the previous text or notes :— Stahr, Aristotelia (2 vols., Halle, 1830-32) ; Aristoteles bei den Rémern (Leipsic, 1834). Biese, Die Philosophie des Aristoteles (2 vols., Berlin, 1835-42). Waitz, Organon (2 vols., Leipsic, 1844-46). Schwegler, Metaphysica (4 vols., Tubingen, 1847-48). Torstrick, De Anima (Berlin, 1862). Meyer, J. B., Disser- tatio de Principits Aristotelis in distributione animalium adhibitis (Berlin, 1854); Aristotelis Thierkunde: ein Beitrag zur Geschichte der Zoologie, Physiologie, und alten Phalo- sophie (1855). Spengel, Ueber dre Rhetorik des Aristoteles (Munich, 1851). (A. GR.)

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ARI—ARI

ARISTOXENUS, of Tarentum, a celebrated Greek | to them. This theory Aristoxenus considered to be an | attempt to force a priori determinations upon nature, and

philosopher and writer on music, was the son of Spintharus or Mnesias. He was at first a pupil of the Pythagorean school, and received instruction from Xenophilus; afterwards re- moving to Athens, he studied under Aristotle. He became one of the most distinguished pupils of the Peripatetic school, aud

is said to have been much disappointed when, after the death of Aristotle, Theophrastus was preferred to him as scholarch. His writings, which, according to Suidas,

were 453 in number, have been almost entirely lost. |

The titles of some of them have been preserved, and

show that his activity had been directed to a great variety |

of topics. With the exception of a few fragments quoted by other authors, there is extant of all his writings only one treatise on Harmony, in three books, which is probably not a complete work, but made up of portions of one or more separate writings. His doctrine of harmony is directly opposed to that of the Pythagoreans, according to whom musical concord depended upon certain numerical ratios, and who were obliged to reject some combinations as dissonant, only because there was no ratio corresponding

he sought to develop a theory of harmony from an empirical basis. According to him, the earis the true judge of concord, and its impressions can be generalised into rules. His followers were called povorxoi, or musicians by ear, in opposition to the Pythagoreans, who were xayvovixol, or musicians by rule. Another doctrine attributed to Aris- toxenus brings out forcibly the strong empirical tendency of his mind. He is said to have held that the soul stood in the same relation to the parts of the body as harmony stands to the parts of a musical instrument; it was the result of organisation. What proofs he advanced in favour of this view, and how the opinion was connected with his general system of thought, we have not now the means of determining.

The best edition of Aristoxenus is by Marquard, with German translation and full commentary, Aristoxenus' harmonische Frag- mente, 1868. The fragments are also given in Miiller, Frag. Hist. Grec., ii. 269, sgqg. See also Mahne's work, Diatribe de Aristoxeno,

1793; and that of Brill, Aristoxenus' rhythinische und metrische Messungen, 1871.

ARITHMETIC

RITHMETIC is the science that treats of numbers, and of the methods of computing by means of them.

In introducing the subject, and endeavouring to trace the progress of the science, there appear to be three points that call for particular notice, viz., the conception of number, the representation of numbers either by words or graphically by characters, and the principles and modes of computation.

1. The primary conceptions of numbers are necessarily of a very crude kind. The child attains the notion slowly by experience, and the ability that even adults have to apprehend the significance of numbers with precision is restricted to an extremely narrow area. 'This is still more the case among uncivilised races, some of which do not appear to be able to count beyond 3, or 4, or 5, or are at least believed to have no words in their vocabularies that express larger numbers. It is to be remembered that the knowledge that is acquired regarding numbers through experience and culture is not of numbers absolutely or in the abstract, but rests almost entirely on a perception of the relations which numbers bear to each other.

The power to form a direct and immediate conception of numbers is very limited; but the relative magnitudes of numbers, large as well as small, can be expressed with the utmost accuracy, and so as to be clearly understood. The system of notation in common use, whereby we express not merely numbers, but parts of numbers, supplies us with means of comparing arithmetically together either the greatest or the minutest magnitudes, to which there is absolutely no limit. The proportion, for instance, that the circumference of a circle bears to the diameter, though it

cannot be stated with arithmetical exactness, has been cal- |

culated to upwards of 200 decimal places,—a nicety for which the vast dimensions that science discloses in the physical universe furnish no means of comparison what- ever. For let it be supposed that a circle were described, with a point on the earth's surface as centre, so as to extend beyoud the most distant star that can be discerned by the most powerful existing telescope, that the radius of the circle were known, and that the

circumference were computed from it, it does not appear that an error in the thirtieth decimal place would be of such magnitude that the keenest vision, aided by the most powerful microscope, could detect it.

In all systems of number, with the exception, perhaps,

of the very rudest, numerical conceptions are aided by the introduction, usually at a very early stage, of methods of grouping. In nearly every case the methods adopted con- nect themselves with the number of the fingers, either of one or, more usually, of the two hands. Having reached 5 or 10, the reckoner proceeds by adding to these the prior numbers; and when a second 5 or 10 is reached, a new word or sign is employed, the significance or derivation of which is generally well marked in the name or form it bears. Similarly when (say) five fives or ten tens are reached, a fresh startis made. These processes of grouping are of great importance, conveying clearer conceptions than could otherwise be obtained of the relative magnitudes of numbers, An additional evidence of the value of the prin- ciple is to be found in certain numerical combinations which are not additive, as such combinations mostly are, but subtractive. Thus, if a conception be formed of 10, and again of 20, 19 and even 18 will connect themselves more readily with the latter than with the former, and so we have such forms as duodeviginti and undevginti; and there is little doubt that similar considerations, in combina- tion with a regard for brevity of expression, have led to the use of the subtractive forms IX., XL., &c.

2. There are two ways in which numbers are represented, —either in words or by particular characters or symbols. It is with the latter that arithmetic has more especially to do, the numerous important and interesting questions that relate to word-numerals falling rather within the domain of language. It is only in so far as they arise out of the systems of grouping already referred to, suggesting in their formation such processes as addition or multiplication, that these call for any notice here. Dr Tylor (Primitive Cul- ture, chap. vil.) gives a variety of remarkable collocations of this sort, as well as of descriptive numerals, that are in use among different races and tribes.

There is also a common use of characters to represent numbers which does not properly belong to this subject. The letters A, B, C, &c., or a, B, y, or

the like, the order of whose succession is fixed, are often employed to indicate numerical order, either singly or in combination with numerals proper. This is not, however, an arithmetical use of the characters; they are merely ordinals, and cannot furnish a basis for calculation.

The origin of the various characters which have been employed te indicate numbers proper, and by means of

aki'

which computations can be effected, is in most cases alpha- betical. In the Hebrew and Greek notations, for instance, the letters were taken in the main in their alphabetical order, being divided into three groups, of which the first represented units, the second tens, and the third hundreds ; and very similar systems have been in use among other nations. As the Hebrew alphabet contained no more than twenty-two letters, the numbers from 500 to 900 -were represented by five final forms, and sometimes by additive combinations with N, 400. The following is the usual Hebrew notation, numbers exceeding nine being made up by placing the larger numeral characters first :— S a A 4 nN 1 t n 6 1 2 3. 4 5 677 8 “) a

wee ss es fo UetlhwelCUS m 20 80 40 0 60 70 80 PFU NY) ie

100 200 300 400 500 600 700 800 900

The ordinary Greek notation has not merely a general resemblance of structure to the Hebrew, but corresponds to it closely, character for character, up to 80. The Greek alphabet consisting of twenty-four letters, three additional characters were introduced. The first, for 6, occupying the place of }, is « (named orai), which was afterwards used as a contraction for or; the others, for 90 and 900, were named xérma and capa respectively, and written ? or 4 and %). The notation is thus as follows :—

wo oy 6) Fk gc & y 8 1: 2 3 4 5 6 a Fs 9

a Qor 4

90

t K r pe Vv é o 1” 80 30 “20 50 Go 70 ‘80 90

ain nm & exe » »

100 200 300 400 500 600 700 800 900

To distinguish the numeral letters an accent was written after the last,~~thus, 38 was Ay’, while thousands were indi~~ cated by writing the accent below,—thus, 3 was 4000. The letter M (for pupéor) increased the numeral 10,000 times. Fractions were separated by a space from the integers they were affixed to, and the denominator was written like an index or power in our notation,—thus, py Ge was 43,%..

In addition to this another entirely different notation is found in Greek inscriptions. It more nearly resembles the Roman system, the numeral characters (except the first) being the initials of the numeral names, and being repeated till the number to be signified was expressed, I represents 1, II (zevre) 5, A (8éka) 10, H (éxarov, the aspirate being written as an H) 100, X (xéAvor) 1000, M (yuptor) 10,000. Characters enclosed within three lines (forming a II) are thereby multiplied by 5. To gave an

example, in this notation (| HH [al AIIIII represents

768.

The Roman system, with which we are still familiar nearly in its completeness, employsthe letters of the alphabet, but is not based upon alphabetical order. Many attempts have been made to account for the symbols, and the com- plete solution of the problem of their origination is perhaps unattainable. Sir John Leslie, following some writers of the 16th and 17th centuries (see in particular the Cursus Mathe- maticus of Dechales, vol. i. 1674, 2d ed. 1690), advocated the opinion that, one line or stroke being taken to repre- sent the unit, when ten of these were set down, a stroke would be drawn across them in a slanting direction to cancel them, and the unit stroke and cancelling stroke would thus give the form X for 10; that a repetition of this proceeding would give a third stroke when 100 was

reached, and the three might take the form [_ or C ; and that, similarly, the combination of four strokes would give

M for 1000. This explanation is perhaps too ingenious.

It has the merit of accounting for the X (the crus of the method), which may have been introduced in some such way. But one does not readily see how the [~ could be formed from the X or the M from the [_; and it appears far more likely that the signs for 100 and 1000 are merely

the initial letters of Centum and Afille,—all the more that the very ancient notation noticed above as found in Greek inscriptions has evidently an origin of this kind. In any case V, L, and D appear to be respectively the halves of X, the angular C ({_), and the rounded M (m). The ancient forms of Dand M, viz., 10 and CIO, have ceased to be familiar. By an extension of this style of characters, 100 denoted 5000; CCIOO, 100,000; CCCIOOD, 1,000,000, &c. 'To represent two, three, &c., millions, the CCCIOOO was repeated the required number of times.

The Roman notation employs fewer characters than the Greek, and makes greater use of combinations. One is repeated up to four; to the new character for five, ones are repeated up to nine; ones are added to the ten

character; at fifteen the five enters, and so at twenty-five, &c.; for the tens up to fifty the ten is repeated, and so on,—the symbols I, V, X, L, C, D expressing all numbers by regular com- binations up to M, a thousand. The subtractive colloca- tions, IV, IX, XL, XC, now the ordinary, were originally alternative forms, as were also the rarer combinations ITX for 8, XIIX for 18, XXC for 80, &c. To the extent cf these subtractive forms, the values of the characters depended on their position, a smaller number being added to a greater when it followed, and subtracted from it when it preceded it. This element of position is, however, an irregular and exceptional one; and, instead of being of such advantage as the local value of the Arabic notation, is rather a hindrance in calculation.

Far superior to all the ancient systems, and indeed to every other system that exists, is the arithmetical nota- tion that is in common use. The Arabic numerals, as they are called, are ten in number, nine of them repre- senting the first nine numbers, and the tenth, the cipher or zero, indicating the absence or negation of numerical value. The significance of these figures or digits depends on their relative position, and the great merit of the system is due to this element of local value. Standing singly, the figures denote simply one, two, three, &c.; but in combina- tions of them every removal towards the left increases the value of the figure ten times. In 5673, for instance, the 3 denotes three, the 7 seven tens (70), the 6 six times ten tens (600), the 5 five times ten hundreds (6000). Should any of the series of tens be wanting, as in nine thousand and forty-eight, where hundreds do not occur, the place is supplied by a cipher, which throws back the digit that expresses thousands into its proper place, thus 9048. It is by this use of the cipher in supplying blanks, and so regulating the places of the significant digits, that the principle of local value is carried out. See further the sec- tions on notation and numeration below, p. 527.

The ordinary numerals are called Arabic, and it appears to have been through the Arabians that they were introduced into Europe; but they are now generally acknowledged to be of Indian origin. As may be imagined, they have passed through a great variety of forms, oue of the earliest types of them being the Devanagari, a species of Sanskrit numerals. In the early Indian treatise of Bhascara and Brahmegupta, translated by Mr Colebrooke (see article Aucepra, p. 517 of vol. i.), as well as in the still earlier writings

of Arya-Bhatta, there are both indications and illustrations of the use of the nine digits and the cipher;

and the system is thus traced back to the 7th, and in all probability to the 5th century of the Christian era. Even then it was evidently no novelty, but is alluded to as hold- ing an established position; and the Hindu writers nowhere lay claim to the invention of it, but constantly assign to it a supernatural origin. The method was known to the Arabians in the 9th century; and in the course of the 10th it seems to have come into general use among them, espe- cially in their astronomical writings and tables, It was probably in the following century that the Arabs intro- duced the notation into Spain; but in regard to this we have no explicit information, and different accounts are given of the earliest instances of the use of the system in Europe. On the one hand, it is alleged that the figures first occur in a translation of Ptolemy, of the date 1136, while others maintain that they were introduced (about 1252) by means of the celebrated astronomical tables pub- lished by and named from Alphonso the Wise. That their use was known in Italy at the commenceinent of the 13th century, appears to be satisfactorily established, for there is no good reason to doubt the genuineness of the MS. writings of Leonardo of Pisa, copies of which have been found bearing the dates 1202 and 1220. Numerous other instances are given of the early use of the nine figures and the cipher, especially by astronomers, and in calendars. The great superiority of this to earlier modes of numerical ex- pression became gradually apparent, and in course of time it came into almost universal use among civilised nations.

For a time there was, not unnaturally, considerable in- exactness or confusion in the employment of the notation. In early writings such combinations are found, for example, as X2 for 12, 301 for 31, &c. In the latter case the law of local value is lost sight of, and the characters 30 are used as equivalent to thirty, irrespective of their position.

3. Calculation or computation by means of numerical characters is what is ordinarily regarded as the distinctive province of arithmetic, and the worth of a system of nota- tion is to be estimated by the facilities it affords for the operations of reckoning. The methods in common use will be detailed, and

the principles on which they depend briefly expounded, in subsequent sections of this article.

Computation of a comparatively rude kind was often carried on in ancient times, and is practised still in some countries, by what are called palpable methods,—as, for instance, by means of counters, or by balls strung on rods or running in grooves. Of this the abacus of the Romans (used too, but not so generally, among the Greeks), the swan-pan, still in constant use among the Chinese, &c., are examples. (See ABacus, vol. i. p. 4.)

The methods that preceded the adoption of the Arabic nunierals were all comparatively unwieldy, and very simple processes involved great labour. The notation of the Romans, in particular, could adapt itself so ill to arithmetical operations, that nearly all their calculations had to be made by the abacus. One of the best and most manageable of the ancient systems is the Greek, though that too is very clumsy, as may be seen from an elementary example.

Let it be required to muliply 862 by 523, z.e., w&' by

dy'. The product of w and ¢ is 400,000, 1. fy; of € and ¢, 30,000, or y,; of B w€B and ¢, 1000, or «. Similarly the multipli- Pxy

cation of w by « gives 16,000, or a, 53 of PuYx & Eby x, ao; of B by x, p; of w by y, Bu; of € by y, pm; and of B by y, s-. These Ao may be arranged in some such order as in Bu the margin, and summed. The result is fu &e OKS , OF 450,856.

The notation employed here extends to hundreds of millions. A scheme proposed by Archi- medes, the wost distinguished mathematician of anti-

Bs €x

ARIV SUF riec ,

quity, in his work entitled Woppirys, Arenarius, goes far beyond this. Taking the limit of the ordinary system, viz., a myriad of myriads, or 100,000,000, as the basis of a new scale, he treats of numbers formed by the continued

pro- duct of that amount repeated eight times, extending to sixty-four places in our notation, These he divided into what we should call periods, of eight figures each, to which he gave the name of octades, He thus appears to have to some extent anticipated the modern method of grouping, though, from the want of knowledge of the principle of local value, the practical advance he made was unimportant. Apollonius of Perga, who flourished a little after the time of Archimedes, took the myriad as the basis of his system, and repeated the sign Mv for each product of a myriad; thus ASMv.Mv.Mv indicates what we would write as 34,000,000,000,000. But his most important contribution to arithmetical science was his grouping the tens in mul- tiplication, so as to connect large numbers, as far as pos- sible, with those we represent by the nine digits. He thus endeavoured, and with some measure of success, to remedy the defect of the general system arising from the want of apparent connection of such characters as \ and 7, for example, or + and w, with what he called their bases, y and y. It is chiefly in the commentaries of Eutocius on the works of Archimedes and Apollonius that the examples of the ancient Greek arithmetic which we possess are preserved.

The operations of the Greek arithmetic involving frac- tions were necessarily very complicated. A simpler system was introduced (by Ptolemy, according to his commentator Theon, but it appears to have existed before his time) in what are known as sexagesimals, which are precisely analo- gous to the duodecimals by which we sometimes calculate areas. The division of the circle into 360 degrees arose, no doubt, from 360 approximating the number of days in the year, and containing a large number of divisors. The radius of the circle, or side of the inscribed hexagon, subtended at the centre 60 of these degrees, and from this the degree was again divided into 60 parts called minutes, the minute into 60 seconds, &c., just as the foot is divided into 12 inches, the inch into 12 seconds, &c., in duo- decimals. The sexagesimal system, though applied in the first instance to circular, was also employed in linear, measurements. As an example, the square of XC 8 ve, we., of 37° 4’ 55’, will be found to be roe 8 & u xe, 2.¢., 1375° 4’ 14” 10” 25” ”. The numerals beyond 60 or € being dis- pensed with in this system, the next letter, 0, was used to denote zero; and it has been conjectured that this may have been the origin of the form of our cipher.

The most important step in the progress of modern arith- metic was the introduction of decimal fractions, and the extension of the Arabic notation to the expression of them. The first writer who advocated and exemplified the use of decimals was Simon Stevin de Bruges, better known as Stevinus, in a paper (Za Disme) published about 1585; but he employed an awkward notation, and it was only after a considerable period that they assumed the form— entirely consistent with the notation of integers—with which we are familiar. From a form which Lord Napier employs in his Rabdologia (1617), the introduction of the decimal point (as a comma) has been ascribed to him, but apparently without sufficient evidence.

The following writers on arithmetic may be named, in addition to those already mentioned:—Diophantus, who flourished in or about the 4th century; Maximus Planudes, who died about 1350; Lucas Pacioli (de Burgo, or di Borgo), whose Summa de Arithmetica (1494) was the first work on algebra printed, and one of the earliest on arith- metic ; Bishop Tonstall, whose De Arte Supputandi (1522) was the first work on the subject printed in English ;

Notation.

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Robert Recorde (died 1558), whose Grownde of Artes and Whetstone of Witte were arithmetical works of great value ; Nicolo Tartaglia (died 1559); Michael Stiefel or Stifelius (1486-1567), said to have been the inventor of the signs + and —; Peter Ramus (1515-1572); Albert Girard (died 1634); William Oughtred (died 1660); Edward Cocker, whose Arithmetic (1st ed. 1677), a posthumous work, and probably a forgery, is of slight merit, though it passed through many editions; Kastner (Geschichte der Mathematik, 4 vols. 1796-1800); Montucla (Histoire des Mathématiques, vol. i. 1799); De Morgan (Arithmetical Books, 1847). By far the best history of arithmetic is that of Dr George Peacock, late Dean of Ely, published in the Encyclopedia Metropolitana.

Of recent works on arithmetic there is great abundance, and many of them are of great excellence. They usually contain statements of modes of operation, under the name of " Rules," with a number of examples under

each for practice ; and not a few of them give in addition explana- tions of the rationale of the methods.

In the following sections the ordinary processes of arith- metical calculation and their commonest practical uses are briefly explained. The various methods of operation are given with greater or less detail, as has appeared necessary for the exposition of the principles on which the operations depend ; and light is in many instances thrown on both processes and principles by illustrative examples, For further examples the reader is referred to the manuals above alluded to. The earlier sections, forming the greater part of the article, are occupied with numbers in the ab- stract, and the remainder with arithmetic in its practical applications.

T. Apstract ARITHMETIC.

1. Notation is the name usually given to the expressing of numbers by means of characters or figures.

The number ten is the basis or radix of the Arabic sys- tem of notation, and every number may be expressed in that notation by combinations of the ten digits, or numeral figures, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, the last (the cipher or zero) having no value except in combination. When several of these are placed together, every removal towards the left increases the value of a figure ten times. The figure placed furthest to the right has the same significance as when it stands alone, z.e., it represents units, the figure next to it denotes tens, the next hundreds, the next thou- sands; 8735 is therefore read as eight thousand seven hundred and thirty-five. With more than four figures we should have—still proceeding to the left—tens of thou- sands; then hundreds of thousands, and then thousands of thousands; but instead of this we use the term millions. A million of millions is a billion,! and a million ef billions a trillion. A digit followed by three figures thus expresses thousands; by six figures, millions; by twelve, billions ; and so on. Beyond trillions we have—taking the figures in groups of six—quadrillions, quintillions, sextillions, sep- tillions, octillions, nonillions, &c. But occasion is very seldom found to employ these terms, and indeed it is diffi- cult to form any distinct or definite idea of even a billion.

The system of notation in ordinary use is remarkable at once for its simplicity and its completeness. The selection of ten as the basis or radix of the system (whence numbers expressed in this way are said to be in the denary scale of notation) is in all probability to be traced to primitive

1 In France, and by a few English writers, a thousand millions is called a billion, a thousand billions a trillion, &. The ordinary Eng- lish usage is at least as convenient, and agrees (which the other does not) with the etymological formation of the words—the billion, tril- lion, quadrillion, &¢., being respectively the second, third, fourth, &c., powers of a million.

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calculations by meaus of the ten fingers. Ten is well chosen, being neither too large nor too small, but twelve might, in some respects, have been found more convenient. All numbers can be expressed with twelve or any other number as basis, just as with ten.?

2. Numeration is the art of reading figures employed to Numera- express numbers. The following table shows the places tion. of the figures, as already described, up to billions :—-

(1.) Units. (2.) Tens. (3.) Hundreds. (4.) Thousands. (5.) Tens of thousands. (6.) Hundreds of thousands. (7.) Millions. (8.) Tens of millions. (9.) Hundreds of millions. (10.) Thousands of millions. (11.) Tens of thousands of millions.

(12.) Hundreds of thousands of millions.

(13.) Billions.

The figures 8,607,034,740,952, for example, are read thus: —Eight billions, six hundred and seven thousand and thirty-four millions, seven hundred and forty thousand, nine hundred and fifty-two. Ciphers are passed over in reading, their function being to determine the proper posi- tion of the significant figures. When the number of figures exceeds four, it is usual to print them off as above in groups of three, by means of commas. At the odd

commas, reckon- ing from the right hand, we always read thousands ; at the even commas, millions, billions, &c.

3. Notation has, in addition to the general meaning already explained, a special signification as the converse of numeration, 7.¢., it is the art of representing by figures numbers that are given expressed in words.

4, Addition is the method of finding the sum of two or Addition. more given numbers, that is, the number to which they amount when taken together.

Suppose a column, added in the ordinary way, amounts to 34. The 4 is set down under the column, and the 3, representing 30, is added with (or, as usually expressed,

" carried to") the next column.

5. Subtraction is the method of finding the difference Subtrac- between two given numbers, that is, the number by which tion. the greater number exceeds the less, or the remaander after the less is taken from the greater.

In subtracting, say, 38 from 92, since 8 cannot be taken from 2, we "borrow" from the place of tens, «.¢., the 2 is increased by 10, and 8 taken from 12 leaves 4. The 10 added (or "borrowed") has to be taken away again, and this is done by taking 1 from 9 in the place of tens. But 3 has also to be taken from this 9; so first of all the 1 and 3 are added together, z.c., 1 is "carried" to the 3, aud 4 taken from 9 leaves 5, giving 54 as the complete re- mainder. The "borrowing" process depends on the con- sideration that when the same amount is added to both numbers their difference is unaltered—it being remembered that ten in the upper line corresponds to one a place to- wards the left in the lower line.

6. Multiplication isa method of finding the result pro- Multipli- duced by adding a given number taken a given number cation. of times. The number to be repeated is called the multiplicand ; the number expressing the times it is taken,

the multiplier; and the result obtained, the product. The

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2 With twelve as basis (i.¢., in the duodenary scale), the number represented by the figures 8735 would be the sum of 8×12×12×12, 7×12×12, 3×12, and 5, ze, 14,873 in the ordinary or denary scale. To convert 8735 of the denary into the duodenary scale, we find the twelves in it, that is, divide it by 12, the quotient by 12, &c. This gives (using the character e¢ for eleven), 507e.

Division.

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multiplicand and multiplier are also said to be factors of the product.

The multiplicand might be written down the required number of times, and the sum found by addition. But this tedious process is unnecessary when the numbers to be added are all the same. We do not then require to pass from figure to figure, as when they are different. In adding six nines, for instance, we do not need to proceed step by step (as with 6+5+9+8+46+47=41), but know the result, 54, at once from a table of products which is committed to memory.

When two numbers are to be multiplied together, either may be taken as the multiplier. For it is evident that the four rows of dots, five in a row, in the margin, are the same as the five rows, four in a row—accord- ing as we take the rows horizontally or vertically ; that is, 4 times 5 and 5 times 4 amount to the same number.

The process of multiplication by a single digit—by 8, for instance—is nothing but an abridgement of the operation of writing the multiplicand eight times and adding. When there are more digits than one in the multiplier, we arrange the successive products in the well-known fashion, because the multiplication has to be by 10 times the second digit (counting from the right), 100 times the third, and so on. Thus, in multiplying 92058 by 734, the 2 of the multipli- cand is really 2000; the 3 of the multipher, 30; and the product of these, 6, 2.¢., 60,000, falls by the ordinary pro- cess Into its proper place.

The process of working may sometimes be considerably shortened by multiplying a product already obtained. Thus, to multiply by 568, we may multiply first by 8, and then take 7 times the result, obtaining the product by 56 at once. So with 549378, we may begin with 9, and mul- tiply the 9 product by 6 for 54, and the 54 product by 7 for 378, observing to arrange the lines correctly, by placing under the right-hand figure of every multiplier the right- hand figure of the corresponding product.

7. Division is the method of finding how often one given number contains another.

Of these two numbers, the former is called the dividend, and the latter the diwvsor. The number expressing the times that the first contains the second is called the quo- tient. When the number of times is not exact, the excess of the dividend over the divisor taken the greatest number of times that the dividend contains it exactly is called the remainder.

As multiplication is a short method of addition, division (which is the converse of multiplication) is an abridged subtraction. Were we to subtract the divisor from the dividend, subtract it again from the remainder, and con- tinue the process till a remainder less than the divisor were obtained, the number of subtractions would give the re- quired quotient. But this operation is greatly shortened by means of multiplication. Thus, if it is required to find how often 9 is contained in 49, remembering that 5 × 9 is 45, and that this is the nearest product not greater than 49, we have at once the quotient 5 and remainder 4.

In dividing, eg., 167685 by 287, by the ordinary pro- cess of long division, we find (after, it may be, a trial or two) that 1676 is more than 5 times but less than 6 times 287. The first quotient figure is therefore 5, represent- ing 500; and proceeding in the customary way, we take from the dividend 500 times the divisor, then 80 times, and then 4 times, with 77 over. The dividend, therefore, contains the divisor 584 times, with a remainder of 77.

When the divisor does not exceed 12, the operation is conducted mentally, and the quotient set down at once. This is called short division. If the divisor is made

up of factors not greater than 12, short division may be employed, the factors being taken in succes-

sion. When there are two such divisors, the 6)4352 remainder of the whole division is obtained 8)725—2 from the partial remainders, by multiplying "GGL_5 the second of these by the first divisor, and

adding the first to the product. Thus, in the annexed example, division by 48 gives a remainder of 32, for it will be seen that 725 is 5 more than 8 times 90, and 4352 is 2 more than 6 times 725. Therefore, 4352 is 2 more than the sum of 48 times 90 and 6 times 5, 2.¢., it exceeds 48 times 90 by 6×5+2=82, or contains 48 90 times and 32 over.

Measures and Multiples of Numbers.—8. A measure of any Measures number is a number that divides it without a remainder. and A multiple of any number is a number that it divides with- ™ultiples, out a remainder. A common measure, or common multiple of several numbers, is a number which is a measure or a multiple of each of them. Thus, 3 is a common measure of 12, 18, and 24; 60 is a common multiple of 6, 10, and 15. A measure of a number is sometimes called a sub- multiple of it.

A prime number is a number which no other, except unity, divides without a remainder ; as 2, 3, 5, 7, 11, 13, 17, &e. Numbers which are divisible by other numbers without remainder, that is, which can be resolved into factors, are called composite numbers; as 4, 6, 8, 9, 10, &c. Any factors into which a composite number can be divided are called its component parts. Numbers are said to be prime to each other when they have no

common measure, as 15 and 28. The prime factors of a number are the prime numbers of which it is the continued product. Thus, 2, 3,

7 are the prime factors of 42; 2, 2, 3, 5, of 60.

9. To find the greatest common measure of two given Greatest numbers, the greater number is divided by the less ; the common former divisor is then divided by the remainder, and each ™°*™™ *successive divisor by the remainder obtained in dividing by it, till there is no remainder. The last divisor is the greatest common measure.*

This depends on the two following principles :—(1.) If a nuniber measures any other, it measures every multiple of that other ; for obviously, since 7 measures 56, it also measures 12 times or 17 times 56; and, (2.) Every number that is a common measure of two others measures also their sum or their difference; for the sum or difference of, say, 13 times 8 and 22 times 8, must, it is evident, be some multiple of 8.

Thus, to find the greatest common measure of 475 and 589, dividing 589 by 475, we have the remainder 114 ; dividing 475 by 114, we have the remainder 19; and 114 divided by 19 leaves no remainder. Therefore, 19 is the greatest common measure. For any number that measures 589 and 475 will measure their difference, 114, and will, therefore, measure 456, which isa multiple of 114. Also, any common measure of 475 and 456 will measure their difference, 19. Therefore, no number greater than 19 can measure both 589 and 475. Again, 19 will measure both, for it measures 114, and therefore measures 456, a multiple of 114. Hence it measures 475, which is 456 +19, and also 589, which is 475+114. Therefore, 19 measures both numbers, and since no greater number does so, it is their greatest common measure.

In seeking for measures or factors, it will be of advantage to attend to the following properties of numbers. (For the sake of brevity, we use "divisible" here for "divisible without remainder.")

(1.) A number is divisible by 2, if the last digit is divisible by 2; by 4, if the last two digits are divisible by 4; and by 8, if the last three digits are divisible by 8.

For, to take the last case, the figures preceding the last

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three are a multiple of 1000, which is a multiple of 8. If, then, the last three figures are divisible by 8, so is the whole number.

(2.) Similarly, and for precisely similar reasons, a num- ber is divisible by 5, if its last digit is so; @.e., if the number ends with 5 or 0; by 25, if it ends with 25 or 75; and by 125, if it ends with 125, 625, 375, or 875.

(3.) A number is divisible by 9 when the sum of its digits is so divisible. This is a case of the important pro- perty that the division of a number by 9 produces the same remainder as the division of the sum of its digits by 9. Taking any number, e.g., 583, we see that it is made up of 58 tens and 3; that is, of 58 nines and 58 and 3. Again, 58 is 5 tens and 8; that is, 5 nines and 5 and 8. ‘Thus, 583 is made up of 58 nines, 5 nines, and 5+8+3; that is, of nines + the sum of its digits. Therefore 583 and 5+8+3 must give the same remainder when divided by 9.

A proof of multiplication, by ‘casting out the nines,” depends on this property. If a number, made up, say, of nines and 7 over, be multiplied by another made up of nines aud 5 over, their product must be nines and 35, that is, nines and 8 over ; and unless this relation holds good, there must be an error in the multiplication.

(4.) Similarly, a number is divisible by 3, if the sum of its digits is so ; for, if every number be made up of nines and the sum of its digits, it must be made of threes and the same sum.

(5.) A number is divisible by 11, if the sums of its alternate digits are equal, or if they differ by a multiple of 11. ‘Take any number whose alternate digits are equal, or differ by a multiple of 11, as 8294. This is equal to the sum of 8000, 200, 90, and 4; that is, of 80 times 99, 80, twice 99, 2, 90, and 4. Leaving out the multiples of 99 (as being multiples of 11), we have 80+90+2+4. But as 2+4 and a multiple of 11 give 8+9, therefore, if

80+90+2+44 be divisible by 11, so must 80+90+8+9 be, and vice versa. But 88+99 is divisible by 11; so, therefore, is 80+ 90 + 2+ 4, and so also 8294.

If, in finding the greatest common measure by the method described, a divisor occurs containing a factor that evidently does not measure one of the numbers given, that factor may at once be omitted, since it can be no part of the common measure. Thus, in finding the greatest com- mon measure of 59241 and 223014, we get 13950 as a divisor. Now, 50 divides this, z.e., 5 × 5 × 2, and neither 5 nor 2 measures the first of the given numbers. We can therefore reduce 13950 to 279 at once, whence we im- mediately find 93 to be the greatest common measure.

10. To find the least common multiple of two given numbers, divide either of the numbers by the greatest common measure of the two, and multiply the other num- ber by the quotient. Thus, the greatest common measure of 30 and 48 is 6. Therefore the least common multiple is 48 ×5 or 30× 8, a¢, 240. For the product 5× 6×8 is evidently a common multiple of 30 (i.e. 5 × 6) and 48 (z.e., 6 × 8), and since 8 and 5 are prime to each other, this product must be the least that contains both 5 × 6 and 6 × 8.

To find the least common multiple of any given num- bers, arrange them in a line, and strike out any of them that measure any of the others; take any number that measures all or part of the remainder, and divide all that it measures by that number, setting down the quotients and the undivided numbers in a second line ; proceed with this second line as with the first, and continue this process till a line is obtained of numbers prime to each other. The continued product of the divisors and the numbers in the last line is the least common multiple required. This de- pends on the principle just demonstrated, that a common

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factor of two or more numbers needs to be taken but once for the common multiple.

In finding the least common multiple of 42, 45, 50, 54, 60, 63, 70, 75, and 90, for instance, we may divide in succession by 5, 7, 5, and 6. It is evident

that 45 may be omitted, since it will measure every multiple of 90. The division by 5 is virtually the substitution for 50, 60, 70, 75, ane 90, of the product 5×10×12×14×15~x 18, which is manifestly a common multiple of them. Then 14 and 18 are omitted, being contained in 42 and 54, Next we substitute for 42 and 63 the product 7×6×9; omit 6 and 9 as being contained in 54; then take 5 × 2 × 3, instead of 10 and 15; omit 2 and 3, as measures of 12 ; and, lastly, substitute 6× 9× 2 for 54 and 12. The pro- duct of 5, 7, 5, 6, 9, 2, gives 18900 as the least common multiple.

If the divisors are all prime numbers, the result must be the least common multiple ; and it is better to avoid using composite numbers as divisors, except when they measure all the numbers in the line. Had 10, for instance, been taken in the example as the first divisor, 75 would have remained in the second line, and the result obtained would have been five times too great. It is often found conveni- ent to write the prime factors of the least common multiple, which is in the example 2× 2×3×3×3×5×5× 7.

Fractions.—11. If unity be divided into any number of Fractions.

equal parts, one or more of these parts is called a frac- tion. If, for example, we divide unity into 7 equal parts, and take 5 of these, we shall obtain the fraction we speak of as five-sevenths. (This, and what follows, may be familiarly illustrated by taking any object and dividing it in the way described—a a line, for instance, thus, ie |

There are two kinds of fractions—Vulgar Fractions, often spoken of simply as Fractions, and Decimal Prac- tions or Decimals.

A vulgar fraction is represented by two numbers, called the terms of the fraction, which are written, the one above and the other below a horizontal linc; thus, the fraction already mentioned is written #7. The number under the line indicates the number of equal parts into which unity is divided, and is called the denominator, as showing the " denomination" (see § 32) of the fraction. The number above the line, indicating the number of those equal parts that the fraction consists of, is called the numerator.

The most usual definition of a fraction is that which is given above. But it may be also defined or regarded as one number divided by another, the

numerator being the dividend, and the denominator the divisor. Thus, the fraction 3, which we have interpreted to mean 5 of the 7 parts into which unity is supposed to be divided, may also be regarded as the seventh part of 5 units. For, if each of 5 units be divided into 7 equal parts, there will be in all 35 of these parts, each of them equal to the seventh part of unity, and the seventh part of these 35 parts is 5 of them. That is, the seventh part of 5 units is the same as 5 seventh parts of unity, or + according to the former definition. It follows from this that, when there is a remainder after division, the quotient is completed by the addition of a fraction, of which the remainder is the

1 Though the word employed to express the denominator (eg., the "sevenths"' in " five-sevenths"') agrees in form with the ordinal nume- ral, this use of it is not ordinal. The seventh day means the seventh in order of time ; but the seventh part of a day is one, any one of seven equal parts into which the day is regarded as divided. Some such distinct name as 'fractional numerals" should be given to the words when used in the latter sense. The expressions "first part" and "second part" are never used in the fractional sense. For the latter "half" is used; there is no fractional corresponding to the former. ws, however, is called the thirty-second part; and so gy, 3, &., are read nine thirty-seconds, four twentyjirsts, &c.

numerator, and the divisor the denominator. For, let it be required to divide 76 by 9. Since 72 divided by 9 gives the quotient 8, and 4 divided by 9 gives §, 76 divided by 9 must be 8%.

A proper fraction is one whose numerator is less than its denominator ; as =2;, 32. An improper fraction is one whose numerator is not less than its denominator; as 3, 3. A proper fraction is evidently less, and an improper frac- tion not less, than unity. A mixed number is an integer or whole number with a fraction annexed to it; as 8}, 5,1. The integer and fraction here are to be considered as added together. A simple fraction is a single fraction that has both its terms whole numbers; as 4, §. A com- pound fraction is a fraction of another fraction, or of a whole or mixed number ;

*as 2 of 8, 2 of 103. A complex fraction is one that has a fraction or mixed number for one of its terms or for both; as – * ot. i ae said to be in tts lowest terms when the numerator and denominator have no common divisor.*

12. If both terms of a fraction be multiplied, or both divided, by the same number, the value of the fraction will remain unchanged. For, if unity be divided into 7 equal parts, and again into 28 equal parts, it is evident that each of the former parts will be identical with 4 of

A fraction is

the latter. 5 of the former will thus be equal to 20 of the latter ; that is, $= 32.

13. We multiply or divide a fraction by any number, if we multiply or divide the numerator by it. For it is evident that four times 2 is 8, since unity is divided into 9 parts in both cases, and the number of parts taken in the one case is four times the number taken in the other. Conversely, dividing $ by 4, we have 4.

To multiply or divide either term of a fraction is the same as to divide or multiply the other. If, for instance, we divide the denominator by 3, we divide unity into one- third of the number of parts, and each of these parts must thus be three times greater than before. The fraction is therefore multiplied by 3. Or otherwise, dividing the denominator of 2 by 3, we obtain 2; and multiplying the numerator by 3, we get $, which (§ 12) is the same as 3. Therefore, to divide a fraction, we may multiply the de- nominator,—a method which must be employed when the divisor is not a measure of the numerator.

14. To reduce a fraction to its lowest terms, divide both terms by their greatest common measure. The reason of this is evident from the definitions. The value of the fraction remains unchanged (§ 12). The results of opera- tions in fractions should, with rare exceptions, be expressed in their lowest terms.

15. To reduce a mixed number to an improper fraction, the integer is multiplied by the denominator of the frac- tion, and the numerator added to the product. This gives the numerator of the required improper fraction, and the denominator of the given fraction is its denominator. Take, ¢eg., 45. If unity be divided into 8 “equal parts, 4 units will make 32 of these parts, and the fraction } con- tains 5 of them; therefore 43=47. Conversely, to re- duce an improper fraction to a whole or mixed number, divide the numerator by the denominator ; the quotient is the integer required, and the remainder, if there is one, is the numerator of a fraction of which the given denominator is the denominator. Thus, 22 =5%; for, if unity be divided into 7 equal parts, 35 of these parts will be the same as 5 units ; therefore 38 parts will be 5 units and 3 parts, z.<.,

38_ 3 <7 = 57

16. To reduce a compound fraction to a simple one, multiply the numerators together for the numerator of the simple fraction, and the denominators together for its

denominator. divide unity into 7 equal parts, and each of these again into 4, we shall have for the fraction 7 20 of these parts, i.e, 22 of unity. The fourth part of this is 5 of these

these numbers, we have 334, value of the fractions has not bcen altered, and all have now the same denominator, 180, which we must obtain in .

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Thus, 2 of § is equal to 33. For, if we

parts, and therefore # is 15 of them, i.¢., 3 of $ is 33.

Mixed numbers inust be put in the form of improper fractions before the multiplication. The reduction of the result to its lowest terms may be effected by. removing before multiplication any factors that are common to the numerators and denominators.

In such compound expressions as where one number is spoken of as one-fourth greater or less than another, the fourth is always to be taken of that number with which the comparison is made. Thus, 30 is one-fifth more than 25 (c.¢., 4 of 25), but 25 is one-sixth less than 30 (7.¢., § of 30).

17. In order to compare the values of fractions, or to add or subtract them, it is necessary to reduce them to others of equal value that have the same denominator. From the definition of a fraction we see at once that 7 is greater than 4, but we do not readily see whether 3% is greater or less than 3. If, however, we take the equiva- lents of thesc fractions, }2 and ,%, unity being now divided into the same number of parts in both cases, we have like quautities to compare, and see that the former fraction is the greater. In practice it is usually the least common denominator that the fractions are compared by. To find this, we first find the least common multiple of the de-

nominators (§ 10), then divide this by the denominator of

each fraction separately, and multiply both terms of that fraction by the quotient.

Take, ¢.g., the fractions 33, 33, $4, and 3%. The least

common multiple of the denominators is 180, and dividing

this by 15, 20, 36, and 45, we get 12, 9, 5, and 4. Multiplying both terms of the fractions in succession by

153 155 152

+33, igo, and 735. The

each case, because we re-multiply the factors into which we resolved it. In practice, indeed, we merely divide 180

by 15, multiply 13 by the 12, and set down 180 under

156 at once.

18. To add fractions, reduce them to others having a common denominator, then add the numerators of these, and write the common denominator under the sum. Thus,

42-107 In each of the re-

50+154-42=107 of them, «e., 133.

Compound fractions must be reduced to simple ones before addition. Mixed numbers may be brought to im- proper fractions, and so added ; but it is generally prefer- able to add the whole numbers and the fractions separately, and then add the two results. The operation may often be shortened by first adding any of the given fractions whose denominator is considerably less than that of all the fractions; thus, to add 2, 13, 33, 38, the sum of the first three may be found first, amounting to 13%. The addition of 36 to this gives 25734.

19. To subtract fractions, reduce them to others having a common denominator, take the difference of the numer- ators so found, and write the common denominator under it. The principle is precisely the same as in addition.

Compound fractions must be simplified as in addition. With mixed numbers the subtraction will generally be best effected by treating the fractions separately, borrowing and carrying, if necessary, on the principle explained in $5. In subtracting 472% from 853%, for instance, borrow- ing 252 and carrying 1 gives 85443-48335 =37g32, OF

20. To multiply fractions, multiply the numerators together for the numerator of the product, and the de- nominators together for the denominator. Thus, in multi- plying & by 7, if we multiply § by 7, we have 35 (§ 13); but our multiplier, 7, is the ninth part of 7; we must therefore divide 35 by 9, which gives 35 (§ 13).

When there are several fractions to be multiplied con- tinuously together, we proceed in the same way. Mixed numbers are reduced to improper fractions, and common factors may be struck out, precisely as in § 16. When an integer has to be multiplied by a fraction, we may convert the integer into a fraction by putting 1 as the denominator ; or we may multiply the integer by the numerator of the fraction and divide by the denominator, since to multiply by % is, as has just been shown, to multiply by 7 and divide by 9. So, to multiply an integer by a mixed number, the common method is to multiply by the integer and the fraction of the latter separately, and add the results. In multiplying mixed numbers like 46} and 14} together, instead of using improper fractions, we may take the four products 46 × 14, 2× 14, 46 × 3, and 7 × 3, and add them. The amount is 644 + 334+ 1534+ 7, = 66245.

21. To divide fractions, invert the terms of the divisor (i.e, interchange the positions of the numerator and deno- minator), and multiply the dividend by the inverted fraction; thus, $+27=5x%=4§%. If we divide § by 7, we have # (§ 13). But since our divisor, , is the ninth part of 7, in dividing by 7 we divide by a number nine times too large. The true quotient must therefore be nine times 3, 1.6. $$

The common method of dividing an integer by a mixed number is a modification of this division. When, in dividing by 374, for instance, we multiply both divisor and dividend by 5, and then divide, we really multiply the dividend by ;%,5. Or the method may be explained on the principle (identical with that of § 12) that the multi- plication of the divisor and dividend by the same number dues not affect the quotient. As an instance of the divi- sion of a mixed number by an integer, let 398252 be divided by 54. The quotient is 73, with remainder 4022; and to obtain the complete quotient, this remainder must be divided by 54 (see § 11), giving +3§-x gy= gis; .¢., T3795 is the result of the division. ..

A complex fraction is reduced to a simple one by divid- ing the numerator by the denominator ; thus,

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*112 52 **

When one term only is fractional, it will be found conve- nient to multiply both terms of the complex fraction by the denominator that occurs in the fractional term ; thus, 13$ 133×4 55 5

Decimals. —22. In the ordinary denary notation, a figure in combination with others has only the tenth part of the value it would have if removed a place towards the left ($1); thus, in 374, the 3 signifies 3 times 100; the 7,7 times 10; the 4, simply 4. By an extension of this notation we obtain a species of fractions that are often of very great use, especially for purposes of comparison. If we mark the place of units by a point put after it, and write other figures after the point, we can denote by the first of these figures one-tenth of the value it would have in the units' place; by the second, one-hundredth part, and soon. In 374°691, then, the 6 is 6 times 74, «e., 35 ; the 9, 9 times ;45, or yo ; and the 1, avo0 Whence, by giving these fractions a common denominator and adding them, we have 374°691=374;5%y5. These decimal frac- tions or decimals, therefore, are fractions of which the numerator only is written, the denominator being the

continued product of as many tens as there are decimal figures.

In addition, subtraction, multiplication, and division of decimals, the operations are, and from the structure of decimals must be, the same as the like operations with integers. The position of the decimal point in the results is the only thing that needs particular explanation.

Results, it may be mentioncd here, are often expressed by decimals that are not exact, but approximate only, it being held sufficient to give the correct value to some assigned nuinber of decimal places. An amount correct to four decimal places differs from the true amount by less than the ten-thousandth part of unity. See above, p. 524.

To reduce a decimal to a vulgar fraction, write the deci- mal as the numerator of the fraction, and set under it for the denominator 1 followed by as many ciphers as there are decimal places. This follows at once from the definition of a decimal.

To reduce a vulgar fraction to a decimal, annex ciphers to both terms of the fraction—the same number in both cases ; divide both terms by the significant figures of the denominator, and then write the numerator as a decimal, pointing off as many decimal places (prefixing ciphers, if necessary) as there are ciphers in the denominator. (See also § 25, infra.) Thus, 735 =73085=r0000 = 0075. Here the vulgar fractions retain their values unchanged (§ 12), and from the last the decimal is set down accord- ing to the definition.

It very often happens that in dividing as above we find there must always be a remainder. In this case, however, a remainder we had before may soon recur, giving the same figure or group of figures over and over again in the quotient ; thus 47 is found to be °47222….. > tos is WOT AIT oc.» The recurring figures are distinguished by points placed over them, the above results being written

‘472 and ‘05729. We shall return to the consideration of these recurring decimals at § 26.

23. To add or. subtract decimals, write the numbers under each other, placing units under units, &c., add or subtract as with integers, and place the decimal point under the points in the given numbers. ‘This follows directly from the definition of decimals.

24. To multiply decimals, multiply as with integers, and point off as many decimal places as there are in both factors taken together. Thus, in 37°64 × 082 = 3:08648, the 4 and 2 in the factors are 745 and y¢oy3 their pro- duct is therefore zo soy t-¢., ‘00008; and so with the others.

If an approximate product be sufficient, the multipli- cation may be shortened thus. Let it be required to find the product, say, of 4°273 and 6°859 correct to three places of decimals. Write the figures of the multi-

plier in reverse order, with the unit figure 4273 under the third decimal place of the multipli- 9586 cand. Begin each multiplication with the 25638 figure above the multiplier, adding what has 3418 to be carried from the right hand figure, and 214 observing to carry the nearest ten (7.e., for 36,

38 for instance, not 3, but 4); place the first "49-398 figures of each multiplication under each other ;

then add and point off three decimal places. It will be

seen that every figure of the product falls into its proper place, eg., the 8 and 7, the 5 and 2, &c., each give thousandth parts.

25. To divide decimals, divide as with integers, and point off as many decimal places in the quotient as the dividend has more than the divisor. This follows from the dividend being the product of the divisor and quotient. Exs. 228°956 + 3°64 = 62°9 ; 2°28956 + 36°4 = 0629 ; 228956 + 364 = 62900. In the second example, the

oo2

dividend having five decimal places and the divisor one, the quotient must have four; a cipher is therefore prefixed to the three figures. In cases like the third example, where the dividend has fewer decimal places than the divisor, the number has to be made up in the former by ciphers, and as far as the end of the ciphers making up that number the quotient must be an integer. The quotient may be pointed at any stage after as many decimal places of the dividend have been made use of as there are in the divisor, the first figure after this being always the first decimal. This is especially to be attended to when the division does not terminate, or when a few figures only are required ; thus, 63°94 divided by °237 to two decimal places gives 269°79; 10 divided by '264 gives 37°87.

The method of converting a vulgar fraction into a deci- mal, given in § 22, is in effect the division of the nume- rator by the denominator, the result being expressed as a decimal. Thus, ;83,=83+ 160 =°51875.

When the quotient is re- quired to a given number of 63584)272°182(428 067

places only (as three in the 254336

example), the operation may 178460 be shortened by dropping the 127168 last figure of the divisor at 51292 each successive multiplica- 5 08 67 tion. But this must not be ——— commenced till the figures 425 required in the quotient are 381 fewer than the figures in the 44 divisor, aud the carriage from 44,

the dropped figure is to be added in each instance.

26. We have seen that the division by means of which vulgar fractions are converted into decimals (§§ 22, 25) will, in certain cases, always leave a remainder. If the fraction be in its lowest terms, there must always be a remainder whenever the denominator contains any other prime number as a factor besides 2 and 5. For in adding ciphers we multiply by tens, and we introduce no other factor. It often happens that we can specdily discover what the decimal must be, so as to be able to set down any number of figures without further actual division. Unless the division terminate, the same figures will recur sooner or later; and the same figures must recur before we use as many ciphers as there are units in the divisor. Sup- posing the divisor is 17, we can only have the numbers from 1 to 16 as remainders; the quotient must therefore repeat itself after all these remaindcrs occur, if not earlier. All do occur in dividing by 17; thus,

wr = '1176470588235294.

The fraction 55, must always be greater than the decimal -41666…., however far the latter be extended ; but we can make the difference as small as we choose. Thus '416666 does not differ from 5 by the millionth part of a

unit. The form of the decimal -416 is used to show that the 6 is to be considered as repeated continually ; and this being understood, we can say that the decimal is equal to 5.

Decimals of this kind are called Recurring Decimals. They are sometimes distinguished as Repeating or Circu- lating Decimals, according as one figure or more than one recur; and as Pure or Mixed, according as the recurring figures stand alone or are preceded by non-recurring deci-

mals. Thus, ‘148 isa pure circulating decimal ; °183 is a mixed repeating one.

27. To reduce a recurring decimal to a vulgar fraction, subtract the decimal figures that do uot recur from the whole decimal ; set down the remainder as the numerator of the fraction, and as many nines as there are recurring

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figures, followed by as many ciphers as there are non- recurring figures, as the denominator.

The reason of proceeding in this way will appear if, taking any mixed recurring decimal, we multiply it by as mauy tens as there are decimal places, and again by as many tens as there are non-recurring decimals, and sub-

tract the second product from the first. Take, e.g., ‘T9054 :

100000 times -79054 = 79054-054054054…. and 100 times -79054= 79°054054054…. therefore 99900 times 79054 = 78975 whence °79054 = 33333, ue, 212.

In the case of pure recurring decimals, we have no sub- traction, and the denominator consists entirely of nines. Thus 3=2=3; 27=27= 3.

28. In practical arithmetic recurring decimals are little used, except in approximations. They can be added or sub- tracted readily to any number of places by extending all a place or two beyond what is required. When we have to multiply or divide by recurring decimals, we must con- vert them into vulgar fractions. They may themselves be multiplied or divided by integers or ordinary decimals, though in this case, too, it is often better to use vulgar fractions, especially when exact results are desired.

Powers and Roots of Numbers.—29. When a given

number is multiplied by itself, the product multiplied again 224 roots.

by the number, and so on, the result obtained is called the second, third, fourth, &c., power of the number, according as it is the product of the number repeated two, three, four, &e., times. Thus, 7 × 7× 7=343 is the third power of 7; 5×5×5×5=625, the fourth power of 5. The term "square " is nearly always used instead of " second power " (e.g., 81 is the square of 9), and " cube" frequeritly instead of "third power." The power to which a number is raised is indicated by a small figure written over the number to the right ; thus, 8° is the fifth power of 8.

The square root of a given number is the number which, when multiplied by itself, produces the given num- ber. And so, in general, whatever power one number is of another, the same roo¢ is the second of the first. Thus, 7 is the third root, or cube root, of 343; 5 is the fourth root of 625; 2 is the fifth root of 32. The sign ,/ (which is really an 7, from radix, a root) prefixed to a number indicates a root of it. The simple sign stands for the square root; a figure is placed over it to denote other roots. Thus, ,/100 is the square root of 100; 4/256, the fourth root of 256.

30. To extract the syuare root of a given number, divide Extraction

it into periods of two figures, by putting a point over every second figure, commencing with that in the units' place ; set down as the first figure of the root, the largest number whose square does not exceed the first or left-hand period ; place the square of this number under the first period, and subtract it from it; to the remainder

annex the next period; place before 5 82169(76 3 this as a trial divisor twice the root 49

figure; consider how often the former 146991 (omitting the right-hand figure) con- pe G

tains the latter, and set down the Peds number that expresses thisas the next 1523)4569 figure of the root; place also this root- 4569

figure to the right of the trial divisor; multiply by it the divisor thus completed; subtract the product from the number formed of the former remainder and the period taken down; add another period to the remainder

now found; then double the whole root for a new trial divisor, and proceed as before.

The 58 of the example being 580000, the 49 must be 490000, and the root 700. So the 146 is 1460; the 921,

Powers

of square root.

ee

, Extraction of cube root.

anit fh a7 c

92100; the 6is60; andsoon. This explains the principle of pointing in periods of two figures.

In place of doubling the whole root for every trial divisor, it will be sufficient to add to the preceding com- plete divisor its last figure; thus, 146+6=152. The7 has been already doubled in 14, and this doubles the 6.

The reason of proceeding as above will appear from the composition of an ordinary product.

Thus, 23×23 is the sum of the four = products 20 × 20, 3 × 20, 20 × 3, and 3 × 3, =a 1.¢., 20%, twice 20× 3, and 3×3, Taking 69 away, then, the square of 20, 2.¢., 400, the 46 remainder must be the sum of 2 × 20 × 3, 529(23 and 3 × 3, ze, 3 times the sum of 2 × 20 4

and 3, which we obtain by the method 43)129 adopted. 129

If there is a remainder, ciphers may be taken down in pairs, and as many decimal places obtained as we please. In this case there must always be a re- mainder, since no unit multiplied by itself produces ciphers. After getting half the decimal places required, we may proceed by contracted division (§ 25).

To extract the square root of a vulgar fraction, we find the roots of the numerator and denominator separately. For, since 3 × 2=,, the square root of 7 must be ¢. If either term of the fraction is nota complete square, it should be reduced to a decimal, Thus, ,/4= /‘5= /0‘50= ‘7071067812 nearly.

31. To extract the cube root of a given number, point off the number from the units’ place into periods of three figures ; write under

the first period the 78402752(428 greatest cube con- 64

tained in it, subtract, 402× 3 = 4800 14402

and annex the next 40 ×2×3 = 240

period to the remain- 22 — 4

der; then, regarding 5044‘10088

the root found as tens, . ora ae multiply the square of A 529200 4314752 x. it by 3 for a trial #20 x oe 3= 10080

divisor, and divide by 8 64

this for the next figure 539344/4314752

of the root; to the

trial divisor add three times the product of the two root numbers (the first being tens), and also the square of the last root figure ; multiply the sum by the last root figure; subtract the product from the number obtained by taking down last period ; annex the next period to the remainder, and proceed as before.

For demonstration of the reason of this process, see ALGEBRA, vol. 1, p. 528. It depends on the form of the product obtained in raising a number to its third power. Thus, 24 × 24 × 24 is 24 times 202+ 2 × 20 × 44+ 42, which will be found to be 203+3× 20?x 4+3 × 20 × 424 48 And this is 20°

added to 4 times 3 × 209+ 3 × 20× 44 4%, which agrees with the process described above.

II. Pracrican ARITHMETIC,

32. Having explained in the foregoing sections the various operations of arithmetic, we now proceed to con- sider them in their combinations and practical applications. What has been said up to this point refers to numbers merely as numbers, or numbers in the abstract. Now they are to be regarded as applied to particular things, or repre- senting particular magnitudes. Numbers so regarded are called concrete; and we now treat of concrete as dis- tinguished from abstract arithmetic. Concrete numbers frequently represent not so much number as quantity. To form a distinct and accurate idea of 5 tb of tea bought

for 15s., it is not necessary to think of the tea as divided into five portions, or as paid for with fifteen pieces of money.

It would be found extremely (indced intolerably) incon- venient to have to make all payments, great and small, by means of oue particular species of coin, or to serve out all quantities of goods, using only one kind of weight or measurement. Various monies, weights, and measures are therefore in customary use, this or that being employed in each particular case according to circumstances. When these measures are of the same kind, differing only in the unit of one of them being so many times the unit of another, they are said to be of different denominations ; as, pounds, shillings, pence ; or again, yards, feet, inches.

In addition and subtraction, the quantities added and subtracted must be either abstract numbers or concrete quantities of the same kind. In multiplication, the multi- plicand may be concrete, but the multiplier is regarded in the process as abstract. If 20 men, for example, receive £5 each, the £5 is not multiplied by 20 men, but taken 20 times, the number of times merely corresponding to the number of men. In division, when the dividend is con- crete, the divisor may be abstract, giving a concrete quotient of the same kind as the dividend, or concrete giving an abstract

quotient. Thus, £100 may be: divided into 20 parts, giving £5 as quotient, or it may be divided into parts of £5 each, giving as quotient the abstract number 20, we, containing £5 20 times. A fraction is strictly abstract, though we often write £3 and the like for $ of £1.

33. The following are the tables of monies, weights, and Tables.

measures in common use :—!

I, Money. | V. Surface.

4 farthings=1 penny, d. | 144 square inches = 1 square foot. 12 pence =1 shilling, s. 9 sq. feet =1 sq. yard. 20 shillings =1 pound, £ or J. 30}sq. yards =1 sq. pole.

’ : . 40 sq. poles =1 rood, ro. Il. Avoirdupois Weight. A arcades ay acre, ae 16 drams, drs. =1 ounce, oz. 16 ounces =1 pound, 7d. ai 28 pounds = quarter, gr. 2 Vi Solidity. . 4 quarters —1 hundred- | 1728 cubic inches=1 cubic foot.

weight, cwt. 27 cubic feet =1 cubic yard.

20 hundredweights=1 ton. Ill. Troy Weight. 24 grains, grs. =1 penny-weight, dwt. 20 pennyweights=1 ounce, oz.

VII. Capacity. 4 gills =1 pint, pé. 2pints =1 quart, gé. 4 quarts =1 gallon, gal. 2 gallons =1 peck, pk.

12 ounces =1 pound, 16. 4 pecks =1 bushel, bus, IV. Length. 8 bushels=1 quarter, gr. 12 inches, in. =1 foot, /¢. } 3 feet =1 yard, yd. VIII. Time. 54 yards =1 pole or 60 seconds, s.=1 minute, m. perch, po. 60 minutes =1 hour, hr. 40 poles =1 furlong, fur.| 24 hours =1 day. 8 furlongs =1 mile, mi. 365 days = year, 77.

On these tables we make the following remarks :—

I. The guinea is 21 shillings, and the crown 5 shillings. Sales are often made in guineas, though the coin is not now used. Farthings are always written

as fractions of a penny. 103d. 7g. means tenpence three farthings and seven-eighths of a farthing.

III. Apothecaries' weight agrees with this, except that the ounce (2) is divided into 8 drams (3), and the dram into 3 scruples (3) of 20 grains.

1 By an Act of Parliament, passed in 1824, the imperial standard weights and measures are connected in the following way with the mean solar day, the length of which is fixed invariably :—The yard of 86 inches is determined from the length of a pendulum, vibrating once in a second, which, in the latitude of London, is 89°138929 inches ; the pound troy of 5760 grains, from a cubic inch of distilled water, weigh- ing 252°458 grains ; and the gallon as being the space occupied by 10 tb avoirdupois (i.e., 70,000 grains troy) of distilled water, equivalent to 277°274 cubic inches,— all these verifications being made with ther- mometer at 62° Fahr. and barometer at 30 inches.

Reduction.

Compound addition.

Compound subtrac- tion.

Compound inultipli- cation,

IV. In measuring cloth, the yard is divided into 4 quarters, the quarter into 4 nails of 24 inches.

V. To measure land, the surveyor's chain of 100 links is'

used. The chain is 22 yards long, and 10 square chains make an acre.

VIL The gallon and lower denominations are liquid measures; the quart and those above it are for dry goods.

VIII. The year, strictly speaking, is 365-24224 days. Every fourth year (leap year) has 366 days.

34. Reduction is the method of expressing quantities in a denomination lower or higher than that in which they are given.

To reduce a higher denomination to a lower, multiply in succession by the numbers which show the times that the unit of each denomination (beginning with that given) contains the unit of the one next below it till the denomi- nation is reached to which the quantity is to be reduced. If quantities in intermediate denominations are given, add each as its denomination is reached.

To reduce a lower denomination to a higher, divide in succession by the numbers which show the times that the unit of each denomination (beginning with that given) is contained in the unit of the next above it, observing that the remainder after such division is of the denomination of the dividend.

Sometimes the two processes are combined; thus, in reducing guineas to crowns, we multiply by 21, obtaining shillings, and then divide by 5.

35. Compound Addition and Compound Subtraction are the addition and subtraction of quantities expressed in more than one denomination.

In Compound Addition, arrange the quantities according to their denominations, each under its .proper heading ; add the lowest, and reduce the sum by division to the next higher, setting down the remainder, and carrying the quo- tient ; add the others, including carriage, in the same way. Suppose that several sums of money are added, and the far- things amount to 29, that is to 74d., the 4d. is set down and the 7d. carried to the pence column, and so in other cases. _In Compound Subtraction, arrange the quantities as in Compound Addition, placing the greater ameunt over the other, and subtract, beginning with the lowest denomina- tion. If in any case the lower number exceeds that above it, increase the latter by as many as make one of the next higher denomination, and afterwards add one to that denomination in the lower line. In subtracting, e.g., 1 qr. 25 tb froin 3 qr. 17 bb, since 25 cannot be taken from 17, a quarter, z.¢., 28 Ib, is added to the 17, making 45; from this 25 is subtracted, leaving 20 tb, and the quarter "borrowed" is taken away again by being added to the 1 qr. The remainder is thus 1 qr. 20 hb.

Fractions of the lowest denomination are to be added or subtracted according to §§ 18, 19; thus, £72, 8s. 3.%d. – £45, 17s. 644d. = £26, 10s. 83d.

36. Compound Multiplication is multiplication in which the multiplicand is expressed in more than onedenomination.

When the multiplier does not exceed 12, multiply the different denominations by it, beginning with the lowest, and setting down and carrying as in Compound Addition. When the multiplier consists of several figures, multiply by each separately in the samie way, taking them from right to left, and setting the result of each successive multiplication always one place

further towards the left in £63 12 7% each denomination, and add a the results as thus arranged. 254 10 72= 4 times, In the accompanying example 572 13 932 =90 times.

the above arrangement puts the product by 90 in the place of tens; and the sums to be reduced to higher denomina-

£5981 8 84=94 times,

‘factors in succession.

METIC

tions are 30 farthings, 104 pence, 148 shillings. If the multiplier be a composite number, we may multiply by the When the multiplier consists of two or more figures, the multiplication is often performed by the whole quantity at once.

37. Compound Division is division in which either the Compound

dividend or both dividend and divisor are expressed in division.

more than one denontination.

(1.) To find the amount that a given amount contains a given number of times, divide the highest denomination by the given number, reduce the remainder to the next lower denomination, adding the corresponding term of the dividend ; divide again, and proceed in the same way with the other denominations. The denominations of the quo- tient correspond to those of the dividend.

Let it be required, for instance, to divide £370, 16s. 13d. into 58 equal shares. As 58 shares of £6 each amount to £348, £6 is part of the quotient, and there remains £22, 16s. 1?d. Reducing £22, 16s. to shillings (456), we find that this gives 58 shares of 7s. each, with 50s. over. Similarly we obtain 10d. and 1 farthing, with 29 farthings over, which, since 22 =, is just half a farthing for each of the 58 shares. 'The quotient then is £6, 7s. 104d. 3q.

(2.) To find the number of times that one given amount contains another, reduce both to the same single denomina- tion, and then divide the one by the other.

To find, for example, how often 12s, 9d. is contained in £171, 13s. 9d., since 12s. 97d.=615 farthings, and £171, 13s. 9d. = 164820 farthings, the number of times the second amount contains the first must be 164820 + 615, i.e, 268. It is to be observed that the quotient here is an abstract number.

38. In multiplying or dividing by fractions or mixed numbers, we follow the methods £94 B 92 8 explained in §§ 20, 21. As an 62.8 v

illustration, we give here the mul- —_____—_""12_ tiplication of £24, 5s. 91d. $q. by 12) 121 9 OF F 62,5,, where we may note that in 10 2 52 A the division by 12 we have to 48 11 724 & divide 22 farthings, giving +°q. x 145 14 102 2

jy= '74, and that in addingthe Gj51g 9 71 2 fraction we have 34 =23; "s

39. Reduction of Fractions and Decimals.—To find the Reduction of frac- tions,

proper value of a fraction or a decimal of any denomina- tion, multiply the fraction or the decimal by the numbers in succession that reduce the denomination to lower de- nominations.

Thus, to find the value of £2 of a pound, it is manifest that this is £2 of 20 shillings, 12, $3 × 20s.=12,7s., or 12s. 34d. ; and so in other cases.

To find the value of a fraction of a quantity consisting of different denominations, we may either first reduce the quantity to one denomination, or we may multiply the compound quantity by the numerator, and divide by the denominator of the fraction; thus, 2 of £5, 7s. 112d. being the same as the uinth part of twice the amount, we may multiply by 2 and divide by 9, obtaining £1, 3s. 113d. 3 q. as the result.

40. To reduce any amount to the fraction or the decimal of another denomination or amount, reduce both amounts to the same denomination, and write them as the terms of a fraction, the quautity of which the fraction is required being made the denominator. If the decimal is required, convert the vulgar fraction into a decimal.

Thus, to reduce 18s. 13d. to the fraction and also to the decimal of a pound, since a pound contains 480 halfpence, a halfpenny is ;}, of a pound, and therefore 13s. 1?d., z.e., 315 halfpence, is £335 = £33 = £°65625.

It is often sufficient to throw the expressions into the

Practice.

Proportion.

ARITHMETIC

reduced form, without actually performing the reduction, and divide the numerator of the complex fraction so obtained by the denominator. Thus, to find the fraction of £4631 that 3 of 462 guineas is, both terms may be ex- pressed as shillings —3 × 232 × 34, and 23> x >; whence, dividing the former by the latter, the required fraction is found to be $7.

In reducing a compound quantity to a decimal of a higher denomination, it is generally best to proceed by successive divisions, beginning 16) 12 oz with the lowest denomination, ——— and inserting the others as they 28) 8-75 tbh. occur, as in the accompanying 4) -3125 qrs. example, where 13 cwt. 8 fb 12 1 2.072195 OZ. OF iodied to be ~~65390625 of a Sa eae ton. It is to be noted that the 65390625 tons. integers here are inserted from the data, and the decimals obtained by division. The form, though somewhat incon~~ gruous, is convenient.

41. Practice is the name given to a method of calculat- ing prices from certain rates being aliquot parts (that is, exact measures) of other rates.

The basis of this species of calculation is generally £1, and the given price is broken up into portions, the first of which is an aliquot part of a pound, and each of the others an aliquot part of some one before it. By the method adopted we virtually multiply the different aliquot parts in succession by the number of articles given. The sum of the result is the total price.

42, Proportion.—When the first of four quantities is the same multiple or the same fraction of the second that the third is of the fourth, the first is said to have the same ratio to the second that the third has to the fourth, and the four quantities are said to be proportionals, or in pro- portion. Thus, since 30 is § of 36, and 50 is § of 60, the numbers 30, 36, 50, and 60 form a proportion.

The proportion is written 30 : 36 = 50:60, or, more com- monly, 30:36::50:60. This is read 30 is to 36 as 50 is to 60. It may also be written 3$ = 3$.

The ratio of two numbers is thus equivalent to the frac- tion that the one is of the other; and a fraction may therefore be defined as the ratio of the numerator to the denominator.

Ratio is a mere abstract relation between two numbers, or between two concrete quantities of the same kind. The ratio of 4s. to 6s., or of 48d. to 72d., is not shillings or pence, but the abstract fraction 3.

If two quantities of one kind be proportional to two of another kind, when any three are given, the fourth can be found. If, for instance, we know the value of any quan- tity of goods, we can determine the value of any other given quantity, or the quantity that has any assigned value, —it being always understood that the rate is the same in both cases ; that is, that were the quantity doubled, trebled, halved, &c., so also would the value be, or, in other words, that the quantity is proportional to the value. Questions of this sort occur with very great frequency in practical arithmetic. The three quantities given are usually arranged as the first three terms of a proportion, whence the fourth term is found.

The rule by which we proceed in such cases of Simple Proportion, as it is called, has often the name given to it of the Rule of Three. It is as follows:— Of the three quantities given, set that down for the third term which is of the same kind as what is required. Consider whether the amount to be found will be greater or less than this third term ; if greater, make the greater of the two remain- ing quantities the second term, and the other the first term ; but if less, put thefless term second, and the greater first. Having thus arranged or "stated" the three terms

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of the proportion, multiply the second and third together, and divide the product by the first.

The first and second terms must be reduced to the same denomination, and it will often be convenient to reduce the third term to the lowest denomination contained in it.

Hx. 1. Tf 54 yards of cloth cost 63s., what will 30 yards cost at the same rate ?

Stating by the rule, we have 54 yards : 30 yards :: 63s., 30 × 63

ms 35s.

This process is to be explaincd by the consideration that, since the rate of price is the same for both quantities, the one price must be the same

fraction of the other that the one 54 yds. 63s.

30 yds. the price required ’ 30 the number of shillings required

oF 54 63s. of these equal fractions by 63, we have 2° x 63 = 35, the number of shillings required, as above.

The first and second terms are to be stated according to the rule, because their ratio is equal to that of the third and fourth, and must therefore be a proper or an improper fraction, according as the other is so. After the propor- tiun is stated, and the terms reduced, any common factor may be removed from the first and second terms, or from the first and third; for, as will appear from the working above, this is virtually reducing a fractional expression to lower terms.

Ex, 2. A bankrupt, whose debts amount to £1275, pays 14s. 6d. in the pound. What do his creditors lose ?

Since 14s. 6d. is paid, there is 5s. 6d. loss for every pound of debt, and the question is—If £1 give 5s. 6d. loss, what will £1275 give? The “‘stating,” therefore, is— £1 : £1275 ::5s. 6d., and the result, £350, 12s. 6d. Par- ticular care must be taken, when all the terms are money, as here, that the first and second be of the same kind. In this instance these terms are debt; and the third term, loss, corresponds to the term required.

Ex, 3. If 91 men could perform a piece of work in 78 days, in what time could 21 men do it, working at the same rate ?

Here, if the number of men were doubled, trebled, halved, &c., the time required would be one-half, one-third, double, &c., the given time; or as the former is increased the latter is diminished in the same proportion, and wce versa. The time in this case is said to be iversely pr’o- portional to the number of men. We have then as equal

2lmen 78days_ |. ‘ ke . antes dipe eeq uel that is, the “stating” of the proportion is 21 men:91 men::78 days, according to the rule, and the result 338 days. The process may also be explained thus:—The work will be 91 × 78 times what

whence the fourth term is

quantity is of the other ; that is,

Multiplying each

ratios

1 man can do in 1 day, or al times what 21 men can

21

91×78

do in 1 day, 2.¢., it will be a1

days' work for 21 men.

43. Compound Proportion.—The ratio of two quantities Compound If, proportion.

frequently depends on a combination of other ratios. for instance, we have to compare the times required for building two walls, one twice the length, twice the height, and twice the thickness of the other, the men employed on the former being half the number employed on the other, and the day half the length, each of these separate conditions implies double the number of days. Each con- dition gives the ratio 1 : 2, and the result must correspond to the product of all the ratios, that is, it is 1:32. This is an instance of what is called compound proportion.

In such cases set down for the third term the quantity which is of the same kind as that required. State each proportion as though it alone had to be considered, writing

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them under each other. Multiply the product of all the second terms by the third term, and divide the result by the product of the first terms.

Hix. Tf 36 men, working 10 hours a day, perform three- fifths of a piece of work in 17 days, how long must 25 men work daily to do the rest of it in 16 days ?

Men, 2p soos: 10 Fifths of the work, 3: 2 Days, To217

Hs o)p-

The length of the day will be greater the fewer the men and the fewer the days are, and less the less the work is ; we therefore state as above.

44, It not unfrequently happens that ratios have to be coinpounded, or other reductions made, before we can state the proportion which will give the required result. We give an example or two of this.

Hx. 1. Though the length of my field is one-seventh greater than that of my neighbour's, and its quality is one- ninth better, yet, as the breadth of mine is one-fourth less, his is worth five guineas more than mine. What is my ficld worth ?

The length of his field is to that of mine as 1 to 14, t.¢., as 7 to 8. The- other ratios are 9:10 and 4:3 (see § 16 ad fin.). Therefore the values of the fields are as 7×9× 4 to 8× 10× 3, we, as 21 to 20, and the difference of these values being £5, 5s., we have the proportion 1: 20::£5, 5s., which gives £105 as the worth of my field.

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tations are performed according to formule or rules which rest ou this as a basis. Advantage is very generally taken of the convenience of 100 as a standard of reference or comparison, proportional relations being stated as at such and such rates per cent. This occurs continually in the calculation of interest, discount, stock-exchange operations, &ec., as well as in the expression of nara losses and gains,

47. Interest is the allowance given by the borrower to Interest.

the lender for the use of money lent. It is usually com- puted at a rate agreed upon of so many pounds for every hundred lent for a year; this is called the rate per cent. The interest of £564, for instance, for

3 years 4 months at 33 per cent. per £100:564:: 32 annum, is to be found by a compound 1; 34 proportion, the meaning being—TIf the

interest of £100 for 1 year be £33, what will the interest of £564 be for 34 years? The result (£70, 10s.) may be obtained by the general rule based on this and similar proportions—Multiply the amount lent (called the prin- cipal) by the rate per cent. and by the number of years, and divide the product by 100. When the time is given in days, the fraction of a year ig taken that the days amount to.

Money is laid out at Compound Interest, when at. the end of a year or other assigned period the interest that has accrued is not paid to the lender, but is put to interest along with the amount originally lent. Here the simple interest has to be computed for each successive year or period, and added to the principal or former amount.

x, 2. If 9 men or 15 women, working 10 hours a day, 48. Commission is the allowance paid to an agent for Commis- could reap a field in 8 days 6 hours, in how many days of transacting commercial business, and usually bears a fixed sin. 104 hours each could 10 men and 12 women reap a field | proportion or percentage, as may be agreed on, to the one-fourth larger ? amount of value involved in the transactions. Brokerage Brokerage.

Since 15 women do as much as 9 men do in the same time, 12 women will do 7+ times a man's work, for 15:12::9:74. Therefore 10 men and a eee 12 women will do 174 times a man's ph ae ei work. From this the stating in the , margin follows. The result is 56} hours, ze, 5 days 3} hours, the day being 104 hours long.

ix. 3. A dealer who has bought 9 oxen and 5 sheep for £186, 2s. 6d., would lose £2 by exchanging 2 oxen for 11 sheep. What is the price of an ox?

The price of 2 oxen being the price of 11 sheep and £2 more, the price of 9 oxen will be (from the ratio 2:9) 494 times the price of a sheep and £9

more. Hence from the data, 544 times the price of a sheep and £9 more will amount to £186, 2s. 6d.; 2.e., 544 times the price of a sheep is £177, 2s. 6d., and therefore a sheep cost £3, 5s.

Also, since the price of 2 oxen is that of 11 sheep and £2.

more, 2 oxen cost £35, 158.4 £2, ae, £37, 15s.; there- fore 1 ox cost £18, 17s. 6d.

is the allowance paid to a broker for buying or selling shares in the public funds, or bargaining otherwise with reference to money investments. are payments in return for which the owner of the pro- perty insured is entitled to receive the assured value of it in the event of its being destroyed. In all these the rates are commonly stated at so much per cent., and the com- putation is similar to that for interest, but simpler, as the elemeut of time does not enter into it.

49. Drscount is a deduction allowed for a payment Discount.

being made at a date prior to the time when the full amount is exigible. The true discount on a money payment due on the expiration of a certain time is the excess of the amount over its present value—the present value being the sum which, laid out at interest, would in the given time amount to the given sum. Suppose, for instance, it is required to find the true discount on £664 due 10 months hence at 43 per cent. Here the interest of £100, being £44 in 12 months, will in 10 months be £33, 2.¢., £100

Propor- _ 45. Proportional Parts.—To divide a number or quan- | would amount to £1033 in 10 months, and the discount rs tity into parts In proportion to given numbers, state and | of £1033 due 10 months hence is therefore £33. Hence

work out the proportions,—As the sum of the given num- bers is to each of them in succession, so is the number to be divided to the several parts required.

If, for example, a bankrupt owes A £580, B £935, C £675, and D £770, and his assets amount to £999, the stating 2960:580:£999 gives £195, 15s. as

A's share, and the others are found similarly.

Here, too, there may be a compound proportion, as when different sums are invested for different times. The divi- sion in those cases must be in proportion to the amounts invested, and also to the time; each amount is therefore to be multiplied by its time.

Applications of Proportion.—46. In commercial and financial transactions frequent use is made of proportion ; aud very often, when it is not directly employed, compu-

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the stating £1033: £664 :: £33, which gives as the dis- count £24. The present value is seen from this to be £640. A banker or merchant, in discounting a bill, charges interest instead of discount, and would in this in- stance gain the interest of £24, since the £24, the true discount of £664, is evidently the enterest of £640.

50. In calculations relating to mercantile Profit and Profit and Loss, which are also effected by proportion, it must be 10ss-

carefully remembered that the percentage of gain or loss is always reckoued on the buying price, unless the contrary is expressly stated. Thus, let it be required to find the cost of goods that are sold for £448, 17s. 6d. at a loss of 64 per cent. Since goods that cost £100 are sold for £933, we have the stating £933: £4482 ::£100, which gives £478, 16s. as the cost price. (a. m'A.)

Insurance Premiums Insurance.

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ARIUS ("Apeos), a well-known name in ecclesiastical history, identified with the origin and spread of the first great "heresy " in the Christian church. Arius is sup- posed to have been a native of Cyrenaica in Africa, but nothing is. really known of his birth or of his early training. He first comes clearly into view asa presbyter of the Church of Alexandria, in the

commencement of the 4th century, engaged in conflict with his bishop, Alexander. At a pre- vious period he is said to have been connected with the Meletian schism, and on this account to have been excom- municated by Peter of Alexandria, who had ordained him deacon. But if so, he had regained a position of import- ance in the Alexandrian Church, as he is found, under Peter's successor, Achillas, in charge of one of the great city churches, Baucalis or Boucalis, where he continued to discharge his duties with apparent faithfulness and industry for six years after the accession of Alexander, the third bishop in order with which ecclesiastical tradition connects him. Theodoret (Hist. Ecel., i. 2) does not hesitate to say that Arius was chagrined because Alexander, instead of him- self, was appointed to succeed Achillas in the see of Alex- andria, and that the beginning of his heretical attitude is, in consequence, to be attributed to discontent aud envy. But this is so common an explanation of heretical movements with the early church historians, that it is not to be received without reserve. Upon the whole, there is no evidence that Arius was animated by mere personal considerations in the advocacy of his doctrinal opinions. Rather, it seems evident, as Neander says (Church Hist., vol. iv. 25), that he thought he was only unfolding the traditionary church doctrine. Although an African he appears to have been trained in the school of Antioch, under Lucian, and there to have imbibed a strong leaning towards the subordination system as to the relation of the Father and Son, which prevailed in that school. Probably it was this training, and a natural lack of insight and speculative depth, which led him into a line of negative thought, from which the church had hitherto wisely abstained. Yet the idea of his craft and ambition deeply pervades early Christian history. In his well-known treatise against eighty heresies (xb. II. Her., lxix. c. 3), Epiphanius describes him as a man " inflamed by his own opinionativeness; of tall stature, with a downcast look ; his figure composed like that of a subtle serpent, to deceive the guileless by his crafty exterior." 'His dress," he adds, "was simple ; his address soft and smooth, calculated to persuade and attract, so that he had drawn away seven hundred virgins from the church to his party."

The views of Arius first attracted attention about 319 A.D. According to the church historian Socrates (lib. 1. c. 5), Bishop Alexander, in addressing the presbyters and other clergy on the doctrine of the Trinity, dwelt so strongly on the consubstantial unity of the Father and the Son that _Arius charged

him with holding Sabellianism. But, ac- cording to Sozomen, a contemporary historian of the 5th century, Arius made himself conspicuous by the advocacy of his special opinions, and Alexander only interfered after being charged with remissness in leaving him so long to disturb the faith of the church. Having called Arius and his opponents before him, Alexander heard their respective arguments, and finally, after due examination, gave judg- ment against Arius. The result was a wide-spread com- motion, extending not only through Africa, but other pro- vinces of the Roman empire. Bishops joined issue with bishops ; congregations were violently excited; and the greatest mystery of the Christian religion became a subject of irreverent controversy ainong women and children. Even the heathen joined in the profane uproar. Arius himself cannot be excused from stirring up this popular and unworthy clamour; for he composed verses, under

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the name of Thalia (@adcia), which appear to have been a sort of popular miscellany for diffusing his opinions. He addressed at the same time an elaborate letter to Euse- bius of Nicomedia, which remains to this day one of the clearest statements of his dogmatic position. It sets out with a complaint of the persecution which he had suffered at the hands of Alexander, who had driven him and his adherents (he says) out of the city as impious men or atheists (dO¢ous), "merely for dissenting from his public de- claration that 'as God is eternal so is His Son'—when the Father, then the Son—the Son is present in God without a birth (dyevvjrws), ever begotten (devyev7s), an unbegotten- begotten (dyevyroyeyjs) ;—an eternal God, an eternal Son ; the Son is from God himself." . . . . "These blasphemies we cannot bear to hear even," he says, "no, not if the heretics should threaten us with ten thousand deaths. What, on the other hand, do we maintain? that the Son is not unoriginate (dyévvytos), nor part of the Unoriginate, nor made of any previously existing substance, but that by the will and purpose of God He was in being before time (apo xpévev Kal mpd aidvwv), perfect God, the only begotten (xdnpys Geds, povoyevys); that before this generation or creation He was not (mpiv yevvnOp . . . . odK jv)," &e.

There is another letter to the same purpose, but more moderate in statement, addressed to Alexander after his banishment; and the student will find in those letters, and in the Thalia, the most original and trustworthy account of the opinions of Arius. "We believe," he says in the letter to Alexander, "in one God alone without birth, alone everlasting, alone unoriginate. . . . We believe that this God gave birth to the only begotten Son before eternal periods (apé xpdvev aiwviwv), through whom He made these periods (aiévas) and all things else ; that He gave birth to Him, not in semblance, but in truth, giving Him a real existence (érocrjoavra), at His own will so as to be unchangeable, God's perfect creature, but not as other creatures .. . . not, as Valentinus (a Gnostic of the 2d century) maintained, a development (apofodrv) ; nor, again, as Manicheeus, a consubstantial part (uépos do- ovcvov); nor as Sabellius, Son and Father at once (viord- repo), Which is to make two out of onc, . . . but created by the will of God, and endowed with His own glorious perfections—yet not so that the Father did thereby deprive himself of attributes which are His without origination (ayers), being the Source (ryyj) of all things ; so that while there are three persons (troordces) yet God is alone the Cause of all things and unoriginate. The Son, on the other hand, is originate, begotten by the Father time- apart. The Son is not, therefore, co-eternal or co-unbe— gotten with the Father, as if these were two unbegotten principles; but God is before all things as (movds) single and the principle of all, and therefore before Christ also."

On the one side, therefore, Arius denied of Christ that He was unoriginate; or part of the Unoriginate; or con- substantial (6~oovcevov) with the Father; or without begin- ning (dvapxos); or a mere development of God.. The Son, he said, "did not exist before He was begotten (ov« jv mpiv yevvnOq)." In other words, "He is of a substance that ouce was uot (é od dvtwv),"—hence the name of Hxoucontians sometimes given to his followers. But, on the other side, Arius affirmed of the Son that He was in being before time (mpoxpévev); that he was perfect God (aArpys eds) ; only begotten (jovoyev7js); that God made the worlds or ages (aidvas) through Him; that He was the making or offspring of the Father, and yet not as one amongst things made (yévvna add' odx ds Ev TOY yeyevnpévov).

Such were the questions which distracted the church beyond all precedent in the beginning of the. 4th century, and led to the first great cecumenical council, which was convened in Nicea in 325. The account of the procecd-

ings of this council will be given under its own heading. It requires only to be mentioned here, that after various turns in the controversy, it was finally decided against Arius, that the Son was "of the same substance " (époov-cvov) with the Father, "'very God of very God." Constan- tine embraced the decision of the council, and resolved to uphold it. Arius and the two bishops of Marmarica and Ptolemais, who refused to subscribe the creed of Nicxa, were excommuniated and banished to Illyria; and even Eusebius of Nicomedia, who accepted the creed, but not its ana- themas, was exiled to Gaul. Alexander returned to his see triumphant, but died soon after, and was succeeded by Athanasius, his deacon, who had been the soul of the orthodox party of Nicsa, and with whose indomitable fortitude and strange vicissitudes the further course of the controversy is bound up. This will be explained in detail under the heading ATHANASIUS, and it only remains for us to sketch at present what is known of the future career of Arius.

Although defeated at the Council of Nicza, Arius was by no means subdued. He obtained means of access to Constantia, the sister of the emperor, who, on her death- bed, strongly urged her brother to reconsider the question, and to recall the heresiarch from banishment. Restored to court, he, along with the Eusebian party, who, although professing to accept the Nicene doctrine, were in reality indifferent, if not hostile, to it, renewed the theological strife, in which Athanasius was nothing loth to join. In- terchanges, now of friendly recognition and now of menace, passed betwixt the emperor and the intrepid bishop of Alexandria, who obstinately refused to reinstate Arius as presbyter. At length, on the banishment of Athanasius to Treves in 336, Arius returned to Alexandria to claim his old position; but even in the absence of the bishop the people rose in uproar against the heretic, and the emperor was forced to recall him to Constantinople. There the bishop was reluctantly compelled to profess his willingness to receive him once more into the bosom of the church, but before the act of admission

was completed Arius was taken suddenly ill, while walking with a friend in the evening, and dicdin a few moments. This was interpreted by the adherents of the Nicene theology as a special inter- position of Providence on their behalf, and they openly gave thanks to God in the church. The modern reader will look with less credulity upon an event which was pro- bably quite natural in its occurrence, but he will hardly see any cause in it for lamentation. The character of Arius, if not originally tainted by self- seeking and restless ambition, appears to have gathered something of this taint in the course of his career, and the most impartial student of church history fails to see anything in it to admire beyond the pertinacity of his courage and his faithful devotion to his own opinions.

The Followers of Arius.—The death of Arius, as de- scribed above, did not extinguish the Arian party. On the contrary, they continued active and zealous within the church for upwards of fifty years, or till the second general council at Constantinople, in 381. Afterwards they may be said to have existed, as a distinct Christian sect, outside the Catholic Church, till about the middle of the 7th century. Constantine, while strongly disposed at first to enforce the Nicene decrees, was gradually won toamore con- ciliatory policy by the influence especially of Eusebius of Cwesarea, and his namesake, Eusebius of Nicomedia. On the other hand, the Nicene doctrine found the most able and ardent defender in Athanasius, the youngdeacon who had attended Bishop Alexander at the council, and who shortly afterwards succeeded him in the see of Alexandria. An unceasing contention ensued betwixt the Eusebian and Athanasian factions of the church. Constantius, who

succeeded his father in 337, strongly favourcd the former, or semi-Arian party, and successive synods were called with the view of adjusting differences and compelling uniformity of faith. 'The highways were covered," says an ancient historian (Ammianus, xxi. 15, quoted by Gibbon, vol. iii. 67, Milman's ed.) "with troops of bishops galloping from every side to these assemblies." At length the tenet of the JZomotousion was substituted for that of the Homoousion at the Council of Rimini (Ariminum) in 360. But the war of words raged as fiercely as ever during the reigns of

Julian (the Apostate) and his successors till after the accession of Theodosius the Great, under whose auspices the Council of Constantinople was convened and the Nicene doctrine was confirmed and finally accepted as the catholic doctrine of the church. Even then, however, Arianism was warmly espoused by several of the German nationalities then assailing the empire. The entire nation of the Ostrogoths became Arian; the Visigoths followed their example, till, at the request of their king, Reccared, they embraced the catholic faith at the Council of Toledo in 589. The Vandals in Africa, the Suevi in Spain, and the Burgundians in Gaul, were all for a time zealous Arians, and the heresy maintained its influence amongst the Lombards in the north of Italy to a later period than elsewhere. Gradually, however, it perished as a distinctive national type of Christianity before the growth of medizva] Catholicism, and the name of Arian ceased to represent a definite form of Christian doctrine within the church, or a definite party outside of it. Individual Christian teachers of great eminence, such as John Milton and Samuel Clark, and even Ralph Cudworth, have been accused of Arianism, but even where, as in Milton's case, the accusation seems well founded, the peculiar heresy known by that name has never assumed ay influence, or regained, for any length of time, its influence in the church. (w. @) ARIZONA, a territory of the United States, bounded N. by Utah, E. by New Mexico, 8. by Mexico, and W. by California and Nevada, with an estimated area of 113,900 square miles. According to the Act creating it a territory in 1863, Arizona comprises all the lands of the United States formerly belonging to New Mexico, extend- ing from W. long. 109° to the California line. Since then, however, the N.W. corner has becn ceded to Nevada. The territory lies in the basin of the Colorado River, which enters it in about 37° N. lat., and forms its western boundary southwards from 36°. In the north there is an extensive but barren plateau, with an average elevation of 7000 feet, through which the Colorado cuts its way, and forms one of the most remarkable gorges in the world, the length being about 300 miles, and the perpendicular walls reaching heights of from 3000 to 6000 feet. South of this plateau is the valley of the Colorado Chiquito (Little Colorado, or Flax River), which joins the Colorado in 36° 15' lat. N. and 113° long. W., while further south the ground rises into another plateau, the main portion of which is known as the Mogollon Mountains. In this dis- trict the country is reported to be beautiful and fertile, the mountains covered with noble pine-trees, and the valleys clothed with rich grama

grass. Further south, again, is the basin of the Gila, with its numerous tributaries, obliquely crossed by detached prolongations of the Sierra Madre of Mexico. The inhabitants of Arizona are mostly Indians. Of these 4300 Pinas and Maricopas occupy 4 reservation of 64,000 acres on the Gila River; 4000 Papa- goes, a wandering tribe in the south-eastern part of the territory, have no grounds allotted them; 4000 Mohaves have 75,000 acres on the Colorado River; 2000 Yumas live near the mouth of the Colorado, but belong to the Mohave reservation; while 1500 Hualapais and 8000 or 12,000 Yavapais and Apaches, without settled habitations,

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live in a state of continual warfare with their neighbours. Civilisation, however, is gradually asserting her claim to those fertile districts. Arizona is rich in mineral pro- ducts—uearly all the mountains in the south and ceutre yielding gold, silver, copper, and lead. Lime, gypsum, and coal are also present, and salt of excellent quality exists in extensive deposits. The vegetable productions are iron- wood, mesquite, cotton-wood, sycamore, ash, oak, willow, walnut, prickly pear, cactus, aloe, artemisia; and, under cultivation, grapes, figs, oranges, lemons, tomatoes, tobacco, Indian corn, and the other cereals. Much of the land produces two crops in the year. The towns are all of incousiderable size, and the whole white population of the territory, in 1870, did not amount to more than 9658. The capital is Tucson, in Pima county; and the other towns, Arizona City and Prescott. Many interesting remains exist of the early inhabitants of this region. See a paper by W. A. Bell, J. of Roy. Geog. Soc., 1869 ; Colorado Exploration; S. W. Cozzens, The Marvellous Country.

ARK OF NOAH, the vessel constructed by Noah for preservation from the approaching deluge. The Biblical account of it is contained in Genesis vi. 14-22. See Noau.

ARK OF THE COVENANT, Ark or THE REVELA- gion (E.V. ark of the testimony, Exod. xxv. 16, 22, dvc.), are the full names of the sacred chest of acacia wood, overlaid with gold, which occupied the holiest place in the tabernacle and temple, and through which the idea of the constant presence of the covenant God with the people of Israel received symbolical

expression. The Old Testament religion conceived of God as spiritual, and so could not think to securc His presence by the use

of images. But the notion of communication between the |

spiritual God and His people still took the form of a tryst or meeting (TWV2 E.V. wrongly, congregation, Exod. xxvii.

21, &c.), under conditions of time and place divinely |

appointed (Exod. xx. 23, 24), and the idea of purely spiritual approach to God without any local and symboli- cal point of rapport between heaven and earth was reserved for the New Testament (John iv. 21, 7) In accordance with this view, certain fixed sanctuaries, consecrated by former revelations, were fit places for man to draw near to God. But the constant presence of God with the nation in its wanderings could not be realised without a portable sanctuary, the central point of which was very fitly the chest in which was contained the "revelation" (Exod. xxv. 16, xl. 20), that is, the tables of stone with the ten commandments (Exod. xxxi. 18; Deut. x. 5), which formed the basis of the covenant. This meaning of the ark is symbolically expressed by the addition of an upper piece called the kappdreth (E.V. mercy-seat), which was wholly of gold, and surmounted by two cherubim or symbolical winged figures, which, in the Old Testament, are always associated with the idea of local manifestations of the God who, though inaccessible to man, yet reveals himself to him. 'The space above the kappdreth and between the cherubim was conceived as the point of meeting between God and man (Exod. xxv. 22; Lev. xvi. 2); and the name kappéreth, which has been very variously interpreted, is probably derived from the atoning ordinances through which alone the high priest, as the people's representative, ventured to come face to face with this awful spot (Lev. XVi.)

The ark contained nothing but the tables of the law, 1 Kings viii. 9. That the pot of manna and Aaron's rod were also contained in it is an opinion resting on Heb. ix. 4, and Rabbinical tradition, but quite without evidence from the Old Testament (Exod. xvi. 33; Num. xvii. 10). That the presence of God to his people above the kappéreth was marked not only by artificial symbols, but by a mira-

culous cloud, is not certainly taught in Lev. xvi. 2, where the cloud is, according to many interpreters, the incense cloud of verse 13.

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As the permanent pledge of God's gracious presence, _ the ark preceded the people in their march, and led them on to victory (Num. x. 33-36). During the conquest of Canaan it stood in the headquarters of the invaders, first at Gilgal, and then at Shilch, nor does it appear to have ceased to move from place to place during the insecure period of the Judges (compare 2 Sam. vii. 6 with 1 Chron. xvii. 5), though the pre-eminence of the tribe of Ephraim seems to have kept it for the most part within their territory. At the close of this period we find it estab. lished in Shiloh. But the old tradition, that the ark is essentially the sanctuary of the armed host of Israel, with the Levites for its body guard, was not yet extinct, and it was brought into the field and captured by the Philistines in the fatal battle of Ebenezer, which broke the supremacy of Ephraim (1 Sam. iv.) Though soon restored by the Philistines who, smitten by a plague, feared to retain it, the ark could not be replaced in the central sanctuary, which had probably been destroyed in the war, and it remained in obscurity till David brought it to Zion, and again gave to the nation a religious as well as a poli- tical centre. Even in David's time the ark was carried into the field by the armies of Israel (2 Sam. xi. 11) ; but the king, who had himself so long maintained his religious life in banishment from the national sanctuaries, was the first clearly to express the conception, that God's help could reach forth to those who were far from Zion without any material pledge (2 Sam. xv. 25; compare Psalm iii. 4, and the idea of a heavenly temple, Psalm xviii.) So soon as this idea was reached, the importance of the ark (which ceased to be carried beyond the temple) was lost in the gradually increasing weight laid on the fixed sanctuary of Zion. Probably it was altogether lost in the counter-reformation of Manasseh, for soon after, in the beginning of the reign of Josiah, Jeremiah (iii. 16) speaks of it as missing and anxiously sought for, though 2 Chron. xxxv. 3 seems to imply that it was subsequently restored. But Jeremiah teaches that the religious significance of Jeru- salem is quite independent of this symbol, and the wild legends of its preservation at the taking of J crusalem (2 Mac. ii. and elsewhere) on}y show that the popular mind was unable to share the vicw that the ark was now an obsolete relic.

More poetical is the tradition that the ark was raised to heaven, there to remain till the coming of the Messiah, which embodies the spiritual idea that a heavenly pledge of God's covenant faithfulness had super- seded the earthly symbol. Compare with this Rev. x1. 19. (Ample traditional material will be found in the younger Buxtorf's dissertation De Arca Federis, Basel, 1659. For historical treatment of the subject compare especially Ewald's Geschichte, vol. ii, and essays by Graf in Merx's Archiv, i. 78, and by Kuenen in the Theologisch Tijdschrift for 1872, together with the usual works on Biblical Antiquities.) ; (W. R. 8.)

ARKANSAS, one of the south-western states of the North American Union, situated between lat. 33° and 36° 30' N., and long. 89° 45', and 94° 40' W., with an area of 52,198 square miles. It is bounded N. by Missouri, E. by Tennessee and Mississippi, from which it is separated by the Mississippi River, S. by Louisiana , and W. by the Indian territory. It belongs to the great basin of the Mississippi, being watered by that river and by several of its main tributaries, which are all more or less navigable. Of these the principal are the St Francis, in the north-east ; the White River with its affluents, the Cache, Little Red, and Black Rivers in the north; and notably the Arkansas, which, entering the state at Fort Smith, traverses it in a south-easterly direction until it joins the Mississippi at Napoleon. The southern part of the state is watered by the Washita in the east, and by a bend of the Red River

in the west. The eastern part of the state, bordering on the Mississippi, is low and swampy, and is annually over- flowed. Westward the country gradually attains a greater elevation, passing off into hills and undulating prairies, which lead up to the Ozark Mountains, beyond which, again, an elevated plain stretches towards the Rocky

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Mountains. The Ozark Mountains do not exceed 2000 feet in height, and the only other great masses of elevation are the Black Hills and the Washita Hills. A geological survey of the whole territory was commenced at the state expense by Dr David D. Owen, in 1857, and two volumes of Reports were published in 1858 and 1860. In the district north of the Arkansas River, the three leading formations are the "mill-stone grit, with its associate shales and conglomerate ; the subcarboniferous limestone and its associate chert, shales, and sandstones; and the magnesian limestones, and their associate sandstones, calciferous sand- rocks and chert, belonging to the lower Silurian period." The mineral products are reported to be very considerable, "including zinc, manganese, iron, lead, and copper; marble, whet and hone stones, rock-crystal, paints, nitre- earths, kaolin, granite, freestone, limestone, marls, green- sand, marly limestones, grindstones, and slate." The zinc ores are said to compare very favourably with those of Silesia, while the argentiferous galena produces a high average percentage of silver. Of coal, anthracite, and lignite, there are abundant supplies. A great number of mineral and thermal springs occur in various parts of the state, the most remarkable and most frequented groups lying to the south of the Arkansas in Hot Springs county. The heat of several attains 146° or 148° Fahr. Among what are called natural curiosities may be mentioned the sandstone dam across Lee's Creek in Crawfurd county, the Mammoth Spring in Fulton, which is supposed to have underground connection with Howel's Valley in Missouri, and is said to pour forth its water "at the rate of 8000 (?) barrels per minute," the Bee Rock in White county, and the crystal- line productions of Magnet Cove. It need hardly be said that there is great variety of soil in such a state as Arkansas, Along the river "bottoms" the alluvium is dark, rich, and deep, and yields excellent crops, The chief crops cultivated are maize, wheat, cotton, and tobacco, as well as apples and other fruits. There is a

natural flora of great richness, a complete list of which is given in Dr Owen's second report. The trees and shrubs most frequently occurring are poplars, oaks, pines, sweet-gum, sycamore, black locust, ash, elm, hickory,

dogwood, elder, palma-christi, black spice, papaw, mocker- nut, wild vine, &c. The fauna of Arkansas includes the buffalo, eland, red-deer, beaver, otter, hare, racoon, wild turkey, goose, and quail, as well as bears and wolves among the mountains. The climate of the lower districts is decidedly unhealthy, largely on account of the lack of wholesome water ; but in the upper regions it is quite salu- brious. Hitherto Arkansas has been mainly agricultural, but it is rapidly advancing in the development of its mine- ral wealth, in the extension of its railway communication, in the embankment and guidance of its rivers, in the reclaiming of its waste but fertile lands, in the progress of manufactures and industries, and in the establishment of educational and benevolent institutions. At the census of 1870 the population amounted to 484,471, comprising 362,115 whites and 122,169 coloured persons. In 1860 the population amounted to 435,450, so that an increase of more than 10 per cent. has taken place between these two periods, principally in the white population. The capital is Little Rock, originally a French settlement, situated on the Arkansas River, and occupying a very central posi- tion in the state ; population, 18,000, Arkansas was first colonised by the French, in the 17th century, and in 1720 Louis XV. made a grant of land on the Arkansas to the well-known John Law, but this led to no results of import- ance. In 1763 the territory was handed over to Spain, but returned to France in 1800. In 1803 it was purchased by the United States, along with the rest of what was then called Louisiana, and was established as a separate non- Indian territory in 1819. It was received into the Union as a slave state in 1836; and during the American Civil War, 1861-65, its Convention sided with the Confederate States, joining that organisation May 6, 1861.

ARKANSAS, a river of North America, which rises in the Rocky Mountains, in lat. 39° N., long. 106° W., 10,000 feet above the level of the sea, flows with a generally east- ward direction through Colorado and part of Kansas, then turns to the south-east, and so proceeds through the rest of Kansas, the north-east part of the Indian territory, and the state to which it gives its name, and finally falls into the Mississippi at Napoleon in lat. 33° 40’ N. The length of its course is stated at 2170 miles, and its drainage-area at 178,000 square miles. It receives a large number of tributaries, of which the most important are the Cimarron, Rio Nutria, and Canadian River. It is

navigable for steam- boats of about 4 feet draught 40 miles above Little Rock, and during flood for some 150 miles further to Fort Gibson.

ARKLOW, a sea-port and market town in the county of Wicklow, Ireland, 50 miles from Dublin, the inhabit- ants of which are principally engaged in the fisheries and in copper-mines. There are oyster-beds on the coast, but the produce requires to be freed from a peculiar flavour by the purer waters of the Welsh and English coast before it is fit for food. The ruins of the ancient castle of the Ormonds, demolished in 1649 by Cromwell, still exist, but there are no traces of the monastery founded by Fitzwalter. In 1789 the Irish insurgents were defeated by the royal troops near Arklow Bridge. Population (1871), 5178.

ARKWRIGHT, Sir Ricnarp, famous for his inven- tions in cotton spinning, was born at Preston in Lanca- shire, in 1732, of parents in humble circumstances. He was the youngest of thirteen children, received but a very indifferent education, and was bred to the trade of a bar- ber. In the year 1760 he had established himself in Bolton-le-Moor, where he exchanged the trade of a barber for that of an itinerant hair-merchant; and having dis-

covered a valuable chemical process for dyeing hair, he was in consequence enabled to amass a little property. It is unfortunate that very little is known of the steps by which he was led to those inventions that have immortalised his name. His residence in a district where a considerable manufacture of linen goods, and of linen and cotton mixed, was carried on, must have given him ample opportunities of becoming acquainted with the various processes that were in use in the cotton manufacture, and of the attempts that had been made and were then making to improve them. His attention was thus naturally drawn to this peculiar department ; and, while he saw reason to conclude that it was likely to prove the most advantageous in which he could engage, he had sagacity and good fortune to invent and improve those extraordinary machines by which, unlike most inventors, he amassed vast wealth, at the same time that he added prodigiously to the demand for labour, and to the riches and comfort of the civilised world.

The spinning-jenny, invented in 1767 by Hargraves, a carpenter at Blackburn in Lancashire, gave the means of spinning twenty or thirty threads at once with no more labour than had previously been required to spin a single thread. The thread spun by the jenny could not, however, be used, except as weft, being destitute of the firmness or hardness required in the longitudinal threads or warp. But Mr Arkwright supplied this deficiency by the invention of the spinning-frame—which spins a vast number of threads of any degree of fineness and hardness. It is not difficult to understand the principle on which this machine is constructed, and the mode of its operation. It consists of two pairs of rollers, turned by means of machinery. The lower roller of each pair is furrowed or fluted longi- tudinally, and the upper one is covered with leather, to make them take a hold of the cotton. If there were only one pair of rollers, it is clear that a carding of cotton, passed between them, would be drawn forward by the revolution of the rollers; but it would merely undergo a certain degree of compression from their action. No sooner, however, has the carding, or roving as it is techni- cally termed, begun to pass through the first pair of rollers, than it is received by the second pair, which are made to revolve with (as the case may be) three, four, or five times the velocity of the first pair. By this ingenious contrivance the roving is drawn out into a thread of the desired degree of tenuity, a twist being given to it by the adaptation of the spindle and fly of the common flax wheel to the machinery. Such is the principle on which Arkwright constructed his famous spinning-frame. It is obvious that it is radically different from the previous methods of spinning either by the common hand-wheel or distaff, or by the jenny, which is only a modification of the common wheel. The idea was entirely original, and was perfected and reduced to practice with consummate skill. Arkwright stated that he accidentally derived the first hint of his great invention from seeing a red-hot iron bar elongated by being made to pass between rollers; and though there is no mechanical analogy between that opera- tion and his process of spinning, it is not difficult to imagine that, by reflecting upon it and placing the subject in different points of view, he might be led by it to his inven- tion. The precise date of the discovery is not known ; but it is most probable that the idea had occurred to his mind as early as the period when Hargraves was engaged in the invention of the jenny, or almost immediately after. Not being himself a practical mechanic, Arkwright employed John Kay,a watchmaker at Warrington, to whom we shall

afterwards have to refer, to assist him in the preparation of the parts of his machine. An application in 1767 to Mr Atherton of Liverpool for pecuniary assistance was unsuccessful, though he is said to have sent some workmen

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to assist in the construction of the machine, the first model of which was set up in the parlour of the house belonging to the Free Grammar School at Preston.

His inventions being at length brought into a pretty advanced statc, Arkwright, accompanied by Kay, and a Mr Smalley of Preston, removed to Nottingham in 1768, in order to avoid the attacks of the same lawless rabble that had driven Hargraves out of Lancashire. Here his operations were at first greatly fettered by a want of capi- tal. But Mr Strutt of Derby, a gentleman of great mechanical skill, and largely engaged in the stocking manufacture, having seen Arkwright's inventions, and satisfied himself of their extraordinary value, immediately entered, conjointly with his partner, Mr Need, into part- nership with him. The command of the necessary funds being thus obtained, Arkwright erected his first mill, which was driven by horses, at Nottingham, and took out a patent for spinning by rollers in 1769. But as horse- power was found too expensive, he built a second factory, on a much larger scale, at Cromford in Derbyshire, in 1771, the machinery of which was turned by a water-wheel, after the manner of the famous silk-mill erected by Sir Thomas Lombe. Having made several additional dis- coveries and improvenients in the processes of carding, roving, and spinning, he took out a fresh patent for the whole in 1775 ; and thus completed a series of machinery so various and complicated, yet so admirably combined and well adapted to produce the intended effect in its most perfect form, as to excite the admiration of every one cap- able of appreciating the ingenuity displaycd and the diffi- culties overcome.

When the vast importance of these discoveries became generally known, it is not surprising that every effort should have been made to have the patents set aside, and Arkwright deprived of the profit and honour to be dcrived from them. But an attentive consideration of the various proceedings relative to this subject will show that there are no good grounds for crediting the statement made in the Court of King's Bench in

1785, and again repeated by Mr Guest in his work on the cotton manufacture, which ascribes the invention of spinning by rollers to Highs, or Hayes, from whom Arkwright is said to have learned it.

Arkwright's first patent for spinning by rollers, which is the essential part of his inventions, was obtained, as we have previously stated, in 1769; and its value and importance were no longer doubtful after the establishment of the factory at Cromford in 1771. The success which attended this novel method of spinning naturally excited the strongest desire on the part of the Lancashire manu- facturers to participate in the advantages to be derived from it; and the fair presumption is that, instead of attempting clandestinely to pirate the invention, they would, had they conceived there were any good grounds to go upon, have at once contested the validity of the patent. But no such attempt was made till 1781, twelve years after the date of the first patent, and siz years after the date of the second. And even then, Arkwright's opponents came forward only in consequence of his having resolved to vindicate his rights, which had begun to be invaded on all sides, by raising an action against Colonel Mordaunt for an infringement of his patent. Mordaunt was supported by a combination of manufacturers: and, as they felt the question to be of the greatest importance, it is all but impossible to suppose that anything would be omitted on their part which was conceived likely to contribute to their success. The case having been tried in the Court of King's Bench, after Trinity term, July 1781, the decision was unfavourable to Arkwright. But it is of import- ance to observe, that no attempt was made at the trial to charge him with having purloined the inventions of others,

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and that the verdict was given on the sole ground of the description of the machinery in the specification being obscure and indistinct. Arkwright admitted that this was partly the case ; adding, however, that the obscurity had been intended only to prevent foreigners from pirating his inventions. On any other principle, indeed, his conduct would be inexplicable; for, as his inventions were fully known to hundreds of workmen in his own employment, and as he had sold the privilege of using them to many persons in different parts of the country, it is impossible to suppose that he

could either have expected or intended to conceal his inventions after the expiration of his patent. In consequence of the result of this trial, Arkwright and his partners prepared a "case," setting forth the value of the inventions, and the circumstances which had led to the indistinctness complained of in the specification, which they at one time intended to lay before Parliament, as the foundation of an application for an Act for their relief. But this intention was subsequently abandoned ; and in a new trial (Arkwright v. Nightingale), which took place in the Court of Common Pleas on the 17th of February 1785, Lord Loughborough, the presiding judge, having expressed himself favourably with respect to the sufficiency of the specification, a verdict was given for Arkwright. On this, as on the former trial, nothing was stated against the originality of the invention.

In consequence of these conflicting verdicts, the whole matter was brought, by a writ of scire facias, before the Court of King's Bench, to have the validity of the patent finally settled. And it was not till this third trial, which took place before Mr Justice Buller and a special jury, on the 25th of June 1785, that Arkwright's claim to the inventions which formed the subject of the patent was disputed. To support this new allegation, Arkwright's opponents brought forward, for the first time, Highs, or Hayes, a reed-maker at Bolton. He stated that he had invented a machine for spinning by rollers previously to 1768; that he had employed the watchmaker Kay to make a model of that machine; and Kay was produced to prove that he had communicated that model to Ark- wright, and that that was the real source of all his pre- tended inventions. Having no idea that any attempt was to be made at so late a period to overturn the patent on this new ground, Arkwright's counsel were not prepared with evidence to repel this statement; but it was stated by Mr Sergeant Adair, on a motion for a new trial on the 10th of November of the same year, that he was furnished with affidavits 'contradicting, in the most pointed manner, the evidence that had been given by Kay and others with respect to the originality of the invention. The court, however, refused to grant a new trial, on the ground that, whatever might be the fact as to the question of originality, the deficiency in the specification was enough to sustain the verdict. But, independently altogether of the state- ments made on the motion for a new trial, the improba- bility of the story told by Highs and Kay seems glaring and. obvious. Highs states in his evidence that he had accused Arkwright of

getting possession of his invention by means of Kay so early as 1769, or about that period, Where, then, it may be asked, was this Mr Highs ever since that period, and particularly during the first trial in July 1781, and the second in February 1785% Living in Lancashire, associating with manufacturers, and in the habit, as he declares in his evidence, of making machines for them, he could not fail to be speedily informed with respect to the vast importance and value of the inven- tion Arkwright had purloincd from him. It is impossible but he must have been acquainted with the efforts that were making by the Lancashire manufacturers to set aside the patents; and is it to be supposed, had he really been

the inventor, that he would have remained for sixteen years a passive spectator of what was goiug forward? that he would have allowed Arkwright to accumulate a princely fortune by means of fis inventions while he remained in a state of poverty? or that he would have withheld his evidence when the manufacturers attempted to wrest from Arkwright what he had so unjustly appropriated? A single hint from Highs or Kay would, had their story been well founded, have sufficed to force Arkwright to give them a share of his profits, or would have furnished the manufacturers with the means they were so anxious to obtain, of procuring the immediate dissolution of the patents. But it has never been alleged that Arkwright took any pains to conciliate these persons ; on the contrary, he treated Highs with the most perfect indifference, and not only dismissed Kay from his service, but even threat- ened to prosecute him on a charge of felony. The sup- position that persons with so many and such overpowering temptations to speak out, and with no inducement of any sort to be silent, should have kept so important a secret for so many years is almost incredible ; and it is infinitely more consistent with probability to suppose that the story of Highs and Kay had been manufactured for the occasion than that it was really true. None of Arkwright's most intimate friends ever had the slightest doubt with respect to the originality of his invention. Some of them, indeed, could speak to the circumstances from their own personal knowledge; and their testimony was uniform and con- sistent.

Ontheir introduction, Arkwright's machines were regarded by the lower classes as even more adverse to their interests than those of Hargraves, and repeated attacks were made on the factories built for them. But however extraor- dinary it may appear, it was amongst the manufacturers that the greatest animosity existed against Arkwright ; and it required all the prudence for which he was so remarkable to enable him to triumph over the powerful combination that was formed against him. At the outset of the business they unanimously refused to purchase his yarn; and when his partners, Messrs Strutt and Need, had commenced a manufacture of calicoes, the manufac- turers strenuously opposed a bill' to exempt calicoes from a discriminating duty of 3d. a yard laid on them over and above the ordinary duty of 3d. by an old Act of Parliament. Luckily, however, the manufacturers failed of their object ; and, in 1774, an Act of Parliament was obtained (14 Geo.

IIL. cap. 72) for the encouragement of the cotton manu-

facture, in which fabrics made of cotton are declared to have been lately introduced, and are allowed to be used as "a lawful and laudable manufacture ;" the duty of 6d. the square yard on such cottons as are printed or stained being at the same time reduced to 3d. But this disgraceful spirit of animosity, which must, had it been successful, haye proved as injurious to the interests of the manufac- turers as to those of Arkwright, did not content itself with actions in the courts of law, or a factious opposition to useful measures in Parliament, but displayed itself in a still more striking and unjustifiable manner. A large factory, erected by Arkwright at Birkacre, near Chorley, in Lancashire, was destroyed by a mob collected from the adjacent country, in the presence of a powerful body of police and military, without any one of the civil authorities requiring them to interfere to prevent so scandalous an out rage.

Fortunately, however, not for himself only, but for his country and the world, every corner of which has been benefited by his inventions, Arkwright triumphed over every opposition. The same ingenuity, skill, and good sense, which had originally enabled him to invent his machine and get it introduced, enabled him to overcome

the various combinations and difficulties with which he had subsequently to contend.

Though a man of great personal strength, which he is said to have displayed, when young, in election riots at Preston, Arkwright never enjoyed good health. During the whole of his memorable career of invention and dis- covery, he was labouring under a very severe asthmatic affection. A complication of disorders at length terminated his truly useful life in 1792, at his works at Cromford, in the sixtieth year of his age. He was high sheriff of Derbyshire in 1786; and, having presented a congratula- tory address from the wapentake of Wirksworth to his Majesty George ITI., on his escape from the attempt on his life by Margaret Nicholson, received the honour of knight- hood. No man ever better deserved his good fortune, or has a stronger claim on the respect and gratitude of pos- terity. His inventions have opened a new and boundless field of employment; and while they have conferred infinitely more real benefit on his native country than she could have derived from the absolute dominion of Mexico and Peru, they have been wniversally productive of wealth and enjoyment.

ARLES (Arelate), a city of France, in the department of Bouches du Rhéne, 46 miles north-west of Marseilles, in lat. 43° 40' 18" N., long. 4° 37°46" E. It stands on the left bank of the Rhone, where that river divides to form its delta. It is generally well built, with regular streets and fine quays. The public buildings consist of the town-hall, dating from Louis XIV., and built after plans by Mansart ; the cathedral of St Trophime, founded in the 7th century and remarkable for its portico; a college, museum, school of navigation, and public library. The building of railway waggons, é&c., is largely carried on, as well as the manufacture of silk, glass-bottles, and soap, and the sausages of Arles are famed for their excellence. The trade in agricultural produce, oil, wine, fruits, cattle, wool, and salt, is considerable. A canal (called after the city) has been constructed from Arles to the harbour of Bouc on the Mediterranean, and a connection is formed with the canals of Beaucaire and Craponne. 'The latter affords communication with the Durance. Population in

1872, 24,699.

Arelate was an important town at the time of Cesar's invasion, and subsequently received a Roman colony, and became under the later emperors one of the most flourish- ing towus on the further side of the Alps. It was pillaged in 270 a.p., but restored and embellished by Constantine, who made it his principal residence, and founded what is now the suburb of Trinquetaille. After the fall of the Roman empire the city passed into the power of the Visigoths, and rapidly declined. It was plundered in 730 by the Saracens, but in the 10th century became the capi- tal of a kingdom of the same name, formed by Bozon from the two kingdoms of Burgundy. In the 12th century it was a free city, governed by consuls and podestats after the model of the Italian republics, which it also emulated in commerce and navigation. In 1251 it submitted to Charles of Anjou, and from that time onwards followed the fortunes of Provence. A number of ecclesiastical councils have been held here, as in 314,—when the Dona- tists were condemued,—354, 452, and 475. Arles still possesses many monuments of Roman architecture and art, the most remarkable being the ruins of an amphi- theatre (arénes), capable of containing 20,000 spectators, which was turned, by Abd-el-Rahman, into a fortress and flanked with four massive towers, of which two are still standing. There are also a theatre, in which, besides the famous Venus of Arles, discovered in 1651, many other remains have been found; an ancient obelisk of a single block, 47 feet high, erected in 1676 in the Place

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Royale ; and the ruins of two temples, an aqueduct, and a triumphal arch. 'There is, besides, a Roman cemetery of great beauty, which has been laid out as a public pleasure- ground, and bears the name of Aylscamps or Eliscamps, which hardly conceals the original designation, " Hlysi Campi." (See Clair, Monuments d'Arles, 1837; Millin, Voy. dans les départ. du Midi de la France; Estrangin, Etudes archéol. sur Arles.)

ARLON (Orolaunum in the Antonine Itinerary), the capital of the Belgian province of Luxemburg, is situated on a rising ground in the midst of a well-cultivated plain. It is a flourishing place of some 5000 or 6000 inhabitants, who are engaged in the manufacture of iron-wares, tobacco, crockery, and clay-pipes, and carry on a trade in grain. Antiquities found on the spot

seem to indicate a Roman settlement. Under its present name the town is mentioned in 870. At one time an independent marquisate, it was united to the countship of Luxemburg in 1214. In the neighbourhood was the nunnery of Clairefontaine or Bar- denburg, established about 1216, which is now a foundry.

ARMADA, a Spanish word, meaning generally an armed force or fleet, is applied specially to designate the great expedition sent out against England in 1588 by Philip of Spain. His principal motive for this enterprise was the desire to strike a decisive blow at the Protestant faith, of which England was then the bulwark. For many months the whole energies of the Spanish nation had been directed towards the construction and equipment of the requisite ships. In 1587 everything was nearly ready, but the sail- ing of the expedition was delayed for a year by Drake, who made a bold dash into the harbour of Cadiz and destroyed nearly a hundred ships, with immense stores of provisions. A further delay was caused by the suddeu death of the marquis of Santa Cruz, who had been ori- ginally intrusted with the chief command. His loss was a serious blow to the Spanish cause, for he was an experi- enced sailor. The duke of Medina Sidonia, a man almost entirely ignorant of naval affairs, was then made admiral. All preparations being at length completed, the great fleet sailed from Lisbon on the 29th (19th o. s.) May 1588. It consisted of 129 large vessels, and carried 19,295 soldiers, 8460 sailors, besides slaves as rowers, and 2431 cannon. 'Their destination was the coast of Flanders, where Alexander Farnese, prince of Parma, was lying with about 35,000 men and a flotilla of boats. This force was to be landed on the Isle of Thanet at the mouth of the Thames, under the protection of the Armada, which would be able to keep the Channel perfectly clear. Another body of troops was then to be Janded further north ; and it had been hoped at one time that the duke of Guise would effect a diversion by landing a force on the west coast. These plans, however, were considerably deranged by the length of time occupied in preparing the expedi- tion, and by the further delays encountered. For the fleet had scarcely sailed from Lisbon, when it was overtaken by a severe storm, which shattered several of the ships, and compelled them all to put in for repairs at Coruiia. It was the 22d (12th) July before they finally sailed from Spain. England meanwhile had not been idle ; when the news arrived that the great expedition was really about to

-set out, the most intense enthusiasm took possession of

the people, who gladly furnished ships and stores, and raised volunteer bands for coast defence. The command of the army was given to the earl of Leicester, who took his post, with about 16,000 men, at Tilbury to oppose the landing of Parma. About 45,000 were assembled round the Queen, to protect her person. The royal navy, which consisted of about thirty ships, was at once put in order, and gradually increased, by the addition of merchantmen and privateers, to about 180 vessels. These carried about

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18,000 sailors, but they had not half the weight of the Spanish artillery, and they were scantily supplied with ammunition and provisions. The ships, however,—those of the Queen in particular,—were in splendid order, and the sailors were the finest in England. The lord high admiral was Lord Howard of Effingham, who had under him Drake, Hawkins, Frobisher, and others, the most celebrated mariners of the age. He took his station with the main body of the ships, about eighty in number, at Plymouth, and another squadron, under Lord Seymour, cruised off Dunkirk, commanding the straits and blockading the prince of Parma. Meantime news was brought to England that the Armada had encountered severe storms, and that the expedition was given up. So much faith was put in this report that several ships began to discharge their crews. Howard, however, sailed down towards Corufia, and discovered that the report had no foundation. On the 29th (19th) July, the fleet was observed entering the Channel, and the beacon-lights along the coast gave warn- ing to England that the dreaded enemy was at hand. That evening Howard's ships were moored so as to be able to slip out of Plymouth Sound at a moment's notice. On the following day the Armada was seen standing upthe Channel in the form of a crescent, seven miles long, and numbering 150 ships. They passed Plymouth towards evening, and during the night the English fleet sailed out of the Sound, and took up a position to windward. On the following day the action began by the duke. of Medina Sidonia attempting to close and come to a general engagement. But he found this to be impossible; the English ships, light and admirably handled, sailed so swiftly, and were manceuvred with such dexterity, that it was out of his power to inflict any injury on them. Their fire

also was rapid and deadly, while the Spanish guns were worked slowly, and generally sent the shot far over the light English vessels. Dismayed at their want of success, the Spanish fleet stood off up the Channel, closely pursued by the English. Throughout all the next week the same tac- tics were pursued; the English, hovering on the rear of the Armada, harassed and weakened it without coming to a general engagement. At length, on the 6th August (27th July), Medina Sidonia cast anchor in the roads of Calais, and sent messengers to the prince of Parma, asking him for ammunition and light vessels, and suggesting that he should now attempt his landing on the coast of England. But the prince declared that it was impossible to cross the Channel while the English fieet was on the sea, that he had no light ships, and that the state of the weather pre- vented him sending such ammunition as he could spare. Lord Howard had now been joined by Seymour's squadron and by many private ships, but he and the other com- manders were still in the deepest anxiety. They were almost destitute of provisions and powder, and did not yet know what damage they had inflicted on the Armada, which, after all their endeavours, seemed now to have reached its destination. At last it was resolved to drive the Spanish fleet out into the open sea, and to effect this by means of fire-ships. Hight ships were selected and filled with combustibles, their rigging was smeared with pitch, and on the night of the 7th August (28th July) they were drifted down with the tide and set on fire. The Spaniards, in great alarm, immediately cut their cables and cleared off from the shore. Next morning Drake pursued them, while Howard remained for some time to attack a galleon that had gone ashore during the night. The Spanish fleet was scattered over a large space off Gravelines, and Drake at once began the action, driving them together into a confused mass by his rapid firing and swift manceuvring, and forcing the whole towards the coast of Flanders. Had his ammunition held out he might

have completed the ruin by driving them on shore; as it was, the injury inflicted by this one day's fighting was enormous. Nearly 4000 men were killed and many ships were disabled, and the hopes of the Spaniards were broken. Their courage completely deserted them; and next day, when a council of war was held, it was resolved to try the perilous voyage to Spain by the North Sea and Pentland Firth rather than again face Drake and the

English fleet. The whole fleet, still numbering 120 vessels, stood off accordingly towards the North Sea. Drake and Howard pursued for some days, till want of provisions compelled them to return. But the weather proved a sufficiently formidable enemy to the unhappy Spaniards. The continuous violent gales which accompanied them along their route, by the north of Scotland and the wild Irish coast, completely shattered their unseaworthy vessels. The shores were strewn with wrecks, and many hundreds of unfortunates who were saved from the sea were slain by the Irish. Con- stant sickness had decimated the troops, and when at length, in September and October, fifty-four shattered vessels reached Spain, they conveyed only 9000 or 10,000 men, and these were in a pitiable state from sickness and want.

A full account of the Armada is given in the curious Spanish work, Za felicisima Armada, é&c., published in 1588, a copy of which, with Lord Burleigh's manuscript notes, is in the British Museum. Froude (History, vol. xii.) gives valuable extracts from Spanish manuscripts bearing on the expedition.

ARMADILLO, a family of South American mammals (Dasypide), belonging to the order Edentata, and distin-

The Peba (Tatusia Peba, Owen).

guished by the peculiar nature of their external covering. This consists of a bony case, partly composed of solid buckler-like plates, and partly of movable transverse bands, the latter differing in number with the species, and, to a certain extent, with the age and sex of the individual, and giving to the entire body a considerable degree of flexibility. The under parts are destitute of bony covering, but in every case are more or less thickly covered with hair. The legs of the armadillo are short, and its movements usually slow, although, when pursued, it is said to be able to outrun a man. In danger, however, it chiefly depends for safety on its long, powerful claws, by which it can bury itself, in a few minutes, several feet below the surface of the ground. Most of the species are nocturnal in their habits, with small, weak eyes, but highly developed organs of hearing and smelling. They all possess molar teeth, and, with the exception of a single species, those only. Their food consists principally of fruits, roots, worms, and insects, but a few

species are more carnivorous, greedily devouring the semi-putrid carcases of the wild

cattle of the pampas, and even, it is said, burrowing into human graves. All the species are eaten by the natives and by the Portuguese and Spanish settlers, who esteem them a delicacy when roasted in the shell. The habitat of the armadilloes, extending from Mexico and Texas south- ward to Patagonia, is the region which, during the Tertiary period, was inhabited by the Glyptodons—gigantic arma- dilloes as large as the rhinoceros, whose remains are found abundantly in the bone-caves of Brazil.

ARMAGH, an inland county of Ireland in the province of Ulster, situated between lat. 54° 3' and 54° 31' N., and long. 6° 14' and 6° 45' W.; comprising an area of 328,086 statute acres, of which 178,064 are under tillage, 100,137 in pasture, 4670 in plantation, and 28,177 in waste, &c., while 17,038 acres are under water. It is bounded on the N. by Lough Neagh, on the E. by the county of Down, on the 8. by Louth, and on the W. by Monaghan and Tyrone. The general surface of the county is gently undulating and pleasingly diversified ; but in the northern extremity, on the borders of Lough Neagh, is a considerable tract of low, marshy land, and the southern border of the county is occupied by a barren range of hills, the highest of which, named Slieve Gullion, attains an elevation of 1893 feet, being the highest mountain in Clster excepting Slieve Donard in the county of Down. The summit of Slieve Gullion, commanding one of the finest prospects in the province, is crowned by a large cairn or pile of stones, which forms the roof of a singular cavern of artificial construction. In the western portion of the county are the Few Mountains, a chain of abrupt hills mostly incapable of cultivation.

The soil of the northern portion of the county is a rich, brown loam, on a substratum of clay or gravel, with an abundance of limestone near Armagh and other places. Towards Charlemont there is much reclaimable bog resting on a limestone substratum. The eastern portion of the county is generally of a light friable soil; the southern portion rocky and barren, with but little bog except in the neighbourhood of Newton Hamilton. The climate

of Armagh is considered to be one of the most genial in Treland, and less rain is supposed to fall in this than in any other county.

The county is well watered by numerous streams. The principal are the Callen, the Tynan, and the Tallwater, flowing into the Blackwater, which, after forming the boundary between this county and Tyrone, empties itself into the south-western angle of Lough Neagh. The Tara, the Newtown-Hamilton, the Creggan, and the Fleury flow into the Bay of Dundalk. The Cam or Camlin joins the Bann, which, crossing the north-western corner of the county, falls into Lough Neagh to the east of the Blackwater. The Newry canal, communicating with Carlingford Lough at Warrenspoint, six miles below Newry, proceeds north- wards through the county of Armagh for about 21 miles, joining the Bann at Whitecoat. The Ulster Canal commences at Charlemont on the River Blackwater, near its junction with Lough Neagh, proceeding through the western border of the county, and passing thence to the south-west by Monaghan and Clones into Upper Lough Erne, after a couse of 48 miles.

The geological features of the county are various and interesting. The granite of Slieve Gullion, an offset of the granite district of Down, is often used for millstones, being very hard and fine grained. The Newry Mountains and the Fathom Hills are also composed of granite. Around Camlough large beds of mica-slate exist. Slate quarries have been worked partially at Dorcy, Newtown-Hamilton, Creggan Duff, and in the neighbourhood of Crossmaglen. Lead mines have been worked, but without much success, in several parts of the county. There are extensive deposits

of lignite in the district near Lough Neagh. The other mineral substances found are potters' clay and a variety of ochres.

The total population in 1821 amounted to 197,427 souls. In 1831 the population was 220,134, and in 1841 it was 232,393, but in 1851 the numbers had declined to 196,085, and by the census of 1871 it was 179,260.

The land is in general but indifferently cultivated, yet owing to the occupation of the peasantry in the linen manufacture they are better lodged, clothed, and fed than in most other parts of Ireland. The cultivation of grain has been for some time slightly on the decrease, and the number of acres under flax diminished from 27,245 in 1866 to 7530 in 1872; but in the green crops there has been considerable increase. The total number of acres under crops amounted in 1872 to 172,550, viz., wheat, 10,599 ; oats, 68,487 ; barley, bere, and rye, 379 ; beans and pease, 254 ; potatoes, 32,799 ; turnips, 7998 ; other green crops, 3287 ; flax, 7530 ; meadow and clover, 41,164.

The farms are in general very small, and show less tendency to decrease in number than in most other parts of Ireland. In 1872 there were 6220 holdings of less than five acres each. Notwithstanding this, their owners are generally in circumstances of comparative comfort, owing to their employment in the linen manufacture. There are few who do not keep at least one cow, or a few sheep; none but the poorest cottar is without a pig. The usual diet is oatmeal, potatoes, and milk-porridge, varied some- times by salt-herrings. The better description of farmers use animal food, chiefly bacon and poultry.

The principal manufacture, and that which has given a peculiar tone to the character of the population, is still that of linen, though it has somewhat declined of late. It is noways necessary to the promotion of this manufacture that the spinners and weavers should be congregated in large towns, or united in crowded and unwholesome factories. On the contrary, most of its branches can be carried on in the cottages of the peasantry. The men devote to the loom those hours which are not required for the cultivation of their littie farms; the women spin and reel the yarn during the intervals of their other domestic occupations. Smooth lawns, perennial streams, pure springs, and the open face of heaven, are necessary for perfecting the bleaching process. Hence the extensive bleachers dwell in the country with all their assistants and machinery. Such is the effect of this combination of agricultural occupations with domestic manufactures, that the farmers are more than competent to supply the resident population of the county with vegetable, though not with animal food; and some of the less crowded and less productive parts of Ulster receive from it a considerable supply of oats,

barley, and flour. Apples are grown in such quantities as to entitle the county to the epithet applied to it, the orchard of Ireland.

The antiquities consist of cairns and tumuli; the remains of the fortress of Eamania near Armagh, once the residence of the kings of Ulster; the Dane's Cast, an extensive forti- fication in the south-east of the county, extending into the county of Down; spears, battle-axes, collars, rings, amulets, medals of gold, ornaments of silver, jet, and amber, é&c., have also been found in various places. The religious houses were at Armagh, Clonfeacle, Killevy, Kilmore, Stradhailloyse, and Tahenny. Of military antiquities the most remarkable are Tyrone's ditches, near Poyntz-Pass, Castle Roe, the fort of Navan, the castles of Criff-Keirn and Argonell, and that in the pass of Moyrath.

Armagh, together with Louth, Monaghan, and some smaller districts, formed part of a territory called Orgial or Urial, which was long subject to the occasional incursions of the Danes.

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The county was made shire ground in 1586, and called Armagh after the city, by Sir John Perrott. When James I. proceeded to plant with English and Scotch colonists the vast tracts escheated to the crown in Ulster, the whole of the arable and pasture land in Armagh, estimated at 77,800 acres, was to have been allotted in sixty-one portions. Nineteen of these, comprising 22,180 acres, were to have been allotted to the church, and forty- two, amounting to 55,620 acres, to English and Scotch colonists, servitors, native Irish, and four corporate towns, the swordsmen to be dispersed throughout Connaught and Munster. This project was not strictly adhercd to in the county of Armagh, nor were the Irish swordsmen or soldiers transplanted into Connaught and Munster from this and some other counties.

Armagh is now divided into eight baronies, viz., Armagh, Fews Lower and Upper, Oneiland East and West, Orior Lower and Upper, and Tiranny. It contains twenty-nine parishes and parts of parishes, the greater number of

which are in the archdiocese of Armagh, and a few in the diocese of Dromore. The county isin the Belfast military district, having barracks at Armagh and Newry. The constabulary force has its headquarters at Armagh, the county being divided into five districts. Assizes are held at Armagh, where the county prison, the county infirmary, and the district lunatic asylum are situated. The only savings bank in the county is at Armagh. There are two poor-law unions, Armagh (partly in Tyrone) and Lurgan (partly in Antrim and Down). The valuation of rateable property in 1872 amounted to £410,757. The chief towns are— Armagh, population in 1871, 8946; Lurgan, 10,632; Portadown, 6735; and part of Newry, with 5321 inhabi- tants, the remainder of this place, with 9616 inhabitants, being in the county of Down. The county returns three members to the imperial parliament, two for the county generally,—constituency in 1873, 7044; and one for Armagh city,—constituency, 621.

In the towns and level parts of the county the Protestant religion, in its two principal forms of the Episcopal and Presbyterian, predominates ; but the Roman Catholic faith is prevalent in the mountainous and less cultivated parts. By the census returns of 1871 the Roman Catholics number 85,057, or nearly one-half of the gross population. The number of children at school in 1871 amounted to 19,887, of whom 14,838 attended the various ‘ National Schools.” There were in the same year twenty-one persons who knew nothing but the native Erse, and 3903 were able to speak both that language and the English.

ARMAGH, a city and parliamentary borough in the above county, 64 miles north of Dublin, in lat. 54° 80”55” N., and long. 6° 37’ 57” W. It derives its name of Ard-macha, or High-Field, from its situation on the sides of a steep hill called Drumsailech, or the Hill of Willows, which rises in the midst of a fertile plain. Of high anti- quity, and, like so many other Trish towns, claiming to have been founded by St Patrick, it long possessed the more important distinction of being the metropolis of Ireland; and, as the seat of a flourishing college, was greatly frequented by students from other lands, among whom the English and Scotch were said to have been so numerous as to give the name of Trian-Sassanagh, or Saxon Street, to one of the quarters of the city. Of a synod that was held here as early as 448, we have interesting memo- rials in the Book of Armagh. Exposed to the succes- sive

calamities of the Danish incursions, the English conquest, and the English wars, and at last deserted by its bishops, who retired to Drogheda, the venerable city sank into an insignificant collection of cabins, with a dilapidated cathedral covered with shingles. From this state of decay, however, it was raised by the unwearied

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exertions of Primate Robinson (otherwise Lord Rokeby), which, seconded as they have been by similar devotion on the part of his successors of the Beresford family, have made of Armagh one of the best-built and most respectable

towns in the country. As the ecclesiastical metropolis of both the Anglican and Roman organisations, it possesses

two cathedrals—of which the Catholic is of the more recent construction—and two archiepiscopal palaces. As the county town it has a court-house, a prison, a lunatic asylum, and a county infirmary. Besides these, there is a fever hospital, erected by John George Beresford; a college, which Primate Robinson was very anxious to raise to the rank of a university; a public library founded by him, and containing upwards of 14,000 volumes; an observatory, which has become famous from the efficiency of its astronomers; and a number of churches and schools. Almost all the buildings are built of the limestone of the district, but the Anglican cathedral is of red sandstone. Population of the parliamentary borough in 1871, 8946.

ARMAGNAGC, a district of the south of France, corre- sponding to a large part of the present department of Gers, with portions of the neighbouring territory, erected in the 10th century into a countship in favour of Bernard the Squint-eyed (le Louche), son of the count of Fezinsac. The family thus founded at various times exercised great influence on the destinies of France, especially in the persous of John I. (d. 1373), Bernard VIL (d. 1418), John IV. (d. 1451), and John V. (d. 1473). Under Bernard VII. the name Armagnacs was given to the party of the house of Orleans, which carricd on so ruthless a contest with the house of Burgundy during the imbecile reign of Charles VI. In 1444-5, the Emperor Frederick II. of

Germany obtained from Charles VIL a large army of Armagnacs to enforce his claims in Switzerland, and the war which ensued took the name of the Armagnac war (Armagnaken- krieg). In Germany the name of the foreigners, who were completely defeated in the battle of St Jakob on the Birs, not far from Bile, was mockingly corrupted into Arme Jacken, Poor Jackets, or Arme Gecken, Poor Fools. On the death of Charles of Armagnac, in 1497, the countship was united to the crown by Charles VIL, but was again bestowed on Charles, the nephew of that count, by Francis I, who at the same time gave him his sister Margaret in marriage. After the death of her husband, by whom she had no children, she married Henry of Albret, king of Navarre; and thus the countship of Armagnac came back to the French crown along with the other dominions of Henry IV. In 1645, Louis XIV. erected a countship of Armagnac in favour of Henry of Lorraine, count of Harcourt, in whose family it continued till the Revolution. James of Armagnac, grandson of Bernard VII., was made duke of Nemours in 1462, and was succeeded in the duke- dom by his second son, John, who died without issue, and his third son, Louis, in whom the house of Armagnac became extinct in 1503.

ARMENIA (Hayasdani or Hatkh, in the native lan- guage), formerly an extensive country of Western Asia, which is now divided between Turkey, Russia, and Persia. Its political relations, and consequently its geographical limits, were subject to frequent variation, but in its widest extent it may be described as reaching from the Caucasus in the N. to the Mountains of Kurdistan in the S., and from the Caspian Sea in the E. to Asia Minor in the W., frequently, indeed, somewhat overlapping with the last- mentioned geographical division. From a very early period a distinction was drawn between Greater Armenia (Armenia Major, Medz Hayotz), to the east of the Euphrates, and Lesser Armenia (Armenia Minor, Phokhr Hayotz), lying to the west. The former is more properly ‘Armenia. It consists for the most part of an elevated

llistory.

ARMENIA

table-land, about 7000 feet above the level of the sea, culminating in the peaks of Mount Ararat, and sinking towards the plains of Iran on the east

and those of Asia Minor in the west, while it is frequently broken by glens and valleys. It is watered by the Euphrates, the Tigris, the Aras, and the Kur, all of which have their sources within its borders; and, like other mountainous countries, it possesses a large number of lakes. The most important of these are Van or Aghtamar, Sevan or Khabodan, and Urmiah or Keghem. The country is naturally fertile, pro- ducing grain, cotton, tobacco, and grapes, but for many centuries it has been sadly neglected. It abounds in romantic scenery and luxuriant pasture. The beauty of the district of Ararat especially has been celebrated by patriotic historians like Moses of Khorene and Lazarus of Pharb. In the time of its greatest prosperity, Armenia Major was divided into fifteen provinces, and contained a large number of flourishing and important towns. The capital for many centuries, under the Haikian dynasty, was Armavir, to the north of the Araxes, but it was changed for Artaxata (Ardashad) towards the close of the first century of our era. Erovant II. (58-78 a.p.) built Erovantashad and Pakaran, and adorned them with the spoils of the earlier cities. From the 2d to the Ath cen- tury the royal residence was at Valarsabad, which no longer exists, and, under the Pagratid dynasty, the chief town was first Shiragavan and afterwards Ani, the remains of which still testify to its magnificence. (Texier, Descrip- tion de ' Arménie; Brosset, Ruines d'Ani., 1860, 1861.) Other places of importance were Erzeroum, Van or Shamira- maguerd, Nakhjuan, Amid, and Pakovan. Divided and in- corporated by the three great empires already mentioned, Armenia has no longer a separate existence, and details re- garding the present condition of the country that formerly bore the name come more appropriately elsewhere. The Russian portion extends south to the Aras, and is mainly included in the government of Erivan; the Persian share is absorbed in Azerbijan; and Turkish Armenia is principally contained in the province of Erzeroum. The chief towns in the first are Erivan, Etchmiadzin, Ordubad, and Alexand- ropol; in the second, Urumiyah; and in the third, Erze- roum and Van.

According to their own legendary history, in which ancient traditions are curiously incorporated with Biblical lore, the Armenians are descendants of Haik, a son of Togarmah, the grandson of Japhet, who fled from the tyranny of Belus of Assyria and settled in the country which now, in their language, bears his name. The con- quest of the land by Semiramis, and the revolt of Barvir against Sardanapalus, are the chief events in the early ages.

Tigranes or Dikran is regarded as the contemporary and ally of Cyrus, and the history of his reign is recorded in detail, His son, Vahakin, who succeeded him, was cele- brated for his strength, and was deified after his death. The dynasty came to an end in the person of Vahi, who was defeated by Alexander the Great, 328 B.c.

The Armenians threw off the Macedonian yoke in 317 B.c., and chose Ardvates as their king; but on his death, about thirty-three years afterwards, they submitted to the Seleucids of Syria. About 190 B.c., Artaxias, who had been appointed governor by Antiochus the Great, took advantage of that monarch's defeat by the Romans and proclaimed Armenia Major independent. It was this prince who afforded an asylum in his court to the exiled Hannibal, The example of revolt was followed in Lesser Armenia by Zadriades, whose descendants maintained their position till the time of Tigranes IJ., when their territory was annexed to Greater Armenia.

About the middle of the 2d century B.c., the great Parthian king, Mithridates I, who had already extended

his empire over Syria, established his brother, Valarsaces (Wagharshag), founder of one of the most important branches of the Arsacid family. The new king greatly promoted the pros- perity of the country by founding cities, cstablishing laws, and rewarding persons of talent. The most celebrated of his successors was his great-grandson, Tigranes IJ., who made himself master of Syria, the Lesser Armenia, and many Parthian provinces, and would, probably, have been the founder of an extensive empire had not the solicitations of his father-in-law, Mithridates of Pontus, brought him into collision with the Romans. In reward for the sub- mission which he ultimately made to Pompey, he was allowed to keep possession of Armenia, with the exception of the provinces of Sophene and Gordyene, which were erccted into a separate kingdom for his son, Tigranes.

in Armenia, and thus rendered him the dynasty,

B.C— 428 a.D.

He Roman in-

continued a faithful ally of the Romans till his death, fluence and

about 55 3B.c., when he was succeeded by his son, Arta: vasdes, who, having adopted a more independent policy, was taken prisoner by Antony and carricd to Alexandria, where he was afterwards beheaded by Cleopatra in 30 B.c.

A period follows of nominal Roman supremacy and actual anarchy; 170 independent families all asserting themselves to the best of their ability, and a few of them succeeding in establishing their petty principalities. At length a usurper, Erovant, an Arsacid by the female line, made himself in some sort master of all the kingdom about 58 a.D., and maintained his position till he was expelled

by Ardashes (Exedarus), a more direct representative of

the race, who was repeatedly dethroned and restored by Parthian and Roman interference, but managed to do some-

thing for the amelioration of his country. When the Arsacids were driven from the Persian throne Subjection sia,

by the Sassanid Artaxerxes (Ardeshir), Chosroes the Great to Per

of Armenia naturally took up arms in their defence ; and he maintained the contest till his assassination by Anag, an Arsacid prince of Persia, when Armenia became subject to the Persian dynasty, 232 a.p. In the massacre of the royal family which ensued, none escaped but Tiridates (Tirdat), a son of Chosroes, who fled to Rome, and after- wards, with the help of the Romans, established himself on the throne, 259 a.p. The first act of his reign was the persecution of the Christians, who had begun to take root in the country during the previous century. St Gre- gory, surnamed the Illuminator, was cast into prison ; but the king being, as he supposed, miraculously cured of a dangerous distemper by the saint, the Christian religion was embraced by himself and most of his people. The introduction of Christianity tended to arouse the animosity of the Persians; and from this period Armenia became the theatre of almost uninterrupted struggles between that nation andthe Romans, until Theodosius the Great agreed to cede to Persia the eastern part of the country, which was thence called Persarmenia, while the western part was annexed to the Roman empire. Theodosius nominated Arsaces IV., then nominal king of Armenia, governor of the western division; and the Persian king, to conciliate the people, appointed Chosroes ILJ., a descendant of another branch of the Arsacids, governor of the eastern part. The rule of the Arsacids in Persarmenia ended with Ardashes IV., who was dethroned by Bahram V. of Persia in 428; and from that date Armenia ceased to be a king- dom, and was ruled till 632 by Persian marzbans or gover- nors, The Persians had all along endeavoured to subvert Christianity, and for that purpose had recourse to the most cruel persecutions. Frequent insurrections were the con- sequence, one of the most remarkable being that which was led by Vartan (see Neumann's History of Vartan, by Elisceus, 1830). From 632 till 839 Armenia was the scene of almost incessant struggles between the Greeks

2 A.D

_ supremacy.

Pagratid dynasty,

743-1079.

Ardzrunian dynasty, 9JU8-1080

Merwanid dynasty,

984-1085

Rhupenian dynasty,

1080-1393.

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and Mahometans, while its own native princes added to the confusion by their rivalriesand strife. Ashod, a mem- ber of the Pagratid family, which claimed to be of ancient Jewish origin, became master of Central and Northern Armenia about 743, and, being recognised by the caliphs ag an independent prince, founded a dynasty which con- tinued till 1079, when Cakig IL was assassinated, and his kingdom incorporated with the Greek empire. Another family, which claimed the parricide sons of Sennacherib as its founders, held possession of the province of Vasburagan and some of the neighbouring territory, and maintained its independence till 1080, when it likewise succumbed to Byzantium. During the same period the district north- west of lake Van was held by the Mussulman race of the Mcrwanids, —called by the Armenians the princes of Abra- huni,—who gave a nominal submission now to the Byzan- tine government and now to the sultans.

Rhupen (Ruben), a relative of the last king of the Pagratid dynasty, retired to the north of Cilicia, and founded in the shelter of the Taurus a small principality, which gradually extended its boundaries to the Mediter- ranean, and became known as the kingdom of Lesser Armenia. The Rhupeniaus entered into alliance with the Crusaders, and formed, along with the kings of Cyprus, the last bulwark of Christianity in the East. They welcomed as allies the Mongolian hordes that overran Asia in the 13th century, and shared in the hostility and ven- geance of the Mamelukes. The last king of the family, Leon, or Ghevond VI., was taken prisoner in spite of a vigorous defence at Gaban in 1375, and, after six years of captivity in

Egypt, wandered through Europe till his death, at Paris, in 1393. (See Langlois, Zssai sur les rots de la dyn. Roupénienne, St Petersb., 1860; Documents pour servir a Vhist. des Lusignans de la P. Arm., 1859; Le Trésor des chartes d'Arménie, 1863.)

About the middle of the 14th century the Kurds had possession of the south of Armenia, the Persians of the north, and the Ottomans of the west. The whole was subjected to the sway of Timour, of whose cruelties a graphic account has been left by the Armenian, Thomas of Medzoph (see Néve's Etude sur Thomas de Medzoph). It was mainly governed by Persian officials during the next century, the only national authority being the patriarch. In 1604 Shah Abbas, in his contest with Ahmed I, laid the whole country waste, and forcibly transplanted about 40,000 of the inhabitants into Persia, where they settled principally in Ispahan and New Julfa, as they fondly called the city which they founded. Since then the Armenians have had no political position ag a nation, though they continue to form an important and valuable portion of the population in Russia, Turkey, and Persia, and their colonies have spread into almost all quarters of the globe. It was calculated, about 1850, that there were approxi- mately four millions of Armenians in the world, of whom 2,500,000 were inhabitants of the Ottoman empire, 1,200,000 of the Russian empire, 25,000 in the empire of Austria, 150,000 in Persia and Azerbijan, 25,000 in continental India and the Archipelago of Asia, and the remaining 100,000 scattered in various countries (Dulau- rier). According toa recent statistician of Turkey (Lejean), there are 400,000 Armenians in the European part of the empire, of whom more than 200,000 are in Constantinople itself. Originally a brave and warlike people, they have become distinguished for their peaceful character and their submissiveness to the government of every country in which they live. (See the articles of Dulaurier and Prince Dadian in Revue des D. Mondes, 1854 and 1867.)

See Saint-Martin's Mémoires sur lV' Arménie, Paris, 1818-19. Brosset's Voy. Archeol. dans la Georgie et dans 0 Arménie en 1847-8, Paris, 1849-51; Boré's ' Arménie" in ZL' Univers Pittoresque ;

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Curzon's Armenia, London, 1854; Jaubert's Voy. en Arinénie, &c. ; Morier's Zweite Reise durch Persicn u. Armenien; Serpos's Compendio storico concernente la naz. Arm. ; Collection des hist. anc. et mod. de ? Arm., by Langlois; Recueil d'actes ct documens rel.aUhist. de la nation Arm., 3 vols., Moscow; Chamich's History, trans. by Avdall, Calcutta, 1827; Phahnazarian's Lsyuisse de Vhist. de TArm., 1856; Dulaurier, Rech. sur la chron. Arm.; Goerres, Die Japhetiten und thre gemeinsame Heimath in Armen., Munich, 1845.

ARMENIAN CHURCH, Tug, is one of the oldest Eastern Christian churches not in communion with the orthodox Greek Church or with the Church of Rome.

1. History.—This is divided into three periods, from 34 to 302 a.v., from 302 to 491, and from 491 to the present time. (1.) The first period is mainly legendary. The Church of Armenia claims an older than apostolic foundation. Our Lord, they say, corresponded by letter with Akbar, prince of Ur or Orfa; and the apostle Thaddeus, accompanied by Bartholomew and Judas, preached the gospel, and

'founded a Christian church in Armenia as early as the year

34 a.pD. But whatever the value of these primitive traditions, Armenia could hardly be said to have a church at all during this first period, although there are evident traces of Christian worship in the country at a very early time. (2.) The historical founder of the Armenian Church was §. Gregory, called the "Illuminator." He was a prince of the reigning family of the Arsacide, who, having been converted to Christianity, was eager for the conversion of his countrymen. In his missionary work he endured many persecutions, but at last managed to win over the king of Armenia and a considerable portion of his subjects. At the king's desire Gregory went to Ceesarea, or Sis, and was there consecrated bishop of Armexia (302 a.p.) His successors afterwards assumed the title of Patriarch, subsequently Catholicos, and under their rule the infant church grew and prospered. It had to struggle against the opposition of heathen fellow-countrymen and Persian conquerors, but it succeeded in establishing itself in the hearts of the people. The Bible was translated in 400 A.D.; the Liturgy, said to be very old, was improved ; and the Armenian bishops took part in several of

the synods of the church, notably in the third cecumenical council (Ephesus, 431 a.p.) About 450 a.p. the Armenian Church suffered a severe persecution, which prevented any of the bishops being present at the fourth cecumenical council (Chalcedon, 451 a.p.), at which Eutyches and his followers, the extreme opponents of Nestorius, were condemned, The Armenian Church never accepted the decisions of the Council of Chalcedon, and, in 49] a.p., the patriarch, in full synod, solemnly annulled them, This act led to the separation of the Armenian from the orthodox Greek Church. (3.) The period of schismatic existence divides into three—(a), from 491 a.p. to the middle of the 15th century; (0), from the middle of the 15th to the middle of the 18th centuries; (c), from 1746 down to the present time. It is difficult to account for the schism of the Armenian Church; according to common report, the Armenians were Eutychians, and were virtually cut off from the church when the Council of Chalcedon condemned that heresy, but their own account of the matter in their authoritative documents is very different. They allege that they were misled by false reports when they annulled the fourth council; that it was reported to them that the council had decided in favour of the Nestorian heresy, and that this mistake was confirmed by a lettcr to the patriarch upon the subject from the bishop of Rome, in which certain words were used which might easily be interpreted in the Nestorian sense. The Patriarch Narses, in his letter to the Emperor Manuel Com- nenus, in 1166, distinctly repudiates the Eutychian heresy, but it is to be noted that, in defending the doctrinal views

of his church, he employs the somewhat vague terms in use before the Council of Chalcedon, not those stricter defini- tions which were in use afterwards ; he employs ctppults, for instance, in its pre-Chalcedonian meaning, not évwors. However occasioned, the separation was gradual ; Armenian bishops attended the 5th, 6th, and 7th eecumenical councils (2d of Constantinople, 553; 3d of Constantinople, 680; 2d of Nicza, 788), and the church acknowledges the decrees of those councils as binding. Cut off from the Eastern Church, the Armenian bishops became all the more closely identified with their native country, and kept alive patriotic feeling in times of great national distress. In spite of many national calamities, foreign domination, internal dissensions, and even banishment, the Armenian

Church preserved its character, doctrine, and discipline until the middle of the 15th century, when great dissensions arose which resulted in a schism. 'These quarrels were occasioned by Jesuit missionaries, who endeavoured to make the Armenians adopt the doctrine, liturgy, and ceremonies of the Roman Church. 'They succeeded in prevailing upon a great number of the adherents of the Armenian Church to separate from the community and join the communion of Rome. The Catholic Armenians, as they are called, first became a separate community towards the end of the 16th century; their existence has proved a source of great weakness to the orthodox church, and through their exer- tions the old persecutions were revived. This state of matters went on until the middle of the 18th century, when the patriarch sought and obtained the intervention of Peter the Great of Russia. Since then the Armenian Church has found shelter under the protection of Russia. There is a reformation now going on in the Armenian Church, and a Reformed Church has arisen, which seeks to ally itself with the Calvinist Churches of Europe and America. ;

2. Doctrines.—These are almost identical with those of the orthodox Greek Church. The Arnienians accept the first three, and the fifth, sixth, and seventh cecumenical councils, denying that of Chalcedon only, but, as has been explained, they, in their authoritative documents, reject the Eutychian heresy, which that council was called to condemn. 'The chief source of information as to the doctrine is contained in the letter of Narses above referred to. They reject the Western addition of filioque to the Nicene Creed, and deny the distinctive doctrines of the Roman Church.

3. The Liturgy is said to date from the lst century, and to have been founded on that of the Church of Jerusalem. St Gregory remodelled it, and introduced the Nicene Crecd, using that edition which contains the damnatory clause, and adding a conclusion of his own. Prayers of John Chrysostom and of Basil the Great were introduced in 430 A.D. Prayers are said for the dead, and entreaty is made for the pardon of their sins, but the church does not believe in purgatory, nor admit of indulgences. The holy days are Sundays, the chief feasts observed in the Eastern Church, and ten national saints' days, Christmas is cele- brated on the 6th of January, on the day of the Epiphany, and not on the 25th of December.

4, Sacraments.—The Church of Armenia has the seven sacraments: baptism, confirmation, the eucharist, pen- ance, ordination, marriage, and extreme unction, Bap- tism is by immersion ; the child is immersed three times, it is then anointed with holy oil, is confirmed, and partakes of the eucharist in both elements. Confirmation is administered to children immediately after baptism. The eucharist is administered in both elements to all members of the church; the bread is always unleavened, and the wine is not mixed with water. Confession must precede the partaking of the eucharist, save in the case of children

under seven years of age. Penance consists of confession and fasting. Ordination is by anointing with the holy oil. The marriage service is almost the same as in the Greek Church. In extreme unction only priests are anointed with oil. Laity have the prayers said over them, but are not anointed.

5. The Clergy.—There is the threefold order— bishops, priests, and deacons ; and there are three degrees of episco- pal rank—the archbishops (chief among whom is the patriarch or catholicos), the bishop, and the vartabed, or doctor of theology, who has frequently charge of a diocese, with cpiscopal functions. The clergy are further divided into the black and the white. The black clergy are monks, aud are alone eligible for the higher clerical offices ; the white clergy include the parish priests and lower clergy. The clergy may marry before ordination, but not after ; and a priest's widow is not allowcd to remarry. The priesthood is hereditary. During his father's or grand- father's lifetime the heir may follow a secular calling ; but he must leave this and enter the priest's office on the death of the priest he is heir to. There are four patriarchs, who have their seats at Constantinople, Jcrusalem, Sis, and Etchmiadzin. 'The clergy of all ranks are supported entirely by the free-will offerings of the people.

Authorities :— The Life and Times of S. Gregory the [lluminatur, translated by S. C. Malan, 1868, (This is a translation of authori- tative papers, and includes a short summary of the state of the Armenian Church. It is founded on authoritative documents.) The Divine Liturgy of the Armenian Chureh, transl. by 8. C. Malan, Lond. 1870 (very carefully done). Histotre, Dogmes,

Tradi- tions et Liturgie de VEglise Arménienne, Paris, 1855 (fuller, but not so accurate). Codex Mysterti Missul Armenorum sew Liturgia Armena, Rome, 1677 (Lat. and Armen. Later editions of the Littirgy published at Rome belong to the Catholic Armenian Church, and are worthless). (Gavi, Ti.)

ARMENIAN LANGUAGE. The Armenian or Haikan language is an offshoot of the Iranian branch of the Indo- Germanic family of languages. Its earliest stage is probably represented in the cuneiform inscriptions of Van, on which see Hincks, in Jour. R. Asiatic Soc., vol. ix. (1848), and Mordtmann, in Zeitschrift d. deutschen morgenl. Gesellschaft, vol. xxvi, (1872). The existing literature of the Armenians dates from the 4th century, and is essentially and exclusively Christian. The translation of the Old Testament by Sahag Bartevatsi, and of the New by Miesrob, are among its oldest monuments. 'The dialect in which this version is written, and in which it is still publicly read in their churches, is called the old Armenian. The modern Armenian not only departs from the elder form by dialectic changes in the native elements of the language itself, but also by the great intermixture of Persian and Turkish words, which has resultcd from the conquest and subjection of the country, and by the character of inversion in the structure of its sentences. Of its two principal dialects,—the Western, spoken in Constantinople and Asia Minor, and the Eastern, spoken by the Armenians scattered over Tartary, Persia, and India,—the latter approaches more nearly to the idiom of the ancient language. Accord- ing to Philostratus (Vita Apollonti, ii, 2), the Armenians had an alphabet of their own in the 2d century a.pD., of which, however, no traces remain. The invention of the present alphabet is ascribed to Miesrob at the beginning of the 5th century; it is probably an amplification of the previous one upon the Greek system of arrangement, and consists of thirty-eight letters, the two last of which, 6 and f, were added after the 12th century. The order of writing is from left to right. The capital letters are used in inscriptions, and at the beginning of sentences and proper names. As to its phonetic elements, the Armenian language is rough and consonantal, with the accent on the last syllable. It possesses no grammatical gender, except

that a masculine is sometimes made feminine by the addition of whi, and that the words for man and woman may be prefixed to nouns to express their natural gender ; there is no dual. The declension is divided into vowel and consonantal declensions, each again being subdivided into strong and weak 'There are seven cases, including an instrumental. Tho nine demonstrative pronouns are regu- lated by the demonstrative letters s, ¢, », the first of which expresses proximity, the second lesser, and the last greater distance. The verb has four conjugations, according to the class vowels, e, a, v, 7, and four tenses,—present, imperfect, aorist, and future, the last two having two forms. In its syntactical structure the old Armenian resembles most nearly the classical Greek. The best and most recent Grammars are by H. Petermann (Berlin, 1872), and M. Lauer (Vienna, 1869) ; Dictionaries by Aucher and Brand (2 vols., Venice, 1821), and by A. Calfa (Paris, 1861), which comprises also the modern dialects. A good Grammar of the modern Armenian (Western dialect) is that of E. Riggs (Constantinople, 1856). There is an essay on the dialect of Tiflis, by H. Petermann, in Abhandlungen der K. Academie der Wissenschaften, Berlin, 1867. The best recent surveys of Armenian literature are by H. G. O. Dwight (Jour, Amer. Or. Soc., iii.) and M. Patcanian (Mélanges Asiatiques, iv.) See also, by the last-mentioned writer, ' Recherches sur la formation de la langue Arménienne," in Journal Asiatique, August and September 1870.

ARMENIAN LITERATURE. With the exception of a few fragments incorporated in later writers, the pre-Christian literature of Armenia has totally perished. The early Armenians seem to have possessed a body of traditional and historical songs analogous to the Skah-nameh of Persia, the memory of which lingered long among the common people, especially in the province of Koghten. Portions of these have been preserved by Moses of Khorene, and investigated by several modern scholars (see Vebk Hnwin Hayasdani, i.c., Chants hist. et pop. de ? Ancienne Arménie, J. B. Emin, Moscow, 1850; Dulaurier, 2ev. des D. Mondes, 1852, vol. xiv.; "Etudes sur les chants hist. de 'anc. Arménie," in Journal Asiatique, 1852). With the introduction of Christianity a great development of literary activity took place, which chiefly expended itself, however, in transla- tions from the Syriac and Greek. Armenian students were found in Athens and Byzantium, Alexandria and Rome, and some of them attained celebrity in their chosen pur- suits. To this tendency we owe the preservation, in Armenian, of many

works that have perished in their original languages. Such are the Chronicle of Eusebius, some of the works of Philo, Bardesanes, Faustus of Byzan- tium, Lerubna of Edessa, &. (see Wenrich, De auctorum Grecorum versionibus Arabicis, Armentacis, &c., Leipsic, 1842). The 5th century was one of the most flourishing periods of Armenian literature. It was then that Miesrob accomplished that modification and development of the Armenian alphabet which has frequently procured him the honour of being regarded as its inventor (see Fr. Muller, Ueber den Ursprung der Armenischen Schrift, 1865). The Old Testament was translated from the Septuagint by Isaac or Sahak, the patriarch (critical edition, Ven. 1805). These learned men were succeeded by a number of worthy disciples, such as Esnig of Golp (Koghb), Goriun the biographer of Miesrob, and David the Invincible, a keen student of Greek philosophy, who has left us Phalosophical Definitions and translations from Aristotle (see "La vie et les ouvrages de David le phil. Armén.," by Neumann in Journal Asiatique, 1829). Yeghishe or Elisezeus wrote a very popular account of the wars of Vartan against the Persians, which has been frequently translated (Neumann, London, 1830). Moses of Khorene is one of the most

important as well as best known historians of his native country. In the 6th century all connection with the centres of Greek culture being cut off by the Persian monarchs, Armenian literature became almost extinct. In the 7th century John the Mamigonian continued Zenob's History of Daron (Taron) ; Sebeos composed a history of Heraclius ; Ananias of Shirag was the author of astrono- mical works, and Theodorus and Sahak wrote upon theolo- gical subjects. Among the writers of the 8th century the chief place is held by John of Osdin and Stephanus of Siunia; and in the 9th century we find John the Catho- likos, Thomas Ardzruni, and Miesrob of Hayotz-dsor. In the 10th century, Khosrov the Great, Ghevond or Leontius the Presbyter, Gregory of Narek, Moses of Kalkand, and Stephanus Asolik (Assoghik) may be mentioned; and in the 11th, Aristakes of Lastiverd, a national historian, and Matthew Yeretz (i.e, the Presbyter) of Edessa, the bio- grapher of Chrysostom.

The 12th and 13th centuries form a second great period of Armenian literature, during which the influence of Syriac is again perceptible. Gregory Magistros, who introduced the Arabic system of versification into his native language, Narses of Lampron, Mekhitar Kosh (see Journ. Astat., 1841), John Vanacan (i.e, the Monk), Vardan the Great (Journ. Asiat., 1867), Vahram, and Sempad, are a few of the numerous writers of note. From the 14th to the 18th century there is a falling off, the most important work, perhaps, being Thomas of Medzoph's History of Timour. In the 18th century a

revival took place, which was mainly due to the Mekhita-

rists of Venice (see Langlois, Votice sur le couvent Armé-

nien de U' tle Saint-Lazare de Venise, Paris, 1863), and since

then Armenian literature has acquired a development which is remarkable in the absence of national unity. Printing presses have been established in most of the cities where Armenians are numerous, the ancient writers have been published and studied, the vernacular literature has been enriched both by original productions and translations, and magazines and newspapers have been established in many of the centres of Armenian activity. The study of the Armenian language and literature by the savants of Western Europe has shared in the general development of Indo-European philology. The earlier labours of Rivola (1633), Villote, La Croze, Osgan, Villefroy, and Freret have been almost completely eclipsed by such men as Saint Martin (an Armenian by race), Dulaurier, Langlois, Boré, and Prudhomme in France ; Néve in Holland ; Emin, Patcanian,and Brosset in Russia; and Windischmann, Marle, Spiegel, Justi, Neumann, and Petermann in Germany.

See Somal's Quadro della storia let. di Arm. ; Karikin, Hist. de la lit. Arm.; Patcanian, "Cat. de la lit. Arm.," in Mélanges Asiat., vol. iv. Petersb., 1860 ; Neumany's Versuch einer Gesch. der Arm. Lit.; Alishan's Tableau suceinet de UVhist. et de la lit. de lV Arm., 1860; Hamachod's Chronological succ. of Arm. Patriarchs (in Armenian).

ARMENIAN VERSION. The Armenian version of the Bible was undertaken in the year 410 by Miesrob, with the aid of his pupils Joannes Ecelensis and Josephus Pal- nensis. It appears that the patriarch Isaac first attempted, inconsequence of the Persians having destroyed all the copies of the Greek version, to make a translation from the Peshito ; that Miesrob became his coadjutor in this work; and that they actually completed their translation from the Syriac. But when the above-named pupils, who had been sent to the ecclesiastical council at Ephesus returned, they brought with them an accurate copy of the Greek Bible. Upon this Miesrob laid aside his translation from the Peshito, and prepared to commence anew from a more authentic text. Imperfect knowledge of the Greek lan- guage, however, induced him to send his pupils to Alexan-

dria to acquire accurate Greek scholarship ; and, on their return, the translation was accomplished. Moses of Khorene, the historian of Armenia, who was also employed, as a disciple of Miesrob, on this version, fixes its completion in the year 410; but he is contradicted by the date of the Council of Ephesus, which necessarily makes it subse- quent to the year 431. In the Old Testament this version adheres closely to the LXX., but, in the book of Daniel, it has followed the version of Theodotion. Its most striking characteristic is, that it docs not follow any known recen- sion of the LXX. Although it more frequently agrees with the Alexandrine text, in readings which are peculiar to the latter, than it does with the Aldine or Complutensian text, yet, on the other hand, it also has followed readings which are only found in the last two. Bertholdt accounts for this mixed text by assuming tbat the copy of the Greek Bible sent from Ephesus contained the Lucian recension, that the pupils brought back copies according to the Hesychian recension from Alexandria, and that the trans- lators made the latter their standard, but corrected their version by aid of the former. The version of the New Testament is equally close to the Greek original, and also represents a text made up of Alexandrine and Occidental readings. This version was afterwards revised and adapted to the Peshito, in the 6th century, on the occasion of an ecclesiastical union between the Syrians and Armenians. Again, in the 13th century, an Armenian king, Hethom or Haitho, adapted the Armenian version to the Vulgate, by way of smoothing

the way for a union of the Roman and Armenian churches. Lastly, the bishop, Uscan, who printed the first edition of this version at Amsterdam in 1666, is also accused of having interpolated the text, by adding all that he found the Vulgate contained more than the Armenian version. The existence of the verse 1 John v. 7, in this version, is ascribed to this supple- mentary labour of Uscan. It is clear from what has been said, that the critical uses of this version are limited to determining the readings of the LXX. and of the Greek text of the New Testament which it represents, and that it has suffered many alterations which diminish its useful- ness in these respects.

ARMENTIERES, a well-built and flourishing town, in the department of Nord in France, on the Lys, nine miles N.W. of Lille. It carries on considerable manufactures of leather, cotton, cloth, linen, lace, soft-soap, beet-root sugar, salt, &c. Situated as Armentiéres is on the frontier, its annals are full of instances of military occupation and eee from the 14th century downwards. Population,

15,579.

ARMFELT, Gustav Mavritz, Baron, afterwards Count, eldest son of a Finnish nobleman, was born at Juva in 1757. He entered the army and gained the favour of Gustavus ITI., who appointed him to a post in the service of the Crown Prince, and afterwards made him general of a division of the army in the war against Russia. He was successful in his military operations, and also materially aided the king in quelling a conspiracy of the officers. In 1790 he signed the treaty of peace at Verela; and two years later, when Gustavus was mortally wounded by au assassin, Armfelt was named by him governor of Stock- holm. But the regent Charles, the late king's brother, was not well disposed towards him, and he took an opportunity to leave the country as ambassador to Naples. While there he entered into a conspiracy to depose the regent. This was discovered; he was outlawed and condemned to death, and his associates were severely punished. The accession of Gustavus IV. restored him to his honours, and after the revolution of 1809, by which the ex-regent became king, he was made president of the military council. Being suspected of having a share

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in the poisoning of the prince of Augustenburg, he fled from Sweden and took refuge at the Russian court, where he received the highest honours. He dicd in 1814 at Tzarskoe-Selo.

ARMINIUS, James, a distinguished Dutch theologian, author of the modified Reformed theology that receives from him its name, was born at Oudewater, South Holland, 1560. Arminius is a Latinised form of his family name Hermanns or Hermannson. His father, a cutler, died while he was an infant, leaving a widow and three children. Theo- dore /Emilius, a pricst, who had turned Protestant, adopting James, removed with him to Utrecht, but died when his charge was in his fifteenth year. Rudolph Snellius, the mathematician, a native of Oudewater, then a professor at Marburg, happening at the time to visit his early home, met Arminius, saw promise in him, and undertook his maintenance and education. But hardly was he settled at Marburg when the news came that the Spaniards had besieged and taken Oudewater, and mur- dered men, women, and children, sparing only certain matrons and maids, "' who had been sold by auction to the soldiers at two or three dollars each." Arminius hurried home, but only to find all his relatives slain. In February the same year (1575), the university of Leyden had been founded, and was becoming a ratlying point and nursery for the nascent literary genius, theological activity, and scholarship of the country. Arminius seized the oppor- tunity thus afforded of pursuing his studies at home. The six years he remained at Leyden (1576-82) were years of active and innovating thought in Holland. The War of Independence had started conflicting tendencies in men's minds. . To some it seemed to illustrate the necessity of the State tolerating only one religion, but to others the necessity of the State tolerating all Richard Koornhert argued, in private conferences and public disputations, that it was wrong to punish heretics, and his great opponents were, as a rule, the ministers, who maintained that there was no room for more than one religion in a State. Casper Koolhaes, the heroic minister of Leyden—its first lecturer, too, in divinity—pleaded against a too rigid uniformity, for such an agreement on "fundamentals" as had allowed Reformed, Lutherans, and Anabaptists to unite. Leyden had been happy, too, in its first professors. There taught in theology William Feuguerzeus, a mild divine, who had written a treatise on persuasion in religion, urging that as to it "men could be led, not driven;" Lambert Danzus, who deserves remembrance as the first to discuss

Christian ethics scientifically, apart from dogmatics ; John Drusius, the Orientalist, one of the most enlightened and advanced scholars of his day, settled later at Franeker; John Kolmann the younger, best known by his saying that high Calvinism made God " both a tyrant and an executioner." Snellius, Arminius's old patron, now removed to Leyden, expounded the Ramist philosophy, and did his best to start his students on the search after truth, unimpeded by the authority of Aristotle. Under these men and influences, Arminius studied with signal success; and the pro- mise he gave induced the merchants' guild of Amsterdam to bear the further expenses of hiseducation. In 1582 he went to Geneva, studied there awhile under Theodore Beza, but had soon, owing to his active advocacy of the Ramist philosophy, to remove to Basle. Aftera short but brilliant career there he returned to Geneva, studied for three years, travelled, in 1586, in Italy, heard Zarabella lecture on philosophy in Padua, visited Rome, and, open-minded enough to see its good as well as its evil, was suspected by the stern Dutch Calvinists of Popish leanings. Next year he was called to Amsterdam, and there, in 1588, was ordained to the ministry. He soon acquired the reputation of being an elegant preacher and faithful

5d2 pastor. He was commissioned to organise the educational system of the city, and is said to have done it well. He greatly distinguished himself by fidelity to duty during a plague that devastated Amsterdam in 1602. In 1603 he was called to a theological professorship at Leyden, which he held till his death in 1609.

Arminius is best known as the founder of the anti-Calvin- istic school in Reformed theology, which created the Remon- strant Church in Holland (see REMONSTRANTS), and con- tributed to form the Arminian tendency or party in England. He was a man of mild and liberal spirit, broadened by varied culture, constitutionally averse to narrow views and enforced uniformity. He lived in a period of severe systematising. The Rcformed strengthened itself against the Roman Catholic theology by working itself, on the one hand, into vigorous logical consistency, and supporting itself, on the other, on the supreme authority of the Scrip- tures. Calvin's first principle, the absolute sovereignty of God, had 'been so applied as to make the divine decrce determine alike the acts and the destinies of men; and his formal principle had been so construed as to invest his system with the

authority of the source whence it professed to have been drawn. Calvinism had become, towards the close of the 16th century, supreme in Holland, but the very rigour of the uniformity it exacted provoked a reaction. Richard Koornhert could not plead for the toleration of heretics without assailing the dominant Calvinism, and so he opposed a conditional to its unconditional predestina- tion. The two ministers of Delft, who had debated the point with him, had, the better to turn his arguments, descended from the supralapsarian to the infralapsarian position, z.e., made the divine decree, instead of precede and determine, succeed the fall. This seemed to the high Calvinists of Holland a grave heresy. Arminius, fresh from Geneva, familiar with the dialectics of Beza, appeared to many the man able to speak the needed word, and so,in 1589, he was simultaneously invited by the ecclesiastical court of Amsterdam to refute Koornhert, and by Martin Lydius, professor at Franeker, to combat the two infralapsarian ministers of Delft. Thus led to confront the questions of necessity and free will, his own mind became unsettled, with the result, that the further he pursued his inquiries the more he was inclined to assert the freedom of man and limit the range of the unconditional decrees of God. This change in doctrinal belief became gradually more apparent in his preaching and in his private conferences with his clerical associates, and occasioned much controversy in the ecclesiastical courts. The controversy was greatly embit- tered, and the differences correspondingly sharpened, by his appointment to the professorship at Leyden. He had as colleague Francis Gomarus, a strong supralapsarian, perfervid, irrepressible; and their collisions, personal, official, political, tended to develop and define their respec- tive positions. Arminius died, worn out by uncongenial controversy, before his system had been elaborated into the logical consistency it attained in the hands of his celebrated successor, Simon Episcopus, but though inchoate in detail, it was in its principles clear and coherent enough. These may be thus stated :—

1. The decree of God is, when it concerns His own actions, absolute, but when it concernsman's, conditional, 2.e., the decree relative to the Saviour to be appointed and the salvation to be provided is absolute, but the decree relative to the persons saved or condemned is made to depend on the acts—belief and repentance in the one case, unbelief and impenitence in the other—of the persons themselves.

2. The providence or government of God while sovereign, is exercised in harmony with the nature of the creatures governed, 7.¢., the sovereignty of God is so exercised as to be compatible with the freedom of man.

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3. Man is by original nature, through the assistance of divine grace, free, able to will and perform the right ; but is in his fallen state, of and by himself, unable to do so; needs to be regenerated in all his powers before he can do what is good and pleasing to God.

4, Divine grace originates, maintains, and perfects all the good in man, so much so that he cannot, though rege- nerate, conceive, will, or do any good thing without it.

5. The saints possess, by the grace of the Holy Spirit, sufficient strength to persevere to the end in spite of sin and the flesh, but may so decline from sound doctrine as to cause divine grace to be ineffectual.

6. Every believer may be certain or assured of his own salvation.

7. It is possible for a regenerate man to live withont sin,

Anminius's works are mostly occasional treatises drawn from him by controversial emergencies, but they everywhere exhibit a calm, well-furnished, undogmatic, and progressive mind. Characteristic are such sayings as these in letters to his friend, Uitenbogaert:—'Truth, even theological truth, has been sunk in a deep well, whence it cannot be drawn forth without much effort." "I should be foolish were I to concede to any one so much of right in me, as that he should be able to disturb me as often as he had a mind. Be this my brazen wall, a conscience void of offence. Forward let me still go in my search after truth, and therein let me die with the good God on my side, even if I must nceds incur the hatred and ill-will of the whole world." He was essentially an amiable man, who hated the zeal for an impossible orthodoxy that constrained "the church to institute a search after crimes which have not betrayed an existence, yea, and to drag into open conten- tions those who are meditating no evil." His friend Peter Bertius, who pronounced his funeral oration, closed it with these words,

—"There lived a man whom it was not pos- sible for those who knew him sufficiently to esteem ; those who entertained no esteem for him are such as never knew him well enough to appreciate his merits."

The works of Arminius (in Latin) were published in a single quarto volume in 1631. The first volume of an English translation, with copious notes, by James Nichols, was published in 1825, the second in 1828, but the third and coneluding volume is still due. A life was written by Casper Brandt, son of Gerard Brandt, the historian of the Dutch Reformation, and published in 1724 ; republished and annotated by the historian Mosheim in 1725; translated into English by the Rey. John Guthrie, and published in 1854.

(A. M. F.)

ARMISTICE, a temporary suspension of hostilities by mutual agreement between two nations at war, or their respective forces, An armistice may be either general or particular : in the first case, there is a complete cessation of hostile operations in every part of the dominions of the belligerent powers; in the second, there is merely a temporary truce between two contending armies, or between a besieged fortress and the force besieging it. A general armistice cannot bé concluded by the commanders-in-chief unless special authority has been previously delegated to them by their respective governments; otherwise, any arrangement entered into by them requires subsequent ratification by the supreme powers of the states. A partial truce may be concluded by the officers of the respective powers, without any special authority from their governments, wherever, from the nature and extent of the commands they exercise, their duties could not be efficiently discharged without their possession of such a power. The conduct of belligerent parties during an armistice is regulated by the following general conditions, which, however, may be set aside by special agreement : —(1.) Each party may do, within the limits prescribed by the truce, whatever he could have done in time of peace. For

example, he can raise troops, collect stores, receive reinforcements, and fortify places that are not actually in astate of siege. (2.) Neither party can take advantage of the armistice to do what he could not have done had

military operations continued. Thus he cannot throw provisions or reinforcements into a besieged town, and neither besiegers nor besieged are at liberty to repair their fortifications or erect new works. (3.) All things contained in places, the possession of which was contested, must remain in the state in which they were before the armistice began. Any infringement by either party of the conditions of the truce entitles the other to recommence hostile opcra- tions without previous intimation.

ARMORICA. 'The Armorici were, in Cesar's time, the Celtic inhabitants of the coast from the Loire to the Scine. The word appears to be composed of "ar," near, and "mor," the sea, and would originally be applicable to any maritime population. It is said to be akin to "Morini," and "Pomerania" (Po-more). In the Middle Ages the name Armorica was still further narrowed into an equivalent for Brittany.

ARMS anp ARMOUR. The history of arms and armour forms one of the most suggestive chapters in the history of civilisation. The use of stone weapons appears to have been universally characteristic of the earlier, as it is still distinctive of the ruder races of mankind. The forms of the weapous fabricated in this intractable material were of necessity few and simple. The commonest and most widely distributed type is that of the imperforate axe, varying from the roughly-dressed wedge of flint, to the finely-shaped and highly-polished lenticular "celt." They were fabricated of flint, diorite, greenstone, serpentine, indurated clay-slate, in short, of almost every material capable of being worked into the desired form, and of retaining the requisite sharpness of edge. Spear-heads and arrow-points were chipped in flint with such surprising dexterity and skill, that they were nearly as effective as those subsequently fabricated in metals, and not much inferior in form and finish. The highest efforts of the ancient stone-workers culniinated in the short leaf-shaped knife-dagger of flint, suggestive of the form which after- wards became the characteristic weapon of the Bronze Age, the leaf-shaped sword. These knife-daggers of flint exhibit considerable variety of form, though always of the same type. They vary also in size, but seldom ex- ceed about 12 inches in length. They are never ground or polished, but delicately chipped to a straight edge, while the flakes are so regularly removed from the convex portions of the blade as to

give a rippled or wavy surface, and the corners of the handle are delicately crimped, thus producing an appearance of great beauty and finish.

The Bronze Age.—In the earliest interments in which the weapons deposited with the dead are of other materials than stone, a peculiar form of bronze dagger occurs. It consists of a well-finished, thin, knife-like blade, usually about 6 inches in length, broad at the hilt and tapering to the point, and always riveted to the handle by massive rivets of bronze. It has been found associated with stone celts, both of the roughly-chipped and the highly-polished kind, showing that these had not been entirely disused when bronze became available. A later type of bronze dagger is a broad, heavy, curved weapon, usually from 9 to 15 inches in length, with massive rivets for attachment to an equally massive handle. The leaf-shaped sword, however, is the characteristic weapon of the Bronze Period. It is found all over Europe, from Lapland to the Mediter-

Fia. 1.—Leaf-shaped flint Dagger.

ranean. No warlike weapon of any period is more graceful in form or more beautifully finished. The finish seems to have been given in the mould without the aid of hammer or file, the edge being formed by suddenly reducing the thickness of the metal, so as to produce a narrow border of extreme thinness along both sides of the blade from hilt to point. The handle-plate and blade were cast in one piece, and the handle itself was formed by side plates of bone, horn, or wood, riveted through the handle-plate. There was no guard, and the weapon, though short, was

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Fia. 2.—Leaf-shaped bronze Sword.

well balanced, but more fitted, however, for stabbing and thrusting than for cutting with the edge. The Scandinavian variety is not so decidedly leaf-shaped, and is longer and heavier than the common British form ; and

instead of a handle-plate, it was furnished with a tang on which a round, flat-topped handle was fastened, like that of the modern Highland dirk, sometimes surmounted by a crescent-like ornament of bronze. A narrow, rapier-shaped variety, tapering from hilt to point, was made without a handle- plate, and attached to the hilt by rivets like the bronze daggers already mentioned. This form is more common in the British Isles than in Scandinavia, and is most abundant in Ireland. The spear-heads of the Bronze eriod present a considerable variety of form, though the leaf-shaped pre- dominates, and barbed examples are extremely rare. Some British forms of this weapon are of great size, occasionally reaching a length of 27 inches. The larger varieties are often beautifully designed, having segmental openings on both sides of the central ridge of the blade, and elaborately

Fic. 3.—Bronze Spear head, length 19 inches.

ornamented with chevrony patterns of chased or inlaid work both on the socket and blade. Arrow-points are much rarer in bronze than in flint. In all probability the flint arrow-point (which was equally effective and much more easily replaced when lost) continued to be used throughout the Bronze Period. Shields of bronze, circular, with hammered-up bosses, concentric ridges, and rows of studs, were held in the hand by a central handle underneath the boss. The transition period between the Bronze and Iron Ages in Central Europe is well defined by the occur- rence of iron swords, which are simple copies of the leaf- shaped weapon, with flat handle-plate previously fabricated in bronze. These have been found associated with articles assigned to the 3d or 4th century B.C.

The Greek Heroic Age.—The Greek sword of the heroic age is described by Homer as double-edged, loug, sharp, and trenchant, the blade of bronze, and the hilt and scab- bard adorned with gold or silver studs. In the Homeric combats, however, the spear, Jance, or javelin always plays the principal part, and the sword is only used when the combatants meet at close quarters, the spear having failed to decide the contest. Both sword and spear appear to have been of the forms which are characteristic of these weapons in the Bronze Age of Central and Northern Europe. The bow of Pandarus is described as made of ibex-horn and strung with sinews. The

arrow-head is the only part of the warrior's equipment which Homer expressly describes as of iron, and the mode of its insertion In a split in the head of the shaft, wherc it was made fast by a liga-

ture of sinew, is precisely that which is still adopted by modern savages with their arrow-poiuts of flint. The defensive armour of the heroic ages was also entirely of bronze. In consisted of helmet, cuirass, greaves, and shield. The helm was sometimes a simple casque, or close- fitting headpiece, but more frequently adorned with crest and plumes. The cuirass of bronze was often elaborately engraved and adorned with gold. The greaves covered the leg to the instep, and were either of bronze or some similar compound metal of great toughness and flexibility. The shield, round or oval in form, is described as of bronze, backed or covered with hide, and decorated with bosses and concentric rings of metal. We have a gauge of the size of Hector's shield in the lines— '"'Heetor of the gleaming helm Turned to depart ; and as he moved along The blaek bull's-hide his neck and ancles smote,

The outer cirele of his bossy shield." Tl. vi. 116-118.

Greek Historic Age.—In the early historic ages the characteristic weapons of the Greek armies were determined by the military tactics of the period. The mode of fight- ing in heavy phalanx necessitated the use of long, heavy spears. The Hoplites when massed in phalanx stood sixteen deep, the men of each rank close together, shield touching shield, the pikes of each line, 21 to 24 feet long, projecting from 2 to 13 feet in front of the foremost rank at equal distances. The shield of the early monuments, though still large, is not nearly so large as that of Hector, usually reaching from the shoulder to the knee, and still retaining its round or oval form and bold convexity. On the early vases the shields are represented as adorned with a great variety of devices. We now find the helm having. a lengthened neck-guard, side-guards for the face, frontlet, and prolonged crest, sweeping graccfully over the rounded top of the head-piece and faliing down the back, At the time of the Peloponnesian war the linen corsclet, so much in favour among the

Egyptians, Assyrians, and Asiatics generally, was introduced instead of the heavy cuirass of the Hoplites, anda smaller shield substituted for the larger and heavier one previously in use, while the length of the sword was considerably increased. The light-armed troops were furnished with a light javelin provided with a strap or thong attached to the middle to assist in hurling it. The mounted troops were similarly equipped as to their defensive armour, and fur- nished with a longer sword, a javelin, and a short dagger,

Ligyptian.—The strength of the Egyptian armies in the earliest times consisted of archers, who fought either on foot or from chariots. The Egyptian bow was somewhat shorter than the height of aman. The string was of hide, catgut, or cord, The arrows varied from 24 to 34 inches in length, and were usually of reed, winged with three feathers and pointed with heads of bronze. These were sometimes cast with sockets and sometimes with tangs. Arrow-heads of flint are occasionally found in the tombs along with those of bronze, and Sir Gardner Wilkinson remarks on this, that 'flint arrow-heads were not confined to an ancient era, nor were they peculiar to Egypt alone; the Persians and other Eastern peoples frequently used them even in war." 'The Egyptian archers were provided with a falchion, dagger, mace, or battle-axe, for close com- bat ; their defensive armour consisted of a quilted head- piece and coat, but they carried no shield, which would have been an impediment to the free use of the bow. The infantry were classified according to the weapons with which they fought, as spearmen, swordsmen, clubmen, and slingers. The spears were 5 or 6 feet long, with large triangular or leaf-shaped heads of bronze, socketed and fastened to the shaft by a single rivet through the sockct.

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The spearmen fought in close phalanx, and were furnished with shields of a peculiar form, rectangular below and semicircular above, like a round-headed door, about half the height of a man. Their shields were covered with bull's hide, having the hair outwards, strengthened by rims and studs of metal, and furnished with a round sight- hole in the middle of the semicircular upper part. They had quilted helmets, and cuirasses of bronze scales or quilted with bands of metal, but no greaves. The early Egyptian sword was of bronze, straight, double-edged, tapering from hilt to point,

and varying from 30 to 36 inches in length. Axes, with short handle and an oblong or crescentic blade, with segmeutal openings, fastened to the handle and uusockcted, maces and clubs of various forms, and short, leaf-shaped daggers of bronze, were also used.

Assyrian.—The Assyrian sword, as represented on the monuments, resembled the Egyptian, but was worn on the left side, slung in a nearly horizontal position by the waist- belt. The bow was also a favourite weapon with the Assyrians, and lances, spears, and javelins, with oblong, leaf-shaped and unbarbed heads, constantly appear upon the sculptures. The shield was round and convex; the helm frequently conical, truncated or curved forward, and with pieces to protect the neck at the back and sides. Their cuirasscs were close-fitting tunics made of many layers of flax, plaited or interwoven, and hardened and cemented with glue,—a species of linen corselet frequently referred to as in use also among the Egyptians, the Greeks, and the Romans.

Etruscan.—The arms and armour of the Etruscans were in the main similar to those of the Greeks. Their cui- rasses, however, were provided with overlapping shoulder- guards, a peculiarity not observed in Greek armour. The shields were round and exceedingly convex, the helmets of very various forms, with a general tendency to a deep, bell- shaped contour, adorned with an excessively elevated and elongated crest, and sometimes with alated projections of considerable height rising from opposite sides near the apex of the helm.

Roman.—The early Roman sword, like that of the Greeks, Egyptians, and Etruscans, was of bronze. We have no direct statement as to its form, but in all proba- bility it was of the leaf-shaped form so universally charac- teristic of this weapon in bronze. We gather from the monuments that, in the lst century B.c., the Roman sword was short, worn on the right side, suspended from a shoulder-belt, and reaching from the hollow of the back to the middle of the thigh, thus representing a length of from 22 inches to 2 feet. The blade was straight, double-edged, and obtusely pointed. On the Trajan column (114 a.p.) it is considerably longer, and under the Flavian emperors the long, single-edyed spatha appears frequently along with the short sword. The characteristic weapon peculiar to the Romans, however,

was the pilum. The form of this weapon and the mode of using it have been minutely described by Polybius, but his description has been much misunderstood in consequence of the rarity of representations or remains of the pilum. It is shown on a monument at St Remi, in Provence, assigned to the age of the first emperors, and in a bas-relief at Mayence, on the grave-stone of Quintus Petilius Secundus, a soldier of the 15th legion. A specimen of the actual weapon is in the museum at Weisbaden. It is a pike with a stout iron head, carried on an iron rod, about 20 inches in length, which terminates in a socket for the insertion of the wooden shaft. As represented on the monuments, the iron part of the weapon is about one-third of its entire length, and its junction with the wooden part of the shaft is fortified by aknob or swelling which is peculiar to this weapon. When used as a javelin at short distances it had a most embarrassing effect. Piercing the

shield, the slender iron neck of the weapon bent with the weight of the shaft, which then dragged along the ground, so that the shield was rendered useless for defence. When used at close uarters it not only answered all the purposes of the modern bayonet, but when firmly wielded in both hands it was equally efticient to ward off sword-strokes, which fell harmless upon the long and strong iron neck of the weapon. Polybius states that the legionary receiving the sword-strokes, with cool steadiness, upon his pulum, soon turned the swords of the enemy into mere hacked and plunted strigils or skin-scrapers. Vegetius also describes the pilwm in a modified form as used in the armies of the Lower Empire, and in a still more modified form it re- appears as the angon of the Franks, to be noticed further on. The defensive armour of the Romans in earlier times resembled that of the Greeks as previously described, and was chiefly of bronze, consisting usually of helmet with crest and cheek-pieces, cuirass of breast and back plates, modelled to the form of the bust, and having a border of leather bands or straps, falling vertically so as to protect the lower part of the body. On the columns of Trajan and Antonine the cui- rass proper is given to the chiefs only, the legionaries having their cuirasses of leather or linen, on which are sewn circular plates of metal, with shoulder-pieces and oblong plates descending vertically from the lower border of the cuirass. There are two varieties of shield on the Trajan column,—an oblong, rectangular, and

highly convex form, peculiar to the legionaries, and an oval, flattened form borne by the knights and velites. In later times the oval shield was assumed by the legionaries. The Roman helmets in the time of the early emperors were simple skull-caps with a hollowed neck-guard, a small bar acting as a visor, and hinged cheek-pieces which fastened under the chin. In the declining days of the empire the helmet became deeper, the shield larger and more varied in form, the length of the sword was greatly increased, and uniformity of weapons and equipment was no longer observed.

Frankish. —The characteristic weapon of the Franks of the Merovingian epoch (450-760 a.p.) was the francisca or battle-axe, which they used as a missile. Procopius describes it as having a broad blade and a short haft, and it is said that the blow of an axe when hurled would pierce a shield or kill a man, and that the Franks rarely missed their aim. Agathias, the continuator of Procopius (535 A.D.), says they wear no body armour, few of them even having helmets, but they carry round shields, swords of the length of a man's thigh, axes having double edges, and darts which are used either for throwing or for thrusting. These darts had barbed iron heads, and were used as the

Fic. 4.—lron head of Angon from a grave at Darmstadt, 38 in. long.

pilum was used by the Romans. When the angon was fixed in the enemy's shield the custom of the Frank was to bound forward, place his foot on the end of the dart as it trailed along the ground, thus compelling the enemy to lower his shield, when he killed him with his axe or sword. ‘’he Frankish sword was a short, straight, broad-bladed, double-edged weapon, somewhat obtusely pointed, and usually about 30 to 32 inches in length. The sword and francisca of Childeric, one of the first of the Merovingian kings (457-481), were discovered in his tomb at Tournay in 1653, and are now in the museum of the Louvre. The sword has a short, straight cross-piece at the lower end of the hilt, and the pommel is of the same form, but smaller. The Carlovingian epoch, though almost devoid of distine- tive characteristics as regards the arms in use, is remark- able for the gradual change from infantry to cavalry, and

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represents the transition to the period of chivalry. The development of the two military orders of the knights or men-at-arms and the common infantry soldiers, serfs or peasants, may be said to have begun in the armies of Charle- magne, and the superior class of fighting men in his time had added to the ordinary equipment of the earlier Franks the helm and coat of mail.

Scandinavian.—The swords of the early Jron Age in Scandinavia are frequently found in the mosses of Schleswig, associated with objects bearing a strongly-marked analogy to those recovered from the graves of our own Pagan Anglo-Saxon ancestors, of the period dating approxi- mately from the 5th to the 7th centuries of the Chris- tian era. They are long, straight, double-edged, and often richly damascened. On the tangs of several of those found at Nydam are the names of the armourers, some of which are of the Roman form. The grip of the hilt was circular, usually narrow in the middle, and the cross-pieces above and below were similar in shape. The sheaths were of wooden laths, adorned with tastefully- executed mountings in bronze. On one of the chapes an inscription in the earlier Runic alphabet occurred. Associ- ated with these swords were flat, circular wooden shields, of 224 to 44 inches diameter, having a single handle under the central boss, and bosses and mountings sometimes of iron, but more frequently of bronze. Helmets were rare, but chain-armour of interlinked iron rings, of alternate rows of riveted and welded rings, was in use. The sword of the early Viking time in Scandinavia was long and heavy, usually double-edged, with strong rectangular cross- piece, narrow grip, and massive square or triangular pommel. In the later Viking time single-edged swords were more common, and the pommel was frequently tri-lobed, and the cross-piece elongated so as to form a decided guard. The shields were usually circular or oval, often painted and adorned with devices, and conical helmets and coats of mail were common.

Anglo Saxon.—The early Anglo-Saxon sword was usually about 3 feet long, straight, double-edged, broad in the blade, and rounded at the point, with hilt and grip and cross-piece like those of the early Scandinavian swords previously described. As the sword was not carried by any man under the rank of thane, it is not often met with in Anglo-Saxon interments. With them, as with the Franks, it was a horseman's weapon, and the common

accoutrement of the infantry was a spear, an axe, a shield, and a scramasaz, or heavy single-edged knife. The Saxon spear was a narrow, long-bladed weapon, varying greatly in form and dimensions, but generally characterised by the socket being slit or unclosed throughout its length. The axe was narrow-bladed and single-edged, and sometimes peaked at the back. The shield, which was circular or oval in form, was of wood, covered with leather, and fur- nished with a high conical boss, often terminating in a pipe ora button. Anglo-Saxon warriors of the 10th century are represented in the manuscripts as wearing hauberks of mail and rounded casques. The A'lfric manuscript, of the end of the 11th century, shows the tri-lobed sword-hilt and round shield.

Norman.—The arms and armour of the Normans at the period of the conquest of Normandy were, of course, Scandinavian. The Norman arms of the period of the conquest of England are portrayed on the Bayeux tapestry. The sword is still of the Scandinavian type, long, straight, double-edged, and somewhat tapering, and round or ob- tusely pointed with cross piece and pommel. The horse- men are armed with long lances as well as swords. On the tapestry the Normans are represented as well provided with archers and cavalry, of which the Saxons are ap- parently destitute. Maces and clubs appear also among the

weapons; and axes, with shafts from 4 to 5 feet in length, appear in the hands of both Normans and Saxons. _ The Norman shield is large and kite-shaped, provided with arm-strap and handle, and adorned with emblazon- ments of badges or devices. Few examples of the older circular shield appear on the tapestry, and these few are Saxon. The body armour eonsisted of a long hauberk, ringed or trellised, with di- vided skirt, and having the hood and body in one piece. The helmet was deep, eoni- cally topped, and furnished with a nasal.

English after the Norman Conquest.—The armour in use in England since the pe- riod of the Norman Conquest may be bricfly divided into four groups, eaeh assoeiated with its own historical period. True mail armour of inter- linked rings was generally adopted in the time of the Crusades, and its use extended to about the beginning of the 14th century. Towards the

close of the 12th century the long plaited or mailed skirt, divided at the bottom, as we sec in the Bayeux tapestry, had been superseded by a short-sleeved tunic, generally of ehain-mail, reaching only to the knees, but sometimes covered with variously-shaped plates of metal. This short hauberk was eonfined by a belt about the waist, and furnished with a hood or coif, over whieh a close-fitting helm was worn. In the 13th century there was less uniformity of military equipment. The hauberk was again lengthened to the middle of the leg, and had a eoif to cover the head, over which the massive helm, with or without a nasal, was woru, sometimes with a movable visor. The sleeves of the hauberk were prolonged, and mittens added to protect the hands; the lower limbs were eovered with mail, the coverings above the knee being ealled chaussons, and those below the knee chausses. The sword was long, straight, and pointed, generally with a short recurved guard and rounded pommel. The shield was small, triangular, or heater-shaped ; the helm massive, high, and flat-topped. After the middle of the 13th century secondary defences of plate for the protection of the joints began to be introduced ; the hauberk was shortened, the mittens of mail were divided into fingers, the helm

Fic. 5.—From the Bayeux tapestry.

was often rounded at the top, and greaves and shoulder-

plates were introduced. The period of mixed mail and plate armour extends from about 1300 to about 1410. The introduetion of secondary defenees of plate for the weaker and more exposed parts of the mail-suit gradnally ehanged the charaeter of the armour, until it produced the eomplete panoply of plate-armour. In the first half of the 14th eentury the sleeves of the hauberk were shortened, demt-brasarts were introduced for the proteetion of the baek of the upper arm, and vambraces worn on the front of the lower arm, roundles were added in front of the shoulder- joints and at the elbows, and the greaves or jambarts were continued over the feet in laminated plates. The bassinet was now worn beneath the huge sugar-loafed helm, and had a camazl, or eurtain of mail, deseending down the back for the protection of the neck, whieh subsequently assumed the form of a close-fitting tippet. By the middle of the century splinted armour had become common, and the euirass with gussets of mail appears. As the

seeond half of the eentury advanced, the arms and legs were cased entirely in plate, laminated sollerets, acutely

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pointed at the toes, eovered the feet, while the body was protected by a long-sleeved hauberk of mail, reaehing to about the middle of the thigh, with laminated épauliéres or shoulder-guards, and coudieres or elbow-guards. The long sword, with cross-guard, and the short dagger or misericorde were now in fashion, and heraldie crests were generally adopted before the close of the eentury. The first ten years of the 15th eentury were a period of transi- tion, and from about 1410 the armour beeame a eomplete panoply of plate. The period of eomplete armour of plate which eommeneed about 1410 extended to the beginning of the 17th century. At the eommeneement of this period, or towards the middle of the first quarter of the 15th eentury, the body armour consisted of breast and back- plates of one pieee, the roundles at the shoulders were replaeed by plates resembling small shields fixed in front of the shoulder-joints, and a fan-like arrangement of plates protected the elbows. Below the waist the body was _pro- tected by the taces, a series of narrow, overlapping plates attached to a lining of leather. The erested helm, some- times with the addition of a collar, was still in use in battle and tournament. The bassinet was more globular in form, and conneeted by a gorget with the suit of plate. By the middle of the eentury the same system of re-inforcing, or adding secondary proteetions to cover the weaker points, which gradually changed the mail into a complete panoply of plate, had effected eonsiderable ehanges on the character of the plate-suits, until the corresponding defences of the right and left sides of the figure became totally unlike each other. The tabard, a short sureoat with short sleeves, emblazoned with the arms of the wearer, now commonly appears over the armour. By the end of this century the defensive system of plate- armour had reached its high- est development. At the com- mencement of the 16th cen- tury, a species of armour of less rigid and cumbrous de- scription, often formed of small plates of metal quilted within garments of linen or other tissues, had come into fashion, skirts of mail also came again into use, while the armour generally beeame more massive and more richly decorated. Pointed or rounded sollerets gave place to sabatons cut off square at the toes, and

plumes were gene- rally attached to the helms. The salade and the morion, light open head-pieces, gave place to the closed helmet, with visor and beevor ; the recurved finger-guard, with the long straight sword, and all varieties of the sabre, came into use; and two-handed swords and _ sword-breakers (curious implements, with notehes and springs for eatehing the blade of an antagonist's sword) were also used. As the century advanees the decadence of armour begins to be evidenced by its assimilation to the forms of dress and prevailing fashions of the time. Mere surface ornamenta- tion is more and more regarded; fluted, laminated, and puffed suits are fashionable, and the gradual disuse of armour is foreshadowed in the increasing use of fire-arms, against which it afforded no sufficient proteetion. After the close of the 16th eentury it continued to be worn as much for display as for real serviee. Cuirasses began to be superseded by buff coats and jerkins, but demi-suits of plate were worn by euirassiers far on in the 17th eentury. The variations of tilting arms and armour, and of horse.

Fia. 6.—Suit of Plate, early in 16th century

armour, are too numerous to be specified in a short notice. For these and other details the works of Grose, Meyrick, Skelton, Stothard, and Hewitt may be consulted by those who wish to study them fully, while the copiously-illus- trated works of Demmin and Lacombe, recently trans- lated by Mr Black of the South Kensington Museum and Charles Boutell, are excellent popular manuals of the general subject.

Artillery.—The adoption of gunpowder as an agent in warfare gradually revolutionised the whole system of mili- tary tactics, and was not only the ultimate cause of the total disuse of defensive armour, but rendered obsolete the whole of the projectile machines and weapons of the Middle Agcs. Bows and shields were tlie first to give way before it, as they were the oldest forms of weapons of offence and defence. Shields are not represented on English effigies after the last quarter of the 14th century, though the round Highland target survived with the broad- sword till 1745. The long-bow, which became such an important weapon in the 13th and 14th centuries, was usually of yew, about five feet in length, and a practised archer would

send an arrow of a yard long through his mark at a distance of 240 yards. The cross-bow, which is first mentioned by the Princess Anna Comnena, appears inan Anglo-Saxon manuscript of the 11th century. Its use against Christians was prohibited by the Lateran Council in 1139, although it was allowed against the infidels. The long-bow continued in use in England till the end of Queen Elizabeth's reign, and the cross-bow was only disused in the French army in the 17th century, so slow was the process of transition from one system to another, even aftcr the superiority of gunpowder had been long well known. Gunpowder had been in use for cen- turies, however, before it was applied to projectiles. The Chinese used it in their fireworks at a very early date, and it is believed to have been introduced into Europe by the intercourse of the Arabs with the natives of the far East. The earliest receipt for its composition with which we are acquainted occurs in the Liber Ignium ad com- burendos hostes of Marcus Grecus (846 a.D.), where it is described as including six parts of saltpetre, two of sulphur, and two of charcoal. A similar receipt occurs in the De Mirabilibus Mundi of Albertus Magnus, bishop of Ratis- bon, 1280 a.p. Until about the beginning of the 14th century, however, it had not been applied in warfare to the purpose of throwing projectiles, and was probably regarded merely as an explosive mixture, like the "Greek fire" and similar preparations, employed to spread terror and conflagration. 'Large cannon were used on the Con- tinent in siege operations, however, as early as the beginning of the 14th century. Canuon are first mentioned in Eng- land in 1338; Froissart alludes to them in 1340, and it is certain that they were used by the English at the siege of Cambray in 1339. At the same time experiments ware being made at Tournay with long, pointed projectiles, and the duke of Brunswick had substituted leaden bullets for those of stone which were then in common use in his artillery. Carronades were used on board the French ships at the battle of Rhodes in 1372, and bronze cannon were cast at Augsburg in 1378. Towards the end of the 14th century there were bombardes in existence, capable of throwing balls of stone of 200 Ibs. in weight. All early cannon were breech-loaders, and at first they were built of bars of wrought-iron hooped together. The well-known Scottish bombarde, Mons Meg, which was used at the sieges of Dumbarton and Norham in 1489 and 1497 is made in this way. So early as the beginning of the 15th century the prototypes of the modern mitrailleuse were «invented. In Germany they

were subsequently styled "'death-organs," and Weigel mentions one which had as many as thirty-

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three pipes. In the 15th century cannon of a lighter kind than those used in siege operations began to be employed in the field, carriages with trails were introduced, trunnions were added to the guns, and iron balls became common. With the improvement in the manufacture of the gun- powder it was found that the increased velocity of the pro-

'jectile made up for the diminution of its weight; and

throughout the 16th century, the course of improvement was chiefly directed to the lightening of the enormous weights of the guns and projectiles, so as to secure facility of transport. So much progress had been made in this direction by the middle of the century, that, in 1556, the Emperor Ferdinand was able to march against the Turks with 54 heavy and 127 light pieces of artillery. At this period the French artillery were restricted by Henry II. to the following sizes:—Cannon throwing a projectile of about 34 Ib; culverins of three sizes, throwing projectiles of 15 ib, 74 ib, and 2 ib respectively ; and the falcon and the falconet, the former of which threw a projectile of about 1 Ib, and the latter of less than half a pound. In the second half of the 16th century mortars began to be used in Germany, and howitzers, or pieces for discharging hollow projectiles in a horizontal direction, came into use in England about the same period. At first the mortars were discharged by double firing, the artilleryman lighting the fuse of the shell with one hand and the priming of the mortar with the other. It was not until 1634 that the mortar was introduced into the French army ; and towards the close of the 17th century the method of igniting the fuse of the shell by the discharge of the piece itself became general, and greatly simplified the use of the arm. Though Benjamin Robins (who died in 1742) is sometimes spoken of as the inventor of the greatest improvement of modern times,—the application of the system of rifling to artillery,—he was merely the first who treated the subject scientifically. There are rifled cannon of the 16th century in the museum of the Hague. One in the arsenal at Ber- lin, dated 1661, is rifled with 16 grooves, and one at- Nuremberg, of 1694, has 8 grooves. But it was not till after the time of Benjamin Robins that, by the application of

an armature of softer metal to the iron projectiles of the rifled guns, the difficulty was surmounted of enabling them at the moment of explosion to fit themselves tightly into the grooves of the rifling. The improvements of Paixhans in 1822, and of Armstrong in England and Krupp in Prussia, have brought the manufacture of these monster pieces of ordnance to the highest pitch of perfection. Krupp's cannon are made of cast-steel, and one of these, a breech-loader, exhibited in 1867, weighed close on fifty tons, and its shot, also of cast-steel, were somewhat over half a ton in weight. The most recent, and perhaps the most important improvement in the working of heavy ordnance is that of Captain Moncreiff, by which the recoil of the gun itself is utilised, so as to withdraw it under the parapet, and by means of a counterpoise to elevate it again, after it has been reloaded and laid by means of a reflecting sight. These operations are thus conducted without exposing a man, and the gun itself is only exposed at the moment of delivering its fire.

Hand Fire-arms.—Hand-cannons appear almost simul- taneously with the larger bombardes. They were made by the Flemings in the early part of the 14th century, and before the end of the century considerable bodies of troops were in existence armed with portable culverins. At the battle of Morat (1476) the Swiss army is said to have been provided with 6000 of these hand fire-arms. In England the yeomen of the guard were armed with them in 1485. At first these portable fire-arms were served by two men, put a smaller kind termed petronels were used by the cavalry. The long-barrelled harquebus, the prototype of the

modern firelock, having the touch-hole on the right side of the barrel, with a pan for the priming, a trigger, and a pair of movable nippers, called serpentine, for holding the match, was invented in Spain in the time of Francis I. (1515-1547). The muschite (so named from the sparrow-hawk, like the falcon or small cannon) which was larger, heavier, and more powerful than the harquebus, came into use shortly afterwards, and was well known in England before the close of the 16th century. On account of its weight it was provided with a long rest, forked in the upper part and furnished with a spike to stick in the ground. The musket and harquebus

when first employed by the French armies were contemptuously spoken of by contemporary writers, by whom they were considered inferior to arblasts and cross-bows. The wheel-lock, which was invented at Nuremberg in 1515, was but sparingly applied to the harquebus and musket on account of the costliness of its mechanism and the uncertainty of its action. The same objection applied to the snaphaunces, the precursors of the first flint locks, and even to the flint locks themselves, which were invented in France about 1640, and it was not till the beginning of the 18th century that the flint-lock musket finally supcrseded the old match- lock. In 1807 a Scottish clergyman, Alexander Forsyth, took out a patent for a percussion gun, though it was not till 1820 that it began to come into general use. The system of firing the charge by a fulminate was followed by the invention of the needle-gun, the first model of which was constructed in 1827 by Jean Nicolas Dreyse, a native of Erfurt. Improvements in the mode of adapting the bullet to the rifled grooves successively led to the perfected system of the Minie rifle, by which the explosion of the charge expands the cup-shaped end of the conical bullet, and drives it into all the grooves, a process which was previously effected by hammering with the ramrod. The needle-gun was first made breech-loading in 1836, and since that time the improvements effected have been mainly directed to the combination of length of range with accuracy of aim and rapidity of fire. According to an official report, the results of the trial at Spandau of the needle-gun used by the different nations of Europe was as follows :—the Prussian, 12 shots per minute; the Chasse- pot, 11; the Snider (England) 10; the Peabody (Switzer- land), 13; the Werndl (Austria), 12; the Remington (Denmark), 14. Neither breech-loaders nor revolvers, however, are inventions of modern date. Both were known in Germany as early as the close of the 15th century. There are in the Musée d'Artillerie at Paris wheel-lock harquebuses of the 16th century which are breech-loaders ; and there is, in the Tower armoury, a revolver with the old match-lock, the date of which is about 1550. A German harquebus of the 16th century, in the museum of Sigma- ringen, is a revolver of seven barrels. Nor is rifling a new thing in fire-arms, for there was a rifled variety of the old harquebus of the 15th century, in which the balls were driven home by a mallet, and a patent was taken out in England for rifling in 1635. All these systems were thus known at an early period in the history of fire-arms, but it is only the perfecting of their mechanism and rifling, the improvements in the gunpowder and the cartridge, and above all

the adoption of the system of firing by a fulminate, that have enabled them to be used with the pre- cision, length of range, and rapidity of fire, that now form such striking features in the warfare of modern times. It remains only to notice the bayonet, the invention of which, about 1650, has been claimed for Puséygur, a native of Bayonne. The bayonet in its simple plug form, inserted into the mouth of the barrel, was adopted in France and England about 1675. In 1689 it was attached by two rings to the barrel by General Mackay,

the French army in 1703. aim with long-range projectiles the bayonet, once the most decisive of modern weapons, has become of secondary importance.

ARM—ARM

and the socketed bayonet was introduced by Vauban into In these days of precision of

Collections. —The formation of historical collections of arms and armour dates no further back than the com-

mencement of the 16th ceutury. The earliest is that

made by Louis XII. at Amboise in 1502. The magnifi- cent collection at Dresden was begun about 1553. The Ambras collection, now at Vienna, of which a series of illustrative photographs has been published by the Baron von Sacken, was commenced in 1570. There is also a splendid collection in the Imperial Arsenal at Vienna, which has been described, with illustrations, by Captain Leitner. The Musée d'Artillerie at Paris, catalogued by M. l Haridon, is one of the richest and best organised collections in Europe. In the Armeria at Turin there is a fine collection, of which a catalogue has been published by Count Seyssel. The collection at Sigmaringen is cata- logued and illustrated by Dr Lehner, and that of Munich by M. de Hefner-Alteneck. Of the remarkable collections at Tzarskoe Selo, St Petersburg, and at Madrid, there are no detailed descriptions. The collection in the Tower of London, which was classified by Dr Meyrick, and cata- logued by Mr John Hewitt, contains about 6000 examples, from the commencement of the Middle Ages downwards. The

most remarkable private collection ever formed in this or any other country was that of Llewelyn Meyrick at Goodrich Court. It is to be regretted that the opportunity of acquiring this collection in its integrity was missed by the Government. It may be noticed as an indication of popular interest in the subject, that a Museum of Arms, including specimens from the earliest period, has been recently established in Birmingham, containing, in addition to a series of fire-arms granted by the Government, a fine and extensive collection made in Italy by the Cavaliere Callandra, of which the guardians of the Birmingham Proof House have become the purchasers. If we except the National Museum of the Antiquaries at Edinburgh, which contains a fine series of stone and bronze weapons, and a few typical examples of the arms of later times, there is no public collection of arms and armour in Scot- land. (3. AN.)

ARMSTRONG, Jouy, a physician, litterateur, and poet, the friend of Thomson, Mallet, and Wilkes, was born about 1709 at Castletown, Roxburghshire, where his father was parish minister. He graduated M.D. at Edinburgh university, and soon afterwards settled in London, where, however, his professional success was small. In all probability he paid more attention to literature than to medicine. He was, in 1746, appointed one of the physicians to the military hospital behind Buckingham House ; and, in 1760, physician to the army in Germany, an appointment which he held till the peace of 1763, His latter years seem to have been embittered by disappointments, as is evinced by the tone of his writings, in which he particularly directs his sarcasms against his medical brethren and the reviewers. He dicdin 1779. Armstrong's first publication, an anonymous one, entitled An Hssay for Abridging the Study of Physic (1735), was a satire on the ignorance of the apothecaries and medical men of his day. This was followed two years after by the Economy of Love, a poem the indecency of which damaged his professional practice. In 1744 appeared his Art of Preserving Health, a very successful didactic poem, and the one production on which his literary reputation rests. Along with this poem were published, in 1770, a number of shorter poetical pieces, under the title of Miscellanies, in which he displays con- siderable humour and powers of observation.

ARMY

RMY, “a collection of armed men obliged to obey one man” (Johnson); “a collection of troops of all arms formed into brigades and divisions, placed under the orders of one commander, with a general and special staff and administrative departments; provided with all neces- sary war materiel, and destined to act offensively and defensively against the enemy” (Block, Dictionnaire de PHconomie Politique). Neither definition is quite satis- factory. The first is too comprehensive; the second excludes the forces of all but highly-civilised nations. The essential characteristics of an army, by which it is distinguished from other assemblages of armed men, are its national character—that is, its representing more or less the will and the power of the nation or its rulers—and its organisation. The degree of the latter must depend on the age and the state of civilisation; the armies of former days we should now call mobs. The art of war has kept pace with the arts of peace, and there is as much difference between the “armies” of the present and of the past as between an elaborate modern machine and an early stone implement. But armies of some kind have existed since the earliest periods of man’s history. At no time has industrial accumulation, with its results, progress and civilisation, been possible unless accompanied by the will and power to defend it. No nation has made its mark in history that has not at some period of its existence been pre-eminently distinguished for martial spirit and proficiency in arms; or been allowed to throw its full energies into the pursuits of peace till it had proved what it was able and willing to do and endure in war. In studying the progress of military art we dwell in succession on the proudest days of all the great nations of the earth, and learn that when this art was neglected the fall of the nation was scldom far distant.

The art of war divides itself into two distinct branches —the first relating to the military institutions of nations, the manner in which armies are raised, their composition, characteristics, organisation, and government ; the second to their employment in war. The first, commonly known as the administration or organisation of armies, is that of which this article treats. A modern army is a vast and complicated machine, so constructed that the whole aggregate force of its numerous parts may be exerted in any direction and on any point required. It is our pro- vince to describe this machine in a

state of rest, explaining the construction, purpose, and combination of its several parts, but leaving its action to be treated of elsewhere (see War).

In the earliest stage of civilisation the army is identical with the tribe or nation. Every man is a warrior; even women and children accompany the expeditions, prepare and carry food, and bear such share as they are fitted for. In more settled communities the able-bodied men only take the field, while the women, the children, and the aged remain at home to watch the herds and till the fields. Production is still so small that no division of duties among the men is necessary. The armies consist of the whole male population, collected under their chiefs and heads of families, or under warriors who have specially distinguished themselves. Such were some of the earliest armies mentioned in history, and such are still the armies of the savage nations with whom our colonial empire brings us in contact,—well fitted for petty warfare between neigh- bouring tribes or nations, when the assailants confine them- selves to raids for plunder and captives, but not for distant expeditions or prolonged operations. As population and

industry increase, a division of labour becomes both pos- sible and necessary. A select portion of the inhabitants are specially devoted to military service, either permaneutly o1 for a time, while the remainder give undivided atten- tion to pacific pursuits. Standing armies and permanent organisation are thus introduced, and lead to improve- ments in administration and progress in the art of war, till finally we attain to the perfection of modern organisation.

History points to Egypt as the first country in which a Egyptian regular military organisation was established, and the warrior 9™Y-*

class, as such, distinguished from the rest of the population. Byits earliest laws the revenues of the state were divided into three equal parts, of which one went to the priests, one to the king, and one to the warriors. Sesostris seems to have been the great military organiser of Egypt. Trained by his father from childhood to war, he early distinguished himself in military expeditions against the Arabians and against Lybia, and mounted the throne with visions of universal conquest. To pave the way for such schemes, he gave Egypt a military organisation, dividing it into thirty-six provinces, and establishing a militia or warrior class, called Kalasires and

Harmatopovi, to each of whom was allotted land sufficieut for the maintenance of himself and his family. These formed the nucleus of the vast army, amounting, according to Diodorus Siculus, to 600,000 infantry, 24,000 cavalry, and 27,000 war chariots, with which he undertook the conquest of the world. We read that the command of this army was given to the companions of the king, who, like himself, had been trained to arms under his father, and that a strict discipline was maintained and a military code established which forbade corporal punishment, appealing to the higher instincts of the soldier ; but of the details of organisation and administration by which so vast an army was moved and fed we can learn little. With this army, aided by a powerful fleet, Sesostris first subdued Ethiopia, and then extended his conquests eastward as far as the Ganges; theuce turning northwards and westwards, he swept over the Punjab, the table-land of Tartary, and the north shores of the Caspian, and descended through Sar- matia and Dacia into Thrace. Finally, he overran Asia Minor, and having conquered the Assyrian empire and seated himself on the throne of Ninus and Semiramis, returned in triumph to Egypt after a nine years' absence, and devoted the rest of his life to the peace and prosperity of his kingdom. Such are the accounts hauded down by the ancient historians; and if any faith is to be attached to them, it seems clear that he did actually raise and main- tain large armies, and with them carry out prolonged and distant expeditions, extending over several years, without interrupting the industry and progress of his own country— facts which in themselves prove a high degree of national and military organisation.

The martial spirit of Egypt, however, seems to have Persian expired with its first and greatest conqueror, and asa nation 4™Y-

it has distinguished itself in the arts of peace rather than those of war: the country became the prey of conquerors and the battle-field of other nations, and the palm of military supremacy passed successively into the hands of the Assyrians, the Babylonians, the Medes, and the Per- sians. The first two nations present no special features in their military systems; their armies, like those of Egypt, consisted mainly of infantry, horsemen and chariots form- ing but a small though highly-prized element. But the Persian empire introduces us toa more highly developed military organisation, and a

system of standing armies closely resembling those of modern times. Drawn from a

Greek armies.

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hardy and nomadic race, its armies at first consisted mainly of cavalry, and owed much of their success to the conse- quent ease and rapidity of their movements. Constantly extending their power by fresh conquests, the warlike Per- sians established themselves as garrisons in the subjected provinces, gladly exchanging their own barren mountain lands for these rich and fertile countries, and for some time remained a distinctly conquering and military race. Their empire attained its highest power under Cyrus and Cam- byses; the former, the founder of the great Persian empire, uniting on his head the crowns of Babylon, Media, and Persia, while the latter still further extended the empire by the conquestof Egypt. Cyrus seems tohave been the founder of that complete military organisation of which we gather details from Xenophon and other writers. To each pro-

vince of the empire was allotted a certain number of

soldiers as garrison or standing army. These troops, formed originally of native Persians only, were called the king's troops. They comprised two classes: the one

devoted exclusively to garrisoning the fortified towns and

castles, the other distributed throughout the country. To each province was appointed a military commander,

responsible for the number and efficiency of the troops im his district; while the satrap, a civil governor, was answer-

able for their subsistence and pay. Annual musters of these troops were held either by the king in person or by generals deputed for the purpose, and invested with full powers. This organisation seems to have fully answered its original purpose, that of holding a vast empire acquired by conquest,

and promptly repelling inroads or putting down insurrections. But when a great foreign war was contemplated, the standing army was augmented by a levy throughout the empire, and each province and tributary nation furnished its quota of men, horses, and provisions. The extent of the em- pire made such a levy a matter of time. Thus the preparations for the invasion of Greece by Xerxes took three whole years; and the heterogeneous and un- organised mass of men of all nations so brought together was a source of weakness rather than strength. That the warlike Persians, whose reputation rose so high under Cyrus, who were distinguished for their powers of endur- ance, and a daring courage which despised stratagem and delighted in single combats, should within a century have failed so disgracefully against the Greeks, has often been matter of wonder. Something, doubtless, was due to the fact that their reputation was won over effeminate races, very different from their later antagonists ; something also to the degeneracy induced amnong themselves by years of success and luxury. But it must also be borne in mind that the vast hosts over which the Greeks gained such easy victories comprised but a very small proportion of the true Persians—of the race which had given Cyrus his con- quests. The cavalryalone seems to have retained its national character, and with it something of its high reputation, even to the days of Alexander. Nevertheless, the first contact between the Asiatic and the Greek proved that the crown of military glory had passed to the western nation.

The earliest knowledge we have of the military institu- tions of the Greeks is derived from the pages of Homer. They are glimpses only that we obtain, but they suffice to distinguish many of their charactcristics. Their compact formations and subordination and silence in the ranks are contrasted with the looser formation and noisy attacks of the Trojans. Their armies consisted almost entirely of infantry. The leaders fought either on foot, like the rest, or from chariots; and single combats between the chiefs on the two sides were common, and often served to open the battle. We have sketched for us the traits of a hardy, independent, enterprising race, sometimes cruel and quarrel-

tactics acquired a renown which has lasted to our day, we

some, but gallant, high-spirited, and intelligent, and well fitted to become distinguished as soldiers. How these qualities were developed, till the Greek armies and Greek

learn from the laws of Lycurgus and Solon, and fron the ample details handed down by Xenophon, Thucydides, and other historians.

By the laws of Athens every free man was liable to mili- Athens, tary service. It was not only his duty but his distinction and privilege. The slave worked, the freeman devoted his time to military exercises and to the gymnasium. At eighteen his name was enrolled on the list of fighting men; for two years his duties were confined to home service, and especi- ally to the guarding of Athens; from his twentieth to his fortieth year he was liable to service wherever the good of the state might require. The collectors of taxes, the singers at some theatres, and a few others, were alone exempted. The only privilege granted to the wealthy was that of serving in the cavalry. The infantry, of which the army was mainly composed, consisted of three classes. First were the heavy troops, " hoplitai," armed with a spear, a dagger, a corslet, and a large oval shield. These formed the phalanx or main line of battle, and were com- posed entirely of free citizens, natives of Attica. Secondly, the light troops, " psiloi," armed with javelins, but carrying little defensive armour, and no shields. These were des- tined for skirmishing and covering the movements of. the phalanx, and were mostly slaves, who followed their masters, serving among the "hoplitai," to war. Thirdly, there were " gumnetai," or irregular light troops, carrying uo defensive armour, but provided with javelins, bows and arrows, and slings, to harass the enemy; these usually consisted of slaves or foreign troops. Besides these there was another class, " peltastai," so called from the light shield or target (pelta) which they carried, and inter- mediate between the "hoplitai" and "psiloi."1 The cavalry consisted entirely of the wealthier Athenians, and was intelligent and enterprising. Each of the tribes of Athens had its own military commander, chosen from itself, and elected for the year only; and an Athenian army thus obeyed ten chiefs ("'strategoi") of equal rank, These commanded by turns for the day, while the teu together formed a council of war to consult and decide in cases of emergency.

Practically the inconvenience of such a system was obviated by leaving nine of the ten behind, or by the appointment of a "polemarch," a sort of permanent chief of the staff, who carried great weight in the councils.

The Spartans owed much of their specially soldierly Sparta. qualities to the institutes of Lycurgus, which had for their aim to form a nation of warriors, and develop to the utmost those physical and moral qualities which render men invincible. Discipline, unquestioning obedience, un- complaining endurance, and contempt of danger, were the principles inculcated on the young Spartan from his earliest years, while his body was strengthened by every exercise and trained to every fatigue. As with the Athenians, military service was the first duty of every citizen of Sparta. The age of enrolment was twenty instead of eighteen; but the service lasted till sixty, and was more severe. In peace as in war, the Spartan lived as if in presence of the enemy. War time was, indeed, his relaxation, for he was then accompanied by slaves, carriages, and beasts of burden, and relieved of every labour or fatigue, to keep him fresh for battle. Cavalry was held in disrepute in Sparta; their infantry was formed

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1 The distinction between the pséloi and the peliastai is not clear, and it would almost seem that they were the same class of troops, the first name being applied to them when used as light troops, the second when formed in close order and attached to the phalanx.

Greek phalanx.

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in five "moras," or regiments, corresponding to the five tribes; later, a sixth, which included a small force of cavalry, was added. The armies were usually commanded by the kings of Sparta; when one only was formed, one king remained at home. The king was accompanied by a body- guard, comprising the winners of the prizes at the athletic games, and had attached to him two polemarchs, or chief staff officers, and three administrative officers, who relieved him of all care of details, leaving him free to devote his mind to the great task of his command.

The phalanx, formed of the hoplitat, or heavy-armed infantry, drawn up eight deep, was the basis of all Greek tactics. The Spartan and Athenian phalanx differed slightly in interior organisation and subdivision, but the general principles were the same. For marching and manoeuvring the ranks stood at open order, that is, 6 feet apart ; for attack at close order, or 3 feet apart; and for defence at locked order, or 14 feet apart. The number of men in each phalanx, and the number of phalanxes into which the battle-array was divided, varied according to circumstances; but from 2000 to 4000 seems to have been the usual strength of a phalanx. The peltastar and light troops and the cavalry formed round or in rear of the phalanx ; the light troops remaining in front and harassing the enemy till the actual moment of collision, and then falling back to the flanks or rear. In counting the forces engaged in a battle, it was usual to reckon only the hoplitat, who answered to the knights and men-at-arms of the Middle Ages; but the peltastai and light troops generally equalled, and often considerably exceeded, the former in numbers, The Athenian phalanx was less com- pact than that of Sparta, but more formidable in its attack, the offensive being best suited to the national character of the former, while the passive courage and endurance of the latter shone especially in the defensive. At Marathon and in subsequent battles the Athenians advanced to the attack at a run, while the advance of the Spartans was always deliberate and slow. The Thebans, under the direc- tion of Epaminondas, modified the phalanx, forming it on a narrower front, with greater depth, and the soldicrs standing so close in the ranks that they could not turn. This gave more weight at the point of impact, and the Theban column of attack, fifty deep, crushed the Lacede- monian phalanx, only eight deep, when opposed to it at

‘ Leuctra and Mantinza. Xenophon compares the effect to

that of a heavy vessel striking a light one amidships with her bow, and dashing her to pieces by the collision. The Macedonian phalanx was a combination and adaptation of the various earlier Greek forms.

The Greek armies were essentially militia. A few guards and garrisons were maintained, but no standing armies like those of Persia; and the troops by whom such perfection in tactics was attained, and such brilliant victories

were won, were only called under arms when occasion required, aud returned to their civil life when the danger was over. By constant wars, however, this militia had acquired all the character of a regular army; and the Spartan forces especially differed only in not receiving pay for their services. Beyond their own country the warlike reputation and soldierly qualities of the Greeks made them highly prized as mercenaries, and large numbers adopted that profession. Thus we hcar of Greek troops in the pay of the Egyptian kings in the time of Cambyscs, and later the garrisons of the Persian towns in Asia Minor were mainly furnished by them; while Xenophon and the ten thousand Greeks who engaged under Cyrus the Younger did more to spread the fame of the arms of Greece than even the great Victories of Marathon and Platza, and, by exposing the

1 For details of the various formations, see article INFANTRY.

weakness of the Persian empire, paved the way for the future conquests of Alexander.

Macedon, inhabited by rude but hardy shepherds and Mace- hunters, and far behind its southern neighbours in civilisa- oe

tion, had made no mark in history till Philip ascended its throne. But this monarch, who combined the highest military qualities with a far-seeing shrewdness which was fettered by no strict principles of honour, had no sooner established himself than he devoted all his energies to raising the military power of his country and extending his authority. The experience of his wars with the Athenians and other nations of Greece taught him that he could only overcome them by a discipline and training superior to their own, and he early saw that such was not to be given to a mere militia force. He set himself, therefore, to form a standing army, to which he gave an organisation, copied, but improved, from that of his adver- saries. By force of arms, by treachery, or by policy, he increased his power and influence till it embraced all Greece; and he was about to make war on Persia at the head of her united armies when his death put an end to his ambitious projects. But his son Alexander had all his father's military genius and ambition, and at the same time inherited the instrument he required in the

highly- trained army so carefully prepared. Within a year he had chastised the Thracians in the north, stamped out the Greek revolt by the storming and destruction of Thebes, and received at Corinth from the representatives of the southern states the chief command over their united forces; and in the following year crossed the Hellespont at the head of an army of 35,000 men, and commenced that carecr of conquest which was not to cease till he had carried his victorious arms over India, and founded the largest empire the world had yet known. The army with which these astonishing campaigns were won was composed of native-born Macedonians, of their allies, and of mer- cenaries. The infantry was divided into heavy and light armed, the peltastai now forming a most important part of the force, besides auxiliaries or irregular troops. None but native Greeks were admitted into the phalanx or the cavalry. The cavalry, which was more numerous than that of the Spartans or Athenians, was also divided into heavy and light; the former carrying horse armour as well as body armour. The actual force with which Alex- ander crossed the Granicus, the frontier line, was 30,000 infantry and 4500 cavalry, of whom about 12,000 were Macedonians, 5000 foreign mercenaries, and the remainder Greeks and allies. Special attention was paid to recruit- ing, generals being left behind to attend to it, and numerous reinforcements were sent to Alexander during his expeditions, so that at the battle of Arbela his army amounted to at least 60,000 men. The tactical organisa- tion of his army was adopted from the Greeks. The Mace- donian grand phalanx, as finally formed by Alexander, numbered 16,384 heavy-armed infantry: it was formed 16 deep, each file of 16 men forming a lochos under a lochagos, who led the file, and thus became the front rank man. These files were variously grouped. Thus two files formed a dilochie, four a tetrarchte, two tetrarchies a taxvarchie, under a taxierch or centurion, &c.; and 32 taxiarchics, or 256 files, formed a simple phalanx of 4096 men. Four of these, with a due proportion of peltastai, light troops, and cavalry, formed the grand phalanx. The depth of 16 was chosen as giving greater solidity than the Spartan phalanx, while admitting of more subdivision. To form a solid column the phalanx was doubled, giving a depth of 32; to extend its front, its depth could be reduced to one-half, still offering a firm line. The principal weapon was the sarissa or pike, 24 feet long, of which 18 fcet extended beyond the grasp. Thus the pike = of six ranks [Ul = Gil

Roman army.

projected beyond the front, and formed that bristling mass of spears which gave the phalanx its formidable appearance. The proportion of peltastai, cavalry, ond irregular troops attached to the grand phalanx varied slightly, but as a rule the total about equalled that of the phalanx. Of these, the peltastai would form one-half, the cavalry and irregular troops about a quarter each. Thus the total strength of a grand phalanx and its auxiliaries amounted to about 32,000 men, and Alexander's army at Arbela was formed of two such. The Macedonian phalanx was the crowning point of Greek military organisation, and therefore has been described at some length; but a still greater military power was already rising in the West, before whose legions the phalanx itself collapsed, and to this it is now time to turn.

The early or legendary period of Roman history is enveloped in a darkness which hides the rise and first development of those institutions which ultimately gave to Rome the empire of the world. Hier earliest military organisation is attributed to Romulus, who grouped the great families or clans ("gentes") in three tribes ; each required to furnish 1000 foot soldiers and 100 cavalry, and in the force so raised is traced the origin of the Roman legion. But it is to Servius Tullius that the legend assigns the great classification, lasting to the time of the Cxsars, according to which the burdens and duties of military service were determined. The whole population was numbered and divided, according to wealth, into six classes; the class determining the amount of war-tribute to be paid by the citizen, his position in the army, and the armour he had to provide. The legionary infantry, Triarw, Principes, Hastati,! were usually drawn from the first four classes ; the light troops, " Velites," from the fifth; while the sixth and poorest class was exempted from all military service and from the tribute. For voting purposes and for enrolment these classes were subdivided into centuries; and a certain number of special centuries of " equites" were formed from the patricians and most wealthy citizens, who were required to provide horses as well as armour, and formed the cavalry of the legion. Every five years a fresh census was held, and the classification according to property revised. Liability to service commenced at the age of seventeen, and lasted until forty-six; and no Roman citizen could aspire to any office

until he had served ten years in the infantry or five in the cavalry. The manner of raising the annual levy of troops is minutely described by Polybius. Immediately after the election of the consuls, twenty-four military tribunes were chosen from among the citizens of longest and most distinguished service. The consuls having published the day on which all persons liable to service were to assemble at the capital, the mili- tary tribunes were apportioned to the several legions. 'The magistrates then proceeded to choose from the different tribes, in order determined by lot, those most fit for mili- tary service, and sent them, in groups corresponding to the number of legions, before the military tribunes, who selected in turn for their several legions till the required numbers were raised. The conscripts then took the mili- tary oath, sacramentum, and were dismissed until the appointed muster-day, when the legion was formed and organised. The youngest and poorest were made Velites, the next in age Hastatz, the most powerful were selected for the Principes, and the oldest or richest reserved for the Triarti. The legion was commonly composed of 600 Triarii, 1200 Principes, 1200 Hastati, and 1200 Velites,

1 The " Hastati," so called from the " hasta," or spear, were com- paratively lightly armed, and usually formed the first rank of the line of battle ; the " Principes," heavily armed, formed the second rank ;

and the "Triarii," armed with shields, body armour, and short heavy

epear (" pilum "), formed a third rank or reserve.

with 300 cavalry,—making a total strength of 4500; the

number of Velites, however, often varied considerably.

When the classification was completed, the thrce classes of Triarii, Principes, and Hastati were divided into ten

manipuli or companies each, and the cavalry into ten

turme or troops; while the Velites were distributed among the thirty manipuli. A first and second centurion was then chosen and appointed to each manipulus; and these again chose each two "ensigns" from their manipuli. The centurions ranked among themselves according to the class to which they belonged; thus a centurion of Triariz ranked above one of Principes or Hastati, and the first centurion of each class commanded the whole of his class or one of the lines of battle of the legion. Originally Roman citizens only, belonging to the five upper classes, were admitted in the army, and the soldier equipped him- self at his own cost, and received no pay. Afterwards, the socii or allics of Rome were included in her armies, and in the time of Polybius a consular army consisted usually of two legions, or 9000 Roman soldiers and about the same number of allies or socii. But under the pressure of the great Punic wars the consular armies were often doubled: at Cannz two double consular armies, or nearly 80,000 men, were brought together; and at one period of the second Punic war as many as 23 legions were raised. The system of payment, too, dating from the prolonged siege of Veii, removed the rcasons for exempting the poor from military service, and they were included in the levies, though usually detailed to the navy as an inferior service. Finally, when civil wars had shaken the institutions, and everything was sacrificed to faction and party spirit, even slaves and criminals were enrolled, and the whole character of the army was changed. Other causes also tended to the same result. The system of raising the consular armies annually, and disbanding them at the con- clusion of each campaign, required to be modified when distant wars were undertaken: legions were kept perma- nently under arms, and recruited annually by levies sent from Rome; ambitious generals found excuses for not dis- banding the armies to which they owed their power, and by degrees a standing army was established; and these changes in the character of the army were accompanied by corresponding changes in its organisation and tactics. The distinction between the three ranks became gradually effaced, and the three corresponding manipuli were merged in the cohort. The legion was no longer divided into three lines and thirty manipuli, but into ten cohorts, and its force was raised from 4000 to 6000 men. The manner of fighting, too, was gradually changed, and the Roman soldier learned to trust less to his sword and heavy pilum, only useful at close quarters, and more to javelins and warlike instruments.

The turning-point in Roman military art is commonly fixed about the time of Marius, to whom the change in the organisation, as well as in the composition, of the Roman armies is attributed. But the evil effects did not make themselves felt immediately, and the legions, whose actions under Cesar shed the brightest lustre on the Roman arnis, were organised on the new system. So long as discipline and the old military spirit remained, the Roman armies retained their superiority, whatever their tactics. This spirit was too deeply implanted to die out soon ; and when- ever men arose worthy to command them, the Roman soldiery regained its reputation. But under a succession of weak and profligate emperors all discipline was lost : the legions, degenerated into a feeble militia, sold the empire which they were incapable of defending, and ulti- nately fell an easy prey to the rude and daring barbarians of the North.

The Roman armies owed their long and remarkable

Early mili- tary insti- tutions of Europe.

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ascendency to three principal causes: discipline ; care in the selection, training, and exercise of the soldiers; and readiness in adopting improvements, whether from friends or foes. In the first the Romans surpassed all other nations. The second especially attracted the attention of contemporary students of their military institutions ; Hirtius, Vegetius, Josephus, all speak of the constant exer- cises by which, in peace as in war, the Roman soldier was trained and inured to war. "If," says Josephus, '" we consider what a study the Romans made of military art, we must confess that the empire to which they have attained is not a gift of fortune, but a reward of virtue. They did not wait for war to handle their arms; nor, slumbering in the bosom of peace, move themselves only when awakened by necessity: as if their weapons were born with them, as if they formed part of their members, they allowed no truce to exercises; and these military games are real apprenticeship to combat. Each soldier tests his strength and courage every day ; thus battles are neither new nor difficult to them; accustomed to keep their places, disorder never arises, fear never troubles their minds, fatigue never exhausts their bodies. They are certain to conquer, because they are certain to find enemies unequal to them; and one

may say, without fear of mis- take, that their exercises are battles without bloodshed, and their battles bloody exercises." Josephus said truly, they would never meet their equals. When they fell, it wag not because their adversaries were superior, but be- cause they themselves were no longer what they had been.

MODERN ARMIES. |

Hitherto war had been a progressive art. Each great military power succumbed in its turn to an organisation and a science superior to its own. But with the fall of Rome we seem to begin afresh. 'The nations by whom the over- throw of this great empire was effected were in the condition from which the Latins had emerged ten centuries before ; and more than ten centuries elapsed before the lost ground was regained, and such highly-trained armies again appeared.

The early institutions of the Frank and German races, the new masters of Europe, were those of a free, proud, warlike people. The right to bear arms was the privilege of the freeman, the mark of his status in the community. No man could assume it till publicly pronounced worthy, and solemnly invested before the assembly of the people. From that time he was never separated from his arms. The same word (wehr) denoted a weapon and a freeman ; even his plot of land (were) was named after that by which alone he held it, and his social existence ceased when no longer able to carry arms and mount his horse. Similarly, nation and army were convertible terms ; the Longobards continued to call themselves an army (Z/cer) long after their settlement in Italy. Their organisation was rude and simple. 'The family was the basis of the social fabric; kindred families formed clans, and these again confedera- tions (Markgenossenschaft), to which admission was only obtained by common consent. Finally, the kindred tribes or communities occupying a certain district (gaw) formed a higher organisation (gaugemeinde), which usually included the whole of a particular race or stock, and had well-de- fined natural boundaries. For political and military pur- poses the gau or province was subdivided into " cireles" (Kreis) and " hundreds," names which have continued to this day; the latter calculated to include as many house- holds as would suffice to place a hundred warriors in the field. Kings and commanders were elected

and were entrusted with absolute power in war time, but in peace every freeman claimed perfect liberty; all great questions were determined by the people in public assembly, and all conquests were the property of the community, to be shared equally among them. It is hard to imagine a greater

contrast than that between the perfect freedom and equality of the early German institutions, and the tyranny and unequal rights of the feudal system which succeeded it. But we can trace the gradual transition. the most adventurous youths attached themselves to the hero of the nation or tribe, to be instructed by him in peace and led to victory in war. Thus each great warrior collected round him a band of personal followers—retainers, whoni he equipped with horses and armour, and rewarded with a share of the booty, and who in return followed him in all expeditions, and obeyed no law but his word. When conquests were effected by such bands, the land was the property of the chief, and was distributed by him as a reward to his followers. Gradually kings and chieftains increased their retinues, extending protection to those who obeyed them, and enriching them by grants of lands acquired by conquest or seizure. These grants soon ceased to be free gifts, rewards for past service, but were held to entail future service also; and the chiefs assumed the right to revoke them. As the power of the nobles and the number of their retainers increased, so did the number and power of the independent freemen decrease; a prey to oppres- sion and exactions of all sorts, they attached themselves in self-defence to some neighbouring lord, surrendering their lands, and consenting to hold them of him as vassals. Finally, the lords increased their pretensions, assuming the titles of "'suzerains" or " seigneurs," claiming absolute authority over the persons and property of their vassals, and requiring an oath of fealty from them; and the feudal system, with all its grinding tyranny, was established. Nations were broken up into small seignioralties, whose lords, at constant war with each other, only united to resist any interference with their privileges ; and if occa- sionally a powerful ruler like Charlemagne succeeded for a time in establishing a real government, it was only per-

sonal, and collapsed as soon as the strong hand was removed. No great national undertakings, no great pro- gress in the arts of peace or war, were possible under such conditions; and it was not till feudalism was nearly extinct that these arts emerged from the darkness of the Middle Ages.

The early Frank and German armies comprised the whole manhood of the nations, rudely organised by " hundreds," or by tribes and families. Some knowledge of tactics had been gained from their adversaries the Romans, and from deserters and escaped slaves in their ranks; but they usually adhered to their own national formation, the wedge- shaped column of attack. The principal arm was infantry, divided into "heavy" and "light ;" the light infantry being originally the élite, and trained to act with the cavalry, but afterwards degenerating into mere attendants of the latter. The transition from the national to the feudal system is seen in the armies of Charles Martel. These consisted in part of his personal followers, partly of mer- cenarics, and partly of national levies. At Tours the latter still formed the great bulk of the force, and fought, as of old, in heavy masses and with little tactical organisation. Under Charlemagne armies became more feudal, the chiefs and their retainers forming a larger proportion, the national levies a much smaller one; and the frequent levies ordered in his reign did much to extinguish the class of freemen, driving them to seek protection as vassals of the great nobles, 'The true feudal armies were formed entirely of the knights, men-at-arms, and vassals, who obeyed the summons of their suzerain, either at the call of the king, or for his own private wars, and whose service lasted variously for twenty or forty days or three months, at the end of which the army disbanded and returned home.

The change in the constitution of armies was accom- panied by changes in their armament. As the equality

From early days Rise of the feudal

system.

Fall of feu- dalism. Rise of standing armies,

of the old freemen gave place to the classification of the people into lords, gentlemen, and serfs, corresponding dis- tinctions in arms and equipment followed; the horseman became the representative of the upper classes, the foot soldier of the serfs and peasants. The feudal system could only be maintained by the superior fighting power of the ruling class. All that money and art could do was there- fore lavished on the equipment of the lord and his imme- diate retainers, while the peasaut remained ill-armed and comparatively defenceless. The strength of armies was measured by the number of men-at-arms. Efforts to arm and train the mass of the people commonly originated with the kings, in their desire to form a more national force than the semi-independent feudal levies, and received small encouragement from the nobles. When they suc- ceeded it was a sign of weakness in the feudal chiefs, and of a more popular government. In no country were the lower orders so warlike and used to arms as in England; and historians have shown how essentially popular was the rule even of our most absolute monarchs.

Two characteristics of feudalism were especially adverse to progress in military art: the undue preponderance given to one arm, numcrically weak; and the impossibility of unity of action or combined organisation among so many independent and rival authorities. Among the causes tending to bring about a better military system must be reckoned the Crusades, those marvellous efforts of fanaticism that still excite a wonder and admiration mixed with pity. It is true they left no mark at all proportionate to the vastness of the efforts. The armies of the Crusaders, as they took the field, were mere tumultuary masses, as destitute of order and discipline as their leaders were ignorant of military science. But for the first time large bodies were kept continuously under arms, and some sort of organisation necessarily developed itself. The knights and leaders becoming conscious of their own numerical weakness, bestowed more care on the arms and discipline of their men, and learnt their value; and the first true infantry of the feudal times dates from the Crusades. An event of very different character, but not less exer- cising a most important influence, was the grant of the franchise to cities and towns, resorted to by Louis VI. of France in 1135 to establish a counterpoise to the power of the barons, aud afterwards adopted in Germany and England. These enfranchised cities raised their own levies (milice des communes), and thus furnished the king

with a military force independent of and antagonistic to the feudatories, and consisting mainly of an infantry superior in quality to the feudal vassals. Another cause was the ever-increasing employment of mercenaries, due partly to the growing wealth and luxury which made personal ser- vice irksome, partly to the proved unfitness of feudal armies for continuous operations. Lastly came the inven- tion of gunpowder, which, though it exercised no imme- diate effect on tactics, and had little to do with the over- throw of feudalism, ultimately revolutionised the whole art of war.

The fall of feudalism as a military system, though gradual, as all such changes are, may be said to have been accomplished in the middle of the 15th century. Two events occurring about that time gave it its death-blow— the defeat of the Burgundian chivalry by Swiss infantry in the three successive battles of Granson, Morat, and Nancy ; and the establishment of "'compagnies d@ordonnance" by Charles VII. of France. The first destroyed for ever the overwhelming prestige attached to the mailed horsemen, and restored infantry to the place which it had held in ancient armies, and has never lost since; from the second dates the origin of standing armies in Europe. Charles VI. had already sought to substitute a permanent national

force for the foreign mercenaries, who were as great a curse to their employers as to their enemies; but the attempt was interrupted by his insanity, followed immediately by internal discord and disastrous wars with England. It was not till sixty years later that Charles VIJ., having firmly established his power by a series of successes over the English, carried out his father's idea; and (in 1445) organised fifteen " compagnies d'ordonnance," to be main- taincd in peace as well as in war. Each company cor- sisted of 100 men-at-arms, or "lancers," with their attend- ants, viz., squire, groom or batman, and three archers— the whole force amounting to 9000 men. Three years later, he organised a corresponding force of infantry, 16,000 strong, named franc-archers. The superiority of a standing army over an assemblage of feudal militia was soon proved, and other states imitated the example of France. A change took place in the

military system of Europe; the practice of calling out the feudal contingent ceased, and permanently paid troops, regularly disciplined and organised, were substituted for them. These troops were not always national. At first they were largely composed of the old bands of wandering mercenaries; but the pro- portion of foreigners decreased as the feudal spirit gave way to a more national one.

The development of the new system may be dated from the begiuning of the 16th century. Armies, no longer undisciplined feudal levies, were permanently organised in companies and in regiments. The use of fire-arms became general, though it was long before the pike was entirely sup- planted. The distinctive duties and value of cavalry and infantry were recognised, and regular tactics introduced for the different arms, the battalion (originally battagla, battle array) becoming the recognised tactical unit for infantry, as distinguished from the administrative organisa- tion by regiments and companies. "Articles of war" were issued to their several armies by Ferdinand of Spain, Francis I. of France, and Charles V., and a regular disci- pline thus established. From this time to the outbreak of the great French Revolution but little change took place in the manner of raising armies, though their tactical organi- Progress it sation varied according to the arms in use. Armies were organisa- raised mainly by voluntary enlistment, compulsory levies = being only resorted to under pressure of war. Usually the king or his commander-in-chief contracted with a nobleman, of repute as a warrior, or of large possessions, to raise a regiment—the nobleman to receive a certain sum down and an annual allowance for its maintenance, and to have the command of it. He in his turn engaged "captains," some of whom brought companies with them, others raised companies under his authority, and others, again, merely commanded the men he himself had raised. Royal officers, "com- missaries," were appointed to muster these regiments periodically, and see that the colonels fulfilled their share of the contract; and, on the other hand, to issue the pay and provide for the subsistence of the forces. The regi- ments were sometimes raised for a fixed time, and disbanded at the expiration of that time or at the close of the war; but as standing armies became general, they were main- tained permancntly, the command being transferred as occasion requircd; and, as the terms of the contract were always favourable to the colonel, the command of a regi- ment was a

valuable piece of court patronage. The earliest form of organisation, both in the cavalry and infantry, was the company, originally representing the group of men who followed a knight to battle and fought under his banner, and later the bands of mercenaries who served under a "captain." These companies were afterwards grouped and organised in regiments, but for a long time each company continued to carry its own banner, indicating its real origin.

Both companies and regiments varied in strength according

Tactical changes,

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to the habits of the country, and according to the wealth or personal influence of the leaders. In the days when men fought in compact masses, and one man's voice could thus control a large number, 500 and even 600 men was not an uncommon strength for a company; and in some nations the numbers never fell very low. In France, however, the policy initiated by Richelieu, and afterwards adhered to by Mazarin and Louis XIV., of breaking the power of the French nobility, and making them followers and dependants of the king, reacted on the organisation of the army; for it was found desirable to give employment to as many of the young noblemen as possible in the royal armies, and thercfore to multiply the companies and commands, and the French companics sometimes fell as low as 30 men. As the undisciplined melée of feudal battles gave way to regular and scientific tactics, the necessity of bodies of constant and uniform strength was felt, and the battalion and squadron were introduced as the fighting formations of infantry and cavalry respectively. Originally battalions were dense masses num- bering several thousand men, and composed of many regi- ments. As changes in arms led to the adoption of more extended formatious, it became necessary to subdivide into smaller fractions, and battalions were gradually reduced in size till they became mere fractions of aregiment. Finally, when the advantages of uniform and permanent organisa- tion were more fully understood, and large standing armies enabled such improvements to be introduced, regiments also were made of uniform strength, and the battalion be- came a fixed fraction, usually one-half or one-third of a regiment, but still retained its distinctive character as a

tactical unit; while for administrative purposes, recruiting, clothing, payment, &c., the regiment was the unit. Simi- larly, the company remained the lesser administrative unit,— that is, the captain was answerable for the pay, equipment, and discipline of his company in camp and quarters; but on the parade-ground or battle-field the battalion was divided into a number of equal divisions not necessarily corresponding to the companies. In Frederick the Great's time a Prussian battalion consisted of five (afterwards four) companies, but on parade was divided into eight "zugs" (divisions); and the Prussian company column, now so famous, is merely a return to the old formations adopted when the company acted independently.

The tactical changes effected in European armies between the beginning of the 16th and end of the 18th centuries, consequent on alterations in arms, need only be very briefly noticed here. In the earlier wars of the 16th century the musketcers formed but a small propor- tion of the infantry, and the great bulk consisted of pikemen, whose power lay in weight and mass: deep formations were consequently the rule. The cavalry still fought principally with the lance. In the latter part of the century, during the great war of inde- pendence of the Netherlands, improvements in fire-arms led to the proportion of musketeers being increased, and the front of battle proportionately extended to give effect to their fire. Thus Maurice of Nassau usually formed his armies in battalions of 500 men, of 250 pikemen, and 250 musketeers each,—the pikemen ten deep in the centre, the muskcteers on the flanks. The cavalry also adopted fire-arms, and were taught to trust more to fire than to the effect of the charge. During the Thirty Years' War (1618-1648) the proportion of musketeers was still further increased. The imperial armies under Tilly and Wallen- stein still fought in heavy masses, but Gustavus Adolphus reduced his formations to six ranks. The bayonet, intro- duced about the middle of the 17th century, gradually superseded the pike, and led to a further reduction of the ranks to four. During the prolonged wars of Louis

XIV.'s reign, and under the auspices of the great generals of that age,— Turennc, Condé, Eugene, and Marlborough,— considerable improvements

were effected in the tactics and organisation of armies, and the permanent grouping of battalions and regiments into brigades and divisions was first introduced. Still further improvements were made during the Silesian and Seven Years' Wars (1740-63). Many changes ascribed to Frederick the Great are really due to Leopold of Dessau, who, under the first Frederick, formed the army which the second Frederick led to victory. He reduced the ranks of the infantry to three, trained them to manceuvre rapidly and with extraordinary precision, and was the author of the drill-book which has remained the basis of all European systems of drill. But the improve- ments in cavalry tactics were unquestionably due to Frederick himself, who taught them the true secret of their strength, shock and rapidity, and further developed their power by the introduction of horse artillery, able to move rapidly and accompany the cavalry anywhere.

At the close of Frederick's brilliant career every army in Europe had copied that of Prussia more or less closely. Infantry was organised in regiments of two or three battalions, each battalion 500 or 600 strong—this number being determined by the length of line which it was considered one man could effectively control. Cavalry was organised in regiments of four squadrons, each squadron from 100 to 150 strong. Artillery organisation was still in its infancy, a large part of the guns being attached to regiments, and the heavy guns often horsed aud driven by contractors. But Gribeauval was laying the foundation in France of the battery organisation afterwards adopted by all nations. The Prussian army, proud of its brilliant series of successes, equally proud of its manceuvring power and drill, was looked up to by all Europe, and believed itself invincible, but in its pride forgot how much was due to the hand which had guided it. The French army had fallen very low in general esti- mation, and even the American war, and minor successful expeditions towards the end of the century, did little to raise it. The Austrian army was slow to adopt improve: ments, but had acquired a reputation for tenacity. Eng- land, recently driven out of her American colonies, was hardly acknowledged as a power on land.

Such was the military condition of Europe when the French French Revolution broke like a storm over the Continent, Revolu-

sweeping away old landmarks and old systems, covering the land for years with a flood, which, when it receded, left the whole face of the country changed. When, in 1792, the monarchs of Europe banded to crush the revolu- tion, the military force of France was at a very low ebb. The old Royalist army was disorganised by revolutionary passions and frequent changes, and the constituent assem- bly had rejected the proposed 'compulsory service" as at variance with the liberty of the citizen. But on the pro- clamation that "the country was in danger," volunteers flocked from all parts to join the armies, and a levy en masse was ordered to repel the invaders. Officials vied in proving their zeal by the numbers of recruits they forwarded to the frontiers, and patriotism and terrorism combined to fill the ranks. Within three years nearly 1,200,000 men were thus poured into the army, and sufficed to repel the invaders, and form the armies which, under Hoche, Moreau, and finally under Bonaparte, brought France forth victorious in 1797. But the long and bloody war had exhausted the supply, large as it was, and some new system of recruiting became necessary, for it was evident that voluntary enlistment would no longer suffice. In 1798, therefore, Jourdan brought forward and passed the law establishing conscription, the basis of all French military legislation since that date, and more or

less of that of other countries also. Every citizen was declared liable to service for five years, and the whole male population, between the ages of twenty and twenty-five, was divided into classes and enrolled by name, to be called out as occasion required. It was the terrible power of the conscription that enabled Napoleon to carry on the gigantic wars which characterised his reign, and after losing in the snows of Russia the largest army ever put in the field, to reappear in a few months with another almost as large. Other nations of necessity fol- lowed the example of France, and the conscription became general. Prussia still further developed its power by reducing the period of service in the ranks, and passing her soldiers as soon as sufficiently trained into a reserve, thus gradually training the whole of her population. The " short service and reserve" system, the greatest revolution ever effected in this branch of military art, and charac- tcrised by a recent foreign writer on political economy as "the greatest, and in its

ulterior consequences probably the most important, of the events of our century," owed its origin to the conditions imposed on Prussia by Napoleon at the treaty of Tilsit. Restricted to an army of 43,000 men, the Prussian statesmen evaded the spirit of the clause by sending the trained soldiers to their homes, to be recalled when needed, and replacing them with recruits. This system, by which every citizen becomes also a trained soldier, and there is no limit to the size of the armies save that of population, was at first only partially adopted by other countries. The prejudice in favour of professional armies — soldiers whose business it was to fight and do nothing else—was too strong, and doubts were felt whether these semi-citizen armies would stand the rough trials of war. But after Sadowa, other nations had no choice but to copy it or resign their military position. It is true the lesson was not learnt at once by all, but 1870 and 1871 enforced what 1866 had already taught ; and within the last few years every great Continental power has reorganised its military institutions on the model of Prussia.

If we glance back at the history of military institutions in Europe since the fall of Rome, we find it divides its- self into four well-defined periods. In the first or barbar- ous stage we have vast armies or hordes, formidable from their numbers and the courage of the warlike freemen composing them, but almost without tactics or organisation. In the second or feudal period we have armies nearly as numerous, but whose strength lay en- tircly in a small body of highly-cquipped knights and men-at-arms,—the bulk of the army no longer freemen fighting for their country, but slaves fighting at their lord's command. Little progress has been made in tactics and organisation, and the fighting power of nations is exhausted in constant petty wars. In the third or "stand- ing army" period we have small armies of highly-trained professional soldiers forming a class distinct from the rest of the population, tactics and organisation becoming a science and making vast progress. Lastly, under the con- scription we have armies once more national, embracing the whole male population, more numerous than ever, but now trained and organised with all the science and skill of professional soldicrs. Some remarks on the general principles involved in this branch of military art will serve as introduction to a morc detailed account of existing armies.

The military institutions of a nation are governed by various considerations, the principal of which are geo- graphical position, policy, national character, and wealth. A country like America, which is threatened by no power- ful neighbours, can devote its whole energies to peaceful pursuits, and reduce its army to a mere police force. But

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a European state, surrounded by warlike and powerful nations, may depend for its very existence on its army, and must consequently keep pace with its neighbours, and develop its forces to the utmost that industrial and economical considerations admit of. Political economists class all military expenditure as non-productive. Perhaps it might more fairly be called indirectly productive, as necessary to the maintenance and extension of civilisation, and the protection and development of trade. Further, the value of property increases with increased security, and military expenditure within certain limits thus tends to repay itself. Broadly, however, it may be treated as a tax for insurance, and as so much withdrawn from the productive power of the nation. The object of all military institutions is to develop the highest amount of fighting power,—that is, attain the greatest security with least strain on the industry of the country,— the latter being measurcd not by the cost of the army as shown by the budget, but by the amouut of productive labour withdrawn and disturbance produced. All ques- tions, therefore, have to be considered under two aspects, military and economical—that of efficiency and that of cost.

The first question that presents itself is the manner of 47,4, of raising armies. There are two methods,—that of voluntary raising enlistment, and that of compulsory levies or conscription : armies,

the former once the universal system, but now retained by England alone; the latter adopted by all other European powers. By voluntary enlistment the burden of military duty is distributed evenly throughout the community, the soldier receiving fair wages for his service, while the citizen bears his share in the form of taxes. Personal liberty is not interfered with, the industry of the country generally is undisturbed, those members only are withdrawn who are likely to contribute least to its wealth, and the army becomes a useful school and refuge for the restless classes of the

community. But the supply of recruits is fluctuating and uncertain, they are drawn almost entirely from the lowest class, every desired improvement is hampered by considerations of its effect on recruiting, and the army tends to become a class rather than a national one. Compulsory service gives unlimited com- mand of men, introduces a higher class in the ranks, and raises the tone of the army generally; while mili- tary efficiency alone has to be considered in organisa- tion. But it presses much more severely on the country. Military service becomes a tax inflicted by lot, falling with excessive weight on some, while others escape free. " Admit substitutes (or exemption by payment), and the hardship falls exclusively on the poor; insist on personal servicc, and the loss of time, which to the young man of fortune is nothing, and which to the lowest class of labourer is unimportant, because the pay while serving is as good as he would get elsewhere, becomes a very heavy tax on the skilled industry of the artisan or the profes- sional man, or those who have business habits to acquire."? Hence in all countries where personal service is enforced, it is necessarily accompanied with provisions for softening its hardships and reducing its inequality. The time of service is reduced to a minimum, and a special short course is established for men of means and education above the average. Exemptions are permitted on personal or family grounds, and in Prussia these exemptions are carried so far that the ballot is practically done away with; and in some countries moncy payments are required from all who do not serve. The relative cost of the two systcms depends upon the size of the army. So long as the num- bers required are small and can be obtained at a fair

1 Speech of Lord Derby, Times, 15th December 1870.

rate of wages, voluntary enlistment is the cheaper of the two; but when the numbers are large, and excessive wages are necessary to stimulate enlistment, compulsory service becomes economical. Such an army as England maintains is actually raised with less cost to the nation by the former system; but armies such as those of the Continental powers are only possible under the latter. So heavily, however, does the conscription press

on the life of a nation, that it may safely be asserted that no nation ever did or will accept it, except of necessity.

The next great question is that of the terms of service. No nation can afford to keep constantly under 'arms the whole force which it may require to put forth in war. In olden times fresh armics were raised on the outbreak of each war. The great step in modern orga- nisation was the maintenance of permanent cadres and the formation of trained reserves. Military forccs are now divided into "standing armies,' comprising those who are actually doing duty as soldiers, and forming in peace time the cadres and the school of instruction of the army; and "reserves," under which name are included all who pursue their industrial callings in peace, but are called to arms in war. Such reserves, however, may be ef very different value, from the Prussian "reservist," a trained soldier in the prime of life, to the garde mobile or volunteer who has only attended a few drills; and their value is always closcly connected with the system and terms of service. There are practically three systems. The first, or long service system is now almost obsolete,—it partly lives in England alone. Under this the soldier was engaged for life, or for a long term of years, remained with the colours so long as fit for service, and was then dis- charged, usually with a pension. It produced a highly- traincd army, in which discipline, mutual reliance, esprit de corps, constancy under discouragement, and all soldierly qualities, were carried to their highest pitch. The soldier made the regiment his home, and knew no law but the word of his commander. But such an army was neces- sarily small, being maintained in peace as well as in war, and could form no reserve, as all remained with the colours till they were no longer fit for service. In war, therefore, it had to be increased, and its casualties replaced by untrained recruits; and its quality deteriorated when excellence was most required. Long service also tended to produce a class army, isolated from the life of the nation, and always a dangerous weapon in the hands of an un- scrupulous ruler. Further, to condemn a man drawn by lot to lifelong service was felt to be incompatible with the maintenance of compulsory service; and when it was found by experience that soldiers could in three years be sufficiently trained for all purposes of war, and that by the application of short service armies could be trebled in numbers in war without increasing the cost in peace, the old long service armies disappeared from Europe.

The converse of this is the second, or mzlztza system, actually in force in Switzerland and Canada, and to a certain extent in America. Under this no permanent army is maintained, but all, or a large proportion, of the inhabitants are liable to service, and undergo a partial training. The cost of such a force is very small, the in- dustrial disturbance reduced to a minimum; yet the forces that are put in the field are formidable, in numbers at least. But its real economy is more than doubtful, History abounds with lessons that such forces can never carry on sustained operations against trained armies, They may show brilliant courage; but they want the mutual knowledge and reliance, the constancy in defeat, and the instinctive discipline which can be acquired by habit alone. The cost of putting them in the field is always disproportionately great. Opposed to trained armies, they

invite defeat; opposed to similar forces, as in the great American war, decisive action on either side is impossible, and the war drags on till its cost far exceeds that of years of standing armies and peace preparations.

The third and intermediate system is that of short service and reserves, now adopted by all nations. The European details of its application vary, but the general principles are the same in all,—to maintain the cadres of a large army in peace, capable of expansion in war, and to keep the recruit in the ranks only so long as is necessary to make him a trained soldier, and then pass him into a reserve. It combines the numerical strength of the militia system with the organisation, training, and discipline of a long service army. Its practical application will be seen in describing the various armies of Europe.

The principles of organisation are comparatively simple.

Organisation is of two kinds, tactical and administrative ; tion.

the first having reference to action on the battle-field, the second to general maintenance in peace as well as in war. Originally the two were often distinct; thus companies and regiments were originally administrative units,

bat- talions tactical ones; and the two had not necessarily any connection. But the most perfect organisation is that which answers both purposes, and in this direction all modern improvements have tended; and as the battle-field is the ultimate object of all preparation, administrative considerations must give way to tactical ones when they clash, and all organisation must conform to the tactical requirements of the day. Great progress was made in this branch during the Revolutionary war. The origin of regiments and battalions has already been described. The first "mixed divisions," «e, divisions comprising troops of all arms, were formed in the Revolutionary armies of 1792, and in 1804 Napoleon organised "' corps d'armée," each forming a complete army in itself, under the com- mand of a marshal,—the necessity for such organisation arising from the size of his armies, which had grown beyond the immediate control of one man. This organisa- tion was copied by other armies, and attained its highest perfection when combined by the Prussians with their territorial system—each corps d'armée being permanently located in and recruited from a particular province. A modern army usually comprises several such corps d'armée.

A Prussian army corps, which may be taken as the type of modern organisation, consists of a staff, two infantry divisions, a cavalry brigade, a regiment (seven batteries) of corps artillery, a regiment of engineers, and a number of administrative services. An infantry division consists of a staff, two infantry brigades, a rifle battalion, four batteries of artillery, and a regiment of cavalry. An infantry brigade consists of a staff and two regiments (six battalions); a cavalry brigade of a staff, three regi- ments (twelve squadrons), and a battery of horse artillery. The engineers comprise a pontoon train, a light field bridge train, a column of entrenching tools, siege materials, and a field telegraph; while nine reserve ammunition columns accompany the corps artillery. The administrative depart- ments include the commissariat, charged with the supply of the troops, and having at its disposal five provision columns and a large amount of hired or requisitioned transport, and provided with a field bakery ;—the medical department, consisting of a staff; three ambulance detach- ments, each having a staff of medical officers, 120 trained stretchcr-bearers to attend to and carry off the wounded on the battle-field, a supply of medical stores, covers for wounded, and a number of ambulance waggons, fitted for the conveyance of wounded; and the medical staff attendants, tents, and all

appliances for 12 field hospitals, each calculated to receive 200 wounded ; —the pay depart- ment, charged with the military chest ;—a field post, a depot

Anglo- Saxon period.

Norman Conquest and feudal system.

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for sick and supernumerary horses, and other services. | about 40,000 men, 12,000 horses, and 1400 waggous and Such an army corps has a fighting strength of 25 bat- | wheeled vehicles.

talions, or about 25,000 infantry, 5 regiments (about

The following table shows approximately the military

3000) cavalry, and 96 guns, and a total strength of | resources of the great powers of Europe:—

*| | *

Army—War Footing.

| A Militar rmy— Ss Country. Population. ua pendivewe, nedee FONE. | eee Depot Garrisons

| Army. Troops. R — – Total. Gueeetiein, <....0….. 32,000,000 | £23,000,000 | 190,000. | 225,000 | 95,000 | 350,000 670,000 Tine dec. .- ccoe coos tt 36,000,000 | 18,000,000 | 450,000 | 780,000 | 270,000 | 500,000 | 1,550,000 German Empire, ... 41,000,000 | 15,500,000 | 400,000 | 680,000 | 240,000 | 380,000 | 1,250,000 TRW@ERNE, coécoseeoonognapsos: 82,000,000 21,500,000 750,000 850,000 150,000 300,000 1,300,000 Austria and Hangary,...| 36,000,000 | 10,500,000 | 275,000 | 600,000 | 150,000 | 220,000 950,000 WGA ecclersee-erertieneess ee 27,000, 000 7,500,000 200,000 375,000 125,000 250,000 750,000

Note.—It is impossible to form anything but an approximate comparison, owing to the different conditions of service and varying

organisation of the several armies.

Under "depdt troops" are included all forces whose province it is to feed the active army.

Under " garrisons and reserves" are included all forces organised for home defence, and not forming part of the field armies; but in several cases

a large proportion of these are available as reinforcements to the active army if required. Only those forces that have received some training and have a permanent organisation are counted; thus the English volunteers are included, but not the German

landsturm, or French reserves of the territorial army.

The British troops serving in India have been included in the military

forces of Great Britain, and the expenses borne on their account by the Indian revenue in the military expenditure; but not the

native forces in India.

HISTORICAL SKETCH OF THE BRITISH ARMY.

The history of the military institutions of England may be divided into three principal periods, each marked by a system peculiar to itself: the Anglo-Saxon, or militia period, preceding the Norman Conquest; the feudal period, extend- ing from that to the great Rebellion; and the period of stand- ing armies, lasting from the Restoration to the present day.

Prior to the Norman Conquest the armed force of Eng- land was essentially a national militia. Every freeman was bound to bear arms for the defence of the country, or for the maintenance of peace. Military service was not a debt due to the king or earl, the obligation of a dependent to his lord, but the service owed by a free citizen to his country. To give some organisation and training to this levy, the sheriffs had authority to call out the contingents of their several shires for exercise. The thanes appeared on horseback, and the bulk of the people, armed with swords, spears, and heavy shields, or with bows and spears, formed the infantry. This force, termed the " Fyrd," was available for home service only, and could not be moved even from its county except in the case of invasion or great emergency; and it was principally to repel the invasions of Danes and others that its services were required. Yet even in those days the necessity of some more permanent force was felt, and bodies of paid troops were maintained by the king and some of the great earls at their own cost. Thus

Canute kept up a household force (huscarle) of 6000 men, and paid troops also formed part of Harold's army at the battle of Hastings.

Although William professed to reign by right of inherit- ance, not of conquest, and to maintain the existing laws of the country, its military institutions underwent a rapid and complete change under him. The great slaughter of the Anglo-Saxon nobility at Hastings, and the frequent and un-successful revolts of the survivors, and consequent forfeiture of their estates, enabled William to make large grants to his followers; and with these he introduced the feudal system of military tenure. Henceforth military service was a debt due by the dependent or vassal to the lord of whom he held his land, not the free service rendered by a citizen to his country. And William took advantage of his exceptional position as a conqueror, and as the original granter of nearly half the lands of England, to carry the feudal system to a perfection which it had never attained on the Continent. Assuming that "the king is the uni-

versal lord and original proprietor of all the lands of the kingdom," he proceeded to divide the country into more than 60,000 military allotments or fees, to be held under tenure of "knight's service." By the conditions of knight's service the tenant of a fee was bound to attend his lord in war, with horse and arms, at his own cost, for forty days in each year,—the tenant of half a fee doing like service for twenty days. Where one man held many fees —and some of the great barons held several hundreds — he became responsible to the king as tenant-in-chief for military service in proportion to his grant, and required the same from his tenants.

This important change in the tenure of land and military system of the country was not effected easily or at once. To the original Saxon proprietors, who still held much of the land, the feudal system was a strange and intolcrable burden. But the ever-growing preponderance of the Norman element, the dissensions among the Saxons them- selves, which William skilfully made use of, the constant wars and revolts, and consequent necessity for improved military organisation, gradually overcame their resistance, and shortly before the Conqueror's death the new system was finally accepted throughout the country. Thus the king could command the services of 60,000 knights? and men-at-arms for forty

days free of cost; and these feudal troops, unlike the Saxon levies, were bound to follow him anywhere. modifications were soon introduced. Forty days might suffice to repel an invasion or crush a revolt, but not to prosecute a foreign war; moreover, many of the tenants' fees were subdivided, and the holders only liable to twenty or ten days' service. On the other hand, many holders of fees could not render personal service, or preferred sub- mitting to a money penalty instead. Thus by mutual consent grew up a system of fines or "escuage," and with the money levied from those who failed to do service the king was able to hire mercenaries, or pay such of the feudal troops as were willing to prolong their service.

| From time to time proclamations and statutes were issued

reminding the holders of knights' fees of their duties; but the immediate object was generally to raise money rather than to euforce personal service, which became more and

1 The " knight of honour," the true knight, must not be confounded with the tenant of a knight-fee. Practically the latter were usually the "men-at-arms," only men of good family being admitted to the honour of knighthood.

Such at least was the theory; but in practice,

Under the Planta- genets.

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more rare. Thus gradually departed the spirit of the feudal system, the principle that those who held the land should fight for it; armies lost their national character, the power of the king was increased, and the first steps laid towards the establishment of standing armies as instruments in his hand. The feudal system had not, however, abrogated the old Saxon levies; and while in the former we trace the source of our stipendiary forces, from the latter arose two national institutions,—the posse comitatus, liable to be called out by the sheriff to maintain the king's peace, and later the militia force. The posse comitatus, or power of the county, included all males capable of bearing arms, peers and spiritual men alone excepted; and

though its primary object was to maintain peace and pursue felons under the command of the sheriff, it was also bound to attend upon summons for the military defence of the country. This levy was organised as an armed force by an Act of 27 Henry IT. (1181 a.p.), and subsequently by the 13 Edward I. (1285 a.p.), commonly known as the "Statute of Winchester," which determined the num- bers and description of weapons to be kept by each man according to his property, and also provided for their periodical inspection. This force was only liable to home service, but even in early days seems to have been used, as now, as a feeder to the army.

The armies with which our kings carried on their foreign wars consisted mainly of paid troops. Many, in the days of the earlier kings especially, were foreign mercenaries, and these were sometimes imported to England to the grcat discontent of the country. But the Edwards found that there was better material to be had in this country than abroad; and the army which Edward III. took to France, and with which he won the battle of Crecy, was composed exclusively of English, Welsh, and Ivish. A muster-roll, still preserved, of the army with which he besieged Calais is interesting as giving the numbers and rates of pay of the different ranks. The prince received £1 a day, and the bishop of Durham, 6s. 8d. Then follow:—

18 Karls, ~. : 44 Barons and bannerets, .

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. at 6s. 8d. per diem. 3 at 4s. Ah

1,046 Knights, j ' – at 2s. 53 4,022 Esquires, captains, and lcaders, at Is. <5 5,104 Vintenars and mounted archers, at 6d. 3 15,480 Foot archers, . js : at 3d. AF 814 Mechanics, gunners, &c., from 12d. to 3d. . 4,474 Welsh foot, . : : at 2d. i

These armies were raised partly from those bound to serve by tenure, partly by forced levies, which, though illegal and often strenuously resisted by Parliament, were not unfrequent; but mainly by contracts entered into "with some knight or gentleman expert in war, and of great revenue and livelihood in the country, to serve the king in war with a number of men." Copies of the in- dentures executed when Henry V. raised his army for the

invasion of France in 1415 are in existence. Under these the contracting party agreed to serve the king abroad for one year, with a given number of men equipped according to agreement, and at a stipulated rate of pay, the items of which are set forth, and agree generally with those given above. A certain sum was usually paid in advance, and in many cases the Crown jewels and plate were given in pledge for the rest. The profession of arms seems to have been a profitable one, and there was no difficulty in raising men where the commander had a good military reputation; Edward II. is said to have declined, the services of num- bers of foreign mercenaries, who wished to enrol under him in his wars against France. The pay of the soldier was high as compared with that of the ordinary labourer, and he had the prospect of a share of plunder in addition.

The funds for the payment of these armies were pro- vided partly from the royal revenues, partly from the fines

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paid in lieu of military service, and other fines arbitrarily imposed, and partly by grants from Parliament. As the soldier's contract usually ended with the war, and the king had seldom funds to renew it even if he so wished, the armies disbanded of themselves at the close of each war. To secure the services of the soldier during his contract, Acts were passed (18 Henry VI. c. 19; and 7 Henry VIL. c. 1) inflict- ing penalties for desertion; and in Edward VI.'s reign an Act "touching the true service of captains and soldiers " was passed, somewhat of the nature of a Mutiny Act.

The six centuries which elapsed between the Norman Conquest and the Rebellion may be treated as one period in the history of the military institutions of England. Though considerable changes had taken place, though the feudal armies in which the great nobles rode at the head of their retainers, and whose main fighting strength lay in the number of knights and men-at-arms, had given place to armies raised by contract, commanded by officers having no personal connection with the men, and in which the com- mon infantry formed the real fighting strength, still these changes had taken place gradually, and fundamentally the principles remained the same. The army seldom came in collision with the nation. Latterly indeed, in Queen Elizabeth's time, the demands of the Irish wars

had led to frequent forced levies, and the occasional billeting of the troops in England also gave rise to murmurs, but the brilliancy and energy of her reign covered a great deal, and the peaceful policy of her successor removed all immediate cause of complaint. But with the accession of Charles I. a new period commences, and we find the army a constant and principal source of dispute between the king and Parliament, until under William III. a standing army is finally established on its present constitutional footing. Charles wished to support his brother-in-law, the Elector Palatine, in his struggle for the crown of Germany, and for that purpose raised an army of 10,000 men. He was already encumbered with debts, and the Parliament refused all grants, on which he had recourse to forced loans to supply the funds, The army was sent to Spain, but re- turned without effecting anything, and was not disbanded, as usual, but billeted on the inhabitants. The billeting was in itself illegal, and was the more deeply resented as it appeared that the troops were purposely billeted on those who had resisted the king's loan. Finally, the dis- orders committed by these troops caused the king to issue a commission to certain persons, officers and others, to proceed against offenders "according to the justice of martial law,"—thus establishing martial law in England in time of peace. These three breaches of the law—forced loans, billeting, and martial law—all directly connected with the maintenance of the army, formed the main sub- stance of the grievances set forth in the celebrated " Peti- tion of Right." In accepting this petition, Charles gave up the right to maintain an army without consent of Parliament ; and when in 1639 he wished to raise one to act against the rebellious Scotch, Parliament was called together, and its sanction obtained, on the plea that the army was necessary for the defence of England. This army again became the source of dispute between the king and Parliament, and later some of the hottest contests arose on the question of the command of the armed forces: finally both sides appealed to arms, and the parliamentary army, after having overthrown the monarchy, upset the Parliament also, and remained undisputed master. Under Cromwell, the force which had raised him to power was naturally augmented and encouraged. For the first time a real standing army, amounting at one time to 80,000 men, was maintained. This army of the Commonwealth differed in character from those which preceded or followed it, the men as a rule being taken from a better class,

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Under

Charles I.

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wealth,

Rise of standing army.

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the officers from a lower one. The common levies of the first parliamentary armies were no match for the gentle- men who gathered round the royal standard, till Cromwell leavened them with a different stamp of men, mainly drawn from the yeomen and middle class,— earnest resolute men, whose stern fanaticism was able to turn the scale against the headstrong valour of the Royalists. This class served largely in Cromwell's army, and gave a tone to the whole, while the pay was sufficiently high to make it a desirable profession for others besides the poorest. But with the officers it was otherwise. The noble and gentle families who commanded the king's armies remained faith- ful to his cause, and Cromwell had to draw his officers from a class little above the men. Few will be found now to dis- pute Cromwell's capacity as a general and ruler, nor the high qualities of the army by which he maintained his power at home, and spread England's prestige abroad. But such an army could not be maintained without great cost and hard- ship to the people at large, and before Cromwell's death it had produced deeper discontent than even Charles's exactions.

On the Restoration this army was disbanded. The king feared and distrusted it, for it was formed of his enemies, and officered by men who had approved his father's execu- tion, and it had made itself hateful to the nation. The permanent forces of the Crown were reduced to the "garrisons and guards" maintained by the king from the revenue allotted to him for carrying on the

government of the country. The "garrisons" were commissioned to special fortresses,—the Tower of London, Portsmouth, &c. The "guards" comprised the sovereign's body guards (the '"yeomen of the guard" and "gentlemen-at-arms," who had existed since the times of Henry VII. and VIII.); Monk's regiment of foot (now the Coldstream Guards), alone retained of the disbanded army ; and two regiments of life guards and one of foot guards, raised principally from the cavaliers who had followed the king's fortunes. Even this small force, at first not exceeding 3000 men, was looked on with jealousy by Parliament, and every attempt to increase it was opposed. The acquisition of Tangiers and Bombay, as part of the dower of the Infanta of Portugal, led to the formation of a troop of horse (now the 1st Royal Dragoons) and a regiment of infantry (now the 2d or Queen's regiment), for the protection of the former ; and a regiment of infantry (afterwards transferred to the Kast India Company, and now the 103d, or Bombay Fusiliers), to hold the latter. These troops, not being stationed in the kingdom, created no distrust ; but when in 1670, on occa- sion of the Dutch war, 12,000 men were raised for the protection of the coasts, Parliament immediately petitioned that they should be disbanded as soon as peace was made. On several occasions during Charles's reign considerable armies were raised, but were mostly disbanded again when the occasion ceased. Several regiments, however, were added to the permanent force, including Dumbarton's regiment (the lst or Royal Scots)! and the 3d Buffs; and on Charles's death in 1685 the total force of " guards and garrisons" had risen to 16,500, of whom about one-half formed what we should now call the standing army.

James II. was more obstinate than his predecessor in his efforts to increasé the army, and Monmouth's rebel- lion afforded him the pretext. A force of about 20,000 men was maintained in England, and a large camp formed at Hounslow. Eight cavalry and twelve infantry regiments

1 This regiment has the oldest history of any in the world. Ori- ginally the " Scottish Guard'"' of the kings of France, it was formed in the 9th century, and constantly recruited from Scotland. In 1625 it was sent to England to attend the coronation of Charles I, and revisited it later to fight against the parliamentary army. On the Restoration it came permanently to England, and was named the Ist Royal Regiment.

were raised, and given the numbers which, with few exceptions, they still bear. liament to disband the militia and further augment the standing army; and although the proposal was instantly rejected by the Commons, he continued to add to the army,

James even proposed to Par-

and to billet them on the country, in defiance of the

remonstrances of Parliament, till the Revolution deprived

him of his throne and put an end to the contest. The army which he had raised was to a great extent disbanded, the Irish soldiers especially, whom he had introduced in large num- bers on account of their religion, being all sent home.

The condition of the army immediately engaged the attention of Parliament. The Bill of Rights had definitely established that "the raising or keeping of a standing army within the kingdom, unless it be by the consent of Par- liament, is against the law," and past experience made them very jealous of such a force. But James was making efforts to recover his throne, and seeking aid from France ; Ireland and Scotland were disaffected, civil war was imminent, foreign war certain; and William had only a few Dutch troops, and the remains of James's army, with which to meet the storm. Parliament therefore sanctioned a standing army, trusting to the checks established on the power of the Crown by the Bill of Rights and Act of Settlement, and by placing the pay of the army under the control of the Commons. An event soon showed the altered position of the army. A regiment which was favourably inclined to James, and had therefore been ordered abroad, mutinied, and marched north, declaring for James. It was surrounded and compelled to lay down its arms; but William found himself without legal power to deal with the mutincers. He therefore applied to Parliament, and in 1689 was passed the first Mutiny Act, which, after repeat- ing the provisions regarding the army inserted in the Bill of Rights,

and declaring the illegality of martial law, gave power to the Crown to deal with the offences of mutiny and desertion by courts-martial. From this epoch dates the history of the standing army as a constitutional force.

Under William the army was considerably augmented. The old regiments of James's army were reorganised, re- taining, however, their original numbers, and three of cavalry and eleven of infantry (numbered to the 28th) were added. In 1690 Parliament sanctioned a force of 62,000 men, further increased to 65,000 in 1691; but on peace being made in 1697 the Commons immediately passed resolutions to the effect that the land forces be reduced to 7000 men in England and 12,000 in Ireland. The war that quickly succeeded obliged Great Britain again to raise a large army, at one time exceeding 200,000 men ; but of these the greater number were foreign troops engaged for the Continental war. On the peace of Utrecht the force was again reduced to 8000 men in Great Britain and 11,000 in the plantations (7.e., colonies) and abroad. From that time to the present the strength of the army has been determined by the annual votes of Parliament, and though frequently the subject of warm debates in both houses, it has ceased to be a matter of dispute between the Crown and Parliament. The following table shows the fluctuations between that time and the present—the peace years show- ing the average peace strength, the war years the maximum to which the forces were raised :—

Year. Number. Year. Number. DSO sities sera 18,857 VAD: cosnscacemneaste. 74, 187 NAO Bins ayaa ciaiacace oeaysayatas 17,018 MVAGH eccrine 67,776 PS D2 ress. an oceeoomee 71,790 1 U7 i err ecec oat 90,734 BUSid se mennpar aceon: 100,011 SHO, o.ceeeocereteate 245,996 WaK…..2eewes 156,995 WBS GG: 7). aaos ccna 275,079 NGG s.. MSD Sine, ccisseceac< sami 222,874

Note.—Prior to. 1856 the British forces serving in India are not included.

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During William's reign the small English army bore an honourable part in the wars against Louis XIV., and _ especially distinguished itself by its intrepidity at Steinkirk, at Ncerwinden, and in the assault of Namur. Twenty English regiments took part in the campaign of 1694. In the great wars of

Queen Anne's reigu the British army under Marlborough acquired a European reputation. 'The cavalry, which had called forth the admiration of Prince Eugene when passed in review before him after its long march across Germany (1704), especially distinguished itself in the battle of Blenheim; and Ramilies, Oudenarde, and Malplaquet were added to the list of English victories. The army was peimanently increased by one regiment of cavalry and eleven of infantry; and though the regiments were much reduced in strength during the following peace, the cadres remained untouched. During the reign of the first and second Georges an artillery corps was organised, and the army further increased by five regi-

ments of cavalry and thirty-five of infantry. Fresh laurels

were won at Dettingen (1743), in which battle twenty English regiments took part ; and though Fontcnoy was a day of disaster for the English arms, it did not lower their reputation, but rather added to it. Six regiments

of cavalry and six of infantry shared. under Prince Ferdi-

nand the honours of the victory of Minden (1759), and the English infantry was especially thanked by the prince for its conduct on that occasion, About this time the first English regiments were sent to India, and the 39th shared in Clive's victory at Plassey. During the first half of George III.'s reign the army was principally occupied in America; and though the conquest of Canada may be counted with pride among its exploits, this page in its history is certainly the darkest. English armies capitulated at Saratoga (1777) and at Yorktown (1781), and the war

ended in 1785 by the evacuation of the revolted states of |

America and the acknowledgment of their independence. Before passing to the great French Revolutionary wars, from which a fresh period in the history of the army may be dated, it will be well to review the general condition of the army in the century preceding.

Regiments were raised almost as in the days of the Edwards. The Crown contracted with a distinguished soldier, or gentleman of high position, who undertook to raise the men, receiving a certain sum as bounty-money for

each recruit. In some cases, in lieu of: money, the con- tractor received the nomination of all or some of the officers, and recouped himself by selling the commissions. This system—termed raising men for rank-—was retained till very recently, and originally helped to create the " purchase system" of promotion. For the maintenance of the regi- ment the colonel received an annual sum sufficient to cover the pay of the men, and the expenses of clothing and of recruiting. The colonel was given a "beating order," without which no enlistment was legal ; and was responsible for maintaining his regiment at full strength. "Muster masters" were appointed to muster the regi- ments, and to see that the men for whom pay was drawn were really effective. Sometimes, when casualties were numerous, the allowance was insufficient to meet the cost of recruiting, and special grants were made. In war time the ranks were also filled by released debtors, pardoned criminals, and impressed paupers and vagrants. Where the men were raised by voluntary enlistment, the period of service was a matter of contract between the colonel and the soldier, and the engagement was usually for life ; but exceptional levies were enlisted for the duration of the war, or for periods of three or five years. The army was officered entirely from the upper ranks, the low rate of pay and the purchase system combining to exclude all but men of independent incomes. Appointments (except when in the

gift of the colonel) were made by the King at home, and by the Commander-in-Chief abroad; even in Ireland the power of appointment rested with the local commander of the forces until the Union. The soldier was clothed by his colonel, the charge being defrayed from the " stock fund." The army lived in barracks, camps, or billets. The barrack accommodation in Great Britain at the beginning of the century only sufficed for 5000 men; and though it had gradually risen to 20,000 in 1792, a large part of the army was constantly in camps or billets—the latter causing endless complaints and difficulties. The drill of the army was mainly borrowed from that of Frederick, but the American war had trained many regiments to skirmishing. The administration was generally corrupt and defective, and

the character of the army stood very low when England embarked on her long war with France.

Her first efforts in this war did not tend to raise it.

After a campaign, fought with great gallantry but not much ~

skill, the English army under the Duke of York was driven out of Holland, and that country annexed to France. But the appointment of the Duke of York to the post of Com- mander-in-Chief of the army was the commencement of a better era. He did much to improve its organisation, discipline, and training, and was ably seconded by com- manders of distinguished ability. Under Abercromby in Egypt, under Stewart at Maida, and under Wellesley and Lake in India, the British armies again attached victory to their standards, and made themselves feared and respected. The energy and unbending resolution of Pitt seemed to communicate itself to the nation, and the threatened invasion of England excited her martial spirit to the highest pitch. Finally, her military glory was raised by the series of successful campaigns in the Peninsula, until it culmin- ated in the great victory of Waterloo; and the army emerged from the war with the most solidly founded re- putation of any in Europe.!

The events of this period belong to the history of England, and fall outside the province of an article dealing only with the army. The great augmentations required during the war were effected partly by raising addi- tional regiments, but principally by increasing the number of battalions, some regiments being given as many as four. On the conclusion of peace these battalions were reduced, but the regiments were retained, and the army was per- manently increased from about 20,000, the usual peace establishment before the war, to an average of 80,000. The Duke of York, on first appointment to the command, had introduced a uniform drill throughout the army, which was further modified according to Dundas's system in 1800 ; and, under the direction of Sir John Moore and others, a high perfection of drill was attained. At the beginning of the war, the infantry, like that of the Continental powers, was formed in three ranks; but a two-rank formation had been introduced in America and in India, and gradually became general, and in 1809 was finally approved.

In the Peninsula the army was permanently organised in divisions, usually consisting of two brigades of three or four battalions each, and one or two batteries of artillery. The Duke of Wellington had also brought the commissariat and the army transport to a high pitch of perfection; but in the long peace which followed these establishments were reduced or broken up. The period which elapsed between Waterloo and the Crimean war is marked by a number of Indian and colonial wars, but by no organic changes in the army, with perhaps the single exception of the Enlistment Act of 1847, by which short service,—+¢., an original

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1 Possédant les scuvenirs de gloire et de succés les plus solides, sang contredit, parmi toutes les armées européennes."—(L' Armée Anglaise, by the Baron de Grancey, Paris, 1873.)

Recent changes.

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enlistment for 10 or 12 years, with power to re-engage to complete 21,—was substituted for the life enlistments hitherto in force. The army went to sleep on the laurels and recollections of the Peninsula. The Duke of Wellington, for many years Commander-in-Chief, was too anxious to hide it away in the colonies, and to save it from further reductions or utter extinction, to attempt any great adminis- trative reforms. The force which was sent to Turkey in 1854 was an agglomeration of battalions, individually perhaps the finest the world had ever seen, but unused to work together, without trained staff, administrative depart- ments, or army organisation of any kind. They fought with distinguished gallantry at the Alma and at Inkerman, but succumbed under the hardships, the privations, and the sickness of the winter before Sebastopol—a sacrifice to maladministration. The lesson was dearly bought, but was not thrown away. From that time successive War Ministers and Commanders-in-Chief have laboured perseveringly at the difficult task of army organisation and administration. Foremost in the work was Lord Herbert, the soldiers' friend, who fell a sacrifice to his labours, but not before he had done much for thearmy. The whole system of administra- tion was revised. In 1854 it was inconceivably

compli- cated and cumbersome. 'The "Secretary of State for War and Colonies," sitting at the Colonial Office, had a general but vague control, practically limited to times of war. The "Secretary at War" was the parliamentary representative of the army, and exercised a certain financial control, not extending, however, to the ordnance corps. The Com- mander-in-Chief was responsible to the sovereign alone in all matters eonnected with the discipline, command, or patronage of the army, but to the Secretary at War in financial matters. The Master-General and Board of Ordnance were responsible for the supply of material on requisition, but were otherwise independent, and had the artillery aud engineers under them. The Commissariat Department had its headquarters at the Treasury; and the militia until 1852 were under the Home Secretary. A number of minor subdepartments, more or less independent, also existed, causing endless confusion, correspondence, and frequent collision. In 1854 the business of the colonies was separated from that of war, and the then Secretary of State, the Duke of Newcastle, assumed control over all the other administrative officers. In the following year the Secretary of State was appointed Secrctary at War also, and the duties of the two offices amalgamated. The same year the Commissariat Office was transferred to the War Department, and the Board of Ordnance abolished, its functions being divided between the Commander-in-Chief and the Secretary of Statc. The minor departments were gradually absorbed, and the whole administration divided under ¢wo great chiefs, sitting at the War Office and Horse Guards respectively. Finally, in 1870 these two were welded into one, and the War Office as now existing was constituted.

Corresponding improvements were effected in every branch. The system of clothing the soldiers was altered, the contracts being taken from the colonels of regiments, who received a money allowance instead, and the clothing supplied from Government manufactories. The pay, food, and general condition of the soldier were improved ; reading and recreation rooms, libraries, gymnasiums, and facilities for games of all kinds being provided. Special attention was directed to sanitary matters; large barracks were built on improved principles ; more space allotted to the men; ventilation and drainage improved, and the rate of mortality greatly reduced. A large permanent camp was formed at Aldershott, where

considerable forces were collected and manceuvred together. Various educational establishments were opened, a staff college established for

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the instruction of officers wishing to qualify for the staff, and regimental schools improved.

The Indian mutiny of 1857, followed by the transference of the government of India from the hands of the East India Company to those of the Queen's ministers, led to important changes. The East India Company's white troops were amalgamated with the Queen's army, and reorganised—a difficult task, and one which cannot yet be said to be completed.

Among recent alterations may be mentioned the localisa- tion of the army, commenced in 1872, but which cannot produce its full effects for many years to come; the trans- ference of certain powers over the militia from the lords- lieutenant to the Crown, in 1871, and the placing the militia and voluntecr forces directly under the generals commanding districts; the abolition of purchase, in 1871 ; the introduction of short service (6 years in the ranks) by the Army Enlistment Act of 1870; the institution of annual autumnal manceuvres, at which considerable forces are eollected and manceuvred against one another over extensive tracts of country ; the formation of the Control Department, &c. ; but these will be dealt with at length in the following pages.

British ARMY AS IT Is.

The supreme command of all the military forces of the nation is vested in the Crown, but can only be exercised through an intermediate and responsible agent. The entire administration, therefore, of the regular army and rescrve or auxiliary forces is under the control and responsibility of the Secretary of State for War, who is assisted by two under-secretaries, the Parliamentary and Permanent Under- Secretaries of State. The actual army administration is divided among three great officers,—the Officer Com- manding in Chief, the Surveyor-General of Ordnance, and the Financial

Secretary. These officers are at the head respectively of the three great departments of the War Office, viz., the Military Department, the Control Depart- ment, and the Financial Department; their duties are defined by orders of Council of the 4th and 23d June 1870. The Officer Commanding in Chief is charged with "the discipline and distribution of the army, and of the reserve forces of the United Kingdom when embodied or called out for actual military service; the military education and training of the officers, non-commissioncd officers, and men of the army, and of the reserve forces when assembled for training, exercise, inspection, or voluntary military duty ; enlisting men for and discharging men from the army and army reserves; the collection and record of strategical information, including topography, in relation to the military circumstances of this and other countries ; the selection of fit and proper persons to be recommended to Her Majesty for appointment to commissions in the army, for promotion for staff and othcr military appointments, and for military honours and rewards." The Surveyor-General of the Ord- nance is charged with " providing, holding, and issuing to all branches of the army and reserve forces, food, forage, fuel, light, clothing, arms, accoutrements, munitions of war, and all other stores necessary for the efficient performance of their duties by such forces, of proper quality and pattern, and in proper quantities, according to the regulations governing the provision, custody, and issue of such supplies ; exercising a strict control over the expenditure of such supplies, and seeing that they are properly accounted for by the several officers and others who may be charged with their custody, issue, and use; the custody of all buildings in which troops are quartered, and allotting quarters ; pro- viding transport for troops, and directing land and inland water transport; preparing the estimates for the above

Adminis- tration of the army.

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services, and causing the expenditure for them to be duly and carefully examined." The Financial Secretary is charged with " preparing the annual estimate for the pay of the army and reserve forces ; collecting and incorporating into a general estimate for army serviccs the estimates of the other departments of the War Office, and financially reviewing the

expenditure proposed in such estimates ; submitting for the instructions of the Secretary of State for War any proposed redistribution of the sums allotted to the different subdivisions of the votes for army services ; finally, allowing all cash expenditure, and recording the same under its proper head of service in the annual account for Parliament; issuing all warrants for the payment of moneys, making all imprests to accountants and others, and seeing that accounts are duly rendered for the same ; advis- ing the Secretary of State on all questions of pay, retired pay, and pensions for the army and reserve forces." Any or all of the above-mentioned great officers may be in Parliament; and the Surveyor-General of Ordnance and Financial Secretary have usually seats in the Lower House.

The Officer Commanding in Chief is nominated by a letter of service, and holds his appointment during Her Majesty's pleasure, differing in this respect from the Surveyor-General and Financial Secretary, who are ap- pointed by the Secretary of State, and removable at his pleasure. The appointment is therefore not a political one, and has becn held by H.R.H. the Duke of Cambridge since 1856. He is assisted in his duties, and his orders are con-

veyed and executed through the agency of the General Staff

of the army, comprising the Headquartcr Staff of the Mili- tary Department at the War Office, and the general officers holding commands at home or abroad, with their subordinate staffs. The Headquarter Staff is subdivided into the Ad- jutant-General's Department, under the Adjutant-General to the Forces, a general officer of high standing, who is named directly by the sovereign, and is the chief staff officer of the Commander-in-Chief, and the channel through which all communications connected with the personuel, military operations, duties, discipline, and general efficiency of the army pass; the Quartermaster-G'eneral's Department,} under the Quartermaster-General to the Forces,—a general officer of subordinate rank to the Adjutant-General, but also appointed by the sovereign—whosc duties embrace the movement and quartering of troops, roster of regiments for foreign service, and military questions connected with barracks ; the Military Secretary's Department, under the military secretary to the

Commander-in-Chief, who is the channel of correspondence on all matters connectcd with the appointment, promotion, exchange, and retirement of officers, and honours and rewards ; the Jntelligence Depart- ment, including the Topographical Department, under a Deputy-Adjutant-General, charged with the collection and registering of all strategical, statistical, and topographical information, whether relating to the British Empire or to foreign countries and armies; the Recrusting Department, under an Inspector-General of Recruiting, charged with the supervision of the recruiting throughout the kingdom ; the Auailiary Forces Department, under an Inspector- General of Reserve and Auxiliary Forces, embracing all questions connected with the militia, yeomanry, volunteers, and army reserves; and the Military Hducation Depart- ment, under the Director-General of Military Education, charged with the instruction and examination of officers, and matters connected with military colleges and regimental or garrison schools and libraries. The artillery and en- gineers have a distinct headquarter staff, subordinate, how- ever, to the Adjutant-General.

The Surveyor-General of the Ordnance is appointed by

i The Adjutant- and Quartermaster-General's Departments have beon recently amalgamated, but the subdivision of duties still remains.

the Secretary for War, and removable at his pleasure ; the appointment is therefore a political one, and usually con- nected with a seat in Parliament. His subordinates and assistants in the performance of his duties are the staff of the Ordnance Department at the War Office, and the officers of the Control Department at the various military stations at homeand abroad. The Ordnance Department is divided into the Supply and Transport Division, under a Dircctor of Supplies and Transport, whose duties embrace questions con- nected with transport, food, forage, fuel and light, barracks, billets, and lodging; the Artillery and Stores Division, under

a Director of Artillery and Stores, whose duties embrace all

questions connected with the manufacture, maintenance, and supply of warlike stores of all kinds, and store and clothing accounts ; the Contracts Division, under a Director of Contracts, who makes all necessary contracts at home, and examines those entered into abroad ; and the Clothing Division, under the Director of Clothing, who has charge of the manufacture and supply of clothing for the army.

Ordnance or Contorl Depart: ment.

The Financial Secretary is appointed by the Secretary Finance

for War, and removable at his pleasure ;

the appointment, Depart-

like that of the Surveyor-General, is therefore a political ai

one, and usually connected with a seatin Parliament. He is assisted by an Accountant-General and large staff of clerks in his department of the War Office, but has no staff or subordinates outside its walls.

The number of men to be maintained and the amount of money to be expended are determined by an annual vote of Parliament, based on the estmates laid before the House by the Minister of War. The minister, with the advice of the Officer Commanding in Chief, decides on the number of men that Parliament shall be asked to provide for the ensuing year, and the estimates are framed accordingly. To obtain the greatest possible accuracy, every subordinate department at home and abroad is called upon for a detailed statement of probable expenditure. These are examined and amended by the heads of the several departments and divisions at the War Office, and passed on to the Finance Department, where they are collected and incorporated into a general estimate, which is submitted to the Secretary of State, with the remarks of the Financial Secretary ; and being revised and finally approved of, is submitted to the Treasury and included in the annual budget of the Chan- cellor of the Exchequer. The Treasury may, however, re- duce any item that appears excessive. When the amount has been voted by Parliament, the Treasury authorises the Pay- master-General to honour the orders of the War Office to the extent of the vote. At home the

necessary funds are obtained by warrants issued by the Accountant-General, under authority of thc Financial Secretary, and paid by the Paymastcr-General by means of orders upon the Bank of England; abroad they are obtained partly by remittances of specie, but principally by the negotiation of bills of exchange drawn upon the Lords of the Treasury by the local Control officers, acting in this respect on behalf of the Treasury. The army estimates, as laid before Parlia- ment, are divided under a certain number of votes, and these again into sub-heads and items; and no money granted under one vote can be applied to a service included under another vote without the sanction of the Treasury. Within the limits of the vote, however, the War Office has the power of redistributing the sums allotted.

The following abstract of the army estimates for 1873-4 (which does not include, however, the cost of that part of the army which is serving in India), will indicate the classification under heads and votes, and the amounts allotted; and although these vary slightly from year to year, the general distribution of expenditure remains tolerably uniform :—

Estimates.

Eniist- ment of soldiers.

574

1. Regular Forces,

VorEs. 1. Staff and Regimental Pay and Allowances.. ..... £5,072,500 2,3, 4. Divine Service, Law, and Medical Serviee…. ..... 821,200 £5,393, 700 2. Auxiliary and Reserve Forces. 5, 6 Molitia and) ScOmanny: ....c-ccecaeetosssepesswasass £894,300 7, 8. Volunteers—Army Reserve….....:0000+. 553,500 £1, 447,800 8. Control Establishments and Services. 9. Control Establishments, Wages, &c. ..... £389,000 10. Provisions, Forage, Fuel, Transport, &.... .. 1,980,700 11. Clothing Establishments and Services…..... 743,100 12. Supply and Manufacture of Warlike Stores, 1,070,000 £4,182,800 4, Works and Buildings. 13. Works, Buildings, and Repairs ….....0-.-4+. £778,000 5. Various Services. 14, 15, 16. Administration, Education, and Miscellaneous, £363,700 6. Non-effective Services, 17, 18. Pay of General Officers, and Rewards ….....

£115, 400 19. Retired Officers—Full and Half Pay…..... 527,900 20. Widows' ..Pensions) (856s ses. cee. cemosivapnesaue tent see 147,300 21, 22, 23. In and Out Pensions, and ditto for Wounds, 1,267,500 24, 25. Superannuation Allowances …....1. eseeeeee 192,300 £2, 250,400

Total Effective and Non-Effective Services…...£14,416,400

The whole of the military forces of England are raised by voluntary enlistment. Recruiting for the army is carried on partly by means of the large staff of non-commissioned officers attached to the brigade depéts, partly by means of pensioners receiving a special rate of pay while so employed, and partly by sergeants or parties sent out by regiments and corps for the purposc—the whole being under the superintendence of the colonel commanding the brigade district. Infantry regiments of the line recruit as far as possible within the districts to which they are attached ; but the cavalry, artillery, engineers, guards, and rifles recruit throughout the country generally. Enlistment in the army is regulated by the annual Mutiny Act and the Army Enlistment Act; the former legalises the maintenance of an army, and lays down the number of men and manner of enlisting them; the latter fixes the period and conditions of service. By the Enlistment Act of 1870 men are enlisted for a first period of twelve years, which may be spent either entirely in the army, or partly in the army and partly in the reserve, as may from time to time be fixed by the Secretary of State for War. At present "short service" is fixed at six years in the army and six in the reserve for infantry, and eight years in the army and four in the reserve for the other branches. The Household cavalry, and a certain proportion in the other branches, are enlisted for " long service," 7.e., twelve years in the ranks.

On the completion of twelve years' army service, soldiers may be allowed to re-engage for nine years, making a total of twenty-one, at the end of which they are entitled to discharge with a pension. Those who are passed into the army reserve remain liable for the rest of their twelve years' engagement to be recalled into the ranks in case of war or national emergency, and to be called out for eight days' training in each year; but otherwise resume their positions as citizens, and are free to follow their callings.

A recruit for the army must be between 18 and 25 years of age, unmarricd, free from physical infirmities, and of such height and chest measurement as may be laid down from time to time. The standard has frequently varied, having been used as a means of regulating the supply of recruits, but stood in 1873 at a minimum of 5 fect

ARMY

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5 inches for the infantry, 5 feet 6 inches for light cavalry and engineers, 5 feet 7 inches for gunners, and 5 feet 8 inches for heavy cavalry ; the minimum chest measurement being 33 inches. For rifle regiments and for artillery drivers the standard is reduced to 5 feet 44 inches, but increased chest measurement is required. Exceptions are also made in favour of artificers and others. When a recruit presents himself for enlistment he is asked certain questions as to age, and whether he has served before ; if the answers are satisfactory, and he is otherwise suitable, he is given a shilling as enlistment money, and served with a notice warning him to attend before a magistrate for attestation. Within not less than twenty-four, and not more than ninety- six hours he is brought before the magistrate. If he then dissents from his enlistment, he may be discharged on payment of 20s. "smart money ;" if he still wishes to enlist, he makes a declaration contained in the attesta- tion paper as to his age, place of birth, trade, &c.; signs the attestation, and takes the oath of allegiance; and is thenceforth legally a soldier. No recruit, however, is finally accepted until he has been examined by a medical officer, and approved by an officer of rank detailed for the purpose. Formerly, recruiting was carried on largely at public-houses kept for the purpose; young men were entrapped by lying placards or by the misrepresentations of recruiting agents, and often enlisted whilst drunk, and then sent under escort to their regiments. Recently great improvements have been made in the recruiting service : the bounties formerly offered, and varying from £1 to £10, according to the demand for recruits, have been abolished, exaggerated placards forbidden, the recruiting taken away as much as possible from the public-houses, and the young soldier sent by himself to join his regiment. Under the system of long service the annual number of recruits required to keep up the army was

from 8 to 10 per cent. of its strength, but in future the proportion will be largely increased. The average number actually raised annually was 16,000 in the ten years 1860-9, and 21,000 in the three years 1870-2; the largest number raised in any one year since the war being 28,000, in 1859.

The rates of daily pay of the soldier and of the non- commissioned ranks are shown in the following table :—

Rank Infantry | Cavalry | Artillery. Engineera| 8. d. & ad & dd. s a. PHVALG is. cdivecsietsdaoeee es! 1 eS 1-2 1 BH do Corporal iss isexcisiess vss i00a8s 1 it Le Gh)" Da 2 is NOLPOAN Eas cas sinssiegaepennes 1 Bas 2 3 2 9 2 3 Colour-Sergeants &) from} 2 5 3 1 3 3 3 3 | Staff-Sergeants, to 3 3 3 7 4 2 4 74

The Household cavalry, horse artillery, and some ranks of the foot guards, receive a higher rate of pay, and the engineers usually earn working pay in addition. Every soldier further receives a free ration of bread and meat, valued at 6d. Taking into consideration the value of the ration, lodgings, clothing, fuel, and light, the pay and allowances of the infantry private represent an average annual value of about £38, and that of the cavalry private about £41, exclusive of any prospective advantages in the way of pension; while the corporals and sergeants range from £45 to £70. Comparing this with the annual receipts of the average labourer, which range between £35 and £45 in different counties of England and Scotland, and are much lower in Ireland, and bearing in mind that the soldier as a rule is called on to do less work, it is evident that his position on the whole is not a disadvantageous one. In addition to the above, the soldier may earn 1d. a day good-conduct pay after 2 years' service, 2d. a day after 6 years', 3d. after 12 years', and 4d. after 18 years' service. The amount to which the soldier is entitled is indicated by

Pay.

Officers,

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good-conduct badges" worn on the arm ; but these, with the corresponding pay, are liable to forfeiture for mis- conduct.

A soldier may claim his discharge at the expiration of his first or second period of service; or he may be dis- charged before the expiration of his service, either by sentence of court-martial or by order of the Commander-in-Chief for misconduct, or as an indulgence at his own request, or on reduction of the army, or as an invalid, if found unfit for further service. A soldier discharged after 21 years' service is entitled to a pension varying from a minimum of 8d. a day for a private, to a maximum of 2s. 6d. a day for a non-commissioned officer ; every good- conduct badge the soldier was in possession of, or would have been entitled to, at the time of discharge, adding a ld. a day to his pension. A soldier discharged on the completion of his first period (12 years), or discharged at any time for misconduct, receives no pension. If dis- charged as an invalid, on account of unfitness for service, he receives a temporary or permanent pension, varying, according to the nature of the disability and the manner in which it arose, from a minimum of 6d. a day for a year, to the full pension given above. Pensions for wounds are given on a special scale, according to the nature of the wound, the maximum being 2s. 6d. for a private and 3s, 6d. for a non-commissioned officer. Soldiers are also allowed to purchase their discharge as an indulgence, according to a fixed scale depending on length of service and character ; £35 in the artillery and engineers, and £20 in the infantry being the maximum rates. After from 12 to 16 years' service such discharge is granted free.

There are ten ranks of combatant officers in the army,— viz., field-marshals, generals, lieutenant-generals, and major- generals (classed as general officers); colonels, lieutenant- colonels, and majors (field officers); captains, lieutenants, and sub-lieutenants (regimental or company officers). The classification and promotion of officers is complicated by the system of brevet or army rank, by which an officer may hold a higher rank in the army than he holds in his regi- ment. Brevet rank is usually given for distinguished service in the field, or for length of service: it begins with the rank of major, and may be said to cease with that of major-general, as in that grade and in those above it all rank is army rank. Relative rank and command within the regiment, regimeutal promotion and duties, and pay,

are determined by regimental rank ; but rank, command, and duties outside the regiment, and army promotion, are governed by army rank. Thus a regimental captain may receive the brevet of major for distinguished service : he is called captain and brevet major, retains his place among the captains of his regiment, and continues to perform a captain's duties in his regiment ; but on any duties where

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the officers of several regiments are mixed he takes his.

place as major, and would command captains of his own regiment, though senior as such to himself.

Previous to November 1871 first appointments and regimental promotion in the cavalry and infantry were made under the purchase system. This system dates from the earliest days of the army, and arose partly from the mode in which regiments were originally raised. Every regi- mental commission had a fixed regulation price, varying from £450, the price of an ensigncy in an infantry regiment, to £7250, that of a lieutenant-colonelcy of Life Guards ;

in addition to which an over-regulation price, which some- |

times even exceeded the regulation price, had sprung up, and become established by custom, though contrary to law. An officer on retiring received the regulation price of his commission from Government, and the over-regulation from the officer who succeeded him ; and the step went to the senior qualified officer of the lower grade in the regiment

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cally under the Civil Service Commissioners.

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who was able and willing to purchase it. An officer who could not afford tv purchase rose with the others till he became senior of his rank, and there remained till a death vacancy or other '" non-purchase step" gave him his

promo- tion. Practically, however, the injury inflicted was less than at first sight appears, as the purchase system stimulated a rapid flow of promotion, by which the non-purchase officer profited also, aud if he lost a year or two in proniotion, he saved several thousand pounds. First appointments were given to gentlemen whose names were on the Commander- in-Chief's list, and to cadets from the Military College at Sandhurst, on passing the required examinations and pay- ing the price of the commission ; a certain number of com- nissions without purchase being given to those who passed high examinations at Sandhurst, and to young men whose fathers' services gave them special claims.

Purchase was abolished by warrant of 20th July 1871, Parliament voting the money to compensate the officers then holding saleable commissions, and a system of promotion by "seniority tempered by selection" was substituted by the present regulations.

First commissions as sub-lieutenants are now given to First ap- successful candidates at an open competitive examination, Ppoint- to non-commissioned officers specially recommended, to pote: university students who have passed certain examinations, and to "Queen's" and "Indian cadets," and pages of honour. A certain number of first commissions as lieu- tenants are also given to lieutenants of militia regi- ments. The limits of age for candidates by competition are from 17 to 20; but this is extended to 22 in the case of university students and militia lieutenants, and 30 in the case of non-commissioned officers. The. great

majority of first appointments are given by open com-

petition, examinations for the purpose being held periodi- The suc- cessful candidates receive commissions as sub-lieutenants, and are seut to the Military College at Sandhurst (or to their regiments, if in India) for a course of instruction ; and after passing the required examination in military subjects at the conclusion of the course, and serving a certain time with their regiments, are eligible for promo- tion to the rank of licutenant. A lieutenant is eligible Promotion. for promotion to captain after two years' service, but the actual time is usually much longer—from eight to eleven years; to qualify, he must pass an examination in regimental duties, drill, &c., and also a special army examination in military law, tactics, field

sketching, and field forti- fication. Promotion to the rank of captain is usually by regimental seniority ; the senior qualified subaltern in the regiment succeeding to a vacancy among the captains. A captain may become regimental major by succession to a vacancy in his own regiment, or by being promoted to a majority in another regiment, or on half-pay ; and brevet major by promotion for distinguished service, or by seniority in the army. Before promotion to a regimental majority a captain must pass a practical examination in subjects connected with the command of a regiment or of a small mixed force in the field. The appointment as major to a regiment is made for five years only, but is renewable. A major may become regimental lieutenant-colonel by appoint- ment to the command of a regiment, or to an unattached

ieutenant-colonelcy ; and by brevet for distinguished service,

or by seniority in the army. Certain staff appointments also carry with them the rank of lieutenant-colonel on appointment, or on completion of five years' service in then1. Regimental promotion ceases with the rank of lieutenant- colonel. When a vacancy arises in a regiment by death or by the promotion of an officer to another regiment, the step

goes in the regiment ; if it arises otherwise, it is filled up as seems best to the Secretary of State and the Commander-

Artillery and Engineers.

Pay.

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in-Chief,—regimental considerations, howevcr, receiving full consideration. A lieutenant-colonel becomes colonel by brevet, by promotion for distinguished service, on appoint- ment as aide-de-camp to the Queen, after five years' service in the command of a regiment, or an equivalent staff appointment, or eight years under certain conditions.

The promotion of general officers is by seniority, regu- lated by a fixed establishment, the numbers of which in 1870 were 71 generals, 115

lieutenant-generals, and 188 major-generals.!_ Promotions may, however, be made iu- dependently of the establishment for distinguished service. Field-marshals are appointed at the will of the sovereign, and without reference to seniority.

All promotions are made upon the recommendation of the Commander-in-Chief, with the approval of the Secretary of State for War.

The Artillery and Engineers have always beon on a different footing from the rest of the army. First appoint- ments to these services are made through the Royal Military Academy, entrance to which is by open competitive examina- tion. After a course of instruction in professional subjects, occupying three years, cadets are examined and finally classed, and receive commissions in the engincers and artillery according to their standing on the list. Those selected for the engineers are required to go through a further course of instruction at Chatham for two years before their commissions are confirmed. Regimental pro- motion in the two serviccs is governed purely by seniority, and a separate establishment of general officers is main- tained for them; in brevet promotion they are on the sane footing as officers of the other branches.

The rates of pay of the several ranks are shown in the following table :—

| |

2 S Rank. Sp 3 E e E 3 as wk iI a = — ee | 23 | & z § g moO EO (iS iS) < S| Gen. Officer, a Colonel of a Regiment or Col. £ £ £ £ £ £ Commandant (annual), | 1800° | 2000 o0r| 1000 13502 994 990 General Offieer, not a 2200 Colonel..... (annual), 450 450 450 450 450 450 (daily), |... oe = fo (OG ORG @ on 1 8 Dil 6 SOs onl solo Trelis Ostia: 7 14 Me 8 0/0 167>10)‘0 19 370 16 oO} 016 © hr 015 11015 6);011 7/014 7/011 0/011 0

010 4/0 7 4:0 6 610 9 0/0 610/0 610

Ij on 0 8 0/0 5 610 5 3)0 8 O10 5 7)/0 5& 7

Officers of the horse artillery receive a higher rate of pay, slightly in excess of that of the corresponding ranks in the cavalry. Officers of the engineers,

doing duty as such, receive extra pay, usually amounting to one-half of their ordinary pay if serving at home, or equivalent to it if serving abroad or in the London district. Lieutenant- colonels of regiments, and other officers holding commands of wings, batteries, or depéts, receive " conimand pay " of from 3s. to ls. 6d. daily. Captains holding higher rank by brevet receive 2s. a day additional; and lieutenants, after seven years' service, ls.a day. Officers holding staff appointments receive the pay of such appointments in addition to their regimental pay or half-pay.

Officers holding certain appointments are " seconded "— that is, their place in the regiment is filled up, and they become supernumerary, thcir names being shown in italics in the Army List; but they still belong to the regiment, and rise in it in due course.

Officers who entered the purchase corps under the old system can retire by the sale of their commissions, receiv-

1 The guards and line, artillery, engineers, and marines, have each their separate list. The total establishment will be increased by pro- motions from the Indian staff corps.

2 Tn future to be only £1000.

ing from Government the value, over-regulation as well as Retire.

regulation, of the commission which they held at the date of the abolition of purchase. Within certain limits officers are allowed to retire on the full pay of their rank after thirty years' service,—-the full pay of a lieutenant-colonel being reckoned at 20s. a day ; and all officers have an unqualified right to retire on half-pay after twenty-five years' service. The rates of half-pay amount usually to about three-fifths of the full pay of the corresponding ranks. Pensions are granted to officers who have received wounds in action equi- valent to the loss of a limb, at the rate of £400 a year to a lieutenant-general, £300 to a colonel or heutenant-colonel, £200 to a major, £100 to a

captain, and £70 to a lieutenant. Such pensions continue as long as the effects of the wound continue, and are held in addition to any pay or retiring allowances the officer is in receipt of. Gratuities, varying from three to twelve months' pay of the rank, are granted to officers who have received less serious wounds.

Pensions are granted to the widows of officers killed in action, or dying of diseases contracted in the field, at rates varying from £60 (lieutenant's widow) to £200 (widow of colonel or lieutenant-colonel) in the former case, and £50 to £150 in the latter; and " compassionate allowances " are granted, at rates varying, according to rank of deceased officer and other circumstances, from £6 to £40 annually for each child. Such compassionate allowances, however, are not granted except in cases where it is shown that the means of the family are so limited that they actually require such assistance; and widows' pensions generally cannot be claimed as a right, and are not granted wherc the widow is left in affluence, or where the Secretary of State sees reason to withhold them on account of miscon- duct or other causes. A reduced rate of pension and com- passionate allowances, ranging from £40 to £120 for the widow, and £5 to £20 for each child, is granted where the officcr died under circumstances which do not entitle his family to the higher rates ; but in such case the aggregate amount must not exceed the half-pay of the rank held by him at the time of his death. When an officer holding a saleable commission is killed in action, or dies within six months of wounds received, his family receive the value of such commission.

Strength, Composition, and Distribution of the Military Forces of the Empire (1873).

A, Regular Army—British Troops.

Non-Com.

; Ay Description of Force. Officers. Mae Horecs. Guns. Combatants. Generali States es ices. scess—2> a 77 AB re Cavalry, 31 Regiments…..... 884 | 16,389 | 11,586 | ... Artillery, 30 Brigades…..... 1416 | 38,3866 | 18,350 | 674 Engineers, 40 Companies, 3) Troo as APRs cao ocasnaapdenoncemeee mes eee = Infantry, 148

Battalions, 70 layuresiials IDYyYhSpeabaneasadooaoacc SAEs, feeds tas Total Combatants .,..... | 8468 | 174,780 | 25,358 | 674 Non-Combatants. Control Department and Army DEL VICCK COL DSeneereeree sear sicee Bee C08) 2a Medical Department and Army Hospital (Corps eses see sees Ae ies Chaplains' Department…..... 78 es Muscellanéous'.s…..2…... see | 93 546 Total Non-Combatants aa 1704 4,876 | 1,087

Total of all ranks, 189,828 ; of these 62,924 serving in India, 21,470 in the colonies, and 105,434 at home.

ments and

ensions,

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B. Reserve ant Auxiliary Forees. All Ranks Ast Class Army Reserve…....ceseessee seen ce teeees 7,993 Jn 10 Beg aac er 23,804 Militia Artillery…....ccccccceceessecnscee see see eee ees 15,735 yo LnfaMty …....ceeeceeeeeeeeeean eee tereee eee cee cee 123,283 Yeomanry Cavalry…..... Be Hahoanenectpecn tonsacnucrects 15,086 Volunteers— Artillery…....ecseccceneeese eee reeseeaee 30,750 e, Infantry, Mounted Rifles, &c…..... 130,000 Total Reserve and Auxiliary Forces…..... 346,651

The addition to this of the regular army at home, 105,434, gives as the total of forces, active and reserve, within the United Kingdom, 452,085.

C. Indian and Colonial Troops.

| Men. | Horses. |Guns. Indian Native Army. Infantry, 130 Battalions…....scsseserees 101,184 ae Cavalry, 37 Regiments.. .....c005 sees ich aa) || ae ateye i aaa Artillery, 6 Batteries… .....~~:sssseevereeee 896 623 | 36 Engineers and Miscellaneous …..... + 4,385 sf a Total Indian Army…....:.:.60~~+ 124,98) | 14,210 | 36 West Indian Regiments (2).....000—+0+ 1,822 ee aa | Royal Malta Fencibles …....-::e0see ees 373 Lasears, Hong-Kong and Ceylon…..... 264 Total Indian and Colonial Troops…| 127,449 | 14,210 | 36 EL ee eee eee D.

Colonial Militia, Volunteers, and Reserve Forces. | Men. | Horses. Guns. 1 North American Confederation …..... | 52,414 | 2081 48 en GE IONG IES Ghppeceosnnd bon Bson GbE SanpeneBoneEnec 8,952 610 24 PANNA COLOMICIE: jenscsico.s— 0 00issississseaseere 4,848 | 1143 19 FEO GSEASLONSMIIN NGIG: soccca ces ss csncnssoesesecere | \2 416 120 6 PATS HALA CONOMICS: -sasce+soscc.eo eco nee ase cns | 19,055 | 1708 48 "ied Nees eee 81,880 | 5657 | 140

Note,—The contingents furnished by Native Indian States under our protection are not included in the summary of our Indian forces ; and the disembodied or untrained militia of Canada, amounting to about 600,000 men, has not been taken into account in the summary of Colonial Reserve Forces.

Staff.

The staff of the British army may be classed under three principal heads— 1. General Officers, commanding divisions, districts, brigades, &e. ; 2. General Staff, including Adjutant-General and Quarter- master-General's Departments, brigade-majors, é&c. 3. Personal Staff, consisting of military secretaries and aides-de-camp. : Appointments to commands are made from the lists of superior officers of corresponding rank. Sometimes, how- ever, commands are given to officers of lower rank than that of the appointment, in which case they receive local and temporary rank The command of brigades is usually given to colonels, with temporary rank of brigadier-general. General officers are responsible for the discipline and efficiency of all the military forces within their commands. They are required to make annual inspections of every regiment or corps, and report minutely on them for the information of the Commander-in-Chief. They are assisted in their duties, and their orders conveyed to the troops, by the officers of the staff. Officers for the General Staff are selected exclusively from the regular army, and, except in eases of proved abilities in the field, must have passed through the Staff College. Admission to the Staff College is obtained by competitive examination, the number entering being limited to twenty annually. Candidates must have

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served not less than five years, and be reported to be thoroughly good regimental officers, qualified from general character, disposition, é&c., for employment on the staff, and physically fit for its active duties. Before being allowed to compete, they are reported upon by a board consisting of the commanding officer and two next seniors of their regiment and corps, and also by a general officer, to whose staff they have bcen attached for a month on trial. Officers of not less than seven ycars' service may present themselves at the final examination without having studied at the college ; but the same qualifications and certificates are required from them. After completing the course and passing the final examination, officers are attached during the following summer drill season either to the staff of a general. officer, or to the other arms of the service.

Officers appointed to the Personal Staff are not required to pass through the Staff College, but have to undergo a qualifying examination.

Staff appointments are held for five years only, at the end of which tine the officer reverts to his regiment or to half-pay. Most of the lower appointments are held by regi- mental officers who are temporarily withdrawn from their regiments, but still borne on its establishment. No effective field officer of a regiment, however, can hold a staff appoint- ment, and no regiment of cavalry may have more than one captain and one subaltern, and no battalion of infantry more than two captains and two subalterns on the staff.

The following table shows the principal ranks and rates of pay of the staff of the army :

*(Chonaiialll nnssosnsnodondaope cnn aqnpedsddsdosongodeanaenss (daily pay) £513 9 NisewbenAMt=Genwerdl..a.casccders+ «sasaccscsecsicne®s . 8 15 10 Major-General ….....scccesecssscssnsecessonss *n il ale 3h Brigadier-General….....cecssceeeseeeeneeees sf i ff © CWolonmeleonmtHensialt… cwecsccese ss seesicssieins (ees 5 i Bee Adjutant- or Quartermaster-General …..... o il ily shi 10/2) 010s yagi boat (0 RR Renee conse ree eon ene et 3 019 0 Asesietins GG, Gp sones@ned sonoppconvopasnngaanososeuD 55 014 3*

master-General, Brigade-Major, Assistant 0 9 6

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Deputy-Assistant-, Adjutant- or Quarter- Military Secretary, or Aide-de-camp…....

The Headquarter Staff receive a special higher rate of pay. ‘These rates are in addition to the pay or half-pay of their regimental commissions. Staff officers also receive an allowance for horses, varying from two for the lowest ranks to eight for a general.

The staff are the assistants of the general in all his duties, and the channels through which his orders are con- veyed to the troops. The duties of the officers of the Adjutant-General and Quartermaster-General’s Departments, and of military secretaries, correspond generally to those of the same departments at headquarters ; the Adjutant- General and his deputies or assistants being charged with the issue of all orders, and matters referring to drill, dis- cipline, returns, duties, &c.; the Quartermaster-General, or his subordinates, with matters connected with the movement and quartering of troops, camps, military positions, recon- naissances, embarkations, and disembarkations, &c. ; and the military secretaries with questions relating to promo- tions and appointments, miscellaneous confidential corre- spondence, and communications with the civil authorities. A brigade-major performs the duties of the Adjutant and Quartermaster-General’s Departments within his brigade. The duties of an aide-de-camp are of a more personal nature In the field he is employed to carry orders, &e. ; In peace he attends his general at inspections and on all public occasions, and renders such services as_his general re- quires of him. Officers of the General Staff, as a rule, are not under the rank of captains; aides-de-camp are appointed without regard to rank, but no officer may hold a staff appointment till he has served three years with his regiment or corps. Appointments to ge Staff are

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made by the Commander-in-Chief by selection from the qualified officers ; appointments on Personal Staff are made on the recommendation of the

general officer. The total numbers of officers employed on the staff of the army are 241 in the United Kingdom and colonies (British establish- ment), and 278 in India (Indian establishment). About two-thirds of the staff on the British establishment belong to regiments, and are borne on their establishments, the remainder being officers on half-pay or unattached. In India the rules regarding staff appointments vary a little, and most of the appointments, with the exception of the higher commands, are filled from a special "staff corps ;" but some are also held by officers from the British regi- ments serving in India.

Cavalry.

The cavalry consists of 31 regiments: viz., 2 of Life Guards and 1 of Royal Horse Guards, forming together the " Household Brigade ;" 7 regiments of Dragoon Guards, 3 of Dragoons, 5 of Lancers, and 13 of Hussars.

The Household Brigade form the body-guard of the sove- reign, furnishing the escorts on all state occasions. They are recruited regimentally, and take none but picked men, of good character, and over 5 feet 10 inches in height. They wear helmet, cuirass, and long jack-boots, and are armed with a breech-loading carbine and long straight sword, 40 inches in the blade. From the great size of the men, added to the weight of the cuirass, they ride very heavyy—from 21 to 22 stone when cquipped for service. They are quartered in or near London, and are only sent abroad in war.

The other regiments are classed as "heavy," "medium," and "light." The dragoons are classed partly as heavy, and partly as medium ; the lancers as medium ; the hussars as light. The heavies recruit from men of 5 feet 8 inches to 5 feet 11 inches in height, and ride, in "service marching order," from 19 to 20 stone; the mediums from men of 5 feet 7 inches to 5 feet 9 inches, and ride from 18} to 19 stone; the lights from men of 5 feet 6 inches to 5 feet 8 inches, and ride from 174 to 184 stone. 'The dragoon guards, dragoons, and hussars are armed with breech- loading carbines and sword. The lancers carry a bamboo lance (9 feet long), sword, and pistol. The colour and facings of the uniform vary in different regiments, the dragoons mostly wearing red, while the hussars and lancers wear blue. The dragoons wear helmets, with the exception of the 2d Dragoons (the "Scots Greys"), who wear bearskins ; the lancers, the lancer square-topped cap; and the

hussars, a busby with plume and bag. The Household Brigade are the only cuirassed regiments.

A regiment of cavalry on war footing consists of 8 troops, forming 4 squadrons in the field, and numbering 1 lieutenant-colonel, 1 major, 8 captains, 12 lieutenants and sub-lieutenants, 5 regimental staff officers, 11 staff sergeants, 8 troop sergeants-major, 24 sergeants, 32 cor- porals, 8 trumpeters, 20 farriers, shoeing smiths, and saddlers, and 504 privates ; in all, 27 officers and 607 men, with 559 horses. They take with them in the ficld 2 forge- waggons, 1 small-arm ammunition-cart, and 7 baggage and store-waggons. The peace establishment is 29 officers, 506 mea, and 320 horses. Of the 28 regiments of the line, 9 are usually in India, and 19 at home. The prin- cipal cavalry stations in the United Kingdom are Alder- shott, the Curragh (with Newbridge), and Dublin ; at each of the two first there is a general commanding the cavalry, who also inspects all the cavalry regiments in that portion of the kingdom. 'The depéts of regiments serving abroad, and the riding establishment, are at Canterbury. Cavalry regiments are not connected with particular counties or districts, but recruit throughout the kingdom.

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The horses for the cavalry are mostly obtained by

purchase from dealers, at the headquarters of the several regiments; no breeding establishments or special arrange- ments for securing a sufficient supply of a good class of horses, such as have been generally introduced on the Continent, exist in England. bought at four years old, £40 being the maximum govern- ment price; the average height is 15 hands 2 inches.

The horses are usually

Officers provide their own chargers, but are allowed to

select from the troop horses under certain restrictions and on payment of £50; snb-lieutenants are provided with horses and horse equipments at the

public expense.

The oldest cavalry regiments are the Horse Guards, raised by the Earl of Oxford, and first known as the Oxford Blues; and the two regiments of Life Guards, raised in 1661-2. The privates in these regiments were for the most part of good family, and were addressed as "Gentlemen of the Life Guards." The youngest regiments, the 19th, 20th and 21st Hussars, were formed from the European regiments in the East India Company's service at the time of the amalgamation.

Artillery.

The artillery, notwithstanding the great augmentations it has received of late years, consequent on the increased importance of its arm, still retains the title of the " Royal Regiment of Artillery." It consists of 205 batteries, forming 28 brigades, of which 5 brigades, or 31 batteries, are horse artillery ; 10 brigades, or 83 batteries, are field artillery ; and 13 brigades, or 91 batteries, are garrison or siege artillery. In addition to these, there is a depot brigade of 12 batteries, and the "coast brigade" of 10 batteries. The battery is the true unit of our artillery, the brigade being rather a grouping for administrative 'pur- poses; in the field and horse artillery, the batteries are almost entirely independent.

The establishment of a battery of horse artillery on war footing is—1 major, 1 captain, 3 lieutenants, 1 assistant- surgeon, 1 veterinary surgeon, 2 staff sergeants, 6 sergeants, 12 corporals and bombardiers, 2 trumpeters, 10 artificers (including shoeing smiths), and 153 gunners and drivers ; altogether 7 officers and 185 men, with 206 horses and 6 guns, 9 ammunition-waggons, and 5 forge, store, &e., waggons. 'The peace establishment varies; the present home establishment is 5 officers, 151 men, and 113 horses. The guns now in use are 9-pounder rifled muzzle-loaders, of wrought iron, In the horse artillery every man is either mounted, or carried on the limber or ammunition-waggons, to enable them to keep pace with cavalry.

A battery of jield artillery on war footing has the same establishment of officers and non-commissioned officers, but more gunners and drivers, and fewer horses. The numbers are—7 officers, 197 men, 184 horses, 6 guns, 12

ammunition and 4 miscellaneous waggons. The peace establishment at home is 5 officers, 152 men, and 85 horses. The guns in use are 16-pounder rifled muzzle-loaders, drawn by 8 horses.

A garrison battery consists of 1 major, 1 captain, 2 lieutenants, 1 staff sergeant, 5 sergeants, 10 corporals and. bombardiers, and 140 gunners. They are all dismounted, and are employed in garrisons in working the heavy guns, at sieges, and on other similar duties.

Besides the above, heavy batteries of position, mountain batteries, and ammunition columns are formed in war time. A heavy battery has 4 guns only, 40-pounder breech-loading rifled guns on the Armstrong principle. Mountain batteries are only organised when the nature of the warfare requires it, and their detail varies accordingly.

Artillery and infantry reserve ammunition columns are formed when an army takes the field, one being attached

to each division. Their establishment is 4 officers and 138 men, with 4 artillery and 16 small-arm ammunition- waggons, 2 spare guu-carriages, 5 miscellaneous waggons, and 142 horses; carrying 360 rounds of gun, and 307,200 of small-arm ammunition.

The coast brigade is formed entirely of old soldiers of good character, drawn from the other brigades. Itis broken up in small detachments, often numbering one or two men only, distributed along the coast ; the men being employed to take charge of unoccupied forts and batteries, and of the guns and artillery stores in those which are occupied. The number of officers in the coast brigade is small, but there are 121 master gunners, ranking as warrant officers, attached to it, who take charge of the more important works and command the small detachments of coast brigade men.

The uniform of the whole of the artillery is blue with red facings ; the horse artillery wear a jacket, the others a tunic. The head-dress for all is a busby with bag. The non-commissioned officers and gunners of the horse artillery, and the mounted men of the field batteries, are armed with the cavalry

sword, the dismounted men with a sword- bayonet ; the drivers carry no arms. Twelve carbines are carried with each horse battery, and 24 with each field battery. The garrison batteries are armed with breech- loading carbines and sword-bayonets.

The headquarters of the artillery are at Woolwich, the great arsenal for the whole kingdom. Two or three brigades are usually stationed there, besides the permanent depot and riding establishment. Three horse brigades (15 batteries), six field brigades (43 batteries), and four garrison brigades (28 batteries) are stationed in India; four garrison brigades (28 batteries) in our colonies and foreign garrisons,—Gibraltar, Malta, Bermuda, Halifax, &c.; and the remainder distributed throughout the United Kingdom. The principal artillery stations besides Woolwich are Alder- shott, Portsmouth, Dover, Dublin, and Plymouth There is a second depot at Sheerness ; and a school of gunnery, with an extensive establishment, has been formed at Shoe- buryness, for the double purpose of instructing officers and men in the higher branches of gunnery, and carrying on artillery experiments—the long reaches of sand near the mouth of the Thames being peculiarly favourable for this purpose.

‘The artillery are not connected with particular districts or counties, but recruit generally throughout the kingdom. The horses for the artillery are obtained by purchases made from dealers, or by officers specially appointed for the purpose, £45 being the maximum price allowed.

Engineers.

For purposes of administration, promotion, &c., the Royal Engineers form a single regiment or corps, consisting of 40 companies, 3 troops, and a large establishment of officers, not attached to any companies, but employed in superintending works and buildings, and in other pro- fessional and scientific duties. Of the 40 companies, four are “survey” companies, and two are attached for service with the postal telegraph ; the remainder are employed in works aud buildings, or undergoing instruction at Chatham. The war establishment of a company is 1 captain, 3 subalterns, 1 assistant-surgeon, 6 sergeants, 12 corporals, 2 buglers, and 100 privates (termed “ sappers ”) of various trades, viz., carpenters, masons,

bricklayers, smiths, painters, printers, telegraphists, &c.; in all, 5 officers and 120 men. The peace establishment is 3 officers and 93 men.

The three engineer troops are,—the field equipment troop, telegraph troop, aud pontoon troop, each of which forms the nucleus of several similar ones to be raised

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in war. is 6 officers and 233 men (of whom 100 are drivers), with

a7) The war establishment of a jield equipment troop

186 horses and 33 waggons and carts. It is divided into three sections, each of which carries the camp equipment and all necessary tools and implements for a company of engineers, and a "field park." The troop is kept together

for convenience in peace time, but in the field would be

broken up, and the sections attached to the companies of engineers. The field equipment troop carries mining and entrenching tools, sandbags, rope, gunpowder and fuses for mines and blasting, a portable forge, sets of carpenters', smiths', farriers', stonemasons', bricklayers', collar-makers', &c., tools and materials; also instruments, drawing mate- rials, printing-press, and photographic apparatus.

A. telegraph troop consists of 6 officers, 245 non-com- missioned officers and men, with 24 carriages, 42 riding and 114 draught horses. Twelve of the waggons are fitted as wire waggons, and carry each three miles of insulated wire, on rollers, besides staples and telegraph poles for carrying the wire along trees or houses, or over obstacles. Four waggons are fitted as offices, with recording instruments (Morse). The troop is so organised that it can be broken up into three sections, each complete in itself. A certain proportion of the men are traincd to act as signallers, and all the materials for visual signalling—flags for use by day, rockets and lime-lights for flashing signals by night—are carried with the troop.

A. pontoon troop consists of 6 officers and 296 non-com- missioned officers and men, with 31 carriages, 20 riding and 210 draught horses. It carries 22 pontoons, being

sufficient to construct 120 yards of bridge, capable of bearing cavalry, infantry, and field artillery ; and a supply

of trestles for light field bridges. Tt is further in contemplation to organise a railway

battalion, composed of men trained to all duties connected

with the construction, repair, and working of railways.

The daily pay of the several ranks has been already given; but in addition to this ordinary rate, officers, when regimentally employed, receive extra pay, usually equal to the ordinary pay, if abroad (or in the London district), or to one-half of it if at home; and the non-commissioned officers and men receive "working pay," varying according to their skill and to the nature of their employment, but commonly ranging between ls. and 2s. a-day. The uniform of the Royal Engineers is scarlet, with blue facings, the head-dress a low busby and plume. The men are armed with a Lancaster breech-loading rifled carbine and sword- bayonet. In the engineer train the non-commissioned officers and sappers carry swords; the drivers carry no arms.

The sappers are recruited entirely from men of good character, able to read and write, and who have been brought up to, or served apprenticeship in, some suitable trade. All men on enlistment are sent to Chatham to go through a long course of training and instruction in the special duties connected with military engineering, such as siege operations, field works, mines, bridging, Wc.

The headquarters and depot of the Royal Engineers are at Chatham, where their great instructional institutions are established. The distribution of the force depends on the works in progress in different parts of the empire. A considerable number of officers are stationed in India, but no men. Thirteen companies are now stationed abroad in our colomies and foreign garrisons

— Bermuda, Gibraltar, Malta, &c.; and 27 companies, with the three troops of engineer train, are at home. Two companies are employed, under the direction of the Post-Office, in the construction and maintenance of the telegraph lines throughout the country, thus acquiring in peace time the practical experience necessary to enable them to under-

take the working of telegraphic communications in war and in an encmy's country; and four are permanently engaged on the great ordnance survey of the kingdom. The others are distributed throughout the principal garrisons; eight or ten usually remaining with the headquarters at Chatham.

The duties of engineer officers are very various. Besides the actual command and superintendence of their men, and their instruction in all branches of field engineering, they include the charge, construction, and repair of forti- fications and barracks, the survey of the kingdom, the management of a number of scientific and experimental establishments, the development of all the scientific appli- ances of war, such as armour plating, torpedoes, field telegraphy and signalling, &c., Engineer officers are also largely employed under the civil government in connection with the educational departments, railways, prisons, &c.

Infantry.

The infantry consists of 3 regiments of Foot Guards (7 battalions), 109 of the Line (137 battalions) and the Rifle Brigade (4 battalions,)}—total, 148 battalions.

The three regiments of guards are the Grenadier Guards, of 3 battalions; and the Coldstream and Scots Fusilier Guards, of 2 battalions each. These form together the brigade of foot guards. They are stationed principally in London, and rarely leave the country except for active service in the field; they furnish the guards on the royal palaces, and guards of honour on state occasions, receive a special rate of pay, and have certain privileges. Up to 1872 their lieutenants had the rank of captains in the army, and their captains that of lieutenant-colonels. This privilege, however, was abolished by a warrant of July of that year as regards officers entering subsequent to that date.

Of the line regiments, Nos. 1 to 25 have two battalions each, two rifle regiments (the 60th and Rifle Brigade) have four each, and the remainder one only. By the localisation of 1873, the single battalion regiments have

been grouped in pairs to form "district brigades." The several battalions are altogether independent of one another in matters of command, internal economy, &c.; but recruiting is carried on for the brigade, and men or officers may be transferred from one battalion to another within it. A district brigade comprises two line battalions, a brigade depot, and a certain proportion of reserve and auxiliary forces.

A battalion of infantry consists of eight companies. Its war establishment is 1 lieutenant-colonel, 2 majors, 8 captains, 16 lieutenants and sub-lieutenants, 1 adjutant, 1 paymaster, 1 quartermaster, 1 assistant-surgeon, 10 staff sergeants, 8 colour sergeants, 32 sergeants, 16 drummers, 40 corporals, 4 hospital orderlies, 10 pioneers, and 946 privates,-—in all, 31 officers and 1066 non-commissioned officers and men. On scrvice it takes with it 62 horses (of which 9 are officers' chargers and 53 draught horses), and 14 waggons and carts (3 ammunition carts, 1 entrenching tool waggon, 1 for quartermaster's stores, and 9 for camp equipment and baggage). The peace establishment varies. Most of the battalions at home are kept at a reduced establishment of 520 rank and file, the guards at 750, the battalions next for foreign service at from 700 to 820, and the battalions in India at 820.

The infantry is at present armed partly with the Snider (converted Enfield) rifle, and partly with the Martini- Henry, but will ultimately be armed entirely with the latter. This weapon, which was selected in 1870 after a careful and protracted series of trials, is a breech- loading rifle, 4 feet 1 inch long, weighs 8 fb. 12 oz, and ranges up to 1000 yards. It is seven-grooved, bore °451

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of an inch, carries a bullet weighing 1 oz., and has been fired at the rate of 25 rounds a minute. The soldier carries 70 rounds of ammunition, viz., 20 in each of two pouches on the waist belt, 10 in expense bag, and 20 in a pocket in his valise. The bayonet (Elcho sword-bayonet) is a short heavy sword, with saw-back, which can be attached to the rifle as a bayonet, or used independently as a sword, or to cut up firewood, chop bushes, &c.

Although the regiments are named Rifles, Fusiliers, Light Infantry, &c., the organisation, armament, and training is the same throughout, the only distinction being in matters of dress. The two rifle regiments wear dark green ; all the rest of the infantry wear red. The guards are distinguished by their tall bearskins; the fusilier regiments (9) wear sealskin caps, resembling the bearskins of the guards, but smaller. There are 9 Highland regi- ments, of whom 5 wear the kilt and bonnet; the others have minor distinctions in dress. The light infantry regi- ments, 11 in number, are distinguished by a horse-hair plume to the shako in place of a ball, The " facings" vary with the different regiments, but all "royal" regi- ments have blue.

All regiments now carry the valise equipment, sub- stituted for the knapsack in 1870. It consists of a black leather bag slung from the shoulders by straps and fitted to lie in the hollow of the back, connected with a waist-belt and ammunition-pouches in such a manner as to distribute the weight evenly over the body, and cause it to hang direct on the shoulders. The greatcoat, when not worn, is strapped above it. The valise holds a spare shirt, pair of boots, socks, cap, towel, and other small articles, and when full weighs about 15 tb; the total weight carried by the soldier, including arms, ammunition, and the clothes he has on, amounts to about 52 bb.

Each battalion has four hospital orderlies, picked men specially trained to the care of sick and wounded, and relieved from all other duties; and ten pioneers, skilled artificers of various trades, who carry a complete set of carpenters' and other tools, and are employed, sometimes under the quartermaster of the regiment and sometimes under the engineers, in executing repairs and other works.

The guards and rifle regiments recruit through the country generally: the former maintain a high standard, usually 2 or 3 inches above that of the line ; the latter take men of low standard, but require special chest measurement. The other infantry regiments recruit as far as possible within the brigade districts in which the depots are permanently stationed. Of the 141 line battalions, 50 are stationed in India, 20 in the colonies and foreign garrisons, and 71 at home ; thus allowing one battalion at home and one abroad from each brigade. The chief foreign garrisons are Malta (7

battalions) and Gibraltar (5 battalions). The largest home stations for infantry are London (for the Guards), Portsmouth, Dublin, Cork, Plymouth, Chatham, Dover, and the camps of Aldershott, Colchester, Shorncliffe, and the Curragh,

The oldest infantry regiments are the Coldstream Guards (General Monck's regiment), the Ist " Royal Scots" (origin- ally the " Douglas" regiment), the Grenadier and Scots Fusilier Guards, the 2d " Queen's " (raised for the defence of Tangier), and the 3d ' Buffs" (raised from the London train-bands). These regiments were formed between 1660 and 1662. The principal augmentations made to the army between this date and the Crimean war have been already detailed. Second battalions were added to the regiments from 1 to 25 in 1857-59, and the 100th was raised in Canada in 1858. The nine regiments from 101 to 109 were formed from the European regiments in the service of the East India Company, on the transference of the powers of that company to the Crown.

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Reserves and Auxiliary Forces.

The reserves are divided into classes. The "1st Class Army Reserve" consists—(a) of men who, after a service of not less than three years in the ranks of the army, have been passed into the reserve to complete the unexpired portion of their engagement ; and (0) of soldiers who have been discharged by purchase or on completion of limited engagement, and have enrolled themselves for 5 years. The men of the lst class reserve receive 4d. a-day, paid quarterly in advance, and an annual allowance of £1 for necessaries. In peace time they may be called out for 12 days' training annually, or to aid the civil power, receiving daily pay at the rate of 2s. in the first case, and 2s. 6d. in the second. In case of war or national danger, they may be recalled to service by proclamation, and attached to any regiment or corps of their own branch of the service, or formed into separate corps. They then resume their posi- tion in all respects as soldiers of the regular army, and are liable for service at home or abroad, and until completion of their term of engagement. The 2d class army reserve consists of enrolled pensioners,—men who have completed their second period of service in the regular army, and been discharged to pension. They receive

no bounty, but an annual allowance of £1 for necessaries, and daily pay at the rate of 2s. or 2s. 6d. when called out for training or in aid of the civil power. They are subject to the same regulations as the Ist class, except that they are only liable for service within the United Kingdom.

By the Act of 1867, a militia reserve was created in addition to the above, consisting of men actually serving in the militia who voluntarily enrol in this reserve for a term of six years, during which they remain with their militia regiments in peace time, but in case of war may be drafted into the regular army. They receive an annual bounty of £1 in addition to their militia pay and bouuty. Their number is limited to one-fourth of the effective strength of the militia, and in 1873 amounted to 28,286 men.

The first attempt to organise a reserve of men who had passed through the ranks of the army was made in 1843, when the enrolment of pensioners for home service in special cases was authorised by Parliament. The num- ber was originally limited to 10,000, but afterwards increased to 20,000. In 1859 when the military power and threatening attitude of France caused the alarm in England which led to the volunteer movement, an effort was made to organise a more efficient reserve from men who had taken their discharges on completion of their first period of service, but the inducements offered were insuffi- cient, and the scheme proved a failure. In 1867, after the proved success of the short service and reserve system in Prussia, a new Reserve Force Act was passed, which, with subsequent modifications, laid the foundation of the present first-class reserve ; but it required increased inducements, and the Short Service Act of 1870, to give the reserve any importance. The militia reserve was formed as a temporary expedient, to be reduced as the army reserve increases. It has been objected to on the grounds that it entails increased expense without any real addition to the armed force of the country, as the men are merely passed from one force to another, and that it takes away the best men froin the militia at the moment this requires to be most efficient. But, in the absence of a sufficient reserve of fully-trained soldiers, a reserve of partly trained men is essential. Practically the militia always has been the feeder of the line in war time, and it was thought better to enrol a number of men in peace time, when they could be selected, and all necessary preparations made for drafting them in at once in war, rather than adhere to the

old system of offering high bounties at the last moment, and getting a worse class of men.

For auxiliary forces, Msxitra, YEoMANRY, and VoLUN- TEERS, see separate articles.

Local Orgamsation of the Military Forces of the Kingdom.

The United Kingdom is divided into 10 military districts, or general officers' commands,—viz., England, 6; Scotland, 1; Ireland, 3.1 Within the district the general officer's authority extends over all the military forces—regular, reserve, or auxiliary. These districts, again, are subdivided into 66 infantry brigade or sub-districts under colonels ; of these 50 are in England, 8 in Ireland, and 8 in Scotland. Each brigade comprises 2 battalions of the line, a brigade depét, 2 militia battalions, and such re- serves and volunteers as are included in the sub-district ; the average male population of the sub-districts being 200,000. The two line battalions are independent of the colonel of the sub-district. One is always abroad, one at some home station, usually a garrison or camp of instruc- tion. But they draw their recruits and reserves from the sub-district, and supply the officers and non-commis- sioned officers for the brigade depét, and for the staff of the militia and volunteers. The brigade depdt is the connecting link between the line battalions and the district. It is permanently established at some principal town in the sub-district, and is formed of two conipanies from each line battalion, under the command of a major of the home battalions. To it are attached 2 captains (adjutants of militia battalions) and a large staff of non- commissioned officers, who join the militia battalions when embodied, but at other times are employed at the depot in recruiting and drilling recruits. The duties of the colonel of the district include recruiting for the line and militia, the training of recruits and of all reserve and auxiliary forces, the annual inspection of the militia and volunteers, the registry and payment of the army reserve and enrolled pensioners, and the care of arms and stores of reserve and auxiliary forces.

For cavalry purposes Great Britain is divided into 2, and for artillery into 12 sub-districts, under colonels, whose duties correspond in the main with those of the infantry colonels as regards recruiting and supervising the training of the auxiliary forces of their respective arms, but are more restricted, as they have no depéts and staff of regulars under their immediate command.

The colonel of the brigade depédt is especially charged with the measures for mobilisation in case of war. On the order being given, the army reserve and militia reserve men are collected at the depdt, and sent to the home battalion to complete it to war strength. The super- numerary men of the reserve, and all men of the field battalion that are unfit for immediate service, are drafted to the depdt, which is increased to the strength of an eight-company battalion, by calling in officers from the half-pay list, and by recruiting. At the same time, one, or, if necessary, both militia battalions are embodied. If an expeditionary force is to be despatched, the militia battalions relieve the regular army in all the home garri- sons; and probably, as was the case during the Crimean war, in some of the foreign ones also.

Civil Departments of the Army.—Control Department.

The Control Department was formed in 1869 and 1870 by the amalgamation of the five formerly distinct adminis- trative departments, viz., Commissariat department, Barrack Ce TE – ge na nena a RR

1 This is exclusive of the four military stations or camps of Alder-

shott, Woolwich, Chatham, and the Curragh, to which no districts are attached.

department, Store department, Purveyors' department, and Military Train. At the head of the Control Department is the Surveyor-General of Ordnance, assisted by a director of supplies and transport, and a director of artillery and stores ; the general duties of the department have already been defined in treating of the administration of the army.

The personnel of the Control Department consists of — (a), administrative officers, named controllers ; (6), execu- – tive officers, divided into two sub-departments, and named commissaries and paymasters ; (c), the non-commissioned officers and men of the Army Service Corps. The ranks of administrative officers are-—controller, ranking with major- general; deputy-controller, ranking with colonel; and assistant-controller, ranking with lieutenant-colonel. Ap- pointments as assistant-controller are made from com- missaries in the supply and transport sub-department, or from combatant officers of the army. In the latter case the officers selected must have five years' full-pay service, be not under the rank of captain, not over 35 years of age (40, if belonging to the artillery,) and have passed through the Staff College or the advanced class at Wool- wich. 'They serve on probation for two years, at the end of which, if found competent and willing to serve in the Control Department, they resign their military commissions, and receive commissions as assistant-controllers. Artillery officers are generally selected to fill the appointments in the artillery and store branch, but the great majority of appointments are made from the sub-departments, and but few from the combatant ranks of the army. Promotion to the higher grades is by selection, after a service of not less than ten years for the rank of deputy-controller, and thirteen years for that of controller, at least three years having been in the next lower rank. After thirty years'

full-pay service, Control officers are entitled to retire ; ald

retirement is compulsory at the age of 60.

Officers of the Control Department conduct their duties uuder the direct orders of the officer commanding the district or station, whose advisers and agents they are in all matters connected with the raising or issue of money, the supply of provisions, stores, and transport. They hold a position analogous to that of officers of the general staff, except that they are at the same time directly responsible to the Secretary of State for War for the proper conduct of their duties. Where the orders of the officer commanding appear inconsistent with the War Office in- structions, it is the duty of the Control officer to point out the inconsistency, and apply for special authority from the commanding officer, which being granted, must be implicitly obeyed, and relieve the Control officer from the responsibility

The executive sub-departments are the supply and trans- port sub-departments, and the pay sub-department. The ranks in the former are—commissaries, ranking with majors ; deputy-commissaries, ranking with captains ; and assistant-commissaries, ranking with lieutenants. The ranks are the same in the pay sub-department; but the officers are called paymasters instead of commissaries. First appointments in the supply and transport sub-department are conferred on civilians selected by open competitive examination, or subaltern officers of the army, and on deserving non-commissioned officers; the limit of age is 17 to 20 for civilian candidates, and 22 for subalterns of the army or militia. Retirement may be claimed after thirty years' service, and is compulsory at the age of 55.

The Army Service Corps consists of 12 transport companies and 11 supply companies, officered from the supply and transport sub-department. The establishment of a supply company is 2 officers, 27 non-commissioned officers, and 97 rank and file; of a transport company, 3

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officers, 13 non-commissioned officers and 117 rank and file, with 91 horses and 26 carriages. In war time these would be largely augmented, according to the requirements of the army and the nature of the service. The supply companies consist of butchers, bakers, issuers, clerks,

mechanics and tradesmen of various kinds ; the transport companies of drivers, with a proportion of smiths, wheelers, saddlers, farriers, &c. The ranks of the Army Service Corps

are filled by volunteers from the army,—men of good

character, specially recommended, aud of not less than two years' service, —or by recruits specially enlisted for it under

authority from the Secretary for War. The rates of pay are

nearly the same as in the cavalry, but the artificers and tradesmen usually earn working pay in addition. The

uniform is blue. The supply companies are armed with

breech-loading carbines and sword bayonets, the transport coinpanies with cavalry swords.

The executive duties that devolve on the Control may be classed broadly under four heads—pay, provisions (“ muni- tions de bouche”), stores (“munitions de guerre”), and transport ; and officers of the sub-departments are selected as far as possible for service in the several branches according to their special training. The provision branch is the most important, and occupies the largest number of officers. In peace time the soldier is fed partly by the Control, partly by means of purchases made by himself. He receives a free ration from Government of 1 tb of bread and #ib of meat, and in addition expends a sum varying from 34d. to 6d. a day on groceries, vegetables, &c. Under certain circumstances the Government ration is slightly

increased, and in the field it is raised to 1} Ib bread and 1 tb

meat; and rations of groceries, spirits, and vegetables are also provided by the Control, though paid for by the soldier. The forage ration for a horse is 10 tb oats and 12 tb hay, with 2 Ib extra oats to horses picketed out, and 2 ib oats and 2 ib hay additional to draught horses doing very heavy work. In peace time the army is supplied by contract, the contractor usually delivering the bread and meat or forage at the Control store, where it is inspected by a board of officers before issue. At some of the large cainps and stations, however, ovens and slaughter-houses have been established, at which the bread is baked and the meat killed and prepared for the troops by the men of the Army Service Corps, When troops are encamped on flying columns, or for autumn manceuvres, iron field-ovens or steam baking waggons are commonly used ; the former turning out about 480 Ib of bread in a day of 12 hours, the latter about 900 ib. Biscuit and salt meat are largely used abroad and at sea, but not at home. (For the supply of an army in the field, see article Wax.)

The transport duties of the army in peace time, when all the civil resources of the country are available, and most articles are delivered at the required point by the contractor, are very slight; but to be efficiently organised for

the field, an army requires a vast amount of trans- port, of which the existing establishment would only suffice to form the nucleus. 'The British army is differently situated from the great Continental armies in this respect, that its operations extend over the most distant and varied countries, involving the most different conditions ; and as the transport service must always be specially organised to suit the peculiar conditions of the theatre of war, it is impossible in peace time to maintain an establishment which shall be equally applicable in all cases. In some countries railways and water transport are largely avail- able, and the duties thrown on the train are comparatively light ; in other countries the local resources in carts and waggons, if properly organised, are ample, and a sufficient cadre of officers and superintendents is alone required ; in others, again, the local resources are nil, and

the army has to bring with it every man, horse, and waggon of the vast train it requires.

And the character of the transport varies as widely as the quantity required. In some countries large waggons are most suitable, in others, light carts only can be used ; in others, again, recourse must be had to pack animals, — horses, mules, bullocks, camels, and elephants,—or to coolies and native carriers. Evidently no establishment can be framed that shall be equally suitable in all cases. The existing transport, therefore, is based on the requirements of an army operating in a civilised country, with good roads, where the transport can be mainly done by waggons ; while for special expeditions, such as those to Abyssinia and Ashantee, special transport is organised. The waggon in common use is the " general service waggon," a strong four-wheeled (cquirotal) waggon, drawn by four horses, weighing 16 cwt., and carrying a load of 30 cwt.

The transport companies at the disposal of the Control have to carry the equipment and baggage of the staff and departments, to horse and drive the ambulance and field hospital waggons, and, above all, to carry the supplies and reserve stores of the army, the bringing the daily sup- plies to the troops being the duty which taxes them most heavily.

The charge and issue of warlike stores is a duty of ever- increasing importance and difficulty in these days of scientific warfare. In most armies this duty devolves on the officers of the artillery, whose education specially qualifies them for it, and the question was warmly dis- cussed when the Control Department was formed. It was ultimately decided to unite all supply duties under the Control, providing, however, by an admixture of artillery officers for the necessary scientific knowledge within the department.

The following table shows the establishment of officers of the Control Department in 1873, with their full pay, aud the daily rates of half and retired pay to which they become entitled :—

RS

Nos.

Retired Pay, a Rank, Full Pay. Half Pay. [after 80 years' Pay.) service.

Pal Oombrollenss..4..5-)<+s-0- £3 0 0/£110 01£2 0 0 14| Deputy-Controllers..... 2 Oo @| 1 UO; 13 6 40| Assistant-Controllers®..... 1 4 0; 018 6! 1 0 0 58 | Commissaries *..... 018 6] 010 0; 016 8*

135 | Deputy-Commissaries....| 011 6) 0 7 0/ O11 8 142.| Assistant-Commissaries*] 0 9 0| 0 4 6] 0 7 8*

*Po) Paymasters".....—++--- 0 01°00 @ 6) 170n0 20| Deputy-Paymasters"****..... O14 16) OF Sh Shy Onlaaeo 36| Assistant-Paymasters****....| 010 6] 0 5 8{| 0 9 0 455, of whom 116 were abroad and 339 at home.*

*Note.—In the ranks marked thus * the full pay is increased after five years' service in the rank by amounts varying from 2s. 6d. to 5s. daily. A reduced rate of retiring pay is allowed to officers of over twenty but less than thirty years' service, who are permitted to retire. In addition to the numbers shown above, 40 sub-assistant commissaries are appointed, on probation, at a rate of 6s. 6d. per day.*

Medical Department.—Hospitals.

The Medical Department comprises 4 ranks of medical officers—viz., Surgeon-General, Deputy-Surgeon-General, Surgeon-Major, and Surgeon, —and the officers and men of the Army Hospital Corps; the whole being under a director-general at the War Office. The officers of the two higher grades are employed chiefly as administrative officers superintending districts or large hospitals; while the surgeons-major and surgeons are attached to regiments and corps, or employed as executive officers in the hospitals. Every battalion serving at home or in the colonies has one medical officer attached to it; and every battalion in

India has one surgeon-major and two surgeons, First appointments in the Army Medical Department are given to candidates who possess two diplomas or licences for medicine and surgery, and, after attending a probationary course at a general military hospital, pass a satisfactory examination in military medicine, surgery, hygiene, and pathology. On appointment as surgeons they rank as lieutenants, and after 6 years' full-pay service, as captains. Promotion from surgeon to surgeon-major is by seniority, but officers may be specially promoted for distinguished service. Surgeons-major rank as majors on appointment, and after 2U years' full-pay service (in the two ranks), as lieutenant-colonels. Promotion from surgeon-major to deputy-surgeon-general, and from that to surgeon-general, is by selection of the Commander-in-Chief, with approval of the Secretary for War. Deputy-surgeons-general rank as lieutenant-colonels from the date of appointment, and after 5 years' service in the rank as colonels ; and surgeons- general as brigadiers for three years, and afterwards as major-generals, The establishment and rates of pay of the several ranks are shown in the following table :—

No. | Rank. Daily Pay. £3. d, £ s. a

10 | Surgeons-General…..... 2 0 Orisingto2 10 0

33 | Deputy-Surgeons-General.. | 1 10 0 iat 6 489 | Surgeons-Major…..... Qi Oo We 2 7 © Gi 1) SU OGNS-. os .c-c-c se ascnseonseas OID O Gg Wilh © 1107, of whom 476 are employed at home, 130 in the colonies,

and 501 in India.

All officers have a right to retire on half-pay after 20 years' service. Surgeons and surgeons-major must retire at the age of 55, and surgeons-general and deputy ditto at the age of 65. Officers retiring after 20 years' service receive a rate equal to half their full pay at the time ; after 25 years' full-pay service, a rate equal to seven-tenths of full pay.

The Army. Hospital Corps consists of 11 " captains of orderlies," 10 lieutenants, 264 sergeants-major and sergeants, and 1060 rank and file. They are employed — entirely on hospital duties, and are under the direction and control of the medical officer of the station, though subject for discipline to the military authority. The officers and non-commissioned officers rank with the corresponding grades in the army, but their authority is confined to their own men and to patients and men attached to military hospitals on duty. Appointments of officers are made from the non-commissioned officers of the corps: the ranks of the corps are filled by volunteers from the army,— men of good character, able to read and write, of not less than two years' service, and not over 30 years of age; and by recruits, whose direct enlistment is specially authorised. They are variously employed as clerks, compounders of medicines, cooks, &c., but principally as attendants on the sick in the general hospitals in peace, or in field hospitals and ambulances in war.

Hospitals are either "general" or " station" hospitals: to the former special governors or commandants are appointed; in the latter the internal administration is under the senior medical officer. The Royal Victoria Hospital at Netley, whither all invalids from abroad are sent, is the largest General Hospital ; it has a large staff, a medical school, and accommodation for 973 patients.

Station Hospitals are organised at all large military stations, for the sick of all regiments or corps quartered there. The hospital is under the immediate

supervision of the principal medical officer, usually a deputy-surgeon-general, and all medical officers at the station are available for such general service in it as he may direct ; but

separate wards are allotted to the different regiments and corps, and their sick are kept as far as possible distinct, and under the immediate attendance of their own medical officers and orderlies. The hospital staff consists of the medical officers attached to regiments at the station, a certain number of medical officers specially attached to the hospital, the officers and men of the Army Hospital Corps, and the hospital sergeants and orderlies of the regiments at the station, At small stations a building or block is specially fitted as a hospital, and is under the charge of the medical officer of the regiment or corps. When an army is organised for service in the field, jield hospitals and ambulances are formed. The latter consist of a number of ambulance waggons, light waggons specially constructed for the carriage of sick and wounded, with a sufficient staff of medical officers and attendants, and a company of "stretcher bearers," provided with stretchers; these are charged with the immediate removal of the wounded from the battle-tield, their first dressings, and conveyance to the nearest field hospital. The field hospitals are pro- vided with large hospital tents, beds, and all the require- ments of an hospital, and a sufficient staff of medical officers and attendants, and either accompany the army in its inarch, or establish themselves in suitable places in rear. The ambulance waggon commonly used is four-wheeled, weighing 16 cwt., drawn by two horses, and constructed to carry eight wounded (two lying down and six sitting), besides a water keg, stretchers, and other medical appliances.

For care of sick and wounded in war, see article War.

The general health of the army has greatly improved of late. The disasters of the Crimean war first drew attention to the importance of proper sanitary arrange- ments in the field; but what, perhaps, aroused public attention still more strongly was the report of the Royal Commission of 1858, by which it appeared that the mortality in the army generally was twice as great, and in the foot guards three times as great, a3 in the corresponding classes of the civil population. Since then, improved barracks, better meals, gymuasia,

recreation-rooms, aud out- of-door amusements provided for the soldicr, have reduced the death-rate to one-half; while the Contagious Diseases Act, severely attacked as it has been, has materially lowered the sick-rate at those stations where it is in force. The admissions from causes under its coutrol have, within five years, been reduced to less than a third at some of the large stations; while a comparison of 14 stations at which the Act is in force, with 14 to which it has not been extended, shows 54°5 cases per 1000 men at the former, and 113°3 at the latter. The annual death-rate in the army generally averages about 14 per 1000. In 1870 Gibraltar, Malta, and Canada were the healthiest stations, showing a death-rate of only 8°7 per 1000. The United Kingdom came next, with a rate of 9°5; while in India the death-rate rose to 22°8. But to appreciate the improvement that has been effected in the health of the army, it is necessary to turn back to the fifteen years pre- ceding the Crimean war, when the death-rate in the United Kingdom averaged 17°5, and that of the army generally 33 per 1000; while the death-rate in India averaged 62 per 1000 between 1837 and 1853, and 81 per 1000 in the twenty years preceding 1837.

Veterinary Department.

The Veterinary Department is charged with the super- vision of the sanitary condition of horses, and their treat- ment when sick; also the selection of such as are proposed to be cast as unfit for the service, and the examination of remounts. The grades are—staff veterinary surgeons, rank- ing as majors; veterinary surgeons, Ist class ranking as cap- tains, and 2d class ranking as lieutenants; the whole under

a principal veterinary surgeon, who ranks as a colonel. Candidates for appointment are required to pass an examina- tion before a board of veterinary surgeons. Veterinary surgeons of the 2d class must have served five years, and passed a further examination, to be promoted to the 1st class; and a service of fifteen years is required for promotion to staff veterinary surgeons. All officers of the departinent are entitled to retire on half-pay after twenty-five years' service, and are placed on the retired list at the age of 55. The establishment (1873) and rates of daily pay of the several ranks are as follows :—

7 Staff Veterinary Surgeons……..£1 1 0 risingto £1 3 0 85 Veterinary Surgeons, Ist class… 0 12 6 9 10 0 70 $5 5 2d class… 0 10 0 e 017 6

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A limited number of acting veterinary surgeons are employed at the diserction of the Secretary for War.

Staff veterinary surgeons are employed to supervise districts or great military stations, the others are attached to cavalry regiments, horse and field artillery, &c. The uniform of the staff surgeons is blue, similar to that of officers of hussars, but with cocked hat and red plume; the veterinary surgeons attached to regiments wear the uniform of the corps, with cocked hat and red plume.

Chaplain's Department.

The Chaplain's Department is under the Chaplain- General at the War Office. Chaplains to the forces are appointed by the Secretary for War ; they must previously be in holy orders, and belong either to the Church of England or Ireland, to the Presbyterian, or to the Roman Cathoiie Church, and must serve six months on probation before their appointment is confirmed. They are divided into four classes,—the first ranking as colonels, the second as lieutenant-colonels, the third as majors, and the fourth as captains. Promotion is governed by length of service, —chaplains being promoted to the third class after ten years, to the second after fifteen years, and to the first after twenty years; but for distinguished services any chaplain may be promoted to the next higher class without regard to length of service. Chaplains are entitled to retirement after twenty-five years' service. The establish- ment (1873) and rates of daily pay of the several classes are as follows :—

10 Chaplains, 1st class…..... £1 0 Orisingto £1 2 6 20 55 DOICIAGS).. cscs: saess ORG

30 ee eee 015 0

20 «4, 4th class……..0 cio 6 5, 012 6

Of these, fifteen are Roman Catholics and six Presby- terian. Chaplains are not attached to particular regi- ments or corps, but are stationed at the principal gar- risons and military stations at home and abroad. Gar- rison chapels, used also in many cases as schools, exist at all the large stations. At smaller stations the troops attend divine service at the parish churches, and an allowance is made to a local clergyman for attending the troops, performing special services when necessary, and visiting the sick.

Education Department.

The educational establishments for the army consist of the military colleges, a staff of instructors for officers serving with their regiments, and army or regimental schools for the instruction of the non-commissioned officers and privates of the army and their children. The super- vision of the education of the army rests with the Director- General of Military Education at the War Office.

BRITISH. |

Military Colleges—The Staff College was established in 1858, with a view to train officers for employment on the staff of the army; replacing the "senior department " of the Royal Military College at Sandhurst, which had existed since the beginning of the century. The pre- sent building, near Sandhurst, was completed in 1862, and accommodates forty students. The qualifications and manner of admission of students have already been noticed (under " Staff"). The course lasts two years, beginning in February, and with vacations at Christmas and Midsummer. The subjects of instruction are military history and art, fortification, military administration and law, surveying and sketching, reconnaissance, mathematics (including a short course in mechanics and practical astronomy), sciences, and languages ; a large part of the course being devoted to out-of-door work and practical instruction in the duties of staff officers in the field. The Staff College is open to officers of all arms of the service, and twenty students are admitted each year. At the end of the first year they are required to pass a qualifying examination; and at the end of the second, the final examination is held, at the close of which the names of

the successful candidates are published in general orders, divided into two classes, —“ Honours” and “ Pass.” Those officers who fail at the qualifying or at the final examina- tion rejoin their regiments at once. The staff of the estab- lishment consists of a commandant and ten professors, of whom four are military, the others civilians.

The Royal Military College, Sandhurst, was originated in 1786, and in 1801 was transferred from Marlow to its present site, and officially recognised by Parliament. This institution was formerly devoted to preparing young gentlemen for commissions in the infantry and cavalry, the ages of admission varying from thirteen to sixteen and eighteen at different periods. Now it is de- voted to the instruction of young officers of these arms after they have passed the requisite examination for _ commissions, and before they are appointed to regiments. The course lasts a year, and the instruction is confined altogether to purely military subjects, — fortification, military sketching, tactics, military law, correspondence, and accounts. At the conclusion of the course the students are required to pass an examination in these subjects, and their commissions are dated according to the result,—those in the first class being antedated two years; those in the second, twelve months; and those in the third dating from day of examination. The present building accommodates about 150 students, and it will probably be necessary to increase it considerably. The staff of the establishment consists of a governor, with an assistant and five staff officers (paymaster, surgeon, &c.), and twelve military professors and instructors. A riding establishment and master are also kept up for the instruc- tion of the students both of the Royal Military College and of the Staff College.

The Royal Military Academy at Woolwich was first established in 1741, and is devoted to the training of candidates for commissions in the artillery and engineers. The course of instruction, which lasts for three years, is mainly scientific and professional, mathematics playing an important part in it. The students are finally classed by the results of the examination held at the end of the course, those who pass the highest having the option of appointment to the engineers, and seniority in the army being determined by their position on the list. The present building accommodates about 250 students. The staff consists of a governor, with a secretary and adjutant, a “captain

of cadets ” and three “lieutenants of cadets ” for purposes of discipline, and twenty-one professors and instructors.

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Garrison Instructors.—For the instruction of officers serving with their regiments, and to enable them to qualify in the special examinations for promotion, staff officers, with the title of garrison instructors, are appointed to all the principal garrisons and military stations at home and abroad. Classes under these are formed for instruction in tactics, field fortification, military sketching and recon- naissance, and law. The course of instruction usually lasts four months, during which time the officer is struck off all other duties. At the close of the course an examination is held, and those who pass satisfactorily are certified as qualified for promotion. Garrison instructors hold the rank and receive the staff pay and allowances of brigade- majors, and are selected from officers who have passed through the Staff College. The establishment consists of one superintending officer (with rank and pay of assistant quartermaster-general) and seventeen garrison instructors, stationed at home or in the foreign garrisons on the British establishment, and one superintending officer and ten garrison instructors in India.

Army Schools are established in every regiment and detachment, for the purpose of giving to non-commissioned officers and soldiers, and to their children, a sound and useful education. These schools are divided into adult, grown children, infant, and industrial schools. To every regiment are appointed a schoolmaster and schoolmistress, and a certain number of assistant schoolmasters, pupil teachers, and monitresses, on a scale according to the number of men and children attending school. Batteries of artillery and detachments of other corps are allowed an acting schoolmaster, with such assistants as may be necessary. All soldiers, soldiers’ children, and children of men belonging to the army reserve, of warders of military prisons, and of discharged soldiers holding military employ- ments, are admitted free of charge to these schools; and children of pensioners and others indirectly connected with the army, on a weekly payment of 3d. Recruits, on first joining, are required to attend these

schools ; and soldiers who are candidates for promotion must obtain certificates of proficiency before they are eligible. Advanced classes are also formed for the instruction of non-commissioned officers. Army schoolmasters receive a rate of pay varying, according to service, from 4s. a-day on appointment to a maximum of 7s. a-day, and rank as non-commissioned officers next below the sergeant-major. Candidates are required to go through a course in the training schools of the Royal Military Asylum, Chelsea, admission to which is by competitive examination, open to non-commissioned officers and soldiers of the army (of good character and especially recommended), to civilian pupil teachers, and certificated schoolmasters. Before appointment the candi- date must enlist for general service for twelve years.

Schoolmistresses are classed in three classes, receiving from £30 to £44 yearly. Candidates must be certificated schoolmistresses, or have been employed as teachers in an army school, and in the latter case must pass an examina- tion before appointment. All first appointments are made to the third class, and promotions are made according to merit and services.

At all important military stations and garrisons large and commodious schoolhouses have been specially built ; at smaller stations barrack-rooms are told off and fitted up for the purpose. Schoolmasters and mistresses are per- manently attached to regiments, and accompany them from station to station, and the schools are under the immediate and constant supervision of the commanding officer. They are also periodically visited and examined by inspectors, who report to the director-general, for which purpose a staff of one inspector of army schools, two local inspectors (officers of the army, receiving an additional rate of pay

for performing these duties), and twelve sub-inspectors, are maintained. The improvement that has taken place in the cducation of the army generally may be gathered from the reports and returns of the director-general, by which it appears that between the years 1858 and 1871 the pro- portion of " uneducated" fell from 40 per cent. to 12 per cent., and that

within the last few years the number pos- sessing a superior education has risen from 6 to 32 per cent. And although much of this is doubtless due to the spread of education throughout the country, a comparison of the educational statistics of the recruits with those of the army generally proves that still more is due to the regimental schools.

Garrison Libraries and Regimental Recreation-Rooms have also been established at the principal barracks at home and abroad, and are open to the troops on payment of a small subscription, which must not exceed threepence a month for a private soldier. The garrison library forms a central depdt from which the recreation-rooms are sup- plied with books. All the rooms are furnished, warmed, and lighted at the public expense, and the recreation-rooms provided with billiard and bagatelle tables, chess, back- gammon, and other games. Aun annual allowance of £2, 10s. is granted by Government for each troop or company ; this, with the subscriptions, forms a fund to defray the cost of purchase and repair of books in garrison libraries, and of games, newspapers, c&c., for recreation-rooms. Many recreation-rooms have a refreshment bar attached to them, where the men are supplied with tea, coffee, and other light refreshments at a very low price. A garrison librarian, usually a non-commissioned officer or a pensioner, takes charge of the library, and a regimental librarian has charge of the recreation-rooms. These are managed by a committee composed of non-commissioned officers and privates; and the garrison libraries are managed by a committee consisting of members chosen from the regi- mental committees, under the approval of the officer com- manding the station.

Scientific and Educational Establishments.

The Department of Artillery Studies was established to give officers of the artillery the means of continuing their studies after they have completed the regular course at Woolwich, and of qualifying by a special training for appointments requiring exceptional scientific attainments. The establishment consists of a director, an assistant- director, and two instructors of artillery, and a number of instructors and lecturers for mathematics, languages, and sciences. Its duties include the instruction of an advanced class of artillery officers, selected by competition, to qualify

for scientific appointments ; and the formation of classes in topography, astronomy, and languages, open to all officers of the artillery wishing to join them. A School of Gunnery is maintained at Shoeburyness for the purpose of giving practical instruction in gunnery to officers and men of the artillery, and carrying on all experiments connected with artillery and stores. The present site was selected for the school in consequence of the facilities afforded by the sands at the mouth of the Thames for artillery practice and firing at long ranges. The establishment consists of a commandant and brigade-major, with six instructors for the gunnery department; and two superintendents of experiments. Officers and non-commissioned officers are selected from brigades of artillery to go through a long course of instruction in gunnery, use of military machines, &c., and qualify as instructors to brigades and batteries; and squads of officers and men are sent there for instruc- tion in the various branches of artillery service.

The Royal Artillery Institution at Woolwich was originally a private military society, but the present building was

erected at Government expense, and the institution is now supported partly by the subscriptions of members, partly by a Government grant. It contains a muscum, lecture theatre, laboratory, and a printing-press; and minutes of proceedings, containing papers on professional and scien- tific subjects, are periodically issued from it.

The School of Military Engineering at Chatham constitutes a special training school for officers of the Royal Engineers after they have passed through the course at Woolwich, as well as for recruits on first enlistment. Companies are also sent there previous to going abroad, and on return from foreign service, to keep up their knowledge. The establishment consists of a commandant aud brigade-major, two discipline officers, and eleven officer instructors in construction, surveying, field fortification, telegraphy, &c.

The School of Musketry at Hythe was established shortly after the introduction of rifled fire-arms, to give a special training in the theory and practice of musketry to officers and non-commissioned officers qualifying to act as musketry instructors to their regiments, and to secure a uniform system of instruction and practice through- out the army. With this view also, squads of officers and men from all regiments in the service are periodi- cally sent there for a short course. The establishment consists of a commandant, a deputy assistant adjutant- general, and five officer instructors. The commandant is also inspector-general of musketry, and exercises a general supervision over the instruction and practice throughout the army ; for which purpose periodical reports are made to him from all regiments, and the annual musketry returns are carefully examined by him before being submitted, with his remarks, to the Commander-in-Chief. To secure sufficient attention to this important part of a soldier's training, musketry instructors are appointed in every regiment ; and staff officers, formerly termed district in- spectors of musketry, are appointed to the principal dis- tricts. Every recruit is required to go through a course – of instruction and practice before being dismissed drill, and every trained soldier is put through an annual course, lasting about a fortnight, in which he fires 60 rounds at fixed distances from 150 to 800 yards. Extra pay of 1d. a day is given to those men who qualify as "marksmen," and additional rewards to the best shots of companies and battalions.

An Army Medical School was formed in connection with the great military hospital at Netley, to which candidates for appointments as surgeons are sent for a probationary course. The school is under the immediate direction of the principal medical officer at Netley, and has a staff of nine professors and assistant professors of military surgery, medicine, hygiene, &c.

The Military School of Music at Kneller Hall, Hounslow, was established in 1857 with the view of instructing non- commissioned officers and soldiers in music, and supplying competent bandmasters and trained musicians to the various regiments. The staff consists of one officer and a number of civil professors : the students, limited to 148, are soldiers selected for good conduct and promise of musical proficiency, and remain for two years.

The Royal Military Asylum at Chelsea (also known as the Duke of York's School), and Royal Hibernian Military School at Dublin, are establishments for the maintenance and education of a limited number of boys who are the sons of soldiers. Candidates for admission must be between the ages of 5 and 12 years, and they are allowed to remain till 14, or, if they belong to the band, till 15. They are then allowed to volunteer into any regiment they may select, or, if not fit for the service, are apprenticed to 4 trade or placed in some other civil employment. The

Royal Military Asylum at Chelsea is also a normal school and training institution for army schoolmasters.

Administration of Justice—Judge-Advocate-General's Department—Military Prisons.

Justice is administered by the commissioned officers of the army: by the commanding officer for minor offences, and by regimentat, district, or general courts-martial for more serious crimes. (See Minirary Law.) The administration of justice as pertaining to descipline falls under the Adjutant- "General's branch of the department of the Commander-in-Chief. But to ensure these disciplinary powers being exer- cised in strict conformity with the law, a Judge-Advocate- General, a legal adviser to the Crown and to the Com- mander-in-Chief, is appointed by patent. This officer is usually a lawyer of high standing, having a seat in the House of Commons, holding his office as a member of the Government, and quitting office with his party. His de- partment includes a deputy judge-advocate-general, who is also a lawyer and civilian, and three deputy judge-advo- cates, military officers; of the latter, two are attached to the Judge-Advocate-General's office in London, and one to the Commander-in-Chief in Ireland. A separate Judge- Advocate's department is maintained in India, where deputy judge-advocates are appointed to every important command. All general courts-martial held at home are sent to the Judge-Advocate-General, to be by him submitted to the Queen for confirmation ; and all district courts- martial, after having been confirmed and promulgated, are sent to his office for examination and custody. The Judge- Advocate-General and his deputy, being judges in the last resort of the validity of the

proceedings of courts-martial, take no part in their conduct ; but the deputy judge-advo- cates frame and revise charges, and attend at general courts-martial.

The punishments that can be awarded to officers and soldiers for various offences are detailed in the Mutiny Act, the Articles of War, and the Queen's Regulations. A commanding officer can "reprimand" a commissioned. officer, but can award him no other punishment. Arrest is not, as in most armies, recognised as a punishment, but is merely a preliminary to further proceedings. An officer, on the commission of an offence, is placed under arrest— that is, deprived of his sword and confined to his room— until the matter has been investigated and disposed of, or sent before a court-martial. A commissioned officer can be tried by a general court-martial only, and can be sen- tenced to death, penal servitude, imprisonment, cashiering, or dismissal, reduction on list of his rank, or reprimand.

A soldier, on commission of an offence, is placed in»

confinement—that is, deprived of his arms and confined in the guard-room. At "orders" (?.e., commanding officer's office hours) the next morning he is brought before the commanding officer, and the case investigated in presence of the officer commanding his troop or company, the adjutant, and the prisoner. If the offence is a minor one the commanding officer disposes of it summarily; his powers including admonition, confinement to barracks for periods not exceeding 28 days, carrying with it punishment drill up to 14 days, imprisonment not exceeding 168 hours, and stoppage of pay for absence. Drunkenness iS punished by fines ranging from 2s. 6d. to 10s. If the offence is more serious, the man is remanded to the guard- room while the necessary steps are being taken for bringing him to trial, and is finally tried by a regimental, district, or general court-martial, according to the nature of the offence. The punishments that can be inflicted by court-martial are death, penal servitude for any period not less than five years, imprisonment for any period not exceeding two years, dismissal from the service, stoppages of pay,

and forfeitures of pay, medals, service, &c. Flogging has been abolished except on active service, as also branding, and all such disgraceful punishments. offences, with very few exceptions, are disposed of by regimental or district courts-martial, and by sentences of imprisonment not exceeding six months. sioned officer can only be reduced and punished by sentence of court-martial.

Practically, military

A. non-commis-

Sentences of penal servitude awarded to soldiers are

carried out in the convict prisons with other convicts ; but sentences of imprisonment are usually carried out in the military prisons. 1844, in order to avoid the necessity of mixing soldiers sentenced for military offences with ordinary criminals in county gaols, They are of two classes, the larger ones being under a governor, and the smaller ones under a chief warder, They are'under the control of the Secretary of State for War, and under the immediate supervision of the officer commanding on the station (acting as his repre- sentative) and of the military visitors,—field officers serving at the station, by whom the prisons are periodically visited, and all serious offences investigated and punished. They are also inspected from time to time by the Govern- ment inspectors of convict prisons. military prisons in the United Kingdom, and six in the colonies ; and the number of prisoners has recently ave- raged about 12 per 1000. Besides these prisons, " provost cells" are provided in every large barrack, in which short sentences of imprisonment not exceeding 28 or 42 days are

Military prisons were established in

There are eight

carried out under the charge of a provost-sergeant.

Barracks.

In the earlier days of the standing army the barrack accommodation in England was altogether insufficient for the force maintained, and suchas there was, was miserably bad. A considerable portion of the army was constantly billeted, camped, or lodged in buildings hired for the time, and every proposal to build barracks was jealously opposed in Parliament. Thus, in 1704 the total accommodation in barracks was only sufficient for 5000 men, and in 1792 did not exceed 20,000 ; but during the long war with France, partly in consequence of the large force kept permanently under arms, and partly also in consequence of the fears aroused by the revolutionary spirit which had penetrated into many of the large towns, barracks were constructed in all parts of the kingdom, and after the peace the accommodation far exceeded the wants of the army. Many barracks were then dismantled and sold, and others were allowed to fall into disrepair ; but little was done towards improving the condition of the existing barracks until the Crimean war brought the army into notice again, and attention was drawn to the heavy rate of mortality among soldiers in peace time, mainly attributable to the defective construction and overcrowd- ing of barracks. New barracks on improved designs were then built, and existing ones altered and reappropriated, so as to allow each man at least 600 cubic feet of air, and, in addition, provide recreation-rooms and other resorts for the soldier during the day.

The following estimate of the number and size of rooms required for a battalion of infantry on peace establishment will show the accommodation provided in modern barracks : —Officers.—Messroom, 45 feet x 25 feet, and 18 feet high ; ante-room, 24 feet x18 feet; kitchen, servants' rooms, larder,—altogether 13 rooms and cellars, &c. Commanding officer's quarters—6 rooms, of from 16 feet x 14 feet to 18 feet x16 feet. Two field officers' quarters —-3 rooms each; 30 officers' quarters of one room each (often made with a recess or bunk for the bed), and 15 rooms for officers' servants. Sergeants——Messroom, 40 feet x 20

feet ; kitchen and storehouse for ditto ; separate rooms for 7 staff-sergeants and 40 company sergeants. Men,—32 rooms to hold 18 men each, 45 feet x 20 feet, arranged by companies in blocks of four, with an ablution-room

attached to each block ; 48 separate quarters for married soldiers, each 16 feet x 14 feet. Offices, Stores, and Workshops.— Orderly-room, commanding officer's, paymaster's, and

uartermaster's offices,—4 rooms; quartermaster's store, P md ig)

40 feet x 20 feet ; provision and issuing stores, two rooms, 18 feetx16 feet; armourer's, tailor's, and shoemaker's shops, 3 rooms, from 16 feet x 14 feet to 16 feet x 32 feet ; guard-room, with prisoners' room and lock-up; cook-house, 40 feet x 20 feet, with separate apparatus for each company ; women's washing-house, 66 feet x 20 feet; latrines parti- tioned and screened. Schools, Recreation-Rooms, Canteens, &e.—Where no garrison schoolroom exists, a building, 50 feet square, divided into 2 large and 4 small class-rooms for the school. Recreation-rooms—2 rooms, 40 feet x 20 feet, fitted with bar in one room, and bookcases in the other. Canteen—bar, including counter and space in front, 24 feetx 12 feet; sitting-room for men, another for non- commissioned officers, and quarter for canteen sergeant. Skittle-alleys and ball-courts are also usually provided. Where no garrison hospital exists, a complete hospital establishment, including medical officer's office, surgery, dispensary, and store-rooms, quarters for sergeant and orderlies, cook-house, wash-houses, &¢., and wards for 10 per cent. of the force, are included in the barrack. In constructing barrack-rooms the beds are usually arranged in two rows, with a passage of 5 feet between the beds, and 1 foot between head of bed and wall; giving a width of 20 feet. The barrack beds are of iron, made to double in the middle ; during the day they are folded back, and the centre of the room thus cleared. Straw mattresses, blankets, and sheets are provided by Government; also forms and tables for day use. The arms are kept in racks by the side of the bed ; knapsacks, kit, and accoutrements on shelves and pegs over the bed; 5 feet lineal space and 600 cubic feet are allowed per man. In hospitals 1200 cubic feet are allowed. In cavalry and artillery stables 1500 cubic feet are allowed per horse; the stalls are 5 feet or 54 feet by 9 feet, with 12 feet down the centre of a double stable, or 7 feet on each side where the horses stand head to head.

Since the formation of the Control Department the construction, maintenance, and repair of barracks have devolved on the Royal Engineers

; but the charge of them when once finished and handed over, the allotment of quarters, and the supply, maintenance, and repair of all barrack stores and movable furniture, rest with the Control Department. The existing barrack accommodation in the United Kingdom, according to the new appropriation, is sufficient for about 122,000 men,—88,000 in Great Britain, and 34,000 in Ireland; and when the works now in progress, or about to be undertaken, are completed, this will be raised to about 135,000, Of this, however, about 2 per cent. must be deducted for small detached forts and coast batteries, which cannot be occupied without great inconvenience to the troops so dispersed, and a margin of at least 10 per cent. must be left for barracks and rooms only partially filled, so that the available accommodation will not exceed 120,000.

Arms, Equipment, and Clothing.

The arms issued to the several branches of the service are supplied partly by contract, but mainly by the ordnance manufacturing establishments. The principal of these is the Royal Arsenal at Woolwich (see article ARSENAL), divided into the carriage factury, laboratory, gun factory, and experimental branch. From these factories are pro-

duced the whole of the guns and gun carriages for naval as well as land service now in use, and the greater pro- portion of the ammunition and equipment belonging to them. Rifles, sword bayonets, and swords are manufactured at the Royal Small-Arms Factory at Enfield, and gunpowder at the Royal Gunpowder Factory at Waltham Abbey; a considerable quantity of powder, however, is also supplied by contract. The various articles worn and carried by the soldier in the field, or issued to him and under his care, are usually classed under the three heads of arms and accoutrements (or equipment), clothing, and necessaries. Of these, the first are supplied and maintained by Govern- ment (though the soldier is held answerable for damage by carelessness or neglect), and under no eircumstances become the property of the soldier. The articles included under the second head (clothing) are issued periodically to the soldier, and

expected to last a given time; during this time he is required to maintain them at his own cost, but at the expiration of the period, and when replaced by the next issue, they become his property. Lastly, the articles termed necessaries are supplied free to the soldier on first joining, but afterwards have to be replaced and maintained at his own cost. The articles supplied as "clothing " vary slightly in different branches of the service, but usually consist of a tunic, a pair of trousers or overalls, and two pairs of boots annually, and a second pair of trousers biennially. Head-dresses, greatcoats, and leggings are issued at intervals varying from three to ten years, but these articles do not become the property of the soldier when done with. All clothing is supplied from the army clothing depét at Pimlico; a certain amount is manu- factured there, but the greater part is obtained by contract, and only examined and stored there. The bulk of the clothing is sent to regiments ready made-up, in sizes according to a size-roll furnished by the regiment; but a certain proportion is sent in material unmade, and an allowance is made to the master tailor of the regiment for making up such articles, and fitting the clothing generally. "'Necessaries" include serge frocks or stable jackets, forage caps, shirts, socks, towels, brushes, combs, and other small articles, of which a stock is always kept on hand by the quartermaster of the regiment, and supplied by him to companies as required. These articles can either be obtained (on payment) from the clothing depét at Pimlico, or purchased independently ; but in the latter case the articles must be compared and found equal to the sealed patterns, and the price must not exceed the Government tariff,

England, from its insular position, has always been a great naval power rather than a military one. On her own element she has for years maintained an empire more undisputed than any power or potentate has ever claimed on land, The rule of Napoleon in the height of his fame was not so haughty and despotic on the Continent as was that of England at sea. Men still living remember the times when the British flag was saluted by every sail that traversed the sea in any quarter of the globe, and no ship, of any nation, dared to pass a British man-of-war without striking its flag. It was to the victories of her navy, and especially to Trafalgar, that England owed her immunity from invasion. It is natural, therefore, that the fame and popularity of the navy should partly have eclipsed the deeds of the army. And yet the British army has a history of which any nation might be proud.

If it cannot count such a list of victories as Napoleon em- blazoned on the banners of France, neither has it suffered such disasters; and it may lay claim to the longest con- tinuous history of any army in Europe. The French army dates all its traditions from Napoleon's time;

"

Character

of the British army.

BRITISH. |

not a trace remains of the regiments that served under Turenne, and Condé, and Luxemburg in the glorious days of the old monarchy, and even the banner under which they fought is proscribed. The Prussian army was almost unknown until the time of Frederick the Great; and Austrian regiments have been so often changed that it is difficult to trace their antecedents. But many English regiments trace back an unbroken history of more than two centuries, and fought, under the numbers and the names they still retain, with William III. in the Nether- lands, and with Marlborough at Blenheim, Ramilies, and Malplaquet.! And their traditions are not confined to Europe. India conqucred and permanently held; every colony in the world at one time wrested from its owners ; the British flag planted on the ramparts of Cabul and Peking; and her arms carried into the fastnesses of Abys- sinia and the forests of Ashantee ;—such are among the deeds that attest the valour and enterprise of the English army. From time immemorial the inhabitants of the British Islands have been distinguished for a determined bravery and a physical power exceeding that of any other nation.

Modern peaceful experiences have confirmed the opinion as to the physical superiority of the Briton, and in this respect no rival has yet been found to the highly-fed English navvy. The army is composed of Englishmen, Scotchmen, and Jrishmen, in the proportion of about 75 per cent. of the first, 10 per cent. of the sccond, and 15 per cent, of the last. The Englishman generally is above the average of nations in height and physical power. Even when the standard for the army has been at its lowest,

it has been several inches above that of Continental armies. His strength lies especially in the upper part of the body—in the chest, shoulders, and arms—and he is ponderous rather than active, His lower limbs are not always proportionately developed, and the Englishman as arule is not a good marcher, nor is he so hardy as the inhabitants of many other countries, In temperament he is calm and rather stolid, not easily roused to enthusiasm, and not full of romantic visions of glory, though not so insensible to such emotions as is often believed ; slow, some- what wanting in resource, and apt to grumble and show his discontent under hardships. On the other hand, he has a strong sense of justice, of right, and of duty, which can generally be successfully appealed to. His spirits rise to danger ; he can always be depended on for battle ; and his courage, if less fiery, is of a more stubborn and enduring kind than that of any other racc. The Scotch-man is less ponderous in frame, but more sinewy and active,—a better marcher, and more capable of enduring hardships and fatigue; more impetuous in action, though capable of a restrained energy very different from the reckless valour of the Frenchman or Irishman, The Scotch regiments have always been distinguished by a strong national feeling and clanship, producing an esprit de corps that cannot be surpassed by any corps d'élite. The Irish- man is active, gay, careless, more ready in resource than the others, and often more reckless in fighting; but, on the other hand, less to be depended upon, and more difficult to hold in the bonds of discipline.

The English officer is drawn exclusively from the upper classes. His early education, his habits, and his traditions all fit him to he a leader of men. His physique, his intelligence, and the spirit of enterprise, are developed by those athletic exercises and field sports which distinguish the aristocracy of England. The character which especially distinguishes him is a love of enterprise. Much of his spare time is spent in travelling, or in sports of a more or

T It is greatly to be regretted that, for some unexplained reason, only the battles fought after the middle of the 18th century are borne by regiments on their colours,

ARMY

| vastly superior force.

less dangerous character. Not a war takes place in the most distant and unhealthy colonies, but crowds of volun- teers are found for it. There is not a country in the globe but has been explored and traversed by English officers for their amusement, and wherever a war takes place they flock to it. Not so devoted, perhaps, as the officcrs of some nations to the details of their profession, they yet carry out all that is required of them with rigorous exactitude and a high sense of duty. But it is in the field, and when thrown on their own resources, that they show to most advantage. 'Trained by our Indian empire and colonial possessions to the life of a conquering nation, command comes natural to them; and the youngest subaltern, sud- denly called to a position of responsibility, raises armies and carries on wars, and dominates all around him by his daring and energy. The histories of Clive, Sir Herbert Edwardes, and others, repeat themselves on a snialler scale whenever the occasion offers.

The social life of the English officer is unlike that of any other army. Off duty, the gradations of rank almost disappear, and all meet on a footing of equality as gentle- men. Our mess system, envied and copied by foreign nations, is only possible where such freedom exists. The officers live together, dine at a table always handsomely furnished, and often rich with trophies and records of the old history of the regiment, at which the president, perhaps the junior officer, is for the time superior ; and wherever stationed, and under all conditions, retain the forms of high-bred society. The discipline of the English army, once proverbial for cruelty and harshness, is now the very reverse, aud there is perhaps no army in which officers and men stand together on a more pleasant footing.

Of the character of the English army in war it is almost unnecessary to speak ; it has written itself in history in a series of battles, often won against heavy odds, from Crecy, Poictiers, and Agincourt, to Waterloo, The highest eulogiums passed on it have been wrung from its adver- garies. "L'infanterie Anglaise est la meilleur du monde ; heurcusement il n'y en a pas beaucoup," was Bugeaud's comment. "Le soldat Anglais," says General Foy, "'posséde la qualité la plus precieuse dans la guerre, le calme

dans la colére." Readers of military history will remember Napier's vivid picture of the assault of Badajoz, when the troops, unable to advance, and yet scorning to retire, remained in the ditches to be shot down by the garrison. And our account may well close with Foy's description of the British infantry at Waterloo ;—" La mort était devant eux, la honte derriére. En cette terrible occurrence les boulets de la Garde Imperiale et la cavalerie de France victorieuse ne purent pas entamer l'immobile infanterie britannique. On eut été tent¢ de croire quelle avait pris racine dans la terre, si ses bataillons ne se fussent ébranl¢s majestueuse- ment quelques minutes aprés le coucher du soleil," ?

Inpian ARMY.

The history of the armies of India is the history of our Indian empire, and as such, in its most striking features, is treated elsewhere. The present notice, therefore, is con- fined to those details of organisation which do not fall within the province of a general history.

2 An anecdote of the Indian mutiny, peculiarly characteristic of officers and soldiers, may serve as a pendant to the opinion given above. A detacliment was holding an advanced post against the attacks of a The enemy gradually enveloped the post, and threatened to cut the retreat of its defenders; but the defence was maintained unshaken. At last an Irishman, with more military instincts, perhaps, than the rest, exclaimed, " Och, captain, captain, we're surrounded!" 'The officer's reply came sharp and stern, " What the devil's that to you, sir; look to your front ;" and the defence was continued.

Bengal army.

Madras army.

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For military purposes India is divided into three great sections—Bengal, Madras, and Bombay. Under the term Bengal must be included Bengal proper, Assam, the North-West Provinces, Oudh, and the Punj&b; under Madras, Burmah; and under Bombay, the province of Sindh. The army of India has always consisted of three native armies, corresponding to the

three presidencies, each associated with a certain number of British troops, Europeans in the service of the late East India Company, and forces furnished by the Imperial Government. This separation into three distinct armies was the natural result of the original foundation of separate settlements and fac- tories in India ; and each retains to the present day its own separate history and traditions.

Half a century after the establishment of the associa- tions of merchant adventurers, whose first charter bears date 1600, the English traders in Bengal were still restricted by the native princes to a military establishment, as guard, of an ensign and 30 men, and this Liliputian force may be taken as the germ of the splendid army which now occupies India from Peshawur to Calcutta. In 1681 Bengal received the first reinforcement from Madras, in the shape of a "corporal of approved fidelity and courage, with 20 soldiers ;" and two years later a company was sent from Fort St George (Madras), raising the little Bengal army to a strength of 250 Europeans. In 1695 native soldiers were first enlisted. The English had by this time moved to Calcutta, and there entrenched themselves ; and in the years 1701-2, the garrison of that now flourishing capital consisted of 120 soldiers and seamen gunners. In 1756 Fort William was captured by Surajah Dowlah, and the terrible tragedy of the Black Hole of Caicutta was enacted ; but vengeance followed promptly. An expedition was at once despatched from Madras, and on the 23d June 1757 the battle of Plassey established the British supremacy in Bengal. The little force, not exceeding 3000 men, with which Clive gained this astonishing victory, was formed mainly of Madras troops, and the 39th regiment, recently despatched from England,—the first royal regiment sent to India, and which now bears the motto, " Primus in Indis." The Bengal army was represented by a few hundred men only ; but from this date the military power and conquests of the Company rapidly increased. A company of artillery already had been organised in 1748; and in 1757, shortly before the battle of Plassey, the lst regiment of Bengal native infantry was raised. In 1759 the native infantry had been augmented to 5 battalions ; in the following year 3 troops of dragoons were raised ; and in 1763 the total forces amounted to 1500 Europeans and 12 bat- talions of native infantry, giving a strength of 11,500 men. In 1765 the army was further increased; the Euro- pean infantry was divided into 3 regiments, and the whole force was organised in 3 brigades, each consisting

of 1 company of artillery, 1 regiment European infantry, 1 troop of native cavalry, and 7 battalions of Sepoys. In 1766, consequent on the reduction of some money allowances, a dangerous combination of the officers of the Bengal army took place, by which they agreed to resign their con- missions simultaneously. This combination was promptly put down by the then Governor and Commander-in-Chief, Lord Clive, to whom the Bengal army may be said to owe its existence. He found Bengal a ruined commercial agency in 1756; he left it, ten years after, a powerful empire.

The constant wars and extensions of dominion which took place during the next thirty years led to further augmentation of the army; the number of brigades and of European regiments was increased to 6; and in 1794 the Bengal army numbered about 3500 Europeans and 24,000 natives.

The first armed force in the Madras Presidency was

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the little garrison of Armegon, on the Coromandel coast, consisting of 12 guns and 28 soldiers. In 1644 Fort St George was built and garrisoned by 100 soldiers, and in 1653 Madras became a presidency. In 1745, when Fort St George was surrendered to the French, its garrison consisted of 200 Europeans, while a similar number, with the addition of 200 "Topasses" (descendants of the Portuguese), garrisoned Fort St David. In 1748 the various independent companies of factory guards at settle- ments on the Coromandel coast and other places were consolidated into the Madras European regiment. In the following year, Clive, with only 200 soldiers and 300 Sepoys, seized and held Arcot, the capital of the Carnatic, and on three several occasions defeated the troops of the Nabob and their French auxiliaries. From this year the military power of Madras may be dated. In 1754 the first royal regiment, the 39th, was sent there, followed in 1758 by three others. In 1772 the Madras army numbered 3000 European infantry and 16,000 natives, and in 1784 the number of native troops had risen to 34,000.

The island of Bombay formed part of the marriage Bombay portion received by Charles Il. with the Infanta of Portu- army.

gal, and in 1662 the Bombay regiment of Europeans was raised to defend it. In 1668 the island was granted to the East India Company, and the regiment at the same time transferred to them. In 1708 Bombay became a presidency, but it did not play so important a part as the others in the early extension of our power in India, and its forces were not so rapidly developed. It is said, how- ever, to have been the first presidency to discipline native troops, and Bombay Sepoys were sent to Madras in 1747, and took part in the battle of Plassey in 1757. In 1772 the Bombay army consisted of 2500 Europeans and 3500 Sepoys, but in 1794, in consequence of the struggles with the Mahratta power, the native troops had been increased to 24,000.

In 1796 a general reorganisation of the Indian armies took place. Hitherto the officers in each presidency had been borne on general "lists," according to the branches of the service to which they belonged. These lists were now broken up, and cadres of regiments formed. The colonels and lieutenant-colonels remained on separate lists, and an establishment of general officers was created, while the divisional commands were distributed between the royal and Company's officers. Further augmentations took place, consequent on the great extension of territory and the complete assertion of British supremacy. In 1798, at the outbreak of the war with Tippoo Saib, the native infantry in India had been increased to 122 bat- talions; and the force which General Harris took from Madras for the attack on Seringapatam consisted of 5000 Europeans, 14,000 native troops, 40 siege guns, 64 field guns, and the Nizam's contingent, numbering 6000 men. In 1808 the total force in India amounted to 24,500 Europeans and 154,500 natives.

The first half of the 19th century was a history of wars and annexations, and further augmentations of the army took place. Horse artillery was formed, and the artillery service increased to a most powerful footing. "' Irregular cavalry " were raised in Bengal and Bombay, commanded by picked officers, and recruited from a better class_ of troopers, who received high pay, on the condition of finding their own horses and equipment.

“Local forces” were raised in various parts from time to time, the most important being the Punjab irregular force (raised after the annexation of the Punjab in 1849), consisting of 3 field batteries, 5 regiments of cavalry, and 5 of infantry, and the Nagpore and Oudh irregular forces. Another kind of military force, which had been gradually formed, was that called “ contingents,”—native troops raised by the native

states under our protection. The strongest of these was that of Hyderabad, originally known as the Nizam’s army, and consisting of two brigades of infantry and cavalry, with artillery. Changes were also made in the organisation of the army. Thestaff wasenlarged, sanitary improvements effected, nanufacturing establishments instituted or increased, and the administration of the army generally improved.

The officering and recruiting of the three armies was in all essentials similar. The officers were mainly supplied by the Company’s Military College at Addiscombe (established in 1809), and by direct appointments under the patronage of the directors. The Bengal army was recruited from Hindustan, the infantry being mostly drawn from Oudh and the great Gangetic plains. The soldiers were chiefly high-caste Hindus, a sixth being Mahometans. The cavalry was composed mainly of Mahometans, recruited from Rohilcund and the Gangetic Doab. The only other elements in the army were the four Ghoorka regiments, enlisted from Nepaul, and the local Punjab irregular force. The Madras army was chiefly recruited from that pre- sidency, or the native states connected with it, and consisted of Mahometans, Brahmins, Mahrattas, Telingas or Gentoos, and Tamils. The Bombay army was recruited from its own presidency, with some Hindustanis, but chiefly formed of Mahrattas and Mahometans ; the Bombay light cavalry mainly from Hindustan proper.

In the year preceding the great mutiny the Indian army had reached its highest strength. The establishment in the several presidencies was as follows :—

Bengal. | Madras. | Bombay. | Total.

British Cavalry Regiments… 2 1 il 4

att Infantry Battalions..) 15 3 4 22 vompany's European Bat-

iaions.. See Obcubeonobaoce 30 2 ® " 2 European and Native Artil-

lery Battalions…..... ee Ta 7 5 aa

Native Infantry Battalions.,.| 74 52 29 155

| Native Cavalry Regiments…| 28 8 3 39

Including the local and irregular troops (about 100,000 strong), the total strength amounted to 38,000 Europeans of all arms, with 276 field guns, and 348,000 native troops, with 248 field guns,—truly a magnificent establishment, and, outwardly, worthy of the great empire which England had created for herself in the East, but inwardly unsound, and on the very eve of crumbling to pieces.

It would be impossible, within the limits of a short article, to do more than briefly summarise the causes which led to the great Sepoy mutiny of 1857. For many years the discipline of the Bengal army had been relaxed. The system under which the ablest regimental officers were withdrawn to staff and civil employ was incompatible with efficiency, the centralisation of the army administration was excessive, aud the powers of commanding officers had greatly diminished. The supposed wrongs of Oudh stirred up the soldiers so largely recruited from that province, and the religious prejudices of those otherwise well disposed were inflamed by the secret emissaries of the disaffected. The Sepoys were told that the Government wished to force them to break their caste and abjure their religion, that they were to be sent across the sea to die in foreign and detested lands, or to be sacrificed on their own shores. Even the ridiculous endeavour to assimilate native to British soldiers in outward appearance was turned to account by these emissaries. The "greased cartridges" were but the spark which set the whole aflame. The miserable delusions spread, the loyally-disposed cast in their lot with the disaffected, feeling that when once a mutinous spirit had been shown all was lost to them as a military body, and the Bengal native army was in a short

space of time only a chaotic mass of disbanded and inutin- ous soldiers! The story of the rebellion is the history of those days, and cannot be treated in this place. Fortunately for our power in India, the mutiny did not spread to the Madras or Bombay armies; and in the darkest days our ancient enemies the Sikhs not only remained faithful, but came forward to render us powerful assistance.

By the autumn of 1858 the mutiny was virtually crushed, Reorgan- and the task of reorganisation commenced. On the 1st isation.

September 1858 the East India Company ceased to rule our Indian empire, and Her Majesty's Government took up the reins of power. On the important question of the reorganisation of the Indian army the opinions and advice of the most distinguished soldiers and civilians were invited. Masses of reports and evidence were collected in India, and by a royal commission in England. On the report of this commission the new system was based. They recom- mended the abolition of a local European army, and the amalgamation of the existing one with the royal army; that the native army should be cnlisted for general service, and be of mixed nationalities and castes; that the irregular system should mainly obtain in the native cavalry; and that the native infantry should be mainly regular.

The European force was permanently increased, while the native army was largely reduced. The Indian artilleries were transferred to the Royal Artillery, the Company's European cavalry became the 19th, 20th, and 21st Hussars, and their European infantry became regiments of the line, numbered 101 to 109. The transference of the Company's Europeans to the Crown was not unattended with trouble. The men considered that faith had not been kept with them, and a mutinous spirit was shown. Ultimately they were offered their discharge, which a large number accepted.

The European officers of the native armies, and those officers and men who did not accept service in the new royal regiments, now formed with the native soldiers the new Indian army. The reorganisation of this by the

Indian Government was a task of no ordinary difficulty, involving much besides reconstruction. Many of the lcvies hastily raised during the mutiny had to be disbanded, or formed into line regiments, and various miscellaneous corps had to be got rid of. The Government was further hampered by the necessity for providing for the large number of officers whose regiments no longer existed. In 1861 a "staff corps" was formed in each presidency, "to supply a body of officers for service in India, by whom various offices and appointments, hitherto held by officers borne on the strength of the several corps of the Indian forces, shall in future be held." Promotion in this corps was to be by length of service,—twelve years toattain the rank of captain, twenty years that of major, and twenty-six years that of lieutenant-colonel. The staff corps was filled up by a large number of Indian and British officers holding various staff employments (the new regimental employments being counted as staff duty), and all kinds of civil posts and situations, and has been gradually opened wider, till it includes the great majority of the Indian officers. The new organisation of the cavalry and infantry of the Indian army was promulgated in 1863, but did not take effect in Bombay and Madras till 1864 and 1865. Cavalry regiments are on the "silladar" or irregular system; their establishment consists of 1 commandant, 1 second in command (also commanding a squadron), 2 squadron officers, 1 adjutant, 2 doing duty officers (Europeans), and 13 native officers, 444 non-commissioned officers and troopers, or "sowars." The infantry battalions have each 1 commandant, 2 wing commandants, 1 adjutant, 1 quarter-

Ne Se

1 Of 74 native infantry regiments, 45 mutinied, 20 were disarmed, and 3 disbanded. Six only remained true.

Present strength, composi- tion, and administra- tion.

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master, and 2 doing duty officers (Europeans), 16 native officers, and 696 natives of all ranks. .

The total strength of the army of India in 1873 was 6162 European officers, 60,174 European non-commissioned officers and men, and 123,671 natives. The supreme military power is the Viceroy and Governor-General in council. The military member of that council is de facto War Minister, and the military department of the Govern- ment of India the War Department. The Commander-in- Chief of the army is the executive military power, and the responsible adviser of Government, as well as local Com- mander-in-Chief in Bengal. The Madras and Bombay Presidencies have military departments and local com- manders-in-chief, but subordinate to the supreme Govern- ment of India; each presidency, however, has certain local peculiarities in its own military system and its own army departments. The army departments are the commissariat (charged with the supply of provisions, forage, fuel, light, and transport), the ordnance department (charged with the custody and supply of all warlike stores), the clothing department, medical department, stud department, &c. The commissariat is officered from the combatant ranks of the army, the subordinates being also drawn perma- uently from its ranks, and is a most excellent and power- ful department. The ordnance department is ofticered from officers of the Royal Artillery, who, as " commissaries of ordnance," have charge of the various arsenals and magazines in the country. The whole of British India is divided into divisions and districts, and the command is exercised by royal or Indian officers according to a pro- portion fixed. The staff is selected from the officers of the British corps in India, the staff corps, and the Indian army, and the system is similar to that in England and the colonies, except that the tenure of brigade majorships is limited to three years.

The following table shows the detailed constitution of the army of India in 1873 :-—

A

Bengal Madras. | Bombay

Army. Army Army. Total. Europeans. Artillery— Horse Field Batteries… 33 13 12 58 Heavy and Mountain 1 1 6 Battertesiesscscu=s:

Garrison Batteries….. 11 6 5 22 Engineers—Companies….. 1 1 1 3 Cavalry—Regiments …..... 6 2 1 9 Infantry—Battalions…..... 82 9 9 50

Natives. Artillery—Mountain IBAGtEMIGS wosasescerenenes= = aig a s Cavalry—Regiments…..... 26 4. 7 37 Engineers—Companies….. 10 10 5 25 Infantry—Battalions. ..... 60 40 30 130 Strength—Europeans…..... 41,055 | 18,214 | 12,067 | 66,336

Natives …...0.0 62,955 | 33,963 | 26,753 | 123,671

The following gives the strength of the several arms :—

European. Native. Infantry, 45,962 101,134 Cavalry, 4,347 18,575 Artillery —Men, 12,306 896 5 Guns, . 370 36

The Punjab field force of 4 batteries of artillery, 5 regi- ments cavalry, 4 regiments Sikh infantry, and 6 regiments Punjab infantry, is included in the Bengal army. The "Hyderabad contingent," of 4 field batteries, 4 cavalry and 6 infantry regiments ; the "'Mysore" troops, of 6 regiments of cavalry and 4 of infantry; the "Nair brigade," of 2 battalions of infantry and four guns; and other minor local forces and contingents, are not included in the above.

M Y

The Bengal army is composed chiefly of Mahometans, Brahmins and other Hindu castes, Rajpoots, Jats, Pun- jabees, natives of Trans-Indus, and hill-men. Some are regiments entirely of one race, as the Ghoorkas, while others are mixed entirely or by companies; but the com- position of every regiment has been definitively laid down. There are no special restrictions on caste or race, but care is taken to prevent an undue preponderance of any class. Enlistment is purely voluntary. Recruiting is carried on by parties detached, or by non-commissioned officers and men on furlough. Pay and pension are fairly good, though depreciated by the general rise in prices; pension being obtainable by men invalided after fifteen years' service. 'The native officers are appointed from the non- commissioned officers, and though a respectable body of men, are not sufficiently educated. It is, however, con- templated to give natives of rank and position direct commissions. The British officers of the Indian army, generally, are obtained through the medium of the staff corps, which is filled by volunteers from the British

army, and now supplies the native armies of India with regi- mental officers.

The Madras native army is composed of a few Christians, Mahometans, and Mahrattas, and a large number of Telingas or Gentoos, and Tamils. The infantry battalions are organised as in the Bengal army. The cavalry are mostly composed of Arcot Mussulmans, descendants of the soldiers of the Nawab of the Carnatic. This cavalry is not " silladar," as in Bengal or Bombay, and the native estab- lishment is weaker, consisting of 12 native officers, 75 non-commissioned officers, and 300 privates. The army is recruited as in Bengal, but has a peculiar institution of its own, viz., the "recruit and pension boys" (sons of soldiers or pensioners) attached to each regiment, and transferred to the ranks when of sufficient age and approved of,—a valuable institution, and one which gives a powerful hold upon the fidelity of the men.

The Bombay army resembles that of Bengal in recruiting, organisation, and equipment. It is composed of a few Christians, some Brahmins and Rajpoots, and other Hindu castes, but mainly of Mahrattas and Purwarees, with a few Punjabees and natives of Trans-Indus.

It is difficult to draw comparisons between the soldiers of our Indian forces, recruited from so many different parts of the empire. The most warlike, undoubtedly, are the inhabitants of Scinde, the Punjab, and Trans-Indus. Perhaps next come the men of Rohilcund, Rajpootana, Oudh, and the Mahrattas. These races possess a greater aptitude for military training, and are generally of a better physique than the inhabitants of the Southern Peninsula. But it is too much to affirm that the former are "born soldiers," the latter only "soldiers by education." The ploughshare has already replaced the sword in many parts, and more and more are once turbulent tribes becoming peaceful tillers of the soil. Of the actual value of native troops it is still more difficult to form a true estimate. The Sikhs, both as friends and foes, have proved them- selves gallant soldiers, not unworthy of being matched with Europeans. The ordinary Sepoy, under the guidance of British officers, has furnished many examples of heroism and devotion. It is said that a Bengal regiment success- fully stood the brunt of a charge from the French at the battle of Porto Novo in 1782; and the devotion of Clive"s

Sepoys at Arcot has passed into a proverb. At the siege of Dehli in 1857, native regiments sustained losses which few European troops could have borne, and crowds of men in hospital, with wounds only part healed, volunteered to join in the final assault. But without their English officers they are of little value; the Asiatic, as a rule, cannot face the European, and it would be dangerous to

trust to them in a war against a Western invader. They are useful auxiliaries, and relieve the European soldier of much of the fatigue inseparable from the task of garrison- ing so large an empire and protecting its frontiers. But the mutiny proved the danger of relying on them, and taught the lesson, never, it is to be hoped, to be forgotten, that our Indian empire must be held, not by native armies, but by British armies.

Many important changes and improvements have taken place since the great reorganisation of the Indian armies was commenced in 1858. The education of the whole army has been improved; musketry, gymnastic, and garrison instruction has been introduced; and strict tests are now required of candidates for the staff, and for promotion in all grades. Annual camps of exercise have been instituted, where large bodies of troops are massed, and opportunities for higher tactical training afforded. The commissariat department has been enlarged, the military account depart- ment remodelled, the matériel of war and its manufacture vastly improved. The new system of reliefs of British troops has greatly shortened the tour of Indian service, splendid barracks have been built, hill sanitariums extended, so that about 10,000 British troops are now located in the hills during the hot weather; by these means, and a liberal expenditure on sanitary requirements, the death- rate among European troops has been reduced to one-half. Other great questions still remain to be dealt with. The local peculiarities of the presidencies seem likely to give way before the increasing intercommunication throughout India. The staff corps was an expedient, and answered its purpose for the time as such, but experience has shown defects in its constitution. The officering of the native regiments will always remain a subject for careful and anxious consideration. The

British rule in India may never again be put to such a severe test as that of 1857, but a wise government will not the less prepare for a day of danger which may yet come for our Indian empire.

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CANADIAN MILITIA.

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last froin eight to sixteen days annually. Money is granted for this purpose by Government; and every year camps of instruction are formed in each of the eleven military districts into which Canada is divided, at which the militia of the district are assembled and trained. Two schools of military instruction for infantry officers are established in each of the provinces of Ontario and Quebec, and one in each of the provinces of New Brunswick and Nova Scotia. There are also two schools of gunnery, which have per-manent batteries of artillery, at Kingston and Quebec. The infantry are armed with long Snider rifles, the cavalry with Speucer carbines and swords. The field artillery includes nine batteries, all well horsed. The "reserve militia" number 656,066 men, but have not hitherto been organised or drilled. The command of the whole force is vested in Her Majesty, who may call it to arms, wholly or in part, whenever necessary.

GERMAN ARMY.

By the "constitution of the German empire," bearing date the 16th April 1871, the land forces of all the states of Germany form a united army under the command of the emperor. The German army thus includes the contingents of Prussia, Bavaria, Saxony, Wiirtemberg, Baden, and a number of minor states, all raised and organised (with insignificant variations) on the Prussian model. The peace strength of the army is fixed at 401,659 men,! or about 1 percent. of the population; and the budget is established on the basis of 257 thalers, or £38, 11s. per soldier pre- sent with the colours. The army is organised in 18 army corps, of which 14 are furnished by Prussia and the states whose contingents are amalgamated with hers, 2 by Bavaria, 1 by Saxony, and 1 by Wiirtemberg. As the Prussian army thus constitutes three-fourths of the military forces of the

empire, and is the model on which not only the other contingents, but to a certain extent the armies of most European powers, have been formed, a detailed account of its organisation will serve as an introduction to the necessarily brief notices of the other armies of Europe.

To complete the account of the military forces of the

The Prussian army, like the monarchy, is of compara- History of British empire some notice of the Canadian militia is

tively recent origin. Its European reputation dates from the Prus-

necessary. Until recently Canada was one of the great military out-stations of the English army, and was garri- soned by a considerable force of British troops distributed throughout the Dominion. Recently these troops were gradually withdrawn, and the colony left to its own resources ; and since 1871 the regular forces maintained in the Dominion have been reduced tothe 2000 men forming the garrison of Halifax, which alone is still occupied as an imperial station. The defence of Canada is provided for by a large volunteer and militia force. By an Act passed in March 1868, all male inhabitants between the ages of 18 and 60 are liable to serve in the militia, exemptions being granted to judges, ministers of religion, professors, and a few others. The men thus liable are divided into four classes, denoting the order in which they would be called out for service—the first including all single men between the ages of 18 and 30; the second, single men between 30 and 45; the third, married men, or widowers with children, between 18 and 45; the fourth, all between 45 and 60. The militia is divided into an active and a reserve force. The active force includes the volunteers, and the regular and the marine militia. Its strength is fixed at 45,000, divided among the various districts in propor- tion to their population. The contingent must be furnished either by volunteers, or, if sufficient volunteers do not pre- sent themselves, by means of the ballot.

Service in volunteer corps lasts for three years, and in the regular militia for two years; the periods of training

the wars of Frederick the Great, but it was his father, %@” “™Y

Frederick William I., aided by Prince Maurice of Dessau, who really created the army which Frederick II. led to victory, and which numbered 70,000 men, admirably trained and equipped, when the latter ascended the throne.

The infantry had been especially perfected by Prince Maurice; and under Frederick's care the cavalry soon rivalled, if it did not excel it. . The gallant struggle against overwhelming odds, and the series of brilliant victories which marked the Seven Years' War, raised the reputation of the army to the highest pitch ; and the superb force of 200,000 men which he bequeathed to his successor was justly accounted the best in Europe. It was hardly, however, a national army, and its excellence was owing rather to Frederick's genius, and to his system of discipline and instruction, than to the goodness of the material. The cavalry, it is true, and the hussars especially, were recruited almost entirely from the Prussian states, and from the sons of the small farmers or better class peasants; but the infantry was raised from all sources, and was largely com- posed of foreigners, deserters, and vagabonds of all kinds. With Frederick's death, the genius which had animated it, and which alone gave value to such heterogeneous materials, was gone. It still retained its imposing appearance and precision of movement, and its overweening self-confidence. But at the first encounter with the armies of Napoleon it

1 One-year volunteers are not included in this number.

fell to pieces ; and after a scries of crushing defeats, Prussia found herself at the feet of the conqueror, shorn of half her territory, obliged to receive French troops in all her towns and fortresses, and only existing as it were by sufferanee. But in these very disasters were laid the seeds of her future greatness. By the treaty of Tilsit the Prussian army was limited to 43,000 men. This limitation suggested to Scharnhorst what was known as the "krumper," or " short- service" system already described. The bitter

humiliation and suffering endured under the French yoke aroused a national spirit which was capable of any saerifices. Every Prussian was eager to be trained to fight against the oppressor of his eountry; and when Prussia rose in 1813, the armies she poured into the field were no longer mercenaries, but national armies, imperfeetly trained and organised it is true, but animated by a spirit whieh more than eompensated for these defeets. At the elose of the war her rulers, with far-seeing sagaeity, at onee de- voted themselves to organise on a permanent footing the system which had sprung up under the neeessities and enthusiasm of the moment. 'The conscription, compulsory personal service, and a three years' term in the ranks, with further periods in the reserve and landwehr, were then introduced ; and though variations have subsequently been made in the distribution of time, the principles were substantially the same as those now in force. By the law of 1814 the periods of service were fixed at three years in the army, two in the reserve, and fourteen in the landwehr, and the annual contingent at 40,000 men. As the popula- tion increased, it was felt that the service was unequally distributed, pressing unnecessarily heavily on some, while others escaped altogether. Further, the experiences of 1859, when Prussia armed in anticipation of a war with France, aroused great doubts as to the efficiency of the land- wehr, which then formed the bulk of Prussia's forces, and of whom many had been as long as ten years away from the colours. Accordingly, by the law of 1860 the annual contingent was fixed at 63,000, the period in the reserve was inereased from two to four years, and that in the land- wehr reduced from fourteen to five. The total armed force thus remained nearly the same (12 contingents of 63,000, in place of 19 of 40,000), but the army and its reserves were more than doubled (inereased from 5 × 40,000 to 7 × 63,000) while the landwehr was proportionately reduced.

This change was not effected without great opposition, and led to a prolonged struggle between the king, guided by his able and ambitious minister Bismarck, and the parliament; for some time the king ruled and levied taxes in open defianee of parliament and the constitution ; and it required the brilliant suceesses of 1866, and the position thereby won for Prussia, to reconcile the nation to the new law.

By the present "military law of the German empire," every German is liable to service (wehrpflichtig), and must render such service personally. Neither substitutes nor purchase of exemption are allowed ; and those who are physically unfit for the ranks may be required to render sueh other serviees—as hospital attendants, tradesmen, é&c.—as they are capable of. Every German eapable of bearing arms belongs to the army for seven years, eom- mencing at the age of 21, and afterwards to the landwehr for five years. Army service is divided between the ranks and the reserve, three years being spent in the former and four in the latter. The annual contingent of reeruits is not now permanently fixed, but is determined by the number required to keep up the peace establishment, and is estimated at from 120,000 to 130,000 annually. By fixing the total peace establishment instead of the annual contingent, the authorities have gained the power

of largely augmenting the army without raising the budget

[GERMAN.

or attracting public attention, as by passing men into the reserve before their time they ean always increase the contingent required to complete the regiments, and thus the total number of trained men available in war. Thus, before the war of 1870, commanding offieers of regiments were direeted to send home a certain number of the most intelligent men after two years' gervice ; and since the war a large proportion of the infantry have been subjected to two years' training only.'

The military organisation of Germany is based on the territorial divisions of the empire. With the exception of the Prussian guard corps, which is recruited generally throughout the kingdom, each army corps has a corps district (Bezirk) within which it is raised, recruited, and stationed. 'The first six army corps districts correspond to the six provinces of old Prussia, the 7th and 8th to the Rhenish provinees. The 9th, 10th, and 11th were formed from Hanover, Sehleswig-Holstein, and the minor states annexed by Prussia in 1866; the 12th by the kingdom of Saxony, the 13th and 14th by Wiirtemberg and Baden, the 15th by Alsace and Lorraine, and the 16th and

17th (called Ist and 2d Bavarian army corps) by the kingdom of Bavaria. The following details apply strietly to the Prussian provinces only.

The corps districts are subdivided into division and brigade districts, and these again into landwehr battalion districts, corresponding to the eivil Kreis, or circle. As a rule, for each infantry regiment there are two corresponding landwehr battalion districts, from whieh the former draws its recruits and reserves. The battalion districts, again, are subdivided into company districts, of which there are from 3 to 6 to a battalion. Every town and village has thus its appointed place in the general organisation, and this is indicated on notice boards conspicuously placed at all the entrances.

At the beginning of each year lists are prepared from the parish registers of all young men who have attained their twenticth year, and to these lists are added the names of those who, though still liable to service, have been allowed to stand over from previous years. In the spring, about May, the battalion recruiting commission commences its labours. This commission is composed of the landwehr battalion commander, the landrath or chief civil functionary, two officers, and a surgeon, as per- manent members, and four local members taken from the more respectable inhabitants of the different villages.

The commission having notified the days of its visiting the headquarters of the several company districts, the youths are mustered there accordingly, and inspected. Those who are found physieally unfit for any service are struek off the lists altogether. Others who are too young and unformed for military service are put back for a year. Many also are permitted to stand over on personal or family grounds, the commission being allowed great lati- tude in granting temporary exemptions.

Every young man can be called up three years in suc- cession, and as arule the majority of the recruits are put back one year at least on medieal grounds, but at the end of the third he must either be definitely passed or exempted. Those who are exempted in their third year are passed into the Ersatz reserve, where they undergo no training, and are free of service in peace time, but in war can be called out and sent to the depdts to replace the casualties in the active army. Men below the regulation standard, but otherwise fit for the army, are passed into the Hrsatz

1 The contingent of recruits for 1872-3 was fixed at 190 per bat- talion. As the peace strength of the battalion, exclusive of the per- manent cadres, is about 450, it is evident these cannot all receive their full three years' training.

Territorial organisa- ion.

Raising of

annual con

tingent.

GERMAN. |

reserve ; as also only sons of widows, and others who are the sole supports of families, or who have, or have lost, brothers in the army. Although exemptions are much more charily granted in the third than in the first and second years of liability, they are still sufficiently numerous to soften materially the hardships of compulsory service. Finally, after all "exemptions" and " adjournments " have been made, there remain those passed as fit for service, and from these the required number are chosen by ballot. But the ballot is almost nominal. In 1862, for instance, when the number coming of age amounted to 227,000, only 69,000 were left on the lists for the ballot—63,000 being the required contingent —and in many districts the ballot was not applied at all In 1867, 262,000 came of age, 110,000 were passed for the service, and about 100,000 taken. The system of exemptions is so elastic that practically the recruiting commission can select, by a process of elimination, those best fitted for service, and abolish the clement of chance. A margin of about 10 per cent., however, is usually allowed; those who draw the lucky numbers are passed into the Ersatz reserve, but remain liable for a year to fill any accidental vacancies in the peace establishment.:

The men drawn for the army are then told off to the different branches of the service; men with good chests aud good feet to the infantry, men accustomed to horses to the cavalry, gamekeepers and foresters to the rifles, men of high standard to the guard, those of inferior physique to the

train, carpenters and mechanics to the engineers, and a certain proportion of shoemakers, tailors, saddlers, &c., to all regiments and corps. The guards recruit throughout the kingdom generally; the cavalry, artillery, fusiliers, and rifles throughout their own corps districts; while the infantry regiments draw their recruits as far as possible from the corresponding landwehr battalion districts. The proceedings of the battalion recruiting commissions are revised by brigade commissions, who distribute the recruits to regiments and corps, and these again by a corps com- mission, The final decision and allotment to regiments is usually completed about September. From that time the men are called recruits, and amenable to military law, but are given passes until the 15th October, the date on which they join their regiments.

These conscripts form the great bulk of the army ; but there are other classes, also, serving under varied conditions. Of these the most important are the "one-year volunteers," young men of means and education who, on condition of passing certain examinations and bearing all expenses of clothing, equipment, &c., are allowed to pass into the reserve after one year's service only. This system is a great boon to the middle and professional classes, who thus materially reduce the interruption which the full term in the ranks would cause in their education; and every effort is made to render the service as light as is consistent with thorough instruction, Many of these pass the requisite examinations for officers' rank, and become officers of land- wehr, or qualify as non-commissioned officers, and serve as such if recalled on mobilisation. A certain number of youths enter voluntarily for three years, gaining the privilege of serving at an earlier age, and choosing their own regiments. The non-commissioned officers are mostly "re-engaged men." Re-engagements are allowed for various periods, and each squadron or company has several " Capztu- lanten," smart young men, who have engaged to prolong their service in the ranks with the object of getting pro- motion. In the cavalry it is common for men to engage to serve four years instead of three, in cousideration of which their time in the reserve is reduced by one year, and. that in the landwehr by two years. Finally, there are a

certain number who serve for a given number of years in

return for advantages received in the way of education or maintenance from Government; such are the pupils of the non-commissioned officers' school and of the school of forestry, &ec.

After completing his term in the ranks the soldier is passed into the reserve, retaining, however, his place in his regiment, borne on its books, and liable to be recalled to it in case of war. The reservist is supposed to take part in at least two manceuvres, not exceeding eight weeks, during his term of reserve service. On completing his seven years' army and reserve service he leaves his regiment and passes into the landwehr, and is taken on the lists of the corresponding landwehr battalion for the remaining five years of liability. The landwehr battalion is the basis of the local organisation, both for recruiting and mobilisation. As a rule, to each three-battalion regiment of the line is attached a two-battalion landwehr regiment. These two are connected as closely as possible; they bear the same number, the line regiment draws its recruits from the battalion districts, furnishes the staff for their cadres, and passes its men into their ranks.

In peace time the landwehr battalions exist only in cadre, viz., a commanding officer, adjutant, and three clerks and orderlies per battalion, and a sergeant-major and two non-commissioned officers per company. These are charged with keeping the registers of the names and addresses of all reserve and landwehr men in their districts, and on mobilisation the whole labour of summoning, collecting, and forwarding the men to their destination falls on the landwehr battalion commander and his staff. The fusilier reserve landwehr battalions form a peculiar feature in local organisation. Each army corps has a fusilier regiment, which does uot draw its recruits from a particular sub- district, but, like the cavalry and special corps, from the corps district generally. But to each fusilier regiment 1s attached a reserve landwehr battalion and district, bearing the same number, but used to equalise and fill up the regi- ments throughout the corps district generally, remedying deficiencies in the regimental quotas of recruits or reserve men, and forming, in fact, a great central depét of recruits and reserves. It has always for its district some important town or

centre of commerce, where the floating population is largest and local attachment weakest, and whence also the communications to all parts of the province are easiest, and is allowed a considerably larger staff.

The following is an approximate estimate of the resources in men at the disposal of the German empire :—

Standing army, . 400,000 Reserves of the army, 450,000 Landwehr, 500,000

Total trained men, 1,350,000

When the army is mobilised, about 1,250,000 of these are embodied, and 100,000 remain still available of men not trained, but registered and liable to be called out; then there are the next year's contingent of recruits, 120,000, and Ersatz reserve, which cannot be estimated under 800,000,— making, with her trained soldiers, a total of about 24 millions.

Prussian Army.

The Prussian arniy is divided into field troops, who in peace time form the standing army and the school of instruction in arms for the nation, and in war time, augmented by the reserves, become the active army; Depot troops (Ersatetruppen), who have no existence in peace time, but in war time are formed of cadres supplied from the field troops, and filled up by recruits and reserve men, and whose duty it is to maintain the active army at full strength; and garrison troops (Besatzungstruppen),

principally formed of the landwehr, and existing only in cadre in peace time, but who are embodied and take up the garrison duties and home defence when the active army takes the field, and also occasionally reinforce it.

The field troops consist of —

115 Regiments of Infantry. 14 Battalions of Rifles. 73 Regiments of Cavalry. 14 Brigades of Artillery. 14 Battalions of Pioneers. 14 Battalions Military

Train.

Infantry.—The infantry is classed as guards, grenadiers, fusiliers, and line. The nine regiments of guards are com- posed of picked men, and are in every way troupes d'élite ; four of them are maintained at a special increased peace establishment. The grenadier regiments only differ from the line in name and in some trifling badges, relics of former times. The fusiliers are the representatives of the old light infantry, and are specially intended for outpost duty, skir- mishing, &c. The men are chosen for activity and intelli- gence, and their armament differs slightly, but in organi- sation they are the same as the line. A fusilier regiment is attached to each army corps.

An infantry regiment has three field battalions, of which the third is called the fusilier battalion. A battalion con- sists of four companies, and has a peace strength of 552 of all ranks, and a war strength of 1022. A regiment on war footing numbers 60 officers, 3000 men, 73 non-combatants, with 105 horses and 19 waggons. Besides the three field battalions, a fourth or depét battalion, 1240 strong, is formed on mobilisation. This includes a company of trades- men 200 strong, who are required to supply all clothing, &c., and execute all repairs required by the battalions in the field. The depdt battalion is formed partly of the next contingent of recruits, who are called out at once on mobilisation, and partly of the oldest classes of reserve men, or, if these do not suffice, of the youngest class of landwehr; any men in the field battalions who, from want of instruction or other causes, are not considered fit for immediate service, are.also transferred to the depdt. The field battalions always maintain direct communication with it, and as soon as their losses amount to 10 per cent. of their strength, draw on it for the necessary reinforcements.

The Prussian infantry stands in three ranks on parade, the third rank being composed of picked shots (Schiitzen), who formerly did all the skirmishing. But for drill and manceuvring the common formation is that of company columns, the company being divided into two "Zugs" or subdivisions, standing at six paces' distance, and the third rank being withdrawn and formed into a separate Zug (Schiitzenzug), two deep, in rear of the others. The Prussian drill, which for many years was the model for Europe, has

lately become so again, and since 1866 the company column formation, by which more independence is given to the captains, and greater freedom of move- ment to the battalion generally, has been adepted by most armies.

The Prussians were also the first to adopt the breech- loader, which they used with marked success against the Danes in 1864 and the Austrians in 1866. Up to 1870 they were armed with the needle-gun, the earliest, but pro- bably also the worst, form of breech-loader; but their losses from the French chassepdt convinced them of the necessity of an improved weapon, and the infantry is now being armed with the Mauser riflo The infantiy soldier of the line carries a long breech-loading rifle, with bayonet always fixed, a short sword, and 80 rounds of ammunition; a reserve of 20 rounds per man is also carried in the bat- talion ammunition waggon. Fusilier regiments, and fusilier battalions of other regiments, are armed with a shorter

rifle without bayonet, but carry a sword which can be fixed and used as such when required. The uniform is a dark blue tunic, grey trousers with red stripe, helmet of black leather, with brass ornaments and spike (Pickelhaube), and boots into which the trousers are generally tucked for marching. The different army corps are distinguished by the colour of the shoulder cords. The knapsack is of brown calfskin, rather large, but shaped to fit the back. The belts of grenadier and line regiments are white, those of fusilier regiments black.

Rifles.—The rifles (Jdger and Schiitzen) are not organised in regiments, but form independent battalions, of which the guard corps has two and the other army corps one each. Their organisation, and peace and war establishment, are almost identical with that of a line battalion, but on mobilisation each battalion forms a fifth or depdt company, which performs the same duties as the depét battalion does for the line regiments. They are recruited by picked men chosen throughout the army corps district. Unlike the rest of the infantry, they always stand in two ranks; and they are further distinguished by carrying a short rifle, and by their green tunics with black

belts. The rifle battalions of the guards are mainly recruited from the rangers of the royal forests.

Cavalry.—tThe cavalry consists of 73 regiments, of which 10 are cuirassiers, 26 dragoons, 19 uhlans (or lancers), and 18 hussars. The cuirassiers and lancers are classed as heavy cavalry, dragoons and hussars as light cavalry. The cavalry of the guard numbers 8 regiments, of which 2 are cuirassiers, 2 dragoons, 3 uhlans, and 1 hussars, and are all carefully-picked men.

The organisation and establishments of all cavalry regi- ments arealike. In peace time they consist of 5 squadrons of 4 officers and 135 men each; in war the regiment takes the field with 4 squadrons of 150 meu each, while the fifth squadron remains behind to form the depédt. The total strength of the 4 field squadrons is 677 men and 706 horses, and of the depdt squadron 267 men and 112 horses. The depdt includes an artificers' detachment of 54 men. A cavalry regiment thus requires a very small augmentation in war, and the field squadrons are completed at once from the fifth or depdt squadron, they scnding to it their recruits and untrained or unserviceable horses. Owing to the terms of service usual in the cavalry, the actual pro- portion of "reservists" is much smaller than in the infantry, but they still far exceed the number required to complete the regiments, and accordingly are used to form the staff escort, field gendarmerie, field post and other special corps, and to furnish non-commissioned officers to the military train.

The Prussian cavalry first won its reputation undcr Frederick the Great, and his brilliant cavalry leaders Ziethen and Seydlitz. In the battles of Hohen Friedberg, Rossbach, and Zorndorf the cavalry decided the fortunes of the day, and gloriously verified their old motto—

Wenn alles wankt und schwankt

Dann wage nicht und zahle nicht, dann d'rauf!} In recent campaigns they have more especially distinguished themselves by their intelligence and enterprise as scouts and outposts, covering the movements of their own armies with an impenetrable screen, while constantly feeling the enemy and reporting his movements. But thcir desperate charges at Mars la Tour and Rezonville, where they sacri- ficed themselves to check the enemy and give

breathing- time to their own overmatched and exhausted infantry, will always be classed among the most heroic deeds in the annals of cavalry.

1 “When fortunes are shaking and brave men are quaking, Then stay not and weigh not, but down on the foe!”

[GERMAN.

The light cavalry (hussars and dragoons) are armed with breech-loading carbines and swords. In the heavy cavalry, 16 men per squadron carry carbines, the remainder pistols. The cuirassiers are armed with a long heavy sword (Pallasch), and wear a black cuirass weighing 16 ib, and supposed to be bullet-proof. The uhlans carry a lance and the usual cavalry sword. The cuirassiers use saddlery of the “German” pattern, very cumbrous; the rest of the cavalry use the “Hungarian” saddle. On the whole, the Prussian cavalry ride slightly heavier than the corre- sponding troops in England. Great attention is paid to the selection of horses for the cavalry, and constant efforts are made, by the importation of valuable stallions and brood mares, to encourage the breeding of a suitable class of horses. The remounts are bought by commissions appointed for the purpose, and either sent direct to the regiments, or, if too young for work, to the remount depdts, where they are carefully broken. In war tinic the necessary augmenta- tion is obtained partly by purchase in the market and partly by contracts previously made in peace time. If these measures are not sufficient, the Government has the power of compulsory purchase. For this purpose all the horses in the kingdom are registered and _ periodically inspected, and returns kept of those considered fit for military service. On the order for mobilisation the owners may be summoned to attend with their horses; these are inspected by a military board, who select as many as they require, and take possession at once; and a mixed board afterwards determines the compensation to be given to the owners.

Artillery.—The artillery of an army corps consists of two regiments of field artillery and a regiment of garrison artillery. One of the two field artillery regiments is organised in two divisions (Abtheilung) of four batteries (two heavy and two light) each; this furnishes the divisional artillery, one .Abtheilung to each infantry division. The other consists of three divisions, two of field and one of horse artillery, of three batteries each; and furnishes

the corps or reserve artillery, and the horse artillery, which is attached to the cavalry divisions. A field battery un peace footing has only 4 guns, with 114 men, 37 horses, and 2 waggons. In war time it has 6 guns, with 155 men, 125 horses, and 10 waggons. A horse battery has a war establishment of 6 guns, 154 men, 207 horses, and 10 waggons. On mobilisa- tion a depét division is formed for each army corps, con- sisting of 1 heavy, 1 light, and 1 horse battery, and a detachment of artificers. Further, a Colonnen Abtheilung, consisting of 9 ammunition columns (of which 5 carry artillery ammunition and 4 small-arm ammunition) is formed, and attached to the field artillery. The regiment of garrison artillery is composed of two divisions of four companies each, with a peace strength of 108, and a war strength of 209 men per company.' On mobilisation the field artillery is augmented by men of the reserve, and by men drawn from the garrison artillery regiment; the gar- rison artillery is principally reinforced from the artillery men inthe landwehr. Sometimes the number of companies of garrison artillery is doubled. The Prussian artillery are armed with rifled breech-loading guns of cast steel, the heavy batteries with the 6-pounder gun, throwing a shell weighing about 15 tb; the light batteries and horse artillery with the 4-pounder gun, throwing a 9 fb shell. The extreme range of these guns is about 5000 paces, but their effective range does not exceed 2500. A heavy battery carries 134 rounds per gun, a light battery 157 rounds; and the corps ammunition columns carry a further supply of about 100 rounds per gun.

1 Four army corps have only a division of garrison artillery instead of a regiment,

Pioneers.—Each army corps has a battalion of pioneers, of four companies, of which the first is the pontoon company, the second and third sapper companies, and the fourth the miner company. The men of each company are thoroughly instructed in their own special duties, but know also the duties of the other companics sufficiently to be able to assist if required.

The peace establishment of a company is 146 men. In war time the second sapper,company remains behind, and forms three garrison companies, and a depét company is also formed. The other three companies, augniented to a war strength of 218 men, take the field, and furnish the per- sonnel for a light field bridge train or pontoon train, and an entrenching tool column, which also accompany the army corps. Further, four railway detachments and four field telegraph detachments are formed for the whole army. The railway detachments are formed from the railway battalion, which was organised immediately after the war of 1870-71, and is composed entirely of men trained to the various duties connected with railways, the officers and non- commissioned officers being qualified to act as railway managers, station-masters, &c. On mobilisation they receive their augmentation from reserve and landwehr men who are actually holding these positions on the various lines; and in war time they are charged with constructing, repairing, and working or destroying the lines in an enemy's country. The field telegraph detachments, in the same way, are trained in peace time to everything connected with telegraphy ; in war they carry a light line, which they lay down as required, or work the existing lines.

Military Train.—The train is a mere skeleton in peace time. The battalion which is attached to each army corps is little but a cadre maintained for instructional purposes, and only numbers 240 men of all ranks, while the train soldiers attached to an army corps on war footing amount to 3500. The men are only subjected to six months' training, and by the constant renewal the number passed into the reserve is enormously increased; additional men are drawn from the cavalry reservists. In war time the train battalion is broken up altogether, and forms a nuinber of separate detachments, viz., five provision columns, three ambulance detachments, a horse depdt, a field bakery column, and an escort squadron, to take charge of the five Fuhr Park columns which are organised of hired or requisi- tioned transport. Further, nearly 1000 train soldiers are sent to the various regiments (65 to an infantry regiment, 37 to a cavalry regiment) to drive the regimental baggage train, act as servants to staff and field officers ; 800 to the artillery, principally as drivers, &c., for the ammunition columns; and 300 to the pioneers, forthe pontoon and tool train; and 400 to the various administrative services. The whole of the transport in the Prussian service is depart- mental,—that is, is told off to certain special departments and

duties, and is not available for general service. Thus the regiments have their regimental transport, the artillery their ammunition columns, the commissariat their provision columns, the medical department their field hospital and ambulance train, &e.

Depot and Garrison Troops.—The depét troops have been described in speaking of the field troops whom they have to feed. The garrison or reserve troops have no such immediate connection with the active army, and are almost entirely formed of the landwehr; they are specially intended for home defence and garrisoning the fortresses, but are also used to maintain communications, and relieve the active army of all detachments to its rear, and sometimes, as in the latter period of the Franco- Prussian war, are organised in divisions, and pushed for- ward to reinforce the active army. Every battalion dis-

trict forms a landwehr battalion, and every army corps district forms a reserve rifle company, one or two reserve cavalry regiments, and three reserve batteries, from the landwehr men on its lists. The garrison companies of sappers and the garrison artillery have already been spoken of, and are more closely connected with the active army than the rest of the garrison troops. The officers for the landwehr and reserve regiments are supplied partly from the field troops, partly from one-year volunteers who have qualified, and non-commissioned officers of the army who have retired with the rank of landwehr officers, and partly from the half-pay list. In addition to the forces above named, a certain number of "garrison battalions" are some- times formed from the surplus landwchr men, and some of the Ersatz reserve. This was done in the war of 1870-71 to relieve the depot troops of the garrison duties which had devolved on them in consequence of the landwebr being sent to the front. The organisation and armament of the landwehr are generally similar to those of the field troops, but the infantry wear a broad flat-topped cap instead of the distinctive Pickelhaube.

The total war strength of the 14 army corps composing the Prussian army is

Men. Tlorses. Guns.

Field Troops, 524,335 161,913 1428 Depét Troops, 186,598 17,801 264 Garrison Troops, . 200,552 26,047 246

911,485 205,761 1938

The general organisation of the Prussian army remains the same in peace and war. 'The king is the Com- mander-in-Chief, and exercises his authority through the War Ministry. The War Ministry is divided into a number of departments, of which the principal are the Central Department, which includes the minister's office; the General War Department, which deals with all questions

of organisation, mobilisation, quartering, training, &c., and |

all strategical and purely military questions ; and the Military Finance Department, which deals with all questions of pay clothing, equipment, and supply. Directly under the king and the War Minister come the commanders of the army corps districts into which the kingdom is divided. In peace time each corps command comprises two divisions, a rifle battalion, a brigade of artillery, and a battalion of pioneers and of train; each division consists of two infantry brigades and one cavalry brigade; each infantry brigade consists of two line regiments (exceptionally three) and one or two landwehr regiments ; each cavalry brigade of two or three cavalry regiments. On the order for mobilisation the regiments are completed to war strength, the depots formed, and the landwehr or garrison troops organised. A few slight alterations are made to equalise the army corps (the details of the war strength of which have been already given) to a uniform strength of 25 battalions, and a portion of the cavalry and one or two batteries of horse artillery are withdrawn from each corps to form separate cavalry divisions. The active army then takes the field, with the same organisation and under the same officers, corps and divisional commanders, brigadiers, staff, dec., that they have been accustomed to in peace. .

'The instructions for mobilisation are minute and com- plete. Every year a "paper mobilisation" scheme is drawn up, showing the number of men and

officers required to place every corps and detachment on war footing, and whence these would be obtained, and showing also on what duties the officers and men actually present would be employed. This scheme is completed at the army corps headquarters, and after revision by the War Minister, is approved and promulgated. Every individual thus knows beforehand what would be his duties in case of war, and the pith of the system lies in two short sentences in

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the "Secret Instructions '—' Every person in authority should know in peace what will be required of him on the order to mobilise, and must expect no further orders. All orders which have to be issued are to be kept ready in peace." The steps to be taken on mobilisation are detailed day for day. On the first day the War Ministry acquaints the commanders of army corps and principal military authorities, and also telegraphs dircct to the commanders of landwehr battalion districts, to summon the reserves. On the second and third days the landwehr commanders complete the written summons, which are kept always ready, notifying to each man when and where he is to join; and these are sent out by aid of the civil authorities. The reserves for the field troops are called in first, the landwchr men one or two days later. On the fourth and fifth days the reserve men assemble, and are forwarded to their regi- ments, whence a few officers and non-commissioned officers have been sent to take charge of them. Meanwhile the regiments have formed their depéts, drawn the reserve clothing and equipment from their stores, and get every- thing in readiness to receive their augmentation men. Most regiments are complete and ready to take the field by the seventh day. As soon as the reserve men have all been despatched, the landwehr men are collected, and equipped from the stores at the headquarters of the bat- talion district. The landwehr battalions are mostly com- pleted about the eighth day. The reserve cavalry and some of the administrative departments take a little longer, but in 1870 the mobilisation was so far completed. that the movement of the army corps to the front could be commenced on the ninth day. The commanders of army

corps, divisions, &c., accompany their commands, and are replaced in their local commands by temporary (stellver- tretende) officials.

Appointment and Promotion of Offcers.—The Prussian army draws its officers mainly from the Kleinadel or lesser nobility, corresponding to the country gentry of England. Promotions from the ranks are very rare, and generally carry with them retirement or transfer to the landwehr. A certain number of young men of middle class obtain commissions, but principally in the scientific corps or in the landwehr. First appointments are obtained either from the cadet schools or by entering the ranks as avantageurs. More than one-half the officers enter by the latter system. A young man seeking a commission obtains a nomination from the colonel of a regiment, which admits him to serve as a private, but with recogni- tion of his being a candidate for the rank of officer, and as such he is called an avantageur. He is usually required to sleep and mess with the privates in their barrack-room for the first two months; after that he has more liberty given to him, and is sometimes received at the officers' table. After six months' service, and passing an examina- tion in the subjects of a liberal education, he becomes qualified for promotion to the rank of Porte épée Fihnrich (swordknot ensign), a sort of intermediate position between the commissioned and non-commissioned ranks. After six months' further service in this rank he is sent to a military school for a ten months' course of instruction, at the closc of which he is required to pass an examination in purely military subjects; and then becomes qualified for a com- mission, subject to being accepted by the officers of the regiment as worthy of admission among their number. The career of those youths who enter from the cadct schools does not differ materially from the above. The great majority enter as "avantageurs," and serve their time as already described, only passing the first or ensign's examination before they enter, and being appointed to regiments by the king, instead of obtaining nominations from the colonels. A certain number who pass through

the higher classes of the cadet school enter the army at once as Porte évée Fdhknrich, and serve their probation in that rank only; while a very few, the selecta, who take the highest honours, are given commissions direct.

Promotion in the army depends solely on the will of the king, but in the main is governed by seniority; but exceptions are made in favour of officers of the general staff, who com- monly receive a step of rank on completing a term of duty in any staff appointment, aide-de-camps of higher gencrals, instructors at the cadet and war schools, and officers who have specially distinguished themselves in the field. As a rule, promotion to the rank of captain is by seniority in the regiment, but above that rank by seniority throughout that branch, or by selection. Officers are also freely trans- ferred from one branch to another ; thus, after the battle of Gravelotte, the command of the rifle battalion of the guard was given to an engineer officer. Especial attention is bestowed on the selection of officers for the general staff. These are generaily taken from those who have passed through the War Academy at Berlin, the highest educational establishment in the Prussian army. Candi- dates for admission to this academy must have served at lcast three years with their regiments, must pass a quali- fying examination, aud must be favourably reported upon by their commanders. The course lasts three years, and those officers who give proof of sufficient abilities are after- wards employed for a time on various military works, under the immediate supervision of the chief of the staff, who thus acquires a personal knowledge of the charactcr and abilities of all staff officers. Occasionally officers specially recommended are taken direct from their regiments ; but they are always tested by the chief of the staff before .receiving appointments. The anxious care bestowed on the selection of officers for these important dutics has borne its fruit: the Prussian staff has made itself a world- wide reputation, and to it and to the genius of its chief, Von Moltke, may be awarded a large share in the success of the Prussian arms. 'The army is equally fortunate in its corps of officers generally,—men who unite the power of command and the high qualities of an aristocracy with the most thorough knowledge of thcir profession and devotion to it. The pay of the Prussian officers in the lower ranks is small, usually about half that of the corresponding ranks in the English army, and lower than in most of the Continental ones ; but the higher ranks are well paid, pro- bably better than in any other army, if the relative value of money and cost of living are considered.

The strength of the Prussian system lies in its close localisation and permanent organisation. The first sccures the strongest possible esprit de

corps and the greatest simplicity and speed in mobilising; the second that fanuili- arity of every individual with his position, duties, and surroundings, which is essential to the smooth working of so complicated a machine as a great national army. It is to these, coupled with the careful training, the subordina- tion of everything to the army, and the ever-watchful foresight with which every contingency is studied and provided for beforehand, that the remarkable successes of the Prussian armies are to be attributed, rather than to the excellence of the material or to the special military qualities of the nation. Physically the Prussian soldier is not much if at all above the average. It is true that the guards and some of the regiments from the northern pro- vinces are exceptionally finc, but the army is very un- equal, and men of practical experience have declared the German, as a rule, to be not equal in power or in endurance to the Frenchman.! In quick aptitude for war

1 See the opinion of Mr Brassey, the eminent contractor, quoted in his Life.

the Frenchman has always had the advantage. Generally, where the two have met on equal terms the Frenchman has been victorious ; and even through the disasters of the late war, impartial witnesses have asserted that, man for man, the Frenchman was the better. But such natural qualities as the Prussian soldier possesses have been developed to the utmost by a civil education superior to that of any other nation, and by a military training, physical as well as mental, which may well serve as a model to all armics. He is docile, temperate, simple in his tastes and aspirations ; and though not so demonstrative as his French neighbour, and with no fanatical enthusiasm, has a deep love of his country and loyalty to his king. If not easily excited to heroism, neither is he easily discouraged. No Englishman can forget that memorable march, when the Prussian army, unshaken by the disaster of Ligny, undeterred by the difficulties of the road or the enemy thundering in their rear, pushed on with indomitable encrgy through all obstruc- tions to succour their hard-pressed allies at Waterloo. The Prussian army, more than any other, is the élite of a nation ; and so long as the nation consents to submit to the burdens of her present military system,

and her affairs are guided by chiefs as able and far-secing as her present rulers, she will hardly forfeit the position she has won as the first military power of Europe.

Saxon Army.

The kingdom of Saxony, with a population of 2} millions,

furnishes one strong army corps (29 battalions of infantry and 6 regiments of cavalry) to the German army. The

Saxons were long renowned as a warlike race, and played a prominent part in all the wars of Northern Europe; and

her princes twice mounted the throne of Poland. At the

outbreak of the wars of the French Revolution she inain- tained an army of over 30,000 men, and at first sided with Prussia. After the disasters of Jena and Auerstadt she

allied herself with France, and for some years furnished a

contingeut to the armies of Napoleon, who in return recog- nised her elector as king, and largely increased his terri- tories. The newly-made king remained faithful to Napo- leon even in his reverses; but the army was too German in feeling to fight willingly under the French flag. In 1809 they did not distinguish themselves at Wagram, and their defection at Leipsic contributed not a little to the results of that bloody day. After the peace the king retained his title, though shorn of a great part of his dominions, and the army was reconstituted on a smaller scale. In 1866 Saxony sided with Austria, and her army shared in the disasters of that brief campaign and the crowning defeat at Koniggratz. At the close of the war she was compelled to ally herself with Prussia, and, as part of the North German Confederation, to place her military forces at the disposal of the Prussian monarch. In 1870 and 1871 her troops, under the command of the crown prince (now king) of Saxony, formed the 12th corps of the great German army, and bore their share in the battles of Gravelotte and Sedan and in the siege of Paris. Her army is organised in every respect as a Prussian army corps, and is

under the command in chief of the German cmperor, who, in concert with the king of Saxony, names the officers for the higher commands. She retains, however, her separate War Ministry, budget, &c.; and appointments and promotion to all but the highest commands are made by the king of Saxony. The Saxon troops fought well in the late war between Germany and France. In appearance they are smarter than most of the German troops, and have a certain resemblance to the English; but their uniform and equipment are assimilated in all respects to the Prussian.

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Bavarian Army.

The kingdom of Bavaria, with a population of a little under five millions, furnishes two army corps to the German army. Like Saxony, Bavaria, originally an electorate, was enlarged and made into a kingdom by Napoleon. Under the command of Marshal Wrede, a distinguished Bavarian, her troops fought side by side with the French through the campaigns of 1805 to 1812, but in 1813 she seceded and joined the Alliance, and attempted to intercept the French on their retreat from Leipsic. Napoleon, however, inflicted a severe defeat on his old general at Hanau, and opened his road to France. In 1866 the Bavarians took part against Prussia, but owing to their dilatoriness in taking the field, the Prussians were able to beat them in detail, nor did their generals or troops shine in this war. In 1870, however, they joined their former enemy in the war against France, and bore their full share in the glories and losses of the campaign, the second Bavarian corps having suffered inore heavily than any but the third Prussian corps. Her army has now been assimilated to that of Prussia in most respects, but still retains certain distinctive peculiarities of dress and equipment, such as her old light blue uniform, and helmet with black plume.

Wiirtemberg Army.

Lastly, Wiirtemberg, with a population of a little under two millions, furnishes one army corps, organised, clothed, and equipped in all respects like the Prussian army. Like the Bavarians, the Wiirtembergers fought against the Prussians in 1866, but in 1870 made common cause with them

against the French, and by the convention entered into the following year, placed their army permanently under the command of the Prussian king asemperor. The emperor nominates to the highest commands, but the king of Wiirtemberg retains the nomination and appointment of officers in the lower grades.

The total military forces of the German empire (war strength) are shown in the following table :—

Offieers and

Field Troops. Nick Horses. Guns. Infantry—148 Regiments…..... 453,731 15,540 3 — 26 Rifle Battalions…. 26,756 754 Cavalry—93 Regiments…..... 62,234 63,932 a Artillery—18} Brigades…..... 68,321 64,250 | 1800 Kngineers—18 Battalions…..... 15,457 3,221 "ist Train—18 Battalions…....»..- 36,315 43,386 Staff and Administration …..... 14,029 13, 404 Total Field Troops…..... 676,843 | 204,587 | 1800 Menotelnoowspectern1-.cseer oe 242,979 18,989 342 Garrison Troops!..... 431,869 34,522 318 Grandehotale.ccsssee 1,251,691 | 258,098 | 2,460

But even this does not represent the entire force at the disposal of the empire in war. More than 100,000 trained soldiers still remain available; while the Hrsatz reserve of men untrained, but registered, and ready to be drafted into the depdts, raises her total to over two millions of men.

Frencu ARMy.

From the earliest times the inhabitants of Gaul were distinguished for bravery and enterprise. First as enemies and afterwards as subjects and auxiliaries, they played an important part in the great wars of Rome; and though they yielded to the irruption of the Franks, the admixture

1 Of these garrison troops, about 165,000 infantry, 10,000 cavalry, and 156 guns are available as reinforcements to the field troops.

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of races seemed only to heighten the warlike spirit of the nation. Under Charlemagne, and, later, in the Crusades, and under Philip Augustus and St Louis, the chivalry of France especially distinguished itself. The excessive power and independence of the great vassals, however, long pre- vented the formation of any permanent national force, and made France a prey to intestine wars and foreign inva- sions. Charles VII. availed himself of the lull which followed the final expulsion of the English in the middle of the 15th century to organise his compagnies d'ordonnance, and thus laid the foundation of a national standing army. But the armies that followed the kings in their wars still consisted mainly of foreign mercenaries, hired for the occa- sion ; and the creations of Charles and his successors fell to pieces during the religious wars. Louvois, War Minister of Louis XIV., was the true creator of the French royal army. On his accession to power, the king's guards, some squadrons of gendarmerie, and a few infantry regiments (afterwards distinguished as the "old"), constituted the whole of the standing army. All other forces had to be created at the outbreak of a war, being usually raised under contracts allotted to generals and others. Louvois first transferred the army from the hands of contractors and speculators to those of the king. He abolished the arriére-ban, and substituted a money tax for the liability to service, thereby obtaining funds for the maintenance of a regular army. In 1672, after ten years of his administra- tion, Louis XIV. was able to take the field with a force of 91,000 infantry, 28,000 cavalry, and 97 guns, all perma- nently organised troops, the largest national army that had yet been seen; and six years later the military forces of France had been raised to nearly 280,000 men. he last half of the 17th century is a brilliant period in the annals of the French armies. Organised by Louvois, animated by the presence of the great king, and led by Condé, Turenne, Luxembourg, Catinat, and Vendome, they made head against coalitions which embraced nearly all the powers of Europe, and won a series of victories that ex- tended the bounds of France, and made her for a time the first military nation of Europe. But after the death of Louis XIV. the French army gradually deteriorated. In the Seven Years' War it was disgracefully defeated. Under the reign of Louis XV. confusion and maladministration prevailed everywhere, and the highest idea of military art was to copy servilely every minute detail of the Prussian army.

‘The higher officers, usually nobles about the court, seldom went near their regiments ; and Madame de Genlis relates how, when young courtiers departed to join their regiments for a few weeks’ duty, the ladies of the court decked them with scarfs and favours, as if proceeding on a distant and perilous expedition.

Under Louis XVI. the army improved somewhat; the American war and the successes of Lafayette and Rocham- beau revived a more warlike spirit ; instruction was more carefully attended to, a good system of drill and tactics was elaborated at the camp of St Omer, and attempts made to reform the administration. But the Revolution broke over France in the midst of these attempts at reorganisa- tion; the old royalist army disappeared with the monarchy, and was merged in that revolutionary army which under a new flag was destined to raise the military fame of France to its greatest height.

If Louvois was the creator of the royal army, Carnot was so of the revolutionary army. At the outbreak of the Revolution the royal army consisted of 105 infantry regiments of 2 battalions each, 14 rifle battalions, 7 regr ments of artillery, and 62 regiments of cavalry, numbermg about 173,000 in all, but capable of augmentation on war strength to 210,000. To this might be added a provincial or militia force of about 60,000, but nominal rather than

real, At the very outset it was deemed necessary to reorganise and augment this army. Voluntary enlistment under the system of racoleurs or “ bringers,” by which the army had hitherto been fed, was found insufficient. ‘Compulsory service” was proposed in 1789, but rejected as “contrary to the liberty of the citizen.” An appeal was then made to the patriotism of the nation, and 200 bat- talions of volunteers were enrolled; but though many presented themselves, and these volunteers contained much of the best blood and highest intelligence of France, the numbers fell far short of the expectations, and the pro- portion that reached the frontier was small. In the winter of 1792-3 the French armies, notwithstanding the unex- pected successes of the preceding campaign, seemed on the point of dissolving

altogether, and the Convention was driven to order a compulsory levy of 300,000 men.

To eradicate the royalist element from the army, the old regiments were broken up and amalgamated by battalions with the volunteers ; aud the name even of "' regiment" was abolished. Promotions were made, not by seniority of rank, but length of service; thus an old sergeant succeeded to the command of a regiment over the heads of all the captains, In August 1793 the affairs of France were at their lowest ebb. Its armies had been driven from the Rhine and out of Belgium, and a dangerous insurrection had broken out in La Vendée. The compulsory levy, slowly and imperfectly carried out, had not yielded the full number ; and those that were obtained deserted by hundreds. The nominal strength amounted in all to 480,000 men, but one army with a paper strength of 90,000 had really only 33,000 in the ranks, and the others were little better. Under the new system of promotion commands changed almost daily, and fell into the hands of men who had never before been entrusted with more than a section; and confusion reigned everywhere.

Such was the position when Carnot, then a captain of engineers, was called to the Ministry of War. A few days later a levy en masse of all the male population between the ages of 18 and 25 was ordered, and was carried out with more method and success than former levies. The muster- rolls of the armies filled rapidly, and by the end of the year the effective force had risen to 770,000. The amalgamation of the old army and the volunteers, which had been com- menced, but imperfectly carried out, was effected on a different and more thorough principle ; the white uniform distinctive of the old days of royalty was abolished, the infantry organised in demi-brigades of three battalions (usually one of the old army to two of volunteers), and the men and cadres intermixed within the demi-brigade. A permanent organisation in divisions, composed of all arms, was introduced, and able officers selected for the com- mands. Jourdan, Hoche, Pichegru, Kleber, Moreau, were at the head of the armies of the republic. Arsenals and manufactories of warlike stores were created, schools of instruction were established; the republican forces were transformed from hordes to armies, well disciplined, organ- ised, and equipped. The enemies of France were defeated at all points; and in tracing the plan for the campaign of 1794

Carnot showed that his genius shone in strategy as much as in administration. 'Twenty-seven victories, of which 8 in pitched battles, 120 combats ; 80,000 enemies hors de combat; 91,000 taken prisoners ; 116 fortresses or important towns taken, 36 of them after siege or blockade ; 230 forts or redoubts carried ; 3800 guns, 70,000 muskets, 1900 millions of powder, and 90 colours captured ;"—such was the account Carnot was able to give of eighteen months of office; and at the close he returned to his duty as a simple major of engineers. Andeven this did not do justice to all he had effected. Himself of an almost Roman type of character,—severe, but a true patriot and republican,- -he

had succeeded in infusing much of his own spirit into the army ; he had given it not merely discipline aud organisa- tion, but honour and soldierly feeling When Moreau promulgated to his army the decree of the Convention, which forbade them to give quarter to any Englishman or Hanoverian, he added, in general orders, "I have too high an opinion of French honour to believe that such an in- struction will be obeyed ;"—and he was right.

In the year 1796 Napoleon appeared on the scene, and by a series of brilliant victories enlarged the frontiers of France and secured a glorious peace. But the exhaustion of years of continuous warfare had made itself felt: the armies were reduced to mere skeletons, and no sufficient means existed of replenishing them, till in 1798 the con- scription was introduced. From that time there was never a dearth of men: the whole male population of France was practically at her ruler's disposal ; and Napoleon had full scope for his genius in organising these masses. His principal improvements were effected in the interval between the peace of Amiens and the war with the third coalition, while threatening the invasion of England. His armies were collected in large camps on the coasts of the Channel, and there received that organisation which, with minor variations, they retained during all his campaigns, and which has since been copied by all European nations. The divisions, as organised by Carnot, consisted usually of two brigades (twelve battalions) of infantry, two regiments of cavalry, and two

or three batteries of artillery. This was a great improvement on former organisation, and worked well in the comparatively small armies which then took the field. But in large armies of 150,000 men and upwards the number of isolated commands was too great. Further, it had been found by experience that the very completeness of the divisional organisation—each division forming a miniature army complete in all branches—tended to exces- sive independence of action on the part of the divisional commanders. Napoleon therefore grouped two or three divisions into corps d'armée, commanded by marshals. He withdrew the whole of the cavalry and a portion of the artillery from the divisions, and with the light cavalry and batteries so obtained formed a reserve corps under the immediate orders of the corps commander; while he kept the whole of the heavy cavalry, amassed in cavalry divisions, his guards, and a certain proportion of artillery, in his own

} hands, as a reserve to the whole army. Thus was organised

that "grande armée" which immortalised itself at Ulm, Austerlitz, Jena, Friedland, Wagram, and Borodino; and after planting the tricolor on every capital of Europe, perished at last in the snows of Russia.

The frightful expenditure of life during Napoleon's wars almost drained France of her manhood, and his frequent calls on the country made the name of the conscription detested. One of the first acts of the Restoration was to abolish it, and return to voluntary enlistment ; but it was soon evident that this means of recruiting no longer sufficed, and within three years compulsory service had to be again resorted to. In 1818 the annual contingent was fixed at 40,000, and the period of service at six years; in 1824 the contingent was increased to 60,000, and in 1832 to 80,000. Of this, however, a part only, according to the requirements of the service, were enrolled; the remainder were sent home on leave or furlough. Up to 1855 certain exemptions were authorised, and substitution or exchange of lots amongst young men who had drawn was permitted, but the individual drawn was obliged either to serve personally or find a substitute. In 1855 the law of "dotation" or exemption by payment was passed, and put an end to personal substitution. The state now undertook to provide substitutes for all who paid a fixed sum, and

did so by high bounties to volunteers or ae for re- : =a

engaging. Although the price of exemption was fixed as

high as £92, on an average 23,000 were claimed annually, and in 1859 as many as 42,000 were granted. 'Thus gradually the conscription became rather subsidiary to voluntary enlistment, and in 1866, out of a total establish- ment of 400,000, only 120,000 were conscripts. Changes had also taken place in the constitution of the army. On the Restoration its numbers were reduced to 150,000, the old regiments broken up and recast, and a royal guard created in place of the old imperial one. When the revolu- tion of July 1830 had driven Charles X. from his throne, the royal guard, which had made itself peculiarly obnoxious, was dissolved ; and under Louis Philippe's reign the army was augmented to about 240,000 with the colours. Under the Provisional Government of 1848 it was further in- creased, and in 1854, when France allied herself with England against Russia, the army was raised to 500,000 men. 'The imperial guard was re-created, and every effort made to revive the old Napoleonic traditions in the army. In 1859 Napoleon III. took the field as the champion and ally of Italy, and the victories of Montebello, Magenta, and Solferino raised the reputation of the army to the highest pitch, and for a time made France the arbiter of Europe. But the campaign of 1866 suddenly made the world aware that a rival military power had arisen, which was prepared to dispute that supremacy. From this time a trial of strength between France and Prussia was looked forward to as inevitable, and both sides prepared for the coming struggle. Niel, the then War Minister of France, saw clearly that the organisation which had with difficulty maintained 150,000 men in Italy, was no match for that which had within a month thrown 250,000 into the very heart of Austria, while waging a successful war on the Maine against Bavaria and her allies. In 1867, therefore, he brought forward a measure for the reorganisation of the army, by which he calculated to raise the military force to 800,000 men—-half of them with the colours and half in reserve—besides forming a separate army for home defence in case of need. It is not necessary to dwell on the law of 1868, for it remained but two years in real operation. To complete Niel's scheme many years were required ; but

Niel himself died within a year, and the next year saw the French army annihilated, or existing only as prisoners of war in Prussia.

At the outbreak of the great Franco-German war the French field troops consisted of 368 battalions, 252 squadrons, and 984 guns. The strength of the entire army on peace footing was 393,000 men; on war footing, 567,000. The forces immediately available for the war on the Rhine were estimated at 350,000, but they actually fell short of 300,000. They formed 8 corps d'armée, each composed of from two to four infantry divisions and one cavalry division,—making a total of 26 infantry divisions of 13 battalions each, 11 cavalry divisions of from 4 to 7 regiments each, and 756 guns. Within seven weeks the whole of this army, with trifling exceptions, was. either captive in Germany or hopelessly shut up in Metz. But the spirit of the nation rose to the occasion, and though, as the result proved, extemporised armies can do little against veteran ones, the efforts of the people and the creative energy of her rulers will always command admiration. The next year's contingent of recruits was called out and hastily trained. Fourth battalions were formed from the depdt cadres, and organised into régiments de marche. The gardes mobiles were mobilised, and by successive decrees and under various names nearly all the manhood of the country called to arms.

The regular troops raised as régiments de marche, &c., amounted to 213,000 infantry, 12,000 cavalry, and 10,000 artillery. The garde mobile exceeded 300,000, and the

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mobilised National Guard exceeded 1,100,000—of whom about 180,000 were actually in the field and 250,000 in Paris ; the remainder in camps or depdts. new formations amounted to nearly 1,700,000, and if to that be added the army existing at the beginning of the war, the total forces developed by France during the struggle reach the enormous amount of 24 millions.

[PRENCH:

Altogether the

The reorganisation of the army took precedence of all

other questions when the conclusion of peace with Germany

and the suppression of the communist revolt gave rest once _

more to the country. By the law of recruiting of 1872 compulsory personal service was introduced, and substitu- tion or purchase of exemption was abolished. The period

of liability was fixed at twenty years—five years of the

time to be passed in the regular army, four years in the

reserve of the regular army, five years in the territorial army, and six in the reserve of the territorial army. The annual contingent is not a fixed one, or determined by the actual requirements of the army, but includes all capable of bearing arms ; certain exemptions in favour of only sons of widows, sole supports of families, teachers, and theo- logical students excepted. But as the peace establishment, governed by financial considerations, would not admit of re- taining the whole of five years' contingents with the colours, it was provided that the contingent should be divided by lot into two classes, the first to serve the full five years, the second to be sent home after six months' or a year's

training. One-year volunteers are admitted on conditions

similar to those existing in Prussia. In the calculations on which the law was based it was estimated that about 300,000 annually came of age, of whom about one-half would be rejected as unfit, or exempted on personal or

family grounds. Of the remaining 150,000, one-half would

serve for the full five years, the remainder for six months or a year only; and the peace army would thus comprise four yearly contingents of 75,000 and one of 150,000. Deducting the one-year volunteers, a percentage for casual- ties, and the men of the fifth year who would usually be sent home

on furlough, the remaining four classes give about 350,000; and adding 120,000 to this for the per- manent part of the army, the total of 470,000, being the proposed peace establishment, is obtained.

The organisation of the army was made the subject of a separate law passed in 1873. 'The land forces are divided into the active army and the territorial army or landwehr. The active army consists of 18 corps d'armée, besides a special corps for service in Algeria ; each corps is composed. of two divisions of infantry, a brigade of cavalry, a brigade of artillery, a battalion of engineers, and a squadron of the military train, and retains its organisation permanently in peace and war. The total strength of an army corps is about 40,000 of all ranks, or about 30,000 combatants, with 108 guns. The country is divided into 18 "regions," and each region has always a corps stationed within it, and is provided with magazines and stores of all sorts required to equip the corps for the field, and to furnish out the depot and territorial army as well. The army corps are not per- manently localised, but are moved from district to district ; and on mobilisation they draw their reserves and stores from the districts in which they happen to be stationed. Recruiting is partly general and partly regional; those recruits who are drawn for five years being distributed throughout the army, while those who have to serve one year only are attached to the corps stationed in their dis- trict. For recruiting and for purposes of mobilisation the "regions" are subdivided, each subdivision compris- ing one or more recruiting offices, in which the recruiting lists, as well as the registers of all furlough or reserve men, and men belonging to the territorial army, are kept. As a rule, each such office corresponds to a battalion of the

line, and has from 2000 to 3000 names on its books. The general commanding an army corps has under his orders all military forces (territorial or rescrve trocps as well as active) and establishments within the district. He is assisted by a staff divided into two sections, of which the first or active part accompanies the active army on mobilisation, while the second or territorial part is per- manently attached to the district, and is specially charged with recruiting, remounts, and all local affairs, and remains stationary on mobilisation. No general can hold the com- mand of

an army corps for more than four years, At the head of each subdivisional recruiting office is placed an officer of rank corresponding closely to the landwehr bat- talion district commander in Prussia. All soldiers of the active army, reserves, or territorial forces who are living at their homes, under whatever conditions, and are domiciled within his subdivision, are under his orders. The territorial army exists in cadre only in peace time ; but its cadres are always formed and its organisation established. It is officered by retired or half-pay officers and one-year volun- teers, or old non-commissioned officers who, on completing their army service, have qualified as officers of the territorial army. 'The reserve of the territorial army is not called out except in case of absolute necessity, and then by classes beginning with the youngest.

The military forces of France under the new laws are estimated as follows, allowance being made for casual- ties :—

Active army (5 classes), ...ceseecesseeeeeees 705,000 Reserve of active army (4 classes),..... 510,000 Temporary exemptions, ...seeeeeeee serene 141,000 Permanent part of army, ...eseseereeeee eee 120,000 Total of active forces, ... 1,476,000 Territorial army— 5 elamaes, torgamised,,.....6 cise sesseescoeee 582,000 6 classes (reserve), not organised, ... 626,000 ole PPAR Rois 1,208,000

In estimating the numbers available for the active army, however, deductions must be made for the last class of recruits (150,000) and the tenporary exempts (141,000), who are untrained, and for a number of non-cffectives, estimated at from 150,000 to 200,000, which would reduce the total to about 1,000,000. Aud further, in comparing these numbers with those of the German army, it must be borne in mind that, whereas almost every man on the German lists has received his three years' training, nearly one-half of the French army is composed of men who have served a year or less with the colours. The peace establish- went of the French army is fixed at 450,000; the war establishment of the field army, exclusive of depdts and garrison troops, at 780,000.

The French field army now (1874) numbers 496 battalions of infantry, 380 squadrons of cavalry, and 380 batteries ; being 126 battalions, 56 squadrons, and 158 batteries in excess of its strength at the outbreak of the

war of 1870. The imperial guard has been broken up, and its soldiers distributed throughout the army. Of the creations of the war, the mobilised national guard has been disarmed and dis- solved; the gardes mobilessent home, but inscribed as reserve of the army; and the régiments de marche have been partly disbanded, partly amalgamated with the regiments from whose depots they had been formed. The infantry consistsof 144 line regiments, each of 3 active and 1 dep5dt battalion ; 4 regiments of Zouaves and 3 of Turcos, each of 4 ficld battalions and a weak depét ; 36 rifle battalions (chassewrs) of 6 field and 2 depdt companies each ; a foreign regiment ; and 3 battalions of Algerian light infantry (“‘ Zephyrs ”). The peace establishment of a regiment of the line is about 2000; the total strength of the infantry, 298,000.

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The cavalry consists of 12 regiments of cuirassiers, 26 of dragoons, 12 of hussars, 20 of chasseurs-a-cheval, 4 of chasseurs d’Afrique, and 3 of Spahis. Notwithstanding the reputation which the Prussian uhlans had acquired in the war, one of the first acts of the French Government was to abolish the lance, and transform the old lancer regiments into dragoons. Hach regiment consists of 5 squadrons, 4 of them field and 1 depdt, and numbers about 900 men and 800 horses; the total strength of the cavalry is 58,000 men and 50,000 horses.

The artillery consists of 38 regiments, of which 19 have each 10 field batteries, and 19 have 6 field and 4 horse- artillery batteries, The battery has six guns. The artillery further comprises 30 garrison batterics, a regiment of ponto- niers, 15 companies of artificers, and 2 regiments of artillery train. The total peace strength of the artillery is 45,000 mien and 24,000 horses,

The engineers consist of a staff of 462 officers and 570 men, and 3 regiments, forming 48 companies of sappers, 6 of miners, and 3 of engineer train. These are ultimately to be formed into 19 independent batteries.

The key to the French military character, its strength and its weakness, is well given by one of their own writers, Blondel :—“ We love the roll of the drum, the coquetry of uniform, the roar and tumult of battle; but obedience

is burdensome to us,—it is strange to our character and to our time. The ruling spirit of criticism is injurious to discipline, and too often the study of duties is overlooked in the study of rights. The warlcke spirit of the ancient Gauls has remained as an inheritance to their descendants ; but notwithstanding the fame which our arms have achieved in all epochs of our history, the true military spirit is rare in France." This warlike spirit, which the French possess perhaps beyond any other nation, is a matter of race and temperament; the military spirit is the result of a nation's training, and in that the French have been singularly unfortunate. From the time that the Franks, fourteen centuries ago, subdued the original Gallic or Celtic popula- tion of France, the nation was divided into two sharply- defined classes, the conquerors and conquered. The former alone were warriors and free; the latter were mere serfs condemned to till the ground and labour. The Frank chivalry was renowned through Europe; but the peasant was perhaps the most abject of his class, This it is that explains the difference between the helpless crowds of foot- men that followed the French nobility to battle, and seemed only brought there to be slaughtered, and the sturdy British archers who formed so important an element of strength in the English armies. Hence also the difficulty found in raising an efficient national infantry ; as their own king, Francis I., says in his manifesto to the German princes—" We have in our land no foot soldiers, because our ancestors trained our peasantry to agriculture rather than war." Even in the days of Lonis XIV. and Louis XV. the foreign troops amounted to onc-third or one-fourth of the army, and formed distinct corps, usually receiving higher pay. The brilliant feats of arms that gave such préstige to the French name were mostly performed by her gay and gallant aristocracy. It was the ' Maison du Roi" who seized Valenciennes in broad day by a coup de main, who decided the battle at Steinkirk, who broke the column of Fontenoy. The common soldiers were canaille, separated by an infinite gulf from their officers. All this was changed by the great Revolution. The former slaves became masters, but they had had no training to qualify them for freedom, and that "law-abiding" spirit that marks the German and Anglo-Saxon races was wanting inthem. The old warlike spirit was revived and stimulated by the enthusiasm of newly-acquired liberty ; and Napoleon knew how to turn to account the admirable material he found to hand. But

while he knew better than any one how to stimulate this martial ardour, he did nothing to raise the tone of the army or inculcate a sense of duty. Glory and rewards were the two levers of action he trusted to; and the extravagant "dotations" bestowed on all occasions on his followers did much to create that mercenary spirit that has ever since tainted the army. To the French soldier war means glory, promotion, plunder: if these are not immediately attainable, he becomes impatient, and blames his leaders. Physically the Frenchman is smaller than the German or Englishman, but is usually better formed about the hips and lower limbs, more active, and more enduring. Mr Brassey, the great contractor, ranks him next after the Englishman and before the German for power of work. Of a gay, volatile, excitable temperament, he has always distinguished him- self by impetuosity in attack, but has not shown equal constancy and perseverance in maintaining the contest. A brilliant offensive brings out all his best qualities; he has a natural aptitude for war, a quick eye to seize the situa- tion, and the furia Francese has become proverbial; but on the defensive he becomes impatient and discouraged, and he is soon demoralised by defeat and disaster. It is then, when discipline and duty alone hold men together, that the want of the true mzletary spirit makes itself felt, and till this is created in France, even her most brilliant successes must be uncertain and transitory.

AUSTRIAN ARMY.

The imperial army of Austria may be said to date from the Thirty Years' War. Long before that, Maximilian I. had established a corps of "kyrisser" (original of the modern cuirassiers), and taken into his pay a considerable force of '"Jandsknechts," the early German infantry. But the latter were companies engaged for the war only, and dis- banded at its termination; and it was not till the reign of Rudolph Il. (about 1600) that any permanent regiments were formed. Even these can hardly be counted as be- longing to the imperial army, for the men composing them were only indirectly subject to the sovereign, and really obeyed their own chiefs, who could transfer their services to other powers. It was Wallenstein who first raised a distinctly imperial army of soldiers owing no duty but to the sovereign; and it was the suspicion that he intended to use this army, which was actually

raised largely at his own expense, to further his own ends, that led to his assassination. From that time the regiments belonged no longer to their colonels, but to the emperor; and the oldest regiments in the present Austrian army date from the Thirty Years' War. At the close of the war Austria had 19 infantry and 7 cavalry (6 cuirassier, 1 dragoon) regi- ments. Half a century later her forces had increased to 40 regiments of infantry and the same of cavalry; and in 1809, when she put forth her whole strength for the great struggle with Napoleon, she had 61 infantry regiments (46 German and 15 Hungarian) and 45 of cavalry. Up to the beginning of this century, her armies were recruited almost entirely by voluntary enlistment; but, like all the other powers, she was compelled to follow the example of France, and have recourse to the conscription during the great Revolutionary wars. During the half-century which intervened between the final overthrow of Napoleon and her struggle with Prussia for supremacy in Germany, various minor alterations were introduced, but in the main her military system remained as it was at the close of the great war. The conscription continued in force, the period of service being fixed at ten years, eight of them in the ranks and two in the reserve; unlimited furloughs, how- ever, were largely granted, and the actual service in the ranks scldom exceeded six years, and was often reduced to

two or three in the infantry. The disastrous war with Prussia in 1866, and the new constitution finally granted in 1867, led to an entire revision of her military institu- tions in the following year, and her present organisation is based on the law of 1868.

The armed forces of Austria consist of the standing army, which in peace time, on a reduced footing, serves as a school for training the nation to arms, and in war time, completed by its reserves, forms the field army; the landwehr, which in war time acts as a support to the field army and provides for home defence; the rsatz reserve, from which casualties in the field army are replaced; and the landsturm, a national levy only called out to resist invasion. The war establishment of the standing army is fixed at

800,000; the peace establishment varies, being governed by financial considerations, but is usually about

250,000.

Every male citizen capable of bearing arms becomes liable to military service on completing his twentieth year. Exemption by payment, or by providing a substitute, is not allowed; and those who are exempted on physical grounds are required to pay a sum of money, proportioned to their means, into the military pension fund. Tem- porary exemptions are, however, granted, as in other armies, to only sons of widows and others who are the sole supports of families. The period of service, or liability to service, lasts for twelve years. The annual contingent of young men passed as fit for service is divided by lot into three classes. The first form the standing army, and serve for three years in the ranks, seven in the reserve of the army, and two in the landwehr. The strength of this first class is determined by the annual requirements of the army, and was fixed at 95,000. The second class forms the " Ersatz" reserve, or reserve for recruits of the standing army. 'They are not trained at all, but for ten years remain liable to be called in in case of war to fill the depdts and replace the casualties of the field army. The total strength of the " Ersatz" reserve may not exceed that of one year's contingent for the active army; the annual "Ersatz" reserve contingent is therefore fixed at ~jth of this. The third class, including all who are not drawn for the two preceding ones, are passed at once into the landwehr, in which they serve their twelve years. The organisa- tion of the landwehr varies in the different provinces. Austria, as far as its military institutions are concerned, is divided into four distinct provinces, viz., Austria proper, Hungary, Tyrol and Vorarlberg, and the military fron- tier. The landwehr of these provinces are distinct, and cannot be moved out of their own provinces except by authority of the Reichsrath or central parliament. Most of the landwehr are trained for eight weeks on first joining, and fourteen days annually afterwards. The Hungarian militia, or "honveds," as they are called, are better trained than the others. Apparently with the object of providing a more distinctly national force, the Hungarian diet has made arrangemeuts by which one company of each regi- ment is kept permanently embodied for instruction pur- poses, so that every man shall have a full year's training. The landwehr also includes the

men who have completed their ten years in the army and reserve, and have to serve for two years in the landwehr. These are intended to provide a steadying element of old soldiers; but as many of them have only actually served two years in the ranks, and been away from their colours for eight, their value is doubtful. The number of young men coming of age and fit for service amounts to 140,000 to 150,000 annually, Of these, 95,000 are passed into the army, and about 10,000 into the " Ersatz" reserve; and the balance, averaging about 40,000, into the landwehr. The landwehr thus comprises two years' contingents of old soldiers (which, after deduc-

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tions, may be estimated at about 150,000), and twelve years' contingents of about 40,000; or a total, after allow- ing for casualties, of between 500,000 and 600,000. The actual organisation, however, only provides for incorporating about one-third of this number. Service in the landsturm is voluntary, except in Tyrol, where all the male popula- tion capable of bearing arms are enrolled, and divided into two classes; the first including all between 18 and 39 who are not actually serving in the army or landwehr, the second those between 30 and 45. All liability ceases at the age of 45.

The standing army consists of—

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Establishment. Establishment. 80 Regiments of Infantry, ...+++5+149, 720 485,440 40) Battalions'of RUTES, <2... sos. coees ee. 19,860 58,430 Total Infantry,.....0.e000- 169,580 543,870 41 Regiments of Cavalry, ...s:.ss0e0— £4,000 58,670 13 Regiments Field Artillery, ... 19,210 41,870 12 Battalions Garrison, ...c:ceceeseseeees 7,790 18,910 Utouell esablerny " Eoncocnsnesonen 27,000 60,780 2 Regiments of Engineers, .../del>-+ 5,710 16,350 1 Regiment of Pioneers, ... s-+++++ 2,800 7,750 72 Squadrons of Train,

~~.....s.eseeeeeeeeees 2,600 30,900 Engineers and Train, ... Leno 55,000 Miscellaneous Establishments, ... 28,860 33, 760 GramdeMo tale: ..cccc: se.-c-005ee 275,550 752,080~~

with 644 guns on peace establishment, and 1600 on war establishment. There is no special corps of guards, as in the Prussian and Russian armies; the "imperial and royal guards," which include the archers of the body-guard, the palace guard, the Hungarian crown guard, &e., only number 600 in all; and their duties are cere- monial and police rather than combatant.

Infantry.—An Austrian infantry regiment consists of 5 field battalions of 4 companies each, and 1 depdt battalion of 5 companies. In peace time the first three battalions are maintained on a peace establishment of 386 of all ranks, the fourth and fifth on a reduced or cadre establishment of 300, and the depdt battalion in cadre only (21 officers and non-commissioned officers). The first three battalions are mobile, their stations being determined by the ordre de bataille; and they are always under the immediate command of the colonel of the regiment. The fourth and fifth and depét battalions remain permanently at the headquarter station of the regimental recruiting district, and are under the command of a colonel or lieutenant-colonel (regimental second in command), called the reserve commander, who is also head of the recruiting district, and charged with all duties connected with the annual conscription, calling out of reserves, &c. The captain commanding the depdt battalion acts as his assistant in these duties. The staff of the depdt battalion conduct all business relating to the muster-rolls and registers of reserve and furlough men, and have custody of the augmentation stores of clothing, arms, ammunition, &c. Its own muster-roll is composed mainly of men who, after an eight weeks' train- ing, have been sent on furlough, but held ready to fill vacancies occurring in the field battalions. The annual contingent of recruits is distributed among the five field battalions, and trained at their headquarters. In war time the five field battalions are raised to a war strength of 952 of all ranks, and the depét battalion to 1155, by calling in the reserve and furlough men.

Tf the field force is still found insufficient, a sixth field battalion may be formed from the first four companies of the dept battalion; and the fifth d2pé6t company, under the com-

mand of the deputy of the district commander, then takes over all the depét duties, being augmented for the purpose. The regiment forms two distinct bodies, the first three battalions, under the regimental commander, taking their place in the active army according to the ordre de bataille ; the remaining two (or three) forming a " reserve regiment," bearing the same number, which may or may not be brigaded with its own regiment.

A rifle battalion consists of four field companies, a reserve company, and a depot company: the four field companies forming a field battalion, which is stationed according to the ordre de bataille, while the reserve and depot companies remain at the recruiting headquarters. In peace time the field battalion has a strength of 460 of all ranks, the reserve company 72, and the depét company a cadre only. In war the field battalion is augmented to 989, the reserve company to 240, and the depot company to 232. The 40 reserve companies are formed into 10 reserve battalions of 4 companies each; and, if necessary, 10 additional reserve battalions can be formed from the depdt companies, leaving only a sufficient staff to train the "Eysatz" reserve and perform the other depét duties. Seven of the existing rifle battalions form together the ' Imperial Tyrol Rifle Regiment ;" the remainder are single battalions, numbered from 1 to 33.

The Austrian infantry stand two deep, but in somewhat looser order than is usual in other armies; their usual formation is in line of company columns, with intervals of three paces if in " mass," or deploying intervals if extended, the companies being formed in columus of sections. Their movements are rather loose but quick; and their new drill gives great independence of action to captains and sub- ordinate commanders. They are armed with breech-load- ing rifles, partly on the " Winzl" pattern, and partly on the " Werndl." The troops armed with the former carry 60 rounds, those armed with the latter 72 rounds of am- munition; and the regimental ammunition waggons carry in addition 30 rounds for the former and 36 for the latter. The old white tunic, long distinctive of the Anstrian army, has been abolished, and replaced by a serviceable blue-grey uniform. The Hungarian regiments are distinguished by wearing pantaloons, fitting close

to the leg and going inside the boot, instead of the trousers worn by the rest of the infantry.

Cavalry.—The cavalry consists of 14 regiments of dra- goons, 16 of hussars, and 11 of lancers. The cuirassiers were converted into dragoons after the war of 1866 (only 2 dragoon regiments existed at the outbreak of that war), and the distinction between the heavy and light cavalry was abolished at the same time. The dragoon regiments are mostly raised in the German provinces of Austria, the hussars in Hungary, and the lancers in the Polish provinces.

A cavalry regiment consists of 6 field squadrons, a depot, and a reserve squadron. 'The 6 field squadrons are kept permanently on a war footing, and form the field regiment which in peace time is stationed according to the ordre de bataille, and in war joins the active army: its establish- ment is 30 officers, 996 non-commissioned officers and men, and 900 horses. The reserve squadron does uot exist in peace time, but is formed on mobilisation from the depot, and has the same establishment as a field squadron (171 men and 150 horses); it is chiefly employed as "staff" cavalry,—to furnish orderlies, escort convoys, watch lines of communication, &c. The depdt squadron is main- tained as a cadre only (19 of all ranks) in peace time, but in war time, besides forming the reserve squadron, is itself raised to a strength of a field squadron. The depét cadre is permanently stationed in the recruiting district (a cavalry regiment recruits from one or more adjoining infantry

recruiting districts), and has charge of the clothing, arms, and equipment of all kinds of the furlough and reserve men, and the registers and muster-rolls, but has nothing to do with the training of either recruits or young horses, who are sent direct to the field squadrons. In recruiting for the cavalry, young men of strong frame, accustomed to horses, and of a minimum height of 5 feet 34 inches, are selected. The remounts of horses are bought by commis- sions, and are trained and broken at the headquarters of the field squadrons; 12 per cent. of its establishment being the maximum number of remounts allowed yearly to a regiment. The Austrian cavalry has always borne a very high reputation, and its drill is

considered by com- petent judges to be the best in Europe. Much of the old pedantry of drill has recently been swept away, and re- placed by a more serviceable system. The soldiers now rise in their stirrups, ride with both hands, and only draw swords when necessary. The instruction of recruits and training of the horses falls almost entirely on the subaltcrn officers of the field squadrons—commencing on the Ist October, when the annual contingent of recruits is called in, and lasting till the end of June, when the tactical instruc- tion of the squadron is supposed to be complete; from July to September is devoted to drilling in regiments and larger bodies. The hussars and dragoons are armed with breech-loading carbines and swords; of the lancers, 32 men per squadron carry carbines, the rest lances, pistol, and sword.

Artillery.—The artillery consists of 13 regiments of field artillery and 12 battalions of garrison artillery. A regiment of field artillery on peace establishment consists of 12 batteries, viz., four 4-pounder field batteries, three 4-pounder horse batteries, and five 8-pounder field bat- teries; and the cadres for two more 8-pounder batteries, a depot battery, and five ammunition columns. The batteries have only 4 guns horsed in peace. The cadres of the depot and two 8-pounder batteries remain at the headquarter station of the rceruiting district; the other batteries are stationed and detached according to circumstances. In war the batteries are raised to a strength of 170 or 200 men, with 8 guns, 8 ammunition and 6 other waggons, and 109 to 147 horses.. Two additional 8-pounder field batteries and a depét battery are formed by each regiment from its cadres, and 5 (in some regiments 6) ammunition columns, A field artillery regiment on war establishment thus numbers 14 batteries or 112 guns; and as a rule a regiment is attached to each army corps of 3 infantry divisions Of the ammunition columns, 3 carry artillery and infantry ammunition in about equal proportions (12 infantry ammunition waggons and 14 artillery waggons), and are attached, one to each infantry division; the others carry principally artillery ammunition, and small-arm am- munition for the cavalry, &c., and are attached to the army corps headquarters or the army ammunition park. The Austrian field guns are rifled muzzle-loaders, of bronze. The 4-pounders and their ammunition waggons have four horses in the field batteries, and six in the horse bat- teries; the 8-pounders and their ammunition waggons are six-horsed. A 4-pounder battery carries 156

rounds per gun an 8-pounder 128 rounds. The remounts of horses are obtained by purchase as in the cavalry, but a larger and heavier class of horse is selected for the artillery.

A battalion of garrison artillery consists of 6 companies, of which in peace time 5 are maintained on a peace estab- lishment of 113 of all ranks, and 1 on a cadre establish- ment. In war they are all augmented to a strength of 234, The companies of garrison artillery are employed in the defence or attack of fortresses. A sinall number of mountain batteries, armed with 3-pounder rifled

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bronze mountain guns, are attached to the garrison bat- talions. ;

The artillery further includes a certain number of "ar- tillery reserve establishments" (siege parks, reserve ammuni- tion parks, &c.), which are only organised in war, and the "artillery material department," which is charged with the construction and supply of all warlike stores in peace, and in war has further to furnish companies of field artificers to the siege parks and artillery reserve establishments. The great factory and depdt for all artillery matériel is the artillery arsenal at Vienna, an establishment of great antiquity and celebrity. The principal powdcr factory is at Stein, near Laibach. Laboratories are established at Wiener-Neustadt, at Vienna, in immediate connection with the arsenal, and at most of the principal artillery stations.

Engineers.—The engineers include two regiments of engineers and oue of pioneers. A regiment of engineers consists of 5 field battalions of 4 companies, 8 reserve companies, and a depdt battalion. In peace time the reserve companies and depét battalions are maintained in cadre only. In war time all the companies are raised to a strength of about 230 of all ranks; the field battalions accompany the active army, a company being usually attached to each infantry division, and a battalion to the army reserve; the reserve companies are employed on the lines of communication. The general duties of the engineers consist in carrying out

all works connected with the investment, attack, and defence of fortresses, strength- ening positions, opening communications, &c. The pioneers form | regiment of 5 battalions; each battalion composed of 4 field companies, 1 reserve company (in cadre only in peace time), and a matérzel reserve. In time of war each battalion forms a depét company as well. The pioneers are charged with the pontoon equipment; the construc- tion of all bridges; and the construction, repair, and working or destruction of railways and telegraphs. They form 15 " field railway divisions" in war, 5 of which are kept mobilised in time of peace, to afford instruction in this most important branch of modern military engineer-

ing. The officers of the pioneer corps are trained at the

cadet school at Hainburg. Special care is tuken in the selection of recruits for the engineer and pioneer regiments. As a rule, they must be of a minimum height of 5 feet 6 inches, of considerable physical strength, and of some educa- tion; and most of them must be mechanics. The standard of height is, however, relaxed in the case of skilled work- men.

Military Train.—The transport of the Austrian army is provided for partly by the military train, partly by the regimental transport attached to the several arms. 'The military train consists of 36 field squadrons, 36 reserve squadrons (in cadre only in peace time), 6 depot squadrons, and 6 matériel depots. In peace time the train forms a mere nucleus, capable of expansion in war, and supplies the transport required by the military authorities in some of the chief garrison towns; its whole strength is only 2500 men, with 500 waggons and 1250 horses. In war time it is raised to a total of nearly 31,000 men, with 12,000 waggons and 36,000 horses. The 36 field squadrons are raised to a strength which varies from 173 men and 197 horses, to 547 men and 718 horses, according to the special duties they have to perform. The 36 reserve squadrons are raised to the same strength, and a similar number of " Ersatz" divisions are formed to carry out the duties which in peace time were performed by the field squadrons. On mobilisation the field squadrons, as a rule, transfer the horses actually in their possession to the field artillery ; and are themselves completed in horses partly by purchase and partly by requisition, and in men

from the reserve, who have been trained in their ranks, and from the cavalry reserve men who are not required to complete the cavalry regiments. When an army takes the field, one squadron of military train is allotted to each infantry or cavalry division, one to each army and army corps headquarters, one to each pioneer battalion for the transport of its bridge equipment, and one to the artillery reserve and ammunition park. A squadron attached to an infantry or cavalry division is formed into five sections, of which the first provides the necessary transport for the divisional and brigade staffs and the field hospital; the second, third, and fourth for the provision column ; while the fifth or reserve section supplies all necessary reliefs and minor miscellaneous requirements. Regimental trans- port is provided for by the regimental train, each infantry regiment having permanently attached to it 8 baggage waggons, 6 commissariat store waggons, and 3 ammuni- tion waggons; and each cavalry regiment, 4 baggage and 13 supply waggons.

General Organisation and Administration of the Army.— Since 1867 the Anstrian empire has consisted of two distinct states, a German or Cis-Leithan empire, commonly known as Austria proper, and a Magyar, or Trans-Leithan, kingdom, known as Hungary. Each of these countries has its own parliament, ministers, and government. The connecting ties between them are a common hereditary sovereign, a governing body known as the Delegations, and a common army and navy. The war strength of 800,000, at which the naval and military forces of the empire are fixed, is distributed between Austria and Hun- gary in proportion to their populations ; Austria contribut- ing 470,368, and Hungary 329,632. The annual con- tingents are divided in similar proportions. The cost of the maintenance of the army, which in 1871 was esti- mated at £10,500,000, is charged in the budget for the "common affairs of the empire," laid before the Delegations. A portion of this is met by the proceeds of the customs, and other sources of revenue set apart to meet the common expenditure ; the rest is defrayed by the two states in the proportion of ths from Austria, and ths from Hungary. The emperor is commander-in-chief of the army ; the mili- tary and administrative business is centred in the War Department, which is presided over by the War Minister and his deputy. The empire is divided into 16 military territorial districts. Of these, 7 are called " general com- mands," and have general officers of high rank specially appointed to them; the

remainder are termed “military commands,” and are commanded by the senior divisional commander stationed in the district. Each commander of a district is assisted by a general officer of lower rank, who has special duties to perform, aud takes the place of the commander in the event of the latter being called away on mobilisation. The military districts again are subdivided into 80 regimental recruiting districts, corresponding to the 80 infantry regiments, each under the superintendence of the reserve commander or second colonel of the regiment, whose duties correspond elosely to the landwehr battalion commanders in the Prussian organisation.

The Austrians have no permanent corps organisation ; their standing army is formed into independent divisions, which have no fixed stations, but are distributed about the empire according to circumstances, and occasionally relieve one another, There are 32 such divisions, of 2 infantry brigades each, 18 of these have cavalry brigades attached to them. In war time 3 infantry divisions, with a regi- ment of artillery and proportion of cavalry, would usually be united to form an army corps; but the division remains the principal unit of organisation. The following gives the strength and details of an Austrian infantry division in the field :—

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Officers | jorses. | Guns. | Waggons.

and Men.

Divistonalistaits..c.:-2-:— 55. 379 114 ae 14

2 Brigades Infantry (4 regi-) ments= 12 battalions, ... § hoes 260 — & 2 Battalions Rifles, ... 1,978 8 ang 8 Cavalry (3 squadrons),..... 531 476 505 8 Artillery (3 batteries), ... 552 370 24 43 1 Company Engineers,..... 234 15 eas 6 Ammunition column, ... 170 166 ae Sid Field Hospital, ... 133 54 ee il Provision column, ...++. 242 288 158 oval, ...05: 16,101 | 1771 | 24 | 364

This includes all, non-combatants as well as combatants, or the "rationing strength" as it is termed. The combatant strength of a division is 12,884 infantry, 472 cavalry, and 24 guns.

The Austrian arny, though long the most perfectly equipped in Europe, and always distingnished for its appear- ance, its discipline, the strong esprit de corps of its officers, and the scientific training of its staff, has yet the most unfortunate history of all the great European armies. Defeated repeatedly by Frederick in the Seven Years' War, by Napoleon in the Revolutionary wars, and later by the French in 1859 and the Prussians in 1866, the Italians are the only nation over whom it can claim to have been generally victorious. Yet its spirit has always remained unbroken ; and however severe the defeat, however dis- astrous the campaign, no reverse ever brought Austria to the condition of Prussia after Jena, or of France after Sedan. There are several causes to which this almost uniform ill-success may be attributed. Trusting to diplo- macy rather than force of arms, her strategy has always been cautious and vacillating. The hands of her generals have repeatedly been held when in the act of striking. But the same caution which often prevented her reaping the successes actually within her reach, or retrieving disasters which were not yet irremediable, also left her always with a reserve and a show of power still formid- able. Austria has also suffered from the heterogene- ous composition of her army. Germans, Hungarians, Czechs, Poles, Croats, Italians, served together under officers who frequently could not communicate with their men. The Germans, or Austrians proper, are loyal and faithful to the house of Hapsburg; but the other nationali- ties were not only indifferent, but frequently hostile, and instances of whole regiments surrendering to the enemy rather than fight for a cause they detested, are common in the history of her wars. The only ties by which this heterogeneous mass was bound together, was a strict and somewhat harsh discipline, and the strong loyalty and esprit de corps of its body of officers. The Austrian officers have always been distinguished by a cameraderie peculiar to themselves. Officers of various nations and of very different social standing meet on terms uf perfect equality and intimacy as the "emperor's servauts," and no distinc- tions are acknowledged within the army save those of military rank. The general physique and intelligence of the rank and file of the army is rather below than above the average. Some of the Hungarian regiments are fine bodies of men, but the standard

in other parts of the empire is very low, and education has made but little pro- gress in the outlying provinces. The men are generally docile and somewhat phlegmatic, but have neither the élan of the French nor the stubbornness of the northern nations.

Since 1866 a great change has taken place in the character of the Austrian forces. The disastrous campaigns of 1859 and 1866 shook the confidence of the nation in that fine imperial army that ever showed so gallantly on parade, and yet seemed ever to suffer defeat in the field.

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The army was reorganised on something of the Prussian model, universal personal service introducing a more intelligent and more highly educated element into the ranks. The cession of her last possessions in Italy, and the independent constitution granted to Hungary, removed the principal causes of disaffection. Her regimental officers, who formerly, though gallant and loyal gentlemen, were not distinguished for study of their profession, are now subjected to tests more severe than in any other country ; while the constant renewal of the rank and file, and even of the non-commissioned officers, under the three years' system, throws on them almost the whole of the arduous and ever-recurring labour of training the annual contingents of recruits. Her rigid drill has given place to one of exceptional freedom. Even the outward appearance of the army is changed; and the gay uniforms for which Austria was once celebrated have given place to more sober and serviceable ones. Whatever may be the result of the next struggle she finds herself engaged in, none who have watched her military development will deny that she deserves success, so far as success can be earned by a frank acceptance of the lessons taught in her disasters, by honest and persevering efforts to remedy the defects laid bare, and by the loyal devotion with which the officers and the country have accepted the new and arduous duties thrown on them.

Russian ARMY.

Of all European powers, Russia maintains by far the largest army. In 1870 its peace establishment amounted to three-quarters of a million, and its war establishment to a million and a quarter; and when the changes which were

commenced in that year have taken full effect, her available war strength will be increased to nearly two millions. But even this enormous force is not excessive when measured by the vast extent of her possessions (7,500,000 square miles), or her population (82 millions); it is calculated that

a levy of 25 per cent. of the young men coming annually |

of age will suffice for the requirements of the army, and that military service will thus fall more lightly in Russia than in any other great nation of the Continent.

Before the recent changes the Russian army was a reflex of the social condition of the country. As in civil life there was practically no middle class, so in the army there was a wide gulf between the offieer and the soldier. The officers were mainly drawn from the nobility, every young man of rank being practically compelled to serve; the soldiers were entirely drawn from the serfs. Although every one was nominally liable to serve, numerous exemp- tions were made in favour of merchants, skilled mechanics, and others whose services were accounted more valuable to the nation in their civil capacities, and the purchase of substitutes was allowed; so that actually the recruits were drawn almost entirely from the lowest class of agri- cultural labourers. Service was nominally for life, though after a certain number of years the soldier was allowed his discharge on pension. The army was recruited by an annual levy of so many per thousand of the male popula- tion (usually from 4 to 6); the number of men required from each village or district being notified, and the head- men and elders charged with furnishing them. The power thus placed in the hands of the small local authorities was most despotically used, and a youth who had incurred the displeasure of his superiors was surely drafted off to the army. Although the army carried with it the advantages of ultimate freedom and a pension, the time in the ranks was so long, its hardships so great, and the pay so miser- ably small, that the service was very unpopular, and severe measures were necessary to prevent the recruits deserting

ARMY

exceptional cases, such as invasion.

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on their way to the depéts. Subsequent to the Crimean war, however, various steps were taken to improve the condition of the soldier; the term of service in the ranks, first fixed at twenty years, was reduced to fifteen, and a system of unlimited furloughs introduced, under which the soldier was sent to his home after seven or eight years' service, though liable to recall if needed. The liberation of the serfs in 1861 paved the way for still further reforms, and by an imperial ukase of the 4th (16th) November 1870, the principle of universal personal liability to service was established. By the new army organisation law, every

_ Russian is liable to service on attaining his twenty-first

year. The purchase of exemption or of substitutes is pro- hibited; but it seems doubtful whether this clause will be fully enforced, and hitherto the purchase of exemption at a

fixed rate of 800 roubles (about £120) has been permitted.

The conscription takes place annually between the Ist November and 15th December, when the number required to complete the active army (estimated at about 25 per cent, of those liable to service) are choseu by lot. The

| period of service is fifteen years,—of which four are spent

in the ranks; two years on furlough, liable to recall at any moment; and nine years in the reserves, which can only be called out in case of war or national danger. In the cavalry and horse artillery, the time with the colours is extended to five years, and that in the reserve is shortened. Those who are not drawn for the active army are put through a short course of training, and then sent to their homes; but for six years they remain liable to be called in to replace casualties in the active army in case of war. After this they pass into the national legions, which in- clude all able-bodied men between the ages of 20 and 38 not actually serving in the army or navy. As in Prussia, certain advantages are given to young men of means and good education, who are allowed to shorten their period of service in the ranks.

Special regulations apply to the Ukraine and provinces which furnish the Cossacks and other irregular troops. ,

The military resources of Russia thus consist of the active army, or men serving with the colours; the reserves, who have completed their period in the ranks, but rejoin the army in case of war; the irregular troops, or Cossacks; and the national legions, or armed levies, only called out in The regular army is formed by the active army, completed in time of war from the reserves, and is divided into field troops and local troops, —the former furnishing the armies for the field, the latter the garrisons, and the depéts at which the recruits are assembled and trained, and whence the field troops are fed. The local troops, as their name implies, are per- manently localised; the field troops are not, as in Prussia, connected with certain districts, but draw their recruits indiscriminately from the whole empire, and are moved from one part to another as occasion demands.

The field troops of the regular army consist of 612 battalions of infantry, 236 squadrons of cavalry, 16 bat- talions. of sappers and engineers, and 306 batteries of guns and mitrailleuses. They are divided into guards and line, each; having its due proportion of all arms, and are organ- ised in detail as follows :—

Infantry.—The infantry consists of—

12 Regiments of Guards (including 2 Grenadiers) of 3 battalions each.

12

i Grenadiers of 3 battalions each. 4 3 Caucasus Grenadiers of 4 battalions each. 148 AA the Line of 3 battalions each. WG – Infantry of the Caucasus of 4 battalions each.

4 Battalions of Rifles of the Guard. 20 29 ”? Line. 8 RS =p Caucasus and Turkestan.

A battalion of the guards or line consists of 4 line com-

panies and 1 of rifles; it has four different establishments, viz., "cadre" strength of 320 rank and file, "'peace" strength of 500, "increased peace" strength of 680, and "war" strength of 900 rank and file. This is exclusive of musi- cians, officers' servants, &c. A regiment on war establish- ment numbers 81 officers, 270 non-commissioned officers, 2700 rank and file, 96 drummers and buglers, and 259 artificers, officers' servants, and other non-combatants ; and is accompanied by 12 officers' horses, 173 draught horses, and 41 ammunition, ambulance, and baggage waggons. Rifle battalions consist of 4 companies only, and have three establishments,—" war," of 720 rank and file; "'in- creased peace," of 544; and "peace," of 400 rank and file.

The Russian infantry is formed in two ranks. On parade the four line companies of a battalion stand in order from right to left, while the rifle company stands at fifty paces in rear of the centre; but for manceuvring purposes the three rifle companies of the regiment are often united to form a separate battalion. The guards still main- tain on parade much of the stiffness and precision for which the Russian army was once famous; but generally the movements of the infantry are loose and rapid. In the main their drill resembles that of the German army; the commonest formation for march and manceuvring is the company column of sections. The men are armed with the " Berdan" breech-loading rifle, a bayonet (which is always carried fixed), and a short two-edged sword. They carry 60 rounds of ammunition in two pouches, and 40 rounds are carried in the regimental ammunition carts, so that there is always present with the regiment 100 rounds per man; and the divisional reserves carry 60 rounds per man besides. A certain number of entrenching tools are issued to each company, and on service are carried by the men in turns. The clothing is of somewhat coarse texture, but very serviceable; that of the guards is of slightly finer material than is supplied to the rest of the army. All infantry alike wear tunic and trousers of dark green cloth (or white linen trousers in summer time), long boots into which the trousers are tucked in the field or for marching, cap or "kepi" of black cloth with straight peak, metal badge, and horse-hair plume, and cloak of reddish-grey cloth with a dark-coloured hood. The tunics of the guard are turned back in front, and faced with red or yellow. Regiments are distinguished by the colour of the " paroli" (a strip of cloth worn on the collar) and of the shoulder straps. The belts of the

first three regiments of the guard and grenadier divisions (with the exception of the rifle companies) are white; those of all others black. The knapsack is rather large, and made of black calf-skin. A white smock frock, intended as a fatigue dress, is worn in summer at drill.

A Russian regiment is very completely equipped with transport. Every company has two waggons attached to it, one carrying ammunition (40 rounds per man), the other six days' rations of biscuit, salt, and other provisions and stores. In addition to these the regiment has an orderly-room waggon, a paymaster's waggon, a store and implement waggon, four ambulance waggons, and two hospital and medicine carts. All these are kept in store in peace time with the headquarters of the regiment; but only one waggon per company is horsed. In war time most of the waggons are four-horsed; but some still have shafts, and are drawn by three horses abreast.

The regimental staff comprises 1 colonel, 3 lieutenant- colonels, 1 supernumerary field officer, a regimental adju- tant, paymaster, quartermaster, and instructor in arms, 3 battalion adjutants, a chaplain, and 4 surgeons. In the field each company is attended by an apothecary, provided with the necessary appliances; and the officers' servants and other unarmed men are taught the elementary prin-

horse grenadiers.

ciples of military surgery, and trained to the duties of stretcher-bearers.

Cavalry.—The regular cavalry consists of 10 regiments of the guard, 18 regiments of dragoons, 14 regiments of

lancers, and 14 regiments of hussars.

The cavalry of the guard comprise 4 regiments of cuiras- siers, 2 of lancers, 2 of hussars, 1 of dragoons, and 1 of There are also 2 regiments of Cossacks of the guard, who in peace time furnish 2 squadrons each for duty, and in war take the field with 6 squadrons, and may

fairly be included among the regular troops.

All regiments of cavalry are organised in the same manner, and consist of 4 field squadrons and 1 reserve squadron, the latter belonging to the "local troops."

'They have two establishments, viz., "war," of 128 men

per squadron (mounted); and " peace," of 112 men per squadron. The war establishment of a cavalry regiment is 32 officers, 73 non-commissioned officers, 512 rank and file, 16 trumpeters, and 305 non-combatants, including dismounted men in reserve, Officers' servants, artificers, dc. ; or a total of 938 officers and men, with 693 horses and 11 carriages. 'The formation and mancuvres of the Russian cavalry do not differ materially from those of other armies of Europe, except in the case of dragoons, who are armed with a rifle and bayonet, and specially trained to act as infantry. In all other cavalry the front rank is armed with a lance in addition to sword and revolver. The rear rank is armed with sword and carbine in lancer and hussar regiments, and sword and revolver in cuirassier regiments. The cuirassiers wear white tunics with shoulder scales, cuirass, and helmet; the dragoons a dark green tunic,

with scales and cloth cap; the lancers, a blue tunic with

metal epaulettes, and the czapka, or lancer cap; and the hussars, a blue tunic and cloth cap. Only the hussars of the guard wear bearskin caps and pelisses. The guards have parade trousers of black or dark blue with stripes; but in the field, trousers or pantaloons of a greyish blue cloth are worn by all cavalry alike. The saddlery is simple in construction, though somewhat heavy and cumbrous. Four separate folds of felt, each } inch thick, support a wooden frame previously fitted to the horse's bare back; on the wooden frame is strapped the horse rug, and the saddle is complete.

When one fold of felt is wet or har- dened by dried perspiration, it is replaced by another, and sore backs are almost unknown. The men as a rule ride fairly well, though not so well as the Austrian or English cavalry; and the peculiar seat, and height of the saddle above the horse's back, strike the eye as ungainly. The horses, though often small, are hardy and enduring; they are provided partly from the Government breeding establishments and partly by purchase, and come mostly from the south-eastern provinces of the empire. They are not taken on the strength of the regiment until rising six years old, and are cast on completing their twelfth year; this securing that they shall always be in their prime, and fit for the severe work of active service.

The staff of a cavalry regiment consists of a lieutenant- colonel commanding, two field-officers commanding divisions (of two squadrons each), and regimental adjutant, paymaster, quartermaster, and instructor in arms. Lach regiment has also a chaplain, two surgeons, and a veterinary surgeon. Each squadron has its provision waggon, and each regiment has an ambulance waggon, and three store and office waggons. Dragoon regiments have two ammunition wag- gons carrying 30 rounds per man; other regiments have only one.

Artillery—The field artillery consists of 3 brigades of field and 1 of horse artillery of the guard; 44 brigades of field and 7 of horse artillery of the line; and 3 Turkestan brigades,

A brigade of field artillery consists of six batteries, viz., three heavy, two light, and one cf mitrailleuses. The horse artillery brigade of the guard comprises five light batteries (including one of the Don Cossacks of the guard); the remaining horse brigades have only two batteries each. The Turkestan brigades vary slightly in composition. The Russian artillery thus numbers—143 heavy field _bat- teries; 100 light field batteries; 19 batteries of horse artillery; 4 mountain batteries; and 50 batteries of mitrail- leuses; or a total of 2128 guns and 400 mitrailleuses.

A battery has three establishments—“ peace,” with only 4 guns and 2 waggons horsed; “increased peace,” with § guns and 8 waggons; and “ war,” with 8 guns and 16 (or 24) waggons. On war establishment a heavy field battery numbers 6 officers, 316 non-commissioned officers and men (including artificers, &c.), and 214 horses; with 8 guns, 24 ammunition waggons, and 9 provision and store car- riages. A light battery has 261 officers and men, 160 horses, 8 guns, 16 ammunition and 8 other waggons and carriages. The guns are of bronze or cast steel, breech- loading and rifled on the Prussian system. The mitrailleuse batteries are armed with a 10-barrelled gun on the Gatling system, slightly modified by the Russian general Gorloff. A heavy battery carries 120 rounds per gun, a light bat- tery 130, and a mitrailleuse battery a total of 6290 rounds. The harness is rough and clumsy, with long rope traces. The dress of the men of the field batteries is similar to that of the infantry, and that of the horse artillery to that of the dragoons.

Engineers.—The corps is divided into sappers and pon- toniers. The sappers form 11 field battalions, 1 field company (Turkestan), and four reserve battalions (local troops); also 2 engineer field parks, 2 siege parks, and 6 field telegraph parks. The pontoniers form 6 half-bat- talions. A field battalion of sappers consists of 4 com- panies, and has a war establishment of 900 rank and file, and a peace establishment of 600. The half-battalions of pontoniers consist of two companies, and have a war esta- blishment of 13 officers, 469 non-commissioned officers and men, with 392 horses, 52 pontoon and 10 other waggons and carriages; and carry 26 iron pontoons aud 12 trestles, sufficient to form 700 feet of bridge.

Organisation of the Field Army.—The organisation of the Russian army is entirely divisional; two or more divi- sions may be brought together to form an army corps, but no such organisation exists permanently. The infantry is formed in 47 divisions, viz., 3 of guards, 3 of grenadiers, 1 of Caucasus grenadiers, and 40 of the line. Each divi- sion consists of 4 regiments or 12 battalions (with the exception of the divisions of the Caucasus, which have 16 battalions), and has attached to it a brigade of field artil- lery, but no cavalry or rifles. The rifles are organised in separate brigades of 4 battalions each, and form 8 brigades (1 guard, 1 of the Caucasus, 1 of Turkestan, and 5 of the line); and the cavalry in cavalry divisions of six

regi- ments, to each of which is attached a brigade of horse artillery. With the exception of the guards (of whom two divisions are always stationed in St Petersburg) and some of the troops of the Caucasus and Turkestan, these divi- sions have no permanent stations, but relieve one another from time to time. Five infantry and two cavalry divisions are usually stationed in the St Petersburg district ; 15 infantry and 2 cavalry divisions in the Warsaw and Vilna districts (Poland and Polish frontier); 8 infantry and 2 cavalry in Kiev and Odessa (south-eastern pro- vinces); 7 infantry and 1 cavalry in Moscow; and 6 infantry and 1 cavalry in the Caucasus. Of the cavalry, the guard divisions and three line divisions are usually maintained on war footing, the remainder on the peace establish- ment; the artillery all on peace establishment. Of the

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time 91) artillery companies.

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infantry, a few battalions in Turkestan are alone main- tained on war footing; the divisions in the Caucasus are mostly on the "increased peace" establishment; the guards and grenadier divisions, and those occupying War- saw and the great fortresses, on " peace" footing; and those distributed about the interior on cadre establishment.

The following was the peace and war strength of the field army in 1873 :—

Peace. War. Infantry (612 battalions), ... 364, 422 694,511 Cavalry (236 squadrons), ...+6 38,3806 49,183 Artillery; sicencs-cossngetet tenes oe tones 41,731 48,773 Hangar: seems oaner ates. ot 13,413 16,203 1 ee 457,872 808,670

Local Troops. —That portion of the Russian army which is stationary in peace is distinguished by the name of "local troops;' and these again are divided into 'reserve and depét troops" and "troops for service in the interior." The reorganisation of these forces was commenced in 1873, but will take some years to complete.

According to the new organisation, the reserve and depot troops will consist of 120 local battalions of infantry, each forming on mobilisation a three-battalion reserve regiment and a depdt battalion; 56 reserve squadrons of cavalry ; 24 local batteries of artillery, forming in war 24 reserve artillery brigades (96 batteries) and 24 depdt batteries; and 5 reserve conipanies of sappers. In peace time they are little more than cadres, distributed according to population, and are charged with the training of recruits and reserve and furlough men. In war they forma reserve army of 30 infantry divisions and 24 artillery brigades, or about 420,000 men and 768 guns, available to reinforce the field army; and depéts numbering about 85,000 men.

The "troops for duty in the interior" consist—First, of 48 "frontier battalions," of which 24 are stationed in the Caucasus, 12 in Turkestan, and the remainder in the mili- tary districts of Orenburg and Eastern and Western Siberia. They are organised in all respects like the rest of the in-fantry, and have a war establishment of 1074, and a peace establishment of 615 of allranks. Secondly, of " garrison infantry and artillery," intended for the defence of fort- resses, and numbering 98 battalions and 59 (in war Thirdly, of '" government battalions" and "local detachments," who do garrison duty in the capitals and towns, and act as police, guards, &c.; of these there are 70 battalions and 400 separate de- tachments, distributed throughout the empire, maintained on a reduced establishment in peace, but raised to a total war strength of 120,000 men when the field army is mobilised. Lastly, of " etappen detachments," stationed on the military roads, and charged with furnishing escorts to recruits and prisoners, and providing them with lodging and subsistence; and local artillery detachments, charged with the care of artillery material stored in large towns.

The total strength of the 'local troops," when the new organisation has been completed, will amount to about 784,000 men and 816 guns.

Irregular Troops.—The irregular troops or Cossacks have always borne a most important share in the wars of Russia. In 1812 more than 100,000 were raised, and the services they rendered in that and the following campaigns made their name famous and a terror throughout Europe. In

1856 they raised 184,000 men, of whom about three- fourths were cavalry; but the Crimean war did not give the

‘opportunity of utilising this class of troops.

The Cossacks have always been a race of free men; neither serfage nor any dependence upon the land has existed among them. It has been the policy of the Russian Government to foster their martial spirit, and various privl-

leges have been granted to them with this object. They

AB

pay no taxes; but in lieu of this render military service, from the age of 19 to 40. Only a portion of this time is actually spent in the ranks; but in war time, by order of the emperor, the whole male population between the ages of 15 and 60 may be called to arms. The Cossacks are organised in “ polks” or regi- ments of light cavalry, about 900 strong, and formed usually of six ‘“sotnias” or squadrons; in battalions of infantry, abont 1100 strong; and horse artillery batteries of 8 guns. In pcace time-a few squadrons are stationed at St Petersburg and Warsaw, furnishing escorts to the emperor and viceroy. The rest are distributed about the Cossack provinces and on the frontiers, maintaining the lines of communication in the wild Asiatic provinces. The force under arms in 1871 amounted to 66,000, forming 323 sotnias or squadrons, 35 companies of infantry, and 12 batteries. In war time this can be raised to—

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Cavalry, 155 “polks” or regiments, ...0++... 142,000 Waifomtry, S7 battalions, ...cccccesseocees 41,000 Horse Artillery, 27 batteries, ...s0sssessseeee 6,000

189,000

with 232 guns. In war time the divisional cavalry of the regular army is furnished by the Cossacks, one polk being attached to each infantry division for purposes of outpost duty, escorts, and orderlies.

Militia.—The. militia or national legions include all men within the ages liable to service who have not served actively in the army. There is as yet no regular organisa- tion for the militia, nor have the men been drilled; notwith- standing this, on the three occasions on which they have been called out (viz., 1807, 1812, and 1855), they have always been rapidly formed, and have done good service to the country. In 1855 the number actually raised was 366,000. The number liable to service in 1871 was over 500,000; and as the new law comes fully into action that number will be enormously increased.

Organisation and Administration.—The emperor is the Commander-in-Chief of the army,and exercises hisauthority through the War Minister. The War Ministry is divided into twelve sections or departments, including the imperial headquarters or military cabinet of the emperor; the council of war, which is the highest legislative and ad- ministrative authority in the empire; the headquarter staff ; and the artillery, engineer, intendance, medical, &c., departments. For purposes of military administration the empire is divided into 14 military districts, corre- sponding to the civil "general governments," and 51 governments or military sub-districts. At the head of each military district is a general, who is also viceroy or governor-general, and has the supreme control of all affairs, civil as well as military. The local forces belonging to each military district are commanded by a local divisional com- mander, and the forces of each government by a local briga- dier. In addition to the command of the local troops, these officers are charged with the keeping of the muster-rolls of men on furlough, &c., and generally with the arrangements for mobilisation. The field troops stationed in the district are under the command of their own divisional generals, subordinate to the district general. The guards and some of the regiments stationed in the fortresses and great towns are lodged in fairly comfortable barracks; but the accommodation generally is quite insufficient. The erection of barracks for the whole army is projected, and the necessary buildings have been commenced in many places ; but it must be long before the plan can be fully carried out. Meanwhile a large part of the troops are billeted in the towns, and in some country districts are distributed among the villages, living with the peasants, and for months without seeing their officers or any opportunities for drill, During the summer

mouths, May to October, the regiments and divisions are brought together in large standing camps for training, commencing with battalion and regimental drill, rifle prac- tice, instruction in field fortification, &c., and concluding with brigade and divisional field-days and great manceuvres. In 1873, 445 infantry battalions, 238 squadrons, 93 sotnias of Cossacks, and 828 guns were thus assembled at the various camps of instruction, the largest of which were at Warsaw, where nearly 50,000 men were collected; and at Krasnoe Selo, near St Petersburg, where about 30,000 men, principally of the guard, were encamped.

The Russian guards, selected as they are with care from the vast military population of the empire, are perhaps the finest body of men in Europe ; and with their brilliant and various uniforms, relieved by the Oriental picturesqueness of the Cossack squadrons, certainly present the most gorgeous and imposing military display to be seen any- where. They have many special privileges, and all officers of the guards rank two grades higher than the correspond- ing ones of the line. 'The ordinary line soldier is rather below the average of Enropean armies both in physique and intelligence; hut he is generally a good marcher, capable of enduring great hardship and fatigue, and is good-natured, cheerful, obedient by instinct and habit, and imbued with a certain religious and superstitious loyalty, which is always a powerful motor, and at times can be excited to fanaticism. Of all their commanders, Suwaroff knew best how to appeal to this semi-barbarous and superstitious instinct, and to this he owed much of his extraordinary influence and brilliant successes, Generally, however, the Russian's strength lies rather in endurance than action ; no army, the British perhaps excepted, fights so stubbornly and will endure such heavy losses without flinching. Hence the most bloody battles in modern history have been those fought against Russian troops,—Zorndorf and Kunnersdorf in Frederick's wars, Eylau and Borodino in Napoleon's time. Outwardly the discipline is good, though the intercourse between men and officers retains somewhat of that mixture of familiarity and servileness characteristic of a stage not far removed from slavery; but it may be questioned whether it is of the kind that will withstand the strain of war, or gives the officers that moral influence which alone tells in moments of danger or discouragement. The

non-existence of a class corresponding to the lesser nobility of Germany or the gentry of England has always made the officering of the Russian army a matter of peculiar difficulty. The staff and scientific corps are largely officered by foreigners, mostly Germans ; in the infantry the want is supplied to a certain extent by promotion from the ranks. The Russian army, like the uation, is in a transi- tional state. The liberation of the serfs was a vast con- stitutional change which could not make itself fully felt in less than a generation, and which affects the army as well as the nation. The introduction of personal service, applied toall classes, must materially alter its character. The Russian Government, fully alive to the present defects of the army, and also to its importance as a means of raising, educating, and disciplining the nation, is using every endea- vour to instruct and improve the soldier. Regimental schools have been established throughout the army, at which the soldier is taught, either by or under the immediate supervision of his officers, for many hours a day during the long winter months. Higher class schools are also formed for the instruction of non-commissioned officers, where they receive not only a military education, embracing tactics, mili- tary history, field fortification, &c., but also a general educa- tion which qualifies them, on leaving the army, to become, as many do, teachers in the national schools, or to fill civil appointments. The physical training of the soldier is also attended to; gymnastics of all kinds are constantly prac-

tised, and with such effect that the Russian soldier contrasts very markedly with the awkward, ungainly peasant.

The military power of Russia has been vastly increased of late years by the construction of the great strategic lines of railway which now traverse the empire in all directions, and enable her to concentrate her vast resources with ease and quickness, The immense extent of the empire has hitherto been an insuperable obstacle to the full development of her power. In 1854-56 the efforts made to hold the Crimea exhausted Russia more completely than a series of defeats in the heart of the empire could have done. For every man who actually reached the Crimea four were expended on the road from sickness and fatigue, and the total losses suffered in this war

were estimated at the enormous amount of 450,000 men. Now reinforcements can be brought with ease by rail from the most distant provinces, and for a concentration on her south-western frontiers she has four distinct main lines of railway, con- nected by branch ones with every important military station. It is not to be wondered at that Prussia and Austria watch with uneasiness the development of the military resources of their powerful neighbour.

ITALIAN ARMY.

The old Piedmontese law of conscription is the basis of the present military organisation of Italy, as its constitu- tion is of the constitution of the new kingdom. The Piedmontese have long borne a high reputation among southern nations for their military qualities. The dukes of Savoy have played a not unimportant part in history, and showed special ability in preserving the independence of their small kingdom between two such powerful neigh- bours as France and Austria. During the wars of the French Revolution Piedmont was temporarily absorbed into the French republic; but the kingdom of Sardinia was restored in 1815. Various causes combined to place Pied- mont at the head of the national and liberal movement which agitated Italy during the ensuing thirty years, and bring her in direct antagonism to Austria. Charles Albert, her then ruler, had paid great attention to the army, and when Italy rose against Austria in 1848 he took the field with an excellent force of nearly 70,000 men. At the outset fortune favoured the arms of Italy; but the genius and energy of Radetsky, the veteran Austrian commander, soon turned the tide, and in the summer of 1849 the Piedmontese army was decisively defeated at Novarra, and her king compelled to sue for peace. Charles Albert abdi- cated in favour of his son Victor Emanuel, a prince who had already distinguished himself by his personal gallantry in the field. Under his care the army soon recovered its efficiency, and the force which joined the allied armies in the Crimea attracted general admiration from the excellence of its organisation, equipment, and discipline. In 1859 Piedmont again took up arms against Austria for the libe- ration of Italy ; but this time she had the powerful assist- ance of France, and played but a subordinate part herself. In this campaign the Sardinian army was composed of one cavalry and five infantry divisions, and numbered about 60,000 combatants. By the peace of

Villa Franca, Italy, with the exception of Venetia, was freed from the Austrians, and Lombardy was added to Piedmont. The revolutionary campaign of Garibaldi in the following year united the whole peninsula under the rule of Victor Emanuel, and in 1866, when Italy for the third tinie took up arms against Austria—-this time as the ally of Prussia—her forces had risen to nearly 450,000, of whom about 270,000 actually took the field. But in quality these were far from being equal to the old Piedmontese army; and the northern army, under the personal command of the king, was de-

feated at Custozza by a much smaller force under the Archduke Albrecht of Austria. Since 1866 the army has been somewhat reduced, but increased care given to its organisation and training, and in manoeuvring power it now stands high among the armies of Europe.

The existing organisation of the Italian army is deter- mined by the laws of 1873. – Every Italian is liable to personal service from the age of 18 to 40. Substitu- tion (except in the case of brothers) and exemption by payment are abolished. Absolute exemption is only allowed to such as are physically unfit for service. Partial exemptions are allowed to only sons of widows, supports of families, &c., who are passed at once into the local militia without serving in the army. Temporary exemp- tions or " adjournments" may be granted for three suc- cessive years on urgent personal or family reasons. The remainder of the annual contingent is divided by lot into two classes. The first class serve eight years in the army, four in the active militia, and the rest of their time in the local militia. Of the eight years in the army, three in the infantry and five in the cavalry are usually spent with the colours; the remainder on furlough. Further, the Minister of War has the power to send home on furlough, after a year's service only, young men of exceptional character or intelligence, school teachers, artists, &c. The second class are liable to service in the several forces for the same periods, but are considered as on unlimited furlough, and only sub- jected to six months' training. One-year volunteers are received on the same conditions as in other armies. The numbers of the first class contingent are determined annu ally by law, and are distributed among the districts and cantons

according to the number of men found fit for service. This is estimated at from 90,000 to 95,000; and the contingent of the first class was fixed in 1872 and 1873 at 65,000. The war strength of the army, exclusive of local or " sedentary" militia, is estimated at 750,000, of whom 375,000 are in the active army, or first line; 250,000 in the active militia, or second line; and 125,000 in the depéts. The peace establishment is fixed at 200,000.

The Italian army consists of 80 regiments of the line, 10 of bersagliert (riflemen), 20 regiments of cavalry, 10 of artillery, and 2 of engineers. A regiment of the line con- sists of 3 battalions of 4 companies each, and numbers about 1500 men on peace and 3000 men on war footing. Eight of the existing regiments are grenadiers. The bersaglieri are formed in regiments of four battalions each, and are picked troops, armed with a shorter rifle, and especially trained to traverse long distances at a run. They are frequently used in conjunction with cavalry, and it is proposed to relieve them of their knapsacks, to in- crease their mobility still further. The cavalry consists of 5 regiments of the line, 7 of lancers, 7 of light horse, and 1 of guides. Each regiment has six squadrons, with a war strength of 150 horses per squadron. Of those squad- rons, two are intended to be detached to the infantry divisions in war time, while the remaining four form the corps cavalry. The artillery comprises 10 regiments of field artillery, and 4 of garrison artillery, besides a certain number of coast and artificer companies. A regiment of field artillery consists of 10 batteries of 8 guns each, and 3 companies of artillery train. A regiment of garrison artillery consists of 15 companies. The engineers consist of a separate staff of officérs, and 2 regiments, each divided into 4 companies of pontoniers, 16 of sappers, and 3 of engineer train. In addition to the above field organisation, every regiment of cavalry, infantry, artillery, or engineers has a depét, which in peace time is maintained on cadre establishment only, but in war is completed from the surplus furlough men, and replaces casualties in the field army,

ITALIAN. |

The total strength of the Italian active army on peace aud war footing is approximately as follows :—

Peace, War.

Infantry, 80 Regiments, ...- 128,000 245,000 Bersaglieri, 10 Se Masse cncsss 18,000 36,000 Cavalry, 20 Re eect neearat ts: 18,000 21,000 Artillery, 10 Field Regiments, ... 11,000 21,000 . ASGaHRIsON 5,8 2 ese. 6,000 18,000 Engineers, 2 Regiments, ...+.. 4,000 7,000 Train, ee es, 2,500 10,000 Staff Administration, &c.,..... 3,500 8,000

191,000 361,000

In war time this force is organised in 20 divisions, forming 10 army corps, —each corps comprised of 24 in- fantry battalions, 4 bersaglieri battalions, 2 cavalry regi- meuts, and 10 field batteries, giving a fighting strength of 28,000 infantry, 2000 cavalry, and 80 guns. The corps and divisional organisation is not permanent in peace time; but the divisional staffs are kept up in those of 16 territorial and 4 active divisions maintained in peace.

The depdts and active militia, or second line of troops, are maintained in cadre only in peace time; the depédts on mobilisation are raised to a strength of 125,000, or a third of the active army. For the militia the cadres of 960 companies of infantry, 60 companies of bersagleri, 10 of engineers, and 60 of artillery, are formed in peace time. On mobilisation these will give a force of about 250,000 men, of whom 200,000, with 40 batteries or 320 guns, could take the field if necessary. The local or "sedentary" militia is not organised in peace time, and is only called out in the last extremity, corresponding generally to the landsturm of Germany.

The kingdom of Italy is divided into 16 " territorial divisions," and these again are subdivided into " districts," of which there arc 62, each comprising one or more of the 80 provinces of the kingdom. These districts are under the supervision of a colonel or lieutenant-colonel, whose duties correspond generally to those of the commander of the landwehr battalion districts in Prussia. He has under him a staff, and the cadres of from 1 to 6 companies, forming the depots of the active army in peace time, and in war furnisliing each the cadres for one militia battalion. He superintends the first instruction and forwarding of the anuual contingent of recruits for the army, and the periodical training of the men belonging to the second class, who are on permanent furlougli.

The Italian army is composed of very various materials, and in its reorganisation it has been the object of the Govern- ment to blend these together as much as possible. Going exactly contrary to the Prussian principle of localisation, the kingdom is divided into five " zones," and special arrange- ments are made to provide that each regiment shall receive recruits in due proportion from all five of these. The Pied- montesce are a hardy, athletic race, superior, perhaps, to any in Europe in power of work and endurance of fatigue, pri- vations, and hardships. They are temperate, intelligent, and combine a certain natural independence with a tradi- tional respect for their princes and aristocracy, which makes them docile and amenable to discipline. The aristocracy of North Italy, like that of England, has always associated itself with the welfare and progress of the country, and deservedly kept the respect of all classes, and furnishes an excellent class of officers to the army. The southern Italian, on the other hand, is generally indolent, and incapable of much exertion, physical or mental ; occa- sionally roused to enthusiasm, but wanting in steadiness of character ; usually either bigoted and a slave to his priest, or a free-thinker, with little respect for any authority human or divine. Since cnervated and luxurious Rome fell before the more vigorous northerner, the southern Italian has shown but little military spirit.

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amalgamation of the various races will raise the whole army to the level of the Piedmontese, or lower the old Pied. montese army to the level of the others, is a problem which can only be solved practically; but one may fairly hope that the new national life which is dawning on Italy will restore to its inhabitants something of the qualities which once made Rome mistress of the world.

SPANISH ARMY.

Spain, once the proudest of nations, has been brought so low by years of misrule and anarchy that she can scarcely now be classed among the

powers of Europe; and the army which under Charles V., the Duke of Alba, and the Con- stable of Bourbon had proved itself so formidable, has been reduced to a state of disorganisation that makes any detailed notice of it impossible. The martial spirit of old Spain, roused by the protracted struggle with the Moors, and fanned by the exploits of the Cid and the successes of Ferdinand of Castile, culminated in the reigns of Ferdi- nand and Isabella, and of their successor, Charles V. At the end of the 15th and beginning of the 16th century the Spanish army was renowned throughout Europe; while the discoveries of Columbus and the conquests of Cortes and Pizarro had extended her power and the fame of her arms to the New World. Gonsalvo de Cordova, Ferdinand's " great captain," was the creator of the Spanish infantry, which, modelled originally on that of the Swiss, soon eclipsed the latter, and became in its turn the model for other nations. More heavily armed than the Swiss, it trusted, like them, to massive formations and the irresistible weight of its attack. During the 16th century the Spanish infantry maintained its reputation, and it was not till the close of the century that its renown began to fade before the new school of Maurice of Nassau, and that the deep masses of the "Spanish brigade" gave way to the smaller and more mobile formations of the Netherland ordon- nance. Under the disastrous reigns of the last princes of the house of Austria the army rapidly degenerated, and when Philip V. ascended the throne in 1700 it scarcely amounted to 15,000 men. During the 18th century it was largely augmented, and at the outbreak of the French revolution numbered about 120,000 of all arms. But though formidable in numbers, it was no longer so in quality ; and throughout the long war with Napoleon it distinguished itself principally by its uniform ill success, and the haste with which it abandoned even the strongest positions. After the peace the army was reorganised, and efforts were made to improve its general condition. But the series of civil wars, or of risings in which the army was a principal actor, thwarted all such attempts. When Isabella was driven from the throne in 1868 the army espoused different sides, the bulk of the infantry joining Prim and the revolu- tionists, while the artillery and some of the corps @élite remained faithful to the queen. In 1867 the total armed forces of the kingdom (including navy and colonial troops) were fixed at 200,000. The land forces in Spain itself amounted to 150,000, of whom 80,000 belonged to the regular army, and the remaining 70,000 were made up of carabineros or gendarmerie, guardia civil, and provincial militia. The law of recruiting

passed in 1870 made all Spaniards liable to service on reaching the age of 20, and fixed the terms of service at four years in the ranks and two in the reserve. Substitution by exchange of numbers or by vemplagants, and exoneration by payment, were sanctioned—the price of the latter being fixed at £60. In 1872 the draft of a new military law was laid before the Cortes, by which substitution and exoneration were abolished, and the annual contingent required to complete the army was to be taken by position (according to age) on the lists, instead of by ballot. The term of service was

fixed at seven years,—three to be passed in the army, two in the first reserve, and two in the second rescrve; the first reserve being liable to be called out at any time to complete the active army, but the second reserve only in case of war, and by a vote of the Cortes. The abdication of King Amadeus, however, prevented the carrying out of the contemplated reorganisation of the army.

The contrast betwcen the conduct of the Spanish soldiers and of the Spanish people during the Peninsular war pre- sents a curious problem. At the very time that the armies of Spain were dispersed on every occasion, often almost without firing a shot, the people were signalising them- selves by the heroic defence of their towns, and by carry- ing on a desperate guerilla warfare that nothing could subdue. The Spaniard possesses many of the highest qualities of a soldier: he is hardy, temperate, individually brave, high-spirited, and independent ; and though naturally indolent and idle, is easily roused, and capable of great heroism, as well as of sustained exertion. Yet this people, when brought together, form without exception the worst soldiers of Europe. They are impatient of discipline and restraint, and as easily discouraged as they are excited; and that mutual confidence in one another and in their leaders, which alone gives moral strength to a mass of men, is altogether wanting. How much of this may be due to the want of good leaders may be a question; but discipline must always be the basis of all military efficiency, and of discipline in the true sense of the word neither the soldiers nor the people of Spain have any idea.

PoRTUGUESE ARMY.

The existing army dates from the Peninsular war, when a considerable force of Portuguese, at one time exceeding 60,000 men, was organised under Marshal Beresford. Trained and partly officered by English officers, it proved itself not unworthy of its allies, and bore its full share in the series of campaigns and battles by which the French were ultimately expelled from Spain. At the peace the army numbered about 50,000 infantry and 5000 cavalry, formed on the English model, and all in the highest state of efficiency. This force was reduced in 1821, under the new constitutional government, to about one-half. By the present law of military organisation, passed in 1864, the strength of the army is fixed at 30,000 men on peace footing, and 68,000 on war footing. The number under arms, however, has never approached this; and in 1869 the actual strength and composition of the army was as follows :—

Officers Men.

18 Regiments (of 9 companies each) Infantry ra "aren: 683 9218 9 Battalions of Rifles)... ..0..000>scacsareesactec 314 3468 8 Regiments of Lancers and Dragoons,.... 244 2253 ap ATDINGR s/ecesses.—seneceeesns 107 1278 T Battalionjom Wngineers,.....06.- 00 3 317 Staff and Administrative Troops, ... 194 106

The number of troops in the Portuguese colonies amounted to 8500 infantry and artillery, besides a reserve of 9500 men.

The army is raised partly by conscription aud partly by voluntary enlistment, more than one-half being obtained by the latter method. Exemption may be purchased by the payment of a fixed sum, amounting to about £80. The time of service is eight years, of which five are spent in the regular army and three in the militia. The Portuguese have distinguished themselves rather by naval enterprise than as soldiers, Physically they are inferior to the Spaniards; but they are more amenable to discipline, and proved theniselves far more valuable and trustworthy auxiliaries in the long Peninsular struggle.

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Dutcu ARMY.

The military power of the ‘ Unitcd Provinces” dates its rise from the iniddle of the 15th century, when, aftcr a long and sanguinary struggle, they succeeded in emancipat- ing themselves from the yoke of Spain; and in the follow- ing century it received considerable development in con- sequence of the wars they had to maintain against Louis XIV. In 1702 they had in their pay upwards of 100,000 men, exclusive of 30,000 in the service of the Dutch East India Company. At the beginning of the wars of the French Revolution the army had fallen to 36,000 men. In 1795 Holland was conquered by the French under Pichegru, and in the course of the changes which ensucd the army was entirely reorganised, and under French direc- tion bore its share in the great wars of the empire. In 1814 Holland was relieved of the yoke of France, and in the following year, her armies, under the gallant Prince of Orange, fought side by side with the British at Waterloo. At the peace of 1815 the Belgian provinces, subject before the war to Austria, were annexed to Holland, and the whole formed into a constitutional kingdom ; but the union between the northern and southern provinces of the Netherlands was dissolved by the Belgian revolution of 1830, and in 1839 Belgium was finally acknowledged as an independent kingdom.

The military forces of the Netherlands cousist of a home or regular army, a colonial army, and a militia The regular army is in theory raised by couscription, five years being the term of service, but substitutes are allowed, and a great part of the force under arms are volunteers, the conscripts being drilled for ten months only, and then sent home on furlough, subject to six weeks’ anuual training. The colonial army is raised entircly by voluntary enlist- ment. The infantry of the regular army consists of 8 regiments of the line, each of 4 active and 1 depét. bat- talion, a regiment of guards, composed of 2 battalions of chasseurs and 2 of grenadiers, and a battalion of in- struction, A. battalion consists of 5 companies, of a peace strength of about 100 men, and a war strength of 200. The cavalry consists of 4 regiments of hussars, each regiment having 6 squadrous, viz, 4 field, 1 reserve, and 1 depédt. The strength of a squadron in time of peace is about 100 men, in time of war about 200. The artillery consists of 5 regiments, viz., 1 field, 3 garrison, and 1 of horse artillery. The

field artillery regiment has 14 active batteries of 6 guns each, and 1 depdt company ; the horse artillery has 4 active batteries and 1 depét; the garrison regiments have each 14 companies, of which 1 is for torpedoes and 1 instructional. The engineers consist of a scientific staff, and 1 battalion of sappers and miners. The war strength of the Dutch army in 1872 was as follows :—

Staff and Administration, ...0..-.cs-0es 175 RRATNGIY Soc oteteecsct sin cates a dees atts oanise ae eee REE . 43,010 (CORON, Sgerppasere ano cqadueosdbesn. caso dsacacsoacsacas 4,259 AMUN ERY cic ossnuisesconase caress var csc conseassesssencets 11,166 IBANGITICETS Ns. .2a.ssaanetousemasc cee asemaccecccaeneecaes ales

0} ae 59,725

with 108 guns. The colonial army numbered about 28,000 men,—13,000 Europeans, and 15,000 natives.

The militia, or garde civique, is divided into two classes: the first, or active militia, numbering about 26,000; the second, or resting militia, about 61,000. The whole are organised in battalions according to locality. They are generally well clothed and armed, and of fair physique, but are very badly drilled. The men of the regular army are well drilled, and sturdy and robust, though rather small. They have had the advantage of the services of many

MINOR EUROPEAN. |

Prussian officers as instructors, and a large camp of in- struction is formed annually. The officers are mainly supplied from the military academy at Breda, and are of the upper classes; promotions from the ranks are very rare.

BELGIAN ARMY.

By a law passed in 1868 the strength of the Belgian ariny was fixed at 100,000 men on war footing, and 40,000 in time of peace. It is formed by conscription, to which every able-bodied male is liable on completing his

19th year. Substitution, however, is permitted, and substitutes or volunteers actually form a large part of the army. The annual contingent is 12,000 men. The period of service is eight years, of which two-thirds are passed on furlough ; the actual time in the ranks has recently been increased from twenty-six to thirty months for the infantry ; in the other services it is three years. The infantry consists of 1 regiment of carabineers, 3 of chasseurs, 1 of grenadiers, and 14 of the line. Each regiment has 3 field and 1 reserve battalion of four companies each, the latter in cadre only in peace time. The cavalry consists of 4 regiments of chasseurs and 4 of lancers, each of four field and one depdt squadron. 'The chasseurs form on mobilisation the divi- sional cavalry, the lancers the reserve cavalry. The artillery is formed in 4 regiments, and numbers 34 field and 6 reserve batteries of 6 guns each. The engineers are organised in 1 regiment of 3 battalions (four companies each), and 5 special companies, viz, two telegraph, one railway and one pontoon, and one of artificers. On mobili- sation the army forms two army corps, each of two infantry divisions and a reserve of cavalry and artillery, and number- ing 26 battalions, 16 squadrons, and 96 guns.

Besides the standing army there isa civic militia (garde nationale), available for the defence of the country in time of war. This force, which numbers 125,000 men without, and 400,000 men with the reserve, is formed of all citizens between 21 and 40 able to bear arms, but is only organised in the large towns and fortresses. In time of peace it is under the Ministry of the Interior, but in time of war under the Ministry of War.

The organisation of the Belgian army was subjected to a practical test in 1870, when it was suddenly mobil- ised and placed in observation on the frontier. The re- sults were not satisfactory. The actual numbers fell considerably short of the estimated ones, and of the men present a large number were quite unfit for service. The number of officers was altogether insufficient, and the army was in many respects incompletely equipped. A bill for the reorganisation of the army, based on com- pulsory personal service, was introduced in 1871, and adopted in principle by an overwhelming majority of the commission appointed to examine it. But public opinion pronounced so decidedly against the abolition of substitu- tion that Government gave way, and the bill was with- drawn. Ultimately, General Thiebault accepted the Ministry of War, and introduced a modified

measure, which yielded the disputed point of substitution, and contented itself with additional guarantees for the character and quality of the substitutes, and reform in various branches of army administration. In a rich and enterprising commercial country like Belgium personal service would naturally fall peculiarly heavily; but, further than that, a not inconsider- able portion of the inhabitants are opposed to the main- tenance of any standing army. The Belgians are not a military nation; the martial spirit which once made them a match for the trained soldiers of the most powerful and warlike kingdom of Europe, seems to have given place to mercantile instincts and industrial pursuits. The troops that fought at Waterloo alongside the British did little to

raise Belgium's military reputation, some having deserted the battle-field in the midst of the conflict. The modern Belgian soldier is active, fairly intelligent, and a good marcher, but undersized, of inferior physique, and in most respects a bad copy of the French soldier.

DanisH ARMY. The Danish army, though small in numbers, has always

been of excellent material, and the gallant stand made in

1864 against the overpowering forces of Austria and Prussia deservedly won the adiniration of Europe. Since then she has reorganised her army on the principle of universal ser- vice; but has applied that priuciple in a manner peculiar to herself, and intermediate between the militia system of Switzerland and the three-years' system of Germany. By the law of 1867 every Danish citizen is liable to serve in the army or navy. Those who have been brought up as sailors, and have served at least eighteen months as such, are inscribed on the reserve lists of the navy; the rest serve in the army. Service commences at 22, except in the case of volunteers, who are allowed to join at 18. The period of service is fixed at eight years in the army, and eight years in the reserve or "reinforcement" (for- staerkning). The actual service with the colours is very short, and is divided into two periods. The first or recruit's course of instruction, which all must go

through, lasts for six months in the infantry, five in the guard, field artillery, and engineers, and nine and a half in the cavalry. The second course lasts for nine months in the infantry, eleven

in the cavalry, and one year in the artillery and engineers, and is confined to those who are considered insufficiently

trained, to non-commissioned officers selected for promotion,

and to a certain number, selected by lot, who are retained

to complete the cadres and carry on garrison duties. In the

infantry the bulk of the recruits are sent home after the first six months, about one-third to one-fourth remaining for

the second term. On the other hand, the great majority of the cavalry, and almost the whole of the field artillery, are retained for the second period, and thus receive respectively twenty and seventeen months' training. For every three months of service in excess of the six months' course, one year is deducted from the period of service in the reserve. Those who were sent home after six months are called out again for a supplementary course of six weeks during their second year, which is passed at the camp of instruction at Hald, near Viborg, where from 8000 to 10,000 men are annually assembled for large manceuvres.

The Danish army is organised territorially, the kingdom being divided into five brigade districts, each of which is again subdivided into two regimental districts. A brigade consists of two infantry regiments, each of two line and one reserve battalion, and a cavalry regiment. The infantry regiments draw their contingent of recruits from the corresponding regimental districts, the two line bat- talions taking it by turns annually to receive and train the whole of the recruits for the regiment. The cavalry are recruited from the brigade districts, and the guard, artil- lery, and engineers from the kingdom generally. After remaining for four years on the lists of the line regiments, the conscripts are transferred for the remaining four years to the reserve battalions, in which they have to perform one course of training, the reserve battalions being mobi- lised during four weeks annually for the purpose.

The Danish army thus consists of 1 regiment of infantry of the guard and 10 of the line, each of three battalions—two active and one reserve; 5 regiments of cavalry, each of three active and two reserve squadrons ; 1 regiment of field artillery of twelve batteries, and 1 regiment of garrison artillery of two battalions; 1 regiment of engineers, of six active and three reserve companies, and 2 companies

of military train. The total strength of the army, exclu- sive of reserves, is about 38,000 men; the number serving with the colours varies according to the time of year.

The Danish soldiers are, generally speaking, a fine body of men, of considerable physical power, and inured to hardship and rough living. They combine a good deal of northern stubbornness with the romance and martial feel- ing of the old Scandinavian. Nursed in old traditions and chivalrous legends, the quiet, hard-working Danish peasant has within him a vein of poetry and a sympathy for heroic deeds strongly contrasting with his outward demeanour. He still retains much of the character of the feudal ages —instinctive respect and attachment to his leaders, and implicit confidence in them; and in the army this feel- ing has been strengthened by the local character which the regiments have always had, officers and soldiers serving together for generations. The officers are all drawn from the upper class, and are asa rule highly-educated gentle- men; they are trained from an early age at the Academy at Copenhagen, where the languages and literature of all countries are taught, as well as purely scientific subjects, and undergo strict examinations before they pass as cadets.

SweEDISH AND NORWEGIAN ARMY.

Although the crowns of Sweden and Norway are now permanently united, each country retains its own govern- ment, constitution, and laws; and the military forces of the two countries are separate and differently organised. The Swedish army is composed of three distinct classes,— the "varfrade," or enlisted troops, to which belong the royal guards, one regiment of hussars, the artillery, and the engineers; the "'indelta," or national army,

paid and kept by the landowners, each of whom furnishes a certain number of men, to whom, besides a small annual pay, a cottage and a piece of land are allotted during the period of service ; and thirdly, the " beriring," or conscription troops, drawn by annual levy from the male population between the ages of 20 and 25 years. The "indelta" are called out for a month's training annually in time of peace. Besides the above, there is a Gothland militia force of 30 com- panies of infantry and 3 batteries of artillery, numbering about 8000 men; these, however, are not compelled to serve beyond the confines of the isle of Gothland, and have a separate command. The royal guards number 2240, the line (under which is included the "'indelta") about 25,000 infantry, 5000 cavalry, 5000 artillery with 234 guns, and 1000 engineers. The " beriring" amount to about 95,000 of all arms. The Swedish troops are physically the finest in Europe,—powerful, hardy, and brave, and retaining much of the old Scandinavian heroic spirit; and, though strictly a militia only, their peculiar aptitude for all warlike exercises would make them formidable antagon- ists, even to the best trained armies. Few nations have so brilliant a military history. Under Gustavus Adolphus in the Thirty Years' War, and later under the heroic but in- satiate Charles XII., they achieved a reputation almost unrivalled in Europe; and their armies and tactics served for many years as models to the great military powers.

The military forces of Norway are differently organised, and though divided into line and militia, are in fact purely a militia force. By the law of 1867 all young men past the age of 2i are liable to the conscription, with exception of the inhabitants of the three northern pro- vinces, who are free from all military service. Actually the troops are raised partly by voluntary enlistment and partly by conscription. The term of service is for ten years, divided into three in the line, four in the reserve, and three in the militia or "landvaern." The cadres of the army are formed entirely of volunteers. The young

annual training of twenty-four days.

reserves 19,000, and the landvaern 11,000.

found the profession of arms a lucrative one.

[MINOR EUROPEAN.

men raised by conscription are required to go through a recruit's course of forty-two days, and subsequently an On the Ist January 1872 the troops of the line numbered 13,000 men, the The land- vaern are ouly liable to service within the frontiers of the kingdom.

Swiss ARMY.

The inhabitants of Switzerland were always a hardy and

independent race, but their high military reputation dates. from the middle of the 15th century, when the com- paratively ill-armed and untrained mountaineers signally defeated Charles the Bold of Burgundy and the flower of the chivalry of Europe in the battles of Granson, Morat, and Nancy.

The Suabian war, towards the end of that century, and the Milanese war, at the beginning of the

following one, added to the fame of the Swiss infantry, and

made it the model on which that arm was formed all over Europe. The wealthier countries vied with each other in hiring them as mercenaries, and the poor but warlike Swiss Whatever discredit may attach to the soldier who sells his services to any country or_cause, and fights for money alone, the Swiss at least have done much to redeem the position by their unswerving loyalty to their employers. The devoted faithfulness of Louis XVI.'s Swiss guard is proverbial, and

has been commemorated with just pride by their country-

men. 'The French Revolutionary armies overran Switzer-

land, as they did all the small neighbouring states, and during Napoleon's career she had to submit to his rule, and furnish her contingent to his armies. Napoleon she regained her independence, and returned to

On the fall of

her old trade of furnishing soldiers to the sovereigns and powers of Europe. Charles X. of France had at one time as many as 17,000 Swiss in his pay; Naples and Rome had each four regiments. The recruiting for these foreign services was openly acknowledged and encouraged by the Govern- ment. The young Swiss engaged usually for a period of four or six years; they were formed in separate regiments,

-officered by countrymen of their own, and received a higher

rate of pay than the national regiments ; and at the close of their engagement returned with their earnings to settle down on their paternal holdings. A series of revolutions, however, expelled them from France and Italy, and recently the advance of liberal ideas, and the creation of great national armies based on the principle of personal service, has destroyed their occupation. Switzerland is now remark- able in a military sense as being the only country that main- tains no standing army; and the fact that, with an annual expenditure of only £200,000, she shows a force of 200,000 men, has made her military institutions the study of econo- mists and the model for many would-be military reformers.

The 13th article of the constitution of 1848 forbids the maintenance of a standing army within the limits of the confederation; but every citizen is required to bear arms for the defence of the country, and for this purpose a certain military training is given at all schools. The actual forces of the republic consist of a militia divided into three classes,—the "' auszug" or élite, the reserve, and the landwehr. 'The strength of the élite is fixed at 3 per cent. of the population, and that of the reserve at 14 per cent.; the landwehr includes all who have passed the élite and reserve up to the age of 44. The total service is limited to twenty-five years. Within these conditions the cantons are allowed to raise their contingents and distri- bute the service as they please ; and it thus happens that service in the élite lasts for five years in some cantons, and for fourteen years in others. Exemption from service is granted to certain Government and public officials, to the

TURKISH. |

clergy, surgeons, &c.; all other citizens become liable on attaining the age of 20. No substitutes are allowed, and any one rejected for bodily infirmity, or exempted from any cause, is required to pay a small tax.

The strength of the armed forces of Switzerland was given as follows in 1872:—

Auszug. | Reserve. |Landwehr.| Total. EG: sesnes rere ae ace oes 841 0 66,649 | 39,078 | 54,334 | 160,061 Rifles (Scharfschiitzen) ..... 6,001 3,364 | 4,616 | 138,981 Cavalry… a 1,913 | 1,086 | 1,571 | 4,570 Artillery …....0cccc00s0 | 8,262 | 5,350] 4,643 | 18,255 IU ROOTS ses nnsscceenassees 1,245 | 1,059 743 | 3,047 Administration …..... 299 129 74 502 | 84,369 | 50,066 | 65,981 | 201,257 | ee fi a saan}

Of these, however, the landwehr exist on paper only, and may be left out of consideration; and the available force is estimated at about 105,000, of whom 70,000 belong to the "auszug," and 35,000 to the reserve.

The infantry are armed and equipped by their cantons, the recruit himself having to bear a portion of the expense. Before being placed on the rolls of the '"auszug" he has to undergo a training of four weeks for the line, or five weeks for the rifles ; and subsequently an annual training of eight days while in the élite, and six days in the reserve. Practically, however, the élite are commonly called out every second year only, and the training of the reserve is often omitted altogether The cavalry, artillery, and engineers have a recruit's course of six weeks, and an annual training of (nominally) a fortnight ; but in practice the latter has been reduced to eight days every second year. The cavalry resemble our yeomanry, consisting of a wealthier class of men, who find their own horses; the engineers are selected from men following suitable trades. The whole army is formed in six divisions, and annually one or two of these are assembled for divisional manceuvres. A handsome federal barrack for infantry and cavalry and a permanent instructional establishment exist at Thun.

Officers are required to go through a six weeks' course at'

this federal school, and to attend one course of recruit training on appointment. The nomination of officers, and promotions up to the rank of

captain, are made by the cantonal governments ; promotion to the higher grades and appointments to the staff by the federal authorities, though usually on the recommendation of the cantons. Candidates for the staff are required to go through a two months' course at a staff school which is annually opened for the purpose.

A study of the military system of Switzerland will at once explain its apparent cheapness. The expenditure shown in the federal budget is only a portion of the real cost of the army; to it must be added the expenses borne by the cantons and by the men themselves. The actual cost is estimated by the best authorities at £533,000 per annum, or about £5 per head for an effective strength of 105,000 men. In England the annual cost of the militia is about £8 per head, of the volunteers £3. The Swiss so-called army may take its place between our militia and volunteers. The men are less trained than our militiamen, but are generally better educated and of a more intelligent class. They show at least as much independence as our volunteers, and many things of acknowledged necessity are left undone, simply because the men will not do them. The officers are in all respects inferior, and that class who have previously seen service in the army is wanting. In equipment the army is far behind our auxiliary forces, and an attempt made in 1872 to improve its organisation generally, and give the federal authorities more power, was successfully resisted by the cantons. During the war of

1870-71 five divisions of the Swiss army, amounting in all to about 37,000 men, were mobilised and assembled on the frontier; and superficial observers were enthusiastic in their praises of the organisation and efficiency of this citizen army. But their own commander reported that there was "incredible friction in the mechanism of the whole force ;" that many of the battalions were in the lowest condition of discipline and efficiency ; and that "to march against an enemy with such troops as these would indeed be a bold enterprise ;" and urged that "it would be far preferable to have an army weaker in point of numbers, but of better quality." What becomes of such forces when opposed to a real army has been abundantly

illustrated by the history of the French gardes mobiles in the war of 1870. Switzer- land exists by the sufferance of her powerful neighbours, and her military institutions are suited to such conditions, but not to a power that relies on itself for its independence.

TURKISH ARMY.

The Ottoman empire, whose power at one time seemed to threaten the very existence of the Christian states, has long lost her terrors, and her military institutions are now studied rather to see what elements of resistance to foreign aggression she still possesses, than for the part she may play in European politics) Her armies have lost their peculiar character and constitution, and with it much of the spirit which once made them formidable. In the early days of her rising power every Osmanli was a soldier; and the whole nation was animated with that martial fanaticism that was the secret of her strength. As her conquests extended, her warriors were rewarded with grants of land, and a system of military tenure arose resembling the feudal system of Western Europe. And though the Osmanli retained his simple habits and warlike spirit, the unfitness of such a militia for prolonged opera- tions soon led, as in the Christian states, to the establishment of a more permanent force. Sultan Amurath I. in 1360 first formed a bodyguard of Christian captives; and this force, highly privileged and rewarded, soon swelled to large dimensions. Such was the origin of the janissaries, the earliest standing army in Europe, and for long the scourge and terror of the neighbouring Christian states. Like most proselytes, they were more fanatical even than the genuine Osmanli ; and this, added to a permanent organisation, made them for a time almost invincible. But success and indulgence produeed their usual results ; they became over-bearing, corrupt, and formidable only to their own country. From being the sultan's slaves they became his masters, and the history of Turkey shows a long list of rulers appointed, deposed, or murdered by the janissaries. Two attempts to break their power failed disastrously. But Sultan Mahmoud II. was not daunted by a first failure, and when in 1826 he commenced his reorganisation of the army, and the janissaries again rose against him, they found him prepared. The new troops remained faithful, and in

a terrible three days' struggle, in which 20,000 of their

number were killed, the janissaries as a body were annihi- lated. Mahmoud now hastened to reconstitute his army on European models ; but while his measures were still in embryo he found himself involved in a war with Russia, and though the newly-raised troops behaved with gallantry, the war soon took an unfavourable turn, and ended dis- astrously for Turkey with the humiliating peace of Adrian- ople. The reforms instituted by Mahmoud were, however, carried on vigorously by his successor, Abdul Medjid, and form the basis of the present military institutions of Turkey.

As now constituted, the Turkish forces consist of the "nizam," or standing army; cies eS a reserve }

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"redif," or second reserve ; '"'hijade," or landsturm; and a certain number of irregular levies.

Although in principle every one is lable to service, the army is recruited entirely from the Mussulman population, Christians and others being exempted on payment of a tax called the "bédel." 'The capital, the island of Crete, and certain frontier districts, are by ancient privilege exempt both from service and from the tax. The burden of the con- scription therefore falls on a comparatively small proportion, considerably Jess than one-half of the population. The actual conscripts, however, are not numerous. A consider- able proportion of the army is raised by voluntary enlist- ment, the pay being sufficiently high to attract poor Mussulinans; and as personal substitutes, or exemption on payment of a fixed sum (in which case Government finds the substitute), are both allowed, all possessed of any means can and usually do escape service. The period of service is fixed at twenty years,—four in the ranks, two in the " ichtjat," six in the "redif," and eight in the "'hijade." The strength of the standing army remaining at 150,000 men, the annual levy is fixed at one quarter of this, or 37,500 ; and it is estimated that this will give 70,000 (two years' contingents, deducting casualties) in the " ichtjat," about 200,000 in the "redif," and 250,000 in the "'hijade," or a total of 670,000 men. Practically, however, these

numbers would never be attained, and a great part of the necessary organisation exists only on paper.

The standing army is divided into six army corps, corresponding to the six military districts or "ordus" into which the empire is divided; each army corps consists of 6 to 7 infantry regiments, 6 or 7 rifle battalions, 2 to 7 cavalry regiments, and 1 artillery regiment. 'There is no divisional or brigade organisation in peace time, the regimental commanders communicating direct with the corps commanders; but in war time brigades of two regiments and divisions of two brigades are formed. The infantry of the standing army consists of 41 line regi- ments of 3 battalions each, and 38 rifle battalions, or a total of 161 battalions, A line or rifle battalion has 8

companies, and anormal or war strength of 33 officers and } one time formed a principal element of strength, 'two kinds,—paid troops (Bashi-Bazouks) and volunteers | (Spahis, by contract, the governor of a province receiving orders to

800 men; the peace strength is variable, being reduced by furloughs granted at the discretion of the corps or regi- mental commander, and seldom exceeds 400. Their regi- mental organisation, parade formations, and drill, are copied from the French. The infantry uniform, which until recently was also on the European pattern, is now more national, and consists of an open blue jacket, an ornamental waistcoat, leather sash, wide Turkish trousers, yellow lace boots, and fez cap. 'The cavalry numbers 25 regiments, all light cavalry, each of 6 squadrons, and numbering on war establishment 42 officers, 914 men, and 856 horses. 'The four centre squadrons are armed with lances, the two flank ones with breech-loading carbines ; all carry sword and revolver besides. The uniform is an open jacket and waistcoat like that of the infantry, but differently laced ; the saddle is that known in Austria as the " Hungarian " saddle.

The artillery consists of 6 regiments of field artillery, attached to the several army corps, a reserve artillery regi-

ment, and 7 regiments of garrison artillery. A field |

artillery regiment consists of 15 batteries of 6 guns each ; the reserve artillery regiment is similarly organised, and acts as a depot to the others. The garrison regiments are distributed to the different fortresses; they are formed of 4 battalions of 3 companies, and have a war strength of 2040 men, but in peace scarcely number a third of that. The fortification corps, or corps of engineers, belongs to the artillery, and consists of 2 battalions of 4 companies each. The artillery has always been the best organised and most highly trained branch of the Ottoman army.

ARMY

[TURKISH,

Mahmoud paid special attention to it, and it was the

fidelity of that branch that gave him the victory in the

struggle with the janissaries. Foreign officers, Germans

especially, have always been largely employed in it, and by their exertions have brought it to a state of efficiency contrasting most favourably with the rest of the army.

The following gives the actual strength of the "nizam "

or standing army in 1870, and its estimated strength on war establishment (combatants only) :—

Actual strength. Estimated war strength.

Tunfarttry….....2088eetes.- 71,000 128,000 @ayalry: .....-.0-sessees- 16,000 20,000 Artillery (gums) .....—.- 396 552

After completing four years' service in the ranks, the Turkish soldier is passed into the "ichtjat," or first reserve,

for two years, during which he is liable at any time to be recalled, and cannot leave his district without permission.

The men of this first reserve, estimated at 70,000, are intended to form separate battalions, but are in all respects available for service like the standing army. Actually a large number would be required to complete the " nizam," and the cadres and officers for these reserve battalions only partially exist. A few such battalions were, however, formed at the time of the Yemen expedition in 1870. After two years in this first reserve, the soldier is passed on to the "'redif," or second reserve. The "redif" can only be called out in war time, and is not liable for service except within the country. It' is divided into two levies, each of three years' contingents, and forms separate regiments and batteries ; and it is proposed to form these into army corps corresponding to the existing corps of the standing army, and consisting each of 6 infantry regiments, 6 rifle batta- lions, 3 cavalry regiments, and 1 artillery regiment of 6 batteries. But this organisation exists on paper only, and it is very doubtful if the necessary cadres and officers would be forthcoming. Lastly, after six years in the "redif," the man is passed on to the "hijade," or landsturm, for eight years; but this force, though liable to be called out in war,

_is not organised even on paper.

The irregular troops, which are raised in war, and at are of

Bedouins, dc.) The former are usually raised

raise a certain number, and being supplied with the necessary funds, and thereupon contracting with such chiefs or adventurers as undertake to furnish the men at the lowest cost. Most of the money finds its way into the pockets of the governor or contractor, and but little goes to the Bashi-Bazouks. In the last war between Russia and Turkey (1853-55) 20,000 to 30,000 of these were raised, for the most part ill-armed and worse disciplined infantry ; but most of them were disbanded before the close of the war. The volunteers, on the other hand, though deficient in organisation, are zealous Mussulmans and brave soldiers. They come mostly from the wild border tribes, in small bodies, under their own chiefs and beys, and furnish a very valuable irregular cavalry. .

The Turkish soldier of the present day is generally docile, faithful, temperate, and capable of undergoing great hard- ships or fatigue. 'The

familiar terms on which the sub- ordinate officers mix with the men would be considered subversive of discipline in any other army, but do not appear to be so in the Ottoman army, and serious military offences are rare. When well commanded, he has shown himself capable of great personal devotion and even heroism, but of a passive rather than an active character. Naturally calm and rather apathetic, he seems to have retained that fatalism which is a special characteristic of his religion, but to have lost the fiery zeal that distinguished his

ancestors, and made them, whether individually or as a nation, such formidable assailants. It may be questioned whether, in a purely military aspect, Mahmoud did not lose more than he gained by the destruction of the janis- saries and reorganisation of his army on modern models, and whether any amount of drill and science will compensate for the old fanatical spirit. But some such reforms were necessary; Turkey could not continue to hold a place in Europe, yet live the life of an Eastern nation and of an age long past. Her new armies have showed themselves for- midable on many occasions ; her artillery promises to rival that of most Western nations; and if the Osmanli character is in some respects ill-suited to the scientific and far-seeing character of modern warfare, it still retains enough of its old religious fanaticism to make her more than ordinarily danger- ous in a defensive and, as it would seem to her, a holy war.

In a notice of the military forces of Turkey mention must be made of her vassal states, Egypt and Tunis, each of which is bound to furnish an auxiliary contingent in war. The military forces of Tunis and Tripoli are too insignificant to require special notice: her contingent is from 2000 to 4000 infantry, 1000 cavalry, and 8 guns, and during the Crimean war she did actually send about 4000 men to the seat of war in Asia Minor. Egypt is now pledged to furnish an army corps of 30,000 men complete with cavalry and guns. Inthe Crimean war she furnished first one and afterwards two divisions, amounting to about 21,000 men; and during the insurrection in Crete she furnished a contin- gent of 10,000 men. The Egyptian army is almost the crea- tion of its present ruler, Ismail Pacha, who on his accession found only two infantry regiments and a few detachments of

irregulars. It now consists of 15 infantry regiments of 3 battalions each, 3 rifle battalions, 4 cavalry regiments, 2 regiments of field artillery, and 3 of garrison artillery, and 1 battalion of sappers; and numbers on war strength about 52,000 infantry, 2500 cavalry, and 144 guns, The peace strength is little more than half this. These troops are all organised and drilled on European principles, mainly after French models. Many of the highest officials are actually old French officers. In addition to these, Egypt maintains a force of about 8000 sandschaks or irregular troops, who receive a higher rate of pay, but are required to arm, clothe, and feed themselves, and are per- manently stationed on her frontiers. In case of war Egypt can raise about 10,000 irregular cavalry among the tribes that are subject to her.

AMERICAN ARMY.

The army of the United States of America is the last that calls for notice. Threatened by no powerful or war- like neighbours, the United States are saved from that ruinous competition in armaments which presses on the industry of European countries. The American army is little more than a police force, of which a few regiments serve as a reserve to the civil power in the great towns, while the rest are dispersed in small posts along the fron- tiers or among the Indian districts. By an Act of 1870 its strength was limited to 30,000 men. It consists of 10 regiments of cavalry, each of 12 companies or troops; 25 regiments of infantry, of 10 companies each ; 5 regiments of artillery, and one engineer battalion. The cavalry, broken up in small detachments, partake more of the character of mounted police than of that of European cavalry. They are armed with swords and breech-loading or repeating rifles, and trained to act on foot as well as on horseback ; and the whole cavalry drill is assimilated as closely as possible to that of the infantry. The infantry are organised after the old English fashion in single battalion regiments of 10 companies. The army is raised entirely by voluntary

enlistment ; the term of service is three years, but it is now proposed to extend it to five, and re-engagements are encouraged. Two regiments of cavalry and three of infantry are composed of negro soldiers, but commanded by white officers. The officers of the army are furnished by West Point Academy, a military school equal to any in Europe. The course of instruction lasts four years, and includes all subjects of general education besides purely professional ones. West Point is sought by young men of the best families in America, and the number educated there considerably exceeds the requirements of the army. It is thus the means of spreading a certain military educa- tion throughout the country, and it was to this West Point training that the Southerners owed the large number of excellent officers that were found in their ranks in the war.

For military purposes the territory of the United States is divided into ten departments, and those grouped into four military divisions: the South, comprising the depart- ments of the South and of Texas; the division of the Missouri, comprising the departments of Dakota, the Platte, and Missouri; the division of the Pacific, comprising the departments of Columbia, California, and Arizona; and the division of the East, comprising the departments of the East and the Lakes.

By the constitution of September 1787 the President is Commander-in-Chief of the army and militia of the Union, and Congress has power to raise and support armies, to make rules for their government and regulation, and to provide for calling forth the militia to execute the laws of the Union, suppress insurrections, and repel invasions. The Articles of War, by which all troops when mustered into service are governed, were enacted in 1806, and are a close but somewhat improved copy of those in force in the English army, and much of their army regulations is identical with the old general regulations and orders of the royal army.

The military history of the United States is as strange as the rise and rapid growth of the nation. In 1790 the rank and file of the army, as fixed by Act of Congress, amounted to 1216 men; and in 1814 an English expedition of only 3500 men was able to seize and burn Washington, the capital of a country which even then numbered eight millions of inhabitants. In 1861, at the commencement of the war of the secession, the whole regular force

amounted to only 14,000 men. In April of that year the President called out 75,000 volunteers for three months to defend the capital, which was threatened ; and in May a further call for 42,000 was made. In July two calls for 500,000 each were authorised by Congress, and as even this vast force proved insufficient for the gigantic struggle which America had now embarked in, it was found neces- sary to introduce the conscription. In October 1863 a levy of 300,000 men was ordered, and in February 1864 a further call of 500,000 was made. Finally, in the begin- ning of 1865 two further levies, amounting in all to 500,000 men, were ordered, but were only partially carried out in consequence of the cessation of hostilities. 'The total number of men called under arms by the Government of the United States, between April 1861 and April 1865, amounted to 2,759,049, of whom 2,656,053 were actually embodied in the armies. If to these be added the 1,100,000 men embodied by the Southern States during the same time, the total armed forces reach the enormous amount of nearly four millions, drawn from a population of only 32 millions,—figures before which the celebrated uprising of the French nation in 1793, or the recent efforts of France and Germany in the war of 1870-71, sink into insig- nificance. And within three years the whole of those vast forces were peaceably disbanded, and the army had shrunk to a normal strength of only 30,000 men. (G. P. C.)

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ARNAUD, Henn, the celebrated pastor, military leader, and historian of the Vaudois, was born, in 1641, at La Tour, or La Torre,in Piedmont. Heis said to have served under William of Orange, and it is probable that he received pecuniary assistance from that prince in_ his efforts to restore the exiled Vaudois to their native valleys. Owing to the cruelties of Victor Amadeus of Savoy, from two to three thousand of these Vaudois had been forced to take refuge in Switzerland and the states along the banks of the Rhine ; and twice they ineffectually attempted to return to their home. But the English Revolution of 1688, and the accession of William of Orange to the throne, encouraged Arnaud to make a grand effort. Concentrat- ing about 900 followers in the great forest of the Pays de Vaud, he remained in concealment for some time ; and at last embarked with them on the Lake of Geneva on the night of 16th August 1689. By September 16 they had

entered the valley of San Martino, after hard fighting with the French and Savoyard troops that harassed and opposed them. Being now, however, in danger of attack from about 20,000 French and Piedmontese troops, they were obliged to repair to the lofty table-land of the Balsille, which they fortified with such skill as to be able to with- stand the fiercest attacks of the enemy, repeatedly renewed through the whole winter. A general assault on the Balsille (2a May 1690) by about 22,000 French was an utter failure, resulting in the decimation of the enemy, without the loss of a single man to Arnaud. Not caring to hazard a renewal of the assault the garrison withdrew from this stronghold to Angrona, where, just when all chance of further escape seemed impossible, they learned that hostilities had broken out between France and Pied- inont, and that their king, who had persecuted and expelled them, was now ready to receive them with open arms. Thus ended the " glorieuse rentrée des Vaudois dans leurs vallées," effected, according to their own account, with a loss of only 30 men, while they made out that the joint losses of the French and Savoyards fell little short of 10,000 men. For a while the Vaudois were allowed to remain in peaceful possession of their ancient homes ; but when the war of the Spanish Succession broke out, Arnaud and his followers took part in the combination against France, and rendered the allies effectual service. When the war came to a close, the ungrateful king of Pied- mont once more joined the French monarch against his own subjects, and complied with the demands of that prince, that the Vaudois should be expelled from some of their valleys. The exiles, amounting in all to about 3000, found an asylum in Wiirtemberg. Arnaud, who had invitations from William II1., and might have spent the remainder of his days in ease and honour in England, chose rather to continue the pastor of the exiles in the village of Schénberg, and wrote, in his retirement, the Histoire de la glorieuse Rentrée des Vaudois dans leurs Vallées. It was printed in 1710, and dedicated to Queen Anne, and has been twice translated into English. Arnaud died at Schénberg in 1721, and every memorial that he left behind him was long cherished by his followers and their pos- terity.

ARNAUD, or ARNOLDUS, DE VILLA NOVA, a physician, alchemist, and astrologer, who lived at Paris about the end of the 13th and beginning of the 14th centuries. The discovery of the three principal acids,— sulphuric, nitric, and hydrochloric,—has been attributed to him, but Hoefer (Hist. de

la Chimie., t. i. p. 385) has shown that these had all been discovered long before his time. His works, with a life prefixed, were printed at Lyons, first in 1504, folio, and again with the notes of Nicholas Tolerus, in 1520, folio ; also at Basel in 1515 and

1585.

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ARNAULD, Anctiiqux (called Angélique de Saint- Jean), niece of the first or great Angélique, was born in 1624. She was educated at Port-Royal, and took the veil in her twentieth year. In 1653 she was made sub-prioress. During the persecution of the Jansenists, from 1661 to 1664, she was the chief support of the nuns in their resolute refusal to sign the Formulary of Alexander VIL. Along with some others she was put into confinement, and, even after permission had been given to return to Port- Royal, they continued to be under the close surveillance of soldiers, who were not withdrawn till 1669, after the "peace" edict of Clement IX. In 1678 Angélique was elected abbess, which office she continued to hold till her death in 1684. She has left several works, in particular the Mémoires pour servir a Phistoire de Port-Royal, kc., 3 vols, 1742, which throw much light on the life of her great aunt. See ARNAULD, JACQUELINE Mari.

ARNAULD, Anrornx, one of the greatest French theologians and philosophers, was born at Paris, Feb. 8, 1612. His father was the most famous advocate of the time, and had gained special distinction by his defence of the university against the Jesuits in 1594. Of his, large family, Antoine was the twentieth and youngest child. As he was at first destined to follow his father's profession, he turned his attention to legal studies as soon as he had completed the usual course of education at the colleges of Calvi and Lisieux. But the earnest advice of his mother, a deeply religious woman, who afterwards became an inmate of Port-Royal, induced him to give up the profession of a lawyer and to engage in the service of the church. He received his first instructions in theology from Lescot, confessor of Richelieu, but his teacher's influence over his

mind was greatly weakened by the study of some works of Augustine, which, at the request of his mother, had been recommended to him by St Cyran.

presented for the degree of bachelor in 1635 showed manifest traces of Augustine's influence, and gave great

The thesis which he

offence to Lescot. Arnauld now entered the Sorbonne, and from 1638 to 1640 professed the courses of theology and philosophy requisite for a licence. In 1641 he was ordained priest, and took his degree of doctor. After being twice rejected on formal grounds, or, perhaps, from the hostile influence of Lescot, he was, in 1634, admitted a member of the Society of the Sorbonne. In 1641 his mother died. Her last words, in which she implored him to hold stedfastly by the truth, made a deep impression on his ind. He gave up several benefices which he had obtained, and resolved to devote himself with all his soul to the defence and propagation of what he believed to be the truth. Between 1641 and 1643 he composed a treatise in two vols, De la Necessité dela Foi (not published till 1700), and another, Théologie Morale des Jésuites. In August 1643 he published his famous work, De la Fréquente Communion, expressly directed against the Jesuits, who held that the mere mechanical reception of the sacraments was sufficient, and that previous preparation and actual repentance were of secondary importance. They had even gone the length of saying, that the more a man sinned the more frequently and boldly should he approach the table of communion. Arnauld's book was sauctioned by many doctors of the Sorbonne, and by several bishops and archbishops. It was denounced by the Jesuits, one of whom, by name Nouet, preached against its heretical tenets, and called Arnauld an heresiarch worse than Calvin or Luther. This, however, carried matters too far; the Sorbonne and the bishops, who had given their sanction, were implicated in such a condemna- tion, and, by their influence, Nouet was compelled to retract. But the Jesuits insisted that the work must be judged at Rome, and laid special stress on a sentence in the preface,

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due not to Aruauld, but to De Barcos. This sentence they held to be adverse to the Papal supremacy, and they so wrought upon Mazarin as to obtain from him a decrec commanding Arnauld and De Barcos to repair to Rome. Such inteuse excitement and indignation were roused by this decree, which

struck a blow at the freedom of the French Church, that Mazarin apologised and withdrew it. De Barcos, who had made preparations for his journey to Rome, now learned that the Jesuits were forming bolder and more dangerous designs against Arnauld and himself. He withdrew into concealment and warned Arnauld, who followcd his example. The book was examined at Rome and defended by Bourgeois, a doctor of the Sorbonne ; and only the one sentence in the preface fell under Papal censure.

Scarcely was this controversy over, when a fresh cause of trouble arose. In 1640 appeared the Augustinus of Jansen, bishop of Ypres, the great object of which was to show that the doctrines of Augustine on grace, freewill, and redemption, were opposed to those of the Jesuits, which were really semi-Pelagian. This work fell under Papal censure in 1642, in the bull Jn eminent, which condemned it as a revival of the errors of Bajus. Arnauld, in 1643, wrote some observations and considerations on the bull, and in 1644-45 a first and second apology for Jansenius. Fora time there was little opposition made by the Jesuits, and Arnauld, besides superintending at Port-Royal, occupied himself in translating into French some of Augustine's works, and into Latin his own treatise De la Fréquente Communion. At last, in 1649, one Cornet proposed to the Sorbonne seven propositions which he maintained to be heretical. Of these, five were drawn from the Augustinus of Jansen. The other two proposi- tions were allowed to drop, and after much controversy the five were condemned by a Papal bull in 1653. Two years later the duc de Liancourt, whose chaplain was a Jansenist, and whose grand-daughter was an inmate of Port-Royal, was refused absolution by a Jesuit confessor unless he dismissed his chaplain and withdrew his grand-daughter from the heretical community. Arnauld wrote two letters upon this affair—the first anonymously, the second signed with his name, and addressed to the duc de Luines. In this second letter it was stated,—lst, that the fathers of the church exhibit to us, in St Peter, a saint who was deficient in saving grace ; 2d, that the five heretical propositions were not contained in the Augustinus. This second statement contains the celebrated distinction of the questions "de jure" and "de facto." As a matter of right,—of faith,—the propositions were heretical, wher- ever they occurred; but as a matter of fact, they were not to be found in Janscn's book in the sense ascribed to them by his opponents. The Jesuits held that this was really a rejection and defiance of the Papal bull ; and, in 1656 they prevailed on the Sorbonne to

expel Arnauld, deprive him of his doctorate, and pass a decree to the effect that all future members of their body must sign the censure. Arnauld's defence against this decree was undertaken by Pascal, who, in his brilliant Provincial Letters, brought down the dispute to the level of public comprehension. Arnauld continued to live in retirement, and, in company with Nicole, composed the valuable Port-Royal treatises on grammar, logic, and geometry. In 1668 the peace of the church allowed him to emerge from his retirement. He was received with great honour, and devoted himself to defending Jansenism from the imputation of leading to Calvinistic heresy. 'To refute this calumny he had already published (in 1664) the work known as the Petite perpetuité de la Foi; and in 1669 appeared the first volume of the Grande perpetuité de la Foi de PEglise sur ? Bucharistie, which was continued in 1671 and 1674.

This great defence of transubstantiation, though appearing

under Arnauld's name, was mainly the work of Nicole.

Arnauld followed it up with several polemical writings

against the impious and immoral tendencies of Calvinism. During this time also he was engaged in his elaborate assault on the moral doctrines of the Jesuits; the first volume of the Morale Pratique des Jésuites appeared in

1669, and seven other volumes followed at intervals up to

1694.

In 1679 Arnauld was again compelled to conceal himself.

He fled from France, and, pursued by the enmity of the Jesuits, went from Mons to Tournai, thence to Ghent, from Ghent to Brussels, and, after having been driven into

Holland, settled at Brussels from 1682 to 1690. In 1690 he was again compelled to leave his refuge, but, after wan- dering about for four years,

returned to Brussels, where he died on the 8th August 1694. He was buried in secret, and his heart was sent to be interred at Port-Royal. Dur- ing the last years of his life his activity never slackened. While continuing the large works already begun, he entered on a long philosophical discussion with Male- branche, in the course of which he published his treatise Des Vraies et des Fausses Idées, 1683, the Réfleaions Philo- sophiques et Théologiques, 1685, and a number of letters to Malebranche. He was also engaged in keen controversy with his old friends Nicole and Domat. Of his unwearied activity a characteristic illustration is his reply to Nicole, who urged him to rest from his labours. " Rest! " replied he, "shall we not have the whole of eternity to rest in?"

As a theologian Arnauld stands high among French writers, not only from the matter of his works, but from their style. He was the first to introduce a pure and grammatical mode of composition, and to lay aside the infinitely numerous subtleties of the preceding centuries. His writing is singularly vigorous and clear. His philo- sophic reputation rests on his doctrine of external percep- tion and his work on logic. He was perhaps the first to oppose the theory of representative ideas, or of percep- tion through the ideas of objects, which ideas exist apart from the perceived thing and the perceiving mind. Ac- cording to him, we perceive things in ideas, but the idea is the same as the perception; we have, in short, only a modification of the mind, conditioned by, or containing objectively, the thing itself. This mental state is subjective, but with an objective reference ; to mark the first charac- teristic, it may be called perception, to mark the second, idea. In many points Arnauld anticipates Reid's objec- tions to representative ideas, but their theories of percep- tion can scarcely be regarded as identical. The Art de Penser, familiarly known as the Port-Royal Logic, is the best specimen of the logic of the Cartesian school. It is fresh, clear, and instructive, not overburdened with the useless paraphernalia of scholastic forms, but rich in practi- cal precepts and examples. It is, however, in the main popular, and falls far short of a scientific presentation of the theory of thought. It has been frequently republished in France, and has been much used both in England and in Germany. The complete edition of Arnauld's works, with life by Larriére, is in 45 volumes, 4to, Paris and Lausanne, 1775-1783.

ARNAULD, JacquetinE Mantz (better known by her religious name, Marie Angélique de Ste Magdeleine), born 8th September 1591, was the second daughter of Antoine Arnauld, the celebrated advocate. She was early destined for the church, and assumed the dress of a novice in 1599. By concealing her age from the Pope, her father obtained a bull nominating her abbess of Port-Royal when she was little more than eleven years old. For some time after entering on office she spent a purely secular life, perform- ing the needful religious exercises, but taking little or no

interest in them, and gradually acquiring an intense dislike to the profession she had adopted. At last, in 1608, a ser- mon preached in the convent chapel produced a great change in her mind. She now saw that her true duty and happiness lay in the work of the convent; she inflicted on herself severe penances, persuaded the nuns to adhere rigorously to their vow of poverty, and excluded even her own relatives from the cloister precincts. The fame of the reformation wrought by her earnestness spread abroad, and when Mme. d'Estrées, abbess of Maubuisson, was, on account of her gross mis- conduct, removed and sent into confinement among the Filles Penitentes at Paris, Angélique was appointed to take charge of the convent. From this she was forcibly ejected by Mme. d'Estrées, and had to be reinstated by a body of the royal archers. For five years she laboured in Maubuis- son, and wrought a considerable change in the state of the convent. In 1623 she returned to Port-Royal, and three years later, as their accommodation became too limited for their numbers, the community removed to the house known as Port-Royal de Paris. Here Angélique accom- plished what she had long desired ; she was allowed to resign her dignity as abbess, the office was made triennial, and the occupants of it were elected by the nuns. From 1633 to 1636 she acted as superior of a religious commu- nity newly instituted in Paris, and then returned, as prioress, to Port-Royal, where her sister Agnes had been elected abbess. In 1648 she, with a few companions, went back to Port-Royal des Champs, and there had opportunities for showing much kindness to the poor, who were oppressed by the disastrous civil wars. Angélique died in 1661, just before the great storm of persecution broke over Port-Royal. Materials for her life are to be found in the general histories of Port-Royal, and in the

works of the younger Angélique. A very full memoir of her is given in Miss Frances Martin's work, Angélique Arnauld, Macmillan, 1873. ARNDT, Ernst Moritz, a distinguished German patriot, poet, and historical and miscellaneous writer, was a native of the island of Riigen in the Baltic, which at the time of his birth belonged to Sweden. He was born at Schoritz on the 26th December 1769. The second of a family of eight, he inherited from his father the sound mind in the sound body, good sense, practical sagacity, warm feeling, and a strong will; and from his mother the earnest, devout, and Christian spirit which animated all his words and deeds. After passing his boyhood in his father's house, familiar with the solitudes of sea and wood, trained in habits of accurate observation and cheerful activity, and stimulated by books to literary attempts of his own, he was sent, in 1787, to the gymnasium of Stralsund. There he studied for two years, and, after spending the next two years in the old home, he en- tered, in the spring of 1791, the university of Greifswald, whence he removed to Jena. There he fell under the influence of Fichte, whose teachings he received with eager love, and whese memory remained ever dear to him. Destined for the church, he applied himself at first to the study of theology, but after some years, conscious of no inward call, he renounced that pursuit. In 1796 he became a private tutor at Altenkirchen ; visited afterwards Austria, Hungary, Italy, and France, giving to the world the fruits of his observation in a series of remarkable volumes published in the course of the following years ; and in 1800 settled at Greifswald as ' privat-docent" of history and philology. In 1806 he was na professor extraordinary. His special faculty and vocation distinctly revealed themselves in his bold History of Serfdom in

Pomerania and Riigen (1803), for which he was denounced

So convincing was

by the nobles to the king of Sweden. In his

the book that, in 1806, serfdom was abolished.

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next work, Geist der Zeit (1807), he aimed at a higher mark. He flung down the gauntlet to Napoleon I. who, in the campaigns of Austerlitz and Jena, had laid Germany prostrate before him, and in burning words he called on his countrymen to rise and shake off the hateful yoke. So great was the excitement produced by this appeal that Arndt, to escape the vengeance of Napoleon, took refuge in Sweden. The work passed through fifteen editions, and grew into four volumes, to which a fifth part, entitled Pro Populo Germanico, was added in 1854, Arndt having thus erected the banner of German freedom and unity, devoted himself thenceforth with unflagging courage to the great cause. In pamphlets, poems, and songs he communicated his own enthusiasm to his countrymen ; and he zealously co-operated with Stein in the reorganisation of the army and preparation for the final struggle. The War of Liberation followed, and Germany was free. Long years were, however, to pass before unity was attained. One of the most famous of Arndt's songs was that commencing, " Was ist der Deutschen Vaterland." After the peace he returned to Germany, edited at Cologne a political journal, entitled Der Wachter (1815-16), and in 1818 was appointed to the chair of history at Bonn. But his bold demands for constitutional reform offended the Diet, and being deprived in the following year, he passed twenty years in retirement and literary activity. In 1840 he was reinstated in his professorship, and in 1841 he was chosen rector of the university. The revolutionary outbreak of 1848 rekindled in the venerable patriot his old hopes and energies, and he took his seat as one of the deputies to the National Assembly at Frankfort. Seeing no prospect of a satisfactory issue he retired with the adherents of Von Gagern. With rare freshness and vigour he continued to lecture and to write, and on his 90th birthday received from all parts of Germany good wishes and love-tokens. About a month later, January 29, 1860, he made a peace- ful departure out of the world. Arndt was twice married, first in 1800, but his wife died in the following year in giving birth to a son; he married a second time in 1817. Among his numerous works, in addition to those already named, are—Vebenstunden, eine Beschreibung und Geschichte der Schottlindischen Inseln und der Orkaden (1820); Die Frage tiber die Niederlande (1831) ; Erinnerungen aus dem diussern Leben (1843) ; Wanderungen und Wandlungen mit dem Reichsfretherrn H. K. F. von Stein (1858) ; and a complete edition of his Gedichte (1860). Lives of Arndt have been written by W. Neumann and Wilhelm Baur; and statues have been erected to his memory

at Schoritz, his birth-place, and at Bonn, where he lies buried. (Ww. L. B. 6.) ARNDT, Joun, was a famous Protestant theologian of the 16th century, and may be regarded as the founder of the German Pietism of a later generation. He was born at Ballenstadt, in Anhalt, in 1555, and studied in a variety of universities—in Helmstidt in 1576; in Wittenberg in 1577, when the crypto-Calvinist controversy was at its height, and where he took the side of Melanchthon and the crypto-Calvinists ; in Strasburg, under Pappus, who was a strict Lutheran and had a great influence over him; in Basel, where he studied theology under Sulcer, and also medicine. In 1581 he went back to Ballenstidt, but was soon recalled to active life by his appointment to the pas- torate at Badeborn in 1583. After some time his Lutheran tendencies exposed him to the anger of the authorities, who were of the Reformed church. He found an asylum in Quedlinburg, and afterwards was transferred to St Martin's church in Brunswick. Arndt's fame rests on his writings, which were mainly of a mystical devotional kind, and were inspired by Bernard, Tauler, and Thomas a Kempis. His principal work is The True Christianity, which has been translated into most European languages,

and has served as the foundation of many devotional works, both Roman Catholic and Protestant. In this book Arndt dwells upon the mystical union between the believer and Christ, and his aim is to correct the purely forensic side of the Reformation theology, which paid almost exclusive attention to Christ's death for His people, by drawing attention to Christ's life a His people. Like Luther, Arndt was very fond of the little anonymous book, Deutsche Theologie, and published an edition with a preface recommending it. The first edition of his Z'rue Christianity appeared in 1605.

the Bible, The House and the Heart Church, Soul Medicine for the Pestilence, and De Unione Credentium cum Christo. His True Christianity has been translated into English at least twice, and has gone through a great number of editions ; the best known translation is that of RW. Boehm, Lond. 1720. Several of his sermons are published in R. Nesselmann's Buch der Predigten, 1858. Arndt has always been held in very high repute by the

German Pietists, and the founders of Pietism, Spener and Storr, repeatedly call attention to him and his writings ; they have gone so far as to compare him to Plato, ef. C. Scheele, Plato und Johan Arndt, Hin Vortrag, é&c., 1857. A valuable account of Arndt is to be found in C. Asch- mann's Essai sur la Vie, etc., de J. Arndt. (T. M. L.) ARNE, Tuomas AucusTINE, musical composer, was born in London on the 28th May 1710, his father being an upholsterer. Intended for the legal profession, he was educated at Eton, and afterwards apprenticed to an attorney. Hlis natural inclination for music, however, proved irre- sistible, and his father, finding from his performance at an amateur musical party that he was already a skilful vio- linist, furnished him with the means of educating himself in his favourite art. In 1733 he produced his first work,— a setting of Addison's Rosamond, the heroine's part being intended for his sister, who afterwards, became celebrated as Mrs Cibber. This proving a success was immediately followed by a burletta, entitled The Opera of Operas, based on Fielding's Zom Thumb. His individuality of style first distinctly asserted itself in the music to Milton's Comus, which was performed at Drury Lane in 1738, and speedily established his reputation. In 1740 he wrote the music for Thomson and Mallet's Masque of Alfred, which is noteworthy as containing the most popular of all his airs—Rule Britannia. In the same year he married Cecilia Young, who was considered the finest English singer of the day. Along with his wife he went, in 1742, to Ireland, where he remained two years. On his return to London he was engaged as leader of the band at Drury Lane Theatre (1744), and as composer at Vauxhall (1745). In 1759 he received the degree of Doctor of Music from Oxford. Three years later he produced, at Covent Garden, his opera of Artaxeraes, the popularity of which is attested by the fact that it continued to be performed at intervals for upwards of eighty years. The libretto was a transla- tion by Arne himself, very poorly executed, of Metastasio's Artaserse. In addition to his numerous operas, Arne wrote several oratorios, which made little impression at the time, and are now almost entirely forgotten. His success in this department might have been greater but for the contem- porary existence of the transcendent genius of Handel, though his deficiency in grandeur of conception and scien- tific resource is enough of itself to account for his failure. He is, however, undoubtedly entitled to a place in the first rank of native English composers. Though inferior to Purcell in intensity of feeling, he has not been surpassed by any of the school as a composer of graceful

and attractive melody. There is something akin to genius in such airs as Rule Britannia and Where the bee sucks, which still

His other works are Zhe Death of Adam and the Life of Christ, Thoughts on various Books of

‘order Composite (composite family).

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retain their original freshness and popularity. As a writer of glees he does not take such high rank, though he deserves notice as the leader in the revival of that pecu- liarly English form of composition. Dr Arne died on the 5th March 1778.

ARNHEM, or Arnueim (according to some the Arenacum of the Romans, Arnoldi Villa in the Middle Ages), the chief town in the province of Guelderland, in the Netherlands, on the right bank of the Rhine along the slope of the Veluwe Hills. It isa clean and prosperous place, in a pleasant and beautiful district, and is much frequented by the wealthy merchants of the Low Countries, whose villas and gardens adorn its environs. The Grovte Kerk, or principal church, formerly dedicated to St Martin, and now to St Eusebius, contains, besides other objects of interest, the marble monument of Charles of Egmont. The Stadhuis, or town-house, by Maarten van Rossum, is remark- able for the grotesque ornamentation which has earned it the name of the Duielshuis. There are also a government- house, a court-house, a gymnasium, an orphanage, a hos- pital for invalided soldiers (Bronbeck’s), a large assembly- hall (Musis Sacrum), a library, a theatre, barracks, and a good number of churches and schools. The town, formerly connected with the Hanseatic League, has still a consider- able traffic by river and canal and rail, manufactures tobacco, which is largely cultivated in the neighbourhood, woollen and cotton goods, paper, earthenware, soap, d&c., carries on wool-combing and dyeing, and has oil and bark mills. Arnhem was fortified in 1233 by Otho JII., duke of Guelders. In 1505 it received the right of coining from Philip of Spain, duke of Burgundy. In 1514 Charles of Egmont took it from the Burgundians. In 1543 Charles V. made it the seat of the Council of Guelders. The States-General got possession of it in 1585, and it resisted all the attacks of the Spaniards) In

1586 Sir Philip Sydney died there from the effects of his wound. The French took the town in 1672, but left it dismantled in 1674. It was refortified by Coehoorn in the beginning of the 18th century. In 1795 it was again stormed by the French, and in 1813 it was taken from them by the Prussians under Biilow.

ARNICA. A genus of plants belonging to the natural The flowers are clustered in heads (capitula), and are surrounded by an involucre composed of two rows of small leaflets called bracts. The outer flowers of the head are strap-shaped (ligulate), and contain pistils only, while the inner or central florets are tubular and have both stamens and pistils. The style is hairy, and the fruit is cylindrical, tapering at each end, and bears at its summit a pappus, consisting of rigid hairs in a single row. The most impor- tant species is Arnica montana (mountain tobacco), a perennial plant found in meadows throughout the northern and central regions of the northern hemisphere, but not extending to Britain. It grows on the mountains of Western and Central Europe. A variety of it, with very narrow leaves, is met with in Arctic Asia and America. The heads of flowers are large, orange yellow, and borne on the summit of the stem or branches. The outer ligulate flowers are an inch in length. The achenes (fruits) are brown and hairy. The root, or rather the root-stock, has — been used in Pharmacy. It is contorted and of a dark brown colour, an inch or two in length. It gives off numerous simple roots from its under side, and shows on its upper side the remains of rosettcs of leaves. It yields an essent{# oil in small quantity, and a resinous matter called arnicin. Arnica has been used as a stimulant in low fevers, and also in cases of palsy. It is said also to act in promoting perspiration. It is a popular remedy for chil- blains, and it is said to prevent the blackness of bruises,

The flowers have also been used in the form of tincture. They have an unpleasant odour. The plant is not much used at the present day. (J. H. B.) ARNIM, Bertrna von, famous for her acquaintance and correspondence. with Goethe, was a member of the Brentano family, and born at Frankfort, April 4, 1785. Her acquaintance with Goethe continued from 1807 until 1811, when it was brought to a close by her offensive behaviour to his wife.

Shortly after his death she published an extensive correspondence alleged to have passed between the parties. Its genuineness was immediately contested by Goethe's old friend Riemer, and the discussion leaves no doubt that it is everywhere interpolated, and to a great extent wholly fictitious. Bettina never could produce the originals of the letters; and it has been demonstrated that the sonnets which she claimed as addressed to herself, and as partly versifications of her own ideas, were in fact addressed to Minna Herzlieb before Goethe had even seen Bettina. This discovery effectually relieves the poet's me- mory from some very unpleasant imputations. The literary merits of the work are in some respects very considerable. Nothing can surpass Bettina's liveliness, freshness, origi- nality, and graphic power when dealing with actual persons and things: she is, unfortunately, addicted to abstract speculation, and then becomes unintelligible. Though probably equally supposititious, her correspondence with the friend of her youth, the interesting and unfortunate Caroline von Giinderode, is superior to her more cele- brated work from its greater truth to nature ; and her almost unknown volume of professed letters to and from her brother, Clemens Brentano, is the best of all. These later productions failed to attract a public sated with her peculiar mannerism, and Bettina had sunk into compara- tive obscurity before her death in 1859. Bettina was a true member of a family whose folly was in her time proverbially said to begin where the folly of others ceases. Her vanity, caprice, mendacity, and utter want of principle can only be excused on the supposition of her virtual irre- sponsibility for her actions. She possessed a brilliant fancy, and her remarks occasionally display great penetration; her conversational powers are described as marvellous. One of her freaks was to translate her correspondence with Goethe into English; the result is an unparalleled literary curiosity. The evidence respecting this correspondence is ably summed up in Mr Lewes's Life of Goethe. (R. G.) ARNIM, or ArnuEIM, JoHAN GEoRG BaRON VON, one of the most distinguished men during the period of the Thirty Years' War, both as a general and as a diploma- tist, was born in 1586, at Boitzenburg, in the province of Brandenburg. He entered the Swedish army, and served under Gustavus Adolphus. In 1626 he, though a Protes- tant, was induced by Wallenstein to join the imperial army. He gained great distinction by his military and diplomatic talents, and became the close friend and faithful ally of Wallenstein. After the dismissal of the latter from his command in 1630, Arnim went over to the

elector of Saxony, and, at the battle of Leipsic, led the left wing of the united Saxon and Swedish armies. But he disliked the Swedes, who distrusted him ; and it was mainly by his influence that the elector detached his forces from Gustavus Adolphus, and that at the peace of Prague the Saxons seceded from their alliance with Sweden. In 1632 Wallenstein, who had been restored to his command, took the field against his old comrade, but little was done by either, and more than a suspicion was roused that they were playing into each other's hands. In February 1634 Wallenstein was assassinated, and Arnim at once began more active operations. In May he gained a great victory over the imperialists at Lieguitz; but after the conclusion of peace, not thinking himself sufficiently honoured by the

elector, he withdrew to his castle of Boitzenburg. Here he was seized by the Swedes, and imprisoned at Stockholm, He escayved, and was engaged in raising an army to revenge himself when he died suddenly in 1641.

ARNIM, Karu Orro Lupwic von, a German writer of travels, was born at Berlin in 1779, travelled from 1835 to 1844 through Turkey and Greece, France, Spain, and Italy, and died in 1861. He was attached for some time to the German embassy at London, and wrote in English Napoleon's Conduct towards Prussia (1814), and German National Melodies (1816). He also translated some Eng- lish plays and poems. His reputation rests mainly on his Flichtige Bemerkungen eines fliichtig Reisenden (1838-1850), which are highly praised for their lively and graceful style.

ARNIM, Lupwie AcHiM von, a distinguished German poet and novelist, was born at Berlinin 1781. He studied at Vienna and Gottingen, and took the degree of M.D., though he never practised as a physician. His attention, however, in his early years seems to have been specially directed towards the natural sciences, and his first literary performance (Theorie der Elektrischen Hrscheinungen) was in that department. But even in this essay he showed the fondness for the supernatural and the predilection for romance that appeared so strongly in his next work, Arvel's Offenbarungen, 1804. In the same year he published Hallin's Liebesleben, with an appendix containing a bio- graphy of Rousseau. He spent some years in travelling through parts of Germany and collecting old popular legends and songs. A

selection of these he published at Heidelberg in conjunction with the poet Clemens Bren- tano, whose sister Bettina (noticed above) he afterwards married. The volumes, entitled Des Knaben Wunderhorn, were received with great favour. In 1809 he published the Wintergarten, a collection of tales; in 1810 an admir- able novel, Die Grdjfin Dolores; in 1811 a humorous dramatic romance, Halle und Jerusalem, and a novel, Isabelle von Aigypten ; and two years later his Schaubiihne or dramatic pieces. His literary activity was for some time interrupted by the war in Germany, but in 1817 he published his last great romance, Die Kronenwachter, the scene of which is laid in the time of the Emperor Maxi- milian. Arnim died in 1831. His works have been published in a collected form at Berlin, 1839-1846. They manifest great originality of invention, but are for the most part marred by the utter absence of literary form, being vague, incoherent, and whimsical to the last degree. Arnim is the subject of a brilliant but much too favour- able criticism in Heine's De l Allemagne.

ARNISAUS, Henninevs, a German physician, was born at Halberstadt, probably about 1580. After com- pleting his studies at the university of Helmstadt and taking his degree as doctor of medicine, he seems to have lectured for some time on moral philosophy at Frankfurt- on-the-Oder. In 1613 he was appointed one of the pro- fessors of medicine at Helmstadt, and he is said to have constructed there a chemical laboratory and a botanical garden. His anatomical plates were very celebrated, and some of them were extant in the time of Haller. In 1620 he was made court physician to Christian IV. of Denmark, and removed to Copenhagen, where he died in 1638. The greater number of his extant works are on the theory of politics, such as Doctrina Politica, published after his death, De Republica, De jure Majestatis, &c. ; the following medical tracts are ascribed to him, Disquisitiones de partus humani legitimis terminis and Disputatio de lue venerea.

ARNO (the ancient Arnus), a celebrated river of Italy. It rises in Monte Falterona, in the Apennines, descends into the valley of Casentino, in Upper Tuscany, passes the town of Bibbiena into the plain of Arezzo, where it receives the Chiana as a tributary, and enters the

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narrow valley of Laterina. Thence it issues through the rocky defile Dell' Inferno, pours into the lovely Val d'Arno, sweeps beneath the woods of Vallombrosa, and, after receiv- ing the Sieve, enters the plain of Florence and flows through that city. Ten miles below Florence it is confined in an artificial channel, formed by the ancient Etruscans, for the purpose of draining the plain. It receives several tributaries, and enters the plain of Pisa, which it traverses ; and after a further course of eight miles, falls into the Tuscan sea by an artificial embouchure excavated in 1603. Its whole winding course is about 140 miles. At Florence it is 400 feet wide, but is fordable in summer. It is liable to sudden floods, and then is impetuous, carrying down with it immense quantities of earth and stones, by which its bed is elevated ; in many places it requires frequent embankment. The most remarkable inundations are those of 1537 and 1740, the water on the former occasion rising 8 feet in the city of Florence. On the banks of the upper Arno are vast accumulations of fossil bones of the elephant, rhinoceros, hippopotamus, and bear, especially between Arezzo and Florence.

ARNO, or Aquiua, tenth bishop and first archbishop of Salzburg, was one of those learned churchmen whom Charles the Great gathered round him, and who did so much to frame and strengthen that alliance between the Emperor and the Pope which lay at the basis of the Holy Roman empire of- the West. The occasion of his introduc- tion to the emperor was the defeat of Thassilo, duke of Bavaria, who had made war upon Charles, and was com- pelled to sue for peace. He sent at the head of the embassy Arno, who was then bishop of Salzburg, and in whose talents and fidelity he had the utmost confidence. The embassy did not succeed, mainly because Thassilo refused to make the required concessions, and Bavaria was annexed to the empire. When this took place Charles secured the services of Arno, and got for him from the Pope the archbishopric of Salzburg in 798 a.p. From this time forward Arno was frequently at the court of Charles, and became the intimate associate of Alcuin and other scholars whom the emperor.

delighted to gather around him. In 799 he presided at a synod of the church held at Reisbach, and in 807 at the more important synod of Salzburg. 'The zeal which he evinced for the conversion of the pagans of Hungary and Bohemia commended him to his ecclesiastical superiors. He established a library in Salzburg formed on the model of the emperor's palace library, and did all he could to further the interests of learning within his diocese. Assisted by a deacon named Benedict, he published a catalogue of the church lands, proprietary rights, and so on, belonging to the church in Bavaria. This is of great value to the historical student, and goes by the name of the Congestum, or Indiculus Arnonis ; an edition with notes was published by Frederick Keinz, Munich, 1869. Arno also wrote De Donis Ducum Bavarie Salzbrugenst Ecclesie datis, which is to be found in the Thesaurus Monumentorum ecclesiasticorum et historicorum (Antwerp, 1725). (© 2% 1.)

ARNOBIUS, called Afer, and sometimes the Elder, was a native of Sicca Venerea in Numidia. The date of his birth is uncertain, but it must have been during the latter part of the 3d century of our era, He was a teacher of rhetoric, and at first an opponent of Christianity. His conversion is said by Jerome to have been occasioned by a dream ; and the same writer adds that the bishop to whom Arnobius applied distrusted his professions, and asked some proof of them, and that the treatise Adversus Gentes was composed for this purpose. But this story seems rather improbable; for Arnobius speaks contemptuously of dreams, and besides, his work bears no traces of haviug been written in a short time, or of having been revised by

a Christian bishop. From internal evidence the time of composition may be fixed at about 303 a.p. Nothing further is known of the lifeof Arnobius. He is said to have been the author of a work on rhetoric, which, however, has not come down to us. His great treatise, in seven books, Adversus Gentes (or Nationes), on account of which he takes rank asa Christian apologist, appears to have been occasioned by a desire to answer the complaint then brought against the Christians, that the prevalent calamities and disasters were due to their impiety, and had come upon men since the establishment of their religion. In the first book Arnobius carefully discusses this

complaint; he shows that the allegation of greater calamities having come upon men since the Christian era is false; and that, even if it were true, it could by no means be attributed to the Christians. He skilfully contends that Christians who worship the self-existent God cannot justly be called less religious than those who worship subordinate deities, and concludes by vindicating the divinity of Christ. The second book is principally taken up with a discussion on the soul, which Arnobius does not think is of divine origin, and which he scarcely believes to be immortal. Curiously enough, he is of opinion that a belief in the soul's immor- tality would tend to remove moral restraint, and have a prejudicial effect on human life. In the concluding chapters he answers the objections drawn from the recent origin of Christianity. Books iii, iv., and v. contain an examina- tion of the heathen mythology, in which he narrates, with powerful sarcasm, the scandalous chronicles of the gods, and contrasts with their grossness and immorality the pure and holy worship of the Christian. These books are valuable as a repertory of mythological stories. Books vi. and vii. discuss, in a very admirable manner, the questions of sacrifices and worship of images. He points out the absurdities of the heathen practices in these respects, and shows how unnecessary they are ina pure system of religion. The work of Arnobius appears to have been written when he was a recent convert, for he does not possess a very extensive knowledge of Scripture. He knows nothing of the Old Testament, and only the life of Christ in the New, while he does not quote directly from the Gospels. He is also at fault in regard to the Jewish sects. The best editions of his work are those of Orelli, 1816 ; Hildebrand, 1844; and Oehler, 1846. It has been translated into English as vol. xix. of the Ante-Nicene Christian Library (1871).

ARNOBIUS, the younger, a Christian priest or bishop in Gaul, flourished about 460 a.p. He is the author of a mystical and allegorical commentary on the Psalms, first published by Erasmus in 1522, and by him attributed to the elder Arnobius. It has been frequently reprinted, and in the edition of De la Barre, 1580, is accompanied by some notes on the Gospels by the same author. To him has sometimes been ascribed the anti-Augustinian treatise Predestinatus, which is anonymous. His opinions, as appears from the commentary, are semi-Pelagian.

ARNOLD of Bresota, remarkable as a forerunner of the Reformation and assailant of the Pope's temporal power, was born about the beginning of the 12th century, and became a priest in his native city. The fame of Abe- lard's eloquence induced him to repair to France for the sake of becoming his disciple. On his return he bitterly attacked the temporal dominion of the Pope and the wealth of the clergy, advocating the secularisation of all ecclesias- tical property. He is said to have also impugned the current doctrine of the sacraments, but this appears to have been an invention of his adversaries. Persecuted in Italy, he returned (1140) to Abelard, and incurred the enmity of the latter's great antagonist, St Bernard, whose denunciations drove him to seek refuge at Zurich, where

he acquired great influence. A popular insurrection at Rome (1146) encouraged him to proceed to that city, where he appeared as a political agitator, preaching the deposition of the Pope and the restoration of the ancicnt republic. He became exceedingly popular, and aided in expelling the Pope from the city, but no practical effect appears to have been given to his plans. The Romans obtained, however, a free constitution on a different model. Upon their demanding the confirmation of this at the accession of the new Pope, Adrian IV. (the Englishman, Nicholas Breakspear), it was refused unless upon condition of their delivering up Arnold. The demand being indignantly rejected, the city, for the first time in history, was laid under an interdict. The consequent suspension of all religious services SO powerfully affected the people as to occasion a tumult, which compelled Arnold to take refuge in a castle in Campania (1155). A new emperor, Frederick Barbarossa, had meanwhile been elected, and was on the way to his coronation in Rome. By him Arnold was arrested and delivered up to the Pope, and the Roman constitution suppressed. Arnold was hanged, his body burned, and the ashes thrown into the Tiber. In history he ranks with Rienzi and Savonarola. His enemies have been his bio- graphers, and they are unanimous in acknowledging his eloquence, his personal influence, and his perfect disin- terestedness. Allowing for a romantic attachment to antiquated political forms, he was as a politician greatly in advance of his

age. The best proof of his truly prophetic insight into the needs of his country is that, although he left no writings and no disciples, his name is to this day a popular cry in Italy. It is also the subject of, perhaps, the only truly national Italian drama, a tragedy by Niccolini. (Franke, Arnold von Brescia ; Guibal, Arnaud de Brescia et les Hohenstaufen; Gregorovius, Rom wm Mut- telalter, vol. iv.) (R. G.)

ARNOLD, SamveEt, a distinguished English composer, was born at London in 1740. He reccived a thorough musical education at the Chapel Royal under Dr Nares, and when little more than twenty years of age was appointed composer at Covent Garden Theatre. Here, in 1765, he produced his popular opera, The Maid of the Mill. In 1776 he transferred his services to the Haymarket Theatre In 1783 he was made composer to George III., and, ten years later, organist in Westminster Abbey, where, on his death in 1802, he was interred. His operas were very numerous and popular, but they have not lived. The best of them were The Maid of the Mill, Rosamond, Inkle_and Yarico, The Battle of Hexham, The Mountaineers He also wrote several oratorios, which have shared the fate of his operas. The first of them was Z'he Cure of Saul, in 1767, which was very successful. The others are Abimelech, The Resurrec- tion, and The Prodigal Son. In 1786 he began an edition of Handel's works, which extended to 40 volumes, but was never completed. It is considered extremely inaccurate. He also published a continuation, in 4 volumes, of Dr Boyce's Cathedral Music.

ARNOLD, Tuomas, a clergyman of the Church of England, was born at West Cowes, in the Isle of Wight, on the 13th of June 1795. He was the son of William and Martha Arnold, the former of whom occupied the situation of collector of customs at Cowes. Deprived at an early age of his father, who died suddenly of spasm in the heart in 1801, his initiatory education was confided by his mother to her sister, Miss Delafield, who, with affec- tionate fidelity, discharged the office with which she had been intrusted. From her tuition he passed to that of Dr Griffiths, at Warminster, in Wiltshire, in 1803; and in 1807 he was removed to Winchester, where he remained until 1811, having entered as a commoner, and afterwards become a scholar of the college. In after life he retained

a lively feeling of interest in Winchester School, and remembered with admiration and profit the regulative tact of Dr Goddard, and the preceptorial ability of Dr Gabell, who were successively headmasters during his stay there.

From Winchester he removed to Oxford in 1811, where

he became a scholar at Corpus Christi College ; in 1815 he was elected Fellow of Oriel College ; and there he continued to reside till 1819. to the pursuit of classical and historical studies, to prepar- ing himself for ordination, and to searching investigations,

This interval was diligently devoted

under the stimulus of continual discussion with a band of talented and congenial associates, of some of the pro- foundest questions in theology, ecclesiastical polity, and social philosophy. The authors he most carefully studied at this period were Thucydides and Aristotle, and for their

writings he formed an attachment which remained to the close of his life, and excrted a powerful influence upon his mode of thought and opinions, as well as upon his literary occupations in subsequent years. Herodotus also came in fora considerable share of his regard, but more, apparently, as a book of recreation than one for work. In theology, his mind, accustomed freely and fearlessly to investigate what- ever came before it, and swayed by an almost scrupulous dread of aught that might appear to savour of insincerity, was doomed to long?and anxious hesitation upon several points of fundamental importance before arriving at 4 serene and settled acceptance of the great verities of Chris- tianity. Once satisfied, however, of these, his faith remained clear and firm ; and having received his religion, not by tradition from men, but as the result of an earnest, penetrating, and honest examination of the evidence on which it rests, he not only held it with a steadfast grasp, but realised it, and felt it as a Jiving and guiding power. From this time forward his life became supremely that of a religious man. To the name of Christ he was prepared to "surrender his whole soul," and to render before it "obedience, reverence without measure, intense humility, most unreserved adoration" (Sermons, vol. iv. p. 210). He did not often talk about religion ; he had no inclination to gossip about his

experience, or dwell upon the frames and feelings through which he passed ; he had not much of the accredited phraseology of piety even when he discoursed on spiritual topics ; but no man could observe him for any length of time without feeling persuaded that more than most men he was directed by religious principle and feeling in all his conduct. The fountain of his piety was in his heart's core ; and its streams mingled easily with all the issues of his life. As his bio- grapher has beautifully remarked, "his natural faculties were not unclothed, but clothed upon ; they were at once coloured by, and gave a colour to, the belief which they received."

He left Oxford in 1819 and settled at Laleham, near Staines, where he was occupied chiefly in superintending the studies of seven or eight young men who were prepar- ing for the university. His spare time was devoted to the prosecution of studies in philology and history, more par- ticularly to the study of Thucydides, and of the new light which had been cast upon Roman history and upon histori- cal method in general by the researches of Niebuhr. He was also occasionally engaged in preaching, and it was whilst here that he published the first volume of his sermons. Shortly after he settled at Laleham, he entered into the marriage relation with Mary, youngest daughter of the Rev. John Penrose, rector of Fledborough, Notting- hamshire.

After nine years spent at Laleham, he was induced. to offer himself as a candidate for the head-mastership of Rugby, which had become vacant ; and though he entered somewhat late upon the contest, and though none of the

electors were personally known to him, he was nevertheless successful. He was elected in December 1827; in June 1828 he received priest's orders; in April and November of the same year he took his degrecs of B.D. and D.D., and in August entered on his new office.

In one of the testimonials which accompanied his appli- cation to the trustees of Rugby, the writer stated it as his conviction, that "if Mr Arnold were elected, he would change the face of education all through the public schools of England." Nobly was the somewhat hazardous pledge redeemed

by him in whose name it had been given. Under his superintendence the school became not merely a place where a certain amount of classical or general learn- ing was to be obtained, but a sphere of intellectual, moral, and religious discipline, where healthy characters were formed, and men were trained for the duties, and struggles, and responsibilities of life.

Rugby was privileged to enjoy his superintendence for nearly fourteen years. During this period his encrgies were chiefly devoted to the business of the school; but he found time also for much literary work, as well as for an extensive correspondence. Five volumes of sermons, an edition of Thucydides, with English notes and dissertations, a History of Rome in three vols. 8vo, besides numerous articles in reviews, journals, newspapers, and encyclopedias, are extant to attest the untiring activity of his mind, and his patient diligence during this period. His interest also in public matters was incessant, especially ecclesiastical ques- tions, and such as bore upon the social welfare and moral improvement of the masses.

In 1841 Dr Arnold reccived from Lord Melbourne, then prime minister, the offer of the chair of modern history at Oxford, an offer which he accepted with peculiar satisfac- tion. On the duties of this new office he entered on 2d December 1841, by delivering his inaugural lecture, amidst circumstances which he felt to be peculiarly gratifying and flattering. Seven other lectures were delivered during the first three weeks of the Lent term of 1842; the whole have been published since his death.

A few months after the delivery of his lectures, Arnold was suddenly removed from his earthly duties and antici- pated enjoyments by an attack of angina pectoris. The midsummer vacation had arrived, and he was preparing to set out with his family to Fox How, a favourite retreat, where he had purchased some property and built a house, in Westmoreland. After a busy day spent in various duties, he retired to rest apparently in perfect health. Between five and six next morning he awoke in severe pain. All attempts to arrest the fatal malady proved fruitless. He bore with heroic fortitude and Christian resignation his sufferings, until eight o'clock, when he expired. The day on which he died was Sunday, the 12th of June 1842. His remains were interred on the following Friday in the chancel of Rugby chapel, immediately under the com- munion table.

We have no space left to attempt a delineation of the separate features of Arnold's character. We can only remark in general, that the great peculiarity and charm of his nature seemed to lie in the regal supremacy of the moral and the spiritual element over his whole being and powers. His intellectual faculties were not such as to surpass those of many who were his contemporaries ; in scholarship he occupied a subordinate place to several who filled situations like his ; and he had not much of what is usually called tact in his dealings either with the juvenile or the adult mind. What gave him his power, and secured for him so deeply the respect and veneration of his pupils and acquaintances, was the intensely religious character of his whole life. He seemed ever to act from a severe and lofty estimate of duty. To bejust, honest, and truthful, he ever

held to be the first aim of his being. With all this, there was intense sympathy with his fellows, the tenderest domestic affections, the most generous friendship, the most expansive benevolence. But to understand aright his claims upon our respect and homage, the history of his life must be read at large. As has been truly observed by one who seems to have known him well—" His Thucydides, his history, his sermons, his miscellaneous writings, are all proofs of his ability and goodness. Yet the story of his life is worth them all.'—Zdim. Rev., vol. lxxxi. p. 234. His life has been most ably written by the Rev. A. P. Stanley, M.A., now D.D. and Dean of Westminster, in two volumes, 8vo. Lond. 1845. (W. L. A.) ARNOTT, Nem, M.D., F.R.S., a distinguished physician and physicist, was born at Arbroath, 15th May 1788. His parents, who were Roman Catholics, removed to Blairs, near Aberdeen, when Arnott was eight years old, and three years afterwards took up their abode in Aberdeen, which enabled him to attend the grammar school there. In 1801 he entered Marischal college, where he took special interest in the natural philosophy subjects, taught at that time by Professor Copland, a skilful experimenter. There his natural bent to physical science was greatly strengthened. He studied medicine first at Aberdeen, and subsequently- under Sir Everard Home, through whom he obtained, while yet in his nineteenth year, the appointment of full surgeon to an East Indiaman. After making two voyages to China he settled in 1811 to practise in London, and speedily acquired high reputation in his profession.

Within a few years he was made physician to the French and Spanish embassies. In 1836, he was appointed a member of the Senate of the new university of London, and became a fellow of the Royal and Geological Societies. In 1837 he was made a physician extraordinary to the Queen. From his earliest youth Arnott had an intense love of natural philosophy, constantly using illustrations and applications of its prin- ciples. 'To this liking was added an inventiveness which served him in good stead in his profession, and to which we owe the " Arnott water-bed," the " Arnott ventilator," the " Arnott stove," &c., all of which, with characteristic philanthropy, he refrained from patenting. He was the author of several works bearing on physical science or its applications. The most important of these is his Llements of Physics, published in 1827, the most successful attempt that had ever been made to popularise a scientific subject. It went through six editions in his lifetime. In 1838 he published a treatise on Warming and Ventilating, and, in 1855, one on the Smokeless Fireplace. He took a lead in sanitary improvements generally. The chief characteristic of his writings and inventions is their high practical utility. He was a strong advocate of scientific, as opposed to purely classical, education; and he manifested his interest in natural philosophy by the munificent gift of £2000 to each of the four universities of Scotland and to the university of London, to promote its study in the experimental and prac- tical form. He died in London, 2d March 1874. ARNOTTO, or ANNATTO, is a dyeing material produced from the seeds of Biwa Orellana (Nat. Ord. Flacourtiacee), a small tree which grows in Central and South America. The seeds are surrounded with a thin coating of a waxy pulp, which is separated from them by washing in water, passing the liquid through a sieve, and allowing the sus- pended pulp to deposit. The water is then drained away and the paste dried, till it is a thick, stiff, unctuous mass. In this state it has a dark orange-red colour, and is known as " roll" or "flag" arnotto, according to the form in which it is put up, but when further dried it is called " cake " arnotto. Arnotto is much used by South American Indians for painting thcir bodies; among civilised communities its principal use is for colouring butter, cheese, and var-

uishes. Ityields a fugitive bright orange colour, and is to some extent used alone, or in conjunction with other dyes, in the dyeing of silks and in calico printing.

ARNSBERG, a city of Westphalia, in Prussia, the chief town of a government and circle of the same name, 51° 94' N. lat., 8° 7' E. long. It is situated on an eminence almost surrounded by the River Ruhr, 44 miles 8.E. of Munster, and 58 miles E.N.E. of Dusseldorf. It is the seat of the provincial authorities, and has a court of appeal, a Catholic gymnasium, which was formerly the Benedictine abbey of Weddinghausen, a library, a normal seminary, and a society of agriculture. Weaving, brewing, and distilling are carried on, and there are manufactories of white lead, shot, and paper, as well as works for the production of railway plant. Arnsberg was the capital of the ancient duchy of Westphalia (incorporated with Hesse Darmstadt in 1803, and with Prussia in 1816), and was a member of the Hanseatic league. The new part of the town has been built since 1815. Population in 1873, 5123. Near the town are the ruins of an ancieut castle once the residence of the earls of Arnsberg, the last of whom, Gottfried, sold his earldom in 1368 to the archbishop of Cologne.

ARNSTADT, an ancient town of Schwarzburg-Sonders- hausen, in Central Germany, about 11 miles south of Erfurt, with which it is connected by rail. The Lieb- frauenkirche dates from the 12th century, and contains a number of interesting monuments. There is also a castle, a palace, a town-hall, a gymnasium, and a variety of charitable institutions. The so-called Giinther's Mill is worthy of notice. Leather, cloth, tobacco, weighing-machines, paper, playing cards, chairs, &c., are among the objects of its industry, and a trade is carried on in grain and wood. There are copper-mines in the neighbourhood, as well as tepid saline springs, the waters of which are used for bathing. Population, 8693.

AROK-SZALLAS, a privileged market-town in Hungary, on the Gyéngyés, 44 miles N.N.E. of Pesth, with a popu- lation of 10,400, largely engaged in the transit trade to Upper Hungary.

ARONA, a town in the province of Novara, near the southern extremity of Lago Maggiore. It is well built, and has a gymnasium, an hospital, a port, and dockyard on the lake, and several churches, of which the most

important is that of S. Maria, with an altar-piece by Gaudenzio Vinci. There is considerable trade with Germany and Switzerland, aud red marble is quarried in the neighbourhood. Count Carlo Borromeo, canonised for his piety and benevolence, was born, in 1538, in the now ruincd castle; and on an eminence overlooking the district stands the colossal statue erected in 1697 to his memory by the gratitude of the people. It was executed by Zanello of Pavia and Falcano of Lugano, and is of bronze in the head and hands and feet, and of wrought copper in the remaining portions. It is 66 feet in height, and is raised 46 feet more by its pedestal. Tt is hollow, and can be ascended from within ; the head affords room for three or four persons, and a beautiful view is obtained through the eyes. Population, 3443.

ARPINO, a town on the River Garigliano (Zz7s), in the province of Caserta, in Italy, with a population of 10,000, engaged in the manufacture of woollen cloth, parchment, paper, &c. The first of these industries seems to have existed from a very early date, to judge by inscriptions and the dedication to Mercurius Lanarius of the temple which is replaced by the church of S. Maria di Civita. Origi- nally a Volscian town, Arpinum passed into the hands of the Samnites, and from them under the dominion of Rome. Tts inhabitants became " Roman citizens" in 302 B.c., and received the right of voting in 188 8.c., being enrolled in the Cornelian tribe. The town is chiefly celebrated as the birth-place of Marius and Cicero. The hereditary vlla of

the orator is supposed to have been situated in the Isola

S. Paola, at the mouth of the Fibrenus, where there now

stands the monastery of S. Dominico Abbatc, in which

Hildebrand was once a monk.

ARQUA, a little Italian town, about 13 miles S.W. of Padua, with a population of 1100, chiefly known for that connection with Petrarch which has been so finely comme- morated in Byron's lines—

“They keep his dust in Arqua, where he died.” Childe Harold, cant. iv. st. 31; also st. 59.

ARQUES, a French village in the department of Seine- Inférieure, noteworthy for its castle, founded by William, the uncle of the Conqueror, which was the scene of several remarkable sieges, and gave name to the battle of 1589 in which Henry IV. of France defeated the duke of Mayenne and the Leaguers. Of the extensive and massive building almost nothing remains. The village church, dating from the 16th century, is interesting for its sculptures and stained-glass windows. Population, 968.

ARRACK, a name derived from the Arabic arak (per- spiration), and applied to a spirituous liquor distilled in India, Ceylon, and Java, and generally consumed in Eastern countries. In Ceylon arrack is distilled from the fermented juice called toddy, drawn from the unexpanded flower-spathes of various palms, chiefly the Palmyra palm (Borassus flabelliformis) and the cocoa palm (Cocos nucifera). On the Indian continent a kind of arrack is made from the flowers of the Muohwa tree (Bassa latifolia), besides that derived from palm toddy; and a large quantity of a nauseous and unpalatable spirit is distilled from rice, which goes by the name of rice arrack. This spirit is consumed by the lower orders and wild tribes of Bengal and Central India. In Java arrack is distilled from the impure molas- ses left in the manufacture of raw sugar, fermented with rice, to which a proportion of palm toddy is added. Large quantities of the deleterious spirit so prepared is shipped from Java to the countries of Northern Europe. The habi- tual use of these inferior liquors in the hot countries in which they are distilled is attended with most disastrous consequences.

ARRAIGNMENT (from arraisonner, arraigner, Old Fr., ad rationem ponere, to call to account), a law term, pro- perly denoting the calling of a person to answer in form of law upon an indictment. After a true bill has been found against a prisoner by the grand jury, he is called by name to the bar, the indictment is read over to him, and he is asked whether he be guilty or not of the offence charged. This is the arraignment. His plea in answer to the charge is then entered, or a plea of not guilty is entered for him if he stands mute of malice and refuses to plead. If he pleads guilty sentence may

be passed forthwith ; if he pleads not guilty, he is then given in charge to a jury of twelve men to inquire into the truth of the indictment. He may also plead in abatement, or to the jurisdiction, or demur on a point of law. Several defendants, charged on the same indictment, are arraigned together.

ARRAN, an island on the west coast of Scotland, near the mouth of the river Clyde, which forms part of the county of Bute. It is about 20 miles in length, by from 8 to 11 in breadth, and contains a superficial area of 165 square miles, or 105,814 acres, of which about 14,431 are cultivated. This island is rugged and mountainous, parti- cularly in the northern part, in which the valleys are deep and romantic. The principal mountain is Goatfell (in Gaelic, Goadh-Bhein, or Mountain of the Winds), 2865 feet above the level of the sea; and a few others, as Beinn Tarsuin and Ben Noosh, approach the same eleva- tion. There are five small lakes and several streamlets in the island. There is little cultivation, the farms being principally pastoral. A good many Highland cattle and

sheep are fed on the island. Game is abundant, consisting of blackcock and grouse. A few red deer and a number of wild goats still find shelter among the mouutains.

The geology of the island is an epitome of that of Scot- land. The mountains of the north, especially Goatfell, consist of granite, surrounded on the flanks by micaceous and argillaceous slates ; lying on the edges of the slate are well secn red sandstone and conglomerate, especially on the eastern shores, but easily traceable across the island. On the eastern side limestone, containing Carboniferous fossils, is found at several points intercalated among the red sand- stones chiefly at Corrie, where several strata divided by shale are quarried. In the southern part of the island the strati- fied formations are overlain by a great series of trap-rocks. Several beds of coal were formerly worked on the north- east coast. This coal lies low down in the Carboniferous series, at the base of the Carboniferous limestone, or in the “ calciferous sandstones.” Numerous veins of most beauti- ful pitchstone and pitchstone-porphyry traverse the red sandstone, especially at Drimadoon and between Brodick and Lamlash. On the mountains are

found jasper, agates, cairngorms, and small clear specimens of rock-crystal, called the Arran diamond.

A considerable manufacture of sulphate of baryta as a pigment was at one time carried on in Glen Sannox. The herring fishery is prosecuted by the islanders. Arran possesses two remarkably fine natural harbours,—Lamlash Bay, on the south-east of the island, and Loch Ranza on the north-west side. The latter is an indentation of the sea on the north of the island, about a mile in length, and is a place of great resort for boats engaged in the herring fishing. The ruins of an old castle stand upon a small peninsula near the entrance. Almost the whole island be. longs to the duke of Hamilton, whose seat is at Brodick Castle. The landing-pier for steamers and the principal hotel are at Brodick Bay, where there is a village with church and school. Six miles from Brodick lies the village of Lam- lash. Its beautiful semicircular bay, sheltered by the Holy Island, forms an excellent harbour for ships of all sizes. The Holy Isle, an irregular cone 1020 feet high, was once the site of a cell inhabited by St Molios, a disciple of St Columba. Off the south-east point of Arran lies the low rocky islet of Pladda, with a lighthouse having two fixed lights 130 and 77 feet above high water, and visible 16 and 13 miles respectively, in clear weather. It has a telegraph station, from which the arrival of vessels in the Clyde is notified to Glasgow and Greenock. Many parts of the island are traditionally connected with Robert Bruce. Thus one of the largest of the water-worn recesses in the high sandstone cliffs of the west coast is called the king's cave, another is the king's kitchen, a third his cellar, and a fourth his table, while the hill above is the king's hill ; the southern extremity of Lamlash Bay is the King's Cross Point; and an ancient fort in Glencloy is said to have sheltered his men.

The antiquities of the island, besides those already men- tioned, are Druidical circles (of which the most complcte are at Tormore, near Drimadoon, and are called Suidhe Choior Fhionn, or Fingal's cauldron seat), Danish forts, and sepul- chral cairns, such as the immense mound, 200 feet in cir- cumference, at the head of Glen Meneadmar or Moneymore.

ARRAS (the Wemetacum of the Romans), a fortified city of France, chief town of the department of Pas de Calais, and formerly capital of the

province of Artois. Its name, otherwise Atrecht, is like Artois, a corruption of the name of the Atrebates. It is situated on both sides of the Scarpe, where that river receives the Crinchon, 32 miles N.E. of Amiens, and 100 miles N.N.E. of Paris. The town is well built and adorned with many handsome edifices, such as the town-house, a beautiful building, dating from 1510; the cathedral (1833), on the site of the older

garden. hosiery, beet-root sugar, salt, soap, and earthenware ; and there is a large general trade in wine, oil, grain, &c. It was

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Gothic, which was destroyed in the Revolution; the citadel,

erected by Vauban, who first employed his lunettes in the defences of the town; an arsenal, barracks, a theatre, &.

It is the seat of a bishop, and of a court of assize ; and

has a royal society, a college, a diocesan scminary, an institution for the deaf and dumb, and schools of design and belles lettres, as well as a public library of upwards of

40,000 volumes, a picture gallery, museum, and botanical Its chief manufacturers are lace, woollens,

at one time so celebrated for its tapestry that in English its name became identified with the manufacture. The River Scarpe is navigable up to the town. Population in 1872, 27,329. Lat. 50° 17’ 31” N., long. 2° 46° 49” E.

Arras was the chief town of the Atrebates as early as the time of Cxsar, and some remains of the Roman town, such as a temple of Jupiter, have been found. In 407 it was destroyed by the Vandals, and by the Normans in 880. It gives name to a treaty concluded in 1414 between the Armagnacs and Burgundians, to another between Philip the Good of Burgundy and Charles VII. of France in 1435, and to a third, in 1482, between Maximilian of Austria and Louis XI. of France, by which Burgundy and Artois were given to the Dauphin as a marriage portion. In 1493 it came again into the

possession of Maximilian ; and in 1578 it was held by the prince of Orange. In 1640 troops of Louis XIII. took Arras ; and by the peace of the Pyrenees, in 1659, France was confirmed in the possession of the town. It suffered scverely during the Revolution, especially at the hands of the infamous Lebon, who, as well as the brothers Robespierre, was born in the town.

ARREST (from the French arrester, arréter, to stop or stay) is the restraint of a man's person, for the purpose of compelling him to be obedient to the law, and is defined to be the execution of the command of some court of record or officer of justice. :

Arrests are either in civil or in criminal cases.

I. In Civil Cases.—The arrest must be by virtue of a precept or order out of some court, and must be effected by corporal seizing or touching the defendant's body, or as directed by the writ, capias et attachias, take and catch hold of. And if the defendant make his escape it is a rescous, or rescue, and attachment may be had against him, and the bailiff may then justify the breaking open of the house in which he is, to carry him away.

Arrests on mesne process, before judgment obtained, are abolished by 32 and 33 Vict. c. 62, § 6; an exception, however, is made in cases in which the plaintiff proves, at any time before final judgment, by evidence on oath to the satisfaction of a judge of one of the superior courts, that he has a good cause of action to the amount of £50, that, the defendant is about to quit the country, and that his absence will materially prejudice the plaintiff in prosecut- ing his action. In such cases an order for arrest may be obtained till security to the amount of the claim be found.

Until a recent period a judgment creditor might arrest his debtor under a writ of capias ad satisfaciendum, but since 32 and 33 Vict. c. 62 (the Debtor's Act, 1869), imprisonment for debt has been abolished in England, except in certain cases, and in these the period of detention must not exceed one year.

The following persons are privileged from arrest, viz, lst, Members of the Royal Family and the ordinary servants of the king or queen regnant, chaplains, lords of the bedchamber, &c. This privilege does not extend to

servants of a queen consort or dowager. 2d, Peers of the realm, peeresses by birth, creation, or marriage, Scotch and Irish peers and peercsses. 3d, Members of the House of Commons during the session of Parliament, and for a

convenicnt time (forty days) before and afterit. Members of Convocation appear to have the same privilege. 4th, Foreign ambassadors and their "domestics and domestic servants." Temporary privilege from arrest is enjoyed by barristers travelling on circuit, by parties, witnesses, or attorneys. connected with a cause, and by clergymen whilst performing divine service. .

The arrest of any privileged person is irregular ab cnitto, and the party may be discharged on motion. The only exception is as to indictable crimes, such as " treason, felony, and breach of the peace."

There are no longer any places where persons are privileged from arrest, such as the Mint, Savoy, Whitefriars, &e., on the ground of thcir being aucient palaccs ; but near the Palacc of Holyrood, Edinburgh, a sanctuary still exists for the benefit of debtors, who resort there for such protection, and take lodgings within the precincts.

Except in cases of treason, felony, or breach of the peace, an arrest cannot be made on a Sunday, and if made it is void (29 Car. IT. c. 7) ; but it may be made in the night as well as in the day.

Il. In Criminal Cases.-—All persons whatsoever are, without distinction, equally liable to this arrest, and any man may arrest without warrant or precept, and outer doors may be broken open for that purpose. The arrest may be made,—~Is¢, by warrant ; 2d, by an officer without warrant; 3d, by a private person without warrant ; or, 4th, by a hue and cry.

1. Warrants are ordinarily granted by justices of the peace on information or complaint in writing and upon oath, and ,thcy must be indorsed when it is intended they should be cxecuted in another county (see 11 and 12 Vict. c. 42). They are also granted in cases of treason or other offence affecting the

Government by the Privy Council, or one of the secretaries of state, and also by the chief or other justice of the court of Qucen's bench in cases of felony, misdemeanour, or indictment found, or criminal information granted in that court. Every warrant ought to specify the offence charged, the authority under which the arrest is to be made, the person who is to execute it, and the person who is to be arrested.

2. The officers who may arrest without warrant arc,—justices of the peace, for felony or breach of the peace committed in their presence ; the sheriff and the coroner in their county, for felony ; constables, for treason, felony, or breach of the peace committcd in their view,—and within the metropolitan police district they have even larger powers ; and watchmen from sunset to sunrise.

3. A private person is bound to arrest for a felony committed in his presence, under penalty of fine and imprisonment.

4. The arrest by hue and cry is whcre officers and private per- sons are concerned in pursuing felons, or such as have dangerously wounded others.

The remedy for a wrongful arrest is by an action for false imprisonment.

In Scotland the law of arrest in criminal procedure has a gencral constitutional analogy with that of England, though the practice differs with the varying character of the judicatories. Colloquially the word arrest is uscd in compulsory proccdure for the recovery of debt ; but the technical term applicable in that department is caption, and the law on the subject is generically different from that of England. There never was a practice in Scottish law corresponding with the English arrest in mesne pro- cess; but by old custom a warrant for caption could be obtained where a creditor made oath that he had reason to believe his debtor meditated flight from the country, and the writ so issucd is called a warrant against a person 7 meditationc fuge. Imprisonment of old followed on eccle- siastical cursing, and by fiction of law in later times it was not the creditor's remedy, but the punishment of a refrac- tory person denounced rebcl for disobedience to the injunctions of the law requiring fulfilment of lis obligation. 'The system was reformed and stripped of its cumbrous fictions by an Act of the year 1837.

Although the pro- eecdings against the person could only follow on completed

process, yet, by a peculiarity of the Scottish law, documents exccuted with certain formalities, ané by special statute bills and promissory-notes, can be registered in the records of a court for execution against the person as if they were

judgments of the court.

ARREST OF JUDGMENT is the assigning just reason why

judgment should not pass, notwithstanding verdict given,

either in civil or in criminal cases, and from intrinsic causes arising on the face of the record.

ARRESTMENT, in Scottish Law, denotes that proccss by which a creditor detains the goods or effects of his debtor in the hands of third parties till the debt due to him shall be paid. It is divided into two kinds,—I1st, Arrest- ment in security, used when proceedings are commencing, or in other circumstances where a claim may become, but is not yet, enforceable ; and 2d, Arrestment in execution, following on the decree of a court, or on a registered document, under a clause or statutory power of registra- tion, according to the custom of Scotland. By the process of arrestment the property covered by it is merely retained in its place; to realise it for the satisfaction of the credi- tor's claim a farther proceeding called " Forthcoming" is necessary. By old practice, alimentary funds, or those necessary for subsistence, were not liable to arrestment. By 33 and 34 Vict. c. 63, the wages of all labourers, farm- servants, manufacturers, artificers, and work-people, are not arrestable except (1) in so far as they exceed 20s. per week; but the expense of the arrestment is not to be charged against the debtor unless the sum recovered excecd the amount of the said expense; or (2) under decrees for alimentary allowances and payments, or for rates and taxes imposed by law.

ARRIA, the wife of Cecina Pxtus, who, having been engaged in the conspiracy of Scribonianus against the Emperor Claudius, 42 a.p., was

condemned to death. Arria, resolving not to survive her husband, stabbed herself with a dagger, which shc then handcd to him with the words, " Pzetus, it does not pain me." Her daughter, also called Arria, was the wife of Thrasea ; and when he was condemned to death by Nero, she would have imitated her mother's example, but was dissuaded by her husband, who entreated her to live for the sake of their children. She was sent into banishment.

ARRIAN (Affuovés), a distinguished Greek historian and philosopher, who lived in the time of the Emperors Hadrian, Antoninus Pius, and Marcus Aurelius. He was a native of Nicomedia, born about the end of the Ist century of our era, and was one of the most distinguished disciples of the famous Epictctus. In 124 a.p. he lived at Athens, where he made,the acquaintance of the Emperor Hadrian, who was so much struck with his practical wis- dom as to raise him to several high offices; and under Antoninus he obtained even the consulship. The only other event of his life of which we know anything is, that he was appointed governor of Cappadocia, and in that capacity distinguished himself by the victory he gained over the Alani, Arrian proudly disdained to give any in- formation regarding himself; and his life, written by Dion Cassius, is lost. History and philosophy are greatly indebted to Arrian ; for, being a disciple of Epictetus, who himself did not write any work, Arrian determined to be to hin what Xenophon had been to Socrates, and published his philosophical lectures in eight books, of which only the first half is extant ; but the portion which has come down to us gives us a most exalted view of the ethical philosophy of Epictetus and the Stoics generally. The work bears the title Avatpy3at 'Emuxryjrov, and is contained in Schweig- hauscr's Philosophie LEpicteteee Monumenta, vol. iil. A second work, by which Arrian testified his attachment to his great master, bears the title 'Eyxepidiov 'Emcxryrov, &

short manual of moral philosophy, compiled from the lectures of Epictetus, which for many centuries was

regarded both by Pagans and Christians as the best book on the subject. It has been published in a great many editions; the best is in the collection of

Schweighauser mnentioned above. Of Arrian's original works the one of greatest importance is his account of the expedition of Alexander the Great in seven books. It contains the most complete and authentic account of that conqueror's career, being based upon the lost works of Aristobulus and Ptolemy, the son of Lagus, both of whom accompanied the king during the expedition. The best modern editions are those of Ellendt, 1832, 2 vols. 8vo ; Kriiger, Berlin, 1835 and 1848, 2 vols. 8vo, and 1851, 1 vol. 8vo; Sintenis, Lips. 1849; and Diibner and Miiller, 1846. Connected with his history of Alexander is a treatise on India, in the Ionic dialect, which he wrote separately, in order not to break the continuity of the narrative. He also wrote a work on the chase, a periplus or voyage round the coasts of the Black Sea, and a manual of tactics ; but of many other works ascribed to him by the ancients there are extant only a few fragments. Certain descriptions of the coasts of the Sea of Azov and the Red Sea, which are ascribed to him, are pro- bably the productions of a later period. Arrian's style is simple, lucid, and manly. His imitation of Xenophon is visible, not only in his style and diction, but even in the subjects on which he wrote. His language, though pure Attic, presents some peculiarities which are not found in the works of his great model.

ARROWROOT. A large proportion of the edible starches obtained from the rhizomes or root-stocks of various plants are known in commerce under the name of arrowroot. Properly the name should be restricted to the

Fig. 1. Arrowroot Plant (Maranta arundinacea).—Fig. 1, stem, leaves, and flowers ; fig. 2, roots.

Fig. 2.

starch yielded by two or three species of Maranta, the chief of which is M. arundinacea ; and when genuine or West Indian arrowroot is spoken of, it is understood that this is the variety meant. Maranta arundinacea is origi- nally a native of the American continent, but it has long been cultivated in the West Indian Islands, and it has now spread to most tropical countries. The plant produces a scaly, white, tuberous rhizome, and it is at the period when this organ is gorged with starch-cells, immediately before the season of rest, that it is ripe for use. In addition to about 25 per cent. of starch, the fresh roots contain a pro- portion of woody tissue, vegetable albumen, and

various salts. The arrowroot may be separated on a small scale in the same manner as potato-starch is frequently prepared, that is, by peeling the root and grating it in water, when the starch falls to the bottom. The liquor is then drained

off, and the starch purified by repeated washings till it is ready for drying. On a large scale the manufacture of arrowroot is conducted with specially prepared machinery. The rhizomes when dug up are washed free of earthy impurities and afterwards skinned. Subsequently, accord- ing to Pereira's Materia Medica, "the carefully skinned tubers are washed, then ground in a mill, and the pulp washed in tinned-copper cylindrical washing-machines. The fecula is subsequently dried in drying-houses. In order to obtain the fecula free from impurity, pure water must be used, and great care and attention paid in every step of the process. The skinning or peeling of the tubers must be performed with great nicety, as the cuticle contains a resinous matter which imparts colour and a disagreeable flavour to the starch. German-silver palettes are used for skimming the deposited fecula, and shovels of the same metal for packing the dried fecula. The drying is effected in pans, covered with white gauze to exclude dust and insects."

Arrowroot is distinguished by the granules agglomerat- ing into small balls, by slightly crepitating when rubbed between the fingers, and by yielding with boiling water a fine, transparent, inodorous, and pleasant-tasted jelly. In microscopic structure the granules present an ovoid form, marked with concentric lines very similar to potato-starch, but readily distinguished by having a " hilum " marking at the thick extremity of the granule, while in potato-starch the same appearance occurs at the thin end (compare figs. 3 and 4 below). In addition to the West Indian supplies, arrowroot is now found in the commerce of Brazil, the East Indies, Australia, Cape Colony, and Natal, in the last of which localities it has become a staple of some im- portance. Bermuda arrowroot has always been held in the highest esteem, but on those islands the cultivation is gradually giving way to more profitable crops. In 1872 only 26,710 ib, of the value of £1323, were exported from the Bermudas, while in 1851 the value of the export trade

was more than £10,000. St Vincent is now the chief seat of arrowroot culture in the West Indies.

Tous-les-mois, or Tulema arrowroot, is obtained from several species of Canna, a genus closely allied to Maranta, and cultivated in the same manner. The granules of tous- les-mots are readily distinguishable by their very large size (fg. 5). Hast Indian arrowroot is obtained from the root-stocks of several species of the zingiberaceous genus, Curewma, chiefly O. angustifolia, Brazilian arrowroot is the starch of the cassava plant, Jatropha Manihot (fig. 6), which when agglutinated on hot plates forms the tapioca of commerce. The cassava is now cultivated in the East Indian Archipelago as well as in South America. Tacca, or Otahette arrow- : root, is the pro- duce of Ziacca pinna- tifida, the Pia plant of the South Sea Islands. Portland arrowroot was for- merly prepared on the isle of Portland from the tubers of the common Cuckoo Pint, Arum maculatum. Various other species of Arumyield valuable food-starches in hot countries. Under the

Fig. 6.

Fig. 5. nameof British arrow- Starch Granules magnified.—Fig. 3, potato ;

root the farina of po- fig. 4, arrowroot; fig. 5, tous-les-mois ; tatoes is sometimes ‘i: 6, jatropha. Bu sold, and the French excel in the preparation of iml-

tations of the more costly starches from this source. The chief use, however, of potato-farina as an edible starch is for adulterating other and more costly preparations. This falsification can readily be detected by microscopic examination, and the accompanying drawings exhibit the appearance under the microscope of the principal starches we have described. Although these starches agree in che- wnical composition, their value as articles of diet varies considerably, owing to different degrees of digestibility and pleasantness of taste. Arrowroot is found frequently to remain in the stomach of invalids when most other forms of food are rejected, and on this account it has considerable therapeutic value. Being

destitute of nitrogen, arrowroot and the other edible starches belong to the force-producing class of foods, and cannot of themselves form a perfect diet. They require to be associated with milk, eggs, meat, or other substances rich in nitrogenous compounds as articles of diet; and they should not be given to young infants, whose organs are not suited for the digestion of starchy food.

ARROWSMITH, the name of a family of geographers. The first of them, Aaron Arrowsmith, was born in 1750 at Winston in Durham. When about twenty years of age he came to London, and was employed by Cary, the engraver. In 1790 he made himself famous by his large chart of the world on Mercator's projection. Four years later he published another large map of the world on the globular projection, with a companion volume of explanation. The maps of North America and Scotland are the most celebrated of his many later productions. He died in 1823, leaving two sons, Aaron and Samuel, the elder of whom was the compiler of the Hton Comparative Atlas, of a Biblical atlas, and of various manuals of geography. John Arrow- smith, nephew of the elder Aaron, was born at Winston in 1790, and in 1810 joined his uncle in London. In 1834 he published his Zondon Atlas, the best set of maps then in existence. He followed up the atlas with a long series of elaborate and carefully-executed maps, those of Australia, America, Africa, and India being especially valuable. In 1862 he received the gold medal of the Royal Geographical Society, of which body he was one of the founders. He died 2d May 1873.

ARSACIDA, the dynasty of Parthian kings, so called from the name of the founder, Arsaces. Very little is known of the circumstances attending the sudden rise of the Parthian power, or of the leader under whom it was effected. He is said by some to have been a Parthian noble, by others to have been a predatory Scythian chief. But at all eveuts, about 250 B.c., when the Seleucid empire of Antiochus II. was distracted by an Egyptian war and the successful rebellion of Bactria, the Parthians, hitherto subject and almost unknown to history, revolted, established an independent kingdom, and made their leader, Arsaces, their first sovereign. He is said to have been killed in battle, after a short reign of three years, and the throne was then occupied by his brother, Tiridates, who, like all succeeding sovereigns of Parthia, assumed the name Arsaces as a regal title. The

empire increased rapidly in extent and strength, and for a time was the most formidable rival of the Roman power. Towards the close of the 2d century a.D. it had fallen somewhat into decay, as is manifest from the successful Roman invasions under Avidius Cassius and the Emperor Severus ; and it finally succumbed to the Persians, who (224 a.p.) revolted uuder Artaxerxes, and slew in battle Artabanus, the twenty- ninth and last of the Arsacide. See PARTHIA.

ARSAMASS, a town in Russia, in the government of Nijni-Novgorod, at the confluence of two minor tributaries of the Volga, the Arsha and Tesha. It has thirty-four churches, three monasteries, several schools, and various benevolent institutions. There are dye-works, soap-fac-

tories iron-works, and extensive tanneries; and a large trade, stimulated by two annual fairs, is carried on, more especially in sheep-skins and sail-cloth. Population, 10,51 7.

ARSENAL (supposed to be derived from ara navalis, whence the Romaunt word arthenal, signifying generally a "citadel," though primarily it meant simply a naval citadel), is an establishment for the construction, repair, receipt, storage, and issue of warlike stores.

A first class arsenal, which can renew the materiel and equipment of a large army must embrace a gun factory, car- riage factory, laboratory, and small arms ammuuition factory, small arms factory, harness, saddlery, and tent factories, and a powder factory ; in addition it must possess great store-houses. In a second class arsenal the factories would be replaced by workshops. The situation of an arsenal Situation, should be governed by strategical considerations. If of the first class, it should be situated at the base of operations and supply; it must be secure from attack, not too near a frontier, and placed so as to draw in readily the resources of the country. The defences of a large arsenal would be Defences. provided for by a chain of detached forts and an enceinte of sufficient strength.

The great point in arranging stores is their proper preser- Organiza-

vation and facility for issue. The branches of an arsenal may tion. be divided into A, Storekeeping ; B, Construction ; C, Ad- ministration. Under

A we should have the following de- partments and stores:—Departments of issue and receipt, pattern room, armoury department, ordnance or park, har- ness, saddlery, and accoutrements, camp equipment, tools and instruments, engineer store, magazines, raw material store, timber yard, breaking up store, unserviceable store. Under B,—Gun factory, carriage factory, laboratory, small arms factory, harness and tent factory, powder factory, de. In a second class arsenal there would be workshops instead of these factories. ©.—Under the head of administration would be classed the chief director of the arsenal, the superin- tendents and assistant-superintendents of the factories and branches of the arsenal. Besides these, who would usually be artillery officers, there would be required managers or fore- men (civil and military), non-commissioned officers, arti- ficers, workmen, and labourers. In addition a staff of clerks and writers are necessary for all the office work of the establishments. In the manufacturing branches we should want skill, and efficient and economical work, both executive and administrative ; in the storekeeping part, good arrangement, great care, thorough knowledge of all warlike stores, both in their active and passive state, and scrupulous exactness in the custody, issue, and receipt of stores. For fuller details than can be given here the reader is referred to a paper on the organisation of an arsenal, by Lieut. Collen, R.A., in vol. viii. Proceedings R.A. Inst.

In England the Royal Arsenal, Woolwich, manu- Royal factures and stores the requirements of the army and navy. Arsenal. Under the scheme of army localisation now in force, there are district-issuing stores for the troops for camp equipage, field stores, and reserve ammunition. The con- centration of nearly the whole of our military factories and stores at one place, Woolwich, has long been considered an evil, and it has been proposed to establish, at some central spot, a large military depdt or arsenal, which should be complementary to Woolwich.

The history of the Royal Arsenal is treated in the paper by Lieut. Grover before referred to. As a manufacturing ; establishment it has existed about 150 years, but asa mili- : tary post and store dept it possesses a greater antiquity. | Before 1805 it was called the "Tower Place" or King's) Warren, and the land had been probably acquired in 1667

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1 See a very interesting paper. by Lieut. C. E. Grover, R.E., in vol. vi. Proceedings R. A. Inst., on the Royal Arsenal at Woolwich,

Royal Gun Factories.

Personnel.

Royal Labo- ratory,

Rockets,

) Fuzes,

| Projectiles.

AS EN A L

as sites for batteries to protect Woolwich against the in- vading Dutch fleet, although in 1664 mention is made of storehouses, &c., and sheds for repairing ship carriages. In 1668 guns, carriages, and stores were concentrated at Woolwich, and in 1695 the laboratory establishment was moved from Greenwich to the former place. Prior to 1716 ordnance was obtained from private manufacturers, and proved by the Board of Ordnance. In 1716 a dan- gerous explosion took place at the Moorfields Foundry, and

it was decided to build a royal brass foundry at the Tower

Place, Woolwich. Founders were advertised for, and the records of those times show that Mr Andrew Schalch of Douay was selected. The popular story of Schalch's fore- seeing the explosion, and being afterwards commissioned to search for a site and build a foundry is completely dis- proved by Lieut. Grover. The original Tower Place con- sisted of 42 acres only, while the present Royal Arsenal occupies 333 acres. In 1741 an academy or school for instructing the people of the military branch of the ordnance was established at the Warren. It was not till 1805 that the

collection of establishments, consisting of a foundry, laboratory, repository, &c., and stores, became the Royal Arsenal.

Having thus glanced at the history of the arsenal, we shall now endeavour to describe the various manu- facturing establishments concentrated at Woolwich, and those at Enfield and Waltham.

The Woolwich establishments consist of the Royal Gun Factories, the Royal Laboratory, the Royal Carriage Department, a Chemical and Photographic establishment, a Gas Factory, and the Control Department Stores. The others are the Royal Small Arms Factory at Enfield, and the Royal Gunpowder Factory at Waltham Abbey.

The Royal Gun Factories consist of forges, smith's shop, rolling mills, pattern shop, brass and iron foundry, gun-boring mill, tool rooms, turneries, lighting room, field-gun section, engine repairing shop, examining branch, pattern room. The factories employ the fol- lowing machinery :—291 lathes, 42 boring machines, 57 drilling machines; 12 rifling, 13 planing, 37 slotting, 64 shaping, 42 milling, 7 screwing, 8 lapping, 3 wheel cutting, and 20 weighing machines; 2 saws, 240 vices, 54 furnaces, 6 blowing fans. The total horse-power employed is—engines, 658, and boilers, 1620. Besides the elaborate machinery detailed there are no less than 86 cranes of all kinds, giving a collective power of 1172 tons, and 17 steam hammers, from 8 cwt. up to 80 tons. The average value of the work turned out is about £253,700 annually, and the department is capable of produc- ing 6000 tons of guns of various calibres per year, or 7500 tons of forgings. The personnel consists of a superintendent and assistant-superintendent (artillery officers), deputy-assistant superintendent, 24 clerks and writers, draftsmen, proof-master and proof-sergeants, and time-keepers ; 22 masters and foremen, 386 artificers, and 571 labourers and boys.

The Royal Laboratory comprises an extensive series of factorics and workshops. Under the head of small arm ammunition alone we find a paper factory, lead or bullet factory, small arms factory, containing 456 machines, and the " magazines," which include capping machines, and all those required for filling and finishing cartridges. The whole plant of 894 machines is capable of produc- ing, in a week of fifty-four hours, 1,500,000

ball cartridges, and 500,000 blank cartridges. For the manufacture of rockets there is the smith's shop in the main factory, and the rocket factory in the marshes. In these, a plant of 73 machines is capable of producing, per week of fifty-four hours, 4450 rockets of all kinds. The manu- facture of fuzes is divided into two parts, for wood and inetal fuzes. In the workshops of the former 98 machines are used, and 7000 wood fuzes can be turned out in a week. For metal fuzes are required metal turners' shops, brass foundry, paper factory, composi- tion buildings, containing the machines for filling, pressing, and finishing fuzes. The whole plant of 142 machines and apparatus can turn out 8000 fuzes in a week. For the manufacture of projec- tiles there area shell foundry, brass foundry, smiths' shops, metal and turners' shops, tinman's shop, rifle shell factory, repairing and tool shop. The whole of the plant consists of 971 machines, capable of turning out weekly 6516 projectiles, field and heavy, taking the 16 pounder and the 9-inch gun as an average, and the weight of such out-turn would be 2814 tons. The wood machinery depart- ment of the Laboratory for making powder barrels and general work consists of carpenter's shop, saw-mills, and cooperage. The plant of 116 machines can turn out 1000 small arms ammunition boxes, and 2700 barrels weekly. The torpedo factory adjoins the main factory, and contains 65 machines. For the manufacture of cor-

rugated brass cases and zinc cylinders (to contain common cartridges), there is a metal-turncr's shop capable of producing weekly 160 brass cases, and 500 zinc cases. The brass foundry can turn out 12 tons of castings weekly. Besides the above there are many mis- cellaneous shops and machine-rooms. In the Royal Laboratory there are 66 engines and boilers of 5155 horse-power (indicated), and a total of 2847 machines, the fuel consumed weekly by this im- mense establishment amounting to 93 tons. The average value of the out-turn is £472,000. 'The personnel consists of a supcrinten- dent and assistant-superintendent (artillery officers), 40 clerks and writers, manager and assistant-manager, 30 masters and foremen, 569 artificers, and 1772 labourers.

The Carriage Department manufactures all carriages, platforms, artillery machines, for the artillery, royal navy, and transport ser- vices. Its shops

arc as follows :—main forge, scrap forge, 6 smithies, containing in all 178 fires; 10 furnaces, with steam hammers, forging machines, &c.; 11 fitters' shops, 6 being for general work, and the remainder for work classed according to the divisions of the artillery service ; general foundry, painters' shops, wheelers' shops, carpen- ters' shops, pattern makers' shops, saw-mills, collar makers' shops. In these different workshops there are 17 steam hammers; 16 forging machines, bolt and nut making machines, rivetting machines, &c.; 22 shearing, punching, and cutting machines ; 9 planing machines ; 19 shaping, 17 slotting, 10 boring and facing, 49 boring and drilling machines; 85 lathes, 17 bolt-screwing and nut-facing, 8 milling, 4 band sawing, 2 bending machines. For tin work there are 7 machines, and numerous machines for cleaning castings and turnings, grind- stones, &c. For woodwork there are 48 saws of various kinds; 5 planing circular, 14 boring, 8 mortising and tenoning, 19 shaping machines; 17 lathes, and machines for sharpening saws and spoke dressing, hydraulic presses, &c. Besides these there are various miscellaneous machines. The total nominal horse-power is 250. The value of the annual out-turn is about £210,000. This depart- ment is able to turn out in one year 65 field batteries, 180 naval or garrison carriages with slides or platforms, 24 turret carriages, 360 transport carriages. In addition to this work a large quantity of repairs, conversions, and experimental work could be carried out. By working at night the out-turn could be increased 380 per cent. The personnel of the establishment consists of 1 superintendent, 1 assistant-superintendent, manager, assistant-manager, 38 clerks and writers, 38 masters and foremen, 792 artificers, 430 labourers and boys.

In the storekeeping branch of the Arsenal, which is under the Control Department, we find 1 controller, 1 deputy-controller, 4 assistant-controllers, 2 comimissaries, 7 deputy-commissaries, 8 assistant-commissaries, 5 sub-assistant-commissaries, 11 clerks and writers, 114 masters and foremen, 58 artificers, 668 labourers and boys, 60 women and girls employed.

The Royal Small Arms Factory at Enfield, and the Powder Fac- tory at Waltham Abbey, scarcely fall under the heading Arsenal, but as in other countries similar factories are sometimes found within the precincts of an

arsenal, and they belong theoretically to the subject, we shall speak of them here.

The factory at Enfield Lock consists of the following shops :— barrel mill, machine room, polishing room, grinding room, temper- ing room, tool room, smithery, millwright's room, foundry and annealing shop, joiner's shop, containing an enormous quantity of beautiful machinery worked by steain and water power. The average annual value of the work turned out is £214,482. The capability of the factory, if worked to its highest pressure, would be about 3006 arms per week with two gangs of workmen.

The personnel consists of 1 superintendent and 1 assistant-super- intendent (artillery officers), a chief inspector of small arms, 27 clerks, writers, and time-keepers, 1 manager, 78 masters and foremen, 715 artificers, 806 labourers and boys.

The Powder Factory consists of 1 saltpetre refinery, 1 house for extracting saltpetre from damaged powder, 1 sulphur refinery, 1 cylinder house with retorts for burning charcoal, 2 steam stores, 2 heading-up houses, 1 barrel house, 1 proof house, 1 mechanic's shop, houses for charcoal and composition mills, incorporating mills, breaking-down machines, press boxes with pumps, granu- lating machines, pellet press, glazing barrels, horizontal reels, slope reels, fire engines, and houses for all the machines required in the manufacture of gun-cotton. Both steam and water power are used. The annual value of the out-turn is £41,000. The capacity of the factory working at highest pressure would be about 30,000 barrels pebble powder per annum, or 20,000 pebble and 4000 R.F.G. powder (each barrel containing 100 Tb), and 150 tons gun-cotton.

The personnel comprises 1 superintendent, 1 assistant-superinten- dent (artillery officers), 1 superintendent and 1 assistant-superin- tendent of machinery, 1 master worker, 1 master refiner, 9 clerks, writers, and time-kcepers, 12 masters and foremen, 71 artificers, 196 labourers and boys.

There are no arsenals, properly so called, in the British colonies. The troops are supplied from stores and work-

shops in charge of the Control Department. In India the Il. — 80

Personnel.

Royal Car- riage De- partment.

Personnel.

Store- keeping Depart- ment.

Royal Small Arms Factory.

Personnel.

Royal Gun- powder Factory, Waltham Abbey.

Personnel.

India,

United States.

France.

Germany.

army is equipped and supplied by the Ordnance Depart- ments of Bengal, Madras, and Bombay ; and the arsenals come under the head of second class, being establishments for storage, issue, receipt, repair, and partial manufacture. Warlike stores are partly obtained from England, but to a great extent manufactured in the military factories of India. The chief arsenals are those of Fort William (Calcutta), Madras, Bombay, Allahabad (in the N.W. Provinces), and Ferozpore (in the Panjab). These arscnals are administered by commissaries of ordnance (artillery officers), assisted by warrant officers chosen from the army, and non- cominissioned officers. Natives are employed as artificers, writers, and labourers. The native establishment is usually divided into "permanent" and "extra," the former class being permanent Government servants, and the latter merely hired according to requirements.

The detail of a chief Indian arsenal may be taken to be some- what as follows:—2 commissaries of ordnance, 10 or 12 warrant officers (conductors, &c.); 2 armourer sergeants, 9 or 10 sergeants and laboratory men, 300 to 400 native foremen, artificers, and workmen, and about 300 labourers. Besides these main arsenals, each of which supplies on an average a force of 36,000 troops of all arms, there are many minor arsenals, ordnance magazines, and ordnance dcpéts. In India an ordnance magazine is a place for the storage, issue, and receipt of warlike stores, and has small workshops. In by-gone days numerous ordnance establishments were necessary, but now, when means of communication by rail and road have in-

creased so largely, there is an obvious military disadvantage in scattering military stores broadcast over the country. In India, also,

the principle is observed of making regiments and battcries inde- pendent of outside aid. They possess the means of executing all repairs of regimental equipment, and as the greater portion of the army of India are in possession of their camp equipage and reserve ammunition, they are able to move at short notice, while the chief arsenals at the bases of operations would form the bases of the equipment of any large force of all arms entering on a campaign. The military factories comprise—(1.) Foundry and shell factory at Cossipore, near Calcutta; (2.) Gun carriage factories at Fathighur (N.W. Provinces), Madras, aud Boinbay; (3.) Small arm ammuni- tion factories at Dumdum (near Calcutta), and Kirkee (Bombay). (4.) Powder factories at Ishapore (near Calcutta), Madras, and Kirkee. (5.) Harness and saddlery factory at Cawnpore (N.W. Provinces).

These factories are administered by artillery officers as superinten- dents, assisted by warrant officers, civil and military mechanics, native artificers, workmen, and labourers.

The United States depend largely on private industry for war material, large trade factories existing for the supply of small arms and guns. 'Tiree were also foundries at Reading, South Boston, and Providence during the war ; and arsenals of construction at Boston, New York, Wash- ington, Bridgeburg, St Louis, Alleghany, Fort Monro. These, however, have been largely reduccd.

Like most of the details of the French military organisa- tion, the system of the supply of war material is somewhat unsettled. Previous to the war of 1870-71, France possessed manufactories and arsenals for store and construction. These were not, however, placed in accordance with true strategical principles, or with reference to the quick supply of the army. Thus the camp equipment was mainly stored at Paris and Versailles, and carriages at Vernon and Chateauroux. Artillery officers and men were employed in the military factories. It is understood that in future each territorial district of the army will have its own arsenal or, at least, its own depét of military stores; but while military factorics are maintained, war materiel will also be drawn from private industry.

The chief German arsenals are at Spandau, Cologne, Dantzig. There are second class arsenals at Dresden, Lud- wigsburg, Carlsruhe, Augsburg, Munich, in the confede- rated states, but the tendency is to reduce these; anda con- siderable concentration has taken place at Spandau, which now forms the great centre of the military manufactories. In

1 Zi.g., Metz and Strasbourg, containing military factories and ex- tensive arsenals, were situated on the front line of danger.

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every artillery garrison and fortress there are artillery dcpéts for the storage of materiel. The system of the German army is to make regiments as independent as possible, and with their depét "work detachments " even re-equipment is performed. Spandau enibraces a gun and projectile foundry, powder factory, laboratory, small arms factory, and a large arsenal of construction. 'There are also a powder factory at Neisse, small arm factories at Erfurt and Dantzig, in addition to Krupp's great factory at Essen, in Westphalia. lt is said Krupp employs good workmen, and that, so far as guns and carriages are concerned, his factory can turn out three to five ficld batteries daily. Artillery officers aro largely employed in Germany in all the work of the arsenals.

At Vienna are united in onc enormous arsenal:a gun- Austria,

carriage factory, laboratory, foundry, small arms factory, é&e. The arscnal can turn out 300,000 to 400,000 projectiles, 1400 guns, 960 field-carriages, and harness for 1800 car- riages. There is also an artillery depét in each military district, besides laboratories, &c. Austria also draws from the trade. She has an organised service, called the Tech- nical Artillery, for the performance of the work connected with her factories and arsenals.

Russia has made considerable strides in the improvement Russia,

of her military manufactories within the last few years. She possesses small arms factories at Tonla near St Peters- burgh, Sestroetz near Moscow, and at Tjewsk. There are foundries at St Petersburg and Olonetz. The arsenal at St Petersburg includes the foundry and other military establishments. 'The arsenals of Briansk and Kiev also contain military factories. Foundry establishments for furnishing projectiles and guns also exist at St Peters- burg, Alexandro-Olonetz (government of Olonctz), Lon- gane (government of Ekaterinoslav), Perm, Ekaterinburg, Kamensk, Nijni-Isetsk, Werkhué-Tournisk, Barentschin, Glatonstov, &c. There are imperial powder factories at Ochta (near St Petersburg), Schosta, and Kasan. There are also mobile artillery arsenals, the materiel of which is kept in time of peace at St Petersburg, Warsaw, Kiev.

Italy has small arms factories at Brescia, Torre-Annun- Italy. ziata near Naples, and Turin ; powder factories at Fossano and Scafati. Turin is the centre of the military factories.

Spain possesses an arsenal of construction at Seville, a Spain. factory at Toledo, a foundry at Trubia, and a small arms factory at Ovicdo. 'There are also the powder factories of Murcia and Grenada ; the laboratory of Seville ; and the factory of Orbaicete.

The military factories of Belgium consist of a gun foundry Belgium. and small arms foundry at Liége. Powder is supplied from a private factory at Ghent. Guns are also obtained from Krupp. At Antwerp there is an arsenal of construc- tion and a laboratory.

Holland possesses a gun foundry at The Hague, and Holland. workshops, small arms factory, laboratory, and powder factory at Delft.

In Sweden and Norway the materiel of war is mainly Sweden furnished from the trade. ae New

Denmark has a state gun foundry and a powder factory Mi at Frederikswoerk. Warlike materiel is also drawn from the trade, but supervised by artillery officers. There are arsenals for store and repair at Copenhagen, Halleboeck, and Frederikswoerk.

Switzerland has a federal foundry at Aarau, and arsenals Switzer of construction at Berne and Thun, at which latter place lend. there is also a small arms factory. (E. H. H. C.)

ARSENIC anp 17s Compounps. Although arsenic was not recognised as a metallic element till the 18th century, several of its compounds were known from remote antiquity ; and the name dpcevixdv (from dpony, male) was applied by Dioscorides to the yellow sulphide of arsenic, orpiment, on account of its very potent properties. To the present day

ARS—ARS

the term arsenic is more frequently applied to arsenious acid (the white arsenic of commerce) than to the metallic element to which it strictly applies. Although not very abundant, arsenic is one of the most widely disseminated of all mctallic elements, few sulphur ores being free from traces of it. Metallic arsenic is found native in veins in metamorphic rocks in the mining districts of Saxony and Bohemia, and other European localitics, at Zmeov in Siberia, and very abundantly in the silver mines at Chanargillo in Chili. The ores employed in the metallurgy of arsenic are mispickel or arsenical pyrites, smaltite, and cobaltite ; the arsenic in the case of the two last being a bye-product of the preparation of cobalt and nickel.

Arsenic is a highly brittle metal of a steel-grey colour, and of no very great importance in the arts. It may be prepared direct from arsenical pyrites by subliming in closed retorts, but it is more commonly reduced with powdered charcoal from arscnious acid. The physical characteristics of the metal vary according to the mode of its preparation ; that produced directly from pyrites being compact, crystal- line, and nearly white, while the metal

reduced from arsenious acid is grey and pulverulent. It is chiefly used for mixing with lead in the manufacture of small shot, the alloy dropping in rounder forms than pure lead, which pro- duces tailed drops. Arsenic is added to iron and steel for the manufacture of chains and ornaments, the resulting combination taking a very brilliant polish ; and an alloy of copper and arsenic produces a brittle grey mctal of a brilliant silvery hue, used in the manufacture of buttons.

Arsenious acid, or more properly anhydride, the arsenic or white arsenic of commerce, is the form in which arsenic is chiefly produced in metallurgical operations. It is found native to a small extent, and known by the mineralogical name arsenite. The greater proportion of arsenious acid is obtained as a bye-product of the reduction of cobalt and nickel from their ores. At Reichenstein in Silesia, and Ribas in Catalonia, mispickel is worked for arsenic. From the returns received at the English Mining Record Office it appears that 5449 tons of arsenic were produced in England in 1873. More than one-third of this came from one mine in Devonshire, where the arsenical pyrites is converted into white arsenic by roasting. In the re- duction of the ores, which is accomplished in reverbera- tory furnaces, special precautions have to be employed to defend the workman against arsenical fumes and dust. The arsenic is obtained as an impure white powder, which is sublimed till sufficiently pure; and thereafter, by sub- limation at a high temperature, the product is formed into a glassy mass. 'This glass is at first perfectly transparent, but it soon assumes the opaque white appearance arsenic presents in commerce. Besides being the basis of most arsenical preparations and compounds, it is used in the manufacture of glass for reducing the iron oxide contained in sand. White arsenic is one of the most violent of the acrid poisons. Its toxicological relations, the tests for it, é&c., will be treated of under MepicaL JURISPRUDENCE.

Arsenic acid is prepared from arsenious acid on the manufacturing scale by oxidising with strong nitric acid. It also is poisonous, but to a less degree than arsenious acid; aud it is noticed that people employed about it become very fat, without any injury to health being appar- ent. It is now very extensively employed in the manufac- ture of aniline dyes, and also as a substitute for tartaric acid in discharging colours in calico printing. Both arsenite and arseniate of soda are used as " dung-substitutes " in calico-

printing. Scheele's green is an arsenite of copper, and Schweinfurth green is the aceto-arsenite of copper. Both are brilliant green pigments in extensive use, and their employment by paper-stainers has caused a good deal of excitement and unnecessary terror. The rubbing off of

arsenical particles in cleaning wall-papers may be injurious to health, but there is no possibility of any arsenical exha- lation arising from the walls as has been alleged.

Two sulphur compounds of arsenic—realgar and orpi- ment—are also of industrial importance. Realgar, or ruby sulphur, is the disulphide of arsenic; and in its native form it was known to the ancients, being the cavdapaxy of Theophrastus. It is prepared usually from arsenious acid by mixing and melting it with.the required proportion of sulphur. It is used only to a limited extent as a pigment, and is a constitucnt of the Indian white fire used in fire signals and pyrotechny. Orpiment (auripigmen- tum), the yellow sulphide of arsenic (the dpoevxdy of Dios- corides), occurs native in many localities. It is, like realgar, artificially prepared by mixing arsenious acid with the requisite quantity of sulphur, and subliming the mixture. Sulphur is used in proportions varying according to the depth of yellow desired, the orpiment of commerce not being a definite chemical compound, but a mixture of arsenious acid and the yellow sulphide, the light tints sometimes containing as much as 97 per cent. of white arsenic. It forms the artists' colour called king's yellow ; and in addition to some use as a common pignient, it is employed in dyeing and calico-printing. The preparations of arsenic used in pharmacy, in addition to arsenious acid, are Liquor arsenicalis, or Fowler's solution, the hydro- chloric solution of arsenic, arseniate of iron, and the arse- niate of soda.

ARSON has been defined as the malicious and wilful burning of the house of another, and is at common law an offence of the degree of felony. Some part of the house must be actually burnt; a bare intention or attempt will not constitute the offencc, but the burning of any part, however trifling, is sufficient. The burning must be mali- cious and wilful. If a man by wilfully setting fire to his own house burn the house of his neighbour also, it will be felony. The word house, in the definition of the offence at common law,

extends not only to dwelling-houses, ‘“ but to all out-houses which are parcel thereof, though not adjoining thereto.” Barns, with corn and hay in them, though distant from a house, are within the definition.

The different varieties of the offence are specified in the statute 24 and 25 Vict. c. 97 (Malicious Injuries to Pro- perty Act). The following crimes are thereby made felonies :—(1.) Setting fire to churches or other places of divine worship ; (2.) Setting fire to a dwelling-house, any person being therein; (3.) Setting fire to a house, out- house, manufactory, farm-building, &c., with intent to impose and defraud any person ; (4.) Setting fire to build- ings appertaining to any railway, port, dock, or harbour , or, (5.) Setting fire to any public building. In these cases the Act provides that the person convicted shall be liable, at the discretion of the court, to be kept in penal servitude for life, or for any term not less than three years (now jive years by the 27 and 28 Vict. c. 47), or to be imprisoned for any time not exceeding two years, with or without hard labour, and with or without solitary confinement, and, if a male under sixteen ycars of age, with or without whipping. Setting fire to other buildings, and setting fire to goods in buildings in such circumstances that, if the same were thereby set on fire, the offence would be felony, are subject to the punishments last enumerated, with this exception, that the period of penal servitude is limited to fourteen years. The attempt to set fire to any building, or any matter or thing (as in last offence), is to be punished in the same way. So also is the crime of setting fire to crops of hay, grass, corn, &c., but setting fire to stacks of the same, or any cultivated vegetable produce, or to peat, coals, é&c., is regarded as a more serious offence, and the penal servitude may be for life. For the attempt to commit the

Jast two offences penal servitude is limited to seven years. Sctting fire to mines is visited with the full measure of penalty, and in the case of the attempt, the penal servitude is limited to fourteen years. Setting fire, or attempting to set fire to ships is punishable by the full penalties already enumerated. Setting fire to her Majesty’s vessels of war is a felony punishable by death.

In Scotland the offence, equivalent to arson in England, is known by the more expressive name of wilful fire-raising. The later statutes cited above do not apply to Scvtland, where the crime is punishable capitally by old consuetudi- nary law. The public prosecutor has the privilege, as in other such cases, of declining to demand capital punish- ment, and invariably does so.

ART, in the most extended and most popular sense of the word, means everything which we distinguish from Nature. Art and Nature are the two most comprehensive genera of which the human mind has formed the concep- tion. Under the genus Nature, or the genus Art, we include all the phenomena of the universe. But as our conception of Nature is indeterminate and variable, so in some degree is our conception of Art. Nor does such ambiguity arise only because some modes of thought refer a greater number of the phenomena of the universe to the genus Nature, and others a greater number to the genus Art. It arises also because we do not strictly limit the one genus by the other. The range of the phenomena to which we point when we say Art, is never very exactly determined by the range of the other phenomena which at the same time we tacitly refer to the order of Nature. Everybody understands the general meaning of a phrase like Pope's "' Blest with each grace of nature and of art." In such phrases we intend to designate familiarly as Nature all which exists independently of our study, forethought, and exertion—in other words, those phenomena in our- selves or the world which we do not originate but find ; and we intend to designate familiarly as Art, all which we do not find but originate —or in other words, the pheno- mena which we do add by study, forethought, and exertion to those existing independently of us. But we do not use these designations consistently. Sometimes we draw an arbitrary line in the action of individuals and societies, and say, Here Nature ends and Art begins—such a law, such a practice, such an industry even, is natural, and such another is artificial; calling those natural which happen spontaneously and without much reflection, and the others artificial. But this line different observers draw at different places. Sometimes we adopt views which waive the distinction ultogether. One such view is that wherein all phenomena are regarded as equally natural, and the idea of Nature is extended so as to include "all the powers existing in either the outer or the inner world, and everything which exists by means of those powers." In this

view Art becomes a part of Nature. It is illustrated in the familiar passage of Shakspeare, where Polixenes reminds Perdita that—

‘ Nature is made better by no mean, But nature makes that mean : so, over that art Which, you say, adds to nature, is an art That nature makes.” . .*

‘there is an art

Which doth mend nature,—change it, rather, but

The art itself is nature.” A posthumous essay of Mr John Stuart Mill contains a full philosophical exposition and defence of this mode of regarding the relations of Nature and Art. Defining Nature as above, and again asa “collective name for all facts, actual and possible,” that writer proceeds to say that such a definition—

‘Is evidently inapplicable to some of the modes in which the

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with the common form of speech by which Nature is opposed to Art, and natural to artificial. For in the sense of the word Nature which has thus been defined, and which is the true scientific sensc, Art is as much Nature as anything else ; and everything which is artificial is natural—Art has no indcpendent powers of its own: Art is but the employment of the powers of Nature for an end. Phenomena produced by human agency, no less than those which, as far as we are concerned, are spontaneous, depend on the properties of the elementary forces, or of the elementary substances and their compounds. ‘Ihe united powers of the whole human race could not create a new property of matter in general, or of any one of its species. We can only take advantage for our purposes of the properties we find. A ship floats by the same laws of specific gravity and equilibrium as a tree uprooted by the wind and blown into the water. The corn which men raise for food, grows and produces its grain by the same laws of vegetation by which the wild rose and the moun- tain strawberry bring forth thcir flowers and fruit. A house stands and holds together by the natural properties, the weight and cohesion of the materials which compose it. A steam engine works by the natural expansive force of steam, exerting a pressure upon one

part of a system of arrangements, which pressure, by the mechanical properties of the lever, is transferred from that to another part, where it raises the weight or removes the obstacle brought into connection with it. In these and all other artificial opcrations the office of man is, as has often been remarked, a very limited one ; it consists of moving things into certain places. We move objects, and by doing this, bring some things into contact which were separate, or separate others which were in contact ; and by this simple change of place, natural forces previously dormant are called into action, and produce the desired effect. Even the volition which designs, the intelligence which contrives, and the muscular force which executes thesc movements, are themselves powers of Nature."

Another mode of thought, in some sort complementary to the last, is based on the analogy which the operations of forces external to a man bear to the operations of man himself. Study, forethought, and exertion are assigned to Nature, and her operations are called operations of Art. This view was familiar to ancient systems of philosophy, and especially to that of the Stoics. According to the report of Cicero, Nature as conceived by Zeno was a fire, and at the same time a voluntary agent having the power or art of creating things with regularity and design

~~*(naturam esse ignem artificiosum ad gignendum progre*~~

dientem via). To this fire not merely creative force and systematic action were ascribed, but actual personality. Nature was "non artificiosa solum, sed plane artifex." "That which in the works of human art is done by hands, is done with much greater art by Nature, that is, by a fire which exercises an art and is the teacher of other arts." This conception of Nature as an all-generating fire, and at the same time as a personal artist both teaching and including in her own activity all the human arts, on the one hand may be said, with Polixenes and Mr Mill, to merge Art in Nature; but on the other hand it finds the essence of Nature in the resemblance of her operations to those of Art. "It isthe propriwm of art," according to the same system, 'to create and beget," and the reasoning proceeds—Nature creates and begets, therefore Nature is an artist or Demiurgus.

But these modes of thought by which Art is included under Nature, or Nature identified with Art, or both at once, are exceptional. In ordinary use

the two concep- tions, each of them somewhat vague and inexact, are anti- thetical. Their antithesis was what Dr Johnson had chiefly in his mind when he defined Art as "the power of doing something which is not taught by Nature or by instinct." But this definition is insufficient, because the abstract word Art, whether used of all arts at once or of one at a time, is a name not only for the power of doing something, but for the exercise of the power ; and not only for the exercise of the power, but for the rules according to which it is exer- cised; and not only for the rules, but for the result. Paint- ing, for instance, is an art, and the idea includes not only the power to paint, but the act of painting ; and not only

word is familiarly employed. For example, it entirely conflicts | the act, but the laws for performing the act rightly; and

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not only all these, but the material consequences of the act or the thing painted. So of agriculture, navigation, and the rest. Hixception might also be taken to Dr Johnson's definition on the ground that it excludes all actions of instinct from the genus Art, whereas usage has in more languages than one given the name of Art to several of those ingenuities in the lower animals which popular theory at the same time declares to be instinctive. Dante, for instance, speaks of boughs shaken by the wind, but not so violently as to make the birds forego their Art,— 'Non perd dal lor esser dritto spartn

Tanto, che gl'augelletti per lor cime

Lasciasser d'operar ogni lor arte."

And Fontenelle, speaking the language not of poetry but of science :—"' Most animals—as, for instance, bees, spiders, and beavers—have a kind of art peculiar to themselves ; but each race of animals has no more than one art, and this one has had no first inventor among the race. Man, on the other hand, has an infinity of different arts which were not born with his race, and of which the glory is his own." Dr John- son might reply that those properties of variety and of originality or individual invention, which Fontenelle him- self alleges in the ingeuuities of man but not in those of the

lower animals, are sufficient to make a generic differ- ence, and to establish the impropriety of calling a honey- comb or a spider's web a work of Art. It is not our pur- pose to trespass on ground so debateable as that of the nature of consciousness in the lower animals. Enough that when we use the term Art of any action, it is because we are thinking of properties in the action from which we infer, whether justly or not, that the agent voluntarily and designedly puts forth skill for known ends and by regular and uniform methods. If, then, we were called upon to frame a general definition of Art, leaving room for every accepted usage of the word, it would run thus :— JZvery regulated operation or dexterity by which organised beings pursue ends which they know beforehand, together with the rulesand the result of every such operation or dexterity.

Here it will be well to consider very briefly the natural history of the name which has been given to this very com- prehensive conception by the principal branches of civilised mankind. Our own word Art the English language has taken, as all the Romance languages of modern Europe have taken theirs, directly from the Latin. The Latin ars proceeds from a root the primitive force of which is open to question. One distinguished philologist thinks that this syllable AR, in that root from which ars is descended, means to plough, and is the same as appears in the Greek Gp-ovv, ap-otpov, dp-ovpa, and Latin ar-are, ar-atrum, ar- yum 'As agriculture was the principal labour in that early state of society when we must have supposed most of our Aryan words to have been formed and applied to their definite meanings, we may well understand how a word which originally meant this special kind of labour was after- wards used to signify labour in general. . . . . And as ploughing was not only one of the earliest kinds of labour, but also one of the most primitive arts, I have no doubt that the Latin ars, artis, and our own word art, meant originally the art of all arts, first taught by the goddess of all wisdom, the art of cultivating the land."— (Max Miiller, Lect. on Science of Language, i. 294.) : The more common supposition refers the word to a root AR, of which the primitive signification will have been to put or fit two things together, and which is to be found in a large family of Greek words, such as dpdp-wrxe, dp-pévos, dp-Opov, dp-t6 nos, ap-Tvw, x.7.4. Asa question of historical probability, the latter account seems the likelier, inasmuch as predatory and nomadic man was certainly in

possession of many dexterities, as that of fitting a stone arrow-head to its shaft,—or say, that of putting two and two together,—

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from which, rather than from the later invention of agri- culture, the group of human dexterities in general is likely to have received its name.

The Greek réyvy, the name both for arts in the particu- lar and art in the abstract, is by its root related both to Téx-Twv and réx-vov, and thus contains the allied ideas of making and begetting. The proprium of art in the logic of the Stoics "to create and beget" (see above) was strictly in accordance with this etymology.

The Teutonic Kunst is formed from kinnen, and konnen is developed from a primitive ch kann. In kann philology recognises a preterite form of a lost verb, of which we find the traces in Kin-d, a child; and the form Jch kann, thus meaning originally "I begot," contains the germ of the two several developments,—konnen, "to be master," "to be able," and kennen, "to know."

Putting by, then, as too doubtful the etymology of ars from ploughing, we see that the chief Aryan languages have with one consent extended a name for the most elementary exercise of a constructive or productive power, till that name has covered the whole province of the skilled and deliberate operations of sentient beings.

In proportion as men left out of sight the idea of creation, of constructing or producing, "artificiosum esse ad gignen- dum," which is the primitive half of this extended notion, and attended only to the idea of skill, of proceeding by re- gular and disciplined methods, '" progredi via," which is the superadded half, the whole notion Art, and the name for it, might become subject to a process of thought which, if analysed, would be like this :— What is done by regular aud disciplined methods is Art; facts are observed and classified, and a systematic view of the order of the uni- verse obtained, by regular and disciplined methods; the observing and classifying of facts, and obtaining a syste- matic view of the order of the universe, is therefore Art. To a partial extent this did unconsciously take place. Science, of which

the essence is only in knowledge and contemplation, came to be spoken of as Art, of which the essence is all in practice and production. Cicero, notwithstanding his citation of the Stoical dictum that practice and production were of the essence of Art, else- where divides Art into two kinds —one by which things are only contemplated in the mind, another by which some- thing is produced and done. ('Quumque artium aliud ejusmodi sit, ut tantummodo rem cernat; aliud, ut moliatur aliquid et faciat."—Acad. ii. 7.) Of tae former kind his instance is geometry; of the latter the art of the violin player. Now geometry, understanding by geometry an acquisition of the mind, that is, a collected body of observa- tions and deductions concerning the properties of space and magnitude, is a science and not an art; although there is an art of the geometer, which is the skill by which he solves any given problem in his science, and the rules of that skill, and his exertion in putting it forth. And so every science has its instrumental art or practical discip- line; and in as far as the word Art is used only of the practical discipline or dexterity of the geometer, the astronomer, the logician, the grammarian, or other person whose business it is to collect and classify facts for con- templation, in so far the usage is just. The same justifica- tion may be extended to another usage, whereby in Latin, and some of its derivative languages, the name Art came to be transferred in a concrete sense to the body of rules, the written code or manual, which lays down the discipline and regulates the dexterity ; as ars grammatica, ars rhe- torica, and the rest. But when the word is stretched so as to mean the sciences themselves as acquisitions of the mind, that meaning is illegitimate. Whether or not Cicero, in the passage above quoted, had in his mind the science of geometry as a collected body of observations and de-

ductions, it is certain that the Ciceronian phrase of the liberal arts, the ingenuous arts, both in Latin and its deri-

vatives or translations in modern speech, has been used |

currently to denote the sciences themselves, and not merely the disciplines instrumental to them. The trivium and the quadrivium (grammar, logic, and rhctoric—geometry, astro- nomy, music, and arithmetic) have been habitually called arts, when some of them have been named in that sense in

which they mean not arts but sciences, " only contem- plating things in the mind." In the German language particularly the words Art and Science have in general becn loosely interchanged. The etymology of the word for Art secured a long continuance for this ambiguity. Kunst was employed indiscriminately in both the senses of the primitive Ich kann, to signify what I know, or Scicnce, and what I can do, or Art. It was not till the end of the 17th century that a separate word for Science, the modern Wissenschaft, came into use. On the other hand, the Greek word réxvy, with its distinct suggestion of the root sig- nification to make or get, acted probably as a safeguard against this tendency. The distinction between réyvy, Art or practice, and émuor/pyn, knowledge or Science, is ob- served, though not systematically, in Greek philosophy. But for our present purpose, that of making clear the true rela- tion between the one conception and the other, further quotation is rendered superfluous by the discussion the subject has received at the hands of the modern writer already quoted. Between Art, of which we practise the rules, and Science, of which we entertain the doctrines, Mr Mill establishes the difference in the simplest shape, by pointing out that one grammatical mood is proper for the conclusions of Science, and another for those of Art. Science enunciates her conclusions in the indicative mood, whereas "the imperative is the characteristic of Art, as distinguished from Science." And as Art utters her con- clusions in her own form, so she supplies the substance of

her own major premise.

'Every art has one first principle, or general major premise, not borrowed from science, that which enunciates the object aimed at, and affirms it to be a desirable object. The builder's art assumes that it is desirable to have buildings ; architecture (as one of the fine arts) that it is desirable to have them beautiful and imposing. The hygienic and medical arts assume, the one that the preservation of health, the other that the cure of disease, are fitting and desirable ends. These are not propositions of science. Propositions of science assert a matter of fact—an existence, a co-existence, a succession, ora resemblance. The propositions now spoken of do not assert that anything is, but enjoin or recommend that something should be. They are a class by themselves. A proposition of which the

predicate is expressed by the words ought or should be is generically different from one which is expressed by ¢s or will be."

And the logical relation of Art and Science, in other words, the manner of framing the intermediate member between the general major premise of Art and its imperative conclu- siou, is thus defined :—

"The Art [in any given case] proposes to itself an end to be attained, defines the end, and hands it over to the Science. The Science receives it, considers it as a phenomenon or effect to be studied, and having investigated its causes and conditions, sends it back to Art with a theorem of the causes and combinations by which it could be produced. Art then examines these combinations of circumstances, and according as any of them are or are not in human power, pronounces the end attainable or not. The only one of the premises, therefore, which Art supplies, is the original major premise, which asserts that the attainment of the given end isdesirable. Science, then, lends to Art the proposition (obtained by a series of inductions or deductions) that the performance of certain actions will attain the end. From these premiscs Art concludes that the performance of these actions is desirable, and finding it also practicable, converts the theorem into arule or precept… . – The grounds, then, of every rule of 'Art are to be found in the thcorems of Science. An Art, ora body of Art, consists of the rules, together with as much of the speculative propositions as comprises the justification of these rules. The complete Art of any matter includes a selection of such a portion

from the Science as is necessary to show on what conditions the effects, which the Art aims at producing, depend. And Art in gencral consists of the truths of Science arranged in the most convenient order for practice, instcad of the order which is most convenient for thought. Science groups and arranges its truths so as to enable us to take in at one view as much as possible of the general order of the universe. Art, though it must assume the same gencral laws, follows them only into such of their detailed consequences as have led to the formation of rules of conduct, and brings together from parts of the field of Science most remote from one another, the truths relating to the production of the ditferent and heterogencous causes

necessary to each effect which the cxigencies of practical life require to be produced." —(Mill's Logic, vol. ii. pp.

542-549.)

The whole discussion may be summed up thus. Science consists in knowing, Art consists in doing. What I must do in order to know, is Art subordinate to or concerned in Science. What I must know in order to do, is Science subordinate to or concerned in Art.

Art, then, is defined by two broad distinctions : first, its popular distinction from Nature ; and next, its practical and scientific distinction from Science. Both of these distinc- tions are observed in the terms of our definition given above. Within the proper limits of this definition, the conception of Art, and the use of the word for it, have undergone sundry variations. These variations correspond to certain vicissitudes or developments in the order of historical facts and in society. It remains very briefly to consider the chief of these. The requirements of society, stimulating the in- genuity of its individual members, have led to the invention of arts and groups of arts, constantly progressing, with the progress of civilisation, in number, in complexity, and in resource. 'The religious imagination of early societies, who find themselves in possession of such an art or group of arts, forgets the history of the invention, and assigns it to the inspiration or special grace of some god or hero. So the Greeks assigned the arts of agriculture to Triptolemus, those of spinning and navigation to Athene, and of music to Apollo. At one stage of civilisation one art or group of arts is held in higher esteem, another at another. In societies, like most of those of the ancient world, where slaves were employed in domestic service, and upon the handicrafts supplying the immediate utilities of life—food, shelter, and clothing-—these constituted a group of servile arts. The arts of husbandry or agriculture, on the other hand, have alternately been regarded as servile and as honourable according as their exercise has been in the hands of a subject class, as under feudal institutions, or, as under the Roman republic, of free cultivators. Under feudal institutions, or in a society in a state of permanent war, the allied arts of war and of government have been held the only honourable class. In commercial states, like the republics of Italy, the arts of gain, or of pro- duction (other than agricultural) and distribution,

have made good their title to equal estimation and greater power beside the art of captains. But among peaceful arts, in- dustries, or trades, some have always been held to be of higher and others of lower rank ; the higher rank being assigned to those that required larger operations, higher training, or more thoughtful conduct, and yielded ampler returns—the lower rank to those which called for simple manual exercise, especially if such exercise was of a dis- agreeable or degrading kind. In the cities of Italy, where both commerce and manufactures were for the first time organised on a considerable scale, the name arte, Art, was retained to designate the guilds or corporations by which the several industries were exercised ; and, according to the nature of the industry, the art was classed as higher or lower (maggiore and minore). a

The arts of which we have hitherto spoken have arisen from positive requirements, and supply what are strictly utilities, in societies, not excluding the art of war, at least

so far as concerns one-half of war, the defensive half. But war continucd to be an honourable pursuit, because it was a pursuit associated with birth, power, and wealth, as well as with the virtue of courage, in cascs where it had no longer the plea of utility, but was purely aggressive or predatory ; and the arts of the chase have stood in this respect in an analogous position to those of war.

There are other arts which have not had their origin in positive practical needs, but have been practised from the first for pleasure or amusement. The most primitive human beings of whom we have any knowledge, the cave- dwellers of the palzeolithic period, had not only the useful art of chipping stones into spear-heads, knife-heads, and arrow-heads, and making shafts or handles of these imple- ments out of bone; they had also the ornamental art of scratching upon the bone handle the outlines of the animals they saw—-mammoth, rhinoceros, or reindeer—or of carving such a handle into a rude resemblance of one of these animals. Here we have a skill exercised, in the first case, for pure fancy or pleasure, and in the second, for adding an element of fancy or pleasure to an element of utility. Here, therefore, is the germ of all those arts which pro- duce imitations of

natural objects for purposes of entertain- ment or delight, as painting, sculpture, and their subordi- nates ; and of all those which fashion useful objects in one way rather than another because the one way gives pleasure and the other does not, as architecture and the subordinate decorative arts of furniture, pottery, and the rest. Arts that work in a kindred way with different materials are those of dancing and music. Dancing works with the physical movements of human beings. Music works with sound. Between that imitative and plastic subdivision, and the subdivision of these which only pro- duce motion or sound and pass away, there is the inter- mediate subdivision of eloquence and the drama, which deal with the expression of human feeling in spoken words and acted gesturcs. There is also the comprehensive art of poetry, which works with the material of written words, and can ideally represent the effects proper to any or all of the other arts. All of these arts have, as a matter of history, been at one time or another intimately associated with religion. Painting, sculpture, architecture, drawing, music, poetry, have all been at one time or another prin- cipally devoted to the honour of supernatural beings imagined to have power over mankind for good and evil. But this use, though a part of thcir history, is not insepa- rable from their nature. What is inseparable from them, and essential to the nature of this group of arts, is twofold. First, of their effect upon those to whom they are addressed: there are certain highly complex properties and relations of rhythm, proportion, and harmony, upon which the pleasur- ableness of these arts depends, and which cach of them, if its appeal to the perceptions and the imagination is to be successful, is bound to observe. Secondly, of the mode in which they are practised: these complex effects can only be produced by the exercise of an equally complex set of faculties in the artist; it is therefore of the essence of this group of arts, that they cannot be practised by habit, rote, or calculation; habit, rote, and calculation may help the artist a certain way, but in the essential parts of his art he passes beyond the reach of rules, and acts by what is called inspiration, that is, by the spontaneous and unrea- soned working together of infinitely complex and highly developed sensibilities and dexterities in his constitution.

We shall not concern ourselves with the many definitions that have been framed by thinkers seeking to classify these arts either according to simple observation and comparison, or according to the principles each of his

chosen meta- physical system. (For an account of these matters, see articles AistHETICS and Finz Arts.) Enough that to-

gether with the useful arts, there exists this great group of arts of which the end is not use, but pleasure, or plea- sure before use, or at least pleasure and use conjointly. In modern language, there has grown up a usage which has not only put these and their congeners into a class by themselves, but sometimes appropriates to them alone the use of the generic word Art, as if they and they only were the arts, car' éoxyv. First as the liberal or polite arts, and then as the fine arts, the languages of modern Europe have separated from the class of arts which exist only for use the class which exist only or chiefly for pleasure. They have gone further, and have reduced the number which the class-word is meant to include. When Art is now currently spoken of in this sense, not even music or poetry is frequently denoted, but only architecture, sculp- ture, and painting by themselves, or with their subordinate and decorative branches. And in correspondence with this usage, another usage has removed from the class of arts, and put into a contrasted class of manufactures, a large number of industries and their products, to which the generic term Art, according to our definition, properly applies. That definition covers the mechanical arts, which can be efficiently exercised by mere habit, rote, or calcula- tion, just as well as the fine arts, which have to be exercised by a higher order of powers. But the word Art, becoming appropriated to the fine arts, has been treated as if it neces- sarily carried along with it, and as if works to be called works of art must necessarily possess, the attributes of individual skill and invention expressing themselves in ever new combinations of pleasurable contrivance. The progress of what an older nomenclature called the mechani- cal arts—the consequence of inventions for making pro- duction easier and more rapid by the application of physical agencies and the economising of human labour—has led to the multiplication of products all alike, all equally bearing the stamp of habit, rote, and calculation, and all equally destitute of those properties of individual contrivance and pleasureableness. And so works of Manufacture, or the products of machinery, which bear only very dully and remotely the mark of their original source in the hand and brain of man, have come to be contrasted

with works of Art which bear such marks vividly and directly. Fora century the mechanical kingdom, or reign of pure Manu- facture, had spread apace in Europe, engrossing an ever larger field of human production. Of late years there is a sign of a reaction in favour of an extension of the kingdom of Art, or at least of endeavours to bring reconciliation and alliance between the two. (8. ¢.)

ART anp PART, a term used in Scottish Law to denote the aiding or abetting in the perpetration of a crime,—the being an accessory before or at the perpetration of the crime. There is no such offence recognised in Scotland as that of being an accessory after the fact.

ARTA (Narda, ae. év"Apda, or Zarta, t.¢., eis "Apra, the ancient Ambracia), a town of Albania, in the eyalet of Joannina, deriving its present designation from a corruption of the name of the river Arachthus on which it stands. It is a place of some six or seven thousand inhabitants, who are mostly Greek. There are a few remains of its old cyclopic walls ; and the town contains a castle, built on the lofty site of the ancient citadel by Nicephorus (1357); a palace belonging to the Greek Metropolitan ; and a number of mosques, synagogues, and churches, the most remarkable being the church of the Virgin of Consolation, founded (1071) by Michael Ducas. The streets of the town were widencd and improved in 1869. Manufacture of woollens, cottons, Russian leather, and embroidery is carried on, and there is trade in cattle, wine, tobacco, hemp, hides, and grain. Much of the neighbouring plain is very fertile, and the town is surrounded with gardens and orchards, in which

the orange, lemon, and citron come to great perfection. In 1083 Arta was taken by Bohemund of Tarentum ; in 1449 it fell into the hands of the Turks, and in 1688 it was cap- tured by the Venetians. In 1797 it was held by the French, but in the following year, 1798, Ali Pasha of Joannina made himself master of it. During the Greek struggle for independence it suffered severely, and was the scene of several conflicts, in which the ultimate success was with the Turks. An insurrection in 1854 was at once repressed.

ARTA (Arachthus), a river of Albania, which rises partly in Mount Lakmon, and partly in the heights between 'Lingon and Mitzekeli, flows south for upwards of forty miles along the eastern side of the Kilberini Mountains, and falls into the Gulf of Arta.

ARTA, Gut or, the Sinus Ambracius of the ancients,

is a large and beautiful inlet of the Ionian sea, twenty-five miles long and ten broad, the northern shores of which

belong to Turkey, and the southern and eastern to Greece. Its only important affluent, besides the Arta, is the Luro (Charadra) also from the north. It abounds with mullets,

soles, and eels, Around its shores are numerous ruins of

ancient cities, as well as several flourishing modern towns, of which may be mentioned Actiwm at the entrance, Nicopolis, Previsa, Arta, Argos, Limnexa, Karavasaras, Olpe, and Vonitza.

ARTAXERXES, a royal Persian name, borne first by several of the kings of the Achemenian dynasty of the Persian empire, and found also in the later Sassanian dynasty. The original and native form of the name, as ascertained from the cuneiform inscriptions of ancient Persia, is Artakhshatra (see Rawlinson, Jour. Asiat. Soc. xi. p. 35). The Hebrew transcript, occurring with slight differences of spelling in different passages of the Old Testament, is Artakhshasta—the Assyrian, Sartakhshatra—the Scythic, Irtaksassa,—all closely answering to the original. The Greek 'Apragéépéns, from which the English form is taken, is less correct, and is misleading through the assimilation of the latter part of the name to the other royal name Xerxes, with which the word before us has etymologically no connection. In later times the name assumes the slightly modified forms of Artachshetr (De Sacy, Antiquités dela Pers, p. 100), and Ardeshir ('Apragdépys and 'Aptagip, in Agathias). In regard to the etymology and meaning of the name there is a general consensus of opinion among modern scholars, Herodotus (vi. 98) was misled by the Greek transcription, when, having rendered Xerxes, Warrior (dpyios), he rendered Artaxerxes, Great Warrior (wéyas dpyios). The elements of the name are arta, an intensive

particle or adjective, connected with the Zend areta, high or honoured (in Skr. rita); and khshatra, kingdom or dominion, which occurs both in Zend and Sanscrit (Raw- linson, Jour. Asiat. Soc., xi. 35 ; Lassen, Ueber die Keil-inschriften, p. 161; Oppert, Les inscriptions des Achémé- nides, p. 299; Spiegel, Die altpersischen Kerlinschroften, p. 185). Lassen translates the name, Exalted in dominion.

It is known that throne-names, or names appropriated to royalty, were in use among the Persians as among other Eastern nations (cf. Heeren, Jdeen, i. pp. 138, 401; Baehr's Ctesias, p. 195). Thus the great Cyrus is said to have been called Agradatus before his accession to the throne. The second and third Darius had both also private names, the one Ochus, and the other Codomannus. To the class of royal names belongs the name Artaxerxes. 'T'o this use its significance is alone suitable, and in the earliest times, at least, it is not found appropriated by any save either the possessors of, or the pretenders to, royalty. In regard to the most of those about to be mentioned, we have express testimony that they took this name only when they ascended the throne,

It will be convenient first to mention the Achzmenian

kings thus designated in the Greek historians and the old Persian inscriptions, and then: consider the questions connected with the identification of these with the kings of this name occurring in Scripture.

1. Artaxerxes, surnamed Maxpoxerp, or Longimanus (by Persian authors, Diraz-dest), the long-handed, so called, says Plutarch (Vita Artaz., i.), because his right hand was longer than his left, or perhaps (see Malcolm, LZist. of Persia, i. p. 66) the long-armed (cf. Edward Longshanks), was the sou of the famous Xerxes, the invader of Greece, and succeeded his father in 465 B.c. According to Josephus (Ant. Jud., xi. 6, 1), he was originally called Cyrus. His reign was marked by the revolt of Egypt under Inarus, in which the Athenians were abettors of the Egyptians, and which was quelled by the Persian general Megabyzus, in 455 p.c.; and by the ratification of the peace of Callias with Athens in 449 B.c. Of the architectural and inscribed remains of the ancient Persian empire very little is recognisable as due to this king. He is recorded in an inscription by his grandson, the next Artaxerxes, as the repairer (?) of the palace at Susa (Loftus, Chaldwa

and Susiana, p. 372; Norris, Jour. Asiat. Soc., xv. pp. 157-162). There is extant a frag- mentary inscription in old Persian, with an Assyrian translation, which seems to have proceeded from him ; and a legend upon a vase at Venice, of Egyptian origin, which reads " Artaxerxes the great king," may with considerable assurance be also referred to this monarch (Oppert, op. cit. pp. 288-290). Artaxerxes died in 425 B.C. after a reign of forty years.

2. The next sovereign that falls to be noticed here was the grandson of the preceding, and the son of the inter- mediate monarch, Darius Nothus. His original and private name was Arsaces, and he assumed that of Artaxerxes on ascending the throne (Ctesias, Huc. Pers. § 57 ; Plutarch, Vita Artax., c. 2). The date of his accession is 405 B.c. It is this Artaxerxes, commonly surnamed Mnemon, from the retentiveness of his memory, whose reign was distin- guished by the attempt of his brother, the younger Cyrus, to gain possession of the crown, and by the victory of Cunaxa 401 B.c., the death of Cyrus, and the retreat of the ten thousand Greeks, immortalised by Xenophon. Other prominent events of this reign were the peace of Antalcidas in 399 3.c., and the Cyprian revolt, with the defeat of Evagoras its leader, about 380 B.c. Arta- xerxes Mnemon died in 359 B.c., after a reign of forty-

'six years, The Greek sources for this reign are com-

paratively abundant. Besides Xenophon, Ctesias, Diodorus, and others, Plutarch has furnished a special life of this monarch. The only native memorial of his reign is the inscription already referred to, found at Susa on the bases of pillars belonging to the royal residence there, which runs thus : —" Says Artaxerxes, the great King, the King of Kings, the King of the countries, the King of this earth, the son of King Darius; Darius was the son of King Artaxerxes, Artaxerxes was the son of Xerxes, Xerxes was the son of King Darius, Darius was the son of Hystaspes, the Achemenian. Darius, my ancestor, built this temple (or edifice), and afterwards it was repaired (1) by Artaxerxes, my grandfather. By the help of Ahuramazda I placed Anahita and Mithra in this temple. May Ahuramazda, Anahita, and Mithra protect me." (See Norris in Loftus, op. cit. p. 872 ; Jour. Asiat. Soc., xv. p. 159 ; Spiegel, op. cit. p. 65.) The inscription, compared with earlier texts, shows a certain negligence of style, and is interesting for the prominence, unparalleled in previous records, given to the worship of the subordinate deities Anahita, or Tanaitis, and Mithra.

3. This sovereign was succeeded by his son Ochus, who, on securing the crown, took the same royal name, and is usually known as Artaxerxes Ochus. The commencement

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of his reign was marked by numerous formidable revolts throughout the western provinces of the empire, which, however, were vigorously repressed, and after the re-subju- gation of the revolted countries, the power of the empire was advanced to an extent and to an apparent stability unequalled since the time of the great Darius. This Artaxerxes perished by poison in 338 B.c. He is known as the builder of one of the palatial structures which stood on the platform of Persepolis; and an inscription proceeding from him (wrongly ascribed to the previous Artaxerxes by Benfey, Die persischen Keilinschriften, p. 67) has been found there, marked, like that already spoken of, and to a greater degree, by defects of style, and presenting his geuealogy in entire accordance with the preceding. (See Rawlinson, op. cit. x. p. 841; Oppert, op. cit. p. 297; Spiegel, op. cit. p. 67.)

4, We find yet another instance in the classical writers of the use of Artaxerxes as a royal name during the Acheemenian period. After Darius Codomannus, the suc- cessor of Artaxerxes Ochus, had been finally and decisively defeated by Alexander at Arbela, he was, while fleeing before the conqueror, traitorously slain by Bessus, the satrap of Bactria, who thereupon, we are told, "'assumed the upright tiara and the royal robe, and the name Arta- xerxes instead of Bessus, proclaiming himself king of Asia" (Arrian, Exp. Alew., iii. 25, 3, ef. Curtius, vi. 6, 13).

Such are the Achemenian kings known to the classical writers by the name Artaxerxes. But the name also occurs in the Scriptural books of Ezra and Nehemiah, as well as in some of the Apocryphal books, and in Josephus, and it remains to be considered whether the persons there referred to are to be identified with any of the kings now mentioned, and if so, with whom? Inthe book of Nehemiah, Arta- xerxes, king of Persia, appears as the monarch to whom Nehemiah acted as cup-bearer (i. 2), from whom he received a commission, in the twentieth year of the king, to rebuild the wall and other ruined edifices in Jerusalem (ii. 1), and whose thirty-second year is also mentioned (v. 14, xiii. 6). In attempting to identify this Artaxerxes with one of those above named, our choice is at once limited by the length of his reign to those surnamed Longimanus and Mnemon. A sufficient proof that it is the former of these who is meant, is found in the genealogy of

Eliashib, the high priest when Nehemiah came to Jerusalem (Neh. iii. 1, and xii. 10). For Eliashib was the grandson of Jeshua, and Jeshua was high priest when Zerubbabel led the first company of returned exiles to Judah, in the days of Cyrus (Ezra ii. 2, iii. 2). Now, the reign of Cyrus dates from 536 B.c.; and from this to the twentieth year of Artaxerxes Longimanus, or 445 B.c., is a period of ninety-one years, leaving room for precisely three generations. The opinion, which is the common one, that the Artaxerxes of Nehemiah is Artaxerxes Longimanus, is thus fully warranted (though some, as De Saulcy, Sept siécles de Vhistoire judaique, p. 28, identify him with Artaxerxes Mnemon), and this enables us to proceed with confidence when inquiring into the reference of the name as it occurs in the book of Ezra. Ezra was contemporary with Nehemiah (Neh. viii. 1), and mention is made in his book of an Artaxerxes who was his own contemporary (Ezra vii. 1, 7,11; viii. 1), in whose seventh year a decree was issued, giving authority to Ezra to levy whatever supplies were needful for the service of the temple at Jerusalem. This, therefore, must have been also Artaxerxes Longimanus, and the year referred to is 458 B.c. Hence, also, when it is said (Ezra vi. 14) that "' the elders of the Jews builded, and they prospered, . . . according to the commandment of Cyrus, and Darius, and Artaxerxes king of Persia," it may without difficulty be understood that the same monarch is here named, the writer singling out the three kings who, of all the Persian

monarchs, distinguished themselves by the favour shown to the Jews.

The name occurs again in an earlier part of the same book, chapter iv. In verse 5 of that chapter mention is made of cfforts of the enemies of the Jews to hinder the rebuild- ing of the temple, put forth "all the days of Cyrus, king of Persia, even uutil the reign of Darius, king of Persia." Then in the two succeeding verses Ahasuerus and Arta- Xerxes are specified as kings in whose reigns representations adverse to the Jews were made at the court of Persia ; and after the detailed accounts of the second of these repre- sentations, and its success with Artaxerxes, it is said (ver. 24), "Then ceased the work of the house of God which is at Jerusalem. So it ceased unto the second year of Darius, king of Persia." The narrative has all the appear- ance of consecutive history, and the natural interpretation

obviously is that the two kings, Ahasuerus and Artaxerxes, intervened between Cyrus and Darius. It is true, mention is made in the memorial presented to king Artaxerxes of the building of the city and the walls, rather than of the temple, the rebuilding of which was at the time the great enterprise of the returned exiles ; but this may be easily accounted for, from the interest of the writers to make out the strongest possible case at the Persian court. Besides, it is impossible to believe that the city and its walls remained utterly desolate as the Chaldeans had left them while the temple was being rebuilt. There is, indeed, express testi- mony to the contrary. Notice is taken of the“ ceiled houses” of Jerusalem at this period (Haggai i. 4). Mention is also made of a “wall” of defence for its inhabitants (Ezra ix. 9), and Josephus (Ant. Jud., xi. 4, 4) records the “strong walls about the city” while the temple was still unfinished. It has indeed been argued, and that quite reasonably, that the wall mentioned in Nehemiah i. 3, which was reported to Nehemiah as “ broken down,” is that to which reference is made in the passages just cited from Ezra and Josephus, built by the first colony of returned Jews, and not that destroyed by the Chaldeans nearly a century and a half before (see Kitto's Cyclopedia, article “ Ahasuerus”). There seems, therefore, to be nothing in the narrative to hinder the two kings to whom it relates, and whom it places between Cyrus and Darius, from being identified with the two kings who did actually intervene between these monarchs, viz., Cambyses and the pseudo-Smerdis ; and this is the view which is taken of the matter by the great majority of interpreters. The difference in the names, however, presents a difficulty which to not a few has appeared insuperable, and from which escape has been sought in various ways. Some, as Scaliger, Hottinger, Mill, believing that Ahasuerus and Artaxerxes in Ezra iv. 6, 7,mean Xerxes and Artaxerxes Longimanus, suppose also that Darius in chapters iv. 24, vi.1, &c., means the successor of the latter, viz., Darius Nothus. But the identification of the Darius with the well-known Darius Hystaspes is sustained by so overwhelming evidence (see Darius), that this opinion may be at once and without hesitation rejected. Others, as Howes (see Pictorial Bible on Ezra iv.), Biley (Jour. Sac. Literature, July 1866), and many Germans,—as Kleinert, Schultz, Hengstenberg, Au- berlen, Vaihinger, Bertheau, Keil, &c.,—believe that the paragraph, Ezra iv. 6-23, forms an intcrpolation or episode, in which the chronicler has summed up the attempts of the adversaries of Judah to hinder the building of the temple, as well as what they did for the

obstructing of the building of the city under Xerxes and Artaxerxcs, in order to bring together in a compendious way al] their machinations against the Jews (see Keil, ad loc.) It is impossible, however, to reconcile this view satisfactorily with the language of the narrative, especially of ver. 24, the plain meaning of which is that the interruption in the work of the house of God caused by the decree of the king named ae con-

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tinued until, and hence was previous to, the second year of king Darius. Some German expositors, indeed, as Herzfeld (Gesch. d. Volkes Isr. i. 303), Merx, Schrader, &c., admit the irreconcilability, and, believing that the two kings in question were Xerxes and his son, maintain that the compiler of the book of Ezra was guilty of a mistake in referring the documents cited to the period preceding, instead of to the period subsequent to, the reign of Darius. But, apart from all questions about inspiration, this must be condemned as an illegitimate procedure. Our only original witness to the events connected with the return of the Jewish exiles is the book of Ezra, and it is not permis- sible to alter its testimony, or to set it aside as erroneous, because it presents some appearances of discrepancy with what is otherwise ascertained. It is to be added that the Apocryphal 1st Esdras, in the version which it gives of the same events, refers them and the king Artaxerxes to the period intervening between Cyrus and Darius (Esdras i. 16-30, v. 72, 73), and that Josephus also in so far agrees that he assigns the events to the same period, though making no mention of Artaxerxes, and naming Cambyses as the king by whom the work at Jerusalem was hindered (Ant. Jud., xi. 2).

Retaining, therefore, the more common view, and iden- tifying the Ahasuerus and Artaxerxes of Ezra iv. with Cam- byses and the pseudo-Smerdis, it remains to be considered if the difference in the names presents any insuperable, or even any serious, objection. Confining the discussion to the subject of the present article (for the other name see AHASUERUS), it has been already abundantly evinced that Artaxerxes is a regal name, and was assumed by all who are certainly known to have borne it, in addition to their private and personal designation, on their accession to the regal

power. There is no difficulty in supposing that the Magian Gomates, when, in the absence of Cambyses on his Egyptian expedition, he personated Bardiya or Smerdis, the younger son of Cyrus, and usurped the throne, assumed algo, like the later usurper Bessus, this as his official name, under which, of course, the public decrees of his administration would be couched, and which would naturally be most current among those who, like the Jews, belonged to the foreign subjects of the Persian monarchy (¢. Tyrwhitt, Zsther and Ahasuerus, p. 333). Nor are we desti- tute of express though somewhat obscure testimony to the fact. 'Two other names are found applied in the classical writers to the pseudo-Smerdis. He is called Tanyoxares by Xenophon (Cyrop., viii. 7) and by Ctesias (Pers., 8-13), and Oropastes by Justin (i. 9). The latter, as Ewald (Gesch. Israels, iv. p. 118) suggests, may well be supposed to be a corruption derived from Ortosastes, which is an exact repro- duction of the Hebrew form of the name Artaxerxes (cf. the rendering 'Ap$acac6d in the LXX., Ezra iv. 7, &c.) In regard to this identification two additional and final remarks are to be made. On the one hand, it is unreasonable to allege, as Keil and others do, by way of objection, that the reign of thepseudo-Smerdis wastoo short (only seven months) to allow of representations being made to his court, and an answer returned in reference to affairs at Jerusalem. It is to be taken into account that the enemies of the Jews had begun their machinations in the time of his predecessor, and their agents were doubtless present in the Persian capital when the new king ascended the throne, ready to avail themselves of the new opportunity. On the other hand, all that is known of the policy of the usurper is in excellent harmony with the part ascribed to him by the sacred writer. Belonging to the Magian tribe, and ruling, probably, in the interest of Median as opposed to Persian supremacy, he naturally set himself to subvert the policy of Cyrus; and we have express and indisputable testimony, in the elaborate inscription at Behistun engraved by the authority of his

successor Darius, that his procedure, especially in regard to religious interests, was of the nature of a revolution, which the son of Hystaspes glories in having arrested and reversed (cf. Rawlinson's Anc. Monarchies, iv. p. 397).

In the Sassanian dynasty there are three royal personages

bearing the name now in question :—(1.) The founder of the dynasty is called Artaxerxes, or Ardeshir, surnamed Babegan, from the name of his father Babek. He was probably tribu- tary king of Persia under the Parthian rule, and he revolted against Artabanus, king of Parthia, about 220 a.p. Arta- banus was defeated and slain in a great battle in the plain

of Hormuz, and Artaxerxes succeeded in establishing the ascendency of Persia, and his own position as independent sovereign in 226 a.p. (see Malcolm, op. cit. i. p. 89 ; Raw- linson, Stath Oriental Monarchy, p. 365, f.) (2.) Another Artaxerxes, belonging to the dynasty of the Sassanides, reigned for four years, 381-385 A.D. ; and (3.) immediately before the Mahometan conquest, an infant prince was raised to the throne by the same name, and nominally occupied it for five months, 629 a.p. For further details regarding these monarchs see PERSIA. (w. TU.)

ARTEDI, Perer, an eminent naturalist, was born in the province of Angermania, in Sweden, on the 22d February 1705. His parents were poor, but found means to give him a liberal education, and with this view sent him to the college of Hernosand. Intending to become a clergyman, he went, in 1724, to study theology at Upsal ; but he turned his attention to medicine from the strong bent of his mind for the study of natural history, in which science he made rapid progress, and soon rose to considerable eminence, particularly in the department of ichthyology, the classifi- cation of which he remodelled upon philosophical principles. This arrangement afterwards became popular over Europe. In 1728 his celebrated countryman Linneus arrived in Upsal, and a lasting friendship was formed between the two. In 1732 both left Upsal, Artedi for England, and Linneus for Lapland; but before parting, they reciprocally bequeathed to each other their manuscripts and books in the event of death. In 1735, however, they met again at Ley- den, where Artedi was introduced to Seba, and was employed in preparing for the press the third volume of that eminent naturalist's Thesaurus, which chiefly related to fishes. He intended, as soon as that work was finished, to return to his native country, and publish the results of his own labours; but as he was returning home from Seba's house on the evening of the 27th September 1735, the night being dark, he fell into the

canal and was drowned. According to agreement, his manuscripts came into the hands of Linnaeus, and his Bibliotheca Ichthyologica and Philosophia Tchthyologica, together with a life of the author, were published at Leyden in the year 1738.

ARTEMIDORUS, a native of Ephesus, flourished during the reign of Marcus Aurelius. He called himself The Daldian, from Daldia, or Daldis, a small town in Lydia, the birth-place of his mother, in order to distinguish himself from Artemidorus, the geographer, who was likewise a native of Ephesus. The work by which he is known, 'Overpoxpiruxd, the Interpretation of Dreams, is said to have been written by command of Apollo Mystes, who had granted to the author the power of divination. The treatise, which contains some valuable notices on ancient customs and modes of thought, is divided into five books: the first and second, addressed to Cassius Maximus, treat generally of divination by dreams; the third and fourth, addressed to his son, discuss some minor parts of the theory; and the fifth consists of a collection of prophetic dreams which had been realised. Artemidorus boasts of the trouble expended on this work; he read all the authors on the subject, travelled widely, and corresponded. or conversed with all who had made dreams their study. He is also

said to have written on Auguries and Chiromancy, but these treatises are not extant. The best editions of his work are those of Reiff, with notes, 2 vols. Leip. 1805, and of Hercher, Leip. 1864. There are several English translations of it. ARTEMIS [Diana], in Greek Mythology, twin sister of Apollo, but born a day before him, as it was said at Athens for the sike of explaining the fact of the 6th of each month being sacred to her, while the 7th was his day. It might seem, too, that-their mother, Leto, had borne them in two different places, since the birth-place of Apollo was Delos, while that of his sister is called Ortygia. But the word Ortygia, meaning strictly, a "'haunt of swallows," applies still to Delos, and may well have been a synonym for that island. In this, its original sense, it does not apply either to the island of Ortygia at Syracuse, or to the spot so named near Ephesus, which were the two principal competitors for the honour of having been the birth-place of the goddess. Besides, she slew Orion in Ortygia, and that

incident is connected with the mythology of Delos. Consistently with her relation to Apollo, she was conceived as sharing his aspect and attributes, her occupations and even her beauty tending rather to what would be appropriate for males. Both were endowed with perpetual youth, and this, if it did not originally help to suggest the idea of their being twins, is consistent with a universal feeling as regards that relationship. Like him she is armed with bow and arrows, which, jointly with him, she used against offending mortals as in the case of the Niobides, or of Laodamia, and the wife of Eétion (Zliad, vi. 205, 428), she slaying women—he, men. At other times, with no sign of anger, her arrows brought soft death, such as Penelope desired (Odyssey, xviii. 201, xx. 62, 80), But, unlike Apollo's, the bow in her hands was chiefly employed, as a borrowed weapon might be, for the amusement of the chase. And here a broad line must be drawn between two sides of her character. On the one hand she is a sister of Apollo, and shares several of his functions, even taking part on occasion in his favourite music and dance. But in this respect her actions seem sometimes forced, as if grafted upon her in comparatively later times, as indeed seems also her name =dprepjs, "spotless," as applied to a virgin. On the other hand she had what appears to be a more primitive name, Oupis or Opis, and a wide variety of functions, which are not only obviously suggested by the real and supposed influence of the moon on nature, but_also approximate often closely enough to the functions of Apollo to have led to the iden- tification of the two deities as brother and sister. The name Opis is taken to refer to the light of the moon. With that luminary she was distinctly associated, but not as guiding its movement,—a task which devolved on Selene (Luna), just as the course of the sun was directed by Helios, not by Apollo. To regard the goddess of the moon as sister of the god of the sun was natural, but it was an observation of a secondary kind, and founded only on the appearance and movement of those orbs, Primitive observations would refer to the sensations immediately awakened by the moonlight. In general terms Artemis, the moon goddess, was styled dwoddpos or ceAacrddpos, and carried, besides bow and arrows, a torch, here only with the idea of spreading light, and not as when, under the name of hegemone, she carried a torch to light the way for travellers, as in the typical instance of Demeter searching for Persephone. At Athens she had an annual festival, Muny- chia, on the 16th of April, for which cakes were made in the form of a full moon stuck over

with lights. But, in particular, the spread of vegetation from the dew under a peaceful moonlight was ascribed to her influence. Her presence was felt near springs, streams, bays, on the sea, and in marshy places, whence she bore the titles of rorapia, Auvaia, Npvaris. In lifting the veil of night she revealed

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to the imagination the world of wild animals, among which she was an intrepid and unwearied huntress, and over which she exercised the care of a goddess. Her favourite animal was the deer, whence she obtained in Olympia and Elis the title of éAadia or éAadiaia. Because Agamemnon had killed a deer sacred to her she detained the Greek fleet in Aulis, and required the sacrifice of his daughter Iphi- genia. But while deer, goats, rams, and wild animals were generally regarded as dependent on her control, certain animals were specially associated with her in particular districts of Greece, as was the wild boar in AXtolia and elsewhere, and the bear in Arcadia, and in her worship as Artemis Brauronia, and Munychia at Athens. When a wild boar appeared ravaging a district, as did the Caly- donian boar, it was sent by Artemis in anger. The boar, however, was not an instrument of her moods, but rather, it would seem, a symbol of the awakening every spring of the hunting season after the sleep of winter. " Bears" (dpxrot) was the name sometimes applied at Athens to young girls who there, as throughout the rest of Greece, were under her special protection, in token of which it was usual for them to dedicate to her a lock of hair, a trinket, or some plaything. Boys also were under her care. With the symbol of a bear she was worshipped among the Arcadi- ans, or " bear people," who claimed her as the primeval mother of their race, till, through the increasing prominence of her virginal character, that honour devolved upon Callisto, whose name is an obvious variation of xaddiory, the title of Artemis, and her transformation into a bear an inven- tion for the purpose. Arcadia was her chief hunting- ground, and more numerous were her sanctuaries there than elsewhere in Greece. As Artemis agrotera, a title under which she was worshipped in Attica, she was con- ceived not only as goddess of the chase, but also as in some way providing the wild impetus with which men rush into battle. Hence the 500 goats annually sacrificed at Athens, to commemorate the battle of Marathon, were sacrificed to her. It

was customary with the Spartans to sacrifice a goat before closing with an enemy (Xenophon, Ledlen., iv. 2, 20). Possibly, also, the curious dance with which the maidens of Caryae (Caryatides), in the valley of the Eurotas, celebrated her festival had reference to her part in war. Her care over children was recognised in Laconia and Messenia under the name of xopvOadia, to whose temple, by the stream Tiasa, nurses brought their charges at the festival of the Tithenidia, 2.¢., festival of nurses. As Aoxfa or Aoxefa she divided the worship of Ilithyia by her helping presence at childbirth. With marriage her care almost ceased, and hence it has been supposed that the dresses which women dedicated to her were such as they had worn as virgins, and were intended to express piety for her past protection. In reference to this, appar- ently, she was styled xurdvn or yerwvia. Youth, innocence, modesty,and a good name were thought to find high favour with her, and as an illustration of this was often told, in works of art andin the tragedies of Sophocles and Euripides, the story of Hippolytus. Her own purity was unsullied (éyv4, Aischylus, Agamem., 135 ; aitv adpyro, Sophocles, Electr., 1239). Actson, the huntsman, she caused to be devoured by his own hounds, because he had seen her bath- ing. She slew Orion because of his pressing advances to Aurora. She transformed Daphne into a laurel to preserve her from pursuit. Meadows in their spring verdure and flowers, fields with the seeds springing, and the gay seasons of rural life, gave occasion for thoughts of her overseeing care, She was hailed by rustic choruses, all manner of rejoicings, and, in particular, on a hill atthe back of Mount Taygetus with songs known as xadafoidia. In Arcadia she was called hymnia. At the mouth of the Alpheus she was worshipped as 'AAgewwria or AAgeiovga, the com-

mon belief being enlivened with the story of how she defeated the god of that river in his passion for her nymph Arethusa, by leading the spring Arethusa underground away to the island of Ortygia at Syracuse.

So far the various phases of her character are such as were more or less generally accepted in the times of literature and art. But there had also survived certain peculiarities in her worship from apparently very early times, though the fact of their being found only in certain localities ren-

ders it impossible to know whether they had been originally only local peculiarities or universally admitted. Of this kind was the Tauric Artemis, peculiar at first to the Crimea and the shores of the Black Sea. From the Crimea, Orestes, it was said, brought the ancient image of the god- dess to Sparta, and with it her worship, the chief character- istic of which was the sacrifice of human beings which it required. At Sparta these sacrifices were afterwards com- muted by Lycurgus for the ceremony of flogging youths at her altar, but not till this barbarous phase of her worship had spread to several places in Greece, Asia Minor, and Italy. Her title at Sparta was Orthia or Orthosia. Again, originally peculiar to Crete was Artemis Britomartis, or Dictynna, the latter name being interpreted by the legend that Minos had loved and pursued her till she leapt into the sea, and was saved by being caught in a fisherman's net. In this character she was chiefly the goddess of seafarers, and as such was widely worshipped on the islands and coasts of the Mediterranean. But nowhere was the wor- ship of Artemis so non-Hellenic in character as among the Greeks at Ephesus. It would seem as if the Greek colonists there had found among the native Carians and Leleges a form of the moon goddess, which, though widely different from their own, had the advantage of an image that had fallen from heaven (diopetes), and an established hold on the people with whom the colonists had to deal. Like theirs she was a goddess with power over wild animals, and iden- tified with their productivity, as appears from her being represented with many breasts,—a characteristic of animals, and not necessarily to be understood as expressing her interest in maternity in the usual sense, which would have been strongly opposed to the Greek feeling towards their virgin goddess. Her worship was surrounded by hierodule and eunuchs. She was the goddess of the warlike Amazons, – whose fondness of the chase presented another point of contact between the Asiatic and the Greek goddess. But however much of the Greek element may in time have become grafted upon her, Diana of Ephesus was only in rare instances accepted by the Greeks outside of Asia Minor. The wealth and splendour of the temple made Ephesus a powerful attraction for devotees in the neighbourhood. A figure of her similar to that at Ephesus existed near Magnesia on the Meander, where from the name of the spot she was called Aevxodpunvy.

The usual figure of the Ephesian Artemis, as preserved in works of art, is in the form of a female with many breasts, from the waist to the feet resembling a pillar, nar- rowing downwards, and sculptured all round with rows of animals. In archaic works, as on the chest of Cypselus of Corinth, she appeared winged, and holding a lion with each hand. As to the original image, believed to have fallen from heaven, it is not impossible that it had been made te take the place of a meteorite. But the Greek Artemis was usually represented as a huntress with bow and quiver, in face very like Apollo, her drapery flowing to her feet, or, more frequently, girt high for speed. She is accompanied often by adeer ora dog, Perhaps the finest existing statue of her is the Diana of Versailles On the coins of Arcadia, A'tolia, Crete, and Sicily, are to be seen varied and beautiful repre- sentations of her head as conceived by the Greek artists in the best times. (a. 8. M.)

ARTEMISIA, daughter of Lygdamis, succeeded her hus- band in the kingdom of Halicarnassus, which was a depend- ency of the Persian empire. She took part in person in the expedition of Xerxes against the Greeks, and fitted out five ships, with which she distinguished herself in the sea- fight near Salamis, 480 B.c. When closely pursued by the Athenians she escaped by the stratagem of attacking one of the Persian vessels, whereupon the Athenians con- cluded that she was an ally, and gave up the pursuit. By her advice Xerxes did not attempt another battle, but at once retired from Greece. A story of her, in all pro- bability entirely without foundation, is preserved by Photius. She is said to have loved a young man named Dardanus, of Abydos, and, enraged at his neglect of her, to have put out his eyes while he was asleep. The gods, as a punish- ment for this, ordered her, by an oracle, to take the famous but rather mythical lover's leap from the Leucadian pro- montory.

ARTEMISIA, the sister and wife of Mausolus, king of Caria, in'mortalised herself by the honours which she paid to the memory of her husband. She built for him, in Hali- carnassus, a very magnificent tomb, called the Afausoleum, which was one of the seven wonders of the world, and from which the name of Mausoleum was afterwards given to all tombs remarkable for their grandeur ; but she died of regret and sorrow before it was finished. She appointed pane- gyrics to be made in honour of him, and

proposed prizes of great value for the best oratorical and tragic composi- tions. She also erected a monument, or trophy, in Rhodes to commemorate her conquest of that island. When the Rhodians regained their freedom they built round this trophy so as to render it inaccessible, whence it was known as the dBarov. She died about 350 B.c.

ARTESIAN WELLS, the name applied to water-springs rising above the surface of the ground by natural hydro- static pressure, on boring a small hole down through a series of strata to a water-carrying bed enclosed between two im- pervious layers. In Europe this mode of well-boring was first practised in the French province of Artois, whence the name Artesian is derived. At Aire, in that province, there is a well from which the water has continned steadily to flow to a height of 11 feet above the ground for more than a century ; and there is, within the old Carthusian con-

vent at Lillers, another which dates from the 12th cen- |

tury, and which still flows. But unmistakable traces of much more ancient bored springs appear in Lombardy, in Asia Minor, in Persia, in China, in Egypt, in Algeria, and even in the great desert of Sahara.

In ordinary wells the water does not rise, but remains at the bottom of the trough dug for it in the soil, and to raise it we must use special apparatus or pumps. In Artesian wells, on the other hand, the water rises from a consider- able depth to the surface of the ground, and usually spouts up to a greater or less height above it. The theoretical explanation of the phenomenon is easily understood.

The secondary and tertiary geological formations, such as those underneath London and Paris, often present the appearance of immense basins, the boundary or rim of the basin having been formed by an upheaval of the subjacent strata. In these formations it often happens that a porous stratum, consisting of sand, sandstone, chalk, or other calcareous matter, is included between two impermeable layers of clay, so as to form a flat porous U tube, con- tinuous from side to side of the valley, the outcrop on the surrounding hills forming the mouth of the tube. The rain filtering down through the porous layer to the bottom of the basin forms there a subterranean pool, which with the liquid or semi-liquid column pressing

upon it constitutes a sort of huge natural hydrostatic bellows. Sometimes the pressure on the superincumbent crust is so great as to

cause an upheaval or disturbance of the valley, and there can be little doubt that many earthquakes, that are mani- festly not of volcanic origin, are due to this simple cause.

it is obvious, then, that when a hole is bored down.

through the upper impermeable layer to the surface of the lake, the water will be forced up by the natural law of water seeking its level, to a height above the surface of the valley greater or less according to the elevation of the level in the feeding column, thus forming a natural fountain on precisely the same principle as that of most artificial foun- tains, where the water supply comes from a considerable height above the jet.

In the Tertiary formations, the porous layers are not so thick as in the Secondary, and consequently the occurrence of underground lakes is not on so grand a scale; but there being a more frequent alternation of these sandy beds, we find a greater number of them, and often a series of natural fountains may be obtained in the same valley, proceeding from water-bearing strata at different depths, and rising to different heights.

It does not follow that all the essentials for an Artesian well are present, though two impermeable strata with a porous one between may crop out round a basin. There inust be, in the first place, continuity of the permeable bed for the uninterrupted passage of the water ; and there must be, on the other hand, no flaw or breach in either of the confining layers by which the water might escape. To one or other of these causes is due the failure of many attempts to find Artesian wells where from appearances they might be expected. It has occasionally happened that on deepening the bore, with the hope of increasing the flow of water, it has ceased altogether, doubtless from the lower confining layer being pierced, and the water allowed to escape by another outlet. The subterranean pool is fre- quently of small extent, and of the nature of a channel rather than of a broad sheet of water ; and the existence of one spring is no guarantee that another will be found

by merely boring to the same depth in its neighbourhood. Several such failures are recorded by Arago in his notices on Artesian wells in the Annuaire du Bur. des Long. (1835, &c.), and referred by him to the circulation of the subterranean waters in irregular trenches between impermeable masses. The preliminary theoretical determination of the existence of these Artesian conditions is in itself a difficult matter, and can be arrived at only by a thorough acquaintance with the geological disposition of the dis- trict. Still more difficult, as can readily be imagined, is the practical execution of the boring of a hole of a few inches diameter to the depth of hundreds of feet. The keeping of the bore quite vertical, the ready elevation of the loosened rubbish, the prevention of the breakage of the boring rods at great depths, are some of the difficulties that beset the operation, and have tried the ingenuity of engineers.

The mechanical appliances employed in boring deep wells are not essentially different from those used in the sinking of mining shafts; and it may be remarked that the ex- pense and tediousness of Artesian boring at the beginning of this century are to be ascribed not so much to the want of stcam engines, as to the awkward mode of using the boring tool. In the old method a continuous boring bar was made use of, the steel boring tool or chisel being fixed to iron rods, which were screwed together in lengths of 10 to 15 feet. This, with a strong cross handle at the top, formed"a sort of large gimlet, and was turned by two men, the tool being raised and suddenly dropped, as required, by a third man at the end of a lever, which was connected by a rope or chain with the gimlet-head. Most of the accidents, which formerly rendered well-sinking a hazardous task, were due to breakages of the borer or boring bar by

the sudden fall which it was necessary to give the too in pecking through a hard stratum. The modern mode of boring is but an adaptation of steam power to a simple method practised for ages by the Chinese. They bore their deep wells by a steel head worked up and down by means of a cord suspended from a lever—a wooden pipe being used to guide the borer and keep the hole perfectly vertical. Free falling tools, worked by steam power, are now employed when bore-holes of large diameter have to be executed,

the weight of the tool giving sufficient percussion to pierce the hardest rock. In the enormous Artesian boring, of 54 feet diameter, begun, in 1866, at La Chapelle, in Paris, a boring tool of about 4 tons weight was employed. It was raised by steam power, and allowed to fall freely from twenty to twenty-five times a minute, a twist of th of a turn being given after each stroke. (See Lngineering, vol. viii. pp. 401, 413.) The borer is withdrawn at intervals, and the rubbish removed by means of a cylindrical augur with a valve at the bottom. Permanent pipes of cast or wrought iron must be fixed in the bore-hole to keep it open; and if the opera- tions are through clay or sand, the pipes must follow the progress of the chisel as closely as possible.

One of the most remarkable examples of the patience and skill required to surmount the difficulties of deep boring is the Artesian well at Grenelle, in the vicinity of Paris. The operation of boring extended from 1834 to 1841; aftera depth of 1254 feet had been reached (May 1837),a length of 270 feet of the boring rods suddenly broke off and fell to the bottom of the hole, and nearly fifteen months' constant labour was required to pick it up again. Discouraged by the delay, the French Government was to have abandoned the project after a depth of 1500 feet had been reached without any satisfactory result ; but the urgent representa- tions of Arago prevailed on them to prosecute the work. And it was fortunate, for an additional depth of about 300 feet proved the correctness of Arago's theory. On the 26th February 1841, at a depth of 1798 feet, the boring rods suddenly sank a few yards. The subterranean water-bearing stratum had been reached, and within a few hours a vast column of water spouted up at the rate of 600 gallons per minute, and at a temperature of nearly 82° Fahr., furnishing a valuable source of supply for a suburb of Paris where it was greatly wanted. Prior to this no Artesian boring had reached even 1000 feet; and that of Grenelle was the deepest executed till the completion (12th August 1850) of the salt-spring at Kissingen, in Bavaria, which throws up a column of water to the height of 58 feet from a depth of 18784 feet. The most remarkable feature of this spring is that the projecting force is due, not to hydro- static pressure, but to that of carbonic acid gas generated at the junction of the gypsum with the magnesian limestone, about 1680 feet down. Modern mechanical improvements have enabled engineers to exceed these Artesian dimensions considerably, and ata greatly diminished cost. The well at Passy, near Paris, which is supplied from the same water-

bearing stratum as that of Grenelle, was bored by the Saxon engineer Kind in a very short time, having been begun on 15th September 1855, and carried to a depth of over 1700 feet by March 1857. Its total depth is now about 1923 feet, with the enormous diameter of 2 feet 4 inches at the bottom; and it throws up a continuous streain of water at the rate of 5,582,000 gallons per day to a height of 54 feet above the ground. Among other deep wells sunk in the Paris basin subsequently to those of Grenelle and Passy, the following may be mentioned. A gigantic bore, 5 feet 7 inches in diameter, was begun in January 1866 at La Chapelle, and by November 1869 had reached a depth of 1811 feet, the intention of the engineers being to extend it to a depth of 2950 feet. The mechanical processes em- ployed are detailed in pp. 401 and 413 of vol. viii. (1869)

of Engineering. A bore of 19 inches diameter was carried down to a depth of 1570 feet in about two and a half years (1864-7), for the purpose of obtaining a water supply for the sugar refinery of M. Say in Paris; and the same engineer who executed this work (M. Dru), began in 1866 an Artesian boring of the huge diameter of 6} feet at the part of Paris named Butte aua Cailles, to be carried down to a depth of 2600 to 2900 feet. (See Hngineering, vol. iii. p. 605.) Besides these monster wells, there are in the Paris basin a great many others, varying from 300 to 400 feet in depth, and from 2 to 8 inches in the diameter of the bore-hole.

The Tertiary chalk strata over which London stands have been riddled with Artesian borings for the sake of pure water supply. The source of the New River (which was opened in 1613) is one of the chalk springs, at Chadwell, near Ware; this alone yields London a twenty-fourth part of its water supply, some 44 million gallons a day, Many of the large London breweries obtain the water employed in the manufacture of their beer from Artesian wells over 300 feet deep. The Kentish Town water-works have a well 900 feet deep, which penetrates the chalk bed some 580 feet. Arte- sian wells also supply water to the Bank of England, the fountains at Trafalgar Square, the Mint, Pentonville Prison, Colney Hatch Asylum, Shoreditch Workhouse, the North Western Railway Station, Holloway Prison, &c. On the duke of Northumberland's property at Sion House there is a chalk well

which descends 620 feet, and spouts the water up about 4 feet above the surface. At Merton in Surrey, at Brighton, at Southampton, all along the east coast of Lincolnshire, and in the low district between the chalk wolds near Louth and the Wash, Artesian borings have long been known, and go by the namie of blow-wells among the people of the district. It is worthy of notice that the general level to which the water rises in the London district has been very sensibly lowered by the immense number of perforations that have been made ; and in several wells where the water formerly rose to the surface, it now stauds considerably below it, and requires to be pumped up.

None of the Artesian borings in England approach the depths frequent on the Continent and in America. The average depth of the water-bearing stratum around Paris is six times that of the London chalk beds ; and in some parts of Germany and of America, wells have been sunk to even double the depth of the Parisian wells of Grenelle and Passy. At Chicago there are two wells, one 700 feet and the other 1000 feet deep, with a diameter of 5 inches, which supply the city with 800,000 gallons of water daily. At the town of St Louis, in the State of Missouri, an Artesian boring was carried down for 3147 feet, but as only brine was obtained, it was ordered by Government to be stopped in September 1868, when the depth was approach- ing three-quarters of a mile. The deepest boring in the world is at Sperenberg, twenty miles from Berlin, having been sunk for the purpose of obtaining a supply of rock salt. A bore-hole of 16 feet diameter was carried down to the depth of 280 feet, where the salt bed began; after a further descent of 680 feet was attained, the bore was reduced to 13 inches diameter, and then continued till the extraordinary depth of 4194 feet was reached, without having pierced through the salt deposit, which has thus the enormous thickness of at least 3907 feet.

The following are some of the other most important Artesian sinkings that have been made. At Louisville, in Kentucky, a bore of 3 inches was carried to a depth of 2086 feet between April 1857 and the summer of 1858, when a supply of water almost as plentiful as that of Grenelle was obtained. At Charleston, South Carolina, there is a well 1250 feet deep, which was begun in 1848, and which discharges water some 10 feet above the surface

at the rate of 1200 gallons an hour. In 1858 a well at Neusalwerk, near Minden, had reached the depth of 2288 feet: At Bourne, Lincolnshire, there is a well 95 feet deep, which yields over half a million gallons of water per day, the pressure being sufficient to supply the town and force the water to the tops of the highest houses. There is one, on the property of the Continental Hotel, in Philadelphia, over 200 feet deep, and 8 inches in diameter, which yields 50,000 gallons a day. Two Artesian wells at Croydon supply a million gallons of water per day ; and Brighton draws over a million gallons from Artesian sinkings. There is a well at Bages, near Perpignan, which gives 330 gal- lons per minute ; and one at Tours, which jets about 6 feet above ground, and gives 237 gallons per minute.

The boring of wells in the great desert of Sahara is a very ancient industry; and some oases are supplied with water wholly from Artesian wells. The average depth of these is from 160 to 200 feet, and the upper strata have only to be pierced to give a constant stream. With their primitive methods of boring, the Arabs often labour for years before they reach the wished-for pool ; and with only palm wood as a casing, they have great difficulty in keeping the bore-hole from closing up by the drifting of the sand, and they require to scour them out periodically, Since 1858 an immense number of perforations have been made by French engineers, and the fertilising effect upon the sandy desert plains is already making itself apparent. Villages are built and palm trees are growing where for- merly there was but waste and solitude. (See Geological Magazine, vol. i. p. 31.) The importance of deep wells in such cases cannot be over-estimated.

Artesian wells have been made to supply warm water, for keeping hospitals, &c., at a constant temperature. In-

variably the temperature of water from great depths is higher

than that at the surface, this being due to some unknown source of heat in the interior of the globe. The tempera-

ture of the water in the well at Grenelle is 82° Fahr.,

and that of Passy the same, showing that they have a common source. Kissingen well has a temperature of 66° Fahr., that of St Louis one of 73°-4

Fahr., that of Louisville 764° Fahr., and that of Charleston 87° Fahr. The average rate of increase of temperature is 1° for a descent of from 40 to 55 feet. In Wiirtemberg the water of Artesian wells is employed to maintain in large manu- factories a constant temperature of 47° when it is freezing outside. Artesian waters have also been employed to reduce the extreme variations of cold in fish-ponds, which are so fatal to their finny inhabitants.

1861, by Berbrugger.

ARTEVELDE, Jacos vAN, a celebrated Flemish popu- lar leader in the 14th century, was a brewer in Ghent. His enormous wealth, great eloquence, and general talent for administration, easily made him the most prominent and powerful man on the side of the citizens in their struggle against the encroachments of Count Louis of Flanders. The people of Ghent gave him the command of their forces, and he banished from the town all the nobles and adher- ents of the count. In 1335 he made a commercial treaty with Edward IIf. of England, and with the aid of some English troops expelled Louis from Flanders. Ten years later, in 1345, after having persuaded Edward to assume the title of king of France, and induced the Flemings to

support the claim, he thought to cement the alliance by making the Black Prince count of Flanders. This proposal was badly received by a large body of the people of Ghent, who were dissatisfied with their leader's somewhat arbitrary government. A popular tumult broke out with its usual impulsiveness, and Artevelde was slain.

ARTEVELDE, Puirip van, son of the above, lived in retirement till 1381. Some years before that date enmity had again arisen between Count Louis of Flanders and the somewhat turbulent citizens of Ghent, who, under one Hyons, had expelled the count's adherents, plundered his house, and slair several of his officers. Hyons died in 1379, and in 1381 the citizens under Peter van der Bosch (Dubois), were closely blockaded by the count. In this emergency Van der Bosch proposed that the son of the great Artevelde should be invited to take the direction of affairs. Philip accepted, at once entered on public life, and by some strong measures secured his power. The

inhabitants of Bruges had at this time allied themselves with the count, and Artevelde resolved to punish them. He led out his forces quietly, and utterly defeated the army of the count, who escaped with difficulty. Bruges was plundered, and submitted to Artevelde. Next year the French, taking up the cause of Louis, invaded Flanders, and at Rosbecque completely routed the forces of Ghent. Many thousands were slain, and among them Artevelde himself. The brief but stirring life of this popular leader is admirably treated in Sir Henry Taylor's drama, Philip van Artevelde.

ARTHROPODA. The Aristotelian distinction of Mala- costraca, or Crustaceans, and Hntoma, or Insects, has been referred to by Agassiz as in reality more precise than Linnzeus's last classification (1766), in which his Crustaceans form part of the Apterous group of insects. But whereas the Greek naturalist recognised the notchings which indi- cate annuli, somites, or body-rings, in Coleoptera and the other groups to which the class-name Insect is now re- stricted, and in Worms, under which he comprehended insect larva, several true Annelids, and intestinal worms (Scolecida), he failed to appreciate this as a feature common to the Malacostraca or Scleroderma, which he named on account of the character of their integument. Linnezus, on the other hand, saw that annulation was the most pro- minent common feature, and his Jnsecta, therefore, were a good natural group so long as embryology could throw no light on the affinities of the Cirripeds and parasitic Crusta- ceans—these two groups forming, together with the intes- tinal worms, molluscs, zoophytes, and lithophytes, the class Vermes. Cuvier (1829) includes in the third branch of his scheme, Animalia articulata, Annelids, Crustaceans, Arach- nids, and Insects (the Myriapods being an order of this class). Latreille (1796) proposed a scheme in which the orders of the Insects (as now restricted) formed equivalent groups with the Crustaceans, Arachnids, and Myriapods, which now first appear as a distinct group, though still united with a section of the Crustaceans. Liatreille further, in 1801, recognised the Cirripeds as intermediate between his nsecta and the Molluscs. Lamarck gave the value of classes to the Insects, the Arachnids (including therein the Thysanura and Myriapoda), the Crustaceans, and the Cirripeds. But he has no province answering to the Cuvierian Articulata, since these orders are, with Annelids, Conchifers (=Lamellibranchs), and Molluses (= Odonto- phora), members of the 'sensitive animals," the Lerneans and other parasitic

Crustaceans being an order of the Vermes, and therefore apathetic animals. De Blainville, still rclying chiefly on external form, recognises four types in the sub-kingdom of the bilateral animals :—(Artiomorpha or Artiozoaria), of which the first is Osteozoaria (Vertebrates). The second, Hntomozoaria (Articulates), includes: Class 1.

Hexapopa, Insecta proprie sic dicta ; 2. Octoropa, Arach- nida; 3. DEcaropa, Crustacea decapoda ond Limulus; 4. HeteERopopa, Squilla, Entomostraca, Epizoa; 5. TETRADEC- APoDA, Amphipoda and Isopoda; 6. Myriapopa; 7. CH&TO- Popa, Annelides; 8. Apopa, Hirudo, Cestoidea, Ascaris. The third type, Aalentozoaria, is intermediate between the Articulates and Molluscs, and embraces two classes: Nemato- poda, Cirripeds; and Polyplaxiphora, the Chitons. The classification of which this forms a part is a compromise between the method of Cuvier, based on the recognition of distinct plans, and that of Ehrenberg, who sketched each group as departing from the common plan of the animal kingdom only by excess of development in one or other direction. The Articulata, viz., Insecta, Arachnoidea, Crustacea (the Cirripeds and Epizoa being included), Annu- lata, and Somatotoma (the two latter making up all that are now known as Annelids), he distinguished from Molluscs – by the isolation of their ganglia and their succession, those of the Molluscs being dispersed. Oweun's Homogangliata, as equivalent to Articulata, is the expression of the same difference ; his Znsecta embrace two sub-orders, Myriapoda and Hexapoda, and the Annellata are placed between the Epizoa and Cirripeds. Milne-Edwards (1855) divides the Entomozoaria or Annellata into two groups,—(1.) Arthropoda, including Insects, Myriapods, Arachnids, and Crustaceans ; and (2.) Vermes, including Annelids, Hel- minths, Turbellarians, Cestodes, and Rotifers. Siebold and Stannius (1845) made the Arthropods a primary division co-ordinate with Vermes, and united the Myriapods with the Crustaceans. Leuckart's Arthropoda comprise two classes,—Crustacea and Insecta ; the latter combining the orders, Myriapoda, Arachnida, and Hexapoda. Fitzinger's Arthrozoa, or eminently motor animals, Crustaceans, Arach- noids, and Insects, contrast with the Dermatozoa or Mol- luses, which are eminently sensitive. Von Baer's Articulata correspond to the Cuvierian group under the same

designa- tion, and like it represent a type of organisation, the longitudinal or bilaterally symmetrical, the organs being arranged with reference to the axial alimentary canal. The embryological system of Van Beneden (1855) rests upon the position of the vitellus relatively to the surface of the embryo, the Articulates being designated by him Epicotyle- dones or Epivitellians, the vitellus being received into the embryo on the dorsal or upper surface, while the vertebrates receive the yelk on the ventral or lower surface, and are therefore Hypocotyledones or Hypovitellians. As will be pointed out afterwards, this nomenclature is unfortunate, since the surfaces thus contrasted are identical, both being the heemal aspects of the body. It may further be remarked that the term Articulata is manifestly one which should be abandoned, since it is made to represent very different things, being used by Cuvier, Ehrenberg, and Owen to include the Annelids,—by Van Beneden, Vogt, and some more recent writers, to their exclusion. Neither is Arthrozoa, the Greek equivalent of Articulata, more commendable, Burmeister and Fitzinger using it with the same difference. But Arthropoda has varied only in the rank assigned to it, not in the area it represents; thus Milne-Edwards makes it a sub-division of the Annellata ; Van Beneden, Siebold and Stannius, and Leuckart, a primary division of the animal kingdom. But as a general designation for those animals which are made up of nearly equivalent somatomes or somites is needed, Macleay's term Annulosa is, perhaps, the best, since it has never been used for two incommen- surate groups. Leach, and later (1825) Latreille, proposed Condylopoda as the name of the group for which Arthropoda was afterwards devised. Custom has overborne the rule of priority, and the later is now the more common name. The classifications hitherto mentioned rest solely on an anatomical basis, those of Von Baer and Van Beneden deal-

ing only with the observed facts of development. Haeckel, applying all that was known of embryology to the con- struction of the pedigree of the groups, made (1866) the Articulata one of the five great trunks of the genealogical tree. The Articulate phylum embraced the Infusoria and intestinal worms, as well as the Annelids, along with the Arthropoda as restricted above. The Arthropoda further formed two groups :—Carvdes, the branchiate Arthropods or Crustaceans; and 7'racheata, the Arachnids,

Myriapods, and Insects, which breathe by trachee. The term Articulate disappears from Haeckel's latest classification, in which a redistribution of the phyla is set forth. From assumed ancestors destitute of body-cavity (Acalomi) descend those Vermes with body-cavity, of whose plan Lchinodermata, Ar- thropoda, Mollusca, and Vertebrata show special modifica- tions. In 1870 Gegenbaur gave a general table, in which the Vermes included Tunicata and Annulata. The former led towards the Mollusca; the latter was the starting point of Arthropoda, Vertebrata, and Echinodermata; of the Arthro-

ods there are four classes,~-Crustaceans, Arachnids, Myriapods, and Insects. Amidst all the varying opinions as to the value of the group, the importance of the limb- structure has been recognised since Latreille dwelt upon the articulations by which the parts of these appendages are connected.

The Arthropoda agree in the characteristic already mentioned, the articulations of their limbs, whence the classname is derived. 'The body presents various degrees of complexity. In the caterpillar, the metamera, somites, somatomes, or annult, owe their mobility to differences in thickness of the integument. In the Myriapods the numerous similar somites are flexed on each other by the overlap of the chitin-thickened portions of cuticle which protect the upper and lower surface of each division. The somites are more or less effaced in the abdomen of insects and spiders ; head and thorax in crabs and spiders have their composite origin concealed. But the external signs of division of the body no longer correspond, as in Annelids, to the distribution of the internal organs, which, with a partial exception in the case of the nervous system, are now unities contributing to the well-being of the whole. Homonomy, the absence of segmentation, or the equiva- lence of the divisions of the body, among the Annelids, has been contrasted with the heteronomy, or segmentation of the arthropod body. The difference, however, is only one of degree, since both the cephalic and caudal extremities, at least of the higher Annelids, are true segments, 1.6.; fused somites which, in addition to fusion, have undergone some amount of specialisation. In the four classes of Arthro- pods the head isa constant segment. It consists of pree-oral and post-oral somites, the ganglia of which are represented by the supra- and sub-cesophageal masses. The number of

somites, as represented by appendages, is not the same in the four classes, and as the variation affects the pre-oral appendages supplied from the supra-cesophageal ganglion the difference is of great importance. In the Crustaceans the somites of this segment are, according to Huxley,— App.— Eyes, Antenne, Antennules, Mandibles, Maxille, Maxille. Som.— 1. 2. 3. 4, 5. 6.

The Podophthalmata present the eyes as modifications of processes identical with those which become ambulatory limbs. In the rest the eyes are sessile. In Myriapods, Arachnids, and Insects, the eyes are sessile, and the pre- oral appendages are reduced to one pair of antenne, whose innervation is from the supra-cesophageal ganglion. Apart from the value to be assigned to descent in the search for homologies among these classes, it is a question of fact whether the eyes are pre-oral or lateral to the oral aperture. The cephalic lobes carry the organs of sight probably in the earliest types of development at the angle of bifurcation,

the position of the single eye of Ostracods. In more co mplex forms the eyes appear more or less towards the outer margin of the lobes; and in insects where the ecphalic arch is high, these organs may appear to correspond not to the most anterior, but to a posterior part of the cephalic sterna, just as sensory organs appear, the gustatory at the base of the outer, the auditory at the base of the inner antennz in the higher Crustaceans. By shortening of the development process the change of position may be obscured, and the eyes, primitively belonging to the extremity of the embryonal body, may from the first appear connected with nore poste- rior somites. The identification of homologous parts of the pre-oral region in the four classes rests on the opinion held as to the origin of the classes. If the Crustaceans are regarded as the stock of the Arthropods, the homologies must be recognisable. If, on the other hand, all four are divergencies from a common stock, then the absolute identity of the parts must hold a second place in comparison with a general conformity to the common plan. The identi- fication of the eyes with a particular pair of appendages necessitates the assumption that these sense organs, when sessile, are so by non-development of their supports. The converse supposition is more admissible, that the eyes are supported on stalks as the result of an adaptive modification. Further, among the Crustaceans we find hints of the primitive

composite character of the Arthropod. The auditory sacs of Mysis are at the caudal extremity of the body, the respiratory organs of Isopods are in the same position, and the genital orifices vary in different genera, and even in the sexes of the same species. Analogous (perhaps no more) is the distribution among Molluses of the eye-spots which fringe the mantle of Pecten, are pedun- culate in the snail, and, with the otolithic sacs, are in close proximity to the nerve centres of cuttlefishes. If this view is accepted, the close comparison of the limbs of Arthropods loses much of its importance, and it becomes more interesting to endeavour to trace the primitive form from which the divergences have occurred. Among Crustaceans the Nau- plius is the earliest recognisable form,—'an unsegmented ovate body, a median frontal eye, and three pairs of natatory feet, of which the anterior are simple, and the other two biramose" (F. Miiller). The third pair of appendages is replaced by the mandibles, the oval body is divided by a transverse fold, and the Nauplius head and tail thus marked off have the mid-body of the adult developed by intercalation between them. Appendages are developed before segmentation is indicated in the free living Nauplius ; but in some this stage is overpassed in the egg, the evidence of its existence being the presence of a thin exuviated membrane which is not egg membrane, nor can it be termed amnion, without overstraining that term which is properly used in the higher vertebrate embryology. In Insects the vermiform stage is rapidly passed through, the priority of segmentation to the development of appendages being indi- cated in the 7richoptera, according to Zaddach, and in Aphis, according to Huxley. If we go to the Rotifers, there are in that group types which are comparable with the Nauplius of Crustaceans, and with the vermiform larve of Insects, as O. Schmidt and Lubbock (Origin and Metamorphoses of Insects) have shown. Pedalion mira (Hudson) has a very close resemblance to the Nauplius, Zindia to the vermiform grub of Dipterous insects. The resemblance is not impaired by the comparison suggested by Ray Lankester between the Molluscs and Rotifers. Huxley calls the Molluses "little more than oligomerous modifications of the polychzetous Annelids" (Nature, December 10, 1874); and in this article it is attempted to show what are the simplest forms pre- senting common features with the Arthropods. The hexapod Insect has been compared by Haeckel, F. Miller, and others to the Zoés of Malacostracous Crustaceans, a group in one

member only of which, Peneus, has a Nauplius stage been detected. The Zoéa and the Insect possess alike three pairs of limbs for locomotion, and three for ingestion of food. The abdomen in both is without appendages, and the mandibles are without palps. Admitting the resemblances, there is a prior question to be settled in the case of Insects, Myriapods, and Arachnids. Are the temporary embryonal investments of these animals, the cellular and the struc- tureless membranes, to be compared with the blastodermic moultings of Crustaceans, with that membrane whose pre- sence in the Amphipods is accepted by some observers, as the last trace of the Nauplius stage? In the Acarids Cla- paréde found the inner layer to invest the embryo after the outer gave way, and Metschnikoff recognises the deutovuin in Platygaster also. The identification with the Nauplius is strongly denied by the last-named observer ; but there is still room for further investigation, since embryologists of high reputation differ so entirely on the matter of fact, irrespective of phylogenetic theories. Should the identi- fication be accepted, the Arthropods would, as a group, agree in having a Nauplius stage, different in detail in each class ; the second, or Zoéa stage, would differ still more in each, and the homologies of the parts would thus become obscured in details, the identity of the general plan being clearly recognisable. All the Arthropods agree in having the terminal portion of the intestinal canal derived from the outer, the middle portion from the inner embryonic layer. Lastly, the Arthropods, in common with the Mol- luses and Annelids, have their body-cavity, or perivisceral space, formed by the splitting of the mesoblast, or derivative layer forined between the outer and inner layer (epiblast and hypoblast, and ectoderm and endoderm). In Insects, in the higher Arachnids, and Crustaceans, yelk segmen- tation is partial; in Myriapods, and the lower Arachnids, and Crustaceans, it is total ; but as in Insects, for ex- ample, the unsegmented yelk undergoes at a later period a division into polygonal masses, the difference, though of value in classification, is not of primary importance. The relation of the branchiate Arthropods, the Crustaceans, to the other three tracheate classes, has been discussed chiefly from a phylogenetic point of view. The priority of aquatic to terrestrial forms is assumed, and the derivation of the latter from the former is traced in various ways. The somites or metamera of the Arthropod retain, more than the nervous system

which is derived from the epiblast, and still more than the alimentary canal and its appendages, the annulose characteristic that each represents a unit ; each may, and many do, give rise to appendages originally similar, but afterwards modified for special functions. Hence the same limbs are tactile in Crustaceans, prehensile in Arachnids, ambulatory in some Crustaceans, accessories of mastication in others, locomotive in some, respiratory in others. In Insects the abdomen of the adult is destitute of appendages, but many larve are provided with tracheal gills, that is, external processes in which air-canals ramify, and in which a large quantity of blood is received within the cavity of the thin-walled dilatable process. These processes are destitute of external apertures, the tracheal system is in them closed. Such structures are found but rarely to co-exist with the open condition of this tracheal system. But Pteornarcys, one of the Orthopterous order, is remarkable for this conjunction, the branchial processes of the adult overhanging the stigmata of the trachee. Considerable variety exists in the position of the gills. The larvee of Perla have three thoracic pairs of gills, and are terminal of the abdomen. In other cases they are con- fined to the abdomen. Now, it is to be noted that these gill projections are not at first tracheal ; in Chloea the trachee appear after another moult, and they are then vibratile. Further, they are developed from the upper surface of the

body. Now, in the Annelids the limbs are typically double pairs projected from the sides of the body; the parapodia consist of two branches, notopodium and neuropodium, and the gills when present are modifications of the notopodium. In the Crustaceans this bipartite condition is indicated by the exopodial and endopodial divisions of the limbs. In the adult insect this duplicity has disappeared, unless we recognise in the position of the gill trachce the equi- valent of the branchiferous notopodium. Gegenbaur and Lubbock regard the wings as tracheal gills transferred from locomotive organs in water to locomotive functions in air. Gegenbaur thinks that the dropping off of the gills determines the opening of the tracheal system by the stigmata or pores. Further, he assigns to the closed tracheal system a function similar to that of the swim-bladder of fishes, structures primarily useful in flotation, subordinately respiratory in function.

Natural as may seem the assemblage included under Arthropoda, there is no group in which adaptive modifica- tions have introduced so much diversity of anatomical and physiological relations. Metamorphoses, the changes of form which changes of external conditions have promoted, are met with of very various amount. The progress of the embryo from the first appearance of the blastoderm up to sexual maturity of the adult may be direct, without metamorphosis, or may be retarded by changes of form and habit, rendering the young animal capable of sustaining life under very various conditions. In any one of these stages, even in the adult, multiplication may be provided for by a process of budding, the bud from which the new form emerges being in essence undistinguishable from the ovum for whose further development impregnation is necessary. These metamorphoses are probably of late origin in the history of the group, their perpetuation being due to change in their surroundings. Their relations may be "falsified by the struggle for existence," the details of the developmental history of the family (phylogenesis) may be crowded into a short space in the development of the individual (Ontogenesis). The description of these varia- tions belongs to the particular treatment of the Crustaceans, Myriapods, Arachnids, and Insects. (J.%.)

ARTHUR, or Arrus, a hero of the Welsh Tales, the Chronicles of Geoffrey of Monmouth, and the Romances of the Round Table. His exploits, even the most fabulous, passed with historians, before the days of historical criti- cism; subsequently a reaction led to the figure of Arthur being regarded aa nothing but a Celtic myth. The truth, so far as it is possible to arrive at it, lies between these two extremes. There was a real Arthur, one of the last Celtic chiefs in Great Britain; but there is no single trait of his real character and exploits which legends, working according to laws to be presently discussed, have not re- modelled and transfigured or disfigured; while the scarcity of documents makes it impossible to reconstruct a coherent historical picture. Thus the work of comparison between the historical and the legendary personages, such as has been performed for Charlemagne by MM. Gaston Paris and Léon Gautier, is impossible in the case of Arthur. We can only study the legend and analyse its elements.

There is an error, not so popular as it once was, which supposes that myths and legends are arbitrary creations, and does not recognise them as having

an origin in regular causcs, and therefore a rational history, before the period when they are crystallised into their final legendary form, or are merged in the current of a literature in that later and artificial stage when it disinters and refashions old materials. Before Arthur took his final French form in the Romances of the Round Table, he was a Celtic hero in the Breton, and more specifically still in the yet earlier Welsh, legends. And behind these is the original Arthur, a — we must

be coutent with such impressions as we can gather from his contemporaries, Myrdhinn and Lywar'ch.

Lywar'ch, a bard and king, born about 480, was one of the companions of the valiant chief, Urien of Reghed, in Cumberland, upon whose death he composed a pathetic lament. He survived the death of his twenty-four sons in the last struggles against the Saxon, and in his old age, banished and a cripple, he wrote from his hiding-place a mournful hymn on his own and his country's decay, in which lovers of the poetry of despair have admired this verse worthy of Job:—'See yonder leaf driven by the wind ; woe for him who has the like lot! it is old, though born within the year." But the bard-king had only despaired after a life-long struggle, and in like manner the bard- prophet Myrdhinn had long sung in praise of peace before he went mad with gricf, on the night of the battle of Arderidd, where the northern and southern Celts slaughtered each other to the profit of the Saxons. Before this fra- tricidal struggle (the beginning of the 6th century) Myrd-hinn had cherished the dream of the resurrection of an ancient chief, whom he called Lemenitz :—

"'My prophetic soul foretells it ; discord shall reign among the British tribes until the federation which shall be formed by the chief of heroes, Lemenitz, when he comes back to the world. Like the dawn he will arise from his mysterious retreat."

By this chief of heroes, destined to bring back union, the bard meant his king and friend, Aurelianus Ambrosius, and after his death Arthur, his

valiant successor, and Myrdhinn's own pupil. The battle of Arderidd came to dissipate the last of these illusions. One of the contending hosts consisted of northern Celts, bent upon imposing on all of their race yet unconquered in Great Britain the authority of Howell of Scotland, the brother of that Gildas who soon afterwards became a convert at once to Chris- tianity and to Saxon interests. The other host, that of the southern Celts, was led by Aurelianus Ambrosius, whose favourite bard was Myrdhinn. After the final destruction of the Celtic power, the destiny of Myrdhinn is to reappear in legend with the Latinised name of Merlin. Aurelianus Ambrosius aud Arthur, the two Celtic chiefs to whom the bard had been so loyal, undergo a like resurrection ; but their lives and exploits are confounded, according to the accumulative method of legend, with each other and with those of Vortigern, king of Kent. The Arthur of the legend more than realises all the prophecies of Merlin ; and these prophecies in the process of oral repetition, and in travelling further from the place and the time of their origin, themselves were altered to an ampler tenor. They underwent one great degree of change in crossing the Channel, and another and greater in passing from the soil and speech of Brittany into those of France. With the tenor of the prophecies grow the proportions of the hero. The poetic Arthur pacifies the Celts, quells the Saxons, and ends by establishing a reign of justice upon earth. It is a hard saying, but true, that the key to all this isa certain sentiment which is the mark of conquered races. The Celtic genius aftcr its defeat in arms would have revenge in songs. What happened was this. The Celtic chief, Vortigern, summoned to his help the Saxon chief Hengist. Now, let it be noted that, in the annals of the Saxon kingdom of Kent, the fourth king in succession from Hengist is the Saxon Ethelbert. Turning to the legend, it will be found that the corresponding fourth king in succession from Vortigern is the British Arthur. For in legend the treachery of Vortigern must not be allowed to bear fruit, the Celts after many a struggle must be left conquerors. The honour of giving the last blow to the Saxon invasion in Kent, West Wales, and elsewhere, is assigned in the legend to Arthur. And why to Arthur? Because of the ancient prophecies of the resur-

rection of the fabled Lemenitz, with whom later times identified him, and above all, because the whole legendary structure hinged upon the impressive portraiture of Merlin, whose historical prototype had, in fact, been the devoted follower of thc historical Arthur and Aurelianus Ambrosius. But this edifice of fable, under which the Celts strove to hide from themselves the real ruin of their race, was not built up in a day. The conquered people repeated and enlarged upon the prophecies of Merlin ; and with these grew the figure of Arthur, enriched by every noble trait which could be borrowed from the stories of the bravest chiefs, and made to accord with the prophecies. Round the main personage soon revolved other ideal types, and little .by little was founded the harmonious hicrarchy of King Arthur and his knights, such as it now remains in romance, and such as never existed in reality. The tales were then carried into France, for just as in England the Irish bards were held in higher esteem than the Welsh, in France the Breton lays were preferred to the songs of the trouveres. While this work of infiltration was going on, Geoffrey of Monmouth set down, in 1130 and 1147, the Arthurian legend in his Historia Britonum, and, emboldened by the popularity of this work, published afterwards a poem entitled Vita Merlini, which lent the authority of Latin to the tissue of fabulous successes. Robert Wace translated the chain of legends into old French, and Richard de Borron added his Saint Graal, which serves in some sort as a theological preamble to the Romances of the Round Table. At that time the poems of the Car- lovingian era had lost their hold on popular favour, as much from the unreality of their heroes,—Charlemagne @ la barbe

florie, Roland, and La violente Blancheflewr,—as because

the dominant sentiment pervading these poems, as binding faith and loyalty between vassal and lord, had ceased to find an echo in the hearts and life of the people. An attempt was made to replace the Carlovingian Cycle by another formed from the various songs taught by Breton minstrels to trouvéres and troubadours ; for Charlemagne was substituted the far more poetical type of Arthur. Languor, fatality, pleasure, were all personified in Lancelot, Tristan, Gaurin, &c., and the Romances of the Round Table took the shape in which they now remain. Never- theless, those who have traced the legend to its source, and for whom the ancient Celtic foundation is still visible, will regret in reading even the graceful paraphrases of Christian de

Troyes, or the sweet and simple poems of Marie de France, their departure from the original types.

The recent discoveries of Messrs Owen Jones and Her- sart de la Villemarqué in Welsh literature show us how much the romances lost in elevation of sentiment and depth of thought as they varied from the Celtic model. To give an example of this revarnishing and its effect in concealing the primitive foundation, we may cite Tristan, who, in the original legend, drinks the philtre to obtain by it all know- ledge, and his madness and despair that ensue are the madness and despair of one fatally gifted with universal insight ; whilst in the French romance the philtre becomes a vulgar love draught. This was only a preliminary step to the false seutiment of modern French romanticists, who have since, in their exaltation of the passions, dispensed with philtres altogether. In the same way Merlin, in the Welsh texts, is mad with grief on beholding a fratricidal war, and his madness, according to the old Celtic idea, endows him with the power of a seer and magician over all nature. In the romances his frenzy and magical power have no worthier cause than his love for Vivian.

The figure of Arthur, on the contrary, seems to gain in dignity by the migrations of the legend. In the Welsh tale of Owain and Gherain (Ivain et Erec, with Christian de Troyes), we see him, it is true, holding his court during

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Easter and Pentecost at Caerleon on the Usk, but as a little exalted monarch, a rot-bonhomme, asleep on his throne, while the chiefs of his following relate at their ease all their adventures. Here we find preserved the idea of the individual independence of all the Celtic chiefs, whose king, ouly primus inter pares, must necessarily have been as little of a sovereign as possible. After the legend has passed into France Arthur becomes a sort of rival Charlemagne, holding supreme and boundless sway, though never as a real feudal emperor (they were tired of that in France), but rather as a Marcus Aurelius,—a monarch, half philosopher, ruling chiefly by his wisdom and subtlety, and still more a judge than a general over his people. The type is one which belongs essentially to the Celtic mind, more akin to the Greek than any other, and naturally as far removed from the Roman as

from the Saxon turn of thought. Among the writers of the 17th and 18th centuries the historical existence of Arthur was, with a few rare exceptions, denied, and the Arthurian legend regarded purely as an invention of the worthy chronicler, Geoffrey of Monmouth. Pinkerton bestows a moment's notice on "the king whose exploits fill all the poetry of the Middle Ages, and whose very existence is doubtful," and then passes on. The difficulty of establishing the filiation of Arthur perplexed Milton, who says, "As to Arthur, more

renowned in songs and romances than in true stories, who

he was, and whether any such reigned in Britain, has been doubted heretofore, and may again with good reason. No less is in doubt who was his father ; and as we doubted of his parentage, so may we also of his puissance." Guin- guené settled everything by the unwarranted explanation, that English romancers had invented an Arthur out of jealousy of the French Charlemagne. English writers of Guinguené's calibre in mythical science replied, that Arthur was a French invention of Richard or Elie de Borron, or of the Anglo-Norman Mapes, basing the asser- tion on an expression found in Geoffrey of Monmouth. Ampére, deficient here in his usual penetration, throws entire discredit on the good faith of Marie de France, who speaks of having seen and handled the original Celtic MS. Fauriel, and with him the other French savans, would fain have attributed the Arthurian legend to the troubadours rather than acknowledge its Welsh origin. He asked for the tests which have since been discovered by Mr Owen Jones and commented on by M. Hersart de la Villemarqué with perhaps indiscreet zeal. Sir Walter Scott's excellent histori- cal instinct had already exhibited a part of the truth in his edition of Thomas of Ercildoune's Rhymes. We may now, therefore, venture on being more positive than Southey, and less sceptical than Mr Thomas Wright, the two modern editors of the translation which Sir Thomas Malory made in 1634 of the five Romances of the Round Table (he "compiled the booke oute of certaine bookes of Frensshe, and reduced it into Englysshe"), and we may follow almost step by step the development of the legend, and of the various Arthurs, from the British Arthur of history to the mythical Arthur of Cambrian and Breton tradition, and lastly to the French Arthur, the rival of Charle- magne.

We shall conclude by noticing the main features of the character of Arthur, and indicating their origin.

Historic Facts.—The general belief regarding Arthur has been that he was a leader of the Celtic tribes of the west of England against the Saxons. It is recorded that, about the middle of the 5th century, Kent, after suffering from famine and pestilence, was invaded by the Picts and Scots, while at the same time another struggle, longer and more keen, was taking place in West Britain against another Saxon invasion. The longer and braver resistance of the Western Celts is partly set down to the merit of their

leaders, Aurelianus Ambrosius and Arthur. The men of Kent, however, after a vain appeal to A'lius, prefect of the Gauls, were induced by Vortigern, their most important chief, not only to make peace with the Saxons, but to invoke their aid against the Pictsand Scots. Hengist was appealed to, and the looked-for Saxon alliance became the Saxon invasion and conquest of Kent, after Hengist, here- tofore a Heretogen, became a king. Whilst his immediate descendants were establishing themselves in succession to him, the contest in the plain of Arderidd took place, which occasioned Myrdhinn's frenzy. Arthur was slain in the battle called by historians the victory of Mountbadon near Bath, 520 a.p.

[The historical Arthur is now regarded by many as having been a 6th century leader, Guledig, or " Dux Bellorum " of the northern Cymry of Cunibria aud Strathclyde against the encroaching Saxons of the east coast (Bernicia), and the Picts and Scots from beyond the Forth and Clyde. For such would appear to be the, at least, approximately certain result of recent researches, in opposition both to the scep- ticism of the 17th and 18th centuries as to the existence of an historical Arthur, aud to the popular notion of him as a West-of-England king, or king of Wales, or Cornwall. This conclusion had, however, been more or less distinctly suggested by Chalmers, by Sir Walter Scott, by a writer in the Gentleman's Magazine (1842), by Mr Nash, and by Dr Burton. Yet this result of special recent researches is still so far from being generally known and accepted, that it may be desirable briefly to indicate the arguments in sup- port of it.

First, then, we have the facts of the northern extension and conflicts of the Cymry in those five centuries, from the 6th to the 10th, which may be distinguished as the Pre- medizval Period. For these facts our first authorities are the only premedizval British historians, Gildas and Nennius —the Historia and Epistola of the one having been com- posed in the 6th, and the earliest of the works that go. under the name of the other in the 7th century. Now, in the former there is, at least, nothing to favour that popular notion as to Arthur which is derived from the medieval chronicles; for the words in the Durham M6., "Qui prope Sabrinum ostium habetur," are now acknowledged to be an interpolation of the 13th century. And the latter is most naturally interpreted as positively affirming that Arthur's conflicts were with the Saxons of Bernicia (North- umberland and the Lothians). It has been contended that this could not be meant, because the Teutonic settlers in the north were Angles. But, in answer to this, it can now be affirmed that the earlier Teutonic settlers in the north were Frisians, a tribe of Saxons; and that the northern settlement of the Angles did not take place till 547, after the time of Arthur. Besides, the bards of the 6th century, to whom are attributed those historical poems, which do not, however, appear to have taken their earliest consistent shape farther back than the 7th century, and which have been recently edited by Mr Skene under the title of the Four Ancient Books of Wales,—these Cymric bards—Merlin, Taliessin, Aneurin, and Llywarch Hen—are all connected with the north; of a large proportion of their poems the scenery and events lie in the north; these poems are, in fact, the literature of the Cymric inhabitants of Cumbria and Strathclyde before these kingdoms were subjugated by the Saxon king, Edmund of Wessex, and by him ceded to the Gaelic king, Malcolm king of Scots, in 946; the warriors, whose deeds are celebrated in these poems, were "G@wyr y Gogledd," or men of the north ; and the histori- cal Arthur, who figures in five of them, 1s no southern king, but a Guledig, whose twelve battles are in the north. And, finally, in evidence of the former northern extension of the Cymry, it is as Bretts and Welsh that the inhabi-

tants of Cumbria and Strathclyde are referred to by the contemporary Saxon chroniclers, and in the charters and proclamations of the Scottish kings, David I., Malcolm TVs and William the Lion. So late, indecd, as

1305, we find a recognition of the Cymry as a distinct element of the population of southern Scotland, in the enactment that "the usages of the Bretts shall be abolished and no more used." And it is to Welsh that we must still look for the etymology of the names of the great natural features of that district of southern Scotland which would appear to have been the scene of the battles of the historical Arthur. From Welsh the names Tweed, Teviot, Clyde, Nith, and Annan, and the numerous Esks, Edens, and Levens, «c., are all derived. From Welsh, also, we explain Cheviot, and the names of the border hills. And where the emi- neneccs of southern Scotland are not Aills, fells, laws, or knowes, they are pens, as in Wales or Cornwall.

But if, as these various facts (and particularly the con- nection in which Arthur is mentioned in contemporary, or approximately contemporary, histories and _ historical poems) lead us to believe, Arthur was a leader of those northern Cymry afterwards absorbed in the population of southern Scotland and the English border, then, in this district, we ought certainly to find localities which can be more or less clearly identified with those mentioned in the earliest historical notices of Arthur; and localities also which, in their names or the traditions associated with them, commemorate his story. Now, it has been shown that such localities are not only found in the district thus defined, but are found there in such numbers as can no- where else be paralleled. And a very important verifica- tion is thus obtained of what, from the scantiness of the carliest sources, might, if thus unsupported, be regarded as a mere hypothesis rather than a theory, with respect to the scene of the battles of the historical Arthur.

Scotland, however, is but the northern extremity of a long line of country in which Arthurian localities are found. What we may call the Arthur-land extends from the Forth and Clyde, or rather from the Grampians, in Scotland, to the Loire in France, and includes (besides the south of Scotland and the north of England) Wales, Somer- setshire, Cornwall, and Brittany. It is certain that the scene of the battles of the historical Arthur of the 6th eentury could have been but a comparatively small area of this vast territory. There must, therefore, have been a migration of Arthurian traditions from the south to the north, or froin the north to the south. And if, on quite independent grounds, we find it more probable that such migration of tradition was from the north to the south, rather than from the south to

the north, it is evident that we shall have a still further verification of the hypothesis suggested by our examination of the earliest historical records. Now, considering these facts,—Cymric migrations from, but not to, the north ; the northern descents of some of the southern dynasties; the upburst of Cymric literature (which belongs in the main to the medizval period) con- temporaneously with the last struggles for, and final loss of, national independence; and the satisfaction, too great to be regardful of historical truth, which a conquered people would have in locally commemorating former victories and heroes of their race,—we cannot but see conditions in the highest degree favourable to the importation from the north of the Arthurian traditions of Wales, the south-west of England, and the north-west of France. On the other hand, we not only find no conditions favourable to the importation of Arthurian traditions from the south into the north, but con- ditions that would have been positively inimical to the pre-servation of such traditions, and conditions, therefore, that would scem to make it impossible to explain the existence of Arthurian localities in the north, except on the hypothesis

of the north having been the scene of actual Arthurian events. Such conditions are to be found in these facts :— the absorption of the northern Cymry by a kindred race with whom they had never, sive temporarily, been at war, viz., the Scots, a brother of whose king they had themselves voluntarily elected to the throne in 918, previously to their being regularly incorporated with the Scottish nationality after the treaty of 946 between Malcolm II. and their Saxon foe, Edmund of Wessex; the preparation for this political incorporation in the 10th century by an ecclesias- tical incorporation in the 8th century, through the sub- version of the native Cymric Church by the opponent Irish or Columban Church of the Scots with its Gaelic language, whence followed the dying out of the Cymric language ; and, finally, the possession by the Scots, with whom the northern Cymry were: thus incorporated, of a traditional and poetic literature of their own, which must certainly have greatly opposed the introduction, after their incor- poration of the Cymry, of Cymric poetry and tradition, and been highly unfavourable to its preservation, if it had any other than a native historical origin. But yet, further, it is to be noted that Arthurian localities

arc, speaking gene- rally, found in Scotland only where, in the 6th century, there was a Cymric population ; that that part of Scotland in which Arthurian localities are, speaking generally, not found, coincides with the ancient kingdoms of the Dicts and Scots, and is dotted all over with localities belonging to the other great cycle of Celtic tradition, the Fenian, Fingalian, or Ossianic ; and that, while Fingalian localities are not found at all in the Arthurian district, Arthurian localities are found in the Fingalian district, or in the ancient territory of the Picts, only in cases in which their being found in that territory is a strong indication of their hav- ing originated in such actual historical facts as they com- memorate. (J. 8. 8.-G.)]

Additions to LWistoric Facts and Introduction of Mytho- logical Elements. —From the Saxon invasions resulted two emigrations closely succeeding each other of Britons into French Brittany ; and the impenetrable forests and moun- tains of Wales afforded a refuge where the more recent fugitives from Wessex or the north mingled with the earlier exiles from Kent, and hence the subsequent confusion of historic facts. Vortigern of Kent became in the legend the kinsman of Ambrosius of Wessex; the gaps in the history were filled up by mythic reminiscences, and to Arthur was assigned a celestial and miraculous parentage from Uthyr Pendragon, that is to say, Head of the Dragon. Under the form of a cloud this Celtic Jupiter became the father of Arthur, who in the same mythological order gave his name to two constellations, Arthur's chariot, 2.¢., the Great Bear, and Arthur's lyre. But the word for cloud in Welsh was Gorlasar. Now, whilst the legend was carried from place to place acquiring new force, the Celtic world had made a stand against Roman and Teu- tonic ideas ; there was, as in Greece, a tendency to ex- plain the earlier myths, no longer understood, into the gross elements of adultery and incest; bastardy was not censured, &c. Thus the Uthyr Pendragon of the Romances of the Round Table is a real Jupiter. The cloud becomes aman, Gorloes ; and there is an Alemene, Ygierne. In short, when Moliére has, with more genius than morality, diverted so many generations by his Amphitryon, he is striking an old Celtic and Welsh chord. Then Arthur is another Hercules. An advantage, from a national point of view, gained to the legend by Arthur's celestial and pagan origin, is that he becomes by it at once above and akin to all the Celtic chiefs. All the chiefs become his brethren; their sons, who flock to fight under his banner, his

beaux neveux,—though one, indeed, among them is the traitor Medrod of the Welsh legends, Mordred of the romances. So in dream was founded,

ART—ART

besides the Round Table which never existed, the Celtic family, which had existed only to destroy itself,

Gradual Formation of the existing character of Arthur in the French Romances.—We have noticed the bonhomie which was the chief characteristic of the early Cambrian Arthur. The Arthur born of the recollections and resentments of exile has a more terrible shape. In Brittany, the land of exile, was elaborated this type of a national avenger,—a more moral David (Arthur slays his giant), a Solomon without his scepticism (Arthur was a great author of pro- verbs). In exile this figure of a Celtic Messiah was graven with some of its most indelible traits. Arthur's own device is very far removed from the gospel ; he out-Herods Herod, and, franker than the Jesuitical cruelty of the twelve tables or of Shylock, he goes beyond the lex talionis; "a heart for an eye, a head for an arm," he says. Alain de Lille relates, in his commentaries and explanations on the prophecies of Merlin, that in his day any one who, drinking with the Bretons, would tell them that Arthur was dead and never to return, was in danger of being stoned. '" Like the dawn, he will arise from his mysterious retreat."

To return to the Arthur of the Round Table, nothing in the romances is touched with more generous sentiment than his invariable affection for Ken (Kay of the Welsh legends), his cunning but clownish, friendly yet treacherous seneschal. For the infant Arthur had been confided by Merlin to Antor, and believed himself his son, while Ken, the real son of Antor gives place to Arthur, is neglected, and all his evil qualities are derived from the wicked nurse to whom he had been given away from his mother; so Arthur was bound to be patient and kind to Ken in after life, and forgive him many times for being "fol et vilain et fel."

We shall not describe the trials to which Arthur submits, those of the sword and of the anvil, for instance, nor the essay in royalty he makes without taking the title of king, though the idea of being made a king, not only by

election, but even after examination, is remarkable. Nor shall we relate how, in disguise, aided by his friends Ban and Bohor, he rescues Leogadan from the "Saisnes" (Saxons) and Danes ; in disguise, as Merlin explains to Leogadan, who had thrown himself at the feet of his deliverer to entreat to know his name—because thus, without naming himself, should a hero, who is the son of a king, seek out and win his wife. So Arthur woos and weds Guenever, Leogadan's daughter, the Gwenhwyvar of the Welsh tales. The Welsh would have their Arthur cross the Channel to succour their kindred allies in Brittany; the Bretons, in the same way, sent their Arthur into' Great Britain, hence confusions which explain each other. One reproach, which has been made at all times, by Mr P. Paris, as by William of Newburgh, to the revengeful instinct which was the soul of the Arthurian legend, is its monstrous vanity, which has depicted Arthur as an opponent and conqueror of the Romans. William of Newburgh has said, "'the Britons were little to be feared as warriors, little to be trusted as citizens ;" and this passage curiously resembles one in the legend where a Roman knight, before the battle of Langres, is made to exclaim, " Behold truly the Britons —slow in action, ready in menace !" Whence has arisen this battle of Langres, where Arthur, allied with Claudas, king of the "Terre Déserte," conquers the Romans and destroys theirempire. Strange to say, the fictitious battle of Langres has an authentic foundation in history, being but an echo in tradition of the obstinate and successful resistance to the Romans carried on by the Celts of the vast district called the 7ractus Armoricanus,—a resist- ance out-lasting, indeed, the Roman power, till Clovis turned it to account and destroyed it ; and of Clovis, the treacherous ally of the Armorican Celts, the portrait is easily recog- nised in the Claudas of the romance.

Rome has been cursed in history more often than she is

named in Camille's imprecation in Corneille's play, and we necd not wonder at the legend, wherein Arthur calls together a confederation of Greeks, Africans, Spaniards, Parthians, Medes, Libyans, Egyptians, Babylonians, Phry- gians, &c., in fact, all nations, against Rome. The legendary hero falls at last, in all his glory and in the midst of his reign of

justice, on the field of Camlan. But he is not deserted by that fairy world with whom Shakespeare's soul delighted to dwell; magically transported into the Isle of Avalon, his body is cured of its wounds, and his soul sleeps, while rests hisenchanted sword Excalibur, till that day comes when he shall rise again from his mysterious retreat. But that day must dawn for all nations at once, as in the veins of all peoples of Europe is hidden some Celtic blood. On the other hand, progress is barred and darkness dwells where the Celtic race remains unmixed. So it is the destiny of some peoples, while buried for ever as a temporal power, because of their irreparable faults, to live on gloriously for the good of all, but only as an idea, an instruction, a legend. (J. A.)

Authorities: Turner's History of Anglo-Saxons; Leland's Asser- tio Arthuri; The British History, translated into English from the Latin of Jeffrey of Monmouth, by Aaron Thompson (London, 1718); Myvyrian Archaiology of Wales; Paulin Paris's edition of the Homans de la Table Ronde: Saint Graal, Merlin, Lancelot; Hersart de la Villemarqueé's Myrdhinn ou U Enchanteur Merlin (Paris, 1862, 8v0); Les Romans de la Table Ronde, Paris, 1860, 12mo0; La Mort d' Arthure, edited by Sir Th. Malory in 1634; Southey's edition (1817, 4to); Thomas Wright's edition (1856, 8vo) ; Gildas, Historia ; Nennius, Historia Britonum; Skene, Four Ancient Books of Wales (1868), Book of the Dean of Lismore, and Chronicles of the Picts and Scots; and Stuart-Glennie, Journey through Arthurian Scotland (1867), and Arthurian Localities (1869).

ARTICHOKE. The common artichoke, Cynara Scoly- mus, is a plant belonging to the Natural Order Composite, having some resemblance to a large thistle. It has long been esteemed as a culinary vegetable ; the parts chiefly employed being the immature receptacle or floret disk, with the lower part of the surrounding Jeaf-scales, which are known as "artichoke bottoms." In Italy the receptacles, dried, are largely used in soups; those of the cultivated plant as Carciofo domestico, and of the wild variety as Car- ctofo spinoso. The Jerusalem artichoke, Helianthus tuberosus, is a distinct plant belonging to the same order, cultivated for its root-tubers, which somewhat resemble potatoes, for which they have been proposed as a substitute. It closely re- sembles the sunflower, and its popular name is a corruption of the Italian Girasole Articocco, the sunflower artichoke.

ARTICLES, Tue Turirty-Ning, of the Church of Eng- land, contain the public standard of religious belief adopted by that body. They were drawn up by Archbishop Parker,

sanctioned by Convocation in 1562, and published by royal

authority in the following year. The general principles of this body of doctrine, and the form into which it was thrown, had been gradually developed during the previous attempts to establish a standard of faith in England. Soon after the authority of the Pope had been thrown off by the English Church, there began to appear wide differences of opinion with regard to the extent of reformation required. One party, the conservative, held by the old practices of the Church of Rome; another, the moderate reformers, desired to abolish these practices on account of the abuses to which they were liable ; while the various sects of the Anabaptists were eager for radical reformation both of doctrine and of practice. Religious turbulence and strife prevailed to such an extent that, in 1536, a set of TEN ARTICLES was published by royal authority, intended, as was expressly stated, to "stablyshe Christen quietnes and unitie among us, and to avoid contentious opinions." A considerable share in the composition of this code was taken by Henry himself. The articles were evidently intended as a compromise; they contained much that was afterwards rejected by the church, and do not seem to have given

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general satisfaction. authoritatively, superseded by the publication, in 1537, of the Institution of a Christcan Man. For two or three years before this negotiations had been carried on with the

Continental reformers, and proposals had been made for a

general conference at which some universal articles of faith might be considered. The conference took place but did not attain the end desired, for Henry, at first favourably disposed, was swayed by the influence of the anti-refor- mation party ; and Cranmer, while able to come to agree- ment with the German deputation so far as points of doctrine were concerned, saw clearly that it would be a hopeless task to try to abolish all the ancient

ceremonies. The increasing influence of the conservative party led to the passing, by Convocation and Parliament, in 1539, of Henry's Srx Arrictzs, the "bloody statute," or "' whip with six strings," as they were then called, from the cruel persecutions to which they gave rise. These articles enforced belief in transubstantiation, declared that com- munion in both kinds was unnecessary, that the marriage of priests was unlawful, that vows of chastity or widowhood were absolutely binding, that private masses and auricular confession were expedient and necessary. The severity of these doctrines was mitigated by the third authorised formulary of Henry's reign, The Necessary Doctrine and Erudition for any Christian Man, called the " King's Book," and published in 1543. The conference with the Germans, though not entirely successful, had not been with- out fruit. Among Cranmer's papers has been found a set of Thirteen Articles bearing evident traces of the Conti- nental ideas, and highly interesting on account of the in- tuence it exercised on the later formularies. Many of these articles are drawn directly from the Augsburg Confession, and there seems no doubt that they thus formed an inter- mediate step between that Confession and the Forry-rwo Axticurs of Edward. These were drawn up by Cranmer in obedience to the command of the king and privy council, who, in 1551, ordered the archbishop to "frame a book of articles of religion, for the preserving and maintaining peace and unity of doctrine in this church, that, being finished, they might be set forth by public authority." Great care was taken in their preparation ; the first draft was sent round to the bishops, then revised by Cranmer, submitted to Cheke and Cecil, and to the six royal chap- lains, and finally laid before the council. In 1553 the mandate enjoining subscription to them was granted by the king, but the articles had already been printed in English. In the same year they were published in Latin, and ap- pended toa short catechism of Christian doctrine. It has been much disputed whether these articles were sanctioned by Convocation, or were only circulated by order of council ; on the whole, the balance of probability seems to be in favour of the supposition that they had received ecclesias- tical sanction (Hardwick, History of the Articles, 106-112).

During the reign of Mary these articles were suppressed, but, on the accession of Elizabeth and the elevation of Parker to the see of Canterbury, attention was again directed to the framing of some standard body of truth. A series of Eleven Articles was drawn up in 1559, and was in use for some

time ; it had not, however, full autho- rity, though it was enforced in Ireland until 1615. In 1562 the houses of Convocation were summoned, and Parker laid before them a revised copy of the Forty-Two Articles. In the work of revision he had been assisted by Bishops Grindal, Horn, and Fox. The changes introduced by them were, for the most part, Lutheran in tendency, and were probably influenced by the Wiirtemberg Confession of 1551. Articles v., xii, xxix.,and xxx. of the present set were newly introduced ; x., xvi., xix. (part being transferred to the present vii.), and xli. of the old series were omitted. Seven-

unsuccessful.

teen other articles were modified by partial omission, altera- tion, or substitution. Convocation further struck out Articles xxxix., xl., and xlii.; made considerable alterations in iii and xxviii, and some slight changes in vill, xv., xxii, xxix., and xxxiii, A Latin manuscript of Parker's, containing a list of signatures, might be supposed to give the final state of the document, but it differs from the extract taken in 1637 by Laud's order from the registers, both in regard to the signatures, and in the omission of the first clause of Articlexx. The articles, now thirty-nine in number, were submitted to the queen, who is said to have read and examined them. After nearly a year's delay they were published in Latin. In this edition the disputed clause of Article xx. is found, and Article xxix. is wholly omitted. In the English version, printed in the same year, the clause of Article xx. is wanting. In all editions after 1571, Article xxix. is inserted, and, with one exception, the same is true of the clause in Articlexx. A law (13 Eliz. c. 12) was passed in 1571, ordaining that the clergy "should subscribe to all the articles which only concern the confes- sion of a true Christian faith, and the doctrine of the sacraments." Convocation of the same year inserted Article xxix., made a few slight changes, added a list of the Apocryphal books, and thus gave the articles their pre- sent form. The only serious attempt at altcration was made in 1595, when the Primate, Whitgift, accepted a series of articles proposed by Dr Whitaker of Cambridge. These,

generally known as the Lambeth Articles, were strongly

Calvinistic in tone. They did not receive sanction, and

were immediately suppressed. At a later date (1604) it

was again sought to introduce them, but the attempt was The canons of 1604 enforced subscription, while the general relation of the articles to the church was defined by the royal declaration of 1628 (now prefixed to them), which enjoins the settlement of disputed points by Convocation, the acceptation of the articles in their plain and full bearing, and the interpretation of them in their literal and grammatical sense.

The articles are not intended to be a complete system of theology, but only enumerate certain truths of such primary importance that any one denying them is thereby excluded from the church. 'They do not, however, furnish merely a negative test ; they were framed not only for the avoidance of diversity of opinion, but for the establishment of consent regarding true religion. Accordingly, they treat in order of the main points of theological doctrine, and may be classified thus:—(1.) Articles i—v., the doctrine of the Trinity ; (2.) Articles vi—viii., the rule of faith or sources of our knowledge of religious matters ; (3.) Articles ix.—xviil., the doctrines which concern the Christian as an indi- vidual, é.e., sin, redemption, and their cognate notions ; (4.) Articles xix.-xxxix., the necessary relations of Christians as members of a religious community, including the general theory of the church, and the doctrine of the sacraments. The Church of Ireland continued to use the Eleven Articles until 1615, when a more elaborate code was drawn up by Ussher. This, in 1635, was superseded by the Thirty-Nine Articles, which were then adopted by the Trish Church. The Episcopal Church in Scotland accepted the articles in 1804, and in America the church subscribed to them in 1801, excluding, however, the Athanasian Creed.

See Abp. Laurence, Bampton Lectures, 1804, new ed. 1853; Lamb, Historical Account of the Thirty-Nine Articles, 1885 ; Hardwick, History of the Articles of Religion, 1859.

ARTICULATA, the name given by Cuvier to his third great division of the animal kingdom. Arthropoda is the designation now generally adopted, which includes the Crustacea, Arachnida, Myriapoda, and Insecta, but

excludes the Annelida, which Cuvier classed with these among the Articulata. See ARTHROPODA.

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ARTILLERY

HE modern term Artillery is used in two senses,— firstly, to designate the matériel of artillery, 2.c., the guns, &c.; secondly, the personnel and organisation by which the power of this arm is wielded. The word itself is derived by some from "arcus," a bow; by others from " ars telaria," signifying bows, arrows, and all implements of projectile warfare. The earliest forms of artillery were the "engines invented by cunning men to shoot arrows and great stones," of which we read in the Old Testament; these developed, with the progress of military art, into the more elaborate machines used by the Ronians under the names of catapulta, balista, battering-ram, &c.; and under various forms and names this " mechanical artillery " con- tinued in use, until the discovery of a propelling agent so powerful as to supersede all others and revolutionise both the implements and the art of war.

The history of artillery proper may be said to date from the discovery of gunpowder. This is popularly attributed to the two monks, Roger Bacon and Bartholdus Schiraz, about the end of the 13th century (see GUNPOWDER) ; but there is ample evidence that substances of somewhat similar composition and powers had been known and used for purposes of war in the East at far earlier times. The Chinese seem to have been the first discoverers of explosive compounds as' engines of war, and to have used them for several centuries before the Christian era; and their "thunder of the earth," produced by filling a huge bombshell with some such compound, and exploding it at the proper moment, is spoken of as early as the 3d or 4th centuries of our era. According to Father Amyot, stone mortars, projecting stone balls, were used by them in the 8th century; and although they were first in- structed in the scientific casting of cannon by niission- aries in the 17th century, there is evidence of large cannon and wall pieces of rough construction having been in use as early as the 12th century. The inhabitants of India seem to have possessed fire-arms of some sort as early as the time of Alexander; but the information is too meagre to

admit of more than the merest speculation as to their nature. The celebrated Greek fire, of which we have ample accounts, was usually in a liquid form, and vomited through long copper tubes, with which the bows of vessels of war were provided, or projected in fire-balls, or by means of arrows and javelins around which flax was twisted. It was used by the Romans of the Eastern empire with much effect, especially at the defences of Constantinople (668-675 and 716-718 a.p.), and the secret of its manufacture was preserved with a superstitious care for nearly 400 years ; but it afterwards passed into the hands of the Mahometans, and was much used by them in their wars with the Chris- tians. The Moors first introduced firearms in western Europe; according to Condé, they used artillery against Saragossa in 1118 a.p., and a little later they defended Niebla by means of machines which threw darts and stones through the agency of fire.

The application of gunpowder to projectile warfare, and the use of cannon, became general in Europe during the 14th century. Mention is made, however, of isolated in- stances of their employment at earlier periods, especially among the Moors. Artillery is also said to have been used by Henry III. of England during the rebellion of the Duke of Gloucester in 1267, and by the Spaniards against Cordova in 1280 and against Gibraltar in 1306. But it is held by those well qualified to judge, that the first unquestionable testimony of the employment of cannon is in 1338 under Edward III. of England. The substitution

of the new engine for the old mechanical artillery was gradual, and was not effected without opposition ; and in the 13th and early part of the 14th centuries, we still find various machines, such as the trebuchet, onazer, scorpion, and espringal, whose action was dependent on the elasticity of twisted cords, used to hurl stones, Greek fire, &c.

The earliest trace of an artillery organisation, such as now plays so important a part in all great armies, is found in the middle of the 14th century. In 1344 Edward III. formed an artillery train and an ordnance establish- ment, numbering 340 men; but of these only twelve were termed artillerymen and gunners, the remainder consisting of waggoners, engineers, and artificers of various kinds. The ordnance establishment at the siege of Harfleur, in 1415, included twenty-five master gunners and fifty

“ ser- vitour gunners.” The gunner of those days seems to have been the captain of the gun, and to have had general charge of the guns aud stores, with the especial duty of laying and firing the piece in action. The manufacturing establish- ments, now maintained on so gigantic a scale, do not seem to have sprung up till considerably later. Piobert states that gun-foundries were established in France in 1377 ; but we have no trace of them in Germany till 1440, and record of them is wanting in England until 1521.

The guns of the 14th century were of the rudest make, cumbrous and inefficient, and though an advance on the earlier machines, and useful in sieges, still played but little part in battles. Whether Edward IIT. used them at Creci or not (a point which has been much debated), it may safely be affirmed that they had but little to do with the result of that day. Progress, howeyer, began to show itself in the 15th century ; the “bombards” were replaced by brass guns, and the cumbrous beds, upon which the earlier ordnance were transported, gave way to rude artillery. carriages on wheels ; and iron was substituted for stone in the manufacture of projectiles. The first step towards a better organisation and some tactical system appears to have been made towards the end of the 15th century by Charles VIII. of France, who used a numerous artillery in his Italian campaigns ; and Louis XII. largely owed his successes in Italy to this arm. Francis I. still further increased its mobility, adopting a lighter construction for field-guns, and having them drawn by the best description of horses ; and in the defeat of the Swiss in 1515, “the French artillery played a new and distinguished part, not only by protecting the centre of the army from the charges of the Swiss phalanxes, and causing them excessive loss, but also by rapidly taking up such positions from time to time during the battle as enabled the guns to play upon the flanks of the attacking columns.”4 In England also con- siderable attention was bestowed on ordnance matters during this period, though the progress was not so great. In 1456 it is stated that a commission was issued to John Judd, as master-general of the ordnance; and in 1483 (Richard III.), Rauf Bigod was appointed master of the ordnance, an office which continued down to 1852. These early masters of the ordnance personally commanded the artillery in expeditions and wars, besides being responsible for the general administration of the personnel and matériel of such artillery as then existed. Henry VII. and Henry – VIII. did much to advance the progress of artillery. Tar- taglia? gives tables of

the different cannon in use about this time. The heavy picces, i.¢., culverins, ke, were drawn by oxen, and corresponded to those now in use for

1 Observations on Fire-Arms, Chesney, 1852. ; 2 Three Books of Colloquies concerning the Art of Shooting.

16th cen- tury.

17th cen- tury.

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siege or position purposes, while the field guns appear to have been the 2, 4, 64, and 8 pounders,—falcons, falconets, and sakers. No permanent artillery trains existed at this time ; the personnel was obtained by withdrawing gunners from garrisons, and supplementing them with men hired for the occasion, and the cattle required for transport were also hired. The artillery train on service included the ammunition waggons, pontoons, and a large proportion of artificers, besides the men actually required to serve the gun, corresponding nearly to the artillery park of the present day, and had its position assigned in camp and on the march. "On the march the train was preceded by an advanced guard of light cavalry to protect it. The first portion of this troop carried hatchets and saws; the second, instruments and implements for the construction of nia- chines ; the third, sledge-hammers, iron wedges, and pick- axes ; finally, the last were provided with pioneers' imple- ments. After these came carriages loaded with guns, capstans, levers, and other like machines; these were followed by the light pieces, by the heavy siege guns, by ammunition waggons, by pontoons and the necessary men for them, by the artillery artificers, and, lastly, by the baggage."

The 16th century was not marked by any great advance in artillery science, though the number of guns which accompanied an army had increased considerably—as many as 1600 gunners, cannoneers, armourers, and clerks of the ordnance, being attached to Lord Mountjoy's army in Ireland in 1599. The artillery tactics were simple ; the guns usually deployed in advance of the troops and fired a few rounds, but from their want of mobility could neither accompany al advance nor protect a retreat, and

were generally captured on the first advauce of the enemy. Greater progress, however, was made in the attack and defence of fortresses by artillery. Vertical fire was used to a considerable extent, and seems to have been conducted by artificers while the "cannoneers" served the guns. In England but little advance was made even in the 17th century, and the commencement of the Great Rebellion found the artillery of England in a very feeble and backward state. Two books by artillerymen of those days? give us much information on its condition, and a very complete account of the "Field Artillery of the Great Rebellion" is furnished by Captain H. W. L. Hime, R.A? The guns chiefly used were the light pieces known as "minion," "saker," and "demi-culverin," «., 3-pounder, 5-pounder, and 9-pounder respectively. The heavier pieces being used in sieges and garrisons, and ranging from the '"'whole culverin," or 15-pounder, to the " Canon Royall," or 63-pounder. The carriages were cumbrous. "They were formed of two large cheeks or brackets, whose general outline was much the same as the brackets of our own bracket-trails, connected together by four transoms." The transport of the ammunition was in carts or wheelbarrows, or on men's backs. The gunners walked beside the gun, and, as in later times, their pace was a measure of the mobility of the field artillery. Cartridges, when used, were made of paper or canvas, but an iron ladle was preferred. The following words of command show the gun-drill of those days :—

. Put back your piece. 8. Put up your powder.

. Order your piece to load. 9. Thrust home your wad.

. Search your piece. 10. Regard your shot.

. Sponge your piece. 11. Put home your shot gently.

"I O> On He 09 DD Et

. Fill your ladle. 12, Thrust home your last wad . Put in your powder. with three strokes. . Empty your ladle. 18. Gauge your piece.

1 Owen's Modern Artillery.

2 The Gunner, by Robert Norton, one of His Majesty's gunners and engineers, 1628 ; The Gunner's Glasse, by William Eldred, master- gunrer of Dover Castle, 1646.

3 Proceedings of the Royal Artillery Institution, vol. vi.

a part of the charge, and when the he is to command all the army."

artillery" seem to answer to our present majors, and the duties of the " gunners" were much the same as those now performed by lieutenauts. leather guns were used with effect against the English in the passage of the Scots over the river Tyne.

history of this arm in Europe. among the first to recognise its coming importance, and occupied himself diligently with improving it. His minister, Sully, was named master-general, and during the last ten years of his reign (1600-1610), he may be said to have created an artillery. More than 400 guns were turned out, including a number of field-pieces. also helped to develop the use under the great Swedish warrior Gustavus Adolphus that

ARTIGEEBERY

As to the draught, twenty-three horses were required for

a cannon on good ground, fifteen or seventeen for the demi-cannon, and nine for a culverin. guns to men was 1 per 1000. The artillery general was a

The proportion of

greater man in those days than in more modern times, as

we find that "the generall of the artillery hath alwayes chief generall is absent, The "gentlemen of the

In the Scotch invasion of 1640,

When Charles I. took the field in 1642, the earl of Peterborough, as parliamentary general of artillery, had a large train under his orders, but such was its want of mobility, that he was obliged to leave his guns behind

him for a time. It came up, however, at last, and was used at the battle of Edgehill, 23d October 1642. In 1648, at Braddoch Doun, an instance occurred of the use of field artillery first masked

by cavalry ; and at Roundway Lord Wilmot handled his

guns so well that he prepared the way for his cavalry, and finally was able to seize the enemy's guns and turn them

against him. At other affairs, however, the artillery seems to have been comparatively useless, and the presence of twenty-five guns on the Royalist side at Marston Moor

was neutralised by Cromwell's flank attack ; and in no

battles of this war did the artillery assume the importance it had already attained on the Continent.

The first half of this century forms an era in the Henry IV. of France was

Maurice of Nassau of this arm. But it was

artillery first began to take its true position on the battle- field. Recognising the necessity for the mobility of field artillery, he introduced "Kalter" guns, "consisting of a thin cylinder of beaten copper screwed into a brass breech, whose chamber was strengthened by four bands of iron, the tube itself being covered with layers of mastic, over which cords were rolled firmly round its whole length and equalised by a layer of plaster, a coating of leather, boiled and varnished, completing the piece." This primitive field artillery was drawn and served by two men, and was first used in his Polish war. The guns could naturally bear but a small charge; the great point gained was mobi- lity, all guns heavier than 12-pounders being separated from field artillery. In his German campaigns he used iron 4-pounder guns, weighing about 54cwt., and drawn by two horses. Rapidity of fire was obtained by the use of car- tridges instead of the old method of ladling the powder. Gustavus attached two of these guns to each regiment, and placed them under the orders of the colonel. Gustavus Adolphus may therefore be said to be the father of the battalionsystem of guns,—a system which had*

itsadvantages in those days of imperfect organisation, but, like many other things, was carried down to a late date when the necessity for the system had entirely disappeared. But he also appreciated the value of concentration of fire, and frequently massed his guns in strong batteries at the centre and flanks. He appears to have been fully alive to the necessity of having both a heavy and light artillery, and it was his practice to retire his heavy guns, protecting @

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4 Chesney's Observations on Fire-Arms, 1852.

Gustavus Adolphus,

An TILE TR Y

retreat by the field artillery. It was in the celebrated Thirty Years' War that his artillery showed the advan- tages which it could win when handled properly. The artillery of the Imperialists was as cumbrous as that of their Swedish adversaries was mobile. Tilly's guns were chiefly 24-pounders, each requiring twenty transport horses and twelve horses for the waggons, while the service of the guns was primitive and defective, and they could hardly even be moved during the course of an action. The first battle of Leipsic was fought the 7th September 1631, between the allicd Swedes and Saxons under Gustavus Adolphus and the Imperialists under Tilly. The Imperialist artillery was badly disposed on a range of hills in rear of their position, so that any forward movement would effectually mask the'fire of the guns. Gustavus, on the other hand, advanced his guns more, and covered his front with 100 guns, which he was able to use with considerable effect, The next action in which the use of the artillery is remark- able was the passage of the Lech, a tributary of the Danube. Tilly had taken up a position on the right bank of the river between Augsburg and Rain, and awaited attack. On the night of the 3d April 1632 the Swedish army threw up earth-works, upon which were mounted seventy-two pieces of artillery. Gustavus, taking advantage of the re-entering bend of the river, brought such a con- verging fire upon the Imperialists that he forced them to retire and gained the passage of thestream. At the battle of Liitzen, 6th November 1632, Wallenstcin had taken advantage of certain eminences and rising

ground in his position to post his guns in batteries of from four .to fourteen pieces, while Gustavus placed powerful batteries on the wings and centre of his line. The battle closed the glorious career of this great warrior, who was struck down in the hour of victory. During his life he had done much to forward the science of artillery. He had increased its mobility and rapidity of fire, and raised the proportion of guns to over six per 1000 men; and though he may be said to have been the originator of the battalion system, with its attendant evils of dispersion of guns, he checked this evil by keeping in hand a considerable re- serve,

Further progress was made in construction and organisation during the latter part of the century. In England the laboratory at Woolwich was established in 1672, and a great reorganisation of the artillery took place in 1682 under the master-general, Lord Dartmouth. About that time we read, that at the Hounslow camp "brass 3-pounders, under gentlemen of the ordnance, were escorted to their places by the grenadiers of the various regiments," an example of the tactical system of "battalion guns" already spoken of. The train of artillery with which James II. pre- pared to meet the invasion of 1688 was a considerable one ; details of it will be found at page 53 of Duncan's History of the Royal Artillery. William III. (1689) introduced foreign artillery, and undertook the reorganisation of the personnel. He formed the first regimental establishment. Howitzers, mortars, and hand-grenades were introduced during this period, being used principally by the Dutch and English. In France the improvements under Louis XIV. seem to have been made chiefly in siege artillery. Heavy guns of position were much used, and there appears to have been a disposition to regard batteries of this kind, covered by epaulements, as in field fortifications, as the natural réle of artillery. Louis XIV., however, was the first to give a permanent foundation to the new arm. In 1671 he raised a regiment of royal fusiliers as artillerymen, composed of gunners and workmen. Schools of instruction were established, and the arm recognised as a special branch. Improvements were also effected in the matériel. The calibres were reduced in number and made uniform, and

those then adopted have remained unaltered up to the present day, some having been rifled. Carriages were improved. "Siege and field carriages had heavy bracket- trails, but were provided with limbers having a straight pintail on the top, like an old service siege limber."! Plat- form waggons were used to transport guns ; wrought-iron field carriages and mortar carriages were used; and the carriage for coast batteries was little dissimilar to the standing gun-carriage of the present day.

The 18th century was fruitful in artillery progress. England it saw the Royal Regiment of Artillery permanently established, and rapid strides made on the Continent in every branch of the arm. The Duke of Marlborough was appointed master-general of the ordnance on the accession of Queen Anne, in 1702, and in the same year war was declared with Germany and the States-General. We have but scanty record of the handling of his artillery by this great general ; but at Blenheim it is said a strong battery, posted on the allied right wing, greatly assisted by its enfilade fire; and at Malplaquet, Marlborough deployed forty guns in the centre of his position. The artillery trains were considerably increased. In 1706 forty-six guns and sixty mortars formed the artillery of a force of 11,000 men, the mortars being used mounted upon travel- ling carriages. The history of the "Royal Regiment of Artillery" commences from the 26th May 1716, when the artillery which had so long existed was formed into two permanent companies of Royal Artillery. In 1727 the organisation was expanded into four complete companies, commanded by a colonel, lieut.-colonel, and a major, and in 1740 two more companies were added. A company consisted of 5 officers, 4 fire-workers, 18 non-commissioned officers and bombardiers, 30 gunners and cadet gunners, 48 matrosses and cadet matrosses, and 2drummers. Albert Borgard was the first colonel. By birth aDane,he scrved first in the Danish army and afterwards in the Prussian service, and subsequently entered that of England. He was adjutant of the short-lived regiment formed by William III., and died in 1751 at the age of 92. In 1741 the Royal Military Academy was instituted at Woolwich for the instruction of cadets, and of officers and men of the artillery. The cadets were accommodated in buildings at the Warren, and it was not till 1806 that the new academy was opened at the foot of Shooter's Hill. In 1748 a company of Royal Arrtil- lery went to the East Indies and took part in the siege of Pondicherry, subsequently forming the nucleus of the Indian

artilleries. In 1755 four additional companies were raised for service in the East Indies, and in 1757 the regiment had increased to twenty-four companies, A Royal Irish Artillery corps was also formed, which gradually increased from a small nucleus to a strength of twenty companies, and was amalgamated with the Royal Artillery in 1801. About this period (the middle of 18th century) the guns in use consisted of 24-pounders, 12-pounders, 6-pounders, and 3-pounders. The guns were divided into brigades, corresponding to the present batteries, of four, five, and six guns respectively, and began to be separated into "heavy" and "light " brigades. Each field gun was drawn by four horses, the two leaders being ridden by artillerymen, and had 100 rounds of shot and 30 rounds of grape. Three companies of the Royal Artillery took part in the battle of Minden in 1759, and were handled with great success; and even in those days the English artillery won praise from foreign critics. Decker says,? "The English artillery was distinguished by its lightness, its elegance, and the good quality of its materials. In the battle of Marburg (1760), although the English artillery

1 Owen's Modern Artillery. , 2 Battles and Principal Combats of the Seven Years' War.

II. — 83

In 18th cen-

Prussia.

Russia.

Austria

France.

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was not horsed, it followed Lord Granby's cavalry at a trot, and was always ready to engage." "The English artillery," says Tempelhof, "could not have been better served; it followed the enemy with such vivacity, and

maintained its fire so well, that it was impossible for the latter to re-form." In the great blockade and siege of Gib- raltar (1779-83), the gallantry and devotion of the garri- gon artillery were conspicuous.

Before passing on to the era formed by the great war against Napoleon, it is necessary to trace the progress made by this arm on the Continent.

The Prussian artillery was very backward at the begin- ning of this century. In 1688 the Brandenburg (Prussian) artillery numbered only 300 men ; and at the death of Frederick-William I., in 1740, there was only one battalion of field artillery of six companies, and one of garrison artillery of four companies. Nor did Frederick the Great at first place much value upon its services. But experi- ence soon convinced him of the necessity for creating an efficient and mobile field artillery. His first efforts in this direction were not successful ; and though the Prussian artillery contributed much to Frederick's victory at Rossbach, it was usually no match for the excellent and well-handled Austrian artillery. But the gradual destruction of his veteran infantry obliged him to devote more attention to this arm; he considerably raised the proportion of guns, and in 1759 he formed the first horse artillery, consisting of a battery of ten light 6-pounders (afterwards changed to six 6-pounders) and two 7-pounder howitzers. Frederick placed great value on howitzers, and made much use of them against entrenched positions, and at the close of the war, after experiments on a large scale, ordered forty heavy howitzers to be attached to each army corps. Frederick seems to have made the mistake during the Seven Years' War of trying to bring heavy artillery into the field, instead of trying to lighten his artillery generally. But he gave a great impetus to the progress of artillery. He raised the proportion of guns from 24 and 3 per 1000 men in the Silesian wars to 5 or 6 per 1000 at the end of the Seven Years' War. He created a horse artillery which in rapidity of movement could rival cavalry; and commenced the formation of a real field artillery by the adoption of a number of light pieces and howitzers, while the heavier guns were relegated to parks for siege and position purposes. And his wars brought forward three important tactical prin- ciples in the employment of artillery,—the establishment of smaller batteries at important points in the line of battle in lieu of the old formations at the centre and flanks, opening the battle and

protecting the deployment of columns by light guns, and changing the position of batteries accord- ing to the course of the action.

Russia and Austria, though they produced no great military leader like Frederick, were ahead of Prussia in the development of this particular arm. In Russia its import- ance had always been recognised, and large numbers of guns employed, while each dragoon regiment had three " licornes" or howitzers attached, with mounted gunners, forming a species of horse artillery. In Austria, though the tactical employment of the artillery was often defective, its general excellence was pre-eminent, and it was ably organised under Prince Lichtenstein, the chief of artillery. But it was in France that the experience of Frederick's wars was best utilised, and the great strides to a more perfect system were made. At the commencement of the century French artillery had made but little progress. The carriages and waggons were driven by waggoners on foot, and on the field of battle the guns were dragged about by ropes or remained stationary. Hollow projectiles had made their

appearance, and lead tarred balls arranged round an axis and.

kept together by a net, and termed grape, were employed.

retained.

guns, artillery of

ARTIULESa a

But the ammunition generally was of a rough and primitive description. improvements were made. lightened, and the guns separated into brigades. cartridges were introduced, the ladle being abolished, and shot with wooden bottoms or sabots invented. But it was under General Gribeauval, in 1765, that the great reforms in the French artillery were commenced. This officer had been sent to Austria during the Seven Years' War, and had held an artillery command under Prince Lichtenstein. Struck with the improvements effected in Austria, he strove, on his return, to build up a complete system both of per- sonnel and matériel, creating a distinct matériel for field, siege, garrison, and coast artillery. importance of

mobility for field artillery, he dismissed from the park all pieces of greater calibre than 12-pounders ; and reduced the length (necessary for the service of guns in

Towards the middle of the century some Field guns and carriages were Siege

Alive to the vital

embrasures and behind parapets) and weight of those He also reduced the charge and the windage. His reforms were resisted, and for a time successfully; but in 1776 he became first inspector-general of artillery, and was able to carry through the improvements which will ever cause his name to be celebrated. For many years artillery had been separated into regimental or battalion position, garrison, and siege artillery, the position guns being distributed in large batteries on the flanks or in front of a position, and the siege artillery collected in a park or train. The field artillery of the new system included 4-pounder regimental guns, and for the park 8 and 12 pounders, with 6-inch howitzers. The am- munition was improved by the introduction of " case OE canisters of sheet-iron holding cast-iron balls, the old grape and case being abolished.

The carriages were constructed on a uniform model, strengthened with iron, the limber-wheels heightened, and the draught diminished. Iron axletrees were introduced, straight pintails on the top of the limbers, and poles took the place of shafts. Boxes on the carriage held part of the ammunition. Travelling trunnion poles were introduced. The horses were harnessed in pairs, instead of in file as formerly, and the prolong of rope was introduced to unite the trail of the gun and the limber in slow retiring move- ments, A new ammunition waggon, carrying fixed ammu- nition, was also invented. The service of the guns was improved by the introduction of cross-headed elevating screws and tangent scales,—the later experiments exploding the old false ideas with regard to the absolute flatness of the path of a projectile. The manner in which the teams were driven remained much the same; but the bricole was introduced, a collar with rope and hook, to which the gun- ners and foot soldiers harnessed themselves. For siege and garrison service Gribeauval adopted the 16-pounder and 12-pounder guns, 8-inch howitzer, and 10-inch mortar ; the 12, 10, and 8-inch gomer mortars

being introduced in 1785. Siege only differed from field carriages in having shafts in lieu of poles. Gribeauval introduced for garrison service a carriage with wheels in front and a truck in rear, while for coast service traversing platforms were adopted, having a bolt in front and a truck in rear running upon a circular racer. The great step made was in a uniform con- struction being adopted for all matériel, and the parts sus- ceptible made interchangeable.

In 1765 the personnel of the French artillery was reor- ganised. The field artillery with an army was divided into regimental guns and corps or reserve artillery. This latter portion was subdivided into divisions of eight guns of the same calibre. A company of artillery was also attached to each brigade of four battalions. The battery or division was thus made the tactical unit, with guns, munitions, and gunners complete, the horses and drivers

War of the French Revolu- tion.

an TE LE mR OY

being added ata later date. The French horse artillery dates from 1791. Horsemen and gunners were combined, each class learning the work of the other. Companies were attached to a battery of six guns; and in 1793, when the divisional organisation was adopted, artillery was attached to divisions in proportionate strength, and regimental guns were abandoned and entirely suppressed by Napoleon in 1796. The reforms of Gribeauval bore fruit in the wars of therepublic. The tables of construction which had been drawn up secured a uniformity of manufacture; the re- duction of the weight of the gun gave mobility to the field artillery, and enabled it to be used with the greatest effect in the new tactics which Napoleon introduced ; and the last step in the complete organisation of field artillery was made in 1800, when the establishment of a driver corps of soldiers put an end to the old system of horsing by con- tract.

At the commencement of our wars on the Continent in 1793, the British artillery was in anything but an efficient condition. The guns were dispersed among the infantry, they were horsed in single train, the ammunition was packed in rough deal boxes, the ammunition waggons were cumbrous and

ill-constructed, the drivers were mere carters on foot with long whips, and the whole equipment was scarcely able to break from a foot pace.1 Prior to the Peninsular war, however, the exertions of an able officer, Major Spearman, had done much to bring about an improved state of things. Horse artillery had been introduced in 1793, and the driver corps established in 1794, The battalion or regimental guns were abolished in 1802,'and field batteries or " brigades " of six guns were formed, horse artillery batteries being styled troops. Mili- tary drivers were introduced, the horses teamed in pairs, the drivers being mounted on the off-horses, while eight gunners were carried on the limbers and waggons. The equipment was lightened and simplified, the ammunition was properly packed, and a correct system of manceuvres was introduced. The invention of shrapnel shell by Major Shrapnel in 1803, and the transformation of the rocket from a mere signal to a destructive engine by Sir W. Con- greve in 1806, also added to artillery power.

The composition of a troop of horse artillery from 1805 to 1807 was about as follows :—

*Men. aS Animals. *

Car- riages. . Gun- 1's.) ners.

The composition of a field '" brigade " between 1808 and 1816 was as follows:—-

Men.

N.C. | Gun- Officers.} ners.

Officers.

Companyof Artillery

Driver

Corps .

The troops of horse artillery were armed with five guns

(6 or 9 pounders) and one 54-inch howitzer. The field brigades were likewise armed with five guns and one how-

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1 British Gunner,

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itzer, the guns ranging from light 6-pounders to 1 2-pounders, At Waterloo there were four different armaments for field brigades. 'The " driver corps," raised in 1794, con- sisted of a few subaltern officers, with non-commissioned officers, artificers, drivers, and horses, The corps was divided into troops, the addition of one of which to a com- pany of foot artillery converted it into a field "brigade." The horse artillery possessed both drivers and horses, and required very limited assistance from the driver corps. Although the British artillery distinguished itself on many occasions during the Peninsular war? and at Water- loo, and French officers were loud in its praise, the field artillery still suffered from the great evil, want of mobility. Matters, however, had somewhat improved by the end of the war.

23,085 of all ranks. After the peace it was again reduced and horse artillery troops and field brigades were placed on a skeleton establishment of two guns each. In 1822 the driver corps was abolished, and the men and horses distributed among the field battalions, men being enlisted as " gunners and drivers." This system did not work well, owing to the difficulty of finding men who could combine such dissimilar duties. During the Peninsular war field guns and waggons were drawn by six and four horses respectively ; but in 1820 a committee recommended eight horses for heavy field guns, and six for light guns and waggons ; and after considerable opposition this was ulti- mately adopted. For some years the artillery, in common with the other branches of the British army, was kept down to the lowest state, but in 1848 the troops of horse artillery were increased to four pieces, and in 1852 they and the field batteries were raised to six guns. The field and horse artillery was increased to twenty batteries, giv- ing a totalof 120 guns. Shortly before the Crimean war a further increase of several battalions took place ; but not- withstanding these various augmentations, both field and

garrison artillery were entirely insufficient during the siege. At this time the field artillery consisted of " position bat- teries" of three 18-pounders and one 8-inch howitzer, or of four 12-pounders and two 32-pounder howitzers; of "field batteries" of four 9-pounders and two 24-pounder howitzers ; and of "horse artillery troops" of four 6§-pounders and two 12-pounder howitzers. In 1858 drivers, specially enlisted and trained, were permanently attached to each field battery. In. 1859 the Royal Regiment of Artil- lery, which had increased to fifteen battalions of field and garrison artillery and one brigade of horse artillery was reorganised and divided into horse, field, and garrison brigades—each an administrative unit complete in itself with its own staff ; and in 1862 the Indian artillery was amalgamated with the Royal Artillery, and the total strength of establishment was five horse and twenty-five field and garrison brigades.

Important changes also took place in the matériel about this period. The advantages of rifling had been long known, but it was not practically applied to ordnance until 1846. IRifled guns were first used by the British artillery at the siege of Sebastopol, but with no great effect, owlng to defective construction. A few years later the introduc- tion of the Armstrong breech-loading rifled gun (first used in the China campaign of 1860) caused a great alteration in the equipment of the British artillery. The 7-inch gun of 82 cwt. was introduced for garrison service and even for siege purposes; 40-pounders, on block trail travelling carriages, for batteries of position, while 20-pounders were intended for the same or heavy field batteries; the

- *For an interesting summary of the employment of artillery in the Peninsular War, see a paper by Captain Hime, R.A., No. 5, vol. viii, Proceedings of R.A. Institution, 1873.*

Great augmentations had also taken place dur- Progress of ing the war, and in 1815 the Royal Artillery numbered British

? since 1815.

France.

Prussia.

12-pounder of 8 ewt. being for the armament of field, and the 9-pounder of 6 cwt. for horse artillery. The field carriages were provided with a gun-metal " saddle" worked by a lever and hand-wheel for traversing, and ball-and-socket elevating screw. The limbers and ammunition waggons were constructed of an improved pattern, and the whole equipment showed a great advance in efficiency ; 124 rounds per gun were carried on the gun carriage and ammunition waggon, and a further "reserve" in a second line of wag- gons. The system of attaching small arm ammunition waggons to field artillery was abolished, and in future separate "ammunition columns" will convey this as well as reserve ammunition for artillery. The Armstrong system, which was but little tested in the field, has since 1873 been almost entirely superseded by muzzle-loading rifled guns, which will be described further on.

In France a new era for artillery opened with the wars of the consulate and the empire. The matériel underwent no great alteration, the 6-pounder being substituted for the 8 and 4-pounders for horse and divisional artillery, and a 24-pounder howitzer introduced. But beyond all other changes, we may note the increased tactical employment of artillery under the great artillery officer, Napoleon I. It 's to his wars that we first look for instances of the impor- tant effects produced by this arm, in that concentration of fire which in those days was only produced by massing guns! After the peace of 1815 the system of Gribeauval, which had served its time, was further improved upon. The matériel adopted in 1827 consisted of 12-pounder and 8-pounder guns, and 6-inch and 24-pounder howitzers. A six gun battery was composed of either four 12-pounders and two 6-inch howitzers, or four 8-pounders and two 24-pounder howitzers. The carriages and ammunition waggons were also improved, so that the detachments could be mounted on them, and the mobility thus much increased. A new mountain artillery equipment was also adopted; a powerful 12-pounder howitzer, but weighing only 220 Ibs., was introduced, the carriage and ammunition boxes being carried on mules ; and this equipment proved very service- able in the Algerian campaigns. In 1852 Napoleon Ta, when president of the Republic, did much to simplify the matériel, and introduced a 12-pounder shell gun, intended to fire solid shot

or shrapnel shell. Louis Napoleon had always made artillery a special subject of study ; and the great work on artillery commenced and mainly carried out by him is a standard work on the subject. In 1858 rifled guns, 12-pounders and 4-pounders, were adopted in the French service, and used with great effect against the Austrians in the Italian campaign of the following year. Since the war of 1870-71, where the French artillery proved itself markedly inferior both in numbers, power, and hand- ling to that of their adversaries, the French have been actively engaged in carrying on experiments, with a view to the introduction of a superior weapon, and have further increased their force of artillery by 120 batteries.

At the commencement of the 19th century the Prussian artillery was rather powerful than mobile, the field artil- lery counting 216 12-pounders, 96 heavy 6-pounders, and only 120 light 6-pounders. After the disasters. of 1806-7 this defect was remedied; and in 1816, when a further reorganisation took place, the ninety-six guns allotted to each army corps were in the proportion of three heavy to eight light. The horse artillery numbered twenty batteries in 1809, and twenty-seven in 1816, and for many years formed the bulk of the reserve artillery. The personnel of the Prussian artillery has developed enormously during the 19th century. In 1808 it formed threc brigades, cach consisting of six field and two horse artillery batteries. In

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1 See below under “ Tactics.”

sary. A considerable

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1814 it was increased to nine brigades, each composed of

twelve field and three horse artillery batteries, besides a proportion of garrison artillery and artificers, and corre- sponding to one of the permanent army corps of the Prus- sian army. modified that Prussia undertook the wars of 1864 and

Tt was with this organisation but slightly

1866. In the latter war the Prussian artillery did not

shine so much as its Austrian adversary ; and deficiencics were brought to light which were carefully remedied in the few years of peace which followed. Tn 1867 an addition was made of three Prussian

and one Saxon regiment of field artillery, with four divisions of garrison artillery, conse- quent on the incorporation of Schleswig-Holstein, Hanover, Nassau, &c., and the formation of three new army corps from these provinces. It was with this establishment that the war of 1870-71 commenced. The South German forces contributed four regiments of Bavarian artillery and twenty-eight batteries of Wiirtemberg, Baden, and Hes- sian artillery ; and altogether seventeen regiments of field and nine of garrison artillery took part, or were effective for service, in that war. In 1872 the German artillery was reorganised, the field artillery of each army corps being augmented to seventeen batteries, and divided into two regiments.

Similar progress was made by the other great European powers during this century. The Austrian artillery has always been pre-eminent both in the excellence of its matériel and in tactical handling on the field. In 1859 rifled guns were introduced; and in 1861 gun-cotton was substituted for gunpowder, but was soon afterwards aban- doned. In the unsuccessful war of 1866 her artillery especially distinguished itself by its gallantry and

devotion, and showed itself decidedly superior to that of her adver-
development of her artillery has taken place within the last few years, which will be treated of further on. Russia, which specially distinguished itself in the Napoleonic wars by the power and good service of her artillery, has continued to devote the same attention to it. In 1861 she adopted the French system of rifled guns, but after the German war of 1866 she abandoned it for the breech-loading system of Prussia, and has armed her field artillery mainly from the manufactory of Krupp at Essen, Of late years Russia has shown the greatest activity in all matters connected with artillery ; the re-equipment of her siege, garrison, and coast artillery has been energetically proceeded with, and her fortresses re- armed; more than 1000 rifled guns having been supplied and mounted in the years 1869-70. Her field artillery has also been increased from three to four batteries per division, and thirty-eight batteries of mitrailleuses addéd. :

To complete this historical portion of the subject some brief notice is necessary of the Indian artillery, which springing from the Royal Artillery in 1748 returned to it again in 1862, after a varied but glorious career. The company of Royal Artillery sent to the East Indies in 1748 formed the nucleus from which three companies of regular artillery, onc for each presidency, were raised in 1749. Five more companies were sent out between that and 1756; and on the reorganisation of the Indian army by Clive in 1765, the greater part of the Royal Artillery then serving there volunteered for, and was incorporated with, the Indian army, thus forming the basis upon which were formed the three corps of Bengal, Madras, and Bombay artillery. Its early days were passed in difficulties and com-parative obscurity ; it was recruited largely from the navy or merchant service, and many of the terms still in use, such as "'lascar" (native assistant-gunner), were drawn from that service. Its officers, as a rule, were utterly without technical training. By degrces, however, educated officers were obtained from the Royal Artillery, and both matériel

Austria,

Russia,

Indian artillery.

Field artillery.

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and organisation were improved, the changes following those adopted in England though somewhat tardily. Up to the end of the 18th century, however, bullocks were alone used for artillery draught, attached to the carriages by yokes and traces of raw hide ; and in the earlier wars the ammunition was carried on the heads of lascars, 'The artillery developed rapidly, as our Indian possessions and Indian armies increased, and bore a constantly increasing share in our triumphs in that country. Early in the 19th century it numbered three horse brigades, and seven Kuro- pean and three native battalions. In 1845 the Afghan and Gwalior campaigns led to improvements in this branch; and in the Sikh wars the artillery was at last placed in its proper position. In 1857 it had attained its maximum strength, and numbered no less than sixty-five European and sixty-six native troops and batteries, with a total of 524 field guns. Its last and most brilliant services as a separate body were rendered in the great Sepoy mutiny, and in 1862 it was amalgamated with the Royal Artillery.

Organisation, Administration, and Matériel.

Modern artillery is broadly divided into field, siege, and garrison ; and field artillery, again, is divided into moun- tain, horse, field (or foot),! and position artillery. The battery is essentially the unit of artillery organisation, both tactical and administrative ; and brigades or regiments are formed by combining a number of batteries for convenience of administration.

A battery of field artillery comprises three elements : viz., matériel—guns, carriages, ammunition, and stores; per- sonnel—officers and non-commissioned officers, gunners to serve, drivers to groom and drive, and artificers; and trans- port—horses, mules, elephants, oxen, &c. The number of guns in a battery varies from four to eight. Mountain and position batteries have usually four or six, field and horse batteries six or eight guns each. In England, France, and Prussia, there are six guns to a field or horse battery; while Russian and Austrian batteries have eight guns. The latter number seems to possess decided advantages. It admits of more convenient

division; and the half-battery of four guns is a small but convenient battery for any particular service. In England, where the battery is divided into three divisions of two guns each, the centre division has to be divided to form half-batteries. Moreover, the larger the unit consistent with tactical considerations, the fewer will be the relative number of non-fighting carriages, such as forges, &e.

Usually the guns in a battery are all of one class, but sometimes what are termed mixed batteries are formed. Thus, until recently a field battery consisted of five guns and one howitzer, or four guns and two howitzers. These mixed batteries were supposed to have an advantage over those of guns alone, in that they commanded every kind of fire, and were adapted to every variety of circumstance. There was, however, a serious objection in the fact, that the differences between the gun and howitzer were so great in range and employment, that the fire of one must usually be comparatively neutralised ; and the universal use of shell guns has now practically abolished mixed batteries.

The carriages which accompany a battery include (besides gun-carriages and limbers) ammunition waggons, store and provision carts or waggons, and forge waggons. The num- ber of ammunition waggons depends upon the amount of ammunition which it is considered necessary for a battery

1 The term field artillery has a general and a particular sense. In the former it applies to all kinds of artillery which accompany an army on the field of battle ; in the latter it is confined to that branch (in some armies called fvot artillery) which is supposed ordinarily to move with infantry, as distinguished from the lighter horse artillery and the heavier position artillery

to take with it in action—an important question, upon which there is considerable diversity of opinion. The greater the amount of ammunition a battery carries with it, the more independent it is; on the other hand, every additional waggon makes the battery more cumbrous, and lengthens out the column of march,—a serious considera- tion at all times, and especially in the case of artillery moving with the advanced guard of an army. The pro-

portion of ammunition to be carried must be based on past experience. At the battle of Liitzen, 1813, the French fired 220 rounds per gun, and on this they based their estimate. But in all the great battles of the Franco-German war of 1870-71 the maximum expenditure was 94 rounds per gun; at Vionville and at many of the great engage- ments not more than half this average was reached. The accumulation of waggons leads to batteries leaving a large part of their ammunition waggons at some convenient point under shelter when going into action; and the tendency now is to reduce the amount of ammunition with the bat- tery in order to obtain the greatest possible mobility, and provide against any failure of ammunition by a more effi- cient system of ammunition columns. In former days bat- teries were further hampered by having to carry the reserve of small-arm ammunition for the infantry and cavalry. This system was said to be advantageous, in that the infantry knew at once where they could obtain their ammunition, but its disadvantages were numerous, as it seriously en- cumbered the artillery; and, moreover, with the new tactics of long-ranging guns, the artillery, instead of closely accompanying the infantry, will often remain at a consider- able distance in rear, while the infantry is advancing. The reserve of small-arm ammunition is therefore now carricd by special ammunition columns.

The distinction between horse and field or foot artillery is another question at present engaging attention. Horse artillery was created to compete with cavalry in rapidity of motion, and for this purpose every man was mounted ; while field batteries were supposed to accompany the infantry, and their pace under ordinary circumstances to be limited to that of a man on foot. Under the new condi- tions of improved fire-arms, the dash of horse artillery has no longer its former value, while more mobility and more independence of action is required for the field batteries. It is therefore held by many that there should be only two classes of artillery : horse, or very mobile field artillery, and position batteries of heavy guns.

The organisation and interior economy of a battery is much the same in all field artillery. In England the com- mand is held by a major. Upon the commanding officer depends to a great extent the efficiency of the battery in peace and in war. He should be not only well versed in stable management and the ordinary routine of his duties, but he should be acquainted with the

matériel with which he has to deal, and be a practical gunner; and further, besides the tactics of his own arm, he should understand the combined tactics of the other arms in order to appre- ciate intelligently what is required of artillery in modern warfare. The second in command is a captain. The bat- tery is divided into three divisions of two guns each, each under a subaltern officer, who is responsible for everything connected with his division,—men, horses, guns, carriages, ammunition, and stores. Each division, again, consists of two subdivisions, each comprising one gun and ammunition waggon, with its quota of men and horses; and at the head of each is the No. 1 of the gun detachment,—usually a sergeant,—who is immediately responsible to the divi- sional officer for his subdivision. 'The No. 1 is technically the head of the gun detachment of nine gunners, and his duties in the field are to lay and command the gun.

Rockets and Mitrailleurs are generally associated with

Siege and garrison artillery,

England.

Mountain batteries,

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field artillery in organisation, but will be found treated of under their own titles. Rockets were applied to warlike purposes by Sir W. Congreve about 1804. They were used in 1809 in the Walcheren expedition, and with great success at Leipsic in 1813, but have since fallen somewhat into discredit on account of the danger of the service and their inaccuracy of flight. They are, however, still used for mountain and forest warfare against savage tribes, as in Abyssinia, in 1868, and in Ashantee, in 1874; and are very valuable for this purpose, from their extreme porta- bility and their moral effect. The rockets now used are Hale's ; they have no stick. They are carried in special rocket carriages when required. The rocket troop of horse artillery did excellent service in its day, but has long been abolished ; for some time a rocket section was attached to every battery, but this has also been done away with. Mitrailleurs are extensively used by some of the Continental powers, especially the French and Russians, but have not yet

been adopted as part of the British field artillery. The Germans oppose them on the ground that they are not equal to the guns, which they to a certain extent supersede. A Russian infantry division has one, and a French division one bat‘ery of mitrailleurs attached to it.

Siege and Garrison Artillery.—Siege and garrison artillery have not usually the complete and permanent organisation that distinguishes field artillery. In India and some other countries permanent siege trains are maintained; but usually the matériel is kept in store, and the personnel and transport are supplied from other sources according to requirement. In garrison artillery, the guns mounted on fortresses and batteries, or stored in arsenals for the pur- pose, furnish the matériel, and the battalions or companies of garrison artillery the personnel.

In giving a brief account of the artillery services of dif- ferent nations at the present time, we begin with that of Great Britain.

(a.) Mountain Batteries have for many years past been used in India, where the details have from time to time been changed by the light of experience. In England no batteries of this kind are maintained, though the matériel would be forthcoming and the personnel would be supplied from the garrison artillery. In 1868 two batteries were organised for the Abyssinian expedition, each composed of six 7-pounder M.L.R.! guns, with steel carriages, am- munition boxes, rockets, forge, &c. The gun now adopted is a 7-pounder steel M.L.R. gun, of 3 in. calibre and 200 ib weight. The carriages are entirely of iron, the axletree consisting of a stout bar of wrought-iron, the brackets, of single plate, being housed directly across it. The projec- tiles are common shell, double shell, sharpnel, and case ; the double shell is fired at high angles, with a reduced charge, and a modified form of vertical fire is thus secured, which is very useful in hill campaigns. In Abyssinia the guns were carried on the backs of mules, transversely sup- ported on iron saddles or cradles, It is generally considered more expedient, however, to carry the guns lengthwise. The carriage is distributed between two mules, one carrying the bed and trail, and the other the wheels. The ammuni- tion is carried in boxes, a pair to each mule. Mules are also provided for a small forge, tools, stores, &c.

In India mountain batteries are of two kinds, European and native, both officered from the Royal Artillery. There are two European batteries stationed in the Himalayas. The detail of each is 6 officers, 23 non-commissioned officers and trumpeters, 1 collar maker, 70 gunners ; total, 100 Europeans, with 119 native drivers, besides a native

1 The abbreviations M.L.R. and B.L.R., for " muzzle loading rifled " and "breech loading rifled" respectively, are used in the technical description of guns.

establishment of muleteers for baggage mules, grass cutters, artificers, d&c., and 182 mules. There are two native mountain batteries in Bengal, and two in Scinde; and it is intended to increase the mountain batteries of India by turning certain native field batteries attached to the local Panjab Frontier Force into mountain batteries.

(b.) Horse Batteries.—Horse artillery batteries differ Horse from field batteries in possessing a lighter equipment, batteries,

and in having the detachments of gunners to serve the guns mounted on horses. They are armed with six 9- pounder M.L.R. guns of wrought-iron, with tempered steel tube weighing 6 cwt.2 The personnel of a horse artillery battery at home is as follows :—

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lishment. lishment. Offices Pe svssps cooavecenscsusuecios-s: emeeaesaane 5 5 N.-C. Officers and Trumpeters…..... 20 22 ENUIRCENS:, , a. cst ees. suinsaaente ss GUIDE GSH tes sac covsscateeescemeteneeer een ee eee 70 70 DriVENS siciona.0. 50 doneueaise # sciaslaattamaeemeene 56 70 Horses (exclusive of officers' (riding…... 54 62 el) (draught…. 78 102

In India a battery has, further, a large non-combatant native establishment, as 23 subordinate medical and hospital attendants, and no less than 339 artificers and followers of various kinds.

The detail of guns and carriages is as follows,—6 guns and carriages, 6 ammunition waggons, 1 forge, 1 store, 1 general service waggon, and 1 store cart. The construction of our carriages is very solid, excessively so in the opinion of many, as mobility is sacrificed to gain strength ; but this is partly caused by the fact that English carriages must be so constructed as to endure all extremes of climate. The gun-carriage for horse (and field) artillery is of wrought-iron.

The. ammunition waggons are built on a framework of wrought-iron, with wrought-iron perches and wooden ammunition boxes. The projectiles are common and shrapnel shell, and case shot. Each limber has two boxes, and the body of the ammunition waggon four; each box contains a centre compartment, with 18 filled cartridges, two compartments front and rear, each with 6 shrapnel shells, and two side compartments containing 3 common shells and fuses in proportion. The ammunition carried is 4 case shot in the axletree boxes of the gun-carriage, 12 common shell, 24 shrapnel in the limber of the gun, and 36 common shell and 72 shrapnel in the ammunition waggons. A total of 148 rounds is thus carried by each gun with its ammunition waggon.

The stores for horse and field batteries are numerous, consisting of camp equipment, entrenching tools, harness and saddlery, artificers' tools, ordnance stores, and miscel- laneous articles, the details of which will be found in the regulation hand-books and equipment tables. These are packed and carried on the different carriages of the battery. Thus the gun-limber carries drag-ropes and axe in front, and other implements, such as spade, shovel, pick-axe, at the side of the boxes, or underneath, A centre box on the limber contains time and percussion fuzes and friction tubes. On the lids of the boxes inside are carried various fuze implements, anda camp kettle and two leather buckets are carried under the limber-boxes. Traversing handspikes and sponges are carried on the gun-carriage itself, and in the axletree boxes, besides the case shot, linch-pins, drag- washers, gun-spikes, cc.

The waggon is packed much in the same way, but two camp kettles are carried under the body, and a spare wheel in front, three picket posts are

carried on each side of the body, and under each alternate waggon of the battery a spare shaft oraxletree. The tents are packed between the

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? In India a few batteries are still armed with guns of old patterns.

Field batteries.

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ammunition boxes, and the many other stores distributed in various ways throughout the battery.

Each carriage in a horse artillery battery has six horses, except the general service waggon and store cart, which have only four. The horses are teamed in pairs,—lead, centre, aud wheel,—thc drivers mounted on the near horses, The off horse of the wheel is in the shafts. Much contro- versy has bcen raised as to the respective merits of "shafts " or "pole ;" the latter was in use in India for many years, and is still generally used by Continental powers. The balance of advantage seems to lie on the side of shafts, but it requires a very powerful horse for the off whceler, on whoinso much isthrown. The harness is strong and fairly simple. The off horses have pads upon which the valises containing the drivers' kits are carried. Pickct ropes and posts are carried on the waggons, and cach mounted man has a head rope and a forage cord, which may be used as a heel rope, a peg and leather shackle being carried for it.

(c.) Field Batteries differ from horse artillery in that they have a heavier armament, and the gunners are not mounted. The guns now in use are—({1) 9-pounder M.L.R. gun of 84 cwt., (2) 12-pounder B.L.R. Armstrong gun of 8 ewt., (3) 16-pounder M.L.R. gun of 12 cwt. No. 2 has, however, been superseded in England, and will erelong become ob- solete in India also, where the whole of the field artillery is being armed with the 9-pounder M.L.R. The 16-pounder isa most powerful gun, probably the most powerful field gun in Europe, but is heavier than the corresponding guns in Continental armies, and some consider that its weight is inconsistent with sufficient mobility.

The personnel of a field battery is as follows :—

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a field battery has, further, a native establishment of hos- pital attendants, lascars, grass-cutters, artificers, &c., and amounting in all to 247.

A. field battery has 6 guns and carriages, 6 ammunition waggons, 1 forge, 1 store, and 1 general service waggon— total, 15. In war time the 6 ammunition waggons (known as the second line of waggons) form the nucleus of the ammuni- tion reserve. In India the second line of waggons are kept in readiness in the arsenals, and when taken into the field are drawn by bullocks. The gun-carriages are of wrought- iron, similar in construction to those of horse artillery. The obstacle to the rapid movement of field artillery has always been, that no means were provided for carrying with the gun the gunners required to serve it, as the limber could at most only accommodate three men. In India the constant necessity for rapid movement had caused the adoption of axletree seats, by which two more gunners

could be mounted, one on each side of the gun, and saddles |

were also provided for the lead and centre horses of the gun team, so that, with the mounted non-commissioned officer, seven men would be at hand to serve the gun, in- dependently of those mounted on the waggons. The axle-tree seats are generally used on the Continent, and have recently been adopted in England for field batteries.

The projectiles for the M.L.R. guns are common shell, shrapnel, and case; the first used against earthworks, buildings, &c., the second against troops, and the third at close quarters. The fuzes used are percussion and wood

time fuzes. The amount of ammunition carried with the 9-pounder M.L.R. gun, and manner of carrying it, are the

same as in the horseartillery. With the 16-pounder M.L.R.

field batteries, the arrangement of the ammunition and the packing of the boxes and stores are similar, but the number of rounds carried is less. The near limber box of both gun and waggon contains 7 common and 5 shrapnel shells, the off one 5 common and 7 sharpncl, while the front waggon boxes contain each 5 common and 7 shrapnel shells, and the rear boxcs 12 shrapnel; so that, with four rounds of case in the axletree boxes, the gun and waggon carry 34 common shell, 62 shrapnel, and 4 case, or 100 ronuds altogether. In India the ammunition stores, &c., are similarly packed, but the camp equipment being larger is separately carried on camels provided for the purpose.

Field artillery has been carrved on elephants in India, and cradles or saddles are kept up there for the purpose in case of nced; and has also been transported by sletghs, asin Canada. The sleigh is a platform placed on runners 16 inches high and 3 feet broad. A description of the sleigh-carriages and the exercise with them is given in the Hand-book for Field Service.

(d.) Position Batteries,—a heavy field artillery, capable Position of inovement, but not required to move fast, or to change batteries.

position frequently, and used in the defence of special unportant points on a battle-field, entrenchments, &c. No manned batteries of this description are kept up in England, but the matériel is kept in store, and the personnel would be furnished from the garrison and field artillery. The guns at present used are 40-pounder B.L.R. Arm- strong guns, 40-pounder M,L.R., and 25-pounder M.L.R. guns. 'The carriages are of angle iron, with bracket trails, and of great strength; the projectiles are common and shrapnel shell, and case. The detail for a battery is as follows,-—4 guns and carriages, 4 ammunition waggons, 1 forge, 1 general service, 1 platform, 1 store waggon, and 1 store cart. The guns are drawn by 12 horses, harnessed four

abreast ; and as it is intended that the horses shall be furnished from the country if possible, the batteries have been specially fitted for the attaclment of farmers' horses.

In India position artillery is maintained in the form of "heavy field batteries," some being armed with 40-pounder Armstrong guns and 8-inch mortars, others still with the old smooth-bore guns. The guns are dragged by elephants, two for each gun, one in the shafts- and the other as leader ; the mortars and ammunition waggons by oxen. Elephants are dangerous under fire, and, therefore, their place is then taken by bullocks, of which ten pair are required for a gun.

(e.) Stege Artillery.—There is no special organisation of Siege The matériel artillery.

siege artillery in England in time of peace. is kept in store, and the personnel and transport are furnished according to the requirements of the particular service. The new M.L.R. wrought-iron guns, 40 and 64-pounders of 35 and 64 cwt. respectively, will probably form part of any future siege train, and with these will be associated 10-inch and 8-inch M.L.R. howitzers, and 54 inch and 10-inch mortars, or, perhaps, a rifled mortar. The personnel would be supplied from the garrison artillery, a battery of which at war strength would form a siege train battery. The transport might be specially furnished or supplied from the country in which opcrations were to be conducted.

The proportions of guns, &c., in a British siege train would be approximately—

55 64-pounder M.L.R. guns.

20 40-pounder Po o

30 8-inch M.L.R. howitzers.

To these would probably be added rifled and smooth-bore mortars according to circumstances, The proportion of ammunition must vary with the

Garrison artillery.

664

nature of the siege, but as a standard a detail has been fixed, which is given at length in the Revised Army Regu- lations of 1870.

The number of men required is calculated for three reliefs, or 30 men per gun, 15 per large mortar, and 9 per small mortar, with a reserve. A brigade of garrison artillery on war strength, numbering 51 officers, 135 non-commissioned officers and trumpeters, and 800 gunners, is held to be sufficient to man a siege train of 35 pieces.

The carriages employed are gun-carriages aud limbers, howitzer and mortar-carriages, platform waggons, general service waggon, Slege Waggon, store waggon, sling waggon and cart, hand and trench carts. 'The carriages are generally of the block trail pattern, and, except that they are stronger, are similar in construction to the travelling carriages for field service. The new siege limber is of universal pattern, and similar to the field limber in con- struction. The mortar-carriages consist of a bed with an axletree mounted on two wheels, and with a perch for limbering up to a limber for travelling. The platform waggon is composed of a fore and hind carriage, with a platform over them for carrying guns and mortars. The general service waggon consists of a fore and hind carriage with body over them, covered with waterproof canvas. The siege waggon is merely the general service waggon strengthened and fitted so as to transport shot and shell. The store waggon consists of a body and limber, and will contain spare stores and materials, and necessary tools. The sling waggon is composed of a body and limber, and fitted with windlass arrangement so that guns can be slung up underneath. In the heavier pieces iron sling waggons are used. Considerable improvements will probably be made in siege carriages so as to admit of the abolition of embrasures and of the gun being fired over the parapet.

In India siege trains are kept in readiness in arsenals, and the transport, which is composed of bullocks, is to a large extent also maintained, These siege trains have been hitherto composed of old smooth-bore guns, but these will be replaced by rifled guns. There are 16 such trains, with a total of 400 or 500 pieces. The personnel would be supplied from the garrison artillery and the native establishment in the arsenals.

The duties of the siege trains, the position of parks and batteries, &c., rather relate to the conduct of sieges, and do not therefore fall within the scope of the present article.

(f.) Garrison Artillery.—The garrison battery consists only of personnel, the matériel used being part of the defences or fortress in which this branch of the artillery is employed. 'The establishment of a battery is as follows :—

Peace, War. India, QOMRGETS es so. « sore ete oe 4 4 INize © (On Geng ieee cs mera sos teobecase 16 16 16 Gunners and Trumpeters….. 80 to 120 142 72

An Indian battery, further, has a native establishment of 30 hospital attendants, followers, &c. The care and preservation of the ordnance in fortresses and batteries, with all the complicated appliances and scientific construc- tions of modern artillery matériel, and of the carriages, stores, and ammunition, devolve upon the garrison artillery in peace time.

For fortress defence large numbers of smooth-bore 68, 32, and 24-pounders, and 8 and 10-inch shell guns, are still mounted. The general tendency, however, is to replace these with rifled guns of calibre suited to the importance and object of the work, while the mitrailleur or Gatling gun will probably be used in flanks and for the defence of ditches, Large numbers of 7-inch or 110-pounder B.L.R. Armstrong guns have been mounted since 1862. The M.L.R. guns are 7, 8, 9, 10, 11, and 12-inch, the latter weighing 35 tons. The projectiles of these are common,

shrapnel, and Palliser shell, case, and Palliser cored shot, and attain the extraordinary weight of 690 ib, An 81-ton gun is now (1875) in process of

construction, and is calcu- lated to throw a shell of 1600 fb.

The old smooth-bore garrison carriages are of wood, with various arrangements and platforms for traversing, The new carriages for the large M.L.R. guns are of wrought- iron, with hydraulic butter arrangements. 'The Moncrieff carriage and system, by which the gun is loaded and laid in a gun pit, raised by a counterwcight, and released again, descending after firing by the regulated power of the recoil, will probably be extensively employed in coast defences; and it is probable that still further improve- meuts will be made in the carriages for the immense ord- nance now used. .

General Organisation.—The whole of the British artillery forms one regiment, the "Royal Regiment of Artillery," numbering 1414 officers and 33,685 men, and distributed in 216 batteries of horse, ficld, and garrison artillery. For purposes of administration a unit higher than the battery is adopted, called the brigade. Each brigade has its own staff of colonel-commandant, 4 lieutenant-colonels, adjutant, quarter-master, &c. The batteries of the bri- gades are, as far as possible, kept in the same part of the country where the headquarters are serving. There are 6 brigades of horse artillery, 12 of field artillery, 13 of garrison artillery, and the " coast brigade ;" their detail and distribution will be found in the account of the British army (see ARMY, p. 578). Besides the brigade organisa- tion, there is another which may be termed the territorial system, or district commands, having reference especially to local duties, stationary matériel, such as guns mounted on forts and batteries, &c. These artillery districts corre- spond generally to the army districts, and have at their head a colonel on the staff, or other officer commanding the artillery district. In the United Kingdom there are also artillery sub-districts, under lieutenant-colonels, who are invested with the commands of the auxiliary and reserve force artillery of the sub-district. The highest adiministra- tion of the Royal Artillery is conducted at the War Office, in the department of the Commander-in-Chief,—a deputy- adjutant-general of artillery, with assistants, being attached for that purpose to the adjutant-general's division, An inspector-general of artillery is charged with special artil- lery inspections in the United Kingdom, and also inspects the matériel and munitions of war in the hands of the artillery. The department of the director of artillery and stores at the War Office is a branch of the

Ordnance Department (see Army, pp. 573, 582), and deals with all matters relating to armaments, stores, and munitions not in artillery charge, and superintends the manufacture of warlike stores aud the scientific experiments which have to be constantly made. In India the administration is not dissimilar, a deputy-adjutant-general and inspector-general of artillery performing duties analogous to those of the similar officials in England, while the director of artillery is represented by an inspector-general of ordnance and magazines.

Although Woolwich is no longer the official headquarters of the artillery it is the chief artillery station, and continues to be that to which officers and men practically look as their headquarters. The mess and band of the regiment are permanently maintained there ; and a large number of batteries, including the greater part of the depot brigade, are always stationed there, and it further contains most of the great artillery establishments, both manufacturing and instructional.

For an account of the manufacturing establishment see ARSENAL, p. 633, and for the scientific and educational establishments see ARMY, p. 586.

Proportion of guns to men.

France.

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Unlike Continental nations, England has no permanently organised army corps and divisions, and, consequently, no combinations of artillery with the other arms. Her colonial possessions, and the vast extent of her Indian empire, raise almost insurmountable obstacles to any organisation which shall fulfil equally the conditions of peace and war, and have necessitated a distribution of the artillery on princi- ples other than those which obtain in the more facile systems of Continental armies. The proportion of guns to men at present existing is 2°45 per 1000 men; the grand total of guns for field service,—including field, mountain, aud position batteries—being 784, while the total strength of troops, British and native, is 320,000. This proportion is somewhat under that now generally accepted, viz., 3 guns per 1000 men. The proportion of guns to men has varied with the circumstances

of the age and country. During the 18th century the proportion was usually 3 per 1000, though Frederick at one time raised it to over 5 per 1000. In the earlier wars of the French Republic the allies increased the proportion unduly; and Napoleon, whose rapid tactics did not admit of his hampering his army with heavy trains, reduced it again. He advocated 2 guns per 1000 with old and tried troops, but 3 guns per 1000 with the usual composition of an army; and in his later cam paigns, when his armies consisted almost entirely of recruits, he even exceeded this proportion. In the Crimean war, and in 1859, the Russians aud Austrians increased this ratio considerably, but the great increase to the strength of armies which took place between 1866 and 1871 led to a coniparative decrease of artillery, and the Germans have now rather less than 3 per 1000. It must be remembered, however, that the actual proportion on service is always in excess of the nominal one, often considerably so, as the guns are not reduced by the wear and tear of the campaign as the personnel of an army is; a battalion is soon reduced from 1000 to 500 men, but a battery always retains its six guns. In the great American war of 1862-65, the pro- portion of guns at first was nearly 6 per 1000, but towards the end was reduced to little over 1 per 1000, showing how the proportion is affected by the nature of the country which is the scene of operations.

Important questions connected with the organisation of the British artillery are now giving rise to discussion, and will probably be solved shortly; the two principal ones being the breaking up of the huge, overgrown " regiment " of artillery into smaller units, and the separation of the field from the garrison artillery. The appellation " regi- ment," for a force of 35,000 men and officers, is manifestly a misnomer, and the continuance of the present system is upheld principally on what may be termed " sentimental " grounds,—unwillingness to break old ties and uproot traditions, and fears that the esprit-de-corps of the service might suffer in the change. The separation of the field from the garrison artillery has often been advocated on the grounds of the essentially different nature of the two ser- vices, and the fact that the men and matériel are already separate, the officers alone being transferred from one branch to the other. The full discussion of the proposed changes does not fall within the province of this article.

The organisation of the French artillery has been com- pletely changed by recent regulations. Previous to the Franco-German war of 1870-71, it consisted of 1 horse artillery and 1 field artillery regiment of the guard, 4 horse artillery and 12 field artillery regiments of the line, with garrison artillery, making up 19 regiments. The horse artillery regiments consisted of 8 batteries of 6 guns each, and the field artillery regiments of 12 batteries. Only 8 out of the 12 were mobilised during war, 4 remaining as batteries de sortie for garrison service. The number of field guns available was 984. This number of guns could not

be put in the field at once, as 58,000 men and 39,000 horses were required, while in peace time only 34,000 men and 16,000 horses were kept up. The guns in the service were a 9-pounder (shell) mountain gun cf 2 ewt., 9-pounder of 64 cwt. for field artillery (canon de 4), 16-pounder of 114 cwt. (canon de 8), 25-pounder of 12 cwt. for position artillery (canon de 12), and 50-pounder of 40 ewt. (canon de 24) for siege purposes. These were of bronze, and rifled on the La Hitte system. In naval service B.L.R. guns of cast-iron, strengthened by rings, have been em- ployed, ranging from 70 to 300-pounders. The field guns fired studded projectiles, shell, shrapnel, and case; and the heavy guns heavy elongated projectiles of similar kinds.

In accordance with the recent regulations, each of the 18 French army corps has a brigade of artillery attached to it, consisting of 2 regiments, 1 of divisional, the other of corps artillery. The divisional regiment consists of 8 field batteries and 1 depét battery; the corps regiment, of 3 horse artillery batteries (1 of which is attached to the cavalry in time of war), 9 field batteries (1 of which is utilised for service in Algeria), and 1 depét battery. Each brigade has besides 4 dismounted batteries for garrison service, and 4 companies of drivers for ammunition columns, An army corps has, therefore, 4 batteries attached to each of its divisions, and employs 10 batteries in addition as its corps or, as it was formerly called, reserve artillery. The war strength of each battery is 5 officers and 168 men, The field guns in use are the 15 and 10-pounder bronze B.L.R. Reffye guns (canons de 5 et de 7). (See Guns AND GUNNERY.)

The general organisation and distribution of the German Germany,

artillery will be found under Army (p. 597). To each terri- torial army corps is attached a brigade of artillery, consist- ing of 2 regiments of field artillery and a regiment, or por-

tion of a regiment, of garrison artillery. The first jield Field regiment or corps artillery consists of 2 field divisions of 3 @ttillery.

field batteries each, and one horse artillery division of 3 batteries. The second field regiment or divisional artillery consists of 2 divisions, each of 4 field batteries. The field guns are the 9-centimétre B.L.R. gun, firing a shell of 154 tb weight, used by the field batteries, and the 8-centimétre B.L.R. gun, firing a projectile weighing 11 ib, with which the horse artillery is armed. These guns are of cast steel, with polygrooved rifling and wedge breech action (systeme de Krupp). Each battery has 16 carriages, viz., 6 guns and carriages, 6 ammunition waggons, 3 provision and store waggons, and 1 forge waggon. The gun-carriages are double cheeked, and made of plate iron. The ammuni-

tion waggon carries one large box opening to the rear, The projectiles are a common shell of novel construction, case, and shrapnel—the latter only lately introduced. The following ammunition is carried per gun :—

Gun Limber.

Waggon Limber.

Waggon

Ammunition. Body.

Case

Common Shell Shrapnel Case

teerce

CO

9-cent. gun | 8-cent. gun

The artillery ammunition columns have 25 waggons each, and provide a first reserve of about 125 rounds per gun. The infantry columns have 24 small-arm ammunition

waggons. a II. — 84

Siege artillery.

Garrison artillery.

666

The tollowing table gives the personnel and transport of a battery or ammunition column on war establishment :— nn |

: A Ammunition

| Batteries. | oie:

Ficld. a E

Iorse. = é

‘g-c.ntm.|9-centm.) 4 &

Commanding officer …..... 1 1 1 1 1

Subaltems 20 Seeeeencmer 4 4 4 Pa ae

Officers of ammunition 9 9 ei eee eter: |) ae hae ae

Laboratory conductor ; 1 1 (os0%01-)) apace conacoesuacoscono” :

Quartermaster …....000++ 1 1 1 il 1

Ensign (aspirant to rank of} 1 T . = Gliteen) eeraes seacemmeosteec:

Non-Commissioned officers .| 12 12 12 12 12

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Spare MeN ….....seeeee eee ees = 23 23 37 34

COrporals….....2s00:500>+-« lier = Aa 3 3

Hospital orderly co seeeee sas seal 1 1 1 ‘| 1

Collarmakers and Saddlers; 2 1 il 1 1

Soldiers of the transport; train (including officers’| ? 5 5 5 80 84 SCLVAMES)-cccscecesoresrsacers

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For siege purposes the Germans use the 12-centimétre (4°68 inch) bronze gun, firing a 29-tb shell, and steel and bronze guns of 15 centimetres (6°85 inch) calibre, firing a 54-3b shell. The mortars used are the 8-inch rifled, and the smooth-bore 15-centimétre. The usual composition of a siege train is 400 guns, viz. :—

40 of 9-cm. (bronze). 120 of 12-cm. (bronze). 120 of 15-cm. ea short 40 of 15-cm. (steel), long. 40 rifled 21-cm. mortars, 40‘smooth-bore 15-cm. mortars,— besides 150 rifled wall pieces.

A 21-cm. shell gun and a 28-cm. rifled mortar are likely to be added to this list soon. Each gun has 508 rounds of ammunition ready for immediate service.

The siege trains are 2 in number, and in time of war have 16 ammunition columns attached to each. These columns consist of 46 ammunition waggons, 6 open waggons, a forge, and some baggage and forage carts. Each waggon is adapted for draught for either 4 or 6 horses.

The garrison guns are the 12-centimétre gun in cast-iron and bronze, 15-centimétre, 23-centimétre (9-inch) cast-iron howitzer and heavy guns for garrison, coast, and naval purposes, ranging from 7-inch to 13-inch calibre. The Prussian artillery is breech-loading, and three systems are employed in the closing of the breech, viz., that of Wahren- dorf, or the " piston" arrangement (Kolbenverschluss)—that of Kreiner, or the ""wedge" system (Ketlverschluss) —and the Krupp system, or cylindro-prismatic wedge (Rundketlver- schluss). The first dates from 1861; the second system has been applied to land guns since 1864; the third is, in slightly varying forms, applied to all the most recently manufactured guns. 'The siege carriages have a peculiar arrangement of iron supports on the cheeks, by means of which the gun is enabled to fire over the parapet. The foot or garrison artillery has recently been reorganised into 30 battalions, counting 122 batteries or companies. The number of regiments is 19, but the number of battalions

320 rifled guns

ARTLLL@ay

in a regiment varies. The garrison artillery is separated from the field artillery, and is specially attached to the army territorial commands, and officers can only be transferred from one branch to the other by special permission.

The Austrian artillery is divided into field, garrison, and technical artillery.

The field artillery consists of 13 regiments, having their permanent headquarters in Prague, Olmiitz, Komorn, Josephstadt, Pesth (2), Gratz, Vienna (2), Lemberg, Neustadt, Laibach, Temesvar. Each regiment comprises six 8-pounder and four 4-pounder field batteries, three 4-pounder horse batteries, one depét battery, and five or six ammunition columns.

Three batteries are attached to each infantry division, and three form the corps artillery, one battery being detached to the cavalry. In peace time a battery has only four guns and two ammunition waggons horsed; on war footing they have eight guns and eight waggons each drawn by four horses in the 4-pounder field batteries, and by six horses in the others. The guns are 4 and 8-pounder bronze rifled guns, having calibres of 3 and 3°9 inches, and firing 8-Ib and 14-Ib shell respectively.

Steel B.L. guns of the Prussian type are, however, being gradually brought into the service, the M.L. system being definitely abandoned. The carriages are double cheeked or bracketed like the Prussian. A box to hold case is fixed on the trail about halfway between the breech of the gun and the point of the trail, and adapted to form a seat. The projectiles are common shell, shrapnel, incen- diary shell, and case. As in the Prussian artillery, the percussion fuze is alone used with common shell, and time fuzes for shrapnel. The peace and war establishments of batteries and ammunition columns, and the number of rounds carried, are shown in the following tables :—

Peace Establishment. War Establishment.

4-pr. 4-pr. Ammun. eg Cadres. Teed Battery. Cols. ; oO = q = o # 3 oS Ao] Lo] oS S/E\S BS EISm| aja la fea) [o3] Captains ….cccorccees ad |) ae): es) a Subalterns ….....00- 3/3| 56} 6| 3| 8| 3] 4 \s 3 CHUGH ..cc.scrocssescescss TL Ma) es if eee | bel | ah IP 2k || cel] cas |) G00'll] one IATHIAGCLS\c.c+<0see- see ou 2 i S|) On eh 2 Sa os aa ee Sergeants….ccccseeeee 404s) a | cael Se el, aS) | meet eer ez Corporals…..ccccseeeee 61) GN Bl) Sal eSh|) Sul ae! |) Ge] Gn) ee Trumpeters Te Weyl ti) DI) Bin Se) M28 1 28 | ee ea SO ct (eal 10 | 16| 16] 16] 20] 8| 8| 8 eeeseecceses ' GUNNETS ..scccreeeeeeee 46 | 46|50|12] 6| 65 | 65 | 75 | 90 | 47 | 52 | 57 DYAVOTS .cccccecrescese 95 | 31 | 31]... | | 60 | 80 | 80 | 70 | 98 }108 [L138 SOLVAHiis)

Total,.....ceee Horses :— OfFiCeTS' ...ccceeeeee 1 Draught — .....00. 84 120 1120 RESETVE ..cccscseeee el} cool) 3 8 riding…...| <<. see aoa draughit…| o.

The 4-pounder batteries carry 156 rounds of ammunition per gun, the 8-pounder 128 rounds, The first ammunition reserve conveys in addition 74 rounds for each 4, and 82 for each 8-pounder. The total number of rounds for each gun is, therefore, 230 and 210 respectively.

In order to avoid dependence on foreign contractors attempts are being made to cast a hard bronze for field guns, and it is hoped that by employing this metal a portion of the new equipment may be furnished by the Austrian arsenals.

The war matériel necessary to place the batteries on @ war

Austria.

Field artillery.

Garrison artillery.

Technical artillery.

Russia,

ARTTELLE RY

footing is kept under charge of the field artillery, store horses being apportioned for it in the barracks of each regiment. By this system mobilisation is more quickly effected, and the matériel is better looked after than when stored in arsenals. Including the depét batteries the Austrian artillery numbers 209 batteries, or 1672 horsed guns.

The garrison artillery consists of 12 battalions of 5 com- panies each (increased to 6 in war time), and one coast artillery regiment of three battalions. The garrison bat- talions further furnish 5 mountain batteries, increased to 6 in war time. The mountain batteries are armed with four 3-pounder rifled bronze guns, and carry 112 rounds per gun, viz., 72 common shell, 24 shrapnel, 16 case. For siege and garrison purposes the guns in use are B.L.R. 15 and 21-centimétre and 8-inch bronze guns ; 8-inch and 64-inch rifled mortars, breech-loading, have also been adopted.

The technical artillery comprises a portion of the workmen charged with the construction and repair of guns in all arms, ammunition, artillery matériel, &c. The personnel, numbering 28 supcrior officers, 162 captains and lieutenants, and about 1600 men, is distributed in sixteen arsenals, established in the chief towns of the empire ; in war time companies of artificers are detached from these to the parks of each army corps. Artillery officers have to serve by roster in the technical artillery.

The instruction of officers is conducted at the cadet school and at the Academy of Technical Artillery. On leaving this academy officers ordinarily pass into the garri- son artillery, and after a year in this enter one of the regiments of artillery. After a second year they may be admitted, on application, to the advanced course of artillery, and after passing successful examinations are nominated as first lieutenants. Schools also exist in each regiment for the instruction of non-commissioned officers, one-year volunteers, and artillery cadets ; and an autumn course of equitation, the most proficient at which are sent to the central school of equitation at Vienna, to be from thence appointed as riding-masters to the artillery regiments. For further details of Austrian artillery organisation see article Army, p. 606.

The Russian matériel is divided into mountain, field, siege and garrison, and coast artillery. The mountain gun is a 3-pounder bronze rifled gun of 224 ib weight, firing a 9-Ib projectile. For field artillery they use both cast steel and bronze B.L.R. guns, 4-pounder and 9-pounder, of 3°3-inch and 4-inch calibres, firing 12-lb and 24-ib shells (loaded). Mitrailleurs have also been introduced for field artillery, and with them the range-finder, invented by Captain Nolan, R.A. The siege and garrison guns are 12 and 24-pounders, throwing 30 and 63-Ib shells, 8-inch bronze and steel guns, and 6 and 8-inch rifled mortars. For coast purposes guns from 6-inch to 11-inch calibre are used. The Russians have also introduced a 50-ton gun, or 1200-pounder, but the future will prove its efficiency. Krupp of Essen has been largely employed by the Russian Government for the supply of steel guns, but these are now furnished by Russian factories.

The field carriages are of wood and iron, that for the mountain gun of iron; but the former are now to be made of greater stability, and the carriages for

siege and garrison artillery have also been improved. The projectiles used are the charokh and shrapnel for the mountain and field guns, chilled shot being used with the heavier ordnance.

The artillery of the active army consists of 48 brigades of field and 8 brigades of horse artillery, besides siege trains, parks, and mobile arsenals.

The horse artillery brigades (bodyguard excepted) con- sist of 4 batteries of 6 guns each. A brigade of field

artillery consists of 5 field batteries (3 heavy and 2 light) and 1 mitrailleuse battery. There are four descriptions of batteries,—(a.) 9-pounder field batteries, (b.) 4-pounder field and horse batteries, (c.) 3-pounder mountain batteries, (d.) mitrailleuse batteries. Each battery has eight guns, drawn by six horses in time of war.

The two-wheel ammunition carts formerly in use are being gradually replaced by four-wheeled waggons. The mitrailleuse batteries carry 6290 rounds. In the 9-pounder battery there are 24, and in the 4-pounder 16 ammunition waggons.

The great increase and development of the Russian army, which began in 1873, was accompanied by a corresponding increase in the artillery, each brigade being raised from 4 batteries, its former strength, to 6, and a further increase of 2 batteries is probable. When the changes in progress are completed, the Russian field artillery will number 300 batteries, or 2400 guns.

Tactics.

The tactics of artillery, combined with the other arms, will be dealt with in another place (see War). The present article treats only of drills, and the simpler or uncom- bined tactics of artillery. Drill, though commonly in- cluded under the head of tactics, is rather the elementary training and education required for the higher development, and varies according to the nature of the artillery. The

drills and instruction for horse artillery are as follows :—(1.) Horse Equitation or riding drill. (2.) Foot drills, as for cavalry, artillery.

(3.) Sword drill. (4.) Field gun drills. This includes the actual service of the gun, the loading, laying, and firing, &e., positions of gunners and detachments under various conditions, limbering up, unlimbering, exercise with drag ropes, dc. ; also, such exercises as dismounting gun and carriage, mounting gun and carriage, replacing a damaged wheel, exchanging gun and limber wheels, shifting shafts from double to single draught, and vice versd, moving dis- abled ordnance, &c. For details the reader is referred to the Manual of Artillery Exercises. (5.) Battery exercise (sometimes called by the horse artillery " gun drill"). In the horse artillery each subdivision consists of gun and waggon, with two non-commissioned officcrs, and six or eight gunners, besides drivers. Two gunners are carried on the limbers. 'The rest are mounted, and are called the detachment, which is placed in front, rear, or on a flank of the gun, according to circumstances. Ammunition waggons of horse artillery do not manceuvre usually, but merely conform to the movements of the guns at a safe distance. A battery of six guns in line occupies 95 yards, each gun being 19 yards from the next. When a battery comes into action, each detachment dismounts, the limber gunners get off the gun-limber to the rear, the trail is unkeyed, the limbers drive on, and the gun is placed in position, and the Nos. 1 lay them during the loading. They are then fired independently, unless the commanding officer gives orders to the contrary. ' Limbering up" is the converse operation. The details of drill will be found in the Manual of Field Artillery Exercises.

Field Artillery.—The drill of a field battery is almost Field the same as that of a battery of horse artillery. The space artillery.

occupied by a battery and the intervals are the same. There are, however, no mounted detachments, and the waggons usually accompany the guns in manceuvring, though on the battle-field they are supposed to be kept at a safe distance, and if possible under cover. The gunners are carried on the limbers and waggons when the battery moves faster than a walk. 'The provision of gun axletree seats now enables a sufficient number of men for

the service of the gun to be kept with it under all circumstances. The drill for mountain batteries is not laid down anywhere

but is conducted on the same general principles as that of a field battery. Ease and celerity in coming into action is the great object in that as in all field artillery drills. At the word "halt, action, front," (" rear," " right," "left "), as the case may be, the carriage is taken off the carriage- mules, the wheels taken off the wheel-mule, and run up to the carriage and put on. The gun has by this time been lifted off by gunners by means of a handspike in the muzzle and one under the cascable, and is put on to the carriage. The movements of a mountain battery in "column of route," i.e., single file, in "columns of subdivisions," the ammunition mules being alongside the gun and carriage mules, or in "columns of divisions," subdivisions being side by side, two and two, are merely adaptations of the manoeuvres of field artillery.

Siege Artillery.—The drills for the service of siege guns are numerous. 'Travelling carriages being used, the drill employed is a medium between field and garrison gun drills, and comprises unlimbering, limbering up, shifting from travelling to firing trunnion holes and, vice versa, the load- ing, laying, firing, &c., the mode of "taking post" under cover and at the gun.

Mortar drill would also come into this section, and embraces the manner in which the travelling mortar-beds are unlimbered and placed on the ground, and the converse operations, the detachment taking post at the mortar, the preparation for action, the mode of laying the mortar, load- ing, firing, &c. The laying of platforms also forms an important part of the duties of siege artillery. " Knotting" and the use of ropes and tackles is an essential branch of the drill. A siege artilleryman must be instructed in all the materials and appliances used in moving ordnance. Chains, levers, handspikes, fulcrums, skids, planks, rollers, crab capstans, lifting jacks, &c., all enter into his work. He must also be acquainted with the numberless operations by which siege guns are moved when dismounted, the mode of mounting and dismounting them, while the drills for gyns, sling waggons, sling carts, sheers, &c., are particularly his province.

Garrison Artillery.—The drills for garrison artillery embrace all those which come under the head of szege, but, further, comprise all the drills and exercises with heavy ordnance, such as drills with heavy guns on standing carriages, traversing platforms, and Moncrieff carriages, and with the enormous 10-inch, 11-inch, and 12-inch guns, fitted with special mechanical contrivances for loading, traversing ; mounting and dismounting of heavy ordnance; and all kinds of work with sheers and derricks. The garrison artillery are also trained in the ordinary duties of infantry, viz., carbine, company, and battalion drill, All artillerymen are further instructed in the laying of ordnance, judging distance, and in the various laboratory operations which gunners are required to know, the handling of all kinds of projectiles, fuzes, &ec.

Field Artillery Maneuvres.—In manceuvring batteries,

bined tac- no fixed right or left is acknowledged, but only the front

to which the guns point when in action, or the horse's face when limbered up. The paces used are the walk, trot, and gallop, and, according to Taubert, the "trot" is the most important. With us field batteries are strictly enjoined not to move beyond a trot, but there are occasions on which it is necessary for a battery to move at its quickest possible pace; and in Germany this is recognised and acted upon. Field artillery has increased in mobility by the recent change in matériel and the provision of axletree seats, so that there is no longer danger of a gun coming into action without a sufficient number of gunners to work it. Batteries should, therefore, be exercised to manceuvre with waggons at a safe distance, taking advan- tage of cover, but conforming to the movements of the guns.

Columns of artillery are composed of batteries, half bat- teries, divisions, subdivisions, and columns of route. Tau- bert divides artillery columns into (1) the column of march, (2), the rendezvous column, (3) the column of manceuvre. 1. With us the first is usually the "column of route " or single file, each waggon following its own gun ina long string. In the German army the guns come first, and then the waggons. 'This has the great advantage of not hampering the line of march, and is peculiarly adapted to the use of artillery with a large advanced guard, Columns of divi- sions may be used on a very broad road. 2. Rendezvous columns are open columns

with the guns at full interval, so as to admit of guns, &c., reversing or taking ground to right or left. 3. The column of manceuvre may, when cover exists, be formed at close interval, but never so under fire. A close formation enables batteries to get near an enemy unseen, and the commander has the force well in hand, but this advantage should not weigh with the necessity for opening out for fire at the earliest moment. The best formation on the battle-field is that which admits of the easiest deploy- ment for action. The position of guns is always governed by the nature of the ground, and " every possible advantage should be taken of this without paying too much attention either to intervals or dressing." The construction of gun- pits and epaulements for the waggons should be an im- portant part of drill.

Positions for artillery must naturally be dependent on the Artillery character of the ground, and the objects to be executed Positions. by the guns. But where a choice exists, we must be guided by principles which secure us the vantage ground. A flat trajectory for our guns is highly important in diminishing the safe space for the enemy, and with this view a very elevated position is to be avoided. Such position is also bad if percussion fuzes are used, and the soil which the enemy occupies is soft. On the other hand, artillery do not now change their positions so frequently as in times past, and are more constantly required to fire over the heads of their own infantry ; and a position sufficiently elevated to give a good command of the country and search out the enemy's position is therefore more required than formerly. Shell firing against troops under cover will also enter largely into the use of artillery in future, and for this command is of im- portance. A point of first importance in selecting a position is the absence of cover for the enemy within range of infantry rifle fire; and the position should be such that advance or retreat is easy. The brow of a hill, where the guns can be partly, and the limbers and waggons entirely covered by being withdrawn, is generally advantageous. The ground should be neither heavy nor stony. A good deal of con- troversy has taken place about the dispersion or concen- tration of guns for fire. If the object, 2.e., concentration of fire, can be attained by dispersion of batteries, it may be better under certain circumstancesof ground to separate than to collect the artillery in large masses ; on the other hand, dispersed batteries are much more out of control, and unable to receive the directing impress of one

mind, and usually the employment of large masses of artillery will have a greater moral effect. The one object, concentration of fire, must be attained.

The most powerful and effective position in which artil- lery can be placed is that in which, acting on a flank, it enfilades or takes in flank the enemy's troops. A remark- able illustration of this was given by Frederick the Great at Rossbach. At the battle of Talavera, July 28, 1809, the British guns changed position to the right, advancing from the left flank, and brought a destructive fire to bear on | the French columns attacking from the centre of their line. | At the battle of Bautzen, May 21, 1813, Napoleon's great | manceuvre, in sending Ney to attack the right rear of the allied position, was frustrated by the fire of 20 Prussian

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guns taking Ney's columns in flank on the march. The battle of the Alma, September 20, 1854, gives an example of the effect produced by the enfilade fire of a few guns. Two guns of Turner's battery boldly advanced to a knoll which had been left unguarded almost in the centre of the Russian position, took the Russian columns in flank, and with such effect as almost to decide the fortunes of the day.

It has been explained that, in the early days of artillery tactics, guns had occasionally been massed, but usually with no clear aims as to their functions ; nor was this state of things altered until far into the Napoleonic era. It was at the camp of Boulogne in 1805 that a truer system of tactics was first practised, and it was at the battle of Friedland, on the 14th June 1807, that the first striking example of the effect of artillery when employed in masses was given. The Russians had crossed the river Alle and taken up position in front of the town of Friedland. Ney had been ordered by Napoleon to drive back the Russian left and occupy Friedland, but had met with a severe check, when the French artillery general Senarmont collected the divisional artillery of the 1st corps, and, dividing it into two batteries of 15 guns each, with a reserve of 6 guns, placed a battery on each side of the road from Eylau, and by a converging and destructive fire of case broke the Russian columns, defeated all attempts on their part to resume the offensive, and finally drove the Russian left into the narrow defile and re-entering bend of the river.

At the battle of Wagram, 6th June 1809, Napoleon, pivoting on his left, advanced his right, turning the Austrian left, and attacked the centre with a mass of 100 guns. This imposing display of artillery power covered the French centre, and fixed the attention of the Austrian commander to the point, while the left was enabled to execute its turning movement. The French artillery, however, suffered excessively, the range being too short, and the want of mobility of the field batteries conspicuous.

The battle of Liitzen or Gross-Gérschen was fought between the allied Russians and Prussians and the French in May 1812. The former had 438 guns, the latter only 236. The allied artillery was not well handled, the fire being kept up in a dispersed and thriftless manner, the guns scattered between the infantry columns, and no powerful reserve being formed. Napoleon, reserving the artillery power he possessed, brought up a mass of 80 guns at the decisive moment, and with such effect that the allies gave ground and ultimately retreated.

The battle of Hanau, October 30, 1813, is a striking instance of an artillery fight. Napoleon was retreating from Erfurt after his defeat at Leipsic. Wrede barred his retreat, holding the issues of the forest of Hanau. Wrede had formed a battery of 60 guns, which for some time defeated all efforts of Napoleon to break out from the forest ; and it was only Drouet's skilful concentration of fire, from three gradually reinforced masses of artillery upon Wrede's large battery, that enabled Napoleou ultimately to win his way out.

For other illustrations of the use of artillery on the battle-field, the reader is referred to Taubert's work On the Use of Field Artillery, translated by Col. H. H. Maxwell, R.A., and Hohenlohe-Ingelfingen's treatise On the Employment of Field Artillery, translated by Capt Clarke, R.A.

Jn the Italian campaign of 1859 a close country prevented much use being made of artillery, but at Solferino both Austrians and French massed considerable numbers of guns, and a brilliant example of the use of artillery was presented on the plain of Medole. M'Mahon having inclined to his left to support the attack on the Solferino heights, while Niel was fully engaged with a superior Austrian force on his right, a gap was created between these

two corps. To fill this a mass of 42 guns, supported by cavalry, formed on the plain of Medole, and their fire frustrated all offensive

attempts of the Austrians at this point. Rifled guns were employed by the French in this campaign, and without doubt contributed largely to their success.

In the struggle for supremacy of the two great German powers in 1866, both combatants were armed with the new weapons, but their proper applications seem to have been totally misapprehended. The Prussian batteries were kept too much in rear of the other troops while on the march, and came into action at ranges which only a very exag- gerated view of the powers of rifled guns could justify. At Trautenau, Nachod, and Skalitz their artillery played an unimportant part ; at Sadowa comparatively few of the vast number of their batteries came into effective action. The Austrian artillery had but little opportunity of dis- playing superiority of management or tactical training, though its heroism and self-sacrifice in covering the retreat on the eve of Sadowa is worthy of mention.

Till the campaign of 1870-71, the proper management and powerful effect of modern artillery was never thoroughly realised. The pungent criticism of certain anonymous writers on the 1866 campaign bore its fruits, and revolu- tionised the system of artillery tactics, From the storming of the Spichern heights up to the capture of Le Mans the same tactical features were prominent on the victorious side. A battle was preluded by the bold advance of all available guns, The attack commenced with a concen- trated fire of artillery, the moral, if not actual, effect of which enabled an offensive movement of infantry to be made with success, or at least kept the enemy in check till the flanking movements, so conspicuous in this war, were carried out. At Worth more than 100 guns were massed on the heights opposite Froschwiller, and enabled a frontal attack to be made across the open valley of the Sauer. In the battles about Metz the massing of batteries was espe- cially prominent. At Rezonville groups of 6 to 10 batteries acted in effective concert; at St Privat more than 200 guns cannonaded the French position for some hours. At Sedan the German guns were pushed forward

regardless of escort, even in front of the advanced guards, and enclosed the ill- fated French army in what has been aptly described as a circle of fire.

In the Napoleonic wars guns were massed at the crisis of an engagement in order to strike a decisive blow, now they are assembled much earlier in order to render an attack possible. Modern artillery tactics may be summed up in a few words, The artillery of advanced guards is considerably increased, and the greater proportion of the corps and divisional guns march close to the head of the main columns, At the commencement of an engagement batteries are pushed to the front with great boldness, massed as much as possible, and concentrate their fire. Frequent change of position is deprecated, but guns must be kept within effective range, and their safety subordi- nated to the success of the other troops. The contem- poraneous action of the three arms is more common than it used to be.

In future wars it is doubtful whether the independent action of artillery will not be somewhat restrained. Me- chanical contrivances may make the accurate finding of ranges possible, and the employment of shrapnel shell, with an efficient time-fuze, render artillery fire more destructive than it has hitherto been. The action of mitrailleurs will probably be important when their efficacy and sphere of employment are thoroughly comprehended. No great im- provement in the range and accuracy of fire of guns can be expected, as the practical limits of both have already been nearly reached. A few years may, however, witness the advent of a projectile power superior to gunpowder, and a shell more destructive than any at present in use. (See Guns anp GuNNERY.) (E. H. H.C.)

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ARTOIS, an ancient province of the north of France, corresponding to the present department of Pas de Calais, with the exclusion of the arrondissments of Boulogne and Montreuil, which belonged to Picardy. It is a rich and well-watered champaign, producing abundance of grain and hops, and yielding excellent pasture for cattle. The capital of the province was Arras, and the other important places were Saint-Omer, Béthune, Aire, Hesdin, Bapaume, Lens, Lillers, Saint-Pol, and Saint-Venant. The name Artois (still more corrupted in “ Arras”) is derived from the Atrebates, who possessed the district in the time of Cesar. From the 9th to the 12th century

Artois belonged to the Counts of Flanders. It was bestowed in 1180 on Philip Augustus of France by Philip of Alsace, as the dowry of his niece, Isabella of Hainault. In 1237 it was raised to the rank of a countship by Saint Louis in favour of his brother Robert. Philip, the son of Robert IL, having died before his father, the transmission of the title was disturbed. The countship was claimed by Robert, Philip's son, and his descendants, better known as the counts of Edu, continued to style themselves counts of Artois; but it was actually inherited by Mahaud or Matilda, daughter of Robert II By her marriage with Otho IV., Artois passed to the house of Burgundy, in whose possession it remained till the marriage of Mary, the daughter of Charles the Bold, to the Archduke Maximilian brought it to the house of Austria. By the peace of Nimeguen it was ceded to France in 1678. The title of count of Artois was borne by Charles X. of France before his accession to the throne.

ARU ISLANDS, a group of about thirty islands, nominally under the Dutch government of the Moluccas, which lie south of New Guinea, between lat. 5° 20' and 6° 55' S., long. 134° 10' and 134° 45' E. Tana-busar, the largest island, is 80 miles from north to south, and is crossed by three river-like creeks tunning east and west, called Watelai, Vorkai, and Maykor. No part exceeds 100 fect in elevation, but it is only on the coast that the ground is swampy. The principal formation is coralline limestone; the eastern coast is defended by coral reefs, and the neighbouring sea is shallow, and abounds in coral in full growth. The other islands of importance are Wamma, Pulo Bali, Oujia, and Wassia. A large part of the surface is covered with virgin forest, consisting of screw-pines, palm-trees, tree ferns, canariums, &c. Kan- garoos, and a number of other marsupials, wild pigs, brush- turkeys, cassowaries, parroquets, cockatoos, birds of para- dise, butterflies, ants, scorpions, sandflies, and mosquitoes are the predominant animals, the fauna being altogether Papuan. The aborigines belong to the Papuan race, but have received intermixture of foreign blood. They are a simple, emotional people, with dark-brown skins and frizzled hair. They wear little clothing, practise polygamy, purchase their wives, and are very lazy, and remarkably talkative. A few villages are nominally Christian, but elsewhere there seems to be no religion or even fetishism of any kind. In Wamma there is a town, Dobbo, to which Dutch, Malay, and Chinese traders resort once a year to traffic with the natives, obtaining trepang, pearl shell, birds of

paradise, &c., and giving in exchange cloths, cutlery, muskets, gongs, tobacco, arrack, and elephants' teeth. The islands are thickly peopled, the inhabitants numbering about 60,000. The Italian naturalist Beccari spent some time among the islands in 1874; and Di Lenn4, an Italian major, has executed a partial survey. (See Wallace's Malay Archipelago; Ocean Highways, 1873 and 1874; and G. Cora's Cosmos, 1873.)

ARUNDEL, a town in Sussex, on the river Arun, about 4 miles from its mouth, 10 miles E. of Chichester,

19 W. of Brighton, and 55 S.W. of London. It is |

built on the slope of a hill surmounted by the castle of the duke of Norfolk, which' dates from the time of Alfred the Great. It confers

on its possessor the title » of Earl of Arundel. At the time of the Conquest the 2%. castle was rebuilt by Roger. 7759s de Montgomerie, but it was Sart taken from his son, who re- '\ belled against the reigning monarch, Henry I. In 1397 it was the scene of a conspir- acy organised by the earl of Arundel, archbishop of Can- terbury, and duke of Glou- cester, to dethrone Richard II. and murder the lords of his council, a plot which was discovered before it could be carried into execution. During the parliamentary wars of the 17th century the stronghold was frequently assaulted by the contending parties, and consequently greatly damaged ; but it was restored by Charles the 11th duke of Norfolk, who made it what it now is, one of the most splendid baronial mansions in England. The town which, according to the whimsical etymology of the corporation seal, takes its name from hirondelle (a swallow), is divided into two parts by the river Arun, which is here navi- gable for vessels of 300 tons, and @ canal connects it with the Thames and Portsmouth. The town-hall is a castellated building, which cost £9000, and was presented to the corporation by the duke of Norfolk. The church of St Nicholas is a very ancient structure (founded about 1375), with a low tower rising from the centre. In the north aisle of the chancel there are several ancient monu- ments of the earls of Arundel, and the high altar is held to be the only perfect original example in England. The church is otherwise remarkable for its reredos and iron work. Some remains of a Maison Dieu,

or hospital, erected in the time of Richard II. still exist. Arundel was a borough by prescription, and returned two members to parliament from the time of Edward I., but it lost one by the Reform Act of 1832, and the other by that of 1868. (See Tierny's Hist. of Castle and Town of Arundel, 2 vols., 1834.)

ARUNDEL, Tuomas, Archbishop of Canterbury, born in 1353, was the second son of Robert, earl of Arundel and Warren. At 22 years of age he was raised to the bishopric of Ely, to the church and palace of which he was a great benefactor. In 1386, after the deposition of the earl of Suffolk, he was appointed lord chancellor of Eng- land; he was deprived of this office in 1389, but again reinstated. In 1388 he was translated to the see of York, and in 1396 was advanced to the primacy of Canterbury, when he resigned the chancellorship. This was the first instance of the translation of an archbishop of York to the see of Canterbury. Scarcely was he fixed in this see when he had a contest with the University of Oxford about the right of visitation. The affair was referred to the king (Richard IL), who determined it in favour of the arch- bishop. At his visitation in London he revived an old constitution, by which the inhabitants of the respective parishes were obliged to pay to their rector one halfpenny in the pound out of the rent of their houses. While bishop of Ely, Arundel had taken a leading part in fore- ing the king to consent to the commission of regency ; Richard never forgave this, and in 1397 the parliament, with the king's leave, impeached the archbishop, with his brother Richard earl of Arundel, and the duke of Glouces: ter, on a charge of high treason. He was sentenced to be banished, and to depart the kingdom within forty days on pain of death. He retired, first to France, and then to the

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Arms of Arundel.

court of Rome, where Pope Boniface IX. gave him a kind reception, and nominated him to the Scottish archbishopric of St Andrews. He was actively engaged in the plot to depose Richard, and place the duke of Lancaster on the throne ; and on Henry's accession, he was restored to the see of Canterbury. Two years after, the Commons moved that the revenues of the church might be applied to the public service, but Arundel opposed the measure with such vigour that it was thrown out. In the year 1408 his zeal for the suppression of heresy was directed against the followers of Wycliffe. Sir John Oldcastle, Lord Cobham, was arrested by his orders, and sentenced to the flames, but contrived to escape from prison. The archbishop also procured a synodical constitution, which prohibited the translation of the Scriptures into the vulgar tongue. He died at Canterbury on the 20th February 1413 of in- flammation of the throat, with which he was seized, as was affirmed by the Lollards, while pronouncing sentence upon Lord Cobham.

ARUNDELIAN or OXFORD MARBLES, part of a collection of ancient sculptures and antiquities, including the famous Parian Chronicle, formed by Thomas earl of Arundel, and presented by his grandson, the Hon. Henry Howard (afterwards duke of Norfolk), to the University of Oxford in the year 1667. They were purchascd for the first proprietor in 1624 by Mr (afterwards Sir William) Petty, who, along with John Evelyn, had been employed by the earl of Arundel to collect marbles, books, statues, and other curiosities in Italy, Greece, and Asia Minor. On their arrival in London in the year 1627 they were placed in the gardens of Arundel House, the site of which is now occupied by Arundel, Norfolk, Surrey, and Howard Streets in the Strand. Thomas Howard, earl of Arundel and Surrey, the founder of the collection, was born in 1586 (or, according to others, 1592). He had at first only the honorary title Lord Maltravers, but in 1603 he was restored to most of the honours previously in the possession of his family. For several years he resided or travelled in Italy, and there acquired a strong taste for works of art, specimens of which he began to collect. In 1621 he was made earl marshal of England, and after- wards discharged the offices of ambassador, general, and lord high steward. He went abroad in 1641, and died at Padua in 1646. His large collection contained not only sculptured marbles, but also coins, busts, statues, and gems. In the turbulent reign of Charles I., and during the Protectorate, Arundel House

was often deserted by its owners; and, in their absence, some of the marbles were defaced and broken, and others either stolen or used for the ordinary purposes of architecture. After the death of the earl his collection was divided among his family. The inscribed marbles, which fell to the elder son, ulti- mately found their way to Oxford; the busts and some statues were sold and dispersed ; and the gems descended to the Marlborough family, in whose possession they now are. Some of the statues, which had been purchased at the sale of Arundel House by Sir William Fermor, were presented to the University of Oxford in 1755. Of the large collection now known as the Arundel or Oxford marbles the most remarkable is the Parian Chronicle, or Marmor Chronicon. This when found consisted of a large oblong slab of Parian marble, on which was engraved in capital letters a chronological compendium of the principal events of Greece during a series of 1318 years, beginning with the reign of Cecrops, 1582 B.c., and end- ing with the archonship of Diognetus, 264 Bc. The marble originally measured 3 feet 7 inches and 2 feet 11 inches on the two sides respectively, its breadth being 2 feet 7 inches ;, but the chronicle of the last 90 years is lost,

of Diotimus, 354 years before the birth of Christ ; and in this fragment the inscription is at present so much cor- roded and effaced that the sense must in some measure be supplied by conjecture. Immediately on the arrival of these marbles in England the greatest curiosity was excited among literary men. Selden, with the assistance of some other scholars, cleaned and examined first the marble containing the Smyrnean and Magnesian league, and then the Marmor Chronicon. The following year Selden pub- lished a small volume in quarto, including about 39 inscrip- tions copied from the marbles. His researches were con- tinued and completed by Prideaux (1676), Maittaire (1732), and Chandler (1763). The Arundelian marbles, though generally regarded as genuine relics of antiquity, have been discovered in some instances to differ somewhat from the most authentic historical accounts. Their authenticity was called in question in a dissertation by the Rev. J. Robertson, published in 1788, entitled The Parian Chro- nicle. This essay has been answered by several writers, particularly by the eminent scholar, Professor Porson, and the anthenticity of the marbles may be regarded as fairly established. See Boeckh, Corpus Inscriptionum Grecarum, 1843.

ARVAL BROTHERS (Fratres Arvales), in Roman Anti- quities, a college or priesthood (sacerdotes arvorwm), con- sisting of twelve members, elected for life from the highest ranks in Rome, and always apparently, during the empire, including the emperor. Their chief duty was to offer annually public sacrifice for the fertility of the fields (ut fruges ferant arva). The origin of the brotherhood was traced to Acca Larentia, the foster-mother of Romulus, who, with her twelve sons, had instituted sacrifices of this kind, and probably this legend arose from the connection of Acca Larentia, as mater Larum, with the Lares who had a part in the religious ceremonies of the arvales. But apart from this, there is proof of the high antiquity of the college in the verbal forms of the song with which, down to late times, a part of the ceremonies was accompanied, and which is still preserved (Becker, Handbuch der Rom. Alterthiimer, iv. p. 407). It is clear also that, while the members were themselves always persons of distinction, the duties of their office were held in high respect. And yet it is singular that no mention of them occurs in Cicero or Livy, and that altogether literary allusions to them are very scarce. On the other hand, we possess a long series of what may be called the minutes of their proceed- ings, drawn up by themselves, and inscribed on stone. At the time of Marini (Gli Atti e Monumenti de Fratelli Arvali, Roma, 1795) 67 of these sets of records were known, beginning at 14 a.p. and extending to the time of Gordian. Since then several othcrs have been discovered. The college consisted of a master (magister), a vice-master (promagister), a flamen, and a pretor, with eight ordinary members, attended by various servants, and in particular by four boys, sons of senators, having both parents alive. These officers were elected annually in May, but did not enter on their dutics till the 17th December. Each wore a wreath of grain, a white fillet, and the pretexta. The great annual festival which they had to conduct was held in honour of the Dea Dia, who appears to have resembled the goddess Ops, the wife of Saturn. It occupied three days, and fell either on the 17th, 19th, 20th, or the 27th, 29th, 30th of May. The ceremony of the first day of the May festival took place in Rome itself, in the house of the magister or his deputy, or ix Palatio Divorwm, where after sunrise the peculiar ceremony was gone through of "touching " (tangere fruges) samples of the old and the young grain. On the second and principal day of the festival the ceremonies were conducted in luco Dew Die,

so that the part now remaining ends with the archonship j that is, in a grove just beyond the fifth milestone from

Hebrew point of view, comprehend many tribes in the north of Asia and Europe who speak Turanian languages. Ewald, who suggested the name of Medvterranean, distin- guishes, besides the Mediterranean, three other families of speech, the Worthern, commonly called North Turanian or Altaic, the Semitic, and the Copto-African. He explains the name of Mediterranean by saying, that ‘“‘the races

Rome on the Via Portuensis. The first act was to sacrifice two young pigs (porclie piaculares) to purify the grove, which, it was held, was liable to be defiled in a religious sense by the felling of trees, and by the presence in it of any iron tool or instrument, such as was required by the lapidary who engraved on stone the records of the proceed-

ings. Then, after the sacrifice of a white cow, the magister drew up a minute of what had been done, and all retired to their tents, At midday they again met, settled and confirmed the minutes, and the public being now excluded, went into the depth of the grove to sacrifice a fat sheep. Returning to the temple, the thesaur, which seem to have been money collected from the people present, were placed on the altar, and the arvales arranged themselves in a line, with an attendant at each end. The attendant at one end received from the public the samples of grain and fruits which they had brought to be “ touched,” or blessed, and handed them to the brother next him, who passed them on till they reached the attendant at the other end, who restored them to the owners. The arvales now entered the temple, and with closed doors proceeded to dance and sing the song of the brotherhood, which is known to have been sung by them in its ancient form down to the 3d century A.D. This was followed by the election of officers for the next year, a banquet, and races. On the third day the sacrifice took place in Rome, and was of the same nature as that offered on the first day. Among the many minor occasions on which the arvales had to offer sacrifice were the birthday of an emperor, the beginning of a con- sulate, an escape from

danger, the starting for or return from a journey, or other event of importance to the imperial family, but especially on the 3d of January, on which day a particular form of prayer for the ruling emperor was recited, and sacrifice offered to a series of deities, male animals to male deities, and female to female. In the British Museum is a bust of Marcus Aurelius in the dress of a Frater Arvalis. (Henzen in the Hermes, ii. p. 37; De Rossi, Annali d. Inst. Arch. Rom., 1858, p. 58.)

ARVE, ariver which rises in the Col de Balme, one of the Savoyan Alps, and passing through the valley of Chamouni, falls into the Rhone near Geneva, after a course of about 50 miles. (See Journ. R. Geog. Soc., vol. xxvii.)

ARYAN, a technical term, applied to one of the great families of language, which extends from India to Europe, and which, for that reason, is called also Indo-European. Friedrich Schlegel, who first recognised the family rela- tionship of these languages (Die Sprache und Weishert der Indier, 1808), assigned to them the name of Indo-Germame, a name still used by preference by many scholars in Ger- many (Pott, Benfey, &c.) Bopp (Vergleichende Gram- matik, vol. i. p. xxiv.) decided in favour of Indo-Huropean as @ more appropriate name for that large family of speech. Other scholars have used the names Japhetic, Sanskritic (W. von Humboldt), and Mediterranean (Ewald).

The objection to Indo-Germanic as the technical name of the whole family is that it is too long, and yet not sufficiently extensive. If the family is to be distinguished by the names of its two extreme members, the name ought to be Indo-Celtic, rather than Indo-Germanic; if by its most important members, then, as remarked by Bopp, the name should be Indo-Classic. Indo-European is an equally cumbersome name, and less correct: even than Indo-Ger- manic, considering that there are many languages spoken both in India and Europe which do not belong to that family. Sanskritic would be a misleading name, as coun- tenancing the idea that all the members of this family are derived from Sanskrit. Japhetic seems to revive the Jewish conception of the three ancestors of the human race, Shem, Ham and Japhet and would, from the strictly

speaking these languages inhabited the large central circle, surrounded by Semitic, South-Indian, Chinese, Turko- Tataric, and Bask languages”

(Lehrbuch der Hebriiischen

Sprache, p. 17, note). ‘The reason why this name has not been accepted, seems to be that locality has little to do with the essential character of languages, and that the central position once occupied by the people who spoke these tongues belongs to them no longer.

Aryan, as a name for a whole family of languages, has the advantage of being short, and, being a word of foreign origin, of lending itself more easily to any technical defini- tion that may be assigned to it. It has been accepted by many writers in England, France, and India. In Ger- many, too, it is used in this wide sense by Lassen and others, while some scholars have used the term in the more restricted sense of Jndo-Iranian,—.e., as compre- hending the languages of India and Persia, which consti- tute the south-eastern as distinct from the north-western (Greek, Latin, Celtic, Teutonic, Slavonic) branch of the family.

Origin of the Word.—Aryan, as a technical term, has been borrowed from the Sanskrit arya or drya, the Zend airya. In the later Sanskrit drya means, of a good family. It is used as a complimentary address. Originally, how- ever, it was used as a national name, and even as late as the time of the Laws of Manu, India is still called Arya- avarta, 7.¢., the abode of the Aryas. In the Veda, Arya is the name by which the believers in the gods of the Veda call themselves, in opposition to their enemies, who are called Dasas or Dasyus. 'The distinction appears in pas- sages such as the following :— :

I. 51,8. "Distinguish, Indra, the Aryas and those who are Dasyus" (vi ganihi dryan yé ka dasyavah).

_X. 86, 19. "1, Indra, distinguishing the Dasa and the Arya" (vikinvan d&ésam &ryam).

We frequently read of the gods protecting the Arya and destroying his enemies.

III. 34,9. " Indra, having killed the Dasyus, protected the Aryan colour" (hatvi daésyin pra dryam varnam avat). This looks like an ethnological distinction of colour between Aryus and Dasyus. ,

X. 49, 3. "I (Indra) who do not give over the Aryan name to the Dasyw" (n& yah raré Xryam néma dasyave).

In X. 11, 4, we read of Aryan clans, éryah visah.

I. 103, 3. "Indra, increase the Aryan power " (dryam

sthah vardhaya). 4 VIII. 103, 1. "Agni, the increaser of the Arya zu (dryasya vardhanam). " VII. 18, 7. "Indra, the companion of the Arya" (sadham&h Sryasya).

I. 130, 8. "Indra protected in battles the Aryan sacri- ficer" (I'ndrah samatsu yagamanam &ryam pra avat).

The gods, it is said, bring light for the Arya.

I. 59, 2. “Agni is made a light for the Arya” (tam tva devisah aganayanta devam vaisvanara gy otih it Xryaya) ; or, “ Agni creates broad light for the Arya, driving the Dasyus from the house” (VII. 5, 4),

_IL 11, 18. “He (Indra) uncovered the light for the Arya, the Dasyu was left on the left hand” (apa avrinoh gyotih aryaya ni’ savyatah sadi désyuh indra).

IV. 26, 2. “I gave the earth to the Arya, and rain to the liberal mortal” (Ahém bhtimim adadam Aryiya aham vrishtim dasishe martyaya).

ARYAN

I. 117, 21. “The two Asvins have made the light wide for the Arya” (urt gyétik kakrathuh Aryaya).

That light itself, the light of the day or the daily light and life, are called the Aryan light, X. 43, 4, and some of the gods too are addressed by the name of Arya. In V. 34, 6, we read of Indra, “that he, the Arya, leads the Dasa, according to his will” (yathivasim nayati dasam Gryah). In X. 138, 3, too, Indra seems to be called by that name.

Most frequently, no doubt, the Arya is conceived as the worshipper of the gods. He was called so in I. 130, 8; again in I. 156, 5, Arya and Yagamdna, sacrificer, are mentioned together. _

In IX. 63, 5, the Arya is opposed to the drdvan, the enemy, the man who offers no sacrifices ; and I. 51, 8, the same distinction is drawn between the barhishmat, the sacrificer or Arya, and the avratd, the lawless, the Dasyu.

But the enemies of the poets and their friends are not only among the Dasyus, but also among the Aryas, and in their tribal feuds one Arya speaks of the other as adeva, godless, in the original sense of the word. Thus we read :—

_X. 102, 3. “Turn away the weapon of the Dasa or the Arya” (disasya va maghavan &ryasya va sanutdh yavaya vadham).

X. 83, 1. “Let us withstand the Dasa, the Arya, with thee as helper” (sahy&ima dasam dryam tvdya yugi).

VI. 33, 3. “Thou, O hero, struckest these two enemies, the Dasa fiends and the Arya” (tvim tin indra ubh4yan amitran désa vritrdni drya ka stira vadhih), 7

VI. 60, 6. “They (Indra and Agni) kill the Arya fiends, they kill the Dasa fiends, they strike off all haters (fem.)” (hatéh vritrini drya hatah disini sdtpati hatah visvahk apa dvishah). –

Similar passages, mentioning Arya and Dasa enemies, occur, VI. 22, 10; VIL 83,1; X. 69, 6, &. In VIIL 24, 27, the Arya enemy is contrasted with the riksha, lite- rally, the bear.

The Arya enemy is called godless in X. 38, 3, ‘“ What- ever Dasa or godless Arya means to fight us” (y4h nah disah dryah va purustuta ddevak indra yudhaya Aiketati).

Lastly, Arya means in some passages what befits or belongs to an Arya, what is proper and right.

_X. 65,11. “The gods spread all over the earth the Aryan laws” (sudanavah, arya vrat& vi srigdntah Adhi kshdmi).

In IX. 63, 14, the sacred receptacles of the Soma are called drya (eté dhamani arya sukr&h ritdsya dhdraya vagam gomantam aksharan). .

It is clear from these passages that Arya is one of the oldest names by which people belonging to this great family of speech called themselves in distinct opposition to their enemies. It is admitted also that the Veda, in which this name occurs, surpasses in antiquity every other literary docu- ment belonging to the same race, and it would be difficult, therefore, to find another name better adapted to serve as a technical term for the whole Aryan family of lan- guages. _

As Arya had become a proper name as early as the poems of the Veda, its original and etymological meaning would be of little consequence, had it

not been used as an additional argument both in favour of and against the technical use of Arya. Professor Bopp derived Arya from the root ar, to go, or even from ark, to venerate. The former etymology would give no adequate sense, the latter is impossible. Lassen explains arya as adeundus, like akarya, teacher. But in explaining Arya, it must be remembered that it cannot be separated from arya with a short a, and that in consequence no etymology of Arya can be entertained which does not at the same time account

for arya. This word is used in the Yagurveda in exactly the same sense as drya in the Rig-veda. Thus we read, Vagasaneyi-Sanhita, 20, 17, " Whatever sin we have com- mitted against an Arya, or against a Sidra" (yak khidré yad arye yad énas kakrim& vayAm).

Here Arya is used in opposition to Stidra, as Arya was used in the Rig-veda in opposition to Dasa. In the Rig- veda, too, we find at least some traces of arya, used in the sense of arya, and in opposition to dasa, viz., in the com- pound aryé-patni, having an Arya as husband, as opposed to dasa-patni, having a Dasa as husband.

There can be no doubt, therefore, that Arya, the word which, as soon as the system of the four castes became more firmly established, took the technical meaning of "belonging to the three upper castes," viz., the Brahmanas, Kshatriyas, and Vaisyas, came from arya, and that in arya must be discovered the original etymological mean- ing of the word.

Here it is of great importance to observe, that Arya is not only used as a comprehensive title of the three upper castes, but also as the special name of one of them, viz., the third caste, the householders or cultivators of the soil.

In Vagg-Samhita, XX VI. 2,itcan mean nothing but Vaisya, a man of the third class, for it is used together with Brahman, Raganya, and Sidra. It is therefore not the commentator only, as Dr Roth says, who here gives the meaning of Vaisya to the word arya, but, from the context itself, it can have no other meaning in that passage. This meaning is still clearer in a passage

from the Latyayana Sutras, IV. 3, 6. Here it is said that some sacrificial act should be performed, primarily by an Arya, but if no Arya is forthcoming, then by any Arya, i.e, either by a Brahmana or Kshatriya (Aryabhave yah kas karyo varnah, Comment, yadi vaisyo na labhyate yah kas karyo varnah syat, brahmano va kshatriyo va).

Panini (III. 1, 103) distinctly ascribes to arya the meaning of Vaisya and master; in IV. 1, 49, the 7th Varttika distinguishes between Arya and Kshatriya; and what is still more important, both the author of a Varttika to Pan., III. 1,103, and the author of the Phit-stitras, state that when arya means Vaisya, it has the accent on the first syllable, like Arya.

Having thus traced the connection of &ryaand Arya, both in form and meaning, we have now to consider how drya came to mean Vaisya. Vaisya, is formed from vis, house, settlement, like drya and arya, from ar. We have also vesyim in the Veda, meaning, as it seems, family or clan. Vaisya, meant a householder, and vis also, plural visah, is frequently used in the Veda as a name for people. Other old names for people in the Veda are kshiti, a dwelling and a dweller, from kshi, to dwell; Greek, «kre in dude krioves ; or krishti ploughing or ploughers.

If, therefore, there was a Sanskrit word ar, meaning earth, then arya, in the sense of landholder, or country. man, would have been formed regularly like Kshdmya, x9ovos, from ksham, yay, earth ; like gAvya, from go, cow, narya, from nar, man. Now ar, in the sense of earth, does not occur in Sanskrit; but that such a word existed is proved by its derivatives. The Greek épa in pate would correspond to a Sanskrit ira, which ira again stands to ir, like kshudha, hunger, to kshudh. Finally, ir must be traced back to a radical ar, the change of a to i being analogous to that of Sk. pitar, father, as compared with matynp, pater, Goth. fadar.

The question now arises, whether ira or ir ever occurs in Sanskrit as a nameof earth. The native dictionaries, such as the Amarakosha, assign that meaning to ira, and to ila, and the latter form occurs in the famous name of Ilaivrita (explained as ila prithivi vrita yena), the district of I/a, the centre of gambudvipa or India, a itself

being the centre of the seven great continents of the world (Vishnu-Purana, B. IT. cap. 2).

In the Rig-veda ira occurs but once, and there, V. 83, 4, it has the meaning of food springing from the earth. "Food is produced for every being, when Parganya quickens the earth with seed" (ira visvasmai bhuvanaya gayate yat parganyah prithivim retasa avati).

Here iri cannot mean simply "a liquid, a draught, feast, particularly a draught of milk ;" for the simile shows that the rain is taken as seed, and that from it the food (ira) is supposed to spring (gayate).

In another passage in the Atharva-veda, V, 11, 10;ara may mean earth, but the sense is doubtful. If it be asked how ira, originally meaning earth, could take the meaning of food, we must remember the tendency of ancient language to mix up cause and effect, the producer and the produced. Ira, meaning originally earth, would be used in many circumstances as the food and sustenance supplied by the earth, just as gauh, cow, in the Veda is used, not only for milk, but even for leather.

The adjective iravat means possessed of nourishment,

nourishing. Anira means without food, and anira amiva

seems to be aname forfamine. In one place, Rig-veda, IX. 97, 17, idavat stands for iravat; vrishtim nah arsha divy4m gigatnim ilavatim, "Give us the heavenly, streaming, fruitful rain."

*Considering the antiquity of the name arya, we may refer its origin to a period in the history of the Aryan language, when the primitive substantive ar was still used instead of the later *ara, ira, gpa. As from xapale we should be justified in postulating the former existence not only of xapé, earth, but even of a more primitive substan- tive xan, which is actually preserved in x@«v, so from Zale, we conclude the former existence not only of épa, but also of a substantive ép, Sk. ar.*

Whether urya means born of the earth, or holding, cul- tivating, possessing the earth, in either case such a name finds ample analogies in the names by which the early dwellers on the earth spoke of themselves. It is not in modern languages only that people call those of their own country, Landsmann, countryman, but in Greek, too, yyirns is used in that sense, while yeér-Gv, equally derived from yj, means neighbour. The Latin vicinus, neighbour, is derived from vicus, the Greek, ofxos, the Sanskrit, vesa ; all connected with the Sanskrit vis, dwelling or dweller, the synonym of Srya in Sanskrit. In Gothic, gaujan, a countryman, is derived from gauja, land, probably con- nected with yap in xap-d-Ce. Connected with this same xop. (xOdv, xPapards) is the Gothic guma(n), man; Lithu- anian, Zmén-es, plur., men; and the Latin, hemdnes (ne- hemo =nemo), and homines, men, not derived from humus, but from an older nominal base, ham, hem, or hom.

Mythology also supplies several instances showing that man was conceived as born of the earth, the son and then the lord of the earth, made of dust, and meant to 'till the ground from whence he was taken." Erechtheus or Erichthonios (both chtheus and chthonios point to xa), the national hero of the Athenians, worshipped in the oldest shrine on the Acropolis, was represented as yyyevjs or airéxOov (Her., VILL. 55), while Homer (Z/., IL. 548) says of him that the Earth bore him (ree de Leidwpos dpovpa). Hellen is the son of Pyrrha, and Pyrrha, the red, was the oldest name of Thessaly. The Germans derive their race from Mannus, who was the son of Tuisco, the heavenly, who was the son of the Earth.

The root ar, which as a substantive supplied the oldest names for earth, took in its verbal application the meaning of ploughing, at least among the members of the north- western branch, Gr., dpo-rpov, apo-r%p, dpd-w ; Lat., ar-a-re, ar-i-trum, ar-d-tor; Goth., arjan, to ear; Lith., ar-ti, to

*plough ; Old Slav., oralo, arathar, plough. In the south-eastern branch it took the technical meaning of ploughing the sea, Sanskrit, ari-tram, meaning rudder, never plough (cf. xtpata téemvev and dpoupav Témvev). belonged to the root ar from the beginning, and though we ought not to derive *ar, *ara, ira, épa, from a rootar, to plough, as little as homo from*

humus, we may well under- stand how ar, as the broken, reclaimed, arable land could be used, even before the Aryan separation, as one of the

plough ; Irish, airim, I plough,

Yet the meaning of moving, stirring up,

names of earth.

The common etymology which would assign to arya the meaning of "belonging to the faithful" (Roth) is unten- able, because arya, with the short a and accent on the last syllable, does not mean faithful or devoted, and it is ex- tremely doubtful whether arf, from which ary4 is said to be derived, occurs anywhere in the Veda with the meaning of desirous, devoted, or faithful. But even if it did, it would be impossible to leave out of consideration the name arya, meaning simply landholder, Vaisya, without any admixture of the meaning of faithful or devoted. The national name, rya, comes directly from this arya, landholder, and arya, landholder, comes from ar, land, not from ari, which means enemy. 'To distinguish ary4, as a term of honour, in the sense of lord or master, from arya, the mere appellative, a change of accent was admitted, which is recognised by the earliest grammarians who mention ary4, lord, as distin- guished from 4rya, landlord, while no native authority ever assigns to arya, still less to ari, the meaning of faithful.

Arya and Arya, as national names, can be traced from India to Persia. In the Avesta, arya means venerable, and is at the same time the name of the people. The first country created by Ormuzd or Ahuramazda is called in the Avesta, Airyanem vaégo, Arianwm semen. The whole extent of country occupied by the worshippers of Ormuzd is also called Airya. As opposed to the Aryan clans (airyao dainhavo), we hear in the Avesta of the un-Aryan clans (anairyao dainhavo), and the same name is contained in the 'Avapidkar of Strabo, a people and town on the frontiers of Hyrcania. Greek geographers use the name of Ariana in a wider sense than the Avesta. All the country between the Indian Ocean in the south and the Indus on the east, the Hindu-Kush and Paropamisus in the north, the Caspian gates, Karamania, and the mouth of the Persian Gulf in the west, is included by Strabo under the name of Ariana; Bactria is called by him the

ornament of the whole of Ariana. As the Zoroastrian religion spread westward, Persia, Elymais, and Media, all claimed the Aryan title. Hellanicus, who wrote before Herodotus, gives Aria as aname of Persia. Herodotus attests that the Medians were called Arii; and even for the northernmost part of Media, Atropatene, the name of Ariania has been preserved by Stephanus Byzantinus. Even Elymais has been supposed to be derived from Ailama, a modification of Airyama. 'That airya was considered a name of honour we see from the cuneiform inscriptions. There Darius calls himself Ariya and Ariyakitra, an Aryan, and of Aryan descent. The same element enters into many historical Persian names, Ariaramnes, Ariobarzanes, &c. When after centuries of foreign invasion and occupation Persia rose again under the sceptre of the Sassanians to the rank of a national kingdom, the kings, the worshippers of Masdanes, called themselves again in their inscriptions, Kings of the Aryan and un-Aryan races, [ran va Aniran, 'Apidvev kat Avapidvev. Hence the modern name of Persia, Iran.

In the name of Armenia the same element of arya has been supposed to exist. The old name of the country is Armina, and its etymology is doubtful. In the language of Armenia, however, ari exists, used in the widest sense

for Aryan or Iranian, and also with the meaning of brave.

More westward still traces of the name have been dis- covered in Aghovan, the name of the Albanians on the border of the Caspian Sea, the gh being the representation of an original r or 1. In the Caucasus itself the only class speaking an Iranian language, the Os of Ossethi, call themselves Iron.

Along the Caspian and in the country washed by the Oxus and Yaxartes, Aryan and non-Aryan tribes were mingled together. Their wars find their poetical record in the Persian epic, the Shahnameh, describing the feuds and friendships between Iran and Turan. Many Scythian names, preserved by Greek writers, have an Aryan char- acter. Beyond the Oxus, in Transoxiana, too, people are mentioned under the name of Ariace and Antariani. Here, however, all certain traces of the word, as a geo- graphical term, vanish. We have indeed Aria as an old name of Thrace, and on the

Vistula we meet a German tribe called Arii; but nothing is known of the origin of these names, and no conclusions should be built on them.

It should be mentioned that some scholars (Curtius) connect the Greek dpioros with Sanskrit arya, though deriving it from a different root; while others (Pictet) recognise arya in the Irish er, good, brave, hero. (F. M. M.)

AS, an ancient weight, consisting of 12 ounces, identi- cal with libra, the Roman pound. The word is common in the old Italic dialects, and may perhaps be connected with the Greek ais, which, in the Doric dialect, is used for efs, one, i.¢., an entire thing; according to others it is derived from @s, because made of the mixed metal known under that name.

It was also the name of a Roman coin, which was of different weight and value at different periods. The first introduction of coined money is ascribed to Servius Tullius, who probably borrowed from the neighbouring Etruscans the general form and scale of value. The old as was composed of the mixed metal es, an alloy of copper and tin, and was called as libralis, or librarius, because actually weighing a pound or 12 ounces. The asses were cast in a mould, and their original shape seems to have been an irregular oblong, which was stamped with the figure of a sheep, ox, or sow. After the round shape was introduced, the one side was always in- scribed with the figure of a ship's prow, and the other with the double head of Janus. The subdivisions of the as had also the ship's prow on one side, and on the other the head of some deity. The first Punic war having exhausted the treasury, the as was reduced to two ounces. In the second Punic war, it was again reduced to half its weight, viz., to one ounce. And lastly, by the Papirian law it was further reduced to the diminutive weight of half an ounce. It appears to have been still more reduced under Octavianus, Lepidus, and Antony, when its value was 4 of an ounce. It probably continued at this value till the time of the Emperor Severus, when it was again lowered to about 5; of an ounce. During the commonwealth and empire es grave was used to denote the old as in contradistinction to the existing depreciated coin; while @s rude was applied to the original oblong coinage of primitive times.

As also denoted any integer or whole ; whence the Eng- lish word ace. Thus as signified the whole inheritance ; whence heres ex asse, the heir to the whole estate.

ASAFCETIDA, a gum-resin obtained principally from Narthex asafetida, and probably also from one or two other closely allied species of umbelliferous plants. It is produced in the southern provinces of Persia, in Bokhara, and in Beloochistan, and the plant grows as far south as the Chenab Valley in the Panjab. MNarthex asafetida

grows to a height of from 5 to 6 feet, and when the plant has attained the age of 4 years, it is ready for yielding asafoetida. The stems are cut down close to the root, and the juice flows out, at first of a milky appearance, but quickly setting into a solid resinous mass. Fresh incisions are made as long as the sap continues to flow, a period which varies according to the size and strength of the plant. A freshly-exposed surface of asafcetida has a trans- lucent, pearly-white appearance, but it soon darkens in the air, and assumes a yellowish-brown colour. In taste it is acrid and bitter; but what peculiarly characterises it is the strong alliaceous odour it emits, from which it has obtained the name asafcetida, as well as its German name Tewfels- dreck (devil's dung). According to the analysis of Pelle- tier, asafoetida contains of resin, 65°0; soluble gum, 19-4; bassorin, 11°2 ; volatile oil, 3°6 ; and malate of calcium, 0°3 per hundred parts. 'The oil, to which its peculiar odour is entirely due, can be distilled off with water, and contains from 20 to 25 per cent. of sulphur. Asafoetida is found in commerce in "lump" or in "tear," and it is always very much adulterated: It is chiefly carried from the various ports on the Persian Gulf to Bombay, and so powerful is the smell of the new resin that special vessels have to be employed in the trade. The whole plant is strongly im- pregnated with the odour of asafcetida; in the regions of its growth it is used as a fresh vegetable, the inner portion of the full-grown stem being regarded as a luxury. The gum-resin itself is very highly relished as a condiment in India and Persia, and it 1s in demand in France for use in cookery. In Great Britain it is only employed in medicine, being of high value in spasmodic and convulsive diseases, such as hysteria, infantile convulsions, &c., but its offensive odour is a great bar to its use.

ASBEN, a country of Central Africa, known also as Arr, which see.

ASBESTOS, or Assestus (from doBeoros, unconsum- able), is a variety of the amphibole or hornblende family of minerals, and akin to tremolite,

actinolite, and common hornblende. The chemical composition of the whole family is chiefly silica, magnesia, alumina, and ferrous oxide, but varies considerably. Those containing most iron are most easily fused. Asbestos consists of fine crystalline elastic fibres, with a silky lustre, varying in colour from white to grey and green, and derives its name from being specially indestructible by fire. A single fibre of it fuses to a white enamel, but in the mass it is capable of resisting ordinary flame, and has on this account been regarded from ancient times as a most interesting substance. Woven into cloth it forms a fireproof texture, which, to be purified, requires only to be thrown in the fire; gloves, napery, towels, handkerchiefs, and even dresses have been woven of it; and it is said that the ancients used to wrap the bodies of their dead in asbestos cloth to keep their ashes separate from those of the surrounding funeral pile. There are several varieties of asbestos :—(1.) Amianthus is the rarest and most delicate kind, its fibres being beautifully white, flexible, long, and regularly laid. It is found in the centre of the older crystalline rocks, in the Pyrenees, the Alps of Dauphiny, on Mount St Gotthard, in North America, in the serpentine of Sweden, in the Ural Moun- tains, Silesia, and New South Wales. But the most beau- tiful specimens come from Tarantaise, in Savoy, and from Corsica, where it is somewhat abundant. (2.) Common Asbestos is not so light, either in colour or weight, as ami- anthus, and is more splintery, inflexible, and irregular in structure. It fuses with difficulty before the blow-pipe into a black scoria. It is found in serpentine rocks in Anglesea, in Cornwall, and also in several parts of Scot- land, as Glenelg, in Inverness. (3.) Mountain leather and Mountain cork are other varieties, where the fibres are less

flexible and regular than in either of the above. Their colour is brown or a dirty white. Mountain leather is in thin flexible sheets, and mountain cork is so named from being not unlike common cork, and so light as to swim on water. It is found in Lanarkshire. (4.) Mowntain wood is a soft, tough, opaque, brownish-coloured variety of asbestos, much heavier than the last, and melting to a black slag before the blow-pipe. It is found in Tyrol, in Dauphiny, and in Scotland at Glen Tilt, Portsoy, and Kildruinmy.

It has been often proposed to employ asbestos in the manufacture of fireproof goods, and it was at one time thought that an important industry would grow out of this application. In early times the art of weaving ami- anthine cloth was its chief application, and was much valued. It was accomplished by weaving the fibres along with those of flax, and then heating the cloth in a furnace to destroy the flax. It is said that Charlemagne had an amianthine tablecloth, which he used to have thrown into the fire after dinner for the astonishment of his guests. Chevalier Aldini, of Milan, is said to have had a complete dress—cap, gloves, tunic, and stockings—made of asbestos cloth, and to have made very successful experiments with it by way of testing its protective power for firemen. Advantage has also been taken of its qualities for the per- formance of clever tricks of fire-handling. Paper has been manufactured from asbestos, and would prove invaluable, in case of fire, for charters and other important documents, were it not that the paper is rather tender for use, and that the writing disappears after a red heat. Its feeble consistency has proved the chief obstacle to its use in textile fabrics. More success has attended its employment for fireproof roofing and flooring, for non- conducting en- velopes of steam pipes, and for the packing in fireproof safes. Lately it has been proposed to use it for piston- packing in steam engines, it having been found to exceed in durability any material hitherto employed—a matter of importance, especially in the case of marine engines that have to be at work night and day on long voyages.

ASCALON, now Askvutan, one of the five chief cities of the Philistines, on the coast of the Mediterranean, 12 geographical miles N. of Gaza. It was a well-fortified town, and the seat of the worship of Derceto. Though situated in the nominal territory of the tribe of, Judah, it was never for any length of time in the possession of the Israelites. After the fall of the Macedonian empire, it became, like the rest of Phcenicia, tributary alternately to Syria and Egypt. Herod the Great was a native of the city, and added greatly to its beauty ; but it suffered severely in the later wars of the Romans and Jews. It again became a flourishing and important place, and from the 4th to the 7th century was the seat of a bishopric. During the first Crusade a signal victory was gained by the Christians in the neighbouring plain on the 15th August 1099 ; but the city remained in the hands of the caliphs till 1157, when it was taken by Baldwin IIL, king of Jerusalem, after a siege of five

months. By Baldwin IV. it was given to his sister Sibylla, on her marriage with William of Montferrat in 1178. When Saladin (1187) had almost annihilated the Christian army in the plain of Tiberias, Ascalon offered but a feeble resistance to the victor. At first he repaired and strengthened its fortifications, but afterwards, alarmed at the capture of St Jean d'Acre by Richard Coeur de Lion in 1191, caused it to be dismantled. It was again restored in the following year by the English king, but only again to be abandoned. From this time Ascalon lost much of its importance, and at length, in 1270, its fortifications were totally destroyed by Sultan Bibars, and its port filled up with stones. The place is now a desolate heap of ruins, with remains of its walls and fragments of granite pillars.

ASC—ASC

ASCENSION, a solitary island in the Atlantic Ocean, in lat. 7° 56' S. and long. 14° 24' W., about 74 miles in length and 6 in breadth, with an area of 34 square miles, and within the immediate influence of the south-east trade-wind. It is one of the peaks of a submarine ridge which separates the northern and southern basins of the Atlan- tic. The whole character of the island is volcanic, and its surface is broken into mountains, hills, and ravines. To- wards the south-east, the Green Mountain, the highest in the island, rises 2870 feet above the level of the sea, while the plains or table-lands surrounding it vary in height from 1200 to 2000 feet. On the north side they sweep gradu- ally down towards the shore; but, on the south, they terminate in bold and lofty precipices. Steep and rugged ravines intersect the plains, opening into small bays or coves on the shore, fenced with masses of compact and cellular lava; aud all over the island are found the usual products of volcanic action. The chief productions of the island are green vegetables. Ascension has long been noted for the abundance of turtle and turtle eggs found on its shores, the season lasting from December to May or June. The coasts abound with a variety of fish of excel- lent quality, of which the most important are the rock-cod, the cavalha, the conger-eel, and the "soldier." The wild ani- mals are guinea-fowl, goats, cats, rats, and land-crabs ; but the goats have been almost exterminated to make way for sheep and cattle. The air is clear and light, and the climate remarkably healthy. The island was discovered by the Portuguese navigator, Juan de Nova, on Ascension day 1501; but remained uninhabited till after the

arrival of Napoleon at St Helena (1815), when it was taken possession of by the British Government. The garrison, with their retainers, resided in George Town, on the north-west coast, which is abundantly supplied with fresh water from a magnificent cistern capable of containing 1700 tons of water, supplied by means of iron pipes from springs in the Green Mountain, 6 miles distant, which were reached by boring in 1830. Asceusion is found useful as a station aud rendez- vous for the vessels employed on the coasts of Africa and Brazil ; and lctters were formerly often left by passing ships in a crevice in one of the rocks. Population, about 500. (See Darwin's Observations on Volcanic Islands and A Naturalists Voyage.)

ASCENSION DAY, a festival of the church, held forty days after Easter, or ten days before Whit Sunday, in memory of Christ's ascension into heaven forty days after his resurrection.

ASCETICISM, from Greek doxyots, meaning the exercise or training to which the athletes subjected them- selves when preparing for the games or contests, is used metaphorically to denote the habitual practice of exercising restraint over, or subduing, the bodily desires and affections which tend to lower objects, in order thereby to advance in the higher life of purity and virtue. It is the means by which the mind withdraws itself from the hindrances and temptations of the world, and clears its vision for what is spiritual and true. In its lowest stage it consists in the mortification of the flesh by fasting, penance, and the like; but in a higher sense it involves the uprooting of all worldly or temporal desires, and withdrawal from the natural relations of life. The origin of such a pecuhar aspect of thought or mode of action is to be found in the wide-spread idea, not wholly Oriental, that in Unity or Identity alone is true goodness and happiness, while in Multiplicity or Difference is evil and misery. Unity is but the abstract expression for God, the Absolute, or Spirit, and Multiplicity for Matter, in which both Orientals aud Greeks thought to find the origin of evil. Now, in man exist both spirit, which is the shadow of or emana- tion from the divine, and the body, with its various desires

and passions, which is of the nature of matter, and there- fore in itself evil. True happiness—nay, true life for man —consists in contemplation of God,

absorption into the divine unity and essence ; and this ecstatic vision can only be attained by the cultivation of the spirit, and the morti- fication of the body. The desires and passions must be subdued, rooted up, and the means recommended are solitude, poverty, celibacy, fasting, and penance. We find, accordingly, that in all nations, those who seek divine illumination prepare themselves by these means. In this respect the Hindoo fakirs, jogis, dervishes, and gymnoso- – phists, and the numerous sect of the Buddhists, are at one with the Hebrew prophets, Nazarites, and Chasidim, and with the priests of the Grecian mysteries. In most of the Greek schools of thought, however, asceticism had less a mystical and religious than a moral and practical bearing. Even the solitude and abstinence practised by the Pytha- goreans were connected partly with their theory of metem- psychosis, but mainly with their ethical training. Socrates, who called temperance, or self-restraint, the chief of virtues, had in view only the higher ethical life of the human spirit; and the Cynics and Stoics, who carried out his doctrine to an extreme, endeavoured to stifle the natural desires, and violate the natural relations of life, in order to realise their ideal of a wise and self-sufficing man of virtue. In Plato, however, appears very prominently the idea of matter as in itself evil and hostile to the divine; and among the neo-Platonic and nco-Pythagorean schools of Alexandria, who draw mainly from him, the doctrine and practice of a mystical and religious asceticism were essentially involved in their philosophical systems. About the same time similar principles had taken root among the Jews, and appeared in Palestine among the Essenes (by some sup- posed to be an offshoot from the Chasidim), in Egypt among the Therapeute. Into the heart of this circle of ideas Christianity entered ; it incorporated many of them, and lent additional strength to the principle of asceticism in its higher signification. The deep sense of the nothing- ness of temporal phenomena when compared with spiritual realities, the conviction that in this world believers are but pilgrims, exposed to many temptations through the weak- ness of the flesh, in which is the origin of sin, and the many expressions which seemed to imply that riches and the ties of marriage were real hindrances in the Christian life, contributed to strengthen the already powerful ten- dency towards ascetic practices. Accordingly, in the early church celibacy and poverty, with occasional fasting and penance, were commonly recommended as means for the attainment of true virtue and communion with God, and such practices soon began to be looked upon as having a

special merit in themselves, 'The natural consequence was that certain enthusiasts—such as Paul of Thebes, Anthony, and Simeon Stylités—vied with each other in their fana- tical asceticism, withdrawing to the desert, and spending their lives in self-mortification. The persecutions of the church, which drove the Christians together, and the intro- duction of cenobitism by Pachomius in the 4th century, gave rise to monasticism, in which, for the first time, asceticism was reduced to an organised system. But the constant reforms required to preserve the purity of the monastic life, and the continuous protests against the whole practice, which began in the 11th century with such men as Peter of Bruis and Henry of Lausanne, and cul- minated in the Reformation, demonstrated the weakuess of the foundation on which the system had been built. Asceticism, meanwhile, was not confined to the church, but had spread through the heretical and religious sects which sprang up alongside of it. The Ebionites and Gnostics inculcated the subjection of the body to the spirit ; the new religion of Mani advocated the absolute withdrawal of all

desires from the world; and among the followers of Ma- homet, one sect, the Persian Sufis, specially distinguished themselves by their practice of abstinence and solitary meditation. Even in modern times, although ascetic practices have been modified, traces of the idea on which they rest are not wanting. The principles of the Quaker Society, of the Methodists, of the Communist bodies in America,—e.g., the Shakers,—and other enthusiasts, are modifications, more or less pronounced, of the ascetic way of thinking.

ASCH, a town of Bohemia, in the circle of Eger, at the foot of the Hainberg, with a population of upwards of 9000, carrying on extensive manufactures of woollen, cot- ton, and other fabrics, as well as of paper, leather, and beer. The district of Asch, with an area of 42 square miles, was originally an immediate dependency of the empire, but has been since 1331 a fief of the Bohemian crown, and since 1770 incorporated with the kingdom. It is now held by the Zedtwitz family.

ASCHAFFENBURG, a town in the government of Lower Franconia, in the kingdom of Bavaria, at the con- fluence of the Aschaffa with the Maine, near the foot of the Spessart-Wald. Its chief buildings are the Johannis-

burg, built (1605-14) by Archbishop Sweikard of Kron- berg, which contains a library, with a number of zncunabula, a collection of engravings aud paintings; the St2ftkirche, or cathedral, founded in 980: by Otto of Bavaria, in which are preserved various monuments by the Vischers, and a sarcophagus, with the relics of St Margaret (1540); the Capuchin hospital; a theatre, which was formerly the house of the Teutonic order; and several mansions of the German nobility. The town, which has been remarkable for its educational establishments since the 10th century, has a gymnasium, lyceum, seminarium, and other schools. The grave of Clemens Brentano (d. 1842) and his brother Christian (d. 1851) is in the churchyard near the Wenne- bach gate; and Wilhelm Heinse (d. 1803) is buried in the town. Cloth and stained paper are the chief manufac- tures; and the trade is principally in wood. The 10th and 23d Romian legions had their station at Aschaffenburg, and on the ruins of their castrum the Frankish mayors of the palace built a castle. Bonifacius erected a chapel to St Martin, and founded a Benedictine monastery. The stonc bridge over the Maine was built by Archbishop Willigis in 989. Adalbert increased the importance of the town in various ways about 1122. In 1292 a synod was held there, and in 1474 an imperial diet, preliminary to that of Vienna, in which the famous concordats were decided, which have therefore been sometimes called the Aschaffenburg con- cordats. The town suffered greatly during the Thirty Years' War, being alternately held by the various belligerents. , In 1842-9, King Louis built himself a country house to the west of the town, called the Pompeianum, from being an imitation of the house of Castor and Pollux at Pompeii. In 1866 the Prussians inflicted a severe defeat on the Austrians in the neighbourhood. Population, 9212.

The principality of Aschaffenburg, deriving its name from the city, comprehended an area of 336 geographical square miles. It formed part of the electorate of Mentz, and in 1803 was made over to the archchancellor, Arch- bishop Charles of Dalberg. In 1806 it was annexed to the grandduchy of Frankfort; and in 1814 was transferred to Bavaria, in virtue of a treaty concluded 19th June between that power and Austria. Conjointly with Lower Franconia, it now forms a circle of the kingdom of Bavaria.

ASCHAM, Roger, a very distinguished scholar and writer, was born at Kirby Wiske, a village in Yorkshire, near Northallerton, about the year

1515. John Ascham, his father, was house-steward in the family of Scroop, and by his wife Margaret was conuected with several respect-

able familics. A short time before his death, Sir Anthony Wingfield having conceived a predilection for his third son Roger, took him into his family, and extended his bounty so far as to give him the advantage of a private education along with his own sons. Under a domestic tutor he made a rapid progress in classical learning, and early discovered a great partiality for reading. The superiority of genius and docility of temper which he constantly displayed in- duced his patron to send him to St John's College, Cam- bridge, in the year 1530.

The revival of Greek and Roman literature at the period Ascham entered upon his studies was peculiarly favourable to the natural bent of his inclination. A desire of excel- ling uniformly influenced his conduct ; and, adopting the maxim Qui docet discit, he began to teach boys the rudi- ments of the Greek language, as soon as he was acquainted with the elementary parts himself. His plan was approved by Pember, and under the direction of this valued friend he soon became acquainted with the best Greek and Latin authors. He devoted himself particularly to Cicero and Cesar, and from his constant study of these writers acquired the elegant Latin style which proved so honourable and so advantageous in the after part of his life. Ascham took his degree of Bachelor of Arts in his 18th year, and was chosen fellow of the college about a month afterwards. The favourable disposition, however, which he manifested towards the reformed religion was no small obstacle in the way of his preferment. He was admitted Master of Arts in the year 1537, and about this period he began to act in the capacity of a tutor.

His reputation for Greek learning soon brought him many pupils, several of whom afterwards rose to considerable eminence. Of these one of the most distinguished was William Grindall, who obtained the station of master of languages to the Lady Elizabeth, upon the recommendation of Sir John Cheke. The reason why Ascham himself was not appointed to that honourable office is not known ; but his partiality for the university seems, from a hint in one of his letters, to have been the cause. At that period there

was no particular chair appropriated to the Greek language, but Ascham was appointed by the university to read lectures upon that language in the schools. A dis- pute arose in the university at that time about the pronun- ciation of the Greek language, in which Ascham first opposed the method observed by Sir John Cheke and Sir Thomas Smith; but, upon more mature deliberation, he adopted that method, which has ever since been practised in the English schools. Both on account of the beauty of his handwriting, and the purity and elegance of his Latin, he was employed to write the public letters of the univer- sity: In 1544, on the resignation of Cheke, he obtained the appointment of university orator, an office which he retained with great reputation during the period he was connected with the university.

By the advice of his friend Pember, he tumed his atten- tion to the study of instrumental music, and thereby enlivened his leisure hours, and prepared his mind for re- newed exertion. In his study he also amused himself with embellishing the pages of his manuscripts with beautiful drawings, and in the field he took part in the diversion of archery. The learned Ascham did not deem his labour improperly bestowed in writing a book entitled Tomo- philus, in an age when the proper use of the bow was of more importance than for mere amusement. This work was written in a more natural, easy, and truly English diction than had hitherto been in use; and it also abounds with beautiful allusions and curious fragments of English history. Ascham candidly acknowledges that, being anxious to make the tour of Italy, which was then the great re- public of letters, and particularly of Greek literature, he

wished, by dedicating his book to the king, to obtain a pension to enable him to make that tour. It reflects credit on Heury VIII. that in the year 1545 he settled upon him an annual pension of £10, which Dr Johnson estimates at the value of £100. Upon the death of Henry this pension was renewed by Edward VI., to whom Ascham was afterwards appointed Latin secretary.

For some years he received an annual gratuity from Lee, archbishop of York, but the amount of it is not recorded ; and, in 1548, upon the death of his pupil Grindall, pre- ceptor to the Lady Elizabeth, his pupils and writings had acquired him such celebrity, that he was appointed to direct the studies

of that princess. He successfully ac- quitted himself in that honourable charge; but two years after, from some unknown cause of dissatisfaction, he returned to the university, having taken an abrupt leave of the princess. This conduct of his did not greatly affect his favour with royalty; for in the same year he was recalled to court, and appointed secretary to Sir Richard Morisine, ambassador to the Emperor Charles V. On his way to London he paid a visit to Lady Jane Grey, whom he found in her chamber reading Plato's Pheedo, in Greek, "and that," says he, "with as much delight as some geutlemen would read a merry tale in Boccace," while the duke and duchess, and the rest of the household, were hunting in the park.

In the character of secretary to Sir Richard, besides aid- ing him in the management of his public affairs, he also conducted his private studies. During the mornings of four days in the week, he read with him a portion of Herodotus or Demosthenes, and in the evenings some pages of Sophocles or Euripides ; on the other mornings he wrote the letters of public business, and on the even- ings he either wrote his own private letters, or continued his diary and remarks. While Ascham was on his travels, he made ashort excursion to Italy, but was much disgusted with the manners of the people, especially of the Venetians. After his return from that tour, he published a curious tract, entitled A Report and Discourse of the Affairs and State of Germany, &c.

Upon the death of Edward VI., Morisine was recalled, and Ascham returned to the university. The accession of a Catholic queen held out little prospect of advancement toa Protestant ; but his fortune soon took a favourable turn, through the interest of Bishop Gardiner, who ob- tained for him the office of Latin secretary to the queen, with a salary of £20 a year, and permission to retain his university emoluments. The prudence of Ascham enabled him to act a respectable part, both under the govern- ment of Mary, and also in the most perilous situations during the reign of Elizabeth ; and the readiness and ele- gance of his Latin style rendered him a useful member at court. He is reported to have written, during the course of three days, 47 letters to persons in the highest ranks of life.

When the crown passed to Elizabeth, it made little alteration in the condition of Ascham, who still retained his station. He spent several hours

every day in reading the learned languages with the queen. Her proficiency was equal to his pains; and it might have been expected that his services would have received some reward more ample than £20 per annum, together with the prebend of Westwang. The allegation that the queen kept him poor because he was extravagant and addicted to cock-fighting, is hardly satisfactory.

In consequence of a conversation which took place in the apartment of secretary Cecil, upon the subject of edu- cation, Sir Richard Sackville, who was present, requested Ascham to write a book on the general subject of educa- tion, This work is entitled The Scholemaster, and contaius

many excellent directions to the instructors of youth, par- ticularly with regard to teaching languages, where he recommends the method of double translation. It was published by his widow after his death. By too close application in composing a poem, which he intended to present to the queen on the New Year's day of 1569, he was seized with an illness which proved fatal. He died on the 23d of December 1568. His death was universally lainented, and the queen expressed her regret by saying, that "she would rather have lost £10,000 than her tutor Ascham." His epistles, which are valuable both on ac- count of their style and historical information, were published after his death, and dedicated to the queen ; the best edition is that of Elstob, published at Oxford in 1703. His English works were published in 4to, with a life by Dr Johnson, in 1771. This edition has been reprinted in 8vo. The whole works have been edited by Dr Giles, London, 1864~—5. Of the Zoxophilus and Scholemaster there are several reprints.

ASCHE, Raxsei, was the first and chief editor of the Talmud. He was born at Babylon in 353 a.D., and was in high repute among his contemporaries for his great learning. He began the Babylonian Zalmud, and spent 30 years of his life at it. He left the work incomplete, and it was finished by his disciples, Rabbi Abina and Rabbi Jose.

ASCHERSLEBEN, a manufacturing city of Prussia, in the government of Magdeburg, formerly the chief town of a circle. It contains one Roman Catholic and five Pro- testant churches, a synagogue, a poor-house, an

asylum for destitute children, and several schools. The discovery of coal in the nejghbourhood has at once stimulated and altered its industries. In addition to the manufacture of. woollen wares, for which it has long been known, there is now extensive production of vinegar, paraffin, potash, and especially beetroot-sugar ; while the surrounding dis- trict, which was formerly devoted in great part to market- gardening, is now turned almost entirely into beetroot fields. Population, 16,741. Aschersleben was probably founded in the 11th century by Count Esika of Ballen- stedt, the ancestor of the house of Anhalt, whose grandson, Otto, called himself count of Ascania and Aschersleben, deriving the former part of the title from his castle in the neighbourhood of the town. On the death of Otto III. (1315) Aschersleben passed into the hands of the bishop of Halberstadt, and at the peace of 1648, was, along with the bishopric, united to Brandenburg.

ASCLEPIADES, of Prusa in Bithynia, a celebrated physician, flourished at Rome in the end of the 2d century B.c He travelled much when young, and seems at first to have settled at Rome as a rhetorician. In that profes- sion he did not succeed, but he acquired great reputation as a physician. He founded his medical practice on a modification of the atomic or corpuscular theory, according to which disease results from an irregular or inharmonious motion of the corpuscles of the body. His remedies were, therefore, directed to the restoration of harmony, and in many cases were not unpleasant. He trusted most to changes of diet, accompanied by friction, bathing, and exercise, though he also employed emetics and bleeding. He recommended the use of wine, and in every way strove to render himself as agreeable as possible to his patients. His pupils were very numerous, and the school formed by them was called the Methodical. Asclepiades died at an advanced age from the effects of a fall.

ASCOLI (Asculum Picenum), the chief town and a bishop's see in the Italian province of Ascoli Piceno, situated on a rising ground on the river Tronto (Zruentus), a few miles to the west of the Apennines, and command- ing a large and fertile plain. It possesses a citadel, a cathedral, built on the site of a basilica erected by Con-

stantine on the ruins of a temple of Hercules, a number of other churches, that of St Francesco dating from the 14th century, and remains of an ancient theatre, temples, &c. The city is built of travertine, and many of its public buildings were designed by Cola dell' Amatrice. It carries on considerable trade, and manufactures woollen cloth, leather, hats, majolica, glass wares, wax, rosoglio, confections, &c. Population, 22,937.

Asculum was the chief city of the Piceni, and a place of great strength. It was captured by P. Sempronius Sophus (268 B.c.), but afterwards took an important part in the Social War, and defied for a time the Roman consul Pompeius Strabo. It fell 89 s.c.; Judacilius, its gallant defender, put an end to his life; its magistrates were executed, and its inhabitants banished. At a later period it received a Roman colony, and recovered its pros- perity. In 545 a.p. it was besieged by Totila. It was under the control of its bishops from the 3d to the 13th century; afterwards passed under the power of the Malatesti of Rimini; and in 1426 was annexed to the Papal States by Pope Martin V.

ASCONIUS PEDIANUS, Quintus, author of some commentaries on Cicero, was born probably a year or two before the Christian era, and died about 83 a.p. He is supposed to have been a native of Padua. Some minor works ascribed to him have been lost ; all that are now extant consist of commentaries ou some of Cicero's orations. These notes, written in very pure Latin, relate chiefly to matters of law, history, or antiquities, and are very valuable for the light they cast on some obscure parts of Cicero. As the commentaries on the Verrine orations deal more with questions of grammar, and do not show such purity of diction as the others, it has been conjectured that they are not the work of Asconius. The manuscript of the commentaries was discovered in 1416 by Poggio Bracciolini in the cellars of the convent of St Gall. He took a copy of it, from which, as the original has been lost, all subsequent reprints have been taken. The best recent edition is by Orelli and Baiter, forming part of their large edition of Cicero's works. See also Madvig, De Asconii Pediani Commentariis Disputatio, Copenhagen, 1828.

ASELLI, AsE.iius, or AsELLIO, GasPpaRo (born 1581), a physician of Cremona, afterwards professor of anatomy at Pavia. He is best known by his important discovery of the Lacteal Vessels. His treatise (De lactibus,

Milan, 4to) on this subject was posthumous, being published in 1627, a year after his death.

ASGARD (from As, god, aud gard, home or hall), the home of the AistR, g.v., the Olympus of northern mytho- logy. The city of Asgard is fabled to have been built on the highest part and in the middle of Ida's plain, which is the very centre of the universe. Here the Atsir erected a court for themselves with seats for twelve, and one high seat for Odin, the All-father, also a lofty abode for the goddesses, called Vingolf. They worked diligently, played at games, were rich in gold and all precious things, and happy, till three maidens from Jotunheim, the giants' world, crossed Ida's plain, and entered Asaheim, when corruption spread amongst its inmates. Asgard had many mansions, the largest and noblest of which was Gladsheim ; whilst another, not so spacious, but the fairest of all, and brighter than the sun, was called Gimli. This will stand when both heaven and earth have passed away, and will be the habitation of all good and upright men through eternity. When the Ausir created men, and placed them in Midgard, they connected the latter with Asgard by a bridge, Bifrdésh, known to mortals as the rainbow, which also leads to the sacred fountain of Urd, by the ash Yggdrasil, where the gods of Asgard take council together. For the other parts of Asgard, which are closely interwoven

with the history of the creation of the world and of man- kind, as taught in the Odinic faith, the reader is referred to Myruotocy, in which the subject is treated more at length. The historical explanation of Asgard, as given by the early northern authorities, is that, in the country called Asahcim to the east of Tanagvise (the Tanais or Don) in Asia, there was a city, Asgard, in which ruled a great chief, known as Odin or Woden, who presided over the religious sacrifices which were held there. At that time the Roman generals were marching over the world, and reducing nations to subjection, and Odin, fore- knowing that he and his posterity would occupy the northern lands, and unwilling to encounter the Romans, left Asaheim with a vast multitude of followers, and wan- dered first westward to Gardcrike (Russia), and afterwards to Saxland (North and East Germany). After some time he proceeded northward, till at length he came to the Malar Lake in

Sweden, where he settled at a place known as Sigtuna, the present Upsala. His twelve diar, or chief priests, in the course of time founded states for themselves, and everywhere set up the laws and usages which they had followed in Asaheim. Here we have an historical link with the mythic story of Odin's halls in Asgard, and his twelve attendant Ausir; but we have no means of fixing the date of the events referred to. It has been conjectured that Odin may have lived at the time when Mithridates Eupator was defying the armies of Rome, 120-80 B.c.; and that, to avoid subjection to either power, he and other Sarmatian or Caucasian chiefs left thcir settlements on the Black Sea, and wandered forth in search of new and independent homes, to the north and west of the primary Asiatic seat of their tribes. It is not im- probable that traditionary records of such earlier migra- tions had lingered among the people dwelling on the shores of the Euxine, for it is certain that, whatever may be the age of Odin's appearance in Scandinavia, previous waves of population had passed from the Black Sea to the Baltic, and cleared the way for the reception of that highest phase of Aryan civilisation brought to Northern Europe by Odin and his followers.

ASGILL, Jonn, an eccentric writer who flourished during part of the 17th and 18th centuries. The exact date of his birth is uncertain. He was bred to the law, and gained considerable reputation, not only by his skill in his profession, but from his first published writings. These consisted of two pamphlets—the first advocating the establishment of some currency other than the usual gold and silver, the second on the registry for titles of lands. His affairs, however, became embarrassed; and in 1699, when a commission was appointed to settle disputed claims in Ireland, he set out for that country, attracted by the hopes of practice. Before leaving London he put in the hands of the printer a tract, entitled An Argument proving that, according to the Covenant of Kternal Lrfe revealed in the Scripture, Man may be translated from hence into that Eternal Life without passing through Death. 'The fame of this extraordinary pamphlet, in which Asgill spoke of dying as an unnecessary and foolish custom, preceded the author, and was of material service in securing his pro- fessional success. He amassed money, and purchased an estate, which unfortunately involved him in a lengthy liti- gation. In 1703 he took his seat in the Irish Parliament, but was dismissed after four days on account of his so- called blasphemous pamphlet. In 1705 he sat in the English Parliament for Bramber ; but in

1707 he was ex- pelled, nominally on account of his unlucky pamphlet, but really, perhaps, because of his debts. The remainder of his life he spent in the Fleet and King's Bench prisons, in one of which he died in 1738. He wrote a number of pam- phlets on the Pretender and on the Hanoverian succession.

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Several of his tracts were collected, and published in London, 1715.

ASH (French, Fréne, German, sche) is the name given to several kinds of trees. The taller or common ash (Frawinus excelsior) belongs to the Natural Order Oleacee, the olive family. It is distinguished by its fruit, which is dry and winged. Normally the fruit should be two-celled and two-seeded ; but generally, by abortion, there is only one cavity and one seed. The Hebrew word Oren, translated ash in Isaiah xliv. 14, caunot refer to an ash tree, as that is not a native of Palestine, but probably to the Syrian pine (Pinus halepensis). The ash is indigenous in Europe, and also extends to Asia. The tree is distin- guished for its height and contour, as well as for its grace- ful foliage. It is one of the most useful of British trees as regards both timber and rapidity of growth. The tree attains a height of from 50 to 80 feet, and flowers in March and April, before the leaves are developed. It thrives best in a dry loamy soil, and, as it exhausts the soil in which it grows, it injures plants growing near it. The flowers grow in clusters, but are not showy. The leaves are compound, and unequally pinnate. A variety of ash, called Fraxinus heterophylla, diverse-leaved, has simple leaves. Another variety of ash is met with in which the branches are pendulous and weeping. Sometimes this variety is grafted on the tall stem of the common ash, so as to produce a pleasing effect. It is said that the weeping variety was first observed at Gamlingay, in Cam- bridgeshire. A variety also occurs with curled leaves, and another with warty stems and branches, called Fraxinus verrucosa. In Europe there is also a small-leaved ash, called Fraxinus parvifolia. In America there are several additional species—such as Fraxinus americana, the white American ash; F. pubescens, the black ash; and 2'. sam- bucifolia, the winter ash. Another plant which bears the name of ash is Fraxinus Ornus, or, more properly, Ornus europea, the

flowering or manna ash. Another species is Ornus rotundifoha, the round-leaved manna ash. The manna ash is a small tree found in Italy, and extending to Switzerland, South Tyrol, Hungary, Greece, Turkey, and Asia Minor. It also grows in the islands of Sicily, Cor- sica, and Sardinia. It blossoms early in summer, produc- ing numerous clusters of whitish flowers. The word manna was first applied to the food supplied miraculously to the Israelites in the desert, but what it was cannot be deter- mined. The name is now given to various saccharine exudations. The manna of commerce is collected almost entirely in Sicily from the manna ash. In order to get it, transverse cuts are made deep into the bark, so as to allow the manna to exude. The best kind is called "flake" manna. It consists of manna sugar, or mannite. The mountain ash belongs to a totally different family from the common ash. It is called Pyrus awcuparia, and belongs to the Natural Order Rosacec, and the tribe Pomew, which includes also apples, pears, &c. Its common name in Scot- land is the rowan tree, and it is well known by its succu- lent scarlet fruit. Pear trees are sometimes grafted on the mountain ash. The name of poison ash is given to /thus venenata, belonging to the Anacardiacece (Cashew family). The bitter ash of the West Indies is Simaruba eaxcelsa, which belongs to the Natural Family Simarubacee. The Cape ash is Hkebergia capensis, belonging to the Natural Order Meliacew. The prickly ash, Xanthowylon fraxineum, belongs to the Natural Order Xanthoxylacee.

ASH-WEDNESDAY, the first day of Lent, is supposed to have received this name from a custom in the church of sprinkling ashes on the heads of penitents then admitted to penance. The early church did not commence Lent until the following Sunday; the additional days were pro- bably included by Gregory the Great.

ASHANTEE

ASHANTEE, or S1anti, a country in Western Africa, in the interior of the Gold Coast, the extent and popula- tion of which can only be approximately given. Stretch- ing from lat. 5° to 9° N., and from long. 0° to 4° W,, it comprises about 70,000 English square miles, and its population has been variously stated at from 1,000,000 to

3,000,000.

Tradition represents the Ashantees as deriving their origin from bands of fugitives, who, two or three centuries ago, were driven before the Moslem tribes migrating south- ward from the countries on the Niger and Senegal. Hay- ing cleared for themselves a region of impenetrable forest, they defendcd themselves with a valour which, becoming part of their national character, raised them to the rank of a powerful and conquering nation. They are supposed to be originally of the same race as the Fantees, nearer the coast, and speak the same language. 'The separation of Fantees and Ashantees is ascribed to a famine which drove the former south, and led them to live on jan, or herbs, while the latter subsisted on san, or Indian corn, &c. (whence the names Fantces and Santees).

Ashantee proper is covered with almost impenetrable forest, the routes through which consist merely of narrow winding tracts, where, though it is possible fur a man to ride, or a palanquin to be carried, no waggon of any de- scription could pass. Many of the trees attain splendid proportions, but the monotony is oppressive, and is hardly ever relieved by the sight of either bird or beast. The country round the towns in the interior, however, is cul- tivated with care, the fields being kept clean, and yielding in abundance grain, yams, vegetables, and fruits. The ter- ritory yields also a considerable quantity of gold. The Ashantees are skilful in several species of manufacture, particularly in weaving the great African fabric of cotton. Their pottery and works in gold also show skill, though surpassed by those produced in the more southern countries. A large quantity of silver-plate and goldsmith's work of great value and considerable artistic elaboration was found in 1874 in the king's palace of Coomassie, not the least remarkable objects being masks of beaten gold. The in- fluence of Moorish art is perceptible in everything.

The government of Ashantee is a mixture of monarchy and military aristocracy ; the lower orders being held in complete thraldom, and liable to be put to death or sold into slavery at the will of the chiefs. The king carries on all the ordinary admiuistration of the state; but in ques- tions relating to peace or war he is bound to consult the council of the caboceers or captains. Each of these cabo- ceers keeps a little court, where he makes

a profuse display of barbaric pomp. Polygamy is indulged in to an enor- mous extent, the king has a regular allowance of 3333 wives, but many of these are employed as guards or in menial services. 'The crown descends to the king's brother, or his sister's son, not to his own offspring.

The dreadful system of human sacrifice, practised among the Ashantees, is founded on a wild idea of piety towards parents and other connections—the chiefs fancying that the rank of their dead relatives in the future world will be measured by the number of attendants sent after them. There are two periods, called the great Adai and little Adai, succeeding each other at intervals of eighteen and twenty- four days, at which human victims, chiefly prisoners of war or condemned criminals, are often immolated to a monstrous extent. On the great Adai, which always falls on a Sunday, the king visits the burial-grounds of the princes and the royal mausoleum at Bantama, where the skeletons of his predecessors—their bones held together by links of gold—sit in grim mockery of state. Still more dreadful is the "' custom " celebrated after the death of the king, or any member of the royal house,

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Early in the 18th century the Ashantees first came under the notice of Europeans, through their successful wars with the king- doms bordering on the maritime territory. Osai Tutu may be con- sidered as the real founder of the Ashantee power. He either built or greatly extended Coomassie, the capital ; he subdued the neigh- bouring state of Denkera (1719) and the Mahometan countries of Gaman and Banna, and extended the empire by conquests both on the east and west. At last he was defeated and slain (1731) ; but his successor, Osai Apoko, made further acquisitions towards the coast.

In 1800, Osai Tutu Quamina, an enterprising and ambitious man, who appears carly to have formed the desire of opening a communi- cation with white nations, became king. About 1807 two chiefs of the Assins, whom he had defeated in battle, sought refuge among the Fantees, the ruling people on the coast. On the refusal of the Fantees to deliver up the fugitives, he invaded their country, defeated them, and drove them towards the sea. At length they reached the town of Annainaboe, where there was then a British

fort. The governor exhorted the citizens to come to terms, and offered to mediate; but they resolved to abide the contest. The resuit was the destruction of the town, with great slaughtcr of the inhabitants. The Ashantees failed, however, to storm the English fort, though the garrison was reduced from 24 to 8 meu. A truce was agreed to, and the king refusing to treat except with the chief governor of Cape Coast, Colonel Torranne repaired to Anna- maboe, where he was received with great pomp. A treaty was con- cluded by which the whole territory of Fantee, including Cape Coast Castle, was ecded by right of conquest to the Ashantee empire.

In 1817 the British Government sent Messrs James, Bowdich, and Hutchison on a mission to Coomassie. They were received with dignified politeness. After one or two harmonious interviews, the king advanced a claim for certain sums which the British were bound to pay to the native Governments, and which the Fantees had been accustomed to receive, for permission to hold fortified factories. Mr James proposcd to refer this claim to the Government at Cape Coast Castle ; whereupon the king broke out into uncon- trollable rage, calling the deputies cheats and liars. Messrs Bow- dich and Hutchison, thinking that the English interests and the safety of the mission were endangered, took the negotiation into their own hands. A treaty was concluded, by which all the king's demands were satisficd ; and, after a residence of sevcral months, they returned to Cape Coast.

The Government at home, though they demurred somewhat to the course that had been pursued, saw the wisdom of cultivating intercourse with this powerful African king. They sent out, therc- fore, to his court, as a fixed resident, M. Dupuis, who arrived at Cape Coast in January 1819. By that time the British local Government had been gained over to the interest of the Fantces. An insurrection had arisen in the interior of the Ashantee territory, respecting which cxaggerated rumours had been listened to with blind credulity. Insulting messages were sent to the king, who was also informed that the inhabitants of Cape Coast were setting his authority at defiance, and were forming a wall to defend the town. The governor, on various pretences, detained M. Dupuis for some time ; but at length, on the arrival of more than oue ambassador from the king, allowed him to proceed. M. Dupuis set out on the 9th February 1820, and on the 28th arrived at Coomassie. After several confidential meetings with the king, a

treaty was drawn up, which adjusted all the ditlerences between the two parties. The king dismissed M. Dupuis with many marks of esteem and kindness, sending along with him two natives of distinction, to proceed as ambassadors to England. On his return to Cape Coast he found that the goveruor disowned the treaty, as betraying British interests and transferring to Ashantee the sovereignty of the Gold Coast. At the same time the Fantee party persuaded Sir George Collier to refuse to transport the Ashantee ambassadors to Britain.

M. Dupuis returned to England to represent the particulars to the Government ; but an entire change meantime took place in the administration of British affairs in Africa. The African Company was abolished by Act of Parliament in 1821, and the forts and possessions transferred to the Crown. Sir Charles M'Carthy was invested with the government of all this range of coast. On his arrival in 1822 he adopted the Fantce policy, placed the town in a posture of defence, and formed alliances with the neighbouring tribes. It was hoped that the hostile attitude of the English would overawe the king, but he speedily declared open war.

After one or two unimportant successes, the British force was completely routed in Essamaco, near the boundary stream of the Prah, by a native army of about 10,000 men. Sir Charles M'Carthy was slain, and only 50 men, including two officers, returned to the castle. On the very day of this defeat Osai Tutu Quamina died, and was succeeded by Osai Okoto. The Ashantee army now marched upon Cape Coast, laying waste the country with fire and sword. At that place, however, detachments of reserve had united with the wrecks of the main corps, and vigorously prepared for defence. The king made repeated and desperate assaults, but at last sustained a signal defeat at Dudowah, on the 7th August 1826. In 1828 all public establishments were withdrawn by the British Government,

and the chief power was transferred to a company of African mer- chants. In 1831 the king was obliged to purchase peace at the price of 6000 ounces of gold, and to send his son as a hostage to Cape Coast Castle. Since this

event the Ashantce power has be- come extinct on the coast. By the treaty concluded at the end of the war, the river Prah was fixed as the boundary of the Ashantee kingdom, and all the tribes to the south of it were placed under British protection.

In 1843 the Crown resumed the government of the Gold Coast. Towards the end of 1852 the Ashantee monarch seemed disposed to interfere with the states absolved from his jurisdiction. Two Assin chiefs, who had revolted from Ashantee and joined the Fantee alliance, were discovered to be intriguing with the king of Ash- antee ; and that monarch, under pretext of making " custom" for the late chief of Denkera, crossed the Prah with a force of about 7000 men. These warlike movements naturally excited much un- easiness at Cape Coast Castle, but the negotiations of the authorities were successful in averting the storm. From 1853 to 1863 there was peace between Ashantee and the Government of Cape Coast Castle ; but in the latter year disagreements broke out on account of a refusal to deliver up certain Ashantee refugees. In 1867 it was agreed that all the Dutch forts to the east of the Sweet River should be handed over to Britain in exchange for all the British forts to the west of that river. Unexpected difficulties, however, arose, which led the Dutch Government to offer all their possessions in that district to Britain, on certain commercial privileges being guaranteed to them. Hereupon the king of Ashantee objected to the transfer of Fort Elmina ; but the superiority he alleged was completely disproved, and the proposal took effect on Aprik6, 1872.

Meanwhile another matter of dispute arose between the king and the English. Messrs Ktihne, Ramsayer, and Palmer, and a French- man named Bonnat, having been inveigled into captivity by an Ashantee chief, the British Government demanded their surrender ; but this, on various pretexts, was obstinately refused by the king. War had for some time been imminent, and at length, on January 22, 1873, au Ashantee force crossed the Prah, and invaded the British protectorate. The importance of the invasion was soon recognised, not only by the local authorities, but by the Govern- ment at home; and measures were taken for the defence of the territory aiid the punishment of the assailants, which ultimately culminated in the despatch of Sir Garnet Wolseley as her Majesty's administrator, £800,000 being voted in parliament for the expenses of the expedition. On

landing (October 2) at Cape Coast, he found that the Ashantee nation wasin arms to the number of 40,000; the Fantce tribes were fragmentary and languid ; and the country was extremely unhealthy for European troops. He determined, how- ever, to march to Coomassie, and dictate terms to the king from his own capital. On January 20, 1874, the river Prah was crossed ; on the 24th the Adansi hills were reached ; on the 31st there was severe fighting at Amoaful; on the Ist of February Becquah was captured ; and on the 4th the victorious army was in Coomassie. The town was full of Ashantee soldiers, but no attempt was made to turn the fortune of the war. As the rainy season was setting in, all possible haste was requisite ; in two days, therefore, the home- ward march was commenced, the city being left beliind in flames. By the time that Fommanah was reached (February 13), the king sent his envoys to conclude a treaty, whereby he agreed, among other conditions, to pay 50,000 ounces of gold, to renounce all claim to homage from certain neighbouring kings, and all pretensions of supreniacy over any part of the former Dutch protectorate, to pro- mote freedom of trade, to keep open a road from Cooniassie to the Prah, and to do his best to check the practice of human sacrifice. Besides coloured troops, there were employed in this campaign about 2400 Europeans, who suffered severely from fever and otherwise, though the mortality on the whole was slight. The success of the expedition was greatly facilitated by the exertions of Captains Glover, Butler, and Dalrymple, who effected important diversions with very inadequate resources.

See the works of Bowdich (1819), Dupuis (1824), Ricketts (1831), Beecham (1841),Stanley, Winwood Reade, Boyle, Brackenbury (1874).

ASHBURTON, a borough and market-town of England, in the county of Devon, 192 miles W.S.W. of London, and 18 from Exeter. It stands in a valley surrounded on every side by hills, at a short distance from the river Dart, and consists principally of one long street. The church of St Andrew is a handsome Gothic structure, built in the form of a cross, with a tower 90 feet high. Ashburton was the seat of one of the stannary courts. Before the Reform Act of 1832 it returned two members to parlia- ment, but it now returns only one. Population in 1871, 2335, principally employed in the manufacture of serge, or in the tin and copper-mines and slate-quarries in the vicinity.

ASHBY-DE-LA-ZOUCH, a market-town of England, county of Leicester, 17 miles north-west of Leicester, on the railway from that city to Burton, The town, which derives the adjunct to its name from the Norman family of La Zouch, consists principally of one long street. It contains six churches and chapels, and has a grammar school and several charity schools. The church of St Helen is a fine old building, containing the tombs of the Hunt- ingdon family, and a " finger pillory." The Ivanhoe baths, erected in 1826, are much frequented for their saline waters, which, as containing bromine, are found useful in scrofulous and rheumatic complaints. To the south of the town are the extensive remains of Ashby Castle, built in 1480 by Sir William Hastings, ancestor of the earls of Huntingdon, who was created baron of Ashby-de-la-Zouch in 1461. It was one of the castles in which Mary Queen of Scots was confined. Population (1871), 7302, principally engaged in the manufacture of stockings, leather, malt, and firebricks, or in the coal and iron mines of the vicinity.

ASHDOD. See Azortus.

ASHFORD, a market-town of England, county of Kent, 12 miles south-west of Canterbury, and 53 from London. It is pleasantly situated on a gentle eminence near the junction of the upper branches of the river Stour, and is a chief station of the South-Eastern Railway. Many of its houses are well built and handsome; its principal street is nearly half a mile in length, and well paved and lighted. It has a fine old Gothic church, with a lofty, well-propor- tioned tower, and many handsome monuments. 'The free grammar school was founded by Sir Norman Knatchbull in the time of CharlesI. Population of parish (1871), 8458.

ASHTON-UNDER-LYNE, or Asuton, a parliamentary borough in the county of Lancaster, and hundred of Salford, on the northern bank of the river Tame, 64 miles east of Manchester, and 197 from London, Like Manchester, it has had a rapid growth from an insignificant country town to a populous and thriving borough. Notwithstanding this it is well built, and contains many spacious streets and handsome public edifices. Among the latter are 4

large churches, 15 dissenting chapels, a spacious town-hall, and a very large and prosperous market-house. There are three banks, a savings-bank, a theatre, a mechanics' institute, and numerous week-day and Sunday schools. The cor- poration have built, at a cost of £16,000, a magnificent set of public baths. There are three newspapers published in the town. Atashort distance to the north of the town are the infantry and cavalry barracks, erected in 1843 at a cost of £42,500, and the union workhouse, erected in 1851 at an expenditure of £12,000. A magnificent in- firmary, built and endowed by public subscriptions, fronts the workhouse. A large public park is provided for the people midway between this and neighbouring borough of Stalybridge. A union hospital for infectious and other diseases has just been completed. The modern growth of Ashton dates from the introduction of the cotton trade in 1769. It enjoys many facilities for manufacturing indus- try, coal being very plentiful in the neighbourhood, four important railway lines passing through it, and canals con- necting it with Manchester, Huddersfield, and Derbyshire. The town, though essentially modern, has an origin of great antiquity, and still exercises many of its ancient feudal customs and manorial privileges. It is divided into four wards, governed by a mayor, eight aldermen, and _twenty-four councillors ; and since the Reform Act of 1832 it has returned one member to the House of Commons. In 1821 it had a population of only 9222, which in 1851 had increased to 29,798, chiefly engaged in spinning cotton yarn and weaving ginghams and calicoes by machinery in the numerous large factories. Population of parliamentary borough in 1871, 37,389; of municipal borough, 31,984.

ASIA.

Ancient

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ASIA

1. HIS division of the earth's surface embraces the

north-eastern portion of the great mass of land which constitutes what is generally known as the Old World, of which Europe forms the north-

western and Africa the south-western region.

Sketch Map of Asia.

2. Geography, in common with most of the other branches

geography. of human learning which have supplied the foundation of

modern science, originated in Egypt and Greece, and its nomenclature naturally carries with it the stamp of the place where it had its birth. The earliest conceptions of geographical position were necessarily formed and expressed in relation to the region in which the ancient geographers lived and wrote ; and the first steps in generalisation which recognised and distinguished the special characteristics of the countries and people grouped round the eastern end of the Mediterranean, and suggested the three great divisions of the Old World, attest the sagacity of the founders of geography, whose landmarks their successors still respect.

3. Much doubt attaches to the origin of the words Europe, Africa, and Asia. Some of the earliest Greek geographers divided their known world into two portions only, Europe and Asia, in which last Libya (the Greek name for Africa) was included. Herodotus, who ranks Libya as one of the chief divisions of the world, separating it from Asia, re- pudiates as fables the ordinary explanations assigned to the names Europe and Asia, but confesses his inability to say whence they came. It would appear probable, how- ever, that the former of these words was derived from an Assyrian or Hebrew root, which signifies the west or setting sun, and the latter from a corresponding root meaning the east or rising sun, and that they were used at oue time to imply the west and the east. There is ground also for supposing that they may at first have been used with a specific or restricted local application, a more extended signification having eventually been given to them. After the word Asia had acquired its larger sense, it was still specially used by the Greeks to designate the country

around Ephesus. The word Africa is the Latin substitute

for the Greek Libya; its origin is obscure. It may have been a local name. It was long used with special refer- ence to the country about Carthage, and

this seems to have been the case even to the time of the Mahometan conquest. The idea of Asia as originally formed was necessarily in- definite, and long continued to be so; and the area to which the name was finally applied, as geographical knowledge increased, was to a great extent determined by arbitrary and not very precise conceptions, rather than on the basis of natural relations and differences subsisting between it and the surrounding regions.

4. The entire surface of the earth being about 196 mil- Area.

lions of square miles in area (of which 51 millions are land, and 145 millions water), Asia contains about 17 millions of square miles, or say one-third of the whole of the dry land and one-twelfth part of the whole surface of the globe. Europe contains about 34 millions of square miles, or close upon one-fifth of the area of Asia; Africa, 114 millions; and the two Americas together, rather more than 15 millions, The remainder of the land belongs to Australia, the islands of the Eastern Archipelago and the Pacific, and the Antarctic regions.

5, The northern boundary of Asia is formed by the Arctic Bound- Ocean ; the coast-line falls between the 70th and the 75th aries.

parallels of N. lat., and so lies within the Arctie circle, hav- ing its extreme northern point in Cape Sievero-Vostochny (¢.e., north-east), in lat. 78° N. On the south the coast- line is far more irregular, the Arabian Sea, the Bay of Bengal, and the China Sea, reaching about to the northern tropic at the mouths of the Indus, of the Ganges, and of the Canton river; while the great peninsulas of Arabia, of Hindostan, and Cambodia, descend to about the 10th degree of N. lat., and the Malay peninsula extends within a degree and a half of the equator. On the west the extreme point of Asia is found on the shore of the Medi- terranean, at Cape Baba, in long. 26° E. from Greenwich, not far from the Dardanelles. Thence the boundary passes in the one direction through the Mediterranean, and down the Red Sea to the southern point of Arabia, at the Straits of Bab-el-mandeb, in long. 45° E. ; and in the other through the Black Sea, and along the range of Caucasus, following approximately the 40th degree of N. lat. to the Caspian, whence it turns to the north on a line not far from the 60th meridian, along the Ural Mountains, and meets the Arctic Ocean nearly opposite the island of Nova-

Zembla. The most easterly point of Asia is Cape Vostochnyii (7.¢., east), in long. 190° E., at the entrance of Behring's Straits. The boundary between this point and the extremity of the Malay peninsula follows the coast of the Northern Pacific and the China Sea, on a line deeply broken by the projec- tion of the peninsulas of Kamchatka and Corea, and the recession of the Gulfs of Okotsk, the Yellow Sea, Tonquin, and Siam.

6. On the east and south-east of Asia are several im- Islands.

portant groups of islands, the more southern of which link this continent to Australia, and to the islands of the Pacific. The Kurile Islands, the Japanese group, Loo-choo, For- mosa, and the Philippines, may be regarded as unquestion- able outliers of Asia. Between the islands of the Malay Archipelago from Sumatra to New Guinea, and the neigh- bouring Asiatic continent, no definite relations appear ever to have existed, and no distinctly-marked boundary for Asia has been established by the old geographers in this quarter. Modern science, however, has indicated a line of physical separation along the channel between Borneo and the Celebes, called the Straits of Macassar, which follows ap-

Form of continent.

Relative

importance

of geo- graphical features.

Tibeto-

Himalayan mountains.

proximately the 120th meridian of E. long., to the west of which the flora and fauna are essentially Asiatic in their type, while to the south and east the Australian element begins to be distinctly marked, soon to become

predominant. To this boundary has been given the name of Wallace's line, after the eminent uaturalist who first indicated its existence.

7. Owing to the great extent of Asia, it is not easy to obtain a correct conception of the actual form of its outline from ordinary niaps, the distortions which accompany pro- jections of large spherical areas on a flat surface being necessarily great and misleading. Turning, therefore, to a globe, Asia, viewed as a whole, will be scen to have the form of a great isosceles spherical triangle, having its north- eastern apex at Cape Vostochnyii, in Behring's Straits ; its two equal sides, in length about a quadrant of the sphere, or 6500 miles, extending on the west to the southern point of Arabia, and on the east to the extremity of the Malay peninsula; and the base between these points, occupying about 60° of a great circle, or 4500 miles, and being deeply indented by the Arabian Sea and the Bay of Bengal on either side of the Indian peninsula. A great circle, drawn through Cape Vostochnyii and the southern point of Arabia, passes nearly along the coast line of the Arctic Ocean, over the Ural Mountains, through the western part of the Cas- pian, and nearly along the boundary between Persia and Asiatic Turkey. Asia Minor and the north-western half of Arabia lie outside of such a great circle, which otherwise indicates, with fair accuracy, the north-western boundary of Asia. In like manner a great circle drawn through Cape Vostochnyii and the extremity of the Malay penin- sula, passes nearly over the coasts of Manchuria, China, and Cochin- China, and departs comparatively little from the eastern boundary.

8. Although for the purposes of geographical nomencla- ture, boundaries formed by a coast line—that is, by depres- sions of the earth's solid crust below the ocean level—are most easily recognised, and are of special convenience; and although such boundaries, from following lines on which the continuity of the land is interrupted, often necessarily indicate important differences in the conditions of adjoin- ing countries, and of their political and physical relations, yet variations of the elevation of the surface above the sea level frequently produce effects not less marked. The changes of temperature and climate caused by difference of elevation are quite comparable in their magnitude and effect on all organised creatures with those due to differ- ences of latitude; and the relative position of the high and low lands on the earth's surface, by modifying the direction of the

winds, the fall of rain, and other atmos- pheric phenomena, produces effects in no sense less im- portant than those due to the relative distribution of the land and sea. Hence the study of the mountain ranges of a continent is, for a proper apprehension of its physical conditions and characteristics, as essential as the examination of its extent and position in relation to the equator and poles, and the configuration of its coasts.

9. From such causes the physical conditions of a large part of Asia, and the history of its populations, have been very greatly influenced by the occurrence of the mass of mountain, which includes the Himalaya and the whole ele- vated area having true physical connection with that range, and occupies an area about 2000 miles in length and vary- ing from 100 to 500 miles in width, between the 65th and 100th meridians east from Greenwich, and between the 28th and 35th degrees of N. lat. These mountains, which are the highest in the world, rise, along their entire length, far above the line of perpetual snow, and few of the passes across the main ridges are ata less altitude than 15,000

or 16,000 feet above the sea. Peaks of 20,000 feet abound along the whole cbain, and the points that exceed that elevation are numerous, the highest hitherto measured being more than 29,000 feet above the sea. A mountain range such as this, attaining altitudes at which vegetable life ceases, and the support of animal life is extremely difli- cult, constitutes an almost impassible barrier against the spread of all forms of living creatures. The mountain mass, moreover, is not less important in causing a com- plete separation between the atmospheric conditions on its opposite flanks, by reason of the extent to which it pene- trates that stratum of the atmosphere which is in contact with the earth's surface and is effective in determining climate. The highest summits create serious obstructions to the movements of nearly three-fourths of the mass of the air resting on this part of the earth, and of nearly the whole of the moisture it contains; the average height of the entire chain is such as to make it an almost absolute barrier to one-half of the air and three-fourths of the mois- ture; while the lower

ranges also produce important atmo- spheric effects, one-fourth of the air and one-half of the watery vapour it carries with it lying below 9000 feet.

10. This great mass of mountain, constituting as it does a complete natural line of division across a large part of tlic coutinent, will form a convenient basis from which to work, in proceeding, as will now be done, to give a general view of the principal countries contained in Asia.

11. The summit of the great mountain mass is occupied by Tibet, a country known by its inhabitants under the name of Bod, or Bodyul. Tibet is a rugged tableland, narrow as compared to its length, broken up by a succession of mountain ranges, which follow as a rule the direction of the length of the tableland, and commonly rise into the regions of perpetual snow; between the flanks of these lie valleys, closely hemmed in, usually narrow, having a very moderate inclination, but at intervals opening out into wide plains, and occupied either by rivers, or frequently by lakes from which there is no outflow and the waters of which are salt. The eastern termination of Tibet is in the line of snowy mountains which flanks China on the west, between the 27th and 35th parallels of latitude, and about on the 103d meridian east. On the west the table- land is prolonged beyond the political limits of Tibet, though with much the same physical features, to about the 70th meridian, beyond which it terminates ; and the ranges which are covered with perpetual snow as far west as Samirkhand thence rapidly diminish in height, and ter- ninate in low hills north of Bukhara.

12. The mean elevation of Tibet may be taken as 15,000 feet above the sea. The broad mountainous slope by which it is connected with the lower levels of Hindostan contains the ranges known as the Himalaya ; the names of Kouenlun, or Karakorum, have been given by some geographers to the northern slope that descends to the central plains of the Gobi, though these mountains are not locally known under those names, Kouenlun being ap- parently a Chinese corruption of some Turkish or Tibetan word, and Karakorum only one of the many passes that lead from Western Tibet to the northward.

13. The extreme rigour of the climate of Tibet, which combines great cold with great drought, makes the country essentially very poor, and the chief portion of it little better than desert. The vegetation is everywhere most

scanty, and anything deserving the name of a tree is hardly to be found unless in the more sheltered spots, and then artificially planted. The population in the lower and warmer valleys live in houses, and follow agriculture ; in the higher regions they are nomadic shepherds, thinly scattered over a large area.

Their physical import-

GEO- GRAPHY,

Tibet.

Its extert.

Its moun- tains,

Its climate and people.

14, China lies between the eastern flank of the Tibetan China. .

- western border.

GEOGRAPHY. |

plateau and the North Pacific, having its northern and southern limits about on the 40th and the 20th parallels of N. lat. respectively. The country 'though generally broken up with mountains of moderate elevation, possesses none' of very great importance apart from those of its It is well watered, populous, and, as a rule, highly cultivated, fertile, and well wooded ; the climate is analogous to that of southern Europe, with hot summers, and winters everywhere cold and in the north decidedly severe.

15. From the eastern extremity of the Tibetan moun- tains, between the 95th and 100th meridians, high ranges extend from about lat. 35° N., in a southerly direction, which, spreading outwards as they go south, reach the sea at various points in Cochiu-China, the Malayan peninsula, and the east flank of Bengal. Between these ranges, which are probably permanently snowy to about the 27th degree of N. lat., flow the great rivers of the Indo-Chinese peninsula, the Mekong, the Mendm, the Salwen, and the Irawady,

the valleys of which forin the main portions of the states of Cochin-China (including Tonquin and Camboja), of Siam (including Laos), and of Burmah. The people of Cochin-China are called Anam ; it is probably from a corruption of their name for the capital of Tonquin, Kechao, that the Portuguese Cochin has been derived. All these countries are well watered, populous, and fertile, with a climate very similar to that of eastern Bengal. The geography of the region in which the mountains of Cochin-China and Siam join Tibet is still very imperfectly known, but there is no ground left for doubting that the great river of eastern Tibet, the Tachok- tsangpo, supplies the main stream of the Brahmaputra. The two great rivers of China, the Hoang-ho and the Yang-tse-kyang, take their rise from the eastern face of Tibet, the former from the north-east angle, the latter from the south-east. The main stream of this last is called Bri-chu in Tibet, and its chief feeder is the Ya-lung-kyang, which rises not far from the Hoang-ho, and is considered the territorial boundary between China and Tibet.

16. British India comprises approximately the area between the 95th and 70th meridians, and between the Tibetan table-land and the Indian Ocean. The Indian peninsula from the 25th degree of latitude southwards is a table-land, having its greatest elevation on the west, where the highest points rise to over 8000 feet, though the ordinary altitude of the higher hills hardly exceeds 4000 feet ; the general level of the table-land lies between 3000 feet as a maximum and 1000 feet.

17. From the delta of the Ganges and Brahmaputra on the east to that of the Indus on the west, and intervening between the table-land of the peninsula and the foot of the Himalayan slope of the Tibetan plateau, lies the great plain of northern India, which rises at its highest point to about 1000 feet, and includes altogether, with its prolon- gation up the valley of Assam, an area of about 500,000 square imiles, comprising the richest, the most populous, and most civilised districts of India. This great plain extends, with an almost unbroken surface, from the most western to the most eastern extremity of British India, and is composed of deposits so finely comminuted, that it is no exaggeration to say that it is possible to go from the Bay of Bengal up the Ganges, through the Punjab, and down the Indus again to the sea, over a distance of 2000 miles and more, without finding a pebble, however small.

18. The great rivers of Northern India—the Ganges, the Brahmaputra, and the Indus—all derive their waters from the Tibetan mountain mass ; and it is a remarkable circumstance, that the waters of almost the whole of the summit of the plateau are carried off into British India between, the 95th and 75th meridians, and that the only

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part of the drainage thrown off to the north, is that of the northern mountain slope.

19. The population of India is very large, some of its Population

districts being probably among the most densely peopled in #

the world. The countryis generally well cleared, and forests ™

are, as a rule, found only along the flanks of the moun- tains, where the fall of rain is most abundant. The more open parts are highly cultivated, and large cities abound. The climate is generally such as to secure the population the necessaries of life without severe labour; the extremes of heat and drought are such as to render the land unsuit- able for pasture, and the people everywhere subsist by cultivation of the soil or commerce, and live in settled villages or towns.

nd cli- ate.

20. The island of Ceylon is distinguished from the Ceylon.

neighbouring parts of British India by little more than its separate administration and the Buddhistic religion of its population. The highest point in Ceylon rises to about 9000 feet above the sea, and the mountain slopes are densely covered with forest. The lower levels are in climate and cultivation quite similar to the regions in the same latitude on the Malay peninsula.

21. Of the islands in the Bay of Bengal, the Wicobar Nicobars

and Andaman groups are alone worth notice. They are?®

placed on a line joining the north end of Sumatra and ™

Cape Negrais, the south-western extremity of Burmah. They possibly owe their existence to the volcanic agencies which are known to extend from Sumatra across this part of the Indian Ocean.

22. The Laccadives and Maldives are groups of small eo an al-

dives,

coral islands, situated along the 73d meridian, at no great distance from the Indian peninsula, on which they have a very slight and ill-defined political dependency.

23. The portion of Asia west of British India, excluding High lands f Persia.

Arabia and Syria, forms another extensive plateau cover- ° ing an area as large as that of Tibet, though at a much lower altitude. Its southern border runs along the Arabian Sea, the Persian Gulf, the Tigris, and thence westward to the north-east angle of the Levant; on the north the high land follows nearly the 36th degree of N. lat. to the southern shore of the Caspian, and thence to the Black Sea and Sea of Marmora. Afghanistan, Balichistén, Frdn or Persia, Armenia, and the provinces of Asia Minor, occupy this high region, with which they are nearly conterminous. The eastern flank of this table- land follows a line of hills drawn a short distance from the Indus, between the mouth of that river and the Himalaya, about on the 72d meridian; these hills do not generally exceed 4000 or 5000 feet in elevation, but a few of the summits reach 10,000 feet or more. The southern and south-western face follows the coast closely up the Persian Gulf from the mouth of the Indus, and is formed further west by the mountain scarp which, rising in many points to 10,000 feet, flanks the Tigris and the Mesopotamian plains, and extends along Kurdistan and Armenia nearly to the 40th meridian; beyond which it turns along the Taurus range, and the north-eastern angle of the Mediterranean. The north-eastern portion

nd Andax

ans,

of the Afghan table-land abuts on the Himalaya and Afghan-

Tibet, with which it forms a continuous mass of moun- tain between the 71st and 72d meridians, and the 34th and 36th parallels of N. lat. From the point of inter- section of the 71st meridian with the 36th parallel of latitude, which falls nearly on the pass called Hindu- kosh (a name which has been extended by geographers to the ridge on which it is placed), an unbroken range of mountain stretches on one side towards the north-east, up to the crest of the northern slope of the Tibetan plateau, and on the other nearly due west as far as the Caspian. The north-eastern portion of this range is of

istan,

Asia Minor,

Extent, climate, population.

Arabia and Syria.

Turkistan.

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great altitude, and separates the head waters of the Oxus, which run off to the Aral Sea, from those of the Indus and its Cabul tributary, which, uniting below Peshawar, are thence discharged southward into the Arabian Sea. The western part of the range, which received the name of Parapomisan Mountains from the ancients, diminishes in height west of the 65th meridian, and constitutes the northern face of the Afghan and Persian platean, rising abruptly from the plains of the Turkoman desert, which lies between the Oxus and the Caspian. These mountains at some points attain a height of 10,000 or 12,000 feet. Along the south coast of the Caspian this line of elevation is pro- longed as the Elburz range (not to be confused with the Elburz of the Caucasus), aud has its culminating point in Demavend,

which rises to 18,500 feet above the sea; thence it extends to the north-west to Ararat, which rises to upwards of 17,000 feet, from the vicinity of which the Euphrates flows off to the south-west, across the high lands of Armenia. Below the north-east declivity of this range lies Georgia, on the other side of which province rises the Caucasus, the boundary of Asia and Europe between the Caspian and Black Seas, the highest points of which reach an elevation of nearly 19,000 feet. West of Ararat high hills extend along the Black Sea, between which and the Taurus range lies the plateau of Asia Minor, reaching to the Aigean Sea; the mountains along the Black Sea, on which are the Olympus and Ida of the ancients, rise to 6000 or 7000 feet; the Taurus is more lofty, reaching 8000 and 10,000 feet ; both ranges decline in altitude as they approach the Mediterranean.

24. This great plateau, extending from the Mediter- ranean to the Indus, has a length of about 2500 miles from east to west, and a breadth of upwards of 600 miles on the west, and nowhere of less than 250 miles. It lies generally at altitudes between 2000 feet and 8000 feet above the sea level. Viewed as a whole, the eastern half of this region, comprising Persia, Afghanistan, and Baluchistan, is poor and unproductive. The climate is very severe in the winter, and extremely hot in summer. The rainfall is very scanty, and running waters are hardly known, excepting among the mountains which form the scarps of the elevated couutry. The population is sparse, frequently nomadic, and addicted to plunder ; progress in the arts and habits of civilisation is small. The western part of the area falls within the Turkish empire. Its climate is less hot and arid, its natural productiveness much greater, and its population more settled and on the whole more advanced.

25. The peninsula of Arabia, with Syria, its continua- tion to the north-west, have some of the characteristics of the hottest and driest parts of Persia and Baluchistan. Excepting the northern part of this tract, which is conter- minous with the plain of Mesopotamia (which at its highest point reaches an elevation of about 700 feet above the sea), the country is covered with low mountains, rising to 3000 or 4000 feet in altitude, having among them narrow valleys in which the vegetation is scanty, with exceptional regions of greater fertility in the neighbourhood of the coasts, where the rainfall is greatest. In Northern Syria the mountains of Lebanon rise to about 10,000 feet, and with a more copious water supply the country becomes more

productive. The whole tract, excepting south-eastern Arabia, is nominally subject to Turkey or Egypt, but the people are to no small extent practically independent, living a nomadic, pastoral, and freebooting life under petty chiefs, in the more arid districts, but settled in towns in the more fertile tracts, where agriculture becomes more profitable, and external commerce is established.

26. The area between the northern border of the Persian high lands and the Caspian and Aral Seas is a nearly desert low-lying plain, extending to the foot of the north-

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western extremity of the great Tibeto-Himalayan moun- tains, and prolonged eastward up the valleys of the Oxus and Jaxartes, and northwards across the country of the Kirghiz and Kassaks, to the south-western border of Siberia. It includes Bukhara, Khiva, and Turkistan proper, in which the Uzbeg Turks are dominant, and for the most part is inhabited by nomadic tribes, who are marauders, enjoying the reputation of being the worst among a race of professed robbers. The tribes to the north, subject to Russia, are naturally more peaceable, and have been brought into some degree of discipline. In this tract the rainfallisnowhere sufficient for the purposes of agriculture, which is only pos- sible by help of irrigation; and the fixed population (which contains a non-Turkish element) is comparatively small, and restricted to the towns and the districts near the rivers.

27. The most northern extremity of the elevated Tibeto- Pamir.

Himalayan mountain plateau is situated about on the 73d meridian east, and 39° N. lat. This region is known as Pémir; it has all the characteristics of the highest regions of Tibet, and so far fitly receives the Russian designation of steppe; but it seems to have no special peculiarities, and the reason of its having been so long regarded as a geographical enigma is not obvious. From it the Oxus, or Amu, flows off to the west, and the Jaxartes, or Sir, to the north, through the Turki state of Kokand, while to the east the

waters run down past Kashgar to the central desert of the Gobi, uniting with the streams from the northern slope of the Tibetan plateau that traverse the principalities of Yérkend and Khoten, which are also Turki. Here the Tibetan mountains unite with the line of elevation which stretches across the continent from the Pacific, and which separates Siberia from the region commonly spoken of under the name of Central Asia.

28. A range of mountains, called Stanovoi, rising to Manchuria

heights of 4000 or 5000 feet, follows the southern coast of the eastern extremity of Asia from Kamchatka to the borders of Manchuria, as far as the 135th meridian, in lat. 55° N. Thence, under the name of Yablonoi, it divides the waters of the river Lena, which flows through Siberia into the Arctic Sea, from those of the river Amur, which falls into the North Pacific ; the basin of this river, with its affluents, constitutes Manchuria. Approximately at right angles to the last named range, another, known as the Khingan, ex- tends between the 120th and 115th meridians, from the 55th to the 42d parallel of N. lat., east of which the drain- age falls into the Amur and the Yellow Sea, while to the west is an almost rainless region, the inclination of which is towards the central area of the continent, which is Mongolva.

29. From the western end of the Yablonoi range, on the Mongolia.

115th meridian, a mountainous belt extends along a some- what irregular line to the extremity of Pamir, known under various names in its different parts, and broken up into several branches, enclosing among them many isolated drainage areas, from which there is no outflow, and within which numerous lakes are formed. The most important of these ranges is the Thian-shan, or Celestial mountains, which form the northern boundary of the Gobi desert ; they lie along the 42d and 43d parallels of N. lat., between the 75th and 95th meridians, and some of the summits are said to exceed 20,000 feet in altitude; along the foot of this range lie the principal cultivated districts of Central Asia, and here too are situated the few towns which have sprung up in this barren and thinly-peopled region. Next may be named the Ala-tau, on the prolongation of the Thian-shau, flanking the Sir on the north, and rising to 14,000 or 15,000 feet. It forms the barrier between the Issik-kul and Balkash lakes, the elevation of which is about

5000 feet. Last is the Altai, near the 50th parallel, rising to 10,000 or 12,000 feet, which separates the waters of the great rivers of Western Siberia from those that col-

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Gobi.

Climate and people,

Siberia.

Malay

> islands,

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lect into the lakes of North-west Mongolia, Zungaria, and Kalka. A line of elevation is continued west of the Altai to the Ural Mountains, not rising to considerable altitudes ; this divides the drainage of South-west Siberia from the great plains lying north-east of the Aral Sea.

30. The central area bounded on the north and north- west by the Yablonoi Mountains and their western exten- sion in the Thian-shan, on the south by the northern face of the Tibetan plateau, and on the east by the Khingan range before alluded to, forms the great desert of Central Asia, known as the Gobi. Its eastern part is nearly con- terminous with South Mongolia, its western forms East Turkistan. It appears likely that no part of this great central Asiatic desert is less than 2000 feet above the sea-level. The elevation of the plain about Kashgar and Yarkend is from 4000 to 6000 feet. The more northern parts of Mongolia are between 4000 and 6000 feet, and no portion of the route across the desert between the Chinese frontier and Kidkhta is below 3000 feet. The precise po- sitions of the mountain ridges that traverse this central area are not properly known ; their elevation is everywhere considerable, and many points are known to exceed 10,000 or 12,000 feet. ‘

31. In Mongolia the population is essentially nomadic, their wealth consisting in herds of horned cattle, sheep, horses, and camels. The Turki tribes, occupying Western Mongolia, are among the least civilised of human beings, and it is chiefly to their extreme barbarity and cruelty that our ignorance of Central Asia is due. The climate is very severe, with great extremes of heat and cold. The drought is very great; rain falls rarely, and in small quantities. The surface is for the most part a hard stony desert, areas of blown sand occurring but exceptionally. 'There are few towns or settled villages, except along the slopes of the higher mountains, on which the rain falls more abundantly, or the melting snow supplies streams for irrigation. It is only in such situations that cultivated lands are found, and beyond them trees are hardly to be seen.

32. The portion of Asia which lies between the Arctic Ocean and the mountainous belt bounding Manchuria, Mongolia, and Turkistan on the north, is Siberia; it is almost equal in area to the whole of Europe. It is for the most part a low-lying diluvial plain, with a nearly level or slightly undulating surface, which extends eastwards from the Ural Mountains almost to Kamchatka. Beyond the 125th meridian the plain is more broken by hills. The extremes of heat and cold are very great. The rainfall, though not heavy, is sufficient to maintain such vegetation as is compatible with the conditions of temperature, and the surface is often swampy or peaty. The mountain sides are commonly clothed with pine forests, and the plains with grasses or shrubs. The population is very scanty ; the cultivated tracts are comparatively small in extent, and restricted to the more settled districts. The towns are entirely Russian. The indigenous races are nomadic Mongols, of a peaceful character, but in a very backward state of civilisation. The Ural Mountains do not exceed 2000 or 3000 feet in average altitude, the highest summits not exceeding 6000 feet, and one of the passes being as low as 1400 feet. In the southern half of the range are the chief mining districts of Russia. The Ob, Yenisei, and Lena, which traverse Siberia, are among the largest rivers in the world.

33. The southern group of the Malayan Islands, from Sumatra to Java and Timor, extends in the arc of a circle, between the 95th and 127th meridians, and from the 5th degree of N. to the 10th degree of S. lat. The central part

of the group is a voleanic region, many of the volcanoes being still active, the summits frequently rising to 10,000 feet or more.

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34. Sumatra, the largest of the islands, is but thinly Sumatra.

peopled; the greater part of the surface is covered with dense forest, the cultivated area being comparatively small, con- fined to the low lands, and chiefly in the volcanic region

near the centre of the island. Java is the most thickly Java.

peopled, best cultivated, and most advanced island of the whole Eastern Archipelago. It has attained a high degree of wealth and prosperity under the Dutch Government. The people are peaceful and industrious, and chiefly occupied with agriculture. The highest of the volcanic peaks rises to 12,000 feet above the sea. The eastern islands of this group are less productive and less ad- vanced.

35. Borneo, the most western and the largest of the Borneo.

northern group of islands which extends between the me- ridians of 110° and 150° E., as far as New Guinea or Papua, is but little known. The population is small, rude, and uncivilised ; and the surface is rough and mountainous, and generally covered with forest except near the coast, to the alluvial lands on which settlers have been attracted from various surrounding countries. The highest moun- tains are supposed to rise to about 10,000 feet, but the ordinary elevations seem not to exceed 4000 or 5000 feet.

36. Of Celebes less is known than of Borneo, which it Celebes.

resembles in condition and natural characteristics. The highest known peaks rise to 8000 feet, some of them being voleanic.

37. Papua is perhaps somewhat smaller than Borneo. It Papua.

extends almost to the same meridian as the eastern coast of Australia, from the north point of which it is separated by Torres Straits. Very little is known even of its coasts. The mountains in the interior are said to rise to 20,000 feet, having the appearance of being permanently covered with snow ; the surface seems generally to be clothed with thick wood. The inhabitants are of the Negrito type, with curly or crisp and bushy hair; those of the west coast have come more into communication with the traders of other islands, and are fairly civilised. Eastward, many of the tribes are barbarous savages, with whom it is almost im- possible for foreigners to hold intercourse.

38. The Philippine islands lie between the 15th and 20th Philip- degrees of N. lat., between Borneo and southern China. pines.

The highest land does not rise to a greater height than 6000 feet; the climate is well suited for agriculture, and the islands generally are fertile and fairly cultivated, though not coming up to the standard of Java either in wealth or population. The Spanish Government is estab- lished over the greater part of the group, though a consider- able numcrical proportion of the people is in some districts beyond their active control.

39. Formosa, which is situated under the northern tropic, near the coast of China, is traversed by a high range of mountains, reaching nearly 13,000 feet in elevation. On its western side, which is occupied by an immigrant Chinese population, are open and well-cultivated plains; on the east 1t is mountainous, and occupied by independent in- digenous tribes in a less advanced state.

40. The islands of Japan lie between the 30th and Japan.

45th parallels. The whole group is traversed by a line of volcanic mountains, some of which are in activity, the highest point being about 13,000 feet above thesea. The country is well watered, fertile, and well cultivated. The people are industrious and intelligent, and show much capacity for mechanical and ornamental art. They have recently attracted special attention from the sudden efforts made by their Government to accept and introduce Western civilisation.

41. Materials are wanting for anything like a connected Groxoey.

sketch of the geological structure of the continent of Asia, and little more can be done than to indicate a few

Tertiary deposits.

Recent elevation of moun- tains and plains.

Himalaya.

Indian peninsula.

Siberia.

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facts which tend to throw light on the probable epochs at which the land has assumed its present configuration.

49, There is evidence of the very recent formation, speak- ing geologically, of the great plains of Northern India, of Mesopotamia, and of portions of Central Asia and Siberia. The existence of deposits containing large mam- malian remains of the older Pliocene or Miocene divisions of the Tertiary period, has been ascertained at many places on the low lands of British India, in Burmah on the east, along the foot of the Himalaya, and near the Gulf of Cutch on the west, which indicates that very great changes of level and of conditions of surface have taken place in those localities since the later Tertiary epoch. The far wider spread of the older tertiaries proves that far greater alterations have occurred since the Kocene period. Num- mulitic limestones are found from Burmah to Eastern Beu- gal; they are continuous along the flank of the table-land of Baluchistan, through Sindh to the Himalaya ; they are frequent throughout Persia, Asia Minor, Syria, Egypt, and along the Caspian; they are found at great elevations in the Himalaya —in one locality at more than 16,000 feet above the sea; all this indicates that over a vast region, which is now dry land, often rising to very great altitudes, there existed a sea area at a period which, geologically speaking, appertains to the more recent epochs of the earth's history. Hence the

present configuration of the land must be due to movements of a subsequent date ; and it is thus shown that the vast elevation of the great Tibetan table-land is due to changes which are among the latest to which the earth's surface has been subjected. No doubt the Caspian and Aral seas formed part of the ancient ocean which once occupied a great part of what is now Western Asia.

43, The occurrence of a regular succession of the older fossiliferous deposits, from Upper Silurian upwards to the Triassic and Jurassic, and even to the Cretaceous formations, along the line lying to the north of the highest Himalayan ranges, gives ground for the supposition that an ancient sea-coast may have existed along this line; and that from a still earlier period there was dry land to the south, where the Himalaya now stands. Thus these mountains may have continued, as a chain of some importance, to occupy their present position from a period anterior to the Silurian epoch, while their existing very great elevation is probably due to the disturbances which have taken place since the middle of the Tertiary period.

44, There is no sufficient evidence of the former extent or distribution of the land south of the Himalaya. But from the absence of marine fossiliferous deposits of the older epochs, it has been inferred that the greater part, at least, of the peninsula of India may have been an area of dry land from a very remote time up to the middle of the Ter- tiary period, during which the great basaltic formations of Central India are supposed to have been thrown up; a partial submergence then seems to have occurred, followed by a re-elevation, which gave the continent its present form. The fossil remains that have been found indicate the presence, in the Triassic or Permian age, of a great con- tinental area, extending from Europe, and forming a con-nection across the Indian Ocean between South Africa and the peninsula of India. Grounds also exist for supposing that the Indian peninsula was formerly united by dry land with Australia, and that, when these conditions pre- vailed, the peninsula was separated by sea from the rest of Asia. Other evidence of this is to be found in the distribu- tion of the races of men, and of plants and animals.

45. The occurrence of a large area of Silurian and other Paleeozoic rocks in Northern Siberia, extending to the Altai mountains, with an apparent

absence of the Mesozoic, has been explained as probably due to the existence of a

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marine area during the Paleozoic epoch, at the close of which it was replaced by an area of land; this was again submerged in the latest Tertiary period, during which a great part of the country was covered with the diluvial de- posits, in which are found the remains of large mammalia.

46. The presence of coal in many parts of China and China. Mongolia is a further indication of great former changes Central of condition of the surface in that part of the continent. ""*

47, Evidence exists of a former far greater extension of Himalayan glaciers on the Himalaya, possibly at the period during glaciers, which the great glacial phenomena of Europe occurred ; but too little is known to enable us to affirm that this in- dicates any general period of cold that affected the northern heinisphere as far south as the Himalaya, though the facts are sufficiently striking to suggest such a conclusion. Another explanation of the decrease of Himalayan glaciers is that it was a consequence of the diminution of the fall of snow, consequent on the gradual change of climate which must have followed a gradual transformation of an ocean area into one of dry land, This last-named circumstance would also account for the great changes in the quantity of rain-fall, and in the flow of the rivers, of which there are many indications in Western India, in Persia, and the regions east of the Caspian.

48. A remarkable feature of Asia is the line of volcanic Volcanoes, activity which extends along its eastern coast through Kamchatka, the Kurile and Japanese islands, Formosa, and the Philippines, to the Malay archipelago. 'Thence the line is prolonged to the west, through Java and Sumatra to the Bay of Bengal, where it ends about in lat. 20° N. on the coast of Aracan. 'To the east and south there also seenis to be a connection with the volcanic regions of New Zealand and the islands of the Pacific, and possibly with

that of the antarctic land. There is no authentic evidence of active volcanoes in the interior of the continent.

49, Although these facts give an extremely incomplete Depend-

view of the geological structure of Asia, they will afford ence of some slight idea of the great changes that have taken place pre throughout all parts of the continent, and serve to convey rol ofl a warning of the necessity for taking such changes into past con account, when attempts are made to understand the manner 'ditions, in which animals and plants are distributed on the earth's surface, and how their development may have taken place. The phenomena of living creatures as now observed are the results of various causes which have been in operation through a long period of time. Those causes which still continue to be in action may, in some respects, call for special attention, as determining the precise conditions under which organisations now have to exist, and as being those which now tend to destroy what has been, and to substitute something different in its place. But what re- mains necessarily depends on what preceded it, and the knowledge of the conditions and forms of life in the past is an essential element of the proper understanding of life as it now is.

50. Climate is among the most important of the condi- Crimats. tions affecting all forms of life. Under this general term is designated the complicated series of phenomena which arise in the air surrounding any locality, and in the watery vapour diffused through that air. These phenomena, which include the variations of temperature and of moisture, the winds, the rain, and the electrical condition of the air, depend essentially on the action of solar heat on the atmo- sphere and the materials of the terrestrial globe. The main conditions which determine the climate of any place, are position on the earth in respect to latitude, elevation above the sea level, and character of the surface in relation to its power of absorbing or radiating heat. Owing to the ex- treme mobility of the air, its temperature and the quantity of moisture it contains are further influenced in a very

Annual tempera- | ture.

Monthly variations,

_ Siberia.

China.

| Extreme | tempera-

it is reduced to about 5°.

CLIMATE. |

important degree by the proximity of large areas of land and water and mountain ranges, and by the position of such areas or ranges in relation to the direction of the earth's motion ou its axis. On no portion of the globe are the diversities of climate due to these causes more remark- able, or brought into more striking contrast, than in Asia.

51. Among the places on the globe where the tempera- ture falls lowest are some in Northern Asia, and among those where it rises highest are some in Southern Asia. The mean temperature of the north coast of Eastern Si- beria is but a few degrees above the zero of Fahrenheit ; the lowest mean temperature anywhere observed is about 4° Fahr., at Melville Island, north of the American con- tinent. The isothermals of mean annual temperature lie over Northern Asia on curves tolerably regular in their out- line, having their western branches in a somewhat higher latitude than their eastern; a reduction of 1° of latitude corresponds approximately—and irrespective of modifica- tions due to elevation—to a rise of 3° Fahr., as far say as Jat. 30° N., where the mean temperature is about 75° Fahr. Further south the increase is slower, and the highest mean temperature anywhere attained in Southern Asia is not much above 82° Fahr.

52. The variations of temperature are very great in Siberia, amounting near the coast to more than 100° Fahr., between the mean of the hottest and coldest months, and to still more between the extreme temperatures of those months. In Southern Asia, and particularly near the sea, the variation between the hottest and coldest monthly means is very much less, and under the equator In Siberia the difference be- tween the means of the hottest and coldest months is hardly anywhere less than 60° Fahr. On the Sea of Aral it is 80° Fahr.; and at Astrakhan, on the Caspian, more than 50°. At Tiflis it is

45°. In Northern China, at Peking, it is 55°, reduced to 30° at Canton, and to 20° at Manilla. In Northern India the greatest difference does not exceed 40°; and it falls off to about 15° at Calcutta, and to about 10° or 12° at Bombay and Madras. The temperatures at the head of the Persian Gulf approximate to those of Northern India, and those of Aden to Madras. At Singapore the range is less than 5°; and at Batavia in Java, and Calle in Ceylon, it is about the same. The extreme temperatures in Siberia may be considered to lie between 80° and 90° Fahr. for maxima, and between —40° and —70° Fahr. for minima. The extreme of heat near the Caspian and Aral seas rises to nearly 100° Fahr., while

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of Afghanistan and Persia, tends to exaggerate the winter cold ; while the sterility of the surface, due to the small rain-fall over the same region, operates powerfully in the opposite direction in increasing the summer heat. In the summer a great accumulation of solar heat takes place on the dry surface soil, from which it cannot be released up- wards by evaporation, as might be the case were the soil moist or covered with vegetation, nor can it be readily conveyed away downwards as happens on the ocean. In the winter similar consequences ensue, in a negative direc- tion, from the prolonged loss of heat by radiation in the long and clear nights—an effect which is intensified where- ever the surface is covered with snow, or the air little charged with vapour. In illustration of the very slow diffusion of heat in the solid crust of the earth, and as affording a further indication of the climate of Northern Asia, reference may here be made to the frozen soil of Siberia, in the vicinity of Yakutsk. In this region the earth is frozen permanently to a depth of more than 380 feet, at which the temperature is still 5° or 6° Fahr. below the freezing point of water, the summer heat merely thawing the surface to a depth of about 3 feet. At adepth of 50 feet the temperature is about 15° Fahr. below the freezing point. Under such conditions of the soil, the land, never- theless, produces crops of wheat and other grain from fifteen to forty fold. .

54. The very high summer temperatures of the area north High sum- of the tropic of Cancer are sufficiently accounted for, when ™et tem- compared to

*those observed south of the tropic, by the Pe@ture**

increased length of the day in the higher latitude, which more than compensates for the loss of heat due to the smaller midday altitude of the sun. The difference be- tween the heating power of the sun's rays at noon on the 21st June, in latitude 20° and in latitude 45°, is only about 2 per cent; while the accumulated heat received during the day, which is lengthened to 153 hours in the higher latitude, is greater by about 11 per cent. than in the lower latitude, where the day consists only of 13} hours.

*55. Although the foregoing account of the temperatures Modifying of Asia supplies the main outline of the observed pheno- °¥*s:*

mena, a very important modifying cause, of which more will be said hereafter, comes into operation over the whole of the tropical region, namely, the periodical summer rains. These tend very greatly to arrest the increase of the summer heat over the area where they prevail, and other- wise give it altogether peculiar characteristics.

_ tures, 56. The great summer heat, by expanding the air up- Periodical

wards, disturbs the level of the planes of equal pressure, and variation causes an outflow of the upper strata from the heated area. cae aa

that of cold falls to — 20° Fahr., or lower. Compared with these figures, we find in Southern Asia 110° or 112° Fahr. as a maximum hardly ever exceeded. The absolute

| General character- | istics,

minimum in Northern India, in lat. 30°, hardly goes below 32°; at Calcutta it is about 40°, though the ther- mometer seldom falls to 50°. At Madras it rarely falls as low as 65°, or at Bombay below 60°. At Singapore and Batavia the thermometer very rarely falls below 70°, or rises above 90°. At Aden the minimum is a few degrees below 70°, the maximum not much cxceeding 90°.

53. These figures sufficiently indicate the main char- acteristics of the air temperatures of Asia. Throughout its northern portion the winter is long and of extreme severity ; and even down to the circle of 35° N. lat., the imininum temperature is almost as low as zero of Fahren- heit. The summers are hot, though short in the northern latitudes, the maximum of summer heat being compara- tively little less than that observed in the tropical countries further south. The moderating effect of the proximity of the ocean is felt in an important degree along the southern and eastern parts of Asia, where the land is broken up into islands or peninsulas. The great elevation above the sea level of the central part of Asia, and of the table-lands

The winter cold produces an effect of just an opposite nature, and causes an accumulation of air over the cold area. The diminution of barometric pressure which takes place all over Asia during the summer months, and the increase in the winter, are hence, no doubt, the results of the alternate heating and cooling of the air over the continent.

57. The necessary and immediate results of such periodi- Periodical cal changes of pressure are winds, which, speaking gener- ¥™4-*

ally, blow from the area of greatest to,that of least pressure, —subject, however, to certain modifications of direction, arising from the absolute motion of the whole body of the air due to the revolution of the earth on its axis from west to east. At the equator, where the velocity of revolution is about 1037 miles per hour, what is called calm air is in absolute motion from west to east with that velocity. If such air were impelled by any disturbance of pressure, from the equator northward, it would advance gradually to places having a less and less velocity of rotation, so that

at lat. 15° N. the earth would be only moving with a

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Effect of earth's re- volution.

Monsoons.'

Direction, how modi- fied.

Do not extend inland.

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velocity of about 1002 miles per hour, while the air arriving from the equator (supposing it not to have been affected by friction) would be moving froin west to east 35 miles per hour faster than the surface, and would there- fore be felt as a wind having that velocity from the west. In fact, however, the motion from the south would be combined with that from the west, and the air would blow as a south-west wind; while the friction against the earth's surface would gradually check the excess of velocity toward the east, and no such great westerly velocity as that named would be developed. In a corresponding manner, air impelled from places situated on a higher latitude towards those on a lower, will be felt as wind having an easterly component. The south-westerly winds, which prevail north of the equator during the hot half of the year, to which navigators have given the name of the S. W. monsoon (the latter word being a corruption of the Indian name for season), arise, in the manner just explained, from the great diminution of atmospheric pressure over Asia, which begins to be strongly marked with the great rise of tem- perature in April and May, and the simultaneous relative higher pressure over the equator and the regions south of it. This diminution of pressure, which continues as the heat increases till it reaches its maximum in July soon after the solstice, is followed by the corresponding develop- ment of the §.W. monsoon; and as the barometric pressure is gradually restored, and becomes equalised within the tropics soon after the equinox in October, with the general fall of temperature north of the equator, the south-west winds fall off, and are succeeded by a N.E. monsoon, which is developed during the winter months by the relative greater atmospheric pressure which then occurs over Asia, as compared to the equatorial region.

58. Although the succession of the periodical winds follows the progress of the seasons as just described, the changes in the wind's direction everywhere take place under the operation of special local influences which often dis- guise the more general law, and make it ditlicult to trace. Thus the S.W. monsoon begins in the Arabian Sea with west and north-westerly

winds, which draw round as the year advances to south-west, and fall back again in the autumn by north-west to north. In the Bay of Bengal the strength of the S.W. monsoon is rather from the south and south-east, being succeeded by north-east winds after October, which give place to northerly and north- westerly winds as the year advances. Among the islands of the Malay Archipelago the force of the monsoons is much interrupted, and the position of this region on the equator otherwise modifies the directions of the prevailing winds. The southerly summer winds of the Asiatic seas between the equator and the tropic do not extend to the coasts of Java, and the south-easterly trade winds are there developed in the usual manner. The China Sea is fully exposed to both monsoons, the normal directions of which nearly coincide with the centre of the channel between the continent of Asia and the eastern islands.

59. The south-west monsoon does not generally extend, in its character of a south-west wind, over the land. The current of air flowing in from over the sea is gradually diverted towards the area of least pressure, and at the game time is dissipated and loses much of its original force. The winds which pass northward over India blow as south-easterly and easterly winds over the north- eastern part of the Gangetic plain, and as south winds up the Indus. They seem almost entirely to have exhausted their northward velocity by the time they have reached the northern extremity of the great Indian plain; they are not felt on the tablelands of Afghanistan, and hardly penetrate into the ranges of the Himalaya, by which mountains, and those which branch off from them into the

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Malay peninsula, they are prevented from continuing their progress in the direction originally imparted to them.

ter seas of Asia must be noticed the revolving storms or cyclones, which are of frequent occurrence in the hot months in the Indian Ocean and China Sea, in which last they are known under the name of typhoon. Bay of Bengal appear to originate over the Andaman and Bay of Nicobar islands, and are commonly propagated in a north- Bengal. westward direction, striking the east coast of the Indian

peninsulaatvarious points, and then often advancing with an

violence across the delta of the Ganges. the hot months, from June to October, and more rarely in November, and appear to be originated by adverse currents

(CLIMATE.

60, Among the more remarkable phenomena of the hot- Cyclones,

The cyclones of the

easterly tendency over the land, and passing with extreme They occur in all

from the north meeting those of the S.W. monsoon. The cyclones of the China Sea also occur in the hot months China, of the year, but they advance from N.E. to 8.W., though occasionally from E. to W.; they originate near the island of Formosa, and extend to about the 10th degree of N. lat. They are thus developed in nearly the same latitudes and in the same months as those of the Indian Sea, though their progress is in a different direction. In both cases, however, the storms appear to advance towards the area of greatest heat. In these storms the wind invariably circu- lates from N. by W. through 8. to E. ;

61. In the cyclones observed in the Southern Indian Southern Ocean off the coast of Madagascar the wind circulates Indian in the opposite direction. These storms advance from as N.E. to 8.W., with a tendency to turn off to the S.E. as they die out. They occur between the months of Decem- ber and April, and between the 10th degree of S. lat. and the southern tropic.

62. In all these cases the cyclones occur during the hot Their months of the year, when strong winds are developed by @™S% the proximity of large heated areas of land and relatively cool areas of sea, and when the air, being highly charged with vapour, is liable to great disturbances of temperature . on any considerable condensation being set up. More- over, they most frequently happen at the times when the direction of the dominant winds is changing, and when important variations of atmospheric pressure are certainly taking place. Actual barometric observations have not yet

been obtained in sufficient number or continuity to establish the precise conditions under which these storms arise, but there is no reason to doubt the correctness of the general views held regarding them, or that with the pro- gress of knowledge much may be done to enable mariners to avoid their worst consequences.

63. The heated body of air carried from the Indian Rains of Ocean over Southern Asia by the S.W. monsoon comes up 8. W. mon highly charged with watery vapour, and hence in a condi- coal tion to release a large body of water as rain upon the land, whenever it is brought into circumstances which reduce its temperature in a notable degree. Such a reduction of Their temperature is brought about along the greater part of the OU coasts of India and of the Burmo-Siamese peninsula by the interruption of the progress of the wind current by con- tinuous ranges of mountains, which force the mass of air to rise over them, whereby the air being rarefied, its specific capacity for heat is increased and its temperature falls, with a corresponding condensation of the vapour originally held in suspension.

64, This explanation of the principal efficient cause of General the summer rains of South Asia is immediately based on characte an analysis of the complicated phenomena actually observed, | and it serves to account for many apparent anomalies. j The heaviest falls of rain occur along lines of mountain of some extent directly facing the vapour-bearing winds, as on the Western Ghats of India and the west coast of the

Land and sta breezes.

~ Diurnal mountain winds.

CLIMATE. |

Malay peninsula. The same results are found along the mountains at a distance from the sea, the heaviest rainfall known to occur anywhere in the world (not less than 600 inches in the year) being recorded on the Khasiya range about 100 miles north-east of Calcutta, which pre- sents an abrupt front to the progress of the moist winds flowing up from the Bay of Bengal. The cessation of the rains on the southern border of Baluchistan, west of Kurrachee, obviously arises from the projection of the south-east coast of

Arabia, which limits the breadth of the S.W. monsoon air current and the length of the coast line directly exposed to it. The very small and irregular rain- fall in Sindh and along the Indus is to be accounted for by the want of any obstacle in the path of the vapour- bearing winds, which, therefore, carry the uncondensed rain up to the Punjab, where it falls on the outer ranges of the western Himalaya and of Afghanistan.

65. Somewhat similar results, though on a smaller scale, attend the operation of the well-known land and sea breezes, which are universally prevalent in hot countries bordering on the sea. The relative greater heating of the land than of the sea during the day disturbs the planes of atmos- pheric equilibrium, and a dispersion of air in the higher regions from over the land leads to a diminution of pres- sure there and an increase over the sea. This causes the sca breeze, which is an inflow of moist air over the land from below; and where, as is frequently the case, this breeze is forced, as it advances, to rise considerably above the sea level, condensation takes place on the mountain slopes either in clouds or rain. The constant precipitation of rain on tropical coasts is mainly due to this action.

66. An analogous, though less well understood, system of alternating winds is almost invariably set up over moun- tains rising abruptly from plains, currents blowing from the higher ground to the lower during the night, and from the lower to the higher during the day. Such winds are often combined with the land and sea breezes, which they tend to exaggerate. The diurnal mountain winds are very strongly marked on the Himalaya, where they probably are the most active agents in determining the precipitation of rain along the chain—the monsoon currents, as was before stated, not penetrating among the mountains. The formation of dense banks of cloud in the afternoon, when the up wind is strongest, along the southern face of the snowy ranges of the Himalaya, is a regular daily pheno- menon during the hotter months of the year, and heavy rain, accompanied by electrical discharges, is the frequent result of such condensation.

67. Too little is known of the greater part of Asia to admit of any more being said with reference to this part of the subject, than to mention a few facts bearing on the rainfall. At Tiflis the yearly fall is 22 inches; on the Caspian about 7 or 8 inches; on the Sea of Aral 5 or 6 inches. In South-western

Siberia it is 12 or 14 inches, diminishing as we proceed eastward to 6 or 7 inches at Barnaul, and to 5 or 6 inches at Urga in Northern Mon- golia. At Nertschinsk in Eastern Siberia it is about 15 to 20 inches. In China we find about 23 inches to be the fall at Peking ; while at Canton, which lies nearly on the northern tropic and the region of the S.W. monsoon is entered, the quantity is increased to 78 inches. At Batavia in Java the fall is about 78 inches ; at Singapore it is nearly 100 inches. The quantity increases considerably on that part of the coast of the Malay peninsula which is not sheltered from the south-west by Sumatra. On the Tenas- serim and Burmese coast falls of more than 200 inches are registered, and the quantity is here nowhere less than 75 or 80 inches, which is about the average of the eastern part of the delta of the Ganges, Calcutta standing at about 64 inches. On the hills that flank Bengal on the east the

fall is very great. On the Khasiya hills, at an elevation of about 4500 feet, the average of 10 years is more than 550 inches. As much as 150 inches las been measured in one month, and 610 inches in one year. On the west coast of the Indian peninsula the fall at the sca level varies from about 75 to 100 inches, and at certain elevations on the mountains more than 250 inches is commonly regis- tered, with intermediate quantities at intervening localitics. On the east coast the fall is far less, nowhere rising to 50 inches, and towards the southern apex of the peninsula being reduced to 25 or 30 inches. Ceylon shows from 60 to 30 inches. As we recede from the coast the fall diminishes, till itis reduced to about 25 or 30 inches at the head of the Gangetic plain. The tract along the Indus to within 60 or 80 miles of the Himalaya is almost rainless, 6 or 8 inches being the fall in the southern portion of the Punjab. On the outer ranges of the Himalaya the yearly fall amounts to about 200 inches on the east in Sikim, and gradually diminishes on the west, where north of the Pun- jab it is about 70 or 80 inches. In the interior of the chain the rain is far less, and the quantity of precipitation is so small in Tibet that it can be hardly measured. It is to the greatly reduccd fall of snow on the northern faces of the highest ranges of the Himalaya

that is to be attri- buted the higher level of the snow-line, a phenomenon which was long a cause of discussion.

68. In Afghanistan, Persia, Asia Minor, and Syria, winter Seasons and spring appear to be the chief seasons of condensation. °f rain.

In other parts of Asia the principal part of the rain falls hetween May and September, that is, in the hottest half of the year. In the islands under the equator the heaviest fall is between October and February.

69. Such are the climatal conditions of the principal Bronoey.

regions of Asia, under which the plants and animals that inhabit them are at present distributed. In attempting to appreciate and to explain the very complicated facts of distribution it is essential to bear in mind that what we find at the present time is, as was before obscrved, the

result of causes that have been in operation from periods Distribu- long antecedent to that in which the earth has taken its tion of life.

existing form, and acquired its existing conditions of tem- perature, climate, and arrangement of land and sea areas. Our knowledge of the manner in which the successive changes which have affected the earth's surface took place is, however, still so imperfect, that it is often not possible to state with certainty how the facts of distribution have occurred, and much is yet open to conjecture. But there is, notwithstanding, an overwhelming force of argument to establish the conclusion, that the diffusion of the forms of animal and vegetable life has gone on for a vast length of time by natural descent, and subject to the action of ten- dencies to variation; the general result being that the forms which first existed have been suppressed, and others introduced in their places.

corresponding movement or diffusion in place, governed no doubt primarily by the variations of temperature and climate and conditions of surface which have accompanied the movements of the solid crust of the earth, or may have been due to cyclical change. The conformity of the facts of the geographical distribution of life with this con- ception is no longer seriously questioned. The mutual relations among the several branches of

animal and vege- table life, and the marked effects produced on all organised creatures by conditions of climate, are apparent. The abundance of certain forms of animals and plants in cer- tain areas, and their gradual diminution in number beyond such areas until they disappear altogether, is well known , as also the ordinary similarity of the gencral assemblages of living creatures in countries not far distant from one

This modification of form in Causes of tume is seen to have been commonly accompanied by a change.

Forms of life in Asia.

Siberia.

Persian plateau. Himalaya.

Arabia. Sindh.

India.

Central Asia.

Malay islands.

China.

BOTANY. Flora of Siberia.

another, and having similar conditions of climate. In pro- portion as the distance between two areas increases, and their mutual accessibility diminishes, and their conditions of climate differ, the likeness of the forms of life within them becomes less, until the connection may be reduced to what is due to common descent from extremely remote ancestors.

70. Turning to the continent of Asia, such broadly char- acterised similarities and differences will be seen to be well marked. The general assemblage of animals and plants found over Northern Asia resembles

greatly that found in the parts of Europe which are adjacent, and which have a similar climate. Siberia, north of the 50th parallel, has a climate not much differing from the similarly situated portion of Europe, though the winters are more severe and the summers hotter. The rainfall, though moderate, is still sufficient to maintain the supply of water in the great rivers that traverse the country to the Arctic Sea, and to support an abundant vegetation. A similar affinity exists between the life of the southern parts of Europe and that in the zone of Asia extending from the Mediterranean across to the Himalaya and Northern China. This belt, which em- braces Asia Minor, Northern Persia, Afghanistan, and the southern slopes of the Himalaya, from its elevation has a temperate climate, and throughout it the rainfall is suffi- cient to maintain a vigorous vegetation, while the summers, though hot, and the winters, though severe, are not ex- treme. 'The plants and animals along it are found to have a marked similarity of character to those of South Europe, with which region the zone is virtually continuous

71. The extremely dry and hot tracts which constitute an almost unbroken desert from Arabia, through South Persia and Baluchistan, to Sindh, are characterised by con- siderable uniformity in the types of life, which closely approach to those of the neighbouring hot and dry regions of Africa. The region of the heavy periodical summer rains aud high temperature, which comprises India, the Indo-Chinese peninsula, and Southern China, as well as the western part of the Malay Archipelago, is also marked by much similarity in the plants and animals throughout its extent. The area between the southern border of Si- beria and the margin of the temperate alpine zone of the Himalaya and North China, comprising what are com- monly called Central Asia, Turkistan, Mongolia, and Western Manchuria, is an almost rainless region, having winters of extreme severity and summers of intense heat. Its ani- mals and plants have a special character suited to the pe- culiar climatal conditions, more closely allied to those of the adjacent northern Siberian tract than of the other bordering regions. The south-eastern parts of the Malay islands have much in common with the Australian con- tinent, to which they adjoin, though their affinities are chiefly Indian. North China and Japan also have many forms of life in common. Much still remains to be done in the exploration of China and Eastern Asia; but it is known that many of the special forms of this region

ex- tend to the Himalaya, while others clearly indicate a con- nection with North America.

72. The foregoing brief review of the principal territorial divisions according to which the forms of life are distri- buted in Asia, indicates how close is the dependence of this distribution on climatal conditions, and this will be made more apparent by a somewhat fuller account of the main features of the flora and fauna.

73. The flora of the whole of Northern Asia is in essen- tials the same as that of Northern Europe, the differences being due rather to variations of species than of genera. The absence of the oak and of all heaths east of the Ural may be noticed. Pines, larch, birch, are the principal trees on the mountains ; willows, alders, and poplars on the lower

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ground. The northern limit of the pine in Siberia is about late 70°. .

ranean to the Himalaya, pean in character. Himalaya, though few are known in its eastern parts. genera common to the Himalaya and Europe are much more abundant, and extend throughout the chain, and to

Japanese and Chinese forms along this zone, these being

[BoTANY.

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74, Along the warm temperate zone, from the Mediter- Warm extends a flora essentially Euro- temperate

Many European species reach the central ies

The

all elevations. There is also a corresponding diffusion of most numerous in the eastern Himalaya, and less frequent in the west.

75. The truly tropical flora of the hotter and wetter Eastern regions of Eastern India is continuous with that of the India and Malayan peninsula and islands, and extends along the lower re ranges of the Himalaya, gradually becoming less marked, , and rising to lower elevations as we go westward, where the rainfall diminishes and the winter cold increases.

76. The vegetation of the higher and therefore cooler Himalaya, and less rainy ranges of the Himalaya has greater uni- formity of character along the whole. chain, and a closer general approach to European forms is maintained; an increased number of species is actually identical, among these being found, at the greatest elevations, many alpine plants believed to be identical with species of the north Arctic regions. On reaching the Tibetan plateau, with the Tibet. increased dryness the flora assumes many features of the.

Siberian type. Many true Siberian species are found, and more Siberian genera. Some of the Siberian forms, thus

bronght into proximity with the Indian flora, extend to

the rainy parts of the niountains, and even to the plains of

upper India. Assemblages of marine plants form another A

remarkable feature of Tibet, these being frequently met

with growing at elevations of 14,000 to 15,000 feet above |

the sea, more especially in the vicinity of the many salt .

lakes of those regions. | 77. The vegetation of the hot and dry region of the Hot and

which desert

south-west of the continent consists largely of plants aes f TS

are diffused over Africa, Baluchistan, and Sindh ; many o these extend into the hotter parts of India, and not a few common Egyptian plants are to be

met with in the Indian peninsula.

78, The whole number of species of plants indigenous in Indian the region of south-eastern Asia, which includes India and fr the Malayan peninsula and islands, from about the 65th to the 105th meridian, is estimated by Dr Hooker at from 12,000 to 15,000. The principal orders, arranged accord- ing to their numerical importance, are as follows :—Legu- minose, Rubiacece, Orchidece, Composite, Graminece, Huphor- biaceee, Acanthacece, Cyperaceee, and Labiate. But within this region there is a very great variation between the vegetation of the more humid and the more arid regions, while the characteristics of the flora on the higher moun- tain ranges differ wholly from those of the plains. In short, we have a somewhat heterogeneous assemblage of tropical, temperate, and alpine plants, as has been already briefly indicated, of which, however, the tropical are so far domi- nant as to give their character to the flora viewed as a whole, The Indian flora contains a more general and com- plete illustration of almost all the chief natural families of all parts of the world than any other country. Composite are comparatively rare; so also Graminee and Cyperacece are in some places deficient, and Labiate, Leguminose, and ferns in others. Euphorbiacec, and Scrophularracee, and Orchidee are universally present, the last in specially large proportions. ,

79. The perennially humid regions of the Malayan penin- Malayan sula and western portion of the archipelago are everywhere Penns covered with dense forest, rendered difficult to traverse by the thorny cane, a palm of the genus Calamus, which has

Fastern India.

North India.

‘Herbace- ous forms.

Special features of flora,

Physiog- – nomy of flora—

| Eastern

its greatest development in this part of Asia. The chief trees belong to the orders of Zerebinthacee, Sapindacee, Meliaceee, Clusiacee, Dipterocarpee, Ternstreemiacece, Legu- menos, laurels, oaks, and figs, with Dilleniaceee, Sapotacee, and nutmegs. Bamboos and palms, with Pandanus and Dracceena, are also abundant. A similar forest flora ex- tends along the mountains of eastern India to the Hima- laya, where it ascends to elevations varying from 6000 to 7000 feet on the east to 3000 or 4000 feet on the west.

80. The arboreous forms which least require the humid and equable heat of the more truly tropical and equatorial climates, and are best able to resist the high temperatures and excessive drought of the northern Indian hot months from April to June, are certain Leguminose, Bauhinia, Acacia, Butea, and Dalbergia, Bombax, Shorea, Nauclea, Lagerstreemia, and Bignonia, a few bamboos and palms, with others which extend far beyond the tropic, and give a tropical aspect to the forest to the extreme northern border of the Indian plain.

81. Of the herbaceous vegetation of the more rainy regions may be noted the Orchidee, Orontiacew, Scitaminee, with ferns and other Cryptoganis, besides Graminee and Cyperacee. Among these some forms, as among the trees, extend much beyond the tropic and ascend into the tem- perate zones on the mountains, of which may be mentioned Begonia, Osbeckia, various Cyrtandracee, Scitamineee, and a few epiphytical orchids.

82. Of the orders most largely developed in South India, and more sparingly elsewhere, may be named Awrantiacee, Dipterocarpece, Balsaminece, Ebenacew, Jasmine, and Cyr- tandracece ; but of these few contain as many as 100 peculiar Indian species. Mepenthes may be mentioned as a genus specially developed in the Malayan area, and extending from New Caledonia to Madagascar; it is found as far north as the Khasiya hills, and in Ceylon, but does not appear on the Himalaya or in the peninsula of India. The Balsaminee may be named as being rare in the eastern region

and very abundant in the peninsula. A distinct connection between the flora of the peninsula and Ceylon, and that of eastern tropical Africa is observable not only in the great similarity of many of the more truly tropical forms, and the identity of families and genera found in both regions, but ina more remarkable manner in the like- ness of the mountain flora of this part of Africa to that of the peninsula, in which several species occur believed to be identical with Abyssinian forms. This connection is further established by the absence from both areas of oaks, conifers, and cycads, which, as regards the two first families, is a remarkable feature of the flora of the penin- sula and Ceylon, as the mountains rise to elevations in which both of them are abundant to the north and east. With these facts it has to be noticed that many of the principal forms of the eastern flora are absent or compara- tively rare in the peninsula and Ceylon.

83. The general physiognomy of the Indian flora is mainly determined by the conditions of humidity of climate. The impenetrable shady forests of the Malay peninsula and Eastern Bengal, of the west coast of the Indian peninsula, and of Ceylon, offer a strong contrast with the more loosely-timbered districts of the drier regions of Central India and the North-western Himalaya. There are no plains covered with forest as in tropical America, the low lands of India being either highly cultivated and adorned with planted wood, or, where cut off from rain, nearly complete desert.

84, The higher mountains rise abruptly from the plains ; on their slopes, clothed below almost exclusively with the more tropical forms, a vegetation of a warm temperate character, chiefly evergreen, soon begins to prevail, com- prising Magnoliacee, Ternstreemiacee, sub-tropical Rosacee,

rhododendron, oak, /lex, Symplocos, Laurinec, Pinus longi- folia, with mountain forms of truly tropical orders, palins, Pandanus, Musa, Vitis, Vernonia, and many others. On

the east the vegetation of the Himalaya is most abundant Eastern.

and varied. The forest extends, with great luxuriance, to an elevation of 12,000 feet, above which the sub-alpine region may be said to begin, in which rhododendron scrub often covers the ground up to 13,000 or 14,000 feet. Only one pine is found below 8000 feet, above which several other Conifere occur. Plantains, tree-ferns, bamboos, several Calami, and other palms, and Pandanus, are abundant at the lower levels. Between 4000 and 8000 feet epiphytal orchids are very frequent, and reach even to 10,000 feet. Vegetation ascends on the drier and less snowy mountain slopes of Tibet to above 18,000 feet. the drier climate, the forest is less luxuriant and dense, and the hill sides and the valleys better cultivated. The warm mountain slopes are covered with Pinus longifolva, or with oaks and rhododendron, and the forest is not com- monly dense below 8000 feet, excepting in some of the more secluded valleys at a low elevation. From 8000 to 12,000 feet, a thick forest of deciduous trees is almost universal, above which a sub-alpine region is reached, and vegetation as on the east continues up to 18,000 feet or more. The more tropical forms of the east, such as the tree-ferns, do not reach west of Nepaul. The cedar or Deodar is hardly indigenous east of the sources of the Ganges, and at about the same point the forms of the west begin to be more abundant, increasing in number as we advance towards Afghanistan.

85. The cultivated plants of the Indian region include Cultivated wheat, barley, rice, and maize; various millets, Sorghum, Plants.

Penicillaria, Panicum, and EHleusine ; many pulses, peas, and beans; mustard and rape; ginger and turmeric; pepper and capsicum ; several Cucurbitacee ; tobacco, Sesamum, poppy, Crotolaria, and Cannabis ; cotton, indigo, and sugar ; coffee and tea; oranges, lemons of many sorts; pomegranate, mango, figs, peaches, vines, and plantains. The more com- mon palms are Cocos, Phenix, and Borassus, supplying cocoa-nut and toddy. Indian agriculture combines the harvests of the tropical and temperate zones. North of the tropic the winter cold is sufficient to admit of the cultiva- tion of almost all the cereals and vegetables of Europe, wheat being sown in November and reaped early in April. In this same region the summer heat and rain provide a thoroughly tropical climate, in which rice and other tropical cereals are freely raised, being as a rule sown early in July, and reaped in September or October. In southern India, and the other

parts of Asia and of the islands having a similar climate, the difference of the winter and summer half years is not sufficient to admit of the proper cultiva- tion of wheat or barley. The other cereals may be seen occasionally, where artificial irrigation is practised, in all stages of progress at all seasons of the year, though the operations of agriculture are, as a general rule, limited to the rainy months, when alone is the requisite supply of water commonly forthcoming.

86. The trees of India producing economically useful Timber timber are comparatively few, owing to the want of dura- trees.

bility of the wood, in the extremely hot and moist climate. The teak, Tectona grandis, supplies the finest timber. It is found in greatest perfection in the forests of the west coasts of Burmah and the Indian peninsula, where the rain- fall is heaviest, growing to a height of 100 or 150 feet, mixed with other trees and bamboos. The sal, Shorea robusta, a very durable wood, is most abundant along the skirts of the Himalaya from Assam to the Punjab, and is found in Central India, to which the teak also extends. The sal grows to a large size, and is more gregarious than the teak. Of other useful woods found in the plains may

On the west, with Western.

Special features.

Hot region of Persian plateau.

North Af- ghanistan.

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Dalbergia. the Himalaya proper is the Deodar, Cedrus, not distinct from the cedar of Lebanon. Besides these are the sandal- wood, Santalum, of Southern India, and many sorts of bamboo found in all parts of the country. The chinchona has recently been introduced with complete success ; and the mahogany of America reaches a large size, and gives promise of being grown for use as timber.

87. The flora of the rainless region of South-western Asia is continuous with the desert flora of Northern and Eastern Africa, and extends from the coast of Senegal to the meridian of 75° E., or from the great African desert to the border of the rainless tract along the Indus and the southern parts of the Punjab. It includes the peninsula of Arabia, the shores of the Persian Gulf, South Persia, and Afghani- stan, and Baluchistan. On the west its limit is in the Cape de Verde Islands, and it is partially represented in Abyssinia.

88, The more common plants in the most characteristic part of this region in Southern Arabia are Capparidee, Euphorbiacee, and a few Leguminose, a Reseda and Dip- terygium ; palms, Polygonacee, ferus, and other crypto- gams, are rare. The number of families relative to the area is very small, and the number of genera and species equally restricted, in very many cases a single species being the only representative of an order. The aspect of the vege- tation is very peculiar, and is commonly determined by the predominance of some four or five species, the rest being either local or sparingly scattered over the area. The absence of the ordinary bright green colours of vegetation is another peculiarity of this flora, almost all the plants having glaucous or whitened stems. Foliage is reduced to a minimum, the moisture of the plant being stored up in massive or fleshy stems against the long-continued drought. Aridity has favoured the production of spines as a defence from external attack, sharp thorns are frequent, and asperi- ties of various sorts predominate. Many species produce gums and resins, their stems being encrusted with the exudations, and pungency and aromatic odour is an almost universal quality of the plants of desert regions.

89. The cultivated plants of Arabia are much the same as those of Northern India—wheat, barley, and the common Sorghum, with dates and lemons, cotton and indigo. To these must be added coffee, which is restricted to the slopes of the western hills. Among the more mountainous regions of the south-western part of Arabia, known as Arabia Felix, the summits of which rise to 6000 or 7000 feet, the rain- fall is sufficient to develop a more luxuriant vegetation, and the valleys have a flora like that of similarly situated parts of southern Persia, and the less elevated parts of Afghanistan and Baluchistan, partaking of the characters of that of the hotter Mediterranean region. In these coun- tries aromatic shrubs are abundant.

‘Trees are rare, and almost restricted to Pistacia, Celtis, and Dodonea, with poplars, and the date palm. Prickly forms of Statece and Astragalus cover the dry hills. In the spring there is an abundant herbaceous vegetation, including many bulbous plants, with genera, if not species, identical with those of the Syrian region, some of which extend to the Himalaya.

90. The flora of the northern part of Afghanistan ap- proximates to that of the contiguous western Himalaya. Quercus Ilex, the evergreen oak of Southern Europe, is found in forests as far east as the Sutlej, accompanied with other European forms. In the higher parts of Afghanistan and Persia Boraginee and thistles abound ; gigantic Umbellifere, such as Ferula, Galbanum, Dorema, Bubon, Peucedanum, Prangos, and others, also characterise the same districts, and some of them extend into Tibet.

ASTA

be named the babool, Acacia ; toon, Cedrela ; and sissoo, | The only timber in ordinary use obtained from

| BOTANY.

91. The flora of Asia Minor and Northern Persia differs Persia but little from that of the southern parts of Europe. The @¢ Asia mountains are clothed, where the fall of rain is abundant, a with forests of Quercus, Fagus, Ulmus, Acer, Carpinus, and Corylus, and various C’oniferw. Of these the only genus that is not found on the Himalaya is Fagus. Fruit trees of the plum tribe abound. The cultivated plants are those of Southern Europe.

92. The vegetation of the Malayan Islands is for the most Malayan

part that of the wetter and hotter region of India; but the Islands. greater uniformity of the temperature and humidity leads to the predominance of certain tropical forms not so con- spicuous in India, while the proximity of the Australian continent has permitted the partial diffusion of Australian types which are not seen in India. The liquidambar and nutmeg may be noticed among the former; the first is one of the most conspicuous trees in Java, on the mountains of the eastern part of which the casuarina, one of the characteristic forms of Australia, is also abundant. Rhododendrons

occur in Borneo and Sumatra, descending to the level of the sea. On the mountains of Java there appears to be no truly alpine flora ; Sasxzfraga is not found. In Borneo some of the temperate forms of Australia appear on the higher mountains. On the other islands similar characteristics are to be observed, Australian genera ex- tending to the Philippines, and even to Southern China.

93. The analysis of the Hong Kong flora by Mr Bentham China, indicates that about three-fifths of the species are common to the Indian region, and nearly all the remainder are either Chinese or local forms. The number of species common to Southern China, Japan, and Northern Asia is small. The cultivated plants of China are, with a few exceptions, the same as those of India. South China, therefore, seems, botanically, hardly distinct from the great Indian region, into which many Chinese forms penetrate, as before, no- ticed. The flora of North China, which is akin to that of Japan, shows manifest relation to that of the neighbouring American continent, from which many temperate forms extend, reaching to the Himalaya, almost as far as Kash- mir. Very little is known of the plants of the interior of Northern China, but it seems probable that a complete botanical connection is established between it and the tem- perate region of the Himalaya.

94, The vegetation of the dry region of Central Asia is Central remarkable for the great relative number of Chenopodiacee, Asia. Salicornia and other salt plants being common ; Polygo- nacecee also are abundant ; leafless forms being of frequent occurrence, which gives the vegetation a very remarkable aspect. Peculiar forms of Leguminose also prevail, and these, with many of the other plants of the southern and drier regions of Siberia, or of the colder regions of the desert tracts of Persia and Afghanistan, extend into Tibet, where the extreme drought and the hot (nearly vertical) sun combine to produce a summer climate not greatly differing from that of the plains of Central Asia.

95. The zoological provinces of Asia correspond very ZooLocy. — closely with the botanical. The northern portion of Asia, as far south as the Himalaya, is not zoologically distinct from Europe, and these two areas, with the strip of Africa north of the Atlas, constitute the Palearctic region of Dr Sclater, whose zoological primary divisions of the earth have met with

the general approval of naturalists. The south-eastern portion of Asia, with the adjacent islands of Sumatra, Java, Borneo, and the Philippines, form his Indian region. The extreme south-west part of the continent constitutes a separate zoological district, comprising Arabia, Palestine, and Southern Persia, and reaching, like the hot desert botanical tract, to Baluchistan and Sindh; it belongs to what Dr Sclater calls the Ethiopian region, which extends over Africa, south of the Atlas. The Celehes.

Palearctic region. Mammals.

Birds.

Indian region. Mammals.

ZOOLOGY. |

Papua, and the other islands east of Java beyond Wallace's line (see par. 6), fall within the Australian region.

A few words may be said about the characteristic ani- mals of each of these divisions.

96. Nearly all the mammals of Europe also occur in Northern Asia, where, however, the Palearctic fauna is enriched by numerous additional species. The character- istic groups belong mostly to forms which are restricted to cold and temperate regions. Consequently the Quad- rumana, or monkeys, are nearly unrepresented, a single species occurring in Japan, and one or two others in North- ern China and Tibet. Insectivorous bats are numerous, but the frugivorous division of this order is only represented by a single species in Japan. Carnivora are also numerous, particularly the frequenters of cold climates, such as bears, weasels, wolves, and foxes. Of the Insectivora numerous forms of moles, shrews, and hedgehogs pre- vail. The Rodents are also well represented by various squirrels, mice, and hares. Characteristic forms of this order in Northern Asia are the marmots (Arctomys) and the pikas, or tailless hares (Lagomys). The great order of Ungulata is represented by various forms of sheep, as many as ten or twelve wild species of Ovis bcing met with in the mountain chains of Asia; and more sparingly by several peculiar forms of antelope, such as the saiga

(Saiga tatarica), and the Grazella gutturosa, or yellow sheep. Coming to the deer, we also meet with characteristic forms in Northern Asia, especially those belonging to the typical genus Cervus. 'The musk deer (Moschus) is also quite restricted to Northern Asia, and is one of its most pecu- liar types.

97. The ornithology of Northern Asia is even more closely allied to that of Europe than the mammal fauna. Nearly three-fourths of the well-known species of Europe extend throughout Siberia into the islands of the Japanese empire. Here again we have an absence of all tropical fornis, and a great development of groups characteristic of cold and temperate regions. One of the most peculiar of these is the genus Phasianus, of which splendid birds all the species are restricted in their wild state to Northern Asia. The still more magnificently clad gold pheasants (Lhaumalea), and the eared pheasants (Crossoptilon), are also confined to certain districts in the mountains of North-eastern Asia. Amongst the Passerves, such fornis as the larks, stone chats, finches, linnets, and grosbeaks, are well developed, and exhibit many species.

98. The mammal fauna of the Indian region of Asia is much more highly developed than that of the Pala- arctic. The Quadrumana are represented by several peculiar genera, amongst which are Semnopithecus, Hylo- bates, and Simia. Two peculiar forms of the Lemurine group are also met with. Both the insectivorous and frugivorous divisions of the bats are well represented. Amongst the Insectivora very peculiar forms are found, such as Gymnura and Tupaia. The Carnivora are likewise numerous ; and this region may be considered as the true home of the tiger, though this animal has wandered far north into the Palearctic division of Asia. Other charac- teristic Carnivora are civets, various ichneumons, and the benturong (Arctictis). Two species of bears are likewise restricted to the Indian region. In the order of Rodents squirrels are very numerous, and porcupines of two genera are met with. The Indian region is the home of the Indian elephant—one of the two sole remaining representa- tives of the order Proboscidea. Of the Ungulates, four species of rhinoceros and one of tapir are met with, besides several peculiar forms of the swine family. The Bovide, or hollow-horned ruminants, are represented by several genera of antelopes, and by

species of true Bos—such as B. sondaicus, B. frontalis,and B. bubalus. Deer are likewise

numerous, and the peculiar group of Chevrotains (77ragulus) is characteristic of the Indian region. Finally, this region affords us representatives of the order Edentata, in the shape of several species of Manis, or scaly ant-eater.

99. The assemblage of birds of the Indian region is one Birds. of the richest and most varied in the world, being surpassed only by that of tropical America. Nearly every order, except that of the Struthiones, or ostriches, is well repre- sented, and there are many peculiar genera not found else- where, such as Buceros, Harpactes, Lophophorus, Euplo- camus, Pavo, and Certornis. The Phasianide (exclusive of true Phastanus) are highly characteristic of this region, as are likewise certain genera of barbets (Megalema), parrots (Palwornis), and crows (Dendrocitta, Urocissa, and Cissa). The family Zurylemide is entirely confined to this part of Asia.

100. The Ethiopian fauna plays but a subordinate part Ethiopian in Asia, intruding only into the south-western corner, and region. occupying the desert districts of Arabia and Syria, although Mammals. some of the characteristic species reach still further into Persia and Sindh, and even into' Western India. The lion and the hunting-leopard, which may be considered as, in this epoch at least, Ethiopian types, extend thus far, besides various species of jerboa and other desert-loving forms.

101. In the birds, the Ethiopian type is shown by the Birds. prevalence of larks and stone-chats, and by the complete absence of the many peculiar genera of the Indian region.

102, The occurrence of mammals of the Marsupial order Australian in the Molucca Islands and Celebes, while none have been region. found in the adjacent islands of Java and Borneo, lying on Mammals. the west of Wallace's line, or in the Indian region, shows that the margin of the

Australian region has here been reached. ‘The same conclusion is indicated by the absence from the Moluccas and Celebes of various other Mamnuals, Quadrumana, Carnivora, Insectivora, and Ruminants, which abound in the western part of the Archipelago. Deer do not extend into New Guinea, in which island the genus Sus appears to have its eastern limit. A peculiar form of baboon, C’ynopithecus, and the singular ruininant, Anoa, found in Celebes, seem to have no relation to Asiatic animals, and rather to be allied to those of Africa.

103. The birds of these islands present similar pecu- Birds, liarities. Those of the Indian region abruptly disappear at, and many Australian forms reach but do not pass, the line above spoken of. Species of birds akin to those of Africa also occur in Celebes.

104. Of the marine orders of Sirenia and Cetacea the Marine Dugong, Halicore, is exclusively found in the Indian mammals. Ocean ; and a dolphin, Piatanista, peculiar to the Ganges, ascends that river to a great distance from the sea.

105. Of the sea fishes of Asia, among the Acantho- Sea fishes. pterygii, or spiny-rayed fishes, the Percide, or perches, are largely represented ; the genus Serranus, which has only one species in Europe, is very numerous in Asia, and the forms are very large. Other allied genera are abundant, and extend from the Indian seas to Eastern Africa. The Squamipennes, or scaly-finned fishes, are principally found in the seas of Southern Asia, and especially near coral reefs. The MZullide, or red mullets, are largely represented – by genera differing from those of Europe. The Polynemi, which range from the Atlantic through the Indian Ocean to the Pacific, supply animals from which isinglass is pre- pared ; one of them, the mango-fish, esteemed a great delicacy, inhabits the seas from the Bay of Bengal to Siam.

The Scveenide extend from the Bay of Bengal to China, but are not known to the westward. Horse mackerel are nu- merous. The Stromateide, or pomfrets, resemble the dory, a Mediterranean form, and extend to China and the Pacific. The sword fishes, Xiphitdee—the lancet fishes, Acanthuridee

Freshwater fishes.

Tnsects.

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_-and the scabbard fishes, Z'richuride, are distributed through the seas of South Asia. Mackerels of various genera abound, as well as gobies, blennies, and mullets.

106. Among the Anacanthini, the cod family so well known in Europe shows but one or two species in the seas of South Asia, though the soles and allied fishes are numer- ous along the coasts. Of the Physostomi, the siluroids are abundant in the estuaries and muddy waters ; the habits of some of these fishes are remarkable, such as that of the males carrying the ova in their mouths till the young are hatched. The small family of Scopelide affords the gela- tinous Harpodon, or bumalo. The gar-fish and flying fishes are numerous, extending into the seas of Europe. The Clupeide, or herrings, are most abundant ; and an- chovies, or sardines, are found in shoals, but at irregular and uncertain intervals. The marine eels, Murcenide, are more numerous towards the Malay Archipelago than in the Indian seas. Forms of sea-horses (Hippocampus), pipe- fishes (Syngnathus), fife-fishes (Sclerodermus), and sun-fish, globe-fish, and other allied forms of Gymnodontes, are not uncommon.

107. Of the cartilaginous fishes, Chondropterygii, the true sharks and haimmer-headed sharks, are numerous. The dog-fish also is found, one species extending from the Indian seas to the Cape of Good Hope. The saw-fishes, Pristide, the electrical rays, Torpedine, and ordinary rays and skates, are also found in considerable numbers.

108. The fresh waters of Southern Asia are deficient in the typical forms of the Acanthopterygii, and are chiefly inhabited by carp, siluroids, simple or spined eels, and the walking and climbing fishes. The Stluride attain their chief development in tropical regions. Only one Silurus is found in Europe, and the same species extends to Southern Asia and Africa. The Salmonidw are entirely absent from the waters of Southern Asia, though they exist in the rivers that flow into the Arctic Ocean and the neighbouring parts of the

Northern Pacific, extending perhaps to Formosa; and trout, though un-known in Indian rivers, are found beyond the watershed of the Indus, in the streams flowing into the Caspian. The Cyprinide, or carp, are largely represented in Southern Asia, and there grow to a size unknown in Europe; a Barbus in the Tigris has been taken of the weight of 300 tb. The chief development of this family, both as to size and number of forms, is in the mountain regions with a temperate climate ; the smaller species are found in the hotter regions and in the low-lying rivers. Of the Clupeda, or herrings, numerous forms occur in Asiatic waters, ascend- ing the rivers many hundred miles ; one of the best known of Indian fishes, the hilsa, is of this family. The stur- geons, which abound in the Black Sea and Caspian, and ascend the rivers that fall into them, are also found in Asiatic Russia, and an allied form extends to Southern China. The walking or climbing fishes, which are peculiar to South-eastern Asia and Africa, are organised so as to be able to breathe when out of the water, and they are thus fitted to exist under conditions which would be fatal to other fishes, being suited to live in the regions of periodi- cal drought and rain in which they are found.

109. The insects of all Southern Asia, including India south of the Himalaya, China, Siam, and the Malayan Islands, belong to one group; not only the genera, but even the species, are often the same on the opposite sides of the Bay of Bengal. The connection with Africa is marked by the occurrence of many genera common to Africa and India, and confined to those two regions, and similarities of form are not uncommon there in cases in which the genera are not peculiar. Of Coleopterous insects known to inhabit East Siberia, nearly one-third are found in Western Europe. The European forms seem to extend to about

human societies have been advancing towards their pre-

measure.

jects; for the evidence of the modifications which the chief

the 30th parallel of N. lat., south of which the Indo- Malayan types are met with, Japan being of the Europeo- Asiatic group. The northern forms extend generally along the south coast of the Mediterranean up to the border of the great desert, and from the Levant to the Caspian.

110. Of the domesticated animals of Asia may first be Domesti- mentioned the elephant. It does not breed in captivity, cated ani- and is not found wild west of the Jumna river in Northern a India, The horse is produced in the highest perfection in Arabia, and the hot and dry countries of Western Asia, Ponies are most esteemed from the wetter regions of the east, and the hilly tracts. Asses are abundant in most places, and two wild species occur. The horned cattle include the humped oxen and buffaloes of India, and the yak of Tibet. A hybrid between the yak and Indian cattle, called zo, is commonly reared in Tibet and the Himalaya. Sheep abound in the more temperate regions, and goats are universally met with; both of these animals are used as beasts of burden in the mountains of Tibet. The rein- deer of Northern Siberia call also for special notice ; they are used for the saddle as well as for draught.

111. Among the later results of scientific research, the Ernno- demonstration of man's existence on the earth at a period 10Gy. vastly anterior to any of which we have any knowledge through existing records, is one of the most important in giving a solid foundation to the study of ethnology. We have learned that man was the contemporary of many extinct animals, at a time when the main outlines of the land within the area of the present continent of Europe were wholly different from what they now are; and that

sent condition during a series of ages for the extent of which our ordinary conceptions of time afford no adequate Such facts have given an altogether different direction to the current of opinion as to the manner in which the great groups of mankind have become distri- buted over the areas where they are now found. So, too, the knowledge of the want of stability of forms of human speech has had an important bearing on these same sub-

spoken languages have undergone during the historic period shows that there is probably no country in which the tongue in use a thousand years ago would now be intelligible, and leads to the conclusion that even a

radical diversity of language need not imply difference of race. In short, the science of ethnology being, like all others, built up on facts only to be obtained by actual observation, requires that these shall be interpreted by an intelligent and constantly repeated review of the whole series of available data as precise knowledge advances.

112. Asia, including its outlying islands, has become Mon-: the dwelling-place of all the great families into which the golian races of men have been divided. By far the largest area 8°“P is occupied by the Mongolian group. These have yellow- brown skins, black eyes and hair, flat noses, and oblique eyes. They are short in stature, with little hair on the body and face. In general terms they extend, with modi- fications of character probably due to admixture with other types and to varying conditions of life, over the whole of Northern Asia as far south as the plains bordering the Caspian Sea, including Tibet and China, and algo over the Indo-Malayan peninsula and Archipelago, excepting Papua and some of the more eastern islands.

113. Next in numerical importance to the Mongolians Melano- are the races which have been called by Professor Huxley Bui) Melanochroic and Xanthochroic. The former includes the ¢hroic. dark-haired people of Southern Europe, and extends over North Africa, Asia Minor, Syria to South-western Asia, and through Arabia and Persia to India. The latter race includes tho fair-haired people of Northern Europe, and

extends over nearly the same area as the Melanochroi, with which race it is greatly intermixed. The Xanthochroi have fair skins, blue eyes, and light hair; the others have dark skins, eyes, and hair, and are of a slighter frame. Together they constitute what were once called the Caucasian races. The Melanochroi are not considered by Professor Huxley to be one of the primitive modifications of mankind, but rather to be the result of the admixture of the Xanthochroi with the Australioid type, next to be mentioned.

golian and Chinese type, having languages fundamentally monosyllabic, but using letters derived from India, and adopting their religion, which is almost everywhere Buddhist, from the Indians, Of these may be named the Tibetans, the Burmese, and the Siamese. Cochin-China is more nearly Chinese in all respects.

120. The Malays, who occupy the peninsula and most Malays.

of the islands of the Archipelago called after them, are Mongols apparently modified by their very different climate,

Austra- 114, The third group is that of the Australioid type. | and by the maritime life forced upon them by the physical lioid. Their hair is dark, generally soft, never woolly. The eycs | conditions of the region they inhabit. As they are now and skin are dark, the beard often well devcloped, the nose | known to us, they have undergone a process of partial broad and flat, the lips coarse, and jaws heavy. This race | civilisation, first at the hands of the Brahminical Indians, is believed to form the basis of the people of the Indian | from whom they borrowed a religion, and to some extent peninsula, and of some of the hill tribes of Central India, | literature and an alphabet, and subsequently from inter- to whom the name Dravidian has been given, and by its | course with the Arabs, which has led to the adoption of admixture with the Melanochroic group to have given rise | Mahometanism by most of them. to the ordinary population of the Indian provinces. It 121. The name of Aryan has becn given to the races Aryans and is also probable that the Australioid family extends into speaking languages derived from, or akin to, the ancient Semites. South Arabia and Egypt. form of Sanskrit, who now occupy the temperate zone Negroid. 115. The last group, the Vegroid, is represented by the extending from the Mediterranean, across the highlands of races to which has been given the name of Negrito, from | Asia Minor, Persia, and Afghanistan, to India. 'The races the small size of some of them. They are closely akin to speaking the languages akin to the ancient Assyrian, which the negroes of South Africa, and possess the characteristic | are now only represented by Arabic, have been called dark skins, woolly, but scanty beard and body hair, broad | Semitic, and occupy the countries south-west of Persia, flat noses, and projecting lips of the African; and are | including Syria and Arabia, besides extending into North diffused over the Andaman Islands, a part of the Malay | Africa. Though the languages of these races are very peninsula, the Philippines, Papua, and some of the neigh- | different they cannot be regarded as physically distinct, bouring islands. The Negritos appear to be derived from | and they are both without doubt branches of the Melano- a mixture of the true Negro with the Australian type. chroi, modified by admixture with the neighbouring races, Distribu- 116. The distribution of

the Mongolian group in Asia | the Mongols, the Australioids, and the Xanthochroi. a offers no particular difficulty. There is complete present, 122. The Aryans of India are probably the most scttled Language Bian. and probably previous long-existing, geographical con- | and civilised of all Asiatic races. This type is found in its ene ae tinuity in the area over which they are found. 'There is | purest form in the north and north-west, while the mixed "8°" also considerable similarity of climate and other conditions | races and the population referred to the Australioid type throughout the northern half of Asia which they occupy. | predominate in the peninsula and Southern India. Among The extension of modified forms of the Mongolian type | the hill tribes of Central India are some which appear to over the whole American continent may be mentioned as a | have a Mongolian origin, and to have come in from the remarkable circumstance connected with this branch of the | north-east, such as the Koles and Bhils. The spoken human race. languages of Northern India are very various, differing Tartars, 117. The Mongolians of the northern half of Asia are | one from another in the sort of degree that English differs almost entirely nomadic, hunters and shepherds or herds- | from German, though all are thoroughly Sanskritic in their men. The least advanced of these, but far the most | vocables, but with an absence of Sanskrit grammar that peaceful, are those that occupy Siberia. Further south the | has given rise to considerable discussion. The languages best known tribes are the Manchus, the Mongols proper, | of the south are Dravidian, not Sanskritic. The letters of the Moguls, and the Turks, all known under the name of | both classes of languages, which also vary considerably, Tartars, and to the ancients as Scythians, occupying from | are all modifications of the ancient Pali, and probably east to west the zone of Asia comprised between the 40th | derived from the Dravidians, not from the Aryans. They and 50th circles of N. lat. The Turks are Mahometans; | are written from left to right, exception being made of Urdu their tribes extend up the Oxus to the borders of Afghani- | or Hindustani, the mixed language of the Mahometan con- stan and Persia, and to the Caspian, and under the name of | querors of Northern India, the character used for writing Kirghis into Russia, and their language is spoken over a | which is the Persian. From the River Sutlej and the large part of Western Asia. Their letters are those of | borders of the Sindhian desert, as far as Burmah and to Persia. The Manchus and Mongols are chiefly Buddhist, | Ceylon, the religion of the great bulk of the people of with letters

derived from the ancient Syriac. The Manchus | India is Hindu or Brahminical, though the Mahometans are now said to be gradually falling under the influence of | are often numerous, and in some places even in a majority. Chinese civilisation, and to be losing their old nomadic | West of the Sutlej the population of Asia may be said to habits, and even their peculiar language. The predatory | be wholly Mahometan, with the exception of certain habits of the Turkish, Mongolian, and Manchu popula- | relatively small areas in Asia Minor and Syria, where tion of Northern Asia, and their irruptions into other parts | Christians predominate. The language of the Punjab does of the continent and into Europe, have produced very | not differ very materially from that of Upper India. West remarkable results in the history of the world, to which | of the Indus the dialects approach more to Persian, which further reference will be made hereafter. language meets Arabic and Turki west of the Tigris, and '| Chinese. 118. The Chinese branch of the Mongolian family are } along the Turkoman desert and the Caspian. Through the a thoroughly settled people of agriculturists and traders. | whole of this tract the letters are used which are common They are partially Buddhist, and have a peculiar mono- | to Persian, Arabic, and Turkish, written from right to left. syllabic, uninflected language, with writing consisting of 123. The presence of the Negroid type in isolated Asiatic Distribu- symbols, which represent words, not letters. areas, so far removed from the existing Negro region, tion of | Indo- 119. The countries lying between India and the Mon- | appears to require for its explanation the former extension Nestoids. Chinese golian area are occupied by populations chiefly of the Mon- | of dry land from Africa across the area now occupied by

II. — 88

HIsTORY,

Prehistoric man,

Aryans and

Semites.

Their mi- grations.

the Indian Ocean, and the later disappearance of such land by changes of level of the earth's surface. If, again, the relation of the Dravidian (non-Aryan) population of Southern and Central India to that of Australia be real,—and the re- lationship seems to be sufficiently established,—the presence in India of this race seems also to require the former occur- rence of great alterations in the distribution of sea and land across the equatorial region of the Indian Ocean, and probably an alternation or repetition of movements such as our better knowledge of other parts of the earth shows us to have been normal rather than abnormal. That changes on a very great scale have taken place in Southern Asia in the very latest geological periods is well established, and as was before observed (par. 44), these hypotheses are supported by direct geological evidence, and corroborated by the facts of botanical and zoological distribution.

124, In looking back on the materials at our com- mand for ascertaining how the existing condition of the earth and its inhabitants has been brought about, we are generally forced to the conclusion that they are but frag- mentary and disappointing; this is more especially the case in dealing with our own race. Of historical records there are hardly any that extend to seven centuries before the Christian era, except those in the form of monuments and of fragmentary and obscure inscriptions. What is left of more remote antiquity is little more than the material wreck of human societies; the living forces that carried them forward have necessarily escaped us, except as matter of conjecture.

125. Of prehistoric man little has yet been discovered in Asia; but a sufficient number of stone and bronze imple- ments or weapons has been found in various parts of India to show that the first steps of the human race in civilisa- tion are everywhere almost identical.

126. The feeble light thrown on the earliest history of the Aryan race exhibits it as a pastoral people occupying the valleys and mountains along the Oxus. In its proximity to the south were the Semitic races, distributed from Syria to the Euphrates and Persia,and perhaps further east. These two

races are seen to have spread across Southern Europe, North Africa, and South-western Asia; the Aryans sup- plying their language to the greater part of Europe and of the temperate zone of Asia, from the Mediterranean to India; the Semites giving theirs to Arabia, Syria, and North Africa. It is supposed that the population of the area referred to was thus distributed by reason of migra- tions caused by pressure from Mongolian tribes on the north, such as is known to have arisen since the historical period. Possibly the movements may have been due to changes in the climate, and the gradual diminution of the rain-fall (of which there is evidence), which might have rendered the area originally occupied by the Aryans unable to sup- port them. But it may be regarded as certain that the Brahminical race, formerly dominant in Upper India, entered that country from the north-west as invaders. The ascertained connection of the languages of India and of the intermediate tract with the ancient Aryan or Vedic lan- guage, the fact that the founders of the Brahminical faith fixed themselves in or near the mountains of Northern India, the greater predominance of the Aryan type in this region, the separation of a privileged higher from a servile lower class or caste, and the general evidence of the diffu- sion of Indian civilisation from west to east, with many other circumstances, tend to corroborate such a view. An intrusion of Aryans into the countries originally occu- pied by the Semites seems also to have taken place in Tran or Persia. As the Aryan language developed into the Sanskrit in India, so in Persia it gave birth to the Zendic or Pehlvi, the language of the sacred books of the Fire-worshippers; and as the Aryans seem to have borrowed

the Dravidian letters in the former country, so they adopted those of the Semites, or ancient Assyrians, in the other. The European branch of the Aryans, the Hellenic races, likewise appear to have had no letters of their own, and to have borrowed a Semitic alphabet from the Pheenicians. The Bactrian Aryans used an archaic quasi-Phcenician alphabet in North India till 250 3.c., about which time the Pali letters, on which the Devanagari alphabet was based, are known to have been current.

127. The races that formerly occupied the plains of Earliest Mesopotamia and the neighbouring mountains—the Baby- civilisation,

lonians and Assyrians—are, next to the Egyptians, those whose monuments and inscriptions supply the earliest definite records of mankind, going back possibly nearly 4000 years from the prescnt time. These, and the corre- sponding remains of the Egyptians, which are of even greater antiquity, taking us back perhaps 6000 years or more, indicate that powerful kings then ruled over these countries, with frequent changes in the boundaries of the separate states, under conditions not very greatly different from those that continued until the kingdoms disappeared before the progress of Roman or Mahometan power. How long these races may have taken to arrive at the state of civilisation in which they were as they first become known to us it is impossible to say; but there is nothing to suggest that their condition is to be accounted for other- wise than by prolonged gradual transformations, such as they and all other races are known to have undergone in the time subsequent to that from which our historical records commence.

128. The task of tracing from these remote epochs to General more recent times the mutual relations that have arisen View.

between the people of the several parts of Asia and the surrounding countries, leads us to a review of the history of the continent, of which a very brief outline will be attempted. From this we shall see how the progressive races of Europe appear to have had their origin in Asia ; how in Asia and Egypt were taken the first steps in human civilisation and learning ; how in Asia arose all the forms of religion which have so greatly influenced the history of man,—the Vedantic, the Buddhist, the Hebrew, and, more especially, Christianity and Mahometanism; how the move- ments of the population of Central Asia have affected the surrounding regions; and lastly, how the condition of almost the whole continent has, from the earliest ages to the present day, been one to invite foreign conquest, and to lead to the supremacy of foreign races over all its parts.

Mahabharat. The account of this is contained in a poem, written about 500 B.c., which is one of the Vedas. It seems to have been a contest between two branches of the house reigning in Northern India, and to have occurred

about 1400 3.c. The accounts of antecedent periods are manifestly mythical, and merely indicate the probability of the gradual progress of the conquering Brahminical race from west to east. The Vedas are a collection of hymns and heroic poems, containing the religious doctrines of the Aryans at that remote period, and embodying the earliest system of philosophy which we possess. The inroad of Alexander the Great to the Sutlej (Hyphasis) in 350 B.c. affords a landmark in a very obscure past. The Greek colony left in Bactria survived nearly to the Christian era. In 550 z.c. was born, in Northern India, Sakya, the founder of Buddhism. This was a development of the Vedic theology ; in the course of two or three centuries it became dominant in India, whence it was carried into Tibet and China, and at length became, and still remains, the religion of the greater part of Asia, though it eventually declined in India, and has now almost entirely disappeared from the

129. The earliest event in Hindu chronology which has Hindu any pretence to being called historical is the war of the oe

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Western Asia,

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country of its origin. Asoka, one of the Hindu kings of whom memorials exist in inscriptions found in various parts of India, lived when Buddhism was triumphant, in 250 B.c. The subsequent annals consist of little more than lists of kings of various dynasties settled in various parts of the country, until we reach the period of the Mahometan conquests.

130. Of the western parts of Asia it will suffice to say that about 600 B.c. the kingdoms known under the names of Babylonia, Assyria, Media, and Persia, began to coalesce, and were at length united under Cyrus, the

Persian, the "Great King," whose territories are said to have extended from the Mediterranean to the Indus.

During this period the civilisation and learning of Egypt and Western Asia had penetrated into Greece, where was developed, from the branch of the Aryan race which occu- pied that country, the most extraordinarily intellectual community which has ever existed. The successful resist-

Greece and ance of Greece to the advance of the Persians probably

Persia, ,

Rome and Persia.

Origin of Christian-

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Its influ-

ence,

Origin of Mahomet- anism,

prevented the spread of the western Asiatics over Europe, and left that continent open to the evolution of the far higher type of civilisation which is its characteristic. The destruction of the Persian monarchy by Alexander took place about 330 p.c. After the Indian expedition and death of the great Greek conqueror, his Asiatic kingdom fell to pieces, and numerous petty sovereignties were formed out of it. About: fifty years before the Christian era, the Romans for the first time appeared on the arena of Asia, took possession of Syria, and soon after occupied a large part of Asia Minor, and at length established them- selves on the Tigris. During this interval the more eastern part of the old Persian kingdom, called by the Romans Parthia, had again acquired an independent exist- ence, and its monarch, once more assuming the title of the "Great King," fruitlessly attempted to drive the Romans out of Asia. In the year 274 a.p. later successes of the Romans in the East were celebrated by the famous triumph of the Emperor

Aurelian, in which, it is said, ambassadors appeared from all parts of Asia, even from China. The conflicts between the Persians and Romans continued long after the division of the Roman empire, 395 a.p., without any material change of the boundaries of the contending parties. The Romans or Byzantines never advanced beyond Armenia or the Tigris; nor conld the Persians permanently retain possessions to the west of those limits, though once (620) they had penetrated to the walls of Constantinople.

131. While these conflicts were in progress, events of an altogether different character had arisen, which have brought a small portion of Western Asia into prominent notice in the world's history. Christianity had its origin in Syria, among the Jews, a tribe of Semitic race, whose sacred writings and history are of extreme antiquity, and have beet preserved and are well known by reason of the special interest created in them. The Christian faith spread rapidly over Asia Minor, and soon extended to all parts of the Roman empire, in which it was at length accepted as the state religion about 320 a.p.

132. Among the efficient agencies of Western progress no doubt can exist that Christianity was one of the most active. It necessarily happened that the religion which established itself on the ruins of the superstitions of the Old World should have an important influence on the new forms of society that arose; and as the Christian faith gradually became the dominant and at length the only religion of Europe, it shared greatly, both through its doctrines and its organisation, in bringing about the intellectual and social advance that has there taken place.

133. But Christianity, though it had its origin in Western Asia, has produced no such consequences there. 'The pro- gress which it had made to the eastward during the first

six centuries was very soon after cut short by the founding of a rival proselytising religion by Mahomet, 620 «.p., whose followers and

successors effectually arrested the spread of the Christian faith in this direction.

134. The Arabs, under the influence of the fanatical Its spread. preachings of their prophet, now burst forth upon the countries around them ; in less than a century, 730 a.D., they had possessed themselves of Persia and Transoxiana, penetrated to the Indus, driven the Byzantine armies out of Asia Minor and Syria, overcome Egypt, advanced along Northern Africa to the Atlantic, had conquered Spain, and even entered France. Nor was this a mere temporary success, Though the Arabs were at once repelled from France, the Mahometans held their ground in Spain for more than seven centuries, and have not only been domi- naut to the present day in all other parts of their earliest conquests, but have since added largely to the area in which the religion of Mahomet has been adopted.

135. It was to the immediate successors of Mahomet Its influ- that our race is indebted for the impulse given to science, ence. which was so long wholly neglected or deliberately con- demned by Christian authority in Europe. But although it is not possible to say that Mahometanism has been with- out beneficial tendencies or results, yet the general history of Mussalman races has been marked by horrible barbari- ties and utter disregard of human life. The annals of Asiatic kingdoms present us, for the most part, with a succession of unscrupulous tyrants, among whom have appeared, at most, two or three sovereigns under whom anything like real progress towards civilisation was possible. And, admitting that rulers of all races and religions have in turn exhibited qualities which can only be regarded with reprobation, and that it is not easy to discriminate between what is due to the influence of race and what to that of religion, it is certain that the Mahometan Mongols to whom Asia was for centuries a prey far outstripped, in the violation of the principles on which civilisation is based, all other communities in any part of Europe or Asia.

136. The Arab empire, under the khalifs of Baghdad, Successors culniinated about 800 a.p., but hardly maintained its of Ma- integrity fifty years more. On its disruption a Turki bomet. dynasty established itself in Ghazni, from which sprung Mahmud, who first invaded India in 1001, and extended his rule to the Oxus and Persia. His successors (not descendants) established

the Mahometan kingdom of Delhi in 1200, which gradually extended over all Northern India in the next two centuries. After Mahmuid's death another Turki house, that of the Seljuks, established itself in Persia, Asia Minor, and Syria, about 1050, extended its authority to Egypt 1170, and retained its vitality till 1300. The Crusades, between 1100 and 1300, set up a small Christian power in Syria, with which the Seljuk Turks were in a state of almost constant conflict, the famous Saladin (Sdlah-u-din) having been one of their chiefs. In the wars between the followers of the crescent and the cross, it is hard to say which party inflicted the greatest atrocities on the unfortunate inhabitants of the country around the Holy Sepulchre.

137. Two centuries before the Christian era the Mon- Chenghiz golian races of Central Asia are known to have begun Khan, the series of predatory incursions on their neighbours, which so long made them the terror of all parts of the Old World less barbarous than their own. 'The most important of these irruptions took place about 1220. Chenghiz Khan, a Mongolian chief, having made him- self master of Central Asia, established his capital at Karakorum, the precise site of which is doubtful. In 1215 he took possession of Northern China, and then turned westward ; he overran the whole of Turkistan, the countries along the Oxus, Afghanistan, and Persia, and

Timur.

Kings of Delhi. Babar.

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added them to his empire. After his death, in 1227, his successors, dividing his kingdom among them, continued their advance to the west. They swept away the remains of the Arab khalifs of Baghdad in 1258, and overthrew the Seljuks in Asia Minor in 1300; several of their expe- ditions for plunder reached India; and they spread them- selves over South-eastern Europe, into Russia, Hungary, and Poland, and entered Siberia. During this interval, as they became settled, they abandoned the simple deistical faith of their fathers, and adopted the religion of the races they had conquered.

138. In the year 1370 there rose, above the ordinary level of the successors of Chenghiz, another chief, who claimed descent from the great khan, but was more indebted for his position to his own force of character. From an obscure position in Sam&rkhand, Timur, commonly spoken of as Tamerlane by European writers, had acquired in the course of twenty years the sovereignty of Afghanistan, Transoxiana, of Persia as far as the Euphrates, and of Eastern Turkistan to Kashgar. His armies reached to Siberia, and he carried his devastations into the heart of Russia, almost to the walls of Moscow. In the years 1398-99, excited by fanaticism and the love of rapine, he made his celebrated march into India, an account of which, with his other exploits, exists, written by himself. He plundered and burnt Delhi, which city was surrendered under a solemn promise of protection ; he carried off in- numerable captives, ravaged the neighbouring country, and massacred the Hindu inhabitants to wash out the stains of Mussulman blood spilt by his sword; and finally quitted India, leaving anarchy, famine, and pestilence behind him, having in four short months overwhelmed the provinces of Northern Hindustan by calamities which prostrated the kingdom of Delhi for nearly a century. From these ruins the ruthless barbarian turned to the extreme west of Asia, which he ravaged with greater ferocity, if possible, than India. After the overthrow of the Seljuk Turks in 1300, the descendants of Chenghiz ruled in Asia Minor for some years. Amid the dis- orders that accompanied the successions of this dynasty, there started up another adventurer, Osmdn or Othman, who established himself in the north-western region of Asia Minor, overlooking the Euxine and Sea of Marmora. The descendants of Osman had already become important chiefs, in 1360, when they had driven the Byzantines out of Asia and, under Amurath, established themselves in Europe in the provinces adjoining Constantinople, and had also extended their sway eastward to the Euphrates. It was against Bajazet, the successor of Amurath, that Timtr turned his arms (1400). Aleppo and Damascus were utterly destroyed by him. From Syria, passing the plains of Mesopotamia, where it is said he erected a pyramid of 90,000 heads on the ruins of Babylon, he pursued the Osmanlis into Anatolia; there Bajazet was defeated and made prisoner. Timur having established his supremacy throughout Western Asia and made the Greek emperor his tributary, turned back to Samarkhand, and died in 1405, on his way to attack China. The suc- cessors of Bajazet soon recovered their hold on Asia Minor and Syria,

and in 1453 took Constantinople, and put a final end to the Byzantine power, establishing in its place the Ottoman empire, extending over Greece, the Danubian provinces, and Asia Minor.

139. Turning once more to India, we find the kings of Delhi still in a feeble condition in 1526, when Babar, the sixth descendant of Timur, and on his mother's side of the family of Chenghiz Khan, who had established him- self at Cabul, marched upon Delhi, defeated the king at Paniput, and made himself master of Northern Hindustan. On this occasion cannon were first used in war in India.

ASIA

On his death, Cabul with the Punjab were separated from the kingdom of Delhi, and after some years of disorder in the succession, the Indian sovereignty came into the hands of his grandson Akbar, 1556, who has been Akbar. justly spoken of as taking a place among that rarest order of princes whose reigns have been a blessing to mankind. He died in 1605, having re-established the

[HIsTORY.

Mogul kingdom of Delhi over all Northern India, from Candahar to Bengal, and as far south as the Deccan. He was remarkable alike for his learning, his tolerance, his justice, the excellence of his personal character, and his administrative capacity; and it may truly be said that the foundations of the present system of govern- ment in Northern India were laid by this great man, who for the first time really consolidated the kingdom, and established an organised administration.

140, Akbar's successors, among whom may be named Later Shah Jehan as being but little less eminent than his dian grandfather, ruled in India till 1748, extending their nies power further south, over nearly the whole of the penin- sula, but with various reverses and a gradual decay of strength. The Mogul dynasty dragged on a feeble exist- ence, till it virtually fell before the Mahrattas ; after this it maintained for a few years a sovereignty little more than nominal, and finally disappeared on the establishment of the British power in Northern India. Among the more notable incidents in this interval

are the establishment of the Mahratta government in the Deccan under Sevaji in 1647, and that of the Sikhs at Lahore in 1708 (the founders of the religion having lived, Nanuk in 1419, and Gurti Govind in 1675), and the third sacking of Delhi by Nadir Shah, the king of Persia, in 1739. .

141. Nothing is more remarkable in the history of Inaptitude human societies than the manner in which the ancient of Indian civilisation of India has maintained itself through the hana centuries which have elapsed since the inroads from the West began, the records of which form so large a part of Indian history. Long before the time to which the annals of any part of Europe go back, India had made consider- able material and intellectual progress, and the fundamental characteristics of the community at present are probably but little different from what they were 2000 or 3000 years ago. The natural wealth of the country, its open character, and the smaller energy and physical force of its inhabitants, have made it a continual prey to the more warlike nations without, and constant internal wars have completed its political disorganisation, so that the reniains of any truly national governments have, with few frag- mentary exceptions, long ceased to exist. But probably few countries that have been subjected to such vicissitudes have changed so little. The well-being of the indigenous population has been preserved in a remarkable degree by that inaptitude to change which appears to be inherent in their race, and which suggests the necessity of the efflux of a very long period of time for the growth of those customs, which have been so little modified since they became fixed in the form described in the ancient Sanskrit writings.

142. The early history of China offers little to call for re- China, mark in such a review as the present. The date of the writ- ings of Confucius is fixed at 550.0. The great wail, con- structed to oppose the inroads of Mongols from the north, was a work of the Han dynasty about 200 z.c. About 585 a.p., the whole of China was united into one empire, having previously been governed by many petty chiefs.

The first successful invasion of the Mongols under Chenghiz Khan took place in 1234 a.p., and he retained possession of the northern half of the empire, handing it to his son, Kublai-Khan, in 1260, who completed the

conquest of the whole country in 1279, and founded the Mongolian dynasty. In his reign Marco Polo, the Venetian traveller, visited

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China, having traversed the whole of Asia, and from him are derived our first authentic accounts of those countries. The Mongolian dynasty fell, from internal insurrection, in 1366 a.D., when anational government was again set up,

‘once more to be overthrown by an invasion of the Man-

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chus from the north, about 1643, when commenced the Manchu dynasty, which has existed till the present time, and from the establishment of which the political import- ance of the Chinese empire began. The supremacy of the present dynasty of China over Central Asia, and the neigh- bouring states of Eastern Turkistan, dates apparently from about 1680; but it has recently been thrown off in the extreme west by the Turkish races, and is very doubtfully maintained in other distant provinces, and has further been seriously limited in late years by the advances of Russia.

143, The islands of Japan have maintained an indepen- dent position from remote antiquity. Formosa is half occu- pied by the Chinese, half in possession of independent tribes. The whole island has quite recently, after a threatened conflict with Japan, been recognised as subject to China.

144. Of the earlier history of the Indo-Chinese nations little is known. The kingdoms are politically insigni- ficant, and the physical peculiarities of the territories on which they are established make foreign invasion by land almost impossible, and internal communication and inter- course with the rest of the world, except by sea, difficult. Similar remarks apply to the Malay Archipelago.

145. The history of Asia thus far is the record of events brought about By the conflict of forces almost wholly developed within the continent itself. But external in- fluences came into operation by which an altogether new set of conditions was created, leading to consequences among the most remarkable of any in the world's history. The germs of civilisation, which had their origin in Western Asia and Egypt, were thence carried by the Greeks into Europe. In Asia arose the first systems of religion and conceptions of philosophy, which have given scope and food to man's intellectual development ; and in it were taken the first steps in the formation of the sciences of observation. But it is to Greeks, instructed in Asiatic learning, that the world is indebted for its further advances. And as Asia no more contributed to this movement which she had started, so she had but little share in its results, or in the benefits it conferred on mankind. Her history presents an unceasing repetition of barbaric invasions, instigated by the love of plunder, which swept, wave after wave, over the most fertile and populous provinces where civilisation and wealth had begun to appear, and left ruin and demoralisation in their departing track. It may well be doubted whether Asia, speaking generally, had imade any permanent advance in the arts of civilisation since the disruption of the Roman empire, until those events occurred which have brought her under the immediate influence of the powers of the West, and which may prove to have given the whole continent a lasting impulse towards pro- gress. These events are the establishment, little more than a century ago, of British supremacy in the south, and still later of that of Russia in the north.

146. The extension of Russian authority into Northern Asia began about the year 1700, and by the end of the century Russian settlements extended across Siberia to Kam- chatka. The advance of this power on the west of Asia into the borders of Turkey, Persia, and Turkistan, and on the east into the outlying provinces of China, is of much later date, and must be regarded

as a natural and necessary consequence of the position of a powerful and civilised state brought into contact with barbarous neighbours,

147. The first introduction and subsequent growth of European power and influence in Eastern and Southern Asia have been almost wholly the result of maritime dis-

covery and enterprise. Under the stimulus of expected commercial gain, and guided by the intelligence of mariners who, like Columbus, were acquainted with the astronomical teachings of the Arabs, and who, in defiance of the Chris- tian church, believed in the sphericity of the earth, the first of a great series of voyages of discovery was under- taken, which in 1492 gave to Europe its knowledge of America. A few years later the discovery of the pas- Their sage round the Cape of Good Hope by Vasco di Gama, effect. in 1498, opened out Asia to the commercial enterprise of the maritime nations of Europe. The trade with the East, which had hitherto found a route overland along the Black Sea and Caspian, or up the Red Sea by Egypt, or by the Persian Gulf to Syria, and had been seriously affected by the irruptions of the Mongols, had been centred with the merchants of Genoa and Venice. The opening of the sea route destroyed the monopoly previously estab- lished by the Italians, and the Portuguese naturally were the first to benefit by their discovery. The other maritime nations soon followed in their track. A new impetus was thus given to intercourse with Asia, which in a short time altogether changed the current of events in that continent.

148. The Portuguese landed on the Malabar coast of Progress' Hindostan in 1498, and speedily made themselves masters of Portt- of the Indian Ocean, which they swept with their fleets 8¥¢s¢. from Arabia to China. They took Ormuz and Aden, be- came supreme on the Malabar and Coromandel coasts, in Ceylon and the Malayan islands, and established powerful settlements at the mouth of the Ganges. They first reached China in 1516, and were permitted to establish about twenty years later a factory at Macao, which they still maintain. From that time the intercourse between

China and Europe by sea has been regularly and gradually ex- tended. The power of the Portuguese in India, after last- ing nearly a century, fell into insignificance, partly by the arms of the Mahometans, partly by the efforts of the Dutch and English—to which latter nation they ceded the island of Bombay in 1661, on the treaty of marriage of Charles the Second.

149. The Dutch, the Danes, the Spaniards, the French, Other

and the British, all acquired in a similar manner, and (ex- nations. cepting the Danes) still retain settlements of various de- grees of importance in India, the Malay peninsula and Archipelago, and China, of which those of the British in India, Ceylon, and China, of the Dutch in Java and the neighbouring islands, of the French in Camboja, and the Spaniards in the Philippine Islands, alone call for mention. The celebrated Jesuit missionaries, who were long the only authorities on China, first reached Canton in 1579, though Christian teachers had penetrated into the country several centuries before, even, it is said, as early as 635 A.D., and churches were built and converts made in 1274, as reported by Marco Polo. The Jesuits, from their superior knowledge, soon made themselves a powerful body in the state, and their influence was great till about 1700, after which, owing at first apparently to conflicts regarding the limits of the Pope's jurisdiction over Chinese, they lost favour, and eventually were subjected to positive per- secution. They have never regained their former authority. The later intercourse of Europeans with China has intro- duced some of the forms of Western progress, and opened the empire to commerce.

150. The history of the British settlements in India East India calls for more detailed notice. The English East India Company. Company was founded in the reign of Queen Elizabeth, in 1599, with a purely commercial aim. For 150 years the Company confined itself to extending its trade, but the difficulties of protecting the operations of commerce in the midst of such anarchy as prevailed in the provinces in which their scttlements were, at length forced them to arm

French India Com-

pany.

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in defence of their factories. The example and rivalry of a powerful foe, the French East India Company, first led them to take an active part in the political intrigues of the numerous native chiefs, and from this, step by step, a simple body of traders has been transformed into a recog- nised branch of the British Government, exercising supreme authority over the whole of India from the Indus to the Malay peninsula.

151. The French Company, established in 1664, had existed side by side with that of the English in complete harmony for 70 or 80 years, though the two nations had been repeatedly at warin Europe. But in 1744the war which then broke out was carried into India by the French, with consequences which the most far-seeing could not have predicted. The French governor of Pondicherry, Dupleix, a man of genius and ambition, formed the project of found- ing a French empire in the Deccan, a project which, under the efforts of a succession of able men, at one time seemed about to be realised. But after a struggle of fifteen years, during which both sides formed alliances among the more powerful native states, the English finally defeated the French in 1760, and destroyed their settlements. T'wo years later, on the restoration of peace, the French were permitted to re-occupy their former factories. But the opportunity of taking a place as the paramount political power in India was gone, nor were their later efforts, which were continued till 1802, more successful.

152. On the other hand, the English Company, with the military aptitudes and experience developed among its servants in these contests, was brought more and more into contact with the many self-constituted chiefs who with more

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or less pretence of a nominal allegiance to the puppet em- peror of Delhi, had carved out for themselves kingdoms from the ruins of the Mogul empire, and subjected all parts of India to rapine and violence. The results of the con- flicts that ensued were to add fresh strength to the Com- pany.

The battle of Plassy, in 1757, gained by the British under the celebrated Clive over the viceroy of Moorshe- dabad, made them masters of Bengal and its dependencies, From that date the history of the Company is a record of the gradual subjugation of all their opponents. The Delhi sovereignty had already entirely fallen to pieces, and the British became by the force of events the paramount power in India, and on them have devolved all the duties and responsibilities of that position.

153. From the commencement of the present century the main scope of the action of the East India Company was the introduction of order and good government into the countries that had fallen under its rule; and since the final destruction of the predatory armies of the Pindarees in 1817-18, India has enjoyed, with few and short excep- tions, a condition of internal peace such as had never been approached in any part of its previous history. Under such circumstances the wealth of the country has enor- mously increased, and the progress of civilisation in all its branches has been great and continued ; and it may be truly affirmed that nowhere has there been established by any race of foreigners arule more beneficent and unselfish, or better designed to advance the best interests of the subject population, than that which has now existed under Great Britain for upwards of a century over a large part of Southern Asia. (R. 8.)

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SIA MINOR is the name commonly given by geo-

. graphers to the portion of Western Asia which pro- jects from the main mass of the continent towards the

west, between the Black Sea and the eastern basin of the

Mediterranean, and which at its north-western extremity

approaches so closely to Europe as to be separated from it

only by the two narrow straits of the Bosphorus and the

Dardanelles, It is situated between 36° and 42° of N. lat., and between 26° and 40° of FE. long., and is about equal in superficial extent to France,

while it is but little inferior to the peninsula of Spain and Portugal, with which it offers some striking analogies. But while its boundaries on three sides—the Black Sea on the N., the Aigean Sea or Archipelago on the W., and the Mediterranean on the S.—are clearly defined by nature, its eastern boundary is wholly arbitrary and uncertain, The ranges of mountains which extend from the Gulf of Scanderoon, at the north- eastern extremity of the Mediterranean, across to the Black Sea near Trebizond, are so far ffom forming a continuous range like the Pyrenees, that they are broken into a number of irregular groups and masses, some of which may be regarded as continuations of the Taurus on the south, while others are connected with the highlands and moun- tain ranges of Armenia on the north; and the great river Euphrates forces its way through the central mass of moun- tains, nearly at right angles to the general direction of the chain. Hence it is impossible to separate Asia Minor on this side from the adjoining regions of Armenia and Meso- potamia by any real or physical boundary, and for this very reason the political limits have in all ages been very vague and fluctuating. For the purpose of geographical descrip- tion it may suffice to take a line roughly drawn along the mountain ranges from the Gulf of Scanderoon or Issus to the Euphrates, between Samosata and Malatiyeh, thence to follow the line of that river to the point near Erzinjan where it first turns to the south, and thence to draw an imaginary line to the Black Sea, a little to the eastward of Trebizond. 'The tract extending along the coast eastwards from the latter city to Batoum, though included within the limits of Turkey in Asia, belongs in a geographical sense to Armenia rather than to Asia Minor. But whatever line of demarcation be assumed, it must be carefully borne in mind that it does not correspond toany natural boundary.

The term Asia Minor, notwithstanding its ancient form, is of comparatively modern introduction, and was unknown to the principal Greek and Roman geographers. Orosius, who wrote early in the 5th century, was the first writer who employs the term in this sense, and he introduces it in a manner that shows it was not yet in general use. The name of Asia was, indeed, specially applied from a much earlier period by the Romans to the province which they constituted out of the Greek kingdom of Pergamus, and which was extended by subsequent additions till it com- prised a large portion of the peninsula, but it was never at any time coextensive with the

geographical region we are considering, nor do we find the distinctive epithet of Minor applied to it before the time of Orosius.

The name of Anatolia, which is not unfrequently used by modern geographers as synonymous with Asia Minor, is obviously a Greek term derived from dévaroA7, the sunrise, and thus corresponding exactly to the modern term of "the Levant." It appears to have first come into use under the Byzantine empire, and is first found in the works of Constantine Porphyrogenitus in the 10th century. It has been retained in general usage by the Turks, but is employed very irregularly, being sometimes applied in an

administrative sense only to the portion of the peninsula westward of the Halys, at other times extended even be- yond the limits which we have assigned to Asia Minor. The use of the latter appellation is therefore decidedly pre- ferable as a geographical term.

The territory comprised within the limits above proposed is about 650 English miles in length, from Malatiyeh on the Euphrates to the promontory opposite the Island of Scio ; but if the line be drawn from Cape Sigeum, at the entrance of the Dardanelles, to the boundary beyond Trebizond, the distance amounts to more than 720 miles. Its greatest breadth from Cape Anamur (Anemurium) on the south coast, to Cape Kerembeh (Carambis) on the north, is just about 6° of latitude, or 420 English miles ; but a line drawn from the head of the Gulf of Scanderoon to the nearest point of the Black Sea (at Ordu) does not exceed 300 miles, This may, therefore, be considered as the isthmus by which the peninsula of Asia Minor is joined to the main continent. But very erroneous notions prevailed in ancient times, and even down to a comparatively recent date,.with regard to the width from sea to sea, so that the peninsular character of the region to the west of it was greatly exaggerated. Herodotus stated that it was only five days' journey for an active man from the east of Cilicia to Sinope on the Euxine; other authors extended this to seven days; and Pliny gives the distance from Amisus to the Gulf of Issus at only 200 Roman miles (about 185 English

miles), Even in the last century the great geographer D'Anville diminished the width of the isthmus between the two seas by a whole degree, or about 70 English miles.

Asia Minor, therefore, can only be termed a peninsula in the same vague and general sense in which that expres- sion is applied to the peninsula of Spain and Portugal. It has been already observed that there are several points of analogy between the two, not only from their forming re- spectively the westernmost portions of the two continents of Europe and Asia, and occupying much the same position in latitude, but still more in regard to their general conformation and structure. In both cases the interior of the country is occupied by a vast table-land, which forms, as it were, the nucleus of the whole, while ranges of mountains border this elevated tract on all sides, and these again are separated from the sea by valleys or plains at a low level, which are in many cases regions of surpassing fertility. The central plateau of Asia Minor is, however, more extensive than that of the Spanish peninsula, and occupies a much greater por- tion of the whole country. Beginning on the east with Cappadocia, the whole of which extensive province is more than 3000 feet above the sea, it is continued to the foot of Mount Taurus, by the high tablelands of Lycaonia and Isauria, the former of which is even superior in elevation to Cappadocia ; while to the north of these two districts it comprises the whole of Galatia, and by far the greater part of Phrygia, together with portions of the adjoining provinces of Mysia and Bithynia. No part of this extensive region is situated less than 2000 feet above the sea, except where it is occasionally cut into by deep valleys on its northern or western borders.

A tract of such great extent naturally presents great diversity of surface, and is not only varied by extensive undulations, and occasionally by deep valleys, but is traversed in different directions by numerous ranges of mountains, some of them rising to a considerable altitude above the ordinary level of the surrounding plains. These ranges separate the different portions of the great central plateau from one another, and thus divide them into several basins,

the waters of which have no direct communication with each other. One of the most remarkable features in the physical geography of the interior is the fact, that one of the basins thus parted off from the rest, extending nearly 250 miles in length and 150 in breadth, from the sources of the Sangarius and Halys on the north to the great chain of Mount Taurus, has no communication with the sea,—the streams by which it is watered having no outlet, and con- sequently forming a chain of lakes extending from near Synnada in Phrygia through the whole of Lycaonia, to beyond Tyana in Cappadocia. The most considerable of these lakes is that called, by Strabo, Tatta, and by the Turks, Tuzlah, or the Salt Pan,—an epithet well deserved from its extreme saltness, which exceeds even that of the Dead Sea, It is about 45 miles in length by 18 in breadth, but varies much with the season, being very shallow, so that a considerable portion of its surface is dry in summer and covered with incrustations of salt.

North of the region of these lakes lies a dry and naked tract, consisting principally of undulating downs, traversed by the branches and tributaries of the Sangarius and Halys, but otherwise scantily supplied with water, and almost wholly destitute of trees. A portion of this region was in ancient times specially designated as Axylus, or the wood- less; but the same epithet might with almost equal pro- priety be applied to the whole tract extending from Doryleum and Cotieum, through the north of Phrygia and Galatia, to the confines of Pontus and Cappadocia, a distance of nearly 300 miles. These vast treeless downs afford pasturage at the present day, as they did in the time of Strabo, to numerous flocks of sheep, but they are for the most part uncultivated, and in many places utterly barren and desolate. The few towns that are found within their limits are, however, sometimes surrounded by luxuriant gardens and fruit-trees in great variety.

Mountains.—The orography of Asia Minor is extremely complicated, and is still but imperfectly known, though the researches of recent travellers, especially of Hamilton and Tchihatcheff, have of late years thrown much light on the subject. But very few of the highest ranges have as yet been accurately measured, and the barometrical determina- tions of the altitudes of numerous points in the interior, which have been made by Hamilton, Ainsworth, and Tchihatcheff, often differ so much from one another, as to render it doubtful how far we can place reliance upon them. At the same

time, we are now able, ina general way, to describe and distinguish the more important mountain ranges of the peninsula—a task for which there existed no sufficient materials down to a late period.

By far the most important of these mountain ranges, and that which constitutes one of the leading geographical features of Asia Minor, is the great chain known to modern as well as ancient geographers by the appellation of Mount Taurus. Beginning at the south-western extremity of the peninsuia, in the province of Lycia, it extends in a direc- tion nearly parallel with the south coast as faras the south- eastern angle at the confines of Cilicia with Syria,—a distance, as measured on the map, of more than 7° of longitude, or above 400 English miles. Throughout this extent it forms a continuous range of very considerable elevation, constituting a complete natural barrier between the Mediterranean and the great upland plains of the interior ; while in some parts, as in Lycia and the western portions of Cilicia, it sends down numerous arms and branches quite to the sea-shore : in others, on the contrary, leaving a broad strip of alluvial plain between the foot of the mountains and the sea. Its positive elevation is very imperfectly known, none of the summits of the great cen- tral range having as yet been measured with any degree of accuracy, and the numbers given in the best maps resting

between 8000 and 9000 feet ;

much in the form of a fan.

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only on the more or less vague estimates of different travel- lers. It is probable, however, that throughout the greater part of its extent the summits of the main range attain to an elevation of from 7000 to 8000 feet, while many of the

higher summits are estimated to exceed 10,000, and in

some instances, at least, to approach to 11,000 feet.

The only portion of the Taurus which has yet been examined with much care is that contained within the ancient province of Lycia. Here, as is observed. by Strabo, the whole country is occupied by the ramifications of the

great chain, which descend in numerous arms and branches

quite to the sea, leaving between them only narrow valleys and alluvial plains of very small extent at the mouths of the different rivers. In this instance, as in many similar cases, several of these offshoots and outliers of the main

chain attain to a greater elevation than the summits of the

central range itself. Thus it is stated, that while the peaks of the Lycian Taurus, which walls off the great mountain table-land of Asia Minor, do not much exceed 7000 feet, the mountain mass of Massicytus (Ak-dagh), which forms the eastern boundary of the Xanthus valley, attains to 10,000 feet ; Soosoos-dagh, east of the preceding, rises to and the highest point of Mount Solyma (Bai-dagh), which rises immediately to the

west of the Gulf of Adalia, attains to 10,500 feet (Spratt and Forbes's Lycta). cisely the natural termination of the Taurus in this part of

It is obviously impossible to fix pre-

Asia, these various ridges expanding from the central chain The Gulf of Macri (the Glaucus Sinus of the ancients) is often taken as marking

its limits to the west, but in reality, the ridges which

descend from the central table-land to the sea opposite Rhodes, as well as to Cnidus and Halicarnassus, are all ramifications of the Taurus, and any one of these headlands

might with equal propriety be chosen as the first com-

mencement of the great mountain chain. The popular notion among the ancients, which regarded Cape Chelidonia (the south-eastern promontory of Lycia) as the termination of the Taurus, is deservedly censured by Strabo,

who regards the chain as prolonged to the Perzea of the Rhodians. One of the characteristic features of the Lycian Taurus, which is found also throughout the whole range, is that of the frequent occurrence of basin-shaped valleys, called by the inhabitants "yailahs," sometimes containing mountain plains of considerable extent, walled in on all sides by limestone mountains, and having no outlet for their waters, which in consequence pour themselves into the precipitous cliffs that surround them. 'These yailahs vary in elevation from 2000 to 6000 feet, and afford excellent pasturage, on which account they are the summer resorts of the wander- ing tribes of Turcomans and Yourouks. Almost the whole mass of the Taurus is composed of limestone, belonging to the same great formation which constitutes the greater part of the Apennines, as well as of the mountains of Greece, and is generally known to geologists by the name of scaglia, or Apennine limestone. The streams which descend from thence to the sea, and which in many cases have had subterranean courses of considerable extent, are so strongly charged with carbonate of lime that they form vast deposits of travertine ; and the level plains intervening between the foot of the mountains and the sea, instead of being com- posed, like ordinary alluvial plains, of loose detritus and soil, consist of solid deposits of travertine rock of an extent unknown elsewhere. The whole plain of Pamphylia, at the foot of the mountains of Pisidia and Tsauria, 1s thus constituted, and a considerable part of the plains of Cilicia is composed of similar materials. ; The principal passes across the chain of the Taurus which are deserving of notice, are the following -—], That which crosses the chain from the plain of Cibyra (a portion of the

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great upland tract of Phrygia, at an elevation of 3500 feet above the sea) into the valley of the Xanthus in Lycia, and descends to the city of the same name. 2. That which leads from Afiom Kara Hissar, in the centre of Phrygia, by Isbarta and the ruins of Sagalassus, to Adalia on the Mediterranean. This is one of the most important lines of route in Asia Minor, being the high road from Constan- tinople to the flourishing seaport of Adalia, at the present day one of the chief ports on the south coast of Asia Minor. 3. A route leading from Konieh (Iconium) by Karaman (Laranda) to Mout, in the valley of the Calycadnus, and thence to Kelenderi

(Celenderis) on the coast of Cilicia. This was the route followed by Colonel Leake in 1800, and is the most direct line of communication with Cyprus. 4. The celebrated pass called the Cilician Gates (Pyle Cilicize), which is not only the direct route from Konieh and Kaisariyeh on the north, to Tarsus and Adana on the south of the Taurus, but has been in all ages the great highway from Asia Minor into Syria and the valley of the Euphrates. It is a narrow gorge or defile between two lofty mountain masses, and derives great military impor- tance from its being easily defensible, while it absolutely commands the entrance into Asia Minor on this side, Hence it is mentioned as a point of special interest during the march of the younger Cyrus towards the Euphrates, as well as in the advance of Alexander previous to the battle of Issus. In modern times it was strongly fortified by Ibrahim Pasha, during the short period for which the Egyptians held possession of Syria (1833-1840) ; but these fortifications have since been abandoned.

This celebrated pass, which crosses the central ridge at an elevation of only about 3300 feet, marks the line of separation between two of the loftiest masses of the moun- tain chain, the Bulghar-dagh on the west and the Ala-dagh on the east, both of which are estimated to attain to a height of from 10,000 to 11,000 feet. Thus far the mountain range of the Taurus may be considered as form- ing a continuous chain, the boundaries and direction of which may be readily described. But from this point its character is altogether changed, and it is very difficult to determine, among the numerous mountain masses which are found on the borders of Asia Minor and Syria, which is most properly entitled to be regarded as the main chain of the Taurus. Strabo, the only ancient writer who appears to have had any clear ideas on the subject, describes the Taurus as sending forth two distinct branches, —the one called Mount Amanus to the south, which bounds the Gulf of Issus, and forms the limit between Cilicia and Syria; the other, to which he gives the name of Anti-Taurus, striking off in a north-easterly direction through the eastern portion of Cappadocia, and gradually sinking into the plain. This last chain is clearly the one which forms the continuation of the Ala-dagh towards the north-east, between the valley of the Sarus and that of the Halys, and is continued, though at a lower elevation, till it joins the mountains that separate Pontus from Arienia. The name of Taurus is given by the Greek geographer to the mountain masses

which extend more towards the east, between the districts of Melitene and Commagene, and are prolonged across the Euphrates into Armenia, where they are connected with the more lofty ranges and high table- lands of that country. All this mountain region is still very imperfectly known, and it will require much investi- gation before its orographical relations are fully under- stood ; but it is clear that there is such a mountain mass as that supposed by Strabo, and which inay be regarded as continuous, though cut through by deep and narrow gorges, through which the rivers Sarus and Pyramus force their way from the elevated valley of Cataonia to the low plains of Cilicia. Just in the same manner the Euphrates,

further east, forces its way through the same mountain range by a channel so narrow and tortuous as to afford no means of communication, so that travellers proceeding south from Malatiyeh (Melitene) to Samosata on the Euphrates, have to cross a pass over the mountains known as the pass of Erkenek. The range here traversed, which is of very considerable elevation, appears to be continuous with that which forms the boundary of Commagene on the west, and is continued under the name of Mount Amanus to the Gulf of Issus. Strabo is also certainly correct in regarding it as connected with the mountains of Armenia, but these lie beyond the limits which we are at present considering.

At a short distance from the chain of the Taurus and Anti-Taurus to the west, but wholly unconnected with them geologically or in a true geographical sense, is a remarkable series of volcanic peaks or groups, extending in a direction from N.E. to §.W., through an extent of more than 150 miles. The northernmost and most elevated of these was known to the ancients as Mount Argus, and is still called by the Turks Erdjish-dagh. It is the highest mountain in Asia Minor, attaining to very nearly (if it does not exceed) 13,000 feet, and its base is upwards of 60 miles in circum- ference. About 60 miles S.W. of this rises the volcanic mass of Hassan-dagh, the highest peak of which attains an elevation of above 8000 feet, and which has covered the whole country to the north-east with a vast extent of volcanic deposits. Beyond this, towards the S.W., is situated the volcanic group of Karadia-dagh, of very inferior altitude, but interesting as

exhibiting a well-marked series of volcanic cones, having in some instances very well preserved craters, extending through a range of above 35 miles, as far as the village of Kara Bounar. About 25 miles S.W. of this rises the insulated mass of Kara-dagh, of similar volcanic character, and estimated to attain to a height of about 8000 feet. All these volcanic mountains are composed principally of trachyte, and though separated by intervening spaces, either of level plain or genfly undu- lating country, may be regarded as forming part of the same line of volcanic action, the axis of which has a direc- tion nearly from N.E. to S.W. It is remarkable that this is almost precisely parallel with the line of the Anti-Taurus, as formed by the Ala-dagh and its continuation towards the north.

Nearly at right angles with the series just described is the range called the Sultan-dagh, which extends through a space of more than 120 miles from the neighbourhood of Afiom Kara Hissar to that of Konieh. It has a general direction from W.N.W. to E.S.E., and is separated from the neighbouring portions of the Taurus by a broad valley having an average elevation of over 3000 feet, as well as by the three upland lakes of Egerdir, Kereli, and Soghla. Its central and highest portion rises to more than 6000 feet in height, and forms a continuous barrier between the valley above described and that known to the ancients as Phrygia Paroreios, through which lay the high road from the central plain of Phrygia to Iconium and the passes of the Taurus. Nearly parallel with the chain of the Sultan- dagh, and of about equal altitude, is that now known as the Emir-dagh, which forms the boundary of Phrygia Paroreios on the north, separating it from the great open plains of Galatia and Lycaonia, the latter of which extend without interruption to the great salt lake of Tatta.

We now come to consider the numerous mountain chains that branch off from the borders of the great central plateau to the west, and descend to the shores of the gean, leaving between them valleys of surpassing beauty and fertility, which were in ancient times thickly studded with towns and cities of Greek origin. As these valleys widen out in approaching the sea, the mountain chains that separate them become clearly marked, ge can ee readily

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distinguished; but as we attempt to trace them back towards the interior, it will be found that they often arise in the same knot or cluster of mountain masses, and are in fact only branches radiating from the same point. But as there is no great central chain from which they can be regarded as emanating, it is convenient to describe them separately,—the more so as, from the familiarity of the Greek writers with this portion of Asia Minor, almost every range has some distinctive appellation by which it is well known to scholars.

It has been already shown that there is no natural limit between the ranges that form the termination of the chain of Taurus on the west, and those that branch off to the Bgean through Caria. The lofty range of Baba-dagh (known to the ancients as Mount Cadmus) in the interior, on the confines of Phrygia and Caria, is certainly closely connected with the mountains that separate Lycia from the upland valley of the Cibyratis, as well as with the high range now called Boz-dagh (the ancient Salbacum), which descends in a 8.W. direction, and forms the boundary between the Cibyratis and Caria. The lower ranges that spread out from thence through the province of Caria, known in ancient times by the appellations of Lida, Grium, and Latmus, may be regarded as only offshoots of this central mass. The ridge of Latmus is, however, in great measure detached, and may be considered as begin- ning on the south bank of the Meander, and terminating towards the §.E. in the elevated plain or plateau on which stand the ruins of Stratonicea.

'The mountain ranges north of the Meander are more clearly marked. That which Strabo describes under the name of Messogis arises on the borders of the great central table-land in the neighbourhood of the town of Buladun, and stretches from thence nearly due west for about 75 miles, till it approaches the neighbourhood of Ephesus, where it makes a sudden turn to the S.W., and ends in the bold mountain range and promontory of Mycale (now called Samsoun-dagh), just opposite to the island of Samos. It nowhere rises to any great elevation, but forms a continuous barrier (from 3000 to 4000 feet in height) on the N. side of the valley of the Meander, which it sepa- rates from the parallel valley of the Cayster. Beyond this

latter again rises the chain of Mount Tmolus, now known as Bozdagh, which branches off from Mount Messogis near the point of their common origin, and after sweeping round the sources of the Cayster, holds a course towards the west, till it sinks to the sea in the neighbour- hood of Smyrna. Through the greater part of its range it forms the southern boundary of the valley of the Hermus, but near its western extremity there arises a subordinate range of inferior importance and elevation, which separates it from the course of that river. It is this inferior range, which is a mere offshoot of Mount Tmolus, of very little importance in a geographical point of view, that bore in ancient times the name of Sipylus, so celebrated from its connection with the fables of Tantalus and Niobe.

North of the valley of the Hermus arise a succession of ranges of no great elevation or importance, which separate it from the valley of the Caicus, and that again from the Gulf of Adramyttium. All these masses, constituting a very broken and irregular country, may be regarded as connected in an orographical point of view with the interior range of the Demirdji-dagh, which extends through the whole of Mysia from near the Gulf of Adramyttium to the frontiers of Phrygia. It is apparently the Mount Temnus of Strabo, and is connected at its S.E. extrenuity with the more lofty groups called Ak-dagh and Murad- dagh, which rise out of the elevated plains of Phrygia to a height of about 8000 feet. The last of these mountains contains the sources of the Hermus, and the chain thus

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described forms the boundary separating that river, and the other streams which flow to the Augean, from the Macestus and Rhyndacus, which flow northwards into the Sea of Marmora.

The north-western angle of Asia Minor, bounded by a

line drawn from the Gulf of Adramyttium to the mouth

of the Aésepus, so as uearly to coincide with the limits of

the district known in ancient times as the Troad, is occupied

almost entirely by the mountain system of which Mount Tda constitutes the centre. The highest summit—the ancient Gargarus, now known to the Turks as Kaz-dagh— rises to a height of 5750 feet, and sends out its arms and underfalls in all directions: the most lofty ridge being that which extends westward to Cape Lectum, while subordinate ranges fill up the space that spreads northwards to the Dardanelles and the Sea of Marmora.

Almost the whole of the northern provinces of Asia Minor, extending along the coast of the Black Sea— Bithynia, Paphlagonia, and Pontus—are extremely moun- tainous, and occupied through the greater part of their extent by successive ranges of mountains, filling up the space between the sea-coast and the borders of the great table-land of the interior. Ina general view these may be characterised as forming a series of vast undulations, more or less parallel with the line of coast, which preserves a general direction from west to east. But when examined more in detail, they will be found to be complicated and broken in a manner that renders their description very difficult, while few of them have any historical importance or special geographical interest. It will suffice here to mention a few of the most important.

The most westerly of these ranges is that known as the Mysian Olympus, which rises on the borders of Mysia and Bithynia, immediately south of the city of Broussa,

and extends in a direction from N.W. to S.E., between the

valley of the Rhyndacus and the head-waters of the Gallus, one of the principal tributaries of the Sangarius. It attains a height of about 6400 feet, and is a conspicuous object in the view from Constantinople, as well as from the plains of the interior. After a range of about 60 miles it sinks to a comparatively low level, where it joins the table- land of Phrygia, but may be considered as continued by subordinate masses which connect it with the range of Demirdji-dagh on the one side, while other elevations branch off from it to the valley of the Sangarius, which separates it from the chain of Ala-dagh, sometimes known as the Galatian Olympus. 'This is a lofty range which extends pretty continuously from the valley of the Sangarius to that of the Halys, constituting during a considerable part of its course the frontier between Galatia and Paphla- gonia, Thé highest and central portion of the

chain rises to between 6000 and 7000 feet, and almost the whole province of Paphlagonia is filled up with the subordinate ranges and offshoots that may be considered as connected with it, From thence it is continued under the name of

East of the Halys, again, the central and maritime portions of Pontus are traversed by a succession of moun- tain ranges, for the most part of no great elevation, but rising progressively as they approach to the great table-land of the interior. Throughout the whole line of coast, from near Samsoun (Amisus) to Trebizond, these mountains de- scend so close to the sea as to render the coast line extremely picturesque and varied. But the most important range appears to be that which extends from the neighbourhood of Trebizond, where it attains to an elevation of more than 8000 feet, in a direction towards W.S.W., so as to pass

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between the towns of Tokat and Sivas. It is here called Chamla Bel, and the passes by which it is crossed from one of these towns to the other attain to above 5000 feet. It is apparently this range to which Strabo gives the name of Paryadres, and which he describes as continuous with another mountain chain called Scydises, and connected also with the mountains of the Moschians, which occupied the sea-coast from Trebizond to the borders of Colchis. But though the great geographer was himself a native of Amasia, his ideas of the orography of his native country were apparently very vague, and he certainly has not supplied us with any definite ideas on the subject, while in modern times the region has still been very imperfectly explored. The whole tract on the borders of Pontus and Armenia is very rugged and mountainous, and is still, as in the days of Strabo, inhabited by wild and lawless tribes, which render it very difficult of access to strangers.

Rivers.—The rivers of Asia Minor are of very little importance in comparison with those of countrics of similar extent in Europe. This is owing principally to the exist- ence of the great table-land in the interior, the climate of which is remarkably dry, and a considerable part of which, as has already been pointed out, does not discharge its waters to the sea. The much steeper inclination of the river-beds, resulting from the high elevation of their sources, tends, moreover, to give them the character of mere

torrents, rather than of placid and- navigable streams, while at the same time none of them are fed, like the Rhine and the Rhone, by the unfailing supply of glaciers. The want of navigable rivers is, indeed, one of the great defects of the country, and one which, so far as the interior is concerned, must always remain a disadvantage not to be surmounted.

Much the largest river of the peninsula is the Halys, called by the Turks the Kizil Irmak, or "Red River," which derives additional interest from its having formed in early ages the boundary between the kingdoms of Lydia and Persia. It takes its rise in the mountains on the borders of Cappadocia and Pontus, in the district called by Strabo Camisene, about 70 miles above the modern town of Sivas, and flows in a direction nearly S.W. for above 200 miles, till it passes within 20 miles of the city of Kaisariyeh ; soon after which it turns to the N.W., and then makes a vast bend round till it assumes a north- easterly direction, which it pursues as far as the town of Osmandjik. Here it makes a sharp and sudden turn, caused by its encountering the range of mountains which extends from Paphlagonia into Pontus, and which it traverses by a winding course through narrow gorges, between precipitous cliffs, until it emerges into the level country near the sea, which it enters about half way between Amisus (Samsoun) and Sinope. Its whole course (as measured on the map, without taking account of the minor windings) is not less than 560 miles, though, from its describing so great a curve, the direct distance from its sources to its mouth is only about 180 miles. In length of course, therefore, it is about equal to such rivers as the Elbe and the Loire, but it is far inferior to them in body of water, in which respect it scarcely equals the second class rivers of France. Even in the lower part of its course its breadth frequently does not exceed 100 yards,

The Halys has but few tributaries of importance. The most considerable are —the Delidji Tchai, which traverses the great upland plains of Galatia, and after flowing near the town of Yuzgat, joins the Kizil Irmak about 70 miles above Osmandjik; (2), the Gok Irmak ('Blue River"), which rises in the mountains of Paphlagonia, a short distance above the town of Kastamuni, and flows through a deep and narrow vailey till it joins the Kizil Irmak in the midst of the narrow gorges above described,

At ashort distance east of the mouth of the Halys is that of another of the most considerable streains that fall into the Black Sea—the Iris of ancient geographers, now known as the Yeschil Irmak, or "Green River." This has its source in the same range of mountains as the Halys, but flows from thence towards the N.W. It passes within a short distance of the town of Tokat, and under the walls of Amasia, the birth-place of Strabo, near which it bends abruptly to the N.E., as far as the site of the ancient Eupatoria, where it receives a tributary stream from the E., and thence pursues a course nearly due north for about 40 miles, till it enters the Black Sea about 15 miles east of Samsoun. It has a course altogether of about 200 miles. Its most important tributary is the oue above noticed, the Lycus of Strabo, now called the Ghermeli Tchai, which is nearly equal to the main stream, It rises in the moun- tains on the bordersof Armenia, nearly due S. of Trebizond, and flows under the walls of Niksar (the ancient Neo- Cesarea). But great part of its course is still very imper- fectly known.

The most important of the northern rivers of Asia Minor, after the Halys, is the Sangarius, which still retains its ancient name in the corrupted form of Sakaria. It falls into the Black Sea, W. of Heraclea, about 80 miles from the mouth of the Bosphorus. It has its sources in the uplands of Phrygia, not far to the N. of Afiom Kara Hissar, and flows by a very winding course through the great table- land of Galatia, as far as a place called Bei Bazar, about 50 miles W. of Angora, where it turns abruptly to the west, and traverses the mountainous regions of Phrygia and Bithynia, till, after approaching within a short distance of the Sea of Marmora, it again turns to the N.E., and pursues its course to the Black Sea. Its course has a length of more than 320 miles, while its sources, which are situated almost due south of its mouth, are distant from it only about 160 miles. Its two chief tributaries are the Enguri Su, or river of Angora, which flows past the city of that name, and the Pursak (the Thymbres of ancient writers), which passes near the towns of Kiutahia (Cotizseum) and Eski Shehr (Doryleum), and falls into the Sakaria about 20 miles below the latter place.

The most considerable rivers which have their outlet to the Sea of Marmora are the Rhyndacus and Macestus, which unite their waters at a distance of

about 15 miles from the sea. They both take their rise in the range of mountains known as the Demirdji-dagh, the Macestus having its source in a small lake called the Simau Gol, a few miles north of Simau (Synnaus), the Rhyndacus in the neighbourhood of Aizani, about 25 miles further east. They flow at first in widely divergent directions, but ulti- mately both turn towards the north ; and the Rhyndacus (now called Adranas Tchai), which is the most considerable of the two, after forming the Lake of Apollonia (an exten- sive sheet of water), receives the waters of the Macestus a few miles lower down.

The streams which flow from the mountain mass of the Ida are of little importance in a geographical point of view, but two of them are of the highest interest from historical associations—the Granicus, so celebrated for Alexander's first victory over the Persians, and the still more famous Scamander, which flowed beneath the walls of Troy. The first of these rivers rises in the northern slopes of Mount Ida, and flows northwards to the Sea of Marmora, after a course of little more than 40 miles. It is now called the Khodja Tchai, but it isa very inconsiderable stream. The Scamander has its sources in Kaz-dagh, the highest part of Ida (Mount Gargarus), and flows at first towards the west, but then turning northwards, pours its waters into the Dardanelles, near the point of Kum Kaleh, which marks the entrance into that remarkable strait.

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The western portion of Asia Minor, between the Gulf of Adramyttium and the frontiers of Caria, is traversed by four considerable streams, which flow through parallel valleys from the uplands of the interior to the Augean Sea. The most northern of these is the Caicus, now called the Bakyr Tchai, which rises in the chain of the Demirdji- dagh (Mount Temnus), and flows through the whole of Mysia, passing within about 5 miles of the city of Pergamus, and falling into the sea about 20 miles below that city, between the sites of Pitane and Elza. Much more impor- tant, as well as more celebrated, is the Hermus, now known as the Ghediz Tchai, from the town of Ghediz, the ancient Cadi, in Phrygia, near its sources. These are derived from the two mountain masses called Ak-dagh and Morad-dagh, the latter being the more considerable stream. After their junction the river flows in a S.W.

direction for about 30 miles, and then turns due west; it traverses the volcanic district of the Katakekaumene, and emerges below Adala into the broad and fertile valley, through which it continues to flow to the sea. It passes only about 5 miles to the north of the celebrated city of Sardis, and almost close to that of Magnesia. It appears to have in ancient times pursued its westerly course to the sea, which it eutered near Phoceea ; but at the present day it makes a turn abruptly to the S., and enters the Gulf of Smyrna about 10 miles from that city. Its only important tributary is the Hyllus, called also the Phrygius, which joins it at Magnesia from the N.E., having its sources above Thyatira. The Pactolus, so famous for its golden sands, which flows under the walls of Sardis, is a very trifling stream.

Next in order, proceeding south, comes the Cayster, a stream' very inferior in magnitude to the Hermus and Meeander, which rises in the knot of mountains at the junction of Mount Messogis and Tmolus, and flows through a broad, fertile valley for above 70 miles, till it enters the sea just below Ephesus. It is now called the Kutschuk Mender or Little Meander. The true Meander (now called Bojftk Mender, or Great Meander) is much the most considerable of the four rivers. It takes its rise at Apamea (previously called Celenz) in Phrygia, above 175 miles in a direct line from its mouth, and is derived from abundant sources of water, so as to form a deep and clear stream almost immediately below its origin. Thence it flows for some distance to the N.W. as far as the site of Peltz, where it receives a tributary called the Sandukli Tchai(the ancient Obrimas), sometimes erroneously regarded as the main stream, and there, turning to the 8. W., pursues a course a little to the southward of west to the sea. It preserves this general direction with no great change, the numerous windings for which it was famous in antiquity being of no great magnitude or extent, but after passing through a series of mountain gorges between Peltz and Tripolis, it emerges into a broad and rich alluvial valley, through which it holds its winding course to the sea. This valley is bounded immediately on the north by the lofty range of Mount Messogis, the streams descending from which have only a very short course, and the Meander, in consequence, receives no affluents of any importance from this side. From the south, on the contrary, it receives several considerable tributaries, which have their sources in the mountains of Caria. The most important of these are the Tchoruk Su, which flows by Colossze and Laodicea, the Arpas Su (the

ancient Harpasa), and the Tchinar Tchai (the Marsyas of ancient writers), which rises in the moun- tain mass of Boz-dagh, on the confines of Caria and Lycia, and flows by the site of Alabanda at Arab Hissar. The total course of the Meander is estimated at about 240 miles,

All these rivers which we have just been considering are remarkable for the great amount of alluvial matter

which they bring down, and the extensive deposits which they in consequence form where they enter the sea. Thus the Cayster, though the least considerable of the four, has not only filled up the port of Ephesus, but has pushed forward the shore for more than two miles beyond its site.. The Mzeander has blocked up the deep gulf formerly extending inwards from near Miletus to the foot of Mount Latmus, so as to convert the inner portion of the gulf into a lake, while it has entirely filled up the port of Miletus, united the island of Lade with the mainland, and formed a broad space of alluvial marshes extending thence to the foot of Mount Mycale. At the present day the alluvial deposits are advancing with such rapidity in the Gulf of Smyrna as to threaten Smyrna with the same fate as has befallen Miletus,

Of the rivers of Lycia the only one which deserves notice is the Xanthus, which rises in Mount Taurus, and falls into the sea about 12 miles below the city of the same name, But a much more considerable stream is that now known as the Gerenis Tchai, which rises on the northern side of Mount Taurus, at a short distance from the sources of the Xanthus, and flows in a northerly direction through the upland district of Cibyra, then turns suddenly round, and pursues a course about 8.8.W., traversing the whole of the mountain region on the borders of Caria and Lycia, until it falls into the sea between Caunus in Caria and the Gulf of Macri. It was called Calbis in the lower part of its course, and Indus in the upper, but ancient geographers were apparently not aware that the two were in fact the same river.

The rivers which flow from the main chain of Taurus to the Mediterranean are very numerous, and many of them in winter bring down a large body of water. But they have necessarily but short courses, and few of them have

much geographical importance. Of those which traverse the plain of Pamphylia it will be sufficient to mention the Cestrus and the Eurymedon, both of them considerable streams, pursuing parallel courses to the sea, which they enter within less than 20 miles of one another. The one flows beneath the ruins of Perge, the other by those of Selge and Aspendus. The rugged and mountainous country of Cilicia, which adjoins Pamphylia on the east, is furrowed by numerous streams flowing through deep and narrow valleys, the largest of which is the Calycadnus (now called the Gok Su, or "Blue River"), which has a direction nearly from W. to E., taking its rise in a lofty spur of Mount Taurus that advances close to the sea, so that its sources are not more than about 20 miles from the sea at Alaja, while it has a course of more than 100 miles (in a direct line) from thence to its mouth. It falls into the sea about 12 miles below Seleucia (still called Selevke), and is a deep and rapid stream of considerable magnitude.

The broad alluvial plain which forms the eastern portion of Cilicia is traversed by several rivers, two of which, the Sarus and Pyramus, now known as the Sihun and Jihun, are among the most important rivers of Asia Minor. Both of them alike take their rise far in the interior, in the high lands beyond the Taurus, and force their way across that great chain through deep and narrow gorges. The Sarus is indeed formed by the junction of two branches, both of which descend from the ranges of the Anti-Taurus through two parallel valleys, and after traversing for a long distance the mountain gorges, pour their united waters into the plain about 20 miles above the town of Adana. The Pyramus takes its rise in the upland district called Cata- onia, near the modern town of Albistan, flows by Marasch, where it receives a considerable tributary from the east, bringing with it the waters of some small lakes on the reverse of the mountains of Commagene, and after passing near the ruins of Anazarbus, falls into the Gulf of Issus or

Scanderoon. Both these rivers have formed great alluvial deposits at their mouths, and it is probable that they have repeatedly altered their channels in flowing through the plain. Hence the accounts of them found in ancient authors are very contradictory. The Cydnus, which flowed by Tarsus, is a very inferior stream to those just described, though its name is perhaps

better known than either of them. It rises in the mass of Mount Taurus called the Bulghar-dagh, and has a course of not more than 50 miles to the sea, but is a clear and rapid river.

Lakes.—The lakes of Asia Minor are numerous, but of no great importance. The most extensive is the great salt lake already noticed, on the bordersof Lycaonia and Cappa- docia, which is bounded on the east bya considerable range of mountains called Khodja-dagh, while on the west it is separated only by some low hills from the broad up- land plains, or steppes, of Lycaonia. Beyond these to the west, but separated from them by the range of the Emir-dagh, is a string of three lakes of no great extent, having a general direction from N.W. to S.E., and follow- ing the line of the valley of Phrygia Paroreios. They bear the names of Eber Gol, Ak-Shehr Gol, and Ilgun Gol, and are all basins of fresh water passing into mere marshy pools during the dry season. Much more important than these are the two lakes now known as the Egerdir Gol and Kereli Gol (from towns of those names built upon their banks), which are situated between the range of the Sultan-dagh and the northern offshoots of the Taurus, and are both of them extensive mountain lakes of not less than 30 miles in length. The northernmost of the two (the Egerdir Gol, which is described as the most picturesque and beautiful of the lakes of Asia Minor) is situated at an elevation of about 2800 feet above the sea, while the level of the neighbouring Kereli Gol, which is separated from it by an intervening range of mountains, is at least 800 feet higher, Both are perfectly fresh, and their waters clear and deep, though the one has no outlet, and the other communicates only by a small rivulet with the much smaller lake called Soghla Gol, the waters of which occa- sionally disappear altogether. They are without doubt carried off by subterranean channels. About 30 miles 8.W. of the Egerdir Gél is the Lake of Buldur, adjoining the town of that name; and at a short distance north of this lies the Tchoruk Su Gol, or Lake of Chardak, the waters of which are extremely salt, so that large quantities of salt are collected there, and sent from thence to Smyrna.

In the north-western portion of Asia Minor, within the confines of Mysia and Bithynia, are situated three lakes of a wholly different character from the preceding, but having much the same features in common. ‘These are the Lake of Nicza (still called Isnik Gol), the Lake of Apollonia (Aboulonia

Gol), and the Lake of Miletopolis (Manyas Gol), All these are within a few miles of the Sea of Marmora, into which they discharge their waters. The Lake of Apollonia (which is rather the largest of the three) is formed principally by an expansion of the river Rhyndacus, which may be considered as flowing through it. The Lake of Nicza, on the contrary (called also Lake Ascania), is a mere basin formed by the streams which descend from the surrounding mountains, and discharging its waters into the neighbouring Gulf of Moudania by a channel only about 10 miles long. The lake itself does not exceed 20 miles in length.

Climate and Natural Productions.—The climate of Asia Minor necessarily presents great differences, All travellers have remarked on the striking contrast as they passed from the warm and fertile regions of the west and south to the cold and bleak uplands of the interior. The great central plateau, which constitutes so large a part of the country, is not only much colder than regions in corresponding lati-

tudes in Europe, but is characterised by a great dryness, in consequence of the moisture from the Mediterranean being in great part intercepted by the continuous mountain chain of the Taurus. The result of this, combined with its great elevation above the sea, is to render the summers excessively hot, and the winters extremely cold. In both these respects the climate of the central parts of Asia Minor presents a close analogy with that of Central Spain, as well as with the still more extreme case of the neigh- bouring Armenia. On the other hand, the plains and low valleys on the south coast, which are in a latitude corre- sponding to that of Sicily and the south of Spain, have a mean temperature considerably higher than those countries, and the summer heat at Tarsus is said greatly to exceed that of Cadiz or Gibraltar, and to be nearly equal to that of Cairo. Systematic observations for any length of time are, however, almost wholly wanting. The north coast, on the contrary, is subject to the depressing influence of the cold winds and fogs of the Euxine, which, as is well known, bring down the mean temperature of Constanti- nople (and still more its winter temperature) far below that of places in corresponding latitudes on the Mediter- ranean. 'This effect is, however, found to diminish as one proceeds eastward along

the shores of the Euxine; and the climate of Trebizond, which is situated almost exactly in the same latitude with Constantinople, is much milder than that of the capital, or of the neighbouring city of Broussa,—a result, doubtless, produced by the sheltering action of the great range of the Caucasus, which prevents the cold winds from the steppes of Russia to the N. and N.E. from sweeping down on the eastern angle of the Black Sea. The western districts of Asia Minor are in all respects the most favoured, and the coasts of Ionia and Caria may be considered as enjoying one of the finest climates to be found in any part of the Mediterranean. The action of the cold north winds from Thrace and the Bosphorus is, however, still felt as far south as Smyrna, and the winters at that place are somewhat colder than those in corresponding latitudes in Spain and Sicily.

The vegetation of the different parts of the peninsula naturally varies with the climate and the soil. The southern coasts present most of the plants and shrubs char- acteristic of the southern portions of the Mediterranean, with the exception of the prickly pear and American aloe (both of them originally exotics imported into Europe), which form so important a feature in the landscape of Sicily and the south of Spain, as well as of Syria, but are very rare in Asia Minor, while the dwarf palm (Chamerops humilis) is wholly wanting. The date palm is occasionally found, but does not ripen its fruit even at Tarsus, where the summer temperature is almost tropical. The vegetation of Lycia, which occupies an intermediate position between the hot plains of Pamphylia and Cilicia and the compara- tively temperate western provinces, is thus described by Forbes :-—

"The wild olive covers the hills, wherever the pine (Pinus mart- tima and halepensis) aud the arbutus leave room. The valonea oaks (Quercus Ballota, digilops, and infectoria) afford ample shade. The mastic, the fig, and the mulberry are not unfrequent, both cultivated and wild. The Oriental planes afford abundant shade near every village; and the dark and towering cypress is planted by the place of burial, but grows wild in the ravines. The pome- granate flourishes in great abundance, and its wild fruit supplies a grateful refreshment under the warm sun of autumn. The almond and manna-ash grow wild among the rocks, and the bay and Judas- tree in the ravines. The orange and the lemon are cultivated. Melons, cucumbers, sesame, maize, cotton, capsicum, lentils, kid- ney-beans, and balmias

(Hibiscus esculentus), are the common culti- vated vegetables."—(Spratt and Forbes's Lycia, vol. ii. p. 152.)

Higher up on the mountain slopes and the uplands facing the sea is the chief realm of the oak and pine forests, with which a large part of the chain of Taurus is

covered. The walnut is the most plentiful and conspicuous tree around the villages, while vineyards and tobacco fields yield rich produce. 'The high upland plains, on the con- trary, are generally bare and treeless, but the villages are frequently surrounded with walnut trees, Lombardy poplars, apples, apricots, and willows. The vine is still grown in many spots in these elevated regions, though in others it will not thrive. Large tracts of the table-land of the interior, as has been already mentioned, are either quite barren and desolate, or open treeless downs, affording pasture only to sheep. But it is probable that they would be capable of producing abundant crops of corn (like the similar tracts of Central Spain) if properly cultivated, except in a few districts, such as the steppes of Lycaonia, where the soil is strongly impregnated with salt.

The northern coast districts present a wholly different climate, and from the influence of the Black Sea and the cold of Russia, have much more of the character of the tem- perate regions of Europe than of that of Rome or Naples which correspond to them in latitude. But the mountains are covered with extensive forests of oaks, chestnut, beech, box, and other trees, while the valleys produce fruit trees in extraordinary abundance and variety. This is the case especially in the province of Pontus, extending eastward from near Sinope to Trebizond, which is a country of singular beauty and great fertility, notwithstanding its mountainous character. This region is supposed to be the uative laud of many of our well-known fruits, especially cherries and apricots. The hills also are covered with medlars, apple, pear, and plum trees, all growing wild, but cultivated also with great success in the neighbourhood of the villages and towns. The olive also thrives in sheltered situations, though it is not found west of Sinope. At the same time, the luxuriant undergrowth of rhododendrons and azaleas, besides bay, myrtle,

arbutus, and other flourish- ing shrubs, gives a special charm to the scenery of this beautiful region. .

Among the vegetable productions that are of importance in a commercial point of view may be mentioned saffron, which is so largely cultivated at a town in Bithynia as to have given it the name of Safaranboli; opium, which has in like manner given name to Afiom Kara Hissar ; madder, extensively grown at Ak Shehr ; the orchis called salep ; and cotton, of which considerable quantities are now produced in the warmer districts near the sea. Mulberries also are extensively cultivated, and large quantities of silk produced in the neighbourhood of Broussa, where there are now established large silk manufactories, as well as at ‘ Tokat, Amasia, and other places. The dried figs and raisins for which Smyrna is so celebrated are grown principally in the valley of the Meander near Aidin.

The wild animals of Asia Minor are in general the same as are found in most parts of Europe, though a few mark its connection with the more eastern parts of Asia. Wolves, wild boars, bears, foxes, are abundant; but with them is associated the jackal, which is found in large troops in all parts of the country. The lion, which was certainly an inhabitant of Asia Minor in ancient times, is no longer found in any part of the peninsula, and though the tiger is said to exist in the Cilician Taurus, the fact does not rest on any good authority. But leopards still occur not unfrequently in the mountain country of the Taurus, and from thence range along the mountains to the west, so that they have been occasionally shot even in the neighbourhood of Smyrna. The high mountains are frequented by the ibex and chamois, while the true wild goat (Capra Afgagrus) is found on those of Cappadocia and Cilicia. The moufflon, also, is not uncommon in Cappadocia; but the wild ass, which existed there in the time of Strabo, is no longer found within the limits of the

peninsula. The gazelle abounds in the plaius of Cilicia, while both fallow and roe deer are found in the forests in large numbers. In regard to the domestic animals, the remark of Professor Forbes, that in Lycia the introduced camel and buffalo, both unknown to the country in ancient times, now play a more important part than the aboriginal quadrupeds, may be extended to the greater part of Asia Minor. Enormous numbers of sheep

are, however, reared on the vast plains of the interior, as well as in the level parts of Cilicia, though they no longer retain the celebrity they enjoyed in antiquity for the fine quality of their wool. This, however, supplies the material for the celebrated Turkish carpets, the principal manufactory of which is at Ushak in Phrygia. Not less celebrated is the breed of goats peculiar to the neighbourhood of Angora, the hair of which is worked up into shawls but little inferior to those of Cashmere. No trace is found of the existence of any such peculiar race in ancient times, or even in the Middle Ages, and the period of its introduction is unknown, In comparison with the sheep and goats, cattle occupy but a subordinate position in Asia Minor ; and though the plains of the interior, and still more those of Cilicia, were cele- brated in ancient times for the number and beauty of the horses reared on them, nothing of the kind is now to be found, and the horses of Asia Minor are generally of an inferior description.

The geology of Asia Minor is still very imperfectly known, very few districts having been as yet examined in detail'; but the researches of Hamilton, Ainsworth, and T'chihatcheff, and of Edward Forbes in Lycia, have thrown much light on the subject, and enabled us to form a general notion of the structure of the country. The great mass of the chain of Mount Taurus, and of the subsidiary ranges connected with it, consists, as has been already noticed, of the formation known as Apennine limestone, which is generally referred by geologists to the Cretaceous period. No sedimentary formations of older date are known to exist in the southern parts of the peninsula, but in the northern districts this is replaced by saccharine limestones and mica schists, with other metamorphic rocks, which are probably to be assigned to a much earlier period. The great table-land of the interior is composed for the most part of a vast lacustrine or fresh water formation belonging to the Tertiary period ; and large portions of similar fresh water tertiaries, detached from the great central mass, are found scattered between its borders and the coasts, in some instances descending quite to the sea, as in the neighbourhood of Smyrna. But in the interior the lacustrine limestones and maris are frequently intermixed with extensive deposits of volcanic tuffs, the soft mate- rials of which are rent by water-courses into deep and narrow glens, often studded with cones and pinnacles, presenting a great variety of picturesque and singular forms, and constituting one of the most peculiar fea- tures of the scenery of Asia Minor. Igneous rocks are found

scattered through almost all parts of the peninsula, and the remarkable chain of volcanic mountains extend- ing from Mount Argeus to the Kara-dagh near Kara- man has been already noticed. All these mountains are of a trachytic character, and apparently belong to the Tertiary period; but there is a district on the borders of Phrygia and Lydia which presents volcanic phenomena of a much later date. It was known in ancient times as the Katakekaumene, or Burnt country, and its volcanic char- acter was fully recognised by Strabo, though we may infer from his silence that there was no record of any eruption within the historical period. It has been fully described by Mr Hamilton, and presents three conical black hills of scoriz and ashes, with well-defined craters, from which have flowed broad streams of rugged black vesicular

lava, the surfaces of which are as barren and as little influenced by atmospheric action as the latest products of Vesuvius, so that if it were not for the negative evidence to the contrary, they might be well supposed to belong to a recent historical period. Igneous rocks of an older character are found in many parts of Asia Minor; those in Lycia are principally serpentine, while in the north-western districts various forms of trachyte prevail, and several of the minor ranges which rise out of the great central table- land are of granitic charactcr.

Towards the sources of the River Halys is an extensive formation of saliferous red sandstones with gypsum, which would doubtless yield abundance of salt, were not that article more readily procured from the salt lakes already mentioned. Coal is found in the neighbourhood of Hera- clea on the Black Sea, and was worked to some extent during the Crimean War. There is little doubt that Asia Minor is rich in minerals, but they are nowhere worked to much purpose. Iron ores of very good quality are still found in abundance in the country of the Chalybes, so celebrated among the Greeks for their skill as workers of iron, and they are still worked in a very primitive fashion by the inhabitants. The district of Cibyra, also, which was noted in the days of Strabo for its iron manufactories, still produces iron ores in plenty, of the same kind as those of Elba, but they are altogether neglected. The copper and silver mines of the north, though partially

worked, are of very little importance. The same neglect has be- fallen the numerous quarries of marble, which attracted so much attention in the time of the Romans, and among which those of Proconnesus (the island of Marmora) and those near Synnada (Afiom Kara Hissar), producing the kind known as Phrygian marble, were the most celebrated.

Though Asia Minor had no active volcanoes it was sub- ject in all ages to frequent and severe earthquakes. The most remarkable of these was one which occurred in 17 s.D., during the reign of Tiberius, and which almost entirely destroyed twelve considerable cities, including Magnesia and Sardis. Laodicea, also, was peculiarly subject to these visitations, which Strabo sagaciously connects with the evidences of recent volcanic action in the Katakekaumene. Thermal springs are found in many parts of the peninsula, but the most remarkable are those of Broussa, which from their proximity to Constantinople are still much frequented, and those at the ancient Hierapolis, the site of which is now utterly deserted.

Ancient Divisions and Ethnography.—The division of Asia Minor which is commonly adopted by geographers, and which is followed in the present article, is that given by Strabo, which coincides in the main with those of Ptolemy and Pliny. According to this the whole peninsula is considered as comprising—1l. Pontus, on the Euxine, adjoining the frontiers of Armenia, and extending west as far as the Halys; 2. Paphlagonia, from the Halys to the Parthenius ; 3. Bithynia, from the Parthenius to the Rhyndacus ; 4. Mysia, which, with the subordinate dis- tricts of the Troad and olis, or the land occupied by the 4Eolian Greek colonists, comprised the north-western angle of the peninsula; 5. Lydia, of which Ionia in like manner formed the sea coast; 6. Caria, including the Dorian Greek colonies ; 7. Lycia; 8. Pamphylia; 9. Cilicia—the last three provinces extending along the southern coast, from the Gulf of Macri to the frontiers of Syria; while in the interior were—10. Pisidia, comprising only the rugged mountain country above Pamphylia ; 11. Phrygia, forming the western portion of the great table-land; 12. Galatia; 13. Cappa- docia; 14. Lycaonia and Isauria, two barren and mountainous regions on the north side of Mount Taurus. (For farther par- ticulars as to the extent and limits of these different regions the reader must be referred to the respective articles).

The system thus adopted by Strabo, and which appears to have been already generally received in his time, was, properly speaking, merely a geographical one. It did not coincide with the political or administrative divisions of the country, either in his time or for at least three centuries earlier. Though some of the countries enumierated—as Bithynia and Cappadocia—had continued down to a late period to form independent sovereignties, the limits of which were well established, the greater part of the penin- sula had undergone many fluctuations and changes, the different provinces passing at one time under the kings of Syria, at others under those of Pergamus, and being trans- ferred by the Romans in an arbitrary manner from the rule of one potentate to another. And when the Romans had established their own dominion over the greater part of the peninsula, it was long before the division of it into provinces had assumed a definite and settled form. But the Roman province of Asia, as it existed from the days of Cicero to those of Strabo, may be regarded as comprising Mysia, Lydia, Caria, and Phrygia, but excluding Lycia, Pisidia, Galatia, and Bithynia, so that it contained much less than half of Asia Minor, with which it is sometimes erroneously supposed to have been identical.

The divisions of the country thus generally recognised were in fact (with one exception) ethnographical ones, or at least had been so originally. Herodotus, the earliest wiiter from whom we have any information on the subject, describes Asia within the Halys, as containing fifteen different races or nations, including the Greek settlers ; and of these the Cilicians, Pamphylians, Lycians, Carians, Lydians, Mysians, Bithynians, Paphlagonians, and Phry- gians undoubtedly then occupied the countries which long after retained their names. East of the Halys lay the Cappadocians, who in his time occupied the whole country from the frontiers of Cilicia to the Euxine. It was not till a later period that the northern portion of this extensive country came to be known and distinguished from the rest as Cappadocia on the Pontus, and eventually under the designation of Pontus alone. Galatia, on the other hand, derived its name from the Gauls, who established them- selves in that country about two centuries B.c., and con- tinued to retain their language and nationality down to a late period of the Roman empire. The Lycaonians, Isau- rians,

and Pisidians are not noticed by. Herodotus; pro- bably the names of these obscure mountain tribes had never yet reached the ears of the Greeks,

Our information concerning the origin and ethnographi- cal relations of the nations that we thus find occupying the peninsula at the earliest period is very imperfect, and rests almost wholly on the vague statements of ancient authors, none of the nations in question, with the exception of the Lycians, having left any trace of their language. But according to the distinct and uniform assertion of ancient writers, the Bithynians were of Thracian origin, and identical with the people who were separated from them by the narrow strait of the Bosphorus—a statement in accordance with the natural probability of the case. The same probability may be alleged also in favour of the Thracian origin of the Mysians, which is asserted both by Herodotus and Strabo, though they would appear to have settled in the peninsula at a much earlier period than the Bithynians, Much less value can be attached to the tra- ditions concerning the original connection between the Mysians, Lydians, Phrygians, and Carians, which would assign a common Thracian origin to all these nations. The Carians indeed were, according to the more prevalent opinion among the Greeks, later immigrants from Crete and the adjoining islands—a theory certainly not supported by internal probability. But there seem strong reasons for regarding the Carians, like their neighbours the Lycians,

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as a peculiar people, distinct from all who surrounded them. The Lycians, as already mentioned, are the only people of Asia Minor who have left us the means of judg- ing of their ethnic affinities by the remains of their lan- guage. From these we learn that they were an Aryan race, apparently more nearly connected with the Persians than with the Greek or other Pelasgic races. But besides the Lycians, there existed within the province of Lycia a tribe called the Solymi, who were generally considered as of Syrian or Semitic origin. The fact does not appear in their case to rest upon any sufficient authority, but the connection of the Cilicians, who held so large a part of the south coast, with the Syrians and Phoenicians, may be con- sidered as well established. All ancient writers, moreover, agree in describing the Cappadocians, who originally extended from Mount Taurus

and the frontiers of Cilicia to the Euxine, as a Syrian racc, so that they were at first called by the Greeks Leucosyri, or White Syrians, to dis- tinguish them from their darker brethren farther south. Whether the mountain tribes of the Pisidians, Isaurians, and Lycaonians were connected with the Cappadocians or with the Phrygians, or to what other race they belonged, we have no information whatever.

The population of Asia Minor at the present day can hardly be said to retain any traces of the earlier nations that composed it, though, according to some writers, the Zeybeks,—a race presenting some marked peculiarities, who occupy the south-western corner of the peninsula— are the lineal representatives of the ancient Carians. They, however, speak only Turkish. The bulk of the population is composed of Turks, Greeks, and Armenians, among whom the Turks preponderate greatly in numbers, and (unlike what is the case in European Turkey) compose the mass of the agricultural and rural population, while the Greeks and Armenians are found principally in the towns, where almost all the trade is in their hands. But besides these elements, which constitute the fixed and permanent population of the peninsula, there is a considerable portion consisting of nomad and half nomad tribes, which are known under the names of Turcomans, Yourouks or Euruques (the name is very variously written), and Kurds. The last of these are found principally in the eastern and south-eastern districts, the Turcomans in the north-eastern and central provinces, and the Yourouks in the west and south-west of the peninsula. They are all exclusively pastoral races, but the Turcomans have in general their villages in which they spend the winter months, wandering over the great plains of the interior with their flocks and herds during the summer months. The Yourouks, on the contrary, are a truly nomad race, dwelling all the year round in tents, and removing from place to place according to the season. Their tents are made of black goats' hair, and their principal covering is a heavy cloak of the same material. Besides large flocks of sheep and goats, they breed many camels, and one of their principal occupations is burning charcoal, in the course of which they do enor- mous injury to the forests. They are by no means limited to the wilder districts of the interior, but when the harvest is over descend into the rich plains and valleys near the coast, through which they wander almost without restraint, and their black tents are often to be seen within a few miles of Smyrna. Though distinguished at the present day by

certain peculiarities from the Turcomans, the You- rouks are apparently of Turkish origin, and speak a Turkish dialect. The Kurds, on the contrary, who are merely a wandering offshoot of the race that occupies the great mountain tract called Kurdistan, extending from the bor- ders of Cappadocia between Armenia and Mesopotamia into Persia, speak a wholly different language, and belong

altogether to a different race. They are, however, confined

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to the border districts on the castern frontier of Asia Minor, and to Cilicia, where the tribes that have their summer encampments in the neighbourhood of Czsarea descend to pasture their flocks in the winter.

History.—It is remarkable that a country like Asia

Minor, possessing such great natural advantages, and to a great extent so clearly limited by nature, can hardly be said to have any history of its own. It was never at any period united under one independent sovereign, but was always either divided among a number of minor potentates, or, as under the Roman, Byzantine, and Turkish rule, con- stituted merely a subordinate portion of a more extensive empire. Its western and northern shores were from a very early period occupied by Greck colonies, which gradually

formed an almost unbroken chain of settlements along its

coasts and islands from Rhodes to Trebizond. But these exercised comparatively little influence upon the nations

of the interior; and the first historical event that can be

considered as affecting the fortunes of the peninsula in general, was the rise of the Lydian monarchy, which at- tained to so great a predominance that for a short time

Croesus, the last monarch of the dynasty (560-546 B.c.),

had subdued the whole of Asia Minor west of the Halys

with the exception of Lycia. But having, unfortunately, engaged in war with Cyrus, king of Persia, he was entirely defeated, and his dominions conquered by the Persian monarch. From this time the whole of Asia Minor, froin

the frontiers of Syria to the Hellespont and the Bosphorus,

continued for more than two centuries to form part of the Persian monarchy, uutil its overthrow by Alexander the Great, 333 B.c. It was during this period divided into

satrapies, the boundaries of which were, however, very

uncertain and fluctuating, like those of the Turkish govern- ments in modern days. In the division of the Macedonian empire after the death of Alexander, Asia Minor became a chief object of contention among his generals, but was ultimately included in the dominions of Seleucus, and the greater part of the peninsula continued for a considerable period to be subject to the Seleucidan kings of Syria. A small independent monarchy had, however, been estab- lished at Pergamus, soon after 280 B.c., and when the Romans entered Asia, and defeated Antiochus III. at the battle of Magnesia (190 B.c.), they transferred a consider- able part of his dominions to Eumenes, king of Pergamus, whose kingdom was thus extended to the Taurus. The monarchy of Pergamus thus constituted continued to sub- sist till after the death of Attalus III., when it was annexed to the Roman dominions under the name of the province of Asia (130 B.c.) Bithynia, however, still continued a separate kingdom, as did also Pontus, which for a short period rose under the great Mithridates to be a really formidable power. But after the defeat and death of Mithridates, in 63 B.c., the greater part of his kingdom, as well as that of Bithynia, was annexed to the Roman dominion ; and though some petty dynasties were allowed to linger on till after the Roman empire, the whole of Asia Minor was virtually subject to Rome from the time of Augustus. There ensued a long period of tranquillity and prosperity under the Roman and Byzantine empires, during which it suffered less than almost any other part of the empire from the inroads and ravages of barbarians. Even after the rise of the Mahometan power, though Asia Minor was repeatedly traversed by the armies of the Arab con- querors, who twice laid siege to Constantinople, it was never permanently

annexed to the dominion of the caliphs, like the adjoining provinces of Syria and Mesopotamia, and the whole country, as far as the passes of Mount Amanus, continued subject to the Byzantine empire, until it was overrun by the Seljukian Turks in 1074 a.p.

The conquest of Asia Minor by the Turks was not a

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mere passing inroad, but a permanent occupation of the country, in which they established themselves in such numbers that they have cver since formed the predominant element in the population, and have to a great extent supplanted or absorbed all the previously existing races, But the dynasty of the house of Seljuk, established by the first conqueror Soliman, who had fixed his capital at Nice, within 100 miles of Constantinople, did not long retain its undivided sovercignty, and its power was broken by the armics of the first Crusade (1097 a.p.), which took Nice, defeated the Turks in a great battle at Doryleum, and then swept over the land almost without opposition, up to the very walls of Antioch. The Byzantine emperor recovered possession of the whole circuit of the coast, from Trebizond to the Syrian gates; and the Seljukian sultans of Roum, as they termed themselves, who had removed their capital to Iconium, in the heart of the interior, found themselves cut off from the sea on all sides. Their domi- nion was gradually broken up, and divided among a number of small independent chieftains, until the rise of the Ottoman dynasty at the commencement of the 14th century once more consolidated the power of the Turks in Asia. The history of Asia Minor from this period is in- separably connected with that of the Turkish empire, and will be given under the head of Turxry. To the same article we must refer our readers for the modern division of the country and the present system of administration, as well as for such statistical information concerning its

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ASKEW, or Ascuz, ANNE, one of the numerous sufferers for the cause of the Reformation in the reign of Henry VIIL, was a lady of great worth and beauty, of a good family in Lincolnshire, and in correspondence with Queen Catherine Parr and the chief ladies of the court. At first a Roman Catholic, she had gradually become convinced of the falsity of transubstantiation ; and her husband, irritated at her change of religious opinions, compelled her to leave his house. On coming to London to seek for a divorce she was arrested, and interrogated by Chancellor Wriothesley and Bishop Bonner, at the instigation of whom, under threats of torture, she signed a qualified recantation. She was iniprisoned, and wrote to the king, says Hume, " that as to the Lord's Supper she believed as much as Christ himself had said of it, andas much of His divine doctrine as the Catholic church had required." But while she could not be brought to acknowledge the king's explications, this declaration availed her nothing, and was rather regarded as a fresh insult. She was cruelly racked in the presence, and it was said by the hand, of the chancellor himself, in order to extort confession of those ladies about court with whom she corresponded. Her fortitude and fidelity probably saved the lives of the qucen and others. She dis- closed nothing, although her limbs were so dislocated by the rack that, when condemued to be burnt alive she could not stand, and was carried in a chair to Smith- field, where on 16th July 1546, she and four others

present state as it is possible to collect in the absence of all official or trustworthy authorities.

At the commencement of the present century our information concerning Asia Minor was extremely imperfect. The survey of the southern coast by Captain Beaufort (published in his Karamania, 4to, Lond. 1817), was the first contribution to a sound knowledge of any part of the country; and the work of Colonel Leake (Journal of a Tour in Asia Minor, 8vo0, Lond. 1824), in which he embodicd a careful review of all the information then existing, and applied it to the comparative geography of the peninsula, became the

basis of all subsequent researches. Since then the labours of successive travellers have thrown a great deal of light upon the subject, and most parts of the peninsula have been visited and described, though the materials for a good map are still wanting, and there exists no satisfactory geographical or geological description of many parts of the country. For further information and details our readers may consult Arundel's Visit to the Seven Churches, 8vo, Lond. 1828, and his Discoveries in Asia Minor, 1834; Hamilton's Researches in Asia Minor, Pontus, and Armenia, 2 vols. 8vo, Lond. 1842; Fel- lows's Excursion in Asia Minor, Lond. 1839, and his Discoverics in Lycia, Lond. 1841; Ainsworth's Travels in Asia Minor, 2 vols., Lond. 1842 ; Spratt and Forbes's Travels in Lycia, 2 vols., Lond. 1847 ; Langlois's Voyage dans la Cilicie, 8v0, 1861; C. T. Newton, Travels and Discoveries in the Levant, 2 vols., Lond. 1867.

The work of M. Tchihatchcff (Asie Minewre—Description Phy- sigue, Statistique, et Arehéologique, 3 vols., 8vo, Paris, 1853-60), the

result of several years' explorations in different parts of the country, and the first attempt at a systematic description of Asia Minor, has unfortunately never been completed. The first volume (pub- lished in 1853) contains by far the best description that has yet appeared of the physical geography of the whole peninsula; the second and third are devoted to the meteorology, zoology, and botany ; but those which should have contained the geology and the archeology have never been published. (E. H. B.)

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underwent this terrible mode of execution with undaunted courage.

ASMAT or Asmayi (full name, Apu Saip ABp-gL- MrLex Inn Korais Ex-Asma{), is one of the most im- portant representatives of. Arabic literature in the 8th century of the Christian era. He was born at Basra 740 or 741 a.p, and attained, by his extensive erudition, to the high rank of preceptor to Harun-al-Rashid, whose court was in that generation the great focus of intellectual activity in the East. Asmai was, as has been happily | remarked by Barbier de Meynard, the almost perfect typo of those nomadic devotees of literature who, after they had grown pale on the benches of Basra or Kufa, went to com- plete their education in the desert, in possession of bound- less stores of learning, and yet animated by an enthusiasm for further acquisition, which made them willing to travel across the sands for hundreds of leagues, if only they might preserve an ancient tradition or pick up the fragments of an ancient song. Of the results of his labours he was no niggard, and a long list might be drawn up of his various productions. It is sufficient, however, to mention his synchronous history of the kings of Persia and Arabia previous to Islam—a work which Sir Henry Rawlinson has described as "perhaps the most valuable and authentic historic volume in the whole range of Arabian literature "— and his wonderful romance of Antar, which might almost be called the Jdiad of the desert. He ss a good old

age, dying, as is generally supposed, about 830 A.D., and left behind him a number of pupils, such as Thalab, Tbn-el- Anberi, and Sukkari, who proved themselves worthy of their master.

ASMODEUS or Ascumepar, an evil demon who appears in later Jewish tradition, and concerning whom there has been much vague and fanciful speculation. The name, probably, means the destroying angel or the tempter, but the etymological grounds for neither of these are quite certain. He is sometimes called the prince of demons, and identified with Beelzebub; but there are many other fables regarding his origin. In the apocryphal book of Tobit occurs the well-known story of his love for Sara, the beautiful daughter of Raguel, whose seven husbands were slain in succession by him on their respective bridal nights. At last Tobias, by burning the heart and liver of a fish, drove off the demon, who fled to Egypt. From the part played by Asmodeus in this story, he has been often fami- liarly called the genius of matrimonial unhappiness or jealousy. Le Sage makes him the principal character in his novel Le Diable Boiteux.

ASMONEUS, or Assamonevs, the first of the dynasty or family of the Asmoneans, who ruled over the Jews for about 130 years. His great-grandson was the celebrated Mattathias (died 167 8.c.), the first of the Maccabees; and the direct line of princes descended from him was closed in 37 .c. by the execution of Antigonus. Agrippa Herodes L and Il. were connected with the Asmoneans through their ancestress, Mariamne, wife of Herod the Great.

ASOLO, the ancient Acelum, a fortified town of Northern Italy, in the province of Treviso, about 19 miles distant from the city of that name. It is built in a beautiful and healthy situation, and possesses a cathedral and the ruins of a Roman aqueduct. In the neighbourhood is the former palace of Catharine Cornaro, queen of Cyprus, now turned into a dairy. Not far off is the quarry of Rocca. Population, 5437.

ASP (Vipera aspis), a species of venomous snake, closely allied to the common adder of this country, which it repre- sents throughout the southern parts of Europe, being specially abundant in the region of the Alps. The term “ Asp” (déo7mis) seems to have been employed by Greek and Roman writers, and by writers generally down to com- paratively recent times, to

designate more than one species of serpent; thus the asp, by means of which Cleopatra is said to have ended her life, and so avoided the disgrace of entering Rome a captive, is now generally supposed to have been the cerastes, or horned viper (Vipera Hassel- quisti), of Northern Africa, a snake about fifteen inches long, exceedingly venomous, and provided with curious horn-like protuberances over each eye, which give it a decidedly sinister appearance. The species, however, to which the word "asp" has been most commonly applied, is undoubtedly the haje (Naja haje) of Egypt, a poisonous snake, from three to four fect long, with the skin of its neck loose, so as to render it dilatable at the will of the animal, as in the cobra di capello of India, a species from which it differs only in the absence of the spectacle-like mark on the back of the neck. Like the cobra, also, the haje has its fangs extracted by the jugglers of the coun- try, who afterwards train it to perform various tricks. The asp (Pethen, })2) is mentioned in various parts of the Old Testament. This name is twice translated "adder," but as nothing is told of it beyond its poisonous character and the intractability of its disposition, it is impossible accurately to determine the species which the sacred writers had in view.

ASPARAGUS. The young shoots of Asparagus offici- nalis (Nat. Ord. Liliacee) have from very remote times been in high repute as a culinary vegetable, owing to their

delicate flavour and diuretic virtues. The plant grows wild on the south coast of England; and on the waste steppes of Russia it is so abundant that it is eaten by cattle like grass. In common with the marsh-mallow and some other plants, it contains a chemical principle called asparagin, to which it owes its medicinal qualities. The roots of asparagus were formerly used as an aperient medicine, and the fruits were likewise employed as a diuretic. Under the name of Prussian asparagus, the spikes of an allied plant, Ornitho- alum pyrenaicum, are used in some places.

ASPASIA, a beautiful hetera of Athens, celebrated in history by her connection with Pericles, was a native of Miletus, and settled in Athens, following the example of her countrywoman, Thargelia, who had become very famous during the time of the Persian wars. Her beauty, but still more her remarkable accomplishments, gained for her an extraordinary

reputation, which was increased after her association with Pericles, who, having divorced his wife, united himself to Aspasia as closely as was possible under Athenian law, according to which marriage with a barbarian was illegal and impossible. Much of the administration of Pericles has been ascribed to her eloquent instruction and political sagacity, and her enemies did not scruple to lay to her charge the Samian and Peloponnesian wars. Although this exaggerates her power, yet her talents must have been extraordinary, for she drew to her house the most noble and learned in Athens, who were willing to learn from her. Even Socrates was not exempt from her influence. The political supremacy of Pericles, which exposed him to many assaults, attracted enmity to Aspasia. She was accused of impiety and other base crimes, and would pro- bably have been condemned, had not the judges been swayed by the tears and entreaties of Fericles himself. After the death of that statesman's two sons by his lawful wife, he procured the passing of a law, by which the children of irregular marriages might be rendered legiti- mate. His son by Aspasia was thus allowed to assume his father's name. After the death of Pericles, Aspasia is said to have formed a similar connection with one Lysicles, wealthy, but of ignoble birth, whom she raised by her instructions to a prominent place in the state. This episode is somewhat obscure, especially as Lysicles seems to have fallen in battle in 428, the year after the death of Pericles, Nothing further is known of the history of Aspasia.

ASPASIUS, a Peripatetic philosopher, and one of the most prolific commentators on Aristotle, flourished pro- bably towards the close of the Ist century A.D., or perhaps during the reign of Antoninus Pius. His commentaries on the Categories, De Interpretatione, De Sensu, and other works of Aristotle, are frequently referred to by later writers, but have not come down to us. Certain com- mentaries on Plato, mentioned by Porphyry in his life of Plotinus, have also been lost. Commentaries on the 2d, 4th, 7th, and 8th books of the Nicomachean Ethics, which pass under his name, were printed along with those of Eustratius and others by Manutius at Venice in 1536. They were translated into Latin by Felicianus in 1541, and have been frequently republished. The authenticity of part, and even of the whole, of these ethical commentarics has been disputed ; and recently some fragments of another commentary by Aspasius on the Ethics have been printed. See Classic. Jour., vols. XXViii., XxiX.

ASPASIUS, a celebrated rhetorician and sophist, was born at Ravenna, and flourished during the early part of the 3d century A.D. He was the son (or, according to Suidas, the scholar) of the rhetorician Demetrianus ; and, after a careful training in all the branches of a rhetorician's art, began to teach at Rome. For many years he filled the chair of rhetoric which had been founded by Vespasian. He travelled extensively in the suite of the emperor, a

whose secretary he acted for some time. His orations, which are praised for their style, have been lost.

ASPEN TREE, called also the trembling-leaved poplar (Populus tremula), is a native of Britain, and is found generally in moist places, somctimes at a considerable elevation, 1600 feet or more, in Scotland. It flowers in Britain in March and April. The name "trembling" is applied to it on account of the constant movement of the leaves even with a gentle breeze. This mobility depends on the leaves being suspended by leaf-stalks flattened laterally, and when subjected to a slight wind, by their friction on each other they give rise to a rustling sound. It is supposed that the mulberry trees (Decaim) mentioned in lst Chronicles xiv. 14, 15, were really aspen trees. 'The wood of the tree is white, aud is made use of by turners. In France sabots are made of it; and the charcoal made from the wood is used in the manufacture of gunpowder. The leaves are in some countries of Europe employed as food for cattle, sheep, and goats.

ASPENDUS (or, as the name appears on the more ancient coins, EstrENpys), a city of Pamphylia, in Asia Minor, situated on an isolated hill near the river Eurymedon (Capri-su) at the extremity of the plain of Perga. It was founded by a colony from Argos, five centuries before the Christian era, and attained to great prospcrity, as is attested, not only by the statements of Greek and Roman writers, but also by the noble ruins that still occupy the site. Of these the most remarkable is the theatre, which is regarded as niore perfect than any other in Asia Minor, requiring but little restoration to render it fit once more for its aucient use. In the first precinct there are twenty- one rows of seats, and in the second eighteen, nearly all of them entire. The date of the building is assigned by an inscription to the

time of Antoninus and Lucius Verus. An aqueduct of magnificent proportions, built, like the theatre, of the silicious conglomerate of the neighbourhood, still stretches across the plain; and the ruins of an agora and other erections are found on the hill. That the city was rich in valuable statues is mentioned by Cicero, who rhetorically accuses Verus of having plundered it of them all. It only appears occasionally in ancient history, as when its inhabitants surprised and assassinated Thrasybu- lus, and again when they surrendered to Alexander ; but the populousness of the place is proved by the fact that it was able to furnish 4000 hoplites.

ASPER, Hans, a Swiss painter, was born in 1499 at Ziirich, where he died on the 21st March 1571. He wrought in a great variety of styles, but excelled chiefly in flower and fruit pieces, and in portrait painting. Many of his pictures have perished, but his style may be judged from the illustrations to Gessner's Historia Animalium, for which he is said to have furnished the designs, and from portraits of Zwingle and his daughter Regula Gwalter, which are preserved in the public library of Ziirich. It has been usual to class Asper among the pupils and imi- tators of Holbein, but an inspection of his works is suffi- cient to show that this isa mistake. Though Asper was held in high reputation by his fellow-citizens, who elected him a member of the Great Council, aud had a medal struck in his honour, he seems to have been frequently in embarrassed circumstances, and there is reason to believe that he died a pauper.

ASPHALT, or AspHALtuM (dodadAros, Aristotle, Bitu- men, Pliny), the German Bergpech, or mineral pitch, so called from the Lacus Asphaltites or Dead Sea, where it was found in ancient times, is a product of the decomposition of vegetable and animal substances. It is usually found of a black or brownish-black colour, externally not unlike coal, but it varics in consistency from a bright pitchy condition, with a sharp conchoidal fracture, to thick viscid masses of

mineral tar. Asphalt melts at or a little below the boiling point of water, and it burns with a rather smoky flame. It is regarded as the ultimate result of a series of changes which take place, under certain conditions, in organised mat- ter, producing—lIst, naphtha; 2d, petroleum ; 3d, mineral tar; and 4th,

asphalt or hard bitumen. 'The whole of these substances merge into each other by insensible degrees, so that it is impossible to say at what point mineral tar ends and asphalt begins. Naphtha, which is the first of the series, is in sone localities found flowing out of the earth as a clear, limpid, and colourless liquid. As such it is a mixture of hydrocarbons, some of which are very volatile and evaporate on exposure ; it takes up oxygen from the air, becomes brown and thick, and in this condition it is called petroleum. A continuation of the same process of evaporation and oxidation gradually transforms the material into mineral tar, and still later into solid glassy asphalt. Asphalts are very variable in composition, and their proximate constituents have not been subjected to a thorough examination. Traces of naphtha or light oils are usually found in them, and they always contain a per- centage of the heavier hydrocarbons not vaporisable below boiling point. Resins soluble in alcohol, and solids, some soluble in ether, and some resisting the solvent action of both ether and alcohol, are found in varying porportions. According to Dana "asphalt may consist of either—(1), unoxygenated, or (2), partly unoxygenated and partly oxygenated (the usual fact), or (3), solely of oxygenated hydrocarbons (very rarely, if ever, true in nature). The state of solidity is not proof that any part of the bitumen is oxygenated." Asphaltic deposits exist widely diffused throughout the world, more especially in tropical and sub- tropical regions. It is found in a state of great purity in the interstices of the older rocks, but its occurrence is not characteristic of any particular formation or period, The most remarkable deposit of asphalt exists in Trinidad, where it forms a lake 99 acres in extent, and of unknown depth, intersected with rivulets of water. At two or three places on the surface of the lake an emission of semi-fluid tar may still be seen in progress, accompanied with an evolution of sulphuretted hydrogen. At these points the substance is still soft and viscid, but by exposure it gra- dually obtains the consistency of the rest of the mass. In addition to the lake deposit, asphalt occurs in the sur- rounding country—named La Brea, on account of this peculiarity—in detached patches, or in sheets of consider- able size, at one point protruding into the sea, and pieces of asphalt are frequently cast up on the neighbouring shore. A considerable quantity of a fine asphalt is also derived from Cuba under the name " Chapapote," or Mexican asphalt; and from Caxitambo in Peru, a very pure variety of high lustre is exported. The asphalt of the Dead Sea is more a tradition than a reality, it being now found there in very small

quantities; but the source of the supply of ancient Babylon, the fountains of Is, on a tributary of the Euphrates, still yields asphalt. It occurs in many localities throughout Europe, but not to any considerable extent. The following table gives the ultimate composition of specimens from several localities :—

Carbon. Hydrogen. Oxygen. Nitrogen. Ash. Auvergne, France …77°64 7°86 8°35 1:02 5°13 Cubic. .csseeesceere 82°34 9°10 Ge25 1°91 0°40 Caxitambo, Peru ….88°66 9°69 1°65

Of greater importance industrially than simple asphalt is asphalt stone,—a limestone impregnated with bituminous matter, which occurs in large quantities at several European localities. The most valuable deposits are in the Val de Travers, canton of Neufchatel; in the neighbourhood of Seyssel, department of Ain; at Bechelbronn in Alsace, Limmer near the city of Hanover, and Hélle in Dit-

marschen; in Holstein, &c. These bituminous stones con- tain from 7 or 8 to about 20 per cent. of asphalt in their composition, that from Val de Travers being richest in bituminous matter and of most value in its industrial applications. 'The asphalt beds of the Val de Travers were first discovered and utilised by Hirinus, a Greek physician, in 1712, who recommended the material as being "peculiarly suitable for covering all kinds of constructions ; to protect wood and stone work against decay, worms, and the ravages of time, rendering them almost indestructible even when exposed to wind, wet, and extreme variations of temperature." Eirinus was aware that asphaltic mortar had been used in the building of ancient Babylon, and he himself succeeded in using it with great effect for the lining of cisterns and walls as a cementing material,. and for the flooring of warehouses, &c, After some time the material fell into disuse; the quarries of Val de Travers were even forgotten, and it was not till the year 1832 that the material was again prominently and successfully re- introduced, the credit on this occasion being due to the Count Sassenay. Under his direction asphaltic stone came to be extensively used in France for pavements and roadways, and for protecting floors and walls from the effects of damp. From France the application of the material for such

purposes extended to other countries, and there is now a wide-spread demand for asphaltic pave- ments. Two principal methods are adopted in laying asphalt pavements,—lst, the mastic process; 2d, the hot compressed process, The mastic process is essentially as follows:—The bed of the road-way is prepared with a smooth level foundation of concrete, which must be thoroughly dry before the application of the asphalt. The mastic is prepared for application by heating the asphaltic stone and breaking it into small pieces, which are then melted up with a quantity of mineral tar, to which some sand is added. The molten mass is then poured over a section of the prepared concrete uniformly to the requisite depth ; the surface is smoothed, and covered with a coating of fine sand which is stamped into the asphalt. The proportions of tar and sand used vary with the composition of the asphaltic stone employed and the position occupied by the pavement. The other mode of laying pavements, now extensively adopted, consists in spreading hot powdered asphaltic stone on the prepared surface, which is then heavily pressed till it forms a homogeneous elastic coating. Roadways so prepared are very durable, smooth, cleanly, and noiseless, but the material is not well adapted for other than level streets on account of the difficulty of foothold. Complaints are also made against such pave- ment, to the effect that accidents to horses from slipping and falling are much more frequent than is the case on ordinary stone pavement. An artificial asphalt is pre- pared by boiling up the pitch of gas-tar with chalk and sand, but such a substitute, though much cheaper, has not the durability of the natural compound. Gas-tar asphalt is also applied for other purposes in which the natural product is used. Asphalt was used by the ancient Egyptians in their process of embalming bodies, It is the principal ingredient in black Japan varnish. It is distilled in large quantities for the illuminating and lubricating oil which it yields, but the bituminous shales from which paraffin and paratfin oils are distilled must not be con- founded with asphaltic deposits. It is also used for preparing roofing felts ; paper water-proofed with asphalt has been used, and drain-pipes of compressed asphalted paper are manufactured.

ASPHYXIA (a priv., o@véis, a pulse), a term in medi- cine which, though literally signifying loss of pulsation, is applied to describe the arrestment of the function of respiration from some hindrance to the entrance of air into

the lungs. (See Paysrotoegy and MepicaL JuRispru- DENCE.

ASPINWALL, or Coton, a city and free port on the northern coast of Panama, one of the united states of Columbia. It is built on the well-wooded coral island of Manzanilla, in lat. 9° 22’ 53” N., and long. 79° 52’ 58” W., owes its origin to the Panama Railway Company, who founded it (1850) for the convenience of their traftic, and derives its more usual name from W. H. Aspinwall, one of their principal shareholders. In spite of the unhealthiness of its situation,—now, indeed, largely diminished,—and the dangerous winds from the north to which it is at some seasons exposed, it has quite superseded the neighbouring port of Chagres, and become the centre of a considerable local trade. The banana, especially, is cultivated in the neighbourhood and largely exported to New York. The population, composed mainly of Jamaica and Spanish negroes, was stated at 6500 in 1872.

ASS, The Domrstic—Asinus vulgaris, Gray—differs chiefly from the horse in its smaller size, in the presence of long hair, forming a tuft, only at the extremity of the tail, and in the absence of warts on its hind legs. Its fur, usually of a gray colour, is characteristically marked with a longi- tudinal dorsal streak of a darker hue, with a similar streak across the shoulders, but white and black varieties also occur. The ass has been from time immemorial under the dominion of man, and it is doubtful whether the original wild stock is anywhere to be found at the present day,— the specimens that have been described as wild being probably the descendants of individuals that have escaped from the domestic state. A wild variety of ass (Asinus teentopus), found in Abyssinia, has the long acute ears and the bray peculiar to the domestic kinds. It is said also to have cross bands on its legs, a feature occasionally met with in our tame breeds; and this fact has led Darwin and others to conclude that in the wild ass of Abyssinia the original of the domestic animal is to be found; the stripes which

occasionally appear on the legs of the latter being regarded as instances of reversion to the ancestral type (Proceedings of Zool. Society, 1862). The marked aversion of the domestic ass to cross the smallest streamlet, an aversion which it shares with the camel, and the evident delight with which it rolls itself in the dust, seem to point to arid deserts as its original home. The ass has generally been the object of neglect and ill treatinent; and attempts have seldom been made to improve the breed by select- ing and matching the finer specimens. It has thus gradually sunk into the dull and obstinate creature which we are accustomed to see. Its reputation for stupidity is not, however, of recent origin. The ancient Egyptians hated it, and symbolised an ignorant person by the head and ears, and the Romans thought it a bad omen to meet an ass (Fosbrooke's Antiquities). In the Middle Ages the Germans of Westphalia made the ass the symbol of St Thomas, the unbelieving apostle; and the boy who was last to enter the school on St Thomas' day was called the "Ass Thomas" (Gubernatis's Zoological Mythology, vol. 1. p. 362). That the ass possesses qualities, which, if de- veloped by careful selection and humane treatment, would make it a worthy companion of the horse as the servant of man, is seen in the too rare instances in which it has received proper attention. In Southern Europe—especially in Spain, Italy, and Malta—the ass is carefully bred, and has thus been greatly improved. No less than £200, it 1s said, is sometimes paid in Spain for a stallion ass. In the state of Kentucky, where mules are in great request as beasts of burden, asses, imported from the south of Europe, are reared with scrupulous care, and with such success, that from an average height of fourteen hands the Ken-

tuckians have-raised these animals to fifteen and even six- teen hands. That the diminutive size of the ass in cold countries is due as much to neglect as to rigour of climate seems proved by the fact, that in the north of India, where it is used by the lowest castes, the ass does not attain a height greater than that of a Newfoundland dog. It is, however, among the south-western nations of Asia and in Egypt that the ass has received that attention usually bestowed in this country on the horse, and it is there that it is to be seen in greatest perfection. The Arabs and Persians know the pedigrees of their asscs, and by careful selection and interbreeding they have formed and

perpe- tuate many useful races. Thus in Syria, according to Darwin, there are four distinct breeds:—"a light and graceful animal with agreeable gait used by ladies, an Arab breed reserved exclusively for the saddle, a stouter animal used for ploughing and various purposes, and the large Damascus breed with peculiarly long body and ears."} The ass, there is little doubt, was first domesticated in Asia,—probably prior to the domestication of the horse,— whence it passed at a comparatively late period into Europe, for in the time of Aristotle it was not found in Thrace. In England there is evidence of its presence so early as the time of the Saxon Ethelred, but it does not appear to have been common till after the time of Queen Elizabeth. The koulan, or wild ass (Asinws Onager, Gray), differs from the domestic species in its shorter and more rounded ears, and in the greater length and finer form of its limbs. Its fur shows the dark streak along the back, but the streak across the shoulders does not appear to be a constant character. It is chiefly to be met with in the plains of Mesopotamia, in Persia, in Cutch, on the shores of the Indus, and in the Panjab, congregating in herds under a leader, and migrating southwards on the approach of wintcr. The adults are ex- ceedingly shy, so that it is difficult to get within rifle range of them. According to Layard, who had ample opportunity for observing them during his researches around Nineveh, "they equal the gazelle in fleetness, and to match them is a feat which only one or two of the most celebrated mares have been known to accomplish." In the same region, over 2000 years ago, Xenophon, during the famous expedition of Cyrus, observed herds of wild asses so " fleet that the horsemen could only take them by dividing themselves into relays, and succeeding one another in the chase." The young are sometimes caught during spring by the Arabs, who feed them with milk in their tents. They are hunted chiefly by the Arabs aud Persians, by whom their flesh is

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esteemed a delicacy. 'Their food, according to Dr Shaw, consists mainly of saline or bitter and lactescent plants ; they are also fond of salt or brackish water. The leather known as shagreen, from the Turkish term sagri, is made from the skin of the ass; the ingrained aspect which it bears is not, however, natural to it, but is produced by a chemical process described by Pallas. The milk of the ass, containing more sugar and less caseine than that of the

cow, closcly resembles woman's milk, and has long been valued as a nutritious diet where the digestive organs are weak.

ASSAM, a province of British India. Until the begin- ning of 1874 Assam formed the north-cast division of the territories under the Licutenant-Governor of Bengal. In that year it was erected into a separate administration, pre- sided over by a Chief Commissioner, who acts directly under the Governor-General of India in council. The district of Cachar was added to the old division of Assam, and now forms part of the Chief Commissioner's jurisdiction. It lies between 22° and 28° N. lat., and between 90° and 98° E. long., and consists of the upper valleys of the Brahmaputra for a length of about 500 miles from where that river centers the north-eastern frontier of British India. These valleys vary in breadth, but generally occupy a space of about 60 miles between the Himalayas on the north, and the water- shed which separates the Brahmaputra from the river system of Cachar. Assam, therefore, is bounded on the N. by the sub-Himalayan ranges of the Bhutia, Aka, Daphla, and Miri tribes; on the E. by the unsurveyed forests and mountains which separate British India from northern Burmah:; on the S. by the hills inhabited by the Nagas, Jaintiyas, and Khasids, which separate Assam from Silhet ; and on the W. by the Garo hills and Kuch Behar. Assam may be considered, however, cither as a natural province or as an artificial political division. In its former aspect, in which it will be dealt with in this article, it has an area of 48,473 square miles, with a population in 1872 of 2,412,480 souls. Itis the outlying province of India to the north-east, so that while the pressure of population in several of the inner divisions of Bengal varies from 500 to 573 persons per square mile, in Assam it is barely 50. Even deducting 12,058 niiles of hill country in Lakhimpur and Cachar districts, the pressure of population is only 66 persons per square mile in the more cultivated parts of Assam. Taken as a political division, it is locally administered by a Chief Commissioner, with his headquarters at Gauhdti. It is subdivided into the ten following districts, each under a deputy commissioner :—

Table showing the Area, Population, and Land Revenue of the Assam Province

N D fo Total populidion i an Christians Others Land Revenue

AME OF DistTRICT, moe | population. |per square Hindus, Muhammadaus. iristians, A : vente, 1. Godlpard i… eee. 4,433 444,761? 311,419 89,916 141 6,238 £13,045 0 0 a Sh ae 3,631 561,681 515,024 45,828 204 630 83,200 0 0 3. Dorang or Darang 8,413 236,009 221,389 13,859 256 505 36,665 8 0 4, Naogaon oo… cece 3,648 256,390 245,615 10,066 179 530 36,146 8 0 Se SUDSMOAe os cseuseens sas 2,418 296,589 282,969 12,619 283 718 46,829 14 0 6. Walehimopur… 02… ..000- 8,145 121,267 115,638 8,826 316 1,487 14,8838 6 0 oo er aes 1,285 | 205,027 128,219 74,261 409 2,038 15,834 12 0 8. N aga Hills sinceseecescenses 4,900 68,918 Not classified | Not classified | Not classified | Not classified 47 6 0 ee ee, ie ||) eee Do. De. Do. Do. 307 16 0 Ome Garovbillsir acc. ... cane 8,890 80,000 Do. Do. Do. Do.

36,415 2,412,480 IS20s2 fo 250, 470 1,788 12,146 £245,959 10 0

The area given in this table is exclusive of 8343 square ; convenience placed under the commissioner of the Kuch

miles of hill country in Lakhimpur, and 3175 square miles of the Cachar hills, but it includes the two districts of Godlpdra and the Garo hills, which, although for political

2 Animals and Plants under Domestication, vol. i. p. 62.

Behar division of Bengal, belong physically and linguisti- cally to Assam. History.—Assam was the province of Bengal which remained

? This includes the population of Eastern Duars, 37,047, not classi-

fied according to religion.

most stubbornly outside the limits of the Mughul empire and of the Muhammadan polity in India. Indeed, although frequently overrun by Musalman armies, and its western districts annexed to the Muhammadan vice-royalty of Bengal, the province maintained an uncertain independence till its invasion by the Burmese towards the end of the last century, and its

final cession to the British in 1826. A full account of its ancient kings will be found in Mr William Robinson's Assam, chap. iv. (Calcutta, 1841). It seems to have been originally included, along with the greater part of north-eastern Bengal, in the old Hindu territory of Kamrup. Its early legends point to great religious revolutions between the rival rites of Krishna and Siva as a source of dynastic changes. Its roll of kings extends deep into pre-historic times, but the first Raja capable of identification flourished about the year 76 A.D. Kamrup, the Pragjotishpur of the ancient Hindus, was the capital of a legend- ary king Narak, whose son Bhagadatta distinguished himself in the great war of the Mahdbhirata. On the rise of the Koch power, the kings of Kuch Behar wrested a portion of Assam from the kings of the Pal dynasty to whom it belonged. In the early part of the 13th century the Ahams or Ahoms, from northern Burmah and the Chinese frontiers, poured into the eastern districts of As- sam, founded a kingdom, and held it firmly for several centuries. A tradition relates that this race of conquerors were originally let down from heaven by iron chains, and alighted in a place called Mungbingram, supposed to be in the Patkai range, in 567 A.D. Their manners, customs, religion, and language were, and for a long time continued to be, different from those of the Hindus ; but they found themselves compelled to respect the superior civilisation of this race, and slowly adopted its customs and eee The con- version of their king Chuchengpha to Hinduism too place about the year 1611 A.D. and the whole Ahams of Assam gradually fol- lowed his example. In medieval history, the Assamese were known to the Musalmén population as a warlike, predatory race, who sailed down the Brahmaputra in fleets of innumerable canoes, plundered the rich districts of the delta, and retired in safety to their forests aud swamps. As the Muhammadan power consolidated itself in Bengal, repeated expeditions were sent out against these river pirates of the north-east. The physical difficulties which an in- vading force had to contend with in Assam, however, prevented anything like a regular subjugation of the country; and after repeated efforts, the Musalmans contented themselves with occupy- ing the western districts at the mouth of the Assam valley. 'The following details will suffice for the history of a struggle in which no great political object was attained, and which left the Assamese still the same wild and piratical people as when their fleets of canoes first sallied forth against the Bengal delta. In 1638, during the reign of the Emperor Shth Jahan, the Assamese descended the Brahmaputra, and

pillaged the country round the city of Dacca ; they were expelled by the governor of Bengal, who retaliated upon the plunderers by ravaging Assam. During the civil wars between the sons of Shah Jahan, the king of Assam renewed his predatory incursions into Bengal ; upon the termination of the contest, Aur- angzeb determined to avenge these repeated insults, and despatched a considerable force for the regular invasion _ the Assamese terri- tory. His general, Mir Jumla, defeated the Raja, who fled to the mountains, and most of the chiefs made their submission to the conqueror. But the rains set in with unusual violence, and Mir Jumla's army was almost annihilated by famine and sickness. Thus terminated the last expedition against Assam by the Muham- madans, whose fortunes in this country were never prosperous. A writer of the Muhammadan faith says : —" Whenever an invading army has entered their territories, the Assamese have sheltered themselves in strong posts, aud have distressed the enemy by stra- tagems, surprises, and alarms, and by cutting off their provisions. If these means failed, they have declined a battle in the field, but have carried the peasants into the mountains, burned the grain, and left the country desert. But when the rainy season has set in upon the advancing eneniy, they have watched their opportunity to make excursions and vent their rage ; the famished vaders have either become their prisoners or been put to death. In this manner powerful and numerous armies have been sunk in that whirlpool of destruction, and not a soul has escaped." The same writer states that the country was spacious, populous, and hard to be penetrated ; that it abounded in dangers; that the paths and roads were beset with difficulties; and that the obstacles to conquest were more than could be expressed. The inhabitants, he says, were enter- prising, well-armed, and always prepared for battle. Moreover, they had lofty forts, numerously garrisoned and plentifully pro- vided with warlike stores ; and the approach to them was opposed by thick and dangerous jungles, and broad and boisterous rivers. The difficulties in the way of successful invasion are of course not understated, as it was the object of the writer to exalt the prowess and perseverance of the faithful. He accounts for their temporary success by recording that "the Musalnian hordes experienced the comfort of fighting for their religion, and the blessings of it reverted to the sovereignty of his just and pious majesty." 'The short-lived triumph of the Musalmans might, however, have warranted a less

ambitious tone. About the middle of the 17th century the chief became a convert to Hinduism. By what mode the conver- gion was effected does not clearly appear, but whatever were tlie means employed, it seems that the decline of the country com- menced about the same period. Internal dissensions, invasion, and disturbances of every kind convulsed the province, and neither prince nor people enjoyed security. Late in the 18th cen- tury some interference took place on the part of the British Government, then conducted by Lord Cornwallis; but the suc- cessor of that nobleman, Sir John Shore, adopting the non-interven- tion policy, withdrew the British force, and abandoned the country to its fate. Its condition encouraged the Burmese, an aggressive people, to depose the Raja, and to make Assam a dependency of 'Ava, The extension of their encroachments ou a portion of the territory of the East India Company compelled the British Government to take decisive steps for its own protection. Hence arose the series of hostilities with Ava known in Indian history as the first Burmese war, on the termination of which by treaty in February 1826, Assam remained a British possession. In 18382 that portion of the province denominated Upper Assam was formed into an independent native state, and conferred upon Purandar Sinh, the cx-Raja of the country; but the administration of this chief proved unsatisfactory, and in 1838 his principality was re- united with the British dominions. After a period of successful administration and internal development, under the Lieutenant-Governor of Bengal, it was erected into a separate Chief-Commis- sionership in 1874.

Puysican Asprcts.—Assam is a fertile series of valleys, with the great channel of the Brahmaputra (literally, the Son of Brahmd) flowing down its middle, and an infinite number of tributaries and water-courses pouring into it from the mountains on either side. The Brahma- putra spreads out in a sheet of water several miles broad during the rainy season, and in its course through Assam forms a number of islands in its bed. Rising in the Thibetan plateau, far to the north of the Himalayas, and skirting round their eastern passes, not far from the Yang- tse-kiang and the great river of Cambodia, it enters Assam by a series of waterfalls and rapids, amid vast boulders and accumulations of rocks. The gorge, situated in Lak- himpur district, through which the southernmost branch of the Brahmaputra enters, has from time immemorial been held in reverence by the Hindus. It is called

the Brahma- kunda or Parasuramkunda; and although the journey to it is both difficult and dangerous, it is annually visited by thousands of devotees. After a rapid course westwards down the whole length of the Assam valley, the Brahma- putra turns sharply to the south, spreading itself over the alluvial districts of the Bengal delta, and, after several changes of name, ends its course of 1800 miles in the Bay of Bengal. Its first tributaries in Assam, after crossing the frontier, are the Kundil and the Digaru, flowing from the Mishmi hills on the north, and the Tengdpani and Nawaé Dihing, which take their rise on the Singpho hills to the south-east. Shortly afterwards it receives the Dibang, flowing from the north-east ; but its principal confluent is the Dihang, which, deriving its origin, under the name of the Sanpu, from a spot in the vicinity of the source of the Satlej, flows in a direction precisely opposite to that river, and traversing the table-land of Thibet, at the back of the great HimAlaya range, falls into the Brahma- putrain 27°48'N. lat., 95°26'. long., after a course of nearly 1000 miles. Doubts were long entertained whether the Dihang could be justly regarded as the continuation of the Sanpu ; these, however, have been gradually removed by the additional testimony of more recent notices; and as it is now ascertained that the last-named river does not flow into the Irawadi, it appears impossible to account for its course to the sea, except by presuming it to dis- charge its waters into the Brahmaputra through the channel of the Dihang. Below the confluence, the united stream flows in a south-westerly direction, forming the boundary between the districts of Lakhimpur and Darang, situated on its northern bank, and those of Sadiy4, Sibsdgar, and Naogéon on the south; and finally bisecting Kémrup, it

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crosses over the frontier of the province, and passes into Bengal. In its course it receives on the left side the Buri Dihing, a river having its rise at the south-eastern angle of the province; and lower down, on the opposite side, it parts with a considerable offset termed the Buri Lohit, which, however, reunites with the Brahmaputra 60 miles below the point of divergence, bearing with it the addi- tional waters of the Subansiri, flowing

from Thibet. A second offset, under the name of the Kalang River, rejoins the parent stream a short distance above the town of Gauhati. The remaining rivers are too numerous to be particularised. Of these, not less than 61 are distinguished by well-known names, of which 34 flow from the northern, 24 from the southern mountains, and the remainder from sources beyond the confines of Assam. The streams of the south are not rapid, and have no considerable current until May or June. Among the islands formed by the intersection and confluence of the rivers is M4juli, or the Great Island, as it is called by way of pre-eminence. This island extends 55 miles in length by about 10 in breadth, and is formed by the Brahmaputra on the south- east, and the Burf Lohit river on the north-west. A Per- sian writer, Muhammad Kazim, in describing Assam at the close of the 17th century, makes some observations on its general appearance. He thus speaks of Majuli two centuries ago :—

"An island well inhabited, and in an excellent state of agricul- ture ; it contains a spacious, clear, and pleasant country. The culti- vated part is bounded by a thick forest, which harbours elephants, and these animals may be caught here, as well as in four or five other forests in Assam. If there be occasion for them, five or six hundred elephants may be procured in a year."

Describing the country south of the Brahmaputra, the same native author observes :—

' Across the river on the side of Garhgdon is a wide, agreeable, level country that delights the heart of the beholder. The whole face of it is marked with population and tillage; and it presents on every side charming prospects of ploughed fields, harvests, gardens, and groves. From the village of Salagira to the city of Garhgaon, a space of about 50 os (100 miles) is filled with such an uninter- rupted range of gardens, oe stocked with fruit trces, that it appears as one garden. ithin them are the houses of peasants, and a beautiful assemblage of coloured and fragrant herbs, and of garden and wild flowers blowing together. As the country is over- flowed in the rainy season, a high and broad causeway has been raised for the convenience of travellers from Salagira to Garhgaon, which is the only uncultivated ground that is to be seen. Hach side of this road is planted with*

shady bamboos, the tops of which meet and are entwined. Among the fruits which this country produces are mangoes, plantains, jacks, oranges, citrons, limes, and punialeh, a species of amleh, which has such an excellent flavour that every person who tastes it prefers it to the plum. There are also cocoa-nut trees, pepper-vines, areca trees, and the sadij (an aromatic leaf), in great plenty. Sugar-cane excels in softness and sweetness, and is of three colours, black, red, and white; there is ginger free from fibres, and betel vines. The strength of vegetation and fertility of the soil is such that whatever seed is sown, or slips planted, they always thrive. The environs of Garhgaon furnish small apricots, yams, and pomegranates; but as these are wild, and not assisted by cultivation and engrafting, they are very indifferent. The principal crop of this country consists in rice and mash. Ades, a kind of pea, is very scarce, and wheat and barley are never sown."

And in respect to the other great division of the province he remarks :—

'¢The country which is on the northern side of the Brahmaputra 1s in the highest state of cultivation, and produces plenty of pepper and areca nuts. It even surpasses the southern portion in popula- tion and tillage; but as the latter contains a greater tract of wild forests and places difficult of access, the rulers of Assam have chosen to reside in it for the convenience of control, and have erected in it the capital of the kingdom. The breadth of the northern division from the bank of the river to the foot of the mountains, which is a cold climate and contains snow, is various, but is nowhere less than 30 miles, nor more than 90. The inhabitants of those mountains are strong, have a robust and respectable appear- ance, and are of a middling size. Their complexions, like those of the natives of all cold climates, are red and white ; and they have also trezs and fruits peculiar to frigid regions."

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This description, written two centuries ago, would apply at the present day. In the upper part of the valley, towards the gorge where the Brahmaputra enters, the country is varied and picturesque, walled in on the north and east by the Himalayas, and thickly wooded from the base to the snow- line. On either bank of the Brahmaputra a long narrow strip of plain rises almost imperceptibly to the foot of the hills. Gigantic reeds and grasses

occupy the low lands near the banks of the great river; expanses of fertile rice-land come next; a little higher up, dotted with villages encircled by groves of bamboos and fruit trees of great size and beauty, the dark forests succeed, covering the interior table-land and mountains. The country in the vicinity of the large rivers is flat, and impenetrable from dense tangled jungle, with the exception of some very low-lying tracts which are either permanent marshes or are covered with water during the rains. Jungle will not grow on these depressions, and they are covered either with water, reeds, high grasses, or rice cultivation. On or near such open spaces are collected all the villages. As the traveller proceeds farther down the valley, the country gradually opens out into wide plains. In the western district of Kamrup the country forms one great expanse, with a few elevated tracts here and there, varying from 200 to 800 feet in height.

VARIETIES OF Sorts.—The soil is exceedingly rich and well adapted to all kinds of agricultural purposes, and for the most part is composed of a rich black loam reposing on a gray sandy clay, though occasionally it exhibits a light yellow clayey texture. The land may be divided into three great classes. The first division is composed of hills, the largest group within the valley being that of the Mikir Mountains, which stand out upon the plain. An- other set of hills project into the valley at Gauhati. But these latter are rather prolongations of spurs from the Khasia chain than isolated groups belonging to the plains. The other hills are all isolated, and of small extent. The second division of the lands is the well-raised part of the valley whose level lies above the ordinary inundations of the Brahmaputra. The channels of some of the hill streams, however, are of so little depth that the highest lands in their neighbourhood are liable to sudden floods. On the north bank of the great river, lands of this sort run down the whole length of the valley, except where they are interrupted by the beds of the hill streams. The breadth of these plains is in some places very trifling, whilst in others they comprise a tract of many miles, according to the number and the height of the rocks or hills that protect them from the aberrations of the river. The allu- vial deposits of the Brahmaputra and of its tributary streams niay be considered as the third general division of lands in Assam. 'These lands are very extensive, and present every degree of fertility and elevation, from the vast chars of pure sand, subject to annual inundations, to the firm islands, so raised by drift-sand and the accumu- lated remains of rank vegetable

matter, as no longer to be liable to flood. The rapidity with which wastes composed entirely of sand newly washed forward by the current during floods become converted into rich pasture, is astonishing. As the freshets begin to lessen and retire into the deeper channels, the currents form natural em- bankments on their edges, preventing the return of a small portion of water which is thus left stagnant on the sands, and exposed to the action of the sun's rays. It slowly evaporates, leaving a thin crust of animal and vegetable matter. This is soon impregnated with the seeds of the Saccharum spontaneum and other grasses that have been partly brought by the winds and partly deposited by the water. Such places are frequented by numerous flocks of aquatic birds, which resort thither in search of fish and mollusca. As vegetation begins to appear, herds of wild

elephants and buffaloes are attracted by the supply of food and the solitude of the newly-formed land, and in their turn eontribute to manure the soil.

GroLocy.—Limestone, coal, and petroleum are found ; with oil springs, mineral springs, and brine springs. The mountains on the opposite sides of the valley are characterised by distinct systems, those on the north being composed of primitive formations, while those ou the south partake largely of sandstone, shell-limestone, and coal. Some valuable mincrals are met with. Gold-dust is found in all the rivers flowing from the northern mountains, but it differs in purity and colour, and also in malleability. That which is obtained in the Dikrang is purer than that found in the Brahmaputra, though it is more abundant in the bed of the latter river. Gold-dust is found most plentifully near the foot of the northern 'hills; it is never sought for in the southern rivers. Beds of iron-ore exist in various places, and tracings of former workings on a large scale remain; but the native article, being undersold by iron imported from England, is now driven out of the market. Coal has also been discovered in beds of considerable magnitude, and from the circumstance of its existence at the two extremities of the province, there appear grounds for the inference that the coal formations of Assam arc co-extensive with the whole length of the valley. The extreme difficulty, however, of moving about in those districts, the absence of roads, and the jungly and almost uninhabited state of the

country, have tended to prevent the opening up of the mincral deposits of the province. More recently, the largely-extended cultivation of tea, and the conse- quently increased demand for means of transport and communica- tion, have directed attention to the local supplies of fuel for the river steamers which now navigate the Brahmaputra. In 1864-65, Mr H. B. Medlicott, Deputy-Superintendent of the Geological Survey, visited this province, and reported most favourably of the value and extent of the coal. To the north of the Brahmaputra no coal worth working was found. To the south, in Upper Assam, the principal localities are in the neighbourhood of Jaipur, in the Debrogarh sub-division of the Lakhimpur district, and in the vicinity of Makum. The chief sites are the Terap, where a minimum thickness of 5 feet of bright clean coal, nearly horizontal, was seen ; the Namchik, a tributary of the Dihang, where, within 200 feet in length, three thick beds of good sound coal were seen, one 8 fect thick ; and at Jaipur, where a seam of 17 feet thick occurs, of which 10 feet is good bright coal. Scveral other seams also exist which have never been touched. 'The inaccessible nature of the country, however, and the want of a trustworthy map, render it quite impracticable at present to obtain even an approximate idea of the extent of arca over which these beds range, and of the amount of fuel available. It can, however, be safely asserted that this amount is very large and most valuable. Assays of the Assain coals showed a proportion of ash not exceeding from 2 to 5 percent. The survey of the country is now being pushed forward. Neither copper nor silver are found in the province. Rock-salt is dug out of the earth, and brine springs are not uncommon, from which salt is made ; but the manufacture is costly, and the salt is as expensive as that imported from Liverpool.

VecETaBLE Propucts: Tra.—The most important artiele of commerce produeed in Assam is tea. The rice erop eovers a very great proportion of the eultivated land, but it is used for loeal eonsumption. The tea plantations oeeupy only a very small area, but they are the one great source of wealth to the provinee, and the neeessities of tea cultivation are the chief stimulants to the development of Assam. The plant was discovered in 1823 by Mr Robert Bruce, who had proceeded thither on a mereantile explora- tion. The country, however, then formed part of the Burmese dominions. But war with this monarehy shortly afterwards broke out, and a brother of the first diseoverer, happening to be appointed to the eommand of a division of

gun-boats employed in some part of the operations, fol- lowed up the pursuit of the subject, and obtained several hundred plants and a considerable quantity of seed. Some specimens were ultimately forwarded to the superintendent of the botanie garden at Calcutta. In 1832 Captain Jenkins was deputed by the Governor-General of India, Lord William Bentinek, to report upon the resourees of the eountry, and the tea plant was brought to his especial notice by Mr Bruce; in 1834 a minute was recorded by the Governor-General on the subjeet, to which it is stated that his attention had been called to it in 1827 before his departure from England. In aecordanee with the views of

that minute, a committee was appointed to proseeute in-

quiries, and to promote the eultivation of the plant. Com-_

munications were opened with China with a view to obtain fresh plants and seeds, and a deputation, eomposed of gentlemen versed in botanieal studies, was despatched to Assam. Some seeds were obtained from China; but they proved to be of small importanee, as it was clearly ascertained by the members of the Assam deputation that both the black and the green tea plants were indigenous here, and might be multiplied to any extent; another result of the Chinese mission, that of procuring persons skilled in the eultivation and manufacture of black tea, was of more material benefit. Subsequently, under Lord Auekland, a further supply of Chinese cultivators and manufacturers was obtained—-men well aequainted with the processes necessary for the produetion of green tea, as the former set were with those requisite for black. In 1838 the first twelve chests of tea from Assam were received in England. They had been injured in some degree on the passage, but ou samples being submitted to brokers, and others of long experience and tried judgment, the reports were highly favourable. It was never, however, the in- tention of Government to earry on the trade, but to resign it to private adventure as soon as the experimental course could be fairly completed. Mercautile assoeiations for the eulture and manufacture of tea in Assam began to be formed as early as 1839; and in 1849 the Government disposed of their establishment, and relinquished the mauufacture to the ordinary operation of commereial en- terprise. In 1851 the erop of the principal eompany was estimated to produee 280,000 ib. Sinee then the

enterprise has rapidly developed. The returns for 1871 show 11,475,398 tb of tea manufactured in Assain, against 9,511,517 in 1870, showing an increase of 1,963,881 Ib in one year. There were 416 gardens open, and the whole extent of land held under the different tenures for this purpose was 474,939 acres, of which 54,384 were reported to be under cultivation. The average monthly number of labourers employed on the tea gardens of As- sam during 1871 was 54,326, of whom upwards of 38,000 were imported under the Labour Transport Acts, ehiefly from the western distriets of Lower Bengal. It is to Le remembered that Assam now includes Caehar, and these statisties are for the whole provinee as constituted in 1874. Tea cultivation is steadily progressing in Assam, and has firmly established itself as a staple of Indian trade. Be- sides riee and tea, the other prineipal erops of Assam are pulses, Indian eorn, oil seeds, sugar-cane, pdn, hemp and jute, rhea grass, mulberry, potatoes, and other vegetables.

ANIMALS.—The zoology of Assam presents some interesting features. Wild elephants abound and commit many depreda- tions, entering villages in large herds, and consuming everything suitable to their tastes. Many are caught by means of female ele- phants previously tamed, and trained to decoy males into the snares prepared for subjecting them to captivity. A considerable number are tamed and exported from Assam every year, but the specula- tion appears to be rather precarious, as it is said about twice the number exported are annually lost in the course of training. Many are killed every year in the forests for the sake of the ivory which they furnish ; and the supply must be very great which can afford so many for export and destruction without any perceptible diminution of theirnumber. The rhinoceros is found in the denser parts of the forests, and generally in swampy places. This animal is hunted and killed for its skin and its horn. The skin affords the material for the best sliields. The horn is sacred in the eyes of the natives. Contrary to the usual belief, it is stated that, if caught young, the rhinoceros is easily tamed, and becomes strongly at- tached to his keeper. Tigers abound, and though many are annu- ally destroyed for the sake of the Government reward, their numbers seem scarcely, if at all, to diminish. Their destruction is some- times effected by poisoned arrows discharged from an instrument resembling a cross-bow, in which the arrow is first fixed, and a string connected with the trigger is then carried across

the path in front of the arrow, and fastened to a peg. The animal thus struck is commonly found dead at the distance of a few yards from

Leopards and bears are numerous; and the Arctonix Collaris of Cuvier, a small animal

somewhat resembling a bear, but having the snout, eyes, and tail of a hog, is found. Among the most formidable animals known is

the engine preparcd for his destruction.

the wild buffalo, which is of grcat size, strength, and fierceness.

Many deaths are caused by this animal, and a reward is given for its The fox and the jackal exist, and the wild hog is Goats, deer of various kinds, hares, and two or

destruction. very abundant. three species of antelope are found, as are monkeys in great variety. The porcupine, the squirrel, the civet cat, the ichneumon, and the otter are common. The birds are too various to admit of enumera- tion. Wild game is plentiful ; pheasants, partridges, snipe, and waterfowl of many descriptions make the country a tempting field for the sportsman. Vultures and other birds of prey are met with. Crocodiles (commonly called alligators) swarm in all parts of the Brahmaputra, and are very destructive to the fish, of which hun-

dreds of varieties are found, and which supply a valuable article of

food. The most destructive of the fere nature, as regards human life, are, however, the snakes, Of these, several poisonous species exist, including the cobra and karait (Naga tripudians and Bun- garus coeruleus), either of these species is deadly; aud it is ascertained that more deaths occur from snake-bite than from all the other wild beasts put together. Among the non-poisonous serpents, the python ranks first. This isan enormous boa-constrictor, of great length and weight, which drops upon his prey from the branch of a tree, or steals upon it in the thick grass. He kills his victim by rolling himself round the body till he breaks its ribs, or suffocates it by one irresistible convolution round its throat. He seldom or never attacks human

beings unless in self-defence, and loss of life from this cause is scarcely ever reported. Full details as to the botany and zoology of Assam will be found in Mr William Robinson's account of the province (Calcutta, 1841),

The Innasirants of the entire province number nearly two and a half millions, of whom more than one million and three-quarters are Hindus; 250,490 are Muhamma- dans, 1788 are Christians, and the remaining third of a million are hill tribes, professing aboriginal faiths. The native population is so exceedingly sparse that the demand for labour on the tea gardens has given rise to a system of importing coolies from western Bengal. A series of laws regulate the terms of the contract between the planter and the imported labourer, prevent abuses in recruiting coolies among the ignorant peasantry of the west, and provide for their health and comfort during their transit to the distant districts of Assam. Under these Acts 4988 labourers were imported into the tea districts of Assam (including Cachar) in 1871, the total number of imported labourers employed on the tea plantations at the end of that year being 39,426. A large proportion of the native inhabitants derive their origin from tribes who came from the Himalayan ranges, from Burmah, or from the Chinese frontier. The most important of these are the Ahams or Ahoms, an off- shoot of the Shan race of Northern Burmah. They were the last conquerors of Assam before the Burmese, and they long preserved their ancient traditions, habits, and institutions. Hinduism first made its encroachments among their kings and nobility. Several generations ago they gave up eating beef, and they are now completely Hinduised, except in a few remote recesses of Assam. Hinduism has also impressed its language upon the pro- vince, and the vernacular Assamese possesses a close affinity to Bengali, with the substitution of s for the Ben- gali ch, of a guttural & for the Bengali ' or sh, and a few other dialectic changes. Indeed, so close was the resem- blance that during the last thirty years Bengali was used as the court and official language of the province under our rule. But with the development of the country the Assamese tongue has asserted its claims to be treated as a distinct vernacular, and a late resolution of Government (1873) re-established it as the language of official life and public business.

The Assam peasant, living in a half-populated province, and surrounded by surplus land, is indolent, good-natured, and, on the whole, prosperous. He

raises sufficient food

The bite of a fairly-grown healthy serpent of

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for his wants with very little labour, and, with the excep- tion of a few religious ceremonies, he has no demand made upon him for money, saving the light rental of his fields. Under the peaceful influences of British rule, he has completely lost his ancient warlike instincts, and for- gotten his predatory habits. In complexion he is a shade or two fairer than the Bengali. His person is in general short and robust, but devoid of the grace and flexibility of the Hindu. A flat face, with high cheek-bones, presents a physiognomy resembling the Chinese, and suggests no idea of beauty. His hair is abundant, black, lank, and coarse, but the beard is scanty, and usually plucked out, which gives him an effeminate appearance. The women form a striking contrast to the men; there is more-of feminine beauty in them than is commonly seen in the women of Bengal, with a form and feature somewhat approaching the European. In most parts of the country the women of rank go about in public, without that artifi- cial modesty practised by native ladies in other parts of India. Although the ancient ruling classes originally came to the province across the Himalayas or from Burmah, a stream of immigration also went on from Ben- gal, and the Nadiy4ls or Doms, who originally emigrated from the Delta, are said to be the most numerous tribe in Assam. Their original employment was that of fishermen, Although a very low caste, and indeed one of the out- castes among the Hindus of Bengal, they observe in As- sam various rules of purity in eating and drinking, with a greater strictness than even the Brahmans. They have not, however, taken a Brdhman as their spiritual guide, but follow the instructions of the Kalités, the ancient priests of the Ahams. The habits of life of the Assamese peasantry are pre-eminently domestic. Great respect is paid to old age; when parents are no longer capable of labour they are supported by their children, and scarcely any one is allowed to become a burden to the public. They have also in general a very tender regard for their offspring, and are generous and kind to their relations. They are hospitable to people of their own caste, but to no others. The use of opium is very general among the Assamese.

Hit Trises.—The hill and frontier tribes of Assam are the Nagas, Singphos, Daphlds, Miris, Khamptis, Mataks, Abars, &c., nearly all of whom, excepting the Nagas, are found near the fron- tiers of Lakhimpur district. The principal of these, in point of numbers, are the Nagds, who inhabit the hills and forests along the eastern and south-eastern frontier of Assam. They generally live in small scattered communities of about twenty houses each, and are divided into numerous clans or khels, of which the six most important residing in British territory are the following, viz., the Namsangids, Bardwarias, Paindwérids, Laptangs, Kaimais, and Topigamaias. Exclusive of the Naga Hills district of Assam, the population of which is returned at 68,918, the Nagas of Lakhimpur count 2865 houses, with an estimated population of 14,383 souls. They cultivate rice, cotton, yams, and Indian corn, and prepare salt from the brine springs in their hills. The different tribes of N agas are independent of and unconnected with one another, and are often at war with each other. The Singphos are the most powerful tribe bordering on the Assam valley, and are scattered over the largest extent of country. Their territory is bordered on the north by the upper reaches of the Brahmaputra; on the south by the Patkai range; on the west by an imaginary line drawn south from the town of Sadiyaé to the Patkai mountains; on the cast by the Langtung mountains. They are a wild, daring tribe; and in the early days of English rule in Assam they gave a good deal of trouble by their frequent raids. They are now, however, looked upon as peaceful and friendly neighbours. They have settled down to agriculture, and now do for themselves what formerly they depended on their Assamese slaves to perform for them. They only cultivate sufficient food for a portion of the year, and during the remaining months they live upon wild yams and other jungle pro- ducts. The Government has no very definite relations with them ; but they are generally obedient, and in a loose way recognise British supremacy. The settlements of the Singphos in or near the fron- tier of Lakhimpur are estimated to number about 3485 souls. The other tribes are the Khaémtis Abars Miris Mishmis, and Daphlés,

Slavery, which existed in a mild form until our acquisition of Assam, has ceased under British rule.

ApMINISTRATION.—The administrative statistics of the province will be given separately for each of the ten dis- tricts mentioned in the foregoing table under their alpha- betical headings. Here it will suffice to say, that Assam as a whole is under a Chief Commissioner who is directly responsible to the Governor-General in council. The Assam districts form what is called a non-regulation province— i.e., one to which it has not been found expedient to extend our system of government in its strict legal entirety. Each district, instead of being under a judge and a magistrate-collector, with their separate sets of subordinates, is managed by a deputy-commissioner, in whom both the executive and judicial functions are combined. It is essentially an out- lying province, yielding very little revenue to Government, and administered as cheaply as practicable. With the exception of Goalpara, the land revenue of Assam is at present under a light temporary settlement, the permanent settlement not having yet been extended to it on account of its sparse population and backward state. The popula- tion is essentially agricultural, and no tendency appears on their part to gather into trading centres or to develop city life. Throughout the whole province there are only two towns with a population of upwards of 5000 souls, viz., Gauhati, population 11,492; and Sibsdgar, 5278. The various Government rules for 'granting waste lands in fee- simple or on long leases at easy rates, have brought a con- siderable number of English capitalists and speculators into the province. It is on these grants that many of the tea- gardens have been formed. The development of European enterprise has created a sudden and an urgent demand for roads, which the Government has hitherto not found itself in a position to meet. For all the ordinary purposes of the province, and for its heavy and bulky staples, such as timber, rice, food grains, and oil seeds, the Brahmaputra and its tributaries afford ample means of transit. The great trunk road, which the Muhammadans drove through 'Assam with a view to controlling the turbulent population, has long ago fallen into decay, and at many places is only recognisable as a line of fragmentary embankments. Each district, however, is now developing a system of roads, or at any rate of country tracks, of its own; and Sir George Campbell, the present Lieutenant-Governor of Bengal (1874), initiated a liberal policy towards the Assam

com- munications, with the view rather to the future of the province than to the amount of expenditure which its revenue at present warrants. Now that it is erected into a separate administration, a still more rapid progress may be looked for. With its vast forests, its inexhaustible rice- grounds, its coal, iron, and tea, and the cheap means of transit which its rivers afford, Assam, although at present one of the most backward among Indian provinces, has capabilities of development such as no other part of Bengal possesses. (w. W. H.)

ASSAROTTI, Orravio Grovanni Battista, the founder of schools for the education of deaf-mutes in Italy, was born at Genoa in 1753. "He received an excellent education ; and after qualifying himself for the church, he entered the society of the Pietists, "Scuole Pie," who devoted them- selves to the training of the young. His superior learning rendered his services very valuable, and he was appointed to lecture on-theology to the students of the order. In 1801 he heard of the Abbe Sicard's experiments in the training of deaf-mutes, and resolved to try something similar in Italy. He began with one pupil, and had by degrees collected a small number round him, when, in 1805, Napoleon, hearing of his endeavours, ordered a con- vent to be given him for a school-house, and funds for supporting twelve scholars to be taken from the convent

revenues. 'This order was scarcely attended to till 1811, when it was renewed, and in the following year Assarotti, with a considerable number of pupils, took possession of the new school. Here he continued, with the exception of a short interval in 1814, till his death in 1829. A pen- sion, which had been awarded him by the king of Sardinia, he bequeathed to his scholars. Nothing definite is known as to the method of instruction pursued by Assarotti; he seems, in fact, to have followed no fixed plan.

ASSASSINS, a secret military and religious sect formed

in Persia and Syria during the 11th century A.D. To understand clearly its nature and tenets, it is necessary to refer to the doctrines of the Ismaelites, of whom it was a branch, and who were themselves an offshoot from the great body of the Shiites. The Shiites, one of the two sects "nto which the Mahometans had separated, held in oppo- sition to the Sunnites, or orthodox, that the true and only legitimate successor of the Prophet was his

son-in-law, Ali. They did not succeed in establishing by force the claims of this family ; and, under the dynasties of the Ommiade and Abbaside caliphs, they were compelled to keep their opinions secret. The large body of Shiites was further divided into several distinct parties, differing principally with regard to the recognised line of succession from Ali; of these the most powerful was that of the Tsmaelites, so called because they held that the Imamat descended in an unbroken line from Ali to Ismael, his seventh successor. The adherents of this sect were most widely spread in Persia, and naturally the special object of their opposition was the Abbaside caliphate of Baghdad, but no active steps were taken by them, until under one of the Persian magi, Abdallah-ibn- Maimun Kadah, they had been organised into a secret society, with definite political objects and peculiar religious or philosophical views. Abdallah, like many of his countrymen, was a free-thinker, and he succeeded in establishing among the Ismaelites a faith, or rather a philosophy, wholly opposed to the doctrines of Islam. The funda- mental principles of his creed appear to have been— (1.) The rejection of all fixed rules either of religion or morality ; all actions were therefore indifferent, only the internal dis- position was of any value ; (2.) The belief that the Imams

of the line of Ismael were at present invisible, and that, consequently, it was the duty of true believers to yield implicit obedience to the vicegerents on earth of these secret rulers; (3.) The allegorical interpretation of the Koran, whereby any doctrine might be either defended or rejected. He also established a regular system of grades or a hierarchy of ranks among the members of the society ; only a few members were fully initiated into the philosophy of indifference, the others were kept in a state of profound ignorance, for the rulers knew how necessary this was in order to secure their obedience.

The first open attempt to put their principles into practice was made by one Ahmed, surnamed Karmath, whence his followers were called Karmathites. After a sanguinary struggle with the caliphs, lasting during many years, this revolt was quelled. But about the same time an adherent of the sect, named Abdallah, a lineal descendant of Ismael, escaped from prison, into which he had been thrown, and, making his way to Egypt, succeeded in placing himself upon the throne of that country. Under the name of Obeid-Allah-

Mahdi, he founded the dynasty ofthe Fatimites, who took their title from their ancestress, the daughter of Mahomet. Tsmaelism thus secured a firm footing in the west, and its doctrines were propagated there with great success. At Cairo a grand lodge was formed in which their philosophical principles were perfected, and the process of initiation carried on in its several grades. While this lodge was at the height of its prosperity there arrived in Egypt a learned daz or missionary of the Eastern

Ismaelites, called Hassan Ben Sabbah. The father of this man, @ native of Khorassan, and au adherent of the Shiites, had been frequently compelled to profess Sunnite ortho- doxy, and from prudential motives had sent his son to study under an orthodox doctor at Nishapur. Here Hassan made the acquaintance of Nizam-el-Mulk, afterwards vizier of the Sultan Malik-Shah, During the reign of Alp-Arslan he remained in obscurity, and then appeared at the court of Malik-Shah, where he was at first kindly received by his old friend the vizier. Hassan, who was a man of great ability, tried to supplant him in the favour of the sultan, but was outwitted and compelled to take his departure from Persia. He went to Egypt, and, on account of his high reputation, was received with great honour by the lodge at Cairo. He soon stood so high in the Caliph Mostansar's favour as to excite against him the jealousy of the chief general, and a cause of open enmity soon arose. The caliph had nominated first one and then another of his sons as his successor, and in consequence a party division took place among the leading men. Hassan, who adopted the cause of Nezar, the eldest son, found his enemies too strong for him, and was forced to leave Egypt. After many adventures he reached Aleppo and Damascus, and after a sojourn there, settled near Kuhistan, He gradually spread his peculiar modification of Ismaelite doctrine, and having collected a considerable number of followers, formed them into a secret society. In 1090 he obtained, it is said by stratagem, the strong mountain fortress of Alamut in Persia, and removing there with his followers, settled as chief of the famous society afterwards called the Assassins,

The speculative principles of this body were identical with those of the Ismaelites, but their external policy was marked by one peculiar and

distinctive feature—the em- ployment of secret assassination against all enemies, This practice was introduced by Hassan, and formed the essential characteristic of the sect. In organisation they closely resembled the western lodge at Cairo. At the head was the supreme ruler, the Sheikh-al-Jebal, 1.e., Chief, or, as it is commonly translated, Old Man of the Mountains. Under him were three Dai-al-Kirbal, or, as they may be called, grand priors, who ruled the three provinces over which the sheikh's power extended. Next came the body of Dais, or priors, who were fully initiated into all the secret doctrines, and were the emissaries of the faith. Fourth were the Refiks, associates or fellows, who were in process of initiation, and who ultimately advanced to the dignity of dats. Fifth came the most distinctive class, the Fedaies, or Fedais (i.e., the devoted ones), who were the guards or assassins proper. These were all young men, and from their ranks were selected the agents for any deed of blood. They were kept uninitiated, and the blindest obedience was exacted from and yielded by them. When the sheikh required the services of any of them, the selected fedais were intoxicated with the hashish, an opiate made from the juice of hemp leaves, and from which the name Assassin is derived. When in this state they were introduced into the splendid gardens of the sheikh, and surrounded with every sensual pleasure. Such a foretaste of Paradise, only to be granted by their supreme ruler, made them eager to obey his slightest command; their lives they counted as nothing, and would resign them at a word from him. Finally, the sixth and seventh orders were the Lasiks, or novices, and the common people. Hassan well knew the efficacy of established law and custom in securing the obedience of a mass of people; accordingly, upon all but the initiated, the observances of Islamism were rigidly enforced. As for the initiated, they knew the worthless- ness of positive religion and morality; they delieved in nothing, and scoffed at the practices of the faithful. The

Assassins soon began to make their power felt. One of their first victims was Hassan's former friend, Nizam-el- Mulk, whose son also died under the dagger of a secret murderer. The death by poison of the Sultan Malik-Shah was likewise ascribed to this dreaded society, and contri- buted to increase their evil fame. Sultan Sanjar, his successor, made war upon them, but he was soon glad to come to terms with enemies whose operations were in- visible, and against whom no precaution seemed available. After a long and

prosperous rule Hassan died at an advanced age in 1124. He had previously slain both his sons, one on suspicion of having been concerned in the murder of a dai at Kuhistan, the other for drinking wine, and he was therefore compelled to name as his successor his chief dai, Kia-Busurg-Omid.

During the fourteen years' reign of this second leader, the Assassins were frequently unfortunate in the open field, and their castles were taken and plundered ; but they ac- quired a stronghold in Syria, while their numerous murders made them an object of dread to the neighbouring princes, and spread abroad their evil renown. A long series of distinguished men perished under the daggers of the fedais; even the most sacred dignity was not spared. The Caliph Mostarschen-ali-Mansur was assassinated in his tent, and not long after, the Caliph Rashid suffered a similar fate. Busurg-Omid was succeeded by his son Mahomet I., who, during the long period of 25 years, ruthlessly carried out his predecessor's principles. In his time Massiat became the chief seat of the Syrian branch of the society. Mahomet's abilities were not great, and the affections of the people were drawn towards his son Hassan, a youth of great learning, skilled in all the wisdom of the initiated, and popularly believed to be the promised Imam become visible on earth. The old sheikh prevented any attempt at insurrection by slaying 250 of Hassan's adherents, and the son was glad to make submission, When, however, he attained the throne, he began to put his views into effect. On the 17th of the month Ramadan, he assembled the people and disclosed to them the secret doctrines of the initiated; he announced that the doctrines of Islam were now abolished, that the people might give themselves up to feasting and joy, for he was the promised Imam, the Caliph of God upon earth. To substantiate these claims he gave out that he was not the son of Mahomet, but was descended from Nezar, son of the Egyptian Caliph Mostansar, and a lineal descendant of Ismael. After a short reign of four years Hassan was assassinated by his brother-in-law, and his son Mahomet II. succeeded. One of his first acts was to slay his father's murderer, with all his family and relatives; and his long rule, extending over a period of 46 years, was marked by many similar deeds of cruelty. He had to contend with many powerful enemies, especially with the great Atabeg Sultan Noureddin, and his more celebrated successor, Jusuf Salaheddin, or Saladin, who had gained possession of Egypt after the death of the last

Fatimite caliph, and against whom even secret assassination seemed powerless. During his reign, also, the Syrian branch of the society, under their duz, Sinan, made themselves independent, and re- mained so ever afterwards. It was with this Syrian branch that the Crusaders made acquaintance; and it appears to have been their emissaries who slew Count Raymond of Tripoli and Conrad of Montserrat. J

Mahomet IIT. died from the effects of poison, adminis- tered, it is believed, by his son, Jelaleddin Hassan IIL, who succeeded. He restored the old form of doctrine,— secret principles for the initiated, and Islamism for the people,—and his general piety and orthodoxy procured for him the name of the new Mussulman. During his reign of 12 years no assassinations occurred, and he obta‘ned

a high reputation among the neighbouring princes. Like his father, he was removed by poison, and his son, Ala- eddin Mahomet IIL, a child of nine years of age, weak in mind and body, was placed on the throne. Under his rule the mild principles of his father were deserted, and a fresh course of assassination entered on. In 1255, after a reign of 30 years, Alaeddin was slain, with the connivance of his son, Rokneddin, the last ruler of the Assassins. In the following year Hulaku, brother of the Tatar, Mangu Khan, invaded the hill country of Persia, took Alamut and many other castles, and captured Rokneddin. He treated him kindly, and, at his own request, sent him under escort to Mangu. On the way, Rokneddin treacherously incited the inhabitants of Kirdkuh to resist the Tartars. This breach of good faith was severely punished by the khan, who ordered Rokneddin to be put to death, and sent a mes- senger to Hulaku commanding him to slay all his captives. About 12,000 of the Assassins were massacred, and their power in Persia was completely broken. The Syrian branch flourished for some years longer, till Bibars, the Mameluke sultan of Egypt, ravaged their country and nearly extirpated them. Small bodies of them lingered about the mountains of Syria, and are believed still to exist there. Doctrines somewhat similar to theirs are to be met with among the Druses, and particularly among the Ansarii or Nosarii, a small Syrian people, dwelling not far from Latakia. Some writers have thought that these Ansarii are the remnants of the

Assassins, but this does not seem possible, for the two sects are at enmity, and in 1809 the stronghold of Massiat, then in possession of some Ismaelites, was attacked and pillaged by the Ansarii.

See Von Hammer, Geschichte der Assassinen, 1818; De Sacy, Mémoires de I Institut, iv., 1818, who discusses the etymology fully ; Calcutta Review, vols. lv. lvi.; A. Jourdain in Michaud's Histoire des Croisades, ii. pp. 465-484, and translation of the Persian historian Mirkhond in Notices et Extratts des Manuscrits, xiii. p. 143, sg. On the Ansarii, see Michaud et Poujoulat, Correspondance d' Orient, vi. p. 458, sg.; and F. Walpole, The Ansayrit, or Assassins, 3 vols., 1851.

ASSAULT, in English Law, is defined "as an attempt or offer with force or violence to do corporal hurt to another, as by striking at another with a stick or other weapon, or without a weapon, though the party misses his aim." Notwithstanding ancient opinions to the contrary, it is now settled that mere words, be they ever so provoking, will not constitute an assault. Coupled with the attempt or threat to inflict corporal injury, there must in all cases be the means of carrying the threat into effect. A battery is more than a threat or attempt to injure the person of another ; the injury must have been inflicted, but it makes no difference however small it may be, as the law does not "draw the line between degrees of violence," but " totally prohibits the first and lowest stage of it." Every battery includes an assault. A common assault is a misdemeanour, and is punishable by one year's imprisonment with hard labour, but severer penalties are provided for the various kinds of aggravated assaults.

ASSAYE, a village of Haidar4b4d, in the Nizdm's dominions, in Southern India, situated in 20° 18' N. lat. and 75° 55' E. long. The place is celebrated as the site of a battle fought on the 23d September 1803 between the combined Marhatté forces under Sindhid and the Raja of Berar and the British under Major-General Wellesley, after- wards the Duke of Wellington. The Marhatta force con- sisted of 50,000 men, supported by 100 pieces of cannon entrenched in a strong position. Against this the English had but a force of 4500 men, which, however, after a severe struggle, gained the most complete victory that ever crowned British valour in India. Assaye is 261 miles N.W. of Haidardbad.

ASSAYING. This term is used in metallurgy to denote a chemical operation in which the quantity of one ingredient

of a mineral or alloy is determined ; it is chiefly used in reference to the precious metals, gold and silver, and it is in this connection that the subject will here be treated of. In the wider acceptation of the term in which it is used amongst practical metallurgists, assaying means almost the same thing as the quantitative estimation of one constituent of a compound, when the process adopted is one which has to be frequently repeated in a laboratory, and the results are required for commercial purposes. In this sense we speak not only of the assay of goldand silver, but of other nietals, such as lead and copper, of non-metallic elements, such as sulphur and iodine, and even of compounds such as nitre, The operations of assaying were, until receutly, chiefly performed by what is called the dry method, but of late years the processes of volumetric analysis have been so largely introduced into the metallurgical laboratory, that the wet method is almost as much used as the dry method. In the processes of assaying the precious metals described in the following pages, the reader will have both these terms explained, for gold is assayed in the dry, while silver is assayed in the wet way.

The precious metals, gold and silver, being almost uni-

versally used as convenient representatives of value, and as

such passing frequently between one country and another,

it is of the utmost importance to ascertain, quickly and

accurately, the marketable value of any sample of gold or silver bullion. Were these metals invariably used in their pure state, their commercial value would be in direct pro- portion to their weight, and all that would have to be known would be the actual value ofa pound of gold or silver ; but the metals exist in commerce in the form of alloys or mixtures containing au indefinite amount of base metal. Gold is generally alloyed with copper and silver, whilst silver is generally alloyed with copper. The problem is, therefore, to ascertain by some ready process, which admits of extreme accuracy as well as moderate rapidity, the exact proportion of pure

gold present in an alloy, ore, or mixture containing this metal; and inasmuch as silver is also a precious metal, the assay of gold almost always involves the assay of the silver which accompanies it, for in many cases the amount of silver present may be sufficient to increase the commercial value of the substance under assay. It is very seldom, however, that the copper or other metal present is in sufficient quantity to be of value, unless, in- deed, the substance under assay be a copper ore or pyrites containing only traces of gold. In the case of silver assay, when the base metal is copper, it is generally neglected. It is, however, frequently necessary to examine silver for gold, for, formerly, the methods of parting these two precious metals were by no means so exact as they are now, and on this account old silver frequently contains an amount of gold which it will pay well to extract by modern methods. 'The principle of assaying gold and silver is very simple theoretically, but in practice great experience is necessary to ensure accuracy, and there is no branch of business which more demands personal and undivided attention.

All substances containing gold may be divided into two classes. The first class comprises ores containing gold in a mineralised form. These include graphic tellurium and foliated tellurium, and are of no commercial importance. For the present purpose, we need simply mention the substances in the second class, which consist of alloys of gold, and include native gold, containing from 65 to 99 per cent. of gold; palladium gold, containing about 86 per cent. of gold; rhodium gold, containing from 59 to 66 per cent. of gold; gold amalgam, containing 38 per cent. of gold; and artificial alloys, as gold coin, jewellery, &c. Of the foregoing list, the only alloys which are of commercial importance are, native gold and artificial alloys, Native

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gold is commonly found in a quartzose gangue, and nearly always associated with iron and copper pyrites, mispickel or arsenical pyrites,

blende, galena, many antimonial minerals, and nearly all the primitive rocks.

The only artificial alloys of gold which will be specially noticed here are the standard gold of this realm, and alloys of gold with silver or copper used for jewellery. The stan- dard of alloys of gold is expressed in fractions of unity. It is assumed that there are 24 carats in unity, and $3nds in the carat. Standard gold, in the 24 carats, contains 22 carats of pure or fine gold, as it is called, and two carats of alloying metal, either silver or copper, or a mixture of the two. Standard gold is, therefore, called 22-carat gold. In a similar way articles of jewellery are denominated 12-carat, 16-carat, 18-carat, &c., according to the propor- tion of fine gold alloyed with the inferior metal. An ordi- nary assay report of gold expresses the variation from the standard, and not the fine metal contained in it, and it is, therefore, marked as either better or worse than standard. The standard of gold being 22 carats fine and 2 alloy, an ingot of gold found to contain only 21 carats pure gold would be reported worse 1 carat. If it contained 234 carats, it would then be reported better 14 carat.

The processes by which gold is generally assayed are cupellation, when the alloy consists of copper, and part- ing, when the alloy consists of silver. Generally speaking, both operations are necessary. We will describe them as they would be performed in practice. When the stan- dard of the alloy to be examined is not approximatively known, a preliminary assay must be made to ascertain the quantity of lead necessary to fuse with the gold alloy. But in most cases this is unnecessary, as, from the circum- stances of the case, the standard of the alloy is generally known within sufficiently close limits.

The process of cupellation is briefly as follows :—The gold alloy is fused with a quantity of lead, and a little silver if silver is already present. The resulting alloy, which is called the lead button, is then submitted to fusion on a very porous support, made of bone-ash, and called a cupel. The fusion being effected in a current of air, the lead oxidises. The heat is sufficient to keep the resulting oxide of lead fused, and the porous cupel has the property of absorbing melted oxide of lead without taking up any of the metallic globule, exactly in the same way that blotting-paper will absorb water

whilst it will not touch a globule of mercury. The heat being continued, and the current of air always passing over the surface of the melted lead button, and fhe oxide of lead or litharge being sucked up by the cupel as fast as it is formed, the metallic globule rapidly diminishes in size until at last all the lead has been got rid of. Now, if this were the only action, little good would have been gained, for we should simply have put lead into the gold alloy, and then taken it out again ; but another action goes on whilst the lead is oxidising in the current of air. Other metals, except the silver and gold, also oxidise, and are carried by the melted litharge into the cupel. If the lead is therefore rightly propor- tioned to the standard of alloy, the resulting button will consist of only gold and silver, and these are separated by the operation of parting, which consists in boiling the alloy (after rolling it to a thin plate) in strong nitric acid, which dissolves the silver and leaves the gold as a coherent sponge. To effect this parting properly, the proportion of silver to gold should be as 3 to 1. The operation by which the alloy is brought to this standard is termed quartation or inquartation, and consists in fusing the alloys in a cupel with lead and the quantity of fine silver or fine gold neces- sary to bring it to the desired composition.

What is called the Z'rial of the Pyx is an ancient cere- mony which takes place about once in every three years, at

which the standard coin of the realm is carefully assayed. For a description of this see the article ComnacE.

It is unnecessary in the present work to describe the various delicate operations which we have briefly alluded to above, but we will describe the implements and furnaces which have been introduced and adopted in the Royal Mint by Mr H. W. Field, the late resident assay-master of that establishment.

Fig. 1 is the front elevation of the furnace; a, a view of the front iron roller on which it rests; b, the ash-pit ; cc are the dampers moving horizontally from side to side towards each other, meeting exactly in the centre; d, the muffle door by which the as- says are introduced ; ee, the door slides. So far, the furnace is similar to that formerly in use, except that the bars on

which the muffle stands run from front to back, and are movable, ren- dering the removal of the brick-work unneces- sary. By this means the muffle stand is easily introduced, and, having steady pins on the under side, it is raised about an inch above the bars. The furnace measures 2 feet 10 inches in height, | foot 7 inches in width, and 1 foot 11 inches in depth. Instead of the furnace, as formerly, be- ing fed at the top, the fuel is charged by the doorh, which also affords the means of regulating the draught, and of throwing a current of ; air through the muffle by the door d. "This door has a bar &, traversing about two-thirds of it, running easily from the top towards the bottom within «, with a ketch m, on each side to keep it close. These are made on an incline, and about 34 inches long, so as to allow the travers- ing bar to slide freely when the door is not required to be closed. In this manner the door may be opened from a quarter of an inch to the extent of three inches. This feeding and regulating door is fixed by hinges W to the front part of the don frame covering the brick lining on the top of the furnace. On this frame rests the square dome r, the front of which, w, is removable by two handles nn ; and by taking out the two thumb-screws 00, the door and part of the frame come away, leaving a large opening, so as to enable the furnace to be cleaned, the muffle repaired, &c. The furnace should be placed in a recess, under a chimney, with a movable iron ceiling ¢, about 1 foot above the dome, fitting close in every part, so that the draught of air may pass through the furnace. A door, or flap, 2, is attached to the iron ceiling by a hinge opening on the side of the recess, with means to fix it at any point required, so that the current of air may be regulated by the operator ; s, a swivel door affords another mode for damping the furnace.

Fig. 2 is a section of the furnace fig. 1; aa, the two rollers on which the furnace is placed; 00, the slides on which the

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Fig. 1.—Front elevation of Furnace.

ash-pit doors run; ¢, the door and ash-pit; d, the iron casing to the furnace; e, the brick lining; f, the ash-pit ; gg, the two bars inserted in the brick lining,—one in front, one at the back, supporting the furnace bars, which can easily be remov- ed at pleasure; h, one of the bars on which the mufile plate rests; 2, a movable tray on which the mouth coal is placed ; k, a section of a mufile charged with its full complement of 50 cupels, showing also the rows of holes over each row of cu- pels, through which a current of air passes; similar holes are placed at the back in three rows; they are : not pierced through pr' CRERR Es horizontally, but slope

towards the ceiling of OT it the muffle at such an angle so as to exclude g/}J

CA

the ashes; / represents the extra covering of fire-clay ; m, the an- w@ thracite coal, showing

the level; n, the feed-

ing and regulating door ; 0, the ketch or inclined plane on which the sliding-bar travels; p, the door, with running staples in which the bar slides; g, the mode in which the movable front is brought round and fixed by the thumb- screws r; sv, the hood; ¢, handle for removing the front; wa, the damper and handle.

Fig. 3 represents the upper interior view of the furnace bars with the mufile stand or jam plate, showing also the space in- tended for the fuel.

Fig. 4 is the mouth of the muffle door, representing the mode of regulating the current of air by cylinders of charcoal.

Fig. 5 is the movable muffle door.

Fig. 6 is a representation of a muffle, 143 inches long, 7} in- ches wide, until it begins to taper at about 14 inches from the front (see fig. 7), when it

does not ex- ceed 54 inches. The height is 64 inches, in the clear 53 inches. Its sides are perforated with holes about a quarter of an inch in diaineter.

Fig. 8 is an annealing-iron for softening the assays after they are flattened and rolled. It resembles a square bar of iron about 4th of an inch thick, having strengthening

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Fria. 2.—Section of Furnace.

Fia. 3.—Section of Furnace.

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Fig. 5.

pieces rivetted at each end and two in the middle bbd8,

between which are receiving places for the assays aaa. The apertures are made

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the box, so that they may be conveniently removed. The under part of the box has a kind of double keel d rivetted on it, so that in taking it from the furnace there be no danger of upsetting it on the annealing trident.

Fig. 9 represents the trident for removing the annealing- iron from the furnace.

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Fria. 8.—Annealing Iron.

Fra. 9.—Trident.

Fig. 10 represents the cupel mould; fig. 11 being the section of the same, showing the four pieces of which it consists. The mould is circu- lar, made of forged steel nicely turned. There are several substances of which cupels may be made, but the one in general use is the ash of burnt bones. This consists princi- pally of phosphate of lime, with a little carbonate and some fluoride of calcium. The bones of sheep and horses are best for cupels. They should be burnt until they are quite white, care being taken not to heat the bone-earth too strong- ly. It must then be finely ground, sifted, and washed Fic. 10.—Cu- several times with boiling dis- Pe! Mould.

tilled water till all soluble salts Fia. 11. —See- areremoved. The finest par- oe br Cupel ould,

ticles of the powdered bone- earth will remain longest suspended in the washing waters. This must be allowed to settle separately, and should be reserved for giving a final coating to the surface of the cupels. For the body of the cupels the bone-ash should be about as fine as wheat flour. The bone-ash being moistened with a quantity of water, just sufficient to make the particles adhere, is put into the mould a, fig. 11, and pressed down level with the surface. The mould is then put together, as in fig. 10, and the pestle struck with a hammer so as to compress the bone earth into a solid cake. The surface of the cupel may then have sifted over it a little of the very fine levigated bone-ash, and the pestle again hammered on it. The pestle is to be turned lightly round so as to smooth the inner surface of the cupel, and then withdrawn, The cupel is removed from the mould by gentle pressure on the

narrowest end. It must be dried gently by a stove, and lastly ignited in a muffle to expel all moisture. It is then ready for use.

Fig 12 shows the appearance of the finished cupel, which is generally 1 inch by ths of an inch. na id

The lead used in capellation should be of the pk ; greatest purity, because, as most lead contains a smal] portion of silver, this silver would necessarily combine with the assay and vitiate the accuracy of the result. Another important consideration is the guantity of lead to be used with each. assay. This information is generally obtained by an ex- perimental assay, unless, as most frequently happens, the circumstances of the case enable the assayer to judge the.

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approximate standard of the alloy with sufficient accuracy. The sample of gold alloy is either cut from a corner, or drilled out of the centre of an ingot, care being taken to secure uniformity of composition with the whole mass. The amount of lead to be added to the alloy varies with the proportion of base metal present; as a rule, from 10 to 20 parts are required to 1 of alloy.

The amount of lead having been determined, the alloy is wrapped up in a known quantity (say one-half of that required for its purification), formed into a case somewhat resembling a thimble, great care being taken to make the joints firm and close so that no gold shall escape. The re- quisite quantity of silver is added at the same time. When a number of assays are made at the same time, they are arranged, enveloped in their lead cases, on a board divided into compartments corresponding in number and position with the cupels into which they are intended to be charged. As the assayer generally makes two or more trials of the same piece, so that great accuracy may be secured, it is his practice to give one assay a side place in the mufile, and the second a middle one, in order to check any irregularity in the result. When a sufficient number of assays are weighed and arranged upon the board in the manner referred to, and the furnace as well as the cupels raised to the neces- sary point of heat, the charging tongs are then taken, and the rest of the lead and silver apportioned to each assay placed individually upon the cupels, beginning at the back of the mufile. The lead

added in this case is not flattened, but is a piece of known weight—various sizes of which, as well as cases, are kept in stock by the assayer. The lead so placed in the furnace rapidly melts, and becomes covered with a gray oxide, but soon after appears fluid and bright: At this point the assays are added by means of a pair of tongs (fig. 13), great care being taken that no part overhangs or touches the edge of the cupel. The assays are thus drawn into the mass of molten lead, and any particles of gold are in this manner prevented from adhering to the sides of the cupels in charging, sufficient despatch being used to obviate the fusion of the assay in its trausition, The assays being charged in order on their respective cupels, and the furnace previ- ously filled with fuel, the door of the muffle is partly closed, and the progress of the cupellation watched. Too much air must not enter, or the muffle will be chilled and the progress retarded, whilst if too little enters the operation will be too Fig. 18. slow.

At first dense fumes will be observed to rise from the melted metal, indicating the oxidation and subsequent volatilisation of the lead. These after continuing some time are followed by the appearance of small luminous points on the surface, which increase in size and brilliancy as the operation progresses. Then a minute stream of red fused oxide of lead is seen to flow from the top of the metal globule and circulate round, when it is carried down and absorbed by the cupel. This is caused by the oxida- tion of the lead by the air, which at the same time oxidises the other metals, except silver, which accompany the gold. As the cupellation advances the fumes gradually lessen in density till they disappear altogether. The melted button at this stage is observed to become more convex and round, and as the last vestiges of the lead and alloy are being carried off, it assumes a cloudy appearance on the surface, changing to large bright points of the fused oxide, till at length it is nearly freedfrom all impurity. At this point the gold-silver alloy displays some singular and beautiful characteristics. Deprived of all the base alloy save the last minute portion that tarnished its lustre, it has become bright and pure, and finally it gives forth from its surface

iridescent circulating bands of light, which indicate the suc- cessful completion of the operation. The globules after being cooled, are removed from the cupels with a pair of pincers and carefully cleaned. They are then placed in their com partments and weighed with the greatest nicety. Finally, they are submitted to the operation of parting. This is effected by boiling with strong nitric acid, which dissolves the silver and leaves the gold as a sponge. The gold-silver globule is first passed through a flattening mill, and reduced to long thin strips, which are annealed and then rolled up into a corkscrew spiral, so that the acid may penetrate between each fold. 'The spirals are now transferred in order to small platinum cups arranged on a frame, so that they can be simultaneously lowered into and removed from the nitric acid. They are kept in the hot acid for the requisite time, then washed, and the residual gold sponge, which possesses considerable coherence, and retains the shape of the original spiral, is carefully dried and finally weighed with the greatest possible accuracy.

We shall now proceed to describe briefly the process of silver assay. The cupellation process does not differ except in details from that of gold,—the outline already given will, therefore, be a sufficient description. Like gold, silver occurs in two classes of combinations,—mineralised, as in red silver ore, chloride of silver, argentiferous galena, &e., or as metallic silver and its alloys. In metallurgi- cal establishments, where silver occurs in small propor- tion with metallic sulphides, such as those of lead or copper, the process of cupellation is generally adopted not only for quantitative estimation of the amount of silver present in the ore, but also for its extraction on the large scale. In the assay of silver bullion, however, the process of cupellation is now almost entirely superseded by a volumetric process, devised by the distinguished French chemist, Gay-Lussac, by whose influence it was introduced into the Paris Mint. The process consists in determining the fineness of silver bullion by the quantity of a standard solution of common salt necessary to precipitate fully and exactly the silver contained in a known weight of alloy. This process is based on the following principles :—

The alloy previously dissolved in nitric acid is mixed with a standard solution of common salt, which precipitates the silver as chloride, a compound perfectly insoluble in water and even inacids, The quantity of

chloride of silver precipitated is determined not by its weight, which would be less exact, and occupy too much time, but by the weight or volume of the standard solution of common salt neces- sary to precipitate exactly the silver previously dissolved in nitric acid. The term of complete precipitation of the silver can be readily recognised by the cessation of all cloudiness when the salt solution is gradually poured into that of the nitrate of silver. One milligramme of that metal is readily detected in 150 grammes of liquid,.and even a half or a quarter of a milligramme may be detected if the liquid be perfectly bright before the addition of the salt solution. By violent agitation during a minute or two, the liquid, rendered milky by the precipitation of chloride of silver, becomes sufficiently bright after a few moments' repose to allow of the effect of the addition of half a milligramme of silver to be perceptible. Filtration of the liquid is more efficacious than agitation; but the latter, which is much more rapid, generally suffices. The presence of copper, lead, or any other metal, with the exception of mercury in the silver solution, has no sensible influence on the quantity of salt required for precipitation ; in other words, the same quantity of silver, pure or alloyed, requires for its precipitation a constant quantity of the standard salt solution. Supposing that 1 gramme of pure silver be the quantity operated on, the solution of salt required to precipitate exactly the whole of the silver ought to be of

such strength that, if it be measured by weight, it shall weigh exactly 100 grammes, or if by volume, 100 cubic centimetres. This quantity of salt solution is divided into 1000 parts, called thousandths. The standard of an alloy of silver is generally the number of thousandths of solution of salt necessary to precipitate the silver contained in a gramme of the alloy.

The operations of assaying depend for their accuracy on the perfection of the balance used to ascertain the weights of the metals taken, and the resulting globules. In a good assay balance three essentials are indispensable :—(1.) It should be quick in its action ; (2.) It should be constant and uniform; (3.) It should be extremely sensitive and delicate, indicating the minutest shades of difference. Assay balances, as now constructed, are capable of indicat- ing a difference of the ten-thousandth of

a grain. Fora description of the modern chemical balance, see article BALANCE, (w. c.)

ASSELYN, Hans, a celebrated Dutch painter, was born at Antwerp iu 1610, and died at Amsterdam in 1660. He received instruction from Esaias Vandervelde, and distin- guished himself particularly in landscape and animal paint- ing, though his historical works and battle-pieces are also admired. He travelled much in France and Italy, and modelled his style greatly after Bamboccio (Peter Laer). He was one of the first Dutch painters who introduced a fresh and clear manner of painting landscapes in the style of Claude Lorraine, and his example was speedily followed by other artists. Asselyn's pictures were in high estimation at Amsterdam, and several of them are in the museums of that city. Twenty-four pieces of landscapes and ruins, which he painted in Italy, have been engraved by Perelle.

ASSEMANT, the name of a Syrian Maronite family of famous Orientalists.

(1.) Josep Simon, a Maronite of Mount Lebanon, was born in 1687. When very young he was sent to the Maronite college in Rome, and was transferred thence to the Vatican Library. In 1717 he was sent to Egypt and Syria to search for valuable MSS., and returned with about 150 very choice ones, The success of this expedition induced the Pope to send him again to the East in 1735, and he returned with a still more valuable collection. On his return he was made titular archbishop of Tyre and librarian of the Vatican Library. He instantly began to carry into execution most extensive plans for editing and publishing the most valuable MS. treasures of the Vatican. His two great works are the Bibliotheca Orientalis Clem- entino-Vaticana rec. manuscr. codd. Syr., Arab., Pers., Turc., Hebr., Samarit., Armen., Aithiop., Greec., Aigypt., [ber., et Malab., jussu et munif. Clem. XI., Rome, 1719-28, nine vols. folio, and Lphraemi Syri opera omnia que extant, Gr., Syr., et. Lat., 6 vols. folio, Rome, 1737-46. Of the Bibliotheca the first three vols. only were completed. The work was to have been in four parts—(1.) Syrian and allied MSS., orthodox, Nestorian, and Jacobite; (2.) Arabian MSS., Christian and Mahometan ; (3.) Coptic, Aithiopic, Persian, and Turkish MSS.; and (4.) Syrian and Arabian MSS. not distinctively

theological ; only the first part was completed, but extensive preparations were made for the others. There is a German abridgement by A. F. Peiffer.

(2.) JosepH Axoysius, brother of Joseph Simon, and professor of Oriental languages at Rome. He died in 1782. Besides aiding his brother in his literary labours, he published, in 1749-60, Codex Liturgicus Ecclesie Universe in xv. libris (this is incomplete), and Comment. de Catholicis sive Patriarchis Chaldeorum et Nestorianorum, Rome, 1775.

(3.) SrEpHEN Evoprus, nephew of Joseph Simon and Joseph Aloysius, was the chief assistant of his uncle Joseph

Simon in his work in the Vatican Library. He was titular archbishop of Apamea in Syria, and held several rich pre- bends in Italy. His literary labours were very extensive. His two most important works were a description of certain valuable MSS. in his Bibliothecee Mediceo-Laurentiane et Palatine codd. manuscr. Orientalium Catalogus, Flor. 1742, fol., and his Acta SS. Martyrum Orientalium. He made several translations from the Syrian, and in conjunc- tion with his uncle, he began the Bibliothecee Apostol. Vatie. codd, manusc. Catal., in tres partes distributus. Only three vols. were published, and the fire in the Vatican Library in 1768 consumed the manuscript collections which had been prepared for the continuation of the work.

(4.) Srmon, grandnephew of Joseph Simon, was born at Tripoli in 1752, and was professor of Oriental languages in Padua. He died in 1820. He is best known by his masterly detection of the literary imposture of Vella, which claimed to be a history of the Saracens in Syria.

ASSEN, a town of the Netherlands, capital of the pro- vince of Drenthe, containing 6836 inhabitants. It lies 16 miles south of Groningen, is connected with the Zuyder- Zee by the Smilder canal, has a considerable trade in corn and peats. There are a number of highly interesting tumuli in the neighbourhood, in which various relics have been found, which are now deposited in the museum at Leyden.

ASSENS, a town of Denmark, on the west coast of Fiihnen, the ordinary port for the traffic between that island and Schleswig. In 1535 it was stormed by John of Ranzau, and afterwards plundered and dismantled ; but its fortifications, of which traces are still to be found, were restored in 1628. Population, 3581. Long, 9° 55' E., lat, 55° 15' N,

ASSER, Joun, or AssERIUs MENEVENSIS, was born in Pembrokeshire, and educated in the monastery of St David's by the Archbishop Asserius, who, according to Leland, was his kinsman. Here he became a monk, and by his assiduous application soon acquired universal fame as a person of great abilities and profound learning. King Alfred, always a munificent patron of genius, about the year 880 sent for him to court, and made him his preceptor and companion. Asa reward for his services, the king appointed him abbot of two or three different monasteries, and at last promoted him to the episcopal see of Sherborne, where he died in the year 910. He was, says Pits, a man of happy genius, wonderful modesty, extensive learning, and great integrity of life. He wrote the life of Alfred (De Vita et Rebus Gestis Alfredt), in 893, apparently for the use of his Welsh countrymen. The authenticity of this work was denied by Mr Wright (in his Biographia Britannica Literaria), who thought it was the production of some monk of St Neots about the end of the 10th century. In this, however, he has had few followers, and the work is generally believed to be Asser's, though somewhat. inter- polated. It was first published by Archbishop Parker at the end of Walsingham's Hist. Lond., 1574. The best editions are those of Wise (8vo, Oxon., 1722), and of Thorpe in his edition of Florence of Worcester for the English Historical Society. An English translation is to be found in Bohn's Antiquarian Library.

ASSESSOR, among the Romans, was a term generally applied to a train .d lawyer who sat beside a governor of a province or other magistrate, to instruct him in the adminis- tration of the laws. The system is still exemplified in Scotland, where it is usual in the larger towns for municipal magistrates, in the administration of their civil jurisdiction, to have the aid of professional assessors. In municipal corporations in England, officers with the same name are appointed to assist at the election of councillors and ascertain the result, By the recent English Judicature Act, provision

is made for trial of matters of fact by the judge with asses- sors instead of by jury, when parties so desire.

ASSETS, a technical English law word, derived through the old Norman phraseology from the same source as the French assez, enough, and signifying the property of a debtor available for the satisfaction of his creditors. Thus the property of a bankrupt is termed his assets, and is the fund out of which his liabilities must be paid. When a person dies, the goods which come to executors or administrators are called assets personal; the lands descending to the heir, are assets real. The former are the primary and natural fund out of which the debts of the testator or intestate of every description must be paid. 'The latter, by 3 and 4 Will. IV. c. 104, are also available, after the personal estate is exhausted, and preference is given to credi- tors by specialty over creditors by simple contract When one of two claimants may go to either fund, and the other is restricted to one fund only, if the first claimant has re- course to the fund open to both, equity will permit the other claimant to stand in the place of the first against the other fund. This is called marshalling the assets. If, for example, before the statute 3 and 4 Will, IV. c. 104, a special creditor, who might claim against either the real or the personal assets, satisfied his debt out of the latter, a creditor by simple contract, having the latter only to claim against, would be permitted to stand in place of the specialty creditor against the real estate.

ASSIDEANS, in Greek 'Acidato, is a transcription of the Hebrew chastdim, pious ones, a word frequent in the Psalms (xxxvii, 28, Ixxix. 2, &c.,—E.V. generally saints), In the first book of Maccabees the name of Assideans appears as the designation of a society of men zealous for the law (1 Mac. ii. 42, according to the correct text as given by Fritzsche), and closely connected with the scribes (1 Mae, vii. 12,13). It is plain from these passages that this society of "pious ones," who held fast to the law under the guidance of the scribes in opposition to the "godless" Hellenising party, was properly a religious, not a political organisation. For a time they joined the revolt against the Seleucids. But the direct identification of the

Assideans with the Maccabee party in 2 Mac. xiv. 6 is one of the many false statements of that book, and directly contradic- tory to the trustworthy narrative of 1 Mac. vii., which shows that they were strictly a religious party, who scrupled to oppose the legitimate high priest even when he was on the Greek side, and who withdrew from the war of freedom as soon as the attempt to interfere with the exercise of the Jewish religion was given up. Under the Asmonean rule the Assideans developed into the better known party of the Pharisees, and assumed new relations to the ruling dynasty. It appears, however, from the Psalter of Solomon that the party continued to affect the title of "pious ones." Most recent inquirers hold that the Essenes as well as the Pharisees sprung from the Assideans (Ewald's Geschichte, vol, a Wellhausen, Die Pharister und die Sadducder,

1874).

ASSIGNMENT, Assitanatron, ASSIGNEE, are terms which, as derivatives of the verb assign, are of frequent technical use in the law of the different parts of the United Kingdom. 'To assign is to make over, and the term is generally used to express a transference by writing, in con- tradistinction to a transference by actual delivery. In England the usual expression is assignment, in Scotland it is assignation. 'The person making over is called the assignor or cedent ; the recipient, the assign or assignee.

ASSISI (ancient Asistwm), a city of Italy in the province of Perugia. It contains about 6000 inhahitants, depending chiefly for subsistence on the devotees, who, to the number of many thousands, make annual pilgrimages to the church which contains the tomb and bears the name of St Francis,

the founder of the Franciscan order, who was born at Assisiin 1182. (See Francis, Sr.) This building is in the Pointed style, and was erected between the years 1228-30 It is attributed by Vasari toa German architect, and by its historian, Pietro Ridolfi, it is called Opus Teutonicum (Hope, On Architecture, vol. i.) The remains of an ancient temple of Minerva stand in the market-place, composed of six Corinthian pillars of fine proportions, and now forming the portico of Santa Maria de Minerva; and there are

several churches of considerable artistic importance. The poet Metastasio was born here in 1698. Long. 12° 24’ 50” E., lat. 43° 4’ 22” N.

ASSIZE or Assisx (from assideo, to sit together; Old French, assire, to set, assis, seated), literally signifies a “session,” but is, in fact, as Littleton has styled it, a nomen cequivocum, meaning sometimes a jury, sometimes the sittings of a court, and sometimes the ordinances of a court or assembly, .

1. It signified the form of trial by a jury of sixteen persons, which eventually superseded the barbarous judicial combat; this jury was named the Grand Assize. The Grand Assize was abolished by 3 and 4 Will. IV. c. 27; but the term assize is still applicable to the jury in criminal causes in Scotland.

2. In the only sense in which the word is not now almost obsolete, assize means the periodical session of the judges of the superior courts of Common Law, held in the various counties of England, chiefly for the purposes of gaol delivery and trying causes at Wisi Prius. Previous to Magna Charta (1215) writs of assize had all to be tried at Westminster, or to await trial in the locality in which they had originated at the septennial circuit of the justices in eyre ; but, by way of remedy for the great consequent delay and inconvenience, it was provided by this celebrated Act that the assizes of mort d’ancestor and novel disseisin should be tried annually by the judges in every county. By successive enactments, the civil jurisdiction of the justices of assize was extended, and the number of their sittings increased, till at last the necessity of repairing to Westminster for judgment in civil actions was almost obviated to county litigants by an Act, passed in the reign of Edward I., which provided that the writ summoning the jury to Westminster should also appoint a time and place for hearing such causes within the county of their origin. ‘The date of the alternative summons to West- minster was always subsequent to the former date, and so timed as to fall in the vacation preceding the Westminster term ; and thus “ Unless before,” or Nisi Prius, issues came to be dealt with by the judges of assize before the summons to Westminster could take effect. The Wisi Prius clause, however, was not then introduced for the first time. It occurs occasionally in writs of the reign of Henry III. The Royal Commissions to hold the assizes are—(1.) General, (2.) Special. The General Commission is issued twice a year to the superior courts of Common Law at Westminster,

and two judges are generally sent on each circuit. It covers commissions—(1.) of oyer and terminer ; (2.) of Nisi Prius ; (3.) of gaol delivery ; (4.) of the peace. Special commis- sions are granted for inquest in certain causes and crimes.

3. Assizes, in the sense of ordinances or enactments of a court or council of state, are of considerable interest in our earlier economic history. As early as the reign of John the observance of the assis venalium was enforced, and for a period of five hundred years thereafter it was considered no unimportant part of the duties of the legislature to regulate by fixed prices, for the protection of the lieges, the sale of bread, ale, fuel, &c. Sometimes in city charters the right to assize such articles is specially conceded. Regulations of this description, though hostile to free trade, were beneficial in the repression of fraud and adulteration.

4, Assizes are sometimes used in a wider legislative connection by early chroniclers and historians,—the " assisz of the realme," ¢.g., occasionally meaning the organic laws of thecountry. In a still more extended sense, the "Assizes of Jerusalem" is the name given to the code of laws framed for the kingdom of Jerusalem at the instance of Godfrey of Bouillon, the Crusader.

*ASSOCIATION OF IDEAS, or Menrat AssoctraTIoN, is a general name used in psychology to express the con- ditions under which representations arise in consciousness, and also is the name of a principle of explanation put forward by an important school of thinkers to account, generally for the facts of mental life. The more common expression, from the time of Locke, who seems to have first employed it, has been Association of Ideas; but it is allowed or urged on all hands that this phrase contains too narrow a reference; association, in either of the senses above noted, extending beyond ideas or thoughts proper to every class of mental states. In_the long and erudite Note D**, appended by Sir W. Hamilton to his edition of Reid's Works, and offered as a contribution towards a history of the doctrine of mental suggestion or association, many anticipations of modern statements are cited from the works of ancient or medieval thinkers, and for Aristotle,*

in particular, the glory is claimed of having at once originated the doctrine and practically brought it to perfection. Aristotle's enunciation of the doctrine is certainly very remarkable. As translated by Hamilton, but without his interpolations, the classical passage from the tract De Memoria et Reminiscentia runs as follows :—

'© When, therefore, we accomplish an act of reminiscence, we pass through a certain series of precursive movements, until we arrive at a movement on which the one we are in quest of is habi- tually consequent. Hence, too, it is that we hunt through the mental train, excogitating from the present or some other, and from similar or contrary or coadjacent. Through this process reminis- cence takes place. For the moveinents are, in these cases, some- times at the same time, sometimes parts of the same whole, so that the subsequent movement is already more than half accomplished."

The passage is obscure (leaving open to Hamilton to suggest a peculiar interpretation of it, that may be noticed in connection with the elaborate doctrine of association put forward by himself, as if to evince the shortcomings rather than the perfection of Aristotle's), but it does in any case indicate the various principles commonly termed Contiguity, Similarity, and Contrast ; and, though the statement of these cannot be said to be followed up by an effective exposition or application, it quite equals in scope the observations of many a modern inquirer. Zeno the Stoic also, and Epicurus, according to the report of Diogenes Laertius (vii. § 52, x. § 32, overlooked by Hamilton), enumerated similar principles of mental associa- tion. By St Augustin, at the end of his long rhapsody on the wonders of memory in book x. of his Confessions, it was noted (c. 19) that the mind, when it tries to remember something it knows it has forgotten, has, as it were, hold of part and thence makes quest after the other part. Meanwhile and later, Aristotle's doctrine received a more or less intelligent expansion and illustration from the ancient commentators and the schoolmen ; and in the still later period of transition from the age of scholasticism to the time of modern philosophy, prolonged in the works of some writers far into the 17th century, Hamilton, from the stores of his learning, is able to adduce not a few philosophical authorities who gave prominence to the general fact of mental association—the Spaniard Ludo- vicus Vives (1492-1540) especially being most exhaustive in his account of the conditions of

memory. This act of justice, however, once rendered to earlier inquirers, it is to modern views of association that attention may fairly be confined.

or thoughts in been regarded, by those who did not look farther the founder of the theory of mental association.

indeed, vividly conceive and illustrate the principle of

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In Hobbes's psychology so much importance is assigned to what he called, variously, the succession, sequence, series, consequence, coherence, train, &c., of imaginations mental discourse, that he has not seldom back, as He did,

Coutiguity, but, as Hamilton conclusively shows, he repro-

duced in his exposition but a part of the Aristotelian doctrine, nor even this without wavering ; representing the sequence of images, in such states as dreams, now (in his Human Nature) as casual or incoherent, now than), following Aristotle, as simply unguided. Not before Hume, among the moderns, is there express question as to a number of distinct principles of association. meanwhile, introduced the phrase Association of Ideas as the title of a supplementary chapter incorporated with the fourth edition of his Hssay, meaning it, however, only as the name of a principle accounting for the mental pecu- liarities of individuals, with little or no suggestion of its general psychological import.

(in Levia-

Locke had,

Of this last Hume had the strongest impression, aud thinking himself, in forgetfulness

or ignorance of Aristotle's doctrine of reminiscence, the first inquirer that had ever attempted to enumerate all the

modes of normal association among mental states, he

brought them to three—Resemblance, Contiguity in time and place, Cause and (or) Effect. Without professing to arrive at this result otherwise than by an inductive con-

sideration of instances, he yet believed his enumeration to be exhaustive, and sought to prove it so by resolving Contrast—one of Aristotle's heads, commonly received— as a mixture of causation and resemblance. Viewed in relation to his general philosophical position, it must

always remain a perplexing feature of Hume's list of principles, that he specified Causation as a principle distinct

from Contiguity in time, while otherwise the list has no superiority to Aristotle's. Hume's fellow-countrynien, Gerard and Beattie, in opposition to him, recurred accord- ingly to the traditional enumeration ; and, in like manner, Dugald Stewart put forward Resemblance, Contrariety, and Vicinity in time and place, though he added, as another obvious principle, accidental coincidence in the sounds of Words, and farther noted three other cases of relation, namely, Cause and Effect, Means and End, and Premisses and Conclusion, as holding among the trains of thought under circumstances of special atten- tion. Reid, preceding Stewart, was rather disposed, for his own part, to make light of the subject of as- sociation, vaguely remarking that it seems to require no other original quality of mind but the power of habit to explain the spontaneous recurrence of trains of thinking, when become familiar by frequent repetition (Intellectual Powers, p. 387). The counter-observation of his editor, Hamilton, that we can as well explain habit by association as association by habit, might with reason have been pointed more sharply.

*Hamilton's own theory of mental reproduction, sugges- tion, or association, given in outline in Note D*** following the historical note before mentioned, at the end of his edition of Reid's Works, calls for more special notice, as perhaps the most elaborate expression yet devised for the principles involved in the phenomena of mental repre- sertation, It is a development, greatly modified, of the doctrine expounded in his Lectures on Metaphysics (vol. 11. p. 228, seg.), which in agreement with some foreign authorities, reduced the principles of association first to two—Simultaneity and Affinity, and these farther to onc supreme principle of Redintegration*

or Totality. In the ultimate scheme he posits no less than four general laws of mental succession concerned in reproduction: (1.) Associa-

bility or possible co-suggestion (all thoughts of the same mental subject are associable, or capable of suggesting each other); (2.) Repetition or direct remembrance (thoughts coidentical in modification, but differing in time, tend to suggest each other) ; (3.) Redintegration, direct remembrance or reminiscence (thoughts once coidentical in time, are, however, different as mental modes, again suggestive of each other, and that in the mutual order which they originally held); (4.) Preference (thoughts are suggested not merely by force of the general subjective relation subsisting between themselves, they are also suggested in proportion to the relation of interest, from whatever source, in which they stand to the individual mind). Upon these follow, as special laws :—A, Primary—modes of the laws of Repetition and Redintegration—(1), law of Similars (Analogy, Affinity) ; (2), law of Contrast ; (3), law of Coadjacency (Cause and Effect, &c.) ; B, Secondary—modes of the law of Preference, under the law of Possibility—(1), laws of Immediacy and Homogeneity; (2), law of Facility. Such is the scheme ; and now may be understood what interpretation Hamilton desires to put upon Aristotle's doctrine, when he finds or seeks in it a parallel relation to that established by himself between the general laws, more especially Redintegration, and his special ones. But, though the commentary of The- mistius, which he eites, lends some kind of support to the position, it cannot be maintained without putting the greatest strain on Aristotle's language, and in one place it is as good as surrendered by Hamilton himself (footnote, p. 900, 6). Nor is the ascription of such a meaning at all necessary to establish Aristotle's credit as regards the doctrine of mental association.

Thus far the principles of association have been con- sidered only as involved in mental reproduction and repre- sentation. There has grown up, however, especially in England, the psychological school above mentioned, which aims at explaining all mental acquisitions, and the more complex mental processes generally, under laws not other than those determining

simple reproduction. Hamilton also, though professing, in the title of his outline just noticed, to deal with reproduction only, formulates a num- ber of still more general laws of mental succession—law of Succession, law of Variation, law of Dependence, law of Relativity or Integration (involving law of Conditioned), and, finally, law of Intrinsic or Objective Relativity—as the highest to which human consciousness is subject ; but it is in a sense quite different that the psychologists of the so-called Associationist School intend their appropriation of the principle or principles commonly signalised. As far as can be judged from imperfect records, they were antici- pated to some extent by the experientialists of ancient times, both Stoic and Epicurean (cf. Diogenes Laertius, as above). In the modern period, Hobbes is the first thinker of permanent note to whom the doctrine may be traced. Though he took, as has been seen, anything but an exhaustive view of the phenomena of mental succession, yet, after dealing with trains of imagination, or what he called mental discourse, he sought in the higher depart- ments of intellect to explain reasoning as a discourse in words, dependent upon an arbitrary system of marks, each associated with, or standing for, a variety of imaginations ; and, save for a general assertion that reasoning is a reckoning—otherwise, a compounding and resolving—he had no other account of knowledge to give. The whole emotional side of mind, or, in his language, the passions, he, in like manner, resolved into an expectation of con- sequences based on past experience of pleasures and pains of sense. Thus, though he made no serious attempt to justify his analysis in detail, he is undoubtedly to be classed with the associationists of the next century—Hartley and the others. They, however, were wont to trace the first

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beginnings of their psychological theory no farther back than to Locke's Hssay. If this seems strange, when Locke did little more than supply them with the word Association, it must be remembered in what ill repute the name of Hobbes stood, and also that Locke's work, though not directly concerned with the question of psychological development, being rather of metaphysical or logical import, was eminently psychological in spirit, and might fairly be held to contain in an implicit form the principle or principles evolved later by the associationists. Berkeley, dealing,

immediately after Locke and altogether in Locke's spirit, with the special psychological problem of visual perception, was driven to posit expressly a principle of suggestion or association in these terms :—" That one idea may suggest another to the mind, it will suffice that they have been observed to go together, without any demonstra- tion of the necessity of their coexistence, or so much as knowing what it is that makes them so to coexist" (New Theory of Vision, § 25); and to support the obvious applica- tion of the principle to the case of the sensations of sight and touch before him, he constantly urged that association of sound and sense of language which the later school has always put in the foreground, whether as illustrating the principle in general or in explanation of the supreme importance of language for knowledge. It was natural, then, that Hume, coming after Berkeley, and assuming Berkeley's results, though he reverted to the larger inquiry of Locke, should be more explicit in his reference to association; and, not only explicit, he was original also, when he spoke of it as a " kind of attraction which in the mental world will be found to have as extraordinary effects as in the natural, and to show itself in as many and as various forms" (Zwman Nature, i.1,§4). Other inquirers were, in fact, appearing about the same time, who con- ceived of association with this breadth of view, and set themselves to track, as psychologists, its effects in detail. Hartley's Odservations on Mun, published in 1749 (eleven years after the Human Nature, and one year after the better-known dnquiry, of Hume), opened the path for all the investigations of like nature that have since that time become so characteristic of the English name in psychology. According to his own statement, his attention was first turned to the subject about eighteen years before, through what he heard of an opinion of the " Rev. Mr Gay," that it was possible to deduce all our intellectual pleasures and pains from association. Gay is known only by a disserta- tion on the fundamental principles of virtue, prefixed, at first anonymously, in 1731, to Archdeacon (afterwards Bishop) Law's translation of King's Origin of Evil, wherein it was maintained, with considerable force, that by associa- tion the feelings belonging to ends may come to attach themselves to means, and give rise to action for the means as if they were ends, as seen (the instance has become a commonplace) in the passion for money-making. In this vein, but on a very different scale, Hartley proceeded to work, A physician by profession, and otherwise well versed in science, he sought to combine with an elaborate theory of mental association a minutely detailed hypothesis as

to the corresponding action‘of the nervous system, based upon the suggestion of a vibratory motion within the nerves thrown out by Newton in the last paragraph of the Principia. So far, however, from promoting the acceptance of the psychological theory, this physical hypothesis proved to have rather the opposite effect, and it began to be dropped by Hartley’s followers (as Priestley, in his abridged edition of the Odservations, 1775) before it was seriously impugned from without. When it is studied in the original, and not taken upon the report of hostile critics, who would not, or could not-—at all events, who did not— understand it, no little importance must still be accorded to

the first attempt, not seldom a curiously felicitous one, to carry through that parallelism of the physical and psychical, which since then has come to count for more and more in the science of mind. Nor should it be forgotten that Hartley himself, for all his paternal interest in the doctrine of vibrations, was careful to keep separate from its fortunes the cause of his other doctrine of mental association. Of this the point lay in no mere restatement, with new precision, of a principle of coherence among “ideas,” but in its being taken as a clue by which to follow the progressive development of the mind’s powers. Holding that mental states could be scientifically understood only as they were analysed, Hartley sought for a principle of synthesis to explain the complexity exhibited not only in trains of representative images, but alike in the most involved combinations of reasonings and (as Berkeley had seen) in the apparently simple phenomena of objective perception, as well as in the varied play of the emotions, or, again, in the manifold conscious adjustments of the motor system. One principle appeared to him sufficient for all, running, as enunciated for the simplest case, thus : “Any sensations A, B, C, &c., by being associated with one another a sufficient number of times, get such a power over the corresponding ideas (called by Hartley also ves- tiges, types, images) a, b,c, &c., that any one of the sensa- tions A, when impressed alone, shall be able to excite in the mind 8, c, &c., the ideas of the rest.” To render the principle applicable in the cases where the associated elements are neither sensations nor simple ideas of sensa- tions, Hartley’s first care was to determine the conditions under which states other than these simplest ones have their rise

in the mind, becoming the matter of ever higher and higher combinations. The principle itself supplied the key to the difficulty, when coupled with the notion, already implied in Berkeley's investigations, of a coales- cence of simple ideas of sensation into one complex idea, which may cease to bear any obvious relation to its con- stituents. So far from being content, like Hobbes, to make a rough generalisation to all mind from the phenomena of developed memory, as if these might be straightway assumed, Hartley made a poiut of referring them, in a subordinate place of their own, to his universal principle of mental synthesis. He expressly put forward the law of association, endued with such scope, as supplying what was wanting to Locke's doctrine in its more strictly psycho- logical aspect, and thus marks by his work a distinct advance on the line of development of the experiential philosophy.

The new doctrine received warm support from some, as Law and Priestley, who both, like Hume and Hartley him- self, took the principle of association as having the like import for the science of mind that gravitation had acquired forthe science of matter. The principle began also, if not always with direct reference to Hartley, yet, doubtless, owing to his impressive advocacy of it, to be applied systematically in special directions, as by Tucker (1768) to morals, and by Alison (1790) to esthetics. Thomas Brown (d. 1820) subjected anew to discussion the question of theory. Hardly less unjust to Hartley than Reid or Stewart had been, and forward to proclaim all that was different in his own position, Brown must yet be ranked with the associationists before and after him for the prominence he assigned to the associative principle in sense-perception (what he called external affections of mind), and for his reference of all other mental states (internal affections) to the two generic capacities or susceptibilities of Simple and Relative Suggestion. He preferred the word Suggestion to Association, which seemed to him to imply some prior con- necting process, whereof there was no evidence in many of

the most important cases of suggestion, nor even, strictly

speaking, in the case of contiguity in time wrere the term

seemed least inapplicable. According to him, all that –

could be assumed was a general constitutional tendency of the mind to exist successively in states that have certain re- lations to each other, of itself only, and without any external cause or any influence previous to that operating at the monient of the suggestion. Brown's chief contribution to the general doctrine of mental association, besides what he did for the theory of perception, was, perhaps, his analysis of voluntary reminiscence and constructive imagination — faculties that appear at first sight to lie altogether beyond the explanatory range of the principle. In James Mill's Analysis of the Phenomena of the Human Mind (1829), the principle, much as Hartley had conceived it, was carried out, with characteristic consequence, over the psychological field. With a much enlarged and more varied conception of association, Professor Bain has re-executed the general psychological task in the present generation, while Mr Herbert Spencer has revised the doctrine from the new point of view of the evolution-hypothesis. John Stuart Mill made only occasional excursions into the region of psychology proper, but sought, in his System of Logie (1843), to determine the conditions of objective truth from the point of view of the associationist theory, and, thus or otherwise being'drawn into general philosophical discussion, spread wider than any one before him its repute.

It is remarkable that the Associationist School has been composed chiefly of British thinkers, but in France also it has had distinguished representatives. Of these it will suffice to mention Condillac, the author of the sensationalist movement in the 18th century, who professed to explain all knowledge from the single principle of association (liaison) of ideas, operating through a previous association with signs, verbal or other. At the present day the later English school counts important adherents among the younger French thinkers. In Germany, before the time of Kant, mental association was generally treated in the traditional manner, as by Wolff. Kant's inquiry into the foundations of knowledge, agreeing in its general purport with Locke's, however it differed in its critical procedure, brought him face to face with the newer doctrine that had been grafted on Locke's philosophy ; and to account for the fact of synthesis in cognition, in express opposition to associationism, as represented by Hume, was, in truth, his prime object, starting, as he did, from the assumrp- tion that there was that in knowledge which no mere association of experiences could explain. To the extent,

therefore, that his influence prevailed, all such inquiries as the English associationists went on to prosecute were discounted in Germany. Notwithstanding, under the very shadow of his authority a corresponding, if not related, movement was initiated by Herbart. Peculiar, and widely different from anything conceived by the associationists, as Herbart's metaphysical opinions were, he was at one with them, and at variance with Kant, in assigning fundamental importance to the psychological investigation of the develop- ment of consciousness, nor was his conception of the laws determining the interaction and flow of mental presentations and representations, when taken in its bare psychological im- port, essentially different from theirs, In Beneke's psycho- logy also, and in more recent inquiries conducted mainly by physiologists, mental association has been understood in its wider scope, as a general principle of explanation.

Associationists differ not a little among themselves in the statement of their principle, or, when they adduce several principles, in their conception of the relative importance of these. Hartley took account only of Con- tiguity, or the repetition of impressions synchronous oF immediately successive; and the like is true of James Mill, though, incidentally, he made an express attempt to

resolve the received principle of Similarity, and through this the other principle of Contrast, into his fundamental law—law of Frequency, as he sometimes called it, because upon frequency, in conjunction with vividness of impres- sions, the strength of association, in his view, depended. In a sense of his own, Brown also, while accepting the common Aristotelian enumeration of principles, inclined to the opinion that "all suggestion may be found to depend on prior coexistence, or at least on such proximity as is itself very probably a modification of coexistence," provided account be taken of "the influence of emotions and other feelings that are very different from ideas, as when an analogous object suggests an analogous object by the influence of an emotion which each separately may have produced before, and which is, therefore, common to both." (Upon which view it obviously occurs to remark, that, except in the particular case, plainly not intended, where the objects are experienced in actual succession with the

emotion common to both, a suggestion through similar emotions must still be presumed.) To the contrary effect, Mr Spencer maintains that the fundamental law of all mental association is that presentations aggregate or cohere with their like in past experience, and that, besides this law, there is in strictness no other, all further phenomena of association being incidental. Thus in particular, he would explain association by Contiguity as due to the circumstance of imperfect assimilation of the present to the past in consciousness ; a presentation in as far as it is distinctly cognised is in fact recognised through cohering with its like in past experience, but there is always, in consequence of the imperfection of our perceptions, a certain range within which the classing of the present experience with past is doubtful—a certain cluster of rela- tions nearly like the one perceived, which become nascent in consciousness in the act of assimilation ; now contiguity is likeness of relation in time or in space, or in both, and, when the classing, which, as long as it is general, goes easily and infallibly forward, becomes specific, a presenta- tion may well arouse the merely contiguous, instead of the identical, from former experience. Midway between these opposed views should be noted, finally, the position of Professor Bain, who regards Contiguity and Similarity, logically, as perfectly distinct principles, though in actual psychological occurrence they blend intimately with each other; contiguous trains being started by a first (it may be, implicit) representation through Similarity, while the express assimilation of present to past in consciousness is always, or tends to be, followed by the revival of what was presented in contiguity with that past.

That Similarity is an ultimate ground of mental associa- tion cannot seriously be questioned, and to neglect or discount it, in the manner of the older representatives of the school, is to render the associationist theory quite inadequate for purposes of general psychological explana- tion. It is simply impossible to over-rate the importance of the principle, and, when Mr Spencer, by way of supporting his position, maintains farther, that the psychological fact of conscious assimilation corresponds with the fundamen- tally simple physiological fact of re-excitation of the same nervous structures, the force as well as pertinence of the observation is at once evident. Nevertheless, it is one question whether a representation, upon a particular occasion, shall be evoked by Similarity, and another question what shall be raised into consciousness along with it; nor for this

is there any help but in positing a distinct principle of Contiguity. The phenomena of presentative cognition or objective perception on which Mr Spencer bases his argument, are precisely those in which the function of Contiguity is least explicitly mani- fested, but only because of the certainty and fixity it has

assumed through the great uniformity and frequency of such experience. Let the series of presentative elements, as in formal education, be less constant in composition, and less frequently recurrent, than are those aggregates of sensible impressions that, in the natural course of experi- ence, become to us objects in space with a character com- paratively fixed, and then the function of Contiguity starts out with sufficient prominence, being found as often as not to fail in determining a revival of the corresponding repre- sentative series. All the phenomena, too, of coalescence, in which a variety of elements become fused to a result in consciousness as heterogeneous as any chemical compound in relation to its constituents—phenomena that have re- mained the very property of the Associationist School since they first were distinctly noted by Hartley—how are these to be explained by the principle of Similarity? Involved as it incontestably is in every repeated apprehension, whether of the elements, or of the product, or of the relation between them, Similarity of itself is powerless to determine a relation the essence of which lies not more in the hetero- geneous character of the result than in the diversity of the elements brought together. Nor, in order to support the claim of the principle of Contiguity to an equally funda- mental position with that of Similarity, is it more difficult to find an expression in terms of physiology corresponding with the subjective process. The fact that different nerve- centres are excited together, synchronously or successively, along definite lines of connection, will leave them, being so connected, in a state of relative instability, which, other things equal, will vary in proportion to the frequency and strength of the excitation ; and thus, when one of them is, in whatever way, again aroused, the rest will tend to be re- affected also by reason of the instability that has remained. The process of psychological representation, running parallel with the nervous events here supposed, involves assimilation at every stage from and including the first ; it is also con- stantly happening, in contiguous trains, that a break occurs

at a particular stage through an express suggestion, by Similarity, of something foreign to the train. But in the one case, as in the other—alike coincident with the implicit action of Similarity, and in the pauses .of express assimila- tion—the principle of Contiguity has a part to play, not to be denied or confounded with any other.

A minor question, also disputed, is whether by the side of Contiguity and Similarity, Contrast should be held, as by Aristotle, an independent principle of association. That things contrasted may and do often suggest each other in consciousness is on all hands allowed, but ever since Hume attempted, however infelicitously, to resolve the principle into others, its independence has not ceased to lie under sus- picion. When the question is approached without preju- dice, it cannot but appear strange that mental states which suggest each other because of likeness, should suggest each other because of unlikeness also, In that case anything might suggest everything else, since like and unlike con- scious states are all that are possible ; nay, unlike states alone are all, as there must always be some difference be- tween any two. Now it is true, in one sense, that anything may suggest anything be it ever so unlike, namely, if the things have been once or repeatedly experienced in con- junction ; but then the bond of association is the contiguity, and not the unlikeness, which obviously cannot be a ground for suggesting this one other thing more than any other thing. By contrast, however, is not generally meant bare unlikeness. Genuine contrasts, as black-white, giant-dwarf, up-down, are peculiar in having under the difference a foundation of similarity, the two members lying within the sphere of a common higher notion, and only being distin- guished the more impressively by reason of the accompany- ing unlikeness, Clearly, in the case of mutual suggestion,

+f it be not the similarity itself that is here the ground of association, it may again be Contiguity, the sharpest expe- rience of each member of the contrast having been when there was experience also of the other; or both grounds may conspire towards the result, the association being then what Professor Bain has marked as Compound. On the whole, it must be

concluded that only in a secondary sense can Contrast be admitted asa principle of mental association.

The highest philosophical interest, as distinguished from that which is more strictly psychological, attaches to the mode of mental association called Inseparable. The coales- cence of mental states noted by Hartley, as it had been assumed by Berkeley, was farther formulated by James Mill in these terms :—

“Some ideas are by frequency and strength of association so closely combined that they cannot be separated; if one exists, the other exists along with it in spite of whatever effort we make to disjoin them.’ —(Analysis of the Human Mind, 2d ed. vol. 8 [os

93.)

J. S. Mill’s statement is more guarded and particular :—

“ When two phenomena have been very often experienced in con- junction, and have not, in any single instance, occurred separately either in experience or in thought, there is produced between them what has been called inseparable, or, less correctly, indissoluble, association; by which is not meant that the association must inevitably last to the end of life—that no subsequent experience or process of thought can possibly avail to dissolve it; but only that as long as no such experience or process of thought has taken place,

the association is irresistible ; it is impossible for us to think the one thing disjoined from the other. ”_ (Examination of Hamilton’s Philo- sophy, 2d ed. p. 191.)

Even this statement, however, is somewhat lacking in precision, since there never is any impossibility of thinking the things apart, in the sense of considering them as logi- cally distinct ; the very fact of association implies at least such distinctness, while there may be evident, besides, a positive difference of psychological origin, as when, in the case of visual extension, the colour of the field is referred to the passive sensibility of the eye, and the expanse to its mobility. The impossibility is of representation apart, not of

logical consideration or thought. It is chiefly by J. S. Mill that the philosophical application of the principle has been made. 'The first and most obvious application is to so- called necessary truths—such, namely, as are not merely ana- lytic judgments but involve a synthesis of distinct notions. Again, the same thinker has sought, in the work just cited, to prove Inseparable Association the ground of belief in an external objective world. The former application, especially, is facilitated, when the experience through which the associa- tion is supposed to be constituted is understood as cumula- tive in the race, and transmissible as original endowment to individuals—endowment that may be expressed either, subjectively, as latent intelligence, or, objectively, as fixed nervous connections. Mr Spencer, as before suggested, is the author of this extended view of mental association.

For a detailed exposition of the psychological theory of the Associationist School, the reader is referred to the works of its latest representatives named above. The question is still under discussion, how far the theory avails to account for the facts of intelligence, not to say the complex phases of mental life in general in all their variety ; nor, were the theory carried out farther than it has yet been by any one, and formulated in terms com- manding more general assent than any expression of it has yet obtained even from professed adherents, is it likely to be raised above dispute. Yet it must be allowed to stand forward with a special claim to the scientific charac- ter; as already in his time Laplace (who, though an outsider, could well judge) bore witness, when, speaking of the principle of association (Contiguity) as applied to the explanation of knowledge, he declared it da partie réelle de la métaphysique (Essai phil. sur les Probabilités, euvres,

vol. vii p. cxxxvii.) If in the physical sciences the object of the inquirer is confined to establishing laws expressive of the relations subsisting amongst phenomena, then, however different be the internal world of mind— however short such treatment may seem to come of express- ing the depth and fulness even of its phenomenal nature— a corresponding object is as much as the scientific psycho- logist can well set to himself. The laws of association express undoubted relations holding among particular mental states, that are the real or actual facts with which the psychologist has to deal, and it becomes strictly scientific task to inquire how far the whole complexity of the internal life may receive an explanation therefrom.

Understood in this sense, Hume's likening of the laws of mental association to the principle of gravitation in external nature is perfectly justifiable. It is to the credit of the associationists to have grasped early, and steadily maintained, such a conception of. psychological inquiry, and, whatever their defects of execution may have been or remain, their work retains a permanent value as a serious attempt to get beyond barren description of abstract mental faculties to real and effective explanation. The psychologists that, in the related point of view, have earned the title of the Analytical School, from holding before their eyes the exemplar of the method of the positive sciences, are precisely those that have fastened upon the principles of association as the ground of mental synthesis ; and, till it is shown that the whole method of procedure is inappli- cable to such a subject as mind, their conception is entitled to rank as a truly scientific one. (G. ©. R.)

ASSUAY, formerly the most southern department of

Ecuador, in South America. It is now broken up into the two provinces of Cuenga and Loxa. Cuenga, Loxa, Jaca, and Borga, were its principal towns. Its chief

roductions were cinchona bark and silver. ASSUMPTION, a festival of the Christian church,

observed on the 15th August, in honour of the miraculous

ascent of the Virgin Mary into heaven. It rests upon a purely traditional account of the ascent, first recorded by Gregory of Tours. Its present place in the calendar was fixed early in the 8th century. The Roman and Greek Churches both celebrate this festival. :

ASSYRIA. The two great empires which grew up on the banks of the Tigris and Euphrates can be separated as little historically as geographically. It is proposed. therefore, to treat both under the heading BaBYLoNIA. From the 'beginning their history is closely intertwined ; and the power of the one is a measure of the weakness of the other. This interdependence of Assyrian and Babylonian history was recognised by ancient writers, and has been confirmed by modern discovery. But whereas Assyria takes the first place in

the classical accounts to the exclusion of Babylonia, the decipherment of the inscriptions has proved that the converse was really the case, and that, with the exception of some six or seven centuries, Assyria might be described as a province or dependency of Babylon. Not only was Babylonia the mother country, as the tenth chapter of Genesis explicitly states, but the religion and culture, the literature and the characters in which it was contained, the arts and the sciences of the Assyrians were derived from their southern neighbours. Both had the same population and spoke the same language. In accordance, therefore, with the evl- dence of the native monuments, Assyria will be treated in connection with Babylonia. With all the similarity, however, there were, of course, certain differences in the character and development of the two countries. These differences will be carefully noted, and subjects which peculiarly belong to either the one or the other empire will be fully and separately dealt with. (See BABYLONIA.)

AST—AST 730

AST, Gzorce ANTHONY FREDERICK, a German philo- sopher and philologist of considerable distinction, was born at Gotha in 1778. He was educated at the gymnasium of that town, and afterwards at the university of Jena. He distinguished himself as a student, and in 1802 he became a privat-docent in his alma mater. Three years later he was appointed professor of classical literature in the university of Landshut, where he remained until 1826, when that institution was transferred to Munich. In this latter city he spent the rest of his life. In recognition of his services as a teacher and author he was made an aulic councillor, and a member of the Bavarian Academy of Sciences. He died on the 30th of December 1841. Ast was an independent although not an original thinker. He was more of a scholar and critic than a philosopher. He belonged to the school of Schelling, but was ready to welcome truths from the most diverse quarters. His writings on zesthetics,—System der Kunstlehre (1805) and Grundriss der Aisthetik (1807),—although containing no distinctively new thoughts, had the merit not only of combining and elaborating the principles of Schelling on beauty and art, but of supplementing them to some extent by the views of Winckelmann, Lessing, Kant, Herder, Schiller, Jean Paul, and others, on these subjects. His Grundlinien der Philosophie, published in 1807, was republished in 1809, but soon after sank into oblivion. His

Grundriss einer Geschichte der Philosophie, also pub- lished in 1807, was longer lived, and deservedly. It was the best book of the kind which the Schelling school could show, at least until the publication of Rixner's Manual, fifteen years later. It is among the earliest of the works pervaded by the thought, so familiar now but so fresh then, that the history of philosophy is not a history of opinions, but the history of reason, the several philo- sophies being only stages in the development of the one true philosophy, the gradually self-revealing absolute reason. It is also among the earliest attempts to " con- strue" the history of philosophy and to formulate its law of movement. The author published a second edition of it in 1825, and Hauptmomente der Geschichte der Philosophie in 1829. In two works, both published in 1808, he sought to determine and expound the principles of the chief divisions of the study in which he was strongest. They are his Grundlinien der Philologie and Grundlinien der Grammatik, Hermeneutik, und Kritik. Both have been commended by competent judges. His reputation as a philologist, however, rests mainly on the vast and toilsome labours on Plato, which occupied the last twenty-five years of his life. His Platon's Leben und Schriften, published in 1816, is the earliest of those elaborate critical inquiries regarding the life of Plato, the authenticity of the works which have come down to us under his name, the order of their composition, their purpose, plan, &c., which may be regarded as having had their proximate cause in the celebrated Introductions of Schleiermacher, and their prim- ary cause in the historical scepticism of Niebuhr and Wolf. He allows scarcely any weight to the ancient biographies and traditions ; but, taking a few of the finest dialogues as standards, he draws from them the criteria in virtue of which he accepts or rejects the others. He pronounces spurious not only those compositions which are generally admitted to be so,—the Lpinomis, Minos, Theages, Eraste, Clitopho, Hipparchus, Eryxias, the Letters and Defimtions, but also the Meno, Huthydemus, Charmides, Lysis, Laches, the First and Second Alcibiades, Hippias Major and Minor, the Ion, Huthyphron, Apology, Crito, and even, in defiance of the explicit testimony of Aristotle, the Zaws. He arranges the dialogues, which he admits to be genuine, into three series; the group which he regards as the earliest in date of composition, and which he

describes as characterised by the predominance of the poetical and dramatical element, consists of the Protagoras, Phedrus, Gorgias, and Phedo ; the second, distinguished. by the marked prominence of dialectic keenness and sub- tility, comprises the Theatetus, Sophist, Statesman, Parmenides, and Cratylus; while the third, displaying the dialectical and poetical qualities of Plato's mind in inter- penetration and harmony, includes the Philebus, Banquet, Republic, Timeus, and Critias. This book was followed by a complete edition of Plato's works (1819-32) in 11 vols., with a Latin translation, and a learned commentary, which occupies the last two volumes. Professor Ast crowned these labours by his Lexicon Platonicum (1834-9), in 3 vols., one of the most comprehensive and valuable of special dictionaries. He wrote various other works of less import- ance than those which have been mentioned. (R. F.

ASTARTE [Asutarotu] was the chief goddess of the Phoenicians in Zidon, where was a temple in her honour. In Tyre also she had a temple, and from thence her worship was transplanted to Carthage. At what time it may have been introduced among the Jews is not known, but its power of attracting them may be seen by reference to 2 Kings xxiii, 13; 1 Kings xi. 5; Judges ii, 13, Among classical writers the usual epithet of Astarte was Celestis or Urania, but while that distinguishes her only as a goddess of the heavens, it would seem that her name itself signifies "star." Her symbol in her temple'at Tyre was a star. Lucian (De Dea Syria, 4) expressly identifies her with Selene, the goddess of the moon; others, again, with the planet Venus. With the goddess Venus (Aphro- dite), as worshipped at Paphos in Cyprus, Astarte had in common the character of a deity of the sky (Urania), and perhaps, also the patronage of immorality (' Ashtaroth, the abomination of the Zidonians," 2 Kings xxiii. 13), The Romans, in calling her Juno Ceelestis, appear to have been guided by her connection with Baal, and her position as queen of heaven. At the time of the 19th Egyptian dynasty Ashtaroth was introduced, with other Asiatic deities, into the religious system of the Egyptians, and had a temple at Memphis. But no representation of her occurs on the Egyptian monuments. The Assyrian goddess Ishtar seems to have been the same as Astarte (Movers, Die Phénizier, p. 601).

ASTELL, Mary, an English authoress, born at New- castle-upon-Tyne in 1668. She was instructed by her uncle, a clergyman, in Latin and French, logic, mathema- tics, and natural philosophy. In her twentieth year she went to London, where she continued her studies. Her efforts were especially directed to the mental improvement of her sex, and she published, in 1697, a work entitled A Serious Proposal to the Ladies, wherein a Method is offered Jor the Improvement of their Minds. With the same end in view she elaborated a scheme for a ladies' college, which was favourably entertained by Queen Anne, and would have been carried out had not Bishop Burnet interfered, The most important of her other works was The Christian Religion, as professed by a Daughter of the Church of England, published in 1705. She died in 1731.

ASTER, a genus of composite plants (Composite), found largely in North America, and scattered sparingly over Asia, Europe, and South America. They are usually perennial, and their flowers are arranged in numerous heads (capitula). Asters receive the name of Michaelmas and Christmas daisies, because they have heads like daisies, and, when the weather is mild, they flower up to these periods of the year. They are, consequently, valuable plants in a garden. The only British species is Aster Tripolium, found abundantly in saline marshes near the sea. One of the species (Aster alpinus) grows at a considerable height on the mountains of Europe. Some

of them, such as Aster spectabilis of North America, are very showy. The plant called the Cape Aster is Agathwa amelloides, while the China aster is Callistephus chinensis. Both these plants belong also to the Natural Order Composite. A variety of the Chinese aster, having beautifully coloured florets of rose, violet, and white, is called Reine Marguerite by gardeners.

ASTERLUS, of Cappadocia, was a heathen sophist and teacher of rhetoric in Galatia. About the year 300 he was converted to Christianity, and became the disciple of Lucian, the founder of the school of Antioch. During the persecution in 304 he relapsed into Paganism, but was received again into the church by Lucian. He is best known as an able defender of the Arian doctrine, and was styled by Athanasius the " advocate" of the Arians. His chief work was the Syntagma, but he wrote many others, chiefly commentaries. C7. Mountfaucon, Collectio Nova PP. et Script. Gree.

ASTERIUS, Bishop of Amasia, in Pontus, in the end of the 4th and in the beginning of the 5th century. His fame rests chiefly on his Homilies, which were greatly esteemed in the Eastern Church. Mostof these have been lost, but five were published in a 4to vol. by Ph. Rubenius of Antwerp in 1615, under the title Asteria Amas. Homitl. Quinque, Gr. et Lat. Combefis published six more, so that we have eleven complete; and Dupin gives fragments of at least twenty-two.

ASTEROIDS, the name given to a large number of small planets, which revolve round the sun in orbits lying between those of Marsand Jupiter. They are all extremely small, their brightness seldom exceeding that of stars of the eighth magnitude; their paths, which cross and recross each other, extend over a belt about 250,000,000 miles in breadth ; and the eccentricities of the orbits of many of them, and the inclinations of their planes to the plane of the ecliptic, are much greater than those of the larger planets. All the asteroids have been discovered during the present century. The first seen, Ceres, was discovered by Piazzi at Palermo on the first day of the century (Jan. 1, 1801), Pallas was seen in 1802, Juno in 1804, and Vesta in 1807. The next, Astrea, was not discovered till 1845; three more

were seen in 1847, and since that time the number has been increased every year, amounting at the end of 1874 to 140. (See Astronomy, p. 806.)

ASTHMA (dc6pa, a gasping, doOpaivw, to gasp for breath), a disorder of respiration characterised by severe paroxysms of difficult breathing, usually followed by a period of complete relief, with recurrence of the attacks at more or less frequent intervals. The term is often incor- rectly employed in reference to states of embarrassed respiration, which are plainly due to permanent organic disease within the chest, and which have none of the distinctive characters of true asthma. The onset of an attack of asthma is usually sudden, although there may exist certain premonitory symptoms which warn the sufferer of its approach, such as a feeling of discomfort, drowsiness, irritability, and depression of spirits. The period when the asthmatic paroxysm comes on is generally during the night, or rather in the early hours of morning. The patient then awakes in a state of great anxiety and alarm, with a sense of weight and tightness across the chest, which he feels himself unable to expand withfreedom. Respira- tion is performed with great difficulty, and is accompanied with wheezing noises. His distress rapidly increases, and _ he can uo longer retain the recumbent position, but gets up, and sits or stands with his shoulders raised, his head thrown back, and his whole body heaving with his desperate efforts to breathe. His countenance is pale or livid, and wet with perspiration, while his extremities are cold ; his pulse is rapid and weak, and frequently irregular or

intermitting. All his clothing must be loose about him ; he cannot bear to be touched, and the very presence of others around him seems to aggravate his distress. His one desire isto breathe fresh air ; and he will place himself by an open window and sit for hours in the middle of the night, unmindful of the exposure. His appearance is alarming in the extreme, and it often seems as if-each breath would be his last. 'The paroxysm, after continuing for a variable length of time, often extending over many hours, begins to abate, the breathing becomes easier, and the subsidence of the attack jis frequently marked by the occurrence of coughing with expectoration. When the expectoration is abundant the asthma is {called humid, but where there is a little or noneit is termed dry. After the cessation of the attack the patient appears to be and feels comparatively well. In cases, however, of long

standing the subject of asthma comes to bear permanent evidence of its effects. He is easily put out of breath on exertion and he requires to lie with his head elevated, circumstances to be ascribed to organic changes in the chest, which oft- recurring attacks of asthma are liable to induce. The asthmatic paroxysms, although occasionally periodic, do not generally observe any regularity in their return. 'They may recur each successive night for several days, or there may be no return for many weeks or months, this being to a large extent dependent on a renewal of the exciting cause. Asthma is much more common in men than in women. In may be developed at any age, but is most fre- quently observed in early and middle life. A large number of cases take their origin in diseases affecting the respiratory system during infancy, such as hooping-cough, measles, and bronchitis. Asthma is often hereditary, and in all cases one attack appears to predispose to others.

With respect to the pathology of asthma, it is now gene- rally held that the essential nature of the disease consists in a spasmodic contraction of the bronchial tubes. This is due to some deranged condition of the nervous system, affecting, either directly or by reflex action, the nerves supplying the contractile fibres lining the bronchi and regulating their calibre. The bronchial tubes being thus spasmodically narrowed, and losing for the time their expansile power, air can only, with the utmost difficulty, be got into or out of the chest. In these circumstances the muscles of the trunk concerned in respiration are called on to act with great violence to expand the chest, but with little avail, and hence the distress and threatened suffoca- tion. But while asthma is thus to be regarded as essentially a nervous ailment, its occurrence, apart from some organic disease in the chest or elsewhere, is admitted to be com- paratively rare. Some cases, however, appear to be of purely nervous origin. To these the term Nervous or Spasmodie Asthma is applied, and it is more particularly to this form that the symptoms above narrated refer. In such cases no actual disease can be discovered with which the asthma could be directly connected. Attacks of this nature appear capable of being excited in those subject to them in very various ways. Thus violent emotions are not unfrequently the cause of asthmatic paroxysms. The effect of the inhalation of certain effluvia in exciting attacks of asthma is undoubted, as in the familiar instances of the odour of hay and of ipecacuan. In no particular is the eccentric character of this disease more

remarkable than in that of locality. Changes of air, otherwise inappreciable, may give occasion to the most severe attacks of asthma, as, on the other hand, they may be the means of accomplishing a cure of the disease where it exists. Circumstances, ap- parently the most trifling, have been known to give rise to severe paroxysms of asthma, as the extinguishing of a light in a sleeping apartment or the shutting of a door. But asthma is very frequently associated with some form

of chest complaint, more particularly bronchitis, and hence the term Bronchitic Asthma. The relation between the two ailments in such cases is rendered sufficiently obvious by the fact that the one does not occur without the other ; and it is evident that the irritation of the bronchial mucous membrane gives rise by reflex nervous action to narrowing of the tubes. When the bronchitis is cured the asthma disappears. Asthmatic-like paroxysms are also of occa- sional occurrence in some forms of heart disease, and the term Cardiac Asthma is used to describe such cases. They can, however, scarcely be regarded as cases of asthma, but rather as attacks of difficult breathing referable to some impediment to the pulmonary circulation, the result of the heart disease.

The treatment of asthma consists in the employment of remedies to allay the paroxysms, and in the adoption of measures likely to prevent their recurrence. During the attack the patient should be placed in as favourable cir- cumstances for breathing as practicable. He usually selects the position easiest for himself. Abundance of air should be admitted to the apartment, and he should be interfered with as little as possible. The remedial agents employed with the view of relieving the paroxysms are very numerous, and only a few of the more important of them can be alluded to. Opiates administered internally or hypoder- mically are of known efficacy, as is also the inhalation of anzsthetic vapours. Much value is attached by many to the smoking of stramonium, and even tobacco smoking appears in some instances to yive relief. The fumes of nitre-paper (blotting-paper prepared by being dipped in a saturated solution of nitre and dried) burnt in the apart- ment often succeed in mitigating the paroxysm. The use of the tincture of Lobelia inflata is recommended by many high authorities, as are

also the employment of emetics, the latter more especially where the attack can be traced to errors in diet. None of these remedies, however, ought to be tried without medical advice. Coffee is a popular and useful remedy, but to do good the infusion must be very strong, and taken upon an empty stomach. To prevent the recurrence of the paroxysms special care must be taken by the sufferer to avoid those influences, whether connected with locality or mode of life, which his ex- perience may have proved to have been the occasion of former attacks. Where the paroxysms are of periodic occurrence the use of quinine or arsenic has been tried with good results. (5..0F A)

ASTI, a large and well-built town of Italy, in the pro- vince of Alessandria (Piedmont), situated on the left bank of the Tanaro. It is the see of a bishop, the chief town of a circondario, and a station on the Turin and Alessandria railway. Its Gothic cathedral dates from 1348, besides which there are a large number of churches, a college, an old castle, and a theatre. In the Middle Ages Asti was a great commercial city, and one of the most powerful republics of Northern Italy. It was long famous for its hundred towers, of which a number are still standing. As a free city it opposed Frederick IL, but it was taken by him and burntin 1155. In 1348 it fell into the possession of the Visconti, and thus passed first to France, and then, after the peace of Cambray in 1529, to Charles V., who bestowed it on his aunt, Beatrice of Savoy. In the war of the Spanish Succession it frequently changed hands, and in 1745 was taken by storm by the French. It was the birth-place of Alfieri, whose statue, by Vini, adorns the piazza. The inhabitants carry on a considerable trade in corn, wine, and silk, and are also engaged in the manu- facture of woollen goods, leather, paper, and hats. Popu- lation, about 31,000.

ASTOR, Joun Jacos, an enterprising American mer- chant, founder of the Astor Library at New York, was

born at the village of Walldorf near Heidelberg, on the 17th July 1763. His father was a peasant, and his early years were spent in the common labours of the farm. At sixteen he joined an elder brother, a musical instrument maker, in London, and at twenty sailed for the United States. On the voyage

he became acquainted with a fur- trader, by whose advice he devoted himself to the same business. By his energy, industry, and 'sound judgment he gradually enlarged his schemes, did business in all the fur markets of the world, and amassed an enormous for- tune,—the largest up to that time made by any Ameri- can. He devoted many years to carrying out a project for organising the fur trade from the Lakes to the Pacific Ocean, and thence by way of the Sandwich Islands to China and India. In 1811 he founded at the mouth of the Columbia River a settlement, named after him Astoria, which was intended to serve as the central depdt; but in the following year the settlement was taken and occu- pied by the English. The incidents of this undertak- ing are the theme of Washington Irving's Astoria. A series of disasters frustrated the gigantic scheme. Astor made vast additions to his wealth by investments in land in New York city. He made many charitable bequests by his will, and among them a gift of $50,000 to the. poor of his native villagein Germany. But the deed by which he will be chiefly remembered was the foundation and endow- ment by his will of the Astor Library at New York, for which he bequeathed the sum of $400,000. The building, erected in Lafayette Place (1850-53), is in the Byzantine style of architecture. Washington Irving was appointed first president, and the formation and arrangement of the library was entrusted to Mr J. G. Cogswell. The building has since been enlarged at the cost of the eldest son of the founder. Mr Astor spent the last twenty five years of his life in retirement, and died at New York, March 29, 1848.

ASTORGA (the ancient Asturica Augusta), a city of Spain, in the province of Leon, in a plain near the Tuento. It confers the title of marquis on the Osorio family, the ruins of whose palace, destroyed in 1810 by the French, are still an object of interest. It is surrounded with ancient Roman fortifications, which now afford a pleasant promenade ; and there is in the vicinity a ruined castle. Jt was formerly called the " city of priests," from the great numbers of that profession resident within its walls; and it is still the see of a bishop under the church of Compostella, and has a Gothic cathedral of the 15th century.

ASTORGA, EMMANUELE D', a distinguished musical composer, was born at Palermo about 1680. His father, a baron of Sicily, took an active part in the attempt to throw off the Spanish yoke, but was betrayed by his own

soldiers and publicly executed. His wife and son were compelled to be spectators of his fate ; and such was the effect upon them, that Emmanuele fell into a state of gloomy despon- dency, which threatened to deprive him of reason, while his mother died on the spot. By the kindness of the Princess Ursini, the unfortunate young man was placed in a convent at Astorga, in Leon, from which town he afterwards took his name. Here he recovered his health, and his admirable musical talents were cultivated under the best masters. In 1703 he entered the service of the duke of Parma, and while at his court produced many compositions, The duke, suspecting that an attachment existed between his daughter and Astorga, dismissed the musician, but gave him a letter of recommendation to Leopold of Austria. The emperor received him kindly, and at his court Astorga produced his pastoral opera of Daphne. In 1705, on the death of his patron, he visited Florence, and then London, where he remained for two years, and wrote his Stabat Mater, con- sidered the best of all his works. He seems to have resided for some years in Spain, and to have as in Bohemia, at

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or near Prague. The date of his death is quite uncer- tain.

ASTRABAD, or AsTERABAD, a small province of Persia, bounded on the N. by the Caspian Sea and the desert, on the S. by the Elburz Mountains, W. by Mazanderan, and E. by the river Gourgan. The country, although mountainous, and interspersed with dense forests, in which it is scarcely possible to travel, possesses beautiful and fertile valleys, producing rice, wheat, and other grains in abundance, or spread out in a boundless expanse of verdure, the pasturage of numerous flocks and herds. Fraser, who travelled through Persia in 1822, extols inthe most lavish terms the appear- ance of the country. The soil, with little culture, is exceed- ingly productive, owing to the abundance of water which irrigates and fertilises it. But while the province in many parts presents a landscape of luxuriant beauty, it is a prey to the ravages of disease, and the frequent incursions of the surrounding tribes. The heavy torrents which fall in the rainy season stagnate in the forests, forming morasses, which, in the heats of summer and autumn, exhale a pestilential vapour, from the decomposition of the

vegetable niatter they contain. From these seats of noxious effluvia the wandering tribes of shepherds fly beyond the Jourgan or the Atrek, and live on the verge of the burning sand, although they have to carry water for each day's consumption from the distant river. The better classes retire from the intense heats of summer into the moun- tains; but the settled inhabitants of the villages, who cannot so easily remove, and who generally remain, suffer severely from sickness. The inhabitants, notwithstanding the unhealthiness of their climate, are a stout and athletic race. The province is famous for furnishing a supply of matchlocks for the king's body-guard. It is the ancient Hyrcania, and the native country of the Kajers, a Turkish tribe, of whom the king is the head, and on whom he con- siders he can rely in times of danger.

AsTRABAD, or ASTERABAD, the capital of the above pro- vince, is situated near the mouth of the River Gourgan, which flows into the Caspian, and at the head of a shel- tered bay, convenient for shipping. It is a straggling town, about 34 miles in circuit, and picturesque in appear- ance, from the buildings being intermingled with trees and gardens. At one time of greater size, it was reduced by Nadir Shah within its present limits. It is surrounded by a dilapidated mud wall, once lofty and formidable, and defended by numerous towers, and also by a wide and deep ditch, now almost filled with rubbish, Astrabad owes its origin to Yezzen-ibn-Messlub, who commanded the armies of Soliman, the seventh caliph of the Ommiades, early inthe 7th century. It was destroyed by Tamerlane in 1384. In 1744 Hanway the English traveller visited the place, and attempted to open a direct trade with Europe. At present its bazaars, though extensive, are but poorly filled, but commercial activity is said to be on the increase, in spite of the insecurity caused by the Turco- mans, who attack the caravans at the very gate of the town. The number of houses within the walls is estimated at from 2000 to 3000. Owing to the noxious exhalations of.the surrounding forests, the town is so extremely unhealthy during the hot weather as to have acquired the title of the City of the Plague. Distance N.E. of Ispahan, 400 miles. Long. 54° 25' E., lat. 36° 50' N.

ASTRAKHAN, a government of European Russia, bounded on the 8.E. by the Caspian Sea, N.E. by Oren- burg, N. by Saratov, W. by the country of the Don Cossacks, and §.W. by the government of the Caucasus. It lies between

lat. 44° 50’ and 49° 50’ N. and between long. 43° 30’ and51° 0’ E. Ithasan area of about 84,948 square miles, divided into two nearly equal parts by the Volga, and consists chiefly of sandy deserts, interspersed with

saline lakes; but in the delta, and on the banks of the

rivers, grapes and other fruits of southern climates are raised. The population in 1867 was estimated at 573,954,

comprising Russians, Tatars, Georgians, Armenians, Per. sians, Hindus, &c., who engage in the rearing of horses, cattle, and sheep, and also in fishing for sturgeon, which forms the principal source of the wealth of the govern-

ment. The vicissitudes of climate are great ; with a mean annual temperature of 48° Fahr., the summer averages 70°, and the winter 13° Fahr. The government is divided into four districts: Astrakhan, Krasnoi-Yar, Zenotaiesk, and

Chemyi-Var. Its capital, Astrakhan, is the only place of much importance.

ASTRAKHAN, the capital of the above government, is situated on a small island in the Volga, about 30 miles above the influx of that river into the Caspian. It is a large, rambling, wood-built city, “dusty in summer, windy in autumn, frozen-up in winter, and knee-deep in mud in spring.” It consists of three parts,—(1.) The Kremlin, or citadel, dating from 1550, which stands on a hill, and contains the cathedral of the Assumption (1582), a spacious brick edifice of peculiar architecture, with the archbishop’s palace, and the convent of the Trinity. (2.) The Belogorod, or white town, containing the government buildings, bazaars, &c. (3.) The Llobodeo, or suburbs, where the bulk of the population reside. Astrakhan is the seat of a Greek and of an Armenian archbishop; and, besides a number of Greek and Armenian churches and con- vents, it contains a Catholic anda Lutheran church, a Hindu temple, and several mosques. Mention may also be made of a botanic garden, bazaars, a theatre, a gymnasium, an ecclesiastical sentinary, and several inferior schools. From its favourable position the town enjoys a very considerable trade both with the interior of Russia, and with India, Persia, &c. Besides its importance as a fishing station, it has

considerable manufactures of cotton, silk, leather, &c. Living is very cheap, —£20 per annum being a fair Income for the maintenance of an ordinary family. This city was anciently the capital of a kingdom belonging to the Tatars, who were expelled about 1554 by the Russian prince, Ivan Vassilivich, In 1569 it was besieged by the Turks under Selim, but they were defeated with great slaughter by the Russians. In 1670 it was seized by the rebel Stenko Razin ; but in 1671 he was dispossessed of it by his uncle, Jacolof, who remained faithful to the Czar. In 1722, when Peter the Great extended his conquests on the Caspian, Astrakhan was his headquarters. In 1702, 1718, and 1767, it suffered severely from conflagrations, it was plundered by the Persians in 1719, and, in 1830, the cholera swept away a great portion of its inhabitants. Lat. 46° 21' N., long. 47° 55' E. Population estimated at 50,000 or 60,000.

ASTROLOGY, the so-called science by which various na- tions, invarious ways, have attempted toassign to the material heavens a moral influence over the earth and its inhabitants. For long ages astronomy and astrology were identified. Isidore of Seville is the first to distinguish between the two; nor did astronomy wholly rid itself of astrology, till, with the system of Copernicus, the conviction that the earth itself is one of the heavenly bodies was finally established. Even at the present daya few may be found who, from a superstitious reverence for the past, or the spirit of contradiction, pride themselves on their adherence to the belief in stellar influences. It is no longer necessary to protest against an error which is dead and buried, but let us pause a moment and ask what we mean by an error With Spinoza we would say that erroneous ideas consist in the fancies and opinions which the senses suggest to the mind in a confused, imperfect, and ill-ordered manner. To this sort of knowledge Spinoza gives the name of vague experience. This vague experience is further complicated

by the employment of signs, which flatter the fancy, and of which we form ideas like those which the objects them- selves presented at first to our imagination. If to these two elements—vague experience and the misleading use of signs—we add the instinctive impulse which Jed primitive man to imagine a universe created according to the analogy of his mind, we have

before us the three causes which led the Indians, Greeks, Egyptians, Chaldeans, and their Alexandrian disciples, the Arabs and their followers, during the Middle Ages and the Renaissance, to lend themselves to the illusions of astrology, and by a preposterous philo- sophy to deduce the laws of nature from a theory of morals.

Astrology is generally divided into natural astrology, the science which predicts the motions of heavenly bodies and eclipses of sun and moon, and judicial astrology, which studies the influence of constellations on the destiny of men and empires, But it is obvious that both of these branches presuppose an advanced stage of astronomical knowledge, and a state of society not necessarily better, but more complex than that in which the first worshippers of the heavens were placed. It follows, then, that both natural astrology and judicial astrology must have been preceded by a science less learned in heavenly motions, and at the same time (as we shall attempt to show) more moral in the best sense of the word. Astronomers have taken very little pains to trace their favourite science to its source by help of the copious astrological commentaries in which the earliest observers embodied their theories of the heavens. Philosophers, with the single exception of Scho-

penhauer, have shown the same indifference. Of modern

writers who have treated of astrology, some, like M. Alfred Maury, have sought to place its errors in a ridiculous light ; others, like Eusébe Salverte, have exposed the quackeries which rendered it a possible profession ; and lastly, a few, like Eliphas Lévi and M. P. Christian, simply attempt to build up again with words a belief which has ceased to rest either on facts or ideas, Neither class of writers is likely to advance the history of human reason. The time has come for a calm and dispassionate survey of an illusion which for a while seemed probable, and may even be said to have done good service in its day. Howdid the error arise? Whence its persistency + These are questions which demand an answer, if only in order to preserve modern science from illusions which, though differing in form, are in their essence similar.

M. Alfred Maury begins his treatise by examining what are the beliefs of savages on the subject of magic and as- trology. Sotoo M. F. Héfer, in his

History of Astronomy, well remarks: "If we wish to seek for the origin of the science, let us place a child or a savage in presence of the earth and the heavens, and ask what thoughts these sug- gest to him. We shal] then obtain a clue to guide us on our path." We shall do well to follow the example of MM. Maury and Hofer, provided we do not confuse the savage of a superior and the savage of an inferior race, or the ancient savage and the modern child. But how can we question the ancient savage? Only by help of his cos- mogonies.

It was long before man learned to distinguish the planets from the fixed stars; even then, as the word zAdvyrtes proves, he assigned to them an erratic instead of a regu- lar motion. Further, we must bear in mind that the first star-gazers had no knowledge of optics, physics, or meteor- ology, to teach them that the blue of the firmament isa subjective phenomenon caused by the light traversing our atmosphere before it strikes the optic nerve; that its regular spherical form is an effect of perspective; that winds, clouds, and northern lights are terrestrial phenomena related to astronomy, but distinct from the science of the true heavens. The ancestors of the sublime and child-

like bards of the Rig-Veda deified the morming glow Arustra, and the diurnal and nocturnal heavens as the twin brethren who had been nursed on the bosom of Aditi. Aditi with them is the space beyond the horizon. Aditi is the sky, heaven. Aditi is mother, father, son. The gods were Adityas, z.e., children of Aditi. Aditi, in a word, was boundless space, but space endowed with life, form, and power,—the power, namely, of delivering men from the heaviest of their chains, that is, sin. Aditi, too, is the mother of storms (Rudras). With the original Aryans storms represented the fecundating principle. 'Thus they pictured the storm among the clouds under the lively image of a bull among cows. Hence the celestial animals. The horse had been already placed in heaven to represent the sun (Asva). The fire of the hearth, too, which they produced by rubbing two sticks together, was as much a god as Varuna and Mitra, and worshipped as Agni, one of the Adityas. Such was the innocent childhood of the Hindus, which originated a poetical mythology so closely allied to science, so rich in moral lessons,—could such innocence last 4

Let us pass on to astrology as we find it among the Etruscans. We shall see the moral astrology of the primi- tive Aryans changed into political astrology. The word templum, the diminutive of tempus, as Varro tells us (de Ling. Lat. lib. vi.), signified—1, a division of the sky; 2, a spot on earth marked out by auspices; 3, by analogy, a spot below the earth. The augur with a staff (lituus) traced a line from north to south called cardo, and another from east to west called decumanus. Thus a temple con- sisted in marking out a spot ; the entry was from the south, the sanctuary was at the north, propitious signs came from the east, unpropitious from the west. The same precautions which, according to Columella, agriculturists took in trans- planting a tree to preserve the same aspect for roots and branches, the Romans, as disciples of the Etruscans, observed in fixing the site of their camps, their towns, &c., and not only this, but their observation of the flight of birds, their curious commentaries on the various forms of thunder and lightning, may all be reckoned as parts of astrology, inas- much as to the Etruscan bards air and thunder appeared celestial phenomena. Just as Chinese astrologists pro- fessed the power of producing or averting eclipses, the Etruscan priests asserted that they could draw down or divert lightning. In fact, such claims are a common cha- racteristic of what we have ventured to call political astro- logies : everywhere political astrologists have laid claim to the production of phenomena which calculation, empiricism, or good fortune has enabled them to predict. If perchance their prediction failed, they saved their credit by saying that by their art they had averted the impending disaster. The Etruscans called their deities consentes, sharers of the destinies of their race, and believed that they were fated to perish after a reign of 6000 years. This doctrine of the renovation of heaven, earth, and gods, is found to pre- vail wherever politics, the growth of conquest, have sup- planted the simple and childlike faith which springs up of itself among an innocent and unconquered race. When a nation left its home,—that land and sky which both wit- nessed the birth of its religion, and was part and parcel of that religion,—its priests gradually lost faith in their religion, and began to mix up politics with religion ; its astrologers, whose business it was to interpret the signs of the heavens, felt that their power was doomed, and pre- dicted a universal ruin, in which the nation, its religion, its gods, and heaven itself, were involved. But hope, which springs eternal in the human breast, made them add to their prophecy, that after the exhaustion of evil and the death of perverted

races, a new order of things should be born, 'This is the creed of Hesiod's sublime cosmogony ;

this is the burden of the 4th eclogue, in which Virgil has clothed the solemn strains of Etruria with a tenderness that is all his own. India, Egypt, Arabia, have all held the same belief, though the period between each palingenesis ig different with each. Later on we shall meet with the same doctrine in the subtle doctor Cardan, though strangely disguised. With the Romans, before they were initiated into the learning of Greece, astrology was only another name for sorcery. Most readers will remember the picture in Tibullus of the witch who can draw down the moon by her charms, or succour the labouring moon. They can understand the idea of Heraclitus (for Greece, too, passed through this stage of meteorological psychology), who thought that truth is mixed up with the atmosphere, and that the sage breathes it. The same idea is thus rendered by Ovid, Fasti i. 473,— ' Que, simul ethereos animo conceperat ignes, Ore dabat vero carmina plena dei."

This is the genuine éyOovoracpds. Nearly every one is familiar with the famous passage in the fourth Georgic, beginning " Lsse apibus partem divine mentis et haustus," and the noble commentary of the poet which follows.

It was the sober belief of primitive Greece that the sun was a torch, and the stars candles periodically lit and extinguished. Xenophanes was the first philosopher who

and men. These are two remarkable lines of Homer (Od. xviii, 136), which Aristotle quotes, and Cicero has trans- lated :—

« cols yap vdos early émixSoviov avOpamav ofov én' jmap &ynot warhp avdpay Te Gedy Tee

Such was Homer's astrology. But as, in course of time, each superior race in turn degenerated through the effects of conquest, either by mixing with inferior races, or by oppressing their equals (thus, for instance, the Lacede- monians mixed with the Messenians or Helots, and thus the primitive

Aryans oppressed the Dravidian tribes), as each race passed from the age of gold, the age of innocence, to the age of bronze or iron, of Krali or evil, so, to com- pensate in some way for the loss of morality, we find them making discoveries in science and art. 'Thus swords were forged of iron, notwithstanding that iron (according to the Finnish legend) had sworn never to slay men. Thus, too, they began to distinguish the several constella- tions through which the sun appeared to pass. Let us turn to the strange Zheogony of Hesiod (1. 119 seqg.), We shall find that Chaos is the parent of Night and Erebus ; but the Earth,—seemingly because it had been the peace- ful abode of the Immortals who dwell on the snowy peaks of Parnassus, partly, too, because the fairest of the Im- mortals is Love,—the Earth is the parent of the Heavens :—

developed this astrological idea, and expounded the con- nection of the stars with the earth. Xenophanes thought that the stars were meteors, that is, terrestrial effluvia. This enables us to explain the malignant influence on plants and animals which both Greeks and Romans attributed to the stars, and expressed respectively by the words doTpo- Bodciobarand siderari. The latest development of this belief is to be found in an English philosopher, who has written a book which proves that epidemics are due to the shocks of comets (Forster, Illustrations of the Astronomical Origin of Epidemic Diseases, Chelmsford, 1829), An American, in a work which shows some lucid intervals, borrows directly the thesis of Kenophanes, and demonstrates that wicked men contaminate the heavens and stars by their breath. Modern hallucinations are often the best commentary on ancient errors.

But the true source of astrology must be sought for in a remoter age than any we have yet reached. So far we have seen men grouped together as nations, possessing laws, reckoning more or less perfectly the course of time, making capital out of the defects of their calendar, like the Romans, or, it may be, complaining of those defects, and hailing the advent of a Meton like the Athenians in Aristophanes's Clouds, But there must have been long preceding ages during which the passage of time was unmarked and unrecorded. Does not this idea of time mark the first stage of civilisation? Some savages cannot reckon at all ; others, like children, cannot go farther back than yesterday, or the day before yesterday ; others, again, can only

mark the year by the changes of the seasons, and their only land- marks for the past are great calamities which have befallen the tribe. But it would be a great mistake to conclude that Chaldeans, Persians, Egyptians, &c., set to work methodically to invent a system of notation, and to map out time into years and months. Assuredly, if men had had no other end in view than the possibility of some day or other keepir:, double entry, figures would be still to seek. Similarly, if meu had thought that the chief result of the various rescarches and discoveries which a calendar ~~pre~~ supposes, would be to enable them to make an appointment a month beforehand, the inducement would have proved insufficient. Fortunately, there were other and higher motives to urge on our ancestors of various races in the path of discovery— those of religion and of astrology. The earth, as Hesiod tells us, was once a common abode of gods

‘ Tellus vero primum quidem genuit parem sibi Ccelum stellis ornatum ut ipsam totam obtegat, Utque beatis sedes Divis tuta semper,” &c.

That the gods inhabited the mountains or groves before

they migrated to heaven is a universal belief. Butin what can this heaven of the gods be said to resemble earth? A

tradition, which Manilius has preserved, informs us that when Justice was banished from the earth she took up her abode, not in the heart of a king of France (there was then no France or king in the modern sense of the word), but in heaven as one of the constellations of the zodiac. The zodiac was the heaven which exactly corresponded to the earth (the first astronomers, we need not remark, knew nothing of declinations); it was the zodiac which pro- tected the earth, taught the earth its duties, pointed out not only days and seasons, but the proper work for each day and season. The zodiac was the first book that lay open for all to read, written in runes, as the Scandinavians thought,—in mim and clif as the Arabs interpreted it,— and in the hieroglyphics of animals and symbols, according to Assyrians and Egyptians. But, alas! this grand con- ception, which seemed so true to the first astronomers, was obscured by the continual displacement of the zodiac. Thus, in judicial astrology the sign under which a child is born is always the ram, as in our almanacs it is the first sign of the year. Thus, too, the sign of Jupiter ¥ in a slightly altered shape, still heads our

prescriptions. Nor is this the only remaining trace of zodiacal belief. For not only was agricultural and political life regulated at first directly by the zodiac, and then through the calendar, but the zodiac applied no less to civil life. Hence the Roman ides and kalends, hence the Greek decade, hence the week of the Jews and other nations. This is not the place to discuss the difficult question of the relation of the zodiac to the week ; for our purpose it is enough to observe, that it was by the days of the week, each placed under the pro- tection of some stellar deity, that the priests regulated the whole civil life of a nation, its law courts, its markets, and marriages. The primitive week began with the day of Saturn, the ancient Bel of the Assyrians, so called in dis- tinction from the younger Bel, #.e., Jupiter, and it ended with the day of Venus, the Assyrian Mylitta. This day, which was afterwards held accursed by the Christian Fathers, was probably consecrated to marriages, Saturn's

day, or the day of Soetere, was identified with the Sabbath, and Sunday with the Lord's day ; the day of Venus with that of Friga, the goddess of love (Friday) ; Jove's with that of the Norse Thor (Thursday); Mercury's with that of Woden, the god who grants wishes (Wednesday); and Mars's with that of 'iw, the god of war (Tuesday). The Latin division of days into dies faste and nefasti has perpetuated the same distinction of lucky and unlucky days which in- spired Hesiod's Works and Days. Many a tradesman at Rome must have made the same complaint as La Fontaine's cobbler, " On nous ruine en fétes." With the Arabs Tues- day and Wednesday were the days for blood-letting, Mars being the lord of iron and blood, and Mercury of the humours. Even at the present day, travellers tell us, when an auspicious day has been proclaimed by the astrologers, the streets of Baghdad may be seen running with blood from the barbers' shops. We see how soon the invention of the week became the engine of politicians and astrologers.

Our investigations have now brought us to judicial astrology, which is nothing else than the corruption of the purer astrology, the various phases of which we have attempted to trace. In a bouk published at Geneva in 1643, the year of Condé's great victory, and of the succes- sion of Louis

XIV., entitled Janua Aurea reserata quatuor linguarum, 12mo, by J. A. Comenius, we find the follow- ing definition:—‘ Astronomus siderum meatus seu motus considerat : Astrologus eorumdem efficaciam, influxum, et efectum.” Kepler was more cautious in his opinion ; he spoke of astronomy as the wise mother, and astrology as the foolish daughter, but he added that the existence of the daughter was necessary to the life of the mother. Tycho Brahe and Gassendi both began with astrology, and it was only after pursuing the false science, and finding it wanting, that Gassendi devoted himself to astronomy. In their numerous allusions to the subtle mercury, which the one makes when treating of a means of measuring time by the efflux of the metal, and the other in a treatise on the transit of the planet, we see traces of the school in which they served their first apprenticeship, Huyghens, more- over, in his great posthumous work, Cosmotheoros, seu de terris colestibus, shows himself a more exact observer of astrological symbols than Kircher himself in his Iter exstaticum. In that remarkable discussion on the plurality of worlds, which was at once translated into French, and afterwards reproduced in a popular form by Fontenelle, Huyghens contends that between the inhabitants of differ- ent planets there need not be any greater difference than exists between men of different types on the earth. ‘“¢ There are on the earth,” continues this rational interpreter of the astrologers and chiromancers, “men of cold tempera- ment who would thrive in Saturn, which is the furthest planet from the sun, and there are other spirits warm and ardent enough to live in Venus.” Astrology among the Egyptians, the Chaldeans, and at Alexandria, had estab- lished a complete parallelism between men of different types and the planets, on the basis of their relative distance from the sun. These different types of character had been fixed by the Greeks in their conception of the planetary gods, Apollo, Mars, Mercury, Jupiter, and Venus. To these the cabalists added the moon, as the planet corre- sponding to the phlegmatic temperament of the northern

races. Apollo represented the nervous physique which Carus has rightly pronounced the most intellectual. But whence did the notion of this parallelism originate? The

solution of this problem will elucidate the practical side of astrology.

Let us once more revert to the first infancy of science. From the general tendency of primitive man to bring all knowledge under a single head, we may safely conclude that the first study of the heavens embraced and dominated

over every other attempt at science. The cosmogonists pretended to explain the earth by the heavens, but as they were bound to proceed from the known to the unknown, they did, in fact, explain the heaven by the earth and, in particular, by men. Hence, in many mythologies, the universe is an egg, and in that of Finland a duck's egg, the spots on the shell representing the constellations. Later on we find the eternal revolution and renovation of the universe symbolised by a serpent biting its tail. Lastly, the universe as a perfect and harmonious order, a xécpos, is conceived as the highest organism to be found on earth, a huge animal This cosmical animal in turn, owing to the interlacing of religious ideas, images, and symbols, was supposed to influence the different parts of the body. This gives us the clue to the first steps of medical science, which, like the other sciences, began by being astrological. In short, the first encyclopsedia was astrology. There is a well-known story of the case of two brothers who fell ill at the same instant. Posidonius the astrologer, on being consulted, pronounced that they were born under the same constellation. Hippocrates the physician concluded from the coincidence that they must be twins; yet even Hippo-erates could not rid himself of the terrestrial theory of the heavens. (See chap. 11, de auris, de aquis, de locis.) The Egyptians peopled the constellations of the zodiac with genii; the ram (Arnum) was lord of the head ; the bull (Apis), of the neck and shoulders ; the twins (Hercules and Apollo), of the arms and hands; and lastly, to the fishes were assigned the feet. The Persians, again, ascribed to the empyrean generally the influence over the citadel of the body—the head. Dionysius the Areopagite, indulging his religious proclivities, established hierarchies of genii in the constellations. The Assyrians were led by their form of government to place thirty-six conciliar-gods in the twelve signs of the zodiac, and to the interpreter-gods, whose province it was to inspect and survey the various divisions of the heavens, they allotted the wandering planets. Whenever a new discovery was made in medicine or science, the province of the god-stars was immediately enlarged ; thus the Egyptians, observing the symmetry of the human body, and connecting this with the dualism of

human faculties, at once made the sun (/a) the lord of the forehead, the moon mistress of the brain, and Mercury of the tongue; but to Saturn they assigned only the left eye ; to Jupiter was given the right ; Mars had the right nostril, Venus the left. Meanwhile, in another quarter of the globe a religion was growing up,—a religion of mild anthropo- morphism, wholly removed from Oriental transcenden- talism. It is in Greece, whose deities had been gradually moulded and drilled so as to serve as types of men and manners, that we must look for the key of astrology. Jupiter, the embodiment of authority, and Cronos, or Saturn, the impersonation of malignant opposition to authority, are the two most prominent figures of ancient mythology. Venus was placed below Mars; that is, the sensual passion was subjected to martial ardour. The astrologers of the Renaissance deviated from the Egyptians in assigning the right nostril to Venus, and the left to Mars : the reason was, that, with Cardan and Vanini, Venus represented rather the German Friga than the Eastern Mylitta,—chaste love rather than luxury. Those of our readers who wish to learn further the opinion of Cardan and Vanini, we would refer to the Amphitheatrum eterne Providentiee and De admirandis nature regine deceque mortalium arcanis libri quatuor, in which the mocking astrologer breaks a lance with the too subtle philosopher. The quarrel between two learned doctors of the art natur- ally resulted in the death of the patient. Astrology, already at its last gasp, could not bear such rude treatment. Vanini, the Lucian among astrologers, the hero, who

exclaimed, as he was being led to the stake, " Courage— let them see how a philosopher can die," has in his works crushed Aristotle by the help of Averroes, and Averroes and Cardan by the help of good sense. And yet the good- humoured satirist, who suffered for his free speech by having his tongue cut out, and being then burnt at the stake, was, notwithstanding, the disciple of Averroes, and the admirer of Cardan. So true is it that reason in its early stages of civilisation is the good genius of the pri- vileged few, who, unlike many moderns, have more sense than they give themselves credit for,—a privilege which they dearly purchased by persecution, or, worse still, by neglect.

Under Albumazar (776-885), astrology, returning to Persian and Greco-Egyptian ideas, appears as the legislator of action and religion. The Caliph Al-Mamun embraced the theory of his favourite astrologer, which fixed the duration of the Mahometan religion at 544, and that of Christianity at 1460 years. Is not this fact in itself sufficient to explode the generally received notion of Mussulman intolerance? Cardan developed this thesis. In one plan he makes Christianity born under Jupiter and Mercury (authority and cunning) ; and, according to this horoscope, it was destined to be short-lived. For once Vanini is found quoting Cardan with ill-concealed satisfaction. But afterwards, to curry favour with the Papacy, he recants, and says that Christianity was born under the most favourable conjunction of the planets Jupiter and the sun (authority and justice). Thereupon Vanini attacks Cardan under the assumed mask of a Dutch atheist. This example will suffice to show us how astro- logical symbols were employed by the sceptics, and what interpretation we must put upon their astrological phrase- ology.

We may now describe the ordinary proceedings of an astrologer. The zodiac was first arranged in much the same fashion as the cards in the game of Tarots. The four ages of man had each three houses in the zodiac. Each of this triple series was composed of a cardinal, a succeeding, and a declining or cadent house. Disastrous signs predominated over auspicious. For kings and nobles these signs were modified, but they took care to preserve a copy of the horoscope to be modified as circumstances required. Pascal remarks, —" They say that eclipses portend misfortunes, because misfortunes are common, so that, as some ill chance often happens, they are often right, whereas if they said that they portended good fortune, they would be generally wrong. They only assign good fortune to rare conjunctions of the stars, and this is how their predictions rarely fail." Those ages during which astrologers were dominant by the terror they inspired, and sometimes by the martyrdom they endured when their predictions were either too true or too false, were in truth the saddest in the world's history. Faith, to borrow their own language, was banished to Virgo, and rarely shed her influence on men. Cardan, for instance, hated Luther, and so changed his birthday in order to give him an un- favourable horoscope. In Cardan's times, as in those of Augustus, it was a common practice for men to conceal the day and hour of their birth, till, like Augustus, they found a complaisant

astrologer. But, as a general rule, astrolo- gers did not give themselves the trouble of reading the stars, they contented themselves with telling fortunes by faces. They practised chiromancy, and relied on after- wards drawing a horoscope to suit. As physiognomists their talent was undoubted, and we may again call Vanini as a witness that there is no need to mount to the house- top to cast a nativity. "Yes," he says, "I can read his face; by his hair and his forehead it is easy to guess that the sun at his birth was in the sign of Libra and near

Venus. Nay, his complexion shows that Venus touches Libra, By the rules of astrology he could not lie." No doubt, by the rules of chiromancy, a calm forehead, clustering locks, a clear and sanguine complexion, are signs of sincerity. If we combine Apollo and Venus, t.e., manli- ness and tenderness, the product is sincerity. If we wish to see this type of character to perfection, we have only to look at a good portrait of Spinoza.

Tn conclusion, we shall give a few salient facts concern-

ing the astrologers and their predictions, remarkable either for their fulfilment, or for the ruin and confusion they brought upon their authors. We may begin with one taken from Bacon's Essay of Prophecies :—" When I was in France, I heard from one Dr Pena, that the queen mother, who was given to curious arts, caused the king her hus- band's nativitie to be calculated, under a false name; and the astrologer gave a judgment, that he should be killed in a duell; at which the queene laughed, thinking her hus- band to be above challenges and duels ; but he was slaine, upon a course at tilt, the splinters of the staffe of Mon- gomery going in at his bever." A favourite topic of the astrologers of all countries has been the immediate end of the world. As early as 1186 the earth had escaped one threatened cataclysm of the astrologers. This did not pre-

vent Stoffler from predicting a universal deluge for the year 1524—a year, as it turned out, distinguished for drought. His aspect of the heavens told him that in that year three planets would meet in the aqueous sign of Pisces. The prediction was believed far and wide, and president Aurial, at Toulouse, built himself a Noah's ark— a curious realisation, in fact, of Chaucer's merry invention

in the Miller's Tale. In China any false prediction of the

astrologers was punished with death. But, as Juvenal remarks in his Siath Satire, the astrologers' chief power depends on their persecution. M. Hofer cannot persuade himself that the Chinese possessed any extensive astronomical knowledge which they afterwards forgot. Still, the position of the astrologists, that is, the astronomers, in China sufficiently explains this relapse in astronomy. They preferred to trust to chance, and live in honour with credulous emperors, at the risk of being hanged by those they failed to please. Inordinate rewards and inordinate punishments made them indifferent to all pure love of science, and life with Orientals has always been reckoned a small stake in the game. Not only was Tycho Brahe from his fifteenth year devoted to astrology, but adjoining his observatory at Uranienburg, the astronomer royal of Den- mark had a laboratory built in order to study alchemy, and it was only a few years before his death that he finally abandoned astrology. We may here notice one very remarkable prediction of the master of Kepler. That he had carefully studied the comet of 1577 as an astronomer, we may gather from his adducing the very small parallax of this comet as disproving the assertion of the Aristotelians that a solid sphere enveloped the heavens. But besides this, we find him in his character of astrologer drawing @ singular prediction from the appearance of this comet. It announced, he tells us, that in the north, in Finland, there should be born a prince who should lay waste Germany and vanish in 1632. Gustavus Adolphus, it is well known, was born in Finland, overran Germany, and died in 1632. The fulfilment of the details of this prophecy was, of course, nothing but a lucky hit, but we may convince ourselves that Tycho Brahe had some basis of reason for his prediction. He was no dupe of vulgar astrology, but gifted rather with a happy inspiration like that of Paracel- sus, who saw in himself the forerunner and prototype of the scientific ascendency of Germany. Born in Denmark of a noble Swedish family, a politician, as were all his contemporaries of distinction, Tycho, though no conjuror

could foresee the advent of some great northern hero. Moreover, he was doubtless well acquainted with a very ancient tradition, that heroes

generally came from the northern frontiers of their native land, where they are hardened and tempered by the threefold struggle they wage with soil, climate, and barbarian neighbours.

Kepler explained the double movement of the earth by the rotation of the sun. At one time the sun presented its friendly side, which attracted one planet, sometimes its adverse side, which repelled it. He also peopled the planets with souls and genii. He was led to his three great laws by musical analogies, just as later on an organist of Hanover, William Herschel, passed from music to as- tronomy. Kepler, who in his youth made almanacs, and once prophesied a hard winter, which came to pass, could not help putting an astrological interpretation on the dis- appearance of the brilliant star of 1572, which Tycho had observed. Theodore Beza thought that this star, which in December 1573 equalled Jupiter in brilliancy, predicted the second coming of Christ. Astronomers were only then beginning to study variable and periodic stars, and disturb- ances in that part of the heavens, which had till then, on the authority of Aristotle, been regarded as incorruptible, combined with the troubles of the times, must have given a new stimulus to belief in the signs in heaven. Mon- taigne (Hssais, lib. i. chap. 10) relates a singular episode in the history of astrology Charles V. and Francis L., who both bid for the friendship of the infamous Aretin, surnamed the divine, both likewise engaged astrologers to fight their battles. In Italy those who prophesied the ruin of France were sure to be listened to. These prophecies affected the public funds much as telegrams do nowadays. 'At Rome," Montaigne tells us, "a large sum of money was lost on the Change by this prognostication of our ruin." The marquis of Saluces, notwithstanding his gratitude to Francis I. for the many favours he had re- ceived, including his marquisate, of which the brother was despoiled for his benefit, was led in 1536 to betray his country, being scared by the glorious prophecies of the ultimate success of Charles V. which were then rife. The influence of the Medici made astrologers popular in France. Richelieu, on whose council was Gaffarel, the last of the cabalists, did not despise astrology as an engine of govern- ment. At the birth of Louis XIV. a certain Morin de Villefranche was placed behind a curtain to cast the nativity of the future autocrat. A generation back the astrologer would not have been hidden behind a curtain, but have taken precedence of the doctor. La Bruyére dares not pronounce against such

beliefs, "for there are perplexing facts affirmed by grave men who were eye-witnesses." In England William Lilly and Robert Fludd were both dressed in a little brief authority. The latter gives us elaborate rules for the detection of a thief, and tells us that he has had personal experience of their efficacy. "If the lord of the sixth house is found in the second house, or in company with the lord of the second house, the thief is one of the family. If Mercury is in the sign of the Scorpion he will be bald, &c." Francis Bacon abuses the astrologers of his day no less than the alchemists, but he does so because he has visions of a reformed astrology and a reformed alchemy. Sir Thomas Browne, too, while he denies the capacity of the astrologers of his day, does not venture to dispute the reality of the science. The idea of the souls of men passing at death to the stars, the blessedness of their particular sphere being assigned them according to their deserts (the metempsychosis of J. Reynaud), may be re- garded as a survival of religious astrology, which, even as late as Descartes's day, assigned to the angels the rdle of moving the planets and the stars. Joseph le Maistre, the last and ablest champion of old-fashioned orthodoxy, be-

lieved in comets as messengers of divine justice, and in animated planets, and declared that divination by astrology is not an absolutely chimerical science. Lastly, we may mention a few distinguished men who ran counter to their age in denying stellar influences. Aristarchus of Samos, Martianus Capella (the precursor of Copernicus), Cicero, Favorinus, Sextus Empiricus, Juvenal, and in a later age La Fontaine, a contemporary of the neutral La Bruyére, were all pronounced opponents of astrology.

In England Swift may fairly claim the credit of having given the death-blow to astrology by his famous squib, en- titled Prediction for the Year 1708, by Isaac Bickerstaff, Esq. He begins by professing profound belief in the art, and next points out the vagueness and the absurdities of the philo- maths. He then, in the happiest vein of parody, proceeds to show them a more excellent way :—" My first prediction is but a trifle, yet I mention it to show how ignorant these sottish pretenders to astrology are in their own concerns: it refers to Partridge the almanac-maker. I have con- sulted the star of his nativity by my own rules, and find he will infallibly die upon the

29th of March next about eleven at night of a raging fever. Therefore I advise him to consider of it and settle his affairs in time." Then fol- lowed a letter to a person of quality giving a full and par- ticular account of the death of Partridge on the very day and nearly at the hour mentioned. In vain the wretched astrologer protested that he was alive, got a literary friend to write a pamphlet to prove it, and published his almanac for 1709. Swift, in his reply, abused him for his want of manners in giving a gentleman the lie, answered his argu- ments seriatim, and declared that the evidence of the publi. cation of another almanac was wholly irrelevant, " for Gadbury, Poor Robin, Dove, and Way do yearly publish their almanacs, though several of them have been dead since before the Revolution."

Seeing that astrology once permeated all sciences, all religion, and all politics, it is not strange if traces of it crop up when we should least expect them. To astrolo- gical politics we owe the theory of heaven-sent rulers, instruments in the hands of Providence, and saviours of society. Napoleon as well as Wallenstein believed in his star. Even now that the science is dead it lives on in our language. Many passages in our older poets are unintel- ligible without some knowledge of astrology. Chaucer wrote a treatise on the astrolabe ; Milton constantly refers to planetary influences ; in Shakspeare's King Lear, Glou- cester and Edmund represent respectively the old and the new faith. We still contemplate and consider ; we still speak of men as jovial, saturnine, or mercurial ; we still talk of the ascendency of genius, or a disastrous defeat.

Erymouocires.—Belief in the influence of the heavens, the air, and the flight of birds upon human affairs has left traces in all languages. The Greek dotpoBodrcioba:, and the Latin siderari, sideratio, templum, have been already referred to. In French, heur, matheur, heureux, malheureux, are all derived from the Latin augurium; the expression né sous une mauvaise étoile, born under an evil star, corresponds (with the change of éoile into astre) to the word malétru, in Provencal malastrue ; and son étoile palit, his star grows pale, belongs to the same class of illusions. The Latin ex augurio appears in the Italian sciagura, sciagurato, softened into sciaura, sciaruato, wretchedness, wretched. The influence of a particular planet has also left tracesin various languages ; but these must rather be explained by chiromancy than by astrology. The French and English jovial aud the

English saturnine correspond rather to the gods who served as types in chiromancy than to the plancts which bear the same names. But this is not the case with the expressions bien or mal luné, well or ill-mooned, avoir un quar- tier de lune dans la téte, to have the quarter of the moon in one's head, nor with the German mondsiichtig and the English moon- struck ; the fundamental idea of such expressions lies in the extra- ordinary opinions formerly held about the moon. The belief in good or evil influence by the mere medium of a look has also left its mark on language ; asin the Italian 7 buon, tl eattiv' occhio, the good, or evil, eye ; la jettatuwra, bewitching by a look, &c. (J. A.)

Origin of the Science.

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ASTRONOMY

ieee (from dorpov, a star, and vénw, to classify

or arrange) is the science which deals with the dis- tribution, motions, and characteristics of the heavenly bodies. It is here treated of under two heads : first, the History of Astronomy; and, secondly, Theoretical Astro- nomy, in which the different theories of the motions of the celestial bodies are explained, and such facts described as observation has made known respecting their nature and constitution.

Chinese and Indians, Gauls and Peruvians, equally regard themselves as the founders of astronomy,——an honour, however, of which Josephus deprives them all, in order to ascribe it to the antediluvian patriarchs, The fables relating to the two columns of brick and marble which these sages are said to have erected, and on which they engraved the elements of their astronomy, to preserve them from the universal destruction by fire and water to which they are said to have learned from Adam the earth was doomed, are not worth the trouble of repetition; nor is there any better proof than the assertion of that credulous historian, of their acquaintance with the annus magnus, the astronomical cycle of 600 years, which brings back the sun and moon to the same points of the heavens so nearly, that its discovery implies a pretty correct know- ledge of the solar and lunar

motions. Passing over those details of traditional observations or unimportant facts, we proceed to give a brief account of the state of astronomy among some early nations who have undoubtedly con- tributed to the improvement of the science, or who, at least, have transmitted to future ages some records of their astronomical labours.

Parr l.—Hisrory or ASTRONOMY.

Astronomy may probably be regarded as the most ancient of the sciences. Even the least civilised races must have recognised the regular vicissitudes of day and night (and, therefore, the diurnal course of the sun), while before long the variety and succession of the seasons would be noted, and their cause—the oblique annual motion of the same luminary—would be recognised. The moon in the sun's absence is so conspicuous and so useful that her motions, her various phases, and her regular disappearance and return after equal intervals of time, must have been watched in the earliest times with attention and interest. The occur- rence of eclipses and other unusual phenomena would stimulate closer scrutiny. 'The spectacle of the starry heavens, seemingly unchangeable, save for the motions of a few wandering orbs along a certain zone of the star-sphere, early suggested an association between the fates of men and nations and these emblems of unchanging destiny on the one hand and of the changeful lot of mankind on the other, Thus astrology had its origin,—a superstition which bore the same relation to astronomy that alchemy bore to chemistry. Like alchemy, astrology was of service— superstition though it was—in encouraging observation and in leading to discoveries of interest.

But though mankind were probably first impelled by motives of mere curiosity to observe the courses of the stars, no great length of time could have elapsed ere they perceived that the regular and uniform revolutions of the heavens might be rendered subservient to their own wants and con- veniencies. By the help of the stars the shepherd, during the night, could count the hours, the traveller track his course through the uniform wastes of the desert, and the mariner guide his bark over the ocean: the husbandman,also, learned to regulate his labours by the appearance of certain constel- lations, which gave him warning of the approaching seasons. The indications derived from the simple observation of such

phenomena were doubtless extremely vague ; but as civilisation advanced, the necessity of determining accurately the length of the solar year and of the lunar month, in order to regulate the calendar and the religious festivals, led to the accumulation and comparison of different observations, whereby errors were gradually diminished, and the founda- tions laid of a more perfect science.

Astronomy thus presenting so many objects of curiosity and interest, and having so many practical uses, could not fail to be one of the sciences first cultivated by mankind. Its origin is, consequently, hid amidst the obscurity of remote ages, and is, in fact, coeval with the earliest development of the human intellect. The records or traditions of almost every ancient nation furnish some traces of attention to the state of the heavens, and of some rude attempts to discover the laws, the order, and the period of the most remarkable phenomena, such as eclipses of the sun and moon, the motionsof theplanets, and the heliacal risings of the princi- pal stars and constellations. The Chaldeans and Egyptians,

Astronomy of the Chaldeans, Egyptians, Phoenicians, Chinese, and Indians.

According to the unanimous testimony of the Greek historians, the earliest traces of astronomical science are to be met with among the Chaldeans and Egyptians. The

the utmost facilities for observing the celestial phenomena ; and its inhabitants, enjoying the leisure afforded by a pastoral life, and stimulated by the vain desire of obtaining a knowledge of the future from the aspects of the stars, assiduously cultivated astronomy and astrology. By along series of observations of eclipses, extending, according to the testimony of some authors, over nineteen centuries, or even a longer period, they had discovered the cycle of 223 lunations, or eighteen solar years, which, by bringing back the moon to nearly the same position with respect to her nodes, her perigee, and the sun, brings back the eclipses inthe same order. This is supposed to be the period which they distinguished by the name of Saros. They had others, to which they gave the names of Sossos and Neros ; but nothing positive is known with regard to their

Chaldaic periods, whatever they were, were purely empiri- cal. Detected by the comparison of recorded observatious, they imply neither theory nor science, unless, indeed, a simple arithmetical operation is to be considered as such ; nor is there any reason to suppose that the Chaldeans employed any process of computation whatever in their predictions of eclipses. Having once established their cycle they were in possession of a simple means of predict- ing all those which occurred in the course of it, with as

great a degree of accuracy as they considered requisite.

the Chaldeans in the cultivation of astronomy ; and although they have left behind them still fewer monuments of their labours, they have obtained, through the exaggerated state- ments of the Greeks, even a greater reputation. The Greeks acknowledge themselves indebted to the Egyptians for their science and civilisation; but regarding themselves likewise as descendants of that ancient people, they indulged their vain-glory in magnifying the accounts of the antiquity and knowledge of their supposed ancestors. It is not improbable that some traditional observations of the

spacious level and unclouded horizon of Chaldea afforded Chaldeans,

nature or extent. It is certain, however, that these

The Egyptians were in ancient times the rivals of pgyptians.

Pheeni- cians,

Chinese.

HISTORY. |

heavens, along with some arts indispensable to society even in its earliest stages, were carried into Europe by tribes migrating from the banks of the Nile; and it is certain that the early philosophers of Greece travelled into Egypt for the purpose of acquiring a more perfect know- ledge of astronomy than could be obtained in their own country. But the facts from which it can be inferred that the Egyptians had much to communicate, are few and ill-attested. They arc also blended with so much absurdity and fable, that no

accurate notions can be formed, from the accounts that have been transmitted to us, of the real advances which that people had made in astronomical science. The priests were the depositaries of the national knowledge; and they carefully concealed it from the common people by shrouding it in allegories, traces of which, it has been remarked, may be detected in the insti- tutions even of the present day.

The Phoenicians are also generally enumerated among the nations who cultivated astronomy at a very early period, though it does not appear, from any facts mentioned by ancient authors, that they devoted themselves specially to thé observation of the heavens, or made any discoveries relative to the motions of the planets. That they excelled in the art of navigation is certain, from the commercial intercourse which they carried on with many places on the coasts of Africa and Spain, and with the principal islands of the Mediterranean; and it may readily be allowed that in their long voyages they would direct their course during the night by the cireumpolar stars. If they had any speculative notions of astronomy, these were probably derived from the Chaldeans or Egyptians.

In China, astronomy has been cultivated from the remotest ages, and has always been considered a science indispensably necessary to the civil government of the state. The Chinese boast of a series of eclipses, recorded in the annals of the nation, extending over a period of 3858 years, all of which, they affirm, were not only carefully observed, but were calculated and figured previous to their occurrence. The same motives which led the Chaldeans and Egyptians to attend to the celestial phenomena, namely, the regula- tion and division of time, had equal influence among the Chinese, and we accordingly find the care of the calendar occupying the attention of their earliest princes. The emperor Fou-Hi, whose reign commenced about 2857 years before our era, is said to have assiduously studied the motions of the celestial bodies, and laboured to instruct his ignorant subjects in the mysteries of astronomy. But as they were not yet enlightened enough to comprehend his theories, he was obliged to content himself with giving them a rule for the computation of time by means of the numbers 10 and 12, the combination of which produces the cycle of 60 years, which is the standard or unit from which they deduce their hours, days, and months. 'Tradi- tion is silent with respect to the sources from which Fou- Hi derived

his. own knowledge. In the year 2608 B.c., Hoang-Ti caused an observatory to be built, for the pur- pose of correcting the calendar, which had already fallen into great confusion, and appointed one set of astronomers to observe the course of the sun, another that of the moon, and a third that of the stars. It was then discovered that the twelve lunar months do not exactly correspond with a solar year ; and that, in order to restore the coincidence, it was necessary to intercalate seven lunations in the space of nineteen years. If this fact rested on undoubted evi- dence, it would follow that the Chinese had anticipated the Greeks by 2000 years in the discovery of the Metonic cycle. The reign of Hoang-Ti is also rendered memorable by the institution of the Mathematical Tribunal, for pro- moting the science of astronomy, and regularly predicting eclipses, to which an extraordinary importance has always

been attached in China. The members of this celebrated tribunal were made responsible with their lives for the accuracy of their predictions, by a law of the empire, which ordained that, "' whether the instant of the occurrence of any celestial phenomenon was erroneously assigned, or the phenomenon itself not foreseen and predicted, either negli- gence should be punished with death." In the reign of T'chong-Kang, the two mathematicians of the empire, Ho and Hi, were the victims of this sanguinary law—an eclipse having taken place which their skill had not enabled them to foresee. The emperor Yao, who mounted the throne, according to the Chinese annals, about the year 2317 B.c., gave a new impulse to the study of astronomy, which had begun already to decline. He ordered his astronomers to observe with the utmost care the motions of the sun and moon, of the planets and the stars, and to determine the exact length of each of the four seasons. To this emperor are attributed the Chinese division of the zodiae into 28 constellations, called the houses of the moon, and the severe laws already noticed in regard to the erroneous prediction of the celestial phenomena. From the time of Yao the Chinese year consisted of 365} days. They also divided the circle into 3654 degrees, so that the sun daily described in his orbit an are of one Chinese degree. Their common lunar year consisted of

364348 days ; and by combining this number with 365}, they formed the period of 4617 years, after which the sun and moon again occupy the same rela- tive positions.

The earliest Chinese observations we are acquainted with, sufficiently precise to afford any result useful to astronomy, were made by Tcheou-Kong, whose reign commenced about the year 1100 before our era. Two of these observations are meridional altitudes of the sun, observed with great care at the village of Loyang, at the time of the summer and winter solsticcs. The obliquity of the ecliptic thus determined at that remote epoch is 23° 54' 3'°15—a result which perfectly agrees with the theory of universal gravita- tion. Another observation made about the same time

'relates to the position of the winter solstice in the heavens ;

and it also corresponds to within a minute of a degree with the calculations of Laplace. Laplace considers this extra- ordinary conformity as an indubitable proof of the authen- ticity of those ancient observations. The golden age of Chinese astronomy extended from the reign of Fou-Hi to the year 480 B.c.,—that is, over a space of 2500 years. Itis only,

'however, towards the latter part of this long period that the

history of China becomes in any degree authentic ; and the true date which must be assigned for the commencement of observations on which any reliance can be placed, is the year 722 B.c., that is, 25 years posterior to the era of Nabonassar. From that period to the year 400 3B.c., Con- fucius reckons a serics of 36 eclipses, and of these 31 have been verified by modern astronomers. After this the science fell into great neglect, notwithstanding the invete- rate tenacity with which the Chinese in general adhere to their ancient customs. The decline of their astronomy is ascribed, whether justly or not, to the barbarous policy of the emperor Tsin-Chi-Hong-Ti, who, in the year 221 B.c., ordered all the books to be destroyed, excepting those only which related to agriculture, medicine, and astrology, the only sciences which he considered as being of any use to mankind. In this manner, it is said, the precious mass of astronomical observations and precepts which had been accumulating for ages was irretrievably lost. —

On considering attentively the accounts which have been given of the Chinese astronomy, we find that it consisted only in the practice of observations which led to nothing more than the knowledge of a few isolated facts. The missionaries who were sent out by the Jesuits about the end of the 17th century, to whom ve indebted for

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Indians.

Thales.

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what is known of the early history of China, either seduced by some appearances of truth, or thinking it prudent to conciliate the people whom they were attempting to convert, adopted their marvellous relations regarding the antiquity of their science, and spread them over Kurope. As the history of the nation begins to become more authentic, thcir astronomy shrinks into its real, insignificant dimen- sions, Superstitiously attached to their ancient usages, and blindly adopting the habits of their ancestors, the Chinese continued to observe the heavens from century to century without making the slightest advances in theo- retical knowledge. In later times they have adopted many improvements, for which they are entirely indebted to foreigners. During the time of the caliphs many Maho- metans passed into China, carrying with them the astro- nomical methods and knowledge of the Arabians. The missionaries introduced the science of Europe ; and the most that can be said in praise of the Chinese is, that their Government sometimes relaxed so far its spirit of jealousy and exclusion, as to afford protection to these strangers, adopt their arts, and place them at the head of the Mathematical Tribunal.

The astronomy of the Indians forms one of the most curious problems which the history of science presents, and one which, notwithstanding much discussion, still continues involved in great uncertainty. Of the science of the ancient nations of which we have already spoken, the accounts which have come down to our times are founded on conjecture and tradition ; for few monuments remain to confirm or confute the glowing descriptions

which authors have given of its high antiquity and great perfec- tion. But the claims of the Indians rest on a more solid foundation. We are in possession of the tables from which they compute the eclipses and places of the planets, and of the methods by which they effect the computation ; we have, in short, an Indian astronomy committed to writing, which represents the celestial phenomena with considerable exactness, and which, therefore, could only be produced by a people far advanced in science. But the

difficulty the problem presents is the determination of the

sources whence this science originated and the epoch of its existence—the question whether it was created by the people who now blindly follow its precepts without under- standing its principles, or was communicated to them by an- other race of a more original genius through chanuels with which we are unacquainted. Some authors regard India as the cradle of all the sciences, particularly of astronomy, which they suppose to have been cultivated there from the remotest ages; others date the origin of the Indian astro- nomy from the period when Pythagoras travelled into that country, and carried thither the arts and sciences of the Greeks ; a third opinion is, that astronomy was conveyed to India by the Arabians in the 9th century of our era, and that the Brahmins are only entitled to the humble merit of adapting the rules and practices of that people to their own peculiar methods of calculation.

Astronomy of the Greeks.

The origin of astronomy in Greece, as in other early nations, ascends beyond the period of authentic history. The true foundations of Grecian science were laid by Thales, who was born at Miletus 640 years before our era. He formed a sect which has been distinguished by the title of the "Ionian School." His doctrines regarding astronomy contain a few truths which do honour to his sagacity and observation, though they are mixed with much error and absurdity. He taught that the stars are formed of fire ; that the moon receives her light from the sun, and is invisible at her conjunctions, because she is hid in the sun's rays. He also taught the sphericity of the earth,

just seen, has also been ascribed to Anaximander.

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which he placed at the centre of the universe. He divided the sphere into five zones, by the arctic and antarctic circles, and the two tropics ; and held that the equator is cut obliquely by the ecliptic, and perpendicularly by the meridian. He is also said to have observed eclipses ; and Herodotus relates that he predicted the famous one which put a stop to the war between the Medes and the Lydiaus. Tt does not appear, however, that he ventured to assign either the day or the month of the eclipse, so that his prediction must have been confined to the year. According to Callimachus, he determined the positions of the stars which form the Lesser Bear, by which the Phcenicians guided themselves in their voyages. It is difficult, however, to conceive how Thales, unacquainted with instruments, could determine the positions of stars with so much accu- racy as to render any essential assistance to the navigator. It is probable that he only pointed out the configuration and some of the more brilliant stars of that constellation, among which he might remark that which is nearest the pole of the heavens. Thales was succeeded by Anaxi- mander, to whom also is attributed a knowledge of the sphere and of the zodiac. According to Diogenes Laertius, he, like his master Thales, supposed the earth to be spherical, and placed at the centre of the universe ; but Plutarch ascribes to him the less philosophical opinion of its resemblance to a column. He supposed the sun to be of equal magnitude with the earth. He invented the gnomon, and placed one at Lacedeemon to observe the solstices and equinoxes. The circumstance which best entitles Anaximander to the gratitude of posterity is the

invention of geographical charts. Anaximenes succeeded Anaxi-
Anaximander in the lunian school, and maintained nearly ™enes-

the same doctrines. Pliny says he was the first who taught the art of constructing dials, an invention which, as we have These two philosophers probably revived the knowledge of an in- strument, the use of which had been forgotten amidst the general rudeness and ignorance of their countrymen. Before their time the Greeks only marked the divisions of the day

by the different lengths of the sun's shadow.

philosopher really entertained the ridiculous opinions ascribed to him by Plutarch, the Ionian school must rather have retrograded than advanced in sound philosophy from the time of Thales. He is said to have believed that the sun is a mass of red-hot iron, or of heated stone, somewhat bigger than the Peloponnesus, that the heaven is a vault of stones, which is prevented from tumbling only by the rapidity of its circular motion, and that the sun is prevented from advancing beyond the tropics by a thick and dense atmosphere, which forces him to retrace his course. These alleged opinions are probably greatly exaggerated ; but it does not appear that Anaxagoras contributed much to extend the knowledge of the heavens. His disregard for the superstitious notions of his age brought its usual penal consequences. Having shown the reason of the eclipses of the moon, he was accused of ascribing to natural causes the attributes and power of the gods; and having taught the existence of only one God, he was accused of impiety and treason towards his country. Sentence of death was pro- nounced on the philosopher and all his family; and it required the powerful interest of his friend and disciple Pericles to obtain a commutation of the sentence into one of perpetual banishment.

While the Ionian sect was so successfully employed in cultivating and propagating a knowledge of nature in Greece, another, still more celebrated, was founded in Italy by Pythagoras.

and of the identity of the morning and evening stars.

Anaxagoras Anaxa- was the disciple and successor of Anaximenes. If this goras.

Pythagoras is said to have acquired in Pytha- Egypt the knowledge of the obliquity of the ecliptic, goras.

Philolaus.

Nicetas.

Metonic cycle,

What he chiefly deserves to be commemorated for in the history of astronomy, is his philosophical doctrine regarding the motion of the earth. He taught publicly that the earth is placed at the centre of the universe; but among his chosen disciples he propagated the doctrine that the sun occupies the centre of the planetary world, and that the earth is a planet revolving round the sun. This system, which still retains his name, being called the old or Pythagorean system of the universe, is that which was revived by Copernicus. It is, however, only just to the latter to observe, that there is a vast difference between the bare statement of the possibility of a fact, and the demonstration of its existence by irrefragable arguments. Pythagoras having remarked the relation which subsists between the tone of a musical chord and the rapidity of its vibration, was led by analogy to extend the same relation to the planets, and to suppose that they emit sounds pro- portional to their respective distances, and form a celestial concert too melodious to affect the gross organs of mankind. Another fancy into which he was led by his passion for analogies, was the application of the five geometrical solids to the elements of the world. The cube symbolically repre- gented the earth; the pyramid, fire; the octahedron, air; the icosahedron, or twenty-sided figure, water; and the dode- cahedron, or figure with twelve faces, the exterior sphere of the universe, Pythagoras left no writings ; and it is doubtful whether he really entertained many of the opinions and reveries which have usually been ascribed to him. Philolaus of Crotona, a disciple of Pythagoras, embraced the doctrine of his master with regard to the revolution of the earth about the sun. He supposed the sun to bea disk of glass which reflects the light of the universe. He made the lunar month consist of 29} days, the lunar year of 354 days, and the solar year of 3654 days. Nicetas of Syracuse seems to have been the first who openly taught the Pythagorean system of the universe. Cicero, on the authority of Theophrastus, the ancient historian of astro- nomy, gives him the credit of maintaining that the apparent motion of the stars arises from the diurnal motion of the earth about its axis ;! but this rational doctrine seems to have been first broached by Heraclides of Pontus, and Ecphantus, a disciple of Pythagoras,

The introduction of the Metonic cycle forms an era in the history of the early astronomy of Greece. The Chal- deans, as we have already stated, established several lunisolar periods ; and the difficulty of reconciling the motions of the sun and moon, or of assigning a period at the end of which these two luminaries again occupy the same positions relatively to the stars, had long embarrassed those who had the care of regulating the festivals. Meton and Euctemon had the merit of first obviating this diffi- culty, at least for a time; for the motions of the sun and moon being incommensurable, no period can be assigned which will bring them back to precisely the same situations. These two astronomers formed a cycle of nineteen lunar years, twelve of which contained each 12 lunations, and the seven others each 13, which they intercalated among the former. It had long been known that the synodic month consisted of 294 days nearly; and in order to avoid the fraction, it had been usual to make the twelve synodic months, which compose the solar year, to consist of 29 and 30 days alternately ; the former being called deficient and the latter full months. Meton made his period consist of

1 " Nicetas Syracusius, ut ait Theophrastus, ccelum, solem, lunam, stellas, supera denique omnia, stare censet; neque, preter terram, rem ullam in mundo moverl; que cum cireum axem se summa celeri- tate convertat et torqueat, eadein effici omnia, quasi, stante terra, celum moveretur."—(Cicero, Acad. Quest., lib. iv. cap. 39.) Co- pernicus himself could not have stated the doctrine with greater precision.

125 full and 110 deficient months, which gives 6940 days for the 235 lunations, and is nearly equal to 19 solar years, This cycle commenced on the 16th of J uly in the year 433 B.C. It was received with acclamation by the people as- sembled at the Olympic games, and adopted in all the cities and colonies of Greece. It was also engraved in golden letters on tables of brass, whence it received the appellation of the golden number, and has been the basis of the calen- dars of all the nations of modern Europe. It is still in ecclesiastical use, with such modifications as time has rendered necessary.

Eudoxus of Cnidus, about the year 370 B.c., obtained Eudoxus.

great reputation as an astronomer. According to Pliny, he introduced the year of 365} days into Greece, Archimedes says that he supposed the diameter of the sun to be nine times greater than that of the moon, which shows that he had in some degree overcome the illusions of sense. The titles of three of his works have been preserved,—the Period or Circumference of the Earth, the Phenomena, and the Afirror, His observatory was still standing at Cnidus in the time of Strabo, Heis noteworthy for his contempt of the Chaldean predictions, and for having contributed to separate true astronomy from the reveries of judicial astrology. Eudoxus seems to have been the first who attempted to give a mechanical explanation of ~~*the apparent motions of the planets. He supposed that each planet occu*~~ *pies a particular part of the heavens, and that the path which it describes is determined by the combined motion of several spheres performed in different directions. The sun and moon had each three spheres : one revolving round an axis which passes through the poles of the earth, and which occasions the diurnal motion; a second revolving round the poles of the ecliptic, in a contrary direction, and causing the annual and monthly revolutions ; the third revolving in a direction perpendicular to the first, and causing the changes of declination. ach of the planets had a fourth sphere to explain the stations and retrogradations. As new inequalities and motions were discovered, new spheres were added, till the machinery became so complicated as to be altogether unintelligible.*

Although Plato can hardly be cited as an astronomer, yet the progress of the science was accelerated by means of the lights struck out by his penetrating genius. He seems to have had just notions of the causes of eclipses; and he imagined that the celestial bodies originally moved in straight lines, but that gravity altered their directions, and compelled them to move in curves. He proposed to astronomers the problem of representing the courses of the stars and planets by circular and regular motions. Geometry was assiduously cultivated in the school of Plato; and on this account he claims a distinguished place among the promoters of true astronomy.

Astronomy is also under some obligations to Aristotle. Aristotle,

In a treatise which he composed on this science, he recorded a number of observations which he had made ; and, among others, mentions an occultation of Mars by the moon, and another of a star in the constellation Gemini by the planet Jupiter. As such phenomena are of rare occurrence, their observation proves that he had paid considerable atteution to the planetary motions,

A great number of astronomers flourished about this time whose labours and observations prepared the way for the reformation of the science which was shortly after effected by Hipparchus. for the prediction of an eclipse, which took place, as Plutarch affirms, at the time announced. History records the names of only three individuals in ancient Greece who predicted eclipses,—Thales, Helicon, and Eudemus.

Eudemus composed a history of astronomy, a fragment Eudemus.

of which, consisting of only a few lines, is preserved by

Helicon of Cyzicus is renowned Helicon.

Calippus.

Theo- phrastus.

Autolyeus.

Pytheas.

Aristillus and Timo- charis.

Aristar- chus.

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Fabricius in the Bibliotheca Greca. In this it is mentioned that the axes of the ecliptic and equator are separated from each other by the side of a pentedecagon, which is equivalent to saying that they contain an angle of 24°. This is the first value which we find assigned by the Greeks to the

obliquity of the ecliptic. It is given in round numbers, and may easily be supposed to contain an error of a quarter of a degree.

Calippus is celebrated for the period which he formed of four Metonic cycles. Having observed, by means of an eclipse of the moon which took place about six years before the death of Alexander, that the Metonic cycle contained an error of a fourth of a day, he introduced the period of 940 lunations, containing four Metonic cycles, diminished by one day. He likewise formed a collection of observa- tions on the heliacal risings of the planets. Theophrastus wrote a history of astronomy, and supposed the Milky Way to be produced by the imperfect junction of the two hemispheres, which allowed the light to penetrate from the firmament beyond. Autolycus of Pitane wrote two books,—one on the movable sphere, the other on the risings and settings of the stars. These are the most ancient of the astronomical works of the Greeks which have come down to our times.

Pytheas of Marseilles, about the time of Alexander the Great, determined the length of the solstitial shadows in various countries by means of the gnomon. He found the shadows equal at Marseilles and Byzantium—a circumstance which does not give a favourable idea of the accuracy of his observations, inasmuch as the difference of the latitudes of the two places amounts to 2} degrees. The observation is, however, interesting, as it 1s the most ancient of the kind which has been preserved after that of Tcheou-Kong, and as it confirms the successive diminution of the obliquity of the ecliptic. Pytheas undertook several voyages for the purpose of obtaining geographical and astronomical infor- ination, and advanced northwards as far as Iceland. His accounts have been treated as fabulous by Strabo and Polybius, but the accuracy of the greater number of them has been confirmed by modern observation and experience. He was the first who distinguished the climates by the different lengths of the days and nights.

Astronomy in the School of Alexandria.

The first astronomers of the Alexandrian school were Aristillus and Timocharis, who flourished under the first Ptolemy, about 300 years before Christ. The chief object of their labours was the determination of the relative positions of the principal stars of the zodiac instead of merely announcing their risings and settings, as had been the practice of the

Orientals and the ancient Greeks. The observations of these two astronomers conducted Hippar- chus to the important discovery of the precession of the equinoxes, and served as the basis of the theory which Ptolemy, some centuries afterwards, gave of that pheno- menon.

Aristarchus of Samos, the next in order of the Alexan- drian astronomers, composed a treatise On the Magnitudes and Distances of the Sun and Moon, which has been preserved to our times. In this treatise he describes an ingenious method which he employed to obtain the relative distances of the two luminaries. At the instant when the moon is dichotomised, that is, when the exact half of her disk appears to a spectator on the earth to be illuminated by the sun's light, the visual ray passing from the centre of the moon to the eye of the observer is perpendicular to the line which joins.the centre of the moon and sun, At that instant, therefore, he measured the angular distance of the two bodies, and finding it to be 87°, he concluded, by the resolution of a right-angled triangle, that the dis-

tance of the sun is between eighteen and nineteen times |

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greater than that of the moon. correct in theory, but it is difficult to be assured of the exact instant of the moon's dichotomy, and in an angle of such magnitude a very small error greatly affects the result. true angle being about 87° 50'. the sun is by consequence far too small ; yet the determina- tion, faulty as it was, contributed to expand greatly the existing notions relative to the boundaries of the universe, for the Pythagoreans had taught that the sun is only three, or at most three and a half times more distant than the moon. was that of the magnitude of the sun's diameter, which, as we learn from Archimedes, he determined to be the 720th part of the circumference of the circle which the sun describes in his diurnal revolution. very far from the truth, and the observation is by no means an easy one. goras respecting the earth's motion, and appears to have entertained juster notions than any of the astronomers who

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This method is perfectly

The error of Aristarchus is very considerable, the The estimated distance of

Another delicate observation made by Aristarchus

This estimate is not

He embraced the doctrine of Pytha-

preceded him, regarding the magnitude and extent of the

universe, The treatise On the Magnitudes and Distances is published in the third volume of the works of Dr Wallis,

with a Latin translation by Commandine, and some notes. Eratosthenes, the successor of Aristarchus, a native of Erato- Cyrene, was invited to Alexandria by Ptolemy Euergetes, sthenes.

who appointed him keeper of the royal library. He is supposed to have been the inventor of armillary spheres, a species of instrument extensively used by the ancient

astronomers. By means of an instrument of this kind he observed the distance between the tropics to be to the whole circumference of a great circle as 11 to 83,—a ratio equivalent to 47° 42’ 39”, half of which gives 23° 51’ 19-5 for the obliquity of the ecliptic. ‘This is a very important observation, and confirms the gradual diminution of the obliquity as indicated by theory. Eratosthenes is celebrated as the first who attempted, on correct principles, to determine the magnitude of the earth. Having remarked, by some means with which we are unacquainted, that Syene, the most southern of the cities of ancient Egypt, is situated nearly on the same meridian as Alexandria, he conceived the idea of determining the amplitude of the celestial arc intercepted between the zeniths of the two places, and of measuring at the same time their distance on the ground,—operations which would afford data for the determination of the whole length of the terrestrial meri- dian, Syene was known to be situated exactly under the tropic; for at the summer solstice the gnemon had no shadow, and the sun’s rays illumined the bottom of a deep well in that city. On the day of the solstice he found the meridional distance of the sun from the zenith of

Alexan- dria to be 7° 12’, or a fiftieth part of the circumference. It had also been ascertained by the bematists or surveyors of Alexander and the Ptolemies, that the itinerary distance between Alexandria and Syene was 5000 stadia ; therefore 5000 × 50 = 250,000 stadia form the circumference of a great circle of the earth, or the length of the terrestrial meridian. Unfortunately, on account of the uncertainty respecting the length of the stadium here employed, we possess no means of estimating the degree of approximation afforded by this rude though ingenious attempt.

About this time the science of astronomy was enriched by the discoveries of some of the distinguished geometri- cians whose labours have so greatly extended the glory of the Alexandrian school. Euclid, the celebrated author of Eueild. the Elements, lived in the reign of the first Ptolemy. He composed a book on the sphere, which probably served as a model for future works of the same kind, and was the first who treated in a geometrical manner the phenomena of the different inclinations of the sphere, Conon of Conon.

Archi- medes.

Apollonius.

Hippar- chus.

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Samos, the friend of Archimedes, collected the records of eclipses, which had been observed by the ancient Egyptians ; and Callimachus ascribes to him the constellation of Berenice’s hair. Archimedes also claims a high rank among the cultivators of astronomy. His celebrated planetarium, which represented the motions of the sun, moon, planets, aud starry sphere, has been a frequent theme of the praises of the poets :—

Jura poli, rerumque fidem, legesque deorum, Kece Syracosius transtulit arte senex.” —Claudian, Epigr. 18.

Apollonius of Perga solved the important problem of the stations and retrogradations of the planets by means of epicycles and deferents ; and he

is entitled to the glory of having formed the alliance between geometry and astro- nomy, which has been productive of the greatest advantages to both.

Astronomy, which had as yet only consisted of a know- ledge of isolated facts, acquired a systematic form, and almost a new existence, from the genius of Hipparchus, perhaps the greatest of all ancient philosophers in the sciences which are not purely speculative. This illustrious founder of astronomical science was born at Nicea in Bithynia, and observed at Rhodes. Flamsteed and Cassini, probably misled by some ambiguous expressions of Ptolemy, have related that his observations were made at Alexandria ; and this opinion seems generally to have been adopted by historians, The question has been examined carefully, and at considerable length, by Delambre (Astronomie Ancienne), who comes to the conclusion that there is no reason whatever to infer that Hipparchus ever saw Alexandria, Ptolemy, in reporting the observations of Hipparchus, supposed Rhodes and Alexandria to be situated on the same meridian, and consequently does not find it necessary to mention the place at which the observa- tions were made. MHipparchus commenced his brilliant career by verifying the determination of the obliquity of the ecliptic made by Eratosthenes. He next directed his attention to the length of the tropical year. By comparing one of his own observations of the summer solstice with a similar one made by Aristarchus 140 years before, he found that the anciently received value of 365} days was too great by seven minutes. This leaves the tropical year a value still too great; but it is probable that the error arose from the inaccuracy of the observation of Aristarchus ; for the observations of Hipparchus, compared with those of the moderns, make the length of the tropical year amount to 365 days, 5 hours, and 49 minutes, which is only 12 seconds greater than the truth. By a careful observation of the solstices and equinoxes, he discovered that the year is not divided by these points into four equal parts, the sun occupying 944 days in passing from the vernal equinox to the summer solstice, and only 924 from the same solstice to the equinox of autumn. The sun, consequently, remained 187 days in that part of the ecliptic which lies between the equator and the north pole, and therefore only about 178 in the other part. This observation led Hipparchus to the great discovery of the eccentricity of the solar orbit. He accounted for the appareut inequality of the sun's motion by supposing that the earth is not placed exactly at the centre of the circular orbit of the

sun, and that, conse- quently, his distance from the earth is subject to variation. When the sun is at his greatest distance, he appears to move more slowly; and when he approaches nearer, his motion becomes more rapid. The distance of the earth from the centre of the orbit is called the eccentricity; it produces an equation between the real and apparent motious which is called the "equation of the centre." He determined the magnitude of this equation in terms of

the radius of the ecliptic, and fixed the position of the line of the apsides, or that which joins the two opposite points of the orbit which are at the greatest and least distance from the earth. With these data he formed the first tables of the sun which are meutioned in the history of astronomy. The discovery of the eccentricity also led Hipparchus to that of the inequality of the lengths of the solar days at different seasons of the year. In the interval which elapses between the sun's passage over the meridian and his return to it the following day, the sun advances by his own proper motion towards the east nearly a degree. But the rate of this motion is unequal, varying between 57 and 61 minutes of a degree ; and the accumulation of the inequalities forms what is called the equation of time, that is, the difference between the true time, as shown by the sun, and the mean time, shown by a well-regulated clock, the motions of which are equal and uniform,

The attention of Hipparchus was next directed to the motions of the moon ; and on this subject his researches were attended with equal success. From the comparison of a great number of the most circumstantial and accurate observations of eclipses recorded by the Chaldeans, he was enabled to determine the period of the moon's revolution relatively to the stars, to the sun, to her nodes, and to her apogee. These determinations are among the most valuable results of ancient astronomy, inasmuch as they corroborate one of the finest theoretical deductions—the acceleration of the mean lunar motion—and thus furnish one of the most delicate tests of the truth of Newton's law of gravitation. It was indeed, by a comparison of the observations of Hipparchus with those of the Arabian and modern astro- nomers that Dr Halley was led to the discovery of that important

phenomenon. Hipparchus also determined the eccentricity of the lunar orbit, and its inclination to the plane of the ecliptic ; and the values which he assigned to these elements, making allowance for the evection and the inequalities of the moon's motion in latitude, are within a few minutes the same as those which are now observed. He had also an idea of the second inequality of the moon's motion, namely, the evectiou, and made all the necessary preparations for a discovery which was reserved for Ptolemy. He likewise approximated to the parallax of the moon, which he attempted to deduce from that of the sun, by determining the length of the frustum cut off from the coue of the terrestrial shadow by the moon, when she tra- verses it in her eclipses. From the parallax he concluded that the greatest and least distances of the moon are re- spectively equal to 78 and 67 semi-diameters of the earth, and that the distance of the sun is equal to 1300 of the same semi-diameters. The first of these determinations exceeds the truth, the second falls greatly short of it, the distance of the sun being nearly equal to 24,000 terrestrial semi-diameters. It may, however, be remarked that Ptolemy, who undertook to correct Hipparchus with regard to the parallax, deviated still farther from the truth.

The apparition of a new star in the time of Hipparchus induced him to undertake the formation of a catalogue of all the stars visible above his horizon, to fix their relative positions, and mark their configurations, in order that pos- terity might have the means of observing any changes which might in future take place in the state of the heavens. This arduous undertaking was rewarded by the important discovery of the precession of the equinoxes, one of the fundamental elements of astronomy.' By comparing his own observations with those of Aristillus and Timocharis, he found that the first point of Aries, which, in the time of these astronomers, or 150 years before, corresponded with the vernal equinox, had advanced two degrees, according to the order of the signs, or at the rate of 48 seconds a year. This determination is not very far from

Ptolemy.

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the truth; for, according to modern observations, the rate of the precession is about 50°1 seconds annually. His catalogue contained 1080 stars,—not,

as has sometimes been erroneously stated, 1022, the number in that of Ptolemy, in which the nebulous and some obscure stars are omitted. He also commenced a series of observations to furnish his successors with the means of forming a theory of the planets. Hipparchus likewise invented the plani- sphere, or method of representing the starry firmainent on a plane surface, which afforded the means of solving the problems of spherical trigonometry in a manner often more exact aud more convenient than the globe itself. He was the first who demonstrated the methods of calculating triangles, whether rectilineal or spherical ; and he con- structed a table of chords, from which he drew nearly the same advantages as we derive at present from the tables of sines. Geography is also indebted to him for the happy idea of fixing the position of places on the earth by means of their latitudes and longitudes; and he was the first who determined the longitude by the eclipses of the moon.

After the death of Hipparchus nearly three centuries elapsed before any successor arose worthy of the name. During this long period astronomy made no essential advancement. Some rough observations, scarcely superior to those of the Chaldeans, and a few meagre treatises, are the only monuments which exist to testify that science had not fallen into utter oblivion in an age so fertile of poets and orators. Geminus and Cleomedes wrote treatises, which have been preserved to our times; Agrippa and Menelaus are said to have observed; the Roman calendar was reformed by Julius Caesar and the Egyptian astronomer Sosigenes; and Posidonius measured a degree, and re- marked that the laws of the tides depend on the motions of the sun and moon.

Ptolemy was born at Ptolemais in Egypt, and flourished at Alexandria about the 130th year of our era, under the reigns of Hadrian and Antoninus. This illustrious ornament of the Alexandrian school is entitled by his own discoveries to the high rank among astronomers which has universally been assigned to him; but the most signal service which he conferred on science was the collection and arrangement of the ancient observations. Out of these materials he formed the MeydAy Svvrakis, or Great Composition, a col- lection which exhibits a complete view of the state of astronomy in the time of Ptolemy, and which contains the germ of most of the methods in use at the present day. The hypothesis which Ptolemy

adopted for the. purpose of explaining the apparent motions, was that which had been followed by Hipparchus. To account for the uniform circu- lar motion, Apollonius imagined the ingenious apparatus of epicycles and deferents; and Hipparchus advanced a step farther, by placing the centre of the sun's circle at a small distance from the earth. Ptolemy adopted both hypotheses, and supposed the planet to describe an epicycle by a uni- form revolution in a circle, the centre of which was carried forward uniformly in an eccentric round the earth. By means of these suppositions, and by assigning proper rela- tions between the radii of the epicycle and deferent circle, and also between the velocity of the planet and the centre of its epicycle, he was enabled to represent with tolerable accuracy the apparent motions of the planets, and parti- cularly the phenomena of the stations and retrogradations, which formed the principal object of the researches of the ancient astronomers. 'The notions of Apollonius and Hip- parchus were thus reduced to a systematic form, and the proportions of the eccentrics and epicycles of all the planets assigned, by Ptolemy; on which account the system has been generally ascribed to him, and has obtained the name of the Ptolemaic System of the universe.

The most important discovery which astronomy owes to render it impossible to

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Ptolemy is that of the evection of the moon. Hipparchus had discovered the first lunar inequality, or the equation of the centre, which serves to correct the mean motion at the syzygies, and had also remarked the necessity of another correction for the quadratures. He even undertook a set of observations, with a view to ascertain its amount and its law; but death put a stop to his labours before he had brought them toa successful issue. Ptolemy completed the investigation, and discovered that the eccentricity of the lunar orbit is itself subject to an annual variation, depending on the motion of the line of the apsides. 'The variation of the position of the apsides produces an inequality of the moon's motion in her quarters, which has been technically denominated the evection. The equation given by Ptolemy, though of course empirical, is remark- ably exact.

Ptolemy employed a very simple process for determining the moon's parallax, which was probably suggested to him by the situation of Alexandria, where he observed. He determined the latitude of a place a little to the south of that city, over the zenith of which the moon was observed to pass when her northern declination was the greatest possible. But when the moon is in the zenith, or in the same straight line with the observer and the centre of the earth, she has no parallax; consequently the obliquity of the ecliptic and the latitude of the station being known, the moon's greatest northern latitude was also determined. The next step was to observe the moon's meridian altitude fifteen days after the first observation, when her southern latitude was necessarily the greatest possible. This obser- vation gave the apparent altitude of the moon, but her greatest northern and southern declinations being supposed equal, her true altitude, as seen from the centre of the earth, was easily computed from the previous observation, and the difference between the true and apparent altitudes gave the amount of the parallax.

The observations of Hipparchus relative to the motion of the stars in longitude, or the regression of the equinoctial points, were confirmed by Ptolemy, although he mistook his amount, and diminished a quantity which Hipparchus had already estimated too low. According to Hipparchus the regression is at the rate of two degrees in 150 years. Ptolemy reduced it to one degree in 90 years. This dis- agreement would seem to indicate an error of more than a degree in the observations, which can with difficulty be adinitted, considering the accordance which subsists among the different observations cited by Ptolemy in support of his own determination. For this and some other reasons Ptolemy has been accused of altering the observations of Hipparchus, and accommodating them to his own theory ; and there would appear to be but too just grounds for the imputation. The error with regard to the regression may, however, have arisen from the circumstance, that Hipparchus had assigned too great a value to the length of the year, whence the motion of the sun with regard to the equinoxes would be made too slow, and the longitudes employed by Ptolemy consequently diminished.

Ptolemy has been called The Prince of Astronomers,—2@ title which may perhaps be justified by the universal and long-continued prevalence of his

system, but to which he has no claim from the number or value of his own obser- vations. After a laborious and minute examination of the Almagest, Delambre doubts whether anything is contained in that great work, beyond the author's own statement, from which it can be decisively inferred that Ptolemy ever observed at all. He, indeed, frequently makes mention of observations made by himself; but his solar tables, rate of the precession, eclipses, determination of the moons motion and parallax, arid above all, his catalogue of stars, doubt that the greater part of the

Albategni.

Tbn-Junis.

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results which he has given as observations are merely com- puted from the tables of Hipparchus. He never in any instance cites a single observation more than is just neces- sary for the object he has immediately in view, and conse- quently, by precluding all comparison of one observation with another, has deprived us of the means even of guessing at the probable amount of the errors of his solar, lunar, and planetary tables. If an astronomer, as Delambre justly remarks, were to adopt the same course at the present day, he would be certain of forfeiting all claim to con- fidence ; but Ptolemy stood alone ; he had neither judges nor rivals; and now no one condescends to calculate the few observations he has left us. His catalogue contains only 1022 stars, and is therefore less extensive than that of Hipparchus, but it is exceedingly valuable on account of its details.

Astronomy of the Arabians.

The most celebrated of the Arabian astronomers was Albategni, or Muhammed Ben Geber Al-Batani, so called from Batan, a city of Mesopotamia, where he was born about 850. He was a prince of Syria, and resided at Rakka in Mesopotamia ; but many of his observations were made at Antioch. Having studied the Syntaxts of Ptolemy, and made himself acquainted with the methods practised by the Greek astronomers, he began to observe, and soon found that the places assigned to many of the stars in Ptolemy's tables were considerably different from their actual situa- tions,

in consequence of the error which the latter had com- mitted with regard to the precession of the equinoxes. Albategni measured the rate of the precession with greater accuracy than had been done by Ptolemy; and he had still better success in his attempt to determine the eccentricity of the solar orbit, his value of which differs extremely little from that which results from modern obser- vations. In assigning the length of the year, however, he fell into an error of more than two minutes; but this pro- ceeded, as has been shown by Dr Halley, from too great confidence in the observations of Ptolemy. Albategni also remarked that the place of the sun's apogee is not immovable, as former astronomers had supposed, but that it advances at a slow rate, according to the order of the signs,—a discovery which has been confirmed by the theory of gravitation. A new set of astronomical tables, more accurate than those of Ptolemy, likewise resulted from the indefatigable labours of Albategni; and his observations, important in themselves, are doubly interest- ing on account of the fact that they form a link of connec- tion between those of the astronomers of Alexandria and of modern Europe. The works of Albategni were pub- lished in 1537 under the title of De Scientia Stellarum.

Ibn-Junis, who flourished at the beginning of the 11th century, constructed a set of tables, and composed a sort of celestial history, in which he has recorded numerous observations of his own and of other astronomers belonging to the same country. This work, imperfectly known through some extracts, long excited the curiosity of astro- homers, as it was supposed to contain observations tending to establish the acceleration of the mean motion of the moon. A manuscript copy of it, belonging to the Uni- versity of Leyden, was, in 1804, transmitted to the French Institute, and translated by Professor Caussin. It contains 28 observations of eclipses from the year 829 to 1004 ; seven observations of the equinoxes , one of the summer solstice ; one of the obliquity of the ecliptic made at Damas- cus, by which the value of that element is found to be 23° 35'; and likewise a portion of tables of the sun and moon, with some other matter illustrative of the state of astronomy among the Arabians, The observations which regard the acceleration of the mean lunar motion aré two

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| eclipses of the sun and one of the moon, observed by Ibn- Junis, near Cairo, in the years 977, 978, and 979, and they agree with theory in confirming the existence of that phenomenon.

Ulugh Begh, a Tartar prince, and grandson of the great Tamerlane, not only encouraged the study of astronomy, but was himself a diligent and successful observer. At Samarcand, the capital of his dominions, he established an academy of astronomers, and caused the most magnificent instruments to be constructed for their use. By means of a gnomon 180 feet in height, he determined the obliquity of the ecliptic to be 23° 30' 20", the precession of the equinoxes at 1° in 70 years, and obtained elements for the construction of tables which have been found to be scarcely inferior in accuracy to those of Tycho Brahe. The ancient astronomy had produced only one catalogue of the fixed stars, that of Hipparchus. Ulugh Begh has the honour of having formed a second, after an interval of sixteen centuries,

Lievival of Astronomy in Europe.

After the death of Ulugh Begh, astronomy received no farther accessions in the East. But the seeds of knowledge had now begun to take root in a more propitious soil, and Europe, destined to carry the development of the human energies to its fullest extent, began to awake from the lethargy in which it had continued during so many ages,

The 14th century produced no astronomer from whose labours the science gained any accessions. George Purbach, or Beurbach, so named from a small town in Austria, where he was born in 1423, obtained great celebrity as a professor. He studied at Vienna, and after giving proofs of exceptional talent, he travelled into Italy, where he was favourably received by Cardinal de Cusa, who himself cultivated astronomy. On his return to Vienna he under- took a translation of the Almagest; and although ignorant both of Greek and Arabic, his perfect acquaintance with the subject enabled him to correct many errors which had been introduced through the carelesness or ignorance of former translators. Purbach had the good fortune to form a disciple who executed many of the plans which had been interrupted by his premature death. This was the cele- brated John Miiller of Kénigsberg,

better known by the name of Regiomontanus. Attracted to Vienna in his youth by the great reputation of Purbach, he continued to study there during ten years, and on the death of his master repaired to Rome for the purpose of acquiring the Greek language, and of making himself, through it, acquainted with the Almagest. At Rome he continued his obser- vations, and translated into Latin the works of Ptolemy, the Conics of Apollonius, and some other treatises of ancient science. In 1471 he retired to Nuremberg, where, with the aid of Bernard Walther, a wealthy burgess, he founded an observatory and furnished it with excellent instruments principally of his own invention, by means of which he was enabled to detect many errors in the ancient tables, After the death of Regiomontanus, Walther continued to observe at Nuremberg during thirty years, His observa- tions were collected by order of the senate of N uremberg, and published by Schéuer in 1544, a second time by Snellius, and, lastly, along with those of Tycho Brahe. In 1484 Walther began to make use of clocks, then a recent invention, to measure time in celestial observations. He was also the first who employed the planet Venus in deter- mining the longitudes of the stars.

Nuremberg had the honour of producing another astro- nomer of some celebrity. John Werner was the first who explained the method, which was afterwards brought into general use by Maskelyne, of finding the longitude at sea, by observing the distance between a fixed star and the

Ulugh Begh.

Purbach.

Regio- montanus,

Copernicus.

Tycho Brahe.

moon. He published some mathematical and geographical treatises, and made a number of observations to determine the obliquity of the ecliptic and the precession of the equinoxes.

We come now to the period of the overthrow of the Ptolemaic system and the total renovation of the science of astronomy, which was due to the labours of Copernicus. The system which is associated with the name of Coper- nicus is now so familiar to every one, that it is almost unnecessary to describe it. The heaven, composed of stars perfectly at rest, occupies the remotest bounds of space, then the orbit of Saturn, next Jupiter, Mars, the Karth (accompanied by its moon), Venus, Mercury, and, lastly, the Sin immovable at the centre. By this arrangement the stations and retrogradations of the planets became simple mathematical corollaries, following from the differences of the radii of their orbits and their unequal motions. The diurnal rotation of the earth explained more simply and rationally the apparent daily revolution of the heavens ; and the precession of the equinoxes was referred to a small variation in the inclination of the earth's axis to the plane of the ecliptic. But the simplicity of the system, and its consequent probability, were the only arguments which Copernicus was able to bring forward in proof of its reality. The motion of the earth can, indeed, never be made an object of ocular demonstration ; but after Richer's discovery of the diminution of gravity towards the equator, it was impossible to doubt longer of the existence of its rotatory motion; and when Roemer had measured the vélocity of light, and Bradley observed the phenomena of aberra- tion, the evidences of its annual revolution were rendered equally convincing. Great, however, as were the merits of Copernicus, it must be acknowledged that he left his system in a very imperfect state. After the example of the ancients, he assumed as anaxiom the uniform circular motion of the planets; and as the only motions which are observed are in astate of incessant variation, he was obliged, in order to explain the inequalities, to suppose a different centre to each of his orbits. 'The sun was placed within the orbit of each of the planets, but not in the centre of any of them, consequently he had no other office to perform than to distribute light and heat; being excluded from any influence on the system, he became as it were a stranger to all the motions. Yet notwithstanding these and other imper- fections, the establishment of the doctrine of the earth's motion, with an evidence which dissipated the illusions of sense, was a great step towards the true knowledge of the planetary system; and when we consider the ignorance and prejudices of the age, we cannot hesitate to admit his claim to a high rank among philosophers. But whether the actual services which he rendered to

astronomy are commensurate with the great fame he has obtained, may admit of doubt. He revived an ancient opinion opposed to the prejudices and religious dogmas of his times, and. fortified it with new and strong, though not absolutely convincing, proofs. It seldom happens, however, with regard to those sciences which ultimately appeal to experi- ence, that general reasoning, even of the soundest kind, tends much to their real advancement ; and there is little reason for thinking that astronomy would have been less perfect, or that any discoveries since made in it would have been retarded a single day, even if Copernicus had never lived. His great merit, like that of Lord Bacon, consists in the sound views which he took of nature, and in advanc- ing so far before the general attainments of his age. For the events of his life see CoPERNICUS.

Tycho Brahe stands next in chronological order on the roll of those who have contributed to the progress of astro- nomy. As an indefatigable and skilful observer, he is justly considered as far superior to any astronomer who

circle round the pole of the ecliptic.

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had preceded him since the revival of the science in Europe. His ample fortune gave him the means of pro- curing the best instruments which the age could produce ; and by his ingenuity and persevering application, he was

admirably qualified to employ them to the best advantage.

He computed the first table of refractions, and if it ex-

tended only to 45°, the reason was, that the effects of refraction, at a higher altitude, were altogether insensible to his instruments.

His solar tables were brought to so great a degree of exactness, that he affirms he could never detect an error in them exceeding a quarter of a minute ;

but there is reason to suspect some exaggeration in this

statement, particularly as Cassini, a century after, with

much better means, could scarcely answer for errors of a

whole minute. He contributed greatly to the improvement of the lunar tables, and detected a considerable inequality in the moon's motion in longitude, to which he gave the name of the Variation, by which it has ever since been

distinguished. He also discovered an equation in latitude

similar to the evection which had been observed by Hip-

parchus, and fixed its amount with great accuracy. He remarked the fourth inequality of the moon in longitude,

although he failed in his attempt to ascertain its amount, or assign its law. He represented the inequalities of the

motions of the nodes, and in the inclination of the lunar

orbit, by the motion of the pole of that orbit in a small He demonstrated that the region of the comets is far beyond the orbit of the

moon, and determined the relative and absolute positions of 777 fixed stars with scrupulous exactness, which gave his catalogue an immense superiority over those of Hip- parchus and Ulugh Begh; and he left to his successors a regular series of observations of the planets, amassed for

the purpose of establishing the truth of his own system,

but of which Kepler made a better use by employing them to establish the system of Copernicus. his life, see BRaHE, TycHo.

The great mass of accurate observations accumulated Kepler.

For an account of

Tycho furnished the materials out of which his disciple Kepler may be said to have constructed the edifice of the universe. The observations of the Danish astronomer had furnished the latter with the means of establishing with certainty the truth or inaccuracy of the various hypotheses which he successively imagined ; and the diligence with which he laboured in comparing and calculating these observations during 20 years, was finally rewarded by some of the most important discoveries which had yet been made in astronomy. Deceived by an opinion which had been adopted by Copernicus, and had never been called in question by the ancients, that all the celestial motions are performed in circles, he long fruitlessly endeavoured to represent by that hypothesis the irregular motions of Mars; and after having computed with incredible labour the observations of seven oppositions of that planet, he at length discovered that the motions could only be accurately represented by supposing the planet to move in an ellipse, having the sun in one of its foci. Having arrived at this important

result, he next proceeded to consider the angular motion of the planet, and finding that it was not uniform in respect of any point situated within the orbit, he concluded that uniform motion, till then universally received as an axiom, had no existence in nature. He perceived, however, that the areas described in equal times by the radius vector of the planet, at its greatest and least distances, were equal; and subsequent observations enabled him to demonstrate that this equality extended to every point of the orbit. It was therefore discovered that Mars moves in an elliptic orbit, of which the sun occupies a focus, and in such a manner, that the area described by a line drawn from the centre of the planet to that of the

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sun is always proportional to the time of description. The same conclusions he found to be true in respect of the orbit of the earth; and therefore he could no longer hesitate to extend them by analogy to the other plants. These are two of the three general principles which are known by the name of the " Laws of Kepler."

It was some years later before Kepler arrived at the knowledge of the analogy which subsists between the dis- tances of the several planets from the sun, and the periods in which they complete their revolutions. To the discovery of this analogy he attached the greatest importance, and regarded all his other labours as incomplete without it, After having imagined numberless hypotheses, it at last occurred to him to compare the different powers of the numbers which express the distances and times of revolu- tions ; and he found, that the squares of the periodic times of the planets are always in the same proportion as the cubes of their mean distances from the sun. This is the third law of Kepler. He demonstrated it to be true of all the planets then known. It has been found to be equally true in regard to those which have been since dis- covered, and likewise to prevail in the systems of the satellites of Jupiter and Saturn. It is, indeed, as can be shown mathematically, a necessary consequence of the law of gravitation—directly as the masses, and inversely as the squares of the distances.

By these brilliant discoveries, the solar system was reduced to that degree of beautiful simplicity which had been conceived by Copernicus, but from which that great astronomer had found himself constrained to depart. The

sun could not occupy the common centre of the circular orbits, but his place is in the common focus of the elliptic orbits of all the planets; and it is to this focus that every motion is to be referred, and from this that every distance is to be measured. The discovery of the elliptic motion, of the proportionality of the areas to the times, and the method of dividing an ellipse, by straight lines drawn from the focus to the periphery, into segments having a given ratio, formed the solu- tion of a problem which had been the constant object of the labours of all astronomers from Ptolemy to Tycho, namely, to assign the place of a planet at any instant of time whatever. The tables which he computed for the elliptic motions form the model of those in present use. Some additions have been made in consequence of per- turbations which the geometry of Kepler was inadequate to estimate, and which were only partially detected by the genius of Newton. It has been considered matter of surprise that Kepler did not think of extending the laws of the elliptic motion to the comets, Prepossessed with the idea that they never return after their passage to the sun, he imagined that it would only be a waste of time to attempt the calculation of the orbits of bodies which had so transitory an existence. He supposed the tail to be produced by the action of the solar rays, which, in travers- ing the body of the comet, continually carry off the most subtile particles, so that the whole mass must be ultimately annihilated by the successive detachment of the particles. He therefore neglected to study their motions, and left to others a share of the glory resulting from the discovery of the true paths of the celestial bodies.

The observations of eclipses had formed the principal object of the earliest astronomers, but it was Kepler who first showed the practical advantages which may be derived from them, by giving an example of the method of calculating a difference of meridians from an eclipse of the sun. The method extends to occultations of the stars, and is deservedly considered as the best we possess for deter- mining geographical longitudes and correcting the tables. He composed a work on optics, replete with new and

interesting views, and gave the first idea of the telescope with two convex glasses, which has since been advantage- ously substituted for that of Galileo. Prompt to seize every happy idea of his contemporaries, he perceived with delight the advantages which practical astronomy would derive from the new invention of the logarithms, and he immediately constructed a table, from which the logarithms of the natural numbers, sines, and tangents could be taken at once,

Kepler was not merely an observer and calculator ; he inquired with great diligence into the physical causes of every phenomenon, and made a near approach to the discovery of that great principle which maintains and regulates the planetary motions. He possessed some very sound and accurate notions of the nature of gravity, but unfortunately conceived it to diminish simply in proportion to the distance, although he had demonstrated that the intensity of light is reciprocally proportional to the surface over which it is spread, or inversely as the square of the distance from the luminous body. In his famous work De Stella Martis, which contains the discovery of the laws of the planetary motions, he distinctly states that gravity is a corporeal affection, reciprocal between two bodies of the same kind, which tends, like the action of the magnet, to bring them together, so that when the earth attracts a stone, the stone at the same time attracts the earth, but by a force feebler in proportion as it contains a smaller quantity of matter. Further, if the moon and the earth were not retained in their respective orbits by an animal or other equipollent force, the earth would mount towards the moon one fifty-fourth part of the interval which separates them, and the moon would descend the fifty- three remaining parts, supposing each to have the same density. He likewise very clearly explains the cause of the tides in the following passage :—" If the earth ceased to attract its waters, the whole sea would mount up and unite itself with the moon, The sphere of the attracting force of the moon extends even to the earth, and draws the waters towards the torrid zone, so that they rise to the point which has the moon in the zenith." It is not difficult to imagine how much these views must have contributed to the immortal discovery of Newton. (See KEPLER.)

Contemporary with Kepler was the illustrious Galileo Galileo,

whose discoveries, being of a more popular nature, and far more striking and intelligible to the generality of mankind, had a much greater immediate effect on the opinions of the age, and in hastening the revolution which was soon about to change the whole face of physics and astronomy. While residing at Venice, he heard it reported that Metius, a Dutch optician, had discovered a certain combination of lenses, by means of which distant objects were approxi- mated to the sight. This vague and scanty intelligence sufficed to excite the curiosity of Galileo, who immediately set about inquiring into the means whereby such an effect could be produced. His researches were attended with prompt success, and on the following day he had a telescope which magnified about three times. It was formed by the combination of two lenses, a plano-convex and plano- concave, fitted in a leaden tube. In a second trial he obtained one which magnified seven or eight times; and subsequent essays enabled him to increase the magnifying power to 32 times. On directing his telescope to the moon, he perceived numerous inequalities on her surface, the diversified appearances of which led him to conclude almost with certainty that the moon is an opaque body similar to the earth, and reflecting the light of the sun unequally, in consequence of her superficial asperities. The planet Venus exhibited phases perfectly similar to those of the moon. These phases had been formerly announced by Copernicus as a necessary consequence of II. — 95

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his system; and the actual discovery of their existence made it impossible to doubt the revolution of Venus round the sun. He detected the four satellites or moons of Jupiter, and, in honour of his patron, gave them the name of the "Medicean Stars." The discovery of these little bodies circulating round the huge orb of Jupiter afforded him a strong analogical proof of the annual revolu- tion of the earth, accompanied by its moon. He perceived spots on the disk of the sun, from the motions of which he deduced the rotation of that body about its axis in the space of 27 days. The singular appearances of Saturn were beheld by him with no less pleasure than astonish- ment. His telescope was not sufficiently powerful to separate the ring from the body of

the planet; and to explain the appearances he supposed Saturn to be composed of three stars almost in contact with one another. These discoveries proved that the substances of the celestial bodies are similar to that of the earth, and demolished the Aristotelian doctrine of their divine essence and incor- ruptible nature. They enlarged the ideas of mankind respecting the planetary system, and furnished the most convincing arguments in favour of the doctrines of Coper- uicus.

Science is indebted to Galileo for two other discoveries of a different kind, less brilliant perhaps, but of far greater importance than those which we have yet enumerated. These are the isochronism of the vibrations of the pendulum, and the law of the acceleration of falling bodies. His telescopic discoveries could not have remained long un- known ; in fact, with the exception of those of the phases of Venus, and of the triple form of Saturn, they were all fiercely disputed, even during his own lifetime. It is now universally admitted that he was the first who discovered the satellites of Jupiter, and the spots of the sun; but the very circumstance of other claimants to these discoveries having arisen, proves that they were within the reach of ordinary observers. For an account of his eventful life see GALILEO.

While astronomy was making these rapid advances in the hands of Kepler and Galileo, an event occurred in Scotland which contributed, though less directly, no less powerfully, to the acceleration of its progress. 'This was the invention of logarithms by Lord Napier, baron of Merchiston ; 'an admirable artifice," says Laplace, " which by reducing to a few days the labour of many months, doubles the life of the astronomer, and spares him the errors and disgust inseparable from long calculations,—an invention of which the human mind has the more reason to be proud, inasmuch as it was derived exclusively from its own resources." It may be added, that without this, or some equivalent artifice, the computations rendered necessary by more correct observations would far exceed the limits of human patience or industry, and astronomy could never have acquired that precision and accuracy by which it is now distinguished above all the other branches of human knowledge.

The same epoch presents to us a great number of excel- lent observers, who, although they did not produce any revolution in the state of astronomy, still rendered it useful service. Scheiner is celebrated for his observations of the solar spots, and his disputes with Galileo. John Bayer of Augsburg published a description of the constellations, accompanied by maps, in which the stars are marked by Greek letters,—a simple idea, which has been universally adopted. Lansberg, a Flemish mathematician, published in 1632 a set of astronomical tables, which, though filled with inaccuracies, rendered good service to science by apprising Horrox of the transit of Venus over the sun's disk, which that young astronomer and his friend Crabtree had the satisfaction of observing on the 24th of November

ASTROBOCMY

phenomenon.

librations.

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1639. They were the first who ever witnessed that rare Snellius is celebrated for his measurement of the earth. Gassendi, who had the merit along with

Descartes of hastcning the downfall of the Aristotelian philosophy in France, particularly one of a transit of Mercury in 1631. works, which fill six folio volumes, abound with curious and useful researches. in 1598, contributed to the progress of astronomy, not so much by his own discoveries, as by collecting and render- ing an account of those of others.

made some useful observations, His

Riccioli, a Jesuit, born at Ferrara

He rejected the system of Copernicus, and was more zealous in maintaining the doctrines of the church than in investigating nature; but his works form a vast repertory of useful information. His Novwm Almagestum is a collection of the observations, opinions, and physical explanations of the phenomena, together with all the methods of computation then known. He

was assisted in his labours by Grimaldi, who discovered the inflection of light, and he gave to the principal spots of the moon the names which are now used by astronomers.

The most accurate observations that were ever made Hevelius. prior to the adaptation of the telescope to astronomical

instruments were those of Hevelius, a rich citizen of Dantzic, who devoted his life and a large fortune to the service of astronomy. Having fitted up an observatory, and furnished it with the best instruments which could be procured, he commenced a course of observations, which he followed assiduously upwards of forty years. In his Selenographia he has given an accurate description of the face and spots of the moon, accompanied with excellent delineations of her appearance in her different phases and The idea of making drawings of the different phases of the moon had previously occurred to Gassendi and Peiresc, but they had not been able to execute the project ; indeed, the difficulty attending it was such, that it occupied Hevelius, who was an excellent draughtsman, as well as observer, during a great number of years. Hevelius made an immense number of researches on comets ; and finding that the observations could not be represented by rectilinear or circular orbits, he supposed them to move in parabolas. During a temporary absence from Dantzic he had the misfortune to lose, in a great fire which occurred in the city, his observatory, instruments, manuscripts, and almost the entire copy of the second volume of his Machina Celestis, which contained the results of his pro- tracted labours. He was now in his old age, but his zeal did not give way under the terrible calamity. He patiently recommenced all his calculations, reconstructed tables of the sun, and prepared for publication his Firmamentum Sobiescianum, or celestial chart, which did not appear till after his death. Towards the latter part of his life the use of telescopic sights began to be generally adopted. Heve- lius, however, resisted the innovation, and continued to employ plain sights. This preference given to the ancient method by so skilful an observer induced Dr Halley to visit him at Dantzic, for the purpose of ascertaining, by a comparison of observations made at the same time and place, which of the two methods gave the most correct results. Dr Halley observed with the telescope, and Hevelius with his own instruments; but such was the dexterity he had acquired through long

practice, that the difference of their observations seldom amounted to more than a few seconds, and in no case to so much asa minute. Notwithstanding this agreement, it is to be regretted that Hevelius did not adopt the new method ; for, on account of the greater precision given to instruments by the use of the telescope, his observations, which were made without it, cannot now be admitted in the construction of tables, and consequently are for the most part useless to astronomy.

Few individuals have rendered more important services

Huyghens.

Picard.

Cassini.

HISTORY. |

to science than Huyghens. His improvement of the tele- scope and his application of the pendulum to clocks were valuable additions to the machinery of astronomical inves- tigation. By means of his telescopes he discovered that the extraordinary appearance exhibited by Saturn was occasioned by a ring surrounding the body of the planet, and inclined to the ecliptic in an angle which he estimated at 21°. He published his obscrvations of this planet in a work entitled Systema Saturnium, which still shows some traces of that species of reasoning from final causes which so greatly disfigures the writings of Kepler. For example, on discovering the satellite, he conceived that as the number of satellites now equalled the number of planets, it was vain to look for more, the equality being necessary to the harmony of the system. He lived, however, to witness the discovery of four more satellites belonging to the same planet. (See Huycuens.)

The application of telescopes and micrometers to gradu- ated instruments forms an important epoch in the history of astronomy. This happy improvement was first brought into use by Picard in 1667. Morin, indeed, had applied a telescope to the quadrant so early as 1634, and perceived the stars in full day in 1635. In 1669 Picard began to observe the stars ou the

meridian in the day time, with a quadrant, to which, in concert with Azout, he had applied an astronomical telescope having cross wires in its focus. Huyghens invented the plate micrometer in 1650; Malvasia that with the fixed wires in 1662; and Azout that with the movable wire in 1666. (See Delambre, Astronomie du Moyen Age, p. 618; note by Bouvard.) It is principally to these ingenious inventions and the fine application of the pendulum to clocks by Huyghens in 1656, that we must attribute the rapid progress since made in practical astro- nomy, and the extreme precision of modern observations, Picard was also the first who introduced the modern method of determining the right ascensions of the stars, by observing their meridional passages, and employed the pendulum for that purpose. He likewise introduced the method of cor- responding altitudes, and is entitled to be regarded as the founder of modern astronomy in France. Roemer, the friend and pupil of Picard, discovered the progressive motion of light in 1675, and measured its velocity by means of the eclipses of Jupiter's satellites. He was the first who erccted a transit instrument, which gave a new accuracy to observations of right ascension.

The Royal Observatory of Paris was completed in 1670, and its direction intrusted to Dominic Cassini, who enriched astronomy with a great number of valuable observations and new discoveries. He determined the motions of Jupiter's satellites from observations of their eclipses, and constructed tables of them, which were found to be remarkably exact. He observed that the ring of Saturn ig double, and discovered four of the satellites of that planet. He also determined the rotation of Jupiter and Mars, and made a number of observations on Venus with the same view. He observed the zodiacal light, and made a near approximation to the parallax of thesun. We also owe to him the first table of refractions calculated on correct principles, and a complete theory of the libration of the moon. Galileo had only observed the libration in latitude ; Hevelius explained the libration in longitude, by supposing that the moon always presents the same face to the centre of her orbit, of which the earth occupies a focus. Cassini made the important remark, that the axis of rotation of the moon is inclined to the ecliptic, and that its nodes coincide with those of the lunar orbit, so that the poles of the orbit, ecliptic, and equator of the moon, are on the same circle of latitude, the pole of the ecliptic being situated between the other two.

Though the greater number of these discoveries were only of secondary importance, Cassini, nevertheless,

obtained an extraordinary reputation. Lalande remarks, that in his hand astronomy underwent the most signal re- volutions, and that his name is, in France, almost synony- mous with that of creator of the science. Delambre has, however, expressed a different and far more accurate view of the real services of Cassini in the following terms :—

" The revolution in astronomy was brought about by Copernicus, by the laws of Kepler, by the pendulum of Huyghens, by the micro- meters of Azout and Picard, by the sectors and mural of Picard and his method of corresponding altitudes, by the transit instruments of Roemer ; and Cassini appears to us an entire stranger to all these innovations. He followed another route; he devoted a long life to painful observations, which at last deprived him of sight. Let us not refuse him the praise which he has so well merited, but let us reserve a place in our esteem for labours less brilliant perhaps, but of greater and more permanent utility, and which evince at least equal talent and sagacity."*

Cassini was assisted in his observations by his nephew, James Philip Maraldi, who determined the regression of the nodes, and the progressive motion of the apsides of the orbit of Jupiter. This astronomer also corrected the theory of Mars, and observed the sun's parallax. He rejected the hypothesis of the progressive motion of light, as being insufficient to explain the inequalities of Jupiter's satellites ; and he conceived the design of forming a new catalogue of the stars, which, however, was never executed. He died in 1729,

There is no period in the history of mankind so distin- guished by great and important discoveries, or so remark- able for the rapid development of the human intellect, as the 17th century. We have already noticed the invention of the pendulum, and its application to regulate the motion of timekeepers; the invention of the telescope, bringing within the range of vision the

phenomena of new worlds; of logarithms, by which computations are so much abridged ; and of the mechanical contrivances for measuring minute angles in the heavens, The same century witnessed the application of algebra to geometry, the discovery of the laws of the planetary motions, the infinitesimal calculus, the acceleration of falling bodies, the sublime theory of central forces, and the great principle of gravitation which connects the celestial orbs, and regulates the motions which it had been the business of the astronomer to observe since the earliest ages of the world. The service which the dis- covery of these primary laws rendered to the progress of astronomy can scarcely be exaggerated. Many of the inequalities of the planetary motions, in consequence of their minuteness and the slowness with which they occur, could not have been detected by observation ; others might perhaps have been perceived, but we should still have been ignorant whether their constant accumulation might not ultimately change the state of the system, and, by destroy- ing all confidence in the tables, demolish the fabric which had been reared at such a vast expense of time and labour. But when these inequalities are detected by theory, and separated from the mean motions with which they were blended, it becomes an object of the highest interest to confirm their existence by the most delicate and accurate observations. Hence, a more refined practice has con- stantly followed every theoretical discovery. Besides, it is the perfection of theory, and not the mere knowledge of isolated facts, which gives astronomy its greatest value in the eyes of the philosopher. Numerous and important as its applications are, they have but a subordinate interest, in coniparison with the knowledge of those general laws to which every particle of matter in the universe is subject, and by the discovery of which man has penetrated so deeply into the mysteries of nature.

By the discovery of the law of gravitation, Newton laid the foundations of physical astronomy ; and by the conse- quences which he deduced from that law, he proceeded far in

Maraldi.

Progress during

the 17th century.

Newton.

Flamsteed.

Halley.

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the ercction of the superstructure. He showed that the

motions of all the bodies of the planetary system are regu-‘

lated by its influence; he determined the figure of the earth on the supposition of its homogeneity; he gave a theory of the tides, discovered the cause of the precession of the equinoxes, and determined some of the principal lunar inequalities and planetary perturbations. Many of his theories were left in an imperfect state; for it is not in matters of science that it is given to the same individual to invent and bring to perfection: their complete develop- ment required that several subsidiary sciences should be farther advanced; but it has been the triumph of his system, that every subsequent discovery has only tended to strengthen and confirm it.

While physical astronomy was undergoing a complete revolution in the hands of Newton, the practical part was re- ceiving great improvement from Flamsteed, the first astro- nomer royal, who conducted the Greenwich Observatory. This celebrated institution, from which so many important discoveries have emanated, was erected under the reign of Charles IL, in 1675. Flamsteed was appointed to it in 1676, and continued with indefatigable zeal to discharge the duties of the office during the long period of 33 years. In the course of this time he made an immense number of excellent observations, the results of which are given in the Historia Celestis, the first edition of which was pub- lished in 1712, at the expense of Prince George of Denmark, the husband of Queen Anne. ‘The second appeared in 1723, some time after the death of the author, in three volumes folio. The first volume contains the observations which he made, first at Derby, and afterwards at Greenwich, of the fixed stars, planets, comets, spots of the sun, and Jupiter’s satellites. The second volume contains the tran- sits of the planets and stars over the meridian, and the places of the

planets deduced from these observations, The third contains a historical notice, in which he gives a description of the instruments used by Tycho and him- self; catalogues of fixed stars by Ptolemy, Ulugh Begh, Tycho, the landgrave of Hesse, and Hevelius ; together with the British Catalogue, containing the places of 2884 stars. 'The labours of Flamsteed were, however, confined entirely to the practical part of astronomy. He made no improvements in theory ; but he is entitled to the merit of having been the first who brought into common use the method of simultaneously observing the right ascension of the sun and a star, a method by means of which the determination of the positions of the stars is reduced to the observation of meridional transits and altitudes. He was likewise the first who explained the true principles of the equation of time; and he improved the lunar tables by introducing into them the annual equation which had becn suggested by Horrox.

Flamsteed was succeeded in the observatory by Halley, who held a prominent place among English astronomers. From early youth he applied himself with ardour to the study of mathematics and astronomy; and having pro- cured a few instruments, he began to make observations, by which he was led to remark the inaccuracy of the tables of Jupiter and Saturn. In his 19th year he published a direct and geometrical method of finding the eccentricities and aphelia of the orbits of the planets; and in the year following he undertook a voyage to St Helena, with a view to form a catalogue of the stars in the southern hemi- sphere. The station was unfortunately chosen, for, owing to the incessant rains and foggy atmosphere of that island, he was able to determine the places of only 360 stars in the course of a whole yeas. He had, however, the satis- faction of observing a transit of Mercury over the sun's disk, a phenomenon which suggested to him the important idea, that the transits of the inferior planets might be

advantageously employed in determining one of the most essential elements of the planetary system, viz., the parallax of the sun, and consequently the diameters of the orbits. The method has since been successfully employed in

the case of Venus: the transits of Mercury, though much more frequent, are not so well adapted to the purpose. The other additions which he made to astronomical knowledge are chiefly recorded in his Synopsis Astronomicee Cometice:,— a work abounding in profound and original views, and which, in respect of theory, formed perhaps the most remarkable accession to the science that had been made since the time of Kepler. In this work he revived an ancient opinion, that the comets belong to the solar system, and move in very eccentric orbits round the sun, returning after stated but long intervals. He also ventured to pre- dict that the comet of 1681 would again return to its perihelion in 1759,—the first prediction of the kind ever verified. In 1720 Halley was appointed to succeed Flamsteed in the Royal Observatory ; and though then in the 64th year of his age, he undertook, with a view to improve the lunar theory, to observe the moon through a whole revolution of her nodes, erroneously supposing that after such a revolution the errors of the tables would again appear in the same order. He was the first who, by a comparison of ancient and modern observations, remarked the acceleration of the mean motion of the moon, and thus called the attention of mathematicians to an important and curious phenomenon, the physical cause of which was at length detected by the powerful analysis of Laplace. He was also the first who pointed out the secular inequalities of Jupiter and Saturn, occasioned by their mutual pertur- bations,—a theory that formed the subject of several pro- found memoirs of Euler and Lagrange, and for the complete development of which astronomy is likewise indebted to Laplace. (See HaL.ey.)

The discoveries of Bradley, who succeeded Halley as Bradley.

astronomer royal, form a memorable epoch in the history' of the science. It was reserved to him to give the theo- retical explanation of a singular motion of the polar star which had been first observed by Picard, who had remarked that the inequality was annual, and amounted to about 40 seconds, but had been unable to refer it to any law. Hooke, in 1674, a few years after the observations of Picard, imagined that he had discovered a parallax in some of the stars; and Flamsteed, following the ideas of Hooke, explained, by means of parallax, the minute changes of position which he had observed in Polaris and some cir- cumpolar stars. Manfredi and Cassini demonstrated the error of Flamsteed, but were not more successful

in their attempts to explain the motion in question. Samuel Molyneux conceived the idea of verifying all that had been said respecting the supposed parallaxes, and for this pur- pose commenced a series of observations at Kew, with an excellent 24-feet sector constructed by Graham. Bradley, who happened at that time to reside at Kew, took part in these observations, the result of which was, that the remarks of Picard were confirmed beyond the possibility of doubt. It was, however, abundantly evident that the apparent motions observed were not connected in any manner with parallax; it therefore became an object of the greatest interest to determine their physical cause, and assign their law and period. The first idea that occurred was to inquire whether they arose from a change of position in the earth's axis; but this supposition was found to be inadequate to the explanation of the phenomena. Moly- neux having been in the meantime appointed a lord of the Admiralty, the observations were discontinued at Kew ; they were, however, shortly after resumed by Bradley at Wanstead, with a smaller but more convenient instrument ; and after they had been continued several years, it was

found that the star (y Draconis) on which they were principally made, appeared to describe annually a small ellipse, the transverse axis of which amounted to 40". This was an important determination; for the ellipse afforded the means of computing at all times the aberration of any star whatever, whether in longitude, latitude, declination, or right ascension, Bradley also pointed out the physical cause of the aberration, and demonstrated that it resulted from the combination of the motion of light with the annual motion of the earth. This very remark- able and important discovery was made in 1728.

Bradley, anxious to verify his ingenious theory, continued his observations, and soon felt the difficulty that had so much embarrassed Picard, The places of the stars, calcu- lated according to his formula for the aberration, could not be reconciled with the observations. The errors coutinued to augment during nine years, after which they went on diminishing during the nine years following. This inequa- lity, of which the period, like that of the

nodes of the moon, was 18 years, was readily explained by supposing a slight oscillation of the earth's axis, occasioned by the action of the moon on the protuberant parts surrounding the equator of the terrestrial spheroid. After assiduously observing its effects during twenty years, Bradley found that the phenomena could be accurately represented by giving the pole of the equator a retrograde motion about its mean place in an ellipse whose axes are 18" and 16", and completing its revolution in the period of 18 years. This result was communicated to the Royal Society in 1748. To these two grand discoveries of Bradley, the aberration and nutation, modern astronomy is greatly indebted for its accuracy and precision; and as Delambre remarks, they assure to their author a distinguished place, after Hipparchus and Kepler, among the astronomers of all ages and all countries. For the biography see BRADLEY, JAMES.

While England was witnessing the brilliant discoveries of Bradley, France produced a number of excellent astronomers, by whose successful labours every depart- ment of the science was signally promoted. Among these Lacaille is distinguished, both by his scientific zeal and the importance of his observations. In 1751 he undertook a voyage to the Cape of Good Hope, the primary objects of which were to determine the sun's parallax, by means of observations of the parallaxes of Mars and Venus, while similar observations were made in Europe, and to form a catalogue of the southern circumpolar stars. No undertaking for the benefit of science was ever more successfully executed. In the course of a single year, Lacaille, without assistance, observed upwards of 10,000 stars, situated between the tropic of Capricorn and the pole, and computed the places of 1942 of them. The details of his observations were published in the Calum Australe Stelliferum, which appeared in 1763. During the same time he measured a degree of the meridian, and made numerous observations of the moon simultaneous with those of Lalande (who observed at Berlin), in order to determine the moon's parallax by means of direct observa- tions made at the extremities of a meridional are of upwards of 85°. Astronomy is likewise indebted to Lacaille for a table of refractions, which he computed from a comparison of above 300 observations made at the Cape and at Paris. In 1757 he published his Astronomie Fundamenta, in which he gave rules and tables for com- puting the apparent motions of the stars, which continued to

be employed till Lambert supplied the corrections de- pending on the nutation, and Dclambre those depending on the aberration.

The question of the figure of the earth furnished ample materials for the practical as well as the speculative astro-

nomer during the 18th century. The results of the measure- ment of the meridian by Cassini were at variance with the theories of Newton and Huyghens; and the Academy of Sciences resolved on making a decisive experiment by the actual measurement of the lengths of two degrees, one at the equator, and another in as high a latitude as could be reached. In the year 1735, three astronomers—Godin, Bouguer, and La Condamine—were commissioned by the French Government to accomplish the first of these objects in Peru; and the year following, Maupertuis, Clairaut, Camus, and Lemonnier went. to Lapland to execute the second under the polar circle. Notwithstanding the greater difficulties they had to contend with, the first party were the more successful; but the result of both operations established the compression of the earth at the poles. Bouguer published the details of the Peruvian measurement in an admirable work On the Figure of the Earth, in which he has also inserted an account of a great number of experiments made by him in the same country to determine the length of the seconds' pendulum, and the effects of the attraction of mountains on the plumb-line. Bouguer is likewise the author of an excellent treatise on light. 'The details of the labours of numerous other observers in the various countries of Europe will be found under their respective names. Here it is sufficient to indicate briefly the share each had in the development of the science.

Delisle formed a school of astronomy in Russia, and 'Delisle.

left a method of computing the heliocentric places of the sun's spots and of Mercury and Venus in their transits over the sun's disk, and likewise of determining, by means of the stereographic projection, the directions of their paths

~vhen they enter and leave the disk. Wargentin, secretary Wargentin.

of the Academy of Sciences of Stockholm, devoted him- self specially to the correction of the tables of the satellites of Jupiter. The theory of the satellites was not then far advanced ; but when theory failed him, he profited by the remarks of others and by his own reflections, and endeavoured by repeated trials to find empizical equations capable of reconciling the tables with the best observations. By confining himself almost exclusively to this subject he acquired a high reputation, and was ranked among the first astronomers of an epoch which abounds in great names. His tables of the satellites have, on account of their superior accuracy, been employed in determining the masses and other elements, which serve as the basis of the analytical theories.

Maskelyne, the second English astronomer royal after Maskelyne.

Bradley, was appointed, in 1761, to observe the transit of Venus at the island of St Helena, and endeavour to verify the existence of a small parallax of the star Sirius, which seemed to be indicated by the observations of Lacaille at the Cape. Unfortunately, the state of the weather prevented him from observing the transit; and his observations on Sirius were abandoned in consequence of the discovery of a defect in the zenith sector which he had carried out with him for the purpose of making the observations in question. The main objects of his voyage were thus frustrated ; but some indirect advantages, notably the improvement of the sector by Ramsden, resulted from it, which compensated in some measure for the disappoint- ment. At St Helena he made several interesting observa- tions of the tides, the variation of the compass, the moon's horary parallaxes, &c. In going out and returning home he paid particular attention to the different methods of finding the longitude at sea, and practised that which depends on observations of the lunar distances from known stars, taken with Hadley's sextant, or some other reflecting instrument. In the year 1765 he was appointed astro- nomer royal, and soon after recommended to the Board of Longitude the general adoption in the navy of the lunar

W. Her- achel.

method of finding the longitude, and proposed that tables for facilitating that method should be calculated and published in the Nautical Almanac. This recommendation was adopted, and the Nautical Almanac continued to be published under his superintendence during forty-eight successive years.

Sir William Herschel, born in Hanover in 1738, has rendered his name immortal by the discovery of a new planet beyond the orbit of Saturn, and thereby doubling the ancient boundaries of the solar system. Having settled in England at Bath, he began to devote his leisure to the construction of telescopes and the polishing of reflecting mirrors. Endowed with equal skill and patience, he soon obtained instruments superior to any that had been known before, by means of which he was led to the most brilliant discoveries that have been made in the heavens since the time of Galileo. Being employed in making a review of the sky with a powerful telescope, he perceived, on the 13th of March 1781, near the feet of Gemini, a star of the fifth magnitude, having a disk perfectly well defined, and differing in appearance from other stars which afforded the same quantity of light. On observing it with a telescope whose magnifying power was 932, he perceived its diameter was enlarged while that of the stars underwent no change. These circumstances were sufficient to draw his attention to the star, and nothing more was requisite to enable him speedily to discover that it had a slow motion. He at first supposed it was a comet, and acquainted Dr Maskelyne with the discovery. The circumstance was soon made known at Paris; and it was gradually perceived, that as the distance of the star did not sensibly vary, it was necessary to regard it as a seventh planet. Herschel, in honour of his patron George IIL, gave it the name of the Georgium Sidus ; but the mythological appellation of Uranus has prevailed. On the 11th of January 17 87 he discovered two satellites revolving round the new planet, and subsequently found that it was accompanied by four others. It was soon noticed that Uranus had been observed by Flamsteed, Mayer, and Temonnier, who had each supposed it to be one of the fixed stars. Their observa- tions enabled Delambre to correct the elements of the orbit, and calculate tables of its motion. By means of his powerful

telescopes Herschel determined the figure and rotation of Saturn, discovered the parallel belts on his surface, and perceived that the ring is double. In 1789 he discovered two new satellites belonging to this planet, revolving near the ring. From some appearances in- dicated by the fixed stars, Herschel was led to conclude that the whole solar system isin motion about some distant centre, and that its direction is at present towards the constellation Hercules,—a conclusion which recent investi- gations have verified. His observations on nebule and double stars opened up a new field of research, bound- less in extent, and interesting by reason of the variety of the objects it presents to the attention of the observer. The extraordinary activity with which he pursued his favourite occupations is attested by 67 memoirs communi- cated by him from time to time to the Royal Society.

Few individuals have contributed so much to the perfec- tion of modern astronomy as Delambre, for many years perpetual secretary of the Academy of Sciences. Associated with Mechain, he was employed during the troubles of the French Revolution in measuring the meridian from Dunkirk to Barcelona,—a labour which was prosecuted with admir- able zeal in the face of innumerable difficulties, and even dangers of the most formidable kind. By an immense number of excellent observations he determined the con- stants which enter into the formule deduced from theory by the profound researches of Lagrange and Laplace, and

also formed a set of tables much more exact than any that

had appeared before them. His Astronomie Théorique et Pratique, in three quarto volumes, contains the best rules and methods which have yet been devised for the guidance of the practical astronomer ; and his Histoire, in six large quarto volumes, gives an account of every successive improvement which has been made in the science, and a full abstract of every work of celebrity which has been written respecting it, from the first rude observations of the Greeks to the end of the last century. It is invaluable to the historian, and will always attest the profound learning and laborious research of its author.

The observatory which was established at Palermo about Piazzi.

the year 1790, under the active superintendence of Piazzi, holds a distinguished rank among the similar institutions of Europe.. Piazzi, born in 1746, took the habit of the religious order of the Theatins at Milan, and finished his noviciate in the convent of St Anthony. Among his pre- ceptors he had the advantage of counting Tiraboschi, Beccaria, Le Sceur, and Jacquier; and from these illus- trious masters he speedily acquired a taste for mathematics and astronomy. After holding several professorships in the colleges of the Jesuits at Rome and Ravenna, he was appointed, in 1780, professor of the higher mathematics in the Academy of Palermo, A few years after his appointment he obtained from the prince of Caramanico, viceroy of the island, permission to found an observatory, and undertook a voyage to France and England in order to provide the instruments necessary for the new estab- lishment, Having procured a vertical circle, a transit, and some other instruments from Ramsden, he returned to Palermo and commenced his observations. His first care was to prepare a new catalogue of stars, the exact positions of which he justly considered as the basis of all true astronomy. In prosecuting this object he did not content himself with a single observation, but before he fixed the position of any star, observed it several times successively ; and, by this laborious but accurate method, he constructed his first great catalogue of 6748 stars, which was crowned by the Academy of Sciences of France, and received with admiration by the astronomers of all countries, His con- stant practice of repeating his observations led to another brilliant result, the discovery of an eighth planet. On the lst of January 1801, Piazzi, searching for the star 87 of the catalogue of Mayer, cursorily observed a small star of the eighth magnitude between Aries and Taurus. On the following day he remarked that the star had changed its position, and accordingly supposed it to be a comet. He communicated his observations to Oriani, who, seeing that this luminous point had no nebulosity like the comets, and that it had been stationary and retrograded within comparatively small limits like the planets, computed its elements on the hypothesis of a circular orbit. He found that this hypothesis agreed with the observations, and other astronomers soon confirmed its accuracy. He gave the planet the name of Ceres Ferdinandea, in honour of Ferdi- nand, king of Naples, in whose dominions he had made the

discovery, and who proposed to commemorate the event by

a gold medal, struck with the effigy of the astronomer ; but Piazzi, preferring the interests of science to vain honours which could add nothing to his glory, requested that the money destined for this purpose should be employed in the purchase of an equatorial, which was still wanting to his observatory. In 1814 he published a new catalogue, extended to 7646 stars, —a splendid monument of inde- fatigable zeal and activity. He made an uninterrupted series of solstitial observations from 1791 to 1816, for the purpose of determining the obliquity of the ecliptic, which, compared with those of Bradley, Mayer, and Lacaille, in 1750, give a diminution of 44" in a year. We will conclude this part of the article by briefly

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adverting to the researches of some illustrious mathemati- cians who have developed the theory of Newton, and by whose investigations physical astronomy has been raised to its present position. Although the law of gravitation, as proposed by Newton, had from the first been admitted by all the most eminent astronomers of Britain, it was for a long time either opposed or neglected on the Continent. In fact, great improvements were required both in analysis and mechanics before it admitted of other applications than had been made by its great author, or could be regarded as anything more than a plausible hypothesis. Newton demonstrated that if two bodies only were pro- jected in space, mutually attracting each other with forces proportional directly to their masses and inversely to the squares of their distance, they would each accurately describe an ellipse round the common centre of gravity ; and the spaces described by the straight line joining that centre and the moving body would be proportional to the time of description, according to the second law of Kepler. But when it is attempted to apply Newton's law to the case of the solar system, great difficulties immediately pre- sent themselves. Any one planet in the system is not only attracted by the sun, but also, though in a much smaller degree, by all the other planets, in consequence of which it is compelled to deviate from the elliptic path which it would pursue in virtue of the sun's attraction alone. Now, the calculation of the effects of this disturbing force was the

problem which geometers had to resolve. In its most general form it greatly transcends the power of analysis ; but there are particular cases of it (and those, too, the cases presented by nature), in which, by reason of certain limitations in the conditions, it is possible to obtain an approximate solution to any required dcgree of exactness. For example, the Sun, Moon, and Earth form in a manner a system by themselves, which is very slightly affected by the aggregate attractions of the other planets. In the same way the Sun, Jupiter, and Saturn, form another system, in which the motions are very little influenced by the action of any other body. In these two cases, then, the number of bodies to be taken into consideration is only three ; and in this restricted form, the problem, celebrated in the history of analysis under the denomination of "the Problem of Three Bodies," is susceptible of being treated mathematically. With the hope of improving the lunar tables, and of completing the investigations which Newton had commenced in the Principia, three distinguished geometers—Clairaut, D'Alembert, and Euler—about the middle of the last century, undertook, simultaneously, and without the knowledge of each other, the investigation of the problem of three bodies, and commenced that series of brilliant discoveries which our own times have seen completed.

Clairaut's solution of the problem of three bodies was presented to the Academy of Sciences in 1747, and was applied to the case of the moon. From this solution he deduced with great facility, not only the inequality of the variation, which Newton had obtained by the application of a more complicated though very ingenious method, but also the evection, the annual equation, and many other in- equalities which Newton had not succeeded in connecting with his theory. It happened, however, curiously enough, that in the calculation of one effect of the disturbing force, namely, the progression of the moon's apogee, Clairaut was led into an error which produced a result that threatened to overturn the system of gravitation. The error consisted in the omission of some of the terms of the series expressing the quantity in question, which he wrongly supposed to have only an insensible value; and by reason of this omission, his first approximation gave only half of the observed progressive motion of the apogee. As this result

was confirmed by D'Alembert and Euler, who had both fallen into the same error, it seemed to follow, as a necessary consequence, either that the phenomenon depended on some other cause than the disturbing force of the sun, or that the law of gravitation was not exactly proportional to the inverse square of the distance. The triumph which this result gave to the Cartesians was not of long duration. Clairaut soon perceived the cause of his error; and by repeating the process, and carrying the approximations farther, he found the computed to agree exactly with the observed progression,—a result which had the effect of dissipating for ever all doubt respecting the law of gravita- tion. The researches of Clairaut were followed by a set of lunar tables, much more correct than any which had been previously computed.

The return of the comet of 1682, which Halley had predicted for the end of 1758 or beginning of 1759, afforded an excellent opportunity for putting to the test both the theory of gravitation and the power of the new calculus. Clairaut applied his solution of the problem of three bodies to the perturbations which this comet sustained from Jupiter and Saturn, and, after calculations of enormous labour, announced to the Academy of Sciences, in November 1758, that the comet would return in the beginning of the following year, and pass through its peri- helion about the 15th of April. It returned according to the prediction, but passed its perihelion on the 13th of March. The correction of an error of computation reduced the difference to nineteen days; and if Clairaut had been aware of the existence of the planet Uranus, he might have come still nearer the truth.

Besides these important researches on the system of the universe, Clairaut composed an admirable little treatise on the figure of the earth, in which he gave the differential equations, till then unknown, of the equilibrium of fluids, whether homogeneous or heterogeneous, supposing an attractive force, following any law whatever, to exist among the molecules. He applied these equations to the earth ; demonstrated that the elliptic figure satisfies the conditions of equilibrium ; and assigned the ellipticity of the different strata of which the earth may be supposed to be formed, to- gether with the law of gravitation at the exterior surface. He likewise discovered the

important theorem which establishes a relation between the oblateness of the terrestrial spheroid and the increase of gravitation towards the poles, on every supposition which can be imagined relative to the interior construction of the earth. By means of this theorem the ellipticity of the spheroid is deduced from observations of the lengths of the seconds pendulum at different points of the earth's surface.

D'Alembert, as has already been mentioned, presented a D'Alem- solution of the problem of three bodies to the Academy bert.

of Sciences at the same time as Clairaut. In the year 1749 he published his treatise on the precession of thc equinoxes,—a work remarkable in the history of analysis and mechanics. By means of his newly invented 'Calculus of Partial Differences," and the discovery of a fertile prin- ciple in dynamics, he determined from theory the rate of the precession, rather more than 50" in a year. He also deter- mined the nutation of the earth's axis, which had been discovered by Bradley, and assigned the ratio of the axes of the small ellipse which the true pole of the earth de- scribes around its mean place in the same time in which the nodes of the lunar orbit complete a revolution. The solution of this problem led to the determination of the ratio of the attractive forces of the sun and moon, which D'Alembert found to be that of seven to three very nearly ; whence he inferred that the mass of the earth is 70 times greater than that of the moon. He proved likewise that the precession and nutation are the same in every hypo-

thesis concerning the interior constitution of the earth. In 1754 he published the first two volumes of his /e- searches on the System of the World. In this work he applied the formule by which he had calculated the motions of the moon to the motions of the planets disturbed by their mutual attraction, and pointed out the simplest method of determining the perturbations of the motions of a planct occasioned by the action of its own satellites. D'Alembert also treated the subject of the figure of the earth in a much more general manner than had been done by Clairaut, who had confined his investigations to the case of a spheroid of revolution. He

determined the attraction of a spheroid of small eccentricity, whose surface can be represented by an algebraic equation of any order whatever, even supposing the spheroid to be composed of strata of different densities.

The first memoir of Euler on the planetary perturbations was transmitted to the secretary of the Academy of Sciences in July 1747, some months before Clairaut and D'Alem- bert had communicated their solutions of the problem of three bodies, and it carried off the prize which the academy had offered for the analytical theory of the motions of Jupiter and Saturn. In this memoir Euler gave the differ- ential equations of the elements of the disturbed planet, but withheld the analysis by which he had been con- ducted to them. This analysis, however, he subsequently expanded in two memoirs, the first of which appeared in the Berlin Memoirs in 1749, and the second in those of St Petersburg in 1750. Of these supplementary memoirs the first is remarkable on several accounts. It contains the first example of a method which has been fruitful of important consequences—namely, that of the variation of the arbitrary constants in differential equations, and the development of the radical quantity which expresses the distance between two planets in a series of angles, multi- ples of the elongations. The expressions which he gave for the several terms of this series were simple and elegant ; and he demonstrated a curious relation subsisting among any three consecutive terms, by means of which all the terms of the series may be calculated from the first two. He was thus enabled to develop the perturbing forces in terms of the sines and cosines of angles increasing with the time, and thereby to surmount a very great analytical difficulty. Notwithstanding, however, the great merit of Euler's memoir, several of the formule expressing the secular and periodic inequalities were found to be inac- curate; and in order to procure a correction of these errors, and give greater perfection to so important a theory, the academy again proposed the same subject for the prize of 1752. 'Chis prize was also carried off by Euler. In the memoir which he presented on this occasion, he con- sidered simultaneously the motions of Jupiter and Saturn, and determined, in the first instance, the amount of their various inequalities, independently of the consideration of the eccentricities of their orbits. Pushing the approxima- tions farther, and having regard to the inequalities depend- ing on thc eccentricities, he arrived at a most important result relative to the periodic nature of the inequalities occasioned by the mutual perturbations of the

planets; which laid the foundation of the subsequent discovery by Lagrange and Laplace of the permanent stability of the planetary system. He demonstrated that the eccentricities and places of the aphelia of Jupiter and Saturn are subject to constant variation, which is confined, however, within certain fixed limits; and he computed that the elements of the orbits of the two planets recover their original values after a lapse of about 30,000 years. In the year 1756 the Academy of Sciences crowned a third memoir of Euler on the same subject as the two former, namely, the inequalities of the motions of the planets produced by their

reciprocal attractions. is also of great value.

the elliptic motion, viz.,—1st, the major axis of the orbit,

which, by the law of Kepler, gives the ratio of the differen-

tial of the mean longitude to the element of the time; 2d, the epoch of this longitude; 3d, the eccentricity of the orbit; 4th, the motion of the aphelion ; 5th, the inclina- tion of the orbit to a given fixed plane; and, 6¢h, the longitude of the node. By considering separately the variations introduced into each of these elements by the disturbing forces, Euler obtained some important results ; but ever in this memoir his theory was not rendered com- plete. He did not consider the variation of the epoch ; and the expression which he gave for the motion of the aphelion did not inclnde that part of it which depends on the ratio of the eccentricities of the orbits of the disturbed and disturbing planet, Besides, the third memoir, like the two former, contained several errors of computation, which, by leading to results known to be wrong, probably prevented the author himself from being aware of the full value of the ingenious methods of procedure which he had described. Euler concluded this important memoir by mak- ing an extended application of his formulz to the orbit of the earth as disturbed by the action of the planets. From some probable suppositions, first employed by Newton, relative to the ratios of the masses of the planets to that of the sun, he determined the variation of the obliquity of the ecliptic at 48” in a century,

—a result which agrees well with observation. By this determination the secular variation of the obliquity of the ecliptic, which had been regarded by Lahire, Lemonnier, D'Alembert, and other eminent astronomers as uncertain, was placed beyond doubt. The three niemoirs which we have mentioned con- tain the principal part of Euler's labours on the perturba- tions ; but physical astronomy is indebted to him for many other researches. He gave a solution of the problem of the precession of the equinoxes, and made several important steps in the lunar theory, with which. he seems to have occupied himself before he undertook the investigation of the planetary perturbations. In the year 1772, when entirely blind, he directed his son, Albert Euler, and two illustrious pupils, Krafft and Lexell, in the composition of a work of enormous labour on the same subject, which was undertaken with a view to discover the cause of the moon's acceleration. 'This work was concluded with a set of lunar tables deduced entirely from theory; but they were found to be far inferior to those of Mayer, and in some respects hardly equal to those of Clairaut.

The first theory of Euler formed the basis of the excel- lent lunar tables which were calculated by Tobias Mayer, and first published in the Memoirs of the Academy of Gottingen in 1753. Mayer was a skilful astronomer, and determined the co-efficients of the arguments of the different lunar inequalities from his own observations. He continued to correct and improve his tables till the time of his death, which happened in 1762, when a copy of them, containing his last corrections, was presented by his widow to the Board of Longitude in London. They were printed along with the author's lunar theory in 1765. Subse- quently, the Board of Longitude directed Mason, who had been assistant to Bradley, to revise them, under the super- intendence of Dr Maskelyne. Mason compared them with about 1200 of Bradley's observations, corrected the co- efficients of Mayer, and introduced some new equations which had been indicated by that astronomer, but which he had considered as too uncertain, or of too small a value, to render it necessary to load his tables with them.

This memoir analytically considered The method which he followed and illustrated has since been generally adopted in researches of the same nature, and consists in regarding as variable, in consequence of the disturbing forces, the six elements of

Mayer.

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Mayer's tables, thus corrected, were published in 1784, and fora long time continued to be the most accurate that had appeared. ;

The solution of the problem of three bodies by Clairaut, D'Alembert, and Euler, gave rise to many other import- ant works relative to the theory of the moon, into the merits of which, however, our limits will not permit us to enter. Thomas Simpson, Walmesley, Frisi, Lambert, Schulze, and Matthew Stewart treated the subject with more or less success; but the complete explication of the theory of the lunar and planetary perturbations was re-served for two mathematicians, whose discoveries perfected the theory of gravitation, and explained the last inequalities which remained to be accounted for in the celestial motions,—Lagrange and Laplace.

In the year 1764, the Academy of Sciences of Paris, which had so successfully promoted the great efforts that had already been made to perfect the theory of attraction, proposed for the subject of a prize the theory of the libration of the moon. Lagrange had the honour of carrying off the prize; but although he treated the subject in a manner altogether new, and with extraordinary analytical skill, he did not on this occasion arrive at a complete solution of the problem. In 1766 he obtained another prize for a theory of Jupiter's satellites. In the admirable memoir which Lagrange presented to the academy on this subject, he included in the differential equations of the disturbed motion of a satellite the attracting force of the sun, as well as of all the other satellites, and thus, in fact, had to consider a problem of six bodies. His analysis of this problem is remarkable, inasmuch as it contained the first general method which was given for determining the variations which the mutual attractions of the satellites produce in the forms and positions of their orbits, and pointed out the plan which has since been so successfully followed in the treatment of similar questions.

Of all the grand discoveries by which the name of Lagrange has been immortalised, the most remarkable is that of the invariability of the mean distances of the planets from the sun. We have already mentioned that Euler had perceived that the inequalities of Jupiter and Saturn, in consequence of their mutual actions, are ulti- mately compensated, though after a very long period. In prosecuting this subject, which Euler had left imperfect, Laplace had discovered that, on neglecting the fourth powers in the expressions of the eccentricities and inclina- tions of the orbits and the squares of the disturbing masses, the mean motions of the planets and their mean distances from the sun are invariable. Ina short memoir of 14 pages, which appeared among those of the Berlin Academy for 1776, Lagrange demonstrated generally, and by a very simple and luminous analysis, that whatever powers of the eccentricities and inclinations are included in the calculation of the perturbations, no secular inequa- lity, or term proportional to the time, can possibly enter into the expression of the greater axis of the orbit, or, consequently, into the mean motion connected with it by the third law of Kepler. From this conclusion, which is a necessary consequence of the peculiar conditions of the planetary system, it results that all the changes to which the orbits of the planets are subject in consequence of their reciprocal gravitation, are periodic, and that the system contains within itself no principle of destruction, but is calculated to endure for ever.

In 1780 Lagrange undertook a second time the subject of the moon's libration ; and it is to the memoir which he niow presented to the Berlin Academy that we must look for the complete and rigorous solution of this difficult problem, which had not been resolved before in a satis- factory manner, either on the footing of analysis or

observation. In the same year he obtained the prize of the Academy of Sciences on the subject of the perturba- tions of comets. In 1781 he published, in the Berlin Memoirs, the first of a series of five papers on the secular and periodic inequalities of the planets, which together formed by far the most important work that had yet appeared on physical astronomy

since the publication of the Principia. This series did not, properly speaking, contain any new discovery, but it embodied and brought into one view all the results and peculiar analytical methods which had appeared in his former memoirs, and contained the germs of all the happy ideas which he afterwards developed in the Mécanique Analytique.

On account of the brilliant discoveries and important labours which we have thus briefly noticed, Lagrange must be considered as one of the most successful of those illustrious men who have undertaken to perfect the theory of Newton, and pursue the principle of gravitation to its remotest consequences. But the value of his services to science is not limited to his discoveries in physical astronomy, great and numerous as these were. After Euler, he has contributed more than any other to increase the power and extend the applications of the calculus, and thereby to arm future inquirers with an instrument of greater efficiency, by means of which they may push their conquests into new and unexplored fields of discovery.

With the name of Lagrange is associated that of Laplace, Laplace.

their rival labours dividing the admiration of the scientific world during half a century. Like Newton and Lagrange, Laplace raised himself at an early age to the very highest rank in science. Before completing his 24th year, he had signalised himself by the important discovery of the invariability of the mean distances of the planets from the sun, on an hypothesis restricted, indeed, but which, as we have already mentioned, was afterwards generalised by Lagrange. About the same time he was admitted into the Academy of Sciences, and thenceforward devoted himself to the development of the laws which regulate the system of the world, and to the composition of a series of memoirs on the most important subjects connected with astronomy and analysis. His researches embraced the whole theory of gravitation; and he had the high honour of perfecting what had been left incomplete by his predecessors,

Among the numerous inequalities which affect the motion of the moon, one still remained which no philosopher as yet had been able to explain. This was the acceleration of the mean lunar motion, which had been first suspected by Halley, from a comparison of the ancient Babylonian observations, recorded by Hipparchus, with those of Alba- tegni and the

moderns. The existence of the acceleration had been confirmed by Dunthorne and Mayer, and its quantity assigned at 10” in a century, but the cause of it remained doubtful. Lagrange demonstrated that it could not be occasioned by any peculiarity in the form of the earth ; Bossut ascribed it to the resistance of the medium in which he supposed the moon to move; and Laplace himself at first explained it on the supposition that gravity is not transmitted from one body to another instantaneously, but successively, in the manner of sound or light. Having afterwards remarked, however, in the course of his re- searches on Jupiter’s satellites, that the secular variation of the eccentricity of the orbit of Jupiter occasions a secular variation of the mean motions of the satellites, he hastened to transfer this result to the moon, and had the satisfaction to find that the acceleration observed by astronomers is occasioned by the secular variation of the eccentricity of the terrestrial orbit. This conclusion has, however, been partly invalidated by the recent researches of Adams of Cambridge.

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Another discovery relative to the constitution of the planetary system, which does infinite honour to the sagacity of Laplace, is the cause of the secular inequalities indicated by ancient and modern observations in the mean motions of Jupiter and Saturn. On examining the differential equations of the motions of these planets, Laplace remarked, that as their mean motions are nearly commensurable (five times the mean motion of Saturn being nearly equal to twice that of Jupiter), those terms of which the arguments are five times the mean longitude of Saturn, minus twice that of Jupiter, may become very sensible by integration, although multiplied by the cubes and products of three dimensions of the eccentricities and inclinations of the orbits. The result of a laborious calculation confirmed his conjecture, and showed him that in the mean motion of Saturn there existed a great inequality, amounting at its maximum to 48’ 2’:3, and of which the period is 929 years ; and that in the case of Jupiter there exists a corre- sponding inequality of nearly the same period, of which the maximum value is 19’ 46”, but which is affected by a contrary sign, that is to say, it diminishes while the first increases, and vice versd. He also perceived that the

magnitude of the co-efficients of these inequalities, and the duration of their periods, are not always the same, but participate in the secular variations of the elements of the orbit.

The theory of the figures of the planets, scarcely less interesting than that of their motions, was also greatly advanced by the researches of Laplace. He confirmed the results of Clairaut, Maclaurin, and D'Alembert, relative to the figure of the earth, and treated the question in a much more general way than had been done by those three great mathematicians. From two lunar inequalities depending on the non-sphericity of the earth, he determined the ellip- ticity of the meridian to be 4}, very nearly.

Newton, in the Principia, explained the cause of the phenomena of the tides, and laid the foundations of a theory which was prosecuted and extended by Daniel Bernouilli, Maclaurin, Euler, and D'Alembert; but as none of these geometers had taken into account the effects of the rotatory motion of the earth, the subject was in a great measure new when it was taken up by Laplace in 1774, Aided by D'Alembert's recent discovery of the cal- culus of partial differences, and by an improved theory of hydrodynamics, he succeeded in obtaining the differential equations of the motion of the fluids which surround the earth, having regard to all the forces by which these motions are produced or modified, and published them in the memoirs of the academy in 1775. By a careful examina- tion of these equations, he was led to the curious remark, that the differences between the heights of two consecutive tides about the time of the solstices, as indicated by New- ton's theory, are not owing, as Newton and his successors had supposed, to the inertia of the waters of the ocean, but depend on a totally different cause, namely, the law of the depth of the sea, and that it would disappear entirely if the sea were of a uniform and constant depth. He also arrived at the important conclusion, that the fluidity of the sea has no influence on the motions of the terrestrial axis, which are exactly the same as they would be if the sea formed a solid mass with the earth, The same analysis conducted him to the knowledge of the conditions necessary to ensure the permanent equilibrium of the waters of the ocean. He found that if the mean density of the earth exceeds that of the sea, the fluid, deranged by any causes whatever, from its state of equilibrium, will never depart from that state but by very small quantities. It follows from this, that, since the mean density of

the earth is known to be about five times greater than that of the sea, the great changes which have taken place in the relative

situation of the waters and dry land must be referred to other causes than the instability of the equilibrium of the ocean.

The chief steps in the progress of the study of tides since the time of Laplace have consisted in co-ordinating the results of observation, and analysing them into their partial phenomena, by the help of Newton's and Bernouilli's theory. This labour has been greatly advanced by Dr Whewell, and also by Sir John Lubbock. The former has con- structed maps of "cotidal lines," which, indicating the relative time of high water in different parts of the globe, give us a graphic conception of the course and propagation of the tidal wave. The tides of the Eastern Pacific are but little known ; but a vast wave advances northwards between Australia and Africa, diverted or retarded by the obstacles it meets with in the Indian Archipelago, Another (and to us the most important) branch sets from south to north up the vast canal of the Atlantic, where it is gradually complicated by local tides, having their origin in the wide expanse between Africa and the Gulf of Mexico. The two sets of waves sometimes reinforce, sometimes oppose one another; they are prolonged to the western shores of England and Norway, where the tidal impulse arrives twenty-four hours after it passed the Cape of Good Hope. It is propagated most rapidly at a distance from coasts, and is retarded in narrows and shallows. It sends offshoots into every bay and strait, always greatly retarded in point of time (apparently by friction), but often increased in elevation by concentration of the effect in a gradually narrowing channel, as we see in the exaggerated tides of the river Amazon, the Severn, and the Bay of Fundy. The same place may be the seat of several tides at once, which may increase or destroy one another ; thus, a small tide is propagated through the Straits of Dover as far as the Dutch coast, where it only arrives simultaneously with the principal wave, which has made the entire tour of Great Britain.

As regards the progress of theory, Dr Thomas Young, one of the greatest philosophers of this century, next after Laplace grappled with the difficulties of this arduous subject. Employing mathematical methods of inferior power but greater directness, and taking into account causes of local action which Laplace had not ventured to include in his analysis, he gradually matured a theory adequate to represent many of the results of experience, of which Laplace gives no account. He distinguishes the results of the forced and free oscillations of the sea: the former resulting from the direct action of the sun and moon combined with the rotation of the earth, and whose periods of rise and -fall are determined solely by those external causes ; the free waves, on the contrary, derived from the former, are transmitted with velocities depending on the mechanism of the fluid itself, on its depth, and on the resistances arising from friction to which those motions are exposed. These all-important modifications of the dynamical theory of the tides were deduced by Young from the general theory of oscillations and resistances, and from the laws of fluids detected by Du Buat, and he applied them with no ordinary skill to the solution of the problems of tides in oceans, estuaries, and rivers. It is satisfactory to find that by an independent and very different method Airy subsequently arrived at substantially the same results as Young.

Closely connected with the problem of the tides is that of the precession of the equinoxes, which also received similar improvements in passing through the hands of Laplace. He demonstrated, as has been mentioned, that the fluidity of the sea has no influence on the phenomena of precession and nutation. He considered some of the effects of the oblate figure of the earth which had not been

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attended to by D'Alembert, and showed that the annual variation of the precession causes a corresponding variation in the length of the tropical year, which at present is about 9 or 10 seconds shorter than it was in the time of Hippar- chus. He proved that the secular inequalities of the motions of the earth and moon have no sensible effect in displacing the axis of the

earth's rotation; and he deter- mined the nutation of the lunar orbit corresponding to the nutation of the terrestrial equator.

Physical astronomy is also indebted to Laplace for a complete theory of the system of Jupiter's satellites, from which Delambre constructed a set of tables representing the motions of these bodies with all desirable accuracy. And when to these numerous and most important researches we add the mathematical theories of molecular attrac- tion, and the propagation of sound, together with many great improvements in analysis,—and reflect, besides, that he is the author of the Mécanique Céleste, the Systéme du Monde, and the Théorie des Probabilités,—we shall not hesitate to rank him next to Newton among the greatest benefactors of the mathematical and physical sciences.

By the brilliant discoveries of Laplace, the analytical solution of the great problem of physical astronomy was completed. The principle of gravitation, which had been found by Newton to confine the moon and the planets to their respective orbits, was shown to occasion every apparent irregularity, however minute, in the motions of the planets and satellites; and those very irregularities which were at first brought forward as objections to the hypothesis have been ultimately found to afford the most triumphant proofs of its accuracy, and have placed the truth of the Newtonian law beyond the reach of all future cavil. Such is the state to which analysis has now attained, that the geometer embraces in his formule every circumstance which affects the motions or positions of the different bodies of the planetary system; and the conditions of that system being made known to him at any given instant of time, he can determine its conditions at any other instant in the past or future duration of the world. He ascends to remote ages to compare the results of his theories with the most ancient observations; he passes on to ages yet to come, and predicts changes which the lapse of centuries will hardly be sufficient to render sensible to the observer. But notwithstanding the comparative perfection to which the theory of astronomy has been brought, it is still far from having reached the limit beyond which further refinement becomes superfluous. The masses of the planets, and some other elements, remain to be determined with still greater precision, by a diligent comparison of the analytical formule with good observations; and the labours of the geometer may still be beneficially

employed in giving greater simplicity to the calculus, or in extending its power over subjects which have hitherto eluded its grasp. The observation of periodic comets that complete their revolutions in comparatively short intervals of time, opens up an interesting field for speculation and research, and will doubtless be the means of throwing light on some curious and as yet very obscure points, respecting the appearances, motions, and physical constitution of those strange bodies,

In the other departments of astronomy, also, numerous questions stili remain to be discussed, the solution of which will occupy and reward the future labours of astronomers, and in which much progress has been made during the present century, by means of the powerful instruments now employed at the great observatories of every civilised country, and the improved methods of analysis brought to bear upon the results of observation. The curious pheno- mena of double and multiple stars, some of which are found to form connected systems of bodies revolving about one

another, or a common centre of motion,—the variable stars,—the proper motions of the stars,—the translation of the solar system in space,—the progressive condensation of nebulz,—are subjects still in a great measure new ; for it is only of late years that observers have begun to direct the requisite attention towards them, or indeed have been in possession of instruments of sufficient power and delicacy to observe and measure the minute changes which take place beyond the boundaries of our own system. The discoveries in astronomy during the present century have been so brilliant and numerous, and the progress in every department is so rapid, and involves so many details, that it would be impossible to give here a detailed account of that progress. Moreover, there is a reason for not attempt- ing this, in the cirenmstance that we have brought the history of our subject as far as is possible without consider- ing the work of men still living. For although some to whom the astronomy of the present day is indebted, and not a few who must always be regarded as among the leading astronomers of the century, have passed away, yet the consideration even of their work would necessarily introduce the discussion of the labours of

those whose labours are still in progress. It seems on all accounts better, therefore, to content ourselves with the discussion of the various results obtained during recent years, without attempting the invidious task of apportioning to the several workers their relative positions.

Part IJ].—TuHeroreticaL Astronomy. CuapTer I.—Apparent Motion of the Star-sphere.

When we look at the heavens on a clear night, we per- ceive a concave hemisphere on which are strewn multitudes of bright points. As we watch these hour after hour, we find that they are carried round precisely as though they were fixed on the interior surface of a spherical shell turn- ing on a fixed axis. New groups are seen to rise above the eastern horizon, while those above the western horizon descend and finally disappear. Turning towards the south, we see that the groups of stars which pass above the horizon somewhat to the east of the south attain but a slight elevation when at their highest in the south, and then descending set as far to the west of the south point as they had risen to the east of it. Turning to the north, we see that there are groups of stars which remain visible the whole night, wheeling around a fixed point, and describing circles of greater or less magnitude according as they are at a greater or less distance from that point. Supposing our stand point to be in or near London, the point thus remaining fixed is due north, and about 514° above the horizon,—therefore, about 384° from the point directly overhead. If the heavens be observed night after night, similar phenomena are seen; and we recognise the uni- formity of the motion of the (imaginary) star-sphere about its (imaginary) axis; for in any assigned interval, on any night in the year, the star-sphere turns by the same amount. It is soon found that the rate of turning is such that a complete rotation is effected in the course of about one day. But before many days have passed we find that this uniform turning motion does not corre- spond exactly to our common day. For though on several successive nights the stars may appear to be nearly in the same situation with respect to the horizon at any assigned hour, yet before long (or even in twenty-four hours if exact observation be made) it is found that the stars occupy the same position, not at the same hour on successive nights, but about four minutes earlier night after night. Thus, in the course of about

fifteen days, the star-sphere has gained one hour's rotation; in about thirty days, two hours' rotation, and so on: until in the

Definitions,

Poles.

Zenith,

Meridian.

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course of a year the star-sphere has gained a complete rotation, and the stars have the same apparent position at any assigned hour of the night as they had when the observations were commenced.

Limiting our attention for the present to the stars,— though already, in speaking of the common day, we have in fact referred to the sun,—the idea suggested by the observed phenomena is that the apparent star-sphere revolves around the earth precisely as it seems to do, turning about an axis, with a perfectly uniform motion, completing one rotation in twenty-four hours, less about four minutes. The natural steps for determining whether this really is the case, are—first, a series of careful observa- tions at one fixed station; and, secondly, a study of the effects produced by change of station.

For the former purpose we require to adopt certain fixed points or circles on the concave hemisphere visible above the horizon, in order that we may refer the apparent motions to these points or circles as unmoving standards.

Let, then, NESW (fig. 1) represent the seemingly circular horizon line around the observer at O; N being the north point, S the oa south, E the east, and W the west, so that the lines SON and WOE are at right angles to each other. Let Z be the pout immediately over- Hy head; and let F, sof placed on the quad- rant ZPN that PN is an arc of 514°, be the apparently fixed point on the heavens already described, so that POP' is the ima- ginary axis about which the star-sphere appears to revolve. Then the points

P and P' are called the oles of the heavens. P is distinguished as the visible pole from P', which is the invisible pole, for the station of the observer at 0; PP' is called the polar axis. The point Z immediately overhead, or geometrically defined by the fact that OZ is perpendicular to the plane of the horizon NESW, is called the zenith ; and Z', the point in which ZO produced intersects the invisible hemisphere, is called the nadir. The line OZ is called the vertical. Any great circle of the sphere, whose plane passes through ZZ', as the circle SZNZ' or the circle E"AWZ', is called a vertical circle. The vertical circle SZPNZ", which passes through the pole, is called the meridian circle, and its plane is called the meridian ; because when the sun is on this circle it is true mid-day. The points N and S, in which the meridian circle meets the horizon, are called the north and south points of the horizon, the north point being distinguished from the south as being the extremity of the quadrant ZPN, on which is the visible pole P. (Reference is here made to the pole seen at the supposed station of the observer; that pole is the north pole of the heavens, and the north point of the horizon is N on the quadrant ZPN through the north pole.) The points N and § divide the horizon into halves, SEN, SWN—the former being the half along which the stars rise, the latter being the half along which they set. A vertical circle EZWZ', having its plane at right angles to the meridian, is called the prime vertical, and intersects the horizon in two points, E and W, called respectively the east and west points of the horizon, the east being distinguished from the west as being on the part of the

Fig. 1.

ASTRONOMY

| E and W for its poles, the arcs

[THEORETICAL—

horizon crossed by rising stars, while the west is on the part crossed by setting stars.

Next, let EMWM" (fig. 2) represent the path of a star Equator,

which rises due east. Then EMWM' is a circle whose plane passes through WOE, and is there- fore a great circle of the sphere. The dia- meter WOE divides this circle into the semicircles EMW and WME, one above, the other below the hori- zon circle NESW,— that is to say, a star which rises in the east has one-half of its course above the hori- zon, and the other half below the horizon. Again, since the circle SZNZ' has the points

EM, MW, WM', and M'E are quadrants,—that is to say, when a star rises in the east, one-fourth of a complete rotation brings it to the meridian, another fourth brings it to the west point, the next fourth part brings it again to the meridian at M' below the hori- zon, and the remaining fourth part brings it to the cast point

again. The circle EMWM' is called the celestial equator. It is the great circle having for its poles the points P and P', which are the poles of the heavens. (It is sometimes, but perhaps not very correctly, called the equinoctial, because when the sun is on this circle, one-half of his course is above and the other below the horizon, and therefore day and night are equal ; but, strictly speaking, the term equinoctial is applied to the geographical equator because there all the year round the nights are of equal length.)

A star at N will clearly be carried by the diurnal motion round the circle Nemw to N again, not passing below the horizon; and any star on the segment of the sphere PNemw will be always above the horizon. Hence the circle of Nemw is called the circle of perpetual apparition, as limiting the region of the stars which never sct. Such stars are called circumpolar stars. There is evidently an equal opposite region, P'Sw'm'e', around the invisible pole, the stars in which are never seen above the plane of the horizon. It is clear that any circle parallel to the equator, between the circle of perpetual apparition and the equator, has more than its half above the horizon, and so much the more as it lies nearer to the circle of perpetual apparition ; that is to say, stars rising in the quadrant EN are above the horizon for more than half the time of a complete rotation of the star-sphere, and the nearer they rise to N the longer they continue above the horizon. In like manner stars rising in the quadrant ES are above the hori- zon for less than half the time

of a complete rotation, and the nearer they rise to S the shorter is the time during which they are above the horizon.

Let us suppose the sphere of fig. 2 so placed (fig. 3) that. the horizon plane appears as a straight line SON, O being the place where the east and west points coalesce. Thus the equator appears as the straight line MOM' at right angles to the polar axis POP'; the circles mN, Sm of fig. 2 become the straight lines mN, Sm' parallel to MM' in fig. 3. And parallel circles intermediate between these two and the equator appear as the parallel straight lines ACB, A'C'B'; while parallel circles outside the circles mN and Sm' appear as the parallel straight lines ab and a'c'b'. All these parallels being at right angles to PP' are bisected

Declina- tion,

DEFINITIONS. |

by PP'. Now, if we consider that the straight line AHB represents a circle seen edgewise, we perceive that AH represents two equal arcs of the circum- ference of this circle, one arc being' that on which a star moving along that circle by the diurnal motion is carried from the hori- zon to the meridian at A,and the other being | the arc on which the star is carried from A to the horizon again. In like manner H'A' represents two equa! ares of a star's diur- ual course,—that is

Fig. 3. to say, the arcs of a star's visible path on the two sides

of the meridian are equal to one another, Similarly the meridian divides the invisible part of a star's course into equal parts. -In the case of a star within the circle of perpetual apparition we perceive that ach represents two semicircles of such a star's diurnal circuit, one-half lying on the east of the meridian, the other lying on the west ; in this case, then, as in the former, the meridian separates the ascending from the descending paths, which are equal, but the ascent is from a point on the meridian below the pole, not from the horizon, and the descent is to the same point of the subpolar meridian. It will be noticed that @ in fig. 3 lies to the north of the zenith Z; but it is also clear from the figure that some of the circumpolar stars cross the meridional arc SMP to the south of the zenith.

We see from fig. 3 that a star is always at its highest above the horizon when on the part PZS of the meridional circle. A star is said to culminate, or to reach its culmina- tion, when on the meridian. The arc of the meridian intercepted between the star and the south point is called the star's meridian altitude ; and the arc of the meridian between the star and the zenith is called the star's zenith distance, or more correctly, the meridional zenith distance. The are-distance of a star from the equator is called its declination, and is northern or southern according as the star is in the northern or southern of the two hemispheres into which the equator divides the celestial sphere. The arc-distance of a star from the north pole is called the north polar distance, the supplement of this arc (the arc-distauce from the south pole) being called the south polar distance, It is evident that the north polar distance of a star having northern declination is complementary to the declination,— that is, N.P.D.=90°-—N. Dec. But when a star has southern declination N.P.D. = 90°+ 8. Dec. When we know the declination or polar distance of a star, we know where it will culminate. For we see from fig. 3 that

Arc SA=SM+MA.

In other words, the altitude of a star culminating at A is equal to the altitude of the equator.on the meridian added to the northern declination of the star. (The are SM is obviously equal to ZP, the zenith distance of the pole, or the complement of the pole's altitude above the horizon.) Again— . Arc SA'=SM- MA',

or the altitude of a star culminating at A' is equal to the altitude of the equator on the meridian diminished by the southern declination. These relations hold so long as the star culminates on the arc SZ. For a star culminating at

a, we have still Sa=MS+Ma.

But the altitude of the star, being in this case measured from the north point N, is the supplement of the arc obtained by thus adding the north declination to the meridional alti- tude of the equator.

We see then that the declination of a star (or its north polar distance) determines the altitude of its culminating point. To determine the time at which the star culminates it is necessary that another co-ordinate should be known.

As we measure the declination from the equator, or in Right other words, determine the altitude of culmination by a ascension.

reference to the equator, it is manifestly convenient to measure the time of a star's culmination by referring it to the time of culmination of some selected point on the equator, This is the course adopted by astronomers. The point selected for the purpose is one of the two points in which a great circle on the celestial sphere, called the ecliptic, and presently to be more particularly described, cuts the equator. This point is called the first point of Aries, and is indicated by the sign Y. At present it is only necessary to note that this point is in reality affected by a slow motion on the star-sphere, due to the fact that the axis on which the star-sphere apparently turns undergoes a slow change of position within the star-sphere itself, so that the equator is not really a fixed circle on the heavens. But for the purpose we have at present in view this slow change may be neglected ; and we assume that the observer on earth has the equator as a fixed circle from which to measure the declination of stars, and that he also has a fixed point on the equator by which to time the culmina- tion of each star. Knowing the declination of a star, he knows at what altitude it will culminate as viewed from the fixed station at which thus far we have supposed him to be placed. Let him now note the exact moment at which the first point of Aries culminates, and let him observe the precise interval in time between that momeut and the moment when a star of known declination cul- minates; this interval is constant, and thereafter he will always know not only at what altitude that star will cul- miuate, but at what time after the culmination of the point . The interval in time between the culmination of T and the culmination of a given star is called the right ascension of the star. It may be measured, indeed, as an are, viz., as the arc on the equator

intercepted between aud that point in which a meridian circle through the star intersects the equator, the arc being measured in the direc- tion opposite to that in which the star-sphere rotates. But the right ascension is more conveniently and now almost always measured in time.

The time measurement employed is the rotation of the star-sphere itself. The interval in time between the suc- cessive culminations of Y is called a sidereal day. It is divided into 24 hours (numbered 0, 1, 2,3… to 24), each hour into 60 minutes, each minute into 60 seconds. If we have a clock showing 24 hours, and so rated as always to show 0 hour 0 min. 0 sec., when Y is at its culmination, that clock will always show true sidereal time. Such a clock would gain nearly 4 min. a day as compared with an ordinary clock; but we need not at present dwell upon this point. Now the right ascension (or, as it is written, the R.A.) is indicated in sidereal time, and therefore corre- sponds to the tinie shown by the sidereal clock when that star is culminating. Thus, if a star's right ascension is 3h. 2m. 6 s., then when the sidereal clock shows time 3h. 2 wn. 6 s., that star is culminating. Whether it be day or night the astronomer knows this certainly, that is, if his sidereal clock is trustworthy.

It will be manifest that an observer at a fixed station, as we have thus far supposed our observer to be, requires to have the means of determining—(1) the moment at which a star culminates (or is on the meridian), and (2) the star's

Transit in- strument.

altitude when at its culmination. We have seen how the movement of the star-sphere determines the cardinal pownts of the horizon. Suppose now a telescope or pointer, so set as to turn upon a horizontal axis lying exactly east and west, asin fig. 4. We see that when the telescope is rotated on this axis, the line of sight, es, or the optical axis of the telescope, sweeps round in the plane of the meridian. It can be directed due south towards 8, or to AX (theculminating point of the celestial equa- tor), or to s, a star on the meridian, or to the zenith Z, or to the pole P, or to the north point N,—in fine, to any point on the celestial meridian. Now, if any contrivance be

adopted to enable the observer to note the exact moment of sidereal time when a star crosses the middle of the field of view of such a tele- scope, then the right ascension of that star is known at once. If also the angle ZOs can be determined, we learn the star's zenith distance. This added to ZP, the zenith distance of the pole, is the star's north polar distance, PZs ; and in this instance the complement of the zenith distance is the north declination. Such an instrument, if devised

Fia, 4.—Transit Instrument.

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the stars are so enormous that the displacement of the observer on the earth, even by several hundred miles, is as nothing by comparison. The uniform change in the pole's elevation cannot be explained, however, by merely supposing the stars very far away compared with terrestrial distances. For let us suppose that A, B, C, D (fig. 5) represent four equidistant stations along a straight north-and-south line SN, and that AP is the direction in which the polar axis seems to lie, as seen from the station A, then from D it is seen at a greater elevation, or as in direction DP. Now, if we suppose P to be the actual pole of the heavens, then BP and CP should represent the polar axis as observed at B and C; but the angles PAN, PBN, PCN, PDN, do not increase uniformly, for this would imply that the angles APB, BPC, and CPD are equal, which we know from geometry not to be the case. Moreover, the star-sphere cannot rotate uniformly about two different axes, as P and PD.

Fig. 5.

Tt is manifest that we can only explain the observed Earth's facts by assuming that the course pursued by the supposed surface observer is not a straight line as SN (fig. 5), but curved, curved f

and that it is curved uniformly, since the polar elevation oa

simply or mainly for noting the moment of culmination, is called a transit instrument. If arranged with circles so that angles—as the zenith distance Zs—can be determined, the instrument is called a transit circle.

An arrangement, now little used, in which a meridional circle bearing a telescope works against a fixed plane surface or wall (necessarily standing in a north-and-south position) is called a mural circle. At present, however, we need not discuss these varieties of construction. The point to be specially noted in this plan is that, from observations of the star- sphere, we determine the cardinal points; and then the position of any star in the heavens can be determined by an instrument contrived so as to swing in the plane of the meridian. 'This done, a clock, carefully rated to show

_sidereal time, enables the astronomer at a fixed station to

turn his transit instrument to the point of culmination of a star at the exact time when the star will culminate, and at the true place of such culmination.

Cuapter I].—The Earth shown to be a Globe within the Star-Sphere.

But now let us suppose our observer to travel in a north. and-south direction, in order to determine what change, if any, will be produced by such voyages. The first effect noticed is that the pole of the heavens rises higher and higher above the northern horizon, as he travels farther and farther north, whereas the pole sinks lower and lower down towards the northern horizon the farther the observer travels towards the south. Close observation shows that the change of the pole's elevation is either exactly propor- tional to the observer's change of place in a north-and-south direction, or so nearly so that any discrepancy will require the closest and most exact scrutiny. The observer also notices that the stars retain their relative positions abso lutely unaltered, but that new stars are seen in the south when he travels southward. This shows that the star- sphere is either truly a spherical enclosure,—all the stars lying at the same distance,—or else that the distances of

changes uniformly when the observer travels at a uniform '

rate. It follows, therefore, that the path of the observer must be part of a circular arc such as dag infig.6. Here suppose a the first position of the observer, and that when

Fic, 6.—Diagram to show Curvature of Earth.

he travels southwards he passes over the equal arcs ab, be, cd, &c., while his northward course from a carries him over the equal arcs ae, ef, fg. From a let the north pole of the heavens be seen in the direction aP,, and for convenience, instead of drawing the south-and-north horizon line at a (which would be a tangent to the are dg at a, and. would be confused with other tangents required to be drawn

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FIGURE OF EARTH. |

from b, c, d, &c.), let us draw a vertical line downwards from a to CO, that is, towards the nadir, and let us draw Ca at right angles to aC, meeting the circle EaE', of which dg isan arc,ina, Through C, the centre of this circle, draw PCP' parallel to aP,. Then we suppose throughout that the pole of the celestial sphere is so far off compared with the dimensions of the circle EaE', that the apparent direction of the polar axis at all points of the arc d g is the same, and therefore parallel to CP. Thus the polar axis at b is represented by the line bP,, at c by the line cP. and s> on, Draw the vertical lines bO, cC, dO, &c., and at right angles to them, through O, draw Cb, Ce, Cd, &é. 5 then clearly the angular elevation of the pole at a, or the angle P,ae, is equal to the angle PCa; at b the elevation of the pole, or the angle P,ba, is equal to the angle PCd; at c to PCc, andatdtoPCd. But these angles PCa, PC8, PCe, PCd, diminish uniformly. In other words, to an observer travelling uniformly along an arc abcd towards the south, the angular elevation of the pole would diminish uniformly, as it is observed to do, if (1) the are da is circular, and (2) the pole of the heavens so far from the observer that lines drawn to it are appreciably parallel. Similarly the uniform increase of the polar elevation, to an observer travelling northwards along thearc ag, is explained, since the elevation of the pole, as he passes to the stations 6, f, and g, changes through the values PC, PCA, PCy, increasing therefore uniformly.

Continuing this voyage beyond ad, southwards, the observer finds the pole continues to sink, until at length when he has arrived at a station E, the north pole of 'the heavens is on the horizon due north, or in direction EP. All the phenomena of celestial rotation continue unchanged, except that towards the south many new stars have come into view. Moreover, the south pole of the heavens has now risen to the horizon, and lies due south, or in direction EP';. If the observer were uow to retrace his course, he would, of course, find the north pole of the heavens rising uniformly again. But if instead of this he continue his journey southwards, he finds the south pole of the heavens rising uniformly. As he travels onwards to the successive stations d',c', b', a', &c., so placed that Ed'= Ed, Ec' = Ee, &c., the phenomena presented may be described exactly as for the northern stations d, c, b, a, &c., respectively, except that for northern must be written southern, and for southern northern, throughout.

The difference in the position of observers on the northern and southern sides of E, fig. 6, may be con- veuiently illustrated as in fig. 7, where G represents the place of an observer near Greenwich, and © the place of an observer near Cape Town, but due south of the former, and HZh, H7Z'h', are supposed to represent the apparent hemispherical dome of the heavens above and around these respective observers. (These hemispherical domes should, of course, be very much larger in proportion, each being here represented with a radius of about 3500 miles, whereas the nearest of the celestial bodies, our moon, is nearly 240,000 from us.) Gp represents the apparent direction of the northern celestial pole as seen from Greenwich, raised about 514° above the north point of the horizon at h, and Ge is the direction of the southern or culminating point of the celestial equator, about 384° above the south point H of the Greenwich horizon. (The east and west points of the horizon-circle are projected at the point G.) At C, Cp' is the direction of the southern celestial pole, about 344° above the southern horizon at H'; Ce' is the direction of the culminating or north point of the celestial equator, about 553° above the northern horizon at h'.

We see that journeys taken in a north-and-south

ent of direction lead to apparent changes of the dome of the oe: heavens, only explicable on the assumption that the path

traversed is a circular arc, or nearly so. It is clear also that the radius of this circular arc is determinable if the observer notes how much the elevation of the pole is

Fig. 7.—Domes of Heavens near Greenwich and near Cape Town.

changed for any given distance traversed by him in a nortp- and-south direction. Suppose, for instance, that in travel- ling from a to b (fig. 6) he finds the elevation of the pole diminished by 7°, and that he has travelled about 480 miles, then (as already shown) he knows that ab = ab = change in polar elevation =an arc of 7° of the circumference of the circle along which he is travelling. Hence the whole

0 360 : ;

circumference = a % 480 miles = 24,686 miles; whence

the diameter of the circle=(roughly) 24,686 x a 7855

miles. This is not the true diameter of the earth's globe, being supposed to be the result of only a rough observation; but the method serves sufficiently to show how in very early times astronomers obtained a measure of the earth. For from whatever station the observer starts on north- and-south journeys, the same uniform elevation or depres- sion of the visible pole as he travels towards or from it is observed ; and the inference, therefore, is that the earth is a globe, since all the lines drawn on it in a north-and-south direction are circular arcs of equal radius, The points corresponding to E, where the poles are both on the horizon, mark the place of the terrestrial equator ; and the points on the earth, P and P' (which have never yet been reached), where the north and south celestial poles are respectively vertical, are the terrestrial or geographical poles.

Thus far we have considered only journeys made along a north-and-south course. Journeys pursued due east or due west, that is, always towards the

point of the hori- zon which is 90° to the right or to the left of the north point, show equally that the observer is travelling on the surface of a globe, though they produce no apparent change either in the elevation of the pole or in the posi- tion of the points at which known stars rise, culminate, and set. We have seen that the observer who remains always at one station can determine the absolute time when any given star will culminate. Let us suppose that when journeying eastward or westward he can carry with him his sidereal time-measurer, and that this continues throughout to show the true sidereal time of his original station. Then if he is travelling eastward he will find that any given star, instead of culminating at the time noted for that star as observed at his original station, will cul- minate earlier, The right ascension of the star will remain unchanged, for this is the diffcrence between its time of

Earth's surface curved east-and- west.

Equatorial instru- ment.

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culmination and the time when the poimt 7 culminates. But instead of Y culminating when the clock points to 0h. Om. Os. of sidereal time, it will culminate before the clock so points; and each star will culminate as much before tés sidereal time, that is, before the sidereal time corresponding to its right ascension, — On the contrary, if the observer travels westwards from his original station, he finds that each star culminates later. Moreover, the observer finds that the amount of change in point of time corresponds to the distance he travels. Suppose a, fig. 8, to be his original sta- tion, and let aa' bea small circle of aglobe, having P and P',, as before determined (see fig. 6), for poles. Then the observer finds that the change in the time of a star's culmination corre- sponds exactly to the length of are tra- versed by him round the circle aa', on the assumption that a complete circumfer- ence of this circle corresponds to 24 hours of sidereal time. Thus, if a is at Greenwich, the polar elevation is 514°, and, therefore, Ea (from what has been already shown in explaining fig. 6), is an arc of 514°; ao, the radius of aa', = EO sin. 512°, and the observer finds that T, the change of time in the culmination of Y, or any given star, for a given easterly or westerly distance

d traversed froin Greenwich, is such that T : asidereal day :: d : 2a. EO. sin. 51}°.

This corresponds with the result of the former series of observations in showing that the earth is a globe, suspended, as it were, within the star-sphere ; and that either the star- sphere turns uniformly around this terrestrial globe from east to west once in 24 sidereal hours, or else the terrestrial globe turns uniformly round the axis PP' (fig. 6) once in 24 sidereal hours from west to east.

Fig. 8.

Cuaprer II.—Of the Apparent Motions of the Sun.

The earth has now been shown to be a globe within the star-sphere, and whether the earth rotates within the star- sphere, or the star-sphere rotates round the earth, or both the earth and the star-sphere rotate, it is known that, relatively to the earth, the star-sphere rotates from east to west once in 24 sidereal hours. This rotation, whether apparent or real, takes place without any appreciable change in the relative position of the fixed stars. And the law of rotation having once been ascertained, it follows that the time of culmination of any star, and the position of the star at the time, are known, insomuch that a telescope or pointer can be directed to the place of the star at the moment of culmination with perfect exactness. Moreover, a star can be followed by an instrument properly devised, in such sort that a pointer shall continue directed upon the star all through the 24 sidereal hours. Suppose, for example, that PP' (fig. 9) is a rod turning on pivots P and P' so placed that the axis of the rod points to the pole of the heavens ; then if TT' be a telescope so attached to an axis in or on PP' (as at O) that it can be turned in any angle to PP'; then if this telescope be placed so that es, its optical axis, is directed towards a star (in which case, necessarily, the angle POs will be equal to the star's north polar distance), it is

clear that by rotating the axis PP' uniformly once in 24 sidereal hours, and in the direction corresponding to the rotation of the heavens, the opti- cal axis es willcon- tinueto bedirected towards the star throughout the whole of those 24 hours, even when the star is below the horizon. Ifa star's north polar distance be known, atelescope thus mounted can be placed so that POs is the proper angle, without seeing the star. If, further, we know the star's right ascension, and also the true sidereal time, we can not only set the telescope so that POs shall be the proper angle, but can rotate the axis PP' in such sort that the tele- scope shall be pointed directly towards the star. Suppose, for example, that the star's N.P.D, = 75°, and the R.A. = 1 hour 26 min. (or 214°), (in other words, the star is close to y of the constellation Pisces); and let the time indicated by the sidereal clock be 3 hours 10 min. Then set TT" (tig. 9) so that the angle POs = 75°, turn the axle PP' so that TT' or es lies in the meridian,—in other words, let the telescope be directed due south, only with an elevation of 53}°, which is the supplement of 75° + the polar elevation at Greenwich, where the observation is made. Then, since the sidereal time is 3 hours 10 min., we know that the point was on the meridian 3 hours 10 min. before the moment of observation; and since the star's R.A. =1 hour 26 min., we know that the star was on the meridian 1 hour 26 min. after Y ; hence the star was on the meridian 1 hour 44 min. (3 hours 10 min. — 1 hour 26 min.) before the moment of observation. We have then only to rotate the axis PP' so as to follow the rotation of the star-sphere through an angle of 26° (the angle corresponding to 1 hour 44 min., since 360° corresponds to 24 hours) to have the telescope directed upon the star. And as we can thus direct a tele- scope, mounted as shown in fig. 9, towards a star at any hour (even when a star is below the horizon, in which case, of course, the telescope will be directed downwards), so con- versely, it is clear that when the telescope is directed in any manner we can tell towards what point of the star-sphere the tube is turned. Thus, if the time shown by the sidereal clock is 3 hours 10 min., and the telescope be in such a position that, in order to bring it to the meridian, it would have to be turned round the polar axis backwards through an arc of 26°, corresponding to the rotation of the heavens in 1 hour 44 min., then we know that it is directed toa point in the star-sphere whose right ascension is 3 hours 10 min. ~~1 hour 44 min., or 1 hour 26 min. If, further, we note that the angle POs is one of 75°, we know that the north~~

~~polar distance of the point towards which the tele~~ scope is directed is 75°. The point, therefore, is known, and is close to the star 7 Piscium.

We perceive, then, that if any celestial object is visible, whether by day or night, then by simply directing towards it such a telescope as is shown in fig. 9, we can ascertain in what part of the stellar heavens that celestial object lies, And if the object is moving upon the stellar heavens,— or, in other words, if it is other than one of these fixed stars with which we have hitherto been dealing,-—then by turning a telescope towards it from time to time we can determine its apparent path among the stars. So that in the case of the sun, which is never seen in company with the stars,

Fia. 9.—Equatorial Instrument.

Refraction.

REFRACTION. |

simply because his light, by illuminating our air, veils the stars from view, we can nevertheless ascertain exactly along what path on the star-sphere he seems to move, at what rate, and whether the rate is uniform or variable.

But before we examine the results of observations carried out for this purpose, it will be well to consider a circum- stance affecting observations made in this manner. We refer to the refractive action of the earth's atmosphere, by which the apparent positions of the celestial bodies are to some degree affected. This is the proper place to mention the effects of refraction, because there can be little doubt that it was during observations of the sun that the refractive action of the atmosphere was first discovered. However, in explaining this action reference will be made to the stars as heretofore, in order that the inquiry into the sun's apparent motions may be referred solely to the sphere of the fixed stars.

By a well-known optical law, a ray of light in passing obliquely from one medium to another of greater density is refracted or bent towards the normal to their common surface. We may regard our atmosphere as composed of an infinity of concentric spherical shells, whose densities increase the nearer they are to the earth's surface. When a ray of light from

a star enters the atmosphere, therefore, it is inflected towards the earth, and the inflection is increased by every successive stratum of the atmosphere through which the light passes. In fig. 10, let AA', BB', COC',

xs

Fig. 10.

represent the boundaries of successive strata, supposed for convenience to have a finite thickness. A ray of light from §, reaching the highest stratum at a, leaves its original direction Saz, and travels in the direction aby; reaching the next stratum at 6 it is further bent, viz., from direction aby to the direction 6z; and at c it is deflected in the direction cO. In its progress from a to O, it has therefore succes- sively moved in the direction of the sides of the polygon abcO; and to the spectator at O, the star from which it pro- ceeded, instead of appearing in its true place at S, will appear to be at S', or in the last direction of the visual ray. Now if AA is the most elevated stratum of the atmosphere into which the ray enters in the direction Sa, it is clear that the whole effect is produced by the atmospherical strata situated below AA, and that the length of Sa is perfectly indifferent; hence the refraction is entirely independent of the distance of the stars, provided they are beyond the limits of the earth's atmosphere.

The decrease of the density of the atmosphere, from the surface of the earth upwards, follows the law of continuity, or takes place by insensible degrees; so that the luminous ray, in traversing the atmosphere, enters at every instant into a denser medium, and is therefore continually brought nearer and nearer to the vertical direction. Hence the true path of the ray is curvilinear, and concave towards the earth, as represented in fig. 11. This is equivalent to-the supposition that the thickness of the different concentric strata of uniform density is infinitely small, and that the light, as it successively penetrates each, deviates from its former path by an infinitely small angle, which may be

considered as the differential of the refraction, the total amount of which will therefore be obtained by integration, The direction of the ray, when it reaches the eye of the. observer, is the tangent to the last portion of its curvilinear path ; and the apparent zenith distance of the star will be ZOS', while the real zenith dis- tance is ZOS. : The difference of

Fig. 1: these two angles, namely S'OS, is what is denominated

the Astronomical Refraction. It is evident that the whole path of the ray is confined to the vertical plane in which the star and the eye of the observer are situated ; for the earth and its atmosphere being very nearly spherical, that plane will divide the strata symmetrically ; there will, therefore, be no displacement in a lateral direction, i.e., no refraction out of the vertical plane. When the observed star is due north or south, the vertical plane is the plane of the meridian; hence, in meridional observations, the whole of the refraction takes place in declination, while the right ascension remains unaltered.

It is evident that the amount of the refraction is greater in proportion as the observed star is nearer to the horizon ; for in this case the luminous rays strike the tangent planes of the atmospherical strata more obliquely, and have besides to traverse a greater extent of atmosphere before they arrive at the eye of the observer. On determining by experiment the refraction at every altitude from zero to 90°, tables of Refraction may be constructed, which will furnish the means of discovering the law of its diminution; but as such a process would be exceedingly tedious, and likewise apt to lead to erroneous results on account of the inevitable errors of observation, it is found more convenient to assume some hypothesis for a basis of calculation, and to verify the results which it leads to by comparing them with observation. In regard to media which may be said to be permanent,—-such, for instance, as water and glass,—the determination of the refraction is not attended with great difficulty ; but the circumstances are greatly altered when we come to make experiments on the atmosphere. In this case the difficulty arises from the incessant changes which the atmosphere is undergoing relatively to its refractive power,—changes which it is impossible for the observer fully to appreciate, inasmuch as he can only determine its physical state within a short distance of the earth, while that

of the upper strata remains wholly unknown to him. The refractive power of the atmosphere is affected by its density and temperature. The effects of the humidity are insensible ; for the most accurate experiments seem to prove that the watery vapours diminish the density of the air in the same ratio as their refractive power is greater. It is therefore only necessary, even in delicate experiments, to have regard to the state of the barometer and thermo- meter at the time the observation is made. At a medium density, and at the temperature of melting ice, it was found by Biot and Arago, from a great number of exact expert- ments, that at any altitude between 10° and the zenith the refraction is very nearly represented by the formula r= 606 tan. (Z— 3:25 xr), in which r is the refrac- tion corresponding to a given zenith distance Z. With the exception of the numerical coefficients, this formula was first given by Bradley ; but whether it was deduced from theory by that astronomer, or was only empirical, is

Twilight. [It may be explained here in passing that the refraction of | pears very large and very small. Desaguliers illustrated the rays of light in traversing the earth's atmosphere is the the doctrine of the horizontal moon by the supposition of cause of Twilight, which sensibly lengthens the duration of | our imagining the visible heavens to be only a small por- the day, and prevents a sudden transition from light to | tion of a spherical surface, as mnop (fig. 12), in which case darkness on the disappearance of the sun. When the sun j the moon, at different altitudes, will appear to be at dif- ss more than 33' below the horizon, the refraction is not | ferent distances, and will therefore seem to vary in magni- powerful enough to bring his rays sufficiently near the | tude, as at m, , o.| earth to reach our eyes ; they pass over our heads, and are Correction being made for refraction, the true position irregularly reflected by the molecules of the atmosphere. | of the sun on the star-sphere can be ascertained day after By this means a portion of the celestial vault is enlightened, | day ; and thus his apparent motions, as we have said, can while the sun is invisible. This illumination of the upper | be determined. regions is called the twilight. It commences as soon as The result of such observations is to show that in a Apparent objects can be distinguished before sunrise, and terminates j period of about 365 days the sun traverses a great circle of motion of when

they cease to be visible after the sun has set. The | the star-sphere inclined to the equator. This period ae time, however, at which the twilight commences and ter- | called a year, and is familiar to all as the period in which The year. minates cannot be assigned with any degree of precision. ; the sun's varying positions, alternately north and south of It is generally supposed to be limited by the depression of | the equator, bring about the circuit of the seasons. For the sun 18° below the horizon. Lacaille found the limit | we have already seen that a star to the north of the equator in the torrid zone to be between 16° and 17°. According | is above the horizon more than half the sidereal day, and to Lemonnier, it varies in France between 17° and 21°. ; at its meridian culmination has an altitude exceeding that The duration of the twilight will evidently be longer or | of the south point of the equator. When the sun is north shorter according as the inclination of the sun's motion to | of the equator he has a daily arc like that of a star similarly the horizon is more or less oblique. placed, so that day lasts longer than night, and at mid-day

Enlarge- The apparent enlargement of the sun and moon near the | the sun pours his heat more directly on the earth than if

ment of horizon is an optical illusion, connected in some measure | he were on the equator. In like manner it is shown that,

——— with the atmosphere, of which various explanations have | when the sun is south of the equator, night lasts longer

horizon, been given since the time of Ptolemy. According to the | than day, and the sun at mid-day has a smaller altitude than

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uncertain. Bradley's formula was r = 57" tan. (Z~-3 ×7). When the direction of the luminous rays makes a smaller angle than 10° with the horizon, it becomes indispensable to take into account, in the calculation of the refraction, the law of the variation of the density of the atmosphere at different altitudes,—a law which is subject to incessant variation, from the operation of winds and other causes which agitate the atmosphere, as well as the decrease of temperature in the superior regions. For this reason all

astronomical observations which have not refraction directly for their object, or which are not by their nature inde- pendent of its influence, are made at an elevation exceed- ing 10°. For lower altitudes it is to be feared that no theory will ever be found sufficiently exact to entitle the observations to much confidence.

_ ordinary laws of vision, the celestial bodies, particularly the

moon, which is nearest to the earth, ought to appear largest in the meridian, because their distance is then less than when they are near the horizon; yet daily experience proves that the contrary takes place. To an observer placed at E (fig. 12), the visual angle subtended by the moon, in the horizon at M, is somewhat less than that under which she appears in the zenith at O; and this fact, a consequence in- deed of her circular motion, is proved by accurate measurement of her diameters in those circumstances by the micrometer. The mean apparent diameter of the moon, at her greatest height, is 31' in round numbers, but in the horizon she seems to the eye two or three times larger. The commonly received ex- planation of this phenomenon was first given by Descartes, and after him by Dr Wallis, James Gregory, Malebranche, Huyghens, and others, and may be stated as follows :—The opinion which we form of the magnitude of a distant body does not depend exclusively on the visual angle under

which it appears, but also on its distance ; and we judge of the distance by a comparison with other bodies. When the moon is near the zenith there is no interposing object with which we can compare her, the matter of the atmos- phere being scarcely visible. Deceived by the absence of intermediate objects, we suppose her to be very near. On the other hand, we are used to observe a large extent of land lying between us and objects near the horizon, at the extremity of which the sky begins to appear; we there- fore suppose the sky, with all the objects which are visible in it, to be at a great distance. The illusion is also greatly aided by the comparative

feebleness of the light of the moon in the horizon, which renders us in a manner sensible of the interposition of the atmosphere. Hence the moon, though seen under nearly the same angle, alternately ap-

if he were on the equator. The result of constant experience shows, that the sun's declination reaches its maximum on the south side of the equator about the 22d of December, when it amounts to 23°-465. From this time it gradually diminishes till about the 21st of March, when the sun reaches the plane of the equator. At this time the days and nights are of equal length all over the earth, and the instant of time at which the sun's centre is in the equatorial plane is called the instant of the equinox. The sun then passes to the northern side of the equator, and his declina- tion or meridional altitude continues to increase till about the 22d of June, when he becomes stationary, and then again shapes his course towards the equator. His maximum declination on the north side of the equator is exactly equal to that on the south, amounting to 23°°-465, The sun now continues to approach the equator till about the 24th of September, when he again reaches that plane, and a second equinox succeeds. Continuing still to move in the same direction, he declines from the equator south- ward, till he reaches his former limit about the 22d of December ; and so on continually.

The two small circles of the sphere, parallel to the Tropics.

equator, which pass through the two points where the decli- nation is greatest, are called the Solstices or the Troptes ; that on the northern hemisphere is called the Zropie of Cancer, aud the other is called the Tropic of Capricorn. These two parallels, which mark the extreme limits of the sun's declination, are, as has just been stated, equally

SUN'S APPARENT MOTION.]

tions of declination on either side are perfectly symmetrical and uniform,

The observations of the sun's right ascensions and meridional altitudes, which have been made daily during

ASTRONOMY

distant from the equator, with regard to which the varia- |

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point of Aries, which is the technical expression for the intersection of the ecliptic and equator, or the place of the sun at the vernal equinox, is assumed as the origin from which the degrees of the ecliptic, as well as of the equator,

are counted from west to east, or in the direction of the sun's annual motion.

so great a number of years, and under so many different meridians, furnish complete proof that the projection of the sun's orbit is a great circle of the celestial sphere, and that

The angular distance of the sun Celestial from this point is called his Longitude, and the longitude latitude

the orbit itself is wholly confined to the same plane.

of a star is the arc intercepted on the ecliptic between the 4 longi:

same point and a great circle passing through the star per-

Ecliptic. The great circle which the sun describes in virtue of his | pendicular to the ecliptic. The arc of this circle inter- proper motion is called the Hcliptic. It has received this | cepted between the star and the ecliptic, or, which is the name from the circumstance that the moon, during eclipses, | same thing, the complement of the star's distance from the is either in the same plane or very near it. These pheno- | pole of the ecliptic, is called the Latitude of the star 3 80 mena can, in fact, only happen when the sun, earth, and | that longitude and latitude bear the same relation to the moon are nearly in the same straight line, and, conse- | ecliptic that right ascension and declination bear to the quently, when the moon is in the same plane with the earth | equator. and the sun. The angle formed by the planes of the The sun's motion along the ecliptic is found not to ecliptic and equator, which is measured by the are of | be strictly uniform, a circumstance into which we shall a circle of declination intercepted

between the equator and | have to inquire more particularly farther on. In this

Definitions. tropic, is called the Obliquity of the Ecliptic. The two | place, let it suffice to notice that the sun is found to move points in which the equator and ecliptic intersect each other | more quickly in winter than in summer, the rate of motion are called the Hgwinoctial Points ; they are also denomi- | changing from its maximum nearly in mid-winter to its nated the Nodes of the Equator ; and the straight linecon- | minimum nearly in midsummer, and thence to its maxi- ceived to join them is the Line of the Equinoxes, or the | mum again, But at no time does the motion differ greatly Line of the Nodes. The node through which the sun | from its mean rate of very nearly 59' in a sidereal day. passes on coming from the south to the north of the | If we call the mean rate 10,000, then the greatest and equator is called the Ascending Node, and is usually distin- | least rates of motion are represented by the members guished by the character 2; the opposite node is the | 10,336 and 9664 respectively.

Descending Node, and is marked by 8. A straight line | The direction in which the sun travels round the ecliptic, passing through the centre of the earth, perpendicular to | and in which longitude is measured, is from west to east, the plane of the ecliptic, is called the Amis of the Ecliptic, | that is, it is contrary to the direction in which the star- and the points in which its prolongation meets the sphere | sphere rotates.

are called its Poles—these denominations being analogous

to those of the axis and poles of the equator. The two Caapter IV.—TZhe Solar Day—Equation of Time— small circles of the sphere which pass through the poles The Seasons.

of the ecliptic, and are parallel to the equator, are called : a the Polar Circles. Since the sun travels thus around the celestial sphere, it is

Zodiacal The ecliptic has been divided by astronomers, from time | manifest that the successive returns of the sun to the

signs immemorial, into twelve equal parts, called Signs, each of | Meridian cannot recur after the same interval of time as

which consequently contains 30 degrees. The names and symbols by which they are characterised are as follows :—

_ North of the Equator. _South of the Equator.

the successive returns of any given star. Ifon any day the sun's centre when he is crossing the meridian has a particular position on the star-sphere, then when that point of the star-sphere next returns to the meridian,—that is,

Ari " h

cares "a ee an: ss m one sidereal day later,—the sun has travelled about 1° from

—. ee . that point, moving along the ecliptic in a direction opposed |) Ou Sagittarius, ... Fj ie ee

Cancer Genusem to that in which the star-sphere rotates. The star-sphere

-.... R rn eri vs must, therefore, rotate a little further round before the sun a 0 OREO OC OIC AO alee OCCU OO OOO ee . °° . fi 7

UPPS..... TY Pisces,.....60060.0.. x will be on the meridian. As a convenient first approxi

In each of these signs the ancients formed groups of stars, which they denominated the Zodiacal constellations (Zia, animals), not confined to the ecliptic, but included within an imaginary belt, extending 9° on each side of it, to which they gave the name of Zodiac (fwSiaxds Kvxdos, circle or zone of the animals). The term sign is now employed only to denote an arc of 30°, and will probably soon be banished entirely from astronomical tables. It is now seldom used even for tables of the planets. For- merly, to denote that the longitude of a planet is 276° 12', it was usual to write 9 6° 12'; or even to employ the characteristic symbol, and to write V8 6° 12', meaning*

that the planet was 12’ in the 6th degree of Capricornus, or the tenth sign. The latter inconvenient practice is now laid aside, and the signs, when they are employed, are simply distinguished by the ordinal numbers.

As the greater part of the celestial phenomena connected with the planetary system take place either in the ecliptic or in planes not greatly inclined to it, it is found to be Most convenient to refer the positions of the planets, and frequently those of the stars also, to that plane. The first

mation to the actual effects, let us make the supposition that the sun moves along the equator instead of the ecliptic, and that he moves exactly 1° in a sidereal day. In this case he would be exactly 1° from the meridian when the point he had occupied on the meridian the day before had reached the meridian. That point on the star-sphere would have completed the full circuit of 360° of rotation while the sun had completed only 359°, and his diurnal motion being therefore only = 5 of the star-sphere’s, it fol- lows that the solar day (or the interval between the sun’s successive returns to the meridian) would be greater than the sidereal day in the ratio of 360 : 359. Therefore, the solar day being divided into 24 × 60 minutes, the sidereal day would manifestly be 4 min. shorter.

But as the sun moves in a circle inclined more than 23° to the equator, and as the sun’s motion is slightly variable, and the mean rate less than 1° per sidereal day, these relations are not exactly presented.

Let us, as a next approximation, suppose the sun to move uniformly round the equator once in the course of a year of 365} days, and determine the length of a solar day

Variations of sun’s motion.

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on this assumption. It is clear that whatever the sun’s daily retardation may be, he loses one complete circuit of the heavens in a year of 365} solar days. In other words, while the sun has been carried round 3654 times by the diurnal rotation, the star-sphere has been carried round 366} times. Therefore, on our assumption

365} solar days = 366} sidereal days and a sidereal day oo

366} = 23h.56m.4s., approximately.

solar day

This, in fact, indicates roughly the manner in which the mean solar day is connected with the sidereal day. It is only necessary in the above process to substitute the true length of the year for the value 365} days,—meaning by the year, the year of seasons, measured by the successive returns of the sun to the equator as he crosses that circle with northward motion. But it will not be until we con- sider the actual nature of the motion by which the sun's annual apparent motion is explained, that we need inquire into the exact relation between the mean solar day and the sidereal day.

As the sun moves at a varying rate, it is manifest that the actual solar day measured by the successive returns of the sun to the meridian could not be constant in value, even if the sun moved round the equator. For the excess of a solar day over the sidereal day is caused by the motion of the sun on the star-sphere, and will be therefore greater or less according as the sun's motion on the star-sphere is greater or less. The actual solar day, therefore, exceeding the constant sidereal day by a variable quantity, must necessarily be itself variable. It is greater than the mean in December and January, when the sun is moving at a rate greater than his mean rate, and less in June and July when he moves at a less rate. And it is clear that if at the end of December the moment of the real sun passing the meridian were taken as the beginning of the mean solar day of twenty-four hours, then the next passage of the meridian by the actual sun would occur after the twenty-four hours of mean solar time had elapsed. Day after day the sun would come to the meridian 'at a later and later hour of mean solar time, until towards the end of March, when, the sun's rate having acquired its mean walue, the actual sun would not lag any farther behind. From this time he would gain, until towards the end of June he would come to the meridian at noon of mean solar time. In the remaining half year he would be in advance, that is, he would cross the meridian before noon of mean solar time. 'Towards the end of September he would have made his greatest advance compared with mean time, and in the remaining quarter of the year he would gradually

lose more and more of that gain, until at the end of December he would again cross the meridian at noon of mean solar time.

But besides this cause of variation in the length of the true solar day, there is another depending on the inclination of the sun's apparent path on the heavens to the celestial equator. 'To conceive the effect of this cause, it is neces- sary to have regard to the motion of the sun with reference to the equator. The sun describes every day a small arc of the ecliptic. Through the extremities of this are sup- pose two meridians to pass; the arc of the equator, which they intercept, is the sun's motion for that day referred to the equator, and the time which that arc takes to pass the meridian is equal to the excess of the astronomical day over the sidereal. But it is obvious that at the equinoxes the arc of the equator is smaller than the corresponding arc of the ecliptic, in the proportion of the cosine of the obliquity of the ecliptic ; at the solstices, on the contrary, it is greater in the proportion of the secant of the same

obliquity. The astronomical day is diminished in the first case, and lengthened in the second.

To have a mean astronomical day independent of these Mean sun,

causes of inequality, astronomers have supposed a second sun to move uniformly on the ecliptic, and to pass over the extremities of the axis of the sun's orbit at the same in- stant as the real sun. This removes the inequality arising from the inequality of the sun's motion. To remove the inequality arising from the obliquity of the ecliptic, con- ceive a third sun to pass through the equinoxes at the same instant with the second sun, and to move along the equator in such a manner that the angular distances of the two suns at the vernal equinox shall be always equal. The interval between two consecutive returns of this third sun to the meridian forms the mean astronomical day. Mean time is measured by the number of the returns of this third sun to the meridian ; and true time is measured by the number of returns of the real sun to the meridian.

The arc of the equator, intercepted between two meridian Equation circles drawn through the centres of the true sun and the of time. »

imaginary third sun, when reduced to time, is what is called the Equation of Time, This will be rendered plainer by the following diagram.

Fria. 13. —Motions of real and mean Sun.

Let Zz = (fig. 13) be the star-sphere; Zz its axis; abcde, d&c., the equator; ABCDE, &c., the northern half of the ecliptic from to =, on the side of the globe next the eye; and MNOP, &c., the southern half on the opposite side from = to'. Let the points at A,'B, C, D, E, F, &c., mark off equal portions of the ecliptic gone through in equal times by the real sun, and those at a, b, c, d, e, f, &c., equal portions of the equator described in equal times by the fictitious sun; and let Zz be the meridian.

As the real sun moves obliquely in the ecliptic, and the, fictitious sun directly in the equator, any point between 7 and F on the ecliptic must be nearer the meridian ZY, than the corresponding point on the equator from 7 to /, that is to say, than the point whose distance from Y is expressed by the same number of degrees; and the more so, as the obliquity is greater; and therefore the true sun comes sooner to the meridian every day whilst he is in the

_ quadrant YF, than the fictitious sun does in the quadrant

f,; for which reason the solar noon precedes noon by, the clock, until the real sun comes to F, and the fictitious to f: which two points being equidistant from the meri- dian, both suns will come to it precisely at noon by the clock.

Whilst the real sun describes the second quadrant of the ecliptic FGHIKL from Cancer to =, he comes later to the meridian every day than the fictitious sun moving throvgh the second quadrant of the equator from f to = ; for the

points at G, H, I, K, L, being farther from the meridian, their corresponding points at g, h, 7, &, 1, must come to it later ; and as both suns come at the same moment to the point =, they come to the meridian at the moment of noon by the clock.

In departing from Libra through the third quadrant, the real sun going through MNOPQ towards ¥$ at R, and the fictitious sun through mnopq towards r, the former comes to the meridian every day sooner than the latter, until the real sun comes to R, and the fictitious to r, and then they come both to the meridian at the same time.

Lastly, as the real sun moves equably through STUVW, from R towards T, and the fictitious sun through stuwo, from r towards Y', the former comes later every day to the meridian than the latter, until they both arrive at the point , and then they make it noon at the same time with the clock.

It is now easy to conceive the effect of taking into account the variable motion of the sun in his annual circuit of the ecliptic. The effect already explained as arising from this cause, on the supposition that the sun moved in the equator, must simply be added to that just shown to arise from the obliquity of the ecliptic.

Let us combine the two causes, starting from December 31, on the assumption (near enough to the truth for our present purpose), that the sun moves most rapidly when at his greatest southerly declination. The effect due to varia- tion of the sun's motion may be called A, and that due to the obliquity of the ecliptie may be called B; and each may be considered positive or negative according as, con- sidered alone, it sets the real sun later or earlier than the mean sun.

We find, then, from January } to March 31, A and B both positive, A increasing from 0 to its maximum, B passing from 0 through its maximum to 0 again. All this time, then, A+B is positive. At the beginning A+B =0. About the middle of February B has its maximum value, and Aa value less than its maximum ; at March 31, B is zero and A has its maximum value.

From April 1 to June 30, Ais positive and B negative, A diminishing from its maximum to zero, B passing from | 0 through its maximum negative value to

0 again. At | the beginning, then, of this quarter, A+B is positive and equal to the maximum value of A. In the middle of | May, B has its maximum negative value, and A has a | value less than its maximum positive value. The maxima due to A and B being not far from equality, it follows | that A+B is now negative, and therefore some time before this A+B must have passed through the value0. At the end of the quarter A+B is again 0, because A=0 and B=0.

From July 1 to September 30, A is negative and B positive, A increasing from 0 to its maximum negative | value, B passing from zero through its maximum positive value to zero again. Hence, at the beginning of the quarter A+B=0; at the end A+B=the maximum negative value of A. But about the middle of August, B has its maximum positive value while A has not its maxi- mum negative value ; hence at this time A+B is positive, and therefore between then and September 30, A+B vanishes,

Lastly, from October 1 to December 31, both A and B are negative, A passing from its maximum value to zero, and B from zero to its maximum value, and thence to zero again. Throughout the quarter, then, A+B is negative. About the middle of November A+B is the sum of the maximum value of B and a value of A less than the maxi- mum. At the end of the quarter A+ B=0.

Owing to the fact that the time when the sun moves most rapidly follows by a few days the date (December 21)

when the sun is at his greatest distance from the meridian, the dates above given are not strictly correct. The equa- tion of time, or A+B, is zero nearly midway between December 21 and the end of the year, or about Christmas day, and it vanishes again on or about April 16, June 16, and September Ist. The equation of time has four maxima. On February 11, the real sun is later than the mean sun by a maximum interval of 14 min. 31 sec. 3; on May 14, the real sun is earlier than the mean sun by a maximum interval of 3 min. 53 sec.; on July 16, the real sun is later than the mean sun by a maximum interval of 6 min. 13 sec.; and lastly, on November 3, the real sun is earlier than the mean sun by a maximum interval of 16 min. 19 sec,

*The inclination of the ecliptic to the equator results The necessarily, as already mentioned, in a difference of seasons, 8¢#8ons. When on the equator, the sun, like an equatorial star, is above the horizon during one-half of the day, and below the horizon during the other half. When he is north of the equator he is above the horizon for more than half the day, and*reaches a higher altitude at noon than when on the equator. When south of the equator he is below the horizon for more than half the day, and does not reach so great an altitude at noon as when he is on the equator. As he is perceptibly the source of light and heat, it fol- lows that when he is north of the equator we receive (in our northern latitudes), more light and heat than when he /is on the equator, and so much the more as his northerly declination is greater; while when he is south of the equator we receive less light and heat than when he is on the equator, and so much the less as his southerly declina- tion is greater. These results are equally accounted for whether we regard the earth as fixed, and the sun as really travelling round the heavenly sphere on his inclined path, or whether we suppose the sun to be fixed, and the earth to travel around him on a correspondingly inclined path after the manner illustrated in fig. 14, Here, while the earth*

LEGO LEED >. bop PS Bi, Lx ore C ae ee

AN ZI

is Nee ri) NBS | } Wy) iii Fs QS

Fic. 14.—Diagram illustrating the Seasons.

goes round the sun in the order of the letters A, B,C, D, its axis preserves its obliquity and always continues paral- lel to its first direction. At c the north pole inclines to- wards the sun, and brings all the northern places more into the light than at any other season of the year. But when the earth is at g, the opposite point of the orbit, the north pole declines from the sun, and a less portion of the

Wid northern hemisphere receives his light and heat. At a and e the axis is perpendicular to the plane of the orbit, so that the poles are situated in the boundaries of the illu- minated hemisphere, and, the sun being directly over the equator, the days and nights are equal at all places. In this figure Ai is

the terrestrial equator, T the tropic of Cancer, the dotted circle the parallel of London, U the arctic or north polar circle, and P the north pole, where all the meridians or hour-circles meet. The spectator is supposed to be placed at the pole of the ecliptic.

It is also manifest that if the earth circles around S, as in fig. 14, the observed phenomena of apparent solar motion will be precisely the same as though the sun circled around the fixed earth. Let us follow the earth round from the position a, noting how the sun would appear to move on the ecliptic, and also how the length of day would be affected by the varying position of the earth's axis with respect to the sun. When the earth is at a, the beginning of Libra, about the 20th of March, the sun, as seen from the earth, appears at the beginning of Aries in the opposite part of the heavens, the north pole is just coming into light, and the sun is vertical to the equator, which, with all its parallels, is divided into two equal parts by the circle which forms the boundary between the dark and illumi- nated hemispheres, and therefore the days and nights are equal all over the earth. As the earth moves in the ecliptic, according to the order of the letters A, B, C, Dy dees, the north pole P comes more and more into the light, and the days increase in length at all places north of the equator fi. When the earth comes to the position between B and C, or the beginning of Capricorn, the sun, as seen from the earth, appears at the beginning of Cancer about the 21st of June ; and the north pole of the earth inclines towards the sun, so as to bring into light all the north frigid zone, and more of each of the northern parallels of latitude in proportion as they are farther from the equator. As the earth advances from Capricorn towards Aries, and the sun appears to move from Cancer towards Libra, the north pole recedes from the light, which causes the days to decrease and the nights to increase in length till the earth comes to the beginning of Aries, and then they are equal as before, —the boundary of light and darkness cutting the equator and all its parallels equally. The north pole then goes into the dark, and does not emerge till the earth has completed a semi-revolution of its orbit, or from the 22d of September till the 20th of March. Similar changes occur, mutatis mutandis, in the southern hemisphere.

It may be well to advise the reader not to allow his mind to be led astray by the proportions indicated in such ' pictures as fig. 14. It is absolutely

imposstble to illustrate the seasons, either by diagrams or by the use of a globe, without introducing incorrect relative dimensions ; but by combining two sets of pictorial illustrations, the mental error apt to arise from the study of such pictures as fig. 14 may be got rid of. Thus, after carefully studying the relations illustrated in that figure, the reader should turn to Plate XXVII., and after noting that the figure of the earth there shown is the same as that in fig. 14 (held so as to have GgF uppermost), he should endeavour to picture to himself such a figure of the earth as is shown in the plate, travelling around the path EE', but so reduced in dimen- sions that its whole disk would have a diameter less than the hundredth part of that of the small white disk, at the centre of the plate, which represents the sun. It will then be instructive to extend this method to Mars, as figured in Plate XXVIL., carrying this planet (after first imagining his disk reduced 5000 times) round his path MM', with constant axial pose. The planets pictured in Plate XXVIII. can be dealt with in like manner. From a careful study of the two plates, with special reference to the indicated

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scales, the general relations of the entire solar system can be inferred, and to some degree conceived. But for the purpose of actually picturing these relations to his mind, the reader may conveniently use Sir J. Herschel's illustra- tion, as follows:—Choose any well-levelled field. On it place a globe 2 feet in diameter to represent the sun ; Mer- cury will be represented by a grain of mustard seed, on the circumference of a circle 164 feet in diameter for its orbit ; Venus a pea, on a circle 284 feet in diameter ; the earth a [somewhat larger] pea, on a circle of 430 feet ; Mars a rather large pin's head, on a circle of 654 feet ; the asteroids grains of sand, in orbits of from 1000 to 1200 feet ; Jupiter a moderate-sized orange, on a circle of half a mile; Saturn a small orange, on a circle of {ths of a mile; Uranus a full-sized cherry, on a circle more than 14 miles ; Neptune an extra-sized cherry, on a circle of 24 miles in diameter.

Cuaprer V.—Apparent Motions of the Moon and Planets—Parallax.

We have seen that while the stars remain fixed, to all appearance, on the celestial concave, the sun circuits around a great circle of the star-sphere, moving always in one direction, and at a rate which, though variable in different parts of the circuit, does not vary largely, and is constant for each part of the ecliptic. Moreover, to ordinary obser- vation, continued for periods of a few years, the sun's path in the heavens appears to remain always the same, and to bear the same relation to the poles and equator of the rotating star-sphere.

But we have now to consider bodies which neither remain fixed like the stars, nor move in a constant ap- parent path like the sun.

The moon is the most noteworthy of these bodies, be- Moon's cause of her apparent size and brightness, and also because phases. of the remarkable changes of appearance which she pre- sents according to her varying position with reference to the sun. When she is seen near him in the heavens, she appears always like a fine sickle of light, with the horns turned away from him. When she is in the part of the heavens directly opposite to the sun, she appears with a full orb. When she is exactly midway between the point occupied by the sun and that opposite to him, she appears as a semicircle of light, with the convexity towards the sun; and in positions intermediate to these she appears with more or less of her circle illuminated, according as she is nearer to or further from the point directly opposite the sun. All this corresponds with what would happen if the moon were an opaque orb nearer to the earth than the sun, and illuminated by him.

Now, when the moon is watched, even for a few hours only, she is found to be travelling on the star-sphere in the same direction as the sun (and, like him, on a path inclined to the equator), but much more rapidly than the sun travels. It is impossible to watch the moon com-

| pletely round the heavens, because she is found to pass close to the sun onee in each circuit, and when very near to. him cannot be seen. | travels continuously in one direction, and when she reap- | pears, after having been for a day or two lost in the sun-

But while she is visible, she

light, she is seen to have shifted her place as though, dur- ing that interval, she had travelled continuously onwards.

The moon's circuit of the star-sphere is found to be see completed in about 274 solar days. But her circuit, con- mont. sidered with reference to the sun, occupies a longer interval.

Thus, suppose we observe her when she is opposite to the sun, or "full." Then she is in the same (or very nearly the same) place among the stars about 274 dayslater. But in the meantime the sun has advanced along the ecliptic

sunar arallax,

PARALLAX. |

about 27°, and the point now directly opposite the sun has, of course, advanced by the same amount. The moon has, therefore, to travel further on before she is again exactly opposite the sun. It is found that this happens rather more than 2 days later; or, in other words, that the in- terval between successive full moons amounts to about 294 days. This interval is called a lunar month, or lunation; the period during which the moon completes the circuit of the heavens being called a sidereal month. The lunation is also called a synodical month.

The path in which the moon travels is found to be inclined at an angle of about 5° 9' to the ecliptic. But continued observation shows that the path, while retaining this inclination, shifts slowly in position—the points where it intersects the ecliptic gradually retrograding (on the whole) until, in the course of about 184 years, they have made a complete circuit of the ecliptic. It is also found that the moon moves, like the sun, with variable velocity in her apparent course. 'The parts of her path, however, where she moves most and least rapidly are not fixed in position like the corresponding parts of the sun's apparent circuit, but advance, travelling round in 8°85 years.

It follows, from the varying position of the moon's apparent path with respect to the ecliptic, that her range uorth and south of the equator is variable. When she crosses the ecliptic, at or near the two points where the

ecliptic crosses the equator, the inclination of her path to the ecliptic is either added to or subtracted from the in- clination of the ecliptic to the equator, so that her range in declination is, in one case, 23° 27'+5° 9', or 28° 36'; and in the other, 23° 27'— 5° 9', or 18°18'. When she crosses the ecliptic at or near the two points where the ecliptic is furthest from the equator, the inclination of her path to the equator is nearly the same as that of the ecliptic, the two paths—the ecliptic, or sun's path, and the apparent lunar path—crossing the equator at different points.

Thus far there is nothing in the observed celestial mo- tions which opposes itself to the belief that the earth is a fixed centre around which the celestial bodies are carried —the star-sphere by the diurnal rotation, the sun circling round the earth in his yearly course on the ecliptic, and the moon in her monthly (lunar) course on a variable path, and both these orbs partaking in the diurnal rotation of the star-sphere, just as bodies in a moving vehicle par- take in the motion of the vehicle, even though they may also be in motion among themselves.

One circumstance in the moon's apparent motions serves, however, to show that the bodies thus far observed lie at different distances, and falls properly to be considered in this place, seeing that the attention of astronomers must first have been directed to it when they were engaged in determining the moon's motions.

The earth being, as we have seen, a globe, and the sun and moon being apparently carried round this globe by the daily rotation, which is uniform, it would naturally occur to astronomers that, if these motions take place around the centre of the earth, they cannot appear altogether uniform as seen from the eccentric position of an observer placed anywhere on the surface. The stars, indeed, seem to be carried uniformly round, but that has been explained as due to their enormous distance. The sun moving mani- festly within the stellar concave, and the moon travelling apparently within the sun's orbit (as may be inferred from her phases), it might well be that their motions would be found affected by the eccentricity of the observer's position. Suppose, for example, that the centre of the earth is at P, fig. 15, and the observer is at E, and let EM, represent a line of sight from E to the

moon's centre when she is in the horizon (refraction being neglected). Then a line PM, from the centre of the earth to the moon is inclined to

the horizon line EM,; and if we draw Pm, parallel to EM,, so that either line represents the direction of the moon as observed from E, we see that, if she were observed from P, she would appear raised by the angle included be-tween the lines PM, and Pm, From E&, then, she is seen lower down than her true geocentric position by the angle M,Pm,; and similarly it is seen that, if the moon be at M, the direction EM in which she is seen islower down —that is, is less inclined to the horizon line Em,—by the angle EMP, or its equal, MPm; if the moon were at M', the displacement would be equal to the angle EM'P; and only when she is at the zenith Z does her direction EZ agree with her geocentric direction PZ. Her observed path from horizon to horizon, when she rises high in the south, but does not reach the zenith, will be as the path m,m.m, (fig. 16), where her geocentric path is as M,M,M,. This will happen if she is near enough to the earth for the angle EM,P (fig. 15), to be appreciable ; and all that has here been said of the moon is equally true of the sun,

Fig. 15.—Diagram illustrating Lunar Parallax.

Horizor

Fic, 16.—Observed and Geocentric Paths of the Moon.

or any other celestial body. But in their case no appreci- able displacement occurs (at least none which the earlier modes of observation could indicate). In the case of the moon the displacement is very marked, being found to amount nearly to a degree when the moon is on the horizon. Such displacement is called parallax, Thus, when any celestial body is at M (fig. 15), the angle EMP (or MPm), between the geocentric direction PM, and the apparent direction EM, is called the parallax of the body. When the celestial body is at M,, so that its true direction is horizontal, the parallax EM,P, is manifestly greater than for any other position of the body at the

same dis- tance from P. This maximum parallax is called the horizontal parallax, and may be defined as the maximum angle subtended by the earth's radius, as supposed to be seen from the body.

It may be noticed, in passing, that if the geocentric dis- Parallax.

tance of a celestial body =d, the earth's radius =7, and the horizontal parallax = p, then

sin. p= 5 (1). 4. & ; : EP This is manifest from fig. 15, where sin. PM,E=5ar '

Again, in the case of a body at M, using the same symbols, and calling the apparent altitude MEM, a, and the parallax p', we have

p =MPm , , EPsin.EPm rsin.a sin. P = MP = ae

That is, sin. p'=sin. a. sin. p (2). For every celestial body, except the moon, the parallax is

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so small that its arc-measure may be substituted for its | sine ; hence, for (1) and (2) we may write

r

d

for all the heavenly bodies except the moon.

From the observed parallactic displacement of the moon it is manifest, apart from the lunar phases, that the moon's orbit relatively to the earth lies within the sun's.

We have now, however, to consider bodies which, if ;

_… (3); and p'=p sin. a (4),

P

Jupiter

Fra, 17.—The Motion of Saturn, Jupiter, and Mars with respect to the Earth.

morning, sometimes in the evening. To these were given the names Saturn, Jupiter, and Mars; and careful observation showed that these bodies, when visible all through the night, always travel among the stars in a direction con- trary to that of the sun's yearly and the moon's monthly motion, but that this retrograde motion continues only for a certain length of time, being preceded and followed by an advancing motion, which is greater in amount than the retrograde motion, so that, on the whole, these bodies are carried round in the same direction as the sun and moon. The nature of these apparent motions will best be under-

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they be regarded as moving around the earth, must move in orbits of very singular shape.

While observing the stars, which maintain apparently a Planetary constant position on the uniformly rotating star-sphere, the motions, ancients early noted five bodies, which seem to travel among the stars like the sun and moon, but not always in one direction. 'To these bodies they gave the name of planets, or wanderers (a term which also included the sun and moon, so that there were seven inall). 'Three could be seen sometimes throughout the night, sometimes in the

stood by referring to fig. 17, and supposing an observer on the earth to watch Saturn, Jupiter, and Mars respec- tively traversing the twisted paths there indicated, in the order shown by the dates, the loops being supposed to lie very nearly but not quite in the level of the paper, which represents the plane of the ecliptic. But this peculiarity was noticed, that when any planet was at the outermost parts of the successive loops (as, for instance, when

Jupiter was as where the date 1712 is placed on his loops), the planet was lost to view in the sun's rays, lying nearly in the same part of the sky, whereas, when a planet was at

when Saturn was as where the date 1710 is placed on his loops), the planet was always opposite the sun. This exact agreement between the times when the planet and sun were in conjunction or in opposition, and the tracing out of the apparent planetary loops, should have suggested, it would seem, a connection between the sun and planets; for we see from fig. 17, that if the earth were the centre of the sun's motion, and each of the three planets had its looped path wherein to travel around the earth, there could be imagined no reason why the planet's motion round its

loops should synchronise with the sun's motion on his.

nearly circular path.

This view should have been confirmed by the apparent motions of two other plauets, Venus and Mercury, which were found to remain always within a certain apparent distance from the sun, never being seen on the part of the sky opposite to him. Venus, the brighter, was observed to have the greater range on either side of the sun, moving from about 46° on the east of the sun, when she is seen as the Evening Star, to about the same distance on the west of the sun, when she is seen as the Morning Star; while Mercury's greatest range on cither side of the sun is more variable, being sometimes as great as 27°, and at other times not greater than 18°. So far as the motion of these planets on the star-sphere could be traced (by using such an instrument as in fig. 9 to determine their right ascension and declination), they appeared to follow looped paths, somewhat like the outer planets; but the nearer and farther parts of the successive loops were both lost to view, the two planets being always too near the sun's place in the heavens to be visible when tracing those parts of their paths.

_ The five planets were found to travel always within a certain range on either side of thé ecliptic, Venus, which has the greatest range, being sometimes as far as 9° north, or 9° south of the equator. A zone, or band,

having the ecliptic for its central circle, and bounded by circles 9° north and south of the ecliptic, so as to be 18° wide, came thus to be regarded as a sort of celestial roadway, outside of which the planets were never seen. This zone was called the zodiac, and it was probably in connection with the planetary rather than the solar motions that the zodiacal constellations were originally formed. ay

- *Considering the observed relation between the motions of all the five planets and those of the sun, it is remark- able that any of the astronomers of old time should have regarded the earth as the common centre of solar and planetary movement. It is true that, by supposing each planet to travel around a centre which itself travelled round the earth, the looped paths of the planets might be explained ; of this no further evidence need be given than fiz. 17, where it is manifest that the loops are such as might be traced by bodies moving round small circles, these being carried round the central earth in large circles. Yet the synchronism between all the movements in these small circles and the sun's supposed motion round the earth, was left wholly unexplained by that theory. If the Ptolemaic system could have been really presented as it is commonly pictured (fig. 18), it would have compared not unfavourably with the simplicity of the modern system. But the circles depicted in this figure for the paths of Saturn, Jupiter, Mars, Venus, and Mercury, represent only the paths of moving centres, round which those bodies were supposed to travel, each in a circle of its own, and all synchronising in these subordinate movements with the sun circling in his special orbit ; while the movements of the moon, travelling in a different circle, neither corre- sponded in any way with those of the sun, nor, like his, seemed to influence any of the planetary motions.*

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the innermost parts of the successive loops (as, for instance,

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Far more reasonable was the ancient Egyptian system; by some described as-identical with, but in any case closely

Prutuure Mobrieg

Nortly South

West Fic. 18.—Pcolemaic System.

resembling in esseutials, the system ot Tycho Brahe, shown Tychonic Here the earth is the centre of the motions of system.

in fig. 19. the sun and moon, but all the planets circle around the sun, Venus and Mercury moving in orbits passing between the earth and sun, while Mars, Jupiter, and Saturn move in orbits passing outside the earth. All the observed movements, and all the peculiarities of the observed rela- tions, were fully explained by this system. Indeed, a

Fra, 19.—Tychonic System.

little consideration will show that the geometrical relations are precisely the same for such a system as is depicted in fig. 19, as they would be in the system pictured by remov- ing the circle showing the sun's orbit in fig. 19, and substituting a circle of equal size around the sun as centre, and passing therefore through the centre of the earth. It is not too much to say that Tycho's system is not only fully equal to the Copernican in its fitness to explain the observed relations, but that, until the law of gravitation had been established, the arguments for the Tychonic system, modified so as to correspond to Kepler's discovery of the shapes of the different orbits, were almost equal in weight to those used by the disciples of Copernicus. The slight advantage of the Copernican system in point of simplicity was counterbalanced by the difficulty of accepting, in those days, the belief that the stars lie at go inconceivably vast a distance that the motion of the earth in an enormous orbit around the sun (for the sun was known even then to lie many millions of miles from II. — 98

Theory of Coperni- cus,

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us) produces no perceptible change in the appearance and rotation of the star-sphere. That the whole span of the earth's orbit was as a mere point compared with the dis- tance of the stars, so that the earth on one side of the sun was, in effect, at the centre of the star-sphere, while it was equally at the centre when on the opposite side, or many millions of miles from its former position, was not unreasonably regarded by Tycho Brahe as scarcely credible.

Cuaprer VI.—Copernican System—Kepler's Laws— Gravitation—The Laws of the Solar System.

Leaving the rotation of the star-sphere out of considera- tion, the apparent motions of the sun, the moon, and the five planets known to the ancients, are most naturally explained by regarding the sun as the centre around which Mercury, Venus, the earth, Mars, Jupiter, and Saturn revolve in that order as to distance, while the moon revolves round the earth. For though there are thus two centres of motion, yet only a small body travelling in a relatively small orbit is set revolving round the earth, now preseuted as a subordinate orb in the system ; and the whole family, including the moon, are set revolving around the sun, for the moon accompanies the earth in her circuit. In the Tychonic system the sun, though presented as a sub- ordinate orb, because travelling round the earth, was yet set as the centre round which all the planets revolved. Hither system was, however, altogether more reasonable than the Ptolemaic, in which all the planets were supposed to move around imaginary centres. Copernicus well indicated the superiority of his system when he said, " We find in this arrangement what can be discerned in no other scheme, an admirable symmetry of the universe, an harmonious disposition of the orbits. For who could assign to the lamp of this beautiful temple a better position than the centre, whence alone it can illuminate all parts at once 1 Here the sun, as from a kingly throne, sways the family of orbs that circle around him."

It is hardly necessary to point out that the arrangement suggested by Copernicus explains the 'motions of the sun and moon as readily as the system which presents both these bodies as moving around the earth. Peculiarities in the motions of the earth and moon are indeed left unac- counted for by a simple theory of uniform circular motion around the sun

and earth as centres; but so they were in the Ptolemaic system until eccentric and epicyclic movements were provided, and these were as admissible in the Coper- nican theory as in the Ptolemaic. It is easy to show also that the general motions of the planets—their progressions, stations, retrogressions, &c.—were explained by the Coper- nican system. Thus, let S (fig. 20) be the sun, E,E,F,, &c., the earth's orbit, P,P,P,, &c., part of the orbit of a superior planet ; and when the earth is at E, let the planet be at P,, so that the planet is in opposition to the sun when at P,. Starting from these positions, suppose that the earth and planct in the same interval of time pass over the arcs E,E, and P,P,, E,E, being greater than P,P,. Then obviously E,P, is inclined to E,P,; and if these two lines are produced they will meet beyond P,. Let them be pro- duced beyond their point of intersection O to K,, K, respec- tively ; then the observer on the earth sees the planet in direction E,K, when the earth is at E,, and in direction E,K, when the earth is at E,, Hence the planet appears to have moved in direction K,K, or backwards, though it has really moved in direction P,P, Carrying the earth on with her more rapid motion, it is obvious that we come to a part E,E, of the earth's orbit, where her motion is so inclined to the line of sight E,P, or E,P, to the planet, that the effect of the earth's more rapid motion is neutral- ised, and these lines of sight are parallel. At this time,

then, the planet neither seems to advance nor retrograde, but appears to be stationary. After this it is manifest that

Fic. 20.—Diagram illustrating Apparent Paths of Planets.

the planet will seem to advance, and with gradually increas- ing rapidity, until when the earth is at E, and the planet at P, (the planet, however, being then in conjunction with the sun, and therefore invisible), the planet lies in direction E,P, far in advance of K,, K,. At this time the unsecn planet is advancing most rapidly, because the earth's motion, as from E, to E,, and the planet's motion, as from P, to P,, combine to cause the advance of the direction of the line E,P,,—the centre round which for the moment the

direction-line to the planet is turning lying at O' between the earth and planet, instead of beyond the planet, as at O in the position first considered. Passing from conjunc- tion to opposition, the planet goes through similar changes in a reverse order. Its progressive motion gradually diminishes, till it becomes stationary; thence the planet retrogrades through opposition to its next station; and so on continually, the total result of its motion in each synodical revolution being a progression from west to east. We see also that the planet is in opposition when in the middle of its retrograde arc, while it is in conjunction when in the middle of its larger arc of progression. All this corresponds precisely with the observed relations.

The same reasoning applies to the case of an inferior planet. In fact, we may employ the same figure for this case as for that of a superior planet. Thus, suppose P.P,P, (fig. 20) the earth's orbit, and E,E,E,, &c., that of an inferior planet, and let the motions be as in the former case, then the same lines represent the direction-lines, only the observer looks along these lines in the contrary direc- tion. Now we see that the direction-lines P,E,, P,E, are carried backwards as viewed from P,, P,, until they reach the parallel positions P,E,, P,E,, at which time the observer on P sees the planet E at a stationary point. After that the direction-lines are carried forward, until, when the earth is at P, and the interior planet at E,, this planet is seen in direction P,E,, or far in advance of its former direction P,E,. And at this time, as is seen by the posi- tion of the lines P,E,and P,E, the inferior planet is advancing most rapidly. In fact, all the motions of an inferior planet viewed from a superior one are precisely the same as those of the superior planet viewed from the inferior one, but are traced ont on opposite parts of the heavens,—a thesis which needs no other proof than the fact, that the line of sight from the inferior to the superior planet is also the line of sight from the superior to the inferior planet ; so that, whatever point the superior planet viewed from the inferior appears to occupy in the star-sphere at any moment, the point directly opposite is that occupied by the inferior planet as viewed from the superior.

;

The only difference in the apparent motions of the inferior planet is that resulting from the position of this planet with respect to the sun. When P, is viewed from E, (fig. 20), it is seen directly opposite the sun; but E, viewed from P, lies in the saine direction as the sun, and is there- fore invisible. This corresponds with the observed fact that Venus and Mercury are in conjunction with the sun, not only in the middle of their advancing arcs, but also in the middle of their arc of retrogradation.

But although the Copernican theory explains the general features of planetary motion, it could not, as originally advanced, explain those features which had rendered neces- sary the eccentrics and the subordinate epicycles of the Ptolemaic system. It was known to Copernicus that the earth does not move uniformly in a circle around the sun as centre, but on an eccentric path with varying velocity. He might, therefore, reasonably assume that the other planets have paths similarly eccentric, and move with vary- ing velocities. But he thought it necessary to explain the planetary motions by uniform motion in circles, using such contrivances to save appearances as the Ptolemaic system had rendered familiar to astronomers, Suppose, for example, that S (fig. 21) is the sun, A the place of a planet when at its greatest distance from the sun, and A' its

Fig. 21.

place when nearest to the sun, C being the bisection of AA'; draw a circle aba'b' with centre C, and any radius less than CA, and with a as centre draw circle AKK'; then if @ point revolve round the circle AKK' in that direction im the same time that the centre of this circle travels round the circle aba'd' in that direction, the point will trace out an ellipse, having C as centre, This is easily proved. For let Ca=R, aA=7, and put CA=R+r=a and CK'=R-—r=b=CB, When the moving point is at P, let the centre of the small circle be at p. The angular velocities being equal, pC and pP are inclined to aC at the same angle; let this bea. Then the co-ordinates of P parallel to CA and Cd are—

x=(R+r) cos,a=acos.a

y=(R-r)sin.a=dsina Whence 27a? + a?y? = a%b2, the equation to an ellipse having C as centre, CA and CB as semi-axes. S will not be the focus

of this ellipse, unless SB=CA; and even then the velocities will not be those observed of a planet' re- volving around § in the elliptic orbit ABA'B'—for the time from A to B will be one-fourth of the period, whereas in the case of a planet the time from A to B bears to the

period the ratio of the area ASB to the area of the ellipse, a ratio exceeding one-fourth. Nevertheless, observed appearances were to some degree explained by the motion illustrated in fig. 21, seeing that at A, or when farthest from the centre S, the tracing point moves most slowly, having there the difference of the velocities due to the two circular motious ; while at A' the point moves most quickly, having there the sum of these velocities. And when Copernicus advanced his theory, observations had not been made with sufficient exactness to prove the insufficiency of such an explanation in any case save that of the moon's motion round the earth,

Tycho Brahe, however, having completed a series of observations of Mars, the nearest planet moving on a

manifestly eccentric orbit, Kepler tested the theory of Laws of

Copernicus in order to ascertain whether any ellipse, described as ABA'B' in fig. 21, could account for the observed positions of the planet. It will be seen that, while the points 8, A, and A' in his inquiry were fixed, and therefore C also fixed, the point a might be taken nearer or further from A within certain limits, these limits being determined by the observed fact, that when near B and B' the planet was not nearer to C by a distance Bb exceeding a certain moderate amount, such as the probable error of Tycho Brahe's observations permitted Kepler to assume.

It was after trying nineteen such arrangements, and rejecting them one after the other as he found them dis- proved by Tycho Brahe's observations, that Kepler was led at last to abandon the attempt to explain the motions of Mars by combining circular uniform motions. Passing to the ellipse, as the curve which Mars appeared to follow, and testing various empiric laws of motion in an elliptic orbit, he at length lighted upon the actual relation, pre-

sented in his first two laws as true for all the planets, though actually proved only in the case of Mars. The laws are these—

1. Every planet moves in an elliptical orbit, in one focus of whieh the sun is situated.

2. The line drawn from the sun to a planet, or the radius- vector of the planet, sweeps over equal areas in equal times.

The second law may be thus illustrated. Let ABA'B' (fig. 22) be the elliptic path of a planet about the sun S, in the focus of the ellipse whose axes are ACSA' and BCB'.

Fig. 22.

Let P be the period in which the planet performs the com- plete circuit of its orbit, and let T be the time occupied by the planet in traversing any are pp' of its orbit. Then joining Sp, Sp', T : P:: sectorial area pSp' : area of the ellipse ABA'B'. It remained now to discover if any law connected the

Gravita- tion.

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became clear that the laws of Kepler are consequences of the general law of gravitation—the law, viz., that

periods in which the planets pursue their different paths. He did not at first try to connect the periods and the dis- tances by any direct numerical relation, probably because he had recognised in the second law the probable existence of geometrical relations. But after many years of inquiry he arrived at the conclusion, that probably the required law connected the powers of the numbers representing the periods and the distances.

idea had occurred to him, ten weeks, instead of some ten minutes, elapsed before he bad verified it. The law con- necting the periods and distances—Kepler's third law—is this—

3. The square of the numbers representing the periodic times of the planets vary as the cubes of the numbers repre- senting their mean dastances.

Or thus, If D, d be the distances of any two planets, and P, p their respective periods, then

P2:p?::D8:d3. . . . (1).

From this law we can deduce a convenient relation between the velocities in circular orbits (a relation holding approximately for the mean velocities in orbits nearly circular like those of the planets). Let V, v be the velo- cities in the orbits of planets whose distances are D, d respectively ; then, obviously,

d 3 V= Cp? and v=c-» where c is some constant. Pp

i 1 oe Ae oP tn Dil that is, the velocities in circular orbits vary inversely as the square roots of the distances.

3 $

And also, Tu5 2-5 ne .

2

D> ye

that is, the velocities in circular orbits vary inversely as the:

cube roots of the periods.

It may be well also to notice the following relation between the angular velocities in such orbits. Let these, for the respective planets just dealt with, be Q and o. Then,

(It is manifest that » because the periods must

a" E be inversely proportional to the angular velocities with which they are uniformly described.)

The three laws of Kepler are approximately true for bodies circling around the same centre. They do not apply to bodies circling around different centres. For instance, the moon's distance and period could not be used for p and din (1). Nor could the distance and period of any one of the satellites of Jupiter pair, according to Kepler's third law, with the distance and period either of our moon or of any planet; but the motions of the satellites were found to accord with the law when com- pared together.

It was probably the recognition of this fact which first put astronomers on the track of the theory that the law depends on some force residing in the centres round which different bodies move. Newton certainly had given atten- tion to this influence before he dealt with the moon's attraction earthwards as a case of the action of terrestrial gravity. But, be that as it may, it is certain that so soon as the action of the earth's attraction on the moon had been demonstrated by him he extended the law of gravita- tion to all cases of motion around a central orb. It then

It affords a strange evidence of : the ponderous nature of Kepler's movements, that after this

[| THEORETICAL—>

Every particle of matter in the universe attracts every

other particle with a force varying directly as the masses, and inversely as the square of the distances.

The proof of the law of gravitation divides itself into

three distinct parts :—

First, The proof that the force acting on the moon is

equal to the force of terrestrial gravity, reduced as the inverse squares of the distances of the moon and of a point on the earth's surface, from the centre of the earth.

Secondly, The proof that a system of bodies circling

around a central body like the sun, attracting them with a force inversely proportionate to their respective distances, would obey the laws of Kepler, or some modification of those laws, giving results according with the motions actually observed. . i

Thirdly, The proof that the mutual attractions of the

several members of any system, and the attractions of members of one system on bodies belonging to another system (as, for instance, of the sun upon the moon regarded

as a dependent of the earth), would result in such. pertur-

bations from the paths due to the attractions of the central

body as are observed actually to take place.

Neither the second nor the third of these arguments can be given here, though certain simple relations involved in them, as also certain consequences, will be mentioned.

The first part of the proof is altogether simple.

The moon is, roughly, at a distance from the earth's centre equal to 60 radii of the earth, and therefore the earth's moving force is less on her than on a body at the earth's surface as 1 to 3600. Now, regarding the moon's orbit as a circle, it is easily shown that, if at any moment the earth's attraction ceased to act, so that for the next second the moon. moved on a tangent to her present course, her distance from the earth's centre at the end of that second would be rather more than ;,th of an inch greater than at the beginning of the second. It follows that her fall

1 towards the earth in a second on account of the earth's

attraction amounts to rather less than 4 of an inch. But the fall of a body near the earth's surface is about 16,1, feet, or nearly 193 inches per second, or nearly 193 × 19 times greater than the fall of the moon towards the earth per second; that is, about 3600 times greater. In other words, the moon is

attracted towards the earth precisely as she would be if the force of gravity acting on bodies near her surface ruled her also, the law of variation of the force with distance being that of the inverse squares.

The second part of the proof is simple for cases of circular motion of various bodies around a common centre. The law of the equable description of areas, indeed, is true for a body moving around a centre attracting according to any law, since it simply implics that there is no force perpendicular to the radius vector. It is easily seen that the increase of the area during any exceedingly short interval of time depends solely on the distance attained by the moving body during that interval from the line representing the position of the radius vector at the beginning of the interval, this distance being measured in a perpendicular direction ; for the area of a triangle is measured by the base x perpendicular. Accordingly, if, during the short interval of time, there is no force tending to increase or diminish the perpendicular distance of the moving body from the original radius vector, as compared with the dis- tance which would have been attained had no force at all acted, the area described will be the same as though-no force had acted. But if no force acted, the body would move uniformly in a straight line, and the radius vector would sweep out equal areas, because triangles having the same vertex and their bases in one straight line have areas

"GRAVITATION.]

proportional to their bases. Hence, under a force not

tending to change at any instant the rate of the moving.

body's perpendicular departure from the radius vector, the areas swept over in equal times will be equal. But a

central force acts always in. the direction. of the radius:

vector, and is therefore a force of the kind supposed. Accordingly, a body travelling round an attracting centre will move so that the radius vector sweeps over equal areas in equal times. –

Suppose next two bodies describing circles with uniform

motion in periods P, p, at distances D and d from a- centre.

of attraction Whose force varies inversely as (distance)?, It is required to determine the relation between P, p, D

and d. The velocities of the bodies are c 2) and c—, where

P ¢ is some constant. Represent these velocities by V and v respectively for convenience ; also call the forces acting on the bodies respectively F and f, which we know to be.

proportional tons and = Clearly, if a body moving in

any direction receives a very slight impulse in a direction at right angles to its motion, its direction of motion will be changed through an angle proportional dircctly to the impulse and inversely to the velocity of the body. So that if we regard the attractive force on the planets as acting by a succession of small impulses, the momentary V therefore, of completing any given change of direction is

variation of direction is proportional to =, and the time,

a two planets have their direction changed through four right angles: Hence

proportional to Now, in times P, p respectively, the

vp © F . 7 ee That is, P?: p? :: D% : d3, which is Kepler's third law.

_ Let us now compare the periods P and p of two bodies, moving at distances D and d, around unequal centres of force, which exert attractions A and a respectively at equal distances, so that: instead of the forces F and / actually

D d Pog : =. D2; -.q?, P P p*

: She : 1 exerted on the two bodies being proportional to pa and "7 :

they are proportional to = and x Tespectively. Then the above proportion becomes Pip Dae Pipiip'g ie of D3 ad? 3 1 omeme 3) es ce ee 2 = That is, Perper ais, orPa ys,

corresponding to a law. which may be thus expressed: The squares of the periods about different centres of force vary directly as the cubes of the distances, and inversely as the attractions of the centres of force at a unit of distance. This relation which is true for elliptic orbits, is general for all systems, and gives the means of comparing the masses of different systems. But it is necessary to observe a modification which Kepler's third law and this extension of it have to undergo to make them strictly true (as re- gards, at least, the unperturbed motions of the planets). The masses of the planets, though very small, yet bear definite relations to the sun, and instead of considering each planet as swayed by the sun's mass, we must regard each as swayed by the sum of its own mass and the sun's, supposed to be gathered at the sun's centre. Thus we must regard the planets as revolving around centres of different attractive energy; Jupiter round a centre equal in mass to Jupiter and the sun; Saturn round a centre.

equal in mass to 'Saturn and the sun, &c:° Instead, then, of'

ASTRONOMY.

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: dist a the ratio ee being constant for the solar sys-

| tem, we find that this ratio for any given planet is propor- _

tional to the sun's mass added to that planet's. Extending the law to bodies travelling around different centres, it runs as follows :—

If a body of mass m revolves round a centre of mass M in time P, and at a mean distance D, and another body of mass m/ revolves round another centre of mass M' in time P', and at a mean distance D', then .

: r : D3 = D2

P?(M+m) ~— P2(M'+m')"

This law enables us at once to compare the sums of the masses when we know the mean distances and periods. For it may be written i

M+m _ D3. Pp. W+m — D3' p Also, where m and m' are both small, compared with M and M' respectively, the law becomes simplified into M D3: p? Ww – De pee These laws suffice to enable us to deduce from the observed periods of the planets their true mean distances, velocities, &c., and: from the observed period of the satellite of any planet, the ratio of the planet's' mass to the sun's, The eccentricities of the planetary orbits are partly deduced from observation, and partly from the law of the equable description of areas, The inclinations of the orbits, and, of course, all elements relating to the planets' own globes, their dimensions, compression, inclination, rotation, and so on, are obtained by telescopic observation and measuré- ment. — a a oe : The following tables of elements are brought into one

- place for convenience of reference, and include many items

of information referred to'in the chapters on the several planets. The illustrative Plates numbered XXVII. and XXVIII. should be studied in combination with the table of planetary elements. i i We may conveniently add here to the laws of planetary stability motion presented above the two following theorems of the Solar (enunciated by Lagrange, but first established by Laplace). System. First, [f the mass of each planet be multiplied by the sguare of the eccentricity, and this product by the square root of the mean dastance, the sum of the products thus formed will be cnvariable. " Secondly, 7 the mass of each planet be multiplied by the sguare of the tangent of the orbit's inclination to a fixed plane, and this product by the square root of the mean dis- tance, the sum of the products thus formed will be invariable, These laws ensure the stability of thesystem. It is true that the whole eccentricity, if it could by any pussibility fall on any one planet (except Jupiter or Saturn), would cause the planet's orbit to interfere with the orbits of other planets, or even, in the case of a small planet, to

‘intersect the sun’s globe. Yet the interchange of eccen-

tricities can never lead to this result. In fact, the sum of the products (mass) x (eccentricity)? x (mean distance)+ for Jupiter and Saturn will always largely exceed the sum

of all such products for the remaining planets.

The fixed plane from which the inclination is to be measured, in the second law, is nearly identical with the plane of Jupiter’s orbit. . Its inclination to the ecliptic is about’ 1° 354’, and the longitude of the node (in 1850) was about, 104° 21’. Comparing these values with the cor- responding elements on next page, we see that the inclina- tion of the planetary orbits would have a smaller mean value if estimated -from the invariable plane than they had

“as éstimated from the plane of the ectiptic. ’ — ~ ee

Elements.

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General Elements of the Solar System. Epoch, January 04 (noon), 1850.

Distance from the Sun in Miles, Mean dis- Sidereal Synodical | yfean daily

SymboL tance—Earth’s| Eccentricity. | Revolutionin | Revolution} ~ yfotion. Mean. Greatest. Least. asl. Days. in Days. er 85,392,000 42,669, 000 98,115,000 0°387099 0°205618 87°9693 | 115°877 | 147382°419 Serasieceare 66,134,000 66,586,000 65,682,000 O°723332 0‘006833 924-7008 | 5838°920 5767°668 Beoeratse | 91,430,000 92,963,000 89,897,000 1:000000 0°016771 365°2564 Eee 3548°193 4 3 139,311,000 152,304,000 126,318,000 1°523691 0°093262 686°9797 | 779°936 | 1886°518 ()@|_ 2004000,000 215,000,000 | 164,000,000 | 2200000 | 0-04 1200" | 4 to to to to to to (127) ke. 315,000,009 370,000,000 276,000,000 3°500000 0°34 2400° ee y 475,692,000 498, 639, 000 452,745,000 5°202798 0°048239 4332°5848 | 398°867 299-129 ames 872,137,000 920,973,000 823,301,000 9538852 0°055996 J0759°2198 | 378°090 120°455 aia er Ri 1,758, 869,

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*….....sseeseeseseeeers 14,600,000 AOCOMNE seston nde cag ash sleet tererguearerwgat entire 4111 Moon's diameter (earth's equatorial diameter as 1).... 0°2725 Do. seen at one time or other do…..... seeeeesene 5889 Earth's equatorial diameter (moon's as 1)..... s+ 3°670 | Mean revolution of nodes (retrograde) in days….. a 6793 °391 Moon's surface (earth's as 1).....-.....ssseereeeneeeeees ia 0°0742 | Do. do. do. in years….,.. Ags 18°5997 Earth's surface (moon's a8 1).....6..cscee eee geeeeeeetereees 13-471 | Mean regression of nodes Per ANNUM.....11-++.—00++ 19° 21' 18"'3 Moon's volume (earth's ag 1).....ssesseeee ceeere eee cen eee 00202 | Mean regression of node between successive conjune- Earth's volume (moon's a8 1) .,.....06- cssererereereseeeene 49°441 tions of sun and rising NOde…,.....cceeeeeees ver eeeees 18° 22' 3°°2 Moon's mass (earth's a8 1).....css+sesssenreesereereserreeter ene 001228 | Mean interval between such conjunctions in days….. 346-607 Barth's mass (Moon's as 1)...,..sseer-seeasreoee crs ere ceeee 81°40 | Mean revolution of perigee (advancing) in days..,..... 3232°578 Density (earth's a3 1) ..... —..sseserrseseeeseneetsserestereee 0°60736 | Do. do. 18 YORE... 200540 cesseenqense 8°8505 Density (water's as 1, and earth's assumed = 5°7)..... 3°46 | Mean advance of perigee per ANDUM..... sss 40° 40' 81"*1 Gravity, or weight of one terrestrial pound…....-..~~2 0°16547 Do. do. tween successive conjunc~~ Bodies fall in one second in feet…..... «+++ ghexceachrind 2°65 tions of sun and perigee.. ..... voce sseege 40° Ol 25S*

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ELEMENTS OF SOLAR SYSTEM. |

Elements of Jupiter's Satellites.

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a ee | ee Elements of Saturn's Satellites.

|Distance in} Diameter

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No.! Revolution sata Ris x tricity. Discoverer. a. hs om.] 0 22 37 3°360 1000 0°06889 | Sir W. Herschel. g 1 8 53 4°312 Bos ate Do. 3 1 «2h 618 5°339 500 0‘0051 J. D. Cassini. 4 2% 41 6° 839 500 0°02 Do. 5 4 72 25 9°552 1200 | 0°02269 Do. 6|16 22 41 | 22°145 3300 0°029223 | C. Huy hens, ri 2b J FF P28: a ane W. Bond. 8 | 79 7 58 | 64°359 1800 0°115 J. D. Cassini.

Dee Se ari, Elements of Uranius’s Satellites.

; Distance in No. —— Radii of

Uranus,

Maximum Elongation,

Discoverer.

W. Lassell. 15 Do. 33 Sir W. Herschel.

Elements of Neptune’s Satellite.

Sidcreal Distance in Radii Maximum Revolution. of Neptune. Elongation. Discoverer. da oh. m. aw 5 21 8 12°00 18 W. Lassell,

The following are the elements of Satum’s ring system according to the best authorities :— Longitude of ascending node on ecliptic…... 167° 43’ 29”

ee ae eee 28° 10’ 22” Exterior diameter of outer ring, in miles. ... 166,920 Interior do. do. GO sas 055 147,670 Exterior do. innerring do. 144,310 Interior do. do. Oe ava0.% 109,100 Interior do. dark ring do. ..... 91,780 Breadth of outer bright ring Gi. x 9,625 Breadth of division between the rings do. ... 1,680 Breadth of inner bright ring do: ... 17,605 Breadth of dark ring da. ... 8,660 Breadth of system of bright rings do.~< 28,910 Breadth of entire system of rings On =a: 37,570 Space between planet and dark rings do. ... 9,760

Cuaprer VIL—The Sun—Sun Spots—Rotation of the Sun —His Physical Constitution and Surroundings—Pro- minences—Corona—Zodiacal Light.

The sun, the central and ruling body of the planetary system, and the source of light and heat to our earth and all the members of that system, is a globe about 852,900 miles in diameter. So far as observation extends, his figure is perfectly spherical, no difference having been observed between his polar and spherical diameters. It has been well remarked, indeed, by Sir G. Airy, that if any observer could by ordinary modes of measurement satisfy himself that a real difference existed between the diameters, that observer would have proved the inexactness of his own work ; for the absence of any measurable com- pression comes out as the result of comparisons between thousands of observations of the sun's limbs made at Greenwich and other leading observatories. The volume

of the sun exceeds the earth's 1,252,700 times. His mean density is almost exactly one-fourth of the earth's, and his mass exceeds hers about 316,000 times. Gravity at the surface of the sun exceeds terrestrial gravity about 27°1 times, so that a body dropped from rest near the sun's surface would fall through 436 feet in the first second, and have acquired a velocity of 872 feet per second. Viewed with the naked eye, the sun appears only as a Sun spots.

luminous mass of intense and uniform brightness ; but when examined with the telescope, his surface is frequently

| observed to be mottled over with a number of dark

spots, of irregular and ill-defined forms, constantly varying in appearance, situation, and magnitude. These spots are occasionally of immense size, so as to be visible even with- out the aid of the telescope ; and their number is frequently so great that they occupy a considerable portion of the sun's surface. Sir W. Herschel observed one in 177 9, the diameter of which

exceeded 50,000 miles, more than six times the diameter of the earth; and Scheiner affirms that

he has seen no less than fifty on the sun's disk at once.

Most of them have a deep black nucleus, surrounded by a fainter shade, or wmbra, of which the inner part, nearest to the nucleus, is brighter than the exterior portion. The boundary between the nucleus and umbra is in general tolerably well defined ; and beyond the umbra a stripe of light appears more vivid than the rest of the sun.

The discovery of the sun's spots has been attributed to Fabricius, Galileo, and Scheiner, and has been claimed for the English astronomer Harriot. Amidst these conflicting pretensions it is perhaps impossible to arrive at the truth ; but the matter is of little importance ; the discovery is one which followed inevitably that of the telescope, and an accidental priority of observation can hardly be considered as establishing any claim to merit.

The solar spots furnish an extensive subject of curious Sun's rota speculation. 'They are, first, interesting tion, on account of their establishing the fact of the rotation of the sun, and afford- ing the means of determining its period. Let M, M', M", fig. 23, be the successive positions of a spot on the surface of the sun on different days. Then, correction being made for the earth's advance dur- Fig. 23. ing these days, M, M', M" will represent the apparent path of the spot on the sun's disk. This path, as thus corrected, is in general an oval slightly differing from an eclipse ; and it is found that all the spots observed at the same time describe similar and parallel curves. They also return to the same relative positions in the same time, and their period is about 274 days,

The paths described by the spots undergo very consider- able changes, according to the season of the year at which they are observed. About the end of November and beginning of December they appear simply as straight lines, Mm, M'm', M'm'" (fig. 24), along which the spots move in

Fig. 24. Fig. 25. Fig. 26.

Fig. 27. Diagrams showing motion of sun spots at different seasons,

*the direction Mm; that is, they enter on the eastern and disappear on the western edge of the sun's disk, and the points at which they disappear are more elevated, or nearer the north pole of the ecliptic than those at which they enter. After a certain time the lines Mm, &c., begin to assume a curved appearance. * During the winter and spring the*

convexity of the ovals is turned towards the north pole of the ecliptic ; but their inclination, or rather the inclination of the straight lines joining their extreme points, to the plane of the ecliptic continues to diminish, and about the beginning of March disappears ; so that the points at which they seem to enter and leave the sun's disk are equally elevated, as in fig. 25. From this time the curvature of the ovals diminishes ; they become narrower and narrower till about the end of May or beginning of June, when they again appear under the form of straight lines (fig. 26) ; but their inclination to the ecliptic is now precisely in a contrary direction to what it had been six months before. After this they begin again to expand, and their convexity is now turned towards the south pole. Their inclinations also vary at the same time, and about the commencement of September they are seen as repre- sented in fig. 27; the points at which they enter and dis- appear being again equally elevated. After this period the ovals begin to contract and become inclined to the ecliptic, and by the beginning of December they have exactly the

same direction and inclination as they had the previous |

ear. " These phenomena are renewed every year in the same order, and the same phases are always exhibited at cor- responding seasons. Hence it is evident that they depend on a uniform and regular cause, which is common to all of them, since the orbits described by the various spots are exactly parallel, and subject in all respects to the same variations. The true explanation of the phenomena was early recognised by Galileo, who maintained that the spots belong to the surface of the sun, and that the sun uniformly revolves round an axis inclined to the axis of the ecliptic. .

From four different combinations of equations, derived from eleven observations of the same spot, Delambre com- puted the following table of

the elements of rotation :—

No. | Node. Inclination. Revolution. Synodic Revol. of: getes ap Rae aH) aor PE | ae ee | 2 | 792135 | 7 12 37 eo, baie Ses |:

8 80 33 40 7 16 33

4 |-794755 | 7 29 4 | Mean' 80 7 4 7 19 – $3 Diurnal motion 14°°394

"With regard to observations of the sun's spots, for the purpose of determining the rotation, Delambre remarked that he attached little value to them,—first, because it is impossible to make them well; and secondly, because (as

he erroneously supposed) they could only lead to results –

of little importance. He discussed a hundred different spots, each observed at least three times by Messier, and deduced thirty different determinations of the elements of rotation. The more he multiplied his calculations, the more certain he became of the impossibility of a good solu- tion ; of which, indeed, there is no other chance than in a compensation of errors, little probable on account of their enormous maguitudes. These discrepancies have been accounted for in recent times, chiefly through the labours of Mr Carrington. It had=been suspected that the spots, besides partaking of the general motion of the solar globe, have also proper motions occasioned either by displacement or by a change of form. Carrington not only succeeded in proving that both these causes operate, but also in recognising systematic proper motions of the spots at rates depending on their solar latitude. It would not be possible to assign definitely the nature of 'such proper motions,

simply because we do not know the normal rotation rate of

the sun; and therefore we are compelled, in describing

Carrington's results, to speak of 'varying rotation rates,'

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although it can hardly be doubted that the sun's globe, as a whole, has-a definite rate of rotation, and that all the seeming variations from this rate are due to proper motions of the spots. Adopting, however, the only available method

of describing Carrington's results, the following table repre-

sents the various rotation rates for different solar latitudes in both hemispheres : —

Deg. Sun's Rotation Period. Rotation per-Day. a… he ™ L

50 N. lat. 27 10041 ee 65374

30 26 9 46 824

20 : oe Ay "is 840 1 2s TO. AG 851

10 – 25 8. 29 859

5 25 0 42 863

0 Equator 24-2 D4 867

5S. lat. 24 23 As 865 10 25 Sa 856

15 25-13 3 845

20 . 25° Ty 82 839

30 26 12 50 814

45 23 ih 40 759

It is noteworthy that in each southern latitude the rota- tion is léss than in the corresponding northern latitude, yet the difference is too small to admit of our attaching at present any considerable importance to this indication. Taking the mean between the results for the northern and southern

hemispheres, Mr Carrington has deduced the fol- lowing empiric formula for the rotation rates in different solar latitudes —— 7 :

Let ¢ be the angle through which a part of the sun in latitude A rotates in one day; then

_ €=14° 25'—165'sin. FA .

Syérer, who has made similar observations, deduces the law f €= 16°8475 — 3°°3812 (sin. + 41° 13') .

The following elements have been. deduced from: the

'results by Carrington and Sporer (for the year 1869) :—

x Elements. Carrington. Sporer, Longitude of node of solar equator…... 73° 57' 74° 37' Inclination of solar equator …..... . te saa (eel: 6 57. Mean diurnal rotation —...:.....e+e- ee 14 18 14 2664 Mean rotation period…..... te he ee 254234

Fra, 28.—Sun Spots seen Sept 25, 1870.

The general 'appearance of the sun's disk, when muclt

elescopic udy of Q spots,

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marked with spots, is shown in fig. 28, which presents the aspect of the sun, seen witha small telescope on September 25, 1870, as drawn by Mr Proctor. Three views of spots, as seen with large telescopes, are presented in figs. 29, 30,

sharp angles, but is always curvilinear, how irregular so- ever the outline of the nucleus may be. 6. The nucleus of a spot, whilst on the decrease, often changes its figuer

Fig. 29.—Sun Spot seen in 1870.

and 31, which show the same spot in different stages of its history, as observed at the Harvard Observatory, Cam-

Fia, 30.—Another Phase of Spot, fig. 29.

bridge, U.S., in March and April 1870. These views, though showing the spots as they have only been seen with the improved instruments of our day, will serve to illustrate the following account of the history of rescarch into these objects better than pictures resembling the imperfect drawings made by the first observers.

The phenomena of the solar spots, as observed by Scheiner and Hevelius, may be summed up iu the follow- ing particulars:—1. Every spot which has a nucleus, or comparatively dark part, has also an umbra, or fainter shade surrounding it. 2. The boundary between the nucleus and umbra is always distinct and well defined. 3. The increase of a spot is gradual, the breadth of the nucleus and umbra dilating at the same time. 4. In like manner the decrease of a spot is gradual, the breadth of the nucleus and umbra contracting at the same time. 5. The exterior boundary of the umbra never consists of

Fie. 31.—Phase of Spots, figs. 29, 30.

by the umbra encroaching irregularly upon it, insomuch that in a small space of time new encroachments are dis- cernible, whereby the boundary between the nucleus and umbra is perpetually varying. 7. It often happens, by these encroachments, that the nucleus of a spot is divided into two or more nuclei. 8. The nuclei of the spots vanish sooner than the umbre. 9. Small unibree are often seen without nuclei. 10. An umbra of any considerable size is seldom seen without a nucleus in the middle of it. 11. When a spot which consisted of a nucleus and umbra is about to disappear, if it is not succeeded by a facula or spot brighter than the rest of the disk, the place where it was is soon after not distinguishable from the rest.

In the Philosophical Transactions, vol. lxiv. (1774), Dr Alexander Wilson, professor of astronomy at Glasgow, gave a dissertation on the nature of the

solar spots, in which he mentioned the following appearances :—1. When the spot is about to disappear on the western edge of the sun's limb, the eastern part of the umbra first contracts, then vanishes, the nucleus and western part of the umbra remaining; then the nucleus gradually contracts and vanishes, while the western part only of the umbra remains. At last this disappears also; and if the spot remains long enough to become again visible, the eastern part of the unmbra first becomes visible, then the nucleus; and when the spot approaches the middle of the disk, the nucleus appears environed by the umbra on all sides, as already mentioned. 2. When two spots lie very near to one an- other, the umbra is deficieut on that side which lies next to the other spot; and this will be the case, though a large spot should be contiguous to one much smaller; the umbra of the large spot will be totally wanting on that side next the small one. If there are little spots on each side of the large one, the umbra does not totally vanish, but appears flattened or pressed in towards the nucleus on each side. When the little spots disappear, the umbra of the large one extends itself as usual. This circumstance, he observes, may sometimes prevent the disappearance of the umbra in the manner above mentioned ; so that the western umbra may disappear before the nucleus if a small spot happens to break out on that side.

These observations led Dr Wilson to adopt the opinion,

that the appearances of the spots are occasioned by real excavations in the solar globe. He supposed the sun to consist of a dark nucleus, covered only to a certain depth by a luminous matter, not fluid, through which openings are occasionally made by volcanic or other energies, per- mitting the solid nucleus of the sun to be seen ; and that the umbra which surrounds the spot is occasioned by a partial admission of the light upon the shelving sides of the boundary opposite to the observer. It is evident that, in proportion as these excavations are seen obliquely, their apparent dimensions will be diminished ; one of the edges will disappear as it approaches the sun's limb, or conte more into view as it advances towards the middle of the disk ; when the spot is about to leave the disk, the bottom of the excavation, or the

nucleus seen through it, will first disappear, but a sort of faint or obscure spot will remain visible as long as the visual ray penetrates the cavity. .

Dr Wilson's theory was keenly combated by Lalande, who adduced several observations of his own, and some by Cassini, that could not be explained by means of it ; aud urged with reason that an hypothesis, founded on the uniformity of appearances which in reality are exceedingly variable, was entitled to little consideration. Lalande himself supposed the spots to be scorize which have settled or fixed themselves on the summits of the solar mountains ; an opinion which he grounded on the circumstance that some large spots which had disappeared for several years were observed to form themselves again at the identical points at which they had vanished.

Sir William Herschel, with a view to ascertain more accurately the nature of the sun, made frequent observa- tions upon it from the year 1779 to the year 1794. He imagined the dark spots on the sun to be mountains, which, considering the great attraction exerted by the sun upon bodies placed at its surface, and the slow revolution it has upon its axis, he thought might be more than 300 miles high, and yet stand very firmly. He says that in August 1792 he examined the sun with several powers from 90 to 500, when it evidently appeared that the dark spots are the opaque ground or body of the sun, and that the luminous part is an atmosphere, through which, when interrupted or broken, we obtain a view of the sun itself. Hence he concluded that the sun has a very extensive atmosphere, consisting of elastic fluids that are more or less lucid and transparent, and of which the lucid ones furnish us with light. This atmosphere, he thought, can- not be less than 1843 nor more than 2765 miles in height ; and he supposed that the density of the luminous solar clouds needs not be much more than that of our aurora borealis, in order to produce the effects with which we are acquainted. The sun, then, if this hypothesis be admitted, "is similar to the other globes of the solar system with regard to its solidity, its atmosphere, its surface diversified with mountains and valleys, its rotation on its axis, and the fall of heavy bodies on its surface; it therefore appears to be a very eminent, large, and lucid planet, the primary one in our system, disseminating its light and heat to all the bodies with which it is con- nected."

Herschel supposed that there are two regions or strata of solar clouds; that the inferior stratum is opaque, and probably not unlike our own atmosphere, while the supe- rior is the repository of light, which it darts forth in vast quantities in all directions. The inferior clouds act as a curtain to screen the body of the sun from the intense brilliancy and heat of the superior regions, and, by re- flecting back nearly one-half of the rays which they receive from the luminous clouds, contribute also greatly to in-

crease the quantity of light which the latter send forth |

AT RO ROR

usually in four or five years the maximum

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into space, and thereby perform an important function in the economy of the solar system. The luminous clouds prevent us in general from seeing the solid nucleus of the sun; but in order to account for the spots, he supposes an empyreal elastic gas to be constantly forming at the sur- face, which, carried upwards by reason of its inferior density, forces its way through the planetary or lower clouds, and mixing itself with the gases which have their residence in the superior stratum, causes decomposition of the luminous matter, and gives rise to those appearances

which he describes under the name of corrugations.

Through the openings made by this accidental removal

of the luminous clouds, the solid body of the sun becomes

visible, which, not being lucid, gives the appearance of

the dark spots or nuclei seen through the telescope. The length of time during which the spots continue visible renders it evident that the luminous matter of the sun cannot be of a liquid or gaseous nature; for, in either case, the vacuity made up by its accidental removal would instantly be filled up, and the uniformity of appearance invariably maintained.

But, perhaps, the most important of all the discoveries Sun-spot which have been made respecting the sun spots, are those period.

which relate to the variation of these objects in number, and in the amount of solar area which they cover. We owe the initiation of observations on these points to Schwabe of Dessau. 'They were commenced in the year 1826, and con- tinued without intermission, except in one case, during the astronomer's illness, for forty-six years. Before many

years had elapsed, Schwabe discovered that the spots wax

and wane in frequency in a period of about eleven years. At the time of spot-minimum the sun remains often for several days not only clear of spots, but with a singular smoothness of aspect, even the minute mottlings ordinarily seen on his surface either passing away for a time or be- coming less conspicuous than usual. From such an epoch there is a gradual return to the spotted condition, and of spot-fre- quency is reached ; then there is a more gradual reduction,

until, in rather more than eleven years on the average, the

minimum is reached. The table on page 787 indicates the facts actually observed by Schwabe between 1826 and 1868, supplemented by observations of a similar kind made at the Kew Observatory to the year 1871.

It will be seen that the law of variation is not uniformly periodic ; the intervals between maximum and maximum are not strictly equal, and the maxima are neither equal nor similar.

The researches of M. De la Rue and his assistants Stewart and Loewy have indicated further laws of varia- tion, apparently connecting the changes of spot-frequency with the movements of the planets Mercury, Venus, the earth, and Jupiter. According to their views the great eleven-year period would correspond with the periodic re- yolution of Jupiter. It is, however, noteworthy that Pro- fessor Wolf of Zurich estimates the spot period at 11-11 years,—a period differing too much from J upiter's to accord with De la Rue's theory. And Carrington notes that, whereas certain epochs of spot-

maxima accord with the passage by Jupiter of his perihelion, others accord almost as exactly with Jupiter's aphelion passage. Yet Wolf accepts the theory of planetary influence. " He finds," says Sir John Herschel, "that a perceptibly greater apparent activity prevails annually, on the average, in the months of September to January, than in the other months of the year; and, again, by projecting all the results in @ continu- ous curve, he finds a series of small undulations succeed- ing each other at an average interval of 7°65 months, or 0°637 of a year. Now the periodic time of Venus, re- duced to a fraction of a year, is 0°616,—a coincidence cer-

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tainly near enough to warrant some considerable suspicion of a physical connection." A longer period, during which the spot-maxima would seem to vary, has been suspected by Wolf. It was suggested by Mr Proctor in 1865, and Prof. Loomis (of Yale College, U.S.) has since advocated the theory, that this period corresponds to the successive conjunctions of Saturn and Jupiter; but the connection is doubtful.

Days of

Days without

Year. New Groups.

Observation. Spots. e 5

the magnetic periods, but not exactly copying them. In 1826 277 118 particular, we notice that during those periods in which 1827 273 161 the range of the magnetic declination was unusually small ste ry a auroral exhibitions were extremely few in number and in- 1830 217 190 significant in respect of brilliancy. If now we inquire as 1831 239 3 149 to the probable connection between these three classes of 1832 270 49 84 phenomena, we cannot suppose that a small black spot on 1833 267 139 33 the sun exerts any direct influence on the earth's magnet- ae ny =e i ism or electricity ; but we must rather conclude that the 1836 200 0 279 black spot is a result of a disturbance of the sun's surface, 1837 168 0 333 which is accompanied by an emanation of some influence 1838 a 0 282 from the sun, which is almost

*instantly felt upon the earth, Lo an : ‘ ne in.an unusual disturbance of the earth’s magnetism, and a 1841 283 15 102 flow of electricity, developing the auroral light in the 1842 307 64 68 upper regions of the earth’s atmosphere. The appearances 1848 312 149 34 favour the idea that this emanation consists of a direct ue a 1% a flow of electricity from the sun. _ If we maintain that light 1846 314 1 157 and heat are the result of vibrations of a rare ether which 1847 276 0 257 fills all space, the analogy between these agents and electri- 1848 278 0 330 city would lead us to conclude that this agent also is the 1849 285 M mi result of vibrations in the same medium, or at least that it ey a 0 14] is a force capable of being propagated through the ether 1852 337 2 125 with a velocity similar to that of light. While this influ- 1853 299 4 91 ence is travelling through the void celestial spaces it de- 1854 334 65 67 velops no light; but as soon as it encounters the earth’s bi ro ne . atmosphere, which appears to extend to a height of about 1857 394 52 98 500 miles, it develops light, and its movements are con- 1858 335 0 202 trolled by the earth’s magnetic force, in a manner analogous 1859 343 0 a to the influence of an artificial magnet upon a current of i oe ; a electricity circulating round it.” 1869 317 3 160 Among the most interesting discoveries in solar physics Spectro- 1863 330 2 124 are those which have been effected by means of the spec- mates 1864 325 4 130 troscopic analysis, not only as regards the constitution of °”**¥”** 1865 oe oe 7c the sun himself, but as to the nature of the solar spots and iar 319 195 25 faculze, as well as of the various objects which lie outside 1868 301 12 101 the sun’s visible surface, and are only rendered discernible 1869! 196 0 224 during the darkness of total solar eclipses. vant 219 0 Be The evidence of the spectroscope respecting the sun’s 18721 158 3 186 constitution 1s too intimately associated with the history*

Connection One of the most interesting results following Schwabe’s

of sun spots with terrestrial pheno- mena.

great discovery was the recognition of an association be- tween the sun-spot period and magnetic disturbances on the earth. Lamont of Munich had independently dis- covered, in 1850, that the mean daily range of the mag- netic declination varies in a period of about ten years. Two years later, General Sabine and Professors Wolf and Gautier noted the coincidence of

this period and that of the solar spots. Wolf afterwards proved that the true period of magnetic variation amounts to 11-1] years approximately. Some still regard the association between the sun-spot period and auroral phenomena as non-existent; but all doubt on the subject appears to be removed by the evidence adduced in two able papers by Professor Loomis (American Journal of Science and Arts, September 1870 and April 1873). In the same papers Professor Loomis indicates the evidence of association between the number of auroras observed each year, and the two orders

1 These lines are from the records of the Kew Observatory.

of phenomena—solar spots and magnetic variations. He remarks that, "the auroral maximum generally occurs a little later than the magnetic maximum, the average difference amounting to one year; while the time of auroral minimum either coincides with the magnetic minimum or slightly precedes it, the average difference amounting to about half a year. On the whole," he proceeds, "there seems to be no room for question that the number of auroras seen in the middle latitudes of Europe and America exhibits a true periodicity, following very closely

of spectroscopic analysis to be properly discussed at any length in this place. We propose, therefore, to present results, rather than to describe in detail the processes by which these results have been obtained, or the considera- tions on which must be based the interpretation of such results.

It has been shown, then, that the light of the sun comes from an orb glowing with intense white light,—that is, light of all refrangibilities. Hence the sun is either liquid or solid, or if vaporous, then so greatly compressed that, in fact, the condition of its vapours is unlike that of any gases with which we are familiar. But inasmuch as the rainbow-tinted streak constituting the solar spectrum is crossed by a multitude of dark lines, it is seen that the glowing mass of the sun is surrounded by a complex vapour- ous envelope at a lower temperature. Nevertheless we are not to suppose that the vapours constituting the solar atmosphere are in any sense cool. In fact, we find from the position of the dark lines of the solar spectrum, that the vapours of

magnesium and sodium, of iron, copper, and other metals, exist in the true solar atmosphere, which

Phenomena of eclipses.

Promi- nences.

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implics au excessive intensity of heat. We know also, in another manner presently to be described, that the vapours of the solar atmosphere, although less intensely hot than the glowing mass of the sun, are yet so hot as to be brightly luminous.

The evidence respecting the constitution of the sun is based on the following coincidences between dark lines of the solar spectrum and bright lines in the spectra of various elements :—

Lines coincident. Lines coincident.

Tivdrnogent, 5 2cc.es. 4 Waneanese…..... SOUIMIM Ss oe. cs cceseee 9 | Chromium…..... 18 sariwniees…cenee I W@oWalliiincetescns ccs 2 19

PCO ON eco eco 58 75 INGOTS Oe esas aeeenene 33 Magnesium…..... cies (GSENY || Asin 8ge: ~~ cogpgonaseeE 2 Aluminium…..... 2 (2%) COD ieee. – +. 2-000 7 [ROM coeeteenctncsne 450 TPUGAVUUE se… vos ve 200

It must not be supposed either that uo other terrestrial elements exist in the sun, or that no other coincidences are recognisable. The above list simply indicates the results obtained by Angstrém, and presented in the latest avail- able announcement on the subject. With each improve- ment in spectroscopic appliances fresh coincidences are determined. Moreover, it is certain that many elements existing in the sun may for ever escape notice, simply be- cause their vapours in the solar atmosphere may be either insufficient in quantity, or too low down to produce any recognisable effect.

Mitscherlich and others have lately shown that where one or two lines of a many-lined spectrum are recognised aud others wanting, the evidence for the existence of the corresponding element in the sun may yet be regarded as sufficient, because under certain conditions only one or two lines of a spectrum show themselves.

The evidence given by the spectroscope respecting the solar spots confirms the theory that these are due to the existence of masses of relatively cool vapours at a lower level, and therefore relatively more compressed than the vapours elsewhere existing in the solar atmosphere. For the spectrum of the umbra of a spot differs chiefly from the spectrum of the solar photosphere in the greater streugth and breadth of some of the dark lines.

We pass on to the phenomena witnessed during total solar eclipses. 'These are the red prominences and sierra, the inner corona, aud the outer or radiated corona. Some add to these " Baily's beads" and like phenomena, of no real interest or importance whatever.

The red prominenccs were first seen during the solar eclipse of July 8, 1842. During the eclipse of July 28, 1851, it was shown incontestably that they belong to the sun, since the moon was seen to traverse them, hiding those on the east and revealing those on the west. Some still maintained that the prominences are lunar or terrestrial phenomena, on the ground that observers might have been deceived. But this doubt was finally set at rest by the photographic records which De la Rue and Secchi obtained of the total solar eclipse of June 18, 1860.

It was not, however, until the cclipse of August 1868— sometimes known as the great Indian eclipse—that the real nature of these wonderful objects was ascertained. Spectroscopic analysis was applied successfully to the investigation of the prominences by Colonel Tennant, Captain Herschel, and MM. Janssen and Rayet. The spectrum was found to consist of bright lines, indicating that the coloured prominences are masses of glowing vapour. All the observers agreed that among the bright lines those of hydrogen were present ; and one yellow line was mistakenly ascribed to sodium.

But Janssen on the day following the eclipse applied a new method of rescarch, the principle of which had been definitcly indicated several

months before by Mr Huggins.

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(See Report of the Council of the Astronomical Society, in the Monthly Notices for February 1868.) This method depends on the fact that prismatic dispersion reduces the brilliancy of a continuous spectrum, but only throws apart the lines of a bright-line spectrum. Accordingly, by using a spectroscope of sufficient dispersive power, and directing it (with suitable telescopic adjuncts) towards a part of the solar limb on which a prominence exists, the light of our atmosphere, which under ordinary conditions obliterates the prominences from view, may be sufficiently dispersed to leave the bright lines of the prominence spectrum dis- cernible (one at a time). By noting the length of a bright line so seen, the extent of the prominence in the particular section viewed could be determined ; and by combining such determinations, the shape of the prominence could be ascertained. Hence it was that Janssen, speaking of his observations on the day following the great eclipse, said, ‘“‘T have enjoyed to-day a continuous eclipse.”

It happened, curiously enough, that Mr Lockyer, in England, had succeeded in applying the method, not in- deed so early as Janssen, but before the news of Jansscn’s success had reached Europe.

Before long, however, Mr Huggins, the first to enunciate the principle of the new method, showed how it could be improved upon in such sort that the whole of a prominence could be seen at once. Since then many observers have studied the prominences without the aid of an eclipse,— the most successful being Zéllner, Secchi, Lockyer, Res- pighi, and (above all) Professor Young, of New Hanover, US

The following remarks respecting the prominences have been derived from a paper by Respighi :—

“In the circumpolar solar regions great prominences are not formed, but only small and short-lived jets. In the spot zone the great prominences are

seen, the equatorial, like the polar zones, being regions of relatively small ac- tivity. Where facule are prescnt prominences are usually seen, but they are not identical with facule. Over spots the jets are seen, but they are not high. 'There is a great difference in the duration of prominences. Some develop and disappear in a few minutes; others remain visible for several days. They originate, generally, in rectilinear jets, either vertical or oblique, very bright and well defined. These rise to a great height, often to a height of at least 80,000 miles, and occasionally to more than twice that ; then, bending back, fall again upon the sun like the jets of our fountains. Then they spread into figures resembling gigantic trees, more or less rich in branches. In general, the highest parts are the regions of the most remarkable transformations."

Before passing to the more systematic researches made Sierra.

by Secchi, a few words must be said about the sierra.

It had been observed, even before the prominences were noticed, that there exists a border of a red colour around the solar disk, which can be recognised on the eastern side just after totality has commenced, and on the western side just before totality ceases. 'Late observations abund- antly confirmed the discovery, and after the eclipse of 1860 it had been definitely admitted by all who had suf- ficiently examined the evidence, that a continuous red envelope surrounds the sun to a depth of three or four thousand miles. This envelope was commonly called the sicrra ; but recently the name chromosphere (which purists correct into chromatosphere) has been given to it.

The new method of observation, as might be expected, shows the sierra spectrum as successfully as that of the prominences, which must be regarded as extensions of the sierra.

Secchi makes the following remarks on the sierra and prominences :—

| Corona.

THE suN.|

“The sierra presents four aspects: (1), smooth, with a defined outline ; (2), smooth, with no definite outline 5 3, fringed with filaments ; and (4), irregularly fringed with small flames.

“The prominences may be divided into three orders— heaps, jets, and plumes. The heaped prominences need no special description. The jets are those to which alone Respighi’s description is applicable. Their luminosity is intense, insomuch that they can be seen through the light clouds into which the sierra breaks up. Their spectrum indicates the presence of many elements besides hydrogen. When they have reached a certain height they cease to grow, and become transformed into exceedingly bright masses, which eventually separate into fleecy clouds. ‘The jet prominences last but a short time, rarely an hour, fre- quently but-a few minutes, and they are only to be seen in the neighbourhood of the spots. Wherever the jet prominences are seen, there also are faculea. The plume prominences are distinguished from the jets in not being characterised by any signs of an eruptive origin. They often extend to an enormous height, they last longer than the jets, though subject to rapid changes of figure, and lastly, they are distributed indifferently over the sun’s surface. It would seem that in jets a part of the photosphere is lifted up, whereas in the case of plumes only the sierra is disturbed.”

The theoretical inquiries of Zéllner, confirmed by his own and Respighi’s observations, show the probability that the jet prominences are true phenomena of eruption. And more recently, Professor Young has witnessed what must be regarded as in all probability a veritable solar eruption, during which matter was propelled to a height of upwards of 200,000 miles above the sun’s surface. The matter whose motion was actually observed was glowing hydro- gen; but it should be noticed that it does not necessarily follow that the matter erupted was hydrogen. The out- rush may have carried along with it portions of hydrogen which had before been quiescent in the solar atmosphere.

The solar corona comes next to be considered,

It had long been known that around the black disc of the moon in total solar eclipses a halo or glory of light is seen, rather bright close by the sun, and fading away at first somewhat quickly, afterwards gradually, into the

darkness of the surrounding sky. The records of some total eclipses described also radiations in this coronal glory, extending in many cases to a great distance from the sun.

Various theories were propounded in explanation of the solar corona. According to one view, it was a mere ter- restrial phenomenon, due to the passage of the solar rays through our own atmosphere. Others ascribed it to the effects produced by a lunar atmosphere. The theory that it is due to diffraction was also advanced. But the gener- ality of astronomers, especially in recent times, regarded the corona as a true solar appendage.

Space will not permit us to enter at length on the dis- cussion of the various theories just mentioned, or on the description of the various observations which appeared to give support to one theory or another. Nor can we pre- sent in full the interesting history of the observations made since 1869, when first the spectroscope was applied to this interesting phenomenon, and real evidence as to its nature and structure began to be obtained. We must be content with the brief statement of the salient points of the recent observations.

During the solar eclipse of August 1869 the American astronomers, Yonng and Harkness, discovered that the Spectrum ofthe corona is discontinuous (or that at least a portion of its light gives a discontinuous spectrum). Cer- tainly one, and probably three bright lines appeared in the

spectrum as they saw it, though the faintness of two of the three lines raised some doubt on the question whether they belonged to the corona. During the eclipse of December 1870, Young renewed his observations successfully, and other observers succeeded in seeing the bright-line spec- trum of the corona. Young thus sums up the results of his own and other observations: —"There is," he said, " sur- rounding the sun, beyond any further reasonable doubt, a mass of self-luminous gaseous matter, whose spectrum is characterised by the green line 1474 Kirchhoff. The pre- cise extent of this it is hardly possible to consider as de- termined, but it must be many

times the thickness of the red hydrogen portion of the chromatosphere, perhaps on an average 8' or 10', with occasional horns of twice that height. It is not at all unlikely that it may even turn out to have no upper limit, but to extend from the sun indefinitely into space."

It was during this eclipse that for the first time photo- graphy gave convincing evidence respecting the corona. Mr Brothers at Sicily, and Mr Willard (an American photo- grapher) in Spain, obtained views which, though differing in extent, accorded so well in those parts which were common to both, as to leave no doubt that the corona is a solar and not a terrestrial phenomenon. A singular V-shaped gap, common to both the photographs, and seen also by several telescopists, attracted particular attention, and was regarded by the late Sir John Herschel as in itself demonstrative of the fact that the corona is a solar appendage.

It was not, however, until the solar eclipse of December 1871 that the evidence on this point became so convincing as to satisfy even those who had most strenuously main- tained the theory that the corona is merely a phenomenon of our own atinosphere. The spectroscopic and the photo-graphic evidence were alike important. Janssen, with the spectroscope, succeeded in recognising, besides the bright lines already seen, others less bright, but manifestly belong- ing tothe corona. He also perceived a faint continuous spec- trum, crossed by dark lines, and therefore presumably due to reflected solar light, which, since our upper air near the sun's place, in total eclipse, is demonstrably not illuminated by sunlight, can have come only from matter in the true corona, such as meteoric flights, vapour clouds, or the like, capable of reflecting the light of the sun. The photographers met with equally decisive success. Lord Lindsay's photo- grapher, Mr Davis, obtained a series of five pictures of the corona at successive stages of the totality, two of which were excellent and the remainder good. All these agreed perfectly in all respects, save only in the extent of the visible corona (depending, of course, on the conditions of illumination). It was demonstrated, therefore, that the features of the corona do not change during the progress of an eclipse at any given station; hence the corona cannot be a phenomenon depending on the passage of light-rays athwart inequalities of the moon's limb. For whether we regard such rays as illuminating our own atmosphere or matter between the earth and the

moon, the illumination would necessarily vary markedly, as the motions of the moon shifted the inequalities of her limb progressively athwart the light-rays. Again, Col. Tennant obtained a series of six photographs (five of which were very good), agreeing perfectly (always excepting differences of extent) with those obtained by Lord Lindsay's photo- grapher. Now Col. Tennant's station was at Dodabetta, near the highest peak of the Neilgherries, more than 10,000 feet above the sea level, while Mr Davis was stationed at Baicull, close to the sea-shore, and hundreds of miles from Tennant's station. The agreement of two series taken under such diverse circumstances, proves to demonstration that the photographers were not dealing with the illumina-

tion of matter in the upper regions of our atmosphere, no matter under what circumstances illuminated. Later, indeed, it was found that photographs taken at Java gave precisely the same features, so that, as Col. Tennant remarks in the latest communication on the subject (Monthly Notices of the Astronomical Society for June 1873), no one now supposes the corona to be other than a solar phenomenon.

The accompanying picture (fig. 32), carefully copicd from the first of Col. Tennant's series of photographs, will afford an idea of the nature of the corona's structure, though only an inadequate one, since photography can

present only a portion of an object like the corona, whose light is for the most part extremely delicate.

Fra. 832.—Solar Corona.

Another very curious phenomenon connected with the gun is the faint nebulous aurora which accompanies him, known by the name of the Zodiacal Light. This pheno- menon was first observed by Kepler, who described its appearance with sufficient accuracy, and supposed it_to be the atmosphere of the sun. Dominic Cassini, however, to whom its discovery has been generally but erroneously attributed, was the first who observed it

attentively, and gave it the name which it now bears. It is visible immediately before sunrise, or after sunset, in the place where the sun is about to appear, or where he has just quitted the horizon. It has a flat lenticular form, and is placed obliquely on the horizon, the apex extending to a great distance in the heavens. Its direction is in general nearly in the plane of the sun's equator, and for this reason it is scarcely visible in our latitudes, excepting at particular seasons, when that plane is nearly perpendicular to the horizon. When its inclination is great, it is either con- cealed altogether under the horizon, or it rises so little above it that its splendour is effaced by the atmosphere of the earth. The most favourable time for observing it is about the beginning of March, or towards the ver- nal equinox. 'The line of the equinoxes is then situated in the horizon, and the arc of the ecliptic is more elevated than the equator by an angle of 234°; so that the solar equator, which is slightly inclined to the ecliptic, approaches nearer to the perpendicular to the horizon, and the pyramid of the zodiacal light is consequently directed to a point nearer the zenith than at any other season of the year.

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Numerous opinions have been entertained respecting the nature and cause of this singular phenomenon. Cassini thought it might be occasioned by the confused light of an innumerable multitude of little 'planets circulating round | the sun, in the same manner as the Milky Way owes its | appearance to the light of agglomerated myriads of stars. | Its resemblance to the tails of comets has been noticed by Cassini and others. Mairan, following Kepler, ascribed it to the atmosphere of the sun. This hypothesis was generally adopted until Laplace showed it to be untenable, because no atmosphere could rotate with the sun if extend- ing beyond the distance where centrifugal force is balanced by gravity, and this distance lies far within the observed range of the zodiacal light.

The general opinion respecting the zodiacal light at the present day is, that it forms the outer part of the solar i, corona, so that if the light of the sun could be for a time obliterated without rendering his appendages invisible, we | should see the corona as shown in the preceding figure, | merging

gradually into the faint glow of the zodiacal light. It must not be understood, however, that this theory in any sense implies a continuity of substance between the zodiacal light and the corona, any more than what has been discovered respecting the corona implies that the corona is a true solar atmosphere. All that is to be understood is, that (1) the inner corona, (2) the outer radiated corona, and (3) the zodiacal light, form part of the series of appendages surrounding the orb of the sun.

*It is to be noted, indeed, that the true atmosphere of the sun appears to underlie even the sierra. It had been noted by Secchi in 1869, that on the very limb of the sun the solar spectrum becomes continuous ; and he inferred that there must exist an atmosplire (relatively very shallow), Young's consisting of the vapours which occasion the dark lines of — the solar spectrum, and that the brightness of the lines of *P"*™™ these vapours corresponding very nearly to the brightness of the ordinary solar spectrum for the parts of the sun very near to the edge, the dark lines of the latter spectrum are as it were cancelled, and so a continuous spectrum is pro- duced. This view was shown during the eclipse of December 1870 to be perfectly correct; for Prof. Young, directing his analysing spectroscope to the part of the sun's limb which was to disappear last, found that at the instant when totality commenced, the solar spectrum was suddenly replaced by a spectrum consisting of thousands of bright lines, that being precisely the kind of spectrum which Secchi's theory required. This observation was success- fully renewed during the eclipse of December 1871, and again during the annular eclipse of June 1872. On the latter occasion the remarkable circumstance was noted, that while the bright-line spectrum was only visible for a second or two on the eastern limb (just before the formation of the ring), it was visible for six or seven seconds on the western limb (just after the annulus was broken). 4*

Carrer VIIL—The Inferior Planets Mercury and Venus.

Mercury is a small body, but emits a very bright white Mercury. light, though he is seldom to be seen, always keeping near / the sun.

Mercury is about 3060 English miles in diameter, and his mean distance from the sun about 35 millions of miles. | On account of his smallness and brilliancy, it is extremely difficult to find any spot on his disk so distinctly

marked as to afford the means of determining his rotation. An attentive observation of the variations of the phases of Mercury led Schroter to infer that the planet revolves about its axis in a period of 24 hours 5 min. 30 sec. M.) Harding discovered in 1801 an obscure streak on the | southern hemisphere of the planet, the observations of

Venus.

VENUS. |

which, together with those of a spot discovered by Schroter, gave the same period of rotation. Schroter states that Mercury's form is spherical, exhibiting no sensible compression ; that his equator is very considerably inclined to his orbit, and the differences of his days and seasons must consequently be very great; and that there are mountains on his surface which cast very long shadows, and of which the height bears a greater proportion to the diameter of the planet than those of the Earth, the Moon, or even of Venus. The height of Chimborazo is Tory of the radius of the earth ; one of the mountains in the moon has been estimated at s+, of her radius; the highest in Venus at yf; and one in Mercury at ;4,. But recent observations render it exceedingly doubtful how far Schroter's observations can be trusted. There are no observations to prove decisively whether Mercury is sur- rounded by an atmosphere.

Venus, the most beautiful object in the heavens, is about 7510 English miles in diameter, and is placed at the distance of 66 millions of miles from the sun. Although the oscilla- tions of this planet are considerably greater than those of Mercury, and she is seldom invisible, yet on account of the uniform brilliancy of her disk, it is extremely difficult to ascertain the period of her rotation. Dominic Cassini, after having long fruitlessly attempted to discover any object on her surface so well defined as to enable him to follow its motions, at length, in 1667, perceived a bright spot, distant from the southern horn a little more than a fourth part of the diameter of the disk, and near the eastern edge. By continuing his observations of this spot, Cassini concluded the rotation of Venus to be performed in about 23 hours; but he does not seem to have considered this conclusion as deserving of much confidence. In the year 1726 Bianchini, an Italian astronomer, made a number of similar observations for the same purpose, from which he

inferred that the rotation of the planet is performed in 24 days 8 hours. The younger Cassini has shown, however, that the observations of Bianchini, as well as those of his father, could be explained by a rotation of 23 hours and 21 or 22 min. whereas the rotation of 24 days 8 hours cannot be reconciled with the appearances observed by the elder Cassini. astronomers as the more probable of the two, particularly as Bianchini was not able to make his observations in a connected manner, because a neighbouring building inter- cepted his view of the planet, and obliged him to transport his telescope to a different situation. The question of the rotation of Venus was again attacked by Schroter, who found it to be performed in 23 hours 21 min. 19 sec. Each of the three observers found the inclination of the axis of rotation to the axis of the ecliptic to be about 75°. Much doubt, however, still exists with respect to the value of this element which De Vico sets at little more than 50°.

Schroter's observations of this planet were principally directed to a mountain situated near the southern horn. The line which joins the extremities of the horns is always a diameter; and the horns of the crescent of a perfect sphere ouglit to be sharp and pointed. Schroter remarked that this was not always the case with regard to the horns of Mercury and Venus. The northern horn of the latter always preserved the pointed form, but the southern occa- sionally appeared rounded or obtuse,—a circumstance which indicated that the shadow of a mountain covered the part ; but beyond the horn he remarked a luminous point, which he supposed to be the summit of another mountain, il'uminated by the sun after he had ceased to be visible to the rest of that hemisphere. Now, in order that the horn of the crescent may appear obtuse in consequence of the shadow of a mountain falling upon it, and another moun- tain may present a luminous point, the two mountains must

The deterniination of Cassini was regarded by

be at the same time both at the ede of the disk and on the line separating the dark from the enlightened part of the planet. But this position cannot be of

long continuance. Rotation will cause the bright point to rise into the enlightened part, or sink into the dark hemisphere, and in either case the mountain will cease to be visible. If, how- ever, the rotation is completed in 23 hours 21 min., the mountain will appear 39 min. sooner than it did on the previous day. Hence it is possible to obtain several consecutive observations, from which an approximate value of the period may be found ; and this being once obtained, it may be rendered still more exact by observations separated from each other by a longer interval. Thus Schroter found that an interval of 20 days 11 hours 15 min. between two appearances of the mountain being divided by 23 hours 21 min. gave 21-04 revolutions ; and that intervals of 121 days 14 hours 25 min., 142 days 1 hour 40 min., 155 days 18 hours 11 min., divided each by 23 hours 21 min., gave 125-01, 146-02, 160-09 revolutions respectively. All these comparisons prove that the revolution of 23 hours 21 min. is somewhat too short. They ought to have given 21, 125, 146, and 160 revolutions exactly, supposing the observa- tions to have been perfectly accurate. On dividing the intervals by 21, 125, 146, and 160 respectively, the quotients will be each the time of a revolution very nearly ; and by taking a mean of the whole, the most probable result at least will be obtained. In this manner Schroter found the period of rotation already stated, namely, 23 hours 21 niin. 19 sec.

Since the time of rotation of Mercury and Venus is nearly equal to that of the earth, the compression of these planets at the poles, which results from the centrifugal force, ought also to be nearly in the same proportion. But at the distance of the earth the compression must be imperceptible even in the case of Venus; for, supposing it to amount to 545, the difference between the radius of her poles and that of her equator would only amount to a tenth of a second as seen from the earth.

During the transits of Venus over the sun's disk in 1761 Phenomena and 1769 a sort of penumbral light was observed round the of transits.

planet by several astronomers, which was occasioned, without doubt, by the refractive powers of her atmosphere. Wargentin remarked that the limb of Venus which had gone off the sun showed itself with a faint light during alinost the whole time of emersion. Bergman, who observed the transit of

1761 at Upsal, says that at the ingress the part which had not come upon the sun was visible, though dark, and was surrounded by a crescent of faint light; but this appearance was much more remarkable at the egress ; for as soon as any part of the planet had disengaged itself from the sun's disk, that part was visible with a like crescent, but brighter. As more of the planet's disk disengaged itself from that of the sun, the part of the crescent farthest from the sun grew fainter, and vanished, until at last only the horns could be seen. The. total immersion and emersion were not instantaneous; but as two drops of water, when about to separate, form a ligament between them, so there was a dark shade stretched out between Venus and the sun; and when this ligament broke, the planet seemed to have got about an eighth part of her diameter from the limb of the sun. The numerous accounts of the two transits which have been published abound with analogous observations, indicating the exist- ence of an atmosphere of considerable height and density. During the transit of 1874 these appearances were so satis- factorily seen, that no doubt can remain as to their reality. Schréter calculated that the horizontal refraction of the atmosphere of Venus must amount to 30' 34", differing little from that of the terrestrial atmosphere. A twilight which he perceived on the cusps afforded him the data from

little reliance can be placed.

The atmosphere of Venus has been analysed with the

spectroscope by Vogel, and the existence of aqueous vapour is regarded as demonstrated. On the occasion of the late transit (1874) Tacchini made spectroscopic observations, which seem more satisfactorily to establish the fact that there is water on Venus, than Vogel's observations. Cassini and Montaigne imagined that they had observed a satellite accompanying Venus ; but this appears to have been an optical illusion arising from the strong light of the planet reflected back from the convex surface of the eye upon the eye-glass of the telescope, and thence reflected a

second time back to the eye. During the transits of Venus in 1761 and 1769, and in the late transit of 1874, no trace

of a satellite was seen ; and there can be now no doubt whatever that Venus is without a satellite.

Cuaprer IX.—The Earth regarded as a Planet—Figure and Mass of the Earth—Precession of the Equinoxes— The Shape and Position of the Earth's Orbit—Dis-

tance from the Sun—Transit Observations.

The earth is the third meniber of the solar system in order of distance from the sun. From what has been already shown, in determining the relative position of the earth and the celestial bodies seen in our skies, we know that the earth is a globe, rotating on her axis once ina day, and circling around the sun inan orbit of great extent ouce in a year. In the present chapter we propose to present the results of more exact inquiries into the figure and motions of the earth.

It has been found by numerous and accurate experiments, that the lengths of arcs of 1° on the same meridian are greater in proportion as we advance nearer the pole. Hence, on account of the similarity of the isosceles triangles of which these arcs form the bases, their sides, ~~or the terrestrial radii, must also be longer, and consequently the convexity of the earth is less towards the poles than at the equator. The surface of the earth is extremely irregular, even independently of the inequalities occasioned by mountains and cavities ; yet it has been discovered that the meridional curves differ almost insensibly from ellipses ; whence it is concluded that the figure of the earth is an ellipsoid of revolution about its shortest axis. In compar~~ ing the results of the various measurements which have been made with the formule belonging to the dimensions of such a body, this conclusion has been fully verified ; and the lengths of the arcs, the ellipticity, the distance of the pole from the equator, and, in short, all the elements of the spheroid, have been determined.

An arc of the meridian in India was measured by Colonel Lambton in the early part of this century. But its value has been much increased by Colonel

Everest's extension of the arc. The arc of Lambton, extending from Punne (lat. 8° 9' 35") to Damargida (lat. 18° 3' 15"), was measured after the model of the English trigonometrical survey. From Damargida, where Lambton's arc terminated, another was measured by Colonel Everest to Kaliana (lat. 29° 30' 48"), a space of 797 miles, covering an arc of 11° 27' 33", the latest geodetical improvements being introduced. The whole extent of Lambton's and Colonel Everest's operations includes a continuous arc of 21° 21' (1477 miles). The work was rivalled in extent by a vast operation executed in Russia and other northern countries of Europe, by which an are of 25° 20', extending from the banks of the Danube to the shores of the Arctic Sea, near the North Cape, was measured under the general super-intendence and direction of W. Struve. |

The ares of India and of Russia include a space from lat.

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which he deduced this conclusion, on which, however, very

justly regards as less trustworthy, "makes the ellipticity of

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8° to lat. 71°, with the exception of only about sixteen degrees, and are unquestionably the most important which exist for the determination of the earth's figure. When to them we add the French arc of 12° 22' in a medium latitude, it will scarcely be necessary to take into account any other, at least for the northern hemisphere.

The following brief details of the Russian arc are taken from M. Struve's report of 1852 :—

The southern extremity of the Russo-Scandinavian arc is Ismail on the Danube (lat. 45° 20°), the northern ex- tremity is Fuglenaes, on the island of Qualoe, in Finn- marken (lat. 70° 40'). The interval from Tornea to Fuglenaes (4° 49') was measured by Swedish and Norwegian engineers ; all the remainder by those of Russia, and, in particular, by M. Von Tenner, who, with M. Struve, from 1816 directed the whole operation.

The calculation of the figure of the earth from the com- pleted Russian arc indicates an ellipticity somewhat greater than that generally received. The results obtained by Colonel Everest, on the other hand, by comparing his arc with those of Europe, give.geucrally small ellipticities, that is, under y¢5. The French and Indian arcs, for instance, give z1,. The determinations by means of the pendulum are somewhat larger. The extensive observations of Colonel Sabine and Captain Foster concur in giving an ellipticity of ;1,, but the French experiments by Duperrey and Freycinet lead to a result considerably greater. The discrepancy between the geodetical and pendulum results may, of course, be a real one depending on local variations of density. The astronomical determination from the lunar inequalities, which might be expected to concur with the results of the pendulum, gives 543 28 @ mean. Captain A. R. Clark, R.E., combining all the results obtained up to the year 1860, arrived at conclusions thus stated by Sir J. Herschel :—"'The earth is not exactly an ellipsoid of revolution. The equator itself is slightly elliptic, the longer and shorter diameters being respectively 41,852,864, and 41,843,096 feet. The ellipticity of the equatorial cir- cumference is therefore z #3, and the excess of its longer over its shorter diameter about two miles. The vertices of the longer diameter are situated in longitude 14° 23' E. and 194° 23' E. of Greenwich, and of its shorter in 104° 23' BE. and 284° 23' E. The polar axis of the earth is 41,707,796 feet in length, and consequently the most elliptic meridian (that of longitude 14° 23' and 194° 23') has for its ellipticity ;2,-s, and the lcast (that of longitude 104° 23' and 284° 23') an ellipticity of zyg-3-"

General Schubert, using a method which Sir J. Herschel

the equator sgs5, and places the vertices of the longer axis 26° 41' to the eastward of Captain Clark's. His polar axis, as deduced from each of the three great meridian ares, the Russian, Indian, and French respectively, is 41,711,000 feet, 41,712,534 feet, aud 41,697,496 fcet, the mean of which, giving to each a weight proportional to the length of the arc from which it is deduced, is 41,708,710 feet."

The figure and volume of the earth being thus determined, Earth's we require only to ascertain its mean density in order to as & know its mass.

But this problem has not been solved, — probably cannot be solved, with any very near approach to exactness. Various methods have been employed, the mere description of which suffices to show the difficulty and uncertainty of the subject.

The deviation of the plumb-line from the vertical in the Mountain neighbourhood of a mountain had been pointed out by oe Newton! as a direct method of dealing with the problem al

1 De Mundi Systemate, § 22. Newton, in a very remarkable pas- sage of the Third Book of the Principia (Prop. X.), conjectures that | "the quantity of matter in the earth may be five or six times greater than if the whole were composed of water.")

Cavendish experi- ment.

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pointing out the form in which the experiment nught be made, and of making the trial, though in a rude and insufficient manner, in the Peruvian Andes in 1738. Maskelyne proposed to the Royal Society in 1772 to repeat the observation on some British mountain. Skiddaw and the Yorkshire Hills were first thought of, but finally Schihallion in Perthshire was preferred. The distance between the two stations, obtained with Ramsden's 9-inch theodolite, was 4364:4 feet, which in the latitude of

difference of latitude by 337 observations with Sisson's 10-feet zenith sector was 54'-6. The excess, or IY 6 8 the double attraction of the hill drawing the plumb-line towards itself at the two stations. The sine of this angle, or y7sy7 Tepresents the actual ratio between the double attraction of the hill and the attraction of the earth. But by the computation of the attraction which the hill ought to exert, from its figure, as determined by Maskelyne's gauges, were its density the same as that of the globe generally, this ratio should amount to 5,45, which can only be accounted for by assuming the earth to be denser on the average than the hill of Schihallion in the proportion of 17,804 to 9933. A careful lithological survey of the hill enabled Professor Playfair to deduce the probable mean specific gravity of the globe to be between 4°56 and 4°87.

A second method was devised by the Rev. Mr Michell, but first put in practice by Mr Cavendish in 1797-8. It consisted in measuring the force of gravitation between two spheres of such small size that they could be moved by the hand nearer to or farther from one another. To provide a balance so delicate as to measure the almost inappreci- able attraction of such small bodies, Michell imagined the balance of torsion. His apparatus came into the hands, first of Wollaston, then of Cavendish, who made the experiment. He used a very light rod of deal, six feet long, suspended by a fine silver or copper wire, forty inches long, within a wooden case to defend it from currents of air. At each end of the lever was hung a ball of lead, two inches in diameter, and by a simple contrivance a pair of leaden spheres, weighing together 348 pounds, could be brought simultaneously into the neighbourhood of the balls (but outside the case), on opposite sides, so that their attractions might concur to swing the suspended lever out of the posi- tion of repose which it had previously taken up, under the action of the slight twisting force of the silver wire. A hew position of rest was thus established, the small balls being pulled as much one way by the attraction of the spheres as they were urged in the opposite direction by the torsion of the wire. The position of repose being observed from a distance by a telescope (to avoid disturbance from the heat of the observer's body), the great spheres were then changed in position so as to act upon the opposite sides of the small balls, from what they formerly did. The deflection and new stable position would be as much on the other side of the zero, and the arc described would be an accurate measure of the double deflection. The force of torsion for one degree of deflection is known by the time of oscillation of the lever and balls when free, and as the forces are exactly as the angles, the force corresponding to any displacement becomes known. Cavendish found the joint attraction of the small balls and large spheres to be about 7,5 of a grain, their centres being 8°85 inches apart, and he thence computed the density of the earth to be 5°48 times that of water. The experiment has been repeated since by Reich of Freiberg and Baily of London. The former obtained 5°44, the latter 5°66 for the earth's specific gravity,—this last result being worthy of much confidence, from the extraordinary care taken to avoid errors and to obtain independent values of the quantities sought.

determining the earth's density. Bouguer had the merit of

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*A third method of determining the earth's density Pendulum depends on the fact that a pendulum suspended at a &*Peti- considerable height above the earth would swing more ™¢2%- slowly than at the surface, while if it be at the summit of a mountain, though it will still swing more slowly, the attraction of the mountain will slightly accelerate the rate of swing. Carlini and Plana, by observations made on this plan, have deduced 4°950 for the mean density of the earth.*

The objection to this method, as well as to the Schihallion

rdolit | experiment, resides in our uncertainty as to the actual Schihallion corresponds to 42"-94 of latitude. The observed

mean density of any given mountain mass If the experi- ment could be carried out by pendulum observations made at the base and on the summit of a conical or conoidal mass, of some known material and of great height, the true density of the earth could thence be very accurately determined.

A similar objection applies to the converse of the third method described above. If a pendulum be suspended at the bottom of a deep mine, of known figure, and existing in a region whose geological structure is well known, the change of rate gives a means of calculating the deusity of the earth, since it obviously depends on the calculable difference of attraction due to increased proximity to the earth's centre (reducing the attraction), and to the absence of counter-attracting matter where the mine is dug out (which in effect increases the attraction). In the Harton colliery, experiments were carried out by Mr Dunkin on this plan in accordance with arrangements devised by the astro- nomer royal. It was found that gravity was increased by tetvpth part at the lower station, 1260 feet below the mouth of the mine, where the upper station was placed. Hence Airy found that, on taking into account the con- figuration of the mine and the structure of the surround- ing region, a density of 6°565 resulted. Very little reliance can be placed, however, on results obtained by this method.

It may be fairly assumed that the earth's mean density amounts to about 5°6 times the density of water, combin- ing which with the known dimensions of the earth, we find that the earth's weight in tons 'may be roundly ex- pressed by the number 6,000,000,000,000,000,000,000.

We have next to inquire into the rotation of the earth Position of about its axis, and especially into the position of that axis, earth'saxis. In Chapter I. we considered the axis as fixed in position ; or, seeing that the earth circles around the sun, we re- garded the axis as moving always parallel to itself, while the earth traversed her path in the plane of the ecliptic. But we must now take into account variations in its position with reference to the ecliptic. In this inquiry we should naturally take the ecliptic as our plane of reference, if we were assured that the position of the plane of the ecliptic is constant,—in other words, that the sun's path in the heavens undergoes no change. This is, in fact, so nearly the case that the ecliptic forms a suitable reference circle for the fixed stars—far more suitable for example than the equator itself. The star's latitude, that is, its distance from the ecliptic measured on the arc of a great circle through the poles of the ecliptic, is very nearly constant ; while the longitude, or the distance between the point T and the point where the great circle through the star cuts the ecliptic, undergoes, as will presently appear, a varia- tion nearly uniform, and nearly the same for every star ; whereas the declination and right ascension of stars are undergoing variations which are neither alike for different stars nor uniform for any star. Yet the place of the ecliptic on the heavens is not absolutely constant. The ecliptic," in fact, is inclined about 14° to the invariable plane mentioned at the end of Chapter V1, and this inclination is undergoing a slow process of change, while the nodes of the ecliptic on it are slowly shifting, A

result of this is that the obliquity of the ecliptic is chang- ing, for the mean inclination of the earth's axis to the invariable plane does not change, so

that the mean inclina- tion of this axis to the ecliptic must neccssarily change. At present the obliquity of the ecliptic—that is, the inclina-

obliquity of tion of the equator to the ecliptic—is diminishing ; and

ecliptic.

Precession of the equinoxes.

this process, which has been going on for many centuries, will continue for a long time yet to come, after which the obliquity will increase, the total range on either side of the mean value amounting to about 3°. The various observa- tions and traditions by which the progressive diminution of the obliquity is confirmed have been collected by Bailly. The following table contains those which appear to be the best authenticated, as well as the results of some more recent observations, from which the present value of the obliquity and the rate of its diminution may be de- duced :—

OO __ eel

Year Name of Observer. Obliquity. Before Christ. . ! Z 1100 | Tchcou-Kong….....+... ++. Beeson 23 54 3 Eratosthenes, confirmed by Hip- – parchus and Ptolemy . Soom a TG \WRiecOhimesen ce… cascecer cree secre 23 45 52 After Christ. 827 | Arabians at Baghdad….....++ 23 33 52 880 | Albategni….....ccccccerecee seco eee eee ees 23 35 40 1150 Dihaneinerne BEARER con: ccs con os cnoancender 23 33 30 WO7ZS || Whey Oliinesetnesscace—s.s-+ ~~oncccee~~ =: 28, cae, 2 1437 | Ulneh Beek… cee ee ae 58 HOO) | WAIGHOES....cc.c0c.000cc0 wascceees-s- seal ee 47 1590 | Tycho. .....:.:see cee seeeee ce ee eee ees 238 29 52 TG” |) LOI! ols cononoee 293 30 20 TaD | TBlexpal tins oo seeeebeeseece sea snesesconcodee 23 29 10 TG || (ClassiiiticacsaanpuquesdecetnonsS cise ueante 23 29 00 1690 PieimenieGel aseapaneeoneaeocsee soeonsoscde 23 28 48 OSs | Bvemehiniler eee. ~~2~~ sees) os eee esos nee 22 28 35 W786ae || Come amine ese eee eern = 23 28 24 1743 | Cassini de Thury…..... | 238 28 26 1750 Teen | es aear Sem eR eGocice.dic 93 28 19 TV75b | rahe. oc… .0ne2- 02-2: een ene enerae 23 28 V5 1756 | T. Mayer 28) 228 SG 1769 | Maskelyne…..... c.cccceseeeeeee cee eee 23 28 10 1780 (Goes ceccssass cs sscnemauade tical ae ems 1800 | Maskelyne…..... .....cccccnc

—.] Op ae 56°6 IIe ee aawelc eins aco se ees se 93 2 Dbs3 WeMSHITG oo .cc acco cnc Qtees- |) ee a SP 1813 |MRetidwareccceeneeecs-| ge ta MERGE 1815 Bessellssccnsenesias «: qoeeeemtiecacrcasicns 23 27 47°46 1816 | Brinkley….....csgsshnuccs ssseers 23 27 49°21 1825 9) Pearsonees: sce ss seueneeeesr ert ae 23 27 44°01

Although the comparison of these observations with one another gives very discordant results relatively to the law according to which the obliquity varies, their totality places the fact of its progressive diminution be yond all manner of doubt. It amounts to about 453" per century at present, and may be regarded as uniform for many centuries to come.

The longitudes of the stars, as has already been mentioned, are measured on the ecliptic from the vernal equinox ; and therefore, if the line of the equinoxes, which is the same as the line of the nodes, is invariable, the longitude of any star will always be the same, whatever interval of time may elapse between two observations of that longitude. But on com- paring the actual state of the heavens with the observations recorded by ancient astronomers, it is perceived that the longitudes of all the stars are considerably increased. The phenomenon is to be explained by attributing to the equi- noctial points a retrograde motion from east to west, in con- sequence of which the sun, whose motion is direct, arrives at them sooner than if they remained at rest ; and therefore

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the equinoxes, and spring, autumn, and the other seasons, happen before the sun has completed an entire circuit, On this account the motion has been denominated the Precession of the Equinoxes. As this motion is extremely slow, its exact amount can be discovered only by a comparisou of observations scparated from each other by long intervals of time. he comparison of modern observations with those of Hipparchus gives as its annual amount 502%, The mean result of the observations of Tycho, compared with those of Lacaille, gives 50}”. On comparing modern observations with one another, we find 50’-06. Delambre, in his solar tables, supposes the annual precession to be equal to 50’“1. According to

this estimate the equinoctial points go backwards at the rate of 1° in 71°6 years nearly, and therefore will make a complete revolution of the heavens in about 25,868 years.

The diminution of the obliquity of the ecliptic arises from the displacement of the ecliptic itself ; the precession of the equinoxes is, on the contrary, occasioned by the con- tinual displacement of the plane of the terrestrial equator. This displacement results from the combined action of the sun aud moon (for the influence of the planets amounts

| only to a fraction of a second, and is consequently scarcely

sensible) on the mass of protuberant matter accumulated about the earth's equator, or the matter which forms the excess of the terrestrial spheroid above its inscribed sphere. The attracting force of the sun and moon on this shell of matter may be resolved into two ; one parallel to the plane of the equator, the other perpendicular to it. The tendency of this last force is to diminish the angle which the plane of the equator makes with that of the ecliptic ; and if the earth had no motion of rotation, it would soon cause the two planes to coincide. In consequence, however, of the rotatory motion of the earth, the inclination of the two planes remains constant ; but the effect produced by the action of the force in question is, that the plane of the equator is constantly shifting its place, in such a manner that the line of the equinoxes advances in the direction of the diurnal motion, or contrary to the order of the signs, its pole having a slow angular motion about the pole of the ecliptic.

If the sun and moon moved in the plane of the equator, there would evidently be no precession; and the effect of their action in producing it varies with their distance from that plane. 'Twice a year, therefore, the effect of the sun in causing precession is nothing ; and twice a year, namely, at the solstices, it is a maximum. On this account the obliquity of the ecliptic is subject to a semi-annual yariation; for the sun's force, which tends to produce a change in the obliquity, is variable, while the diurnal motion of the earth, which prevents the change from taking place, is constant. Hence the plane of the equator is subject to an irregular motion, which is technically called the Solar Nutation. 'The existence of the solar nutation Nutation is, however, only a deduction from theory, for its amount:

is too small to be perceptible by observation ; but a simi- lar effect of the moon's action is sufficiently appreciable, and was, in fact, discovered by Bradley before theory had indicated its existence. Its period, however, is different, and depends on the time of the revolution of the moon's nodes, which is performed in 18 years and about 7 months. During this time the intersection of the lunar orbit with the ecliptic has receded through a complete circumference ; and the inequality of the moon's action will consequently, in the same time, have passed through all its different degrees. Bradley observed that the declinations of the stars continued to augment during nine years, that they diminished during the nine years following, and that the greatest change of declination amounted to 18". He remarked further, that this motion was connected with an

Change of

| eccentricity the sun is indicated in the elements (p. 782). Plate XXVII.

and peri- | helion of earth's arbit.

THE EARTH. | ASTRONOMY 795

greater in the summer half than in the winter half of the orbit. Thus the winter cold is less enduring than the summer heat. In the southern hemisphere all these rela- tions are reversed. The summer heat is rendered more intense by the greater proximity of the sun. the winter cold is intensified by his increased distance. The summer heat is less enduring than the winter cold. We have in the north a relatively short but moderate winter (so far as the sun's proximity can moderate winter cold), and a long but also moderate summer; in the southern hemisphere they have a short and intensely hot summer, a long but also intense winter. he presence of a great expanse of sea in the southern hemisphere partially tends to moderate the seasonal changes; but we see in the wider extension of the antarctic snows the effect of the long and cold winter and the short summer. We have, however, referred to these considerations lesson account of their intrinsic importance, than to show how the eccentricity of the earth when near its maximum value, and when the perihelion was differently situated from its present position, may have caused the condition of the two terrestrial hemispheres to differ from that now existing. The present value of the

eccentricity is nearer the minimum than the maximum value, though the perihelion is at present so placed as to produce almost the maximum possible difference between the two hemispheres, with the present degree of eccentricity. ‘ It must not be supposed that the eccentricity, in obedience to the law relating to planetary eccentricities (Chapter VI), oscillates between the absolute maximum and the absolute minimum, the perihelion shifting continuously forwards. On the contrary, the successive maxima and miniina are very unequal, and are attained after very unequal intervals ; while the perihelion, apart from short periods of regression, and though always progressing on the whole in any considerable period, yet progresses at very uncqual rates in different periods. This will be seen from the following table, presenting the eccentricity as calculated for different epochs from 1,100,000 years before our present era till now, chiefly by Mr James Croll, but partly from Leverrier and Stone:—

irregularity of the precession of the equinoxes, which followed exactly the same period ; whence he concluded that the motion of the poles of the equator, occasioned by this vibration of its plane, was not confined to the solstitial colure. A series of observations on stars differently situated proved that all the phenomena could be explained on the hypothesis that the pole of the equator describes in 18 years a small circle of 18” diameter, contrary to the order of the signs; or that the axis of the earth, following the circumference of this circle, describes the surface of a, cone, the axis of which forms with its side an angle of 9”. This apparent vibratory motion is denominated the Vutation of the Harth’s Axis.

Bradley remarked that the effects of the nutation would be represented still more accurately by supposing tue curve described by the pole of the equator about its mean place to be, not a circle, but an ellipse, the transverse and con- Jugatc axes being 18” and 16” respectively. This is also confirmed by theory, from which Laplace calcalated the semi-axes of the ellipse at 9-63 and 7”-17, The semi- transverse axis of the ellipse described by the pole in virtue of the sun’s action alone does not exceed half a second, and is therefore scarcely appreciable. The sensible part of the nutation follows exactly the period of the revolution of the nodes of the moon. By 603 observations of Polaris, made at Dorpat between 1822 and

1838, M. Peters has determined the semi-axis major of the ellipse to be 92361, and gives, for his definitive result, 9’-2231.

We must draw a distinction then, between the mean and the true or apparent obliquity of the ecliptic. The mean obliquity is the obliquity calculated for any particular date on the supposition that there is no nutation, while the true obliquity is that quantity increased or diminished by the nutation. The progressive diminution of the mean obliquity and the nutation of the earth’s axis are inequalities distinguished from each other, not only by their being derived from different and distinct causes, but still more by the very great difference of time required for their full development.

The path in which the earth at present travels around

| Eccentricity, Longitude || Eccentricity fongiude

0

Years B.C. | of Earth’s to} | Years B.C. | of Earth’s Orbit. Perihelion. | Orbit.

-|-——_— SE

4

1,100,000} 00308 | 54 12 || 720,000] 0-0422

also shows the varying rate at which the carth moves owing to the eccentricity of her orbit. It will be seen also from that plate, and more precisely from the table of elements,

Perihelion.

125 14

that the perihelion of the orbit lies near the place of the 1,050,000| 00326 4 8 | 710,000] 0-0307 | 177 96 winter solstice, so that, in fact, about ten days after} {1,000,000| 0-0151 | 248 22 | 700,000] 0-0220 | 208 13 midwinter of

the northern hemisphere the carth is at her 990,000 | 0°0224 | 313 50 ||——)—_____}_____

141

980,000} 0°0329 | 358 2 650,000 | 0°0226

32

970,000} 070441 | 32 40 | 600,000] 0-0417 960,000 | O:0491.| G6 4o ||—___ es 950,000| 0:0517 | 97 51 550,000] 0-0166 940,000 | 0:0495 | 127 42 | 500,000] 0-0388 930,000} 0-0423 | 156 11 |

920,000] 0-0305 | 181 40 || 450,000] 0-0308 910,000} 0°0156”} 194 15 | 400,000] 0-0170 900,000} o:0102 | 185 2 ||————_j- —_____|_—____|_—__—_|_ 350,000] 0-0195 890,000] 00285 | 127 1 || 300,000! 0-0424 | 93 29 880,000 | O-0456 | Ub ite ee 870,000} 0:0607 | 180 23 | 250,000] 0:0258 860,000} 0-0708 | 209 41 | 240,000] 0-0374 850,000 | 0°0747 | 239 28 230,000] 00477 840,000] 0-0698 | 269 14 220,000] 0-0497 830,900 | 0-0623 | 298 28 210,000] 0°0575 820,000} 0°0476 | 326 4 200,000} 0-0569

nearest to the sun. An important difference thus exists between the seasons of the two hemispheres. In the northern we have the sun farthest from us a few days after midsummer, while at the corresponding season in wintcr the sun is at his nearest. So far, then, as the sun’s distance is concerned, the seasons are rendered more moderate for the northern hemisphere by the effects of the earth’s eccentricity. Nor is the difference on this account by any means inconsiderable. The sun in aphelion is farther from us than in perihclion in the proportion of about 61 to 59, an! the earth receives more heat in the proportion of about 31 to 29, or roughly, about ;},th more heat in aphelion than in perihelion. ‘There is also a difference due to the varying rate of the earth’s real (that

is, of the sun’s apparent) motion. In winter the earth 810,000 | 0-0296 | 348 39 |—__—__|___ moves more rapidly than in summer, really as 61 to 59, 800,000 | 0°0132 | 343 49 || 190,000] 0-0532 | 190 : ———-—|_____| 180,000} 0-0476 | 209

but the apparent change of the sun's rate of motion along the ecliptic is as 31 to 29, because the increased rate is magnified by the earth's greater proximity. Hence the interval from the autumnal to the vernal equinox is shorter

790,000 | 0°0171 | 293 19 | 170,000] 00437 780,000 | 0°0325 | 303 37 | 160,000} 0:0364 770,000 | 070455 | 328 38 || 150,000] 0:0332 760,000} 0:0540 | 357 12 | 140,000] 0:0346

than the interval from the vernal to the autumnal equinox. 750,000 | 0°0575 A ae | seine one = This also is shown by Plate XXVII., where the number of 740,000 | 0°0561 | 58 , ee ae y ; 730,000 0:0507 | 90 55 || 110,000| 0-0460 | 293 48

divisions marking the earth's daily journey is seen to be

Determina- tion of sun's dis- tance,

Parallax of Mars.

Transits of Venus.

796

Eceentricity, Longitude Eccentricity| Longitude | Years B.C. | of Earth's of Year A.D. | of Earth's of { Orbit. Perihelion. | Orbit. Perihelion. | ° y? ° 100,000 | 0°0473 | 316 18 1850 | 0°0168 | 100 oy) 90,000; 0°0452 | 340 2 89,000} 070398 4 18 | To these add Croll's special | 70,000} 0°0316 27 22 calculation for the maximum 60,000} 0:0218 48 8 || eccentricity between 851,000 | 50,000} 0°0131 50 3 B.c. and 849,000 B.c. 40,000 | 0:0109 28 36 30,000] 0°0151 5 50 851,000 | 0°07454 20,009; 0°0188 44 0 850,000 | 0074664 10,000} 0°0187 78 28 849,500 | 0°07466 ees ees Sar it 0| 0-0168 |

While the shape of the earth's orbit and the position of its centre (whose longitude = long. of perth. + 180°) thus undergo continual alteration, her mean distance from the sun remains appreciably constant. This we know from the length of the year, which certainly has not changed ten seconds in length since the time of the Chaldean determina- tion of that element.

There are various ways of determining the sun's distance from the earth in terms of the earth's semidiameter. The distance of a planet from the sun may likewise be obtained if we can find the means of measuring its distance from the earth at any epoch, for the geocentric positions of the sun and the planet being known from the theory of their motions, the radius vector of the orbit, or planet's distance from the sun at that epoch, may be found by a simple trigonometrical computation. To determine the distance of a planet from the earth, it might seem only necessary to determine its horizontal parallax; but in general the parallaxes of the planets are quantities by far too small to be directly observed. That of Mars, however, becomes very appreciable in particular circumstances, that is to say, when Mars is in opposition with the sun, and at the same time near the perihelion of his orbit. Thus, in the year 1751, on the 6th of October, that planet, being near his opposition, was observed at the same instant of time by Lacaille at the Cape of Good Hope, and by Wargentin at Stockholm; and the horizontal parallax deduced from the two observations, was found to amount to 24"°6, corre- sponding to a solar parallax of 9"°4.

This method requires that observations should be made from opposite sides of the earth; but Flamsteed long ago pointed out that the distance of Mars might be determined by observing how much the planet's place is shifted by the diurnal rotation of the earth. Both methods have been employed very successfully in modern times. Stone, of Greenwich, by combining the two methods, discussing obser- vations of Mars at the opposition of 1862,—iade (1), at Greenwich, (2), at Greenwich and Cape Town, and (3), at Greenwich and Williamstown,—deduced a solar parallax of 8-943. Winnecke, from the discussion of the same 'opposition as observed at Poulkowa and Cape Town, deduced the solar parallax 8-964. Professor Newcomb of Washington, U.S., deduced the value 8-855.

A wore accurate method of determining the sun's distance, and thence the dimensions of the planetary orbits, is afforded, though rarely, by the transits of Venus over the sun's disk. When Venus is at her inferior conjunction, and at the same time very near either node, her body will be projected on the disk of the sun ; and through the effect of her proper motion, combined with that of the earth, she will appear as a dark spot passing over the disk, and describing a chord which will be seen under different aspects by spectators

placed at different points on the earth, because, by reason of the parallax, they refer the planet to

different points on the solar disk. The position of the spectator not only occasions a diffcrence in the apparent path described by the planet, but has also a very sensible influence on the duration of the transit, in consequence of which the parallaxes both of Venus and the sun can be determined with great exactuess. In order to illustrate this, let E (fig. 33) represent the earth, V Venus, and & the sun. An observer placed at E, near the north pole of

Fra. 33.—Diagram illustrating Transit of Venus.

the earth, would see Venus projected on the sun's disk at v, and she would appear to describe the line lym. An observer placed at E', near the south pole, would see the planet at v', and she would appear to describe the chord 'y'm'. This is a necessary result of the difference of the parallaxes of Venus and the sun; and as the chords ly, U'v' differ in length according as they are more or less remote from the centre of the disk, the duration of the transit will be longer or shorter according to the situation of the observer and the geocentric latitude of the planet. If by reason of the relative parallax the time of a transit 1s longer than the true time in one hemisphere, it will be shorter in the other; and hence the difference of the times (which may be observed with great accuracy) at places having very different latitudes may serve to determine the relative parallax, or the difference between the parallax of Venus and that of the sun. But the parallaxes are reciprocally proportional to the distances ; and the ratio of the distances being known, therefore the ratio of the parallaxes is also known ; and having thus the ratio and the difference of the two parallaxes, it is easy to compute the separate amount of each.

This particular application of the transits of Venus to the determination of the sun's distance was first pointed out by Dr Halley, when he announced the transit of 1761. The transit of Venus in 1769 was observed in many different parts of the world. The result of the whole of the observations led

to the conclusion, that the parallax of the sun is included within the limits 8’°5 and 8’”°7. The mean 8’°6 was adopted by Delambre and Lalande ; and later the value 85776 was deduced by Encke from a careful re-examination of all the observations made in 1761 and 1769. But several methods have been since applied to the determination of the solar parallax, with results which appear to agree in indicating a larger value for the parallax, or in other words, a smaller value for the sun’s distance, than had been deduced from the transits of 1761 and 1769.

One of these depends on the moon’s motions, and was first indicated by Laplace towards the close of the last century. Since the moon’s distance from the earth, though small compared with the sun’s, bears yet a measurable ratio thereto, it follows that there is not a perfect symmetry between the perturbations produced by the sun when the moon is passing from third to first quarter, and from first to third. he effect of this circumstance is recognisable in the lnnar motions, which are affected by a minute variation arising from this cause, and called the Parallactic Inequality. } about 2’; and as it depends on the proportion of the sun’s ’”° distance to the moon’s known distance, its amount supplies a means of determining the solar parallax. In 1854 Hansen announced, in a letter addressed to the astronomer royal, that this method, applied to his new tables of the lunar motions, gives a parallax of 89159.

Tt amounts at the maximum to Parallactic

quality.

Velocity of | light.

SUN’S DISTANCE. |

A second method depends on the fact, that the earth in reality revolves, in the course of a lunar month, around the conimon centre of gravity of her own globe and the moon’s. The dianreter of the orbit thus circuited by the earth (in the same sense, at least, as the moon may be said to circuit in her monthly orbit) amounts to about 6000 miles, and by the radius of this small orbit the carth is sometimes in advance of and sometimes behind her mean position in heliocentric longitude. The sun’s geocentric longitude is affected

to precisely the same degree as the earth's heliocentric longitude; and by determining the actual amount of the sun's displacement, we can ascertain what angle the mean diameter of the earth's monthly orbit sub- tends at the sun. Leverrier, by the careful study of a great number of observations of the sun made at the principal observatories in Europe, came to the conclusion that the solar parallax is 8-95. But recently Mr Stone of Greenwich detected a numerical error in Leverrier's com- putations, and when this is corrected, the value 8'-9] results. Prof. Newcomb of Washington has by the same method deduced the value 8'°84.

Another method, depending on terrestrial measurements of the velocity of light, need not be here described, as the principles involved are mainly optical, and belong to the subject of Licnr. Of course the comparison between the velocity of light measured without reference to extra- terrestrial bodies, and the velocity inferred from the time of the passage of light over given celestial distances, supplies at once the means of testing the accepted measures of these distances. Fizeau, by a measurement of the velocity of light depending on the rapid rotation of toothed wheels, has deduced a solar parallax falling even somewhat short of that obtained by Delambre from the transit of 1769. But Fizeau's method is not susceptible of great exactness. Foucault, by a much more effective method (the principle of which is due to Wheatstone), depending on the use of revolving mirrors, deduced the value 8'-942.

We have seen that observations of Mars have given the values 8'°943 in Stone's hands, 8-964 in Winnecke's, and 8"-855 in Newcomb's. By combining, according to their various importance, the values indicated above, the astronomer royal and Leverrier deduced the probable mean

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junction.

visa

sphere another method called Delisle's was employed. This method depends on the observation and eventual comparison of the absolute times of ingress

or egress, where these phenomena are considerably accelerated or retarded by the

effects of parallax. Photography has also been applied, as well as direct micrometrical measurement, to determine the planet's distance from the sun's centre at different epochs, Owing to certain mistakes made with reference to the relative values of the two methods of observation, for the transits of 1874 and 1882, it was long-thought that Delisle's only could be applied; and it was stated positively that Halley's method fails totally in 1874. But fortunately the mistake was discovered in good time, and in the summer of 1873, the leading astronomers of England urged the desirability of applying Halley's method. At the time of writing (April, 1875), the reports from the principal stations, though promising excellent results, afford 110 means of determining what changes will have to be made in our estimate of the sun's distance. The first rough analysis of some of the observations gives 8"88 for the solar parallax. Another transit of Venus will occur on December 6, 1882; after which Venus will not again transit the sun until June 8, 2004, and June 6, 2012. The beginning of the transit of 1882, the whole transit of 2004, and the end of the transit of 2012, will be visible in England.

Cuapter X.—The Moon—Her Phases, Parallax, Magni- tude, Motions, and Probable Physical Conditions.

The different appearances or phases of the moon were probably the first celestial phenomena observed with any degree of attention. They have been described in genera] terms in Chapter IV., but must now be more particularly considered. The following definitions may conveniently be given in this place. When the moon passes the meridian at the same time with the sun, she is said to be in Con- The two points of her orbit in which she is situated when in opposition and conjunction are called the Syzygies ; those which are 90° distant from the sun are called the Quadratures; and the intermediate points between the syzygies aud quadratures are called the Octants

A slight attention to the lunar phases during a single Lunar revolution will be sufficient to prove that they are occasioned Phases by the reflection of

*the sun's light from the opaque spherical °*P!4ined. surface of the moon. This fact, which was recognised in*

value 8-94. Unfortunately, Leverrier's own estimate had uot been corrected when this value was adopted, and 8-92 may be considered as in all probability nearer the truth. But for the present 8-94 may be adopted for convenience,

as it has been used in the recalculation of the dimensions of the solar system by nearly all writers on astronomy in Europe and America. It is the value which has been used in the table of Elements at p. 782. Mr Stone, after discussing the observations made in 1769, with special reference to the effects of the peculiarity at the internal contacts of Venus, described in Chapter VIII., supra, has arrived at the conclusion, that the value 8'-9 more correctly represents the observations of 1769 than De- lambre's 8-6, or Encke's 8"5776. But little value can be attached to this result, seeing that the correction for the interval of time between real contact and apparent contact comes out from the equations themselves which are made use of to determine the parallax, and this correction 17° is constant, whereas the observed time difference in 1769 was not only far from constant, but in every instance far exceeded 17%. One or two English astronomers still attach weight to Mr Stone's investigation, but Continental and American astronomers are unanimous in discarding it. Much interest attaches to the late transit of 1874, now known to have been successfully observed at a sufficient number of stations to ensure success. At most of the stations the whole transit was observed by Halley's inethod. At the English stations in the northern hemi-

the earliest ages, will be made obvious by the help of a diagram. If the moon is an opaque body, we can only see that portion of her enlightened side which is towards the earth. Therefore, when she arrives at that point of her orbit M, (fig. 34) where she is in conjunction with the sun S, her dark half is towards the earth, and she dis- appears, as at 1, fig. 35, there being no light on that half to render it visible. When she comes to her first octant, at M,, or has gone an eighth part of her orbit from her conjunction, a quarter of her enlightened side is towards the earth, and she appears horned, as at 2. When she has gone a quarter of her orbit from her

conjunction, to M., she shows us one-half of her enlightened side, as at 3, and we say she is a quarter old. At M,, she is in her second octant, and by showing us more of her enlightened side she appears gibbous, as at 4. At M,, her whole enlight- ened side is towards the earth, and therefore she appears round, as at 5, when we say it is full moon. In her third octant, at M,, part of her dark side being towards the earth, she again appears gibbous, and is on the decrease, as at 6. At M,, we just see one-half of her enlightened side, and she appears as a semicircle, as at 7. At M,, when she is in her fourth octant, we only see a quarter of her enlightened side, and she appears horned, as at 8. And at

Constant of

parallax.

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M,, having completed her course from the sun to the sun again, she disappears, and we say it is new moon,

ASTRONOMY

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The moon's absolute distance from the earth is obtained by means of her parallax, which on account of her proximity

HERE InTERVENS A SPACE EQuAL TO

Asout 190 Times THE Distance M, M,

Fra. 34.—Diagram illustrating the Phases of the Moon.

is very considerable. On comparing her parallaxes ob- served at different times, they are found to differ con- siderably in value. These differences in the value of the

parallax arise from the variations of the moon's dis- tance from the earth. But it is also observed to differ sensibly at different points of the earth's

surface, even at

Fic. 35.—Diagram illustrating the Phases of the Moon.

the same instant of time, on account of the spheroidal figure of the earth. Hence it is necessary, in speaking of the horizontal parallax, to specify the place of the observa- tion.

Since the parallax of the moon is subject to incessant variation, it is necessary to assume a certain mean value, about .which the true and apparent values may be con- ceived to oscillate. This is called the constant of paral- lax. If we abstract all the inequalities of the lunar orbit,

and suppose the moon to be at her mean distance and |

mean place, the constant of parallax will be the angle under which a given semidiameter of the earth is seen by a spectator at the moon in such circumstances. But,

for convenience, the constant of parallax is understood |

to be = sath'sequat.red. which, see Chapter IV., is in reality moon's mean dist.

= sine of the mean horizontal parallax.

The best modern observations assign 57' 2"-7 as the value of the lunar mean equatorial horizontal parallax, corre- sponding to a distance of 238,818 miles. The mean equa- torial parallax being 57' 2-7, its double is 1° 54' 6"°4, which expresses the angle subtended by the diameter of the earth at the distance of the moon. The angle subtended by the moon at the same distance is 31' 5-1; whence the diameter of the moon is to that of the earth as 31' 51 is to 1° 54'5'-4, oras 3to 11 nearly. The accurate expression of the above ratio is 1 : 0°27251; hence the true diameter of the moon is 0°2725 diameters of the terrestrial equator. The surface of the moon is consequently (0°02725)?= 00742 = zz4,7 of that of the earth, and its volume (0°2725)? = 00202 = z54,, or, in round numbers, oyths of the

volume of the earth. For other elements, see table of Lunar Elements, p. 782.

The Ascending Node of the lunar orbit is that point of the ecliptic through which the moon passes when she rises above the ecliptic towards the north pole; it is distin- guished by the character 2. The Descending Node, 8,

is the opposite point of the ecliptic, through which she |

passcs when she descends below that plane towards the south. The position of the nodes is not fixed in the heavens. They move in a retrograde direction, or contrary to the order of the signs; and their motion is so rapid that its effects become very apparent after one or two revolu- tions.

The mean retrograde motion of the nodes is found, by

| the comparison of observations made at distant epochs, to

amount to 19° 21’ 18”:3 in a mean solar year, and the time in which they make a tropical revolution is con- sequently .6793°391 mean solar days. The inclination of the lunar orbit is observed to vary between 5° 3’ and 5° 13’, The mean inclination may be taken at 5° 8’.

The inclination of the lunar orbit to the plane of the Harvest terrestrial equator occasions considerable differences in the ™0om.

intervals between the moon’s rising or setting on successive days, and gives rise to the phenomenon of the Harvest Moon. As the daily motion of the moon is abeut 13° from west to east, it follows that if she moved in a plane parallel

‘to the equator, she would rise 50 minutes later every

successive evening. For the sake of explanation, we may here suppose the moon to move in the plane of the ecliptic. Now, the time in which a given arc of the ecliptic rises above the horizon depends on its inclination to the horizon. In our latitudes the inclination of the ecliptic at different points to the horizon varies so much, that at the first point of Aries an arc of 13°

becomes visible in the short space of 17 minutes, while at the 23d of Leo the same arc will only rise above the horizon in 1 hour and 17 minutes. Hence, when the moon is near the first point of Aries, the difference of the times of her rising on two successive evenings will be only about 17 minutes; and as this happens in the course of every revolution, she will rise for two or three nights every month at nearly the same hour. But the rising of the moon is a phenomenon which attracts no attention, excepting about the time when she is full, that is, when she rises at sunset. In this case she is in opposition to the sun, and consequently, if she is in Aries, the sun must be in Libra, which happens during the autumnal months. At this season of the year, therefore, the moon, when near the full, rises for some evenings at nearly the same hour. This circumstance affords important advantages to the husbandman, on which account the phenomenon attracts particular attention.

It is obvious that, as this phenomenon is occasioned by the oblique position of the lunar orbit with regard to the equator, the effect will be greater than what has just been described if the plane of that orbit makes a greater angle with the equator than the plane of the ecliptic does. But we have seen that the plane of the moon's orbit is inclined

'to the ecliptic in an angle exceeding 5°; consequently,

Lunar theory.

) centre,

THE MOON. |

when her ascending node is in Aries, the angle which her orbit makes with the horizon will be 5° less than that which the ecliptic makes with the horizon, and the difference of time between her risings on two successive evenings will be less than 17 minutes, which would have been the time had her orbit coincided with the ecliptic. On the contrary, when the descending node comes to Aries, the angle which her orbit makes with the horizon will be greater by 5°, and consequently the difference of the times of her successive risings will be greater than if she moved in the plane of the ecliptic. If when the full moon is in Pisces or Aries the ascending node of her orbit is also in one of those signs, the difference of the times of her

rising will not exceed 1 hour and 40 minutes during a whole week ; but when her nodes are differently situated, the difference in the time of her rising in the same signs may amount to 34 hours in the space of a week. In the former case the harvest moons are the most beneficial, in the latter the least beneficial to the husbandman. All the variations in the intervals between the consecutive risings or settings take place within the period in which the line of the nodes makes a complete revolution.

The moon's orbit at any moment is an ellipse, having the earth at one of the foci; but this orbit is continually changing in form and position, the eccentricity alternately increasing and decreasing between the limits 0-066 and 0044, and the perihelion sometimes advancing and some- times retrograding, but on the whole advancing at an average rate of 403° per annum, so as to complete a sidereal revolution in 3232575 mean solar days. See also table of Lunar Elements. These changes, like those which affect the inclination of the orbit and the position of the nodes, are due to the perturbing influence of the sun on the moon's motions relatively to the earth. The consideration of these perturbations, whether as affecting the figure and position of the moon's orbit, or her motions in that orbit, constitutes what is called the Lunar Theory. The following are the chief peculiarities of the lunar movements :—

In the first place, the moon's motion differs from uniform motion around the earth as centre, because the moon's orbit is elliptic, so that an equation of the centre corresponding to that already described in dealing with the sun's motion, but greater in amount, has to be applied to the mean motion.

Secondly, the sun lying constantly far outside the moon's orbit relatively to the earth, his influence on the whole must tend to diminish the earth's influence. It is true that when the moon is in quadrature the sun's attraction tends to draw her towards the earth; but it is manifest that this influence is small compared with the action of the sun in drawing the moon from the earth when she is in conjunction with him, and in drawing the earth from the moon when she is in opposition. The balance of effects during a single lunation must correspond to a diminution of the earth's influence, or in other words, to an increase in the moon's period. Now, if the earth and moon, or their conlmon centre of gravity, were always at the same dis-

tance from the sun, this action of his would be uniform all the year round. But as he is nearer in perihelion than in aphelion, he exerts a greater influence in the former than in the latter position ; in other words, the lunar month in winter (when the sun is near perihelion) is lengthened to a greater degree by the sun's perturbing action than in summer (when the sun is in aphelion). Accordingly, on the whole, the moon's motion in longitude is less in winter than in summer. She lags behind her mean place more and more throughout the whole time that the sun is at a distance exceeding his mean distance ; she is therefore at her maximum displacement, behind her mean place, near the time that the sun is at his mean distance after perihelion passage ; while she is at her maximum displacement, in

advance of her mean place, when the sun is at his mean distance aftcr aphelion passage. The greatest amount by which, so far as this cause is considered, she gets in advance of or behind her mean place, is about 11' 12"; and this displacement, because of its period, is called the Annual Equation.

Since the sun acts to diminish the earth's influence when The varia- the moon is in syzygies, and to increase that influence tion. when the moon is in quadratures, the motion of the moon is retarded in the former case and accelerated in the latter, and at the octants there is neither acceleration nor retarda- tion. Hence arises an inequality called the Variation. It was discovered by Tycho Brahe, who found that the moon's place, calculated from her mean motion, the equation of the centre, and the evection, does not always agree with her true place, and that the variations are greatest in the octants, or when the line of the apsides makes an angle of 45° with that of the syzygies and quadratures. Having observed the moon at different points of her orbit, he found that this correction has no dependence on the position of the apsides, but only on the moon's elongation from the sun. Its maximum value is additive in the octants which come immediately after the syzygies, and subtractive in the octants which precede the syzygies. It vanishes altogether in the syzygies and quadratures, and on this account was not

perceived by the ancient astronomers, who only observed the sun in those positions. Its maximum value is 35’ 42”.

The next inequality to be mentioned is the largest of The evec- all, except, of course, the equation of the centre. It is tion. called the evection, and was discovered by Hipparchus, but Ptolemy first recognised the law of its effects. These are to diminish the equation of the centre when the line of the apsides lies in syzygy, and to augment it when the same line lies in quadratures. Thus, supposing the apsides to lie in syzygy, and that it is sought to compute the moon’s true longitude about seven days after she has left the perigee, by adding the equation of the centre to the mean anomaly, the resulting longitude will be found to be above 80° less than that which is given by observation. But. if the line of the apsides lies in quadratures, the place of the moon at about the same distance, that is, 90° from the perigee, computed in the same manner, will be found to be before the observed place by above 80’; that is, the com- puted will be greater than the observed longitude by more than 80’. The maximum value of the evection is 1° 20’ 299. It is occasioned by the sun’s action in modifying the form of the lunar orbit, and so causing the equation of the centre to vary in amount.

The lunar inequalities which we have as yet considered Secular in- are all of a periodic nature. But there are others of a &dualities. different kind, the periods of which are so long that, with reference to the duration of human life, they may be con- sidered as permanently affecting the elements of the lunar orbit. These are the Secular Inequalities, the most remarkable of which is the acceleration of the moon’s mean motion,

On comparing the lunar observations made within the Lunar ac- last two centuries with one another, there results a mean celeration, secular motion greater than that which is given by comparing them with those made by Ibn-Junis, near Cairo, towards the end of the 10th century, and greater still than that which is given by comparing them with observations of eclipses made at Babylon in the years 719, 720, and 721 before our era, and preserved by Ptolemy in the Almagest. This acceleration of the moon’s mean motion was first remarked by Dr Halley, and was fully confirmed by Dun- thorne, who was led, by the discussion of a great number of ancient

observations of eclipses, to suppose that it proceeded uniformly at the rate of 10’ in 100 years. This

Various lunar months.

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was the first attempt to estimate the value of the secular equation, which had hitherto been confounded with the mean secular motion. Mayer was led to the value 7”, which he advanced to 9” in his last tables published in 1770. Lalande found it to amount to 9’°886. In 1786 Laplace demonstrated that the acceleration is one of the effects of the attraction of the sun, and connected with the variations of the eccentricity of the earth’s orbit, in such a manner that the moon will continue to be accelerated while the eccentricity diminishes, but cease to be accelerated when the eccentricity has reached its maximum value; and when that element begins to increase, the mean motion of the moon will be retarded. Professor Adams, however, has recently shown that though a portion of the acceleration is undoubtedly due to the cause assigned by Laplace, in reality one-half or thereabouts remains unexplained by that cause. The researches of Delaunay confirm this view. The theory is entertained that the unexplained part of the acceleration is only apparent, the real cause in operation being a retardation of the earth’s motion of rotation.

The same cause which gives rise to the acceleration of the mean motion, namely, the diminution of the eccentricity of the earth’s orbit, also occasions secular inequalities in the motion of the perigee aud nodes of the orbit of the moon. These two inequalities are, however, affected with opposite signs to that of the former, that is, while the inean motion of the moon is accelerated, the motion of her perigee and that of her nodes are retarded. By push- ing the approximations to a great length MM. Plana and Carlini, and M. Damoiseau, in Memoirs which obtained the prize of the Academy of Sciences for 1820, found different numbers ; those of Damoiseau are 1, 4°702, and 0°612.

The three secular inequalities which have been pointed out will obviously occasion others, for all quantities de- pending on the mean motion, the motion of the perigee, or of the nodes, must be in some degree modified by

them. They can only be developed by the complete integration of the differential equations of motion. What is most essential is to select, among the multitude of terms, such as may possibly acquire considerable co-efficients by inte- gration.

Understanding by the term month the time which the moon employs to make an entire revolution relatively to any given point, movable or fixed, we have as many different species of months as there are different motions with which that of the moon can be compared. For example, if we estimate her revolution relatively to the sun, the month will be the time which elapses between two consecutive conjunctions or oppositions. This is called the synodic month, lunar month, or lunation. If we con- sider her revolution as completed when she has gone through 360° of longitude counted from the movable equinox, we shall have the tropical or pertodic month. The interval between two successive conjunctions with the same fixed star is the sidereal month, A revolution with regard to the apsides of her orbit, that is to say, the time in. which she returns to her perigee or apogee, gives the anomatlistic month. And, finally, the revolution with regard to the nodes is the nodical month.

It is clear that, taking the sidereal lunar month as a standard of reference, any other month 'will be greater or less according as the point which defines it moves in the same direction around the star-sphere as the moon or in the reverse direction, and that the excess or defect will be greater or less as such motion is more or less rapid. Thus, as the sun advances with considerable rapidity, the synodical month will much exceed the sidereal month; as the point T retrogrades very slowly, the tropical month is very slightly less than the sidereal month ; as the apsides

advance, on the whole completing a revolution in 8°85 years, the anomalistic month will exceed the sidereal, but

only by about 22°ths the excess of the synodical month;

while, as the nodes retrograde, on the whole, completing a

revolution in about 18°6 years, the nodical month will fall short of the sidereal by a defect equal to about 7'y%ths of the excess of the synodical month. This is illustrated in the following table presenting the values of the different lunar months. (See further the table of Lunar Elements, p. 782) —

Differs from Sidereal

Month. Synodical month…..... 29°53059 days. +2°20893 days. Sidorell spe ecsaanctes 2732166 ,, 000000 ,, Tropical A MMergneeOO CCR ACE pat saya axe) a —0°00010 ,, JAmOnTaNISPIC). 9) eessecssss 27°55460_ ,, +0'23294 ,, Nodical pp trerecdoorers PA OME I a —0710944 ,,

The moon at all times presents very nearly the same face to the earth. If this were rigorously the case, it would follow that the moon revolves about an axis per- pendicular to the plane of her orbit in the same time in which she completes a sidereal revolution about the earth, and that the angular velocities of the two motions are

exactly equal. It is, however, proved by observation, that Libration,

there are some variations in the apparent position of the spots on the lunar disk, Those which are situated very near the border of the disk 'alternately disappear and become visible, making stated periodical oscillations, which indicate a sort of vibratory motion of the lunar globe (apparent only), which is known by the appellation of the Libration.

The rotation of the moon is sensibly uniform, while the motion of revolution is variable. The apparent rotation occasioned by the revolution of the moon round the earth is, consequently, not exactly counterbalanced by the real rotation, which remains constantly the same. Hence the different points of the lunar globe must appear to turn about her centre, sometimes in one direction, and sometimes in the contrary, and the same appearances be produced as would result from a small oscillation of the moon, in the plane of her orbit, about the radius vector drawn from her centre to the earth. The spots near the eastern or western edge of her disk disappear according as her motion in her orbit is more or less rapid than her mean motion. This is

called the Libration in Longitude. Its maximum value corresponds to a rotation through 7° 45',

Further, the axis of rotation of the moon is not exactly perpendicular to the plane of her orbit ; hence the two poles of rotation, and those parts of her surface which are near these poles, are alternately visible from the earth. This is the Libration in Latitude. Its maximum value amounts to 6° 44'.

Again, the observer is not placed at the centre of the earth, but at its surface. Thus in the course of a day the moon appears to oscillate about her radius vector because of the earth's rotation. This phenomenon constitutes what is called the Diurnal Libration, and is evidently the effect of the lunar parallax, and corresponds to it in amount, measured in minutes of arc. It therefore never exceeds LeeT'B8e8:

The libration in latitude and the diurnal libration were discovered by Galileo soon after the invention of the tele- scope. It was Hevelius who discovered and first explained the libration in longitude. Regarding libration in gene- ral, it remains to be stated that, instead of one-half of the moon remaining invisible, about 4111 parts out of 10,000 are absolutely and at all times unseen. If diurnal libration be neglected, about 4198 parts out of 10,000 may be regarded as altogether unseen.

The nodes of the lunar equator coincide with those of the moon's orbit. The mean inclination of the lunar

Moon's in- clination.

equator to the ecliptic is 1° 28' 42'. Mr Baily makes it 1° 30' 113. Since the descending node of the equator coincides with the ascending node of the orbit, it is evident that its plane lies on one side of a plane parallel to the plane of the ecliptic, while the plane of the orbit lies on the other. Thus the plane of the equator makes an angle of about 1° 30' with the first, and of 6° 39' with the second, on the average. But these angles are slightly variable.

The coincidence of the nodes of the lunar equator and orbit ranks among the most curious discoverics of modern astronomy. It was shown by Lagrange to be a necessary consequence of the attraction which the earth exercises on the lunar spheroid.

The various features of the moon's surface have been

determine their selenographic positions. On account of their number, it has been found necessary to distinguish them by particular names. Riccioli designated the most conspicuous of them by the names of astronomers and other eminent men. Hevelius gave them the names belonging to countries, islands, seas, and regions on the earth, without reference to situation or figure. The nomenclature of Riccioli is now universally followed. Delineations of the lunar disk have been given by Hevelius, in his Selenographia, by Cassini, Russeli, Schroter, Lohr- mann, and others. 'The subjoined engraving (fig. 36) gives

a pretty accurate view of the appearance of the moon in ' her mean libration.

Fia. 36,—The Moon in her mean Libration (telescopic or inverted view).

That there are great inequalities on the surface of the moon is proved by looking at her through a telescope at any other time than when she is full; for then there is no regular line bounding the dark and illuminated parts, but the confines of these parts appear as it were toothed and cut with innumerable notches and breaks; and even in the dark part, near the borders of the enlightened surface, there are seen some small spaces illuminated by the sun's beams. It is impossible that this should be the case, unless these shining points were higher than the rest of the surface, so that the rays of the sun may illumine their

summits before they reach their basis. Portions of con- siderable extent are also perceived on the lunar surface, which are never brilliant like the other

parts, but remain constantly obscure. These are thought by some to be old sea-bottoms ; they were formerly supposed to be seas, but this idea has been abandoned. Some of these cavities are upwards of four English miles in depth, and forty in circumference at the orifice. An insulated mountain is fre- quently observed to rise in the centre of these enormous pits or caverns, and they are surrounded by high annular

ridges, the masses of which would fill the enclosed cavities. II. — 101

observed with great interest since the discovery of the Spots on telescope, and astronomers have been at much pains to the moon.

Lunar charts,

Lunar pho- tography.

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Herschel imagined that he even observed volcanoes in activity ; but it is now known that he mistook for volcanic light the effects of earth-light reflected from those parts of the moon's surface which have the highest reflective capa- city. It has been urged that, as the brightness of the moon is sensibly equal at all times, she cannot be surrounded by an atmosphere similar to that of our earth. Moreover, if a lunar atmosphere existed, its influence would be percep- tible in the occultations of the planets, or fixed stars, by the moon. The effects of refraction as exerted by an atmosphere resembling the earth's would cause a star to remain visible for a considerable time after it had really passed behind the moon's globe. In fact, it is easily shown that an atmosphere like our earth's would prevent any star from being con- cealed at all. It would render visible a star really placed directly behind the moon's centre ; for the actual refractive effect required for this purpose would correspond to a deviation of the rays of light by about 16', or 8' in entering, and 8' in passing out of the lunar atmosphere. Now the earth's atmosphere produces a refractive effect of 34' on an orb in the horizon, or more than four times as much as would be required in a lunar atmosphere in order to render visible a star directly beyond the moon's centre. In point of fact, stars are occulted by the moon

the instant they reach her edge ; or if at any time there is apparent delay, this is such only as may be fairly attributed to the effect of irradiation.

In recent years the surface of the moon has been studied with increased care.

Lohrmann, a land surveyor of Dresden, planned the con- struction of a lunar chart on a large scale in twenty-five sections, and in 1824 the first four sections were published. He was unable, however, to complete this arduous task, as failing sight compelled him to desist. He published in 1838 a good general chart of the moon, 15} inches in diameter.

Amongst contributions to this department of astronomical research must be mentioned the well-executed map by Messrs Beer & Madler (see their work Der Mond). It is the result of several years' careful study and micrometrical measurement of the surface of the moon, and every point discovered by the telescope has been laid down with great precision. In Der Mond these astronomers give the measurements of 919 spots, and 1095 determinations of the height of lunar motintains.

Schmidt of Athens has completed the most important contribution yet made to selenographic research. Passing over his earlier and, in his own estimation, unsatisfactory processes of charting, commenced in 1839, we may note that, according to his present plan, the complete chart has a diameter of 6 feet. It is constructed, however, in 25 sections (after Lohrmann's plan), and these are now com- pleted. But the work still awaits publication, as the expenses of engraving must be very great, and are beyond Schmidt's means.

Photography has been applied successfully to the work of picturing our satellite, though it will probably be long before photographic charts can be produced comparable with the work of Schmidt, or even of Beer and Madler, so far as details are concerned.

The moon was first photographed by Dr J. W. Draper of New York, in 1840. Bond photographed the moon successfully in 1850, using the telescope of the Cambridge (U.S.) Observatory. Between the years 1850 and 1897, the moon was photographed by Secchi in Rome, Bertch and Arnauld in France,

Phillips, Crookes, Hartnup, De la Rue, Fry, Huggins, Dancer, Baxendell, and others in England. Later, De la Rue produced lunar photographs of remark- able accuracy and beauty. But the very best pictures of the moon yet obtained are by Rutherfurd of New York, using

ASBTRONOSY

[THEORETICAL—

a refractor of 11} inches aperture, and 13 feet focal length, corrected for the chemical rays.

A series of interesting researches has been made into the light-reflecting capacity, or, in point of fact, the whiteness of our satellite, by Zdllner of Leipsic. Bouguer had assigned to the moon a brightness equal to sovo0oth part of the sun's. Wollaston made the proportion much snialler, determining it at gyyo7oth only. Zéllner employed two different methods of research. In one he determined the moon's illumination by tests of her surface brightness ; in the other he obtained point-like images of the sun and moon for comparison with corresponding images of candle-flames. The results, lying between those obtained by Bouguer and Wollaston, are also in close agreement inter se. According to the former method, the light of the full moon is gygoy0th part of the sun's light ; according to the other, the propor- tion is as one to 619,000.

But the most interesting results obtained by Zéllner are those relating to the varying brightness of the moon at her different phases. He found that the defect of light when the moon is not full is much greater than it would be if the moon were a smooth but unpolished globe. From the agreement between the observed results and an empiric formula, intended to correspond for phases within 70° of the full moon with the case of an orb grooved meridionally so that the slopes of the grooves' sides are inclined 52° to the surface, Zéllner infers that the average slope of the lunar elevations amounts to about 52°. The following table indicates the degree of approximation :—

Theoretical Brightness. Full Moon's as 100. Observed Brightness.

———_—

Are from Moon's place to point

alg oe Moon regarded| By Zéllner's Zoilner. as smooth. | formula. +1° 99°98 98°60 98°60 5 99°63 92°79 87°20 8 99-06 88°41 92°19 ll 98°24 84:04 88°76 -13 97°57 81°21 82°60 +19 94°93 72°29 68°41 24 92°13 65°15 71°38 27 90°18 61°00 57:90 = 90°18 61:00 63°47 +28 89°50 59°60 56°15 =28 89°50 59°60 57°00 20) 85°82 52°90 48°60 —39 80°87 45°00 41°70 +40 80°04 43°70 47°10 41 77°78 42°50 43°95 — 49 76°27 41°40 38°00 +46 74°61 36°70 36°10 —52 68°87 27°63 AJ | +58 62°91 24°30 27°10 — 62 58°89 20°60 20°40 -— 69 51°82 15°20 14°60

Cuaprer XI.—Eelipses of the Sun and Moon.

Strictly speaking, the term eclipse extends. to all cases in which one celestial body is wholly or partially obscured by another, either by direct intervention or by the interception of light illuminating the former, so that the term includes transits of inferior planets, the concealment of stars by the moon or by a planet, or the concealment of a satellite by its primary. But the term eclipse is for convenience limited to the three following orders of phenomena :—(1.) The total or partial concealment of the sun by the moon, called a solar eclipse. (2.) The obscuration of the moon by the shadow of the earth, called a lunar eclipse. (3.) The con- cealment of a satellite of a planet by the shadow of the primary, called eclipses of satellites, and distinguished from occultations in which the disk of the primary hides the satellite from view.

Moon's brightness, —

Eclipses.

Seasons.

ECLIPSES. |

Solar and lunar eclipses can be considered together, so far as the general law of their sequence is concerned, From what has been already shown, it follows that, if the motions of the sun and moon could be watched continuously from the centre of the earth, the moon would be seen to pass round the star-sphere once in each sidereal month on a path inclined about 5° 8' to the ecliptic, while the sun would complete the circuit of the ecliptic once in a sidereal year; and the moon would pass the sun's place once in each synodical month. The place of conjunction of the sun and moon would clearly pass round the star-sphere, advancingly, making the complete circuit of the heavens once in each year on the average; and the same would happen with the place of conjunction of the moon and the point directly opposite the sun. Moreover, as the moon at these conjunctions would, of course, be on her own apparent orbit, and that orbit is inclined to the sun's, it is clear that, supposing the moon's orbit fixed, the conjunc- tions of sun and moon during one-half of the year would occur with the moon in the northern half of her apparent orbit, and those in the other half

would occur with the moon in the southern half of her orbit. The same would be true of the conjunctions of the moon with the point opposite the sun, only, of course, the halves of the lunar orbit would be interchanged. At or near the time when 'the place of either conjunction was crossing from the northern to the southern side of the moon's orbit, or vice versa, the conjunction would occur with the moon so near to the ecliptic, that if the conjunction was one of sun and moon, she would hide the sun's disk wholly or partially, while, if the conjunction was one of the moon with that point opposite the sun towards which the earth's shadow is thrown, she would enter that shadow wholly or partially. In other words, at two seasons separated by six months there would be eclipses of the sun or moon, or both, whereas during the intervening months no eclipses would occur.

The number of eclipses which could occur in either eclipse-season would depend on the rate at which the points of successive conjunction approached and left the ecliptic, on the proximity necessary for the occurrence of an eclipse of either sort, and alsu on the manner in which the lunar node happened to be passed. For example, suppose that a conjunction of the sun and moon occurred when the moon was exactly at a node, so that a central eclipse of the sun occurred ; then, half a synodical month before and half a synodical month after that conjunction, there would be a conjunction of the moon with the point opposite the sun, and the moon being only half a month's journey from her

node, would be ata point of her orbit not far from the ecliptic. But the extent of the earth's shadow is such, that the moon would only be partially in the penumbra, and penumbral lunar eclipses are not considered by astronomers, There would therefore be only one eclipse in such an eclipse-season, viz., a central solar eclipse. Next, Suppose that when the moon was at her node, she was exactly opposite the sun, then there would be a total lunar eclipse. Half a lunation later and earlier she would be in conjunction with the sun, and she would be at a point of her orbit not far from the ecliptic. In this case, although during half a month from nodal passage the

moon supposed to be viewed from the earth's centre gets to a distance from the ecliptic exceeding the sum of her

| own and the sun's seniidiameters, and therefore so viewed

would pass clear of the sun, yet for the earth, regarded as a whole, she would not pass quite clear'of the sun. In other words, for those parts of the earth where the effect of parallax would shift the moon most towards the sun, there would be a slight partial solar eclipse at the conjunc- tion following or preceding the total lunar eclipse. In this case, then, there would be three eclipses, one lunar and total, the other two solar and partial. These results would be approximated to if the conjunction of sun and moon in the first case, or of moon and sun-shadow in the second case, occurred with the moon very near a node. But otherwise there would be an eclipse either solar or lunar a few days before her nodal passage, and another either lunar or solar a few days after her nodal passage, and no other eclipse of either sort in that eclipse-season.

All this corresponds to the actual conditions except in one respect. The lunar nodes retrograde, so as to meet the advancing conjunction-points of either kind ; and thus, instead of a year being occupied in the complete circuit of the conjunctions, the actual interval has for its mean value the mean interval between the successive conjunctions of the sun with the rising node of the moon's orbit, or 346°607 days. Accordingly, the average interval between successive eclipse-seasons is 173-3 days instead of half a sidercal year.

Eclipses of both sorts are illustrated in fig. 37. Here E Theory of is the earth, and the moon is shown in two places—at M, eclipses.

directly between the earth and sun, and at the point opposite M, in the heart of the earth's shadow-cone. The true geometrical shadows of the.earth and moon are shown black, the true geometrical penumbre are shaded (of course the vertical dimensions in the figure have been enormously exaggerated). The distance EC is variable, being as great

JoucnINe SUN's GLOBE.

ToucHING SUN __~. oOo Toucnine Sun

4 7 A Fevcnine Suns GlogE

Fig. 37.

aS 870,300 miles when the earth is in aphelion, and as small as 843,300 miles when the earth is in perihelion.

Fig. 38.

Fig. 39.

The earth's shadow thus extends about 34 times as far from | that for solar eclipses we have—

the earth as the moon's orbit. In figs. 38 and 39 the extremity of the moon's shadow is shown on a larger scale, in one case falling short of the earth, in the other extending beyond the earth. For the moon's conical shadow has a length which varies in the same propor- tion as the earth's shadow, that is, as 8703 to 8433 ; and the absolute length thus varies from 229,780 miles (fig. 38) to 237,140 miles (fig. 39). Since the moon's greatest mean and least distances are respectively 252,984 miles, 238,818 miles, and 221.593 miles, it follows

Eclipse limits.

Number of eclipses annually

804

(yin apogee

Point C is 23,204 miles from earth (fig. 38). Point C is 9088 miles from

Sun in perigee at mean distance earth (fig. 38).

: : Point C is 8187 miles beyond in perigee….. ... earth (fig. 39). (in apogee Point C is 15,844 miles from l Par ones: earth (fig. 38). a ne +: tena diate

Point C is 1678 miles from pager aeiie earth (fig. 38). : – { Point C is 15,547 miles be- {im perigee…....-. | yond earth (fg. 39).

These numbers correspond to the fact that the limits between which the apparent diameter of the sun varies are 39’ 364 and 31’ 31”-8, while the lunar disk varies in diameter from 33’ 31”-1 to 29’ 21-9, so that in a central solar eclipse, where the sun is in perigee and the moon in apogee, the sun’s disk extends beyond the moon’s by

} (32' 36-4 — 20" 21-9), or by 1’ 3772;

while the sun is in apogee and the moon in perigee, the moon’s disk extends beyond the sun’s by

4 (33' 31’-1 — 31’ 318) or by 596.

In the former case, or any case in which the sun’s disk exceeds the moon’s so that in central eclipse a ring of sun- light is seen, the eclipse is called an annular solar eclipse ; while, if the moon’s disk exceeds the sun’s, and the whole of the sun is thus eclipsed, when the centres of the disks coincide, the eclipse is called a total solar eclipse. When only a part of the sun is hidden, and no aunulus is formed, the eclipse is called a partial solar eclipse. It is clear that an eclipse which is total or annular for certain parts of the earth will be partial elsewhere ; and in cases (which occur very seldom, however) where the point C falls between E and a, fig. 38, the eclipse will be total along a certain part of the central track, and annular along the rest of that track. In a total eclipse the greatest possible breadth of the total shadow ww’ (fig. 39) is about 173 miles. This is the minor axis of the shadow-ellipse.

The following table, combined with the fact that the moon’s greatest apparent diameter is 33’ 318, will be suffi- cient to illustrate the general conditions of lunar eclipses and the limits for totality :—

Apparent diameters of earth’s shadow. ° i a

) im apogee …....-..+5 1 15 24°30

Sun in perigee, at mean distance….. 1 2B 2a in perigee ….....++ 30 40°31

) in apogee …...2..00+ 1 1 566

Sun at mean distance, at mean distance….. 1 23 34°87 in perigee …....0++ 1 8 12°87

) in apogee ….....1 16 28°29

Sun in apogee, at mean distance ….. 1 24 6°30 in PeTIQee ....-+sseeee 1 31 44°30

It may be added that an eclipse of the sun can only occur when the moon at the time of mean conjunction with the sun is within 192° of her node, and will certainly occur if she is within 133°. A lunar eclipse can only happen when she is within 134° of her node, at the time of mean opposition to the sun, and will certainly occur if she is within 7°; but the limits are somewhat wider than those for solar eclipses, if penumbral lunar eclipses be counted. It is convenient to notice that in every period of 21,600 lunations there are, on the average, 4072 solar eclipses and 2614 lunar eclipses, besides 1617 penumbral lunar eclipses— that is, 4231 lunar eclipses including penumbral ones.

Noting that eclipse-seasons last on the average about 33 days, and that three eclipse-seasons each having three eclipses cannot occur in succession, it is easy to determine the greatest and least number of eclipses which may occur in any single year. The average interval between successive eclipse-seasons is 173°3 days. Two such intervals

amount together to 346°6 days, or fall short of a year by about 19 days. Hence there cannot be three eclipse-seasons in a year; for each eclipse-season lasts on the average 33 days. Suppose an eclipse-season to begin with the begin- ning of a year of 366 days. The middle of the season occurs at about midday on January 17; the middle of the next eclipse-season 173°3

days later, or on the evening of July 8; and the middle of the third occurs yet 173°3 days later, or on December 29, early in the forenoon; so that nearly the whole of the remaining half belongs to the fol- lowing year. This is clearly a favourable case for the oc- currence of as many eclipses as possible during the year. If all three seasons could be of the class containing three eclipses, there would be eight eclipses in the year, because the second eclipse of the third season would occur in the middle of that season. This, however, can never happen. But there may be two seasons, each containing thrce eclipses, followed by a season containing two eclipses, only one of which can occur in the portion of the eclipse-season falling within the same year. In this case there would be seven eclipses in the year. So also there would be seven if in the first season there were three, in the second two, and in the third three, for then the portion of the third falling within the year, being rather more than one-half, would comprise two eclipses. So also if the three succes- sive seasons comprise severally two, three, and three eclipses. The same would clearly happen if the year closed with the close of an eclipse-season.

There may then be as many as seven eclipses in a year, in which case at least four eclipses will be solar, and at least three of these partial, while of the lunar eclipses two at least will be total.

As regards the least possible number of eclipses, it is ob- vious that, as there must be two eclipse-seasons in the year, and at least one eclipse in each, we cannot have less than two eclipses in the course of a year. When there are only two, each eclipse is solar and central.

As regards intermediate cases, we need make no special inquiry. Many combinations are possible. The most com- mon case is that in which there are four eclipses—two solar and two lunar. Further, it may be noticed that, whatever the number of eclipses, from two to seven inclusive, there must always be two solar eclipses at least in each year.

Cyapter XII.—TZhe Planet Mars.

After Venus, Mars is the planet whose orbit is nearest Mars. to the earth. His diameter is about 4400 miles, and his volume about one-sixth of the earth's; his mass, however, is little more than one-ninth of hers, his density

being estimated at only ;{,ths of the earth's. His mean distance from the sun is about 139 millions of miles ; but the eccen- tricity of his orbit amounting to 0°093262, his greatest and least distances differ considerably from this mean value, amounting to 152,304,000 and 126,318,000 miles respectively. It follows that his distance from the earth when in opposition varies largely —in opposition near his perihelion his distance is about 33,800,000 miles, whereas, when he is near aphelion, his opposition-distance amounts to 61,800,000 miles. As he is also more brightly illumin- ated by the sun when in perilielion, it follows that he appears much brighter when in opposition at that part of his orbit. In fact, the brightness of Mars at opposition near perihelion bears to his brightness at opposition near aphelion, the ratio

(61,800,000)? x (152,304,000) : (33,800,000) x (126,318,000), or about 34: &

In other words, the planet is nearly five times as bright at one of the favourable oppositions as at one of the unfavour-

able. The planet's synodical period being 779-936 days, or

two years and about 494 days, it follows that the place of |

opposition performs a complete circuit of the ecliptic in an average period of rather more than 7 times the synodical period (for 7 × 491 days = 3464 days, so that the change in

the place of opposition nearly corresponds to the earth's |

yearly motion). The correspondence is nearer if two circuits of the ecliptic be taken; for 15 synodical revo- lutions are equal to 11,699-040 days, and 32 sidereal years are equal to 11,688:2048 days, or not quite 11 days less. Buta much nearer agreement still is effected in 79 years, which differ by little more than two days from 42 sidereal revolutions of Mars. So that if at any time Mars in opposition has been very favourably placed for observa- tion, the same condition of things, or very nearly so, will be brought about after 79 years. For instance,

from the sun is by far the nearest alike to that of the earth ; nor will the length of the Martial year appear very different from what we enjoy, when compared to the surprising duration of the years of Jupiter, Saturn, and the Georgium Sidus. 1f we then find that the globe we-inhabit has its polar regions frozen and covered with moun- tains of ice and snow, that only partly melt when alternately ex- posed to the sun, I may well be permitted to surmise that the Same causes may probably have the same effect on the globe of Mars ; that the bright polar Spots are owing to the vivid reflection of light from frozen regions ; and that the reduction of those spots is to be ascribed to their being exposed to the sun."

According to Herschel, the ratio of his equatorial and polar axes is 103 to 98. Schroter estimates the same

ratio to be that of 81 to 80, but later observers have found no perceptible compression.

Observations of Mars in recent times have added largely Charts of to our knowledge of the planet.

in the opposition of 1719, Mars was within 24° of perihelion, and shone so brightly as to be mis-

taken for a new star. He was similarly situated

at the opposition of 1798, and will again be so situated when in opposition in 1877.

It is said that Fontana first noted the spots of Mars, and suspected the planet's rotation. But

Fontana's credit is shaken by his alleged dis-

covery of seven Jovian satellites. Cassini ob-

served the spots at Bologna in 1666, and having continued his observations for a month, deter- mined the planet's rotation-period as 24 h. 40 m. Observers at Rome, mistaking two opposite faces of the planet for the same face, deduced the period 13h. Cassini in 1670 again observed the planet, obtaining the same rotation-period as before.

Maraldi in 1704 noted changes in the shape of

the spots; but from some which underwent little change, he deduced the rotation-period 24 h. 39 m.

In 1719, when (as already mentioned) Mars was exceedingly well placed for observation, Maraldi

again carefully observed the planet, deducing from the observations of 37 days a rotation-period identical with Cassini's,

Besides the dark spots, which have a somewhat greenish colour, the rest of the disk being mostly ruddy, astronomers had noticed a portion of the disk around the south pole which was brightly white. Maraldi states that this spot had been observed for 60 years before his later observations were made. One part seemed fainter than the rest, and this portion was subject to considerable changes, occasionally disappearing, while the brighter part was constantly seen.

Sir W. Herschel examined a similar bright region around the north pole, which had not before his time been well seen, because the northern regions of the planet are only bowed towards us when the planet is traversing the parts of its orbit near aphelion, Herschel's powerful telescopes, however, enabled him to examine the planet during opposi- tions occurring in any part of the ecliptic. The magnifying _ powers he used were sometimes as high as 932, and with this the south polar spot was found to be 41" in diameter. From these observations Herschel concluded that the diurnal rotation of Mars is accomplished in 24h. 39m. 21$8., that his equator is inclined to his orbit at an angle of 28° 42', and his axis of rotation to the axis of the eclip- tic at an angle of 30° 18'.

The bright appearance so remarkable about the poles of Mars was ascribed by Herschel to the reflection of light from mouutains of ice and snow accumulated in those regions.

"'The analogy between Mars and the earth," he says, "' is per- haps by far the greatest in the whole solar system. Their diurnal motion is nearly the same, the obliquity of their respective ecliptics not very different ; of all the superior planets, the distance of Mars

Fic. 40.—Chart of Mars on Mercator's Projection.

From drawings by Beer and Midler (1830-1857), Dawes (1856-1866), De la Rue, Secchi, and others, Proctor has constructed the above chart of the planet (fig. 40).

bia, 42.—Mars, May 22, 1873,

Fig. 41.—Mars, May 23, 1873, oC: Mae 11.30 G. M. T.

Fic, 44.——Mars, May 18, 1873, 12.30 G. M. 1.

But the latest drawings, taken during the opposition of

Fia. 48.—Mars, May 19, 1873, 12.30 G. M. T.

Compres- sion.

Rotation of Mars.

Atmo- sphere of Mars.

Discovery of Ceres.

806

1873, while showing excellent agreement with the chart ag respects the southern parts of Mars, present some features in the northern hemisphere (more favourably seen in 1871 and 1873 than for many previous years) which are waut- ing in the above chart. This will be manifest from the views

here given (figs. 41, 42, 43, and 44), obtained by Mr Knobel, F.R.A.S., with an 8-inch reflector of the Browning-With construction. ;

The shape of the planet has been repeatedly measured, but the results are not accordant. A set of measures made at Greenwich with a double-image micrometer in 1845 gave dz for the ellipticity, and another set in 1852 gave zo: Arago contends for an ellipticity of zo, the result of the Paris measures. But some observers can detect no differ- ence between the polar and equatorial diameters ; some even find the polar diameter longer than the equatorial. Adhuc sub judice lis est.

The planet's rotation has been determined more accurately than was possible in Herschel's time. Beer and Madler, from their observations in 1830-1837, deduced the rotation- period 24h. 37m. 23°8s., and showed how Herschel had omitted to count one complete rotation when he deduced the period above mentioned. Kaiser of Leyden, by com- paring his own observations in 1862 with those of Beer and Midler, Sir W. Herschel, and finally (carrying back the research) with an observation made by Huyghens in 1672, deduced the period 24h. 37m, 22°62s.

Proctor, by a similar process, extending from observa- tions made in 1869 backwards to an observation by Hooke in 1666 (N.S.), deduced the period 24h. 37m. 29-735. Kaiser contended for the accuracy of his result, asserting that Hooke's pictures were less trustworthy than Huyghens's. But recently, in 1873, Proctor has detected three errors in Kaiser's computation, who has reckoned the years 1700 and 1800 as leap years instead of common years, and made a further error of a day in correcting Hooke's date from old style into new. When account is taken of these corrections, Hooke's observations and Huyghens's are easily reconciled. Due weight being given to each, the period 24 h. 37m. 22°72. results, a value probably lying within 0°01 s. of the true sidereal rotation- period of the planet.

It remains only to be added, that the spectroscopic observations of Mr Huggins show that the vapour of water is present in the atmosphere of Mars, a discovery of great interest and importance. A volume, however, instead of the limited space which is here available, would be required to discuss fully all that has been discovered respecting the planet Mars.

Cuaprer XIII.—Asterotds, or Minor Planets.

On the first day of the present century a new planet was discovered, which, although in one sense seeming to fill up a gap in the solar system, was yet unlike any hitherto known member of the planetary family. Kepler and Titius, followed in later times by Bode, had adopted the view that a planet was wanting to complete the symmetry of the solar system, as indicated by a certain law of progres- sion in the planetary Gistances. This law is presented in the following table, which includes Uranus (known to Bode, but not to his predecessors in the recognition of this law) :—

ee 1 Mercury.| Venus. Earth. | Mars. Missing |

Planet, | Jupiter.) Saturn. | Uranus. 4 4 4 4 4 mie A 0 3 6 12 24 48 96 | 192 4 7 10 | 16 | 28 | 52 | 100 | 196

52 | 95 | 192

ASTRONOMY

[THEORETICAL—

Here the series 7, 10, 16, &c., is obtained by adding tc 4 successively the numbers 3, 6, 12, 24, &e., forming a geometrical series ; and the distances of Venus, the earth, Mars, Jupiter, &c., which are indicated in the lowest row, are found to correspond with the members thus obtained very closely indeed. Mercury is included in the above table, though the proper number to add to the constant 4 would be 14, not zero, and thus the distance of Mercury is really less than 58,ths of the proper distance according to the law of progression. And in passing it may be noticed that the distance of Neptune on the outside of the system differs as ‘markedly from that indicated by the above law as the distance of the innermost known planet; for the law gives the distance of the next planet beyond Uranus as 388 on the scale above used, whereas the real distance of Neptune is 300 on that scale. However, towards the close of the last century, when Uranus had but lately been discovered and found to obey the law of distances, it was natural that the attention of astronomers should be directed to the strange gap in the series between Mars and Jupiter. So great was the confidence

with which many now regarded the law, that the theory was advanced that. a planet invisible to the naked eye was travelling within the seemingly vacant space ; and through

the exertions of Baron de Zach, an association of 24 astro-

nomers was formed to search the zodiac for the unseen planet. Yet the discovery was not made by any member of this society. Wollaston had laid down a star in his catalogue where no star could be seen. Piazzi carefully examined the neighbourhood, to determine whether some star really existing there had been misplaced by Wollaston. On January 1, 1801, he noted a small star in Taurus, which on January 3 had changed its place. He wrote to Oriani and Bode; but the planet, which was at its station- ary point, following opposition, on January 12, had become invisible owing to its approach to the sun, before the letter reached them, and Piazzi himself fell ill soon after. But Gauss the eminent mathematician undertook to compute the new planet's orbit and motions from the observations made by Piazzi, and at length, after long searching, De Zach rediscovered the planet on December 3, 1801, Olbers independently discovering it on the following evening. The planet was found to correspond well with the theory which had suggested the search for it, since its distance is 2-767 where the earth's distance is represented by unity, or 27°67 on the scale used in the above table. Piazzi gave to the new planet the name Ceres. Besides differing from the other known planets in being so small as apparently to belong to a different order, Ceres was found to have an inclination (of more than 10}°) exceeding largely even that of Mercury. But these anomalous relations were soon found to be but the first indications of a discovery alto- gether more remarkable.

During his long and arduous search for Ceres, Dr Olbers Pallas.

'of Bremen had had occasion to examine with peculiar

care the stars near her path. On March 28, 1802, he observed a star near Bode's stars 20 and 191 Virginis, where he felt sure that no star had existed during his former observations. After two hours it had moved very much as Ceres had done when he had first seen her almost in the same spot. Subsequent observations. showed that this was a small planet (to which the

name Pallas was given) travelling in an orbit having a mean distance of about 2°770 (carth's as 1), slightly exceeding, therefore, that of Ceres, but with an eccentricity of '248, considerably exceeding that of any known planet, and an inclination of 34° 39', exceeding the sum of the inclinations of all the other planets together. The effect of this great inclination on the geocentric position of the planet is even more remarkable than th heliocentric range

t

asteno1s ASTRONOMY 807 ; of more than 69° in latitude. For when Pallas is at her e . . . tos 1 Hy greatest heliocentric latitude, and near opposition, her No. Name. Date of Diseovery.| Discoverer. Place of Diseovery. geocentric latitude exceeds 42°, This is very different from | }— Venus's range of less than 9° in geocentric latitude, which qrleecee 1852, November 16 | Hind | London i | Thalia December 15 | Hi had been regarded as the maximum, and had led astrono- | } 24/ Themis 1853, April 6 Le Bay ae mers to assign to the zodiac a breadth of 18°. A zodiac to | | 25|Phocea. Sor 6 Chacornae _| Marseilles aval d " er 26 | Proserpina May 5 Lutber Bilk include the asteroids should be 90° in breadth, and would 27 | Euterpe November 8 | Hind London cover ;';ths of the whole heavens. Oo Ae nice [em March I | Luther Billk I : 29 Amphitrite March 1 Marth London Even more remarkable, however, was the discovery of | | 30| Urania guy 28 ey | Hind London ; ° ' pHhrosyne tember] | F 4 i two planets having nearly the same mean distance from | | 32|Ponon. October 26 | Golisehmnlat . Pe the sun. The supposition that yet others might be found i at me | ses heel 6 – re a in ~ h AY acor i was naturally suggested ; indeed, Olbers was led to con- = Foner eg April 19 Luther ilk . 3 | Atalanta October 5 1 r jecture that Ceres and Pallas are but fragments of a larger 37 | Fides October 5 — Bik planet formerly circulating at the same distance, and | | 33/}eda, | 1856, penny 12 (Chacornae | Paris 3 é 'ebruar; P shattered by some tremendous internal convulsion ; and he – | oadcenraga Mareh 31 Goldsenmiat Pails aphne May 22 ld i 'i proposed that search should be made where the paths of | | 42| isis | May 23 a Oxford these planets nearly intersect. For if his theory were true, | | 4#/Atiadne 1857, April 15 | Pogson Oxford : ; 5 ysa ay 27 Goldschmi i = must be the region where the explosion took place, 45/ Eugenia June 28 Goldschmiat | Paris – : estia A t 5 y and the fragments

must continue to pass through that region. | | 47 | Aglaia rte tattal ie ba Juno. While Harding of Lilienthal was charting the stars : aa September 19| Goldschmidt | Paris FB a ales September 19! Goldschmidt | Pari near the paths of Ceres and Pallas in the region thus 50 | Virginia October 4 | Ferguson Rade gion indicated, he determined, on September 2,1804, the position | | 51/Nemausa | 1858, January 22 | Laurent Nismes f Il st in, Pi ? ; 52 | Europa February 6 | Goldschmidt | Paris : & smail star in Pisces, near 93 and 98 of Bode's cata- i Calypag April 4 Luther Bilk _ . exandra September 10! Goldschmidt | Paris ogue. On September 4 the star was no longer in the } | 55| Pandora September 10| Searle Albany, U.S. same position. It was found to bea planet (to which the 37 | Mucecosyne |roog Scbtember 9 | Goldschmiat | Paris : F : es nemosyne , ember 22| Luther Bilk name Juno was given) travelling at a mean distance of | | s8| conenay 1860, Mareh 24" | Luther Bill 2°67 (considerably less than that deduced for Ceres and | | ® ao Pon ait eo al a i : . Pig of : mber erguson ashington Pallas), in an orbit having eccentricity 0°257, and inclina- . roy oer Goldschmidt Chatition-eous-Bagnenx . ' = As . rato ctober 10 | Forster Berli tion 13°11'. The effect of this great eccentricity is remark- 63) Ausonia —_/ 1861, February 10 | De Gasparis coals able, as may be thus indicated :—supposing the apsides of ibe mae foe Marseilles . os 2 arc 'empe Marsei the orbit to correspond to the planet's solstices, then the =| ee April 9 Tuttle Cambridge, US. 8 ; : sia April 17 Pogson Madras ummer of one hemisphere is only half as long as the | | &% Leto April 29 | Luther Bilk winter of that hemisphere, or as the summer of the other. Loe aaa ace Cage ree A ner . _ 'anopea a oldschmi F ~~aUux~~ Vesta, Next Olbers, pursuing the same method, discovered 71! Niobe haves 7+-beaee a Vesta, moving in an orbit having miean distance 2:373 (far |-| felon" | ae00 pee Ai je em i. – ¥ 7 : e ambridge, U.S. less even than J uno's), eccentricity 0-0898, and inclination | | 74| Galatea August 29 | Tempel Marseilles 7° val 75 | Eurydice September 22 | Peters Clinton, U.S. . ; ' Freia October 21 | d'Arrest Copenhagen Later A long interval then elapsed without the discovery of Prigga ee ee SS A dioreries. anv ne b thi : Diana 1863,Mareh 15 | Luther Bilk – : — ers of this remarkable family. It was not Eurynome fe September 14 Watson Ann Arbor, U.S. – unt; e : appho 64, May 3 Pogson Madras 0 cem er 8, 1845, that the fifth was recognised. Terpsichore September 30] Tempel Marseilles n that night M. Hencke, an amateur astronomer of ee aes Tees # father Bilk : : . eatrix pril 26 é€ Gasparis |

*Naples Driessen, + gig the body since named Astrea, He Clio “August ac, [iat Bilk communicate i ; ” ty) ptember 19} Peters Clinton, U.S. is fi ; 8 SDCOV OEY to Encke and Schumacher, Semele 1866, January 6 Tietjen Berlin’ ie 0 confirmed it by observations made with more powerful one ane 16 ronson Madras , F 6 isbe une 15 eters Clinton, U.S, telescopes. M. Hencke also discovered the sixth planet, Julia August 6 —_| Stéphan Marseilles on July 1, 1847. Since that time not a year has passed He et i ee . . . na ovember phan arseilles without the discovery of one or more minor planets; and Undina 1867, July 7 Peters Clinton, U.S. 1D 80 Minerva August 24 | Watson Ann Arbor, U.S. * me years as many as ten or twelve have been added, aafore September 26’ Watson Ann Arbor, U.S. t present (April 1875), the total number known amounts arethusa | 45 November 23| Luther Balk . , . ‘ e , Februar oggia arseilles to 143, as shown in the following table, which gives also Clotho February 17 | Tempel Marseilles the names of the discoverers, as well as the date and place coed ee – ate ala ad f ai E ? Dike May 29 Borelly Marscilles Pr iscovery. It is to be observed that Melete, numbered Hecate July i , Watton Ann Arbor, U.S. : ¢ elena ugust 16 atson Ann Arbor, U.S. , was mistaken for 41 till January 1859. Miriam August 22 ‘ Peters Clinton, U.S. a = Hera se i | ten Ann Arbor, U.S. Clymene ptember 13! Watson Ann Arbor, U.S. | Date of Discovery.| Discoverer. Place of Discovery. Artemis September 16} Watson Ann Arbor, US. Dione October 10 | Watson Ann Arbor, U.S. Camilla November 17 | Pogson Madras 1 1801, January1 ‘| Piazzi Palermo Hecuba 1869, April 2 Luther Bilk 2} Pallas 1802, March 28 Olbers Bremen Felicitas October 9 Peters Clinton, U.S. 3} Juno 1804, September 1 | Harding Lilienthal Lydia 187, ApH te = | Berelly pe cage 4| Vesta 1807, March 29 __| Olbers Bremen Ate Angus 14 | Peters ee Oe 5| Astrea 1845, December8 | Hencke Driessen Iphigenia September 19 | Peters Clinton, U.S. 6| Hebe 1847, July 1 Hencke Driessen Amalthea | 1871, March 12 Luther Bilk 7| Iris August13 | Hind London Cassandra July 24 Peters Clinton, U.S. 8| Flora October18 | Hind London Thyra August 6 Watson Ann Arbor, U.S 9| Metis 1848, April 25 Graham Markree Sirona September 8 | Peters Clinton U.S. Hygeia 1849, April 12 De Gasparis | Naples Lomia September 12 | Borelly Marseilles Parthenope | 1850, May 11 De Gasparls | Naples Peitho 1872,March 15 | Luther Bilk Victoria September 13} Hind London Althea April 3 Watson Ann Arbor, U.S. Egeria November 2 | De Gasparis {| Naples 120 | Lachesis April 10 Borelly Marseilles Irene 1851, May 19 Hind London 121 |*

Hermione May 12 Watson Ann Arbor, U.S. Eunomia July 29 De Gasparis | Naples 122 | Gerda July 31 Peters Clinton, U.S. Psyche 1852, March 17 De Gasparis | Naples 123 | Brunhilda July 31 Peters Clinton, U.S Thetis April 17 Luther Bilk 124 | Aleestis August 23 _| Peters Clinton, U.S. Melpomene June 24 Hind London 125 | Liberatrix September 11 | Prosper Henry Paris Fortuna August 22 Hind London 126 | Velleda November § | Paul Henry | Paris 20 | Massilia September 19 | De Gasparis | Naples 127 | Johanna November 5 | Prosper Henry Paris 21) Lutetia November 15| Goldsehmidt | Paris 128 |} Nemesis November 25, Watson | Ann Arbor, U.S.

Mass of

a ne

Name. |Date of Discovery.| Diseoverer. Place of Discovery. 129 | Antigone 1873, February 3 | Peters Clinton, U.S. 1380 | Electra February 17 | Peters Clinton, U.S. 181 | Vala May 26 Peters Clinton, U.S. 132, £thra June 13 Watson Ann Arbor,U.S. 138 | Cyrene August 16 Watson Ann Arbor, U.S. 184 | Sophrosyne September 27 | Luther Bilk 135 | Hertha 1874, February 18 | Peters Clinton, U.S. 136 | Austria March 18 Palisa Pola 187 | Melibcea April 21 Palisa Pola 188 | Tolosa May 19 Perrotin Toulouse 139 on October 10 | Watson Peking (Transit Exped. 140 | Siwa Oetober 13 | Palisa Pola 141

It has been shown by Leverrier, from the observed

Asteroids. secular motion of the perihelion of Mars, that the combined

Jupiter.

mass of all the asteroids cannot exceed one-fourth of the earth's mass, even if the whole perturbation were ascribed to asteroids, and no account taken of the error in the estimated mass of the earth compared with the sun's. But as the recent new estimate of the sun's distance assigns a rela- tively increased mass to the earth, almost sufficient of itself to account for the observed motion of the perihelion of Mars, it appears to follow that the combined mass of the asteroids must be exceedingly small. Prof. Newcomb, of Washington, after carefully analysing the motions of the asteroids, comes

to the conclusion, that, " though there are some peculiarities in the mutual relations between the orbits of these bodies which might favour Olbers's hypo- thesis, a much greater number of peculiarities negative the assumption."

Prof. Kirkwood, of Bloomington, Indiana, has shown that, when the mean distances of the minor planets are arranged in order of magnitude, certain gaps are recognised, that is, there are no asteroids having mean distances nearly equal to certain definite values. These values correspond to distances at which asteroids would revolve in periods associated with Jupiter's period by certain simple laws of commensurability. He infers, therefore, that the asteroids had an origin resembling that assigned to them by the nebular hypothesis. He com- pares the observed peculiarity to the existence of at least one great gap in the Saturnian ring system, showing that " satellite revolving within that gap would have a period associated with the periods of Saturn's inner satellites, by similar simple laws of commensurability."

Cuarter XIV.—The Planet Jupiter.

Jupiter is the largest planet of the solar system. Indeed he surpasses the rest so greatly, that the combined mass of all of them together would barely exceed two-fifths of his. This superiority is deserving of more consideration than it has commonly received. If we are justified in regarding our moon or the asteroids as belonging to a different order of bodies from the earth, Venus, Mars, and Mercury, because so much less than them in mass, we nay not unreasonably regard Jupiter as belonging to a different order, because so much exceeding in mass the planets which travel within the zone of asteroids. The earth exceeds the moon only 81 times in mass, but Jupiter exceeds the earth in mass more than 300 times.

Jupiter travels at a distance from the sun exceeding the earth's 5} times, or at a mean distance of 475,692,000 miles, The eccentricity of his orbit is considerable, amounting to 0°048239, so that his greatest and least distances amount respectively to 498,639,000 miles and 452,745,000 miles. When in opposition, and at his mean distance, his distance from the earth amounts to about 361,000,000 miles. His orbit is inclined about 1° 18' 403 to the ecliptic. His sidereal revolution is completed in

[THEORETICAL—

4332-5848 days, or 11 years 314-92 days; whence it is easily calculated that his synodical period, or the interval separating his mean returns to opposition, has a mean value of 398°867 days. His mean diameter is nearly 85,000 miles in length, according to the best modern measurements, though strict accuracy cannot be claimed for this estimate, as the various determinations, even by the most skilful observers, differ considerably inter se. Until recently, the compression of his globe had been estimated at 7';, from the observations of W. Struve; but later measurements ive ;}, as the compression. His volume exceeds the earth's 1233-205 times, but his density is only about one- fourth of hers, and his mass does not exceed hers more than 301 times.

Although the actual order of discovery would lead us to Jupiter's speak of the satellites of Jupiter before considering the belts.

features of his globe, it will be for several reasons more convenient to describe these features first. Cassini was the first to discover that Jupiter's globe is surrounded by belts appareutly belonging to his surface. The features of these belts as described by Cassini are those which still continue to be recognised. Their number is variable ; sometimes only one can be readily discerned, while at others the whole surface is covered by them. They are generally parallel to one another, as iu fig. 45, but not always so. Their breadth is likewise variable, one belt having been

Fra, 46.—Jupiter as seen Nov. 18, 1858, by Lassell.

Fic. 45.—Jupiter as seen Nov. 27, 1857, by Dawes. observed to grow narrow, while another in its neighbourhood has increased in breadth, as if one had partially flowed into the other; and in this case a part of an oblique belt is commonly recognised between them, as if forming the channel of communication. Some of these peculiarities are illustrated in figs. 46, 47, and 48. Sometimes the belts

Fra. 47.—Jupiter as seen March 12, 1860, by Jacob.

Fic, 48.—Jupiter as seen April 9, 1860, by Baxendell.

remain unchanged for months; at others, new belts have formed in an hour or two. thus variable, yet at times spots have been visible for several weeks, whose motions have served to indicate the law of the planet's rotation.

In 1665 Cassini observed a spot near the large central belt of Jupiter. It moved more quickly when near the middle of the disk than when near the edge, and also appeared narrower when at the edge, showing that it belonged to the surface (that is, to what appears as the surface) of the planet. This principal or ancient spot, as

Although his surface appears Rotation

'JUPITER. |

it is called, is the largest and most permanent of any yet discovered. Jt appeared and vanished eight times between the years 1665 and 1708, then continuing invisible till 1713. Thespot has been frequently observed since, some- times remaining visible for two or three years in succession, at others being unseen for as long or longer. It would be rash, however, to assume that the same spot has been seen, especially as there is reason to believe that a dark spot on Jupiter, instead of being a permanent feature of his surface (and only concealed from time to time by clouds), resembles rather a large spot upon the sun, an opening formed either by cyclonic disturbance in a deep atmosphere, or by some process of disturbance acting from beneath such an atmo- sphere. From various sets of observations made upon spots seen for long periods, the following rotation-periods have

been deduced :— Jupiter's Rotation-Period, Mm 8.

h. C0 CS) 5 0 Swe ic Cee en 2 soo) 0 Sal oD oon s3 MMe Sates ie os csed luna ad aiev ons eee OD 55e 25 ene ces cccssscce ons nonsvecens 9 55 26°6

Madler's rotation-period is commonly regarded as the most reliable, It was based on observations commenced on November 3, 1834, and continued on every clear night until April 1835, a period including 400 revolutions. Two

dark spots were visible when these observations were made. It need hardly be said, however, that very little reliance can be placed on the seconds in Madler's, Airy's, or Schréter's determinations. In fact, there is clear evidence that spots on Jupiter are subject to a proper motion, like that which affects the spots on the sun. Schmidt, in No. 1973 of the Astronomische Nachrichten, gives a number of cases of such proper movements of spots, ranging in velocity from about 7 miles to about 200 milesan hour. It may be noted, also, that from a series of observations of one spot made between March 13 and April 14, 1873, with the great Rosse reflector, a period of 9h. 55 m. 4s. was deduced, while observations of another spot in the same interval gave a rotation-period of 9h. 54m. 55-4 s,

The equator of Jupiter is inclined only 3° 5' 30" to the planet's orbit, so that there can be no appreciable " seasonal changes. We should expect, therefore, a great calm to reign in the atmosphere of this planet, the more so that the sun's heat poured upon each square mile of it is (on the average) less than the 27th part of that received by each Square mile of the earth's surface. Moreover, the seasons of Jupiter last nearly twelve times as long as ours, so that we should expect all changes in his atmosphere produced by solar action take place with exceeding slowness. When, instead, W@¥ find signs of very rapid changes in the aspect of the belts, implying remarkable changes in the condition of the Joyian atmosphere, we seem compelled to recognise the operati@n of causes much more active than the heat poured by the sun on the distant orb of J upiter. It seems natural to suppose that Jupiter's mass is itself intensely heated, and that such inherent heat produces these changes in the condition of his atmosphere. We find also in this theory an explanation of several remarkable circumstances, the significance of which has been somewhat strangely overlooked.

So soon as we institute a comparison between Jupiter and the earth, on the supposition that Jupiter is sur- rounded by an atmosphere bearing the same relation to his mass that the atmosphere of the earth bears to her mass, we find that a state of things would prevail in no sort resembling what we are acquainted with on earth. For the mass of Jupiter exceeds the earth's more than three hundredfold, while his surface exceeds hers little more than a hundredfold; so that the quantity of

atmosphere above each square mile of surface would be three times greater on Jupiter than on the earth, and, owing to the greater force of gravity, the atmospheric pressure would still more largely exceed that on the earth, In fact, the density of the Jovian atmosphere at the surface would be more than six times as great as the density of our air at the sea level. Yet the extension of the atmosphere would be very much less in the case of Jupiter ; for in our air the density is halved for each vertical ascent of 34 miles, whereas in the case of a Jovian atmosphere similarly constituted, the density would be halved for each vertical ascent of z miles. Ata height, therefore, of 10} (7 times 1}) miles from the surface of Jupiter the pressure would only exceed 3 (= 4,th) that at his surface, or say goth that at the surface of our earth ; whereas, at a height of 10} (3 times 34) miles from

our sea level the atmospheric pressure is still equal to =

(= 4th) that at the sea level, or 2} times as dense as the Jovian atmosphere at the same height under the supposed conditions.

We see that, in the case of J upiter, under any assump- tion of resemblance in atmospheric constitution and con- dition, we should infer great density at the surface of the planet, but an exceedingly shallow atmosphere, the density diminishing much more rapidly with vertical height than in the case of our atmosphere; and if aqueous clouds formed in such an atmosphere, as in ours, they would occupy much shallower layers. Yet everything in the telescopic aspect of Jupiter implies that the cloud-layers are of great depth. In fact, their appearance shows that they are far deeper than the terrestrial cloud-layers. The dis- appearance of dark spots at a considerable distance from the limb of the planet, as observed by Madler (who found that the two great spots by which he timed the planet's rotation became invisible at from 56° to 57° from the centre of the disk), would indeed imply that the darker inner region lay at an enormous distance below the upper light-reflecting layer. Yet even a depth of thirty or forty miles below the upper cloud-layer would not be consistent with any hypothesis of resemblance between the condition of Jupiter and the earth. Assuming a depth of only thirty miles,

the atmospheric pressure would be increased 220 times, or more than a millionfold, and the density in the same degree, if the atmosphere could retain the properties of a perfect gas at that enormous pressure. But such a density would exceed some fiftyfold the density of platinum, and of course no gas could exist as such at a thousandth part of this pressure.

Even when we place on one side the difficulty of reconciling observed appearances with the behaviour of gases under conditions with which we are familiar, a difficulty remains which cannot be removed without regarding Jupiter as utterly unlike our earth. If J upiter had a shallow atmosphere, so that his solid globe were apparently of the same dimensions as the orb we measure, the mean density of such a globe would far surpass the earth's mean density, if the materials of the two globes were similar ; for the pressure within the globe of J upiter would be enormously greater. Yet we know that, instead of the density of Jupiter being greater than that of the earth, it is not one-fourth of hers. The theory that Jupiter's globe is hollow is inadmissible, because no shell of Jupiter's mass could resist the pressure generated by its own gravity, The alternative theory suggested by Brewster, that the substance of Jupiter and his fellow-giants of the outer planetary family may be porous, like pumice stone, is equally untenable for a like reason.

We seem forced, then, to the conclusion, that no

resemblance exists between the condition of Jupiter and that of our earth. This being so, the theory to which we

indicates clearly the existence of a very deep vapour-laden atmosphere around each planet.

have been already led, that the condition and rapid changes of condition of the deep Jovian atmosphere are due to the planet's intense heat, suggests at once a solution of the difficulties just mentioned. These difficultics arose while we were dealing with Jupiter as a planet like our earth. But at the outset we noted, in his great volume and mass, the suggestion of a wide difference between his condition and that of our earth. Regarding him as belonging to a different class on account of his enormous size, and being led also to consider him as intensely heated, we may fairly compare him with a body known to be intensely heated, and of size enormously surpassing the earth, viz., with the sun, And though our difficulties are not in this way removed, yet we find that a much more complete analogy can be established between Jupiter and the sun than between the earth and Jupiter. Thus the density of the sun, like that of Jupiter, is small compared with the earth's; in fact, the mean density of the sun is almost exactly the same as that of Jupiter. The belts of Jupiter may be much more aptly eompared with the spot-zones of the sun than with the trade-zones of the earth, which would certainly not present, as viewed from Mercury or Venus, any resemblance to the belts of Jupiter. The spots on Jupiter are not constant, and in this respect resemble the sun spots. They are like these also in having a pro- per motion. They change less rapidly, but this is intelli- gible when we consider how much less intensely heated Jupiter is than the sun.

It remains to be mentioned, in support of this theory of the inherent heat of Jupiter, that the light received from him is far greater than he would reflect if his surface were like that of the moon or of Mars. As the reasoning we have given has not been intended to relate solely to Jupiter, but to Saturn certainly, and probably to Uranus and Neptune, we may suitably present here a table which exhibits the relation between the light received from the various members of the solar system, and appears as markedly to distinguish the giant planets from the inner family, as the relations of size, mass, orbital scale, rapid rotation, and complexity of system, which have been longer known. From the observations of Zéllner, @rundziige einer all-gemeinen Photometrie des Himmels, Berlin, 1861, it appears that the light of the five planets at their mean opposition bears the following proportion to the light of the sun:—

Probable Error.

Per eent. Sun= 6,994,000,000 times Mars… .....::-sseereeee 5°8 Sun= 5,472,000,000 ,, Jupiter……..... seers Beg Sun= 130,980,000,000 ,, Saturn (without the ring) 5:0 Sun= 8,486,000,000,000 ,, Urantis…….....sceceerenees 6:0 Sun ==79,620,000,000,000 ,, Neptune …....2. sere 5°5

To which add two estimates of the moon's light, by com- paring surfaces, and by eomparing point-like images, of the sun and moon :—

Probable Error.

2°7 per cent. 1°6

Sun=618,000 times Moon Sun=619,600 ,,

th)

Whence the average reflecting powers of the surfaces of the six orbs compared would be (on the assumption that the outer plancts have no inherent light),—

INGOTUAUe ae Osage | Saturn:,.....0 0°4981 iNigt sie Sees. eee 0°2672 LUE ETT a eee 0°6400 Jupiber …..

These results seem strongly to suggest that the four members of the outer family of planets shine partly by inherent lustre. The spectroscopic analysis of the light of Jupiter and Saturn, though not altogether satisfactory,

Soon after the invention of the telescope, Galileo dis- Satellites covered that four small orbs or satellites cirele aroun Jupiter. circular, and their motions nearly uniform. They revolve in planes inclined little to the plane of the ecliptic, so that as viewed from the earth they appear to traverse very nar-

Galileo soon found that their orbits are nearly

row ellipses. Even when these ellipses are most open, they all, save the outermost, have minor axes less than Jupiter's apparent diameter, so that any one of the three interior satellites is necessarily occulted when in superior conjunc- tion with Jupiter as viewed from the earth, and eclipsed

in his shadow when in superior heliocentric conjunction ; while when in inferior geocentrie conjunction, it is in transit across the planet's disk ; and when in inferior heliocentric conjunction, its shadow is in transit, The same is true of the fourth satellite during about two-thirds of Jupiter's year, viz., for about one-sixth of his year before and after the two equinoxes (four-sixths in all), the plane of the satellite's orbit being nearly coincident with the planet's equator. The elements of the satellites are given in the tables on p. 783, and the orbits are pictured to scale in Plate XXVIII. To the elements tabulated may be added these (the densities usually given in the books being alto- gether incorrect) :—

Density Density (earth's as 1). (water as 1), SIRI Jip@eebacancpnanconccucnecccocc 0°198 148 meee 0°374 an go TUM. 0 .c.ye ance 0°825 1°883 soy | Vislewnsestaseseieisec ndemmeerene 0°258 1°468

Thus all the satellites (except the first) have a density ex- ceeding Jupiter's. Probably their real densities are greater, as irradiation increases their apparent size.

The motions of Jupiter's satellites have been very care- fully studied. They had not been long observed before a peculiarity was recognised, which Roemer was the first to interpret. Their various phenomena were found to occur earlier when Jupiter was in opposition, and later when he was near conjunction, than the predicted time. (In con- junction, of course, he cannot be seen.) Roemer suggested that the time-difference is due to Jupiter's variations of distance from the earth,—light, which brings to our earth information of the phenomena, taking a longer time in reaching us when Jupiter is farther away. Ridiculed at first, this theory was before long established by repeated observation, and eventually placed beyond all question by ap discovery of aberration. (See ABERRATION, vol. i, p. 48.

A singular relation exists between the motions of Jupiter's three inner satellites. It will be observed from the table of elements that the period of the second is almost exactly double the period of the first, that of the third almost exactly double that of the second; in other words, the sidereal motions of I. II. and III. are almost exactly as the numbers 4, 2, and 1. This will be more clearly shown by

the following table :—- Sidereal Revolution Sidereal Revolution

in Seconds. per Seeond.

Sat. 1. . 152853°505 8-478706 fy _ 100. on nonass sea ebnesaas 306822°040 4°223947 pp WLS cae nonoocsoatesane 618153°360 2°096567 LN eee Pine conwectss = LAG Sura 0°898795

The coincidence is not exact ; but the following relation holds exactly :— The sidereal motion of I, added to twice the sidereal motion of III. is equal to three times the sidereal motion of II. Thus—

(8”-478706) + 2(2”°096,567) = 12’°671840 = 3(4°223947). A result of this relation, combined with the fact that when

d of Jupiter,

SATURN. |

both ; after another, II. and IIT, are in conjunction, and J.

in opposition to both; after another, IT. and L. are in con- junction, and III. in quadrature to both 3 and after a fourth, the same arrangement is resumed as at first, I. and

III. being in conjunction, and II, in opposition to both,

but the line on which all four satellites now lie holding a

slightly different position from that occupied when these

circuits began. Thus the satellites can never be all occulted

together, or all in transit together.

CHAPTER XY. -~The Planet Saturn.

Saturn is the largest planet but one of the solar system, being surpassed in mass by Jupiter alone. His mass exceeds the combined mass of all the other

planets (Jupiter excepted) nearly threefold. He is the sixth planet in order of distance from the sun, and was the remotest planet known to the ancients. He travels at a mean dis- tance of 872,137,000 miles from the sun, his greatest distance being 920,973,000 miles, his least distance 823,301,000 miles. The cccentricity of his orbit is 0°055996, and the inclination 2° 29' 28" to the plane of the ecliptic. Saturn's mean sidereal period of revolution in his orbit is 29 years 167 days (see the Zlements, p. 782); his mean synodical revolution, or the mean interval between his successive returns to opposition, is 378-090 days. The planet's mean diameter is about 7 0,000 miles, his polar diameter about 3500 miles less, his equatorial diameter about 3500 miles greater. In volume he exceeds the earth nearly 700 times, but in mass only about 90 times, his density being less than the carth's in the pro- portion of about 13 to 100. He rotates on his axis in about 103 hours, the plane of his cquator being inclined nearly 27° to the plane of his orbit.

This planet, in consequence of a luminous ring with which he is surrounded, is one of the most interesting objects in the heavens. This singular appendage was first noticed by Galileo, to whom the planet presented a triple appear- ance, as if a large orb were situated between two small bodies or ansew. He observed that sometimes the anse were so enlarged as to present the appearance of a continuous rig ; at other times they entirely disappeared, and Saturn ap- peared round like the rest of the planets. After a certain time they again became visible, and gradually increased in magnitude. These curious appearances were shown by Huyghens to be occasioned by an opaque, thin, circular ring surrounding the equator of Saturn, and at a considerable distance from the planet. Saturn moving in the plane of his orbit, carries the ring along with him, which, presenting itself to the earth under different inclinations, occasions all the phenomena which have been described. The ring being only luminous in consequence of its reflecting the solar light, it is evident that it can be visible only when the sun and the earth are both on the same side of it; if they are on opposite sides, it will be invisible. It will likewise be invisible in two other cases, namely, lst, when its plane produced passes through the centre of the earth, for then none of the light reflected from it can reach us; and 2d, when its plane passes through the sun, because only its edge is then enlightened, and being very thin, the whole quantity of reflected light will scarcely be

sufficient to render it visible. It is, however, evident that in these two cases the effect will be modified in some degree by the power of the telescope. In ordinary telescopes the ring disappears sometimes before its plane comes into either of

I. and III. are in conjunction II. is in opposition to both, is that the three satellites are never in conjunction together. Thus, starting from a conjunction of I. and III., with II, in opposition, we have, after almost exactly one revolution of I, IL. and I. in conjunction, and IIL. in quadrature to

the situations mentioned ; but Herschel never lost sight of it, either when its plane passed through the earth or the sun. In the last case the edge of the ring appeared as a luminous line on the round disk of the planet, measuring scarcely a second in breadth ; but at the distance of Saturn a second corresponds to 4000 miles, which is equal to the semidiameter of the terrestrial globe. The reason of the ring's disappearance will be easily understood by referring to fig. 49, where the circle a bc d represents the orbit of

Fic. 49,—Diagram illustrating Different Appearances of Saturn's

Rings. he ; the earth, A B CD that of Saturn 9} times more distant from the sun. When Saturn is at A, the earth and sun are both in the plane of the ring ; its edge is consequently turned towards us, and it will be invisible unless telescopes of very high power are used. See Plate XXIX. fig. 1. As Saturn advances from A to B, the ring gradually opens, see Plate XXIX. fig. 2, and it attains its greatest breadth at C, where a straight line perpendicular to its plane makes a more acute angle with the visual ray than in any other situation, see Plate XXIX. fig. 3. As the planet advances towards D, the plane of the ring becomes more oblique to the visual ray; the breadth of the ring consequently contracts, and it again disappears at KE, From E to F, G, and A, the same phenomena will be repeated, only in this case it is the southern side of the ring which is visible to the earth, whereas, while Saturn

was in the other half of his orbit, it was the northern side. . These changes take place in a period whose full length is Saturn's year, or about 291 of our years. Thus the interval between successive disappearances is about 15 years.

The brothers W. and J. Ball discovered a division sepa- Divisions in rating the ring into two concentric rings, the inner being the rings. the wider. Cassini confirmed this discovery. Sir W. Herschel concluded that the matter of the ring is no less solid than that of Saturn, as it casts a strong shadow upon the planet. The light of the ring is generally brighter than that of the planet; for it appears sufficiently luminous when the telescope affords scarcely light enough for Saturn. The outer ring is much less brilliant than the inner.

In observing the ring with very powerful telescopes, some astronomers have remarked, not one only, but several

Fic. 50.—Saturn, as seen at Malta by Mr Lassell with a 20 feet Reflector on 9th October 1852.

dark concentric lines on its surface, which divide it into as many distinct circumferences. In common telescopes these are not perceptible ; for the irradiation, by enlarging the space occupied by each ring, causes the intervals between them to disappear, and the whole seems blended together in one belt of uniform appearance. (See fig. 50.)

By means of some spots observed on the surface of the

Rotation of ring, Herschel found that it revolves in its own plane in

the rings.

The dark

ring.

Nature of the rings.

Rotation and figure of Saturn.

10 hours 32 min. 15-4 sec.; and Laplace arrived at the same result from theory. It is worthy of remark, that this is the period in which a satellite, having for its orbit the mean circumference of the ring, would complete its revolution according to the third law of Kepler.

Amongst the most remarkable discoveries of recent times with regard to the rings of Saturn is that of the ner dusky or semi-transparent ring, sufficiently obvious to any observer capable of using wella moderately good telescope, but which, previously to the year 1850, was only once men- tioned by any astronomer. Dr Galle of Berlin saw this ring with the Berlin refractor in 1838, but the attention of the scientific world was not generally drawn to it. The account of Galle's observations is accompanied by drawings exhibiting the trace of the dusky ring where it crosses the body of the planet. In the year 1850 the ring was recog- nised almost simultaneously by two observers, namely, by Prof. Bond of the Cambridge Observatory, U.S., and by Mr Dawes. Since that time there has been no difficulty in seeing this appendage, though it requires a practised cye and a good telescope.

At the time of the discovery of the dusky ring, Mr Dawes also satisfactorily established the fact of the divi- sion of the exterior ring near its outer extremity; and sub- sequently he observed a series of discontinuous grada- tions of colour or intensity of brightness in a portion of the inner bright ring. He observes that "the exterior por- tion of the inner bright ring to about one-fourth of its whole breadth was very bright, but, interior to this, the shading-off did not appear, as under ordinary circumstances, to become deeper towards the inner edge without any dis- tinct or sudden gradations of shade; on the contrary, it was clearly seen to be arranged in a series of narrow con- centric bands, each of which was darker than the next exterior one. Jour such were distinctly made out: they looked like steps leading down to the black chasin between the ring and the ball. The impression I received was, that they were separate rings, but too close together for the divisions to be seen in black lines." This curious pheno- menon was confirmed afterwards by Professor Bond.

Captain Jacobs, at the Madras Observatory, discovered that the dusky ring is semi-transparent, the body of the planet being visible through it. M. Otto

Struve shows with tolerable certainty that the inner or dusky ring is not a modern appendage to the planet, but that, at the begin- ning of the 18th century, the dark line thrown by it across the planet was known by the name of the equatorial belt. He also finds reason to believe, from a comparison of the measures of Huyghens, Cassini, Bradley, Herschel, W. Struve, Encke, Galle, and himself, that the inner edge of the interior bright ring is gradually approaching the body of the planet, while at the same time the total breadth of the two bright rings ts constantly increasing.

The opinion now generally entertained respecting the Saturnian ring-system is, that it is composed of multitudes of minute satellites, probably intermixed with vapour, travelling independently around the planet. On no other supposition, indeed, can the permanence of the ring-system be explained.

From observations of some obscure belts, and a very con- spicuous spot on the surface of Saturn, Sir W. Herschel con- cluded that his rotation is performed in 10 hours 16 min., on an axis perpendicular to the belts and to the plane of the ring ; so that the planes of the planet's equator and ring coincide. According to the same astronomer, the ratio of the equatorial aud polar diameters of Saturn is 2981 to 2061, or nearly 11 to 10. He also observed that the globe of Saturn appeared to be flattened at the equator as well as at the poles. The compression he thought to

extend to a great distance over the surface of the planet, and the greatest diameter to be that of the parallel of 43° of latitude, where, consequently, the curvature of the meridians is also the greatest. The disk of Saturn, there- fore, resembled a square of which the four corners have been rounded off. According to recent measures the shape of the planet has been found to be that of an exact spheroid of revolution ; but it does not follow that this is always the case. Applying to Saturn reasoning similar to that already employed in the case of Jupiter, we see that the atmospheric envelope may be so deep that the cloud-layers which the astronomer really measures may

lie at different levels, under the varying conditions to which the planet is subject.

Saturn is surrounded by a system of eight satellites— Saturnian |

the most extended as well as most numerous subordinate satellites,

system within the sun's domain. The span of the orbit of the outermost satellite amounts to nearly 4 millions of miles, This satellite is probably larger than our moon, while Titan, the 6th satellite, is nearly as large as the planet Mercury. The elements of the satellites and the names of their discoverers are indicated in the table at p. 783. Their motions are less interesting to observers than those of Jupiter's satellites, because, owing to their considerable inclination to the plane of Saturn's orbit, they are seldom occulted by the planet, or transit across his disk.

Onaprer XVI.—The Planets Uranus and Neptune.

Uranus is the seventh primary planet in order of distance Uranus, from the sun, and, with the exception of Neptune, the remotest. His mean distance from the sun exceeds the earth's more than 19 times, and amounts to 1,753,869,000 miles. But the eccentricity of the orbit is considerable, amounting to 0°0466; consequently, the variation of the planet's distance is also great, his greatest distance amount- ing to 1,835,561,000 miles, his least to 1,672,177,000 miles. Subtracting roughly from his greatest, mean, and least distance the earth's distance, we obtain the opposition distances 1,744,000,000 miles, 1,662,500,000 niles, and 1,581,000,000 miles respectively ; and, therefore, it is manifest that the planet is seen under much more favour- able conditions in some oppositions than in others, especi- ally if it is remembered that when at one of his nearer oppositions, Uranus, beiug also nearer to the sun, is more strongly illuminated, a point of great importance in the case of a planet so far from the sun. The sidereal revolu- tion of Uranus is performed in 30,686°8208 days, or 84 years 64 days. His mean diameter is about 33,000 miles, and, as seen from the earth, Uranus in opposition subtends an angle of less than 4". The apparent diameter of the sun seen from Uranus is less than ;/;th of the diameter of the sun as we see him, or is but about 12'; and the ap- parent surface of the sun is but about the 367th part of the apparent surface of the sun we see.

Accordingly, the light and heat received by Uranus are less in the same proportion. This refers, of course, only to the light and heat received per unit of surface. The whole globe of Uranus receives about j-th part of the heat which is received by the whole globe of the earth. It has been asserted that Uranus turns upon an axis in about 9} hours, but the evidence on which this statement rests is slight and insufficient.

Uranus was discovered by Sir W. Herschel on March Discovery 13, 1781,~~while he was examining the small stars in the of Urams~~ neighbourhood of 7 Geminorum. Being struck with the enormous magnitude of a star in this region, he suspected it to be a comet. He examined it with higher power, and found the disk enlarged, which would not be the case with astar. He therefore announced the discovery of a contet.

Uranian satellites.

Discovery © of Neptune.

NEPTUNE. |

But it was found to be moving in a nearly circular path, and was presently recognised as one of the principal planets of the solar system. Herschel gave it the name of Georgium Sidus, and foreign astronomers called it Herschel ; but the name Uranus, suggested by Bode, of Berlin, is now universally adopted. In 1787 Herschel discovered that it was attended by two satellites, and he subsequently sup- posed that he had discovered four others; but there is great reason to believe that he had mistaken small stars near the planet for satellites. Two other satellites inferior to the rest have been discovered by Mr W. Lassell, com- pleting the series of four satellites whose elements are given at p. 783. Recently Prof. Holden of Washington, U.S., after careful study of the motions of all four satellites, has found reason for believing that one of those discovered by Sir W. Herschel (subsequently to satellites 3 and 4) is identical with satellite 2, while another seems not impro- bably identical with the innermost satellite. The satellites of Uranus are distinguished from all others in the solar system by the great inclination of their orbits to the ecliptic, amounting to nearly 80°, and by their retrograde motion. Hind gives 79° 26’ as the inclination of the

orbits of Titania and Oberon (3 and 4), and for the longitudes of their rising nodes 165° 25’ and 165° 28’ respectively.

Little of interest has rewarded the telescopic study of Uranus ; nor has the spectroscope given any trustworthy evidence, though Secchi, Huggins, and Vogel recognise peculiarities distinguishing the spectrum of Uranus from that due to reflected sun-light.

The discovery of the planet Neptune ranks amongst the most brilliaut of the scientific feats of the present century.

For many years the orbit of Uranus had been the occa- sion of great embarrassmeut to astronomers, from the

impossibility of adequately reconciling the ancient and

modern observations by any one sct of elements, and from the rapid increase of the error from year to year. Bouvard early suggested that some planet exterior to Uranus caused these apparent irregularities. Amongst the astronomers who entered seriously upon the task of determining the position of such a disturbing planet two arrived at a suc- cessful solution of the problem, namcly, Mr Adams and M. Leverrier.

Adams had, ever since the year 1841, determined on attempting the solution of the problem relating to the unknown disturbances of Uranus, and in 1843 he began his investigations. In September 1845 he communicated to Professor Challis the values of the elements of the orbit of the supposed disturbing planet, and in the following month he communicated to the astronomer royal the same results slightly corrected. These conimunications did not lead, however, to any steps being taken to secure by observation the discovery of the planet till the summer of 1846, after the publication of Leverrier’s second memoir, in which the same position, within one degree, was assigned to the disturbing planet as that given in Adams’ papcr.

Leverrier undertook the task of revising the theory of Uranus at the instance of M. Arago. His first memoir on the subject was read before the French Academy in Novem- ber 1845, and his second memoir in June 1846. A third memoir, entitled “Sur la planéte qui produit les anomalies observées dans

le mouvement d' Uranus—Determination de sa masse, de son orbite, et de sa position actuelle," was read on August 31, 1846. A fourth memoir, containing the re- maining part of M. Leverrier's investigations, was read after the discovery of Neptune on October 5, 1846.

The discovery of the disturbing planet followed alinost iminediately after the publication of the third memoir of Leverrier. He wrote to his friend Dr Galle, of Berlin, requesting him to search for the planet with the large refracting telescope of the Berlin Observatory, at the posi-

tion which he indicated to him. This letter reached Berlin on September 23, and on the same evening Galle observed all the stars in the neighbourhood of the place indicated, and compared their places with those given in Bremiker's Berlin Star-Map. This map had not yet reached England, and on this circumstance probably depended the priority of discovery at Berlin. Galle very quickly found a star of about the eighth magnitude, nearly in the place pointed out, which did not exist in the map. Little doubt was entertained at the time that this was the planet, and the observations of the next two days confirmed the discovery.

After Leverrier had announced the results of his labours, agreeing, as we have secn, with Adams's results, the resources of the Cambridge Observatory were brought into use for the discovery of the planet, and a systematic search was begun by Professor Challis with the great Northum-berland telescope. The sweeps of the portion of the heavens in which it was supposed the planet would be found were begun on July 29, and the planet was actually observed on August 4, but without recognition. After the discovery of the planet at Berlin, it was found that the planet had also been observed on August 12. If, therefore, Bre- miker's map had been in the hands of Professor Challis, or if he had found leisure for the mapping of his observa- tions from night to night, Neptune would have been infal- libly detected within a very few days of the commencement of the search, and the whole glory of the discovery would have belonged to the English geometer.

An ancient observation in Lalande's catalogue was discovered almost simultaneously by Mr Walker, of the Washington Observatory, and by Dr Peters at Altona. Two observations, the one in October 1845, and another in September 1846, were also detected by Mr Hind in Lamont's Zones ; and these (especially the former) contri- buted greatly to the construction of an accurate orbit. An excellent orbit was computed by the joint labours of the American astronomers Peirce and Walker,

Almost ininediately after the discovery of Neptune, it Neptune's This discovery satellite.

was found to be attended by one satellite. was made by Mr Lassell in October 1846. The orbit of the satellite is inclined to the ecliptic at an angle of about 29°. By observations of this satellite at Cambridge (in America), and at Poulkowa, two separate values of the mass, namely, ;yizp and zzhgq have been deduced ; but: the object is so difficult to observe, that a considerable time must elapse before any very accurate determination can be obtained. The satellite is supposed to travel in a retro- grade direction, like the satellites of Uranus; but this has not yet been demonstrated.

CuapTerR XVII.—Comets.

The comets form a class of bodies belonging to the Comets.

solar system, distinguished from the planets by their physical appearance and the great eccentricities of their orbits.

While the orbits of all the planets are confined within a Orbits of narrow zone, or to planes not greatly inclined to the comets.

ecliptic, those of the comets are inclined in all possible angles. The figures of the orbits, instead of being nearly circular, like those of the planets, often have the appcarance of being almost rectilinear. Hevelius seems to have been the first who discovered, by means of a geometrical construc- tion, that the orbits might be represented by parabolas ; and Dorfel first calculated their elements on this hypothesis. After it was known, however, that certain comets return to the sun in the same orbits, it became necessary

to adopt the opinion that, in conformity with the laws of Kepler, the coinetary orbits are ellipses having the sun in

Halley's comet.

Lexell's comet.

Phenomena of comets.

814

one of the foci. As the ellipses are in general extremely elongated, and the comets are only visible while they describe a small portion of their orbits on either side of their perihelia, their paths during the time of their appear-auce differ very little from parabolas ; whence it is usual, on account of the facility of computation, to assume that they really move in parabolic curves. Newton employed the hypothesis of an elliptic motion to compute the orbit of the famous comet of 1680. They have received the name of coniets (coma, hair) from the bearded appearance which they frequently exhibit.

One of the most remarkable periodic comets with which we are acquainted is that known to astronomers as Halley's. Having perceived that the elements of the comet of 1682 were nearly the same as those of two comets which had respectively appeared in 1531 and 1607, he concluded that all the three orbits belonged to the same comet, of which the periodic time was about 76 years. After a rough estimate of the perturbations it must sustain from the attraction of the planets, Halley pre- dicted its return for 1757,—a bold prediction at that time, but justified by the event, for the comet again made its appearance as was expected, though it did not pass through its perilelion till the month of March 1759, the attraction of Jupiter and Saturn having caused, as was computed by Clairaut previously to its return, a retardation of 618 days. This comet had been observed in 1066, and the accounts which have been preserved represent it as having then appeared to be four times the size of Venus, and to have shone with a light equal to a fourth of that of the moon. History is silent respecting it from that time till the year 1456, when it passed very near to the earth : its tail then extended over 60° of the heavens, and had the form of a sabre. It returned to its perihelion in 1835, and the splendour of its appearance rendered it once

more an object of universal interest ; it was well observed in almost every observatory.

The orbit of the comet of 1770 was calculated by Lexell, and subsequently by Burckhardt, and both these astrono- mers found that the observations could only be represented by an ellipse in which the time of revolution was five years and a half; yet the comet has never been seen since, or at least has not been seen moving in the same orbit. Hence it is concluded with certainty that the attrac- tion of Jupiter, near which planet it had passed, was so great as to compel it to move in a totally different ellipse.

Another famous comet, whose periodic returns have been verified by observation, received the name of Encke the astronomer, who first recognised it as having been observed in previous revolutions. It returns to its perihelion in 1208 days. Encke's comet, although its identity was not discovered till 1818, had been frequently observed, as in 1789, 1795, 1801, and 1805; and on these occasions it exhibited very different appearances, having been seen with and without a nucleus, and with and without a tail,—circumstances which account for its having so long escaped being recognised as a regular attendant on the sun. In its returns to its perihelion in 1808, 1812, and 1815, it escaped detection; but it reappeared in 1818, and it was from the observations of that year that Encke computed the elliptic elements of its orbit. Ou its next return, in 1822, it was invisible in Europe ; but it was observed at Paramatta, in New South Wales, during the whole month of June, and the time of its perihelion passage was found to differ only by about three hours from that previously computed by Encke. During most of its returns since then it has been well observed.

Other periodical comets will be mentioned further on.

The appearances exhibited by comets are diversified, and sometimes remarkable. That which appeared in the year

- experience in their approaches to the sun.

[THEORETICAL-—

134 B.c., at the birth of Mithridates, is said to have had a disk equal in magnitude to that of the sun. Ten years before this, one was seen which, according to Justin, occupied a fourth part of the sky (that is, extended over 45°), and surpassed the sun in splendour. Another, equally remarkable, appeared in the year 117 of our era; and in 479 there was one, of which the disk, according to Freret, was of such magnitude, that it might have occasioned the extraordinary eclipse of the sun which took place about that time. In 400 one was observed, which is said to have resembled a sword, and to have extended from the zenith to the horizon. That of 531 was of greater magnitude still, and its appearance more terrific. 'Those which appeared in 1066 and 1505 exhibited disks larger than that of the moon. It is, however, probable that these accounts were exaggerated ; for since comets have been observed by astronomers, no instances have occurred in which their magnitudes and appearances have been so extraordinary. The most remarkable among those of which we possess accurate accounts appeared in the years 1456, 1618, 1680, 1744, 1759, 1769, 1807, 1811, 1841, 1858, 1861, and

1874.

The nucleus, which is the densest and most luminous part, may be said to form the true body of the comet. It is far, however, from having the dense and solid appearance of the planets, and astronomers consider it to be diaphanous, and believe that they have observed stars through it. But it is extremely difficult to distinguish the nucleus from the surrounding nebulosity. If the nucleus were an opaque globular body, it would exhibit phases like Venus or Mars, according to its different positions with relation to the sun and the earth ; and such were supposed to have been observed in the case of the comet of 1682, by Hevelius, Picard, and Lahire. But the nebulosity renders the phases obscure, and prevents the true body of the comet from being seen. 'The real nucleus has probably never been observed by any astronomer.

It is known certainly that comets are of small density, from the circumstance that they produce no appreciable effect on the motions of the planets. The comet of 1770 traversed the system of Jupitcr's satellites without causing any sensible perturbation of these small bodies. This comet also passed

very near the earth; and Laplace calculated that, if its mass had been equal in density to that of the earth, the effect of its attraction would have incrcased the length of the sidereal year by 2 hours 28 min. But since its influence was altogether insensible, it is certain that its mass was not equal to the five-thousandth part of that of the earth, aud was probably much less than even this quantity.

If the real nuclei of comets were solid, the matter of which they are composed must be extremely fixed, in order to enable them to resist the intense heat they necessarily According to the computation of Newton, the great comet of 1680, at its perihelion, was only distant from the sun by the 163d part of the semidiameter of the earth's orbit, where it would be exposed to a heat above 2000 times greater than that of red-hot iron,—a temperature of which we can form no conception, and which would instantly dissipate any substance with which we are acquainted.

The most interesting features of recent research into the subject of comets are (1) the spectroscopic examination of those comets which have appeared since the importance of spectroscopic analysis has been recognised, and (2) the association which has been recognised between meteor- systems and comets.

Before proceeding, however, to discuss these matters, we a be S comets.

give the following tables indicating the progress which ha, been made in the determination of the orbits of periodic comets :—

| | |

COMETS. | ASTRON OM Y 815 Lable of Comets having a Mean Distance less than that of There are already recoguised more than one hundred Saturn. meteor-systems, known by the direction in which the We daenee| a corresponding falling stars encounter the earth. = four aia, | S°eenivisiley:) Tnelinaatite| TO. The best-known meteor-systems are those which produce oo | | @ shower on November 13-14 in certain years, and those vie ee a. oe i ¥ | a Which usually produce a display on August 10-11. The BureLhar dt's…| 2-9337 03640 | 8 145! 5-095 former have becu called the Leonides, because the part of Clausen's…..... 3°0913 O70 tens 45 5'435 the stellar

sphere whence the meteors appear to radiate is De Vico's 3°1028 0°6173 25445) 5-469 in the constellation Leo. The latter, for a like reason, Winnecke's…...) 3°1343 0°7547 10 48 4 5°549 appearing to radiate from Perseus, have been ll 1 Brorsen's…..... 81468 | 0-7945 | 80 57 51) 5-581 | | PLEO DS ee a a a Hexellisy. ...00s0+. 3°1560 0°7861 1 34 28 5°607 = : ore 31609 0°7552 110 42 481 5-618 It has been found that these two meteor-systems accord, D'Arrest's …..... 3°1618 0°6609 | 13 56 6! 6°380 so far as their orbital motions are concerned, with two nae reeeeeesecee es : s a – ' "- comets, viz., respectively T'empel's comet, L., 1866, and the DVIS Ge ciusveeee ; B57 2 . : Ne a Cee mo ery: 6787 | 47 43 0.1 10-008 ae ie! as ae Teme. The association is indicated CTETE Bosc .ssass 63206 | 0-7567 | 13 214] 15-990 in the following table :—

i 4 ayamie ais – : Orbit of Orbit of Motion in all cases direct. on ~ Novem er ae Angust Sema TtL Table of Comets having a Mean Distance exceeding Saturn's, | |—__ — =o and less than that of Uranus, j —_ egg ae J oy July 23°62 | Aug. 22°9 Name. ae. Eccentricity. | Inclination. | FP ae er dis- 09765 09643 0-9626 Westphal's…..... 16-6200 o-0248 40 08 82 | 67-770 atin S48" 38" | 844° 41' cee ; _ 73 3 i ° , ° – ° Ds Oo te De vies Seprin.: ie-baae 09544 4 af 13 78-950 8 51°28" | 51° 26"1 | 9138°16'| 187° 27 : OE re 17°6338 0°9312 | 44 29 55 74°050 Keceutricity .. 09033 0°9054 STOTSEN'S.....5… 17°7795 0°9726 | 19 8 25) 74-970 Semi – axis ; ; Halley's…..... 17°9875 | 09674 | 17 45 5 | 76-680 major. ..... L0sa30 had vss ee ome aes oa Bet Motion of the first five direct, of Halley's retrograde. rae gritty — ae a om Analysis of The fine comet of 1858-59, called D onati's, was subjected Wetion Retrograde | Retrograde Retrograde | Retrograde cometic —_ to. a rough spectroscopic analysis by Donati, and the spec- aml : aT spectra. trum shown to be discontinuous, consisting of a few broad Other comets have been associated, though not quite so bands. Comet I., 1866 (called Tempel's), examined by distinctly, with meteoric systems. But perhaps the most Huggins in 1866, showed three bands in the spectrum of | remarkable evidence in this matter is that afforded by the nucleus. Brorsen's comet, examined in 1868, showed |} Biela's comet. At the return in 1866, and again in 1872, similar appearances. But it was not until the examination this comet was uot seen; and as it had become divided of Winnecke's comet in 1868 that any successful attempt | into two distinct comets in 1847, the inference was, that was made to compare the band

spectrum of a comet's | it had further subdivided since it was last seen in 1859. nucleus with the spectrum of a known terrestrial element. | N ow the orbit of this comet nearly intersects that of the The result was somewhat remarkable. It was found that earth, at about the place occupied by the carth on the spectrum is that obtained from carbon when the electric | November 27. Accordingly, after the fruitless telescopic spark is taken through olefiant gas. The same result has | search for the comet in 1872, Professor Alexander Herschel been obtained, both by Huggins and by Professors Hark. pointed out that, during the last weck in November, meteors ness and Young of America, from the spectroscopic analysis | following in the train of this comet might be expected to of Encke's comet in 1872. Professor Harkness sums up the | make their appearance. On the night of November 27, result of his own series of researches into the condition of | 1872, a remarkable shower of meteors was observed, the this comet as follows :—(1.) Encke's comet gives a carbon | meteors radiating from a region of the heavens indicating spectrum, (2.) From November 18 to December 2, the | that they were travelling in the track of Biela's comet, wave length of the brightest part of the comet's spectrum The telescopic study of some of the remarkable comets Telescopic was continually increasing. (3.) No polarisation was de- | of the last quarter of a century has been rewarded by oration tected in the light, of the comet. (4.) The mass of Encke's | results of interest. This has been the case in particular % comets. comet is certainly not less than that of an asteroid. (5.) | with Donati's comet of the year 1858. During the comet's There is some probability that the electric currents which | passage past its perihelion, several envelopes formed around give rise to auroras are propagated in a medium which per- | the head, continually passing outwards, and disappearing vades all space, and that the aurora is in reality the spectrum | after a certain distance from the nucleus had been reached, of the medium. 6. It is not improbable that the tails of | while new envelopes appeared within, Besides the prin- all large comets will be found to give spectra similar to | cipal tail, which was curved like an aigrette plume, another that of the aurora, though additional lines may be present. | thin straight tail was visible for a while ; and for a short | Connection It is only of late years that the study of meteors or fall- | time yet another was seen, A striation of the chief tail could ofeomets ing stars has come to be regarded as belonging to astro- | also be recognised, which, according to the researches of —

nomy. Even now the discovery of the connection of | Bond and Norton in America, corresponded to the action

meteors and comets is so recent, and the aspect under which the new department of astronomy presents itself varies so continually as fresh relations are recognised, that it seems desirable to limit our remarks to the statement of afew broad facts. '

It has been shown, then, that meteors travel in systems round the sun, and that displays of falling stars occur when the earth passes through a meteor-system.

of a repulsive force exerted by the sun, and sweeping matter away from the main tail with a velocity exceeding that with which this tail itself was formed, but not exceeding the velocity indicated by the straightness of the subsidiary tails.

The great comet of 1874 is shown in fig. 51, as Coggia's peculiarity comet.

pictured by Mr Huggins. It exhibits well a which has characterised many comets, the well-defined dark

The con- stellations.

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streak behind the nucleus (which, however, is in this case somewhat eccentrically situated). This phenomenon is not

Fia. 51.—Coggia's Comet.

easily explained. It is common, indeed, to find it accounted for as due to the absence of illuminated matter behind the nucleus. But asa comet's tail is not a flat object, spread out on the dome of the heavens, but a conical, or rather conoidal, appendage, which viewed from all sides would present, no doubt, much the same appearance, the line of sight directed towards the axis must pass through the illuminated en- velope. Huggins's spectroscopic examination of this comet yielded results resembling those he had already

obtained from small comets. But this was the first comet whose tail he had analysed. The spectroscopic analysis of the various parts of the comet gave the following results :—

“ When the slit of the spectroscope was placed across the nucleus and coma, there was seen in the instrument a broad spectrum, con- sisting of the same three bright bands exhibited by Comet II., 1868, crossed by a linear continuous spectrum from the light of the nucleus. On the continuous spectrum of the nucleus,’ he proceeds, “‘] was not able to distinguish with certainty any dark lines of absorption, or any bright lines, other than the three bright bands. Besides these spectra, there was also present a faint broad continu- ous spectrum between and beyond the bright bands. When the slit was moved on to different parts of the coma, the bright bands and the faint continuous spectrnm were found to vary in relative intensity. When the slit was brought past the nucleus ou to the commencement of the tail, the gaseous spectrum became rapidly fainter, until, at a short distance from the nucleus, the continuous ‘spectruin predominated so strongly that the middle band only, which is the brightest, could be detected on it. We have presented to us, therefore, by the light of the comet, three spectra : (1.) The spectrum of bright bands; (2.) The continuous spectrum of the nucleus; (3.) The continuous spectrum which accompanies the

gaseous spectrum in the coma, and which represents almost entirely the light of the tail.”

Cuaprer XVIII.—The Fixed Stars and Nebule.

The great multitude of stars visible even to the naked eye renders it impossible to distinguish each by a parti- cular name ; astronomers, accordingly, for the sake of re- ference, have formed them into groups, known as Constella- tions or Asterisms. To these the early astronomers gave the names of men and animals, and other objects, from fancied resemblances or analogies, for the most part not easily traced. These denominations are preserved in modern catalogues ; and the practice of delineating the object itself on celestial globes and charts has been only recently, if it has yet been altogether, abandoned. The ancients distinguished some of the brightest stars in the different constellations by

particular names ; but to include others less conspicuous, it became necessary to adopt a

different mode of proceeding. According to the usual method, first introduced by Bayer in his Uranometria, each of the stars in every constellation is marked by a letter of the Greek alphabet, commencing with the most brilliant, which is designated by a; the next most con- spicuous is called f, the third y, and so on. When the Greek letters are exhausted, recourse is had to the Roman or Italic. The order of the letters was intended to indicate only the relative brilliancy of the stars in the same constellation, without any reference to those in other parts of the heavens. 'Thus a Aquarii is a star of the same order of brightness as y Virginis. Moreover, whether owing to carelessness in the original lettering or to changes in the brightness of the stars, the order of the letters does not always correspond to the brightness, even in the same constellation. Thus, «, 4, and y Urse Majoris are far brighter than 5 of that constellation. The stars of the first order of brightness are likewise denominated stars of the first magnitude ; those of a degree inferior in brightness are said to be of the second magnitude, and so on with the third, fourth, &c. Below the sixth the same denomina- tions are continued; but the stars of the seventh and inferior magnitudes are no longer visible to the naked eye, and are therefore called telescopic stars.

The number of constellations given by Ptolemy is 48, viz. -—

North of the Zodiac.

The Little Bear.

The Great Bear.

The Dragon.

Cepheus.

The Herdsman, orthe Bearwarden. The Northern Crown.

Hercules (kneeling).

. Ursa Minor,

. Ursa Major,

Draco,

. Cepheus,

Bootes, or Arctophylax, . Corona Borealis,

. Hercules (Ev yévacw),

. Lyra, The Harp.

. Cygnus, The Swan. 10. Cassiopeia, The Lady in her Chair. 11. Perseus, Perseus.

12. Auriga, The Waggoner.

13. Serpentarius, or Ophiuchus, The Serpent-bearer.

14. Serpens, The Serpent.

15. Sagitta, The Arrow.

16. Aquila (or Vultwr) et Antinous, The Eagle and Antinous.

17. Delphinus, The Dolphin.

18. Equuleus, The Horse's Head.

19. Pegasus, or Equus, The Flying Horse, or the Horse. 20. Andromeda, Andromeda.

21. Triangulum, The Triangle.

In the Zodiae.

22. Aries, The Ram.

23. Taurus, The Bull.

24. Gemini, The Twins. The Crab.

25. Cancer, 26. Leo,

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27. Virgo,

28. Libra,

29. Scorpio, 30. Sagittarins,

The Lion, to which Ptolemy joined some stars of Berenice's hair.

The Virgin.

The Balance.

The Scorpion.

The Archer.

31. Capricornus, The Goat. 32. Aquarius, The Water-Bearer. 33. Pisces, The Fishes. Southern Constellations. 34. Cetus, The Whale. 35. Orion, Orion. ; 36. Eridanus, or Fluvins, Eridanus, or the River. 37. Lepus, The Hare.

38. Canis Major, 39. Canis Minor, 40. Argo Navis,

The Great Dog. The Little Dog. The Ship Argo.

41. Hydra, The Hydra. 42. Crater, The Cup.

43. Corvus, The Crow. 44, Centaurus, The Centaur. 45. Lupus, The Wolf. 46. Ara, The Altar.

The Southern Crown.

47. Corona Australis, I The Southern Fish.

48, Piscis Australis,

| Distance of the stars,

FIXED STARS. |

The constellations added by Hevelius are the following

*(those marked * being now little used) :— *1, Antinous, Antinous. 2. Mons Menelai, Mount Menelaus. 3. Canes Venatici, The Greyhounds.*

*4, Camelopardalis, The Giraffe. *5. Cerberus, Cerberus. 6. Coma Berenices, Berenice's Hair. 7. Lacerta, The Lizard. 8. Lynx, The Lynx,*

Sobieski's Shield.

The Sextant.

The Southern Triangle. The Little Lion.

Halley in the southern

**9. Scutum Sobieskii, 10. Sextans, 11. Triangulum Australe, 12. Leo Minor, The constellations added by hemisphere are,—*

*1. Columba Noachi, Noah's Dove. *2. Robur Carolinum, The Royal Vak. 3. Grus, The Crane. 4, Phenix, The Pheenix. 5. Pavo, The Peacock. 6. Apus, The Bird of Paradise. 7. Musca, 3 The Fly. 8. Chameleon, The Chameleon.*

In considering the fixed stars, the first point to which our attention is naturally directed is the determination of their real dimensions, and a necessary, though not sufficient, preliminary is the determination of their

distances from us. An obvious consequence of the annual motion of the earth is the existence of an annual parallax of the stars ; but on account of the enormous distances of these bodies, this effect of the earth's motion is so small, that it cannot be easily measured ; and there are even now very few cases in which, with the utmost refinements of methods and instruments, a measurable parallax has been detected. We find that, compared with the distances of the fixed stars, the diameter of the earth's orbit is merely a poiut ; for in most cases, the most careful observation of the same star, at intervals of six months, indicates no variation what- ever in the star's position, after the proper corrections have been made for the small effects produced by dif- ferent known causes. The limits of the errors of modern observations cannot well be supposed to exceed 1". It follows, therefore, that, seen from the distance of the fixed stars, the diameter of the ecliptic, which exceeds 180 millions of miles, subtends an angle of less than 1'. Had the annual parallax' exceeded this small quantity, it could scarcely have escaped the multiplied efforts that have been made to detect it; yet the distance of a star

having a parallax of 1" is x radius of earth's orbit,

sin. 1" that is, about 19 billions of miles.

The first star actually shown to have an annual parallax was the star 61 Cygni, a binary system of two sixth-magni- tude stars, having a large proper motion. The parallax was detected and measured by Bessel, using the Konigs- berg heliometer. He compared the position of the point midway between the pair with that of two very small and presumably more distant stars. From the observations made between October 1837 and March 1840, Bessel deduced as the parallax 07-3483, corresponding to a distance of about 600,000 radii of the earth's orbit. This result was confirmed shortly after by Peters at Poulkowa, who, from observations of the zenith distances, deduced the parallax 0'-349. It will presently be seen that more recent measures do not accord well with these results. In the meantime, though the result was published later, Mr Henderson, at the Cape Town Observatory, had been observing a Centauri, one of the brightest of the southern Stars, with the object of determining if it has a sensible parallax. Notwithstanding

the inferiority of the instrument he employed (a mural circle imperfectly graduated), Mr Henderson succeeded in recognising a parallax, which he

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estimated at 1’°16, Maclear, who was his successor as astronomer royal at the Cape, determined the parallax to be 0’-9128, and subsequent observations assign to the parallax the value 0”9187. Doubtless 09 fairly repre- sents the most probable value. It is less than a tenth of the solar parallax ; in other words, the orbit of the earth as seen from a Centauri subtends less than a tenth of the are which the earth’s disk subtends as seen from the sun. The distance corresponding to this parallax is in round numbers about 20 billions of miles, a distance which light traverses in about 31 years,

Other stars have since so far yielded to the attacks made upon them by astronomers as to show signs of having measurable parallax. But it must be admitted that many of the results hitherto obtained are open to considerable doubt, as the following table serves sufficiently to indicate :—

Magn Parallax formerly given Latest Measure- i by Sir J. Herschel. ments of Parallax. : 0-976 (Henderson, cor- a a ae Fucgoosrsc 1 rected by Maclear) 0°91 Gl Cyan. .scdces 6 | 0°348 (Bessel) ..... 0°55 Lalande, 21,258.. 0°260 (Kriiger)....., easy eee: Oeltzen, 17,415-6 0°247 (Kriiger)..... Hh , 0°155 (W. Struve, cor- CB ae 1 rected by O. Struve) i oa 0°150 (Henderson, cor- ; i 1 rected by Peters)... 0:27 70 Ophiuchi…....] 5 | 0:160 CISHHGER) cco: Oe t Urse Majoris…| 3 | 0°133 (Peters)..... vs Arcturus botidecbdader 1 | 0°127 (Peters)..... ae es PPGIATIG: cos .sccu ove 2 | 0°067 (Peters)..... O11 Capella veces… 1 | 0-046 (Peters).. ..... pee as EMOCVOM 8.565000 cc 1 On

If we consider that, with the exception of a Centauri, no star has been observed with accordant results, we may question whether the instruments employed by astronomers are as yet competent to measure accurately small parts of a second of arc. As for the parallax assigned to the five last stars of the above list, it would be absurd to place any reliance on the estimated

value, save as indicating that those stars lie at so enormous a distance that their parallax cannot be measured.

As the most powerful telescope does not show the real Light from

disk of a star, it is not possible to determine by actual the stars. measurement the size of even the largest or the nearest. The amount of light received from a star whose distance is known can, however, be compared with that which our sun would give if removed to the star's distance; and if we then assume equal intrinsic surface-lustre, we may infer (though not very safely) the surface, and therefore the size, of the star. Thus the distance of a Centauri exceeds the sun's 230,000 times, so that the sun, removed to the star's distance, would shine with only the 52,900,000,000th part of his observed lustre. But a Centauri shines with about the 16,950,000,000th part of the sun's brightness. Hence the star emits three times as much light as the sun, or (on our assumption) has a surface three times, a diameter ,/3 times, and a volume 3/3 times (or more than 5 times) as great as his. Sirius dealt with in like manner would appear to have a volume exceeding the sun's about 2700 times. But it is probable that the larger stars shine also with a greater intrinsic lustre, mile for mile of surface, and therefore are not so much larger as we should infer from the above method of reasoning.

That the stars resemble the sun in general constitution Analysis of and condition has been proved by spectroscopic analysis, stellar the spectra of stars being in general respects like the spec- SPe¢t. trum of the sun. Nevertheless, characteristic differences

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Coloured stars

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exist, insomuch that the stars have been divided into four orders, distinguished by their spectra. These are thus presented by Secchi, after examination of the spectra of more than 500 stars :—

The first type is represented by a Lyre, Sirius, &c., and includes most of the stars shining with a white light, as Altair, Regulus, Rigel, the stars 8, y, «, ¢, and y of Ursa Major, &c. These give a spectrum showing all the seven colours, and crossed usually by multitudes of dark lines, but always by the four lines of hydrogen, very dark and ‘ strong. The breadth of these lines indicates a very deep absorptive stratum at a high temperature and at great pressure. Nearly half the observed stars showed this spectrum.

The second includes most of the yellow stars, as Capella, Pollux, Arcturus, Aldebaran, a Urse Majoris, Procyon, &c. The Fraunhofer lines are well seen in the red and blue, but not so well in the yellow. The resemblance of this spectrum to the sun’s suggests that stars of this type resemble the sun closely in physical constitution and con- dition. About one-third of the observed stars showed this spectrum.

The third type includes Antares, a Orionis, a Herculis, B Pegasi, Mira, and most of the stars shining with a red light. The spectra show bands of lines (Secchi’s instru- ment showed shaded bands, but with superior spectro- scopes multitudes of fine lines appear). The spectra resemble somewhat the spectrum of a sun spot, and Secchi infers that these stars are covered in great part by spots like those ofthe sun. About 100 of the observed stars belong to this type.

The fourth type differs only from the last in the arrangement and appearance of the bands, and includes only faint stars. A few stars, as y Cassiopeie, 7 Argus, B Lyre, &c., show the lines of hydrogen bright instead of dark, as though surrounded by hydrogen glowing with a heat more intense than that of the central orb itself.

The exact spectroscopic observation of many stars by Huggins and Miller has shown (what Secchi’s comparatively rough observations could not effect) that many elements known to us exist in these stars. Thus, in the spectruin of Aldebaran are lines coinciding with the lines of the clements hydrogen, sodium, magnesium, iron, tellurium, antimony, calcium, bismuth, and mercury. In the spec- trumof Betelgeuse these physicists recognised in like manner the lines of sodium, magnesium, iron, bismuth, and calcium, but found the lines of hydrogen wanting. Sirius, Pollux, Castor, the stars of Ursa Major, and many others, were examined with similar results.

Many stars are coloured. Thus Antares, Aldebaran, and Betelgeuse are ruddy; Arcturus, Procyon,and Pollux yellow ; Vega and Altair slightly bluish ; while Capella, Sirius, and many other stars are brilliantly white. Among telescopic stars, some are of a deep, almost blood, red, while others are ruddy, orange, yellow, garnet-coloured, and so on. Few single stars show a well-marked blue colour. But among the binary and multiple star-systems, blue, green, indigo, violet, and lilac stars are common, especially as smaller companion stars; such colours as olive, russet, grey, ash-colour, fawn, and so on, are also observed, though this is probably due to the combined lustre of several very small stars closely set. Complementary colours are not uncommon among double stars, the brighter of a pair (in such cases) usually having a red, orange, or yellow colour, and the smaller showing the respective complementary, green, blue, or purple. Nor are these instances to be explained as due to contrast (though contrast doubtless strengthens the apparent hue of the smaller star); for when the brighter is concealed from view, the fainter is still found to shine with its colour unchanged. Spectro-

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scopic analysis shows that usually the colour of a star is due to the presence of absorptive vapours in the star's atmosphere cutting off certain portions of the light. Thus the orange component of the double star Albireo has a spectrum crossed by several bands in the blue and violet portion, while the blue component has a spectrum showing many strong lines in the red and orange portion,—hence the former star looks orange because of the deficiency of

j fe and violet in its light, and the latter looks blue because

ts light is deficient in red and orange.

On examining the stars with telescopes of considerable Double an/ power, many of them are found to be composed of two or multiple |

more stars placed contiguous to each other, or at dis- tances subtending a very minute angle. This appearance is probably in many cases owing solely to the optical — effect of their position relatively to the spectator ; for it is evident that two stars will appear contiguous if they are placed nearly in the same line of vision, although their real distance may be immeasurably great. There are, however, many instances in which the angle of position of the two stars varies in such a manner as to indicate a motion of revolution about a common centre; and in this case the two stars form a binary system, performing to each other the office of sun and planet, and connected together by gravity or some equivalent principle. The observations of Herschel, Dawes, South, and Struve have placed this fact beyond doubt. Motions have been detected which are so rapid as to be measurable within very short periods of time; and in certain cases the smaller star has been observed to disappear, either on passing behind or before its primary, or by approaching so near to it that its light has been absorbed by that of the other. The most remark- able instance of a regular revolution of this sort is that of the double star € Urs Majoris, in which the angular velocity is 6°-4 annually, so that the two stars complete a revolution about one another in the space of 60 years, and about a circuit and a half have been already described since its discovery in 1781. The double star 70 Ophiuchi presents a similar phenomenon, a revolution being com- pleted in a period of about 80 years. a Castoris, y Virginis, ¢ Cancri, £ Bootis, § Serpentis, and that remarkable double star 61 Cygni, together with several others, exhibit similar variations in their respective angles of position. Sir W. Herschel observed in all 2400, double stars. The catalogue of Struve of Dorpat contains 3063 of the most remark- able. 'The object of these catalogues is not merely to fix the place of the star within such limits as will enable it to be easily discovered at any future time, but also to record a description of the appearance, position, and mutual dis- tances of the individual stars composing the system, in order that subsequent observers may have the means of detecting their connected motions, or any changes by which they may be affected, There are many triple, quadruple, and quintuple stars. Every region of the heavens furnishes examples of these curious phenomena; but it is remarked that some parts of the heavens contain very few, while others present them in great abundance. Agegregations of stars more and more complex appear as Star we extend our survey, and wider and wider regions of the sa heavens are occupied by groups of associated

stars. most complex and extensive of all such gatherings is the way. galaxy or milky-way, a zone-shaped region surrounding the whole sphere of the heavens, in which stars innumerable so combine their lustre as to present a milky luminosity. We speak of a zone-shaped region, be it noticed, not of a zone, for the milky-way does not form a complete zone, but simply occupies a zone within which appear streams, and nodules, and irregular clusterings of stars. Along part of the region there is but one well-marked stream; else-where two streams are seen, and in other places several.

The The milky

| Variations of stellar lustre.

Temporary stars.

FIXED STARs. |

But parts of the circuit are incomplete, while in some cases dark regions in the very midst of a bright stream attest the irregular conformation of this Strange star region. .

Some of the fixed stars are subject to periodical varia- tions of brilliancy. Several, formerly distinguished by their splendour, have entirely disappeared ; others are now conspicuous which do not seem to have been visible to the ancient observers ; and some alternately appear and disap- pear, or at least undergo great periodic variations in bright- ness. Some seem to become gradually more obscure, as 8 Ursee Majoris ; others, like 8 in the Whale, to be increas- ing in brilliancy. Some stars have all at once blazed forth with great splendour, and, after a gradual diminution of their light, have again become extinct. The most remark- able instance of this sort is that of the star which appeared in 1572, in the time of Tycho. It suddenly shone forth in the constellation Cassiopeia with a splendour exceeding that of stars of the first magnitude, or even Jupiter and Venus at their least distances from the earth, and could be seen with the naked eye on the meridian in full day. Its brilliancy gradually diminished from the time of its first appearance, and at the end of sixteen months it entirely disappeared, and has never been seen since, During the whole time of its apparition, its place in the heavens remained unaltered, and it had no

annual parallax ; its distance was consequently of the same order as that of the fixed stars. Its colour, however, underwent considerable variations. Tycho describes it as having been at first of a bright white ; afterwards of a reddish yellow, like Mars or Aldebaran ; and lastly, of a leaden white, like Saturn. Another instance of the same kind was observed in 1604, when a star of the first magnitude suddenly appeared in the right foot of Ophiuchus. It presented phenomena analogous to the former, and disappeared in like manner after some months.

Many stars have been observed whose light seems to undergo a regular periodic increase and diminution, and these are properly called variable stars. The star o Ceti (called also Mira) has a period of 334 days, and is remark- able for the magnitude of its variations. From being a star of the second magnitude, it becomes so dim as to be seen with difficulty through powerful telescopes. But its maxima and minima of brightness are variable. Thus between October 1672 and December 1676 Mira was never visible to the naked eye, while on October 5, 1839, it was half a magnitude brighter than its usual maximum.

Some are remarkable for the shortness of the period of their variation.

Algol (8 Persei) shines ordinarily as a second magni- tude star, but during about 7 hours in each successive period of 69 hours undergoes the following changes :— It decreases gradually to the fourth magnitude, remaining so for 20 minutes, and then increases as gradually to the second magnitude. Thus it remains a second magnitude star for about 62 hours in each period of 69 hours. The star 6 Lyre in successive periods of 12 days 22 hours undergoes a double change, each occupying 6 days 11 hours (formerly assigned as the star's true period). In each period the star has a maximum brightness of about the 30 magnitude, but the minima of brightness are appreciably unequal, the star's magnitude in one being 4°3, in the other 4-5. The star 8 Cephei varies in a period of 5 days 8 hours 48 min. from the fifth to the 3°5 magnitude, occupying 1 day 14 hours in passing from minimum to maximum, but 3 days 19 hours in passing from maximum to mininum. 'Two or three hundred stars are now recog- nised as variable. The most probable explanation of the variation in long periods is

that stars so affected have periodical maxima and minima of disturbance, resembling that which causes the sun spots, only more marked. Some of

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the variables of short period are probably covered unequally in different parts of their surface by spots. But the varia- tion of such stars as Algol, which shine with a constant lustre for the greater part of each period, and are reduced in lustre for a short interval, cannot be thus explained, and we must suppose that a large opaque orb circling around them transits the central luminary at regular intervals. Most of Irregularly the stars which have appeared suddenly, and shone for a Variable short time, probably resemble in character the only star of S"S- this kind hitherto examined—the star T in Corona Borealis,

which, blazing out suddenly as a second magnitude star (usually of the tenth magnitude only), was found by Hug-

gins and Miller to have a spectrum crossed by fine black

lines, on which was superposed the spectrum of glowing hydrogen. As the star waned, the hydrogen spectrum

faded, and finally disappeared. Presumably there had

been an outburst of glowing hydrogen, or a conflagration

in which hydrogen was the principal agent. The maximum brightness of the star exceeded the normal lustre almost 800-fold. The star » Argus can hardly as yet be classed

either among periodically variable stars or among stars undergoing irregular changes. In 1677 Halley catalogued

it as of the fourth magnitude ; Lacaille, in 1751, obscrved

it as of the second magnitude. Between 1811 and 1815

it was of the fourth magnitude; from 1822 to 1826 of

the second ; in 1827 of the first magnitude ; thereafter, till

1837, of the second; in 1838 of the first; in 1843 the

star was brighter than any except Sirius. At present it is

barely visible to the naked eye.

Passing over the speculations of Bruno, Hooke, and others, stellar we find that. Halley was the first to suspect from observa- proper tion the proper motion of the stars. From comparisons ™otions. between the observed places of Arcturus, Aldebaran, and Sirius, and the places assigned to these stars by the Alex- andrian astronomers, he was led to the opinion that all three are moving towards the south. (Phil. Trans., Ls.)

The elder Cassini adopted the same view respecting Arc- turus, proving, in fact, that even since the time of Tycho Brahe this star had shifted 5' in latitude; for he showed that » Bootis, which should have shared in the change if the ecliptic itself had shifted in position, had not changed appreciably in position. Bradley and Wright theorised respecting the causes of stellar motion, and suggested that the sun and his fellow-suns, the stars, are moving in space. Tobias Mayer, in 1771, comparing Roemer's observations in 1706 with his own and Lacaille's in 1750-56, was led to the opinion that the stellar motions afford no sufficient evidence of the translation of the solar system through space. But in 1783 Sir W. Herschel, from the proper Proper motions of seven principal stars,as determined by Maskelyne, motion of deduced as the point towards which the sun is moving the sun. (or, as it is now commonly termed, "the apex of the solar way") a point in Hercules in right ascension 257°. After carefully examining Mayer's list of proper motions, he indicated a point close to the star A Herculis (Hf, fig. 52). In 1805 Sir W. Herschel published a paper based on Maskelyne's catalogue of the proper motions of 36 stars published in 1790, and presenting a result consider- ably different from that which he had before announced. He now set the apex in R.A. 245° 52' 30" and north declination 49° 38° (HI, in fig. 52). Bessel in 1818 (F'un- damenta Astronomee) expressed the opinion that Mayer had been right in denying

the existence of sufficient evi- dence for determining the proper motion of the solar system. Later, however, the subject has been dealt with by Midler, Argelander, and O. Struve, whose various determinations of the solar apex are shown in fig. 52, marked M, Ar., and =, respectively. Sir G. Airy re-examined the subject by a new method, assigning to the sun (by an appli-cation of the method of least squares) such a direction

and rate of motion as accounts for the greatest proportion of the observed stellar motions. The plan was carried out

Fia, 52.—Various Determinations of the Apex of the Sun's Way.

according to two different hypotheses respecting errors of observation, and was first applied to about 300 stars, afterwards to about 1500, by Mr Dunkin. The results of the first pair of solutions are indicated by the points A, and A, in fig. 52, the results of the others by the point A, and A, A, Jies in R.A. 261° 14' and N.P D. 57° 51'; A, in R.A. 263° 44' and N.P.D. 65°. Lastly, Mr Galloway, by considering the motion of southern stars, has deduced the result indicated at G. Giving to these various results their due weight, we find for the probable position of the apex that shown in fig. 52.

The analysis of the proper motions of the stars by Mr Proctor has led to the recognition of local star-drifts. This is illustrated in fig. 53. Here arrows are drawn from

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Fra. 53.—Iilustrating Star-drift.

the several stars, indicating their direction and rate of motion, the rate being such that 36,000 years would be required to carry any star from its

present position to the position marked by the extremity of the arrow-point. It will be seen that the stars B, y, 6, «, and € Urse Majoris,

_with the companions of , are travelling in the same direc-

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tion and at the same apparent rate. Similar drifting motious can be recognised in other parts of the heavens.

Spectroscopic analysis affords a means of determining Proper

the motions of stars in the direction of the line of sight. motions of For if a star is receding, the wave length of any definite ae portion of its light must be apparently lengthened ; while sion if the star is approaching, such wave-length must be shortened. Thus, if the position of some known line in a star's spectrum can be compared with the position of the same line in the spectrum of a terrestrial element, any shift of position indicates whether the star is receding or ap- proaching. In this way several of the brighter stars have been dealt with by Mr Huggins, and motions of recession and approach, amounting in some cases to 30 or 40 miles per second, have been recognised. This method has afforded au interesting confirmation of Mr Proctor's views about star- drift, seeing that Mr Huggins assigns to the five stars £, y, 6, «, aud ¢ Urse Majoris, equal motions of recession (about 17 miles per second). He also finds that their spectra are alike, indicating a resemblance in constitution and structure, such as we should expect to find in the members of a drifting system.

The Vebule are celestial objects which present a cloudy The appearance. When examined with a telescope of moderate nebula. power, the greater part of the nebule are distinctly per- ceived to be composed of clusters of little stars, impercep- tible to the naked eye, because, on account of their apparent proximity, the rays of light proceeding from each are blended together, through the effects of irradiation, in such a manner as to produce only a confused luminous appearance. In others, however, no individual stars cau be perceived, even through the best telescopes, and the nebula

exhibits only the appearance of a self-luminous or phosphorescent patch of matter in a highly dilated or gaseous state. In some instances the nebula presents the appearance of a faint luminous atmosphere, of a circular form and of large extent, surrounding a star of considerable brilliancy. One of the most remarkable nebulz is that Orion which is situated in the sword-handle of Orion. It was nebul, discovered by Huyghens in 1656, and described and figured by hin in his Systema Saturnium, Since that time it has been examined and described by various observers, parti- cularly Fouchy, Mairan, Le Gentil, and Messier, who have given engravings of it; and if any trust can be placed in their descriptions of so indistinct and difficult an object, it must have undergone great changes in its form and physical appearance. Unfortunately, however, no satisfactory in- ference can be drawn from the comparison of the different descriptions ; for it is found that the same nebula, viewed on the same night with different telescopes, presents appearances so different as to be scarcely recognisable as the same object. The effects of atmospherical variations also cause great differences in its appearance, even when it is viewed through the same telescope at different times, so that it is scarcely possible that any two observers will be found to agree in their delineation of its outline. Sir J. Herschel, in the second volume of the Memoirs of the Astronomical Society, has given a detailed description of this nebula as it appeared in his twenty-feet reflector in 1824, together with a drawing, which, on account of the superiority of his telescope, is probably a much more cor- rect representation of the object than any which previously existed. Plate XXX. is copied from that drawing. Of that portion of the nebula which he calls the Huyghenian region Sir J. Herschel gives the following account : "I know not how to describe it better than by comparing it to a curdling liquid, or a surface strewed over with tlocks of wool, or to the breaking up of a "mackerel" sky when the clouds of which it consists begin to assume a cirrous appearance. It is not very unlike the mottling of the sun's disk, only (if

I may so express myself) the grain is much coarser, and the intervals darker; and the flocculi, instead of being geuerally round, are drawn into little wisps. They pre- sent, however, no appearance of being composed of

small stars, and their aspect is altogether different from resolvable nebule. In the latter we fancy that we see stars, or that could we strain our sight a little more, we should see them . but the former suggcst no idea of stars, but rather of something quite distinct from them.”

spectrum of three bright lines, indicating that they consist of glowing gas. One of these lines is the F line of the

. hydrogen spectrum, another is a line of nitrogen, and the

third is undetermined. A few of the gaseous nebule show a fourth line.

Some nebule are variable.

undergo extensive variations ; and we have seen that the great nebula in Orion is strongly suspected of variability.

: ‘ A large irregular nebula Viera surrounding the singular variable star » Argus appears to nebule.

resembling the stellar spectrum in general characteristics. But the irregular nebule, planetary nebule, and a con- siderable proportion of the irresolvable nebule, give a

Nebula Another very remarkable nebula is that in the girdle | Some nebule have vanished ; others have appeared where in — of Andromeda, which, being visible to the naked eye, | formerly no nebulosity had been recognised. mu was known in the earliest ages of astronomy. It was| As thereare double and variable nebulz as well as double Groups of rediscovered in 1612 by Simon Marius, who describes it | and variable Stars, so also are there groupings and aggrega- nebule. as having the appearance of a candle seen through horn, | tions of nebule as of stars. It is noteworthy that the zone that is, a diluted light, increasing in density towards a | region occupied by the milky-way shows very few nebula,

centre. Le Gentil mentions that its figure had appeared | and those mostly of the resolvable order. The regions to him for many years round, but that in 1757 it had | farthest from the milky-way, that is, the regions around become oval. He also remarks that its light was perfectly | the poles of the galactic circle, are those richest in nebule, uniform in all parts,—a fact which is quite at variance speaking generally; but the distribution of the nebuls is with its present appearance, and which, if true, argues that | in reality too irregular to be sufficiently described in such the nebulous matter is in a rapid state of condensation. | terms, Streams and branches and clustering aggregations "At present," says Sir J. Herschel in the volume above | of nebule are found in both of the two hemispheres into referred to, "it has not, indeed, a star orany well-defined | which the galaxy divides the heavens. Most remarkable disk in its centre; but the brightness, which increases among these aggregations are the Nubecule or Magellanic by regular gradations from the circumference, suddenly Clouds, inthe southern heavens. These resemble the milky- acquires a great accession, so as to offer the appearance of way in aspect, but on telescopic examination are found to a nipple, as it were, in the middle, of very small diameter consist, not of stars alone, like the milky-way, but of stars (10" or 12"), but totally devoid of any distinct outline, so | mixed with nebula. Within the Nubecula Major, Sir J. that it is impossible to say precisely where the nucleus | Herschel counted 278 nebula, besides more than 50 out- ends and the nebula begins. Its nebulosity is of the most lying nebulz. The Nubecula Minor is not so rich in nebuls, perfect milky, absolutely irresolvable kind, without the | but still deserves to be regarded as an aggregation of these slightest tendency to that scparation into flocculi above objects. _ described in the nebula of Orion; nor is there any sort of Space will not permit us to consider fully here the various Theories of appearance of the smallest star in the centre of the nipple." | theories of the constitution of the sidereal heavens ad- the sidereal This nebula has, however, been resolved into stars, at least | vanced by Wright, Kant, Lambert, the Herschels, Struve, "verse. partially, by the Harvard reflector. Madler, Herbert Spencer, Proctor, and others. But so Messier formed a list of 103 nebule. But Sir W. | far as discussion of this subject depends on observation, Herschel, by means of his large telescopes, discovered no | it may be thus presented :—The zone of the milky-way less than 2500 ; and Sir John Herschel added 500 northern being rich in stars, we must either infer great extension of and 1700

southern nebule (staying seven years at the Cape | the sidereal system in the direction of that zone, Or a to catalogue these last), In all, about 3700 nebule are | real aggregation of stars within a ring-shaped or spirally- known. They have been thus classified :— shaped region around the earth. If we adopt the former Onders of — (1.) Clusters of stars (globular or irregular) in which the | view, we shall naturally be led to regard the nebule, _nebule. stars are clearly distinguishable. except only those known to be gaseous, as other sidcreal (2.) Resolvable nebule, and such as, from their appear- | systems outside our own, and so distant as to appear like ance, probably require only increased power to be resolved | small cloudlets of stars, But if we adopt the latter view, into separate stars. we may regard many of the nebuls, if not all, as cluster- (3.) Nebulse properly so called, showing no appearance | ing aggregations of stars belonging to the same systein. of stars. Sir W. Herschel adopted the former hypothesis at the (4.) Planetary nebulz. beginning of his career as an observer ; but later (though (5.) Stellar nebulz. nearly all writers on astronomy overlook the fact), his en Nebulous stars. opinion turned towards the lattcr. It was while he still Among the varietics of form may be noted spiral, elliptic, supposed the stars spread with tolerable uniformity through- and ring nebule, dowble nebule, and irregular nebule. out the sidereal system that he trusted to a method of star- Sir W. Herschel classified the nebule according to his gauging depending on the number of stars seen In equal conception of the probable stage of their development from telescopic fields in different directions. tt is manifest purely nebulous matter into stars, single or multiple, as | that, if the telescope reaches to the limits of a system follows :— of stars scattered uniformly, the greater the distance at (1.) Widely-spread nebulosity. — which the limit lies in any direction the greater will be (2.) Irregular nebule. the number of stars in that direction. Gauging the sidereal (3.) Planetary nebule. system on this principle, Sir W. Herschel deduced the (4.) Nebulous stars. inference that it is shaped like a cloven flat disk. But (5.) Diffused clusters. later, perceiving that the rich regions are often seemingly te" Stellar nebula. circular in shape, he inferred that such groups are really (7.) Rich star-clusters. globular in form. It was natural to extend this principle, Srectra of Examined with the spectroscope by Mr Huggins, the | and, seeing tbat parts of the milky-way are stream-shaped, bul. stellar and resolvable nebule are found to give a spectrum | to infer that this appearance indicates the existence of real

streams of stars. Also, since the clustering aggregations are various in size and constitution, it might be assumed that the nebule themselves are only clustering aggregations

more remote than the rest, and belong, therefore, to the sidereal system. The fact that nebulz are rich in regions remote from the milky-way would confirm this supposition, if not of itself sufficient (as Herbert Spencer thinks) to establish it beyond question. If the nature of the Magel- lanic clouds had been known to Sir W. Herschel, this inference would have appeared to him irresistible. How- ever, the results towards which his later views seemed tending were not definitely indicated or adopted by him, probably because he had already attained an extreme old age when he first enunciated his later and juster views of the sidereal universe. Sir J. Herschel does not appear to have recognised his father's change of views, though con- scious of serious difficulties in the older theory, and even definitely indicating the fact that the constitution of the Nubecule cannot possibly be reconciled with that theory. The elder Struve, probably the only astronomer of his time who had thoroughly stwdied Sir W. Herschel's remarkable papers, recognised clearly the change in Herschel's opinions. Following a suggestion thrown out by Piazzi, Struve com- pared the number of stars down to the eighth magnitude in different directions round the equator, and justly regarded the greater richness of such stars on and near the galaxy as a disproof of Herschel's earlier theory of generally uni- form distribution. Strangely enough, however, while thus recognising a variation in the richness of stellar distribution in one direction, z.e., in approaching the medial plane of the galaxy, Struve was unable to divest himself of a belief in uniformity of distribution in directions parallel to that plane. In an investigation claiming to be free from all hypothesis, but in reality (as Encke, Forbes, Proctor, and others have shown) based on several hypotheses, some of which are not even probable, Struve advanced the theory that the sidereal system is infinite in extension along the direction of the medial plane of the galaxy.

But in reality the evidence we possess indicates laws of stellar aggregation which by their very nature preclude the possibility of applying such methods

of gauging as either Sir W. Herschel or W. Struve endeavoured to use. The gathering of stars of the leading orders of apparent magni- tude in the galactic zone shows that stars of many orders of real size and brightness are there gathered together. The analysis of a rich star-region with higher and higher powers is shown to be, not necessarily, as was supposed, the pene- trating farther and farther into space, but the more and more searching scrutiny of one and the same region of space. The two processes, indeed, may be combined, an increase of telescopic power bringing into view at the same time smaller stars in a particular region and remoter stars lying towards the same direction. In fact, it would be as great a mistake to assume, without definite evidence, that new stars so revealed are smaller in real magnitude, as to assume that they are more remote. The only kind of evidence available to discriminate between the two cxplana- tions, or to show to what extent either may operate, is that derived from statistical enumeration ; but so complex are the relations involved, that such enumeration can only be interpreted when graphically illustrated. In other words, the secrets of the stellar universe can only be revealed by presenting in well-devised maps the results of widely ex- tended scrutiny of the star depths. This process has already been applied by Mr Proctor to stars down to the eleventh order of magnitude (in the northern heavens), the resulting view of the stellar universe differing widely from that which would have been presented if any of the theories hereto- fore advanced had been just. It is probable that an exten- sion of the system of uniform star-gauging and charting to the remoter star-depths will still further illustrate the com- plexity and diversity of structure existing within the universe. Already these general conclusions may be re-

garded as cstablished:—" The sidereal system is altogether more complicated and more varied in structure than has hitherto been supposed: in the same region of the stellar depths co-exist stars of many orders of rcal magnitude; all the nebule, gaseous or stellar, planetary, ring-formed, elliptical, and spiral, exist within the limits of the sidereal system; and lastly, the whole system is alive with move- ments, the laws of which may

one day be recognised, though at present they are too complex to be understood."

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Spherical and Practical Astronomy), and Loomis's Practical Astronomy. But, with the improvements con- tinually being made in instruments and methods, the best work on practical astronomy soon becomes obsolete unless supplemented by the careful examination of the journals and proceedings mentioned above. Forthis reason a section on Practical Astronomy has not been added here, as in former editions of this work. Among popular treatises on general astronomy the most trustworthy are Airy's Ipswich Lectures, Arago's Astronomte Populaire (and the English version by Grant and Smyth), Herschel's Outlines of Astronomy, Chambers's Descriptive Astronomy, aud Guillemin's The Heavens (later editions). Among works in special departments of astronomy may be mentioned Nasmyth's treatise On the Mcon, Secchi's Le Soleil, Herschel's Southern Observations, Pingré's Cométographie, Coulvier-Gravier's Recherches sur les Etoiles Filantes, and W. Struve's Etudes d'Astronomie Stellaire. The principal star atlases are Harding's Atlas Novus Calestis, Heis's Atlas and accompanying Catalogue, Bode's Uranographia, Argelander's Uranometria, and Lubbock's six maps on the Gnomonic Projection, published for the S.D.U.K. For many departments of stellar research, however, celestial atlases are insufficient, and star catalogues have to be em- ployed. Among the most important catalogues of isolated stars are Flamsteed's, Bradley's, Piazzi's, Lalande's, Groombridge's Cirewm- polar Stars, the Cataloguc of the British Association, Argelander's Bonn series (containing 320,000 stars), Bessel's, Weisse's, Main's, &c. Among catalogues of double stars may be mentioned Sir W. Herschel's in the Phil. Transactions, those by Sir J. Herschel and South, and by Sir J. Herschel alone, the lists in the Afonthly Notices of the Astr. Society, and the catalogues of Dembouski, Burnham, P. Secchi, Brothers, and others. Schellen's Spectral Analyse, or Roscoe's work on Spectroscopic Analysts, will be suffi- cient introduction to the subject of astronomical spectroscopy. In all the departments, however, there are many works besides those named which the student who desires to deal thoroughly with astro- nomy will do well to examine.

For the construction and use of astronomical instruments see the articles OBSERVATORY, SPECTROSCOPE, TELESCOPE, ce. (aaeks

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ASTRUC, JEAN, a celebrated physician, was born in 1684 at Sauves, in Languedoc. His father, a Protestant clergy- man, bestowed great pains upon his early education, after which he studied at the university of Montpellier, where, having commenced the study of medicine, he took his degree as doctor of physic in 1703. In 1706 he lectured at Montpellier as substitute for Professor Chirac. He studied most diligently all medical authors, both ancient and modern, and in 1710 published a treatise on muscular motion, which greatly increased his reputation. In that year he was appointed to the chair of anatomy at Toulouse. In 1717 he was appointed to teach medicine

at Montpel- lier. Subsequently he was appointed successively superin- tendent of the mineral waters of Languedoc, first physician to the king of Poland, and, in 1731, regius professor of medicine at Paris. Here his lectures on the practice of physic attracted students from other universities, as well as from foreign countries. He prosecuted his studies with unwearied assiduity to an advanced age, and was thus enabled to write many valuable works on medical subjects. He died on the 5th of May 1766, in the 82d year of his age. Of his numerous works, that on which his fame princi- pally rests is the treatise entitled De Morbis Venerers libri sex, 1736, 4to. This was afterwards enlarged to 2 vols. 4to; it was translated into French by Jault, 4 vols. 12mo, and has been frequently translated into English. In addition to niany other works, principally on midwifery and cognate subjects, he published some treatises not connected with medicine, one with the title of Conjectures sur les Mémoures originaux qui ont servi d Moise pour écrire la Genese, Bruxelles (Paris), 1753, 12mo; and two dissertations on the Immateriality, Immortality, and Liberty of the Soul, Paris, 1755. A long analysis of the Conjectures is given in the supplement to Herzog's Real-Encyk. d. Prot. Theol.

ASTURIAS, one of the ancient provinces of Spain, for- merly (from 1388 downwards) conferred as a principality on the heir-apparent to the throne. By the new division of Spain in 1833, the province took the name of Oviedo, though not to the exclusion, in ordinary usage, of the older designation. It is bounded on the N. by the Bay of Biscay, on the S. by Leon, on the W. by Galicia, and on the E. by Santander, which is now incorporated with Old Castile. It consists of a portion of the northern slope of what is properly a part of the Pyrenean system, and is covered in all directions with offshoots from the main chain, by which it is almost completely shut in on all sides. Only a few of the passes across the mountains are prac- ticable for carriages, and most of them are difficult even for horses. Along the coast there is a narrow strip of level ground, which consists largely of bare and moor-like reaches, covered with furze. The province, as might be supposed, is watered by numerous streams and _ rivers, which have hollowed out beautiful and picturesque valleys ; but owing to the narrowness of the level tract, their courses are short, rapid, and subject to floods. The most impor- tant is the Nalon or Pravia, which receives the waters of the Caudal, the Trubia, and the Narcea, and has a course of 62 miles; after it rank the

Navia and the Sella. Along the whole extent of the coast, a distance of 130 miles, there is not one good port. In that of Riba de Sella a large frigate may anchor, and Gijon will admit a vessel drawing 16 or 17 feet of water; but the entrance is in both cases difficult and dangerous. The climate of the district is generally mild, but overcharged with humidity, and in the higher regions the winters are protracted and severe. The broken character of the surface prevents any- thing like extensive agricultural industry, but abundant pasturage is found in the valleys) The wheat crop fre- quently fails. Rye succeeds better, and is often mixed with the maize which forms the principal food of all but the

higher classes. Chestnuts—here, as elsewhere in Spain, an important article of diet—are very abundant on the hills, and the tree supplies valuable timber. Other timber- trees, such as oak and beech, are found in the moun- tains, along with various medicinal plants, such as helle- bore, angelica, and valerian. Apples are abundant, and cider forms the common drink of the people; but little attention is paid to vines. The horses of Asturias are specially gentle and sure-footed, ranking among the best in Spain, and excelling those of Andalusia in strength, though surpassed by them in beauty. Wild deer, boars, and bears are not uncommon among the mountains ; and the sea-coasts, as well as the streams, abound with fish of various kinds, including salmon and lampreys, which are sent to the markets of Madrid.

With regard to mineral wealth, Asturias can no longer boast, as it did in the days of the Romans, of satisfying the quest of the "pale seeker after gold," but it possesses valuable coal-measures, which are worked at Langres, Mieres, Santo Firme, &c., and furnish a supply to Cadiz, Carthagena, and other ports in the Mediterranean. The yield in 1868 was 2,720,000 met. quintals, or upwards of 267,000 tons. Beneath the coal-beds there is frequently a large development of hematite or iron ore; copper mines are worked in the neighbourhood of the river Aviles ; and lead, magnesia, arsenic, cobalt, lapis lazuli, alum, antimony, jet, marble, and rock-crystal are found in various parts of the province, while amber and coral are gathered along the coast. Fuel of various kinds being plentiful, several manufactories of copper utensils are maintained, which supply some parts of Leon and Castile with kettles, pots, and similar articles. There used,

besides, to be a large royal cannon-foundry near Oviedo. Coarse cloth is manu- factured in the province, but not in sufficient quantity to supply the inhabitants. The roads in Asturias are not of a very satisfactory description, with the exception of the Camino real, or royal highway, leading from Gijon to Leon and Madrid, which was projected by Jovellanos,—himself a native of Gijon,—and cost so much that Charles V. inquired if it were paved with silver. It is carried by means of bridges and embankments over every impediment of a rug- ged and mountainous territory. A railway has been formed from Gijon to Langres, about twenty-five miles inland, where there are mines ; and a more important line uniting Gijon to Leon has for long been "in course of construction."

The capital of the province is Oviedo, and the other towns of importance are Gijon, Aviles, Llanes, and Luarea. Ten miles E.S.E. of Oviedo is the collegial church and sanctuary of Covudonga, famous for its connection with the struggle of Pelayo against the Moors. The people of Asturias have been called the Swiss of Spain: they are robust, patient, and hardy ; unenterprising, but laborious; hospitable to strangers, and enthusiastic lovers of their country. Like the Swiss, they leave their homes in large numbers, and make a living in the southern cities as ser- vants and water-carriers, the married women even often hiring themselves as nurses in Madrid and elsewhere. The native dialect is called Bable, and among other distinctive marks employs f for the usual Spanish 4 in many words, thus approaching nearer to the original Latin. There is a special clan among the Asturians called the Baqueros, who lead a nomadic life, tending their cattle in winter on the coast, and in summer on the mountains of Leytariegos. They never marry beyond the bounds of the tribe. The ancient Asturians or Astures—so called, it is supposed, from the old Spanish root ast, a hill-fortress—were in pos- session, not only of the present province, but also of what is now the northern part of Leon, where they have left their name to the city of Astorga. The district south of the Cantabrian mountains was subjugated by the Romans

about 25 B.c., but the warlike natives maintained their

independence in the north. And long after, when the rest –

of Spain was in the hands of the Moors, this rugged region was a refuge to the otherwise vanquished race, which at length acquired strength to break forth from its fastnesses and beat back the invader.

ASUNCION, or Assumprioy, the capital of the Republic of Paraguay in South America. – It is situated in the midst of a fertile territory on the eastern bank of the River Para- guay (here upwards of 600 yards in width), about 18 miles above the most northerly mouth of the Pilcomayo. It was one of the earlier Spanish settlements in this part of América, being founded in 1535 by Gonzalo de Mendoza and Juan de Salazar y Espinosa, and receiving its name of Nuestra Setiora de la Asuncion, in honour of the festival] of the Assumption. Originally a small fort, it soon became, from the convenience of its situation, a town of considerable importance, and in 1547 was erected into a bishopric. Formerly, while the Jesuits were masters of the country, it consisted of a rather irregular assemblage of one story houses, relieved by ecclesiastical buildings of varying pretension, from the cathedral downwards ; but under the dictatorship of Francia, the streets were more symmetrically arranged, and a number of secular buildir ¥s erected. These were greatly increased under the rule of his succes. sors, and Asuncion was brought into similarity with a European city of corresponding rank, having its govern- ment house, its president's palace, its arsenal, custom-house, barracks, military hospital, theatre, and railway station. During the recent war between Paraguay and the neigh- bouring states, Asuncion suffered greatly, being taken and plundered in 1869 by the Brazilian forces, who had already bombarded it from the river. The population, Spanish for the most part in language, but of various races, was esti- mated, before the war, at 48,000, and carried on a some- what extensive trade in Paraguay tea, or Yerba Maté, hides, tobacco, fruits, molasses, and rum.

ASYLUM (éovAov), in Greek Antiquities, a temple enclo- sure, within which protection from bodily harm was afforded to all who sought it and could prove their danger. Ina general sense, all Greek temples and altars were dovAa, that is, it was a religious crime to remove by force any person or thing once under the protection of a deity. But it was only in the case of a small number of temples that this protecting right of a deity was recognised with common consent, and, apparently, these were among the oldest temples

of Greece. Such, for example, was the temple of Athena Alea at Tegea in Arcadia, where King Pausanias II. spent the remainder of his days after the battle of Haliartus ; or the temple of Ganymeda (Hebe) at Phlius, where, it is said, persons who had escaped from prison hung up their chains in the sacred grove. Other instances are the sanctuaries of Poseidon at Calauria and Tzenarum, of Athena Chalcicecus at Sparta, and of Amphiaraus at Oropus, though it is possible, also, with regard to the three last-named sanctuaries, to explain the facts as proving only the ordinary religious asyla (Schémann, Griech. Alter- thiimer, ii. p. 202). In Asia Minor these asylums were more numerous and, in Roman times at least, more exten- sive, so that in the reign of Tiberius the Roman senate considered the question of reducing their limits (Tacitus, Annal., iii. 60, iv. 14). Of these the chief seems to have been that of the temple of Diana at Ephesus, which exer- cised its right of protection beyond its boundary wall, at one time so far as to include part of the city. But Augus- tus, finding this an encouragement to crime, reduced the limits (Strabo, p. 641). Even debtors obtained sanctuary at Ephesus. Generally, however, the classes of persons who claimed the rights of asylum were slaves who had been mal- treated by their masters, soldiers defeated in battle and

pursued by the enemy, and criminals who feared a trial, or who had taken advantage of the opportunity allowed for escape before sentence was passed. A slave was required to show the justice of his complaint, and, if he failed, was re- stored to his master ; if not, a new master was found. In all cases, it seems that the refugee was retained under protection only so long as his means of subsistence lasted,

and it may have often happened that pursuit was given up less out of respect conviction that want would soon drive the fugitive out of the asylum again. tion peculiar to the Greeks.—Livy, xxxv. 51 , Lemplum est

for the rights of a temple than from a Asylums in this sense were an institu-

Apollonis Delium—ubi et in Jano lucoque ea religione et €0

jure sancto quo sunt templa quee asyla Greeci appellant.

ATACAMA, a district of South America, extending

along the W. coast from 21° to 25° S. lat. , partly belonging to Chih, and partly to Bolivia,—the 24th parallel, according to the treaty of 1866, being recognised as the line of demarcation. about 38,000 square miles, with a population of 82,300. It is bounded 8. by the province of Coquimbo, W. by the

(1.) The Chilian province has an area of

Pacific, and E. by the Argentine Republic. It is one of the richest copper and silver districts in the world, nearly 1000 mines being worked for the former metal, and about 250 for the latter. The silver ore was first discovered in 1832, by a shepherd, Juan Godoy, at a place which has since been occupied by a village that bears his name. The ores of lead and zinc are frequently found, and sulphur, alum, and salt are all of them abundant, the deposit of the

last article alone covering about 50 Square miles at the Laguna Salada. Gold likewise occurs in sufficient quantity

to be mentioned in the list of exports. The capital of the province is Copiapo, with 13,380 inhabitants, and the population is principally clustered in the valleys of Copiapo and Huasco, and in the neighbourhood of the various mines. Caldera is the principal port, and is connected with the capital and the eastern districts by the first railway con- structed in South America. The value of the mineral exports through this and the adjacent ports was in 1871 estimated at 6,218,275 dollars. (2.) The Bolivian department has an area of about 70,000 square miles, with a population of about 8000, which is rapidly increasing. It also owes its prosperity almost solely to its wealth in copper and silver, The mines of Caracoles, recently discovered, are said to be the most productive silver mines in the world, In other products it coincides with the Chilian province, with the addition, however, of meteoric iron, which has been found in remarkable masses. A large part of what is more especially designated the Desert of Atacama is included in the department. It is not, as the name might suggest, a sandy, but for the most part a rocky and rugged, tract, with the merest patches and strips of vegetation. The capital of the department is

Cobija, or, as it is officially called, Puerto de la Mar; but its prosperity is in some degree threatened by the rise of Mejillones, a seaport which has recently been connected by railway with the principal mining districts. See Philippi, Reise durch die Wiiste Atacama, Hajle, 1860; Tchudi, Reise durch die Andes, a supplement to Petermann's M€tttheil., 1860 ; Journ. Roy. Geog. Soc. 1851, 1855.

ATAHUALLPA (atahu, Latin vrtus, and allpa, sweet), called the last of the Incas, was the son of Huayna Capac, eleventh Inca of Peru, by the daughter of the conquered sovereign of Quito. His brother Huascar succeeded Huayna Capac ; for, as Atahuallpa was not descended on both sides from the line of Incas, Peruvian law considered him illegitimate. He obtained, however, the kingdom of Quito, whether by stratagem or not is uncertain. A jealous feeling soon sprang up between him 'and Huascar, who insisted that Quito should be held as a aan province

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'of hisempire. A civil war broke out between the brothers, and, thongh the details of it are not accurately known, it appears that just about the time when Pizarro was begin- ning to move inland from the town of San Miguel, Huascar had been defeated and thrown into prison, and Atahuallpa had become Inca. Pizarro set out in September 1532, and made for Cassamarca, where the Inca was. Messengers passed frequently between them, and the Spaniards on their march were hospitably received by the inhabitants. On the 15th November, Pizarro entered Cassamarca, and sent his brother and Fernando de Soto to request an inter- view with the Inca. On the evening of the next day, Atahuallpa entered the great square of Cassamarca, accont- panied by some five or six thousand men, who were either unarmed, or armed only with short clubs and slings con- cealed under their dresses, Pizarro's artillery and soldiers were planted in readiness in the streets opening off the square. The interview was carried on by the priest Vicente de Valverde, who addressed the Inca through an interpreter. He stated briefly and dogmatically the principal points of the Christian faith and the Roman Catholic policy, and concluded by calling upon Atahuallpa to become a Christian, obey the commands of the Pope, give up the

administration of his kingdom, and pay tribute to Charles V., to whom had been granted the conquest of these lands. To this extraordinary harangue, which from its own nature and the faults of the interpreter must have been completely unintelligible, the Inca at first returned a very temperate answer. He pointed out what seemed to him certain difficulties in the Christian religion, and declined to accept as monarch of his dominions this Charles, of whom he knew. nothing. He then took a Bible from the priest's hands, and, after looking at it, threw it violently from him, and began a more impassioned speech, in which he exposed the designs of the Spaniards, and upbraided them with the cruelties they had perpetrated. The priest retired, and Pizarro at once gave the signal for attack. The Spaniards rushed out snddeuly, and the Peruvians, astonished and defenceless, were cut down in hundreds. Pizarro himself seized the Inca, and in endeavouring to preserve him alive, received, accidentally, on his hand the only wound inflicted that day on a Spaniard. Atahuallpa, thus treacherously captured, offered an enormous sum of money as a ransom, and fulfilled his engagement ; but Pizarro still detained him, until the Spaniards should have arrived in sufficient numbers to secure the country. While in captivity, Atahuallpa gave secret orders for the assassination of his brother Huascar, and also endeavoured to raise an army to expel the invaders. His plans were betrayed, and Pizarro at once brought him to trial. He was condemned to death, and, as being an idolater, to death by fire. Atahuallpa, however, professed himself a Christian, received baptism, and his sentence was then altered into death by strangula- tion. His body was afterwards burned, and the ashes conveyed to Quito. From the reports of the Spanish historians, it is impossible to gain an accurate idea of the character and abilities of the Peruvian monarch, and we have no other notices by which to test their account. (See Prescott's Conquest of Peru, and Helps's Spanish C'on- quest of America.)

ATALANTA, in Greek Legend, (1) was connected with Arcadia, where, at her birth, she had been exposed on a hill, her father Jasion having expected a son. At first she was suckled by a shc-bear, and then saved by huntsmen, among whom she grew up to be skilled with the bow, swift, and fond of the chase, like the virgin goddess Artemis. At the hunt of the Calydonian boar her arrows were the first to hit the monster, for which its head and hide

were given her by Meleager. At the funeral games of Pelias, she wrestled with Peleus, and won. Melanion, with intense

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love, followed, fought, and toiled in her service, she despis- ing love, and remaining true to Artemis long, but yielding at last. was (2) another Atalanta in Bceotian legends, who was to be obtained in marriage only by him who could outstrip her in a race, the consequence of failure being death. Hippomenes, before starting, had obtained from Aphrodite three golden apples, which at intervals in the race he

She was the mother of Parthenopzeus. But there

dropped, and Atalanta, stopping to pick them up, fell

behind. Both were happy at the result; but forgetting to

thank the goddess for the apples, they were led by her to a religious crime, and for this were transformed into lions (Ovid, Met., x. 560-704). Latterly the adventures of these two separate heroines were united and told as of one. 2

ATAXY, LOCOMOTOR (a priv., ragéis, order-—Syno- nyms, Progressive locomotor ataxy, Tabes dorsalis, Posterior spinal sclerosis), a disease of the nervous system, manifest- ing itself principally by disordered movements of the limbs in locomotion. This disorder is not, as was once supposed, a form of paralysis (there being no diminution of muscular strength), but is dependent on the loss of the power of co- ordinating the muscles into harmonious action, which is essential to the proper performance of the voluntary move- ments of the body, and the maintenance of its equilibrium. Although the disease had been previously noticed both by Professor Romberg and Dr R. B. Todd, it was first fully described and named by Dr Duchenne in 1858. Its path- ology has subsequently been investigated by Mr Lockhart Clarke. Locomotor ataxy usually begins insidiously, and advances slowly. Among the earlier symptoms observed are disorders of

vision, with occasionally temporary or per- manent paralysis of some of the cranial nerves, a feeling of uneasiness in the back, accompanied with violent shooting pains down the limbs, increased or perverted sensibility in various parts of the body, and disturbance of the genito- urinary functions. These initial symptoms may continue without much change for a long period, but generally in the course of time others are superadded, which give more definite intimation of the existence of the disease, and render its diagnosis a matter of little difficulty. The sufferer begins to be aware that he cannot walk with the same freedom as before, and he feels as if some soft sub- stance were interposed between his feet and the ground. His gait assumes a peculiar and characteristic appearance. He begins the act of walking with evident difficulty, and his steps are short and hurried. Each leg is lifted well from the ground ; but as he moves forward it is thrown out from him, and his heel descends forcibly, and is followed at a longer than the normal interval by the sole. In walking he requires the aid of his vision to preserve his equilibrium, and he therefore looks at his feet, or rather at the ground a little in front of them, as he advances. He cannot turn about suddenly without the risk of falling. If asked to stand erect with his feet approximated, and then directed to close his eyes or to look upwards, he immediately begins to sway and totter, and would fall if not supported. These various phenomena are the result, not of any weakness of motor power, but simply of defective muscular co-ordina- tion. Along with this there usually exists markedly diminished tactile and cutaneous sensibility, particularly in the feet and legs. Sometimes the disorder implicates the upper extremities, and then the hands and fingers cease to perform their functions with precision, so that the patient is unable to pick up any small object from the ground, to button or unbutton his clothing, and even sometimes to feed himself, although at the same time there is no weakness 1n the muscular power of the hand, which is capable of grasp- ing as firmly as before. With the advance of the disease the disorder of movements increases. The patient's efforts

to walk become more and more difficult and distressing, for his limbs are jerked about wildly without restraint, while even the aid of his vision and the support of a stick are insufficient to prevent him from falling. Ultimately,

all efforts of this kind have to be abandoned, and he is com- pelled to lie in bed. In the later stages of the disease all the symptoms become aggravated. The shooting pains and violent jerkings of the limbs increase, motor power becomes impaired, and the patient sinks under the pro- longed and exhausting course of suffering, or dies from some intercurrent disease. Although usually progressive toa fatal termination, locomotor ataxy is sometimes arrested, and even appears occasionally to be recovered from, particularly in its earlier stages. In most instances its duration extends over a number of years,

The pathological condition giving rise to locomotor ataxy is disease of a certain portion of the spinal cord, viz., the posterior columns and the posterior nerve roots. These undergo various transformations, which result in their ulti- mately becoming atrophied and indurated. When affect- ing, as this lesion most commonly does, the lower dorsal and lumbar regions of the cord, the ataxic symptoms are chiefly confined to the legs; but when it affects the cervical portion, the arms are involved. Occasionally the whole posterior columns of the cord are found diseased. The exciting causes of this malady are but ill understood. Exposure to cold and privation, intemperance, over exertion, and mental anxiety have been supposed to give rise to it. In some instances the disease appears to be hereditary. Locomotor ataxy is much more common among men than among women. It is a disease of middle life, being most frequently observed to occur between the ages of 30 and 50. From the nature of the structural changes affecting the spinal cord in locomotor ataxy, it is evident that, beyond the employment of means to alleviate the various painful symptoms, little can be done towards its cure. Numerous medicines have from time to time been brought forward as supposed to possess special efficacy in the treat- ment of this disease, but none of them have proved to be of much value. The employment of electricity in the form of the continuous current has been recommended by many high authorities. Probably most good will be found to result from careful efforts to maintain the general health by a well-appointed diet and regimen. (J. 0. A.)

ATBARA (Bahr-el-Aswad, or Black River), an important river of Eastern Africa. It rises in the mountains of Abyssinia to the N.W. of Lake Tana, unites its waters with a number of rivers, such as the Settite, the Salaam, the

Angarep, and the Tacazze, several of which more than equal it in volume, and continues its northward course till its junction with the Nile at El-Damer. It flows in many parts through a very fertile and beautiful country, tenanted only by the beasts of the field, or sparsely peopled with a few Arab tribes. In the dry season its waters are con- siderably lessened, but during the rains it has an average depth of 35 or 40 feet, and measures 400 or 500 yards across atitsembouchure. See Hassenstein and Petermann's Karte und Mémoire von Ost-Afrika (supplement of Peter- mann's Mitthel., 1861); and Baker's Journey to Abyssinia in Jour. Roy. Geog. Soc. 1863.

ATCHAFALAYA (the Lost Water), a river of Louisiana, in North America, or more properly a secondary channel of the Mississippi, by which a portion of its water flows off from the main trunk into the Mexican Gulf. Its mouth is 120 miles W. of the principal embouchure of the Mississippi.

ATE, in Greek Mythology, a personification of criminal folly (Iliad, xix. 91). She had misled even Zeus to take a hasty oath, when Heracles was born, for which, seeing

his folly, he cast her by the hair out of Olympus, whither

since then it has sunk into ruins.

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she did not again return. She fell, it was in later times said, on the hill where Troy was built. Ate, however, remained always a mere allegory, and never assumed the individuality of a goddess, though described (Ziad, ix. 502) as a swift-footed being, who leads to crimes which the old and crippled Litz obtain redress for.

ATELLA, an ancient city of Campania, about 9 miles from Naples. In the second Punic war it sided with Hannibal, and, in consequence, its inhabitants were dis- persed by the Romans and their place supplied by the people of Nuceria. In the time of Cicero it was a flourish- ing town, and under Augustus it received a military colony. In the early Christian centuries it was an epis- copal see ; but in 1030 a.p. its inhabitants were removed to Aversa, the newly founded city of Count Rainulph, and The

Labule Atellane (named after this city) was a species of satirical comedy exhibited at Rome after the subjugation of Campania. The principal characters were Maccus, a fool with ass's ears ; Bucco, a loquacious glutton ; Pappus, an old sim- pleton ; and Dossenus, a sharper. The comedy was originally in high repute, but was eventually suppressed by order of the senate for indecencies introduced into it.

ATH, or Azra, a city of Belgium, in the province of Hainaut, situated on the river Dender, a navigable con- fluent of the Schelde, rather more than 30 miles by rail from Brussels. It is well built, and possesses a parish church (St Julian's), dating originally from 1393, and remarkable for the height of its spire ; a college, founded in 1416; a town-house, erected about 1600 3 an orphan asylum, a theatre, &c. The oldest building in the city is the Tour du Barbant, which dates from 1150. The popu- lation, numbering about 8300, is variously employed in the manufacture of linen, lace, cotton, soap, sugar, salt, beer, gin, dyes, trinkets, &c. Ath was a place of importance in the 13th and 14th centuries, and was afterwards fortified by the Spaniards. It was besieged and captured by Louis XIV. in 1666, restored to the Spaniards in 1679, recap- tured by the French under Catinat in 1697, and fortified by Vauban, but again given up by the treaty of Ryswick in the same year. In 1706 it fell into the hands of the allies, but was restored to the empire in 1716. It was captured by the French under Banderon in 1745, and dismantled and restored by Maria Theresa in 1748. Its: fortifications were again destroyed in 1781, rebuilt in 1815, and finally demolished in 1830.

ATHABASCA, or ATHAPEsCow, a river in the north- western territory of British North America, which flows into a lake of the same name. It rises in the Rocky Mountains, and has a long and tortuous course in a north-eastern direction, during which it receives the Lesser Slave River, the Red Deer, and several others. The lake is about 230 miles in length, with a breadth varying from 30 to 14 miles, lying in a direction almost E. and W., in lat. 59° N., long. 110° W. It communicates with Hud- son's Bay on the one hand, and with the Polar Sea on the other.

ATHALIAH, the daughter of Ahab and wife of Jeho- ram, king of Judah, who, after the death of King Ahaziah, her son, caused all the male members of the royal house of Judah to be massacred, in order that she might usurp

the throne. Among the victims were her own grandchildren, except the youngest, Joash, who was concealed in the temple by his aunt, Jehosheba, wife of the high priest, Jehoiada. After six years Jehoiada organised a successful revolution in favour of Joash, and caused Athaliah to be put to death by the Levitical guards (2 Kings xi. ; 2 Chron. xxii. 10-12, xxiii.) The story of Athaliah forms the subject of one of Racine's best tragedies. It has been musically treated by Handel and Mendelssohn.

ATHANASIUS, St, Bishop of Alexandria, and one of the most illustrious defenders of the Christian faith, was born at Alexandria about the year 297. Of his family, circumstances, or early education nothing can be said to be known, although a legendary story has been preserved by Rufinus of Aquileia as to the manner in which he came, while yet a boy, under the notice of his predecessor, Alexander. It seems certain that Alexander became his patron, took him as a youth into his house, and employed him as his secretary. This was probably about 313, and from this time Athanasius may be said to have been devoted to the Christian ministry. He was, no doubt, a student in the " Didascaleion," or famous " catecheti- cal school" of Alexandria, which included amongst its already illustrious teachers the names of Clement and Origen. In the museum, the ancient seat of the Alex- andrian university, he may have learned grammar, logic, and rhetoric. His mind was certainly well disciplined, and accustomed to discuss from an early period the chief questions both in philosophy and religion. The per- secution under which the Alexandrian Church suffered at this time, and his intimacy ,with the great hermit Antony, of which he himself has told us, had all their effect upon his character, and served to nurture in him that undaunted fortitude and high spirit of faith by which he became distinguished.

Before the outbreak of the Arian controversy, which began in 319, Athanasius had made himself known as the author of two essays addressed to a convert from heath- enism, one of them entitled Against the Gentiles, and the other On the Incarnation of the Word. Both are of the nature of apologetical treatises, arguing such questions as monotheism, and the necessity of divine interposition for the salvation of the world ; and already

in the second may be traced that tone of thought respecting the essen- tial divinity of Christ as the " God-man" for which he afterwards became conspicuous. The origin of the Arian controversy has been already described under the heading Arius. 'There is no distinct evidence of the connection of Athanasius with the first contentions of Arius and his bishop, which ended in the exile of the former, and his entrance into Palestine under the protection of Eusebius the historian, who was bishop of Cesarea, and subsequently of his namesake the bishop of Nicomedia. It can hardly be doubted, however, that Athanasius would be a cordial assistant of his friend and patron Alexander, and that the latter was strengthened in his theological position by the young enthusiastic student who had already expounded the nature of the divine Incarnation, and who seems about this time to have become archdeacon of Alexandria. At the Council of Nica, in the year 325, he appears pro- minently in connection with the dispute. He attended the council, not as one of its members (who were properly only bishops or delegates of bishops), but merely as the attendant of Alexander. In this capacity, however, he was apparently allowed to take part in its discussions, for Theodoret (i. 26) states that 'he contended earnestly for the apostolic doctrines, and was applauded by their champions, while he earned the hostility of their opponents. Within 'five months' after the return of Alexander to the scene of his episcopal labours he expired, and his friend and archdeacon was chosen to succeed him. He was elected 'in the sight and amidst the acclamations of the people.' He was now about 30 years of age, and is spoken of as remarkable both for his physical and mental characteristics. He was small in stature, but his face was radiant with intelligence, as 'the face of an angel.' This is the expression of Gregory of Nazianzus (Orat., xxii. 9), who has written an elabo- rate panegyric upon his friend, describing him as fit 'to keep on a level with common-place views, yet also to soar

high above the more aspiring,' as accessible to all, slow to anger, quick in sympathy, pleasant in conversation, and still more pleasant in temper, effective alike in discourse and in action, assiduous in devotions, helpful to Christians of every class and age, a theologian with the speculative, a comforter of the afflicted, a staff to the aged, a guide of the young."

The first few years of the episcopate of Athanasius were tranquil ; but the storms in which the remainder of his life was passed soon began to gather around him. The Coun- cil of Niczea had settled the creed of Christendom, but had by no means composed the divisions in the church which the Arian controversy had provoked. Arius himself still lived, and his friend Eusebius of Nicomedia rapidly regained influence over the Emperor Constantine. The result of this was a demand made by the emperor that Arius should be re-admitted tocommunion. Athanasius stood firm, and refused to have any communion with the advocates of a "heresy that was fighting against Christ." Constantine was baffled for the moment ; but many accusers s00n rose up against one who was known to be under the frown of imperial displeasure. The archbishop of Alexandria was charged with cruelty, even with sorcery and murder. It was reported that a Meletian bishop in the Thebaid, of the name of Arsenius, had been unlawfully put to death by him. He was easily able to clear himself of such charges, but the hatred of his enemies was not relaxed, and in the summer of 335 he was peremptorily ordered to appear at Tyre, where a council had been summoned to sit in judgment upon his conduct. He did not venture to disobey the imperial order, and a commission was appointed to inquire into an alleged instance of cruelty urged against him, notwithstanding the explanations which he had made. There appeared plainly a \predetermination to condemn him, and he fled from Tyre to Constantinople to appeal to the emperor himself. "He resolved," says Gibbon, "to make a bold and dangerous experiment, whether the throne was inaccessible to the voice of truth." He presented himself suddenly with five of his suffragans before the emperor, while riding into his new capital. Refused at first a hearing, his perseverance was at length rewarded by the emperor's consent to his reasonable request—that his accusers should be brought face to face with him in the imperial presence. The leaders of the Tyrian council, amongst the most conspicuous of whom were the two Eusebii, were accordingly summoned to Constantinople, just after they had celebrated, at a great dedication festival at Jerusalem, the condemnation of Athanasius and the restoration of Arius to church communion. Jn confronting the former before Constantine they did not attempt to repeat the charge of cruelty, but found a more ready and effective weapon to their hands in a new charge of a poli- tical kind—that Athanasius had threatened to stop the Alexandrian corn-ships bound for Constantinople. Here, as in other matters, it is very difficult to understand

how far there was any truth in the persistent accusations made against the prince-bishop of Alexandria. Probably there was in the very greatness of his character and the extent of his popular influence a certain species of dominance which lent a colour of truth to some of the things said against him. On the present occasion his accusers suc- ceeded in at once arousing the imperial jealousy ; and the consequence was, that, notwithstanding his earnest denial of the act attributed to him, he was banished to Trier, or Treves, the capital of Gaul.

This was the first banishment of Athanasius, which lasted about two years anda half. It was only brought to a close-by the death of Constantine, and the accession of Constantine II. as emperor of the West. It is recorded by himself (Apol. 7) that, on his return to Alexandria,

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"the people ran in crowds to see his face 3 the churches were full of rejoicing; thanksgivings were offered up everywhere ; the ministers and clergy thought the day the happiest in their lives." But this period of happiness was destined to be short-lived. His position as patriarch of Alexandria 'placed him, not under his friend Constantine II., but under Constantius, another son of the elder Con- stantine, who had succeeded to the throne of the East, He in his turn fell, as his father had done, more and more under the influence of the Nicomedian Eusebius, now trans- ferred to the see of Constantinople. A second expulsion of Athanasius was accordingly resolved upon. The old charges against him were revived, with the addition of his having set at naught the decision of a council. It was further resolved on this occasion to put another bishop in his place. Accordingly, in the beginning of the year 340, a Cappadocian named Gregory, said to be an Arian, was installed by military force on the throne of the great de fender of the faith, who, to save his followers from outrage, withdrew to a place of concealment. As soon as it was possible he repaired to Rome, to "lay his case before the church." He was declared innocent at a council held there in 342, and in another held at Sardica some years later. Julius, the bishop of Rome, warmly espoused his cause, and, generally, it may be said that the Western Church was Athanasian in its sympathies and

its creed, while the majority of the Eastern bishops sided with the Eusebian party. This severance was clearly shown at the Council of Sardica, where the Orientals refused to meet with the representation of the Western Church, because the latter insisted on recognising the right of Athanasius and his friends to attend the council as regular bishops. The commonly received date of this council is 347, but the rediscovered Festal Letters of Athanasius have had the effect of throwing back this date for some years. It has been placed by some as early as the end of 343, by Mansi and others in the end of 344, The decision of the Council of Sardica, however, had no immediate effect in favour of Athanasius. Constantius continued for some time implac- able, and the bold action of the Western bishops only incited the Arian party in Alexandria to fresh severities. Gradually, however, the excesses of the Arian party brought their own revenge, while the death of the intruded bishop Gregory, in the beginning of 345, opened up the way for a reconciliation betwixt the Eastern emperor and the banished prelate. The result was the restoration of Athanasius for the second time, amidst the enthusiastic demonstrations of the Alexandrian populace, which is represented by his panegyrist, Gregory Nazianzen, as streaming forth "like another Nile" to meet him in the distance as he approached the city. His restoration is supposed to have taken place, according to the more accurate chronology based upon the Festal Letters, in Octo- ber 346.

For ten years at this time Athanasius held his ground in Alexandria. But the intrigues of the Arian or court party were soon renewed against him, and the feeble emperor, who had protested that he would never again listen to their accusations, was gradually stimulated to new hostilities. A large council was held at Milan in the spring of the year 355, and here, notwithstanding the Vigorous opposition of a few faithful men amongst the Western bishops, a renewed condemnation of Athanasius was procured. This was followed up by the banishment of the faithful prelates, even of Hosius of Cordova, whose conciliatory character and intimate connection with the imperial family had not prevented him from addressing to Constantius a pathetic remonstrance against the tyranny of the Arian party. When his friends were thus scattered in exile, their great leadcr could not long escape; and on

the night of the 8th of February 356, while he was en- gaged in service in the church of St Thomas, a band of armed men burst into the sacred building. He has him- self described the scene (Apol. de Juga, 24). Here for a time he maintained his composure, and desired the deacon to read the psalm, and the people to respond—" Hor His mercy endureth for ever ;" and how, as the soldiers rushed

forward with fierce shouts towards the altar, he at length

made his escape in the crowd, and sought once more a place of safe retirement. The solitudes of Upper Egypt, where numerous monasteries and hermitages had been planted, appear to have been his chief shelter at this time. Here, protected from pursuit, he spent his time in literary labours in behalf of his cause; and to this period, accord-

ingly, belong some of his most important writings, above all the great Orations. or Discourses against the Arians,

which furnish the best exposition of his theological position

and principles.

For six years at this time Athanasius continued in exile, till the death of Constantius in November 361 opened once more the way for his return to his episcopate. Julian, the successor to the imperial throne, professed indifference to the contentions of the church, and granted permission to the bishops exiled in the late reign to return home. Amongst others, Athanasius took advantage of this per- mission, and seated himself once more upon his throne, amidst the jubilations of the people. He had begun his episcopal labours with renewed ardour, and summoned a council to Alexandria to decide various important questions, when an imperial mandate yet again drove him from his place of power. 'The faithful gathered around him weep- ing. "Be of good heart," he said, "it is but a cloud: it will soon pass." His forecast proved true; for within a few months Julian had closed his brief career of Pagan revival, and Athanasius "returned by night to Alexan- dria." He received a letter from the new emperor, Jovian, praising his Christian fidelity, and encouraging him to resume his work. With the emperor he continued to maintain friendly relations, and even drew out for

him a synodal letter embodying the Nicene Creed, which was graciously received. During the brief reign of this bluff soldier-prince, comparative quiet prevailed in the church. But the repose was of short duration. In the spring of 365, after the accession of Valens, troubles reappeared. An order was issued for the expulsion of all bishops who had been expelled by Constantius, and Athanasius was once more forced to take refuge in concealment from his persecutors. His concealment, however, only lasted for four months, when an order came for his return ; and from this time (Feb. 366) he was left undisturbed to pursue his episcopal labours. Those labours were unceasing in refut- ing heretics, in building churches, in rebuking rapacious governors, in comforting faithful bishops, and in strengthen- ing the orthodox everywhere, till at length, in the spring of 373, "in a good old age,' he ceased from all his work. Having consecrated one of his presbyters his successor, he died quietly in his own house. His "many struggles," according to his panegyrists, won him "many a crown." He was gathered to his fathers, patriarchs, prophets, apostles, and martyrs, who had contended for the truth. Even those who fail to sympathise with the cause which Athanasius stedfastly maintained, cannot refuse their tribute of admiration to his magnanimous and heroic cha- racter. The cynic eloquence of Gibbon grows warm in recounting his adventurous career, and the language of Hooker breaks into stately fervour in celebrating his faith and fortitude. 'The whole world against Athanasius, and Athanasius against it; half a hundred of years spent in doubtful trial which of the two in the end should prevail —the side which had all, or else the part which had no

friends but God and death—the one a defender of his innocency, the other a finisher of all his troubles." If imperious in temper and inflexible in dogmatic determina- tion, Athanasius had yet a great heart and intellect, enthusiastic in their devotion to Christ, and in work for the good of the church and of mankind.

His chief distinction as a theologian was his zealous advocacy of the essential divinity of Christ as co-equal in substance with the Father. This was the doctrine of the Homoousion, proclaimed by the Nicene Creed, and elabo- rately defended by his life and writings. Whether or uot Athanasius

first suggested the use of this expression, he was its greatest defender ; and the catholic doctrine of the Trinity has ever since been more identified with his "immortal" name than with any other in the history of the church and of Christian theology. (For an exposition of the Athanasian Creed, see the article CREEDS.) (J. T.)

ATHELSTAN, or Airnetstan, son of King Edward the elder, and grandson of Alfred the Great, was born in 895. There has been much doubt with regard to his legi- timacy, as his mother, Ecgwyn, is said to have been of hunible origin; but these suspicions appear to rest on slight foundations. On the death of Edward in 925, Athelstan, who had been named by him as his successor, was elected king by the Mercians and West Saxons, and crowned at Kingston in Surrey. Considerable opposition was made to his election, and several of the leading nobles entered into a conspiracy to put out his eyes and deprive him of the kingdom. Alfred the Atheling, who himself aimed at the royal power, was suspected of being concerned in this plot, and was obliged to proceed to Rome and there take an oath of innocence. While in the act of swearing at the altar, he is said to,have dropped down in a fit, and to have died three days afterwards. In 925 Athelstan gave one of his sisters in marriage to Sihtric, the Danish ruler of Northumbria, on whose death, in the following year, he invaded the Danish dominions, drove out Sihtric's son, Guthfrith, and took possession of his territory. Guth- frith, after an unsuccessful attempt to stir up Constantine, king of Scotland, to whom he had fled, and after a fruitless invasion of England, made submission to Athelstan, and was kindly treated by him. During the next few years, the Welsh, both of Wales and of Cornwall, appear to have been subdued, and to have done homage to the king of England, who levied tribute on them, and fixed the Wye and the Tamar as the boundaries of Wales and Cornwall respectively. He was thus virtually king of all England. In 933 or 934 he also invaded Scotland, ravaged all the south country, and compelled Constantine to pay a yearly tribute. Four years later, in 937, a powerful combination was made against him. Anlaf, a Danish chief, or, accord- ing to some accounts, a son of Sihtric, with the king of Scotland, the Welsh, and the Danes of the north, invaded England. Athelstan, with his half brother Edmund, met and signally defeated the invaders in the battle of Brunan- burh, celebrated in the " Brunanburh War-Song." In 940 or 941 Athelstan died at Gloucester, and was buried at Malmesbury. England had

prospered under his reign ; fur he devoted much attention to commerce, and exercised a fostering care over the civil and religious interests of his people. His power made him respected and esteemed on the Continent, and several foreign princes and nobles were sent to be educated at his court.

ATHENA (AOnva,'AOyjvy, AOnvaia), in Greek Mythology, a goddess who, from being originally a personification of the clear, bright upper region of the sky, had, as early as the time of the epic poets, changed, or advanced, so as to embody under a divine form a conception of the clear in- sight of the human mind in its various functions. This upper air or ether seemed to be a distinct element in the

universe. From it came the light of morning before sun- rise and of evening after sunset, reminding us of the light which, in the Mosaic account of the Creation, existed before the sun and moon were placed in the sky. In the first stage of her character, in which, like the other deities of Olympus, she was directly identified with an element of nature and supposed to act as it acted, Athena bore the name of Pallas, and was thought of more in connection with the storms than with the serenity or light of the heavens. The obvious counterpart of a storm was a raging battle, and, accordingly, she became a goddess of war, armed with spear and helmet, and with the egzs, or storm- shield, of her father, resistless among men, hurling to the ground the giant Enceladus, and even superior in might to Ares himself, the god of war. The storm sweeps sorest round high citadels, where also the storms of war rage fiercest ; and on such places was her favourite abode. But a storm is followed by serenity brighter than before, more enjoyable, and more exciting to activity of every kind ; and then the goddess lays aside her armour to encourage and foster skill and industry. Her titleisthen Ergane. To her was ascribed the invention of spinning and weaving ; of taming horses, bridling and yoking them to the war-chariot ; of the flute, and in some way of the healing art. This is the second stage of her character, which the myth, agreeably to its principle, explains in a different fashion, when it says that she sprang into existence from the brain of the/all-wise ruler of the world,'Zeus, and that he had before swallowed his wife, Metis (intelligence). She must therefore have been in a measure a complement of him, created for the purpose of carrying out among men what was in his mind, but what yet he could not himself, as the supreme and

impartial ruler, execute. As his substitute, she lent her aid to Heracles in all his hardships and adventures ;: to Theseus under similar circumstances; to the Greeks in their war against Troy ; to Perseus in slaying the Gorgon Medusa, whose head she afterwards bore upon her egis, from which she obtained the name of Gorgophone ; and to the Argonauts on their expedition to Colchis. She main- tained always her character of a virgin, and, to express this, bore, at Athens in particular, the name of Parthenos. Her birth took place in Olympus, in presence of the other deities, Hephzstus aiding it, as it is coarsely said, by splitting open with his hatchet the skull of Zeus, a subject often represented on the ancient painted vases. This was also the subject of the sculptures in the front pediment of her greatest temple, the Parthenon at Athens. From the fact that in the other pediment the sculptures represented her contest with Poseidon for divine supremacy over Attica, it might perhaps seem that the first act of her existence was to claim this sovereignty. Foremost in her character always is her protection of high citadels, like that of Athens. Yet it was not for this, but for her causing an olive to grow on the bare rock of the Acropolis, that she was chosen rather than Poseidon, whose claim was that he had raised on the same rock a spring of brackish water. The olives of Attica were a source of great wealth, and the light supplied by their oil may have seemed not-unlike the light of the ether. As the defender of citadels her title was Polias. There is, however, a different account of her origin hing- ing on her name of Tritogenea or Tritonis, and describing her as a daughter of Poseidon and the Triton lake in Libya. But this is obviously a late invention, founded, apparently, on traditions handed down in Libya from the early Minye colonists, in whose original seat at Orchomenos and Alal- comenz in Beeotia was a very early form of the worship of Pallas as a goddess in some way connected with lakes and streams. In this district, in Arcadia, and in Crete also, were found rivers bearing the name of Triton, and associated in very early traditions with the birth of Athena.

At one time, therefore, her relation to or control of the watery

element must have formed a considerable part of her wor- ship. To this also is traced her ancient name of “Oyya or “Oyxaat Thebes. How she came by

the name of Glaucopis, z.¢., “ owl-eyed,” by which she is so frequently addressed in the Ziad, is not satisfactorily explained, least of all by the recent theory, which, interpreting it as “ owl-headed,” maintains that the goddess had originally the head of an owl, and appeals to certain rude clay vases and figures found on the supposed site of Troy, with faces intended to be human, but yet not much unlike the face of an owl. As the goddess of victory she was called N ike, and it was to her in this capacity that the edifice known as the Temple of the Wingless Victory was erected on the Acropolis of Athens. Hippia was her title as the tamer of horses, Erichthonius, at Athens, was the first mortal whom she taught to yoke horses. For Bellerophon, on the Acropolis of Corinth, she bridled the winged horse Pegasus. Besides Corinth, the chief seats of her worship outside of Attica were Argos, Sicyon, Treezen (in Arcadia, where, with the title of Alea, warm, fostering, she had a celebrated temple), Laconia, Elis, and in Asia Minor, at Ilium, where it survived after her image, the Palladion, which had fallen from heaven, had been removed to Athens or Argos, both of which claimed to have received it. At Athens an ancient image of her existed in the Erechtheum, and was regarded with peculiar sanctity, even in the times when men were familiar with the splendid statue of her by Phidias in the Parthenon. Except at Athens, little is known of the cere- monies or festivals which attended her worship. There we have—(1.) The ceremony of the Three Sacred Ploughs, by which the signal for seed-time was given, and, apparently, dating from a period when agriculture was one of the chief occupations of her worshippers; (2.) The Procharisteria, at the end of winter, at which all the magistrates offered sacrifice ; (3.) The Skirophoria, with a procession from the Acropolis to the village of Skiron, in the height of summer, the priests who were to offer sacrifice to Athena walking under the shade of parasols held over them; (4.) The Oschophoria, at the vintage season, with races among boys, and a procession, with songs in praise of Dionysus and Ariadne; (5.) The Chalkeia, with rites referring to her as a goddess presiding jointly with Hephestus over industrial arts; (6.) The Plynteria and Callyn- teria, at which the ancient image in the Erechtheum was cleaned, with a procession in which bunches of figs were carried; (7.) The Arrhephoria, at which four girls, between seven and eleven years of age, selected from noble families, brought during the night certain sacred objects from the temple of Aphrodite by an underground passage to the Acropolis; (8.) The Panathenea, at which the new robes for

the image of the goddess were, before being laced on it, carried through the city, spread like a sail on ainast. The last festival was attended by athletic games, open to all who traced their nationality to Athens. As to artistic representations of Athena, we have first the rude figure which seems to be a copy of the Palladion ; secondly, the still rude, but otherwise more interesting, figures of her, as, ¢.g., when accompanying heroes, on the early painted vases ; and thirdly, the type of her as produced by Phidias, from which little variation appears to have been made. (A. Ss. M.) ATHEN ZUM, a name originally applied to buildings dedicated to Athena (Minerva), was specially used as the designation of a temple in Athens, where poets and men of learning were accustomed to meet and read their produc- tions. The academy for the promotion of learning which the Emperor Hadrian built at Rome, near the Forum, was also called the Atheneum. Poets and orators still met and discussed there, but regular courses of instruction were

given by a staff of professors in rhetoric, jurisprudence, grammar, and philosophy, This species of university continued in high repute till the 5th century. The same name was afterwards applied to similar institutions in Lyons and Marseilles; and it has become a very general designation for literary clubs or academies. It has also been used as the title of literary periodicals, particularly of the journal of art criticism edited by the brothers Schlegel, and the two well-known modern papers published in Lon- don and Paris.

ATHEN AUS, a Greek rhetorician and grammarian, or man of letters, wasa native of N aucratis, a town in Egypt, near the mouth of the Nile, Exceedingly little is known of his life, but from one or two references to known events which occur in his works it may be gathered that he flourished about the end of the 2d and the beginning of the 3d century a.p. Besides a history of the Syrian kings, and a small tract on the identification of the thratta, a peculiar kind of fish, mentioned by the comic poet Archip- pus, both of which are lost, he wrote the extensive work, in fifteen books, called the Deipnosophiste, i.e., the Feast of the Learned, or, as it may be translated, the Skilled in Feasting. The first two books, and parts of the third, eleventh, and fifteenth, are only extant in epitome, but otherwise we

seem to possess the work entire. It is an immense store-house of miscellaneous information, largely but not exclusively on matters connected with the table, and full of quotations from writers whose works have not come down to us. It has been calculated that nearly 800 writers and 2500 separate writings are referred to by Athenzus ; and he boasts of having read 800 plays of the Middle Comedy alone. Of many writers we have no remains, save the excerpts given by him; and a glance at any collection of Greek fragments will show how large is the proportion drawn solely from this source. The plan of the Deipnosophiste is exceedingly cumbrous, and is badly carried out. It professes to be an account given by the author to his friend Timocrates of a banquet held at the house of Laurentius, a wealthy patron of art. It is thus a dialogue within a dialogue, after the manner of Plato, but a conversation of sufficient length to occupy several days (though represented as taking place in one) could not be conveyed in a style similar to the short con- versations of Socrates. Among the twenty-nine guests whose remarks Athenxus reports are Galen and Ulpian, a lawyer, supposed to be the famous jurist. Their conversa- tion ranges from the dishes before them to literary matters of every description, including points of grammar and criticism; and the guests are expected to bring with them extracts from the poets, which are read aloud and discussed at table. The whole is but a clumsy apparatus for display- ing the varied and extensive reading of the author. Asa work of art it can take but a low rank, but as a repertory of fragments and morsels of information it is invaluable. The text, particularly in the quotations from the minor comic poets, is still in a very corrupt state.

Editions :—Casaubon's, 1597 ; Schweighauser's, 14 vols., with translation and copious commentary, 1801-1807; the best recent editions are Dindorf's, 3 vols., 1827, and Meincke's, 4 vols., 1858-66.

ATHENAGORAS, a Christian apologist, was a native of Athens, and lived during the 2d century a.p. The only sources of information regarding him are a short notice by Philip of Sida, and the inscription on his principal work. Philip says that he was at the head of an Alexan- drian school (the catechetical), that he lived in the time of Hadrian and Antoninus, to whom he addressed his Apology, and that Clement of Alexandria was his pupil, while Pantznus was the pupil of Clement. This statement is thoroughly

inaccurate and worthless. The inscription on the work describes it as the " Embassy of Athenagoras,

the Athenian, a philosopher and a Christian, concerning the Christians, to the Emperors Marcus Aurelius Antoninus and Lucius Aurelius Commodus, &c." This statement has given rise to considerable discussion, but from it and internal evidence the date of the Apology may be fixed at about 176 or 177 a.pD. Athenagoras is also the author of a discourse on the resurrection of the dead, which is not authenticated otherwise than by the titles on the various manuscripts. In the Apology, he refutes the accusations brought against the Christians of atheism, eating human flesh, and licentiousness, and in doing so takes occasion to make a vigorous and skilful attack on Pagan polytheism and mythology. The discourse on the resurrection answers objections to the doctrine, and attempts to prove its truth from considerations of God's purpose in the creation of man, His justice, and the nature of man himself. Athena- goras is a powerful and clear writer, but his theology is strongly tinged with Platonism. His discussion of the Trinity has some points of speculative interest, but it is not sufficiently worked out; he regards the Son as the Reason or Wisdom of the Father, and the Spirit asa divine effluence. On some other points, as the nature of matter, the immortality of the soul, and the principle of sin, his views are interesting. There are many editions of Athena- goras ; the best are those of the Benedictine Maranus, and of Otto, Jena, 1857. The works have been translated into English by Humphreys, London, 1714, and by the Rev.

B. P. Pratten, Edinburgh, 1867 (Ante-Nicene Christian Library). In 1599 and 1612 appeared in French a work on Zrue and Perfect Love, purporting to be a translation from the Greek of Athenagoras ; it is a palpable forgery. ATHENODORUS, surnamed CaNANITES or SANDONUS, a Stoic philosopher, was born at Tarsus. He probably gave instruction to Augustus when he was at Apollonia ; and on proceeding to the Roman courts, he was made tutor to Tiberius. The emperor esteemed him greatly for his proved virtue and probity. He was in the habit of giving his opinion very freely, and warned Augustus, whenever he found himself giving way to anger, to

rehearse the twenty- four letters of the alphabet before saying or doing any-thing. Retiring late in life to his native town, he died there at the age of 82. None of his works have sur- vived. Another Stoic of this name, surnamed CoRDYLION, also of Tarsus, was keeper of the library at Pergamus, and died at Rome in the house of Cato the Younger. There were likewise two sculptors named Athenodorus, one of whom assisted Agesander in the group of the Laocoon. ATHENRY,a decayed town of Ireland, county of Galway, and province of Connaught, 14 miles E. of Galway. Itis a place of antiquity, and traces of its walls and castle, and of an old Dominican monastery, are still visible. 'It gave the title of baron to the family of De Bermingham, and from the time of Richard II. till the Union it returned two members to parliament. Population of the parish in 1871, 3639.

END OF VOLUME SECOND.

NEILL AND COMPANY, PRINTERS, EDINBURGH.

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ANTELOPE.

Pablished by A & C. Black, Edinburga.

PLATE T.

Water Bok (Hobos E. llupsiprymnits)

832

the Athenian, a philosopher and a Christian, concerning the Christians, to the Emperors Marcus Aurelius Antoninus and Lucius Aurelius Commodus,

&c.” This statement has given rise to considerable discussion, but from it and internal evidence the date of the Apology may be fixed at about 176 or 177 a.p. Athenagoras is also the author of a discourse on the resurrection of the dead, which is not authenticated otherwise than by the titles on the various manuscripts. In the Apology, he refutes the accusations brought against the Christians of atheism, eating human flesh, and licentiousness, and in doing so takes occasion to make a vigorous and skilful attack on Pagan polytheism and mythology. The discourse on the resurrection answers objections to the doctrine, and attempts to prove its truth from considerations of God’s purpose in the creation of man, His justice, and the nature of man himself. Athena- goras is a powerful and clear writer, but his theology is strongly tinged with Platonism. His discussion of the Trinity has some points of speculative interest, but it is not sufficiently worked out; he regards the Son as the Reason or Wisdom of the Father, and the Spirit asa divine effluence. On some other points, as the nature of matter, the immortality of the soul, and the principle of sin, his views are interesting. There are many editions of Athena- goras; the best are those of the Benedictine Maranus, and of Otto, Jena, 1857. ‘The works have been translated into English by Humphreys, London, 1714, and by the Rev.

Puates, Vou. II.

When insertion throughout the text is desired, the

following pages -—

Plate I. page 100 Plate XI. page 405 Plate aan page re ” IL, 100 ”? XI. ,, ‘ ” XXIL ” 438 Tail om | , a. ee be 4 4 oo | XXIV. ,, 438 IV Sm) | aye, Eg MD % ;,

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__DirEcTions to BINDER.

Plates to be placed opposite the

OL. IT. | : ANTELOPE.

| PLATE T.

ja >

; : SS Water Bok (Hobos Ellipsiprymnits) Common Antelope [Antilope cervicapra) Published ‘by A:& C. Black Baixilur ¥ ‘ees Sak

PLATE I.

i yoLm ANTELOPE.

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vo LU AQUEDUCT. PLATE III.

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Remains of AQUEDUCT in the Island of MYTILENE.

PORTA MAGGIORE at Rome.

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Arches of ROMAN AQUEDUCTS,

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Pubhshed by A &C Black. Edinburgh.

VOL IL. AQUEDUCT. PLATE 1V

Pr : a ee Remains of AQUEDUCT of METz.

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ARCHA OLOGY. PLATE V.

Greek Lecythus, bood Style. Greek Hydra, Good Style Patera, Late Style?

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Ltruscan Sarcophagus, Late Style

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VOL TIT.

ARCHITECTURE. PLATE VII

EGYPTIAN. Plaw, Section and Elevations of the: Lemp le of Apollinopolis Magna at Ldfoo. Vigel,

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Elevation of Propwlaea, Ang le;torus, & lotus enrichinent of Fig toh

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a WkA.E. Johnston, Edin? and London.

Fig.1.

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F ug. o. Fig. 4. Enlarged Capital of Fig. 4. External Columen of Fi,

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ARCHITECTURE.

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eripleral & Hy pethral Temple .

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PLATE VUTI

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W&AK J hnston, Fdin™ and London

VOL. IT ARCHITECTURE. GRECIAN DORIC Pig. ck, Fronv Elevation. of a: Greek Dorie Hexastyleperipteral Temple,

Fig. 2.

y// Sectional Elevation of the Promaos of a Hexcastyle-peripteral Temple'.
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Fig 12, Plan of Planceer of Cornice

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Plan of a Greek Hexastyle-peripteral & Cleithral. Temple. ‘WH delt

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Lhe Temple of Minerva Parthenon at dthens:. (North-west ven.)

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PLATE X

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Fig.2.

Elevation: of a breek-lonic Hexa prostyle: (The Erechtheum Athens /

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Fig.l. Transverse Seetionor capital

Fig. 14. Longitudinal Section of capital

Flan of a Greek Hexa-prostyle Temple

ENCYCLOPADIA BRITANNICA, NINTH EDITION,

ARCHITECTURE. PLATE XI GRECIAN CORINTHIAN AND CARYATIC

Cheragic Monument of Lysicrates, Athens,

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f W@. vo, Details of Fig. 4. enlarged

fig 4 Caryatic Fortico of Temple in.Acropolis, Athens

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Temple of Antonius & Py. /.

| Fig. 2.

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PLATE XIV

Lae Temple of Vesta, Tivoli

PRE He, Portico of Eantheon,

Rome

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VOL. WM

ARCHITECTURE, ROMAN

PLATE XV7

Figd. The Colosseur

/ ‘ = ‘ nm “Amphitheatre Rome. . :

| SUIT TS

The Pantheon ,Flank Elevation

Pegi, Bis

Section. of Fantheon

fig. G,

Fig.l. . as 10. ; Fig ll Temple of Paris Virilis, Rome. Arch. of Septimius Severus re

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ARCHITECTURE. 1 x Fee € I : RE | PLATE XVII

Fig.

References LLL, shops

2,2, store-rooms opening into shops ars . 3 fountain

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Sketch of the Entrance te the Mansion [Pig Fl. 2h /tn its present stale.

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“ s ; ‘ ‘ ‘ : from Pompeii Fig l. Man ota koman Mansion, with the hi uses, Shops & streets, surrounding tt, Por pet. c

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VOL IU. ARCHITEC TU RE. PLATE XVI

Sectional compartment of the Nave of Lincoln Cathedral.

Sectional compartment of the Choir of Lincoln Cathedrad.

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i] fig.é. Canopies, Pinnacles &c. of

Lower Tabernacle. d of Fig I.

Fig 13. Corbel. ke of fig il.

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PLATE XXI

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ARCHITECTURE. PLATE XXII

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PLATE XXV.

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— rawn and Engraved by J Bartholomew. F R.G.S

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VOL. ASTRONOMY PLATE X2VG

ORBITS oF MARS (d), THE EARTH (6), VENUS (Q), AND MERCURY.

Nodes $25,, Nearer Apses M.E.V.m.

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‘ 90 The dots romd the orbits shew ——— — aN the coke the position of the planets at ae ass The symbols 1] indivate the greatest intervals of ten days ¢ ge

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ee eee AQ Place of each planet on Jan? L 1875, at noon . Xe. oy*

oe VS Venus Mercury The Sun Position of) | ! of Axis | ° unlcnown | Axis unknown Scale five thousand tames that of Orbits Seale fifty tines that of Orbits

(The Earth, Mars, and the Sun, are shewn we their true axtal position)

ALAPrector, delt J Bartholomew, scuip ENCYCLOPADIA BRITANNICA, NINTH EDITION.*

Wadeae ASTRONOMY PLATE XXXVI ORBITS or NEPTUNE (!, URANUS (H), SATURN (h)

AND JUPITER (2). ‘Zone of Asteroids, and orbits of 76). 23), 3. @,2 and Ome

Nodes Q Be Nearer Apses N.U.S, J.

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The dots round the orbits shew the position of the planets at

The symbols iy indicate the greatest intervals of a thousand days

distance of an orbit nerth ana south of the plane of the Eeliptic

Scale of huniireds of millions of miles Lhe arrow-head on each orbit shews

the direction. of revolution, also the place of each planet on Jar? 1 1875, at noon

+ $

1000 million miles = 1 inch

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*za… SO Saturn i f Leg S&S \ Jupiter ie ey . *

Mercury Venus Earth Mars

Neptune

Secale of Planets 10.000 times that of Orbits

(Jupiter and Saturn are shewn in their true axial position, — Sh ie Uranus and Neptune in the axial positions interred trom the motions of’ their Satellites) Scale 2000 times that of the Orbits

yy Systent or Satellites |

*eS * : Go) aw ~ Neptune’s Satellite*

*R.A.Proetar, del**

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ASTRONOMY.

Fig, 4. SATURN AND HIS RINGS, FEBRUARY ATURN AND HIS RINGS, NOVEMBER

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ENCYCLOPA DIA BRITANNICA

NINTH EDITION

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THE

ENCYCLOPADIA BRITANNICA

A

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME III

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Earliest settlement on the Acropolis,

ENCYCLOPADIA BRITANNICA.

ATHENS

THENS (’A@jvor, ATHEN#) was the name of as many as nine towns in various parts of the Grecian world, among which Athene Diades, in the N.W. of Eubcea, a town belonging to the Athenian confederation, is worthy of mention. But it was the capital of Attica which invested the name of Athens with an undying charm for the poet, the artist, the philosopher, the historian, for all time. It is situated in long. 23° 44’ E., lat. 37° 58’ N., towards the south of the central plain (zedéov) of Attica, about 43 miles from the harbour of Pireeus, and nearly 4 from the Bay of Phalerum. The survey of Pausanias (i. 2-30), when compared with existing remains, and

supplemented by the numerous incidental notices of ancient authors, enables us to form a more perfect conception of the topo- graphy of ancient Athens than of any other Greek city, Recent excavations have added greatly to our knowledge of it, and the literature of the subject is very extensive (see p. 11, infra). Our object in this article will be to treat of the topography of Athens from an historical point of view, and to show how the rise, the greatness, the decline of the city may be read in the history of its buildings.

There seems little reason to doubt that the earliest settle- ment on Athenian soil was upon the cliff afterwards famous as the Acropolis. Such is the express statement of Thucydides (ii. 15), who observes that the Acropolis was commonly termed at Athens 7 wéA1s, much as the oldest part of London is styled “The City.” The earliest inhabi- tants appear to have been Pelasgians ; and though it was the boast of the Athenians that they alone of all Greek

states were indigenous (airdxOoves), yet their town would |

from the first have received accessions from various parts of the continent, the peaceful poverty of Attica affording a welcome refuge in those early and unsettled times (Thucyd., i. 2). The most accessible portion of the Acro- polis is the western side, where it is joined by a neck of hill to the Areopagus. On this side there existed down to later times the remains of fortifications built by the earliest inhabitants, with nine doorways, one within the other, called 76 IleAacyixov, or 76 “Evvedrrvdov. This fort protected the only entrance to the citadel, which was surrounded by a wall, and artificially levelled for the recep- tion of buildings. Within this fortified’ enclosure stood the shrine of Athena Polias (Homer, Iliad, ii. 449; Odyssey,

vii. 81), afterwards known as the Erechtheium,—and an altar of Zeus Polieus, where the strange sacrifices of the Dipolia were celebrated. A Prytaneium, containing the hearth-fire of the state, and serving as the residence of the king, would be another indispensable feature in the primitive town. But while the king and some of the most sacred families probably had dwellings within the fortress itself, Thucydides (ii. 15) points out that a great part of the early population dwelt outside its walls, under the south side of the cliff, probably without fortification, but retiring to the

citadel in times of peril. In this quarter, towards the Ilissus, stood the oldest Athenian sanctuary of Dionysus, in a region called Aduva, from having been literally a marsh in early times. Not far off, and nearer the stream, stood the temple of Zeus Olympius, said to be founded by Deucalion (Pausan., i. 18), of which more will be said presently, the precinct of Geea Olympia, and other sacred places. Here also was the fountain of Callirrhoe, afterwards ornamented by the Pisistratids, and called Enneacrunus, the water of which was sought for sacred purposes long after the city had outgrown these early limits (Thucyd., ii. 15). The region we have been describing formed the nucleus of the later city, and therefore, at the subdivision of all Attica into demes, this quarter was distinguished by the name Kudabyjvatov.

To the west of the Acropolis there extends from N. to S. a range of hills, the three most prominent heights of which are commonly known respectively as the Hill of the Nymphs, the Pnyx, and the Museium,—the Nymphs' Hill being separated from the Acropolis by the Areopagus, which intervenes between.

covered of ancient dwellings hewn out of the solid rock. But while all these rock-dwellings are extremely ancient, yet some appear less primitive than others ; it is remarked that those which exist on the Areopagus and on the hill- sides nearest to the Acropolis are of a smaller and ruder type, those more distant froin the citadel being somewhat more convenient in plan and extent. Legend declares the Athenians to have originally dwelt in rock-hewn caves (Dyer's Athens, ch. i.), and it would seem that primitive Athens gradually extended itself from the Acropolis in this W. and 8.W. direction. This quarter was afterwards II. — 1

Everywhere upon the slopes Early rock- of the hills just mentioned traces have lately been dis- dwellings.

Thesean ovvoikio- pds.

Altar of the Semne.

Leocoriun).

Early city

wall.

The Pisis-

tratids,

Olympium.

Pythium.

2

known as the intramural deme of Melite, a name derived, perhaps, from the balm which then grew there (the edadys pedtrea of Theoer., iv. 25).1 The historian E. Curtius (Attische Studven, pt. i.) has, indeed, gone so far as to regard these rock-dwellings as earlier than the occupa- tion of the Acropolis itself. But the contrary opinion of Thucydides is worth something, and the natural strength of the Acropolis would make it the most obvious spot for primitive occupation. Accordingly, we shall not be giving too free a licence to our imagination if we conceive of primitive Athens as a twofold settlement, partly on the Acropolis and the low ground at its southern foot, and partly upon the eastern slopes of the hills on the west. It may even have been the consolidation of these two villages into one township that gave rise to the legend ascribing to Theseus the cvvouxicpos or consolidation of Attica. It would be natural for legend to assign to one definite time, and connect with one great mythical name, that process of unification which probably was as gradual as it was spontaneous. As the population of the early town con- tinued to increase, two more districts seem to have been in-corporated—Collytus, extending from the east of Melite, between the Acropolis and Areopagus, and Cerameicus, or the “ Potters’ quarter ” (“Tuileries”), which extended from the same two hills towards the north and north-west. The regions we have now described appear to have made up the Athens of Solonian times. The earliest historical event which illustrates Athenian topography is the rising of Cylon (IHerod., v. 71; Thueyd., i. 126 ; Pausan., i. 28). The narratives of that event imply that the Acropolis was already fortified by the Enneapylum, that the Areopagus was already the

seat of the court which bore its name (see ArEopacus), and that near the entrance of the citadel stood an altar of the Semne, or Furies, at which Cylon and his partisans were slain. This altar has been immor- talised by Aischylus in the splendid conclusion of the Eumenides. Another sacred spot in early Athens must have been the Leocorium, where Hipparchus was assassin- ated (Thucyd., i. 20; vi. 57). This was a shrine erected in honour of the daughters of Leo, who were sacrificed by their father to Athena, in order to avert a pestilence. The nature of the legend testifies to the antiquity of the site. The words of Thucydides respecting Cylon imply that the early city was already surrounded by a ring-wall, and this probably remained intact until the invasion of the Persians, although the buildings within the walls under- went great alteration and improvements under the govern- ment of Pisistratus and his sons.

The reign of the Pisistratids was recognised by the ancients as marking an important era in Athenian topo- graphy. We have already mentioned the fountain of Enneacrunus as being built by them. It was Pisistratus who laid the foundations of the great temple of Zeus Olympius upon the ancient site above mentioned. His magnificent design had an eventful history : left unfinished by its author, the Athenians, perhaps from dislike to

the “tyrant,” made no effort to complete it. At length, |

after receiving additions from various foreign princes, it was completed by Hadrian (c. 130 a.D.), and formed the grandest edifice in the region of the city which, in acknow- ledgment of the imperial munificence, was called Hadrian- opolis. The Olympium was one of the largest temples in the world ; but of its 124 Corinthian columns only 15 are now standing. The Pythiwm, or sanctuary of the Pythian

1 Many of the names of the Attic demes, and indeed of Greek local names everywhere, were derived from plants and flowers ; see Tozer’s Lectures on the Geography of Greece, p. 338: “The most plausible derivation that has been suggested for the name ’A@Hva: is from &6-, the root of &y@os, a flower; and Lobeck proposed to translate it by ‘ Florentia,’ ”—(1bid., p. 161).

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Apollo near the Olympium, was also ascribed to Pisis- tratus, whose grandson and namesake dedicated an altar within it (Thucyd., vi. 54). To Pisistratus was ascribed the founding of the Lyceium, or temple of Apollo Lyceius, which stood on the right bank of the Ilissus, a short distance from the city. ‘The names both of Pericles and Lycurgus the orator are also associated with this building ;

Lyceium.

yet it is not known who added the gymnasium close by, .

which afterwards became famous as the favourite haunt of Aristotle, and the birthplace of the Peripatetic philosophy. The yet more famous seat of the rival philosophy seems also to have owed something to the Pisistratids, for Hipparchus was said to have enclosed the Academy with a wall, This was a gymnasium surrounded by pleasant gardens lying to the N. of the city, about a mile from the Dipylum gate. It owes all its fame, of course, to its connection with Plato, who lived, taught, and was buried there. This site, so full of glorious memories, cannot now be identified with certainty. Its trees, like those of the Lyceium, were despoiled by Sulla to make implements of war. The name of Pisistratus is connected with another important site. Professor E. Curtius (Attische Studien, pt. 2), supposes that the most ancient Athenian market lay on the 8. of the Acropolis, and that the Pisistratids superseded it by a new market at the northern foot of the Areopagus. Be this as it may, we are sure that, as early as their times, this site formed the centre of Athenian commercial and civic life. The narrow valley between the Pnyx Hill and the Areopagus, where older topographers placed the Agora, is not a spacious enough site for the purpose. The obvious locality for an Agora would be the rectangular space enclosed by the Acropolis on the E., and on the W. by the eminence occupied by the Theseium, To the N. and N.E. no barrier existed ; accordingly, the entrance was from the Dipylum gate on the N.W., and on the N.E. the market received extension in Roman times. The Agora thus stood in the region known as Cerameicus. But as the Cerameicus extended for some miles in a N.W. direction, it became divided by the city wall into the outer and the inner Cerameicus. The outer Cerameicus was an agreeable suburb, lying on

the road to the Academy and Colonus, the home of Sophocles ; and it was here that citizens who died in their country's wars received a public burial. Through gate Dipylum one passed into the inner Ceramei- cus, the most important quarter of which was naturally the Agora itself ; and so it was common to speak of the Agora as "The Cerameicus." How much this market-place may have owed to the designs of the Pisistratids we cannot now determine. The statues of Harmodius and Aristogiton formed a conspicuous ornament of the south portion, and Thucydides (vi. 54) informs us that the grandson and namesake of Pisistratus adorned the Agora by building the altar of the twelve gods, If the Agora belongs to the age of Pisistratus, some of the civic build- ings within it would also be coeval with him. Such were the Stoa Basileius, or Portico, where the archon basileius presided ; the Bouleuterium, where the senate of 500 held its sittings ; the Tholus close by it, where the Prytanes of the senate sacrificed—a circular building with a dome of stone, from whence it gained its name; and the Prytan- eium, said to be founded by Theseus (Thucyd., i. 15), which contained the hearth-fire of the state, and where the Prytanes and public benefactors had the privilege of dining at the public expense. The statues of the ten heroes (eponymi), who gave their names to the Athenian tribes, decorated the Agora probably from the first ; against these statues were affixed public notices and proclamations. Other buildings in the Agora of later and ascertained dates will be enumerated in their proper place.

Academs

The Ago

Areopagus on the S., by the _

Outer ai inner C meicus.

ATHENS 3

The revolution which expelled the Pisistratids (510 B.¢.), and gave Athens a frec government, left its mark upon the – topography of the city. The old Pelasgic fortress (70 'EvvedrvAov), in which "the tyrants" had for a time held out, was now broken down, and the site occupied by its ruins was devoted by the Delphic oracle to eternal desolation. Only in the

Peloponnesian war, when the country population was crowded within the city walls, do we read of this spot being occupied by dwellings (‘Thucyd., ii. 17), Another work which may probably be assigned to the age of Clisthenes is the first arrangement of the . Pnyx, or place of public assembly. The hill that is commonly known as the Pnyx Hill contains one of the most remarkable ruins in Athens; the silence, however, of Pausanius respecting what was probably in his day already a mere ruin has occasioned some doubt conceruing its proper identification. The spot in question consists of two terraces sloping down the hill towards the Areopagus, from §.W. to N.E. The upper terrace, indeed, does not slope, but is levelled out of the solid rock near the summit of the hill, being about 65 yards in length (E. to W.), and about 43 in breadth at its broadest part (N. to 8.) It is bounded at the back (S.) by a rock-wall, and at the W. end there stands a cubical block, allowed to rise out of the solid rock when this upper terrace was levelled. There is good reason for considering this as the altar for the sacrifices (ra. tepicria) with which every assembly of the ecclesia was opened (Bursian, Philologus, 1854, p. 369, foll. ; Dyer, Athens, p. 462). The lower and considerably larger terrace is separated from the upper terrace by another wall cut out of the solid rock. This wall, which is nearly 126

a large scale, hewing out what is still known as the bema, giving the semicircular wall a wider sweep, and raising the tiers of seats at least to a level with the new bema, if not above it. For there is no reason to suppose that the surface of the lower terrace has undergone no change in the lapse of centuries, or that the ‘‘ Cyclopean” wall surrounding it never excecded its present height.

A building of greater architectural importance and of The Diony- Dramatic siactheatre.

cqual interest belongs to this same period. performances at Athens originally took place in wooden theatres extemporised for the occasion; but the fall of one of these led, in the year 500 B.c., to the erection of the marble theatre on a site already consecrated to Dionysus as the Leneum, upon the S.E. slope of the Acropolis. (Suidas, s.v. Uparivas.) We may be sure that the first stone theatre was comparatively simple in construction, consisting of a xotAoy or auditorium, with tiers of rock-hewn seats, and an

épxnorpd, or space for the chorus, while the stage itself and its furniture were of wood, The excavation of the Dionysiac theatre in 1862 has made every one familiar with the row of marble thrones for the various priests and officers of state, the elaborate masonry of the stage, the orchestra floor, and other features. But these and other interesting decora- tions of the theatre belong to a later age. It was under the administration of Lycurgus the orator (337 B.c.) that the building was first really completed; and many of the sculptures which have been lately brought to light belong to a restoration of the theatre in the 2d, or perhaps even in the 3d, century a.D.?

Enough has now been said of the condition of Athens

yards long, is not quite straight, but encroaches slightly upon the upper terrace, and forms at the centre a very obtuse angle. At this point there rises, projecting from the wall, a large cubical mass, cut out of the solid rock, resembling somewhat, though on a larger scale, the altar described above. It is itself 11 feet square and 5 feet high, and stands on a plat- form consisting of three very massive steps. This remarkable monument has been recognised by tradition as the oxdAa Tot Anpoobéveos, and almost every traveller since Chandler's time has regarded it as no other than the famous .bema of the ancient Athenian assembly. The rock-wall from which

before the Persian War. It was surrounded by a ring-wall Thesean of narrow circuit, some doubtful traces of which are sup- wall. posed to remain. At its centre stood the Acropolis, already crowded with temples and sanctuaries, some upon the summit, some built at its foot, and others—like the famous grotto of Pan, on the N.W. slope—mere caves in its rocky Grotto of sides. Pan. The Persian invasion, which forced the Athenians to take After the refuge in their " wooden walls," and to leave their city at Persian the mercy of the barbarian, marked an important epoch in W": the annals of Athenian building. Upon the retreat of Mar-

it projects forms the chord of a vast scmicircular space, the enclosure of its arc being a wall of " Cyclopean " masonry. The radius of the semicircle measures between 76 and 77 yards from this outer wall to the bema. Here, then, was the auditorium of the Pnyx. But several difficulties beset the identification. Towards the bottom of the lower bema Prof. E. Curtius (Attische Studien, pt. 1.) has discovered another similar though smaller

bema. Again, Plutarch asserts that the bema which had originally faced towards the sea was by the Thirty Tyrants turned round the other way, in their hatred of the maritime democracy. More- over, if the block of marble above mentioned be rightly identified as the bema, then it would have the auditorium sloping downwards from it, an arrangement ill suited for addressing a tumultuous popular assembly. Dr Curtius accordingly pronounces the entire identification to be a mistake, and would regard this spot as a primitive precinct and rock-altar of the Most High Zeus. It would not be difficult, if space allowed, to disprove Dr Curtius's theory. Far more reasonable is the view of Dr Dyer (Athens, App. iii.) He thinks that the lower and smaller bema dis- covered by Dr Curtius was the bema of Clisthenes, which did (however much Plutarch's statement is discredited by his own absurd explanation) face in the direction of the sea. The orator would thus speak from the arc of the semicircle, having the audience above him. The Thirty may well have defaced the Pnyx, and it would have been natural for Thrasybulus after the anarchy to restore it on

donius, the Athenians returned to Attica to find their city virtually in ruins. Its fortifications and public buildings had been destroyed or burnt, and the private dwellings had been wantonly defaced or ruined by neglect. Amid the enthusiasm of hope which followed upon the grcat deliverance of Greecc, a natural impulse led the Athenians to rear their city more glorious from its ruins. Themis- tocles fanned their patriotism with the foresight of a statesman, and Athens rose again with marvellous rapidity. This haste, however, though creditable to their patriotism, and, indeed, necessary in order to forestall the jealous op- position of Sparta, was not without its evils. The houses were rebuilt on their old sites, and the lines of the old streets, narrow and irregular as they had been, were too readily followed. A similar haste marked the rebuilding of the city walls, a work in which men and women, old and young, took zealous part, not scrupling to dismantle any building or monument, private or public, which could sup-

ply materials for the building. But in rebuilding the walls Rebuilding Themistocles gave them a wider circuit, especially towards of the At the same time W4!s.

the N. and N.E. (Thucyd., i. 90, 93). he determined to construct new harbours, and to fortify the Pireeus, regarding the navy of Athens as her principal source of strength. It is doubtful whether the “ Long Walls” formed a distinct portion of his designs; but he may certainly be regarded as the founder of the greatness

1 The best account yet given of the Dionysiac theatre is to be found in Dr Dyer’s ascent work on Athens.

Gates.

The Pirgzeus and its buildings.

of Athens, the works and embellishments carried out by Pericles being only a fulfilment of the far-sighted aims of Themistocles. Thucydides (ii. 13) makes the circuit of the city wall to be 43 stades (about 54 miles), exclusive of the unguarded space between walls; this is found to correspond accurately cnough with the existing remains. In tracing the circuit of the ancient walls, we may take our start from the N.W. side of the city, at the one gate whose site is absolutely certain, the Thriasian gate (called also the Sacred gate, as opening upon the sacred way to Eleusis, and also 75 AarvAov, as consisting of two gates, perhaps one within the other), which is marked by the modern church of the Holy Trinity, a little N. of the bottom of Hermes Street— a spot attractive to the modern tourist through the beautiful “street of tombs” here laid bare by recent excavations. From the Thriasian gate the wall of Themistocles ran due E. for some distance; thence, skirting the modern theatre, it ran N.E., parallel to the modern Pireeus Street as far as the Bank, when it returned in a 8.E. direction across the site of the present Mint, as far as the Chamber of Deputies. Thence towards the §.E. it included nearly all the modern Royal Gardens, and then ran S.W., following the zig-zag of the hills above the north bank of the Ilissus, until westwards by a straight course parallel with the Acropolis ‘+ reached the Museium Hill. Thence it may be traced in a direction N.W. and N., following more or less the contour of the hills, until we return to our starting-point at the Dipylum gate. Hight other gates (exclusive of wickets, avaises, Which must have existed) are mentioned by an- cient authors—the

Piraean, Hippadcs, Melitides, Ttonian, Diomeian, Diocharis, Panopis, and Acharnian. Their exact sites cannot be certainly fixed, but some of them may be determined within narrow limits, such as the Pirean gate, which led out of the Agora, and opened upon the long walls. Having completed the defences of the city proper, among which must be included the building of the north wall of the Acropolis (Dyer, p. 121), Themistocles pro- ceeded to fortify the Pirseeus.

Athens, like most of the old Greek towns, was built, for greater security, at a distance from the coast, and only when more settled times brought her greater prosperity was a harbour formed at the nearest bay of Phalerum, near the modern. church of St George. It is said that Themistocles would gladly have transported the Athenian population bodily from the upper city to the coast, there to form a great maritime state. Though this was impos- sible, yet he could strengthen Athens on the seaward side. The isthmus of Pireeus, though somewhat more distant than Phalerum, presented obvious advantages as a sea- port. It formed on its north side the spacious and secure basin of Pirseeus (now Port Drako), the north and south shores of which towards the entrance fall back into two smaller bays—harbours within the harbour—known respectively as the copds Ayny and xavOapos. The neck of the isthmus on the south is formed by Port Zea (now Phanari), the entrance of which was secured by Phreattys, the headland of Munychia. Round to the east of the district of Munychia, again, and facing Phalerwn, was the harbour known anciently as Munychia, and now as Port Stratiotiki. Themistocles thus, in giving up Port Phalerum, gave Athens three harbours instead of one. The fortifications of Pireeeus were conceived on a grand scale, and carried out with no sign of hurry. The whole circuit of Pireeus and of the town of Munychia was enclosed alike on the sea and land sides by walls of immense thickness and strength, which were carried up to a height of more than 60 feet—this being only half the height intended by Themistocles! (see Grote, Hist. Greece, c. xliv.) The laying out of the new seaport belonged rather to the regime of Pericles (Grote, c. xlvii.) It was then that

fortification. ‘The experiment of connecting a town by

Hippodamius, the eccentric architect, planned the Agora which bore his name; aud' the various public buildings which adorned Pireweus doubtless arose with growth of Athenian commerce. The harbour-basin was lined with porticoes, which served as warehouses and bazaars. Two theatres existed in the town, aud numerous temples. The local deity was Artemis Munychia ; but the large number of foreigners (uérockor) Who became naturalised at this port led to the introduction of many foreign forms of worship. Artemis herself came to be identified with the Thracian Bendis, and her festival (ra Bevdédeua) is referred to in the immortal opening of Plato's Republi.

If not a part of the original designs of Themistocles, it Long wal was at least a natural development of them, to carry " Long Walls" from the newly-fortified Piraeus to the upper city, and thus combine them both into one grand system of

long walls with its port had been already tried between Megara and Nisza (Grote, Hist. Greece, c. xlv.), and it was now repeated on a grander scale under Cimon. From the portion of the city wall between the Museium and the Nymphs' Hill a sort of bastion was thrown out to 8.W. so as to form an irregular triangle, from the apex of which a 'long wall," about 4 miles long, was carried down to the N. portion of the Piraeean fortifications ; this was termed ro Bépeov reixos. Another "Jong wall" of somewhat shorter length ran down to the wall of Phalerum, which had hitherto served as the port of Athens; this was TO Padypixdv teixos. A third wall, between the two, parallel to the first, and but a few yards from it (70 vérvov TELXOS, 7d 81d. pérov Teixos), was afterwards added by Pericles, and the maritime fortifications of Athens became complete. But the city owed still more to the munificence of Cimon. Out of the spoils of his Persian campaign he fortified the S, side of the Acropolis with a remarkably solid wall, which terminated in a sort of bastion at the W.end. Here he reared a' little temple of Athena Nike (otherwise called the Wingless Victory), although the existing sculptures of Wingles the frieze are pronounced on account of their style to Victory. belong to a somewhat later date (Pausan., i. 28, 3 ; Corn. Nep., Cimon, ii; Plutarch, Cimon, xiii.) It was Cimon who first set the example of providing the citizens with agreeable places for promenade (Plutarch, ibid.), by plant- ing the Agora with plane trees, and laying out the

Aca- demy with trees and walks. It is probable that some of the porticoes in the Agora were built by Cimon ; at all events, the most beautiful one amongst them was reared by Stoa Pisianax, his brother-in-law, and the paintings with which Peeile. Polygnotus, his sister’s lover, adorned it (representing scenes from the military history of Athens, legendary and . historical) made it ever famous as the Sroa rouxthyn. One) more building, the most perfect existing relic of ancient . Athens, was also built by Cimon. The Theseium (as we Theseiun still may venture to call it, in spite of the doubts lately cast upon its identification)* is a hexastyle Doric temple standing on an eminence due N. of the Arcopagus, and is the first object which meets the eye of the tourist who approaches the city from the Pirzeus. Having served in Byzantine times for a Christian church, it is now a museum of antiquitics, and contains some of the choicest treasures discovered by recent excavations. We have now brought this sketch of Athenian topography Periclea down to the most distinguished period of Athenian history &T@. and Athenian architecture—the era of Pericles. As the champion of Hellenic freedom against the Persians, as the head of the Ionic confederation, Athens had suddenly grown to be the foremost city in Greece. But when one by one the confederate states sank into the position of subject-

1 See Dyer, Athens, p. 230, foll., who thinks it is really the temple of the Amazons.

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ATR

allies; when the fycpovia of Athens passed insensibly into a cupavvis (Thucyd., ii. 63); when the contribution of ships and nen was commuted in most cases for a money payment, and the funds of the confederation were transferred from the Apollonium at Delos to the Athenian Acropolis,—an enormous revenue became at the disposal of the Athenian Government. It is to their erédit that so little of it found its way into private pockets. It was natural for the thoughts of a Greek, especially of an Athenian, to turn to the decoration of his city ; it was politic that the central city of the Ionian confederacy should be adorned with a beauty equal to her prestige. The buildings connected with the name of Cimon had been chiefly for utility or defence ; those of Pericles were mainly ornamental. The first edifice completed by him seems to have been the Odeium, on the E. of the Dionysiac theatre, to serve as a place for recitations by rhapsodists, and for musical per- formances. It was burnt by Aristion during Sulla's siege of Athens, but afterwards rebuilt. Mention has already been made of the building of the Long Walls and the laying out of the Pireeus by Pericles ; but it was the Acropolis itself which witnessed the greatest splendours of his administration. Within its limited area arose buildings and statues, on which the genius of Phidias the sculptor, of Ietinus and Mnesicles the architects, were employed for years; while multitudes of artists and craftsmen of all kinds were busied in carrying out their grand designs.' The spoils of the Persian War had already been consecrated under Cimon to the honour of the national goddess, in the erection of a colossal statue of Athena by Phidias between the entrance of the Acropolis and the Erechtheium ; her warlike attitude gained her the title of popaxos, and the gleam of her helmet's plume and uplifted spear was hailed by the homeward seaman as he doubled Cape Sunium (Pausan., i. 28). But the national deity was to receive yet greater honours at the hand of Pericles. That an old temple stood on the site afterwards occupied by the Par- thenon is proved, less by the doubtful expressions of Hero- dotus (viii. 51, 55), and the testimony of later compilers like Hesychius, than by recent excavations, which reveal that a large temple must have been at least begun upon this spot when the Persian invaders destroyed the old buildings of the Acropolis by fire. Here, then, Pericles proceeded to rear what has ever since been known as the Parthenon. The designer of this masterpiece of architecture was Ictinus; the foundations of the old temple were at his suggestion extended in length and breadth, and thus arose upon the 8. side of the

Acropolis a magnificent temple of the virgin goddess. It was completed in the year 438 B.c. It stood upon the highest platform of the Acropolis, so that the pavement of the peristyle of the Parthenon was on a level with the capitals of the columns of the east portico of the Propylea. The temple was built entirely of white marble from the quarrics of Mount Pentelicus. Ascending a flight of three steps, you passed through the great east entrance into the Pronaos, wherein was stored a large collection of sacred objects, chiefly of silver. From the Pronaos a massive door led into the cella, called Hecatompedos (véws 6 “Exardpumedos), because it measured in length 100 Attic feet. The treasure here bestowed consisted chiefly of chaplets and other objects of gold. The west portion of the cella was railed off (by xyyides), and formed the Parthenon proper, 2.¢., the adytum occupied by the chryselephantine statue by Phidias of Athena Parthenos,—a work which yielded the pre-eminence only to one other statue by the same artist, viz., the Zens at Olympia. In this adytum were stored a number of silver bowls and other articles employed at the Panathenaic festi-

1 See the animated description in Plutarch, Pericles, 12, oll.

hand of the goddess,

vals. The westernmost compartment at the rear of the cella was the Opisthodomus, which served as the national treasury; hither poured in the tribute of the Athenian allies, It is important to remember that the Parthenon was never intended as a temple of worship ; for this pur- pose there already existed another temple, presently to be described as the Erechtheium,—standing upon the primeval site of that contest between Athena and Poseidon which established the claim of the goddess to the Attic citadel and soil. The Parthenon was simply designed to be the central point of the Panathenaic festival, and the storehouse for the sacred treasure. The entire temple should be regarded as one vast dvaOypa. to the national deity, not as a

place for her worship. Thus directly in front of her statue

in the cella there stood an erection, which has been mistaken for an altar, but which is more probably to be regarded as the platform which the victorious competitors in the Panathenaic contests ascended to receive, as it were from the the golden chaplets aud vases of olive oil that formed the prizes (see Michaelis's Parthenon, p. 31). This consideration lends significance to the decorations of the building, which were the work of Phidias. Within the outer portico, along the outside of the top of the wall of the building, ran a frieze 3 feet 4 inches in height, and 520 feet in total length, on which were sculptured figures in low relief2, representing the Panathenaic procession. Nearly all of these sculptures are in the British Muscum, and the entire series has been recently made complete by casts from the other fragments, and arranged in the order of the original design. The marvellous beauty of these reliefs, which was heightened originally by colour, has been long familiar to all the world from numerous illustrated descrip- tions. 'The procession of youths and maidens, of priests and magistrates, of oxen for sacrifice, of flute-players and singers, followed by the youthful chivalry of Athens on prancing steeds—is represented as wending its way from the west towards the eastern entrance.? Outside of the building, on the N. and S. sides, the metopes between the Doric triglyphs were filled with sculptures representing scenes from the mythical history of Athens. But the glory of the Parthenon were the sculptures of the E. and W. pediments. Unhappily but a few figures remain, and none are wholly perfect, of the statues which formed these groups ; and Pausanias appears to have thought it super- fluous to give a minute description of objects so familiar to every connoisseur and traveller. The sculptures on the eastern pediment related to the birth of Athena ; the cen- tral group was early destroyed by the Byzantine Christians in converting the Parthenon into a church, with the Pronaos for its apse. But nearly all the subordinate figures aro preserved in a more or less injured condition in the British Museum. 'The noble head of the horse of the car of Night, the seated female figures of "The Fates," and the grand torso commonly known as the " Theseus," are familiar to us all. It would be out of place here even to enumerate the many attempts that have been made to reconstruct the groups of either pediment. The sculptures on the W. represented the contest between Athena and Poseidon for the possession of Attica; and although scarcely any por- tions of these figures are now existing, yet they are better known to us than the E. pediment by means of the faithful (if clumsy) sketches made by the

Frenchman Carrey in 1674, when they were in a comparatively perfect state. Those who desire to know all that is to be known concern- ing the sculptures of the Parthenon should consult the beautiful work of Michaelis, Der Parthenon, while the

: Sce the remarks of Mr Ruskin, Aratro Pentelica, p. 174. He who desires to enjoy these sculptures, should come from a

perusal of Michaelis's eloquent work Der Parthenon, and spend a day

in the British Museum with the guide-book in his hand.

Erech- theium.

Propy lea.

measurements and architectural details of the edifice have never been so splendidly given as by our countryman Penfose, in his Principles of Athenian Architecture.

We will turn now to the other buildings of the Acropolis, none of which, however, are so full of significance as the Parthenon itself. For, indeed, standing as it does on the high wst point of Athenian soil, its erection marked the culminating point of Athenian history, literature, politics, andart. The " Birth of Athena," over the eastern entrance, may symbolise to us the sudden growth of Athenian great- ness, while in the contest between the armed goddess of peaceful wisdom and the violent god of sea, which adorned the western front, we may see an allegory of the long struggle between the agricultural and the maritime interests which forms the central thread of Athenian history.

Opposite to the Parthenon, on the northern edge of the Acropolis, stands another remarkable temple, far smaller in size, and built in the most graceful forms of the Jonic order. The Erechtheium appears to be designed expressly to contrast with the severe sublimity of the Parthenon ; and on the side which confronts those mighty Doric shafts, the columns of the smaller

building are allowed to trans- form themselves into Canephori. The temple of Athena Polias, which contained the ancient wooden image of the goddess, and formed the centre of her worship, suffered from fire in the Persian War (479 B.c.) A building so sacred would hardly have been allowed to remain for long in ruins; but it was reserved for Pericles to set about a complete restoration of it. However, the Peloponnesian War seems to have interrupted his designs, and in the year 409 p.c. the edifice was still unfinished,! and soon after this it was totally destroyed by fire. But soon afterwards it must have been rebuilt, without doubt retaining all its original features. The temple in its present state consists of an oblong cella extending fom E. to $V. From each side of the W. end of the cella projects a portico, forming a sort of transept. The eastern portico formed the temple of Athena Polias, upon the site of her ancient contest with Poseidon. The west portion was the Pandroseium, dedicated to Athena Pandrosus. The building thus formed two temples in one, and is styled by Pausanias a dS:rAoty otknpa. It seems at a later time to have been commonly called the Erechtheium, because of a tradition that Erechtheus was buried on this site.

Among the many glories of the Acropolis, the Propylea are described by Pausanias as being exceptionally magni- ficent (i. 22). They rivalled even the Parthenon, and were the most splendid of all the buildings of Pericles. The western end of the Acropolis, which furnished, and still furnishes, the only access to the summit of the hill, was about 160 feet in breadth,—a frontage so narrow, that to the artists of Pericles it appeared practicable to fill up the space with a single building, which, in serving the main purpose of a gateway, should contribute to adorn as well as to guard the citadel. This work, which rivalled the Parthenon in felicity of execution, and surpassed it in boldness and originality of design, was begun in the archonship of Euthymenes, in the year 437 B.c., and com- pleted in five years, under the directions of the architect Mnuesicles. Of the space which formed the natural entrance to the Acropolis, 58 feet near the centre were left for the grand entrance, and the remainder on either side was occupied by wings projecting 32 feet infront of the central colonnade. The entire building received the name of Propylea from its forming the vestibule to the five door-

1 An important inscription in the British Museum gives a survey of the works as they stood in that year, drawn up by a commission ap- pointed for the purpose. See Greek Inscriptions in the British Mu- seum, vol. i. No. 35.

ways, still in existence, by which the citadel was entered. The wall in which these doors were pierced was thrown back about 50 feet from the front of the artificial opening of the hill, and the whole may therefore be said to have resembled a modern fortification, although, in fact, the Propylaa was designed, not for defence, but for decoration. The whole building was of Pentelic marble. The Megaron or great vestibule in the centre consisted of a front of six fluted Doric columns, mounted upon four steps, which supported a pediment, and measured 5 feet in diameter and nearly 29 in height, with an intercolumniation of 7 feet, except between the two central columns, which were 13 feet apart, in order to furnish space for a carriage-way. Behind this Doric colonnade was a vestibule 43 feet in depth, the roof of which was sustained by six inner columns in a double row, so as to divide the vestibule into three aisles or compartments ; and these columns, although only three feet and a half in diameter at the base, were, includ- ing the capitals, nearly 34 feet in height, their architraves being on the same level with the frieze of the Doric colonnade. ‘The ceiling was laid upon marble beams, resting upon the lateral walls and the architraves of the two rows of Ionic columns,—those covering the side aisles being 22 feet in length, and those covering the central aisles 17 feet, with a proportional breadth and thickness. Enormous masses like these, raised to the roof of a building, standing upon a steep hill, and covered with a “ceiling which all the resources of art had been employed to beautify, might well overcome the reserve of a matter-of- fact topographer like Pausanias, and at once account for and justify the unusual warmth of his language when he is speaking of the roof of the Propylea (i. 22), Of the five doors at the extremity of the vestibule, the width of the central and largest was equal to the space between the two central columns of the Doric portico in front, and the same also as that between the two rows of Ionic columns in the vestibule ; but the doors on either side of the principal one were of diminished height and breadth, and the two beyond these again were still smaller in both dimensions. These five gates or doors led from the vestibule into a back portico 18 feet in depth, which was fronted with a Doric colonnade and pediment of the same dimensions as those of the western or

outer portico, but placed on a higher level, there being five steps of ascent from the western to the level of the eastern portico. From the latter or inner portico there was a descent of one step into the adjacent part of the platform of the Acropolis.

The wings of the Propylea were nearly symmetrical in front, each presenting on this side a wall adorned only with a frieze of triglyphs, and with ante at the extremities. The inner or southernmost column of each wing stood in a line with the great Doric columns of the Megaron ; and as both these columns and those of the wings were upon the same level, the three porticoes were all connected together, and the four steps which ascended to the Megaron were continued also along the porticoes of the two wings. But here the symmetry of the building ended; for, in regard to interior size and distribution of parts, the wings were exceedingly dissimilar. In the northern or left wing, a porch of 12 feet in depth conducted by three doors into a chamber of 34 feet by 26, the porch and chamber thus occupying the entire space behind the western wall of that wing ; whereas the southern or right wing consisted only of a porch or gallery of 26 feet by 16, which, on the S. and E. sides, was formed by a wall connected with and of the same thickness as the lateral wall of the Megaron, and, on the W. side, had its roof supported by a narrow pilaster, standing between the N.W. column of the wing and an anta, which terminated its southern wall. In front of the southern or right wing of the

Stadium.

‘Street of Tripods.

ATHENS

Propylaa there stood, so late as the year 1676, the small Ionic temple dedicated to Athena Nike, and commonly known by the ancients as the temple of the Wingless Victory (Niky darrepos), which has already been mentioned as probably one of the buildings of Cimon. Perhaps before the 18th century this building was pulled down by the Turks, and the only remains of it—parts of the frieze built into a wall—which were known in his day were carried off by Lord Elgin, and are now in the British Museum. In 1835 careful excavations were made under the directions of Professor

Ross, when not only were the remains of the Propylea opened up far more clearly than before, but also nearly all the fragments of this little temple of Victory were discovered; they had been used for building a Turkish battery, and so preserved. Thus the temple was at once restored by a reconstruction of the original fragments. Few quarters of ancient Athens have received more advan- tage from judicious excavation in recent years than this western eud of the Acropolis.

From the disastrous termination of the Peloponnesian war to the yet more fatal defeat at Cheroneia, the architec- tural history of Athens is a blank, only interrupted by the restoration of the Long Walls and the rebuilding of the fortifications of Pirzeeus by Conon, both of which had been destroyed by Lysander. The financial genius of the orator Lycurgus, whose administration lasted from 338 to 325 B. oh, replenished to some extent the exhausted resources of his country. He reorganised her finance, he catalogued and rearranged the sacred and national treasuries, and brought order and efficiency into every department of state. This new impulse made itself felt in building activity. The Dionysiac theatre was now first completed ; and though, as we have already seen, many of the sculptures and other marbles recently uncovered on its site are the restorations of a very much later age, yet we may confidently assume that in all material points the theatre as we are now able to view it represents the condition of the building as it stood in the time of Lycurgus. Another remarkable work which signalised his administration was the Panathenaic Stadium. On the southern side of the Ilissus, at right angles to the stream, a hollow space was scooped out of the soil, some 680 feet in length and 130 in breadth. It is possible that the site had been used for gymnastic contests before the orator’s time ; it was he, however, who first undertook to level it properly and lay it out. But it was reserved for the munificence of Herodes Atticus finally to complete it. He furnished the place with magnificent seats of Pentelic marble, tier upon tier, capable of accommodat- ing, at the very least, 40,000 spectators. An attempt was recently made to excavate the Stadium, but it was found that every trace of antiquity had been destroyed, the marble having been used as a quarry for building pur- poses.

The administration of Lycurgus is an important era in Athenian architecture ; for after his time we never seem to hear of any more buildings having

been reared by the Athenian Government. The best-known extant edifices of the period immediately following were the work of wealthy private persons. Round the eastern end of the Acropolis, starting from the eastern entrance of the Dionysiac theatre, then leaving the Odeium of Pericles to the left, and thence sweeping westward to the Agora, there ran a street which formed a favourite promenade in ancient Athens, commonly known as the “Street of Tripods.” It gained this name from the small votive shrines which adorned it, supporting upon their summit the bronze tripods which had been obtained as prizes in the choragic contests. The tripods thus mounted often themselves served as a frame to some masterpiece of sculpture, such, for example, as the famous satyr of Praxiteles. It had early become the custom to

the theatre ; but when this space was filled, they gradually extended all along this street, and their erection was made more and more a matter of private display. One of these shrines still stands, and is well known as the monument of Lysicrates. It bears the following inscription upon its architrave :—“ Lysicrates, son of Lysitheides, of the deme Cicynna, was choragus; the tribe Acamantis gained the prize with a chorus of boys; Theon accompanied them

upon the flute; Lysiades of Athens taught them; Eueenetus

was archon.” In other words, the date of this monument was 335 B.c. Fifteen years after that a somewhat similar shrine was reared at the topmost summit of the back of the great theatre, where an ancient grotto was by Thrasyllus converted into a choragic monument. The Byzantine Christians transformed the building into a chapel of the Virgin, under the title of Panaghia Spiliotissa, or Our Lady of the Grotto. Early travellers describe this little shrine as consisting of three pilasters engaged in a plain wall, surmounted by an inscribed architrave ; above was supported a figure of Dionysus, now preserved, but in a much injured state, in the British Museum. On the top of the statue originally rested the tripod that formed the prize of Thrasylius.

7

dedicate the prize tripods within the sacred precincts of

Monument

of Lysi- crates.

Monument

of Thra- syllus.

The Macedonian period again marks a new epoch in the Mace-

history of Athenian topography.

Henceforward almost dovian

every embellishment Athens received was at the hands of Period.

the various foreign princes, whose tastes inclined them to patronise a city so rich in historical associations, and so ready to reward each new admirer with an equal tribute of servile adulation. But whatever decoration the city might owe to royal vanity or munificence, her connection with these foreign potentates brought her far more of injury than advantage. She became entangled in their wars, and usually found herself upon the losing side.

Upon the death of Alexander the Athenians claimed their liberty, but they at once had to submit to Antipater (322 B.c.), who placed a garrison in Munychia. It perhaps was he who defaced the ancient Pnyx ; at all events, from this time forward the political oratory of Athens became silent for ever. In 318 B.c. Demetrius the Phalerean was made governor of Athens by Cassander, and received every kind of homage from his servile subjects. But as soon as the other Demetrius, surnamed Poliorcetes, appeared in the Pirseus, the Athenians welcomed him with open arms. For restoring to them the forms of democracy he was extolled with abject adulation, and had assigned to him a residence in the Opisthodomus of the Parthenon itself, where he profaned the. sanctuary of the virgin goddess with unbridled sensuality. Upon the defeat of Antigonus at Ipsus (301 B.c.), Demetrius fled from Athens, and under Lachares, the leading demagogue of the time, the city enjoyed the shadow of independence. But the demagogue soon developed into a tyrant, and when Demetrius reappeared in 296 B.c. and

besieged the city, Lachares had to fly from the indignation of the citizens, taking with him the golden shields that adorned the eastern front of the Acropolis, and having rifled the chryselephan- tine statue itself. Again, in 268 B.c., Athens endured a long siege from Antigonus Gonatas, who laid waste the surrounding country. Still more disastrous was the in- effectual siege by Philip V. in 200 3.c., who, pitching his camp at Cynosarges, destroyed everything that lay around— the temple of Heracles, the gymnasium there, and the Lyceium as well, At length, in 146 B.c., Greece became a Roman province, and Athens succumbed peacefully to the Roman yoke.

During the inglorious period of Athenian history which has just been sketched, several new buildings were reared by the munificence of foreign princes. Ptolemy Philadelphus

Roman period.

Sulla at Athens.

gave his name to a large gymnasium—the Ptolemeeum-— built by him near the Theseium. Attalus L, king of Pergamus, erccted a stoa on the north-east of the Agora, and laid out a garden in the Academy. His successor, Eumenes II. (197-159 3.c.), built another stoa near the great theatre. Antiochus Epiphanes designed the comple- tion of the Olympium, a work which was interrupted by his death.

Under the rule of the Romans Athens enjoyed the privileges of a libera civitas, .e., nO garrison was intro- duced into the town, no tribute was levied upon it, and the constitution was nominally left unaltered. The Areopagus, indeed, under Roman influence, recovered some of its ancient power, and was made to take pre- cedence of the more democratic assemblies of the Boule and Ecclesia. The revision also of the laws by Hadrian would, of course, introduce some changes. Yet it may surely be maintained that Athens under the Roman dominion was in a far better position than in the days be- fore the taking of Corinth by Mummius, when she had been at the mercy of each successive Macedonian pretender. The

Romans appear to have shown a remarkable respect for the feelings of the Athenian people. It would be superfluous here to recall the warm expressions of admira- tion which fall from Cicero and Horace when speaking of Athens. A visit to Athens was regarded by the educated Roman as a kind of pilgrimage.t One great disaster Athens did indeed undergo at the hands of Rome; this was the siege and plunder of the city by Sulla in the Mithridatic War. Yielding to the threats of the king and the representations of the villainous Aristion, the Athenians had joined the cause of the king of Pontus, and Sulla deliberately resolved to gratify his revenge (Athensus, v. 47, foll.; Plut., Sulla, 12). After a protracted siege, in which the inhabitants suffered the extreme of famine, mocked at once by the insolence of Aristion within, and pressed by a remorseless foe without, Athens at length was taken on March 1, 86 Bc. Many of the public buildings (happily not the most important) were over- thrown, much of the sacred treasure was rifled by the soldiers, and many works of art, together with the library of Apellicon, containing the collections of Aristotle and Theophrastus, were carried off by the cultivated Sulla. The loss of life was also great: large numbers were butchered by the soldiery, and the Agora of Cerameicus flowed with blood. We are told that Sulla was wont to take credit for having "spared Athens." He did not indeed destroy it, but his conduct on this occasion alone would suffice to fix an indelible stain upon his memory. With this disastrous exception, Athens prospered under the Roman rule, and students from all parts of the Graeco- Roman world flocked thither to attend the lectures of the philosophers and rhetoricians, or to view the countless works of art that adorned the city. Athenian society grew more and more academic. The current tone of educated circles was antiquarian even to pedantry.?_ The inscriptions relating to the Roman period clearly reveal to us the chief interests of contemporary Athenian life. Epitaphs in abundance testify to the deodaovia which delighted in proper names derived from deities and religious ceremonies,' and the pride of genealogical pedantry. Honorary decrees abound to justify the charge of adulation which was the reproach of the later Athenians. But the commonest class of monuments are the gymnastic inscriptions, which give

1 The beautiful elegy of Propertius, beginning ' Magnum iter ad doctas proficisci cogor Athenas"' (iv. 21), is worth referring to.

2 See note in No. 81 of Greek Inscriptions in the British Museum, also No. 93.

8 Of. ibid., No. 47; and Cumanudes, *Emvypagpa) *Arriniis éritim- Biot, passim.

us lists of the students from all quarters who, while pursu- ing their studies at Athens, enrolled themselves at a gymnasium, and there had the advantage of a social life and regular discipline, which reminds onc somewhat of the college system in the English universities.*

But enough has now been said of the condition of Athenian society under the Roman rule; it is time to enumerate the embellishments which the city received during this period. It is uncertain at what exact date the

Horologium of Andronicus of Cyrrhus was erected, which: Horo-

is generally known as the Tower of the Winds. mentioned by Varro (De Re Rust., iii. 5, 17), and is there- fore older than 35 3.¢., though certainly not earlier than the Roman conquest. This monument, so familiar to every scholar, is described by Virruvius (i. 6, 4) as an octagonal tower of marble. It stands at what anciently formed the eastern extremity of the Roman Agora, presently to be described. On each face, beneath the cornice, is sculptured the figure of the wind which blew from the corresponding quarter; on the top of the roof was a pedestal supporting a bronze triton (now destroyed), which was constructed to turn with the wind, and to point out the wind’s quarter with a wand which he held in his hand. The sculptured figures of the winds are in good preservation, though of a declining period of art. They represent the four cardinal points and the intermediate quarters between these. Each has his emblems: Boreas, the north wind, blows his noisy conch; Notus, the rainy south wind, bears his waterjar; Zephyrus, the west wind, has his lap full of flowers, and so on. Under each figure are the remains of a sun-dial ; and besides all these external features, the interior was constructed to form a water-clock, supplied with water from the spring at the Acropolis called Clepsydra. Thus in cloudy weather a substitute was pro- vided for the dial and the sun.

The Agora in Cerameicus has already been described, and it was there noticed that the name Cerameicus often appears to be employed alone to denote the Agora. This may be easily accounted for. By the munificence of Julius Cesar and of Augustus, a propyleum of four Doric columns, which still exist, was reared at the N.E. extremity of the Cerameicus Agora. The space between the central columns is about 12 feet, between the side columns not quite 5 feet. Over the pediment is a pedestal, with an inscription in honour of Lucius Cesar, the grandson of Augustus, whose equestrian statue it appears to have supported. This propyleum has by some archeologists been regarded as a portico of a temple to Athena Archegetis, to whom we learn, from an inscrip- tion on the architrave, that the building was dedicated out of the moneys given by Julius and Augustus. But there can be no reasonable doubt that these columns formed

It is first logium Androni

cus.

the entrance into a new Agora, dedicated to Athena New or Archegetis, just as it was customary with the Romans Roman

to dedicate a forum to some deity, and intended chiefly, it would seem, for the sale of the olive oil which formed so large and characteristic an export from Athens. This appears to be proved by the lengthy inscription (see Bockh, Corp. Inser. Grec., No. 355) which exists immedi- ately within the entrance, and contains an edict of the Emperor Hadrian regulating the sale of oil and the duties payable upon it. It is easy to understand how, after the erection of the Roman Agora, the old market would be styled 4 é-yopa év Kepapecxé or simply Cerameicus, while the new oil-market would be distinguished as the

a ee

4 See Greek Inscriptions in the British Museum, No. 39, and fold. The best account of the condition of Athens under the Romans may be found in a dissertation by H. L. Ahrens, De Athenarum statu politico, &c., and another by Professor Dittenberger, De Hphebia Attica.

Agora,

erodes ‘!| Atticus. aH

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STHERNS 9

Agora.! The “Tower of the Winds,” which had previously been erected, formed, with its useful timepieces, an appro- priate embellishment at the north-eastern extremity. The market was enclosed by a wall, and it was reserved for Hadrian to complete its decoretion by building a magnificent

stoa on its northern side. Augustus himself received the honour of a small circular shrine upon the Acropolis, dedicated to Augustus and Roma. was honoured by an equestrian statue in front of the Pro- pylwa, the pedestal of which still exists. The Agrippeium was a theatre erected by Agrippa in the Cerameicus. It is possible, moreover, that the Diogeneium—the only gymnasium mentioned in the Ephebic inscriptions of the imperial period—was built about this time. Its site has recently been thought to have been discovered about 200 yards east of the Tower of the Winds. Whatever licen- tiousness and misgovernment might mark the reign of succeeding emperors, they at all events refrained from doing injury to Athens. It had been proposed to finish the great temple of Zeus Olympius in honour of Augustus, but the design fell through, and it was reserved for Hadrian to finally complete the building of this magnificent temple, some six centuries from the time when the first stone was laid.

The reign of Hadrian made literally a new era in the history of Athens.? For Greece, and especially for Athens, this emperor entertained a passionate admiration. He condescended to hold the office of archon eponymus ; in his honour a thirteenth tribe, Hadrianis, was instituted ; and the emperor shared with Zeus the title of Olympius, and the honours of the newly-finished temple. While, however, many portions of the city bore witness to his munificence, it was in the south-eastern quarter that most of his new buildings arose, in the neighbourhood of the Olympium. This suburb was

accordingly styled Had- rianopolis, or New Athens, to distinguish it from the old city of Theseus and of Themistocles, The arch of Hadrian still stands in a fairly perfect state, and marks the boundary between the ancient town and the new suburb embellished by Hadrian. On the north-western front of the architrave is the inscription aff clo' 'AOjvar @noéws 7 mpiv TALS ; on the other front, ai8' cio' 'ASpuavod Kat ody! Onréws 7s. At the same time many of the older buildings underwent restoration at his command. Nor was his bounty shown in works of building alone. He ceded to the Athenians the island of Cephallenia, and bestowed upon them large presents of money, and an annual largess of corn.

The immediate successors of Hadrian were guided by his example. Antoninus Pius completed an aqueduct which Hadrian had commenced for bringing water into the town from the Cephisus. Marcus Aurelius visited Athens for the purpose of initiation at the Eleusinian mysteries.

The list of distinguished persons who made themselves famous as benefactors of Athens may be said to close with the name of Herodes Atticus the rhetorician. Herodes had counted Marcus Aurelius amongst his pupils, and was sure of a distinguished career at Rome; but, like the friend of Cicero, he preferred the more peaceful atmosphere of Greece and took the surname of Atticus. His ambition was to excel as a sophist, but he owed his fame yet more to the enormous wealth he inherited from his father, which he spent in works of public munificence. Various towns of Greece and even of Italy were enriched by his bounty, but Athens most of all. In addition to his many other benefactions, two architectural works in parti-

1 The name Cerameicus is never used by writers of pre-Roman times for the old market; they always speak of ‘‘the Agora.” Pausanias uses both words in their more modern meanings respectively.

2 Many inscribed documents are found, dated “ from Hadrian's first visit.” See Dittenberger in the Hermes, 1872, p. 213.

His son-in-law Agrippa

cular immortalised his name. One was the Stadium, which he adorned with magnificent marble seats. The other was the Odcium (see Pausan., vii. 20),

the rnins of which are still to be seen under the south-west of the Acropolis. An odeium resembled a theatre in its general plan and the purposes it served : it differed apparently in being roofed in. The ancient theatres were open to the sky ; but the most remarkable feature of this odeium, built by Herodes in honour of his deceased wife Regilla, was its roof of cedar, fragments of which were actually dis- covered in the excavations made upon this site in 1857.

It isa fortunate circumstance that the best and only Tour of extant account of ancient Athens came from the pen of a Pausanias.

traveller who visited the city just at the time when the munificence of Hadrian and of Herodes had left nothing more to be added to its embellishment. The Odeium of Regilla, indeed, had not been commenced when Pausanias visited Athens, and he describes it later on in his seveuth book. Wemay place his tour through Athens about the year 170 A.D. His manner of description is as methodical as a modern guide-book, and his very knowledge and appreciation of the endless masterpieces of Grecian art prevent him from covering his pages, like some modern tourists, with rapturous word-painting and expressions of delight. He begins his account of Athens (bk. i. ch. iii. § 1) with a description of the Pireeus and the harbours, and his first tour is along the road from Phalerum to the city, where he enters by the Itonian gate, within which he finds a monument te the Amazon Antiope. In his next tour (ch. ii, § 2-ch. v.) he supposes us to start again from Pireeeus, and approach the city along the remains of the Long Walls. Thus entering the city by the Pirean gate,® he conducts us along the southern side of the old Agora (which he styles the Cerameicus), describing all the buildings that occur upon the way, from the Stoa Basileius and another stoa near it, adorned with a statue of Zeus Eleutherius, in an eastward direction past the temple of Apollo Patrous, the Metroum, the Bouleuterium, and Tholus, and other buildings, which lay at the northern and north-eastern foot of the Areopagus. This walk ends with the mention of the temple Eucleia and the Eleusinium. It is not easy to see why Pausanias here introduces an account of the foun- tain Enneacrunus and the temple of Demeter and Core, which every archeologist hitherto has placed near the llissus, in the south-eastern extremity of the city. In his next walk (ch. xiv. § 5—xviii. § 3), having already described the south side of the

Cerameicus Agora, he starts again from the Stoa Basileius, describes the buildings on the west and north of the Agora, and then enters the new or Roman Agora, In this tour he mentions the altar of Mercy, the gymnasium of Ptolemy, the Theseium, the temple of Aglaurus, and the Prytaneium. In his next walk he starts from the Prytaneium, and proceeding east- ward (ch. xviii. § 4, xix.), he mentions the temples of Sarapis and of Ileithuia, until, leaving the eastern end of the Acropolis at some distance on his right hand, he passes through the arch of Hadrian, and describes the Olympium and the other buildings of that emperor. This tour included the temple of Aphrodite év Kiros, the Cynosarges, the Stadium, and other buildings on both sides of the Ilissus. For his next walk he returns again to the Prytaneium (ch. XX.- xxviii. § 3), and enters the Street of Tripods, which leads him to the temple and theatre of Dionysus, which he describes. Thus he at length reaches the western extremity

8 Curtius and others are probably mistaken in supposing the Dipy- lum to be the gate intended by Pausanias.

4 Dr Dyer, in his recent work on Athens, Appendix i., endeavours to explain this difficulty by assuming the existence of two fountains called Callirrhoe, one of which (Enneacrunus) he places on the north- west of the Acropolis.

mI = 4

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of the Acropolis, and entering through the Propylea, he describes in order each object which adorned the sumunit, with an accuracy fully borne out by recent excavations. His last walk in Athens (ch. xxviii. § 4, xxix. § 1) con- ducts us through the various buildings at the western base of the Acropolis. From the temple of the Semnez he passes to the court of the Areopagus, and the mention of this leads him to speak of the other judicial courts of Athens. The rest of his first book is occupicd with an account of the suburbs of Athens—the Academy, the sacred way to Eleusis, &c., and the topography of Attica in general.

Subsequent A few words may suffice to describe the ultimate fate of

history of Athens. In the reign of Valerian the northern barbarians

Athens. first appeared in the north of Greece, where they laid siege to Thessalonica. This extraordinary apparition having alarmed all Greece, the Athenians restored their city wall, which Sulla had dismantled, and otherwise placed the town in a state of defence sufficient to secure it against a coup- de-main. But under Gallienus, the next emperor, Athens was besieged, and the archonship abolished, upon which the strategos or general, who had previously. acted as inspector of the Agora, became the chief magistrate. Under Claudius the city was taken, but recovered soon afterwards. Constantine the Great gloried in the title of General of Athens, which had been conferred upon him, and expressed high satisfaction on obtaining from the people the honour of a statue with an inscription,—a distinction which he acknowledged by sending to the city a yearly gratuity of grain. He also conferred on the governor of Attica and Athens the title of Méyas Aodé, or Grand Duke, which soon became hereditary ; and his son Constans bestowed several islands on the city, in order to supply it with corn. In the time of Theodosius I, that is, towards the end of the 4th century, the Goths laid waste Thessaly and Epirus; but Theodorus, general of the Greeks, acted with so much prudence, that he saved the Greek cities from pillage and the inhabitants from captivity, a service which was most gratefully acknowledged. But this deliver- ance proved only temporary. The fatal period was now fast approaching, and, in a real barbarian, Athens was doomed to experience a conqueror yet more remorseless than Sulla. This was Alaric, king of the Goths, who, under the Emperors Arcadius and Honorius, overran both Italy and Greece, sacking, pillaging, and destroying. Never, indeed, did the fury even of barbarian conquest discharge itself in a fiercer or more desolating tempest. The Peloponnesian cities were overturned ; Arcadia and Lacedzemon were both laid waste; the gulfs of Lepanto and Agina were illuminated with the flames of Corinth ; and the Athenian matrons were dragged in chains to satisfy the brutal desires of the barbarians. The invaluable treasures of antiquity were rcmoved; stately and magni- ficent structures were reduced to heaps of ruin; and Athens, stripped of the monuments of her ancient splendour, was compared by Synesius, a writer of that age, to a victim of which the body had been consumed, and the skin only remained.

After this dreadful visitation Athens sank into insigni- ficance, and became as obscure as it had once been illustrious. We are indeed informed that the cities of Hellas were put in a state of defence by Justinian, who repaired the walls of Corinth, which had been overturned by an earthquake, and those of Athens, which had fallen into decay through age. But from the time of this emperor a chasm of nearly seven centuries ensucs in its history; cxcept that, about the year 1130, it furnished Roger, the first king of Sicily, with a number of artificers, who there introduced the culture of silk, which afterwards passed into Italy. The worms, it seems, had been brought from India to Con- stantinople in the reign of Justimian.

aided by

in whose possession it remained until 1455, when it taken by Omar, a general of Mahomet II., and thus fell a

ATHENS

Doomed, apparently, to become the prey of every spoiler, Athens again emerges from oblivion in the 13th century,

under Baldwin and his crusaders, at a time when it was besieged by a general of Theodorus Lascaris, the Greek emperor. In 1427 it was taken by Sultan Amurath IT; but some time afterwards it was recovered from the infidels by another body of crusaders under the marquis of Montferrat, a powerful baron of the West, who bestowed it, along with

Thebes, on Otho de la Roche, one of lis principal followers.

For a considerable time both cities were governed by Otho and his descendants, with the title of dukes; but being unable to maintain themselves in their Greek principality, they were at length succeeded by Walter of Brienne, who,

soon after his succession, was expelled by his new subjects, the Spaniards of Catalonia. The next rulers of Athens were the Acciajuoli, an opulent family of Florence, was

second time into the hands of the barbarians. The victorious sultan settled a Mahometan colony in his new conquest, which he incorporated with the Ottoman empire ; and Athens, as well as Greece, continued to form an integral part of the Turkish dominions, until the treaty of Adrianople in 1829, following up the provisions and stipulations of the treaty of London, 7th July 1827, estab- lished within certain limits the new state of Greece, of which Athens is now the capital.

From the period of the Ottoman conquest to the com- mencement of the insurrection in 1821, Athens was only known in history by two attempts, on the part of the Venetians, to expel the Turks and make themselves masters of the city. The first of these took place in 1464, only nine years after its capture by the Osmanlis, and proved an entire failure. But the sccond, which was undertaken in 1687, more than two centuries later, was crowned with a temporary and fatal success. In the month of September of that year, Count Kénigsmark, a Swede in the service of Venice, having disembarked at the Pirweus a force of 8000 foot and 870 horse, forming part of the armament under Francesco Morosini, afterwards doge, marched to Athens, and having summoned the citadel without effect, he erected a battery of heavy ordnance on the hill of the Pnyx, and placing two mortars near the Latin convent at the western foot of the Acropolis, bombarded it for several days. ‘The fire of the cannon was chiefly directed against the Propylea, and the modern defences below that edifice, whilst the mortars continued, without intermission, to throw shells into the citadel. The consequence was, that the beautiful little temple of Nike Apteros, the frieze of which is now in the British Museum, was completcly destroyed by the breaching battery ; and the Parthenon, besides being greatly injured by the bursting of the shells, was, towards the close of the attack, almost rent in pieces by the explosion of a powder magazine, which reduced the middle of the temple to a heap of ruins, threw down the whole of the wall at the eastern extremity, and precipitated to the ground every statue on the eastern pediment. The western extremity was fortunately less injured, and a part of the Opisthodomos was still left standing, together with some of the lateral columns of the peristyle adjoining to the cell. But the shock was nevertheless abundantly disastrous ; and when the Turks afterwards regained possession of the citadel (from which, on this occasion, they were expelled), they did all in their power to complete the destruction which the

Venetians had so vigorously begun, by defacing, mutilating, or burning for lime every fragment of the edifice within their reach.

In the course of the revolutionary war Athens sus- tained three sieges. The first was laid by the Greeks in 1822. Having carried the town by storm, and driven

Modern

sieges.

] Present condition.

the Turks into the citadel, they established a strict blockade of the fortress, which was continued until the advance of the Pasha at the head of 4000 men induced them to abandon their enterprise, and fly, with the Athenians, to Salamis and /Mgina. Two months afterwards, the Pasha having left Athens to the defence of 1500 men, the Greeks again ventured to attack the town, and succeeded in obliging the Turks to seek refuge in the citadel, which they forthwith determined to besiege ; but, from ignorance and want of means, no progress whatever was made in the operation until they obtained possession of the well which supplied the garrison with water, when the Turks agreed to capitulate upon condition of being immediately embarked with their families and sent to Asia Minor. On various pretences, however, embarkation was delayed from time to time ; and when intelligence at length arrived that a large Turkish force was advancing upon Athens, the Palicari, instead of manning the walls and preparing for a vigorous defence, rushed in a body to the houses where the prisoners were confined, and commenced an indiscriminate massacre. For this atrocity it is no palliation to remember that the Greek character had morally suffered from centuries of servitude, and that they had terrible arrears of vengeance to exact. he third siege was laid by the Turks in 1826. The Greeks had left a strong garrison in the Acropolis, with provisions for several months; and a spring of water having been discovered in the cave of Pan, and enclosed by Odysseus within the defences of the citadel, there was no danger of its being starved into a surrender. But the Turks having established batteries

near the Pnyx and on the hill of the Museium, and having drawn a line of trenches round the citadel, with the view of intercepting all communication betweon the besieged and the Greek army, the garrison was hard pressed ; and although Colonel Fabvier succeeded in forcing his way through the Turkish lines with 500 men and a supply of ammunition, and thus affording immediate relief, yet the total defeat of the Greek army under General Church at the battle of Athens, fought in the hope of raising the siege, led soon afterwards to the

surrender of the Acropolis, which remained in the hands of |

the Turks until the termination of the revolutionary war. In 1812 Athens could boast of a population of 12,000 souls, but during the war the greater part of the city was laid in ruins, and most of the inhabitants were dispersed. In 1834 it was declared the capital of the new kingdom of Greece. Great exertions have been made since then to restore the city; streets have been opened, levelled, widened; the ancient sewers have been cleared and repaired, and the marshes of Cephisus drained. Excava- tions of ancient sites and buildings have been carried out,—

ATHENS, the name of several towns in the United States of America, the chief of which are the following :— (1.) The capital of a county of the same name in the S.E. of the state of Ohio, finely situated on the Hocking River. It is the seat of the Ohio university, which was founded in 1804. Population of county, 23,768. (2.) The capital of Clarke county, Georgia, on the W. bank of the Oconee River. It is the seat of the Georgia university, which was

founded in 1801, and the central town of a large cotton- |

growing district. Population in 1870, 4251, of whom 1967 were coloured.

ATHERTON, or CHowBENT, a township in the parish of Leigh and hundred of West Derby, in Lancashire, 200 miles from London. It is one of those places which have grown to wealth and populousness through the extension of the cotton trade. Besides its factories, it has collieries and ironworks, Population in 1871, 7531.

chiefly through the efforts of the Archeological Society of Athens, but the antiquaries and scholars of all Europe have anxiously watched their endeavours, and France and Prussia have vied with Great Britain in the prosecution of Athenian discovery. The Theseium has become a treasury of ancient sculpture, and a new archeological museum has been also erected to contain the ever-increasing stores of ancient inscriptions and sculptures. The royal palace is a large building of Pentelic marble, situated in the eastern quarter of the city, on the highest part of the gentle eminence which rises from the level of the Ilissus and Cephisus towards Lycabettus. The University (zaveruorjpuov) was founded in 1837, and numbers over 1200 students, while its staff of 52 professors includes the names of some of the most learned Greek archologists in Europe. In fact, the schools and other educational institutions of Athens are very numerous, and thoroughly efficient. The archzo- logical journals of Athens are full of information concern- ing the progress of excavations, and publish the texts of newly-discovered inscriptions. The population in 1871 was over 48,000, exclusive of the population of the Pirseeus, which would bring the total up to about 60,000. The harbour is visited by ships of all nations. A railway conuects the Pirseeus with the city, and enters the ancient town about half-way between the site of the Dipylum and Pireean gates. The terminus stands in the inidst of what once was the Agora in Cerameicus. The principal street is Hermes Street, running from west to east, a little north of the terminus, until it reaches the royal palace. Two other good strects, Athena Street and A‘olus Street, traverse

| this at right angles. The other streets, with the exception

of Stadium Street on the N.E., between the chamber of deputies and the University, are generally narrow and winding. Altogether, Athens, like the rest of Greece, is in a condition of increasing prosperity, and reaps the blessings of freedom. It is true that in our own country the ardent philhellenism of forty years ago has cooled down, and Greece is no longer an object of popular and sentimental admiration. Yet never did the scholars of Europe turn with keener zest to the study of her ancient monuments ; and if Attica were clearcd for ever of

| brigands, and furnished with satisfactory roads, then in

numbers tenfold greater than now would revcrent travellers from the west of Europe delight to make their pilgrimage to the birthplace of philosophy, literature, and art.

The following are'some of the most important works on the subject :— Leake's Topography of Athens ; Wordsworth's Athens and Attica; Bursian's Geographie von Griechenland, and article " Athene"' in Pauly's Meal-Encyclopidic, 2d ed.; E. Curtius's

Attische Studien ; Dyer's Ancient Athens ; Wachsmuth's Die Stadt Athen in Alterthum. (E. L. H.)

ATHIAS, Josepn, a celebrated rabbi and printer at Amsterdam, whose editions of the Hebrew Bible are noted for the general correctness of the text. Although he was a learned Hebraist, there are occasional errors in the points, especially in the edition of 1661, but many of these were corrected in that of 1667. Healso printed several editions of the Bible in the corrupted Hebrew spoken by the Jews of Spain, Germany, Poland, and England. He died in

1700.

ATHLET (a6Ayrai), among the Greeks and Romans, was the designation of persons who contended for prizes (a0Aa) in the public games, exclusive of musical and other contests, where bodily strength was not called into play, though here also the word was sometimes applied, and it was even extended to horses which had won a race, and again metaphorically, e.g., to persons who had exerted themselves in good decds (46Ayras tév Kadav épywv). On the other

hand, the term was restricted so as to exclude those who, for mere exercise, without the incentive of a prize, prac- tised in the daily gymnastic competitions. For such the name was dywvicrai, and this distinction was the more necessary in the later period of Greek history, when trained athletes became a professional class (400-300 B.c.) Yet it was not the value of the prizes themselves which led men to devote their lives to athletic exercises.

That was at most very insignificant. But from the heroic legends of competitions for prizes, such as those at the obsequies of Patroclus (Iliad, xxiii. 257, foll.), from the great antiquity of the four national games of Greece (the Olympian, Pythian, Nemean, and Isthmian, with the local Panathenzea at Athens), and from the high social position of the competitors in early times, there gradually became attached to victory in one of these games so much glory, that the townsmen of a victor were ready to, and frequently did, erect a statue to him, receive him in triumph, and care for him for the rest of his life. Against specially trained athletes the better class of citizens refused to compete, and the lists of the public games being thus left practically open only to professionals, training became more a matter of system and study, particularly in regard to diet, which was rigorously prescribed for the athletes by a public functionary, styled the Aleiptes, who also had to salve their bodies when practising. At one time their principal food consisted of fresh cheese, dried figs, and wheaten bread. Afterwards meat was introduced, gene- rally beef or pork; but the bread and meat were taken separately, the former at breakfast (dpwrov), the latter at dinner (de?zvov). Except in wine, the quantity was unlimited, and the capacity of some of the heavy weights (Bapets 40An7ai) must have been, if such stories as those about Milo are true, enormous. Cases of death from apoplexy are not unknown among them. The Tarentine Iccus was an example of the strictest abstinence. Their instruction consisted, besides the ordinary gymnastic exercises of the paleestra, in carrying heavy loads, lifting weights, bending iron rods, striking at a suspended leather sack (xwpuxos) filled with sand or flour, taming bulls, &c. Boxers had to practise delving the ground, to strengthen their upper limbs. The competitions open to athletes were in running, leaping, throwing the discus, wrestling, boxing, and the Pancratium, or combination of boxing and wrestling. Victory in this last was the highest achieve- ment of an athlete, and was reserved only for men of extraordinary strength. The competitors were naked, having their bodies salved with oil. Boxers wore the cestus, t.e., straps of leather, round the wrists and fore- arms, with a piece of metal in the fist, which was some- times employed with great barbarity. An athlete could begin his career as a boy in the contests set apart for boys. He could appear again as a youth against his equals, and though always unsuccessful, could go on competing till the age of 35, when he was debarred, it being assumed that after this period of life he could not

improve. It some- times happened that an athlete would agree to allow his rival to win; but for that and other cases of dishonesty a fine was imposed, and the money expended in erecting statues, called Zaves, with warning inscriptions. The most celebrated of the Greek athletes whose names have been handed down are Milo, Hipposthenes, Polydamas, Proma- chus, and Glaucus. Cyrene, famous in the time of Pindar for its athletes, appears to have still maintained its reputa- tion to at least the time of Alexander the Great; for in the British Museum are to be seen six prize vases carried off from the games at Athens by natives of that district. These vases, found in the tombs, probably, of the winners, are made of clay, and painted on one side with a repre- sentation of the contest in which they were won, and on

the other side with a figure of Pallas Athena, with an inscription telling where they were gained, and in some cases adding the name of the eponymous magistrate of Athens, from which the exact year can be determined. Among the Romans, fond as they were of exhibitions of physical skill and strength, the profession of athletes was entirely an exotic, and was even under the empire with difficulty transplanted from Greece. The system and the athletes themselves were always purely Greek. (a. 8. M.) ATHLETIC SPORTS. Although this term is un- doubtedly derived from the ancient a@Anrai, the derivation does not exactly indicate its present meaning, inasmuch as our modern athletes are distinctly defined to be amateurs, in contradistinction to professionals. In fact, the former pursue the agonistic art, and should be styled “ agonistics,” if we may be allowed to invent such a word, rather than athletes. How the pastime came to be thus named in Britain some fifteen years ago it is hard tosay. Till about 1860, all exercises wherein the feet played the principal part were rightly styled “pedestrianism.” Up to that period all prizes, whether contended for by amateurs or professionals, were invariably in money. As the practice of the pastime, however, rapidly spread amongst the former, it was naturally found they were loth to compete on the same terms with, and for similar trophies as, the latter. Hence arose the modern definition of an amateur athlete, viz., ‘‘ Any person who has never competed in an open competition, or for public money, or for admission money, or with professionals for a prize, public money, or admission money ; nor has ever at any period of his life,

taught, or assisted in the pursuit of athletic exercises as a means of livelihood; nor is a mechanic, artisan, or labourer.” The moment this definition was brought into force a wide barrier arose between the two classes, and amateurs ceased to compete for money prizes amongst themselves, or against professionals, on any terms, unless they were willing to forfeit their status. A generic term was required for the new pastime, and in lieu of a better it was entitled “ athletic sports,” and its votaries “athletes.” Hence the haphazard origin of the name. The birthplace of the modern pastime was undoubtedly the great universities and the military and public schools. Cricket has always been justly considered the national game of Great Britain during the summer months, and football fills the same position in the winter. For a month or six weeks in spring and autumn the weather and condition of the ground are in a transition state, and fit for neither of these pastimes, and athletic sports step in and appropriately fill the vacuum. About the year 1812 the Royal Military College at Sandhurst inaugurated modern athletic sports ; but the example was not followed till about 1840, when Rugby School, Eton College, Harrow School, Shrewsbury Royal School, and the Royal Military Academy, Woolwich, came to the front. Fifteen years later college meetings had become pretty general both at Oxford and Cambridge. Kensington Grammar School had founded the first annual series of gatherings held in London, whilst Cheltenham College led the van amongst English public schools, After a few months’ negotiations the first Oxford v. Cambridge annual meeting was held in 1864, and is justly considered the premier réunion of the whole year, the interest shown and the attendance of spectators being little, if anything, less than at the annual boat race between the same two seats of learning. Two years later the annual amateur cham- pionship meeting was founded in London, when the Oxford and Cambridge victors meet representatives from all parts of the United Kingdom, and contend for the “ blue ribands” of the various events. The principal athletic society at present in existence is undoubtedly the “ London Athletic Club,” which takes the lead in all matters per- taining to athletics throughout the United Kingdom. In

England, moreover, there is now scarcely a country town, sea-side watering-place, cricket, rowing, or football club of importance, and

probably not a single university or school, which does not hold its annual gathering for athletic pur- poses. Across the border the professional still far eclipses the amateur element, and there is no meeting of amateurs which can by any means be compared with the autumn Highland gatherings at Braemar and elsewhere. Until recently the two classes contended indiscriminately together, and the prowess displayed by such amateurs as the late Professor Wilson affords ample tcstimony that gentlemen were quite capable of holding their own against profes- sionals, ‘The number of annual amatcur gatherings held in Scotland is, however, extremely limited, and scarcely extends beyond the universities and chief schools connected with Edinburgh, St Andrews, Glasgow, and Aberdeen. In Treland the origin of the pastime is again attributable to the leading university, viz., Trinity College, Dublin, where the decision of isolated events, from about the year 1845, has given rise to the meetings now annually held in the picturesque College Park at Dublin. The Irish civil service meeting was inaugurated in 1867, since which time the pastime has made marvellous strides in the island, as is testified by important meetings now held annually in Belfast, Cork, and Galway; whilst the recently formed Irish Champion Athletic Club takes the lead, and stands in the same relation to Ireland as the London Athletic Club does to the whole of Great Britain. Athletic sports are also now extending on the Continent, at many great watering-places where Englishmen are in the habit of con- gregating. Our great colonies of India, Australia, New Zealand, and Canada, too, as well as the United States of America, Buenos Ayres, China, and even Japan, are not without their annual gatherings for competitors of the Anglo-Saxon race. The contests now classified under the name “athletic sports” are, walking, running, leaping, throwing the hammer, and putting the weight. Leaping and running are respectively identical with the dAwa and Spduos of the ancient pentathlon; whereas throwing the hammer and putting the weight bear some resemblance to throwing the Sicxos. Spear-hurling, dxdvriov, is never practised but by a few gymnastic societies ; and wrestling, wdéAn, between amateurs is rarely witnessed. Running and leaping, however, are nearly always combined on every occasion in two descriptions of contests, viz., steeplechasing and hurdle-racing. Race-walking finds most votaries in London, the northern counties of England, and in Ireland, all distances, from 1 mile to 7, being in vogue amongst amateurs. Running comprises all distances from 100 yards upto4 miles. Leaping may be divided into three

principal heads, viz., running high-leaping, running wide-leaping, and running pole-leaping, which are found to be included in nearly every athletic programme. Adjuncts to these are the running hop-step-and-jump, standing high-leaping, and standing wide-leaping, all of which are favourite pastimes in the northern and midland counties of England. Vault- ing, too, is sometimes practised, but belongs rather to the gymnasium than outdoor athletic arena. Steeplechasing proper can only be practised over natural courses across country. Its home is to be found at Rugby School, and amongst members of hare-and-hounds' clubs, who keep themselves in exercise thereby during the winter months. Artificial steeplechase courses are often made on athletic grounds ; but the leaps are generally far too sensational, and constructed rather to afford merriment to the spec- tators than a fair test of the competitors' leaping powers. A prettier sight than a well-contested hurdle race can scarcely be imagined ; but few first class hurdle racers are met with outside the universities and public schools. Scot- land is undoubtedly the birthplace both of hammer throw-

ing and putting the weight, yet they are now practised at nearly every English and Irish meeting. 16 th is the usual weight of the missile except in Treland, where a 42-Tb, and sometimes a 56-Ib weight are put, though in a very un- satisfactory fashion, Athletic sports may be practised in a well-rolled grass field, but the best arena is an enclosure, with a regularly laid down running track, the foundation made of clinkers and rubble, and the surface of well-rolled fine cinder ashes. (H. F. W.)

ATHLONE, a market-town and parliamentary borough of Ireland, lying partly in West Meath and partly in Roscommon, 76 miles W. of Dublin. The River Shannon divides the town into two portions, which are connected by a handsome new bridge, opened in 1844. The rapids of the Shannon at this point are obviated by means of a canal about a mile long, which renders the navigation of the river practicable for 71 miles above the town. In the war of 1688 the possession of Athlone was considered of the greatest importance, and it consequently sustained two sieges, the first by William III. in person, which failed, and the second by General Ginkell, who, in the face of the Irish, forded the river and took possession of the town, with the

loss of only fifty men. At the time of the last war with France it was strongly fortified on the Roscom- mon side, the works covering 15 acres and containing two magazines, an ordnance store, an armoury with 15,000 stand of arms, and barracks for 1500 men. There are two parish churches, two Roman Catholic parochial chapels, a Franciscan and Augustinian chapel, Presbyterian, Baptist, and Methodist meeting-houses, a court-house, bridewell, a union work-house, and two branch banks. It has a woollen factory, as well as other industries, and an active trade is carried on with Shannon harbour and Limerick by steamers, and with Dublin by the Grand and Royal Canals and several railway lines, while the importance of its fairs and markets is increasing. There is also a valuable fishery in the river. Market-days, Tuesday and Saturday. The borough returns one member to parliament. Popula- tion in 1871, 6566; constituency in 1873, 336.—Thom's Trish Almanac for 1875.

ATHOR, Aruyr, Harnor, the name of the Egyptian divinity corresponding to Aphrodite or Venus. Her name meant "the abode of Hor" or Horus, and she was the mother of that deity in some of his types, and as such a form of Isis, of whom she was a higher or celestial mani- festation. Her name occurs as early as the 4th dynasty, when she is styled the mistress of the tree, or sycamore, neha, or the tree of the south. Besides the local titles of the different cities over which she presided, she was entitled regent of the gods, living mistress of the upper and lower world, mistress of the heaven and regent of the West, and pupil or eye of Ra, or the Sun, with whom she was con- nected. In her celestial character she is represented as an Egyptian female holding a sceptre, her head surmounted by the sun's disk, horns, and ureus, and her flesh coloured blue, the colour of the heaven, or yellow, that of gold and beauty (according to Egyptian notions), a term also applied to Aphrodite in Greek mythology. In her terrestrial char- acter she was the goddess who presided over sports and dancing, music and pleasure, like the Greek Aphrodite, the goddess of love ; but her particularly special type was the white or spotted cow, the supposed mother of the sun. The solar deities Shu and Tefnut were her children. In certain legends she is mentioned as the seven cows of Athor, which appear in the Ritual or Book of the Dead. These cows, like the Moire, or fates of Greek mythology, appeared at the births of legendary persons, and predicted the course and events of their

lives. It is in this capacity that Athor is connected with Ptah, or the Egyptian Hephestus, and is allied to Sekhet or Bast, called the wife

or mistress of Ptah, the seven cows being the mystical companions of the Apis, the second life or incarnation of the god of Memphis. She was also represented under the attributes and with the titles of the goddess Nut, or the Egyptian Rhea. The cow of Athor wore on its head the solar disk, and hawk feather plumes, like Amen Ra; and in this character as the great cow she has on some monuments her human head replaced by that of a cow wearing a disk, or the disk and plumes. This emblem also appears in her type at a later period, when her head is represented with long tresses curled into a spiral at the end, and she has the ears of a cow instead of human ears. Her head is then surmounted by a doorway or its cornice, emblem of the abode of the sun, which she represented. This is sometimes surmounted by the disk and horns. The handle of the sistrum, a musical instrument with bars, was generally made in shape of this head and cornice, as were also the capitals of the columns of Abusimbel, Den- derah, and other temples, and the eegis and prows of certain arks, As the goddess of beauty and youth, many of the queens of Egypt assumed her type and attributes, and young females after death, at the Ptolemaic and subsequent periods, had their names preceded by that of the goddess, as both sexes had “Osiris” from the period of the 19th dynasty, that of Athor being a later substitute, and for females only. The third month of the Egyptian year was named ‘Athor after her, and the fish aten or latus, a kind of carp, was sacred to her. The names and titles of Athor were very numerous, and she is named in the inscriptions the lady or mistress of Silsilis, Abusimbul, Pselcis, Ombos, Hermonthis, Apollonopolis Magna, and Heliopolis ; but the chief site of her worship was Denderah, or Tentyris, where she is mentioned under many names, and all the different festi- vals held in her honour are recorded in the calendar of the temple. Athor is one of the oldest of the Egyptian deities, and her worship continued till the fall of Pantheism and substitution of Christianity. Her worship passed from Egypt to the neighbouring isles, cow-headed figures of the goddess having been discovered in Cyprus. Her figures and representation are common. J ablonski, Panth. ; Wil- kinson, Manners and

Customs, iv. 387; Birch, Gall Antiq., p. 25; Duemichen, Bauurkunde der Dendera, Leip. 1865. (s. B.

ATHOS is, strictly speaking, the terminal peak of the most eastern of the three peninsular promontories which stretch south from the coast of Turkey (Macedonia), like the prongs of a trident, into the Archipelago. The name is, however, frequently extended to the whole peninsula which was formerly known as Acte. The peak rises like a pyramid, with a steep summit of white marble, to a height of 6780 feet, and can be seen at sunset from the plain of Troy on the one hand, and on the other from the slopes of Olympus. The whole peninsula is remarkable for the beauty of its scenery, with rocky heights and richly- wooded flanks, ravines “embowered from the light,” and glimpses or free outlook over the surrounding sea. The climate is for the most part healthy and pleasant, though the western side is perhaps too much exposed to the heats of summer ; and Lucian assures us that in ancient times the inhabitants were famous for longevity. Several towns, such as Sane, Dium, Olophyxus, Cleone, are mentioned by Greek and Latin writers as existing in the Peninsula; but none of them seem to have attained any great importance, and the most remarkable event in the ancient history of Athos is the construction by Xerxes of a ship-canal across the isthmus between the outer sea and the Singitic gulf. Traces of this canal, which was regarded by Juvenal as a Greek myth, have been found almost right across the neck of land, and leave no doubt of the truth of the story. In more modern times the district of Athos has been famous for

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the number of hermits and monks that have found shelter in its retreats. No fewer than 935 churches, chapels, and oratories are said to exist, and many of the communities It is believed that, with the

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Sketch-Map of Athos.

Athos are the oldest specimens of domestic architecture in Europe; the shrines are in many cases richly decorated with goldsmith's work of great antiquity; the wealth of the monastic libraries in illuminated manuscripts has long been celebrated; and nowhere, according to Mr Byzantine school of painting be studied

with equal advantage. The date of the oldest religious

foundation in the peninsula is not clearly ascertained, and the traditional chronology of the monks themselves can hardly be trusted. A bull of Romanus Lecapenus speaks

of the restoration of the monastery of Xeropotamu in 924, and as early as 885 a rescript of Basil the Macedonian forbids the molestation of the " holy hermits." Lavra, on Mount Athos proper, was founded by St Athanasius in 960 ; the village of Caryes or "The Hazels, " was appointed as the seat of government about the same time ; and shortly afterwards there followed the establishments Iveron (rav IBjpwv), Vatopedi (Barorédiov), and Sphigmenu (rod "Eodtypévov). The family of the Comneni (1056-1204) bestowed great privileges on the existing monastaries, and added to their number. In the reign of Alexius the first purely Slavonic monastery (that of Chilandari) was founded by the. Servian prince Stephen Nemenja. The taking of Constantinople by the Latins in 1204 brought persecution and pillage on the monks; this reminded them of earlier Saracenic invasions, and Jed them to appeal for protection to Pope Innocent III., who gave them a favourable reply. Under the Paleologi they recovered their prosperity, and were enriched by gifts from various sources. In the 14th century the peninsula became the chosen retreat of several of the emperors, and the monasteries were thrown into commotion by the famous dispute about the mystical Hesychasts. Their numbers were gradually increased by the foundation of St Dionysius, Simopetra, Constamonitu, Russico, St Paul. In the 15th century the monks made terms with the Turkish conqueror Amurath, and have since been molested by none of the sultans, except Soliman the

Magnificent, who laid waste some parts of the peninsula. In 1545 Stavroniceta, the last monastery, was added to the list. The hospodars of Wallachia, who were recognised as the protectors of Athos, enriched the communities with lands; but a process of secularisation was commenced by

late [.

who confiscated their holdings in Grecce ; and more recently they have been stripped of their possessions in the Danubian principalities. They still retain some property in parts of the Archipelago. A Turkish official resides at Caryes, and collects the taxes, which amount to about ten shillings a head ; but for the most part the peninsula is autonomous, being governed by an administrative body of four presidents (émuordrar), one of whom bears the title of " First Man of Athos," and a representative body called the Holy Synod, which consists of twenty members, one from each of the monasteries proper. These twenty communities are partly Coenobitic, with a common stock and a warden, and partly Idiorrhyth- mic, with a kind of republican government and great individual liberty. Besides these regular monasteries, there are a number of doxyripva, or sketes, which consist of several small associations gathered round a central church, and numerous little communities known as xaGicpara, or retreats, as well as genuine hermitages. Harmony is not always maintained between the different establishments, as was shown by a bitter dispute about a water-course between Cutlumusi and Pantocratoros, which led to the interference of the British consuls of Salonica and Cavalla, in answer to an appeal from some Ionian monks who were British subjects (1853). For the most part, however, the inhabi- tants of Athos are quiet and moderately industrious. They are said to number about 3000, all men ; for no female, even of the lower animals, is permitted to desecrate the pre- cincts of the Holy Mountain.

Capodistrias,

"Descriptio Montis Atho et xxii. ejus Monast.," by Jo. Comnenus in Montfaucon's Paleographia Greea ; Georgirenes, Description of Pre- sent State of Samos, Patmos, Niearia, and Mownt Athos, Lond. 1678 ; Lieut. Webber Smith, ''On Mount Athos," &c., in Journ. Roy. Geog. Soc., 1887;

Curzon, Visits to Monasteries in the Levant, 1849; Fallmerayer, Fragmenta aus dem Orient, 1845 ; Gass, Commen- tatio Historica, &c., and Zur Geschichte, &c., 1866; Ramner's Hist. Taschenbuch, 1860 (art. by Pischon); Report by M. Minoide Minas, 1846; J. Miiller, Denkméler in den Klistern von Athos ; Langlois, Athos, &c.; Didron's Jeonographie Chrétienne, 1844 ; Journal Asiatique, 1867; Tozer's Highlands of Turkey, 1869.

ATHY, a market-town of Ireland, county of Kildare, 34 miles §.W. of Dublin. It is a station on the Great Southern and Western Railway, and is intersected by the river Barrow, which is here crossed by a bridge of five arches. It has a church, a Roman Catholic chapel, a Presbyterian and a Methodist meeting-house, court-house, jail, two banks, hospital, dispensary, barracks, é&c. Adjoin- ing the town is a small chapel, an ancient cemetery, and a small Dominican monastery. Previous to the Union it

returned two members to the Irish parliament. The principal trade is in corn, which is ground at the neigh- bouring mills. Population in 1871, 4510.

ATINA, a town of Naples, province of Terra di Lavoro, near the Melfa, and 12 miles 8.E. of Sora. It has a cathedral, convent, and hospital, with about 5000 inhabi- tants; but it is chiefly remarkable for its ancient remains, consisting of portions of its walls, the ruins of an extensive aqueduct, and numerous other structures, besides monu- ments and inscriptions. The city is of great antiquity, and was a place of importance down to the days of the Roman empire. It is remarkable now, as of old, for the exceptional coolness of its situation.

ATITLAN, a lake in the department of Solola, in Guatemala, 20 miles long, with an average breadth of 9 miles. It seems to occupy the crater of an extinct volcano, and its depth is reported to be very great. The scenery in the neighbourhood is striking and picturesque, the volcano of Atitlan rearing its head 12,500 feet above the level of the sea. A little Indian town, Santiago de Atitlan, nestles at the foot of the mountain.

ATLANTA, the capital of Georgia, one of the United States of North America, is situated about 7 miles to the SF. of the Chattahoochee River, at an elevation of 1100 feet above the sea. Laid out in 1845, and incorporated as a city in 1847, it has since rapidly increased. It is the centre of a large trade in grain and cotton, and has extensive railway communication in all directions. En- gineering work of various kinds is carried on, ay well as the manufacture of cast-iron, flour, and tobacco, There are two national and two savings banks. Educational institu- tions are numerous, and comprise the North Georgia Female College, Oglethorpe College, a medical college, a uni- versity for men of colour, and a variety of schools, The state library contains upwards of 16,000 volumes. There are about thirty churches of different denominations, the Methodists being most largely represented, and one of their churches ranking among the finest buildings in the city. During the war Atlanta was the centre of important military operations, and suffered greatly in consequence (1864). It was strongly fortified by the Confederates, and defended, first by General Joseph E. Johnston, and then by General Hood, against the attack of Gencral Sherman. Hood was compelled to evacuate the city, and Sherman afterwards retired to Chattanooga,—movements which occasioned the destruction by fire of the greater part of the buildings, both public and private. Populatioun—(1860),

9554; (1870), 21,789.

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| Moen designation Atlantic Ocean, originally given to the

sea that lies beyond the great range of Atlas in North-western Africa, has come to be applied, with the extension of geographical knowledge, to the whole of that vast ocean which occupies the wide and deep trough that separates the New from the Old World. Its limits are variously defined; some geographers regarding it as extending from pole to pole, whilst others consider it as bounded at its northern and southern extremities by the Arctic and Antarctic circles respectively. As the peculiarity of the physical conditions of the Polar Seas renders it on every account more appropriate to describe them under a separate head (PotaR Rectons), the Atlantic will be here treated as bounded at the north by the Arctic circle, which nearly corresponds with the natural closing-in of its basin by the approach of the

coasts of Norway and Greenland with Iceland lying between them ; while at the south, where the basin is at its widest, its only boundary is the Autarctic

circle. The line which separates its southern extension from the Indian Ocean may be considered to be the meridian of Cape Agulhas, the southernmost point of the African continent; whilst the boundary between the South Atlantic and South Pacific would be formed in like manner by the meridian of Cape Horn. Although the Baltic and the Mediterranean are commonly regarded as appendages to the Atlantic, yet their physical conditions are so peculiar as to require separate treatment. (See Bantic and Meptr- TERRANEAN.)

Every physical geographer who has written upon the Atlantic has noticed the curious parallelism between its eastern and its western borders,—their salient and retiring angles corresponding very closely to each other. Thus, beginning at the north we see that the projection formed by the British Islands (which extends much further westwards at 100 fathoms below the surface than it does above the sea-level), answers to the wide entrance to Baffin's Bay ;

whilst, on the other hand, the projection of the American coast at Newfoundland answers to the Bay of Biscay. Further south, the great rounded prominence of Northern Africa corresponds with the vast bay that stretches from Nova Scotia to St Thomas; whilst the angular projection of South America towards the east corresponds with that receding portion of the mid-African coast-line which is known as the Gulf of Guinea.

This correspondence suggested to Humboldt the idea that the Atlantic basin was originally excavated by a very violent rush of water from the south, which, being repulsed by the mountain ranges of Brazil, was directed by them towards the coast of Africa, and formed the Gulf of Guinea; being there checked and turned to the west by the mountains of Upper Guinea, the stream excavated the Caribbean Sea and the Gulf of Mexico; and issuing thence, it ran between the mountains of North America and Western Europe, until it gradually diminished in velocity and force, and at length subsided. Another writer speaks of the basin of the Atlantic as an immense

rift, made by some terrible force, which rent the surface-land asunder, but left the edges of the ravine to show by their form that they had once been connected. For neither of these specula- tions, however, isthere thesmallest foundation in fact. What has to be accounted for, indeed, in regard to either of the great areas at present covered by water, is not so much the excavation of its sea-bed, as its segregation from an ocean originally universal by the boundaries that now enclose it ; in other words, not so much the depression of the bottom of its basin as the elevation of its sides. Not only is the proportion of the land-surface of the globe to its water- surface scarcely more than one-third (being as 1 to 2°78), but the entire mass of the land which thus covers little more than one-fourth of the surface of the globe is quite insignificant in comparison with that of the water which covers the remaining three-fourths. For whilst the average elevation of the whole land is certainly less than one-fifth of a mile, giving from 9 to 10 millions of cubic miles as the total mass of land that rises above the sea-level, the average depth of the sea (so far as at present known) may be taken at about 2 miles, giving a total of nearly 290 millions of cubic miles of water, which is therefore about thirty times the mass of the land. From the computation of Keith Johnston, it appears that, "'if we conceive an equalising line, which, passing around the globe, would leave a mass of the earth's crust above it, just sufficient to fill up the hollow which would be left below it, this line would then fall nearly a mile below the present level of the sea." This is tantamount to saying that, if the solid crust of the earth could be conceived to be smoothed down to one uniform level, its entire surface would be covered with water to the depth of about a mile. Hence it is obvious that as the elevation of that crust into land over certain areas must be accompanied by a corresponding depression of the sea-bed over other areas, such depression, augmenting in those areas the previous depth of the aqueous covering of the globe, would be quite sufficient to account for the existence of the great oceanic basins, without any excavating action. And a confirmation of this view is found in the fact, ascertained by recent soundings, that the deepest local depressions of the sea-bed are met with in the neighbourhood of islands that have been raised by volcanic agency. Further, as the quantity of solid mat- ter that must have been removed (on Humboldt's hypo- thesis) in the excavation of the Atlantic valley must have been nearly four times as great as that which forms the whole known land of the globe, and as it is impos- sible to conceive of any mode in which

such a mass can have been disposed of, we may dismiss that hypothesis as not only untenable in regard to the Atlantic basin, but |

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as equally inapplicable to any other valley of similar width and depth.

The general direction of geological opinion, indeed, has of late been, on physical grounds, towards the high anti- quity of the great oceanic basins, not exactly as at present bounded, but as areas of depression having the same rela- tion as they have now to the areas of elevation which form the great continents. Thus Sir Charles Lyell was strongly impressed by the fact that the mean depth of the sea is not improbably fifteen times as great as the mean height of the land ; and that depressions of the sea-bottom to a depth of three miles or more extend over wide areas, whilst elevations of the land to similar height are confined to a few peaks and narrow ridges. Hence, he remarked, “ while the effect of vertical movements equalling 1000 feet in both directions, upward and downward, is to cause a vast transposition of land and sea in those areas which are now continental, and adjoining to which there is much sea not exceeding 1000 feet in depth, movements of equal amount would have no tendency to produce a sensible alteration in the Atlantic or Pacific Oceans, or to cause the oceanic and continental areas to change places. Depressions of 1000 feet would submerge large areas of the existing land; but fifteen times as much movement would be required to convert such land into an ocean of average depth, or to cause an ocean three miles deep to replace any one of the existing continents.”? And Professor Dana, who, more than any other geologist, has studied the structure of the existing continents and the succession of changes concerned in their elevation, has been led, by the consideration of the probable direction of the forces by which that elevation was effected, to conclude that the defining of the present con- tinental and oceanic areas began with the commencement of the solidification of the earth’s crust. ‘ The continental areas are the areas of least contraction, and the oceanic basins those of the greatest, the former having earliest had a solid crust. After the continental part was thus stiffened, and rendered comparatively unyielding, the oceanic part went on cooling, solidifying, and contracting throughout ; consequently, it became depressed, with the sides of the depression somewhat abrupt. The formation

of the oceanic basins and continental areas was thus due to ‘unequal radial contraction.’” In the opinion of Professor Dana, there has never been any essential change in the relations of these great features. “It is hardly possible,” he says, “to conceive of any conditions of the contracting forces that should have allowed of the continents and oceans in after time changing places, or of oceans, as deep nearly as exist- ing oceans, being made where are now the continental areas ; although it is a necessary incident to the system of things that the continental plateaus should have varied greatly in their.outline and outer limits, and perhaps thousands of feet in the depths of some portions of the overlying seas, and also that the oceans should have varied in the extent of their lands.” . . . “The early defining, even in Archzean times, of the final features of North America, and the con- formity to one system visibly marked out in every event through the whole history—in the positions of its outlines and the formations of its rocks, in the character of its oscillations, and the courses of the mountains from time to time raised—sustain the statement that the American con- tinent is a regular growth. The same facts also make it evident that the oceanic areas between which the continent

1 The case of such a shallow trough as that of the English Channel, of the former continuity of whose sides there is ample evidence, whilst its bottom is nowhere 500 feet beneath the surface, is obviously alto- gether different. The extraordinary depth of the Mediterranean basin, on the other hand, affords strong reason for regarding it as, like the Atlantic, a portion of the original area of depression, circumscribed by the elevation of its borders.

2 Principles of Geology, 11th ed. vol. i. p. 269.

lies have been chief among the regions of the earth’s crust that have used the pent-up force in the contracting sphere to carry forward the continental developments. If this was true of the North American continent, the same in principle was law for all continents.”?

Dimensions of the Atlantic.—The length of the Atlantic basin, considered as extending from the Arctic to the Antarctic circle, is nearly 8000 geographical miles. The nearest approach of its boundaries is between

Greenland and Norway, whose coasts are only about 800 miles apart. They thence recede from each other towards the south, as far as the parallel of 30° N. lat., where, between the peninsula of Flerida and the western coast of Marocco, there is an interval of 70° of longitude, or about 3600 geographical miles. The channel then rapidly narrows as it passes southward, so that between Cape St Roque in Brazil (6° S. lat.) and the coast of Sierra Leone (between 5° and 8° N. lat.) the African and American continents approach within 1500 miles of each other. The sudden eastward recession of the African coast as it approaches the equator, and the westward trend of the South American coast-line between Cape St Roque and Cape Horn, widen out the South Atlantic basin to the same breadth as that of the North Atlantic in the parallel of 30° N.,—the interval between the Cape of Good Hope and the estuary of La Plata, in the parallel of 35° 8., being no less than 732° of longitude, or about 3600 geographical miles.

The depth of the North Atlantic has been more care- fully and systematically examined than that of any other oceanic basin ; and the general contours of its undulating sea-bed may now be regarded as pretty well determined. Putting aside the older soundings as utterly untrust- worthy, and accepting only those taken by the modern methods, whose reliability has been amply tested by the accordance of diversified experiences, we can now assert with confidence that scarcely any portion of its floor has a depth exceeding 3000 fathoms, or about 3°4 miles, the greatest depth determined by the recent “Challenger” sound- ings, which was that of a limited depression about a hundred miles tq the north of St Thomas, having been 3875 fathoms, or about 4°4 miles. Except in the neigh- bourhood of its coast-lines, and in certain shallower areas to be presently specified, the floor of the basin at its widest part seems to lie at a depth of from 2000 to 3000 fathoms, its slopes being extremely gradual. The central portion of the principal basin of the North Atlantic, however, is occupied by a plateau of irregular shape, of which a considerable part lies at a less depth than 2000 fathoms. Of this plateau the Azores may be regarded as the culmination ; and that group being taken as its centre, it may be said to extend to the north as far as lat. 50°, and to the south-west as far as the tropic of Cancer. The northern extension of this plateau narrows out into a sort of isthmus, which connects it with the plateau that occupies a great part of the Atlantic basin to the north of 50° N. lat. ; and it is across this isthmus,

and along the bottom of the deep narrow valley on either side of it, that the telegraph cables are laid between Ireland and Newfound- land. Whether its south-western prolongation, known as the “Dolphin Rise” (fig. 1, infra) extends to the equator, so as to become continuous with the elevated area which cul- minates in St Paul’s rocks, and by a further southward ex- tension becomes continuous either with the volcanic elevation of St Helena and Ascension Island, or with the elevation in the middle of the South Atlantic which culminates in the island of Tristan da Cunha (fig. 2), has not yet been ascertained. According to the view already suggested as to the formation of the Atlantic basin, the plateau might

1 “*On some Results of the Earths Contraction trom Cooling,” in Amer. Journ. of Science, June 1873.

converted into dry land.

be regarded as representing the original sea-bed (from which the Azores have been lifted up by volcanic action), whilst the deep valleys on cither side of it are “areas of subsidence ” answering to the “ areas of elevation” of the land that borders them.

Generally speaking, the depths of these valleys increase pretty rapidly with the distance from the shore-line, so that the contour-lines of one and two miles follow the shore-lines pretty closely. But there are two localities in which shallow water extends to a much greater distance from land than it appears to do elsewhere. One of these lies in the neighbourhood of the British Isles. For a dis- tance of about 230 miles to the westward of Ireland there is a slope of only about 6 feet in a mile ; but in the next 20 miles there is a fall of 9000 feet, after which there is little change of level for 1200 miles. Hence as the depth of the sea immediately surrounding the British Isles is nowhere 100 fathoms (so that an elevation of their whole area to that amount would unite these islands not only to each other but also to the continent of Europe), it is obvious that the platform on which they rest is really, although now submerged, a part of the land-mass of Europe. Another of these extensive shallows is that of which the Banks of Newfoundland form the highest part ; and of the existence of this a probable explanation

may be found in the accumulation of the rock-masses that are brought down by icebergs every summer from the coasts of Greenland and Labrador. For it is now generally admitted that these icebergs are really parts of glaciers, that were originally formed on the mountain-slopes of Greenland and Labrador, and then descended valleys which open out on their coasts, 80 a8, on arriving at the mouths of these valleys, to detach themselves and float away, being borne southwards by the Polar Current to be presently described. Most Arctic icebergs of which a near view can be obtained are observed to have upon them a considerable number of pieces of rock, sometimes of a very cousiderable size ; and these are of course deposited on the sea-bed when the icebergs melt (which they usually do on the borders of the Gulf Stream), thus forming a vast conglomerate bed, to which parallels are not improbably to be found in various geological epochs.

Geological Age of the Atlantic Basin.—Guided by the principle that great oceanic basins are to be considered rather as original marine areas that have been limited by the elevation of their boundaries, than as having been formed by the excavation of terrestrial areas, we have to inquire what evidence there is that the basin of the Atlantic has undergone any considerable change within a compara- tively recent period.

As has been pointed out by Prof. Wyville Thomson (Depths of the Sea, p. 473), it is difficult to show that any oscillations have occurred in the north of Europe since the termination of the Secondary period, to a greater extent than from 4000 to 5000 feet,—this being the extreme vertical depth between the base of the Tertiaries and the highest point at which Tertiary or post-Tertiary shells are found on the slopes end ridges of mountains. Such oscillations, while considerably modifying the boundaries of the Atlantic, would not seriously affect the condition of the deeper parts of its sea-bed ; and hence it may be concluded that the two deep valleys, one on the European side of the modern volcanic platform of the Azores, and the other on the American, each having a width of 600 or 700 miles, and an average depth of 15,000 feet, could neither have been formed by such oscillations, nor could, when once formed, have been It will be presently shown that this idea of the existence of an Atlantic basin correspond- ing generally to that now existing, as far back as the later Secondary period, is strongly supported by the evidence

recently obtained of the continuity of animal life on the Atlantic sea-bed from the Cretaceous epoch to the present time.

Important information as to the changes which the sea- bed of the Atlantic has undergone within the later geolo- gical periods, may be gathered from the structure of the islands which lift themselves above its surface. Along its eastern border, at no considerable distance from the coast of North Africa, there are three principal groups,—the Madeiras, Canaries, and Cape Verd, —all of which have an evidently volcanic origin, and rise up from the eastern slope of the basin, where it is progressively shallowing towards its continental shore-line. Further out, in mid- ocean, lies the group of the Azores, which also is volcanic, and rises from the plateau already spoken of ; but between this area and the slope from which the Madeiras and Canaries are based is a very deep channel, ranging down- wards to at least 15,000 feet; and a like depth is also found between the Azores and the coast of Portugal. The structure of all these groups of islands gives obvious indications of their formation by separate igneous eruptions in a sea of great depth ; and the earliest of these eruptions seems to have taken place in the later Miocene period. As soon as the first solid lavas raised their heads above water, and were ‘thus exposed to the action of the waves, fragments were detached and rounded on the shore ; and these being swept off, with the débrvs resulting from their attrition, formed deposits of various kinds upon the slope of the cone, in which corals, shells, &c., were embedded. These fossiliferous deposits have been subse- quently elevated to heights of from 1500 to 2000 feet above the level of the sea, showing a rise of the base of the craters; progressive additions have been made to their upper part by the piling up of basaltic and trachytic lavas.} That this state of activity still continues is proved by the fact that in 1811 a new island was temporarily formed in the Azores group, off St Michael, by the throwing-up of ashes, and the formation of a cone about 300 feet high, with a crater in the centre. This island, to which the name Sabrina was given, was soon washed away by the waves. And only a few years since, another submarine eruption in this neighbourhood was indicated by earth- quakes, jets of steam and

columns of smoke, and floating masses of scoriz. All these considerations concur (as Sir Charles Lyell, doc. cit., justly urges) to negative on geological grounds the hypothesis which has been advocated by some eminent naturalists, that the Azores, Madeiras, and Canaries are the last remaining fragments of a continuous area of land which once connected them with the west of Europe and North Africa.

Proceeding to the south of the equator, we mcet with similar evidence of volcanic activity in the structure of the only two islands, Ascension and St Helena, which lie near the line stretching from the Cape Verd group to the Cape of Good Hope; and these also arise from a plateau of considerably less depth than the circumjacent area whose eastern slope gradually shallows to the coast of South Africa. This plateau stretches in a north-westcrly direction towards the equator, so as to meet it in from 20° to 22° W. long. ; and here indications of volcanic activity — earthquakes, troubled water, floating scoriz, and columns of smoke— have been several times observed since the middle of the last century, betokening the probable formation of an island or an archipelago in that locality.

Nearly midway between the southern prolongations of the African and American continents, the solitary peak of Tristan da Cunha (fig. 2) lifts itself above the ocean ; this also is volcanic, and seems to rise from a broad base

1 See Sir C. Lyell's account of them in his Principles of Geology, 11th ed. p. 407, sqq.

of general elevation, resembling the plateau of the North Atlantic.

The entire chain of the Greater and Lesser Antilles, which stretches from the delta of the Orinoco to the peninsula of Florida, and forms the eastern boundary of the Caribbean Sea, seems to have been in like manner elevated by vol- canic action. That this elevation, like that of the groups of islands on the eastern side of the Atlantic, took place for the most part during the later Tertiary period, is shown by the occurrence of shells, corals, &c., of upper Miocene age, in the upraised sedimentary beds of several of the islands ;

while the presence of “fringing reefs” of coral around the shores of many of the West India islands is an indication that they lie in an area in which elevation is still proceeding. The channels by which they are separated are so deep as to render it very unlikely that there was ever a continuity of land between them; and the occa- sional recurrence of earthquakes and volcanic eruptions at different points of this “line of fire,” shows that the plutonie action by which the islands were raised is still going on beneath.

The case is very different, however, in regard to the Bermuda group, which constitutes a singular exception to the general fact of the absence in the Atlantic of those coral islands that are so numerous in the Pacific. This group consists of about 300 islands, of which, however, only five are of any considerable size; and these rise from a shoal or platform of about 23 miles long by 13 miles broad, the channels between the islands being very shallow, while at a small distance from the edge of the shoal, the bottom rapidly deepens to 15,000 feet. The islands are entirely composed of upraised beds of coral, shells, &e. (the highest elevation being only about 180 feet above the sea-level) ; and the shoal itself appears to have the like structure throughout, no traces of any other rock than a limestone formed by the metamorphoses of coral being anywhere met with. Hence, as this insular platform proves to be the summit of a submarine column of 15,000 fect high, rising from a very small base, and as nothing we know of the structure of mountains—volcanic or other— would justify us in supposing that a column of such a height could be formed in any other way than by coral growth, the structure of the Bermuda group would seem to indicate a progressive subsidence of the bed of this part of the Atlantic during its formation, corresponding to that which (according to the well-known views of Mr Darwin) is at present in progress over a large area of the Pacific. It is probable that this coral growth was deter- mined in the first instance by the existence of a submarine mountain, of which the summit lay near the surface, or lifted itself above it; that as soon as this came to be submerged, the coral formation commenced ; and that by its continued growth at the summit, at a rate equal to that of the subsidence of its base, the platform has been kept up to the sea-level. The slight elevation which has raised its highest portion above that levcl may not impro- bably have taken place in connection with the much larger recent elevations already refcrred to.

Thus, then, we have evidence of considerable recent local modifications in the level of the Atlantic sea-bed, without any such change as would affect its general cha- racter as an ocean basin; while all geological probability seems in favour of the remoteness of the principal depres- sion of the Atlantic area, even if we do not regard it as dating back to the period when the surface of the globe was first undergoing solidification.

Currents of the Atlantic.—By the term “ current ” will be here meant that sensible movement of ocean water in particular directions which can be generally traced, directly

| or indirectly, to the action of wind upon its surface. A

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current thus directly impelled by wind is termed a ‘ drift.

current,” whilst a current whose onward movement is sustained by the vis a tergo of a drift-current is called a But there is another source of current-movement, which has been overlooked by most writers on this subject, namely, the indraught which necessarily takes

“¢ stream-current.”

place to keep up the level of any area from which the surface-water is constantly being drifted away. Such cur- rents, which may be designated as “ indraught ” or “ supply currents,” complete the “horizontal circulation ” that must necessarily take place in any oceanic area of which one part is subjected to the action of a wind almost constantly blowing in the same direction. Of such a circulation we have a very characteristic example in the South Atlantic, the principal currents of which we shall see to be very easily accounted for.

The initial movement of the current-system, alike of the North and of the South Atlantic, is given by the trade- winds, which are continually driving the water of the inter- tropical region from the African towards the American side of the basin, so as to produce what is known as the Hqua- torial Current. The position of the northern and southern boundaries of this

current shifts, like the area of the trade- winds, in accordance with the northward and southward declination of the sun ;—a steady westward drift being generally met with to the north of the tropic of Cancer in the summer of the northern hemisphere, and to the south of the tropic of Capricorn in the summer of the southern, whilst in the winter of each hemisphere the border of the drift lies within the tropic of that hemisphere. But as the thermal equator lies from two to three degrees to the north of the geographical equator, the entire zone of the trade- winds, and of the Equatorial Current propelled by them, is wider on the northern than on the southern side of the latter ; and while the northerly trade often reaches 30° N. in July, and rarely extends south in January within 2° or 3° of the geographical equator, the southerly trade does not extend farther than 25° S. in January, and generally crosses the equator in July, even extending occasionally as far as 5° N. As between the northerly and southerly trades there is a region of ‘‘ equatorial calms,” so there is a corresponding interval between the northern and southern divisions of the Equatorial Current ; and in this interval there is a counter-current (resembling the “ back-water” often to be noticed in a stream that is flowing rapidly past some obstacle, such as a vessel at anchor, or a projecting angle of a river-bank), that runs eastwards, sometimes with considerable velocity, towards the Bight of Biafra, which may be considered the “ head-water” of the Equatorial Current. From the recent observations of Capt. Nares in the “Challenger,” it appears that the Equatorial Current, like other drift-currents, is very shallow, its depth being not much greater than 50 fathoms. He estimates its rate at the surface to be about 0°75 niles per hour, or 18 miles per day, whilst at 50 fathoms it only moves at about half that rate! Its surface temperature generally ranges between 75° and 80°; but the thermometer falls to 60° at a depth of little more than 100 fathoms,—the temperature of this belt of water, as will be hereafter shown, being kept down by the continual rising of polar water from below.

The Equatorial Current passes directly across the Atlantic towards the chain of the Antilles and the coast of South America ; and as not only the whole of the northern divi- sion, but a considerable part of the southern, strikes the American coast-line to the north of the salient angle of Cape St Roque (about 5° 8. lat.), the portion of the current which is deflected into the

northern hemisphere is much greater than that which is turned to the southward. It is

1 Mr Laughton, however, states the average velocity to be between 20 and 30 miles per day.

a general fact, that where a current encounters any partial obstruction,—such as a coast-line meeting it obliquely, a narrowing of its channel, the lateral pressure of another current, or even that of a mass of stationary water,—its velocity increases ; and so the portion of the Equatorial Current that is pressed to the northward by the coast-line between Cape St Roque and the mouth of the Orinoco (known in the first part of its course as the Cape St Roque Current, and afterwards as the Guiana Current) acquires a greatly augmented rate, running ordinarily at the rate of from 30 to 50 miles, and occasionally at arate of 80 miles, in the 24 hours. Entering the Carib- bean Sea, it is reinforced by the portion of the Equatorial Current which flows in between the Lesser Antilles ; and it then passes westwards along the northern coast of South America, until it is deflected northwards by the coast-line of Central America, and driven between the peninsula of Yucatan and the western extremity of Cuba into the Gulf of Mexico, at the rate of from 30 to 60 miles per day. A por tion of it passes direct to the N.E. along the northern shore of Cuba; but by far the larger part sweeps round the gulf, following the course of its coast-line, and approaches the coast of Cuba from the N.W. as a broad deep stream of no great velocity, seldom running at more than 30 miles per day. The reunited current, being met by the Equatorial Current from the outside, which is pressing to the west along the north coast of Cuba and between the Bahama isles, is deflected northwards through the passage termed the Florida Channel, which is bounded on the one side by the southern extremity of the peninsula of Florida, and on the other by the coast of Cuba and the Bahamas. The rate of movement of the powerful current that flows through this channel, henceforth known as the Gulf Stream, is con- siderably augmented in its narrowest part, which is also its shallowest ; but although its velocity sometimes reaches 4 (nautical) miles per hour, or even more, its average

rate through the whole year may be confidently stated at not more than 2 miles per hour, or 48 miles per day.?

The Gulf Stream current, however, does not by any means occupy the whole of the sectional area of the Florida Channel ; for it is separated from the American coast by a band of cold water, which occupies about three-eighths of its total breadth of 40 miles, and which also dips under the outflowing current. The movement of the cold superficial band is perceptibly inwards, and that of the cold under- stratum is presumably so; and it is the opinion of the American surveyors that the depth of the warm outward current is not more than one-third of that of the channel through which it flows. It is probable that the rate of movement decreases from the surface downwards ; but upon this point we have as yet no certain information. The meaning of the cold inflow will hereafter become apparent.

The course taken by the Gulf Stream in the first in- stance is nearly parallel to the line of the United States coast, from which it is everywhere separated by a band of cold water,—the boundary line between the two being so distinct as to be known as the “cold wall.” It does not show for some time any great disposition to spread itself out laterally, though a division into alternate bands of warmer and colder water, the cause of which seems to lie in the contour of the bottom of the Florida Channel, be- comes perceptible before it reaches Charleston, and is very marked off Cape Hatteras. The Stream there presents the form of a fan, its three warm bands spreading out over the Atlantic surface to an aggregate breadth of 167 miles,

i This statement, which is much lower than that adopted by most writers on the Gulf Stream, is based on the entire aggregate of observa- tions collected by the Meteorological Department, which further show that, for six months of the year, the monthly mean averages only 1°4

miles per hour, or 34 miles per day, whilst for the other six months it only averages 24 miles an hour, or 60 miles per day.

whilst two cold bands of an aggregate breadth of 52 miles are interposed between them. The innermost warm band is the one which exhibits the highest temperature and greatest rate of flow, its velocity being greatest where it is pressed on laterally by the Arctic Current, so that a rate of 4 miles per hour is occasionally observed. Capt. Nares estimates the depth of the Stream in this part of its course at about 100 fathoms, and its rate of flow in the line of most rapid movement at 3 miles per hour. The outermost band, on the other hand, graduates insensibly, both as to temperature and rate of movement, into the general sur- face-water of the Atlantic. It is when passing Sandy Hook that the Gulf Stream takes its decided turn east- wards, —this change in its direction being partly due to the eastward bend of the United States coast-line, and partly to the excess of easterly momentum which it brings from the lower latitude in which it issued from the Florida Channel. Its general rate of flow past Nantucket seems not to exceed 1 mile per hour, and to be frequently less ; but several degrees to the eastward of this, the current has been found occasionally running at the rate of 4 miles an hour,—this acceleration being probably due to the lateral pressure of the Arctic Current, which, during the early months of the year, is driven southwards at the rate of 10 or 12 miles per day by the N. and N.W. winds then pre- vailing along the coast of Labrador, and which, turning westwards round the south of Newfoundland, keeps close to the coast of the United States (being left behind in the rotation of the earth, in consequence of its deficiency of easterly momentum), and follows it southwards, every- where separating it from the Gulf Stream.

By the gradual thinning-out and expansion of the Gulf Stream after passing the Banks of Newfoundland, by the progressive reduction of its rate of movement, and by the loss of that excess of temperature which previously distinguished it, as well as of its peculiar blue colour (which probably depends on its holding in suspension the finest particles of the river-silt brought down by the Mississippi), this remarkable current so far loses all its special attri- butes, as to be no longer recognisable to the east of the meridian of 30° W. long.,—there degenerating into the general easterly drift of that region of the Atlantic which is kept up by the prevalence of westerly winds, some- times called “ anti-trades.” Where the Florida Current or true Gulf Stream can last be distinctly recognised, it forms a stratum not more than 50 fathoms in thickness 5 and it is there flowing almost due east, at a

rate which would require about 100 days to bring it to the Land's End. The only valid evidence of the extension of any part of it to the western shores of Europe (the ameliora- tion of their temperature being otherwise accounted for, while the transport of trunks of trees, drift-timber, fruits, shells, &c., to the Western Hebrides, the Orkney, Shetland, and Faroe islands, and the coast of N orway, may be fairly set down to the surface-drift sustained by the pre- valence of §.W. winds) is afforded by the variablé current known as Lennell's, which, flowing eastwards into the southern part of the Bay of Biscay, is deflected in a N.W. direction by the trend of its coast-line, so as to cross the British Channel towards the Scilly Islands, whence it passes to the S.W. coast of Ireland, its strength mainly depending on the continued prevalence of the westerly anti-trades. (See Plate I.)

Of the whole mass of water, ou the other hand, that is brought into the mid-Atlantic by the Gulf Stream, it may be stated with confidence that the larger proportion turns southward to the east of the Azores, and helps to form the North African Current ; the other tributary of which may be considered as originating as far north ag Cape Finisterre, under the influence of the northerly winds which prevail

along the coast of Portugal. As this current flows past the entrance to the Strait of Gibraltar, a part of it, forming what is known as the Gibraltar Current, is drawn in to keep up the level of the Mediterranean, which would other- wise be reduced by the excess of evaporation from its sur- face; but the greater part keeps its course southwards along the Marocco coast, reinforcing the south-flowing extension of the Gulf Stream. On arriving at the border of the northerly trade, the North African Current divides into two parts,—the western division being at once carried into the course of the equatorial drift, whilst the eastern, which may be considered as essentially an indraught or supply current, follows the African coast-line, and turns eastward into the Gulf of Guinea, forming the Guinea Current, which, coalescing with the eastward " back-water " already mentioned, flows pretty constantly, sometimes with con- siderable rapidity, towards the Bight of Biafra. There it meets the South African Current, which forms the other great feeder of the Equatorial Current; and the circulation thus completed

may be considered as recommencing from this “ head-water.” The large area of comparatively still water which lies in the interior of this North Atlantic circulation is called the Sargasso Sea,—a corruption of the name (Mar de Sargago) which it received from Columbus and the early Spanish navigators, on account of the quantity of sea-weed that floats on its surface. The boundaries of this area, which is of an irregularly elliptical shape, and nearly equals that of Continental Europe, are somewhat variable; but it may be considered to lie between the parallels of 20° and 35° N., and between the meridians of 30° and 60° W. Into it is collected a large propor- tion of the drift or wreck which floats about the North Atlantic.

Proceeding now to the South Atlantic, we meet with a circulation of the same kind, uncomplicated by any embaying of the Equatorial Current. The smaller division of this current which strikes the coast of South America to the south of Cape St Roque flows along the coast of Brazil at the rate of from 12 to 20 miles a day, forming the Brazil Current, which, however, is separated from the land by an intervening band of lower temperature, that has, during the winter months, a distinct flow towards the equator. The Brazil Current can be traced southwards, by its temperature rather than by its movement, as far as the estuary of the La Plata, before reaching which, however, a great part of it takes an easterly direction, and crosses the Atlantic towards the Cape of Good Hope, forming what is known as the Southern Connecting Current. The easterly movement of this current seems to be partly due to the westerly anti-trades, and partly to the excess of easterly momentum which is retained by the Brazil Current in its southward course from Cape St Roque; whilst it partly depends also on the junction of an Antarctic current that flows N.E. from Cape Horn, meeting the Brazil Current off the estuary of La Plata, just as the Arctic Current meets the Gulf Stream off Newfoundland,—dense fogs being produced, in the one case as in the other, through the precipitation of the vapour overlying the Equatorial Current, by the colder air that overlies the Polar. On meeting the coast of South Africa, the Southern Connecting Current turns northwards, and runs towards the Bight of Biafra, forming the South African Current, the movement of which is partly sustained by the southerly winds which prevail along that coast, but is partly attributable to the indraught set up to supply the efflux of the Equatorial Current. In its passage thither, however, the part of it most distant from the land is draughted westwards by the southern

trade, forming the most southerly portion of the equatorial drift. Between this and the Southern Con- necting Current is a central space, lying between the

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parallels of 20° and 30° S., and the meridians of 0° and 25° W., over which there arc no regular currents ; this the name Sargasso Sea is sometimes applied by analogy,

although its surfacc has no covering of sea-weed. (See Plate I.)

Temperature of the Atlantic.—The distribution of surface temperature over the area of the Atlantic has now been corresponds

nade out with considerable accuracy ; and it closely with what has been already stated as the course of the surface currents. change, alike in its northern and in its southern division, this change being more and more marked as we recede from the equator. Following the course of the mean annual isotherms, however, we find that they cross the South Atlantic at nearly regular intervals, in an east and west direction, the principal departure from that direction being

shown at their western end in the bend they take towards

the south under the influence of the warm Brazil Current, and at their eastern in the still stronger bend they take

towards the north under the influence of the cold South

African Current, which reduces to about 75° the temperature

of the southern equatorial that flows alongside the Guinea

Current, whose temperature is 82°. In the North Atlantic, however, the influence of the movement of oceanic water on

the surface-temperature is very much more marked. The

annual isotherms, which cross the Sargasso Sea with nearly

regular parallelism, and on the African side tend somewhat

to the south, where they meet the colder water of the North African Current, show a strong northward bend on the American side, along the early course of the Gulf Stream; but as its excess of temperature above that of the Atlantic generally diminishes as we trace it towards the Banks of Newfoundland, this northward deflection progres- sively becomes less. The marked contrast in temperature which is often there exhibited between two contiguous bands of water,—a thermometer hanging from a ship's bow show- ing a temperature of 70°, whilst another hanging from the stern shows only 40°,—is due not so much to the elevation produced by the Gulf Stream as to the depression produced by the Arctic Current. This depression manifests itself in the southward bend given, on the American side, alike to the summer and the winter isotherms (see Plate), beyond the summer isotherm of 70° and the winter isotherm of 60°, which may be considered as having nearly their normal position; whilst the northward tendency of these same isotherms on the European side not less conspicuously indicates a flow of warm water towards the western coasts of the British Isles, Norway, and even Iceland and Spitzbergen. It has been customary to regard this flow as an extension of the Gulf Stream; but if that term be limited (as it ought) to the current that issues from the Gulf of Mexico through the Florida Channel, the hypothesis is found to be untenable so soon as the thermal phenomena of that current are carefully examined. For, in the first place, the popular idea that the Gulf Stream retains its high temperature with little diminution during its passage first northwards and then eastwards is clearly disproved by observation, as is shown by the following table of average temperatures taken at different seasons in the warmest of its bands :—

4 &

r ps Florida Channel……...+: 25 N. Off Charlestown…….....- SomNe Off Cape Hatteras ……... 35 N. S.E. of Nantucket Shoals} 35 N. S. of Nova Scotia……... | 35 N,

and to

There is, of course, a seasonal

ture with which the Gulf Streata leaves the Florida Channel ‘5 retained in summer with only 5° reduction as far as Nova Scotia, there is a reduction of 5° in winter during its north- ward passage to Cape Hatteras, anda further reduction of no less than 10° during its eastward passage from Cape Hatteras to Nova Scotia, making a total reduction of No”. In spring, again, there is a total reduction of 11°, and in autumn of 13°; and in both cascs the reduction during the eastward flow under the parallel of 35° N. is greater than the reduction in the northward flow from 25° N. to 35° N. ‘The explanation of this is plainly to be found in the fact that in the early part of the course of the Gulf Stream its superheated stratum is a thick one, so that when its superficial film is cooled down by a superincumbent atmosphere of lower temperature, it is replaced by the uprising of a deeper stratum having nearly its original temperature. But as the stream spreads out superficially, its superheated stratum becomes proportionally thinner, and will consequently be more and more rapidly cooled down by the superincumbent atmosphere. Even supposing, therefore, that it were not subjected to any special cooling influence, it appears certain that, as the rate of the current slackens and its depth diminishes, the cooling process must continue at an increased rate, so as to bring down the surface-temperature of the stream to the normal isotherm of the locality, long before it could reach the shores of Europe. But it has been shown that when it passes Newfoundland the Gulf Stream 7s subjected to a special cooling influence —that of the Labrador Current with its fleet of icebergs, which melt away when borne into it; and this produces such an immediate reduction of its surface- temperature, that it thenceforth shows very little excess, although its sub-surface stratum still appears to be warmer than that of the ocean through which it flows.

But, further, the Gulf Stream, where it is last recog- nisable as a current, is flowing due east, and its southern portion turns first south-east and then south, whilst, on the other hand, the course of the isothermal lines (see Plate) clearly shows that the flow of warm water which carries them northward spreads across the whole breadth of the Atlantic, from the British

Isles to Labrador, even extending up to the west of north into Baffin's Bay. When we contrast this immense body of north-moving water with the thinned-out film of what is by comparison a mere rivulet, it becomes obvious (1) that its northward flow cannot be attributable to the vis a tergo of the Florida Current, whilst (2) its convection of heat to the Arctic Sea cannot be accounted for by any amount of excess of temperature that is limited to a small depth, since the temperature of such a stratum, moving north-east at a rate of (at most) 4 or 5 miles per day, must soon be brought down to that of the atmosphere above it.

Influenced by these considerations, several eminent hydrographers, both British and American, have been disposed to deny, not only that the temperature of the North Atlantic is modified in any considerable degree by the true Gulf Stream, but that any other ageucy than that of warm §.W. winds is concerned in producing the climatic amelioration popularly attributed to it. They maintained, in fact, that the surface-temperature of the North Atlantic and Arctic Seas follows that of the superincumbent air,— the atmospheric temperature not being in any degree raised by that of warmer water beneath. This doctrine, however, is found to be inconsistent with the results of careful com- parisons recently instituted between marine and atmospheric temperatures along the western coasts of Scotland, the Orkney, Shetland, and Faroe Islands, and especially with those obtained along the western coast of Norway. For it is found that during the winter months there is a constant

From this it appears that, while the high surface-tempera- | excess of sea-temperature above that of the air, averaging

6°-2 Fahr. along the western coast of Scotland and its islands, and rising to 14°-5 at Fruholm near the North Cape. And it is alsoa very significant fact (ascertained by the care- ful inquiries of Mr Buchan), that while the summer isotherms cross the British Islands nearly east and west (the tempera- ture diminishing pretty regularly from south to north), the winter isotherms traverse them nearly north and south (the temperature diminishing from west to east); whilst in Ireland the isotherms seem to envelope the islands in their folds, which increase in warmth from the centre of the island to its sea-

board. So in Norway the isothermal lines run parallel to the coast-line, and this alike in summer and in winter,—the temperature falling in winter, and rising in summer, with the increase of distance from the sea. Nothing could prove more conclusively than such facts as these (taken in connection with the absence of ice in the harbours of Norway, even as far north as Hammerfest, through the whole winter) the dependence of the mild winter climate of the north-western coasts of Europe upon the proximity of a sea which is warmer than the superincumbent atmosphere ; and we have now to inquire how this great N.E. movement of a stratum of warm water sufficiently thick to retain a surface-temperature con- siderably higher than that of the air above it is to be accounted for.

The solution of the problem seems to be afforded by the doctrine of a General Oceanic Circulation, sustained by opposition of temperature only, which was first distinctly propounded in 1845 by Professor Lenz of St Petersburg, on the basis of observations made by him during the second voyage of Kotzebue (1825-1828). Others had been previously led to surmise that “ Polar Currents” flow along the floors of the great oceans, even as far as the equator, balancing the superficial counter-currents which are observable in the opposite direction. But Lenz was led to conclude that the whole of the deeper portion of the great ocean-basins in communication with the polar areas is occupied by polar water, which is constantly, though slowly, flowing towards the equator ; whilst conversely the whole upper stratum of equatorial water is as con- stantly, though slowly, flowing towards one or both of the poles. And he particularly dwelt on the existence of a belt of water under the equator, colder than that which lies either north or south of it, as an evidence that polar water is there continually rising from beneath towards the surface,—a phenomenon which, he considered, admits of no other explanation. He further adduced the low salinity of equatorial water (previously noticed by Hum- boldt, and confirmed by his own observations), compared with that of tropical water, as evidence that the equatorial water of the surface is derived from the polar underflow. And he attributed the maintenance of this circulation to the continually renewed disturbance of equilibrium between the polar and equatorial columns,—the greater lateral (because downward) pressure of the former! causing a bottom outflow of polar water in the direction of the latter, whilst the

reduction of level thus occasioned will produce a surface indraught from the warmer towards the colder areas.

The doctrine of Lenz, so far from meeting with the general acceptance to which it had a fair claim,—alike on theoretical grounds and from its accordance with the facts ascertained by careful observation,—seems to have been put aside and forgotten, a preference being given to the doc- trine of the prevalence of a uniform deep-sea temperature of 39°, which was supposed to be established by the

1 It must be borne in mind that sea water does not expand like fresh water in cooling below 39°°2, but continues to contract down to its freezing point, which lies between 27° and 25° Fahr., according as it is still or agitated.

thermometric observations made in the voyages of D'Urville and Sir James Ross. No such precaution was taken, however, in these observations as that to which Lenz had recourse, to obviate the effects of the tremendous pressure (1 ton per square inch for every 800 fathoms of depth) to which deep-sea thermometers are exposed; and it is now certain that the temperatures at great depths recorded by D'Urville and Ross were several degrees too high.

It was in entire ignorance of the doctrine of Lenz, and under the influence of that of D'Urville and Ross, which had been stamped with the great weight of Sir John Herschel's weight of authority,? that Dr Carpenter com- menced in 1868 (in concert with Professor Wyville Thom- son) a course of inquiry into the thermal condition of the deep sea, which at once convinced him of the fallacy of the uniform 39° doctrine, and led him to conclusions essentially accordant with those of Lenz. For in the channel of from 500 to 600 fathoms' depth between the north of Scotland and the Faroe- Islands, they found the deeper half to be occupied by a stratum of glacial water, whose temperature ranged downwards from 32° to 29° ; whilst the upper half was occupied by a stratum warmer than the normal temperature of the latitudes. This phenomenon was interpreted by Carpenter as indicat- ing a deep glacial flow from N.E. to 8.W., and a warm upper flow from S§.W. to N.E.; and finding that to the west of this channel, on the border of the deep

Atlantic basin, the excess of warmth extended to a depth of more than 500 fathoms, he came to the conclusion that the north-moving stratum which brought it could not be an extension of the true Gulf Stream, but must be urged on by some much more general force. A series of tempera~- ture-soundings taken along the west of Ireland, the Bay of Biscay, and the coast of Portugal, confirmed him in this view, by showing that the division between an upper warm stratum and a cold under-stratum exists in the North Atlantic at a depth of from 700 to 900 fathoms, the whole mass of water below this having either flowed into the basin from the polar area, or having had its temperature brought down to from 39° to 36°5 by mixture with the polar inflow. And this conclusion was confirmed by the result of temperature-soundings taken at corresponding depths and under the same parallels of latitude in the Mediterranean ; for as they showed a uniform temperature of from 54° to 56°, from beneath the stratum of 100 fathoms that was superheated by direct insolation, to the very bottom, it became clear that depth per se could have no effect in reducing the bottom-temperature ; and that the cause of the excess of temperature in the mass of water occupying the Mediterranean basin above that of Atlantic water at the same depths, lies in the seclusion of the former from the polar underflow which brings down the deep temperature of the latter. This conclusion having received marked confirmation from temperature-soundings taken in the Eastern seas, was put forward by Carpenter as justify- ing the doctrine of a vertical oceanic circulation sustained by opposition of temperature only, quite independent of and distinct from the horizontal circulation produced by wind,—which doctrine he expressed in terms closely cor- responding with those that had been used by Lenz. And the collection of data for the establishment or confutation of this doctrine was one of the objects of the “ Challenger” expedition, which has already made, in the determination of the thermal stratification of the Atlantic between 38° N. lat. and 38°S. lat., what may be fairly characterised as the grandest single contribution ever yet made to terrestrial physics.

The following are the most important of the facts thus

2 See his Physical Geography of the Globe, originally published in the eighth edition of this Zncyclopedia,

SPLAN TLS established :—Of the water which fills the deep trough of |

the North Atlantic (fig. 1) between Teneriffe (lat. 283° N:

mill

bli

co 200 800 400 600 600 700 600 000 1000, 100 1200

72300 1500 1700

Horizontal Scale of Nautical Miles

23

divided by the “ Dolphin

and St Thomas (lat. 183° N.), by far the larger

rise” into an eastern and western basin,

of Fathoms.

Vertical Scale

m0 2200 7300 2400 2600 2600 2700

Fic. 1.—Section of North Atlantic Ocean between St ‘‘homas and Teneriffe.

mass has a temperature ranging from 40° downwards, in the eastern basin, to a bottom-temperature of 354°, whilst in the western basin—apparently under the influence of the Antarctic underflow—the bottom-temperature sinks to 34°-4, A tolerably regular descent is shown in this sec- tion, from a surface-temperature rising near St Thomas to 75°, to the bathymetrical isotherm of 45°, which lies be- tween 400 and 600 fathoms’ depth ; there is then a stratum between 45° and 40°, of which the thickness varies from about 250 to 450 fathoms, the isotherm of 40° lying at between 750 and 1000 fathoms’ depth, while below this, down to the bottom at between 2000 and 3000 fathoms, the further reduction to 34°°4 is very gradual.

The same general condition prevails in the South Atlantic (fig. 2), between Abrolhos Island (lat. 18° 8.) on the coast of Brazil, and the Cape of Good Hope (lat.

344° 8.), this trough also being divided into two basins by the elevation of the bottom which culminates in the island of Tristan da Cunha. The temperature of the water that occupies it, however, is lower through its whole vertical range than that of the North Atlantic. The stratification is nearly uniform from the surface downwards to the isotherm of 40°, which

lies at from 300 to 450 fathoms' depth, the isotherms of 39° and 38° also lying within about 500 fathoms; there is then a slower reduction down to the isotherm of 35°, which lies between 1400 and 1800 fathoms; while the whole sea-bed is covered by a stratum of about 600 fathoms' thickness, whose tempera- ture ranges downwards from 35° to 33°. The whole of this deepest stratum is colder than any water that is found in the corresponding portion of the North Atlantic, except near St Thomas

Tristan da Cunha. H38:S. &

500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2600 2600 2700 2600 2000 3000

Horizontal Scale of Nautical Miles.

Fria. 2.—Section of South Atlantic.

Tt is not a little remarkable that the sub-surface stratum of water, having a temperature above 40°, is thinner under the equator than it is in any other part of the Atlantic from the Faroe Islands to the Cape of Good Hope. Not- _ withstanding the rise of the surface-temperature to 76°-80°

the thermometer descends in the first 300 fathoms more rapidly than anywhere else; so that polar water is met with, as shown in fig. 3, at a much less depth than in the

North Atlantic (fig. 1), and 100 fathoms nearer to the surface than even in the colder South Atlantic (fig. 2); whilst the temperature of the bottom is but little above 32°. Thus the influence of the polar underflow is more pronounced under the equator than it is elsewhere; as is distinctly seen in the section shown in fig. 4, which is taken in a north and south direction so as to exhibit the relation of the thermal stratification of the North to that

of the South Atlantic, and of both to that of the equatorial

Horizontal Scale of Nautical Miles Fra, 3.—Section of Equatorial Atlantic.

The isotherm of 40°, which in lat. 22° N. lies at a

depth of about 700 fathoms, gradually rises as the equator is approached ; and it is between the equator and 7° S., where the surface-temperature rises to nearly 80°, that cold water is soonest reached,—the isotherm of 40° rising to within 300 fathoms of the surface, while that of 55°, which in lat. 38° N. lies at nearly 400 fathoms' depth, and in lat. 22° N. at about 250 fathoms, actually comes up under the equator within 100 fathoms of the surface. At the same time, while the bottom-temperature under the equator is the lowest anywhere met with, namely, 32°-4,1 the thickness of the stratum beneath the isotherm of 35° is not less than 600 fathoms. In passing southwards, the superficial iso- therms are observed to separate again from each other, partly by the reduction of the surface-temperature, and partly by the descent of the isotherm of 40° toa depth of something less than 400 fathoms, which it keeps with little reduction as far south as the Cape of Good Hope. The significance of these facts becomes more remarkable, when we consider that if a portion of the oceanic area under the equator were to be secluded, like the Mediterranean or the

"<= Haizantal Scale of Nautical Miles Fria, 4.—Section of Mid-Atlantic, taken nearly north and south.

Red Sea, from all but local influences, the temperature of its water from the sub-surface stratum downwards to the bottom—-whatever its depth—would be its isocheimal or mean winter-temperature, which, in the equatorial zone, would be certainly not below 75°.

Nothing, Dr Carpenter contends, could more conclu- sively support the general doctrine of a Vertical Oceanic Circulation sustained by opposition of temperature, than the precise conformity of the facts thus determined by observation to the predictions which his confidence in the theory had led him to put forth. These predictions were essentially as follows :—

'1, That instead of the local depressions of bottom-temperature imputed by previous writers to polar currents, the temperature of every part of the deep

sea-bed in communication with either of the polar areas would be not many degrees above that of the polar areas themselves.

“2. That this general depression of bottom-temperature would be found to depend, not upon such a shallow glacial stream as might be maintained to be a return from the polar areas of water propelled towards them by wind-currents, but upon a creeping flow of the whole under-stratum, having a thickness of from 1000 to 2000 fathoms.

**3. That as the depression of bottom-temperature in any part of the general oceanic basin would be proportional to the freedom of communication between its deeper portion and that of one or other of the polar areas, the bottom-temperature of the South Atlan- tic would probably range downwards to 32°, while that of the North Atlantic would not be below 35°, except where it first receives the Arctic flow, or comes under the influence of the Antarctic underflow, which would very probably extend itself to the north of the equator.

**4, That as the Arctic and Antarctie underflows must meet at or near the equator, whilst the surface-stratum is there continually being draughted off thence towards either pole, there would be a

continual ascent of glacial water under the line, showing itself by a nearer approach of cold water to the surface in the énier-tropical than in the extra-tropical zone.”

It was further pointed out by Lenz, and more recently (in ignorance of his doctrine) by Carpenter, that additional evidence of such ascent is furnished by the low salinity of the surface-water of the equatorial belt corresponding with that of polar water. For, as was originally observed by Humboldt, then by Lenz himself, and subsequently by many other voyagers, the specific gravity of the surface- water of the Atlantic gradually increases as either tropic is approached from the polar side of its own hemisphere, reaches its maximum a little nearer the equator, and then rapidly diminishes, coming down under the equator to the standard of polar water. Thus a mean of eight observations taken in the “Challenger” expedition between Bermuda (32° N.) and St Thomas (183° N.) gave 1027-2 as the sp. gr. of surface-water, whilst a mean of seventeen observa- tions between the Cape Verd Islands

(164° N.) and Bahia (13° S.) gave a sp. gr. of only 1026°3. Now, since between St Thomas and Bermuda the eight “‘ Challenger” observa- tions of bottom (polar) water gave a mean sp. gr. of 1026°3, whilst between Cape Verd and Bahia the mean sp. gr. of the bottom-water was even slightly lower (the results being

1 That the bottom-temperature beneath the equator was lower than any that was met with in the South Atlantic, is attributable to the cir- cumstance that, in consequence of unfavourable weather, the tempera- ture-soundings were taken at intervals too wide to detect the deep channel through which the coldest Antarctic water doubtless flowed to- wards the equator.

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in all cases expressed according to a common standard of temperature), such a close conformity subsists between the salinity of the equatorial water of the surface and that of the polar waters of the bottom, as can scarcely be accounted for in any other way than by the continual and tolerably rapid ascent of the latter.

‘Another indication of this ascent is given by the moder: ation of the surface-temperature of oceanic water, even under the equator. If there were no ascent of colder water from beneath, there seems no reason why the constant powerful insolation to which equatorial water is subjected should not raise the temperature of its surface to the highest possible elevation. The limit to that elevation, which is obviously set by the cooling influence of evapora- tion, is probably that which is met with in the Red Sea, where the monthly average for August rises to 864° and for September to 88°, whilst the maxima rise much higher, temperatures of 100°, 106°, 100°, and 96° having been noted on four consecutive days. Moreover, Coast, and especially in the Bight of Biafra, temperature is stated to range as high as 90°.

overflowed by the glacial stratum. Now, parts of the equatorial Atlantic the surface-temperature usually ranges between 75° and 80°; and this is its ordi- nary range in the Mediterranean during the months of August and

September. That the temperature of an equa- torial ocean should be thus kept down to that of a sea of which the grester part lies between the parallels of 40° and 35°, can scarcely be accounted for in any other way than by the continual uprising of polar waters from beneath. The same principle, once admitted, fully accounts for that amelioration of the cold of north-western Europe, which (as already shown) cannot be fairly attributed to the Florida Current or true Gulf Stream. For it is obvious that a continual efflux of the lower stratum from the polar areas towards the equatorial must involve a continual indraught of the upper stratum towards the polar areas ; and this indraught will be much more marked in the Northern than in the Southern Atlantic, on account of the progressive narrowing of the former, whilst the latter progressively widens out. Of such a slow northerly set of a stratum of water, extending downwards to a depth of at least 600 fathoms, we have evidence in a comparison of the temperature-soundings taken in the “ Porcupine” expedi-

Fic. 5.—Section of North Atlantic, taken nearly north and south.

tions of 1869 arid 1870, between the coast of Portugal (34° N.) and the Faroe Islands (59}° N.), from which the section fig. 5, has been worked out. For it is there

along the Guinea the surface- But in these cases there is no reduction of surface-temperature by the upward movement of polar water ; for this is altogether excluded from the Red Sea by the shallowness of the Strait of Babelmandeb, whilst the depth of the bottom along the Guinea Coast is too small to allow of its being over the deeper

seen that, although the surface-temperature is reduced by the thinning-out of the superficial stratum, there is but a slight change in the position of the bathymetrical isotherms of 45° and 40°; so that there is an obvious continuity of a stratum of many hundred fathoms’ thick- ness between these two points, notwithstanding their sepa- ration by 254° of latitude. The contrast between the position of the isotherm of 40° at 800 fathoms’ depth off the Faroes, and its position at less than 300 fathoms’ depth under the cquator, is most remarkable. We have seen that the isocheimal in the latter

area would not be below 75°, and yet we find water colder than 40° lying at within 300 fathoms of the surface; whilst, on the other hand, the normal isocheimal at 593° N. would certainly be below 40° (probably no more than 35°), and yet we find water above 43° extending downwards to 600 fathoms, and water above 40° to 800 fathoms. ‘Thus the vertical oceanic circulation carries a vast mass of water which is below the normal off the coast of Portugal, into a region where it is above the normal, with very little loss of heat by the way, except in its surface-film ; and a little consideration will show that such a movement must be much more effectual as a heater than a corresponding move- ment of a thin stratum of much warmer water. For the latter, when it passes beneath an atmosphere much colder than itself, will soon be brought down to a like standard, not having warmer water from below to take its place when it has been cooled down; whilst in the former, each sur- face-layer, when cooled below the temperature of the warmer stratum beneath, will sink and be replaced by it. Now since the true Gulf Stream, when we last know it, has been so thinned out that it could not long retain any excess of temperature, it seems inconceivable that it should exert any decided effect on the temperature of the Faroes and the coast of Norway, unless (as supposed by Dr Petermann and Professor Wyville Thomson) its thickness undergoes an increase from less than 100 fathoms to 600. But since the course of Dr Petermann’s isotherms shows that the north-ward flow extends across the whole breadth of the Atlantic between Newfoundland and the British Isles—a distance of about 2000 miles—we are required to believe that a rivulet (for such it is by comparison) of 60 miles’ breadth and 100 fathoms’ depth (see section, fig. 5), of which the greater part turns southwards round the Azores, and of which the remainder is flowing due east when we last recognise it, is able to impart a northerly movement to a stratum of 2000 miles in breadth, and at least 600 fathoms’ depth. On the other hand, the eastward set of this stratum, considered as a northward inmdraught into the polar area, is readily accounted for by the excess of easterly momentum which it derives from the earth’s rotation, this being only half as rapid in lat. 60° as it is under the equator; and since there is a still more rapid reduction in the rate of this rotation in yet higher latitudes, the con- tinually increasing excess of easterly momentum will give to the northward flow a progressively stronger eastward set.

On the other hand, the deficiency of easterly momentum in the cold underflow coming from the pole towards the equator will tend to produce a lagging-behind, or westward set of that underflow; and this has been shown by the “ Challenger” temperature-soundings to be the case,—the cold deep strata of the Western Atlantic surging upwards along the slope of the North American coast-line, as is shown in fig. 6, where we see not only the bathymctrical isotherms of 60°, 55°, and 50°, but the yet deeper isotherms of 45° and 40°, successively rising to the surface as we approach the land; while at a depth of only 83 fathoms, a temperature of 35° was encountered, which, at no great distance to the south, would only be found at a depth of 2000 fathoms. That the cold water should thus run up-

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hill is quite conformable to what we see in other cases, in which a heavier under-stratum has a definite set towards a slope ;and whilst ;

Arctic flow, no other explanation of it has been sug- gested. We now see that the cold Labrador Cur- rent overlies a band of water as cold as itself; and the south- ward extension of this cold band, far beyond that of any definite current – move- ment, and its entrance into the Gulf of Mexico, through the Florida Channel, at the side of and beneath the outflowing Gulf Stream, are thus accounted for.

The remarkable accordance of so many facts of actual observation, in the Atlantic area, with the probabilities deducible from a theory whose soundness can scarcely be disputed, seems now to justify the admission of the general (vertical) oceanic circulation sustained by opposition of temperature as an accepted doctrine of terrestrial physics.

Distribution of Organic Life.—All that will be attempted under this head will be to indicate the general conditions that seem, from recent researches, to have the greatest influence on the distribution of plants and animals through this great oceanic basin.

The distribution of marine plants seems mainly deter- mined by light, temperature, and depth,—a further influence being exerted by the character of the shores. The diminu- tion of light in its passage through sea-water is so rapid, that the quantity which penetrates to a depth of 250 or 300 fathoms may be regarded as almost infinitesimal ; and in conformity with this we find a very rapid diminution of Algal life below the depth of 100 fathoms. The upper stratum is occupied for the most part by the larger and coarser forms of the Fucacee, or olive-green sea-weeds, whilst the more delicate Ceramiacee, or red sea-weeds, fre- quent deeper waters ; and, as it appears from experiments made in aquaria that the latter do not flourish in full light, but grow well in shadow, it may be concluded that their preference for a moderate depth is rather for reduced light and stillness than for depth per se. At a depth of 150 fathoms very few ordinary sea-weeds maintain their ground ; and below this we seldom find any Algse, save the Coral- lines and Nullipores consolidated by calcareous deposit. The distribution of particular types over different parts of the Atlantic area appears to be mainly regulated by tem- perature ; and this would seem to be remarkably the case with the floating Diatomacee, which, though they form green bands in the surface-water of polar seas, have not been encountered in like abundance in the Atlantic, and do not coutribute largely, by the subsidence of their siliceous lorice, to the composition of its bottom-deposit. Although it is the habit of the larger Algze to grow from a base of attachment (their roots serving no other purpose however,

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Vertical Scale of Fathoms.

0 100 200 300 400 500 600

Horizontal Scale of Nautical Miles.

Fic. 6.—Section from Bermuda to Halifax.

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than that of anchorage), the enormous mass of Gulf-weed found in the Sargasso Sea seems quite independent of any such attachment. It was at one time supposed that this originally grew on the Bahama and Florida shores, and was torn thence by the powerful current of the Gulf Stream ; but it seems certain that if such was its original source, the “ Gulf-weed” now lives aud propagates whilst freely floating on the ocean-surface, having become adapted by various modifications to its present mode of existence.

The distribution of the animals that habitually live in that upper stratum of the ocean whose degree of warmth varies with the latitude, seems mainly determined by temperature. Thus the “right whale” of Arctic seas, and its representative in the Antarctic, seems never to enter the inter-tropical area, generally keeping away from even the temperate seas, whilst, on the other hand, the sperm-whale ranges through the parts of the ocean where the “ right whales ” are never seen.

The distribution of fishes seems generally to follow the same rule; as does also that of floating mollusks. Thus the little Clio (a Pteropod mollusk), which is a principal article of the food of the “right whales” in polar seas, is rarely met with in the Atlantic, where, however, other pteropods, as Hyalca, present themselves in abundance. On the other hand, the warmer parts of its area swarm with Salpa-chains, which are not frequent in higher latitudes ; and the few representatives of the Nautiloid Cephalopods, that were so abundant in Cretaceous seas, are now restricted to tropical or sub-tropical

areas. And the distribution of the mollusks, echinoderms, and corals, which habitually live on the bottom, seems to be determined, within certain limits at least, by temperature rather than by depth.

The bathymetrical range to which animal life of any higher type than the Rhizopodal might extend, was until recently quite unknown; but the researches initiated by Prof. Wyville Thomson and Dr Carpenter in 1868, and since prosecuted by the “Challenger” expedition, have fully established the existence of a varied and abundant fauna in ocean-depths ranging downwards to 2000 fathoms. And these researches have further established that the distribu- tion of this fauna is mainly determined by the tempera- ture of the sea-bed ; so that whilst in the channel between the north of Scotland and the Faroes there were found at the same depths, and within a few miles of each other, two faunze almost entirely distinct—one a boreal and the other a warmer-temperate—on sea-beds having respectively the temperatures of 30° and 43°, various types to which a low temperature is congenial are traceable continuously along the whole abyssal sea-bed that intervenes between those northern and southern polar areas within which they present themselves at or near the surface. And hence it becomes clear that, since glacial types are even now being embedded in the strata which are in process of formation beneath the equator, no inferences as to terrestrial climate can be drawn from the character of marine deposits.

One very remarkable feature which presents itself over a large proportion of the Atlantic basin is the abund- ance of the minute Globigerine and other Foraminifera, the accumulation of whose shells, and of their disintegrated remains, is giving rise to a calcareous deposit of unknown thickness, that corresponds in all essential particulars to Chalk. This deposit, in some parts of the North Atlantic, is replaced by an Arctic drift of fine sand, whilst in other parts there is a mixture of arenaceous and of calcareous components, such as is found in certain beds of the Cretaceous formation. Now on the surface of this deposit there have been found so many living types, especially belonging to the groups of Echinoderms, Corals, Siliceous Sponges, and Foraminifera, which closely correspond with types hitherto regarded as characteristic of the Cretaceous epoch, that the question naturally suggests itself whether

the existing are not the lineal descendants of the fossil types,—the differences they present being not greater than may be fairly attributed to the prolonged action of differences of temperature, food, pressure, Wc. And when these facts are taken in connection with those previously stated as to the probable remoteness of the period when (if ever) the present sea-bed of the Atlantic was dry land, the doctrine first put forth by Prof. Wyville Thomson, that there has been a continuous formation of Globigerina-mud on the bottom of the Atlantic from the Cretaceous epoch to the present time —or, in other words, that the formation of chalk on the sea-bed of the Atlantic did not cease with the elevation of the European area, but has been going on through the whole Tertiary period,—must be admitted as (to say the least) a not improbable hypothesis. ‘That some considerable change took place at the conclusion of the Cretaceous epoch, by which the temperature of the upper stratum was lowered, so as to be no longer compatible with the existence of the fishes and chambered cephalopods characteristic of the Cretaceous fauna, may be fairly assumed from their disap- pearance ; but this would not so much affect the deeper part of the basin, in which those lower types that seem more capable of adapting themselves to changes in external conditions would continue to hold their ground, That the like conditions had prevailed also through long previous geo- logical periods, may be surmised from the persistence, over various parts of the Atlantic sea-bed, of the Apiocrinite type, which carries us back to the Oolitic formation, and of

the Pentacrinus type, which has come down with very little alteration from the Liassic; whilst many existing Tere- bratulide do not differ more from Oolitic types than the latter differ among each other. Going back still further, we find in the persistence of certain Foramiuiferal types from the Carboniferous limestone to the present time, and in the character of its deep-sea beds, a strong indication that they originated in a F oraminiferal deposit, represent- ing in all essential particulars that which is now going on ; while the persistence of the Lingula from the early Silurian strata to the present time suggests the question whether certain oceanic areas may not

have remained in the condition of deep sea throughout the whole subsequent succession of geological changes.

BrstiocRAPHY.—In addition to the ordinary sources of information, the following publications may be specially referred to for recent information in regard to the physical geography of the Atlantic :—‘ Reports of the Deep-Sea Explorations carried on in H.M. Steam-vessels ‘ Lightning,’ ‘ Porcupine,’ and ‘ Shearwater,’ ” in Proceedings of the Royal Society for 1868, 1869, 1870, and 1872; “On the Gibraltar Current, the Gulf Stream, and the General Oceanic Circula- tion,” in the Journal of the Royal Geographical Society for 1871; and “ Further Inquiries on Oceanic Circulation ” (containing a summary of the “ Challenger” Temperature Survey of the Atlantic), in the same journal for 1874 ; Currents and Surface-Temperature of the North and South Atlantic, published by the Meteorological Committee ; and The Depths of the Sea, by Prof. Wyville Thomson. (W.B.C.)

ATLANTIS, Aratantis, or ATLANTICA, an island men- tioned by Plato and other classical writers, concerning the real existence of which many disputes have been raised. In the Zimceus, Critias relates how his grandfather Critias had been told by Solon some remarkable events in early Athenian history which he had learned from the Egyptian priests at Sais, whose records went much further back than the native accounts. “The most famous of all the Athenian exploits,” Solon had been told, “wasthe overthrow of the island Atlantis. This was a continent lying over against the pillars of Hercules, in extent greater than Libya and Asia put together, and was the passage to other islands and to another continent, of which the Mediter- ranean Sea was only the harbour ; and within the pillars the empire of Atlantis reached to Egypt and Tyrrhenia. This mighty power was arrayed against Egypt and Hellas and all the countries bordering on the Mediterranean.

Then did your city bravely, and won renown over the | and on the throne of

whole earth. For at the peril of her own existence, and when the other Hellenes had deserted her, she repelled the invader, and of her own accord gave liberty to all the nations within the pillars. A little while afterwards there was a great earthquake, and your warrior race all sank into

the earth ; and the great island of Atlantis also disappeared | on the

shoulders the pillars on which the sky rested. He knew the depths of the sea (Odyssey, vil. 245), and in the first instance seems to have beena marine creation. The pillars which he supported were thought to rest in the sea, immediately beyond the most western horizon. But by the time of Herodotus (iv. 184), a mountain is suggested as best suited to hold up the heavens, and the name of Atlas is transferred to a hill in the N.W. of Africa, Then the name is traced to a king of that district, rich in flocks and herds, and owning the garden of the Hesperides. Finally, Atlas was explained as the name of a primitive astronomer. He was the father of the Pleiades and Hyades. Perseus encountered him when he searched for Medusa. Heracles took the burden of the sky from his shoulders, but cleverly contrived to replace it. Atlas bear- ing up the heaveus is mentioned as being represented on early works of art,¢.g.,on the chest of Cypselus (Pausan.,v. 18,1), Apollo at Amyclee (Pausan., iii. 18, 7) ; and this subject occurs on several existing works of art. ATLAS, a mountain-chain of Northern Africa, between the great desert of the Sahara and the Mediterranean. The range has been but partially explored, and geographers differ as to its extent, some considering it to reach from Cape Ghir Atlantic to Cape Bon, the north-east point of Tunis,

in the sea. This is the explanation of the shallows which | while others include under the name the whole mountain are found in that part of the Atlantic occan.”—(Jowett’s | system between Cape Nun and the greater Syrtis. In

Introduction to the Timeus.) Such is the main substance of the principal account of the island furnished by the ancients,—an account which, if not entirely fictitious, belongs to the most nebulous region of history. The story may embody some popular legend, and the legend may have rested on certain historical circumstances; but what these were it is (as the numerous theories advanced on the subject may be held as proving) impossible now to determine. ATLAS (“ArAas), in Greek Mythology, called_sometimes a son of Japetus and the nymph Asia, or of Uranus and Gaia, and at other times traced to a different parentage, but always known as the being who supported on his

this latter sense it forms the mountain-land of the countries of Marocco, Algeria, Tunis, and Tripoli. It is composed of ranges and groups of mountains, enclosing well-watered and fertile valleys aud plains, and having a general direction from W. to E. The highest peaks are supposed to attain an elevation of nearly 15,000 feet ; and although none of them reach the height of perpetual snow, some of their loftiest summits are covered with snow during the greater part of the year. Mount Miltsin, 27 miles 8.E. of the city of Marocco, was ascertained by Captain Wash- ington to be 11,400 feet high. The greatest heights are in Marocco, from which point they appear to diminish in

elevation as they extend towards the E. These mountains, except the loftier summits, are, for the most part, covered with thick forests of pine, oak, cork, white poplar, wild olive, and other trees. The inferior ranges seem to be principally composed of Secondary limestone, which, at a greater elevation, is succeeded by micaceous schist and (quartz-rock ; and the higher chains are said to consist of granite, gneiss, mica-slate, and clay-slate. The Secondary and Tertiary formations are frequently disturbed and upraised by trap-rocks of comparatively modern date. Lead iron copper, antimony, sulphur, and rock-salt occur

A TOs

ae oe ‘is the name applied to the invisible elas- Zz tic envelope which surrounds the earth, the gaseous matter of which it is composed being usually distinguished by the name of air. Storms and weather generally, solar and terrestrial radiation, the disintegration of rocks, animal and vegetable life, twilight, and the propagation of sound, are some of the more striking phenomena which are either to a large extent or altogether dependent on the atmo- sphere. That air possesses weight may be shown by the simple experiment of taking a hollow globe filled with air and weighing it; then removing the contained air by means of an air-pump, and again weighing the globe, when it will be found to weigh less than at first. The difference of the two results is the weight of the air which has been

removed. From Regnault’s experiments, 100 cubic inches of dry air, or air containing no aqueous vapour, under a pressure of 30 English inches of mercury, and at a temperature of 60° Fahr., weigh 31-:03529 grains ; and since 100 cubic inches of distilled water at the same pressure and temperature weigh 25,2521 grains, it follows that air is 813°67 times lighter than water.

Air as an elastic fluid exerts pressure upon the earth or any substance on which it rests, the action of a boy’s sucker and of a water-pump being familiar instances showing the pressure of the atmosphere. When air is removed from a water-pump, the water rises in the pump only to a certain height ; foras soon as the water has risen to such a height that the weight of the column of water in the pump above the level of the surface of the water in the well just balances the pressure exerted by the atmosphere on the surface of the well, it ceases to rise. If the pressure of the atmosphere be increased, the water will rise higher in the pump ; but if diminished, the level of the water will sink. The height to which the water rises within the pump thus varies with the pressure of the atmosphere, the height being generally about 34 feet. Since a given volume of mercury weighed 2 vacuo at a temperature of 62° Fahr. is 13-569 times heavier than the same volume of water, it follows that a column of mercury will rise in vacuo to a height 13°569 times less than a column of water, or about 30 inches. If we suppose, then, the height of the mercurial column to be 30 inches, which is probably near the average height of the barometer at sea-level, and its base equal to a square inch, it will contain 30 cubic inches of mercury ; and since one cubic inch of mercury contains 3426-7 grains, the weight of 30 cubic inches will be nearly 14-7304 tb avoirdupois. Thus the pressure of the atmosphere is generally, at least in these latitudes, at sea-level equal to 14:7304 Ib on each square inch of the earth’s surface. Sir John Herschel has calculated that the total weight of an atmosphere averaging 30 inches of pressure 1s about 112 trillions of pounds ; and that, making allowance for the Space occupied by the ads above the sea, the mass of such an atmosphere is about Tz00000 part of that of the earth itself. This enormous

frequently ; and in the Marocco portion of the range gold and silver are said to exist. In the Algerian division are mines of copper, lead, silver, and antimony. The lion, hyena, boar, and bear are common throughout the moun- tains. None of the rivers which take their rise in the sys- tem are of any great importance. The Tafilet is absorbed in the sands ; the Tensift and Draa flow into the Atlantic; and about five or six find their way to the Mediterranean. Dr Hooker has explored the botany of many parts of the range, and the travels of Roblfs have added largely to our general knowledge of it.

PHERE

pressure is exerted on the human frame in common with all objects on the earth's surface, and it is calculated that a man of the ordinary size sustains a pressure of about 14 tons ; but as the pressure is exerted equally in all direc- tions, and permeates the whole body, no inconvenience arises in consequence of it.

A pressure agreeing approximately with the average atmospheric pressure at sea-level is often used as a unit of pressure. This unit is called an atmosphere, and is employed in measuring pressures in steam-engines and boilers. The value of this unit which has been adopted, in the metrical system, is the pressure of 760 millimétres (29°922 Eng. inches) of the mercurial column at 0° C. (32° Fahr.) at Paris, which amounts in that latitude to 1-033 kilogrammes on the square centimétre. In the English System, an atmosphere is the pressure due to 29°905 inches of the mercurial column at 32° Fahr. at London, amounting there to nearly 143 Ib weight on the square inch, The latter atmosphere is thus 0:99968 of that of the metrical system.

As regards the distribution of atmospheric pressure over the globe, there was little beyond conjecture, drawn from theoretical considerations and for the most part erroneous, till the publication in 1868 of Buchan's memoir "On the Mean Pressure of the Atmosphere and the Prevailing Winds over the Globe."! By the monthly isobaric charts and copious tables which accompanied the memoir, this important physical problem was first approximately solved. Since then the British Admiralty has published charts showing the mean pressure of the atmosphere over the ocean.? The more

important general conclusions regarding the geographical distribution of atmospheric pressure are the following :—

There are two regions of high pressure, the one north and the other south of the equator, passing completely round the globe as broad belts of high pressure. They enclose between them the low pressure of tropical regions, through the centre of which runs a narrower belt of still lower pressure, towards which the north and south trades blow. The southern belt of high pressure lies nearly parallel to the equator, and is of nearly uniform breadth throughout ; but the belt north of the equator has a very irregular outline, and great differences in its breadth and in its inclination to the equator,—these irregularities being due to the uncqual distribution of land and water in the northern hemisphere. Taking a broad view of the subject, there are only three regions of low pressure,—one round each pole, bounded by or contained within the belts of high pressure just referred to, and the equatorial belt of low pressure. The most remarkable of these, in so far as yct known, is the region of low pressure surrounding the south pole, which appears to remain pretty constant

1 Trans. Roy. Soc. Edin., vol. xxv. p. 575.

® Physical Charts of the Pacific, Atlantic,and Indian Oceans, Lond.

1872.

during the whole year. ‘The depression round the north pole is divided into two distinct centres, at each of which there is a diminution of pressure greatly lower than the average north polar depression, These two centres lie in the north of the Atlantic and Pacific Oceans respectively. The distribution of pressure in the different months of the year differs widely from the annual average, particularly in January and July, the two extreme months. In January the highest pressures are over the continents of the nor- them hemisphere,—and the larger the continental mass the greater the pressure, —and the lowest pressures are over the northern portions of the Atlantic and Pacific, South America and South Africa, and the Antarctic Ocean. In the centre of Asia the mean pressure of the atmosphere in this month is

fully 30:400 inches, whercas in the North Atlantic, round Iceland, it is only 29°340 inches, or upwards of an inch lower than in Central Asia. The area of high barometer is continued westwards through Central and Southern Europe, the North Atlantic between 5° and 45° N. lat., North America, except the north and north-west, and the Pacific for some distance on either side of 15° N. lat. It is thus an exaggerated form of the high belt of annual mean pressure, spreading, however, over a much vreater breadth in North America, and a still greater breadth in Asia.

In July, on the other hand, the mean pressure of Central Asia is only 29-468 inches, or nearly an inch lower than during January ; or, putting this striking result in other words, about a thirtieth of the pressure of the atmo- sphere is removed from this region during the hottest months of the year as compared with the winter season. The lowest pressures of the northern hemisphere are now distributed over the continents, and the larger the con- tinental mass the greater is the depression. At the same time, the highest are over the ocean between 50° N. and 50° S. lat., particularly over the North Atlantic and the North Pacific between 25° and 40° N. lat., and in the southern hemisphere over the belt of high mean annual pressure, which in this month reaches its maximum height. Pressure is high in South Africa and in Australia, just as in the winter of the northern hemisphere pressures are high over the continents.

Over the ocean, if we except the higher latitudes, atmospheric pressure is more regular throughout the year than over the land. In the ocean to westwards of each of the continents there occurs at all seasons an area of high pressure, from 0°10 inch to 0°30 inch higher than what prevails on the coast westward of which it lies. The distance of these spaces of high pressure is generally about 30° of longitude ; and their longitudinal axes lie, roughly speaking, about the zones of the tropics. The maximum is reached during the winter months, and these areas of high pressure are most prominently marked west of those continents which have the greatest breadth in 30° lat.; and the steepest barometric gradients are on their eastern sides. It is scarcely possible to over-estimate the importance of these regions of high and low mean pressures, from their intimate bearing on atmospheric physics, but more par- ticularly from their vital connection with prevailing winds and the general circulation of the atmosphere. This

rela- tion will be apprehended when it is considered that winds are simply the flowing away of the air from regions where there is a surplus (regions of high pressure) to where there is a deficiency of air (regions of low pressure). Every- where over the globe this transference takes place in strict accordance with Buys-Ballot's 'Law of the Winds," which may be thus expressed :—The wind neither blows round the space of lowest pressure in circles returning on them- selves, nor does it blow directly toward that space ; but it takes a direction intermediate, approaching, however, more

nearly to the direction and course of circular curves than of radii to a centre. More exactly, the angle is not a right angle, but from 45° to 80°. Keeping this relation between wind and the distribution of pressure in mind, the isobaric lines give the proximate causes of the prevailing winds over the globe, and through these the prominent features of climates. As regards the ocean, the prevailing winds indicate the direction of the drift-currents and other sur- face-currents, and thereby the anomalous distribution of the temperature of the sea as seen in the Chili, Guinea, and other ocean currents, and the peculiarly marked climates of the coasts past which these currents flow, are explained; for observations have now proved that the prevailing winds and surface-currents of all oceansareall butabsolutely coincident.

As regards the annual march of pressure through the months of the year, curves representing it for the different regions of the earth differ from each other in every con- ceivable way. It is only when the results are sct down in their proper places on charts of the globe that the subject can be well understood. When thus dealt with, many of the results are characterised by great beauty and simplicity. Thus, of all influences which determine the barometric fluctuation through the months, the most impor- tant are the temperature, and through the temperature the humidity. Comparing, then, the average pressure in January with that in July, which two months give the greatest possible contrasts of temperature, the following is the broad result :—

The January exceeds the July pressure over the whole of Asia except Kamtchatka and the extreme north-east, the greatest excess being near the centre of the continent ; over Europe to south and east of a line drawn from

the White Sea south-westward to the Naze, thence southward to the mouth of the Weser, then to Tours, Bordeaux, and after passing through the north of Spain, out to sea at Corufia ; over North America, except the north-east and north-west. On the other hand, the July exceeds the January pressure gencrally over the whole of the southern hemisphere, over the northern part of the North Atlantic and regions immediately adjoining (the excess amounting in Iceland to 0°397 inch), and over the northern part of the North Pacific and surrounding regions. Thus the pres- sure which is so largely removed from the Old and New Continents of the northern hemisphere in July is trans- ferred, partly to the southern hemisphere, and partly to the northern portions of the Atlantic and Pacific Occans.

Atmospheric pressure is more uniformly distributed over the globe in April and October than in any of the other months. In May and November, being the months immediately following, occur the great annual rise and fall of temperature ; and since these rapid changes take place at very different rates, according to the relative distribution of land and water in each region, a comparison of the geographical distribution of May with that for the year brings out in strong relief the more prominent causes which influence climate, and some of the morc striking results of these causes. This comparison shows a diminu- tion of pressure in May over tropical and sub-tropical regions, including nearly the whole of Asia, the southern half of Europe, and the United States. An excess prevails over North America to the north of the Lakes, over Arctic America, Greenland, the British Isles, and to the north of a line passing through the English Channel in a north-easterly direction to the Arctic Sea. The excess in the southern hemisphere includes the southern half of south America and of Africa, the whole of Australia, and adjacent parts of the ocean, The influence of the land of the southern hemisphere, which in this month is colder than the surrounding seas, brings about an excess of pressure ; on the other hand, the influence of land over those regions

which are more immediately under the sun brings about a lower pressure, interesting examples of which occur in India, the Malayan Archipelago, and the Mediterranean, Black, and Caspian Seas. In many cases the lines of

pressure follow more or less closely the contours of the coasts. Thus the diminution is greater over Italy and Turkey than over the Adriatic and Black Seas. The greatest diminution occurs in Central Asia, where it exceeds 0200 inch, and the greatest excess round Iceland, where it exceeds 0°200 inch. It is to the position of Great Britain, with reference to the deficiency of pressure on the one hand and the excess on the other, that the general prevalence of east winds at this season is due. These easterly winds prevail over the whole of Northern Europe, as far south as a line drawn from Madrid and passing in a north-easterly direction through Geneva, Munich, &c. To the south of this line the diminution of pressure is less, and over this region the winds which are in excess are not easterly, but southerly. Crossing the Mediterranean, and advancing on Africa, we approach another region of lower pressure, towards which easterly and north-easterly winds again acquire the ascendency, as at Malta, Algeria, &c.

This, in many cases great, variation of the pressure in the different months of the year must be kept carefully in view in deducing heights of places from observations nade by travellers of the pressure of atmosphere, by the barometer or the temperature of boiling water. In reducing the observations, it is necessary to assume a sea- level pressure if the place is at a considerable distance from any meteorological observatory. Previous to the publica- tion of Buchan's Mean Pressure of the Atmosphere, it appears that a mean sea-level pressure of 29°92 or 30-00 inches was in such cases universally assumed. The mean pressure at Barnaul, Siberia, being 29°536 inches in July, 30°293 inches in January, and 29-954 inches for the year, it follows that, by the former method of calculating the heights, observations made in January to ascertain the height of Lake Balkash would make the lake 350 feet too high, and observations made in July would make it 330 feet too low,—the difference of the two observations, each set being supposed to be made under the most favourable circumstances, and with the greatest accuracy, being 680 feet. This illustration will serve to account for many of the discrepancies met with in books regarding the heights of mountains and plateaus

Of the periodical variations of atmospheric pressure, the most marked is the daily variation, which in tropical and sub-tropical regions is one of the most regular of recurring phenomena. In higher latitudes the diurnal oscillation is

masked by the frequent fluctuations to which the pressure is subjected. If, however, hourly observations be regularly made for some time, the hourly oscillation will become apparent. The results show two maxima occurring from 9 to 1] a.m. and 9 toll p.m, and two minima occurring from 3 to 6 a.m. and 3 to6 p.m. The following are the ex- treme variations for January, April, July, and October from the daily mean pressure at Calcutta, deduced from the observations made during six years, viz., 1857-62 :—

A.M. P.M.

Hour.| Max. |Ifour.)| Min. |Hour.| Max. |Hour.

Inch. — 053 -— 071 —°051 — ‘047

Inch, +°010; 10 +°016] 10 +°029| 10 +°018] 10

3 |+°040 3 aie

Similarly the maxima and minima at Vienna, with the hour of their occurrence, are as follows :

ATMOSPHERE

A.M. Min. |Hour.| Max. |Hour.|| Min. |Hour.| Max. |Hour. Inch. Inch. Inch. Inch. lm January ….. — 008) 6 |+°018|] 10 ||—-020}) 3 |+-012) 10 April ‘ 1-003] 5 |+°021|°10 |]-—°027| 5 |4+°014} 11 July Seen Soe +°003} 8 |+ °022} 9 |-—“028|) 5 |4+:009) LI October …..)-°010] 6 |+°020) 10 |}-°015| 4 |+°008] 10

These two illustrations may be regarded as typical, to a large extent, of the diurnal barometric oscillations in tropical and temperate regions. At Calcutta the amounts are large, and the dates of the occurrence of the maxima and minima very regular from 3 to 4 and 9 to 10 a.m. and P.M. respectively. On the other hand, the oscillations at Vienna are much smaller and more variable in amount, and the dates of occurrence of the critical phases take place through a wider interval, viz., from 3 to 6 and 9 to 11 A.M, and P.M. respectively.

Though the diurnal barometric oscillations are among the best-marked of meteorological phenomena, at least in tropical and sub-tropical regions, yet none of these pheno- mena, except perhaps the electrical, could be named respecting whose geographical distribution so little is really known, whether as regards the amount of variation, the hour of occurrence of the critical phases, or, particularly, the physical causes on which the observed differences de- pend. This arises chiefly from the want of a sufficient number of ascertained facts ; and to remedy this deficiency, observations have, in the preparation of this present article, been collected and calculated from upwards of 250 places in different parts of the globe, and the data set down on charts. The chief results of this inquiry are the following, attention being entirely confined to the chief oscillation, viz., that occurring from the A.M. maximum to the P.M. minimum.

The a.m, Maximum.—In January this occurs from 9 to 10 in tropical and temperate regions as far as 50° N. lat.; in higher latitudes the time of occurrence varies from 8 A.M. to noon. In July it occurs from 9 to 10 everywhere onl as far as about 40° N. lat.; the time at Tiflis (41° 42’ N. lat.) being between 7 and 8 a.m. In higher latitudes the time varies from 8 to 11 a.m., the last hour being general in north-western Europe.

The e.m. Minimum.-—In January this occurs from 3 to 4 p.m. nearly everywhere over the globe, a few exceptions occurring in north-western Europe, the extremes being 2 p.m. at Utrecht and 6 p.m. at St Petersburg. It is quite different in July, when the time from 3 to 4 P.M. is regu- larly kept as far north as about 40° N. lat. In higher latitudes the hour is very generally 5, but at some places it is as early as 4 P.M., and at others as late as 6 P.M.

In the northern hemisphere, in summer, the afternoon minimum falls to a greater extent below the mean of the day than the forenoon maximum rises above it, at 82 per cent, of the stations; but in winter the percentage is only 61. In the southern hemisphere the same relation is observed in the summer and winter months, thus showing that in the summer of both hemispheres the influence of the sun tends to lower the minimum at 3 to 4 P.M. to a greater extent than to raise the 9 to 10 A.M. maximum.

Decrease between Morning Maximum and Afternoon Minimum.— -Of the four daily oscillations, this is the most important. When the amounts at

different places are entered on charts of the globe, it is seen that the amplitude of this fluctuation is, speaking generally, greatest in the tropics, diminishing as we advance into higher latitudes; greater over the land than over the sea, increasing greatly on proceeding inland; nearly always greater with a dry than with a moist atmosphere; and generally, but by no means always, it is greatest in the month of highest

temperature and greatest dryness combined. The regions of largest amplitude include the East India Islands, Eastern Peninsula, India, Arabia, tropical Africa, and tropical South and Central America, where it either closely approaches or exceeds 0°100 inch. At Silchar, in Assam, it is 0°133 inch, In the tropical parts of the ocean the oscillation is from 0-020 to 0-030 inch less thanon land. The influence

of the Mediterranean Sea in lessening the amount over all.

regions bordering it is very strongly marked. The line showing an oscillation of 0050 inch crosses North America about lat. 44°, curves southward at some distance from the east coast to lat. 23°, then north-eastward along the coast of Africa, passes eastwards near the north coast of that continent, thence strikes northwards, cutting the eastern part of the Black Sea, and eastward across the Caspian to a point to northward of Peking, and then bends southward to the Loo Choo Islands. ‘The line of 0-020 inch cuts the N.W. of Spain and N.W. of France, and runs northward through Great Britain as far as the Tweed, thence to Christiania, then southwards to Copenhagen and to Cracow, the latitude of which it follows eastward through Asia.

The more marked seasonal changes are these:—In India the oscillations during the dry and wet seasons, or in January and July, respectively, are—Bombay, 0:120 and 0-067 inch; Poonah, 0°133 and 6-059 inch ; and Calcutta, 0132 and 0-091 inch, At Madras, where the rain-bringing characters of the monsoons are reversed, the numbers are 0-114 and 0°115 inch, and at Roorkee, where rain falls all the year round, 0°088 and 0:079. Again, at Aden, in Arabia, where the weather of July is peculiarly hot and dry, the oscillation in December is 0:106, but in July it rises to 0°137 inch.

The point to be insisted on here is, that, whatever be the cause or causes to which the daily barometric oscillation is due, the absolute amount is largely dependent on comparatively local influences.

While illustrations similar to the above may be adduced from many other parts of the globe, showing the influence in the same direction of prevailing dry or wet, hot or cold seasons on the amplitude of the oscillation, the North Atlantic and regions adjoining present an apparent excep- tion to the law which seems to be indicated by these results. ‘The whole of the North Atlantic, particularly north of lat. 20°, and the sea-boards which bound it, to which the Mediterranean and its immediate sea-board may be added, are strikingly characterised by a small summer oscillation; and this diminution is most strongly marked along the eastern part of the ocean. Thus, in July, at Ponta Delgada, in the Azores, the oscillation is only 0°06 inch ; at Angra do Heroisma, also in the Azores, 0°010 inch; at Funchal, Madeira, 0011 inch; at Oporto, 0-018; Lisbon, 0-030; and Lagos, 0:021 ; at Naples and Palermo, 0008 ; and at Malta, 0°020 inch. Now, with reference to this extensive region, it is to be noted that the rainfall of July is either zero or very small; and yet with this dry state of the atmosphere and high temperature (the annual maxi- mum occurring at the time), this oscillation is extraor- dinarily diminished, being exactly the reverse of what takes place during the dry and wet seasons in India. The diminution on the western half of the Atlantic, though not so great, is also striking, the January and July oscilla- tions being 0°056 and 0036 inch in Barbadoes, 0°080 and 0°056 at Jamaica, 0°082 and 0°054 at Havanna, 0:053 and 0-024 in the Bahamas, and 0:054 and 0-022 in Bermuda. Over the whole of the region here indicated the rainfall of July is largely. in excess of that of January. The apparently exceptional character of this region is pro- bably due to the circumstance, that at this time of the year the sun’s rays fall perpendicularly over a more diversified surface of the earth, that is, on a greater extent of land, than at any other season. At this time the Mediterranean,

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which is completely shut in by land, and the Atlantic, which is bounded by two great continents, show a much smaller oscillation than prevails over the land adjoining them, and the lines of equal oscillation now attain their

annual maximum. On the other hand, in January, when the sun's rays fall perpendicularly over the most uniform surface, or over the maximum extent of ocean, the lines are almost everywhere parallel with the parallels of latitude.

Again, on advancing inland from the Atlantic, the effects of comparatively local influences are very striking, as the following mean July oscillations, from places situated in lines running in different directions, show :—Dublin, 0°012; Oxford, 0-022; Ostend, 0-009 ; Brussels, 0:019; Vienna, 0-049 ; Odessa, 0024; and Tiflis, 0:077 : Limerick, 0°010; Helston, 0:007 ; Paris, 0°020; Geneva, 0:045 ; Turin, 0°052 ; Rome, 0:036 ; Palermo, 0:008 ; and Malta, 0-020. But the most remarkable illustration is the following, the places being all situated between 38° and 49° N. lat. : San Francisco, 0:068; Fort Churchhill, 0-091; Washington, 0°063; Angra do Heroisma, 0:006; Lisbon, 0-030; Campo Maior, 0°054; Palermo, 0°008 ; Tiflis, 0-077 ; and Peking, 0-060.

It follows from what has been stated that much which has been written regarding these fluctuations, and in ex- planation of them, does not rest on facts; and nearly everything yet requires to be done in the way of collect-ing data towards the representation and explanation of the daily oscillations of atmospheric pressure which are, as regards two-thirds of the globe, perhaps, as already stated, the most regular of recurring phenomena, and an explanation of which cannot but throw much light on many of the more important and difficult problems of the atmosphere. The data chiefly required are—barometric data from which the amplitude of the four daily oscillations can be represented in their distribution and times of occurrence for each of the months; temperature data, com- parable inter se, from which the diurnal march of tempera- ture for each month can be ascertained ; hygrometric data for hourly values; rain data also for the hours; wind observations conducted on a satisfactory and uniform plan ; together with magnetic and electrical observations. It is singularly unfortunate that the disposition of meteorologists of recent years has been to recommend as hours of observa- tions for places which observe only twice or thrice daily, hours which do not correspond with the times when the great barometric and thermometric daily phases occur ; hence these phases cannot be noted

except at the great observatories, which are too few and far apart to give sufficient data for the proper discussion of many of those questions.

Since the two maxima of daily pressure occur when the temperature is about the mean of the day, and the two minima when it is at its highest and lowest respectively, there is thus suggested a connection between the daily barometric oscillations and the daily march of temperature; and similarly a connection with the daily march of the amount of vapour and humidity of the air. The view enter- tained by many of the causes of the daily oscillations may be thus stated :—The forenoon maximum is conceived to be due to the rapidly increasing temperature, and the rapid evaporation owing to the great dryness of the air at this time of the day, and to the increased elasticity of the lowermost stratum of air which results therefrom, until a steady ascending current has set in. As the day advances, the vapour becomes more equally diffused upwards through the air, an ascending current, more or less strong and steady, is set in motion, a diminution of elasticity follows, and the pressure falls to the afternoon minimum. From this point the temperature declines, a system of descending currents set in, and the air of the lowermost stratum

approaches more nearly the point of saturation, and from the increased elasticity, the pressure rises to the evening maximum. As the deposition of dew proceeds, and the fall of temperature and consequent downward movement of the air are arrested, the elasticity is again diminished, and pressure falls to the morning minimum. Since the view propounded some years ago, that if the elastic force of vapour be sub- tracted from the whole pressure, what remains will show only one daily maximum and minimum, has not been con- firmed by observation, it follows that the above explanation is quite insufficient to account for the phenomena ; indeed, the view can be regarded in no other light than simply as a tentative hypothesis.

Singularly enough, Lamont and Broun, a few years ago, were led, independently of each other, to form an opinion that the daily barometric oscillations were due to the magneto-electric influence of thesun. It admits of no doubt, looking at the facts of the case so far as they have been disclosed, that the daily barometric oscillations originate with the sun, and

that more than the sun’s influence as exerted on the diurnal march of the tempera- ture and humidity of the atmosphere is concerned in bringing them about. But from the facts adduced, it is equally certain that, be the originating cause what it may, its effects are enormously modified by the distribution of land and water over the globe, by the wind, and by the absolute and relative humidity of the atmosphere. The smallness of the amount of the summer oscillation from the forenoon maximum to the afternoon minimum over the North Atlantic as far south as lat. 30°, and its diminished amount, as far south at least as the equator, will no doubt play an important part in the unravelling of this difficulty.

One of the most important steps that could be taken would be an extensive series of observations from such countries as India, which offers such splendid contrasts of climate at all seasons, has a surface covered at one place with the richest vegetation, and at others with vast stretches of sandy deserts, and presents extensive plateaus and sharp ascending peaks—all which conditions are indis- pensable in collecting the data required for the solution of this vital problem of atmospheric physics.

The ancients thought that air was one of the four elements from which all things originated, and this doctrine continued to prevail till 1774, when Priestley discovered oxygen gas, and showed it to be a constituent part of air. Nitrogen, the other constituent of air, first called azote, was discovered soon after, and the marked differences between these two gases could not fail to strike the most careless observer. It is remarkable that Scheele independently discovered both oxygen and nitrogen, and was the first to enunciate the opinion that air consists essentially of a mixture of these two gases. From experiments made by him to ascer- tain their relative volumes he concluded that the propor- tions are 27 volumes of oxygen and 73 volumes of nitrogen. Tt was left to Cavendish to show from 500 analyses that che relative proportions were practically constant, and that the proportion is 20°833 per cent. of oxygen. The results obtained by Cavendish, though not attended to for many years after they were published, have been shown by recent and more refined analyses to be wonderfully exact. The most recent analyses of specimens of air collected under circumstances which ensure that it is of average purity, give as a mean result the following :—

Volume. Oey ee Mila o. saacnes See eee 20°96 per cent. UNV EMGEM GHA oe. csscnvlinoces ice ees 79°00 ~ @anbooie agid ….....ccsc..00.0000 0:04 _

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The circumstances under which these proportions vary,

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and the other gases and substances which are found in the air, will be afterwards adverted to.

Besides these three constituents of air, there is a fourth, viz., the vapour of water, from which no air, even at the lowest temperatures yet observed, is wholly free, so that absolutely dry air does not exist in the free atmosphere. The dry air of the atmosphere—oxygen (inclusive of ozone), nitrogen, and carbonic acid—is always a gas, and its quantity is constant from year to year; but the vapour of water does not always remain in the gaseous state, and the quantity present in the atmosphere is, by the processes of evaporation and condensation, varying every instant. Water evaporates at all temperatures, even the lowest, and rises into the air in the form of an invisible elastic gas called aqueous vapour. The elasticity of vapour varies with the temperature. At 0° Fahr. it is capable of sustaining a pres- sure equal to 0:044 inch of the mercurial barometer, as calcu- lated from Regnault's experiments; at 32° (freezing), 0°181 inch; at 60°, 0°18 inch; at 80°, 1023 inch; and a 100°, 1918 inch, being nearly +!; the average pressure of the atmosphere.

In investigating the hygrometry of the atmosphere, the chief points to be ascertained are—(1), the temperature of the air; (2), the dew-point; (3), the elastic force of vapour, or the amount of barometric pressure due to the vapour present ; (4), the quantity of vapour in, say, a cubic foot of air; (5), the additional vapour required to saturate a cubic foot of air; (6), the relative humidity; and (7), the weight of a cubic foot of air at the pressure at the time of obser- vation, The vapour of the atmosphere is observed by means of the hygrometer (see HyGroMETER), of which it is only necessary here to refer to Regnauilt's as the most exact, and August's as the most

convenient, and, consequently, the one in most general use. August's hygrometer consists of a dry and a wet bulb, with which are observed the tempera- ture of the air and the temperature of evaporation. Of these two observed data, the formula of reduction, as deduced from Apjohu's investigations, is as follows :—Let F be the elastic force of saturated vapour at the dew-point, J the elastic force at the temperature of evaporation, d the difference between the dry and wet bulb, and 6 the barometric pressure, then

b

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when the reading of the wet bulb is above 32°; and qd 2

Me when below it. From Reguault's values of the elastic force of vapour, f is found, and d and 6 being observed, F is calculated.. From F the dew-point is found. In calculat- ing relative humidity, saturation is usually assumed to be 100, perfectly dry air0. The humidity is found by divid- ing the elastic force at the dew-point by the elastic force at the temperature of the air, and multiplying the quotient by 100.

The elastic force may be regarded as representing approximately the absolute quantity of vapour suspended in the air, It may be termed the absolute humidity of the atmosphere. Since the chief disturbing influences at work in the atmosphere are the forces called into play by its aqueous vapour, a knowledge of the geographical distri- bution of this constituent through the months of the year is of the utmost possible importance. Hence every effort ought to be made to place the observation of the hygrometry of the air, and the reduction of the observed data, on a sounder basis than has yet been done. As regards geogra- phical distribution, the elastic force is greatest within the tropics, and diminishes towards the poles: it is greater over

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the ocean, and decreases on advancing inland; greater in summer than in winter; and greater at midday than in the morning. It diminishes with the height generally ; but in particular cases, different strata are superimposed on each other, differing widely as regards dryness and humidity, and the transitions from the one to the other are often sharp and sudden.

The relative humidity of the air may be regarded as the degree of approach to saturation. It is greatest near the surface of the earth during night, when the temperature, being at or near the daily minimum, approaches the dew-point; it is also great in the morning, when the sun's rays have evaporated the dew, and the vapour is as yet only diffused a little way upwards ; and it is least during the greatest heat of the day.

Between the humidity, both absolute and relative, of the air and the temperature there is a vital and all-important connection. Observation shows that when the quantity of

_ vapour in the air is great, and also when the relative

humidity is high, temperature falls little during the night, even though the sky be perfectly clear; but when the quantity of vapour is small, or the relative humidity is low, temperature rapidly falls. On the other hand, during the day the temperature rises slowly, when the quantity of vapour is great, or relative humidity high, even though the sky be clear, but when the quantity of vapour is small, and humidity low, temperature rapidly rises. These facts are explained by the circumstance that perfectly dry air is diathermanous, that is, it allows radiant heat to pass through it without being sensibly warmed thereby. Add vapour to this air, and its diathermancy is diminished. The dia- thermancy is also reduced if the temperature approach nearer to the dew-point; in other words, if the relative humidity be increased. Hence, with an increase of vapour or with increased humidity, the effects of both solar and terrestrial radiation are much less felt on the surface of the earth—the vapour screen performing, in truth, one of the most important conservative functions of the atmosphere.

Since ascending currents fall in temperature as they ascend, through diminished pressure and consequent dilata- tion, they increase their relative humidity; and since descending currents increase in temperature, and conse- quently reduce their relative humidity, it follows that, over a region from which ascending currents rise, solar and terrestrial radiation is very considerably obstructed, but over a region upon which currents descend, radiation is much less obstructed. Most of our exceptionally hot summer and cold winter weather is to be explained in this way, on which occasions there is generally observed a high barometric pressure overspreading a comparatively limited region, on which a slow downward movement of the air proceeds.

Of the solar heat which reaches the surface of the globe, that part which falls on the land may be regarded as wholly absorbed by the thin superficial layer exposed

tothe heating rays; and since there is no mobility in

the particles of the land, the heat can be communicated downwards only by conduction. On the other hand, the solar heat which falls on water is not, as in the case of land, arrested at the surface, but penetrates to a con- siderable depth, the heating effect being in the case of clear water appreciably felt at a depth of from 500 to 600 feet. Since the heat daily received by the ocean from the sun is diffused downwards through a very considerable depth, the surface of the ocean on which the atmosphere rests is much less heated during the day than is the surface of the land. Similarly it is also less cooled during the night by terrestrial radiation.

This points to a chief acting force on which the great movements of the atmosphere depend, viz., simultaneous

local irregularities in the distribution of temperature in the atmosphere. The local expansion of the atmosphere by heat during the day is greatest over land, where the air is clear, dry, and comparatively calm, and least over the ocean, where the sky is clouded, and the air loaded with moisture. On the other hand, the local contraction by cold during night is greatest over land,

whcre the air is clear, dry, and calm, or nearly so, and least over the ocean, where the air is clouded, and loaded with moisture. As familiar illustrations of atmospheric movements result- ing from local expansions by heat and contractions by cold, we may refer to the land and sea breezes, and what de- pend upon exactly the same principle, the dry and rainy monsoons in different parts of the globe. But the illustra- tion of the principle on the broadest scale is the system of atmospheric circulation known as the equatorial and polar currents of the atmosphere, which originate in the unequal heating by the sun of the equatorial, temperate, and polar regions,

The other principal motive force in atmospheric circula- tion depends on the aqueous vapour. The many ways in which this element acts as a motive force will be seen when it is considered that a large quantity of sensible heat disappears in the process of evaporation, and reappears in the process of condensation of the vapour into rain or cloud ; that saturated air is specifically lighter than dry air; and that the absolute and relative amount of the vapour powerfully influences both solar and terrestrial radiation. ‘The question to be carefully considered here is, how in these ways the vapour produces local irregularities in the distribution of atmospheric pressure, thus giving rise to acrial movements which set in to restore the equili- brium that has thus been disturbed.

It is from these local irregularities—using the word local in a very wide sense—in the distribution of atmos- pheric pressure, whether the irregularities originate in the temperature or aqueous vapour, that all winds, from the lightest breeze to the most destructive hurricane, take their rise; for, as already stated, wind is merely the flowing away of the air from where there is a surplus of it to where there is a deficiency.

In examining weather charts embracing a considerable portion of the earth’s surface, such, for instance, as those published in the Journal of the Scottish Meteorological Society, vol. ii. p. 198, which include a large part of the northern hemisphere, there are seen two different systems of pressure changing their forms and positions on the globe from day to day—one set being systems of low pressure marked off by concentric isobarics enclosing pressures successively lower as the central space is approached, and the other set being systems of high pressure marked off by roughly concentric

isobarics bounding pressures succes- sively higher towards their centres. These two systems are essentially distinct from each other, and without some knowledge of them the circulation of the atmosphere can- not be understood.

1. Areas of Low Pressure, or Cyclones.—The annexed woodcut, fig. 1, is a good representation of a cyclone which passed over north-western Europe on the morning of 2d November 1863, The pressure in the central space is 28-9 inches, from which it rises successively, as shown by the isobarics, to 29-1, 29°3, 29°5, 29-7, and 29-9 inches. The arrows show the direction and force of the wind, the force rising with the number of feathers on the arrows. The two chief points to be noted are the following :—(1.) The direction of the arrows shows a vorticose motion of the air inwards upon the space of lowest pressure, the motion being contrary to that of the hands of a watch. It will be observed that the winds blow in conformity with what is known as Buys-Ballot's 'Law of the Winds," already

referred to, but which may be otherwise thus put :—Stand with your back to the wind, and the lowest barometer, or centre of depression, will be to your left in the northern hemisphere (in the southern hemisphere to the right) ; this rule holds universally. (2.) The force of the wind is proportional to the barometric gradient, or the quotient of the dis- tance between two places stated in miles by the. difference of pressure stated in inches of mercury as observed at the two places. Hence, in the Channel, where the isobarics are close together, winds are high, but in the north of Scotland, where the isobarics are far apart, winds are light. This rule also holds uni- versally, though the exact relation requires still to be worked out by observa- tion. As regards the important climatic elements of tem- perature and moisture, the air in the 8.S.E. half of the cyclone is mild and humid, and much rain falls ; but in the other half it is cold and dry, and little rain falls. A succession of low pressures passing eastward, in a course lying to northwards of Great Britain, is the characteristic of an open winter in Great Britain; on the other hand, if the cyclones follow a course lying to the southward, the winters are

severe. This is a chief point of climatic impor- tance connected with the propagation eastward of these cyclonic areas.

2. Areas of High Pressures, or Anticyclones—The accom-

Fia, 1.— Weather chart, showing cyclone,

Fig. 2.—Weather chart, showing anticyclone.

panying weather chart, fig. 2, for 24th August 1868, represents an anticylone or region of high pressure, which

overspread the greater part of Europe at that time. Here the highest pressure is in the centre of the system, and, as usually happens, the isobarics are less symmetrical than those near the centre of a cyclone. The winds, as usual in anticyclones, are light; this, however, is the essential point of difference—the winds do not flow inwards upon the centre, but outwards from the region of high pressure ; and it will be observed that in many cases they cut the isobarics at nearly right angles. Another important point of difference is in the air over the region covered by the anticyclone being, particularly in its central portion, very dry, and either clear or nearly free from clouds.

Climatically, the significance of the anticyclone consists in the space covered for the time by it being, on account of its dryness and clearness, more fully under the influence of both solar and terrestrial radiation ; and consequently in winter it is accompanied with great cold, and in summer with great heat. As shown by Buchan, in reviewing the weather of north-western Europe for 1868,! the intense heat which prevailed in Great Britain during 2~4th August of that year was due to the high barometric pressure accompanying this anticyclone, the comparative calmness of the atmosphere, the clearness of the sky, the dryness of the air, and the strong insolation which took place under these circumstances.

Thus, then, the tendency of the winds on the surface of the earth is to blow round and in upon the space where pressures are low and out of the space where pressures are high. Now, since vast volumes of air are in this way

poured into the space where pressure is low, without increasing that pressure, and, on the other hand, vast volumes flow out of the space where pressure is high, without diminishing that pressure, it necessarily follows that the air poured in is not allowed to accumulate over this space, but must escape into other regions ; and also that the air which flows out from the anticyclonic region must have its place supplied by fresh accessions from above. In other words, the central space of the cyclone is occupied by a vast ascending current, which after rising to a con- siderable height flows away as upper currents into sur- rounding regions ; and the central space of the anticyclone is filled by a slowly descending current, which is fed from upper currents, blowing towards it from neighbouring regions. When the area of observation is made sufficiently wide, cyclones are seen to have one, or sometimes more, anticyclones in proximity to them, the better marked anticyclones having two, and sometimes more, cyclones in their vicinity. In fig. 2, a part of a cyclone in Iceland is seen, and another cyclone in the Crimea accompanied the anticyclone there figured. Hence the cyclone and the anticyclone are properly to be regarded as counterparts, belonging to one and the same great atmospheric disturb- ance.

From this it follows that observations of the winds cannot be conducted, and the results discussed, on the supposition that the general movement of the winds felt on the earth’s surface is horizontal, it being evident that the circulation of the atmosphere is effected largely through systems of ascending and descending currents. The only satisfactory way of discussing the winds, viewed especially in their climatic relations, is that recently proposed by Képpen of St Petersburg, and applied by him with very fruitful results in investigating the weather of that place during 1872 and 1873. In attempting an explanation of these phenomena, we are met with several as yet insuper- able obstacles :—(1.) An imperfect knowledge of the mode

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1 Atlas Metéorologique de U Observatoire Impérial, Année 1868. Dp: 89:

of formation and propagation of low-pressure systems; (2.) Imperfect knowledge of the relations of the formation of cloud and aqueous

precipitation to barometric fluctuations; (3.) A want of information with reference to the merely mechanical effects of ascending, descending, and horizontal currents of air on the barometric pressure ; in other words, we do not know how far the barometric pressure is an indication of the mass of air in the column vertically over it, when that column is traversed by air-currents; (4.) An almost total absence of really good wind observations ; and (5.) Deficient information in nearly everything that respects aqueous vapour—its relation to radiant heat, both solar and terrestrial ; its mode of diffusion vertically and horizontally in the free atmosphere, especially from an evaporating surface ; the influence which its condensation into cloud and rain exerts on aerial currents,—in regard to all which more satisfactory methods of observing this vital element, and discussing the results of observation, are greatly to be desired. There are here large important

. fields of inquiry awaiting experimental and observational

physicists.

The law of the dilatation of gases, known as the “Law of Boyle” or ‘Law of Mariotte,” is this: The volume occupied by a gas is in inverse ratio to the pressure under which it exists, if the temperature remains the same; or the density of a gas is proportioned to its pressure. Consequently, air under a pressure equal to that of two atmospheres will occupy only half the volume it occupied under the pressure of one atmosphere ; under the pressure of three atmospheres, one- third of that volume, &c. By doubling the pressure we double the elasticity. If, however, the temperature be increased, and the air occupy the same space, the pressure will be increased ; but if the pressure is to remain the same, the air must occupy a larger space. From Regnault’s experiments, it is concluded that the co-efficient which denotes increase of elasticity for 1° Fahr. of air whose volume is constant equals ‘002036; and that the co- efficient which denotes increase of volume for 1° Fahr. of air whose elasticity is constant equals (002039.

Those portions of the atmosphere in contact with the earth are pressed upon byall the air above them. The air at the top of a mountain is pressed upon by all the air above it, while all the portion below it, or lying between the top of the mountain and the surface of the sea, exerts no pressure whatever upon it. Thus the pressure of the atmosphere constantly diminishes with the

height. If, then, the pressure of the atmosphere at two heights be observed, and if at the same time the mean temperature and humidity of the whole stratum of air lying between the two levels were known, the difference in height between the two places could be calculated. For the development of this principle, see BaromMEeTRid MaASUREMENTS OF HEIGHTS.

The air thus diminishing in density as we ascend, if it consists of ultiniate atoms, as is no doubt the case, it follows that the limit of the atmosphere will be reached at the height where the force of gravity downwards upon a single particle is equal to the resisting force arising from the repulsive force of the particles. It was long supposed, from the results of observations on the refraction of light, that the height of the atmosphere did not exceed 45 miles ; but from the observations of luminous meteors, whose true character as cosmical bodies was established a few years ago, it is inferred that the height of the atmosphere is at least 120 miles, and that, in an extremely attenuated form, it may even reach 200 miles.

Though there are considerable differences in the specific gravities of the four constituent gases of the atmosphere, viz., oxygen, nitrogen, carbonic acid gas, and aqueous vapour, there is yet no tendency to separation among them,

owing to the law of diffusion obtaining among elastic fluids mixed together. While the proportion of these gases is in a general sense constant, there are, however, consistent differences in the amounts of oxygen and nitrogen in the air of unwholesome places, as first shown by Regnault. The following figures, showing the volume per cent. of oxygen, rest on the authority of Dr Angus Smith, who has given much attention to this subject :—Sea-shore of Scot- land and Atlantic (lat. 43° 5’ N., long. 17° 12’ W.), 20°99 ; tops of Scottish hills, 20°98; in sitting-room feeling close but not excessively so, 20°89 ; backs of houses and closets, 20°70; under shafts in metalliferous mines, 20°424 ; when candles go out, 18°50; when itis very difficult to remain in the air many minutes, 17:20. The variations in the amounts of carbonic acid in different situations are great ; thus—in the London parks it is 0301; on the Thames, ‘0343; where fields begin, ‘0369 ; in London streets in summer, ‘0380 ; during fogs in Manchester, ‘0679 ; in workshops

it rises to ‘3000, and in the worst parts of theatres to ‘3200; and the largest amount, found in Cornwall mines, is 25000.

Great differences have been observed by Dr A. Smith between country rain and town rain: country rain is neutral; town rain, on the other hand, is acid, and cor- rodes metals and even stones and bricks, destroying mortar rapidly, and readily spoiling many colours. Much infor- mation has been obtained regarding impurities.in the air of towns and other places by examining the rain collected in different places. The air freest from impurities is that collected at the sea-coast and at considerable heights. Again, ammonia is found to diminish, while nitric acid increases, in ascending to, at least, habitable heights. As regards organic matter in the air, it corresponds to a con- siderable extent with the density of the population. As might have been supposed from the higher temperature, more nitric acid is contained in rain collected on the Continent than in the British Islands. Thisinquiry, which is only yet in its infancy, will doubtless continue to be vigorously prosecuted, particularly since we inay hope thereby to arrive at the means of authoritatively defining the safe limits of the density of population, and the extent to which manufactures may be carried on within a given area. The influence of atmospheric impurities on the public health has received a good deal of attention.

The relation of weather to mortality is a very important inquiry, and though a good deal has been known regarding the question for some time, yet it has only recently been systematically inquired into by Dr Arthur Mitchell and Mr Buchan, the results of the investigation which deals with the mortality of London being published in the Journal of the Scottish Meteorological Society (New Series, Nos, 43 to 46). Considering the weather of the year as made up of several distinct climates differing from each other according to temperature and moisture and their relations to each other, it may be divided into six distinct climates, characterised respectively by cold, cold with dry- ness, dryness with heat, heat, heat with moisture, and cold with moisture. Each of these six periods has a peculiar influence in increasing or diminishing the mortality, and each has its own group of diseases which rise to the maxi- mum, or fall to the minimum mortality, or are subject to a rapid increase or a rapid decrease. The mortality from all causes and at all ages shows a large excess above the average from the middle of November to the

middle of April, from which it falls to the minimum in the end of May ; it then slowly rises, and on the third week of July suddenly shoots up almost as high as the winter maximum of the year, at which it remains till the second week of August, falling thence as rapidly as it rose to a secondary minimum in October. Regarding the summer excess, which is so abrupt in its rise and fall, itis almost altogether

due to the enormous increase of the mortality among mere infants under one year of age; and this increase is due not only to deaths at one age, but to deaths from one class of diseases, viz., bowel complaints. If the deaths from bowel complaints be deducted from the deaths from all causes, there remains an excess of deaths in the cold months, and a deficiency in the warm months. In other words, the curve of mortality is regulated by the large number of deaths from diseases of the respiratory organs. The curve of mortality for London, if mere infants be excepted, has thus an inverse relation to the temperature, rising as the temperature falls, and falling as the tempera- ture rises. On the other hand, in Victoria, Australia, where the summers are hotter and the winters milder, the curves of mortality and temperature are directly related to each other—mortality and temperature rising and falling

ATMOSPHERIC RAILWAY, a railway in which the pressure of air is used directly or indirectly to propel car- riages, as a substitute for steam. It was devised at a time when the principles of propulsion were not so well under- stood as they are now, and when the dangers and inconveni- ences attendant on the use of locomotives were very much exaggerated, It had been long known that small objects could be propelled for great distances through tubes by air pressure, but a Mr Vallance, of Brighton, seems to have been the first to propose the application of this system to passenger traffic. He projected (about 1825) an atmospheric railway, consisting of a wooden tube about 6 feet 6 inches in diameter, with a carriage running inside it. A diaphragm fitting the tube, approximately air-tight, was attached to the carriage, and the air exhausted from the front of it by a stationary engine, so that the atmospheric pressure behind drove the carriage forward. Later inventors, commencing with Henry Pinkus (1835), for the most part kept

the carriages altogether outside the tube, and connected them by a bar with a piston working inside it, this piston being moved by atmospheric pressure in the way just mentioned. The tube was generally provided with a slot upon its upper side, closed by a continuous valve or its equivalent, and arrangements were made by which this valve should be opened to allow the passage of the driving bar without permitting great leakage of air. About 1840, Messrs Clegg & Samuda made various experiments with an atmospheric tube constructed on this principle upon a — of the West London Railway, near Wormwood Scrubs. The apparent success of these induced the Dublin

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TOM (dropos) is a body which cannot be cut in two. The atomic theory is a theory of the constitution of bodies, which asserts that they are made up of atoms. The opposite theory is that of the homogeneity and continuity of bodies, and asserts, at least in the case of bodies having no apparent organisation, such, for instance, as water, that as we can divide a drop of water into two parts which are each of them drops of water, so we have reason to believe that these smaller drops can be divided again, and the theory goes on to assert that there is nothing in the nature of things to hinder this process of division from being repeated over and over again, times without end. This is the doctrine of the infinite divisibility of bodies, and it is in direct contradiction with the theory of atoms. The atomists assert that after a certain number of such divisions the parts would be no longer divisible, because each of them would be an atom. The advocates of the

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together ; the reason being that in Victoria deaths from bowel complaints are much greater, and those from diseases of the respiratory organs much less than in London.

The curves show that the maximum annual mor- tality from the different diseases groups around certain specific conditions of temperature and moisture combined. Thus, cold and moist weather is accompanied with a

high death-rate from rheumatism, heart diseases, diphtheria, and measles ; cold weather, with a high death-rate from bron- chitis, pneumonia, &c.; cold and dry weather, with a high death-rate from brain diseases, whooping-cough, convul- sions; warm and dry weather, with a high death-rate from suicide and small-pox ; hot weather, with a high death-rate from bowel complaints; and warm moist weather with a high death-rate from scarlet and typhoid fevers. (See CLIMATE.) (A. B.)

and Kingstown Railway to adopt Clegg & Samuda's scheme upon an extension of their line from Kingstown to Dalkey, where it was in operation in 1844, Later on, the same system was adopted on a part of the South Devon line and in several other places, and during the years 1844~1846 the English and French patent records show a very large number of more or less practicable and ingenious schemes for the tubes, valves, and driving gear of atmospheric railways. The atmospheric system was nowhere per- manently successful, but in all cases was eventually superseded by locomotives, the last atmospheric line being probably that at St Germains, which was worked until 1862. Apart from difficulties in connection with the working of the valve, the maintenance of the vacuum, &c., other great practical difficulties, which had not been indicated by the experiments, soon made themselves known in the working of the lines. Above all, it was found that stationary engines, whether hauling a rope or exhausting a tube, could never work a railway with anything like the economy or the convenience of locomotives, a point which is now regarded as settled by engineers, but which was not so thoroughly understood thirty years ago. Lately, the principle of the atmospheric railway has been applied on a very large scale in London and elsewhere, under the name of "PNEUMATIC DEsPaTcH" (g.v.), to the transmission of small parcels in connection with postal and telegraph work, for which purpose it has proved admirably adapted. (See paper by Prof. Sternberg of Carlsruhe in Hensinger von Waldegg's Handbuch fiir specielle Kisenbahntechntk, vol. i. pt. 2, cap. xvii.

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continuity of matter assert that the smallest conceivable body has parts, and that whatever has parts may be divided.

In ancient times Democritus was the founder of the atomic theory, while Anaxagoras propounded that of con- tinuity, under the name of the doctrine of homcomeria (‘Oporopépia), or of the similarity of the parts of a body to the whole. The arguments of the atomists, and their replies to the objections of Anaxagoras, are to be found in Lucretius.

In modern times the study of nature has brought to light many properties of bodies which appear to depend on the magnitude and motions of their ultimate constituents, and the question of the existence of atoms has once more become conspicuous among scientific inquiries.

We shall begin by stating the opposing doctrines of atoms and of continuity before giving an outline of the state of

molecular science as it now exists. In the earliest times the most ancient philosophers whose speculations are known to us seem to have discussed the ideas of number and of continuous magnitude, of space and time, of matter and motion, with a native power of thought which has probably never been surpassed. Their actual knowledge, however, and their scientific experience were necessarily limited, because in their days the records of human thought were only beginning to accumulate. It is probable that the first exact notions of quantity were founded on the consideration of number. It is by the help of numbers that concrete quantities are practically measured and calculated. Now, number is discontinuous. We pass ‘ from one number to the next per saltum. The magnitudes, on the other hand, which we meet with in geometry, are essentially continuous. The attempt to apply numerical methods to the comparison of geometrical quantities led to the doctrine of incommensurables, and to that of the infinite divisibility of space.

of Elea time was still regarded as made up of a finite number of “moments,” while space was confessed to be divisible without limit. This was the state of opinion

when the celebrated arguments against the possibility of motion, of which that of Achilles and the tortoise is a

specimen, were propounded by Zeno, and such, apparently, continued to be the state of opinion till Aristotle pointed out that time is divisible without limit, in precisely the same sense that space is, And the slowness of the develop- ment of scientific ideas may be estimated from the fact that Bayle does not see any force in this statement of Aristotle, but continues to adimire the paradox of Zeno, (Bayle's Dictionary, art. "Zeno"). Thus the direction of true scientific progress was for many ages towards the recogni- tion of the infinite divisibility of space and time.

It was easy to attempt to apply similar arguments to matter. If matter is extended and fills space, the same mental operation by which we recognise the divisibility of space may be applied, in imagination at least, to the matter which occupies space. From this point of view the atomic doctrine might be regarded as a relic of the old numerical way of conceiving magnitude, and the opposite doctrine of the infinite divisibility of matter might appear for a time the most scientific. The atomists, on the other hand, asserted very strongly the distinction between matter and space. The atoms, they said, do not fill up the universe ; there are void spaces between them. If it were not so, Lucretius tells us, there could be no motion, for the atom which gives way first must have some empty place to move luto.

'* Quapropter locus est intactus, inane, vacansque Quod si non esset, nulla ratione moveri Res possent ; namque, officium quod corporis exstat, Officere atque obstare, id in omni tempore adesset Omnibus: haud igitur quicquam procedere posset, Principium quoniam cedendi nulla daret res."' —De Rerum Natura, i. 335.

The opposite school maintained then, as they have always done, that there is no vacuum—that every part of space is full of matter, that there is a universal plenum, and that all motion is like that of a fish in the water, which yields

in front of the fish because the fish leaves room for it behind.

- Cedere squamigeris latices nitcntibus aiunt Et liquidas aperire vias, quia post loca pisces Linquant, quo possint cedentes confluere unde." —i. 373. In modern times Descartes held that, as it is of the essence of

matter to be extended in length, breadth, and thickness, so it is of the essence of extension to be occu-

Meanwhile, the same considerations had not been applied to time, so that in the days of Zeno

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pied by matter, for extension cannot be an extension of nothing.

- Ac proinde si queratur quid fiet, si Deus auferat omne corpus quod in aliquo vase continetur, et nullum aliud in ablati locum venire permittat ? respondendum est, vasis latera sibi invicem hoc ipso fore contigua. Cum enim inter duo corpora nihil interjacet, necesse est ut se mutuo tangant, ac manifeste repugnat ut distent, sive ut inter ipsa sit distantia, et tamen ut ista distantia sit nihil ; quia omnis distantia est modus extensionis, et ideo sine substantia extensa esse non potest.” — Principia, ii. 18.

This identification of extension with substance runs through the whole of Descartes’s works, and it forms one of the ultimate foundations of the system of Spinoza. Des- cartes, consistently with this doctrine, denied the existence of atoms as parts of matter, which by their own nature are indivisible. He seems to admit, however, that the Deity might make certain particles of matter indivisible in this sense, that no creature should be able to divide them. These particles, however, would be still divisible by their own nature, because the Deity cannot diminish his own power, and therefore must retain his power of dividing them. Leibnitz, on the other hand, regarded his monad as the ultimate element of everything.

There are thus two modes of thinking about the consti- tution of bodies, which have had their adherents both in ancient and in modern times. They correspond to the two methods of regarding quantity—the arithmetical and the geometrical. To the atomist the true method of estimating the quantity of matter in a body is to count the atoms in it. The void spaces between the atoms count for nothing. To those who identify matter with extension, the volume of space occupied by a body is the only measure of the quantity of matter in it.

Of the different forms of the atomic theory, that of Boscovich may be taken as an example of the purest monadism, According to Boscovich matter is made up of atoms. Each atom is an indivisible point, having position in space, capable of motion in a continuous path, and possessing a certain mass, whereby a certain amount of force is required to produce a given change of motion. Besides this the atom is endowed with potential force, that is to say, that any two atoms attract or repel each other with a force depending on their distance apart. The law of this force, for all distances greater than say the thousandth of an inch, is an attraction varying as the inverse square of the distance. For smaller distances the force is an attraction for one distance and a repulsion for another, according to some law not yet discovered. Bos- covich himself, in order to obviate the possibility of two atoms ever being in the same place, asserts that the ultimate force is a repulsion which increases without limit as the distance diminishes without limit, so that two atoms can never coincide. But this seems an unwarrantable concession to the vulgar opinion that two bodies cannot co-exist in the same place. This opinion is deduced from our experience of the behaviour of bodies of sensible size, but we have no experimental evidence that two atoms may not sometimes coincide. For instance, if oxygen and hydrogen combine to form water, we have no experimental evidence that the molecule of oxygen is not in the very same place with the two molecules of hydrogen. Many persons cannot get rid of the opinion that all matter is extended in length, breadth, and depth. This is a pre- judice of the same kind with the last, arising from our experience of bodies consisting of immense multitudes of atoms. The system of atoms, according to Boscovich, occupies a certain region of space in virtue of the forces acting between the component atoms of the system and any other atoms when brought near them. No other system of atoms can occupy the same region of space at the same time, because, before it could do so, the mutual

action of the atoms would have caused a repulsion between the two systems insuperable by any force which we can command, ‘Thus, a number of soldiers with firearms may oceupy an extensive region to the exclusion of the enemy’s armies, though the space filled by their bodies is but small, In

this way Boscovich explained the apparent extension of bodies consisting of atoms, each of which is devoid of extension. According to Boscovich's theory, all action between bodies is action at a distance. There is no such thing in nature as actual contact between two bodies. When two bodies are said in ordinary language to be in contact, all that is meant is that they are so near together that the repulsion between the nearest pairs of atoms belonging to the two bodies is very great.

Thus, in Boscovich's theory, the atom has continuity of existence in time and space. At any instant of time it is at some point of space, and it is never in more than one place at a time. It passes from one place to another along a continuous path. It has a definite mass which cannot be increased or diminished. Atoms are endowed with the power of acting on one another by attraction or repulsion, the amount of the force depending on the distance between them. On the other hand, the atom itself has no parts or dimensions. In its geometrical aspect it is a mere geo- metrical point. It has no extension in space. It has not the so-called property of Impenetrability, for two atoms may exist in the same place. This we may regard as one extreme of the various opinions about the constitution of bodies.

The opposite extreme, that of Anaxagoras—the theory that bodies apparently homogeneous and continuous are so in reality—is, in its extreme form, a theory incapable of development. 'To explain the properties of any substance by this theory is impossible. We can only admit the observed properties of such substance as ultimate facts. There is a certain stage, however, of scientific progress in which a method corresponding to this theory is of service. In hydrostatics, for instance, we define a fluid by means of one of its known properties, and from this definition we make the system of deductions which constitutes the science of hydrostatics. In this way the science of hydrostatics may be built wpon an experimental basis, without any con- sideration of the constitution of a fluid as to whether it is molecular or continuous, In like manner, after the French mathematicians had attempted, with more or less ingenuity, to construct a theory of elastic solids from the hypothesis that they consist of atoms in equilibrium under the action of their mutual forces, Stokes and others showed that all the results of this hypothesis, so far at least as they agreed with facts, might be deduced from the postulate that elastic bodies exist, and from the

hypothesis that the smallest portions into which we can divide them are sensibly homo- geneous. In this way the principle of continuity, which is the basis of the method of Fluxions and the whole of modern mathematics, may be applied to the analysis of problems connected with material bodies by assuming them, for the purpose of this analysis, to be homogeneous. All that is required to make the results applicable to the real case is that the smallest portions of the substance of which we take any notice shall be sensibly of the same kind. Thus, if a railway contractor has to make a tunnel through a hill of gravel, and if one cubic yard of the gravel is so like another cubic yard that for the purposes of the contract they may be taken as equivalent, then, in estimating the work required to remove the gravel from the tunnel, he may, without fear of error, make his calculations as if the gravel were a continuous substance. But if a worm has to make his way through the gravel, it makes the greatest possible difference to him whether he tries to push right against a piece of gravel, or directs his course through

one of the intervals between the pieces; to him, therefore, the gravel is by no means a homogeneous and continuous substance.

In the same way, a theory that some particular substance, say water, is homogeneous and continuous may be a good working theory up to a certain point, but may fail when we come to deal with quantities so minute or so attenuated that their heterogeneity of structure comes into prominence, Whether this heterogeneity of structure is or is not con- sistent with homogeneity and continuity of substance is another question.

The extreme form of the doctrine of continuity is that stated by Descartes, who maintains that the whole universe is equally full of matter, and that this matter is all of one kind, having no essential property besides that of extension. All the properties which we perceive in matter he reduces to its parts being movable among one another, and so capable of all the varieties which we can perceive to follow from the motion of its parts (Principia, ii. 23). Descartes’s own attempts to deduce the different qualities and actions of bodies in this way are not of much value. More than a century was required to invent methods of investigating the conditions of the motion of systems of bodies such as Descartes imagined. But the hydrodynamical

discovery of Helmholtz that a vortex in a perfect liquid possesses certain permanent characteristics, has been applied by Sir W. Thomson to form a theory of vortex atoms in a homo- geneous, incompressible, and frictionless liquid, to which we shall return at the proper time.

OUTLINE oF MopERN MoLECULAR SCIENCE, AND IN PAR- TICULAR OF THE MoLECULAR THEORY OF GASES.

We begin by assuming that bodies are made up of parts, each of which is capable of motion, and that these parts act on each other in a manner consistent with the principle of the conservation of energy. In making these assump- tions, we are justified by the facts that bodies may be divided into smaller parts, and that all bodies with which we are acquainted are conservative systems, which would not be the case unless their parts were also conservative systems,

We may also assume that these small parts are in motion. This is the most general assumption we can make, for it includes, as a particular case, the theory that the small parts are at rest. The phenomena of the diffusion of gases and liquids through each other show that there may be a motion of the small parts of a body which is not perceptible to us.

We make no assumption with respect to the nature of the small parts— whether they are all of one magnitude. We do not even assume them to have extension and figure. Each of them must be measured by its mass, and any two of them must, like visible bodies, have the power of acting on one another when they come near enough todo so. The properties of the body, or medium, are determined by the configuration and motion of its small parts.

The first step in the investigation is to determine the amount of motion which exists among the small parts, independent of the visible motion of the medium as a whole. For this purpose it is convenient to make use of a general theorem in dynamics due to Clausius.

When the motion of a material system is such that the time average of the quantity 3(mx*) remains constant, the state of the system is said to be that of stationary motion. When the motion of a material system is such that the sum of the moments of inertia of the system, about three axes at right angles

through its centre of mass, never varies by more than small quantities from a constant value, the system is said to be in a state of stationary motion.

ATO

The kinetic energy of a particle is half the product of its mass into the square of its velocity, and the kinetic energy of a system is the sum of the kinetic energy of all its parts.

When an attraction or repulsion exists between two points, half the product of this stress into the distance between the two points is called the virial of the stress, and is reckoned positive when the stress is an attraction, and negative when it isa repulsion. The virial of a system is the sum of the virials of the stresses which exist in it. If the system is subjected to the external stress of the pressure of the sides of a vessel in which it is contained, this stress will introduce an amount of virial $pV, where p is the pressure on unit of area and V is the volume of the vessel.

The theorem of Clausius may now be stated as follows :— In a material system in a state of stationary motion the time-average of the kinetic energy is equal to the time- average of the virial. In the case of a fluid enclosed in a

vessel = 43 (mo) = 3pV + $23(Br) ,

where the first term denotes the kinetic euergy, and is half the sum of the product of each mass into the mean square of its velocity. In the second term, p is the pressure on unit of surface of the vessel, whose volume is V, and the third term expresses the virial due to the internal actions between the parts of the system. A double symbol of summation is used, because every pair of parts between which any action exists must be taken into account. We have next to show that in gases the principal part of the pressure arises from the motion of the small parts of the medium, and not from a repulsion between them.

In the first place, if the pressure of a gas arises from the repulsion of its parts, the law of repulsion must be inversely as the distance. For, consider a cube filled with the gas at pressure p, and let the cube expand till each side is n times its former length. The pressure on unit of surface

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‘Cas of a face of the cube is n? times what it was, the whole

according to Boyle’s law is now and since the area

mu : Sho pressure on the face of the cube is F of its original value.

But since everything has been expanded symmetrically, the distance between corresponding parts of the air is now n times what it was, and the force is m times less than it was. Hence the force must vary inversely as the distance.

But Newton has shown (Principia, bk. i. prop. 93) that this law is inadmissible, as it makes the effect of the dis- tant parts of the medium on a particle greater than that of the neighbouring parts. Indeed, we should arrive at the conclusion that the pressure depends not only on the density of the air but on the form and dimensions of the vessel which contains it, which we know not to be the case.

Tf, on the other hand, we suppose the pressure to arise entirely from the motion of the molecules of the gas, the interpretation of Boyle’s law becomes very simple. For, in this case

The first term is the product of the pressure and the volume, which according to Boyle’s law is constant for the same quantity of gas at the same temperature. The second term is two-thirds of the kinetic energy of the system, and we have every reason to believe that in gases when the temperature is constant the kinetic energy of unit of mass is also constant. If we admit that the kinetic energy of unit of mass is in a given gas proportional to the absolute temperature, this equation is the expression of the law of Charles as well as of that of Boyle, and may be written—

pV =R6,

where 6 is the temperature reckoned from absolute zero, and R is aconstant. The fact that this equation expresses with considerable accuracy the relation between the volume, pressure, and temperature of a gas when in an extremely rarified state, and that as the gas is more and more com- pressed the deviation from this equation becomes more apparent, shows that the pressure of a gas is due almost entirely to the motion of its molecules when the gas 1s rare, and that it is only when the density of the gas is consider- ably increased that the effect of direct action between the molecules becomes apparent.

The effect of the direct action of the molecules on each other depends on the number of pairs of molecules which at a given instant are near enough to act on one another. The number of such pairs is proportional to the square of the number of molecules in unit of volume, that is, to the square of the density of the gas. Hence, as long as the medium is so rare that the encounter between two molecules is not affected by the presence of others, the deviation from Boyle's law will be proportional to the square of the density. If the action between the molecules is on the whole repulsive, the pressure will be greater than that given by Boyle's law. If it is, on the whole, attractive, the pressure will be less than that given by Boyle's law. It appears, by the experiments of Regnault and others, that the pressure does deviate from Boyle's law when the density of the gas is increased. In the case of carbonic acid and other gases which are easily liquefied, this devia- tion is very great. In all cases, however, except that of hydrogen, the pressure is less than that given by Boyle's law, showing that the virial is on the whole due to attractive forces between the molecules.

Another kind of evidence as to the nature of the action between the molecules is furnished by an experiment made by Dr Joule. Of two vessels, one was exhausted and the other filled with a gas at a pressure of 20 atmospheres ; and both were placed side by side in a vessel of water, which was constantly stirred. The temperature of the whole was observed. Then a communication was opened between the vessels, the compressed gas expanded to twice its volume, and the work of expansion, which at first produced a strong current in the gas, was soon con- verted into heat by the internal friction of the gas. When all was again at rest, and the temperature uniform, the temperature was again observed. In Dr J oule's original

experiments the observed temperature was the same as before. In a series of experiments, conducted by Dr Joule and Sir W. Thomson on a different plan, by which the thermal effect of free expansion can be more accurately measured, a slight cooling effect was observed in all the gases examined except hydrogen. Since the temperature depends on the velocity of agitation of the molecules, it appears that when a gas expands without doing external work the velocity of agitation is not much affected, but that in most cases it is slightly diminished. Now, if the molecules during their mutual separation act on each other, their velocity will increase or diminish according as the force is repulsive or attractive. It appears, therefore, from the experiments on the free expansion of gases, that the force between the molecules is small but, on the whole, attractive.

Having thus justified the hypothesis that a gas consists of molecules in motion, which act on each other only when they come very close together during an encounter, but which, during the intervals between their encounters which constitute the greater part of their existence, are describing free paths, and are not acted on by any mole- cular force, we proceed to investigate the motion of such a system.

The mathematical investigation of the properties of such

a system of molecules in motion is the foundation of mole cular science. Clausius was the first to express the relation between the density of the gas, the length of the free paths of its molecules, and the distance at which they encounter eacb other. He assumed, however, at least in his earlier investigations, that the velocities of all the molecules are equal. The mode in which the velocities are distributed was first investigated by the present writer, who showed that in the moving system the velocities of the molecules range from zero to infinity, but that the number of molecules whose velocities lie within given limits can be expressed by a formula identical with that which expresses in the theory of errors the number of errors of observation lying within corresponding limits. The proof of this theorem has been carefully investigated by Boltzmann,! who has strengthened it where it appeared weak, and to whom the method of taking into account the action of external forces is entirely due.

The mean kinetic energy of a molecule, however, has a definite value, which is easily expressed in terms of the quantities which enter into the expression for the distribu- tion of velocities. The most important result of this investi- gation is that when several kinds of molecules are in motion and acting on one another, the mean kinetic energy of a mole- cule is the same whatever be its mass, the molecules of greater mass having smaller mean velocities. Now, when gases are mixed their temperatures become equal. Hence we conclude that the physical condition which determines that the temperature of two gases shall be the same is that the mean kinetic energies of agitation of the individual niole- cules of the two gases are equal. This result is of great importance in the theory of heat, though we are not yet able to establish any similar result for bodies in the liquid or solid state.

In the next place, we know that in the case in which the whole pressure of the medium is due to the motion of its molecules, the pressure on unit of area is numerically equal to two-thirds of the kinetic energy in unit of volume. Hence, if equal volumes of two gases are at equal pressures the kinetic energy is the same in each. If they are also at equal temperatures the mean kinetic energy of each molecule is the same in each. If, therefore, equal volumes of two gascs are at equal temperatures and pressures, the number of molecules in each is the same, and therefore, the masses of the two kinds of molecules are in the same ratio as the densities of the gases to which they belong.

This statement has been believed by chemists since the time of Gay-Lussac, who first established that the weights of the chemical equivalents of different substances are proportional to the densities of these substances when in the form of gas. The definition of the word molecule, however, as employed in the statement of Gay-Lussac’s law is by no means identical with the definition of the same word as in the kinetic theory of gases. The chemists ascertain by experiment the ratios of the masses of the different substances in a compound. From these they deduce the chemical equivalents of the different substances, that of a particular substance, say hydrogen, being taken as unity. The only evidence made use of is that furnished by chemical combinations. It is also assumed, in order to account for the facts of combination, that the reason why substances combine in

definite ratios is that the molecules of the substances are in ‘the ratio of their chemical equiva- lents, and that what we call combination is an action which takes place by a union of a molecule of one substance to a molecule of the other.

This kind of reasoning, when presented in a proper form and sustained by proper evidence, has a high degree of

1 Sttzungsberichte der K, K. Akad., Wien, 8th Oct. 1868.

cogency. But it is purely chemical reasoning; it is not dynamical reasoning. It is founded on chemical experi- ence, not on the laws of motion.

Our definition of a molecule is purely dynamical. A molecule is that minute portion of a substance which moves about as a whole, so that its parts, if it has any, do not part company during the motion of agitation of the gas. The result of the kinetic theory, therefore, is to give us informa- tion about the relative masses of molecules considered as moving bodies. The consistency of this information with the deductions of chemists from the phenomena of com- bination, greatly strengthens the evidence in favour of the actual existence and motion of gaseous molecules.

Another confirmation of the theory of molecules is derived from the experiments of Dulong and Petit on the specific heat of gases, from which they deduced the law which bears their name, and which asserts that the specific heats of equal weights of gases are inversely as their com- bining weights, or, in other words, that the capacities for heat of the chemical equivalents of different gases are equal. We have seen that the temperature is determined by the kinetic energy of agitation of each molecule. The molecule has also a certain amount of energy of internal mo- tion, whether of rotation or of vibration, but the hypothesis of Clausius, that the mean value of the internal energy always bears a proportion fixed for each gas to the energy of agitation, seems highly probable and consistent with experiment. The whole kinetic energy is therefore equal to the energy of agitation multiplied by a certain factor. Thus the energy communicated to a gas by heating it is divided in a certain proportion between the energy of

agita- tion and that of the internal motion of each molecule. For a given rise of temperature the energy of agitation, say of a million molecules, is increased by the same amount what- ever be the gas. The heat spent in raising the temperature is measured by the increase of the whole kinetic energy. The thermal capacities, therefore, of equal numbers of molecules of different gases are in the ratio of the factors by which the energy of agitation must be multiplied to obtain the whole energy. As this factor appears to be nearly the same for all gases of the same degree of atomicity, Dulong and Petit's law is true for such gases.

Another result of this investigation is of considerable importance in relation to certain theories," which assume the existence of ethers or rare media consisting of molecules very much smaller than those of ordinary gases. According to our result, such a medium would be neither more nor less than a gas. Supposing its molecules so small that they can penetrate between the molecules of solid substances such as glass, a so-called vacuum would be full of this rare gas at the observed temperature, and at the pressure, what- ever it may be, of the etherial medium in space. The specific heat, therefore, of the medium in the so-called vacuum will be equal to that of the same volume of any other gas at the same temperature and pressure. Now, the purpose for which this molecular zether is assumed in these theories is to act on bodies by its pressure, and for this purpose the pressure is generally assumed to be very great. Hence, according to these theories, we should find the specific heat of a so-called vacuum very considerable com- pared with that of a quantity of air filling the same space.

We have now made a certain definite amount of progress towards a complete molecular theory of gases. We know the mean velocity of the molecules of each gas in metres per second, and we know the relative masses of the molecules of different gases. We also know that the molecules of one and the same gas are all equal in mass. For if they i ee

2 See Gustav Hansemann, Die Atome und ihre Bewegungen. 1871.

(H. G. Mayer.)

ATOM

are not, the method of dialysis, as employed by Graham, would enable us to separate the molecules of smaller mass from those of greater, as they would stream through porous substances with greater velocity. We should thus be able to separate a gas, say hydrogen, into two portions, having different densities and other physical properties, different combining weights, and probably different chemical pro- perties of other kinds. As no chemist has yet obtained specimens of hydrogen differing in this way from other specimens, we conclude that all the molecules of hydrogen are of sensibly the same mass, and not merely that their mean mass is a statistical constant of great stability.

But as yet we have not considered the phenomena which enable us to form an estimate of the actual mass and dimensions of a molecule. It is to Clausius that we owe the first definite conception of the free path of a molecule and of the mean distance travelled by a molecule between successive encounters. He showed that the number of encounters of a molecule in a given time is proportional to the velocity, to the number of molecules in unit of volume, and to the square of the distance between the centres of two molecules when they act on one another so as to have an encounter. From this it appears that if we call this distance of the centres the diameter of a molecule, and the volume of a sphere having this diameter the volume of a molecule, and the sum of the volumes of all the molecules the molecular volume of the gas, then the diameter of a molecule is a certain multiple of the quantity obtained by diminishing the free path in the ratio of the molecular volume of the gas to the whole volume of the gas. The numerical value of this multiple differs slightly, according to the hypothesis we assume about the law of distribution of velocities. It also depends on the definition of an encounter. When the molecules are regarded as elastic spheres we know what is meant by an encounter, but if they act on each other at a distance by attractive or repul- sive forces of finite magnitude, the distance of their centres varies during an encounter, and is not a definite quantity. Nevertheless, the above statement of Clausius enables us, if we know the length of the mean path and the molecular volume of a gas, to form a tolerably near estimate of the diameter of the sphere of the intense action of a molecule, and thence of the number of molecules in unit of volume and the actual mass of each molecule. To complete the investigation we have, therefore, to determine the mean path and the molecular volume.

The first numerical estimate of the mean path of a gaseous molecule was made by the present writer from data derived from the internal friction of air. There are three phenomena which depend on the length of the free path of the molecules of a gas. It is evident that the greater the free path the more rapidly will the molecules travel from one part of the medium to another, because their direction will not be so often altered by encounters with other molecules. If the molecules in different parts of the medium are of different kinds, their progress from one part of the medium to another can be easily traced by analysing portions of the medium taken from different places. The rate of diffu- sion thus found furnishes one method of estimating the length of the free path of a molecule. This kind of diffusion goes on not only between the molecules of different gases, but among the molecules of the same gas, only in the latter case the results of the diffusion cannot be traced by analysis. But the diffusing molecules carry with them in their free paths the momentum and the energy which they happen at a given instant to have. The diffusion of momentum tends to equalise the apparent motion of different parts of the medium, and constitutes the phenomenon called the internal friction or viscosity of gases. The diffusion of energy tends to equalise the

temperature of different parts of the medium, and constitutes the phenomenon of the conduction of heat in gases.

These three phenomena—the diffusion of matter, of motion, and of heat in gases—have been experimentally investigated,—the diffusion of matter by Graham and Loschmidt, the diffusion-of motion by Oscar Meyer and Clerk Maxwell, and that of heat by Stefan.

Thesc three kinds of experiments give results which in the present imperfect state of the theory and the extreme difficulty of the experiments, especially those on the con- duction of heat, may be regarded as tolerably consistent with each other. At the pressure of our atmosphere, and at the temperature of melting ice, the mean path of a molecule of hydrogen is about the 10,000th of a milli- metre, or about the fifth part of a wave-length of green light. The mean path of the molecules of other gases is shorter than that of hydrogen.

The determination of the molecular volume of a gas is subject as yet to considerable uncertainty. The most obvious method is that of compressing the gas till it assumes the liquid form. It seems probable, from the great resistance of liquids to compression, that their molecules are at about the same distance from each other as that at which two molecules of the same substance in the gaseous form act on each other during au encounter. If thisis the case, the molecular volume of a gas is somewhat less than the volume of the liquid into which it would be condensed by pressure, or, in other words, the density of the molecules is somewhat greater than that of the liquid.

Now, we know the relative weights of different molccules. with great accuracy, and, from a knowledge of the mean path, we can calculate their relative diameters approxi- mately. From these we can deduce the relative densities of different kinds of molecules. The relative densities so calculated have been compared by Lorenz Meyer with the observed densities of the liquids into which the gases may be condensed, and he finds a remarkable correspondence between them. There is considerable doubt, however, as to the relation between the molecules of a liquid and those of its vapour, so that till a larger number of comparisons have been made, we must not place too much reliance on the calculated densities of molecules. Another, and perhaps a more refined, method is that adopted by M. Van der Waals, who deduces the molecular volume from the devia- tions of the pressure from Boyle’s law as the gas is com- pressed.

The first numerical estimate of the diameter of a molecule was that made by Loschmidt in 1865 from the mean path and the molecular volume. Independently of him and of each other, Mr Stoney, in 1868, and Sir W. Thomson, in 1870, published results of a similar kind-—those of Thomson being deduced not only in this way, but from considerations derived from the thickness of soap bubbles, and from the electric action between zinc and copper.

The diameter and the mass of a molecule, as estimated by these methods, are, of course, very small, but by no means infinitely so. About two millions of molecules of hydrogen in a row would occupy a millimetre, and about two hundred million million million of them would weigh a milligramme.

These numbers must be considered as exceedingly rough guesses ; they must be corrected by more extensive and accurate experiments as science advances ; but the main resuit, which appears to be well established, is that the determination of the mass of a molecule isa legitimate object of scientific research, and that this mass is by no means immeasurably small.

Loschmidt illustrates these molecular measurements by a comparison with the smallest magnitudes visible by means of a microscope. Nobert, he tells us, can draw 4000 lines in the breadth of a millimetre. The intervals between

these lines can be observed with a good microscope. A cube, whose side is the 4000th of a millimetre, may be taken as the minimum visibile for observers of the present day. Such a cube would contain from 60 to 100 million molecules of oxygen or of nitrogen; but since the molecules of organised substances contain on an average about 50 of the more elementary atoms, we may assume that the smallest organised particle visible under the microscope contains about two million molecules of organic matter. At least half of every living organism consists of water, so that the smallest living being visible under the microscope does not contain more than about a million organic molecules. Some exceedingly simple organism may be supposed built up of not more than a million similar molecules. It is impossible, however, to conceive so small a number sufficient to form a being furnished with a whole system of specialised organs.

Thus molecular science sets us face to face with physiolo- gical theories. It forbids the physiologist from imagining that structural details of infinitely small dimensions can furnish an explanation of the infinite variety which exists in the properties and functions of the most minute organ- isms.

A microscopic germ is, we know, capable of development into a highly organised animal. Another germ, equally microscopic, becomes, when developed, an animal of a totally different kind. Do all the differences,

infinite in number, which distinguish the one animal from the other, arise each from some difference in the structure of the respective germs? Even if we admit this as possible, we shall be called upon by the advocates of Pangenesis to admit still greater marvels. For the microscopic germ, according to this theory, is no mere individual, but a repre- sentative body, containing menibers collected from every rank of the long-drawn ramification of the ancestral tree, the number of these members being amply sufficient not only to furnish the hereditary characteristics of every organ of the body and every habit of the animal from birth to death, but also to afford a stock of latent gemmules to be passed on in an inactive state from germ to germ, till at last the ancestral peculiarity which it represents is revived in some remote descendant.

Some of the exponents of this theory of heredity have attempted to elude the difficulty of placing a whole world of wonders within a body so small and so devoid of visible structure as a germ, by using the phrase structureless germs.! Now, one material system can differ from another only in the configuration and motion which it has at a given instant. To explain differences of function and development of a germ without assuming differences of structure is, therefore, to admit that the properties of a germ are not those of a purely material system.

The evidence as to the nature and motion of molecules, with which we have hitherto been occupied, has been derived from experiments upon gaseous media, the smallest sensible portion of which contains millions of millions of molecules. The constancy and uniformity of the properties of the gaseous medium' is the direct result of the incon- ceivable irregularity of the motion of agitation of its molecules. Any cause which could introduce regularity into the motion of agitation, and marshal the molecules into order and method in their evolutions, might check or

even reverse that tendency to diffusion of matter, motion, ~ and energy, which is one of the most invariable phenomena of nature, and to which Thomson has given the name of the dissipation of energy.

Thus, when a sound-wave is passing through a mass of

1 See F. Galton, " On Blood Relationship," Proc. Roy. Soc., June

13, 1872.

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air, this motion is of a certain definite type, and if left to itself the whole motion is passed on to othcr masses of air, and the sound-wave passes on, leaving the air behind it at rest. hot body except to enter a colder body, so that the energy

pagated so as to pass wholly out of one portion of the

Heat, on the other hand, never passes out of a of sound-waves, or any other form of energy which is pro-

medium and into another, cannot be called heat.

We have now to turn our attention to a class of molecular motions, which are as remarkable for their regularity as the motion of agitation is for its irregularity.

It has been found, by means of the spectroscope, that the light emitted by incandescent substances is different according to their state of condensation. When they are in an extremely rarefied condition the spectrum of their light consists of a set of sharply-defined bright lines. As the substance approaches a denser condition the spectrum tends to become continuous, either by the lines becoming broader and less defined, or by new lines and bands appear- ing between them, till the spectrum at length loses all its characteristics and becomes identical with that of solid bodies when raised to the same temperature.

Hence the vibrating systems, which are the source of the emitted light, must be vibrating in a different manner in these two cases. When the spectrum consists of a number of bright lines, the motion of the system must be com-pounded of a corresponding number of types of harmonic vibration.

In order that a bright line may be sharply defined, the vibratory motion which produces it must be kept up ina perfectly regular manner for some hundreds or thousands of vibrations. If the motion of each of the vibrating

bodies is kept up only during a small number of vibrations, then, however regular may be the vibrations of each body while it lasts, the resultant disturbance of the luminiferous medium, when analysed by the prism, will be found to contain, besides the part due to the regular vibrations, other motions, depending on the starting and stopping of each particular vibrating body, which will become manifest as a diffused luminosity scattered over the whole length of the spectrum. A spectrum of bright lines, thercfore, indicates that the vibrating bodies when set in motion are allowed to vibrate in accordance with the conditions of their internal structure for some time before they are again interfered with by external forces.

It appears, therefore, from spectroscopic evidence that each molecule of a rarefied gas is, during the greater part of its existence, at such a distance from all other molecules that it executes its vibrations in an undisturbed and regular manner. This is the same conclusion to which we were led by considerations of another kind at p. 39.

We may therefore regard the bright lines in the spectrum of a gas as the result of the vibrations executed by the molecules while describing their free paths. When two molecules separate from one another after an encounter, each of them is in a state of vibration, arising from the unequal action on different parts of the same molecule during the encounter. Hence, though the centre of mass of the molecule describing its free path moves with uniform velocity, the parts of the molecule have a vibratory motion with respect to the centre of mass of the whole molecule, and it is the disturbance of the luminiferous medium com- municated to it by the vibrating molecules which constitutes the emitted light.

We may compare the vibrating molecule to a bell. When struck, the bell is set in motion. This motion is compounded of harmonic vibrations of many different periods, each of which acts on the air, producing notes of as many different pitches. As the bell communicates its motion to the air, these vibrations necessarily decay, some

x TO a

of them faster than others, so that the sound contains fewer and fewer notes, till at last itis reduced to the fundamental note of the bell.1 If we suppose

that there are a great many bells precisely similar to each other, and that they are struck, first one and then another, in a perfectly irregular manner, yet so that, on an average, aS many bells are struck in one second of time as in another, and also in such a way that, on an average, any oné bell is not again struck till it has ceased to vibrate, then the audible result will appear a continuous sound, composed of the sound emitted by bells in all states of vibration, from the clang of the actual stroke to the final hum of the dying fundamental tone.

But now let the number of bells be reduced while the same number of strokes are given in a second. Lach bell will now be struck before it has ceased to vibrate, so that in the resulting sound there will be less of the fundamental tone and more of the original clang, till at last, when the peal is reduced to one bell, on which innumerable hammers are continually plying their strokes all out of time, the sound will become a mere noise, in which no musical note can be distinguished.

In the case of a gas we have an immense number of molecules, each of which jis set in vibration when it encounters another molecule, and continues to vibrate as it describes its free path. The molecule is a material system, the parts of which are connected in some definite way, and from the fact that the bright lines of the emitted light have always the same wave-lengths, we learn that the vibrations corresponding to these lines are always executed in the same periodic time, and therefore the force tending to restore any part of the molecule to its position of equilibrium in the molecule must be proportional to its displacement relative to that position.

From the mathematical theory of the motion of such a system, it appears that the whole motion may be analysed into the following parts, which may be considered each independently of the others:—In the first place, the centre of mass of the system moves with uniform velocity in a straight line. ‘This velocity may have any value. In the second place, there may be a motion of rotation, the angular momentum of the system about its centre of mass remain- ing during the free path constant in magnitude and direc- tion. This angular momentum may have any value whatever, and its axis may have any direction. In the third place, the remainder of the motion is made up of a number of componeut motions, each of which is an harmonic

vibration of a given type. In each type of vibration the periodic time of vibration is determined by the uature of the system, and is invariable for the same system. The relative amount of motion in different parts of the system is also determinate for each type, but the absolute amount of motion and the phase of the vibration of each type are determined by the particular circumstances of the last encounter, and may vary in any manner from one encounter to another.

The values of the periodic times of the different types of vibration are given by the roots of a certain equation, the form of which depends on the nature of the connections of the system. In certain exceptionally simple cases, as, for instance, in that of a uniform string stretched between two fixed points, the roots of the equation are connected by simple arithmetical relations, and if the internal structure of a molecule had an analogous kind of simplicity, we might expect to find in the spectrum of the molecule a

1 Part of the energy of motion is, in the case of the bell, dissipated in the substance of the bell in virtue of the viscosity of the metal, and assumes the form of heat, but it is not necessary, for the purpose of illustration, to take this cause of the decay of vibrations into account,

series of bright lines, whose wave-lengths are in simple arithmetical ratios.

But if we suppose the molecule to be constituted accord- ing to some different type, as, for instance, if it is an elastic sphere, or if it consists of a finite number of atoms kept in their places by attractive and repulsive forces, the roots of the equation will not be connected with each other by any simple relations, but each may be made to vary independently of the others by a suitable change of the connections of the system. Hence, we have no right to expect any definite numerical relations among the wave-lengths of the bright lines of a gas.

The bright lines of the spectrum of an incandescent gas are therefore due to the harmonic vibrations of the mole- cules of the gas during their free paths. The only effect of the motion of the centre of mass of the molecule is to alter the time of vibration of the light as received by a stationary observer.

When the molecule is coming towards the observer, each successive impulse will have a shorter distance to travel before it reaches his eye, and therefore the impulses will appear to succeed each other more rapidly than if the molecule were at rest, and the contrary will be the case if the molecule is receding from the observer. The bright line corresponding to the vibration will there- fore be shifted in the spectrum towards the blue end when the molecule is approaching, and towards the red end when it is receding from the observer. By observations of the displacement of certain lines in the spectrum, Dr Huggins and others have measured the rate of approach or of recession of certain stars with respect to the earth, and Mr Lockyer has determined the rate of motion of tornadoes in the sun. But Lord Rayleigh has pointed out that accord- ing to the dynamical theory of gases the molecules are moving hither and thither with so great velocity that, however narrow and sharply-defined any bright line due to a single molecule may be, the displacement of the line towards the blue by the approaching molecules, and towards the red by the receding molecules, will produce a certain amount of widening and blurring of the line in the spectrum, so that there is a limit to the sharpness of de- finition of the lines of a gas. The widening of the lines due to this cause will be in proportion to the velocity of agitation of the molecules. It will be greatest for the molecules of smallest mass, as those of hydrogen, and it will increase with the temperature. Hence the measurement of the breadth of the hydrogen lines, such as C or F in the spectrum of the solar prominences, may furnish evidence that the temperature of the sun cannot exceed a certain value.

ON THE THEORY oF VoRTEX ATOMS.

The equations which form the foundations of the mathematical theory of fluid motion were fully laid down by Lagrange and the great mathematicians of the end of last century, but the number of solutions of cases of fluid notion which had been actually worked out remained very small, and almost all of these belonged to a particular type of fluid motion, which has been since named the irrota- tional type. It had been shown, indeed, by Lagrange, that a perfect fluid, if its motion is at any time irrotational, will continue in all time coming to move in an irrotational manner, so that, by assuming that the fluid was at one time at rest, the calculation of its subsequent motion may be very much simplified.

It was reserved for Helmholtz to point out the very remarkable properties of rotational motion in a homo- geneous incompressible fluid devoid of all viscosity. We must first define the physical properties of sucha fluid. In the first place, it is a material substance. Its motion is

continuous in space and time, and if we follow any portion of it as it moves, the mass of that portion remains invari- able. These properties it shares with all material sub- stances. In the next place, it is incompressible. The form of a given portion of the fluid may change, but its volume remains invariable ; in other words, the density of the fluid remains the same during its motion. Besides this, the fluid is homogeneous, or the density of all parts of the fluid is the same. It is also continuous, so that the mass of the fluid contained within any closed surface is always exactly proportional to the volume contained within that surface. This is equivalent to asserting that the fluid is not made up of molecules ; for, if it were, the mass would vary in a discontinuous manner as the volume increases continuously, because first one and then another molecule would be included within the closed surface. Lastly, it is a perfect fluid, or, in other words, the stress between one portion and a contiguous portion is always normal to the surface which separates these portions, and this whether the fluid is at rest or in motion.

We have seen that in a molecular fluid the interdiffusion uf the molecules causes an interdiffusion of motion of different parts of the fluid, so that the action between contiguous parts is no longer normal but in a direction tending to diminish their relative motion. Hence the perfect fluid cannot be molecular.

All that is necessary in order to form a correct mathe- matical theory of a material system is that its properties shall be clearly defined and shall be consistent with each other. ‘This is essential; but whether a substance having such properties actually exists is a question which comes to be considered only when we propose to make some practi- cal application of the results of the mathematical theory. The properties of our perfect liquid are clearly defined and consistent with each other, and from the mathematical theory we can deduce remarkable results, some of which may be illustrated in a rough way by means of fluids which are by no means

perfect in the sense of not being viscous, such, for instance, as air and water.

The motion of a fluid is said to be irrotational when it is such that if a spherical portion of the fluid were sud- denly solidified, the solid sphere so formed would not be rotating about any axis. When the motion of the fluid is rotational the axis and angular velocity of the rotation of any small part of the fluid are those of a small spherical portion suddenly solidified.

The mathematical expression of these definitions is as follows:—Let u, v, w be the components of the velocity of the fluid at the point (a, y, 2), and let dv dw dw du du dv dz dy » Oe en) Teas (1), then a, 8, y are the components of the velocity of rotation of the fluid at the point (a, y,z). The axis of rotation is in the direction of the resultant of a, B, and y, and the velocity of rotation, w, is measured by this resultant.

A line drawn in the fluid, so that at every point of the line

a=

ae HS dsb ° #° (2), where s is the length of the line up to the point a, y, z, 1s called a vortex line. Its direction coincides at every point with that of the axis of rotation of the fluid.

We may now prove the theorem of Helmholtz, that the points of the fluid which at any instant lie in the same vortex line continue to lie in the same vortex line during the whole motion of the fluid.

The equations of motion of a fluid are of the form

ju d “3 (3),

PM da Oda ~ :

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when p is the density, which in the case of our homogene- ous incompressible fluid we may assume to be unity, the

5 a operator + represents the rate of variation of the symbol to which it is prefixed at a point which is carried forward with the fluid, so that

% dt dx “dy dz (4), p is the pressure, and V is the potential of external forces, There are two other equations of similar form in y and z. Differentiating the equation in y with respect to z, and that in z with respect to y, and subtracting the second from the first, we find d iv d bw ds 4 dy Be wr Performing the differentiations and remembering equa- tions (1) and also the condition of incompressibility,

du dv dw ae i we find ba du du du 5 ae age ah

Now, let us suppose a vortex line drawn in the fluid so as always to begin at the same particle of the fluid. The components of the velocity of this point are u,v, w. Let us find those of a point on the moving vortex line at a distance ds from this point where

ds = wde (8). The co-ordinates of this point are x+ado,y+PBdo,z+ydo . and the components of its velocity are

(9),

3a 06 by ye 5 Gap or , w+ +.do : (10).

Consider the first of these components. equation (7) we may write it

Dae

In virtue of

du du du ute ada + = Bde gages ‘ (11), or du dx du dy du da Oygds ‘agee do+—7 Io (12), or du uta do (13).

But this represents the value of the component w of the velocity of the fluid itself at the same point, and the same thing may be proved of the other components.

Hence the velocity of the second point on the vortex line is identical with that of the fluid at that point. In other words, the vortex line swims along

with the fluid, and is always formed of the same row of fluid particles. The vortex line is therefore no mere mathematical symbol, but has a physical existence continuous in time and space.

By differentiating equations (1) with respect to a, y, and z respectively, and adding the results, we obtain the equa- tion—

de dS dy _ de® dy dz

This is an equation of the same form with (6), which expresses the condition of flow of a fluid of invariable density. Hence, if we imagine a fluid, quite independent of the original fluid, whose components of velocity are a, B, y, this imaginary fluid will flow without altering its density.

Now, consider a closed curve in space, and let vortex

(14).

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lines be drawn in both directions from every point of this

curve, These vortex lines will form a tubular surface,

which is called a vortex tube or a vortex filameut.

the same.

rotation is the same. of the vortex tube. A vortex tube cannot begin or end within the fluid ; for, if it did, the imaginary fluid, whose velocity components are a, B, y, would be generated from nothing at the begin- ning of the tube, and reduced to nothing at the end of it.

Hence, if the tube has a beginning and an end, they must

lie on the surface of the fluid mass. If the fluid is infinite the vortex tube must be infinitc, or else it must return into itself.

We have thus arrived at the following remarkable theorems relating to a finite vortex tube in an infinite fluid :—(1.) It returns into itself, forming a closed ring. We may therefore describe it as a vortex ring. (2.) It always consists of the same portion of the fluid. Hence its volume is invariable. (3.) Its strength remains always the same. Hence the velocity of rotation at any section varies inversely as the area of that section, and that of any segment varies directly as the length of that segment. (4.) No part of the fluid which is not originally in a state of rotational motion can ever enter into that state, and no part of the fluid whose motion is rotational can ever cease to move rotationally. (5.) No vortex tube can ever pass through any other vortex tube, or through any of its own convolu- tions. Hence, if two vortex tubes are linked together, they can never be separated, and if a single vortex tube is knotted on itself, it can never become untied. (6.) The motion at any instant of every part of the fluid, including the vortex rings themselves, may be accurately represented by conceiving an electric current to occupy the place of each vortex ring, the strength of the current being pro- portional to that of the ring. The magnetic force at any point of space will then represent in direction and magni- tude the velocity of the fluid at the corresponding point of the fluid.

These properties of vortex rings suggested to Sir William Thomson! the possibility of founding on them a new form of the atomic theory. The conditions which must be satisfied by an atom are—permanence in magnitude, capa- bility of internal motion or vibration, and a sufficient amount of possible characteristics to account for the differ- ence between atoms of different kinds.

The small hard body imagined by Lucretius, and adopted by Newton, was invented for the express purpose of ac- counting for the permanence of the properties of bodies. But it fails to account for the vibrations of a molecule as revealed by the spectroscope. We may indeed suppose the atom elastic, but this is to endow it with the very pro- perty for the explanation of which, as exhibited in aggre- gate bodies, the atomic constitution was originally assumed. The massive centres of force imagined by Boscovich may have more to recommend them to the mathematician, who has no scruple in supposing them to be invested with the power of attracting and repelling according to any law of the distance which it may please him to assign.

Such centres of force are no doubt in their own nature indivisible, but then they are also, singly, incapable of vibration. To obtain vibrations we must imagine molecules consisting of many such centres, but, in so doing, the possibility of these centres being separated altogether is again introduced.

1 “On Vortex Atoms,” Proc. Roy. Soc. Edin., 18th February 1867.

Since the imaginary fluid flows along the vortex lines without change of density, the quantity which in unit of time flows through any section of the same vortex tube must be Hence, at any section of a vortex tube the product of the area of the section into the mean velocity of This quantity is called the strength

Besides, it is in questionable scientific taste, after using atoms so freely to get rid of forces acting at sensible dis- tances, to make the whole function of the atoms an action at insensible distances.

On the other hand, the vortex ring of Helmholtz, imagined as the true form of the atom by Thomson, satisfies more of the conditions than any atom hitherto imagined. In the first place, it is quantitatively permanent, as regards its volume and its strength,—two independent quantities. It is also qualitatively permanent as regards its degree of implication, whether “ knottedness ” on itself or “linked- ness” with other vortex rings, At the same time, it is capable of infinite changes of form, and may execute vibrations of different periods, as we know that molecules do. And the number of essentially different implications of vortex rings may be very great without supposing the degree of implication of any of them very high.

But the greatest recommendation of this theory, from a philosophical point of view, is that its success in explaining phenomena does not depend on the ingenuity with which its contrivers ‘ save appearances,” by introducing first one hypothetical force and then another. When the vortex atom is once set in motion, all its properties are absolutely fixed and determined by the laws of motion of the primitive fluid, which are fully expressed in the fundamental equations. The disciple of Lucretius may cut and carve his solid atoms in the hope of getting them to combine into worlds ; the follower of Boscovich may imagine new laws of force to meet the requirements of each new phenomenon ; but he who dares to plant his fect

in the path opened up by Helmholtz and Thomson has no such resources. His primitive fluid has no other properties than inertia, invari- able density, and perfect mobility, and the method by which the motion of this fluid is to be traced is pure mathematical analysis. The difficulties of this method are enormous, but the glory of surmounting them would be unique.

There seems to be little doubt that an encounter between two vortex atoms would be in its general character similar to those which we have already. described. Indeed, the encounter between two smoke rings in air gives a very lively illustration of the elasticity of vortex rings.

But one of the first, if not the very first desideratum in a complete theory of matter is to explain—first, mass, and second, gravitation. To explain mass may seem an absurd achievement. We generally suppose that itis of the essence of matter to be the receptacle of momentum and energy, and even Thomson, in his definition of his primi- tive fluid, attributes to it the possession of mass. But according to Thomson, though the primitive fluid is the only true matter, yet that which we call matter is not the primitive fluid itself, but a mode of motion of that primi- tive fluid. It is the mode of motion which constitutes the vortex rings, and which furnishes us with examples of that permanence and continuity of existence which we are accustomed to attribute to matter itself. The primitive fluid, the only true matter, entirely eludes our perceptions when it is not endued with the mode of motion which converts certain portions of it into vortex rings, and thus renders it molecular.

In Thomson’s theory, therefore, the mass of bodies requires explanation. We have to explain the inertia of what is only a mode of motion, and inertia is a property of matter, not of modes of motion. It is true that a vortex ring at any given instant has a definite momentum and a definite energy, but to show that bodies built up of vortex rings would have such momentum and energy as we know them to have is, in the present state of the theory, a very difficult task,

It may seem hard to say of an infant theory that it is bound to explain gravitation. Since the time of Newton,

the doctrine of gravitation has been admitted and ex- pounded, till it has gradually acquired the character rather of an ultimate fact than of a fact to be explained.

It seems doubtful whether Lucretius considers gravita- tion to be an essential property of matter, as he seems to assert in the very remarkable lines—

‘© Nam si tantundem est in lane glomere, quantum Corporis in plumbo est, tantundem pendere par est : Corporis officium est quoniam premere omnia deorsum.”

—De Rerum Natura, i. 361.

Tf this is the true opinion of Lucretius, and if the down- ward flight of the atoms arises, in his view, from their own gravity, it seems very doubtful whether he attributed the weight of sensible bodies to the impact of the atoms. The latter opinion is that of Le Sage, of Geneva, pro- pounded in his Lucréce Newtonien, and in his T’raaté de Physique Mécanique, published, along with a second treatise of his own, by Pierre Prevost, of Gencva, in 1818.1 The theory of Le Sage is that the gravitation of bodies towards each other is caused by the impact of streams of atoms flying in all directions through space. These atoms he calls ultramundane corpuscules, because he conceives them to come in all directions from regions far beyond that part of the system of the world which is in any way known to us. He supposes each of them to be so small that a collision with another ultramundane corpus- cule is au event of very rare occurrence. It is by striking against the molecules of gross matter that they discharge their function of drawing bodies towards each other. A body placed by itself in free space and exposed to the impacts of these corpuscules would be bandied about by them in all directions, but because, ou the whole, it receives as many blows on one side as on auother, it cannot thereby acquire any sensible velocity. But if there are two bodies in space, each of them will screen the other from a certain proportion of the corpuscular bombardment, so that a smaller number of corpuscules will strike either body on that side which is next the other body, while the number of corpuscules which strike it in other directions remains the same.

Each body will therefore be urged towards the other by the effect of the excess of the impacts it receives on the side furthest from the other. If we take account of the impacts of those corpuscules only which come directly from infinite space, and leave out of consideration those which have already struck mundane bodies, it is easy to calculate the result on the two bodies, supposing their dimensious small compared with the distance between them.

The force of attraction would vary directly as the product of the areas of the sections of the bodies taken normal to the distance and inversely as the square of thc distance between them.

Now, the attraction of gravitation varies as the product of the masses of the bodies between which it acts, and inversely as the square of the distance between them. If, then, we can imagine a constitution of bodies such that the effective areas of the bodies are proportional to their masses, we shall make the two laws coincide. Here, then, seems to be a path leading towards an explanation of the law of gravitation, which, if it can be shown to be in other respects consistent with facts, may turn out to be a royal road into the very arcana of science.

Le Sage himself shows that, in order to make the effec- tive area of a body, in virtue of which it acts as a screen to the streams of ultramundane corpuscules, proportional to the mass of the body, whether the body be large or small, we must admit that the size of the solid atoms of the body is exceedingly small compared with the distances between

oe also Constitution de la Matiére, &c., par le P. Leray, Paris,

Ao Oi

them, so that a very small proportion of the corpuscules are stopped even by the densest and largest bodies. We may picture to ourselves the streams of corpusculcs coming in every direction, like light from a uniformly illuminated sky. We may imagine a material body to consist of a con- geries of atoms at considerable distances from each other, and we may represent this by a swarm of insects flying in the air. To an observer at a distance this swarm will be visible as a slight darkening of the sky in a certain quarter.

This darkening will represent the action of the material body in stopping the flight of the corpuscules. Now, if the proportion of light stopped by the swarm is very small, two such swarms will stop nearly the same amount of light, whether they are in a line with the eye or not, but if one of them stops an appreciable proportion of light, there will not be so much left to be stopped by the other, and the effect of two swarms in a line with the eye will be less than the sum of the two effects separately.

Now, we know that the effect of the attraction of the sun and earth on the moon is not appreciably different when the moon is eclipsed than on other occasions when full moon occurs without an eclipse. This shows that the number of the corpuscules which are stopped by bodies of the size and mass of the earth, and even the sun, is very small compared with the number which pass straight through the earth or the sun without striking a single molecule. To the streams of corpuscules the earth and the sun are mere systems of atoms scattered in space, which present far more openings than obstacles to their rectilinear flight.

Such is the ingenious doctrine of Le Sage, by which he endeavours to explain universal gravitation. Let us try to form some estimate of this continual bombardment of ultramundane corpuscules which is being kept up on all sides of us.

We have seen that the sun stops but a very small frac- tion of the corpuscules which enter it. The earth, being a smaller body, stops a still smaller proportion of them. The proportion of those which are stopped by a small body, say a 1 tb shot, must be smaller still in an enormous degree, because its thickness is exceedingly small compared with that of the earth.

Now, the weight of the ball, or its tendency towards the earth, is produced, according to this theory, by the excess of the impacts of the corpuscules which come from above over the impacts of those which come from below, and have passed through the earth. Either of these quantities is an exceedingly small fraction of the momentum of the whole number of corpuscules which pass through the ball in a second, and their difference is a small fraction of either, and yet it is equivalent to the weight of a pound. The velocity of the corpuscules must be enormously greater than that of any of the heavenly bodies, otherwise, as may easily be shown, they would act as a resisting medium opposing the motion of the planets. Now, the energy of a moving system is half the product of its momentum into its velocity. Hence the energy of the corpuscules, which by their impacts on the ball during one second urge it towards the earth, must be a number of foot-pounds equal to the number of feet over which a corpuscule travels in a second, that is to say, not less than thousands of millions. But this is only a small fraction of the energy of all the impacts which the atoms of the ball

receive from the innumerable streams of corpuscules which fall upon it in all directions.

Hence the rate at which the energy of the corpuscules is spent in order to maintain the gravitating property of a single pound, is at least millions of millions of foot-pounds per second,

What becomes of this enormous quantity of energy? If the corpuscules, after striking the atoms, fly off with a

ATOM

velocity equal to that which they had before, they will earry their energy away with them into the ultramundane regions. But if this be the case, then the corpuscules rebounding from the body in any given direction will be both in number and in velocity exactly equivalent to those which are prevented from proceeding in that direction by being deflected by the body, and it may be shown that this will be the case whatever be the shape of the body, and however many bodies may be present in the field. Thus, the rebounding corpuscules exactly make up for those which are deflected by the body, and there will be no excess of the impacts on any other body in one direction or another.

The explanation of gravitation, therefore, falls to the ground if the corpuscules are like perfectly elastic spheres, and rebound with a velocity of separation equal to that of approach. If, on the other hand, they rebound with a smaller velocity, the effect of attraction between the bedies will no doubt be produced, but then we have to find what becomes of the energy which the molecules have brought with them but have not carried away.

If any appreciable fraction of this energy is communicated to the body in the form of heat, the amount of heat so generated would in a few seconds raise it, and in like manner the whole material universe, to a white heat.

It has been suggested by Sir W. Thomson that the corpuscules may be so constructed so to carry off their energy with them, provided that part of their kinetic energy is transformed, during impact, from energy of translation to energy of rotation or vibration. For this purpose the

corpuscules must be material systems, not mere points. Thomson suggests that they are vortex atoms, which are set into a state of vibration at impact, and go off with a smaller velocity of translation, but ina state of violent vibration. He has also suggested the possibility of the vortex corpuscule regaining its swiftness and losing part of its vibratory agitation by communion with its kindred corpuscules in infinite space.

We have devoted more space to this theory than it seems to deserve, because it is ingenious, and because it is the only theory of the cause of gravitation which has been so far developed as to be capable of being attacked and defended. It does not appear to us that it can account for the teniperature of bodies remaining moderate while their atoms are exposed to the bombardment. The temperature of bodies must tend to approach that at which the average kinetic energy of a molecule of the body would be equal to the average kinetic energy of an ultramundane corpuscule.

Now, suppose a plane surface to exist which stops ail the corpuscules. The pressure on this plane will be p= NMu? where M is the mass of a corpuscule, N the number in unit of volume, and w its velocity normal to the plane. Now, we know that the very greatest pressure existing in the universe must be much less than the pressure p, which would be exerted against a body which stops all the corpuscules. We are also tolerably certain that N, the number of corpuscules which are at any one time within unit of volume, is small compared with the value of N for the molecules of ordinary bodies. Hence, Mu? must be enormous compared with the corresponding quantity for ordinary bodies, and it follows that the impact of the corpuscules would raise all bodies to an enormous tempera- ture. We may also observe that according to this theory the habitable universe, which we are accustomed to regard as the scene of a magnificent illustration of the conservation of energy as the fundamental principle of all nature, is in reality maintained in working order only by an enormous expenditure of external power, which would be nothing less than ruinous if the supply were drawn from anywhere else than from the infinitude of space, and which, if the contrivances of the most eminent mathematicians should be

found in any respect defective, might at any moment tear the whole universe atom from atom.

We must now leave tliese speculations about the nature of molecules and the cause of gravitation, and contemplate the material universe as made up of molecules. Every molecule, so far as we know, belongs to one of a definite number of species. The list of chemical elements may be taken as representing the known species which have been examined in the laboratories. Several of these have been discovered by means of the spectroscope, and more may yet remain to be discovered in the same way. The spec- troscope has also been applied to analyse the light of the sun, the brighter stars, and some of the nebulz and comets, and has shown that the character of the light emitted by these bodies is similar in some cases to that emitted by terrestrial molecules, and in others to light from which the molecules have absorbed certain rays. In this way a considerable number of coincidences have been traced between the systems of lines belonging to particular terrestrial substances and corresponding lines in the spectra of the heavenly bodies.

The value of the evidence furnished by such coincidences may be estimated by considering the degree of accuracy with which one such coincidence may be observed. The interval between the two lines which form Fraunhofer's line D is about the five hundredth part of the interval between B and G on Kirchhoff's scale. A discordance between the positions of two lines amounting to the tenth part of this interval, that is to say, the five thousandth part of the length of the bright part of the spectrum, would be very perceptible in a spectroscope of moderate power. We may define the power of the spectroscope to be the number of times which the smallest nieasurable interval is contained in the length of the visible spectrum. Let us denote this by p. In the case we have supposed p will be about 5000.

If the spectrum of the sun contains » lines of a certain degree of intensity, the probability that any one line of the spectrum of a gas will coincide with one of these n lines is

1 =(i-syeaie> +4&e.), Ds 2 2 Pp and when p is large compared with n, this becomes

nearly “If there are 7 lines in the spectrum of the

gas, the probability that each and every one shall coincide

with a line in the solar spectrum is approximately –

Hence, in the case of a gas whose spectrum contains several lines, we have to compare the results of two hypotheses. If a large amount of the gas exists in the sun, we have the strongest reason for expecting to find all the 7 lines in the solar spectrum. If it does not exist, the probability that r lines out of the m observed lines shall coincide with the lines of the gas is exceedingly small. If, then, we find all the r lines in their proper places in the solar spectrum, we have very strong grounds for believing that the gas exists in the sun. The probability that the gas exists in the sun is greatly strengthened if the character of the lines as to relative intensity and breadth is found to correspond in the two spectra.

The absence of one or more lines of the gas in the solar spectrum tends of course to weaken the probability, but the amount to be deducted from the probability must depend on what we know of the variation in the relative intensity of the lines when the temperature and the pres- sure of the gas are made to vary.

Coincidences observed, in the case of several terrestrial substances, with several systems of lines in the spectra of the heavenly bodies, tend to increase the evidence for the

doctrine that terrestrial substances exist in the heavenly bodies, while the discovery of particular lines in a cclestial spectrum which do not coincide with any line in a terres- trial spectrum does not much weaken the general argument, but rather indicates either that a substance exists in the heavenly body not yet detected by chemists on earth, or that the temperature of the heavenly body is such that some substance, undecomposable by our methods, is there split up into components unknown to us in their separate state.

We are thus led to believe that in widely-separated parts of the visible universe molecules exist of various kinds, the molecules of each kind having their various periods of vibration either identical, or so nearly identical that our spectroscopes cannot distinguish them. We might argue from this that these molecules are alike in all other respects, as, for instance, in mass. But it is sufficient for our present purpose to observe that the same kind of molecule, say that of hydrogen, has the same set of periods of vibration, whether we procure the hydrogen from water, from coal, or from meteoric iron, and that light, having the same set of periods of vibration, comes to us from the sun, from Sirius, and from Arcturus.

The same kind of reasoning which led us to believe that hydrogen exists in the sun and stars, also leads us to believe that the molecules of hydrogen in all these bodies had a common origin. For a material system capable of vibra- tion may have for its periods of vibration any set of values whatever. The probability, therefore, that two mate- rial systems, quite independent of each other, shall have, to the degree of accuracy of modern spectroscopic measure- ments, the same set of periods of vibration, is so very small that we are forced to believe that the two systems are not independent of each other. When, instead of two such systems, we have innumerable multitudes all having the same set of periods, the argument is immensely strength- ened,

Admitting, then, that there is a real relation between any two molecules of hydrogen, let us consider what this relation may be.

We may conceive of a mutual action between one body and another tending to assimilate them. Two clocks, for instance, will keep time with each other if connected by a wooden rod, though they have different rates if they were dis- connected. But evenif the properties of a molecule were as capable of modification as those of aclock, thereis no physical conncction of a sufficient kind between Sirius and Arcturus.

There are also methods by which a large number of bodies differing from each other may be sorted into sets, so that those in each set more or jess resemble each other. In the manufacture of small shot this is done by niaking the shot roll down an inclined plane. The largest specimens acquire the greatest velocities, and are projected farther than the smaller ones. In

this way the various pellets, which differ both in size and in roundness, are sorted into different kinds, those belonging to each kind being nearly of the same size, and those which are not tolerably spherical being rejected altogether.

If the molecules were originally as various as these leaden pellets, and were afterwards sorted into kinds, we should have to account for the disappearance of all the molecules which did not fall under one of the very limited number of kinds known to us; and to get rid of a number of indestructible bodies, exceeding by far the number of the molecules of all the recognised kinds, would be one of the severest labours ever proposed to a cosmogonist.

It is well known that living beings may be grouped into a certain nuniber of species, defined with more or less preci- sion, and that it is ditficult or impossible to find a series of individuals forming the links of a continuous chain between one species and another. In the case of living beings,

however, the generation of individuals is always going on, each individual differing more or less from its parents. Each individual during its whole life is under- going modification, and it either survives and propa- gates its specics, or dies early, accordingly as it is more or less adapted to the circumstances of its environment. Heuce, it has been found possible to frame a theory of the distribution of organisms into specics by means of generation, variation, and discriminative destruction. But a theory of evolution of this kind cannot be applied to the case of molecules, for the individual molecules neither are born nor die, they have neither parents nor offspring, and so far from being modified by their environment, we find that two molecules of the same kind, say of hydrogen, have the same properties, though one has been compounded with carbon and buried in the earth as coal for untold ages, while the other has been “ occluded” in the iron of a meteorite, and after unknown wanderings in the heavens has at last fallen into the hands of some terrestrial chemist.

The process by which the molecules become distributed into distinct species is not one of which we know any instances going on at present, or

of which we have as yet been able to form any mental representation. If we suppose that the molecules known to us are built up each of some moderate number of atoms, these atoms being all of them exactly alike, then we may attribute the limited number of molecular species to the limited number of ways in which the primitive atoms may be combined so as to form a permanent system.

But though this hypothesis gets rid of the difficulty of accounting for the independent origin of different species of molecules, it merely transfers the difficulty from the known molecules to the primitive atoms. How did the atoms come to be all alike in those properties which are in themselves capable of assuming any value?

If we adopt the theory of Boscovich, and assert that the primitive atom is a mere centre of force, having a certain definite mass, we may get over the difficulty about the equality of the mass of all atoms by laying it down as a doctrine which cannot be disproved by experiment, that mass is not a quantity capable of continuous increase or diminution, but that it is in its own nature discontinuous, like number, the atom being the unit, and all masses being multiples of that unit. We have no evidence that it is possible for the ratio of two masses to be an incommensut- able quantity, for the incommensurable quantities in geometry are supposed to be traced out in a continuous medium. If matter is atomic, and therefore discontinuous, it is unfitted for the construction of perfect geometrical models, but in other respects it may fulfil its functions.

But even if we adopt a theory which makes the equality of the mass of different atoms a result depending on the nature of mass rather than on any quantitative adjustment, the correspondence of the periods of vibration of actual molecules is a fact of a different order.

We know that radiations exist having periods of vibration of every value between those corresponding to the limits of the visible spectrum,.and probably far beyond these limits on both sides. The most powerful spectroscope can detect no gap or discontinuity in the spectrum of the light emitted by incandescent lime.

The period of vibration of a luminous particle is therefore a quantity which in itself is capable of assuming any one of aseries of values, which, if not mathematically con- tinuous, is such that consecutive observed values differ from each other by less than the ten thousandth part of either. There is, therefore, nothing in the nature of time itself to prevent the period of vibration of a molecule from assuming any one of many thousand different observable

values. That which determines the period of any particular kind of vibration is the relation which subsists between the corresponding type of displacement and the force of restitu- tion thereby called into play, a relation involving constants of space and time as well as of mass.

It is the equality of these space- and time-constants for all molecules of the same kind which we have next to consider. We have seen that the very different circum- stances in which different molecules of the same kind have been placed have not, even in the course of many ages, produced any appreciable difference in the values of these constants. If, then, the various processes of nature to which these molecules have been subjected since the world began have not been able in all that time to produce any appreciable difference between the constants of one mole- cule and those of another, we are forced to conclude that it is not to the operation of any of these processes that the uniformity of the constants is due.

The formation of the molecule is therefore an event not belonging to that order of nature under which we live. It is an operation of a kind which is not, so far as we are aware, going on on earth or in the sun or the stars, either now or since these bodies began to be formed. It must be referred to the epoch, not of the formation of the earth or of the solar system, but of the establishment of the existing order of nature, and till not only these worlds and systems, but the very order of nature itself is dissolved, we have no reason to expect the occurrence of any operation of a similar kind.

In the present state of science, therefore, we have strong reasons for believing that in a molecule, or if not in a molecule, in one of its component atoms, we have something which has existed either from eternity or at least

from times anterior to the existing order of nature. But besides this atom, there are immense numbers of other atoms of the same kind, and the constants of each of these atoms are incapable of adjustment by any process now in action. Each is physically independent of all the others.

Whether or not the conception of a multitude of beings existing from all eternity is in itself self-contradictory, the conception becomes palpably absurd when we attribute a relation of quantitative equality to all these beings. We are then forced to look beyond them to some common cause or common origin to explain why this singular relation of equality exists, rather than any one of the infinite number of possible relations of inequality.

Science is incompetent to reason upon the creation of matter itself out of nothing. We have reached the utmost limit of our thinking faculties when we have admitted that, because matter cannot be eternal and self-existent, it must have been created. It is only when we contemplate not matter in itself, but the form in which it actually exists, that our mind finds something on which it can lay hold.

That matter, as such, should have certain fundamental properties, that it should have a continuous existence in space and time, that all action should be between two portions of matter, and so on, are truths which may, for aught we know, be of the kind which metaphysicians call necessary. We may use our knowledge of such truths for purposes of deduction, but we have no data for speculating on their origin.

ATOOI, one of the larger Sandwich Islands, in the South Pacific Ocean. Towards the N.E. and N.W. the country is rugged and broken, but to the southward it is more level. The hills rise from the sea with a gentle acclivity, and, at a little distance back, are covered with wood ; the central peaks attain an elevation of 7000 feet.

But the equality of the constants of the molecules is a fact of a very different order. It arises from a particular distribution of matter, a collocation, to use the expression of Dr Chalmers, of things which we have no difficulty in imagining to have been arranged otherwise. But many of the

ordinary instances of collocation are adjustments of constants, which are not only arbitrary in their own nature, but in which variations actually occur; and when it is pointed out that these adjustments are beneficial to living beings, and are therefore instances of benevolent design, it is replied that those variations which are not conducive to the growth and multiplication of living beings tend to their destruction, and to the removal thereby of the evidence of any adjustment not beneficial.

The constitution of an atom, however, is such as to render it, so far as we can judge, independent of all the dangers arising from the struggle for existence. Plausible reasons may, no doubt, be assigned for believing that if the constants had varied from atom to atom through any sensible range, the bodies formed by aggregates of such atoms would not have been so well fitted for the construc- tion of the world as the bodies which actually exist. But as we have no experience of bodies formed of such variable atoms this must remain'a bare conjecture.

Atoms have been compared by Sir J. Herschel to manufactured articles, on account of their uniformity. The uniformity of manufactured articles may be traced to very different motives on the part of the manufacturer. In certain cases it is found to be less expensive as regards trouble, as well as cost, to make a great many objects exactly alike than to adapt each to its special requirements. Thus, shoes for soldiers are made in large numbers without any designed adaptation to the feet of particular men. In another class of cases the uniformity is intentional, and is designed to make the manufactured article more valuable. Thus, Whitworth's bolts are made in a certain number of sizes, so that if one bolt is lost, another may be got at once, and accurately fitted to its place. The identity of the arrange- ment of the words in the different copies of a document or book is a matter of great practical importance, and it is more perfectly secured by the process of printing than by

| that of manuscript copying.

In a third class not a part only but the whole of the value of the object arises from its exact conformity to a given standard. Weights and measures belong to this class, and the existence of many well-adjusted material standards of weight and measure in any country furnishes evidence of the existence of a

system of law regulating the transactions of the inhabitants, and enjoining in all pro- fessed measures a conformity to the national standard.

There are thus three kinds of usefulness in manufactured articles—cheapness, serviceableness, and quantitative accu- racy. Which of these was present to the mind of Sir J. Herschel we cannot now positively affirm, but it was at least as likely to have been the last as the first, though it seems more probable that he meant to assert that a number of exactly similar things cannot be each of them eternal and self-existent, and must therefore have been made, and that he used the phrase “ manufactured article” to suggest the idea of their being made in great numbers.

(J. C. M.

The chief ports are Waimea and Hanalei. The island was one of the stations chosen for the observation of the transit of Venus in 1874. It is nearly 40 miles in length, and contains about 10,000 inhabitants, Long. 159° 40’ W., lat. 21° 57’ N. ATRATO, a river of Colombia, South America, which, Ill. —

cloister, situated between the porch or vestibule and the body of the church. In the centre was placed a fountain, wherein the worshippers washed their hands before enter- ing church. In the atrium those who were not suffered to advance farther, and more particularly the first class of penitents, stood to solicit the prayers of the faithful as they went into the church. It was also used as a burying- ground, at first only for distinguished persons, but after- wards for all believers.

ATROPHY (a priv., zpopy, nourishment), a term in medicine used to describe a state of wasting due to some interference with the function of healthy nutrition. In the living organism there are ever at work changes involv- ing the waste of its compouent tissues, which render neces- sary, in order to the preservation of life, the supply and proper assimilation of nutritive material. It is also essen- tial for the maintenance of health that a due relation exist between these processes of waste and repair, so that the

after a course of 250 miles, almost due N., for the most part through a low and swampy region, falls into the Gulf of Uraba or Darien. The gold and platinum mines of Choco were on some of its affluents, and its sands are still auriferous. The river has attracted considerable attention in connection with schemes for the construction of a ship- canal across the isthmus. It is navigable for small vessels for about 140 miles.

ATREK or Arrruck, a river which rises in the moun- tains of Khorasan, and flows W. along the borders of Persia and the Russian possessions, till it falls in the south-eastern corner of the Caspian, a short distance to the N. of Ashurada.

ATREUS, in Greek Legend, a son of Pelops, had, with his brother Thyestes, settled in Mycenze, where he succeeded Eurystheus in the sovereignty, in which he was secured by the possession of a lamb or ram with a golden fleece. His wife Aérope, a daughter of Minos, bribed by Thyestes,

assisted the latter to carry off the ram. But Zeus, in the interest of Atreus, wrought a miracle, causing the sun which before had risen in the west to mse in the east. Thyestes was driven from Mycene, but returned to his brother begging to be forgiven. Atreus, appearing to welcome him, invited him to a banquet to eat of his own son, whom he had slain. From this crime followed the ills which befel Agamemnon, the son of Atreus (Aischylus Agam. 1583, foll.)

ATRI or Artrta, the ancient Hadria, a town of Naples, in the province of Abruzzo Ulteriore L., situated on a steep mountain 5 miles from the Adriatic, and 18 miles 8.E. of Teramo. It is the see of a bishop, and has a cathedral, a parish church, and several convents and hospitals. It con- tains 9877 inhabitants. Remains of the ancient city have been discovered to the S. of the present site, consisting of the ruins of a theatre and baths, with pavements, and vases of Greek manufacture. It wasa very flourishing commercial port at an early period, but had declined into a small town in the time of Strabo. Its modern revival has been furthered by the excavation of new canals.

ATRIUM, the principal apartment in a Roman house, was entered through the ostiwm or janwa, which opened off the vestibulum, a clear space between the middle of the house and the street, formed by the projection of the two sides. It was generally quadrangular in shape, and was roofed all over, with the exception of a square opening, called compluvium, towards which the roofs sloped, and by which the rain-water was conducted down to a basin (impluviwm) fixed in the floor. The opening in the roof seems sometimes to have been called impluviwm (Terence, Eun., iii. 5; Phorm., iv. 4). In the early periods of Roman civilisation, the atrium was the common public apart- ment, and was used for the reception of visitors and clients, and for ordinary domestic purposes, as cooking and dining. In it were placed the ancestral pictures, the marriage-couch, the focus, or hearth, and generally a small altar. Here, too, were kept the looms at which the mistress of the house sat and span with her maid-servants. At a somewhat later period, and among the wealthy, separate apartments were built for kitchens and dining-rooms, and the atrium was kept as a general reception room for clients and visitors. It appears sometimes to have been called cavediwm, but the relation of these two is somewhat obscure. According to some authorities, the cavedium was simply the open space formed when the impluvium was surrounded with pillars to support the roof ; according to others, the cave- dwwm was really the principal room, to which the atrium served as an antechamber.

ATRIUM, in Ecclesiastical Antiquities, denotes an open place or court before a church. It consisted of a large area or square plat of ground, surrounded with a portico or

one may not be in excess of the other. When the appro- priation of nutriment exceeds the waste, hypertrophy or increase in bulk of the tissues takes place. (See HyPEr- TRoPHY.) When, on the other hand, the supply of nutritive matter is suspended or diminished, or when the power of assimilation is impaired, atrophy or wasting is the result, Thus the whole body becomes atrophied in many diseases ; and in old age every part of the frame, with the single exception of the heart, undergoes atrophic change. . Atrophy may, however, affect single organs or parts of the body, irrespective of the general state of nutrition, and this may be brought about in a variety of ways. One of the most frequently observed of such instances

is atrophy from disuse, or cessation of function. Thus, when a limb is deprived of the natural power of motion, either by paralysis or by painful joint disease, the condition of exercise essen- tial to its nutrition being no longer fulfilled, atrophy of all its textures sooner or later takes place. The brain in imbeciles is frequently observed to be shrivelled, and in many cases of blindness there is atrophy of the optic nerve and optic tract. This form of atrophy is likewise well exemplified in the case of those organs and structures of the body which subserve important ends during feetal life, but which, ceasing to be necessary after birth, undergo a sort of natural atrophy, such as the thymus gland, and certain vessels specially concerned in the feetal circulation. The uterus after parturition undergoes a certain amount of atrophy, and the ovaries, after the child-bearing period, become shrunken. Atrophy of a part may also be caused by interruption to its normal blood supply, as in the case of the ligature or obstruction of an artery. Again, long standing disease, by affecting the nutrition of an organ and by inducing the deposit of morbid products, may result in atrophy, as frequently happens in affections of the liver and kidneys. Parts that are subjected to continuous pres- sure are liable to become atrophied, as is sometimes seen in internal organs which have been pressed upon by tumours or other morbid growths, and is well illustrated in the case of the feet of Chinese ladies, which are prevented from growing by persistent compression exercised from birth. Atrophy may manifest itself simply by loss of sub- stance ; but, on the other hand, it is often found to co-exist with degenerative changes in the textures affected and the formation of adventitious growth, so that the part may not be reduced in bulk although atrophied as regards its proper structure. Thus, in the case of the heart, when affected with fatty degeneration, there is atrophy of the proper muscular texture, which, however, being largely replaced by fatty matter, the organ may undergo no diminution 10 volume, but may, on the contrary, be increased in size. Atrophy is usually a gradual and slow process, but some- times it proceeds rapidly. In the disease known by the

name of acute yellow atrophy of the liver, that organ under- goes such rapidly destructive change as results in its shrinking to half, or one-third, of its normal size in the course of a few days.

The term progressive muscular atrophy (synonyms, wasting or creeping palsy) is applied to an affection of the muscular system, which is characterised by the atrophy and subsequent paralysis of certain muscles, or groups of muscles, and is associated with morbid changes in the anterior roots of the nerves of the spinal cord. This disease begins insidiously, aud is often first observed to affect the muscles of one hand, generally the right. The attention of the sufferer is first attracted by the power of the hand becoming weakened, and then there is found to be a wasting of certain of its muscles, particularly those of the ball of the thumb. Gradually other muscles in the arms and legs become affected in a similar manner, their atrophy being attended with a corresponding diminution in power. Although sometimes arrested, this disease tends to progress, involving additional muscles, until in course of time the greater part of the muscular system is impli- cated, and a fatal result ensues. (J. Of mae

ATROPOS (ca priv., and zpézew, to turn), the eldest of the three Moirai, Parcee, or Fates. Her name, The Unalter- able, indicates the part generally played by her, viz., that of rendering the decisions of her sisters irreversible or immut- able. This is the function ascribed to her by Plato (Rep., x. 620), who also assigns to her supremacy over future events (617). Ancient authorities, however, are not unanimous in their distribution of the parts of the three sisters. Atropos is most frequently represented with scales, a sun-dial, or a cutting instrument, the “ abhorred shears,” with which she slits the thin-spun thread of life that has been placed on the spindle by Clotho and drawn off by Lachesis. See Parca,

ATTACHMENT, in English Law, is a process from a court of record, awarded by the justices at their discretion, on a bare suggestion, or on their own knowledge, and is properly grantable in cases of contempt. It differs from arrest, in that he who arrests a man carries him to a person of higher power to be forthwith disposed of ; but he that attaches keeps the party attached, and presents him in court at the day assigned, as appears by the words of the writ. Another difference is, that arrest is only upon the body of a man, whereas an attachment is often upon his goods. It is distinguished from distress in not extending to lands, as the latter does; nor does a distress touch the body, as an attachment does. Every court of record has power to fine and imprison for contempt of its authority. Attachment being merely a

process to bring the defendant before the court, is not necessary in cases of contempt in the presence of the court itself. Attachment will be granted against peers and members of Parliament, only for such gross contempts as rescues, disobedience to the Queen's writs, and the like. Attachment will not lie against a corporation. The Couuty Courts in this respect are regulated by the 9 and 10 Vict. c. 95, § 113, and the 12 and 13 Vict. c. 101, § 2. They can only punish for contempts committed in presence of the court. (See ConTEMPT oF Court.) Attachments are granted on a rule in the first instance to show cause, which must be personally served before it can be made absolute, except for non-payment of costs on a master's allocatur, and against a sheriff for not obeying a rule to return a writ or to bring in the body. The offender is then arrested, and when committed will be compelled to answer interrogatories, exhibited against him by the party at whose instance the proceedings have been had; and the examination when taken is referred to the master, who reports thereon, and on the contempt being reported, the court gives judgment according to its dis-

cretion, in the same manner as upon a conviction for a misdemeanour atcommon law. Sir W. Blackstone observes that "this method of making the defendant answer upon oath to a criminal charge is not agreeable to the genius of the common law in any other instance," and it may be added that the elasticity of the legal definitions of contempt of court, especially with respect to com ments on judicial proceedings, is the subject of much complaint.

ATTACHMENT ouT oF CHANCERY enforced answers and obedience to decrees and orders of that court, now merged in the High Court of Justice under the J udicature Act, 1873, and was made out without order upon an affi- davit of the due service of the process, &c., with whose requirements compliance was sought. A corporation, how- ever, is proceeded against by distringas and not by attach- ment. It was formerly competent to the plaintiff to compel the appearance of a defendant in Chancery by attachment, but the usual course was to enter appearance for him in case of default. By the proposed rules under the Judicature Act, 1873, a writ of attachment is to have the same force and effect as the old attachment out of

Chancery. It is one of the modes of execution allowed for the recovery of property other than land or money.

ATTACHMENT OF THE Forest is the proceeding in the Courts of Attachments, Woodmote, or Forty Days' Courts. These courts have now fallen into absolute desuetude. They were held before the verderers of the royal forests in dif- ferent parts of the kingdom once in every forty days, for the purpose of inquiring into all offences against " vert and venison." The attachment is by the bodies of the offenders, if taken in the very act of killing venison, or stealing wood, or preparing so to do, or by fresh and immediate pursuit after the act is done; else they must be attached by their goods. These attachments were received by the verderers and enrolled, and certified under their seals to the Court of Justice seat, or Sweinmote, which formed the two superior of the forest courts.

ATTACHMENT, FOREIGN, is an important custom prevailing in the city of London, whereby a creditor may attach money owing to his debtor, or property belonging to him in the possession of third parties. The person holding the pro- perty or owing the money must be within the city at the time of being served with the process, but all persons are entitled to the benefit of the custom. The plaintiff having commenced his action, and made a satisfactory affidavit of his debt, is entitled to issue attachment, which thereupon affects all the money or property of the defendant in the hands of the third party, who in these proceedings is called the garnishee. The garnishee, of course, has as against the attachment all the defences which would be available to him against the defendant, his alleged creditor. The garnishee may plead payment under the attachment, if there has been no fraud or collusion, in bar to an action by the defendant for his debt or property. The court to which this process belongs is the Mayor's Court of London, the procedure in which is regulated by 20 and 21 Vict. c. 157. This custom, and all proceedings relating thereto, are expressly exempted from the operation of the Debtor's Act, 1869. Similar customs exist in Bristol aud a few other towns in England, and also in Scotland. See ARREST and ARRESTMENT.

ATTACHMENT OF Desrs.—It was suggested by the common law commissioners in 1853 that a remedy analogous to that of Foreign

Attachment might be made available to creditors, after judgment, against debts due to their debtors. Accordingly, the Common Law Procedure Act, 1854, enacted that any creditor, having obtained judgment in the superior courts, should have an order that

the judgment debtor might be examined as to any debts due and owing to him before a master of the court. On affidavit that the judgment was still unsatisfied, and that any other person within the jurisdiction was indebted to the judgment debtor, the judge was empowered to attach all debts due from such third person (called the garnishee) to the judgment debtor, to answer the judgment debt. This order binds the debts in the hands of the garnishee, and if he does not dispute his liability execution issues against him at once. Tf he disputes his liability the question must be tried. Payment by the garnishee or execution against him is a complete discharge as against the judgment debtor. These provisions were, by an order in Council of 18th Nov. 1867, extended to the County Courts. (By 33 and 34 Vict. c. 30, it is enacted that no order for the attachment of the wages of any servant, labourer, or workman shall be made by the judge of any court of record or inferior court.) The proposed rules and regulations under the Judicature Act, 1873, retain the process for attachment of debts as established by the Procedure Act of 1854.

ATTAINDER, in the Law of England, was the imme-

diate and inseparable consequence from the common law upon the sentence of death. When it was clear beyond all dispute that the criminal was no longer fit to live, he was called attaint, attinctus, stained or blackened, and could not, before the 6 and 7 Vict. c. 85, $ 1, be a witness in any court. This attainder took place after judgment of death, or upon such circumstances as were equivalent to judgment of death, such as judgment of outlawry on a capital crime, pronounced for absconding from justice. Conviction without judgment was not followed by attainder. The consequences of attainder were—Ist, Forfeiture ; 2d, Corruption of blood. On attainder for treason, the criminal forfeited to the Crown his lands, rights of entry on lands, and any interest he might have in lands for his own life ora term of years. For murder, the offender forfeited to the Crown the profit of his frecholds

during life, and in the case of lands held in fee-simple, the lands themselves for a year and a day; subject to this, the lands escheated to the lord of the fee. These forfeitures related back to the time of the offence committed. Forfeitures of goods and chattels ensued not only on attainder, but on conviction for a felony of any kind, or on flight from justice, and had no relation backwards to the time of the offence committed. By corruption of blood, “ both upwards and downwards,” the attainted person could neither inherit nor transmit lands. The lands escheated to the lord of the fee, subject to the Crown’s right of forfeiture. The doctrine of attainder has, however, ceased to be of much importance. By the 33 and 34 Vict. c. 23, it is enacted that henceforth no confession, verdict, inquest, conviction, or judgment of or for any treason or felony, or felo de se, shall cause any attainder or corruption of blood, or any forfeiture or escheat. Sentence of death, penal servitude, or imprisonment with hard labour for more than twelve months, after conviction for troason or felony, disqualifies from holding or retaining a seat in Parliament, public offices under the Crown or other- wise, right to vote at elections, &c., and such disability is to remain until the punishment has been suffered or a pardon obtained. Provision is made for the due administration of convicts’ estates, in the interests of themselves and their families. Forfeiture consequent on outlawry is exempted from the provisions of the Act.

Bills of Attainder in Parliament ordinarily commence in the House of Lords; the proceedings are the same as on other bills, but the parties affected by them may appear by counsel and witnesses in both Houses. In the case of an impeachment, the House of Commons is prosecutor and the House of Lords judge; but proceedings by Bill of

Attainder are legislative in form, and the consent of Crown, Lords, and Commons is therefore necessary.

ATTALIA, an ancient city of Pamphylia, which de- rived its name from Attalus II., king of Pergamus. It seems to have been a place of considerable importance, and is most probably to be identified with the modern Adalia, Antalia, or Sataliah, as it is variously called. See SATALIAH.

ATTAR, or Orro, of Roszs, a well-known perfume of great strength, is an essential oil of roses, prepared chiefly in Hindustan and Persia. See Oms and PERFUMERY.

ATTENTION, in Psychology, may be defined as the concentration of consciousness, or the direction of mental energy upon a definite object or objects. By means of it we either bring within the circle of our conscious life per- ceptions and ideas which would not otherwise have risen from their obscurity, or render clearer and more distinct some of those already under notice. Its mode of operation and the effects produced by it may be compared with the concentration of visual activity on some definite part of the field of vision, and the clearer perception of the limited portion which is thereby attained. In both cases the result is brought about, not by effecting any change in the perceptions themselves, but simply by isolat- ing them, and considering them to the exclusion of all other objects. Since all consciousness involves discrimina- tion, 2.c., isolation of one object from others, it involves attention, which might therefore be defined as the neces- sary condition of consciousness. Such a definition is, however, too general, and throws no light upon the nature of the process whereby our mental energy is strengthened in particular cases. ‘This increase of force, when conscious-

ness is directed to any one object to the exclusion of others,

is partly to be explained by reference to the general law

that, as the amount of intellectual energy at our disposal is limited, the greater the number of objects over which it is spread, the less will each receive, pluribus intentus, minor est ad singula sensus; and conversely, the greater the con-

centration, the fewer must be the objects attended to. In addition to this general law of limitation, there are special circumstances which determine the amount of consciousness we shall bestow on any object. In the first place, there are certain mechanical influences only partly subject to the will, such are the force or vividness of the impression, the interest attaching to an object, the trains of associated ideas excited, or the emotions roused by its contemplation. There is, secondly, an exercise of voli- tion employed in

fixing the mind upon some definite object ; this is a purely voluntary act, which can be strengthened by habit, is variable in different individuals, and to which, as being its highest stage, the name Atten- tion is sometimes restricted. The general law of the limitation of conscious activity, pointed out above, throws considerable light on the nature of abstraction and its relation to Attention. It is clear that concentration of consciousness upon any one attribute or attrioutes of an object involves withdrawal of consciousness from all other attributes. This withdrawal is, logically and etymologically, Abstraction, which is thus the negative side of Attention, or, as Hamilton expresses it, the two processes form the negative and positive poles of the same mental act. ATTERBOM, Per DanieL AMADEUS, a Swedish poet, was born in Ostergéthland in 1790, studied in the University of Upsala from 1805 to 1815, became Professor of Philosophy there in 1828, and died in 1855. He was the leader in the great romantic movement which revolutionised Swedish literature. In 1807, when in his 17th year, he founded at Upsala an artistic society, called the Aurora League, the members of which included Palmblad, Elgstrom, Hedborn, and other youths, whose names were destined to

take a foremost rank in the belles-lettres of their generation. Their first newspaper, Polyxem, was a crude effort, soon abandoned, but in 1810 there began to appear a journal, Fosforus, edited by Atterbom, which lasted for a consider- able time, and finds a place in classic Swedish literature. It consisted entirely of poetry and zsthetico-polemical essays; it introduced the study of the newly-arisen Romantic school of Germany, and formed a vehicle for the early works, not of Atterbom only, but of Hammarskold, Dahlgren, Palmblad, and other eminent poets. Among Atterbom’s independent works the most celebrated is Lycksalighetens 6 (The Fortunate Island), a romantic drama of extraordinary beauty, published in 1823. Before this he had published a cycle of lyrics, The Flowers, of a mystical character, somewhat in the manner of Novalis. Of a great drama, Fogel bla (The Blue Bird), only a fragment is preserved, but what exists is among the most exquisite of his writings. As a purely lyrical poet he has uot been excelled in Sweden, but his popularity has been endangered, partly by his weakness for allegory and symbolism, partly by his consistent adoption of the mannerisms of Tieck and Novalis. his lifetime was unbounded.

ATTERBURY, Francis, a man who holds a con- spicuous place in the political, ecclesiastical, and literary history of England, was born in the year 1662, at Middle- ton in Buckinghamshire, a parish of which his father was rector. Francis was educated at Westminster School, and carried thence to Christ Church a stock of learning which, though really scanty, he through life exhibited with such judicious ostentation that superficial observers believed his attainments to be immense. At Oxford, his parts, his taste, and his bold, contemptuous, and imperious spirit soon made him conspicuous. Here he published, at twenty, his first work, a translation of the noble poem of Absalom and Ahithophel into Latin verse. Neither the style nor the versification of the young scholar was that of the Augustan age. In English composition he succeeded much better. In 1687 he distinguished himself among many able men who wrote in defence of the Church of England, then persecuted by James II., and calumniated by apostates who had for lucre quitted her communion. Among these apostates none was more active or malignant than Obadiah Walker, who was master of University College, and who had set up there, under the royal patronage, a press for printing tracts against the established religion. In one of these tracts, written apparently by Walker himself, many aspersions were thrown on Martin Luther. Atterbury undertook to defend the great Saxon Reformer, and per- formed that task in a manner singularly characteristic. Whoever examines his reply to Walker will be struck by the contrast between the feebleness of those parts which are argumentative and defensive, and the vigour of those parts which are rhetorical and aggressive. The Papists were so much galled by the sarcasms and invectives of the young polemic, that they raised a cry of treason, and accused him of having, by implication, called King James a Judas.

After the Revolution, Atterbury, though bred in the doctrines of non-resistance and passive obedience, readily swore fealty to the new Government. In no long time he took holy orders. He occasionally preached in London with an eloquence which raised his reputation, and soon had the honour of being appointed one of the royal chaplains, But he ordinarily resided at Oxford, where he took an active part in academical business, directed the classical studies of the undergraduates of his college, and was the chief adviser and assistant of Dean Aldrich, a divine now chiefly

remembered by his catches, but renowned among his contemporaries as a scholar, a Tory, and a High-

His renown during

Churchman. It was the practice, not a very judicious practice, of Aldrich, to employ the most promising youths of his college in editing Greek and Latin books. Among the studious and well-disposed lads who were, unfortunately for themselves, induced to become teachers of philology when they should have been content to be learners, was Charles Boyle, son of the earl of Orrery, and nephew of Robert Boyle, the great experimental philosopher. The task assigned to Charles Boyle was to prepare a new edition of one of the most worthless books in existence. It was a fashion among those Greeks and Romans who cultivated rhetoric as an art, to compose epistles and harangues in the names of eminent men. Some of these counterfeits are fabricated with such exquisite taste and skill, that it is the highest achievement of criticism to distinguish them from originals. Others are so feebly and rudely executed, that they can hardly impose on an intelligent schoolboy. The best specimen which has come down to us is perhaps the Oration for Marcellus, such an imitation of Tully's eloquence as Tully would himself have read with wonder and delight. The worst specimen is perhaps a collection of letters purporting to have been written by that Phalaris who governed Agrigentum more than 500 years before the Christian era. The evidence, both internal and external, against the genuineness of these letters is overwhelming. Wher, in the 15th century, they emerged, in company with much that was far more valuable, from their obscurity, they were pronounced spurious by Politian, the greatest scholar of Italy, and by Erasmus, the greatest scholar on our side of the Alps. In truth, it would be as easy to persuade an educated Englishman, that one of Johnson's Bamblers was the work of William Wallace, as to persuade a man like Erasmus, that a pedantic exercise, composed in the trim and artificial Attic of the time of Julian, was a despatch written by a crafty and ferocious Dorian, who roasted people alive many years before there existed a volume of prose in the Greek language. But though Christ Church could boast of

many good Latinists, of many good English writers, and of a greater number of clever and fashionable men of the world than belonged to any other academic body, there was not then in the college a single man capable of distinguishing between the infancy and the dotage of Greek literature. So superficial, indeed, was the learning of the rulers of this celebrated society, that they were charmed by an essay which Sir William Temple published in praise of the ancient writers. It now seems strange, that even the eminent public services, the deserved popularity, and the graceful style of Temple, should have saved so silly a performance from universal contempt. Of the books which he most vehemently eulogised, his eulogies proved that he knew nothing. In fact, he could not read a line of the language in which they were written. Among many other foolish things, he said that the letters of Phalaris were the oldest letters and also the best in the world. Whatever Temple wrote attracted notice. People who had never heard of the Epistles of Phalaris began to inquire about them. Aldrich, who knew very little Greek, took the word of Temple who knew none, and desired Boyle to prepare a new edition of these admirable compositions which, having long slept in obscurity, had become on a sudden objects of general interest.

The edition was prepared with the help of Atterbury, who was Boyle's tutor, and of some other members of the college. It was an edition such as might be expected from people who would stoop to edit such a book. The notes were worthy of the text; the Latin version worthy of the Greek original. 'The volume would have been forgotten in a month, had not a misunderstanding about & manuscript arisen between the young editor and the

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greatest scholar that had appeared in Europe since the revival of letters, Richard Bentley. 'The manuscript was in Bentley's keeping. Boyle wished it to be collated. A mischief-making bookseller informed him that Bentley had refused to lend it, which was false, and also that Bentley had spoken contemptuously of the letters attributed to Phalaris, and of the critics who were taken in by such counterfeits, which was perfectly true. Boyle, much provoked, paid, in his preface, a bitterly ironical compli- ment to Bentley's courtesy. Bentley revenged himself by a-short dissertation, in which he

proved that the epistles were spurious, and the new edition of them worthless ; but he treated Boyle personally with civility as a young gentleman of great hopes, whose love of learning was highly commendable, and who deserved to have had better instructors.

Few things in literary history are more extraordinary than the storm which this little dissertation raised. Bentley had treated Boyle with forbearance ; but he had treated Christ Church with contempt; and the Christ Churchmen, wherever dispersed, were as much attached to their college as a Scotchman to his country, or a Jesuit to his order. Their influence was great. They were dominant at Oxford, powerful in the Inns of Court and in the College of Physicians, conspicuous in Parliament and in the literary and fashionable circles of London, Their unani- mous cry was that the honour of the college must be vindicated, that the insolent Cambridge pedant must be put down. Poor Boyle was unequal to the task, and disinclined to it. It was, therefore, assigned to his tutor Atterbury.

The answer to Bentley, which bears the name of Boyle, but which was, in truth, no more the work of Boyle than the letters to which the controversy related were the work of Phalaris, is now read only by the curious, and will in all probability never be reprinted again. But it had its day of noisy popularity. It was to be found not only in the studies of men of letters, but on the tables of the most brilliant drawing-rooms of Soho Square and Covent Garden. Iiven the beaux and coquettes of that age, the Wildairs and the Lady Lurewells, the Mirabells, and the Millamants, congratulated each other on the way in which the gay young gentleman, whose erudition sate so easily upon him, and who wrote with so much pleasantry and good breed- ing about the Attic dialect and the anapestic measure, Sicilian talents and Thericlean cups, had bantered the queer prig of a doctor. Nor was the applause of the inultitude undeserved. ‘The book is, indeed, Atterbury’s masterpiece, and gives a higher notion of his powers than any of those works to which he put his name That he was altogether in the wrong on the main question, and on all the collateral questions springing out of it, that his knowledge of the language, the literature, and the history of Greece, was not equal to what many freshmen now bring up every year to Cambridge and Oxford, and that some of his blunders seem rather to deserve a flogging than a refutation, is true; and therefore it is that his performance is, in the

highest degree, interesting and valuable to a judicious reader. It is good by reason of its exceeding badness. It is the most extraordinary instance that exists of the art of making much show with little substance. There is no difficulty, says the steward of Molitre's miser, in giving a fine dinner with plenty of money: the really great cook is he who can set out a banquet with no money at all, That Bentley should have written excellently on ancient chronology and geography, on the development of the Greek language, and the origin of the Greek drama, is not strange. But that Atterbury should, during some years, have been thought to have treated these subjects much better than Bentley, is strange indeed. It is true that the champion of Christ Church

inestimable treasure of massy bullion.

ATTERETEHEY

had all the help which the most celebrated members of that society could give him. Smalridge contributed some very good wit; Friend and others some very bad archeology and philology. But the greater part of the volume was entirely Atterbury's: what was not his own was revised and retouched by him; and the whole bears the mark of his mind—a mind inexhaustibly rich in all the resources of controversy, and familiar with all the artifices which make falsehood look like truth, and ignorance like knowledge. He had little gold; but he beat that little

out to the very thinnest leaf, and spread it over so vast a

surface, that to those who judged by a glance, and who did not resort to balances and tests, the glittering heap of worthless matter which he produced seemed to be an Such arguments as he had he placed in the clearest light. Where he had no arguments, he resorted to personalities, sometimes serious, generally ludicrous, always clever and cutting. But, whether he was grave or merry, whether he reasoned or sneered, his style was always pure, polished, and easy. Party spirit then ran high ; yet, though Bentley ranked among Whigs, and Christ Church was a stronghold of Toryism, Whigs joined with Tories in applauding Atter- bury's volume. Garth insulted Bentley, and extolled Boyle in lines which are now never quoted except to be laughed at. Swift, in his Battle of the Books, introduced

with much pleasantry Boyle, clad in armour, the gift of all the gods, and directed by Apollo in the form of a human friend, for whose name a blank is left whieh may easily be filled up. The youth, so accoutred and so assisted, gains an easy victory over his uncourteous and boastful antagonist. Bentley, meanwhile, was supported by the conscious- ness of an immeasurable superiority, and encouraged by the voices of the few who were really competent to judge the combat. ‘No man,” he said, justly and nobly, “ was ever written down but by himself.” He spent two years in preparing a reply, which will never cease to be read and prized while the literature of ancient Greece is studied in any part of the world. This reply proved not only that the letters ascribed to Phalaris were spurious, but that Atterbury, with all his wit, his eloquence, his skill in con- troversial fence, was the most audacious pretender that ever wrote about what he did not understand. But to Atterbury this exposure was matter of indifference. He was now engaged in a dispute about matters far more important and exciting than the laws of Zaleucus and the laws of Charondas. The rage of religious factions was extreme. High Church and Low Church divided the nation. The great majority of the clergy were on the High Church side ; the majority of King William’s bishops were inclined to latitudinarianism. A dispute arose be- tween the two parties touching the extent of the powers of the Lower House of Convocation. Atterbury thrust himself eagerly into the front rank of the High Churchmen. Those who take a comprehensive and impartial view of his whole career will not be disposed to give him credit for religious zeal. But, it was his nature to be vehement and pugnacious in the cause of every fraternity of which he was a member. He had defended the genuineness of a spurious book simply because Christ Church had put forth an edition of that book ; he now stood up for the clergy against the civil power, simply because he was a clergy- man, and for the priests against the episcopal order, simply because he was as yet only a priest. He asserted the pretensions of the class to which he belonged in several treatises written with much wit, ingenuity, audacity, and acrimony. In this, as in his first controversy, he was opposed to antagonists whose knowledge of the subject in dispute was far superior to his; but in this, as in his first controversy, he imposed on the multitude by bold assertion,

APPTRRBURY

by sarcasm, by declamation, and, above all, by his peculiar knack of exhibiting a little erudition in such a manner as to make it look like a great deal. Having passed himself off on the world as a greater master of classical learning than Bentley, he now passed himself off as a greater master of ecclesiastical learning than Wake or Gibson. By the great body of the clergy he was regarded as the ablest and most intrepid tribune that had ever defended their rights against the oligarchy of prelates. The Lower House of Convocation voted him thanks for his services ; the University of Oxford created him a doctor of divinity ; and soon after the accession of Anne, while the Tories still had the chief weight in the Government, he was promoted to the deanery of Carlisle.

Soon after he had obtained this preferment the Whig party rose to ascendency in the state. From that party he could expect no favour. Six years elapsed before a change of fortune took place. At length, in the year LGL0; the prosecution of Sacheverell produced a formidable explosion of High Church fanaticism At such a moment Atterbury could not fail to be conspicuous. His inordinate zeal for the body to which he belonged, his turbulent and aspiring temper, his rare talents for agitation and for controversy, were again signally displayed. He bore a chief part in framing that artful and eloquent speech which the accused divine pronounced at the bar of the Lords, and which presents a singular contrast to the absurd and scurrilous sermon which had very unwisely been honoured with impeachment. During the troubled and anxious months which followed the trial, Atterbury was among the most active of those pamphleteers who inflamed the nation against the Whig ministry and the Whig Parlia- nent. When the ministry had been changed and the Parliament dissolved, rewards were showered upon him. The Lower House of Convocation elected him prolocutor. The Queen appointed him dean of Christ Church on the death of his old friend and patron Aldrich. The college would have preferred a gentler ruler. Nevertheless, the new head was received with every mark of honour. A congratulatory oration in Latin was addressed to him in the magnificent vestibule of the hall; and he in reply professed the warmest attachment to the venerable house in which he had been educated, and paid many gracious compliments to those over whom he was to preside. But it was not in his nature to be a mild or an equitable gover- nor. He had left the chapter of Carlisle distracted by quarrels, He found Christ Church at peace ;

but in three months his despotic and contentious temper did at Christ Church what it had done at Carlisle. He was succeeded in both his deaneries by the humane and accomplished Smalridge, who gently complained of the state in which both had been left. “Atterbury goes before, and sets everything on fire. I come after him with a bucket of water.” It was said by Atterbury’s enemies that he was made a bishop because he was so bad a dean. Under his administration Christ Church was in confusion, scandalous altercations took place, opprobrious words were exchanged ; and there was reason to fear that the great Tory college would be ruined by the tyranny of the great Tory doctor. He was soon removed to the bishopric of Rochester, which was then always united with the deanery of Westminster. Still higher dignities seemed to be before him. For, though there were many able men on the Episcopal bench, there were none who equalled or approached him in parlia- mentary talents. Had his party continued in power it is not. improbable that he would have been raised to the archbishopric of Canterbury. The more splendid his prospects the more reason he had to dread the accession of a family which was well known to be partial to the Whigs. There is every reason to believe that he was one of those

religious antipathies.

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politicians who hoped that they might be able, during the life of Anne, to prepare matters in such a way that at her decease there might be little difficulty in setting aside the Act of Settlement and placing the Pretender on the throne. Her sudden death confounded the projects of these conspirators. Atterbury, who wanted no kind of courage, implored his confederates to proclaim James IIL, and offered to accompany the heralds in lawn sleeves. But he found even the bravest soldiers of his party irresolute, and exclaimed, not, it is said, without interjections which ill becaine the mouth of a father of the church, that the best of all causes and the most precious of all moments had been pusillanimously thrown away. He acquiesced in what he could not prevent, took the oaths to the House of Hanover, and at the coronation ofticiated with the outward show of zeal, and did his best to ingratiate himself with the royal family. But his servility was requited with cold contempt. No creature is so revengeful as a proud man who has

humbled himself in vain. Atterbury became the most factious and pertinacions of all the opponents cf the Government. In the House of Lords his oratory, lucid, pointed, lively, and set off with every grace of pro- nunciation and of gesture, extorted the attention and admiration even of a hostile majority. Some of the most remarkable protests which appear in the journals of the peers were drawn up by him; and, in some of the bitterest of those pamphlets which called on the English to stand up for their country against the aliens who had come from beyond the seas to oppress and plunder her, critics easily detected his style. When the rebellion of 1715 broke out, he refused to sign the paper in which the bishops of the province of Canterbury declared their attachment to the Protestant succession, He busied himself in electioneering, especially at Westminster, where as dean he possessed great influence ; and was, indeed, strongly suspected of having once set on a riotous mob to prevent his Whig fellow-citizens from polling.

After having been long in indirect communication with the exiled family, he, in 1717, began to correspond directly with the Pretender. The first letter of the cor- respondence is extant. In that letter Atterbury boasts of having, during many years past, neglected no opportunity of serving the Jacobite cause. ‘‘ My daily prayer,” he says, “is that you may have success. May I live to see that day, and live no longer than I do what is in my power to forward it.” It is to be remembered that he who wrote thus was a man bound to set to the church of which he was overseer an example of strict probity; that he had repeatedly sworn allegiance to the House of Bruns- wick; that he had assisted in placing the crown on the head of George I., and that he had abjured James IIL, “ without equivocation or mental reservation, on the true faith of a Christian.”

It is agreeable to turn from his public to his private life. His turbulent spirit, wearied with faction and treason, now and then required repose, and found it in domestic endearments, and in the society of the most illustrious of the living and of the dead. Of his wife little is known; but between him and his daughter there was an affection singularly close and tender. The gentleness of his manners when he was in the company of a few friends was such as seemed hardly credible to those who knew him only by his writings and speeches. The charm of his “softer hour” has been commemorated by one of those friends in imperishable verse. Though Atterbury’s classical

attainments were not great, his taste in English literature was excellent ; and his admiration of genius was so strong that it overpowered even his political and His fondness for Milton, the mortal enemy of the Stuarts and of the church, was such as to

many Tories seemed a crime. On the sad night on which Addison was laid in the chapel of Henry VIL, the West- minster boys remarked that Atterbury read the funeral service with a peculiar tenderness and solemnity. The favourite companions, however, of the great Tory prelate were, as might have been expected, men whose politics had at least a tinge of Toryism. He lived on friendly terms with Swift, Arbuthnot, and Gay. With Prior he had a close intimacy, which some misunderstanding about public affairs at last dissolved. Pope found in Atterbury not only a warm admirer, but a most faithful, fearless, and judicious adviser. The poet was a frequent guest at the episcopal palace among the elms of Bromley, and entertained not the slightest suspicion that his host, now declining in years, confined to an easy chair by gout, and apparently devoted to literature, was deeply concerned in criminal and perilous designs against the Government.

The spirit of the Jacobites had been cowed by the events of 1715. It revived in 1721. The failure of the South Sea project, the panic in the money market, the downfall of great commercial houses, the distress from which no part of the kingdom was exempt, had produced general discontent. It seemed not improbable that at such a moment an insurrection might be successful. An insur- rection was planned. The streets of London were to be barricaded ; the Tower and the Bank were to be surprised ; King George, his family, and his chief captains and coun- cillors were to be arrested, and King James was to be proclaimed. The design became known to the duke of Orleans, regent of France, who was on terms of friendship with the house of Hanover. He put the English Govern- ment on its guard. Some of the chief malcontents were committed to prison; and among them was Atterbury. No bishop of the Church of England had been taken into custody since that memorable day when the applauses and prayers of all London had followed the seven bishops to the gate of the Tower. The Opposition entcrtained some hope that it might be possible to excite among the people an

enthusiasm resembling that of their fathers, who rushed into the waters of the Thames to implore the blessing of Sancroft. Pictures of the heroic confessor in his cell were exhibited at the shop windows. Verses in his praise were sung about the streets. The restraints by which he was prevented from communicating with his accomplices were represented as cruelties worthy of the dungeons of the Inquisition. Strong appeals were made to the priesthood. Would they tamely permit so gross an insult to be offered to their cloth? Would they suffer the ablest, the most eloquent member of their profession, the man who had so often stood up for their rights against the civil power, to be treated like the vilest of mankind? There was con- siderable excitement ; but it was allayed by a temperate and artful letter to the clergy, the work, in all probability, of Bishop Gibson, who stood high in the favour of Walpole, and shortly after became minister for ecclesiastical affairs.

Atterbury remained in close confinement during some months. He had carried on his correspondence with the exiled family so cautiously that the circumstantial proofs of his guilt, though sufficient to produce entire moral con- viction, were not sufficient to justify legal conviction. He could be reached only by a bill of pains and penalties. Such a bill the Whig party, then decidedly predominant in both Houses, was quite prepared to support. Many hot-headed members of that party were eager to follow the precedent which had been set in the case of Sir John Fenwick, and to pass an act for cutting off the bishop’s head. Cadogan, who commanded the army, a brave soldier, but a headstrong politician, is said to have exclaimed with great vehemence, “ Fling him to the lions in the Tower.” But the wiser and more humane Walpole was }

ATTEREUCEEe

Among them was Pope. while he was an inmate of the palace at Bromley, the bishop’s time was completely occupied by literary and domestic matters, and that no leisure was left for plotting.

forty-three. the majority. Their conduct drew on them a sharp taunt from Lord Bathurst, a warm friend of Atterbury and a zealous Tory. quarter, because they believe that they shall inherit the skill and prowess of every

adversary whom they destroy. Perhaps the animosity of the right reverend prelates to their brother may be explained in the same way.”

dignity and tenderness worthy of a better man. fine lines of his favourite poet were often in his mouth—

always unwilling to shed blood, and his influence prevailed, When Parliament met, the evidence against the bishop was laid before committees of both Houses. Those committees reported that his guilt was proved. In the Commons a resolution pronouncing him a traitor was carried by nearly two to one. A bill was then introduced which provided that he should be deprived of his spiritual dignities, that he should be banished for life, and that no British sub-

ject should hold any intercourse with him except by the royal permission. little difficulty ; for the bishop, though invited to defend himself, chose to reserve his defence for the assembly of

This bill passed the Commons with

which he was a member. In the Lords the contest was

sharp. The young duke of Wharton, distinguished by his parts, his dissoluteness, and his versatility, spoke for

Atterbury with great effect; and Atterbury’s own voice

was heard for the last time by that unfriendly audience which had so often listened to him with mingled aversion

and delight. He produced few witnesses, nor did those witnesses say much that could be of service to him. He was called to prove that,

But Pope, who was quite unaccustomed to speak in public,

lost his head, and, as he afterwards owned, though he had only ten words to say, made two or three blunders.

The bill finally passed the Lords by eighty-three votes to The bishops, with a single exception, were in

‘¢The wild Indians,” he said, “ give no

Atterbury took leave of those whom he loved with a Three

*¢ Some natural tears he dropped, but wiped them soon: The world was all before him, where to chuse His place of rest, and Providence his guide.”

At parting he presented Pope with a Bible, and said, with a disingenuousness of which no man who had studied the Bible to much purpose would have been guilty, “lf ever you learn that I have any dealings with the Pretender, I give you leave to say that my punishment is just.” Pope at this time really believed the bishop to be an injured man. Arbuthnot seems to have been of the same opinion. Swift, a few months later, ridiculed with great bitterness, in the Voyage to Lapute the evidence which had satisfied the two Houses of Parliament. Soon, however, the most partial friends of the banished prelate ceased to assert his innocence, and contented themselves with lament- ing and excusing what they could not defend. After a short stay at Brussels he had taken up his abode at Paris, and had become the leading man among the Jacobite refugees who were assembled there. He was invited to Rome by the Pretender, who then held his mock court under the immediate protection of the Pope. But Atter- bury felt that a bishop of the Church of England would be strangely out of place at the Vatican, and declined the invitation. During some months, however, he might flatter himself that he stood high in the good graces of James. The correspondence between the master and the servant was constant. Atterbury’s merits were warmly acknowledged, his advice was respectfully re- ceived, and he was, as Bolingbroke had been before him, the prime minister of a king without a kingdom.

But the new favourite found, as Bolingbroke had found before him, that it was quite as hard to keep the shadow of power under a vagrant and mendicant prince as to keep the reality of power at Westminster. Though James had neither territories nor revenues, neither army nor navy, there was more faction and more intrigue among his courtiers than among those of his successful rival. Atter- bury soon perceived that his counsels were

disregarded, if not distrusted. His proud spirit was deeply wounded. He quitted Paris, fixed his residence at Montpellier, gave up politics, and devoted himself entirely to letters. In the sixth year of his exile he had so severe an illness that his daughter, herself in very delicate health, determined to run all risks that she might see him once more. Having obtained a licence from the English Government, she went by sea to Bordeaux, but landed there in such a state that she could travel only by boat or in a litter. Her father, in spite of his infirmities, set out from Montpellier to meet her; and she, with the impatience which is often the sign of approaching death, hastened towards him. Those who were about her in vain implored her to travel slowly. She said that every hour was precious, that she only wished to see her papa and to die. She met him at Toulouse, embraced him, received from his hand the sacred bread and wine, and thanked God that they had passed one day in each other's society before they parted for ever. She died that night.

It was some time before even the strong mind of Atter- bury recovered from this cruel blow. As soon as he was himself again he became eager for action and conflict ; for grief, which disposes gentle natures to retirement, to inac- tion, and to meditation, only makes restless spirits more restless. The Pretender, dull and bigoted as he was, had found out that he had not acted wisely in parting with one who, though a heretic, was, in abilities and accom- plishments, the foremost man of the Jacobite party. The bishop was courted back, and was without much difficulty induced to return to Paris, and to become once more the phantom minister of a phantom monarchy. But his long and troubled life was drawing to a close. To the last, however, his intellect retained all its keenness and vigour. He learned, in the ninth year of his banishment, that he had been accused by Oldmixon, as dishonest and malignant a scribbler as any that has been saved from oblivion by the Dunciad, of having, in concert with other Christ Churchmen, garbled Clarendon's History of the Rebellion. The charge, as respected Atterbury, had not the slightest foundation; for he was not one of the editors of the History, and never saw it till it was printed. He published a short vindication of himself, which is a model in its kind, luminous, temperate, and dignified. A copy of this little work he sent to the Pretender, with a letter singularly eloquent and graceful. It was impossible, the old man said, that he should write anything on such a subject without being reminded of the resemblance

between his own fate and that of Clarendon. They were the only two English subjects that had ever been banished from their country and debarred from all communication with their friends by Act of Parliament. But here the resem- blance ended. One of the exiles had been so happy to bear a chief part in the restoration of the royal house. All that the other could now do was to die asserting the rights of that house to the last. A few weeks after this letter was written Atterbury died. He had just completed his seventieth year.

His body was brought to England, and laid, with great privacy, under the nave of Westminster Abbey. Only three mourners followed the coffin. No inscription marks the grave. That the epitaph with which Pope honoured the memory of his friend does not appear on the walls of

the great national cemetery is no subject of regret, for nothing worse was ever written by Colley Cibber.

Those who wish for more complete information about Atterbury may easily collect it from his sermons and his controversial writings,

‘from the report of the parliamentary proceedings against him,

which will be found in the State Trials ; from the five volumes of his correspondence, edited by Mr Nichols, and from the first volume of the Stuart papers, edited by Mr Glover. A-very indulgent but a very interesting account of the bishop’s political career will be found in Lord Stanhope’s valuable History of England. (M.) ATTICA, the most famous district of ancient Greece, is a triangular piece of ground projecting in a south-easterly direction into the Augean Sea, the base line being formed by the continuous chain of Mounts Cithzron and Parnes, the apex by the promontory of Sunium. It is washed on

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two sides by the sea, and this feature seems to have given rise to the name; for, notwithstanding the unusual letter- change, ’Arrixy probably stands for ’Axrixy, since Strabo and other ancient writers inform us that the country origi- nally bore both this name and that of ’Axry. The latter designation was frequently used by the Greeks to describe an extensive tract reaching into the sea, especially when, as in the case of Attica and the Argolic Acte, it was joined to the continent by a broad base. The coast is broken up into numerous small bights and harbours, which, however, are with few exceptions exposed to the south wind; the irregularity of the outline accounts for its great length in com- parison of the superficial area of the country. The surface of Attica, as of the rest of Greece, is very mountainous, and between the mountain chains lie several plains of no great size, open on one side to the sea.. On the west its natural boundary is the Corinthian Gulf, so that it would include the district of Megaris; and, as a matter of fact, before the Dorian invasion, which resulted in the foundation of Megara, the whole of this country was politically one, being in the hands of the Ionian race. This is proved by the column which, as we learn from Strabo, once stood on the Isthmus of Corinth, bearing on one side the inscription, “ This land is Peloponnesus, not Ionia ”—

Tad éor) MeAordéyyyneos, obk “lwvla—

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Sketch Map of Attica.

{| and on the other, “This land is not Peloponnesus, but

Ionia ”— 7d3 obx) MeAomdvynoos, GAA’ “Iwvla.

III. — 8

Central position.

Mountains.

Soil.

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The central position of Attica in Greece was one main cause of its historical importance. When K. O. Miller compares Greece to a body, whose members are different in form, while a mutual connection and dependence naturally exist between them, he speaks of Attica as one of the extreinities which served as the active instruments of the body of Greece, and by which it was kept in constant con- nection with other countries. Hence in part arose the maritime character of its inhabitants; and when they had once taken to the sea, the string of neighbouring islands, Ceos, Cythnos, and others, some of which lay within sight of their coasts, and from one to another of which it was possible to sail without losing sight of land, served to tempt them on to further enterprises. Similarly on land, the post it occupied between Northern Greece and the Peloponnese materially influenced its relation to other states, both in respect of its alliances, such as that with Thessaly, towards which country it was drawu by mutual hostility to Beeotia, which lay between them,—a friendship of great service to Athens, because it brought to her aid the ‘Thes- salian cavalry, an arm with which she herself was feebly provided ; and also in respect of offensive combinations of other powers, as that between Thcbes and Sparta, which throughout an important part of Greek history were closely associated in their politics, through mutual dread of their powerful neighbour.

The mountains of Attica, which form its most character- istic feature, are to be regarded as a continuation of that chain which, starting from Mount Tymphrestus at the southern extremity of Pindus, passes through Phocis and Beeotia under the well-known names of Parnassus and Helicon ; from this proceeds the range which, as Cithzron in its western and Parnes in its eastern portion, separates Attica from Beeotia, throwing off spurs southward towards the Saronic Gulf in Aigaleos and Hymettus, which

bound the plain of Athens. Again, the eastern extremity of Parnes is joined by another line of hills, which, separating from Mount (ta, skirts the Euboic Gulf, and, after enter- ing Attica, throws up the lofty pyramid of Pentelicus, over- looking the plain of Marathon, and then sinks towards the sea at Sunium to rise once more in the outlying islands. Finally, at the extreme west of the whole district, Cithzron is bent round at right angles in the direction of the isthmus, at the northern approach to which it abuts against the mighty mass of Mount Geraneia, which is interposed be- tween the Corinthian and the Saronic Gulf. The elevation reached by some of these is considerable, both Cithzron and Parnes being about 4600 feet, Hymettus 3360, and Pentelicus 2560, while Augaleos does not rise higher than 1536 feet. At the present day they are extremely bare, and, to one who is accustomed to Italian scenery, their severity is apt at first to be almost repellent ; but after a time the eye is delighted with the delicacy of the outlines, the minute articulation of the minor ridges and valleys, and the symmetrical way in which nature has grouped the several mountains so as to form a balance between them. The appearance thus produced can be best described as classical.

The soil of Attica is light and thin, and requires very careful agriculture to develop its produce. This feature belongs not only to the rocky mountain sides, but to some extent also to the maritime plains, and had considerable influence on the development of the inhabitants, both by enforcing industrious habits, and in leading them at an early period to take to the sea. Still, the level ground was sufficiently fertile to form a marked contrast to the rest of the district, and this fact is represented in the mythical genealogy of the early kings, which embodies several geo- graphical features. Thus, while first we find the name of Actus or Actzon, who represents the dxry or sea-coast,

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later on occurs Cranaus, a personification of the rocky ground, whence both Pindar and Aristophanes apply the epithet xpavaai to Athens; and further we meet with Erichthonius, whose name is inteuded to express the fruit- ful plains. Thucydides attributes to the nature of the thin soil (i. 2, 76 Aerrdyewv), Which presented no attraction to invaders, the permancnce of

the same inhabitants in the country, whence arosc the claim to indigenousness on which the Athenians so greatly prided themselves; while at the same time the richer ground fostered that fondness for country life, which is proved by the enthusiastic terms in which it is always spoken of by Aristophanes, and by the discontent of the people of Attica at being forced to betake themselves to the city at the commencement of the Pelo-ponnesian War. That we are not justified in judging of the ancient condition of the soil by the aridity which pre- vails at the present day, is shown by the fact that out of the 174 demes into which Attica was divided, at least one-tenth were named from trees or plants.

But whatever drawbacks the people of Attica experienced (1 in respect of the soil were more than compensated by the-

fineness of the climate. In this point they enjoyed a great advantage over their neighbours the Boeotians ; and while at the present day travellers speak of the excessive heat in summer and cold in winter which they have experienced in Beotia, Attica has always been fanious for its mildness. In approaching this district from the north, a change of temperature is felt as soon as a person descends from Citheron or Parnes, and the sea breeze, which in modern times is called 6 éuBarns, or that which sets towards shore, moderates the heat in summer. Both the Attic comedians and Plato speak with enthusiasm of their native climate, and the fineness of the Athenian intellect was attributed to the clearness of the Attic atmosphere. It was in the neighbourhood of Athens itself that the air was thought to be purest. This is what Euripides refers to in the well-known passage where he describes the inhabitants as “ever walking gracefully through the most luminous ether” (Med., 829); aud Milton, who is always an admirable exponent of Greek literature, in like manner says— ‘¢ Where, on the Aigean shore, a city stands,

Built nobly, pure the air, and light the soil,— Athens, the eye of Greece.”

Thus it is hardly hyperbole in Xenophon to say ‘one would not err in thinking that this city is placed near the centre of Greece—nay, of the civilised world,—because, the farther removed persons are from it, the severer is the cold or heat they meet with” (Vectigal.,i. 6). To the clearness of the atmosphere must be referred the distinctness with which distant

objects can be discerned, for from the Acropolis the lines of white marble that streak the sides of Pentelicus are visible, and also the brilliant colouring which is so conspicuous in an Athenian suuset. Thus Dean Stanley speaks of “the flood of fire with which the marble columns, the mountains, and the sea are all bathed and penetrated ;” ‘the violet hue which Hymettus assumes in the evening sky, in contrast to the glowing furnace of the rock of Lycabettus, and the rosy pyramid of Pentelicus.” And M. Bursian says—“ Amongst the most beautiful natural scenes that I have beheld I reckon the sight of Hymettus from Athens at sunset, whilst the entire range, as soon as the sun begins to sink, quivers with the loveliest rosy red, which gradually passes through the most varied gradations into the deepest violet. No one who has not enjoyed this spectacle can understand the purpuwreos colles florentis Hymetti of Ovid.” This otherwise perfect climate is slightly marred by the prevalence of the north wind. This is expressed on the Horologium of Antonius Cyr rhestes, called the Temple or Tower of the Winds, at

Athens, where Boreas is represented as a bearded man of stern aspect, thickly clad, and wearing strong buskins; he blows into a conch shell, which he holds in his hand as a sign of his tempestuous character. This also explains the close connection between him and this country in mytho- logy, especially in the legend of Orithyia, who is the daughter of the Cephisus, thus representing the mists that rise from the streams, and whom he carries off with him and makes his wife. One of their offspring is called Chione, i or the Snow Maiden. Vietation. When we turn to the vegetation of Attica, the olive first 1 calls for our attention. This tree, we learn from Hero- i dotus (v. 82), was thought at one time to have been found in that country only; and the enthusiastic praises of Sophocles (Gd. Col., 700) teach us that it was the land in which it flourished best. So great was the esteem in which it was held, that in the early legend of the struggle between the gods of sea and land, Poseidon and Athena, for the patronage of the country, the sea-god is represented as having to retire vanquished before the giver of the olive ; and at a later period the evidences of this contention were found in an ancient olive tree in the Acropolis, together with three holes in the rock, said to have been made by the trident of Poseidon, and to be connected with a salt well hard by. The fig also found its favourite home in this country, for Demeter was said to have bestowed it as a gift on the Eleusinian Phytalus, ze, “the gardener.” Both Citheron and Parnes must have been wooded in

former times ; for on the former are laid the picturcsque silvan scenes in the Bacche of Euripides, and it was from the latter that the wood came which caused the neighbour- ing deme of Acharnz to be famous for its charcoal—the dvOpaxes Lapvyjctoe of the Acharniansof Aristophanes (348). It was the thymy slopes of Hymettus, too, from which came the famous Hymettian honey. Among the other products we must notice the marble—both that of Pen- telicus, which afforded a material of unrivalled purity and whiteness for building the Athenian temples, and the blue marble of Hymettus—the trabes Hymettie of Horace— which used to be transported to Rome for the construction of palaces. But the richest of all the sources of wealth in Attica was the silver mines of Laureium, the yield of which was so considerable as to render silver the principal medium of exchange in Greece, so that “a silver piece” (dpyvpov) was the Greek equivalent term for money. Hence Aischylus speaks of the Athenians as possessing a “ fountain of silver” (Pers., 235), and Aristophanes makes his chorus of birds promise the audience that, if they show him favour, owls from Laureium, ze., silver pieces with the emblein of | Athens, shall never fail them (Av., 1106). In Strabo’s time, though the mines had almost ceased to yield, silver was obtained in considerable quantities from the scorie ; and at the present day a large amount of lead is obtained in the same way, the value of what was exported in 1869 having been £177,000 sterling.

eral Having thus noticed the general features of the country, d{:ription. let us proceed to examine it somewhat more in detail. It has been already mentioned that the base line is formed by the chain of Cithzron and Parnes, running from west to east ; and that from this transverse chains run southward, dividing Attica mto a succession of plains, The western- most of these, which is separated from the innermost bay of the Corinthian Gulf, called the Mare Alcyonium, by an offshoot of Cithzron, and is bounded on the east by a ridge which ends towards the Saronic Gulf in a striking two-horned peak called Kerata, is the plain of Megara. It is only for geographical purposes that we include this district under Attica, for both the Dorian race of the in- habitants, and its dangerous proximity to Athens, caused it to be at perpetual feud with that city ; but its position

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as an outpost for the Peloponnesians, together with the fact of its having once been Ionian soil, sufficiently explains the bitter hostility of the Athenians towards the Megarians. The great importance of Megara arose from its commanding all the passes into the Peloponnese. These were three in number: one along the shores of the Corinthian Gulf, which, owing to the nature of the ground, makes a long detour ; the other two starting from Megara, and passing, the one by a lofty though gradual route over the ridge of Geraneia, the other along the Saronic Gulf, under the dangerous precipices of the Scironian rocks. The town of Megara, which was built on and between two low hills rising out of the plain rather more than a mile from the sea, had the command of both gulfs by means of its two ports—that of Peg on the Corinthian, and that of Nicza on the Saronic. The necessities of the case occasionally brought the Megarians and their powerful neighbours together ; for the former greatly depended on Athcns for their supplies, as we see from their famished state, as described by Aristophanes in the Acharnians (729 seq.), when excluded from the ports and markets of that country.

To the east of the plain of Megara lies that of Eleusis, Plain of bounded on the one side by the chain of Kerata, and on Hleusis. the other by that of A®galeos, through a depression in which was the line of the sacred way, where the torchlight processions from Athens used to descend to the coast, the “brightly-gleaming shores” (Aaprades axrai) of Sophocles (Gd. Col., 1049). Here a deep bay runs into the land, opposite to which, and separated from it by a strait, which: forms a succession of graceful curves, was the rocky island of Salamis, at all times an important possession to the Athenians on account of its proximity to their city. The scene of the battle of Salamis was the narrowest part of this channel, where the island approaches the extremity of Aigaleos ; and it was on the last declivities of that moun- tain that—

‘* A king sate on the rocky brow Which looks o’er sea-born Salamis.” The eastern portion of this plain was called the Thriasian plain, and the city of Eleusis was situated in the recesses of the bay. The coast-line of this part, between the sanctuary of Poseidon at the isthmus, which was originally Ionian, and Athens, is the principal scene of the achieve- ments of Theseus, a hero who holds the same relation to the lonians of Greece proper as Hercules does to the Greeks at large, viz., that of being the great author of improvements in the country. In this instance his feats seem to describe the establishment of a safe means of communication. On the isthmus itself he destroys the monster Sinis, the “ravager,” otherwise called Pityocamptes, or the “pine-bender,” which names imply that he is the embodiment of a violent wind, though the legend grew up that he fastened his victims to the bent branches of two pines, by the rebound of which they were torn in sunder. His next exploit is near Crommyon, where he destroys a wild sow, called Phzea, or “the dusky,” which probably means that he checked a torrent, since violent water- courses are often represented by that animal in Greek mythology. Then follows the struggle with the brigand Sciron, who signifies the dangerous wind, which blows with such violence in this district that at Athens the north-west wind received the name of Sciron from the neighbouring Scironian rocks ; the pass, which skirts the sea at the base of the cliffs, is now known by the ill-omened title of Kake Scala, and is still regarded as a perilous transit. Finally, between Eleusis and Athens, Theseus overcomes Procrustes, or “the racker,” who apparently represents the dangers of the pass between Eleusis and Athens, now called Daphne ; for the ridge of Mount Agaleos hard by was in ancient

times called Corydallus, and this, we are told by Diodorus (iv. 59), was the scene of the contest.

Next in order to the plain of Eleusis came that of Athens, which is the most extensive of all, reaching from the foot of Parnes to the sea, and bounded on the west by Figaleos, and on the east by Hymettus. Its most con- spicuous

feature is the broad line of dark green along its western side, formed by the olive-groves of Colonus and the gardens of the Academus, which owe their fertility to the waters of the Cephisus, by which they are irrigated. This river is fed by copious sources on the side of Mount Parnes, and thus, unlike the other rivers of Attica, has a constant supply of water; but it does not reach the sca, nor did it apparently in classical times, having been diverted, then as now, into the neighbouring plantations ; for this is what Sophocles means when he speaks of “the sleepless fountains of Cephisus, which stray forth from their channels” (@d. Col., 685 seg.) The position of Colonus itself is marked by two bare knolls of light coloured earth, which caused the poet in the same chorus to apply the epithet “white” (dpyjra) to that place. On the opposite side of the plain runs the other river, the Ilissus, which rises from a beautiful fountain in Mount Hymettus, and skirts the eastern extremity of the city of Athens ; but this, notwithstanding its celebrity, is a mere brook, which stands in pools a great part of the year, and in summer is completely dry. The situation of Athens relatively to the surrounding objects is singularly harmonious ; for, while it forms a central point, so as to be the eye of the plain, and while the altar-rock of the Acropolis and the hills by which it is surrounded are conspicuous from every point of view, there is no such exactness in its position as to give for- mality, since it is nearer to the sea than to Parnes, and nearer to Hymettus than to Augaleos. The most striking summit in the neighbourhood of the city is that of Lyca- bettus, now Mount St George, on the north-eastern side ; and the variety is still further increased by the continua- tion of the ridge which it forms for some distance north- wards through the plain. Three roads lead to Athens from the Beeotian frontier over the intervening mountain barrier—the easternmost over Parnes, from Delium and Oropus by Deceleia, which was the usual route of the in- vading Lacedeemonians during the Peloponnesian War ; the westernmost over Cithzron, by the pass of Dryoscephale, or the ‘ Oakheads,” leading from Thebes by Platza to Eleusis, and so to Athens, which we hear of in connection with the battle of Plateea, and with the escape of the Platezans at the time of the siege of that city in the Pelo- ponnesian War; the third, midway between the two, by the pass of Phyle, near the summit of which, on a rugged height overlooking the Athenian plain, is the fort occupied by Thrasybulus in the days of the Thirty Tyrants. On the sea-coast to the south-west of Athens rises the hill of Munychia, a mass of rocky ground, forming the acropolis of the town of Pireeeus, which

was once separated from the mainland ; for Strabo (i. 3, § 18) speaks of it as having been formerly an island. On one side of this, towards Hymettus, lay the open roadstead of Phalerum, on the other the harbour of Pireeus, a completely land-locked inlet, safe, deep, and spacious, the approach to which was still further narrowed by moles. The eastern side of the hill was further indented by two small but commodious havens, which were respectively called Zea and Munychia.

The north-eastern boundary of the plain of Athens is formed by the graceful pyramid of Pentelicus, which re- ceived its name from the deme of Pentele at its foot, but was far more commonly known as Brilessus in ancient times. This mountain did not form a continuous chain with Hy- mettus, for between them intervenes a level space of ground two miles in width, which formed the entrance to the

Mesogzea, an elevated undulating plain in the midst of the mountains, reaching nearly to Sunium. At the extremity of Hymettus, where it projects into the Saronic Gulf, was the promontory of Zoster, or “the Girdle,” which was so called because it girdles and protects the neighbouring harbour ; but in consequence of the name, a legend was attached to it, to the effect that Latona had loosed her girdle there. From this promontory to Sunium there runs a lower line of mountains, and between these and the sea a fertile strip of land intervenes, which was called the Paralia, Beyond Sunium, on the eastern coast, were two safe ports, that of Thoricus, which is defended by the island of Helene, forming a natural breakwater in front of it, and that of Prasie, now called Porto Raphti, or “the Tailor,” from a statue at the entrance to which the natives have given that name. But it still remains to mention the most famous spot of ground in Attica, the little plain of Marathon, which lay in the north-east corner, encircled on three sides by Parnes and Pentelicus, while the fourth faces the sea and the opposite coast of Eubcea. It was on the mountain slopes that the Greeks were stationed, while the Persians with their ships occupied the coast; and on the two sides the marshes may still be traced by which the movements of the invader’s host were impeded. The mound, which at once attracts the eye in the centre of the level plain, is probably the burial-place of the Athenians who fell in

the battle. The bay in front is sheltered by Eubcea, and is still more protected from the north by a projecting tongue of land, called Cynosura. The mountains in the neigh- bourhood were the seat of one of the political parties in Attica, the Diacrii or Hyperacrii, who, being poor moun- taineers, and having nothing to lose, were the principal advocates of change ; while, on the other hand, the Fedieis, or inhabitants of the plains, being wealthy landholders, formed the strong conservative element, and the Parali, or occupants of the sea-coast, representing the mercantile in- terest, held an intermediate position between the two. Finally, there was one district of Attica, that lay without its natural boundaries, the territory of Oropus, which pro- perly belonged to Beeotia, as it was situated to the north of Parnes ; but on this the Athenians always endeavoured to retain a firm hold, because it facilitated their communi- cations with Eubcoea. The command of that island was of the utmost importance to them; for, if Aégina could rightly be called “the eyesore of the Pireeus,” Eubcea was quite as

truly a thorn in the side of Attica; for we learn from Demos-

thenes (De Cor., p. 307) that at one period the pirates that |

made it their headquarters so infested the neighbouring sea as to prevent all navigation.

Of the condition of Attica in medieval and modern times Presat little need be said, for it has followed for the most part condita the fortunes of Athens. The population, however, has undergone a great change, independently of the large ad- mixture of Slavonic blood that has affected the Greeks of the mainland generally, by the immigration of Albanian colonists, who now occupy a great part of the country. The most important of the classical ruins that remain out- side Athens are those of the temple of Athena at Sunium, . which form a conspicuous object as they surmount the headland, and gave rise to the name which it bore, until lately, of Cape Colonne ; it is in the Doric style, of white marble, and 13 columns of the temple and a pilaster are now standing. At Eleusis the foundations of the propy- lea of the great temple of Demeter and other buildings have been laid bare by excavation ; at Thoricus there are remains of an ancient theatre; and at Rhamnus, northward from Marathon, at a little distance from the sea, are the

basements and some of the columns of two temples in the same enclosure, which were dedicated to Nemesis and Themis. (a. F. T.)

ATT—ATT

ATTICUS, Trrus Pompontvs, the friend of Cicero, was one of the most distinguished men during the period of the decline and fall of the Roman republic. His life gives an

admirable picture of the classical man of culture, who, .

withdrawing from the stir of political affairs, devoted himself to literary and artistic pursuits. He was born at Rome 109 8.¢., and was thus three years older than Cicero, along with whom he and the younger Marius were educated. His family is said to have been of noble and ancient descent ; his father belonged to the equestrian order, and was very wealthy. When Pomponius (who afterwards reccived the surname Atticus, on account of his long resi- dence at Athens, and his intimate acquaintance with Greek literature) was still a young man, his father died, and he at once took the prudent resolution of transferring himself and his fortune to Athens, in order to escape the dangers of the civil war, in which he might have heen involved through his connection with the murdered tribune Sulpicius Rufus. Here, in retirement, he contrived to keep himself free from the entanglements of faction, while preserving friendly relations with all parties. Sulla, who urged him to come to Rome and join his party, took no offence at his refusal, but treated him with marked kindness. He assisted the younger Marius and Brutus with money when they were fleeing from their enemies, and remained on the most cordial terms with Czesar and Pompey, Antony and Octavianus. His most intimate friend, however, was Cicero, whose correspondence with him extended over many years, and who seems to have found his prudent counsel and sympathy a remedy for all his many troubles. His private life was tranquil and happy. He did not marry till he was 53 years of age, and his only child became the wife of Vipsanius Agrippa, the distinguished minister of Augustus. His large fortune was increased on the death of his uncle, L. Cecilius, who bequeathed to him the greater part of his property. He formed a large library at Athens, and kept a staff of slaves engaged in making copies of valuable works. He probably derived considerable profits from the sale of these books. In 32 B.c. he was

seized with an illness believed to be incurable. He resolved not to protract a painful and hopeless struggle, and died after five days of voluntary starvation. As might have been expected from his easy temper and equable disposition, Atticus professed a mild Epicureanism, but philosophical problems, as such, do not seem to have had much interest for him; he was emphatically a man of literature. Of his writings none are extant, but we have notices of two, one a Greek history of Cicero's consulship, the other, in Latin, on Roman annals, a subject to which he had given much attention. This work was highly commended for its minute exactness, chronological accuracy, and simple style.

ATTICUS HERODES, Tiserius Ciaupius, a very wealthy citizen of Athens, was born about 104 a.p. His grandfather's estates had been confiscated for treachery, but the fortunes of the family had bcen restored by the discovery in his father's house of an enormous sum ot money, which the Emperor Nerva permitted them to retain. This great wealth Herodes afterwards increased by his marriage. He received acareful education under the most distinguished masters of the time, and specially devoted himself to the study of oratory, to excel in which seems to have been the ruling motive of his life. While very young he delivered a speech before one of the emperors; but it was so ill received that he was with difficulty restrained from throwing himself into the Danube. He ultimately attained to great celebrity as a speaker and as a teacher of rhetoric. Among his pupils were Marcus Aurelius and Lucius Verus. He was highly esteemed by the Antonines, particularly by Aurelius, and received many marks of favour, among others the archonship at Athens and the

consulate at Rome. Atticus is principally celebrated, however, for the vast sums he expended on public purposes. He built at Athens a great racecourse of marble from Pentelicus, and a splendid musical theatre, called the Odeum. At Corinth he built a theatre, at Delphi a stadium, at Thermopyl hot baths, at Canusium in Italy an aqueduct. He even contemplated cutting a canal through the I sthmus of Corinth, but it is said did not dare to carry out his plan because the same thing had been unsuccessfully attempted before by the Emperor Nero. Many of the partially ruined cities of Greece were

restored by Atticus, and numerous inscriptions testify their gratitude to their bene- factor. His wealth, and, it is reported, some disagreement with regard to one of the provisions of his father's will, roused up the enmity of the Athenians against him. He withdrew from Athens, and resided at his villa near Marathon, where he died about 180 a.p. None of his writings are extant.

ATTILA, or Erzet, the famous lcader of the Huns, sur- named the " Fear of the World," or the " Scourge of God," was born probably about 406 a.p. His father Mundzuk, king of the Huns, was succeeded by his brothers Octar and Rhuas ; and on the death of Rhuas, in 434, Attila and his brother Bleda together ascended the throne. They ruled not only over the Huns, but over nearly all the tribes north of the Danube and the Black Sea; under their banners fought Ostrogoths, Gepidz, Alani, Heruli, aud many other Teutonic peoples. Their dominions are said to have extended from the Rhine to the frontiers of China. Attila was superstitiously reverenced by his countrymen ; he was said to possess the iron sword of the war-god, Mars, and he proclaimed himself to be the man-child born at Engaddi, who was destined to rule over the whole world. In 441 and 442 the brothers ravaged Thrace and Illyria, defeated the troops of the Eastern Empire in three great battles, and penetrated as far as Thermopylae. Peace was made on the Romans agreeing to pay a heavy tribute. About this time Attila contrived to make away with his brother Bleda, and thus secured undivided supremacy. In 445 and the following years, he again directed his attacks against the Eastern Empire, and laid waste the whole country round Constantinople. Nowhere did he meet with resistance save from the brave little town of Azimus. The empire seemed about to succumb, when Theodosius entered into negotiations and made terms with his conqueror. While matters were being arranged, a plot was laid to assassinate Attila, in which the emperor was implicated. The conspiracy was discovered, and the barbarian upbraided the Christian monarch with his want of honour and manly courage. Theodosius died soon after, and his successor, Marcian, returned a firm refusal to Attila's demands for tribute. War seemed inevitable ; but at this time the attention of the Hun was drawn to the Western Empire. It is said that the Princess Honoria, sister of Valentinian, tired of her life of enforced celibacy, sent her ring and an offer of her hand to Attila, who upon this grounded his claim to a part of the empire. It is probable, however, that he merely used

this as a pretext, and that his real designs were more comprehensive. He evidently thought it a favourable opportunity for taking advantage of the enmity between the Romans and the Visigoths ; and to this plan he was also induced by the proposals of Genseric, king of the Vandals, who offered to unite with him against his rival, Theodoric, king of the Visigoths. In 451 Attila assembled his forces, it is said 700,000 strong, led them through the centre of Ger- many, probably by Franconia, and crossed the Rhine, at what place cannot be determined, He defeated the Burgundians, and pushed on through the heart of Gaul, until his centre was checked by the valiant resistance offered

by Orleans. Meanwhile, Thcodoric and Aétius, the Roman general, had collected and united their forces, and marching with all speed, arrived in time to raise the siege of Orleans. Attila retreated to a position in the plain of Chalons, and there concentrated his forces for a great engagement. A tremendous battle ensued—one of the most gigantic as well as most important contests recorded in history. The Romans, who formed one wing, were driven back, and although they kept together, and at nightfall retired to the camp of the Visigoths, Aétius had given up the day as lost. The Visigoths, who were on the other wing, had also been repulsed, and were discouraged by the fall of their leader Theodoric. But the fortune of the day was changed by the impetuous bravery of Thorismund, Theo- doric's son, who, burning to avenge his father's fall, led on the infuriated Visigoths, and drove Attila back to his camp. He even penetrated into the fortifications, but was wounded and thrown from his horse, and his followers with difficulty carried him off. Next day, Attila remained in his camp in expectation of an attack, and having thrown all his baggage into a gigantic pile in the centre of the camp to be burned in case of defeat, resolved to sell his life dearly. But no attack was made ; for Thorismund was persuaded by Aétius to march to Toulouse in order to obtain his father's king- dom. Attila was thus enabled to retire in perfect security. Next year he poured his forces through the defiles of the Alps, and laid waste the whole north of Italy. Rome itself seemed likely to fall before the invader, when his course was arrested by an embassy headed by Pope Leo. Attila at once withdrew from Italy, but the motive which led him to act thus is not known. At the time his retreat was

ascribed to a miraculous interposition of Providence, Peter and Paul having appeared in the camp of the Huns along with the embassy. The whole matter is rather obscure ; and scarcely more credible is the story told by Jornandes that Attila invaded Gaul a second time and was completely defeated by Thorismund. No other historian mentions this circumstance. In the year 453, Attila died from the bursting of a blood-vessel on the night of his mar- riage with a beautiful Gothic maiden, called Idiko, or Hilda. He was buried by his followers with great pomp and lamentation. The vast empire over which he had ruled broke up immediately after his death, no one chief being powerful enough to seize the supremacy. In person Attila is described as having been of true Hunnish type, short, but strongly made, with a large head, flat, wide- spread nostrils, and small glittering eyes. His presence was majestic and imposing, and he excelled all his followers in military exercises.

ATTOCK, a town and fort of British India, in the Panjab, situated on the eastern bank of the Indus, in 33° 54’ N. lat., and 72° 20’ E. long. The place is both of political and commercial importance, as the Indus is here crossed by the military and trade route through the Khaibar Pass into Afghdmstan. Alexander the Great, Tamerlane, and Nadir Shéh, are believed to have suc- cessively crossed the Indus at or about this spot in their respective invasions of India. The river runs past Attock in a deep rapid channel about 200 yards broad, but is easily crossed in boats or on inflated skins of oxen. A bridge of boats is maintained for a considerable part of the year, but withdrawn in the summer as soon as the melting of the snows in the northern mountains endangers it. The fort of Attock was built by the Emperor Akbar in 1581, on a low hillock beside the river. The walls are of polished stone, and the whole structure is handsome; but from a military point of view it is of little importance, being commanded by a hill, from which it is divided only bya ravine. The town was formerly a place of importance, but has now fallen into decay. Ou the opposite side of

the river is the village of Khairébd4d, with a fort, also erected by Akbar according to some, or by Nadir Shah according to others.

ATTORNEY, in Znglish Law, signifies, in its widest sense, any substitute or agent appointed to act in “ the turn, stead, or place of another.” The term is now com- monly confined to a class of qualified agents who undertake the conduct of legal proceedings for their clients. By the common law the actual presence of the parties to a suit was considered indispensable, but the privilege of appearing by attorney was conceded in certain cases by special dis- pensation, until the statute of Merton and subsequent enactments made it competent for both parties in all judi- cial proceedings to appear by attorney. Solicitors appear to have been at first distinguished from attorneys, as not having the attorney’s power to bind their principals, but latterly the distinction has been between attorneys as the agents formally appointed in actions at law, and solicitors who take care of proceedings in Parliament, Chancery, Privy Council, &c. In practice, however, and in ordinary lan- guage, the terms are synonymous. Regulations regarding the qualification of attorneys are found as far back as the 20 Edward 1. which required the judges to select in each county the most learned and able attorneys and apprentices to do service in the courts. By the 6 and 7 Vict. c. 73, and other statutes, the qualifications necessary for admis- sion on the rolls of attorneys and solicitors are :——1st, The due execution of a proper contract in writing with some practising attorney or solicitor for the term of five years, or of three years if the clerk be a graduate of the universi- ties of Oxford, Cambridge, Dublin, London, or Durham, or of the Queen’s University, Ireland, or if he have been a member of the bar, a writer to the signet, a solicitor before the supreme courts in Scotland, or for ten years bona fide managing clerk to an attorney; 2d, The payment of the stamp duty on such contract, amounting to £80; 3d, The registry or enrolment of the contract within six calendar months ; 4th, Actual service for the prescribed period in the proper business of an attorney and solicitor; but one year may be served with the London agent, and, where the service is for five years, another year with a barrister or certificated special pleader ; 5th, Due notices of the applica- tion to be admitted ; 6th, Fitness and capacity ascertained upon examination, and certified by the examiners ; 7th, Taking the prescribed oaths, and being admitted and enrolled ; 8th, The certificate of the registrar of attorneys that he is duly enrolled, and the stamped certificate of the annual payment of the duty. Attorneys duly admitted in any of the superior courts have a right to be admitted and to practise in any of the courts in the kingdom, and this right may be enforced by mandamus.

They may act as advocates in certain of the inferior courts. Conveyancing, formerly considered the exclusive business of the bar, is now often performed by attorneys. Barristers are under- stood to require the intervention of an attorney in all cases that come before them professionally, although in criminal cases the prisoner not unfrequently engages a counsel directly by giving him a fee in open court. The relation of attorney and client disqualifies the former from dealing with his client on his own behalf, while it gives him a lien, on professional services, over the deeds, &c., of the client in his possession. An attorney may be struck off the rolls for professional or other misconduct, on application by counsel at the instance of an injured party, or, as the case generally is, of the Incorporated Law Society as representing the profession.

A letter or power of Attorney is an authority under hand and seal, empowering the person named therein to do some act on behalf of the principal, which otherwise could only be done by the principal himself. It expires with death of the

principal, and is revocable at his will, unless it has been given for a valuable consideration. A warrant of Attorney is an authority to one or more attorneys to appear for the party executing it, in a court of record, at the suit of the person for whose benefit it is given, and to suffer judgment summarily to pass in his favour. It is usually given as a security to creditors for the summary recovery of money lent, or sums certain, but may be used in other cases also.

ATTORNEY-GENERAL, the chief law officer ap- pointed to manage all the legal affairs and suits in which the Crown is interested. He is appointed by patent, authorising him to hold office during the Queen’s pleasure. He is ea officio the leader of the bar, and only counsel of the highest eminence are appointed to the office. The royal mandate of 14th December 1814 gives him precedence in all the courts, and it is now settled that in the House of Lords he has precedence of the Lord Advocate, even in Scotch appeals. He is a necessary party to all proceedings affecting the Crown, and has extensive powers of control in matters relating to charities, lunatics’ estates, criminal pro- secutions, &c. His assistant, also appointed by patent, is the

Solicitor-General, who has full power to act in the absence of his principal, and by almost invariable usage, succeeds to his office when it becomes vacant. The income attached to these offices has hitherto been derived in great part from fees on patents for inventions, but by a recent arrangement the Attorney-General and Solicitor-General receive a salary of £7000 and £6000 respectively, exclusive of such fees as they may receive for any litigious business they may conduct on behalf of the Crown.

ATTRACTION. That the different parts of a material system influence each other's motions is a matter of daily observation. In some cases we cannot discover any material connection extending from the one body to the other. We call these cases of action at a distance, to dis- tinguish them from those in which we can trace a con- tinuous material bond of union between the bodies. The mutual action between two bodies is called stress. When the mutual action tends to bring the bodies nearer, or to prevent them from separating, it is called tension or attrac- tion. When it tends to separate the bodies, or to prevent them from approaching, it is called pressure or repulsion. The names tension and pressure are used when the action is seen to take place through a medium. Attraction and repulsion are reserved for cases of action at a distance. The configuration of a material system can always be defined in terms of the mutual distances of the parts of the system. Any change of configuration must alter one or more of these distances. Hence the force which pro- duces or resists such a change may be resolved into attrac- tions or repulsions betweeu those parts of the system whose distance is altered.

There has been a great deal of speculation as to the cause of such forces, onc of them, namely, the pressure between bodies in contact, being supposed to be more easily conceived than any other kind of stress. Many attempts have therefore been made to resolve cases of apparent attraction and repulsion at a distance into cases of pressure. At one time the possibility of attraction at a distance was supposed to be refuted by asserting that a body cannot act where it is not, and that therefore all action between different portions of matter must be by direct contact. To this it was replied that we have no evi- dence that real contact ever takes place between two bodies, and that, in fact, when bodies are pressed against each other and in apparent contact, we may sometimes actually measure the

distance between them, as when one piece of glass is laid on another, in which case a considerable pressure must be applied to bring the surfaces ncar enough to show the black spot of Newton’s rings, which indicates a distance of

about a ten thousandth of a millimetre. If, in order to get rid of the idea of action at a distance, we imagine a material medium through which the action is transmitted, all that we have done is to substitute for a single action at a great distance a series of actions at smaller distances between the parts of the medium, so that we cannot even thus get rid of action at a distance.

The study of the mutual action between the parts of a material system has, in modern times, been greatly simplified by the introduction of the idea of the energy of the system. The energy of the system is measured by the amount of work which it can do in overcoming external resistances. It depends on the present configuration and motion of the system, and not on the manner in which the system has acquired that configuration and motion. A complete knowledge of the manner in which the energy of the system depends on its configuration and motion, is sufficient to determine all the forces acting between the parts of the system. For instance, if the system consists of two bodies, and if the energy depends on the distance between them, then if the energy increases when the distance increases, there must be attraction between the bodies, and if the energy diminishes when the distance increases, there must be repulsion between them. In the case of two gravitating masses m and m’ at a distance 7, the part of the energy

which depends on r is — = – We may therefore express

the fact that there is attraction between the two bodies by saying that the energy of the system consisting of the two bodies increases when their distance increases. The ques- tion, therefore, Why do the two bodies attract each other 4 may be expressed in a different form. Why does the energy of the system increase when the distance increases?

But we must bear in mind that the scientific or science- producing value of the efforts made to answer these old standing questions is not to be measured by the prospect they afford us of ultimately obtaining a solution, but by their effect in stimulating men to a thorough investigation of nature. To propose a scientific question presupposes scientific knowledge, and the questions which exercise men's minds in the present state of science may very likely be such that a little more knowledge would show us that no answer is possible. The scientific value of the question, How do bodies act on one another at a distance? is to be found in the stimulus it has given to investigations into the pro- perties of the intervening medium.

Newton, in his Principia, deduces from the observed motions of the heavenly bodies the fact that they attract one another according to a definite law. This he gives as a result of strict dynamical reasoning, and by it he shows how not only the more conspicuous phenomena, but all the apparent irregularities of the celestial motions are the calculable results of a single principle. In his Principia he confines himself to the demonstration and development of this great step in the science of the mutual action of bodies. He says nothing there about the means by which bodies gravitate towards each other. But his mind did not rest at this point. We know that he did not believe in the direct action of bodies at a distance.

'Tt is inconceivable that inanimate brute matter should, without the mediation of something clse which is not material,operate upou and affect other matter without mutual contact, as it must do if gravitation inthe senseof Epicurusbe essential and inherent init… . That gravity should be innate, inherent, and essential to matter, so that one body can act upon another at a distance, through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that 1 believe no man, who has in philosophical matters a competent faculty of thinking, can ever fal] into it."—Letter to Bentley.

And we also know that he sought for the mechanism of

gravitation in the properties of an ethereal medium diffused over the universe.

‘It appears, from his letters to Boyle, that this was his opinion early, and if he did not publish it sooner it proceeded from hence only, that he found he was not able, from experiment and observa- tion, to give a satisfactory account of this medium and the manner of its operation in producing the chief phenomena of nature.” ?

In his Optical Queries, indeed, he shows that if the pressure of this medium is less in the neighbourhood of dense bodies than at great distances from them, dense bodies will be drawn towards each other, and that if the diminution of pressure is inversely as the distance from the dense body the law will be that of gravitation. The next step, as he points out, is to account for this inequality of pressure in the medium ; and as he was not able to do this, he left the explanation of the cause of gravity as a problem to succeeding ages. As regards gravitation the progress made towards the solution of the problem since the time of Newton has been almost imperceptible. Faraday showed that the transmission of electric aud magnetic forces is accompanied by phenomena occurring in every part of the intervening medium. He traced the lines of force through the medium ; and he ascribed to them a tendency to shorten themselves and to separate from their neighbours, thus introducing the idea of stress in the medium ina different form from that suggested by Newton ; for, whereas Newton’s stress was a hydrostatic pressure in every direction, Faraday’s is a tension along the lines of force, combined with a pressure in all normal directions. By showing that the plane of polarisation of a ray of light passing through a transparent medium in the direction of the magnetic force is made to rotate, Faraday not only demonstrated the action of magnetism on light, but by using light to reveal the state of magnetisation of the medium, he “illuminated,” to use his own phrase, “ the lines of nagnetic force.”

From this phenomenon Thomson afterwards proved, by strict dynamical reasoning, that the transmission of mag- netic force is associated with a rotatory motion of the small parts of the medium. He showed, at the same time, how the centrifugal force duc to this motion would account for inagnetic attraction.

A theory of this kind is worked out in greater detail in Clerk Maxwell's Treatise on Electricity and Magnetism. Tt is there shown that, if we assume that the medium is in a state of stress, consisting of tension along the lines of force and pressure in all directions at right angles to the lines of force, the tension and the pressure being equal in numerical value and proportional to the square of the intensity of the field at the given point, the observed electrostatic and electromagnetic forces will be completely accounted for.

The next step is to account for this state of stress in the medium. In the case of electromagnetic force we avail ourselves of Thomson's deduction from Faraday's discovery stated above. We assume that the small parts of the medium are rotating about axes parallel to the lines of force. The centrifugal force due to this rotation produces the excess of pressure perpendicular to the lines of force. The explanation of electrostatic stress is less satisfactory, but there can be no doubt that a path is now open by which we may trace to the action of a medium all forces which, like the electric and magnetic forces, vary inversely as the square of the distance, and are attractive between bodies of different names, and repulsive between bodies of the same names.

The force of gravitation is also inversely as the square of the distance, but it differs from the electric and magnetic forces in this respect, that the bodies between

1 Maclaurin's account of Sir Isaac Newton's diseoveries.

inversely as the square of the distance. of the bodies were a generator of the fluid and the other an absorber of it, the bodies would repel each other.

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which it acts cannot be divided into two opposite kinds, one positive and the other negative, but are in respect of gravitation all of the same kind, and that the force between them is in every case attractive. To account for such a force by means of stress in an intervening medium, on the plan adopted for electric and magnetic forces, we must assume a Stress of an opposite kind from that already mentioned. We must suppose that there 1s a pressure

in the direction of the lines of force, combined with a tension in all directions at right angles to the lines of force. Such a state of stress would, no doubt, account for the observed effects of gravitation. We have not, however, been able hitherto to imagine any physical cause for such a state of stress. It is easy to calculate the amount of this stress which would be required to account for the actual effects of gravity at the surface of the earth. It would require a pressure of 37,000 tons' weight on the square inch in a vertical direction, combined with a tension of the same numerical value in all horizontal directions. The state of stress, therefore, which we must suppose to exist in the invisible medium, is 3000 times greater than that which the strongest steel could support.

Another theory cf the mechanism of gravitation, that of Le Sage, who attributes it to the impact of " ultramun- dane corpuscules," has been already discussed in the article AToM, supra, p. 46.

Sir William Thomson? has shown that if we suppose all space filled with a uniform incompressible fluid, and

if we further suppose either that material bodies are always generating and emitting this fluid at a constant rate, the fluid flowing off to infinity, or that material bodies are

always absorbing and annihilating the fluid, the deficiency

flowing in from infinite space, then, in either of these

cases, there would be an attraction between any two bodies If, however, one

Here, then, we have a hydrodynamical illustration of

action at a distance, which is so far promising that it shows how bodies of the same kind may attract each other.

But the conception cf a fluid constantly flowing out of a body without any supply from without, or flowing into it without any way of escape, is so contradictory to all our experience, that an hypothesis, of which it is an

essential part, cannot be called an explanation of the phenomenon of gravitation.

Dr Robert Hooke, a man of singular inventive power, in 1671 endeavoured to trace the cause of gravitation to waves propagated in a medium. He found that bodies floating on water agitated by waves were drawn towards the centre of agitation. He does not appear, however, to have followed. up this observation in such a way as to determine completely the action of waves on an immersed body.

Professor Challis has investigated the mathematical theory of the effect of waves of condensation and rarefac- tion in an elastic fluid on bodies immersed in the fluid. He found the difficulties of the investigation to be so great that he has not been able to arrive at numerical results. He concludes, however, that the effect of such waves would be to attract the body towards the centre of agitation, or to repel it from that centre, according as the wave's length is very large or very small compared with the dimensions of the body. Practical illustrations of the effect of such waves have been given by Guyot, Schellbach, Guthrie, and Thomson.*

A tuning-fork is set in vibration, and brought near @ delicately suspended light body. The body is immediately

"2 Proceedings of the Royal Society of Edinburgh, 7th Feb. 1870. 3 Posthumous Works, edited by R. Waller, pp. xiv. and 134, 4 Philosophical Magazine, June 1871.

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attracted towards the tuning-fork. If the tuning-fork is itself suspended, it is seen to be attracted towards any body placed near it.

Sir W. Thomson has shown that this action can in all cases be explained by the general principle that in fluid motion the average pressure is least where the average energy of motion is greatest. Now, the wave motion is greatest nearest the tuning-fork, the pressure is therefore least there; and the

suspended body being pressed unequally on opposite sides, moves from the side of greater pressure to the side of less pressure, that is towards the tuning-fork, He has also succeeded in producing repul- sion in the case of a small body lighter than the surround- ing mediuin.

It is remarkable that of the three hypotheses, which go some way towards a pliysical explanation of gravitation, every one involves a constant expenditure of work. Le Sage's hypothesis of ultramundane corpuscules does so, as we have shown in the article Atom. That of the genera- tion or absorption of fluid requires, not only constant expenditure of work in emitting fluid under pressure, but actual creation and destruction of matter. That of waves requires some agent in a remote part of the universe capable of generating the waves.

According to such hypotheses we must regard the processes of nature not as illustrations of the great principle of the conservation of energy, but as instances in which, by a nice adjustmeut of powerful agencies not subject to this principle, an apparent conservation of energy is maintained. Hence, we are forced to conclude that the explanation of the cause of gravitation is not to be found in any of these hypotheses.

For the mathematical theory of attraction and attraction of ellipsoids, see PorENTIAL ; for attraction of gravitation, capillary attraction, and attraction of cohesion, see respec- tively GRAVITATION, CaPILLARY ATTRACTION, and Con- STITUTION OF BopIEs. Gc?)

ATTWOOD, Tuomas, musical composer, was born in London in 1767. As one of the boy choristers in the chapel royal he received his early instruction in music from Nares and Ayrton. In 1783 he was sent to study abroad at the expense of the Prince of Wales, who had been favourably impressed by his skill as a performer on the harpsichord. After spending two years at Naples, Attwood proceeded to Vienna, where he became a favourite ' pupil of Mozart. On his return to London he held fora short time an appointment as one of the chamber musicians to the prince of Wales. In 1795 he was chosen organist of St Paul's, and in the following year he succeeded Dr Dupuis as composer to the chapels royal. His court con- nection was further confirmed by his appointment as musical instructor to the duchess of York and afterwards to the princess of Wales. For the

coronation of George IV. he composed the anthem, The King shall Rejoice, a work of high merit. The king, who had neglected him for some years on account of his connection with the princess of Wales, now restored him to favour, and in 1821 appointed him organist to his private chapel at Brighton. Soon after the institution of the Royal Academy of Music, Attwood was chosen one of the professors. He wrote the anthem, O Lord, grant the King a Long Life, which was performed at the coronation of William IV., and he was composing a similar work for the coronation of Queen Victoria when he died (March 24, 1838). Attwood's com- positions are favourable specimens of the English school. His services and anthems were published in a collected form after his death by his pupil Walmesley, and are fre- quently used in cathedral worship. Of his secular composi- tions several songs and glees are well known and popular. The operas which he composed in early life are now almost

forgotten, belonging, as they do, to a period when English music was at its lowest ebb.

ATWOOD, Gores, an author celebrated for the accuracy of his mathematical and mechanical investigations, and considered particularly happy in the clearness of his explana- tions, and the elegance of his experimental illustrations, was born in the early part of the year 1746. He was educated at Westminster school, to which he was admitted in 1759. Six years afterwards he was elected of to Trinity College, Cambridge. He took his degree of Bachelor of Arts in 1769, with the rank of third wrangler and first Smith's prizeman. These distinctions were amply sufficient to give him a claim to further advancement in his own college. In due time he obtained a fellowship, and was afterwards one of the tutors of the college. He became Master of Arts in 1772, and in 1776 was elected a fellow of the Royal Society of London. In the year 1784 he ceased to reside at Cambridge, and soon afterwards received from Mr Pitt a patent office, which required but little of his attendance, and enabled him still to devote a consider- able portion of his time' to his special studies. He died in 1807. Atwood's published works, exclusive of papers contributed to the Philosophical Transactions, for one of which he obtained the Copley medal,

are as follows :—(1.) Analysis of a Course of Lectures on the Principles of Natural Philosophy, Cambridge, 1784. (2.) Treatise on the Rectilinear Motion and Rotation of Bodves, Cambridge, 1784, which contains a good account of the elementary principles of mechanics, though it is deficient in the appli- cation of higher mathematical analysis. It also gives some interesting experiments, by means of which mechanical truths can be ocularly exhibited and demonstrated, and describes the machine, since called by Atwood's name, for verifying experimentally the laws of simple acceleration of motion. (3.) Review of the Statutes and Ordinances of Assize which have been established in England from the 4th year of King John, 1202, to the 37th of his present Majesty, London, 1801, a work of some historical research. (4.) Dissertation on the Construction and Properties of Arches, London, 1801, with supplement, pt. i. 1801, pt. ii, 1804, an elaborate and, in its time, valuable work, though it is now completely superseded.

ATYS, Artis, or Arrss, in the Phrygian and Lydian Mythology, a youth beloved for his beauty by the goddess Rhea, there called Agdistis. Like Adonis, he was a per- sonification of the changes in nature, from the beauty of spring and summer to the severity and darkness of winter. The story, as told at Pessinus, the centre of the worship of the goddess, was that she had born to Zeus a being both male and female ; that the gods, displeased, had transformed this being into a tree, from the fruit of which the daughter of the river-god Sangarius bore a boy, who grew up among herdsmen marvellous in his beauty, so as to win the love of Agdistis. This was Atys, and he was about to be married to the king's daughter of Pessinus, when the god- dess appeared among the guests, terrified them, and caused Atys to run to the woods, where he maimed himself and was transformed into a pine tree; from his blood sprang violets. Agdistis begged Zeus to restore him, but he could only assure her that the youth would never decay, and that his hair would always grow. She conveyed the pine to her cave at Pessinus, and gave herself up to grief.

AUBAGNE, a town of France, in the department of Bouches-du-Rhéne, with a population of 7408, who carry on the manufacture of wine, pottery, leather, coarse cloth, &c. The only remarkable monument is a fountain to

the memory of the Abbé Barthélemy, whose family was long connected with the town.

AUBE, a department of France, bounded on the N. by the department of Marne, N.W. by Seine-et-Marne, W.

by Yonne, 8. by Cote-d'Or, and E. by Haute-Marne. It con- sists of a portion of Champagne and Vallage, with a small part of Burgundy, and has an area of 2317 square miles. Its general inclination from S.E, to N.W. presents little variety of surface, the only elevations being a double line of hills along the course of the Seine, never exceeding 1150 feet in height. The department belongs to the Seine basin, and is watered by that river and its tributaries, the Ource, the Sarce, the Melda, and the Aube, &c. The climate is comparatively mild, but damp. Heavy rains fall at the beginning of winter. In the N. and N.W. the soil is dry and sterile; but the S. and E. districts are very fertile, particularly the valleys, which are admirably adapted for the cultivation of the vine. About two-thirds of the surface consists of arable land, and the agricultural con- dition of the country is improving. The principal produc- tions are wheat, rye, oats, potatoes, and wine, of which last about one-half is exported. In minerals Aube is one of the poorest departments in France ; a few iron mines have been worked, but with insignificant results. Chalk and clay are abundant; and there are also quarries of marble, lithographic stone, and building stone. The principal manufacture is hosiery; but the department also produces glass, earthenware, paper, sugar, and ropes, and has a large number of distilleries, tile-works, and dye-works, and an oil factory. Among the celebrated men connected with Aube are Villehardonin, Pope Urban IV., Mignard, Danton, Beugnot, and Ulbach, 'The capital is Troyes, and the arrondissements are Troyes, Arcis-sur-Aube, Nogent-sur- Seine, Bar-sur-Aube, and Bar-sur-Seine. Population in

1872, 255,687.

AUBENAS, a town of France, department of Ardeéche, near the river of that name, 14 miles S.W. of Privas. It is beautifully situated on the slope of a hill, but its streets generally are crooked and narrow. It is surrounded by a ruinous wall flaiked with towers, and has an old Gothic castle, now occupied by the municipal authorities. As the centre of the silk trade of the surrounding district, it is a place of considerable traffic, and there is besides a large local manufacture of silk and woollen goods. Population, 7694.

AUBER, Daniet Francois Esprit, musical composer, the chief representative of the French school, was the son of a Paris printseller. He was born at Caen, in Normandy, on the 29th January 1782, while his mother was on a visit to that town. Destined by his father to the pursuits of trade, he was allowed, nevertheless, to indulge his fondness for music, and learnt to play at an early age on several instruments, his first teacher being the Tyrolean composer, Ladurner. Sent at the age of twenty to London to com- plete his business training, he returned after the rupture of the peace of Amiens. He had already attempted musical composition, and at this period produced several concertos pour basse, in the manner of the violoncellist, Lamare, in whose name they were published. The praise given to his concerto for the violin, which was played at the Conservatoire by Mazas, encouraged him to undertake the resetting of the old comic opera, Julie. Conscious by this time of the need of regular study of his chosen art, he placed himself under the severe training of Cherubini, by which the special qualities of the young composer were admirably developed. In 1813 he made his débwt in an opera in one act, the Séjowr Militaire, the unfavourable reception of which put an end for some years to his attempts as composer. But the failure in business and death of his father, in 1819, compelled him once more to turn to music, and to make that which had been his pastime the serious employment of his life. He produced another opera, the Testament et les Billets-doux, which was no better received than the former. But he persevered, and the next year was rewarded by the complete success

of his Bergére Chatelaine, an opera in three acts. This was the first in a long series of brilliant successes, terminat- ing only in the eighty-sixth year of his age. In 1822 began his long association with M. Scribe, who shared with

him, as librettist, the success and growing popularity of his compositions. The opera of Leicester, in which they first worked together (1823), is remarkable also as showing the first evidences of the influence of Rossini on Auber's style. This style was, however, distinctly original, and

was easily recognisable.. A phrase of Auber, said his friend Théodore Gautier, is not the phrase of any one else. characteristics are lightness and facility, sparkling vivacity, grace and elegance, clear and piquant melodiousness,—these marking him out as a true son of France, and making him her darling singer. 'sentiment, intensity of passion, inspiration which grasps the sublime and the infinite—these are not in Auber.

His

Depth of thought, elevation of

Devoted by preference to the comic opera, as the most

fitting field for his talents, he ventured on more than one occasion to pass into the field of grand opera, and in his La Muette de Portici, familiarly known as Masaniello, he

achieved his greatest musical triumph. Produced at Paris

in 1828, it rapidly became a European favourite, and its overture, songs, aud choruses were everywhere heard. The duet, Amour sacré de la patrie was welcomed like a new

Marseillaise ; sung by Nourrit at Brussels in 1830)5

became the signal for the revolution which broke out there.

Among his other works, about fifty in all, the more

important are—Fra Diavolo (1830), Lestocg (1834), L' Ambassadrice (1836), Le Domino Noir (1837), Le Lae

des Fées (1839), Les Diamants de la Couronne (1841),

Haydée (1847), Marco Spada (1853), and La Fiancée du rot de Garbe (1864).

Official and other dignities testi- fied the public appreciation of Auber's works. In 1829 he

was elected member of the Institute, in 1830 he was named

director of the court concerts, and in 1842 he succeeded Cherubini as director of the Conservatoire. He wasalso a member of the Legion of Honour from 1825, and attained the rank of commander in 1847. One of Auber's latest compositions was a march, written for the opening of the International Exhibition in London in 1862. His fascinat- ing manners, his witty sayings, and his ever ready kindness and beneficence won for him a secure place in the respect and love of his fellow-citizens. He remained in his old home during the German siege of Paris, 1870-71, but the miseries of the Communist war which followed sickened his heart, and he at last refused to touch his beloved instru- ment, or to take food. He died May 13, 1871. (W.L.R.C.)

AUBIN, a town of France, in the department of Aveyron and arrondissement of Villefranche, principally remarkable for its extensive mines of coal, sulphur, and alum. It also carries on an active trade in sheep, iron goods, &e, A church of the 12th century, with some remarkable sculpture, and the ruins of the castle of the counts of Rouergue, are still in existence. Population, 8863.

The name Aubin, or St Aubin, is one of the most fre- quent in France, being borue by upwards of fifty villages from the Pyrenees to Jersey.

AUBUBN, the capital of Cayuga county, in the state of New York, on the railway between Albany and Buffalo, 174 miles W. of the former. The irregularity of the surface on which the city is built has prevented the com- plete carrying out of the rectangular arrangement of streets, which is so much in favour in the United States, but the thoroughfares are wide and lined with trees, and the houses for the most part well built. The principal public buildings are in Genesee Street. The most remark- able of the institutions is the state prison, founded in 1816, which is conducted on the

“silent system,” and usually con- tains upwards of 1000 prisoners, who are employed each 1m

the work to which he has been trained. Auburn also possesses a Presbyterian theological seminary, founded in 1821, an academy, five public free schools, sixteen churches, an orphan asylum, two opera houses, and several news- paper offices. The water-power supplied by the outlet of the neighbouring lake of Owasco is utilised in a number of manufactories. Cotton and woollen goods, carpets, agricultural implements and other tools, paper, flour, and beer are the principal products.

AUBUSSON, a town of France, situated in a picturesque valley on the banks of the Creuse, in the department to which that river gives its name. It is said to have owed its origin to a number of Saracens, who, having escaped from the battle in which their nation was defeated by Charles Martel, were enticed by the beauty and conveni- ence of the spot to establish themselves permanently there. It has long been famous for its carpets and tapestry, the art of weaving which was probably derived from those Eastern settlers, and it also manufactures common cot- ton and woollen goods, leather, tobacco, &c. Population,

6625.

AUCH, the ancient Climberrum or Augusta Auscorum, one of the most ancient cities of France, capital of the de- partment of Gers. In Cesar’s time this was the chief town of the Ausci. In the 8th century it became the capital of Gascony ; and when that district was divided into countships, was the capital of Armagnac. ‘The site of the modern town does not exactly coincide with that of the ancient, being on the opposite (the left) bank of the river Gers. Auch was probably destroyed by the Saracens about 724 a.D., and was afterwards rebuilt in its present picturesque situa- tion on the slope of a hill. On the opposite side of the river, and occupying the site of the ancient city, is a con- siderable suburb, which is connected with the town by a bridge ; and communication between the lower and the upper town is afforded by long flights of steps. The streets, though narrow, are generally well built, and a fine pro- menade in the upper part of the town gives a

magnificent view of the surrounding country. Auch is the seat of an archbishopric, which was founded in the 4th century, and gave, till the Revolution, the title of Primate of Aquitania to the holder of the see. It has tribunals of commerce and primary jurisdiction, a royal college, an agricultural society, a theological seminary, with a museum and an extensive library, a theatre, &c. The cathedral of St Mary, one of the most magnificent in France, was commenced in the reign of Charles VIII. (1489), and finished in that of Louis XV. It exhibits several styles of architecture, contains many elegant monuments, and is adorned with fine stained-glass windows and carved woodwork. The préfecture, formerly the archiepiscopal palace, is a vast and noble edifice. The principal manufactures are hats, various kinds of linen and cotton stuffs, leather, &c., and there is a considerable trade, especially in the brandies of Armagnac, Population in 1872, 13,087.

AUCHTERARDER, a town and parish of Scotland, county of Perth, 15 miles W.S.W. of Perth. The town consists of a single street about a mile in length. It was formerly a royal burgh, but is now disfranchised. Near it is an ancient castle, said to have been a hunting-seat of Malcolm Canmore. It was in connection with this parish that the ecclesiastical dispute arose which led to the Dis- ruption in the Church of Scotlandin 1843, Population of town in 1871, 2599.

AUCHTERMUCHTY, a royal burgh and parish of Scotland, county of Fife, 8 miles W.S.W. of Cupar. The town is irregularly built on an elevated site, and is divided by the Leverspool, a rapid streamlet which runs down its centre. ‘The manufacture of linen is carried on. Popula- tion of burgh in 1871, 1082.

AUCKLAND, a province of New Zealand, consisting of the northern portion of North Island, and bounded for the most part on the 8. by the 39th parallel of latitude. In the N.W. it runs out into a peninsula between 200 and 300 miles in length, with a very irregular coast-line, especially on the eastern side. The total area of the province 1s about 17,000,000 acres, of which nearly 11,275,000 are still in possession of the Maoris, who are, however, con- tinually disposing of their claims to the Government. The

surface of the province is of a very varied character, pre- senting wide and fertile plains, stretches of fern-heath and swamp, mountain ranges and isolated peaks, tracts of richly-wooded jungle, rocky plateaus, and districts of strange volcanic activity. All round the coast there are a large number of natural harbours, and the most of the interior is traversed by navigable streams. ‘The principal river-system is that of the Waikato (or Rushing Water), which rises in the Taupo Lake, in the south of the province, forces its way though an extensive rocky table-land, flows onwards for about 35 miles through a rich but marshy basin, joins its waters with the Waipa (or Peaceful Water), its largest tributary, cuts a passage through the Taupiri range, and after traversing the fertile expanse of its lower basin, turns abruptly to the W. and falls into the sea about 35 miles 8. of the city of Auckland. The value of the Waikato as a commercial highway is greatly lessened by its mouth being encumbered with sandbanks, that prevent the entrance of ships. To the E. of this river lies the valley of the Thames, fertile and well watered by several streams, and still further eastward extends the versaut of the Bay of Plenty. The course of settlement has hitherto advanced for the most part along the valleys of the Waikato and the Thames,—Cambridge, about 104 miles 8. of the city of Auckland, being the frontier station in the former, and Tapapa, a little further to the 8. in the latter. Nearly the whole of the N.W. peninsula is oceupied by a scattered population, and various flourishing townships are situated along the coast on all sides. In 1873 there were 3842 holdings in the province, and about 225,000 acres had been broken up. Hitherto the cultiva- tion of the cereals has not proved sufficiently remunerative, though climate and soil are equally favourable, and the attention of the farmer has principally been turned to the rearing of the various descriptions of live stock, more especially sheep. The natural wealth of the province consists principally in its gold and timber. Coal has been found in several districts, and a few mines have been successfully worked, as Kawakawa (at the Bay of Islands), Drury, and Whangarei; but the most important deposits are comparatively undisturbed, It is believed that iron may eventually be found in considerable quantities, and various minerals have been pointed out in the interior by scientific travellers. The chief seats of the gold-diggings are the Coromandel peninsula and the Thames valley. The quantity exported in 1871 was valued at £1,888,708. The most important timber tree is the kauri-pine, which is peculiar to Auckland, and does not grow further south than

37° 30’. It is of magnificent dimensions, and valuable, not only as the most extensively used building material, but on account of the fossil gum which is found wherever the kauri forest has been. This gum forms one of the chief articles of export, about 14,277 tons being the amount in the three years 1870, 1871, and 1872. There are vari- ous other trees of considerable value, such as the rimu, the kahikatca, and the totara. The timber trade, both domestic and foreign, is increasing in importance, and shipbuilding is extensively carried on. There are large districts overgrown with the phormium or New Zealand flax, and the right to cut it on the waste lands is granted by the Government at alow price. In 1873, 1497 tons

of the prepared fibre, valued at £27,783, were exported, besides a considerable quantity of manufactured rope. Those great necessities of commerce, roads and railways, are being constructed in various directions. A line is in course of formation from Auckland up the valley of the Waikato, as far as Newcastle, at the confluence of the Waipa, and a survey has been made for about 20 miles further. A road runs from Bowen, on the Bay of Plenty, across the country, through the wonderful lake district, with its boiling fountains, steam geysers, and mud-baths, round by the east coast of Taupo Lake, and over the highlands to Napier, in Hawke’s Bay province. The history of Auckland was for long the history of New Zealand, and will be fully treated under that heading. (See New ZEALAND.)

For a descriptive account of a large part of the province, the reader is referred to Dr Hochstetter’s valuable works, especially to his New Zealand, 1863. A very graphic sketch of some of the natural curiosities is furnished by Anthony Trollope in his Australia and New Zealand, vol. i.

AUCKLAND, the capital of the above province, is finely situated on an isthmus in the N.W. peninsula, on the 8. shore of the Waitemata harbour, which is formed by an inlet of the Hauraki Gulf. Lat. 36° 51’ S. long. 174° 50’. On the other side of the isthmus lies the harbour and town of Manukau, which serves as a supplementary port to the city. Auckland was founded in 1840 by Governor Hobson, and became a burgh in 1851. It was till 1865 the seat of the Government, which is now situated at Welling- tou. The city has a fine appearance, especially from the harbour, and is surrounded by a

number of flourishing suburban villages, with several of which it is connected by railway. Among the public buildings in the city and neigh- bourhood may be mentioned the governor's house, the cathedral, St John's Episcopal college, about 4 miles distant,

the Auckland college and grammar school, the Episcopal |

grammar school, in the suburb of Parnell, the provincial hospital, the provincial lunatic asylum, and the orphanage at Parnell. A wharf, 1690 feet in length, has been built opposite the centre of the city, and affords excellent accomniodation for the gradually increasing traffic of the harbour, In 1872, 170 non-colonial vessels, with a tonnage of 54,257 tons, entered the port, besides a large number of coasting ships. There are registered at Auck- land 167 sailing vessels and 20 steamships, most of them of provincial build. The population, which was 7989 in 1862, had increased by 1871 to 12,937 (with the suburbs to 18,000), and is now estimated at about 21,000. AUCKLAND ISLANDS, a group discovered in 1806 by Captain Briscoe, of the English whaler " Ocean," about

180 miles 8. of New Zealand, in lat. 50° 24', long. 166°

7' E. The islands, of volcanic origin, are very fertile, and are covered with forest. They were granted to the Messrs Enderby by the British Government as a whaling station, but the establishment was abandoned in 1852. (See Ray- nal's Auckland Islands, 1874.)

AUCKLAND, Witu1am Eprn, Baron, an eminent diplomatist and politician, third son of Sir Robert Eden, Bart., of West Auckland, was born in 1744. He was edu- cated at Eton and Oxford, and adopted the profession of the law. At the age of twenty-seven he resigned his practice at the bar, and engaged in political life as under-secretary to Lord Suffolk. By the favour of the duke of Marlborough, he obtained a seat for Woodstock, and soon gave proof of his ability in the House. He attached himself to Lord North's party, and after serving under Lord Carlisle on the unsuc- cessful commission to the colonists in America, acted as secretary to that nobleman, when he held the post of viceroy in Ireland. During this time he had obtained the offices of director and auditor of Greenwich Hospital, which

probably yielded him an income sufficient for carrying on his political career. In 1783 he took a leading part in negotiating the: remarkable coalition between North and Fox, and was rewarded by being made vice-treasurer of Treland. In 1784 he opposed Pitt's proposal for commercial reciprocity with Ireland, but in so doing contrived to separate himself to some extent from his own party, and shortly after accepted from Pitt the office of plenipotentiary at Paris. Here he successfully negotiated the important commercial treaty with France; and after his appointment as ambassador to Spain, he rendered valuable service in settling the dispute between the British and French Governments with regard to the affairs of Holland. In 1789 he was made an Irish peer, with the title of Baron Auckland, and in 1793 he was raised to the British peerage as Baron Auckland, of West Auckland, Durham. For three years, 1798-1801, he held office as postmaster-general. He died suddenly in 1814. In 1776 he married the sister of the first earl of Minto, by whom he had a large family. Besides numerous pamphlets on political mat- ters of the day, Lord Auckland wrote a treatise on the Principles of the Penal Law, 1771. His political con- duct has been frequently censured; he was a skilful diplomatist, and as a statesman was specially remarkable for his clear grasp of economic principles. His Journal and Correspondence, 4 vols. 1860-1862, published by his son, the bishop of Bath and Wells, throws considerable light on the political history of his time.

AUCKLAND, Grorcze Eben, Eart or, Governor- General of India, born 20th August 1784, was the second son of the subject of the preceding notice. He completed his education at Oxford, and was admitted to the bar in 1809. His elder brother was drowned in the Thames in the following year; and in 1814, on the death of his father, he took his seat in the House of Lords as Baron Auckland. He supported the Reform party steadily by his vote, and in 1830 was made president of the Board of Trade and master of the Mint. In 1834 he held office for a few inonths as first lord of the Admiralty, and in 1835 he was appointed Governor-General of India. He proved himself to be a painstaking and laborious legislator, and devoted himself specially to the improvement of native schools, and the expansion of the commercial industry of the nation committed to his care. These

useful labours were inter- rupted in 1838 by the hostile movements of the Persians, which excited the fears not only of the Anglo-Indian Government but of the home authorities. Lord Auckland resolved to enter upon a war in Afghanistan, and on the 1st October 1838, published at Simla his famous manifesto. The early operations were crowned with success, and the Governor-General received the title of Earl of Auckland. But reverses followed quickly, and in the ensuing cam- paigns the British troops suffered the most severe disasters. Lord Auckland had the double mortification of seeing his policy a complete failure, and of being superseded before his errors could be rectified. In the autumn of 1841 he was succeeded in office by Lord Ellenborough, and returned to England in the following year. In 1846 he was made first lord of the Admiralty, which office he held until his death, 1st January 1849. He died unmarried, and the earldom became extinct.

AUCTION, a mode of selling property by offering it to the highest bidder in a public competition. By 8 Vict. c. 15, the uniform duty of £10 per annum is imposed on every licence to carry on the business of auctioneer, but duties on sales by auction are abolished. It is the duty of an auctioneer to sell for the best price he can obtain, and his authority cannot be delegated to another unless by special permission of his employer. The auctioneer's name must be exhibited on some conspicuous place during the

sale, under a penalty of £20. Sales by auction usually take place under certain conditions, which it is the duty of the auctioneer to read to the bidders before the sale begins. 'To complete a sale by auction there must be a bidding by, or on behalf of, a person capable of making a contract, and an acceptance thereof by the auctioneer, and until the bidding is accepted both vendor and bidder are free, and may retract if they choose. If due notice is given, an agent may be employed to bid on behalf of the seller, but the employment of several bidders is improper, and if the sale is declared to be without reserve, any bidding on the behalf of the seller will vitiate the sale. Puffing, it has been said, is illegal, even if there be only one puffer. On the other hand, any hindrance to a free sale, either by a bidder deterring competitors from offering against him, or by an engagement among the

competitors to refrain from bidding, in order to keep down the price of the goods and then share the profit, isa fraud upon the vendor. Two persons, however, may agree not to bid against each other. Auctioneers are entitled by their licence to act as appraisers also.

AUDAUS, or Auptus, a reformer of the 4th century, by birth a Mesopotamian. He suffered much persecution from the Syrian clergy for his fearless censure of their irregular lives, and was expelled from the church, He was afterwards banished into Scythia, where he gained many followers and established the monastic system. He died there at an advanced age, about 370 a.p. ‘The Audeans celebrated the feast of Easter on the same day as the Jewish Passover, and they were also charged with attributing to the Deity a human shape. They appear to have founded this opinion on Genesis 1. 26.

AUDE, a southern department of France, forming part of the old province of Languedoc, bounded on the E. by the Mediterranean, N. by the departments of Hérault and Tarn, N.W. by Upper Garonne, W. by Ariége, and 8. by that of Eastern Pyrenees. It lies between lat. 42° 40’ and 34° 30’ N., and is 80 milesin length from E. to W., and 60 miles in breadth from N. to 8S. Area, 2341 square miles. The department of Aude is traversed on its western boundary from 8. to N. by a mountain range of medium height, which unites the Pyrenees with the Southern Cevennes ; and its northern frontier is occupied by the Black Mountains, the most western part of the Cevennes chain. The Corbiéres, a branch of the Pyrenees, runs in a S.W. and N.E. direction along the southern district. The Aude, its principal river, has almost its entire course in the department. Its principal affluents on the left are the Fresquel, Orbiel, Argent-Double, and Cesse; on the right, the Guette, Salse, and Orbieu. The canal of Lan- guedoc, which unites the Atlantic with the Mediterranean, traverses the department from E. to W. The lowness of the coast causes a series of large lagunes, the chief of which are those of Bages, Sigean, Narbonne, Palme, and Leucate. The climate is variable, and often sudden in its alterations. The wind from the N.W., known as the Crs, blows with great violence, and the sea breeze is often laden with pesti- lential effluvia from the lagunes. Various kinds of wild animals, as the chamois, bear, wild boar, wolf, fox, and badger, inhabit the mountains and forests; game of all kinds is plentiful; and the coast and

lagunes abound in fish. Mines of iron, copper, lead, manganese, cobalt, and antimony exist in the department; and, besides the beauti- ful marbles of Cascastel and Caunes, there are quarries of lithographic stone, gypsum, limestone, and slate. The coal mines are for the most part abandoned. The moun- tains contain many mineral springs, both cold and thermal. The agriculture of the department is in a very flourishing condition, The meadows are extensive and well watered, and are pastured by numerous flocks and herds. The grain

produce, consisting mainly of wheat, oats, rye, and Indian corn, considerably exceeds the consumption, and the vine- yards yield an abundant supply of both white and red wines. Olives and almondsare also extensively cultivated, and the honey of Aude is much esteemed. Besides impor- tant manufactures of woollen and cotton cloths, combs, jet ornaments, and casks, there are paper-mills, distilleries, tanneries, and extensive iron and salt works. ‘The chief town is Carcassonne, and the department is divided into the four arrondissements of Carcassonne, Limoux, Nar- bonne, and Castelnaudary. Population in 1872, 285,927.

AUDEBERT, Jean Baptisre, a distinguished French naturalist and artist, was born at Rochefort in 1759. He studied painting and drawing at Paris, and gained con- siderable reputation as a miniature painter. In 1787 he was employed to make drawings of some objects in a natural history collection, and was also a contributor in the preparation of the plates for Olivier’s [istowre des Insectes. He thus acquired a taste for the study of natural history, and devoted himself with great eagerness to the new pursuit. In 1800 appeared his first original work, DL Histoire Naturelle des Singes, des Makis, et des Galéopr- théques, illustrated by 62 folio plates, drawn and engraved by himself. The colouring in these plates was unusually beautiful, and was laid on by a method devised by the author himself. Audebert died in 1800, but he had left complete materials for another great work, LHvstoire des Colibris, des Otseaux-Mouches, des Jacamares, et des Pro- merops, which was published in 1802. 200 copies were printed in folio, 100 in large quarto, and 15 were printed with the whole text in letters of gold. Another work, left unfinished, was also published after the author’s death,

I’Histoire des Grimpereaux, et des Oiseaux de Paradis. The last two works also appeared together In two volumes with the title Otseauz dorés ou a reflets metalliques,

1802.

AUDITOR, a person appointed to examine the accounts kept by the financial officers of the Crown, public corpora- tions, or private persons, and to certify as to their accuracy. The multifarious statutes regulating the audit of public accounts have been superseded by the 29 and 30 Vict. c. 39, which gives power to the Queen to appoint a “ comp- troller and auditor-general,” with the requisite staff to examine and verify the accounts prepared by the different departments of the public service. In examining accounts of the appropriation of the several supply grants, the comp- troller and auditor-general “shall ascertain first whether the payments which the account department has charged to the grant are supported by vouchers or proofs of pay- ments ; and second, whether the money expended has been applied to the purpose or purposes for which such grant was intended to provide.” The Treasury may also submit certain other accounts to the audit of the comptroller- general. All public moneys payable to the Exchequer are to be paid to the “ account of Her Majesty’s Exchequer ” at the Bank of England, and daily returns of such payments must be forwarded to the comptroller. Quarterly accounts of the income and charge of the consolidated fund are to be prepared and transmitted to the comptroller, who, in case of any deficiency in the consolidated fund, may certify to the bank to make advances. The accounts of local boards, poor-law unions, &c., must be passed in a similar manner by an official auditor. It is the duty of the auditor to disallow all illegal payments, and surcharge them upon the person making or authorising them ; but such disallow- ances may be removed by certeorart into the Court of Queen’s Bench, or an appeal may be made to the local Government Board. In municipal corporations two

burgesses must be chosen annually as auditors of the accounts.

AUDOUIN, Jean Victor, a distinguished French entomologist, was born at Paris, Apri] 27,1797. He began the study of law, but was diverted from it by

his strong predilection for natural history, which subsequently led him to enter the medical profession. In 1824 he was appointed assistant to Latreille in the entomological chair at the Paris museum of natural history, and succeeded him in 1833. He established in 1824, in conjunction with Dumas and Adolphe Brongniart, the Annales des Sciences Naturelles, to which he made numerous valuable contribu- tions, generally in co-operation with M. Milne-Edwards. The greater part of his other papers are contained in the Transactions of the Entomological Society, of which he was one of the founders, and for many years president. In 1838 he became a member of the Academy of Sciences. He died in 1841, more from the effects of mental than of bodily exhaustion His principal work, Histoire des Insectes nuisibles & la Vigne, was continued after his death by Mulne-Edwards and Blanchard, and published in 1842.

AUDRAN, the name of a family of French artists and engravers, who for several generations were distinguished in the same line. The first who devoted himself to the art of engraving was Claude Audran, born 1592, and the last was Benoit, Claude's great-grandson, who died in 1712. The two most distinguished members of the family are the following :—

AUDRAN, GERARD, or GIRARD, the most celebrated French engraver, was the third son of Claude Audran, and was born at Lyons in 1640. He was taught the first principles of design and engraving by his father; and, following the example of his brother, went to Paris to perfect himself in his art. He there, in 1666, engraved for Le Brun Constantine's Battle with Maxentius, his Triumph, and the Stoning of Stephen, which gave great satisfaction to the painter, and placed Audran in the very first rank of engravers at Paris. Next year he set out for Rome, where he resided three years, and engraved several fine plates. That great patron of the arts, M. Colbert, was so struck with the beauty of Audran's works, that he per- suaded Louis XIV. to recall him to Paris. On his return he applied himself assiduously to engraving, and was appointed engraver to the king, from whom he received great encouragement. In the ycar 1681 he was admitted to the council of the Royal Academy. He died at Paris in 1703. His engravings of Le Brun's Battles of Alexander are regarded as the best of his numerous works " He was," says the Abbé Fontenai, "the most celebrated engraver that ever existed in the historical line. We have several subjects,

which he engraved from his own designs, that manifested as much taste as character and facility. But in the Battles of Alexander he surpassed even the expectations of Le Brun himself.” Gérard published in 1683 a work entitled Les proportions du corps humain mesurées sur les plus belles figures de Vantiquité, which has been translated into English.

AUDRAN, JEAN, nephew of Gérard, was born at Lyons in 1667. After having received instructions from his father, he went to Paris to perfect himself in the art of engraving under his uncle, next to whom he was the most distin- guished member of his family. At the age of twenty his genius began to display itself in a surprising manner ; and his subsequent success was such, that in 1707 he obtained the title of engraver to the king, Louis XIV., who allowed him a pension, with apartments in the Gobelins; and the following year he was made a member of the Royal Academy. He was eighty years of age before he quitted the graver, and nearly ninety when he died. The best prints of this artist are those which appear not so pleasing to the eye at first sight. In these the etching constitutes a great part; and he has finished them in a bold, rough

style. The Rape of the Sabines, after Poussin, is con. sidered his masterpiece.

AUDUBON, Joun Jams, a well-known naturalist, was born in 1781 in Louisiana, where his parents, who were French Protestants, had taken up their residence while it was still a Spanish colony. They afterwards settled in Pennsylvania. From his early years he had a passion for observing the habits and appearances of birds, and attempt- ing delineations of them from nature. At the age of fifteen he was sent to Paris, and remained there about two years, when among other studies he took some lessons in the drawing-school of David. On returning to America his father established him in a plantation in Pennsylvania, and he soon after married. But nothing could damp his ardour for natural history. For fifteen years he annually explored the depths of the primeval forests of America in long and hazardous expeditions, far from his family and his home. In these excursions he acquired the facility of making those spirited drawings of birds that gives such value to hig magnificent work, The Eirds of America. At that period he had not dreamed of any publication of his labours; as he informs us, “it

was not the desire of fame that prompted to those long exiles ; it was simply the enjoyment of nature.” He afterwards removed with his family to the village of Henderson on the banks of the Ohio, where he continued his researches in natural history for several years, and at length set out for Philadelphia with a portfolio containing 200 sheets filled with coloured delineations of about 1000 birds. Business obliged him to quit Phila- delphia unexpectedly for some weeks, and he deposited his portfolio in the warehouse of a friend ; but to his intense dismay and mortification he found, on his return, that these precious fruits of his wanderings and his labours had been totally destroyed by rats. The shock threw him into a fever of several weeks’ duration, that well-nigh proved fatal. But his native energy returned with returniug health ; and he resumed his gun and his game-bag, his pencils and his drawing-book, and plunged again into the recesses of the backwoods. In about three years he had again filled his portfolio, and then rejoined his family, who had in the meantime gone to Louisiana. After a short sojourn there he set out for the Old World, to exhibit to the ornithologists of Europe the riches of America in that department of natural history.

In 1826 Audubon arrivedat Liverpool, where the merits of his spirited delineations of American birds were imniediately recognised, An exhibition of them to the public in the gal- leries of the Royal Institution of that town was so successful that it was repeated at Manchester and at Edinburgh, where they were no less admired. When he proposed to publish a work on the birds of America, several naturalists advised him to issue the work in large quarto, as the most useful size for the lovers of natural history, and the most likely to afford him a sufficient number of subscribers to remu- nerate his labours. At first he yielded to this advice, and acknowledged its soundness; but finally he decided that his work should eclipse every other ornithological publica- tion. Every bird was to be delineated of the size of life, and to each species a whole page was to be devoted ; con- sequently, the largest elephant folio paper was to receive the impressions. This necessarily increased the expense of the work so much as to put it beyond the reach of most scientific naturalists—which accounts for the small number of persons who, for a considerable time, could be reckoned among his supporters in the gigantic under- taking. The exceptionally high character of the work, however, gradually became known; and a_ sufficient

number of subscribers was at length obtained in Great Britain and America, during the ten or twelve years that the work was going through the press, to indemnify him

for the great cost of the publication—leaving him, however, a very inadequate compensation for his extraordinary in- dustry and skill. The first volume was published at New York in the end of the year 1830, the second in 1834, the third in 1837, and the fourth and last in 1839. The whole consists of 435 coloured plates, containing 1055 figures of birds the size of life. It is certainly the most magnificent work of the kind ever given to the world, and is well char- acterised by Cuvier, “ C’est le plus magnifique monument que l’Art ait encore élevé & la Nature.”

During the preparation and publication of his great work Audubon made several excursions from Great Britain. In the summer of 1828 he visited Paris, where he made the acquaintance of Cuvier, Humboldt, and other celebrated naturalists, and received from them every mark of honour and esteem. The following winter he passed in London. In April of 1830 he revisited the United States of America, and again explored the forests of the central and southern federal territories. In the following year he returned to London aud Edinburgh, but the August of 1831 found him again in New York. The succeeding winter and spring he spent in Florida and South Carolina ; and in the summer of 1832 he set out for the Northern States, with an inten- tion of studying the annual migrations of birds, particularly of the passenger pigeon, of which he has given a striking description; but his career was arrested at Boston by a severe attack of cholera, which detained him there till the middle of August. After that he explored the coasts, lakes, rivers, and mountains of North America, from Labrador and Canada to Florida, during a series of laborious journeys, that occupied him for three years. From Charleston, accompanied by his wife and family, he took his third departure for Britain. During his earlier residence in Edinburgh he had begun to publish his Ameri- can Ornithological Biography, which at length filled five large octavo volumes. ‘The first was issued there by Adam Black in 1831; the last appeared in 1839. This book is admirable for the vivid pictures it presents of the habits of the birds, and the

adventures of the naturalist. The descriptions are characteristically accurate and interesting.

In 1839 Audubon bade a final adieu to Europe; and returning to his native country, he published, in a more popular form, his Birds of America, in seven octavo volumes, the last of which appeared in 1844. His ardent love of nature still prompted him to new enterprises, and he set out on fresh excursions ; but in these he was always accompanied by his two sons, and one or two other natural- ists. The result of these excursions was the projection of a new work, The Quadrupeds of America, in atlas folio, and also a Biography of American Quadrupeds, both of which were commenced at Philadelphia in 1840. The latter was completed in 1850, and is, perhaps, even superior to his Ornithological Biography.

To great intelligence in observing, and accuracy in delineating nature, to a vigorous, handsome frame, and pleasing expressive features, Audubon united very estiinable mental qualities, and a deep sense of religion without a trace of bigotry. His conversation was animated and instructive, his manner unassuming, and he always spoke with gratitude to Heaven for the very happy life he had been permitted to enjoy. He died, after a short illness, in his own residence on the banks of the Hudson, at New York, on the 27th of January 1851. See Life and Adven- tures of J. J. Audubon the Naturalist, edited, from materials supplied by his widow, by Robert Buchanan, London, 1868.

AUGEIAS (Adyeias, Atyéas, of. HAlov avy), in Greek Legend, a son of Helios, the sun. He was a prince of Elis, and, consistently with his being a descendant of the sun-god, had an immense wealth of herds, including twelve bulls sacred to Helios, and white as swans. He lived

beside the stream Menios (Mjv = moon) ; and his daughter Agamede was, like Medeia and Circe, skilled in witchcraft, and connected with the moon goddess. The task of Hercules was to clear out all his stalls in one day, and without help. This he did by making an opening in the wall and turning the stream through them. Augeias had promised him a tenth of the herd, but

refused this, alleging that Hercules had acted only in the service of Eurystheus.

AUGEREAU, Pierre Frangors Cxartes, Duke of Castiglione, was the son of obscure parents, and born in 1757. After serving for a short period in the armies of France, he entered the Neapolitan service, and for some time supported himself by teaching fencing at Naples. {In 1792 he joined the Republican army that watched the movements of Spain. He rose rapidly to the rank of brigadier-general, and commanded a division in the army of Italy. Here he distinguished himself in numerous engagements by his energy, skill, and vigorous rapidity of action. ‘To him were due in great measure the brilliant victories of Millesimo, Dego, and Castiglione, and he led the decisive charges at the bloody combats of Lodi and Arcola. In 1797 he took part with Barras and the Directory, and was an active agent in the revolution of the 18th of Fructidor; but his jealousy of his former com-rade, Bonaparte, prevented their intimacy; and he was one of the general officers not privy to the noted revolution of the 18th of Brumaire (Nov. 9) 1799. He received, however, the command of the army of Holland and the Lower Rhine, but was superseded in 1801. From that time he lived in retirement, till 1804, when he was made a marshal of the French empire, and in the following year he was appointed to the command of the expedition against the Vorarlberg, which he quicklysubdued. Healso distinguished himself greatlyin the battles of Jenaand Eylau. In1809-10 he commanded the French in Catalonia, and tarnished his laurels by his great cruelty to the Spaniards; but he was again more honourably conspicuous in the campaign of 1813, especially in the terrible battle of Leipsic. In 1814 he had the command of a reserve army at Lyons, and might have made a diversion in favour of Napoleon, but he preferred to submit, and retained a command under the Bourbons. In the following year he at first refused to join Napoleon on his escape from Elba, and when he would afterwards have accepted a command his services were declined. He also failed to obtain military office under the new dynasty, and after having had the painful task of being one of the commission on the trial of Ney, he returned to his estates, where he died of dropsy in 1816.

AUGSBURG, a celebrated city of Germany, capital of the circle of Swabia and Neuburg in Bavaria, the principal seat of the commerce of South

Germany, and of commer- cial transactions with the south of Europe. It derives its name from the Roman Emperor Augustus, who, on the conquest of Rhetia by Drusus, established a Roman colony named Augusta Vindelicorum (about 14 B.c.) In the 5th century it was sacked by the Huns, and afterwards came under the power of the Frankish kings. It was almost entirely destroyed in the war of Charlemagne against Thassilon, duke of Bavaria ; and after the dissolution and division of that empire, it fell into the hands of the dukes of Swabia. After this it rose rapidly into importance as a manufacturing and commercial town, and its merchant princes, the Fuggers and Welsers, rivalled the Medici of Florence ; but the alterations produced in the currents of trade by the discoveries of the 15th and 16th centuries occasioned a great decline. In 1276 it was raised to the rank of a free imperial city, which it retained, with many changes in its internal constitution, till 1806, when it was annexed to the kingdom of Bavaria. Meanwhile, it was

the scene of numerous events of historical importance. It was besieged and taken by Gustavus Adolphus in 1632, and in 1635 it surrendered to the imperial forces; in 1703 it was bombarded by the electoral prince of Bavaria, and forced to pay a contribution of 400,000 dollars ; and in

PUBLIC CARDENS

Sketch Plan of Augsburg.

K, Maximilian’s Platz. 9. Police. 1. Cathedral. 10. Firehouse.

A, St Stephan’s Platz. B, Carolinen Platz.

C, Fruit Market. 2. Frohnhof. 11. St Moritz Church.

D, Metzger Platz. 3. Palace. 13. St Katherine’s Nun- E, Perlachthurm. 4. Court Garden. nery.

F, Ludwig’s Platz. 5. Barefoot Church. 14. St Ulrich’s Chureh. G, Fish Market. 6. Shambles. 15. Military Stables.

H, Horse Market. 7. Town-Hall. 16. Holy Ghost Hospital. J, St Anna Platz. 8. Exchange (Borse).

the war of 1803 it suffered severely. Of its conventions the most memorable are those which gave birth to the Augs- burg confession (1530) and to the Augsburg alliance (1686).

The city is pleasantly situated in an extensive and fertile plain, between the rivers Wertach and Lech, 36 miles W.N.W. of Munich, lat. 48° 21’ 44” N., long. 10° 54’ 42” BK. Its fortifications were dismantled in 1703, and have since been converted into public promenades. Maxi- milian Street is remarkable for its breadth and architectural magnificence. One of its most interesting edifices is the Fugger House, of which the entire front is painted in fresco. Among the public buildings of Augsburg most worthy of notice is the town-hall, said to be one of the finest in Germany, built by Elias Holl in 1616-20. One of its rooms, called the ‘Golden Hall,” from the profusion of its gilding, is 113 feet long, 59 broad, and 53 high. The palace of the bishops, where the memorable Confession of Faith was presented to Charles V., is now used for Government offices. The cathedral dates in its oldest portions from the 10th century. There are also vari- ous churches and chapels, a school of arts, a polytechnic institution, a picture gallery in the former monastery of St Catherine, a museum, observatory, botanical gardens, an exchange, gymnasium, deaf-mute institution, orphan asylum, public library, several remarkable fountains dating from the 16th century, &c. The “Fuggerei,” built in 1519 by the brothers Fugger, consists of 106 small houses, let to indigent Roman Catholic citizens at a merely nominal

rent. The manufactures of Augsburg are various and important, consisting of woollen, linen, cotton, and silk goods, watches, jewellery, and goldsmith-work, mathema- tical instruments, machinery, leather, paper, chemical stuffs, types, &c. Copper-engraving, for which it was formerly noted, is no longer carried on; but printing, litho- graphy, and publishing have acquired a considerable de- velopment, one of the best-known Continental newspapers being the Allgemeine Zeitung or Augsburg Gazette. Augs- burg is an important railway junction. On the opposite side of the river, which is

here crossed by a bridge, lies the little village of Lechhausen. Population in 187],

51,270.

AUGSBURG CONFESSION. See Creeps.

AUGURS, in Roman Antiquities, a college or board appointed to interpret, according to the books (libri augurales) in which the science of divination was laid down, the awuspicia or signs of approval or disapproval sent by Jupiter on the occasion of any public transaction. At first, it is said, there were only two augurs, one from each of the tribes Ramnes and Tities. Two more were added by Numa, and again other two for the third tribe of Luceres, that is six altogether. But in the year 300 B.c. it is certain that there were only four, to which number five plebeian places were added by the lex Ogulnia. Sulla increased the number to fifteen, at which it con- tinued, with the exception that Cesar appointed a sixteenth, and the emperors frequently added as supra numerum persons of distinction, or of their own family. An augur retained his office and sacred character for life. The college had the right of election of new members. The insignia of their office were the ditwus, or crook, and the dress called trabea. The natural region to look to for signs of the will of Jupiter was the sky, where lightning and the flight of birds seemed directed by him as counsel to men. The latter, however, was the more difficult of interpretation, and upon it, therefore, mainly hinged the system of divination with which the augurs were occupied, and which is expressed in the terms auguriwm and auspr- cium (aves gerere, aves spicere). The presence of augurs was required only in observing signs in the sky, where their first duty was to mark out with the litwus a space or templum in the sky within which the omen must occur. Such observations being properly made only in the city of Rome, augurs are not found elsewhere. Signs of the will of the gods were of two kinds, either in answer to a request (auspicia impetrativa), or incidental (auspicia oblatia). Of such signs there were five classes:—(1.) Signs in the sky (cclestia auspicia), consisting chiefly of thunder and lightning, but not excluding falling stars and other pheno- mena. Lightning from left to right was favourable, from right to left unfavourable ; and this being a very direct and impressive token of the will of Jupiter, the observation of it was held to apply to all public

transactions fixed for the day on which it occurred. Whether favourable or the reverse in its direction, the appearance of lightning was held as a voice of the god against business being done in the public assemblies. But since the person charged to take the auspices (de colo servasse) for a certain day was constitutionally subject to no other authority who could test the truth or falsehood of his statement that he had observed lightning, it happened that this became a favourite means of putting off meetings of the public assembly. Restrictions were, however, imposed on it in the later times of the republic. When a new consul, preetor, or queestor entered on his first day of office and prayed the gods for good omens, it was a matter of custom to report to him that lightning from the left had been seen. (2.) Sagns from birds (signa ex avibus), with reference to the direction of their flight, and also to their singing, or uttering other

sounds. In matters of ordinary life on which divine counsel was prayed for, it was usual to have recourse to this form of divination. For public affairs it was, by the time of Cicero, superseded by the fictitious observation of lightning. (3.) Peeding of birds (auspicia ex tripudiis), which consisted in observing whether a bird,—usually a fowl,—on grain being thrown before it, let fall a particle from its mouth (tripudium solistimum). If it did so, the will of the gods was in favour of the enterprise in question. The simplicity of this ceremony recommended it for very general use, particularly in the army when on service. The fowls were kept in cages by a servant, styled pullarius. In imperial times are mentioned the decuriales pullarii. (4.) Signs from animals (pedestria auspicia, or ex quadru- pedibus), 2.¢., observation of the course of, or sounds uttered by, quadrupeds and serpents within a fixed space, corresponding to the observations of the flight of birds, but much less frequently employed. It had gone out of use by the time of Cicero. (5.) Warnings (signa ex diris), con- sisting of all unusual phenomena, but chiefly such as boded ill. Being accidental in their occurrence, they belonged to the augurva oblatiwa, and their interpretation was not a matter for the augurs, unless occurring in the course of some public transaction, in which case they formed a divine veto against it. Otherwise, reference was made for an interpretation to the Pontifices in olden times, afterwards frequently to the Sibylline books, or the Etruscan

haruspices, when the incident was not already provided for by a rule, as, for example, that it was unlucky for a person leaving his house to meet a raven, that the sudden death of a person from epilepsy at a public meeting was a sign to break up the assembly, not to mention other instances of adverse omens. A Roman, however, did not necessarily regard a warning as binding unless it was clearly appre- hended. Not only could an accidental oversight reuder it useless, but to some extent measures could be taken to prevent any warning being noticed. At sacrifices, for instance, the flute was played ne quid aliud exaudiatur (Pliny, Vat. Hist., xxviii. 2, 11).

Among the other means of discovering the will of the gods were casting lots, oracles of Apollo (in the hands of the college sacris faciundis), but chiefly the examination of the entrails of animals slain for sacrifice. Anything abnormal found there was brought under the notice of the augurs as warnings, but usually the Etruscan haruspices were employed for this. The persons entitled to ask for an expression of the divine will on a public affair were the magistrates. To the highest offices, including all persons of consular and preetorian rank, belonged the right of taking auspicia maxima; to the inferior offices of edile and questor, the auspicia minora; the differences between these, however, must have been small. The subjects for which auspicia publica were always taken were the elec- tion of magistrates, their entering on office, the holding of a public assembly to pass decrees, the setting out of an army for war. They could only be taken in Rome itself ; and in case of a commander having to renew his auspicia, he must either return to Rome or select a spot in the foreign country to represent the hearth of that city. The time for observing auspices was, as a rule, between midnight and dawn of the day for which the transaction was fixed about which they were desired. But whether it was so ordered in the ritual, or whether this was to leave the whole day free, is not known. In military affairs this course was not always possible, as in the case of taking auspices before crossing a river. The founding of colonies, the beginning of a battle, before calling together an army, before sittings of the senate, at decisions of peace or war, were occasions, not always but frequently, for taking auspices. The place where the ceremony was performed was not fixed but

varied, so as to have a close relation to the object to which it referred. A spot being selected, the official charged to make the observation (spectio) pitched his tent there some days before. A matter postponed through adverse signs from the gods could on the following or some future day be again brought forward for the auspices (repetere auspicia). If an error (vitium) occurred in the auspices, the augurs could, of their own accord or at the request of the senate, inform themsclves of the circumstances, and decree upon it. A consul could refuse to accept their decree while he remained in office, but on retiring he could be prosecuted.

AUGUST, originally Seatilis, as being the sixth month in the pre-Julian Roman year, received its present name from the Emperor Augustus. The preceding month, Quintilis, had been called July after the great Julius Cesar, and the senate thought to propitiate the emperor by conferring a similar honour upon him. August was selected, not as being the natal month of Augustus, but because in it his greatest good fortune had happened to him. In that month he had been admitted to the con- sulate, had thrice celebrated a triumph, had received the allegiance of the soldiers stationed on the Janiculum, had concluded the civil wars, and had subdued Egypt. As July contained thirty-one days, and August only thirty, it was thought necessary to add another day to the latter month, in order that Augustus might not be in any respect inferior to Julius.

AUGUSTA, the capital of the State of Maine, and seat of justice, is situated on the Kennebce River (in Kennebec county), 43 miles from its mouth, in lat. 44° 19’ N., long. 69° 50° W. The city lies mainly on the right bank of the Kennebec River, which is here crossed by a bridge 520 feet long. The business portion of the city was destroyed by fire in 1865, but has since been rebuilt. Its principal public buildings are the State house, State insane asylum, and United States’ arsenal. It has several banks, daily and weekly newspapers, and numerous churches. The popula- tion of Augusta, by the census of 1870, was 7808.

AUGUSTA, a city of Georgia, in the United States of America, the capital of the county of Richmond. It is situated in a beautiful plain, on the Savannah River, 231 miles from its mouth, and has extensive railway communi- cation. Like other American cities it is spacious and regular in its

plan, Greene Street, for example, being 168 feet in width, with a row of trees extending along each side. The principal buildings are the city hall, a masonic hall, an oddfellows' hall, the Richmond academy, the Georgia medical college, the opera-house, and an orphan asylum. Besides these, the city possesses an arsenal, water-works, a number of banks, newspaper offices, exten- five cotton factories and flour mills, several foundries, two tobacco factories, &c. Water-power is abundantly supplied from the river by the Augusta canal, which was con- structed in 1845. Augusta was an important place during the revolutionary war, and continued to flourish amazingly till the opening of the Georgia railway. A temporary decline then took place, owing to the change in the methods of traffic; but a new current of prosperity ciel set in, which still continues. Population in 1870,

386.

AUGUSTAN HISTORY is the title bestowed upon a collection of the biographies of the Roman emperors, from Hadrian to Carinus, written under Diocletian and Constan-

tine, and usually regarded as the composition of six authors,—/Hlius Spartianus, Julius Capitolinus, Ailius Lampridius, Vulcatius Gallicanus, Trebellius Pollio, and Flavius Vopiscus. Upon investigation, however, there appears good reason for reducing these writers to four. The distribution of the respective biographies among them, according to the arrangement of the MSS., is supported by no extraneous authority, and depends upon no intelligible principle. Without entering into detail, for which space fails us, it must suffice to state that up to and including the biography of Alexander Severus, the authorship of the various memoirs is interchanged among Spartianus, Lam- pridius, and Capitolinus, in a manner only explicable upon the hypothesis of a division of labour among these writers, or on that of their having selected their subjects entirely at random. The latter is contradicted by their own affirma- tions, and no trace of any mutual concert is discoverable, neither is there any perceptible difference of style. When, thercfore, we find the excerpts in the Palatine MS. assigning all the

biographies preceding that of Maximin to Spartianus alone, and remark that his preenomen and that of Lam- pridius are alike given as Alius, we cannot avoid suspecting with Casaubon and Salmasius that the full name was Alius Lampridius Spartianus, and that two authors have been manufactured out of one. We further find Spartianus observing, at the commencement of his life of Adlius Verus, that having written the lives of all the emperors who had borne the title of Augustus from Julius Cesar down to Hadrian, he purposes from that point to comprise the Czesars also. This excludes the idea of his having written without a plan, or in concert with any colleague. His biographies are regularly dedicated to Diocletian down to that of Pescennius Niger, after which, with one exception, probably due to the corruption of the MSS., they are inscribed to Constantine, as would naturally be the case with a work continued under this prince's reign after having been commenced under his predecessor's. We may also with probability ascribe to Spartianus the life of Avidius Cassius, attributed in the MSS. to Vulcatius Gallicanus, but whose author describes his undertaking in terms almost identical with those employed by Spartianus. No biography subsequent to that of Alexander Severus is attributed to Spartianus by any MS., and the next series, comprising the Maximins, the Gordians, and Maximus and Balbinus, is undoubtedly the production of Julius Capi- tolinus, who addresses his work to Constantine, and pro- fessedly proceeds, in some respects, upon a different plan from his predecessor. The work of Spartianus must have remained incomplete, and Capitolinus must have proposed to fill up the interval between him and Trebellius Pollio, who dedicates his life of Claudius Gothicus to Constantius Chlorus, and whom we know, from the testimony of Vopiscus, to have written the lives of the Philippi and their successors up to Claudius, some years before 303 a.p. In that year (and not 291 a.p., as supposed by Salmasius and Clinton) Vopiscus was solicited by the urban prefect, Junius Tiberianus, to undertake the life of Aurelian; this biography appears from internal evidence to have been published by 307 A.D., and the lives of Aurelian's successors down to Carinus were added before the death of Diocletian in 313. We may therefore reduce the Augustan historians from six to four, and assign their respective shares as follows : To Spartianus, the biographies from Julius Czsar to Alexander Severus, all anterior to Hadrian being lost ; to Capitolinus, those from Maximin to the younger Gordian ; to Trebellius Pollio, the lives of Valerian, Gallienus, the "Thirty Tyrants," and

Claudius Gothicus, those of the Philippi, the Decii, Gallus, Aimilianus, and part of Vale- rian's being lost ; to Vopiscus, the remainder, from Aurelian to Carinus. Some difficulty is created by the mention of

Capitolinus, the latest biographer in order of composition, by his predecessor Vopiscus, but the passage may be an interpolation, or may refer to some other work.

The importance of the Augustan history as a repertory of information is very considerable, but its literary pretensions are of the humblest order. The writers' standard was con- fessedly low. "My purpose," says Vopiscus, " has been to provide materials for more eloquent persons than myself." Considering the perverted taste of the age, it is perhaps fortunate that the task fell into the hands of no showy declaimer, who measured his success by his skill in making surface do duty for substance, but of homely, matter-of-fact scribes, whose sole concern was to record what they knew. Their narrative is most unmethodical and inartificial; their style is tame and plebeian ; their conception of biography is that of a collection of anecdotes ; they have no notion of arrangement, no measure of pro- portion, and no criterion of discrimination between the im- portant and the trivial ; they are equally destitute of critical and of historical insight, unable to sift the authorities on which they rely, and unsuspicious of the stupendous social revolution comprised within the period which they undertake to describe. Their value, consequently, depends very much on that of the sources to which they happen to have recourse for any given period of history, and on the fidelity of their adherence to these when valuable. Marius Maximus and Junius Cordus, to whose qualifications they themselves bear no favourable testimony, were their chief authorities for the earlier lives of the series. For the later they have been obliged to resort more largely to public records, and have thus preserved matter of the highest importance, rescuing from oblivion many imperial rescripts and senatorian decrees, reports of official proceedings and speeches on public occasions, and a number of interesting and characteristic letters from various emperors. Their incidental allusions sometimes cast vivid though undesigned light on the circumstances of the age, and they have made large contributions to our knowledge of imperial

jurisprud- ence in particular. Even their trivialities have their use; their endless anecdotes respecting the personal habits of the subjects of their biographies, if valueless to the historian, are most acceptable to the archzeologist, and not unimpor- tant to the economist and moralist. Their errors and deficiencies may in part be ascribed to the contemporary neglect of history as a branch of instruction. Education was in the hands of rhetoricians and grammarians; historians were read for their style, not for their matter, and since the days of Tacitus, none had arisen worth a schoolmaster's notice. We thus find Vopiscus acknowledg- ing that when he began to write the life of Aurelian, he was entirely misinformed respecting the latter's competitor Firmus, and implying that he would not have ventured on Aurelian himself if he had not had access to the MS. of the emperor's own diary in the Ulpian library. The writers' historical estimates are superficial and conventional, but report the verdict of public opinion with substantial accuracy. The only imputation on the integrity of any of them lies against Trebellius Pollio, who, addressing his work to a descendant of Claudius, the successor and pro- bably the assassin of Gallienus, has dwelt upon the latter

versatile sovereign's carelessness and extravagance without

acknowledgment of the elastic though fitful energy he so frequently displayed in defence of theempire. The caution of Vopiscus's references to Diocletian cannot be made 4 reproach to him.

No biographical particulars are recorded respecting any of these writers. From their acquaintance with Latin and Greek literature they must have been men of letters by profession, and very probably secretaries or librarians to persons of distinction. They appear particularly versed in

law. Spartianus's refereuce to himself as " Diocletian's own" seems to indicate that he was a domestic im the imperial household. They address their patrons with deference, acknowledging their own deficiencies, and seem painfully conscious of the profession of literature having fallen upon evil days.

The first edition of the Augustan History was printed at Milan in 1475, by Bonus Accursius, along with Suetonius. Being based upon the best MSS. it is superior to any of its successors until Casaubon's (1608). Casaubon manifested great critical ability in his notes, but for want of a good MS. left the restoration of the text to Salmasius (1620), whose notes are a most remarkable monument of erudition combined with acuteness in verbal criticism and general vigour of intellect. Little has since been done for the improvement of the text, which is still in a very unsatisfactory state. The most accurate edition is that by Jordan and Eyssenhardt (Berlin, 1863), grounded on a collation of the Bamberg MS. with the Palatine (now the Vatican) used by Salmasius. The most important separate dis- sertations on the Augustan historians are that on the sixth volume of Heine's Opuscula Philologica ; Brocks's essay on the first four of them (Kinigsberg, 1869); Dirksen's elucidation of their references to Roman jurisprudence (Leipsic, 1842); Peter's critical emenda- tions (Posen, 1868); Brunner's monograph on Vopiscus in the second volume of Biidinger's Untersuchungen zur Romischen Kaiser- geschichte, and J. Miiller's disquisition in the third (Leipsic, 1868-69). There is no English translation. (R. G.)

AUGUSTI, Joun CurisTIAN WILLIAM, a distinguished German theologian, was born at Eschenberga, near Gotha, in 1772. He was of Jewish descent, his grandfather having been a rabbi who had been converted to the Christian faith. His early education he received partly from Moller, pastor of Gierstidt, who introduced him to the study of Hebrew, and partly at the gymnasium at Gotha. He then proceeded to the university of Jena, and completed his studies there in 1793. In 1798 he obtained a post as privat-docent, or university lecturer on philosophy, and began to turn his attention chiefly to Oriental subjects. In 1800 he was made professor extraordinary of philo- sophy, and three years after was appointed to the chair of Oriental languages. In 1808 he received the degree of doctor of theology, and in 1812 accepted a call to the chair of theology at the recently renovated university of Breslau. During the troubled years 1813 and 1814 he acted as rector, and received great praise for his firm and judicious conduct. In 1819 he was transferred to the university of Bonn, and in 1828 he united with his professorship the office of director of the consistory. He died at Coblentz in 1841. Augusti had little sympathy with the modern philosophical interpretations of dogma, and although he took up a position

of free criticism with regard to the Biblical narratives, he yet held fast to the traditional faith. His works on theology (History of Dogma, 1805, and System of Dogmatics, 1809) are simple statements of fact, and do not attempt a speculative treatment of their subjects. In addition to several exegetical works, his most impor- tant writings are the Denkwiirdigkeiten aus der Christlichen Archdologie, 12 vols., 1817-31, a partially digested mass of materials, and the Handbuch der Christ. Archdologie, 3 vols., 1836-7, which gives the substance of the larger work in a more compact and systematic form.

AUGUSTINE (Avretius Aveusrinus), one of the four great fathers of the Latin Church, and admittedly the greatest of the four, more profound than Ambrose, his spiritual father, more original and systematic than Jerome, his contemporary and correspondent, and intellectually far more distinguished than Gregory the Great, the last of the series. The theological position and influence of Augustine may be said to be unrivalled. No single name has ever exercised such power over the Christian church, and no one mind ever made such an impression upon Christian thought.

Aurelius Augustinus was born at Tagaste (Tajelt), a town of Numidia, on the 13th of November 354 a.p. His father, Patricius, was a burgess of this town, and was still a

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pagan at the time of his son’s birth. His mother, Monica, was not only a Christian, but a woman of the most elevated, tender, and devoted piety, whose patient prayerfulness for both her husband and son (at length crowned with success in both cases), and whose affectionate and beautiful enthu- siasm, have passed into a touching type of womanly saintli- ness for all ages. She early instructed her son in the faith and love of Jesus Christ, and for a time her instruction seems to have impressed his youthful mind. Falling ill he wished to be baptised ; but when the danger was past, the rite was deferred, and, notwithstanding all his mother’s admonitions and prayers, he grew up without any profes- sion of Christian piety, or any devotion to Christian principles. Inheriting from his father a vehement and sensual disposition, he early gave way to the unbridled impulses of passion, and while still a mere youth, formed a connection, common enough at the

time, but at variance with the principles of Christian morality. As the result of the connection he became the father of a son, whom he named Adeodatus in a fit of pious emotion, and to whom he was passionately attached.

In the midst of all his youthful pleasures Augustine was an earnest student. His father, observing the early development of his talents, formed the ambition of training him to the brilliant and lucrative career of a rhetorician, and he seems to have spared no expense to equip him for this career. The youth studied not only at his native town, but at Madaura and Carthage, and especially devoted himself to the Latin poets—many traces of his love for which are to be found in his writings. His acquaintance with Greek literature was much more limited, and, indeed, it has been doubted whether he could use, in the original, either the Hebrew or Greek Scriptures… Apparently, he was in the habit of using translations of Plato (Confess., viii. 2), but, on the other hand, Greek words frequently occur in his writings correctly rendered and discriminated ; and he speaks in one of his epistles to Marcellinus (LIX. tom. ii. 294) of referring to the Greek Psalter and finding, in reference to certain difficulties, that it agreed with the Vulgate. Clausen, who has particularly investigated the point, sums up the evidence to the effect that Augustine was “fairly instructed in Greek grammar, and a subtle distinguisher of words,” but that beyond this his knowledge was insufficient for a thorough comprehension of Greek books, and especially for those in the Hellenistic dialect.

While a student at Carthage he was particularly attracted by the theatre, the spectacles at which were of unusual magnificence. To his enthusiastic and sensuous spirit they were irresistible, and the extent to which he seems to have yielded to the fascination is sufficient proof of his active alienation from Christianity at this period. The Christian church, as it has been said, “abhorred the pagan theatre. The idolatrous rites, the lascivious attitudes, the gladiatorial shows, which were its inseparable accompaniments, were equally opposed to the dogmatic monotheism, to the piety, and to the mercy of the gospel.” One of the most signi- ficant signs of a man having become a Christian was his habitual absence from the theatre. No one was more emphatic on this point afterwards than Augustine himself, and as the result of his own experience, he seems to have doubted, apart from the gross

immoralities of the pagan stage, whether the indulgence in fictitious joys and woes is a warrantable excitement (Confess., iii. 2).

Cicero's Hortensius, which he read in his nineteenth year, first awakened in Augustine's mind the spirit of specula-

1 "Augustinus extitit, ut alii, Ebrae ac Greece Jingue ignarus.'"' (Walch, Bibl. Patrist.,p. 352.) ''Imperitus non tantum Hebraicex sed etiam Greece lingue, ipsos fontes adire non potuit, sed solam fere trans- lationem Latinam explicare conatus est.''—(Rosenmiiller, Hist. Inter- pret., iii. 40.)

tion. He engaged restlessly in philosophical studies, and passed from one phase of thought to another, unable to find satisfaction in any. Manichism first enthralled him. Its doctrine of two principles, one of good and one of evil, seemed to answer to the wild confusion of his own heart, and the conflict of higher and lower impulses which raged within him. It seemed to solve the mysteries which per- plexed him in his own experience and in the world. He became a member of the sect, and entered into the class of auditors. His ambition was to be received among the number of the Hlect, and so get to the heart of what he believed to be their higher knowledge. But falling in with Faustus, a distinguished Manichzean bishop and disputant, and entering into discussion with him, he was greatly dis- appointed. The system lost its attraction for him; he gradually became disgusted, and abandoned it. But before this he had left Carthage, shocked with the licence of the students, and had betaken himself for a time to Rome in the pursuit of his profession. 'There he also soon became dis- satisfied, and accepted an invitation to proceed to Milan, where the people were in search of a teacher of rhetoric. He travelled thither at the public expense, and was welcomed by friends who already seem to have recognised his distinction (Confess., i. 16).

At Milan the conflict of his mind in search of truth still continued. He was now in his thirtieth year, and for eleven years he had been seeking for mental rest, unable to find it. " To-morrow," he said to himself, "I shall find it: it will appear manifestly, and I shall grasp it" (Con- Jess., vi. 18). But it still eluded his grasp, and he sunk back again into despondency. 'The way,

however, was being prepared for his conversion. Ambrose was bishop of Milan, and, although he had a weak voice, was noted for his eloquence. Augustine was attracted by his reputa- tion, and went to hear the famous Christian preacher in order, as he himself relates (Confess., v. 23), ‘to see whether his eloquence answered what was reported of it. I hung on his words attentively,” he adds, “but of the matter I was but an unconcerned and contemptuous hearer.” He confesses his delight so far: “ The bishop’s eloquence was more full of knowledge, yet in manner less pleasurable and soothing, than that of Faustus.” He wished an opportunity of conversation with him, but this was not easily found. Ambrose had no leisure for philosophic discussion. He was accessible to all who sought him, but never for a moment free from study or the cares of duty. “Augustine used to enter, as all persons might, without being announced ; but after staying for a while, afraid of interrupting him, he departed again.” He continued, however, to hear Ambrose preach, and gradually the gospel of divine truth and grace was received into his heart. First Plato and then St Paul opened his mind to higher thoughts, and at length certain words of the latter were driven home with irresistible force to his conscience. He was busy with his friend Alypius in studying the Pauline epistles. His struggle of mind became intolerable ; the thought of divine purity fighting in his heart with the love of the world and of the flesh. He burst into an incon- trollable flood of tears and rushed out into his garden, flinging himself under a fig tree that he might allow his tears to have full vent, and pour out his heart to God. Suddenly he seemed to hear a voice calling upon him to consult the divine oracle, “ ‘Take up and read, take up and read.” He left off weeping, rose up, and sought the volume where Alypius was sitting, and opening it read in silence the following passage: “ Not in rioting and drunkenness, not in chambering and wantonness, not in strife and envying. But put ye on the Lord Jesus Christ, and make not provision for the fiesh to fulfil the lusts thereof” (Rom. xiii. 13, 14). He adds, “I had neither desire nor need to

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read farther. As I finished the sentence, as though the light of peace had been poured into my heart, all the shadows of doubt dispersed. Thus hast Thou converted me to Thee, so as no longer to seek either for wife or other hope of the world, standing fast in that rule of faith in which Thou so many years before hadst revealed me to my mother ” (Confess., viii. 30).

After his conversion, which is supposed to have occurred in the summer of 386, Augustine gave up his profession as a teacher of rhetoric, and retired to a friend’s house in the country, in order to prepare himself for baptism. His religious opinions were still to some extent unformed, and even his habits by no means altogether such as his great change demanded. He mentions, for example, that during this time he broke himself off a habit of profane swearing, and in other ways sought to discipline his character and conduct for the reception of the sacred rite. He received baptism in Easter following, in his thirty-third year ; and along with him his son Adeodatus and his friend Alypius were admitted to the Christian church. Monica, his mother, had rejoined him, and at length rejoiced in the fulfilment of her prayers. Dying before his return to his native country, her last hours were gladdened by his Christian sympathy. She implored him to lay her body anywhere, but wherever he might be to remember her “at the altar of the Lord,” a devout duty which he invites others to share with him, so that her last request may, “through the prayers of many,” receive 2 more abundant fulfilment.

Augustine went back to Rome for a short period and then returned to his native city, where he took up his abode in retirement, forming, with some friends who joined him in devotion, a small religious community, which looked to him as its head. They had all things in common, as in the early church, and fasting and prayer, Scripture reading and almsgiving, formed their regular occupations. Their mode of life was not formally monastic according to any special rule, but the experience of this time of seclusion was, no doubt, the basis of that monastic system which Augus- tine afterwards sketched, and which derived from him its name. Solitary monasticism had sprang up in the Egyptian deserts before this. The life of St Anthony by Athanasius had widely diffused the fervour for religious solitariness,, and greatly touched Augustine at this period of his pro- fession. It did not remain for him, therefore, to originate the monastic idea ; but the association of monks in com- munities under a definite order and head received a special impulse both from Ambrose and his illustrious convert. As may be imagined, the fame of such a convert in such a position soon spread, and invitations to a more active ecclesiastical life came to him from many quarters. He shrank from the responsibility, but his destiny was not to be avoided. After three years spent in retirement he took a journey to Hippo, to see a Christian friend, who desired to converse with him as to his design of quitting the world and devoting himself to a religious life. He was the less reluctant to make this journey, because there being already a bishop at Hippo he hoped to escape all solicitation. But although the Christian community there had a bishop, they wanted a presbyter; and Augustine being present at the meeting called to choose a presbyter, the people unani- mously chose him. He burst into tears, and would fain have escaped ; but the church could not spare his services. He was ordained to the presbyterate, and in a few years afterwards he was made coadjutor to the bishop, and finally became sole bishop of the see.

Henceforth Augustine’s life is filled up with his ecclesias- tical labours, and is more marked by the series of his numerous writings and the great controversies in which they engaged him than by anything else. Alrcady he had distinguished himself as anauthor. He had written several

philosophical treatises ; he had combated the scepticism of the New Academy (Contra Academicos libri tres, 386 A.D.); he had treated of the " Blessed Life" (De vita beata, 386) and of the " Immortality of the Soul" (De Immortalitate Anime, 387); he had defended the church against the Manichzeans, whose doctrines he had formerly professed. 'When I was at Rome," he says (/etract., i. 7), " after my baptism, and could not hear in silence the vaunting of the Manichzeans over true Christians, to whom they are not to be compared, I wrote two books, one on The Morals of the Catholic Church, and the other on The Morals of the Mani- cheeans." These tracts or pamphlets, for they are little more, were written in the year 388, about two years after his conversion. Later, in 395, and again in 400, he pursued the controversy with the Manichzans, making an elaborate reply, in the latter year, to his old associate and friend Faustus. The reply was provoked by an attack made by Faustus on the Catholic faith, which the '" brethren" invited Augustine to answer. 'This he did characteristically and energetically by giving in succession "the opinions of Faustus, as if stated by himself," and his own in response. Tt was natural that the Manichean heresy, which had so long enslaved his own mind, should have first exercised Augustine's great powers as a theological thinker and disputant. He was able from his own experience to give force to his arguments for the unity of creation and of spiritual life, and to strengthen the mind of the Christian church in its last struggle with that dualistic spirit which had animated and moulded in succession so many forms of thought at variance with Christianity.

But the time was one of almost universal ecclesiastical and intellectual excitement; and so powerfu) a mental activity as his was naturally drawn forth in all directions. Following his writings against the Manichzeans come those against the Donatists. This controversy was one which strongly interested him, involving as it did the whole question of the constitution of the church and the idea of catholic order, to which the circumstances of the age gave special prominence. The Donatist schism sprang out of the Diocletian persecutions in the beginning of the century. A party in the Church of Carthage, fired with fanatical zeal on behalf of those who had distinguished themselves by resistance to the imperial mandates and courted martyrdom, resented deeply the appointment of a bishop of moderate opinions, whose consecration had been per- formed, they alleged, by a

traditor. They set up, in con- sequence, a bishop of their own, of the name of Majorinus, succeeded in 315 by Donatus. ‘The party made great pre- tensions to purity of discipline, and rapidly rose in popular favour, notwithstanding a decision given against them both by the bishop of Rome and by the Emperor Con- tantine, to whom they personally appealed. Augustine was strongly moved by the lawlessness of the party, and launched forth a series of writings against them, the most important of which survive, though some are lost. Amongst these are Seven Books on Baptism, and a lengthened answer, in three books, to Petilian, bishop of Cirta, who was the most eminent theologian amongst the Donatist divines. At a somewhat later period, about 417, he wrote a treatise concerning the correction of the Donatists (De Correctvone Donatistarum), ‘for the sake of those,” he says in his Ketractations, ii. c. 48, “ who were not willing that the Donatists should be subjected to the correction of the imperial laws.” In these writings, while vigorously maintaining the validity of the Catholic Church as it then stood in the Roman world, and the necessity for moderation in the exercise of church discipline, Augustine yet gave currency, in his zeal against the Donatists, to certain maxims as to the duty of the civil power to contro] schism, which were of evil omen, and

have been productive of much disaster in the history of Christianity.

The third controversy in which Augustine engaged was the most important, and the most intimately associated with his distinctive greatness as a theologian. As may be supposed, from the conflicts through which he had passed, the bishop of Hippo was intensely interested in what may be called the anthropological aspects of the great Christian idea of redemption. He had himself been brought out of darkness into ‘“ marvellous light,” only by entering into the depths of his own soul, and finding, after many struggles, that there was no power but divine grace, as revealed in the life and death of the Son of God, which could bring rest to human weariness, or pardon and peace for human guilt. He had found human nature in his own case too weak and sinful to find any good for itself. In God alone he had found good. This deep sense of human sinfulness coloured all his theology, and gave to it at once its depth —its profound and sympathetic adaptation to all who

feel the reality of sin—and that tinge of darkness and exaggera- tion which as surely have repelled others. When the expres- sion Augustinianism is used, it points especially to those opinions of the great teacher which were evoked in the Pelagian controversy, to which he devoted the most mature and powerful period of his life. His opponents in this controversy were Pelagius, from whom it derives its name, and Ceelestius and Julianus, pupils of the former. Pela- gius was a British monk. Augustine calls him Brito ; and Jerome points to his Scottish descent, in such terms, however, as to leave it uncertain whether he was a native of Scotland or Ireland (habet progeniem Scotice gentis de Britannorum vicinia). He was a man of blameless char- acter, devoted to the reformation of society, full of enthu- siasm, and that confidence in the natural impulses of humanity which often accompanies philanthropic enthu- siasm. Travelling to Rome about the beginning of the 5th century, he took up his abode for a time there, and soon made himself conspicuous by his activity and opinions. His pupil Ccelestius carried out the views of his master with a more outspoken logic, and was at length arraigned before the bishop of Carthage for the following, amongst other, heretical opinions :—(1.) That Adam's sin was purely personal, and affected none but himself; (2.) That each man, consequently, is born with powers as incorrupt as those of Adam, and only falls into sin under the force of temptation and evil example ; (3.) That children who die in infancy, being untainted by sin, are saved without baptism. Views such as these were obviously in conflict with the whole course of Augustine's experience, as well as with his interpretation of the catholic doctrine of the church. And when his attention was drawn to them by the trial and excommunication of Ccelestius, he undertook their refutation, first of all, in three books on Forgiveness of Sins and Baptism, addressed to his friend Marcellinus, in which he vindicated the necessity of the baptism of infants because of original sin and the grace of God by which we are justified (Retract., ii. c. 23). This was in 412. In the same year he addressed a further treatise to the same person, " My beloved son Marcellinus," on Zhe Spurit and the Letter. Three years later he composed two further treatises on Wature and Grace, and the relation of the Human to the Divine Righteousness. 'The controversy was continued during many years in no fewer than fifteen treatises. Upon no subject did Augustine bestow more of his intellectual strength, and in relation to no other have his views so deeply and permanently affected the course of Christian thought. Even those who most

usually agree with his theological stand-point will hardly deny that, while he did much in these writings to vindicate divine truth and to expound the true relations of the divine and human,

he also, here as elsewhere, was hurried into extreme ex- pressions as to the absoluteness of divine grace and the extent of human corruption. Like his great disciple in a later age—Luther—Augustine was prone to emphasise the side of truth which he had most realised in his own experience, and, in contradistinction to the Pelagian exaltation of human nature, to depreciate its capabilities beyond measure. There are few thoughtful minds who would not concede the deeper truthfulness of Augustine's spiritual and theological analysis, in comparison with that of his opponent, as well as its greater consistency with Scripture ; but there are also few who would now be disposed to identify themselves with the dogmatism of the orthodox bishop any more than with the dogmatism of the heretical monk. And on one particular point, which more or less runs through all the controversy—the salvation of infants—the Christian consciousness, in its later and higher growth, may be said to have pronounced itself de- cisively on the side of the monk rather than of the bishop.

In addition to these controversial writings, which mark the great epochs of Augustine's life and ecclesiastical activity after his settlement as a bishop at Hippo, he was the author of other works, some of them better known and even more important. His great work, the most elaborate, and in some respects the most significant, that came from his pen, is The City of God. It is designed as a great apologetic treatise in vindication of Christianity and the Christian church,—the latter conceived as rising in the form of a new civic order on the crumbling ruins of the Roman empire,—but it is also, perhaps, the earliest contribution to the philosophy of history, as it is a repertory throughout of his cherished theological opinions. This work and his Con- Jessions are, probably, those by which he is best known, the one as the highest expression of his thought, and the other as the best monument of his living piety and Christian experience. Zhe City of God was begun in 413, and continued to be issued in its several portions for a period of thirteen years, or till 426. The Confessions were written shortly after he

became a bishop, about 397, and give a vivid sketch of his early career. To the devout utterances and aspirations of a great soul they add the charm of personal disclosure, and have never ceased to excite admiration in all spirits of kindred piety. His systematic treatise on The Trinity, which extends to fifteen books, and occupied him for nearly thirty years, must not be passed over. “I began,” he says (Retract., ii. 15), “as a very young man, and have published in my old age some books concerning the Trinity.” This important dogmatic work, unlike most of his dogmatic writings, was not provoked by any special controversial emergency, but grew up silently during this long period in the author’s mind. This has given it something more of completeness and organic arrangement than is usual with him, if it has also led him into the prolonged discussion of various analogies, more curious than apt in their bearing on the doctrine which he expounds. The exegetical writings of Augustine,—his lengthened Commentary on St John and on the Sermon on the Mount, &c.,—and then his Letters, remain to be mentioned. The former have a value from his insight into the deeper spiritual meanings of Scrip- ture, but hardly for their exegetical characteristics. The latter are full of interest in reference to many points in the ecclesiastical history of the time, and his relation to contemporary theologians like Jerome. They have neither the liveliness nor variety of interest, however, which belong to the letters of Jerome himself, The closing years of the great bishop were full of sorrow. The Vandals, who had been gradually enclosing the Roman empire, appeared before the gates of Hippo, and laid siege to it. Augustine was ill with his last illness, and could

only pray for his fellow-citizens. He passed away during

the progress of the siege, on the 28th of August 430, at —

the age of seventy-five, and -was spared the indignity of seeing the city in the hands of the enemy.

The character of Augustine, both as a man and a theologian, has been briefly indicated in the course of our sketch. Little remains to be added

without entering into discussions too extended for our space. None can deny the greatness of Augustine's soul—his enthusiasm, his unceasing search after truth, his affectionateness, his ardour, his self-devotion. And even those who may doubt the soundness or value of some of his dogmatic conclusions, cannot hesitate to acknowledge the depth of his spiritual convictions, and the strength, solidity, and penetration with which he handled the most difficult questions, and wrought all the elements of his experience and of his profound Scriptural knowledge into a great system of Christian thought.

The best complete edition of Augustine's writings is that of the Benedictines, in 11 vols. folio, published at Paris, 1679-1800, and reprinted in 1836-38 in 22 half-volumes. Tillemont, in his Heclesi- astical History, has devoted a quarto volume to his life and writ- ings. Two extensive monographs have appeared on him; the one by Kloth, a Roman Catholic (Aachen, 1840), and the other by Bindemann, a Protestant (Berlin, 1844, 1855). See also Ritter's Hist. of Christian Philosophy, vol. i.; Bohringer's Hist. of the Church ; Dr P. Schaff's St Augustine (Berlin, New York, and Lon- don, 1854); Nourrisson, La Philosophie de S. Augustine (Paris, 1866); A. Dorner, Augustinus (Berlin, 1872) ; Neander's Church History; Mozley's Augustinian Doctrine of Predestination, 1855 ; Jameson's Sacred and Legendary Art. J.

AUGUSTINE, or Austin, St, the first archbishop of Canterbury, was originally a monk in the Benedictine convent of St Andrew at Rome, and was educated under the famous Gregory, afterwards Pope Gregory J., by whom he was sent to Britain with forty monks of the same order, to carry out the favourite project of converting the

English to Christianity. The missionaries set out with —

much reluctance, for the journey was long and perilous, and on the way they endeavoured to persuade the Pope to allow them to return. His orders, however, were peremp- tory ; they proceeded, therefore, on their journey, and at last landed, some time in the year 596, on the isle of Thanet. Having sent interpreters to explain their mission to King Ethelbert, whose queen, Bertha, was a Chris- tian, they received from him permission to preach and to make converts. He treated them with great favour, held a public

conference with them, and assigned them a re sidence at Durovernum, now Canterbury. His own conver- sion to the Christian faith, which took place shortly after- wards, had a powerful influence with his subjects, who joined the new church in great numbers. Augustine, seeing the success of his labours, crossed to France, and received consecration at Arles. He then despatched messengers to the Pope to inform him of what had been done, and to pro- pose for his consideration certain practical difficulties that had arisen. They brought back the palliwm, with which Augustine was consecrated as first archbishop of Canterbury, and certain vestments and utensils for the new churches. Gregory also gave most prudent counsel for dealing with the new converts, strongly advising the archbishop to make the change of faith, so far as ceremonial went, as gradual as possible, and not on any account to wound the feelings of the people by destroying their temples, but rather to con- secrate them afresh, and use them for Christian worship. Augustine passed the remainder of his life principally at Canterbury, where he died, probably in 607, on the 26th May. See Lives of the English Saints, No. III. 1847, and Mrs Jameson’s Legends of the Monastic Orders.

AUGUSTINTANS, a monastic order of the Roman Catholic Church, claiming to have received its rule from St Augustine. See ABBEY and Monasticism.

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Pe onal his ry of Avastus.

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AU G—

AUGUSTOVO, a city in Russian Poland, in the govern- ment of Suvalki, situated on.the river Netta, near a lake, which abounds in fish. It was founded in 1557 by Sigismund II. (Augustus), and is laid out in a very regular manner, with a large market-place. It carries on a large trade in cattle and horses, and manufactures linen and huckaback. Population, 9383.

AUGUSTUS anp tue Aucustan AcE. The name of Augustus was the title of honour given by the Romans to the emperor Caius Julius Cesar Octavianus, or, as he was originally designated, Caius Octavius. This title was intended to be hereditary in his family, but all the succeeding Czesars or emperors of Rome continued to adopt it, long after they had ceased to be connected with the first Augustus by blood. The era of Augustus formed an illustrious epoch in Roman history, and was distinguished for its splendid attainments in arts and arms, and more especially in literature. The Romans in later times looked back to the age of Augustus with great complacency, as the most prosperous and the most distinguished in their annals. The name of the "Augustan Age" has been specially applied to it in modern times, and the same title has been given, with more or less justice, to certain epochs in modern history as the highest compliment to their glory. The reign of Louis XIV. is called the Augustan age of France; the reign of Anne, the Augustan age of England.

Caius Octavius was the son of a noble Roman of the same name, of the plebeian order. The father had married Atia, the daughter of Julia, sister to the great C. Julius Cxsar, who was accordingly great-uncle to the young Octavius. Czsar, the dictator, having no son of his own, took an interest in this youth, caused him to be enrolled among the Patricians, and bred him with a view to the highest honours of the republic. Already, in his eighteenth year, he had chosen him for his " master of the horse," but this was a merely nominal distinction. The young man was sent to carry on his education at the camp at Apollonia in Illyricum, and there, at the age of nineteen, he heard of his great kinsman's assassination (44 B.c.) He had already become a favourite with the soldiers, who offered to escort him to Rome, and follow hisfortunes, But this he declined, and crossed over alone to Italy. On landing he learnt that Cesar had made him his heir and adopted him into the Julian gens, whereby he acquired the designation of C. Julius Cesar Octavianus. The inheritance was a perilous one; his mother and

others would have dissuaded him from accepting it, but he, confident in his abilities, declared at once that he would undertake its obligations, and discharge the sums bequeathed by the dictator to the Roman people. M. Antonius had possessed himself of Ceesar's papers and effects, and made light of his young nephew's pretensions. The liberators paid him little regard, and dispersed to their respective provinces. Cicero, much charmed at the attitude of Antonius, hoped to make use of him, and flattered him to the utmost, with the expectation, however, of getting nd of him as soon as he had served his purpose. Octavianus conducted himself with consummate adroitness, making use of all competitors for power, but assisting none. Con- siderable forces attached themselves to him. The senate, when it armed the consuls against Antonius, called upon him for assistance ; and he took part in the campaign in which Antonius was defeated at Mutina, but both the con- suls, Hirtius and Pansa, slain. The soldiers of Octavianus demanded the consulship for him, and the senate, though now much alarmed, could not prevent his election. He now effected a junction with Antonius, who quickly over- threw the power of the republican party in their stronghold, the Cisalpine provinces, with the death of Decimus Brutus, the ablest of the liberators. Thereupon Octavianus and Antonius, taking Lepidus into union with them, met on

the river Rhenus near Bononia, and proclaimed themselves a triumvirate for the reconstitution of the commonwealth, They divided the western provinces among them, the east being held for the republic by M. Brutus and Cassius. They drew up a list of proscribed citizens, entered Rome together, and caused the assassination of three hundred senators and two thousand knights. They further con- fiscated the territories of many cities throughout Italy, and divided them among their soldiers. Cicero was murdered at the demand of Antonius. The remnant of the republican party took refuge either with Brutus and Cassius in the East, or with Sextus Pompeius, who had made himself master of the seas.

Octavianus and Antonius crossed the Adriatic in 42 B.c. to reduce the last defenders of the republic. Brutus and Cassius were defeated, and fell at the battle of Philippi. War soon broke out between the victors, the chief incident

of which was the siege and capture by famine of Perusia, and the alleged sacrifice of three hundred of its defenders by the young Cesar at the altar of his uncle. But peace was again made between them. Antonius married Octavia, his rival's sister, and took for himself the eastern half of the empire, leaving the west to Cesar. Lepidus was reduced to the single province of Africa. Meanwhile Sextus Pompeius made himself formidable by cutting off the supplies of grain from Rome. The triumvirs were obliged to concede to him the islands in the western Mediterranean. But Octavianus could not allow the capital to be kept in alarm for its daily sustenance. He picked a quarrel with Sextus, and when his colleagues failed to support him, undertook to attack him alone. Antonius, indeed, came at last to his aid, in return for military assistance in the campaign he meditated in the East. But Octavianus was well served by the commander of his fleet, M. Vipsanius Agrippa. Sextus was completely routed, and driven into Asia, where he perished soon afterwards. Lepidus was an object of contempt to all parties, and Octavianus and Antonius remained to fight for supreme power.

The alliance of Antonius with Cleopatra, queen of Egypt, alienated the Romans from him. They now gladly accepted the heir of Cesar as the true successor of the most illustrious of their heroes. It was felt almost universally that the empire required a single head, and that repose could only be assured by the sovereignty of the chief of its armies. The battle of Actium, followed by the death of Antonius, 31 B.c., raised the victor to universal empire. Nevertheless, Octavianus did not hasten to assume his position, He first regulated the affairs of Egypt, which he annexed to the Roman dominions, then lingered for a time in Greece, and entered upon a fifth consulship at Samos, 29 z.c. On his return to Rome he distributed the vast sums he had accumulated among the people and the soldiers, while he soothed the pride of the nobles by maintaining unchanged the outward show of republican government, Of his personal history from this period there remains little to be said. He continued to reside almost constantly at Rome and in the neighbourhood, making one expedition into Spain, 27 B.c., and a journey through Greece in 21, on which occasion he advanced into Syria, and received back the standards taken by the Parthians from Crassus. In 16 B.c. he went to Gaul to regulate the affairs of that province, an expedition which he repeated, 9 B.c. But from thenceforth he intrusted the defence of the position to his lieutenants, and more especially to the young princes of

his own family. The empire continued to enjoy profound internal tranquillity. More than one plot was formed against the head of the state by some of the discontented nobility, but these were discovered and disconcerted; and when it was evident that they met with no favour from the people generally, he

His policy and go- vernment.

Imperator,

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could afford to treat them with a signal clemency, which seems to have secured him from any further attempts. The serenity and placability which he displayed in his latter years forms a marked contrast to his jealousy and ferocity at an earlier period ; and the character of the Emperor Augustus Czesar has been a problem to historians in consequence. ‘The life of the emperor was prolonged to the year 14 a.v. He died at Nola in his seventy-fifth year, after holding supremie power in the state for nearly half a century. ‘

During the years which had intervened between his accepting the inheritance of Cesar, and his attaming to Ceesar’s undivided sovereignty, the young aspirant had been meditating how to secure the retention of his power. At first, excited by fears for his own personal safety, and urged by the examples of party leaders around him, and of others who had gone before him, he plunged into a career of wholesale bloodshed, and cut off without scruple every public man from whose principles or whose passions he might have cause of apprehension. A large porportion, perhaps, of the senators and nobles had perished in the proscriptions and bloody wars of the triumvirate. Still it could not be expected that the germsof republican sentiment would ever be wholly eradicated. Thesense of patriotism and the sense of interest would not fail to raise up enemies to the sovereign ruler of the Roman commonwealth. The conqueror’s first object was to protect himself by force of arms, his next to soothe the passions of the class from whose resentment he had most cause of fear, and after that to raise up another class in direct sympathy with himself to balance the power which the first must necessarily retain in a well-ordered government. It was to the

attainment of these three objects that Octavianus directed his organisa- tion of the commonwealth.

The powers of the imperator or commander of the Roman army ceased on his return to the city. He then became once more a plain citizen. If war again arose he must seek his reappointment to command with the usual forms. Cesar had not trusted his countrymen so far. He had claimed from them the title of imperator in per- petuity. With this title prefixed to his name, he continued to be still the commander of the legions, whether in the city or in the provinces. With this power his successor dared not dispense. On his arrival at Rome from the East he at once required the senate to accord it to him, as to his uncle before him; but he pretended only to ask it for a limited period of five years. At the expiration of that term, however, he assumed it again and again, though each time for ten years only, but never actually relin- quished it to the end of his career. He thus received authority to command the whole force of the state in chief, and the officers who acted under him became simply his lieutenants. If they gained victories, the honours of the triumph were reserved for the imperator “under whose auspices” they were reputed to have served. It followed that all the provinces on the frontiers, or in which armies were maintained, were placed under the emperor’s direct authority, while it was only the central and peaceful por- tions of the empire that were handed over to the govern- ment of the senate. The imperial provinces were adminis- tered by the legati Ceesaris, the senatorial by proconsuls.

The person of the emperor was thus secured as far as the power of the sword could secure it. But he was anxious that the source of this power should not be too apparent. The second Cesar wished to maintain the appearance at least of government by the constitutional powers of the republic. The senate had once been practically the ruling power, as far as it was not actually controlled by the masters of the legions. He would not degrade it in its own estimation, or in the estimation of the people, any

further, at least, than might be necessary for his main object. He caused himself to be appointed censor, not for one but for five years, in order to give him full time to revise the list of senators, to supply the fearful gaps in

the ranks of the old nobility, and to expel such members, and many they were, who seemed unworthy, from their foreign ex- traction, their low birth, their scanty means, or their bad character, to have a place in that august assembly. The irregularities of the epoch which he hoped now to close had filled its benches with personages who degraded the order in the eyes of genuine citizens. The nobles and good citizens generally hailed this revision with deep satisfaction. It accorded with the national taste as well as with historical traditions. From the individual resentments it provoked, it was an act of some personal danger to the censor; but the danger was more than repaid by the popularity attend- ing upon it, which was enhanced to the utmost by the liberality with which provision was made for raising some of the poor but honourable members of the order to the standard of property now to be required of them.

The emperor placed himself at the head of this reconsti- Pri tuted body, by assuming the office and title of Princeps Se Senatus. The office was indeed little more than nominal ; it gave the right of proposing measures and of speaking first in the highest legislative assembly of the state, and having been borne in earlier times by some of the most distinguished of Roman patriots, it carried with it the re- spect and affection of the people. The titular precedence it gave was all the more valuable, inasmuch as it might be conceded without a blush by the sturdiest republican in the senate. But it was the consul who possessed practically the chief authority in the assembly. Octavianus had been already five times consul, and he shrank from seizing in perpetuity an office which, according to Roman ideas, differed in nothing from royalty, except that it was elective, and that it was limited to the tenure of a single year. Yet he could hardly afford to yield it to the citizen whom the people might at any time elect to thwart or to rival him. What should he do? He took what was certainly a bold step. It was a manifest innovation upon the forms of the free state when he required from the citizens the As perpetual “ potestas,” or power of the consulship, at the 4! same moment that he resigned the office itself, and suffered consuls to be annually elected to sit, one on each side of him, in the senate. The potestas which was thus conceded to him rendered him the head of the state, both in its legis- lative and executive departments. When he quitted the city he carried with him into the provinces a proconsular authority, and became to all intents and purposes king for life of the Romans and of their subjects.

Even in the senatorial provinces he was now recognised as supreme; and thus it was that in him were centred all the great political functions which had been hitherto divided by the great assembly of the Roman magnates.

But the emperor did not limit his views to becoming the chief of the nobles. It was the part of a wary statesman to associate himself not less intimately with the opposite faction, which, under the name of the plebeians, had aimed at securing co-ordinate power with the patricians. The original meaning of these designations had indeed long been lost. The plebeians could boast many families as eminent both for honours and possessions as their haughty rivals. Step by step they had won an equal share with them in political privileges. But the class which still bore the title of plebeian was much more

| widely extended, and embraced the great mass of the

knights and men of business in the city, and also of the citizens settled throughout the provinces. This large class had for more than a century contended with the nobles for the perquisites of office, and their mutual rivalry had

Chief pontiff,

The title Augustus,

Religious sentiment of the age.

AUGUSTUS

armed Sulla against Marius and Cesar against Pompeius. The heir of Ceesar inherited the favour of the plebeians, and was bound to requite it by distinguished patronage. The plebeians were still the electors to the tribunate, and still regarded the tribunes as their protectors against the encroachments of the patricians represented by the senate. The tribunes had proved themselves most useful allies to Cesar, and might yet again array themselves in support of the faithful inheritor of his principles. The emperor pro- posed to balance the consular potestas by assuming at the same time a tribunician potestas also. He thus endowed himself with the authority of the

tribune for life, and assured the commons of the city and empire that he could at any time exercise the formidable veto upon the proceed- ings of the consuls which had served them so well, even down to recent times. Thus did he become emperor indeed,—the sovereign both of the nobles and the people in the city, as well as the commander of the army in the field and in the provinces.

There remained yet another sovereign authority in the state, namely, that which the chief pontiff exercised over the affairs of religion. However much the religious sentiment had been weakened throughout the Roman world, there was yet enough superstition left among the citizens to confer great and sometimes overwhelming influence upon the legitimate interpreter of divine things to the nation. The senate had exercised this power with great effect, as long as the appointment to the chief ponti- ficate rested with the patrician curia. Of late years, however, this important dignity had been thrown open to the commons also. Octavianus was well pleased to accept it on the nomination of the whole people combined. He allowed, indeed, his former colleague Lepidus to retain it unmolested during his lifetime, but upon his death he assumed himself the exalted position which he might hesitate to intrust to any other. With this last addition to his prerogatives the emperor might well be content. The name of king he had from the first utterly repudiated. The office of dictator approached too near to that of a king to be acceptable to a ruler, who studied to confine himself within the limits of the republican constitution. Yet there still lacked some general appellative which might reflect in a single word the full dignity and power resulting from the combination of so many honours and prerogatives. The emperor proposed at first, it is said, to assume the name of Komulus ; but Romulus had been a king; and further, Romulus had been destroyed, according to the tradition, by the senate, just as Caesar had been in later times. Such associations were ominous. At last he fixed upon the epithet Augustus, a name which no man had borne before, and which, on the contrary, had been applied to things the most noble, most venerable, and most sacred. The rites of the gods were called august ; their temples were august. The word itself was derived from the holy auguries ; it was connected in meaning with the abstract term authority, and with all that increases and flourishes upon earth. The use of this glorious title could not fail to smooth the way to the general acceptance of the divine character of the mortal who was deemed worthy to

bear it. The senate had just decreed the divinity of the defunct Cesar ; the courtiers were beginning now to insinuate that his successor, while yet alive, enjoyed an effluence from deity ; the poets were even suggesting that altars should be raised to him ; and in the provinces, among the subjects of the state at least, temples to his divinity were actually rising, and the cut of Augustus was beginning to assume a name, a ritual, and a priesthood.

Augustus, as we may now call him, viewed all this with secret satisfaction. It was one of his first objects, indeed to restore the outward show at least of reverence for divine

things, and re-establish the old Roman religion on its firm political basis, It was easy to rebuild, or cause to be rebuilt, the fallen or dilapidated temples of the national gods. The nobles paid their court to their master by seconding his efforts in this direction, The Pantheon, the temple of all the gods, if such was its original destination, remains still as a monument of his minister Agrippa's munificence ; but Virgil would assure us that not less than three hundred "grand" temples were erected throughout the city. Perhaps, indced, these were mostly the sacella or chapels of the Lares, which are placed at the corners of the streets. Augustus took the sentiment of the people at a favourable moment. They were thoroughly sickened by the miseries of the civil wars; they were ashamed of the crimes for which the whole nation were more or less responsible ; they were eager to rush into any scheme of expiation and reparation that should be offered to them, and leud their hands to the material work of restoring at least the outward semblance of penitence for sin, and thankfulness for the mercy vouchsafed them. There can be no doubt that the conscience of the nation was awakened to a sense of the divine retribution under which they had suffered, but which had been at last averted under the blessed influence of the ruler whom they had at last chosen. 'The Romans had not lost their belief in a divine Providence, which oppressed them with anxiety and terror, however little they connected it with a sense of moral duty. The spirit of materialistic philosophy had, however, been rife among them, and during the past century the anti- religious dogmas of Epicurus had sapped the belief of the educated and literary classes. The patrician youth of Rome had

been trained in the schools of Greece, and especially at Athens, or had been placed under the teaching of Greek instructors at home ; and of the three contending schools, the Stoics, the Epicureans, and the Academics, the second was that which had carried off far the greater number of disciples. The men of books or of speculative character might be generally Academics, and claim Cicero as their noblest leader; the men of imagination and deep religious fervour might follow, with Cato and Brutus, the teaching of the Stoics; but the practical men, the men of arts and arms and business, if they adhered to any school of thought at all, were almost all, like Ceesar himself and his associates generally, addicted to the easy precepts and still laxer morality of Epicurus. This philosophy was noted for its utter denial of Providence and, for all practical objects, of divinity altogether. None of these rival systems, whatever degrees of right sense and reason they might embrace respectively, could sanction any real belief in the still current mythology of the national worship, which was assailed and derided on all sides. Nevertheless, such was the pertinacious adherence of the Roman people to their ancient forms, especially where they had any connection with their national polity, that the outward ritual of their religion was still maintained, though a mere shadow of itsformer substance. Statesmen, indeed, had invented a formula for reconciling their actual unbelief with their outward profession. Varro had said, and the dictum was favourably accepted, that the ancient beliefs were to be upheld as a matter of public policy. Such, no doubt, was the principle on which Augustus, who was himself neither a believer nor a philosopher, but a politician only, proceeded, when he assumed the part of a restorer of the national religion. He touched, with great sagacity, a chord which vibrated to the heart of the people, who firmly believed that the destinies of the city were bound up with the due observance of the ancient rites, and statesmen looked on with decorous acquiescence at shows and cere- monies to which they attached no significance whatever. The world “ composes its countenance to the expression Ill. — 11

Literature of the age.

Virgil.

assumed by the king.” Such was the aphorism of the man of the world, and in this particular Augustus was a king indeed. The Romans rushed forward in the course he marked out for them. His word dictated the fashions of the day, not in sentiment only, but in many particulars of external conduct. He was anxious to restore the dignity of the Roman citizen, as one of the conquering race which ruled its subjects as much by the prestige of its character as by its arms, and he resented all relaxation from the strait-laced discipline of the ancients, even to the petty matters of their dress and deportment. He marked his sovereign displeasure at the degenerate Romans who indulged in the loose habiliments of Greece. ‘ Are these,” he exclaimed, in the language of Virgil, “ the rulers of the world, the nation of the gown?” And in order to keep up the high distinction of Roman citizenship at a period when provincials from all sides were crowding into it, he reversed, in this single instance, the policy of Ceesar, and was very sparing in granting admission to the Roman frauchise. He was, indeed, extremely careful in striking a balance between the tendency of the age to a general fusion of castes and privileges and the ancient spirit of exclusion, in which he thought the strength of the republic still really reposed. The policy of Augustus was one, on the whole, of cautious and moderate reaction. He made an effort to stay the process of disintegration, which he found so rife throughout the vital forces of the empire. The lawlessness of his own usurpation did indeed combine with the gross selfishness of his personal character to sap the moral principles of society, and render its ultimate dissolution inevitable ; but he made a vigorous effort to stem the tide, and succeeded in giving the Roman world a period of rest in the downward path which it was generally pursuing.

The character of the period, however, as an epoch of rest for reflection and self-control, was chiefly marked in the literature, which, more than anything else, has con- tributed to give it the name of the Augustan Age. The religious sentiment which has been described, resting as it did upon a deep sympathy with historical antiquity, coloured by a bold and vigorous imagination, is reflected in the poetry of Virgil, and more particularly in the spirit of his great epic, the Zneid. No doubt, both depth and tenderness of feeling may be traced even in the eclogues of the same master, however slight for the most part their subjects, and however imitative their treatment. The Georgics present us with more serious and dignified characteristics,

and though these pieces are directed mainly to the practical treatment of practical operations, they admit of high moral as well as religious colouring. They recall the Roman reader to the moral foundations of the national character, its honest simplicity, its love of nature, its devotion to labour, its conviction that industry is the appointed path to virtue and to honour. But this moral feeling is elevated by a sense of the divine within man and around him. The Roman husbandman, the breed of heroes, is never suffered to forget that there is a God and a Providence, or that the favour of the divine power has ae hap upon the industrious and the virtuous.

hat Etruria of old, and Rome in later times, waxed illustrious and mighty; thus that the city on the seven hills became the fairest object of creation." The Georgies are undoubtedly animated throughout with a religious sentiment, and bespeak the high religious purpose of their author. But in the Znerd this religious sentiment and purpose are both still more distinctly proclaimed to us. The great epic of Virgil, the national epic of the Roman

people, glorifies the divine Providence which founded Rome:

in the beginning, and carried her through all her triumphs to the consummation of her greatness in the era of Augustus.

AUGUSTUS

It begins with the divine Aineas, and it leads us on to the divine Caesar.

The greatness and the weakness of the hero of the poem equally tend to this one end, the illustra- tion of the Providence which has educed strength out of weakness, and overruled everything to the glory of the Roman people. The moral to be deduced from the story of Aineas is too plain for any Roman to mistake. The divinity which protects Rome is the Lord of heaven and earth and all that is therein. There is no God or Lord like unto Him. Blessed are the Romans who have this Lord for their God. The majesty of the Roman empire, now at the crowning summit of its progress, is the immediate efflux of this sovereign power, and the one is for ever bound up with the other. If such was the doctrine sung by Virgil, surely none could be more grateful to Augustus, the sovereign ruler of an empire so guided and protected.

The names of Virgil and Horace are familiarly united in He, every review of the age of Augustus; yet no two men can stand more in contrast one with the other in their per- sonal character, in the scope of their writings, and in the influences they respectively exercised upon their contem- poraries. Horace, as is well known, had been a republican in his youth; he had espoused the cause of Brutus and Cassius, and, while yet a student in the schools at Athens, had obtained a commission in their army. He fought in person in the battle of Philippi, and, as he tells us himself, threw away his shield in his rapid flight from the swords of the Cesarians. From that time he abjured the losing cause, and obtained, perhaps without seeking it, the advice of the minister Mecenas, by whom he was taken into favour and introduced to Augustus himself. However agreeable might be his temper and manners, it is not likely that the politic usurper would distinguish a mere upstart with admission to his society without at least tacitly exacting some return. The character of this poet's compositions, both in his lyrics and his satires and epistles, seems pretty clearly to betray the inspiration of the emperor and his astute associates. The most animated and imaginative of his pieces are almost invariably employed in sounding the praises of the Cesar and his family. When he descends from his highest flights of poetry, he finds congenial matter for his muse in delicate flattery of Maecenas and other magnates of the court. But it will be observed that he seldom, if ever, addresses the haughty nobles of Rome except in a strain of prudential advice, soothing their pride, but lowering their ambition, and directing them to seek contentment and happiness not in objects of public interest, but in the tranquil enjoyment of ease, which he dignifies with the name of philosophy. The poetry of Horace is full of pleasing sentiments, but it contains perhaps no single strain of generous and ennobling enthusiasm. Such feelings it was the policy of Augustus to discourage, and the policy of Augustus is faithfully represented in the utterances of his courtly flatterer. But there was another task imposed upon him, and it is to this that his satires and epistles are more commonly directed, namely, to put out of countenance the offensive self-assertion of the "new men" of the empire, the men whom the fortunes of the civil war had suddenly raised from their native obscurity, and enriched or ennobled, notwithstanding the barrenness of their origin and the vulgarity of their breeding. Augustus wanted, no doubt, to tame the aspiring spirits of his genuine nobles, but he shrank from driving them to desperation by swamping them with an inundation of base-

born inferiors, perhaps their own former clients and freed- men. It was part of Horace’s office, as a gentleman usher at court, to discountenance all such undue pretensions, and shut the door with consummate urbanity upon the most disagreeable or the most importunate of the courtiers. He

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possessed in perfection both the delicate irony and the graceful amenity which are essential to the performance of a task so critical. Doubtless Horace, in his own peculiar line, exercised as great an influence in Roman society as Virgil. The laughing philosopher was no less a power among his contemporaries than the religious devotee. Each of them, in his several way, performed an immense service to the government under which he enjoyed favour and reward ; nor can we deny that, considering how necessary the government of Augustus was to the bleeding common- wealth, each in bis several way did an invaluable service to his country.

Nor, though we may admit that irony and persiflage were Horace’s forte, should we do him justice if we supposed that he had no feelings of genuine tenderness and earnest- ness. Even Horace had his instinctive sense of religious duty, which peeps out occasionally from under the robe of his pretended philosophy, and shows that he recognised a principle of duty, and felt ill at ease in the consciousness of his own deficiencies. We may recognise in many of his later compositions his growing dissatisfaction with the worldly views of life which he had been wont to recom- mend, aud some efforts at the attainment of higher sources of satisfaction. Both Virgil and Horace were cut off in middle life, but both, we imagine, had already entered into the cloud, and were painfully conscious that the common- wealth they loved had fallen into its decline, and that their own attempts to invigorate or to soothe it were little likely to prove availing. If Virgil deserves our admiration, Horace too is not unworthy of our sympathy ; and it is well that we can part in such good temper from the two most perfect artists of the Roman, or perhaps of the ancient, world altogether.

Of Ovid, the third great poet of the Augustan Age, we can hardly think or speak so favourably. Ovid, too, was a genuine representative of his epoch, which occupied, however, the latter part of the career of Augustns, when the character of the age had begun to show manifest signs of deterioration. In

the character of this poet, which may be abundantly gathered from his numerous works, there appears no religious feeling and no moral purpose. Never- theless, his writings reflect, in some important particulars, the social tendencies of the epoch, and afford valuable illustrations of the genius of the Augustan Age. To the historian and archeologist the Wasti presents a store of interesting information ; but in this poetical account of the Roman calendar the writer undoubtedly proposed to meet a social want of the time. The work is in fact a rationale of the divine offices, and expounds to the nation the “seasons and the reasons (tempora cum causis)” of the religious services which the emperor recommended to their pious attention. Minute and manifold ag were the memorials of their past history, or of their accredited mythology, which the cult of the Roman temples enshrined, we can imagine how much they must have faded away from the recollection of the people generally during the century of confusion from which they had just emerged, and how even the priests and flamens of the national divinities must have stood in need of a learned interpreter of the rites which they mechanically performed. The Fasti is remarkable as a speaking witness to the fact of the ceremonial revival of the Augustan Age.

The generally immoral tendency of a great part of Ovid’s poetry is well known ;- and it speaks all the worse for the character of the age that the writer could declare, and pro- bably not without justice, that his personal conduct was purer than the sentiments with which he sought to please the public. The deterioration of sentiment between Virgil and Ovid is marked in the tone with which they speak in the higher flights of their respective poetry. The writer

of the Zneid fully maintains the pure standard of thought and expression which he received as a tradition from Homer, and which had been respected by the epic poets gencrally; but Ovid, in his Metamorphoses, an heroic, if not an epic, composition, allows himself to descend far below this exalted level, and is not only licentious in his language, but seems to choose, and of set purpose, the most licen- tious of the stories which his varied subject offers. Again, though Horace adopts the lighter tone and looser phraseology of the lyric poets of Greece, there is at least nothing meretricious in his

style; he was not a corrupter of youth himself, nor were the models such which he proposed for adaptation. But Ovid descends to the imitation of a more wanton kind of poetry. He, too, seeks his models for the most part from among the Greeks, but they are the Greeks of a more degenerate age —the Greeks of the court of Alex- andria, who pandered to the vicious tastes of a corrupt and degraded society. But, imitator as he doubtless was, Ovid had a strong personal individuality, and all his poetry is marked with the genuine sentiment of his age and country. Perhaps we trace more of the real man in his Z7istia and Ex Ponto, in which he is thrown entirely on his own resources, though in the depth of his affliction and the decline of his powers, than in the abler and more interesting works in which he owed we know not how much to the Grecks before him.

We have, besides these, the remains of other poets, such as Tibullus and Propertius, who also hold up the mirror to their times, and assist us in scanning its character on all sides. But it will be well to pass them over in this brief sketch, and bring our review of the literature of the Augustan Age to a close with a notice of the great historian Livy. The consummate excellence in form and style of the work to which we refer bears witness to the intellectual accomplishments of the epoch. No doubt the Romans did much at a later period to improve their method of teaching, and to extend their acquaintance with the highest models of literary excellence. An age succeeded in which Rome was formed into an academy, like that of Athens or Alexandria, when all the arts and sciences of the time were taught or practised under the direct instruction of approved professors. Great were the merits of the historical literature of Rome at a later age, and illustrious are some of the men who distinguished themselves in its exercise. But, on the whole, a reasonable criticism will award to Livy the palm of merit at least in the two par- ticulars just specified,—a palm which he may well contest even with the masters of the art in Greece. The form of Livy’s history partakes in exquisite proportion of the descriptive, the narrative, and the dramatic; it is replete with personal characteristics, which bring us into direct acquaintance with the individuals of whom it treats; it abounds, moreover, in matter of antiquarian interest, which we who read it at a distance of nineteen centuries feel to be specially valuable, and which did not fail to attract the sympatny even of the writer’s own contemporaries. The Romans in the time of Augustus were just beginning to be keenly self-

conscious. They felt that they had attained to such a position in the world's history as no people before them had acquired. They were lcd by all the traditions of their youth to attribute their splendid success to the examples of national virtue paraded before them. They were sensible of the deep debt they owed to their ancestors, and they wanted to know who their ancestors were; they wanted to trace the features of their own character in the lineaments of the great men who had gone before them. Of these ancient heroes of the commonwealth they had hitherto imbibed a faint and vague conception from songs and poems and family or national traditions. The legends connected with their ritual and their laws and

institutions assumed the existence of those heroes, and the reality of the deeds imputed to them; but the men and their deeds were for the most part wrapped in obscurity, or presented under dubious colours. The voice of Jiivy's contemporaries muttered around him that of all their compatriots he should be held most in honour among them, who should bring these traditions of the past into the light of day, and make them pass among a generation, willing so to accept them, as genuine and accredited history. The history of Livy was the true product of the age, inasmuch as it answered to the call of the age. It pre- sented Roman history to the Romans much as Shakespeare's dramas presented English history to the English; the history in both cases was just what the people wished to be- lieve, and from thenceforth they so accepted and believed it.

As regards the style of Livy's composition, it is enough to say that it is generally regarded as the most perfect specimen of the Latin prose writing that we possess, and we may be pretty confident that if anything better had been written, posterity would not have suffered it to perish. It holds the middle place between the oratorical exuberance of Cicero and the philosophic sententiousness of Tacitus. While sentence follows sentence throughout in logical sequence, so that the thread of meaning and argument is never lost under a mass of verbiage, yet we are beguiled in our lengthened study by the repeated recurrence of passages of highly-imaginative colouring ; we feel that if the histo- rian sometimes deviates

into poetry, he never misleads us with a show of empty rhetoric. The Roman people, as represented by Livy, retained the genuine strength and bluntness of their character. The teaching of their Greek instructors had had as yet little effect in seducing them into the conceits and affectations of the more frivolous people they had conquered. The history of Livy remains the noblest monument of the Romanus honos, the national dignity, which his countrymen so proudly contrasted with the Grata licentia, which was gradually enervating and degrading them. The spirit of the Augustan Age is set forth, perhaps at its best and brightest, in the illustrious history of Livy.

It is probable that Livy, who had been a republican in hig heart, lived for the most part the retired life of a student, though he is said to have been employed in the education of some of the princes of the imperial family. He reflects the character of the earlier generation, among whom he was born, rather than of the later, in which he died, at an advanced age, in the fourth year of Tiberius. All the great poets above mentioned met an early death about the middle of the principate of Augustus, except Ovid, who survived to the eighth year of his successor. Accordingly, it is in Ovid, as might be expected, that we trace the first marks of degeneracy from the high standard of the Augustan literature—the Golden Age of Latin composition. The decline of Rome, both in intellect and morals, was becoming rapidly apparent. The splendid promise of the Augustan Age was quickly exhausted. The spirit of freedom evaporated under the influences of the time, and the spurious appearances which the emperor kept up had no power to impart real vigour to the national constitution. Just in the same manner it is abundantly clear that the fame of the age of Louis XIV. in France is founded on the excellence of the men who were actually born and bred in an earlier epoch and under a healthier régime. Neither the age of Augustus nor that of Louis produced the men who have rendered it illustrious. But the decline of Rome was becoming marked before the death of Augustus in other respects also. Although internal dissensions had been appeased, and private ambi- tion quelled, the external relations of the empire were insecure, and caused vivid apprehensions. The frontiers

-over the minds of his people.

of the Rhine and Danube were constantly harassed by the indomitable spirit of the barbarians beyond them. On the Danube the Roman arms seem to have been crowned with a sufficient measure of success, but on the Rhine the great disaster of Varus, and the loss of three legions, deft a deep impression of gloom upon the feelings of the age. Augustus himself suffered a succession of disappointments in the premature death of his nearest kindred, and in the loss of his trustiest advisers. Though he maintained to the last an outward serenity almost touching, he appears to have been painfully conscious of the substantial failure of the great pacification he had accomplished, and to have augured nothing but evil from the character of the stepson, to whom, at the last moment, he was content to leave his inheritance. A general foreboding of evil was creeping The age of Augustus, which lasted nearly fifty years, was indeed along day even in the life of a nation, but its sun was manifestly hastening to its setting, and the night was coming, slowly, gradually, but surely. (c. M.) AUGUSTUS IL (also, and more accurately, designated Freperick Avucustus I.), Elector of Saxony and King of Foland, second son of John George III. of Saxony, was born at Dresden, 12th May 1670. His personal beauty was remarkable, and from his great physical strength he received the surname of The Strong, by which he is com- monly distinguished. He was very carefully educated, and spent several years travelling in Europe, visiting most of the courts, and taking part in some campaigns against the French. In 1694 he succeeded his elder brother as elector of Saxony, and shortly after, having entered into alliance with Austria, was appointed to the chief command of the imperial forces against the Turks. In 1697, after having suffered a defeat at Olasch, he resigned this office, and proceeding to Vienna, entered into negotiations with regard to the throne of Poland, left vacant by the death of John Sobieski in 1696. As a preliminary step in his candidature, Augustus renounced the Protestant faith, and proclaimed himself a Catholic. Among his rivals the most formidable was the French prince of Conti. Both expended enormous sums in buying over the Polish nobles, and both claimed to be elected at the general diet. Conti, however, was not on the spot, and Augustus, marching into Poland with his Saxon forces, gained possession of the kingdom. Scarcely was he settled on the throne, when he entered into alliance with Russia and Denmark against the young king of Sweden, and with his Saxon troops (for the Poles would not unite with him) invaded Livonia. In the campaigns which followed (1700-

1704), he was completely worsted by the extraordinary military genius of his opponent, the celebrated Charles XII. of Sweden; he was driven from Poland, and Stanislaus Leszczinski was crowned in his place. The Swedes, following up their victories, invaded Saxony, and in 1706, at Altranstadt, Augustus was compelled to make peace, to repay the expenses of the Swedish army, to acknowledge Stanislaus as king of Poland, and to congratulate him on his accession. After these reverses he spent soine time as a volunteer in the Netherlands, but the defeat of Charles at Pultowa (1709) again raised his hopes. He at once declared the Altranstaidt treaty null and void, and having received promises of assistance from Russia, entered Poland, drove out Stanislaus, and was a second time proclaimed king. During the following years he continued to carry on the war with Sweden, while at the same time his kingdom was distracted by the jealousy with which the Poles regarded the Saxon troops, who were compelled to leave Poland in 1717. In 1718 Charles XII. was killed at Fredericshall, and from that time the reign of Augustus was marked by uo important event. His court became celebrated as the

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most extravagant and luxurious in Europe, and he himself as the most dissolute and magnificent of princes. His lavish expenditure, though it enriched his capital with treasures of art, impoverished both Poland and Saxony, and laid the foundations for the future misfortunes of those countries. He died, 1st February 1733, from mortification of an old wound. Of his numerous natural children, the most famous was the distinguished general, Maurice of Saxony. AUGUSTUS IIL, or Freperick Aucustus II., Elector of Saxony and King of Poland, only legitimate son of Augustus the Strong, was born at Dresden, 7th October 1696. He was brought up in the Protestant faith, but in 1712, while on his travels, he entered the Church of Rome, though his change of opinion was not publicly known till 1717. In 1733 he succeeded his father as elector of Saxony, and put forward claims to the kingdom of Poland. The Polish nobles, however, had become dissatisfied with foreign rule, and endeavoured to reinstate Stanislaus Lesz-ezinski, whose daughter was married to Louis XV. of France. Russia and

Austria, probably bribed, but certainly dread- ing French influence in Poland, supported Augustus, who was elected, though in an informal manner, and by their aid established himself in the kingdom. On the death of Charles of Austria in 1740, Saxony at first joined the league against Maria Theresa, but jealousy of the Prussian successes in the first campaign caused Augustus to unite with the empress when war broke out a second time in 1744. His forces were completely defeated by Frederick, and Saxony was overrun and pillaged by the Prussian troops. Eleven years later Augustus joined the alliance against Frederick, which gave rise to the Seven Years' War. He was again unfortunate; the whole Saxon army was surrounded and compelled to surrender at Pirna in 1756, and during the remainder of the war Saxony and Poland were the seats of operations, and suffered severely. Augustus died 5th October 1763, surviving only by a few months the peace of Hubertsburg. During his reign considerable additions were made to the collections of art treasures formed by his father, and Dresden began to be celebrated throughout Europe for its china and pictures. AUK, a name common to several species of sea-fowl belonging, with one exception, to the family Alcide. Of these, special interest attaches to the Great Auk, or Gare- fowl (Alca impennis), from the circumstance that there is no authentic record of its having been taken, or even seen alive, for more than a quarter of acentury. In the autumn of 1821 Dr Fleming, while ona cruise through the Hebrides, observed and described one which had been taken alive in the sea off St Kilda and put on board the yacht. With a rope attached to one of its legs, this specimen was occasionally allowed to disport itself in its native element, where it astonished every one by the rapidity with which it swam under water. On one of these occasions it got loose from its bonds, and was soon beyond reach of pursuit. Another specimen had been observed a few years before off Papa Westra, one of the Orkney Islands, but in spite of the exertions of the crew of a six-oared boat, continued for several hours, the auk could not be overtaken. This specimen, however, was afterwards secured, and is now in the British Museum. The Great Auk measures about three feet in length, has a large bill, but wings so small as to be totally useless for flying, serving, however, as powerful swimming organs It is said to have laid a single egg on the bare rock,—usually, from the inability of the bird to rise ou wing to the higher cliffs, close to the water edge. Its food, according to Fabricius, consisted of the lump- sucker and other fishes of a similar size. From the earliest existing

accounts, the Great Auk does not appear to have ever been more than an occasional visitant to the British Tsles, and then chiefly to the sea around St Kilda and the

Orkneys, while Iceland, the Faroes, and the islets about Newfoundland, appear to have been its proper home. The probability that this bird is now totally extinct gives special value to the remains of it now existing. These, according to Professor Newton, are as follows :-—71 or 72 skins, 9 skeletons, 38 or 41 detached bones of different birds, and 65 eggs. The other Auks are the Puffin, the Razorbill, aud the Little Auk, all widely distributed along the northern-temperate and Arctic coasts.

AULIC COUNCIL (from the Latin aula, a hall, in German, Reichshofrath), one of the two supreme courts of the old Germanic empire, the other being the imperial chamber (Reichskammergericht). It was called into exist- ence in 1501 by the Emperor Maximilian, and was by him intended to counterbalance the influence of the im- perial chamber, which he had been compelled to form by the states six years before. The Aulic Council had in many respects equal power with the chamber; from its decisions there was no appeal, and under its special juris- diction were included the consideration of the imperial reserved rights, fees, and privileges, the settlement of disputes as to precedence among the several states, and the arrangement of matters relating to the Italian posses- sions of the empire. All questions of law could be sub- mitted either to this council or to the chamber. The members were at first appointed by the emperor, at whose death the court dissolved, and new appointments were made by his successor. The power of the council increased under several of the emperors; it was formally recognised as coequal with the imperial chamber ; and after the peace of Westphalia its organisation was altered so as to meet the requirements of the time. Tt then and afterwards consisted of a president, vice-president, and eighteen councillors, all selected and paid by the emperor, and of a vice-chancellor, whose appointment rested with the electorate of Mainz. Six members were Protestants, and the votes of these six, when unanimous, could not be overturned by any majority of the others. The councillors were divided into two parties—the first consisting

of the counts and barons, the second of the men of learning, who possessed equal rights with the nobles, but were more highly paid. At the dissolution of the old Germanic imperial system in 1806, the Aulic Council in its former signification came to an end, though an Austrian court bearing the same title still continued to sit in Vienna.

AULIS, a town in Beeotia, supposed to have been situated on a rocky peninsula between two bays, about three miles S. of Chalcis. During the Trojan war it was the rendezvous of the Greek fleet, and has obtained celebrity as the scene of the sacrifice of Iphigenia. Pausanias states that in his day there was still to be seen here the temple of Artemis ascribed to Agamemnon.

AUMALE, formerly ALBEMARLE, from the Latin Alba Marla, a town of France, in the department of Seine Inférieure, on the banks of the Bresle, 35 miles N.E. of Rouen. Grain and hemp are cultivated in the neighbour- hood ; cloth is manufactured ; and the town has a trade in wool and cattle. Population, 2229. Aumale was erected by William the Conqueror into a countship, which was afterwards held in succession by the houses of Castile, Dammartin, Harcourt, and Lorraine; and in 1547 it was raised to the rank of a dukedom in favour of Francis of Lorraine. It afterwards passed to the house of Savoy, from whom it was purchased in 1675 by Louis XIV., who conferred it as an apanage on one of his natural sons. In 1769 it came into possession of the house of Orleans. The earl of Albemarle, in the British peerage, derives his title from Aumale.

AUNGERVYLE, Ricuarp, commonly known by the name of Richard de Bury, was born in 1281, at Bury St

Edmund’s in Suffolk, and educated at the university of Oxford. He entered the order of Benedictine monks, but was shortly afterwards appointed tutor to the prince of Wales. On the accession of his pupil to the throne as Edward III., he was promoted to various offices of dignity, and was finally made bishop of Durham, as well as lord high-chancellor and treasurer of England. He was several times engaged in cmbassies on the Continent, and became acquainted with many of the most eminent men of the time,

particularly with the poet Petrarch. A portion of his correspondence with the latter has been preserved. At Oxford he founded a library for the use of the students, which he furnished with the best collection of books then in England, and appointed five keepers, to whom he granted yearly salaries. He died at his manor of Auck- land, 24th April 1345, and was buried in the cathedral church of Durham. His works are—(1.) Philobiblon, con- taining directions for the management of his library at Oxford, and an elaborate eulogy of learning, written in very bad Latin,—first printed at Cologne 1473, then at Spires, 1483, and finally at Oxford, 1599; (2.) Hpistole Familiarium, some of which are addressed to Petrarch ; (3.) Orationes ad Principes, mentioned by Bale and Pits.

AURAY, a small town of France, situated on the slope of a hill near the mouth of the river of the same name, in the department of Morbihan, 10 miles W.of Vannes. Its port is greatly frequented by coasting vessels; and it carries on a considerable industry in stocking-weaving, silk-spinning, tanning, shipbuilding, &c. The principal buildings are the church of St Esprit (13th century), which is now transformed into a college, the church of St Gildas, the town-house (17th century), and the Chartreuse, which marks the site of the battle of 1364, in which Charles of Blois was defeated by John de Montfort. In the neighbourhood is the church of Sainte Anne d'Auray, one of the principal places of pilgrimage in Brittany. Population, 4542. (See Palliser's Brittany and its Bye- ways, 1869.)

AURELIANUS, Cz tvs, a eclebrated Latin physician, born probably at Sicca in Numidia, but regarding whose life scarcely anything isknown. The very date at which he flourished is quite uncertain. In his books he refers frequently to Soranus, and does not mention Galen, from which it has been inferred that he lived at a period inter- mediate between these two writers, z. ¢, during the 2d century A.D. Butif the writings under his name arc, as seems at least probable, translations or paraphrases from Soranus, the absence of any refercnce to Galen can easily be understood. Again, Galen does not mention Aurelianus, though he notices many minor physicians ; from which fact, together with the corrupt Latin style of his extant works, it has been supposed by several authorities that the more correct date is the 5th century a.D. The writings of Aurelianus, which are composed from the point of view of the methodical school, and show considerable practical

skill in the diagnosis of ordinary and even of exceptional diseases, consist of the following:—(1.) A treatise, in three books, on acute diseases (Acutarum or Celerum Passionum), Paris, 1533 and 1826. (2.) A treatise, in five books, on chronic diseases (Tardarum or Chronicarum Passionum), Basle, 1529. Both these treatises were published together in 1566, and frequently since. (3.) Fragments of a com- preliensive treatise on medical science in the form of a dialogue (Medicinales Responsiones), referred to in the preface to the work on acute diseases, have been discovered and published by Val. Rose in his Anecdota Greeca et G'reeco- Latina, vol. ii. 1871.

AURELIUS ANTONINUS, Marcus, the noblest of

pagans, the crown and flower of Stoicism, was born at Rome | Volusianus Marcianus, a distinguished jurist.

21st and the 26th April. His original name was Marcus Annius Verus. His father, Annius Verus, died while he was pretor; his mother, who survived her husband, was Domitia Calvilla or Lucilla. By both his parents he was of noble blood, his mother being a lady of consular rank, and his father claiming descent from Numa Pompilius, Marcus was an infant when his father died, and was there- upon adopted by his grandfather. The latter spared no pains upon his education, and the moral training which he received, both from his grandfather and froin his mother, and to which he alludes in the most grateful and graceful terms in his Afeditations, must have becn all but perfect, The noble qualities of the child attracted the attention of the Emperor Hadrian, who, playing upon the name Verus, said that it should be changed to Verissimus. When Marcus reached the age of seventeen, Hadrian adopted, as his suc- ecssor, Titus Antoninus Pius (who had married Annia Galeria Faustina, the sister of Annius Verus, and was consequently the uncle of Marcus), on condition that he in turn adopted both his nephew and Lucius Ceionius Commodus, the son of Ailius Cesar, whom Hadrian, being childless, had origin- ally intended as his successor, but who had died before him. It is generaliy believed that, had Marcus been old enough, Hadrian would have adopted him directly.

After the death of Hadrian, and the accession of Antoninus Pius to the throne, it became at once apparent that a distinguished future was in store for Marcus. He had been, at the age of fifteen, betrothed to the sister of Commodus; the engagement was broken off by the new eniperor, and he was instead betrothed to Faustina, the daughter of the latter. In 139 a.p. the title of Cesar was conferred upon him, and he dropped the name of Verus. The full name he then bore was Marcus Alius Aurelius Antoninus, A‘lius coming from Hadrian’s family, and Aurelius being the original name of Antoninus Pins. He is generally known as Marcus Aurelius or Marcus Aurelius Antoninus. In 140 a.p. he was made consul, and entered fully upon public life.

The education of Aurelius in his youth was so minute, and has been so detailed by himself, that it ought not to be passed over without notice. Professor Long says, with perfect truth, apparently, of the trainers and the trained, “Such a body of teachers, distinguished by their acquire- ments and their character, will hardly be collected again, and as to the pupil we have not had one like him since.” We have already alluded to the care bestowed upon him in youth by his mother and grandfather ; a better guardian than that thoroughly good man and prudent ruler, Antoninus Pius, could not be conceived. Marcus himself says, “To the gods I am indebted for having good grand- fathers, good parents, a good sister, good teachers, good associates, good kinsmen and friends, nearly yeverything good.” He never attended any of the Roman public schools, and this he makes a matter for self-congratulation. He was trained by tutors, in whom, particularly in Rusticus, he appears to have been very fortunate, and to whom he showed gratitude when he reached the throne by raising them to the highest dignities of the state. Like most of the young Romans of the day, he began his studies with rhetoric and poetry, his teachers being Herodes Atticus and M. Cornelius Fronto. But, at the early age of eleven, he entered upon another course of study, in which he may be said to have continued more or less till the end of his life. He became acquainted with Diognetus the Stoic, was fascinated by the philosophy he taught, assumed the dress of his sect, and ultimately abandoned rhetoric and poetry for philosophy and law, having among his teachers of the one Sextus of Cheeronea, and of the other L. He went

121 A.D., the date of his birth being variously stated as the | thoroughly and heartily into the practice as well as the

theory of Stoicism, and lived so abstemious and laborious a life, that he injured his health. It was from his Stoical teachers that he learned so many admirable lessons,—to work hard, to deny himself, to avoid listening to slander, to endure misfortunes, never to deviate from his purpose, to be grave without affectation, delicate in correcting others, “not frequently to say to any one, nor to write in a letter, that I have no leisure,” nor continually to excuse the neglect of ordinary duties by alleging urgent occupa- tions. Through all his Stoical training, Aurelius pre- served the natural sweetness of his nature, so that he emerged from it the most lovable as well as the saintliest of Pagans.

Antoninus Pius reigned from 138 to 161 a.p., and the concord between him and his destined heir was so com- plete, that it is recorded that during these twenty-three years Marcus never slept oftener than twice away from the house of Pius. It is generally believed that Aurelius married Faustina in 146, at all events a daughter was born to him in 147. The two noblest of imperial Romans were associated both in the administration of the state and in the simple country occupations and amusements of the sea-side villa of Lorium, the birthplace of Pius, to which he loved to retire from the pomp and the wretched intrigues of Rome.

Antoninus Pius died of fever, 161 a.D., at his villa of Lorium at the age of seventy-five. As his end approached, he summoned his friends and the leading men of Rome to his bedside, and recommended to them Marcus, who was then forty years of age, as his successor, without men- tioning the name of Commodus, his other adopted son, commonly called Lucius Verus. It is believed that the senate agreed with what appeared to be the wishes of the dying emperor, and urged Aurelius to take the sole ad- ministration of the empire into his hands. But at the very commencement of his reign, Marcus showed the magnani- mity of his nature by admitting Verus as his partner in the empire, giving him the tribunitian and proconsular powers, and the titles Cesar and Augustus. This was the first time that Rome had two emperors as colleagues. Verus proved to be a weak, self-indulgent man;

but he had a high respect for his adoptive brother, and deferred uniformly to his judgment, Although apparently ill- assorted, they lived in peace; and Verus married Lucilla, the daughter of Aurelius. In the first year of his reign Faustina gave birth to twins, one of whom survived to become the infamous Emperor Conimodus.

The early part of the reign of Aurelius was clouded by various national misfortunes: an inundation of the Tiber swept away a large part of Rome, destroying fields, drowning cattle, and ultimately causing a famine ; then came earth- quakes, fires, and plagues of insects; and finally, the unruly and warlike Parthians resumed hostilities, and under their king, Vologeses, defeated a Roman army and devastated Syria. Verus, originally a man of considerable physical courage and even mental ability, went to oppose the Parthians, but, having escaped from the control of his colleague in the purple, he gave himself up entirely to sensual excesses, and the Roman cause in Armenia would have been lost, and the empire itself, perhaps, imperilled, had Verus not had under him able generals, the chief of whom was Avidius Cassius. By them the Roman prestige was vindicated, and the Parthian war brought to a con- clusion in 165, the two emperors having a triumph for their victory in the year following. Verus and his army brought with them from the East a terrible pestilence, which spread through the whole empire, and added greatly to the horrors of the time. The people of Rome seem to have been completely unnerved by the universal distress, and to have thought that the last days of the empire had

come. Nor were their fears without cause. The Parthians had at the best been beaten, not subdued, the Britons threatened revolt, while signs appeared that various tribes beyond the Alps intended to break into Italy. Indeed, the bulk of the reign of Aurclius was spent in efforts to ward off from the empire the attacks of the barbarians. To allay the terrors of the Romans, he went himself to the wars with Verus, his headquarters being Carnuntum on the Danube. Ultimately, the Marcomanni, the fiercest of the tribes that inhabited the country between Illyria and the sources of the Danube, sued for peace in 168. The following year Verus died, having been, it is said, cut off by the pestilence which he had brought from Syria, although in that wicked age there were not wanting gossips malig- nant

enough to say even of Marcus that he hastened his brother's death by poison.

Aurelius was thenceforth undisputed master of the Roman empire, during one of the most troubled periods of its history. Mr Farrar, in his Seekers after God, thus admirably describes the manner in which he discharged his multifarious duties :—" He regarded himself as being, in fact, the servant of all. It was his duty, like that of the bull in the herd, or the ram among the flocks, to confront every peril in his own person, to be foremost in all the hardships of war, and most deeply immicrscd in all the toils of peace. The registry of the citizens, the suppression of litigation, the elevation of public morals, the care of minors, the retrenchment of public expenses, the limitation of gladiatorial games and shows, the care of roads, the restoration cf senatorial privileges, the appointment of none but worthy magistrates, even the regulation of strcet trailic, these and numberless other duties so completely absorbed his attention, that, in spite of indifferent health, they often kept him at severe labour from early morning till long after midnight. His position, indeed, often necessitated his presence at games and shows, but on these occasions he occupied himself either in reading, in being read to, or in writing notes. He was one of those who held that nothing should be done hastily, and that few crimes were worse than the waste of time."

Peace was not long allowed the emperor. The year after the death of his partner, two of the German tribes, the Quadi and the Marconianni, renewed hostilities with Rome, and, for three years, Aurelius resided almost constantly at Carnuntum, that he might effectually watch them. In the end, the Marcomanni were driven out of Paunonia, and were almost destroyed in their retreat across the Danube, In 174 Aurelius gained a decisive victory over the Quadi, to which a superstitious interest is attached, and which is commemorated by one of the sculptures on the Column of Antonine. The story is that the Roman army had been entangled in a defile, from which they were unable to extricate themselves, while at the same time they suffered intensely from thirst. In this extremity a sudden storm gave them abundance of rain, while the hail and thunder which accompanied the rain confounded their enemies, and enabled the Romans to gain an easy and complete victory. This triumph was universally con- sidered at the time, and

for long afterwards, to have been a miracle, and bore the title of “The Miracle of the Thundering Legion.” The Gentile writers of the period ascribed the victory to their gods, while the Christians attributed it to the prayers of their brethren in a legion to which, they affirmed, the emperor then gave the name of Thundering. Dacier, however, and others who adhere to the Christian view of the miracle, admit that the appel- lation of Thundering or Lightning (xepavvoBdros, or xepavvopdpos) was not given to the legion because the Quadi were struck with lightning, but because there was a figure of lightning on their shields. It has also been

virtually proved that it had the title even in the reign of Augustus.

Even after this Aurelius was not allowed to rest. From Rome, to which he had returned, he marched to Germany to carry on the war against the tribes which harassed the empire. There the alarming news reached him that Avidius Cassius, the brave and experienced commander of the Roman troops in Asia, had revolted and proclaimed himself emperor. But the rebellion did not last long. Cassius had only enjoyed his self-conferred honour for three months, when he was assassinated, and his head was brought to Marcus. With characteristic magnanimity, Marcus did not thank the assassins for what they had done ; on the contrary, he begged the senate to pardon all the family of Cassius, and to allow his life to be the only one forfeited on account of the civil war. This was agreed to, and it must be cousidered as a proof of the wisdom of Aurelius’s clemency, that he had little or no trouble in pacifying the provinces which had been the scene of rebellion. He treated them all with forbearance, and it is said that when he arrived in Syria, and the correspond- ence of Cassius was brought him, he burnt it without reading it. During this journey of pacification his wife Faustina, who had borne him eleven children, died. The gossiping historians of the time, particularly Dion Cassius and Capitolinus, charge Faustina with the most shameless infidelity to her husband, who is even blamed for not paying heed to her crimes. But none of these stories rest on evidence which cau fairly be considered trustworthy ; while, on the other hand, there can be no doubt whatever that Aurelius loved his wife tenderly, and trusted her im- plicitly while she lived, and mourned deeply for her loss, It would seem that

Aurelius, after the death of Faustina and the pacification of Syria, proceeded, on his return to Italy, through Athens, and was initiated in the Eleusinian mysteries, the reason assigned for his doing so being, that it was his custom to conform to the established rites of any country in which he happened to find himself. Along with his son Cominodus he entered Romo in 176, and obtained a triumph for victories in Germany. In 177 occurred that persecution of Christians, the share of Aurelius in which has caused great difference of opinion, and during which Attalus and others were put to death. Meanwhile the war on the German frontier continued, and the hostile tribes were defeated as on former occasions. In this campaign Aurelius led his own forces ; and, probably on that account, he was attacked by some infectious disease, which ultimately cut him off, after a short illness, accord- ing to one account, in his camp at Sirmium (Mitrovitz) on the Save, in Lower Pannonia, and, according to another, at Vindobona (Vienna), on the 17th March 180 a.p., in the fifty-ninth year of his age. His ashes (according to some authorities, his body) were taken to Rome, and he was deificd. Those who could afford the cost obtained his statue or bust, and, for a long time, statues of him held a place among the Penates of the Romans. Commodus, who was with his father when he died, erected to his memory the Antonine Column (now in the Piazza Colonna at Rome), round the shaft of which are sculptures in relief com- memorating the miracle of the Thundering Legion and the various victories of Aurelius over the Quadi and the Marcomanni.

The one blemish in the life of Aurelius is his hostility to Christianity, which is the more remarkable that his morality comes nearer than any other heathen system to that of the New Testament. Attempts have been made to show that he was not responsible for the atrocities with which his reign is credited, but the evidence of Justin, of Athenagoras, of Apollinaris, and above all, of Melito, bishop of Sardis, and of the Church of Smyrna, is overwhelmingly

to tue effect that not only were there severe persecutions of Christians, in which men like Polycarp and Justin perished, but that the foundation of these persecutions was certain rescripts or constitutions issued by Aurelius

as supplementary to the milder decrees of his predecessors Hadrian and Antoninus Pius. Jn explanation, however, if not in extenuation, of the attitude of Aurelius towards Christianity, several circumstances should be taken into consideration. In the first place, it is evident that he knew little of the Christians, and absolutely nothing of Christian ethics. In his Meditations he makes only one reference (xi. 3) to the adherents of the new creed, and that of the most contemptuous character, showing that he confounded them all with certain fanatics of their number, whoin even Clemens of Alexandria compares, on account of their thirst for martyrdom, to the Indian gymnosophists. How far this ignorance was culpable it is impossible at so remote a date tosay. Further, it should be noted, in regard to the rescripts upon which the persecutions were founded, that, although they were in the name of the emperor, they may not have proceeded directly from him. There is no evidence that he was an active persecutor, except a passage in Orosius to the effect that there were persecutions of the Christians in Asia and Gallia "under the orders of Marcus ;" and it should not be kept out of consideration that he was to some extent a constitutional monarch, and had to pay deference both to the consulta of the senate and the pre- cedents of previous emperors. At the time there was a great popular outcry against the Christians on social and political, even more than on religious, grounds; and Aurelius may have been as much at the mercy of intriguers or fanatics when he gave his sanction to the butcheries of Christians in Asia Minor, as William II]. was at the mercy of Stair and Breadalbane, the real authors of the massacre of Glen- coe. Finally, it should be borne in mind that, in the reign of Aurelius, the Christians had assumed a much bolder attitude than they had hitherto done. Not only had they caused first interest and then alarm by the rapid increase of their numbers, but, not content with a bare toleration in the empire, they declared war against all heathen rites, and, at least indirectly, against the Government which per- mitted them to exist. In the eyes of Aurelius they were atheists and foes of that social order which he considered it the first of a citizen's duties to maintain, and it is quite possible that, although the most amiable of men and of rulers, he may have conceived it to be his duty to sanction measures for the extermination of such wretches. Still his action at the time must be considered, as John Stuart Mill puts it, as "one of the most tragical facts in all history." The book which contains the philosophy of Aurelius is known by the title of his Reflections, or his Meditations, although that is not the name which he gave

to it him- self, and of the genuineness of the authorship no doubts are now entertained. It is believed that the emperor also wrote an autobiography, which has perished with other treasures of antiquity. The Meditations were written, it is evident, as occasion offered,—in the midst of public business, and even on the eve of battles on which the fate of the empire depended,—hence their fragmentary appear- ance, but hence also much of their practical value and even of their charm. It is believed by many critics that they were intended for the guidance in life of Aurelius's son, Commodus. If so, history records how lamentably they failed in accomplishing their immediate effect, for Com- modus proved one of the greatest sensualists, buffoons, and tyrants that disgraced even the Roman purple. But they have been considered as one of the most precious of the legacies of antiquity,—as, in fact, the best of nom- inspired reflections on practical morality. They have been recognised as among the most effectual stimuli to strugglers

in life, of whatever class and in whatever position, in the field of speculation as in that of action. The Meditations of Marcus Aurelius were, with Machiavelli's Art of War, the daily study of Captain John Smith, the real founder of the United States. They are placed by Mr Mill in his posthumous essay on the Utility of Religion as almost equal in ethical elevation to the Sermon on the Mount.

Aurelius early embraced, and throughout life adhered to, the Stoical philosophy, probably because he considered it as the sternest and most solid system to oppose to the corruption of his time. But, as Tenneman says, he im- parted to it "a character of gentleness and benevolence, by making it subordinate to a love of mankind, allied to religion." In the Meditations it is difficult to discover anything like a systematic philosophy, which, indeed, means, as he used the word, tranquillity, or a serene habit of mind. From the manner, however, in which he seeks to distinguish between matter (ty) and cause or reason (atria, Adyos), and from the Carlylean earnestness with which he advises men to examine all the impressions on their minds (¢avracéa), it may be inferred that he held the view of Anaxagoras—that God and matter exist independently, but that God governs matter. There can be no doubt that Aurelius believed in a deity, although Schultz is probably

right in maintaining that all his theology amounts to this,—the soul of man is most intimately united to his body, and together they make one animal which we call man; and so the deity is most intimately united to the world or the material universe, and together they form one whole. We find in the Medita- tions no speculations on the absolute nature of the deity, and no clear expressions of opinion as to a future state. We may also observe here that, like Epictetus, he is by no means so decided on the subject of suicide as the older Stoics. Aurelius is, above all things, a practical moralist. The goal in life to be aimcd at, according to him, is not happiness, but tranquillity, or equanimity. This condition of mind can be attained only by "living con- formably to nature," that is to say, one's whole nature, and as a means to that, man must cultivate the four chief virtues, each of which has its distinct sphere—wisdom, or the knowledge of good and evil; justice, or the giving to every man his due; fortitude, or the enduring of labour and pain; and temperance, or moderation in all things. It is no "fugitive and cloistered virtue" that Aurelius seeks to encourage; on the contrary, man must lead the "life of the social animal," must "'live as on a mountain ;" and "' he is an abscess on the universe who withdraws and separates himself from the reason of our common nature through being displeased with the things which happen." While the prime principle in man is the social, " the next in order is not to yield to the persuasions of the body, when they are not conformable to the rational principle which must govern." This " divinity within a man," this 'legislating faculty " (76 tyye~ovuxdv) which, looked at from one point of view, is conscience, and from another is reason, must be implicitly obeyed. He who thus obeys it will attain tranquillity of mind; nothing can irritate him, for everything is according to nature, and death itself "is such as generation is, a mystery of nature, a composition out of the same elements, and a decomposition into the same, and altogether not a thing of which any man should be ashamed, for it 1s not contrary to the nature of a reasonable animal, and not contrary to the reason of our constitution."

The morality of Marcus Aurelius cannot be said to have been new when it was given to the world, far less can it be said to be systematic. Compared, indeed, with elaborate treatiscs on ethics, the Jfeditations of Marcus Aurelius are as tonic medicine to succulent food. The

charm of his morality lies in its exquisite accent and its infinite tenderness. Where can the connoisseur in morals find anything finer than such sentences as this }—“ ‘The pride which is proud of its want of pride is the most intolerable of all;” or where can a more delicate rebuke to the Pharisaism which lurks in the breast of every man be obtained than this ?+ —“ One man, when he has done a service to another, is ready to set it down to his account as a favour conferred. Another is not ready to do this, but still, in his own mind, he thinks of the man as his debtor, and he knows what he has done. A third ina manuer does not even know what he has done, but he is like a vine which has produced grapes, and seeks for nothing more after it has once produced its proper fruit. So a man when he has done a good act, does not call out for others to come and see, but he goes on to another act as a vine goes on to produce again the grapes in season.” But above all, what gives the sentences of Marcus Aurelius their enduring value and fascination, what renders them superior to the utterances of other moralists of the same school, such as Epictetus and Seneca, is that they are the gospel of his life. His practice was in accordance with his precepts, or rather his precepts are simply the records of his practice. To the saintliness of the cloister he added the wisdom of the man of the world; constant in misfortune, not elated by prosperity, never “carrying things to the sweating point ;” preserving, in a time of universal corrup- tion, unreality, and self-indulgence, a nature sweet, pure, self-denying, unaffected, Marcus Aurelius has given to the world one of the finest examples of the possibilities of humanity.

The Meditations of Marcus Aurelius have been translated into English, German, French, Spanish, and Italian. The two chief English translations are those of Jeremy Collier (1702) and of George Long; the last may be considered final. The text most commonly used is the Greek one edited by J. M. Schultz (republished by Tauchnitz in 1821). Many books have been written on the life and times of Aurelius, and the essays on his Meditations are innumer- able. One of the best cstimates of him is contained in Mr F. W. Farrar’s Seekers after God, 1868. A scholarly work issued in 1874 by M. Gaston Boissin, entitled La Religion Romaine @ Auguste aux Antonines,

gives, perhaps, the most interesting existing account of the state of society under the Antonines.

AUREOLA, AvREOLE, the radiance or luminous cloud which, in paintings of sacred personages, is represented as surrounding the whole figure. In the earliest periods of Christian art this splendour was confined to the figures of the persons of the Godhead, but it was afterwards extended to the Virgin Mary and to several of the saints. The aureola, when enveloping the whole body, is generally oval or elliptical in form, but is occasionally circular or quatrefoil. When it is merely a luminous disk round the head, it is called specifically a ntmbus, while the combination of nimbus and aureole is called a glory. The strict dis- tinction between nimbus and aureole is not commonly maintained, and the latter term is most frequently used to denote the radiance round the heads of saints, angels, or persons of the Godhead.

AURICH, a town of Prussia, in the province of Hanover, situated on the Trecktief canal. It is regularly built ; possesses a castle, which was formerly the residence of the prince of East Friesland, a lyceum, and four libraries ; and carries on the manufacture of leather, paper, pottery, and tobacco. The famous meeting-place of the East Fries- re Upstaalsboom, is in the neighbourhood. Population,

AURIFABER (the Latinised form of the name Gorp- SCHMIDT), JOANNES, a Lutheran divine, celebrated as the

friend of Luther and as one of the editors of his works, was born in 1519 in the county of Mansfeldt, or, more probably, in the town of Weimar. After completing his education at the university of Wittenberg, where he heard the lectures of Luther, he became tutor to Count Mansfcldt, und in the war of 1544-5 accompanied the army as field-preacher. For some months afterwards he resided with Luther as his famulus or private secretary, and was present at his death in 1546. In the following year he spent six months in prison along with John Frederick, elector of Saxony, who had been captured by the emperor, Charles V. He held for some years the office of

court-preacher at Weimar, but, owing to theological disputes, was compelled to resign this office in 1561. In 1566 he was appointed to the Lutheran church at Erfurt, which post he held, though not without serious differences with his fellow- clergymen, till his death in 1575. Besides taking a share in the first collected or Jena edition of Luther's works, Aurifaber sought out and published at Eisleben in 1564-5 several writings not included in that edition. He also published Luther's Letters (1556, 1565), and Zable Talk

1566).

| ee JOANNES, a Lutheran divine, born at Breslau in 1517. He was educated at Wittenberg, and was there specially attracted to Melanchthon, with whom

AU R—

he ever afterwards remained on terms of close friendship. After graduating in 1538 he spent twelve years as docent | at the university, and having then received his doctorate of | divinity, was appointed professor of divinity and pastor of

the church of St Nicholas at Rostock. He distinguished

himself by his prudence and conciliatory disposition, ; took a leading part in the composition of the regulations for the Mecklenburg Church, and was successful in allay-

AURORA

URORA POLARIS, Aurora BorEALISand AUSTRALIS, Potar Licut, NoRTHERN LicuTs, or STREAMERS,

an electrical meteor, appearing most frequently in high lati- tudes, in the form of luminous clouds, arches, and rays, of which the latter sometimes meet at a point near the zenith, and form what is called a boreal crown. The arches are sometimes single ; sometimes several concentric ones are seen, and they are usually nearly stationary, or move slowly southward. They

cross the magnetic meridian at right angles, and, therefore, in England, have their centres nearly N.N.W. The rays rise perpendicularly from the arches, but are sometimes seen detached, or when the arch is below the horizon. They are parallel to the dipping needle, or, in other words, to the curves of magnetic force ; and the boreal crown, at which they appear to meet, is merely an effect of perspective. This point is in England about 70° in altitude, and nearly 8.S.E. of the zenith. The rays are seldom stationary, but appear and disappear suddenly, shooting with great velocity up to the zenith, and moving slowly eastward or westward, but most com- monly the latter. They sometimes cover the whole sky, and frequently have a strong tremulous motion from end to end. This tremulous motion is sometimes seen also in the arches when near the zenith ; and Benjamin V. Marsh mentions a case in which the matter of the arch had the appearance of a rapid torrent flowing from east to west. A rare form of aurora is that in which the rays appear to hang from the sky like fringes or the folds of a mantle. The ordinary colour of the aurora is a pale greenish-yellow, but crimson, violet, and steel-colour are not uncommon.

Crimson auroras have often been imagined by the super- stitious to be omens of war, pestilence, and famine; and lively imaginations have seen in their motions—

ing some religious disputes in the town of Liibeck. The Grand-duke Albert of Prussia, who was very desirous of healing the differences in the Prussian Church caused by the discussion of Osiander’s doctrines, was attracted by Aurifaber, invited him to Kénigsberg in 1553, and in the following year appointed him to the professorship of divinity in that university, and to the presidency of the Samland diocese. Aurifaber, however, found it impossible to conciliate all parties, and in 1565 returned to Breslau, where, for the three remaining years of his life, he dis- charged the joint offices of pastor in the church of St Elizabeth and director of the Lutheran Church and schools. He died 19th October 1568.

AURILLAC, the capital of the department of Cantal, France, situated on the right bank of the Jourdanne, which is here crossed by a handsome bridge. It contains tribunals of primary instance and commerce, a communal college,

societies of agriculture, arts, and commerce, a public library, and a museum. Most of the town is of comparatively modern construction, its more ancient build- ings having suffered severely in the religious wars of the 16th century. Of highest claims to antiquity are portions of the castle of St Etienne, the church of St Géraud, anda Benedictine abbey, which is regarded by many as the original nucleus round which Aurillac gathered. There is a statue of Sylvester II., who was a native of the town, and was educated in the abbey, which soon afterwards became one of the most famous schools of France. The manufactures consist of tapestry, lace, cutlery, paper, leather, &c., and a considerable number of horses are bred. Population in 1872, 11,098.

AURORA, the Roman personification of the dawn of day, corresponding to the Greek goddess Eos (q.v.)

POLARIS

“* Fierce fiery warriors fight upon the clouds In ranks, and squadrons, and right form of war.”

They were called by the ancients chasmata, bolides, and trabes, according to their forms and colours. In Shetland, where they are very frequent, and in the north of Scotland, they are known as the “merry dancers” (perhaps the ancient capre. saltantes) ; while, from a curious passage in Sit’s Ceylon and the Cingalese, vol. ii. p. 117, it seems that the aurora, or something like it, is occasionally visible in Ceylon, and that the natives call it the Buddha lights. Mr Jansen says, however, that the great aurora of 4th February 1872, which was seen at Bombay, was not visible in Ceylon. In many parts of Ireland a scarlet aurora is supposed to be a shower of blood, and under this name is not unfrequently mentioned in the old annals, always in connection with some battle or the murder of a great chief. The earliest mentioned was in 688, in the Annals of Cloon-mac-noise, after a battle between Leinster and Munster, in which Foylcher O’Moyloyer was slain. It was observed at Edessa in 502, and in Syria in 1097, 1098, and 1117.

The only thing resembling a distinct history of this Hist»

phenomenon is that which has been given by Dr Halley, in the Philosophical Transactions, No. 347. The first account he gives, taken from a book entitled A Description of Meteors, by W. F., D.D., reprinted at London in 1654, describes the appearance of what is called by him burning spears, which were seen at London on the 30th January 1560. The next appearance, according to the testimony of Stow, was on the 7th October 1564. In 1574 also, according to Camden and Stow, an aurora borealis was observed two nights successively, viz., on the 14th and 15th of November, having much the same appearances as that described by Dr Halley in 1716. Again, an aurora

was twice seen in Brabant, in the year 1575, viz., on the 13th of February and 28th of September. Both appear- ances were described by Cornelius Gemm, professor of medicine at Louvain, who comparcs them to spears, fortified cities, and armies fighting in the air. Michacl

saw an auroral corona with rays tothe horizon. J. Glaisher, Franklin, and others, have also observed the phenomenon. It is scarcely possible that a light so faint as not even to obscure the stars should be visible in sunlight, and such facts would seem to suggest that the auroral light is deve-

Joped in cloud or mist of some sort, which may become Connection visible by reflected light, as well as by its own. Franklin of aurora says, "‘ Upon one occasion the aurora was seen immediately With

Mestlin, tutor to Kepler, states that at Backnang in Wiirtemberg these phenomena, which he styles chasmata,

were seen by himself no less than seven times in 1580. In 1581 they again appeared in great splendour in April and September, and in a less degree in some other months of the same year. In September 1621, a similar pheno- menon was observed all over France, and described by Gassendi, who gave it the name of aurora borealis ; yet neither this, nor any similar appearance posterior to 1574, is described by English writers till the year 1707. From

1621 to 1707, indeed, there is no mention made of an aurora borealis having been seen at all; and, considering the number of astronomers who during that period were continually scanning the heavens, it might almost be sup- posed that nothing of the kind really made its appear- ance until after an interval of eighty-six years. A small one was seen in November 1707 ; and during that and the following year the same appearances were repeated five times. The next on record is that mentioned by Dr Halley in March 1716, which from its brilliancy attracted universal attention, and was considered by the common people as marking the introduction of a foreign race of princes. Since that time these meteors have been much more frequent, and most of our readers must have seen the brilliant displays within the last few years which have been visible over the whole of Europe.

One singular phenomenon which seems to be connected with the aurora is that of a dark bank of cloud below the arches, and usually just above the northern horizon. Although this appears decidedly darker than the uncovered portion of the sky, it is of so thin a character that stars can be seen through it, as well as through the auroral arches and rays, with but little diminution of brightness, It is, however, quite possible that this cloud is only the somewhat misty open sky near the horizon, which appears darker by contrast with the bright arch above it.

It has been repeatedly affirmed that cracking, hissing, or whizzing sounds have been heard proceeding from the

after sunset, while bright daylight was still remaining.

clouds.

oe polar lights, aud the natives of high latitudes are almost | in these latitudes usually to occur at a height much | unanimous in alleging that this is sometimes the case. | greater than that of ordinary clouds. Dr Richardson’s Scoresby, Richardson, Franklin, Parry, Hood, and later | observations (Franklin and Richardson’s Journey to the observers seem to have listened in vain for such noises, and | Shores of the Polar Sea) seem to show, however, that, in’

it seems that in the intense cold of the Arctic night the | the Arctic regions, the aurora is occasionally seated in a contraction of the ice, or its cleavage under the pressure of | region of the atmosphere below a kind of cloud which approaching tempests, produces sounds exactly such as are | is known to possess no great altitude, namely, that modi-

! described. Still, mere negative evidence must be received | fication of cirro-stratus which, descending low in the ! with caution, and it is very possible that in high latitudes | atmosphere, produces a hazy sheet of cloud over head, or a such sounds may occasionally be heard, since the electric | fogbank in the horizon. Indeed, Dr Richardson is inclined discharge seems to originate near the poles. The aurora, | to infer that the aurora borealis is constantly accompanied

too, seems to vary greatly in height, and in lower latitudes | by, or immediately precedes, the formation of one or other

is usually at such an altitude that audible sounds from it | of the forms of cirro-stratus. On the 13th of November

are quite impossible. Musschenbroeck says that the Green- | and 18th December 1826, at Fort Enterprise, its connec-

land fishers in his time assured him that they had frequently | tion with a cloud intermediate between cirrus and cirro-

l heard noises proceeding from the aurora borealis, and his | stratus is mentioned; but the most vivid coruscations of testimony is confirmed by that of many others. There is | the aurora were observed when there were only a few thin

no @ priort improbability of such sounds being occasionally | attenuated shoots of cirro-stratus floating in the air, or heard, since a somewhat similar phenomenon accompanies | when that cloud was so rare that its existence was only

the brush discharge of the electric machine, to which the | known by the production of a halo round the moon. The

aurora bears considerable resemblance. natives of the Arctic regions of North America pretend to

< ia Numerous observers (ature, iv. 27, 47) have attested | foretell wind by the rapidity of the motions of the aurora ;

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the occasional visibility of aurora by daylight. In the Transactions of the Royal Irish Academy, 1788, Dr H. Ussher notices that aurora makes the stars “flutter” very much in the telescope, and states that, having noticed this effect strongly one day at 11 a.m., he examined the sky, and

and they say that when it spreads over the sky in a uniform sheet of light, it is followed by fine weather, and that the changes thus indicated are more or less speedy, according as the appearance of the meteor is early or late in the evening,—an opinion not improbable, when it is recollected

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that certain kinds of cirro-stratus are also regarded by meteorologists as sure indications of rain and wind. Dr Richardson frequently observed the lower surface of nebulous masses illuminated by polar lights,—a fact illus trative of the comparatively low situation of these aurore. Biot, also, in the island of Unst, observed many aurore that could not be higher than the region of clouds. ‘ir John Franklin in like manner observed low aurore. ‘Ehe important fact,” says he, “of the existence of the aurora at a less elevation than that of dense clouds was evinced on two or three occasions this night (13th February 1821, at Fort Enterprise), and particularly at 11 hours 50 min., when a brilliant mass of light, variegated with the prismatic colours, passed between a uniform steady dense cloud and the earth, and in its progress completely concealed that portion of the cloud which the stream of light covered, until the coruseation had passed over it, when the cloud appeared as before.” Captain Parry, as stated in his third voyage, observed auror near to the earth’s surface. It is said that while Lieutenants Scherer and Ross and Captain Parry were admiring the extreme beauty of a polar light, they all simultaneously uttered an exclamation of surprise at seeing a bright ray of the aurora shoot suddenly down- ward from the general mass

of light, and between them and the land, which was only 3000 yards distant. The ray or beam of the polar light thus passed within a distance of 3000 yards, or less than 2 miles, of them. Further, Mr Farquharson observed in Aberdeenshire an aurora borealis not more than 4000 feet above the level of the sea. Fitzroy believed that aurora in northern latitudes indicates and accompanies stormy weather at a distance, and that straining and cracking of the ice may cause the hissing and whizzing sounds. : ;

M. Silbermann (Comptes Rendus, Ixviii. p. 1051) notes facts which strongly confirm the connection of aurora with some form of cirrus cloud He says (of the aurora of 15th April 1869),—“ At 11 hours 16 min. the pheno- menon disappeared in a singular fashion. It appeared as if the columns of the aurora were still visible, but the stars were hidden, and it soon became obvious that fan-like cirrus clouds, with their point of divergence in the north, had taken the place of the aurora. Between 1 and 2 in the morning these clouds had passed the zenith, and let fall a very fine rain. On stretching out the back of the

hand one felt a pricking of cold, and now and then there:

were minute scintillations in the nearest strata of air, like a hail of tiny crystals of ice, which afterwards turned to a rain of larger and larger drops. At 4 o’clock in the morn- ing the cirrus of the false aurora was still visible, but deformed towards the top, and presenting a flaky aspect. One interesting point is, that the cirrus never appeared to replace the aurora either from the right or the left, but to substitute itself for it, like the slow changes of a dioramic view.” “I had previously observed a fall of small ice crystals on the 30th April 1865. At 6 P.m. Paris seemed enveloped in a cirrus of vertical fibres, recall- ing those of amianthus, and more or less wavy. It was a rain of little sparkling prisms. At the same time I heard a rustling or crepitation, and on extending my hand I felt a pricking sensation of cold, and distinguished the crystals which fell and melted immediately.”

In a later memoir (/bid., p. 1120) he remarks that many storm-clouds throw out tufts of cirri from their tops, which extend over a great portion of the sky, and resolve them- selves into a very fine and cold drizzle, which frequently degenerates into a warmer and more abundant rain. Usually the fibres are more or less sinuous, but in much rarer cases they become

perfectly rectilinear, and surround the cloud like a glory, and occasionally shine with a sort of phosphorescence, As an illustration he quotes his obser-

AWRORG

vations on the night of the 6th September 1865 :—“A stormy cloud was observed about 11 p.m. in the N.N.W,,

and lightning was distinctly visible in the dark cumulous mass.

Around this mass extended glories of a phos- phorescent whiteness, which melted away into the darkness of the starry sky. Round the cloud was a single and unin- terrupted corona, and outside this, two fainter corone broken by rifts which corresponded with each other, After the cloud had sunk below the horizon the glories were still visible. The light could not have been due to the moon or any foreign cause. The rays showed great mobility, and a sort of vibration intermediate between

that of the aurora and the ‘ brush discharge’ of the electric

machine.” He goes on to say that—

‘‘Tuminous clouds have been frequently observed. There are many examples in Gilbert’s Annals, and we may recall also the observations of Becaria, Deluc, the Abbé Rozier, Nicholson, and Colla. Mists also are occasionally luminous, as, for instance, that observed by Dr Verdeil at Lausanne in 1758, and by Dr Robinson in Ireland.”

A still more curious fact is mentioned by Sabine, who, during his magnetic survey, anchored some days at Loch Scavaig in Skye. This loch is surrounded by high and bare mountains, one of which was nearly always enveloped in a cloud, resulting from the vapours which almost constant west winds brought from the Atlantic. This cloud at nights was permanently self-luminous, and Sabine frequently saw rays similar to those of the aurora. He

entirely repudiates the idea that the rays could be due

to aurore beyond the mountain, and is sure that these

phenomena, whatever their nature, were produced in the .

cloud itself.

Silbermann asserts that aurore are preceded by the same general phenomena as thunderstorms, and concludes that everything had happened as if the aurore of 1899 and 1869 had been storm-clouds, which, instead of burst- ing in thunder, had been drawn into the upper parts of the atmosphere, and their vapour being crystallised im tiny prisms by the intense cold, the electricity had become luminous in flowing over these icy particles, This view is very strongly supported by the observation of Professor Piazzi Smyth that the monthly frequency of aurora varies inversely with that of thunderstorms. The following are his numbers of relative frequency, the means of all observa- tions of the Scottish Meteorological Society prior to 1871 —

Lightning. Aurora.

MeN UA Pe ccecas sees ce 24:0 29°7 HGRBGIYS 65 …02<. 222s ssecnes 14-4 42°5 MWCATC hee cece ccacstiscocee neces 7:0 35:0 HAGE cen csn< wasaee-eeoueetensss 15-4 27°5 May 37°4 4°8 June 48°0 0°0 a nr 0-5 JSTOR Weaaaner panne sabenarsesceaee 38'4 12°6 NSi@jet 207] C181? ~~apeeonaenscaaascoe canon 22°4 36°6 Wctoleenee. see. 22.5 eee 20°8 49°4 INOv@Mmmber .o……2~~.-ce0csess+ eos 15°0 32°4 Weeentbetie ns. .c.22-2+s-rec0n-2: 15°0 28°8

Mean of whole year… 24°0 20°1

It must, however, be remembered that the observed frequency of aurore is much affected in Scotland by the continuous twilight during the summer months. If there be this connection between thunder-clouds and aurore, it is not improbable that the “dark segment” is sometimes 4 real cloud or mist, situated at a height where the density of the air is too great for luminous discharge; and m several cases Silbermann has seen auroral rays rise from small clouds, which gradually melted entirely away, or left a small non-

luminous nucleus when their electricity was discharged. j ! If, as would certainly be the case in a mist, any portion

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of the auroral light is reflected, whether it be its own or derived from some other body, it should be polarised ; but so far polariscope observations are deficient, and give no certain information. It is difficult to separate the proper polarisation of the aurora from the mere atmospheric polari- sation of the sky. Mr Ranyard, who appears to have used a double-imaged prism and Savart during the great aurora of Feb. 4, 1872, and also to have made some observations on that of Nov. 11, 1871, did not detect polarisation. On the other hand, Prof. Stephen Alexander, in his report on his expedition to Labrador (App. 21, U. S. Coast Survey Rep., 1860), found strong polarisation with a Savart, and, singularly enough, thought it strongest in the dark parts of the aurora. ‘The observations were made in lat. about 60°, in the beginning of July, and near midnight, but he does not state whether there was twilight or any trace of air polari- sation at the time, nor docs he give the plane of polarisation.

With regard to the height of aurore, Sir W. R. Grove (Nature, vol. iii. p. 28) states that he saw an aurora some years ago at Chester in which the rays came between him and the houses; and Mr Ladd observed a similar case in which the lighthouse at Margate was visible through a ray. The evidence, however, appears strong that aurora is usually at a very great height. Dalton calculated the height of an auroral arch, which was seen as far north as Edinburgh, and as far south as Doncaster, and at most intermediate places, from its apparent aititude, as measured by its posi- tion in relation to the stars as seen from Kendal and War- rington, 83 miles apart. The resulting height was about 100 miles, and the position slightly south of Kendal. An observation at Jedburgh confirmed this, but some taken at Edinburgh placed it above Carlisle at a height of 150 miles.

calculated by other methods. It cannot well be objected that such altitudes are beyond the limits of our atinosphere, since Prof. A. 8. Herschel (Wature, vol. iv. 504) gives the height of twenty meteors varying from 40 to 118 miles, with an average of about 70 miles, and it is almost certain that these bodies are rendered incandescent by atmospheric friction, Assuming 0° C. as the temperature at the earth's surface, and the absolute zero, — 273° C., as a minimum for the auroral region, the pressure would be about 0°2 millimetre (0:0078 inch) at a height of 100 kilometres (62 miles) above the earth's surface. This result, of course, assumes a good deal; but if correct, it implies a vacuum attainable with difficulty even with the Sprengel pump. The pressure may, however, be much greater in the path of the auroral beams, since, as Prof. A. S. Herschel suggests, electrical repulsion may carry air or other matter up to a great height. A similar effect is observed in the so-called vacuum tubes, in which the pressure becomes much greater in the narrow central part, while the discharge is passing. It is found that the apparent altitude of the auroral corona is always a little less than that indicated by the dipping needle, owing to the curvature of the lines of magnetic force, or, in other words, because its altitude corresponds with the inclination of the parallel of latitude over which it is actually situated; and Galle has suggested (Pogg. Ann., exlvi. 133), that from this divergence the height may be calculated, and, indeed, gives a series of heights so determined, which do not differ materially from Prof. Newton's. It is, however, doubtful if the position of these corone, and consequently the value of the small angle (not more than 4° or 5°), admit of sufficiently accurate determination for such a use.

| Dalton, however, considered the former reckoning the more) trustworthy. Backhouse has made many calculations, and

Early observers, and especially Mr Canton, conjectured Spectro-

that the aurora was an electric discharge in the rarefied foe ooserva-

considers that the average height of aurore ranges from 50 to 100 miles, and numerous other observers have calculated similar heights. All these observations, however, are liable to the objection, that different observers

may really have seen different arches, of which, as has been remarked, there are often several concentric ones. Itis not likely that this was really the case in most instances, but it has, no doubt, sometimes occurred, and may account for the heights of 500 to 1000 miles calculated by early observers. This difficulty is met by a method proposed by Prof. H. A. Newton (Sill. Jour. of Sc., 2d ser. vol. xxxix. p. 286) for calculating the height by one observation of altitude and amplitude of an arch. It seems almost certain that the auroral arches are ares of circles, of which the centre is the magnetic axis of the earth ; or, at least, that they are nearly parallel to the earth's surface, and probably also to the narrow belt or ring surrounding the magnetic and astro- nomical poles, and passing through Faroe, the North Cape, and the north of Nova Zembla, which Loomis and Fritz have

upper atmosphere, and the resemblance between it and the phenomena exhibited by discharges in an air-pump vacuum confirmed the idea. Recent spectroscopic observations have thrown some little doubt on this conclusion, or at least have shown that there is still a mystery left unexplained. When the light of any glowing gas is analysed by the prism, it is found to consist of a series of coloured lines and bands, of which the number and position is dependent on the nature of the gas, and which is called its spectrum. The light of the aurora gives a spectrum usually consist- ing of a single line in the greenish yellow, which does not coincide with a principal line of any known substance, —a spectrum totally different from those of the gases of the atmosphere. Besides this line there is occasionally visible a sharp line in the red, and several fainter and more refrangible bands. The following tabie includes most of the principal determinations of the auroral lines, which have hitherto been published :—

found to be the region of most frequent aurora. This being WL Ob Mean | Prob] ; ; : Remarks. int assumed, Prof. Newton finds that, d being the distance from — —" wt. [pe the observer to the centre of curvature of the nearest part , ; of this belt (which for England is situated about 75°.N. || (6597 | Forel ee ee ae lat., 50° W. long.), A the apparent altitude of the arch, 2a 14 6350 | Elle ong Coeeenay : : é : : Ty visible 6303, 48°1 its amplitude on the horizon, x its height, R the earth's eae Oettingen 40 radius, and ¢ the distance of the observer from the ends 6300 | C. Piazzi Smyth J of the arch, — earl Angstrom ey > sin. @=sin. d. cos. a cosec. (d h) (1), ae bs +0°92

tan. c =2 sin. h sin. > sec. (2 a eee > 5548 | Oettingen +30 and “=R (sec. c—1). (3). 9) 5545 | Struve | He gives the heights of twenty-eight aurore calculated by 5569 ne oem | ‘i this method, ranging from 33 to 281 miles, with a mean of 5570 Pee 130 miles. The method, of course, rests on the assumption 5578 | Respighi ; ee P en that auroral arches are arcs of circles, but it is decidedly 5579 | C. Piazzi Smyth confirmatory both of this assumption and of the heights 5608: | Hille | J

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of, Mean | Prob. Observer. Remarks. sit, (iOheRare,

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Vogel

Peirce

Alvan Clark

Vogel +9 Peirce

Winlock

C. Piazzi Smyth Lemstrom

Angstrom

Vogel

Oettingen +22 Baekhouse : Barker

Vogel +3 Oettingen 257) Backhouse

5342 +16

5214 +5°4

5161/4+9°7

4984411

Barker

Angstr6m

C. Piazzi Smyth Clark

Barker

4823, +9°3

Broad band some- Vogel what fainter in the middle. +3 C. Piazzi Smyth Barker Angstrom Lemstrom Oettingen +25 Backhouse Peirce Peirce Oettingen Backhouse Clark , ee 4299 +9°3 | Lemstrom C. Piazzi Smyth Lemstrom

4667\+9°8

a Nn a ete er gt at ——————$__—

Vogel remarks that the line at 5569, which is often the only one visible, as well as the faint band at 4667, become noticeably fainter when the red line is visible, while under the same circumstances that near 5189, as well as the red line, is very brilliant. This fact, which has also been noted by other observers, makes it almost certain that the auroral spectrum is not a simple one, but is derived either from two or more sources, or from the same source under very varying conditions. Angstrém says (ature, x. 211)—

“‘1t may be assumed that the spectrum of the aurora is composed of ¢wo different spectra, which, even although appearing sometimes simultaneously, have in all probability different origins. The one spectrum consists of the homogeneous yellow light which is so charae- teristic of the aurora, and which is found even in its weakest mani- festation. The other spectrum consists of extremely fecble bands of light, which only in the

stronger aurora attain such intensity as cnables one to fix their position even approximately. As to the yellow line in the aurora, or the one-coloured spectrum, we are as little able now as when it was first obscrved to point out a corre- sponding line in any known spectrum. Truc, Piazzi Smyth (Comptes Ltendus, Ixxiv. 597) has asserted that it corresponds to one of the bands in the spectrum of hydrocarbons ; but a more exact observa- tion shows that the line falls into a group of shaded bands, which belong to the spectrum, but almost midway between the second and third. Herr Vogel has observed that this line corresponds to a band in the spectrum of rarefied air (Pogg. Ann., exlvi. 582). This is quite true, but in Angstrém's opinion is founded on a pure mis- conception. The spectrum of rarefied air has in the yellow-green part seven bands of nearly equal strength, and that the auroral line corresponds with the margin of one of these bands, which is not even the strongest, eannot be anything else than merely accidental."

Angstrém's own view is that this line is due to fluores- cence or phosphorescence, and he remarks that "since fluorescence is produced by the ultra-violet rays, an electric discharge may easily be imagined, which though in itself

of feeble light, may be rich in ultra-violet rays, and there- fore in a condition to cause a sufficiently strong fluorescence, It is also known that oxygen is phosphorescent, as also several of its compounds." We are, however, just as ignorant of any body which would give such a light by phosphorescence or fluorescence as by ignition, and it seems more probable that the light may be due to chemical action, It is assumed by Angstriém that water vapour is necessarily absent in the higher atmosphere on account of the cold, but when we remember that its molecular weight is lighter than that of oxygen in the proportion of 9 to 16, it is not unlikely that it may attain great elevations under the very low tensions that prevail at such heights, and it is possible also that both it and other bodies may, by electric re pulsion in the auroral beams, be carried up much above the level which they would attain by gravity. If, then, electric discharges take place between the small sensible particles of water or ice in the form of mist or cirrus, as Silbermann has shown to be likely, surface decomposition would ensue, and

it is highly probable that the nascent gases would combine with emission of light. It has been almost proved in the case of hydrogen phosphide that the very character- istic spectrum produced by its combustion is due neither to the elements nor to the products of combustion, but to some peculiar action at the instant of combination, and it is quite possible that, under such circumstances as above described, water might also give an entirely fresh spectrum.

It is, perhaps, proper to mention that H. R. Procter found an apparent coincidence by often repeated direct comparison with a band frequently seen both in air and oxygen tubes, which he eventually succeeded in tracing with tolerable certainty to some form of hydrocarbon. The comparison spectroscopes were only of low dispersion, but on more accurate measurement of the carbon band it was found that, though more refrangible than the first band of citron acetylene (candle-flame), it was still less so than careful measurement assigns to the aurora. In addition, the band was shaded towards the violet, which is not the case with that of the aurora, though with feeble light it seemed like a line.

If, leaving the citron line, we pass on to the feeble spectrum towards the violet, we shall obtain more hope- ful coincidences. Angstrém thinks that three of the bands correspond with the three brightest bands of the violet aurora of the negative pole in rarefied air, and has tried to reproduce the conditions of the aurora on a small scale. He says—

“Into a flask, the bottom of which is covered with a layer of phosphorie anhydride, the platinum wires are introduced, and the air is pumped out to a tension of only a few millimetres. If the inductive eurrent of a Ruhmkorff coil be then sent through the flask, the whole flask will be filled, as it were, with the violet light, which otherwise proceeds only from the negative pole, and from both electrodes a spectrum is obtained consisting chiefly of shaded violet bands. If this spectrum be compared with that of the aurora,

Angstrém thinks the agreement between the former and some of the best established bands of the latter is satisfactory.

Lines. Wave Lengths. according to Barker, 431 470°5 Bo Of the aurora rs Vogel, ie 469°4 5233 spectrum, SS Angstrom, .. 472 521

” Lemstrém, 426°2 469°4 523°5 Mean, 428°6 470°3 §22°6 Of the spectrum of the violet light, 427°2 470°7 = 5227

In the neighbourhood of the line 469°4 Herr Vogel has, more- over, observed two weak light-bands, 466°3 and 462°9 (!). The spectrum of the violet has also two corresponding shaded bands, 465:4 and 460°1. F

“Should the aurora be flamy, and shoot out like rays, there 1s good reason for assuniing a disruptive discharge of electricity, and then there ought to appear the strongest line in the spectrum of the air, the green, whose wave-length is 500°3. Precisely this has actually been observed by Vogel, and has, morcover, been seet

by Angstrém and others. Finally, should the aurora be observed as it appears at a less height in the atmosphere, then arc recognised both the hydrogen lines and also the strongest of the bands of the dark-banded air-spectrum. There are found also again nearly all the lines and light-bands of the weak aurora spectrum whose posi- tion has with any certainty been observed.”

With regard to the red line, which is sometimes perfectly sharp and well defined, and occasionally, though very rarely, even as bright as the citron line, scarcely even a plausible theory has been hazarded. ‘That it is not the C line of hydrogen is certain, as they have been directly compared, and are widely separated; and none of the air lines near its position are at all comparable to it in brightness. Vogel thinks it may “correspond with the first system of lines in the spectrum of nitrogen (6620 to 6213), and that probably only the bright part of this group of lines is visible on account of the extreme faint- ness of the aurora.” This, however, cannot be the case, since the present writer has seen it both bright and sharp. Vogel points out that the line near 5189 closely corresponds to an oxygen line of that wave-length which is bright and constant under very different conditions of pressure and temperature. He states that the faint line near 6390 corresponds in like manner to a nitrogen line. He points out that, though the correspondences with the iron lines are very striking, but little weight can be laid on the fact, since many of the brightest lines of the iron spectrum do not appear. The following table gives the principal iron lines (Thalén) and

the auroral ones; and it will be seen that the former are so abundant that coincidences could scarcely fail :—

Tron. Brightness. Aurora, | Iron. Brightness. Aurora.| Iron. Brightness. Aurora.

6490 6 5546 10 5167 8 5161 6399 10 5429 10 5139 8

6300 6 6803 | 5405 8 5051 8 6245 8 | 5403 8 5049 8

6230 8 5396 8 4957 10 4984 6190 8 5392 8 4920 10 6136 8 53871 10 4918 8

6065 8 5346 8 5342 | 4890 10

5658 10 5339 8 4871 8 5614 10 5327 10 4870 8 4823 5602 10 5323 8 4415 10 4667 5597 10 5283 8 4404 10 5591 8 5269 10 4383 10 5586 10 5268 10 4325 10 5575 8 5266 8 4307 10 4299

5572 10 §232 10 4271 10 5569 8 5569 | 5226 10 5214 | 4251 10

5545 10 5192 8 4250 10

Angstrom asserted some years since that he had detected the principal line of the aurora in the spectrum of the zodiacal light, but he appears to have been misled by a faint aurora, for more recent observers, and notably Prof. C. Piazzi Smyth, Mr Backhouse, and A. W. Wright (Sill. Jour. of Sc., viii. 39), have found that the spectrum of the zodiacal light is continuous and quite analogous to that of twilight or faint starshine, and polariscope observations prove that it is mostly reflected. The very faint line positioned by Alvan Clark at 5320 has been said by Winlock to coincide with the principal coronal line 5322. The position of the auroral line is uncertain; and even if it were accurate, a single doubtful coincidence with a faint line is not the least proof of identity.

We have already remarked the manifest relation between the forms and position of aurore and the earth’s lines of magnetic force, and in addition to this have noted the disturbance of the magnetic needle during auroral dis-

plays. It is not, however, at such times only that the magnetic elements are subject to variation; the total force, declination, and inclination, all are constantly varying both regularly with the hours of the day and the seasons of the year, and irregularly at uncertain times, The irregular

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oscillations when violent are called magnetic storms, and it must be noted that auroral display never takes place except during such disturbances, although a large propor- tion of the most remarkable magnetic storms are unaccom- panied by visible auroree.

Franklin, who was one of the first observers of this relation (at Fort Enterprise, 64° 30’ N., 113° 10’ W.), says of the magnetic needle,—‘ The motion communicated to it was neither sudden nor vibratory. Sometimes it was simultaneous with the formation of arches, prolongation of beams, or certain other changes of form or action of the aurora. But generally the effect of these phenomena upon the needle was not visible immediately, but in about half an hour or an hour the needle had attained its maximum of deviation. From this its return to its former position was very gradual, seldom regaining it before the following morning, and frequently not until the afternoon, unless it was expedited by another arch of the aurora operating in a direction different from the former one.”

‘*‘The arches of the aurora,” he adds, ‘‘ most commonly traverse the sky nearly at right angles to the magnetic meridian, but devia- tious from this direction, as has already been stated, were not rare; and I am inclined to consider that these different positions of the aurora have considerable influence on the direction of the needle. When an arch was nearly at right angles to the magnetic meridian, the motion of the needle was towards the west. This westward motion was still greater when one extremity of the arch bore 301°, or about 59° to the west of the magnetic north, that is, when the extremity of the arch approached from the west towards the magnetic north. A westerly motion also took place when the extremity of an arch was in the true north, or about 36° to the west of the magnetic north, but not in so great a degree as when its bearing was about 301°. A contrary effect was

produced when the same eud of an arch originated to the southward of the magnetic west, viz., when it bore from 245° to 234°, and of course when its opposite extremity approaclied nearer to the magnetic north. In these cases the motion of the needle was towards the east. In one case only a complete arch was formed in the magnetic meridian, in another the beam shot up from the magnetic north to the zenith ; and in both these cases the needle moved towards the west.

‘*The needle was most disturbed on February 13th, v.M., at a time when the aurora was most distinctly seen passing between a stratum of clouds and the carth, or at least illuminating the face of the clouds opposed to the observer. ‘This and several other appear- ances induced me to infer that the distance of the aurora from the earth varied on different nights, and produced a proportionate effect on the needle. When the light shone through a dense hazy atmo- sphere, when there was a halo round the moon, or when a small snow was falling, the disturbance was generally considerable; and on certain hazy, cloudy nights the needle frequently deviated in a considerable degree, although the aurora was not visible at the time. Our observations do not enable us to decide whether this ought to be attributed to an aurora concealed by a cloud or haze, or entirely to the state of the atmosphere. Similar deviations have been observed in the day-time, both in a clear and cloudy state of the sky, but more frequently in the latter case. An aurora sometimes approached the zenith without producing any change in the position of the needle, as was more generally the case ; whilst at otler times a considerable alteration took place although the beams or arches did not come near the zenith. The aurora was frequently seen without producing any perceptible effect on the necdle. At such times its appearance was that of an arch, or an horizontal stream of dense yellowish light, with little or no internal motion. The dis- turbance in the needle was not always proportionate to the agitation of the aurora, but it was always greater when the quick motion and vivid light were observed to take place in a hazy atmosphere. Ina few instances the motion of the needle was observed to eommence at the instant a beam darted upwards from the horizon; and its former position was more quickly or slowly regained according to circumstances. If an arch was formed immediately afterwards, having its extremities placed on opposite sides of the magnetic north and south to the

former one, the return of the needle was more speedy, and it generally went beyond the point from whence it first started.”

Speaking of the aurora of May 13, 1869, M. Lamont of Munich says (Comptes Rendus, \xviii. 1201)-—

“1. During 40 years I have only scen seven or eight aurore at

Munich, and this small number is insufficient for a study of the characters of the phenomenon.

“2, Aurore, whether visible at Munich or not, are always acconipanied by magnetic perturbations,

“©3. In the perturbations of declination which I have observed for 28 years, I have been unable to recognise any general law. ;

‘© 4. The perturbations of horizontal intensity commence 1n general by an inerease of that foree, and finish always by a diminu-

tion, which lasts for two or three days. ; ‘5. In all perturbations there Is a constant relation between

changes of inclination and the simultaneous changes of horizontal intensity, such that an augmentation of intensity of Youur corre- sponds to a diminution of inclination of 8°-28 (for Munich).

«¢g, In telegraphic wires we cannot observe the existence of a constant terrestrial current, since the conductivity of the soil is infinitely greater than that of the telegraphic wire, and it is only sudden changes that manifest themselves. In consequence, during

magnetic perturbations in the galvanometer of a telegraphic wire, we only see irregular deflections to right or left, succeeding each other at intervals of a few minutes.

“In 1850 and 1851 we made elcctrical observations from hour to hour, from 7 A.M. to 6 P.M., without being able to see any connection between the atmospheric electricity and the magnetic perturbations. Later I abandoned these observations, beeause the indications of the electrometers depended too much on local and accidental circumstances.”

It should be noted here that the horizontal component of magnetic force varies with the inclination as well as with the intensity of the total force, and the ratio noted above is almost exactly that which would be produced by a change in the inclination alone ; and it would appear as if the actual horizontal force, independent of the inclination, was subject to comparatively little variation. This is not improbable, since variations in the horizontal force could correspond only to electro-magnetic easterly or westerly currents, while changes in declination, inclination, and vertical force might correspond to currents from the mag- netic north and south, which there is reason to believe are most frequent in auroral displays.

To give some idea of the extent of magnetic perturba- tions, we may mention that during the aurora of 13th May 1869, the declination at Greenwich varied 1° 25’, while the vertical force experienced four successive maxima, and the greatest oscillation amounted to 0°04 of its total mean value. The horizontal force at the same time only varied 0-014 of its mean value. During the aurora of the 15th April of the same year the declination at Stonyhurst varied 2° 23’ 14” in nine minutes.

The electric currents produced at such times in telegraph wires, though transient, are often very powerful. Loomis (Stl. Jour., vol. xxxii.) mentions cases where wires had been ignited, brilliant flashes produced, and combustible materials kindled by theirdischarge. It often happens that the ordinary signals are completely interrupted during their continuance.

In addition to the resemblance between the auroral phenomena and those of electric discharges in rarefied gases which we have already mentioned, we have seen that auroral displays are accompanied by marked disturbances both in the direction and force of terrestrial magnetism. This fact is in itself almost proof of their electrical character, and, taken in conjunction with the strong “ earth-currents ” which are at such times produced in lines of telegraph, and with the manifest polarisation of the arches and rays with

regard to the magnetic meridian, may be considered as conclusive that the aurora is some sort of electric discharge. There are still some points with regard to the origin of this electricity which are unexplained, and it is uncertain whether the magnetic disturbance causes the electrical phenomena, or wice versa. It has been shown by Prof. Pliicker that when an electric discharge takes place through rarefied gas in the field of a magnet, it is concen- trated in the magnetic curves, which are the only paths in which it can move without being disturbed by the magnet' This is well shown in De la Rive's well-known experiment, in which an electro-magnet is enclosed in an electric egg. As soon as the magnet is set in action, the discharge, which had before filled the ege, is concentrated into a defined band of light, which rotates steadily round the

magnet,—the direction of its rotation being changed by reversal either of the current or of the polarity of the mag. net. If we suppose that the aurora is an electric discharge passing from one magnetic pole to the other, and following the terrestrial magnetic curves, we shall find that the theory agrees with observed facts even in its lesser details. In these latitudes the magnetic curves are sensibly straight and parallel, and are inclined S.E. atan angle of about 70°

from the perpendicular, and, by the well-known laws of |

perspective, will appear to converge towards this point, as, in fact, the auroral streamers do. The streamers should move from east to west, or from west to east, according as the discharge is from north to south, or vice versa, and, in fact, they are in constant motion. Professor Loomis (Sill. Jour. of Sc., xxxiv. 45) gives a catalogue of forty-six cases of such movement, of which thirty- one were from E. to W. and only fifteen in the opposite direction ; and as part of these apparent motions are due to a real motion from N. to 8., he concludes that the actual motion of the streamers is from about N.N.E. to S.S.W. This would make the north pole the negative electrode, which is most likely usually the case. Prof. Loomis has shown that during auroral displays electrical currents tra- verse the earth's surface in the same general direction, though subject to great variation in intensity

and even to reversal. Waves of magnetic disturbance are also propa- gated in the same direction (ib¢d., xxxii. 318).

With regard to the arches it is evident that they are generally circles concentric to the magnetic pole, and itis very probable that they are analogous to the striz often seen in discharges in rarefied gases. Gassiot, quoted by B. V. Marsh (S2ll. Jour., xxxi. 316, and Roy. Soc. Proc., vol. x. Nos. 38 and 39), describes an experiment with his great Grove's battery of 400 cells, in which the exhausted receiver was placed between the poles of the large electro- magnet of the Royal Institution :—' On now exciting the magnet with a battery of ten cells, effulgent strata were drawn out from the positive pole, and passed along the under or upper surface of the receiver according to the direction of the current. On making the circuit of the magnet and breaking it immediately, the lumincus strata rushed from the positive, and then retreated, cloud following cloud with a deliberate motion, and appearing as if swal- lowed up by the positive electrode." This, as Mr Marsh remarks, bears a very considerable resemblance to the conduct of the auroral arches, which almost invariably drift slowly southward ; and we cannot do better than sum up his theory in his own words :—" The foregoing con- siderations seem to render it probable that the aurora is essentially an electric discharge between the magnetic poles of the earth leaving the immediate vicinity of the north magnetic pole in the form of clouds of electrified matter, which float southward through the atmosphere at a height of 40 miles or more from the earth, sometimes to a distance of more than 30° from the pole; that whilst they are thus moving forward, with a comparatively slow and steady

motion, or sometinies even remaining almost stationary for —

a long time, bright streams of electricity are from time to time suddenly shot out from them in a nearly vertical direction, that is to say, in the magnetic curves correspond- ing to the points from which they originate ; that these curves, ascending toa great height beyond the atmosphere, then bending more and more southward and downward until they finally reach corresponding points in the southern magnetic hemisphere, are the pathways by which the electric currents pass to their destination; and that for several hundred miles from the earth these curves are thus 'traced

throngh space and illuminated with bright electne light ;’ and further, that the magnetism of the earth also causes these luminous currents and the electrified matter

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composing the arch to revolve round the magnetic pole of the earth, giving them the motion from east to west, or from west to east, which the components of the arch are observed to have.”

The principal difficulties and deficiencies of this hypo- thesis, which was first suggested by De la Rive, are that it makes no attempt to account for the origin of such an electrical discharge, and that it is difficult to understand how an electric current can traverse vast spaces of the almost perfect vacuum which must exist at the distance from the earth (many hundreds of miles) which is attained by the magnetic curves, since, in the best vacuums of our Sprengel pumps, discharge will not take place even across the interval of a few centimctres. It is not, however, certain that stellar space is an insulator, and it is possible, moreover, that the auroral currents do not follow the magnetic curves through their whole course, since electric discharge is always in the path of least resistance, and this is modified not only by the magnetic forces, but by atmospheric density, and it is possible that on attaining a certain height the current may proceed horizontally on a stratum of least resistance. It need create no surprise that the discharge is generally invisible in the intermediate zone of low latitudes, since this is well accounted for not only by the large surface over which it is spread at great heights, but because this part of its course is at right angles to the line of sight, while in higher latitudes we look at the streamers almost ‘“ end-on,” and thus have before our eyes a very great depth of luminous gases. It is common enough, too, in discharges in rarefied gases to see the two poles surrounded by luminous aure, while the intermediate space is almost or quite dark, or consists of luminous disks or strise separated by dark spaces. It seems probable that this “glow” discharge in rarefied gases is really a sort of electrical convection, which is propagated comparatively slowly, and from particle to particle; and that the striz are surfaces at which the difference of potential of the moving molecules is so great as to cause

discharge between them, while in the intermediate dark spaces the electric force is carried mechanically and silently by the particles moving in regular currents under the repulsive and attractive forces of electrification. On this hypothesis the auroral discharge becomes comprehensible, since we have only to suppose that the electricity is carried mechanically, as it were, through the vacuous spaces, which, if they contain no matter to conduct electricity, can contain none to impede the motion of the molecules, It is, moreover, by no means certain that the bright rays indicate actual currents. They may simply consist of matter rendered luminous in the arches, and projected by magnetic or electrical repulsion in the curves of magnetic force, since Varley (Roy. Soc. Proc., xix. 236) shows that when a glow discharge in a vacuum tube is brought within the field of a powerful magnet, the magnetic curves are illuminated beyond the electrodes between which the discharge is taking place as well as within the path of the current; and also that this illumination is caused hy moving particles of matter, since it deflected a balanced piate of talc on which it was caused to impinge. It has also been shown that in electrical discharges in air at ordinary pressures, while the spark itself was unaffected by the magnet, it was surrounded by a luminous cloud or aura, which was drawn into the niagnetic curves, and which might also be separated from the spark by blowing upon ‘it. It is evident, therefore, that any mechanical force may separate the luminous particles from the electric discharge which produces them.

With regard to the geographical distribution of aurora, Prof. Loomis (Sil. Jowr., xxxi.) has laid down a series of zones of equal auroral frequency, and in Petermann’s Mittheilungen for October 1874, Prof. Fritz has given a

chart embodying the results of his extensive researches on the same subject. He finds, like Prof. Loomis, that the frequency of auroral display does not continue to increase to the pole, but reaches a maximum in a zone which, for the northern hemisphere, passes through the Faroe Islands, reaches its most southern point, about 57°, nearly south of Greenland, passes over Nain on the Labrador coast, then tends northwards, across Hudson’s Bay (60° N. lat.), and through great Bear Lake, and leaves the American con- tinent slightly south of Point Barrow. It then skirts the northern coast of Asia,

reaching its most northerly point, about 76° N., near Cape Taimyr, passing through the north of Nova Zembla, and skirting the N.W. coast of Norway. Not oniy are auroral displays less frequent in Iceland and Greenland than further south, but it is found that while south of this zone aurorze appear usually to the north of the observer, north of it they are generally to the south, and within it, north or south indifferently. South of this lie other zones approximately parallel to it, and of constantly diminishing frequency. That in which the average yearly number of aurore is 100 passes through the Drontheim, the Orkneys, and the Hebrides, and reaches the American coast just north of Newfoundland. South of this the frequency diminishes rather rapidly. At Edin- burgh the annual average is 30, at York 10, in Normandy 5; while at Gibraltar the average is about 1 in ten ycars.

These curves, which Prof. Fritz calls zsochasmen, are nearly normal to the magnetic meridians, and bear a close relation to the curves of equal magnetic inclination, especi- ally with those laid down by Hansteen in 1730, while they noticeably diverge in some places from those of Sabine of 1840. They also approximate to the isobaric curves of Schouw, and Prof. Fritz remarks that the curves of greater frequency tend towards the region of lowest atmospheric pressure. It is not unlikely that there may be such a connection, since Prof. Airy has showed a relation betwecn barometric and magnetic disturbances.

It will be noticed that, eastward from England, the isochasmic curves tend rapidly northward, Archangel being only on the same auroral parallel as Newcastle. Prof. Fritz points out that they bear some relation to the limit of perpetual ice, tending most southward where, as in North America, the ice limit comes furthest south, He also endeavours to establish some connection between the periods of maximum of auroree and those of the formation of ice, and considers ice as one of the most important local causes which influence their distribution. He quotes a curious fact mentioned by several Arctic voyagers, that aurora was most frequently seen when open water was in sight, and usually rather in the direction of the water than of the magnetic north. In this connection it may be well to remind our readers that the water of the Arctic regions is always warmer than the ice fields, and must cause upward currents of dampair. For the southern hemisphere there are not yet

sufficient observations to make any determination of geographical distribution.

With regard to distribution in time Loomis and Fritz Distribu- and Wolf have shown that there are periodical maxima tion in

about every ten or eleven years, and that these maxima coincide both with those of sun spots, and of magnetic disturbance. The following are Fritz and Wolf's dates of maxima :—

Sun Spots. Aurore. Sun Spots. Aurore.

1706 1707 1788 1788 1718 1721 1804 1804 1728 1728 1817 1816 1739 1738 1830 1830 1756 1749 1837 1839 1761 1760 1848 1848 1770 1769 1860 1860 1779 1779 1871 1872

spot area since 1776.

98

The annexed chart from Prof. Loomis's paper (Sil. Jour., April 1873) shows, in a very striking manner, the correspondence of aurore, magnetic variation, and sun-

It is not improbable that there may

also be changes of longer period which our observations are yet insufficient to determine.

Annual diss tribution.

Meteoric hypothesis.

40 = 40

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Diagram showing Correspondence of Aurore, Magnetic Variation, and Sun Spots.

Tt has frequently been stated that the aurora returned periodically on certain days in the same manner as metcors. On the 3d of February brilliant aurorz occurred in 1750 and 1869, and on the 4th in 1869, 1870, 1871, 1872, 1873, and 1874; on the 13th February in 1575, 1821, 1822, 1865, and 1867 ; on the 6th March in 1716, 1777, 1843, 1867, and 1868; on the 9th September in 1776, 1827, 1835, 1866, 1868, 1872, and on the 29th in 1828, 1840, 1851, 1852, 1870, and 1872. This conclu- sion, however, is not supported by systematic investigation. A considerable catalogue of auroree was divided into decen- nial periods, and it was found that the maxima of one period rarely coincided with those of others, and that the larger the number of years taken into account the less prominent the maxima appeared,—evident proof that they were only accidental. It may be, however, that if only prominent aurore had been considered, more periodicity might have been found, or that the periodicity is constaut for very short periods only.

Although no daily periodicity can be affirmed, there are two well-marked annual maxima in March and October, of which the latter is the greater, and two minima—the greater in June and the less in January. In this respect the aurora differs from the sporadic meteors, which have a maximum in autumn and a minimum in spring. It also differs from meteors in the hours of its appearance, the former being most frequent before and the latter after midnight.

Although the electric hypothesis is the one generally accepted by scientific men, it is only fair to allude to one that has been recently proposed

independently by Dr Zehfuss (Physikalische Theorie, Adelman, Frankfort) and by H. J. H. Groneman of Groningen (Astronomische Nachrichten, No. 2010-2012). According to this view, the light of the aurora is caused by clouds of ferruginous meteoric dust, which is ignited by friction with the atmosphere. Groneman has shown that these might be arranged along the magnetic curves by action of the earth's magnetic force during their descent, and that their in-

fluence might produce the observed magnetic disturbances, The arches may be accounted for by the effects of perspec- tive on columns suddenly terminated at a uniform height by increase of atmospheric density, while the correspond- ences with iron lines in its spectrum are sufficiently close to favour the idea. Fcrruginous particles have been found in the dust of the Polar regions (E. A. Nordenskiold, Ast, Nach., 1874, § 154), but whether they are derived from stellar space or from volcanic eruption is uncertain. The yearly and eleven-yearly periodicity of aurore tends to support the theory, but it is a formidable difficulty that, while shooting stars are more frequent in the morning, or on the face of the earth which is directed forwards in its orbit, the reverse is the case with aurore. Groneman meets this difficulty by supposing that in the first case the velocity may be too great to allow of arrangement by the earth's magnetic force, and that, consequently, only diffused

-light can be produced. He accounts for its unfrequency

in equatorial regions by the weakness of the earth's magnetic force, and the fact that, when it does occur, the columns must be parallel to the earth's surface. Without pronouncing in favour of this hypothesis, it must be

admitted that it furnishes a plausible explanation of the

phenomenon, although we have no evidence that meteoric dust, even if it exists, would produce the observed spectrum, and, as has been already remarked, the iron coincidences

| are of little weight.

Although we must confess that the causes of the aurora are very imperfectly explained, we may hope that the rapid progress which the last few years have witnessed in bringing terrestrial magnetism under the domain of cosmical laws may soon be extended to the aurora, and that we shall see in it fresh evidence that the same forces which causé hurricanes in the solar atmosphere thrill sympathetically to the furthest planets of our system in waves, not only of light and heat, but of magnetism and electricity.

The following is a list of the most important papers, treatises, and Biblio works on this subject:—Berlin Mem. 1710, i. 131; Halley, Phil. graphy

Trans. 1716, 1719, xxix. 406 xxx. 584; Hearne, Phil. Trans.,xx%

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1107 ; Langworth, Huxham, Hallet, and Callendrini, Phd. Trans. xxxiv. 182, 150; Mairan, 7’raité de lV Aurore Boréale, 17388, 1754; Weidler, De Aurora Boreali, 4to ; Wargentin, Phil. Trans. ALi, 1D: 126, 1752, p. 169, 1753, p. 85; Bergmann, Schw, Abh., 200, 251; Wiedeburg, Ueber dic Nordlichter, 8vo, Jena, 1771; Hiipsch, Unter- suchung des Nordlichts, 8vo, Cologne, 1778 ; Van Swinden, Lccweil de Mémoires, Hague, 1784; Cavallo, Phil. Trans. 1781, p. 329; Wilke, ‘‘ Von den Neuesten Erklaérungen des Nordlichts, Schwed- isches Mus., 8v0, Wismar, 1783 ; Hey, Wollaston, Hutchinson, Frank- lin, Pigott, and Cavendish, Phil. Trans. 1790, pp. 32, 47, 101; Dalton’s Meteorological Observations, 1793, pp. 54, 158 ; Chiminello, ‘6On a Luminous Arch.,’’ Soc. Jtal., vii. 158; Loomis, ‘‘ Electrical and Magnetic Relations,” S722. Jour. 2d ser., xxxii. 824, xxxiv. 34, Sept. 1870; on “Catalogue, Geog. dist., Sun spots,” &c., ibid., 3d ger, v. 245, &c. ; B. V. Marsh, ‘‘ Electrical Theory,” zbid. 3d. ser., xxxi. 311; Oettingen and Vogel on “Spectrum,” Pogg. Ann., cxlvi.

AURUNGABAD, or AvRraNGABAD, a city of India, in the native state of Haidardbdd, or the Niz4m’s dominions, situated in 19° 51’ N. lat., and 75° 21’ E. long., 138 miles from Puna, 207 from Bombay wa Puna, and 270 from Haidardbid. It was founded about the year 1620, under the name of Gurka, by Malik Ambar, an Abyssinian, who had risen from the condition

of a slave to great influence. Subsequently it became the capital of the Moghul conquests in the south of India. Aurungzebe made it the seat of his government during his viceroyalty of the Deccan, and gave it the name of Aurungdbaéd. It thus grew into the prin- cipal city of an extensive province of the same name, stretching westward to the sea, and comprehending nearly the whole of the territory now comprised within the northern division of the presidency of Bombay. Aurungabdd long continued to be the capital of the succession of potentates bearing the modern title of Nizam, after those chiefs be- came independent of Dehli. They abandoned it subse- quently, and transferred their capital to Haidarabad, when the town at once began to decline. It is now greatly fallen from its ancient grandeur. The city is but half- peopled, and is half in ruins, presenting everywhere the melancholy appearances of desertion and decay. The popu- lation is, however, still considerable, and in the bazar, which is very extensive, various rich commodities, particu- larly silks and shawls, are exposed for sale. The walls of the town are similar in their construction to those of all the other cities in this quarter of India, being rather low, with round towers.

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284, 569; Galle and Sirks on “Crown,” @did., exlvi. 138, exlix. 112; Silbermann, Comptes Rendus, Ixvili. 1049, 1120, 1140, 1164 ; Prof. Fritz, ‘‘Gcog. Distrib.,” Petermann’s Mitt., Oct.1874; Zehfuss, Physikalische Theorie, Adelman, Frankfort ; Balfour Stewart, Phil. Mag. 4th ser., xxxix. 59; A. S. Davis, ibid., xleeeos, OC. Piawal Smyth, Ed. Ast. Observations, xiii. R. 85, Phil. Mag., 4th ser., xlix., Jan. 1875; A.S. Herschel, Nat., iii. 6; Sir W.R. Grove and J. R. Capron, ibid., 28°; Webb, Glaisher, &c., ‘‘ Daylight Aurore,” 2bid., 104, 126, 348, 510, iv. 209, &c; Heis, ‘ Auroras at Melbourne,’’ ibid., iv. 213; Prof. C. A. Young, idid., iv. 845 ; Kirkwood, ‘‘ Perio- dieity,” ibid., iv. 505; H. R. Procter, ibid., iii. 7, 346, &e. ; I EK. Chase, ‘On Auroras and Gravitating Currents,” 7cbid., iv. 497; H. A. Newton, ‘‘ Height,” Sidi. Jour. 2d ser., xxxix. 286, 371; Angstrom, Pogg. Ann. (“Jubelband”) and Nat., x. 211 ; J. R. Capron, ‘‘Spectrum,” Phil. Mag., 4th ser., xlix., April Gis: (H.R. py

Dara, a brave and honourable prince, but disliked by the Mussulmans on account of his liberality of thought, had a natural right to the throne.

Accordingly, on the illness of his father, he at once seized the reins of government and established himself at Dehli. The second son, Soojah, governor of Bengal, a dissolute and sensual prince, was dis- satisfied, and raised an army to dispute the throne with Dara. The keen eye of Aurungzebe saw in this conjuncture of events a favourable opportunity for realising his own am- bitious schemes. His religious exercises and temperate habits gave him, in popular estimation, a great superiority over his brothers, but he was too politic to put forward his claims openly. He made overtures to his younger brother Murad, governor of Guzerat, representing that neither of their elder brothers was worthy of the kingdom, that he himself had no temporal ambition, and desired only to place a fit monarch on the throne, and then to devote himself to religious exercises and make the pilgrimage to Mecca. He therefore proposed to unite his forces to those of Murad, who would thus have no difficulty in making himself master of the empire while the two elder brothers were divided by their own strife. Murad was completely deceived by these crafty representations, and at once accepted the offer. Their united armies then moved north- ward. Meanwhile Shah Jchan had recovered, and though Dara resigned the crown he had seized, the other brothers professed not to believe in their father's recovery, and still pressed on. Soojah was defeated by Dara's son, but the imperial forces under Jesswunt Singh were completely

AURUNGZEBE, one of the greatest of the Moghul | routed by the united armies of Aurungzebe and Murad.

emperors of Hindustan, was the third son of Shah Jehan, and was born in October 1618. His original name, Mahomet, was changed by his father, with whom he was a favourite, into Aurungzebe, meaning ornament of the throne, and at a later time he assumed the additional titles of Mohi-eddin, reviver of religion, and Alam-gir, conqueror of the world. At a very early age, and throughout his whole life, he manifested profound religious feeling, perhaps instilled into him in the course of his education under some of the strictest Mahometan doctors. He was employed, while very young, in some of his father's expeditions into the country beyond the Indus, gave promise of considerable military talents, and was appointed to the command of an army directed against the Usbeks. In this campaign he Was not completely successful, and soon after was trans- ferred to the army engaged

in the Deccan. Here he gained several victories, and in conjunction with the famous general, Meer Jumla, who had deserted from the king of Golconda, he seized and plundered the town of HaidarAbad, which belonged to that monarch. His father's express orders prevented Aurungzcbe from following up this success, and, not long after, the sudden and alarming illness of Shah Jehan turned his thoughts in another direction. Of Shah Jehan's four sons, the cldest,

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Dara in person took the field against his brothers, but was defeated and compelled to fly. Aurungzebe then, by a clever stroke of policy, scized the person of his father, and threw him into confinement, in which he was kept for the remaining eight years of his life. Murad was soon removed by assassination, and the way being thus clcared, Aurung- zebe, with affected reluctance, ascended the throne in August 1658. He quickly freed himsclf from all other competitors for the imperial power. Dara, who again invaded Guzerat, was defeated and closely pursued, and was given up by the native chief with whom he had taken refuge. He was brought to Dehli, exhibited to the people, and assassinated. Soojah, who had been a second time defeated near Allahabad, was attacked by the imperial forces under Meer Jumla and Mahomet, Aurungzebe's eldest son, who, however, deserted and joined his uncle. Soojah was defeated and fled to Aracan, where he perished ; Mahomet was captured, thrown into the fortress of Gwalior, and died after scven years' confinement. No similar contest disturbed Aurungzebe's long reign of forty-six years, which has been celebrated, though with doubtful justice, as the most brilliant period in the history of Hindustan. The empire certainly was wealthy and of enormous extent, for there were successively added to it the rich kingdoms of

Bajapore and Golconda, and the barren province of Assam, but it was internally decaying, and ready to crumble away before the first vigorous assault. Two causes principally had tended to weaken the Moghul power. The one was the intense bigotry and intolerant policy of Aurungzebe, which

had alienated the Hindus and roused the fierce animosity of the haughty Rajputs. The other was the rise and rapid growth of the Mahratta power. Under their able leader, Sevaji, these daring freebooters plundered in every direc- tion, nor could all Aurungzebe's efforts avail to subdue them. At the close of the long contests between them, the Moghul power was weaker, the Mahratta stronger than at first. Still the personal ability and influence of the emperor were sufficient to keep his realms intact during his own life. His last years were embittered by remorse, by gloomy forebodings, and by constant suspicion, for he had always been in the habit of employing a system of espionage, and only then experienced its evil effects. He died, on the 21st February 1707, at Ahmadnagar, while engaged on an extensive but unfortunate expedition against the Mahrattas.

AUSCHWITZ, or Oswirctm, a town in Galicia, Austria, on the right bank of the Sola, a tributary of the Wechsel, 33 miles W.S.W. of Cracow. It has a population of up- wards of 3800, and carries on a trade in salt. Previous to the first partition of Poland in 1773, it was the seat of a dukedom, which had been united by Sigismund Augustus with the duchy of Zator in 1564.

AUSCULTATION (auscultare, to listen), a term in medicine, applied to the method employed by physicians for determining, by the sense of hearing, the condition of certain internal organs. The ancient physicians appear to have practised a kind of auscultation, by which they were able to detect the presence of air or fluids in the cavities of the chest and abdomen. Still no general application of this method of investigation was resorted to, or was indeed possible, till the advance of the study of anatomy led to correct ideas regarding the locality, structure, and uses of the various organs of the body, and to the altera- tions produced in them by disease. In 1761 Auenbrugger of Vienna introduced the art of percussion in reference more especially to diseases of the chest. This consisted in tapping with the fingers the surface of the body, so as to elicit sounds by which the comparative resonance of the subjacent parts or organs might be estimated. Auen- brugger's method attracted but little attention, till Corvisart, in 1808, demonstrated its great practical importance ; and then its employment in the diagnosis of affections of the chest soon became general. Percussion was originally practised in the manner above mentioned (cmmeduate per- cussion), but subsequently the method of mediate percus- ston was introduced by Piorry,

and is that now largely adopted. It is accomplished by placing upon the spot to be examined some solid substance named a plexiumeter (stroke-measurer), upon which the percussion strokes are made either with the fingers or with a small hammer tipped with india-rubber. The pleximeter consists of a thin oval piece of ivory ; but one or more fingers of the left hand applied flat upon the part answer equally well, and this is the method which most physicians adopt. Percussion must be regarded as a necessary part of auscultation, particu- larly in relation to the examination of the chest ; for the physician who has made himself acquainted with the uormal condition of that part of the body in reference to percussion is thus able to recognise by the ear alterations of resonance produced by disease. But percussion alone, however important in diagnosis, could manifestly convey only limited and imperfect information, for it could never indicate the nature or extent of functional disturbance, or distinguish between different forms of disease, even in

those organs which it had proved to be in an abnormal condition, while in other eases, and notably in many alfec- tions of the heart, it could afford no assistance whatever. In 1819 the distinguished French physician, Laennee, introduced the method of auscultation by means of the stethoscope (ar7jOos, the chest, and cxorέw, to examine), with which his name stands permanently associated. For some time previously, physicians, more especially in the hospitals of Paris, had been in the habit of applying the ear over the region of the heart for the purpose of listening to the sounds of that organ, and it was in the employment of this method that Laennec conceived the idea that these sounds might be better conveyed through the medium of some solid body interposed between his ear and the patient’s chest. He accordingly, by way of experiment, rolled up a quire of paper into the form of a cylinder and applied it in the manner just mentioned, when he found, as he states, that he was able to perceive the action of the heart more distinctly than he had ever been able to do by the immediate application of his ear. He thence inferred that not merely the heart’s sounds, but also those of other organs of the chest might be brought within reach of the

ear by some such instrument, and he, therefore, had con- _

structed the wooden cylinder, or stethoscope, which bears his name. ‘This consisted of a cylindrical piece of wood, about 12 inches long, with a narrow perforation from end to end, the extremity for applying to the chest having a movable piece of conical form fitting into the cylinder, which was withdrawn by the physician while listening to the sounds of respiration, the complete instrument being used for examining the sounds of the voice and those of the heart. This instrument, though rendered portable by being made to screw into two halves, was inconveniently large and heavy, and was subsequently modified by Piorry to the form now generally used of a thin narrow cylinder of about 7 inches long, with an expansion at one end for applying to the chest, and a more or less flattened surface at the other for the ear of the listener. Having ascertained by carefnl observation the sounds elicited on auscultation of the healthy chest, Laennec studied the modifications of these as produced by disease; and by comparing cases with one another, and especially by investigating the state of the affected parts after death, he was able, in his cele- brated Traité de Auscultation médiate, to lay the founda- tion for a rational system of diagnosis of the great classes of pulmonary and heart complaints. It does not, how- ever, appear to be the case, as Laennec supposed, that mediate auscultation by the stethoscope is superior in an acoustic point of view to immediate auscultation by the unaided ear. On the contrary, sounds are heard louder by the latter than by the former method. Nevertheless, the stethoscope possesses special advantages, among the chief of which are that by its use particular areas can be ex- amined and compared with greater accuracy ; that it can be applied to all parts of the chest, and that it can be used in all cases where, from the sex or the bodily condition of the patient, the direct application of the ear is inadmissible. On the other hand, immediate auscultation is to be preferred in the examination of young children, who are readily frightened by the sight, and still more by the pressure upon them, of the stethoscope.

The whole subject of auscultation has been greatly elaborated since the time of Laennec, and while some of his opinions have been found to require modification, con- tinued investigation only serves more clearly to demonstrate the value of this method of diagnosis, and to elicit fresh and more accurate results from its employment. Although much remains to be done in the way of the correct inter- pretation of the phenomena observed in auscultation, yet the facts already established are among the most important

acquisitions in the whole domain of practical medicine. The numerous diseases affecting the lungs can now be recognised and discriminated from each other with a precision which, but for auscultation and the stethoscope, would have been altogether unattainable, a point which bears most intimately upon the treatment of this great and common class of ailments. The same holds good in the case of the heart, whose varied and often complex forms of disease can, by auscultation, be identified with striking accuracy. But in addition to these its main uses, auscul- tation is found to render great assistance in the investiga- tion of many obscure internal affections, such as aneurisms and ccrtain diseases of the esophagus and stomach. To the accoucheur the stethoscope yields valuable aid in the detection of some forms of uterine tumours, and especially in the diagnosis of pregnancy,—the auscultatory evidence afforded at a particular stage by the sounds of the foetal heart being by far the most reliable of the many signs of that condition. (5. 0. A.)

AUSONIUS, Decmwus Macnvus, a Roman poet of the 4th century, was the son of an eminent physician, and born at Burdigala (Bordeaux) about 310 a.p. His education was conducted with unusual care, either because his genius was very promising, or because the scheme of his nativity, which had been cast by his maternal grandfather, was found to promise great fame and advancement. He made extraordinary progress in classical learning ; and, after completing his studies at Toulouse, he practised for a time at the bar in his native place. At the age of thirty he became a teacher of grammar, and soon afterwards was promoted to the professorship of rhetoric. In this office he acquired so great a reputation that he was appointed pre- ceptor to Gratian, the Emperor Valentinian’s son. The rewards and honours conferred on him for the faithful discharge of his duties, prove the truth of Juvenal’s maxim—that when Fortune pleases she can raise a man from the humble rank of rhetorician to the dignity of consul. He was appointed consul by the Emperor Gratian in the year 379, after having filled other important offices ; for besides the dignity of queestor, to which he had been nominated by Valentinian, he was made preefect of Latium, of Libya, and of Gaul, after that prince’s death. His speech, returning thanks to Gratian on his promotion to the consulship, is a good specimen of high-flown rhetorical

flattery. The time of his death is uncertain, but he was alive in 388, and probably survived till about 394. From references in his works he appears to have been a convert to Christianity.

Of his prose writings, there are extant the Actio ad Gratianum, the Perioche (or summaries) in Iliadem et Odysseam, and one or two of the Epistole. The principal pieccsin versc are the Lpigrammata, some of which are extremely felicitous; the Parentalia and Com- memoratio Professorum Burdigalensium, which give interesting details concerning his relations and literary friends ; the Epistola ; and, finally, the Jdyllia, a collection of twenty small poems, the most famous of which arc the Cento Nuptialis, a selection of obscene lines from Virgil, and the Mosella, a descriptive poem on the river Mosclle, containing some good passages. Ausonius was rather a man of letters than a poet; his wide reading supplied him with materials for verse, but his works exhibit no traces of a true poctic spirit; even his versification, though ingenious, is frequently defec- tive. The best editions of his works are those of Tollius (Amster- dam, 1669), and Souchay (Paris, 1730), and the Bipontine (1785). The Mosella has been edited scparately by Bécking (1828, 1842).

AUSPICIA, See AUGURS.

AUSSIG, AUSSYENAD, or LAaBeM, a town of Austria, in Bohemia, situated in a mountainous district, at the con- fluence of the Bila and the Elbe. It carries on a large manufacture of woollen wares, linen, paper, &c. Its chemi- cal works alone give employment to 500 operatives, and about 600 boats are annually built in its yards. Besides a considerable trade in grain, fruit, mineral-waters, and

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had few of the modern accomplishments.

after, was bought back by the author.

wood, there is a large export of coal from the neighbouring mines. Aussig, once strongly fortified, was destroyed by the Hussites in 1426, burned down in 1583, and captured by the Swedes in 1639. Population, 10,933.

AUSTEN, Jans, one of the most distinguished modern British novelists, was born December 16, 1775, at the parsonage of Steventon, in Hampshire, of which place her father was for many years rector. Her life was singularly

tranquil and void of incident, so that but few facts are

known concerning her from which an idea of her character can be formed. She was tall and attractive in person, and of an extremely kind and gentle disposition. Under her father's care she received a sound education, though she She had a fair acquaintance with English literature, her favourite authors being Richardson, Johnson, Cowper, and Crabbe; she knew French well and Italian slightly, had some taste for music, and was noted for her skill in needlework. She was a particular favourite with all her younger relatives, especially on account of her wonderful power of extem- porising long and circumstantial narratives. At a very early age she seems to have begun to exercise her faculty for composition, and wrote several short tales and frag- ments of larger works, some of which have been found among her papers. These first essays are written in a remarkably pure and vigorous style, and are not unworthy of her later reputation. In 1796 her first large work, Pride and Prejudice, was begun and completed in about

ten mouths ; Sense and Sensibility and Northanger Abbey

were written soon after, during 1797 and 1798. Many

years elapsed before these works were published, for the first attempts to introduce them to the public were badly received. Pride and Prejudice was summarily rejected by Mr Cadell; Worthanger Abbey was sold for £10 to a

Bath publisher, but was never printed, and, many years From 1801 to 1805 the Austen family resided in Bath, they then removed

to Southampton, and finally, in 1809, settled at Chawton. There Miss Austen, who for some years had written nothing, resumed her pen, and began to prepare for publication her early novels. published in 1811, Pride and Prejudice in 1813, Mansfield Parkin 1814, Emma in 1816. These four were anonymous.

Sense and Sensibility was

Northanger Abbey and Persuasion appeared together under Miss Austen's name in 1818, after her death. arly in 1816 her health had begun to give way; her strength gradually declined, and on the 18th July 1817, she died at Winchester, whither she had removed for change of air and scenery. She was buried in the cathedral of that town. Miss Austen's works at the time of their appearance were on the whole well received, and brought her consider- able reputation,—more, indeed, than she had herself antici- pated ; but their full merits were not then so generally re- cognised as they have since been. The novels most popular at that time belonged to the class of which Mrs Radclifie's Udolpho, Godwin's St Leon or Caleb Williams, and Lewis's Monk are the best known representatives. Against this style of fiction Miss Austen from the first set her face ; she had a remarkably keen sense of humour, and the ludicrous aspect of these thrilling incidents, mysterious situations, and unnatural characters, presented itself very strongly to her mind. Northanger Abbey, one of her earliest productions, is a clever and well-sustained parody on romances of this type. She did not, however, confine herself to mere negative criticism, but resolved to show that the interest of readers could be roused and sustained by a story absolutely free from the whole machinery of romance and exaggerated sentiment, but presenting an accurately-drawn picture of quiet, natural life. This task she accomplished with complete success ; she was the first

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to introduee the novel of domestic life, and her writings are still the best specimiens of that class of fiction. It could hardly be expected that such works would become imme- diately popular ; the characters, the motives of action, and the plot itself were too ordinary, one may say too common-place, to appeal strongly to the sympathies of the general mass of readers. Her colours were not showy enough to strike the vulgar eye. It is probable, indeed, that her admirers will always be few in number ; for not only does it require a somewhat cultivated taste to appreeiate the rare skill with which the seanty materials of her tales are handled, but the author's experience of life was so limited that her works are entirely wanting in ecrtain elements—such as depth of feeling and breadth of sympathy—which are indispensable before a work of fiction can exercise any considerable influence on the publie mind.

The framework in nearly all Miss Austen's novels is the same, taken as they are from ordinary English middle-class life ; her characters are in no way distinguished by any remarkable qualities, they are such persons as one would readily expect to meet in every-day life ; the plot is exceed- ingly simple, and the incidents, never rising above the level of the most common-place occurrences, flow naturally from the characters of the actors. In the hands of most writers such materials would infallibly become monotonous and tiresome ; but from any danger of this Miss Austen is conl- pletely freed by her wonderful power of exciting interest in the "involvements and feelings of ordinary life," and the skill with which, by a series of imperceptible but effective touches, she discriminates her characters, rounds them off, and makes them stand out from the canvas real and living personages, Her gallery of portraits is certainly small, and the same character appears over and over again, but each figure is so distinctly drawn, and has such marked individuality, that one is never struck with a sense of repetition. A warm admirer of her works, Archbishop Whately, has compared them to the carefully-executed pictures of the Dutch school ; perhaps the analogy of miniature painting, suggested by the author herself, is more happy and expressive.

Miss Austen's life has been written by her nephew, Rev. J. Austen-Leigh (1870, 2d ed., 1871), who has also pub- lished some extracts from her papers, including a short tale, Lady Susan, written in the form of letters; a

frag- ment of a larger work called Zhe Watsons ; the first draft of a chapter in Persuasion ; and the beginning of a novel, on which she was engaged at the time of her death.

AUSTERLITZ, a small town of Moravia, 12 miles E.S.E. of Briinn, containing a magnificent palace belonging to the prince of Kaunitz-Rietberg, and a beautiful church. It has been rendered memorable by the great victory ob- tained in its vicinity, on the 2d December 1805, by the French under Napoleon, over the united forces of Austria and Russia under their emperors. Population, 3450.

AUSTIN, Joun, one of the ablest English writers on jurisprudence, was born on the 3d March 1790. At an early age he entered the army, and passed five years in military service. He then retired, applied himself to the study of law, and was ealled to the bar in 1814. His powers, though admirably adapted for grasping the funda- mental principles of law, were not of a nature to render him successful in legal practice. His health, too, was delicate, and in 1825 he resigned aetive employment at the bar. In the following year, however, he was appointed to the chair of jurisprudence in the newly-founded London university. He immediately crossed over to Germany to prepare himself for his new duties, and at Bonn beeame acquainted with some of the most eminent German jurists. His lectures were at first attended by a number and a class of students quite beyond his anticipations. Among his

writer, was born in 1793. family of Norwich, several of whose members had distin- guished themselves in the fields of literature and science. She was the youngest child of her family, reeeived a liberal and solid education at home, chiefly from her mother, and had the advantage, too, of enjoying in her father’s house much intellectual society. She grew up a beautiful and cultivated woman, and in 1820 became the wife of John Austin, noticed above. among the familiar visitors of their house were Bentham, the Mills (father and son), the Grotes, Romilly, Buller,

her husband in

hearers were such men as Lord Romilly, Sir G. C. Lewis, and J. S. Mill. were afterwards published, and he has given an admirable account of Austin in his Dissertations (vol. iii) But it soon became apparent that there would be no steady demand for training in the science of law, which, though useful, was not of immediate utility in practiee. stances Austin, who was almost too conscientious in regard to his own work, thought it right to resign the chair in

1832.

Temple also failed, and, as his health was delicate, he retired to Boulogne, where he remained for nearly two years. and discharged the dutics of that offiee most efficiently. The next ten years were spent in travelling on the Con- tinent, as the state of his health hardly permitted him to reside in England. The Revolution of 1848 drove him from Paris, and on his return to England he settled at Weybridge, in Surrey, where he remained till his death in December 1859. the chief work he published was his Province of Jurispru- dence Determined (1832), a treatise on the relation between ethics and law, which gives a clear analysis of the notion of obligation, and an admirable statement of utilitarianism, the ethical theory adopted bythe author. After his death, his widow, Mrs Sarah Austin, published his Lectures on Juris- prudence; or, The Philosophy of Positive Law. These, com- bined with the Province, have been edited, under the same title, by Mr R. Campbell, and reached in 1875 a fifth edition.

From Mill’s notes some of the lectures

Under these cireuni- An attempt to institute lectures at the Inner

In 1837 he acted as royal commissioner in Malta,

Austin wrote one or two pamphlets, but

AUSTIN, Saran Taytor, translator and miscellaneous She was one of the Taylor

They settled in London, and

Sydney Smith, and other eminent men. She accompanied 1827 to Bonn, where they spent some months, and made acquaintance with Niebuhr, Schlegel, Arndt, and other distinguished Germans. She afterwards lived some years in Germany and France, and was left a widow in December 1859. Mrs Austin is best known as a singularly skilful translator of German and French works. In 1832 appeared her version of the Travels of Prince Puckler Muskau. This was followed by Character- istics of Goethe from the German of Falk, History of the Reformation in Germany and History of the Popes from:the German of Ranke, and Dr Carove's Story with- out an End. She contributed "Travelling Letters" and critical and obituary notices to the Atheneum, edited the Memoir of Sydney Smith and her daughter Lady Duff (lordon's Letters from Egypt, and for some years of her widowhood was occupied in arranging for publication her husband's Lectures on Jurisprudence. She was also author of Germany from 1760 to 1814, National Education, and Letters on Girls' Schools. Mrs Austin died at Weybridge in Surrey, 8th August 1867.

AUSTRALASIA, one of the six great geographical divisions of the globe, is situated, as its name indicates, south of Asia, between the equator and 50°8. lat., and 110° and 180° E. long. It eomprises the island-continents of New Guinea, Australia, Tasmania, and New Zealand, and the conterminous archipelagoes of New Britannia, Solomon Islands, New Hebrides, Loyalty Islands, and New Cale- donia which will be treated of under speeial headings.

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Plate II.

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AUSTRALIA

USTRALIA or New Howwanp, the largest island- continent of Australasia, is situated within 10° 47’

and 39° 11’ S. lat., and 113° and 153° 30’ E. long. It measures 2500 miles in length from west to east, by 1950 miles in breadth from north to south, and contains an area of about 3,000,000 square miles—nearly the same as that of the United States of America, exclusive of Alaska. It is surrounded on the west by the Indian Ocean, and on the

east by the South Pacific. In the north it is separated ;

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110 120 EAST of 330 CREENWIEH 140 150 Sketch Map of Australia.

from New Guinea by Torres Strait, which is 80 miles broad, and from the Eastern Archipelago by Arafura Sea; while on the south Bass Strait, 140 miles wide, separates it from Tasmania. The neighbouring colony of New Zealand lies 1200 miles opposite its south-east coast. Owing to its position at the antipodes of the civilised world, Australia has been longer a terra incognita than any other region of the same extent. Its first discovery 1s involved in considerable doubt, from confusion of the names which were applied by the earlier navigators and geographers to the Australasian coasts. The ancients were somehow impressed with the idea of a Terra Australis which was one day to be revealed. The Phoenician mariners had pushed through the outlet of the Red Sea to eastern Africa, the Persian Gulf, and the coasts of India and Sumatra. But the geographer Ptolemy, in the 2d century, still conceived the Indian Ocean to be an Inland sea, bounded on the south by an unknown land, which connected the Chersonesus Aurea (Malay Peninsula) with the promontory of Prasum in eastern Africa. This €rroneous notion prevailed in medieval Europe, although some travellers like Marco Polo heard rumours in China of large ingular countries to the south-east. he investigations of Mr R. H. Major make it appear probable that the Australian mainland was known as “Great hs to the Portuguese early in the 16th century; and 7 € following passage in the Descriptionis Ptolemaice ‘ ppm of Cornelius Wytfliet, printed at Louvain in rae 1s Perhaps the first distinct account that occurs of bh eel — The Australis Terra is the most southern lands, and is Separated from New Guinea by a-

narrow strait. Its shores are hitherto but little known, since, after one voyage and another, that route has been deserted, and seldom is the country visited, unless when sailors are driven there by storms. The Australis Terra begins at one or two degrees from the equator, and is ascertained by some to be of so great an extent, that if it were thoroughly explored it would be regarded as a fifth part of the world.”

It was in 1606 that Torres, with a ship commissioned by the Spanish Government of Peru, parted frorn his com- panion Quiros (after their discovery of Espiritu Santo and the New Hebrides), and sailed from east to

west through the strait which bears his name; while in the same year the peninsula of Cape York was touched at by a vessel called the ‘‘ Duyfhen” or “ Dove” from the Dutch colony of Bantam in Java, but this was understood at the time to form a part of the neighbouring island of New Guinea. The Dutch continued their attempts to explore the un- known land, sending out in 1616 the ship “ Endraght,” com- manded by Dirk Hartog, which sailed along the west coast of Australia from lat. 26° 30’ to 23° S. This expedi- tion left on an islet near Shark’s Bay a record of its visit engraved on a tin plate, which was found there in 1801. The “ Pera” and “ Arnhem,” Dutch vessels from Amboyna, in 1618 explored the Gulf of Carpentaria, giving to its west- ward peninsula, on the side opposite to Cape York, the name of Arnhem Land. The name of Carpentaria was also bestowed on this vast gulf in compliment to Peter Carpenter, then governor of the Dutch East India Com- pany. In 1627 the “Guldene Zeepard,” carrying Peter Nuyts to the embassy in Japan, sailed along the south coast from Cape Leeuwin, and sighted the whole shore of the Great Bight. But alike on the northern and southern sea- board, the aspect of New Holland, as it was then called, presented an uninviting appearance.

An important era of discovery began with Tasman’s voyage of 1642. He, too, sailed from Batavia; but, first crossing the Indian Ocean to the Mauritius, he descended to the 44th parallel of 8. lat., recrossing that ocean to the east. By taking this latter course he reached the island which now bears his name, but which he called Van Diemen’s Land, after the Dutch governor of Batavia. In 1644 Tasman made another attempt, when he explored the north-west coast of Australia, from Arnhem Land to the 22d degree of latitude, approaching the locality of Dirk Hartog’s discoveries of 1616. He seems to have landed at Cape Ford, near Victoria River, also in Roebuck Bay, and again near Dampier’s Archipelago. But the hostile attitude of the natives, whom he denounced as a malicious and miserable race of savages, prevented his see- ing much of the new country; and for half a century after this no fresh discoveries were made.

The English made their first appearance on the Austra- lian coast in 1688, when the north-western shores were visited by the famous buccaneer Captain William Dampier, who spent five weeks ashore near Roebuck Bay. A few years later (1697) the Dutch organised another expedition under

Viamingh, who, first touching at Swan River on the west coast, sailed northward to Shark's Bay, where Hartog had been in 1616. Dampier, two years later, visited the same place, not now as a roving adventurer, but with a commis- sion from the English Admiralty to pursue his Australian researches. This enterprising navigator, in the narrative of his voyages, gives an account of the trees, birds, and reptiles he observed, and of his encounters with the natives. But he found nothing to invite a long stay. There was

yet another Dutch exploring squadron on that coast in 1705, but the results were of little importance.

It was Captain Cook, in his voyages from 1769 to 1777, who communicated the most important discoveries, and first opened to European enterprise and settlement the Australasian coasts. In command of the bark "' Endeavour," 370 tons burden, and carrying 85 persons, amongst whom were Sir Joseph Banks and Dr Solander, returning from the Royal Society's expedition to observe the transit of Venus, Cook visited both New Zealand and New South Wales. He came upon the Australian mainland in April 1770, at a point named after Lieutenant Hicks, who first sighted it, on the shore of Gipps' Land, Victoria, S. lat. 38°, E. long. 148° 53'. From this point, in a coasting voyage not without peril when entangled in the barrier reefs of coral, the little vessel made its way up the whole length of the eastern side of Australia, rounding Cape York, and crossing Torres Strait to New Guinea. In his second expedition of Australasian discovery, which was sent out in 1773, Cook's ship, the " Resolute," started in com- pany with the " Adventure," commanded by Captain Fur- neaux. The two vessels separated, and Cook went to New Zealand, while Furneaux examined some parts of Tasmania and Bass Strait. The third voyage of Cook brought him, in 1777, both to Tasmania and to New Zealand.

Next to Cook, twenty or thirty years after his time, the names of Bass and Flinders are justly honoured for con- tinuing the work of maritime discovery he had so well begun. To their courageous and persevering efforts, begun at their private risk, is due the correct determination of the shape both of Tasmania and the neighbouring continent. The French

admiral Entrecasteaux, in 1792, had made a careful examination of the inlets at the south of Tasmania, and in his opinion the opening between Tasmania and Australia was only a deep bay. It was Bass who discovered it to be a broad strait, with numerous small islands. Captain Flinders survived his friend Bass, having been associated with him in 1798 in this and other useful adventures. Flinders afterwards made a complete survey in detail of all the Australian coasts, except the west and north-west. He was captured, however, by the French during the war, and detained a prisoner in Mauritius for seven years.

The shores of what is now the province of Victoria were explored in 1800 by Captain Grant, and in 1802 by Lieutenant Murray, when the spacious land-locked bay of Port Phillip was discovered. New South Wales had already been colonised, and the town of Sydney founded at Port Jackson in 1788. West Australia had long remained neglected, but in 1837, after the settlement at Swan River, a series of coast surveys was commenced in H.M.S. “Beagle.” These were continued from 1839 to 1843 by Mr Stokes, and furnished an exact knowledge of the western, north-western, and northern shores, including four large rivers.

Inland Exploration.—The geographical position of the Australian continent had now been sufficiently determined, and what remained for discovery was sought, not as hitherto by coasting along its shores and bays, but by striking into the vast tract of terra incognita that occupied the interior. The colony of New South Wales had been founded in 1788, but for twenty-five years its settlers were acquainted only with a strip of country 50 miles wide, between the Blue Mountains and the sea-coast, for they scarcely ever ventured far inland from the inlets of Port Jackson and Botany Bay. Mr Bass, indeed, once while waiting for his vessel, made an attempt to cross the Blue Mountains, and succeeded in discovering the River Grove, a tributary of the Hawkesbury, but did not proceed further. An expedition was also conducted by Governor Hunter along the Nepean

River west of the settlement, while Lieutenant Bareiller, in 1802, and Mr Caley, a year or two later, failed in their endeavour to surmount the Blue Mountain range. This formidable ridge attains a height of 3400 feet, and being intersected with precipitous ravines 1500 feet deep, pre- sented a bar to these explorers' passage inland. At last, in 1813, when a summer of severe drought had made it of vital importance to find new pastures, three of the colonists, Messrs Wentworth and Blaxland and Lieutenant Lawson, crossing the Nepean at Emu Plains, gained sight of an entrance, and ascending the summit of a dividing nidge, obtained a view of the grassy valley of the Fish River. This stream runs westward into the Macquarie, which was discovered a few months afterwards by Mr Evans, who followed its course across the fertile plains of Bathurst.

In 1816 Lieutenant Oxley, R.N., accompanied by Mr Evans and Mr Cunningham the botanist, conducted an expedition of great interest down the Lachlan River, 300 miles to the north-west, reaching a point 34° S. lat., and 144° 30' E. long. On his return journey Oxley again struck the Macquarie River at a place he called Wellington, and from this place in the following year he organised a second expedition in hopes of discovering an inland sea. He was, however, disappointed in this, as after descending the course of the Macquarie below Mount Harris, he found that the river ended in an immense swamp overgrown with reeds. Oxley now turned aside—led by Mr Evans's report of the country eastward—crossed the Arbuthnot range, and traversing the Liverpool Plains, and ascending the Peel and Cockburn Rivers to the Blue Mountains, gained sight of the open sea, which he reached at Port Macquarie. A valuable extension of geographical knowledge had been gained by this circuitous journey of more than 800 miles. Yet its result was a disappointment to those who had looked for means of inland navigation by the Macquarie River, and by its supposed issue in a Mediterranean sea.

During the next two or three years public attention was occupied with Captain King's maritime explorations of the north-west coast in three successive voyages, and by ex- plorations of West Australia in 1821. These steps were followed by the foundation of a settlement on Melville Island, in the extreme north, which, however, was soon abandoned. In 1823 Lieutenant Oxley proceeded to Moreton Bay and Port Curtis, the first place

7° north of Sydney, the other 10°, to choose the site of a new penal establishment. From a shipwrecked English sailor he met with, who had lived with the savages, he heard of the river Brisbane. About the same time, in the opposite direction, south-west of Sydney, a large extent of the interior was revealed. The River Murrumbidgee—which unites with the Lachlan to join the great River Murray—was traced by Mr Hamilton Hume and Mr Hovell into the country lying north of the province of Victoria, through which they made their way to Port Phillip. In 1827 and the two following years, Mr Cunningham prosecuted his instructive explora- tions on both sides of the Liverpool range, between the upper waters of the Hunter and those of the Peel and other tributaries of the Brisbane north of New South Wales. Some of his discoveries, including those of Pandora's Pass and the Darling Downs, were of great practical utility.

By this time much had thus been done to obtain an acquaintance with the eastern parts of the Australian con- tinent, although the problem of what could become of the large rivers flowing north-west and south-west into the interior was still unsolved. With a view to determine this question, Governor Sir Ralph Darling, in the year 1828, sent out the expedition under Captain Charles Sturt, who proceeding first to the marshes at the end of the Mac- quarie River, found his progress checked by the dense mass of reeds in that quarter, He therefore turned westward,

and struck a large river, with many affluents, to which he gave the name of the Darling. This river, flowing from north-east to south-west, drains the marshes in which the Macquarie and other streams from the south appeared to be lost. The course of the Murrumbidgee, a deep and rapid river, was followed by the same eminent explorer in his second expedition in 1831 with a more satisfactory result. He travelled on this occasion nearly 2000 miles, and discovered that both the Murrumbidgee, carrying with it the waters of the Lachlan morass, and likewise the Darling, from a more northerly region, finally joined another and larger river. This stream, the Murray, in the upper part of its course, runs in a north-westerly direction, but afterwards turning southwards, almost at a right angle, expands into

Lake Alexandrina on the south coast, about 60 miles §.E. of the town of Adelaide, and finally enters the sea at Encounter Bay in E. long. 139°.

After gaining a practical solution of the problem of the destination of the westward-flowing rivers, Sir Thomas Mitchell, in 1835, led an expedition northward to the upper branches of the Darling; but the party meeting with a sad disaster in the death of Mr Cunningham, the eminent botanist, who was murdered by the natives on the Bogan River, further exploration of that region was left to be undertaken by Dr Leichardt, nine years later, and by the son of Sir Thomas Mitchell. Meantime, from the new colony of Adelaide, South Australia, on the shores of Gulf St Vincent, a series of adventurous journeys to the north and to the west was commenced by Mr Eyre, who explored a country much more difficult of access, and more forbid- ding in aspect, than the “ Riverina” of the eastern pro- vinces. He performed in 1840 a feat of extraordinary per- sonal daring, travelling all the way along the barren sea- coast of the Great Australian Bight, from Spencer Gulf to King George’s Sound. Mr Eyre also explored the interior north of the head of Spencer Gulf, where he was misled, however, by appearances to form an erroneous theory about the water-surfaces named Lake Torrens. It was left to the veteran explorer, Sturt, to achieve the arduous enterprise of penetrating from the Darling northward to the very centre of the continent. This was in 1845, the route lying for the most part over a stony desert, where the heat (reaching 131° Fahr.), with scorching winds, caused much suffering to the party. The most northerly point reached by Sturt on this occasion was about S. lat. 24° 25°. His unfortunate successors, Burke and Wills, travelled through the same district sixteen years later; and other expeditions were organised, both from the north and from the south, which aimed at learning the fate of these travellers, as well as that of Dr Leichardt. These efforts completed our knowledge of different routes across the entire breadth of Australia, in the longitude of the Gulf of Carpentaria; while the enterprising journeys of Mac- Douall Stuart, a companion of Sturt, obtained in 1862 a direct passage from South Australia northward to the shores of the Malayan Sea. This route has been utilised by the construction of an overland telegraph from Adelaide to the northern coast.

A military station having been fixed by the British Go- vernment at Port Victoria, on the coast of Arnhem Land, for the protection of shipwrecked mariners on the north Coast, 1t was thought desirable to find an overland route between this settlement and Moreton Bay, in what then was the northern portion of New South Wales, now called Queensland. This was the object of Dr Leichardt's expe- dition in 1844, which proceeded first along the banks of the Dawson and the Mackenzie, tributaries of the Fitzroy River, in Queensland. It thence passed farther north to the Burdekin, ascending to the source of that river, and turned westward across a table-land, from which there was

an easy descent to the Gulf of Carpentaria. Skirting the low shores of this gulf, all the way round its upper half to the Roper, Leichardt crossed Armhem Land to the Alli- gator River, which he descended to the western shore of the peninsula, and arrived at Port Victoria, otherwise Port Essington, after a journey of 3000 miles, performed within a year and three months. In 1847 Leichardt undertook a much more formidable task, that of crossing the entire continent from east to west. His starting point was on the Fitzroy Downs, north of the River Condamine, in Queens- land, between the 26th and 27th degrees of S. latitude. But this eminent explorer had not proceeded far into the interior before he met his death, his last despatch dating from tle Cogoon, April 3, 1848. In the same region, from 1845 to 1847, Sir Thomas Mitchell and Mr EB, Ken- nedy explored the northern tributaries of the Darling, and a river in §, lat. 24°, named the Barcoo or Victoria, which flows to the south-west. This river was more thoroughly examined by Mr A. C. Gregory in 1858. Mr Kennedy lost his life in 1848, being killed by the natives while attempting to explore the peninsula of Cape York, from Rockingham Bay to Weymouth Bay.

Among the performances of less renown, but of much practical utility in surveying and opening new paths through the country, we may mention that of Captain Banister, showing the way across the southern part of West Australia, from Swan River to King George's Sound, and that of Messrs Robinson and G. H. Haydon in 1844, making good the route from Port

Phillip to Gipps' Land with loaded drays, through a dense tangled scrub, which had been described by Strzelecki as his worst obstacle. Again, in West Australia there were the explorations of the Arrow- smith, the Murchison, the Gascoyne, and the Ashburton Rivers, by Captain Grey, Mr Roe, Governor Fitzgerald, Mr R. Austin, and the brothers Gregory, whose discoveries have great importance from a geographical point of view.

These local researches, and the more comprehensive attempts of Leichardt and Mitchell to solve the chief prob- lems of Australian geography, must yield in importance to the grand achievement of Mr Stuart in 1862. The first of his tours independently performed, in 1858 and 1859, were around the South Australian lakes, namely, Lake Torrens, Lake Eyre, and Lake Gairdner. These waters had been erroneously taken for parts of one vast horse- shoe or sickle-shaped lake, only some twenty miles broad, believed to encircle a large portion of the inland country, with drainage at one end by a marsh into Spencer Gulf. The mistake, shown in all the old maps of Australia, had originated in a curious optical illusion. When Mr Eyre viewed the country from Mount Deception in 1840, look- ing between Lake Torrens and the lake which now bears his own name, the refraction of light from the glittering crust of salt that covers a large space of stony or sandy ground produced an appearance of water. The error was discovered, after eighteen years, by the explorations of Mr Babbage and Major Warburton in 1858, while Mr Stuart, about the same time, gained a more complete knowledge of the same district.

A reward of £10,000 having been offered by the Legis- lature of South Australia to the first man who should traverse the whole continent from south to north, starting from the city of Adelaide, Mr Stuart resolved to make the attempt. He started in March 1860, passing Lake Torrens and Lake Eyre, beyond which he found a pleasant, fertile country till he crossed the M'Donnell range of moun- tains, just under the line of the tropic of Capricorn. On the 23d of April he reached a mountain in §. lat. nearly 22°, and E. long. nearly 134°, which is the most central marked

oint of the Australian continent, and has been nained Cen- fral Mount Stuart. Mr Stuart did not finish his task on * II. — 14

this occasion, on account of indisposition and other causes. But the 18th degree of latitude had been reached, where the watcrshcd divided the rivers of the Gulf of Carpentaria from the Victoria River, flowing towards the north-west coast. He had also proved that the interior of Australia was not a stony desert, like the region visited by Sturt in 1845. On the first day of the next year, 1861, Mr Stuart again started for a second attempt to cross the continent, which occupicd him eight months. He failed, however, to advance further than one geographical degrec north of the point reached in 1860, his progress being arrested by dense scrubs and the want of water.

Meanwhile, in the province of Victoria, by means of a fund subscribed among the colonists and a grant by the Legislature, the ill-fated expedition of Messrs Burke and Wills was started. It made for the Barcoo, with a view to reach the Gulf of Carpentaria by a northerly course midway between Sturt's track to the west and Leichardt's to the east. The leading men of the party were Mr Robert O'Hara Burke, an officer of police, and Mr William John Wills, of the Melbourne observatory. Messrs Burke and Wills, with two men named Gray and King, left the others behind at the Barcoo on 16th December 1860, and proceeded, with a horse and six camels, over the desert traversed by Sturt fifteen years before. They got on in spite of great difficulties, past the M'Kinlay range of mountains, S. lat. 21° and 22°, and then reached the Flinders River, which flows into the head of the Gulf of Carpentaria. Here, without actually standing on the sea- beach of the northern shore, they met the tidal waters of the sea. On February 23, 1861, they commenced the return journey, having in effect accomplished the feat of crossing the Australian continent. Unhappily, three of the party perished on the road home. Gray, who had fallen ill, died on the 16th of April. Five days later, Burke, Wills, and King had repassed the desert to the place on Cooper Creek (the Barcoo, 8. lat. 27° 40', E. long. 140° 30'), where they had left the depdt, with the rest of the expedition. Here they experienced a cruel dis- appointinent. The depdt was abandoned; the men in charge had quitted the place the same day, believing that Burke and those with him were lost. The main body of the expedition, which should have been led up by a Mr Wright, from Menindie, on the Darling, was miscon- ducted and fata'ly delayed. Burke, Wills, and King, when they found themselves so fearfully left alone and unprovided in the wilderness, wandered about in that district till near the end of June. They subsisted miser- ably on the

bounty of some natives, and partly by feeding on the seeds of a plant called nardoo. At last both Wills and Burke died of starvation. King, the sole survivor, was saved by meeting the friendly blacks, and was found alive in September by Mr A. W. Howitt's party, sent on purpose to find and relieve that of Burke.

Four other parties, besides Howitt's, were sent out that year from different Australian provinces. Three of them, respectively commanded by Mr Walker, Mr Lands- borough, and Mr Norman, sailed to the north, where the latter two landed on the shores of the Gulf of Carpentaria, while Mr Walker marched inland from Rockhampton. The fourth party, under Mr J. M'Kinlay, from Adelaide, made for the Barcoo by way of Lake Torrens. By these means, the unknown region of Mid Australia was simultaneously entered from the north, south, east, and west, and important additions were made to geographical knowledge. Lands- borough crossed the entire continent from north to south, between February and June 1862; and M'Kinlay, from south to north, before the end of August in that year. 'The interior of New South Wales and Queensland, all that lies east of the 140th degrce of longitude, was ex-

amined. The Barcoo and its tributary streams were traced from the Queensland mountains, holding a south-westerly course to Lake Eyre in South Australia; the Flinders, the Gilbert, the Gregory, and other northern rivers water- ing the country towards the Gulf of Carpentaria were also explored. These valuable additions to Australian geography were gained through humane efforts to relieve the lost explorers. The bodies of Burke and Wills were recovered and brought to Melbourne for a solemn public funeral, and a noble monument has been erected to their honour.

Mr Stuart, in 1862, made his third and final attempt to traverse the continent from Adelaide along a central line, which, inclining a little westward, reaches the north coast of Arnhem Land, opposite Melville Island. He started in January, and on April 7 reached the farthest northern point, near S. lat. 17°, where he had turned back in May of the preceding year. He then

pushed on, through a very thick forest, with scarcely any water, till he came to the streams which supply the Roper, a river flowing into the western part of the Gulf of Carpentaria. Having crossed a table-land of sandstone which divides these streams from those running to the western shores of Arnhem Land, Mr Stuart, in the month of July, passed down what is called the Adelaide River of North Australia, Thus he came at length to stand on the verge of the Indian Ocean; “ gazing upon it,” a writer has said, “ with as much delight as Balboa, when he had crossed the Isthmus of Darien from the Atlantic to the Pacific.” The line crossing Australia which was thus explored has since been occupied by the electric telegraph connecting Adelaide, Melbourne, Sydney, and other Australian cities with London.

A third part, at least, of the interior of the whole con- tinent, betwecn the central line of Stuart and the known parts of West Australia, from about 120° to 134° E. long., an extent of half a million square miles, still remained a blank in the map. But the two expeditions of 1873, conducted by Mr Gosse and Colonel Egerton Warburton, have made a beginning in the exploration of this terra incognita west of the central telegraph route. That line of more than 1800 miles, having its southern extremity at the head of Spencer Gulf, its northern at Port Darwin, in Arnhem Land, passes Central Mount Stuart, in the middle of the continent, S. lat. 22°, E. long. 134°. Mr Gosse, with men and horses provided by the South Australian Government, started on April 21 from the telegraph station fifty miles south of Central Mount Stuart, to strike into West Australia. He passed the Reynolds range and Lake Amadeus in that direction, but was compelled to turn south, where he found a tract of well-watered grassy land. A singular rock of conglomerate, 2 miles long, 1 mile wide, and 1100 feet high, with a spring of water in its centre, struck his attention. The country was mostly poor and barren, sandy hillocks, with scanty growth of spinifex. Mr Gosse, having travelled above 600 miles, and getting to 26° 32’ S. lat. and 127° E. long., two degrees within the West Australian boundary, was forced to return. Meantime a more successful attempt to reach the western coast from the centre of Australia has been made by Colonel Warburton, with thirty camels, provided by Mr T. Elder, M.L.C., of South Australia. Leaving the telegraph line at Alice Springs (23° 40’ S. lat., 133° 14’ E. long.), 1120 miles north of Adelaide city, Warburton succeeded in making his way to the De Grey River, West Australia Overland routes have now been found

possible, though scarcely convenient for traffic, between all the widely separated Australian provinecs. In Northern Queensland, also, there have been several recent explorations, with results of some interest. That performed by Mr W. Hann, with Messrs Warner, Tate, and Taylor, in 1873,

related to the country north of the Kirchner range, watered by the Lynd, the Mitchell, the Walsh, and the Palmer Rivers, on the east side of the Gulf of Carpentaria. The coasting expedition of Mr G. Elphinstone Dalrymple, with Messrs Hill and Johnstone, finishing in December 1873, effected a valuable survey of the inlets and navigable rivers in the Cape York peninsula. The Endeavour River, in 8. lat. 16°, which was visited by Captain Cook a hundred years ago, seems capable of being used for communi- cation with the country inland. A newly discovered river, the Johnstone or Gladys, is said to flow through a very rich land, producing the finest cedars, with groves of bananas, nutmeg, ginger, and other tropical plants. The colonial geologists predict that the north-east corner of Australia will be found to possess great mineral treasures. At the opposite extremity of the continent, its south-west corner, a tour lately made by Mr A. Forrest, Government surveyor, from the Swan River eastward, and thence down to the south coast, has shown the poorness of that region. The vast superiority of eastern Australia to all the rest is the most important practical lesson taught by the land-exploring labours of the last half century.

Physical Description.—The continent of Australia, with a circumference of nearly 8000 miles, presents a contour wonderfully devoid of inlets from the sea, except upon its northern shores, where the coast line is largely indented. The Gulf of Carpentaria, situated in the north, is enclosed on the east by the projection of Cape York, and on the west by Arnhem Land, and forms the principal bay on the whole coast, measuring about 6° of long. by 6° of lat. Further to the west, Van Diemen’s Gulf, though much smaller, forms a better protected bay, having Melville Island between it and the ocean; while beyond this Queen’s Channel and Cambridge Gulf form inlets about S. lat. 14° 50’. On the north-west of the continent the coast line is much broken, the chief indentations being Admiralty Gulf, Collier Bay, and King Sound, on the shores of Tasman Land. Western Australia, again, is not

favoured with many inlets—Exmouth Gulf and Shark Bay being the only bays of any size. The same remark may be made of the rest of the sea-board ; for, with the exception of Spencer Gulf, the Gulf of St Vincent, and Port Phillip, on the south, and Moreton Bay, Hervey Bay, and Broad Sound, in the east, the coast line is singularly uniform.

The conformation of the interior of Australia is very peculiar, and may perhaps be explained by the theory of the land having been, at a comparatively recent period, the bed of an ocean, The mountain ranges parallel to the east and west coasts would then have existed as the cliffs and uplands of many groups of islands, in widely scat- tered archipelagoes resembling those of the Pacific. The singular positions and courses of some of the rivers lend force to this supposition. The Murray and its tributaries, the Murrumbidgee, the Lachlan, and the Darling, rising from the mountains on the east coast, flow inwards so far that they were at one time supposed to issue in a central sea. They do, in fact, spend their waters in a large shallow lake; but this is not far from the south coast, and is provided with an outlet to the oceau. The Macquarie and the Lachlan merge in extensive swamps, and their beds in the dry season become a mere chain of ponds. This agrees with the idea that the whole country was a sea-bottom, which has scarcely yet assumed the character of permanent dry land, while another proof consists in the thinness and sterility of the soil in the lowlands.

Along the entire line of the east coast there extends a Succession of mountain ranges from Portland, in Victoria, to Cape York in the extreme north, called in different parts the Australian Grampians, the Australian Alps, the Blue Mountains, the Liverpool Range, and other names. These

constitute, like the Andes of South America, a regular Cordillera, stretching from north to south 1700 miles in length, with an average height of 1500 feet above the sea. The rivers flowing down the eastern slope, having but short courses before they reach the sea, are of a more determined character than those which take a westerly and inland direction. They cut their way through the sand- stone rocks in deep ravines ; but from their tortuous and

violent course, and from the insufficient volume of water, they are unfit for navigation. Very few of them traverse more than 200 miles, inclusive of windings, or pass through any district extending more than 50 miles inland. It is different with the Murray, flowing westward, which has a course of 1100 miles, traversing a space from east to west measuring 8° of longitude. The Murray is navigable during eight months of the year along a great part of its course. This great river, with its tributaries, drains a basin the area of which is reckoned at half a million of square miles. Yet it has no proper outlet to the sea, de- bouching into a lagoon called Lake Alexandrina, on the sea-coast of Encounter Bay. On the opposite or north- western part of the continent there are several important water-courses. One river, the Victoria, which rises some- where about 18° or 19° §. lat. and 131° E. long., flows northward to 15° 30’ S. lat., where it turns westward. Its bed forms a deep channel through the sandstone table- land, with cliffs 300 feet high, while in width it sometimes extends to half a mile, its depth varying from 50 feet to as many fathoms. The Victoria debouches into Cam- bridge Gulf, 14° 14’ S. lat. and 129° 30’ E. long., an estuary 20 miles broad, with a depth of 8 or 10 fathoms. To the westward of this district run two other large rivers, the Prince Regent and the Glenelg, the latter being navi- gable, with a fertile country on its banks. The Roper, a navigable stream in Arnhem Land, has a width of 500 to 800 yards 40 or 50 miles from its mouth, which is at the Limmen Bight in the Gulf of Carpentaria. In the more settled and inhabited provinces of Australia there are the Brisbane, the Fitzroy, and the Burdekin, rivers of Queens- land ; the Glenelg River, of Victoria ; and the Swan River, of West Australia. But this continent cannot boast of a Nile, an Indus, or a Mississippi, and the interior suffers from the want of water communication.

Geology.—The interior plain of Australia, enclosed by the coast mountain ranges, is a vast concave table of sand- stone, with a surface area of 1,500,000 square miles. The sedimentary rock, in some parts, has been washed away or scooped out; but in the opinion of Mr W. H. L. Ranken (Dominion of Australia, 1874), the edges of the plateau, where highest and least reduced by denudation, are actually formed of this sediment. While the southern margin of the plain consists of walls of sandstone cliffs, extending along the sea-coast, the plateau on the east, south-east, the west, and partly on the north, is bordered by terraced ramparts of mountains. These

elevations consist of granite and syenite on the west side, rising from 1000 to 3000 feet in height. On the east side, in New South Wales and Gipps' Land, they rise to a much greater height, attaining 7000 feet at the south-east corner in the Australian Alps. Here, too, the sandstone masses are often violently rent asunder, and mingled with the overflows of igneous matter, forming basalt and trap. On the north side of the con- tinent, except around the Gulf of Carpentaria, the edge of the sandstone table-land has a great elevation; it is cut by the Alligator River into gorges 3800 feet deep.

In examining more particularly the geological structure of eastern Australia, we must take into account the neigh- bouring island of Tasmania. The late Count Strzelecki, author of the first scientific essay upon the subject, in 1845, after minutely describing all the mountain ranges of

New South Wales, passes on to Wilson Promontory, the most southerly point of Australia, whence he looks sea- ward at the islands in Bass's Strait. As he there observes the Tasmanian mountains, with which he is equally familiar, it occurs to him that the whole is the result of identical forces, operating in a direction from north-east to south-west. Such phenomena he ascribes to a series of '' volcanoes of elevation," along a vast fissure of the earth, upon the line regarded by him as "the Australian eastern axis of pertur- bation." These forces he believes to have been exerted, with different degrees of intensity, at four several epochs, which "are indicated by the character of the sedimentary rocks, broken through or contorted by the eruptive greenstone and basalt. That eruptive action is seen in the ravines and precipices of the Blue Mountains near Sydney; in the Grose valley, below Mount Hay and its neighbours, Mount King George and Mount Tomah ; but still more remark- ably in the mountains of Tasmania, viewed from Ben Lomond, within 30 miles of Launceston. The sedimentary deposits of the first epoch are characterised by the presence of mica slate, and of argillaceous and siliceous slate, as well as by the absence of gneiss. Those of the second epoch are found to be arenaceous, calcareous, or argillaceous stratified deposits. The third epoch includes the coal deposits, with their intervening shales and sandstones, including many fossils ; while the fourth and last epoch is marked by the occurrence of elevated peaks,

and by the remains of land animals found in the limestone caves or in alluvial deposits.

The Rev. W. B. Clarke, of Sydney, again, in a revised treatise published in 1871, expresses a doubt whcther the southern range of mountains, extending to Wilson's Pro- montory, be really a continuation of the main Cordillera of New South Wales. He rather considers this to be pro- longed in a westerly direction, taking a bend that way at the Warragong or Snowy Alps, and to be continued within 60 miles of the border of South Australia, which is on the 141st meridian of EK. long. The subject is further dis- cussed by Mr R. Brough Smith, of Melbourne, in his essay of 1872 on the mineralogy and rock formations of Victoria. This geologist has also remarked that the Murray, which must have repeatedly shifted its bed and changed its out- let, may have once been a far more powerful stream, flood- ing a vast tract of the interior,and thus becoming an effective agent in the geological formations of all south-east Aus- tralia. It has produced, in Victoria more especially, the Tertiary stratifications which are equivalent to the Pliocene rocks of Europe. ;

Throughout the whole of eastern Australia, including New South Wales and Queensland, while no tertiary marine deposits have been found, there occur many remarkable beds of siliceous sandstone, bearing impressions of ferns and leaves of trees, which are referred to the Tertiary epoch.

An interesting theory is advanced by Mr Clarke to account for the absence of Tertiary deposits on the eastern coast, when they are found on the western and southern coasts of Australia. In the islands of New Caledonia and other Australasian groups, from the Louisiade, near New Guinea, to New Zealand, there is a repetition of Australian geo- logical formations, and there are abundant Tertiary deposits : and this may confirm the supposition that the Australian continent at some period extended farther to the east, and that a vast portion has disappeared under the ocean. To the same hypothetical cause Mr Darwin ascribes the formation of the Great Barrier Reef, stretch- ing along the east coast from 8. lat. 22° 23' to Torres Strait, with an interval between it and the land varying from 12 to 140 miles.

With regard to the nore remote geological epochs, Aus- tralia presents fewer materials for study than the other

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continents of our globe. Mr Clarke doubts the origin of some of the more aucientslates mentioned in the “first epoch” of Count Strzelecki, and does not find, either in eastern or in southern Australia, sufficient proof that these regions contain azoic and metamorphic rocks. Large masses of granite occur along the coast, and more extensively in Western Australia. Of the lower Paleozoic there is a great deal of Upper Silurian rock in New South Wales and Queensland, and some in Tasmania. It is in the Lower Silurian formation, as Sir Roderick Murchison predicted, that gold deposits are chiefly found. Rocks of the Devonian period are not yet proved to exist anywhere in Australia, and it is doubtful if any true Permian or Trias, so common elsewhere, have been met with in this continent. The great Carboniferous series is very prominent in New South Wales and in parts of Queensland; it prevails less in Victoria. Coal-beds, of thickness varying from 3 feet to 30 feet, are found associated, both above and below, with fossils resembling those of the Carboniferous strata in Ireland. Their antiquity is proved beyond question, in some districts, as in the valley of the Hawkesbury, where they are overlaid with beds of sandstone, shale, and con- glomerate, 1000 feet thick. It has been shown by Mr Daintree that there is a very extensive distribution of the Secondary or Mesozoic rocks in Queensland—the Cretaceous strata, both there and in Western Australia, covering a large area. The Oolitic are more abundant in Western Australia,

The great plains of the interior, and the slopes of the inner mountain ranges, consist largely of deposits of the Tertiary epoch. They occupy an immense area in Victoria and New South Wales, including the Riverina district, which was probably, as Mr Brough Smith considers, levelled and planed down by the ancient vast expansion of the Murray. ‘The waves of the sea,” he remarks, “and the waters of this river, have eaten away mountains of granite and great hills of schist in past times, and placed instead of them a smooth covering of sands and clays.” The great basin east of Port Phillip, connected with another basin about Westernport, is underlaid with

Mesozoic carbonaceous rocks, upper Miocene, a nodular basalt, and decomposed amygdaloid of older volcanic origin, the quartzose drift of the first Pliocene formations, and some volcanic products of more recent date. Here the Miocene beds abound with fossil leaves of plants belonging to that age. The sands, clays, and gravels of later periods, in the ancient beds of the streams within the Silurian areas, are more or less auriferous. Some of the deeper “leads” of the gold-miner contain fossil fruits and the trunks and branches of trees, which are described by Baron von Miiller in the Melbourne official reports of the mining surveyors. In the Ballarat gold-fields the auriferous quart- zose gravels are overlaid by flows of lava and vesicular volcanic rocks, while in a neighbouring district south of Ballarat, pebbles and sand are cemented by ferruginous matter into an extremely hard conglomerate.

In eastern Australia, where no Tertiary marine deposits are met with, there are deep accumulations of drift, such as transmuted beds of the Carboniferous formation, porphyry, and basalt, and other igneous rocks, and fragments of the older Paleozoic strata. Many of the drift streams are not only highly auriferous, but contain gems of all kinds. Diamonds, though of small size, have been taken from the Cudgegong River, near Mudgee, in New South Wales, and likewise from the Macquarie River.

In the eastern plains of the interior, embedded in black muddy trappean soil, are found the bones of enormous animals of the marsupial or kangaroo order, as well as birds, fishes, and reptiles. The accumulations of bones caverns at Wellington, New South Wales, and on the rivers Colo, Macleay, and Coodradigbee, are of great intcrest.

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A femur bone of the dinornis, the gigantic extinct bird of New “Zealand, has been discovered in the drift on Peak Downs in eastern Australia, at the depth of 188 feet ; and this would lead to the belief that land once existed where now the Pacific Ocean separates by a thousand miles two countries of Australasia, whose present animal and vege- table races have so little in common.

Minerals.—The useful and precious metals exist in considerable quantities in each of the five provinces of Australia. New South Wales has abundance of gold, copper, iron, and coal, as well as silver, lead, and tin. The mineral riches of Victoria, though almost confined to gold, have been the main cause of her rapid progress. South Australia possesses the most valuable copper mines. Queensland ranks next to the last-named province for copper, and excels her neighbours in the production of tin, while gold, iron, and coal are also found in considerable quantitics. In Western Australia mines of lead, silver, and copper have been opened ; and there is much ironstone.

The discovery of gold in New South Wales and Victoria took place in 1851, and during the next twenty years Vic- toria exported 40,750,000 oz. of the precious metal, while New South Wales, from 1851 to 1871, exported nearly 10,000,000 ounces. The Queensland gold mines, since 1860, have displayed increasing promise; up to the end of 1872 they had yielded rather less than 1,000,000 ounces; but much was expected, at a more recent date, from the Palmer River and other districts of the north. The yearly value of the aggregate gold exports of Australia, on the average of fifteen years, has been £10,000,000. Vic- toria alone has produced gold to the value of £170,000,000. The alluvial gold-fields, in which the early diggers, with the simplest tools, obtained for a short time large quantities of the coveted ore, seem now to be mostly exhausted. It is in the quartz formations of the mountain ranges, or in those at a great depth underground, reached by the sinking of shafts and regular mining operations, that Australian gold is henceforth to be chiefly procured. There are mines in Victoria 1000 feet deep, as at Clunes, and many others from 300 to 600 feet.

The copper mines of Burra Burra, in South Australia, proved very profitable some twenty-five years ago, yielding in a twelvemonth ore to the value of £350,000, and the Moonta mines, in 1872, were scarcely less productive. The province of South Australia, in that year, exported copper to the amount of £800,000. Queensland, in 1873, produced one-fourth that quantity. Tin, an article of great, mercantile interest, is divided between Queensland and New South Wales in a frontier district, two-thirds of the extent of which belongs to the Darling Downs, within the last-mentioned province. There is a little tin, also, in some parts of Victoria. Lead, silver,

and cinnabar have been obtained not only in New South Wales, but likewise in Western Australia.

The abundance of good iron ore, in convenient vicinity to thick beds of excellent coal, ensures a future career of manufacturing prosperity to New South Wales, and not less to Queensland. ‘The country north and south of Syd- ney, and west of that city 100 miles inland to the dividing range of mountains, is all of Carboniferous formation. At the mouth of the Hunter River, from the port and town of Newcastle, coal was exported in 1873 to the value of £1,000,000 sterling, The collieries there taken up have an extent of 35,000 acres, but the area of the coal-field is Officially estimated at 10,000,000 acres, and the seams are 9 feet to 11 feet thick. The quality of this coal is said to be equal to that of Great Britain for most furnace pur- poses, and it is generally used by steamships in the Pacific and Chinese navigation. Next in importance are the Wollongong collieries, south of Sydney, and those of

Hartley, Maitland, and Berrima, now connected by railway with the capital.

In each of the places above named there is iron of a superior quality, the working of which to advantage cannot be long delayed. On the Illawarra coast it is found close to the finest bituminous coal, and to limestone. The iron of New South Wales is mostly hematite, and the ironstone contains from 60 to 70 per cent. of ore.

Among other mineral products of the same region are cannel coal and shale yielding kerosene oil. This is a re- cognised article of export from New South Wales to the other colonies. It is hardly worth while to speak of dia- monds, opals, and precious stones, but they are often picked up, though of small size, along the Mudgee and Aber- crombie Rivers, and at Beechworth and Daylesford, in Vic- toria.

Climate. — The Australian continent, extending over 28° of latitude, might be expected to show a consider- able diversity of climate. In reality,

however, it experi- ences fewer climatic variations than the other great continents, owing to its distance (28°) from the Antarctic circle and (11°) from the equator. There is, besides, a powerful determining cause in the uniform character and undivided extent of its dry interior plain. On this subject Mr Ranken, in his Dominion of Australia, remarks —‘A basin having its northern portion in the tropics, it acts like an oven under the daily sun. It becomes daily heated ; then its atmosphere expauds ; but such is its immensity that no sufficient supply of moist sea air from the neigh- bouring oceans can reach it, to supply the vacancy caused by this expansion. Of an almost perfectly flat surface, there is no play for currents of air upon it; only the heat is daily absorbed and nightly radiated. Such is the heat, that in the summer the soil is more like a fire than an oven; the air, if it moves, is like a furnace-blast ; and such its ex- tent and sameness, that as great heat may prevail hundreds of miles south as north of the tropics.” This continual radiation of heat is sometimes relieved—though not with the regularity of an annual season, indeed rather at uncer- tain intervals of several years—by the admission of masses of vapour, drawn in from the Pacific or the Indian Ocean. Great masses of clouds, after labouring many months to reach the interior from the sea, succeed in passing over the gea-bound mountains, and spread themselves in floods of rain upon the inland country. The north-west shore, and that of Carpentaria, are favoured with an annual visitation of the monsoons, from December to March, penetrating as far as 500 miles into the continent, where the sands of the desert are driven in wavy heaps by the force of this wind. But South Australia, though it feels a cool sea breeze from the south-west, gets little rain, for lack of any mountain range parallel with the coast to arrest and condense the passing vapours. The yearly rainfall at Adelaide and Gawler is therefore not more than 15 or 20 inches, while at the head of Spencer Gulf it is but 6 or 8. In Victoria and in New South Wales, on the contrary, where a wall of mountain fronts the ocean, most places on the sea-board enjoy a fair allowance of rain. It is 32 inches at Portland, nearly 26 inches at Melbourne ; at Sydney and Newcastle, on the east coast, as much as 48 and 44 inches in the year. But at Brisbane, in Queensland, farther north, it amounts to 50 inches ; at Rockingham Bay, in latitude 18°S., where the hills are covered with dense forests, the rainfall in 1871 was no less than 90 inches, In every part, however, of this magnificent highland region, the supply of moisture is rapidly diminished by passing

inland ; so that very little remains to fall on the interior or western slopes of the coast ranges, and to irrigate the interior plains.

With regard to the temperature, the northern regions of the continent being situated within the tropic of Capricorn,

resemble the parts of South America and South Africa, that are situated in corresponding latitudes. The sea- ward districts of New South Wales seem in this respect to be like Southern Europe. The mean annual tempera- ture of Sydney is 62° 4’ Fahr., almost equal to that of Lisbon in Portugal. The inland plains of this colony, how- ever, west of the Blue Mountains, which suffer much from evaporation, experience in summer a heat which rises to 100° Fahr. in the shade, and sometimes as high as 140°. There are highland districts, on the contrary, such as Kiandra, 4640 feet above the sea-level, where frost, snow, and hail are endured through the winter. On the Australian Alps, cold being more intense in the dry air, the limit of perpetual snow comes down to 7145 feet. The days on which rain falls in the coast regions of New South Wales average from 100 to 150 in the year, and the amount from 20 inches to 50 inches, decreasing generally farther inland.

In winter, in New South Wales, the prevalent winds blow from the west, with occasional storms of wind and rain from the eastward ; while the autumn months have much cloudy weather, not accompanied by rain. January and February are the hottest months of summer, and July the coldest month of winter.

With regard to the climate of Victoria, Mr Robert Ellery, Government astronomer at Melbourne, in his report of 1872, furnishes exact information. The mean annual temperature at Melbourne during fourteen years was 57° °6, and that of the whole province 56°°8, including stations 2000 feet or 1400 feet above the sea-level at Daylesford and Ballarat. This is equivalent to the mean annual temperature of Marseilles and Florence, in the northern hemisphere, but the climate of Melbourne is much more equable than that of the Mediterranean shores. The lowest temperature yet recorded has been 27°, or 5° below the freezing point ; the highest, 111° in the shade,

occurring during one of the hot winds, called “ brickfielders,” which, loaded with dust, occasionally blow for a few hours in summer. At Sandhurst, 778 feet above the sea, the greatest extremes of temperature yet observed were 117° and 27°°5; at Ballarat the extreme of winter cold was 10° below freezing.

The amount of humidity in the air is liable to great and rapid variations in the summer months. It is some- times reduced as much as 60 per cent. within a few hours, by the effect of hot dry winds. But this is com- peusated by an access of moisture upon a change of wind. The annual average rainfall at Melbourne, which for thirty years is stated at 25°66 inches, does not seem less than that of places in similar latitudes in other parts of the world. Yet it proves inadequate, because of the great amount of evaporation, estimated by Professor Neumayer at 42 inches.

The spring season in Victoria, consisting of the months of September, October, and November, is genial and pleasant, with somerain. The summer —December, January, and February—is generally hot and dry, though its first month is sometimes broken by storms of cold wind and heavy rain. In February the north winds assume the character of siroccos, and bush-fires often devastate the grassy plains and forests of the inland country. The autumn months—March, April, and May—are, in general, the most agreeable; and at this season vegetable life is refreshed, and puts forth a growth equal to that of the spring. The winter is June, July, and August, with strong, dry, cold winds from the north, alternating with frequent rain from the opposite quarter ; there is little ice or snow, except in the mountain districts.

Botany.—A probable computation of the whole number of distinct vegetable species indigenous to Australia and

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Tasmania has been made by Baron Ferdinand von Miiller, the Government botanist at Melbourne. He believes that, omitting the minute fungi, there will not be found above 10,000 species of Australian plants. The standard

authority upon this subject, so far as it could be known sixty years ago, but now requiring to be completed and extended, was the Prodromus Flore Nove Hollandie, published in 1810 by Mr Robert Brown of the British Museum. Besides making personal observations from 1802 to 1805, he had classified the collections procured by Sir Joseph Banks when Captain Cook's ship visited the eastern shore. Upon that occasion, in 1769, the name of Botany Bay was given to an inlet near Port Jackson, from the variety of new specimens found there. Baron von Miiller's Report of 1857 on the researches made by him alone in the North Australian exploring expedition under Mr Gregory, exhibits 2000 new species, representing more than 800 genera, which belong to 160 different orders. He could discover no new natural order, or fundamental form of the vegetable king- dom, in a minute examination of the flora of Armhem Land, the country around the Gulf of Carpentaria, and the Victoria River, but 60 genera were found that had not been noticed by any earlier Australian botanist.

The eastern parts of this continent, New South Wales and Queensland, are very much richer, both in their botany and in their zoology, than any other parts of Australia. Much was done here for the former science, half a century ago, by Mr Allan Cunningham, whose monumental obelisk fitly stands in the Botanic Garden at Sydney. In general, the growth of trees on the north and north-west coasts is wanting in size and regularity, compared with their growth in eastern Australia. To the last-mentioned region, for instance, the pines are entirely confined ; here the Moreton Bay pine, and Bunya Bunya pine, of the genus Araucaria, growing to 150 feet in height, yield excellent timber. The red cedar, the iron bark, the blue gum-tree, and others useful to the carpenter, belong likewise to the eastern highlands. The Casuarina, or she-oak, is found on the shores of Carpentaria and in the interior, but not on the banks of the Victoria River to the north-west. Of the Eucalyptus, or gum-tree, Australia has 400 species; but the one most uniformly distributed is the Lucalyptus rostrata or acuminata, called the flooded gum-tree ; its timber is durable, and takes a fine polish. Rosewood, tulip-wood, sandal-wood, and satin-wood, with other materials for the cabinetmaker's ornamental work, abound in the forests of Queensland. The forest scenery of the more northerly districts, within the tropics, and onwards to Rockingham Bay, is described as of great luxuriance. It consists of many kinds of large umbrageous trees, some of an Indian type,

intermixed with noble araucarias, all matted together in an impervious thicket by lianes of the convolvulus, the calamus, and other plants, climbing or pendent, harbouring in their shade many parasitical orchids and ferns. Such forests overhang the seaward sides of the mountain ranges, where they inhale abundant moisture from the winds of the Pacific Ocean, and feed upon a congenial soil from the decomposition of schistose rocks.

A striking contrast is offered to the view beyond the coast ranges. The interior of Queensland presents either high- land downs of basaltic origin, almost bare of trees, but with abundant herbaceous vegetation, good pasture grass, and an immense quantity of vervain, or the Brigalow scrub, merely shrubs and small trees, on a soil of argillace- ous sandstone. The sandstone table-lands, again, naked and dry, produce but a few diminutive eucalypti, and sparse tufts of uneatable grasses, while the inland deserts have only the acacia to break the monotony of the scene. The character of the inland flora adds confirmation to the belief that the interior was formerly a marine soil, which

has not yet been deprived of its saline properties. In the districts farthest removed from the action of fresh water, hundreds of miles are covered with such plants as will grow on the sea-shore, ¢.g., the mesembryanthemum called pig’s face or Hottentot fig. Other species belonging to the coastward uplands seem to have been conveyed into the interior by the action of water, as the belts of timber, and of pine or cypress scrub, are always found to extend along the line of direction taken by floods. They grow on sandy ridges, alongside of hollows, or depressed channels. On the north coast, so much of which is flat, and often swampy or sandy, the mangrove flourishes as in other tropical regions.

From the extreme aridity of the climate in most parts of northern Australia, there is a singular absence of mosses and lichens. North-west Australia possesses, in the Adan- sonia Gregori, or gouty-stem tree, a counterpart of the West African baobab, or monkey-bread tree. It is worthy of remark that, with a few exceptions, the Australian trees are evergreens. They also show a peculiar reverted position of their leaves, which hang vertically, turning their edges instead of their sides towards the sun; and the eucalypti have the

peculiarity of shedding their bark annually instead of their leaves. In Australia the native species of lily, tulip, and honeysuckle: appear as standard trees of considerable size. The native grasses do not form a continuous and even greensward, as in Europe, but grow in detached clumps or tufts. None of the cereal plants are indigenous, and very few of the fruits or roots that supply human fuud; but many Australian plants are likely to be valuable for medicinal or chemical manufactures.

This continent, as might be expected, has some of the same botanical families that occupy South Africa, Poly- nesia, and South America. Its relations in that respect to Europe are shown by Alphonse de Candolle's tabular statements in the Géographie Botanigue Raisonnée. He gives the exact number of species common to Australia and to France in each of the principal families or natural orders. It appears that of 3614 species of phanerogamic plants in France, only 45 belong to Australia. But it will be sufficient, without citing the numerical details, to quote Baron von Miiller's list of the natural orders having the most numerous species of indigenous growth in South Australia. They are here arranged in succession, according to their comparative amounts of specific diver- sity, those which have the greatest number of species being mentioned first. Of the phanerogamic series, the legumin- ous and the composite families united form nearly one-fourth. Indeed, the half of the dicotyledonous plants, or exogens, that exist in the sub-tropical districts belong to these two orders. Next come the myrtaceous plants, the ferns, and the grasses; the Proteaceze, which form a conspicuous feature of Australian botany; the Orchidacee, the epacrid family, and the parsley family, or Umbelliferce F the Diosmex, a sub-order of the Rutacez or rue family; the Liliacex, the Labiate or mint family, the Goodeniz, the Scrophulariacez or figworts, and the Salsolacex. The Ranunculacez, the geranium family, the rosaceous plants, and the epacrid group, are not found in Australia north of the tropical line.

Animals.—The zoology of Australia and Tasmania pre- sents a very conspicuous point of difference from that of other regions of the globe, in the prevalence of non-placental mammalia. The vast majority of the mammalia are pro- vided with an organ in the uterus, by which, before the birth of their young, a vascular connection is maintained between the embryo and the parent animal. There are two orders, the Marsupialia and

the Monotremata, which do not possess this organ. Both these are found in Australia, to which region indeed they are not absolutely confined ;

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but the marsupials alone constitute two-thirds of all the Australian species of mammals. It is the well-known peculiarity of this order that the female has a pouch or fold of skin upon her abdomen, in which she can place the young for suckling within reach of her teats. The opossum of America is the only species out of Australasia which is thus provided. Australia is inhabited by at least 110 different species of marsupials, which have been arranged in five tribes, according to the food they eat, viz., the root- eaters (wombats), the fruit-eaters (phalangers), the grass- eaters (kangaroos), the insect-eaters (bandicoots), and the flesh-eaters (native cats and rats). Of these tribes the wombats are closely allied to the phalangers, represented by the opossums and flying squirrels, with the native bear, while fossil remains of twenty extinct species have also been found. Of wombats now existing there are four species, all of nearly the same size, seldom exceeding 100 ib in weight. They all burrow in the ground, and their habitat is in New South Wales, Tasmania, and South Australia, There is but one species of the singular animal miscalled the native bear, which is more like a sloth in its habits. Three varieties of brush-tailed opossum are found, but one of them exists only in Tasmania; and there are three ring- tailed varieties in almost every part of Australia. The great flying phalanger (Petaurista) is nearly allied to the last-mentioned genus ; it exists only in East Australia; as does the small flying phalanger (Belideus), which is re- stricted to mountain districts. The interior of Australia and the west coast are wanting in these species, but two or three of them occur on the north coast. The smallest phalanger (Acrobata pygmea) is less than a mouse, and has a feathery tail. The little Zarsipes rostratus is almost toothless, but has a long hairy tongue, which it thrusts into flowers to suck their sweetness.

The kangaroo (Macropus) and most of its congeners show an extraordinary disproportion of the hind limbs to the fore part of the body. The rock wallabies again have short tarsi of the hind legs, with a long pliable tail for climbing, like that of the tree kangaroo of New Guinea, or that of the

jerboa. Of the larger kangaroos, which attain a weight of 200 Ib and more, eight species are named, only one of which is found in West Australia. There are some twenty smaller species in Australia and Tasmania, besides the rock wallabies and the hare kangaroos; these last are wonderfully swift, making clear jumps eight or ten feet high. To this agility they owe their preservation from the prairie fires, which are so destructive in the interior during seasons of drought. In the rat kangaroo there is not the same disproportion of the limbs; it approaches more nearly to the bandicoot, of which seven species exist, from the size of a rat to that of a rabbit. The carnivorous tribe of marsupials, the larger species at any rate, belong more to Tasmania, which has its “tiger” and its “devil.” But the native cat, or dasyurus, is common to every part of Australia, Several different species of pouched rats and mice, one or two living in trees, are reckoned among the flesh-eaters. Fossil bones of extinct kangaroo species are met with, which must have been of enormous size, twice or thrice that of any species now living.

We pass on to the other curious order of non-placental mammals, that of the Monotremata, so called from the structure of their organs of evacuation with a single orifice, as in birds. Their abdominal bones are like those of the marsupials ; and they are furnished with pouches for their young, but have no teats, the milk being distilled into their pouches from the mammary glands. Australia and Tasmania possess two animals of this order,—the echidna, or spiny ant-eater (hairy in Tasmania), and the Platypus anatinus, the duck-billed water-mole, otherwise named the Ornithorhynchus paradoxus, This odd animal is provided

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with a bill or beak, which is not, like that of a bird, affixed to the skeleton, but is merely attached to the skin and muscles.

Australia has no apes, monkeys, or baboons, and no rumi- nant beasts. The comparatively few indigenous placental maimmals, besides the dingo, or wild dog—which, however, may have come from the islands north of this continent— are of the bat tribe and of the rodent or rat tribe. There are four species of large fruit-eating bats, called flying foxes, twenty of insect-eating bats, above twenty of land-rats, and five of water-rats. The sea produces

three different seals, which often ascend rivers from the coast, and can live in lagoons of fresh water ; many cetaceans, besides the “ right whale” and sperm whale; and the dugong, found on the northern shores, which yields a valuable medicinal oil.

The birds of Australia in their number and variety of species (reckoned at 690) may be deemed some compensa- tion for its poverty of mammals ; yet it will not stand com- parison in this respect with regions of Africa and South America in the same latitudes. The black swan of West Australia was thought remarkable when discovered as belying an old Latin proverb. There is also a white eagle. The vulture is wanting. Sixty species of parrots, some of them very handsome, are found in Australia. The emu, a large bird of the order Cursores, or runners, corresponds with the African and Arabian ostrich, the rhea of South America, and the cassowary of the Moluccas and New Guinea, In New Zealand this order is represented by the apteryx, as it formerly was by the gigantic moa, the remains of which have been found likewise in Queensland. Of the same species as the birds of paradise is the graceful Menura superba, or lyre bird, with its tail feathers spread in the shape of a lyre. The mound-raising megapodes, the bower- building satin-birds, and several others, display peculiar habits. The honey-eaters present a great diversity of plumage. There are also many kinds of game birds, pigeons, ducks, geese, plovers, and quails.

The ornithology of New South Wales and Queensland is more varied and interesting than that of the other pro- vinces.

As for reptiles, Australia has a few tortoises, all of one family, and not of great size. The “leathery turtle,” which is herbivorous, and yields abundance of oil, has been caught at sea off the Illawarra coast so large as 9 feet im length. ‘The saurians or lizards are numerous, chiefly on dry sandy or rocky ground in the tropical region. The great crocodile of Queensland is 30 feet long; there is a smaller one, 6 feet long, to be met with in the shallow lagoons of the interior. The monitor, or fork-tongued lizard, which burrows in the earth, climbs, and swims, is said to grow to a length of 8 or 9 feet. This species, and many others, do not extend to Tasmania. There are about twenty kinds of night-lizards, and many which hibernate. One species can utter a cry when pained or alarmed, and the tall-standing frilled lizard

can lift its forelegs, and squat or hop like a kangaroo. ‘There is also the Moloch horridus of South and West Australia, covered with tuber- cles bearing large spines, which give it a very strange aspect. This and some other lizards have power to change their colour, not only from light to dark, but in some parts from yellow to grey or red. Dr Gray, of the British Museum, has described fifty species of Australian lizard. |

The snakes are reckoned at sixty-three species, of which forty-two are venomous, but only five dangerous. North Queensland has many harmless pythons. ‘There are forty or fifty different sorts of frogs; the commonest is distin- guished by its blue legs and bronze or gold back; the largest is bright green ; while the tree-frog has a loud shrill voice, always heard during rain.

The Australian seas and rivers are inhabited by many

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fishes of the same genera as exist in the southern parts of Asiaand Africa. Of those peculiar to Australian waters may be mentioned the arripis, represented by what is called among the colonists a salmon trout. A very fine fresh- water fish is the Murray cod, which sometimes weighs 100 tb ; and the golden perch, found in the same river, has rare beauty of colour. Among the sea fish, the snapper is of great value as an article of food, and its weight comes up to 50 tb. This is the Pagrus unicolor, of the family of Sparide, which includes also the bream. Its colours are beautiful, pink and red with a silvery gloss ; but the male as it grows old takes on a singular deformity of the head, with a swelling in the shape of a monstrous human-like nose. ‘These fish are caught in numbers outside Port Jackson for the Sydney market. Two species of mackerel, differing somewhat from the European species, are also caught on the coasts. The so-called red garnet, a pretty fish, with hues of carmine and blue stripes on its head, is much esteemed for the table. The Zrigla polyommata, or flying garnet, is a greater beauty, with its body of crimson and silver, and its large pectoral fins, spread like wings, of a rich green, bordered with purple, and relieved by a black and white spot. Whiting, mullet, gar-fish, rock cod, and many others known by local names, are in the lists of edible fishes belonging to New

South Wales and Victoria, Much interesting and valuable information upon Australian zoology will be found in a recent essay by Mr Gerard Krefft, curator and secretary of the museum at Sydney, and in the Count de Castelnau's report on the fishes of Victoria at the International Exhibition of 1873.

Aborigines—The Papuan, Melanesian, or Australasian aborigines exhibit certain peculiarities which are not found in the African negro, to which race they otherwise present some similarity. In the Australasian the forehead is higher, the under jaw less projecting, the nose, though flat and extended compared with that of the European, is less depressed than in the African. His lips are thick, but not protuberant; and the eyes are sunken, large, and black. The colour of his skin is lighter—of a dusky hue—than that of the Negro. In stature he equals the average European, but tall men are rare, except in North Queens- land; his body and limbs are well shaped, strongly jointed, and highly muscular. The hind parts are not, as in the African, excessively raised ; and while the calf of the leg is deficient, the heel is straight. The natives of Papua have woolly spirally-twisted hair. Those of Tasmania, now exter- minated, had the same peculiarity. But the natives of the Australian continent have straight or curly black hair. The men wear short beards and whiskers.

Their mental faculties, though probably inferior to those of the Polynesian copper-coloured race, are not contemptible. They have much acuteness of perception for the relations of individual objects, but little power of generalisation. No word exists in their language for the general terms tree, bird, or fish; yet they have invented a name for every species of vegetable and animal they know. The grammatical structure of some North Australian languages has a considerable degree of refinement. The verb presents a variety of conjugations, expressing nearly all the moods and tenses of the Greek. 'here is a dual, as well as 4 plural form in the declension of verbs, nouus, pronouns, and adjectives. The distinction of genders is not marked, except in proper names of men and women. All parts of speech, except adverbs, are declined by terminational inflec- tions. There are words for the elementary numbers, one, two, three; but "four" is usually expressed by "two- two;" then "five" by "two-three," and so on. They have no idea of decimals. The number and diversity of separate languages, not mere

dialects, is truly bewilder- ing. Tribes of a few hundred people, living within a few

miles of each other, have often scarcely a phrase in com- mon. ‘This is more especially observed in New South Wales, a country much intersected by dividing mountain ranges. But one language is spoken all along the Rivers Murray and Darling, while the next neighbours of the Murray tribes, on both sides, are unable to converse with them. .

It is, nevertheless, tolerably certain that all the natives of Australia belong to one stock. There appears reason to believe that their progenitors originally landed on the north-west coast, that of Cambridge Gulf or Arnhem Land, in canoes drifting from the island of Timor. They seem then to have advanced over the continent in three separate directions. By one route they moved, in tho course of ages, directly across to the south coast, near the head of the Great Bight, Spencer Gulf, and the Gulf of St Vincent. Another division followed the west coast to Swan River, and round by King George’s Sound. ‘The third and most important body, turning eastward, crossed the head of the Gulf of Carpentaria, then split and sub- divided itself amidst the rivers and highland ranges of Queensland, while some of its tribes crossing the Upper Darling occupied New South Wales, overspread the Riverina, and peopled the south-eastern quarter of Aus- tralia. The proofs and arguments upon which this hypo- thetical distribution is based are set forth by Mr Eyre in his interesting essay on the Australian aborigines (Dis- coveries in Central Australia, &c., by E. J. Eyre, resident magistrate, Murray River, vol. ii.) It is chiefly the pre- valence of some peculiar customs, such as circumcision, or the removal of two upper-jaw teeth at a stated age of adolescence, that seems to mark the common descent of tribes, now widely distant in location, which appear to have belonged to one of the supposed main streams of population, The discontinuance of such customs among the tribes of the other main divisions is plausibly ascribed to local influences. From a comparison of their languages, the diversities of which have been already referred to, it appears that little aid is to be expected from them in ethno- logical grouping.

The natives of the north-eastern quarter—a tropical region of diversified surface, with many rivers and thick forests, as well as open highlands—arc far superior in body, mind, and social habits to those of the rest of Australia. They bear, in fact, most resemblance to their neighbours and kindred in the island of New Quinea, but are still below these in many important respects.

If a general view be taken of the tribes of Australia, and the state in which they existed independently of recent Kuro- pean intercourse, two or three extraordinary defects exhibit themselves, They never, in any situation, cultivated the soil for any kind of food-crop. They never reared any kind of cattle, or kept any domesticated animal except the dog, which probably came over with them in their canoes. They have nowhere built permanent dwellings, but con- tented themselves with mere hovels for temporary shelter. They have neither manufactured nor possessed any chattels beyond such articles of clothing, weapons, ornaments, and utensils as they might carry on their persons, or in the family store-bag for daily use. Their want of ingenuity and contrivance has, however, undoubtedly been promoted by the natural poverty of the land in which the race settled.

The sole dress of both sexes in their aboriginal state is a cloak of skin or matting, fastened with a skewer, but open on the right-hand side. No headgear is worn, except sometimes a net to confine the hair, a bunch of feathers, or the tails of small animals. The bosom or back is usually tattoed, or rather scored with rows of hideous raised scars, produced by deep gashes at the age when youth comes to manhood or womanhood. ‘Their dwellings, for the most

part, are either bowers, formed of the branches of trees, or hovels of piled logs, loosely covered with grass or bark, which they can erect in an hour, wherever they encamp. But some huts of a more commodious and substantial form were seen by Flinders on the south-east coast in 1799, and by Captain King and Sir J. Mitchell on the north-east, where they no longer appear. The ingenuity of the race is mostly to be recognised in the manufacture of their weapons of warfare and the chase. While the use of the

bow and arrow does not seem to have occurred to them, the spear and axe are in general use, commonly made of hard-wood ; the hatchets of stone, and the javelins pointed with stone or bone. The peculiar weapon of the Australian is the boomerang, a curved blade of wood, of such remark- able construction, that it swerves from its direct course, sometimes returning so as to hit an object behind the thrower. Their nets, made by women, either of the ten- dons of animals or the fibres of plants, will catch and hold the strong kangaroo or the emu, or the very large fish of Australian rivers. Canoes of bent bark, for the inland waters, are hastily prepared at need; but the inlets and straits of the north-eastern sea-coast are navigated by larger canoes and rafts of a better construction.

Without claiming permanent ownership of the land, each native tribe was accustomed, till the English squatter came, to enjoy the recognised manorial dominion of its own hunting-ground, perhaps ten or twelve miles square. This was subdivided between the chief heads of families. Tho affairs of a tribe are ruled by a council of the men past middle age who are still in full vigour of mind and body. One may be their president, but they have no hereditary prince. Their most solemn assemblies take place when the youth undergo one or other of the painful ceremonies of ini- tiation into manhood. In every case of death from disease or unknown causes the sorcerers hold a public inquest, and pretend to ask the corpse how it was killed. Such deaths are invariably inscribed to witcheraft practised by a hostile or envious neighbouring tribe. The bodies of the slain in battle are sometimes eaten, or the fat of the kidneys, at least, is extracted for a feast of victory. But cannibalism in Australia is not confined to the flesh of enemies, nor is it generally associated with an insulting triumph. It is rather, like that reported of the ancient Scythians, a rite of funcral observance, in honour of deceased kindred and friends. The reality of this custom is proved by the testi- mony of trustworthy English witnesses, who have watched the revolting act. The only idea of a god known to be enter- tained by these people, is that of Buddai, a gigantic old man lying asleep for ages, with his head resting upon his arm, which is deep in the sand. He is expected one day to awake and eat up the world. They have no religion beyond those gloomy dreams. Their notions of duty relate mostly to neighbourly service and social interest ; and they are not all thieves or liars, but are capable of many good deeds. The marriage bond is observed by the wife or wives, the penalty of its violation

being death. But chastity upon any other account is a virtue beyond the native conception, though a certain delicacy of feeling in matters of sex is not unknown. The deplorable lack of moral restraint has involved this unhappy race in sufferings which may be easily under- stood, from their contact with the more reckless and vicious representatives of foreign nations.

The numbers of the native Australians are steadily diminishing. A remnant of the race exists in each of the provinces, while a few tribes still wander over the interior. Altogether it is computed that not more than about 80,000 aborigines remain on the continent.

Perhaps the most complete and trustworthy informa- tion on the Australian race is to be found in works pub- lished some twenty or thirty ycars ago, before the country

was occupied as it now is by the European settler. Mr Eyre's work above referred to, and Captain (afterwards Sir George) Grey's Discoveries in North-West and Western Australia, are authorities that may be relied upon.

Colonial History.—Of the five Australian provinces, that of New South Wales may be reckoned the oldest. It was in 1788, eighteen years after Captain Cook explored the east coast, that Port Jackson was founded as a penal station for criminals from England; and the settlement retained that character, more or less, during the subsequent fifty years, transportation being virtually suspended in 1839. The colony, however, from 1821 had made a fair start in free industrial progress. :

By this time, too, several of the other provinces had come into existence. Van Diemen's Land, now called Tasmania, had been occupied as early as 1803, It was an auxiliary penal station under New South Wales, till in 1825 it became a separate province. From this island, ten years later, parties crossed Bass's Straits to Port Phillip, where a new settlement was shortly established, forming till 1851 a part of New South Wales, but now the

richer and more populous colony of Victoria. In 1827 and 1829, an English company endeavoured to plant a settlement at the Swan River, and this, added to a small convict station established in 1825 at King George's Sound, constituted Western Australia. On the shores of the Gulf St Vincent, again, from 1835 to 1837, South Australia was created by another joint-stock company, as an experimeut in the Wake- field scheme of colonisation.

Such were the political component parts of British Australia up to 1839. The earlier history, therefore, of New South Wales is peculiar to itself. Unlike the other mainland provinces, it was at first held and used chiefly for the reception of British convicts. When that system was abolished, the social conditions of New South Wales, Victoria, and South Australia became morc equal. Pre- vious to the gold discoveries of 1851 they may be included, from 1839, in a general summary view.

The first British governors at Sydney, from 1788, ruled with despotic power. They were naval or military officers in command of the garrison, the convicts, and the few free settlers The duty was performed by such men as Captain Arthur Phillip, Captain Hunter, and others. In the twelve years' rule of General Macquarie, closing with 1821, the colony made a substantial advance. By means of con- vict labour roads and bridges were constructed, and a route opened into the interior beyond the Blue Mountains. A population of 30,000, three-fourths of them convicts, formed the infant commonwealth, whose attention was soon directed to the profitable trade of rearing fine wool sheep, first commenced by Mr John M'Arthur in 1803.

During the next ten years, 1821-31, Sir Thomas Bris- bane and Sir Ralph Darling, two generals of the army, being successively governors, the colony increased, and eventually succeeded in obtaining the advantages of a representative institution, by means of a legislative council. Then came General Sir Richard Bourke, whose wise and liberal administration proved most beneficial. New South Wales became prosperous and attractive to emigrants with capital. Its enterprising ambition was encouraged by taking fresh country north and south. In the latter direc- tion, explored by Mitchell in 1834 and 1836, lay Australia Felix, now Victoria, including the well-watered, thickly- wooded country of Gipps' Land.

This district, then called Port Phillip, in the time of Governor Sir George Gipps, 1838 to 1846, was growing fast into a position claiming independence. Melbourne, whick began with a few huts on the banks of the Yarra-Yarra in 1835, was in 1840 a busy town of 6000 inhabitants, the population of the whole district, with the towns of

Geelong and Portland, reaching 12,850; while its import trade amounted to £204,000, and its exports to £138,000. Such was the growth of infant Victoria in five years; that of Adclaide or South Australia, in the same period, was nearly equal to it. At Melbourne there was a deputy governor, Mr Latrobe, under Sir George Gipps at Sydney, Adelaide had its own governors, first Captain Hindmarsh, next Colonel Gawler, and then Captain George Grey. Western Australia progressed but slowly, with less than 4000 inhabitants altogether, under Governors Stirling and Hutt.

The general advancement of Australia, to the era of the gold-mining, had been satisfactory, in spite of a severe commercial crisis, from 1841 to 1843, caused by extrava- gant land speculations and inflated prices. Victoria produced already more wool than New South Wales, the ageregate produce of Australia in 1852 being 45,000,000 Ib; and South Australia, between 1842 and this date, had opened most valuable mines of copper. The population of New South Wales in 1851 was 190,000; that of Victoria, 77,000; and that of South Australia about the same.

At Summerhill Creek, 20 miles north of Bathurst, in the Macquarie plains, gold was discovered, in February 1851, by Mr E. Hargraves, a gold-miner from California, The intelligence was made known in April or May; and then began a rush of thousands,—men leaving their former employments in the bush or in the towns to search for the ore so greatly coveted in all ages. In August it was found at Anderson’s Creek, near Melbourne ; a few weeks later the great Ballarat gold-field, 80 miles west of that city, was opened; and after that, Bendigo, now called Sandhurst, to the north. Not only in these lucky pro- vinces, New South Wales and Victoria, where the auriferous deposits were revealed, but in every British colony of Australasia, all ordinary industry was left for the one exciting pursuit. The copper mines of South Australia were for the time deserted, while Tasmania and New Zea-

land lost many inhabitants, who emigrated to the more promising country. The disturbance of social, industrial, and commercial affairs, during the first two or three years of the gold era, was very great. Immigrants from Europe, and to some extent from North America and China, poured into Melbourne, where the arrivals in 1852 averaged 2000 persons inaweek. The population of Victoria was doubled in the first twelvemonth of the gold fever, and the value of imports and exports was multiplied tenfold between 1851 and 1853.

The colony of Victoria was constituted a separate pro- vince in July 1851, Mr Latrobe being appointed governor, followed by Sir Charles Hotham and Sir Henry Barkly in succession. The more rapid increase of Victoria since that time, in wealth and number of inhabitants, has gained it a pre-eminence in the esteem of emigrants; but the varied resources of New South Wales, and its greater extent of territory, may in some degree tend to redress the balance, if not to restore the character of superior importance to the older colony.

The separation of the northern part of eastern Australia, under the name of Queensland, from the original province of New South Wales, took place in 1859. At that time the district contained about 25,000 inhabitants ; and in the first six years (as Sir George Bowen, the first governor, observed in 1865) its population was quadrupled and its trade trebled.

It appears, from a general view of Australian progress in the last twenty years, that the provinces less rich in gold than Victoria have been enabled to advance in prosperity by other means. Wool continues the great staple of Aus- tralia. But New South Wales, possessing both coal and iron, is becoming a seat of manufactures ; while Queens-

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land is also favoured with much niineral wealth, including tin. The semi-tropical climate of the latter colony is suit- able for the culture of particular

crops, needing only a supply of other than European labour. Meantime South Australia, besides its production of copper and a fair share of wool, has become the great wheat-growing province of the continent.

The separate colonies of Australia are still in a some- what transitional state, emigration being so continuous, and the country to be yet occupied so extensive. For this and for other reasons, therefore, it may be more fitting to describe the several colonies, with respect to their in- dustrial and social conditions, under their respective names. To enable the reader, however, to judge of the general posi-

tion of the provinces at a recent date, the following statis- tics are appended :—

Estimated Publie

Popula- | Revenue Denton Value of | Value of

Name of Colony. tion at of Mec G1 Imports | Exports Close of 1873. 1873 » | for 1878. | for 1873.

£ £ £ £

Victoria 3,948,691 | 12,445,722 | 16,533,856 | 15,302,454 New South Wales… 10,842,415 | 11,088,388 | 11,815,829 South Australia 2,174,900 | 3,829,830 | 4,587,859 Queensland 4,786,850 | 2,881,726 | 3,542,513 Tasmania. 1,477,600 | 1107167} ‘893°556 Western Australia.. 25,761 134,832 35,000 297,328 265,217 tal for Austra- ; Total for nustra- | 1,895,692 | 9,754,671 | 21,762,487 | 35,738,295 | 36,407,428

AUSTRIA

USTRIA, or more strictly Austria-Hunoary (Ger. Oesterreich and Oecsterreich-Ungarn), is an extensive country in the southern portion of Central Europe, lying between long, 9° and 26° E., and lat. 42° and 51° N.

It thus extends through 17 degrees of longitude and 9 degrees of latitude, and has an area of about 240,000 English square miles, With the exception of the islands in the Adriatic, and the narrow projecting tract of Dalmatia, it forms a compact region of country, but of an irregular shape. It is surrounded on all sides by other countries, except where it borders upon the Adriatic, which is about one-fifth of the entire extent of its boundaries Of the rest, about one- third on the W. and N. is formed by the German empire (Bavaria, Saxony, and Prussia), a third on the S. and E,

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Sketch Map of Austria.

by the Turkish empire and the Danubian Principalities, and the remaining third by Russia on the N.E. and Switzerland and Italy on the 8.W. The boundaries are formed in some parts by river courses, in others by moun- tain ranges, and sometimes they extend through an open country. As compared with France, Austria has a form nearly as compact, but its frontiers are by no means so well defined or so strongly protected by natural barriers. It ranks third in extent among the countries of Europe (after Russia and Sweden), and fourth in point of popula- tion (after Russia, the German empire, and France). Austria is, after Switzerland, the most mountainous country of Europe, and about four-fifths of its entire area 18 more than 600 feet above the level of the sea. The mountains are frequently covered with vegetation to a great elevation. At the base are found vines and maize j on

the lower slopes are green pastures, or wheat, barley, and other kinds of corn; above are often forests of oak, ash,

elm, &.; and still higher the yew and the fir may be |

seen braving the fury of the tempest. Corn grows to between 3400 and 4500 feet above the level of the sea, the forests extend to 5600 or 6400 feet, and the line of per- petual snow is from 7800 to 8200 feet. In some parts, however, particularly in Tyrol, Styria, Carinthia, and Carniola, the mountains appear in wild confusion, with rugged peaks and bare precipitous sides, forcibly remind- ing the traveller of Switzerland. ‘Tyrol in particular has, like that country, its cascades, its glaciers, its perpetual snows, and its avalanches.

The Alps occupy the south-west portion of the country, and form its highest lands. They are distinguished by various names, as the Rhzetian, Noric, Carnic, Julian, and Dinaric Alps. The Rhetian or Tyrolese Alps enter Tyrol from the Swiss canton of the Grisons, and are the loftiest range in the country, a number of the summits rising to the height of 12,000 feet, and the highest, the Orteler Spitze, attaining a height of 12,814 feet above the level of the sea. They divide into three principal chains, the most southern of which occupies the southern portion of Tyrol, and contains the Orteler Spitze, and others of the loftiest points in the country. The niuddle or principal chain extends in an easterly direction to the borders of Salzburg and Carinthia, and has many of its peaks covered with perpetual snow. The northern chain is inferior in eleva- tion to the others, and few of its most elevated points reach the snow-line. The Noric Alps are a continuation of the Rhetian eastward, passing through Salzburg, Styria, Carinthia north of the Drave, Lower and Upper Austria, to Hungary, where they gradually sink into the plains. They comprise three chains, a main chain and two lesser chains proceeding northward—the one the Salzburg, the other the Styria-Austrian Alps. The main chain, the Noric Alps in a stricter sense, traverses Salzburg, Carinthia, and Styria, and hasa length of about 170 miles, some of its peaks rising to the height of 12,000 feet. The Carnic or Carinthian Alps are also an offshoot of the Rheetian Alps eastward, occupying the south-east of Tyrol, Carinthia, and the north of Carniola. They form several branches, and some of the summits are over 9000 feet high. The Julian or

Carniolan Alps extend in a south-easterly direc- tion through Carniola and Croatia. They prescnt little of an Alpine character, and with one or two exceptions nowhere rise to the height of 5000 feet. They are for the most part bare and rugged. The Dinaric Alps are a con- tinuation of the preceding, extending through Croatia and Dalmatia, and resemble them in character. The highest point, Mount Dinara, from which they take their name, is 5956 feet above the level of the sea.

After the Alps, the most important mountain system of Austria is the Carpathians, which occupy its eastern and north-eastern portions, and stretch in the form of an arch

through Silesia, Moravia, Galicia, Hungary, and Transyl- vania. They have an extent of about 650 miles, and are divided into three principal groups—the Hungarian Car- pathians, the Carpathian Waldgebirge or Forest Moun- tains, and the Transylvanian Highlands. The Hungarian Carpathians stretch from west to east, through Hungary, Moravia, Silesia, and Galicia for about 200 miles, and comprise various smaller groups, among which are the Beskides, the Little Carpathians, and the Central Car- pathians or the Tatra Mountains. This last group consti- tutes the highest portion of the Carpathians, having an average elevation of over 6000 feet, and its two principal summits, the Kisthaler Thurm and the Lomnitzer Spitze, having a height of 8378 and 8222 feet respectively. In character it resembles the Alps more than the Carpathians, having rugged precipitous sides, deep chasms, snows, glaciers, cascades, &c. The Waldgebirge, or Forest Moun- tains, are a series of moderate elevations, for the most part wooded, and stretching for about 160 miles through Hungary, Galicia, and Buckowina, with an average breadth of about 45 miles. They are in general from 3000 to 6000 feet in clevation, the highest point, Pietrozza, rising to 7086 feet. The Transylvanian Highlands extend over Transylvania, a part of Hungary, and the Military Frontier, into Moldavia and Wallachia. They have a length of about 350 miles, and breadth of from 30 to 90. Several of the summits rise to the height of 8000 feet. The sides of the Carpathian mountains are generally covered with forests to a considerable height.

The Hercynian mountain system spreads itself over Bohemia, Silesia, Moravia, and the middle and northern portions of Upper and Lower Austria. It includes the lesser systems of the Bohemian Forest, the Erzgebirge, the Riesengebirge, and the Sudetes. The Bohemian Forest is a series of wooded heights on the confines of Bohemia and Bavaria, and extending south from the Eger to the Danube. Its highest point is 4610 feet above the sea. The Erzge- birgo, or Ore Mountains, commence on the left bank of the Elbe, run eastward between Bohemia and Saxony, and terminate near the sources of the White Elster. None of the summits rise to the height of 4000 feet. The Riesenge- birge or Giant Mountains are on the confines of Bohemia towards Prussian Silesia, and have their highest point, Schneekoppe or Riesenkoppe, 5330 feet above the sea. The Sudetes is a name sometimes given to all the moun- tains of Northern Bohemia, but it more properly belongs to that range which runs between Moravia and Prussian Silesia, from the March to the Oder. The highest summit, the Spieglitzer Schneeberg, is 4774 feet high.

The great central chain of the Alps consists of primitive rocks, principally gneiss, mica slate, and granite. Occa- sionally clay-slate, greywacke, and limestone overlie these rocks. Iron ore is very abundant here, and gold and copper are found. The northern and southern ranges of the Alps are composed of limestone. In the southern range the limestone rests upon gneiss, which crops out in some parts. Iron, copper, lead, and zine ores, and quick- silver are found in some parts to a large extent. In the northern range the limestone is in some places covered. with clay-slate, greywacke, and transition limestone. In the north the limestone is covered with sandstone, which extends in an almost continuous line from the Lake of Constance to the neighbourhood of Vienna. In this dis- trict a number of beds of coal are found. The central range of the Carpathians is formed chiefly of gneiss, granite, clay-slate, greywacke, and transition limestone, frequently covered with extensive patches of Tertiary formations. North and south of this are ranges of sandstone mountains, on which diluvial and alluvial deposits are also found. The northern sandstone range is rich in salt; the ceutral

chain abounds in iron aud copper ore; and the gneiss and granitic mountains of Hungary and Transylvania are rich in ores of gold and silver. also found in the later formations. Moravian mountain system is composed chiefly of gneiss and granite. stone are also common.

[PHYSICAL

Numerous beds of coal are The Bohemian and

Basalt, clinkstone, greenstone, and red sand- Silver and lead mines are exten- sively worked, also mines of zine and iron. Coal is abundant here. The plain and hilly parts of the country

belong chiefly to the middle or Miocene period of the

Tertiary formation, and comprise sand, gravel, clay-marl, &e.

As the highlands of Austria form part of the great water- Rivers,

shed of Europe which divides the waters flowing north- ward into the North Sea or the Baltic, from those flowing southward or eastward into the Mediterranean or the Black Sea, its rivers flow in three different directions —northward, southward, and eastward. With the exception of the small streams belonging to it which fall into the Adriatic, all its rivers have their mouths in other countries, and its principal river, the Danube, has also its source in another country. This, which after the Volga is the largest river of Europe, rises in the grand duchy of Baden, flows through Wiirtemberg and Bavaria, and is already navigable when it enters Austria, on the borders of which it receives the Inn, a river which has as large a body of water as itself. It has a course of about 820 miles within the country, which is about 48 per cent. of its entire length. | Where it enters it is 898 feet above the level of the sea, and where it leaves only 132 feet. It has thus a iall within the country of 766 fect, and is at first a very rapid stream, but latterly a very slow one. Its afflucnts, after the Inn, are at first generally small, the principal being the Traun, the Enns, and the March. In Hungary it receives from the Carpathians the Waag, Neutra, Gran, and Eipel; and from the Alps the Drave, the Mur, and the Save. But the principal affluent of the Danube is the Theiss, which rises in the Carpathians, and drains nearly the whole of

the eastern half of Hungary. The country drained by the Danube is formed into several basins by the mountains approaching its banks on either side. The principal of these are the Linz and Krems basins, the Vienna basin, and the little and great Hungarian basins. Between this last and the plains of Wallachia, it passes through the narrow rocky channels of Islach, Kasan, and the Iron Door, where the fall is about 41 feet in less than half a mile, The Dniester, which, like the Danube, flows into the Black Sea, has its source in the Carpathians in Eastern Galicia, and pursues a very winding course towards the south-east. It receives its principal affluents from the Carpathians, and drains in Austria a territory of upwards of 12,000 English square miles. It is navigable for about 300 miles. The Vistula and the Oder both fall into the Baltic. The former rises in Moravia, flows first north through Austrian Silesia, then takes an easterly direction along the borders of Prussian Silesia, and afterwards a north-easterly, separating Galicia from Russian Poland, and leaving Austria not far from Sandomir. Its course ll Austria is 240 miles, draining an area of 15,500 square miles. It is navigable for nearly 200 miles, and its prin- cipal affluents are the Save and the Bug. The Oder has also its source in Moravia, flows first east, and then north-east through Austrian Silesia into Prussia, Its length within the Austrian territory is only about 55 miles, no part of which is navigable. The only river of this country which flows into the North Sca is the Elbe. It has its source in the Ricsengebirge, not far from the Schneekoppe, flows first south, then east, and afterwards north-east through Bohemia, and then enters Saxony. Its principal affluents are the Adler, Iser, and Eger, and, most important of all, the Moldau. The last, from the length of its course,

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PEATURES. |

and the quantity of watcr which it brings down, is entitled to be considered the main stream. It has a course of 260 miles, and is navigable for 190. The Elbe itself has a course within the Austrian dominions of 185 milcs, for about 65 of which it is navigable. It drains an area of upwards of 21,000 square miles. The Rhine, though scarcely to be reckoned a river of the country, flows for about 25 miles of its course between it and Switzerland. The principal river of Austria which falls into the Adriatic is the Adige. It

rises in the mountains of Tyrol, flows south, then east, and afterwards south, into the plains of Lombardy. Its principal affluent is the Eisack. Of the streams which have their course entirely within the country, and which fall into the Adriatic, the principal is the Isonzo, 75 miles in length, but navigable only for a short distance from its mouth.

The lakes and marshes of Austria are very numerous, and some of them are of great extent. The lakes lie principally in the valleys among the Alps, and the marshes are frequent along the courses of the rivers. The largest lake of Austria is the Balaton, in Hungary, which is about 46 miles in length by 18 in breadth, and, including the swamps in connection with it, covers an area of 500 square miles. The Neusiedler, also in Hungary, is 18 miles in length, by from 4 to 7 in breadth, and covers an area of 106 square miles. Among the many smaller ones the principal are the Traunsee, Attersee, Worthersee, Mondsee, &c. No other European country equals Austria in the number and value of its mineral springs. No fewer than 1500 of these are reckoned, and they occur princi- pally in Bohemia and Hungary. In the former are Karlsbad, Marienbad, Franzensbad, Teplitz, Piillna, and Seidlitz.

The climate of Austria, in consequence of its great extent, and the great differences in the elevation of its surface, is very various, It is usual to divide it into three distinct zones, The most southern extends to 46° N. lat., and includes Dalmatia and the country along the coast, together with the southern portions of Tyrol and Carinthia, Croatia, Slavonia, and the most southern part of Hungary. Here the seasons are mild and equable, the winters are short (snow seldom falling), and the summers last for five months, The vine and maize are everywhere cultivated, as well as olives and other southern products. In the south of Dalmatia tropical plants flourish in the open air. The central zone lies between 46° and 49° N. lat., and includes Lower and Uppcr Austria, Salzburg, Styria, Carinthia, Carniola, Central and Northern Tyrol, Southern Moravia, a part of Bohemia, the main portion of Hungary, and Transylvania, The seasons are more marked here than in the preceding. The winters are longer and more severe, and the summers are hotter. The vine and maize are cultivated in favourable situations, and wheat and other kinds of grain are generally grown. The northern zone embraces the territory lying north of 49° N. lat., comprising Bohemia, Northern Moravia, Silesia, and Gali- cla, The winters are here

long and cold; the vine and maize are no longer cultivated, the principal crops being wheat, barley, oats, rye, hemp, and flax. The mean annual temperature ranges from about 59° in the south to 48° in the north. In some parts of the country, however, it is as low as 46° 40’ and even 36°. In Vienna the average annual temperature is 50°, the highest temperature being 94°, the lowest 2° Fahr. In general the eastern part of the country receives less rain than the western. In the south the rains prevail chiefly in spring and autumn, and in the north and central parts during summer. Storms are frequent in the region of the South Alps and along the coast. In some parts in the vicinity of the Alps the rain- fall is excessive, sometimes exceeding 60 inches. It is less among the Carpathians, where it usually varies from

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30 to 40 inches. In other parts the rainfall usually averages from 20 to 24 inches, but in the plains of Hungary it is as low as 16.

From the varied character of its climate and soil the Flora.

vegetable productions of Austria are very various. It has floras of the plains, the hills, and the mountains; an alpine flora, and an arctic flora; a flora of marshes, and a flora of steppes ; floras peculiar to the clay, the chalk, the sand- stone, and the slate formations. The number of different species is estimated at 12,000, of which one-third are phanerogamous, or flowering plants, and two-thirds crypto- gamous, or flowerless. The crown-land of Lower Austria far surpasses in this respect the other divisions of the country, having about four-ninths of the whole, and not less than 1700 species of, flowering plants, Hungary, Bohemia, Moravia, and Galicia are the principal corn- growing regions of the country; and Tyrol, Salzburg, and Upper Styria are the principal pastoral regions.

The animal kingdom embraces, besides the usual domestic Animals,

animals (as horses, cattle, sheep, swine, goats, asses, &c.), wild boars, deer, wild goats, hares, &c.; also bears, wolves, lynxes, foxes, wild cats, jackals, otters, beavers, polecats, martens, weasels, and the like. Eagles and hawks

are common, and many kinds of singing birds. The rivers and lakes abound in different kinds of fish, which are also plentiful on the sea-coast. Among insects the bee and the silkworm are the most useful. The leech forms an article of trade. In all there are 90 different specics of mammals, 248 species of birds, 377 of fishes, and more than 13,000 of insects.

Austria comprises five countries, each bearing the naine Divisions.

of kingdom—-viz., Hungary, Bohemia, Galicia, Illyria, and Dalmatia; one archduchy, Austria; one principality, Transylvania; one duchy, Styria; one margraviate, Mora- via; and one county, Tyrol. These are now divided into provinces, which are called crown-lands, and of which at present there are 18, 14 being in Austria Proper, and 4 in Hungary. The following table gives the area and civil population of the different crown-lands in 1857 and at 31st December 1869. The first 14 crown-lauds constitute Austria Proper, and the remaining 4 form the kingdom of Hungary. Gortz, Istria, and Trieste are also known as the Maritime District.

a a P opula- Population in 1869, Crown-lands. . ion in English} “}g57. Males. | Females. | Totul.

1,681,697 967,087 987,164 | 1,954,251

707,400 858,117 373,462 731,579 146,760 73,468 77,942 151,410

je 1,056,773 555,289 576,020 | 1,181,309 CALIAEDIAG. ccsasceessescees 3,992 332,456 161,519 174,881 336,400 @annioll it. -<....vecese 3,844 451,941 220,009 243,264 463,278 Gortz, Istria, & Trieste 3,074 520,978 288,293 293,786 582,079 Tyrol and Vorarlberg | 11,287 851,016 429,241 449,666 878,907 Bohemia 19,997 | 4,705,525 | 2,433,629 | 2,672,440; 5,106,069 a 1,867,094 948,206 | 1,049,691 | 1,997,897 RULES Miss secnsctsesaccasade 443,912 242,574 269,007 511,581 GSN CHa. cs. .sc 4,597,470 | 2,660,518 | 2,757,498 | 5,418,016 Buekowina 456,920 255,919 56,045 511,964 Dalmatia 404,499 220,169 222,617 442,796 Hungary…. wis 9,900,785 | 5,499,462} 5,618,161 | 11,117,623 Transylvania …..... 21,159 | 1,926,797 | 1,051,145} 1,050,582 | 2,101,727 Croatia and Slavonia… 7,421 876,009 495,962 501,644 997,606 Military Frontier…... 12,919 | 1,064,922; 606,991 693,380 | 1,200,371 GCE

WWevasnanesasnsnest 239,637 | 31,992,954 | 17,467,598 | 18,167,260 | 35,634,858

A more recent report states that the population of Austria Proper had risen from 20,210,000 in 1869 to 20,970,000 in 1873—the male population having increased from 9,810,000 to 10,200,000, and the females from 10,400,000 to 10,770,000. The most thickly populated crown-land is Silesia ; the most thinly, Salzburg,

The civil population of Austria in 1818 amounted to Population.

29,769,263, in 1830 it had increased to 34,082,469, in 1842 to 35,295,957, in 1857 to 37,339,012, and in 1869 to 35,634,858. Between the two last dates it had lost its Lombardo- Venetian territories, with more than 5,000,000

Races.

Religion.

118 Kj UST Bhi & [EDUCATION.

inhabitants, In Austria Proper the number of births in 1869 was 812,474, of which 419,374 were males and 393,100 females ; 699,047 were legitimate, and 113,427 illegitimate, and 17,114 were still-born. The number of deaths among children up to 5 years of age was 281,643— 152,294 being males, and 129,349 females. The number of marriages that took place during that year was 208,787, of which 164,018 were between parties neither of whom had been previously married ; 8670 between parties both of whom had bcen previously married; 23,533 between widowers and unmarried females, and 12,566 between widows and unmarried males. The total number of deaths during 1869 was 583,995, of which 302,104 were males and 281,891 females, Of these the ages of 28 males and 40 females are given as over 100 years. Violent deaths carried off 5988 males and 1939 females, of whom 1110 males and 265 femalcs had committed suicide, 244 males and 82 females were murdered, and 4 males executed. In Austria Proper there were 738 cities and large towns, 1270 market towns, 52,919 villages, and 2,766,314 inhabited and 121,045 uninhabited houses. In Hungary there

were 189 cities and large towns, 769 market-towns, 16,373 villages, and 2,450,213 houses. The cities containing more than 100,000 inhabitants in 1869 were Vienna (833,855), Pesth (201,911), and Prague (157,275). Seven cities contained between 50,000and 100,000 inhabitants; 42 between 20,000 and 50,000 ; and 90 between 10,000 and 20,000.

The population of Austria is made up of a number of distinct races, differing from each other in manners, customs, language, and religion, and united together only by living under the same government. The most numerous race is the German, amounting to 9,000,000, and forming 25 per cent. of the entire population. They are found more or less in all the crown-lands, but are most numerous in Lower and Upper Austria, Salzburg, Styria, Carinthia, and Northern Tyrol. The different Slavonic races number together 16,540,000, or 46 per cent. The principal Slavonic races are,—in the north, the Czechs and Moravians (4,480,000), who, together with the Slovacks in the Western Carpathians (1,940,000), form 18 per cent. of the entire population, and the Poles (2,370,000) and the Ruthens (3,360,000) occupying Galicia; and in the south, the Slovens (1,220,000), the Croats (1,520,000), and the Serbians (1,651,000). The northern Slavonians are found chiefly in Bohemia, Moravia, Galicia, and the north of Hungary ; the southern in Carniola, Dalmatia, Croatia, Slavonia, and the Military Frontier. The Magyars or Hungarians occupy chiefly Hungary and Transylvania, and number 5,590,000, or 16 per cent. of the whole population. The Ruméni or Wallachians number 2,940,000, or over 8 per cent.; the Jews, 1,105,000, or 3 per cent. ; the Italians, 515,000, or 1°4 per cent. ; and the gipsies, 140,000. The rest consist of Armenians, Bulgarians, Albanians, Greeks, &c.

Austria has always remained strongly attached to the Roman Catholic Church. Her sovereigns, however, have in general resisted the temporal pretensions of the popes, and reserved to themselves certain important rights, such as the imposing of taxes on church property, the nomina- tion of bishops and archbishops, and the option of restrict- ing, or even prohibiting, the circulation of Papal bulls. About two-thirds of the people, or nearly 24,000,000, pro- fess the Roman Catholic religion. If, however, we deduct the kingdom of Hungary and Galicia, where less than one- half of the people are Roman Catholics, the proportion in the rest of the country is much increased. In some parts the proportion to the entire population is as

high as 90 to 98 per cent. The Greek Catholics number in Austria Proper 2,342,168 (almost all in Galicia), and in Hungary 1,599,628. The Eastern Greek Church numbers 461,511 adherents in Austria, and 2,589,319 in Hungary. Of the

Protestant denominations, the Lutherans are more numer- ous in the western half of the empire, the Calvinists in the eastern. ‘The numbers are—in Austria Proper, Lutherans, 252,327, and Calvinists, 111,935; in Hungary, Lutherans, 1,365,835, Calvinists, 2,143,178. The principal other religions are the Jewish, 1,375,861 (nearly half of them in Galicia); Armenian, 10,133; Unitarian, 55,079 (nearly all in Transylvania). The Catholic Church (includ- ing the Greek and Armenian Catholics) has 11 archbishops, 24 suffragan bishops, 2 vicariate bishops, and 1 military bishop, in Austria Proper, and 5 archbishops and 23 bishops in Hungary. Altogether there are about 34,000 ecclesiastics, and 950 convents, with 8500 monks and 5700 nuns. The Oriental Greek Church has, in Austria Proper, 3 bishops (1 in Buckowina and 2 in Dalmatia), and in Hungary, the patriarch of Karlowitz, the archbishop of Herrmannstadt, and 8 bishops, with, in all, 4000 priests, and 40 convents, with 300 monks.

Previous to 1848 Austria was very far behind in the Educaticy! matter of education; but since that time great improve ments have been effected, and an entire change has taken place. This subject now receives the greatest attention; schools of all kinds have been established throughout the country, improved systems of teaching have been intro- duced, and instruction is open to all without regard to class or creed at a very small cost, or even gratuitously. It still continues, however, to be in great measure under the control of the priests, and many of the teachers are ecclesiastics. The Roman Catholic religion forms an essential part of the instruction in all schools, except those for special subjects. The Oriental Greek and Protestant Churches have, as a rule, their own common schools, and where this is not the case, they have to send their children to the Catholic schools. The Jews also, in places where they have no special schools, are obliged to send their children to Christian schools.

The various cducational institutions may be arranged under four classes—(1.) The lower or common schools; (2.) The higher or middle schools ; (3.)

The universities, academies, and technical schools; (4.) The special schools (for particular branches of science or art). All children from 6 to 12 years of age are bound to attend the common schools. This law, however, would appear to be not very strictly carried out, for of the number of 2,219,917 children who ought to have been attending the common schools in Austria Proper in 1868, the number given as actually at school is only 1,691,349, or about 76 per cent. This percentage, moreover, varies greatly in different parts of the country, being in some, as Tyrol, Salzburg, Moravia, and Upper and Lower Austria, as high as 98 or 100, and in Styria and Carinthia from 93 to 96 ; in others, as in Carniola, only 56, in the Maritime District 47, Dalmatia 28, Galicia 27, Buckowina 20. The proportion for the whole of Hun- gary is 88 per cent., and it is higher in the western than in the eastern half of the kingdom. The number of common schools in Austria in 1868 was 15,054, with 32,137 male and 2814 female teachers, 12,225 of the former being ecclesiastics, and 1036 of the latter nuns ; in Hungary the number of schools was over 16,000, and of teachers 28,000. In connection with many of these schools there are training institutions for teachers, industrial schools for girls, and trade and agricultural schools for boys. The middle schools are the gymnasia, real-gymnasia, and real-schools. A com- plete gymnasium provides for a course of eight years' study, divided into two parts of four years each. The lower course not only pre- pares for the higher, but is also complete in itself for those who do not wish to advance farther. The branches of study include Latin, Greek, and modern languages, geography, history, religion, mathe- matics, natural history, physics, writing, drawing, singing, and gymnastics. In passing from one class to another the scholars undergo a very searching examination. The real-schools, or middle industrial schools, have been cstablished since 1848, and are designed to impart technical knowledge, and afford a suitable training to those intending to follow industrial pursuits. They are divided into two courses of three years each, a lower and an upper—the former serving not only as a preparation for the latter, but formin also an independent course, fitting for the lower kinds of industria occupations. The branches taught include geography, history, arithmetic, mathematics, writing, book-keeping, exchange, natural history, technology, drawing, &c. The real-gymnasia arc a class of institutions intcrmediate between these two, partaking of the

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AGRICULTURE. |

character of both. In Austria Proper there were, in 1871, 92 gym- nasia, with 1647 teachers (518 being ecclesiastics) and 26,102 scholars ; 31 real-gymnasia, with 375 teachers (66 ecclesiastics) and 45,290 scholars; and 83real-schools, with 777 teachers (91 ecclesiastics) and 15,622 scholars. In Hungary there were 142 gymnasia, 1 real- gymnasium, and 25 real-schools, having in all 38,000 scholars. There are six universities in Austria Proper (Vienna, Gratz, Inns- briick, Prague, Cracow, Lemberg), and one in Hungary (Pesth), with, in all, 707 professors and 10,900 students. Hach university (except Lemberg, which has no medical faculty) has faculties for Roman Catholic theology, law and political economy, medicine and surgery, and philosophy. The theological and law courses occupy four years each, the medical five, and the philosophical three. Of the students, 40 per cent. were at the university of Vienna, 18 at Pesth, 16 at Prague, 10 at Lemberg, and 64 at Gritz. Of the 8532 students attending the six Austrian universities, 1888 were receiving free instruction and 924 were stipendists, and in addi-tion to this, 682 were paying only half fees. The technical high schools or acadeinies have for their object the imparting of a high scientific education. The students generally enter them from the upper real-schools, and the complete technical course cxtends over five years. There are eight of these institutions in Austria Proper, having in all 284 professors and teachers, and 3179 scholars, of whom 1501 were receiving free instruction, and 231 were stipcndists. The principal of these is the Polytechnic institution in Vienna, which has 79 professors and teachers, and 782 scholars. Among the special educational institutions may be mentioned about seventy theological seminaries connected with the Catholic Church, and a number of similar institutions connected with the Eastern Greek and Protestant Churches; a rabbinical school (in Presburg); acade- mies for law, mining, navigation, conimercc, agriculture, and the management of forests; normal and military schools; schools for surgery and midwifery; veterinary schools, &c. There are also a number of private schools of various kinds, schools for the deaf and dumb and blind, orphan institutions, &. In connection with the

uuiversities and many of the higher educational institutions are to be found libraries, museums of natural history and antiquities, botanic gardens, observatories, chemical laboratories, &c. There also exist numerous Icarned and scientific societies. The intellectual progress of Austria is, of late years, particularly manifest in the de- partments of law, inedivine, natural science, history, and Oriental languages.

The majority of the people of Austria are engaged in agricultural pursuits or in connection with the forests, the proportion varying in different parts from 50 to 80 per cent. of the entire population. The proportion of those engaged in trade or manufacture varies, amounting to 30 per cent. in Lower Austria, 24 in Bohemia, 22 in Moravia and Silesia, 19 in Upper Austria, 14 in Tyrol, 18 in Salz- burg, 11 in Carinthia, 9 in Carniola, 5 in Buckowina, and 4 in Galicia and Dalmatia. In Dalmatia about 8 per cent. of the people are employed in navigation and the fisheries.

The productive land of Austria Proper is estimated at 89°6 per cent. of its superficial area, and that of Hungary at 84°4—making 86°9 per cent. of the whole country. Farther, the arable land in Austria forms 31°6 per cent., the vineyards 0°7, gardens and mea- dows 11°7, pasturage 14°7, and forests 30°9. In like manner, in Hungary the arable: land forms 30°6 per cent., vineyards 1°2, gar- dens and meadows 12°8, pasturage 13°2, and forests 26°6. The prin- cipal product of the arable land is grain, of which the annual yield is over 400,000,000 bushels. Of this about one-fifth is wheat, one-fourth rye, one-fourth oats, one-seventh maize, one-seventh barley, and the rest buck-wheat and millet. The principal grain-pro- ducing districts are Hungary, Bohemia, Galicia, Moravia, and Lower and Upper Austria. In agriculture Austria is still behind many otuer countries, but great improvements have of late years taken place. Flax, hemp, and beet are chiefly found in Silesia, Moravia, Bohemia, and Hungary ; hops in Bohemia, and tobacco (which is a state monopoly) only in Hungary, Galicia, and Tyrol. Among the other products may be mentioned pease, beans, potatoes, turnips, rape seed, cabbages, &c. Though the vineyards are not very extensive, a considerable quantity of wine is produced, and some of the Hungarian wines, as Tokay, are justly celebrated. ‘The annual yield of wine is about 375,000,000 gallons, of which 72 per cent. isfrom Hungary and the neighbouring districts, 63 from Lower Austria, 5 from Southern

Tyrol, 44 from Styria, 4 from Dalmatia, 3 from Moravia, and 2 from the Maritime District. The principal garden products are fruit and kitchen vegetables. The best fruit districts are Moravia, Transylvania, Hungary, Bohemia, Upper Austria, and Styria. Certain districts are distinguished for parti- cular kinds of fruit, as Tyrol for apples, Hungary for melons, Dal-Matia for figs, pomegranates, olives, &c. In the south of Dalmatia the palm grows in the open air, but bears no fruit. The chestnut, olive, and mulberry trees are common in the south—the olive chietly in Dalmatia, the Maritime District, and Southern Tyrol; the mulberry tree in Southern Tyrol, the south of Hungary, Slavonia, and Styria. The forests occupy nearly one-third of the produc- tive area of the country, and cover 66,600 English square miles.

They are much more extensive in the eastern than in the western half of the country, the relative proportions being 62 per cent. in the former, and 38 in the latter. They are found particularly in the region of the Carpathians, and especially in Galicia and Bucko- wina. The Alpine regions are generally well wooded, as is also the country of the Sudetes. The forests are chiefly of oak, pine, beech, ash, elm, and the like, and are estimated to yield annually over 27,000,000 cords of building wood and firewood.

Austria is distinguished for the number and superiority of its Horses,

horses, for the improvement of which nunicrous studs exist over the country. The breeding of horscs is more or less extensively carried on in all the crown-lands, but more especially in Hungary, Transy]- vania, Buckowina, Galicia, Styria, Bohemia, Moravia, and Upper and Lower Austria. The total nuinber of horses in the country in 1870 was 3,525,842, of which 2,158,819 were in Hungary. All kinds of horses are represented, from the heaviest to the lightest, from the largest to the smallest. The most beautiful horscs are found in Transylvania and Buckowina, the largest and strongest in Salzburg. The horses of Styria, Carinthia, Northern Tyrol, and Upper Austria are alsofamous. In Dalmatia, the Maritime District, and Southern Tyrol, horses are less numerous, and mules and asses in a great measure take theirplace. Of the 13,891 mules in the country, 45 per cent.

were in Dalmatia, and 30 per cent. in the Maritime District and Southern Tyrol; and of the 61,831 asses, 28 per cent. were in the former and 21 in the latter. The Hungarian crown-lands con- tained 2266 mules and 80,482 asses.

Austria cannot be said to be remarkable as a cattle-rearing coun- Cattle.

try. Indeed, except in certain districts, particularly among the Alps, it must be considered to be much behind in this branch of industry. The finest cattle are to be found in the Alpine regions ; in other parts the breeds are gencrally very inferior. The Hun- garian crown-lands, however, have of late years been improving in this respect. The country numbered 12,704,405 head of cattle in 1870, of which 5,279,193 were in Hungary, 2,070,572 in Galicia, and 1,602,015 in Bohemia. The cattle of the eastern half of the country considerably outnumbered those of tho western; but in quality the lattcr were far superior to the former. In Hungary and Transylvania there are about 72,000 buffaloes. The rearing of shcep receives a large share of attention, and is carried on to a consider- able extent in all the crown-lands, and in some very extensively. Much has been done of late years in the way of improving tho breeds, more particularly in Moravia, Silesia, Bohemia, Upper and Lower Austria, and Hungary. The main object has been the im- provement of the wool, and with this view the merino and other fine- wooled breeds have been introduced. Some attention, how- ever, is also given to the fattening properties. For mutton, the best sheep are those of Lower Carinthia, the Maritime District, Dalmatia, and the Military Frontier. The sheep are frequently driven from one part of the country to another for the sake of pas- ture, and even into other countries, as Lombardy, Turkcy, and the Danubian Principalities. The number of shcep in the country in 1870 was 20,000,000, of which 15,000,000 were in the kingdom of Hungary. The goat, which has been called the poor man’s cow, is also to be found in all parts of the country, but more particularly in the mountainous districts and among the poorer peasantry. The total number in the country in 1870 was 1,552,000, of which 573,000 were in Hungary. Dalmatia, however, is the great coun- try of the goats, where they number 280,656, after which follow Bohemia with 194,278, and Tyrol with 137,698. The number of swine was 6,984,752, of which 4,443,279 were in Hungary. They are naturally most numerous in those crown-lands which contain extensive

oak aud beech forests, or which have many distilleries, Henee they are mostly found in Hungary, Transylvania, the Mili- tary Frontier, Galicia, Styria, and Bohemia.

Bees are extensively kept, particularly in the crown-lands of Lower Austria, Hungary, Galicia, and Transylvania. There were in 1870 15,300,000 bee- hives in the country, yielding 7,750,000 Ib of honey and 340,000 fb of wax. The silk-worm is cultivated in certain parts of the southern districts, particularly in Southern Tyrol, which yiclds 2,200,000 Ib of cocoous, being nearly double that of all the rest of the country put together. The rivers and lakes in general abound with fish, which are also plentiful along the coast. In Dalmatia, in particular, fishing constitutes an im- portant branch of industry, affording employment to many of tho population. Leeches are common in the swamps, and form a con- siderable article of export. The avcrage annual value of the pro- duce of the land and forests, including the cattle, aud hunting and fishing, is estimated at £212,000,000. The value of the real pro- perty, including the cattle and agricultural implements, is given at £782, 000,000.

In the extent and variety of its mincral resources Austria ranks Minerals.

among the first countrics of Europe. Besides the noble metals, gold and silver, it abounds in ores of more or less richness of iron, cop- per, lead, and tin; while in less abundance are found zine, anti- mony, arsenic, cobalt, nickel, manganese, bismuth, chromiuin, uranium, tcllurium, sulphur, graphitc, asphalt, rock-salt, coal, and petroleum. There are also marble, roofing-slate, gypsum, porcc-

Manufae- tures.

lain earth, potter’s clay, and precious stones. The crown-lands in which mining operations are chiefly carried on are Styria (iron and coal), Carinthia (lead and iron), Carniola (quicksilver), Hun- gary (gold, silver, copper, iron, and coal), Transylvania (gold and silver), Salzburg (iron), Bohemia (silver, lead, iron, and coal), Mo- ravia (iron and coal), Galicia (salt). The chief places where gold and silver ores are found are—(1.) at Zalathna in

Transylvania, on the southern range of the Behar Mountains, where affiuents of the Kérés and Maros take their rise, in which, as well as in tlie Theiss and the Danube, gold is also found ; (2.) The district of Schemnitz and Kremnitz in Hungary ; (8.) Pribram and Joachimsthal in Bo- hemia. Nearly 3,000,000 ewt. of gold and silver ores is obtained annually, from which 64,298 oz. of gold and 1,476,000 oz. of silver are extracted. Of the gold, 54 per cent. is obtained in Transy]- vania, and 44 in Hungary; and of the silver ore, 65 per cent. 1s raised in Hungary, 27 in Bohemia, and 54 in Transylvania. Iron is found more or less in all the crown-lands except Upper Austria, the Maritime District, and Dalmatia ; but it is most plentiful and best in quality in Styria and Carinthia. The amount of raw and cast iron annually obtained from the ore raised in the country is 7,600,000 cwt., of which 28 per cent. is from Styria, 15 from Carinthia, 124 from Bohemia, 114 from Moravia, 16 from Upper Hungary, 64 from other parts of the kingdom of Hungary, and_ the remainder from the other crown-lands. ‘The principal place where copper is obtained is the neighbourhood of Schmélnitz in Hungary. The quantity for the whole country amounts to 1,500,000 ewt. of ore, from which 65,000 cwt. of pure metal is obtained. Of this, 80 per cent. is from Upper Hungary, 6 from Tyrol, and 4 from Buckowina. Carinthia is particularly rich in /ead, and from it more than one-half (52 per cent.) of the entire quantity raised in the coun- try is obtained. Bohemia yields 26 per cent., and Hungary 15. Altogether, 195,000 ewt. of ore, and 114,000 ewt. of pure metal is obtained. Idria in Carniola has, after Almaden in Spain, the rich- est quicksilver mine in Europe, producing 3900 cwt. of pure metal. Of the rest, Hungary produces 1120 cwt., and Transylvania 450. Tin is found only in Bohemia, which supplies 55,000 ewt. of ore, from which 450 ewt. of tin is obtained. Zinc is found chiefly in the neighbourhood of Cracow, where 146,475 cwt. of ore is raised. Austria is particularly rich in salt. In Galicia there exists a stratum of rock-salt many miles in extent, which is worked at Wicliczka and other places. Similar layers occur in Hungary (Marmaros) and Transylvania (at Thorda). There also exist salt springs in Galicia, in Marmaros, and in Transylvania, from which salt is largely ex- tracted, as it is also to a considerable extent from sea water on the coast. About 3,900,000 ewt. of rock-salt is annually obtained from the mines (of which 22 per cent. is from Galicia, 24 from Mar- maros, 34 from Transylvania), from the various salt springs about 2,800,000 ewt., and from the salt-works on the coast

1,400,000 ewt. Austria is possessed of almost inexhaustible stores of coal, and the amount annually raised exceeds 6,000,000 tons, of which 48 per cent. is in Bohemia, 12in Hungary, 11 in Silesia, 10 in Styria, 64 in Moravia, 24 in Galicia, and 14 in Carniola. Peat and clay are abundant in certain parts of the country ; porcelain earth is found in Bohemia and Moravia; white, red, black, and variously-coloured marbles exist in the Alps, particularly in Tyrol and Salzburg; quartz, felspar, heavy spar, rock-crystal, asbestos, &c., are found in various parts ; and among precious stones may be specially mentioned the Hun- garian opals and the Bohemian garnets. The number of persons em loye in the various mines in Austria Proper in 1870 was 75, 451, and in the smelting and casting works, 13,857. In addition to these, 9818 persons were employed in the salt-mines and other salt- works. In Hungary 50,143 persons were employed in mining and smelting. The total annual value of the raw materials obtained from the mines is estimated at over £9,000,000, of which nearly one-half is of coal, a fifth of iron, an eighth of gold and silver, and a tenth of rock-salt.

The manufactures of Austria have made great progress during the last twenty years, and now some of them are extensively carried on. They inelude cotton, flax, hemp, woollen and silk stulis ; gold, silver, iron, lead, copper, tin, and zine articles; leather, paper, beer, brandy, and sugar; porcelain and earthenware ; chemical stuffs ; scientific and musical instruments, &c. The manufactures are principally carried on in the western crown-lands, and more particularly in Bohemia, Moravia, Silesia, and Lowcr Austria. In Galicia and the Hungarian crown-lands the manufactures are com- paratively neglected. The principal scats of the cotton, woollen, and linen manufactures are in Moravia, Silesia, Bohemia, and Vienna ; of iron and steel wares in Styria and Carinthia ; iron in Upper Austria ; cast-iron goods in Moravia, Styria, Carinthia, and Bohemia ; silk in Vienna ; glass and porcelain in Bohemia ; beet- root sugar in Bohemia and Moravia; leather in Bohemia, Moravia, Galicia, and Hungary ; beer in Bohemia and Lower Austria; brandy in Galicia, Moravia, and Bohemia; cabinet wares and musical in- struments in Vienna and Prague ; and scientific and surgical in- a in Vienna.

The cotton manufacture has made very rapid progress, and is now one of the most extensive and dourishing in tie country. In 1831

the import of cotton was 101,000 cwt., and the export 175; in 1850 the former had risen to 522,000, and the latter to 1270; and in 1870 the former was 1,100,000, and the latter 36,000 ewt. There are 172 spinning factories, with 1,750,000 spindles, in the country, almost all situated in Lower Austria, Bohemia, and Vorarlberg, There are 46 factorics, with 550,000 spindles, in Lower Austria between the Vienna Forest and the Leitha, and beside them are 7 dyeing and printing works. A principal seat of the cotton manu- facture is in Northern Bohemia, from the Eger to Reichenberg, where there are no fewer than 80 spinning factories and 25 printing works. Besides these, there are 7 factories at Prague and 1 is Southern Bohemia. In Vorarlberg there are 21 factories, with ig spindles ; and in Upper Austria 7 factories and 6 printing works.

The flax and hemp manufacture is one of the oldest in the coun- try, and was long the most important. In consequence, however, of the rapid advancement of the cotton manufacture it is no longer of the same importance as formerly; yet it still affords em- ployment to a great number of persons, and is very generally ex- tended over the country. It is principally carried on as a domestie branch of industry, and in country districts is frequently engaged in as a sccondary pursuit by those employed in agricultural labours. The flax is mostly spun by hand, and the weaving confined to the commoner kinds of linen, being chiefly intended for home use. In Bohemia, Moravia, Silesia, and Upper Austria, however, this manufacture is more extensively carried on than in other parts. There are here a number of factories for the spinning of flax, and the finer kinds of linen are manufactured.

The woollen manufacture is also an old established branch of industry, and is actively carried on. It is estimated that about 600,000 ewt. of wool is annually spun; and there are about 230 spinning factories, with upwards of 700,000 spindles. The great seats of the woollen manufacture are in Boliemia, Moravia, Silesia, and Upper Austria. In Bohemia its great seat is in and around Reichenberg, where the annual value of the goods produced is about £1,800,000. In Moravia the principal seats are Briinn (for coarse,

and also the finest sorts of cloth), Namiescht, and Iglan. In these two crown-lands is made half of the entire quantity of woollen goods produced in the country. The principal of the other seats are the districts Bielitz in Silesia, Vienna in Lower Austria, and Viktring in Carinthia (for fine goods). Viennais also distinguished for its manufacture of shawls. ‘The coarser kinds of woollen goods are generally manufactured over the country, and principally in the people’s houses, and for home use.

The manufacture of si/k stuffs is principally carried on in Vienna, and to a small extent in the north of Bohemia and in the Maritime District. The spinning of silk has its principal seat in Southern Tyrol, where about 550,000 ib are spun annually, besides which about 1,700,000 1b are annually brought from other countries.

The iron and steel manufactures form one of the most important branches of industry, and afford employment to a great number of persons. ‘They are more or less extensively carried on in all the crown-lands, except the Maritime District, Dalmatia, Croatia, and Slavonia; but their principal seats are in Lower and Upper Austria, Bohemia, Moravia, Styria, and Carinthia. One of the most im- portant of these seats is Steier and its neighbourhood, in Upper Austria, where thcre are about 700 establishments, producing

oods—chiefly cutlery, seythes, sickles, firearms, &c.—to the value of £400,000 annually. In Styria there are large ironworks at Maria-Zell and Neuberg; and in Carinthia, at Prevali, Buch- scheiden, and Ferlach. There are also large ironworks in Lower Austria, Carniola, Tyrol, Bohemia, and Moravia. The making of steam engines and other kinds of machinery is largely carried on in and about Vienna, where there are 26 establishments for this pur- pose. There are similar establishments in other parts of Lower ‘Austria, in Styria, Bohemia, Silesia, and Buckowina. The Lloyds’ Company has also large workshops at Trieste. About 1,100, 000 ewt. of iron are annually used in the making of machinery, and about 6,600,000 ewts. in the other iron and steel manufactures, among which may be mentioned cutlery, firearms, files, wire, nails, tin- plate, stecl pens, needles, &c.

The principal copper-works areat Brixlegg and other places in Tyrol, and in Galicia, Buckowina, and Hungary. The quantity of metal employed is about 40,000 ewt., and the value of the articles annually produced is £250,000. In

the lead-works the quantity of metal employed is 65,000 cwt., and the annual value of the goods pro- duced, £100,000. Zin is manufactured (principally in Bohemia) to the annual value of £50,000, and zinc to that of £2500. The precious metals, gold and silver, are principally worked in the larger towns, particularly Vienna aud Prague, and the valuc of the articles annually produced is about £1,700,000. In addition to this a considerable amount of gold and silver is annually taken up by the mints. The mixed metals are also made and manufactured to a considerable extent, as brass, bell metal, gun metal, pinchbeck, &c.

The glass manufacture has its greatest development in Bohemia, where there are not only the greatest number of works (85 12 Northern and 85 in Southern Bohemia), but the wares are also of

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very superior quality. Their annual value is about £1,000,000. Except in Styria and Moravia there is little glass made in other parts of the country, and that only of the commoner sorts. The manufacture of mirrors is also extensively carried on in Bohemia and some other parts. Bohemia and Moravia are likewise distinguished for their earthen and porcelain wares. The preparation of chemical stuffs has been of late years greatly extended, and is now actively carried on. Sulphuric and muriatic acids are largely made in Bohemia, Lower Austria, and Silesia ; pharmaceutical preparations and perfumes are made chiefly in Vienna, and dye-stuifs in Lower Austria and Bohemia. The manufacture of wooden articles is widc- spread over the country, and affords employment to a great number of persons, ‘The smaller articles, particularly children’s toys, are largely made by the peasantry in the mountainous and rural dis- tricts, particularly in Tyrol, Salzburg, Upper Austria, and Bohemia. Furniture, waggons, and carriages are made in Vienna and other large towns. ‘There are also several establishments for the manu- facture of railway carriages in Vienna and Prague.

The manufacture of mathcmatieal, optical, and surgical instru- ments, and of physical and chemical apparatus, has of late years risen rapidly into importance, particularly in Vienna and Prague, and now these are to be

found among the exports to other countries. Austria is also distinguished for the manufacture of musieal instru- ments, particularly pianos and organs, butalso for other stringed and

_ wind instruments. Clock or watch making is not very extensively

carried on.

The leather manufacture forms an important branch of industry, the value of tlie goods annually produced being estimated at not less than £10,000,000 It is principally carried on in Lower Austria, Bohemia, Moravia, Galicia, Transylvania, and Hungary. Vienna and Prague are the great centres of the boot and shoe trade, and the gloves made in these towns are considered little inferior to those of Vrance. Saddlery is also largely carried on in these towns, and in Pesth.

Paper-making has of late made considerable progress in Austria. There are 70 paper machines and 193 paper mills in operation, 20 of the former and 100 of the latter being in Bohemia. The rest are mostly in Lower Austria, Styria, and Fiume. Painting, lithograph- ing, engraving, and map making, are actively carried on in Vienna and some of the other large towns. ‘There are 44 printing and 78 lithographic establishments in Vienna alone.

Austria is noted for its beer, particularly that of Vienna and Bohemia. ‘There are about 3200 breweries in the country, of which more than 1000 are in Bohemia. ‘The largest establishments, how- ever, ate in Lower Austria, in the neighbourhood of Vienna. The annual quantity of beer made is estimated at about 186,000,000 gallons. Brandy is made largely in Hungary, Galicia, and Bucko- wina, and to a less extent in Bohemia, Moravia, and Lower Austria. Rosoglio, maraschino, and other liqueurs, are made in Dalmatia and Moravia.

The manufacture of sugar from beet-root is in a very flourishing state, and is rapidly extending In 1857 there were in Austria Proper 91 sugar-works, consuming 8,300,000 ewt. of bect, which amounts were in 1870 raised to 190 and 24,834,646 respectively. In Bohemia alone there were 126 works, consuming 15,279,000 cwt. of beet. Of the other works, Moravia possessed

45, Silesia 10, Lower Austria 6, Galicia 5. This manufacture is alsc carried on to some extent in Hungary and Transylvania.

The manufacture as well as the growth of ¢obacco is a govern- ment monopoly. There are 22 establishments for the manufacture of tobacco and cigars, employing about 20,000 workpeople. Of these there are 5 in Lower Austria, 3 in Galicia, 2 in Moravia, 2 in Tyrol, and 4in Hungary. The largest are those of Hainburg in Lower Austria (where about one-sixth of the whole is manufactured), Furstenfeld in Styria, and Sedler in Bohemia. About 70,000,000 Ib of tobacco are manufactured annually.

The annual value of the industrial products of Austria is esti- mated at not less than £130,000,000, of which 33 per cent. falls to the eastern, and 67 per cent. to the western half of the country. Among the crown-lands, 18 per cent. belongs to Bohemia alone, 15 to Lower Austria, 15 to Hungary, 6 to Transylvania and the other Hungarian crown-lands, 11 to Galicia and Buckowina, 10 to Moravia, 6 to Tyrol, 4 to Styria, and 4 to Upper Austria.

‘ Austria is not favourably situated for commerce on account of its inland position, its small extent of sea-coast, and the mountainous character of much of its surface. Its trade was also formerly very much hampered by high duties, and restrictions of various kinds. These, however, have now been very much modified or removed, and its trade has in consequence rapidly improved. Much has been done, too, in the way of making and improving the roads, opening mountain passes, constructing railways, and establishing lines of steamers. In 1874 there were 9530 miles cf railway in operation, of which 5755 were in Austria and 3775 in Hungary. Besides these there were about 2000 miles in course of construction. There a also 59,770 miles of highways, of which 70 per ccnt. are in : ustria and 30 in Hungary. Bohemia, in particular, is distinguished or the nuniber and excellence of its roads. The river Danube is

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navigable for steamers for its entire length in the country—from Passau to Orsova. Many of its affluents are also navigable for a considerable length,

particularly the Theiss, Drave, and Save. The Danube Steam Company possesses 155 steamers, of 13,946 horse- power, and 495 towed boats. There are also steamers on a number of the larger lakes. Altogether, Austria possesses 4240 miles of navigable river and canal communication, of which the greater part (60 per cent.) is in Hungary.

The principal seaports of Austria arc Trieste and Fiume, at the head of the Adriatic, the former in the Maritime crown-land, the latter in that of Croatia. The number of vessels that entered the port of Trieste in 1870 was —sailing vessels, laden, 5332; in ballast, 898; total tonnage, 407,606; value of imports, £4,673,170: steamers, laden, 924; in ballast, 900; total tonnage, 552,497; value of imports, £12,586,950. The number of vessels that left was —sailing vessels, laden, 4409; in ballast, 1794; total tonnage, 441,601; valuo of exports, £3,325,400: steamers, laden, 920; in ballast, 900; total tonnage, 571,175 ; value of exports, £6,716,940. Trieste is the seat of the Austrian Lloyds' Company, which tradcs principally with the eastern ports of the Mediterranean, Galacz, Sinope, Smyrna, Beirout, Alexandria, &. They own 68 steam vessels. The number of vessels that entered the port of Fiume in 1870 was—sailing vessels, laden, 1530; in ballast, 270 ; total tonnage, 77,499 ; value of imports, £519,820: steamers, laden, 229 ; in ballast, 17; total tonnage, 52,671; value of imports, £174,720. The number of vessels that left was—sailing vessels, laden, 1180 ; in ballast, 622 ; total tonnage, 88,781; value of exports, £366,790 : steamers, laden, 245; in ballast, 1; total tonnage, 52,671; value of exports, £94,340.

The commercial navy of Austria in 1870 comprised 83 steam vessels, of 47,242 tons burden, having 2352 men; 566 large sailing vessels, trading with foreign countries, of 255,930 tons burden, having 5939 mien; and 2487 coasting vessels, of 555,318 tons burden, having 7588 men. Besides these, there were 4717 smaller vessels, with 14,475 tons and 12,305 men, employed as lighters, in fishing, &c. Thenumber of trading vessels that entered and left tlie various ports in 1870 was—entered, sailing vessels, Austrian, Jaden, 17,564 (tonnage, 486,745); in ballast, 9727 (tonnage, 270,887) ; foreign, laden, 4860 (tounage, 263,942) ; in ballast, 2793 (tonnage, 184,760): steamers, Austrian, laden, 4964 (tonnage, 1,676,095) ; in ballast, 2597 (tonnage, 409,480); forcign, laden, 179 (tonnage, 138,032); in ballast, 12 (tonnage, 7847). Left—sailing vessels, Austrian, laden, 17,204

(tonnage, 468,093); in ballast, 10,308 (tonnage, 290,531); foreign, laden, 5705 (tonnage, 384,019); in ballast, 1976 (tonnage, 103,995): steamers, Austrian, laden, 4160 (tonnage, 1,403,865) ; in ballast, 3397 a 678,512) ; foreign, laden, 160 (tonnage, 143,100); in ballast, 32 (tonnage, 21,790). Total entered—Austrian vessels, 34,852 (tonnage, 2,843,207) ; foreign, 7344 (tonnage, 594,581): left—Austrian, 35,069 (tonnage, 2,841,001) ; foreign, 7271 (tonnage, 652,904). The total value of the imports was £16,630,150; of the exports, £13,052,250— £7,098,180 of the former, and £3,578,810 of the latter, being in foreign vessels. The principal a trade is carried on with Italy, Greece, Turkey, England, Holland, Norway and Sweden, North Germany, Denmark, and North America. The number of vessels belonging to the principal foreign states that entered and left the various ports in 1870, was as follows :—

Entered. Left. | Value of Value of Vessels.| Tonnage. | Cargoes. Vessels.| Tonnage. Cargoes. £ £

HWalian <...:...0% 3557 185,142 | 1,623,730 | 4508 801,781 | 1,589,910

Greek. 383 31,511 448,140 313 35,415 308,260

Turkish…...00 234 13, 367 155,940 126 12,455 132,510

British …...06. 213 137,330 | 3,724,810 175 138,462 | 1,237,390

Duteni…....0008 41 8,795 234,710 35 8,770 112,160 Swedish and 9

Norwegian 30 7,471 264,870 23 8,762 71,980

The principal imports, with their values, were—coffee, £805, 370 ; sugar, £218,950 ; tobacco, in leaf, £417,670 ; ditto, manufactured, £457,520; wheat, £311,500; maize, £331,060; flour, £431,840 ; olive oil, £778,890; iron, raw and wrought, £1,210,570; raw cotton, £1,855,210; cotton yarn, £303,130; cotton goods, £1,375,390; linen goods, £226,470; wool, £266, 270 ; woollen goods, £252,900; machines, £216,010. The principal exports were—coffee, £336,610; sugar, £381,090; manufactured tobacco, £370,610 ; wheat, £244,410; maize, £434,980; flour, £938,730 ; olive oil, £614,640; spirits of wine, £334,620; barrcl staves, £517,520; building stones,

£307,040; raw cotton, £293,750 ; cotton goods, £2,030,060; wool, £109,490; woollen goods, £249,788 ; articles of clothing, £212,540; paper, £256,070.

As might be expected from its natural position, the overland foreign trade of Austria is more important than its sea traflic. While the latter amounted to £29,682,400, the former was no less than £55,039, 034 (imports, £27,890,181; exports, £27,148,853). Of the overland trade about 74 per cent. is with Germany, 14 with

Turkey, 6} with Italy, 5} with Russia, and rather more than 4 with Switzerland. I¢ includes colonial goods, agricultural and garden produce, animals and animal produce, the produce of the mines and manufactures, chemical products, machines, scientific instruments, wine, beer, brandy, &c. Besides these, there is a con- siderable transit trade through the country, chiefly from the sca- ports and the eastern borders, towards the north and north-west. It is cstimated at about £12,000, 000.

The internal trade consists chiefly of the exchange of the pro- ducts of different parts of the country, more particularly of the agricultural products of the east with the industrial products of the west. Important markets are held at fixcd times in the principal towns for the different kinds of produce. Vienna, as being the capital and the seat of so many different branches of industry, and as having ready means of communication with all parts of the country, is the principal seat both of the home and of the foreign trade, and the great resort of merchants and capitalists.

Austria possesses a number of banks, the principal of which are— the National Bank, founded in 1816, and having an active capital of £9,000,000 ; the Austrian Land-Credit Institute, founded 1864, active capital, £960,000; the Austrian Trade and Manufacturcs Credit Institute, founded 1855, active capital, £4, 000,000 ; the Anglo-Austrian Bank, founded 1863, active

capital, £1,704,500; the Union Bank, founded 1870, active capital, £1,200,000 ; the Franco-Austrian Bank, founded 1869, active capital, £800,000 ; the Lower Austrian Discount Company, founded 1858, active capital, £700,000. The National Bank is the only company authorised to issue notes. There are also a number of savings banks and loan institutions of various kinds, as well as numerous societies formed with the view of furthering in various ways industry and commerce. In 1871 there were 3504 post-offices in Austria, and 1638 in Hun- gary ; the number of private letters that passed through the former in that year was 125,614,538, and through the latter, 37,368,139 ; of newspapers through the former, 51,780,909, and through the latter, 22,308,771. There were also throughout the country 1081 tele- graph stations, and 22,536 miles of lines transmitting upwards of 5,000,000 messages during that year.

The head of the Austro-Hungarian monarchy is the emperor and king, who is also the head of the army and of the executive. The succession is hereditary, in the order of primogeniture, in the male line of the house of Hapsburg-Lothringen, or Lorraine; and failing this, in the female line. The monarchy comprises two distinct states—a German or Cisleithan, commonly called Austria, and a Magyar or Transleithan, usually termed Hungary. Each of these has its own parliament, ministers, and government ; while the army and navy and foreign rela- tions are commou. ‘These are under the direction of a controlling body known as the Delegations, consisting of sixty members for each state, two-thirds being elected by the Lower House, and one-third by the Upper House of each of the parliamentary bodies. ‘They usually sit and vote in two chambers—one for Austria, the other for Hungary ; but in the event of disagreement on any ques- tion, they meet together, and without further deliberation give their final votes, and the decision thus arrived at is binding on the whole empire. Their resolutions require neither the approval nor the confirmation of the represen- tative assemblies by which they are chosen, but only imperial assent. The executive is vested in three depart- ments—(1), A ministry of foreign affairs ; (2), a ministry of war; and (3), a ministry of finance. These are respon- sible to the Delegations. The Reichsrath, or Parliament of Austria, consists of an Upper and a Lower House. The former, the House of Lords, is composed—(1), of princes of the imperial house who are of age (14 in 1874); (2), of the heads of noble houses of high rank, in whom the

dignity is hereditary (56) ; (3), of the archbishops (10) and of bishops with the rank of princes (7); and (4), of life members nominated by the emperor on account of dis- pcan services (102). The Lower House, or House of

epresentatives, 1s composed of 353 members, elected to | eas oie different crown-lands by all citizens who are : age and possessed of a small property qualification.

e cage annually convokes the Reichsrath, and nomi- see £ acute and vice-presidents of each division out of the members. The business of the Reichsrath

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embraces all matters of legislation relating to laws, duties, and interests, except such as are specially excluded as belonging to other departments. It also takes up matters connected with trade, commerce, and finance, the post- office, railways, telegraphs, customs, the mint, raising of new loans, imposing of new taxes, budgets, matters relat- ing to military service, &e. The members of either House have the right to propose new laws on matters within their province ; but the consent of both Houses, as well as the sanction of the emperor, is required to render them valid. The executive is vested in the president and ministries of the interior, religion and education, finance, commerce, agriculture, national defence, and justice. The ministers form also the Ministerial Council, which is pre- sided. over by the emperor or a minister-president.

In addition to the Reichsrath, there are seventeen pro- vincial diets established in different districts of the country for the direction and regulation of local matters, taxation, education, religion, public works, charitable institutions, industry, trade, &c. Each diet is composed of the arch- bishops and bishops of the Roman Catholic and Greek Catholic Churches, of the rectors of the universities, and of representatives of the great landed estates, of the towns, of chambers of industry and commerce, and of rural com- munes. ‘The number of members varies according to the

size and importance of the districts—from 20 or 30 up to 100 for Moravia, 151 for Galicia, and 241 for Bohemia.

The Hungarian Parliament or Reichstag consists of an Upper and a Lower House,—the former known as the House of Magnates, the latter as the House of Represen- tatives. ‘The Upper House, in 1873, consisted of 3 princes of the reigning house, having estates in the kingdom, 31 archbishops and bishops of the Roman Catholic and Greek Churches, and 381 high officials and peers of the king- dom. The Lower House is composed of representatives elected for three years by citizens of age who pay a certain amount of direct taxes. The number of representatives, in 1873, was 444, of whom 334 represented the counties, rural districts, and towns of Hungary; 75 represented Transylvania ; and 35 Croatia and Slavonia. The president and vice-president of the House of Magnates are nominated by the king from among the members ; and the president and two vice-presidents of the House of Representatives are elected by the members. The sovereign, though emperor of Austria, is styled “king” in all public documents. The executive is vested in a president and ministries of national defence, the court, finance, interior, religion and education, justice, public works, agriculture, industry and commerce, and for Croatia and Slavonia.

The revenue and expenditure are presented in three Financ, distinct budgets :—(1), That of the Delegations for the whole empire; (2), that of the Austrian Reichsrath for Austria; and (3), that of the Hungarian Reichstag for Hungary. By an arrangement of 1868 Austria pays 70 per cent., and Hungary 30 per cent., towards the common expenditure of the empire. The total expenditure for the whole empire, in 1873, was estimated as follows : —

Ordinary, Extraordinary. Total. 1. Ministry of Foreign Affairs £424,629 el lealioil £435,810 ; °. Ministry of War | ATMY---8:909,356 989,962 9,899,318 . Ministry of War) Navy……€81,427 182,654 1,014,081 3. Ministry of Finance…..... 192,098 105 192,203 | 4, Board of Control ….....+ 10,409 aA 10,409

£10,367,919 £1,183,902 £11,551,821 The estimated Revenue for the same period was as follows :—

Ministry of Foreign Affairs ….....s06++ £65,750 AD Pea cans Sete au ane teh casteteeece

a nn es. 258

Beardtot Control… -sceseseeeeeeeaee se: 83

510,141 | |

£580, 232

ee

Carry forward, £580,282

—_———

FINANCE. | AUSTRIA 123 Brought forward, £580,232 debt amounted to £82,500,000, in 1830 to £108,000,000, in 1848

Constanne: IDWIIGS: nerencceotosbpot0s Seep ee en cee EEE Ee eeeeerne 1,555,600 to £125,000,000, in 1857 to £239, 000,000, in 1866 to £291,000,000, Payments by Hungary on account of Military and in 1874 to £323,800,000, of which £264,000,000 was funded, TMH ICUS Eee Gigs cio 2 occ 04568 sbineeeees 188,319 £22,200,000 redeemable, and £37,600,000 floating debt. By the

hare of Expenditure falling to Austria (70 p.c.).. 6, 459, 368 = E Hungary (80 p.c.) 2,768,302

cession of the Lombardo-Venetian provinces in 1866, Austria was relieved of £3,500,000 of debt affecting those territories. The kingdom of Hungary had also at the end of 1878 a debt of

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Sule Hole 2k es rer ‘i ; : A

: , ustria is said to have ‘‘ during the last few years made greater Army. The budget of Austria Proper for 1873 was as follows :— sacrifices to improve the dititincy of her army an obtained ee Recetpis. results than any other nation in Europe. Her military educational Direct MESES) ap con ODBECO CADRE E noe eee Eee nCnerce £9,034, 400 establishments and system of training, both elementary and pro- Customs Duties Paciaeisietsisivieieicisisiblstsisieieicicise s\sisleieeiaiein 2,314,100 fessional, for officers and men, are of a very high order” (Captain Duties on Articles of Consumption……..... 5,876, 230 W. 8. Cooke On the Armed Strength of Austria, 1873). A new Sal 10000 1,872,000 scheme of army organisation was brought into operation in 1869, Tobacco Momopoly……..4. .ssesseseeseeeeeess 5,812,600 by which the military forces of the whole empire are divided into eee ee cic enisce en aqaree ses eosvaa 1,400,000 the standing army with its reserve, the Landwehr, the Ersatz- yee. ces eeecevessccccseoeusvocesness 3,360,000 reserve, and the Landsturm. The standing army is maintained for 0. 00 1,526,000 the defence of the empire against a foreign foe, and for the preserva- Ree ee eirencocresseesccccecsssnvenen ens 274,300 tion of order and security at home. The Landwehr is intended to State Property and Mint….....00000 177,748 support the standing army in time of war and for home defence. Domains and Forests ……..scccccsesesvvscees 449, 800 The Ersatz-reserve is composed of a eertain class of conscripts who 2 2 gue eeemece 477,050 are destined to fill up the ranks of the standing army in time of Post-Office and Telegraphs……..... ..... 1,932,200 war, but in peace remain on permanent furlough. The Landsturm Miscellancous……..
....~~.:sssessseeeeeeeeerevees 4,861,341 is made up of volunteers who do not belong either to the standing ee army, tle navy, or the Landwehr. It is called out and organised £39, 367,769 to the extent required when the country is threatened by a hostile Expenditure. invasion, and is intended to support the standing army and Land~~ MPeTEAUTOUSCHOIG…..,.....c000:er0rcceee vee £615,000 wehr. Military service is compulsory on all citizens capable of eiotmeCHANCELY…….....scccecceerecsseeeeees (pevall bearing arms. The term of service lasts for twelve years—three Reichsrath….....06 Soa Renoateceancteascoe 56, 436 in the standing army, seven in the reserve, and two in the Land-

MariiOt tHe HMpiTe ….....csecesccnees 2,300 wehr. ‘The strength of the army in peace is fixed at 252,000 WommctROf MANISEETS.....055+0.seeeerccorsnees 59, 200 men, to be raised during war to 800,000, of which Austria has to

Meimtabry Of the Interior ….....ccsseoess 1,838,061 furnish 457,012, and Hungary 342,988. It is composcd of 80 regi-

os National Defence….....4. 891,300 ments of infantry, 41 regiments of cavalry, 13 regiments of artillery,

of Religion and Education…..... 1,384,270 2 regiments of engineers, 1 regiment pioneers, and other troops. (See

i Mien Ohara ristnee ctaesacssestwens eve 8,028,328 Army, vol. ii. p. 604.) The navy was in 1874 composed of 47 steam- Navy.

MECC hy 5 cg cciscececcceyeancess 8,262,576 vessels, of 96,700 tons burden and 16,635 horse-power, carrying 395

“ PASE TEMIDULO sc. oscscs a ssseacteerens 1,060,853 guns ; 17 sailing vessels, of 11,800 tons; and 6 steam tenders, of 1260

. Nose, sos vaciaewinsienss Sea 1,529,226 tons burden and 366 horse-power. The number of seamen in peace, PO MMIMOM CONGO] se… 0c00 ssc cecccsseevvensevscees 14, 820 5782 ; in war, 11,5382. The naval stations arc Pola and Trieste. Pensions, Grants, and Subsidies…..... 2,381,628 F : een, : Share of Interest on Public Debt…..... 9,320, 269 The present empire of Austria tock its rise in a margra- History. Administration of Public Debt…..... 746,600 viate founded by Charlemagne, towards the close of the Proportion of Public Expenditure…..... 7,799,846 Sth century, in that fertile tract of country lying along

£38, 992,929 the southern bank of the Danube to the east of the

The budget for 1874 gives the revenue as £38,329,897, and the River Enns, and now included in Lower Austria. It __ expenditure as £39,896,531; and that for 1875, the revenue as called Ostreich or Oesterreich, the eastern

country, from its £36,942,969, and the expenditure as £38,178, 255. position relative to the rest of Germany. It continued

The budget of the kingdom of Hungary for 1873 wasas follows :— | to be ruled by margraves (Ger. Jarkgraf, lord of the

Receipts. marches) for several centuries, down to the year 1156, ES £4, 481,842 when the territory west of the Enns was added to it, and it Indirect do…..... Seana: satecessrecnnnseesanse 7,166,546 was raised to aduchy. It subsequently received further oO ne e eae: 4,000,081 accessions of territory, and in 1453 was made an arch-

BUMS UIANCOUG. 2. .....0..c00ccssovecesconsseres 1,262,652 duchy. ; The country of the present archduchy of Austria was in

— £16,911,071 early times inhabited by the Taurisci, a Celtic race, who xpenditure. ai ee) Sly) “6 £365,000 were afterwards better known as the Norici. They were Gipmen Ohencery…....scecccceccccccccee 6,139 conquered by the Romans in 14 B.C. ; and thereafter a 0 oe 70,000 portion of what is now Lower Austria and Styria, together Council of Ministers My sce sicecvasss ‘ 35,908 with the municipal city of Vindobona, now Vienna, and Ministry of the Court…….....1.cs00 ee -_ ee even then a place of considerable importance, was formed fe OMMEEGE ess, c8esccescsies-s co os- TODGTIS : : 5 ’ a > = ae ae 896,670 into the province of Pannonia; and the rest of Lower cf Religion and Education…..... Sane Austria and Styria, together with Carinthia and a part of Jc er ssccs 1,068,147 Carniola, into that of Noricum. ‘Tyrol was included in m9 Agriculture and Commeree…. 1,189,738 Rheetia, while north of the Danube, and extending to the m6 ROMAGSAGCH Es 5. co acay cvsivss’oseacenes 4,776,958 ; : . Se i. a 6 468 481 borders of Bohemia and Moravia, were the territories of – ROME ei ceecssesescscs, 495,670 the Marcomanni and the Quadi. These were not unfre- Share of Interest on Public Debt…..... .. 8,272,320 quently troublesome to the Romans; and during the ray Expenses Seeeicialetietsvsiats) dibialaisss’a-eiaia a’s vs eh greater part of the reign of Marcus Aurelius, from 169 Ree LLC ORES GI eniisfe Caistsieisiieisise! ais te eicicievieieeeai- oe 650,26 to 180 A.D., they maintained with varying success a harass- £23, 220,939 ing war against them. In 174 the Roman army was so

The budget for 1874 gives the revenue as £22,402,790, and the nearly cut off by the Quadi that its safety was attributed expenditure as £25,673,382, being a deficit of £3,270,592. to a miracle. The emperor died at Vindobona when on Though the Austrian budget for 1873 presents a surplus, there | an expedition against those troublesome neighbours, and

had for many years i F : j eG previously been a large annual deficit, amount- uecessor, Commodus, was glad to make | ing in some years to £6,000,000 or £7,000,000; and the two sub- bas : ’ 8 € peace with them.

sequent years also show a considerable deficiency. Consequently, On the decline of the imperial [each these Roman pro- the public debt has been rapidly increasing. In 1815 the national | vinces became a prey to the incursions of barbaric tribes.

Hapsburg dynasty.

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During the 5th and 6th centuries the country was suc- cessively occupied by the Boii, Vandals, Heruli, Rugn, Goths, Huns, Lombards, and Avari. About 568, after the Lombards had settled in Upper Italy, the River Enns became the boundary between the Bajuvarii, a people of German origin, and the Avari, who had come from the east. In 788 the Avari crossed the Enns and attacked Bavaria, but were subsequently driven back by Charle- magne, and forced to retreat as far as the Raab, their country from the Enns to that river being then made a part of Germany. It was taken by the Hungarians in 900, but was again annexed to Germany in 955 by Otho I. In 983 the emperor appointed Leopold I, of Babenberg or Bamberg, margrave of Austria, and his dynasty ruled the country for 263 years. He died in 994, and was succeeded by his son, Henry I., who governed till 1018. In 1156 Austria received an accession of territory west of the Enns, and was raised to a duchy by the Emperor Frederick I. The first duke was Henry Jasomirgott, who took part in the second crusade. He removed the ducal residence to Vienna, and began the building of St Stephen’s cathedral, His successor, Leopold V., in 1192, obtained Styria as an addition to his territory, and Frederick II. received posses- sion of Carniola. Frederick, in the latter years of his life, contemplated the erection of Austria into a kingdom, but his

sudden death in a battle against the Magyars, in 1246, put an end to the project, and with him the line became extinct.

The Emperor Frederick II. now declared Austria and Styria to have lapsed to the imperial crown, and appointed a lieutenant to govern them on the part of the empire. But claims to the succession were brought forward by descendants of the female branch of the Babenberg line ; and after various contests Ottocar, son of the king of Bohemia, gained possession about 1252 of the duchies of Austria and Styria. In 1269 he succeeded to Carinthia, a part of Carniola and Friuli; but he lost all by refusing to acknowledge the Emperor Rudolph of Hapsburg, and eventually fell in battle in an attempt to recover them in

1278.

The empcror now took possession of the country, and appointed his eldest son governor; but subsequently, in 1282, having obtained the sanction of the clectors of the cmpire to the act, he conferred the duchies of Austria and Styria, with the province of Carinthia, on his sons Albert and Rudolph, and thus introduced the Hapsburg dynasty. The brothers transferred Carinthia to Meinhard, count of Tyrol; and in 1283 Albert became sole possessor of Austria, Styria, and Carniola. He increased his possessions con- siderably by wars with his neighbours, but was murdered at Rheinfelden in 1308, when on an expedition against the Swiss, by his nephew, John of Swabia, whom he had deprived of his hereditary possessions. He was succeeded by his five sons, Frederick, Leopold, Henry, Albert, and Otto. In 13814 Frederick, the eldest, was set up by a party as emperor in opposition to Louis, duke of Bavaria, but was defeated and taken prisoner by his rival in 1322. In 1315 Duke Leopold was defeated in an attempt to recover the forest towns of Switzerland which had revolted from his father. Leopold died in 1826, Henry in 1327, and Frederick in 1830. The two surviving brothers then made peace with the Empcror Louis, and in 1335 they acquired Carinthia by inheritance. On the death of Otto in 1339 Albert became sole ruler. He died in 1358. His son and successor, Rudolph IL., finished the church of St Stephen’s and founded the university of Vienna, dying childless in 1365. He was succeeded by his two brothers, Albert III. and Leopold III., who in 1379 divided their possessions between them, the

former taking the duchy of Austria, the latter Styria and other parts. Leopold fell at Sempach in

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1386, but his descendants continued to rule in Styria. Albert acquired Tyrol and some other districts, and died in 1395. was poisoned at Znaim in 1404, when on an expedition against Procopius, count of Moravia, Albert V. succeeded his father, and having married the daughter of the Em- peror Sigismund, he obtained the thrones of Hungary and Bohemia, and became emperor (Albert II.) in 1438. He died the following year, and was succeeded by his pos- thumous son Ladislaus, who died without issue in 1457, The Austrian branch of the family thus became extinct, and was succeeded by that of Styria. and Bohemia passed for a time into other hands.

[HISTORY.

He was succeeded by his son, Albert IV., who

The crowns of Hungary

The possession of Austria, which in 1453 had been

raised to an archduchy, was for some years a subject of dispute between the Emperor Frederick II1. and his brothers, but at length, on the death of Albert in 1463, the emperor obtained sole possession. His son Maximilian, by marrying the daughter of Charles the Bold, acquired the Netherlands in 1477, but on the death of his father in

1493 he succeeded him as emperor, and transferred the government of the Netherlands to his son Philip. He added Tyrol and some parts of Bavaria to his paternal pos-

sessions, and made some advances towards the recovery of

Hungary and Bohemia. His son Philip, by his marriage with Johanna, daughter of Ferdinand and Isabella, acquired a right to the crown of Spain, but died in 1506. Maxi- milian dicd in 1519, and was succeeded by his

grand- son Charles (son of Philip), who two years before had obtained the Spanish crown, and was now made em- peror under the title of Charles V. By treaties dated 1521 and 1524, Charles resigned all his hereditary posses- sions in Germany, except the Netherlands, to his brother Ferdinand. The latter, by his marriage with Anna, sister of the king of Hungary, acquired right to the kingdoms of Hungary and Bohemia, together with Moravia, Silesia, and Lausatia. His right to Hungary, however, was con- tested by John Zapolya, waywode of Transylvania, who was elected by a party of the nobles, and was crowned king in 1527. Being unable to cope single-handed with Ferdinand, John sought the aid of the sultan, Soliman IL, who in 1529 advanced with a large army to the very gates of Vienna; but after several ineffectual attempts to take the city he raised the siege and returned to Buda, At length, in 1535 an agreement was come to, in terms of which John was allowed to retain the title of king, to- gether with half of Hungary, but his descendants were to be entitled to Transylvania only. John died in 1540, but the people of Lower Hungary were opposed to Fer- dinand, and set up the son of their late king against him. In the struggle which ensued the aid of the Turks was again invoked, and the result was that Ferdinand had to agree to pay an annual sum of 30,000 ducats to the sultan for this part of Hungary. Ferdinand was also under the ne- cessity of surrendering Wiirtemberg to Duke Ulrich, on condition of its remaining a fief of Austria and reverting to that country on the extinction of the male line. Not- withstanding this, the possessions of the German line of the house of Austria at this time are estimated at 114,000 square miles. On the abdication of Charles V. in 1556, Ferdinand succeeded to the imperial throne. He died in 1564, leaving directions for the division of his possessions among his three sons. The eldest, Maximilian IL, received the imperial crown, together with Austria, Hungary, and Bohemia ; the second, Ferdinand, obtained Tyrol and Lower Austria ; and the third, Charles, was made master of Styria, Carinthia, Carniola, and Girtz. In 1556 the sultan Soli- man again marched at the head of a great army into Hun- gary, but met with a very determined resistance at Szigeth, before which town he was suddenly cut off by apoplexy.

Thirty Years’ War.

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Peace was concluded with his successor, and in 1572 Maxi- milian caused his eldest son Rudolph to be crowned king of Hungary. He was afterwards crowned king of Bohemia, aud was also elected king of the Romans. Maximilian died in 1576, and was succeeded by Rudolph on the imperial throne. This monarch was little fitted to rule, and left the manage- ment of affairs very much to others. He was entirely under the power of the Jesuits, set at nought the ancient laws of the country, and persecuted the Protestants. The latter, under Bocskay, revolted in 1604, and having se- cured the aid of the sultan, gained repeated victories over the imperial troops, compelling Rudolph to give them terms of peace in 1606. During this reign the possessions of the Archduke Ferdinand of Tyrol reverted to the two other lines ; while in 1608 Rudolph was compelled to cede Hun- gary, and in 1611 Bohemia and Austria, to his brother Matthias, who on the death of Rudolph in 1612 was crowned emperor. His reign was full of promise, but unfortunately it was only of short duration. Being an old man and childless, he chose as his successor his cousin Ferdinand, archduke of Styria, whom he caused to be crowned king of Bohemia in 1616, and of Hungary in 1618. He died the following year, when Ferdinand became emperor.

Before the death of Matthias, the memorable struggle between Roman Catholicism and Protestantism, known as the Thirty Years' War (1618 to 1648), had commenced. It originated in an insurrection of the Protestants of Bohemia, who renounced their allegiance to Ferdinand and chose for their king the elector palatine Frederick V. Frederick was supported by all the Protestant princes except the elector of Saxony, while Ferdinand was assisted by the king of Spain and the other Catholic princes. At first success attended the arms of the insurgents, who repeatedly routed the imperial troops, and even laid siege to Vienna. But the Duke Maximilian of Bavaria, coming to the assist- ance of the imperialists at the head of a well-appointed army, totally defeated Frederick at the White Hill near Prague (8th November 1620). The following day Prague opened its gates to the conqueror, and in a short time the whole country was reduced to subjection, and the territories of the elector palatine divided among the allies. The war

might have ended here had Ferdinand adopted a concilia- tory policy, but impelled by revenge and fanatical zeal he adopted an opposite course, and instituted against the Pro- testants a severe persecution. They were thus again com- pelled to take up arms, and in 1625 Christian IV., king of Denmark, supported by subsidies from England, put him- self at their head. He was subsequently joined by Count Mansfeld and Christian of Brunswick, while opposed to him were Wallenstein and Tilly at the head of two power- ful armies. In April 1626 Mansfeld was defeated by Wal- lenstcin at Dessau, and a few months later Tilly vanquished the Danish king at Lutter. The victorious armies after- wards marched into Denmark, and the king was compelled to conclude a humiliating peace at Liibeck in 1629. The Protestants were now awed into submission, and Ferdinand was emboldened to carry out to still greater lengths his policy of suppression. Aiming at the total extirpation of Protestant doctrines throughout his dominions, he revoked all the privileges that had formerly been granted, even such as had previously received his approval. By the so-called Lidict of Restitution, dated 6th March 1629, he enjoined the restitution of all ecclesiastical property secularised since the peace of Passau, and ordered the Protestants to relin- quish to the Catholics all benefices which they had appro- priated contrary to the peace of Passau and the Ecclesiastical Reservation.

The Catholic princes themselves were now becoming alarmed at the enormous power which they had contributed to place in the hands of the emperor. They therefore

demanded a reduction of the army and the dismissal of Wallenstein, and with these demands the emperor felt him- self obliged to comply. But a new champion of the Pro- testant cause now appeared in the north, in the person of Gustavus Adolphus, king of Sweden. This valiant price, having received promises of aid from France as well as from England and the United Provinces, suddenly landed an army of 15,000 men at Usedom in June 1630. Pomerania and Mecklenburg were soon conquered by him, and a great part of Brandenburg was overrun by hisarmy. He was unable,

however, to relieve the town of Madgeburg, which was besieged by Tilly and taken by assault 20th May 1631, when the most barbarous atrocities were perpetrated upon the unfortunate inhabitants. The elector of Brandenburg and afterwards the elector of Saxony joined Gustavus, and the combined army met the imperialists under Tilly at Breitenfeld, near Leipsic, and defeated them with great slaughter (7th September 1631). The victor now rapidly regained all that had been lost. Again Tilly was beaten at the passage of the River Lech on 5th April 1632, and the following day he died of his wounds. Wallenstein was now recalled and placed at the head of the imperial troops. His name inspired fresh ardour among the soldiery, men flocked to his standard, and he speedily found himself at the head of a very large army. He drove the Saxons out of Bohemia, and afterwards marched to Nuremberg, where Gustavus was entrenched in a strong position. The two armies watched each other for eight weeks, when the king directed an attack against the imperialists, but after a fierce struggle was repulsed.

died on the 15th February 1637, and was succeeded by his son Ferdinand III. The war was carried on for eleven years longer ; and the success which at first was with the imperialists, after a time came round to their adversaries, till at length the emperor, pressed on all sides and deserted by his allies, was glad to agree to terms of peace. By the peace of Westphalia, signed 24th October 1648, France acquired Alsace ; Sweden got Upper Pomerania, the Isle

‘of Rugen, and some other territory; the sovereignty and

independence of the different states was recognised ; the Calvinists were placed on the same footing as the Lutherans ; and the independence of the United Provinces and the Swiss Confederation was acknowledged.

Ferdinand III. died in 1657, and was succeeded by his son Leopold I. This prince, by his harsh treatment of the Hungarians, drove that people into revolt ; and they, being unable to cope with the power of thc empire single-handed, called in the aid of the Turks, who, under Kara Mustapha in 1683,

besieged Vienna, which was only saved by an army of Poles and Germans under John Sobieski. The imperial army then reduced the whole of Hungary into subjection, and united to it Transylvania, which had been hitherto governed by its own princes; and the whole was declared to be a hereditary kingdom. In 1699 Turkey, aftcr being defeated in several sanguinary engagements by the celebrated general Prince Eugene, was compelled by the peace of Carlowitz to cede to Hungary the country lying between the Danube and the Theiss. Previous to his troubles with Hungary and Turkey, Leopold had lent his aid in 1672 to the Dutch in their struggle against the ambitious designs of France. This was brought to a close by the peace of Nimeguen in 1678; but the conflict broke out afresh the following year, when the English also came forward and contributed largely both in troops and money. 'The chief scenes of warfare were the Nether- lands and the banks of the Rhine. At last in 1697 came the peace of Ryswick, which left the contending parties in nearly the same relative positions as at the beginning of the contest. The allies had, however, the satisfaction of having compelled the French king to stop short in his schemes of aggrandisement.

The death of Charles II. of Spain in 1700, without leay- ing issue, led to what is known as the War of the Succes- sion. Louis XIV. had married the eldest sister of the late king, but she had by solemn covenant renounced her right to the Spanish crown. The second sister had married the Emperor Leopold, and she had made no such renunciation, but her daughter had, who was married to the elector of Bavaria. Leopold had two sons by a second marriage, and now claimed the crown for the younger of these, on the ground of his mother being an aunt of the deceased king. Intrigues had been carried on by the several parties concerned for some time before the king's death, and he had been induced to make a secret will, in which he named Philip, duke of Anjou, grandson of Louis XIV., as his successor. Leopold, however, was by no means inclined to depart from what he con- sidered his rights, and the other states of Europe looked with jealousy on the prospect of a union of France and Spain under a Bourbon dynasty. An alliance was accord- ingly formed by Austria with England and Holland against France, with which power on the other hand Bavaria allied herself. The emperor despatched an army into Italy under Prince Eugene, to take possession of the Spanish territories in that country ; while the English and Dutch united their forces under Marlborough. The former ex- perienced a good deal of

hard fighting, but effected little of consequence, while the latter busicd himself in taking one after another of the French strongholds in the Nether- lands. At length the two generals combined their forces

and met the united army of their enemies at Blenheim, The latter numbered about 56,000 men and occupied a strong position, while the number of the former was about 52,000. The fight commenced by Marlborough leading the right wing against the French, while Eugene with the left wing advanced against the Bavarians. The battle was long and fierce, the assailants being repeatedly driven back by a most terrible fire from the enemy's artillery. At length victory declared for the allied English and Austrian armies (13th August 1704). About 10,000 of the French and Bavarians fell on the field, and nearly 13,000 were made prisoners, among whom was the commander of the French army, Marshal Tallard. The elector of Bavaria was compelled to cross the Rhine with the French, and his territory was occupicd by the imperialists. The follow- ing year the emperor died, and was succeeded by his eldest son, Joseph. The war was continued with vigour, but fora time nothing of importance was anywhere effected. France now directed her chief attentien to the conquest of the Netherlands, and sent into that country a magnificent army under the command of Marshal Villeroi. But this general was no match for Marlborough ; and in the battle of Ramillies (23d May 1706) he was totally defeated with a loss of about 13,000 men. Prince Eugene's efforts in Italy were also this year crowned with much success, After a memorable march of more than 200 miles, he suddenly appeared before Turin, which was then closely besieged by the enemy. Having effccted a junction with the duke of Savoy, he attacked the French lines (7th September), and though repeatedly driven back, at length succeeded in totally routing the enemy. The French general, Count Marsin, was wounded, taken prisoner, and died the following day. The French power in Northern Italy was thus shattered, and soon after both French and Spaniards were driven out of the country. The like suc- cess attended the efforts of Marlborough in the Nether- lands, where he took possession of every place of note. After Eugene had settled affairs in Italy, he again formed a junction

with Marlborough in the Netherlands, and on 11th June 1708 they attacked and routed the French under Venddme at Oudenarde. France now made over- tures for peace; but these being rejected, she sent a new army into the field, under the command of Marshal Villars. He was attacked by the two victorious generals in his entrenchments at Malplaquet (11th September 1709) and totally defeated. France again made proposals for peace, but these meeting with no better success, the war was continued. The emperor died on 17th April 1711, and his successor being his brother, the Archduke Charles, who laid claim to the Spanish crown, this event contributed not a little to restore peace. The prospect of the union on one head of the crowns of Austria and Spain did not accord with the views of those who had been hitherto supporting the claims of Austria, and the transfer of Spain toa grandson of Louis XIV. appeared to them the less dangerous alternative of the two. This, joined to the change of ministry in England, and the removal of Marlborough from the command, together with the im- patience of the Dutch under so long and so burdensome a war, led to the peace of Utrecht, which was signed 11th April 1713. Austria continued the war for some time longer, but the next year agreed to substantially the same terms at Baden. By this treaty France engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should ever be transferred to her ; she also ceded to England Nova Scotia, Newfoundland, Hudson's Bay, and St Kitt's, and agreed to destroy the fortifications of Dunkirk; Spain gave up her possessions in the Netherlands and in Italy to Austria (who, on her part, renounced her claim to the Spanish

succession), and ceded Gibraltar and Minorca to Eng- land; the Dutch received a small accession of territory ; and the duke of Savoy obtained Sicily, with the title of king—afterwards (1720) exchanged for the island of Sar- dinia. The Austrian monarchy now embraced about 190,000 square miles of territory, with nearly 29,000,000 of inhabitants. Its annual revenue was _ between 13,000,000 and 14,000,000 florins, and its army consisted of 130,000 men.

Austria next became involved in a war with the Turks, and in 1716 Prince Eugene set out at the head of an army against them. 'The result wag a series

of splendid suc- cesses, which led to a peace signed at Passarowitz (1718), by which Austria received a considerable accession of ter- ritory. Disaffection still continued to subsist between Spain and Austria, which led to repeated negotiations on the part of the other powers to preserve peace. Charles being without heirs-male, was desirous of securing the succession to his eldest daughter, Maria Theresa, and with this view he framed the celebrated Pragmatic Sanction, and it became his great object to get the assent of the other powers to this arrangement. England and almost all the other powers, except France, Spain, and Sardinia, acceded toitin 1731. In 1733 the emperor became in- volved in a war with France on behalf of Augustus III. of Saxony, who had been elected king of Poland. France supported the claims of Stanislaus Leczinski, and received the aid of Spain and Sardinia. The war was carried on principally in Italy, where Austria was driven out of most of her possessions, and was glad to suefor peace. By this treaty Augustus was confirmed on the throne of Poland; but Austria was obliged to cede to Stanislaus the duchies of Lorraine and Bar, to be afterwards trans- ferred to France ; Don Carlos was placed on the throne of the Two Sicilies, and the grand duchy of Tuscany was bestowed on the duke of Lorraine, the emperor receiving as compensation Parma and Placentia; and France, and afterwards Spain and Sardinia, acceded to the Pragmatic Sanction. War again broke out with the Turks, and Prince Eugene being now no more, the Austrians were repeatedly beaten and expelled from one stronghold after another, till, by the peace of Belgrade (1739), the emperor was compelled to yield up almost all that the arms of Eugene had formerly gained for him. The emperor died on the 20th October 1740, and his eldest daughter, Maria Theresa, who was married to the duke of Lorraine or Lothringen (afterwards archduke of Tuscany), assumed the government. Immediately counter-claims were ad- vanced on all sides. The elector of Bavaria claimed to be rightful heir to the kingdom of Bohemia; the elector of Saxony and king of Poland, and also the king of Spain, claimed the entire succession; the king of Sardinia laid claim to the duchy of Milan, and Frederick IT. of Prussia to the province of Silesia. France espoused the cause of Bavaria, while England alone came forward to the assist- ance of the queen, and the Hungarians, now united and loyal, willingly recruited her armies. Aided by France and Saxony, the elector of Bavaria took possession of Bohemia, and was proclaimed king in 1741, and the fol- lowing year he was elected emperor under the title of Charles VIL ‘The king of Prussia

marched suddenly into Silesia and took possession of that country. The elector of Bavaria, aided by French troops, next invaded Austria, and even threatened Vienna. ‘The queen fled to Presburg and convoked the Hungarian diet. She appeared in the midst’ of the assembly with her infant son J oseph in her arms, and appealed to them for protection and help. A burst of enthusiasm followed, and a powerful Hungarian army was speedily at her service. The French and Bavarians were soon driven out of the archduchy.

battle was fought between the Austrians under the prince of Lorraine and the Prussians under Frederick, at Czaslau (17th May 1742), in which the former were defeated, and this was followed by the peace of Breslau (11th June), by which Prussia acquired possession of Upper and Lower Silesia (excepting the towns of Troppau and Jagerndorf, and the mountains of Silesia) and the county of Glatz. Austria now turned her arms against the French and Bavarians, the former of whom were driven out of the country. In 1744 the king of Prussia, jealous of the success attending the Austrians, again took the field against them in support of the emperor. He marched into Bohemia and took Prague, but subsequently was forced to retreat; and the death of the emperor Charles on 20th January 1745 changed the aspect of affairs. Maria Theresa’s husband was in September elected emperor under the title of Francis I., and after some more fight- ing, a peace was concluded with Prussia at Dresden, by which the king was confirmed in the possession of Silesia. The war with France was prosecuted for some time longer in the Netherlands and in Italy with varying success, but ultimately peace was concluded at Aix-la-Chapelle, in October 1748, Austria gave up the duchies of Parma, Placentia, and Guastalla to Don Philip, son of the king of Spain, and several districts of Milan to Sardinia ; Prussia was confirmed in the possession of Silesia and Glatz; while Maria Theresa was recognised as rightful monarch of Austria. After having acquired peace, and been thus confirmed in her possessions, her great desire was to recover Silesia from Frederick, whose conduct towards her had sunk deep into her heart. She directed her attention to strengthening and improving her army,

and to forming alliances with the other states against the Prussian king, particularly with Russia and Saxony. In 1755 war broke out in North America between France and England, and in view of its becoming more general England solicited the aid of Austria, but without success, This naturally led to a union between England and Prussia, while France allied herself with Austria and Russia.

In July 1756, Frederick despatched a messenger to Seven Vienna to ascertain the meaning of the large forces Years'War.

assembled in Bohemia and Moravia. Receiving an evasive answer, he at once marched an army of 60,000 men into Saxony, took Dresden, and made himself master of the country, the Saxon army of only about 17,000 men being shut up in a strong position, but ill provisioned, between Pima and Konigstein. An Austrian army, under the command of Marshal Browne, advanced from Bohemia to the relief of Saxony, but was met by Frederick. A battle took place at Lowositz (1st October), which, though not decisive, ended in the retreat of the Austrians; and the famished Saxon army, after an ineffectual attempt to effect a retreat to Bohemia, laid down their arms. This ended the first campaign, and both sides did their utmost to prepare for renewing hostilities the following year. The

empress strengthened her forces in Bohemia, and the 1757.

imperial diet conceded an army of 60,000 men to assist her. France engaged to send an army of 80,000 or 100,000 men into Germany, and Russia set in motion an army of 100,000 men against Prussia. In all, the allies were estimated to muster about 500,000 men, while Frederick could scarcely raise 200,000 of his own, his auxiliaries (English, Hanoverians, &c.) probably amounting to about 40,000 more. Frederick renewed the war by marching an army into Bohemia, where, on 6th May, he gained a victory over the Austrians, under Prince Charles of Lorraine, in the neighbourhood of Prague, and then laid siege to that city. General Daun, at the head of an Austrian army, advanecd to the relief of the city, and the king set out to meet him. The encounter took place at Kolin (18th June), and the

1758.

Prussians, being much inferior in numbers, were beaten with great slaughter. Frederick was compelled at once to raise the siege and to evacuate Bohemia. In honour of this victory the empress instituted the military order of Maria Theresa. It had also the effect of inspiring the allies with fresh courage. The Russians invaded the kingdom of Prussia ; the Swedes entered Pomerania ; and two French armies crossed the Rhinc in order to attack Hesse and Hanover and then march into Prussia. One of these armies, under the command of Prince Soubise, advanced towards Thuringia, in order to form a junction with the imperial forces under the prince of Hildburghausen, while Marshal d'Estrées, who commanded the larger French army, en- tered Hanover, and through the incapacity of his opponent, gained an easy victory over the Anglo-Germanic army, under the duke of Cumberland, near Hastenbeck, on the Weser (26th July). The duke afterwards completed his disgrace by agreeing to disband his troops and give up Hanover, Hesse, Brunswick, and the whole country between the Weser and the Rhine, to the French. The other French army effected a union with the imperial troops of Thu- ringia, and made preparations for driving the Prussians out of Saxony. Frederick, however, determined to meet them, and after a series of marches and countermarches the two armies came together near Rossbach. The Prus- sian army amounted to about 22,000 men, while that of the French and Austrians numbered nearly 60,000. _ Fre- derick's troops were encamped upon a height, and the allies, when they advanced to the attack, were suddenly met by such a tremendous fire that they were thrown into confusion and unable to recover themselves. In less than half an hour the day was decided (5th November 1757). The allies had 1200 killed and more than 7000 taken prisoners, while the loss of the Prussians scarcely exceeded 500 in killed and wounded. At this time the imperialists had entered Silesia and there gained several advantages over the Prussians, who were at length driven to the walls of Breslau. Here a battle was fought (22d November) in which the Austrians were victorious, and the city itself soon after surrendered to the conquerors. Frederick now made what haste he could to retrieve his fortunes in this quarter, aud met the Austrian army, under Prince Charles of Lorraine, in a plain near the village of Leuthen. The Austrians numbered about 80,000 men, while the Prus- sians did not exceed 30,000, yet by the skilful disposal of his troops and the

celerity of his movements Frederick again gained a complete victory (5th December). The field was covered with slain, and it is estimated that about 20,000 surrendered themselves prisoners. Breslau was speedily retaken, and the Austrians driven out of Silesia.

_ The English were very indignant at the treaty entered into by the duke of Cumberland, and another army was speedily raised and placed under the command of Duke Ferdinand of Brunswick, who commenced the campaign of 1758 by suddenly attacking the French in their winter quarters. In a few weeks he succeeded in driving them out of the country, pursued them across the Rhine, and attacked them furiously at Crefeld, where they were completely routed.

While Field-Marshal Daun, who had received the com- mand of the Austrian army, was waiting the attack of Frederick in Bohemia, the latter, by forced marches, entered Moravia and laid siege to Olmiitz. The town, however, defended itself with the greatest bravery, and the Prussians were compelled to raise the siege. By this time, Daun having blocked up Frederick's retreat into Silesia, the Prussian army was marched suddenly north- ward into Bohemia, and attacked the Russians who had invaded Brandenburg. After a desperate battle the latter were defeated with great slaughter at Zorndorf (26th

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August), and compelled to retreat into Poland. _ Frederick now entered Saxony, where his brother Prince Henry was hard pressed by the Austrians. Thereupon Daun retired to a strong position in Lusatia, and Frederick took up a | position near him, little thinking that Daun would attack him. Early in the morning of the 14th of October, however, the Austrians suddenly fell upon him at the village of Hoch- | kirchen, and in the confusion and darkness the slaughter was terrible. Frederick lost several of his best generals, including Prince Francis of Brunswick, Prince Maurice of Dessau, and Field-Marshal Keith, with about 9000 of his soldiers. His camp, baggage, and ammunition also fell into the hands of the Austrians. The victory, however, was productive of little material results ; Frederick

retreated into Silesia, whilc the Austrians, after ineffectual attempts on Leipsic, Torgau, and Dresden, retired to Bohemia for the winter. The Austrian army was again largely reinforced, and every preparation made for renewing hostilities with vigour. The following ycar (1759) Duke Ferdinand found 1759, | himself hard pressed by two French armies under the Duke de Broglie and the Marshal de Contades. He sus- tained a defeat at Bergen (12th April), but afterwards gained a signal victory at Minden (1st August), and com- pelled the French to retreat. Daun, waiting the approach of the Russians, did not take the field till the beginning of May, when, on their advance towards the Oder, he moved into Lusatia. In June, Dohna, who was sent to check the advance of the Russians, was forced to retreat, | and, on the 23d July, Wedel, who succeeded him in the command, was totally routed near Ziillichau, The Russians then marched on to Frankfort-on-the-Oder, where they were joined by 18,000 Austrians under Marshal Loudon. Frederick hastened with what troops he could collect to give battle to the combined army. The latter took up a strong position on the heights near Kunersdorf, and there they were attacked early on the 12th of August by the . king. The Prussians numbered about 50,000, while the Russians and Austrians amounted to 90,000. The battle raged long and furiously, and the issue was long doubtful, but at length the Russians were giving way on all sides, and victory was about to declare for the Prussians, when unexpectedly the Austrians made a furious attack upon them, threw them into confusion, and in a short time drove them from the field. Frederick lost in this action 20,000 of his bravest troops, and the loss on the side of the allies was not less than 24,000 men killed and wounded. In the meantime the Austrians overran Saxony, took

-Torgau, Wittenberg, and Leipsic, and invested Dresden,

which, after a spirited defence, surrendered when an army of relief was close at hand. But Frederick was speedily in the field again at the head of a new army, and, by dint of skilful manceuvring and cutting off supplies, he succeeded in harassing the two armies, and compelled the Russians again to retire into Poland, An army of 13,000 men, under General Fink, attacked the rear of the Austrian army near Maxcn, but after a brief but sanguinary conflict they were defeated and taken prisoners. Daun took up his winter

quarters in Saxony, notwithstanding every effort of Frederick to dispossess him,

The imperial troops had been very successful during the last campaign, and were in good condition to renew the fight, while the Prussians had sustained great losses, were dispirited, and could only muster about 80,000 fighting men, and these no longer veterans, but in great measure raw recruits. In the campaign of 1760 Frederick was himself to 1760. conduct the war in Saxony, Prince Henry was to protect the marches against the Russians, and General Fouquet was to defend Silesia against the Austrians under Loudon, On 23d June, 8000 Prussians, under Fouquet, were surrounded and attacked on all sides by 30,000 Austrians at Landshut,

‘1761.

1762,

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HISTORY. |

and, after defending themselves long with great bravery, were obliged to yield. The king, after an ineffectual attack upon Dresden, niarched into Silesia followed by the Austrians. At Liegnitz he found himself between three armies, under Generals Daun, Lacy, and Loudon, number- ing about 90,000 men, while his own army amounted to only about 30,000. On the night preceding the 15th of August, Frederick took up a position on the neighbouring heights of Pfaffendorf. Scarcely had he done so when the Austrian army, under Loudon, made its appearance, it having also intended to occupy the same position, and then fall upon the Prussians. The Austrians were greatly astonished to find the:enemy before them; nevertheless, they fought for three hours with great bravery, return- ing again and again to the attack, but were at length compelled to retreat with a loss of 4000 killed and 6000 wounded. Daun afterwards came up and made an attack upon the Prussians, but, learning what had happened to Loudon, he withdrew. Frederick now directed his march on Breslau; and meanwhile the Russians effected a junc- tion with the Austrians, and marched on Berlin, which surrendered to them (3d October). A week later, hearing that the king was advancing against them, they left the city and retired into Saxony. Daun had likewise arrived in Saxony, and taken up a very strong position near Torgau. Here the Prussians attacked him with great fury on 3d November. The battle lasted till night without being decisive, and the carnage on both sides was fearful. The Prussians prepared to renew the attack next day, but the Austrians retreated during the night. They lost about 12,000 men killed and wounded, and 8000 prisoners. By this battle Frederick reconquered the greater part of Saxony, and accordingly he fixed his winter quarters there, establishing his headquarters at Leipsic. In 1761 Frederick employed every stratagem to prevent the junction of the Russian army under Buturlin with the Austrian under Loudon. The two armies, however, at length came to- gether in the environs of Strigau (12th August),

the com- bined force amounting to 130,000 men, while the Prussians numbered only about 50,000. The leaders, however, could uot agree to a common course of proceeding, and the two armies separated without effecting anything of consequence. The Austrians surprised and took Schweid- nitz (Ist October), and the Prussians, after a four months' siege, took possession of Colberg (13th December). In Saxony Prince Henry had to retreat before Daun; but the latter gained no great advantages, and Frederick settled in Breslau for the winter. It seemed as if Prussia must at last yield to her assailants, but this was as far as ever from the king's mind. To add to his difficulties, the subsidies from England were stopped by the earl of Bute after the death of George II. But by the death of the Ozarina Elizabeth (5th January 1762) he was freed from one of the most powerful of his enemies; and her successor, Peter IIT., not only recalled the army, but delivered up all the Prussian prisoners, and even entered into an alliance with the king. Sweden also retired from the contest, and entered into terms of peace. Frederick was therefore in a better condition to carry on the war vigorously against Austria, and the seventh campaign was marked by a series of disasters to that power. He attacked and overthrew Daun's right wing at Burkersdorf (21st J uly), gained a victory at Reichenbach (16th August), and took Schweid- nitz after a very gallant defence (9th October). Prince Henry was also victorious at Freiberg (29th October). In the meantime Duke Ferdinand had been during the last three years successfully maintaining the war with the French. Fresh reinforcements and new generals were brought against him, but he could not be crushed ; and, by

the victories of Wilhelmsthal (24th June) and Luttern-|

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burg (23d July), France was brought to agree to peace. Thus Austria and Prussia were left to carry on the war alone ; and the former, though amply provided with troops, was without money to furnish the necessary supplies, while Frederick was ever ready to come to terms on having the possession of Silesia secured to him. Austria found herself obliged to yield this point, and peace was at length agreed to. The treaty was signed at the castle of Hubertsburg,

in Saxony, 15th February 1763, and thus ended the Seven 1763.

Years' War,—a war disastrous to all concerned, and which is estimated to have cost in actual fighting men 853,000. It effected no territorial change in any of the countries, but through it Prussia rose to be one of the great powers of Europe. Austria, on her part, had carried on the con- flict with remarkable vigour and determination; her sol- diers had displayed great bravery, and some of her generals had shown a military genius not greatly inferior to that of Frederick himself.

Maria Theresa now zealously devoted herself to improv- ing the condition of her people and country. She estab- lished schools, removed feudal hardships, improved the condition of the serfs, reformed ecclesiastical abuses, and fostered industry and commerce. The Emperor Francis died 18th August 1765, and was succeeded by his son, Joseph II., who the previous year had been elected king of the Romans. He also became joint-regent with his mother of the hereditary states. Maria established two collateral branches of her house in the persons of her two younger sons, the Archduke Leopold in Tuscany, and the Archduke Ferdinand, who married the heiress of Este, in Modena. By the first partition of Poland (1772) Austria acquired Galicia and Lodomeria, and in 1777 Buckowina was ceded by the Porte. On the death of the elector of Bavaria without issue, the Emperor Joseph laid claim to his do- minions. To this Frederick was opposed, and again took the field against Austria. The dispute, however, was settled without war (1779), Austria being content with the cession by Bavaria of the frontier district called the quarter of the Inn, and one or two others. The empress died 29th November 1780, in the sixty-fourth year of her age and the forty-first of her reign. She was a woman of many and great virtues, with few weaknesses, and effected more for Austria than any of her predecessors. Mr Carlyle says that she was "most brave, high and pious minded ; beauti- ful, too, and radiant with good nature, though of a temper that will easily catch fire; there is, perhaps, no nobler woman then living." At her death the monarchy com- prised 234,500 square miles, with a population estimated at 24,000,000, and a public debt of 160,000,000 florins, or £16,000,000.

The Emperor Joseph II., whose zeal for reform had in great measure been kept in check during the lifetime of his mother, now felt. himself at liberty to give it full scope. He attempted a number of changes, of which several were praiseworthy in their objects, but abrupt and premature in their operation, so that in the end they were productive of evil consequences. He sought to establish a system of central government and uniformity of legislation through- out his dominions ; enjoined the exclusive use of the German language in all schools, courts of justice, &c.; granted free and unreserved toleration to all sects of Christians ; abo- lished numerous convents and monasteries; dismantled various fortresses ; and did away with primogeniture and feudal vassalage. Had his people been ripe for these changes he would probably have been hailed as a reformer of abuses ; but the Austrians were attached to their old usages, and were little inclined for change, while the arbi- trary manner in which the improvements were introduced could not fail to provoke discontent. General uneasiness, therefore, began to prevail, which in the Netherlands

1792.

War with France.

1793,

1794,

broke out into open revolt in 1789. This, together with an unsuccessful war in which he had engaged with Russia against Turkey, is understood to have preyed upon his over-seusitive mind, and caused his death on 20th February 1790. He was, says Mr Carlyle, “a man of very high qualities, and much too conscious of them ; a man of am- bition without bounds; one of those fatal men—fatal to themselves first of all—who mistake half genius for whole; and rush on the second step without having made the first.”

He was succeeded by his brother Leopold, grand duke of Tuscany, who by his moderation and firmness was suc- cessful in restoring peace to the country, and in quelling the insurrection in the Netherlands. He also made peace with the Porte. The misfortunes of his sister Maria Antoinette and her husband, Louis XVI. of France, led him to enter into an alliance with Prussia against the Revolutionists, but he died before the war broke out (1st March 1792). He was succeeded by his son, Francis IL, who had hardly ascended the throne when he found himself involved in a war with France. Hostilities com- menced on 28th April with an attempted invasion of Flanders by the French, but their undisciplined troops were speedily routed and put to flight. A combined army of 50,000 Prussians, under the command of the duke of Brunswick, and 15,000 Austrians under General Clairfait, besides about 20,000 French, soon after crossed the French frontier, took Longwy and Verdun, and marched on Paris. In the meantime Dumouriez was actively engaged in col- lecting an army, and soon found himself in a condition to meet them. A series of engagements took place without any decided result, beyond checking the advance of the allied troops, who were now also suffering very severely from sickness and famine. It was therefore deemed pru- dent to retire, and Verdun and Longwy were soon after retaken. Dumouriez next invaded the Netherlands with an army of 100,000 men, to oppose which the Austrian army only amounted to 40,000.

of the year, was transformed into a republic. In the begin- 1795,

ning of 1795 Prussia abandoned the cause of the allies, and concluded a treaty of peace with the French republic at Basle (5th April), and was joined therein by Hanover and Hesse Cassel, so that Austria and England were left alone to pro- secute the war. For some months a cessation of hostilities took place between the contending parties; but on the 6th of September the French army under Jourdan suddenly crossed the Rhine near Diisseldorf, invested that town, and drove the Austrians before it over the Maine. Clairfait, however, reassembled his troops behind the latter river, and attacked the French at Hochst, near Frankfort, and completely defeated

them (11th October), so that they were obliged to recross the Rhine. Inthe meantime Pichegru had crossed the river with another army, near Mannheim, and took pos- session of that town. Wurmser, who was sent for its relief, arrived too late for that purpose, but attacked the French army near it, put them to flight, and compelled them to recross the Rhine, leaving a garrison of 8000 men to defend the town, which, after a vigorous siege, surrendered to the Austrians. The French, undismayed by these failures,

were only stimulated to greater efforts; and the following 1796,

year they sent out three armies against Austria, one under Jourdan towards the Lower Rhine, another under Moreau towards the Upper Rhine, and a third into Italy. In the end of May the French army under Jourdan crossed the Lower Rhine, and gained some successes, but was after- wards attacked by the Archduke Charles (16th June), and forced to recross the river. Moreau soon after effected his passage over the Upper Rhine at Strasburg, defeated the Austrians in several partial engagements, and reduced the circle of Swabia to subjection. Jourdan again pushed for- ward his troops, and took Frankfort by bombardment, but was defeated with great loss by the archduke at Am- berg (24th August), and again at Wurzburg (3d September). Moreau had in the meantime continued his advance into Bavaria, but was ultimately obliged to effect a retreat, which he carried out with great skill, suffering compara- tively little loss, and recrossing the Rhine on 20th October. But a different fate was attending the army in Italy, under the command of a young officer, who afterwards became world-famous for his generalship, namely, Bonaparte. By the promptitude of his movements, and the suddenness of his attacks, he completely overcame and separated the army of the Sardinians from that of the Austrians, and forced the Sardinian king to sign a treaty of peace. He then turned his arms against the Austrians, defeated them in several engagements, and made himself master of the whole of Lombardy, except Mantua. Wurmser was now summoned from Germany with an army of 30,000 men, which raised the Austrian force to about 60,000 ; while opposed to them were about 55,000 French. In- stead, however, of advancing in one body, the Austrians were divided into two columns, which advanced by different routes, a mistake of which Bonaparte did not fail to take advantage. One division of 20,000 men was attacked and compelled to retreat towards the mountains, while

Wurmser with the other division entered Mantua. Leaving that city he sustained a double defeat at Lonato and Castiglione (3d August); and, being again severely beaten at Medola (5th August), he was forced to seek shelter in the moun- tains of Tyrol. Having received reinforcements, however, he again advanced in divided columns, one of which was defeated at Roveredo, the other, under himself, near Bassano. He took the road to Mantua with the remains of his army, and reached that town after a brilliant victory over a body of French troops that had been sent to im tercept him. Meanwhile the Austrians collected another army of 40,000 men under Alvinzi, who, after a series of successes, gained a decided victory over Bonaparte at

1797.

1799,

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Caldiero (11th November). Four days later the Austrians were again attacked by the French near the village of Arcola, and after three days' desperate fighting on both sides the Austrians at length retreated. Alvinzi received reinforcements, and again set out to attack the French, but suffered a severe defeat at Rivoli on 14th January 1797. A fortnight later Mantua capitulated, and the French be- came undisputed masters of the country. Speaking of the perseverance and patriotic spirit of the Austrians in this struggle in Italy, Sir A. Alison says, " It is impossible to contemplate without admiration the vast armies which they successively sent into the field, and the unconquerable courage with which these returned to a contest where so many thousands of their countrymen had perished before them. Had they been guided by greater or opposed by less ability they unquestionably would have been successful, and even against the soldiers of the army of Italy and the genius of N. apoleon, the scales of fortune repeatedly hung equal." —-(History of Europe.) The Archduke Charles was now recalled from the Rhine to oppose Bonaparte. The latter set out on his journey northward on the 10th of March, with the view of crossing the Alps and so reaching Vienna. The Austrians attempted to oppose his progress at the river Tagliamento, but without success; and a desperate struggle took place for the possession of the Col de Tarvis, which ended in favour of

Napoleon, so that in twenty days after the campaign opened the army of the archduke was driven over the Julian Alps, and the victori- ous French army of 45,000 strong was on the northern declivity of the Alps, within 60 leagues of Vienna. Napoleon, still pressing on, took possession of Klagenfurt, and advanced as far as Judenburg on the River Mur ; but finding his position very insecure, and dangers thickening upon him, he despaired of carrying out his intention of dictating peace under the walls of Vienna. He there- fore offered terms of accommodation to the Austrians, which they deemed it prudent to accept. Preliminaries were agreed to at Leoben (18th April), anda formal treaty of peace was signed at Campo Formio, 17th October 1797. By this treaty Austria ceded to France Flanders and her Italian possessions, and received in return Venice and its dependent provinces. It, however, contained certain secret articles, by one of which Austria consented to sur- render the whole of the left bank of the Rhine to France ; and a convention was appointed to meet at Rastadt to pro- vide equivalents on the right bank for the princes dis- possessed on the Jeft, and otherwise to settle the affairs of the empire. The terms were not particularly hard as regards Austria. The ceded territories contained about 3,500,000 souls, and those acquired about 3,400,000. But the taking away of the independence of Venice, which had been maintained for 1400 years, was an act of rapacity which excited the indignation of Europe, and Austria’s share in it must ever remain a stain on her annals.

This peace was not of long duration. As the business of a convention which met at Rastadt advanced, and the bearing of the secret articles became known, a great sensa- tion was created in Germany. The high-handed manner in which the French conducted their negotiations, and the Insolence and contempt with which they treated the empire, led to the recall of the Austrian ambassador from the con- vention in the beginning of 1799, and on the 13th of March France again declared war against Austria. In the Meantime the latter power had entered into an alliance with England and Russia against the former. In Germany the Archduke Charles defeated Jourdan at Stockach (26th March), and in several other encounters, and drove him out of the country ; and he afterwards reconquered the whole of the western portion of Switzerland to beyond Zurich from Massena, In Italy Scherer was defeated by the

Austrian general Kray at Verona and at Magnano, and then resigned the command into the hands of Moreau. The Russian army, under Suwaroff, now formed a junction with the Austrian, and the French were again beaten near Cassano (27th April). This was followed by other suc- cesses, so that in less than three months the French standards were driven back to the summit of the Alps, and the whole plain of Lombardy, with the exception of a few of its strongest fortresses, was recovered. After this the Russian general marched against Macdonald, who was advancing with a French army from Naples. A desperate conflict took place on the banks of the Trebbia, which was maintained with consummate bravery and skill for three days (17-19 June), until victory declared for the Russians. Out of 36,000 men in the field the French lost above 12,000 in killed and wounded, and the allies nearly as many. One place after another now fell into the hands of the allies; but mutual jealousies and divisions breaking out among them, the Russian and Austrian forces were eventually separated. This led to the most disastrous results. The Russians were to prosecute the war in Switzerland, while the Austrians remained to carry it on in Italy. In the meantime another French army had been collected under General Joubert; and, on the 15th of August he was attacked by the allies at Novi. The battle was long and obstinate, but at length the allies were victorious. The French lost their general, who fell mortally wounded, besides about 1500 killed, 5500 wounded, and 3000 prisoners. The loss of the allies was 1800 killed, 5200 wounded, and 1200 prisoners. The Russian general now directed his march towards the Alps, forced the St Gotthard, and descended into the valley of the Urseren, driving the French before him with great slaughter. With great difficulty and loss he effected a passage through the horrible defile of the Shachenthal, between Altdorf and Mutten; but, at the latter place, instead of meeting the allied troops, as he had expected, he found himself in the midst of the enemy. Before this time Massena had so beset the Russian general Korsakotf at Ziirich, that he was compelled to fight, and with difficulty made his escape with the remaius of his army, while the Austrian forces under Hotze had also been beaten by Soult. Nothing remained for Suwaroff but retreat, a course which he adopted with extreme reluctance, making his

way with incredible resolution and perseverance over the rugged Alps into Glarus and the Grisons, and at length reaching the valley of the Rhine (10th October). Disagreements having taken place between the Austrian and Russian generals regarding their future proceedings, the latter with- drew to winter quarters in Bavaria; and soon after this the capricious czar of Russia, Paul, withdrew from the alliance and recalled his troops.

Bonaparte, who had now returned from his Egyptian 1800.

campaign, made proposals for peace, which were rejected, and both sides prepared to renew the contest in 1800. A numerous and well-appointed French army was collected at Dijon, at the head of which the first consul suddenly put himself, and set out for Italy across the Great St Bernard. The passage was effected with great skill and determination in spite of every obstacle, and he arrived in Lombardy before Melas, the Austrian general there, had been informed of the expedition. On the 14th of June a great battle took place near the village of Marengo, the most obstinate and sanguinary that had up to this time been fought. The Austrian army numbered 21,000 foot and 7000 horse, while opposed to them was an army of 22,000 men. The battle was maintained with great spirit and obstinacy on both sides; but at length, after repeated charges, the French were compelled to give way, and the retreat be- came general. At this moment, however, a fresh body of

1801.

1805.

French troops under Desaix arriving on the field the con- test was renewed, and after a final struggle the Austrians were compelled to yield. They lost about 7000 men in killed and wounded, and 3000 prisoners; while the French lost about the same number in killed and wounded, and 1000 prisoners, taken in the early part of the day. Their retreat being cut off, the Austrians capitulated to the conqueror, who thus again acquired possession of the whole of Italy In the meantime Moreau had invaded Germany and defeated Kray in several engagements, parti- cularly at Stockach and

Méskirch, and again at Biberach and Hochstidt; he also took Munich, and laid Bavaria and Swabia under contribution. An armistice was now agreed to (Parsdorf, 15th July), and overtures were made for peace, but without success. Hostilities were resumed in the end of November, and at first the Austrians gained some advantages, but on the 3d of December they sustained a crushing defeat at Hohenlinden. The fight was long and obstinate ; the French lost on that and the preceding days 9000 men, while the loss of the Austrians was nearly twice as great. The moral effects of the defeat were most disastrous Moreau now advanced by hasty marches, crossed the Inn, took Salzburg, and pressed on towards Vienna, but an armistice was agreed to on 25th December. In Italy the Austrian forces sustained a severe defeat at the passage of the Mincio (26th December). Suffering under these disasters Austria was glad to agree to terms, which were concluded at Luneville, 9th February 1801. {

By this treaty the whole of the left bank of the Rhine was again ceded to France, and the Adige was declared to be the boundary of Austria in Italy; the grand duke of Tuscany, on the promise of an indemnity in Germany, re- nounced his dukedom in favour of the infant duke of Parma, created king of Etruria; the duke of Modena re- ceived the margraviate of Breisgau in exchange for his territory ; and the independence of the Batavian, Helvetic, Cisalpine, and Ligurian republics was recognised and guaranteed. A convention was to be again summoned for the regulation and adjustment of the rights of all con- cerned. In order to provide indemnities for the despoiled princes, a large proportion of the ecclesiastical sovereignties of thc empire was secularised, or, in other words, con- fiscated ; and all the free imperial cities were deprived of their privileges with the exception of six. To the share of Prussia fell the bishoprics of Hildesheim and Paderborn, the city of Munster, and other cities and abbacies, to the amount of more than four times what she had lost on the left bank of the Rhine. Thus was she rewarded for her discreditable neutrality and impolitic desertion of the European alliance, though she subsequently suffered for this at Jena and by the treaty of Tilsit. The grand duke of Tuscany received the archbishopric of Salzburg, the bishopric of Eichstadt, and part of that of Passau, in exchange for his hereditary possessions. Austria received the Tyrolese archbishoprics of Trent and Brixen. She had also received, in 1795, Western Galicia as her share in the third division of Poland, so that now her territory comprised

over 254,000 square miles, her public debt amounting to 1,220,000,000 florins, or £122,000,000.

Austria now enjoyed a short period of peace, and em- ployed it in silently repairing the breaches in her army and finances which had been produced by the late wars. After Napoleon had assumed the title of emperor of the French, the Emperor Francis took for himself and his successors Geet ot emperor of Austria (11th August 1804). On 11th

pril 1805, an alliance was formed between England and Russia for resisting the encroachments of France, and some months later Austria and Sweden likewise joined it. Prussia held aloof, in the hope of receiving Hanover as a

reward for her neutrality; while Baden, Wiirtemberg, and Bavaria sided with France. . Deceived by the efforts that ‘Napoleon was ostensibly making for the invasion of Eng- land, the Austrians (9th September) crossed the Inn, in- vaded Bavaria, and took up a position in the Black Forest, Meanwhile the French troops were in full march from the shores of the Chanmel to the banks of the Rhine 3 and the force in Hanover, under Bernadotte, was ordered to cross the Prussian territory without asking permission, and form a junction with the Bavarians in the rear of the Austrians, while other corps were at the same time directed by circuit- ous routes upon their flanks. The Austrian general, Mack, on the first intelligence of the approach of the French, had concentrated his forces at Ulm, Memmingen, and Stockach, contemplating an attack only in front. Great was his consternation, therefore, when he found that there was also an army on his rear. After several partial engagements, in which the Austrians were defeated, the Archduke Ferdinand, at the head of a body of cavalry, succeeded in making his way through the enemy, and in reaching Bohemia ; while Mack, with the rest of the army, shut himself up in Ulm, which, with 30,000 men, he was forced to surrender (20th October). After this, Napoleon, with his usual rapidity, marched with the main body of his troops upon Vienna, and on the 5th of November established his headquarters at Linz, the capital of Upper Austria. The Russian and Austrian troops made

various attempts to obstruct his farther progress (particularly at Diirrenstein, where a desperate engagement took place), but without success ; and, on the 13th November, Vienna was in the hands of the conqueror, who made his headquarters at Schénbrunn. In the meantime the Archduke Charles was with the army in Italy, where, on 29th October, he was attacked with great fury on the heights of Caldiero, by the French under Massena. A terrible con- flict ensued, and continued till night parted the combat- ants. It was renewed the following day, when at length victory declared for the Austrians. The archduke, how- ever, was unable to avail himself of his success, for, hear- ing of the unfortunate state of matters in Germany, he set out with his army for the defence of the capital, and con- ducted it with great skill over the mountains, so that it suffered no serious loss. Marshal Ney, who had been sent with a body of troops into Tyrol, succeeded in taking the mountain barrier of Scharnitz by storm, and in making himself master of Innsbruck. Two bodies of Austrian troops had been so hard pressed that they were obliged to capitulate—one under General Jellachich at Feldkirch, and another under the Prince de Rohan at Castel-Franco in Italy,

After the loss of Vienna the allied forces collected them- selves in Moravia, whither they were followed by Napoleon. At length the two armies came in sight of each other at Austerlitz, and both sides prepared for battle, which it was felt must be a most momentous one, and was to be witnessed by three emperors (those of France, Austria, and Russia). The allied forces numbered fully 80,000 men, of whom 15,000 were cavalry, while the French had 90,000 men in the field. The army of the allies was not well generaled, while on the side of the French were Soult, Bernadotte, Davoust, Murat, Lannes, Oudinot, Bessi¢res, &c. The battle commenced on the morning of the 2d December, and continued till night. Both sides displayed the greatest skill and bravery; at one part of the field the allies would be victorious, at another the French; at one time victory would incline to the French, and again to the allies. At length, however, towards evening, the allies came to be beaten at all points, and the route soon became general. Numbers sought to save themselves by crossing the frozen lake of Satschan; but shots from the French batteries on the heights above broke the ice in all directions, and about

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9000 men perished. ‘The allics lost about 30,000 men, killed, wounded, or made prisoners, while the French lost about 12,000 in killed and wounded. This was the most glorious of all Napoleon’s victories ; but he was still in a very dangerous position. The Archduke Charles, with an army of 80,000 men, was now approaching Vienna ; Hun- gary was rising en masse against him; Russian reserves were advancing; and Prussia was at length preparing to declare war, on account of the unauthorised passage of French troops through her territories. From these difficul- ties, however, he was freed by the desire of the Emperor Francis for peace. An armistice was agreed to, and finally a treaty of peace was drawn up and signed at Presburg (25th December 1805). By this treaty Austria ceded to Bavaria, now erected into a kingdom, the whole of the Tyrol, Vorarl- berg, Lindau, Burgau, Passau, Eichstadt, Trent, and Brixen, besides several petty lordships; to Wiirtemberg, now also become a kingdom, the bordering Austrian dominions in Swabia; and to Baden the Breisgau, the Ortenau, and the town of Constance. She also yielded up her Venetian possessions, and agreed to pay a war contribution of £1,600,000. In exchange for all these sacrifices she merely réceived the small electorate of Salzburg, and the possessions of the Teutonic Order. In all, Austria lost about 28,000 square miles of territory, with a population of 2,700,000, and a revenue of 14,175,000 florins. It was evidently not the intention of Napoleon to overthrow the Austrian monarchy, but rather to throw its strength to the eastward, and to impose a barrier of subordinate kingdoms between it and France, so as to prevent its interference with his schemes of aggrandisement in Germany and Italy.

A blow was inflicted upon the constitution of the Ger- man empire by Napoleon, in the formation of the Con- federation of the Rhine.

Represeutatives of the different powers concerned assembled at Paris in the beginning of July 1806; and, on the 12th of that month, an Act was signed whereby the kings of Bavaria and Wiirtemberg, the elector of Baden, and thirteen other princes of Western Germany, separated themselves from the German empire, and formed a confederation under the protection of the emperor of the French. 16,000,000 men were thus, by a single stroke, transferred from the empire to a foreign alli- ance, Wisely yielding to what he could not prevent, the Emperor Francis, by solemn deed, renounced the title of emperor of the Romans, and declared himself the first of the emperors of Austria.

The peace of Presburg was quickly followed by the war between France and Prussia, in which the latter suffered terrible retribution for her selfish policy in leaving Austria to struggle unaided against the common foe of Europe. Great efforts were made to induce Austria to take part in this war, but she prudently remained neutral, conteuting herself with making every effort to strengthen and improve her army, and increase her warlike resources. During the whole of 1806 and 1807 the efforts of the war department, under the guidance of the Archduke Charles, were inces- Sant to restore the losses that had been sustained in the late war. The army was also remodelled upon the system adopted by Napoleon. The transfer of a large portion of the French army in Germany to the Peninsula on the breaking out of war there, emboldened the Austrian Gov- ernment to issue a decree (9th June, 1808), instituting a landwehr or militia to be raised by conscription, which soon amounted to 300,000 men, in addition to a regular Standing army of 350,000. On hearing of this, Napoleon addressed strong remonstrances to the court at Vienna, which made loud professions of pacific intentions, but did not cease 1ts warlike preparations. In the spring of 1809 the armies on both sides took the field, and, on 8th April, Austrian troops crossed the frontiers at once in Bohemia,

on the Inn, in the Tyrol, and in Italy. In the mean- time France was bringing together her forces trom all quarters towards the valley of the Danube, where at length she had an army, including the troops of the German

Confederation, of about 200,000 men, and Berthier was despatched to take the command till the arrival of the emperor. The Archduke Charles had crossed the Inn with upwards of 120,000 men, and on the 16th they had advanced as far as the Isar, which they crossed. Berthier, instead of concentrating his troops, was separating them, so that they were in the utmost danger, when the arrival of Napoleon at once changed the aspect of affairs. On the 19th an action took place at Thann, between a body of about 20,000 French and a like number of Austrians, with- out any decisive result; and the following day the main body of the Austrians, over 50,000 strong, was suddenly attacked and defeated after a feeble resistance at Abens- berg, by a French army of 65,000 men. The same day the Austrians attacked and took Ratisbon, and secured the bridge over the Danube there. Both sides now prepared for a general engagement, which took place at Eckmiihl on the 22d of April. The battle was bravely contested ; but at length the French were victorious, the loss to the Austrians being 5000 killed and wounded, and 7000 prisoners. The archduke retired during the night to recruit his army in Bohemia, and Ratisbon was taken by storm. In other parts, particularly in Italy, success was attending the Austrian arms.

Napoleon now lost no time in again marching on to Vienna, and no great attempt was made to unpede his progress except at Ebersberg, where Hiller with about 30,000 Austrians took his stand to defend the wooden bridge over the Traun. He was gallantly attacked by a body of French troops under Massena, and a fearful struggle took place ; but at length the French prevailed, and Hiller with- drew his troops. Each side lost about 6000 men on this occasion. On the 10th of May the French eagles appeared before the walls of Vienna, and, after an ineffectual attempt at defence, the city surrendered on the 13th. The Arch- duke Charles was hastening to the relief of the town, but arrived too late. The two armics therefore prepared for battle, the one on the north bank of the Danube, the other on the south. On the night of the 19th the French pre- pared to cross the river at the island of Lobau, and by daybreak on the 21st they had 40,000 men landed on the northern side. The Austrians now resolved upon an attack, and by two o’clock, when the fight began, the French force amounted to about 50,000 men, while the Austrians had 80,000 to oppose them. The scene of action was near the villages of Aspern and Essling, and the struggle was maintained with the most desperate courage on both sides till night parted

the combatants. The Austrians had everywhere the advantage, but both sides prepared to renew the contest the next day. During the night, and early in the morning, French troops were still passing over, so that, notwithstanding his losses, Napoleon had fully 70,000 men to renew the fight. It commenced early in the morning, and continued the greater part of the day; but at length the French were beaten on all sides, and compelled to retreat to the island of Lobau. In these two days they lost upwards of 30,000 men, and the Austrians not less than 20,000. The victory produced a great impression on the mind of Europe, and dissipated in a great degree the charm of Napoleon's invincibility.

He, however, made every preparation for renewing the contest. He summoned troops from different parts, and for- tified his position on the island of Lobau, connecting it also by several bridges with the south bank of the river. On the evening of the 4th of July he assembled his troops on the island, amounting to 150000 infantry and 30,000

cavalry, with 750 pieces of cannon. During the night several bridges, which had been secretly prepared, were thrown over to the northern bank at a point where they were not looked for, and by six o'clock the following morning the whole body had passed over. In the after- noon the French made a vehement attack upon the Austrians, but were repulsed with great slaughter. arly on the morning of the 6th the Austrians began the attack, Their numbers were then about 115,000 infantry and 25,000 cavalry; but they were in hourly expectation of the arrival of an additional body of 30,000 under the Arch- duke John, which was known to be not far off. The battle was contested with the utmost determination and bravery on both sides. The Austrian right wing succeeded in over- throwing and putting to flight the left wing of the enemy. On the other wing the contest was long and doubtful; but two divisions of troops having at length succeeded in turn- ing the extreme flank of the Austrians, the latter, after a gallant defence, were compelled to abandon their position. In these circumstances, Napoleon collected all his dispos- able forces and brought them to bear upon the centre of the Austrians, which was their weak point, the archduke having thrown his strength chiefly into the two wings. After repeated

charges, which were repulsed with great bravery, the French succeeded in forcing their line, and the archduke, despairing of maintaining his position, ordered a retreat, which was effected in good order and with little loss, The French were so exhausted that they displayed little vigour in the pursuit, and neither guns nor prisoners were taken. The Archduke John came up in the afternoon, but too late to be of any service. Had he made his appearance sooner there can be no doubt that the result would have been different. As it was, the Austrians suc- ceeded in making a most gallant stand against a greater number of the best troops of France, led by Napoleon and some of his greatest generals. This battle of Wagram was one of the greatest and most obstinately contested fights in the whole war, and is perhaps the most glorious in the annals of Austria. The loss on both sides was immense, amounting to about 25,000 on each, including killed and wounded. The Archduke Charles retreated towards Bohemia without any serious molestation from the enemy. A battle was fought at Znaim (11th July) be- tween the Austrians and a French army under Massena which was following them, but before it was decided news of an armistice arrived. This was followed by the peace of Vienna (14th October). “The campaign of Aspern and Wagram,” says Sir A. Alison, “is the most glorious in the Austrian annals,—one of the most memorable examples of patriotic resistance recorded in the history of the world. . . . Other empires have almost invariably succumbed upon the capture of the capital. . . . Austria is the only state recorded in history which (without the aid of a rigor- ous climate like Moscow) fought two desperate battles in defence of its independence after its capital had fallen,” —(Mistory of Europe.) By the peace of Vienna Austria was compelled to cede Salzburg, Berchtesgaden, the Innviertel, and the Hausruckviertel, to Bavaria ; portions of Galicia to Russia and the grand duke of Warsaw ; and Carniola, Trieste, the greater part of Croatia, Istria, the circle of Villach, é&c., to Italy In all she lost about 42,000 Square miles of territory and 3,500,000 inhabitants, to- gether with more than 11,000,000 florins of revenue. The emperor also agreed to reduce his army to not more than 150,000 men; and a war contribution of £3,400,000 was imposed on the provinces occupied by the French troops. Before leaving the Austrian capital Napoleon caused the fortifications to be blown up.

Soon after this Napoleon obtained a divorce from his wife Josephine, and offered his hand to Maria Louisa,

daughter of the emperor of Austria, and was accepted, The marriage was celebrated with great pomp at Vienna on the 11th March 1810. In 1812 Austria was obliged to enter into an alliance with France against Russia, and to furnish an auxiliary force of 30,000 men for the invasion of the latter country. The disastrous result of that expedi- tion to the invaders showed Germany that the fortunate moment had now arrived for regaining her independence.

Prussia was the first to form an alliance with Russia, and 1813,

declared war against France (17th March 1818). efforts were made to induce Austria to join this alliance, but without success. She directed her attention to raising her military strength, and making other preparations to enable her to take an important part in the coming struggle, on the one side or the other. After the defeat of the allies at Liitzen and Bautzen, and the conclusion of an armistice at Pleswitz, Austria came forward as a mediator, with the view of effecting a peace between the parties, and not with- out the view, also, of gaining some material advantage for herself. In fact, she now held in her hand the balance between the contending parties. Her army of 150,000 or 200,000, which she had collected in Bohemia, would bring victory to whatever side she joined. Metternich, who at that period had the direction of the cabinet of Vienna, was too clear-headed not to perceive the advantages of the position, and he determined to avail himself of them, in order if possible to restore to Austria her lost possessions. He had openly avowed, that if Napoleon would accede to the terms which he proposed Austria would throw her whole 200,000 men into the scale in his favour. At first it seemed doubtful to which side she would attach herself; but it would appear that the allies had reason to believe that she was favourable to them, and that Napoleon had also reason for suspecting the strength of her attachment to him. It is evident that she would have more to expect from the allies than from Napoleon, but at the same time it was doubtful how far she

would be influenced by the existing matri- monial alliance. While things were in this doubtful state news arrived of the battle of Vitoria, by which the death- blow was given to the power of France in the Peninsula, and after this there was little hope of peace on either side. Austria, whatever her previous intentions, doubtless now felt that there was little to be gained from attaching her- self to a sinking empire and a falling cause, and she agreed, in the event of Napoleon not accepting the terms proposed, to join the allies. They could have had little hope that the terms would be accepted ; they included the cession to Austria of all the Illyrian provinces, with Trieste, the re- instatement of Prussia in her ancient possessions, with a frontier on the Elbe, and the dissolution of the grand duchy of Warsaw, to be divided between Russia, Austria, and Prussia. These terms not being acceded to, both parties prepared for war. Austria agreed to furnish 200,000 to the allied forces, stipulating in return that she should be restored to the condition in which she was in 1803, or, at any rate, at the peace of Presburg.

By gigantic efforts Napoleon was able to raise his army to 400,600 men, of whom nearly 350,000 were effective, and he resolved to make Dresden the pivot on which all his operations should turn. To oppose him the allies mus- tered about 400,000 men, so that the two forces were pretty nearly equal. Of the latter, a grand army of 220,000 men, chiefly Austrians, under Prince Schwarzenberg, was sta- tioned in Bohemia; Bliicher, with 95,000 men, was to protect Silesia; while Bernadotte, the crown prince of Sweden, who had joined the allies with 28,000 troops, was to protect Berlin and Brandenburg with an army of 90,000. Napoleon resolved to march with the main body of his troops into Silesia against Bliicher, having despatched an army of 80,000 men under Oudinot against Berlin, and

gending a force of 30,000 to keep the passes from Bo- hemia to Dresden. Bliicher judiciously retreated before the French troops, and while Napoleon was following him, the allied army in Bohemia came down upon Dresden. In place, however, of at once beginning the attack, it was delayed till Bonaparte, who had been informed of their movements, had time to arrive. The attack was commenced on 28th August, and kept up with great fury

during the day ; but in the evening a series of sallies were made from the town, which took the besiegers completely by surprise, and compelled them to withdraw. Napoleon had now re- ceived sufficient reinforcements to enable him to give battle, which he did the next day. He was then able to muster 130,000 men, while the allies numbered about 160,000. The fight was maintained for some time with great bravery on both sides, but at length a body of French troops under Murat succeeded in turning the flank of the allied left wing, and then attacking them suddenly on flank and rear; they were thus thrown into confusion, and the great body of them killed or made prisoners. The allies lost on this occasion about 26,000 men, of whom about 13,000 were prisoners. A French force under Vandamme had been sent to cut off the retreat of the allies, but this was engaged near Culm (29th August) by a body of Russians under Ostermann, and a desperate struggle took place, which was renewed the next day, and only ended by the appearance in the rear of the French of a large body of Prussians, when the leader and most of his troops were made prisoners. The French lost in the two days 18,000 men, of whom 7000 were prisoners.

Napoleon, on quitting Silesia, had left Macdonald with an army of 80,000 men to oppose Bliicher. The latter suddenly attacked them with great fury on the Katzbach (26th August), and defeated them with great slaughter. The fight was several times renewed during the three fol- lowing days when the allies were in pursuit, and in all the French lost about 7000 men in killed and wounded, and 18,000 prisoners. Nor was the French army under Oudi- not more successful, for it sustained a severe defeat at Gross Beeren (23d August), and in that and subsequent engagements lost about 4000 in killed and wounded, and an equal number of prisoners. Napoleon was strongly affected by these reverses, the more so that they were quite unexpected. He gave the command of the army in the north to Ney, and set out himself against Bliicher. Ney engaged the allied army at Dennewitz, and a desperate battle was fought (6th September), in which the French were at length beaten and put to flight with a loss of 13,000 men, of whom one-half were prisoners. The army in Bohemia now again resumed the offensive, and was preparing to fall upon Dresden, when N apoleon suddenly returned and drove them back. He again marched against Bliicher, but returned to Dresden without effecting any- thing. He then resolved to enter Prussia and take Berlin, but was obliged to give up this project on learning that Bavaria

had joined the allies (8th October). Now fearing that his retreat might be cut off, he directed his march towards the Rhine, and reached Leipsic on the 15th of October. Here the combined allied armies under Schwarzen- berg, Bliicher, and Bernadotte assembled, and on the 16th an indecisive battle was fought, which to the French was equivalent to a defeat, and the same evening Napoleon made proposals for peace, but no answer was returned. The battle was renewed on the 18th. The French army numbered about 175,000 men, while the allied forces amounted to about 290,000. The French strength was also weakened by two Saxon brigades of foot and one of cavalry passing over to the enemy during the engagement. Notwithstanding these disadvantages the French fought with great bravery and determination but were at length

beaten on every side. Next day they were in full retreat, and Leipsic was taken by the allies after a gallant defence. The total loss of the Freuch during these four days exceeded 60,000 men. The emperor reached Erfurt on the 23d October, and there collected the scattered remains of his army. The Bavarians, under Wrede, attempted to inter- cept his retreat at Hanau, but though aided by some of the allied troops, they were defeated with great slaughter (30th October). The Rhine was crossed on 1st November, and on the 9th Napoleon arrived in Paris. Thus Germany regained its independence, and the Confederation of the Rhine was dissolved. Austria, as we have seen, had a principal share in bringing this about; but the Emperor Francis was opposed to the adoption of extreme measures against Napoleon, being desirous that the sceptre of France should continue in the hands of his daughter and her de-

scendants. Other views, however, prevailed. The war was 1814.

carried into the enemy’s country, and at length, not with- out a good deal of fighting, the allies entered Paris on 31st March 1814. On 11th April Napoleon resigned the im- perial crown.

Tn the end of September following a congress was assem- bled at Vienna to adjust the claims and the mutual rela- tions of the several states. This, however, was found to be a matter of no small difficulty. Russia demanded the whole of Poland, and Prussia laid claim to Saxony. Austria, France, and England were opposed to these claims, and determined to resist them, so that at one time it appeared as if war was again to break out; but more peaceful views

began to prevail, and when the news arrived that Napoleon 1815.

had secretly quitted Elba, all minor differences were for- gotten in the presence of this pressing danger. They at once declared him an enemy and a disturber of the peace of the world, and prepared to bring against him an army of upwards of half a million of men. But before these had all been collected, Wellington and Bliicher had brought the military career of Bonaparte to a close on the field of Waterloo. In the new partition of Europe, which was fixed by the Congress of Vienna (1815), Austria received Lom- bardy and Venice, the Illyrian provinces, Dalmatia, the Tyrol, Vorarlberg, Salzburg, the Innviertel, and Hausruck- viertel, together with the part of Galicia formerly ceded by her, making in all about 3,200 square miles of territory. The emperors of Austria and Russia and the king of Prussia also entered into a “ Holy Alliance,” by which they bound themselves to remain united in the bands of true and brotherly love, to mutually help and assist each other, to govern their people like fathers of families, and to main- tain religion, peace, and justice in their dominions. This alliance, beautiful in theory, was made, in fact, the means of maintaining absolute power in the hands of the rulers, and of suppressing free institutions and almost every form of liberty among the people. This was particularly the case in Austria, under the direction of Metternich, who did everything in his power to carry out these principles. A strict censorship of the press was established, not only to overlook the home press, but also to superintend the in- troduction of foreign publications. A system of secret police was also organised to observe and report what was said and done by the people in private. Besides this, Austria was ever ready to aid in the suppression of revolu- tionary movements in other states. In the construction of the German Confederation she used her influence to sup- press the popular voice in all matters of government ; her armies were

employed in quelling the popular insurrections in Naples and Piedmont in 1822; and by diplomacy she aided in the suppression of the popular movement in Spain in 1823. During the insurrection in Greece the influence of Austria was exerted against it ; and when Greece was estab- lished as a kingdom (1827), under the protection of England,

France, and Russia, she kept aloof. When, however, Russia invaded Turkey in 1828, Austria joined with Eng- land in interfering to preveut the fall of Constantinople, and in bringing about peace.

The commotions that followed the French revolution of July 1830 in different parts of Europe considerably affected Austria. This manifested itself chiefly in Lombardy, where the presence of 30,000 troops was required to maintain the imperial authority. In Parma and Modena the people suddenly rose in insurrection and expelled their rulers, and Austrian troops were cmployed to restore them. An in- surrection also broke out in the Papal States, and the Pope invoked the aid of Austria, whose troops entered Bologna and established themselves there (January 1832). Upon this the French sent a force to occupy Ancona, and at one time it seemed as if France and Austria were again to cross swords on Italian soil, but this danger was at length averted. In the minor states of Germany the cry for popular insti- tutions was raised, and in many cases the rulers were obliged for a time to comply with them, but after the danger appeared to pass away, Austria, acting in concert with Prussia, succeeded in bringing back the old state of things in the confederation. The Poles, tired of Russian rule, and hoping to be supported by France, took up arms to regain their independence (1831). Although Austria pro- fessed a strict neutrality in the struggle, a Polish corps that was driven into her territories was disarmed and detained, while a body of Russian troops under the same circum- stances was allowed to continue its operations against Poland. During the remainder of the reign of Francis I. no public event of importance occurred. He died on the 2d of March 1835, in the sixty-seventh year of his age and the forty-third of his reign. He was one of those well- meaning but weak-minded men, who unfortunately adopt the wrong means for effecting the good which they intend. He wished to make his people contented and

happy, but he sought to do so by repressing all independence in thought or action, and keeping them in the most abject subjection. He earnestly strove for their advancement, but it was by strenuously endeavouring to keep things as they were, and epposing every form of change. The transition from an old to a new state of things was in his mind always asso- ciated with the utmost danger, and to be by all means avoided. He did much in the way of establishing ele- mentary schools throughout the country, but said that he wished to have no learned men, only good loyal citizens. ‘He was thoroughly conscientious and correct in his con- duct, but at the same time narrow-minded, suspicious, and bigoted. He was most assiduous in his attention to the business of the state, but occupied himself chiefly with small matters and minor details, while more important con- cerns were entirely overlooked and neglected. His good qualities, however, commended him to the affections of his people, and this doubtless did much to repress among his subjects the insurrectionary spirit which subsequently mani- fested itself.

He was succeeded by his eldest son, Ferdinand I., an amiable but weak-minded prince, who left the government very much in the hands of his prime minister, Metternich. The various signs of discontent which had been manifested during the former reign soon. became stronger and more marked. Baron Pillersdorf, the successor of Metternich, speaking of this period, says, ‘Circumstances permitted an uninterrupted enjoyment of peace, but the necessity for internal ameliorations became by so long a delay more urgent, the demand for them more sensible, whilst, owing to the procrastinations of the Government, faith and con- fidence were diminished. It is true that the prosperity of the provinces generally did not decline; on the contrary, many branches of commerce manifested an increase in their

development; but in spite of this the situation of the whole empire inspired in different respects scrious apprehensions, arising from the disordered state of the economy of finance, the yearly augmentation of the public debt, the inefficiency of the measurcs adopted, and still more from the oppressed

disposition of mind of the clear-sighted and intelligent classes of the population.”—(7he Political Movement in Austria during 1848-49.) The people saw growing up in the nations around them freer institutions and more liberal modes of government, and they could not help con- trasting those with their own system. Austria, too, was made up of a number of different nationalities, and the Government attempted to strengthen its position by working upon their national prejudices and antipathies, setting race against race, and creed against creed. In particular, the German element was favoured at the expense of the other nationalities; and the Germanising measures of the Govern- ment excited great discontent among the other races. It has been remarked that the aversion of Austria to the develop- ment of the Slavonic element in her population was greatly owing to jealousy of Russia, which power she regarded as desirous of attaching all the Slavonic races to itself. Hence Austria has always been opposed to the encroachments of Russia in Turkey, and in favour of maintaining the integrity of the latter, so that, when war broke out in 1839 between the Sublime Porte and the Pasha of Egypt, she readily joined England in support of the former.

The court of Vienna was first frightened from its sense of security by an insurrection in Galicia in 1846. This having been suppressed, Austria, in conjunction with the other two powers which had dismembered Poland, deter- mined to lay hold on Cracow, and thus extinguish the last remnant of Polish independence. ‘This step being contrary to the treaty of Vienna, was strongly remonstrated against both by England and France; but these remonstrances were unheeded, and the republic was incorporated in the Austrian empire. The French revolution of 1848, which convulsed almost the whole of continental Europe, caused the Austrian empire to totter to its foundations.

whole city was in a state of open rebellion (13th March). The populace, headed by the students, and forcing the magistracy along with them, made their way into the im- perial palace, and loudly demanded from the emperor the dismissal of his old counsellors, and the immediate grant of anew constitution. Alarmed at these demonstrations Prince Metternich resigned, and was soon after on his way to London ; and an imperial proclamation was issued, declar- ing the abolition of the censorship of the press, the

estab- lishment of a national guard, and the convocation of a national assembly. ‘These measures, however, as well as the nomination of a new ministry, were far from sufficing to arrest the popular movement, encouraged and led on by the students and other members of the university. The national guard just called into being, along with the academic legion, formed themselves into a permanent com- mittee, and dictated laws to the Government. On the 17th of May, Ferdinand, accompanied by the empress and the members of his family, secretly quitted the palace, and fled to Innsbruck. An attempt to dissolve the academic legion caused an outbreak on the 25th, and the streets were barricaded; but no fighting took place, for the ministers yielded to the demands of the rioters, and gave up their design. A committee of citizens, national guards, and students, which was formed for the preservation of peace and order, was legalised by the prime minister, and assumed the authority of the Government. In the mean- time the revolutionary spirit was manifesting itself 1n other parts of the empire. In Italy the inhabitants of

Scarcely had the news Revolatio of the fall of Louis Philippe reached Vienna when the of 18.

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Milan and Venice rose against their rulers, and expelled the Austrian troops. This was followed by a general rising throughout Lombardy and Venice. The insurgents found an ally in Charles Albert, king of Sardinia, who came with an army to their assistance, and declared war against the empire. At first he succeeded in driving the Austrians back to the northern frontier of Italy; but General Radetzky, having received reinforcements, van- quished him in several engagements, and compelled him to flee to his own dominions, and conclude a truce with the victors. This was followed by the reconquest of Milan and the whole of Lombardy. Venice withstood the besieging army of the Austrians for some months, but was at length obliged. to surrender. In Bohemia the Czechs or Slavonic party determined to obtain redress against the Germanis- ing measures of the Government, and forwarded a petition to the emperor, demanding a united and independent national assembl) for Bohemia and Moravia, independent municipal institutions, and an equal share im public offices with the

German part of the population. An evasive answer was returned, and the citizens of the capital rose in insurrection, A national assembly of delegates of the Slavonians in all parts of the empire was summoned to meet at Prague. ‘Three hundred made their appearance, and the assembly was opened in the beginning of June. The efforts of the military to maintain peace excited the enmity of the citizens, and they petitioned for the removal of the commander, Prince Windischgratz. Meanwhile a collision took place between the Slavonic militia and the regular troops. ‘he Germans joined with the military, and the insurrection raged for five days; the town was bombarded and taken, and the leaders dispersed or taken prisoners.

In Hungary the National Diet had passed measures in favour of a responsible ministry, a perfect equality of civil rights, religious toleration, the formation of a national guard, and abolition of the censorship of the press. The emperor gave his consent to these measures; but a strong Austrian party in the country, chiefly Slavonians, was opposed to them, and, instigated and supported by the Austrian Government, they broke out in open revolt. Jellachich, the ban or governor of Croatia, was the leader of the insurgents, and collecting an army of 65,000 men, he marched on towards Pesth. An army was speedily raised by the Hungarians to meet him, and a battle was fought within 25 miles of the capital on 29th September, in which Jellachich was beaten. The emperor now openly declared against the Hungarians, annulled the decrees of the Diet, suspended the civil authorities, and appointed Jellachich commander of the army. The Diet, denying the authority of the emperor, organised a committee of safety, and elected Kossuth president. This was equivalent to a declaration of war, and an Austrian army was ordered out against them. The people of Vienna, sympathising with the Hungarians, rose in arms, when the garrison of that city departed for Hungary (6th October). A deputation waited on the minister of war, Latour, demanding their recall, and on his refusal they took the arsenal by storm, and murdered him. The National Diet, which had met on the 22d of July, now declared its sittings permanent, and elected a committee of public safety. It sent an address to the emperor asking for a new ministry, the revocation of the edict against the Hungarians, the dismissal of Jellachich, and an amnesty for the rioters. The emperor, who had returned from Innsbruck to Vienna in June, returned an evasive answer, and fled to Olmiitz. The people in the capital armed themselves under the

leader- ship of General Bem, and prepared to resist the impend- ing attack of the army. The garrison, after having retired outside the limits of the city, was joined by Jellachich's

horde of Croatians and by the army of Windischgratz. On 23d October, an army of 100,000 men appeared before Vienna, and the city was summoned to surrender. This the people refused to do, and the attack was commenced on the 28th, when the city was set on fire in many places. The next day a part of the suburbs was taken, and the leaders began to think of surrendering when the news of a Hungarian army hastening to their relief inspired them with fresh courage. This force, however, was attacked and put to flight by Jellachich (30th October), and next day the city was taken by storm, after a desperate struggle, which was attended with immense slaughter. On 22d November a uew ministry was formed, of which Prince Schwarzenberg was president; and on 2d Deceinber the Emperor Ferdinand was induced to abdicate the throne. His brother, Francis Charles, who was his legal successor, likewise renounced his right in favour of his son, Francis Joseph, who was proclaimed emperor under the title of Francis Joseph I.

The war in Hungary was renewed by Windischgratz, who crossed the Leitha, and after several successful en- gagements entered the capital of that country (January 1849), the Hungarian Government and one division of the army having departed eastward to Debreczin, while the other under Gorgei retired northward towards Waitzen. The Austrian general, instead of pursuing them, remained in- active for seven weeks at Pesth, and thus afforded them time to organise. In Transylvania General Bein gained a decisive victory over the Austrians in that territory, and also defeated and put to flight a Russian force that had come to their assistance. At length Windischgratz moved forward towards Debreczin, and met the Hungarians at Kapolna, where an obstinate and bloody but indecisive battle was fought (26th February). Next day the Austrians, having received reinforcements, renewed the fight, and the Hungarians were obliged to retire. The latter having re- cruited their forces, another obstinate battle was fought near

G6d6l6 (5th April), in which the Austrians were de- feated, as they were in several subsequent engagements, so that they were compelled to abandon the capital and recross the Danube, leaving a small garrison at Buda, which after- wards surrendered. Had the victorious army now marched on to Vienna they would doubtless have succeeded in bringing the Austrians to terms; but disputes among the rulers and dissensions among the generals prevented such a course. In June Prince Paskewitch crossed the Galician frontier at the head of a Russian army of 130,000 men ; and General Haynau, who now had the command of the Austrian troops, was joined by a Russian corps under General Palutin. ‘The Hungarians were unable to contend against these forces, and had again to leave their capital, the seat of the Government being transferred to Szegedin. Driven from this place, the army made a stand at Temesvar, but were defeated with great slaughter (9th August), and again, two days later, at Arad. On 13th August the Hun- garian general, Gérgei, who had been named dictator, sur- rendered to the Russians. Hungary was now treated as a conquered country, and the greatest cruelties were prac- tised against the people by the Austrian general, Haynau. The military and parliamentary leaders were shot or hanged, and the prisons filled with unhappy victims. In the mean- time the war in Italy was renewed by the king of Sardinia. He was, however, defeated at Mortara (21st March) by the Austrian general, Radetzky, and again at Novara (23d March), when he abdicated in favour of his son, Victor Emmanuel, with whom a peace was concluded. Venice held out against the Austrians till 23d August, when it was forced to surrender,

The congress which, since the final struggle in Vienna, had been adjourned to Kremsier, was dissolved (March 4,

1849), and a constitution promulgated by the free will of the evaperor. At this time efforts were made in the German National Assembly at Frankfort to form Germany into one integral empire, excluding Austria, the imperial crown being offered to the king of Prussia. This was violently opposed by the Austrian Government, and though the king of Prussia did not venture in the face of this opposition to accept the imperial crown, he concluded a

treaty with the kings of Saxony and Hanover (May 1849), with the view of forming a strict union with the different states of the German confederacy to the exclusion of Austria. To this treaty the majority of the lesser states afterwards ac- ceeded, and a diet was convened at Erfurt (May 1852), under the presidency of Prussia, for the reorganisation of Germany. Austria, to counteract the efforts of her rival, invited the different states to send their representatives to Frankfort, where she assumed the lead. The legality of the assembly was at once acknowledged by Bavaria, and Saxony and Hanover were subsequently gained over to it. While matters were in this state disturbances arose in Hesse- Cassel. The margrave invoked the assistance of Austria, while the people looked for aid to Prussia. Having re- ceived the authority of the diet at Frankfort, Austria sent an army into Hesse, where they were confronted by another army from Prussia, and an immediate commencement of hostilities was looked for, but this was averted by a con- ference held at Olmiitz, when Prussia acknowledged the right of Austria to enter Hesse. Soon after this Austria and Prussia convoked a congress of all the states at Dres- den, where it was agreed that the final settlement of the affairs of the confederacy should be submitted to the de- cision of the diet at Frankfort. Austria now proposed to the diet that all her provinces, including Hungary and Lombardo-Venetia, should be included in the German con- federacy, but this bold proposal failed of acceptance. Austria now made strenuous efforts to develop the re- sources of the monarchy by encouraging agriculture, in- dustry, and commerce. The land was freed from the burdens of feudalism, taxes were removed, new roads were formed, and railways were constructed. A new tariff was adopted (July 1851), and negotiations were entered into with the other German states for a complete customs' union with the Zollverein, but this was strongly opposed by Prussia and several of the other states in the union. A commercial treaty, however, was, after considerable negotiation, con- cluded between Austria and the Zollverein (19th February 1853). The liberal concessions that had been made by the Government were rapidly disappearing, a rigorous military system of rule was being introduced, and centralisation was taking the place of the old provincial system. On the 1st of January 1852 it was announced that the constitution aud fundamental rights were abolished, the ministers were declared responsible only to the emperor, trial by jury was set aside, the censorship of the press was again in operation. The influence of the Roman Catholic clergy and the Jesuits was also re-established. A popular

outbreak occurred in Milan (6th February 1853), when a number of the military were killed, but it was speedily suppressed. An attempt was made to assassinate the emperor in Vienna by a young Hungarian (18th February). In the quarrel between the Montenegrins and the Porte, Austria sided with the former, and Count Leiningen was sent to Constantinople (February 1853) to demand the redress of their grievances, which was granted. About this time Russia demanded the protectorate of the Greek Christians in Turkey, and this being denied, her troops crossed the Pruth and occupied the principalities of Moldavia and Wallachia (July 1853). Austria took a leading part, along with France and England, in condemn- ing these proceedings and in endeavouring to bring about peace. She also gave the Western powers to believe that

she would actively co-operate with them in the defence of Turkey, but afterwards fell back upon vague promises, and on April 20, 1854, entered into an alliance with Prussia, by which the two powers guaranteed each other’s dominions from attack, and pledged themselves only to take an active part in the war when the interests of Germany appeared to be endangered. On June 14th Austria agreed with Turkey to occupy the Danubian principalities with an armed force, and by the end of August she had a large army there, which virtually brought the war on the Danube toanend. Austria still continued to use her exertions to bring about peace, and with this view a conference was opened at Vienna in March 1855, but the representatives of the several powers were unable to agree upon a basis. After the fall of Sebastopo] she again renewed her efforts, and having ascertained the terms on which the Western powers would be prepared to treat, she sent Count Ester- hazy to St Petersburg to lay them before the czar, by whom they were accepted, and a treaty of peace was signed at Paris, 3lst March 1856.

In August 1855 the emperor signed a concordat with the Pope, giving the church greater power in the country than it had ever possessed before. The clergy were to have unlimited control over all ecclesiastical matters and matters connected with education, and were to enjoy free communication

with Rome without the intervention of the civil power. The Government now seemed desirous of re- laxing somewhat their restrictions, and of making the people forget the troubles of 1848 and 1849. The mili- tary rule was made less strict, and a general amnesty was proclaimed for political offences (12th July 1856). The em- peror visited Italy in the end of 1856 and Hungary in May 1857, but the remembrance of past wrongs was still alive in the minds of the people, and he was everywhere received with the greatest coolness. Austria was opposed to the union of the Danubian principalities, and for some time refused to evacuate them, but at length (March 1857) her troops were recalled.

Sardinia had frequently remonstrated with Austria con- cerning her policy in Italy, while Austria, on the other hand, complained of the attacks made upon her by the Sardinian press. A growing coolness had also sprung up between Austria and France on this subject, which reached its climax when the French emperor said to the Austrian

ininister, M. Hiibner, at the levee on the Ist of January 1859.

1859, “I regret that our relations with your Government are not so good as they were; but I request you to tell the emperor that my personal feelings for him have not changed.” The preparations for war were carried on with the greatest activity by Austria, France, and Sardinia. England sent Lord Cowley to Vienna to endeavour to arrange diffcrences, but without success. Russia proposed

iy a congress of the five great powers, and this was agreed to, War wit

but Austria demanded the disarmament of Sardinia previous France to the congress, which the latter declined to agree to, and Sardi

both sides prepared for war. Austrian troops poured into Italy, France was concentrating her forces at Toulon, and Garibaldi was organising a corps of Italian volunteers. The Austrians crossed the Ticino (April 26), and the French troops were marched into Italy. Napoleon left Paris on the 10th of May, and reached Genoa on the 12th, where he was next day joined by Victor Emmanuel. The first serious encounter took place at Montebello (May 20), when a strong body of Austrians was, after a desperate resist-

ance, defeated and put to flight by a body of French troops. The Austrians again suffered a severe defeat at Palestro (May 31). On 4th June the battle of Magenta was fought, in which the Austrians were, after a long and desperate conflict, defeated and put to flight by the combined army of the French and Sardinians, under the command of the

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Emperor Napoleon in person. The Austrians fought with great bravery and determination, but were not well officered, and the arrival of General M‘Mahon with his troops at an opportune moment decided the battle against them. They had about 75,000 men in the field, while the allies num- bered about 55,000. – The latter lost about 4000 men in killed and wounded, the former about 10,000, besides 7000 prisoners. Next day the inhabitants of Milan rose in insurrection, and the garrison fled. Pavia was evacuated on the 7th, and on the 8th the fortified position of Melegnano was taken after three hours’ hard fighting. The same day the allied monarchs made their triumphal entry into Milan. One stronghold after another now fell into the hands of the conquerors. The defeated army retreated to the further bank of the Mincio, where it was reorganised, and the emperor himself assumed the command. It then recrossed the Mincio, and took up a position near the village of Solferino. Here the allies came up to it, and both sides prepared for battle. The Austrian army num- bered about 170,000 men, while the allied troops were not less than 150,000. The battle commenced early in the morning of the 24th June, and continued till late in the afternoon, The Austrian line extended for nearly 12 miles. ‘The right and left wings of the Austrians were for some time successful, while Napoleon was using every effort to break their centre. In this he was at length suc- cessful, and the wings were then obliged to retire in order that they might not be overflanked. The French lost in killed and wounded 12,000 men, the Sardinians 5000, and the Austrians 20,000, besides 7000 prisoners. The Austrians now abandoned the line of the Mincio, and fell

back upon Verona. The allies crossed the Mincio, Peschiera was invested, and great preparations were made on both sides for renewing the contest. While all Europe was in the expectation of another great battle, news arrived that an armistice for five weeks had been agreed to; and on 11th July the two emperors met at Villafranca, and agreed to terms of peace. A conference was afterwards held at Ziirich, and a treaty drawn up and signed (10th November 1859). By it Austria gave up Lombardy, with the exception of the fortresses of Mantua and Peschiera, to Napoleon, who was to hand it over to the king of Sardinia ; Italy was to be formed into a confederation under the presidency of the Pope, and Austria was to be a member on account of Venetia ; and the princes of Tuscany and Modena were to have their possessions restored to them.

In March 1860 the emperor, by patent, enlarged the number and powers of the Reichsrath or council of the empire, and on 21st October promulgated a new constitu- tion, in which he declared the right to issue, alter, and abolish laws, to be exercised by him and his successors only with the co-operation of the lawfully assembled diets and of the Reichsrath. The things to be settled with the co-operation of the Reichsrath were all legislative matters relating to the rights, duties, and interests of the seve- ral kingdoms and countries, such as the laws connected with the coinage, currency, public credit, customs, and commercial matters. This was followed by proposals of similar changes for Hungary; and, on 27th February fol- lowing, it was decreed that their former constitutions should be restored to Hungary, Croatia, Slavonia, and Transy]l- vania. At last-mentioned date a fundamental law was also promulgated for the representation of the empire by a Reichsrath, composed of two bodies, a house of peers and a house of deputies, and declaring the constitution and functions of each. It was declared to be the earnest wish of the Government that hyper-centralisation should be avoided. On 1st May the new Reichsrath was formally opened by the emperor at Vienna, when he declared his conviction “that liberal institutions, with the conscientious

introduction and maintenance of the principles of equal rights of all the nationalities of his empire, of the equality of all his subjects in the eye of the law, and of the partici- pation of the representatives of the people in the legisla- tion, would lead to a salutary transformation of the whole

monarchy.” Hungary, Croatia, Slavonia, and Transylvania declined to send representatives, claiming to have constitu- tions and rights distinct from the empire. The Reichsrath sat till the close of 1862, occupying itself chiefly with eccle- siastical affairs, the state of education, personal liberty, and the laws relating to the press, commerce, feudal tenures, &c. In 1863 the emperor of Austria invited the different poten- tates of Germany to meet him at Frankfort, in order to determine upon a scheme of reform for their common country. They almost all responded to the invitation except the king of Prussia, and the congress was opened (August 16) by a speech from the emperor. The proceedings, how- ever, did not result in any important change, owing in great measure to the want of sympathy from Prussia.

The death of Ferdinand VII., king of Denmark (15th November 1863), gave rise to a general ferment in Germany on the subject of the duchies Schleswig, Holstein, and Lauenburg. To the Germans a united fatherland had long been a favourite idea, and they now saw a step towards its accomplishment. Notwithstanding the treaty of London (8th May 1852), which fixed the succession to the Danish crown, and was signed by Austria and Prussia, they denied the right of the new king, Christian IX., to the duchies, and laid claim to them as part of Germany. ‘l’o enforce their claim the diet determined that they should be occu- pied by an armed force, and Saxony and Hanover were directed to enter and take possession of Holstein. This was done without their coming into hostile collision with the Danish troops, who retired to Schleswig (December 1863). Soon after this, however, Austria and Prussia gave notice that they, as the chief powers in Germany, in- tended to take upon themselves the carrying on of the war. Hostilities commenced (1st February 1864) when Austrian and Prussian troops crossed the Schleswig frontier. Den- mark had trusted to England and France coming forward to maintain the conditions of the treaty of 1852; but these powers remained passive, and the Danes, after a short but heroic stand, were forced to succumb. An armistice was concluded (lst August), and a treaty of peace was eventually signed at Vienna (30th October), by which Denmark made over Schleswig, Holstein, and Lauenburg to Austria and Prussia.

But Austria speedily suffered terrible retribution for the part she had taken in this affair. By inducing Austria to join with her, Prussia succeeded in

removing part of the odium of the proceeding from herself, and she also suc- ceeded in obtaining the aid of a rival power to secure territories which she had previously determined to appro- priate as her own. The acquired territory naturally lay very convenient for Prussia, and Austria would have will- ingly enough given up her claim on it if Prussia had agreed to grant her a territorial equivalent in some other quarter of her dominions. This the latter power declined to do, but would readily have consented to a pecuniary compen- sation. A convention was therefore held at Gastein (August 1865), which brought about a temporary understanding. Prussia was to receive Lauenburg on payment of a sum of 1,500,000 thalers, while Austria was to have the adminis- tration of affairs in Holstein, and Prussia in Schleswig. Austria, however, was desirous of the formation of the duchies into a separate state, and supported the claims of the duke of Augustenburg to them. This was strenu- ously opposed by Prussia, who regarded the public meet- ings that were permitted to be held in Holstein in sup- port of this as a breach of agreement. Austria referred

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War with Prussia.

the question to the Frankfort dict, which decided in favour of the duke. Matters were now approaching a crisis. Prussia had long looked with jealousy upon the power of Austria, and considered a war with that country for the supremacy of Germany as sooncr or later a necessity. The German people had for some time felt that there was not room for two great powers, —each too great to submit to the other,—one or other must give way before the country could obtain its proper place and influence in Europe. While both powers were professing the utmost desire for peace, each was actively preparing for war. Prussia entered into an alliance with Victor Emmanuel (27th March 1866), the latter undertaking to declare war against Austria as soon as ‘Prussia commenced hostilities, while the former engaged to secure Venetia for her Italian ally. In the beginning of May orders were issued by the emperor of Austria for putting the whole army upon a war footing, and for concentrating a portion of it upon the Bohemian and Silesian frontiers ; and about the same time the Prus- sian cabinet issued orders to fill up to the

war strength the different branches of the service. On 7th June the Prus- sian troops entered Holstein, and compelled the Austrians to retire, which they did without bloodshed.

Austria was in an unprepared state when the war actu- ally broke out, but the Prussian forces, ou the other hand, were thoroughly equipped. The Austrian army in the north amounted to 247,000 men, besides the Saxon army at Dresden of 24,000, in all 271,000. The Prussian force consisted of three armics: the first, under the command of Prince Fredcrick Charles, consisted of 93,000 men, and was destined for Saxony and Bohemia; the second, under the crown prince, numbered 115,000 men, and was to operate in Silesia; while the third, or army of the Elbe, under Gencral Herwarth, consisting of 46,000 men, was to march on the right flank of the first army, making in all 254,000 men, besides reserve corps of 24,300 men stationed at Berlin. General Benedek was appointed commander- in-chief of the Austrian army, and his forces were distri- buted along the frontier that separates Moravia from Saxony and Silesia. On the 16th of June the Prussians entered Saxony, and marched upon Dresden, the Saxon army retiring to join the Austrians. On the 18th the Austrians entcred Silesia, and the same day the Prussians iook possession of Dresden. The three Prussian armies now advanced into Bohemia, and endeavoured to concen- trate in the direction of Gitschin. On June 26th an en- gagement took place between some companies of the first army and a body of Austrians at Podol, in which the latter were defeated, whilc, at Hiihncrwasscr, the advanced guard of the Elbe army attacked some Austrian troops and drove them back towards Miinchengritz. Here, on the 28th, a severe struggle took place between the Prussians and the Austrians, supported by the Saxons, but the latter were ultimately driven back in the direction of Gitschin. In the meantime the second army, under the crown prince, had to march through the long and narrow passes of the inountains lying between Silesia and Bohemia. On the 27th one of the corps of this army, under General Stein- inetz, engaged an Austrian forec under General Ramming, and after a severe contest began to give way, but the crown prince coming up, the Austrians were driven back. The same day another corps of this army took possession of Trautenau, but were attacked by the Austrians under General Gablenz, and sustained a repulse. Both sides having received reinforcements, the action was renewed next day at Soor, when victory

ultimately declared for the Prussians, At Skalitz, on the 28th, the Prussians, under Steinmetz, were attacked by the Austrians under Archduke Leopold, but the latter were defeated, and the town taken by storm. It is said that on this occasion the archduke

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had disobeyed positive orders, which were on no account to make an attack. On the 29th, two divisions of the first army, under Geuerals Tiimpling and Werder, defeated the

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Austrians under Count Clam Gallas, at Gitschin, and took the town. The count, who occupied a strong position here, had orders not to attack the enemy, but these he had disobeyed, and the consequence was that Benedek, who had taken up a strong position at Dubenetz to oppose the: army of the crown prince, found himself at once in a most dangerous sitnation, and was obliged to retreat towards Koniggriitz. On the same day bodies of Austrians were defeated at K6niginhof and Schweinschadel. In these various engagements the Austrians lost in all from 30,000 to 40,000 men. Both sides now concentrated their forces in the direction of Kéniggratz, and prepared for a general engagement. On June 30 the king of Prussia joined the army, and the battle of Koniggratz, or Sadowa, was fought on the 3d of July. The Austrians numbered about 220,000, and the Prussians probably about 240,000. The battle was long and well contested, both sides fighting with the greatest determination and bravery; but at length the Austrians were broken, and obliged to retire. The Prus- sians lost 359 officers and 8794 men, while the Austrians and Saxons lost in all about 44,200 men, of whom 19,800 were prisoners. This terminated what has been sometimes called the Seven Days' War. The Austrians retreated to Zwittau and afterwards to Olmiitz.

'Mantua, Verona, and Legnano ; recognised the dissolution

of the late German Confederation, and consented to a new formation of Germany, in which she should have no part; gave up all claim to the duchies of Holstein and Schleswig ; and agreed to pay a war indemnity of

40,000,000 thalers, less 20,000,000 allowed her on account of the duchies. Having thus obtained peace, the emperor now tumed his attention to home affairs. Hungary was still in a very troubled and dissatisfied state. We have secn that she declined to send representatives to the Reichsrath, insisting on her right to self-government, and refusing to have any- thing else. The plan of opposition she adopted was that of passive resistance, by the non-payment of taxes. At length, at the opening of the Hungarian diet at Pesth by the emperor in person, on December 14, 1865, he recog nised the necessity of self-government for Hungary so far as it did not affect the unity of the empire and the position of Austria as a great European power. He also recognised the Pragmatic Sanction as the basis on which a settlement of their difficulties was to be sought. At the opening of the diet on 19th November 1866, an insperial rescript, signed by the emperor, was read, in which he promised, by the appointment of a responsible ministry and the re-storation of municipal self-government, to do justice to the constitutional demands of the Hungarians. In the end of

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1866, Baron Beust, who had previously been priine minister of Saxony, and was not only a foreigner but a Protestant, was made foreign minister. He subsequently became prime minister and chancellor of the empire. In the spring of 1867 the emperor summoned the Rcichsrath to assemble at Vienna to deliberate upon various unportant measures,— the proposed amendinents in the Hungarian constitution, the question of ministerial responsibility, the sending of dele- gates to assemblies, the extension of the constitutional self-government of the different provinces, the reorganisation of the army, the improvement of the administration of justice, and the promotion of the economical interests of the coun- try. It was opened by the emperor in person on May 22, and in his speech on the occasion he earnestly recommendcd to their attention these subjects. “To-day,” he said, “we are about to establish a work of peace and of concord. Let us throw a veil of forgetfulness over the immediate past, which has inflicted deep wounds upon the empire. Let us lay to heart the lessons which it leaves behind, but let us derive with unshaken courage new strength, and the resolve to secure to the empire pcace and power.” On 8th June the emperor and empress were crowned king and queen of Hungary at Pesth amid great public rejoicings,

on which occasion full pardon was given for all past political offences, and full liberty to all offenders residing in foreign countries to return. Many important and liberal measures were dis- cussed and carried in the Reichsrath ; in particular, mar- riage was made a civil contract, and the perfect equality of believers of different creeds was recognised. On 25th May 1868, the civil marriage bill received imperial assent, and on 30th July 1870 the concordat with Rome was de- clared to be suspended in consequence of the promulgation

of the doctrine of Papal infallibility. This last measure | introduced a very beneficial change in the relations between ‘

Austria and the kingdom of Italy, and has brought about more sympathy and cordiality between these two states than formerly existed.

For some years the Government had much difficulty in settling the law of elections so as to secure the due repre-

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| sentation of the different races and classes of the people in the Reichsrath. On 6th March 1873 a reform bill was passed by the lower house, taking the election of members of the Reichsrath out of the hands of the provincial diets and transferring it to the body of the electors in the several provinces, thus substituting direct for indirect election. In April it passed the upper house and received the unperial assent. This mcasure was hailed with great satis- faction, and has established the government upon a much ‘ broader and more secure basis. The session of the new | Reichsrath was opened by the emperor in person on Novem- ; ber 5. In the same year a great exhibition of the indus- l tries of all nations was held at Vienna. It was opened on ; May 1 by the emperor, and attracted to the capital, among | others, the prince of Wales, the czar of Russia, the em- i peror and empress of Germany, the king of Italy, and the | shah of Persia. On 2d December the twenty-fifth anni- | versary of the emperors accession to the throne was | celebrated amid great rejoicings in Vienna, having been | celebrated three days before in Pesth. The emperor and | empress were present on both occasions, and everywhere iimet with an enthusiastic reception. In the spring of | 1874 a bill for the abolition of the concordat was intro- | duced

by the Government, and measures for restricting the i powers of the clergy passed both houses. In his speech at the opening of the Reichsrath on 5th November of that | year, the empcror said that by the system of direct popu- ; lar elections the empire had obtained real independence, ; and exhorted the members to work with united energy at | the solution of the greatest of their tasks, the uniting of | the people of Austria, so that she might become a powerful | state, strong in ideas of justice and liberty. | See Dr F. Kohlrausch, Die Deutsche Geschichtc, 1866 ; Ungewitter, Die Ocsterrcichische Monarehie, 1856; Geschichte der Oesterreichischen Kaiscrstaates, 1859 ; Stein, Handbuch der Geographie, 1870; Grant Duff, Studies in European Politics, 1866, and Elgin Speeches, 1871; Sir A. Malet, The Overthrow of the Germanie Confederation, 1870 ; The Campaign of 1866 in Germany, translated by Colonel Von Wright, 1872 ; Steinhauser, Gcographie von Oesterrcich-Ungarn, 1872 ; The Armed Strength of Austria, by Captain W. 8S. Cooke, 1874. (D. K.)

AUTOCHTHONES, in Greek Mythology, the first human beings who appeared in the world, and who, as their name implies, were believed to have sprung from the carth itself. Instead of one pair as the first parents of the whole race, each district of Greece had its own autochthones, who, according to the prominent physical features of the neigh- bourhood, were supposed to have been produced from trees, rocks, or marshy places, the most peculiar, and apparcntly the most widely-spread belief being that which traced the origin of mankind to the otherwise unproductive rocks. Whether the first appearance of mankind was regarded as having been simultaneous in the various districts or not, at what time or times such appearance was made with refer- ence, for example, to the origin of the gods who also had sprung from the earth (Pindar, Vem. vi. 1; Hesiod, Works and Days, 108), and whether the first men possessed the full human form, are questions which therc is no material to answer satisfactorily. On the last point it is to be observed that Erysichthon at Athens was said to have had legs in the form of serpents, and that this is taken to denote his origination from a marshy place. Similarly the earth-born giants, who made war against the gods, had legs in the form of serpents. In Thebes, the race of Sparti were believed to have sprung from a field sown with dragons’ teeth. The Phrygian Corybantes had been forced out of the hill-side like trees by Rhea,

the great mother, and hence were called devdpopvets, But whatever the Primitive form of men was believed to have been, it is clear

| from Adschylus (Prometheus, 447, foll.) that they were _ supposed to have at first lived like animals in caves and woods, till by the help of the gods and heroes they were raised to a stage of civilisation. The practice of describing legendary heroes and men of ancient lineage as “ earth- born,” yyyevels, strengthened greatly the doctrine of autochthony, and nowhere so much as in Attica. AUTO-DA-FE (Act of Faith), a public solemnity of the Inquisition in Spain and Portugal, at which the sentences | of the court were read; those who were declared innocent | were formally absolved, and the condemned were handed over tothe secular power for punishment. The day chosen was usually some Sunday between Trinity and Advent. The first auto-da-fe was held by Torquemada at Seville in 1481; the last was probably that mentioned by Llorente, | the historian of the Inquisition, as having been solemnised | in Mexico in 1815. See Inquisition. | AUTOGRAPH (durés and ypadew), that which is | written with a person’s own hand, an original manuscript as opposed to an apograph or copy, is used to designate either a whole document (¢.g., a letter) or a signature only. | The latter is perhaps the more common use of the term. The interest attaching to the possession of autographs of distinguished men, which has created a new branch of industry, is partly historical, partly psychological. The signatures or original manuscripts are interesting and valuable elements in the representation of the life of any individual; and it has-been thought that from the

autograph some conclusions might be drawn as to the mental characteristics of the writer. It is doubtless true that temperament will in some degree affect handwriting, but the conditions to be taken into account are so numerous and variable that the attempt to infer the one from the other seems practically hopeless. Poe, in his ingenious “Chapter on Autography” (Works, Ed. Ingram, vol. inven); speaks very strongly on this subject. He thinks that none but the unreflecting can deny “‘ that a strong analogy does generally and naturally exist betwecn every man’s clirography and character,” and to support his statement compares the signatures and mental

characteristics of a large number of contemporary American writers. In many cases, however, he is obliged to confess that no inference whatever can be drawn, in some others the analogy is extremely forced, and in others, again, the knowledge of the writer's character has evidently furnished the key for the interpretation of the handwriting. The value placed by an amateur on any autograph will, of course, vary with the celebrity of its author and the scarcity of genuine specimens. 'The taste for collecting autographs is not confined to modern times ; many large collections, e.g., those of Loménie de Brienne, of Lacroix du Maine, and others, were formed in the 16th century, and during the same period we know that albums used to be carried about for the purpose of obtaining the signatures of famous personages. One of these albums preserved in the British Museum is of date 1578. There are at present many valuable public and private collections, while state papers and archives, of course, contain a rich harvest of royal and noble signatures. Fac-similes of original manuscripts appear first to have been printed in Forbes's Full View of the Public Transactions in the Reign of Queen Elizabeth, 1740-41; and soon after, several were given in Fenn's Original Letters from the Archives of the Paston Family, 1787.

The following are, perhaps, the most useful works on the sub- ject :—J. G. Nichol's Autographs of Royal, Noble, Learned, and Remarkable Personages conspicuous in English History, from the Reign of Richard II. to that of Charles II., Lond. 1829; Autographic Mirror, 1864, sqq.; Netherclift, Handbook of Autographs; Phillips and Netherelift, Autographic Album ; Simms, Autographic Souvenir ; Netherclift and Simms, Autographic Miscellany; Isographic des Hommes Célébres, 4 vols. 1829-48; Iconographie des Contemporains, 2 vols. 1823-32; Feuillet de Conches, Causeries d'un Ouricux, 3 vols. 1862-64; Lescure, Lcs Autographes, 1865; Giinther und Schulz, Handbuch fiir Autographensammler, 1856; Sammlung his- toriseh berithinter Autographen, 1846; Autographen Album zur 200 jahr. Gedéchinissfeier des Westphilischen Fricdens-sehlusses, 1848.

AUTOLYCUS of Prranz, in olis, was one of the earliest Greek writers on mathematics and astronomy. As he is said to have given instruction to Arcesilaus, he probably flourished about the middle of the 4th century B.C. His extant works consist of two treatises; the one, epi Kwoupevys opaipas,

contains some simple propositions on the motion of the sphere, the other, wept émirod@v Kal dvcewv, in two books, discusses the rising and setting of the fixed stars. Neither treatise is of much scientific value. There are several Latin versions of Autolycus, and a French translation by Forcadel, 1572.

AUTOMATON (from airdés, self, and pdw, to seize), a selfmoving machine, or one in which the principle of motion is contained within the mechanism itself, Accord- ing to this description, clocks, watches, and all machines of a similar kind, are automata, but the word is generally applied to contrivances which simulate for a time the motions of animal life. If the human figure and actions be represented, the automaton has sometimes been called specially an androides. We have very early notices of the construction of automata, e.g., the tripods of Vulcan, and the moving figures of Dedalus. 400 years B.c., Archytas of Tarentum is said to have made a wooden pigeon that could fly ; and during the Middle Ages numerous instances of

the construction of automata are recorded. Regiomontanus is said to have made an iron fly, which would flutter round the room and return to his hand, and also an eagle, which flew before the Emperor Maximilian when he was entering Nuremberg. Roger Bacon is said to have forged a brazen head which spoke, and Albertus Magnus to have had an an- droides, which acted as doorkeeper, and was broken to pieees by Aquinas. Of these, as of some later instances, e.g., the figure constructed by Descartes and the automata exhibited by Dr Camus, not much is accurately known. But in the i8th century, Vaucanson, the celebrated mechanician, exhibited three admirable figures,—the flute-player, the tambourine-player, and the duck, which was capable of eating, drinking, and imitating exactly the natural voice of that fowl. ‘The means by which these results had been produced were clearly seen, and a great impulse was given to the construction of similar figures. Knauss exhibited at Vienna an automaton which wrote; a father and gon named Droz constructed several ingenious mechanical figures which wrote and played music; Kaufmann and Maelzel made automatic trumpeters who could play several marches. ‘The Swiss have

always been celebrated for their mechanical ingenuity, and they construct most of the curious toys, such as flying and singing birds, which are frequently met with in industrial exhibitions. The greatest difficulty has generally been experienced in devis- ing any mechanism which shall successfully simulate the human voice. No attempt has been thoroughly suc- cessful, though many have been made. ‘The figure ex- hibited by Fabermann of Vienna is, perhaps, as yet the best. No notice of automata can be complete without at least a reference to Kempelen’s famous chess player, which for many years astonished and puzzled Europe. This figure, however, was no true automaton, although the mechanical contrivances for concealing the real performer and giving effect to his desired movements were exceedingly ingenious. AUTUN, the capital of an arrondissement of the same name in the department of Sadne and Loire, in France, is picturesquely situated on the declivity of a hill, at the foot of which flows the Arroux. It is one of the most ancient towns of France; and when Czsar invaded Gaul it was the most important of the Aidui. Its name was then Bibracte, but being afterwards much improved and embellished by Augustus it took that of Augustodunum. In the later days of the Roman empire it was a flourishing city, and consequently attracted the barbarian bands. It was successively plundered and burned by the Vandals in 406, the Burgundians in 414, the Huns in 451, the Franks in 534, the Saracens in 739, and the Normans in 895. It was burned by the English in 1379, and besieged in 1591 by D’Aumont. Yet in spite of all these disastrous events, its former greatness is attested by many Roman and other remains, among which are large masses of its ancient walls, two gates in admirable preservation, called the Porte d@ Arroux and the Porte Saint-André, the walls of the so- called temple of Janus, and a pyramid in the neighbour- bouring village of Couard, in which some recognise a monu- ment to Divitiacus. The cathedral is a structure of the 11th and 12th centuries, and is surmounted by a remark- able spire of the 15th. Autun is the seat of a bishopric, and has a college, a diocesan seminary, a museum, which is very rich in medals and other minor antiquities, a library, a theatre, &c., with tribunals of primary jurisdiction and commerce. It has manufactures of cotton goods, hosiery, carpets, leather, and paper, with a considerable trade in timber, hemp, and cattle. Population in 1872, 11,684. AUVERGN#, a district, and formerly a province, of France, corresponding to the

departments of Cantal and Fuy-de-Déme, with the arrondissement of Brioude in Haute- Loire. It is divided into Lower and Upper by the River

Ruc; the distinction between the two portions being well marked by their physical features. Upper Auvergne is rugged and mountainous, and is covered with evidences of volcanic activity, while Lower Auvergne consists largely of fertile and well-watered expanses. In climate, too, there is a marked difference ; the former suffering from violent extremes, and the latter enjoying a mild and equable temperature. The whole district is largely agricultural, and special attention is paid to the rearing of cattle, horses, and mules. The mountains are rich in minerals, such as iron, lead, copper, and coal; and numerous medi- cinal springs are scattered along their slopes. The inhabi- tants, who to a certain extent are the descendants of the ancient Arverni, are a strong, ungainly race, habituated to toilsome labour. For a long time they have been accus- tomed to leave their homes for the purpose of seeking their fortunes abroad, returning after they have acquired a competency. Spain was at one period a favourite resort, but the current of emigration is now principally towards Paris or the Belgian towns. In Paris alone it has been calculated that the Awvergnats number 50,000. They speak a distinct dialect, and are also recognised by their pronunciation. A closer resemblance to Latin, and the presence of many sounds, such as ts, tz, dj, which are foreign to ordinary French, are among the most striking features of the patois ; the vocabulary also contains words introduced by the English at the time of their occupation of the country in the 14th century. Of the existing literature a con- siderable proportion is spurious. Auvergne was early raised to the rank ofa countship, and passed into the hands of various families, the most important of which is known as La Tour d’Auvergne. It was finally united to the crown by Louis XIII.

Of the numerous books which have been written on this intcresting province, the following may be mentioned :—Aigueperse, Petit Dict. des personnages d’Auvergne, 1850; Michel, L’ancienne Auvergne, 3 vols. fol.; Imberdis, L’ Auvergne historique, and ITist. des guerres rélig. en Auvergne pendant les XVI° et XVII° siécles; Allard, Les eaus thermo-minérales d Auvergne.

AUXENTIUS of Cappapocta was an Arian theologian of some eminence. When Constaiitine deposed the ortho- dox bishops who resisted, Auxentius was installed into the seat of Dionysius, bishop of Milan, and came to be regarded as the great opponent of the Nicene doctrine in the West. So prominent did he become, that he was specially mentioned by name in the condemnatory decree of the synod which Damasus, bishop of Rome, convened in defence of the Nicene doctrine. When the orthodox emperor Valentinian ascended the throne, Auxentius was left undisturbed in his diocese, but his theological doctrines were publicly attacked by Hilarius of Poitiers. The chief source of information about him is the Liber contra Auaxen- twwm in the Benedictine edition of the works of Hilarius.

AUXERRE (the ancient Avudtissiodurum), a town of France, in the department of Yonne, situated on the banks of the Yonne, in a wine-producing district, and built in an antique fashion. Its cathedral is one of the finest Gothic buildings in the country, and its episcopal palace, now used ag a prefecture, will bear comparison with any. It has several normal schools, a college founded by the famous J acques Amyot (who was a native of the town, and died there in 1593), a society of agriculture, botanic garden, museum, theatre, an extensive and valuable library, &ec. The Yonne is navigable from a little above the town. Besides trade in wine and in firewood, there are manufac- tures of cloths, druggets, serges, cotton and woollen stock- ings, and some considerable tanneries. Population, 15,497. _ AUXONNE (formerly Assonium, i.e, ad Sonam, from its position on the Sadne), a city of France, in the arron- dissement of Dijon and department of Céte d’Or.

It is |

strongly fortified, and possesses an old castle, an arsenal, and a school of artillery. Besides their manufactures of cloth and serges, the inhabitants carry on by the river con- siderable traffic with Lyons in wine, grain, and wood. Long. 5° 24’ E., lat. 47° 13’ N. Population, 5911.

AVA, the former capital of the Burman empire, les in 21° 52’ N. lat., and 96° 1’ E. long. It is situated on the Irawadi, which is here 3282 feet broad,

and which, making a bend out of its ordinary course, flows past the city on the north. On the east it has the river Myt-nge, a rapid stream 450 feet broad, which flows into the Irawadi close under its walls. From this river a canal has been dug, through which its waters flow on the south-east angle of the city, and are again brought into the same river. On the south flows the deep and rapid torrent of the Myt-tha, an offshoot of the Myt-nge, which, falling into the Irawadi, forms the defence both of the south and of the west face of the town. It is divided into the upper and lower, or the lesser and the larger town, both of which are fortified.

The briek wall that surrounds the city is 154 feet in height and 10 feet in thickness, on the inside of whieh is thrown up a bank of earth, forming an angle of 45 degrees. There is a ditch round the outer wall which is inconsiderable, and in the dry season fordable in every part. The lesser town is ehiefly occupied by the royal palace, the hall of justice, the council chamber, the arsenal, and the habitations of a few courtiers of distinetion. A strong well- built wall of more solid construetion than the outer wall of the city, and about 20 feet high, encloses the square in which these buildings are situated, and on the outside is a teak-wood stoekade of the same height. The ditch which surrounds the lesser town is, moreover, deeper and broader than that of the city, and when full is not to be forded. ‘here are, however, three causeways across, which com- inunicate with the adjacent country. The circumferenee of the city, excluding the suburbs, is about 5$ miles, but over this exten- sive area the houses are but thinly scattered ; some quarters arc, indeed, wholly destitute of habitations, and have the appearance merely of neglected commons. In general the dwellings of the inhabitants are of the most miserable sort, being mere huts thatched with grass. Wretched as are such habitations to European eyes, the poorer classes are perhaps as well lodged here as in any other parts of Asia. Their sleeping-places are elevated 2 or 3 feet from the ground. Some of the houses of the chiefs are constructed of planks, and tiled; but there are not, aecording to Mr Crawford, more than half-a-dozen edifices built of brick and mortar. Ava, like all the other Burmese towns, is adorned with numerous temples, of which the gilded spires, rising aloft, present on a distant view of the place a splendid and imposing appearanee, which is far from being realised on a nearer inspection. The largest of these temples contains two distinct edifices, one in the ancient, the other in a modern form; the former

containing an image of Gautama, not of marble, as Symes supposes, but of sandstone. It is in a sitting posture, and is 24 feet in height. The head is 8 feet in diameter. There is another very large temple, and a third named the ‘‘ Beautiful.” The one called Maong-Ratna is of great celebrity ; it is the one in whieh the public officers of the government take, with the most solemn forms, the oath of allegiance. The temple called Maha-mrat-muni had an addition made to it some years ago, of which Mr Crawford mentions that the numerous and richly- gilded pillars and splendid ceiling exceeded anything that was to be seen Without the palace. Ava contains eleven markets or bazars, composed of thatched huts and sheds, which, however, are well supplied with all that is neeessary for the wants of the people. Besides native commodities, there are exposed in these markets the produce of China and Lao, with British cottons, woollens, glass, and earthenware. ‘he Burman monasteries are mostly built of wood ; and of those composed of more solid materials, a few ancient ones are nearly all that are to be seen. The only exception is a monastery, built some years ago by the queen, adjoining the palace— an unshapely fabric of immense size, but a very conspicuous object.

This former capital of the Burman dominions compre- hends, according to the political divisions of that empire, the town of Sagaing, on the opposite shore of the Irawadi, and the town of Amarapura, 4 miles to the east. The town of Sagaing extends along the Irawadi for more than a mile and a half, but is of inconsiderable breadth. It consists of mean houses thinly scattered among gardens and orchards, the principal trees in the latter consisting of fine old tamarinds. Over the site of the town and its environs are scattered innumerable temples, some of them

old and ruinous, others modern. On the river face it has a brick wall about 10 feet in height, with parapet and embrasures like that of Ava, and extending for above half a mile along the river. Amarapura is a large place, and was formerly the capital; but Ava, which was twice before the capital, was again made so in 1822. It continued to be so till 1853, when the present king, on his accession, transferred the capital to Mandalay. To each of the towns of Ava, Sagaing, and Amarapura, are attached dis- tricts, the two

former of which extend 12 miles along the river, and are of equal breadth. The district of Amara- pura is of equal size, so that Ava must be considered as not only the name of the former capital, but of a large district, which includes an area of 288 miles, containing, according to the most accurate estimate, 354,200 inhabi- tants; but the city of Ava is not supposed to contain more than 50,000 inhabitants, and, according to Mr Craw- ford, half that number would be nearer the truth. The place, taken altogether, affords few indications of industry or commercial enterprise.

AVALLON, a town of France, in the department of Yonne, finely situated on a granite rock, at the foot of which flows the river Voisin or Cousin. The church of St Lazare, which dates from the 12th century, is a good specimen of Burgundian Gothic. Manufactures of cloth, hats, hosiery, leather, and paper are carried on, and there is a considerable traffic in firewood, which is conveyed by the Voisin, the Yonne, and the Seine to Paris. The town was long an object of dispute between Burgundy and France, but was finally united to the crown on the death of Charles the Bold. It was pillaged by the Leaguers in 1594. Population, 6070. Long. 3° 56’ E.,, lat. 47° 30’N.

AVATCHA, one of the numerous volcanoes of Kam- chatka, in lat. 538° 17’ N., and long. 158° 50’ E. It rises to a height of nearly 9000 feet (Mr Kennan says 11,000), and has an extensive crater at the summit and another on its side. Jt was in active eruption in 1827, 1837, and 1855. About twenty miles to the south lies the village of Avatcha on a river of the same name; and in the immediate neigh- bourhood of the mountain is situated the little town of Petropavlovski, which contains memorials of Behring and La Perouse, and was the scene of a desperate conflict during the Crimean War between the Russians and an invading party of the allies.

AVEBURY, a village of England, in the county of Wilts, 6 miles W. of Marlborough. It occupies the site of

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Plan of Avebury.

one of the most remarkable megalithic structures in England. This consisted of a large outer circle formed of

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100 stones of from 15 to 17 feet in height, and about 40 feet in circumference, enclosing an area of about 1000 feet in diameter. ‘This circle was surrounded by a broad ditch and lofty rampart. Within its area were two smaller circles, 350 and 325 feet in diameter respectively, each consisting of a double concentric row of stones,—a stone pillar or maenhir, 20 feet high, occupying the centre of the one, and a cromlech or dolmen that of the other. A long avenue of approach, now known as the Kennet Avenue, consisting of a double row of stones, branched off from this structure towards the 8.E. for a distance of 1430 yards, Few traces of this immense erection now remain—the stones having been broken down and used in the construc- tion of the houses of the village, and for other purposes, In the vicinity are two other monuments of great impor- tance, which may be regarded as belonging to the same group, namely, the double oval of megaliths on Hakpen Hill—Haca’s pen—and the artificial mound known as Silbury Hill. ‘The Hakpen oval was, according to Stuke- ley, 138 feet by 155, and had an avenue 45 feet wide stretching in the direction of Silbury Hill, This hill is due south from Avebury, and the distance from the centre of the circle to the

centre of the mound is very nearly one Roman mile. Much discussion has taken place about the age and object of these constructions, the most popular theory hitherto being that which ascribed them to the Druids, and thus got rid of historic difficulties by escaping into the region of the prehistoric. Recently, Mr Fergusson has strenuously maintained that the larger circle, or Avebury proper, and Silbury Hill, commemorate the last of the twelve Arthurian battles, which was fought (520 a.p.) at Badon Hill, a name which he identifies with Waden Hill.

AVEIRO, a town of Portugal, province of Beira, the seat of a bishopric and college. It has sardine, oyster, and herring fisheries, as well as a thriving trade in oil, salt, wine, and oranges. The haven is wide and deep. Population, 6456. Long. 8° 34’ W., lat. 40° 40’ N.

AVELLA, a town of Italy, in the province of Principato Ulteriore, in a fine situation, and commanding most exten- sive prospects. It is distant about 20 miles from Naples, and contains 3714 inhabitants. Near it are the remains of the ancient Abella.

AVELLINO, a fortified city of Italy, in the province of Principato Ulteriore, at the foot of Mount Vergine, and 28 miles E. of Naples. It is the see of a bishop, and has a cathedral, several parish churches, a royal college, &., with manufactories of cloth, paper, maccaroni, and sausages, and extensive dye-works. It has a considerable trade in corn, chestnuts, and hazel-nuts. The city has at various times suffered severely from earthquakes. Population,

20,492.

AVEMPACE. Anu Bexr MonamMen Ibn JAnYA, sur- named Ibn Badja or Ibn Sayeg (ze., son of the goldsmith), whose name has been corrupted by the Latins into Avem- pace, Avenpace, or Aben Pace, was the earliest and one of the most distinguished of the Arab philosophers in Spain. Almost nothing is known of the events in his life; he was born, probably at Saragossa, towards the close of the 11th century, and died at Fez in 1138 at a not very advanced age. Like most of the Arab philosophers, he was a physi- cian by profession, and he is also said to have been a man of wide general culture. He was a skilled musician, mathematician, astronomer, and

poet, and though he 18 now known only through his metaphysical speculations, these do not secm to have been his favourite studies. His writings, if we accept the report of Oceibia, were varied and numerous. Several treatises on logical subjects are mentioned by Casiri as still among the MSS. at the Escurial, and some smaller pieccs are also found in other

libraries. The most important of his works is that noticed by Averroes, who promised a complete discussion of it, but unfortunately neither the treatise nor the exposition has come down to us. Our knowledge of it is almost entirely drawn from the notices given by Moses of Narbonne, a Jewish writer of the 14th century, in his commentary on the somewhat similar work of Ibn Tofail. The title of the work may be translated as the Légime or Conduct of the Solitary, understanding by that the organised system of rules, by obedience to which the individual may rise from the mere life of the senses to the perception of pure intelligible principles, and may participate in the divine thought which sustains the world. These rules for the individual are but the image or reflex of the political organisation of the perfect or ideal state; and the man who strives to lead this life is called the solitary, not because he withdraws from society, but because, while in it, he remains a stranger to its ways, and guides himself by reference to a higher state, an ideal society. Avempace does not develop at any length this curious Platonic idea of the perfect state. His object is to discover the highest end of human life, and with this view he classifies the various activities of the human soul, rejects such as are material or animal, and then analyses the various spiritual forms to which the activities may be directed. He points out the graduated scale of such forms, through which the soul may rise, and shows that none are final or complete in themselves, except the pure intelligible forms, the ideas of ideas, These the intellect can grasp, and in so doing it becomes what he calls intellectus acquisitus, and is in a measure divine. This self-consciousness of pure reason is the highest object of human activity, and is to be attained by the speculative method. The intellect has in itself power to know ultimate truth and intelligence, and does not require a mystical illumination as Algazali taught. Avempace’s principles, it is clear, lead directly to the Averroistic doctrine of the unity of intellect, but the obscurity and incompleteness of the Régime do not permit

us to judge how far he anticipated the later thinker. (See Munk, Mélanges de Phil. Juive et Arabe, pp. 383-410.) AVENBRUGGER, or AuENBRUGGcER, LEOPOLD, a phy- sician of Vienna, the discoverer of the important mode of investigating diseases of the chest and abdomen by auscul- tation. His method was to apply the ear to the chest, and to note the sounds it afforded on percussion by the hand, or what is called immediate auscultation. His Latin trea- tise, Inventum novum ex Percussione Thoracis Humant Interni Pectoris Morbos detegendi, published in 1761, excited little attention, until it was translated and illus- trated by Corvisart, in 1808, when it soon led the way to Laennec's great improvement of aiding the ear by the stethoscope, or mediate auscultation. The great value of the method introduced by Avenbrugger, in the diagnosis of internal diseases, is now universally acknowledged. He was born at Gritz in 1722, and died in 1809. AVENTINUS [Jowann Tuurmayr], author of the Annals of Bavaria, was born in the year 1466 at Abens- berg. He studied first at Ingoldstadt, and afterwards in the university of Paris. In 1503 he privately taught rhetoric and poetry at Vienna, and in 1507 he publicly taught Greek at Cracow, in Poland. In 1509 he read lectures on some of Cicero's works at Ingoldstadt, and in 1512 wag appointed preceptor to Prince Ludwig and Prince Ernst, Sons of Albert the Wise, duke of Bavaria, and travelled with the latter of these princes. After spending Several years in the collection of materials he undertook to write the Annales Boiorum, or Annals of Bavaria, being encouraged by the dukes of that territory, who settled a Pension upon him, and gave him hopes that they would defray the expenses of publication. He finished, but did

not publish, his work in 1528, and in the following year he was imprisoned on suspicion of heresy. He was soon released from confinement, but the indignity he had suf- fered seriously affected him. He died in 1534 at Ratisbon. His history, which has gained for him considerable repu- tation as a writer, was published, but with some important omissions, in 1554, by Ziegler, professor of poetry in the university of Ingoldstadt. These passages, which were adverse to the Roman Catholics, were all restored in the edition published at Basle in 1580, by Nicholas Cisner. Besides his other writings,

Gesner attributes to him a curious work, entitled Nwmerandi per digitos manusque Veterum Consuetudines.

AVENZOAR [Anu MeRwan ABDALMALEC IBN ZoHR], an eminent Arabian physician, who flourished about the end of the 11th or beginning of the 12th century, was born at Seville, where he exercised his profession with great reputation. His ancestors had been celebrated as physi- cians for several generations, and his son was afterwards held by the Arabians to be even more eminent in his pro- fession than Avenzoar himself. He was coutemporary with Averroes, who, according to Leo Africanus, heard his lectures and learned physic of him. This seems probable, because Averroes more than once gives Avenzoar very high and partly deserved praise, calling him admirable, glorious, the treasure of all knowledge, and the most supreme in physic from the time of Galen to hisown. Avenzoar, not- withstanding, is by the generality of writers reckoned an empiric ; but Dr Freind observes that this character suits him less than any other of the Arabian physicians. Aven- zoar belonged, in many respects, to the Dogmatists or Rational School, rather than to the Empirics. He was a great admirer of Galen; and in his writings he protests emphatically against quackery and the superstitious re- medies of the astrologers. He shows no inconsiderable knowledge of anatomy in his remarkable description of inflammation and abscess of the mediastinum in his own person, and its diagnosis from common pleuritis as well as from abscess and dropsy of the pericardium. In cases of obstruction or of palsy of the gullet, his three modes of treatment are ingenious. He proposes to support the strength by placing the patient ina tepid bath of nutritious liquids, that might euter by cutaneous imbibition, but does not recommend this. He speaks more favourably of the introduction of food into the stomach by a silver tube ; and he strongly recommends the use of nutritive enemata. From his writings it would appear that the offices of physi- cian, surgeon, and apothecary were already considered as distinct professions. He wrote a book entitled The Method of Preparing Medicines and Diet, which was translated into Hebrew in the year 1280, and thence into Latin by Para- vicius, whose version, first printed at Venice 1490, has passed through several editions.

AVERAGE, a term used in maritime commerce to signify damages or expenses resulting from the accidents of navigation, Average is either

general or particular. General average arises when sacrifices have been made, or expenditures incurred, for the preservation of the ship, cargo, and freight, from some peril of the sea, or from its effects. It implies a subsequent contribution, from all the parties concerned, rateably to the values of their respective interests, to make good the loss thus occasioned. Particular average signifies the damage or partial loss happening to the ship, goods, or freight by some fortuitous or unavoidable accident. It is borne by the parties to whose property the misfortune happens, or by their insurers. The term average originally meant what is now distinguished as general average ; and the expression “ particular average,” although not strictly accurate, came to be afterwards used for the convenience of distinguishing those damages or partial

losses for which no gencral contribution could be claimed.

Although nothing can be more simple than the funda- mental principle of general average, that a loss incurred for the advantage of all the coadventurers should be made good by them all in equitable proportion to their stakes in the adventure, the application of this principle to the varied and complicated cases which occur in the course of maritime commerce has given rise to many diversities of usage at different periods and in different countries. It is soon discovered that the principle cannot be applied in any settled or consistent manner unless by the aid of rules of a technical and sometimes of a seemingly arbitrary character. The distinctions on which these rules turn are often very refined indeed. ‘This is the chief reason why no real pro- gress has yet been made towards an international system of general average, notwithstanding repeated conferences and other efforts by most competent representatives from different countries, seeking to arrive at a common under- standing as a preliminary basis for such a system. A brief summary only can be given here of the rules which have been established in Great Britain by usage, or by legal decisions, in connection with the subject.

All general average losses may be divided into two principal classes—(1), sacrifices of part of the cargo and freight, or of part of the ship, for the

general safety ; (2), extraordinary expenditures incurred with the same object. We shall notice these in their order.

AVERAGE

| in connection with the case of Stewart v. the West India

| general average charge.

When a part of a cargo is thrown overboard (or jettisoned, :

as it is termed) to save the ship from foundering in a storm, or to float her when stranded, or to facilitate her escape from an enemy, the loss of the goods and of the freight attached to them must be made good by average contribution. But if goods jettisoned have been originally stowed on deck, no contribution can be demanded for them, unless they are so

carried according to the comnion usage and course of trade |

on the voyage for which they are shipped, or with the consent of all the parties concerned in the ship and cargo.

If, instead of being thrown overboard, the goods are put into boats or lighters, and lost or damaged before reaching the shore, such loss is regarded as a virtual jettison, and gives a claim to average contribution. The same rule applies to damage occasioned by the goods being put ashore on muddy ground, or where they cannot be kept in ordinary safety. But when the goods have been conveyed to a place of ordinary safety, they cease to be at the risk of the ‘general interest ; and should they be damaged there by fire or other accidents the loss must be borne by the indi- vidual proprietors, or by their insurers.

Damage done to the cargo by discharging it at a port of refuge in the manner and under the circumstances customary at that port, is not allowed as general average. This rule covers the case of wastage, breakage, leakage, &c., from handling the goods in the ordinary course of discharging, warehousing, and reshipping.

If goods are thrown overboard from having become, through heating or other cause peculiar to their own con- dition, a source of special danger to the whole interest, the loss is not recoverable in general average. So, too, if a cargo is discharged at a port of refuge from damage resulting from its own vice propre, the costs are chargeable to its owners.

The loss of corn, salt, guano, or similar goods, arising from their being pumped up or baled out with the water in the vessel, is not recoverable by average contribu- tion. The damage done to the cargo by means of water thrown down the hatches, or admitted into the ship by scuttling her, for the

purpose of extinguishing an accidental fire, was excluded from general average by the usage of Lloyds up till 1873. In that year the courts of Queen's Bench and Exchequer Chamber expressed a strong opinion

and Pacific Steamship Company, that such damage ought to be made good by average contribution. 'The usage has now been altered accordingly.

The amount of compensation to be made for goods sacrificed by general average acts is determined by the net market price they would have produced on arrival at the port of destination had they not been sacrificed ; but under deduction of the freight attaching to them (which is made good to the shipowners), ard of the charges for duties and landing expenses which are saved.

The general average acts next to be considered are those which involve sacrifices of part of the ship or her materials,

The same principles which regulate the case of goods thrown overboard apply also to the jettison of the ship's chains, anchors, hawsers, spars, boats, or other stores, But if water-casks are stowed on deck, or if chains and hawsers are carried on deck when the vessel is not near the land go as to render it necessary that they should be so carried, the loss arising from the jettison of these articles falls on the shipowner ; and if boats are jettisoned in consequence of their having been broken adrift from their fastenings on deck by the force of the sea, they are excluded from general average, and are charged to particular average on the ship. The damage done to the ship by cutting holes to effect a jettison of the cargo, or to pour down water to a fire, or by scuttling her for that purpose, is allowed as a The damage arising from cutting or knocking away a portion of the ship's bulwarks in order to prevent the deck from being flooded in a storm, is com- pensated in the same manner.

When sails or masts are cut away in order to right a ship which has been thrown on her beani-ends, or to pre- vent her from driving on a lee-shore, the loss is made good by average contribution ; but if the object in cutting away a sail or spar be merely to save a mast, the loss is not made good in general average.

It frequently happens that masts or yards are sprung and carried away by the force of the wind, and are left entangled in the rigging, or hanging over the ship's side in what is termed ''a state of wreck;" in these circum- stances it becomes necessary to cut them away, with the sails and rigging attached, and to throw the whole over- board, otherwise they would impede the navigation, and endanger the ship and cargo. On this ground it is held by some authorities that the loss caused by the act of cutting them away should be made good by average con- tribution. But this act is the direct consequence of the previous accident, which places these articles in a situation where it is impossible to save them without imperilling the ship, cargo, and lives. It would not be reasonable to imperil these for such a purpose ; whence it follows that the displaced articles are already virtually lost by means of the original accident, before the loss is actually con- summated by cutting them away, This loss is accordingly excluded, by the usage of this country, from average con- tribution. On the same principle, no contribution can be demanded for any articles which are sacrificed as having themselves become, through previous accident, the imme- diate cause of danger to the whole interest.

The loss of sails or spars, in consequence of carrying @ press of canvas to avoid a lee-shore, or to escape from an enemy, is not the subject of general average in this countzy ; neither is the damage suffered by the ship from straining, under any such extraordinary press of sail.

When anchors and cables are slipped from in order to work a vessel off a lee-shore, or to avoid collision with another ship, the loss is made good by average contribu- tion; but if the cable is slipped in order that the vessel may join convoy, or because the anchor has become

hooked to some object at the bottom and cannot be raised, the loss is borne by the shipowner.

When sails, ropes, or other materials are cut up and used at sea for the purpose of stopping leaks or to rig jury-masts, or when the common benefit requires that they should be applied to some purpose for which they were not originally intended, the loss ls made good in general average. The same

rule applies to the case of hawsers, cables, anchors, sails, or boats, lost or damaged in attempt- ing to force off a stranded vessel from the shore.

The damage sustained in defending a ship against a pirate or an enemy is not the subject of general average in this country ; itis treated as particular average on the ship.

Tt has been much debated by writers on maritime law, whether the voluntary stranding of a ship, in order to pre- vent her from foundering, should be treated as a general or as a particular average loss, In the United States it has been settled, by judicial decision, that the loss in question constitutes a general average claim ; but the opposite doctrine is acted upon in the usage of Great Britain, and the point has never been decided by the courts of law. It appears to us that the argument greatly preponderates against the rule adopted in the United States, and in favour of the usage established in this country. The only reason for regarding this loss as the subject of general average is, that it originates in the inten- tional act of running the ship aground, for the preservation, as far as possible, of the whole interest concerned. But it can seldom be known beforehand how the different interests at stake will be specially affected by the act in question ; — whether, for instance, the damage to the cargo may not be more serious than the damage to the ship, or wice versa. Thus no particular part of the interest can be said to be intentionally sacrificed for the benefit of the whole ; the intention, indeed, is not to sacrifice any one part, but to place the whole interest in a situation of less peril than it would otherwise have been in. What particular damages may thereafter ensue to either ship or cargo will depend, in each case, on a varicty of circumstances entirely accidental in their character, and therefore in no proper sense the subject of previous intention. The same rule, therefore, which excludes from general average accidental damages in all other cases, ought to cxclude them in this case also. Moreover, when the alternatives are either that the vessel be left to founder, or that she be run ashore with a chance of preservation, there can really be no room for choice, or, at all events, the elements of will and intention are entirely subordinate in the part they must play under the pressure of the existing circumstances; and in this view the stranding is as truly inevitable as if it had been caused by the force of the winds and waves alone.

But, even were these reasons less weighty than it appears they are, a serious practical objection might be urged against the doctrine that voluntary stranding should be a general average loss, on the ground that it would in most cases be impossible to distinguish between the damages received by the ship and cargo prior to the stranding, and those sustained after or in consequence of it. It is needless to remark, that before a ship can be in such imminent danger of foundering as to render it necessary to run her ashore, she must be presumed to have sustained a very considerable amount of damage; aud the probability is, that the cargo also will have suffered to a corresponding extent. Up to this point these damages are confessedly particular average; and were it held that the damages after the stranding were the subject of general average, it Would, of course, be necessary to distinguish the separate damages that belonged to each. But in every case these different damages would exist in varying proportions, yet always so incorporated together that justice could never

have a more perplexing task than that of discriminating between them. No general rule could be applied that would meet the widely different circumstances of each particular case; and the arbitrary method of adjustinent that would alone be possible would doubtless give rise to endless dissatisfaction and dispute. On the ground of expediency, therefore, as well as on that of principle, the usage now established in this country ought to be main- tained, notwithstanding the high authorities by whom the opposite practice has been countenanced.

The amount of general average losses on the ship is compensated by allowing to the owners the cost of repairs, or of new materials in place of those sacrificed, subject to the deduction of one-third for the difference of value between old and new; but no deduction is made from the cost of new anchors, and only one-sixth is deducted from the cost of new chain cables. If the ship be on her first voyage (which is held to include the homeward as well as the outward passage), the repairs and new materials are allowed in full.

We now procecd to notice the second principal class of general average losses, consisting of extraordinary expendi- tures incurred with a view to

the common benefit.

When a ship is obliged to put into a port of refuge, in consequence of damage received in the course of the voyage, the usage in this country is to allow as general average all the charges connected with the entrance of the vessel into the port, and with the landing and warehousing of the cargo, when this is necessary to admit of the ship being repaired. Thus the expenses of pilotage or other assist- ance into the port, the harbour dues, and similar charges, the costs of the protest taken by the master and crew, and of the survey held to ascertain whether the cargo requires to be discharged, together with the charges for landing the cargo and conveying it to a warehouse or other place of safety, are all made good as general average. The costs of repairing the ship are charged to general average only in so far as the repairs may refer to damages which are themselves the proper subject of general contribution. If the damages are of the nature of particular average, as is more usually the case, they are charged accordingly ; or if they proceed from “wear and tear,” they. are stated against the shipowner.

The warehouse rent for the cargo at a port of refuge, and any expenses connected with its preservation, form special charges against that particular intercst, and are borne by the proprietors of the goods, or by their insurers. When goods are insured “free from particular average, unless the ship be stranded,” it is necessary, if the ship has not been stranded, to distinguish the charges for warehouse rent and fire insurance from those incurred in connection with the preservation of the goods from the effects of damage,—the underwriters being liable for the former, but not for the latter.

The expenses of reshipping the cargo, and the pilotage, or other charges outwards, are borne by the freight. If the entire cargo cannot be taken on board again, from the want, at the port of refuge, of the usual facilitics for stow- ing it, the loss or expenses resulting from the exclusion of part of it are not treated, in this country, as the subject of general contribution.

The wages and provisions of the master and crew during the period of detention at a port of refuge are not admitted as a charge against general average, it being held that the shipowner is bound to keep a competent crew

on board the ship from the commencement to the end of the voyage at his own expense.

The charges for agency at a port of refuge are brought against the general average, even though they may have been originally made in the form of separate charges

against the ship and cargo respectively. Commissions on money advanced, maritime interest on bottomry and respondentia, and the loss on exchanges, d&c., are appor- tioned relatively to the gross sums expended on behalf of the several interests concerned.

The expenses incurred in getting a stranded ship off the ground, the hire of extra hands to pump a ship which has sprung a leak, and the sums awarded for salvage or for other services rendered to the ship and cargo under any extraordinary emergencies, are compensated by average contribution. But this rule applies only to the extraneous assistance that may have been obtained, the crew being bound to do their utmost in the service of the ship on all occasions, with extra remuneration for what they might consider extraordinary exertions on their part.

The costs of reclaiming the ship and cargo after having been captured are allowed as general average charges ; and although ransom to an enemy is prohibited in this country by legal enactment, it seems that this does not apply to the case of money or goods given up by way of composition to pirates for the liberation of the ship and cargo, and that this would also form a subject of average contribution.

When the ship and cargo arrive at the port of destination it is unnecessary, in ordinary cases, to distinguish, in the adjustment of the general average, between the losses which have arisen from sacrifices and those which have resulted from expenditures for the common benefit. But if the ship and cargo should be lost before reaching their destination, no contribution is due for the goods or ship’s materials which may have been sacrificed at a former stage of the voyage, the owners of these being in no worse posi- tion than any of their coadventurers. On the other hand, it is evident that when

money has been expended for the common benefit, the subsequent loss of the ship and cargo should not affect the right of the party who has made the advance to recover it in full from all the parties for whose advantage it was originally made. Hence, while sacrifices are made good only in the event of the ship and cargo being ultimately saved, expenditures must be reimbursed whether the ship and cargo be eventually saved or lost ; and the contribution for these expenditures must be regulated by the values of the ship, cargo, and freight as they stood at the time when the advances were made.

If, however, the money required for average expendi- tures has been raised by means of bottomry, and the ship be lost before completing the voyage, there can be no claim for reimbursement,—the risk being assumed by the bottomry lender in consideration of the premium he receives on the sum advanced. When there is no bottomry, it is a usual practice, but not an invariable rule, to insure the average disbursements by a special policy. When this has been done, and when the amount has been recovered on the subsequent loss of the ship, it cannot be again claimed from the individuals who would otherwise have been liable. But if the expenditures are not insured, either by a bottomry contract, or by a special policy, and if the ship and cargo be totally lost in the subsequent course of the voyage, the parties for whose benefit the expenditures were incurred must reimburse then on the principles already explained. These parties, however, have recourse on their original insurers, not only for the total loss of the interests insured, but also for the previous expenditures, although the insurers may thus be called on to pay a larger sum than the amount of the insurance.

The contribution for general average losses is regulated by the values of the respective interests for the benefit of which they were incurred. The practical rule adopted, in all ordinary cases, is to estimate the ship, cargo, and freight at their net values to their owners, in the state in

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which they arrive at the port of destination, but including in these values the sums made good for sacrifices, and to assess the contribution accordingly. The necessity for including the amount of compensation made for sacrifices in the valuations on which the contribution is charged, arises from the principle that all the parties interested in the adventure should bear the

ultimate loss in exact pro- portion to their respective interests, which would not be the case if the owners of the articles sacrificed were to recover their full value without being themselves assessed for the loss thereon in the same manner as their coadventurers,

The contributory value of the ship is accordingly her actual value to her owner in the state in which she arrives, whether damaged or otherwise, including the sum made good in the general average for any sacrifices which may have been made of part of the ship or her materials.

The value of the cargo for contribution is its net market value on arrival, after deducting the charges incurred for freight, duty, and landing expenses, but without deducting the costs of insurance or commission. If goods be damaged, they contribute only according to their deteriorated value ; and if special charges have been incurred on the cargo at a port of refuge (as for warehouse rent, &c.), the amount of these charges is deducted. The sum charged to general average for goods sacrificed is of course added to the valuation. All goods carried in the ship for the purposes of traffic must be included in the valuation of the cargo ; but the wearing apparel, or personal effects, of the passengers and crew are exempted from contribution.

The value of the freight for contribution is the sum received by the shipowner on the completion of the voyage for the carriage of the cargo, after deducting from that sum the wages reckoned as from the date of the casualty, the port charges at the place of destination, and the special charges against the freight which may have been incurred at a port of refuge, consisting of the costs of reshipping the cargo, and of outward pilotage, &c. The provisions for the voyage are not deducted, as these are held to have formed part of the original value of the ship, If the freight has been paid in advance, it forms part of the value of the goods, and, consequently, does not contribute as a separate interest. When a sum has been advanced on account of freight, subject to insurance, it must be distinguished from the portion of the freight which remains at the shipowner’’s risk, and be charged separately for its rateable contribution ; and the freight so advanced is not subject to deduction for wages, &c., this deduction being made only from the freight at risk. It has been decided that, when a vessel has been originally chartered for a double voyage, the whole freight to be earned

under the charter-party must contribute at its net value, after deducting the wages and other charges which must be incurred in earning it. The effect of this rule is to render the freight attaching to the retwrn voyage. as well as that attaching to the voyage outwards, liable to contribute for average losses arising in the course of the outward passage,—a result the equity of which is not always very apparent.

An adjustment of general average made at any foreign port where the voyage may terminate, if proved to be in conformity with the law and usage of the country to which such foreign port belongs, is binding on all the parties interested as coadventurers, although they may be subjects of this country, and ulthough the adjustment may be made on principles different from those sanctioned by the laws or usages of Britain. The reason for this rule is, that the parties engaging in the adventure are held to assent to the known maritime usage according to which general average is adjusted on the arrival of the ship and goods at the port of destination.

AVE—AVE

The subject of general average is only incidentally con- nected with that of marine insurance, being itself a distinct Bat the subject of particular average arises directly out of the contract of insurance, and

branch of maritime law.

will therefore be best considered in connection with it. (See INSURANCE.)

For further information with respect to the subject of

average, the reader is referred to the famous work of M. Valin, Commentaire sur V’Ordonnance de 1681, t. ii. p. 147-198, ed. 1760; to Emerigon, Z’raité des Assurances,

t. i. pp. 598-674; Arnould on Marine Insurance; and the

treatises on Average of Stevens, Benecke, Baily, Hopkins, and Lowndes. (J. WA.) AVERNUS, a lake of Campania in Italy, near Baie,

occupying the crater of an extinct volcano, and about a From the gloomy horror of its surroundings, and the mephitic character of its exhala- tions, it was regarded by ancient superstition as an entrance It was especially dedicated to

mileand a half in circumference.

to the infernal regions. Proserpine, and an oracle was maintained on the spot. In

214 3.c., Hannibal with his army visited the shrine, but

not so much, according to Pliny, for purposes of piety, as in hope of surprising the garrison of Puteoli. By some critics the Cimmerians of Homer were supposed to have been the inhabitants of this locality, and Virgil in his Zneid adopted the popular opinions in regard to it. Originally there seems to have been no outlet to the lake, but Agrippa opened a passage to the Lucrine, and turned this “mouth of hell ” into a harbour for ships. The channel, however, appears to have become obstructed at a later period. In the reign of Nero it was proposed to construct a ship-canal from the Tiber through Avernus to the Gulf of Baie, but the works were hardly commenced, The plan of connecting the lake with the Gulf of Baise was brought forward as late as 1858, but only to be abandoned. The Lago d’ Averno is now greatly frequented by foreign tourists, who are shown what pass for the Sibyl’s Grotto, the Sibyl’s Bath, and the entrance to the infernal regions, as well as the tunnel from Cume, and ruins variously identified as belonging to a temple or a bathing-piace.

AVERROES, known among his own people as Abil- Walid Mohammed Ibn-Ahmed Ibn-Mohammed Inn-Rosxp, the kadi, was born at Cordova in 1126, and died at Marocco in 1198. His early life was occupied in mastering the curriculum of theology, jurisprudence, mathematics, medicine, and philosophy, under the approved teachers of the time. The years of his prime were a disastrous era for Mahometan Spain, where almost every city had its own petty king, whilst the Christian princes swept the land in constant inroads. But with the advent of the Almohades, the enthusiasm which the desert tribes had awakened, whilst it revived religious life and intensified the observance of the holy law within the realm, served at the same time to

reunite the forces of Andalusia, and inflicted decisive defeats on the chiefs of the Christian North, For the last time before its final extinction the Moslem caliphate in Spain displayed a splendour which seemed to rival the ancient glories of the Ommiade court. Great mosques arose ; schools and colleges were founded 3 hospitals, and other useful and beneficent constructions, proceeded from the public zeal of the sovereign; and under the patronage of two liberal rulers, Jusuf and J akib, science and Philosophy flourished apace. It was Ibn-Tofail (Abubacer), the philosophic vizier of Jusuf, who introduced Averroes to that prince, and Avenzoar (Ibn-Zohr), the greatest of Moslem physicians, was his friend. Averroes, who was versed in the Malekite system of law, was made kAdi of Seville (1169), andin similar appointments the next twenty- five years of his life were passed. We find him at different periods in Seville, Cordova, and Marocco, probably follow-

ing the court of Jusuf Almansur, who took pleasure in engaging him in discussions on the theories of philosophy and their bearings on the faith of Islam. But science and free thought then, as now, in Islam, depended almost solely on the tastes of the wealthy and the favour of the monarch. The ignorant fanaticism of the multitude viewed speculative studies with deep dislike and distrust, and deemed any one a Zendik (infidel) who did not rest content with the natural science of the Koran. These smouldering hatreds burst into open flame about the year 1195. Whether, as one story ran, he had failed in conversation and in his writings to pay the customary deference to the emir, or a court intrigue had changed the policy of the moment, at any rate Averroes was accused of heretical opinions and pursuits, stripped of his honours, and banished to a place near Cordova, where his actions were closely watched. Tales have been told of the insults he had to suffer from a bigoted populace. At the same time efforts were made to stamp out all liberal culture in Andalusia, so far as it went beyond the little medicine, arithmetic, and astronomy required for practical life. But the storm soon passed, when the transient passion of the people had been satisfied, and Averroes for a brief period survived his restoration to honour. He died in the year before his patron Almansur, with whom (in 1199) the political power of the Moslems came to an end, as did the culture of liberal science with Averroes. The philosopher left several sons, some of whom became jurists

like their great-grandfather. One of them has left an essay, expounding his father's theory of the intellect. The personal character of Averroes is known to us only in a general way, and as we can gather it from his writings. His clear, exhaustive, and dignified style of treatment evidences the rectitude and nobility of the man. In the histories of his own nation he has little place; the renown which spread in his lifetime to the East ceased with his death, and he left no school. Yet, from a note in a manuscript, we know that he had intelligent readers in Spain more than a century afterwards, His historic fame came from the Christian Schoolmen, whom he almost initiated into the system of Aristotle, and who, but vaguely discerning the expositors who preceded, admired in his commentaries the accumulated results of two centuries of labours.

For Aristotle the reverence of Averroes was unbounded, and to expound him was his chosen task. The uncritical receptivity of his age, the defects of the Arabic versions, the emphatic theism of his creed, and the rationalising mysticism of some Oriental thought, may have sometimes led him astray, and given prominence to the less obvious features of Aristotelianism. But in his conception of the relation between philosophy and religion, Averroes had a light which the Latins were without. The science, falsely so called, of the several theological schools, their groundless distinctions and sophistical demonstrations, he regarded as the great source of heresy and scepticism. The allegorical interpretations and metaphysics which had been imported into religion had taken men's minds away from the plain sense of the Koran, and destroyed the force of those appeals which had heen spoken to the hearts and understandings of our common humanity, not to the wisdom of the " people of demonstration." God had declared a truth meet for all men, which needed no intellectual superiority to understand, in a tongue which each human soul could apprehend according to its powers and feelings. Accordingly, the expositors of religious metaphysics, Algazali included, are the enemies of true religion, because they make it a mere matter of syllogism. Averroes maintains that a return must be made to the words and teaching of the prophet ; that science must not expend itself in dogmatising on the metaphysical consequences of fragments of doctrine for

popular acceptance, but must proceed to reflect upon and examine the existing things of the world. Averroes, at the same time, condemns the attempts of those who tried to give demonstrative science where the mind was not capable of more than rhetoric: they harm religion by their mere negations, destroying an old sensuous creed, but can- not build up a higher and intellectual faith.

In this spirit Averroes does not allow the fancied needs of theological reasoning to interfere with his study of Aristotle, whom he simply interprets as a truth-seeker. The points by which he told on Europe were all implicit in Aristotle, but Averroes set in relief what the original had left obscure, and emphasised things which the Christian theologian passed by or nuisconceived. Thus Averroes had a double effect. He was the great interpreter of Aristotle to the later Schoolmen, worthy of a place, according to Dante, beside the glorious sages of the heathen world. On the other hand, he came to represent those aspects of Peripateticism most alien to the spirit of Christendom ; and the deeply-religious Moslem gave ‘his name to the anti-sacerdotal party, to the materialists, aceptics, and atheists, who defied or undermined the dominant beliefs of the church.

On three points Averroes, like other Moslem thinkers, came specially into relation, real or supposed, with the religious creed, viz., the creation of the world, the divine knowledge of particular things, and the future of the hunan soul But the collision was rather with the laboured ratiocinations by which the Asharite and Motazelite theologians aimed at rationalising dogma than with the doctrine of religion in its simplicity. True philosophy is the foster sister of religion, but is the critic of scholastic subtleties. In regard to the second charge, Averroes himself remarks that philosophy only protests against reducing the divine to the level of the created mind. But the real grandeur of Averroes is seen in his resolute pro- secution of the stand-point of science in matters of this world, and in his recognition that religion is not a branch of knowledge to be reduced to propositions and systems of dogma, but a personal and inward power, an individual truth which stands distinct from, but not contradictory to, the universalities of scientific law. In his science he followed the Greeks, and to the Schoolmen he and his compatriots rightly seemed philosophers of the ancient world. He maintained alike the claim of demonstrative science with its generalities for

the few who could live in that ethereal world, and the claim of religion for all,—the common life of each soul as an individual and personal consciousness. But theology, or the mixture of the two, he regarded as a source of evil to both—fostering the vain belief in a hostility of philosophers to religion, and meanwhile corrupting religion by a pseudo-science. A stand-point like this was the very antithesis of scholasticism ; it was the anticipation of an adequate view which modern speculation has seldom exhibited.

The latent nominalism of Aristotle only came gradually to be emphasised through the prominence which Chris- tianity gave to the individual life, and, apart from passing uotices as in Abelard, first found clear enunciation in the school of Duns Scotus. The Arabians, on the contrary, emphasised the idealist aspect which had been adopted and promoted by the Neo-Platonist commentators. Hence, to Averroes the eternity of the world finds its true expression in the eternity of God. The ceaseless movement of growth and change, which presents matter in form after form as a continual search after a finality which in time and movement is not, and cannot be reached, represents only the aspect the world shows to the physicist and to the senses. In the eye of reason the full fruition of this desired finality is already and always attained; the

actualisation, invisible to the senses, is achieved now and ever, and is thus beyond the element of time. This tran- scendent or abstract being 7s that which the world of nature is always seeking. He is thought or intellect, the actuality, of which movement is but the fragmentary attainment in successive instants of time. Such a mind is not in the theological sense a creator, yet the onward movement is not the same as what some modern thinkers seem to mean by development. or the perfect and absolute, the con-summation of movement is not generated at any point in the process ; it is an ideal end, which guides the operations of nature, and does not wait upon them for its achieve- ment. God is the unchanging essence of the movement, and therefore its eternal cause.

A special application of this relation between the prior perfect, and the imperfect, which it influences, is found in the doctrine of the connection of

the abstract (transcendent) intellect with man. This transcendent mind is sometimes connected with the moon, according to the theory of Aris- totle, who assigned an imperishable matter to the sphere beyond the sublunary, and in general looked upon the celestial orbs as living and intelligent. Such an intellect, named active or productive, as being the author of the development of reason in man, is the permanent, eternal thought, which is the truth of the cosmic and physical movement. It is in man that the physical or sensible passes most evidently into the metaphysical and rational. Humanity is the chosen vessel in which the light of the intellect is revealed ; and so long as mankind lasts there must always be some individuals destined to receive this light. ‘There must of necessity always be some philo- sopher in the race of man.” What seems from the material point of view to be the acquisition of learning, study, and a moral life, is from the higher point of view the manifes- tation of the transcendent intellect in the individual. The preparation of the heart and faculties gives rise to a series of grades between the original predisposition and the full acquisition of actual intellect. These grades in the main resemble those given by Avicenna. But beyond these, Averroes claims as the highest bliss of the soul a union in this life with the actual intellect. The intellect, therefore, is one and continuous in all individuals, who differ only in the degree which their illumination has attained. Such was the Averroist doctrine of the unity of intellect—the eternal and universal nature of true intellectual life. By his interpreters it was transformed into a theory of one soul common to all mankind, and when thus corrupted conflicted not unreasonably with the doctrines of a future life, com- mon to Islam and Christendom.

Averroes, rejected by his Moslem countrymen, found a hearing among the Jews, to whom Maimonides had shown the free paths of Greek speculation. In the cities of Languedoc and Provence, to which they had been driven by Spanish fanaticism, the Jews no longer used the learned Arabic, and translations of the works of Averroes became necessary. His writings became the text-book of Levi ben Gerson at Perpignan, and of Moses of Narbonne. Mean- while, before 1250, Averroes became accessible to the Latin Schoolmen by means of versions, accredited by the names of Michael Scot and others, William of Auvergne is the first Schoolman who criticises the doctrines of Averroes, not, however, by name. Albertus Magnus and St

Thomas devote special treatises to an exaniination of the Averroist theory of the unity of intellect, which they labour to confute in order to establish the orthodoxy of Aristotle. But as early as Augidius Romanus ,1247-1316), Averroes had been stamped as the patron of indifference to theolo- gical dogmas, and credited with the emancipation which was equally due to wider experience and the lessons of the Crusades. There had never been an absence of protest

against the hierarchical doctrine. Berengar had struggled in that interest, and with Abelard, in the 12th century, the revolt against authority in belief grew loud. The dialogue between a Christian, a Jew, and a philosopher suggested a comparative estimate of religions, and placed the natural religion of the moral law above all positive revelations. Nihilists and naturalists, who deified logic and science at the expense of faith, were not unknown at Paris in the days of John of Salisbury. In such a critical generation the words of Averroism found willing ears, and pupils who outran their teacher. Paris became the centre of a sceptical society, which the decrees of bishops and councils, and the enthusiasm of the orthodox doctors and knight-errants of Catholicism, were powerless to ex- tinguish. At Oxford Averroes told more as the great commentator. In the daysof Roger Bacon he had become an authority. Bacon, placing him beside Aristotle and Avicenna, recommends the study of Arabic as the only way of getting the knowledge which bad versions made almost hopeless ; and the student of the present day might echo his remark. In Duns Scotus, Averroes and Aristotle are the unequalled masters of the science of proof; and he pronounces distinctly the separation between Catholic and philosophical truth, which became the watchword of Aver- roism. By the 14th century Averroism was the common leaven of philosophy; John Baconthorpe is the chief of Averroists, and Walter Burley has similar tendencies.

Meanwhile Averroism had, in the eye of the great Dominican school, come to be regarded as the arch-enemy of the truth. When Frederick II. consulted a Moslem free-thinker on the mysteries of the faith, when the phrase or legend of the “‘ Three Impostors” presented in its most offensive form the scientific survey of the three laws of Moses, Christ, and Mahomet, and

when the characteristic doctrines of Averroes were misunderstood, it soon followed that his name became the badge of the scoffer and the sceptic. What had begun with the subtle disputes of the universities of Paris, went on to the materialist teachers in the medical schools and the sceptical men of the world in the cities of Northern Italy. The patricians of Veniceand the lecturers of Padua nade Averroism synonymous with doubt and criticism in theology, and with sarcasm against the hierarchy. Petrarch, vexed by the arrogance and over- refinements of their argumentation, and by the barbarism of their words, refuses to believe that any good thing can come out of Arabia, and speaks of Averroes as a mad dog barking against the church. In works of contemporary art Averroes is at one time the comrade of Mahomet and Antichrist ; at another he lies with Arius and Sabellius, vanquished by the lance of St Thomas.

It was in the universities of North Italy that Averroism finally settled, and there for three centuries it continued as a stronghold of Scholasticism to resist the efforts of revived antiquity and of advancing science. Padua became the scat of Averroist Aristotelianism; and, when Padua was conquered by Venice in 1405, the printers of the republic Spread abroad the teaching of the professorsin the university. As early as 1300, at Padua, Petrus Aponensis, a notable expositor of medical theories, had betrayed a heterodoxy in faith; and John of Jandun, one of the pamphleteers on the side of Lewis of Bavaria, was a keen follower of Averroes, whom he styles a “perfect and most glorious physicist.” Urbanus of Bologna, Paul of Venice (d. 1428), and Cajetanus de Thienis (1387-1465), established by their lectures and their discussions the authority of Averroes ; and a long list of manuscripts rests in the libraries of Lombardy to witness the diligence of these writers and their successors. Even a lady of Venice,

Cassandra Fedele, in 1480, gained her laurels in defence of Averroist theses

With Pomponatius, in 1495, a brilliant epoch began for the school of Padua. Questions of permanent and present interest took the place of outworn scholastic problems. The disputants ranged themselves under the rival commen- tators, Alexander and Averroes; and the immortality of the soul became the battleground of the two parties. Pomponatius defended the

Alexandrist doctrine of the utter mortality of the soul, whilst Augustinus Niphus, the Aver- roist, was entrusted by Leo X. with the task of defending the Catholic doctrine. The parties seemed to have changed when Averroism thus took the side of the church ; but the change was probably due to compulsion. Niphus had edited the works of Averroes (1495-7) ; but his expressions gave offence to the dominant theologians, and he had to save himself by distinguishing his personal faith from his editorial capacity. Achillini, the persistent philosophical adversary of Pomponatius both at Padua and subsequently at Bologna, attempted, along with other moderate but not brilliant Averroists, to accommodate their philosophical theory with the requirements of Catholicism. It was this comparatively mild Averroism, reduced to the merely ex- planatory activity of a commentator, which continued to be the official dogma at Padua during the 16th century. Its typical representative is Marc-Antonio Zimara (d. 1552), the author of a reconciliation between the tenets of Averroes and those of Aristotle.

Meanwhile, in 1497, Aristotle was for the first time expounded in Greek at Padua. Plato had long been the favourite study at Florence ; and Humanists, like Erasmus, Ludovicus Vives, and Nizolius, enamoured of the popular philosophy of Cicero and Quintilian, poured out the vials of their contempt on scholastic barbarism with its ‘impious and thrice-accursed Averroes.” The editors of Averroes complain that the popular taste had forsaken them for the Greek. Nevertheless, while Fallopius, Vesalius, and Galileo were claiming attention to their discoveries, the Professors Zabarella, Piccolomini, Pendasio, and Creinonini continued the traditions of Averroism, not without changes and additions. Cremonini, the last of them, died in 1631, after lecturing twelve years at Ferrara, and forty at Padua. The legend which tells that he laid aside his telescope rather than see Jupiter’s moons, which Galileo had dis- covered, is a parable of the fall of scholastic Averroism. Medievalism, with its misconstruction of Averroes, perished because it would not see that the interpretation of the past calls for the ripest knowledge of all discoveries in the present.

The literary works of Averroes include treatises on jurisprudence, grammar, astronomy, medicine, and philosophy. In 1859, a work of Averroes was for the first time published in Arabic by the Bava- rian Academy, and a German translation appeared in 1875 by the editor, J. Miiller. It is a treatise

entitled Philosophy and Theology, and, with the exception of a Gernian version of the essay on the conjunction of the intellect with man, is the first translation which enables the non-Semitic scholar to form any adequate idea of Aver- rocs. The Latin translations of most of his works are barbarous and obscure. A great part of his writings, particularly on jurisprudence and astronomy, as well as essays on special logical subjects, prolego- mena to philosophy, criticisms on Avicenna and Alfarabius, remain in manuscript in the Kscorial and other libraries. ‘The Latin editions of his medical works include the Colliget (i.e., Kulliyyat, or suminary), a réswmé of medical science, and a commentary on Avicenna’s poem on medicine; but Averroes, in medical renown, always stood far inferior to Avicenna. The Latin editions of his philosophical works comprise the Commentaries on Aristotle, the Destructio Destructionis (against Algazali), the De Substantia Orbis, and a double treatise De Anime Beatitudine. The Commentaries of Averroes fall under three heads:—the larger commentaries, in which a paragraph is quoted at large, and its clauses expounded one by one; the medium commentaries, which cite only the first words of a section ; aud the paraphrases or analyses, treatises on the subjects of the Aristotelian books. The larger commentary was an innovation of Averroes ; for Avicenna, copied by Albertus Magnus, gave under the rubrics furnished by Aristotle works in which, though the inaterials were borrowed, the grouping was his own. The great

commentaries exist only for the Posterior Analytics, Physics, De Calo, De Anima, and Mctaphysics. On the History of Animals no cominentary at all exists, and Plato’s Republic is substituted for the then inaccessible Politics. ‘The Latin editions of these works between 1480 and 1580 number about 100. The first appeared at Padua, 1472; about fifty were published at Venice, the best known being that by the Juntas (1552-3), in ten volumes folio.

See Renan, Averroes et l Avcrroisme; Munk, Mélanges, 418-458; Miiller’s German translation, Philosophie und T’heologie, Miinchen, 1875; Stockl, Phil. d. Mittelalters, ii. 67-124; Averroes (Vater und Sohn), Drei Abhandl. iiber d. Conjunction d. separaten Intellects mit ad, Menschen, translated

into German from the Arabic version of Sam. ibn-Tibbon, by Dr J. Hercz, Berlin, 1869. (W. W.)

AVERSA, a town of Italy, province of Terra di Lavoro, situated in a beautiful plain covered with orange-groves and vineyards, about midway between Naples and Capua. It is the seat of a wealthy bishopric, and its foundling hospital and lunatic asylum, the latter founded by Murat, are very celebrated. Aversa owed its origin to the Nor- mans, and dates from 1030, the people of the ancient city of Atella being transported thither. Population, 21,176.

AVESNES, a town of France, in the department of Nord, situated in a fertile district on the Greater Helpe. It is generally well built, and is fortified on Vauban's system. Its principal building is the cathedral, surmounted by a tower 330 feet high, which is raised on four columns, and has a fine chime. It is the seat of a sub-prefect, and has a tribunal of primary jurisdiction, an agricultural society, and a communal college. The principal manu- factures are hosiery, coarse serge, and soap ; there are also breweries, tanneries, salt-refineries, and brick and marble works.

Prussians in July 1815, but was soon afterwards rebuilt.

Population, 3737.

AVEYRON, a department in theS. of France, bounded on the N. by Cantal, E. by Lozére, S. by Hérault and Tarn, and W. by Tarn-et-Garonne and Lot, containing an area of 3429 square miles. It corresponds to a large por- tion of the ancient district of Rouergue in Guienne, which formerly gave its name to a family of counts. Its earliest inhabitants known to us were the Rutheni, whose capital was Segodunum, identified with the modern Rodez. The department is rich in prehistoric antiquities, such as the dolmens at Taurines, Laumiéres, Grailhe, &c. (see paper by M. E. Cartailhac in Norwich vol. of Internat. Cong. of Prehist. Arch., 1868). A large portion of Aveyron is occupied by offshoots of the Cevennes, the highest summit being Cham-de-la-Roche, 4350 feet above the level of the sea. About half the area is under cultivation, nearly one-fourth is heath, one-tenth woods and forests, and rather more than an eighth part meadow land. Vineyards occupy about one-twelfth part of the cultivated land. The department has

mines of copper, lead, silver, iron, zinc, alum, and antimony, and extensive coal-fields of great value. Rather more than three-fourths of the. inhabitants are engaged in agricultural pursuits of one kind or another, —miainly in the rearing of cattle, sheep, and swine; and there are manufactures of paper, woollen and cotton goods, silk, and leather, to which water-power is skilfully applied. Aveyron exports chestnuts, almonds, hemp, wool, wax, the famous Roquefort cheese, timber, and cattle. Among the numerous men of mark belonging to the department may be mentioned Jean de la Valette, the defender of Malta, Raynal, Bonald, and Louis Blanc. The capital is Rodez, and the arrondissements are Rodez, Espalion, Milhau, Saint-Affrique, and Villefranche. Popu- lation in 1872, 402,474. For investigations into the races represented in the department see Bulletins de la Soc. Wd' Anthrop. vol. iv.

AVEZZANO, a town of Italy, in Abruzzo Ulteriore II., containing a castle, which was built in 1499 by Virgilio

Orsini, afterwards belonged to the family of the Colonnas, and is now in the possession of the Barberinis. Population about 5900. Long. 13° 32' E., lat. 41° 58' N. AVICEBRON. The writer referred to by the Scholas- tics of the 13th century under this name was sup- posed by them to be an Arabian philosopher, and- was accordingly classed along with Avempace, Abubacer, and others. Recent researches have shown that this is an error, and that this author, about whom so little was known, is identical with Salomon ben Gebirol, a Jewish writer, several of whose religious poems are still celebrated among the Jews. Few details are known regarding the life of Gebirol. He was born at Malaga, and received his education at Saragossa, where, in 1045, he wrote a small treatise on morals, which has been several times reprinted, His death is said to have taken place in 1070 at Valencia, Among the Jews he is known only through his poeins, and, with a few unimportant exceptions, no Jewish writer refers to his philosopbical speculations. The Christian Schoolmen, about the middle of the 12th century, became acquainted with Gundisalvi's Latin translation of a work called Fons Vite or Sapientie, which exercised a powerful influence on their metaphysical discussions. The author was called by them Avicebron, or

Avicembron, or Avence- brol, and nothing was known regarding him till M. Munk discovered a Hebrew abridgment, by Ibn Falaquéra, of Rabbi S. ben Gebirol's treatise on the source of life. He readily identified this with the work of the unknown Avicebron, and the discovery of two Latin MSS. of the Fons has placed the identification beyond doubt. The extracts of Falaquéra give a fair idea of the work, and enable us to understand the peculiar influence it exercised. The objects of metaphysics according to it are three in number, the knowledge of matter and form, of the divine will or creative word, and of the supreme unity of God. God, as infinite, cannot be known by intelligence which is finite, for all knowledge involves comprehension, or requires that the known be contained in the knowing. God works through the divine will, which is intermediate between the supreme unity and the world. All things in the world possess both matter and form ; all the various species of matter are but variations of one universal matter; and similarly all forms are contained in one universal form. This unity of matter applies to the soul and mind as well as to material things, and it is against this proposition that the orthodox Schoolmen, as Albertus and Thomas, princi- pally argue. The matter and form in the universe is dis- posed in successive stages, and rising above the lowest grade or corporal matter there are certain intermediate substances uniting it with the divine will, without which there is no motion. These intermediate substances, taken in order, are —the universal intellect, the rational soul, the vital soul, the vegetative soul, and nature, or the principle of motion in material things. Activity is transmitted from the divine will through these stages, each of which causes the one next below itself to pass from potentiality into actuality. The materials of Avicebron's philosophy are due mainly to the Alexandrian speculations concealed in the pseudo-Aristote- lian Theology. The position of the divine will, somewhat enigmatical in a philosophical point of view, is probably a concession to Jewish orthodoxy. For a full account of ail that is known regarding Avicebron's life and philosophy, with translation of Falaquéra's extracts, see Munk's Mélanges de Phil. Juive et Arabe, pp. 1-306; for his poems see Sachs's Die Religiise Poesie der Juden m Spanien, and Geiger's S. ben Gabirol und seine Dichtungen. AVICENNA (in Arabic, Abd Ali el-Hosein Ibn-Abdallah Ipn-Sina) was born about the year 980 a.p. at Afshena, one of the many hamlets in the district of Bokhara. His mother was a native of the place; his father, a Persian

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from Balkh, filled the post of tax-collector in the neigh- pouring town of Harmaitin, under Nah ibn Mansir, the Samanide emir of Bokhara. On the birth of Avicenna's younger brother the family migrated to the capital, then one of the chief cities of the Moslem world, and famous for a culture which was older than its conquest by the Saracens. Avicenna was put in charge of a tutor, and his precocity soon made him the marvel of his neighbours,—as a boy of ten who knew by rote the Koran and much Arabic poetry besides. From a greengrocer he learnt arithmetic; and higher branches were begun under one of those wandering scholars, who gained a livelihood by cures for the sick and lessons for the young. Under him Avicenna read the Zsagoge of Porphyry, and the first pro- positions of Euclid. But the pupil soon found his teacher to be but a charlatan, and betook himself, aided by com- mentaries, to master logic, geometry, and the Almagest. Before he was sixteen he not merely knew medical theory, but by gratuitous attendance on the sick had, according to his own account, discovered new methods of treatment. For the next year and a half he worked at the higher philosophy, in which he encountered greater obstacles. In such monients of baffled inquiry he would leave his books, perform the requisite ablutions, then hie to the mosque, and continue in prayer till light broke on his difficulties. Deep into the night he would continue his studies, stimu- lating his senses by occasional cups of wine, and even in his dreams problems would pursue him and work out their solution. Forty times, it is said, he read through the metaphysics of Aristotle, till the words were imprinted on his memory; but their meaning was hopelessly obscure, until one day they found illumination from the little com- mentary by Alfarabius, which he bought at a bookstall for the small sum of three drachmze. So great was his joy at the discovery, thus made by help of a work from which he had expected only mystery, that he hastened to return thanks to God, and bestowed an alms upon the poor. Thus, by the end of his seventeenth year, he had gone the round of the learning of his time; his apprenticeship of study was concluded, and he went forth a master to find a market for his accomplishments.

His first appointment was that of physician to the emir, whom the fame of the youthful prodigy had reached, and who owed him his recovery from a

dangerous illness. Avicenna's chief reward for this service was access to the royal library, contained in several rooms, each with its chests of manuscripts in some branch of learning. The Samanides were well-known patrons of scholarship and scholars, and stood conspicuous amid the fashion of the period, which made a library and a learned retinue an indispensable accompaniment of an emir, even in the days of campaign. In such a library Avicenna could inspect works of great rarity, and study the progress of science. When the library was destroyed by fire not long thereafter, the enemies of Avicenna accused him of burning it, in order for ever to conceal the sources of his knowledge. Meanwhile, he assisted his father in his financial labours, but still found time to write some of his earliest works for two wealthy patrons, whose absolute property they became. Among them was the Collectio, one of those short synopses of knowledge which an author threw off for different patrons,

At the age of twenty-two Avicenna lost his father. The Samanide dynasty, which for ten years had been hard pressed between the Turkish Khan of Kashgar on the north and the rulers of Ghazni on the south, came to its end in December 1004, Avicenna seems to have declined the offers of Mahmud the Ghaznevide (who, like his compeers, was rapidly gathering a brilliant cortege of savants, includ- ing the astronomer Albiruni), and proceeded westwards to

the city of Urdjensh in the modern district of Khiva, where the vizier, regarded as a friend of scholars, gave him a small monthly stipend. But the pay was small, and Avicenna wandered from place to place through the districts of Nishapur and Merv to the borders of Khorasan, seeking an opening for his talents. In the restless change which threw the several cities of Iran from hand to hand among those feudal emirs of the Buide family, who disputed the fragments of the caliphate, the interests of letters and science were not likely to be regarded. Shems al-Maali Kabiis, the generous ruler of Deilem, himself a poet and a scholar, with whom he had expected to find an asylum, was about that date (1013) starved to death by his own revolted soldiery. Avicenna himself was at this season stricken down by a severe illness, Finally, at Jorjau, near the Caspian, he met with a friend, who

bought near his own house a dwelling in which Avicenna lectured on logic and astronomy. Jor this patron several of his treatises were written ; and the commencement of his Canon of Medicine also dates from his stay in Hyrcania.

He subsequently settled at Rai, in the vicinity of the modern Teheran, where a son of the last emir, Medj Addaula, was nominal ruler, under the regency of his mother, At Rai about thirty of his shorter works are said to have been composed. But the constant feuds which raged between the regent and her second son, Shems Addaula, conipelled the scholar to quit the place, and after a brief sojourn at Kaswin, he passed southwards to Hama- dan, where that prince had established himself. At first he entered into the service of a high-born lady ; but ere long the emir, hearing of his arrival, called him in as medical attendant, and sent him back with presents to his dwelling. Avicenna was even raised to the office of vizier ; but the turbulent soldiery, composed of Koords and Turks, mutinied against their nominal sovereign, and demanded that the new vizier should be put to death. Shems Addaula consented that he should be banished from the country. Avicenna, however, remained hidden for forty days in a sheikh's house, till a fresh attack of illness induced the emir to restore him to his post. Even during this perturbed time he prosecuted his studies and teaching. Every evening extracts from his great works, the Canon and the Sanatio, were dictated and explained to his pupils; among whom, when the lesson was over, he spent the rest of the night in festive enjoyment with a band of singers and players. On the death of the emir Avicenna ceased to be vizier, and hid himself in the house of an apothecary, where, with intense assiduity, he continued the composi- tion of his works, Meanwhile, he had written to Abu Jaafar, the prefect of Ispahan, offering his services; but the new emir of Hamadan getting to hear of this corre- spondence, and discovering the place of Avicenna's conceal- ment, incarcerated him in a fortress. War meanwhile continued between the rulers of Ispahan and Hamadaén ; in 1024 the former captured Hamad&n and its towns, and expelled the Turkish mercenaries. When the storm had passed Avicenna returned with the emir to Hamadan, and carried on his literary labours ; but at length, accompanied by his brother, a favourite pupil, and two slaves, made his escape out of the city in the dress of a Sufite ascetic. After a perilous journey they reached Ispahan, and received an honourable welcome from the prince. The remaining ten or

twelve years of Avicenna's life were spent in the service of Abu Jaafar Ala Addaula, whom he accompanied as physician and general literary and scientific adviser, even in his numerous campaigns. During these years he began to study literary matters and philology, instigated, it is asserted, by criticisms on his style. But amid his rest- less study Avicenna never forgot his love of enjoyment. Unusual bodily vigour enabled him to combine severe

devotion to work with facile indulgence in sensual pleasures. His passion for wine and women was almost as well known as his learning. With much gaiety of heart, and great powers of understanding, he showed at the same time the spirit of an Aristippus more than that of an Aristotle at the courts of the wealthy. Versatile, light-hearted, boastful, and pleasure-loving, he contrasts with the nobler and more intellectual character of Averroes. His bouts of pleasure gradually weakened his constitution ; a severe colic, which seized him on the march of the army against Hamadan, was checked by remedies so violent that Avicenna could scarcely stand. Ona similar occasion the disease returned ; with difficulty he reached Hamadan, where, finding the disease gaining ground, he refused to keep up the regi- men imposed, and resigned himself to his fate. On his deathbed remorse seized him ; he bestowed his goods on the poor, restored unjust gains, freed his slaves, and every third day till his death listened to the reading of the Koran. He died in June 1087, in his 58th year, and was buried among the palm-trees by the Kiblah of Hamadan.

It was mainly accident which determined that from the 12th to the 17th century Avicenna should be the guide of medical study in European universities, and eclipse the names of Rhazes, Ali, and Avenzoar. His work is not essentially different from that of his predecessors Rhazes and Ali; all present the doctrine of Galen, and through Galen the doctrine of Hippocrates, modified by the system of Aristotle. But the Canon of Avicenna is distinguished from the £l-Hawi (Continens) or Summary of Rhazes by its greater method, due perhaps to the logical studies of the former, and entitling him to his surname of Prince of the Physicians. The

work has been variously appreciated in subsequent ages, some regarding it as a treasury of wisdom, and others, like Avenzoar, holding it useful only as waste paper. In modern times it has been more criticised than read. The vice of the book is excessive classification of bodily faculties, aud over-subtlety in the discrimination of diseases. It includes five books; of which the first and second treat of physiology, pathology, and hygiene, the third and fourth deal with the methods of treating disease, and the fifth describes the composition and preparation of remedies. This last part contains some contingent of personal observation. He is, like all his countrymen, ample in the enumeration of symptoms, and is said to be inferior to Ali in practical medicine and surgery. He introduced into medical theory the four causes of the Peripatetic system. Of natural history and botany he pretends to no special knowledge. Up to the year 1650, or thereabouts, the Canon was still used as a text-book in the universities of Louvain and Montpellier.

The rank of Avicenna in the medieval world as a philo- sopher was far beneath his fame as a physician. Still, the logic of Albertus Magnus and succeeding doctors was largely indebted to him for its formule. In logic Avi- cenna starts from distinguishing between the isolated concept and the judgment or assertion ; from which two primitive elements of knowledge there is artificially gene- rated a complete and scientific knowledge by the two pro- cesses of definition and syllogism. But the chief interest for the history of logic belongs to his doctrine in so far as it bears upon the nature and function of abstract ideas. The question had been suggested alike to East and West by Porphyry, and the Arabians were the first to approach the full statement of the problem. Alfarabius had pointed out that the universal and individual are not distinguished from each other as understanding from the senses, but that both universal and individual are in one respect intel- lectual, just as in another connection they play a part in perception. He had distinguished the universal essence in its abstract nature, from the universal considered in

AV GE WN & relation to a number of singulars. These suggestions formed the basis of Avicenna’s doctrine. The essences or forms—the intelligibilia which constitute the world of real

knowledge—may be looked at in themselves (metaphysi- cally), or as embodied in the things of sense (physically),

or as expressing the processes of thought (logically). The first of these three points of view deals with the form or

idea as self-contained in the principles of its own being,

apart from those connections and distinctions which it receives in real (sensuous) science, and through the act of intellect. Secondly, the form may be looked at as the similarity evolved by a process of comparison, as the work

of mental reflection, and in that way as essentially express-

ing a relation. When thus considered as the common features derived by examination from singular instances, it becomes a universal or common term strictly so called. It

is intellect which first makes the abstract idea a true universal. (Intellectus in formis agit universalitatem.) In

the third place, the form or essence may be looked upon as embodied in outward things (in sengularibus proprus), and

thus it is the type more or less represented by the members

of a natural kind. It is the designation of these outward things which forms the “ first intention” of names; and

it is only at a later stage, when thought comes to observe

its own modes, that names, looked upon as predicables and universals, are taken in their “second intention.” Logic

deals with such second intentions. It does not consider

the forms ante multiplicitatem, 7.¢., as eternal ideas—nor

in multiplicitate, t.¢., aS immersed in the matter of the phenomenal world—but post multiplicitatem, 1.¢., as they

exist in and for the intellect which has examined and com- pared. Logic does not come in contact with things, except

as they are subject to modification by intellectual forms.

In other words, universality, individuality, and speciality

are all equally modes of our comprehension or notion ;

their meaning consists in their setting forth the relations attaching to any object of our conception. In the mind,

é.g., one form may be placed in reference to a multitude of things, and as thus related will be universal. The form animal, e.g., is an abstract intelligible, or metaphysical

idea. When an act of thought employs it as a schema to

unify several species, it acquires its logical aspect (respectus)

of generality ; and the various living beings qualified to | have the nume animal applied to them constitute the natural class or kind. Avicenna's view of the universal may be compared with that of Abelard, which calls it " that whose nature it is to be predicated of several," as if the generality became explicit only in the act of predication, in the sermo or proposition, and not in the abstract, unrelated form or essence. The three modes of the universal before things, in things, and after things, spring from Arabian influence, but depart somewhat from his stand-point.

The place of Avicenna amongst Moslem philosophers is seen in the fact that Shahrastani takes him as the type of all, and that Algazali's attack against philosophy is in reality almost entirely directed against Avicenna. His system is in the main a codification of Aristotle modified by fundamental views of Neo-Platonist origin, and it tends to be a compromise with theology. In order, for example, to maintain the necessity of creation, he

taught that all things except God were admissible or possible in their own nature, but that certain of them were rendered necessary by the act of the creative first agent,—in other words, that the possible could be transformed into the necessary. Avicenna's theory of the process of knowledge is an interesting part of his doctrine. Man has a rational soul, one face of which is turned towards the body, and, by the help of the higher aspect, acts as practical understanding ; the other face lies open to the reception and acquisition of the intelligible forms, and its aim is to become a reason-

able world, reproducing the forms of the universe and their intelligible order. In man there is only the sus- ceptibility to reason, which is sustained and helped by the light of the active intellect. Man may prepare him- self for this influx by removing the obstacles which prevent the union of the intellect with the human vessel destined for its reception. The stages of this process to the acquisition of mind are generally enumerated by Avicenna as four; in this part he follows not Aristotle, but the Greek commentator. The first stage is that of the hylic or material intellect, a state of mere potentiality, like that of a child for writing, before he has ever put pen to paper. 'The second stage is called im habitu ; it is com- pared to the case of a child that has learned the elements of writing, when the bare possibility is on the way to be developed, and is seen to be real. In this period of half-trained reason, it appears as happy conjecture, not yet transformed into art or science proper. When the power of writing has been actualised, we have a parallel to the intellectus in actu—the way of science and demonstra- tion is entered. And when writing has been made a permanent accomplishinent, or lasting property of the subject, to be taken up at will, it corresponds to the

Tn several points Avicenna endeavoured to give a ratzo- nale of theological dogmas, particularly of prophetic rule, of miracles, divine providence, and immortality. The permanence of individual souls he supports by arguments borrowed from those of Plato. The existence of a prophet is shown to be a corollary from a belief in God as a moral governor, and the phenomena of miracles are required to evidence the genuineness of the prophetic mission. For man, in order to his well-being and the permanence of his kind, requires

in the first place a clear vision of right and truth, and must, secondly, depend upon some power capable of carrying out these discoverics of moral law. If pro- vidence has so arranged that the eyelids and the hair of the cyebrows shall grow to protect the eye, much more is it needful for a prophet to arise who shall preach the truth of God's unity, prescribe laws for men, and exhort them to well-doing by the promise of recompense to come. The weal of humanity demands the revelation from God, and, to certify his office, the prophet must work miracles, Just as in ordinary states the soul influences the bodily organs, So in exalted conditions it may attain the level of those high immaterial spirits, whose energy is strong enough to permeate the whole passive world. This mystical union with the hidden universe is a mystery which the ordinary mind cannot understand. Many things then become visible as by a lightning flash in the darkness, and are apprehended by the vigorous grasp of pure intuition. But More generally the imagination throws itself on these intuitions, and presents them to the lower soul under the semblance of forms and sounds—the angelic beauty which the seer beholds, and the harmonious speech which a heavenly Voice seems to utter in his ear. Thus Avicenna, like his predecessors, tried to harmonise the abstract forms of philosophy with the religious faith of his nation. But

IS arguments are generally vitiated by the fallacy of

assuming what they profess to prove. His failure is made obvious by the attack of Algazali on the tendencies and results of speculation.

Upwards of 100 treatises are ascribed to Avicenna. Some of them are tracts of a few pages, others are works extending through several volumes. The best-known amongst them, and that to which Avicenna owed his European reputation, is the Canon of Medicine; an Arabic edition of it appeared at Rome 1593, and a Hebrew version at Naples in 1491. Of the Latin version there were about thirty editions, founded on the original translation by Gerard of Cremona. The 15th century has the honour of composing the great commentary on the text of the Canon, grouping around it all that theory had imagined, and all that practice had observed. Other medical works translated into Latin are the Medicamenta Cordialia, Canticwm de Medicina, Tractatus de Syrwpo Acetoso. Scarcely any member of the

Arabian circle of the scienccs, including theology, philology, mathematics, astronomy, physics, and music, has been left untouched by the treatises of Avicenna, many of which probably varied little, except in being commissioned by a different patron and having a diffcrent form or extent. He wroto at least one treatise on alchemy, but several others have been falsely attributed to him. His book on animals was translated by Michael Scot. His Logic, Metaphysics, Physics, De Colo, are treatises giving a synoptic view of Aristotelian doctrine. The Logicand Metaphysics have been printed more than once; the latter, e.g., at Venice in 1498, 1495, and 1546. Some of his shorter essays on medicine, logic, &c., take a poctical form (the poem on logic was published by Schmeelders in 1836). Two encyclopedic treatises, dealing with philosophy, are often mentioned. The larger, Al-Shefa (Sanatio), exists nearly complete in manuscript in the Bodleian Library and elsewhere ; part of it on the De Anima appeared at Pavia (1490) as the Liber Sextus Natwraliwm, and the long account of Avicenna's philosophy given by Shahrastani seems to be mainly an analysis, and in many places a reproduction, of the 4/-Shcfa. A shorter form of the work is known as the Al-Nedjat (Libcratio). The Latin editions of part of these works have been modified by the corrections which the monkish editors confess that they applied. There is also a Philosophia Orientalis, mentioned by Roger Bacon, and now lost, which according to Averroes was pantheistic in tone.

For Avicenna's life, see Ibn Khallikan's Biographical Dictionary, translated by Slane (1842); Wiistenfeld's Geschichte der Arabischen Aerate und Naturforschcr, Gottingen, 1840; Abul-Pharagius, His- toria Dynastiarum. For his medicine, see Sprengel, Histoire dc la Médecine; and for his philosophy, see Shahrastani, Germ. transl. vol. ii, 213-332 ; Prantl, Geschichte der Logik, ii. 318-861; Stéckl, Phil. d. Mittelalters, ii. 28-58; Munk, Aélanges, 352-366; and Haneberg in the Abhandlungen der Philos.-Philolog. Class, der Baycrischen Academie, 1867. (Ww. W.)

AVIENUS, Rurus Festus, a Latin poet, who appcars to have flourished in the latter half of the 4th century. Any knowledge we have of the facts of his life is derived from a Latin inscription, printed by Meyer (Anthologia Latina, 278), which has been supposed to refer to him. He is in all probability the Festus who was proconsul in Africa in 366 and following

years, and in Achaia in 372. He is the author of the following works:—1. Descriptio Orbis Terre, sometimes called Aetaphrasis Periegeseos Dionysir, being derived from the zepujyyors of that writer; 2. Ora Maritima, of which there is extant only a fragment describing the Atlantic coast, and the Mediterranean as far as Marseilles; 3. Aratea Phenomena, and Aratea Prognostica, which are paraphrases of two works of Aratus. These poems, with the exception of the Aratea, are con- tained in Wernsdorf's Poéte Latini Minores, vol. v. pt. i.

AVIGLIANO, a town of Italy, in the province of Basilicata, 11 miles N.N.W. of Potenza. It stands on the declivity of a hill, and contains a collegiate church, several convents, and a royal college. A peculiar kind of pottery produced here towards the end of the 18th century is still sought after by collectors. The surrounding country is said to produce the finest cattle in the kingdom. A part of the town was destroyed by a land-slip in 1824. Popula- tion, 15,982.

AVIGNON, the chief town of the department of Vaucluse in France, situated in a beautiful plain, on the left bank of the Rhone, not far from the entrance of the Durance. It is surrounded by its ancient crenellated walls, which are in a state of remarkable preservation,

and, on the outside, by a line of pleasant boulevards planted with trees. A precipitous rock rises from the river's edge; and from its summit the cathedral of Votre Dame des Doms, a building of the 12th century, looks down on the city, but is almost thrown into insignificance by the Palace of the Popes, which rises by its side, and

Sketch Plan of Avignon.

2. Former Palace of the Archbishops. 3. Town-House 4. Calvet Museum. 5. Convent of the Visitation. 6. Theological Seminary (St Charles). 7 Hospital (St Louis). 8. Cavalry Barracks. 9. Barracks. 10. Penitentiary. 11. Infantry Barracks. 12. St Joseph's College. 13. Con- vent ofthe Holy Saerament. 14. Hotel-Dieu and General Charity. 15. Chureh of St Symphorien. 16. Church of the Sacred Heart. 17. Prisons. 18. Savings Bank and Loan Offiee. 19.

Court-House. 20. Lyceum. 21. Lyceum. 22. Sus- pension Bridge. 23. Benezet Bridge. A, Plaee du Palais. B, Place de I'Hétel de Ville. C, Rue de la République. D, Rue Calade. G, Rue des Liees. H, Plaee Pie. J, Vieux Septier. Rue Carréterie. M, Porte du Rhéne. Lazarus. Q, Porte L'hnbert. Porte de l'Oulle.

J

. Palace of the Popes.

K, Rue du Saule. L, N, Porte de la Ligne. 0, Porte St R, Porte St Michael. §, Porte St Roehe. T,

stretches in sombre grandeur along the southern slope. This building, or congeries of buildings, was commenced by Benedict XII. in 1336, and continued by successive popes for sixty years. It covers an area of rather more than 1} acres. The paintings with which it was profusely adorned are in great measure destroyed, and even the grandeur of its dismantled interiors was for a long time broken in upon by the carpentry and plaster-work of French barracks. A restoration has, however, been for some time in progress ; and the building will again be appropriated for ecclesiastical and civic purposes. The churches of St Agricol, St Didier, and St Pierre may be mentioned as of some importance ; also the papal mint, now known as a music academy ; the town-hall, built in 1862; the Calvet museum, rich in Roman remains; the Requien museum of natural history; and the Hétel des Invalides. Of the church of the Cordeliers, in which Petrarch's Laura was buried, only a small part is standing, and the tomb itself has been entirely destroyed. The city is the seat of an archbishop, and has tribunals of primary jurisdiction and commerce, a royal college, a theological seminary, a society of arts, the Vaucluse academy, a public library, a theatre, &c. The chief object of industry is the preparation of silk and the manufacture of silk goods; there are also manufactures of paper, leather, hats, jewellery, iron-ware &c. Avignon is remarkably subject to violent winds, of which the most disastrous is the mistral ; and, according to the proverb, Avenio ventosa, sine vento venenosa, cum vento fastidiosa (windy Avignon, liable to plague when it has not the wind, and plagued with the wind when it has it). The town was a place of some importance in the times of Roman supremacy, and seems to have had some special connection with the Greek colony at

Massilia. It was incorporated with the Burgundian kingdom, and on its dissolution became a free republic, after the Italian type. As late, indeed, as 1790, it retained its consuls, though its

F, Place du Corps Saint. °

republican constitution was really destroyed by Charles of Anjou. From 1309, when Clement V. took up his abode in the city, to 1877, when Gregory XI. returned to Rome, Avignon was the seat of the papal court, and it continued from 1378 to 1418 to be the seat of French anti-popes. In 1348 it was purchased by Pope Clement VI. from Joanna of Sicily for the sum of 80,000 florins, and it remained in possession of the popes till the French Revolution. Popula- tion in 1872, 38,196. ,

AVILA, a province of Spain, one of the modern divisions of the kingdom of Old Castile, situated between long. 4° 14’ and 5° 55’ W., and lat. 40° 48″ and 41° 18’N. It is bounded on the N. by Valladolid, E. by Segovia and Madrid, S. by Toledo and Caceres, and W. by Salamanca, The area is 2570 square miles; population, 176,769, It naturally divides itself into two sections, differing com- pletely in soil, climate, productions, and social economy. The northern portion is generally level; the soil is of indifferent quality, strong and marly in a few places, but rocky in all the valleys of the Sierra de Avila; and the climate alternates from severe cold in winter to extreme heat in summer. The population of this part is agricultural. The southern division is one mass of rugged granitic sierras, inter- spersed, however, with sheltered and well-watered valleys, abounding with rich vegetation. The winter here, especially in the elevated region of the Paramera and the waste lands of Avila, is long and severe, but the climate is not unhealthy. The inhabitants are occupied in the rearing of cattle. The principal mountain chains are the Guadarrama, separating this province from Madrid; the Sierras de Avila, a con- tinuation of them westward; the Sierra de Gredos, running from the south of Piedrahita through Barco, Arenos, and part of Cebreros; and the Paramera, stretching southwards from the city of Avila into Arenas and Cebreros. The various ridges which ramify from the latter are covered with wood, presenting a striking contrast to the bare peaks of the Sierra de Gredos, and the barren levels in which they rise

on the north. The principal rivers are the Alberche and Tietar, belonging to the basin of the Tagus, and the Tormes, the Corneja, and the Adaja, belonging to that of the Douro. The mountains contain silver, copper, iron, lead, and coal, but their mineral wealth has been exaggerated, and the actual production is absolutely nil. Quarries of fine marble and jasper exist in the district of Arenas. The province has declined in wealth and popula- tion during the last two centuries, a result due less to the want of activity on the part of the inhabitants than to the oppressive manorial and feudal rights and the strict laws of entail and mortmain, which have acted as barriers to improvement. The principal production is the wool of the Merino sheep, which at one time yielded an immense revenue. Game is plentiful, and the rivers abound in fish, specially trout. Olives, chestnuts, and grapes are grown, and the culture of silk-worms is also carried on. There is little trade, and the manufactures are few, consisting chiefly of copper utensils, lime, soap, cloth, paper, combs, &c. The state of elementary education is comparatively good, and the ratio of crime is proportionately low (Madoz, Diccionario de Espafia).

Avia (the ancient Abula), a city of Spain, the capital of the above province, is situated on the right bank of the Adaja, about 3000 feet above the sea-level, at the termina- tion of the Guadarrama Mountains. “On all sides,” says a recent traveller, “the town is surrounded by a tawny desert, over whose arid plains numbers of gray boulders are scattered like flocks of sheep.” Its ancient wall is still in good preservation, crowned by a breastwork, with towers of great strength ; but a large part of the town hes beyond the circuit. Avila is the seat of a bishop suffragan to Santiago, and has a Gothic cathedral, built by Garcia

da Estrella in 1107; a numbcr of interesting churches, such as Santo Tomas, with the beautiful tomb of Prince Juan, San Vincenti, with its remarkable carving, and Nuestra Seraf. Madre Santa Teresa, built over the birthplace of the patroness of Spain (who here founded the conveut of St Joseph); as well as several monasteries and schools, an infirmary, and a foundling hospital. It was formerly the seat of a university, which was founded in 1482, and changed into the college of St Thomas in 1807. The only manufacture of

any importance is the spinning of the wool furnished by the native sheep. Population, 6892.

AVILA, Git GonzaLEz D’,a Spanish biographer and antiquary, was born at Avila about the year 1577, and died there in 1658. He was made historiographer of Castile in 1612, and of the Indies in 1641. Of his numerous works, the most valuable are his Zeatro de las Grandezas de Madrid (Madrid, 1623, sqq.), and his Teatro Eclesiastico, descriptive of the metropolitan churches and cathedrals of Castile, with lives of the prelates (Madrid, 1645-53, 4 vols, 4to).

AVILA Y ZUNIGA, Luts p’, author of a Spanish his- tory of the wars of Charles V. Nothing is knownas to the place or date either of his birth or of his death. He was probably of low origin, but married a wealthy heiress of the house of Zuniga, whose name he added to his own. He rose rapidly in the favour of the Emperor Charles V., served in the army and as ambassador to Rome, and was present at the funeral of Charles in 1558. His work is entitled Comentarios de la Guerra de Alemafia, hecha de Carlos V. en el aio de 1546 y 1547, and appears to have been printed in 1548. It became very popular, and was translated into English, French, Dutch, German, Italian, and Latin. As was to be expected from the position of the author, the book gave a rather one-sided account of Charles, and its misrepresentations have been severely criticised.

AVILES, San Nicoxas pz (the Latin Flavionavia), a town of Spain, in the province of Oviedo, about a league from the sea-coast, in lat. 43° 34’ N., long. 5° 58’ W. It has a considerable trade by means of its port, which affords good anchorage for all classes of vessels. There are here some copper works and coal mines, and the stone quarries are extensive and productive. Aviles has two parish churches, a theatre, and a public school. Population, 3297.

AVLONA, or Vatona (the ancient AiAdv), a town and seaport of Albania, in the eyalet of Yanina. It stands on an eminence near the Gulf of Avlona, an inlet of the Adriatic, almost surrounded by mountains, The port, which is protected by the island of Sasseno, the ancient Saso, is the best on the Albanian coast. It is visited weekly by Austrian steamers, and carries on considerable intercourse with Brindisi, &c. The town is about a mile and a

half from the sea, and has rather a pleasant appear- ance with its minarets and its palace, surrounded with gardens and olive-groves. The Christian population, of Which a considerable proportion are Italians, is largely engaged in commerce; while the Turks manufacture Woollen stuffs and arms, The material imported into England for tanning, under the name of Valonia, is the pericarp of an acorn produced in the district. Avlona played an important part in the wars between the Normans and the Byzantine empire. In 1464 it was taken by the Ottomans; and after being in Venetian possession in 1690, was restored to them in 1691. In 1851 it suffered severely from an earthquake.

AVOIRDUPOIS, or Averpurors, the name of a system of weights, commonly supposed to be derived from the French, avo du pois, to have weight. The suggested derivation from averer, to verify, seems, however, more probable, averdupois being the earlier form of the word.

of France, in the department of Manche.

Avoirdupois weight is used for all commodities except the precious metals, gems, and medicines. The pound avoir- dupois, which is equal to 7000 grains troy, or 453°54 grammes, is divided into 16 ounces, and the ounce into 16 drams. See WEIGHTS AND MEASURES.

AVOLA, a city on the coast of Sicily, in the province of Syracuse, with 11,912 inhabitants. It manufactures straw-mats, and has trade in wine, grain, oil, honey, &e. ; and there are sugar plantations.

AVON, the name of several rivers in England, Scotland, and France. The word is Celtic, appearing in Welsh as afon, in Manx as aon, aud in Gaelic as abhuinn (pronounced avain), and is radically identical with the Sanskrit ap, water, and the Latin agua and amnis. The root appears more or less disguised in a vast number of river names all over ths Celtic area in Europe. Thus, besides such forms as Evan, Aune, Anne, Ive, Auney, Inney, &c., in the British Islands, we have Aff and Aven in Brittany, Avenza and Avens in Italy, Ava in Portugal, and Avono in Spain; while tho terminal syllable of a large proportion of the French rivers, such as the Sequana, the Matrona, the

Garumna, and so on, seems originally to have been the same word. The names Punjab, Doad, &c., show the root in a clearer shape. (Sce Taylor's Words and Places.) Of the principal Eng- lish rivers of this name in its full form three belong to the basin of the Severn. The Upper or Shakespearean Avon, rising in Northamptonshire, near the battlefield of Naseby, flows through Warwickshire, Worcester, and Gloucester, past Rugby, Warwick, Stratford, and Evesham, and joins the larger river at Tewkesbury; while the Lower Avon has its sources on the borders of Wiltshire, and enters the estuary of the Severn at King's Roads, after passing Malmesbury, Bath, and Bristol. (See Ireland's Upper Avon ; Lewis's Book of English Rivers, 1855.) Tho Middle or Little Avon has its whole course in Gloucester- shire, and reaches the Severn a short distance below tho town of Berkeley. Another river of this name rises in Wilts, and flows past Salisbury to the British Channel. In Scotland one is a tributary of the Clyde, another belongs to the basin of the Forth, and a third joins its waters with the Annan, while an Aven is a confluent of the Spey. In France there are two " Avons" in the system of the Loire, and two in that of the Seine.

AVRANCHES (ancient Abrincate, or Ingena), a town It was an im- portant military station of the Romans, and has in more modern times sustained several sieges, the most noticeable of which was the result of its opposition to Henry IV. It stands on a wooded hill, comnianding a fine view of the bay and rock of St Michel, about three miles distant. At tho foot of the hill flows the river Sée, which at high tide is navigable from the sea. The principal trade is in corn, cider, and salt ; and candles, lace, nails, parchment, leather, &c., are manufactured. Avranches was formerly a bishop's see; and its cathedral, destroyed as insecure in the time of the first French Revolution, was the finest in Normandy. Its site is now occupicd by an open place, called after the celcbrated Huet, bishop of Avranches; and one stone re- mains with an inscription marking it out as the spot where Henry II. received absolution for the murder of A Becket. Saint-Saturnin's church dates from the 13th century, and has a remarkable gateway. The ancient episcopal palace is now used as a museum of antiquities; and an extensive public library is kept in the " mairie." A new cathedral is in course of erection. The agreeable situation and climate of this town make it a favourite residence of English families. Population in 1872, 8137.

AXHOLM, or AxELHouLM, an island in the N.W. part of Lincolnshire, England, formed by the rivers Trent, Idle, and Don. It consists mainly of a plateau of slight elevation,

and comprises the parishes of Althorpe, Belton, Epworth, Haxey, Luddington, Owston, and Crowle; the total area being about 47,000 acres. Ata very early period it would appear to have becn covered with forest ; but this having been in great measure destroyed, it sank into a comparative swamp. In 1627 King Charles I., who was lord of the island, entered into a contract with Cornelius Vermuyden, a Dutchman, for reclaiming the meres and marshes, and rendering them fit for tillage. This undertaking led to the introduction of a large number of Flemish workmen, who settled in the district, and, in spite of the violent measures adopted by the English peasantry to expel them, retained their ground in sufficient numbers to affect the physical appearance and the accent of the inhabitants to this day. Elaborate volumes have been published on the island by Peck (1815), Stonehouse, and Read. (See paper, by E. Peacock, in Anthropological Review, 1870.)

AXIOM, from the Greek dgéiwua, is a word of great import both in general philosophy and in special science ; it also has passed into the language of common life, being applied to any assertion of the truth of which the speaker happens to have a strong conviction, or which is put forward as beyond question. The scientific use of the word is most familiar in mathematics, where it is customary to lay down, under the name of axioms, a number of propositions of which no proof is given or considered necessary, though the reason for such procedure may not be the same in every case, and in the same case may be vari- ously understood by different minds. Thus scientific axioms, mathematical or other, are sometimes held to carry with them an inherent authority or to beself-evident, whercin it is, strictly speaking, implied that they cannot be made the subject of formal proof; sometimes they are held to admit of proof, but not within the particular science in which they are advanced as principles ; while, again, some- times the name of axiom is given to propositions that admit of proof within the science, but so evidently that they may be straightway assumed.

Axioms that are genuine principles, though raised above discussion within the science, are not therefore raised above discussion alto- gether. From the time of Aristotle it has been claimed for general or first philosophy to deal with the principles of special science, and hence have arisen the questions concerning the nature and origin of axioms so much debated among the philosophic schools. Besides, the general philo- sopher himself, having to treat of human knowledge and its conditions as his particular subject-matter, is called to determine the principles of certitude, which, as there can be none higher, must have in a peculiar sense that character of ultimate authority (however explicable) that is ascribed to axioms; and by this name, accordingly, such highest principles of knowledge have long been called. In the case of a word so variously employed there is, perhaps, no better way of understanding its proper signification than by considering it first in the historical light—not to say that there hangs about the origin and early use of the name an obscurity which it is of importance to dispell.

The earliest use of the word in a logical sense appears in the works of Aristotle, though, as will presently be shown, it had probably acquired such a meaning before his time, and only received from him a more exact determination. In his theory of demonstration, set forth in the Posterior Analytics, he gives the name of axiom to that immediate principle of syllogistic reasoning which a learner must bring with him (i. 2, 6); again, axioms are said to be the common principles from which all demonstration takes place—com- mon to all demonstrative sciences, but varying in expression according to the subject-matter of each (i. 10, 4). The principle of all other axioms—the surest of all principles —is that called later the principle of Contradiction, in-

demonstrable itself, and thus fitted to be the ground of all demonstration (Metaph., ili. 2, iv. 3). Aristotle’s fol- lowers, and, later on, the commentators, with glosses of their own, repeat his statements. Thus, according to Themistius (ad Post. Anal.), two species of axioms were distinguished by ‘lheophrastus—one species holding of all things absolutely, as the principle (later known by the name) of Excluded Middle, the other of all things of the same kind, as that the remainders of equals are

equal. These, adds Themistius himself, are, as it were, connate and common to all, and hence their name Axiom ; “for what is put over either all things absolutely or things of one sort universally, we consider to have precedence with respect to them.” The same view of the origin of the name reappears in Boethius’s Latin substitutes for it—dzignitas and maxima (propositio), the latter preserved in the word Maxim, which is often used interchangeably with Axiom. In Aristotle, however, there is no suggestion of such a meaning. Ag the verb d&otv changes its original meaning of deem worthy into think fit, think simply, and also claim or require, it might as well be maintained that dfiwpa— which Aristotle himself employs in its original ethical sense of worth, also in the secondary senses of opinion or dictum (Metaph., iii. 4), and of simple proposition (Topics, viii. 1)—was conferred upon the highest principles of reasoning and science because the teacher might require them to be granted by the learner. In point of fact, later writers, like Proclus and others quoted by him, did attach to Axiom this particular meaning, bringing it into relation with Postulate (airnua), as defined by Aristotle in the Posterior Analytics, or as understood by Euclid in his Elements. It may here be added that the word was used regularly in the sense of bare proposition by the Stoics (Diog. Laert., vii. 65, though Simplicius curiously asserts the contrary, ad Epict. Hnch., c. 58), herein followed in later times by the Ramist logicians, and also, in effect, by Bacon.

That Aristotle did not originate the use of the term axiom in the sense of scientific first principle, is the natural conclusion to be drawn from the reference he makes to ‘“‘ what are called axionis in mathematics” (Metaph., iv. 3). Sir William Hamilton (Note A, Reid’s Works, p. 765) would have it that the reference is to mathematical works of his own now lost, but there is no real ground for such a supposition. ‘True though it be, as Hamilton urges, that the so-called axioms standing at the head of Enclid’s Elements acquired the name through the influence of the Aristotelian philosophy, evidence is not wanting that by the time of Aristotle, a generation or more before Euclid, it was already the habit of geometricians to give definite expression to certain fixed principles as the basis of their science. Aristotle himself is the authority for this asser- tion, when, in his treatise De Calo, iii. 4, he speaks of the advantage of having definite principles of demonstration, and these as few as possible, such as are postulated by

mathematicians (kaOdmep dgotor kat of év rots pabqpacw), who always have their principles limited in kind or num- ber. The passage is decisive on the point of general mathematical usage, and so distinctly suggests the very word axiom in the sense of a principle assumed or postulated, that Aristotle's repeated instance of what he himself calls by the name—If equals be taken from equals, the remainders are equal—can hardly be regarded otherwise than as a citation from recognised mathematical treatises. The conclusion, if warranted, is of no small interest, in view of the famous list of principles set out by Euclid, which has come to be regarded in modern times as the typical specimen of axiomatic foundation for a science.

Euclid, giving systematic form to the elements of geome trical science in the generation after the death of Aristotle,

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propounded, at the beginning of his treatise, under the name of dpor, the definitions with which modern readers are familiar ; under the name of airjara, the three principles of construction now called postulates, together with the three theoretic principles, specially geometrical, now printed as the tenth, eleventh, and twelfth axioins ; finally, under the name of xowal évvorai, or common notions, the series of general assertions concerning equality and inequality, having an application to discrete as well as coutinuous quantity, now printed as the first nine axioms. Now, throughout the lements, there are numerous indications that Euclid could not have been acquainted with the logical doctrines of Aristotle: a most important one has been signalised in the article ANALYsIS, and, in general, it may suffice to point out that Euclid, who is said to have flour- ished at Alexandria from 323 (the year of Aristotle's death) to 283 B.c., lived too early to be affected by Aristotle's work—all the more that he was, by philosophical profession, a Platonist. Yet, although Euclid's disposition of geome- trical principles at the beginning of his Hlements is itself one among the signs of his ignorance of Aristotle's logic, it would seem that he had in view a distinction between his postulates and common notions not unlike the Aristotelian distinction between airjara and d&idpara. All the postulates of Euclid (including the last three so-called axioms) may be brought under Aristotle's description of

airnwara-—principles concerning which the learner has, to begin with, neither belief nor disbelief, Post. Anal., i. 10, 6); being (as De Morgan interprets Euclid's meaning) such as the "reader must grant or seek another system, whatever be his opinion as to the propriety of the assumption." Still closer to the Aristutelian conception of axioms come Kuclid's common notions, as principles "' which there is no question every one will grant" (De Morgan). From this point of view, the composition of Euclid's two lists, as they originally stood, becomes intelligible: be this, however, as it may, there is evidence that his enumeration and division of principles were very early subjected to criticism by his followers with more or less reference to Aristotle's doctrine, Apollonius (250-220 B.c.) is mentioned by Proclus (Com. in Hucl., iii.) as having sought to give demonstrations of the common notions under the name of axioms, Further, according to Proclus, Geminus made the distinction between postulates and axioms which has become the familiar one, that they are indemonstrable principles of construction and demonstration respectively. Proclus himself (412-485 A.D.) practically comes to rest in this distinction, and accordingly extrudes from the list of postulates all but the three received in modern times. 'The list of axioms he reduces to five, striking out as derivative the two that assert in- equality (4th and 5th), also the two that assert equality between the doubles and halves of the same respectively (6th and 7th). Euclid's postulate regarding the equality of right angles and the other assumed in the doctrine of parallel lines, now printed as the 11th and 12th axioms, he holds to be demonstrable: the 10th axiom (regarded as an axiom, not a postulate, by some ancient authorities, and so cited by Proclus himself) —Two straight lines cannot enclose @ space—he refuses to print with the others, as being a special principle of geometry. Thus he restricts the name axiom to such principles of demonstration as are common to the science of quantity generally. These, he then declares, are principles immediate and self-manifest— untaught anticipations whose truth is darkened rather than cleared by attempts to demonstrate them.

The question as to the axiomatic principles, whether of knowledge in general or of special science, remained where it had thus been left by the ancients till modern times, when new advances began to be made in positive scientific Inquiry and a new philosophy took the place of the peri-

patetic system, as it had been continued throueh the Middle Agcs. It was characteristic alike of the philosophic and of the various scientific movements begun by Des- cartes to be guided by a consideration of mathematical method—that method which had led in ancient times to special conclusions of exceptional certainty, and which showed itself, as soon as it was seriously taken up again, more fruitful than ever in new results. ‘To establish philo- sophical and all special truth after the model of mathe- matics became the direct object of the new school of thought and inquiry, and the first step thither consisted in positing principles of immediate certainty whence deduction might procecd. Descartes accordingly devised his criterion of perfect clearness and distinctness of thought for the determination of ultimate objective truth, and his followers, if not himself, adopted the ancient word axiom for the principles which, with the help of the criterion, they proceeded freely to excogitate. About the same time the authority of all general principles began to be considered more explicitly in the light of their origin. Not that ever such consideration had been wholly over- looked, for, on the contrary, Aristotle, in pronouncing the principles of demonstration to be themselves indemon- strable, had suggested, however obscurely, a theory of their development, and his followers, having obscure sayings to interpret, had been left free to take different sides on the question ; but, as undoubtedly the philosophic investiga- tion of knowledge has in the modern period become more and more an inquiry into its genesis, it was inevitable that principles claiming to be axiomatic should have their pretensions scanned from this point of view with closer vision than ever before. Locke it was who, when the Cartesian movement was well advanced, more especially gave this direction to modern philosophic thought, turn- ing attention in particular upon the character of axioms ; nor was his original impulse weakened—rather it was greatly strengthened—by his followers’ substitution of positive psychological research for his method of general criticism. The expressly critical inquiry undertaken by Kant, at however different a level, had a like bearing on the question as to the nature of axiomatic principles; and thus it has come to pass that the chief philosophic interest now attached to them turns upon the point whether or not they have their origin in experience.

It is maintained, on the one hand, that axioms, like other general propositions, result from an elaboration of particular experiences, and that, if they possess an excep- tional certainty, the ground of this is to be sought in the character of the experiences, as that they are exceptionally simple, frequent, and uniform. On the other hand, it is held that the special certainty, amounting, as it does, to positive necessity, is what no experience, under any circum- stances, can explain, but is conditioned by the nature of human reason. More it is hardly possible to assert gene- rally concerning the position of the rival schools of thought, for on each side the representative thinkers differ greatly in the details of their explanation, and there is, moreover, on both sides much difference of opinion as to the scope of the question. 'Thus Kant would limit the application of the name axiom to principles of mathematical science, denying that in philosophy (whether metaphysical or natural), which works with discursive concepts, not with intuitions, there can be any principles immediately certain ; and, as a matter of fact, it is to mathematical principles only that the name is universally accorded in the language of special science—not generally, in spite of Newton's lead, to the laws of motion, and hardly ever to scientific principles of more special range like the atomic theory. Other thinkers, however, notably Leibnitz, lay stress on the ultimate prin- ciples of all thinking as the only true axioms, and would

contend for the possibility of reducing to these (with the help of definitions) the special principles of mathematics, commonly allowed to pass and do duty as axiomatic. Still others apply the name equally and in the same sense to the general principles of thought and to some principles of special science. In view of such differences of opinion as to the actual matter in question, it Is not to be expected that there should be agreement as to the marks character- istic of axioms, nor surprising that agreement, where it appears to exist, should often be only verbal. The charac- ter of uecessity, for example, so much relied upon for ex- cluding the possibility of an experiential origin, may either, as by Kant, be carefully limited to that which can be claimed for propositions that are at the same time syn- thetic, or may be vaguely taken (as too frequently by Leibnitz) to cover necessity of mere logical implication— the necessity of analytic, including identical,

propositions— which Kant allowed to be quite consistent with origin in experience. The question being so perplexed, no other course seems open than to try to determine the nature of axioms mainly upon such instances as are, at least practically, admitted by all, and these are mathematical principles.

That propositions with an exceptional character of certainty are assumed in mathematical science is notorious ; that such propositions must be assumed as principles of the science, if it is to be at once general and demonstrative, is now conceded even by extreme experientialists ; while it is, farther, universally held that it is the exceptional character of the subject-matter of mathematics that renders possible such determinate assumption. What the actual principles to be assumed are, has, indeed, always been more or less disputed ; but this is a point of secondary importance, since it is possible from different sets of assumption to arrive at results practically the same. The particular list of proposi- tions passing current in modern times as Euclid's axioms, like his original list of common notions, is open to objection, not so much for mixing up assertions not equally underiva- tive (as the ancient critics remarked), but for including two—the 8th and 9th—which are unlike all the others in being mere definitions (viz., of equals and of whole or part). Being intended as a body of principles of geometry in particular within the general science of mathematics, the modern list is not open to exception in that it adds to the pro- positions of general mathematical import, forming Euclid's original list, others specially geometrical, provided the addi- tions made are sufficient for the purpose. It does, in any case, contain what may be taken as good representative in- stances of mathematical axioms both general aud special; for example, the Ist, Things equal to the same are equal to one another, applicable to all quantity; aud the 10th, Two straight lines cannot enclose a space, specially geometrical. (The latter has been regarded by some writers as either a mere definition of straight lines, or as contained by direct implication in the definition ; but incorrectly. If it is held to be a definition, nothing is too complex to be so called, and the very meaning of a definition asa principle of science is abandoned ; while, if it is held to be a logical implication of the definition, the whole science of geometry may as well be pronounced a congeries of analytic propositions. When straight line is strictly defined, the assertion is clearly seen to be synthetic.) Now of such propositions as the

two Just quoted it is commonly said that they are self-evident, that they are seen to be true as soon as stated, that their opposites are inconceivabie ; and the expressions are not too strong as descriptive of the peculiar certainty pertaining to them. Nothing, however, is thereby settled as to the ground of the certainty, which is the real point in dispute between the experiential and rational schools, as these have become determinately opposed since the time and

mainly through the influence of Kant. Such axioms, according to Kant, being necessary as well as synthetic, cannot be got from experience, but depend on the nature of the knowing faculty ; being immediately synthetic, they are not thought discursively but apprehended by way of direct intuition. According to the. experieutialists, as represented by J. 8. Mill, they are, for all their certainty, inductive generalisations from particular experiences ; only the experiences are peculiar (as already said) in being extremely simple and uniform, while the experience of space—Mill does not urge the like point as regards number —is farther to be distinguished from common physical experience in that it supplies matter for induction no less in the imaginative (represeutative) than in the presentative form, Mill thus agrees with Kant on a vital point in holding the axioms to be synthetic propositions, but takes little or no account of that which, in Kant's eyes, is their distinctive characteristic—their validity as universal truths in the guise of direct intuitions or singular acts of percep- tion, presentative or representative. The synthesis of subject and predicate, thus universally valid though imme- diately effected, Kant explains by supposing the singular presentation or representation to be wholly determined from within through the mind's spontaneous act, instead of being received as sensible experience from without ; to speak more precisely, he refers the apprehension of quantity, whether continuous or discrete, to " productive imagina- tion," and regards it always as a pure mental construction. Mill, who supposes all experience alike to be passively received, or, at all events, makes no distinction in point of original apprehension between quantity and physical quali- ties, fails to explain what must be allowed as the specific character of mathematical axioms. Our conviction of their truth cannot be said to depend upon the amount of support: ing experience, for increased experience

(which is all that Mill secures and secures only for figured magnitude, without psychological reason given) does not make it stronger ; and, if they are conceded on being merely stated, which, unless they are held to be analytic propost- tions, amounts to their being granted upon direct inspection of a particular case, it can be only because the case, so decisive, is made and not found—is constituted or con- structed by ourselves, as Kant maintains, with the guarantee for uniformity and adequacy which direct construction alone gives. Still it does not therefore follow that the construe- tion whereby synthesis of subject and predicate is directly thade is of the nature described by Kant—due to the activity of the pure ego, opposed to the very notion of sensible experience, and absolutely a priort. As we have a natural psychological experience of sensations passively received through bodily organs, we also have what is not less a natural psychological experience of motor activity exerted through the muscular system. Only by muscular movements, of which we are conscious in the act of perform- ing them, have we perception of objects as extended and figured, and in itself the activity of the describing and circumscribing movements is as much matter of experience as is the accompanying content of passive sensation, At the same time, the conditions of the active exertion and of the passive affection are profoundly different. While, in objective perception, within the same or similar movements, the content of passive sensation may indefinitely vary beyond any control of ours, it is at all times in our power to describe forms by actual movement with or without a content of sensation, still more by represented or imagined movement. Our knowledge of the physical qualities of objects thus becomes a reproduction of our manl- fold sensible experience, as this in its variety can alone be reproduced, by way of general concepts ; our knowledge of their mathematical attributes is, first

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and last, an act of conscious production or construction. It is manifestly so, as movement actual or imaginary, in the case of magnitude or continuous quantity ; nor is it otherwise in the case of number or discrete quantity, when the units are objects (points or anything else) standing apart from each other in space. When the units are not objects presented to the senses or represented as coexistent in space, but are mere subjective occurrences

succeeding each other in time, the numerical synthesis, doubtless, proceeds differently, but it is still an act of construction, dependent on the power we have of voluntarily determining the flow of subjective consciousness, Thus acting constructively in our experience both of number and form, we, in a manner, make the ultimate relations of both to be what for us they must be in all circumstances, and such relations when expressed are truly axiomatic in every sense that has been ascribed to the name.

Beyond the mathematical principles which may be thus accounted for, there are, as was before remarked, no other principles of special science to which the name of axiom is uniformly applied. It may now be understood why the name should be withheld from such a fundamental generalisation as the atomic theory in chemistry, even when we have become so familiar with the facts as to seem to see clearly that the various kinds of matter must combine with each other regularly in definite proportions : the proposition answers to no iutuition or direct apprehen- sion. At most could it be called axiomatic in the sense, of course applicable to mathematical principles also, that it is assumed as true in the body of science compacted by means of it. The laws of motion, however, formulated by Newton as principles of general physics, not only were called by him axiomatic in this latter sense, but have been given out by others since his time as propositions intuitively certain ; and, though it cannot seriously be pretended that there is the same case for ascribing to them the character of a prior truths, there must be some reason why the name of axiom in the full sense has been claimed for them alone by the side of the mathematical principles. The a priori character, it is clear, can only in a peculiar sense be claimed for truths which all the genius of the ancients failed to grasp, and which were established in far later times as inductions from actual experiments; Newton, certainly, in calling them axioms, by no means claimed for them aught but an experiential origin. On the other hand, it must be conceded that motion as an experience has in it a character of simplicity, like that belonging to number and form, consisting mainly in a clear apprehension of the circumstances under which the phenomenon varies, while, agai, such apprehension is conditioned by the psychological nature of the experience, namely, that it is one depending on activity of our own which we can control, and does not come to us as bare passive affection which we must take as we find it. We do in truth make or constitute motion, as we construct number and space ; moving, as we

please, without external occasion, and, when apprehending objective movements, following these with conscious motions of our members. Notwithstanding, our proper motions far less adequately correspond to the reality of external motions than do our subjective constructions of space and number answer to the reality of things figured and numbered. With limited store of nervous energy and muscles of con- fined sweep, we cannot execute at all such continued unvarying movements as occur, at least approximately, in nature ; we cannot, by any such combinations of movements as we are able to make, determine beforehand the result of such complex motions as nature in endless variety exhibits 3 Nor, again, can we with any accuracy appreciate the relation between action and reaction by opposing our muscular organs to one another. We must wait long upon

experience that comes to us, or rather, in face of the objective complexity presented by nature, sally forth to niake varied experiments with moving things, and there- upon generalise, before anything can be determined posi- tively respecting motion. Thisis precisely what inquirers, until about the time of Galileo, were by no means content to do, and they had accordingly laws of motion which were, indeed, devised a priori, but which were not objectively true. Since the time of Galileo true, or at least effective, laws of motion have been established inductively, like all other physical laws ; only it is more easy than in the case of the others, which are less simple, to come near to an adequate subjective construction of them, and hence the claim sometimes set up for them to be in fact a priort and in the full sense axiomatic.

Jt remains to inquire in what sense the general principles of all knowledge or principles of certitude may be called, as they often are called, axioms. The laws of Contradiction and of Iuxcluded Middle, noted though not named by Aristotle, together with that formulated as the law of Identity, presupposed as they are in all consistent thinking, have, with a character of widest generality, also a character of extrenie simplicity, and may fitly be denominated axioms in the sense of immediate principles. They stand, however, as pure logical principles, apart from all others, being wholly formal, without a shade of material content. There can be no question,

therefore, of their certainty being guaranteed by a direct intuition, valid for all cases because fully representative of all; as little does there appear valid ground for calling them, in the proper sense, inductive generalisations from experience. They may rather be held to admit only of the kind of proof that Aristotle calls dialectical: whoever denies them will find that he cannot

-argue at all or be argued with; he cuts himself off from all

part in rational discourse, and is no better, as Aristotle forcibly expresses it, than a plant. The like position of being postulated as the condition of making progress belongs to the very different principle or principles (which may, however, be called logical, in the wider sense) implied in the establishment of truth of fact, more particularly the inductive investigation of nature. Whether expressed in the form of a principle of Sufficient Reason, as by Leibnitz, or, as is now more common, in the form of a principle of Uniformity of Nature, with or without a pendant principle of Causality for the special class of uniformities of succession, some assumption is indispensable for kuitting together into general truths the discrete and particular elements of experience. Such postulates must be declared to have an experiential origin rather than to be a priort principles, but experience may more truly be said to suggest them than to be their ground or foundation, since they are themselves the ground, express or implied, of all ordered experience. Their case is perhaps best met by pronouncing them hypothetical principles, and as there are no axioms—not even those of mathematics—that are thought of without reference to their proved efficiency as principles leading to definite conclusions, they may be called axiomatic on account of their extreme generality, however little they possess the character of immediacy.

The name axiom, at the end of the inquiry, is thus left undeniably equivocal, and it clearly behoves those who employ it, whethér in philosophy or science, always to make plain in what sense it is meant to be taken. Before closing, it is, perhaps, necessary to add why, in dealing with the question of origin, no account has been taken of the doctrine of evolution which has become so promi- nent in the latest scientific and philosophical speculation. From the point of view of the present article, that doc- trine has only an

indirect bearing on the inquiry. If the conditions of experience as they are found in the

individual suffice to explain the different assurance with which general assertions are made in different de- partments of knowlege, there is no nced to carry the psychological consideration farther back. The effect of such difference in the conditions of experience may, of course, be accumulated in the life of the race, and the accumulation may go far to determine the psychological history of the individual, but the question, as a rational one, must be decided upon analysis of the conditions as they are. (a. © R.)

AXMINSTER, a market-town of England, in the county of Devon, 147 miles from London, and 24 from Exeter. It takes its name from the River Axe, on which it stands. The ancient abbey-church, or minster, which adorns the centre of the town, was built by King Athelstan to com- memorate a victory over the Danes. The town was formerly distinguished for its production of the best and most costly description of carpets; and it still manufac- tures broad and narrow cloths, cotton, leather, gloves, tapes, and druggets. Dr Buckland was a native of the town. Population of the parish in 1871, 286].

AXUM, an ancient city of Abyssinia, 85 miles N.W. of Antalo, still remarkable for its ruins. It was for a long time the capital of a great Shemitic people, who extended their sway over a large part of Abyssinia ; and the language spoken there at the time of the introduction of Christianity has continued to be the ecclesiastical language ever since. The chronicles of Abyssinia were preserved in the church, and are frequently referred to as the Books of Axum. The most interesting of the monuments still extant are the obelisk and the so-called coronation-room, both constructed of granite, and the latter containing some valuable bilingual inscriptions. In the modern town, which is the capital of the kingdom of Tigré, the weaving of cotton and manufac- ture of parchment are carried on. (See Salt’s Z’ravels, and Schimper in Zeztsch. der Ges. Erdk., Berlin, 1869.)

AYAMONTE, a fortified city of Spain, in the province of Huelva, on the left bank of the Guadiana, about 2 miles from its mouth, The harbour is good, but, on account of a bar at its mouth, it is of difficult entrance. The principal employment of the inhabitants is afforded by the fisheries, especially for sardines, tunny, cod, and horse-mackerel ; but this branch of industry has suffered by the extension of the general coasting traffic. Silk-weaving is carried on. Ayamonte is said to have had in the 16th century 16,000 inhabitants. Population, 5960.

AYLESBURY, a market-town, parliamentary borough, and railway junction, in the county of Buckingham, 39 miles N.W. of London. It stands ona gentle eminence in the centre of a fertile vale, and consists of several streets and lances irregularly built, but well paved and lighted. The county-hall, market-house, and county gaol are hand- some buildings, as is also the parish church, an ancient structure with a tower rising from the centre. It has a free grammar-school (1611), several other schools and charities, a corn-exchange (1865), three banks, a savings bank, an infirmary (1833), a union workhouse, and places of public worship for Roman Catholics, Methodists, Baptists, Independents, &c. It returns two members to parliament. The assizes and quarter sessions and the elections of mem- bers for the county are held here. The inhabitants are prin- cipally employcd in the manufacture of bonelace and straw- plaiting, besides the rearing of ducks, which are sent in large quantities to the London market at Christmas. A branch canal, six miles in length, connects Aylesbury with the Grand Junction Canal. Population of parliamentary borough in 1871, 28,760.

AYLESFORD, a village of England, in the county of Kent, 34 miles from Maidstone, and 32 from London. Tt stands at the base of a hill on the right bank of the

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Medway, which is here crossed by a stone bridge of six arches. The church stands on an eminence behind the village. Ata short distance to the W. was a Carmelite friary, founded in 1240, the remains of which now form a part of

the family mansion of the earl of Aylesford, The vicinity exhibits several remains of antiquity, among which is, or rather was, for it is grievously destroyed, a cromlech called Kit's Coity House, about a mile N.E. from the village. This is supposed by Mr Fergusson, in accord- ance with tradition, to mark the burial-place of Catigern, who was slain here in a battle between the Britons and Saxons in 455 a.p. The tomb of Horsa, who fell in the same battle, is situated at Horsted, about 2 miles to the N, Near Aylesford, too, are other remains, known as the Count- less Stones. Population of parish in 1871, 2100.

AYLMER, Joun, Bishop of London in the reign of (Jueen Elizabeth, was born in the year 1521 at Aylmer- hall, in the parish of Tilney, in the county of Norfolk. Whilst a boy, he was noticed for his precocity by the marquis of Dorset, afterwards duke of Suffolk, who sent him to the university of Cambridge. He afterwards procceded to Oxford, where he completed his studies and took his degree in divinity. He was then made chaplain to the duke and tutor to his daughter, the accomplished and unfortunate Lady Jane Grey, whose extraordinary proficiency in the Greek and Latin languages reflects no small honour on her preceptor. His first preferment was to the archdeaconry of Stow, in the diocese of Lincoln, which gave him a seat in the Convocation held in the first year of Queen Mary, where he resolutely opposed the return to Popery, to which the generality of the clergy were inclined. He was soon after obliged to fly his country, and take shelter among the Protestants in Switzerland. While there he wrote a reply to Knox's famous Blast against the Monstrous Regiment of Women, under the title of An Harborowe for Faithfull and Trewe Subjects, &c. On the accession of Qucen Elizabeth he returned to England. In 1562 he obtained the arch- deaconry of Lincoln, and was a member of the famous synod of that year, which reformed and settled the doctrine and discipline of the Church of England. In 1576 he was consecrated bishop of London, and while in that position made himself notorious by the harsh manner in which he insisted on the Act of Uniformity. His persecution of the Puritans, and of any clergymen suspected of Puritanical leanings, with the extreme measures he used, made him unpopular even with his own party. He is frequently assailed in the famous Aarprelate Tracts, and is char- acterised as Morrell, the bad shepherd, in Spenser's Shephearde's Calendar. He seems to have been a man of harsh and violent temper, coarse, and avaricious, and with

few redeeming qualities. He is said to have been an able scholar, but he has left nothing which could prove this. He died in 1594. (Strype, Life and Actions of John Aylmer, Bishop of London.)

AYR, County oF, or AYRSHIRE, a Scottish county, bounded by Wigtownshire and the stewartry of Kirkcud- bright on the S. ; by Kirkcudbright, Dumfries, and Lanark on the E.; and by Renfrewshire on the N. On the W. it has a coast line extending to 70 miles on the Irish Sea and the Firth of Clyde. The county contains 1149 square miles, or 735,262 acres. The middle part, which is the broadest, is about 26 miles across, There are six rivers of some note in Ayrshire—Stinchar, Girvan, Doon, Ayr, Irvine, and Garnock. Of these the Ayr, from which the county and county town take their name, is the largest. It rises at Glenbuck, on the border of Lanarkshire, and, after a course of 33 miles, falls into the Firth of Clyde at the county town. The scenery along its banks from Sorn downwards—passing Catrine, Ballochmyle, Barskim-

ming, Sundrum, Auchencruive, and Craigie—is varied and beautiful. ‘The lesser streams are numerous; and there are many fresh-water lochs, the largest of which is Loch Doon, the source of the river Doon. The southern and eastern parts of the county are hilly, but none of the peaks reaches a height of 2000 feet. In former times the shire was divided into three districts —Carrick, south of the Doon; Kyle, between the Doon and the Irvine ; and Cun- ningham, north of the Irvine. Kyle, again, was divided by the river Ayr into King’s Kyle on the south, and Kyle Stewart on the north. The county is now politically divided into south and north Ayrshire. The former com- prises Kyle and Carrick, and the latter Cunningham, and each division returns a representative to Parliament. The old divisions, however are still popularly retained. The greater part of Carrick is hilly, and fit only for sheep-walks. The uplands of Kyle are also extensive, but there is a larger proportion of good low-country land in that district. Cunningham is comparatively level, and has a great exteut of rich land, though rather heavy in its character. The scenery is not grand in any part of the county, but much of it is picturesque and beautiful. From many of the heights a rich, undulating, well-wooded country may be seen, with the Bay of Ayr, or the

Firth of Clyde beyond, and the lofty peaks of Arran, or the Argyllshire hills, in the distance.

There has been no lack of agricultural enterprise in Ayr- shire With a moist climate, and, generally, a rather heavy soil, draining was necessary for the successful growth of green crops. Up till 1840, or a few years later, a green crop in the rotation was seldom seen, except on porous river-side land, or on the lighter farms of the lower districts. In the early part of the ccntury lime was a powerful auxiliary in the inland districts, but, with repeated applica- tions, it gradually became of little avail. Thorough drain- ing gave the next great impulse to agriculture. Enough had been done to test its efficacy previous to the announce- ment of Sir Robert Peel's drainage loan, after which it was rapidly extended throughout the county. Green-crop husbandry, and the liberal use of guano and other auxiliary manures, made a wonderful change on the face of the county, and increased immensely the amount of agricultural produce. Early potatoes are now extensively grown in some localities. The farmers on the coast lands of Girvan and West Kilbride are first in the market, and the next supplies come from the friable lands about Ayr and St Quivox. A considerable extent of ground is cleared in June for the Glasgow market ; and, in dropping seasons, good crops of turnips follow. Atthe end of July and the beginning of August, great quantities of potatoes are sent to Newcastle, and to the large towns of Lancashire and the West Riding. The mild climate of the Ayrshire coast in spring is favour- able to this kind of cropping, which brings quick returns, and on the whole is profitable. Carrots and mangolds are cultivated more extensively than in any other Scotch county, and, with early sowing and rich manuring, heavy crops are raised. Wheat generally follows green crops in the lower parts of the county, though barley is coming more into use than in former times on light land. The border line for wheat may be drawn at a little over 300 feet ; above that height its growth is exceptional. The dairy forms an important department of farm manage- ment in Ayrshire. Dunlop cheese was a well-known pro- duct of Ayrshire dairies a quarter of a century ago. Part of it was very good; but it was unequal in its general character, and unsaleable in English markets. Dissatisfied with the inferior commercial value of their cheese in com- parison with some English varieties, the Ayrshire Agri- cultural Association brought a Somerset farrner and his wife in 1855 to teach the Cheddar method, and thcir

effort has been most successful. Cheddar cheese of first rate quality is now made in Ayrshire and Galloway, and the annual cheese show at Kilmarnock is the most im- portant in the kingdom. The cheese may be more thoroughly fine in a few Somerset dairies, but the aver- age quality of Scotch Cheddar is higher than the English. This great change of an industrial art has brought wealth to the county. It is not too much to say that it has added £2 per cow to the annual value of dairy produce, and there are 45,000 cows in Ayrshire.

The manufactures of Ayrshire have attained considerable importance. The cotton works at Catrine are extensive, and have been a long time established. The site was chosen with the view of utilising the water power of the river Ayr, and steam is still merely an auxiliary. At Kilmar- nock and Ayr there are extensive engineering establish- ments, and large carpet works; and other fabrics are manufactured in those towns and at Dalry, Kilbirnic, Beith, and Stewarton. Until the last three or four years, Irvine was a back-going place, but it has received an impulse from the erection of large chemical works. The situation is very suitable for chemical manufactures, as the soil is poor and sandy, and the liquid refuse of chemical works is easily carried into the sea, without causing the nuisance which is inevitable in a large town. The Eglinton Chemical Com- pany are most extensive manufacturers of bichromate of potash—a substance which is used at dyeworks as an oxidising agent ; and another company is largely engaged in the alkali trade, and in the extraction of copper from burnt pyrites ore. On the coast, between Irvine and Ardrossan, works have been erectcd on the sandhills for the manufacture of dynamite, which is now well known as one of the most powerful explosive agents. It is much used for blasting under water, and large quantities of it are sent to America for blowing up the roots of trees in the reclamation of land.

The iron trade of Ayrshire has risen to great import- ance. The manufacture has long been carried on at Muir- kirk, although the iron had to be carted long distances to Ayr and Glasgow before the introduction of railways. Immense fields of ironstone have been opened up within the last quarter of acentury; and there are now 33 furnaces in blast within the county, producing about 330,000 tons per annum. The works are all connected with

the Glasgow and South-Western Railway. The whole manufacture of iron in Ayrshire is in the hands of three great companies, namely, William Baird & Com- pany, the Dalmellington Iron Company, and Merry & Cunningham. Hematite of good quality is raised in Sorn and Muirkirk, and discoveries of it have been made in Carrick. The coal-fields are of great extent, and limestone exists in large quantities. A valuable whetstone quarry is worked at Bridge of Stair on the Ayr.

The old harbours of the county were at Ayr, Irvine, and Saltcoats. The latter is now neglected, and its place is supplied by the more important harbour of Ardrossan. The works at Ardrossan were carried through by the private enterprise of the last two earls of Eglinton. They were begun in the early part of this century, with the expecta- tion of making Ardrossan an important shipping port for Glasgow, in connection with a canal, which, however, was never carried further than from Glasgow to Johnstone. The works were designed by Telford. The pier was finished in 1811, and the docks were completed by the late earl. The harbour of Troon was likewise the work of an enterprising nobleman. It was formed by the late duke of Portland, who connected it with Kilmarnock by a rail- way, which was among the earliest in the couutry. Troon has an extensive shipping business, as the outlet for the great coal-fields of the Kilmarnock district. Acts of parlia-

ment have been obtained, which sanction harbour improve- ments at Irvine and Girvan, and a large wet-dock is in course of formation at Ayr. The dock at Ayr is important, as Ayr is the natural outlet for the great coal-fields up the river, and for the ironworks at Dalmellington, Lugar, and Muirkirk, as well as the fields which are being developed on the railways, called the Ayrshire lines, between Cum- nock and the river Doon.

The Glasgow, Kilinarnock, and Ayr Railway was parti- ally opened in 1840, and soon after completed. A con- nection was made a few years later from the Ayr line at Kilwinning to Ardrossan, and an extension from Kilmar- nock to Cumnock, with a branch to Muirkirk. Extensions followed from Cumnock to Dumfries and Carlisle, and from Ayr to Dalmellington, and to

Maybole and Girvan ; and the Troon Railway was acquired from the duke of

Portland, as a connecting link of what is now the Glasgow |

and South-Western Railway system. Other important branches have been made, and a trunk line is now in course of formation between Girvan and Stranraer, which will give a connection between Glasgow and Ayrshire and the north of Ireland by the shortest sea passage. Ayr- shire is thus well supplied with railways.

The antiquities of Ayrshire are not of much note. There are cairns in Galston, Sorn, and other localities ; a road, supposed to be a work of the Romans, which extended from Ayr, through Dalrymple and Dalmellington, towards the Solway; camps, attributed to the Norwegians or Danes, on the hills of Knockgeorgan and Dundonald ; and the castles of Loch Doon, Turnberry, Dundonald, Porten- cross, Ardrossan, &c. ‘There are interesting remains of the celebrated abbeys of Kilwinning and Crossraguel ; and the ruins of the little church of Alloway, amid the lovely scenery near the birthplace of Burns, have become more famous from their associations than many great works of architectural genius,

The rural population of Ayrshire is decreasing, but the mining population has increased, and the towns are grow- ing. At the last census there were 27,132 inhabited houses, and the population reached 200,745. The county valuation last year amounted to £1,178,183, 5s. 10d., being an increase of more than £50,000 from the previous year. The amount for Kyle was £446,874, 18s. 5d.; for Cunningham, £411,504, 1s. 6d.; for Carrick, £177,168, 10s. 3d.; for the burgh of Ayr, £63,273, 16s. 6d.; for Kil- marnock, £63,202, 19s.; and for Irvine, £16,159, Os. 2d.

Ayr, the capital of the above county, is situated at the mouth of the river of the same name, and about 40 iniles 8.S.W. from Glasgow The spot has probably been inhabited from a remote antiquity. Nothing, however, is known of its history till the close of the 13th century, when it was made a royal residence, and soon afterwards a royal burgh, by William the Lion. The charter con- ferring upon it the latter privilege has been preserved, of which a fac-simile will be found in vol. i. of the National Manuscripts of

Scotland. During the wars of Scottish independence the possession of Ayr and its castle was, according to tradition, an object of importance to both the contending parties. In Blind Harry's Life of Wallace they are frequently mentioned, and the scene is laid there of one of the patriot's greatest exploits; but the authen- ticity of many of the minstrel-historian's statements is more than doubtful. On better authority, the records of the burgh, it is known that early in the 16th century Ayr was a place of considerable influence and trade. The liberality of William the Lion had bestowed upon the cor- poration an extensive grant of lands; while in addition to the well-endowed church of St John's, it had two monas- teries, each possessed of a fair revenue. When Scotland was overrun by Oliver Cromwell, Ayr was selected as the

site of one of those forts which he built to command the country. This fortification, termed the citadel, enclosed an area of ten or twelve acres, and included within its limits the church of St John's, in which the Scottish Parlia- ment on one occasion met, and confirmed the title of Robert Bruce to the throne. into a storehouse, the Protector partly indemnifying the

The church was converted

inhabitants for this seizure by liberally contributing

towards the erection of a new place of worship, now known as the Old Church. Ayr proper lies on the south bank of the river, and is connected with Newton and Wallacetown on the north by two bridges, the Old and

the New, the " Twa Brigs" of Burns. Of late years the town has extended greatly on the Ayr side of the stream, Nearly the whole of Cromwell's Fort is now covered with

houses, and to the south, in the direction of the race-

course, numerous fine villas have been erected. Ayr possesses several good streets and a number of elegant public and other edifices. The County Buildings, which afford accommodation for the circuit and provincial

courts, as well as for the various local authorities, occupy the west side of Wellington Square. Contiguous to these is the jail, a well-regulated establishment, partly used as a penitentiary. The Town's Buildings, near the New Bridge, is a handsome erection, the effect of which is somewhat impaired by the lowness of the site. They contain assembly rooms and a reading-room, and are surmounted by a spire 217 feet high, designed by Hamilton, of Edin- burgh, and considered by many the finest in the west of Scotland. All the Edinburgh and Glasgow banks have branches in Ayr, and some of them have built ornamental structures for their accommodation. Besides the old church already mentioned, there is another parish church called the New, and a number of dissenting places of worship, none of them, however, noteworthy on account of their architecture. The Academy, a large building in a convenient position, includes, or has superseded, the Grammar School of the burgh, the existence of which can be traced back as far as the 13th century. A portion of the tower of St John's Church still remains, but, to the regret of the antiquary, has been completely modernised. The "Wallace Tower" is a Gothic structure in High Street, erected on the site of an old building of the same name taken down in 1835. A niche in front is filled bya statue of the Scottish hero by Thom, a self-taught sculptor, who executed in a much more successful manner the statues of Tam o' Shanter and Souter Johunie, now in the grounds of Burns' Monument. Ayr Hospital is a plain but substantial erection near the Townhead railway station. There are two subscription libraries in the town, and it also supports one weekly and one bi-weekly news- paper. Its religious and charitable societies are numerous. A market is held every Tuesday, and there are five yearly fairs. The Western Meeting takes place in September of every year on Ayr racecourse, a large enclosure in the suburbs, which has been reserved for this purpose for more than a century. Alloway Kirk and Burns' Monument are distant 24 miles. The principal manufactures of Ayr are leather, carpets, woollen goods, &c.; and fisheries and shipbuilding are also carried on to a small extent. There are several foundries and engineering establishments. Ayr has a general trade of considerable value. Large quan- tities of timber are imported from Canada and from Norway ; coal and iron are the chief exports, The har bour occupies both sides of the river from the New Bridge to the sea, and has been built at a very considerable ex- pense in a most substantial manner. The south pier projects some distance into the sea ; on the north side is @ large breakwater

protecting the entrance, and on the north pier are three lights, two bright and one red from 12 to

35 feet above high water. The depth of water at the bar is about 14 feet at neap and 16 at spring tides. Ex- tensive docks are in the course of formation, which are ex- pected to increase largely the importance of the place as a seaport. Railways converge upon Ayr from the north, east, and south, opening up a connection with all parts of the country. The burgh unites with Irvine, Inveraray, Campbel- town, and Oban in returning a member to Parliament. Pre- vious to 1873, its municipal boundary on the north was the river, but an Act of Parliament was obtained in that year by which this boundary was extended so as to include Newton-on-Ayr and Wallacetown, and made the same as that of the parliamentary burgh. ‘The corporation of Ayr consists of a provost and four bailies, and twelve town councillors. In 1871 the population of the extended burgh was 17,851. Though thus conjoined with Ayr for the parliamentary franchise and municipal government, and forming with it in reality but one town, Newton and Wallacetown were formerly each quite separate. The for- mer is a burgh or barony of very ancient erection. The original charter has been lost ; but it is traditionally said to have been granted by King Robert the Bruce in favour of forty-eight of the inhabitants who had distinguished themselves at Bannockburn. Be this as it may, the com- mon property of the burgh is held to be the exclusive property of the freemen, forty-eight in number. The extent of the lots possessed by each varies from six to ten acres, and their value is considerable. Newton has a council, consisting of two bailies, a treasurer, and six coun- cillors, annually elected by the freemen from among their own number; but the powers of the council, though originally extensive, are now very limited. Wallacetown is qguoad cwilia @ part of the neighbouring parish of St Quivox. About two miles east of Newton is the village of Prest- wick, the headquarters of one of the most flourishing golf clubs in Scotland.

AYRER, Jacos, one of the earliest dramatists of Ger- many, was born in 1560, probably at Nuremberg,—at least he resided there when a mere boy. His first occupation was keeping an iron-store, which he did with

considerable success, After studying law for some time at Bamberg, where he attained a good position as a lawyer, he returned to Nuremberg, and continued to practise there, acquiring the freedom of the city in 1594, and ultimately becoming an imperial notary. He died 26th March 1605. Ayrer's works consist of numerous small poems, and of the series of dramas on which his fame rests. Like other dramas of the time, his productions are, for the most part, spec- tacular displays, with laboured dialogue, and vary in length from five to twenty-eight acts. The plots are Plainly taken from the Latin and Italian tales which supplied material to nearly all the early European drama- tists. The chief interest of Ayrer's works for English readers arise from their connection with Shakespeare, Ayrer adopted several of Shakespeare's plots, as well as his method of representing the characters on the puise after life, "and so produced," says his editor,

according to the new English manner and art, that all can be personally acted and placed so that it shall seem to the spectators to be really happening." In Ayrer's time the dramatic spirit in England was strong, and good Plays and players abounded. Some of the latter took circuits through Germany, and though performing in their native tongue, excited enthusiasm by their vivacity. Ayrer caught this enthusiasm, and adapted several of the English dramas to the German stage. The Opus Theatri- cum, In one folio volume of 1262 pages, was published i in 1618. It contained thirty plays and sai a een interludes, A second volume to contain

» though promised, did not appear. Of the

comedies and tragedies of Ayrer, six have been reproduced with an English translation in Cohn's Shakespeare in Germany. These contain respectively plots resembling Lhe Tempest, Much Ado about Nothing, The Two Gentle- men of Verona, Titus Andronicus, Romeo and Juliet, and ffamlet. In 1601, a comic prose work by Ayrer was published, giving an account of an Imaginary Suit of the Devil against Jesus Christ for Destroying Hell. Some of his plays were published prior to 1585, but these are not now to be had, and even the folio of 1618 is extremely rare. Further information about Ayrer may be gained from Tieck's Deutsches Theater, vol. i. ; Wolff's Encyc. der Deutschen Nationalliteratur, vol. i.; Cohn's Shakespeare in

Germany ; Dr Bell’s Shakespeare’s Puck, and his Folk- lore; Dr Latham’s Z’wo Dissertations on “ Hamlet ;” W. J. Thom’s Three Notelets on Shakespeare.

AYTON, Str Roperr (1570-1638), a Scottish lyrical poet, the second son of Andrew Ayton of Kinaldie in Fife- shire, was educated at the University of St Andrews, and seems afterwards to have resided for several years in France, where he gained considerable reputation as a poet and scholar. On the accession of James VI. in 1603, Ayton published a very elegant Latin panegyric, which at once brought him into notice and favour at court. He was knighted by the king, and held various important offices, particularly that of private secretary to the queen. He was of an exceedingly amiable disposition, and was much beloved by his contemporaries; even Ben Jonson, who criticised all other poets so severely, seems to have made an exception in his favour, for he told Drummond that Sir Robert loved him dearly. Ayton’s extant works consist of some Latin poems, and of a few pieces in the English dialect, which are distinguished by smoothness of rhythm and delicacy of fancy. His best ode, Inconstancy Reproved, beginning, “TI do confess thou’rt smooth and fair,” may take rank with the finest pieces of Herrick or Suckling, while a few others are but little inferior. His poems have been collected and published by Sir C. Roger (Edin. 1844).

AYTOUN, Wittiam EpmonstToung, a Scottish poet, humourist, and miscellaneous writer, was born at Edin- burgh, 21st June 1813. He was the only son of Roger Aytoun, a writer to the Signet, and the family was of the same stock as Sir Robert Ayton noticed above. From his mother, a woman of marked originality of character and considerable culture, he derived his distinctive qualities, his early tastes in literature, and his political sympathies, his love for ballad poetry, and his admiration for the Stuarts. At the age of eleven he was sent to the Edin- burgh Academy, whence he passed in due time to the University, studied the classics under Professors Pillans and Dunbar, and attended the course of Professor John Wilson on Moral Philosophy. In 1833 he spent a few months in London for the purpose of studying the law; but in September of that year he went to study German at Aschaffenburg, where he remained till April 1834. He then resumed his legal pursuits in his father’s chambers, was admitted a writer to

the Signet in 1835, and five years later was called to the Scottish bar. But, by his own confession, though he “ followed the law, he never could overtake it.” He disliked his profession, and allowed his literary tastes to predominate. His first publication—a volume entitled Poland, Homer, and other Poems, in which he gave expression to his eager interest in the state of Poland—appeared in 1832. While in Germany he made a translation in blank verse of the first part of Faust ; but, forestalled by other translations, it was never published. In 1836 he made his earliest contributions to Blackwood’s Magazine, in translations from Uhland; and from 1839 till his death he remained on the staff of Black- wood. About 1841 he became acquainted with Mr Theo-

dore Martin, and in association with him wrote a series of light humorous papers on the tastes and follies of the day, in which were interspersed the verses which afterwards became popular as the Bon G’ualtier Ballads, The work on which his reputation as a poet chiefly rests is the Lays of the Scottish Cavaliers. The first of these appeared in Blackwood’s Magazine in April 1843, and the whole were published in a collected edition in 1848. They became very popular, and have passed through ninetecn editions, the last of which has spirited and beautiful illustrations by Sir J. Noel Paton and W. H. Paton. Meanwhile, he obtained, in 1845, the chair of Rhetoric and Belles Lettres at Edinburgh University, which he filled honourably and successfully till 1864. He devoted himself conscientiously to the duties of the office, and his pupils increased in number from 30 to 150. In 1849 he married the youngest daughter of Professor John Wilson (Christopher North), whose death, in 1859, was the great calamity of his life. His services in support of the Tory party, especially during the Anti-Corn-Law struggle, received official recognition in his appointment (1852) as sheriff of Orkney and Zetland. In 1854 appeared Pirmilian, a Spasmodic Tragedy, in which he attacked and parodied the writings of Bailey, Sydney Dobell, and Alexander Smith ; and two years later he published his Bothwell, a Poem. Among his other literary works are a Collection of the Ballads of Scotland, a translation of the Poems and Ballads of Goethe, executed in co-operation with his friend Theodore Martin, a small volume on the Life and Times of Richard I., written for the Famity Library, and a novel entitled

Vorman Sinclaar, many of the details in which are taken from incidents in his own experience. In 1860 Aytoun was elected honorary president of the Associated Societies of Edinburgh Uni- versity. The death of his mother took place in November 1861, and his own health was failing. In December 1863 he married Miss Kinnear, and health and happiness for a time revived; but his malady recurred, and he died at Blackhills, near Elgin, 4th August 1865. His remains were interred at Edinburgh, A memoir of Aytoun by Theodore Martin, with an appendix containing some of his prose essays, was published in 1867. (w. L. B.C.) AZAIS, Prerre HyacintuHe, a brilliant French writer on philosophy, was born at Sorréze in 1766, and died at Paris in 1845. He was educated at the college in his native town; and at the age of 17 joined a religious body with the view of afterwards entering the church. He remained only a year in this society, and then accepted an appointment as teacher in the college at Tarbes. The duties of this otfice proved most uncongenial to him, and he gladly entered the service of the bishop of Oléron, to whom he acted as secretary. With this, too, he quickly became dissatisfied, either on account of the bishop’s reiterated desire that he should take orders, or from the many petty annoyances incident to his post. He with- drew to the little village of Villemagne, near Beziers, where he supported himself by performing the duties of organist in the church. He afterwards acted as tutor to the Count de Bosc’s sons, with whom he remained till the outbreak of the Revolution. Azais, at first an ardent admirer of that great movement, was struck with dismay at the atrocities that were perpetrated, and published a vehement pamphlet on the subject. He was denounced, and had to seek safety in flight. For eighteen months he found refuge in the hospital of the Sisters of Charity at Tarbes 3 and it was not till 1806 that he was able to settle in Paris. There, three years later, he published his treatise Des Compensations dans les Destinées Humaines, in which he sought to show that happiness and misery were fairly balanced in this world, and that consequently it was the duty of citizens to submit quietly to a fixed government.

This doctrine was not displeasing to Napoleon, who made its author professor at St Cyr. After the removal of that college, he obtained, in 1811, the post of inspector of the public library at Avignon, and from 1812 to

1815 he held a similar office at Nancy. His preference for the Bonaparte dynasty naturally operated in his disfavour at the Restora- tion ; but after suffering considerable privation for some years, he obtained a government pension, which placed him beyond the reach of want. He employed the remain- ing years of his life in oral and published expositions of his system of philosophy. – _

According to Azais, the whole of existence, the universe, whose cause is God, may be regarded as the product of two factors, Matter and Force. Matter in its primitive state consists of homogeneous elements or atoms. All force is in its nature expansive, and is, therefore, subject

to one supreme law, that of equilibrium, or equivalence of

action and reaction ; for evidently expansive force emanat- ing from each body is repressive force acting on all other bodies. The whole of the phenomena of the universe are successive stages in the development caused by the action

of this one force under its one law on the primitive atoms;

and in tracing this development we must group facts into three distinct orders,—first, the physical; second, the physiological; third, the intellectual, moral, and political. In the sphere of physical phenomena, distinct development can be traced from the simplest mechanical motion up through the more complex forces of light, heat, and elec- tricity to the power of magnetic attraction, by means of which the second great order of facts is produced out of the first. For magnetic force acting on elastic bodies, which as reactive have potential life, creates the primitive living globule, which is shaped like a tube open at both ends, From this first vital element a gradual ascent can be traced, culminating in man, who is differentiated from the other animals by the possession of intellect, or consciousness of the ideas with which external things impress him. These ideas, however, are in themselves corporeal; what is immaterial in man, or his soul, is the expansive force inherent in him. Moral and political phenomena are the results of two primitive instincts, progress and self-con- servation, corresponding to the two forces, expansion and repression. From the reciprocal relations of these instincts may be deduced the necessary

conditions of social and political life. The ultimate goal of humanity is the perfect fulfilment of the law of equilibrium, the establishment of universal harmony. When that is accomplished, the destiny of man has been achieved, and he will vanish from this earth. Such a consummation may be looked for in about 7000 years. During an additional period of 5000 years the great cosmical forces will be gradually tending towards the establishment of complete equilibrium ; and, when this is attained, the present system of things is at an end,

The chief works of Azais, besides the Compensations, are- -Systéme Universel, 8 vols. 1812; Du Sort de UV homme, 3 vols. 1820 ; Cours de Philosophie, 8 vols. 1824; Haplication Universelle, 3 vols. 1826-8 ; Jeunesse, Maturité, Religion, Philosophie, 1837 ; De la Phrenologie, du Magnetisme, et de la Folie, 1843.

AZARA, Don FEtix Dz, a Spanish naturalist, was born 18th May 1746, and died in 1811. He studied first at the university of Huesca, and afterwards at the military aca- demy of Barcelona. In 1764 he entered the army as @ cadet, and in 1767 obtained an-ensigncy in the engineer corps. In 1781 he was appointed, with the rank of lieutenant-colonel of engineers and captain in the navy, on a commission to lay down the line of demarcation between the Spanish and the Portuguese territories in South America. There he spent many years, observing and collecting specimens of the various interesting objects of

natural history that abound in those wide and little-known regions. In 1801 he obtained leave to return to Spain, and after a short residence at Paris, was appointed a member of the Junta de fortificaciones y defensa de Ambos Indias, a public board, in which chiefly was centred the home government of the Spanish colonies. His principal work is his Travels in South America from 1781 to 1801 ; published in French from the author’s MS., by C. A. Walckenaer, with atlas and plates, 4 vols. 8vo, Paris, 1809. It contains a valuable account of the discovery, conquest, and civil and natural history of Paraguay and Rio de la Plata; and embodies his former contributions to the zoology of these countries, which had appeared in a French translation at Paris in 1801. The work is enriched with the notes of Walckenaer and

Cuvier, and a notice of the author by the former. An English translation of part of Azara's work on the Natural History of Paraguay appeared at Edinburgh in 1838.

AZARA, Don Josz NicHouas p', the elder brother of the naturalist, born in 1731, was appointed in 1765 Spanish agent and procurator-general, and in 1785, ambassador at Rome. During his long residence there he distinguished

'himself as a collector of Italian antiquities and as a patron

of art. He was also an able and active diplomatist, took a leading share in the difficult and hazardous task of the expulsion of the Jesuits from Spain, and was instrumental in securing the election of Pius VI. He withdrew to Florence when the French took possession of Rome in 1798. He was afterwards Spanish ambassador at Paris; was three tines deprived of, and restored to his office; and was finally preparing to return to his antiquarian studies in Italy when he was seized with a fatal illness, and died at Paris in January 1804.

AZEGLIO, Massimo TAPARELLI, Marquis D', an emi- nent Italian author and statesman, was born in October 1798, at Turin. He was descended from an ancient and noble family of Piedmont, and was the son of a military officer, who, when the subject of this notice was in his fifteenth year, was appointed ambassador to Rome. The boy went with him, and, being thus introduced to the mag- nificent works of art for which the Eternal City is famous, contracted a love for painting, as well as for music. He desired to become a painter, and, although his studies were for a time interrupted by his receiving a commission in a Piedmontese cavalry regiment, and by a subsequent illness, brought on by the severity of his scientific investigations and resulting in his quitting the service, he eventually returned to Rome, and, with some difficulty, obtained his father's permission to devote himself to art. He remained at the Papal capital eight years, and acquired great skill and some fame as a landscape-painter. At the close of that period events directed his mind into other channels, His father died in 1830, and the younger Azeglio then removed to Milan, where he became acquainted with Alessandro Manzoni, the poet and novelist, whose daughter he married. In this way his thoughts were turned towards literature and politics. At that

time, Italy was profoundly agitated by the views of the national and liberal party. The country was divided into several distinct states, of which the greater number, even of those that were nominally independent, were under the influence of Austria, Lombardy and Venetia formed parts of the Austrian dominions. The petty monarchies of the north were little better than vassals to the house of Haps- burg ; the Papacy, in the centre, was opposed to all national aspirations; and the kingdom of the Two Sicilies, in the south, was a despotism, which for cruelty and mental darkness could not have been exceeded in Asia itself. The French revolution of July 1830 gave additional force to the movements of the Italian liberal

party, and the young men of the day threw themselves with fervour into the crusade against old abuses and foreign domination. Mazzini was just beginning his career as an agitator, and the whole air was surcharged with revolu- tionary enthusiasm. ‘This was especially the case in the north of Italy, where Massimo d’Azeglio was now settled. Art was abandoned by him for literature, and literature was practised with a view to stimulating the sense of national independence and unity. In 1833, M. d’Azeglio published a novel called Lttore Fieramosca, which was followed in 1841 by another, entitled Wiccolo di Lapv. Both had a political tendency, and, between the two dates at which they appeared, M. d’Azeglio visited various parts of Italy,diffusing those liberal principles which he saw were the only hope of the future. His views, however, were very different from those of the republican party. He was a constitutional monarchist, and strongly opposed to the insurrections and secret conspiracies which Mazzini and others so frequently fostered at that time, and which always resulted in failure and renewed oppression. His treatise Degli Ultimi Casi di Romagna (Of the Last Events in the Romagna), published in 1846, before the death of Pope Gregory XVI., was at once a satire on the Papal Govern- ment, a denunciation of the republican attempts at insur- rection, and an exhortation to the Italian princes to adopt a national policy. M. d’Azeglio returned to Rome in 1846, after the death of Pope Gregory, in June, and, it is thought, had considerable influence in persuading the new Pope (Pius IX.) to conduct his government in accordance with liberal principles. He supported measures relating to the freedom of the press, the reform of the Papacy, and

the emancipation of the Jews. In 1848 he accompanied the Papal army of observation sent from Rome to watch the insurgent forces in Lombardy and Venetia, which had temporarily discomfited the Austrians, and were being supported by Charles Albert, king of Sardinia. General Durando, who had the command of the Papal army, actively assisted the rebels, in defiance, it is said, of his instructions ; and Azeglio was severely wounded in the leg at the battle of Vicenza, where he commanded a legion. In the same year (1848), he published a work on the Austrian Assassinations in Lombardy ; and on the opening of the first Sardinian parlia- ment he was chosen a member of the chamber of deputies. After the crushing defeat of the Sardinians at Novara, March 23, 1849,—a defeat which brought the second of the two brief wars with Austria to a disastrous close,— D'Azeglio was made president of the cabinet by Victor Emmanuel, in whose favour his father, Charles Albert, had just resigned, In this position the marquis used his high powers with great advantage to the progress and consolida- tion of the Sardinian kingdom. His occupation of the office lasted from the llth of May 1849 to the 20th of October 1852, when he was replaced by Count Cavour. At the termination of the war of 1859, when a large portion of the States of the Church shook off the dominion of the Pope, and declared for annexation to the kingdom of Northern Italy, Azeglio was appointed general and com- missioner-extraordinary, purely military, for the Roman States—a temporary office, which he administered in a conciliatory and sagacious spirit. He died on the 11th of January 1866, leaving a reputation for probity and wisdom, which his countrymen will not forget to cherish, His writings, chiefly of a polemical character, were numer- ous. In addition to those already mentioned, the most noteworthy was a work on The Court of Rome and the Gospels, of which an English translation, with a preface by Dr Layard, appeared in 1859. A volume of personal recollections was issued, in 1867, after M. d'Azeglio's death.

AZERBIJAN (socalled, according to Sir William Ouseley, from a fire-temple ; azer, fire, and baijjan, a keeper), a pro-

vince of Persia, corresponding to the ancient Atropatene. It is separated from a division of the Russian Empire on the N. by the River Araxes, and

from Irak on the 8S. by the Kizil-Uzen, or Golden Stream, while it has the Caspian Sea and Ghilan on the E., and Asiatic Turkey on the W. Its area is estimated at 25,280 square miles. The country is superior in fertility to the southern provinces of Persia. It differs entirely from the provinces of Fars and Irak, as it consists of a regular succession of undulating eminences, partially cultivated, and opening into extensive plains such as Anjan, Tabreez,and Urumiyah or Van. Near the centre of the province the mountains of Sahend or Serhund rise in an accumulated mass to the height of 9000 feet above the sea. The highest point, Mount Sevellan, towards its eastern frontier, attains a height of about 12,000 feet according to some authorities, but according to Khani- koff, itis 15,400; and the Talish Mountains, which run from N. to S. parallel to, and at no great distance from, the Caspian, have an altitude of 7000 feet. Except the boundary rivers already mentioned, there are none of any great extent; but these both receive a number of tribu- taries from the province, and several streams of consider- able volume, such as the Jughutu, the Agi, and the Shar, belong to the basin of the Lake Urumiyah. This lake is about 300 miles in circumference, and 4200 feet above the sea. Its waters are more intensely salt than the sea, and it is “supposed to contain no living creature except a kind of polype ;” but it is the resort of great flocks of the flamingo. The country to the N. and W., namely, the districts of Urumiyah and Selmart, is the most picturesque and prosperous part of Azerbijan; yet even here the tra- veller from the more civilised regions of Europe laments the want of enterprise among the inhabitants. Azerbijan is on the whole, however, reckoned one of the most pro- ductive provinces of Persia, and the villages have a more pleasing appearance than those of Irak. The orchards and gardens, in which they are for the most part embosomed, yield delicious fruits of almost every description, which are dried in large quantities. Provisions are cheap and abundant, and wine is made in considerable quantities. There is throughout the district a lack of forests and of timber trees. Lead, copper, saltpetre, sulphur, and coal are found within the confines of Azerbijan ; also a kind of beautiful transparent marble or jasper, which takes the highest polish, and is used in the buildings of Tabreez, Shiraz, and Ispahan, under the name of Tabreez or Belghami marble. There are exports of silk and cotton, textile fabrics, leather, hides and lambskins, dry-fruits, sugar, drugs, tobacco, and wax, &c., the total value in 1870, a year of great trade depression, being £422,632. In the same year the imports

amounted to £1,094,717. The chief towns are Tabreez, Urumiyah (the supposed birthplace of Zoroaster), Ardebil, Khoee, Maragha, Dilman, Abbasabad, Mehrand, Siral, and Souj-Bolak. The climate is healthful—in summer and autumn hot, but cold in winter. The cold is severely felt by the lower orders, owing to the want of fuel, for which there is no substitute except dried cow-dung, mixed with straw. The spring is temperate and delightful in the plains, but on the moun- tains snow lies eight months in the year; and hail-storms are so violent as frequently to destroy the cattle in the fields. The best soils yield from fifty to sixty fold when abundantly irrigated; and supplies of water for this purpose are drawn from the many small rivers by which the province is intersected. Oxen are generally used to draw the plough. The population is of a very varied character, comprising Kurds, Armenians, Syrians, Tatars, Persians proper, and other tribes or nationalities, and is roughly estimated at 2,000,000. The Persian army is largely composed of natives of Azerbijan, who make ex-

cellent soldiers; they are subject to compulsory enlistment, The province is under the government of the heir-apparent to the Persian throne. (Kinneir's Geographical Memour of the Persian Empire, 1813; Fraser's Travels and Adven, tures in the Persian Provinces on the Oaspian Sea ; Rawlinson's "Tabriz to Takhti Suleiman," in Jour, of Roy. Geog. Soc., 1840; Chesney's Huphrates and Tigris Luxpedition, 1850; Abbott's " Memorandum" in Pro, of Roy. Geog. Soc., 1864.)

AZIMGARH, a district and city in the Benares diyj- sion of British India, and under the jurisdiction of the Lieutenant-Governor of the North-Western Provinces, lies between 25° 38 3" and 26° 24' 45 N. lat., and 82° 44' 15" and 84° 10' 45" E. long. It is bounded on the N, by the river Ghagrd, separating it from Gorakhpur district ; on the E. by Ghazipur district and the river Ganges; on the S. by the districts of Jaunpur and Ghazipur; and on the W. by Jaunpur and the Oudh district of Faizdbad, Its area in 1872 was returned at 2494 square miles, of which 1268 square miles are under cultivation, 344 square miles are cultivable waste, and the remaining 882 square miles are barren and uncultivable. 'The population of the district in 1865 was 1,385,872 souls, of whom 1,184,689 were Hindus, and 201,183

Mahometans. The pressure of the population on the soil averaged 555 per square mile. The census of 1872 discloses a population of 1,531,410, of whom 1,333,805 were Hindus, 197,581 Mahonietans, and 24 Christians and others ; the pressure of the popula- tion on the land being 614 per square mile. The portion of the district lying along the banks of the Ghagré is a low-lying tract, varying considerably in width; south of this, however, the ground takes a slight rise. The slope of the land is from north-west to south-east, but the general drainage is very inadequate. Roughly speaking, the dis- trict consists of a series of parallel ridges, whose summits are depressed into beds or hollows, along which the rivers flow; while between the ridges are low-lying rice lands, interspersed with numerous natural reservoirs. The prin- cipal streams are the Tons, Sarju, Khurd, Kunwar, Majhor, Mangai, Udanti or Aura, and the Bhansai. The chief lines of road traffic are the following :—(1.) From Gorakhpur to Ghazipur, running north and south; (2.) from Gorakhpur to Azimgarh town, in a north-easterly and south-westerly direction, and continued thence to Jaunpur cantonment; (3.) from Ghazipur to Azimgarh, and thence on to FaizAbad in Oudh; (4.) from Ghazipur to Lucknow. The soil is fertile and very highly cultivated, bearing magnificent crups of rice, sugar-cane, and indigo. The principal-indus- tries of the district are cotton and silk manufactures, the total value of which in 1872 amounted to £109,081. The settlement of the land revenue in 702 estates or mahals is fixed and permanent; in the remaining 3284 estates a settlement was made by Mr Thomason in 1836 for thirty years, and is now (1873) undergoing revision. The total revenue of the district from all sources amounted in 1870-71 to £187,464; the expenditure in the same year being £172,550. Six towns are returned by the census of 1872 as containing a population of upwards of 5000 inhabitants—viz., Azimgarh (the capital of the district), population 15,893; Mau-Nath Bhanjan, 13,765; Mubarak- pur, 12,068 ; Sikandarpur, 5239; Dubari, 5014; and Pur, 5213, The municipalities are as follows :— Azimgarh city: the municipal income, which is derived from octroi, amounted in 1872 to £1233, 2s., the average incidence of taxation being 1s. 64d. per head of the population. Mau- Nath Bhanjan, municipal income £125, 8s.; Mubarakpur, £112, 16s.; and Sikandarpur, £48. The cost of the municipal police of these three towns is levied by means of a direct cess on house occupiers. The total number of schools in Azimgarh district in 1871-72 was 286, attended

by 4271 Hindu and 3813 Mahometan pupils. The force necessary for the protection of person and property in 1871-72 consisted of 673 regular police, equal to 1 man to every 3°70 square miles of area, or 1 to every 2275 inhabitants ; besides a village watch or rural police force consisting of 2538 men, equal to 1 watchman to every 0-98 square miles, or 1 to every 603 inhabitanis.

AzimGaRH City, the principal place in the district of the same name, is situated on the river Tons, in 26° 0’ N. lat., and 83° 14’ E. long. The city is said to have been founded about 1620 by a powerful landholder named Azim Khan, who owned large estates in this part of the country. For municipal income and population, see above.

AZO, a distinguished professor of civil law in the university of Bologna, and a native of that city. He was the pupil of Joannes Bassianus, who taught at Bologna towards the end of the 12th century, and who was the author of the famous Arbor Actionum. Azo, whose name is sometimes written Azzo and Azzolenus, and who is sometimes described as Azo Soldanus, from the surname of his father, occupied a very important position amongst the gloss-writers, and his Meadings (Lectura) on the Code, which were collected by his pupil, Alexander de Sancto Mgidio, are considered by Savigny, a most competent judge, to be the most valuable of the works of that school which have come down to us.

AZOFYF, or Asov (in Turkish, Asak), a town on the left bank of the southern arm of the Don, about 20 miles from its mouth. Its identification with the ancient Tanais and the medieval Tana seems erroneous; but it was long a place of great importance both as a military and commercial position. Peter the Great obtained possession of it after a protracted siege in 1696, and did a great deal for the security and prosperity of the town. At the peace of 171], however, he had to restore it to the Turks; and it was not till 1774 that it was finally united to the Russian empire. Since then it has greatly declined, owing to the silting up of its harbour and the competition of the city of Taganrog. Its population, principally engaged in the fisheries, numbers, according to Russian statistics, 16,791.

AZOFF, Tue Sa or, an inland sea of Southern Europe, communicating with the Black Sea by the Strait of Yenikale, the ancient Bosphorus Cimmerius. To the Romans it was known as the Palus Meotis, from the name of the neighbouring people, who called it in their native language Temarenda, or Mother of Waters. Possibly to account for the outward current into the Black Sea, it was long supposed to possess direct communication with the Northern Ocean, and, when it was discovered that there was no visible channel, recourse was had to a “ secret sluice ;” there being, it was thought, but a comparatively narrow isthmus to be crossed. In some prehistoric time, according to Pallas and Murchison, a connection with the Caspian Sea seems to have existed; but no great change has taken place in regard to the character or relations of the Sea of Azoff since our earliest records. It lies between 45° 20′ and 47° 18’ N. lat.,and between 35° and 39° E.long., its length from 8.W. to N.E. being about 235 miles, and its greatest breadth 110. It is for the most part com- paratively shallow ; the deepest portion forming as it were a prolongation of the bed of the Don, its largest and, indeed, its only very important tributary. Near the mouth of that river the depth varies from 3 to 10 feet, and the greatest depth does not exceed 44 feet. Fierce and continuous winds from the E. prevail during July and August, and in the later part of the year those from the N.E. and §.E. are not unusual. A great variety of currents are thus produced, and the relative depths of the differents parts of the sea are greatly modified. From December to March the whole surface is generally frozen.

The water is for the most part comparatively fresh, but differs considerably in this respect according to locality and current. Fish are so abundant that the Turks use the name Baltik-Denis, or Fish-Sea. To the W., separated from the main basin by the long, narrow spit of Arabat, lies the remarkable series of lagunes and marshes known as the Sivash, or Putrid Sea. Here the water is intensely salt, and at the same time swarms with life. The Sea of Azoff is of great importance to Russian commerce, and a number of flourishing cities have grown up along its shores. Of these the most important are Taganrog, Berdiansk, Mariupol, and Yenikale. Unfortunately, there is a lack of safe and commodious harbours and roads.

AZORES, Tue, or WESTERN ISLANDS, are situated in the Atlantic Ocean, and extend in an oblique line from N.W. to 8.E., between 36° 55’ and 39° 55’ N. lat., and between 25° and 31° 16’ W. long. They are generally considered as pertaining to Europe, though separated by a distance of 800 miles from the coast of Portugal. They are divided into three distinct groups: the south-eastern consisting of Sad-Miguel, or St Michael’s, and Sta Maria; the central and largest, of Fayal, Pico, Sad Jorge, Terceira, and Graciosa ; and the north-western, of Flores and Corvo.

It does not appear that the ancient Greeks and Romans had any knowledge of the Azores, but from the number of Carthaginian coins discovered at Corvo it has been supposed that the islands must have been visited by that adventurous people. The Arabian geographers, Edrisi in the 12th century, and Ibn-al-Wardi in the 14th, describe, after the Canaries, nine other islands in the Western Ocean, which are in all probability the Azores. This identification is supported by various considerations. The number of islands is the same; the climate under which they are placed by the Arabians makes them north of the Canaries ; and special mention is made of the hawks or buzzards, which were sufficiently numerous at a later period to give rise to the present name (Port. Acor, a hawk.) The Arabian writers represent them as having been populous, and as having contained cities of some magnitude ; but they state that the inhabitants had been greatly reduced by intestine warfare. The Azores are first found distinctly marked in a map of 1351, the southern group being named the Goat Islands (Cabreras) ; the middle group, the Wind or Dove Islands (De Ventura sive de Columbis); and the western, the Brazil Island (De Brazi)—the word Brazil at that time being employed for any red dye-stuff. In a Catalan map of the year 1375 the island of Corvo is found as Coru: Marini, and Flores as Li Conigi ; while Sad Jorge is already designated San Zorze. It has been conjectured that the discoverers were Genoese, but of this there is not sufficient evidence. It is plain, however, that the so-called Flemish discovery by Van der Berg is only worthy of the name in a very secondary sense. According to the usual account, he was driven on the islands in 1432, and the news excited considerable interest at the court of Lisbon. The navigator, Gonzalo Velho Cabral—not to be confounded with his greater namesake, Pedro Alvarez Cabral—was sent to pro- secute the discovery Another version relates that Don Henry of Portugal had in his possession & map in which the islands

were laid down, and that he sent out Cabral through confidence in its accuracy. The map had been presented to him by his brother, Don Pedro, who had travelled as far as Babylon. Be this as it may, Cabral reached the island, which he named Santa Maria, in 1432, and in 1444 took possession of St Michael's. The other islands were all discovered by 1457. Colonisation had meanwhile been going on prosperously ; and in 1466 the Azores were presented by Alphonso V. to his aunt, Isabella, the duchess of Burgundy. An influx of Flemish settlers followed, and the islands became known for a time as the

Flemish Islands. From 1580 to 1640 they were subject to Spain like the rest of the Portuguese kingdom, of which they now form a province. At that time the Azores were the grand rendezvous for the fleets on their voyage home from the Indies; and hence they became a theatre of that maritime warfare which was carried on by the English

English Miles @.20 20 30 40 60 The dotted line shows the depth of 100 fathoms

\ 31 Ea) * 29

AZORES

28 Wof Greenwich

under Queen Elizabeth against the Peninsular powers, The connection with England has long since been of a more peaceful description ; no other country affording such a ready market for Azorean productions.

The islands are now divided into three administrative districts, which take their names from the chief towns of

2′

Map of the Azores or Western Islands.

Angra in Terceira, Horta in Fayal, and Ponta-Delgada in St Michael's—the first of the three being also the capital of the islands. The most of the inhabitants are of Portu- guese origin, but there is a mixture not only of Flemish but Moorish blood. Negroes, Mulattoes, English, Scotch, and Irish immigrants are present in considerable numbers, especially in San Miguel and Fayal. Education is in a very backward state, the great proportion of the lower classes being unable to read or write. Progress, however, is being made in this as well as other respects.

Under the active administration of Pombal, considerable efforts were made for the improvement of the Azores, but the stupid and bigoted Government which followed rather tended to destroy these benefits, and to create a retrograde course. Towards the beginning of the present century, the possession of the islands was contested by the claimants for the crown of Portugal. The adherents of the constitu- tion, who supported against Miguel the rights of Maria da Gloria, obtained possession of Terceira in 1829, where they succeeded in maintaining themselves, and after various struggles, Queen Maria's authority was established over all the islands. She resided at Angra from 1830 to 1833.

The aspect of all the islands is very similar in general characteristics, presenting an elevated and undulating outline, with little or no table-land, and rising into peaks, of whick the lowest (that of Sta Maria) is 1889 feet, and the highest (that of Pico) 7613 feet above the level of the sea. Their lines of sea-coast are, with few exceptions, high and precipitous, with bases of accumulated masses of fallen rock, in which open bays, or scarcely more enclosed inlets, form the harbours of the trading towns. The volcanic character of the whole archipelago is very obvious, and has been abundantly confirmed by the numerous earth-

quakes and eruptions which have taken place since its discovery. Hitherto the western group of Flores and Corvo has been quite exempt, Graciosa has been equally undis- turbed, and Fayal has only suffered from one eruption, in 1672. The centre of activity has for the most part been St Michael's, while the neighbouring island of Santa Maria has altogether escaped. In 1444-45 there was a great eruption at St Michael's, of which, however, the accounts that have been preserved exaggerate the importance. In 1522 the

town of Villa Franca, at that time the capital of the island, was buried, with all its 6000 inhabitants, during a violent convulsion. In 1572 an eruption took place in the island of Pico; in 1680 St George was the scene of numerous outbursts ; and in 1614 a little town in Terceira was destroyed. In 1630, 1652, 1656, 1755, 1852, de, St Michael has been visited with successive eruptions and earthquakes, several of them of great violence. On various occasions, as in 1638, 1720, 1811, and 1867, subterranean eruptions have taken place, which have sometimes been accompanied by the appearance of temporary islands. Of these the most remarkable was thrown up in June 1811, about half a league from the western extremity of St Michael's. It was called Sabrina by the commander of the British man-of-war of that name, who witnessed the phenomenon. Details will be found in a valuable chapter of Hartung's Die Azoren, p. 99, and in the 23d vol. of the Philosophical Transactions.

The climate is particularly temperate and equable, the extremes of sensible heat and cold being, however, increased by the humidity of the atmosphere. This is so great that paper-hangings will not adhere to the walls, and the veneer- ing of furniture strips off. The range of the thermometer is from 45° Fahr., the lowest known extreme, or 48°, the

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ordinary lowest extreme of January, to 82°, the ordinary, | running rapidly down on all sides into the sea (Geographi- or 86°, the highest known extreme of July, near the level | cal Journal, vol. xv.) of the sea. Between these two points (both taken in the Hot springs abound in many parts of the island, and shade) there is from month to month a pretty regular | from almost every crevice vapour is seen issuing. But gradation of increase or decrease, amounting to somewhat | the most remarkable phenomena are the Caldeiras or less than four degrees (Geographical Journal, vol. xv.) In | boiling fountains, which rise chiefly from a valley called winter the prevailing winds are from the north-west, west, | the Furnas, near the western extremity of the island. The and south; while in summer the most frequent are the | water ascends in columns to the height of about 12 feet, north, north-east, and east. The weather is often extremely | after which it

dissolves in clouds of vapour. The ground stormy, and the winds from the west and south-west render | in the immediate vicinity is entirely covered with native the navigation of the coasts very dangerous. sulphur, like hoar frost. At a small distance is the The general character of the flora is decidedly European, Muddy Crater, the vertex of which, 45 feet in diameter, no fewer than 400 out of the 478 species generally con- | is on a level with the plain. Its contents are in a state sidered as indigenous belonging likewise to that continent, | of continual and violent ebullition, accompanied with a while only four are found in America, and forty are peculiar | sound resembling that of a tempestuous ocean. Yet they to the archipelago. Vegetation in most of the islands is | never rise above its level, unless occasionally to throw remarkably rich, especially in grasses, mosses, and ferns, | toa small distance a spray of the consistence of melted heath, juniper, and a variety of shrubs. Of tall-growing | lead. The Furnas abounds also in hot springs, some of trees there was, till the present century, an almost total lack; | them of a very high temperature. There is almost always, but through the exertions of José de Canto and others the | however, a cold spring near to the hot one. These springs Bordeaux pine, the European poplar, the African palm-tree, | have for a considerable period been greatly resorted to in the Australian eucalyptus, the chestnut, the tulip-tree, the | cases of palsy, rheumatism, scrofula, and similar maladies, elm, the oak, and many others, have been successfully | and bath-rooms and various conveniences for visitors have introduced into one or more of the islands. The orange, | been erected. the apricot, the banana, the lemon, the citron, the Japanese The plains are fertile, producing wheat, barley, and In- medlar, and the pomegranate, are the common fruits, and | dian corn; whilst vines and oranges grow luxuriantly on various other varieties are more or lesscultivated. At one | the sides of the mountains. The plants are made to spring time much attention was given to the growing of the sugar- | even from the interstices of the volcanic rocks, which are cane, but it has now for the most part been abandoned. The | sometimes blasted to receive them. Raised in this manner, culture of woad introduced in the 16th century also belongs | these fruits are said to be of superior quality ; but the to the past. A kind of fern (Dicksonia culcita), called by | expense of such a mode of cultivation necessarily restricts it. the natives cabellinho, and common throughout the archi- | The western part of the island yields hemp, which might pelago, furnishes a silky material for the stuffing of mat- | be raised to

a considerable extent. The exports consist tresses, which forms an article of export to Brazil and | of wine, fruit, and provisions, the most important trade Portugal. being in oranges. Foreign intercourse was at one time The mammalia of the Azores are limited to the rabbit, | confined rigorously to Lisbon; but the inhabitants now weasel, ferret, rat (brown and black), mouse, and bat, in } trade directly with England, America, and other countries. addition to domestic animals. Among the fish caught off | The exports during 1872 at the port of St Michael's were the coast may be mentioned the mullet, the tunny, the | of the value of £85,279, and the imports amounted to bonito. The numbers of birds are so remarkable that in | £91,943. St Michael's, where a reward is given for the destruction of The principal town in the island is Ponta-Delgada, the blackbird, the bullfinch, the redbreast, the chaffinch, | which contains 15,520 inhabitants. It is built with toler- and the canary, the sum paid annually represents a death- | able regularity, the streets being straight and broad. The list of 420,000. The game includes the woodcock, red par- | religious edifices are numerous and elegant. The harbour tridge (introduced in the 16th century), quail, and snipe. | receives only small vessels; those of larger size must anchor St St Michael's, the largest and most populous of the islands, | in an open roadstead, which cannot be occupied during Michael's. has an area of 224 square miles, and 105,404 inhabitants. | the prevalence of southerly gales. A breakwater and The east end rises from a bluff cliff, from 1200 to 1400 feet | harbour of refuge have been in process of construction for high, to a lofty inland peak, whence a central range, varying | a number of years; and a lighthouse is being built at the in height from 2000 to 2500 feet, runs to the westward, | north-east end of the island. The other towns are Villa terminating in the Serra da Agoa de Padé, 3060 feet above | Franca, Ribeira Grande, Alagoa, Agoa de Pad, &e. the sea, 'The sea-coast gradually declines in approaching St Mary is a small island immediately adjacent to St St Mary. the last point, where it is not more than abcut 100 feet | Michael's, through the medium of which its trade is con- high. The middle part of the island is lower, and more | ducted, as it has no good harbours of its own. It has an undulating ; its western extremity being marked by the | area of 36 square miles, and produces wheat in abundance, conspicuous Serra Gorda, 1574 feet above the sea; itsshores | of which a considerable quantity is exported. Various on both sides are low, broken, and rocky. The aspect of | volcanic rocks are the predominant formations, but beds of the

western portion of the island is that of a vast truncated | limestone also occur, giving rise to numerous stalactite cone, irregularly cut off at an elevation of about 800 feet, | grottoes all over the island. Population from 7000 to 8000. and falling on the N., S., and W. sides to a perpendicular Terceira (so called as being the third in order of dis- Terceira, coast of betweeen 300 and 800 feet high. In the higher | covery) is smaller than St Michael's, but being placed parts an undergrowth of shrubs gives the mountains a | in a more central position with respect to the other islands, rich and wooded appearance. Like all volcanic countries, | has been chosen as the seat of government. The port the face of the island is uneven and irregular, being deeply | of Angra, protected by Mt. Brazil, is also superior to any excavated by numerous ravines, and roughened by streams | of those in St Michael's. This island does not exhibit: of semi-vitrified and scoriaceous lava, that resist all atmo- | nearly the same extensive traces of volcanic action ; and spheric influences and repel vegetation. Heavy rains falling | the summits of its mountains are generally level. It on the mountains afford a constant supply of water to abounds in grain and cattle; but the wines are inferior, four lakes at the bottom of extinct craters, and a number | and fruits are raised merely for internal consumption. of minor reservoirs, and through them to small streams | The number of inhabitants is estimated at 50,000.

Fayal.

Pico.

Graciosa.

St George.

Corvo and Flores.

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Fayal (so called from the extreme abundance of the faya, an indigenous shrub) is the most frequented of all the Azores, after St Michael's, as it has one of the best harbours in the islands, and lies directly in the track of vessels that are crossing the Atlantic in any direction. Its principal town is

Villa de Horta, with a population of 7636. The town is defended by two castles and a wall, both in decay, and serving rather for show than strength. The city contains two convents for monks and three for nuns, with eight churches. The bay is two inilesin length and three- quarters of a mile in breadth, and the depth of water from 6 to 20 fathoms. Though a good roadstead, it is not altogether free from danger in 8.8.W. and S.E. winds. The women of this island manufacture fine lace from the agave thread, and till recently produced large quantities of open-work stockings. They also execute carvings in snow-white fig- tree pith, and carry on the finer kinds of basket-making. A small valley, called Flemengos, still perpetuates the name of the Flemish settlers, who have left their mark on the physical appearance of the inhabitants. Population,

26,264.

A considerable quantity of wine used to be exported from Fayal under the name of Fayal wine, which was really the produce of Pico, one of the most remarkable of the Azores. This island is composed of an immense conical mountain, rising to the height of 7613 feet, and bearing every trace of volcanic formation. ‘The soil consists entirely of pulverised lava. All the lower parts of the mountain used to be in the highest state of cultivation, and covered with vine and orange plantations. But in 1852 the vines were attacked by the Ocdiwm fungus and completely destroyed, while: the orange-trees suffered almost as much from the Coccus Hesperidum. The people were consequently re- duced to want, and forced to emigrate in great numbers. The planting of fig-trees and apricots alleviated the evil, and after a time many of the emigrants returned, Pico also produces a valuable species of wood resembling, and equal in quality to, mahogany. Population, 24,000.

Graciosa and St George are two small islands, situated between Fayal and Terceira. Graciosa, as its name imports, is chiefly noted for the extreme beauty of its aspect and scenery. The chief town is Sta Cruz, and the total population 8000. The only manufacture is the burning of bricks, and the population 18,000.

The two small islands of Corvo and Flores seem but imperfectly to belong to the group. They lie also out of the usual track of navigators; but to those

who, missing their course, are led thither, Flores affords good shelter in its numerous bays. Its poultry is excellent; and the cattle are numerous, but small. It derives its name from the abundance of the flowers that find shelter in its deep ravines. Population of Corvo, 1000, and of Flores, 10,508.

See Hartmann's Hdrisi ; Voyages des Hollandois, tome i.; Astley's Collection, vol. i.; Masson's ''Account of St Miguel," in Phil. Trans., 1778 ; Cook's Second Voyage; Adanson's Voyage to Senegal ; History of the Azores, London, 1813, and the review of this work in the Quarterly for 1814 ; Boid's Azores ; London Geographical Journal ; A Winter in the Azores, by J. and H. Bullar, 1841; Hartung's Die Azoren im Acusseren Erscheinung u. Geognost. Natur, Leipsic, 1860; Morelet's Iles Acores, 1860; Drouet's Elémens de la Faune Acoréenne, 1861; Drouet's Mollusques Marins des Iles Acores, 1858 ; Drouet's Lettres Acoréennes, 1862; Ramos (Dr A. G.), Noticia do Archipelago dos Agores, &c., 1871; Godman's Nat. Hist. of the Azores, 1870 ; *' Voyages aux Acores," by Fouqué in the Revue des Dew Mondes, 1873; ** Allgemeine Charac. des Klimas" in Hydro. Mitth. vom Hydr. Bur, der Admir., Berlin, 1873 ; Kerhallet's Deser. del' Archip. des Acores, 1851, translated by Totten, 1874,

AZOTUS, the name given by Greek and Roman writers to Ashdod, or Eshdod, an ancient city of Palestine, now represented by a few remains in the little village of Esdud, in the pashalik of Acre. It was situated a short distance

AZO—

The chief town of St George is Velas, .

A faa inland from the Mediterranean, on the usual military route between Syria and Egypt, about 18 geographical miles N.F, of Gaza. As one of the five chief cities of the Philistines, and the seat of the worship of Dagon, it maintained, down even to the days of the Maccabees, a vigorous, though somewhat intermittent, independence against the power of the Israelites, by whom it was nominally assigned to the territory of Judah. In spite of its being dismantled by Uzziah, and somewhat later, in 731 B.c., captured by the Assyrians, it was strong enough in the next century to resist the assaults

of Psammetichus for twenty-nine years, Restored by the Roman Gabinius from the ruins in which it had been left by the Jewish wars, 1t was presented by Augustus to Salome, the sister of Herod. It became the seat of a bishop early in the Christian era, but seems never to have attained any importance as a town.

AZPEITIA, a town of Spain, in the province of Guipuz- coa, on the left bank of the Urola, 15 miles S.W. of San Sebastian. The neighbouring country is fertile, and quarries of marble are wrought in the mountains. During the Carlist movement in 1870-74, Azpeitia was the seat of the Guipuzcoan Diputacion, or court for the management of the war; and gunpowder, cartridges, and cannon were manu- factured in the town. ‘The famous monastery of San Ignacio, dedicated to Loyola, about a mile distant, was also appropriated for military purposes. Population stated at

2335.

AZTECS, the native name of one of the tribes that occupied the table-land of Mexico on the arrival of the Spaniards in America. It has been very frequently employed as equivalent to the collective national title of Nahuatlecas, or Mexicans. The Aztecs came, according to native tradition, from a country to which they gave the name of Aztlan, usually supposed to lie towards the N.W., but the satisfactory localisation of it is one of the greatest difficulties in Mexican history. The date of the exodus from Aztlan is equally undetermined, being fixed by various authorities in the 11th and by others in the 12th century. One Mexican manuscript gives a date equivalent to 1164 A.D. They gradually increased their influence among other tribes, until, by union with the Toltecs, who occupied the table-land before them, they extended their empire to an area of from 18,000. to 20,000 square leagues. The researches of Humboldt gave the first clear insight into the early periods of their history. See MExtco.

AZUNI, Domenico ALBERTO, a distinguished jurist and writer on international law, was born at Sassari, in Sardinia, in 1749. He studied law at Sassari and Turin, and in 1782 was made judge of the consulate at Nice. In 1786-88 he published his Dazionario Universale Ragionato della Giurisprudenza Mercantile. In 1795 appeared his sys- tematic work on the maritime law of Europe, Sistema Univer- sale det Principri del Diritto

Maritimo dell’ Europa, of which a second edition was demanded in the following year. A French translation by Digeon was published in 1798, and in 1805 Azuni recast the work, and translated it into French. In 1806 he was appointed one of the French commission engaged in drawing up a general code of commercial law, and in the following year he proceeded to Genoa as pre- sident of the court of appeal. After the fall of Napoleon in 1814, Azuni lived for a time in retirement at Genoa, till he was invited to Sardinia by Victor Emmanuel IL., and appointed judge of the consulate at Cagliari, and director of the university library. He resided at Cagliari till his death in 1827, Besides the works above mentioned, Azuni wrote numerous pamphlets and minor works, chiefly on maritime law, an important treatise on the origin and pro- gress of maritime law (Paris, 1810), and an historical, geographical, and political account of Sardinia (lst ed. 1799 ; 2d, much enlarged, 1802).

is the second symbol of all European alphabets B except those derived from the Cyrillic original (see ALPHABET, vol. i. p. 613), such as the Russian. In these a modified form, in which only the top of the upper loop appears, stands as the second letter, with the value of the original sound 6; whilst the old symbol B comes third with the phonetic valuev or w. In Egypt this letter was originally a hieroglyph for a crane, and afterwards represented also the sound. The symbol and its phonetic value were borrowed by the Pheenicians, but not its name, as we infer from finding it called in Hebrew beth, i.¢., a house. In its oldest known Phcenician form the upper loop only exists in a more or less rounded shape. In different alphabets’ even the upper loop was gradually opened, so that in the square Hebrew the original form can no longer be detected. The Greeks, when they borrowed

“it from the Phoenicians, closed up the lower loop as well as

the upper for convenience of writing. Sometimes the loops were angular, but more generally they were rounded. There is little variation of the form, except in the old alphabets of Corinth and Corcyra, where the original is hardly recognisable. In old Latin both the rounded and

‘ the pointed loops appear.

The original sound which this symbol represented, and which it still represents in most European languages, is a closed labial, z.e., one in which perfect closure of the lips is necessary, the sound being heard as the lips open. Like all closed sounds, it is not capable of prolongation. It differs from p, which is also a closed labial, as a sonant from a surd. A sonant is heard when the breath, as it passes through the glottis, is vocalised by the tension or approximation of its edges. When there is no such action of the glottis, mere breath alone passes through ; but the explosiveness of the breath when the vocal organs are opened produces a sound, and this is called a surd. The vocal organs are in precisely the same position for p as for 6; but in producing p they act upon breath only; in pro- ducing 6 they articulate voice.

In the earliest stage to which we can trace back the language spoken by the forefathers of the Indo-European nations, 1t cannot be certainly proved that the sound 8 was ever heard at the beginning of a word. Perhaps in this

_ position it may have been sounded indistinctly as a labial v In English and all Low German languages p has-

taken the place of original b, which is preserved in Greek and Latin; thus the 6 in kdvvaBis is replaced by p in English “hemp.” We do not certainly know the reason of this shifting of sound, which affects all momentary

‘sounds, and which is commonly known in England by the

name of “Grimm’s law.” By the same law English 6 has taken the place of original 2. Thus our “ beech” stands for onginal “bhaga,” which is represented, according to the phonetic laws of the languages, by Greek ¢yyés and Latin “fagus.” In the middle of a Latin word, and con- Sequently generally in the languages derived from the Latin, b represents original bA,

There is a tendency among some peoples to allow the 6 sound to pass into a v,in which the lips are not firmly closed, and so the sound is capable of prolongation, because it does not consist (as } proper does) in the momentary anes of the voice after the lips have been compressed and Ps opened, This v, in the production of which the lips atone are concerned, must be carefully distinguished from our English », which is the result of

pressure between the upper teeth and lower lip; it is more like our English w.

It is the sound which has taken the place of 6 in modern Greek. The same confusion is found in Latin inscriptions of the 3d and 4th centuries after Christ, when the symbol v represents original b ; thus sivi stands for siz, livido for libido (see Corssen, Aussprache, é&c., i. 131) ; and still more frequently 6 appears. for v, as bexit for vixit. The change would be inconceivable if the symbol v in these cases had had the same sound as with us, that of a labiodental. The same indistinctness appeared locally in dialects, as is shown by Martial's well-known epigram— '* Hand temere antiquas mutat Vasconia voces, Cui nil est aliud vivere quam bibere."

BAADER, Franz XAVER VoN, an eminent German philosopher and theologian, born 27th March 1765 at Munich, was the third son of F. P. Baader, court physician to the elector of Bavaria. His two elder brothers were both distinguished, the eldest, Clemens, as an author, the second, Joseph, as an engineer. Franz when young was extremely delicate, and from his seventh to his eleventh year was afflicted with a specics of mental weakness, which singularly enough disappeared entirely when he was introduced for the first time to the mathematical diagrams of Euclid. His progress thenceforth was very rapid. At the age of sixteen he entered the university of Ingolstadt, where he studicd medicine, and graduated in 1782. He then spent two years at Vienna, and returning home, for a short time assisted his father in his extensive practice. This life he soon found unsuited for him, and he decided on becoming a mining engineer. He studied under Werner at Frieburg, travelled through several of the mining dis- tricts in North Germany, and for four years, 1792-1796, resided in England. There he became acquainted with the works of Jakob Bohme, and at the same time was brought into contact with the rationalistic 18th-century ideas of Hume, Hartley, and Godwin, which were extremely distasteful to him. For Baader throughout his whole life had the deepest sense of the reality of religious truths, and could find no satisfaction in mere reason or philosophy. "God is my witness," he writes in his journal of 1786, " how heartily and how often I say with Pascal, that with all our speculation and demonstration we remain without God in the world." Modern philosophy he thought essentially atheistic in its tendencies, and he soon grew to be

dissatisfied with the Kantian system, by which he had been at first attracted. Particularly displeasing to him was the ethical autonomy, or the posi- tion that man had in himself a rule of action, that duty contained no necessary reference to God. This Baader called “a morality for devils,” and passionately declared that if Satan could again come upon earth, he would assume the garb of a professor of moral philosophy. The mystical, but profoundly religious, speculations of Eckhart, St Martin, and above all of Bohme, were more in harmony with his mode of thought, and to them he devoted himself. In 1796 he returned from England, and in his passage through Hamburg became acquainted with Jacobi, the Faith philosopher, with whom he was for many years on terms of close friendship. He now for the first time learned something of Schelling, and the works he published during this period were manifestly influenced by that philosopher. Yet Baader is no disciple of Schelling, and probably, in the way of affecting the future course of Schelling’s thought, gave out more than he received. Their personal friendship continued till about the year 1822, when Baader’s vehement denunciation of modern

philosophy in his letter to the Czar of Russia entirely alienated Schelling.

While prosecuting his philosophical researches, Baader had continued to apply himself diligently to his profession of eugineer. He gaincd a prize of 12,000 gulden (about £1000) for his new method of employing Glauber’s salts instead of potash in the making of glass. From 1817 to 1820 he held the post of superintendent of mines, and was raised to the rank of nobility for his services. He retired from business in 1820, and soon after published one of the best of his works, Fermenta Cognitionis, 6 pts., 1822-25, in which he combats modern philosophy, and recommends the study of J. Bohme. In 1826, when the new university was opened at Munich, he was appointed professor of philosophy and speculative theology. Some of the lectures delivered there he published under the title, Spekulative Dogmatik, 4 pts., 1827-1836. In 1838 he opposed the interference in civil matters of the Roman Catholic Church, to which he belonged, and in consequence was, during the last three years of his life, interdicted from lecturing on the philosophy of religion. He died 23d May 1841.

It is extremely difficult to give in moderate compass an adequate view of Baader's philosophy ; for he himself generally either gave expression to his deepest thoughts in brief, obscure aphorisms, or veiled them under mystical symbols and analogies. In this respect his style of exposi- tion is not undeserving of Zeller's strictures (Ges. d. deut. Phil., 732, 736). Further, he has no systematic works ; his doctrines were for the most part thrown out in short detached essays, in comments on the writings of Bohme and St Martin, or in his extensive correspondence and journals. For his own part, he was distinctly of opinion that philosophy is not as yet capable of reduction to scientific form, and it would consequently be an error to demand from him a rigidly coherent body of truth. At the same time, the general tendency of his thought is very apparent, and there are some salient points which stand out with a clearness sufficient to render possible an outline of his whole course of speculation. In the mode in which he approaches the problems of philosophy, Baader is entirely opposed to the modern speculative spirit, which, beginning with Descartes, has endeavoured to erect a rational or coherent system on the basis of self-conscious- ness alone, and has protested agaiust the presupposition of anything which can fetter reason, and against the accepta- tion of any truth which cannot be rationally construed. He starts from the position that human reason is in a corrupt condition, and by itself cau never reach the end it aims at, and maintains that we cannot throw aside the presuppositions of faith, church, and tradition. His point of view may, with some truth, be described as Scholasticism ; for, like the great scholastic doctors, he believes that theology and philosophy are not opposed sciences, but that reason has to make clear the truths given by authority and revelation. Butin his attempt to draw still closer the realms of nature and of grace, of faith and knowledge, of human thought and divine reason, he approaches more nearly to the mysticism of Eckhart, Paracelsus, and Béhme. All self-consciousness, he thinks, is at the same time God-consciousness ; our knowledge is never mere scientia, it is invariably con-scientea—a know-ing with, consciousness of, or participation in God. Of this knowledge, as of knowledge in general, there are three grades :—(1.) Where the thing known impresses itself upon us without or against the will, where the knowledge is necessary,—such, ¢.g., is the knowledge that God is; (2.) Where the thing known is cognised by an act on our part, where knowledge is free,—such,

e.g., is the voluntary belief or trust 7x God; (8.) Where the thing known enters into, and forms part of, the very process of

BAD is

knowing,—such is the speculative knowledge of God, where- in we recognise that without God we are not, and that we know Him only in and through His knowledge of us. The notion of God is thus the fundamental thought of Baader : his philosophy is in ali essentials a theosophy, and its first great problem is to determine accurately the nature of the divine Being. Now God, who is, according to Baader, the primary will which lies at the basis of all things, is not to be conceived as mere abstract Being, substantia, but as everlasting process, activity, actus. Of | this everlasting process, this sclf-generation of God, we

may distinguish two aspects—the immanent or esotéric,

and the emanent or exoteric. God has reality only in so far

as He is absolute spirit, and only in so far as the primitive

will cognises or is conscious of itself can it become spirit

at all. But, in this very cognition of self is involved the

distinction of knower and known, producer and produced,

from which proceeds the power to become spirit. This

immanent process of self-consciousness, wherein indeed a

trinity of persons is not given but only rendered possible,

is mirrored in, and takes place through, the eternal and

impersonal idea or wisdom of God, which exists beside,

though not distinct from, the primitive will. Conerete

reality or personality is given to this divine Zernar, as

Baader calls it, through nature, the principle of self-hood,

of individual being, which is eternally and necessarily pro-

duced by God. Only in nature is the trinity of persons

attained. These processes, it must be noticed, are not to

be conceived as successive, or as taking place in time; they

are to be looked at sub specie eternitatis, as the necessary

elements or momeuts in the self-evolution of the divine Being. Nor is nature to be confounded with created sub- | stance, or with matter as it exists in space and time; it is | pure non-being, the mere otherness, alteritas, of God —his shadow, desire, want, or desidervum sui, as it is called by mystical writers. Creation is itself a free and non-temporal act of God's love and will, and on this account its reality cannot be speculatively deduced, but must be accepted as an historic fact. Created beings were originally of three orders—the intelligent, or angels; the non-intelligent natural existences ; and man, who mediated between these two orders. Intelligent beings are endowed with freedom; it is possible, but not necessary, that they should fall. Hence the fact of the fall is not a speculative, but an historic truth. The angels fell through pride—through desire to raise themselves to equality with God; man fell by lowering himself to the level of nature. Only after the fall of man begins the creation of space, time, and matter, or of the world as we now know it; and the motive of this creation was the desire to afford man an opportunity for taking advantage of the scheme of redemption, for bring- ing forth in purity the image of God according to which he has been fashioned. 'The physical philosophy and anthro- pology which Baader, in connection with this, unfolds in various works, is but little instructive, and coincides in the main with the semi-intelligible utterances of Bohme. In nature and in man he finds traces of the dire effects of sin, which has corrupted both, and has destroyed their natural harmony. As regards ethics, it has been already pointed out that Baader rejects the Kantian or any autonomic system of morals. Not obedience to a moral law, but realisation

in ourselves of the divine life, through and in which we have our being, is the true ethical end, But man has lost the power to effect this by himself ; he has alienated himself from God, and therefore no ethical theory which neglects the facts of sin and redemption is satisfac- tory or even possible. The history of man and of humanity is the history of the redeeming love of God. ‘The means whereby we put ourselves so in relation with Christ as to receive from Him his healing virtue, are chiefly prayer and

the sacraments of the church, though it must be noted that mere works are never sufficient. With regard to man in his social relations there are two great institutions or systems of rules under which, or in connection with which, he stands. One is temporal, natural, and limited—the state ; the other is eternal, cosmopolitan, and universal— the church. In the state two things are requisite: first, common submission to the ruler, which can only be secured or given when the state is Christian, for God alone is the true ruler of men; and, secondly, inequality of rank, without which there can be no organisation. A despotism of mere power and liberalism, which naturally produces socialism, are equally objectionable. The ideal state is a perfectly organised church society, a civil community ruled by a universal or Catholic church, and the principles of this church are equally distinct from mere passive pietism, or faith which will ‘now nothing, and from the Protestant doctrine, which is the very radicalism of reason.

Baader is, without doubt, the greatest speculative theo- logian of modern Catholicism, and his influence has ex- tended itself even beyond the precincts of his own church. The great work of Rothe, Zheologische Hthik, is thoroughly impregnated with his spirit ; and, not to mention others, J. Miiller, Christ. Lehre v. der Stinde, and Martensen, Christ. Dogmatik, show evident marks of his influence.

His works have been collected and published by a number of his adherents —Hoffmann, Hamberger, E. v. Schaden, Lutterbeck, Von Osten-Sacken, and Schliiter—Baadcr’s Séimmtliche Werke, 16 vols., 1851-60. Valuable introductions by the editors are prefixed to the several volumes. Vol. xv. contains a full biography ; vol. xvi., an index, and an able sketch of the whole system by Lutterbeck. Among the most valuable works in elucidation

or development of Baader's philosophy may be named :—Hoffmann, Vorhalle zur Speku- latiwen Lehre Baader's, 1886; Grundztige der Societiéts-Philosophie Franz Baader's, 1837; Philosophische Schriften, 3 vols., 1868-72 ; Die Welialter, 1868 ; Hamberger, Cardinalpunkte dcr Baadersehen Philosophie, 1855 ; Fundamentalbegriffe von F. B's. Ethik, Politik, u. Religions-Philosophie, 1858; Lutterbeck, Philosophische Stand-punkte Baader's, 1854; Baader's Lehre vom Weltgebéude, 1866. The only satisfactory survey in any history of philosophy is that given by Erdmann, Versuch einer Gesch. d. ncuern Phil., iti. 2, pp. 5838- 636. (R. AD.)

BAAL is a Semitic word, which primarily signifies lord or owner, and then, in accordance with the Semitic way of looking at family and religious relations, is specially ap- propriated to express the relation of a husband to his wife, and of the deity to his worshipper. In the latter usage, which does not occur among the Arabian Semites, the word Baal seems at first to have been a mere title of deity and not a proper name. In the Old Testament it is regularly written with the article—"the Baal;" and the Baals of different tribes or sanctuaries were not necessarily con- ceived as identical, so that we find frequent mention of Baalim, or rather "the Baalim," in the plural. There is even reason to believe that at an early date the Israelites applied the title of Baal to Jehovah himself, for one of Saul's sons is named Esh-baal (1 Chron. viii. 33), while everything we know of Saul makes it most unlikely that he was ever an idolater. Afterwards, when the name Baal was exclusively appropriated to idolatrous worship (cf. Hos. i. 16, 17), abhorrence for the unholy word was marked by writing Bosheth (shameful thing) for Baal in compound pro- per hames, and thus we get the usual forms Ishbosheth, Meplitbosheth. (Cf. Ewald, Geschichte, ii. 537, and Well-hausen, Teat der Biicher Samuelis, pp. xii. 30, where more arguments are adduced for this view.) ae lic great difficulty which has been felt by investigators in determining the character and attributes of the god Baal mainly arises from the originally appellative sense of the word, and many obscure points become clear if we remem- ber that when the title became a proper name it might be appropriated by different nations to quite distinct deities, while traces of the wider use of the word as a title for any

god, might very well survive even aftcr one god had come to be known as Baal par excellence. That Baal is not always one and the same god was known even to the ancient myth- ologists, who were very much disposed to fuse together dis- tinct deities ; for they distinguish an ‘‘ old” Baal or Belitan (Bel éthan) from a younger Baal, who is sometimes viewed as the son of the other. The “old” Baal has sometimes been identified with the planet Saturn, but it is more likely that he is the Baal (in Assyrian pronunciation Bil) of the first triad of the Babylonian Pantheon, that is the Bel, as distinct from the Baal, of the Old Testament. This Assy- rian and Babylonian Bel is no mere solar or planetary god, but is represented in Chaldean cosmogony as the shaper of heaven and earth, the creator of men and beasts, and of the luminaries of heaven (Berosus, ed. Richter, p. 50), At the same time, we find that the inscriptions give the title of Bel to other and inferior gods, especially to Merodach or the planet Jupiter. This planet was, we know, the Baal (Bal, Bil) of the heathen Mesopotamians (Sabians) of later times, and of the Babylonian Mcndeans.

The Baal ef the Syrians, Phoenicians, and heathen Hebrews is a much less elevated conception than the Babylonian Bel. He is properly the sun-god, Baal Shamem, Baal (lord) of the heavens, the highest of the heavenly bodies, but still a mere power of nature, born like the other luminaries from the primitive chaos (San- choniathon, ed. Orelli, pp. 10, 14). As the sun-god he is conceived as the male principle of life and reproduc- tion in nature, and thus in some forms of his worship is the patron of the grossest sensuality, and even of sys- tematic prostitution. An example of this is found in the worship of Baal-Pcor (Num. xxv.), and in general in the Canaanitish high places, where Baal, the male principle, was worshipped in association with the unchaste goddess Ashera, the female principle of nature. The frequent references to this form of religion in the Old Testament are obscured in the English version by the rendering “grove” for the word Ashera, which sometimes denotes the goddess, some- times the tree or post which was her symbol. Baal himself was represented on the high places not by an image, but by obelisks or pillars (Afageeboth, E. V. wrongly “ images”), sometimes called chammanim or sun-pillars, a name which is to be compared with the title Baal-chamman, frequently given to the god on Pheenician inscriptions. There is rea- son to believe that these symbols, in their earliest form of the sacred tree and the sacred stone, were not specially

appropriated to Baal worship, but were the mark of any sanctuary, memorials of a place where the worshipper had found God (see, for example, Gen. xxi. 33, where for grove read tamarisk, Gen. xxviii. 18), while the stone pillar was also a primitive altar. Gradually, however, they came to be looked upon as phallic symbols, appropriate only to sensual nature worship, and as such were attacked by the prophets (Micah v. 13, 14; Isa. xvii. 8, xxvii. 9, d&c.), and destroyed by such orthodox kings as Josiah. The worship of Baal among the Hebrews has two distinct periods—one before the time of Samuel, and a second from the intro- duction of the Tyrian worship of Baal by Ahab, who mar- ried a Pheenician princess. The ritual of this new Baal, with his long train of priests and prophets, his temple and sacred vestments (2 Kings x.), was plainly much more splen- did than the older Canaanitish worship. Of the worship of the Tyrian Baal, who is also called Melkart (king of the city), and is often identified with the Greek Heracles, but sometimes with the Olympian Zeus, we have many accounts in ancient writers, from Herodotus downwards. He had a magnificent temple in insular Tyre, founded by Hiram, to which gifts streamed from all countries, especially at the great feasts. The solar character of this deity appears especially in the annual feast of his awakening shortly after

the winter solstice (Joscph., Axt., viii. 5). At Tyre, as among the Hebrews, Baal had his symbolical pillars, one of gold and one of smaragdus, which, transported by phan- tasy to the Farthest West, are still familiar to us as the pillars of Hercules. The worship of the Tyrian Baal was carried to all the Phoenician colonies. His name occurs as an element in Carthaginian proper names (Hannibal, Asdrudal, &c.), and a tablet found at Marseilles still re- mains to inform us of the charges made by the priests of the temple of Baal for offering sacrifices.

A much-disputed question is the relation of the sun-god Baal to Moloch-Saturn. Moloch is certainly called Baal in Jer. xix. 5, xxxii. 35, but the word may here retain its appellative force. It is, however, the theory of many scholars, especially worked out by Movers, that Moloch is only a special development of Baal, representing the de- structive heat instead of the life-

giving power of the sun. Another question of some nicety concerns the precise char- acter and mutual relations of the female deities associated with Baal. In the Old Testament, as we have seen, Baal is generally associated with Ashera, but sometimes with Ashtoreth or Astarte (in the plural Ashtaroth, associated with the plural Baalim, 1 Sam. vii. 4, &c.) As Ashtoreth is constantly associated with the Pheenician Baal, it was long customary to identify Ashera with her, a theory op- posed to the fact that Ashtoreth is represented as a chaste goddess. The key to the difficulty is probably to be sought in the Assyrian mythology, where we find that the planct Venus was worshipped as the chaste goddess Istar, when she appeared as a morning star, and as the impure Bilit or Beltis, the Mylitta of Herod. (i. 199), when she was an evening star. These two goddesses, associated yet coutrasted, seem to correspond respectively to the chaste Ashtoreth and the foul Ashera, though the distinction between the rising and setting planet was not kept up among the West- ern Semites, and the nobler deity came at length to be viewed as the goddess of the moon.

Finally, we may mention as a special form of Baal the Philistine Baal-zebub, or " Baal of flies," a conception which has more than one analogy in Greek religion, especially the Zeds 'Amdpvos at Olympia. The use of the word Beelze- bub, or rather, with a slight change, Beelzebul, by the later Jews, to denote the prince of the devils (Mat. xii. 24), is easily understood on the principle laid down in 1 Cor. x. 20.

For further information as to Baal, the reader may con- sult works on Syrian and Pheenician religion. Of older books, the most celebrated is Selden's De diis Syris; of recent books, Movers's Die Phénizier, i., a work full of learn- ing, but deficient in method and logic. The valuable con- tributions to the subject from Assyrian research are partly brought together by Schrader in the Stud. und Krit. for 1874, pp. 335, sqq. (w. R. 8.)

BAALBEC, or Ba'aBak, an ancient city of Syria, cele- brated for the magnificence of its ruins, which, with the exception of those at Palmyra, are the most extensive in that region. The derivation of the latter part of the name is still dubious, some boldly identifying it with the Egyp- tian bakt, a city, and others comparing it with the Arabic bakha, "to be thronged." It is almost certain that the Greek Heliopolis was intended to be a translation of

the name. ‘The town is pleasantly situated on the lowest de- clivity of the Anti-Libanus, at the opening of a small valley into the plain of El-Bukda or Sahlat Ba’albak, about 35 miles N.N.W. of Damascus, and 38 §.S.E. of Tripoli. The inhabitants have a saying, Burton informs us, that it lies on the balance, meaning that it occupies the flattened crest of a watershed. By Russegger its height above the sea is given at 3496 Paris feet, and by Schubert at $572,— the mean of the observations being 3584 Paris feet, or 4502

English feet. A small stream, rising in the immediate neighbourhood from a fountain known as Ra’as-el Ayn, is cmployed for the irrigation of the valley.

The origin of Baalbec is lost in remote antiquity, and the historical notices of it are very scanty. The silence of the classical writers respecting it would secm to imply that previously it had existed under another name, and various attempts have been made to identify it with certain places mentioned in the Bible, as with Baalgad, “in the valley of Lebanon” (Josh. xi. 17) ; Baalath, one of Solomon’s cities (1 Kings ix. 18); Baal-hamon, where Solomon had a vine- yard (Cant. viii. 11.); and “the plain of Aven” (Bikath- Aven, Amos i. 5), referred to by Amos; but none of these identifications seem to rest on any very solid support, though they have each in turn met the approval of some writer of authority. In the absence of more positive in- formation, we can only conjecture that its situation on the high road of commerce between Tyre and Palmyra and the farther East rendered it at an early period a seat of wealth and splendour. It is not at all improbable that the state- ment of Macrobius in his Saturnalia may be founded on the tradition of a real and potent connection between Heliopolis and its Egyptian namesake. It is mentioned by Josephus (Azt., xiv. 3, 4), Pliny (Wat. Hist., v. 22), and Ptolemy, and coins of the city have been found belonging to the reigns of almost all the emperors from Nerva to Gallienus. John Malala of Antioch ascribes the erection of a great temple to Jupiter (vadv 76 Aud péyav) at Helio- polis to Antoninus Pius; and two votive inscriptions still exist on the bases of columns in the Greater Temple, be- longing to the age of Septimius Severus. From the civic coins of the reigns of Nerva and Hadrian we learn that the city had been constituted a colony

by Julius Cesar, and that it was the seat of a Roman garrison in the time of Augustus, and obtained the Jus ftalicum from Septimius Severus (Ulpian, De Censibus, lib. i.) Some of the coins of this Jast emperor bear the figure of a temple and the legend COL.HEL.1.0.M.H., Colonia Heliopolis Jovi Optimo Maximo LHeliopolitano ; while one of the reign of Valerian has the representation of two temples.

It is evident that in the early Christian centuries Helio- polis was one of the most flourishing seats of Pagan wor- ship, and the Christian writers draw strange pictures of the morality of the place. In 297 it became the scene of the martyrdom of Gelasinus. ‘The Emperor Constantine, according to Sozomen, issued a rescript against the licen- tious rites of the people, and founded a basilica among them; but, on the accession of Julian, the Pagan popula- tion broke out into violent persecution, and the city be- came so notorious for its hostility to Christianity, that Christians were banished thither from Alexandria as a special punishment. Theodosius the Great is said to have turned “the temple of alanius, the Trilithon,” into a Christian church, and the city seems to have been the seat of a bishop.

From the accounts of Oriental writers, Baalbec seems to have continued a place of importance down to the time of the Moslem invasion of Syria. They describe it as one of the most splendid of Syrian cities, enriched with stately palaces, adorned with monuments of ancient times, and abounding with trees, fountains, and whatever contributes to luxurious enjoyment. After the capture of Damascus it was regularly invested by the Moslems, and after a courageous defence, at length capitulated. The ransom exacted by the conquerors was 2000 ounces of gold, 4000 ounces of silver, 2000 silk vests, and 1000 swords, together with the arms of the garrison. The city afterwards became the mart for the rich pillage of Syria; but its prosperity soon received a fatal blow from the caliph of Damascus, by whom it was sacked and dismantled, and the principal in-

habitants put to the sword (748 a.p.) It continued, how- ever, to be a place of military importance, and was fre- quently an object of contest between the caliphs of Egypt and the various Syrian dynasties. In 1090 it passed into the hands of the Seljuk princes of Aleppo and Damascus, who in 1134 were

disputing its possession among them- selves, and had to yield in 1139 to the power of Genghis Khan. He held the city till 1145, when it reverted to Damascus, and continued mostly, from that time, to follow the fortunes of that city. During the course of the century it suffered severely from one or more of the earthquakes that visited the district in 1139, 1157, 1170. In 1260 it was taken by the forces of Hulagu, who destroyed the fortifica- tions; but, in the 14th century, it is again described by Abulfeda as enclosed by a wall with a large and strong fortress. Whether it was Baalbec, or, as others say, Cairo, that was, in 1367, the birthplace of Takkieddin Ahmed, the Arabic historian, he appears to have derived the name by which he is best known, El-Makrizi, from one of the quarters of the city. In 1400 it was pillaged by Timur in his progress to Damascus ; and afterwards it fell into the hands of the Metaweli, a barbarous predatory tribe,

who were nearly exterminated when Djezzar Pacha perma-:

nently subjected the whole district to Turkish supremacy. The ancient walls of the city are about 4 miles in com- pass; but the present town is, with the exception of some portions of its Saracenic fortifications and its two mosques, a cluster of mean-looking buildings, which serve only to bring out into greater prominence the grandeur of the neighbouring ruins. These consist of three temples, usu- ally known as the Great Temple (and it well deserves the name), the Temple of Jupiter, Apollo, or the Sun, and the Circular Temple. The Great Temple (wide Plan), which would seem at one period to have been a kind of pantheon, is situated on a magnificent platform, which raises it high above the level of the ground, and extends from east to west a distance of about 1100 feet. The portico is at the eastern end, and must have been reached by a grand flight of steps. It is 180, or, including the exedre or pavilions, 260 feet from north to south. A threefold entrance leads into the first court, which is hexagonal in shape, and measures about 250 feet from corner to corner. A portal 50 feet wide, flanked on each side by a smaller aperture of 10 feet, gives admittance to the great quadrangle, which extends from east to west for 440 feet, and has a breadth of 370, thus including an area of between 3 and 4 acres. On all sides, except the eastern, where the “stately stairs ” led up to the temple front, this court was surrounded with exedree of various dimensions, enclosed by costly pillars, and adorned with numerous statues; but statues

and pillars and steps are now all involved in a common confusion. The peristyle of the temple proper was composed of fifty- four columns, the front line consisting of ten and the side line of nineteen each. The height of the shafts was about 62 feet, and their diameter 7 feet at the base and about 5 feet at the top. They were crowned with rich Corinthian capitals, and supported an eutablature of 14 feet in height (Col. Chesney says 11 feet 9 inches), Most of them were formed of three blocks, united without cement by strong iron dowels. Only six of these columns still stand at the western end of the southern side—three having fallen since the visit of Wood and Dawkins in 1750. That part of the great platform on which the peristyle rests consists of im- mense walls built up about 50 feet from the ground, and formed, as may be easily seen on the northern side, of thirteen courses of bevelled stones in alternate layers of longer and shorter blocks. Outside these walls, at a distance of 29} feet, is another (so-called substruction) wall on ‘the north, west, and probably, though concealed by rubbish, also on the east side. This is built of large

stones, and contains three blocks of such extraordinary proportions that the temple acquired from them its ancient name of Trilithon, or “‘Three-Stone-Temple.” These mea- sure respectively 64 feet, 63 feet 8 inches, and 63 feet in length, are 13 feet in height, and have been raised 20 feet from the ground in the western wall. Two underground passages, 17 feet wide and 30 feet high, run from east to west along the sides of the platform of the great quadrangle, and are connected by a transverse tunnel of similar descrip- tion. They seem, from inscriptions on the walls, to have been tenanted at some time by Roman soldiery.

Slightly to the north of the Great Temple, and agreeing with it in its orientation, is the Temple of the Sun, which is in much better preservation than its neighbour, and, though small in comparison with it, is larger than the Parthenon at Athens. It likewise is built on a plat-

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Ground-Plan of Great Temple and Temple of the Sun at Baalbec. (From Wood and Dawkins, Ruins of Balbec.)

form, and was reached by a flight of steps at the eastern end, which, it would seem, were still standing in 1688. The arrangement of its peristyle may be seen from the plan. The height of the columns is 45 feet, including the Corinthian capitals, and the circumference of each 19 feet. They supported an entablature of 7 feet in height, from which a ceiling was carried back to the wall of the cedla, consisting of slabs enriched with sculpture of great beauty. The principal ornament of each slab is a hexagonal mould- ing enclosing the figure of some god or hero; but the pro- fusion and elegance of the fretwork can only be rendered by the artist. After passing the vestibule, which was partly freed from its barbarous screen by Mr Burton in II. — 23

1870, we reach “an exquisitcly-carved doorway, having a staircase on each side leading to the top of the building,” which gives entrance to the interior of the temple. On the soffit is the figure of the eagle referred to by so many of the travellers, and regarded by Volney and others as the emblem of the sun-god. This part of the building was greatly damaged in the earthquake of 1759, and if mea- sures are not taken to support the lintel, it must soon fall to the ground. The cella seems to have been hypethral ; and, like the rest of the building, it was richly ornamented, the floor now presenting a mass of broken sculpture and pillars. A spiral staircase, in the interior of a massive column, leads to the roof on each side of the portal.

Further east stands the Circular Temple, which is of very small dimensions, but of beautiful workmanship and design. It consists of a semicircular cella surrounded on the outside by eight Corinthian columns, while within there is a double tier of smaller pillars, the lower row being Ionic and the upper Corinthian. Down to the last century it was used as a Greek church ; but it is now in a very ruinous condition, and “choked with wretched hovels.” It is known to the people of Baalbec as Barbarat- el Atikah (Za Sainte Barbe).

The remains of the military works of the Saracens and their successors are only too numerous about Baalbec ; but they have left no buildings of greater intcrest than the mosques already mentioned, the larger of which was built by Melek el As’ad, and the smaller by his father, Melek el Zahir (670 a.u.) Several interesting excursions may be made in the neighbourhood, in regard to which the reader may consult Murray’s Handbook, Joanne and Isambert’s Itinéraire, and a letter of Mrs Burton’s in Unexplored Syria.

The ruins of Baalbec have awakened the admiration of European travellers from the 16th century down to the present day. Baumgarten visited them in 1507, Belon in 1548, Thevet in 1550, Melchior von Seydlitz in 1557, Radzivil in 1583, Quaresmius in 1620, Monconys in 1647, De la Roque in 1688, and Maundrell in 1699. In the 18th century Pococke gave a sketch of the ruins, which was followed up by the magnificent work of Wood and Dawkins (1751), to this day one of our principal authori- ties, and Volney, in 1784, supplied a graphic description. During the present century the number of travellers who have visited Baalbec has enormously increased ; it may be sufficient to mention Richardson, Addison, Lindsay, Wilson, the Duke of Ragusa, Lamartine, De Saulcy, Chesney, and Robinson. Of the chapters of the last writer, in his Biblical Researches, vol. iii., especial use has been made in the present article. In spitc, however, of such a series of investigators, much might still be done to extend our knowledge of those wonderful remains. A few superficial excavations have been made from time to time; but thc ruins of Baalbec still wait for their Layard or their Schliemann.

BABATAG, or BaBapaa, a city of Turkey in Europe, in the government of Bulgaria and sanjak of Silistria. It stands on the lake or estuary Rasein, which communicates with the Black Sea, and is surrounded by mountains covered with woods. It used to be the winter headquarters of the Turkish army during their wars with Russia; and, in 1854, it was bombarded by the Russians. Long. 28° 32’ E., lat. 44° 55’ N. The population of 10,000 includes many Jews, Armenians, Tatars, and Grecks. Babatag was founded by Bajazet.

BABBAGE, CHARLES, a distinguished English mathe- matician and mechanician, was born, 20th December 1792, at Teignmouth in Devonshire. He was educated at a private school, and afterwards entered Trinity College, Cambridge, where he graduated in 1814, Though he did

not compete in the mathematical tripos, he acquired a great reputation at the university. In the year after his gradua- tion he contributed a paper on the ‘ Calculus of Func- tions” to the Philosophical Transactions, and in 1816 wag

made a fcllow of the Royal Society. Along with Herschel and Peacock he laboured to raise the standard of mathe- matical instruction in England, and specially endcavoured to supersede the Newtonian by the Leibnitzian notation in the Calculus. With this object the three friends trans- lated, in 1816, Lacroix's Treatise on the Differential and Integral Calculus, and added, in 1820, two volumes of exaniples. Mr Babbage's attention seems to have been very early drawn to the number and importance of the errors introduced into astronomical and other calculations through inaccuracies in the computation of tables. He contributed to the Royal Society some notices on the rela- tion between notation and mechanism; and in 1822, in a letter to Sir H. Davy on the application of machinery to the calculation and printing of mathematical tables, he discussed the principles of a calculating engine, to the construction of which he devoted many years of his life, Government was induced to grant its aid, and the inventor himself spent a portion of his private fortune in the pro- secution of his undertaking. He travelled through several of the countries of Europe, examining different systems of machinery; and some of the results of his investigations were published in the admirable little work, Hconomy of Machines and Manufactures, 1834, which Blanqui has called "a hymn in honour of machinery." The great calculating engine was never completed ; the constructor apparently desired to adopt a new principle when the first specimen was nearly complete, to make it not a difference but an analytical engine, and Government declined to accept the further risk. From 1828 to 1839 Babbage held the office of Lucasian professor of mathematics at Cambridge. He contributed largely to several scientific periodicals, and was instrumental in founding the Astronomical and Statistical Societies. He only once endeavoured to enter public life, when, in 1832, he stood unsuccessfully for the borough of Finsbury. During the later years of his life he resided in London, and, surrounded by his workshops, still continued to devote himself to the construction of machines capable of performing arithmetical and even algebraical calcula- tions. He died at London, 20th October 1871. He gives a few biographical details in his Passages from the Lnfe of a Piulosopher, 1864, a work which throws considerable light upon his somewhat peculiar character. His works, pamphlets, and papers, were very numerous; in the Passages he cnumerates eighty separate writings. Of these the most important, besides the few alrcady mentioned, are, Tables of Logarithms, 1826; Comparative View of the Various Institutions for the Assurance of

Lives, 1826; Decline of Science in England, 1830; Ninth Bridgewater Treatise, 1837 ; The Exposition of 1851, 1851.

BABEL was the native name of the city called Babylon by the Greeks. It means “gate of god,” or “gate of the gods,” and was the Semitic translation of the original Ac- cadian designation Ca-dimirra. According to Gen. xi. 1-9, mankind, after the deluge, travelled from the mountain of the East (or Elwand), where the ark had rested, and settled in Shinar (Sumir, or the north-west of Chaldea). Here they attempted to build a city and a tower whose top might reach unto heaven, but were miraculously prevented by their language being confounded. In this way the diversity of human specch was accounted for; and an etymology was found for the name of Babylon in the Hebrew verb balbel, “to confound.” According to Alexander Poly-histor (frg. 10) and Abydenus (frgs. 5 and 6), the tower was overthrown by the winds. The native version of the story has recently been discovered among the cuneiform

tablets in the British Museum. It is fuller and more com- plete than the account in Genesis, and formed part of a collection of Babylonian legends older, probably, than 2000 pc. We learn from it that the tower was crected under the supervision of a semi-divine being called Etanna. The tower has been identified with the temple-or tomb of Belus, which Strabo stated with some exaggcration to have been a stade (606 feet) high, but without sufficient reason. It is most probably represented by the modern Birs Nimrud, the ruined remains of the “Temple of the Seven Lights of the Earth,” at Borsippa, a suburb of Babylon, which was dedi- cated to Nebo. The temple had been begun by “a former king,” and built to the height of 42 cubits, but it lay an uncompleted ruin for many centuries, and was not finished till the reign of Nebuchadnezzar. Dr Schrader believes that the state of wreck in which it so long remained caused “the legend of the confusion of tongues” to be attached to it. The earliest buildings met with in Chaldea are constructed of sun-dried brick and mud. A similar tradi- tion to that of the tower of Babel is found in Central America. Xelhua, one of the seven giants reseued from the deluge, built the great pyramid of Cholula in order to storm heaven. The gods, however, destroyed it with fire and confounded

the language of the builders. Traces of a somewhat similar story have also been met with among the Mongolian Tharus in Northern India (Report of the Census of Bengal, 1872, p 160), and, according to Dr Livingstone, among the Africans of Lake Ngami. The Esthonian myth of “the Cooking of Languages” (Kohl, Reisen in die Ostseeprovinzen, ii. 251-255) may also be compared, as well as the Australian legend of the origin of the diversity of speech (Gersticker, Reisen, vol. iv. p. 381, seq.) See further the articles BasyLon and Basy- LONIA, (A. B.S.)

BAB-EL-MANDEB, that is, the Gate of Tears, is the strait between Arabia and Abyssinia which connects the Red Sea with the Indian Ocean. It derives its name from the dangers attending its navigation, or, according to an Arabic legend, from the numbers who were drowned by the earth- quake which separated Asia and Africa. The distance across is about 20 miles, from Ras Menheli on the Arabian coast to Ras Seyan on the African. The island of Perim, a black and desolate rock, about 44 miles long by 2 broad, and rising to a height of 240 feet, divides the strait into two channels, of which the castern and most frequented, known as the Bab Iskender (Alexander’s Strait), is not more than 4 miles wide, and varies in depth from 7 to 14 fathoms, while the western, or Dact-el-Mayun, has a width of about 15 miles anda depth of 180 fathoms. Near the African coast lic a group of smaller islands known as the Seven Brothers, here is usually a surface outflow from the Red Sca, but a strong under-current must set inwards to compensate not only for this, but for the loss occasioned by the great evaporation. (See Carpenter’s “ Further In- quiries” in J. BR. Geog. S.,1874.) In the end of the 18th century (1799) the island of Perim was taken possession of by the British and held as a military outpost, so to speak, of the Indian empire. They again asserted their right to it in 1857, and in 1861 a lighthouse was built at Straits Point, at the eastern extremity of the island. The harbour is accessible and commodious, and the position gives com- plete command of the Red Sea.

BABER. Zernrr-ep-pin Mauomer, surnamed Baber, or the Tiger, the famous conqueror of India aud founder of the so-called Moghul dynasty, was born on the 14th Feb- ruary 1483. He was a descendant of Genghis Khan and Timur, and his father, Omar Sheikh, was king of Farghana, @ district of Transoxiana, lying east of Samarcand. Omar died in 1495, and Baber,

though only twelve years of age, succeeded to the throne. An attempt made by his uncles

to dislodge him proved unsuccessful, and no sooner was the young sovereign firmly settled than he began to meditate an extension of his own dominions. In 1497 he attacked and gained possession of Samarcand, to which he always seems to have thought he had a natural and hereditary right. A rebellion among his nobles robbed him of his native kingdom, and while marching to recover it, his troops deserted him, and he lost Samarcand also. After some reverses he regained both these places, but in 1501 his most formidable encmy, Schaibani Khan, ruler of the Usbeks, defeated him in a great cngagement, and drove him from Samarcand. For three years he wandered about trying in vain to recover his lost possessions; at last, in 1504, he gathered some troops, and crossing the snowy Hundu Kush, besieged and captured the strong city of Cabul. By this dexterous stroke he gained a new and wealthy kingdom, and completely re-established his for- tunes. In the following ycar he united with Hussain Mirza of Herat against Schaibani. The death of Hussain put a stop to this expcdition, but Baber spent a year at Herat, enjoying the pleasures of that capital. He returned to Cabul in time to quell a formidable rebellion, but two years later a revolt among some of the leading Moghuls drove him from his city. He was compelled to take to flight, with very few companions, but his great personal courage and daring struck the army of his opponents with such dismay that they again returned to their allegiance, and Baber regained his kingdom. Once again, in 1510, after the death of Schaibani, he endeavoured to obtain pos- session of his native country. He received considerable aid from Shah Ismael of Persia, and in 1511 made a tri- umphal entry into Samarcand. But in 1514 he was utterly defeated by the Usbeks, and with difficulty reached Cabul. He seems now to have resigned all hopes of recovering Farghana, and as he at the same time dreaded an invasion of the Usbeks from the west, his attention was more and more drawn towards India. Several preliminary incursions had becn already made, when in 1521 an opportunity pre- sented itself for a more extended expedition. Ibrahim, emperor of Delhi, had madc himself detested, even by his Afghan nobles, several of whom called upon Baber for assistance. He at once assembled his forces, 12,000 strong, with some pieces of artillery, and marched into India. Ibrahim, with 100,000 soldiers and numerous elephants, advanced against

him. The great battle was fought at Paniput, 21st April 1526, when Ibrahim was slain and his army routed. Baber at once took possession of Agra. A still more formidable enemy awaited him; the Rana Sanga of Mewar collectcd the enormousforce of 210,000 men, with which he moved against the invaders. On all sidcs there was danger and revolt, even Baber's own soldiers, worn out with the heat of this new climate, longed for Cabul. By vigorous measures and inspiriting speeches he restored their courage, though his own heart was nearly failing him, and in his distress he abjured the use of wine, to which he had been addicted. At Kanwch, on the 10th March 1527, he won a great victory, and made himself absolute master of India. The remaining years of his life he spent in arranging the affairs and revenues of his new empire and in improving his capital, Agra. He dicd 26th December 1530, in his forty-eighth year. Baber was above the middle height, of great strength, and an admirable archer and swordsman. Tis mind was as well cultivated as his bodily powers ; he wrote well, and his observations are generally acute and accurate; he was brave, kindly, and generous. Full materials for his life are found in his Memoirs, written by himself (translated into English by Leyden and Erskine, London, 1826 ; abridged in Caldecott, Life of Baber, London, 1844),

BABEUF, Frangois-Noet, surnamed by himself

Gracchus Babeuf, the earliest of the French socialists, was born in 1762, in the department of Aisne. From his father, a major in the Austrian army, he received special instruction in mathematics, but was deprived of him by death at the age of sixteen. Established as a land-sur- veyor at Roye, in the Somme department, he became a fervid advocate of the Revolution, and wrote articles in the Correspondant Picard, for which he was prosecuted in 1790. He was acquitted on that occasion, and was afterwards elected an administrator of the department; but a charge of forgery being brought against him, he was condemned by the Somme tribunal to twenty years' imprisonment in 1793, Escaping to Paris, he became secretary to the Relief Committee of the Commune, and joined Garin in his denunciation of the Committee of Public Safety. This led to his incarceration, ostensibly under the foriner sen- tence. This was, however, annulled by the Court of Cassa-

tion; and he was also discharged by the Aisne tribunal (18th July 1794), to which he had been remitted. Return- ing to Paris, he entered on a violent crusade against the remains of the Robespierre party, and started the Journal de la Liberté de la Presse to maintain his views. In the following year (1795) the Girondists acquired supremacy in the Convention ; Babeuf's journal was suspended, and him- self imprisone¢d—first in Paris and then at Arras. Thrown into the society of certain partisans of Robespierre, he was won over by them, and was ready, on his release, to become the indiscriminating defender of the very men whom he had previously attacked (No. 34 of the Zrzbun, as he now called his journal). In April 1796 Babeuf, Lepelletier, and others, constituted themselves a "' Secret Directory of Public Safety," and took the title of the '' Equals ;" while another association of self-styled '' Conventionals" and " Patriots " met at the house of Amar. The latter party aimed at the re-establishment of the revolutionary government, while Babeuf and his friends wanted besides to realise their sehetues for the organisation of common happiness. Dis- putes naturally arose; and to reconcile the Equals and the Patriots, it was agreed, first, to re-establish the constitu- tion of 1793; and secondly, to prepare for the adoption of true equality by the destruction of the Government. Every-thing was ready by the beginning of May 1796, and the number of adherents in Paris was reckoned at 17,000; but on the 10th the Government succeeded in arresting the main leaders of the plot. The army protected the Government, and the people of Paris looked on. The trial was opened at Vendome on Feb. 2, 1797, and lasted three months. Babeuf and Darthé were sentenced to death; Germain, Buonarroti, and five others, to transportation ; Amar, Vadier, Duplay, and the remaining fifty-three, were acquitted. On the announcement of the sentence, Babeuf and Darthé stabbed themselves, but the wounds were, not mortal. They passed a frightful night, and next morning were borne bleeding to the scaffold. Ardent and generous, heroic and self-sacrificing, Babeuf had neither solid knowledge nor steadiness of judgment. "The aim of society is happiness, and happiness consists in equality," is the centre of his doctrine. Propagated under the name of Babouvism, it became the germ of contemporary com- munism. Babeuf's influence was fatal in a threefold way,— because he re-established the memory of Robespierre among French Republicans, connected them with the theories of Rousseau, and paved the way for that school of Socialists which left the lessons of experience and observation for Utopian dreams.

Babeuf’s works are—1. Cadastre perpétucl, dédié & l’Assemblée Nationale, & Paris, 1’an 1789 et le premier de la Liberté Frangaise, in 8vo; 2. Journal de la Liverté de la Presse, which appeared from the 23d No. under the title of ‘ Le tribun du peuple,” styled

by Michelet “le monument le plus instructif de l’époque ;” 3. Du Systeme de Dépopulation, ou la vie et les crimes de Carrier, par Grac-

chus Babeuf, Paris, an TI], in 8vo. See also, in addition to legal documents and the histories of the time, Buonarroti’s Histoire de lg Conspiration de Babeuf, of which there is an English translation by Bronterre, London, 1836. :

BABI, or BAxy, the appellation of a remarkable modern sect in Persia, is derived from the title (40, 7.¢., gate) assumed by its founder, Seyed Mohammed Ali, born at Shiraz about 1824, according to Count Gobineau, but ten years earlier according to Kasem Beg. Persia, as is well known, is the least strictly Mahometan of all Mahometan countries, the prophet himself occupying an almost secondary place in the popular estimation to his successor Ali, and the latter’s sons, Hassan and Hosein. ‘The cause of this hetero- doxy is, no doubt, to be sought in ethnological distinctions, the Aryan Persians never having been able to thoroughly accommodate themselves to the creed of their Semitic con- querors. ‘Their dissatisfaction has found vent partly in the universal homage paid to Ali, and the rejection of the Sunna or great mass of orthodox Mahometan tradition, partly in violent occasional outbreaks, most characteristically of all in the mystical philosophy and poetry of the Sufis, which, under the guise of a profound respect for the ex- ternals of Mahometanism, dissolves its rigid Monotheism into Pantheism. Babism is essentially one of the innumer- able schools of Sufism, directed into a more practical channel by its founder’s keen perception of the evils of his times. His first appearance in public took place about 1843, when, on his return from a pilgrimage to Mecca and after a prolonged course of meditation in the ruined mosque of Kufa, the scene of Ali’s murder, he presented himself in his native city with a journal of his pilgrimage and a new commentary on the Koran. He speedily became engaged in controversy with the mollahs or regular clergy, who, exasperated

by the freedom of his strictures on their lives ag well as their doctrines, obtained an official decree for- bidding him to preach in public, and confining him to his house. The Bab, by which title he was now universally known, complied in appearance, but continued to instruct his disciples in private; his doctrines rapidly assumed more logical consistency, and his pretensions augmented in an equal ratio. He now laid aside the title of Bab, declaring himself to be the Mokteh or Point, @.e¢., not merely the re- cipient of a new divine revelation, but the focus to which all preceding dispensations converged. There was little in such a pretension to shock Oriental habits of thought, while the simplicity and elevation of the ethical part of the Bab's system, united to the charm of his manner and the eloquence of his discourse, rapidly gained fresh proselytes. The most remarkable of these was the Mollah Hussein Boushrevieh, a man of great erudition and energy of char- acter, who, having come all the way from Khorassan to hear him, became his convert, and undertook the dissemination of his religion throughout the empire. Two other apostles were speedily added, the appearance of one of whom may almost be said to mark an epoch in Oriental life. It is rare indeed to find a woman enacting any distinguished part in the East, least of all that of a public teacher. Such, however, was the part assumed by the gifted Zerryn Taj (Crown of Gold), better known by the appella- tion of Gourred-Oul-Ayn (Consolation of the Eyes), be- stowed in admiration of her surpassing loveliness. The third missionary was Mohammed Ali Balfouroushi, a reli- gious man, who had already acquired a high reputation for sanctity. The new religion made rapid progress, and the endeavours of the authorities to repress it eventually pro- duced a civil war. Hussein constructed a fort in the pro- vince of Mazanderan, where he defeated several expeditions despatched against him, but at length fell mortally wounded in the momentof victory, and his followers, reduced tosurren- der by famine, were mostly put to dcath (1849). Balfov-

roushi, with a number of his principal adherents, perished in the city of Zendian after an obstinate defence (May 1850). Ere this event had taken place, the Government had pro- ceeded to the execution of the Bab himself, who had now 'been confined for some time in the fortress of Cherigh,

where he is said to have greatly impressed his gaolers by his patience and dignity. He was removed to Tabriz, and all attempts to induce him to retract having failed, he was suspended from the summit of a wall by the armpits in view of the people, along with one of his disciples; the object of this public exposure being to leave no doubt of the reality of his death. A company of soldiers discharged their muskets at the martyrs; but although the disciple was killed on the spot, the bullets merely cut the cords by which the Bab himself was suspended, and he fell to the ground unhurt. With more presence of mind on his part, this apparently miraculous deliverance might have pro- voked a popular insurrection in his favour; but, bewildered by the fall, instead of invoking the people, he took refuge in a guard-house, where he was promptly despatched. His death was far from discouraging his followers, who recog- nised as his successor Mirza Yahya, a youth of noble birth. Yahya established himself at Baghdad, where he is or was recently still residing, No new event of importance occurred until 1852, when an attempt of several Babis to assassinate the Shah led to a ferocious persecution, in which the beautiful Gourred-Oul-Ayn perished with many others. In the opinion of M. Gobineau, this persecution has rather tended to encourage than to repress the scct, which is believed to be widely diffused in Persia at this moment, under the mask of couformity to the established ereed. It can only be regarded as an individual symptom of a constantly recurring phenomcnon—the essential in- compatibility between the religious conceptions of Aryan and Semitic races. The doctrines of Babism are contained in an Arabic treatise, entitled Biyan (the Exposition), written by the Bab himself. It is essentially a system of Pautheism, with additions from Gnostic, Cabbalistic, and even Buddhistic sources. All individual existence is re- garded as an emanation from the Supreme Deity, by whom it will ultimately be reabsorbed. Great importance is attached to the nuniber seven, being that of the attributes supposed to be displayed in the act of creation, and to the uumber nineteen, which mystically expresses the name of the Deity himself, and is, moreover, the sum of the pro- phets among whom the latest incarnation of the divine nature is conceived to be distributed in the present dispen- sation. Of these the Bab is chicf, but the other eighteen are regarded as no less participators in the divine nature. This sacred college cannot become extinct until the last Judgment; the death of any of its members being imme- diately followed by a reincarnation, as in the case of the Grand Lama. The prophetic character of Moses, Christ, and

Mahomet is acknowledged, but they are considered as mere precursors of the Bib. The morality of the sect 1s pure and cheerful, and it manifests an important advance upon all previous Oriental systems in its treatment of Woman. Polygamy and concubinage are forbidden, the veil is disused, and the equality of the sexes so thoroughly recognised that one at least of the nineteen sovereign pro- phets must always be a female. The other chief precepts of Babism inculcate hospitality, charity, and generous liv- ing, tempered by abstinence from intoxicating liquors aud Tugs. Asceticism is entirely discountenanced, aud men-

mee" being regarded as a form of it, is strictly pro-

- po opel authorities on Babism to this date are Count Gobi- cau, formerly French attaché at Teheran, in his work, Les Réligions

et les Philosophies dans l Asie centrale (Paris, 1865), and an article by Kasem Beg in the Journal Asiatique for 1866. These materials have been condensed into a valuable essay, by F. Pillon, in L' Année Philosophique for 1869. Sec also the History of Persia wnder the Kajar Dynasty, by R. G. Watson (whose accusations of immorality against the Babis seem to be founded solely on the misconduct of par- ticular members of the sect); Ethé, Essays und Studien (Berlin, 1872); and incidental notices in the travels of Vambéry, Polak, Piggott, and Lady Sheil. (R. G.)

BABOON, the popular name of apes belonging to the genus Cynocephalus of the family Simiade. See APE, vol, 11, p. 152.

BABRIUS, or Baprias, or GaBrias (the original name being possibly Oriental),a Greek fabulist, who wrote, accord- ing to Sir G. C. Lewis, shortly before the Augustan age, though dates have been assigned to him from 250 B.c. to 250 A.D. One of his editors, Boissonade, believes that he was a Roman. His name occurs in some of the old gram- marians, and a few fragments were ascribed to him. Tho first critic who made him more than a mere name, was Bentley in his Dissertation on the Fables of Atsop. Ina careful examination of these prose A'sopian fables, which had been handed down in various collections from the time of Maximus Planudes, Bentley

discovered traces of versification, and was able to extract a numbcr of verses which he assigned to Babrius, Tyrwhitt followed up the researches of Bentley, and for some time the efforts of scholars were directed towards reconstructing the metrical original of the prose fables. In 1842, however, M. Mynas, a Greek, the discoverer of the Philosophoumena of Hippo- lytus, came upon a MS. of Babrius in the convent of St Laura on Mount Athos, This MS. contained 123 fables out of the supposed original number, 160. The fables are written in choliambic, ¢.e., limping or imperfect iambic verse, having a spondce as the last foot, a metre originally appropriated to satire. The style is extremely good, the expression being terse, pointed, and elegant, and the construction of the stories is fully equal to that in the prose versions. The MS. was first published by Boissonade in 1844 ; afterwards by Lachmann, 1845; by Orelli and Baiter, 1845; by Sir George Cornewall Lewis, 1846; and by Schneidewin, 1853. The genuineness of this collcc- tion of the fables was generally admitted by scholars. In 1857 Mynas professed to have discovered at Mount Athos another part containing 94 fables and a pro- cemium. According to his statement, the monks, who had been willing to sell the MS. containing the first part for a sufficient price, refused altogether to part with the second. He therefore made a copy whicli was sold to the British Museum, and was published in 1859 by Sir G. C. Lewis. But these fables only purport to be Babrius spoiled, after having passed through the hands of a “ diasceuast,” that is, some late writer who has turned his verses into barbarous Greek and wretched metre. In a Latin dis- sertation, published in 1861, Professor Conington carefully examined this part, arriving at the conclusion that the fables were metrical versions of the prose stories, executed by some forger who must have been acquainted with Lachmann’s conjectures on fragments formerly known. Cobet expresses a similar opinion, but in stronger terms. It is not impossible that the forger was Mynas himself. Sir G. C. Lewis, however, holds that the similarity between the fables and these existing prose versions appears such as might have been produced not by a forger copying from a prose writer, but rather by two grammarians recasting the same work of Babrius. The standard edition of Babrius is that of Sir. G. C. Lewis; there is a faithful translation in verse by Davies. For Conington’s dissertation see his Miscellaneous Writings, vol. ii. pp. 460-491.

BABYLON-—-BABYLONIA

ABYLON (the modern JZillah) is the Greek form of Babel or Bab-ili, “the gate of god” (or, as it is some-

times written, “of the gods”), which, again, is the Semitic rendering of Ca-dimirra, the ancient name of the city in the Turanian language of the primitive Accadian popula- tion of the country. I is doubtful whether the god meant was Merodach or Anu, Merodach being the patron divinity of Babylon in the Semitic period, and Su-Anna, “the valley of Anu” (Anammelech), being one of its oldest names. Another synonym of the place was E-ci, “the hollow,” in reference to its situation, and it was also known, down to the latest times, as Din-Tir, “‘ the house of the jungle,” though this seems properly to have been the designation of the town on the left bank of the Euphrates. Under the Cassite dynasty of Khamniuragas, it received the title of Gan-Duniyas or Gun-Duni, “ the Fortress of Duniyas,” which was afterwards made to in- clude the neighbouring territory, so that the whole of Babylonia came to be called by this name. Sir H. Rawlin- son has suggested that it was the origin of the Biblical (san Eden, or “Garden of Eden,” to which a popular etymology has given a Hebrew form. However this may be, Babylon figures in the antediluvian history of Berosus, the first of his mythical monarchs, Alorus, being a native of it. The national epic of the Babylonians, which grouped various old myths round the adventures of a solar hero, knows of four cities only—Babylon, Erech, Nipur (Vifer) or Calneh, and Surippac or Larankha; and according to Genesis x., Babylon was a member of the tetrapolis of Shinar or Sumir, where the Semite invaders of the Acca- dians first obtained permanent settlement and power. It seems, however, to have ranked below its three sister-cities, among which Erech took the lead until conquered by the Accadian sovereigns of Ur. It was not until the con- quest of Khammuragas that Babylon became a capital, a position, however, which it never afterwards lost, except during the Assyrian supremacy. But it suffered severely at the hands of its northern neighbours. Tiglath-Adar drove the Cassi from it, and established an Assyrian dynasty in their place; and after being captured by Tiglath-Pileser I. (1130 B.c.) and Shalmaneser (851 B.c.), it became a dependency of the Assyrian empire in the reign of the son of tho lattcr. The decline of the first Assyrian empire restored Babylon to independence ; but it had soon

afterwards to submit to the Caldai, and from the reign of Tiglath-Pileser II. to the death of Assur-bani- pal, it was a mere provincial town of Assyria, breaking now and then into fierce revolt under the leadership of the Caldai, and repeatedly taken and plundered by Sargon, Sennacherib, and Assur-bani-pal. Sennacherib, indeed, razed the city to its foundations. After the defeat of Suzub (690 3.c.), he tells us that he " pulled down, dug up, and burned with fire the town and the palaces, root and branch, destroyed the fortress and the double wall, the temples of the gods and the towers of brick, and threw the rubbish into the Araxes," the river of Babylon. After this destruction it is not likely that much will ever be dis- covered on the site of Babylon older than the buildings of Hssar-haddon and Nebuchadnezzar. It was under the latter monarch and his successors that Babylon became the huge metropolis whose ruins still astonish the traveller, and which was described by Greek writers. Of the older city we can know but little. The Babylon of Nebuchad- nezzar and his father, Nabopolassar, must lave suffered when taken by Cyrus; but two sieges in the reign of Darius Hystaspis, and one in the reign of Xerxes, brought

about the destruction of the defences, while the monothe- istic rule of Persia allowed the temples to fall into decay, Alexander found the great temple of Bel a shapeless ruin, and the rise of Seleucia in its neighbourhood drew away its population and completed its material decay. The buildings became a quarry, first for Seleucia and then for Ctesiphon, Al Modain, Baghdad, Kufa, Kerbelah, Hillah, and other towns, and our only cause for wonder is that the re- mains of the great capital of Babylonia are still so extensive,

The principal of these lie on the left bank of the Euphrates, and consist of three vast mounds—the Babil or Mujellibe, the Kasr, and the Amrdm, which run from north to south ; two parallel lines of rampart east and west of them ; and an isolated mass, together with a series of elevations separated by the river westward of the Kasr,— the whole being surrounded by a triangular rampart. Our two chief authorities for the ancient topography of the city are Herodotus and Ctesias; and though both were eye-witnesses, their statements differ considerably. The city was built, we are told, on both sides of the river, in the form of a square, and enclosed within a double row of high walls. Ctesias adds a third wall, but the inseriptions refer only to two, the inner encezte, called Imgur-Bel, and its salkhu or

outwork, called Nimitti-Bel. Ctesias makes the outermost wall 360 stades (42 miles) in circum- ference, while according to Herodotus it measured 480 stades (56 miles), which would include an area of about 200 square miles! Pliny (WV. Z/,, vi. 26) follows Herodotus in his figures, but Strabo (xvi. 1, 5) with his 385 stades, Qu. Curtius (v. 1, 26) with his 368 stades, and Clitarchus (ap. Diod. Sic. ,ii. 7) with 365 stades, agree sufficiently closely with Ctesias. Even the estimate of Ctesias, how- ever, would make Babylon cover a space of about 100 square miles, nearly five times the size of London. Sueli an area could not have been occupied by houses, especially as these were three or four stories high (Hdt., 1, 180). Indeed Q. Curtius asserts (v. 1, 27) that even in the most flourishing times, nine-tenths of it consisted of gardens, parks, fields, and orchards. According to Herodotus, the height of the walls was about 335 feet, and their width 85 feet; while Ctesias makes the height about 300 feet. Later writers give smaller dimensions, but it is clear that they have merely tried to soften down the estimates of Herodotus (and Ctesias); and we scem bound, therefore, to accept the statement of the two oldest eye-witnesses, astonishing as it is. But we may remember that the ruined wall of Nineveh was 150 feet high, even in Xenophon’s time (Anab., iti. 4, 10, and ef. ii, 4, 12), while the spaces be- tween the 250 towers irregularly disposed along the wall of Babylon (Ctes. ap. Diod., ii. 7) were broad enough to allow a four-horse chariot to turn (Hdt., i. 179). The clay dug from the moat had served for the bricks of the wall, which was pierced with 100 gates, all of brass, with brazen lintels and posts. The twoinner enclosures were faced with coloured brick, and represented hunting-scenes. Two other walls ran along the banks of the Euphrates and the quays with which it was lined, each containing 25 gates, which answered to the number of the streets they led into. Ferry-boats plied between the landing-places of the gates ; and a movable drawbridge (30 feet broad), sup- ported on stone piers, joined the two parts of the city together. At each end of the bridge was a palace; the great palace of Nebuchadnezzar on the eastern side (the modern Kasr), which Herodotus incorrectly transfers to the western bank, being the most magnificent of the two. It was surrounded, according to Diodorus (ii. 8, 4), by three

walls, the outermost being 60 stades(7 miles) in cireuit. The inner walls were decorated with hunting-scenes painted on brick, fragments of which have been discovered by modern explorers. Two of its gates were of brass, and had to be opened and shut by a machine ; and Mr Smith has found traces of two libraries among its ruins, The palace, called “the Admiration of Mankind” by Nebuchadnezzar, and commenced by Nabopolassar, overlooked the Ai-ipur-sabu, the great reservoir of Babylon, and stretched from this to the Euphrates on the one side, and from the Imgur-Bel, or inner wall, to the Libil, or eastern canal, on the other. Within its precincts rose the Hanging Gardens, consisting of a garden of trees and flowers on the topmost of a series of arches at least 75 fect high, and built in the form of a square, each side measuring 400 Greek feet. Water was raised from the Euphrates by means, it is said, of a screw (Strab., xvi. 1, 5; Diod., ii. 10, 6). Some of the materials for the construction of this building may have been obtained from the old ruined palace of the early kings, now represented by the adjoining Amra4m mound. The lesser palace in the western division of the city belonged to Neriglissar, and contained a number of bronze statues.

The most remarkable edifice in Babylon was the temple of Bel, now marked by the Badbt/, on the north-east, as Professor Rawlinson has shown. Jt was a pyramid of eight square stages, the basement stage being over 200 yards each way. A winding ascent led to the summit and the shrine, in which stood a golden image of Bel 40 feet high, two other statues of gold, a golden table 40 feet long and 15 feet broad, and many other colossal objects of the same precious material. At the base of the tower was a second shrine, with a table and two images of solid gold. Two altars were placed outside the chapel, the smaller one being of the same metal. A similar temple, represented by the modern Birs Nimrud, stood at Borsippa, the suburb of Babylon. It consisted of seven stages, each ornamented with one of the seven planetary colours, the azure tint of the sixth, the sphere of Mercury, being produced by the vitrifaction of the bricks after the stage had been completed. The lowest Stage was a square, 272 feet each way, its four corners exactly corresponding to the four cardinal points, as in all other Chaldean templcs, and each of the square stages raised upon it being placed nearer the south-western than the north-eastern edge of the underlying one. It had been partly built by an ancient monarch, but, after lying un- finished

for many years, like the Biblical tower of Babel, was finally completed by Nebuchadnezzar.

The amount of labour bestowed upon these brick edifices inust have been enormous, and gives some idea of the human force at the disposal of the monarch. If any further illustration of this fact were needed, it would be found in the statement made by Nebuchadnezzar in one of his inseriptions (and quoted also from Berosus), that he had finished the Imgur-Bel in fifteen days. The same monarch also continucd the embankment of the Euphrates for a considerable distance beyond the limits of Babylon, and cut some canals to carry off the overflow of that river into the Tigris. The great rescrvoir, 40 miles square, on the west of Borsippa, which had becn excavated to receive the waters of the Euphrates while the bed of its channel was being lined with brick, was also used for a similar purpose. The reservoir seems to have been cntered by the Arakhtu or Araxes, “the river of Babylon,” which flowed through a deep wady into the heart of Northern Arabia, as Wetzstein has pointed out. Various nomad tribes, such as the Nabatheans or the Pekod, pitched their tents on its banks ; but, although it is not unfrequently mentioned in early Babylonian history, we hear no more of , after the time of Nebuchadnezzar. It is possible, there-

ore, that it was drained by the western reservoir. (A. 1.8.)

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BABYLONIA anp ASSYRIA. Geographically, as well as ethnologically and historically, the whole district en- closed between the two great rivers of Western Asia, the Tigris and Euphrates, forms but one country. The writers of antiquity clearly recognised this fact, speaking of the whole under the general name of Assyria, though Babylonia, as will be scen, would have been a more accurate designation. It naturally falls into two divisions, the northern being more or less mountainous, while the southern is flat and marshy ; and the near approach:of the two rivers to one another, at a spot where the undulating plateau of the north sinks suddenly into the Babylonian alluvium, tends still more completely to separate them. In the earliest times of which we have any record, the northern portion was comprehended under the vague title of Gutium (the Goyim of Gen. xiv. 1), which stretched from the Euphrates on the west to the mountains of Media

on the east ; but it was definitely marked off as Assyria after the rise of that monarchy in the 16th century B.c. Aram-Naharaim, or Mesopotamia, however, though claimed by the Assyrian kings, and from time to time overrun by them, did not form an integral part of the kingdcm until the 9th century B.c., while the region on the left bank of the Tigris, between that river and the Greater Zab, was not only included in Assyria, but contained the chief capitals of the empire. In this respect the monarchy of the Tigris resembled Chaldea, where some of the most important cities were situated on the Arabian side of the Euphrates. The reason of this preference for the eastern bank of the Tigris was due to its abundant supply of water, whereas the great Mesopotamian plain on the western side had to depend upon the streams which flowed into the Euphrates. This vast flat, the modern El-Jezireh, is about 250 miles in length, interrupted only by a single limestone range, rising abruptly out of the plain, and branching off from the Zagros nountains under the names of Sarazir, Hamrin, and Sinjar. The numerous remains of old habitations show how thickly this level tract must once have been peopled, though now for the most part a wilderness. North of the plateau rises a well-watered and undulating belt of country, into which run low ranges of limestone hills, sometimes arid, sometimes covered with dwarf-oak, and often shutting in, between their northern and north-eastern flank and the main mountain-line from which they detach themselves, rich plains and fertile valleys. Behind them tower the massive ridges of the Niphates and Zagros ranges, where the Tigris and Kuphrates take their rise, and which cut off Assyria from Armenia and Kurdistan. The name Assyria itself originally denoted the small territory immediately sur- rounding the primitive capital “the city of Asur” (a/ Asur, the Ellasar of Genesis), which was built, like the other chief cities of the country, by Turanian tribes, in whose language the word signified ‘‘ water-meadow.” It stood on the right bank of the Tigris, midway between the Greater and the Lesser Zab, and is represented by the modern Kalah Sherghat. Itremained the capital long after the Assyrians had become the dominant power in Western Asia, but was finally supplanted by Calah (Wimrid), Nineveh (Nebi Yunus and Kouyunjik), and Dur-Sargina (Khorsabad), some 60 miles further north. See NINEVEH.

In contrast with the arid plateau of Mesopotamia, stretched the rich alluvial plain of Chaldea, formed by the deposits of the two great rivers by which it

was enclosed. The soil was extremely fertile, and teemed with an industrious population. Eastward rose the mountains of Elam, southward were the sea-marshes and the ancient kingdom of Nituk or Dilvun (the modern Bender-Dilvun), while on the west the civilisation of Babylonia encroached beyond the banks of the Euphrates, upon the territory of the Semitic nomades (or Suti). Here stood Ur (now

Mugheir), the earliest capital of the country ; and Babylon, with its suburb, Borsippa (Birs Nimrid), as well as the two Sipparas (the Sepharvaim of Scripturc, now MMosazb), occupied both the Arabian and Chaldean side of the river. (See Basyton.) The Araxcs, or " River of Babylon," was conducted through a decp valley into the heart of Arabia, irrigating the land through which it passed ; and to the south of it lay the great inland fresh-water sea of Medjef, surrounded by red sandstone cliffs of considerable height, 40 miles in length and 35 in breadth in the widest part. Above and below this sea, from Borsippa to Kufa, extend the famous Chaldcan marshes, where Alexander was nearly lost (Arrian, Zup. Al., vii. 22.; Strab., xvi. 1, § 12,) ; but these depend upon the state of the Hindiyah canal, dis-appearing altogether when it is closed. Between the sea of Nedjef and Ur, but on the left side of the Euphrates, was Krech (now Warka), which with Nipur or Calneh (now Nifer), Surippac (Senkereh ?), and Babylon (now Hillah), formed the tetrapolis of Sumir or Shinar. This north- western part of Chaldea was also called Gan-duniyas or Gun-duni after the accession of the Cassitc dynasty. South- eastern Chaldea, on the other hand, was termed Accad, though the name came also to be applicd to the whole of Babylonia. The Caldai, or Chaldeans, are first met with in the 9th century B.c. as a small tribe on the Persian Gulf, whence they slowly moved northwards, until under Mcrodach-Baladan they made themselves masters of Babylon, and henceforth formed so important an clement in the population of the country, as in later days to give their name to the whole of it. In the inscriptions, how- ever, Chaldea represents the marshes of the sea-coast, and Teredon was onc of their ports. 'The whole territory was thickly studded with towns; but among all this "vast number of great cities," to use the words of Herodotus, Cuthah, or Tiggaba (now Fbrahim), Chilmad (Kalwadah), Ts (Ait), and Dur-aba (Akkerkuf) alone need be mentioned,

The cultivation of the country was regulated by canals, the three chief of which carried off the watcrs of the Euphrates towards the Tigris above Babylon,—the “ Royal River,” or Ar-Malcha, entcring the Tigris a little below Baghdad, the Nahr-Malcha running across to the site of Seleucia, and the Nahr-Kutha passing through Ibrahim. The Pallacopas, on the other side of the Euphrates, supplied an immense lake in the neighbourhood of Borsippa. So great was the fertility of the soil that, according to Herodotus (i. 193), grain commonly returned two hundred- fold to the sower, and occasionally three hundredfold. Pliny, too (H. V., xviii. 17), says that wheat was cut twice, and afterwards was good keep for sheep; and Berosus remarked that wheat, barley, sesame, ochrys, palms, apples, and many kinds of shelled fruit grew wild, as wheat still does in the neighbourhood of Anah. A Persian poem celebrated the 360 uses of the palm (Strab., xvi. 1, 14), and Ammianus Marcellinus (xxiv. 3) states that from the point reached by Julian’s army to the shores of the Persian Gulf was one continuous forest of verdure.

Such a country was well fitted to be one of the primeval seats of civilisation. Where brick lay ready to hand, and climate and soil nceded only settled life and moderate labour to produce all that man required, it was natural that the great civilising powcr of Western Asia should take its rise. The history of the origin and development of this civilisa- tion, interesting and important as it is, has but recently been made known to us by the decipherment of the native monu- ments. The scanty notices and conflicting statements of classical writers have been replaced by the evidence of con- temporaneous documents ; and though the matcrials are still but a tithe of what we may hope hereafter to obtain, we can sketch the outlines of the history, the art, and the science of the powerful nations of the Tigris and Euphrates. Before

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doing so, however, it would be well to say a few words in regard to our classical sourccs of information, the only ones hitherto available. The principal of these is Bcrosus, the Manetho of Babylonia, who flourished at the time of Alexander’s conquests (though sce Havet, Mémoire sur la Date

des Ecrits qui portent les noms de Bérose et de Manethon). He was priest of Bel, and translated the records and astronomy of his nation into Greek. His works have unfortunately perished, but the second and third hand quotations from them, which we have in Euse- bius and other writers, have been strikingly verified by inscriptions so far as regards their main facts. The story of the flood taken from Berosus, for instance, is almost identical with the onc preserved on the cuneiform tablets, Numerical figures, however, as might be expected, are untrustworthy. According to Berosus, ten kings reigned before the Deluge for 120 saroi, or 432,000 years, beginning with Alorus of Babylon and ending with Otiartes (Opartes) of Larankha, and his son Sisuthrus, the hero of the flood. ‘Then came eight dynasties, which are given as follows : —

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Next to Berosus, the authority of Herodotus ranks highest. His information, however, is scanty, and he had to trust to the doubtful statements of ciceroni. Herodotus was controverted by Ctesias of Cnidus, the physician of Artaxerxes Mnemon. But Ctesias mistook mythology for history, and the Ninus and Semiramis, the Ninyas and Sardanapalus, of Greek romance were in great measure his creations. We may yet construct an Assyrian epopee, like the Shahnameh of Firdusi, out of his pages, but we must not look to them for history. Other historical notices of Assyria and Babylonia, of more or less questionable value, are to be gathered from Diodorus and one or two more writers, but beyond Berosus and, to a limited extent, Herodotus, our only ancient authority of much value upon this subject is the Old Testament.

Ethnology and History.—The primitive population of Babylonia, the builders of its cities, the originators of its culture, and the inventors of the cuneiform system of writing, or rather of the hieroglyphics out of which it gradually developed, belonged to the Turanian or Ural- Altaic family. Their language was highly agglutinative, approaching the modern Mongolian idioms in the simplicity of its grammatical machinery, but otherwise more nearly related to the Ugro-Bulgaric division of the Finnic group ; and its spcakcrs were mentally in no way inferior to the Hungarians and Turks of the present day. The country

was divided into two halves, the Sumir (Sungir, or Shinar) in the north-west, and the Accad in the south-east, corre- sponding most remarkably to the Suomi and Akkara-k, into which the Finnic race believed itself to have been separated in its first mountain home. Like Suomi, Sumir signified “(the people) of the rivers,” and just as Finnic tradition makes Kemi a district of the Suomi, so Came was another name of the Babylonian Sumir. The Accadai, or Accad, were “the highlanders ” who had descended from

the moun- tainous region of Elam on the east, and it was to them that the Assyrians ascribed the origin of Chaldean civilisa- tion and writing. They were, at all events, the dominant people in Babylonia at the time to which our earliest contemporaneous records reach back, although the Sumir, or " people of the home language," as they are sometimes termed, were named first in the royal titles out of respect to their prior settlement in the country. A survey of the syllabary has led to the conclusion that the first attempts at writing were made before the Accad had descended into the plains and exchanged papyrus as a writing material for clay ; other considerations, however, go to show that although the system of writing may have been invented before they had entered Babylonia, it was not completed until after they had done so. In harmony with this, we find Berosus ascribing the culture of "the mixed population of Chaldea" to Oannes and other similar creatures from the Persian Gulf. So far as we can judge, the civilisation of Elam is at least coeval with that of Babylonia, and the capture of Babylon by the Medes, with whom the historical dynasties of Berosus are commonly supposed to begin, must be explained by an Elamite conquest. Media was the Accadian Mada, ''the land" par excellence ; and Acca- dian tradition looked back upon the mountainous district to the south-west of the Caspian as the cradle of their race. Among these " mountains of the east," and in the land of Nisir (the furthermost division of Gutium beyond the Lesser Zab), rose "' the mountain of the world," the Turanian Olympus, on which the ark of the Chaldean Noah was believed to have rested. From this centre Turanian tribes spread in all directions, meeting Alarodians on the north, and Semites on the south-west. The Aryans had not yet penetrated across the great Sagartian desert. The numerous tribes of Susiana, both civilised and uncivilised, spoke languages more closely Ugrian than even that of the Accadians ; the oldest towns of Northern Syria, where the Semite afterwards reigned supreme, bore Accadian names, and, as in the case of Haran, were mythologically connected with Babylon; while the chief cities of Assyria were founded by Accadians, were denoted by Accadian symbols, and were ruled by Accadian princes, in strict accordance with the statement of Genesis that out of Babylonia "went forth Asshur." An Elamite conqueror of Chaldea, like Chedorlaomer (Gen. xiv. 1), imposed his authority not only over Shinar, but over Assyria and Gutium as well. The earliest geographical lists know only of Nuvva, or Elam, on the east, the Khani on the west, Martu, the land of "the path of the setting sun," Subarti,

or Syria, with its four races, and Gutium, which stretched across Mesopotamia from the Euphrates on the one side to the mountains of Media on the other. To these must be added Anzan, or southern Elam, with its capital Susa, Dilvun, or Nituk, on the Persian Gulf, and, at a considerably later date, the Hittites, with their chief city Carchemish.

The first monarchs whose monumental records we possess had their seat at Ur, on the right bank of the Euphrates. Ur, in Accadian, signified “the city” par excellence, and 80 bore testimony to the supremacy claimed by its rulers over the rest of Babylonia. The great temple of the Moon-god there was one of the oldest buildings in the country, and its erection was due to a prince who claimed

sovereignty over the whole of Babylonia, and adorned Erech, Nipur, Larsa, and other cities with temples of vast size, dedicated to the sun, to Istar, and to Bel. He seems to have been the first great Babylonian builder; and this would imply that it was under him that Ur rose to its prominent position, and united the numerous principalities of Chaldea under one head. The enormous brick struc- tures were cemented with bitumen in the place of lime mortar ; but the use of the buttress, of drains, and of external ornamentation, shows that architectural knowledge was already advanced. The cuneiform system of writing had attained its full development, signet stones were carved with artistic skill, and the amount of human force at the disposal of the monarch may be estimated from the fact that the Bowariyeh mound at Warka, on the site of the temple of the Sun-god, is 200 feet square and 100 fect high, so that above 30,000,000 bricks must have been employed upon its construction. The vicinity of Ur to the Semitic tribes of Arabia implies that the Accadian sove- reigns had been turning their attention in that direction, and we find nothing surprising therefore in the Scriptural account of Abraham’s migration from this place, or the Pheenician tradition of the original home of the Canaanitish race on the shores of the Persian Gulf (Strab., i. 2, 35, xvi 3,45 27; Justin, xviii. 3,2; Pliny, J. 17, iv. 36). Indeed, we have clear evidence that Semitic was spoken in Ur itself at this remote epoch. Although the ruling caste were Accadian,

and generally wrote their inscriptions in that language, Dungi, one of their earliest monarchs, in spite of his Turanian name, has left us a short legend in Semitic ; and it is more than probable that the imperial title of ““Sumir and Accad ” was soon to be assumed to mark a linguistic as well as a geographical distinction. The brick legends of the various viceroys who governed the cities of Chaldea under this dynasty are all, however, in Accadian.

The supremacy of Ur had been disputed byits more ancient rival Erech, but had finally to give way before the rise of Nisin or Karrak, a city whose site is uncertain, and Karrak in its turn was succeeded by Larsa. Elamite conquest seems to have had something to do with these transferences of the seat of power. In 2280 B.c.—the date is fixed by an inscription of Assur-bani-pal’s—Cudur-nankhundi, the Elamite, conquered Chaldea at a time when princes with Semitic names appear to have been already reigning there, and Cudur-mabug not only overran ‘‘the west,” or Pales- tine, but established a line of monarchs in Babylonia. His son and successor took an Accadian name, and extended his sway over the whole country, Twice did the Elamite tribe of Cassi or Kosseeans furnish Chaldea with a succession of kings. At a very early period we find one of theso Kosseean dynasties claiming homage from Syria, Gutium, and Northern Arabia, and rededicating the images of native Babylonian gods, which had been carried away in war, with great splendour and expense. The other Cassite dynasty was founded by Khammuragas, who established his capital at Babylon, which henceforward continued to be the seat of empire in the south. The dynasty is probably to be identified with that called Arabian by Berosus,! and it was during its domination that Semitic came gradually to supersede Accadian as the language of the country. Kham- muragas himself assumed a Semitic name, and a Semitic inscription of his is now in the Louvre. A large number of canals were constructed during his reign, more especially the famous Nahr-Malcha, and an embankment built along the banks of the Tigris. The king’s attention seems to have been turned to the subject of irrigation by a flood which overwhelmed the important city of Mullias. His

1 If so, the number of reigns to be assigned to it, as well as its duration, will have to be corrected, as we know of at least nineteen kings belonging to this Cassite dynasty.

first conquests were in the north of Babylonia, and from this base of operations he succeeded in overthrowing Naram-Sin (or Rim-Acu?) in the south, and making himself master of the whole of Chaldea. Naram-Sin and a queen had been the last representatives of a dynasty which had attained a high degree of glory both in arms and in literature. Naram-Sin and his father Sargon had not only subdued the rival princes of Babylonia, but had successfully invaded Syria, Palestine, and even, as it would seem, Egypt. At Agane, a suburb of Sippara, Sargon had founded a library, especially famous for its works on astrology and astronomy, copies of which were made in later times for the libraries of Assyria. Indeed, so prominent a place did Sargon take in the early history of Babylonia, that his person became surrounded with an atmosphere of myth. Not only was he regarded as a sort of eponymous hero of litera- ture, a Babylonian Solomon, whose title was "the de- viser of law and prosperity,' popular legends told of his mysterious birth, how, like Romulus and Arthur, he knew no father, but was born in secrecy, and placed by his mother in an ark of reeds and bitumen, and left to the care of the river; how, moreover, this second Moses was carried by the stream to the dwelling of a ferryman, who reared him as his own son, until at last the time came that his rank should be discovered, and Sargon, " the constituted king," for such is the meaning of his name, took his seat upon the throne of his ancestors. It was while the Cassite sovereigns were reigning in the south, and probably in consequence of reverses that they suffered at the hands of the Egyptians, who, under the monarchs of the 18th dynasty, were pushing eastward, that the kingdom of Assyria took its rise. Its princes soon began to treat with their southern neighbours on equal terms; the boundaries of the two kingdoms were settled, and inter-marriages between the royal families took place, which led more than once to an interference on the part of the Assyrians in the affairs of Babylonia. Finally, inthe 14th century B.c., Tiglath-Adar of Assyria captured Babylon, and established a Semitic line of sovereigns there, which continued until the days of the later Assyrian empire. From this time down to the destruction of Nineveh, Assyria remained the leading power of Western Asia. Occasion-ally, it is true, a king of Babylon succeeded in defeating his aggressive rival

and invading Assyria ; but the contrary was more usually the case, and the Assyriaus grew more and more powerful at the expense of the weaker state, until at last Babylonia was reduced to a mere apanage of Assyria.

We possess an almost continuous list of Assyrian kings ; and, as from the beginning of the 9th century downwards there exists a native canon, in which each year is dated by the limmu or archon eponymos, whose name it bears, as well as a portion of a larger canon which records the chief events of each eponymy, it is evident that our chronology of the later period of Assyrian history is at once full and trustworthy. Similar chronological lists once existed for the earlier period also, since an inscription of a king of the 14th century B.c. is dated by one of these eponymies ; and the precise dates given in the inscriptions for occurrences which took place in the reigns of older monarchs cannot otherwise be accounted for. How far back an accurate chronological record exteuded it is impossible to say ;_ but astronomical observations were made in Babylonia from a remote period, and the era of Cudur-nankhundi was known, as we have seen, more than 1600 years afterward ; while in Assyria not only can Sennacherib state at Bavian that Tiglath-Pileser I. was defeated by the Babylonians 418 years before his own invasion of that country, but the same Tiglath-Pileser can fix 701 years as the exact interval

between his restoration of the temple of Anuand Rimmon at Kalah Sherghat and its foundation by the dependent viceroys of the city of Assur.

This Tiglath-Pileser, in spite of his subsequent defeat by the Babylonians, was one of the most eminent of the sovereigns of the first Assyrian empire. He carried his arms far and wide, subjugating the Moschians, Comagenians, Urumians, and other tribes of the north, the Syrians and Hittites in the west, and the Babylonians (including their capital) in the south. Huis empire, accordingly, stretched from the Mediterranean on the one side to the Caspian and the Persian’ Gulf on the other; but, founded as it was on conquest, and centralised in the person of a single individual, it fell to pieces at the least touch. With the death of Tiglath-Pileser, Assyria seems to

have been reduced to comparative powerlessness, and when next its claims to empire are realised, it is under Assur-natsir-pal, whose reign lasted from 883 to 858 B.c. The boundaries of his empire exceeded those of his predecessor, and the splendid palaces, temples, and other buildings raised by him, with their elaborate sculptures and rich painting, bear witness to a high development of wealth and art and luxury. Calah, which had been founded by Shalmaneser I. some four or five centuries previously, but had fallen into decay, became his favourite residence, and was raised to the rank of a capital. His son Shalmaneser had a long reign of 35 years, during which he largely extended the empire he had received from his father. Armenia and the Parthians paid him tribute ; and under the pretext of restoring the legitimate monarch he entered Babylon, and reduced the country to a state of vassalage. It is at this time that we first hear of the Caldai or Chaldeans,—carefully to be dis- tinguished from the Casdim or Semitic " conquerors" of Scripture,—who formed a small but independent principality on the sea-coast. In the west Shalmaneser succeeded in defeating in 854 B.c. a dangerous confederacy, headed by Rimmon-idri or Ben-hadad of Damascus and including Ahab of Israel and several Phoenician kings. Later on in his reign he again annihilated the forces of Hazael, Ben- hadad's successor, and extorted tribute from the princes of Palestine, among others from Jehu of Samana, whose servants are depicted on the black obelisk. The last few years of his life, however, were troubled by the rebellion of his eldest son, which well-nigh proved fatal to the old king. Assur, Arbela, and other places joined the pretender, and the revolt was with difficulty put down by Shalmaneser's second son, Samas-Rimmon, who shortly after succeeded him. Samas-Rimmon (824-811) and Rimmon-nirari (811-782) preserved the empire of Assyria undiminished ; but their principal exploits were in Babylonia, which they wasted with fire and sword, and converted into an Assyrian province.

The first Assyrian empire came to an end in 744, when the old dynasty was overthrown by a usurper, Tiglath- Pileser, after a struggle of three or four years. Once settled on the throne, however, Tiglath-Pileser proceeded to restore and reorganise the empire. Babylonia was first attacked ; the Assyrian monarch offered sacrifices and set up his court in its chief cities; and the multitudinous Arab tribes who encamped along the banks of the Euphrates were reduced to subjection. The Caldai in the south alone held

out, and to them belonged the first four kings given in Ptolemy's canon. Indeed, it may be said that from the invasion of Tiglath-Pileser to the revolt of Nabopolassar, Babylonia ceased to have any separate existence. It was governed by Assyrian kings or the viceroys they appointed, and the only attempts to recover independence were made under the leadership of the " Caldean" chiefs. It becomes nothing more than an important province of Assyria.

The second Assyrian empire differed from the first in its

greater consolidation. The conquered provinces were no longer loosely attached to the central power by the payment of tribute, and ready to refuse it as soon as the Assyrian armies were out of sight ; they were changed into satrapies, each with its fixed taxes and military contingent. Assyrian viceroys were nominated wherever possible, and a turbu- lent population was deported to some distant locality. This will explain the condition in which Babylonia found itself, as well as the special attention which was paid to the countries on the Mediterranean coast. The possession of the barbarous and half-deserted districts on the east was of little profit; the inhabitants were hardy mountaineers, difficult to subdue, and without wealth; and although Tiglath-Pileser penetrated into Sagartia, Ariana, and Aracosia, and even to the confines of India, the expedition was little more than a display of power. The rich and civilised regions of the west, on the contrary, offered attractions which the politicians of Nineveh were keen to discover. 'Tiglath-Pileser overthrew the ancient kingdoms of Damascus and Hamath, with its nineteen districts, and after receiving tribute from Menahem (which a false read- ing in the Old Testament ascribes to a non-existent Pul) in 740, placed his vassal Hoshea on the throne of Samaria in 730 in the room of Pekah. Hamath had been aided by Uzziah of Judah; and, on the overthrow of the Syrian city, Judah had to become the tributary of Assyria. Tiglath-Pileser seems to have met with a usurper's fate, and to have fallen in a struggle with another claimant of the throne, Shalmaneser. The chief event of Shalmaneser's reign (727-722) was the campaign against Samaria. The capture of that city, however, was reserved for his successor, Sargon, in 720, who succeeded in founding a new dynasty. Sargon's reign

of seventeen years forms an era in later Assyrian history. At the very commencement of it he met and defeated the forces of Elam, and so prepared the way for the future conquest of that once predominant monarchy. He came into conflict, also, with the kingdoms of Ararat and Van in the north; and the policy of the countries beyond the Zagros was henceforth influenced by the wishes of the Assyrian court. But it was in the west that the power of Nineveh was chiefly felt. Syria and Palestine were reduced to a condition of vassalage, Hamath was depopulated, and Egypt, then governed by Ethiopian princes, first came into collision with Assyria. The battle of Raphia in 719, in which the Egyptians and their Philis- tine allies were defeated, was an omen of the future; and from this time onward the destinies of civilised Asia were fought out between the two great powers of the ancient world. As the one rose the other fell; and just as the climax of Assyrian glory is marked by the complete sub- jugation of Egypt, so the revolt of Egypt was the first signal of the decline of Assyria. The struggle between the representative states of the East led, as was natural, to the appearance of the Greek upon the stage of history. Sargon claims the conquest of Cyprus as well as Pheenicia, and his effigy, found at Idalium, remains to this day a witness of the fact. Babylonia, however, was the point of weakness In the empire. It was too like, and yet too unlike, Assyria to be otherwise than a dangerous dependency; and its inhabitants could never forget that they had once been the dominant nation. New blood had been infused into them by the arrival of the Caldai, whose leader, Merodach-Baladan, the son of Yacin, called Mardokempados in Ptolemy’s canon, had taken advantage of the troubles which closed the life of Tiglath-Pileser to possess himself of Babylonia; and for twelve years he continued master of the country, until in 710 Sargon drove him from the pro- Vince, and crowned himself king of Babylon. Merodach- Baladan had foreseen the attack, and endeavoured to meet it by forming alliances with Egypt and the principalities

of Palestine. The confederacy, however, was broken up in a single campaign by the Assyrian monarch; Judea was overrun, and Ashdod razed

to the ground. Sargon, who now styled himself king of Assyria and Babylon, of Sumir and Accad, like Tiglath-Pileser before him, spent the latter part of his reign in internal reforms and extensive building. A new town, called after his name, was founded to the north of Nineveh (at the modern Kouyunjik), and a mag- nificent palace was erected there. The library of Calah was restored and enlarged, in imitation of his semi-mythical namesake of Agane, whose astrological works were re-edited, while special attention was given to legislation. In the midst of these labours Sargon was murdered, and his son, Sennacherib, ascended the throne on the 12th of Ab 705 B.c. Sennacherib is a typical representative of the great warriors and builders of the second Assyrian empire, and is familiar to the readers of the Old Testament from his invasion of Judah, which the native monuments assign to the year 701. The check he received at Eltakeh, where he was met by the forces of Egypt and Ethiopia, saved the Jewish king, not, however, before his towns had been ravaged, a heavy tribute laid upon the capital, and his allies in Ascalon and Ekron severely punished. At the commencement of this campaign Sennacherib had reduced Tyre and Sidon, and the overthrow of these centres of commerce caused a transfer of trade to Carchemish. Baby- lonia had shaken off the yoke of Assyria at the death of Sargon under Merodach-Baladan, who had escaped from his captivity at Nineveh, but was soon reduced to obedience again, and placed under the government of the Assyrian viceroy Belibus. In 700, however, the year after the Judean war, Babylon rebelled once more under the in- domitable Merodach-Baladan, and Suzub, another Chaldean. Sennacherib was occupied with a naval war—the first ever engaged in by the Assyrians—against a body of Chaldeans who had taken refuge in Susiana, and the revolt in his rear was stirred up by the Susianian king, But the insur- gents were totally defeated; Assur-nadin-sum, Sennacherib’s eldest son, was appointed viceroy of the southern kingdom ; and the Assyrian monarch felt himself strong enough to carry the war into the heart of Elam, wasting the country with fire and sword. A last attempt, made by the Susianians and the Chaldeans of Babylonia, to oppose the power of Assyria was shattered in the hardly-contested battle of Khaluli, The interregnum, however, which marks the last eight years of Sennacherib’s rule in Ptolemy’s canon, shows that Chaldea still continued to give trouble and resist the Assyrian yoke.

Meanwhile Sennacherib had been constructing canals and aqueducts, embanking the Tigris, and building himself a palace at Nineveh on a grander scale than had ever been attempted before. His works were interrupted by his murder, in 681, by his two sons, who, however, soon found themselves confronted by the veteran army of Essar-haddon, their father's younger and favourite son. Essar-haddon had been engaged in Armenia; but in January 680 he defeated them at Khanirabbat, and was proclaimed king. Soon afterwards he established his court at Babylon, where he governed in person during the whole of his reign. After settling the affairs of Chaldea his first campaign was directed against Syria, where Sidon was destroyed and its inhabitants removed to Assyria, an event which exercised a profound influence upon Asiatic trade. The most re- markable expedition of his reign was into the heart of Arabia, to the kingdoms of Huz and Buz, 980 miles dis- tant from Nineveh, 280 miles of the march being through arid desert. The Assyrian army accomplished a feat never since exceeded. In the north, also, it penetrated equally far, subjugating the tribes of the Caucasus, receiving the submission of Teispes the Cimmerian, and taking posses-

sion of the copper-mines on the most remote frontiers of Media. All this part of the country was now in the hands of Aryan settlers, and each sinall town had its independent chief, like the states of Greece. In fact, on two sides, on both north and west, the Assyrian empire was in contact with an Aryan population, and among the twenty-two kings who sent materials for Hssar-haddon's palace at Nineveh were Cyprian princes with Greck names. But the most important work of Essar-haddon's reign was the conquest of Egypt, which left the ancient world under the rule of a single power for some twenty years, and by fusing the nations of Western Asia together, broke down their differences, spread an equalised civilisation, and first struck out the idea of universal empire. In 672 3B.c. the land of the Pharaohs was invaded, Tirhakah, the Ethiopian, driven beyond its borders, and the country divided into twenty goveruments. Vain efforts to shake off the Assy- rian supremacy were made from time to time; but just as Babylon had to look to the foreign Caldai for the championship of its independence, so Egypt found its leaders in Ethiopian princes, In 669 Essar-haddon fell ill,

and on the 12th day of Iyyar in the following year he associated his son, Assur-bani-pal, with him in the king- dom. On his death at Babylon in 667, Assur-bani-pal was left sole king. One of his first acts was to appoint his brother Savul-sum-yucin (Sammughes) governor of Baby- lonia.

Assur-bani-pal, the Sardanapalus of the Greeks, was the ‘“‘grand monarque” of ancient Assyria. The empire on his accession was at the height of its glory and magnitude; the treasures and products of the world flowed into Nineveh, and its name was feared from the frontiers of India to the shores of the Mgean. Constant wars asserted the superiority of the Assyrian troops, though they drained the empire of money and men; and the luxury, which had come in like a flood, was sapping the foundations of the national strength. Assur-bani-pal, in spite of his victories, his buildings, and his patronage of literature, left a dimin- ished inheritance to his son; and the military expeditions, formerly conducted by the king in person, were now en- trusted to his generals. His first work was to check the southward advance of the Ciminerians, who were thus driven upon Asia Minor, and to quell a revolt that had broken out in Egypt. Two campaigns were requisite to effect this, and meanwhile Gyges of Lydia had sent tribute to the formidable Assyrian monarch. War had also broken out with Elam, which ended, after a long and hard struggle, with the complete conquest of the country. It was divided into two states, each ruled by Assyrian vassals. But soon after this (in 652) the first blow was struck which eventu- ally led to the downfall of the empire.

Assur-bani-pal’s buildings were unrivalled for size and grandeur. Assyrian culture reached its culminating point in his reign, and his palaces glittered with the precious metals, and were adorned with the richest sculpture. The library which he formed at Nineveh far surpassed any that

had ever existed before; literary works were collected from all sides; the study of the dead language of Acead was encouraged, grammars and dictionaries were compiled, and learned men of all nations were attracted to the court, Patron of the arts as he was, however, Assur-bani-pal’s character

was stained by cruelty and sensuality. Under his second name of Sin-inadina-pal, he appears as king of Babylon in Ptolemy's list ; and the complete amalgamation of Assyria and Babylonia in the later years of his rule ig shown by the appearance of a prefect of Babylon among the Assyrian eponyms. He was succeeded in 625 by his son Assur-ebil-i. His death was the signal for a general revolt. Nabopolassar, the viceroy of Babylonia, made himself independent ; and Assyria, shorn of its empire, was left to struggle for bare existence, until, under Sara- cus its last monarch, Nineveh was taken and burnt by the Babylonians and Medes.

The seat of empire was now transferred to the southern kingdom. Nabopolassar was followed in 604 by his son Nebuchadnezzar, whose long reign of forty-three years made Babylon the mistress of the world. The whole East was overrun by the armies of Chaldea, Egypt was invaded, and the city of the Euphrates left without a rival. Until sys- tematic explorations are carried on in Babylonia, however, our knowledge of the history of Nebuchadnezzar's empire must be confined to the notices of ancient writers, although we possess numerous inscriptions which record the restora- tion or construction of temples, palaces, and other public buildings during its continuance. One of these bears out the boast of Nebuchadnezzar, mentioned by Berosus, that he had built the wall of Babylon in fifteen days. Evil- Merodach succeeded his father in 561, but he was mur- dered two years after, and the crown seized by his brother- in-law, Nergal-sharezer, who calls himself son of Bel-suma- iscun, "king of Babylon." Nergal-sharezer reigned four years, and was succeeded by his son, a mere boy, who was put to death after nine months of sovereignty (555 8.c.) The power now passed from the house of Nabopolassar, Nabu-nahid, who was raised to the throne, being of another family. Nebuchadnezzar's empire already began to show signs of decay, and a new enemy threatened it in the person of Cyrus the Persian. 'The Lydian monarchy, which had extended its sway over Asia Minor and the Greek islands, had some time before come into hostile collision with the Babylonians, but the famous eclipse foretold by Thales had parted the combatants and brought about peace. Crcesus of Lydia and Nabu-nahid of Babylonia now formed an alliance against the common foe, who had subjected Media to his rule, and preparations were made for checking the Persian advance. The rashness of Croesus, however, in mecting Cyrus before his allies had joined him, brought about his

overthrow; Sardis was taken, and the Persian leader occupied the next fourteen years in consolidating his power in the north. This respite was employed by Nabu-nahid in fortifying Babylon, and in constructing those wonderful walls and hydraulic works which Herodotus ascribes to Queen Nitocris. At last, however, the attack was made; and after spending a winter in draining the Gyndes, Cyrus appeared in the neighbourhood of Babylon. Belshazzar, Nabu-nahid's eldest son, as we learn from an inscription, was left in charge of the city, while his father took the field against the invader. But the Jews, who saw in the Persians monotheists and deliverers, formed a con- siderable element of the population and army ; and Nabu- nahid found himself defeated and compelled to take refuge in Borsippa. By diverting the channel of the Euphrates the Persians contrived to march along the dry river-bed, and enter the city through an unguarded gate. Babylon was taken, and Nabu-nahid shortly afterwards submitted to the conqueror, receiving in return pardon and a residence In

Carmania. He probably died before the end of Cyrus's reign ; at all events, when Babylon tried to recover its in- dependence during the troubles that followed the death of Cambyses, it was under impostors who claimed to be " Nebuchadnezzar, the son of Nabu-nahid."

Art, Science, and Literature.—Although in art, as in other things, Assyria was but the pupil and imitator of Babylonia, there was yet a marked difference between its development in the two countries, due partly to natural causes. While the Assyrians had stone in abundance, the Babylonians were obliged to import it from a distance. Brick-clay, on the contrary, lay ready at hand, and archi- tecture among them, consequently, took the forms imposed upon it by the use of bricks instead of stone. Where the Assyrians employed sculptured alabaster to ornament their buildings, the Babylonians contented themselves with ena- melled bricks and painted plaster. It is a curious proof of the servile dependence of the northern upon the southern kingdom in artistic matters, that the Assyrians continued to make large use of brick up to the downfall of the em- pire, in spite of the accessibility of stone and the rapid decay of their palaces caused by the employment of the more fragile material. Still, although Assyrian art clung

thus unaccountably to the building materials of another country, it did not dispense with its native stone altogether ; and speaking broadly, we may say that the architecture of Nineveh is characterised by the use of stone in contradis- tinction to the brickwork of Babylonia. Sculpture was naturally developed by the one, just as painting was by the other; and the ornamentation which could be lavished on the exterior in Assyria had to be confined to the interior in Chaldea.

Another distinction between the art of the two monar- chies arose from the character of their respective popula- tions. Babylonia was essentially a religious country, and its art, therefore, was primarily religious. Nearly all the great edifices, whose ruins still attract the traveller, were temples, and the inscriptions we possess of the Babylonian princes relate almost wholly to the worship of the gods. In Assyria, on the other hand, the temple was but an ap- pendage of the palace, the king among “these Romans of Asia,” as Prof. Rawlinson calls them, being the central object of reverence. While the Chaldean temple, with its huge masses of brickwork, rose stage upon stage, each tier smaller than the lower, differently coloured, and surmounted at the top by a chamber which served at once as a shrine and an observatory, the Assyrian palace was erccted upon a mound of rubble, with open courts and imposing entrances, though never more than one or two stories high.

Closely connected with this difference in the religious feelings of the two nations was the greater care and atten- tion paid to burial in Babylonia. As yet not a single tomb has been found in Assyria, while sepulchral remains abound in Chaldea. The vast necropolis of Erech astonishes us by the number of its graves, and the potters of Babylonia were largely employed in making clay coffins. ‘The char- acter of Assyrian art being thus secular, and that of Baby- lonia sacred and sepulchral, necessarily led to a different application and development of it in the two countries.

We must regard Assyrian art as parallel with later Baby- lonian, both having branched off from Accadian. In

ssyrian we inay trace two or even three periods of develop- ment; but our want of materials makes it impossible to do this in the case of !ater Babylonian. Among neither people, however, did art altogether escape from the swath- ing-bands of its nursery, although it was never crystallised a3 in

ancient Egypt. The oldest monuments of Accad already display it in all its forms, rude and rudimentary though they may be. The terraced temples of Ur, Erech,

and other places, mount back to the earliest times of Chal- dean history, and we find them already adorned with enamelled bricks, which were first coloured, then glazed, and finally baked in the fire. ‘Terra-cotta cones of various hues, imbedded in plaster, were used for external ornamen- tation, and at Warka (Erech) coloured half-columns are employed for the same purpose,—an ornamentation which recurs in Sargon’s palace at Khorsabad, and was the germ of the many kinds of pillars met with in Assyria. The internal walls of the shrine were bright with paint and bronze and gilding; but the brilliant colouring of the Chaldeans was not reproduced in the northern monarchy where more sombre tints were preferred. The huge struc- tures themselves, of burnt and unburnt brick, were sup- ported by buttresses, and the rain was carried off by elaborately-constructed drains, some of which afford us the earliest examples of the arch. A leaden pipe for the same object was found by Mr Loftus at Mugheir (Ur).

Stone, on account of its scarcity, was highly prized, and used only for sculpture and carving. Fragments of the statue of an Accadian king have been brought from Hammam, aud a portrait of Merodach-iddin-akhi, the suc- cessful opponent of Tiglath-Pileser I. (1120 B.c.), is cut in low relief on a stone now in the British Museum. Like all other Babylonian stone relics, they are of small size, and of hara black granite, and the royal portrait is interesting not only as being one of the few specimens we possess of Babylonian sculpture, but as showing the marked contrast of the Babylonian face to the typically Jewish features of the Assyrians. If larger stones were rarc, however, the same cannot be said of smaller ones, which were used as signets and talismans. These were always incised, and though the figures are frequently rude, and still more often grotesque, they are always clearly cut and vigorous. In- deed, it is clear that emery must have been used for the purpose, while many of the carvings are so minute as to suggest the employment of a magnifying-glass. This, how- ever, seems to

be out of the question at so early a date as that to which many of the gems belong, although a crystal lens was discovered by Mr Layard at Nimruid. The design on the signet-cylinder of the earliest king of Ur of whom we have any knowledge is of a high order of merit.

Next to gem-cutting, pottery was carried to considerable perfection by the Accadians. Some of their vases and lamps exhibit great beauty of form, and bear evidence of the potter's wheel; though the large majority are made by the hand, and extremely rude. Spirited bas-reliefs in terra-cotta, however, have been exhumed at Senkereh, and some small terra-cotta figures may also be assigned to this early period. Metallurgy was more backward. Stone im- plements were still in use, although weapons and orna- ments of bronze and copper are met with in abundance; and even iron was not unknown. . Bronze bowls occur in almost every tomb, sometimes wrought with considerable skill. Metallurgic art, however, attained its highest point in the manufacture of gold objects like ear-rings and fillets. The latter may be compared with the gold head-dresses found by Dr Schliemann in the Troad. This backward state of metallurgy is somewhat remarkable when we con- sider the skill displayed in the making of textile fabrics. The oldest genis portray the most richly embroidered robes, and it is probable that the muslins and carpets for which Babylonia was afterwards so famous were already a branch of industry.

Art in Assyria developed chiefly, as has been said, on the side of architecture and sculpture. Its first period is best represented by the reign of Assur-natgir-pal, in whose palaces we obtain excellent illustrations of its excellencies and defects. The period is characterised by a simplicity and vigour which shows itself in the bas-reliefs, where the

figures, more especially the animal forms, are spirited and natural beyond anything that we meet with at a later time. Nothing, for instance, can be bolder and more life- like than the lion-hunt depicted on the slabs of Assur-natsir-pal. There is a freedom in the attitude cf the animals which evidenccs a remarkable grandeur of concep- tion. On the other hand, the execution is somewhat heavy, the perspective is worse even than in later works, and the outlines are reproduced with too servile an exacti- tude. A background,

again,is entirely wanting, the atten- tion of the artist being concentrated upon the principal group. In the second period, which extends from the beginning of the second empire to the reign of Essar- haddon, the freshness and bolduess of the preceding stage have passed away. The care once exclusively bestowed upon the chief figures is now shared with an elaborate background, and a pre-Raffaellite minuteness prevails throughout the whole. This, added to a total want of perspective, causes too obtrusive a realism. Still, what is lost in vigour is gained in delicacy and finish, and the general effect of such rich and intricate grouping could not but have been effective. The reign of Assur-bani-pal inarks the third and last period of Assyrian art. Drawing has made a rapid advance, and the sculptures furnish several instances of successful foreshortening. The art of this period is distinguished by great softncss and chaste- uess ; vegetable forms are represented with admirable skill, and the overcrowding of the preceding stage is avoided by recurring to the plain backgrounds of the first period, or introducing merely the main outlines of a landscape. At the same time, it is clear that Assyrian art is beginning to decline; the freedom and boldness that once marked it tend to disappear, and it is pervaded by a spirit of effemi- nacy which is well exemplified by the subjects portrayed. For the first time scenes are taken from the harem ; the king lies, with his wife seated beside him, banqueting under

the shade of the vine; and the lions that Assur-natsir-pal |.

hunted in the open field at the risk of life are now tame creatures, kept in cages, and let out for aroyal battwe, where they have to be whipped into activity.

The effect of this Assyrian bas-relief sculpture was heightened by judicious colouring. Red, blue, black, and white—none of them, however, of very great brilliancy —were laid upon certain parts of the picture, such as the eyes, hair, and fringes of the garments. This partial colouring was also adopted by the Greeks, and it is extremely probable that they borrowed it from Assyria. The beginning of Greek art coincides with the decadence of Assyrian; and the objects found by M. Cesnola and others in Cyprus show us the transition of the one into the other. While the remains found by Dr Schliemann in the Troad do not exhibit any Assyrian influence, the oldest

works of art in Greece itself are thoroughly Assyrian in character. Indeed, we can trace the lion-sculpture at Mycenz through the similar rock-carving at Kumbet, in Phrygia, back to the artists of Nineveh. The lions themselves are Assyrian in all their details, and the pillar against which they rest reappears in the monuments of Assur-bani-pal. Columnar architecture, in fact, obtained a more extensive development in the empire of the Tigris than has ever been the case elsewhere. The half columns of ancient Chaldea germinated into a wonderful variety of elaborate forms. The most peculiar are those which rest with circular pedestals upon the backs of lions, dogs, and winged bulls. The chasteness of Hellenic taste preserved it from this Eastern fantasticness, but the Doric and Ionic pillars had their first home on the banks of the Tigris. There was something in the round firm column which was congenial to the mind of the Assyrian.

Indeed, it may be said that solidity and realism

underlie all Assyrian art. Muscular strength and power of an intensely earthly and human nature is expressed in their bas-reliefs and the colossal bulls that guarded the palace from the entrance of evil spirits. Nowhere else in the world can we find such an embodiment of brute force and unimaginative energy. Not only is Assyrian art valuable as disclosing the genesis of Hellenic, but yet more so ag filling up a vacant chapter in the history of esthetics, The divine calm and mysterious immensity of Egyptian sculpture was not more foreign to the Greek than the stiff unspirituality and coarse vigour of the Assyrians, which found in the lion an appropriate symbol. But the Assyrian artists did not confine themselves to architecture and bas- reliefs. Gem-cutting was carried to high perfection, and even sitting statues of “the great king” were attempted. These, however, were not so successful as the terra-cotta models, some of which are of great beauty. Indeed, the potters’ work of Nineveh can quite vie with that of ancient Greece, and their lamps seem to be prototypes of those which we find in the tombs of Athens or Syracuse. Besides porcelain, glass was also manufactured, and though transparent glass does not appear to have been known before the reign of Sargon, coloured glass, with all the tints that we

admire in Venetian ware, had long been an article of trade. Metallurgy, again, was a branch of industry in which the Assyrians particularly excelled. Their gold ear-rings aud bracelets are admirable both in design and workmanship ; their bronze casts are free from the narrowness of their sculptures in stone; and so well were they acquainted with the art of inlaying one metal with another, that our modern artists have been content to learn from them the method of covering iron with bronze. Household furniture, too, gives us a high idea of Assyrian skill. Like gem-cutting, it brought out the Chinese minute- ness and accuracy of the people, and the profuse, though taste- ful ornamentation of the seats is especially to be noticed.

It is unfortunate that our knowledge of the develop- ment of art in the sister kingdom is still so imperfect. As has been said, however, it is characterised by painting rather than sculpture, and the use of brick instead of stone. The few bas-reliefs that exist are small and inferior in execution; but brilliant colouring and a lavish use of the metals made up for this want. The walls were covered with the most costly materials, and “images portrayed with vermilion” excited the admiration of the stranger. The love of bright colours, in contrast with the sober hues of the Assyrian palaces, led also to the cultivation of gardens, and the hanging gardens of Babylon, raised upon tiers of arches, were one of the wonders of the world. The Babylonian had, too, a strong sense of humour. In the engraved gems and metal: work of the southern empire, we miss the finish and minute care of the sister-kingdom, but they are replaced by a spirit of grotesqueness and serio-comedy. In pottery and the manufacture of textile fabrics the Babylonians particularly excelled ; their carpets and variegated dresses were highly prized, while their fondness for music was much celebrated. The history of the latter art, however, both in Babylonia and in Assyria, has yet to be traced.

The science of Assyria, like most things else, was derived from Accad.

LITERATURE. |

fixed above Elam, and uot above Babylonia, and “ the mountain of the East,” the primitive home of the race, was supposed to support the firmament. The shrines on the topmost terraces of the temples were used also as obser- vatories. Ur had its royal observatory, and so probably had

the other cities of Chaldea ; in Assyria they existed at Assur, Nineveh, and Arbela, and the astronomers-royal had to send in their reports to the king twice a month. Atan early date the stars were numbered and named ; but the most important astronomical work of the Accadians was the formation of acalendar. This came after the divi- sion of the heavens into degrees, since the twelve months (of 30 days each) were named after the zodiacal signs, and would seem to belong to about 2200 B.c. Somewhat strangely, the Accadian calendar appears to have passed to the Assyrians (and through them to the Jews) through the medium of the Aramzans. The year being roughly made to consist of 360 days, intercalary months had to be added, one of them being regularly inserted every six years, and two others being counted in by the priests when necessary. The soss of 60 years, the ner of 600, and the sar of 3600, were merely cycles dependent upon the general mathe- matical system of the Babylonians, which made 60 the unit, and then multiplied it by the factors of itself. The week of 7 days was in use from an early period ; indeed, the names which we still give to the days can be traced to ancient Babylonia; and the seventh day was one of sulwm or "rest." The night was divided into three watches ; but this was afterwards superseded by the more accurate divi- sion of the day into 12 casbu (of 2 hours each), corre- sponding to the divisions of the equator, each casbu being further subdivided into 60 minutes, and these again into 60 seconds. The sections of the equator contained 30 degrees each—a degree being 60 sosses or minutes; but since an astrolabe, now in the Museum, divides each of the 12 sections in the outer circle into 20 degrees, and those in the inner circle into 10 degrees, it is plain that a different system was adopted for astrological purposes. Eclipses were carefully recorded from a very remote epoch, and since some of these are said to have happened "'according to calcu- lation," and others "contrary to calculation," their recur- rence after a cycle of eighteen years must have been roughly determined. One of the Assyrian reports states that a watch was kept for an eclipse of the sun on the three last days of the month, but that, contrary to expectation, the eclipse did not take place, and we possess notices of eclipses which have been verified by modern astronomers, though antecedent to the era of Nabonassar, with whom, so far as Ptolemy knew, the first record of them began. 'The chief work on astronomy was one compiled for the library of Sargon of Agane in seventy tablets or books, which went through many editions, one of the latest being now in the British Museum. It was called "

the illumination of Bel," and was translated into Greek by Berosus. The catalogue of its contents includes observations on comets, on the pole- star, the conjunction of the sun and moon, and the motions of Venus and Mars. The main purpose, however, of all these Babylonian astronomical observations was an astro- logical one ; to cast a horoscope, or predict the weather, was the chief business of the Chaldean astronomer. Indeed, the patient minuteness of the meteorological observations 18 most curious, and it was believed that the same weather recurred after a definite number of years. In the later Assyrian period the study became more scientific, and the observatory reports have something of the precision of modern times. But from a much earlier era we obtain interesting tables of lunar longitudes and numerical equi- valents of the daily increase and decrease of the moon. As is implied by the attention given to astronomy, mathematics was fairly advanced. The unit was 60, a very convenieut

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number, especially when used as the denominator of a fraction. A tablet found at Senkereh gives a table of squares and cubes, correctly calculated, from 1 to 60; anda people who were acquainted with the sun-dial, the clepsydra, the lever, aud the pulley, must have had no mean knowledge of mechanics. The lens, too, discovered at Nineveh, ex- plains the minuteness of the cuneiform writing on so many of the tablets, and suggests the possibility of artificial aids to the observation of the heavens.

Assyria possessed but little native literature. It was essentially a land of soldiers, and the more peaceful pur- suits had their home in Babylonia, where the universities of Erech and Borsippa were renowned down to classical times. It was not until the reign of Assur-bani-pal that any attenipt was made to rival Babylon in learning; then for the first time original compositions came from the pens of Assyrian scholars, and works were even written in the dead language of Accad. Syllabaries, together with gram- mars, dictionaries, and reading-books of Assyrian and Accadian, were drawn up, besides lists of Semitic syno- nyms, In these grammars and vocabularies lay the germ of comparative philology, and they are otherwise valuable as affording us the earliest native analysis of Semitic speech. But

before this closing period of the empire, the Assyrians had been chiefly content to translate the ancient Accadian literature, or re-edit the contents of Babylonian libraries ; and the cramping influence of a dead language, in which all the precedents of law and the first principles of science were locked up, could not but make itself felt. Every great city of Chaldea had at least one library, and it was in imitation of this that the royal libraries at Calah, Nineveh, Assur, and elsewhere, were founded. The larger part of the literature was in clay, stamped in minute characters upon baked bricks, latercule coctiles as Pliny calls them ; but papyrus was also used, though none of tlus fragile material has been preserved to our day. In fact, the use of papyrus seems to have preceded that of clay, which was not employed until after the settlement of the Accadians in the plains. The clay tablets or books were arranged in order ; and we learn from the catalogue of Sargon's library at Agane (about 2000 3.c.) that each was numbered, so that the student had only to write down the number of the tablet he wanted and the librarian thereupon handed it to him. The subjects of Accadian literary composition were multifarious. Among the most interesting are the hymns to the gods, some of which strikingly resemble the Hebrew psalms in substance as well as in form. Indeed, the parallelism of Hebrew and Assyrian poetry seems to have been borrowed from the Accadians. But the similarity of expression and feeling is no less remarkable. Thus we read in one—(1.) " May god, my creator: take mine hands. (2.) Guide thou the breath of my mouth: guide thou mine hands; (3.) Olord of light!" and in another—(1.) "In heaven who is high? Thou alone, thou art high. (2.) In earth who is high? Thou alone, thou art high. (3.) As for thee, thy word in heaven is declared: the gods bow their faces to the ground. (4.) As for thee, thy word in earth is declared : the spirits of earth kiss the ground ;" or ina third—(1.) "O Lord, my transgressions are many: great are my sins, (2.) The Lord in the anger of His heart: has confounded me. (3.) God in the strength of His heart: set himself against me." A collection was afterwards made of these hymns, which was used for ritualistic purposes, and regarded as an inspired volume, and has been aptly com- pared by M. Lenormant with the Rig-Veda of the Hindus. Of an older date is the collection of magic formule and charms, chiefly intended to counteract the effects of sorcery and demoniac possession, which go back to the Shamanistic period of Accadian religion. Later than the hymns, but still prior to the second millennium B.o. and

the formation of the calendar, are the mythological poems which grew out of the development of a solar worship and the personification of the attributes of the gods. Two of these poems we possess intact,—on the Deluge and the descent of Istar into Hades,—and part of a third which describes the war of the seven evil spirits against the moon. The first two form the sixth and eleventh books of a very remarkable epic which centred round the adven- tures of a solar hero, older and originally independent lays being woven into it as episodes. The epic was divided into twelve books, each book dealing with a legend ap- propriate to the name of the corresponding zodiacal sign. This astronomical basis of the national epic shows how thoroughly the study had penctrated the mind of the people ; and the clearness with which we can trace the growth and formation of the whole work throws great light on the history of epic literature generally, and adds one more confirmation to the theory of Wolf. The Assyrians also had their epic, in imitation of the Acca- dians, and M. Lenormant has pointed out that the Semi- ramis and Nannarus of the Greeks and the other personages of Ctesias were really figures of this mythical epopee. The historical and chronological works that have been preserved are of purely Assyrian origin, though there is every reason to suppose that when the libraries of Accad come to be excavated similar compositions will be found in them. The legal literature of the Accadians was certainly very extensive, and a collection of fables, one a dialogue between the ox and the horse, and another between the eagle and the sun, has been met with. Language, Law, and Trade.—As above stated, the lan- guage of the primitive Sumirian and Accadian population of Assyria and Babylonia belonged to the Turanian or Ural- Altaic family of speech. The Semitic tribes, who first possessed themselves of the tetrapolis of Sumir or Shinar, and then gradually spread over the whole of Assyria and Babylonia, borrowed many words from their more civilised predecessors, and lent them a few others in return. The so-called Assyrian language is sub-divided into the two dialects of Assyria and Babylonia, the latter dialect being characterised by a preference for the softer sounds, and a fuller use of the vowels. Literature and the influence of a dead language stereotyped it to such an extent that it underwent comparatively little change during the 1500 years during which we cau watch its career; at least this is the case with the literary dialect. The closest

affinities are with Hebrew and Phoenician; it shares their pecu- liarities in phonology, grammar, and vocabulary ; and some obscure points in Hebrew etymology have already been cleared up by its help. Next to Hebrew, it shows per- haps the greatest resemblance to Arabic; differing most widely, on the other hand, from Aramaic. Aramaic, how- ever, from becoming the lingua franca of trade and diplo- macy after the fall of Tyre and Sidon, ended (like Arabic in later times) in superseding its sister idioms ; but in Baby- lonia this did not happen until after the Persian conquest. A large number of the legal precedents of an Assyrian judge, like the titles upon which he had to decide, went back to the Accadian epoch. A table of early Accadian laws shows us that the mother occupied the same pro- minent place as among modern Turanian tribes. The son is punished with a fine for denying his father, but with banishment for denying his mother. On the other hand, the husband can divorce the wife upon payment of a pecuniary compensation, while the wife who repudiates her husband is condemned to be drowned. The life and person of the slave are already under the protection of the state, the master who misuses him being subject to a fine, while the slave could purchase his freedom. The rights of property, however, were strictly guarded by the

law; the maximum of interest seems also to have been defined ; and houses, land, or slaves could be taken ag security for a debt. The carefulness with which deeds were signed and attested, and adjudicated cases reported, the deeds and cases being afterwards enclosed in an envelope of clay on which the names and main points were inscribed, testifies to a wide-spread study of law. Wit- nesses and contracting parties generally affixed their seals; but where they were too poor to possess any, a nail-mark was considered sufficient. In the Accadian period a father could assign property to his son during his lifetime, though he could not put him in possession ; and in later times a limited power of willing was in existence. The private will of Sennacherib, in which he bequeaths certain treasures to his favourite son Essar-haddon, is one of the most curious documents of antiquity; unlike other persons, the monarch does not require any witnesses, Great activity of

trade is evidenced by this development of law. But here again we must note a distinction due to situation between the northern and southern kingdoms, Of the Chaldeans, it is emphatically said that ‘ their cry was in their ships,” and we have many indications of early commerce with the southern coast of Arabia, The trade of Assyria, on the other hand, was wholly overland; and its first flect was the one built by Phoenician captives for Sennacherib, when pursuing the fugitive Chaldeans through the Persian Gulf. Like the Jews, however, the Assyrians showed an aptitude for trade from the very first. The earliest Semitic settlements in Babylonia seem to have been mainly for commercial purposes, and their career there may be compared with that of the English in India. In the 12th century B.c. the trading spirit had so thoroughly pervaded them that not only were objects of utility and art a marketable commodity, but we find Tiglath-Pileser I. bringing trees from the countries he had overrun, and acclimatising them in Assyria. The fullest development of business and commerce, however, does not show itself until the 8th and 7th centuries B.c., when Nineveh was a busy centre of trade. Sidon and Tyre had been ruined by the Assyrian kings—indeed, it is very possible that the obstinate wars with the Phcenician cities had their origin in commercial jealousy, and trade had accordingly transferred itself to Carchemish, which was conveniently situated on the Euphratcs. The maneli of Carchemish became the standard of weight, and Aramaic the common language of trade. The interest upon money was usually at 4 per cent.; but sometimes, more especially when objects like iron were borrowed, at 3 per cent. Payment might still be made in kind ; but more ordinarily in bars of the three chief metals, which were weighed, though mention of coined money also occurs. Houses could be let on lease, and the deeds which conveyed them give a careful inventory of the property and its appurten- ances, Commercial relations extended from India on the one side, whence came ivory and the teak found at Mugheir, which Sennacherib probably means by “ wood of Sinda,” to the tin islands of Cornwall on the other. Religion and Mythology.—The earliest religion of Accad was a Shamanism resembling that of the Siberian er Samoyed tribes of to-day. Every object had its spint, good or bad; and the power of controlling these spirits was in the hands of priests and sorcerers. The world swarmed with them, especially with the demons, and there was scarcely an action which did not risk demoniac possession, Diseases were regarded as caused in this way, and the cherubs, bulls, and other composite creatures which guarded

the entrance to a house, were believed to protect it from mischief, In course of time certain spirits (or rather deified powers of nature) were elevated above the rest into the position of gods ; and at the head of all stood the

Triad of Na or Anna, “the sky,” Ea, ‘the earth,” and Mulge, “the lord of the underworld.” The old Shamanism gradually became transformed into a religion with a host of subordinate semi-divine beings; but so strong a hold had it upon the mind, that the new gods were still ad- dressed by their spirits. The religion now entered upon a new phase; the various epithets applied to the same deity were crystallised into fresh divinities, and the sun-god under a multitude of forms became the central object of worship. This inevitably led toa mythology, the numerous personified attributes passing into demi-gods and heroes. A large part of the Accadian mythology was solar, and the transparency of its proper names which, as in other agglu- tinative languages, never disguise their primitive meaning, makes it valuable in verifying the so-called “ solar theory” of comparative mythology. At this stage of development, however, an important change passed over the old faith. The Semitic settlers in Sumir had adopted the Accadian pantheon and belief, and after a conflict between the dis- cordant religious conceptions of the two races, a great sacerdotal “reform” took place analogous to that of Brah- manism, and the official religion fused them into one whole. The magicians were taken into the priestly body, and the hierarchy of divine beings was determined. The old triad of Na, Ea, and Mulge became the trinity of Anu, Ea, and Bel the Demiurge, all children of Zicu or Zicara, “the sky” (the Sige of Nicolaus Damascenus) ; Ea, “the god of life and knowledge,” “the lord of the abyss,” “the king of rivers and the garden,” the husband of Bahu (the Bohu of Gen i. 2), whose spirit pervades the universe, being made the father of Bel-Merodach, the tutelary divinity of Babylon. In accordance with the genius of the sex-denot- ing Semitic idioms, each deity was furnished with a female principle, and “The god” in Babylonia, and the personified city of Assur, with his wife Serud, in Assyria, were placed at the head of the Pantheon. Below these four supreme divinities came a second trinity of the Moon- god, Sun-god, and Air-god, and the seven together formed “the seven magnificent deities.” After these were arranged “the fifty great gods,” and then the 300 spirits of beaven, and

the 600 spirits of earth, among whom was found a place for the primeval divinities of Accad as well as for the many local deities of Chaldea. The most dreaded of “the spirits of earth” were “the seven spirits” who werc born “without father and mother” in the encircling abyss of ocean, and carried plague and evil over the carth. ‘An old myth told of their war against the moon, which was deputed to watch over the interests of mankind.

Along with the establishment of the Babylonian official religion, an astro-theology was created by the introduction of astronomy into the religious sphere. The “ spirits” of the various stars were identified with the gods of the new creed, Merodach, for instance, properly one of the forms of the sun-god, being identified with the planet Jupiter, and the five planctary deities were added to the seven magnificent gods, making up altogether “the twelve chiefs of the gods.” The elaboration of this astro-theology was also accompanied by the formation of a cosmogony. The details of the latter are to be found in the fragments of Berosus and Nicolaus Damascenus, whose statenients are confirmed by the inscriptions, and they show a remarkable resemblance to the cosmogonies of Genesis and Pheenicia. It must be remembered that both Phcenicians and Hebrews profess to have migrated from Chaldea.

The resemblance is still more striking when we examine the Babylonian mythology. The sacred tree of Babylonia, with its guardian “cherubs ”—a word, by the way, which seems of Accadian origin—as well as the flaming sword or thunderbolt of fifty points and seven heads, recall Biblical analogies, while the Noachian deluge differs but slightly

from the Chaldean one. Indeed, the Jehovistic version of the flood story in Genesis agrees not only in details, but even in phraseology with that which forms the eleventh lay of the great Babylonian epic. The hero of the latter is Tam-zi or Tammuz, “the sun of life,” the son of Ubara- tutu, “the glow of sunset,” and denotes the revivifying luminary of day, who sails upon his “ark” behind the clouds of winter to reappear when the rainy season is past.

He is called Sisuthrus by Berosus, that is, Susru “the founder,” a synonym of Na “the sky.” The mountain on which his ark rested was placed, as already noticed, in Nisir, south-west of Lake Urumiiyeh. Its peak, whereon the first altar was built after the deluge, was the Icgendary model after which the zigwrats or towers of the Babylonian temples were erected. Besides the account of the flood, fragments have been met with of stories resembling those of the tower of Babel or Babylon, of the creation, of the fall, and of the sacrifice of Isaac,—the latter, by the way, forming probably the first lay of the great epic, The sixth lay we possess in full. It describes the descent of Istar into Hades in pursuit of her dead husband Du-zi, “the offspring,” the Babylonian Adonis. Di-zi is but another form of Tam-zi, and denotes the sun when obscured by night and winter. At each of the seven gates of Hades the goddess left some portion of her apparel, until she at last reached the abode of the dead, dark and joyless, where dust alone is the food of the unhappy shades. In the midst rose the golden throne of the spirits of earth, beneath which welled “the waters of life,” and here, too, was the seat of Bahu. Bahu, as queen of the underworld, smote Istar with many diseases, and confined her in Hades until her brother the Sun-god complained to the Moou-god and Ea, who sent a sphinx to pour the waters of life upon the imprisoned goddess and restore her to the light of day. This myth gives a good idea of the Chaldean conception of the next world. Certain favoured individuals, however, might look forward to a happier state of existence. A psalm which invokes blessings upon the king wishes him everlasting life in “the land of the silver sky,” where the gods feast and know no evil. It will be observed that the Babylonian Hades (like the Hebrew Sheol) is not very dis- similar to the Homeric one; and the possibility of borrow- ing on the part of the Greeks is suggested by the fact, that the seven-headed serpent of Hindu legend is of foreign origin, being taken from the seven-headed serpent of the Accadians, ‘“‘ which lashes the waves of the sea,” while the story of Andromeda came through Phoenician hands from a Chaldean myth which forms the subject of one of the lays of the great epic. So, too, the Oceanus of Homer finds its prototype in the encircling abysmal waters of Accadian geography, and the fravashis and mithras of Mazdaism were introduced by the Magian (or Turanian) population found in Media by the Aryan invaders.

But the old Shamanistic ideas survived also in Assyria and Babylonia, and so were handed on to the Jews. An elaborate system of augury flourished down to the last days of the empire, and omens were drawn from every event that could possibly happen. Magic formule for warding off the attacks of demons were extensively used, and the bronze bowls found by Mr Layard, as well as the part played by charms and demons in the Talmud, show how strongly the belief had seized upon the Jewish mind. Through the Jews and the various Gnostic systems of early Christianity, the primitive doctrines of Accad found their way into the medizval church, and the features of the medizeval devil may be traced in an Assyrian bas-relief, where a demon with horns, claws, tail, and wings, is being pursued by the god Adar. Even the phylacteries of the Jews go back to the same origin. Accadian magic ordered the sorcerer to bind the charm, twice knotted with seven

knots, round the limbs of the sick man, and this, with the further application of holy water, would, it was believed, infallibly produce a cure, while the same result might be brought about by fixing ‘‘a sentence out of a good book on the sufferer’s head as he lay in bed.” Similar super- stitions may yet be detected in the corners of our own land, and still more on the Continent, where the break with the traditions of the past has been less strongly felt. They form an important element in the history of the human intelligence, and the light thrown upon their origin and

early fortunes by the revelations of cuneiform discovery has opened a new chapter in the science of religion.

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| For Babylon and Babylonia see Rich's Babylon and Persepolis and two memoirs on Babylon; Layard's Nineveh and Babylon ? Loftus's Chaldwa and Susiana ; Rawlinson's Five Great Mon. archics; Oppert's Expédition Scientifique en Meésopotamie, and Fastecs de Sargon; Ménant's Annales des Rois d' Assyrie; Lenor- mant's Premiéres Civilisations, and La Magie chez les Chaldéens ; Schrader's Keilinschriften und das Alte Testament ; Records of the Past; and the Transactions of the Society of Biblical

Archeology. (A. H. §,)

BACCARAT, a town of France, in the department of Meurthe and arrondissement of Lunéville. It has a large export trade of timber, planks wheelwright's work, and charcoal, and is celebrated for the products of its glassworks, which were established in 1765. Population, 4763.

BACCHIGLIONE, a river of north-eastern Itaiy, which, rising in the mountains eastward of Trent, passes by Vicenza and Padua, and, after a course of 90 miles, falls into the lagune of Venice, south of Chioggia. It is navi- gable for large boats as far as Vicenza, and is connected with the Adige by means of a canal. The river is pro- bably the ancient 7Z'ogisonus.

BACCHUS, the Latin name of Dionysus, the god of wine. See Dionysus.

BACCHYLIDES, BaxxvAidys, a famous Greek lyric poet, born at Iulis in Ceos, was the nephew of Simonides, and flourished about 470 years before Christ. He resided long at the court of Hiero of Syracuse with Simonides and Pindar, of whom he is said to have been the rival. His works consisted of odes, dithyrambs, and hymns. Two epigrams contained in the Greek Anthology ascribe to him peculiar softness and sweetness of style. The few remains of his writings are contained in the collections of Brunck, Bergk, Bland, and Hartung They have been pub- lished separately by Neue, Bacchylidis Cet Frag., Berl., 1823.

BACCIO DELLA PORTA, called Fra BartoLoMMEO pi §. Marco, a celebrated historical and portrait painter, was born at Savignano, near Florence, in 1469, and died in 1517. He received the first elements of his artistic edu- cation from Cosimo Roselli ; and after leaving him, devoted himself to the study of the great works of Leonardo da Vinci. Of his eariy

productions, which are distinguished for their grace and beauty, the most important is the fresco of the Last Judgment, in which he was assisted by his friend, Mariotto Albertinelli, While he was engaged upon some pieces for the convent of the Dominican friars, he made the acquaintance of Savonarola. who quickly acquired great influence over him, and Baccio was so affected by his cruel death, that he soon after entered the convent, and for some years gave up hisart He had not long resumed it, in obedience to his superior, when the celebrated Raffaelle came to Florence and formed a close friendship with him, Bartolomineo learned from the younger artist the rules of perspective, in which he was so skilled, while Raffaelle owes to the frate the improvement in his colouring and handling of drapery, which was noticeable in the works he produced after their meeting. Some years afterwards he visited Rome, and was struck with admiration and a feeling of his own inferiority when he contemplated the masterpieces of Michel Angelo and Raffaelle. With the latter, however, he remained on the most friendly terms, and when he departed from Rome, left in his hands two unfinished pictures which Raffaelle completed. Barto- lommeo's figures had generally been small and draped. These qualities were alleged against him as defects, and to prove _that his style was not the result of want of power, he painted the magnificent figure of St Mark, and

| the undraped figure of St Sebastian. The latter was so

well designed, so naturally and beautifully coloured, and ! so strongly expressive of suffering and agony, that it was | found necessary to remove it from the place where it had | been exhibited in the chapel of a convent. The majority of ' Bartolommeo's compositions are altar-pieces, and few of them are to be met with out of Tuscany. They are remarkable for skill in the massing of light and shade, richness and delicacy of colouring, and for the admirable style in which the drapery of the figures is handled, Bartolommeo having been the first to introduce and use the lay-figure with joints.

BACH, JoHANN-SEBASTIAN, was born at Eisenach in Thuringia, on March 21, 1685, the same year which gave birth to his great contemporary Handel. His father held a musical appointment from the town council, being him- self descended from a musician. The family of the Bachs, like those of

some of the great Italian painters, may be cited as one of the most striking instances of hereditary artistic genius. Through four consecutive generations they followed the same calling, counting among their number no less than fifty musicians of more or less re- markable gifts. Even of the first ancestor of the family known to us, a miller and baker, who, owing to religious persecutions, had to leave Pressburg in Austria for the Protestant north of Germany, we are told that in his leisure hours he was fond of playing the lute, the sounds of which, as the old family chronicle naively adds, must have mixed sweetly with the clattering of the wheels of his mill. The accumulated artistic gifts and traditions of his forefathers were at last brought to their highest de- velopment by the genius of our master, who again trans- mitted them to his numerous sons. Johann-Sebastian's parents died before he had reached his tenth year, and he was left to the care of his elder brother, an organist at Ohrdruf, from whom he received his rudimentary musical education. According to a tradition the elder Bach was by no means pleased with the rapid progress of his more gifted brother, and even refused him access to the sources of knowledge available at that primitive period; he was particularly anxious to withhold from him a certain col- lection of compositions for the pianoforte, by contemporary masters, which, however, the younger Bach contrived to obtain surreptitiously, and which he copied at night in the course of six months. By practising the music thus become his own on the pianoforte, he made himself master of the technique of an instrument, the capabilities of which he was destined to enlarge and develop by the works of his own genius. In 1698 his brother died, and Bach, at the age of fourteen, saw himself thrown on his own resources for his further means of support. He went to Liineburg, where his beautiful soprano voice obtained him an appoint- ment as chorister at the school of St Michael. In this manner he became practically acquainted with the pmn- cipal works of vocal music, continuing at the same ime his practice on the organ and pianoforte. A special teacher of any of these instruments, or, indeed, of the theory of music, Bach seems never to have had, at least

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not to our knowledge, and his style shows little affinity to the modes of expression in use before him. In some measure, indeed, it may be said that

he new-created his own style, and, at the same time, that of modern music in general, a proot both of the originality of his power and of the autodidactic kind of his training. Nevertheless, Bach was anxious to profit by the examples of contem- porary masters of his art. We hear of frequent trips to the neighbouring cities of Hamburg, Liibeck, and Celle, at that time important centres of artistic life. In the first-mentioned city Keiser created sensation by the un- rivalled splendour of his operatic productions, while at Liibeck the celebrated organist, Buxtehude, excited the enthusiastic admiration of the young art-aspirant. In Celle, on the other hand, a celebrated band, composed chiefly of French artists, offered an opportunity for the practical study of orchestral music. Such were the ele- ments of his self-education, to which must be added his thorough knowledge of Palestrina and other masters of the grand old Italian school, of most of whose works Bach possessed copies written with his own hand.

At the age of eighteen Bach returned to Thuringia, where his executive skill on the organ and pianoforte attracted universal attention, and even obtained him various musical appointments, of which we mention as the most important that of court organist to the duke of Weimar. One, and not the least welcome, of his official duties was the com- position of sacred music. One of his most beautiful sacred cantatas, Ich hatte viel Bekiimmerniss, was com- posed during his stay at Weimar. An amusing in- cident of his otherwise quiet and eventless career also belongs to this time. We are speaking of his musical combat with the celebrated French organist, J. Louis Marchand, who had reached Dresden on his travels, and lorded it over his artistic colleagues at the Saxon court in the most sublime manner. The injured musicians, in their endeavours to humble the pride of the Frenchman, at last hit upon the idea of proposing a competition on the organ between him and Bach, whose fame at that time had begun to spread far beyond his place of residence. He was summoned to Dresden, and the day of the tournament fixed, at which the court and all the musical celebrities of the town were to be present. At first Marchand treated his young and comparatively unknown rival with scorn, but on hearing him perform at a preparatory meeting, he was so struck with Bach’s power that he igno- miniously quitted the field, and vanished from Dresden before the day of the contest arrived. This triumph led to Bach’s appointment as musical conductor (Kapell- meister) to the duke of Kothen, which he held

from W17-17 23, after a previous stay at Weimar for nearly nine years. In 1723 he removed to Leipsic, where the position of cantor at the celebrated “ Thomasschule,” combined with that of organist at the two principal churches of Leipsic, was offered to him. It was here that the greater part of his works were composed, mostly for the immediate requirements of the moment. Several of them he engraved himself, with the assistance of his favourite son, Friedemann. The further course of his life ran smoothly, only occasionally ruffled by his altercations with his employers, the town-councillors’ of Leipsic, who, it 1s said, were shocked by the “ unclerical ” style of Bach’s compositions, and by his independent bearing generally. He was married twice, and had by his two wives a family of eleven sons and nine daughters. In 1747 Bach made a journey to Potsdam by the invitation of Frederick the Great, who, himself a musical amateur, received the master with distinguished marks of regard. He had to play on the numerous pianofortes of the king, and also to try the organs of the churches of Potsdam. Two years

after this event his sight began to fail, and before long he became perfectly blind, a circumstance which again coincides with the fate of his great contemporary, Handel. Bach died of apoplexy on the 28th July 1750. His loss was deplored as that of one of the greatest organists and pianoforte players of his time. Particularly his powers of improvisation are described as unrivalled by any of his contemporaries. Of his compositions comparatively little was known. His MS. works were at his death divided amongst his sons, and many of them have been lost in the course of time ; only about one-half of his greater works were recovered, whien, after the lapse of nearly a century, the verdict of his neglectful contemporaries was reversed by an admiring posterity.

The history of this Bach revival is closely connected with the name of Mendelssohn, who was amongst the first to proclaim by word and deed the powers of a genius almost too gigantic to be grasped by the receptivity of one gene- ration. By the enthusiastic endeavours of Mendelssohn, Schumann, and others, the circle of Bach’s worshippers has increased rapidly. In 1850, a century after his death, a society was started for the

correct publication of all of Bach's remaining works, to which music owes the rescue from oblivion of some of its sublimest emanations. Amongst those who have vastly contributed to establish the rapport between our master's genius and modern lovers of art, we also mention Dr Robert Franz, himself one of Germany's greatest lyrical composers, who has edited and adapted to the resources of the modern orchestra several of Bach's most beautiful works. Of these works, comprising almost all the different forms of music, vocal and instrumental, bar- ring the opera, we can enumerate only the most important ones, referring the reader for further information to the biographical and critical works by Bach's son, Philipp Emmanuel, by Forkel, and more recently by Bitter and Spitta. The last-mentioned book has appeared quite lately, and exceeds its predecessors both by comprehensivencss of research and critical appreciation. Of his numerous and sacred oratorios, cantatas, and similar choral works, we name the so-called Christmas oratorio (1734), the Passion music to the words of St John, and that infinitely grander to the gospel of St Matthew (1734), also his Mass in B minor, one of the greatest masterpieces of all times, and the Magnificat in D. Another cantata is constructed on Luther's grand chorale, Hin' feste Burg. The most celebrated amongst his pianoforte compositions is the so-called Woltemperirte Clavier, a collection of preludes and fugues in the different keys of the scale. For the orchestra we name the Grande Suite in D, and for his favourite instrument, the organ, the so-called Chromatic Fantasia. It remains to add a few words about Bach's position in the history of musical development. By Marx, a well-known critical writer, he has been called the "Founder and Father of German Music;" and it cannot be denied that no other German composer before him had attained a specifically national type of musical utterance as distinguished from that of other nations. This applies both to matter and manner. Bach has frequently founded his grandest conceptions on the simplest tune of old chorales, that is, of purely popular effusions of pious fervour, such as had survived in the living memory of the nation from the time of Luther and his great revival of religious feeling. Sometimes these tunes were adapted for religious purposes from still older songs of a secular character, being thus thoroughly interwoven with the in- most feeling of theGerman people. In raising these simple creations of popular growth to the higher sphere of art, Bach has established his claim to the name of the creator of the Germanic as opposed

to the Romance phase of musical art. This spirit of German, or to speak more

accurately, North German nationality, thoughtful yet native, earnest yet tender, has also reacted on the form of Bach's creations. Bach's counterpoint, compared with the poly- phonous splendour of Palestrina or Orlando di Lasso, is, as it were, of a more intense, more immediately personal kind. In his sacred cantatas, the alternate exclamations of the voices sometimes rise to an almost passionate fervour of devotion, such as is known only to the more indivi- dualised conception of human relations to the Deity peculiar to Protestant worship,—applying that term in a purely emotional, that is, entirely unsectarian sense. It is thus that Bach has vivified the rigid forms of the fugue with the fire of individual passion. About the peculiarities of his style, from a technical point of view, we can speak no further. How his style and his genius, neglected by his contemporaries, and obscured by other masters, like Haydn and Mozart, starting from a different basis and imbued with a different spirit, have ultimately been destined to exercise a potent spell on modern art, we have indicated already. (F. H.)

BACH, Kari Puainrpp EMMANUEL, second son of the above, was born at Weimar on the 14th March 1714, and died at Hamburg on the 14th September 1788. He was perhaps the most highly gifted musician of the eleven brothers, aud his influence on the development of certain inusical forms gives him a prominent place in the history of the art. He studied at the Thomasschule and after- wards at the university of Leipsic, devoting himself, like several of his brothers, to jurisprudence. In 1738 he took up his residence in Berlin, where he was soon after- wards appointed chamber musician to Frederick the Great. In 1767 he was allowed, after considerable negotiation, to relinquish his situation at court in order to accept the post of kapellmeister at Hamburg, where he passed the last twenty-one years of his life. He was a very prolific composer, his most ambitious work being the oratorio of The Israelites in the Wilderness. The majority of his compositions, however, were naturally written for his in- strument, the clavier. His Versuch tiber die wahre Art das Klavier zu spielen (Essay on

the true method of harpsichord playing) was long a standard work, and Clementi pro- fessed to have derived from Bach his distinctive style of pianoforte playing. Haydn is said to have acknowledged in his old age his deep obligation to the works of Philipp Emmanuel Bach. From them he certainly learned the form of the sonata and symphony, of which Bach may fairly claim to have been the originator, though Haydn enriched it and gave it permanence. This fact gives Bach's name a distinction to which the intrinsic merits of his compositious might not entitle him, it being now generally agreed by the best critics that he was a somewhat feeble imitator of his father's style.

BACHE, ALExanpEeR Dattas, a distinguished Ameri- can physicist, who has gained a wide reputation as super- intendent of the great American Coast Survey, was a great- grandson of Benjamin Franklin, and was born at Phila- delphia, 19th July 1806. In 1821 he entered the mili- tary academy at West Point, and graduated there with the highest honours in 1825. For some time he acted as assistant professor in the academy, holding at the same time a commission as lieutenant of engineers, in which capacity he was engaged for a year or two in the erection of coast fortifications. He occupied the post of professor of mathe- matics in the university of Pennsylvania from 1827 to 1836, and was then made president of the newly-instituted Girard College. In this capacity he undertook a journey through sonie of the principal countries of Europe, in order to examine their systems of education, and on his return published a very valuable report. In 1843, on the death of Professor Hassler, he was appointed by

Government to the office of superintendent of the coast survey. He succeeded in impressing Congress with a sense of the great value of this work, and by means of the liberal aid it granted, he carried out a singularly comprehen- sive plan with great ability and most satisfactory results, By a skilful division of labour, and by the erection of nume- rous observing stations, the mapping out of the whole coast proceeded simultaneously under the eye of the general director. Nor were the observations confined to mere description of the coast-line; the several stations were well supplied with instruments, and a vast mass of magnetic and meteorological

observations was collected, such as niust in- fallibly prove of infinite service in the future progress of physical science. The annual reports issued by the super- intendent were admirable specimens of such summaries, and secured for him a high reputation among European savants. Professor Bache contributed numerous papers to scientific journals and transactions, aud laboured ear- nestly to raise the position of physical science in America, For some mouths before his death, which took place at Newport, 17th February 1867, he was afflicted with soft- ening of the brain, caused, perhaps, by intense and long- continued mental exertion.

BACHELOR, a word of various meaning, and of ex- ceedingly obscure origin. In modern times the most common significations of it are—(1), an unmarried person; (2), one who has taken the lowest degree in any of the faculties at a university. At various times, however, it has signified either a young man in general, from which the first of the modern meanings was easily developed ; or a knight who was unable to lead a body of retainers into the field, 7.e., to use the technical phrase, was not able lever banmiére ; or, finally, an ecclesiastic at the lowest stage of his course of training. It has also been pointed out that bacheleria, which meant the body of aspirants to knighthood, came to be used as synonymous with gentry.

Etymology gives little help in arranging these meanings so as to discover the unity underlying them. In medizval Latin the word baccalaria (connected by Ducange with vasseleria, by Stubbs with bacca, i.e., vacca, a cow), which, according to Diez, is peculiar to the south of France and the north of Spain, signified a certain portion of land, the size and tenure of which imposed on the possessor certain feudal duties, The possessor was called baccalarins, and the name readily acquired the signification of one who, from poverty or other cause, as youth, was not able to take rank as a knight. As a third stage in the use of the word, Diez marks out the application of it to denote the lowest degree in auniversity. But though these transitions from the primitive meaning may perhaps appear natural, there is no historic evidence of their having taken place. The same applies to the five meanings given in Ducange.

We look with more prospect of success to the old French words bacelle, bacelote, bachelette, bachelerie, bachelage, which have all the meaning of

youth, apprenticeship. They may possibly be connected with the Celtic or Welsh words, bach, little, bachgen, a boy. (See Wedgwood, s.v., who is of opinion that the baccalarius of the north of Spain is not in any way connected with our word bachelor.) It is very probable that this is truly the root of the word. It has, however, been frequently connected with baculus, a stick, from which is supposed to have come bacularius, as the word used often to be spelled. (See Promptorium Par- vulorum, s.v.) Whether the relation in this case is that of shooting forth or budding (cf. the Portuguese bacharel, a twig of vine, and Barbazan's derivation from baccalia), or the more obvious one suggested by the functions of the bacularius, who appears to have acted as the monitor or preepostor at schools (see H. T. Riley, Chronica Monasteru St Albani), is very doubtful.

BAC—BAC

Bachelors, or unmarried persons, have in many countries been subjected to penal laws. The best-known examples of such legislation are those of Sparta and Rome. At Sparta, citizens who remained unmarried after a certain age were subjected to a species of aryuia. They were not allowed to witness the gymnastic exercises of the maidens ; and during winter they were compelled to march naked round the market-place, singing a song composed against themselves, and expressing the justice of their punishment. The usual respect of the young to the old was not paid to bachelors (Plut., Zyc., 15). – At Athens there was no definite legislation on this matter ; but certain minor laws are evidently dictated by a spirit akin to the Spartan doctrine (see Schémann, Gr. Alterth., i. 548). At Rome, though there appear traces of some earlier legislation in the matter, the first clearly known law is that called the Lex Julia, passed about 18 B.c. It does not appear to have ever come into full operation; and in 9 4.p. it was incor- porated with the Lex Papia et Poppa, the two laws being frequently cited as one, Lex Julia et Papia Poppwa. This law, while restricting marriages between the several classes of the people, laid heavy penalties on unmarried persons, gave certain privileges to those citizens who had several children, and finally imposed lighter penalties on married per- sons who were childless. In Britain there has been no direct legislation bearing on bachelors; but, occasionally, taxes have been made to bear more heavily on

them than on others. Instances of this are the Act (6 and 7 Will. III.) passed in 1695; the tax on servants, 1785; and the income tax,

1798.

BACHIAN, one of the East Indian islands belonging to the group of the northern Moluccas, situated immediately south of the equator, and lying with its subordinate islands, Mandioli and Kasiruta, between 127°and 127°and 50’ E. long. It is of an irregular form, consisting of two distinct moun- tainous parts, united by a low isthinus, which a slight sub- sidence would submerge. The area is estimated at about 600 geographical square miles. Sandstone, coralline limestone, and pebbly conglomerate are the prevailing rocks. Of volcanic formations no traces were discovered by Mr Wallace, but other travellers speak of hot springs that seem to point to voleanic activity. The sulphur spring at Taubeukit has a temperature of 125° Fahr.; and a more remarkable example of the same phenomenon exists at Sayowang on the east coast. The highest mountain in the southern half of the island is Gunong Sabella, which is regarded by the natives as the seat of evil spirits. It was partially ascended by Bernstein in 1861. A large portion of the surface is richly wooded, and sago, cocoa-nuts, and cloves are abundantly pro- duced, while, in spite of the extermination of nutmeg-trees by the Dutch, at least one extensive grove remains. Bachian is remarkable as the most eastern point on the globe in- habited by any of the Quadrumana. The interior of the island is uninhabited, and noue of the dwellers on the coast are indigenous. They consist of the Sirani or Christian descendants of the Portuguese, of Malays, with a Papuan element, Galela men from the north of Jilolo, and a colony from Tomore, in the eastern peninsula of Celebes. _ The Sirani preserve various marks of their Portu- guese origin, wear a semi-European dress, and celebrate Sunday with dancing and music. The government of the island is vested in a sultan, under the protection of the Dutch, to whom it is becoming of considerable importance from the discovery of coal and other minerals. The chief town or village, called Amassing by the natives, but often spoken of ‘as Bachian, is situated on the isthmus.

BACKGAMMON, a game played with dice, said to have been invented about the 10th century (Strutt). The ety- mology of the word backgammon

is disputed; it is probably Saxon,—Bee, back ; gamen, gaille, z.¢.,a game in which

the players are liable to be sent back. Other derivations are, Dan. bakke, tray, gammen, game (Wedgwood) ; and Welsh, bach, little, cammaun, battle (Henry). Backgammon is played by two persons, having between them a backgammon board. (See diagram.) The board is divided into tables, each table being marked with six points, coloured alternately white and black. The inner and outer tables are separated from each other by a projecting bar.

BLACK. Black’s Home or Inner Table.

White’s Outer Table.

White’s Home or Inner Table. WHITE. Backgammon Board. The board is furnished with fifteen white and fifteen black men, disposed at the commencement of a game in the

manner shown above. The arrangement of the men may be reversed, as it would beif the diagram were turned upside down, and the white men put where the black now stand, and. vice versa, there being no rule as to whether the play shall be from right to left, or from left to right. It is usual to make the inner table (see diagram) the one nearest to the light (Académie des jeux ; regles du jeu de toute-table).

Two dice boxes are required, one for each player, and a pair of dice, which are used by both players. The dice are marked with numbers on each face from one to six, number one being called ace ; two, deuce ; three, trovs (pronounced trey); four, quatre (katre); five, cinque ; and six, six (size).

The board being arranged, each player throws one die ; the one who throws the higher number has the right of playing first ; and he may either adopt the throw originally made by the two players, each throwing one die; orhe may throwagain, using both dice.

Each player moves his own men from poiut to point, the moves being determined by throws of the dice made by the players alternately. A player may move any of his men a number of points corresponding to the numbers thrown by him, provided the board is not blocked by two or more of his adversary's men occupying the point to which he wishes to move. Thus, suppose white throws cinque, six, he may move one of his men from the left-hand corner of the black's inner table to the left-hand corner of black's outer table for six ; he may, again, move the same man five points further on, viz., to the right-hand point of the same table for five, when his move is completed ; or he may leave the man first moved six, and move any other man five points, where the board is open. But white can- not move a man for five from the ace point in black's inner table, because the six point in that table (¢.e., the fifth point from where white moves) is blocked by the black men. Any part of the throw which cannot be moved is of no effect ; but it is compulsory for a player to move the whole throw if he can. Thus, if the men were

| differently placed, and white couid move a six, and having

done so could not move a five, his move is completed. If, however, by moving the five first, he can afterwards move a six, he may be required to make the move in that manner. All white's moves must be in the direction indicated, viz., from black's inner table to black's outer, and from this to white's outer table, and so on to white's inner table; and all black's moves must be in the contrary direction. Of course, where men are originally placed part of the way home, they only have to traverse the remainder of the distance.

A player in moving must not skip a point which is blocked by his adversary's men, Thus, suppose white's first throw is fives, he cannot move a man from the ace point of black's inner table to the cinque point of black's outer, although that is free; because in moving the first cinque he comes to a point which is occupied by black.

When two similar numbers are thrown (called doublets), the player has a double move. Thus, if he throws aces he has to move four aces instead of

two, and so on for the other numbers.

When a player moves his men so as to occupy a point with two men, it is called making a point. Thus, if ace, trois are thrown and white moves one man from the three in his outer table to the cinque point in his inner table, for trois, and then moves a man from the six point to the cinque point of his inner table, for ace, he makes a point there.

If a player leaves only a single man on a point, or places a single man on an unoccupied point, it is called leaving a blot. Thus, if the first throw is six, cinaue, and white carries a man from black's inner table as far as he will go, white leaves a blot on the ace point of his opponent's home table.

When a blot is left the man may be taken up, or the blot may be zt, if, while it remains, the adversary throws a number which will enable him to place a man on that point. For example, if a blot is left on black's ace point, as in the case previously supposed, and black throws a five, or numbers that make up five, he can hit the blot from his six point ; or similarly, if he throws seven, or numbers that make up seven, he can hit the blot from the three men posted in his outer table. The man hit is placed on the bar, and has to enter black's inner table again at white's next throw.

It will be observed that black in taking up white leaves a blot himself, which subjects him to be taken up if white enters with an ace. If this should occur, black's man is placed on the bar, and has at his next throw to enter white's inner table, whence he has to start his journey home. Suppose white to have a blot as before on black's ace point, and black to throw sixes, black could then move two men from white's outer table to his own bar point (so called because it is close to the bar), and thence again to his own ace point, when he would hit white without leaving a blot.

The point in which a man is entered must not be blocked by two or more men belonging to the adversary. Thus, to carry on the illustration, if white now throws aces, or sixes, or six, ace, he cannot enter at all. He is not allowed to move any man while he has one to enter; consequently his throw is null and void, and black throws again. It some- times happens that one player has a man up, and that his adversary occupies all the points on his own home table with two or more men (called having his table made up). In

this case, the player with a man up cannot enter; and as it 1s useless for him to throw, his adversary continues throw- ing until he is obliged to open a point on his innertable.

Two blots may be taken up at once if the adversary throws numbers that will hit them both. It is possible with doublets to take up four blots at once, but this could scarcely happen,in a game between players of any proficiency,

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The game proceeds by moving the men round towards home, or by hitting blots and sending them back, until one of the players gets all his men into his inner table or home, As soon as this stage is reached, the player who has accomplished it begins to take his men off the board or to bear them. Thus, suppose he has several men on every point of his table, and throws six, quatre; he bears one man from his six point, and one from his quatre point. If his six point is unoccupied, he can bear a six from his cinque point, or from the highest point which is occupied, and so on with smaller numbers, provided the numbers thrown are higher than the points occupied ; if lower, the throw must be moved. A player has the option of moving a man when he can, instead of bearing it. Thus, in the case originally given the six must be borne, because a six cannot be moved ; but the quatre may be moved if pre. ferred, by moving a man from the six point to the deuce point, or from cinque point to the ace point. Doublets entitle to bear or move four men in accordance with the previous rules. The adversary similarly bears his men as soon as he gets them all home. If, after a player has commenced bearing his men, he should be hit on a blot, he must enter on his adversary’s inner table, and must bring the man taken up into his own inner table before he can bear any more.

Whoever first bears all his men wins the game :—a single game or hit if his adversary has borne any of his men; a double game or gammon if the adversary has not borne a man ; and a triple game or backgammon, if, at the time the winner bears his last man, his adversary, not having borne a man, has one in the winner’s inner table.

When a series of games is played, the winner of a hit has the first throw in the succeeding game ; but if a gammon is won, the players each throw a single die to determine the first move of the next game.

In order to play backgammon well, it is necessary to know all the chances on two dice, and to apply them in various ways. The number of different throws that can be made is thirty-six. (See Hazarp.) By taking all the combinations of these throws which include given numbers, it is easily discovered where blots may be left with the least probability of being hit. For example, to find the chance of being hit where a blot can only be taken up by an ace; the adversary may throw two aces, or ace in combination with any other number up to six, and he may throw each of these in two different ways, so that there are in all eleven ways in which an ace may be thrown. This deducted from thirty-six (the total number of throws), leaves twenty-five ; so that it is 25 to 11 against being hit on an ace. It is very important to bear in mind the chance of being hit on any number. The following table gives the odds against being hit on any number within the reach of one or two dice :-—

It is 25 to 11, or about 9 to 4, against being hit on 1 a 28 op U2 Gl gical 3 2 » 22,, U4, orabouts 5, 2) FP 3 2? 21 7 15, or 7 9 5, Led 4 2? 21 99 15, 9 7 ted 5, +9 5 o> 19 99 i; 9 94 ” 83, 9 6 29 30 29 6, aie. 5 29 I, 29 7 Ee) 30 9? 6, ”? 5 He) iy che 8 97 31 2? 5, a9 6 ”) 1, 39 9 » 33,, 3, » il, 4, ” 10 29 34 9 2, 29 V7 re) 1, 9 11 22 35 29 5 29 35 99 Ik 29 12

The table shows that if a blot must be left within the reach of one die (7.¢., on any number from 1 to 6), the nearer it is left to the adversary’s man, the less probability there is of its being hit. Also, that it is long odds against being hit on a blot which is only to be reached with double dice, and that, in that case (.e., on any number from 7 to 12), the further off the blot is, the less chance there 1s of its being hit.

BACKGAMMON

The table assumes that the board is open for every pos- sible throw. If part of the throw is blocked by an interven- ing point being held by adverse men, the chance of: being hit may be less. Thus, a blot may be hit on an eight with dueces ; fours ; cinque, trois (twice) ; or six, deuce (twice). If the fourth point is blocked, the blot cannot be hit with deuces or fours, and consequently the chance of its being hit is reduced from 30 to 6 to 32 to 4, or from 5 to 1 to

1.

° Two principles, then, have to be considered in moving the men :—(1.) To make points where there is the best chance of obstructing the opponent ; (2.) When obliged to leave blots, to choose the position in which they are least likely to be hit, z.e., either as near as possible to an adverse man, or as far as possible from any adverse men; or where the intervening points are blocked by the player's own men.

At the beginning of the game it is advisable, if possible, to secure the cinque point in your own inner table, or the cinque point in your adversary's inner table, or both, If you succeed in this, you should then play a bold game in hopes of winning a gammon. The next best point to gain is your own bar point; and the next to that the quatre point in your own inner table. ;

If you are fortunate enough to secure all these points, and your adversary's inner table is less favourably made up, it is then to your interest to open your bar point (in expectation of compelling your adversary to run out of your inner table with a six), and also to keep any men you may have in the outer tables spread (z.¢., not to crowd a number of men on one point). In this case you havea good chance of hitting the man your adversary brings out, and also of hitting the man he has left on your ace point.

Tf you succeed in taking both these men, and your ad- versary has a blot in his inner table, it will be to your in- terest not to make up your own table, but to leave a blot there on purpose, in hopes of his entering on it. You will then have a probability of hitting a third man, which, if accomplished, will give you considerable odds (according to Hoyle, 4 to 1) in favour of

winning a gammon; whereas if you have only two of his men up, the odds are against your gammoning him.

The best move for every possible throw at the commencement of a game is as follows:—If you throw aces (the best of all throws), move two on your bar point and two on your cingue point. This throw is often given to inferior players by way of odds.

Ace deuce: move the ace from your adversary's ace point (if playing for a hit only), and the deuce from the five men placed in your adversary's outer table. If playing for a gammon, move the ace from the six to the cinque point in your inner table.

Ace trois : make the cinque point in your inner table.

Aee quatre and ace cinque: move the ace from your adversary's ace point, and the quatre or cinque from the five men in your ad- versary's outer table. If playing for a gammon, play the ace on the cinque point in your inner table.

Ace six: make your bar point.

Deuces : move two on the quatre point in your inner table, and two on the trois point in your opponent's inner table. If playing for a gammon, move two on the quatre point in your inner table, and two from the five men in your adversary's outer table.

_ Deuce trois and deuce einque : move two men from the five placed in your adversary's outer table.

Deuce quatre : make the quatre point in your own table.

Deuce six: move a man from the five in your adversary's outer table, and place him on the einque point in your own table.

Threes : play two on the cinque point in your inner table, aud three on the quatre point of your adversary's inner table. Fora gammon, play two on your Cinque point and two on your trois point in your inner table.

Trois quatre: move two men from the five in your opponent’s outer table.

Trois cinque: make the trois point in your own table.

Tols six: bring a man from your adversary’s ace point as far as he will go.

Fours : move two on the cinque point in your adversary’s inner table, and two from the five in his outer table. For a gammon, move two men from the five in your opponent’s outer table to the Cinque point in your own table,

Quatre cinque and quatre six: carry a man from your adversary’s ace point as far as he will go.

Fives: move two men from the five in your adversary’s outcr table to the trois point in your inner table.

Cinque six: move a man from your adversary’s ace point as far as he will go.

Sixes (the second best throw): move two on your adversary’s bar point, aud two on your own bar point.

Subsequent moves depend on the intervening throws; conse- quently the problem becomes too complicated for analysis. Some general rules, however, may be given.

In carrying the men home carry the most distant man to your adversary’s bar point, next to the six point in your outer table, and then to the six point in your inner table. By following this rule as nearly as the throws admit, you will carry the men to your inner table in the fewest number of throws. When all are home but two, it is often advisable to lose a point, if by so doing you put it in the power of a high throw to save a gammon.

If, in endeavouring to gain your own or your adversary’s cinque point, you have to leave a blot and are hit, and your adversary is forwarder in the game than you, you must put another man on your cinque or bar point, or into your adversary’s table. If this man is not hit, you may then make a point,

and so get as good a game as your opponent. If it is hit, you must play a back game (i.e., allow him to take up as many men as he likes); and then in entering the men taken up, endeavour to secure your adversary's ace and trois points, or ace and deuee points, and keep three men upon his acc point, so that if you hit him from there you still keep the ace point protected,

To find which is the forwardest, reckon how mauy points you have to bring all your men home to the six point in your inner table. Add to this six for every man on the six point in your tables, five for every man on your cinque point, and so on ; and then make the same calculation for your adversary's men.

Avoid carrying many men upon the trois or deuce point in your own tables, as these men are out of play, and the board is left open for your adversary.

Whenever you have taken up two of your adversary's men, and have two or more points made in your inner table, spread your other men to take the best chance of making another point in your tables, and of hitting the man your adversary enters. As soon as he enters, compare his game with yours, and, if equal or better, take up his man, except when playing for a hit only, and your playing the throw gives you a better chance for the hit.

Always take up a man if the blot you leave in making the move can only be hit with double dice, except when playing for a hit only, aud you already have two of your opponent's men in your tables, and your game is forwardest ; because your having three of his men in your tables gives him a better chance of hiting you with- out leaving a blot than if he has only two.

In entering a man which it is to your adversary's advantage to hit, leave the blot upon the lowest point you can, ¢.g., ace point in pre- ference to deuce point, and so on ; because this crowds his game by taking out of it the men played on the low point.

When your adversary is bearing his men, and you have two men in his table, say on his ace point, and several men in the outer table, it is to your advantage to leave one man on the aee point, because it prevents his bearing his men to the greatest advantage, and gives you the chance of his leaving a

blot. But if, on calcula- tion, you find that you can probably save the gammmon by bringing both your men out of his table, do not wait for a blot. To make this caleulation, you must aseertain in how many throws you can bring all your men home (a throw averaging eight points), and in how many throws he ean bear all his men, on the assumption that he will bear on the average two men at each throw.

The laws of backgammon (as given by Hoyle) are as follows :—

1, When a man is taken from any point, it must be played ; when two men are taken from it, they also must be played. 2. A man is not supposed to be played till it is placed upon a point and quitted. 3. Ifa player have only fourteen men in play, there is no

enalty inflicted, because by his playing with a lesser number than ka is entitled to, he plays to a disadvantage for want of the deficient man to make up his tables. 4. If he bear any number of men before he has entered a man taken up, and which of course he was obliged to enter, such men so borne must be entered again in the adversary's tables as well as the man taken up. 5. If he have mis- taken his throw and played it, and his adversary have thrown, it is not in the choice of either of the players to alter it, unless they both agrec so to do.

Russian Backgammon or Tric-Trac is played with the same implements as backgammon. The men are not placed on the board, but both black and white are entered in the same table by throws of the dice, and both players move

in the same direction round to the opposite table. A player is not obliged to enter all his men before he moves any; aud he can take up blots on entering, although he has some of his men, which have never been entered, off the board. But, while a player has a man up, he must enter it before entering any more, or moving any of those already entered. If he cannot enter the man that is up, he loses the benefit of the throw.

A player who throws doublets must move not only the number thrown, but also doublets of the number corresponding to the opposite side of the dice; thus, if he throws sixes, he must first enter or move the sixes, as the case may be, and then aces, and he also has another throw. If he throws doublets a second time, he moves according to the rule already given, and throws again, and so on. The privilege is sometimes restricted by not allowing this advantage to the first doublets thrown by each player. It is somietimes extended by allowing the thrower of deuce, ace, to choose any doublets he likes on the opposite sides of the dice, and to throw again. The restriction with regard to the first doublets thrown does not apply to deuce, ace, nor does throwing it remove the restriction with regard to first doublets.

A player must first be able to complete the doublets

thrown. If he cannot move the whole throw, he cannot take the corresponding doublets; and he is not allowed another throw if he cannot move all the points to which he is entitled. In other respects the game is similar to ordinary backgammon. The chief object in the game is for the player who has his men in advance to secure as many successive points as possible, so that his adversary may be unable to pass or hit the forward men. (H. J.)

BACKHUYSEN, Lupotr, an eminent painter of the Dutch school, was born at Embden, in Hanover, in 1631,and died in 1709. He was brought up as a merchant at Amster- dam, but early discovered so strong a genius for painting that he relinquished business and devoted himself to art, He studied first under Everdingen and then under Dubbels, two eminent masters of the time, and soon became cele- brated for his sea pieces. He was an ardent student of uature, and frequently exposed himself on the sea in an open boat in order to study the effects of tempests. His compositions, which are very numerous, are nearly all variations of one subject, and in a style pecuiiarly his own, marked by intense realism or faithful imitation of nature. In his later years Backhuysen employed his time in etching and caligraphy. Several of his best pieces are in the gallery of the Louvre.

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BACON, FRANCIS

ACON, Francis, Baron VervuLaM, Viscount St ALBAN, was born at York House in the Strand, Lon- don, on the 22d January 1561. He was the youngest son of Sir Nicholas Bacon, the celebrated lawyer and statesman, who for twenty years of Elizabeth's reign held the seals as lord keeper. His mother, the second wife of Sir Nicholas, was a daughter of Sir Anthony Cooke, formerly tutor to Edward VI. She was a woman of considerable culture, well skilled in the classical studies of the period, and a warm adherent of the Reformed or Puritan Church. One of her sisters was married to the famous Lord Treasurer Burghley. Very little is known of Bacon's early life and education. His health being then, as always, extremely delicate, he probably received much of his instruction at home. Yet, Rawley tells us, "his first and childish years were not without some mark of eminency ; at which time he was endued with that pregnancy and towardness of wit, as they were presages of that deep and universal apprehension which was manifest in him afterwards, and caused him to be taken notice of by several persons of worth and place, and especially by the queen, who, as I have been informed, delighted much to confer with him and to prove him with questions ; unto whom he delivered himself with that gravity and maturity above his years that her majesty would often term him, Zhe young lord keeper." In April 1573 he was entered at Trinity College, Cambridge, where for three years he resided with his brother Anthony. Our information with regard to these important years is singularly scanty. We know only that Bacon at Cam- bridge, like Descartes at La Fléche, applied himself dili- gently to the several sciences as then taught, and came to the conclusion that the methods employed and the results attained were alike worthless and erroneous. Although he preserved a reverence for Aristotle (of whom, however, he seems to have known but little), he learned to despise the Aristotelian philosophy. It yielded no fruit, was serviceable only for disputation, and the end it proposed to itself was a mistaken one. Philosophy must be taught its true business, and to attain its new aim a new method must be devised. With the first germs of this great con- ception in his mind, Bacon left the i ye in 1576. In the same yew he and his brother Anthony were

entered de societate magistrorum at Gray’s Inn, and a few months later he was sent abroad with Sir Amyas Paulet, the English ambassador at Paris. He spent some time in that city, and travelled through several of the French pro- vinces. The disturbed state of government and society in France at that time must have afforded him much valuable political instruction ; and it has been commonly supposed that certain Motes on the State of Christendom, usually printed in his works, contain the results of his observa- tions. But Mr Spedding has shown that there is uo reason for ascribing these “ Notes” to him, and that they may be attributed with more probability to one of his brother Anthony’s correspondents.

The sudden death of his father in February 1579 neces- sitated Bacon’s return to England, and exercised a very serious influence on his fortunes. A considerable sum of ‘money had been laid up by Sir Nicholas in order to pur-

chase an estate for his youngest son, the only one other- wise unprovided for. Owing to his sudden death, this intention was not carried out, and but a fifth part of the money descended to Francis, who thus began his career in comparative poverty. It was one of the gravest misfor- tunes of his life: he started with insufficient means, acquired a habit of borrowing, and was never afterwards out of debt. As it had become absolutely necessary that he should adopt some profession by which an adequate income would be yielded, he selected that of law, and took up his residence at Gray’s Inn in 1579.

Nothing throws so clear a light on the career of any great man as a knowledge of his character and aims when he made the first step into the world. We learn from this how he himself desired to shape his course, and at every point can see how far his actions correspond to the end he had placed before him. We have, fortunately, information from Bacon himself on these points. In the fragment De Interpretatione Nature Procemium (written probably

feared 1603) he analyses his own mental character, and | lays before us the objects he had in view when he entered j on public life. If his opening sentence, Ego cum me ad ‘ utilitates humanas natum existimarem, seems at

first sight la little arrogant, it must be remembered that it is the | arrogance of the peyaddyuxos, who thinks himself worthy

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of great things, and ts worthy; it is a great self-esteem, based upon a consciousness of great powers. This grand and comprehensive aim, the production of good to the human race through the discovery of truth, was combined in him with the more practical desire to be of service to his country, service for which he felt himself by birth and education eminently fitted. He purposed, therefore, to obtain, if possible, some honourable post in the state which would give him the means of realising, so far as in him lay, these two great projects, and would at the same time enable him to do somewhat for the church, the third of the objects whose good he had at heart. The constant striving after these three ends is the key to Bacon's life. His qualifications for accomplishing the task he thus set before him were not small. His intellect was far-seeing and acute, quick and yet cautious, meditative, methodical, and free from prejudice. If we add to this account what Bacon himself does not tell us—that he seems to have been of an unusually sweet temper and amiable disposition —we shall have a fairly complete picture of his mental character at the critical period of his entry into the world.

In 1580 he appears to have taken the first step in his projected career by applying, through his uncle, Burghley, for some post at court. His suit, though well received by the queen and the lord treasurer, was unsuccessful; the particulars of it are totally unknown. For two years after this disappointment he worked quietly at Gray's Inn, and in 1582 was admitted an outer barrister. In 1584 he took his seat in Parliament for Melcombe in Dorsetshire, but the notes for the session do not disclose what part he took or what reputation he gained. About the same time he made another application to Burghley, apparently with a view to expediting his progress at the bar. His uncle, who appears to have "taken his zeal for ambition," wrote him a severe letter, taking him to task for arrogance and pride, qualities which Bacon vehemently disclaimed. It is uncertain what success attended this suit; but as his advancement at the bar was unusually rapid, his uncle's

influence may uot improbably have been exerted in his

behalf. Some years later, in 1589, he received the first substantial piece of patronage from his powerful kinsman, the reversion of the clerkship of the Star Chamber being granted to him. The office was valuable, worth about

£1600 a year; but it did not become vacant for nearly

twenty years, and was thus, as Bacon used to say, “ like another man’s ground buttailing upon his house, which might mend his prospect, but did not fill his barn.” A considerable period of his life had thus slipped away, and his affairs had not prospered. He had written on the condition of parties in the church; he had set down his thoughts on philosophical reform in the lost tract, Temporis Partus Maximus; but he had failed in obtaining the position which he looked upon as an indispensable condition of success, A long and eloquent letter to Burghley,! written ae tment filets

¢ . : . 1 “T wax now somewhat ancient ; one-and-thirty years is a great T ever bare a mind (in some

Again, the meanness of my estate doth somewhat move me ; for though I cannot accuse myself that I am either prodigal or slothful, yet my health is not to spend, nor my course to get. Lastly, I confess that I have as vast contemplative ends as I have moderate civil ends: for I have taken all knowledge to be my province ; and if I could purge it of two sorts of rovers, whereof the one with frivolous disputations, confutations, and verbosities, the other with blind experiments and auricular traditions and impostures, hath committed so many spoils, I hope I should bring in industrious observations, grounded conclusions, and profitable inventions and discoveries—the best state of that province. This, whether it be curiosity, or vain-glory, or nature, or (if one take it favourably) philanthropia, is so fixed in my mind ag it cannot be

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under these circumstances, gives a vivid picture of his mental state, throws additional light upon his character and aims, and at the same time gives a slight hint as to the cause of his uncle’s slackness in promoting him.

Some time before this, perhaps as early as 1588, Bacon appears to havebecome acquainted with Essex, the impetuous and headstrong favourite of Elizabeth's later years. At the close of 1591 he was acting as the earl's confidential adviser, and in the following year Anthony Bacon, returning from the Continent, was also introduced to the young noble- man, and the two brothers exerted themselves diligently in his service. In Feb. 1593 Parliament was called, and Bacon took his seat as member for Middlesex. The special occasion for which the House had been summoned was the discovery of one of the numerous Popish plots that distracted Elizabeth's reign. The conspiracy seemed to be formidable, and Government felt the necessity for increased supplies. As Bacon's conduct in this emergency seriously affected his fortunes, and has been much misunderstood, it is necessary to state, as briefly as possible, the whole facts of the case. The House having been duly informed of the state neces- sities, assented to a double subsidy, and appointed a committee to draw up the requisite articles. Before this was completed, a message arrived from the House of Lords requesting a conference, which was granted. The committee of the Commons were then informed that the crisis demanded a triple subsidy to be collected in a shorter time than usual, that the Lords could not assent to less than this, and that they desired to confer on the matter. This proposal of the Lords to discuss supply infringed upon the privileges of the Commons; accordingly, when the report of committee was read to the lower House, Bacon stood up and spoke against the proposed conference, point- ing out at the same time that a communication from the Lords might be received, but that the actual deliberation on it must be taken by themselves alone. His motion, after some delay, was carried, and the conference was rejected. The Lords upon this lowered their demands, and desired merely to make a communication, which, being legitimate, was at once assented to. The House had then before them the proposal for a triple subsidy, to be collected in three, or, as the motion ultimately was shaped, in four years, instead of in six, as the ordinary custom would have been. Bacon, who approved of the increased subsidy, was opposed to the short period in which it was proposed to be raised. He sug- gested that it would be difficult or impossiblefor the people to meet such heavy demands, that discontent and trouble would arise, and that the better method of procedure was to raise money by levy or imposition. His motion appears to have received no support, and the four years' subsidy was passed unanimously. Bacon, as it turned out, had been

mistaken in thinking that the country would be unable to meet the increased taxation, and his conduct, though prompted by a pure desire to be of service to the queen, gave deep and well-nigh ineradicable offence. He was accused of seeking popularity, and was for a time excluded from the court. His letter to Burghley,? who had told him of the queen's dis- pleasure with his speech, offers no apology for what he had

removed. And I do easily see, that place of any reasonable command- ment doth bring commandment of more wits than of a inan's own. ... And if your lordship shall find now, or at any time, that I do seek or affect any place whereunto any that is nearer to your lordship shall be convenient, say then that I am a most dishonest man. And if your lordship will not carry me on, . . . this I will do, I will sell the inheritance that I have, and purchase some lease of quick revenue, or some office of gain that shall be executed by deputy, and so give over all care of service, and become some sorry bookmaker, or a true pioneer in that mine of truth." —(Spedding, Letters and Life, i. 108-9.)

? Spedding, Letters and Life, i. 234-35, cf. i. 8362. This letter, with those to Puckering or Essex and the queen, i. 240-41, should be com- pared with what is said of them by Macaulay in his Zssay on Bacon, and by Campbell, Lives, ii, 287.

said, but expresses regret that his motives should have been misunderstood, and that any offence should have been taken. He soon felt that the queen's anger was not to be appeased by such a justification. The attorney-generalship had fallen vacant, and Bacon became a candidate for the office, his most formidable rival being his life-long antagonist, Coke, who was then solicitor. Essex warmly espoused Bacon's cause, and earnestly pressed his claims upon the queen ; but his impetuous, pettish pleading tended rather to retard than advance the cause. Burghley, on the other hand, in no way promoted his nephew's interest ; he would recommend him for the solicitorship, but not for the attorney-generalship ; and it is not improbable that Sir Robert Cecil secretly used his influence against his cousin. The

queen delayed the appointment, and Bacon's fortunes, as they then stood, could ill brook delay. He was harassed with debt, and at times so disheartened that he contem- plated retirement from public life and devotion to abstract studies. In March 1594 it was at last understood that Coke was to be attorney-general. Essex, though bitterly mortified, at once threw all his energies into the endcavour to procure for Bacon the solicitorship ; but in this case also, his method of dealing, which was wholly opposed to Bacon's advice,! seemed to irritate, instead of conciliating the queen. The old offence was not yet forgiven, and after a tedious delay, the office was given, in Oct. 1595, to Sergeant Fleming. Burghley and Puckering seem to have assisted Bacon honestly, if not over-warmly, in this second application ; but the conduct of Cecil had roused suspicions which were not perhaps without foundation. Essex, to compensate in some degree for Bacon's disappoint- ment, insisted upon presenting him with a piece of land, worth about £1800, and situated probably near Twicken- ham Park. Nor did his kindness cease there; before sailing on the expedition to Cadiz, in the beginning of 1596, he addressed letters to Buckhurst, Fortescue, and Egerton, earnestly requesting them to use their influence towards procuring for Bacon the vacant office of master of the rolls. Before anything came of this application, the Cadiz expedition had resulted in a brilliant success, and Essex became the idol of the army and the people. Bacon saw clearly that such a reputation would assuredly alienate the affections of the queen, who loved not to have a subject too powerful or too popular. He therefore addressed an eloquent and imploring letter to the earl, pointing out the dangers of his position, and urging upon him what he judged to be the only safe course of action, to seek and secure the favour of the queen alone; above all things dis- suading him from the appearance of military popularity. His advice, however, was unpalatable and proved ineffectual. The earl still continued his usual course of dealing with the queen, depending solely upon her supposed affection for him, and insanely jealous of any other whom she might seem to favour. His unskilful and unlucky management of the sea expedition to Ferrol and the Azores in no way lowered his popularity with the people, but undoubtedly weakened his influence with the queen.

Bacon's affairs in the meantime had not been prospering. He had increased his reputation by the publication, in 1597, of his Essays, along with which

were the Colours of Good and Evil and the Meditationes Sacre ; but his private fortunes were ina bad condition. No public office apparently could be found for him; he failed in the endeavour to retrieve his position by a marriage with the wealthy widow, Lady Hatton, and in 1598 he was arrested for debt. He seems, however, to have been growing in favour with the queen. Some years previously (perhaps about 1594), he had begun to be employed by her in crown affairs, and he gradually acquired the standing of one of the learned

1 See Letters and Life, i. 289, ii. 34,

counsel, though he held no commission or warrant, and received no salary. At the same time he was no longer on the former friendly terms with Essex, a certain estrangement having sprung up between them, causcd no doubt by the earl finding his friend's advice distasteful. The earl's affairs were then at a somewhat critical stage, and as our judg- ment upon a most important episode in Bacon's life depends upon our knowledge of the events of the ensuing year, it will be requisite to enter more minutely than would other- wise be neccessary into proceedings with which Bacon himself had nothing to do.

Treland was then in a rebellious and discontented con- dition, and it was somewhat difficult for the English Government to decide either on a definite course of policy with regard to it, or on a leader by whom that policy might be carried out. Upon this subject a violent quarrel took place between the queen and Essex, who for some months retired from court, and refused to be reconciled. At last he came forth from his seclusion, and it was soon under- stood that he was in person to undertake the subjugation of the rebels in Ireland, with a larger force than had ever before been sent into that country. Into the obscure details of this unhappy campaign it is unnecessary to enter ; one fact stands out clearly, that Essex endeavoured to carry out a treasonable design. His jealousy and ill temper had been so roused that the only course open to him seemed to be the obtaining a powerful military force, the possession of which would compel the queen to reinstate him in her favour. Whether or not this plan was in contemplation before he undertook the Irish expedition is not evident, though even

outsiders at that time entertained some suspicions, but there can be no doubt of the treasonable character of the negotia- tions carried on in Ireland. His plans, probably not very definite, were disturbed by an imperative message from the queen, ordering him not to return to England without her permission. He at once set off, and, trusting apparently to her affection for him, presented himself suddenly before her. He was, for the moment, received kindly, but was soon afterwards ordered to keep his chamber, and was then given into the custody of the lord keeper at York House, where he remained till March 1600. His great popularity, and the general ignorance of the reasons for his imprison- ment, stirred up a strong feeling against the queen, who was reported to be influenced by Bacon, and such indigna- tion was raised against the latter, that his friends feared his life would be in danger. The groundless character of this accusation shows how little confidence should be reposed in popular versions of obscure occurrences. It was at last felt necessary that the queen should in some way vindi- cate her proceedings, and this she at first did, contrary to Bacon's advice, by a declaration from the Star Chamber. This, however, gave little or no satisfaction, and it was found expedient to do what Bacon had always recommended, to have a fair trial, yet not one in which the sentence must needs be damaging to the earl. The trial accordingly took place before a body of her majesty's councillors, and Bacon had a subordinate and unimportant part in the accusation. Essex does not seem to have been at all hurt by his action in this matter, and shortly after his release they were again on friendly terms, Bacon drawing up letters as if to or from the earl with the design of having them brought before the queen. But Bacon did not know the true character of the transactions in which Essex had been engaged. The latter had been released from all custody in August, but in the meantime he had been busily engaged in treasonable cor- respondence with James of Scotland, and was counting on the Irish army under his ally, Montjoy, the new deputy. But Montjoy had apparently come to see how useless the attempt would be to force upon the queen a settlement of the succession, and declined to go further in the matter.

BACON

Essex was thus thrown upon his own resources, and his anger against the queen being roused afresh by the refusal to renew his monopoly of sweet

wines, he formed the des- perate project of seizing her person and conrpelling her to dismiss from her council his enemies Raleigh, Cobham, and Cecil. As some pretext, he intended to affirm that his life was in danger from these men, who were in league with the Spaniards. The plot was forced on prematurely by the suspicions excited at court, and the rash attempt to rouse the city of London (8th February 1601) proved a complete fiasco. The leaders were arrested that night and thrown into prison, Although the actual rising might have ap- peared a mere outburst of frantic passion, the private examinations of the most prominent conspirators disclosed to the Government a plot so widely spread, and involving so many of the highest in the land, that it would have been perilous to have pressed home accusations against all who might be implicated. Essex was tried along with the young earl of Southampton, and Bacon, as one of her majesty's counsel, was present on the occasion. Coke, who was principal spokesman, managed the case with great want of skill, incessantly allowing the thread of the evidence to escape, and giving the prisoners opportunity to indulge in irrelevant justifications aud protestations which were not ineffectual in distracting attention from the real question at issue, On the first opportunity Bacon rose and briefly pointed out that the earl's plea of having done nothing save what was absolutely necessary to defend his life from the machinations of his enemies was weak and worthless, inas- much as these enemies were purely imaginary; and he compared his case to that of Pisistratus, who had made use of a somewhat similar stratagem to cloak his real de- signs upon the city of Athens. He was thereupon inter- rupted by the earl, who proceeded to defend himself, by declaring that in one of the letters drawn up by Bacon, and purporting to be from the earl to Anthony Bacon, the existence of these rumours, and the dangers to be appre- hended from them, had been admitted ; and he continued, "Tf these reasons were then just and true, not counterfeit, how can it be that now my pretences are false and injuri- ous?" To this Bacon replied, that "the letters, if they were there, would not blush to be seen for anything con- tained in them, and that he had spent more time in vain in studying how to make the earl a good servant to the queen than he had done in anything else." It seems to be forgotten in the general accounts of this matter, not only that Bacon's letters bear out what he said, but that the earl's excuses were false. A second time Bacon was compelled to interfere in the course of the trial, and to recall to the minds of those present the real question at issue. He

animadverted strongly upon the puerile nature of the defence, and in answer to a remark by Essex, that if he had wished to stir up a rebellion he would have had a larger company with him, pointed out that his depend- ence was upon the people of London, and compared his attempt to that of the duke of Guise at Paris. To this the earl made little or no reply. Bacon's use of this illus- tration, and of the former one of Pisistratus, has been much commented on, and in general it seems to have been thought that had it not been for his speeches Essex might have escaped, or, at all events, have been afterwards pardoned. But this view of the matter depends on the supposition that Essex was guilty only of a rash outbreak.! That this was not the case was well known to the queen and her council. Unfortunately, prudential motives hindered the publication of the whole evidence; the people, consequently, were still ignorant of the magnitude of the crime, and, till recently, biographers of Bacon have been in a like ignorance.? The

' See Macaulay's Essay on Bacon.

- The whole story of Essex is given in Mr Spedding's Letters and

earl himself, before execution, confessed his guilt and the thorough justice of his sentence, while, with singular lack of magnanimity, he incriminated several against whom accusations had not been brought, among others his sister Lady Rich. After his execution it was thought necessary that some account of the facts should be drawn up and circulated, in order to remove the prejudice against the queen's action in the matter. This was intrusted to Bacon, who drew up a Declaration of the Practices and Treasons attempted and committed by Robert, late Earl of Essex, his first draft being extensively altered and corrected by the queen and council. Nothing is known with certainty of the reception given to this official explanation, but the ill feeling against Bacon was not wholly removed, and some years later, in 1604, he published, in the form of a letter to Montjoy, an Apology for his action in the case. This Apology gives a most fair and temperate history of the relations between Bacon and Essex, shows how the prudent counsel of the one had been rejected by the other, and brings out very clearly what we conceive to be the true explanation of the matter. Everything that Bacon could do was done by him, until the real nature of Essex's de- sign was

made apparent, and then, as he had repeatedly told the earl, his devotion and respect were for the queen and state, not for any subject ; friendship could never take rank above loyalty. Those who blame Bacon must acquit Essex of all wrong-doing.

Bacon's private fortunes, during the period after the death of Essex, were not in a flourishing condition. He had obtained a grant of £1200 from the fines imposed on Catesby, one of the conspirators, but his debts were sufficient to swallow up this and much more. And, though he was trusted by Elizabeth, and on good terms with her, he seems to have seen that he had no chance of advance- ment. But her death in 1603, followed by the undisputed succession of James, gave him new hopes; to use his own expression, he found himself "as one awaked out of sleep." It appeared to him that at length the abilities he was con- scious of possessing would obtain recognition ; he thought that " the canvassing world" had gone, and the " deserving world" had come. He uscd every means in his power to bring himself under James's notice, writing to all his friends at the Scottish court and to the king himself. He managed to obtain a personal interview with the king, but does not seem to have been much satisfied with it. In fact, while the king confirmed in their situations those who had held crown offices under Elizabeth, Bacon, not holding his post by warrant, was practically omitted. He was, however, continued, by special order of the king, as learned counsel extraordinary, but little or no law business appears to have been intrusted to him. He procured, through his cousin Cecil, the dignity of knighthood, which, contrary to his inclination, he received along with about 300 others, on the 23d July 1603. Between this time and: the opening of James's first Parliament he was engaged in literary work, and sent to the king two pamphlets—one on the Union, the other on measures for the pacification of the church. What opinion was formed of them by James is unknown. Shortly after he published his Apology; the reception it met with is equally uncertain. In March 1604 Parliament met, and during their short session Bacon's hands seem to have been full of work. It was a busy and stirring time, and events occurred during it which carried within them the seeds of much future dissension. Prerogative and privilege came more than once into collision, the abuses of purveyance and wardship were made matters of conference, though the thorough discussion of them was deferred to a

Life. It is also very vigorously told by Mr Bruce in the Introduction to his Correspondence of James VI. with Str Robert Cecil, Camden Society, 1861.

succeeding session; while James's temper was irritated by the objections brought against his favourite scheme of the Union, and by the attitude taken up by the House with re- gard to religious affairs. The records are barely full enough to enable us to judge very accurately of the share taken by Bacon in these discussions ; his name generally appears as the reporter of the committees on special subjects. We can occasionally, however, discern traces of his tact and remarkable prudence; and, on the whole, his attitude, par- ticularly with regard to the Union question, recommended him to James. He was shortly afterwards formally in- stalled as learned counsel, receiving the salary of £40, and at the same time a pension of £60 yearly. He was also appointed one of the commission to treat of the conditions necessary for the Union; and the admirable manner in which the duties of that body were discharged must be attributed mainly to his influence and his complete mastery of the subject. During the recess he published his Advance- ment of Learning, dedicated to the king.

He was now fairly brought into relations with James, and his prospects began to look a little brighter. It is important for us to know what were his ideas upon government, upon parliaments, prerogative, and so forth, since a knowledge of this will clear up much that would seem inexplicable in his life. It seems quite evident? that Bacon, from position, early training, and, one might almost think, natural inclination, held as his ideal of government the Elizabethan system. The king was the supreme power, the centre of law and justice, and his prerogative must not be infringed. Parliament was merely a body called to consult with the king on emergencies (circa ardua regni) and to grant supplies. King and parliament together make up the state, but the former is first in nature and importance. The duty of a statesman was, therefore, to carry out the royal will in as prudent a manner as possible; he was the servant of the king, and stood or fell according to his pleasure. It is hard to put ourselves at this point of view, and we can with difficulty understand how such a man as Bacon held a theory which seems now so inadequate. But he was not singular in his opinions, and he was

undoubtedly sincere; and it is only by keeping them constantly in mind that we can understand his after relations with the king.

In the second Parliament there was not so much scope for the exercise of his powers. The Gunpowder Plot had aroused in the Commons warmer feelings towards the king; they passed severe laws against recusants, and granted a triple subsidy. At the same time they continued the collection of the grievances concerning which they were to move. In the course of this session Bacon married Alice Barnham, “the alderman’s daughter, an handsome maiden, to my liking,” of whom he had written some years before to his cousin Cecil. Little or nothing is known of their married life.

The third Parliament was chiefly occupied with the commercial and legal questions rising out of the proposed Union, in particular, with the dispute as to the naturalisa- tion of the Post Natt. Bacon argued ably in favour of this measure, but the general feeling was against it. The House would only pass a bill abolishing hostile laws be- tween the kingdoms; but the case of the Post Nati, being brought before the law courts, was settled as the king wished. Bacon’s services were rewarded in June 1607 by the office of solicitor; he had at last gained a step upon the ladder of advancement. His promotion, how- ever, was not rapid ; several years passed before he gained another step. Meantime, though circumstances had thrown him too much into active life, he had not forgotten his cherished project of reorganising science. A survey of

1 See Letters and Life, iv. 177, vi. 88, vii. 116,117…

the ground had been made in the Advancement, and some short pieces not published at the time were probably written in the subsequent two or three years. Towards the close of 1607 he sent to his friends a small tract, entitled Cogituta et Visa, probably the first draft of what we have under that title. In 1609 he wrote the noble panegyric, Zn felicem memoriam Elizabethe, and the curi- ously learned and ingenious work De Sapientia Veterum ; and completed what seems to have been the Redargutio Philosophiarum, or treatise on the idols of the theatre.

In 1610 the famous fourth Parliament of James met, It is not possible to enter minutely into the important occurrences of thisshort session. Prerogative, despite Bacon's advice and efforts, clashed more than once with liberty ; Salisbury's bold schemes for relieving the embarrassment caused by the reckless extravagance of the king proved abortive, and the House was dissolved in February 1611. Bacon took a considerable share in the debates, consistently upheld the prerogative, and seemed yet to possess the confidence of the Commons. The death of Salisbury, occurring soon after, opened a position in which Bacon thought his great political skill and sagacity might be made more immediately available for the king's service. How far he directly offered himself for the post of secretary is uncertain, but we know that his hopes were disappointed, the king himself undertaking the duties of the office. About the same time he made two ineffectual applications for the mastership of the wards; the first, on Salisbury's death, when it was given to Sir George Carey; the second, on the death of Carey. It is some what hard to understand why so little favour was shown by the king to one who had proved himself able and willing to do good service, and who, in spite of his disappointments, still continued zealously to offer advice and assistance. At last, in 1613, a fair opportunity for promotion occurred. The death of Sir Thomas Fleming made a vacancy in the chief-justiceship of the King's Bench, and Bacon, after some deliberation, proposed to the king that Coke should be removed from his place in the Court of Common Pleas and transferred to the King's Bench. He gives several reasons for this in his letter to the king, but in all probability his chief motive was that pointed out by Mr Spedding," that in the Court of King's Bench there would be less danger of Coke coming into collision with the king on questions of prerogative, in handling which Bacon was always very circumspect and tender. The vacancy caused by Coke's promotion was then filled up by Hobart, and Bacon, finally, stepped into the place of attorney-general. The fact of this advice being offered and followed in all essentials, illustrates very clearly the close relations. between the king and Bacon, who had become a confidential adviser on most occasions of difficulty. That his adherence to the royal party was already noticed and commented on appears from the signi- ficant remark of Chamberlain, who, after mentioning the recent changes among the law officials, says, "There is a strong apprehension that little good is to be expected by this change, and that Bacon may prove a dangerous instrument."

Further light is thrown upon Bacon’s relations with James, and upon his political synipathies, by the letter to the king advocating the calling of a parliament,’ and by the two papers of notes on which his letter was founded.‘ These documents, even after due weight is given to all considerations urged in their favour,® seem to confirm the view already taken of Bacon’s theory of government, and at the same time show that his sympathies with the royal party tended to blind him to the true character of certalu courses of action, which can only be justified by a strai-

2 Letters and Life, iv. 381.

8 Tbid., iv. 380. ‘ Thid., iv. 365-73.

5 Tbid., iv. 375-78.

ing of political ethics. The advice he offered, in all sin- cerity, was most prudent and sagacious, and might have been successfully carried out by a man of Bacon’s tact and skill ; but it was intensely one-sided, and exhibited a curi- ous want of appreciation of what was even then beginning to be looked on as the true relation of king, parliament, and people. Unfortunately for James, he could neither adopt nor carry out Bacon’s policy. The Parliament which met in April 1614 and was dissolved in June, after a stormy session, was by no means in a frame of mind suitable for the king’s purposes. The House was enraged at the sup- posed project (then much misunderstood) of the “ Under- takers ;” objection was taken to Bacon being elected or serving as a member while holding office as attorney-general ; and, though an exception was made in his favour, it was re- solved that no attorney-general should in future be eligible for a seat in Parliament. No supply was granted, and the king’s necessities were increased instead of diminished. The emergency suggested to some of the bishops the idea of a voluntary contribution, which was eagerly taken up by the noblemen and crown officials. The scheme was afterwards extended so as to take in the whole kingdom, but lost something of its voluntary character, and the means taken to raise the money, which were not what Bacon would have recommended,! were calculated to stir up dis- content. The general dissatisfaction received a somewhat unguarded and intemperate expression

in a letter sent to the justices of Marlborough by a gentleman of the neighbour- hood, named St John, in which he denounced the attempt to raise funds in this way as contrary to law, reason, and religion, as constituting in the king personally an act of per- jury, involving in the same crime those who contributed, and thereby subjecting all parties to the curses levelled by the church at such offences, St John was summoned before the Star Chamber for slander and treasonable language ; and Bacon, ex officio, acted as public prosecutor. The sentence pronounced (a fine of £5000 and imprisonment for life) was severe, but it was not actually inflicted, and probably was not intended to be carried out, the success of the prosecution being all that was desired. St John remained a short time in prison, and was then released, after making a full apology and submission, The fine was remitted. It seems in- credible that Bacon's conduct on this occasion should have been censured by his biographers, The offence was clear ' the law was undoubted; no particular sympathy was excited for the culprit; the sentence was not carried out ; and Bacon did only what any one in his place would naturally and necessarily have done. The nature of his office involved him in several trials for treason occurring about the same time, and one of these is of interest sufficient to repay a somewhat longer examination. Edmund Peachain, a clergy- man in Somersetshire, had been committed to custody for a libel on his superior, the bishop of Bath and Wells. In Searching his house for certain papers, the officers came upon some loose sheets stitched together in the form of a Sermon, the contents of which were of such a nature that it was Judged right to lay them before the council. As it was at first suspected that the writing of this book had been prompted by some disaffected persons, Peacham was interrogated, and after he had declined to give any informa- tion, was subjected to torture. Bacon, as one of the learned counsel, was ordered by council to take part in this ex- amination, which was undoubtedly warranted by precedent, whatever may now be thought of it. Nothing, however, was extracted from Peacham in this way, and it was resolved to proceed against him for treason. Now, in the excited state of popular feeling at that period, the failure of Government to substantiate an accusation of treason would have been a serious matter. The king, with whom

1 Letters and Oh

the council agreed, seems therefore to have thought it desirable to obtain beforehand the opinions of the four chief judges as to whether the alleged offence amounted to treason. In this there was nothing unusual or illegal, and no objection would at that time have been made to it, but James introduced a certain innovation; he proposed that the opinions of the four judges should be given separately aud in private. It may be reasonably inferred that his motive for this was the suspicion, or it may be the know- ledge, that Coke did not consider the matter treasonable. At all events when Coke, who as a councillor already knew the facts of the case, was spoken with regarding the uew proposal of the king, he at once objected to it, saying that "this particular and auricular taking of opinions" was "new and dangerous," and "not according to the custom of the realm." He at last reluctantly assented, and pro- posed that Bacon should consult with him, while the other law officers addressed themselves to the three puisne judges. By Bacon's directions, the proposal to the three judges to give their opinions separately was made suddenly and con- fidently, and any seruples they might have felt were easily overcome. The first step was thus gained, and it was hoped that if "infusion" could be avoided, if the papers bearing on the case were presented to the judges quickly, . and before their minds could be swayed by extraneous in- fluence, their decision on the case would be the same as that of the king. It is clear that the extraneous influence to be feared was Coke, who, on being addressed by Bacon, again objected to giving his opinion separately, and even seemed to hope that his brother judges after they had seen the papers would withdraw their assent to giving their decisions privately. Even after the discussion of the case with Bacon, he would not give his opinion until the others had handed in theirs. What the other judges thought is not definitely known, but Bacon appears to have been unable to put in operation the plan he had devised for swaying Coke's judgment,? by putting him in some dark manner in doubt that he should be left alone ; or if he did attempt this, he was unsnccessful, for Coke finally gave an opinion consistent with what he seems to have held at first, that the book was not treasonable, as it did not disable the king's title. Although the opinions of the judges were not made public, yet as we learn, not only from Bacon, but from a sentence in one of Carleton's letters,3 a rumour had got about that there was doubt as to the book being treason- able. Under these

circumstances, Bacon, who feared that such a report might incite other people to attempt a similar offence, proposed to the king that a second rumour should be circulated in order to destroy the impression caused by the first. ‘‘I do think it necessary,” he says, “that because we live in an age in which no counsel is kept, and that it is true there is some bruit abroad that the judges of the King’s Bench do doubt of the case that it should not be treason, that it be given out constantly, and yet as it were in secret, and so a fame to slide, that the doubt was only upon the publication, in that it was never published. For that (if your majesty marketh it) taketh away or at least qualifieth the danger of the example; for that will be no man’s case.”* Bacon’s conduct in this matter has been curiously misrepresented. He has been accused of torturing the prisoner, and of tampering with the judges® by consult- ing them before the trial; nay, he is even represented as selecting this poor clergyman to serve for an example to terrify the disaffected, as breaking into his study and finding there a sermon never intended to be preached, which merely encouraged the people to resist tyranny.6 All this lavish condemnation. is wide of the mark, and rests on a complete misconception of the case. If any blame attaches

3 Ibid., v. 121, . * Ibid., v. 124, 6 Campbell, Lives, ii. 344,

2 Letters and Life, v. 101. 5 Macaulay’s Essay.

to him, it must arise either from his endeavour to force Coke to a favourable decision, in which he was in all probability prompted by a feeling, not uncommon with him, that a matter of state policy was in danger of being sacrificed to some senseless legal quibble or precedent, or from his advice to the king that a rumour should be set afloat which was not strictly true. We do not imagine that in any other politician either of these actions would meet with very severe condemnation.

Bacon’s share in another great trial which came on shortly afterwards, the Overbury and Somerset case, is not of such a nature as to render it necessary to enter upon that obscure and thorny subject.!_ It may be noted, how- ever, that his letters about this time show that he had become acquainted with the king’s new favourite, the brilliant Sir George Villiers,

and that he stood high in the king's good graces. In the early part of 1616, when Ellesmere, the lord chancellor, was dangerously ill, Bacon wrote a long and careful letter to the king, proposing him- self for the office, should it fall vacant, and stating as frankly as possible of what value he considered his services would be. In answer, he appears to have received a dis- tinct promise of the reversion of the office; but, as Elles- mere recovered, the matter stood over for a time. He proposed, however, that he should be made a privy coun- cillor, in order to give him more weight in his almost re- cognised position of adviser to the king, and on the 9th June 1616 he took the oaths and his seat at the council board.

Meanwhile, his great rival Coke, whose constant ten- deucy to limit the prerogative by law and precedent had made him an object of particular dislike to James, had on two points come into open collision with the king's rights. The first case was an action of premunire against the Court of Chancery, evidently instigated by him, but brought at the instance of certain parties whose adversaries had obtained redress in the chancellor's court after the cause had been tried in the Court of King's Bench. With all his learning and ingenuity, Coke failed in inducing or even forcing the jury to bring in a bill against the Court of Chancery, and it seems fairly certain that on the technical point of law involved he was wrong. Although his motive was, in great measure, a feeling of personal dislike towards Ellesmere, yet it is not improbable that he was influenced by the desire to restrict in every possible way the jurisdiction of a court which was the direct exponent of the king's wishes. The other case, that of the commendams, was more im- portant in itself and in the circumstances connected with it. The general question involved in a special instance was whether or not the king's prerogative included the right of granting at pleasure livings in commendam, '.e., to be enjoyed by one who was not the incumbent. Bacon, as attorney-general, delivered a speech, which has not been reported ; but the king was informed that the arguments on the other side had not been limited to the special case, but had directly impugned the general prerogative right of granting livings. It was necessary for James, as a party interested, at once to take measures to see that the decision of the judges should not be given on the general question without due consultation. He accordingly wrote to Bacon, directing him to intimate to the judges his pleasure that they should delay judgment until after dis- cussion of the

matter with himself. Bacon communicated first with Coke, who in reply desired that similar notice should be given to the other judges. This was done by

1 The mysterious crimes supposed to be concealed under the obscure details of this case have cast a shadow of vague suspicion on all who were concerned in it. The minute examination of the facts by Mr Spedding (Letters and Life, v. 208-347) seems to show that these secret crimes exist nowhere but in the heated imaginations of romantic biographers and historians,

| brought forward by Bacon.

Bacon, though he seems to hint that in so doing he wag going a little beyond his instructions. The judges took no notice of the intimation, proceeded at once to give judg. ment, and sent a letter in their united names to the kin announcing what they had done, and declaring that it wag contrary to law and to their oath for them to pay any attention to a request that their decision should be delayed, The king was indignant at this encroachment, and actine partly on the advice of Bacon, held a council on the 6th June 1616, at which the judges attended. James then entered at great length into the case, censuring the judges for the offensive form of their letter, and for not having delayed judgment upon his demand, which had been made solely because he was himself a party concerned, The judges, at the conclusion of his speech, fell on their knees, and implored pardon for the manner of their letter ; but Coke attempted to justify the matter contained in it, say- ing that the delay required by his majesty was contrary to law. The point of law was argued by Bacon, and decided by the chancellor in favour of the king, who put the ques- tion to the judges individually, ‘Whether, if at any time, in a case depending before the judges, which his majesty conceived to concern him either in power or profit, and thereupon required to consult with them, and that they should stay proceedings in the meantime, they ought not to stay accordingly?” To this all gave assent except Coke, who said that “when the case should be, he would do that should be fit for a judge to do.” No notice was taken by the king of this famous, though somewhat evasive, reply, but the judges were

again asked what course they would take in the special case now before them. They all declared that they would not decide the matter upon general grounds affecting the prerogative, but upon special circumstances in- cident to the case; and with this answer they were dismissed. Bacon's conduct throughout the affair has been blamed, but apparently on wrong grounds. As attorney he was merely fulfilling his duty in obeying the command of the king ; and in laying down the law on the disputed point, he was, we may be sure, speaking his own convictions, Censure might more reasonably be bestowed on him, because he deliberately advised a course of action than which nothing can be conceived better calculated to strengthen the hands of an absolute monarch.2 This appeared to Bacon justifiable and right, because the pre- rogative would be defended and preserved intact, Coke certainly stands out in a better light, not so much for his answer, which was rather indefinite, and the force of which is much weakened by his assent to the second question of the king, but for the general spirit of resistance to encroachment exhibited by him. He was undeniably troublesome to the king, and it is no matter for wonder that James resolved to remove him from a position where he could do so much harm, On the 26th June he was called before the council to answer certain charges, one of which was his conduct in the premunire question. He acknowledged his error on that head, and made little defence. On the 30th he was suspended from council and bench, and ordered to employ his leisure in revising certain obnoxious opinions in his reports. He did not per- form the task to the king's satisfaction, and a few months later he was dismissed from office.

Bacon's services to the king's cause had been most important; and as he had, at the same time, acquired great favour with Villiers, his prospects looked brighter than before. According to his custom, he strove earnestly to guide by his advice the conduct of the young favourite. His letters, in which he analyses the various relations in which such a man must stand, and prescribes the course of

2 A somewhat similar case is that of the writ De Rege inconsulto See Letters and Life, v. 233-36,

action suitable for each, are valuable and deserving of attention.! Very striking, in view of future events, are the words? in which he gives him counsel as to his dealing with judges: ‘“ By no means be you persuaded to inter- pose yourself by word or letter in any cause depending, or like to be depending, in any court of justice, nor suffer any man to do it where you can hinder it; and by all means dissuade the king himself from it, upon the impor- tunity of any, either for their friends or themselves. If it should prevail, it perverts justice ; but if the judge be go just, and of so undaunted a courage (as he ought to be) as not to be inclined thereby, yet it always leaves a taint of suspicions aud prejudice behind it.” It is probable that Villiers at this time had really a sense of the duties attaching to his position,’ and was willing to be guided by a man of approved wisdom. It was not long before an opportunity occurred for showing his gratitude and favour. Ellesmere resigned the chancellorship on the 5th March 1617, and on the 7th the great seal was bestowed upon Bacon, with the title of Lord Keeper. Two months later he took his seat with great pomp in the Chancery Court, and delivered a weighty and impressive opening discourse. He entered with great vigour on his new labours, and in less than a month he was able to report to Buckingham that he had cleared off all outstanding Chancery cases. He seemed now to have reached the height of his ambi- tion; he was the first law officer in the kingdom, the accredited minister of his sovereign, and on the best terms with the king and his favourite. His course seemed per- fectly prosperous and secure, when a slight storm arising opened his eyes to the frailty of the tenure by which he held his position.

Coke was in disgrace but not in despair; there seemed to be a way whereby he could reconcile himself to Buckingham, through the marriage of his daughter, who had an ample fortune, to Sir John Villiers, brother of the marquis, who was penniless or nearly so. The match was distasteful to Lady Hatton and to her daughter ; a violent quarrel was the consequence, and Bacon, who thought the proposed marriage most unsuitable, took Lady Hatton’s part. His reasons for disapproval he explained to the king and Buckingham, but found to his surprise that their indignation was strongly roused against him. He received from both bitter letters of reproof ; it was rumoured that he would be disgraced, and Buckingham was said to have compared his present conduct to his previous unfaithful- ness to Essex.

Bacon, who seems to have acted from a sunple desire to do the best for Backingham's own interests, at once changed his course, advanced the match by every means in his power, and by a humble apology appeased the indignation that had been excited against him. It had been a sharp lesson, but things seemed to go on smoothly after it, and Bacon's affairs prospered. In January 1618 he received the higher title Lord Chancellor ; in July of the same year he was made Baron Verulam; and in January 1621 he was created Viscount St Alban. His fame, too, had been increased by the publication in 1620 of his most celebrated work, the Novwm Organum. He seemed at length to have made satisfactory progress towards the realisation of his cherished aims ; the method essential for his Instauration was partially completed ; and he had attained as high a rank in the state as he had ever contemplated. But history too clearly tells us that his oo ee

1 Letters and Life, vi a 3 oid. vi. 38. al git aa ala A position which 5 "Of Ambition." eal favourites ; but it great ones ; for wh the favourite, it ig

eve some respects approved. See Essays, ' Itis counted by some a weakness in princes to have 1s of all others the best remedy against ambitious en the way of pleasuring and displeasuring lieth by impossible any other should be over great."

actions in that position were not calculated to promote the good of his country.

Connected with the years during which he held office is one of the weightiest charges against his character. Buckingham, notwithstanding the advice he had received from Bacon himself, was in the habit of addressing letters to him recommending the causes of suitors. In many cases these seem nothing more than letters of courtesy, and from the general tone, it might fairly be concluded that there was no intention to sway the opinion of the judge illegally, and that Bacon did not understand the letters in that sense. This view is supported by considera- tion of the few answers to them which are extant. One outstanding case, however, that of Dr Steward,® casts some suspicion on all the others. The terms of Bucking- ham's note® concerning it might easily have aroused doubts ; and we find that the further

course of the action was to all appearances exactly accommodated to Dr Steward, who had been so strongly recommended. It is, of course, dangerous to form an extreme judgment on an isolated and partially understood case, of which also we have no explanation from Bacon himself, but if the interpretation given by Mr Heath be the true one, Bacon certainly suffered his first, and so far as we can see, just Judgment on the case to be set aside, and the whole matter to be reopened in obedience to a request from Buckingham.

It is somewhat hard to understand Bacon's position with regard to the king during these years. He was the first officer of the crown, the most able man in the kingdom, prudent, sagacious, and devoted to the royal party. Yet his advice was followed only when it chimed in with James's own will; his influence was of a merely secondary kind ; and his great practical skill was employed simply in carrying out the measures of the king in the best mode possible. We know indeed that he sympathised cordially with the home policy of the Government; he had no objection to such monopolies or patents as seemed advantageous to the country, and for this he is certainly not to be blamed.' The opinion was common at the time, and the error was merely ignorance of the true principles of political economy. But we know also that the patents were so numerous as to be oppressive, and we can scarcely avoid inferring that Bacon more readily saw the advantages to the Government than the disadvantages to the people. In November 1620, when a new parliament was summoned to meet on January following, he earnestly pressed that the most obnoxious patents, those of alehouses and inns, and the monopoly of gold and silver thread, should be given up, and wrote to Buckingham, whose brothers were interested, advising him to withdraw them from the impending storm. This prudeut advice was unfortunately rejected. But while he went cordially with the king in domestic affairs, he was not quite in harmony with him on questions of foreign policy. Not only was he personally in favour of a war with Spain for the recovery of the Palatinate, but he foresaw in such a course of action the means of drawing together more closely the king and his Parliament. He believed that the royal difficulties would be removed if a policy were adopted with which the people could heartily sympathise, and if the king placed himself at the head of his Parliament and led them on. But his advice

was neglected by the vacillating and peace-loving monarch, his proffered proclamation was put

4 Letters and Life, vi. 278, 294-96, 313.

5 Ibid., vii. 579-588, analysis of the case by Mr Heath, who ex- presses a strong opinion against Bacon's action in the matter.

6 Jbid., vi. 444.

7 For a full discussion of Bacon's connection with the monopolies, see Gardiner, Prince Charles, &c., ii. 355-373. For his opinion of monopolies in general, see Letters and Life, vi. 49.

aside, and a weak, featureless production substituted in its place. Nevertheless the new Parliament seemed at first more responsive than might have been looked for. A double subsidy was granted, which was expressly stated to be "not on any consideration or condition for or con- cerning the Palatinate." The session, however, was not far advanced when the question of patents was brought up ; a determined attack was made upon the very ones of which Bacon had been in dread, and it was even proposed to proceed agaiust the referees (Bacon and Montagu) who had certified that there was no objection to them in point of law. This proposal, though pressed by Coke, was allowed to drop; while the king and Buckingham, acting under the advice of Williams, afterwards lord keeper, agreed to give up the monopolies. It was evident, how- ever, that a determined attack was about to be made upon Bacon, and that the proceeding against the referees was really directed against him. It is probable that this charge was dropped because a more powerful weapon had in the meantime been placed in his enemies' hands. This was the accusation of bribery and corrupt dealings in Chancery suits, an accusation apparently wholly unexpected by Bacon, and the possibility of which he seems never to have contemplated until it was actually brought against him. At the beginning of the session a committee had been appointed for inquiring into abuses in the courts of justice. Some illegal practices of certain Chan- oery officials had been detected and punished by the court itself, and generally there was a disposition to

overhaul its affairs, while Coke and Cranfield directly attacked some parts of the chancellor's administration. But on March 14th one Aubrey appeared at the bar of the House, and charged Bacon with having received from him a sum of money while his suit was going on, and with having after- wards decided against him. Bacon's letter! on this occasion is worthy of serious attention; he evidently thought the charge was but part of the deliberate scheme to ruin him which had already been in progress. A second accusation (Egerton's case) followed immediately after, and was investigated by the House, who, satisfied that they had just matter for reprehension, appointed the 19th for a con- ference with the Lords. On that day Bacon, as he had feared, was too ill to attend. He wrote? to the Lords excusing his absence, requesting them to appoint a con- venient time for his defence and cross-examination of witnesses, and imploring them not to allow their minds to be prejudiced against him, at the same time declaring that he would not "trick up an innocency with cavillations, but plainly and ingenuously declare what he knew or remembered." The charges rapidly accumulated, but Bacon still looked upon them as party moves, and was in hopes of defending himself. Nor did he seem to have

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- Letters and Life, vii. 213: 'I know I have clean hands and a clean heart, and I hope a clean house for friends or servants. But Job himself, or whosoever was the justest judge, by such hunting for matters against him as hath been used against me, may for a time

seem foul, specially in a time when greatness is the mark and accusa- tion is the game."

2 Tbid., vii. 215-16.

8 Ibid., vii. 225-26. From the letter to the king (March 25, 1621)— "When I enter into myself, I find not the materials of such a tem- pest as is comen upon me. I have been (as your majesty knoweth best) never author of any immoderate counsel, but always desired to have things carried swavibus modis. Ihave been no avaricious op- pressor of the people. I have been no haughty or intolerable or hateful man in my conversation or carriage. I have inherited no hatred from my father, but am a good patriot born. Whence

should this be? For these are the things that use to raise dislikes abroad. . . . And for the briberies and gifts wherewith I am charged, when the book of hearts shall be opened, I hope I shall not be found to have the troubled fountain of a corrupt heart in a depraved habit of

taking rewards to pervert justice, howsoever I may be frail, and par- take of the abuse of the times.”

BACORR

lost his courage, if we are to believe the common reports of the day,* though certainly they do not appear worthy of very much credit.

The notes® bearing upon the interview which he obtained with the king, show that he had begun to see more clearly the nature and extent of the offences with which he wag charged, that he now felt it impossible altogether to exculpate himself, and that his hopes were directed towards obtaining some mitigation of his sentence. The long roll of charges made upon the 19th April finally decided him ; he gave up all idea of defence, and wrote to the king begging him to show him favour in this emergency. The next day he sent in a general confession to the Lords,’ trusting that this would be considered satisfactory. The Lords, however, decided that it was not sufficient as a ground for their censure, and demanded a detailed and particular confession, A list of twenty-eight charges was then sent him, to which an answer by letter was required. On the 30th April his “ confession and humble submission” was handed in. In it, after going over the several instances, he says, “I do again confess, that on the points charged upon me, although they should be taken as myself have declared them, there is a great deal of corruption and neglect ; for which [am heartily and penitently sorry, and submit myself to the judgment, grace, and mercy of the court.” On the 3d May, after considerable discussion, the Lords decided upon the sentence, which was,!° That he should undergo fine and ransom of £40,000; that he should be imprisoned in the tower during the king’s pleasure ; that he should be for ever incapable of any office, place, or employment in the state or commonwealth ; that he should never sit in parliament, or come within the verge of the court. This heavy sentence was only partially executed. The fine was in effect remitted by the king ; imprisonment in the tower lasted for about four days ; a general pardon (not of course covering the

parliamentary censure) was made out, and though delayed at the seal for a time by Lord Keeper Williams, was passed probably in November 1621. The cause of the delay seems to have lain with Buck- ingham, whose friendship had cooled, and who had taken offence at the fallen chancellor's unwillingness to part with York House. This difference was finally smoothed over, and it was probably through his influence that Bacon received the much-desired permission to come within the verge of the court. He never again sat in parliament.

So ends this painful episode, which has given rise to the most severe condemnation of Bacon, and which still presents great and perhaps insuperable difficulties. On the whole, the tendency of the most recent and thorough researches has been towards the opinion that Bacon's own account of the matter (from which, indeed, our knowledge of it is chiefly drawn) is substantially correct. He distinguishes three ways in which bribes may be given," and ingenuously

4 Letters and Life, vii. 227, and Gardiner, Prince Charles, &c., i.450.

5 Ibid., vii. 236, 238. 6 Jbid., vii. 241.

7 Ibid., vii. 242-4: "It resteth therefore that, without fig-leaves, I do ingenuously confess and acknowledge, that having understood the particulars of the charge, not formally from the House, but enough to inform my conscience and memory, I find matter sufficient and full, both to move me to desert the defence, and to move your lordships to condemn and censure me."

STbid., vii. 252-262. 9 Tbid., vii. 261. 10 Jbid., vii. 270.

1 Tbid., 236-36 : "The first, of bargain and contract for reward to pervert justice, pendente lite. The second, where the judge conceives the cause to be at an end, by the information of the party or other- wise, and useth not such diligence as he ought to inquire of it. And the third, where the cause is really ended, and it is sine fraude without relation to any precedent promise. . . . For the first of them I take myself to be as innocent as any born upon 8t Innocent s Day, in my heart. For the second, I doubt on some particulars I may be faulty. And for the last, I conceived it to be no fault, but therein I

desire to be better informed, that I may be twice penitent, once for the fact and again for the error.”

BACON

confesses that his own acts amounted to corruption and were worthy of condemnation. Now, corruption strictly interpreted would imply the deliberate sale of justice, and this Bacon explicitly denies, affirming that he never “had bribe or reward in his eye or thought when he pronounced any sentence or order.” When we analyse the specific charges against him, with his answers to them, we find many that are really of little weight. The twenty-eighth and last, that of negligence in looking after his servants, though it did him much harm, may fairly be said to imply no moral blame. ‘The majority of the others are instances of.gratuities given after the decision, and it is to be re- gretted that the judgment of the peers gives us no means of determining how such gifts were looked upon, whether or not the acceptance of them was regarded as a “ corrupt” practice. In four cases specifically, and in some others by implication, Bacon confesses that he had received bribes from suitors pendente lite. Yet he affirms, as we said before, that his intention was never swayed by a bribe; and so far as any of these cases can be traced, his decisions, often given in conjunction with some other official, are to all appearance thoroughly just. In several cases his judgment appears to have been given against the party bestowing the bribe, and in at least one instance, that of Lady Wharton, it seems impossible to doubt that he must have known when accepting the present that his opinion would be adverse to her cause. Although, then, he felt that these practices were really corrupt, and even rejoiced that his own fall would tend to purify the courts from them,}! he did not feel that he was guilty of perverting justice for the sake of reward. How far, then, is such defence or explanation admissible and satisfactory ? It is clear that two things are to be considered : the one the guilt of taking bribes or presents on any consideration, the other the moral guilt depending upon the wilful perversion of justice. The attempt has sometimes been made to defend the whole of Bacon’s conduct on the ground that he did nothing that was not done by many of his contemporaries. Bacon him- self disclaims a defence of this nature, and we really have no direct evidence which shows to what extent the offering and receiving of such bribes then prevailed. That the practice was common is

indeed implied by the terms in which Bacon speaks of it, and it is not improbable that the fact of these gifts being taken by officials was a thing fairly well known, although all were aware of their illegal character, and it was plain that any public exposure of such dealings would be fatal to the individual against whom the:charge was made out.2_ Bacon knew all this; he was well aware that the practice was in itself indefensible? and that his conduct was therefore corrupt and deserving of censure. So far, then, as the mere taking of bribes is concerned, he would permit no defence, and his own confession and judgment on his actions contain as severe a condemnation as has ever been passed upon him. Yet in the face of this he does not hesitate to call himself "the justest chancellor that hath been in the five changes since Sir Nicholas Bacon's time"; and this on the plea that

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1 Letters and Life, vii. 242.

- Ibid., vii. 244°: " Neither will your lordships forget that there are vitia temporis as well as vitia homints, and that the beginning of reformations hath the contrary power to the pool of Bethesda, for that had strength to cure only him that was first cast in, and this hath commonly strength to hurt him only that is first cast in."

See, among many other passages, Essays, ''Of Great Place:" "For corruptions do not only bind thine own hands or thy servant's hands from taking, but bind the hands of suitors also from offering ; for integrity used doth the one ; but integrity professed, and with a manifest detestation of bribery, doth the other ; and avoid not only the fault but the suspicion."

4 Of. Letters and Life, vii. 560: "I was the justest judge that was in England these fifty years; but it was the justest censure in Par- liament that was these two hundred years.''

his intentions had always been pure, and had never been affected by the presents he received. His justification has been set aside by modern critics, not on the ground that the evidence demonstrates its falsity,> but because it

is inconceivable or unnatural that any man should receive a present from another, and not suffer his judgment to be swayed thereby. It need hardly be said that such an apriort conviction is not a sufficient basis on which to found a sweeping condemnation of Bacon's integrity as an administrator of justice. On the other hand, even if it be admitted to be possible and conceivable that a present should be given by a suitor simply as seeking favourable consideration of his cause, and not as desirous of obtain- ing an unjust decree, and should be accepted by the judge on the same understanding, this would not entitle one absolutely to accept Bacon's statement. Further evidence is necessary in order to give foundation to a definite judg- ment either way; and it is extremely improbable, nay, almost impossible, that such can ever be produced. In these circumstances, due weight should be given to Bacon's own assertions of his perfect innocence and purity of in- tention; they ought not to be put out of court unless found in actual contradiction to the facts ; and the reverse of this is the case, so far as has yet appeared.®

The remainder of his life, though still harassed by want of means, for James was not liberal, was spent in work far more valuable to the world than anything he had accom- plished in his high office. In March 1622 he presented to Prince Charles his History of Henry VII. ; and imme- diately, with unwearied industry, set to work to complete some portions of his great work. In November 1622 appeared the Historia Ventorum ; in January 1623, the Historia Vite et Mortis ; and in October of the same year, the De Augmentis Scientiarum, a Latin translation, with many additions, of the Advancement. Finally, in December 1624, he published his Apophthegms, and Translations of some of the Psalms ; and, in 1625, a third and enlarged edition of the Zssays.

Busily occupied with these labours, his life now drew rapidly to a close. In March 1626 he came to London, and when driving one day near Highgate, was taken with a desire to discover whether snow would act as an anti- septic. He stopped his carriage, got out at a cottage, pur- chased a fowl, and with his own hands assisted to stuff it with snow. He was seized with a sudden chill, and became so seriously unwell that he had to be conveyed to Lord Arundel's house, which was near at hand. Here his illness increased,

the cold and chill brought on bronchitis and he died, after a few days' suffering, on the 9th April 1626.

Bacon's WorRKS AND PHILOSOPHY,

A complete survey of Bacon's works and an estimate of his place in literature and philosophy are matters for a volume. It is here proposed merely to classify the works, to indicate their general character, and to enter somewhat more in detail upon what he himself regarded as his great achievement,—the reorganisation of the scieuces, and the exposition of a new method by which the human mind might proceed with security and certainty towards the true end of all human thought and action.

5 Or on the ground that there was a distinct rule forbidding chancellors and the like officials to take presents. This does not seem to have been the case, if we may judge from what Bacou says, Letters and Life, vii. 233.

6 Not only do the cases, so far as they are known, support Bacon s plea of innocence, but it is remarkable that no attempt at a reversal of any of his numerous decrees appears to have been successful. Had his decrees been wilful perversions of justice, it is scarcely conceivable that some of them should not have been overturned. See Letters and Life, vii. 555-562.

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Putting aside the letters and occasional writings, we may conveniently distribute the other works into three classes, Professional, Literary, Philosophical. Of the Professional works, which include the Reading on the Statute of Uses, the Maxims of Law, and the treatise (possibly spurious) on the Use of the Law, only experts can speak with confidence ; and their opinion, so far as it has yet been given, coincides to some extent with Bacon's own estimate of his powers as a lawyer. 'Iam in good hope," he says, "that when Sir Edward Coke's reports and my rules and decisions shall come to posterity, there will be (whatsoever is now thought) question who was the greater lawyer." If Coke's reports show completer mastery of technical details, greater knowledge of precedent, and more of the dogged

grasp of the letter than do Bacon’s legal writings, there can be no dispute that the latter exhibit an infinitely more compre- hensive intelligence of the abstract principles of jurispru- dence, with a richness and ethical fulness that more than compensate for their lack of dry legal detail. Bacon seems indeed to have been a lawyer of the first order, with a keen scientific insight into the bearings of isolated facts, and a power of generalisation which admirably fitted him for the self-imposed task, unfortunately never completed, of digest- ing or codifying the chaotic mass of the English law.

Among the literary works are included all that he himself designated moral and historical pieces, and to these may be added some theological and minor writings, such as the Apophthegms. Of the moral works the most valuable are the Hssays. It is imposible to praise too highly writings which have been so widely read and universally admired. The matter is of the familiar, practical kind, that “ comes home to men’s bosoms.” The thoughts are weighty, and even when not original, have acquired a peculiar and unique tone or cast by passing through the crucible of Bacon’s mind. A sentence from the Hssays can rarely be mistaken for the production of any other writer. The short, pithy sayings,

‘“‘ Jewels, five words long, That on the stretched forefinger of all time Sparkle for ever,’ have become popular mottoes and household words. The style is quaint, original, abounding in allusions and wit- ticisms, and rich, even to gorgeousness, with piled-u analogies and metaphors.! The first edition contained only ten essays, but the number was increased in 1612 to thirty- eight, and in 1625 to fifty-eight. The short tract, Colours of Good and Evil, which with the Meditationes Sacre originally accompanied the Hssays, was afterwards incor- porated with the De Augmentis. Along with these works may be classed the curiously learned piece, De Sapientia Veterum, in which he works out a favourite idea, that the mythological fables of the Greeks were allegorical and concealed the deepest truths of their philosophy. As a scientific explanation of the myths the theory is of no value, but it affords fine scope for the exercise of Bacon’s unrivalled power of detecting analogies in things apparently most dissimilar. The Apovhthegms, though hardly deserv- ing Macaulay’s praise of being the best collection of jests in the world, contain a number of those significant anecdotes which Bacon used with such effect in his other writings. Of the

historical works, besides a few fragments of the projected history of Britain, there remains the History of

1 The peculiarities of Bacon's style were noticed very early by his contemporaries. (See Letters and Life, i. 268.) Raleigh and Jonson have both recorded their opinions of it, but no one, it seems to us, has characterised it more happily than his friend, Sir Tobie Matthews, "A man so rare in knowledge, of so many several kinds, endued with the facility and felicity of expressing it all in so elegant, significant, so abundant, and yet so choice and ravishing a way of words, of metaphors, of allusions, as perhaps the world hath not seen since it was a world."— "Address to the Reader" prefixed to Coilection of English Letters, 1660.

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Henry VII., a valuable work, giving a clear and animated

narrative of the reign, and characterising Henry with great The style is in harmony with the matter, vigorous and flowing, but naturally with less of the quaintness and richness suitable to more thoughtful and original writings, The series of the literary works is completed by the minor treatises on theological or ecclesiastical questions. Some of the latter, included among the occasional works, are admirably sagacious and prudent, and deserve careful study, Of the former, the principal specimens are the JJeditationes Sacre and the Confession of Faith. The Paradoxes (Characters of a believing Christian in paradoxes, and seem- ing contradictions), which was often and justly suspected, has been conclusively proved by Mr Grosart not to be the work of Bacon.

Philosophical Works.—The great mass of Bacon's writ- ings consists of treatises or fragments, which either formed integral parts of his grand comprehensive scheme, or were closely connected with it. More exactly they may be classified, as is done by the most recent editors, under three heads :—A. Writings which actually formed part of the Instauratio Magna;

B. Writings originally imtended to form parts of the Jnstauratio, but which were after- wards superseded or thrown aside; C. Works connected with the Jnstauratio, but not directly included in its plan.

To begin with the second of these classes, we have under it some important tracts, which certainly contain little, if anything, that is not afterwards taken up and expanded in the more elaborate works, but which are not undeserving of attention, from the difference in the point of view and method of treatment. The most valuable of them are— (1.) The Advancement of Learning, of which no detailed account need be given, as it is completely worked up into the De Augmentis, and takes its place as the first part of the Jnstauratio. (2.) Valerius Terminus, a very remarkable piece, composed probably about 1603, though perhaps retouched at a later period. It contains a brief and somewhat obscure outline of the first two parts in the Instauratio, and is of importance as affording us some insight into the gradual development of the system in Bacon's own mind. (3.) Zemporis Partus Masculus, another curious fragment, remarkable not only from its contents, but from its style, which is arrogant and offen- sive, in this respect unlike any other writing of Bacon's. The adjective masculus points to the power of bringing forth fruit possessed by the new philosophy, and perhaps indicates that all previous births of time were to be looked upon as feminine or imperfect; it is used in a somewhat similar sense in Letters and Life, vi. 183, " In verbis masculis, no flourishing or painted words, but such words as are fit to go before deeds." (4.) Redargutio Philoso- phiarum, a highly finished piece in the form of an oration, composed probably about 1608 or 1609, and containing in pretty full detail much of what afterwards appears in con- nection with the Jdola Theatri in book i. of the Vovum Organum. (5.) Cogitata et Visa, perhaps the most im- portant of the minor philosophical writings, dating from 1607 (though possibly the tract in its present form may have been to some extent altered), and containing in weighty and sonorous Latin the substance of the first book of the Organum. (6.) The Descriptio Globi Intellectuals, which is to some extent intermediate between the Advance- ment and the De Augmentis, goes over in detail the general classification of the sciences, and enters particularly on some points of minor interest. (7.) The brief tract De Interpretatione Nature Sententie Duodecim is evidently a first sketch of part of the Novwm Organum, and in phrase- ology is almost identical with it. (8.) A few smaller pieces, such as

the Inquisitio de Motu, the Calor et Frigus, the Historia Soni et Auditus, and the Phenomena Universi,

are early specimens of his Vatural Iistory, and exhibit the first tentative applications of the new method.

The third great division of the philosophical works con- sists of treatises on subjects connected with the Jnstauratio, but not forming part of it. It is not necessary to charac- terise these at any length. The most interesting, and in many respects the most remarkable, is the philosophic romance, the New Atlantis, a description of an ideal state in which the principles of the new philosophy are carried out by political machinery, and under state guidance, and where many of the results contemplated by Bacon are in imagination attained. The work was to have been com- pleted by the addition of a second part, treating of the laws of 2 model commonwealth, which was never written. Another important tract is the De Principits atque Origini- bus secundum Fabulas Cupidinis et Coli, where, under the disguise of two old mythological stories, he (in the manner of the Sapientia Veterum) finds the deepest truths concealed. The tract is unusually interesting, for in it he discusses at some length the limits of science, the origin of things, and the nature of primitive matter, giving at the same time full notices of Democritus among the ancient philosophers and of Telesius among the modern. Deserv- ing of attention are also the Cogitationes de Natura Rerum, probably written early, perhaps in 1605, and the treatise on the theory of the tides, De Fluxu et Refluxu Maris, written probably about 1616.

The philosophical works which form part of the Instauratio must of course be classed according to the positions which they respectively hold in that scheme of the sciences. Before entering on an account of Bacon’s object and method, it is necessary to give the general outline of his arrangement.

The great work, the reorganisation of the sciences, and the restoration of man to that command over nature which he had lost by the fall, consisted in its final form of six divisions.

IL Partitiones Screntiarum, a survey of the sciences, either such as then existed or such as required to be con- structed afresh—in fact, an inventory of all the possessions of the human mind. The famous classification! on which this survey proceeds is based upon an analysis of the faculties and objects of human knowledge. This division is represented by the De Augmentis Scientiarum.

Il. Interpretatio Naturc.-—After the survey of all that has yet been done in the way of discovery or invention, comes the new method, by which the mind of mau is to be trained and directed in its progress towards the renovation of science. This division is represeuted, though only imperfectly, by the Novwm Organum, particularly book ii.

II. Historia Naturalis et Experimentalis—The new method is valueless, because inapplicable, unless it be sup- plied with materials duly collected and presented—in fact, unless there be formed a competent natuial history of the Phoenomena Universi. A short introductory sketch of the requisites of such a natural history, which, according to Bacon, is essential, necessary, the basis totius negotii, is given in the tract Parasceve, appended to the Novum Organum. The principal works intended to form portions of the history, and either published by himself or left in manuscript, are Historia Ventorum, Historia Vite et Mortis, Historia Densi et Rari, and the extensive collection of facts and observations entitled Sylva Syluerum.

IV. Scala Intellectus,—It might have been supposed that the new philosophy could now be inaugurated.

1 As is wellknown, the division of the sciences adopted in the great French Encyclopédie was founded upon this classification of Bacon’s. See Diderot’s .Prospectus (Cuvres, iii.) and D’Alembert’s Discours (Quvres, i.) The scheme should be compared with later attempts of the same nature by Ampere, Cournot, Comte, and H. Spencer.

Materials had been supplied, along with a new method by which they were to be treated, and naturally the next step would be the finished result. But for practical purposes Bacon interposed two divisions between the

preliminaries and the philosophy itself. The first was intended to consist of types or examples of investigations conducted by the new method, serviceable for keeping the whole process vividly before the mind, or, as the title indicates, such that the mind could run rapidly up and down the several steps or grades in the process. Of this division there seems to be only one small fragment, the Filum Labyrinthi, consisting of but two or three pages.

V. Prodromz, forerunners of the new philosophy. This part, strictly speaking, is quite extraneous to the general design. According to the Distributio Operis,? it was to contain certain speculations of Bacon's own, not formed by the new method, but by the unassisted use of his understanding. These, therefore, form temporary or uncertain anticipations of the new philosophy. There is extant a short preface to this division of the work, and according to Mr Spedding, some of the miscellaneous treatises, such as De Principus, De Fluxu et Refluxu, Cogitationes de Natura Rerum, may probably have been intended to be included under this head. This supposition receives some support from the manner in which the fifth part is spoken of in the Vovum Organum, i. 116.

VI. The new philosophy, which is the work of future ages, and the result of the new method.

Bacon's grand motive in his attempt to found the sciences anew was the intense conviction that the knowledge man possessed was of little service to him. "The know- ledge whereof the world is now possessed, especially that of nature, extendeth not to magnitude and certainty of works." Man's sovereignty over nature, which is founded on knowledge alone, had been lost, and instead of the free relation between things and the human mind, there was nothing but vain notions and blind experiments. To restore the original commerce between man and nature, and to recover the imperium hominis, is the grand object of all science. The want of success which had hitherto attended efforts in the same direction had been due to many causes, but chiefly to the want of appreciation of the nature of philosophy and its real aim. Philosophy is not the science of things divine and human ; it is not the search after truth. 'I find that even those that have sought knowledge for itself, and not for benefit or ostenta- tion, or any practical enablement in the course of their life, have nevertheless propounded to themselves a wrong

mark, namely, satisfaction (which men call Truth) and not operation.”* ‘Is there any such happiness as for a man’s mind to be raised above the confusion of things, where he may have the prospect of the order of nature and error of man? But is this a view of delight only and not of discovery? of contentment and not of benefit? Shall he not as well discern the riches of nature’s warehouse as the beauty of her shop? Is truth ever barren? Shall he not be able thereby to produce worthy effects, and to endow the life of man with infinite commodities ?”® Philosophy is altogether practical; it is of little matter to the fortunes of humanity what abstract notions one may entertain concerning the nature and the principles of things.®© This truth, however, has never yet been recog- nised ;? it has not yet been seen that the true aim of all science is ‘‘ to endow the condition and life of man with

2 See also “ Letter to Fulgentio,” Letters and Life, vii. 533.

3 Fil. Lab. ; Cog. et Visa, i.; ¢f. Pref. to Ins. Mag.

4 Val. Ter., 232; ef. N. O., i. 124.

5 Letters, i, 123. o ON; OF 1. V6.

7 Fil. Lab., 5; of..N.O., i. 81; Val. Ter. (Works, iii. 235); Advance- ment, b. i. (Works, iii, 294).

new powers or works,”! or “to extend more widely the limits of the power and greatness of man.”* Nevertheless, it is not to be imagined that by this being proposed as the great object of search there is thereby excluded all that has hitherto been looked upon as the higher aims of human life, such as the contemplation of truth. Notso, but by follow- ing the new aim we shall also arrive at a ¢rwe knowledge of the universe in which we are, for without knowledge there is no power; truth and utility are in ultimate aspect the game; “works themselves are of greater value as pledges

of truth than as contributing to the comforts of life.”

Such was the conception of philosophy with which Bacon started, and in which he felt himself to be thoroughly original. As his object was new and hitherto unproposed, so the method he intended to employ was different from all modes of investigation hitherto attempted. ‘It would be,” as he says, ‘‘an unsound fancy and self-contradictory, to expect that things which have never yet been done can be done except by means which have never yet been tried.”* There were many obstacles in his way, and he seems always to have felt that the first part of the new scheme must be a pars destruens, a destructive criticism of all other methods. Opposition was to be expected, not only from previous philosophies. but especially from the human mind itself. In the first place, natural antagonism might be looked for from the two opposed sects, the one of whom, in despair of knowledge, maintained that all science was impossible; while the other, resting on authority and on the Iearning that had been handed down from the Greeks, declared that science was already completely known, and consequently devoted their energies to methodising and elaborating it. Secondly, within the domain of science itself, properly so called, there were two “ kinds of rovers” who must be dismissed. The first were the speculative or logical philosophers, who construe the universe ex analogia hominis, and not ex analogia mundi, who fashion nature according to preconceived ideas, and who employ in their investigations syllogism and abstract reasoning. The second class, who were equally offensive, consisted of those who practised blind experience, which is mere groping in the dark (vaga experientia mera palpatio est), who occa- sionally hit upon good works or inventions, which, like Atalanta’s apples, distracted them from further steady and gradual progress towards universal truth. In place of these straggling efforts of the unassisted human mind, a graduated system of helps was to be supplied, by the use of which the mind, when placed on the right road, would proceed with unerring and mechanical certainty to the invention of new arts and sciences.

Such were to be the peculiar functions of the new method, though it has not definitely appeared what that method was, or to what objects it could be applied. But, before proceeding to unfold his method, Bacon found it necessary to enter in considerable detail upon the general subject of the obstacles to progress, and devoted nearly the whole of the first book of the Organum to the ex- amination of them. This discussion, though strictly

speak- ing extraneous to the scheme, has always been looked upon as @ most important part of his philosophy, and his uame is perhaps as much associated with the doctrine of [dola as with the theory of induction or the classification of the sciences,

The doctrine of the kinds of fallacies or general classes of errors into which the human mind is prone to fall, appears in many of the works written before the Vovum Organum, and the treatment of them varies in some respects. The classification in the Organum, hcwever, not only has the

1 Fil. Lab. 5; of. N. 0.,i. 81; Val. Ter. (Works, iii. 222, 238) ; New Atlantis (Works, iii. 158).

2a. OFF 1. 106; 3 Joid., i. 124. * Ibid., i. 6.

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author’s sanction, but has received the stamp of historical acceptation ; and comparison of the earlier notices, though a point of literary interest, has no important philosophic bearing. The Jdola,® false notions of things, or erroneous ways of looking at nature, are of four kinds: the first two innate, pertaining to the very nature of the mind and not to be eradicated ; the third creeping insensibly into men’s minds, and hence in a sense innate and inseparable ; the fourth imposed from without. The first kind are the Idola Tribus, fallacies incident to humanity or the race in general, Of these, the most prominent are—the prone- ness of the mind to suppose in nature greater order and regularity than there actually is ; the tendency to support a preconceived opinion by affirmative instances, neglecting or throwing out of account all negative or opposed cases ; and the tendency to generalise from few observations, or to give reality to mere abstractions, figments of the mind. Manifold errors also result from the weakness of the

‘senses, which affords scope for mere conjecture ; from the in-

fluence exercised over the understanding by the will and pas- sions; from the restless desire of the mind to penetrate to the ultimate principles of

things; and from the belief that “man is the measure of the universe,” whereas, in truth, the world is received by us in a distorted and erroneous manner. ‘The second kind are the Jdola Specus, idols of the cave, or errors incident to the peculiar mental or bodily constitution of each individual, for according to the state of the individual’s mind is his view of things. Errors of this class are innumerable, because there are numberless varieties of disposition ; but some very promi- nent specimens can be indicated. Such are the ten- dency to make all things subservient to, or take the colour of some favourite subject, the extreme fondness and rever- ence either for what is ancient or for what is modern, and excess in noting either differences or resemblances amongst things. A practical rule for avoiding these is also given: “In general let every student of nature take this as a rule, that whatever his mind seizes and dwells upon with par- ticular satisfaction is to be held in suspicion.”® The third class are the Jdola Fori, idols of the market-place, ze., errors arising from the influence exercised over the mind by mere words. This, according to Bacon, is the most troublesome kind of error, and has been especially fatal in philosophy. For words introduce a fallacious mode of looking at things in two ways : first, there are some words that are really merely names for non-existent things, which are yet supposed to exist simply because they have received a name; secondly, there are names hastily and unskilfully abstracted from a few objects and applied reck- lessly to all that has the faintest analogy with these objects, thus causing the grossest confusion. The fourth and last class are the Jdola Theatri, idols of the theatre, i.¢., fallacious modes of thinking resulting from received systems of philosophy, and from erroneous methods of demonstration. ‘The criticism of the demonstrations is introduced later in close connection with Bacon’s new method; they are the rival modes of procedure, to which his own is definitely opposed. The philosophies which are “redargued” are divided into three classes, the sophistical, of which the best example is Aristotle, who forces nature into his abstract schemata and thinks to ex-

5 The word Jdolon is manifestly borrowed from Plato. It is used twice in connection with the Platonic Ideas (N.O., i. 28, 124), and is con- trasted with them as the false appearance. The ef5wAov with Plato is the fleeting, transient image of the real thing, and the passage evidently referred to by Bacon is that in the Rep. vii. 516 A. _ ral mpOroyv piv Tas oKids hy

SGoTa Kadopen, Kat pera TodTO év TOIs aot 7a Te Tav dvOpdruy Kal Ta Tav BAAwy eLBwAa, borepoy 5é aurd.” It is explained well in the Advancement, bk. i. (Works, iii. 287).

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plain by definitions ; the empirical, which from few and limited experiments leaps at once to general conclusions ; and the superstitious, which corrupts philosophy by the introduction of poetical and theological notions.

Such are the general causes of the errors that infest the human mind ; by their exposure the way is cleared for the introduction of the new method. The nature of this method cannot be understood until it is exactly seen to what it is to be applied. What idea had Bacon of science, and how is his method connected with it? Now, the science! which was specially and invariably conteniplated by him was Natural Philosophy, the great mother of all the sciences ; it was to him the type of scientific knowledge, and its method was the method of all true science. To discover exactly the characteristics and the object of natural philo- sophy it is necessary to examine the place it holds in the general scheme furnished in the Advancement or De Augmentis, All human knowledge, it is there laid down, may be referred to man’s memory, or imagination, or reason. In the first, the bare facts presented to sense are collected and stored up ; the exposition of them is History, which is either natural or civil. In the second, the mate- rials of sense are separated or divided in ways not cor- responding to nature but after the mind’s own pleasure, and the result is Poesy or feigned history. In the third, the materials are worked up after the model or pattern of nature, though we are prone to err in the progress from sense to reason; the result is Philosophy, which is con- cerned either with God, with nature, or with man, the second being the most important. Natural philosophy is again divided into speculative or theoretical, and operative or practical, according as the end is contemplation or works. Speculative or theoretical natural philosophy has to deal with natural substances and qualities, and is subdivided into physics and metapliysics. Physics inquires into the efficient and material causes of things; metaphysics, into the formal

and final causes. The principal objects of physics are concrete substances, or abstract though physical qualities. The research into abstract qualities, the fundamental problem of physics, comes near to the metaphysical study of forms, which indeed differs from the first only in being more general, and in having as its result a form strictly so called, z.2, a nature or quality which is a limitation or specific manifestation of some higher and better known genus. Natural philosophy is, therefore, in ultimate resort the study of forms, and, conse- quently, the fundamental problem of philosophy in general is the discovery of these forms.

““On a given body to generate or superinduce a new nature or natures, is the work and aim of human power. ... Of a given nature to discover the form or true specific difference, or nature- engendering nature (natura naturans) or source of emanation (for these are the terms which are nearcst to a description of the thing), is the work and aim of human knowledge.”?

The questions, then, whose answers give the key to the whole Baconian philosophy, may be put briefly thus— What are forms? and how is it that knowledge of them solves both the theoretical and the practical problem of science? Bacon himself, as may be seen from the passage quoted above, finds great difficulty in giving an adequate and exact definition of what he means by a form. Asa general description, the following passage from the Vouwm Organum, ii, 4., may be cited :— the form ofa nature is such that given the form the nature Infallibly follows. . . . Again, the form is such that if it be taken away the nature infallibly vanishes. . . . Lastly, the true forin is such that it deduces the given nature from some source of being which is inherent in more natures, and which is better known in the natural order of things than the form itself.” 3

EN. O.,31 79, 80, 98, 108. S Hezche we 1

- This better known in the order of nature is nowhere satisfactorily

From this it would appear that, since by a nature is meant some sensible quality, superinduced upon, or pos- sessed by, a body, so by a form we are to understand the cause of that nature, which cause is itself a determinate

case or manifestation of some general or abstract quality inherent in a greater number of objects. But all these are mostly marks by which a form may be recognised, and do not explain what the form really is. A further definition is accordingly attempted in Aph. 13 :—

‘The form of a thing is the very thing itself, and the thing differs from the form no otherwise than as the apparent differs from the real, or the external from the internal, or the thing in reference to the man from the thing in reference to the universe.”

This throws a new light on the question, and from it the inference at once follows, that the forms are the per- manent causes or substances underlying all visible pheno- mena, which are merely manifestations of their activity. Are the forms, then, forces? At times it seems as if Bacon had approximated to this view of the nature of things, for in several passages he identifies forms with laws of activity. Thus, he says—

‘“When I speak of forms I mean nothing more than those laws and determinations of absvlute actuality which govern and con- stitute any simple nature, as heat, light, weight, in every kind of matter and subject that is susceptible of them. ‘Thus the form of heat or the form of light is the same thing as the law of heat or the law of light.”’4 ‘‘ Matter rather than forms should be the object of our attention, its configurations and changes of configuration, and simple action, and law of action or motion ; for forms are fig- ments of the human mind, unless you will call those laws of action forms.”® ‘* Forms or true differences of things, which are in fact laws of pure act.” ‘*For though in nature nothing really exists besides individual bodies, performing pure individual acts accord- ing to a fixed law, yet in philosophy this very law, and the in- vestigation, discovery, and explanation of it, is the foundation as well of knowledge as of operation. And it is this law, with its clauses, that I mean when I speak of forms.’’?

Several important conclusions may be drawn from these passages. In the first place, it is evident that Bacon, like the Atomical school, of whom he highly approved, had a clear perception and a firm grasp of the physical character of natural principles; his forms are no ideas or abstractions, but highly general physical properties. Further, it is hinted that these general qualities may be looked upon as the modes of action of simple bodies. This

fruitful con- ception, however, Bacon does not work out; and though he uses the word cause, and identifies form with formal cause, yet it is perfectly apparent that the modern notions of cause as dynamical, and of nature as in a process of flow or development, are foreign to him, and that in his view of the ultimate problem of science, cause meant causa immanens, or underlying substance, effects were not con- sequents but manifestations, and nature was regarded in a purely statical aspect. That this is so appears even more clearly when we examine his general conception of the unity, gradation, and function of the sciences. That the sciences are organically counected is a thought common to him and to his distinguished predecessor Roger Bacon. ‘TI that hold it for a great impediment towards the advancement and further invention of knowledge, that particular arts and sciences have been disincorporated from general knowledge, do not understand one and the same thing which Cicero’s discourse and the note and conceit of the Grecians in their word circle learning do intend. For I mean not that use which one science hath of another for ornament or help in practice; but I mean it directly of that use by way of supply of light and information, which the particulars and instances of one science do yield and present for the framing or correcting of the axioms of an-

explained by Bacon. Like his classification of causes, and in some

degree his notion of form itself, it comes from Aristotle. See An. Post., 71, 6 33; Topic, 141, b5; Eth. Nic., 1095, a 80. *N. 0. i 17. Po Lbid., i. 51. 8Jbid., 1. 75. 7 Tbid., ii. 2.

other science in their very truth and notion.”! In accord- ance with this, Bacon placed at the basis of the particular sciences which treat of God, nature, and man, one funda- mental doctrine, the Prima Philosophia, or first philosophy, the function of which was to display the unity of nature by connecting into one body of truth such of the highest axioms of the subordinate sciences as were not special to one science, but common to several.? This first philosophy had also to investigate what are called the adventitious or transcendental conditions of essences, such as Much, Little, Like, Unlike, Possible, Impossible, Being, Nothing, the logi- cal discussion of which certainly belonged rather to the laws of reasoning than to the

existence of things, but the physical or real treatment of which might beexpected to yield answers to such questions as, Why certain substances are numerous, others scarce? or why, if like attracts like, iron does not attract iron? Following this summary philosophy come the sciences proper, rising like a pyramid in succes- sive stages, the lowest floor being occupied by natural history or experience, the second by physics, the third, which is next the peak of unity, by metaphysics.2 The knowledge of the peak, or of the one law which binds nature together, is perhaps denied to man, Of the sciences, physics, as has been already seen, deals with the efficient and material, z.e., with the variable and transient, causes of things. But its inquiries may be directed either towards concrete bodies or towards abstract qualities. The first kind of investigation rises little above mere natural history; but the other is more important, and paves the way for metaphysics. It handles the configurations and the appetites or motions of matter. The configurations, or inner struc- tures of bodies, include dense, rare, heavy, light, hot, cold, &c., in fact, what are elsewhere called simple natures, Motions‘ are either simple or compound, the latter being the sum of a number of the former. In physics, however, these matters are treated only as regards their material or efficient causes, and the result of inquiry into any one case gives no general rule, but only facilitates invention in some similar instance. Metaphysics, on the other hand, treats of the formal or final cause® of these same substances and qualities, and results in a general rule. With regard to forms, the investigation may be directed either towards concrete bodies or towards qualities. But the forms of substances “are so perplexed and complicated, that it is either vain to inquire into them at all, or such in- quiry as is possible should be put off for a time, and not entered upon till forms of a more simple nature have been rightly investigated and discussed.”® ‘‘To inquire into the form of a lion, of an oak, of gold, nay, even of water or air, is a vain pursuit; but to inquire the form of dense, rare, hot, cold, &c., as well configurations as motions, which in treating of physic I have in great part enumerated (I call them forms of the first class), and which (like the

1 Valerius Terminus, iii. 228-29.

2 Cf. N. O., ii. 27. Bacon nowhere enters upon the questions of how such a science is to be constructed, and how it can be expected to possess an

independent method while it remains the mere receptacle for the generalisations of the several sciences, and consequently has a content which varies with their progress. His whole conception of Prima Philosophia should be compared with such a modern work as the First Principles of Herbert Spencer..

3 It is to be noticed that this scale of nature corresponds with the scale of ascending axioms.

4 Cf. also, for motions, NV. O., ii. 48.

> The knowledge of final causes does not lead to works, and the con- sideration of them must be rigidly excluded from physics. Yet there is no opposition between physical and final causes ; in ultimate resort the mind is compelled to think the universe as the work of reason, to refer facts to God and Providence. The idea of final cause is also fruitful in sciences which have to do with human action. (Cf. De Aug., lil. cc. 4,5; Mov. Org., i. 48, ii. 2.)

® De Aug., iii. 4. In the Advancement (Works, iii. 355) it is distinctly said that they are not to be inquired into. One can hardly sce how the Baconian method could have applied to concrete substances.

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letters of the alphabet) are not many, and yet make up and sustain the essences and forms of all substances— this, I say, it is which I am attempting, and which con- stitutes and defines that part of metaphysic of which we are now inquiring.” Physics inquires into the same qualities, but does not push its investigations into ultimate reality or reach the more general causes. We thus at last attain a definite conclusion with regard to forms, and it appears clear that in Bacon’s belief the true function of science was the search for a few fundamental physical qualities, highly abstract and general, the combinations of which give rise to the simple natures and complex pheno- mena around us. His general conception of the universe may therefore be called mechanical or statical ; the cause of each

phenomenon is supposed to be actually contained in the phenomenon itself, and by a sufficiently accurate process could be sifted out and brought to light. As soon as the causes are known man regains his power over nature, for ““whosoever knows any form, knows also the utmost possibility of superinducing that nature upon every variety of matter, and so is less restrained and tied in operation either to the basis of the matter or to the condition of the efficients.” 7

Nature thus presented itself to Bacon’s mind as a huge congeries of phenomena, the manifestations of some simple and primitive qualities, which were hid from us by the complexity of the things themselves. The world was a vast labyrinth, amid the windings of which we require some clue or thread whereby we may track our way to knowledge and thence to power. This thread, the filwm labyrinthi, is the new method of induction. But, as has been frequently pointed out, the new method could not be applied until facts had been observed and collected. This is an indispensable preliminary. ‘Man, the servant and interpreter of nature, can do and understand so much, and so much only, as he has observed in fact or in thonght of the course of nature; beyond this he neither knows anything nor can do anything.” The pro- position that our knowledge of nature necessarily begins with observation and experience, is common to Bacon and many contemporary reformers of science, but he laid pecu- liar stress upon it, and gave ita new meaning. Whathe really meant by observation was a competent natural history or collection of facts, ‘The firm foundations of a purer natural philosophy are laid in natural history.” § “First of all we must prepare a natural and experimental history, sufficient and good ; and this is the foundation of all”’® The senses and the memory, which collect and store up facts, must be assisted ; there must be a munistra- tion of the senses and another of the memory. For not only are instances required, but these must be arranged in such a manner as not to distract or confuse the mind, «e., tables and arrangements of instances must be constructed, In the preliminary collection the greatest care must be taken that the mind be absolutely free from preconceived ideas ; nature is only to be conquered by obedience ; man must be merely receptive. ‘All depends on keeping the eye steadily fixed upon the facts of nature, and so receiv- ing their images simply as they are ; for God forbid that we should give out a dream of our own imagination for a pattern of the world ; rather may He

graciously grant to us to write an apocalypse or true vision of the footsteps of the Creator imprinted on his creatures.” !° Concealed among the facts presented to sense are the causes or forms, and

? Thus the last step in the theoretical analysis gives the first means for the practical operation. Cf. Aristotle, Hth. Nic., iii. 3, 12, 22 toxarov ev TH avaddoe: mpa@rov elvas ev TH yeveoes.” Cf. also Now. Org., i. 108.

5 Cogitationes (Works, iii. 187). §N. O., ii. 10.

10 Pref. to Instaur. Cf. Valerius Term. (Works, iii. 224), and N. 0., i, 68, 124.

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the problem therefore is so to analyse experience,’ so to break it up into pieces, that we shall with certainty and mechanical ease arrive at a true conclusion. This process, which forms the essence of the new method, may in its entirety, as a ministration to the reason, be called a logic ; but it differs widely from the ordinary or school logic in end, method, and form. Its aim is to acquire command over nature by knowledge, and to invent new arts, whereas the old logic strove only after dialectic victories and the discovery of new arguments. In method the difference is even more fundamental. Hitherto the mode of demonstra- tion had been by the syllogism ; but the syllogism is, in many respects, an incompetent weapon. It is compelled to accept its first principles on trust from the science in which it is employed ; it cannot cope with the subtlety of nature ; and it is radically vitiated by being founded on hastily and inaccurately abstracted notions of things. For a syllogism consists of propositions, propositions of words, and words are the symbols of notions. Now the first step in accurate progress from sense to reason, or true philosophy, is to frame a bona notio or accurate conception of the thing; but the received logic never does this. It flies off at once from experience and particulars to the highest and most general propositions, and from these de- scends, by the use of middle terms, to axioms of lower generality. Such a mode of procedure may be called anticipatio naturcee (for in it reason is allowed to pre- scribe to things), and is opposed to the true method, the interpretatio nature, in which reason follows and obeys nature, discovering her secrets by obedience and submis-

sion to rule. Lastly, the very form of induction that has been used by logicians in the collection of their in- stances is a weak and useless thing. It is a mere enume- ration of a few known facts, makes no use of exclusions or rejections, concludes precariously, and is always liable to be overthrown by a negative instance.? In radical opposition to this method the Baconian induction begins by supplying helps and guides to the senses, whose un- assisted information could not be relied on. Notions were formed carefully, and not till after a certain process of induction was completed.? The formation of axioms was to be carried on by a gradually ascending scale. “Then and only then may we hope well of the sciences, when in a just scale of ascent and by successive steps, not inter- rupted or broken, we rise from particulars to lesser axioms; and then to middle axioms, one above the other ; and last of all to the most general.”4 Finally the very form of induction itself must be new. ‘The induction which is to be available for the discovery and demonstration of sciences and arts must analyse nature by proper rejections and exclusions ; and then, after a sufficient number of negatives, come to a conclusion on the affirmative instances, which has not yet been done, or even attempted, save only by Plato.5 . . . And this induction must be used not only to

1 Pref. to Inst.

- Bacon’s summary is valuable. “In the whole of the process which leads from the senses and objects to axioms and conclusions, the de- monstrations which we use are deceptive and incompetent. The process consists of four parts, and has as many faults. In the first place, the impressions of the sense itself are faulty, for the sense both fails us and deceives us. But its shortcomings are to be supplied and its de- ceptions to be corrected. Secondly, notions are all drawn from the impressions of the Sense, and are indefinite and confused, whereas they should be definite and distinctly bounded. Thirdly, the induction is amiss which infers the principles of sciences by simple enumeration, and does not, as it ought, employ exclusions and solutions (or separa- tions) of nature. Lastly, that method of discovery and proof accord- ing to which the most general principles are first established, and then intermediate axioms are tried and proved by them, is the parent of Breer and the curse of all science.”—(N. O., i. 69.)

: NV. O., i. 105. 4 Ibid., i. 104; of. i. 19-26.

This extract gives an answer to the objection sometimes raised that Bacon is not original in his theory of induction. He certainly admits

discover axioms, but also in the formation of notions.” © This view of the function of exclusion is closely connected with Bacon’s doctrine of forms, and is in fact dependent upon that theory. But induction is neither the whole of the new method, nor is it applicable to forms only. There are two other grand objects of inquiry: the one, the trans- formation of concrete bodies; the other, the investigation of the latent powers and the latent schematism or configu- ration, With regard to the first, in ultimate result it depends upon the theory of forms; for whenever the com- pound body can be regarded as the sum of certain simple natures, then our knowledge of the forms of these natures gives us the power of superinducing a new nature on the concrete body. As regards the latent process which goes on in all cases of generation and continuous development or motion, we examine carefully, and by quantitative measure- ments, the gradual growth and change from the first ele- ments to the completed thing. The same kind of investi- gation may be extended to many cases of natural motion, such as voluntary action or nutrition; and though inquiry is here directed towards concrete bodies, and does not therefore penetrate so deeply into reality as in research for forms, yet great results may be looked for with more con- fidence. It is to be regretted that Bacon did not complete this portion of his work, in which for the first time he approaches modern conceptions of change. The latent configuration or inward structure of the parts of a body must be known before we can hope to superinduce a new nature upon it. This can only be discovered by analysis, which will disclose the ultimate constituents (natural particles, not atoms) of bodies, and lead back the discussion to forms or simple natures, whereby alone can true light be thrown on these obscure questions. Thus, in all cases, scientific explanation depends upon knowledge of forms; all phenomena or secondary qualities are accounted for by being referred to the primary qualities of matter.

The several steps in the inductive investigation of the form of any nature flow readily from the definition of the form itself. For that is always and

necessarily present when the nature is present, absent when it is absent, decreases and increases according as the nature decreases and increases. It is therefore requisite for the inquiry to have before us instances in which the nature is present. The list of these is called the table of Essence and Presence. Secondly, we must have instances in which the nature is absent ; only as such cases might be infinite, attention should be limited to such of them as are most akin to the instances of presence.? The list in this case is called table of Absence in Proximity. Thirdly, we must have a number of instances in which the nature is present in different degrees, either increasing or decreasing in the same subject, or variously present in different subjects. This is the table of Degrees or of Com- parison. After the formation of these tables, we proceed to apply what is perhaps the most valuable part of the

that Plato has used a method somewhat akin to his own; but it has frequently been contended that his induction is nothing more than the érdywyn of Aristotle (see Rémusat's Bacon, &c., pp. 310-315, and for a criticism, Waddington, Hssats de Logique, p. 261, sgg.) This seems a mistake. Bacon did not understand by induction the argument from particuiars to a general proposition ; he looked upon the exclusion and rejection, or upon elimination, as the essence of induction. To this process he was led by his doctrine of forms, of which it is the neces- sary consequence ; it is the infallible result of his view of science and its problem, and is as original as that is. Whoever accepts Bacon's doctrine of cause must accept at the same time his theory of the way in which the cause may be sifted out from among the phenomena. It is evident that the Socratic search for the essence by an analysis of instances—an induction ending in a definition—has a strong resem- blance to the Baconian inductive method.

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7 That is to say, differing in nothing save the absence of the nature under investigation.

Baconian method, and that in which the author took most pride, the process of exclusion or rejection. This elimina- tion of the non-essential, grounded

on the fundamental propositions with regard to forms, is the most important of Bacon's contributions to the logic of induction, and that in which, as he repeatedly says, his method differs from all previous philosophies. It is evident that if the tables were complete, and our notions of the respective phenomena clear, the process of exclusion would be a merely mechanical counting out, and would infallibly lead to the detection of the cause or form. But it is just as evident that these conditions can never be adequately fulfilled. Bacon saw that his method was impracticable (though he seems to have thought the difficulties not insuperable), and therefore set to work to devise new helps, adminicula. These he enumerates in it., Aph. 21 :— Prerogative Instances, Supports of Induction, Rectification of Induction, Varying the Inves- tigation according to the Nature of the Subject, Prerogative Natures, Limits of Investigation, Application to Practice, Preparations for Investigation, the Ascending and Descend- ing Scale of Axioms. The remainder of the Organum is devoted to a consideration of the twenty-seven classes of Prerogative Instances, and, though it contains much that is both luminous and helpful, it adds little to our knowledge of what constitutes the Baconian method. On the other heads we have but a few scattered hints. But although the rigorous requirements of science could only be fulfilled by the employ- ment of all these means, yet in their absence it was permis- sible to draw from the tables and the exclusion an hypotheti- cal conclusion, the truth of which might be verified by the use of the other processes ; such an hypothesis is called fantastically the First Vintage (Vindemiatio). The induc- tive method, so far as exhibited in the Organum, is exem- plified by an investigation into the nature of heat.

Such was the method devised by Bacon, and to which he ascribed the qualities of absolute certainty and mechanical simplicity. But even supposing that this method were accurate and completely unfolded, it is evident that it could only be made applicable and produce fruit when the pheno- mena of the universe have been very completely tabulated and arranged. In this demand for a complete natural history, Bacon also felt that he was original, and he was deeply impressed with the necessity for it ;1 in fact, he seems occasionally to place an even higher value upon it than upon his Organum. Thus, in the preface to his series of works forming the third part of the Znstauratio, he says: "It comes, therefore, to this, that my Organum, even if it were completed, would not without the Natural History

much advance the Jnxstawration of the Sciences, whereas the Natural History without the Organum would advance it not a little'? Buta complete natural history is evidently a thing impossible, and in fact a history can only be collected by attending to the requirements of the Organum. This was seen by Bacon, and what may be regarded as his final opinion on the question is given in the important letter to Baranzano :—~~" With regard to the multitude of instances by which men may be deterred from the attempt, here is my answer. First, what need to dissemble? Either store of instances must be procured, or the business must be given up. All other ways, however enticing, are impassable. Secondly, the prerogatives of instances, and the mode of experimenting upon experiments of light (which I shall hereafter explain), will diminish the multi~~ tude of them very much. Thirdly, what matter, I ask, if the description of the instances should fill six times as inany volumes as Pliny's History? ... . For the true

1 Distrib. Op. (Works, iv. 28); Parasceve (ibid., 251, 252, 255-256) ; Deserip, Glob. Intel., ch. 3. 2 Wornay 3. 16; ef. NV. O., 1. Ta0.

natural history is to take nothing except instances, con- nections, observations, and canons." The Organum and the History are thus correlative, and form the two equally necessary sides of a true philosophy ; by their union the new philosophy is produced.

Two questions may be put to any doctrine which pro- fesses to effect a radical change in philosophy or science. Is it original? Is it valuable? With regard to the first, it has been alrcady pointed out that Bacon's induction or inductive method is distinctly his own, though it cannot and need not be maintained that the general spirit of his philosophy was entirely new.

The value of the method is a separate and more difficult question. It has been assailed on the most opposite grounds. Macaulay, while admitting the accuracy of the process, denied its efficiency, on the ground that an opera- tion performed naturally was not rendered more easy or efficacious by being subjected to analysis.4 This objection is curious when confronted with Bacon's reiterated asser- tion that the natwral method pursued by the unassisted human reason is distinctly opposed to his; and it is besides an

argument that tells so strongly against many sciences, as to be comparatively worthless when applied to any one, There are, however, more formidable objections against the method. It has been pointed out,® and with perfect justice, that science in its progress has not followed the Baconian method ; that no one discovery can be pointed to which can be definitely ascribed to the use of his rules, and that men the most celebrated for their scientific acquirements, while paying homage to the name of Bacon, practically set at naught his most cherished precepts. The reason of this is not far to seek, and has been pointed out by logicians of the most diametrically opposed. schools. The mechanical character both of the natural history and of the logical method applied to it, resulted necessarily from Bacon's radically false conception of the nature of cause and of the causal relation. The whole logical or scientific problem is treated as if it were one of co-existence, to which in truth the method of exclusion is scarcely applicable, and the assump- tion is constantly made that each phenomenon has one and only one cause. The inductive formation of axioms by a gradually ascending scale is a route which no science has ever followed, and by which no science could ever make progress. The true scientific procedure is by hypothesis followed up and tested by verification ; the most powerful instrument is the deductive method, which Bacon can hardly be said to have recognised. The power of framing

3 Letters and Life, vii. 377.

4 Compare what Bacon says, NV. O., i. 130.

5 Brewster, Life of Newton, 1855 (see particularly vol. ii. 408, 405); Lasson, Ueber Baco von Verulam's wissenschaftliche Principien, 1860; Liebig, Ueber Francis Bacon von Verulam, &c., 1863 (a translation of the last appeared in Macmillan's Magazine for July and August 1863). Although Liebig points out how little science proceeds according to Bacon's rules, yet his other criticisms seem of extremely little value. In a very offensive and quite unjustifiable tone, which is severely commented on by Sigwart and Fischer, he attacks the Baconian methods and its results. 'These results he claims to find in the Sylva Sylvarum, entirely ignoring what Bacon himself has said of the nature of that work (N. O., i. 117; cf. Rawley's Pref. to the S. S.), and thus putting a false interpretation on the

experiments there noted. It is not surprising that he should detect many flaws, but he never fails to exaggerate an error, and seems sometimes completely to miss the point of what Bacon says. (See particularly his remarks on ¥. S., 33, 336.) The method he explains in such a way as to show he has not a glimpse of its true nature. He brings against Bacon, of all men, the accusations of making induction start from the undetermined perceptions of the senses, of using imagination, and of putting a quite arbitrary interpretation on phenomena. He crowns his criticism by expounding what he considers to be the true scientific method, which, as has been pointed out by Fischer, is simply that Baconian doctrine against which his attack ought to have been directed. (See his account of the method, Ueber Bacon, 47-49 ; K. Fischer, Bacon, p. 499-502.)

6 Mill, Logic, ii. pp. 115, 116, 329, 230.

hypotheses points to another want in the Baconian doctrine. If that power form part of the true method, then the mind isnot wholly passive or recipient; it anticipates nature, and moulds the experience received by it in accordance with its own constructive ideas or conceptions ; and yet further, the minds of various investigators can never be reduced to the game dead mechanical level.t There will still be room for the scientific use of the imagination, and for the creative

flashes of genius." "Se : If, then, Bacon himself made no contributions to science,

if no discovery can be shown to be due to the use of his rules, if his method be logically defective, and the prob- lem to which it was applied one from its nature in- capable of adequate solution, it may not unreasonably be asked, How has he come to be looked upon as the great leader in the reformation of modern science? How is it that he shares with Descartes the honour of inaugurating modern philosophy? To this the true answer seems to be, that Bacon owes his position not only to the general spirit of his philosophy, but to the manner in which he worked into a connected system the new mode of thinking, and to the incomparable power and eloquence with which he ex- pounded and enforced it. Like all epoch-making works,

the Novum Organum gave expression to ideas which were already beginning to be in the air. The time was ripe for a great change ; scholasticism, long decaying, had begun

1 Whewell, Phil. of Ind. Sc., ii. 399, 402-3; Ellis, Int. to Bacon's Works, i. 39, 61; Brewster, Newton, ii. 404 ; Jevons, Prine. of Science, ii, 220. A severe judgment on Bacon's method is given in Diihring's able but one-sided Aritische Gesch. d. Phil., in which the merits of Roger Bacon are brought prominently forward.

- Although it must be admitted that the Baconian method is fairly open to the above-mentioned objections, it is curious and significant that Bacon was not thoroughly ignorant of them, but with deliberate consciousness preferred his own method. We do not think, indeed, that the notiones of which he speaks in any way correspond to what Whewell and Ellis would call "conceptions or ideas furnished by the mind of the thinker;" nor do we imagine that Bacon would have admitted these as necessary elements in the inductive process. But he was certainly not ignorant of what may be called a deductive method, and of a kind of hypothesis. This is clear from the use he makes of the Vindemiatio, from certain hints as to the testing of axioms, from his admission of the syllogism into physical reasoning, and from what he calls Kxperientia Literata. The function of the Vindemiatio has been already pointed out ; with regard to axioms, he says (N.O., i. 106), "In establishing axioms by this kind of induction, we must also examine and try whether the axiom so established be framed to the measure of these particulars from which it is derived, or whether it be larger or wider. And if it be larger and wider, we must observe whether, by indicating to us new particulars, it confirm that wide- ness and largeness as by a collateral security, that we may not either stick fast in things already known, or loosely grasp at shadows and abstract forms, not at things solid and realised in matter." (Cf. also the passage from Valerius Terminus, quoted in Ellis's note on the above aphorism.) Of the syllogism he says, "I do not propose to give up the syllogism altogether. S. is incompetent for the principal things rather than useless for the generality. In the mathematics there is no reason why it should not be employed. It is the flux of matter and the inconstancy of the

physical body which requires induction, that thereby it may be fixed as it were, and allow the formation of notions well defined. In physics you wisely note, and therein I agree with you, that after the notions of the first class and the axioms concerning them have been by induction well made out and defined, syllogism may be applied safely ; only it must be restrained from leap- mg at once to the most general notions, and progress must be made through a fit succession of steps.”—(“ Letter to Baranzano,” Letters and Life, vii. 377.) And with this may be compared what he says of mathematics (Vou. Org., ii. 8; Parasceve, vii.) In his account of Lixperientia Literata (De. Aug., v. 2) he comes very near to the modern mode of experimental research. It is, he says, the procedure from one experiment to another, and is not a science, but an art or learned Sagacity (resembling in this Aristotle’s ayxtvoi), which nay, how- ever, be enlightened by the precepts of the Interprctatio. Bight varieties of such experiments are enumerated, and a comparison is drawn between this and the inductive method ; ‘‘though the rational method of inquiry by the Organon promises far greater things in the end, yet this sagacity, proceeding by learned experience, will in the meantime

present mankind with a number of inventions which lie near at hand.” (Ch WO), is 103.)

to fall; the authority not only of school doctrines but of the church had been discarded ; while here and there a few devoted experimenters were turning with fresh zeal to the unwithered face of nature. The fruitful thoughts which lay under and gave rise to these scattered efforts of tho human mind, were gathered up into unity, and reduced to system in the new philosophy of Bacon.2 It is assuredly little matter for wonder that this philosophy should con- tain much that is now inapplicable, and that in many respects it should be vitiated by radical errors. The details of the logical method on which its author laid the greatest stress have not been found of practical service ;* yet the fundamental ideas on which the theory rested, the need for rejectiug rash generalisation, and the necessity for a critical analysis of experience, are as true and valuable now as they were then. Progress in scientific

discovery is mado mainly, if not solely, by the employment of hypothesis, and for that no code of rules can be laid down such as Bacon had devised. Yet the framing of hypothesis is no mere random guess work ; it is not left to the imagination alone, but to the scientific imagination. There is required in the process not merely a preliminary critical induction, but a subsequent experimental comparison, verification, or proof, the canons of which can be laid down with precision. To formulate and show grounds for these laws is to construct a philosophy of induction, and it must not be forgotten that the first step towards the accomplishment of the task was made by Bacon, when he introduced and gave due prominence to the powerful logical instrument of exclusion or elimination.

Of the general characteristics of Bacon's philosophy, and of the consequent place he holds in the history of modern speculative thought, this is not the place to speak. It is curious and significant that in the domain of the moral and metaphysical sciences his influence has been perhaps more powerful, and his authority has been more frequently appealed to, than in that of the physical. This is due, not so much to his expressed opinion that the inductive method was applicable to all the sciences,® as to the generally prac- tical, or, one may say, positive spirit of his system. Theological questions, which had tortured the minds of generations, are by him relegated from the provinco of reason to that of faith. Even reason must be restrained from striving after ultimate truth ; it is one of the errors of the human intellect that it will not rest in general prin- ciples, but must push its investigations deeper. Experience and observation are the only remedies against prejudice and error. Into questions of metaphysics as commonly understood Bacon can hardly be said to have entered, but a long line of thinkers have drawn inspiration from him, and it is not without justice that he has been looked upon as the originator and guiding spirit of that empirical school which numbers among its adherents such names as Hobbes, Locke, Hume, Hartley, Mill, Condillac, the Encyclopedists, and many others of smaller note.

In concluding this article, the writer desires to express his obliga- tions to Mr James Spedding for various observations and suggestions made upon it before it went to press, and for the use of certain MS. notes relating to disputable passages in Bacon's life.

Biography.—Spedding, Letters and Life of Lord Bacon, 7 vols. 1862-74 ; Macaulay, Hssays ; Campbell, Lives of Chancellors ; Mon- tagu, Works, vols. xvi. and xvii., 1834; Hepworth Dixon, Personal History of Lord Bacon, 1861, and Story of Lord Bacon's Life, 1862.

Works.---The classical edition is that by Messrs R. L. Ellis, J. Spedding, and D. D. Heath, 2d ed., 7 vols., 1870 (i.~~iii. con~~ tains Philosophical Works ; iv. v., Translations; vi. vii., Literary and Professional Works). Montagu's edition (17 vols., 1825-34)

3 See the vigorous passage in Herschel, Discourse on the Study of Natural Philosophy, § 105 ; cf. § 96 of the same work. 4 Bacon himself seems to anticipate that the progress of science would of itself render his method antiquated (Nov. Org., i. 130). © Nov. Org., i. 127. III. — 28

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is full, but badly arranged and edited. Of numerous editions of individual works, or portions of the whole, the following are good :— (Guwres Philosophiques de Bacon, par Bouillet, 3 vols., 1834 ; Essays, by Whately, 5th ed., 1866, and by W. A. Wright, 1862; Novwm Organum, by Kitchin (1855); Translation by the same (1855) ; Advancement of Learning, by W. A. Wright. ; Philosophy.—Besides the Introductions in Ellis and Spedding's edition, the following may be noticed :—Kuno Fischer, Franz

BACON, Jouy, who may be considered the founder of the British school of sculpture, was born Nov. 24, 1740. He was the son of Thomas Bacon, cloth- worker in South- wark, whose forefathers possessed a considerable estate in Somersetshire. At the age of fourteen he was bound apprentice in Mr Crispe's manufactory of porcelain at Lambeth, where he was at first employed in painting the small ornamental pieces of china, but by his great skill in moulding he soon attained the distinction of being modeller to the work. The produce of his labour he devoted to the support of his parents, then in somewhat straitened circum- stances. While engaged in the porcelain works he had an opportunity of seeing the models executed by different sculptors of eminence, which were sent to be burned at an

adjoining pottery. An observation of these productions appears to have immediately determined the direction of his genius ; he devoted himself to the imitation of them with so much success, that in 1758 a small figure sent by him to the Society for the Encouragement of Arts received

‘a prize, and the highest premiums given by that society

were adjudged to him nine times between the years 1763 aud 1776. During his apprenticeship he also improved the method of working statues in artificial stone, an art which he afterwards carried to perfection. Bacon first attempted working in marble about the year 1763, and, during the course of his early efforts in this art, was led to improve the method of transferring the form of the model to the marble (technically called getting out the points), by the invention of a more perfect instrument for the purpose, which has since been adopted by many sculptors both in this and other countries. This instru- ment possesses many advantages above those formerly employed ; it is more exact, takes a correct measurement in every direction, is contained in a small compass, and can be used upon either the model or the marble. In the year 1769 he was adjudged the first gold medal given by the Royal Academy, and in 1770 was made an associate of that body. He shortly afterwards exhibited a figure of Mars, which gained him considerable reputation, and he was then engaged to execute a bust of George III., in- tended for Christ Church College. He secured the king’s favour, and retained it throughout life. His great cele brity now procured him numerous commissions, and it is said, that of sixteen different competitions in which he was engaged with other artists, he was unsuccessful in one case only. Considerable jealousy was entertained against him by other sculptors, and he was commonly charged with ignorance of classic style. This charge he repelled by the execution of a noble head of Jupiter Tonans, and many of his emblematical figures are in perfect classical taste. On the 4th of August 1799, he was suddenly attacked with inflammation, which occasioned his death in little more than two days, in the 59th year of his age. He left a widow, his second wife, and a family of six sons and three daughters. Of his merit as a sculptor, the universal reputation of his works affords decisive proof, and his varlous productions which adorn St Paul’s Cathedral, London, Christ Church and Pembroke

Colleges, Cxford, the Abbey Church, Bath, and Bristol Cathedral, give ample

testimony to his powers, Perhaps his best works are to

BACON

Bacon und seine Nachfolgcr, 2d ed., 1875 (ist ed., 1856, trans, into English by Oxenford, 1857); Rémusat, Bacon, sa vie, ée., 1857 (2d ed., 1858); Craik, Bacon, his Writings and his Philo- sophy, 8 vols. 1846-7 (new ed., 1860); A. Dorner, De Baconis Philo- sophia, Berlin, 1867; Liebig, Ueber Francis Bacon von Verulam und die Methode der Naturforschung, 1863 ; Lasson, Ueber Baco von Verulam's wissenschaftliche Principien, 1860; Bohmer, Ueber FP, Bacon von Verulam, 1864. (R, AD.)

be found among the monuments in Westminster Abbey. (See Memoir of the late John Bacon, k.A., by the Rev. Richard Cecil: London, 1811.)

BACON, Sir Nicuotas, lord keeper of the great seal in Nicholas,

the reign of Queen Elizabeth, was born at Chislehurst in Kent in 1510, and educated at the university of Cambridge, after which he travelled in France, and made some stay at Paris. On his return he settled in Gray's Inn, and applied himself with such assiduity to the study of the law, that he quickly distinguished himself; and, on the dissolution of the monastery of St Edmund's Bury in Suffolk, he obtained a grant of several manors from King Henry VIIL., then in the thirty-sixth year of his reign. Two years later he was promoted to the office of attorney in the court of wards, which was a place of both honour and profit. In this office he was continued by King Edward VI.; and in 1552 he was elected treasurer of Gray's Inn. His great moderation and prudence preserved him through the dangerous reign of Queen Mary. Very early in the reign of Elizabeth he was knighted; and in 1558 he succeeded Nicholas Heath, archbishop of York, as keeper of the great seal of England ; he was at the same time made one of the queen's privy council. As a statesman, he was remarkable

for the clearness of his views and the wisdom of his

counsels, and he had a considerable share in the settling of ecclesiastical questions. That he was not unduly elated by his preferments, appears from the answer he gave to Queen Elizabeth when she told him his house at Redgrave was too little for him, “Not so, madam,” returned he, “but your majesty has made me too great for my house.” On only one occasion did he partially lose the queen’s favour. He was suspected of having assisted Hales, the clerk of the hanaper, in his book on the succession, written at the time of Lady Catherine Grey’s unjust imprisonment. Bacon was deprived of his seat at the council, and it was even contemplated to deprive him of the seal also. He seems, however, to have quickly regained his position, and to have stood as high in the royal favour as before. He died on the 26th of February 1579, having held the great seal more than twenty years, and was buried in St Paul’s, London, where a monument, destroyed by the great fire of London in 1666, was erected to his memory. Granger observes that he was the first lord keeper who ranked as lord chancellor ; and that he had much of that penetrating genius, solidity, judgment, persuasive eloquence, and comprehensive knowledge of law and equity, whichatfter- wards shone forth with such splendour in his illustrious son.

BACON, Rocer. The 13th century, an age peculiarly Roger.

rich in great men, produced few, if any, who can take higher rank than Roger Bacon. He is in every way worthy to be placed beside such thinkers as Albertus Magnus, Bonaventura, and Thomas Aquinas. These had au infinitely wider renown in their day, while he was ignored by his contemporaries and neglected by his succes- sors; but modern criticism has restored the balance in his favour, and is even in danger of going equally far in the opposite direction. Bacon, it is now said, was not appre- ciated by his age because he was so completely in advance of it; he isa 16th or 17th century philosopher, whose lot has been by some accident cast in the 13th century ; he

Roger.

BACON

is no schoolman, but a modern thinker, whosc conceptions of science are more just and clear than are even those of his more celebrated namesake! In

this view there is certainly a considerable share of truth, but it is much exaggcrated. Asa general rule, no man can be completely dissevered from his national antecedents and surroundings, and Bacon is not an exception. Those who take up such an extreme position regarding his merits have known too little of the state of contemporary science, and have limited their comparison to the works of the scholastic theologians. We never find in Bacon himself any consciousness of originality ; he has no fresh creative thought or method to introduce whereby the face of science may be changed; he is rather a keen and systematic thinker, who is working in a well-beaten track, from which his contemporaries were being drawn by thesuperiorattractions of theologyand metaphysics. Roger Bacon was born in 1214, near Ilchester, in Somersetshire. His family appears to have been in good circumstances, for he speaks of his brother as wealthy, and he himself expended considerable sums on books and instruments; but in the stormy reign of Henry III. they suffered severely, their property was despoiled, and several members of the family were driven into exile. Roger com- pleted his studies at Oxford, though not, as current tradi- tions assert, at Merton or at Brazenose, neither of those colleges having then been founded. His great abilities were speedily recognised by his contemporaries, and he came to be on terms of close intimacy with some of the most independent thinkers of the time. Of these the most prominent were Adam de Marisco and Robert Grosse- teste (Capito), afterwards bishop of Lincoln, a man of liberal mind and wide attainments, who had especially devoted himself to mathematics and experimental science. Very little is known of Bacon’s life at Oxford ; it is said he took orders in 1233, and this is not improbable. In the following ycar, or perhaps later, he crossed over to France, and studied for a considerable length of time at the univer- sity of Paris, then the centre of intellectual life in Europe. The years Bacon spent there were unusually stirring. The two great orders, the Franciscans and Dominicans, were in the vigour of youth, and had already begun to take the lead in theological discussion. Alexander of Hales, the author of the great Swmma, was the oracle of the Francis- cans, while the rival order rejoiced in Albertus Magnus, and in the rising genius of the angelic doctor, Thomas Aquinas. The scientific training which Bacon had received, partly by instruction, but more from the study of the Arab writers, made patent to his eyes the manifold defects in the imposing systems reared by these doctors. It dis- gusted him to hear from all around him that philosophy was now at length

complete, that it had been reduced into compact order, and was being set forth by a certain pro- fessor at Paris. Even the great authority on which they reposed, Aristotle, was known but in part, and that part was rendered well-nigh unintelligible through the vileness of the translations; yet not one of those professors would learn Greek so that they might arrive at a real knowledge of their philosopher. The Scriptures, if read at all in the schools, were read in the erroneous versions; but even these were being deserted for the Sentences of Peter Lombard. Physical science, if there was anything deserving that name, was cultivated, not by experiment in the true Aris- totelian way, but by discussion and by arguments deduced from premises resting on authority or custom. Every- where there was a show of knowledge covering and con cealing fundamental ignorance. Bacon, accordingly, who knew what true science was, and who had glimpses of a scientific urganon or method, withdrew from the usual

1 See Diihring, Kritische Ges. d. Phil., 192, 249 51.

scholastic routine, and devoted himself to languages and experimental researches. Among all the instructors with whom he came in contact in Paris, only one gained his esteem and respect; this was an unknown individual, Petrus de Maharncuria Picardus, or of Picardy, probably identical with a certain mathematician, Petrus Peregrinus of Picardy, who is perhaps the author of a MS. treatise, De Magnete, contained inthe Bibliothéque Impériale at Paris. The contrast between the obscurity of such a man and the fame enjoyed by the fluent young doctors of the schools seems to have roused Bacon’s indignation. In the Opus Minus and Opus Tertium he pours forth a violent tirade against Alexander of Hales, and against another professor, not mentioned by name, but spoken of as alive, and blamed even more severely than Alexander. This anonymous writer, he says, who entered the order when young (puerulus), who had received no proper or systematic in- struction in science or philosophy, for he was the first in his order to teach such subjects, acquired his learning by teaching others, and adopted a dogmatic tone, which has caused him to be received at Paris with applause as the equal of Aristotle, Avicenna, or Averroes. He has cor- rupted philosophy more than any other; he knows nothing of optics

or perspective, and yet has presumed to write de naturalibus; he is ignorant of speculative alchemy, which treats of the origin and generation of things; he, indeed, is a man of infinite industry, who has read and observed much, but all his study is wasted because he is ignorant of the true foundation and method of science.”

It is probable that Bacon, during his stay in Paris, ac- quired considerable renown. He took the degree of doctor of theology, and seems to have received from his contem- poraries the complimentary title of doctor mirabilis, In 1250 he was again at Oxford, and probably about this time, though the exact date cannot be fixed, he entered the Franciscan order, His fame spread very rapidly at Oxford, though it was mingled with suspicions of his dealings in magic and the black arts, and with some doubts of his orthodoxy. About 1257, Bonaventura, general of the order, interdicted his lectures at Oxford, and commanded him to leave that town and place himself under the superintendence of the body at Paris. Here for ten years he remained under con- stant supervision, suffering great privations, and strictly prohibited from writing anything which might be published. But during the time he had been at Oxford his fame had reached the ears of the Papal legate in England, Guy de Foulques, a man of culture and scientific tastes, who in 1265 was raised to the papal chair as Clement IV. In the following year he wrote to Bacon, who had been already in communication with him, ordering him, notwithstanding

2 Tt is difficult to identify this unknown professor. Brewer thinks the reference is to Richard of Cornwall; but the little we know of Richard is not in harmony with what is said herc, nor with the terms in which he is elsewhere spoken of by Bacon. Erdmann conjectures Thomas Aquinas, which is cxtremely improbable, as Thomas was un- questionably not the first of his order to study philosophy. Cousin and Charles think that Albertus Magnus is aimed at, and certainly much of what is said applies with peculiar force to him. But some things do not at all cohere with what is otherwise known of Albert. The unknown is said to have received no regular philosophic training ; we know that Albert did. The unknown cntered the order when very young ; unless the received date of Albert’s birth be false, he did not enter till nearly twenty-eight years of age. Albert, too, could not be said with justice to be utterly ignorant of alchemy, and his

mechanical inventions are well known. It is worth pointing out that Brewer, in transcribing the passage bearing on this (Op. Ined. p. 327), has the words Fratrum puerulus, which in his marginal note he interprets as applying to the Franciscan order. In this case, of course, Albert could not be the person referred to, as he was a Dominican. But Charlcs, in his transcription, cntirely omits the important word Fratrum. There are other instances in which Brewer and Charles do not agree, é.g., according to Brewer, Bacon speaks of Thomas and Albert as puert duorum ordinum ; according to Charles, he says, primi duorum ordinum ; a discrepancy not unimportant.

any injunctions from his superiors, to write out and send to him a treatise on the sciences which he had already asked of him when papal legate. Bacon, who in despair of being ever able to communicate his results to the world, had neglected to compose anything, and whose previous writings had been mostly scattered tracts, capitula quedam, took fresh courage from this command of the Pope. Rely- ing on his powerful protection, he set at naught the many obstacles thrown in his way by the jealousy of his superiors and brother friars, and despite the want of funds, instru- ments, materials for copying, and skilled copyists, com- pleted in about eighteen months three large treatises, the Opus Majus, Opus Minus, and Opus Tertium, which, with some other tracts, were despatched to the Pope by the hands of one Joannes, a young man trained and educated with great care by Bacon himself.

The composition of such extensive works in so short a time is a marvellous feat. We do not know what opinion Clement formed of them, but before his death he seems to have bestirred himself on Bacon’s behalf, for in 1268 the latter was released and permitted to return to Oxford. Here he continued his labours in experimental science, and also in the composition of complete treatises. The works sent to Clement he regarded as mere preliminaries, laying down principles which were afterwards to be applied to the several sciences. The first part of an encyclopedic work probably remains to us in the Compendium Studit Philosophie, belonging to the year 1271. In this work Bacon makes a vehement attack upon the ignorance and vices of the clergy and monks, and generally upon the in- sufficiency of the existing

studies. In 1278 he underwent the punishment which seems to have then been the natural consequence of outspoken opinions. His books were condemned by Jerome de Ascoli, general of the Franciscans, a gloomy bigot, who afterwards became Pope, and the un- fortunate philosopher was thrown into prison, where he remained for fourteen years. During this time, it is said, he wrote the small tract De Retardandis Senectutis Acct- dentibus, but this is merely a tradition. In 1292, as ap- pears from what is probably his latest composition, the Compendium Studii Theologia, he was again at liberty. The exact time of his death cannot be determined ; 1294 is probably as accurate a date as can be fixed upon.

Bacon's Works.—Leland has said that it is easier to col- lect the leaves of the Sibyl than the titles of the works written by Roger Bacon; and though the labour has been somewhat lightened by the publications of Brewer and Charles, referred to below, it is no easy matter even now to form an accurate idea of his actual productions. His writ- ings, so far as known to us, may be divided into two classes, those yet in manuscript and those printed. An enormous number of MSS. are known to exist in British and French libraries, and probably all have not yet been discovered. Many are transcripts of works or portions of works already published, and therefore require no notice. Of the others, several are of first-rate value for the comprehension of Bacon's philosophy, and, though extracts from them have been given by Charles, it is clear that till they have found an editor, no representation of his philosophy can be complete.!

The works hitherto printed (neglecting reprints) are the following :—(1.) Speculum Alchimie, 1541—+translated into English, 1597; (2.) De Mirabili Potestate Artis et

1 The more important MSS. are :—(1.) The extensive work on the fundamental notions of physics, called Communia Naturalium, which is found in the Mazarin Library at Paris, in the British Museum, and in the Bodleian and University College Libraries at Oxford ; (2.) On the fundamental notions of mathematics, De Communibus Mathematice, part of which is in the Sloane collection, part in the Bodleian ; (3.) Baconis Physica, contained among the additional MSS. in the British Museum ; (4.) The fragment called Quinta Pars Compendii Theologica,

Nature, 1542—English translation, 1659; (3.) Lebellus de Roger, Retardandis Senectutis Accidentibus, 1590—translated as the “Cure of Old Age,” 1683; (4.) Sanioris Medicine Magistri D. Rogeri Baconis Anglici de Arte Chymie Scripta,

1603—a collection of small tracts containing Lacerpta de

Libro Avicenne de Anima, Breve Breviarvum, Verbum Abbreviatum,? Secretum Secretorum, Tractatus Triwm Ver-

borum, and Speculum Secretorum ; (5.) Perspectiwa, 1614,

which is the fifth part of the Opus Majus ; (6.) Specula

Mathematica, which is the fourth part of the same; (7.) Opus Majus ad Clementem IV., edited by Jebb, 1733; (8.) Opera hactenus Inedita, by J. 8. Brewer, 1859, con-

taining the Opus Tertiwm, Opus Minus, Compendium Studu Philosophie, and the De Secretis Opertbus Nature.

How these works stand related to one another can only

be determined by internal evidence, and this is a somewhat hazardous method. The smaller works, which are chiefly on alchemy, are unimportant, and the dates of their com- position cannot be ascertained. the Opus Majus Bacon had already written some tracts,

It is known that before

among which an unpublished work, Computus Naturalium, on chronology, belongs probably to the year 1263 ; while, if the dedication of the De Secretis Opertbus be authentic, that short treatise must have been composed before 1249.

It is, however, with the Opus Majus that Bacon’s real activity begins. That great work, which has been called

by Whewell at once the Encyclopedia and the Organum

of the 13th century, requires a much fuller notice than can here be given. As published by Jebb it consists of six parts; there should, however, be a seventh, De Morali Philosophia, frequently referred to in the Opus Tertium. Part I. (pp. 1-22), which is sometimes desig- nated De Utilitate Scientiarum, treats of the four ofendi- cula, or causes of error. These are, authority, custom, the opinion of the unskilled many, and the concealment of real ignorance with show or pretence of knowledge. The last error is the most dangerous, and is, in a sense, the cause of all the others. The offendicula have sometimes been looked upon as an anticipation of the more celebrated doc- trine of Jdola ; the two classifications, however, have little in common. In the summary of this part, contained in the Opus Tertium, Bacon shows very clearly his perception of the unity of science, and the necessity of an encyclo- pedical treatment. ‘Nam omnes scientie sunt annexe, et mutuis se fovent auxiliis, sicut partes ejusdem totius, quarum quelibet opus suum peragit, non solum propter se, sed pro aliis.”—{Op. Ined., p. 18.)

Part II. (pp. 23-43) treats of the relation between philo- sophy and theology. All true wisdom is contained in the Scriptures, at least implicitly ; and the true end of philo- sophy is to rise from the imperfect knowledge of created things to a knowledge of the Creator. Ancient philo- sophers, who had not the Scriptures, received direct illu- mination from God, and only thus can the brilliant results attained by them be accounted for.

Part III. (pp. 44-57) treats of the utility of grammar, and the necessity of a true linguistic science for the ade- quate comprehension either of the Scriptures or of books on philosophy. ‘The necessity of accurate acquaintance with any foreign language, and of obtaining good texts, isa subject Bacon is never weary of descanting upon. He lays down very clearly the requisites of a good translator ; he should know thoroughly the language he is translating ee

in the Brit. Mus.; (5.) the Metaphysica, in the Biblioth. Impér. at Paris ; (6.) The Compendium Studii Theologic, in the Brit. Mus. ; (7.) The logical fragments, such as the Summa Dialectices, in the Bodleian, and the glosses upon Aristotle’s physics and metaphysics in the library at Amiens.

2 At the close of the Verb. Abbrev. is a curious note, concluding with the words, “ipse Rogerus fuit discipulus fratris Alberti!”

from, the language into which he is translating, and the subject of which the book treats.

Part IV. (57-255) contains an elaborate treatise on mathematics, “the alphabet of philosophy,” and on its importance in science and theology. Bacon shows at great length that all the sciences rest ultimately on mathematics, and progress only when their facts can be subsumed under mathematical principles. This singularly fruitful thought he exemplifies and illustrates by showing how geometry is applied to the action of natural bodies, and demonstrat- ing by geometrical figures certain laws of physical forces. He also shows how his method may be used to determine some curious and long-discussed problems, such as the light of the stars, the ebb and flow of the tide, the motion of the balance. He then proceeds to adduce elaborate and sometimes slightly grotesque reasons tending to prove that mathematical knowledge is essential in theology, and closes this section of his work with two comprehensive sketches of geography and astronomy. That on geography is par- ticularly good, and is interesting as having been read by Columbus, who lighted on it in Petrus de Alliaco’s Imago Mundi, and was strongly influenced by its reasoning.

Part V. (pp. 256-357) treats of perspective. This was the part of his work on which Bacon most prided himself, and in it, we may add, he seems to owe most to the Arab writers Alkindi and Alhazen. The treatise opens with an able sketch of psychology, founded upon, but in some im- portant respects varying from, Aristotle’s De Anima. The anatomy of the eye is next described; this is done well and evidently at first hand, though the functions of the parts are not given with complete accuracy. Many other points of physiological optics are touched on, in general erroneously. Bacon then discusses very fully vision in a right line, the laws of reflection and refraction, and the construction of mirrors and lenses. In this part of the work, as in the preceding, his reasoning depends essentially upon his

peculiar view of natural agents and their activities. His fundamental physical maxims are matter and force; the latter he calls wrtus, species, imago agentis, and by num- berless other names. Change, or any natural phenomenon, is produced by the impression of a virtus or species on matter —the result being the thing known. Physical action is, therefore, impression, or transmission of force in lines, and must accordingly be explained geometrically. This view of nature Bacon considered fundamental, and it lies, in- deed, at the root of his whole philosophy. ‘To the short notices of it given in the 4th and 5th parts of the Opus Majus, he subjoined two, or perhaps three, extended ac- counts of it. We possess at least one of these in the tract De Multiplicatione Specierum, printed as part of the Opus Majus by Jebb (pp. 358-444). We cannot do more than refer to Charles for discussions as to how this theory of nature is connected with the metaphysical problems of force and matter, with the logical doctrine of universals, and in general with Bacon’s theory of knowledge.

Part VI. (pp. 445-477) treats of experimental science, “domina omnium scientiarum.” There are two methods of knowledge : the one by argument, the other by experience. Mere argument is never sufficient ; it may decide a ques- tion, but gives no satisfaction or certainty to the mind, which can only be convinced by immediate inspection or intuition. Now this is what experience gives. But experi- ence 1s of two sorts, external and internal; the first is that usually called experiment, but it can give no complete knowledge even of corporeal things, much less of spiritual. On the other hand, in inner experience the mind is illu- minated by the divine truth, and of this supernatural en- lightenment there are seven grades.

Experimental science, which in the Opus Tertium (p. 46) is distinguished from the speculative sciences and the

operative arts in a way that forcibly reminds us of Francis Bacon, is said to have three great prerogatives over all other sciences :—(1.) It verifies their conclusions by direct experi- ment; (2.) It discovers truths which they could never reach ; (3.) It investigates the secrets of nature, and opens to us a knowledge of past and future. As an instance of his method, Bacon gives an

investigation into the nature and cause of the rainbow, which is really a very fine specimen of inductive research,

The seventh part of the Opus Majus, not given in Jebb's edition, is noticed at considerable length in the Opus Ter- tiwm (cap. xiv.) Extracts from it are given by Charles, (pp. 339-348).

As has been seen, Bacon had no sooner finished this elaborate work than he began to prepare a summary to be sent along with it. Of this summary, or Opus Minus, part has come down and is published in Brewer's Op. Jned. (313-389), from what appears to be the only MS. The work was intended to coutain an abstract of the Opus Majus, an account of the principal vices of theology, and treatises on speculative and practical alchemy. At the same time, or immediately after, Bacon began a third work as a preamble to the other two, giving their general scope and aim, but supplementing them in many points. The part of this work, generally called Opus Tertium, is printed by Brewer (pp. 1-310), who considers it to be a comiplete treatise. Charles, however, has given good grounds for supposing that it is merely a preface, and that the work went on to discuss grammar, logic (which Bacon thought of little service, as reasoning was innate), mathematics, general physics, metaphysics, and moral philosophy. He founds his argument mainly on passages in the Communia Naturalium, which indeed prove distinctly that it was sent to Clement, and cannot, therefore, form part of the Com- pendium, as Brewer seems to think. It must be confessed, however, that nothing can well be more confusing than the references in Bacon's works, and it seems well-nigh hope- less to attempt a complete arrangement of them until the texts have been collated and carefully printed.

All these large works Bacon appears to have looked on as preliminaries, introductions, leading to a great work which should embrace the principles of allthe sciences. This great work, which is perhaps the frequently referred to Liber Sex Scientiarum, he began, and a few fragments still indicate its outline. First appears to have come the treatise now called Compendium Studi Philosophie (Brewer, pp. 393-519), con- taining an account of the causes of error, and then entering at length upon grammar. After that, apparently, logic was to be treated ; then, possibly, mathematics and physics ; then speculative alchemy and experimental science. It is, however, very

difficult, in the present state of our know- ledge of the MSS., to hazard even conjectures as to the con- tents and nature of this last and most comprehensive work.

Bacon's fame in popular estimation has always rested on his mechanical discoveries, Careful research has shown that very little in this department can with accuracy be ascribed to him. He certainly describes a method of constructing a telescope, but not so as to lead one to con- clude that he was in possession of that instrument. Gun- powder, the invention of which has been claimed for him on the ground of a passage in his works, which fairly in- terpreted at once disposes of any such claim, was already known to the Arabs. Burning-glasses were in common use, and spectacles it does not appear he made, although he was probably acquainted with the principle of their con- struction. His wonderful predictions (in the De Secretis) must be taken cum grano salis; and it is not to be for- gotten that he believed in astrology, in the doctrine of signatures, and in the philosopher's stone, and knew that the circle had been squared.

The best work on Roger Bacon is undoubtedly that of E. Charles, Roger Bacon, sa Vie, ses Ouvrages, ses Doctrines d apres des textes in- édits, 1861. Against the somewhat enthusiastic estimate and modern interpretation given in this work, Schneider in his Roger Bacon, Eine Monographie, Augsburg, 1878, has reclaimed. He points out very clearly certain aspects in which Bacon appears as a mere scholastic. The new mattcr contained in the publications of Charles and Brewer was summarised by H. Sicbert, Roger Bacon : Inaugural Dissertation, Marburg, 1861. Cf also, J. K. Ingram, On the Opus Majus of Baeon, Dublin, 1858 ; Cousin, Fragments, Phil. du Moyen Age (re- printed froin Journal des Savans, 1848); Saisset, Préeurseurs et Disciples de Deseartes, pp. 1-58 (reprinted from Revue de Dewx Mondes, 1861); Prantl, Gesch. der Logik, iii. 120-129 (a severe criti- cism of Bacon's logical doctrines). (R. AD.)

BACONTHORPE, or Bacon, Joun, called The Resolute Doctor, a learned monk, born towards the end of the 13th century, at Baconthorpe, a village in Norfolk. After spend- ing the early part of his life in the convent of Blakeney, near Walsingham, he removed to Oxford, and from that city to

Paris, where he obtained great reputation for his learn- ing, and was esteemed the principal of the Averroists. In 1329 he returned to England, and was chosen twelfth pro- vincial of the English Carmelites. In 1333 he was sent for to Rome, where, we are told, he first maintained the Pope's sovereign authority in cases of divorce; but this opinion he is understood to have afterwards retracted. He died in London in 1346. His chief work was published in 1510, with the title Doctoris resolutt Joannis Bacconis Anglict Carmelite radiantissimi opus super quattuor sen- tentiarum libris, 4 vols. folio; it has passed through several editions. The little that is known of this schoolman, who in his own day and order had a reputation rivalling that of Thomas Aquinas, may be secn in Brucker, Hist. Crit., tii. 865 ; Stock], Phil. d. Mittel. ii. 1044-5; Haurdéau, Phil. Scol., i. 476; Prantl, Ges. d. Logik, iii. 318.

BACSANYI, Janos, a Hungarian poet, was born at Tapo- leza, May 11, 1763, and died at Linz, May 12, 1845. In 1785 he published his first work, a patriotic poem, Zhe Valour of the Magyars. In the same year he obtained a situation as clerk in the treasury at Kaschau, and there, in conjunc- tion with other two Hungarian patriots, edited the Magyar Museum, which was suppressed by the Government in 1792. In the following year he was deprived of his clerkship ; and in 1794, having taken part in the conspiracy of Bishop Martinovich, he was thrown into the state prison of the Spielberg, near Briinn, where he remained for two years. After his release he took a considerable share in the Magyar Minerva, a literary review, and then procceded to Vienna, where he obtained a post in the bank, and married. In 1809 he translated Napoleon's proclamation to the Magyars, and, in consequence of this anti-Austrian act, had to take refuge in Paris. After the fall of Napoleon he was given up to the Austrians, who allowed him to reside at Linz, on condition of never leaving that town. He pub- lished a collection of poems at Pesth, 1827 (second edition, Buda, 1835), and also edited the poetical works of Anyos and Faludi.

BACTRIA, or Bacrrtana, an ancient country of Central Asia, lying to the south of the River Oxus, and reaching to the westcrn part of the Paropamisan range, or Hindu Kush. It was sometimes regarded as including the district of Margiana, or Merv, which was more frequently considered as distinct. The character of the country is very various, and has been well

described by Curtius, whose account is confirmed by the few modern travellers who have passed through it. Some portions are remarkable for the beauty of their scenery, or the fertility of the soil, evidenced by a rich and varied vegetation, while other parts are stretches of barren and drifting sands. In early history Bactria is connected with some of the most important movements of the Indo-European races, and has no small claims to be regarded as the cradle of our present civilisation. Accord-

ing to Persian tradition, it became the seat of the Iranian wanderers, who established the religion of Zoroaster, and expelled the Vedic inhabitants of the country. In the 7th century B.C. it passed under the dominion of the Medes, and not long after formed part of the conquests of Cyrus. In the reign of Darius it ranked as the twelfth satrapy of the empire, and furnished valuable contingents to the imperial army; these are described at a later date by Herodotus as wearing the Median head-dress, and making use of their native bows and short spears. Like the rest of Western Asia, Bactria was subjugated by Alexander, and formed part of the empire of the Seleucids; but in the 3d century B.C. it was raised to the rank of an independent kingdom by the successful revolt of Diodotus, the Greek satrap. There thus arose a remarkable dynasty—if dynasty it can be called—of Greeco-Bactrian kings, who have been the object of much modern investigation, but are not as yet arranged in any satisfactory order. The names of seven or eight of them are known from the Greck and Roman historians, and upwards of forty are preserved on their coins. The great problem to be solved by numisma- tists 1s how to dispose of so many claimants in the compara- tively narrow space of time at their disposal. It is highly probable that many of them held contemporaneous sway in different parts of the Bactrian region, sometimes with a distinct preponderance on the part of one, and sometimes with practical equilibrium of power ; but their geographical distribution can only be conjectured from what are under- stood to be. mint-marks on their coins. The period of the final disintegration of the Greeco-Bactrian power is not definitely ascertained ; but as early as the time of Eucratides (160 3.c.) there appears on the coinage the so-called Bac- trian Pali, a language cognate with Sanskrit but written in characters of seemingly Phcenician origin. Besides these inonetary legends, several

Bactrian inscriptions have been recently discovered, among the most important of which are the “ Taxila” copperplate, which has furnished the key to the Bactrian numeral system, the Peshawur vase, the Manikyala cylinder, the Bimaran vase, and the Wardak urn, but none of them are of very much historical value. Bactria seems to have passed successively under the power of various Saca and Parthian and so-called Indo-Scythian rulers, and during the first six or seven centuries of the Christian era it became one of the most important centres of Buddhistic monasticism. (See Batku.) Its modern history is of but little importance, as it has never formed an independent kingdom of any power or stability.

See Bayer, Iist. Reg. Greco-Bactr., Petrop., 1738; Kohler, Aféd. greeques des Rots de la B., St Pet., 1822-8; Tychsen, Comm. Reeen. Gétting., v. vi.; Tod, in Roy. Asiat. Soc. T’rans., 1824; Schlegel, in Journ. Asiat., 1828 ; Prinsep, in J. of Asiat. Soe. Bengal, 1833- 88; Raoul-Rochctte, in Jour. des Savants, 1884-89 and 1844; Jacquet, in J. Asiat., 1886; Masson, in J. of Asiat. Soc. Bengal, 1836; K. O. Miller, in Gottingen Anzcigen, 1885 and 1838; Mionnet, in Supplément viii. to his Déscription, &c., 1837; Lassen, Zur Geseh. der Griech. u. Indoskyth. Kén., Bonn, 1838 ; Grotefend, Dic Miinzen der Kon. v. Baetr., Hanover, 1889 ; Wilson, Ariana Antiqua, 1841; Cunningham, Numism. Chron., viii. 1843; Lassen, Indische Alter-thumskunde, vol. ii., 1852 ; Babu Rajendra Lal, in J. Asiat. Soc. of Bengal, 1861; E. Thomas, ‘‘ Bactrian Coins,” in J. Roy. Asiat. Soc. Gr. Brit. and I., 1873; Dowson, ‘‘B. Pali Inser.,” dbidem.

BACUP, a town of England, in Lancashire, 20 miles N- from Manchester. It is situated in a beautiful valley on the River Speddon, and is a station on the East Lancashire railway. It is chiefly important for its factories, foundries, and mills, as well as for the coal-mines in the neighbour hood, Since 1841, when the population of the chapelry was only 1526, Bacup has rapidly increased, and its sanitary condition has been greatly improved by the exertions of a local board. ‘The river has been deepened for a mile above the town, and a water supply has been secured by means of a reservoir at Higher Stacks. There are two Episcopal

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churches and several dissenting places of worship, a mechanics' institute and library, and various other institu- tions. A new market-hall was built in 1867. Population of local board district in 1871, 17,199.

BADAJOS, a province of Spain, forming, by the division of 1833, the southern half of the old province of Estrema- dura, or what is generally called Lower Estremadura. It is bounded on the N. by Caceres, E. by Ciudad Real, S. and S.E. by Cordova, Scville, and Huelva, and W. by Portugal, embracing an areaof 8687 square miles. See EstREMADURA.

Bavasos, the capital of the above province, is a fortified city, and the see of a bishop. It is situated about 5 miles from the Portuguese fronticr, on a slight elevation near the left bank of the Guadiana, and is one of the principal stations on the railway between Madrid and Lisbon. The height is crowned by the ruins of a Moorish castle. A strong wall and bastions, with a broad moat and outworks, and forts on the surrounding heights, make the city a place of great strength. The river is crossed by a magnificent granite bridge, originally built in 1460, repaired in 1597, and rebuilt in 1833. The city is well built, and contains an arsenal, a cathedral, built like a fortress and bombproof, several churches, hospitals, and schools. Its monasteries are all secularised, one being occupied as infantry barracks ; and some of its nunneries are closed. Badajos was finally taken from the Moors in 1235 by Alphonso IX., and from its importance as a frontier garrison has since been the scene of numerous sieges. The last and most severe was in 1812, when it was stormed by the British troops under Wellington and carried with dreadful loss. The town was delivered up to a two days' pillage. It had been surrendered the previous year to Soult by the treachery of Imaz, the commander of the garrison. 'The trade and manufactures of Badajos are considerable, and much contraband traffic is carried on with Portugal. Badajos is the birthplace of the painter Luis de Morales and of Manuel Godoy. Pop. 22,895.

BADAKHSHAN, a country of Central Asia, situated in the upper valley of the Kokcha river, one of the principal head streams of the Oxus. The name has been variously spelt Badascian, Balacian, Balakhshan, Balashan, Balaxien and Balaxia. Including Wakhan, it lies between 35° 50' and 38° N.

lat., and between 69° 30’ and 74° 20’ E. long. The chief ascertained positions are as follows: Faizibad, 37° 2’N., 70° 36’ E.; Ishkashm, 36° 45’ N., 71° 38’ E. ; Punja, 37° 5’ N., 72° 39’ E.; and Karkat Yassin lake, 37° 14’ N., 74° 18’ E. Its extent from east to west is about 200 miles, and from north to south about 150 miles. On the north it is bounded by Kulab and Darwaz ; on the east by the lofty table-land of Pamir; on the south by the Hindu Kush range; and on the west by Kunduz. The Pamir land is the principal watershed of Asia, and Badakhshan forms part of the western water slope consti- tuting the basin of the Oxus. The country is for the most part mountainous, but there are numerous plains and fertile valleys. The general slope of the country is great, since Kunduz is probably not more than 500 feet above the level of the sea, while Lake Victoria, close to the principal watershed, is estimated at 15,600 feet.

Badakhshan comprises 16 districts. The principal district called Faizibid is under the rule of the Mir Mahmud Shah ; the others are dependencies ruled by relatives of the Mir, or by hereditary feudatories. Each ruler is inde- pendent, but is bound to aid the Mfr of Faizdbd4d in time of need. The Mir himself pays tribute to the Amir of Cabul. The other districts besides Faizibid are Daraim, Shahr-{-buzurq, Gumbuz, Farakhar, Kishm, Rustak, Rushdn, Shighndn, Ishk4shm, Wakhdn, Zebak, Minjin,Ragh, Daung, and Asidba. Each district has its sub-divisions. In Faizé- bad there are several fertile tracts ; amongst them are the hilly regions of Yaftal and Shewd, which are thickly popu-

lated, the former by Tajiks, and the latter by Turks of the Jakha Moghal tribe ; and the plateaus of Argu and SheweA, of which the former is somewhat higher than the plain of Faizdbad, about 15 miles in length by about 8 in breadth, aud well cultivated, while the latter is still higher, and forms the best and largest pasture ground in Badakhshan. A lake named Sir- i-kol, about 20 miles in circumference, is situated on the Shewé plateau. In and around Faizdbéd there are numerous excellent fruit and flower gardens; the principal manufactures are cast-iron pots, boots and shoes, and a material woven from silk and cotton, called zlacha. The district of Jirm, also subject to Mahmud Shah, com- prises numerous rich valleys, as well as the

famous mineral region called Yamgan, or “all mines.” The mines yield rubies, lapis lazuli, lead, alum, sal-ammoniac, sulphur, copper, &c. The annual yield of lapis lazuli averages about £1500, which is sold at the rate of seven shil- lings per pound; it is exported to Russia, Kashmir, and China. The Dasht-Baha-rak is an extensive plain in this district, on which was formerly situated a large city, once the capital of Badakhshan. There are several villages on it, as also the summer residence of the Mir. The caravan route from India to Faizdbéd passes over this plain. The districts of Rustak, Ragh, Kishm, Daraim, and Shahr-i-buzurg are next in importance as regards fertility and population. They abound in fertile hills and plains. The principal cultivated productsare wheat, rice, Cicer artetinum, Phaseolus Mungo, cotton, linseed, poppy, sesame, apples, grapes, mul- berries (which form the principal article of food in these regions), pears, apricots, walnuts, melons, gourds, turnips, radishes, carrots, spinach, leeks, as also numerous garden flowers and timber trees. The districts of Minjan and Rushan are more mountainous, have a cooler climate, and are more sparsely populated than the foregoing. Their inhabitants are also distinct, differing in physical features, creed, language, and habits. The celebrated ruby mines are in Ishkashm; they have not been worked for more than 30 years, except temporarily in 1866. Itis, however, suspected that they are worked surreptitiously by the people. They yield the well-known Balas (7.e., Badakhshan) ruby.

The principal domesticated animal is the yak. There are also large flocks of sheep, cows, goats, ponies, numerous fine dogs, and Bactrian camels. The more important wild animals are a large wild sheep (Ovis polz), foxes, wolves, jackals, bears, boars, deer, and lions; amongst birds, there are partridges, pheasants, ravens, jays, sparrows, larks, a famous breed of hawks, é&e.

Badakhshan proper is peopled by Tajiks, Turks, and Arabs, who speak the Persian and Turki languages, and profess the orthodox doctrines of the Mahometan law adopted by the Sunnite sect; while the mountainous districts are inhabited by Tajiks, professing the Shia creed, and speaking distinct dialects in diffcrent districts.

Badakhshan was visited by Hwen Thsang in 630 and 644, The Arabian geographers of the 10th century speak of its mines of ruby and azure, and give notices of the flourishing commerce and large towns of Waksh and Khotl, regions which appear either to have in part corresponded with or to have lain close to Badakhshan. In 1272-73 Marco Polo and his companions stayed for a time in Badakh- shan. During this and the following centuries the country was governed by kings who claimed to be descendants of Alexander the Great. The last of these kings was Shah Mahomet, who died in the middle of the 15th century, leaving only his married daughters to represent the royal line. Early in the middle of the 16th century the Uzbeks obtained possession of Badakhshan, but were soon expelled, and then the country was generally governed by descend- ants of the old royal dynasty by the female line. About the middle of the 18th century the present dynasty of

Mirs established its footing in place of the old one which had become extinct. In 1765 the country was invaded and ravaged by the ruler of Cabul. During the first three decades of the present century it was overrun and depopu- lated by Kokan Beg and his son Murad Beg, chiefs of the Kataghan Uzbeks of Kundus. The country was still suffering from these disasters when Wood visited it in 1837. When Murad Beg died, the power passed into the hands of another Uzbek, Mahomet Amir Khan. In 1859 the Kataghan Uzbeks were expelled; and Mir Jahander Shah, the representative of the modern royal line, was reinstated at Faizib4d under the supremacy of the Afghans. In 1867 he was expelled by the Afghans and replaced by the present ruler, Mir Mahomet Shah, and other representatives of the same family. According to the latest accounts the country was reviving from its past misfortunes, and the towns were again rising. Badakh- shan owes part of its prosperity to the baneful traffic in slaves. A strong man is considered a fair exchange for a large dog or horse, and a fine girl for about four horses. The district is of some political interest in connection with the frontier line of Afghanistan, which has recently been the subject of discussion between the Russian and British Governments.

In 1867 a report on Badakhshan was drawn up by the Pundit Mun-phool after a sojourn of two or three years in the country. For further information, see the Book of Ser Marco Polo, vol. i. 1871, edited by Col. Yule ; A Journey to the Source of the River Oxus, by Capt. J. Wood, edition of 1872 ;“ Report on the Mirza’s Exploration from Cabul to Kashgar,” by Major Montgomerie, in the Journal of Roy. Geo. Soc.,” vol. xli. p. 132 ; “ A Havildar’s journey through Chitral to Faizabéd in 1870,’’ by Major Montgomerie, in journal last mentioned, vol. xlii. p. 180; ‘‘ Papers connected with the Upper Oxus Regions,” by Col. Yule, in thesame volume, p.438; ‘‘Monograph on the Oxus,” by Maj.-Gen. Sir H. C. Rawlinson, in the same volume, p. 482; and a paper by the writer last mentioned, ‘‘ On Badakhshan and Wakhan,” in the Proceedings of the Roy. Geog. Soc., vol. xvii. p. 108.

BADALOCCHIO, Sisto, surnamed Rosa, a painter and engraver, was born at Parma in 1581, and died in 1641 or 1647. He was of the school of Annibale Carracci, by whom he was highly esteemed for design. His principal engravings are the series known as Zhe Buble of Raflfaelle, which were executed by him in conjunction with Lanfranc, another pupil of Carracci’s. The best of his paintings, which are few in number, are at Parma.

BADEN, THe Granp Dvucay of, is situated in the 8. W. of Germany, between 47° 32’ and 49° 52’ N. lat., and_be- tween 7° 27’ and 9° 50’ E. long. It is bounded on the N. by Bavaria and Hesse-Darmstadt; W. by Rhenish Bavaria, Alsace, and Lorraine; 8. by Switzerland; and E. by Wiirtemberg and part of Bavaria. At the commencement of the present century Baden was only a margraviate, with an area little exceeding 1300 square miles, and a popula- tion of 210,000. Since then it has from time to time acquired additional territory, so that its area now amounts to upwards of 5800 square miles, and its population to nearly a million and a half.

It consists of a considerable portion of the eastern half of the fertile valley of the Rhine, and of the mountains which form its boundary. The mountainous part is by far the most extensive, forming, indeed, nearly 80 per cent. of the whole area. From the Lake of Constance in the south to the River Neckar is a portion of the so-called Black Forest or Schwarzwald,

which is divided by the valley of the Kinzig into two districts of different elevation. To the south of the Kinzig the mean height is 3100 feet, and the loftiest summit, the Feldberg, reaches about 4780 feet ; while to the north the mean height is only 2100 feet, and the Belchen, the culminating point of the whole, does not ex- ceed 4480. To the north of the Neckar is the Odenwald range, with a mean of 1440 feet, and, in the Katzenbuckel,

an extreme of 1980. Lying between the Rhine and the Dreisam is the Kaiserstuhl, an independent volcanic group, nearly 10 miles in length and 5 in breadth, the highest point of which is 1760 feet.

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FLURRACH

Sketch Map of the Grand Duchy of Baden.

The greater part of Baden belongs to the basin of the Rhine, which receives upwards of twenty tributaries from the highlands of the duchy alone ; a portion of the territory is also watered by the Main and the Neckar. A . part, however, of the eastern slope of the Black Forest belongs to the basin of the Danube, which there takes its rise in a number of mountain streams. Among

the numer- ous lakes which belong to the duchy are the Mummel, Wilder, Nonnenmattweiher, Titti, Eichener, Schluch, &c., but none of them are of any size. The Lake of Constance, or Boden See, belongs partly to Bavaria and Switzerland.

From 1819 to 1832 Baden was divided into six circles, which were reduced in the latter year to the four follow- ing :—The Lake Circle or Constance, the Upper Rhine or Freiburg, the Middle Rhine or Carlsruhe, and the Lower Rhine or Manheim. ‘This division, though still employed, has been legally supplanted by one into the eleven circles of Constance, Villingen, Waldshut, Freiburg, Lérrach, Offenburg, Baden, Carslruhe, Manheim, Heidelberg, and Mosbach. The capital of the duchy is Carlsruhe, which in 1871 had a population of 36,582; the other principal towns are Manheim (39,614), Freiburg (24,599), Heidelberg (19,988), Pforzheim (19,801), Rastadt (11,559), Baden (10,083), Constance (10,052), Bruchsal (9786), and Lahr (6710). The population is most thickly clustered in the north and in the neighbourhood of the Swiss town of Basel.

The mineral wealth of Baden is not very great ; but the mines of Oberwert, Kandern, é&c., produce excellent iron ; there are two zinc mines and one of lead; coal is worked at Diesburg, Zunsweier, Baden, &c. ; and silver, copper, gold, cobalt, alum vitriol, and sulphur are also obtained in small quantities. Gold washing, at one time extensively carried on along the Rhine, is now little practised. Peat is found in abundance, as well as gypsum, china-clay, and

potter’s earth. The duchy was formerly dependent on France for its salt supply, but extensive salt works have for a num- ber of years been maintained by the Government at Diirr- heim and Rappenau. In 1874 the amount produced was of the value of £54,880. The mineral springs of Baden are very numerous, and have acquired great celebrity,— those of Baden-Baden, Badenweiler, Antogast, Griesbach, Friersbach, and Petersthal, being the most frequented.

The inhabitants of Baden are of various origin,—those to the N. of the Murg being descended from the Alemanni, and those to the S. from the

Franks, while the Swabian plateau derives its name and its population from another race. ‘This distinction is still marked in the manners, the language, and the dress of the different districts. The ma- jority of the people are engaged in agricultural and pastoral pursuits, for which much of the country is well adapted. In the valleys the soil is particularly fertile, yielding luxuriant crops of wheat, maize, barley, spelt, beans, potatoes, flax, hemp, hops, beet-root, and tobacco ; and even in the more mountainous parts rye, wheat, and oats are extensively cultivated. There is a considerable extent of pasture land, and the rearing of cattle, sheep, pigs, and goats is largely attended to. The culture of the vine has recently been increasing, and the wines, which are charac- terised by a mildness of flavour, are in good demand. The gardens and orchards supply abundance of fruits, especially almonds and walnuts ; and the keeping of bees is common throughout the country. A greater proportion of Baden than of any other of the South German states is occupied by forests. In these the predominant species are the fir and pine, but many others, such as the chestnut, are well represented. A third, at least, of the annual supply of timber is exported, the chief consumer being Holland, though of late years Paris has derived a con- siderable supply from this source.

The manufactures of Baden were formerly very insig-

nificant, but have greatly increased since its accession to the Zollverein in 1835. They are, however, chiefly con- fined to iron and hardware goods, and the spinning and weaving of cotton. The latter industry is principally carried on at Ettlingen, Offenburg, St Blaise, Zell, Schopfheim; Manheim has an extensive manufacture of mirrors, and Carlsruhe of machines; while Pforzheim is famous for its production of jewellery and goldsmiths’ work. Beet-root sugar is manufactured at Waghiusel more largely than anywhere else in Germany. Paper, leather, and tobacco are also important objects of industry. The inhabitants of the Black Forest have long been celebrated for their dexterity in the manufacture of wooden orna- ments and toys, watches, clocks, musical boxes, organs, &e. Of clocks alone about 600,000 are made every year. _ The exports of Baden, which coincide largely with the industries just mentioned, are of considerable import- ance, but the bulk of its trade consists in the transit of goods. The country is well furnished with roads and railways, the greater proportion of the latter being in the hands of

the state. A line runs the whole length of the land, for the most part parallel with the Rhine, while branches cross obliquely from east to west.

The educational institutions of Baden are numerous and flourishing, and public instruction is largely subsidised by the Government. There are two universities, the Protestant one at Heidelberg, founded in 1386, and the Catholic one at Freiburg, founded in 1457. The library at Heidelberg numbers 150,000 volumes, and that at Freiburg 100,000, while there is another of almost equal size at Carlsruhe. There are also lyceums at Carlsruhe, Constance, Freiburg, Heidelberg, Manheim, Rastadt, and Wertheim ; several gymnasiums ; normal schools at Carlsruhe, Ettlingen, and

Meersburg, besides upwards of 2000 common schools estab- lished throughout the country. There is an institution in Pforzheim for the deaf and dumb, and one in Freiburg for the blind. The polytechnic school at Carlsruhe is among the most efficient institutions of the kind in Germany. The preparatory course extends over three years, and includes French, German, English, special history, mathematics, drawing, modelling, chemistry, mineralogy and geology, mechanics, &c. The special courses are engineering, architecture, forestry, chemistry, mechanics, commerce, and post-oflice service, and extend over from one to four years. ‘The ducal family of Baden belong to the Pro- testant section of the Church, but the majority of the population are Roman Catholics. The returns of the census of 1871 are as follows :—Catholics, 942,560; Pro- testants, 491,008 ; other sects, 2265; and Jews, 25,703. The district where the Roman Catholic preponderance was greatest was Constance, while the Protestants were slightly more numerous in the district of Manheim.

The government of Baden is an hereditary monarchy, with the executive power vested in the grand duke, and the legislative authority in a Parliament consisting of two Chambers. The upper Chamber is composed of all the princes of the reigning line who are of age, the chiefs of ten noble families, the possessors of hereditary landed estates worth £25,000, the Roman Catholic archbishop of Freiburg, the president of the Protestant Church, a deputy from each of the universities, and eight nominees of the duke. The lower Chamber consists of 63 repre- sentatives, of whom 22 are elected by

the burgesses of cer- tain towns, and 41 by the inhabitants of the bailiwicks. The parliamentary candidate must possess tax-paying pro- perty of the value of 10,000 florins (£833), or derive a salary of at least £125 from a public office. Every citizen, if neither criminal nor pauper, has the right of voting, but only in the choice of deputy-electors, by whom the real election of the representatives is decided. The members of the lower House are elected for eight years, and meetings of Parliament must take place every two years.

The budgets are granted by Parliament for a term of two years. In 1875 the ordinary expenses were rated at £1,572,959, and the ordinary receipts at £1,557,108. The total public debt on the lst of January 1874 was £12,985,067.

Since the organisation of 1864 courts are held at Con- stance, Freiburg, Offenburg, Carlsruhe, and Manheim, the supreme court being in the city last named. Manheim is also the seat of the central commission for the naviga- tion of the Rhine.

The ducal fanrily of Baden traces its descent from the counts of Zihringen, who flourished in the 11th century, and derived their title from what is now a little town to the north of Freiburg. Hermann J., the second son of Count Berthold I., took the title of margrave of Hoch- berg in Breisgau, and was succeeded in 1074 by his son Hermann II., who was the first to style himself margrave of Baden. On the death of the Margrave Christopher in 1527, his estates were divided among his three sons, but one of them having died soon after, the two survivors became the sole inheritors, and founded the two lines of Baden-Baden and Baden-Durlach. The former of these, which produced one of the most famous generals of the 17th century, became extinct by the death of Augustus George in 1771, and its possessions were united with Baden-Durlach under Charles Frederick. By the treaty of Lunéville in 1801, Baden acquired a considerable addition of territory ; in 1803 the margrave received the title of Elector; and by the treaty of Presburg in 1805 his domains were still further increased by the accession of Breisgau. On the dissolution of the empire in 1806, the elector

joined the Confederation of the Rhine, and received the title of Grand Duke, with 1950 square miles of additional territory. Shortly after this extension and consolidation had taken place, Bavaria laid claim to a portion of the duchy, but her demands were indignantly rejected, and in 1818 the grand duke bestowed on the country a political constitution, the fundamental principle of which was the territorial integrity of Baden. In the fol- lowing year this integrity was guaranteed by the Frankfort Commission. The first session of the Baden parliament fell into disputes and had to be dissolved ; but the second, in 1820, commenced the work of reform by the complete abolition of serfdom and the establishment of ministerial responsibility. In 1821 the union of the two Protestant churches in Baden was brought about. Other questions of importance, such as trial by jury, freedom of the press, abolition of tithes, and extension of education, became sub- jects of interest and debate ; but, unfortunately, the influence of the French revolution. of 1830 led the democratic party to excesses, which the Government met with acts of ill-advised repression. Matters were beginning to readjust themselves when the revolution of 1848 again aroused the opposing

forces. In 1849 the duke was constrained to flee, and Brentano, the democratic leader, took possession of Carls-

ruhe in the name of the national committee. By the 25th of June, however, the Prussian forces, after several severe engagements with the revolutionists,

effected the restoration of the duke, who returned to his capital on 18th August ; and it was not long before the country began to recover from the effects of the outbreak. Not, indeed, that it became quiescent ; for Baden has had its full share in the political and ecclesiastical disputes that have been so rife throughout Germany during recent years. The Roman Catholic clergy, with the bishop of Freiburg at their head, have maintained an obstinate struggle with the Liberal party, which is now predomi- nant. The separation of church and state has been established ; the Jews have been admitted to full civic rights; freedom of trade has been promulgated, and a

number of minor reforms successfully carried through. In the German war of 1866 Baden sided against Prussia ; but in 1870 it joined in the formation of the new German empire, and its troops are incorporated in the 14th corps of the imperial army.

Ground-Plan of Baden-Baden.

BADEN (or BADEN-BADEN, to distinguish it from other places of the name), a town and celebrated watering-place of Germany, in the grand duchy of Baden. It stands on the side of a hill, near the Oos or Oel, in a beautiful valley of the Black Forest, 18 miles S.W. of Carlsruhe ; and it is connected by a branch with the Manheim and Basel railway. The superiority of its situation, itsextensive pleasure-grounds, gardens, and promenades, and the brilliancy of the life that is led during the season, have for along series of years con- tinued to attract crowds of visitors from all parts of the world. ‘The resident population amounts to about 10,000, but that number is frequently augmented fourfold. The prevailing nationality is, or rather was, the French, but

Americans, Russians, and English are all numerously repre- sented. The hot springs, which were among the earliest attractions of the place, are twenty-nine in number, and vary in temperature from 37° to 54° R.,2.¢.,from 1 15° to 153° Fahr. They flow from the castle rock at the rate of 90 gallons per minute, and the water is conveyed through the town in pipes to supply the different baths. The town proper 1s on the right bank of the Oos, but the principal resorts of the adventitious population are on the other side.

Conversationshaus and a Trinkhalle or pump-room (1842), a theatre (1861), and a picture-gallery, are among the chief fashionable buildings, to which may be added the library and reading-room. The gaming-tables, which for so many

years were a striking feature of Baden-Baden, are now abolished. The only building of much antiquarian interest, with the exception of the castles, is the parish church, which dates from the 15th century, and contains the tombs of several of the margraves. There is a Protestant church a short

distance to the east of Leopoldsplatz, and not far off a small Episcopalian church ; while on the Michaelsberg is the Greek chapel, with its gilded dome, which was erected over the tomb of the Roumanian prince, Michael Stroudza, who died at Baden in 1863.

The springs of Baden were known to the Romans, and the foundation of the town is referred to the Emperor Hadrian by an inscription of somewhat doubtful authen- ticity. The name of Aurelia Aguensis was given to it in honour of Aurelius Severus, in whose reign it would seem to have been well known. Fragments of its ancient sculp- tures are still to be seen, and in 1847 remains of Roman vapour baths, well preserved, were discovered just below the New Castle. From the 14th century down to the close of the 17th, Baden was the residence of the margraves, to whom it gave itsname. They first dwelt in the Old Castle, the ruins of which still occupy the summit of a hill above the town, but in 1479 they removed to the New Castle (still so called), which is situated on the hill-side uearer to the town, and is remarkable for its subterranean dungeons. During the Thirty Years' War Baden suffered severely from the various combatants, but especially from the French, who pillaged it in 1643, and laid it in ashes in 1688. The margravine Sibylla rebuilt the New Castle in 1697, but the margrave Louis removed to Rastadt in 1706. Since the beginning of the present century the Government has greatly fostered the growth of the town.

BADEN, Switzerland, a small town in the canton of Aargau, on the Limmat, 14 miles N.W. of Zurich. It is much frequented on account of its warm medicinal springs, which are about 20 in number, and vary in temperature from 98° to 126° Fahr. About 15,000 persons visit the place annually. Tacitus, in the first book of his Histories (c. 67), incidentally speaks of it as in modum municipii extructus locus, ameeno salubriumaquarumusu frequens ; andnumerous remains of pillars and inscriptions, coins, and other antiqui- ties confirm his description. It was destroyed by the Alemanni and the Huns, but was again frequented during the reign of Charlemagne, though its modern prosperity only dates from the 15th century. For a long time the countship of Baden was in the hands of the Hapsburgs, but it was conquered by the Swiss Confederates in 1415. It was here that the famous disputation of Eck with Zwingle and C&co- lampadius took place in 1526; and here was held the conference of 1589. In 1714 the peace which put an end to the war of the Spanish Succession was concluded at Baden between Austria and France ; and four years after- wards a treaty between Zurich, Berne, and St Gall received its name from the town. Resident population, 3412.

BADEN, the chief town of a circle in Lower Austria, about 12 miles S. of Vienna on the railway to Gratz. It is beau- tifully situated at the mouth of the romantic ZHelenenthal, near the banks of the Schwachat,a rapid stream with several waterfalls, and has become a favourite summer resort with the inhabitants of the neighbouring capital. The warm baths, which give name to the town, are thirteen in number, and vary in temperature from 72° to 97° Fahr. They rise, for the most part, at the foot of the Calvarienberg, which 18 composed of dolomitic limestone. The number of patients 1s about 8000 annually. The celebrity of Baden dates back to the days of the Romans, who knew it by the name of Aquee Cetie ; and remains of their occupation still exist. In 1812 the town suffered severely from a fire, but it has since been elegantly rebuilt. The principal buildings are the church of St Stephen, the theatre, the casino, and the

military hospital. A short distance to the west of the town stands the castle of Weilberg, which belongs to members of the imperial family. The only manufacture of much importance that is carried on in Baden is the production of steel-wares ; these, especially the razors, are of excellent quality. Permanent population, about 6500.

BADGER (MMeles), a family of Plantigrade Carnivora, possessing greatly elongated bodies and short limbs, each of the latter furnished with five toes, provided at their extremities with long, powerful claws, by means of which they form deep burrows in the earth. The carnassial tooth, which in the bears is wholly tuberculate, is in the badgers provided also with a cutting edge, their whole dentition being specially adapted to the partly vegetable, partly animal diet on which they subsist. The badger differs from all other mammals in having the lower jaw so articu- lated to the upper, by means of a transverse condyle firmly locked into a long cavity of the cranium, that dislocation of the jaw is all but impossible, and this enables those creatures to maintain their hold with the utmost tenacity. The European badger (Afeles Taaus) may be taken as typical of the entire family. It is nowhere abundant, but is found over the entire northern parts of Europe and Asia. It is a quiet, inoffensive animal, nocturnal and solitary in its habits, sleeping by day in its burrow, and issuing forth at night to feed on roots, beech-mast,

fruits, the eggs of birds, some of the smaller quadrupeds, frogs, and insects. It is said also to dig up the nests of wasps in order to eat the larvee, as the ratel—a closely allied South African form—is said to rob the bees of their honey. The male and female are seldom seen together, and are supposed to trace each other by means of the odour of the secretion contained in a glandular pouch beneath the tail. Although the badger does not seek to attack, yet, when driven to bay, its great muscular power and tough hide renders it a for- midable antagonist, as was often seen in the days, now happily gone by, when badger-baiting was a favourite amusement of the English peasantry. Fossil remains of the badger have been found in this country, apparently contemporaneous with the extinct cave bear, hyena, and tiger; still more ancient remains are said to have been found in the Red Crag of Suffolk, and should these prove authentic, the European badger, says Professor Owen, “will be the oldest known species of mammal now living on the face of the earth.” The American badger (Meles Labradorica) isa native of California and Texas, and in its habits closely resembles the former species; it seems, however, to be more carnivorous. According to Gray, several species inhabit the southern parts of Asia. When badgers were more abundant than they now are, their skins dressed, with the hair attached, were commonly used for pistol furniture. They are now chiefly valued for the hair, that of the European badger being used in the manu- facture of the best shaving-brushes, while the softer hair of the American species is employed for the same purpose, and also for painters’ pencils. 5197 skins of the American badger were imported into London during 1873.

BADIA Y LEBLICH, Domrinco, a celebrated Spanish traveller, better known under his assumed name of Ali Bey, was born in Biscay in the year 1766. After receiving a liberal education he devoted particular attention to the Arabic language, and made special preparation otherwise for his Oriental travels. Under the name of Ali Bey and in Mussulman costume, he visited Egypt, Marocco, Tripoli, Arabia, and Syria, and was received as a person of high rank wherever he appeared. On his return to Europe in 1807 he declared himself a Bonapartist, and was made Intendant, first of Segovia, and afterwards of Cordova. When the French were driven from Spain, Badia was compelled to take refuge in France, and there, in 1814, published an

account of his travels under the title of Voyage d’ Ali Bey en Asie et en Afrique, &c., in 3 vols. 8vo. A few years later he set out again for Syria, under the assumed name of Ali Othman, and, it is said, accredited as a political agent by the French Government. He only reached Aleppo, and there died, 30th August 1818, not without suspicion of having been poisoned.

BADIUS, Jopocus or Jossz, sometimes called Baprus Ascensius from the village of Asche, near Brussels, where he was born in 1462, was an eminent printer at Paris, whose establishment was celebrated under the name of Prelum Ascensianum. Ho was himself a scholar of considerable repute, had studied at Brussels and Ferrara, and before settling in Paris, had taught Greek for several years at Lyons. He illustrated with notes several of the classics which he printed, and was the author of numerous pieces, amongst which are a life of Thomas 4 Kempis, and a satire on the follies of women, entitled Mavicula Stultarum Mulierum. He died in 1535. His epitaph was written by his grandson, the celebrated Henry Stephanus.

BADMINTON, a game of recent introduction. It may be played in or out of doors, by any number of persons from two to eight; two or four makes the best game. The

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Diagram illustrating the Game of Badminton.

following description applies to the outdoor game; the in- door follows the same plan, modified only by circumstances affecting a room.

A tolerably level surface is required to form a ground. Turf or asphalt is the best. The size of the ground varies from 40 ft. by 20 ft. to 30 ft. by 15 ft., according to the space at command and the activity of the players.

The ground is divided into courts as shown in the diagram, which gives the marking-out and measurements of a full-sized ground.

The boundaries of the ground and of the courts should be defined by means of whiting and water, or pegged- down tape, the former being preferable.

On each of the spots marked “ post,” half-way between the service lines, and 15 ft. apart, a post about 6 ft. high must be erected, either on a stand or driven into the ground, and supported by guy-ropes.

A net, about 5 ft. 6 in. or 5 ft. high should be stretched from post to post. The depth of the net is of but little consequence. Where expense is no object, it should reach to the ground.

The implements required in playing the game are— (1), shuttlecocks, and (2), rackets or battledores. The former should be about 5 in. high, and about 1 oz. in weight. For outdoor play the shuttlecocks are sometimes made heavier by being loaded with lead. The body should be covered with india-rubber. The rackets should be similar to those used at the game of the same name, only smaller, about 2 ft. 6 in. long.

The game consists in sending the shuttlecock with the racket over the net, forwards and backwards, until one of the players fails to return it. The players decide

by lot which shall commence or have first hand-in and choice of ends. The player who is hand-in (say A) stations himself in one of the courts at his end, his adver- sary (say B) in the diagonally opposed court at the other end. A. then serves to B., 7.e., A. standing in the court chosen by him, strikes the shuttlecock over the net with the racket into the diagonally opposed court. B. then has | to return the service by striking the shuttlecock back over the net without allowing it to touch the ground, and soon alternately until one player fails. If this is the player who served, he is hand-out, his adversary becomes hand-in, and serves, and no scoreaccrues. Butif the player failing is the one who was served to, his adversary scores one point towards game, called an ace. The player who first scores 15 aces wins the game ; but if the score arrives at 14 all, it is necessary for one player to score two consecutive aces in order to win. The server must serve according to the following conditions :—He must stand with both feet in the court served

from ; he must send the shuttlecock clean over the net (i.e., without touching net or posts), and so that it will drop into or beyond the service line bounding the court served into, and into the diagonally opposed court. If he fails to comply with these conditions it is a fault, and he has to serve again. Two consecutive faults put his hand out. The server's hand is also out if he fails to send the shuttlecock over the net; if he hits the shuttlecock beyond the external boundary of the ground, or more than once ; or, if after the server has loosed it, it touches him. No fault is allowed for these failures, as they are considered more serious than those first enumerated. After service is properly given, if either player fails to return the shuttle-cock clean over the net, and so that it drops within the external boundary of the ground on the side of the net furthest from the striker, the player failing loses an ace, or is hand-out as the case may be. It will be observed that in the service the shuttlecock must be sent from right court to right court, or from left to left, but in the return, by either player, it is only required that the shuttlecock shall drop within any part of the ground, bounded by the external line of all. In addition the shuttlecock must be struck before it touches the ground, and must be touched only with the racket, and must only be hit once, otherwise it counts against the striker. If the shuttlecock drops on the line enclosing the court served into, or in the return drops on the boundary line, it is generally reckoned as a let, ¢.e., the stroke or innings goes for nothing, and the server serves again. But this is an utterly useless rule, and it is better to count everything that drops on the line to the striker. In the case of a fault, or in the case of returns that are not according to the conditions, if the adversary returns or attempts to return the shuttlecock, the service or return counts the same as though it had been properly made. If the server scores he serves again, this time from his other court, and so on alternately from one court to the other as long as he scores. When he is hand-out, his adversary commences serving from either of the courts at his end, and, on scor- ing, serves from his other court, and so on. In partner games the disposition of the players, and the rules by which they conduct the game, as to the two hands in, and so forth, are identical with those which prevail at lawn

tennis. See TENNIS. (u. J.) BADNUR, the headquarters of the district of Betul, consists, besides the European houses, of two bazars. The

largest, the Kothi Bazdr, has a population of 2015 souls. The public buildings are the Commissioner’s court-house, the district court-house, the jail, the schools, the police- station, the post-office, the dispensary, &c. There isa good sardt or inn for native travellers, and a ddék bangalow or resting-place for Europeans. Not far from Badnur 18 Kherl4, the former residence of the Gond Rajas, where

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there is an old fort, now in ruins, which used to be held Paghem. Lat. 21°57’ N., long. 77° 59° E.

BADRINATH, a town and celebrated temple in Hindu- stan, in the British district of Garhwal, situate on the right bank of the Vishnugangé, a tributary of the Alaknanda River, in the middle of a valley nearly 4 mules in length, and 1 in breadth, in 30° 44’ N. lat. and 79° 32’ E. long. The town is small, containing only twenty or thirty huts, in which reside the Brahmans and the attendants on the temple. The building, however, which is considered a place of high sanctity, by no means corresponds to its great celebrity. It is about 40 or 50 feet in height, built in the form of a cone, with a small cupola, on the top of which is a gilt ball and spire, and contains the shrine of Badrinath, dedicated to an incarnation of Vishnu. The principal idol is of black stone, and is 3 feet in height. Badrinath is the favourite resort of pilgrims from all parts of India. In ordinary years the number varies from 7000 to 10,000 ; but every twelfth year, when the festival of Kumbh Meld is celebrated, the concourse of persons is said to be 50,000. In addition to the gifts of votaries, the temple enjoys a further source of revenue from the rents of villages assigned by former Rajas. Some years ago the temple was shat- tered by an earthquake, and has only been partially restored. It is situate among mountains rising 23,000 feet above the jevel of the sea. Elevation of the site of the temple, 10,294 feet.

BAENA, a town of Spain, in the province of Cordova, 8 leagues S.E. of the city. It is picturesquely situated, near the River Marbello, on the slope of a hill crowned with a castle, which formerly belonged to Gonzalo de Cordova, and is now the property of the Altamira family. It has four parish churches and three schools, one of which, exclusively for girls, has a high reputation in the province. The education, which is conducted by sisters of charity, does not go beyond reading, writing, arithmetic, and religious instruction. Grain and oil are the principal articles of commerce. The site of the Roman town (Baniana or Biniana) can still be traced, and various antiquities are frequently met with. A subterranean vault was discovered in 1833, containing twelve cinerary urns, with inscriptions commemorating various members of the Pompeian family. In 1292 Mahomet Ibn Aljama vainly besieged the city, the defence of which on that occasion is commemorated by the five Moorish heads in its coat-of-arms, Baena is the birthplace of Juan de Pejialosa. Population, about 12,000.

BAEZA (ancient Beatia), a city of Spain, in the province of Jaen. It stands on a considerable elevation, about 3 miles from the right bank of the Guadalquivir. Lat. 37° 59’ N., long. 3° 28’ W. ‘It is well built, and has a cathedral and several fine public buildings, among which the most worthy of notice are the university (founded in 1533, and for some time defunct), the oratorio of the order of St Philip Neri, and the marble fountain with Caryatides in the Plaza de la Constitucion. The Cordova and Ubeda gates, and the arch of Baeza, are among the remains of its old fortifications, which were of great strength. There is little trade or manufacture here. The principal productions of the neighbourhood are grain and oil. The red dye made from the native cochineal was formerly celebrated. In the time of the Moors Baeza was a flourishing city of 50,000 inhabitants, and the capital of a separate kingdom, but it never recovered from the sack of 1239. Itis the birthplace of Gaspar Becerra, the celebrated sculptor and painter. Present population, about 11,000.

BAFFIN, Wittiam, an able and enterprising English seaman, born in 1584. Nothing is known of his early life, and his fame rests entirely on the voyages undertaken by him during the years 1612 to 1616. In 1612 he accom- panied Captain James Hall on his fourth voyage in search

of the north-west passage, and in 1613 he commanded one of the English vessels engaged in the Greenland fisheries. In 1615 and 1616 Baffin made two voyages in the “Discovery” under Bylot, and on the second of them explored the large inlet, afterwards called Baffin’s Bay. The only accounts of these expeditions were given by Baffin himself, and later investigators have thoroughly confirmed his descriptions. In 1618 he is said to have been mate in a voyage to Surat and Mocha; and in 1621 he was killed while attempting, in conjunction with a Persian force, to expel the Portuguese from Ormuz. (See Purchas’s Pilgrims and the publica- tions of the Hakluyt Society for 1849.)

BAFFIN’S BAY, or Barrin’s SzA, is properly neither a bay nor a sea, but part of the long strait or inlet which separates Greenland from the N.E. coast of America. It extends from about 69° to 78° N. lat., and from 54° to 72° W. long, and is connected by Lancaster Sound and Barrow’s Strait with the Arctic Ocean. It was first explored in 1616 by the English navigator Baffin. The part of the strait to the south is known as Davis Strait, and the narrower channel to the north takes the name of Smith’s Sound. The coasts are generally high and precipitous, and are deeply indented with gulfs. The most important island on the east side is Disco to the north of Disco Bay, where there is a Danish settlement. During the greater part of the year this sea is frozen, and it is navigable only from the beginning of June to the end of September. It is annually visited by vessels engaged in the whale and seal fishery. (See Petermann’s Mittheil., 1873, map 13, and Markham’s Cruise in Baffin’s Bay.)

BAGATELLE is an indoor game, probably derived from the old English shovel-board, described by Cotton in his Compleat Gamester (1674), though many consider that its invention is due to the French. Like billiards, chess, and draughts, its origin is not certainly known ; but whatever its genesis, its name is undoubtedly French. Bagatelle games are played on an oblong board, usually from six to ten feet in length, by a foot and a half to three feet in width. The bed of the table, which is ordinarily of slate or mahogany, is covered with fine green cloth; and at the upper end, which is rounded, there are nine holes or cups, numbered from 1 to 9, thus

Into these holes ivory balls are driven by a cue in all respects similar to the instrument used in BILLIARDS, which see. The sides and circular end of the table are furnished with elastic cushions ; and in some of the newer tables there is also a pocket on each side. Nine balls— eight white, and one red or black (sometimes four white, four red, and one black)—are used in the most popular of the several bagatelle games.

The ordinary game is played according to the following rules :—

1, Any number of persons may play, whether singly or in sides. 2. Each player strings for lead, and he who lodges his ball in the highest hole begins. In the case of partners, one only on each side need string for the lead. 3. The player who wins the lead takes the nine balls and plays them one after the other up the table from baulk, first striking at the red ball which is placed on the spot about a foot below the 1 hole. The object of the player is to lodge his own, or the coloured ball, or both balls, in the holes. 4.‘The red ball counts double when it is played into a hole; and for each white ball lodged or holed, a corresponding number of points is scored to that marked

in the cup. (Sometimes two coloured balls are used, in which ease both count double.) 5 The red ball must be first struck, and the remainder of the balls are played up to the holes—the sum total of the holes made being the striker’s score. 6. Any number of rounds may be played for the game, as agreed on at the commencement; and the player (or side) obtaining the highest aggregate score wins. 7. Any ball that rebounds beyond the baulk line, or is forced over the table, is not re-used in that round.

Sans Egal, or the French Game, is the next most gene- rally played game on the bagatelle table. It is governed by the following laws :—1. The player who takes the lead (which is decided as in bagatelle) makes choice of four balls of either colour, and placing the black one on the spot, com- mences by striking it with a ball from baulk. 2. The other player then strikes up one of his balls, and so on alternately, 3 He who holes the black ball counts it towards his game, together with any number made by the white 4. If either player hole his adversary’s ball, the number scored by such ball, or balls, is

marked to the other side. 5. The player who makes the greatest number of points in each round wins the game, and takes the lead in the next. The rule as to balls rebounding beyond the baulk line, or being forced off the table, is the same as in the preceding game.

The Cannon Game, sometimes played on a table without holes, consists entirely of cannons, that is to say, two balls struck in succession by the cue-ball. This game is played 50, 100, or 150 up, and the holes into which the balls fall are soinetimes countedinadditionto thecannon. Three ballsonly are used—a white, a spot-white, anda black ball. At start- ing the latter is placed on the spot. and the adversary's ball on a point equi-distant between the first and centre holes, land 9 If the striker make a cannon, he goes on as long as he can score, but no hole can be counted without first making the cannon. To miss the white involves the loss of 1 point; and to miss the black ball, 5 points. The striker's break is ended when he fails to cannon, and then the other player goes on,—he who first gains the required number winuing the game. When there are pockets to the table, two points are taken for every white ball pocketed, and three points for the red. Should the player's ball fall into a pocket before he make the cannon, the score is taken by the opponent. Inthe Jrish Cannon Game the holes do not count, except by way of penalty ; all points made by holing the balls being added to the score of the adver- sary. Sometimes, in both the cannon games two points are taken for a cannon from white to white and then to red, and three fora cannon from white to red and then to white ; or, when two coloured balls are used, three points are taken for a cannon from the black to the red. – Lately, bagatelle tables as much as 14 feet long by 6 feet wide have been made for the cannon game.

Mississippi isa game played on a bagatelle table with a bridge pierced with arches, each arch bearing a certain number—say, from 1 to 10 or 12. The balls are first played from the baulk against the cushion on to the bridge, which is placed just in front of the lowermost hole. The rules are —J. If the ball pass through the bridge, all the points indicated on the arch are counted towards the player's score, in addition to any points made by the ball falling into a hole beyond the bridge. The game may be played by two or more persons, and he who first makes the number of points agreed on—100, 200, 500, &c.—wins, A modifi- cation of this game is called

Trou Madame. In this the balls are played from the baulk straight up to the bridge without touching the cushion, and only the points marked upon the arches score,— al] points made by the balls dropping into the holes beyond being scored to the opponent. Another variety, called

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Cockamaroo, or Russian Bagatelle, is played on a table prepared with a number of pins, holes, arches, and bells, up to and through which the ball is played from the baulk end of the table. It is a childish amusement, requiring little skill, and therefore needing only the barest mention.

In playing the bagatelle games a much less degree of force is required for the stroke than is necessary for bil- liards. Some adepts are able to fill all the holes at one essay ; first, by striking the red ball on the side, making a double hazard, say, into the 7 and the 8 holes, and then, either by playing direct at the holes or at the cushion, lodging each successive ball till the whole nine are pocketed. In this way, counting double for the red, as many as 54 points can be scored in a single round of the balls. When two coloured balls are used, of course a proportionally larger score is made. The cue should be held lightly between the fingers and thumb, not grasped in the palm of the hand; and much use may be made of the various strokes employed in billiards,—as the side, the screw, the twist, and the drag; for which terms see the article BILLIARDS. (a. F, B)

BAGGESEN, Jens EMMANUEL, the most prominent literary figure in Denmark during the latter part of last century, was born on the 15th of February 1765, at Korsdr. His parents were very poor, and before he was twelve he was sent to copy documents at the office of the clerk of the district. By dint of indomitable perseverance, he managed to gain an education, and in 1782 entered the university of Copenhagen. His success as a writer was coeval with his earliest publication ; his Comical Tales in verse, poems that recall the Broad Grins that Colman the younger brought out a decade later, took the town by storm, and the struggling young poet found himself a popular favourite at twenty-one. He then tried serious lyrical writing, and his tact, elegance of manner, and versatility, gained him

a place in the best society. This sudden success received a blow in 1788, when a very poor opera he had produced was received with mockery, and a reaction against him set in. He left Denmark in a rage, and spent the next years in Germany, France, and Switzerland. In the country last mentioned he married, began to write in German, and pub- lished in that language his next poem, Alpenlied. In 1790 he returned to his mother-country, bringing with him as a peace-offering his fine descriptive poem, the Labyrinth, in Danish, and was received with unbounded homage. The next twenty years were spent in incessant restless wan- derings over the north of Europe, Paris latterly becoming his nominal home. He continued to publish volumes alter- nately in Danish and German. In 1811 he returned to Copenhagen to find the young Ohlenschlager installed as the great poet of the day, and he himself beginning to lose his previously unbounded popularity. Until 1820 he re- sided in Copenhagen, in almost unceasing literary feud with some one or other, abusing and being abused, the most important feature of the whole being Baggesen's de- termination not to allow Ohlenschlager to be considered a greater poet than himself. He then went back to his beloved Paris, where he lost his wife and youngest child, and fell at last into a state of hopeless melancholy madness. In 1826, having slightly recovered, he wished to see Den- mark once more, but died at Hamburg on his way, on the 3d of October, and was buried at Kiel. His many-sided talents achieved success in all forms of writing, but his domestic, philosophical, and critical works have long ceased to occupy attention. A little more power of restrain- ing his egotism and passion would have made him one of the wittiest and keenest of modern satirists, and his comic poems are deathless. The Danish literature owes Baggesen a great debt for the firmness, polish, and form which he introduced into it—his style being always finished

and elegant. With all his faults he stands as the greatest figure between Holberg and Ohlenschlager. Of all his poems, however, the loveliest and best isa little simple song, called There was a time when I was very little, which every Dane, high or low, knows by heart, and which is matchless in its simplicity and pathos. It has outlived all his ete (x. w. 6.)

BAGHDAD, a Turkish pashalic or government of Asia, computed to have an area of above 100,000 square miles. It stretches in a N.W. direction, from the mouth of the Shatt-el-Arab at Bussorah, to Merdin, situated near the source of the Tigris; and from the confines of Persia to the banks of the Khabour, which separates it from the pashalic of Diarbekir. Its general boundaries are the Euphrates and the Arabian desert of Nejd to the W. and §., Kusistan and Mount Zagros to the E., the pashalic of Diarbekir to the N.W., and Armenia with the terri- tories of the Kurdish chief of Julamerick to the N. This great tract comprehends ancient Babylonia and the greatest part of Assyria proper. The first includes the space enclosed by the Tigris and the Euphrates, which is also known under the general appellation of Mesopo- tamia; and the second, that which is beyond the Tigris, commonly called Lower Kurdistan. This tract of country is an extensive and very fertile plain, and is watered by the Tigris and the Euphrates, which at Baghdad approach within 25 miles of each other, aud afford an inexhaustible supply of the finest water. Only some parts of these fertile districts, however, are cultivated, as the population consists in many places of wandering Arabs, who are averse to agriculture, and who, in their vagrant life of idleness and rapine, neglect all the natural advantages of the country. ‘The most productive portion of the pashalic is on the banks of the Shatt-el-Arab, in the neighbourhood of Bussorah. This tract, for upwards of 30 miles below that city, is well cultivated, and yields vast quantities of dates, wheat, barley, and various kinds of fruits. The banks of the Euphrates produce abundant crops of dry grain. Higher up the Euphrates, the country which is possessed by the Arabs is a low marshy tract, formed by the expansion of the Euphrates, and is famed for plentiful crops of rice. Among the mountainous districts of the Upper Euphrates the country is highly picturesque and beautiful; it is watered by the River Mygdonius (the Gozan of Scripture), and is in a tolerable state of cultivation. It produces in abundance the finest fruits, such as grapes, olives, figs, pomegranates, which are considered the most delicious in the East ; apples, pears, apricots of an inferior quality; and the finest dates, on which the inhabitants, as in other parts of Asia, depend in many cases for subsist- ence. The domestic animals are, the horse, for which the country has long been famed, the ass, camel, drome- dary, buffalo, and mule. Of the wild animals, the lion, the hyena, the jackal, the wolf, and the wild boar, are common; and antelopes are very numerous. Fares are plentiful, but foxes are seldom seen. All sorts

of poultry are bred except the turkey. On the cultivated lands, and on the borders of the rivers, the black partridge is met with in great numbers. Snipes and almost every species of wild fowl may be found in the marshes, and pelicans on the banks of the Euphrates and Tigris. In addition to these two rivers, the country is watered by the Khabour or Chaboras, formed by the junction of several small streams about ten miles to the S.W. of Merdin, and by the Mygdonius, or Gozan, the Hermas of the Arabs, which used formerly to discharge a part of its waters into the Euphrates through the Khabour, and a part into the Tigris through the Thirthar, passing by Hatra, but which is now entirely lost in a salt marsh at the foot of the Singar hills.

In ancient times the plain of Mesopotamia was occupied by the great and wealthy cities of Nineveh, Babylon, Seleucia, Ctesiphon, &c., and was in a high state of cul- tivation. It was intersected by many well-constructed canals and other works, which, in dispersing over the country the superfluous waters of the Tigris and Euphrates, proved extremely useful to agriculture. ‘These works are now all ruined, and not a vestige remains of many of the canals, while the course of others can only be faintly traced in their imperfect remains. One canal, however, called El-Hye, still exists; it connects the Euphrates and the Tigris exactly half-way between Bussorah and Baghdad, and is navigable in spring for large boats.

BAGHDAD, a city of Asia, formerly the capital of the empire of the caliph, and long renowned for its commerce and its wealth, is situated on an extensive and desert plain, which has scarcely a tree or village throughout its whole extent; and though it is intersected by the Tigris, it stands mostly on its eastern bank, close to the water’s edge. Old Baghdad on the W. is now considered as merely a suburb to the larger and more modern city on the eastern shore, the former containing an arca of only 146 acres, while the latter extends over 591. It has, however, numerous and extensive streets, well furnished with shops, and is protected by strong walls, with three gates opening towards Hillah on the Euphrates and Kazimeen. Beyond these modern bulwarks vestiges of ancient buildings, spreading in various directions, are visible in the plain, which is strewed with fragments of brick, tiles, and rubbish. A burying-ground has extended itself over a large tract of land formerly occupied by the streets of the city; and here is the tomb of Zobeide, the favourite wife of Haroun el Raschid, built of brick, of a high

octagonal shape, and surmounted by a lofty superstructure in the form of a cone. It was originally built in 827 a.p., but has been frequently restored. The two towns of Old and New Baghdad are connected by a bridge of thirty pon- toons. The form of the new city is that of an irregular oblong, about 1500 paces in length by 800 in breadth ; and a brick wall, about five miles in circuit, encloses the town on both sides of the river. This wall, which is built of brick, has been constructed and repaired at different periods ; and, as in most other works of the same nature in Mahometan countries, the oldest portion is the best, and the more modern the worst part of the fabric. At the principal angles are large round towers, with smaller towers intervening at short distances ; and on these large towers batteries are planted, with brass cannon of different calibre, badly mounted. Of two of these angular towers Mr Buckingham remarked that the workmanship is equal to any ancient masonry that he had ever seen. The wall has three gates —one on the S.E., one on the N.I., anda third on the N.W. of the city; and it is surrounded by a dry ditch of considerable depth. A fourth gate on the northern side, which has been closed since the capture of the city by Sultan Amurath IV. in 1638, is a good specimen of Saracenic brick-work. It was formerly called " the white Gate," but is now known as the " Bab-el-Zilism," or "'Talismanic Gate," from a fine Arabic inscription in relief on ascroll border round the tower, which bears the date of 618 a.n. (1220 a.p.) The town has been built without the slightest regard to regularity. The streets are even more intricate and winding than those in most other Eastern towns; and, with the exception of the bazaars and some open squares, the interior is little else than a labyrinth of alleys and passages. The streets are unpaved, and in many places so narrow that two horsemen can scarcely pass each other; and as it is seldom that the houses have windows facing the great public thoroughfares, and the doors are small and mean, they present on both sides the

gloomy appearance of dead walls. All the buildings, both public and private, are constructed of furnace-burnt bricks, of a yellowish-red colour, taken chiefly from the ruins of other edifices, as their rounded angles evidently show. A house is generally laid out in ranges of apartments open- ing into a square interior court, and furnished with subter- ranean rooms

called serdaubs, into which the inhabitants retreat during the day for shelter from the intense heats of summer ; and with terraced roofs, on which they take their evening meal, and sleep in the open air. Occasion- ally in the months of June, July, and August, when the Sherki or south wind is blowing, the thermometer at break of day is known to stand at 112° Fahr.; while at noon it rises to 119°, and a little before two o'clock to 122°, standing at sunset at 117°, and at midnight at

114°. But this scale of temperature is exceptional. During the summer months the wind is usually in the north-west, and the air, though hot, is fresh and exhilarat- ing, the thermometer ranging from about 75° at sunrise to 107° at the hottest time of the day. The interiors of the houses of the rich are splendidly furnished, and ornamented in the ceilings with a sort of chequered work, which has a handsome appearance. A great portion of the ground within the walls of the town is unoccupied by buildings, especially in the north-eastern quarter; and even in the more populous parts of the city near the river, a considerable space be- tween the houses is occupied by gardens, where pome- granates, grapes, figs, olives, and dates grow in great abundance, so that the city when seen from a distance has the appearance of rising out of the midst of trees.

Ground-Plan of the Enceinte of Baghdad. Reduced from Survey made by Commander F. Jones and Mr W. Collingwood of the Indian Navy, 1853-54.

The principal public buildings in Baghdad are the

mosques, the khans or caravanserais, and the serai or palace of the pasha. The palace, which is situated in the north-western quarter of the town, not far from the Tigris, is distinguished rather for extent than grandeur. It is

a comparatively modern structure, built at different periods,

and forming a large and confused pile, without proportion, beauty, or strength. There are no remains of the ancient palace of the caliphs.

In all Mahometan cities the mosques are conspicuous objects. The number in Baghdad is above 100; but of these not more than thirty are distinguished by the charac- teristic minarets or steeples, the rest being merely chapels and venerated places of prayer. The most ancient of these mosques was erected in the year of the Hegira 633, or 1235 of the Christian era, by the Caliph Mustansir. All that remains of the original building is the minaret, and a small portion of the outer walls; the former a short,

heavy erection, of the most ungraceful proportions, built |

of bricks of various colours, diagonally crossed. The jamah or mosque of Merjaneeah, not far distant from the former, though the body of it is modern, has some remains of old and very rich arabesque work on its surface, dating from the 14th century. The door is formed by a lofty arch of the Pointed form, bordered on both sides by rich bands exquisitely sculptured, and having numerous inscriptions. The mosque of Khaseki, supposed to have been an old Christian church, is chiefly distinguished by the niche for prayer, which, instead of a simple and unadorned recess, is crowned by a Roman arch, with square pedestals, spirally fluted shafts, a rich capital of flowers, and a fine fan or shell-top in the Roman style. Around the arch is a sculptured frieze; and down the centre, at the back of the niche, is a broad band, richly sculptured with vases, flowers, &c., in the very best style of workmanship,—the whole executed on a white marble ground. The building in its present state bears the date of 1682 a.p., but the sculptures which it contains belong probably to the time of the early

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caliphs. The mosque of the vizier, near the Tigris, has a fine dome and lofty minaret ; and the great mosque in the square of El Meidan is also a noble building. The others do not merit any particular notice. The domes of Baghdad are mostly high, and disproportionately narrow. They are richly ornamented with glazed tiles and painting, the colours chiefly green and white, which, being reflected from a polished surface, impart more liveliness than magni- ficence to the aspect of these buildings. In the opinion of Mr Buckingham, they are not to be compared to the rich and stately domes of Egypt, as the minarets, although they have the same bright assemblage of colours, are far from being equal “‘to the plain and grave

dignity of some of the Turkish towers at Diarbekir, Aleppo, and Damascus, or to the lighter elegance of many of those in the larger towns on the banks of the Nile.”

There are about thirty khans or caravanserais in Baghdad, all of inferior construction to those in the other large towns of Turkey. The only remarkable building of this class is called Khan-el-Aourtmeh, and adjoins the Merjaneeah mosque, to which it formerly belonged. The vaulted roof of this building is a fine specimen of Saracenic brick- work, and like the adjoining mosque, bears the date of 1356 a.p. It is said, however, to occupy the site of an ancient Christian church. The bazaars, which are numer- ous, are mostly formed of long, straight, and tolerably wide avenues. ‘The one most recently built is the largest and the best ; still it has an air of meanness about it that is not common in the bazaars of large Turkish cities. It is long, wide, and lofty, and well filled with dealers and wares of all sorts. Several of these bazaars are vaulted over with brick-work ; but the greater number are merely covered with flat beams which support a roof of straw, dried leaves, or branches of trees and grass. There are about fifty baths in Baghdad, which are also very inferior in their accommodations to those in the other large towns of Mesopotamia. The only other Mahometan remains which it is necessary to mention are—l. The Tekiyeh, or shrine of the Bektash dervishes, on the western bank of the river. The shrine is in ruins, but it contains a fine Cufic inscription now mutilated, which bears the date of 333 AH. (or 944 a.p.) 2. The tomb of the famous Maaruf-el-Kerkhi, in the immediate vicinity, dating from 1215 a.p. 3. In Eastern or New Baghdad the college of Mustansir, near the bridge, now in ruins, but bearing a fine inscription dated 630 a.u. (or 1233 a.p.) 4. The shrine of the famous Saint Abdul Kadir, which is visited by pilgrims from all parts of the Mahometan world. The original tomb was erected about 1252 a.p., but the noble dome which now canopies the grave dates from about two centuries later. An aqueduct, the only one in the city, conveys water from the river to this shrine. None of the other mosques or tombs require particular notice.

Baghdad is about 500 miles from the mouth of the Tigris (following its course), and about 400 from Bussorah; and with the latter place it carries on a constant communication by means of boats of from twenty to fiftytons burden, though the river is navigable for larger vessels. With a northerly

wind these boats will make the passage to Bussorah in seven or eight days; in calms, when they have merely the aid of the current, the passage occupies from ten to fifteen days. Sir R. K. Porter mentions that the stream of the Tigris runs at the rate of seven knots an hour. This, however, is probably during floods, since, with such a powerful current, a boat could not occupy ten or fifteen days on its passage from Baghdad to Bussorah. In coming up the stream, thirty or forty days are required to reach Baghdad. Of late years, however, steam communication has almost en- tirely superseded the use of the native craft between Bagh- dad and Bussorah. British steamers were first placed upon

the Tigris and Euphrates by Colonel Chesney in 1836, and, with the sanction of the Turkish Government, they have ever since been maintained there, one small vessel of the Indian naval service being attached to the British Residency, and two commercial steamers belonging to an English com- pany being employed in navigating the Tigris for trade pur- poses. The Turks have also endeavoured to establish a line of mercantile steamers of their own between Baghdad and Bussorah, but they have not hitherto been very successful, The smaller craft, used for bringing supplies of provisions and fruit to the city, are circular boats of basket-work, covered with skins, the same that have been employed from the remotest antiquity. The Euphrates and the Tigris are liable to spring floods ; and the streams of both rivers being sometimes joined, inundate the desert plain on which Bagh- dad stands, when the city appears like an island in the midst of the sea, The inhabitants are supplied with water from the Tigris, which is brought to their houses in goats’ skins, the convenience of water-works, cisterns, and pipes being entirely unknown.

Baghdad has much declined from its ancient importance. It was formerly a great emporium of Eastern commerce ; and it still receives, by way of Bussorah, from Bengal the manufactures and produce of India, which are distributed over Arabia, Syria, Kurdistan, Armenia, and Asia Minor. At the same time the inland trade from Persia and the East has fallen off. The productions and manufactures of Persia, which were intended for the Syrian, Armenian, and Turkish markets, and were sent to Baghdad as a

central depét, now reach Constantinople by the more direct route of Erzeroum and Tocat. Wealth, indeed, appears to be deficient among all classes, and Baghdad has many symptoms of a decayed city. It must, however, be noted that a very considerable trade has sprung up of late years between the European markets and Baghdad, several English houses being established in the city, who import goods direct from London and Liverpool, xa the Suez Canal and Bussorah, and French, German, Swiss, and Greek merchants being also engaged in the traffic. The staple articles of export are dates, wool, and grain, to which may be added cloth of various kinds, drugs, dye-stuffs, and miscellaneous produc- tions. A very considerable trade in horses is also carried on. The total value of the exports in 1870-71 reached about £46,900, while the imports for the same year were stated at upwards of £285,000. There is a considerable manufacture of red and ycllow leather, which is made into shoes, and finds a ready sale.

The population is a mixture of nations from various quarters of the East. The chief officers of Government, whether civil or military, are of the families of Constanti- nopolitan Turks, though they are mostly natives of the city; the merchants and traders are almost all of Persian or Arabian descent; while the lower classes consist of Turks, Arabs, Persians, and Indians, There are some Jews and Christians, who still remain distinct from the other classes; while the strangers in the town are Kurds, Persians, and desert Arabs in considerable numbers. Thc dress of the Baghdad Turks is not nearly so gay or splendid as that of their northern countrymen; and the costume of the residents is, upon the whole, unusually plain in com- parison with that of other Asiatics. As every nation retains its own peculiar dress, it may be easily conceived what an amusing variety of costume must be seen in the streets of Baghdad. The dress of the females is as mean as that used in the poorest villages of Mesopotamia; women of all classes being enveloped in a blue checked cloth, such as is worn by the lowest orders in Egypt, and having their faces covered by hideous veils of black horse-hair.

Baghdad is governed by a pasha, assisted by a council. He was formerly chosen from the ranks of the Georgian

Mamelukes, but is now always selected from among the highest officers of the Constantinople court, his term of office being usually for four or five years. He is also governor-general of Irak, and possesses supreme authority from Diarbekir to Bahrein, though he does not under ordinary circumstances interfere with the subordinate governments of Mosul and Kurdistan.*

The East India Company used to maintain a resident in Baghdad with a large establishment, and his post is now replaced by that of a consul-general and political agent. A French consul is also regularly appointed.

Until recently Baghdad was supposed to be entirely a Mahometan city, dating from the time of Al Mansur ; but Sir H. Rawlinson discovered in 1848, during an unusually dry season, when the rivers had fallen six feet below the ordinary low-water mark, that the western bank of the Tigris ' svas lined with an embankment of solid brick-work, dating from the time of Nebuchadnezzar, as the bricks were each stamped with his name and titles; and it has been since remarked that in the Assyrian geographical catalogues of the time of Sardanapalus, one of the Babylonian cities bears the name of Bagdad, and may thus very possibly represent the after site of the capital of the caliphs. According to the Arabian writers, however, there were no traces of former habitation when Al Mansur laid the foundation of the new city. It was adorned with many noble and stately edifices by the magnificence of the renowned Haroun el Raschid, who also built on the eastern side of the river, connecting the two quarters of the town by a bridge of boats. Under the auspices of Zobeide, the wife of that prince, and Jaffer the Barmecide, his favourite, the city may be said to have attained its greatest splendour. It con- tinued to flourish and increase, and to be the seat of ele- gance and learning, until the 656th year of the Hegira (1277 s.p.), when Hulaku the Tatar, the grandson of Genghis Khan, took it by storm, and extinguished the dynasty of the Abbassides. The Tatars retained possession of Baghdad till about the year 1400 of our era, when it was taken by Timur, from whom the Sultan Ahmed Ben Avis fled, and finding refuge with the Greek emperor, contrived afterwards to repossess himself of the city, whence he was finally expelled by Kara Yusef in 1417. In 1477 his descendants were driven out by Usum Cassim, who reigned 39 years in Baghdad, when Shah Ishmael the First, the founder of the royal house of Sefi, made himself master of it.

From that time it continued for a long period an object of contention between the Turks and Persians. It was taken by Soliman the Magnificent, and retaken by Shah Abbas the Great; and it was afterwards besieged by Amurath the Fourth, with an army of 390,000 men. After an obstinate resistance, it was forced to surrender 1638 a.p.; when, in defiance of the terms of capitu- lation, most of the inhabitants were massacred. Since

1 Besides the court of superior officers which assists the pasha in the general administration of the province, there is also a Mejlis, or mixed tribunal, for the settlement of municipal and commercial affairs, to which both Christian and Jewish merchants are admitted. Much, of course, depends on the individual character of the pasha, but, on. the whole, justice is fairly administered, and with less disposition perhaps to press on the non-Mussulman portion of the population than in any other city of Asiatic Turkey. The Jewish and Christian communities, indeed, from their wealth, intelligence, and long standing in the country, enjoy an exceptionally favourable social position, and live on terms of equality with their Mahometan neighbours.

Baghdad is also the headquarters of the army of Irak, and regular troops to the amount of five or six thousand men of all arms are usually kept together in the city, while an equal force is distributed in small garrisons in the Arab and Kurdish districts. Baghdad, after paying all its expenses, remits about £100,000 per annum to the imperial treasury, but its resources are capable of almost indefinite development, and there is indeed no reason why the valleys of the Tigris and Euphrates should not, under an enlightened government, yield a revenue fully equal to that of the valley of the Nile.

that period it has remained under a nominal subjection to the Turks. Baghdad, and the first who rendered the pashalic inde- pendent of the Porte, defended the town with such courage against Nadir Shah, that the invader was compelled to raise the siege, according to Colonel Chesney, previously to the great plague of 1830; but in 1853 Mr Layard estimated its population under 50,000. An estimate made in 1872 on a census taken in 1869 rises as high as 150,000, but this is in all probability an exag- geration (v. Allen’s Indian Mail, 1874). lat. 33° 21’N. Buckingham’s Travels in Mesopotamia

(1827);

Armenia, and Ancient Babylonia (1821-2 7 graphical Memoir of the Persian Empire (1818) ; Chesney's Expedition (1850); Rousseau's Description du pachaltk de Bagdad (1809); Wellsted's City of the Caliphs ; Grove's Residence in Baghdad (1830-32) ; Transactions of Bombay Geog. Soc. (1856).

tral Africa, lying to the S. of Lake Chad and S.W. of Bornu, It extends about 240 miles from N. to S., and has a breadth of barely 150 miles. with a slight inclination to the N., and the general eleva- tion is about 950 feet above sea-level. The Shari, a large and always navigable river, forms the western boundary, and throws out an important effluent called the Bachikam,

consists partly of lime and partly of sand, and is by no means unfertile. In many parts not a stone is to be seen.

grains in cultivation, but rice grows wild, and several kinds

and indigo are grown to a considerable extent, especially by Bornu immigrants.

Achmet, the greatest of the pashas of

after suffering great loss. Baghdad, had 110,000 inhabitants

Long. 44° 24' E.,

Sir R. K. Porter's Zravels in Georgia, Persia, Kinneir's Geo-

(H. ©. BR.) BAGHERMI, or BacrrM1, a district or kingdom of Cen-

The surface is almost flat,

which passes through the heart of the country. The soil

Negro-millet, sesamum, and sorghum are the principal of grass or poa are used as food by the natives. Cotton

Among the trees the most import- ant are the tamarind, the deleb-palm, the dum-palm, the hajilij or Balanites egyptiaca, the sycamore, and the cornel. The country often suffers from drought, and is greatly plagued with worms and insects, especially ants of all kinds, red, black, and white. The Kungjungjudu, a sort of beetle which does great damage to the crops, is eaten by the natives. A large proportion of the people have their feet mutilated by the attacks of a small worm, which takes up its residence in the first joint of the little toe and eats it gradually away. The inhabitants of Baghermi are a vigorous, well-formed race, who, according to their own traditions, came from the Far East several centuries ago. They speak a language cognate with those spoken by the Sara, who dwell about two degrees further south, and the Dor, who are situated at the confluence of the Dyor with the White Nile. On theirarrival they soon extended their power over the Fellata and Arabs already settled in the district, and after being converted to Mahometanism under Abd-Allah, their fourth king, they extended their authority over a large number of heathen tribes. The most import- ant of these are the Sokoro, the Bua, the Nyillam, the Sara, . the Tumok, and the Busso. They are almost all in a low . state of civilisation, and practise strange superstitions—a belief in a god whom they identify with thunder being the greatest extent of their religion. They are subject to the barbarous raids of their Baghermian masters, who derive from them a constant supply of slaves with which to pay the tribute demanded from them in their turn by the sultan of Bornu. For our knowledge of this district we are prin- cipally indebted to Barth and Nachtigal; the former was for some time a prisoner in Massefia, the capital.

See Barth, Zravels in Northern and Central Africa m 1849-53, vol. iii., and Nachtigal, in Petermann’s Mitthev. for 1874, and in Zeitsch. d. Ges. f. Hrdkunde xu Berlin, 1875.

BAG—BAG

BAGHMATI, a river of Hindustan, which has its source in the hills to the north of Katmandu, the eapital of Nepal, whence it flows in a southerly direction through the district of Tirhut in the province of Behar, and, receiving the waters of the Buchid on its north bank, and of Burd Gandak on its south bank, joins the Ganges, after a course of 285 miles, in 25° 23’

N. lat. and 86° 34’ E. long., about 8 miles below the town of Monghir, but on the opposite bank.

BAGLIVI, Gioraio, an illustrious Italian physician, descended from a poor persecuted Armenian family, was born at Ragusa in 1669, and assumed the name of his adoptive father, Pietro Angelo Baglivi, a wealthy physician of Lecce. He studied successively at the universities of Salerno, Padua, and Bologna; and after travelling over Italy, he went in 1602 to Rome, where, through the in- fluence of the celebrated Malpighi, he was elected professor of anatomy in the college of Sapienza. He died at Rome in 1707, at the early age of thirty-eight. A collection of his writings, which are all in the Latin language, was published in 4to in 1704, and has been several times repriuted in the same form. An edition in 2 vols. 8vo was published in 1788. Baglivi’s work De Fibra Motrice, is the foundation of that theory of medicine which was substi- tuted by Hoffmann and Cullen for the Humoral Pathology.

BAGNACAVALLO, Barrotommxgo, an Italian painter, who flourished about the beginning of the 16th century. His real name was Ramenghi, but he received the cogno- men Bagnacavallo from the little village where he was born in 1484. He studied first under Francia, and then proceeded to Rome, where he became a pupil of Raffaele. While studying under him he worked along with many others at the decoration of the gallery in the Vatican, though it is not known what portions are his work. On his return to Bologna he quickly took the leading place as an artist, and to him were due the great improvements in the general style of what has been called the Bolognese school. His works were considered to be inferior in point of design to some other productions of the school of Raffaelle, but they were distinguished by rich colouring and graceful delineation. They were highly esteemed by Guido and the Carracci, who studied them carefully and in some points imitated them. The best specimens of Bagnacavallo’s works, the Dispute of St Augustin and a Madonna with Child, are at Bologna. He died in 1542.

BAGNERES-DE-BIGORRE (the Vicus Aquensis of the Romans), the capital of an arrondissement in the depart- ment of Hautes-Pyrénées, is situated on the left bank of the Adour, 13 miles S.E. of Tarbes. It is one of

the princi- pal watering-places in France, and is much admired for its picturesque situation and the beauty of its environs, parti- cularly the valley of Campan, which abounds with beautiful gardens and handsome villas. The town is remarkably neat and clean, and many of the houses are built or orna- mented with marble. Its thermal springs and baths are numerous and varied, and are very efficacious in debility of the digestive organs and other maladies. Their temperature 1s from 90° to 135° Fahr. The season commences in May and terminates about the end of October, during which time the population is more than doubled. Manu- factures of woollen cloth, worsted, leather, pottery, and toys are carried on, and marble from the neighbouring quarries 1s wrought in the town. Greatly frequented by the Romans, and destroyed by the Gothic invaders, Bagnéres begins to appear again in history in the 12th century, and rose into permanent importance under the reign of Jeanne d'Albert, the mother of Henry IV. Per- manent pgpulation, about 9500.

BAGNERES-DE-LUCHON, a small well-built town of France, department of Haute-Garonne, pleasantly situated in the valley of the Luchon, at the foot of the Pyrenees.

It is celebrated for its sulphurous thermal springs, which vary in temperature from 88° to 180° Fahr. The bath- ing establishment is one of the most complete in Europe. The waters are employed with success in a variety of chronic affections, and about 10,000 patients visit the town annually. Resident population, about 3600.

BAGPIPE (Fr. musette, Ger. Sackpfeife, Ital. cornamusa), a musical instrument of unknown antiquity, which seems to have been at one time or other in common use among all the uations of Europe, and still retains its place in many Highland districts, such as Calabria, the Tyrol, and the Highlands of Scotland. The wind is generally supplied by a blowpipe, though in some cases bellows are used. These and other slight variations, however, involve no essential difference in character or construction, and a description of the great bagpipe of the Highlands of Scotland will serve to indicate the leading features of the instrument in all its forms. It consists of a large wind- bag made of greased leather covered with woollen cloth; a

mouth-tube, valved, by which the bag is inflated with the player's breath; three reed drones; and a reed chanter with finger-holes, on which the tunes are played. Of the three drones, one is long and two are short. The longest is tuned to A, an octave below the lowest A of the chanter, and the two shorter drones are tuned each an octave above the A of the longest drone; or, in other words, in unison with the lowest A of the chanter. The scale of the chanter has a compass of nine notes, all natural, extending from G on the second line of the treble stave up to A in alt. In the music performed upon this instrument, the players introduce among the simple notes of the tune a kind of appoggiatura, consisting of a great: number of rapid notes of peculiar embellishment, which they term warblers. No exact idea of these warblers can be formed except by hear- ing a first-rate player upon the Highland bagpipe. The history of the bagpipe can be clearly traced from the earliest periods by means of pictorial representations and references occurring in literature. The instrument probably consisted at first of the pipes without the bag, and in this form it is mentioned in Scripture (1 Sam. x. 5; Isa. v. 12; Jer. xlvui. 36), and was used by the Egyptians, the Greeks, and the Romans. The strain upon the player of these pipes was so great that he had to bandage up his lips and cheeks with a gopBela or mepiordutov, the Roman capistrum, a leathern inuzzle or headstall. It seems very probable that the bagpipe derived its origin from these double and triple reed-pipes, by the after addition to them of a wind-bag made of the skin of a goat or kid, together with a valved porte-vent,in order to relieve the strain on the lungs and cheeks of the player. There are several evidences that the bagpipe was well known in the time of Nero. It is represented on a coin of that reign, copied in Montfaucon's Antiquities, and Suetonius (Ver., 54) speaks of a promise made by Nero shortly before his death, that he would appear before the people as a bagpiper (utricu- carius). In medizval Latin the instrument is designated the Zibia utricularia. Chaucer represents the miller as skilled in playing the bagpipe; and Shakspeare's familiar allusion to "the drone of a Lincolnshire bagpipe" is suffi- cient of itself to disprove the common notion that the instrument has always been peculiar to Scotland.

BAGRATION, Peter, PRIncE, a distinguished Russian general, descended from the noble Georgian family of the Bagratides, was born in 1765. In 1782 he entered the Russian army and served for some years in the

Caucasus, In 1788 he was engaged in the siege of Oczacow, and afterwards accompanied Suwaroff, by whom he was highly esteemed, through all his Italian and Swiss campaigns. He particularly distinguished himself in 1799 by the eapture of the town of Brescia. In the wars of 1805 his

desired junction at Smolensk. He was mortally wounded in the bloody battle of the Borodino, 7th Sept. 1812, and died one month later.

achievements were even more brilliant. With a small force he withstood for several hours the united troops of Murat and Lannes, and though half his men fell, the retreat of the main army under Kutusoff was thereby secured. At BAHAMAS, or Lucayas, a very numerous group of Austerlitz he had the command of the advanced guard of | islands, cays, rocks, and reefs, comprising an area of 3021 Prince Lichtenstein's column, and at Eylau and Friedland | square miles, lying between 21°42' and 27° 34' N. lat. and he fought with the most resolute and stubborn courage. | 72°40' and 79°5' W. long. They encircle and almost enclose In 1808 he commanded in Finland, and in 1809 in Turkey, | the Gulf of Mexico, stretching more than 600 miles from and was almost uniformly successful in his operations. In | the eastern coast of Florida to the northern coast of St the famous Russian campaign of 1812 the corps under his | Domingo, and are traversed by only three navigable leadership had been separated from the main army under | channels—Ist, the Florida Channel to the N., which Barclay de Tolly, and was defeated by Davoust at | runs along the coast of the United States and lies to the Mohilev. Bagration, however, succeeded in effecting the ' westward of the whole Bahama group; 2d, the Providence

Stream

fa] & Gus

Cy

Sketch-Map of the Bahama Islands,

Channels, passing through the group

to the N., and | limestone, honeycombed and perforated with innumerable

separating the Great and Little Banks; and 3d, the old ! cavities, without a trace of primitive or volcanic rock ; the Bahama Channel, which passes to the 8. of the Great Bahama | surface is as hard as flint, but underneath it gradually

Bank, between it and Cuba. The islands lie for the most part on the windward edge of the Great and Little Banks, or of the ocean sounds or tongues which pierce them. The total number of islands is 29, while the cays are reckoned at 661, and the rocks at 2387. The principal islands are New Providence (which contains the capital Nassau), Abaco, Harbour Island, Eleuthera, Inagua, Mayaguana, St Salva- dor, Andros Island, Great Bahama, Ragged Island, Rum Cay, Exuma, Long Island, Crooked Island, Acklin Island, Long Cay, Watling Island, the Berry Islands, and the Biminis. Turk’s Island and the Caicos, which be- long geographically to the Bahama group, were separated politically in 1848. The formation of all the islands is

softens and furnishes an admirable stone for building, which can be sawn into blocks of any size, these hardening on exposure to the atmosphere. The shores are generally low, the highest hill in the whole range of the islands being only 230 feet high. The soil, although very thin, is very fertile. On Andros Island and on Abaco there is much large timber, including mahogany, mastic, lignum vite, iron, and bullet woods, and many others. Unfortu- nately the want both of labour and of roads renders It m- possible to turn this valuable timber to useful account. The fruits and spices of the Bahamas are very numerous,—the fruit equalling any in the world. The produce of the islands includes tamarinds, olives, oranges, lemons, limes, eitrons,

the same,—calcareous rocks of coral and shell hardened into | pomegranates, pine-apples, figs, sapodillas, bananas, sower-

BAHAMAS

sops, melons, yams, potatoes, gourds, cucumbers, pepper, cassava, prickly pears, sugar cane, ginger, coffee, indigo, Guinea corn and pease. ‘Tobacco and cascarilla bark also flourish ; and cotton is indigenous, and was woven into cloth by the aborigines. ; ;

It is a remarkable fact that except in the island of Andros, no streams of running water are to be found in the whole group. The inhabitants derive their water supply from wells, the rain-water in which appears to have some con- nection with the sea, as the contents of the wells rise and fall with the tide upon the neighbouring shore. The Baha- mas are far poorer in their fauna than in their flora. It is said that the aborigines had a breed of dogs which did not bark, and a small coney is also mentioned. The guana also is indigenous to the islands, Oxen, sheep, horses, and other live stock introduced from Europe, thrive well, but of late years very little attention has been paid to stock rearing, and Nassau has been dependent upon Cuba for its beef, and on the United States or Nova Scotia for its mutton. There are many varieties of birds to be found in the woods of the Bahamas; they include flamingoes and the beautiful humming-bird, as well as wild geese, ducks, pigeons, hawks, green parrots, and doves. The waters of the Bahamas swarm with fish, and the turtle pro- cured here is particularly fine. In the southerly islands there are salt ponds of great value.

The story of the Bahamas is a singular one, and bears principally upon the fortunes of New Providence, which, from the fact that it alone possesses a perfectly safe harbour for vessels drawing more than 9 feet, has always been the seat of Government, when it was not the headquarters of lawless villainy. St Salvador (Cat Island, or as some sup- pose, Watling Island), however, claims historical precedence as the landfall of Columbus on his memorable voyage. He passed through the islands, and in one of his letters to Ferdinand and Isabella he said, “This country excels all others as far as the day surpasses the night in splendour; the natives love their neighbours as themselves ; their con- versation is the sweetest imaginable ; their faces always smiling ; and so gentle and so affectionate are they, that I swear to your highness there is not a better people in the world.” But the natives, innocent as they appeared, were doomed to utter destruction. Ovando, the governor of Hispaniola, who had exhausted the labour of that island, turned his thoughts to the Bahamas, and in 1509 Ferdinand authorised him to

procure labourers from these islands. It is said that reverence and love for their departed rela- tives was a marked feature in the character of the aborigines, and that the Spaniards made use of this as a bait to trap the unhappy natives. They promised to convey the ignorant savages in their ships to the “heavenly shores,” where their departed friends now dwelt, and about 40,000 were transported to Hispaniola to perish miserably in the mines. From that date until after colonisation of New Providence by the English, there is no record of a Spanish visit to the Bahamas, with the exception of the extraordinary cruise of Juan Ponce de Leon, the conqueror of Porto Rico, who passed months searching the islands for “ Bimini,” which was reported to contain the miraculous “ Fountain of Youth.”

The deserted islands were first visited by the English in 1629, and a settlement formed in New Providence, which they held till 1641, when the Spaniards expelled them but made no attempt to settle there themselves. The English again took possession in 1667, and in 1680 Charles II. made a grant of the islands to George, Duke of Albemarle ; William, Lord Craven; Sir George Carteret ; John, Lord Berkeley ; Anthony, Lord Ashley; and Sir Peter Colleton, Governors were appointed by the lords proprie- tors, and there are very copious records in the state papers

of the attempts made to develop the resources of the island ; but the repeated attacks of the Spaniards, and the tyranny and mismanagement of the governors, proved great obstacles to success. In July 1703 the French and Spaniards made a descent on New Providence, blew up the fort, spiked the guus, burnt the church, and carried off the governor, with the principal inhabitants, to the Havannah ; and in October the Spaniards made a second descent, and completed the work of destruction. It is said that when the last of the governors appointed by the lords proprietors, in ignorance of the Spanish raid, arrived in New Providence, he found the island without an inhabitant. It soon, however, became the resort of pirates, and the names of many of the worst of these ruffians is associated with New Provi- dence, the notorious Blackbeard being chief among the nuinber. At last matters became so intolerable that the merchants of London and Bristol petitioned the Crown to take possession and restore order, and Captain Woods Rogers

was sent out as the first Crown governor, and arrived at New Providence in 1718. Many families of good character now settled at the Bahamas, and some progress was made in developing the resources of the colony, although this was interrupted by the tyrannical conduct of some of the governors who succeeded Captain Woods Rogers. At this time the pine-apple was introduced as an article of cultivation at Eleuthera ; and a few years subse- quently, during the American war of independence, colonists arrived in great numbers, bringing with them wealth end also slave labour. Cotton cultivation was now attempted on a large scale. In 1783, at Long Island, 800 slaves were at work, and nearly 4000 acres of land under cultivation. But the usual bad luck of the Bahamas pre- vailed ; the red bug destroyed the cotton crops in 1788, and again in 1794, and by the year 1800 cotton cultiva- tion was almost abandoned. ‘There were also other causes that tended to retard the progress of the colony. In 1776 Commodore Hopkins, of the American navy, took the island of New Providence ; he soon, however, aban- doned it as untenable, but in 1782 it was retaken by the Spanish governor of Cuba. The Spaniards retained nominal possession of the Bahamas until 1783, but before peace was notified New Providence was recaptured by a loyalist, Colonel Deveaux, of the South Carolina militia, in June 1783. In 1787, the descendants of the old lords proprietors received each a grant of £2000 in satisfaction of their claims, and the islands were formally reconveyed to the Crown. The Bahamas began again to make a little progress, until the separation of Turks and Caicos Islands in 1848, which had been hitherto the most productive of the salt-producing islands, unfavourably affected the finances. Probably the abolition of the slave-trade in 1834 was not without its effect upon the fortunes of the landed proprietors.

The next event of importance in the history of the Bahamas was the rise of the blockade-running trade, con- sequent on the closing of the southern ports of America by the Federals in 1861. At the commencement of 1865 this trade was at its highest point. In January and February 1865 no less than 20 steamers arrived at Nassau, importing 14,182 bales of cotton, valued at £554,675. The extraordinary difference between the normal trade of the islands and that due to blockade-running, will be seen by comparing the imports and exports before the closing of the southern ports in 1860 with those of 1864. In the former year the imports were £234,029, and the

exports £157,350, while in the latter year the imports were £5,346,112, and the exports, £4,672,398. The excite- ment, extravagance, and waste existing at Nassau during the days of blockade-running exceed belief. Individuals may have profited largely, but the Bahamas probably

benefited little. ‘The Government managed to pay its debt amounting to £43,786, but crime increased, and sickness became very prevalent. The cessation of the trade was marked, however, by hardly any disturbance ; there were no local failures, and in a few months the steamers and their crews departed, and New Providence subsided into its usual state of quietude. This, however, was not fated to last long, for in October 1866 a most violent hurricane passed over the island, injuring the orchards, destroying the fruit-trees, and damaging the sponges, which had proved hitherto a source of profit. The hurricane, too, was followed by repeated droughts, and the inhabitants of the out-islands were reduced to indigenco and want. There was an increase, however, in the production of salt. The exports as a whole fell off. Those of native produce, which in 1866 had been £77,604, were reduced in 1867 to £71,117, and the remaining exports of 1866, amounting to £184,372, were, in 1867, £156,131. The depression has continued almost to the present time (1875). The public debt paid off during the days of the blockade-running swelled again toa sum of £54,161, 13s. 2d., and the revenue until very lately was steadily on the decline. It was £47,530 in 1870, while the expenditure was £48,598, and in 1872 there was a further decrease of revenue to £37,574, with an expenditure of £39,000. In 1873 there was, however, an improvement. The revenue rose to £44,053, the ex- penditure being only £42,737, The improvement in the finances is due principally, it would seem, to the readjust- ment of the customs’ duties. In a recent Blue Book it is stated that the Government in 1873 increased the duties on ale, brandy, gin, rum, and whisky by 50 per cent.; on cigars and tobacco, by 100 per cent.; and on wine by 200 per cent. As regards other articles the Assembly at the same time relieved the general consumer by reducing the 25 per cent. ad valorem duties to 15 per cent. They abolished the export duty on vessels in distress, and they reduced the tonnage and

wharfage dues. They also abolished a licence fee, payable hitherto by the men employed as wreckers, and they repealed a special income- tax levied upon public officers. The last colonial report expresses a hope and a belief that the sound financial con- dition to which the colony has been restored will continue. The hope, however, hardly seems justified at present by the commercial progress of the Bahamas, In 1870 the imports were of the value of £283,970. In 1872 they had fallen to £201,051, and in 1873 they had increased to £226,306, In like manner the exports of 1873 con- trasted favourably with those of 1872, having increased from £136,224 to £156,613. But the increase in exports is due to the development of trade in articles, such as pine- apples and oranges, the production of which is uncertain, since a season's crop may perish ina hurricane. The sponge trade is not so prosperous as it should be, the Spanish authori- ties, it appears, interfering with the spongers working on the reefs near Cuba; while the excessive duty levied in the United States on salt has almost paralysed the salt-making trade of the Bahamas. The total number of pine-apples exported to the United States and England in 1873 was 422,994 dozen, valued at £38,767. To this must be added the tinned fruit, a branch of industry introduced in 1872. Pine-apples in tins were exported in the follow- ing year to the number of 69,165 dozen, valued at £13,018, and cases of pine-apples from the same establish- ment to the value of £1712. The exportation of other fruit was—of oranges, 2,252,000, valued at £3822; of Bananas, 7172 bunches, valued at £346 ; and about £700 worth of grape-fruit, shaddocks, lemons, limes, and melons. One great and profitable business at the Bahamas has decreased, and is not likely to flourish again. There has

been of late years a marked diminution in the number of marine casualties, which in past times threw into the ports of the colony a large amount of valuable property, of which a great part was frequently exported. The erection of lighthouses, the diversion of trade from the southern ports of America, and the increased use of steam, have all tended to this decline of the wreckers' trade, and it is said that the people of Harbour Island, at one time the great stronghold of the wreckers, have now all turned their attention to the cultivation of pine-apples. In 1864 the number of wrecks

reported was, including complete and partial, 67, while in 1871 it was but 39.

The colony is divided into 13 parishes, although the division is now used for civil purposes only. An Act to amend the ecclesiastical laws of the colony was assented to on the Ist of June 1869, and confirmed on the 7th of October 1869, and the Church of England at the Bahamas disestablished. ‘The population of the islands taken at the census of 1871 was 39,162 (being an increase in the decennial period since 1861 of 3875), of whom 19,349 were males, and 19,813 females, With regard to race, it may be said that the native and coloured inhabitants now enormously outnumber the white colonists. The last return showing the varieties of race was published in 1826 ; the population was 16,033, of whom 4588 were white, 2259 coloured, and 9186 black; since then the proportion of coloured and black to white has increased. The health of the colony has been improving of late years ; the death-rate of 1872 was only 17°9 in 1000. The total births were 1475 against 704 deaths. ‘The climate of the Bahamas has always borne a reputation for salubrity. The mean of a series of daily observations of temperature for 10 years is as follows :—

Height of Thermometer in Degrees Fahr. at 9 A.M. Med. Min.

FEST CGT page aero 75 70 66 RGDIutary .<.6:0JWENFON sooeseesness va5ode 78 72 66 SAS beeccabsasvaceree eee 81 75 68 WME ong esiclen sic ceieer 84 78 7 iMate Gerad enonenedaacns 88 81 74 HAWS gneecppereanmouncant 88 82 75 MAMIO USM Fadearesecsclons 88 81 75 September ….....- 86 81 75 October .ciscae

The rainfall is heavy from May to October. During the winter months it is small, and from the month of Novem- ber up to April the climate of New Providence is most agreeable, Advantage has been taken of this for many years by the inhabitants of the mainland of America, who can escape by a four days’ voyage from the icy winter of New York to the perpetual summer of the Bahamas. New Providence has gained a name as a resort for the consumptive, and perhaps justly so far as the Anglo-Saxon race is concerned, but the Africans and coloured races suffer greatly from diseases of the lungs, and the black troops stationed at Nassau have always been notorious for the proportion of men invalided from con- sumptive disease.

The principal religious denominations are the Wesleyan, Baptist, Church of England, and Presbyterian. The following figures represent approx mately the number of persons generally attending the churches and chapels of the several denominations :— Wesleyan, 7370; Baptist, 7971; Church of England, 4250; Presbyterian, 300. There is no Roman Catholic place of worship in the islands, and the members of that church are very few in number. The constitution of the Bahamas consists of a governor, aided by an executive council of 9 members, a legislative councilof 9 members,

and a representative assembly of 28 members. The qualifications of electors are full age, a residence of twelve months, six of which must have been as a freeholder, or a resi- dence of six months and a payment of duties to the amount of £26, 0s. 10d. The qualification of members is possession of an estate of real or personal property to the value of £500, The executive is composed partly of official and partly of unofficial members; the latter have usually a seat in one of the branches of the legislature. There are 35 Government schools in the Bahamas, 5 of which are in New Providence, and 30 in the out islands. These schools are managed by an education board composed of 5 or more members, with the governor as president. The legislative grant for educational purposes is £2200 a year, exclusive of the salary of the inspector of schools, who is porne upon the civil establishment on a salary of £200. The number of children on the books is about 3006, and there are 1200 in addition attending schools in connection with the Church of England. It is calculated that about 55 per cent. of the children between 5 and 15 attend school. The isolation of the settlements, the low salaries of the teachers, and the indifference of parents, are great obstacles to the spread of sound education in the Bahamas.

There are numerous lighthouses in the group, the princi- pal being at Gun Cay, Abaco, Cay Sal, Great Isaacks, Cay Lobos, Stirrups Cay, Elbow Cay, Castle Island, Hoy Island, and Athol Island. ‘The chief institutions of the Bahamas are to be found in New Providence. They include a savings’ bank, a public library, a well-conducted newspaper press, the Agricultural Society, Bahama Institute, Fire Brigade, the New Providence Asylum, Public Dispensary, St Andrew’s Charitable Society, a provincial grand lodge of

freemasons, &c. There are also libraries at Dunmore Town, in Harbour Island, at Matthew Town, Inagua, at New Plymouth, at Abaco, &ec. (J. ‘T. w. B.)

BAHIA, a province of the Brazilian empire, situated on the S.E. coast, and extending from the Rio Grande do Belmonte in the S. to the Rio Real in the N. It is bounded by Sergipe and Pernambuco on the N., by Piauhi on the N.W., by Goyaz on the W., and on the S. by Minas Geraes and Espirito Santo. It has an area of 202,272 square miles, and its population is stated at 1,450,000. Bahia sends 14 deputies to the general assembly of the empire, and 7 senators to the upper house, while its own legislative assembly consists of 36 members. Besides Bahia the capital, Olivenga, Branca, Jacobina, and Joazeira are important towns. A chain of mountains, broken into numerous sierras, runs from N. to S. through the province at the distance of 200 miles from the coast, while the intermediate district gradually rises in suc- cessive terraces. The maritime region, the so-called Aecon- cavo, is remarkably fertile, and is studded with thriving towns and villages, but the interior is often very dry and barren, and is only thinly peopled in many places with wandering Botacudos. The main sources of the wealth of the province are cotton, coffee, sugar, and tobacco, all of which are cultivated with the greatest success. Mandioc, rice, beans, and maize are grown; also jalap, ipecacuanha, and saffron, as well as oranges, mangoes, and various other fruits. A large portion is still covered with primeval forest, but the woodman is rapidly diminishing the extent. The mineral wealth of the province is but partially explored and still more partially utilised. In 1844 diamond mines were discovered to the N. of the River Peraguass, and, till the deposits near the Cape of Good Hope were brought to light, afforded employment to a large number of garim- pewros or “ washers.” The discovery of amethysts at Catité in 1872 attracted numerous searchers; and about the same time coal was found in the island of Itaparica, Gold is present in the alluvium of the River San Francisco.

BAHIA, or, in full, San Satvapor DA BAHIA DE TODOS os Santos, a large city, and, till 1763, the capital of Brazil, is situated on the S.E. coast on the Bay of All Saints, from which it takes its name, in 13°S. lat., and 38°

20’ W. long. Built partly along the foot and partly on the top of a steep hill, it consists of an upper and lower town, com- munication between the two being effected by large flights of steps, and since 1873 by a powerful hydraulic elevator. The carrying of goods and passengers up and down these stairway-streets affords employment to a large number of negro porters and chairmen. The lower town, or Praya, consists mainly of one long and narrow street, with still narrower and more tortuous lanes. The houses are built of stone, and many of them are several stories high. This is the business part of the city, where are situated the quays, docks, warehouses, custom-houses, exchange, and arsenal; and here the sailors, porters, and lower classes generally reside. The church of Mostra Senora da Praya is remarkable as having been built of stones that were hewn in Lisbon and shipped across the ocean. ‘The upper city has wide and well-paved streets, open squares, and pleasant promenades, adorned with orange trees and bana- nas. The most important isthe Passeto Publico, which was opened in 1814, and overlooks the beautiful bay. There is no city in Brazil that can vie with Bahia in the number and splendour of its ecclesiastical buildings, among which the Jesuits’ college, now used as a hospital, and the cathedral, which is built of marble, are pre-eminent, There are likewise numerous educational institutions, includ- ing a lyceum (in which Latin, Greek, French, and English, mathematics, philosophy, &c., are taught), a theological seminary, and a medical academy, which is supported by the imperial Government, and has about 400 students. The museum and public library also deserve mention. Among the buildings connected with the civic and commercial acti- vity of the city are the government-house, the court-house, the mint, and the town-house; also the Alfandega, where all foreign importations have to be entered, and the Consolado, where all native productions are registered for exportation. There are likewise a number of banks and commercial asso- ciations of various kinds. Bahia has long been a place of great traffic. The streets of the upper city are very in- conveniently paved, but the city and its suburbs are now connected by street railways, two running in the upper town and one in the lower. Bomsim is the name of the northern suburb, and Victoria that of the southern ; the foreign merchants for the most part reside in the latter. The commerce principally consists in the exportation of cotton, coffee, sugar, rum, tobacco, and rosewood, and the importation of miscellaneous foreign goods. The value of the imports in 1870 was £1,671,676, of which £885,206 belonged

to Britain. The exports of the same year were valued at £1,790,928. The bay is one of the finest in America, and is well defended by forts. The entrance is protected by the large island of Itaparica, which has upwards of 16,000 inhabitants, of whom more than 7000 are collected in the town of San Gonzalo. A large number of these are em- ployed in the whale-fishery, which has greatly fallen off, however, from its former prosperity.

Bahia was visited in 1503 by Amerigo Vespucci. The first settlement was founded and called San Salvador by Diego Alvarez Correa, who had been shipwrecked on the coast ; but the Portuguese governor who gave formal existence to the city was Thomas de Souza, who landed in 1549. It owed its increase to the Jesuits, who defended it against the English in 1588. In 1623 it fell into the hands of the Dutch, who held it for two years. In 1823 it was surrendered by the Portuguese to the Brazilian nationality. A revolution, which broke out in the city in 1837, was suppressed by the imperial Government. The

first printing-press was introduced in 1811, and the first sugar-mill in 1823. Tn 1858 railway communication was established to Joazeiro.

BAHRDT, Kart Friepricu, a German theologian, distinguished for his extreme rationalism and his erratic life, was born in 1741 at Bischofswerda, of which place his father, afterwards professor of theology at Leipsic, was for some time pastor. He was educated chiefly at the celebrated school of Pforta, and afterwards entered the university of Leipsic, where he studied theology, and at first attached himself to the strongly orthodox party headed by Crusius. After graduation he lectured for a time as adjuuct to his father, and then with the rank of catechist proceeded to Leipsic, where he became exceedingly popular as a preacher, and was appointed extraordinary professor of Biblical philology. During this period of his life he pub- lished a popular book of devotions, called the Christian in Solitude. In 1768 the notorious irregularity of his conduct necessitated his resignation and his departure from Leipsic. By some influence he obtained a professorship of Biblical antiquities in the philosophical faculty of the new univer- sity of Erfurt, and having procured a theological degree from Erlangen, he again began to read theological lectures. His orthodoxy had by this time

completely vanished ; he was an avowed rationalist of the extreme school, and with great diligence and ability sought to popularise the prin- ciples of his creed. At the same time his bitter and quarrelsome disposition embroiled him with his colleagues, and in 1771 he left Erfurt, but obtained another professor- ship at Giessen. Here also the bold expression of his opinions cut short his tenure of office ; in 1775 he resigned and became director of Von Salis's educational establish- meut, the philanthropin at Marschlins, a post he held for only one year. For a brief period he acted as general superintendent at Diirkheim, and then endeavoured, but unsucessfully, to set up an educational institution at Heidesheim. He had now become most obnoxious to the German Government, who prohibited him from lecturing or publishing any work on theology, or from holding any professorial office. In 1779 he took refuge in Halle, where he resided for ten years, lecturing in the forenoon on moral philosophy, and officiating in the afternoon as land- lord of a public-house which he had opened at the gate of the town, and which was largely patronised by the students. In 1789 he was arrested, partly on account of a pasquinade he had written upon the Prussian religious edict, and was condemned to two years' imprisonment. 'The period of his confinement, reduced by the king to one year, was employed by Bahrdt in writing memorials of his life and opinions. After his release he continued his former course of life, and died after a severe illness, 23d April 1792. His numerous works, including a translation of the New Testament, are comparatively worthless, and are written in an offensive tone. He has been well called by Herzog a caricature of the rationalism of the 18th century.

BAHREIN, the principal island of a cluster in the Persian Gulf, in an indentation of the Arabian coast. It is about 70 miles long and nearly 25 broad, and is very flat and low except towards the east, where a range of hills attain an elevation of 800 or 900 feet. The climate is mild, but humid, and rather unhealthy. The soil is for the most part fertile, and produces rice, pot herbs, and fruits, of which the citrons are especi- ally good. Water is abundant, but frequently brackish. Fish of all kinds abound off the coast, and are very cheap inthe markets. The inhabitants are a mixed race of Arab, Omanite, and Persian blood, slender and small in their physical appearance ; they possess great activity and in- telligence, and are known in all the ports of the Persian Gulf for their commercial and industrial ability. The

traffic in the island itself is great and various, the harbour of Manama, which admits vessels of 200 tons, being largely frequented by ships from Persia, Sindh, India, &c. This town, which has in some respects supplanted the older and more inland Ruffin, is well built, and contains about 25,000 inhabitants ; and there are besides about 15 villages in the island. There is a city of almost equal extent in the neighbouring and smailer island of Mohanek, but the trade is not so great. Bahrein has from a remote period been famous for its pearl fishery, which produces the finest pearls in the world. The Portuguese obtained possession of the islands in 1507, but were driven from their settle- ments in that quarter by Shah Abbas in 1622. The islands afterwards became an object of contention between the Persians and Arabs, and at last the Arabian tribe of the Athubis made themselves masters of them in 1784. Since then they have been for some time subject more or less to the Wahabees, whose interference has greatly damaged the commerce of the ports, and led to extensive emigration of the inhabitants. (See Palgrave, in J. Roy. Geo. Soc., vol. xxxiv.)

BAILA, an ancient town of Campania, Italy, situated between the promontory of Misenum and Puteoli, on the Sinus Baianus, and famous for its warm springs and baths, which served the wealthier Romans for the purposes both of health and pleasure. The variety of these baths, the mild- ness of the climate, aud the beauty of the landscape, capti- vated the minds of the opulent nobles. The habitations at first were small and modest; but increasing luxury added palace to palace, and enterprising architects, supported by boundless wealth, laid the foundations of new erections in the sea. From being a place of occasional resort for a season, Baiz grew up into a city, and the confluence of wealthy inhabitants rendered it as much a miracle of art as it had before been of nature, though it never attained the rank of a municipiwm, but continued to be dependent on Cume. C. Marius, Lucullus, Pompey, and Julius Cesar are among the most remarkable of those who gave éclat to Baiz during the republic ; and at a later period it was a favourite resort of Nero, Caligula, Hadrian, and Severus. It flourished till the days of Theodoric the Goth; but its destruction followed quickly upon the irruption of the northern conquerors. When the guardian hand of man was withdrawn, the sea reclaimed its old domain; moles and buttresses

were washed away; and promontories, with the proud towers that once crowned their brows, were under- mined and tumbled into the deep. Innumerable ruins, heaps of marble, mosaics, and other relics of the past, attest the ancient splendour of the city. The most remark- able are the so-called temples of Mercury, Venus, and Diana, and various buildings which, rightly or wrongly, have been assigned to the more famous of those who are known to have had villas in the town. The Castello di Baja was built in the 16th century by Pietro di Toledo. Long. 14° 3’ E., lat. 40° 50’ N.

BAIBURT, a town of Asiatic Turkey, in the pashalic of Erzeroum, and 65 miles W.N.W. from that city. Accord- ing to Neumann it was an Armenian fortress in the Ist century, and it is identified by Ritter with the Bazberdon fortified by Justinian. It was afterwards one of the strong- holds of the Genoese, when prosecuting their trade with India. Remains of their fortifications still exist, but in a very dilapidated state, the Russians having blown up the defences in 1829. (See viewin Yule’s Marco Polo, vol. i.) Population of town about 6000. –

BAIF, Jean ANTOINE DE, poet of the French Renais sance and member of the Pleiad, was the natural son of Lazare de Baif and an Italian girl. He was born in 1532 at Venice, where his father was residing as French ambassador. Thanks, perhaps, to the surroundings of his childhood, he

grew up a fanatic for the fine arts, and surpassed in zeal all the leaders of the Renaissance in France. Besides writing an immense number of short poems of an amorous or congratulatory kind, he translated or paraphrased various pieces from Bion, Moschus, Theocritus, Anacreon, Catullus, and Martial. He resided in Paris, enjoyed the continued favour of the court, and founded the Académie Royale de Musique; his house became famous for the charming con- certs which he gave, entertainments at which Charles IX. and Henry III. frequently flattered him with thcir presence. He was a dear friend of Ronsard and the other members of the Pleiad. His works were published in 4 thick volumes, entitled Amours, Jeux, Passetemps, et Poémes (1571-74), containing, among much that is now hardly readable, some pieces of infinite grace and delicacy. He died in 1589 or 1591. His father, Lazare de Baif, pub- lished a translation of the Hlectra of Sophocles

in 1537, and afterwards a version of the Hecuba, was an elegant versifier in Latin, and is commended by Joachim du Bellay as having introduced certain valuable words into the French language.

BAIKAL (2.2, Baiakhal, or Abundant Water), a great fresh-water lake of Siberia, in the government of Irkutsk, 397 miles in length from 8.W. to N.E., and from 13 to 54 miles in breadth, with an area of about 12,500 square miles. This vast reservoir is situated 1360 feet above the level of the sea, in the midst of steep mountain ranges, that often rise sheer from the water's edge in lofty walls of syenite, gneiss, or conglomerate, while elsewhere their sloping flanks are thickly clad with dark forests of conifer- ous trees. The lake is fed by several rivers,—the Upper Angara, the Selenga, which descends from the basin of Lake Kossogol, the Barguzin, and others ; while the only visible outlet is by the Lower Angara, a tributary of the Yenisei, The water is excellent, and is extremely clear, so that the bottom can be secn at the depth of 8 fathoms. The depth of the lake varies from 22 to upwards of 300 fathoms. It yiclds abundance of salmon, and there is a profitable fishery of seals on its shores during the whole summer. The climate is extremely severe; and the lake, which is frozen over from November to May, is almost perpetually swept by the wind. It facilitates, however, the-Russian trade with China, and that between Irkutsk and Dauria. It is navigated by the Russians in summer, and in winter they cross it on the ice. Europeans em- barked on its waters for the first time in 1643. Steam- vessels were introduced in 1846, and the passage across is made in about eight hours. Several hot springs and mineral waters are seen on the margin, and naphtha is sometimes found floating on the surface. The lake is between 51° 20' and 55° 30' N. Jat., and 103° and 110° E, long. The island of Olkhon, near its north shore, is 32 miles long and nearly 10 broad. This island and the southern borders of the lake are inhabited by Mongolian tribes, while towards the north the Tungooses are to be found in gradually diminishing numbers. (See " Description du lac de Baikal," trad. du russe par M. Klaproth, in Nouv. Ann. des Voy. t. xvii. p. 289; Erman's Siberia, 1848 ; Semenoff, Slovar Ross. Imp.)

BAIKTE, Wiir1am BatFrour, M.D., eldest son of Captain John Baikie, R.N., was born at Kirkwall, Orkney, on the 21st August 1824. He studied at Edinburgh, and, on obtaining his degree, joined the royal navy. He early

attracted the notice of Sir Roderick Murchison, through whom he was appointed surgeon and naturalist to the Niger Expedition of 1854. The death of the senior officer occurring at Fernando Po, Dr Baikie succeeded to the command. The results of the voyage are given in his own and other narratives. Ascending the river about 250 miles beyond the point reached by former explorers, the

little steamer Pleiad returned and reached the mouth after a voyage of 118 days without the loss of a single man. The second expedition started in March 1857. After two years passed in exploring, the navigating vessel was wrecked in passing through some of the rapids of the river, and Dr Baikie was unable longer to keep his party together. All returned home but himself; no way daunted, he determined single-handed to carry out the purposes of the expedition. Landing from a small boat with one or two native followers at the confluence of the Quorra and Benue, he here chose the old model farm ground as the base of his future opera- tions—a spot memorable from the disasters of the explor- ing party of 1841. After purchasing the site, and con- cluding a treaty with the native chief, he proceeded to clear the ground, build houses, form enclosures, and pavo the way for a future city. Numbers flocked to him from all parts round, and in his settlement were representatives of almost all the tribes of Central Africa. To the motley commonwealth thus formed he actcd not merely as ruler, but also as physician, teacher, and priest. Before fivo years he had opened up the navigation of the Niger, made roads, and established a market, to which the native produce was brought for sale and barter. He had also collected vocabularies of nearly fifty African dialects, and translated portions of the Bible and_ prayer-book into Housa. Once only during his residence had he to employ armed force against the surrounding tribes. He died on his way home, at Sierra Leone, in November 1863, aged thirty-nine years. An appropriate monument has been erected to his memory within the nave of the ancient cathedral of St Magnus.

BAIL (Ballium) is used in common law for the free- ing or setting at liberty of one arrested or imprisoned upon any action, either civil or criminal, on surety taken for his appearance at a certain day and place.

BAILEN, a town of Spain, in the province of Jaen, 24 miles N.N.W. of Jaen. It seems to correspond to the ancient Bzecula, where Scipio gained signal victories over Hasdrubal, 209 3B.c., and over Mago and Masinissa, 206 B.c. (Polyb., x. 38, xi. 20; Liv., xxvii. 18-20, xxviii. 13). In the neighbourhood also, in 1812, was fought the great battle of Navas de Tolosa, where Alphonso VIII. is said.to have left 200,000 Moors dead on the field, with the loss of only 25 Christians. Here again, on the 23d of July 1808, the Freuch general Dupont, after a bloody contest of several days, signed the capitulation of Bailen, by which 17,000 men were delivered up to the Spaniards as prisoners of war. This disaster was the first great blow to the French arms in the Peninsula. There is nothing remarkable about the town, except the ruins of a castle, formerly belonging to the counts of Benavente, and now the property of the Osuna family. Glass and tiles are manufactured, and the weaving of cloth and pressing of olives are carried on. Population, 7831. (Madoz, Diccionario; Ukert, vol. x. p. 379.

ata: or Batty, NATHANAEL or NATHAN, an emi- nent English philologist and lexicographer, whose Htymo- logical English Dictionary, published apparently in 1721, was a great improvement on all previous vocabularies, and really formed the basis of Johnson’s great work. It is still worthy of being consulted for information with regard to the change of signification in certain words, and to the date at which others were introduced into the language. Bailey had a school at Stepney, near London, and was the author of Dictionartum Domesticum and several other educational works. He died in 1742,

BAILEY, SamveEt, an able writer ou philosophical and literary subjects, was born at Sheffield in 1791. His father carried on a large general business in that town, aud for some years the son devoted himself to mercantile pur-

suits. It was not long, however, before he gave up this occupation, and, having a competent fortune, withdrew from all business concerns, with the exception of the Sheffield Banking Company, of which he was chairman for many years. Although an ardent Liberal of most advanced. views, he took

little or no active part in political affairs. On two occasions, at the earnest solicitation of his numerous friends and admirers, he stood for Sheffield, but without success. The “ Bentham of Hallamshire,” as he has been ealled, was of too retiring a disposition, and had too much of the philosophical politician about him to win the admiration or suffrages of an ordinary body of electors. His life is for the most part a history of his numerous and varied publications, and his name is known to a very limited circle. The intimation of his sudden death on the 18th January 1870, with the subse- quent notice of his munificent gift of £90,000 to his native town, excited some curiosity and interest, which, however, quickly dicd away. This is not quite as it should be. Bailey has certainly given to the world no work of first- rate importance, but there are few authors of modern times who have written more elegantly and clearly, or with more originality of treatment, on the various problems of psycho- logy and political science. His first work, Lssays on the Formation and Publication of Opinions, published anony- mously in 1821 (2d ed. 1826, 3d ed. 1837), a thoughtful, practical, and clearly written treatise, has attracted a greater share of public attention and favour than any of his other writings. A sequel to it appeared in 1829, Hssays on the Pursuit of Truth, on the Progress of Knowledge, and on the Fundamental Principle of all Evidence and Hxpectation (2d ed. 1844). Intermediate between these two were Ques- tions on Political Economy, Politics, Morals, éc., 1823, and a Critical Dissertation on the Nature, Measure, and Causes of Value, directed against the opinions of Ricardo and his school. His next publications were also on economic or political subjects, Lationale of Political Representation, 1835, and Money and tts Vicissitudes, 1837 ; about the same time also appeared some of his pamphlets, Discusscon of Parliamentary Reform, Right of Primogeniture Examined, Defence of Joint-Stock Banks. Bailey seems then to have turned his attention almost entirely to speculative philosophy. In 1842 appeared his Review of Berkeley’s Theory of Vision, an acute and able work, whieh called forth rejoinders from J. 8. Mill in the Westminster Review (reprinted in Dzssertations), and from Ferrier in Blackwood (reprinted in Lectures and Remains, ii.) Bailey replied to his critics in A Letter to a Philosopher, &c., 1843. In 1851 he published one of his best works, Theory of Rea- soning (2d ed. 1852), a thoughtful discussion of the nature of inference, and an able criticism of the functions and value of the syllogism. In 1852 he published Dzscowrses on Various Subjects ; and finally summed up his

philosophic views in the Leéters on the Philosophy of the Human Mind (three series, 1855, 1858, 1863), which is at once the most considerable and the most valuable of his contributions to mental science. Bailey had not entirely given himself up to abstract studies; in 1845 he had ventured on poetical eomposition. Jfaro, a poem in four cantos (85 pp., Long- mans), contains a somewhat lively description of the mental state of a young poet who printed 1000 copies of his first pocm, of which only 10 were sold. He had also been a dili- gent student of Shakespeare, and his last literary work was the treatise, in two volumes, On the Recewed Teat of Shake- speare's Dramatic Writengs and its Improvement. It must be confessed that many of the emendations suggested by him are more fantastic than felicitous.

The Letters contain, in clear and lively language, a very fresh discussion of many of the principal problems in philosophy, or rather in psychology. Bailey ean hardly be

classed as belonging either to the strictly empirical or to the idealist school, but his general tendency is towards the former. The following are the most interesting points in his work :—(1.) In regard to method, he founds psychology entirely on introspection ; critical study of one's own con- sciousness is, according to him, the only means of obtaining materials for philosophy. He thus, to a certain extent, agrees with the Scotch school, but he differs from them in rejecting altogether the doctrine of mental faculties. What have been designated faculties are, upon his view, merely classified facts or phenomena of eonsciousness. He criti- cises very severely the habitual use of figurative or meta- phorical language in describing mental operations. (2.) His doctrine of perception, which is, in brief, that "the perception of external things through the organs of sense is a direct mental act or phenomenon of consciousness not susceptible of being resolved into anything else," and tho reality of which can be neither proved nor disproved, is not worked out in detail, but is supported by elaborate and sometimes subtle criticisms of all other theories. Upon this point Bailey's remarks are deserving of attention. (3.) With regard to general and abstract ideas and general propositions, his opinions are those of the empirical school, but his analysis frequently puts the matter in a new light, and brings

forward points of novelty. (4.) In the theory of morals Bailey is an advocate of Utilitarianism, and works out with great skill the steps in the formation of the “ com- plex” mental facts involved in the recognition of duty, obligation, right. His handling of the moral sentiments (Letters, iii. 193-258) is one of the best specimens of his general style of psychological analysis.

BAILLET, ApRIEN, a French writer and critic, was born in June 1649, at the village of Neuville, near Beauvais, in Picardy, and died in January 1706. His parents could only afford to send him to a small school in the village, but he picked up some Latin from the friars of a neighbouring convent, who brought him under the notice of the bishop of Beauvais. By his kindness Baillet received a thorough education at the theological seminary, and was afterwards appointed to a post as teacher in the school of Beauvais. In 1676 he took orders, and was presented to a small vicarage. His duties interfering too much with his studies, he accepted in 1680 the appointment of librarian to M. de Lamoignon, advocate-general to the parliament of Paris, of whose library he made a Catalogue Raisonné in thirty-five volumes folio, all written with his own hand. The remainder of his life was spent in incessant, unremit- ting labour ; so keen was his devotion to study that ho scarcely allowed himself even natural rest. In the list of his numerous works the following are among the most conspicuous :—1. Histoire de Hollande depuis 1609 jusqw & 1690, 4 tom. 12mo, a continuation of Grotius, and pub- lished under the name of Neuville. 2. Les Vies des Saints, 3 tom. fol. 3. Des Satires personelles, travté historique et critique de celles qui portent le titre d’ Anti, 2tom. 12mo. 4. Vie de Descartes, 2 tom. 4to. 5. Jugemens des Savants sur les principaua Ouvrages des Auteurs, 9 tom. 12mo. The last is the most celebrated and useful of all the works of this learned and indefatigable writer. The edition in seven volumes quarto, published in 1722 by M. de la Monnoye, contains the Anti-Baillet of M. Menage, besides notes ; but the edition published at Amsterdam in 1725 is more esteemed.

BAILLEUL, an ancient town of France, in the depart- ment of Nord, near the Belgian frontier, situated on a rising ground to the north of the River Lys. It was formerly a place of great strength, and is now a busy 1n- dustrial town, with manufactures of lace, thread, black soap, pottery, woollen stuffs

and ribbons, brandy, leather, and cheese. Population, 12,896. Lat.50° 45’ N., long. 2 44’E,

BAI—BAd

BAILLIE, Joanna, poet and dramatist, was born at the manse of Bothwell, on the banks of the Clyde (Scot- land), in 1762. At an early period of her life she removed with her sister Agnes to London, where their brother, the celebrated Dr Matthew Baillie, was settled. The two sisters were left a small competence by their uncle, Dr William Hunter, and took up their residence at Hampstead, on the outskirts of London, where they passed the remainder of their lives. Miss Baillie died on the 23d Feb. 1851, at the advanced age of 89, her faculties remaining unimpaired to the last. Her gentleness and sweetness of disposition made her a universal favourite, and her little cottage at Hampstead was the centre of a brilliant literary society. Miss Baillie had received an excellent education, and probably cultivated very early her faculty of poetical composition, but it was not till 1798 that she published the first volume of her Plays on the Passions. Her design, founded on a careful study of the nature of dramatic poetry, was to illustrate each of the deepest and strongest passions of the human mind, such as Hate, Jealousy, Fear, Love, by a tragedy and a comedy, in each of which should be exhibited the actions of an individual under the influence of these passions. The success of the first volume was very considerable, and a second edition was soon called for. A second volume followed in 1802, a third in 1812, and three more in 1836. Some miscellaneous dramas were published in 1804, and the Family Legend appeared in 1810. Miss Baillie herself intended her plays not for the closet but for the stage. The Family Legend, brought out at Edinburgh under the enthusiastic patronage of Sir Walter Scott, had a brief though brilliant success ; De Monfort had a short run in London, mainly through the acting of Kemble and Mrs Siddons ; Henriguez and The Separation were coldly received. The popular verdict has thus been given against the dramas as good stage plays, and the almost universal decision of readers has confirmed this judgment. With very few exceptions, they are unsuited for stage exhibition. Not only is there a flaw in the fundamental idea, that, viz., of an individual who is the embodiment of a single passion, but there is a want of incident, and a narrowness, consequent upon the attention being too much directed on a single point,

that present insuperable ob- stacles to their success as acting pieces. The plot is generally well constructed, but the very consciousness of aim with which it is wrought out gives to the whole a morbid and unnatural aspect ; there is rarely, if ever, any progress in the play ; the whole is apparent from the out- set, and the action never heightens the spectators' interest. It must be confessed, also, that. Miss Baillie had no very adequate notion of what is required in a stage drama, and that her experience was too limited. This is apparent in her comedies, which are very inferior productions. In short, her want of success is a clear proof of the impracti- cability of that analytic or psychological method, which she expounds and defends in her preliminary dissertations. The plays, however, are admirably adapted for reading ; they show remarkable powers of analysis and acute obser- vation, and are written in a pure and vigorous style, rising occasionally into strains of high poetic feeling and expres- sion. The best of the tragedies are undoubtedly Henriquez, Lhe Separation, De Monfort, and Count Basil, the first of which might perhaps be made into a good acting play. Miss Baillie's reputation does not rest entirely on her dramas: she is the authoress of some poetical pieces and songs of great beauty, and in all probability great portion of her fame will be found to rest on these minor works. The best of them are the Zines to Agnes Baillie on her Birthday, The Kitten, To a Child, and some of her adapta- tions of Scotch songs, such as Woo'd and Married aw a'. Scattered throughout the dramas are also some lively and

beautiful songs, such, eg., as the Chough and the Crow in Orra, the lover's song in the Phantom, beginning—

'" T've seen the moon gleain through the cave, And minute drops like diamonds glancing."

And the sailor's song—

'*O swiftly glides the bonny boat Just parted from the shore." (See Joanna Baillie's Dramatic and Poetical Works, Lond. 1851, 1 vol.)

BAILLIE, Dr MarrHew, anatomist and physician, was born in the manse of Shotts, Lanarkshire,in 1761. He came of a highly gifted family : his father,

the Rev. James Baillie, was successively clergyman of the parishes of Shotts, Bothwell, and Hamilton, in Lanarkshire, and after- wards professor of divinity in the university of Glasgow ; his mother was Dorothea, sister of the celebrated William and John Hunter; and his sister Joanna was the poet. Dr Baillie was for several years a student in the university of Glasgow, where he heard the lectures of Dr Reid on moral philosophy. His professional career was determined by the advice of his uncle, Dr William Hunter, who undertook to superintend his education. On his father's death he obtained an exhibition to Balliol College, Oxford, where he remained a year before removing to Lon- don. His studies were there carried on under the personal direction of his uncle, and after two years he began to be associated with Dr Hunter in his anatomical lectures as an assistant and demonstrator, visiting Oxford occasionally, so as to keep the terms necessary for the degree of bache- lor of medicine. Dr Hunter, at his death, bequeathed the use of his magnificent collections to his nephew, together with the lecture-rooms in Windmill Street, an annuity of £100 a year, and a sinall family estate in Scotland. The last was resigned by Baillie to his other uncle, Dr John Hunter, whom he considered as the natural heir. Within two years after Dr Hunter's death his nephew became the principal teacher in that celebrated school of anatomy ; and in 1787, although only a bachelor of medi- cine, he was appointed physician to St George's Hospital. In 1789 he married Sophia, daughter of the eminent accoucheur Dr Denman, a connection favourable to his practice. In 1795 he published his Morbid Anatomy, a work which was speedily translated into French, Italian, and German, into the last by the anatomist Sémmering. After this he had the honour of being enrolled a doctor of medicine of Oxford, and Fellow of the Royal College of Physicians. As a practising physician he was universally respected, and his decease, which took place on the 23d of September 1823, in the 63d year of his age, was sincerely regretted.

The second edition of the Morbid Anatomy appeared in 1797 ; and two years afterwards it was illustrated by a 4to volume of en- gravings, with descriptions of the plates. His Anatomical Lectures and Medical Observations were printed privately after his death. The Works, 2 vols. 8vo, edited, with a biographical sketch, by Mr Wardrop, contain only the Morbid Anatomy and miscellaneous medical papers.

BAILLIE, Roxpert, a prominent Scotch Presbyterian of the 17th century, was born at Glasgow in 1602. He graduated in 1620 at the university of that town, and then applied himself to the study of divinity. In 1631, after he had been ordained and had acted for some years as regent in the university, he was appointed to the living of Kilwinning in Ayrshire. The church disputes of the century were just beginning, and Baillie was naturally drawn into them. In 1638 he was a member of the famous Glasgow Assembly, and soon after he accompanied Leslie and the Scotch army as chaplain or preacher. In 1642 he was made professor of divinity at Glasgow, and in the following year was selected as one of the five Scotch

clergymen who were sent to the great Westminster As- sembly. In 1649 he was one of the commissioners sent to Holland for the purpose of inviting Charles II. to Scot- land, and of settling the terms of his admission to the government. He continued to take an active part in all the minor disputes of the church, and in 1661, after the ejection of Gillespie, he was made principal of the Glasgow University. He died in August of the following year,— his death being probably hastened by his mortification at the apparently firm establishment of Episcopacy in Scot- land. Baillie was a man of learning and ability; his views were not extreme, and he played but a secondary part in the stirring events of the time. His Letters, by which he is now chiefly remembered, are of considerable historical importance, and give a very lively picture of the period. A complete memoir and a full notice of all his writings will be found in Dr Laing's edition of the Letters and Journals of Robert Baillie, Bannatyue Club, 3 vols., Edin- burgh, 1841-42.

BAILLY, Jean Syivarn, a French astronomer and orator, was born at Paris on the 15th September 1736. He was originally intended for the profession of a painter ; his own inclinations, however, tended strongly towards literary pursuits, and it is said that at a very early age he had com- pleted two tragedies. But his acquaintance and friendship with the celcbrated mathematician Lacaille, and perhaps the example of his brilliant young contemporary Clairaut, finally decided the direction of his studies, which were then entirely devoted to science and scientific investigation. The first

of his labours wasa calculation of the comet which appearcd in the year 1759. In 1763 he was admitted a member of the Academy of Sciences; and in the same year he published a reduction of the observations made by Lacaille in 1760 and 1761 on the zodiacal stars, a compila- tion of great labour and utility. In 1764 he competed for the prize offered by the Academy for a dissertation on the thcory of Jupiter's satellites. Lagrange, who was a complete master of the most powerful analysis, was the successful competitor ; but Bailly's memoir, which was published in an expanded form in 1766, showed great ability, and at once established the author's reputation as a physical astronomer. He followed up his dissertation in 1771 with an able and important memoir on the Liyht of the Satellites, in which he expounded some novel and elegant methods of observation.

His attention, meantime, was not solely devoted to ab- stract science ; he was equally distinguished for eloquence and brilliancy of style. His Hloges on Corneille, Leibnitz, Moliére, and others, were universally admired. In 1773 he was proposed as a candidate for the secretaryship of the Academy of Sciences, and was supported by Buffon ; the influence of D'Alembert, however, secured the appointment of the famous Condorcet. In 1784 Bailly was made secre- tary of the French Academy, and in the following year he was admitted to the Academy of Inscriptions and Belles Lettres. This was the only instance, from the time of Fontenelle, of any writer being at the same time a member of all the three academies. :

In the year 1775 he published the first volume of his most extensive work, Hzstory of Astronomy, which con- tained the history from its origin down to the foundation of the Alexandrian school. This was followed by three volumes on Modern Astronomy, published between 1776 and 1783. The work is of little or no historical value, but it is admirably written, and added greatly to the author's reputation as a master of narrative exposition. In 1787 he completed the history by a volume on Indian and Ori- ental astronomy, which shows considerable erudition, but is not founded on a complete knowledge of the Indian records, and is highly fantastic in its speculations.

The quiet course of Bailly's life, hitherto devoted to literature and science, was now broken in upon by that great convulsion, the French Revolution, of which he was one of the first and most zealous promoters. In the part which he acted, he has had the singular good fortune to be well spoken of by opposite factions, and has never been charged either with want of integrity or with selfish de- signs. When the states-general of France were assembled in 1789, he was elected a deputy to the ¢ders-état, of which he was afterwards chosen president; and when the na- tional assembly had been constituted, he continued in the chair, and officiated as president at the time the king's proclamation was issued ordering that body to disperse. During the struggle which took place between the national assembly and the court, Bailly was amongst the most for- ward in asserting those popular rights which were then new in France; and it was he who dictated the famous oath to the members of the tiers-état, by which they pledged themselves "'to resist tyrants and tyranny, and never to separate till they had obtained a free constitu- tion." On the 14th of July following, the day on which the Bastille was stormed and taken by the people, he was by universal consent appointed mayor of Paris. In this high office he is allowed to have acted with great integrity, courage, and moderation, and to have discharged its ardu- ous and sometimes perilous duties in a highly honourable manner, and during its course he was instrumental in pro- moting the various measures by which the popular party at length prevailed over that of the court; for which, as well as for his conduct in other respects, he obtained a high degree of popularity. But the multitude, newly un- shackled from the fetters of despotism, greedy of novelty, fired with enthusiastic and unsettled notions of freedom, and daily panting for change, would brook no opposition to their wild schemes. Bailly, who probably saw too late the general disposition of the people to anarchy, still wished the laws to be respected, and hoped by the vigorous enforce- ment of them to restore and maintain tranquillity. He ordercd some deputies from the military insurgents of Nancy to be arrested, and firmly opposed the rash proceedings of Marat and Hebert ; he ceased to be a member of the Jacobin club; and he exerted himself strongly to persuade the populace to permit the king and royal family to depart to St Cloud. By these measures, which were very distasteful to the fickle and infuriated people, he lost their confidence and favour; and his popularity was finally destroyed by his conduct on the occasion of the tumultuous meeting of the populace on the 17th of July

1791, to demand the abolition of monarchy ; for, when called on by the national assembly to disperse the mob, who had assaulted the sol- diery, he ordered the latter to fire, by which means 40 persons were killed and above 100 wounded. Finding himself after this an object of hatred and suspicion to the people, whom he had faithfully served, he resigned his office at the dissolution of the constituent assembly in the end of the year 1791, and retired to Nantes. From there he wrote to Laplace, who was residing at Melun, and pro- posed, if it were safe, to join him. Laplace, finding that a de- tachment of revolutionary troops had been ordered to Melun, advised Bailly not to venture, but his advice was neglected. The ex-mayor was recogniscd by one of the soldiers, arrested, and thrown into prison. Arraigned on 10th November 1793 before a sanguinary tribunal, he was on the 11th condemned to death as a conspirator, and exe- cuted the day following, near the spot where he had given the order for the military to fire on the people. He met his death with the greatest calmness and courage.

Several works written by Bailly, and found in manuscript, have

been published since his death ; particularly an Hssay on Fables and their History, and Memoirs of « Witness of the Revolution,

‘hich come down to October 1789. Notices of his life are given ene Bloges by St Just, Lalande, and Lacretelle ; also in Arago,

Notices Biographiques, vol. ii.

BAILY, Epwarp Hopazs, a distinguished sculptor, was born at Bristol, 10th March 1788, and died at Lon- don, 22d May 1867. His father, who was a ship-carver of great repute, destined him for a commercial life, but

even at school the boy showed his natural taste and re-

markable talents by producing numerous wax models and busts of his schoolfellows, and afterwards, when placed in a mercantile house, still carried on his favourite employ- meut. ‘Two Homeric studies, executed for a friend, were shown to Flaxman, who bestowed on them such high com-

mendation, that in 1807 Baily came to London and placed himself as a pupil under the great sculptor. In 1811 he gained the Academy gold medal for a model of Hercules restoring Alcestis to Admetus, and soon after exhibited Apollo discharging us arrows against the Greeks, and Hercules casting Lichas into the sea. In 1821 he was elected R.A., and exhibited one of his best pieces, Hve. He was for many years engaged in lucrative employment as modeller for Messrs Rundell & Co. and Messrs Storr & Mortimer. He was also entrusted with the carving of the bas-reliefs on the south side of the Marble Arch at Hyde Park. Besides numerous busts and statues, such as those of Nelson on the Monument, of Earl Grey, of Lord Mansfield, and others, his finest pieces are, Hve at the Fountain, Eve lustening to the Voice, Maternal Affection, Girl preparing for the Bath, and the Graces.

BAILY, Francis, an English astronomer, was born in Berkshire in the year 1774, and for many years carried on business as a stockbroker in London. While amassing a large fortune by his business, he applied the profound mathe- matical knowledge for which he was distinguished to the doctrine of probabilities, and published several interesting works on that subject, as, Tables for the Purchasing and Renewing of Leases, The Doctrine of Interest and Annui- tues, The Doctrine of Annuities and Assurances, &c. In 1820 he was oue of the original and most active promoters of the Astronomical Society ; and on his retirement from business in 1825, he entered with the utmost energy upon the cultivation of astronomy and the kindred sciences. He gave the Nautical Almanac its present form and intro- duced other improvements; he took an active part in the investigation of the effects of the atmosphere on pendulum experiments ; he aided in the repetition of the experiment of Cavendish on the specific gravity of the earth ; he super- intended the publication of the Astronomical Society’s catalogue of the fixed stars; and the revision of the annual catalogues in the 13th volume of the Society’s Memoirs was entirely his work. On his recommendation the Bri- tish Association undertook the republication of the [istoire Céleste of Lalande, combined with Lacaille’s catalogue, which together contain no less than 57,000 stars; and there is reason to believe that he took an important part in the investigation of the course of the tidal wave in the Atlantic. His Account of the Rev. John Flamsteed, Furst Astronomer-Royal, 1835, a work of great ability and re- search, excited much discussion from

the disclosures it made relative to the character of Sir Isaac Newton. Baily was extremely patient and methodical, and these qualities enabled him to effect, in the last twenty years of his career, a greater number of researches than most other philosophers have accomplished during a whole lifetime. He died August 30, 1844.

BAINBRIDGE, Dr Jouy, physician and astronomer, was born at Ashby-de-la-Zouche, in Leicestershire, in the year 1582. He taught a grammar school for some years, and practised physic, employing his leisure hours in astronomy, which was his favourite study. After removing

to London he was admitted a Fellow of the College of Physicians, and gained considerable reputation by his de- scription of the comet in 1618. The next year Sir Henry Savile appointed Bainbridge his first professor of astronomy at Oxford; and the masters and fellows of Merton College made him first junior, and then superior, reader of Lin- acre's lecture. He died in 1643. His published works are—l. An Astronomical Description of the late Comet, Lond. 1619. 2. Procli Sphera, 1620. 3. Canicularia ; a Treatise concerning the Canicular Days, Oxford, 1648. Several of his unpublished writings exist in manuscript in the library of Trinity College, Dublin.

BAINES, Epwanrp, for many years proprietor and editor of the Leeds Mercury, and M.P. for Leeds from 1834 to 1841, was born in 1774 at Walton-le-Dale, a village dis- tant a little way from Preston, in Lancashire. He was educated at the grammar schools of Hawkshead and Preston, and at the age of sixteen was apprenticed to a printer in the latter town. After remaining there four years and a half he removed to Leeds, finished his appren- ticeship, and at once started in business for himself. He was always a most assiduous student, and quickly became known as a man of great practical shrewdness and ability, who took a keen interest in political and social movements. His liberal opinions in politics led him to sympathise with the dissenting party in church affairs, and it was not long before he joined the body of Independents. In 1801 the assistance of friends among the members of that party enabled him to purchase the copyright of the Leeds Mer- cury. Provincial newspapers did not at that time possess much influence ; the editorial province was not extended to the composition of

what are now called leading articles, and the system of reporting was defective. In both respects Baines made a complete change in the Mercury. The ability of his political articles gradually caused the paper to be looked upon as the organ of Liberal opinion in Leeds, and it contributed not a little to the spread of sound doc- trines on practical questions in the north of England. At the same time his watchful care secured the efficiency of the minor departments. Baines soon began to take a more prominent part in politics; he was an ardent advo- cate of parliamentary reform, and it was mainly by his influence that Macaulay was returned for Leeds in 1832. In 1834, when a vacancy was caused by Macaulay's accept- ance of an Indian appointment, Baines was proposed as a candidate, and was returned after a sharp contest. He was re-elected in 1835 and 1837, but was obliged to resign from ill health in 1841. He was noted in Parliament as a judicious supporter of the Liberal party, but with independent views. He strongly advocated the sepa- ration of church and state, and opposed Government interference in national education. His letters to Lord John Russell on the latter question (1846) had a powerful influence in determining the action of the Government. He died in 1848. In the midst of his active life he had found time for literary work. His best known writings are:—Zhe Lfistory, Directory, and Gazetteer of the County of York; History, Directory, and Gazetteer of the County of Lancaster; History of the County Pala- tune and Duchy of Lancaster. He was also the author of a History of the Wars of Napoleon, which was con- tinued under the title of A History of the Reign of George IiI. His Life (1861) has been written by his son, Edward Baines, jun., for some time editor, and still (1875) one of the proprietors, of the Leeds Mercury, and well known by his histories of the cotton and woollen manufactures of Great Britain.

BAINES, Marrnew Taxsot, eldest son of the above, was born in 1799, and died in 1860. He was educated at Cambridge, and entered the bar. In 1837 he was made

recorder of Hull, and in 1847 was returned to Parliament for that city. His remarkable ability made itself quickly apparent, and in 1848 he became president of the Poor- Law Board. In 1852 he sat for Leeds, and was again

appointed president of the Poor-Law Board, which office he held till 1855. In 1856 he was made ehancellor of the Duchy of Lancaster, with a seat in the cabinet.

BAINI, GiusEeprr, a learned musical critic and com- poser of church music, was born at Rome in 1775, aud died there in 1844. He was instructed in composition by his uncle, Lorenzo Baini, and afterwards by Jannaconi. In 1814 he was appointed musical director to the choir of the pontifical chapel, in which he had for several years been one of the principal bass singers. His compositions were very favourable specimens of the severe ecclesiastical style; one in particular, a Afiserere, was long performed alternately with the more celebrated work of Allegri in the services of the Sistine chapel during Passion week. Baini held a higher place, however, as a musical critic and histo- rian than as a composer, and his Life of Palestrina (Me- morte storico-critiche della vita e delle opere di Giovanni Pierluigi da Palestrina, 1828) ranks as one of the best works of its class.

BAIRAM, a Turkish or Persian word meaning feast, is the name applied to the two great Mahometan festivals. The first of these, called generally, though, according to some authorities, incorrectly, the Greater Bairam, is the day following the Ramadan, or month of fasting. It lasts strictly for only one day, though the common people geue- rally extend it to three, and is a period of great animation and enjoyment. What is called commonly the Lesser Bairam follows the first at an interval of sixty days. It is the feast of sacrifices, at which all Mahometans imitate the offerings of animals which are then being made at Mecca to commemorate Abrahain's offering of Isaac. It lasts for four days, and is not of so sacred a character as the first Bairai.

BAIRD, Generar Str Davin, Bart., was born at New- byth in Aberdeenshire, in December 1757. He entered the British army in 1773, and was sent to India with the 73d Highlanders in 1779. In the following year he had the misfortune to fall into the hands of Hyder Ali, in the Mysore chief's perfidious attack on a handful of British troops at Perambucum. 'The prisoners, it is well known, were most barbarously treated. Baird survived his cap- tivity ; and on his release, visited his native country, but returned to India in 1791 as a lieutenant-colonel. When Harris marched against Tippoo

Sahib, Baird, now a major- general, served under him in that campaign; and when it was resolved to storm Seringapatam, he solicited and obtained the honour of leading the storming party to the breach. He made a daring assault, and was soon a master of the stronghold in which he had long been the prisoner. Through some misconception, Baird seems to have looked upon the temporary appointment of Colonel Wellesley to hold the captured town as permanently super- seding him, and on this ground he judged himself to have been treated with injustice and disrespect. He after- wards received the thanks of the British Parliament and of the East India Company for his gallant bearing on that important day, and a pension was offered him' by the Company, which he declined, apparently from the hope of receiving the order of the Bath from the Government. General Baird commanded the Indian army which was sent in 1801 to co-operate with Hutchinson in the expulsion of the French from Egypt. He landed at Kosseir, conducted his army to Keneh on the Nile, and thence to Rosetta, where he arrived just as the French were treating for the evacuation of Alexandria. On his return to India in 1802 he was employed against Scindia, but irritated at some

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neglect he had experienced, he relinquished his command and returned to Europe. In 1804 he was knighted, and in the following year commanded the expedition against the Cape of Good Hope, and captured Cape Town ; but here again his usual ill-luck attended him, for he was recalled before he had organised his conquest, for having sanctioned the expedition of Sir Home Popham against Buenos Ayres. He served again in 1807 in the expedition against Copen- hagen, and in the following year commanded the consider- able force which was sent to Spain to co-operate with Sir John Moore. In the battle of Corufia, where, after the death of Moore, he held supreme command, a grape-shot shattered his left arm, so that it had to be amputated at the shoulder-joint. He again obtained the thanks of Parlia- ment for his gallant services, and was rewarded with the de- coration of the order of the Bath, and the rank of a baronet. Sir David married Miss Campbell Preston, a Perthshire heiress, in 1810. In 1820 he was appointed commander- in-

chief in Ireland; but the post does not appear to have been suitable for him, and he was removed in 1821. From that period he no more appeared in public life. He died on the 18th August 1829. (See Hook's Life of Sur David Baird.

BAIREUTH, or Bayrevutu, the capital of the circle of Upper Franconia, in Bavaria, is pleasantly situated in a valley on the left bank of the Red Maine, 40 miles N.N.E. of Nuremberg. It is well built, with broad, regular, and well-paved streets, and is partially surrounded by old walls. The river is crossed here by two bridges. Most of the buildings are of comparatively modern date, the city having suffered severely from the Hussites in 1430, and froma conflagration in 1621. Among the more important are—the old castle, erected in 1454, the new castle, built in 1753, the opera-house, one of the finest in Germany, the gymnasium, founded in 1664, the riding school, and the barracks. Among the ecclesiastical buildings, the Stadt-kirche, dating from 1439, and containing the monuments of the margraves of Baireuth, is the most important; and there are also a handsome synagogue, a public library, theatre, hospital, and an orphan and a lunatic asylum. In 1841,a monument, by Schwanthaler,was erected here to Jean Paul Richter, who spent the last twenty years of his life in the city, and has left some beautiful descriptions of the neighbourhood in his Szebenkds. His house was in Fricd- richsstrasse. Baireuth is a railway junction, and has an active trade, chiefly in grain and horses. It manufactures woollen, linen, and cotton goods, leather, delft and other earthenware, and tobacco, and has also several breweries and distilleries. About half a league distant is the village of St George, noted for its marble works ; and about two niles to the E. is the Hermitage, a fanciful building, erected in the early part of the last century, with gardens containing terraces, statues, and fountains. Baireuth has been chosen by Richard Wagner as the scene of his musical festivals, and a theatre is being erected for his special use. Population, 17,841. Baireuth was formerly the capital of a principality of the same name, which was annexed in 1791 to the kingdom of Prussia. In 1807 it was ceded by Prussia to France, which kept possession of it till 1810, when it was transferred to Bavaria.

BAJA, a market-town of Hungary, in the county of Bacs, on the left bank of the Danube, £0 miles 8. of Festh. It was burned down in 1807, but has since

been well built. It carries on a considerable trade in grain and pigs, and its four annual markets are largely attended. The Roman Catholics, the Greek Church, and the Jews have each a place of worship in the town, which also possesses a gymnasium, and a castle belonging to the Grassalkovich family. Population, 18,110.

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BAJAZET L., sultan of the Turks, commenced to reign in 1389, and died in 1403. The well-known story of the iron cage, in which this monarch was said to have been carried about by his conqueror Timur, has no authority, aud probably originated in a mistake as to the word for a litter, in which Bajazet was carried.

BAJAZET IIL. son of Mahomet II., succeeded his father as sultan in 1481, and died in 1512. See Con- STANTINOPLE and TURKEY.

BAJUS, or Dz Bay, Micwast, a celebrated theologian, was born at Melin in Hainaut in 1513. He distinguished himself highly during his course of study at Louvain, and was quickly promoted to a professorship in the college of that town. In 1549 he took his doctor’s degree, and two years later he was appointed regius professor of divinity. On account of his eminence in theological learning he was selected by the king of Spain to go to the great council at Trent, in the proceedings of which he took a prominent part. His studies having been chiefly directed to Augustine, with whose works he was very familiar, Bajus found that his doctrines on the fundamental points of freewill, predestination, grace, and the sacraments, were in direct opposition to the scholastic theology recog- nised as orthodox by the powerful body of the Jesuits. Highteen propositions, said to be gathered from the works of Bajus and his colleague Hessels, were condemned by the Sorbonne, and a more extensive collection of seventy- six were censured by Pope Pius V. in 1567. This censure, which did not press very heavily on Bajus, who was not indeed mentioned as holding the condemned doctrines, was confirmed by a bull of Gregory XIII. in 1580. Bajus, who was a man of meek and mild temper, quietly made such submission as was requisite under the circumstances, continued to hold his professorship, and even advanced to the dignity of chancellor of the university. He died in 1589, in the 77th year of his age. His principal works have been published in a

collected form at Cologne, 1696, 1 vol. 4to, in 2 parts; some large treatises have not been published. The doctrines for which Bajus was censured, and the discussions arising with regard to them, are interesting in connection with the history of Jansen- ism, for Jansen did little more than reproduce the Augustinianism of Bajus.

BAJZA, Anton, a distinguished Hungarian poet and critic, was born at Sziicsi in 1804. His earliest contribu- tions were made to Kisfaludy's Aurora, a literary paper of which he was editor from 1830 to 1837. He also wrote largely in the Kritische Bldtter, the Atheneum, aud the Figyelmezé, or Observer. His criticisms on dramatic art were considered the best of these miscellaneous writings. In 1830 he published translations of some foreign dramas, Auslindische Biihne, and in 1835 a collection of his own poems. In 1837 he was made director of the newly established national theatre at Pesth. He then, for some years, devoted himself to historical writing, and published in succession the Historical Library (Toérterett Kinyvtar), 6 vols. 1843-45; the Modern Plutarch (Uj Plutarch), 1845-47; and the Universal History (Vildgtirétet), 1847. These works are to some extent translations from German authors. In 1847 Bajza edited the journal of the opposition, Hllenér, at Leipsic, and in March 1848 Kossuth made him editor of his paper, Kossuth Hirlapja. a he was attacked with brain disease, and died in

_BAKARGANYJ, a district of British India in the Dacca division, under the Lieutenant-Governor of Bengal, situated between 23° 14' 27" and 21° 48' N. lat., and 89° 55' 10" and 91° 4' 50" E. long. It is bounded on the N. by the districts of Dacca and Faridpur, from which it is separated by the Padma and Maindkdtikh4l; on the E. by the

Meghu4 and Shahbdzpur rivers, and by the Bay of Bengal, which separates it from Nodkhal{ and Tipperah ; on the 8. by the Bay of Bengal; and on the W. by Jessor and Farid- pur districts. Area, 4935 square miles; population, 2,377,433. The general aspect of the district is that of a flat even country, dotted with clusters of bamboos and betel-nut trees, and intersected by a perfect network of dark-coloured and sluggish streams. There is nota hill or hillock in the whole district, but it derives a certain picturesque beauty from its wide expanses of cultivation, and the greenness and freshness of the

vegetation. This is especially conspicuous in the rains, but at no time of the year does the district present a dried or burnt-up appear- ance, The villages, which are always walled round by groves of bamboos and betel-nut palms, have often a very striking appearance; and Bakarganj has many beauties of detail which strike a traveller in passing through the country. The level of the country is low, forming as it does a part of the great Gangetic delta; and the rivers, streams, and water-courses are so numerous that it is very difficult to travel except by boat at any season of the year. Every natural hollow is full of water, around the margin of which long grasses, reeds, and other aquatic plants grow in the greatest profusion, often making it difficult to say where the land ends and where the water begins. Towards the north-west the country is very marshy, and nothing is to be seen for miles but tracts of unreclaimed swamps and rice lands, with a few huts scattered here and there, and raised on mounds of earth. In the south of the district, along the sea face of the Bay of Bengal, lie the

forest tracts of the Sundarbans, the habitation of tigers,

leopards, and other wild beasts.

The principal rivers of the district are the Mcglina, the Arial Khan, and the Haringhata or Baleswar, with their numcrous off- shoots. The Meghna represents the accumulated waters of the Brahmaputra and Ganges. It flows along the castern boundary of the district in a southerly direction for about 100 miles, till it debouches into the Bay of Bengal. During the latter part of its course this noble river expands into a large estuary contain- ing many islands, the principal of which 1s that of Dakshin Shahbazpur. The Arid] Khan, a branch of the Ganges, enters thie district from the north, and flows generally in a south-easterly direction till it falls into the estuary of the Meghna. The main channel of the Arial Khan is about 1700 yards in width in the dry season, and from 2000 to 3000 yards in the rains. It recclyes a number of tributaries, sends off scveral offshoots, and is navigable throughout the year by native cargo boats of the largest size. The Haringhata, Baleswar, Madhumati, and Garai, are various local names for the same river in different parts of its course, and represent another great offshoot of the Ganges. It enters Bakarganj near the north-west corner of the district, whence it forms its western boundary, and runs south, but with

great windings in its upper reaches, till it crosses the Sundarbans, and finally falls into the Bay of Bengal by a large and deep estuary, capable of receiving merchant ships of considerable burden. In the whole of its course through the district the river is navigable by native boats of large tonnage, and by large sca-going ships as high up as Morrellganj, in the neighbouring district of Jessor. Among its many tributaries in Bakarganjthe most important is the Kacha, itself a considerable stream and navigable by large boats all the year round, which flows in a southerly direction for 20 miles, when it falls into the Baleswar. Other rivers of minor importance are the Barisal, Bishkhalt, Nihdlganj, Khairabad, Ghagar, Kumar, &c. All the rivers in the district are subject to tidal action from the Meghna on the north, and from the Bay of Bengal on the south, and nearly all of them are navigable at high tide by country boats of all sizes. The rise of the tide is very considerable in the estuary of the Meghna, and many of the creeks and water-courses in the island of Dakshin Shahbazpur, which are almost dry at ebb tide, contain 18 or 19 feet of water at the flood. A very strong ‘‘bore” or tidal wave runs up the estuary of the Meghna at spring tides, and a singular sound like thunder, known as the ‘¢ Barisal Guns,” is often heard far out at sea about the time it is coming in. There are numerous marshes in the district, of great size and depth, and abounding in fish. The following peculiarity of some of them is quoted from Colonel Gastrell’s Geographical and Statistical Report of the District (1868):—‘‘In some of the swamps, especially in those of Bakarganj, the surface growth of aquatic plants, mixed with drift weeds,

grasses, and rice stalks, increases annually, and in process of time a crust is formed capable of supporting human beings, and on which rice is cultivated. Small floating patches are thus formed, and the natives assert that in very strong blowing weather these are some- times carried from one side of the swamp to the other, and are a cause of great dispute. A Government official, whose duties often took him to these swamps, mentioned that the first time he found himself on ground of this kind, being totally unaware of its nature, he was greatly alarmed at feeling, as he thought, the earth moving beneath him; and still more astonished when, on seeking information from the inhabitants, he was told ‘it was only the tide

coming in.’ ‘The owners of these floating fields make holes through them, and catch the fish which are immediately attracted by the light.”

The census of 1872 disclosed a population of 2,377,483 souls in Bakarganj district, spread over 4935 square miles, inhabiting 4269 villages and 321,657 houses; persons per square mile, 482; per vil- lage, 557; per house, 7°4. The Mahometans are the largest section of the population, and number 1,540,965, or 64°8 per cent. of the total inhabitants; Hindus, 827,393, or 34°8 per cent.; Bud- dhist, 4049, or 2 per cent. ; Christians, 4852, or ‘2 per cent.; and

ersons of unspecified religion, 174 souls. The Musalmans of

akarganj are among the worst of their creed, steeped in ignorance and prejudice, easily excited to violence and murder, very htigious, and grossly immoral. The Fardizis or Puritan sect of Mahometans are exceedingly numerous in the district. The Buddhist population consists of Maghs or the people of Arakan, who first settled in Bakarganj about seventy years ago, and have made themselves very useful in the clearing of the Sundarbans. A gipsy-like tribe called the Bebajids are rather numerous in this district. They principally live in boats, travelling from place to place, profess Muhammadan- ism, and gain their subsistence by wood-cutting in the Sundarbans, fishing, fortune-telling, and trading in trinkets. The Christian community of Bakarganj owes its origin to the Roman Catholic monastery at Bandel near Calcutta, and to the Protestant (Bap- tist) missionaries at Serampur. The principal native converts come from the Hindu low-caste Chandals, &c., who subsist by cultiva- tion.

Barisal, the headquarters station, situated on the west bank of the Barisal river, in 21° 41’ 40” N. lat., and 90° 24’ 30” E. long., is the only town containing upwards of 5000 inhabitants. In 1872 its population amounted to 7684 souls; municipal income, £1019, 18s.; municipal expenditure, £1006, 2s.; incidence of taxation, 2s. 72d. per head. There are also three other municipal towns— (1.) Nalchiti, a large trading village; principal exports, rice and paddy; imports, salt, tobacco, oil, and sugar ; (2.) Shélakati or Mahdrdjganj, a large timber market, also trading in rice, paddy, and salt; (3.) Daulat Khan, the principal village in the island of Dakshin, Shahbazpur ; exports, betelnut. A number of small trading villages exist throughout the

district, and each locality has its periodical fairs for purposes of traffic. The material condi- tion of the people is good. Every inhabitant is a small land-holder, and cultivates sufficient rice and other necessaries for the support of his family. Owing to this reason, hired labour is very scarce, and during the harvest season, when the few available labourers are sought for by the landholders, the price of labour rises to 1s. per diem. The average cost of living to a labouring man is about 6s. per month. Except in the larger villages, the dwellings of the people are very isolated. The inhabitants seldom congregate together into hamlets, but each man builds his homestead on the highest spot on his own land without any reference to his neigh- bours. Rice is the great crop of the district, and three harvests are obtained annually—the dman, or winter rice ; dus, or autumn crop ; and boro, or spring rice. The former yields the finest grain, and is the staple crop of the district. It is sown at the setting in of the rains in April or May, transplanted from the beginning of June to the middle of August, and reaped in November or December. About 100 varieties of the dman rice are cultivated in the district. The dus crop is sown in the early part of the hot weather, and reaped in August. Upwards of 20 varieties of this rice are produced. The boro or spring rice is of a coarse description, largely used by the poorer classes, and is cul- tivated to a considerable extent in the alluvial river accre-

tions, and on other low-lying grounds. It is sown broadcast in December, and reaped in April or May. Bakarganj exports its rice chiefly to Calcutta. The average yield of rice land here is from 174 to 22 cwt. per acre. Other crops—khesért (Lathyrus sativus), musuri (Cicer lens), sarishd or mustard, rape-seed, linseed, jute, sugar-cané, betel-nut, &c. Manufactures—pottery, coarse cloth, oil, fine mats, and molasses. The district has only five small roads, but its rivers afford ample means of communica- tion.

Like all other districts of Bengal, Bakarganj has steadily increased in prosperity since its administration passed into the hands of English officers, and especially of late years, since the country has been directly under the Crown, From the time of the acquisition of Bengal by the British in 1765 up the end of 1817, Bakarganj formed a part of the Dacca district. It was then

formed into a separate collectorship, with the object of encouraging enterprising persons to cultivate its immense tracts of waste lands, In 1818 the net revenue of the district amounted to £96,438, and the net civil expenditure to £13,647. Two years later (1820) the net district revenue had slightly decreased to £95,709, while the net expenditure on civil administration had increased to £16,659. During the next forty years both revenue and expenditure rapidly increased, and in 1860-61 the net revenue of the district amounted ‘to £150,305, and the net civil expenditure to £32,584. In 1870-71 the total net revenue was £203,445, and net avil expenditure, £44,902. The land revenue of Bakarganj is settled in perpetuity with the zaminddrs. In 1872 the district contained 4729 estates, held by 5960 proprietors, who were assessed at a total revenue of £143,156. In 1871 the machinery for protecting the district consisted of 583 men of the regular police of all ranks, maintained at a total cost of £11,186. Attached to the regular police is a river patrol consisting of five boats, and manned by a crew of 35 men. The village watch or rural police consisted in 1871 of 5135 men, maintained at a cost of £18,486, paid by the landholders and villagers, each village watchman having besides a small plot of ground rent free. A muni- cipal police of 53 men was also maintained in the towns and large villages, at a total cost of £403, 14s., defrayed out of municipal receipts. Education is in a very back- ward state in Bakarganj, owing to the inhabitants being almost wholly composed of petty husbandmen, the majority of whom are Mahometans of the most bigoted tenets. In 1856-57 the district contained 5 schools, attended by 482 pupils, and maintained ata total cost of £595, 13s, Ia 1871-72 there were 78 Government and aided schools, attended by 3713 pupils, and maintained at a total cost of £3767, 12s., the total cost to the state being £1232, 10s. This is exclusive of private schools uninspected by the education department. The census report of 1872 returned the total number of schools (Government and private) at 512, attended by a total of 7299 pupils. Barisdl town contains a Government school, which is the largest in Eastern Bengal, and financially the most successful ; the cost to Government for its 355 pupils in 1872 being only £31, 12s. Bakarganj district is divided into 5 magisterial sub-divisions, viz., Barisil, Dakshin Shahbazpur, Maédé- ripur, Pirozpur, and Patudkhalf, comprising 18 police circles or thdnds, and 54 fiscal divisions or pargands, The climate of Bdkarganj is one of the healthiest in Eastern Bengal, owing to the strong south-west monsoon, which comes up directly from the Bay of

Bengal, and keeps the atmosphere cool; but the heavy rain-fall and consequent humidity of the atmosphere, combined with the use of bad water, are fruitful sources of disease. The average annual temperature varies from 78° to 85°. The thermometer ranges from 62° to 98°. The endemic discases of Bakar-

ganj are fevers of the intermittent, reniittent, and continued types, attributable to the extreme dampness and malarious nature of the district. Cholera is always present, the nuinber of cases increasing in the hot season and the begin- ning of the cold weather. Smallpox occasionally makes its appearance in an epidemic form,—frequently caused by inoculation, which is carried on to a great extent in Bakar- ganj by the native medical practitioners.

BAKER, Hewry, a distinguished naturalist, was born in Fleet Street, London, in 1698. At the age of fifteen he was apprenticed to a bookseller, with whom he remained for seven years. He then became clerk to Mr Forster, attorney, whose deaf and dumb daughter he instructed carefully, and with such success that for a time he devoted himself to the training of persons similarly afflicted. During this period of his life he published several poems, and married Sophia, youngest daughter of the famous Daniel Defoe, who bore him two sons, both of whom he survived. In 1740 he was elected fellow of the Society of Antiquaries and of the Royal Society. He contributed many memoirs to the 7ransactions of the latter society, and in 1744 received the Copley gold medal for microscopical experiments on the crystallisation and configuration of saline particles. Mr Baker died at his apartments in the Strand on the 25th of November 1774, Besides his numerous memoirs in the Philosophical Transactions, he published two valuable treatises on the microscope: Zhe Microscope made Easy, London, 1743, and Hmployment for the Microscope, 1753. Another well- known work is his philosophical poem, The Universe, which has passed through several editions. Mr Baker’s memory is perpetuated by the Bakerian Lecture of the Royal Society, for the foundation of which he left by will the sum of £100.

BAKER, Sir Ricwarp, author of the Chronicle of the Kings of England, was born at Sissinghurst, in Kent, about the year 1568. He was educated at Oxford, took the degree of Master of Arts, and in 1603 received the honour of knighthood. In 1620 he was made high sheriff of Oxfordshire ; but having engaged to paysome debts of his wife's family, he was reduced to poverty, and obliged to betake himself for shelter to the Fleet prison, where he died, February 18, 1645. During his confinement he composed numerous works, historical, poetical, and mis- cellaneous, Amongst these are Meditations and Disquisi- tions on the Lord's Prayer ; Meditations, dc., on several of the Psalms of David ; Meditations and Prayers upon the Seven Days of the Week ; Cato Variegatus, or Cato's Moral Distichs ; Theatrum Triwmphans, or Theatrum Redivivum, being a reply to Prynne's Wistriomastix, &c. His principal work, the Chronicle of the Kings of England, inexact and uncritical, but written in a pleasant and readable style, quickly acquired a high reputation. It was continued to 1658 by Edward Phillips, Milton's nephew, and has passed through many editions.

BAKER, Tuomas, a learned antiquary, descended from an ancient family distinguished by its loyalty, was born at Crook in 1656. He was educated at the free school at Durham, and proceeded thence, in 1674, to St John's College, Cambridge, where he afterwards obtained a fellow- ship. Lord Crewe, bishop of Durham, collated him to the rectory of Long-Newton in his diocese, in 1687, and further intended to give him that of Sedgefield, with a golden prebend, had not Baker incurred his displeasure for refusing to read James II.'s Declaration of Indulgence. The bishop who disgraced him for this refusal, and who was afterwards specially excepted from William's Act of Indemnity, took the oaths to that king, and kept his bishopric till his death. Baker, on the other hand, though he had opposed James, refused to take the oaths to

William ; he resigned Long-Newton on the Ist of August 1690, and retired to St John's, in which he was protected till the 20th of January 1716-17, when he and one-and- twenty others were deprived of their fellowships. After the passing of the Registering Act in 1723, he could not be prevailed on to comply with its requirements by regis- tering his annuity of £40,

although that annuity, left him by his father, with £20 per annum from his elder brother's collieries, was now his whole subsistence. He retained a lively sense of the injuries he had suffered ; and inscribed himself in all his own books, as well as in those which he gave to the college library, socius ejectus, and in some rector ¢yectus. He continued to reside in the college as commoner-master till his death on the 2d of July 1740. The whole of his valuable books and manuscripts he bequeathed to the university. The only works he pub- lished were, Leflections on Learning, showing the Insuff- ciency thereof in rts several particulars, in order to evince the usefulness and necessity of Revelation, Lond. 1709-10, and the preface to Bishop Fisher's Funeral Sermon for Mar- garet, Countess of Richmond and Derby, 1708,—both with- out hisname. His valuable manuscript collections relative to the history and antiquities of the university of Cam- bridge, amounting to thirty-nine volumes in folio and three in quarto, are divided between the British Museum and the public library at Cambridge,—the former possessing twenty-three volumes, the latter sixteen in folio and three in quarto. The life of Baker has-been written by Robert Masters, 8vo, 1784, and by Horace Walpole, in the quarto edition of his works,

BAKEWELL, a market-town in Derbyshire, on the River Wye, 152 miles from London. Its fine old church contains monuments of the families of Vernon and Manners. The inhabitants are supported by the working of the coal, lead, and zinc mines, and the stone and marble quarries in the neighbourhood. There is also a large cotton manufac- tory in the town established by Arkwright. Bakewell is remarkable for a chalybeate spring, frequented by invalids. It. has a free school of ancient date, a literary and scientific institution, and a museum, About four miles distant is Chatsworth House, the seat of the duke of Devonshire. Population in 1871, 2283. ~ BAKHCHISARAI (Turkish, the Garden Palace), a town of Russia in the government of Taurus, situated in a narrow gorge on the banks of a small stream called the Chiryuk-Su, about 10 miles §.8.W. of Simpheropol. Of unknown origin, it became towards the close of the 15th century the residence of the Tatar khans; and its chief objects of interest are the remains of its splendour under the Tatar dynasty. The principal building, the palace, or Khan-Serai, was originally erected in 1519 by Abdul- Sahal-Gerai, and was restored at Potemkin's command by the architect Elson for the reception of Catherine. Not far off is a cemetery, which contains the tombs

of many of the khans. There are, besides three or four churches and a synagogue, no fewer than thirty-five mosques, of which the most important was founded in the early part of the 18th century. The population still consists for the most part of Tatars, Catherine II. in 1783 having granted them the exclusive right of habitation in the city. The remainder consists of Russians, Greeks, Armenians, and Jews. Bakh- chisarai is a place of considerable industry, manufacturing red and yellow morocco, sheepskin cloaks, agricultural implements, sabres, and other cutlery, and forming an important depét for the corn, flax, fruits, tobacco, and other produce of the whole surrounding district. In the neighbourhood is Chufut-Kali (or Jews' city), the chief seat of the Karaitic Jews of the Crimea, situated on lofty and, except on one side, inaccessible cliffs, Popula- tion, 10,528,

BAKHMUT, a town of Russia in the government of Ekaterinoslav, near the river from which it derives its name, It owed its origin in the latter half of the 17th century to the discovery of salt-springs, which ceased, however, to be utilised in 1782. Its present importance is chiefly due to the extensive coal-deposits in the vicinity. Population, 16,791

BAKING. The art of baking consists in heating any- thing in an oven or fire so as to harden it, and in this sense the term is used when applied to the manufacture of bread, porcelain, pottery, and bricks. It is also applied to certain modes of dressing or cooking animal food ; thus we speak of baked meats, pies, &c. In the present article the baking of flour or meal for use as human food will alone be treated On

The origin of baking, as of most arts of primary im- portance, precedes the period of history, and is involved in the obscurity of the early ages of the human race. Ex- cavations conducted on the site of some of the numerous lake dwellings of Switzerland have resulted in the discovery of abundant evidence that the art of making bread was practised by our prehistoric ancestors as early as the Stone Period. Not only have stones for grinding meal and bak- ing bread been discovered, but bread itself in large quan- tities has been disinterred, preserved by being carbonised in the fires which

frequently destroyed the pile-dwellings of the primitive inhabitants of the world. At Roben- hausen, Meisskomer discovered 8 tb of bread, a weight which would correspond with about 40 Ib of newly-baked bread. At Wangen there has been discovered “actual baked bread or cake made of the crushed corn, precisely similar to that found about the same time by Mr Meiss- komer at Robenhausen. Of course, it has been burned or charred, and thus these interesting specimens have been preserved to the present day. The form of these cakes is somewhat round, and about an inch to an inch and a half in diameter. The dough did not consist of meal, but of grains of corn more or less crushed. In some specimens the halves of grains of barley are plainly discernible. The under side of these cakes is sometimes flat, sometimes con- cave, and there appears no doubt that the mass of dough was baked by being laid on hot stones and covered over with glowing ashes.”—(Keller’s Lake Dwellings, Lee’s Translation, p. 63.)

The very early mention of bread in written history further bears out the great antiquity of the art of baking. Bread is first specifically mentioned in Genesis xviii. 5, when Abraham, wishing to entertain the three angels on the plains of Mamre, offered to “fetch a morsel of bread ;” and the operation of baking is immediately thereafter alluded to in the instructions to Sarah to “make ready quickly three measures of fine meal, knead it, and make cakes upon the hearth.” At the same time, when, in the city of Sodom, Lot entertained two angels, “ he made them a feast, and did bake unleavened bread, and they did eat” (Genesis xix. 3). It may be inferred from the mention of unleavened bread that, in those patriarchal times, the two great classes of bread were known and used. At a period little later the art of baking was carried to high perfection in Egypt, which then took the lead in the arts of civilised life. The Egyptians baked cakes and loaves of many varieties and shapes, in which they employed several kinds of flour, and they favoured their bread with various aromatic in- gredients, The chief baker of Pharaoh, who was in prison along with Joseph, doubtless pursued his craft in its essen- oe features in the same way as bakers do at the present

ay.

From ancient Egypt excellence in the art of baking tra- velled with the march of civilisation into Greece, and the allusions to bread in the works of

classic authors are very

numerous. is made of no less than sixty-two varieties of bread as known among the ancient Greeks, and minute descriptions of many

tasks connected with the occupation.

BAK—BAK

In The Deipnosophists of Athenzeus mention

of them are given. We learn from Pliny (Wat. Hist., xviii. 28) that professional bakers were first introduced into Rome

at the close of the war with Perseus, king of Macedon,

By the practical Romans the baking trade was formed into a kind of incorporation or guild, with special privileges and immunities attached to the calling. Public bakeries were distributed throughout the city, to which slaves were assigned for performing the heavier and more disagreeable Grain was delivered into public granaries by enrolled Saccarii, and it was dis- tributed to the bakers by a corporation called the Catabo- lenses. No separate mills for grinding corn then existed, the grain being pounded and sifted in the bakeries, and hence the Roman bakers were known as Pistores, A special magistrate was appointed to take cognisance of every matter connected with the management of public bakeries.

The calling of the baker during the Middle Ages was considered to be one so closely affecting the interests of the public that it was put under strict regulation and super- vision, and these special restrictions continued to affect the trade down to very recent times. In England, an Act of Parliament was passed in 1266 for regulating the price of bread by a public assize, and that system continued in operation till 1822 in the case of the city of London, and till 1836 for the rest of the country. The price of bread was determined by adding a certain sum to the price of every quarter of flour, in name of the baker’s expenses and profit; and for the sum so arrived at tradesmen were required to bake and sell eighty quartern loaves, or a like proportion of other sizes, which it was reckoned each quarter of flour ought

to yield. The following table ex- hibits the assize price of bread in London in 1814:—

Price of 2-Ib Loaf.

Price of Quartern Loaf.

Price of Flour in Shillings.

Price of Ib

Loaf.

Price of 4-Ib Loaf.

Price of 1-tb

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The art of making bread made its way northwards very slowly ; and even at present, in the northern countries of Europe and Asia, loaves of bread are

seldom used except by the higher classes of inhabitants. In Sweden, for example, rolls are frequently seen in the towns, but loaves rarely. Towards the end of 1812 the captain of an English packet ordered a Gothenburg baker to bake for him a quantity of bread, to the value of £1 sterling. The baker was con- founded at so large an order, and refused to comply till the captain gave him security that he would carry off and pay for the loaves, declaring that he could never dis- pose of so great a quantity of bread in Gothenburg if it were left upon his hands. In the country part of Sweden no bread is made but rye-cakes, nearly as hard as flint, which are only baked twice a year. About a century ago loaf-bread was almost as rare in the rural districts of Scot- land, barley bannocks and oaten cakes then constituting the universal substitutes among almost all ranks. In many parts of England it is the custom for private families to bake their own bread. ‘This is particularly the case in

Kent, and in some parts of Lancashire. In the year 1804 the town of Manchester, with a population of 90,000 per- sons, did not contain a single public baker. Bakers in Great Britain are now placed under the provisions of “ The Bakehouses’ Regulation Act, 1863” (26 and 27 Vict. cap. 40), a statute passed after a searching inquiry into the condition of bakehouses in London and of the persons employed in them. By this Act no young person under the age of 18 is permitted to work in a bakehouse between the hours of 9 p.m. and 5 a.M., and special enactments pro- vide for securing the cleanliness and ventilation of bake- houses, and for the regulation of sleeping apartments con- nected with them.

As compared with wheat-flour all other materials used for making bread are of comparative insignificance. Oat cakes still form a staple article of food in many rural dis- tricts of Scotland, and are occasionally used in other coun- tries. They are made by mixing up oatmeal, warm water, and salt, sometimes with the addition of butter or fat, into a very stiff paste, and kneading this out into a thin cake, which is first fired on a hot plate or “

girdle,” and finished in front of an open fire. Scones of barley-flour, sweet and tough, were formerly largely uscd in Scotland, but have now given place to a similar preparation of wheaten flour. Rye bread, both fermented and unfermented, is largely con- sumed by the inhabitants of the northern parts of Europe in the poor and backward districts. Cakes of maize meal, baked like oat cakes, are consumed in some parts of the United States. The meal of various species of millet is used in Southern Europe to form bread; and in India and China, durra (Sorghum vulgare) and other cereal grains are baked for food. Of non-cereal flours, the principal uscd for bread-making is buckwheat, Fagopyrum escu- lentum, extensively employcd in Russia and Holland. The flour of pease, beaus, and other leguminous seeds, are also baked into cakes; and cassava cakes are made from the meal of the tapioca plant, Jatropha Manihot, in South America. Excepting rye, none of these substances is used for making vesiculated or fermented bread.

The grain of wheat consists of an outer husk or cover- ing, an embryo or germ, and a ccntral mass of farinaceous material. The outer husk is composed of several distinct layers of ligneous tissue, closely adhering to the seed, and very hard in texture. In grinding, this is detached in scales, and constitutes the chief proportion of the bran, The Inner portion of the envelope is softer, and contains an active nitrogenous principle, termed cerealin, and is besides rich in fat and salts. This portion goes with the pollard or parings in the dressing of wheat flour. Towards the centre of the grain the substance becomes whiter in colour and more friable in texture, so that, in grinding, the finest flour in consistence is always the whitest in appearance. By agriculturists several hundred varieties of wheat and a number of distinct species are recognised ; but in com- merce the grain is distinguished as white and red, or as hard and soft wheats. There is a considerable range of difference in the proportions of their proximate constitu- ents, hard wheats as a rule being much more nitrogenous than the soft varieties ; and similarly, wheats grown in hot climates are also usually richest in nitrogen. The follow- ing analyses of two typical varieties of wheat are taken from Payen’s tables, water being neglected :—

Hard Wheat. Soft Wheat. : Taganrog. Touzelle. Nitrogenous matter……..... 20°00 12°65 Be iia. case spices +.» 68°80 74°51 DEVIN

os cosceeeceseesecouss ses 8-00 6°05 OE a vcttdcissincnssssievwass 3°10 2°80 i Zoo EB, Minera! watter,.....000. 2°85 2.12

of mill products, ranging from fine flour to bran, according to the size of the ground particles. The divisions vary in different mills and localities ; but the accompanying table —the result of an elaborate series of experiments by Messrs Lawes and Gilbert—may be regarded as a standard of the relative proportions of mill products :—

Mean Yield of Flour, Bran, &c., in 100 parts Meal.

Wheat of | Wheat of | Wheat of | Mean of

1846. 1847. 1848. the 28

7 Cases. | 19 Cases. | 2 Cases. Cases.

aS ATI a lpeecerocon ce merenennee 44°0 35°7 47°4 41°1 Ds AS Ce ee ees 17°9 16°4 23°9 18°6 De. MVAITDRD ac cinche sacissa.saeseulene 8:7 213373) 2°0 9°2

Amounts of 1, 2, and tiie ; : ; ;

Satogetheniasc-.sc GokS ms “2 A APES hesctresractoretavaerers ow siniafasaeias 4:9 5°8 ASI 5:3 5. FineSharps or Middlings} 10°2 8°7 4°5 8°8 6. Coarse Sharps…..... 3°5 3°3 3°6 3°4 ie ine pollard sesperneencnte 3:9 11%} 2°6 2°4 8. Coarse Pollard….....- 4°4 T2 79 6°5 Lbanves [STENT sae bono ocnopeaac 3°5 2°5 5:9 3°0

The tails and fine sharps are generally passed through the mill a second time, bringing up the yield of flour to about 80 per cent, of the entire grain. As an example of mill products in practice, the following table is copied from the actual mill receipts of a Scotch miller. The quantity dealt with represents 16 quarters of wheat, weighing 637 ib per bushel, in all 578 st. 11 Ib. The yield was—

St. Ib MORMON EMOUNT ceo. canaapces sicaasseeseatsenai voure—es 414 0 Gdd’and Second Plour……...5….0.sc01.eseeeseee 23 13 Parings (Sharps and Pollards)..... 86 12 Bran and Shellings….....0cceccccssesessssseeeees 92 0 NN cece hava seiove ni oes caneun caves. saeneavenes 11 0

The composition of flour and bran given in the under- stated table is the mean result of a series of fourteen analyses by Peligot :—

Flour. Bran.

AWC Mecca ss crite’ «ods» «sca ue entrees tamer eitees sates’ evisisanae 140 10°30 TIERS? TOR 21 Jonge no noe sendedNde60n nob One n00 Conadeogedebeds006 coc 1:2 2°82 Nitrogenous substances insoluble in water (gluten) ...12°8 10°84 a . soluble », (albumen) 1°8 1°64 Non-nitrogenous soluble substances—dextrin, sugar, 7°2 5°80 Stare MeMeRee nee ee ca cetncn eclotdessaebienisrsiiasincen@aselene sesame ete 59°7 22°62 (CISIINTIOES, a eononsonseenoansedsoagoanonodsnannebosesooocaoracon ccc 17 43°98 (STUBS: sa 6 Sane eatcomandine asonuaebecn cen ceadhocs daoancnnosadrtaco.den 16 2°52

It is a disputed point whether dextrin or sugar exists in flour of the best quality; but the action of heat and mois- ture in the baking process quickly transforms a portion of the starch into the soluble condition. In flour of inferior quality a large percentage of dextrin is usually found—a circumstance very detrimental to its bread-inaking qualities. A table of the percentage of gluten, obtained by Messrs Lawes and Gilbert from a large number of flours, shows a variation from 8°9 to 14:9 per cent. This gluten itself (the insoluble nitrogenous substance in flour) is a compound body, composed of three or four distinct substances ; but its physical conditions of elasticity, tenacity, and colour are of much greater importance to the baker than either its chemical constitution or its amount.

The varieties of wheaten bread are divisible into two great classes—Unvesiculated and Vesiculated Bread. Under the first head are included such products of the art as are fired or baked without first being raiscd or rendered spongy by the development of carbonic acid gas within the mass,

either by fermentation or otherwise. Vesiculated bread is produced when carbonic acid is either developed in or introduced into the dough, so as to per- meate the mass with an infinite number of minute cavities,

When wheat is ground it is sifted or dressed into a series | which render the product light and spongiform.

Biscuits.

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UNVESICULATED BreaD.—The simplest form of bread, and the rudest baking, are seen in the Australian “ Damper,” a cake made from dough composed of flour, salt, and water, baked in the dying embers of a wood fire. The dough is laid on a flat stone, covered with a tin plate, and the hot ashes heaped around and over it, care being taken not to expose it to a heat of more than 212° Fahr. Pass- over cakes, scones, and “bannocks” are prepared from a similar dough, and fired on hot plates or in ovens, and form an agreeable and nutritious food. When such dough is exposed to a high heat, so that the resulting cake is hard, dry, and resonant, biscuits (bis cuit, twice baked) are formed.

Biscuit Manufacture.—Biscuit making is a branch of trade distinct from ordinary baking, conducted under different conditions, and requiring machinery and processes peculiar to itself. Biscuits are made by a rapid and con- tinuous process ; they can be preserved a long time, and in proportion to their price they occupy little space, so that it is practicable to sell them in markets remote from the place of manufacture. The manufacture of biscuits is now conducted on a very large scale, ingenious and complicated machinery is employed in the various processes, and a large export trade in biscuits has grown up. The firm of Messrs Carr & Co., of Carlisle, was the first to originate the manu- facture, and that firm still possesses one of the largest and best-appointed establishments. To the partners of this

firm we are indebted for much information as to the pro- cesses employed in this modern industry.

The general arrangements of a ship-biscuit factory are shown in the sectional view, fig. 1. The flour stored on the

Fria. 1.—Sectional view of Ship-Biscuit Factory.

upper floor is passed down through a shoot to the flour-room, where it is sifted to free it from knots or lumps. In the making of plain water or ship biscuits, the flour is shot directly down into the mixer a, on the ground floor, in quantities usually of one bag at a time, to which the requi- site quantity of water, regulated by a gauge-glass, is added. The mixer is a cylindrical vessel of cast-iron, in which a series of knives or arms is kept revolving on a central axis. The revolution of these knives is sufficient to incorporate the flour and water thoroughly into a very stiff dough in about seven minutes. From the mixer the dough is de- livered on a table in large amorphous masses, and it is next carried forward to the brake machine 6. The brake consists of two heavy iron rollers, having generally a re- ciprocating motion, between which the dough is passed backwards and forwards several times till it is rolled out into a plate or sheet of uniform thickness and consistency. The sheet of prepared dough is next carried forward to the cutting and panning machine c, a highly complex and ingenious apparatus, the principle of which is shown in fig. 2. In this machine the dough is first passed between a pair of gauge rollers a, graduated to secure a sheet of any desired uniform thickness, from which it is received on an endless sheet of felt 6. On this web the sheet of

BAKING

dough is carried forward by intermittent motion to a punch- ing apparatus c, in which moulds or cutting edges of the

Fic. 2.—Cutting and Panning Machine.

size and form of biscuit desired are arranged. Here the biscuits are cut out, the scrap being caught on a web d, and carried upward till it falls over in a box or trough on the table e, from which it is returned to the brake machine. The biscuits are carried down the web /, and fall into tin trays, which are fed in at g by a boy, and move forward at the same rate the biscuit web travels, so that they are ready for being immediately placed on the travelling stage

of the patent oven. The processes are so arranged that the oven carries forward the biscuits as quickly as they are delivered by the cutting machine, and in some cases the ovens are fed direct from the cutting and panning appa- ratus by automatic machinery. The patent travelling ovens are constructed from 30 to 44 feet long, and fitted with endless webs either of plates or chains. The chain webs are used for baking small and fancy biscuits, such as are placed in trays, and the plates are used for large and plain water biscuits, which are placed by hand on the travelling plates. The rates at which biscuits of different sizes and degrees of richness must traverse the whole length of the oven varies from about five to forty minutes, and the tem- perature of the oven has also to be modified to suit the various qualities. Both the heat and rate of motion are under easy and adequate control in the patent ovens. There is an endless variety in the form and composition of plain and fancy biscuits. In the trade list of Messrs Vicars, of Liverpool, the chief manufacturers of biscuit. machinery, the names of 128 varieties of cutters are men- tioned. In the making of fancy biscuits, milk, eggs, sugar, butter or lard, and flavouring essences are extensively used, and in these cases the proportions of the various ingredi- ents are roughly mingled before being sent down the shoot into the mixer. The richest class of biscuits, the dough for which is necessarily soft, are cut out by hand labour, and fired on trays in common ovens. The dough for rout biscuits is placed in a strong metal box or cham- ber in which a piston is tightly fitted. The piston is moved forward by a screw, and it pushes the dough through a series of holes or dies. The dough is received on a sliding board, and is cut into proper lengths by a knife. Cracknels are made without either milk or water being used to mix the dough, eggs alone being employed for this purpose. Certain proportions of butter, sugar, and sesquicarbonate of ammonia are added to the mixture of flour and eggs, and the dough is baked in the usual way. The cracknels, when cut out, are thrown into a boiler of boiling water, and in about two minutes they float to the top. They are then fished out and thrown into cold water, and then drained on cloths, panned, and fired in an ordinary oven at a high heat. In the firing, the ammonic carbonate, being very volatile, is driven off, and the cracknel thus assumes its spongy structure. Many other varieties of biscuits are rendered light and spongiform by the use of the sesqui- carbonate of ammonia, or of carbonate of soda, in conjunc- tion with sour milk. In the

firing of biscuits, not only the moisture of the dough is driven off, but a certain pro-

Loaf-bread.

BAKANG

portion of the water held by the flour in its apparently dry state, so that from 10 ib of flour only about 9 fb of

water biscuits are obtaincd. The composition of plain biscuit is given by Dr Parkes as follows :—

Gait onpenend epeaeueees 8 to 12 PSIUIGTIP sonenceoanen cappodne 1°9 Nitrogenous substances 15 EE see aise ees 3} WeaxbWMeecsaccssssseors+ oss DION |MTTABC MG erercccc ess coeees 12 to 75

VrsicuLATED BREAD.—-Under this head is included such bread as is rendered spongiform in structure by the action of carbonic acid within the dough, and which is not baked hard and dry as in the case of biscuits. It includes ordi- uary loaf bread, pan loaves, French or Paris loaves, cottage loaves, bricks, rolls, buns, and many varieties of fancy bread distinguished by local namcs and minor differences of form and composition. Vesiculated bread is made in three different ways :—

Ist, By the developmeut of carbonic acid within the dough through fermentation of the flour. This is the ordinary and principal method of bread-making.

9d, By mixing the dough with water previously acrated with carbonic acid. The aerated bread made under the patent of the late Dr Dauglish is thus manufactured.

3d, By the disengagement of carbonic acid from chemi- cal agents introduced into the dough. Dodson’s patent unfermented bread comes under this head, and the “ baking powders” and “yeast powders” extensively sold consist generally of carbonate of soda or ammonia and citric or tartaric acid, which evolve carbonic acid in presence of water.

Fermented Bread.—The manufacture of fermented or leavened bread is, as has already been hinted, of very great autiquity, and it is still by the fermentation process that bread is chiefly made. In ancient times leaven was em- ployed to induce fermentation in dough (“a little leaven leaveneth the whole lump,” Gal. v. 9), and to this day Parisian bakers, who excel all others in the quality of the bread they produce, chiefly use the same ferment. Leaven is simply a portion of dough, put aside from a previous baking, in which the fermentative action has reached an advanced stage of activity. Yeast, however, has been used as a ferment from an early period, and it appears that it was first so employed in France. Pliny says (Wat. [zst., xviii, 12), “ Gallize et Hispanize frumento in potum reso- luto, spuma ita concreta pro fermento utuntur; qua de causa levior illis quam ceteris panis est.” The use of yeast appears to have died out in Francc, but was revived again towards the end of the 17th century, when its reintroduc- tion was violently opposed by the Faculty of medicine of Paris. Yeast is now used by Parisian bakers for fancy bread and pastry only.

The baking of fermented bread involves three distinct operations, which are technically denominated “ setting the sponge,” making the dough or kneading, and baking or firing. It will be convenient first to describe these pro- cesses as they are conducted in a London bakehouse. The first duty of the baker is to mix a ferment, which consists of a mixture of potatoes, yeast, and flour. The potatoes, in the proportion of 6 ib to a sack of flour, are boiled and mashed in a tub, and water is stirred in till the mixture is reduced to a temperature of from 70° to 90° Fahr. About 24 pints of yeast and 12 bb of flour scalded in boiling water are then added, and the whole forming a thin uniform paste is set aside for several hours, during which it undergoes an active fermentation. Setting the sponge consists in mixing the ferment in a large trough with flour and water sufficient to make the whole into a rather stiff paste. The flour used at this stage, when “Pull sponge” is made, should be about one-half the entire quantity intended to be used in the “ batch,” and the ingre- dients have to be thoroughly incorporated by the workman

stirring them laboriously together with his arms. The operation occupies from twenty minutes to half an hour, and when ready the sponge is covered over and allowed to rest for several hours according to the temperature at which it is maintained. Generally in from four to five hours the sponge "rises;" fermentation has been going on, and carbonic acid steadily accumulating within the tenacious niass till it has assumed a puffed out appearance. By degrces the sponge gives off the gas in puffs, and the mass begins to collapse, till what was a swollen convex surface assumes a somewhat concave form, the centre be- ing depressed while the sides adhere to the edges of the trough. The workman judges by the amount of collapse the time the sponge is ready to be taken in hand for kneading or making the dough. This process is thus described by an eye-witness:—"The batch consisted of a sack and a half of flour, nearly one-half of which had been used in making the sponge. Two men coin- menced breaking the sponge at 1.4 p.m. Having poured the water into it, they plunged their arms in and stirred it about until it became of the consistency of thin batter. At 1.10 they began to mix the dry flour with it, immediately upon doing which they were enveloped in a cloud of flour dust, their heads being bent down to within a few inchs of the mass they were handling. Flour and pieces of dough were splashed over the trough. upon the floor. At 1.12a third man was added. Their hair, caps, and face powdered thickly with the dust, a thick cloud of which was thrown up with every movement, especially when large masses of dough, as it became a little solid, were taken up in their arms and thrown upon the rest, fresh flour being first strewn between. At 1.15 one of the men became very red and heated. The other two were very pale, and did not show any perspiration. At 1.16 the cutting off of large masses began, as much as two men could lift to place over the adjoining mass. At 1.23 the men began to pound the mass with their fists. At 1.26 one of the pale men, who was also very thin, began to look red and hot. At 1.29, after smoothing the mass down, they began again to pound it with their fists. At 1.30 it was again smoothed over, the sides of the trough scraped, and a little dry flour thrown over it. It was then considered finished."+ After this laborious process the finished dough is covered over for some time, varying from half an hour to two hours accord- ing to the temperature, during which fermentation again begins, and the mass is " proofed." It is then "scaled off," z.e., weighed on scales in pieces of 4 Ib 4 oz., if 4-Ib loaves are to be made, or half that amount for 2-Ib loaves ; and as rapidly as

weighed it is “moulded” into the form of the loaf, when it is ready to put into the oven, Flour of good quality will take up about 17 gallons of water in course of the foregoing operations, and before putting into the oven the ingredients of a 4-Ib loaf will be—

A loaf ready for going into the oven has about half the bulk it attains during the process of firing. Batches of cottage and household loaves are packed close side by side on the sole of the oven, the sides of each loaf being rubbed with butter to prevent them from adhering to each othcr, and they are consequently crusted on the top and bottom only. Pan loaves are baked each in separate tinned pans of the form of the loaf, and Parisian loaves are baked end to end in long tinned pans. The firing of bread in the oven occupies from 1 to 14 hours, the temperature at the

1 Tremenheere’s Report on Journeymen Bakers.

beginning of the process being from 550° to 600° Fahr. The baker can ascertain if the oven is at a proper tem- perature by throwing a little flour on the sole of the oven, which ought to turn to a light brown colour. Ovens in London are usually built of brick, with a sole only 2 inches thick; in Scotland stone is used, the sole being from 10 to 12 inches thick, and the oven consequently retains heat much more effectually.

In Scotland the system of using ferments is not gener- ally practised as in London, some of the varieties of yeast or barm being mixed directly with the flour. In some localities the system of setting “ quarter sponge” is adopted, in which the sponge originally prepared contains only one- fourth of the flour to be used. To this, after an interval of about twelve hours, more flour and water are added, which brings it up to half sponge, and about two hours thereafter the mass is ready for making the dough. In Paris, where bread-making is carried to the highest perfection, leaven, as has already been mentioncd, is the fermenting agent employed. This consists of a portion of dough laid aside from a previous baking in a uniform temperature for seven or eight hours, during which it swells and acquires an alcoholic odour. This, termed “ the chief leaven,” is taken and worked up with flour and water to a firm paste double

its original mass, when it becomes “the first leaven.” After

an interval of six hours the amount is again doubled, forming the second leaven. The “complete leaven” is formed by doubling the size of the second leaven, and the proportion the complete leaven bears to the finished dough is about one-third in summer and one-half in winter.

Sound flour yields from 90 to 94 4-Ib loaves per bag of 280 Ib, some “strong” flours giving even a greater quantity of bread. A table of experiments, conducted by Messrs Lawes and Gilbert, gives a mean result of 135°2 of bread from 100 of flour; and in the observations of a large number of English and French authorities quoted by them, the ratio of bread to 100 of flour varied from 127

to 150. The following table gives the mean of 25 analyses of the bread of London bakers by Dr Odling:— AWE WO? snoconesesopovbaacnooucocdonpntadoscoEbocac 43°43 Organic matter ….....c0.scceceseeeneeee senses 55°26 Mineral matter orasit ….....2… ssseseeereee 1°30 Percentage of ash in dry bread ….....:.eeeeeeees 2°30 aD nitrogen in new bread ….....++ 1°26 ee ‘ TVG MONCAC el ecinctisayence=- 2°22

The bakers’ standard of excellence of flour, apart from the question of colour, is the weight of bread it will pro- duce of a proper dryness and texture. The “strength” of flour in this respect appears to depend much more on its condition than on the absolute percentage of its con- stituents.

Panary Fermentation.—It would be altogether out of place in this paper to refer to the conflicting theories as to the cause of fermentation in organic substances. The so- called panary fermentation in bread-making is a true alco- holic fermentation, and whether induced by yeast or leaven the result is precisely the same. The gluten of the flour is the fermenting agent, and it is stirred into activity by contact with a glutinous body already in an active condi- tion, which may be either yeast or leaven. In this con- dition it exerts a fermentative influence over the sugar which may either have existed previously in flour, or which is at least immediately developed in it by the influ- ence of moisture. The active gluten splits up each mole- cule of sugar into two of alcohol, two of carbonic acid, and one of water, and

consequently an infinite number of minute air bubbles are developed throughout the ferment- ing mass. The reaction is shown in the following equa- tion: C,H,,0; = 2C,H,O + 2CO, + H,0.

to 1 per cent. of the flour employed.”

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Carb. Hyd. Oxy. Carb. Hyd. Oxy.

1 molccule of Grape Sugar…..... 6 ld 2 molecules of Alcohol…..... 4 12 2
2 Carbonic Acid …... 2. . ee 1 i WidtGnS cease reccma ss um 2 al — 6 14 7

As the evolution of carbonic acid and alcohol proceeds, the sponge gradually swells, the little bubbles coalesce and enlarge, rising through the tenacious mass till the surface is reached, and then the carbonic acid bursts out and the dough begins to fall, This process would go on a consider- able time, but the alcoholic fermentation would soon pass into an acetous fermentation and the sponge would become sour. When acetous fermentation ensues, aS not un- frequently happens in baking, it may be remedied to some extent by the addition of bicarbonate of soda to the sponge. The late master of the mint, Dr Thomas Graham, was the first to demonstrate the presence of alcohol in fermented dough, and he thus described his experiment :—“ To avoid the use of yeast, which might introduce alcohol, a small quantity of flour was kneaded, and allowed to ferment in the usual way to serve as leaven, By means of the leaven a considerable quantity of flour was fermented, and when the fermentation had arrived at the proper point, formed into a loaf. The loaf was carefully enclosed in a distilla- tory apparatus, and subjected for a considerable time to the baking temperature. Upon examining the distilled liquid, the taste and smell of alcohol were quite perceptible, and by repeatedly rectifying it, a small quantity of alcohol was obtained, of strength sufficient to burn and to ignite gun- powder by its combustion. The experiment was frequently repeated, and in different bakings the amount of the spirit obtained of the above strength was found to vary from 0°3 Although the tem- perature of the oven drives off that amount of the spirit, fermented bread is yet found to retain a proportion of alco-

-hol, as much as from 0°221 to 0°401 per cent. having been

found in different specimens of baked bread. Speaking in 1858, Dr Odling estimated the amount of alcohol thrown out into the atmosphere from the bread baked in London as equal to 300,000 gallons of spirits annually. Many years ago a patent was secured by a Mr Hicks for collect- ing and condensing the alcoholic fumes from bakers' ovens, and a company was formed for working the invention. After an expenditure of £20,000 the attempt had to be abandoned, not from any failure to obtain the spirit, but because the bread baked in the process was dry, unpalat- able, and unsaleable.

When what is termed "whole wheaten flour"—that is, the entire substance of the grain, excepting only the outer bran—is baked, it is known that the resulting loaf is of a dark brown colour, sweetish in taste, and liable to be some- what heavy and sodden. The brown colour was at one time supposed to be due to the presence of bran particles in the flour, and in 1846 an American, Mr Bentz, invented a process for removing the outer cuticle of wheat before grinding, it being supposed that the flour so prepared would yield a loaf of white colour, while utilising a larger proportion of the substance of the grain than is commonly used. 'To the astonishment of experimenters, however, the bread made from such flour was found to have the colour and other characteristics of whole wheaten bread. The subject was investigated by an eminent French chemist, M. Mége Mouriés, who found that the peculiar action of whole wheaten flour was due to the presence in the outer part of the seed of a peculiar nitrogenous body, to which he gave the name cerealin, and which is closely allied in composition and action to the diastase of malt. Cerealin exerts a peculiarly energetic influence on starch, transform- ing it into a brown adhesive mixture of dextrin and sugar. He showed that when the fermentative action of gluten

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preponderates, the result is the formation of the products desired by the baker—carbonic acid and alcohol ; but when the influence of cerealin prevails, lactic fermentation ensues, and dextrin, sugar, and acid substances

are formed, which it is the object of the baker to avoid. Several methods of avoiding this deteriorating influence of cerealin, and at the same time securing the use of the maximum of flour, have been put in operation by M. Mége Mouriés. The process now in use at the Boulangerie Centrale de |'Assistance Publique (the Scipion) in Paris, for the preparation of the flour and baking white bread with the whole of the mill products excepting the bran, he thus describes :—‘‘ The corn is moistened with from 2 to 5 per cent. of water satu- rated with sea-salt, and at the end of some hours the exterior coverings only become nioist and tender. The grain ig then thrown between nearly closed millstones, and 70 per cent. of flour is obtained without cerealin, plus 10 to 14 per cent. of meal. This is bruised between light stones, and separated by winnowing from the greater part of the husk remnants. To prepare the bread, all the leaven is made with flour at 70 per cent., and the meal is added to the soft dough last of all; as, in spite of the small amount of cerealin which it still contains, it will not produce brown bread, because at that time the length of incubation is not sufficient to change it into a leaven, Thus white bread is produced containing all the farinaceous part of the wheat.”

It not unfrequently happens that flour of good colour, and unexceptionable chemical composition, fails to yield a dough which will rise by fermentation, and the loaf from which is sweet, solid, sodden, and adhesive. Wheat that has been badly harvested, or which in any way has been allowed to sprout, has part of the gluten changed into the form of diastase, which, like cerealin, changes starch into dextrin and sugar. The gluten of flour which has been dried at a too high temperature, and of flour which has been kept in a damp situation, is modified and acts in the same manner. If dough is made with an infusion of malt, it yields a result exactly the same as that above described. It is to guard the starch of inferior flour against this deteriorative influence that a proportion of alum is used by many bakers of second-class bread. Alum has the power of preserving starch to a large extent from the metamorphic action of altered gluten, diastase, or cerealin, and of producing from an inferior flour a loaf of good texture and colour. The use of alum is regarded as an adulteration, and heavy penalties have been imposed on its detection ; but its estimation in bread is a process of the greatest difficulty, and authorities are by no means agreed as to its deleterious influence. Other mineral salts have a similar protective power

on the starch of inferior wheat, and lime-water has been successfully employed in place of alum. To this also it is objected by some that the addition of lime renders the valuable phosphatic salts of flour in- soluble by transforming them into phosphate of lime.

Aerated Bread.—When carbonic acid, instead of being generated by fermentation within dough, is separately pre- pared and incorporated with flour and water, aerated bread 1s produced, The system by which this is effected was invented by the late Dr Dauglish, and aerated bread has been manufactured under his patent since March 1859. The system is now in operation in all the principal towns in the United Kingdom, and it appears to be steadily gaining in public favour.

_ The Dauglish apparatus (see fig. 3) consists of the follow- Ing parts :—Ist, a generator A, in which carbonic acid is evolved from chalk by sulphuric or hydrochloric acid ; 2d, a gas-holder, in which the carbonic acid is stored for use after being purified in passing through water; 3d, an air-

_ bump, for pumping carbonic acid from the gas-holder, and

forcing it into the water vessel and mixer; 4th, another Aerated air-pump, for withdrawing atmospheric air from the mixer bread.

Fig, 3.—Dauglish Apparatus—double set.

before the aerated water is admitted ; 5th, a water vessel B, a strong cylinder of copper capable of withstanding a pressure of 100 ib on the square inch, and of sufficient size to contain water for a full charge of the mixer ; attached to this water vessel there are a gauge-glass OC, and a pressure gauge D, for indicating the pressure of gas as it is pumped in; 6th, the mixer E, a globular vessel of cast-iron, capable of bearing high pressure, through the centre of which an axle runs, fitted with iron kneading- arms extending to the circumference of the vessel. The pumps and the revolving arms within the mixer are worked by steam power. In order to make a sack of flour into dough, a lid at the top of the mixer is opened, and the flour passed down into it through a spout from the floor above. The lid of the

mixer is then fitted tightly on, and the air within it exhausted by the pump. The requisite quantity of water, about 17 gallons, is drawn into the water vessel, and carbonic acid is forced into it, till the pressure amounts to from 15 to 25 Ib per square inch. The aerated water is then passed into the mixer, and the mix- ing arms are set in motion, by which, in about seven. minutes, the flour and water are incorporated into a perfectly uniform paste. At the lower end of the mixer a cavity F is arranged, gauged to hold sufficient dough for a 2-ib loaf, and by a turn of a lever that quantity is dropped into a pan ready for at once depositing in the oven. The whole of these operations can be per- formed in less than half an hour. When 4-tb loaves are to be baked the lever has simply to be twice turned. At another part of the lower end of the mixer is placed a pipe G, with a stop-cock, by which dough intended to be fired as Paris bread, on the sole of the oven, is drawn off and weighed before being placed in the oven. The pressure of gas within the mixer is sufficient to force out the whole of the dough, which, immediately on being liberated, swells up by expansion of the gas confined within the tenacious mass. Currant loaves and various kinds of fancy bread are made by the aerated process by placing the necessary ingredients in the mixer along with the flour.

The advantages claimed for Dr Dauglish's process are :—

'€(1.) It does away entirely with fermentation, and with all those chemical changes in the constituents of the flour which are conse- quent upon it.

'* (2.) It avoids the loss consequent upon the decomposition of the portion of starch or glucose consumed in the process of fermentation, estimated at about from 3 to 6 per cent.

"(3.) It reduces the time requisite to prepare a batch of dough for the oven, from a period of from eight to twelve hours to less than thirty minutes.

'«(4.) Its results are absolutely certain and uniform.

"«(5.) It does away with the necessity for the use of alum with

poor flour, and the temptation which bakers are under to use it with all.

‘©(6.) It has the recommendation of absolute and entire cleanli- ness, the human hand not touching the dough or the bread from

the beginning to the end. ; ‘ “«(7.) The journeymen are relieved from a circumstance most

destructive to their health—that of inhaling the flour dust in the

process of kneading. .... ¥ e ‘*(8.) It will produce a healthier condition of the baking trade,

and thereby diminish to a great extent the inducements which lead to the extensive system of fraud now practised upon the public by the production of adulterated and inferior bread.

“*(9.) It will effect an immense saving in the material from another source, namely, by preventing the sacrifice of at least 10 per cent.in the nutritive portion of the grain, hitherto lost as human food by the method of grinding and dressing necessary in the preparation of flour for making white bread by fermentation.

‘““(10.) Together with the preservation of this large proportion of the entire quantity of wheat converted into flour, there is also the important result of the proportion preserved (the ecrealin) being a most powerful agent in promoting the easy and healthy digestion of food.”

It is objected by opponents of the Dauglish system that the product is not really bread, but only an artificial pro- duct resembling bread. It is held that the process of fer- mentation has a specific influence on the constitution of bread, beyond its mechanical effect of rendering the mass spongy or porous. One of the chief hindrances to the more general use of aerated bread is the fact that it is, as com- pared with fermented bread, insipid and tasteless. In practice, the public have not hitherto derived any advan- tage from the alleged economy of manufacture, and the suitability of inferior and cheap flour for the process. Al- though fermented bread is hurtful in some conditions, it is not easy to supplant well-made fermented loaves in general

public estimation, and aerated bread can scarcely be said to have hitherto had a fair trial, as with the necessarily expensive machinery a large trade is necessary in order to return a fair profit on the capital invested.

Unfermented Bread.—Under this head is included such bread as is vesiculated by means of carbonic acid evolved from chemical substances introduced in the making of the dough. In writing the article on “ Baking” for the supple- ment to the fifth edition of this Hncyclopedia, published in 1816, Professor Thomas Thomson of Glasgow stated that the only end served by fermentation was the genera- tion of carbonic acid gas, and that this might be accom- plished by the use of hydrochloric acid and bicarbonate of soda. About 1842 Mr Henry Dodson commenced to manufacture bread on this system, and obtained a patent for his process. He used hydrochloric acid and bicarbon- ate of soda in such proportions that while, by their re- action, they liberated sufficient carbonic acid to aerate the dough, they formed chloride of sodium or common salt enough for the bread. Liebig, in his Familiar Letters, says regarding this system :—“ Chemists, generally speak- ing, should never recommend the use of chemicals for culinary preparations, for chemicals are seldom met with in commerce in a state of purity. Thus, for example, the muriatic [hydrochloric] acid which it has been proposed to mix with carbonate of soda in bread is always very impure, and very often contains arsenic.” The sesquicarbonate of ammonia is also used as a source of carbonic acid in vesiculating bread, and it, on account of its highly volatile nature, is entirely driven off in the process of baking. A great amount of private or domestic baking is conducted on the same principle, butter milk and bicarbonate of soda being used for mixing the dough in making “ scones.” In this case the lactic acid of the milk combines with the soda, liberating carbonic acid. The baking powders and ycast powders which are sold, and the so-called self-raising flour, all depend for their action on the mixture of bicar- bonate of soda with some organic acid, such as tartaric or citric acid. .

Baking Machinery and Ovens,—The art of baking, al-

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though it is the most important of all industries connected Mac

with the preparation of human food, is one which is stil] carried on in the most rude and primitive manner. While modern inventions aud the progress of improvement have changed the conditions under which nearly all arts and manufactures are conducted, the baking of bread is stil] conducted as it was during the palmy days of ancient Greece. The nature of the processes necessary for the preparation of bread, the limited time it will keep, and the consequent impossibility of storing the product or send- ing it any considerable distance, tend to keep the trade in the position of a limited and local handicraft. It is, there- fore, not a pursuit which attracts capitalists, and master bakers are mostly in the position of small tradesmen, with- out either the inclination or ability to invest money in expensive machinery and fittings. In the case of biscuit- baking the conditions are quite different, and it, as has been seen, has developed into a great manufacture, with elaborate and complex machinery and the most perfect mechanical appliances. Many forms of machine have been proposed as substitutes for the rude and laborious manual labour—always unfavourable to health, and sometimes not very cleanly—involved in baking. Many of these machines admittedly produce better bread than can be made by hand. work, and that at no inconsiderable saving of material and time, but the necessity of either steam or water power for their effective working greatly restricts their use.

The two processes to which machinery has been success- fully adapted, are the mixing of the sponge and the knead- ing of the dough. Attempts have been made to mould loaves by machinery, but these have hitherto failed; nor has the endeavour to fire bread in travelling ovens yet been practically successful. A great variety of knead- ing machines have been suggested and used, since the first trial of such an implement in Paris upwards of a century ago. The various plans upon which such machines have been constructed will be seen in the accompanying illustrations. Fig. 4 is a form of dough-making machine in common use. It consists of a trough or box, the lower portion of which is semi-cylindrical, hung on a spindle, with a series of iron crossbars revolving inside. It is made to be worked by either hand or steam-power, and of various sizes, as required by bakers. In this machine the

whole of the operations connected with setting the sponge, breaking the sponge, and mixing the dough, are performed. The gearing is arranged to give a fast motion for setting the sponge, and a slow motion towards the close of the

Fig. 4.—Kneading Machi

dough making, when it is desirable to draw out the mass in order to give it a “skin,” or smooth superficial texture. A worm-wheel, working in toothed gearing, tilts over the machine when the process of kneading is complete, and nd dough is then conveyed to the scaling and moulding table.

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Fig. 5 represents a kneading-machine, of a highly approved form, used in the great Scipion bakery of Paris, the inven-

Fic. 5.—Boland’s Kneading-Machine. tion of M. Boland. Externally it is like the former, and it is also geared to move at two rates of rapidity. It has further an adjustment by which the force of the motion is increased while its rate is diminished. The main pecu- liarity of M. Boland’s pétrin méchanique consists in the form of the revolving blades inside the trough. These blades are so arranged that they operate when in motion some-

Fra. 6.— Kneading-Machine of Deliry-Desboves.

what like alternate screws, and so toss backward and for- ward the dough when it is thin, and lift and draw it out when stiff, passing it to each side of the trough alternately. An entirely different form of kneader is seen

In fig. 6. This also is of French origin, the invention of M. Deliry-Desboves of Soissons (Aisne). Its construction and operation are thus described :—“ The trough is a cast- Iron basin, which turns on a vertical axis. The interior is provided with a kneader, shaped like a lyre, which first works up the dough and then divides it during the entire period of operation. Two other implements are also used, of a helical form, to draw out and inflate the dough in a!l directions, part by part, as is practised in kneading by hand. . . . The baker in charge can regulate the paste without stopping the mechanism. The water and lcaven are first introduced, the trough is then set to work, the

workers’ employed to manipulate the dough are put in gear, and the leaven being diluted and flour added, the kneaders are also put in gear. After the lapse of twelve or fifteen minutes the dongh is sufficiently kneaded, and, by turning the hand wheel fixed to the screw on the vertical

shaft, the three kneaders are thrown out of gear. The implement which effects the cleaning of the trough is then removed, and its place supplied by a balance-hook, by which the dough may be weighed in the trough itself. It is simply necessary to turn the basin on its axis as re- quired, until the whole of the dough is weighed,”—(Villain, Etudes sur U Exposition de 1867.)

The fourth form of mechanical kneader we shall describe is that invented by Messrs Vicars of Liverpool, who are extensive makers of all forms of machinery connected with bread and biscuit making. This machine (fig. 7) consists

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Fic. 7.—Patent Vertical Mixcr.

of two vertical shafts, carrying radial arms. These arms pass each other in opposite directions, so that, in addition to a tearing action on the dough, which the knives have on passing each other, they have a screw action, pressing the dough down on one side and up on the other. The vessels containing the dough are made of wood, of an oval form, to correspond

with the action of the machine. One considerable advantage connected with Messrs Vicars's machine is, that any number of troughs can be worked by the same pair of niixing shafts, as the troughs are movy- able, and are raised to, or lowered from, the blades of the mixer by means of friction wheels and spur gear. A baker can thus have several troughs containing sponges in different stages of advancement, all mixed by one pair of shafts, and all in their turn being made into dough by the same shafts.

Much thought and skill have been expended in the Ovens.

endeavour to effect improvements in the ordinary form of a baker's oven, but hitherto no plan has been devised which produces bread of a quality superior to that fired in the oven which is commonly used. A baker's oven of the common description is a low vaulted chamber, about 10 feet long, by 8 feet wide, and 30 inches high. It is built and floored of stone or brick, and has a small door in front by which the moulded dough is put in and the loaves withdrawn. At one side of this door, in the extreme corner, are placed the furnace and fire-grate, opening into the oven, and at the opposite corner, the smoke flue by which smoke escapes from the interior. The heat is by this arrangement carried throughout the entire oven, and when the temperature is sufficient the fire is withdrawn, the flue shut, and the dough is quickly introduced on a "peel," or long wooden shovel. Various efforts have been made to effect the heating of ovens by fire external to the chamber itself, but they fail to produce that radiation of heat which is found essential to good baking. Perkin's hot-water oven for some time met with favour in Great Britain, and a modification of it was employed in France, Ill. — 33

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On this system the oven is heated by superheated water, conveyed from a stove through closed pipes, which are coiled round the entire interior of the oven. This oven has the recommendation of perfect cleanness, and the temperature in it is easily regulated; but it is costly in construction, and the method has not commended itself in practice. Among ovens heated from the exterior, that of M. Rolland takes a high place for ingenuity and novelty of construction. Its characteristic peculiarity consists in the possession of a revolving sole, which not only allows the easy introduction and withdrawal

of the bread, but the bringing of the different parts regularly and uniformly under the influence of the heat applied. ‘The revolution of the sole is accomplished by a. handle worked from the front of the oven; and besides this rotatory motion the sole can also be raised or lowered so as to bring either the upper or under side of the bread close to the heat as desired. The heating of M. Rolland’s oven is effected by means of flues, which pass radially under and over the revolving sole. The chief objection urged against this form of oven is, that the air within it becomes too dry, which detracts from the flavour of the loaves fired in it. The use of the Vienna oven is general in Germany, and is extending in Paris for the baking of small or Vienna bread. It is egg-shaped in form, with an inclined sole, a very small aperture, and a low roof. Its average internal dimensions are 12 feet in depth, 10 feet wide, and 18 inches high. In the best of these ovens glazed tiles are used for the sole. The in- clination of the sole facilitates the filling and emptying of the oven; and the confined space of the interior retains a large proportion of moisture, which gives a fine colour to the crust and flavour to the crumb of the bread.

Qualities of Bread.—The process of baking changes the structure of the crust or outer part of a loaf, and, accord- ing to Reichenbach, develops in it a substance termed assamar, which he says has an influence in retarding the waste of tissue. It does not alter the starch of the crumb or internal part, but only swells the granules, and by the induced sponginess of the mass renders it readily digestible. Well-baked bread should have a yellowish-brown crust ; the crumb should be uniform in texture, permeated with minute cavities, and without “eyes” or large air-cells) The colour of the crumb, unless in the case of whole wheaten bread, should be white; it should be free from acidity and sourness. It should keep sweet and eatable for several days; and when stale it will be found to become soft and pleasant by again heating it in an oven, after which, however, it rapidly changes. According to Dr Frankland’s determinations, “1 tb of the crumb of bread, if digested and oxidised in the body, will produce an amount of force equal to 1333 tons raised 1 foot high. The maximum of work which it will enable a man to per- form is 267 tons raised 1 foot high. 1 Ib of crumb of bread can produce, at the maximum, 1,5 oz. of dry muscle or flesh.”

The adulteration of bread, and its detection, are treated under the heading ADULTERATION, vol. i. p. 170. (J. PA.)

BAKU, or Bapxu, the chief town of the government of the same name, in the Russian province of Transcaucasia (Daghestan), situated in the peninsula of Apsheron, on the west coast of the Caspian, and possessing one of the most spacious and convenient ports in that sea. Long. 49° 53’ E., lat. 40° 23’ N. It is built in the form of an obtuse tri- angle, on the slope of an arid hill, and is defended by a double wall and ditch constructed during the reign of Peter the Great. The general appearance of the town is decidedly Oriental, with its flat-roofed houses rising one behind the other, often in so close proximity that the top of the one

‘ 1 The Vienna oven is figured in Knapp’s Technology, vol. iii. p.

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forms the courtyard of the next. The hill is crowned by a castle, which dates from the 15th century, and the mosque of Shah-Abhas, still in good preservation. At the entrance of the harbour stands the Maiden’s Tower, now used as a lighthouse, which derives its name from a tragedy like that of the Cenci. Baku is not only a principal station of the Russian fleet, but it carries on a very extensive trade, exporting naphtha, iron, linen, and woollen goods, and re- ceiving in return cotton, grain, fruits, &c. The numerous naphtha wells in the neighbourhood, and the remarkable escape of inflammable gases, rendered Baku a favourite resort of the firc-worshippers, who for long maintained their temples in the district; but, though the natural phenomena display themselves as abundantly as ever, they are now almost entirely deserted by devotees. The Arabian Masudi, in the 10th century, is supposed to be the first to mention “ Baki” and its fire-breathing mountain; and the naphtha wells are probably those alluded to by Marco Polo, In 1509 it was taken by the Persians, who lost it to the Turks,

but recovered it under Shah-Abbas. Captured by the Russians in 1723, it was restored to Persia in 1735, but after various vicissitudes it was finally incorporated with the Russian empire in 1806. (See Goldschmid's Tele graph and Travel, 1874; Filippi's Viaggio in Persia, 1865; Hist. des découvertes faites par div. sav. voyageurs, Lausanne, 1784; La Tour du Monde, 1863; "Baku" in Zeitschrift der Deutsch. Geol. Gesellsch., 1874.)

BALA, a market-town of Wales, county of Merioneth, and hundred of Penllyn, at the northern extremity of the lake of the same name, 17 miles N.E. of Dolgelly. It consists principally of one wide street. Its manufactures are flannels, stockings, gloves, and other woollen hosiery. There is an endowed granimar school, founded in 1712, and a theological college, belonging to the Calvinistic Methodists. 'The Rev. Thomas Charles, well known in connection with the religious literature of his country, was long a minister at Bala. Population, 1539. The Lake of Bala, which is 4 miles long and about half a mile broad, is subject to sudden and sometimes dangerous floods. It is very deep aud clear, and abounds with pike, perch, trout, eels, and the gwyniad, or Coregonus fera.

BALAAM, or rather BrLram, the son of Beor, belonging to Pethor, by the River Euphrates in Aram, is represented in Scripture as a seer who possessed the power of blessing and cursing effectually. According to the narrative — in Numbers xxii.—xxiv., he was invited by Balak, king of Moab, to come and curse Israel, in order to ensure the latter's defeat. Jehovah, however, forbade him to go as he was requested, and therefore he refused to accompany the deputation of elders, who had been sent to invite him, 'with the rewards of divination in their hand." After the arrival of a second embassy more imposing than the first, he received divine permission to go, but only on condition that he should adhere strictly to what Jehovah should tell him. He set out accordingly, and in his journey experi- enced the anger of the Lord, an angel being sent to stop his progress, who was perceived only by the ass on which the pro- phet was riding. After Balaam's eyes had been opened he saw the angel, and declared his willingness to go back, but received permission to continue his journey on condition of saying nothing but what was suggested to him by God. His reception by Balak was honourable and imposing, yet he continued faithful to Jehovah, and told the king he would only announce what Jehovah revealed. Standing

on the height of Baal-Bamoth, and surveying the tents of Israel, he declared his inability to curse a people so peculiar and righteous. Brought next to the top of Pisgah, and behold- ing thence a part of the Israelite camp, he anuounced that Jehovah saw no iniquity or perverseness in Jacob; that

| He was with them; that they were therefore strong aud

BA L victorious. Conducted afterwards to the top of Peor, he surveyed the army of Israel, and predicted their future, their goodly dwellings in Canaan, and their successful wars against the nations down to Saul's time. Though Balak was angry and interrupted him, Balaam continued his prophecy, announcing Israel's valiant deeds, from David down to Hezekiah. Upon this he returned to his home.

Another account of Balaam appears in Numbers xxx1. 8-16, Joshua xiii. 22, where we learn that he advised the Midianite women to seduce the Israelites to the licentious worship of Baal, and that he was slain in a war with the Midianites.

The character given to Balaam in the first account is a favourable one. He is a worshipper of Jehovah the true God, receives divine revelations, and repeatedly declares that he will not go beyond or against them. Faithful to his calling, he steadfastly resists temptations sufficiently powerful, and therefore God communicates His Spirit to him, enabling him to predict the future of Israel.

The second account is unfavourable. In it he appears as a diviner, opip, a heathen seer, who tempted the wor-

shippers of the true God to idolatry. Instead of being a prophet of Jehovah, receiving visions and revelations, a man to whom the Almighty came by night, giving him instructions what to do, he is an immoral soothsayer. Of the two accounts, the latter, brief as it is, seems entitled to greater consideration. The former is elaborate and artificial, the theme being the glorification of the chosen people by the mouth of one of their enemies, An inspired seer from the far distant land of Aram is called in to bless the Israelites. He does so reluctantly, but like a true prophet, announcing nothing but what came to pass. The way in which he is taught the high des-

tiny of the chosen people is instructive. Ignorant at first of Israel's relation to the true God, and thinking they were like others, he was disposed to curse them, but is enlightened, and forcibly impelled to follow the divine revelations. From a heathen mantis he is converted into a true prophet by revelations and visions which he cannot resist. 'The seer is taken to three places in succes- sion, whence he surveys Israel, and utters oracular sayings concerning them. Three times the angel of the Lord stands in the way, and three times the ass is smitten by Balaam. 'There are four prophetic announcements—xxiil. 7-10, 18-24; xxiv. 3-9, 15-24. The first refers to the separate condition of Israel, their numbers, and their wor- ship of the true God amid the idolatry of the surrounding nations. The second declares that God blesses Israel because there is no iniquity or perverseness in them, that He dwells among them, reveals himself to them, and makes them powerful and victorious. Both these refer to Mosaic times, or at least to times not later than Joshua. But the third announcement has the character of prediction, and refers to future events. Hence Balaam is introduced as a mau whose eyes are opened, who hears the words of God, and sees visions of the Almighty. The condition of the people down to the time of Saul is glanced at, their secure settlement in Canaan, and victorious wars with the native races. The fourth prophecy apparently carries down the history to the time of Hezekiah ; and a future ruler is distinguished as the star out of Jacob, the sceptre out of Israel, the conqueror of the Moabites and Edomites. The mention of the Kenites and Assyria in ver. 22, the former of whom were allies of Edom, shows, in the opinion of some recent critics, that the writer was acquainted with the Edomite wars under Amaziah and Uzziah, and hoped that the latter power would permanently subjugate the restless Edomites. This would bring the composition down to the first half of the 8th century. Verses 23 and 24 are obscure, but probably refer to no event later than

Hezekiah. A fleet from the Phoenician Cyprians seems to have attacked the Canaanitish and Phcenician coasts, threatening the Syrians farther north.

The writer of Num. xxxi. 8, 16, Joshua xiii. 22, is the Elohist, whose account is very brief. Meagre, however, as it is, it is probably historical. A

heathen soothsayer, connected with the Midianites, perished in one of their battles with Israel. The writer of Numbers xxii.—xxiv. is, in this view, the Jehovist, who, under the name of Balaam, gives expression to his ideas and hopes in the elevated diction of an inspired prophet. As Jacob and Moses had pronounced blessings on Israel under the imme- diate inspiration of the Almighty, so Balaam is summoned from a distant land to eulogise the saine people.

The character of Balaam has been apprehended very variously. Such diversity must exist according as the Elohist or Jehovist is followed. The Old Testament writers who mentioned him afterwards were influenced by the Jehovistic notice, and pronounce no judgment upon the seer (Deut. xxiii. 5, 6; Joshua xxiv. 9, 10; Micah vi. 5; Nehemiah xiii. 2); but the New Testament authors followed the Elohistic account, and speak of him disparagingly, attri- buting to him love of " the wages of unrighteousness," mad- ness, idolatrousness, and impiety (2 Peter ii. 15, 16; Jude 11; Rev. ii. 14). Josephus calls him pdytis dpictos trav tore, 'the best prophet of his time," supposing him to be a prophet of the true God, but with a disposition ill- adapted to resist temptation. Philo describes his character more critically : "'"There was a man at that time celebrated for divination, who lived in Mesopotamia, and was an adept in all the forms of the divining art; but in no branch was he more admired than in augury ; to many persons, and on many occasions, he gave great and astounding proofs of his skill, For to some he foretold storms in the height of summer ; to others drought and heat in the depth of win- ter; to some scarcity succeeding a fruitful year, and then again abundance after scarcity ; to others the overflowing and drying up of rivers, and the remedies of pestilential diseases, and a vast multitude of other things, each of which he acquired great fame for predicting." 'The unfavourable character drawn of him by Philo is that which is generally taken by the later Jews. The later Targumists call him a sinner and an accursed man, while the Talmudists make him the representative of the godless, in contrast with Abraham, the representative of the pious. Yet they do not ignore his prophetic gift. The Midrashim about him are hardly worth mentioning, such as that he was one of Pharaoh's counsellors, that he was governor of a city in Ethiopia which he excited to rebellion, but was unable to defend against Moses at the head of an army who stormed the place and put Balaam to flight. In Yalkut (§ She- moth) he is said to have been

identified by some with Laban, Jacob's father-in-law; by others with Elihu, Job's friend ; while others say that Janres and Jambres were his sons. In Sanhedrin (§ Chelek) he is said to have been blind of an eye. 'These, and other rabbinical fables, are entirely worthless ; and Origen's belief that the Magi from Persia, who came to worship the infant King of the Jews, learnt the meaning of the star from Balaam's prophecies, is of the same character.'

Most of the Fathers, including Augustine and Ambrose, judged him to be a soothsayer or magician, a prophet in- spired by the devil. A few, as Tertullian and Jerome, took a more favourable view of his character. The Ma- hometans have various fables concerning Balaam. They say that he was of the race of Anakim, or giants of Pales- tine, and that he read the books of Abraliam, where he got the name Jehovah, by virtue of which he predicted the

1 See Fabricius's Codex Pseudepigraphus Vet. Test., p. 807, &c.

future, and got from God whatever he asked. This pro- cured him great renown. In consequence, however, of his prevarication, God was offended with him, and left him to himself, so that he fell into infidelity. It is generally supposed that the words in the Koran (§ Al-Araf) refer to him :—' The history of him unto whom we brought our signs and he departed from them; wherefore Satan followed him, aud he became one of those who were seduced. And if we had pleased, we had surely raised him thereby unto wisdom ; but he inclined unto the earth, and followed his own desire. Wherefore his likeness is as the likeness of a dog, which, if thou drive him away, putteth forth his tongue ; or if thou let him alone, puttcth forth his tongue also."

It has been conjectured with much probability that the Arabic wise man, commonly called Lokman, is identi- cal with Balaam. The two names coincide in meaning, devourer, swallower ;* aud the names of their fathers are also alike. The Jews suppose Balaam to have been a Nahorite, and so Lokman is regarded by many Arabic authors, though the more general opinion is that he was an Abyssinian slave who lived in the time of David,

and was renowned as a Hakim. The proverbs or fables attri- buted to him are of Greek origin.

Modern critics are divided in opinion respecting him. Three leading views embrace the varieties of belief as to his true position, viz., that he was an idolater and sooth- sayer, whose soul was uninfiuenced by true religion—a sorcerer who had acquired reputation by his insight into the force of nature and his incantations; that he was a true prophet of God, a pious man who fell through covet- ousuess ; and that he was a heathen soothsayer and a prophet of Jehovah at the same time, occupying an inter- inediate position, with an incipient knowledge and fear of God, needing but to be developed, though checked bythe love of gain. It appears impossible to arrive at a definite or com- prehensive vicw of one who is described in different sources inconsistently. Bishop Butler, not recognising that the his- tory of Balaam has poetical elements, and that different tradi- tions are given respecting him, considers him a very wicked man under a deep sense of God and religion, persisting still in his wickedness, and preferring the wages of unright- eousness even when he had before him a lively view of death. His mind was distracted by contradictory principles of action. All we know about him aniounts to very little. After admitting that a heathen soothsayer of this name existed in Mesopotamia, and had acquired some renown in the regions adjoining, and that he was employed in some way as a medium for uttering eulogiuins upon Israel, of whose pre-eminence and permanence he is fully conscious, nothing else can be affirmed with certaiuty. (Davidson's Introduction to the Old Testament, vol. i. p. 328, &e. ; Ewald's Geschichte des Volkes Israel, zweyter Band, p. 298, &c., 3d edition, and his Jakrbiicher, part 8, p. 1, &c. ; Kurtz's Geschichte des alten Dundes, zweyter Band, p. 454, &e. ; Hengstenberg's Die Geschichte Bileam's und seine Werssagungen, 1842; Winer's Realwérterbuch, s.v. "Bileam;" Knobel's Dre Biicher Numeri, Deuteronomium, und Josua erklart, p. 121, &e.; Schenkel's Bibel-Lexicon, sv. "Bileain ;" and Hamburger's Real-Hncyclopedie fur Bibel und Talmud, s.v. " Bileam.")

BALAGHAT, a British district in the Central Provinces of India, situated between 21° and 23° N. lat. and 80° and

U pyba from yba, with the formative letter 1D. It has been de-

rived from DY—}0A (Sanhed. 105), destroyer or corrupter of the people, so that the name has passed for a typieal designation of Israel’s enemy ; and this is reflected in the Greek word NixoAatrns (Rev. ii. 6), from yixaéy and Aads, as if the Nicolaitanes were essentially Balaamites, or sedueers. improbable.

But this etymology of the name Balaam is

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81° E. long. ; bounded on the N. by the district of Mandla; on the E. by the district of Chhattisgarh ; on the S. by Chhattisgarh and Bhandar4 ; and on the W. by the district of Seoni. Balaghat forms the eastern portion of the cen- tral plateau which divides the province from east to west, These highlands, formerly known as the Raigarh Bichhia tract, remained desolate and neglected until 1866, when the district of Balaghat was formed, and the country opened to the industrious and enterprising peasantry of the Waingangé valley. Geographically the district is divided into threes distinct parts:—(1.) The southern lowlands, a slightly undulating plain, comparatively well cultivated, and drained by the Waingangé, Bagh, Deo, Ghisri, and Son rivers, (2.) The long narrow valley, known as the Mau Taluka, lying between the hills and the Wainganga river, and com- prising a long, narrow, irregular-shaped lowland tract, intersected by hill ranges and peaks covered with dense jungle, and running generally from north to south. (3.

The lofty plateau, in which is situated the Raigarh Bichhia tract, comprising irregular ranges of hills, broken into numerous vallcys, and generally running from east to west. The highest points in the hills of the district are as fol- lows:—Peaks above Lanji, 2300 or 2500 feet; Tepdgarh hill, about 2600 feet; and Bhainsdghdt range, about 3000 fect above the sea. The principal rivers in the district are the Waingangé, and its tributaries, the Bagh, Nahra, and Uskal ; a few smaller streams, such as the Masmar, the Mahkard, &e. ; and the Banjér, Halon, and Jamunia, tribu- taries of the Narbad4, which drain a portion of the upper plateau. Balaghdt containsvery

extensive forests, but they do not produce timber of any great value. They teem with

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wild animals, from the great bison to the fox ; 470 beasts

and venomous snakes were killed in 1867-68, a total reward of £156 being paid under this head. The district contained in 1868 an assessed area of 1462-08 square miles or 935,731 acres, of which 214,587 acres were under cultivation; 488,510 grazing lands ; 116,938 culturable, but not actu- ally under cultivation ; 115,696 unculturable waste. The census report of 1872 returned the area at 2608 square miles. The census of 1866 showed a population of 170,964. This had in 1872 increased to 195,008, residing in 37,192 houses and 781 villages; average number of persons per square mile, 74°77; per village, 249°69; per house, 5:24. Of the total population, 131,176 or 67°27 per cent. were Hindus; 2934 or 1°50 per cent. Mahometans; 39 Buddhists ; 11 Christians; 60,848 or 31:20 per cent. of unspecified religions of aboriginal or imperfectly Hinduised types.

Since 1867 considerable encouragement has been given to the cultivating tribes of Ponwars, Kunbis, Mardrs, &c., of the low country to immigrate, and take up lands in the upland tracts. By this means a large quantity of jungle lands has lately come under cultivation. The acreage under the principal crops grown in the district is returned as follows :—rice, 188,312 acres; wheat, 585; other food grains, 8770; oil-seeds, 3436; sugar, 505; fibres, 100; tobacco, 638; total, 202,346 acres. Iron is smelted by the Gouds; gold exists in the beds of some of the rivers, but not in sufficient quantities to repay the labour of washing. There are no regularly made roads in the dis- trict. Five passes lead from the low country to the high- lands, viz., the Banpur Ghat, the Warai Ghat, the Panchers Ghat, the Bhondw4 Ghat, and the Ahmadpur Ghat. For revenue purposes the district is divided into two sub- divisions, the Burha Tahsil and the Paraswdr4 Tahsfl. In 1868-69 the total revenue of the Béalaghdat district amounted to £11,746, of which £6754, or 57 per cent, was from land. For the protection of person and property, Government maintained, in 1868, 115 policemen, at a total cost of £1156, 16s, In 1868 only two towns in the dis-

trict had upwards of 2000 inhabitants, viz., Hatta, popula- tion, 2608, and Lanji, population, 2116. About 60 years ago the upper part of the district was an impenetrable waste. About that time one Lachhman Naik established the first villages on the Parasswaré plateau, on which there are about 30 flourishing settlemcuts. But a handsome Buddhist temple of cut stone, belonging to some remote period, is suggestive of a civilization which had disappeared before historic times.

BALANCE. For the measurement of the “ mass” of (i.e, of the quantity of matter contained in) a given body we possess only one method, which, being indepen- dent of any supposition regarding the nature of the matter to be measured, is of perfectly general applicability. The method—to give it at oncein its customary form—consists in this, that after having fixed upon a wnt mass, and procured a sufficiently complete sct of bodies representing each a known nuniber of mass-units (a “sct of weights ”), we determine the ratio of the weight of the body under examination to the weight of the unit piece of the set, and identify this ratio with the ratio of the masses. Machines constructed for this particular modus of weighing are called balances, Evidently the weight of a body as determined by means of a balance—and it is in this sense that the term is always used in everyday life, and also in certain sciences, as, for instance, in chemistry—is independent of the magnitude of the force of gravity ; what the merchant (or chemist) calls, say, a ‘‘ pound” of gold is the same at the bottom as it is at the top of Mont Blanc, although its real weight, z.¢., the force with which it tends to fall, is greater in the former than it is in the latter case.

To any person acquainted with the elements of me- chanics, numerous ideal contrivances for ascertaining which of two bodies is the heavicr, and for even determining the ratio of their weights, will readily suggest themselves ; but there would be no use in our noticing any of these many conceivable balances, except those which have been actually realised and successfully employed. These may be con- veniently arranged under six heads.

1. Spring Balances,—The general principle of this class of balances is that when an elastic body is acted upon by a weight suspended from it, it undergoes a change of form, which, cwteris paribus, is the greater the

greater the weight. The simplest form of the spring balance is a straight spiral of hard steel (or other kind of elastic) wire, suspended by its upper end from a fixed point, and having its lower end bent' into a hook, from which, by means of another hook crossing the first, the body to be weighed is suspended,— matters being arranged so that even in the cmpty instrument the axis of the spiral is a plunib-line. Supposing a body to be suspended at the lower hook, it is clear that the point where the hooks intersect each other will descend from the level it originally occupied, and that it must fall through a certain height A before it can, by itself, remain at rest. This height, provided the spiral was not strained beyond its limit of elasticity (7.c., into a permanent change of form), is proportional to the weight P of the body, and consequently has to the mass M the relation h=cgM, where c is a constant and g the acceleration of gravity. Hence, supposing in a first case h and M to have been h' and M', and in a second case, h" and M', we have h': h":: gM: gM"; and it is only as long as g is the same that we can say h': h";: M':M". Spring balances. are very extensively used for the weighing of the cheaper articles of commerce and other purposes, where a high degree of pre- cision 1s not required. In this class of instruments, to com- bine compactness with relatively considerable range, the spring 1s generally made rather strong ; and sometimes the exactitude of the reading is increased by inserting, between the index and that point the displacement of which serves

to measure the weight, a system of levers or toothed wheels, constructed so as to magnify into convenient visibility the displacement corresponding to the least difference of weight to be determined. Attempts to convert the spring balance into a precision instrument have scarcely ever been made; the only case in point known to the writer is that of an elegant little instrument con- structed by Professor Jolly, of Munich, for the determination of the specific gravity of solids by immersion, which consists of a long steel-wire spiral, suspended in front of a vertical strip of silvercd glass bearing a millimetre scale, To read off the position of equilibrium of the index on the scale, the observing eye is placed in such a position that the eye, its image in the glass, and the index are in a line, and the point on the scale noted down with which the index apparently coincides.

2. Chain Balances.—This invention of Wilhelm Weber's having never, so far as we know, found its way into actual practice, we confine ourselves to an illustration of its prin- ciple. Imagine a flexible string tu have its two ends attached to the two fixed points C and D (fig. 1), forming the ter-

C D

ane

Fia, 1.—Diagram illustrating Chain Balance.

minal points of a horizontal line CD shorter than the string. Suppose two weights to be suspended, the one ata point A, the other at a point B'of the string; the form of the polygon CDBA will depend, ceteris paribus, on the ratio of the two weights. Assuming, for simplicity's sake, CA to be equal to DB, then, if the weights are equal, say, each=P units, the line AB will be horizontal. But if now, say, the weight at B be replaced by a heavier weight Q, the point A will ascend through a height A, the point B will descend through a lesser height h' in accordance with equation Ph = Qh', and the angle between what is now the position of rest of the base line A'B', and the original line AB will depend on the ratio of P:Q. The exact measurement of this angle would be difficult, but it would be easy to devise very exact means for ascertaining whether or not it was horizontal, and, if not, whether it slanted down the one way or the other; and thus the instrument might serve to determiuc whether P was equal to, or greater or less than, Q; and this obviously is all that is required to convert the contrivance into an exact balance.

3. Lever Balances.—This class of balances, being more extensively used than any other, forms the most impor- tant division of our subject. There is a great variety of lever balances ; but they are all founded upon the same principles, and it is consequently expedient to begin by summing up these into one general theory,

Theory of the Lever Balance (fig. 2).—In developing the "theory" of a machine, the first step always is and must be that we substitute for the

machine as it is a fictitious machine, which, while it closely corresponds in its working to the actual thing, is free from its defects. In this sense what now follows has to be understood. Imagine

23

d---+|----------9, (A+W)

Fria. 2.—Diagram illustrating the theory of the Lever Balance.

an inflexible beam suspended from a stand in such a manner that, while it can rotate freely about a certain horizontal axis fixed in its position with respect to both the stand and the beam, and passing through the latter somewhere above its centre of gravity, it cannot perform any other motion. Imagine the beam at each end to be provided with a vertical slit, and each slit to be traversed by a rigid line fixed in the beam in such a situation that both lines are parallel to, and in one and the same plane with, the axis of rotation; and suppose the mass of the beam to be so distributed that the line connecting the centre of gravity S with its projection O on the axis of rotation stands perpen- dicular on that plane. Suppose now two weights, P’ and P”, to be suspended by means of absolutely flexible strings, the former from a point A on the rigid line in the left, the other from a point B on the rigid line in the right slit, and clearly, whatever may be the effect, it will not depend on the length of the strings. Hence we may replace the two weights by two material points situated in A and B, and weighing P’ and FP” respectively. But two such points are equivalent, statically, to one point (weighing P’ + F”) situated somewhere in D within the right line connect- ing A with B. Suppose the beam to be arrested in its “normal position” (by which we mean that position in which AB stands horizontal and the line SO is a plumb- line), and then to be released, the statical effect will depend on the situation of the point D, and this situation, supposing the ratio /’: 1” to be given, on the ratio P’: P”. If P’ ’ =P” ll”, D lies in the axis of rotation; the beam remains at rest in its normal position, and, if brought out of it, will return to it, being in stable equilibrium. This at once suggests two modes of constructing the instrument and two corresponding methods of weighing. First Method.—We so construct our instrument that while J’ is constant, 2” can be made to vary and its ratio to l’ be measured. In order then to determine an unknown weight P’, we suspend it at the point pivot A; we

then take a standard weight P” and, by shifting it forwards and backwards on AB, find that particular position of the point of suspension B, at which P” exactly counterpoises P’, We N a4 then read off Ms , and have P’= Pi. But, practically, the body to be weighed cannot be directly suspended fron A, but must be placed in a pan suspended from A, and consequently

the weight p, of the pan and its appurtenances would always have to be deducted from the total weight P’, as found by the experiment, to arrive at the weight of the object p= P’—»,. Hence, what is actually done in practice is so to shape the right arm that its back coincides with the line AB, and to lay down on it a scale, the degrees of which are equal to one another, and to’ (or some convenient sub- multiple or multiple of /’) in length, and so to adjust p, and number the scale, that when the sliding weight P” is suspended at the zero-point, it just counterpoises the pan ; so that when now it is shifted successively to the points 1, 2,3… p, it balances exactly 1, 2, 3… p units of weight placed in the pan. This is the principle of the common steel-yard, which, on account of the rapidity of its working, and as it requires only one standard weight, is very much used in practice for rough weighings, but which, when carefully constructed and adjusted, is susceptible of a very considerable degree of precision. In the case of a precision steel-yard, it is best so to distribute the mass of the beam that the right arm balances the left one + the pan, to divide that arm very exactly into, say, only 10 equal parts, and instead of one sliding weight of P” units to use a set of standards weighing P”’, py P’, aio PF’, rosa P”, &e. The great difficulty is to ensure to the heavier sliding weights a sufficiently constant position on the beam. To show the extent to which this difficulty can be overcome it may be stated that in an elegant little steel-yard, constructed by Mr Westphal of Celle (for the determination of specific gravities), which we had lately occasion to examine, even the largest rider, which weighs about 10 grammes, was so constant in its indications that, when suspended in any notch, it always produced the same effect to within less than xpath of its value.

Second Method.—We so construct our instrument that both U’ and J” have constant values, and are nearly or exactly equal to each other, and provide it

with pans, whose weights p,/ and p,” are so adjusted against each other that p’l =p,’l’, and, consequently, the empty instrument is at rest in its normal position. We next procure a sufficiently complete set of weights, ¢.e., a set which, by properly com- bining the several pieces with one another, enables us to build up any integral multiple of the smallest difference of weight 8 we care to determine, a set, for instance, which virtually contains any term of the series 0-001, 0°002, COOF ie SS 100-000 grammes. In order now to determine an unknown weight p’, we place it, say, in the left pan, and then, by a series of trials, find that combina- tion of standards p” which, when placed in the right pan, establishes equilibrium to within+6. Evidently—

»_ (p= d)l’ (1).

=— 7

In the case of purely redative weighings, there is nothing to a a

hinder us from adopting 7 units (¢.9., 7 grammes as our

unit of mass, and simply to identify the relative value of p’

with the number p”. But even if we want to know the

absolute value of p’ in true grammes, we need not know a”

the numerical value of T° All we have to do is, after

N

é , ao l having determined the value of p in terms of yp

the positions of object and staudards, and, in a similar

manner, to ascertain the value p,” which now counterpolses

the unknown weight py’ lying in the right pan. Obviously a /

to reverse

p =p” one a7 Whence (p’)? = pp,” and p = Jp rs for which expression, if the two arms are very nearly of equal length, we may safely substitute p’ = $(p” + py’). Or, instead of at once finding the counterpoise for p’ in stan- dards, we may first counterpoise it by means of shot or other

material placed in the opposite pan, and then find out the number of grammes p” which has to be substituted for p’ to again establish absolute equilibrium. Evidently p’ = p’ r6 This (in reference to the ideal machine meant to be realised) is the theory of the common balance as we see it working in every grocer’s shop, and also that of the modern precision balance, which, in fact, is nothing but an equal-armed beam and scales refinedly constructed. In the case of the latter class of balances the inconvenience involved in the use of very small weights may be avoided (and is generally avoided) by dividing the right arm of the beam, or rather the line AB, into 10 equal parts, and determining differ- ences of less than, say, 001 gramine by means of a sliding weight possessing that value. But evidently, instead of dividing the whole length of the right arm, it is better to divide some portion of it which is so situated that the rider can be shifted from the very zero to the “10,” and so to adjust the rider, that when it is shifted successively from Oto 1, 2,3… itis the same as if 1, 2,3… tenths of its weight were placed in the right pan. The rider in this case must, of course, form part and parcel of the beam. It is singular that none of our precision-balance makers have ever thought of this very obvious improvement on the customary system. In the very excellent instrument made by Messrs Becker and Company of New York, this, it is true, is realised partially in a rider weighing 12 milligrammes and a beam divided into 12 equal parts (instead of 10 and 10 respectively) ; but this does not enable one to shift the rider to where it would indicate from 0 to say 43, or +4 of a milligramme. Whichever of these modes of weighing we may adopt, we must have an arrangement to see whether the balance is in its normal position, and it is desirable also to have some means to enable us, in the course of our trials, to form at least an idea as to the additional weight which would have to be added to the standards on the pan (or to be taken away) in order to establish equilibrium. To define the normal position, all that is required is to provide the beam with a sufficiently long “ needle,” the

axis of which is parallel to the line OS, and which plays against a circular limb fixed to the stand and constructed so that the upper edge of the limb coincides very nearly with the path of the point of the vibrating needle, and to graduate the limb so that, as fig. 2 shows, the zero point indicates the normal position of the beam. In order to see how the graduation must be made to be as convenient as possible a means for translating deviations of the needle into differences of weight, let us assume the balance to be charged with P’ grammes from A and with P’ + A grammes from B, and P’ and P” to satisfy the equation P’ / =P”. The two weights F’ and P” being equivalent to one point P’+ P” in the axis of rotation, the effect is the same as if these two weights did not exist and the beam was only under the influence of two weights, viz., the weight W of the beam acting in § and the weight A acting in B. But this comes to the same as if both W and A were replaced by one point weighing W-+A, and situated somewhere at C, between, and ona line with, Band 8. Hence, suppos- ing the beam to be first arrested in its normal position and then to be left to itself, the right arm will go down and not be able by itself to remain at rest before it has reached that position in which ©, lies vertically below the axis of rotation. Cwteris paribus C, will be the nearer to B, and consequently the angle a, through which the beam (and with it the needle) has to turn to assume what now 1s 1ts position of stable equilibrium, will be the greater the greater Ais, and for the same A and W the angle of devia- tion will be the greater the less the distance s of the centre of gravity of the beam § is from the axis of rotation. The former proposition enables one in a given case to form an idea of the amount A which has to be taken away from the

right pan to establish equilibrium. To find the exact mathematical relation between A and the corresponding angle a, let us remember that the position of C, is the same whatever may be the direction of gravity with regard to the beam. Assuming gravity to act parallel to OS, we have (W + A) CC,= Al”, where C stands for the pro- jection of C, on OS. Assuming, secondly, gravity to act parallel to the line OB, we have (W + A). CO=W. OS; . Cp a ; Fo =tana= -. i Wwe 2 (2).

Obviously, the right way of graduating the limb is to place the marks so that their radial projections on the tangent to the circle at the zero-point divide that line into parts of equal length. In the ordinary balance where l” is a constant, the factor We has a constant value, which can be determined by one experiment with a known A—always supposing that in the instrument used the requirements of our theory were exactly fulfilled. In good precision balances they are fulfilled, to such an extent at least, that although the factor named is not absolutely constant, but a function of P, it can be looked upon as a relative constant, so that by determining the deviations produced by a given A, say A= 1 milligramme, for a series of charges (i.e., values of P’’), one is enabled to readily convert deviations of the needle, as read off on the scale, into differences of weight. This method is very generally followed in the exact determina- tions of weights as required in chemical assaying, in the adjusting of sets of weights, &c. Only, instead of letting the needle come to rest and then reading off its position, what is done is to note down 2, 3,4… consecutive excursions of the needle, and from the readings (a, a,, as, a,...4,) to calculate the position a, where the needle would come to rest if it were allowed to do so. It being understood that the readings must be taken as positive or negative quantities according as they lie to the left or to the right of the zero-point, a, might be identified with any of the sums—

4 (a, +4,), $ (a,+4,),-..... 4 (A,1 + 4,), but clearly it is much better to calculate a, by taking the mean of these quantities, thus—

F _ +4, +2 (gta… + a1) | 7 2 (n—1) :

and it is also easily seen that to eliminate as much as possible the influences of the resistance of the air and (let us at once add by anticipation of what ought to be reserved for a subsequent paragraph) of the friction in the pivots of the balance, it is expedient to let m be an odd number. Theoretically this method is. of course, not confined to small A’s, and it is easy to conceive a balance in which the limb is so graduated that it gives directly the weight of an object placed.in the right pan; this is the principle of the Tangent Balance, a class of instruments which used to be very generally employed for the weighing of letters, parcels, &c., but is now almost entirely superseded by the spring balance.

After having thus given a general theory of the cdeal, let us now pass to the actual instrument. But in doing so we must confine ourselves mainly to the consideration of that particular class of instruments called precision balances, which are used in chemical assaying, for the ad- justment of standard weights, and for other exact gravi- metric work.

The Precision Balance being, as already said, quite identical in principle with the ordinary “pair of scales,” there is no sharp line of demarcation between it and what is usually called ‘‘a common balance,” and it is equally

impossible to name the inventor of the more perfect form of the instrument. But taking the precision balance in what is now considered its most perfected form, we may safely say that all which distinguishes it from the com- mon balance proper is, in the main, the invention of the late Mr Robinson of London. In Robinson’s, as in most modern precision balances, the beam consists of a perforated flat rhombus or isosceles triangle, made in one piece out of gun-metal or hard-hammered brass. The substitution for either of those materials of hard steel would greatly increase the relative inflexibility of the beam, but, unfortunately, steel is given to rusting, and, besides, is apt to become magnetic, and has therefore been almost entirely abandoned. The perforations in the beam are an important feature, as they considerably diminish its weight (as compared with what that would be if the perforations were filled up) without to any great extent reducing its relative solidity. In fact, the loss of carrying power which a solid rhombus suffers in consequence of the middle portions being cut out, is so slight that a very insignificant increase in the size of the minor diagonal is sufficient to compensate for it. Why a balance beam should be made as light as possible is easily seen ; the object (and it is as well here to say at once, the only object) is to diminish the influence of the unavoidable imperfections of the central pivot. To reduce these imper- fections to a minimum, the beam in all modern balances is supported on a polished horizontal plane of agate or hard steel fixed to the stand, by means of a perfectly straight “ knife-edge,” ground to a prism, of hard steel or agate, which is firmly connected with the beam, so that the edge coincides with the intended axis of rotation. In the best instruments the bearing plane is continuous, and the edge rests on it

along its entire length ; in less expensive instru- ments the bearing consists of two separate parts, of which the one supports the front end, the other the hind end of the edge. Every complete balance is provided with an “ arrest- ment,” one of the objects of which is, as the name indi- cates, to enable one to arrest the beam, and, if desired, to bring it back to its normal position ; but the most impor- tant function of it is to secure to every point of the central edge a perfectly fixed position on its bearing. So far all modern precision balances agree; but the way in which the point-pivots A and B of our fictitious machine are sought to be realised varies very much in different in- struments. In Robinson’s, and in the best modern balances, the beam is provided at its two extremities with two knife- edges similar to the central one (except that they are turned upwards), which, in intention at least, are parallel to, and in the same plane as, the central edge ; on each knife-edge rests a plane agate or steel bearing, with which is firmly con- nected a bent wire or stirrup, provided at its lower end with a circular hook, the planeof whichstands perpendicular to the corresponding knife- edge ; and from this hook the pan is sus- pended by means of a second hook crossing the first, mat- ters being arranged so that, supposing both end- bearings to be in their proper places and to lie horizontally, the work- ing points A’ and B’ of the two hook-and-eye arrangements are vertically below the intended point-pivots A and B on theedges. In this construction it is an important func- tion of the arrestment to assign to each of the two ter- minal bearings a perfectly constant position on its knife- edge. How this is done a glance at figs. 3 and 4 (of

Fia. 3.—Oeritling’s Balance. End of Beam.

BALANCE

which the former is taken from an excellent instrument constructed by L. Oertling of London, and the latter from an equally good balance, represented in fig. 5, made by

- Messrs Becker & Co., of New York) shows better than any

verbal explanation. But what cannot be seen from these sketches is that the range of the arrestment is regulated, and its catching con- trivances are placed, so that when the arrestment is at its highest place, the cen- tral edge

is just barely liftedfrom its bearing, and the terminal bear- ings are similarly lifted from their re- spective knife-edges, so that the beam is now at rest in its normal position. In other bal- ances, as, for instance, in the justly celebrated instru- ments of Mr Staudinger of Giessen, Robinson's plane

Fic. 4.—Becker's Balance. End of Beam.

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¥ia. 5.—Becker's Balance.

terminal bearings are replaced by roof-shaped ones (fig. 6), so that their form alone suffices to secure to them a fixed position on their knife-edges. Another A

construction (which offers the great advantage of being easy of execution and facilitating the adjustment of the instrument) is to give to the terminal edges the form of circular rings,

Fig. 6.

the planes of which stand parallel to the central edge, and from which the pans are suspended directly by sharp hooks, so that the points A' and B' coincide with

A and B respectively. In either case the terminal bearings are independent of the arrestment, which must consequently be provided with some extra arrangement, by means of which the beam, when the central edge is lifted from its support, is steadied and held fast in its normal position. In second and third class instruments even the central edge is made independent of the arrest- ment, by letting it work in a semi-cylindrical or, what is better, a roof-shaped bearing, which, by its form, assigns to it (in intention at least) a definite position.

In order now to develop a complete theory of the precision balance, let us first imagine an instrument, which, for distinctness, we will assume to be

constructed on Robinson’s model, the knife-edges and bearings, &c., being exactly and absolutely what they are meant to be, except that the terminal edges, while still parallel to the axis of rotation, are slightly shifted out of their proper places. Supposing such a balance were charged with P’ = p’, + p’ from the left, and P” = p”, + p” from the right knife-edge,—and it is clear that in this case also the charges may be assumed to be concentrated,—P’ in a certain fixed point A on the

from the axis of rotation, r= ,/x,? + y,2, and for the angle a through which the needle, supposing it to start from the zero-point, must turn to reach its position of stable equilibrium—

left, and P” in a certain fixed point B on the right edge, and, consequently, the statical condition of the balance is the same as if the weights W, P’, P” were all concentrated in one fixed point C, (fig. 7), the position of which, in regard to the beam, is independent of the extent to which the latter may have turned, and independent of the direction of gravity. It is also easily seen that in a given

My P’°r—PT (3)

% WetP he Pw oO ee ee

If, in particular cases, one or more of the points A, B, S$ should lie above the X-axis, we need only consider the respective ordinates as being in themselves negative, and the equations (as can easily be shown) remain in force, Taking equation 3, together with what was said before, we at once see that if a balance is to be at all available for what it has been made for, and supposing two of the co-ordinates h’, h” to have been chosen at random, the third must be chosen so that, at least whenever P’ ex- actly or nearly counterpoises P’, Ws, + Ph’ + P’h” > 0. For if it were = 0, then, in case of PU’ = P’l,” the balance would have no definite position of equilibrium, and if it were negative, y, would be negative, and the position of stable equilibrium would lie outside the angle of free play. Obviously, the best thing the maker can do is so to adjust the balance that h’ = h” = 0 andl’ = I”, because then the customary method of weighing (see above) assumes its

greatest simplicity, and, especially, the factor with which the deviation of the needle has to be multiplied to convert it into the corresponding excess of weight present on the respective pan assumes its highest degree of relative con- Stancy. We speak of a degree of constancy because this factor can never be absolutely constant, for the simple reason that no beam is absolutely inflexible, and consequently A’ as well as h” is a function of P’, and P” of the form A= h,+ yP, where y has a very obvious meaning. What is actually done in the adjusting of the best instruments is so to place the terminal edges that, for a certain medium value of P’ + P’,h’ + h” = 0,580 that the sensibility of the balance is about the same when the pans are empty as when they are charged with the largest weights they are intended to carry. The condition /’ = 2” also cannot be fulfilled absolutely in practice, but mechanicians now-

tan a=

Fig. 7.— Diagram illustrating theory of Precision Balance.

beam the position of C, will depend only on P’ and and supposing P’ to remain constant it will change its position whenever P” changes its value. The point C, will in general lie outside of the axis of rotation, and conse- quently there will in general be only two positions of the beam in which it can remain at rest, namely, first, that posi- tion in which C, lies vertically above, and, secondly, that position in which it lies vertically below the axis of rotation. Only one of these two positions can possibly lie within the angle of free play which the beam has at its disposal. The second of the two positions, if it is within this angle, can easily be found experimentally, because it is the position of stable equilibrium, which the beam, when left to itself in any but the first position, will always by itself tend to assume. The first position, viz., that of unstable equilibrium, 1s practically beyond the reach of experimental determina- tion. Hence the points A, B, and S must be situated so

a a-days have no difficulty in reducing the difference 7 -1 to less than + zggqq, and even a greater value would create no serious inconvenience. We shall therefore now assume our balance to be exactly equal-armed ; and, substituting for A’ + kh” the symbol 2h, and under- standing it to be that

(small) value which corresponds to the charge, substitute for equation 3 the simpler expression

that, at least whenever PU’ = Pl” exactly or very nearly, A.l the beam has a definite position of stable equilibrium, and tan a, es; (4),

that this position is within the angle of free play. To formulate these conditions mathematically, assume a system of rectangular co-ordinates, X, Y, Z, to be connected with the beam, so that the axis of the Z coincides with the central edge and the origin with the projection O of the centre of gravity on that edge, while the Y-axis passes

which, on the understanding that P” = P’+ A, and that A is a very small weight, gives the tangent-value corre- sponding to Pand A. Sometimes it is convenient to look upon the pans (weighing p, each) as forming part and parcel of the beam ; the equation then assumes the form—

through the centre of gravity. Let the values of the t – Al (5) co-ordinates of the points A,B, 8, C, (imagined to be situated ne We + 2ph ; as indicated by the figure) be as follows :— where p=P—p,. Point A a & & In a precision balance the sensibility, z.e., the tangent- w=-l’ 41″ Q i, value of the deviation produced by A = 1, which is =e He ty, tana ‘i an en ah (The 2s are evidently of no practical consequence.) To find 4 W’s! + 2ph

, and y, we need only again apply the reasoning which | must have a pretty considerable value, and at the same helped us In the case of the similar problem regarding the | time ought to be as nearly as possible independent of the ideal instrument. Assuming, then, first, gravity to act | charge. Hence what the equation (4) indicates with refer- parallel to Y, we have (P’ + P” 4 W)2, = P’l’—PT. | ence to a balance to be constructed is, that, so far as these Assuming, secondly, gravity to act parallel to X, we have | two qualities are concerned, we may choose the weight of (P+ PY 4+ W)y, = Ph’ + P’h” + Ws, .-. for the | the beam as we like; and in regard to the sensibility which distance of the common centre of gravity C, of the system | the instrument is meant to have when charged to a certain III. — 34

extent, we have even the free choice of the arm-length, because, whatever Z or W be, if only the centre of gravity of the empty beam is brought to the proper distance from the central edge, we can give to the sensibility any value we please. What is actually done is so to construct the beam that its centre of gravity lies decidedly lower than one would ever care to have it, and then to connect with the beam a small movable weight (called the "'bob") in such a manner that it can be shifted up and down along a wire, the axis of which coincides with the Y-axis, and thus the value s, of the distance of the centre of gravity of the beam from the central edge be caused to assume any value, from a certain maximum down to nothing, and even a little beyond nothing. As to the relative independence of the sensibility of the charge, equation 5 shows that a given balance will possess this quality in the higher a degree the lessthe distance h of the central edge is from the plane of the two terminal ones, and, supposing / to be constant (7.e., the adjustment to be finished), the less the initial sensibility a, exhibited by the empty instrument. Passing from one balance to the other, but supposing % and a, to remain constant, we readily see that the sensibility is the more nearly independent of the charge p in the pans, the greater the arm-length l is. From what has been said above, it would appear that by means ofa balance provided with a gravity-bob, we could attain any degree of precision we liked, but evidently this is not possible practically, because in the actual instrument neither the knife-edges and their bearings nor the arrest- ment are what we have hitherto supposed them to be ; and, consequently, both 7' and /' as well as h, instead of being constants, are variable quantities. Obviously, the non- constancy of the ratio /' : 2" is the most important point, and to this point we shall therefore confine our attention. Let us imagine that the imaginary balance hitherto con- sidered has been charged equally on both sides (with P = p, + p), so that its normal position is its position of rest, and then assume, first, that the middle edge (which hitherto has been an absolutely rigid line) is now a nar- row and slightly, but irregularly, curved rough surface. The effect will be, that, supposing the balance to be repeatedly arrested and made to vibrate, the axis of rota- tion, instead of being constant, will shift irregularly between x = +X and «= —) where A means a small length. But this comes to the same as if the central pivot were abso- lutely perfect, but had the common centre of gravity C,, in- stead of being fixed at « = 0, oscillating between x = + A,f. In other words, the balance may possibly come to rest at any position

within a certain angle + , which, as an angle of deviation, corresponds to the overweight

«= (2(p,+p) + WH.

Assume now, secondly, that, say, the right terminal edge was slightly turned so as no longer to be parallel to the middle edge. This in ztself would not matter much, be- cause although it might produce a change in the length of the right arm, this change would be permanent, and the arm-length again be constant, provided the hook-and-eye arrangement for the suspension of the pan, and the arrest- nient, were ideally perfect. But, practically, they are not, and, moreover, the knife-edge and its bearing are not what theory supposes them to be ; and the effect is the same as if the virtual point of application A of the charge Pp, + p, instead of being at the constant distance / from the centre, oscillated irregularly between 7 + ‘ and /—-X, where X’ has a similar meaning to that of A,. effect of the imperfections of the three pivots is that the

indications of the balance, instead of being constant, are variable within + e«, where e means a small weight deter-

mined approximately by the equation—

- Wsy+2h(po+D)’

The joint

c= (Art) +W),+2%+P)} + (7),

Hence, in a balance to be constructed for a given purpose, Z must be made long enough to make sure of its compensating the effects of the X’s, which, for a given set of knife-edges, and a given degree of absolute exactitude in their adjustment, may be assumed to have constant values. given balance ¢ has nothing to do with the sensibility, and consequently it would be useless to increase the sensibility beyond what is required to make the angle B, corresponding to ¢ (ie. that angle within which the balance is, so to speak, in indifferent equilibrium), con- veniently visible. To go further would, in general, be a mistake, because the greater the sensibility the more markedly

it varies with the charge, the less is the maximum overweight which can be determined by the method of vibration, and, last not least, the more slowly the balance

Evidently in a

will vibrate, because the time of vibration ¢ is governed by

the equation —

EW + 2(9) P) , L Wsy 2h(po+P) Ro

i=

where & is a constant which depends on the shape of the beam, and for the ordinary perforated rhombus is about

= +, while R, stands for the length of the pendulum

beating seconds at the place. Introducing the sensibility—

: we have t=c ,/a, where c is a constant.

4. Compound Lever Balances.—Of these numerous inven-

tions—in all of which a high degree of practical conveni- ence is obtained at the expense of precision—we must con- tent ourselves with noticing two which, on account of their

extensive use, cannot be passed over. We here allude, in

the first place, to that particular kind of equal-armed lever balances, in which the pans are situated above the

beam, and which are known as “ Roberval’s balances ;” and

secondly, to those peculiar complex steel-yards which are used for the weighing of heavy loads by means of compara- tively small weights.

In Roberval’s balance (fig. 8), the beam consists of a parallelogram, in which each of the four corners A, B, A’, B’ is a joint, and which by means of two joints situated in the centres of the > two longer sides AB and A’B’ is sus- pended from a ver-

i o that th — ror” “dba Lia AA’ and BP’ under Fra. 8.—Roberval’s Balance. all circumstances stand vertical. With these two sides the pans are rigidly connected ; and the main feature in the ma- chine is, that wherever the charge in the pan may lie, Vbry whatever may be the virtual point of application of the whole charge P in regard to the vertical side of the beam, its statical effect is the same as if P was concentrated in a point D in the axis of the rod AA’ or BB’, That this really is so 18 easily proved. Imagine the particle weighing P units to be rigidly connected with, say, AA,’ but situated to the left of that line, and, whatever may be its distance from AA’, when the beam descends through a certain angle, the vertical projection of the path described by the point D, «2, its fall 4, has the same value whatever its distance from AA’. Hence the work done, say, against an elastic string tending to hold the beam in its place, invariably 1s = Ph as it would be if D was situated in AA’.

BAL—BAL

The ordinary Decimal Balance is a combination of levers illustrated by fig. 9. a, c, b, d, e, g, h, f, are all joints or pivots ;a@ and / rest on the fixed framework of the machine, and consequently indirectly on the ground ; c rests on the lever a6. In the actual machine cd supports the “ bridge,” which accommodates the load, while at f is suspended a pan for the weight. The pan is so adjusted

/

Fic. 9.—Decimal Balance,

that it balances the bridge Suppose the load P to be placed so that its centre of gravity is at 2, and a portion P, of P will press on the knife-edge at c, the rest P, will pull at d and, with the same force, at g. Now, P, =

¢

P, = , equivalent to = P, pulling at } or e, equivalent to c a

-_.. oe ; i pulling at gy. The dimensions are so chosen ab ch gh that =~, hence the effect of P, at g is equivalent to ab é

a weight P. oe . The other portion of P, viz., P,, pulls cd = = i Hence the effect of the total load is equivalent to P, Gz ed gh = yo *f, one pound in the pan will counterpoise ten pounds at any point of the bridge.

5. Torsion Balances.—Of the several instruments bearing this name, the majority are no balances at all, but machines for measuring horizontal forces (electric, magnetic, &c.), by the extent to which they are able to distort an elastic wire vertically suspended and fixed at its upper end. In the torsion balances proper the wire is stretched out horizon- tally, and supports a beam so fixed to it that the wire passes through its centre of gravity. Hence the elasticity of the wire here plays the same part as the weight of the beam does in the common balance. An instrument of this sort was invented by Ritchie for the measurement of very small weights, and for this purpose it may offer certain advan- tages; but, clearly, if it were ever to be used for measuring larger weights, the beam would have to be supported by knife-edges and bearings, and in regard to such application therefore (i.¢., as a means for serious gravimetric work), it has no ratson d’étre. See Evgcrrictry and MaGnerism.

6. For Hydrostatic weighing machines see the article HypRoMETER, (Ww. D.

BALANCE OF POWER. The theory of the Balance of Power may be said to have exercised a preponderating influence over the policy of European statesmen for more than two hundred years, that is, from the Treaty of Westphalia until the middle of the present century ; and to have been the principal element in the political combinations, negotiations, and wars which marked that long and eventful period of modern history. It deserves, therefore, the attentive consideration of the historical student, and, indeed, the motive cause of many of the greatest occurrences would be unintelligible without a due estimate of its effects. Even down to our own times

at d, and consequently also at g, with a force P.

- P units suspended at g, and if, for instance,

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it has not been without an important influence ; for the Crimean War of 1854 was undertaken by England and France for uo other object than to maintain the balance of power in Eastern Europe, and to prevent the agegrandise- ment of Russia by the dismemberment of the Ottoman empire and the conquest of Constantinople. Nevertheless there is, perhaps, no principle of political science, long and universally accepted by the wisest statesmen, on which modern opinion has, within the last twenty years, under- gone a greater change ; and this change of opinion is not merely speculative, it has regulated and controlled the policy of the most powerful states, and of none more than of Great Britain, in her dealings with the continent of Europe. At the date of the publication of the last edition of this work, the theory of the balance of power was believed to be so firmly established, both by reason and experience, that it was laid down, in the forcible words of Earl Grey, that “the poorest peasant in England is inter- ested in the balance of power, and that this country ought to interfere whenever that balance appeared to be really in danger.” At the present time no English statesman would lay down that proposition categorically ; and pro- bably no European statesman would be prepared to act upon it. In proportion as the theory of the balance of power has lost much of its former authority, the doctrine of non-intervention has gained strength and influence, and this has been accepted at the present day both by Whig and Tory ministers, so that no strong difference of opinion can at the present time be said to exist in the British nation on the subject. Within the last fifteen years political changes of extraordinary magnitude have been brought about in Europe by force of arms and by revolutions. In former times such changes would certainly have led to a general war, on the principle that it was essential to maintain the relative strength and independence of states, and to support the fabric of European policy. But, under the policy of non-intervention, the effects of these contests have been confined to the states which were directly engaged in them ; and the other powers of Europe have maintained a cautious neutrality, which has

probably not lessened their own strength, and which has saved the world from a general conflagration.

The theory of the balance of power rested on several assumptions. It was held, more especially from the time of Grotius, in the early part of the 17th century, that the states of Europe formed one grand community or federal league, of which the fundamental principle and condition was the preservation of the balance of power; that by this balance (in the words of Vattel) was to be understood such a disposition of things, as that no one potentate or state shall be able absolutely to predominate and prescribe laws to the others ; that all were equally interested in maintaining this common settlement, and that it was the interest, the right, and the duty of every power to interfere, even by force of arms, when any of the conditions of this settlement were infringed or assailed by any other member of the community. The principle can hardly be more tersely expressed than in the words of Polybius (lib. i. cap. 83) : “ Neque enim ejusmodi principia contemnere oportet, neque tanta cuiquam astruenda est potentia, ut cum eo postea de tuo quamvis manifesto jure disceptare ex zquo non queas.” Or, to borrow the language of Fénelon in his Instructions, drawn up by him for the guidance of the Duc de Bourgogne, “ This attention to maintain a sort of equality and equipoise between neighbouring nations is the security of the general tranquillity. In this respect all neighbouring nations, trading with each other, form one great body and a sort of community. Thus, Christendom is a kind of universal republic, which has its interests, its fears, and its precautions to be taken. All the members

of this great body owe it to one another for the common good, and owe it to themselves for the security of their country, to prevent the progress of any other members who should seek to overthrow this balance, which would turn to the certain ruin of all the other members of the same body. Whatever changes or affects this gencral system of Europe is too dangerous, and draws after it infinite mis- chiefs.” Whatever may be the value of these philanthropic principles, history reminds us that when they were niost loudly professed they were most frequently violated, and that no cause of war seems to have been so frequent or so fatal as the spurious pretext of

restoring peace and defend- ing the general tranquillity of the world. Thus, it was to balance the power of the house of Austria that Cardinal Richelieu flung France into the quarrels of Germany in the Thirty Years' War, and even lent her aid to the Protestant cause. It was to balance the encroaching and aggressive power of Louis XIV. that numerous combinations were formed between England, Austria, and Holland, which, after nearly half a century of almost uninterrupted contests and bloodshed, ended in the peace of Utrecht. The pretext of Frederick [I., when he was meditating some act of rapine, generally was that he believed some hostile combination had been formed against him, which it was wise to antici- pate. In short, no cause of war has been more frequently alleged and acted upon, than that a proper consideration for the balance of power rendered it necessary to take forcible measures to avert some remote or hypothetical danger.

It is obviously a maxim, not only of policy but of com- mon sense and human nature, that the weak should combine to protect themselves against the strong, and that when the independence of minor states is threatened by the ambitiou or the overwhelming superiority of a power aiming at universal empire, they will do wisely to unite for the purposes of self-defence and resistance. Frederick II. himself says, in his Anti-Machiavel, where he laid down precepts which he did not practise, ‘‘ When the excessive agerandisement of one power threatens to overwhelm all others, it is the part of wisdom to oppose barriers to its encroachments, whilst there is yet time to stay the torrent. The clouds are seen to gather, the lightning announces a coming storm, and the sovereign who is unable to contend against the tempest will, if he is wise, unite himself with all those who are menaced by the same common danger. Had the kings of Egypt, Syria, and Macedonia confederated together against the Roman power, they would not have fallen under its oppressive yoke; an alliance prudently contracted, and a war carried on with energy, would have saved the ancient world from universal despotism.” So too, Hume, in his celebrated Lssay on the Balance of Power, endeavours to show that the ancients were familiar with the principle both as statesmen and historians, and, for example, he avers that whoever will read Demosthenes's oration for the Megalopolitans, will see the utmost refine- ments on this principle that ever entered into the head of a Venetian or European speculatist.

But with great respect to these illustrious authorities, they appear to have discussed, under the name of the balance of power, a principle which might more fitly be termed a theory of warlike alliances. ‘The object of the balance of power, rightly understood, is not to carry on war with success, but to avoid war altogether, by establish- ing a common interest and obligation in the maintenance of the conditions of peacc. When war is declared, public law is suspended, and each state must be guided by what it conceives to be its own interest and duty. If the theory of the balance of power has any value at all, it is not in the hour of violence and bloodshed, when the fate of nations may be decided on a field of battle, but rather in

those negotiations which must eventually terminate the contest, which commonly bring together for that purpose the representatives of all the belligerents, and which are de- signed to provide against the recurrence of these calamities,

The ablest and most eloquent champion of the system of equipoise in the present century was the Chevalier von Gentz, who published his Fragments upon the Balance of Power in Europe in 1806, under the influence of the cata- strophe which had subjugated the Continent, and who subse- queutly took an active part at the Congress of Vienna in the attempts to constitute a new system of European policy. Gentz defines the balance of power as “a constitution subsisting between neighbouring states more or less con- nected with one another, by virtue of which no one among them can injure the independence or essential rights of another, without meeting with effectual resistance on some side, and consequently exposing itself to danger.” And he rests this constitution ou four propositions :—(1.) That no state must ever become so powerful as to coerce all the rest ; (2.) That every state which infringes the conditions is liable to be coerced by the others; (3.) That the fear of coercion should keep all within the bounds of modera- tion; and (4.) That a state having attained a degree of power to defy the union should be treated as a common enemy, He argues that bya strict adherence to these principles wars would be averted, excessive power restrained, and the independent existence of the humblest members of the confederacy secured. But, for the reasons we have previously assigned, it is

a fallacy to suppose that even the civilised states of Europe have ever naturally formed a confederacy, or that their relations are governed by common rules of action, recognised alike by all of them. That theory sup- plics a very insecure basis for the balance of power and the maintenance of peace. The law of nations, not being im- posed or sanctioned by any supreme and sovereign authority, is, in fact, reducible to the general laws of morality, which ought to regulate the dealings of mankind, except when it has been expressed and established in the form of a contract, binding on all the parties to that obligation. To determine the true character and limits of the halance of power, we must have recourse, not to vague general principles, but to positive law, framed in the shape of international contracts, which are termed treaties, and which have been sanctioned at different epochs of modern history by a congress of states. This historical treatment of the subject leads us to more tangible and solid ground ; and it will be seen that on these occasions more especially attempts have been made to establish a balance of power in Europe upon the basis of general treaties ; and that these attempts have been rewarded by considerable, though not by permanent, success in the 17th, 18th, and 19th centuries.

The first idea of a general congress, to put an end to the horrors of the Thirty Years' War, and to adjust the conflicting claims of rival creeds and hostile princes, appears to have originated with the emperor of Germany in 1640, The attempt to restore peace by the authority of the Germanic Diet had failed. It became necessary to have recourse to mediating powers, and after a protracted pre- liminary negotiation, the Congressof Miinster or Westphalia opened on the 11th July 1643,—the Catholic and Protes- tant belligerents being represented on the one hand, and the mediating powers, France, Sweden, Venice, and the Pope, ou the other. We do not propose in this place to follow the train of these complicated negotiations. It is enough for our present purpose to remark that the great treaty which resulted from them, and was signed on the 24th October 1648, became the basis of the public law of Europe, and the first official recognition of the existence of a European balance of power. The conditions established

in Germany left the Catholic, the Lutheran, and the Reformed Churches in possession of their respective indc- pendence, whilst they relieved the minor princes from their strict dependence on the empire; but, above all, they con- ferred on France and Sweden, as mediating powers, the right of intervention for the purpose of upholding the provisions of the treaty. In other words, the balance which had been established between the states of Central Europe was regulated by external weights, which could be brought to bear upon it. The result of this combination, due mainly to Cardinal Mazarin, was certainly injurious to the unity and independence of Germany, and it tended to aid the aggressive and dictatorial power of Louis XIV. Nevertheless, the fundamental principles of the Treaty of Westphalia were recognised and renewed as the conditions of the general peace of Europe down to the French Revolu- tion ; they were not wholly absent from the minds of the negotiators at Vienna in 1815; and they only received their death-blow from the hand of the Prussian Government in 1866 and 1870. Whatever might be the merits of the Treaty of Westphalia, it had not that of securing to Europe an unbroken or durable peace; and even the territorial relations of France and Germany were altered within thirty years of that time by the conquest of Franche Comté and Alsace. But the wars of Louis XIV. were not general wars, until he engaged in the fatal attempt to place his grandson on the throne of Spain, and to unite the two crowns in the house of Bourbon. Efforts had been made, in view of the approaching extinction of the Spanish branch of the house of Austria, to preserve the balance of power by a timely partition of the vast dominions of the Spanish empire—a remarkable example of an attempt to prevent a formidable catastrophe by an equitable arrangement. But it may be doubted whether any arrangement in which so little account was taken of the wishes and traditions of nations could possibly have succeeded ; and it unques- tionably failed, because Louis XIV. did uot hesitate to repudiate the treaties he had signed, and to avail himself of the last will and testament of Charles II., which had been extorted from the Spanish court by his intrigues. That event raised again the whole question of the balance of power in Europe. It was received as a doctrine of political faith that the union of the French and Spanish crowns in one family must be fatal to the independence of all other states; that it would replace the Stuarts upon the throne of England, and establish the ascendency of France and the Catholic party over Europe. It was there- fore resisted by a coalition, of which England, Austria, and

Holland were the principal members. France was at length reduced to the lowest point of humiliation, and in 1709 peace might have been obtained on every point but one. Louis refused to turn his arms against his own grandson, and the war continued till 1715. Philip V. retained the Spanish crown, and the relations of all the Kuropean states were once more adjusted with legal nicety at Utrecht. Great pains were taken to provide, by a system of renunciations, against the possibility of the union of the crowns of France and Spain on the same head, because it was held that such a contingency would be fatal to the balance of power in Europe. But these precautions did not prevent the conclusion, at a later period, of the family compact between the two branches of the house of Bourbon, which was regarded as a lasting danger to other countries, and was opposed by the whole strength of Britain and the genius of Chathain, The peace of Utrecht was denounced by Parliament and detested by the nation as an inglorious termination of a glorious war, and its authors were con- signed to obloquy and exile ; but it secured the peace of Europe for thirty years ; it reduced the power of France ; and had it not been for the German dominions of the house

of Hanover, it might have been still longer before England was drawn into another war.

Hitherto the political system of Europe had comprised little more than the states of France, Austria, Spain, Sweden, and Holland, with the occasional intervention of Great Britain, more for the defence of the interests of others than of her own. But the 18th century witnessed a total change in the politics of the world. A new empire, Russia, arose in the north, under the geuius of Peter and of Catherine ; the ambition and military skill of Frederick II. raised Prussia from a secondary member of the German empire to a powerful and independent kingdom ; the colonial empires of Spain, France, and Britain had extended their territorial interests to the continents of Asia and Ainerica, and to the eastern and the western isles, inso- much that wars, begun in Europe, soon raged on the banks of the Ganges and the St Lawrence ; and the declaration of independence of the United States of America called into being a new and powerful people of the future. The partition of Poland, which was commenced in 1772, marked a new era of aggressive revolutionary policy ; it was a gross invasion of the principle of the balance of power, effected by three powers, jealous of thcir respective strength, but indifferent to the rights of an independent nation and to the opinion of Europe! That lawless act was the prelude to more violent attacks on the sovereignty and nationality of many countries, for before the century closed the French Revolution, and the wars that followed it, crushed to atoms the ancient fabric of Europe. Whilst events of this magni- tude were occurring in the world, it is obvious that the theory of the balance of power was entirely displaced and dislocated. New elements were at work over a far wider area; new sources of power and influence were opened of far more importance than those territorial and dynastic questions which occupied the statesmen of Minster and of Utrecht ; ancient land-marks were swept away ; minor states were annihilated; and the temporary domination of Napoleon over a great portion of the continent of Europe seemed to have overthrown the balance of power for ever. In those dark and evil days public writers ike Gentz and Mackintosh still maintained the principle that peace could only be restored by a due recognition of the rights and independence of every nation, and England adhered in- flexibly to the policy of combining the scattered elements of Europe against the common

enemy. Half a dozen times over these coalitions failed ; but they succeeded at last, and this country had the glory of playing no inconsiderable part in the restoration of the liberties of all other nations against foreign aggression. Great as were the cost and the burden of that tremendous war, we still hold that the pro- digious power of France and the boundless ambition of Napoleon left us no honourable alternative but to pursue it ; and, as Mr Fox himself discovered when he conducted the negotiations of 1806, it was impossible to conclude peace with France without basely surrendering the whole inte- rests of Europe to universal oppression, and without exposing this country to be at last the victim of a power which had devoured all the rest. The principle of the balance of power, in the sense of mutual defeuce, was never asserted with greater energy than it was by this country in that struggle, and we do not regret it. ‘“‘ As long,” says Bacon, ‘‘ as men are men, and as long as reason is reason, a just fear will be a just cause of a preventive war; but

1 It deserves to be noticed that down to the partition of Poland, no state, however small, had been extinguished, annihilated, and “annexed” in the continuous wars of the two previous centuries—down to the republics of Geneva and San Marino all retained their national existence. The wars of the French Revolution, and still more the wars of our own times, have swept a multitude of the minor states and dynasties from the map of Europe, and incorporated them in larger empires.

especially if it be part of the case that there be a nation that is manifestly detected to aspire to new acquests, then other states assuredly cannot be justly accused for not pay- ing for the first blow, or for not adopting Polyphemus’s courtesy, to be the last that shall be eaten up. ”—(Speech concerning a War with Spain.)

Upon the fall of Napoleon in 1814 it became the com- mon interest, and the universal desire, of all the sovereigns and nations of Europe to restore peace upon a settled basis, to re-establish the authority of public law, to reinstate the rightful owners in the possessions and dominions they had been forcibly deprived of, to reduce the military establish- ments which weighed so heavily on the finances and on the population of Europe, and to create anew

a balance of power between the states of Europe, by which the greatest of them might be restrained and the least of them protected. A secret article had been annexed to the Treaty of Paris, declaring that “the allied powers had agreed among them- selves on the bases which were to be given to the future system of equilibrium ;” though what the nature of that agreement and of those bases was, has never been made clearly apparent. But the matter was unquestionably referred to the congress then about to open at Vienna, where the most powerful sovereigns and the most distin- guished ministers of all the Huropean states met for the first time in council. That congress was certainly the most complete, and in its action the most important, assemblage of independent political powers and their representatives which ever took place in the world. Its decisions were not all of them just, or wise, or disiuterested. The broad general principles of pacification which had been laid down were more than once traversed and thwarted by particular interests and ambitions. The theory of the rights of legitimate sovereigns over their subjects was carried to an extravagant point, pregnant with danger for the future. Genoa was transferred to Sardinia, Venice to Austria, Norway to Sweden, Poland to Russia, part of Saxony to Prussia, and the sacred hopes and pledges of freedom which had animated the nations in the contest were forgotten by the leading courts of Europe in the division of the spoil. But in spite of these shortcomings and abuses, we cannot concur with writers who, like Harden- berg, denounce the Congress of Vienna as an auction of nations and an orgy of kings. It was said that every one withdrew from the Congress of Vienna disappointed, no one having obtained as much as he expected ; but if so, that would suggest the inference that the general interest of Europe prevailed over the pretensions of each particular state. From the point of view we are now considering, which is the restoration of the balance of power, it cannot be denied that the Treaties of Vienna secured forty years of peace to Europe. They stood the brunt of two fresh convulsions in France in 1830 and in 1848, and their main provisions, though modified with respect to the Low Countries in 1832, and abrogated in Italy by the campaign of 1859, were not seriously impaired until the dissolution of the Germanic body in 1866, and the Franco-German War of 1870. During the whole of this period the warlike ambition of France, and the disposition of Russia to over- awe Central Europe, were successfully held in check. At Vienna itself, and during the congress, the struggle was close aud sometimes doubtful. Russia

was resolved to retain the whole of Poland, which she occupied with her armies, and Prussia claimed the whole of Saxony as a com- pensation for her share of the Polish provinces. To counteract this combination of Russia and Prussia, an alli- ance was signed on the 3d January 1815 between Austria, England, and France, which might have led to hostilities between those powers and their recent allies. Perhaps it

broke up the congress, and reminded all the powers that union and mutual concessions were the first duties of those who had devoted themselves to the cause of law, order, and peace. It was a sign of the wisdom of the congress, and of its respect for sound principles, that although France was the vanquished power and the author of the calamities of Europe, she was treated at Vienna with as much con- sideration as any other state. Her ambassador, M. de Talleyrand, had his full weight in the congress; and no attempt was made in 1814 to curtail her ancient territorial possessions or to lower her rank in Europe. On the con- trary, the just influence of France was recognised as an essential condition of the balance of power.

For the first time, then, by this general act of the Congress of Vienna, the territorial possessions and frontiers of the Continental states were defined in one document, to which all the Governments of Europe were parties; the constitution of the Germanic body was incorporated in the same instrument, and the neutrality and independence of the smallest cities and commonwealths were established and guaranteed. very state in Europe had therefore an equal right and interest to invoke the authority of the treaty, and to claim the execution of all its conditions. A complete fabric of European polity, such as had never existed before, was thus literally established by mutual contract; and every infraction of it might justly be brought under the consideration of the high contracting parties, or might even have been the ground of a declaration of war. In several instances this controlling power was wisely and beneficially exercised, and more than one burning question was adjusted by the conferences which met from time to time, always on the basis of the treaties of 1815. This certainly was the nearest approach ever made to a practical balance of power; and we owe to it, as we have seen, a long period of mutual confidence, respect for public law, and peace,

which contributed enormously to the pro- gress, prosperity, and happiness of the world.

But there are darker shades to the picture. The com- prehensive interest which every state was thus held to have acquired in maintaining the general settlement might be held, and was held, to justify a dangerous and mischievous degree of intervention in the internal affairs of every other country, and this right was too often exercised in a manner injurious to liberty and independence. The northern powers, not content with the terms of the general alliance and the Treaties of Vienna, proceeded to connect themselves more closely by the mystic ties of the Holy Alliance, which provided that they were to act together on all subjects, and to regard their interests as one and indivisible. The con- struction they put upon the system recently established in Europe was that it gave the allied powers a right to inter- fere, not only for the prevention of quarrels, aggressions, and war, but in the internal government of states, for the purpose of preventing changes which they chose to regard as injurious to their own security and eventually to the balance of power. At the congresses and conferences of Troppau, Carlsbad, Aix-la-Chapelle, and Verona, these doctrines were avowed and acted upon to their furthest extent, and under pretence of maintaining and defending the common interests of Europe, the popular movements and constitutional progress of Italy were crushed, a French army entered Spain in 1823 to restore the authority of Ferdinand VII. against the Cortes, and even the inde- pendence of the South American colonies was represented as a blow to the peace and security of Europe. ‘he British Government had early perceived that the interpretation thus given to the theory of the balance of power, and to what was termed the federal system in Europe, was only another name for an intolerable oppression, and that the

was fortunate that the return of Napoleon from Elba | right of intervention in the internal affairs of other countries

was claimcd and exercised under false and dangerous pretexts. The duke of Wellington, who represented this country at the Congress of Verona, under instructions framed by Lord Castlereagh, was the first to declare that England could be no party tosuch an application of the theory of the

alliance, and that this country preferred isolation to any such system of combined policy. That was the germ of the modern doctrine of non-intervention. But as long as the Treaties of Vienna lasted, it was our duty and our right to endeavour to support their authority, and to vindicate the rights established by a compact to which this country was a party. We declined in 1852 to join with Prussia in enforcing the declaration made by the allied powers in 1815, which excluded any member of the family of Bonaparte from the throne of France ; but we sought, in conjunction with France, to protest against the annihilation of the kingdom of Poland, the incorporation of Cracow, the admission of non-German provinces into the confederation, and the invasion of Schleswig ; and we op- posed the annexation of Savoy and Nice to France, but alone and without effect. The compact of Vienna was gradually set aside and violated in the course of years by those who were most interested in maintaining it; and when the Emperor Napoleon III. proposed, in 1863, a new congress for the purpose of revising and re-establish- ing the balance of power in Europe, under the name of an International Council, England refused to be a party to the negotiation, and rejected the scheme. Lord Russell replied, ‘There being no supreme authority in such an assembly to enforce the decision of the majority, the con- gress would probably separate, leaving many of its mem- bers on worse terms with each other than they had been before.” This was the last attempt made to bring the authority of a congress, representing the collective authority of Europe, to bear on questions affecting the general peace. When this point was reached it was apparent that the whole theory of the confederated system in Europe had become, for a time at least, obsolete; that the treaties and mutual guarantees on which that system rested had lost their power ; and that there was no controlling force to resist the ambitious or warlike designs of any state capable of giving effect to them. The Italian campaign of 1859 had considerably altered the condition of Southern Europe, and weakened Austria. Possibly, Prussia, in withholding her assistance at that time from her federal ally, foresaw in the defeat of Austria an event favourable to her own future pretensions, At any rate, for the first time, a war seriously affecting the balance of power was begun and ended by the two priucipal belligerents alone, and even the price paid by the house of Sardinia for the services of France-—the cession of Savoy and Nice—was tacitly acquiesced in by Europe. Twenty years before, it would have

been thought impossible that the doctrine of non-intervention should have acquired so great an ascendency.

But the consequences of this novel state of affairs soon became manifest in the increasing disintegration of Europe. No state could have a greater claim than Denmark to the protection of the principles of the balance of power, for, as late as 1852, all the great powers had pledged themselves by treaty to maintain the integrity of her dominions, the unity of the monarchy, and the order of succession to the crown which was then established. Yet in 1864 the German powers proceeded to what was termed a Federal Execution against her ; Holstein, Lauenberg, and, eventu- ally, Schleswig were torn from her by Prussia, Austria acting a subordinate part. England in vain appealed by her diplomacy to the terms of the agreement of 1852, but France and Russia stood aloof, and the greatest injustice the world had witnessed since the partition of Poland was consummiated. As every event in political

life is closely connected, Prussia now proceeded to ally herself with the crown of Italy against Austria, and to execute her grand design of the overthrow of the Germanic Confederation and the expulsion of Austria from that body, which had been regarded as the centre of gravity of the European system. As long as that body subsisted, war was impossible between its respective members, and France was incapable of attacking their united forces. The success of Prussia in the campaign of 1866 was rapid and complete, and Austria ceased to form part of the Germanic Confedera- tion. The power of Prussia was further increased by the military conveutions, which gave her the absolute com- mand over the armies of the minor German states, This was undoubtedly the severest blow which had yet been inflicted on the balance of power in Europe; and the Emperor Napoleon III., who had recently given vent to his dissatisfaction with the treaties of 1815, now found himself confronted by an enemy infinitely more powerful and dan- gerous. The results of Sadowa were as fatal to the influence and security of France as if she herself had lost a campaign, The French nation, however, failed to under- stand the magnitude of the danger, though they were irritated by the approach of it. War was, on more than one

occasion, on the point of breaking out; and at length France plunged into it with a recklessness and incapacity only to be equalled by the tremendous calamities that war caused her to endure. Again, no third state was drawn by political considerations into the conflict. The terms of peace were settled between the vanquished and the con- querors without reference to the general interests of other nations ; and no attempt has been made to place these arrangements under the sanction of the public law of Europe. Russia took advantage of the agitated condition of Western Europe to abrogate, by her own will and pleasure, an important stipulation of the Treaty of Peace of 1856, and Europe again submitted to this breach of covenant.

The general result is that, at the present time, the military power of the German empire far surpasses that of any other state, and could only be resisted by a gene- ral combination of all the rest. The balance of power, as it was understood fifty years ago, and down to a more recent time, has been totally destroyed ; no alliances can be said to exist between any of the great powers, but each of them follows a distinct course of policy, free from any engagements to the rest, except on some isolated points ; the minor states can appeal to no certain engagement or fixed general principle for protection, except, perhaps, as far as the neutrality of Switzerland and Belgium is con- cerned ; and for the last two centuries there has not been a time at which all confidence in public engagements and common principles of international law has been so griev- ously shaken. Where the reign of law ends, the reign of force begins, and we trace the inevitable consequence of this dissolution of legal international ties in the enormous augmentation of military establishments, which is the curse and the disgrace of the present age. Every state appears to feel that its security depends on arming the whole virile population, and maintaining in what is called a state of peace all the burdens of a complete armament; indeed, in the most barbarous ages and the most sanguinary wars there were, doubtless, fewer men under arms, and less money was spent in arming them, than at the present day.

We have shown in the preceding observations that we do not retain the faith of our forefathers in the balance of power. It is impossible to equalise the strength of uations. It is impossible to regulate or control the growth and de- velopment of their forces, which depend not on territorial possessions

alone, but on their industry, their credit, their natural resources, and their internal institutions. It is

impossible to weigh their relative power and influence iu nice or golden scales, nor can we always compel them "'parcere subjectis et debellare superbos." But the recog- nition of certain mutual obligations and principles of public law is the fundamental condition of civilisation itself. Nothing can be more injurious to society than that the states of Europe should exist without alliances, without mutual confidence, without a common system based on the principles of justice and of peace, the weak living in dread of the strong, the strong armed to the teeth against each other. We trust that before another great catastrophe arises from this state of disguised hostility, a truer balance of power may be established by a return to sounder prin- ciples ; for peace can never be secure unless it is protected by the concurrence of the leading nations of the world, and by their determination to oppose a combined resistance to those who have no object but their own aggrandisement and ambition. (H. R.) BALASOR, a district of British India in the Orissa division, under the Lieutenant-Governor of Bengal, lies between 20° and 21° N. lat., and in 86° and 87° E. long., and is bounded on the N. by the district of Midnapur ; on the 8. by Cattack district, from which it is separated by the Baitarant river ; on the W. by the tributary states of Keun- jhar, Nilgiri, and Morbhanj; and on the E. by the Bay of Bengal. Balasor district forms a strip of alluvial land between the hills and the sea, varying from about 9 to 34 miles in breadth; area, 2066 sq. miles. The hill country rises from the western boundary line. The district natu- rally divides itself into three well-defined tracts—(1.) The Salt Tract, along the coast ; (2.) The Arable Tract, or rice country ; and (3.) The Submontane Tract, or jungle lands. The Salt Tract runs the whole way down the coast, and forms a desolate strip a few miles broad. Towards the beach it rises into sandy ridges, from 50 to 80 feet high, sloping inland, and covered with a vegetation of low scrub jungle. Sluggish brackish streams creep along between banks of foetid black mud. The sand hills on the verge of the ocean are carpeted with creepers and the wild convol- vulus. Inland, it spreads out into prairies of coarse long grass and scrub jungle, which harbour wild animals in plenty ; but throughout this vast region there is scarcely a

hamlet, and only patches of rice cultivation at long inter- vals. From any part of the Salt Tract one may see the boundary of the inner arable part of the district, fringed with long lines of trees, from which every morning the villagers drive their cattle out into the saliferous plains to

graze. The Salt Tract is purely alluvial, and appears to be of recent date. Towards the coast the soil has a distinctly saline taste.

Salt is largely manufactured in this tract by evaporation. The following is the process followed :—At the beginning of December the contractor selects his locality, about a quarter to half a mile from the sea, and engages a class of men called chuliyds, or heads of salt gangs. These men receive ls. a cwt. for whatever amount of salt they turn out. They, in their turn, engage working parties of malangis, who are paid at the rate of 3d. to 5d. a day. The ground is first marked out by a shallow trench, and the grasses and bushes are carefully dug up and removed. A deep ditch is next dug from the sea, by means of which, twice a month, the spring tides overflow the salt-field, and fill a number of reservoirs, 4 feet in diameter, and 2 or 3 feet deep. A mound of earth is then piled up to the height of 2 feet, and from 3 to4 in diameter. It is next hollowed out into the shape of a bowl, plastered inside with clay, and furnished with a hole at the bottom, covered with a layer of grass 6 inches thick. The salt-makers fill this bowl with saline earth scraped off the adjacent land, and pour the sea-water on it from the top. By the end of

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six hours the water has drained through into a pit at the bottom, and runs down a thatched trench towards a reser- voir, whence it is transferred to the evaporators. The latter consist of from 160 to 200 little unglazed earthenware pots, fastened together by stiff tenacious mud, and holding two quarts each. The neighbouring plains supply grasses for the fuel. Six hours' boiling completes the process, The brine, which consisted in the first place of sea-water charged to its maximum power of solution by percolating through the bowls of salt earth, subsides into dirty crystals at the bottom of the pots. It is then ladled out in spoons made of half cocoa-nuts. The whole

process is as rude and careless as can well be imagined. The total cost of manufacture is estimated at 2s. ld. a cwt., which with the Government duty of 8s. 8d., makes a total cost of 10s. 9d.

The Arable Tract lies beyond the salt lands, and embraces the chief part of the district. It is a long dead level of rich fields, with a soil lighter in colour than that of Bengal or Behar; much more friable, and apt to split up into small cubes with a rectangular cleavage. A peculiar feature of the Arable Tract is the Pdts, literally the Cups, or depressed lands near the river banks. They were probably marshes that have partially silted up by the yearly overflow of the streams. These Cup-lands bear the finest crops. As a whole, the Arable Tract is a treeless region, except around the villages, which are encircled by fine mango, pipal, banyan, and tamarind trees, and intersected with green shady lanes of bamboo. A few palmyras, date palms, and screw pines (a sort of aloe, whose leaves are armed with formidable triple rows of hook-shaped thorns) dot the expanse, or run in straight lines between the fields. The Submontane Tract is an undulating country with a red soil, much broken up into ravines along the foot of the hills, Masses of laterite, buried in hard ferruginous clay, crop up as rocks or slabs. At Kopdri, in Kila Ambohata, about 2 square miles are almost paved with such slabs, dark red in colour, perfectly flat, and polished like plates of iron. A thousand mountain torrents have scooped out for themselves picturesque ravines, clothed with an ever-fresh verdure of prickly thorns, stunted gnarled shrubs, and here and there a noble forest tree. Large tracts are covered with Sal Jungle, which nowhere, however, attains to any great height.

Balasor district is watered by six distinct river systems : 1. The Subanrekha, literally the streak of gold, forms the boundary between Balasor and Midnapur, flowing in a tortuous southern course, with gigantic bends from east to west till it reaches the sea in lat. 21° 35’ N. and long. 87° 28’ E. It is navigable by country craft as high as Kalikapur, about 16 miles from the mouth, to which point the tide also runs. Rice boats of 2 tons’ burden can make their way up to the end of the Balasor district, and during the rains far into the tributary state of Morbhanj. 2. The intermediate country on the south of the Subanrekha and the north of the Burdbalang, forms a great line of drainage down from Morbhanj. It is watered by a number of small streams, of which the principal are the Jamira, Bans, and Bhairingi. They

unite, bifurcate, and re-unite in the wildest confusion, and at length enter the sea as the Panchpara, in lat. 21° 31’ N. and long. 87°10’ E. 3. South of this network of rivers is the Burdbalang, litcrally the Old Twister. It rises among the Morbhanj hills, in lat. 21° 24’ and long. 86° 36’, and after receiving two small tributaries, the Gangahar and Sunai, wriggles into the sea in lat. 21° 28’ and long. 87° 5’. Brigs, sloops, and sea-going steamcrs can navigate this river as far as the town of Balasor, about 16 miles up its twisting course, but the sand-bar across the mouth of the river renders the entrance difficult. 4. South of the Burdbalang, a network of rivers, known as the Jamka, find their way down the line of drainage from the western Nilgiri hills, and enter the sea by many channels. 5. The Kansbans, ris- ing in Kila Ambohata, runs in a south-easterly direction, at first almost parallel with the Nilgiri hills, and receives from them a number of nameless drainage streams on its northern bank. At Birpara it bifurcates, the northern branch retaining its original name, and entering the sea in lat. 21°12’ 25”, long. 86° 52’ 10”. The southern branch receives the name of Gammui, and falls into the sea 6 miles south of the Kansbans. This river is navigable only

a few miles up, but is celebrated for its sudden floods and the vast extent of country which it submerges in the rainy season. 6. The Baitarani enters the district at the village of Balipur, and flows for about 45 miles in a south-westerly direction till it joins the Dhamrd, 5 miles from its mouth. The united stream enters the sea under the name of the Dhamrda, in lat. 20° 47’, long. 87°. The Dhamra is a fine navigable estuary, but, like all the Orissa rivers, it is ren- dered perilous by a bar across its mouth. a Fopulation of Balasor in 1872, 770,232 souls, residing in 3266 villages, and 138,913 houses ; persons per square mile, 378; vil- lages per square mile, 1°58; persons per village, 236; houses per square mile, 67; persons per house, 5°5. Of the total population 738,396, or 95°9 per cent., were Hindus ; 18,878, or 2°4 per cent., Mahometans ; 530, or ‘1 per cent., Christians; 1 Buddhist ; and 12,427, or 1°6 per cent., of aboriginal origin. The proportion of males to the total district population was 49°2 per cent.; number of male adult agriculturists, 150,391, and male adult non-agricul- turists, 82,542. Brahmans, Karans, Khandaits, and other castes, compose the Hindu population. There are two settlements of Christian missionaries in the

district belonging to the Freewill Baptists, from Dover, New Hampshire, U.S. The district contains only one town with upwards of 5000 inhabitants, viz., Balasor itself, with 18,263. Almost the whole population of the district lives by agriculture. Ricc forms the staple crop of the district, and is divided into 5 great genera, and 49 principal varieties. Pulses, oil-seeds, hemp, tobacco, cotton, sugar-cane, &c., make up the other agricultural products of Balasor. Balasor husbandmen consist of two classes, thdné or cultivators, with a right of occupancy, and paht, or tenants at will. Roughly speaking, one half of the district is under tillage, and the other half incapable of cultivation. Exports —Grain, sugar, oil-seeds, timber, hides, horns, &c. Imports— Native cloths, English piece-goods, &c. Total revenue of the Bala- sor district in 1870-71, £102,052, of which £41,408, or 40 per cent., was from land ; total expenditure in the same year, £51,620. In 1872 the police force of the district consisted of 566 officers and men of the regular police, maintained at a total cost of £8879, 8s. ; 32 officers cal men of the municipal police, maintained at a cost of £224, 12s ; and 2320 men of the village watch, maintained by grants of service lands and by subscriptions from villages, which amounted to £2745 in 1872 ; total strength of police, 2918 men ; total cost, £11,849. Balasor contained 1053 schools in 1872, attended by 11,538 pupils. The Government and aided schools were 43 in number, attended by 1631 pupils, and maintained at a total cost of £1559, to which Government contributed £748, 16s. The climate of Balasor greatly varies according to the seasons of the year. The hot season lasts from March to June, but is tempered by cool sea breezes ; from June to September the weather is close and oppressive ; and from October to February the cold season brings the north- easterly winds, with cool mornings and evenings. (W. W. H.)

Batasor, the principal town and administrative head- quarters of the above district, situated on the River Burd- balang, in 21° 28’ 45” N. lat., and 86°59 33” E. long., about 8 miles from the sea-coast as the crow flies, and 16 by the river. The English settlement of Balasor, formed in 1642, and that of Pippli in its neighbourhood, seven years earlier, became the basis of the future greatness of the British in India. The servants of the East India Company here fortified themselves in a Strong position, and carried on a brisk investment in country goods, chiefly cottons and muslins. They flourished in spite of the oppressions of the Mahometan governors, and

when needful asserted their claims to respect by arms. In 1688, affairs having come to a crisis, Captain Heath, commander of the Company's ships, bombarded the town. In the 18th century Balasor rapidly declined in importance, on account of a dangerous bar which formed across the mouth of the river. At present the bar has 12 to 15 feet of water at spring tides, but not more than 2 or 3 feet at low water in the dry season. Large ships have to anchor outside in the open roadstead. The town contains a population of 18,263; municipal income in 1872, £519 ; expenditure, £514 ; rate of taxation, 63d. per head of population. (w. W. #.)

BALBI, Aprran, one of the most eminent geographers of modern times, was born at Venice in 1782. In 1820 he visited Portugal, and there collected materials for his well-known work entitled Essai Statistique sur le Royaume de Portugal et d'Algarve, which was published at Paris in 1822. This was followed by Variétés Politiques et Statis- teques de la Monarchie Portugaise, which contains some

curious observations respecting that country under the Roman sway, and on the state of literature and the arts. In 1826 he published the first volume of his Atlas Ethno- graphique du Globe, &c., a work of great erudition, embodying the researches of the most distinguished German philologists and geographers. In 1832 appeared the Abrégé de Geographie, which added greatly to the author's reputa- tion. This work, in an enlarged form, was translated into the principal languages of Europe. Balbi afterwards retired to Padua, where he continued to pursue his favourite science with unabated ardour. Besides those already mentioned, he was the author of several other works in the same de- partment of science. He died on the 14th of March 1848.

BALBO, Czsarg, an important Italian writer and states- man, was born at Turin, November 21,1789. His father, Prospero Balbo, held a high position in the Piedmontese court, and at the time of Cesare's birth was syndic of the capital. His mother, a member of the Azeglio family, died when he was three years old; and he was brought up in the house of his great-grandmother, the countess of Bugino, "a noble and proud old lady." In 1798 he joined his father at Paris. From 1808 to 1814 Balbo served in various

capacities under the Napoleonic empire, helping, at Florence and Rome, to fix the chains of despotism on his country. Gradually, however, his eyes were opened, and, on the fall of Napoleon, he was ready, in various capacities, to serve the cause of his country. While his father was appointed minister of the interior, he entered the army, and undertook political missions to Paris and London. On the revolution of 1821 he was forced into exile, and though, not long after, he was allowed to return to Piedmont, all active service as a statesman was denied him. Reluctantly, and with frequent endeavours to obtain some appointment, he gave himself up to literature as the only means left him to influence the destinies of his country. This accounts for the fitfulness and incompleteness of so much of his literary work, and for the practical, and in many cases temporary, element that runs through even his most elaborate produc- tions. The great object of his labours was to help in securing for Italy that independence from foreign control which, even more than internal freedom, he regarded as the first necessity of national life. Of true Italian unity he had no expectation and no desire. A confederation of separate states under the supremacy of the Pope was the genuine beau tdéal of Balbo, as it was the ostensible beau tdéal of Gioberti. But Gioberti, in his Primato, seemed to him to neglect the first essential of independence, which he accordingly inculcated in his Speranze or Hopes of Italy. Preparation, both military and moral, alertness, and patience, were his constant theme. He did not wish revolution, but reform; and thus he became the leader of a moderate party, and the steady opponent not only of despotism but of democracy. At last, in 1848, his hopes were so far satisfied by the constitution granted by the king. He was appointed a member of the commission of electoral law, and held a post in the first reformed government. With the ministry of Azeglio, which soon after got into power, he continued on friendly terms, and his pen continued the active defence of his political principles till his death, on the 3d June 1853. The most important of his writings are historico-political, and derive at once their majesty and their weakness from his theocratic theory of Christianity. His style is clear and vigorous, and not unfrequently terse and epigrammatic. He published Quattro Novelle in 1829; Storia d’Italia in 1830, Vita di Dante, 1839; Meditaaont Storiche, 1842-5 ; Le Speranze d’Jtalia, 1843 ; Sommarto della Storia d’Italia.

BALBOA, Vasco NuNezz pz, one of the bravest and most successful of the Spanish discoverers of America, was born at Xeres de los Caballeros, in Estremadura, about the

year 1475. He was by birth a hidalgo, or gentleman, but was in poor circumstances. Little is known of his life tiJl the year 1501, when he was one of the company of adventurers who followed Roderigo de Bastidas in his voyage of discovery to the western seas. He appears to have settled in Hispaniola, and took to cultivating land in the neighbourhood of Salvatierra, but with no great success, as his debts soon became oppressive. In 1509 the famous Ojeda sailed from San Domingo with an expedition, and founded the settlement of San Sebastian. He had left orders with Enciso, an adventurous lawyer of the town, to fit out two ships and convey provisions to the new settle- ment. Enciso set sail in 1510, and Balboa, whose debts made the town unpleasant to him, managed to accompany him, by concealing himself in a cask which was conveyed from his farm to the ship as if containing provisions. The expedition, after various adventures, reached San Sebastian to find Ojeda gone and the settlement in ruins. While Enciso was undecided how to act, Vasco Nuiiez proposed that they should sail for Darien, on the Gulf of Uraba, where he had touched when with Bastidas. His proposal was at once accepted, and carried out. The new town was named Sta Maria de la Antigua del Darien. Bitter quar- rels soon broke out among the adventurers, caused chiefly by Enciso prohibiting all private interchange for gold with the natives. Enciso was deposed from the office of autho- rity which he had assumed, but it was found no easy matter to elect a successor. Nicuesa, in whose province they were, was proposed by several, and was brought from Nombre de Dios by a ship which had been sent out to bring assistance to him. The inhabitants of Darien, how- ever, would not receive him, and, in their wrath, seized him and placed him, with seventeen companions, in a crazy bark with which to find his way back to Hispaniola. The party of Vasco Nufiez grew strong ; Enciso was thrown into prison, aud finally sent off to Spain along with Vasco’s ally, the alealde Zamudio. Being thus left in authority, Balboa began to make excursions

into the surrounding country, and by his bravery and conciliatory manners gained the friendship of several native chiefs. On one of these excursions he heard for the first time of the great ocean that lay on the other side of the mountains, and of the wondrous land of gold, afterwards called Peru. Soon after his return to Darien he received letters from Zamudio, informing him that Enciso had complained to the king, and had obtained a sentence condemning Balboa and summoning him to Spain. In his despair at this message Vasco resolved to attempt some great enterprise, the success of which he trusted would conciliate his sovereign. On the 1st September 1513, he set out with about 190 men, well armed, and sailed to Coyba, where he left half his forces to guard the canoes and ships. With the remainder he started on his perilous journey across the isthmus. On the 26th September they reached the summit of the range of mountains, and the glorious expanse of the Pacific was displayed to them. Three days later, they began to descend the mountains on the western side, and Vasco, arriving at the sea-shore, formally took possession of the ocean in the name of the Spanish monarch. He remained on the coast for some time, heard again of Peru, had the Pearl Islands pointed out to him, and set out for Darien. On the 18th January 1514 he reached the town, and was received with the utmost joy. He at once sent messengers to Spain bearing presents, to give an account of his dis- coveries ; but, unfortunately, these did not arrive till an expedition had sailed from Spain, under Don Pedro Arias de Avila (generally called Pedrarias, or Davila), to replace Vasco Nuiiez, and to take possession of the colony. For some time after Pedrarias reached Darien Vasco was in great straits. but at length letters came from the king,

announcing to him his satisfaction with his exploits, and naming him Adelantado, or admiral. Pedrarias was pre-

vailed upon to be reconciled with Vasco, and gave him one of

his daughters in marriage. Vasco then resolved to accom- plish his grand project of exploring the western sea. With

infinite labour materials for building ships were conveyed

across the isthmus, aud two brigantines were constructed. With these the adventurers took possession of the Pearl Islands, and, had it not been for the weather, would have reached the coast of Peru. This career of discovery was stopped by the jealousy of Pedrarias, who feared that Balboa would throw off his allegiance, and who enticed him to Acla by a crafty message. As soon as he had him in his power, he threw him into prison, had him tried for treason, and forced the judge to condemn him to death. The sentence, to the grief of all the inhabitants, was carried into execution on the public square of Acla in alee llre3

BALBRIGGAN, a seaport of Ireland, in the county of Dublin and parish of Balrothery, 184 miles N.N.E, of the capital. The harbour, though dry at low tides, has a depth of 14 feet at high-water springs, and affords a good refuge from the E. or S.E. gales. It is formed by a pier 600 feet long, with a lighthouse at its extremity, in 53° 37’ N. lat., 6° 12’ W. long. A viaduct of eleven arches crosses the harbour. The town has considerable manufactures of cottons and hosiery, and is much frequented as a watering- place in summer. Population in 1871, 2332.

BALDE, Jaxkoz, a modern Latin poet of considerable repute, was born at Ensisheim in Alsace in 1603, and died in 1668. He entered the Society of the Jesuits in 1624, and for the greater part of his life acted as court-preacher and professor of rhetoric at Munich. His Latin poems were very numerous, and those in imitation of Horace are particularly successful. Although Balde has received some attention since Herder translated several of his best pieces, and although some of his poems are by no means deficient in lightness, grace, and skilful versification, it would be a mistake to look upon him as a poet of high rank. A col-

Jected edition of his works in 4 vols. was published at

Cologne in 1650; a more complete edition in 8 vols., at Munich, 1729. Extracts have been given by Orelli, 1805, 1818; and some detached poems have been published by various editors.

BALDI, Bernarpino, a distinguished mathematician and miscellaneous writer, was descended of a noble family at Urbino, in which city he was born on the 6th of June 1533. He pursued his studies at Padua with

extraordi- nary zeal and success, and is said to have acquired, during the course of his life, no fewer than sixteen languages, though according to Tiraboschi, the inscription on his tomb limits the number to twelve. The appearance of the plague at Padua obliged him to retire to his native city, whence he was, shortly afterwards, called to act as tutor to Fer- rante Gonzaga, from whom he received the rich abbey of Guastalla. He held office as abbot for twenty-five years, and then retired to his native town. In 1612 he was employed by the duke as his envoy to Venice, where he distinguished himself by the congratulatory oration he delivered before the Venetian senate on the election of the new doge, Andrea Memmo. Baldi died at Urbino on the 12th of October 1617. He was, perhaps, the most universal genius of his age, and is said to have written upwards of a hundred different works, the chief part of which have remained unpublished. His various works give satisfactory evidence of his abilities as a theologian, mathe- matician, geographer, antiquary, historian, and poet. The Cronica dei Matematici is an abridgment of a larger work, on which he had bestowed twelve years of tabour, and which was intended to contain the lives of more than two

His life has been written by

hundred mathematicians. Affé, Mazzuchelli, and others,

BALDINGER, Ernest Gorrrriep, a German physician of considerable eminence, and the author of a great number of medical publications, was born near Erfurt, 13th May

1738, He studied medicine at Erfurt, Halle, and Jena,

and in 1761 was intrusted with the superintendence of the military hospitals connected with the Prussian encampment

near Torgau. He published, in 1765, a dissertation on the diseases of soldiers, which met with so favourable a reception that he published an enlarged edition, under the title of Treatese on the Diseases that prevail in Armes, Langensalza, 1774, 8vo. In 1768 he became professor of medicine

at Jena, whence he removed, in 1778, fo Gottingen, and in 1785 to Marburg, where he died of apoplexy on the 21st of January 1804. Among his pupils were Akermann, Sémmering, and Blumenbach. Some eighty-four separate treatises are mentioned as having pro- ceeded from his pen, in addition to numerous papers scat- tered through various collections and journals.

BALDINUCCI, Fiutrpo, a distinguished Italian writer on the history of the arts, was born at Florence about 1624, and died in 1696. Hischief work is entitled Notizie de Professori del Disegno da Cimabue in qua (dal 1260 sino al 1670), and was first published, in six vols. Ato, 1681-1728. The capital defect of this work is the attempt to derive all Italian art from the schools of Florence. A good edition is that by Ranalli (5 vols. 8vo, Florence, 1845-47). Baldinucci's whole works have been published in fourteen vols. at Milan, 1808-12.

BALDOVINETTI, Axzssto, was a distinguished painter of Florence in the 15th century, whose works have now become very scarce. Hogarth takes himas a type of those obscure artists to whom the affected amateurs of his time were wont to ascribe old paintings—*'Tis a fine piece of Alessio Baldovinetti, in his third manner." His father, Baldovinetti, belonged to a merchant family of good stand- ing and fortune. Alessio was born in 1422, and took to painting, according to Vasari, against his father's desire. His art was distinguished rather for study than for genius. It represents completely some of the leading characters of the Florentine school in that age. It was an age of diligent schooling and experiment, in which art endeavoured to master more of the parts and details of nature than she had mastered heretofore, and to improve her technical means for their representation. Among the parts of nature especially studied in the 15th century, were landscape and natural history, the particulars of scenery, and the charac- ters of birds, beasts, and plants. Alessio Baldovinetti sur- passed all his contemporaries in attention to these matters. In Vasari's words, you see in his paintings "rivers, bridges, stones, grasses, fruits, roads, fields, cities, castles, arenas, and an infinity of suchlike things." From this quality of his art it has been guessed, without sufficient cause, that he was the pupil of Paolo Uccelli, the first Florentine master who devoted himself to such matters. For the rest, this ex- treme care and minuteness renders his manner

somewhat hard, Like many other painters of his time, he treats draperies, hair, and such parts, with a manner that shows the influence of the goldsmith, and is more proper to metal work than to painting. His principal extant works are a nativity in the church of the Annunziati, an altar-piece, No. 24, in the gallery of the Uffizi, and another, No. 2, in the gallery of ancient pictures in the Academy of Arts at Florence. The great work of his life was a series of frescoes from the Old Testament in the chapel of the Guanfigliazzi family in the church of Sta Trinita, containing many interesting contemporary portraits ; but these were destroyed about 1760. He also designed a likeness of Dante for the cathedral of Florence in 1465. His technical experiments

were of the same nature as those made by his contempo raries—Pesellino, Pollaiuolo, and Domenico Venizianv, who endeavoured to find out an oil medium at Florence before Antonello da Messina had brought to Venice the secrets of the Flemish practice. Vasari relates how Alessio thought he had made a great discovery with the mixture of yolk of egg and heated vernice liguida, but how the work so painted presently became discoloured. He understood mosaic as well as painting, and between 1481 and 1484 was engaged in repairing ancient mosaics, first in the church of San Miniato, next in the baptistery at Florence. He is said to have instructed Dominico Ghirlandaio (see BiGoRD!I) in this art. He died on the 29th of August 1499, within two years and a half of the completion of his frescoes in the Gianfigliazzi chapel. (Vasari, ed. Lemonnier, vol. iv. pp. 101-107 ; Crowe and Cavaleaselle, Hist. of Painting in ftaly, vol. ii. pp. 372-381.) (h’c:)

BALDUINUS, Jacosus, a distinguished professor of civil law in the university of Bologna. He was by birth a Bolognese, and is reputed to have been of a noble family. He was a pupil of Azo, and the master of Odofredus, of Hostiensis, and of Jacobus de Ravanis, the last of whom has the reputation of having first applied dialectical forms to legal science. His great fame as a jurist caused him to be elected podesta of the city of Genoa, where he was intrusted with the reform of the laws of the republic. He died at Bologna in 1225, and has left behind him some treatises on Procedure, which have the merit of being the earliest of their kind.

BALDUR, one of the most interesting figures of the Scandinavian mythology, was the son of Odin and Frigg. His name (from baldr, the foremost or pre-eminent one) denoted his supreme excellence and beauty. In the Gylfeginning we read that he was so amiable that all loved him, so beautiful that a light seemed to shine about him, and his face and hair were for ever refulgent. He was the mildest, wisest, and most eloquent of the Aisir ; and when he pronounced a judgment, it was infallible. His dwelling was in Brejdablik (far-sight), where nothing impure could come, and where the most obscure question could be explained. The wonderful legend of his death is first dimly recorded in the Véluspa, the grandest and most ancient of Eddaic poems, and more fully in the younger Edda. Baldur was visited by evil dreams, and felt his life to be in danger. His mother, Frigg, took oath of all things in the world, animal, vegetable, and mineral, that they should not slay her son. The gods being then secure, found pastime in setting the good Baldur in their midst, and in shooting or hurling stones at his invulnerable body. Then Loki, the evil god, took on him the form of a woman and went to Frigg in Fenusal. From Frigg he learned that of all things in the earth but one could injure Baldur, and that was a little tree westward from Valhal, that was too young to take the oath, Thither went Loki aud found the plant ; it was the mistletoe. He plucked it up, fashioned it into an arrow, and went back to the A¥sir. They were still in a circle, shooting at Baldur; and outside the ring stood the blind god Hider, of whom Loki asked wherefore he did not shoot. When Héder had excused himself because of his blindness, Loki offered to aim for him, and Héder, shooting the arrow of mistletoe, Baldur suddenly fell, pierced and dead. No such misfortune had ever yet befallen gods or men; there was long silence in heaven, and then with one accord there broke out a loud noise of weeping. The Alsir dared not revenge the deed, because the place was holy, but Frigg, rushing into their midst, besought them to send one to Hel to fetch him back. Hel promised to let him go if all things in heaven and earth were unanimous in wishing it to be 80; but when inquiry was made, a creature called Thokt was found

in the cleft of a rock that said, “ Let Hel keep its booty.” This was Loki, and so Baldur came not back to Valhal. His death was revenged by his son Vale,

who, being only one night old, slew Hider ; but Loki fled from the revenge of the gods. In Baldur was personified the light of the sun; in his death the quenching of that light in winter. In his invulnerable body is expressed the incorporeal quality of light ; what alone can wound it is mistletoe, the symbol of the depth of winter. It is noticeable that the Druids, when they cut down this plant with a golden sickle, did so to prevent it from wounding Baldur again. According to the Voluspa, Baldur will return, after Ragna-rék, to the new heavens and the new earth; so the sun returns in spring to the renovated world. In the later versions it was no ordinary season, but the Fimbul winter, which no summer follows, which Baldur's death prefigured. It must not be overlooked that the story of Baldur is not merely a sun-myth, but a personification of that glory, purity, and innocence of the gods which was believed to have been lost at his death, thus made the central point of the whole drama of the great Scandinavian mythology. Baldur has been also considered, in relation to some state- ments of Saxo Grammaticus, to have been a god of peace, —peace attained through warfare; this theory has been advanced by Weinhold with much ingenuity. Several myths have been cited as paralleling the story of the death of Baldur ; those of Adonis and of Persephone may be considered as the most plausible. (E. W. G.)

BALDUS, an eminent professor of the civil law, and also of the canon law, in the university of Perugia. He came of the noble family of the Ubaldi; and his two brothers, Angelus de Ubaldis and Petrus de Ubaldis, were almost of equal eminence with himself as jurists. He was born in 1327, and studied civil law under Bartolus at Perugia, where he was admitted to the degree of doctor of civil law at the early age of seventeen in 1344. Fredericus Petrucius of Siena is said to have been the master under whom he studied canon law. Upon his pro- motion to the doctorate he at once proceeded to Bologna, where he taught law for three years; after which he was advanced to a professorial chair at Perugia, which he occupied for thirty-three years. He taught law subsequently at Pisa, at Florence, at Padua, and at Pavia, at a time when the schools of law in those universities disputed the palm with the school of Bologna. Baldus has not left behind him any works which bear out the great reputation which he acquired amongst his contemporaries, This circumstance may be in some respects accounted for by the active part which he took in public affairs, and by the fame which he acquired by his consultations, of which five volumes have been published

by Diplovataccius, Baldus was the master of Peter Beaufort, the nephew of Pope Clement VI., who became himself Pope under the title of Gregory XI., and whose immediate successor, Urban VI., summoned Baldus to Rome to assist him by his consulta- tions against the anti-pope Clement VII. Cardinal de Zabarella and Paulus de Castro were also amongst his pupils. His Commentary on the Inber Fendorum is con- sidered to be one of the best of his works, which have been unfortunately left by him for the most part in an incomplete state.

BALDWIN, Tuomas, a celebrated English prelate of the 12th century, was born of obscure parents at Exeter, where, in the early part of his life, he taught a grammar school. After this he took orders, and was made archdeacon of Exeter ; but he resigned that dignity, and became a Cister- cian monk in the monastery of Ford in Devonshire, of which, in a few years, he was made abbot. In the year 1180 he was consecrated bishop of Worcester. In 1184 he was promoted to the see of Canterbury, and by Urban IIL

was appointed legate for that diocese. He laid the founda- tion of a church and monastery in honour of Thomas 4 Becket at Hackington, near Canterbury, for secular priests ; but being opposed by the monks of Canterbury and the Pope, he was obliged to desist. Baldwin then laid the foundation of the archiepiscopal palace at Lambeth. In 1189 he crowned King Richard I. at Westminster, and two years later, after making a pilgrimage through Wales to preach the Crusade, followed that prince to the Holy Land, where he died at the siege of Ptolemais or St Jean d’Acre. Giraldus Cambrensis, who accompanied him in an expedition through Wales, says he was of moderate habits and of an extremely mild disposition. He wrote various tracts on religious subjects, some of which were collected and published by Bertrand Tissier in 1662.

BALE, Joun, Bishop of Ossory, in Ireland, was born at Cove, near Dunwich in Suffolk, in November 1495. He was educated in the monastery of the Carmelites at Norwich, and afterwards at Jesus College, Oxford. He belonged at first to the Roman Catholic Church, but was converted to the Protestant religion by Thomas Lord Wentworth. On the death of Lord

Cromwell, the favourite of Henry VIII, who had protected him from the persecutions of the Romish clergy, he was obliged to take refuge in Flanders, where he continued eight years. Soon after the accession of Edward VI. he was recalled; and being first presented to the living of Bishop's Stocke (Bishopstoke),in Hampshire, he was nominated in 1552 to the see of Ossory, in Ireland. During his residence there he was remarkably assiduous in propagating the Protestant doctrines, but with little suc- cess, and frequently at the hazard of his life. On the accession of Queen Mary the tide of opposition became so powerful that, to avoid assassination, he embarked for Holland ; and, after various vicissitudes, reached Basel in Switzerland, where he continued till the accession of Queen Elizabeth. After his return to England he was, in 1560, made prebendary of Canterbury, where he died in Novem- ber 1563, in the sixty-eighth year of his age. Bale is noted as being one of the last (though not the last, as has some- times been said) of those who wrote miracle-plays. Several of his are extant, and a list of titles of about twenty is given by Collier (ii. 238), They are remarkable for the determi- nation they manifest to introduce and inculcate the doctrines of the Reformed religion. The best of his historical plays, Kynge Johan, has been published by the Camden Society, 1838. Of his numerous other works the most noted is his collection of British biography, entitled [Ulustrium Majoris Britannie Scriptorum Catalogus, a Japheto sanctissims Noah filio ad An. Dom. 1559, This work was first pub- lished in quarto in 1548, and afterwards, with various additions, in folio, in 1557-59. Although slightly inaccu- rate, it is still a work of great value for the minute notices it gives of writers, concerning whom little is otherwise known. A selection from his works was published in 1849 by the Parker Society, containing the Hxaminations of Cobham, Thorpe, and Anne Askew, and the Jmage of the two Churches. Bale's style is frequently coarse and violent, and his truthfulness has been sometimes chal- lenged.

BALEARIC ISLANDS, a remarkable group in the western part of the Mediterranean Sea, lying to the S. and E. of Spain, between 38° 40' and 40° 5' N. lat., and between 1° and 5° E. long. The name, as now employed, includes not only the ancient nsule Baleares (Major and Minor), but also the Pityuse or Pine Islands, as the two more western were called. The origin of the name Baleares is a mere matter of conjecture, and the reader may choose any of the derivations usually offered with about an equal chance of

not being right. On the other hand, it is obvious that the modern Majorca (or, in Spanish, Mallorca) and Minorea

Majorca.

BALEARIC ISLANDS

(in Spanish, Menorca) are obtained from the Latin Major | of, probably, and Minor, through the Byzantine forms Maopixa and | Greeks (Colubraria of the

Muwopixa ; while Iviza is plainly the older Ebusus, a name

Carthaginian origin. The Ophiusa of the Romans) is now known as

Formentera.

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Sketch Map of the Balearic Islands.

Majorca is the largest island of the group, having an area of 1430 square miles. Its shape is that of a trape- zoid, with the angles directed to the cardinal points ; and its diagonal, from Cape Grozer in the W. to Cape Pera in the E., is about sixty miles. On the N.W. the coast is highly precipitous, but on the other sides it is low and sloping. On the N.E. there are several considerable bays, of which the chief are those of Alcudia and Pollenza ; while onthe S.W. is the still more important bay of Palma. No fewer than twelve ports or harbours are enumerated round the island, of which may be mentioned Andraix, Soller, and Porto Colom. In the N.W. Majorca is traversed by a chain of mountains running parallel with the coast, and attaining its highest elevation in Silla de Torillas, 4600 feet above the sea. Towards the south and east the surface is comparatively level, though broken by isolated peaks of con- siderable height. The northern mouutains afford great protection to the rest of the island from the violent gales to which it is exposed, and render the climate remarkably mild and pleasant, while the heats of summer are tempered by the sea-breezes. The scenery of Majorca is varied and beautiful, with all the picturesqueness of outline that usually belongs to a limestone formation. Some of the valleys, such as those of Valdemoza and Soller, with their luxuriant vegetation, are delightful resorts. There are quarries of marble, of various grains and colours—those of Santagny, in the partido of Manacor, being especially celebrated ; while lead, iron, and cinnabar have also been obtained. Coal of a jet-like character is found at Benisalem, where works were commenced in 1836, at Selva, where it has been mined since 1851, near Santa Maria, and elsewhere. It is used in the industrial establishments of Palma, and in the manufacture of lime, plaster, and bricks, in the neighbour- hood of the mines,—a considerable quantity being also exported to Barcelona. The inhabitants are principally devoted to agriculture, and most of the arable land of the islands is under cultivation. The mountains are terraced ;

and the old pine woods have in many places given place to the olive, the vine, and the almond tree, to fields of wheat and flax, or to orchards of figs and oranges. For the last- mentioned fruits the valley of Soller is one of the most important districts, the produce being largely transmitted to France, and realising about £25,000 per annum. The oil harvest is very considerable, and Inca is the centre of the oil district. The wines are light but excellent, especi- ally the Muscadel and Montona. The agricultural

methods of the islands are still somewhat primitive, but the intro- duction of machinery indicates improvement, as well as the drainage, by an English company, of a marsh and lake, 8000 acres in extent, near the town of Alcudia. During the summer there is often great scarcity of water; but, according to a system handed down by the Moors, the rains of autumn and winter are collected in enormous reservoirs, which contain sufficient water to last through the dry season; and on the payment of a certain rate, each landholder in turn has his fields flooded at certain intervals. Mules are used in the agriculture and traffic of the island. The cattle are small, but the sheep are large and well fleeced. Pigs are largely reared, and exported to Barcelona. There is abundance of poultry and of small game.

Minorca.

the island. The people are industrious and hospitable, and pique themselves on their loyalty and orthodoxy. They are often but poorly educated, and their superstition is great ; crime, however, is rare. Vaccination is comnion throughout the island, except in the cities,—the women often performing the operation themselves when medical assistance cannot be got. Castilian is spoken by the upper and commercial classes ; the lower and agricultural employ a dialect resembling that of the Catalans, with whom, also, their general appearance and manners connect them. Besides the towns already mentioned, Lluchmayor and Campos are places of considerable size ; and the castle of Belbez near Palma, which was the former residence of the kings, is worthy of notice. Population of the island,

204,000.

Minorca, the second of the group in size, is situated 27 miles E.N.E. of Majorca. It has an area of 260 square miles, and extends about 35 miles in length. The coast is deeply indented, especially on the north, with numerous creeks and bays,—that of Port Mahon being one of the finest in the Mediterranean, if not the best of them all, as the couplet of Andrea Doria quaintly puts it—

‘*Junio, Julio, Agosto, y puerto Mahon Los mejores puertos del Mediterraneo son “—

“June, July, August, and Port Mahon are the best har- bours of the Mediterranean.” The ports Addaya, Fornelle, Ciudadela, and Nitja may also be mentioned. The surface of the island is uneven, flat in the south and rising irregularly towards the centre, where the mountain El Toro—probably so called from the Arabic Tor, a height, though the natives have a legend of a toro or bull—has an altitude of 5250 feet. Owing to want of shelter from mountaius, the climate is not so equable as that of Majorca, and the island is exposed in autumn and winter to the violence of the north winds. The soil of the island is of very unequal quality ; that of the higher districts being light, fine, and fertile, and producing regular harvests without much labour or cultivation, while that of the plains is chalky, scanty, and alike unfit for pasture and the plough. Some of the valleys have a good alluvial soil; and where the hills have been terraced, they are cultivated to the summit. The wheat and barley raised in the island are sometimes sufficient for home consumption ; there is rarely a surplus. The Hedysarum coronarium, or zulla, as it is called by the Spaniards, is largely cultivated for fodder. Wine, oil, potatoes, legumes, hemp, and flax are produced in moderate quantities; fruit of all kinds, including melons, pomegranates, figs, and almonds, is abundant. The moniato, or sweet potato, is grown and exported to Algeria. The caper plant is common through- out the island, growing onruined walls. Horned cattle, sheep, goats, &c., are reared, and the island abounds with small game. Stone of various kinds is plentiful ; a soft stone, easily quarried, and acquiring hardness by exposure, is used for building. In the district of Mercadal and in Mount Santa Agueda are found marbles and porphyries superior to those of Italy, and lime and slate are also abundant. Lead, copper, and iron might be worked were it not for the scarcity of fuel. There are manufactures of the wool, hemp, and flax of the island; and formerly there was a good deal of boat-building ; but, with the exception of agriculture, all branches of industry are comparatively neglected. The principal exports are wheat, cattle, cotton- stuffs, and shoes. An excellent road, constructed in 1713-15 by Brigadier Kane, to whose memory a monument was erected at the first milestone, runs through the island from S.E. to N.W., and connects Port Mahon with Ciudadela, passing

by Alayor, Mercadal, and Ferrerias. Ciudadela, which was the capital of the island till Mahon was raised

to that position by the English during their occupancy of the island, still possesses considerable remains of its former importance. Population of the island, 39,000.

Iviga, Iviza, or, in Spanish, Ibiza, the Hbusus of the Ivica.

ancients, lies 50 miles 8.W. of Majorca, and about 60 from Cape San Martin on the coast of Spain, between 38° 50’ and 39° 8 N. lat., and between 1° 14’ and 1° 38’ E. long. Its greatest length from N.E. to 8.W. is about 25 miles, and its greatest breadth about 13. The coast is indented by numerous sniall bays, the principal of which are those of San Antonio on the N.W., and of Iviza on the S8.E. coast. Of all the Balearic group, Iviza is the most varied in its scenery and the most fruitful. The hilly parts are richly wooded. It was on one of the summits called Campsey that one of the stations in the celebrated measure- ment of an arc of the meridian was placed. The climate is for the most part mild and agreeable, though the hot winds from the African coast are sometimes troublesome. Oil, corn, and fruits (of which the most important are the common fig, the prickly pear, the almond, and the carob- bean) are the principal productions of the island; but the inhabitants are rather indolent, and their modes of culture are very primitive. Hemp and flax are also grown. There are numerous salt-pans along the coast, which were formerly worked by the Spanish Government, but are now in the hands of a joint-stock company. Carob-beans, almonds, charcoal, and lead are the other articles of export, to which may be added stockings of native manufacture The imports are rice, flour, and sugar, woollen goods, andcotton. The capital of the island, and, indeed, the only town of much importance,—for the population is remarkably scattered,— is Iviza or La Ciudad, a fortified town on the 8.E. coast, con- sisting of a lower and upper portion, and possessing a good harbour. ‘The population of the island is about 21,000, of whom-5500 are resident in the capital.

South of Iviza les the smaller and more irregular island Formen- of Formentera, which is said to derive its name from the tera.

production of wheat. It is situated between 1° 22’ and 1° 37’ E. long. With Iviza it agrees both in general appearance and in the character of its productions, but it is altogether destitute of streams. Goats and sheep are found in the mountains, and the coasts are greatly frequented by flamingoes. The last station in the measurement of the arc of the meridian was in this island.

There are several smaller islands in the Balearic group, smaller such as Cabrera, or Goat Island, and Conejera, or Rabbit islands,

Island, south of Majorca, but none of them are of any size or importance except Cabrera, which is full of caverns, and is used asa place of banishment. In 1808 it was the scene of a deed of gross barbarity—a large number of Frenchmen being landed on the island, and almost allowed to perish for want of food.

Of the origin of the early inhabitants of the Balearic Islands History.

nothing is certainly known, though Greek and Roman writers refer to Beeotian and Rhodian settlements. According to general tradi- tion the natives, from whatever quarter derived, were a strange and savage people till they received some tincture of civilisation from the Carthaginians, who early took possession of the islands, and built themselves cities on their coasts. Of these cities, Mahon, the most important, still retains the name which it derived from the family of Mago. About twenty-three years after the destruc- tion of Carthage the Romans accused the people of the islands with piracy, and sent against them Q. Cecilius Metellus, who soon reduced them to obedience, settled amongst them 3000 Roman and Spanish colonists, founded the cities of Palma and Pollentia, and introduced the cultivation of the olive. Besides valuable contin- gents of the celebrated Balearic slingers the Romans derived from their new conquest mules (from Minorca), edible snails, sinope, and pitch. Of their occupation numerous traces still exist,—the most remarkable being the aqueduct at Pollentia.

In 428 a.p. the islands were taken possession of by the Vandals, and in 798 by the Moors. They became a separate Moorish king- dom in 1009, which, becoming extremely obnoxious for piracy, was the object of a crusade directed against it by Pope Pascal II., in

which the Catalans took the lead. This expedition was frustrated at the time, but was resumed by Don Jaime, king of Aragon, and the Moors expelled in 1232. During their occupation the island was populous and productive, and an active commerce was carried on with Spain and Africa. Don Jaime conferred the sovereignty of the isles on his third son, under whom and his successors they formed an independent kingdom up to 1349, from which time their history merges in that of Spain. In 1521 an insurrection of the peasantry against the nobility, whom thcy massacred, took place in Majorca, and was not suppressed without much bloodshed. In the war of the Spanish Succession all the islands declared for Charles ; the duke of Anjou had no footing anywhere save in the citadel of Mahon. Minorca was reduced by Count Villars in 1707; but it was not till Jnne 1715 that Majorca was subjugated, and meanwhile Port Mahon was captured by the English under General Stanhopein 1708. In 1718 theisland was sccured to them by the peace of Utrecht ; but in 1756 it was invaded by a force of 12,000 French, who, after defeating the unfortunate Admiral Byng, captured Port Mahon. Restored to England in 1769 by the peace of Versailles the island remained in our possession till 1782, when it was retaken by the Spaniards. Again seized by the English in 1798, it was finally e-ded to Spain by the peace of Amiens in 1803. When the French invaded Spain in 1808, the Mallorquins did not remain indifferent ; the governor, D. Juan Miguel de Vives, announced, amid universal acclamation, his resolution to adhere to Ferdinand VIJ. Atfirstthe Junta would take no active part in the war, retaining the corps of volunteers that were formed for the defence of the island ; but find- ing it quite secure, they transferred a succession of tliem to the Penin- sula to reinforce the allies. Such was the animosity excited against the French when their excesses were known to the Mallorquins, that some of the French prisoners, conducted thither in 1810, had to be transferred with all speed to the island of Cabrera, a transference which was not effected before some of them had been killed. Armstrong’s Hist. of Minorca, 1756; Dameto’s Hist. del reyno Balearico o de Mallorca ; Hist. of Balearic Islands, London, 1716 ; Vincente Mut’s Historia ; Cleghorn’s Diseases of Minorca, 1751; Wernsdorf, Antiquitates Balearic ; Clayton’s Sunny South, 1869 ; George Sand, in Revue des Deux Mondes, 1841; D’Hermilly, Hist. du Royaume de Minorque, Maestricht, 1777; ‘‘ Balearic

Islands," in Bates's Illustrated Travels, vol. i. ; Die Balearen in Wort und Bild geschildert, Leipsic, 1871; " Klima der Balearen " in the Zeit. der Oesterr. Gesell. fiir Meteorologie, 1874; Juan Ramis, Antiguedades Celticas de la Isla de Menorca, Mahon, 1818; Pauli, 'Ein Monat auf den Balearen" in Das Ausland, 1878; Arago, De ma jeunesse, Guvres,vol. i.; Biot, Recueil d' Observations géodésiques, &c., 1821.

BALES, Peter, a famous caligraphist, and one of the first inventors of short-hand writing. He was born in 1547, and is described by Anthony Wood as a "most dexterous person in his profession, to the great wonder of scholars and others." We are also informed that "he spent several years in sciences among Oxonians, particularly, as it seems, in Gloucester Hall; but that study, which he used for a diversion only, proved at length an employment of profit." He is mentioned for his skill in micrography in Hollingshed's Chronicle, anno 1575. "Hadrian Junius," says Evelyn, "speaking as a miracle of somebody who wrote the Apostles' Creed and the beginning of St John's Gospel within the compass of a farthing: what would he have said of our famous Peter Bales, who, in the year 1575, wrote the Lord's Prayer, the Creed, Decalogue, with two short prayers in Latin, his own name, motto, day of the month, year of the Lord, and reign of the queen, to whom he presented it at Hampton Court, all of it written within the circle of a single penny, inchased in a ring and borders of gold, and covered with a crystal so accurately wrought as to be very plainly legible ; to the great admira- tion of her majesty, the whole privy council, and several ambassadors then at court?" Bales was likewise very dexterous in imitating handwritings, and about 1576 was employed by Secretary Walsingham in certain political manoeuvres. We find him at the head of a school near the Old Bailey, London, in 1590, in which year he published his Writing Schoolmaster, in three Parts. In 1595 he had a great trial of skill with one Daniel Johnson, for a golden pen of £20 value, and won it; and a contemporary author further relates that he had also the arms of caligraphy given him, which are azure, a penor. Bales died about the year 1610.

BALFE, MicuagrL WILLIAM, was born, in 1808, at Limerick in Ireland. His musical gifts became apparent at an early age. 'The only instruction he

received was from his father, and a musician of the name of Horn ; and it seems to have been limited to a superficial training of the voice, and to some lessons on the pianoforte. At one time Balfe also practised the violin, and was even bold enough to play in public one of Viotti's concertos, but, seemingly, without much success. He never seems to have studied systematically the fundamental principles of his art, and this want of rudimentary training has left the stamp of imperfection on all his works. Being in pos- session of a small but pleasant barytone voice, he chose the career of an operatic singer, and made his début in Der Freischiitz, at Drury Lane, at the early age of six- teen. The following year he was taken to Rome bya wealthy family. In Italy he wrote his first dramatic work, a ballet, Perouse, first performed at the Scala theatre, Milan, in 1826, In the later part of the same year he appeared as Figaro in Rossini's Barbiere, at the Italian Opera in Paris, at that time the scene of the unequalled vocal feats of such singers as Sontag, Malibran, Lablache, and others. Balfe's voice and training were little adapted to compete with such artists; he soon returned to Italy, where, during the next nine years, he remained singing at various theatres, and composing a number of operas, now utterly and justly forgotten. During this time he married the prima donna, Mdlle. Luisa Roser, a lady of German birth, for whom one of his operas was written. He even made bold to disfigure, by interpolated music of his own, the works of Rossini, Donizetti, and other masters of estab- lished reputation. Fétis says that the public indignation, roused by an attempt at "iniproving" in this manner the opera I/ Crociato by Meyerbeer compelled Balfe to throw up his engagement at the theatre La Fenice in Venice. He returned to England where, in 1835, his Siege of Rochelle was produced, and rapturously received at Drury Lane. Encouraged by his success, he produced a series of operas which for some time made him the most popular composer of the day. Amongst the works written for London we mention Amelia, or the Love-test (1838) ; Falstaff (with the incomparable Lablache as Sir John); Keolanthe; and the Bohemian Girl (1844). The last-mentioned work is generally considered to be his chef d'wuvre ; it carried its composer's name to Germany, where it was perfornied with considerable success at various theatres. Balfe in the meantime also wrote several operas for the Opéra Comique and Grand Opéra in Paris, of which we may mention those called Le Puits Amour, Les quatre Fils Aymon, and L'étoile de Seville. After a short period of success his popularity began to decline, and at the time of

his death in 1870, most of his music had become antiquated. A posthumous work of his, The Yalisman, the libretto of which is taken from Walter Scott's novel, was performed at the Italian Opera, Drury Lane, in 1874, with consider able success. The chief charm of his works consists in a certain easy, not to say trivial, melodiousness, such as may be readily accounted for by the composer's Irish nationality without the addition of individual genius of a higher kind. He had also a certain instinct for brilliant orchestration, and for the coarser effects of operatic writing. Musical knowledge of a higher kind he never possessed, nor did he supply this want by the natural impulses of a truly refined nature. "To speak of Balfe as an artist is either to misuse the word or to permit its meaning to depend on temporary success, no matter how acquired." Such is the stern but not unjust verdict of the late Mr H. F. Chorley, whose opinion of the detrimental effect of Balfe's success "on the chances of establishing a real national opera" also appears to be correct. Balfe's claim to particular notice rests,

indeed, less on the intrinsic merits of his works than on their undoubted success; and, most of all, on the fact of his being one of the few composers of British birth whose names are known beyond the limits of their own country. (¥. H.)

BALFOUR, Srr James, of Pittendreich, at one time lord president of the Supreme Court in Scotland, an active and unscrupulous politician during the stormy period of the reign of Mary. He was originally educated for the church, and adopted the principles of the Reformers. With Knox and others he was condemned to the galleys on account of the part he had taken in the murder of Beaton, but after their release he abjured Protestantism, and speedily acquired great favour with the court, obtaining some con- siderable legal dignities. He was deeply implicated in the murder of Darnley, and drew up the bond which was signed by all the conspirators. As some reward for his services, he was made, by Mary, governor of Edinburgh Castle, a position in which he had a good opportunity for the exercise of his great talents for treachery. He yielded the castle to Murray on conditions favourable to himself alone, and then threw in his lot with the regent's party, by whose favour he secured the post of lord president. During the

next few years he changed his political views more than once, but managed to keep in safety, though for a time he deemed it prudent to withdraw to France. On the aecession of James he returned ; and, after having had once to flee from Morton, now his deadly enemy, he brought about the destruction of that nobleman by. producing the bond bearing upon Darnley's murder. He died not long after in 1583. The collection of statutes entitled the Practicks is generally ascribed to him ; but it is not known how much of the book belongs to him and how much to Sir John Skene, his colleague in the task of arranging them.

BALFOUR, Str James, Bart., of Denmylne and Kinnaird, an eminent annalist and antiquary, was born about 1600. He received a good education, travelled for some time on the Continent, and then devoted his attention almost entirely to the study of the history and antiquities of his country. He was well acquainted with Sir Wm. Segar and with Dugdale, to whose Afonasticon he contri- buted. He was knighted by Charles I. in 1630, was made lyon king-at-arms in the same year, and in 1633 received the baronetcy of Kinnaird. He was removed from his office of king-at-arms by Cromwell, and died in 1657. Some of his works, which are very numerous, are preserved in the Advocates' Library at Edinburgh, together with his correspondence,—from which rich collection Mr Haig published Balfour's Annales of Scotland from the zevre 1057-1603, in 4 vols. 8vo. (1824-25). See Sibbald, Memoria Balfouriana, 1699.

BALFOUR, Rosert, a learned Scotchman, born about the year 1550, who was for many years principal of the Guienne College at Bordeaux. His principal work is his Commentary on the Logic and Ethics of Aristotle (Burdig. 1616-20, 2 tom. 4to), which is described by Dr Irving (Zzves of the Scottish Writers) as uniting vigour of intellect with great extent and variety of learning. Balfour was one of the scholars who in the Middle Ages contributed to spread abroad over the Continent the fame of the perfervidum ungenvum Scotorum.

BALFROOSH, or Barrurtsh, a large commercial town of Persia, province of Mazanderan, on the River Bhawal, which is here crossed by a bridge of nine arches, about twelve miles distant from the southern shore of the Caspian Sea, where the small town of Meshed-i-Sir serves as a kind of port.

Built in a low and swampy, though fertile country, and approached by deep and almost impassable roads, it would not seem at all favourably situated for the seat of an extensive inland trade. It is, however, peopled entirely

by merchants, mechanics, and their dependants, and is wholly indebted for its present size and importance to its commercial prosperity. The principal articles of its trade are rice, silk, and cotton. The town is of a very peculiar structure and aspect. It is placed in the midst of a forest of tall trees, by which the buildings are so separated from one another, and so concealed, that, except in the bazaars, it has no appearance of a populous town. The streets are broad and neat, though generally unpaved ; and they are kept in good order. No ruins are to be seen, as in other Persian towns ; the houses are comfortable, in good repair, roofed with tiles, and enclosed by substantial walls. There are no public buildings of any importance. The only places of interest are the bazaars, which extend fully a mile in length, and consist of substantially-built ranges of shops, covered with a roof of wood and tiles, and well stored with commodities, There are about ten principal caravansaries, and from twenty to thirty medresses or colleges, the place being as much celebrated for learning as for commerce. At the time of Fraser's visit (1822) it was said to contain 200,000 inhabitants, but this was probably an exaggera- tion. Since that time its population has undergone various fluctuations, and is now estimated at 125,000. Long. 52° 42′ E., lat. 36° 37' N.

BALGUY, Joun, an eminent English theologian and moral philosopher, was born at Sheffield on August 12, 1686. He received his early education partly under his father, and partly under Mr Daubuz, his father's successor, in the grammar-school of that town. He entered St John's College, Cambridge, in 1702, graduated Bachelor of Arts in 1706, was ordained to the ministry in 1710, and soon after obtained the small living of Lamesly and Tanfield in the county of Durham. He married in 1715. It was the year in which Bishop Hoadley preached that famous sermon on The Kingdom of Christ, which gave rise to the long, wearisome, and confused theological war known as the " Bangorian controversy ;" and Balguy, under the nom de plume of Silvius, began his career of authorship by taking the side of Hoadley in this

controversy against some of his High Church opponents. In 1726 he published A Letter to a Deist concerning the Beauty and Excellency of Moral Virtue, and the support and improvement which wt receives from the Christian Religion, chiefly designed to show that, while a love of virtue for its own sake is the' highest principle of morality, religious rewards and punish- ments are most valuable, and in some cases absolutely indispensable, as sanctions of conduct. He supposed that a contrary opinion had been maintained by Lord Shaftesbury in his Inquiry concerning Virtue ; but an examination of that essay will prove him to have in this respect done Shaftesbury injustice. In 1728 he was made a prebend of Salisbury by his friend, Bishop Hoadley. He published in the same year the first part of a tractate entitled The Foundation of Moral Goodness, and in the following year a second part, "illustrating and enforcing the principles con- tained in the former." 'The aim of the work is twofold— to refute the theory of Hutcheson regarding the basis of rectitude, and to establish the theory of Clarke. His objections to Hutcheson's theory are,—(1.) That it represents virtue as arbitrary and insecure by making it depend on two instincts, benevolent affection and the moral sense; (2.) That if true, brutes, since they have kind instincts or affections, must have some degree of virtue; (3.) That if such affections constitute virtue, the virtue must be the greater in proportion as the affections are stronger, contrary to the notion of virtue, which is the control of the affections ; and (4.) That virtue is degraded by being made a result of instincts instead of being represented as the highest part of our nature. Clarke's fundamental ethical principle, that virtue is conformity to

reason,—the acting according to fitnesses which arise out of the eternal and immutable relations of agents to objects, — is the central and guiding thought in Balguy's moral speculations, and even the source of what is most distinctive in his theology. His exposition of it is characterised by insight into its significance, and by ingenuity in disposing of the objections which had been urged against it. In 1729 he became vicar of Northallerton, in the county of York. His next work was an essay on Divine Rectitude ; Ora Brief Inquiry concerning the Moral Perfections of the Deity, particularly in respect of Creation and Providence. Itis an attempt to show that the same

moral principle which ought to direct human life may be perceived to underlie the works and ways of God: goodness in the Deity not being a mere disposition to benevolence, but a regard to an order, beauty, and harmony, which are not merely relative to our faculties and capacities, but real and absolute; claiming for their own sakes the reverence of all intclligent beings, and alone answering to the perfection of the divine ideas, It is only, Balguy thinks, when the divine rectitude is thus viewed as aiming at order no less than at happiness, as acting according to the true reasons of things no less than from the affection of benevolence, that such facts as the gift of freedom to man, the introduction and infliction of natural evil, the inequalities of human fortune, the sufferings of the righteous, and the prosperity of the wicked, can be satis- factorily explained. There followed A Second Letter to a Deist, concerning a late bvok entitled " Christianity as old as the Creation," more particularly that chapter which relates to Dr Clarke. Here Balguy argues that Tindal had falsely inferred revelation to be superfluous from the perfection of the law of nature and the ability of reason to discover that law. He grants that the law of nature is perfect and unchangeable, and that men cau know whatever it is their duty to do, but maintains that the light of reason may have, and has had, added to it by revelation knowledge of great interest and value. This, he holds, is all that Clarke had maintained, and Tindal had failed to show that he had fallen into any self-contradictions. The same leading thoughts which we find in the tracts just mentioned meet us again in The Law of Truth, or the Obligations of Reason essential to all Leligion. In this essay it is contended,— (1.) That reason binds or obliges, in the strictest sense of the word, all moral agents ; (2.) That, considering men in their intellectual and moral capacity, the obligations of religion are entirely founded on the obligations of reason ; and (3.) That on this ground, religion, whether natural or revealed, stands very firm and secure. Balguy collected these tracts and published them ina single volume in 1734, the Letter to a Deist and the Foundation of Moral Goodness having previously passed through three editions. In 1741 he published an Hssay on Redemption, containing somewhat peculiar views. Redemption as taught in Scripture means, according to him, " the deliverance or release of mankind from the power and punishment of sin, by the meritorious sufferings of Jesus Christ," but involves no translation of guilt, substitution of persons, or vicarious punishment, Freed from these ideas, which have arisen from interpreting literally expressions which are

properly figurative, the doctrine, he argues, satisfies deep and urgent human wants, and is in perfect consistence and agreement with reason and rectitude. His last publication was a volume of sermons, pervaded by good sense and good feeling, and clear, natural, and direct in style, but bearing few traces of the influence of the most distinctive and potent Christian motives. He died at Harrowgate, September 21, 1748. A second volume of sermons appeared shortly afterwards. The edition of his sermons most commonly met with is the 3d, in 2 vols., published in 1760. The notice of his life in the Biographia Britunnica was written by his son. See

also Hunt's Leligious Thought in England, vol. ii. 362-4, 454-6, iii, 87-9. Mr Hunt erroneously represents Shaftesbury and not Hutcheson as the philosopher assailed in the Moundation of Moral Goodness. (Rr. F.) BALI, or Lirrze Java, one of the Sunda Islands, in the Eastern Seas, scparated from Java by the straits of the same name, which are a nile and a half wide. It is 75 miles in length ; its greatest breadth is 50 miles. A chain ~ of mountains crosses the island in a direction E. and W., and terminates on the E. in the volcanic peak Gunung- agung, 12,379 fect above the sea-level. 'The climate and soil are the same as in Java; it has mountains of propor- tionate height, several lakes of great depth, and streams well fitted for the purposes of irrigation. ice is produced in great quantities, and is even exported to Madura, Celebes, Timor, and Java. The other productions are tobacev, maize, pulses, oil, and salt; also cotton of an excellent quality. Coffee is now grown with great success ; in the district of Teja Kulo alonc, 150,000 trees were planted in the first four months of 1873. 'The inhabitants (estimated at about 800,000), though originally sprung from the same stock as those of Java, exceed them in stature and muscular power, as well as in activity and enterprising habits. 'They have," says Sir Stamford Rafiles, 'a higher cast of spirit, independence, and man- liness than belongs to any of their neighbours," They are good agriculturists and skilful artisans, especially in textile fabrics and the manufacture of arms. The imports are iron and cotton cloths, and opium to a great extent; in the district of Tabanan alone, forty chests of this drug are annually consumed. Both imports and exports are on the increase ; but trade is chiefly in the hands of Euro- peans, Chinese, and Arabs, who have their firms or agents in Batavia,

Surabaya, Makassar, and Singapore. The trade returns in the port of Padang Cove: are estimated at £500,000 to £600,000 per annum ; those of Bulelceng and Jembrana were about £500,000 in 1873. The island is divided into the eight independent principalities of Bulelong, Karang Asam, Bangli, Tabanan, Mengui, Klong- kong, Gyanyar, and Badong, each under its own ruler. The deputy-commissioner of Banyuwangi in east Java is also charged with the superintendence of the island of Bali in behalf of the Dutch Government. Though native rule is described as very tyrannical and arbitrary, especially in the principalities of Badong and Tabanan, trade and industry could not flourish if insecurity of persons and property existed to any great extent. The natives have also a remedy against the aggression of their rulers in their own hands ; it is called Afetilas, consists in a general rising and renunciation of allegiance, and proves mostly successful. Justice is administered from a written civil and criminal code. Slavery is abolished, Hinduism, which was once the religion of Java, but has been extinct there for four centuries, is still in vogue in the islands of Bali and Lombok, where the cruel custom of widow burning is still practised, and the Hindu system of the four castes, with a fifth or Pariah caste (called Chandéla), adhered to. It appears partly blended with Buddhism, partly overgrown with a belief in Kalas, or evil spirits. To appease these, offerings are made to them either direct or through the mediation of the Devas (domestic or agrarian deities) ; and if these avail not, the Menyepi, or Great Sacrifice, is resorted to, Buddhism prevails only in threc districts. The Mahometan religion is said to be on the wane, in spite of the good influence it has exerted upon the people. Of the early history of their island the Balinese know nothing. The oldest tradition they possess refers to a time shortly after the overthrow of the Majapahit dynasty in Java, about the middle of the 15th century; but, according to Lassen, who identifies Bali with the island visited by III. — 36

Jamibulos, there must have been Indian settlers there before the middle of the 1st century, by whom the present name, probably cognate with the Sanskrit balin, strong, was in all likelihood imposed. It was not till 1633 that the Dutch attempted to enter into alliance with the native princes, and their earliest permanent settlement at Port Badong only dates from 1845.

Their influence was extended by the results of the war which they waged with the natives about 1847-9.

Crawfurd's Descriptive Dictionary of the Indian, Islands, 1856 ; P. J. Veth, Woordenboek van Nedcrlandsch Indie, 1869; Tijd- sehrift voor Nederlandsch Indie for 1874, vol. ii. p. 439, f.; Lassen's Indische Alterthumskunde, iii. iv., passim; Friedrich's '"'Verslag van Bali" in Trans. of Butavian Soc. of Arts and Sci., xxiii., and a paper in the Journal of the Ind. Arch., 1849 ; M. de Carnbée's " Essai sur Bali" in Le Moniteur des Indes Orient., 1846-

47; Dubois's Vies des Gouverncurs-généraux ; Backer's L' Archipel Indien, 1874; Jaarbock van het Mijnwezen in N. Ost.-Indie, 1874.

BALIOL, or Batuiot, Str JoHNn DE, an English baron, after whom Balliol College in Oxford has been named, was the son of Hugh Baliol, of Bernard's Castle, in the diocese of Durhain. His great wealth and power raised him to a prominent position in the kingdom, and he rendered good service to Henry III. in his contest with De Montfort and the revolted barons. In 1263 he endowed several scholar- ships at Oxford, and formed the intention of founding a college. This he did not accomplish, but after his death in 1269, his widow, Devorgille or Devorguill, carried out his design, and the foundation received the name of Balliol College. Sir John's son was the well-known John Baliol, the competitor with Bruce for the throne of Scotland.

BALKAN (the ancient Hemus), a mountain range that separates the waters of the Lower Danube from those that flow into the Archipelago; or, in the more extended application of the name, the whole mountain system from the Adriatic to the Euxine. The main chain has a mean elevation of 4000 or 5000 feet, and rises in various parts to a height of 7000 or 8000. Especially towards the east it breaks up into a number of parallel chains, and sends out various offshoots both south and north. Mount Scardus, the highest point of the Char-Dagh, attains to 9700 feet above the sea. The most of the rivers of the northern watershed find their way to the Black Sea, while those from the southern fall intu the Mediterranean. The range is crossed by numerous defilcs, most of which are left in a

nearly impassable condition, though they might in many cases be turned into serviceable routes. Communication is kept up between Vienna and Constantinople by the pass usually known as Trajan's Gate. Others of importance are the Nadir-Derbent, the Karnabad, and the Basardshik-Sophia. The mountains are for the most part of granitic for- mation, and are said to contain a variety of valuable mine- rals, but are still imperfectly known, in spite of the labours of Pouqueville, Boué, Viquesnel, Grisebach, Hahn, Barth, &c. Kanitz, between 1870 and 1874, crossed the eastern part no fewer than seventeen times by different passes.

See Journey across Balkan by the Passes of Selimno and Pravadi, London, 1831; Jochinus's " Journey," 1847, in Journ. Roy. Geog. Soc., 1854; Nouvelles Annales des Voyages, 2d series, vol. x.}; Petermann's Mittheil., 1873-74.

BALKH, the ancient Bactra or Zariaspa, was formerly a great city, but is now for the most part a mass of ruins, situated on the right bank of the Adirsiah or Balkh river, in a large and fertile plain 1800 feet above the sea. The modern name is, according to Vambéry, the Turkish balzk, or balikh, a city. The ruins, which occupy a space of about twenty miles in circuit, consist chiefly of fallen mosques and decayed buildings of sun-burnt brick. No monuments of pre-Mahometan date have been pointed out, if we except the bricks with cuneiform inscriptions which Ferrier asserts he observed ; but nothing like a proper investigation of the site has yet been effected. The antiquity and great- ness of the place are recognised by the native populations, who speak of it as the Mother of Cities. Its foundation is mythically ascribed to Kaiomurs, the Persian Romulus ; and it is at least certain that, at a very early date, it was the rival of Ecbatana, Nineveh, and Babylon. Fer a long time the city and country was the central seat of the Zoroastrian religion, the founder of which is said to have died within the walls. From the Memoirs of Hwen Thsang, a Chinese traveller, we learn that, at the time of his visit in the 7th century, there were in the city, or its vicinity, about a hundred Buddhist convents, with 3000 devotees, and that there was a large number of stupas, and other religious monuments. The most remarkable was the Nau Behar, Nava Bihara, or New Convent, which

pos- sessed a very costly statue of Buddha. A curious notice of this building is found in the Arabian geographer Yakat. Ibn-Haukal, an Arabian traveller of the 10th century, describes Balkh as built of clay, with ramparts and six gates, and extending half a parasang. He also mentions a castleanda mosque. El Edrisi, in the 12th century, speaks of its possessing a variety of educational establishments, and carrying on an active trade. ‘There were several im- portant commercial routes from the city, stretching as far east as India and China. In 1220 Genghis Khan sacked Balkh, butchered its inhabitants, and levelled all the build- ings capable of defence,—treatment to which it was again subjected in the 14th century by Timur. Notwithstand- ing this, however, Marco Polo can still, in the following century, describe it as “a noble city and a great.” Balkh formed the government of Aurungzebe in his youth. In 1736 it was conquered by Nadir Shah. Under the Durani monarchy it fell into the hands of the Afghans; it was conquered by Shah Murad of Kunduz in 1820, and for some time has been subject to the Khan of Bokhara.

See Houcn Thsang, tr. by Julien, vol. i. pp. 29-32; Burnes’s Travels in Bokhara, 1831-33 ; Ferrier’s Travels; Vambery’s Bokhara, 1873.

BALL, Joun, a Puritan divine, of whom Baxter speaks in very high terms, was born, in 1585, at Cassington, or Chessington, near Woodstock, and died in 1640. He entered Brazenose College, Oxford, in 1602, and remained there five years. He then migrated to St Mary’s Hall, from which he took his bachelor’s degree in 1608. Soon after graduating he went into Cheshire to act as tutor to

the children of Lady Cholmondeley. While there he was thrown into the company of some enthusiastic Puritans, whose views he quickly adopted. He resolved upon enter- ing the church, and, going up to London, obtained ordination from an Irish bishop. He was afterwards appointed to the small curacy of Whitmore, near Stoke, in Staffordshire, and here he passed the remainder of his life, eking out his miserable stipend by teaching a small school. The most popular of his numerous works was the Short Treatise, containing all the Principal Grounds of Christian Leligion, which has passed through a great many editions, and has been in common use as a

Puritan catechism. His Treatise of Faith, and friendly Trial of the Grounds tending to Separation, the latter of which defines his position with regard to the church, are also valuable works.

BALLADS. The word ballad is derived from the Old French baller, to dance, and originally meant a song sung to the rhythmic movement of a dancing chorus. Later, the word became the technical term for a particular form of old fashioned French poetry, remarkable for its involved and recurring rhymes. “ Laisse moi aux Jeux Floraux de Toulouse toutes ces vieux poésies Francoises comme ballades,” says Joachim du Bellay in 1550; and Philaminte, the lady pedant of Moliére’s Femmes Scavantes, observes—

‘* La ballade, & mon gout, est une chose fade, Ce n’en est plus la mode, elle sent son vieux temps.”

In England the term has usually been applied to any simple tale, told in simple verse, though attempts have been made to confine it to the subject of this paper, namely, Popular Songs. By popular songs we understand what the Germans call Volks-lieder, that is, songs composed by the people, for the people, handed down by oral tradition, and in style, taste, and even incident, common to the people in all European countries. The beauty of these purely popular ballads, their directness and freshness, has made them admired even by the artificial critics of the most artificial periods in literature. Thus Sir Philip Sydney confesses that the ballad of Chevy Chase, when chanted by “a blind crowder,” stirred his blood like the sound of trumpet. Addison devoted two articles in the Spectator to a critique of thesame poem. Montaigne praised the naivété of the village carols; and Malherbe preferred a rustic chansonette to all the poems of Ronsard. These, however, are rare instances of the taste for popular poetry, and though the Danish ballads were collected and printed in the middle of the 16th century, and some Scotch collections date from the beginning of the 18th, it was not till the publication of Allan Ramsay’s Zvergreen and Tea Table Miscellany, and of Bishop Percy’s Leliques, that a serious effort was made to recover Scotch and English folk-songs from the recitation of the old people who still knew them by heart. At the time when Percy was editing the Jeliques, Madame de Chénier, the mother of the celebrated French poet of that name,

composed an essay on the ballads of her native land, modern Greece; and later, Herder and Grimm and Goethe, in Germany, did for the songs of their country what Scott did for those of Liddesdale and the Forest. It was fortunate, perhaps, for poetry, though unlucky for the scientific study of the ballads, that they were mainly regarded from the literary point of view. The influence of their artless melody and straightforward diction may be felt in the lyrics of Goethe and of Coleridge, of Wordsworth, of Heine, and of André Chénier. Chénier, in the most affected age even of French poetry, translated some of the Romaic ballads ; one, as it chanced, being identical with that which Shakspcare borrowed from some English reciter, and put into the mouth of the mad Ophelia. The beauty

of the ballads and the interest they excited led to numerous.

forgeries. It is probable that Hogg was as great a culprit in Scotland as Prosper Mérimée with his Guzla, or collec-

tion of Servian imitations, in France. Editors could not resist the temptation to interpolate, to restore, and to improve the fragments that came in their way. The Marquis de la Villemarqué, who first drew atteution to the ballads of Brittany, is not wholly free from this fault. Thus a very general scepticism was awakened, and when questions came to be asked as to the date and authorship of the Scottish traditional ballads, it is scarcely to be wondered at that Dr Chambers attributed most of them to the accomplished Lady Wardlaw, who lived in the middle of the 18th century.

The vexed and dull controversy as to the origin of Scottish folk-songs was due to ignorance of the comparative method, and of the ballad literature of Europe in general. The result of the discussion was to leave a vague impression that our native ballads were perhaps as old as the time of Dunbar, and were the production of a class of professional minstrels. These minstrels are a stumbling-block in the way of the student of the growth of ballads. The domestic annals of Scotland show that her kings used to keep court- bards, and also that strollers, jonglewrs, as they were called, went about singing at the doors of farm-houses and in the streets of towns. Here were two sets of minstrels who had apparently left no poetry; and, on the

other side, there was a number of ballads that claimed no author. It was the easiest and most satisfactory inference that the courtly minstrels made the verses, which the wandering crowders imitated or corrupted. But this theory fails to account, among other things, for the universal sameness of tone, of incident, of legend, of primitive poctical formule, which the Scotch ballad possesses, in common with the ballads of Greece, of France, of Provence, of Portugal, of Denmark, and of Italy. The object, therefore, of this article is to prove that what has long been acknowledged of nursery tales, of what the Germans call J/archen, namely, that they are the immemorial inheritance at least of all European peoples, is true also of ballads. The main incidents and plots of the fairy tales of Celts, and Germans, and Slavonic and Indian peoples, their unknown antiquity and mysterious origin, are universally recognised, No one any longer attributes them to this or that author, or tu this or that date. The attempt to find date or author for a genuine popular song is as futile as a similar search in the case of a Mdrchen. It is to be asked, then, whether what is confessedly true of folk-tales,—of such stories as the Sleeping Beauty and Cinderella,—is true also of folk-songs. Are they, or have they been, as universally sung as the fairy tales have been narrated? Do they, too, bear traces of the survival of primitive creeds and primitive forms of consciousness and of imagination? Are they, like Afarchen, for the most part, little influenced by the higher religions, Christian or poly- theistic? Do they turn, as Jfdrchen do, on the same incidents, repeat the same stories, employ the same ma- chinery of talking birds and beasts? Lastly, are any specimens of ballad literature capable of being traced back to extreme antiquity? It appears that all these questions may be answered in the affirmative; that the great age and universal diffusion of the ballad may be proved; and that its birth, from the lips and heart of the people, may be contrasted with the origin of an artistic poetry in the demand of an aristocracy for a separate epic literature, destined to be its own possession, and to be the first development of a poetry of personality, —a record of indt- vidual passions and emotions. After bringing forward examples of the identity of features in European ballad poetry, we shall proceed to show that they all sprang from the same primitive custom of dance, accompanied by improvised song, which still exists in Greece and Russia, and even in valleys of the Pyrenees.

There can scarcely be a better guide in the examination

of the notes or marks of popular poctry than the instruc- tions which M. Ampére gave to the committee appointed in 1852-53 to search for the remains of ballads in France. M. Amptre bade the collectors look for the following char- acteristics :—‘‘ The use of assonance in place of rhyme, the brusque character of the recital, the textual repetition, as in Homer, of the speeches of the persons, the constant use of certain numbers,—as three and seven,—and the representation of the commonest objects of every-day life as being made of gold and silver.” M. Ampére might have added that French ballads would probably employ a “ bird- chorus,” the use of talking-birds as messengers; that they would repeat the plots current in other countries, and dis- play the same non-Christian idea of death and of the future world, the same ghostly superstitions and stories of metamorphosis, and the same belief in elves and fairies, as are found in the ballads of Greece, of Provence, of Brit- tany, Denmark, and Scotland. We shall now examine these supposed common notes of all genuine popular song, supplying a few out of the many instances of curious identity. As to brusqueness of recital, and the use of assonance instead of rhyme, as well as the aid to memory given by reproducing speeches verbally, these are almost unavoidable in all simple poetry preserved by oral tradition. In the matter of recurring numbers, we have the eternal—

“Trois belles filles

I’y en a’z une plus belle que le jour,” who appear in old French ballads, as well as the “ Three Sailors,” whose adventures are related in the Lithuanian and Provengal originals of Mr Thackeray’s Little Billee. Then there is “the league, the league, the league, but barely three,” of Scotch ballads; and the tpua zovAakid, three golden birds, which sing the prelude to Greek folk-songs, and soon. A more curious note of primitive poetry is the lavish and reckless use of gold and silver. M. Tozer, in his account of ballads in the Highlands of Turkey, remarks on this fact, and attributes it to Eastern influences. But the horses’ shoes of silver, the knives of fine gold, the talking “birds with gold on their wings,” as in Aristophanes, are common to all folk-song. Everything almost is gold in the Kalevala, an epic formed by putting into juxtaposition all the popular songs of Finland. Gold is used as

freely in the ballads, real or spurious, which M. Verkovitch has had collected in the wilds of Mount Rhodope. ‘The captain in the French song is as lavish in his treatment of his runaway bride,— *¢ Son amant l’habille,

Tout en or et argent ;” and the rustic in a song from Poitou talks of his faucille Wor, just as a variant of Hugh of Lincoln introduces gold chairs and tables. Again, when the lover, in a ballad common to France and to Scotland, cuts the winding sheet from about his living bride—“ il tira scs ciseaux d’or fin.” Jf the horses of the Klephts in Roiaic ballads are gold shod, the steed in Willie’s Lady is no less splendidly accoutred, —

“* Silver shod before,

And gowden shod behind.” Readers of Homer, and of the Chanson de Roland, must have observed the same primitive luxury of gold in these early epics.

Next as to talking-birds. These are not so common as in Mdarchen, but still are very general, and cause no surprise to their human listeners. The omniscient popinjay, who “ up and spoke” in the Border minstrelsy, is of the sane family of birds as those that, according to Talvj, pervade Servian song; as the tpid rovAaKid which introduce the story in the Romaic ballads ; as the wise birds whose speech is still understood by exceptionally gifted Zulus ; as the wicked dove that whispers temptation in the sweet

French folk-song; as the “bird that came out of a bush, on water for to dine,” in the Water o’ Wearies Well.

In the matter of identity of plot and incident in the ballads of various lands, it is to be regretted that no such comparative tables exist as Von Hahn tried, not very exhaustively, to make of the ‘ story-roots” of Jfdrchen. A common plot is the story of the faithful leman, whose lord brings home ‘‘a braw new bride,” and who recovers his affection at the eleventh hour. In Scotland this is the ballad of Lord Thomas, and Fair Annie; in Danish it is Skiaen Anna. It occurs twice in M. Fauriel’s collection of Romaic songs. Again, there is the familiar ballad about a girl who pretends to be dead, that she may be

borue on bier to meet her lover. This occurs not only in Scotland, but in the popular songs of Provence (collected by Damase Arbaud) and in those of Metz (Puymaigre), and in both countries an incongruous sequel tells how the lover tried to murder his bride, and how she was too cunning, and drowned him. Another familiar feature is the bush and briar, or the two rose trees, which meet and plait over the graves of unhappy lovers, so that all passers-by see them, and say in the Provengal,—

- Diou ague l’amo Des paures amourous.”

Another example of a very wide-spread theme brings us to the ideas of the state of the dead revealed in folk-songs. The Night Journey, in M. Fauriel’s Romaic collection, tells how a dead brother, wakened from his sleep of death by the longing of love, bore his living sister on his saddle- bow, in one night, from Baghdad to Constantinople. In Scotland this is the story of Proud Lady Margaret; in Germany it is the song which Burger converted into Lenore ; in Denmark it is Aagé und Elsé; in Brittany the dead foster-brother carries his sister to the apple close of the Celtic paradise (Barzaz Breiz). Only in Brittany do the sad-hearted people think of the land of death as an island of Avalon, with the eternal sunset lingering behind the flowering apple trees, and gleaming on the fountain of forgetfulness. In Scotland the channering worm doth chide even the souls that come from where, “ beside the gate of Paradise, the birk grows fair enough.” The Romaic idea of the place of the dead, the garden of Charon, whence “neither in spring or summer, nor when grapes are gleaned in autumn, can warrior or maiden escape,” is likewise pre- Christian. In Provengal, Danish, and Yorkshire folk-song, the cries of children ill-treated by a cruel step-mother awaken the departed mother,—

‘*¢°Twas cold at night and the bairnies grat, The mother below the mouls heard that.”

She reappears in her old home, and henceforth, “when dogs howl in the night, the step-mother trembles, and is kind to the children.” To this identity of superstition we may add the less tangible fact of identity of tone. The ballads of Klephtic exploits in Greece match the Border songs of Dick of the Law and Kinmont Willie. The same simple delight of living animates the short Greek Scholia and their counterparts in France. Everywhere in

these happier climes, as in Southern Italy, there are snatches of popular verse that make but one song of rose trees, and apple blossom, and the nightingale that sings for maidens loverless, —

‘¢ J) ne chante pas pour moi, Je’n ai un, Dieu merci,”

says the gay French refrain.

It would not be difficult to multiply instances of resem- blance between the different folk-songs of Europe; but enough has, perhaps, been said to support the position that they are popular and primitive in the same sense as Mirchen. They date from times, and are composed by

peoples who find, in a natural improvisation, a natural utterance of modulated and rhythinic speech, the appropriate relief of their emotions, in moments of high-wrought fecling or on solemn occasions. “ Poesie” (as Puttenham well says in his Art of Hnglish Poesie, 1589) “is more ancient than the artificiall of the Greeks and Latines, and used of the savage and uncivill, who were before all science and civilitie. This is proved by certificate of merchants and travellers, who by late navigations have surveyed the whole world, and discovered large countries, and wild people strange and savage, affirming that the American, the Perusine, and the very Canniball do sing and also say their highest and holiest matters in certain riming versicles.” In the same way Aristotle, discoursing of the origin of poetry, says (Poet., c. iv.), eyeryyoay rHv Tomow ék Tov dvTocxediacparwv. M.de la Villemarqué in Brittany, M. Pitré in Italy, Herr Ulrich in Greece, have described the process of improvisation, how it grows out of thc custom of dancing in large bands and accompanying the figure of the dance with song. “If the people,” says M. Pitré, “ find out who is the composer of a canzone, they will not sing it.” Now in those lands where a blithe peasant life still exists with its dances, like the kolos of Russia, we find ballads identical in many respects with those which have died out of oral tradition in these islands. It is natural to conclude that our ballads too were first improvised, and circulated in rustic dances. We learn from M. Bujeaud and M. de Puymaigre in France, that all ballads there have their air or tune, and that every dance has its own words, for if a new dance comes

in, perhaps a fashionable one from Paris, words are fitted to it. Is there any trace of such an operatic, lyrical, dancing peasantry in austere Scotland? We find it in Gawin Douglas's account of—-

'* Sic as we elepe wenehes and damosels, In gersy greens, wandering by spring wells, Of bloomed branehes, and flowers white and red, Plettand their lusty ehaplets for their head, Some sang ring-sangs, danees, ledes, and rounds."

Now, ring-sangs are ballads, dancing songs; and Young Tamlane, for instance, was doubtless once danced to, as we know it possessed an appropriate air. Again, Fabyan, the chronicler (quoted by Ritson) says that the song of triumph over Edward II., " was after many days sung in dances, to the carols of the maidens and minstrels of Scotland." We might quote the Complaynt of Scotland to the same effect. 'The shepherds, and their wyvis sang mony otlier melodi sangs, ... than efter this sueit celestial harmony, tha began to dance in ane ring." It is natural to conjecture that, if we find identical ballads in Scotland, and in Greece, and Italy, and traces of identical customs,—customs crushed by the Reformation, by Puri- tanism, by modern so-called civilisation,—the ballads sprang out of the institution of dances, as they still do in warmer and pleasanter climates. It may be supposed that legends on which the ballads are composed, being found as they are from the White Sea to Cape Matapan, are part of the stock of primitive folk-lore. 'Thus we have an immemorial antiquity for the legends. and for the lyrical choruses in which their musical rendering was improvised. We are still at a loss to discover the possibly mythological germs of the legends; but, at all events, genuine ballads may be claimed as distinctly popular, and, so to speak, impersonal in matter and in origin. It would be easy to show that survivals out of this stage of inartistic lyric poetry linger in the early epic poetry of Homer and of the French épopées, and that the Greek drama sprang from the sacred choruses of village vintagers. In the great early epics, as in popular ballads, there is the same directness and simplicity, the same use of recurring epithets, the '" green grass," the "salt sea," the "shadowy hills," the same

repetition of speeches, and something of the same barbaric profusion in the use of gold and silver. But these resem- blances must not lead us into the mistake of supposing Homer to be a collection of ballads, or that he can be properly translated into ballad metre. ‘The Zliad and the Odyssey are the highest form of an artistic epic, not com- posed by piecing together ballads, but devcloped by a long series of noble dodo, for the benefit of the great houses which entertain them, out of the method and materials of popular song. Ballads sprang from the very heart of the people, and flit from age to age, from lip to lip of shepherds, peasants, nurses, of all the class that continues nearest to the state of natural men. They make music with the plash of the fisherman’s oars and the hum of the spinning-wheel, and keep time with the step of the ploughman as he drives his team. The country scems to have aided man in their making; the bird’s note rings in them, the tree has lent her whispers, the stream its murmur, the village-bell its tinkling tune. The whole soul of the peasant class breathes in their burdens, as the great sea resounds in the shells cast up on the shores. Ballads are a voice from secret places, from silent peoples, and old times long dead; and as such they stir usin a strangely intimate fashion to which artistic verse can never attain,

The works of the following authors will be found useful to the student of ballads :—Talvj, Charakteristik der Volkslieder, dealing ehiefly with the northern raees of Europe, and with some African and Asiatic tribes; Kretsehmar’s Volkslieder; J. Grimm, in several treatises. For Brittany—-Marquis de la Villemarqué’s Barzaz Breiz; also M. Luzels’s Chansons Populaires. For France— Bugeaud, Chansons Populaires; De Puymaigre (for the Metz distriet), Damase Arbaud (for Provenee) ; Champfleury’s large eollection is rather miscellaneous. The quarterly journal, Row- mania, publishes many folk-songs. For Greeee—Fauriel, Passow, Le Grand. For Italy—Pitré and Nigra. For Seotland—Seott, Jamieson, Motherwell. (A. L.)

BALLANCHE, Prerre Simon, a distinguished French philosopher of the theocratic school, was born at Lyons in 1776. His health from infancy was extremely delicate, his nervous system was weak, and he was frequently sub- ject to hallucinations and mental disorders. This weakness was much aggravated by his experience of the horrors con- sequent on the insurrection at Lyons and the siege of that town, during which he and his mother were

compelled to take refuge in the country. His education seems never to have been very complete ; but he was early imbued with ideas on the construction of society, which naturally sprang from the events of the revolutionary period. His first literary effort was an epic poem, describing the occurrences at Lyons; this he never published. In 1801 he wrote an essay Du Sentiment considéré dans la littérature et dans les Arts, a work which shows very well the defects as well as the merits of his style and manner of thinking. It is essentially unsystematic ; and the few good ideas contained in it are expressed in language so figurative that it costs an effort to discover what is really being said. Ballanche, indeed, was essentially unsystematic and unscientific, and sccms to have had no conception of what is trnly required in a philosophy. His style is not external to the thinking, but is undissolubly connected with it; strange thoughts and bizarre expressions arise together.

His next great work, the Antigone, a prose poem, pub- lished in 1814, was the fruit of long and quiet meditation, and was reccived with great favour by the brilliant literary society surrounding Chateaubriand and Mme. Récamier, into which Ballanche had been introduced. From this year, 1814, dates his serious effort towards a speculative reconstruction of society, an exposition of the palingenesis of social order. He transferred his residence to Paris, where he continued to live in communication with the few thinkers who had like philosophical tendencics with himself, In 1817 appeared his Lssaz sur les Institutions

Sociales dans leur rapport avec les Idées nouvelles, which was intended to serve as a prelude to his great tripartite social epic. The work is more intelligible than any other of Ballanche’s; it advocates a moderate constitutional government, and was, on this account, misjudged by many, who fancied it recommended Bourbonism. A philosophical dialogne, Le Vieillard et le Jeune Homme, and a novel, L’ Homme sans Nom, were written in 1819 and 1820. He then devoted himself to his great work, the Palingénésie Sociale. This, which was to be a T’heodicwa, an exposition of the workings of God in history, was divided into three parts: the first reconstructed that period of the world which was before the rise of religion,

which is prehistoric, or mythical ; the second endeavoured, from a study of known history, to deduce a universal law or rule; the third sketched that state of things through and in which humanity at last attains its final end and crowning glory. The works representing these three parts were called L'Orphée, La Formule, and La Ville des Expiations; only the first was completed, but some fragments of the others are in existence. 'To the whole a general introduction was pre- fixed, which is the most valuable of all Ballanche's works. His latest writing, Vision d'Hébal (Hebal being the chief of a Scottish clan, and gifted with second sight), was evidently intended to form portion of the third part of the Palingénésie. In mystical language it gives vague and semi-prophetic utterances on the future course of world-history. It is by some considered his greatest production. Ballanche, who in 1841 had received the distinguished honour of a seat in the French Academy, died in 1847. He was much beloved by his friends, and seems to have been a most amiable, warm-hearted man, enthusiastic and poetical in temperament, whose intellect, however, was over- shadowed by his imagination. A collected edition of his works was set on foot in 1830, and was intended to occupy nine vols. Only four appeared, and were republished in a smaller form in 1833.

It is almost impossible to give a connected view of Ballanche's fundamental ideas. As has been said, he belonged to the theocratic school, who, in opposition to the rationalism of the preceding age, emphasised the principle of authority, placing revelation above individual reason, order above freedom and progress. But Ballanche nlade a sincere endeavour to unite in one system what was valuable in the opposed modes of thinking. He held with the theocratists that individualism was an impracticable view ; man, according to him, exists only in and through society. He agreed further with them that the origin of society was to be explained, not by human desire and efforts, but by a direct revelation from God. Lastly, with De Bonald, he reduced the problem of the origin of society to that of the origin of language, and held that language was a divine gift. But at this point he parts company with the theocratists, and in this very revelation of language finds a germ of progress. Originally, in the primitive state of man, speech and thought are identical ; but gra- dually the two separate; language is no longer only spoken, it is also written, and finally is printed. Thus the primitive unity is broken up; the original social order which co-existed

with, and was dependent on it, breaks up also. New institutions spring up, upon which thought acts, and in and through which it even draws nearer to a final unity, a rehabilitation, a palingenesis. The volition of primitive man was one with that of God, but it becomes broken up into separate volitions which oppose themselves to the divine will, and through the oppositions and trials of this world work onwards to a second and completer harmony. The history of humanity is therefore comprised in the fall from the perfect state, and in the return, after repeated trials, to a similar condition. In the dim,

shadowy records of mythical times may be traced the obscure outlines of priniitive society and of its fall; and this is at- tempted in the Orphée. Actual history exhibits the conflict of two great principles, which may be said to be realised in the patricians and plebeians of Rome. Such a distinction of caste is regarded by Ballanche as the original state of his- torical society; and history, as a whole, he considers to have followed the same course as that taken by the Roman plebs in its gradual and successful attempts to attain equality with the patriciate. On the future events through which the human race shall achieve its destiny Ballanche gives few intelligible hints. The sudden flash which disclosed to the eyes of Hebal the whole epic of humanity cannot be reproduced in language trammelled by time and space. Scattered throughout the works of Ballanche are many valuable ideas on the connection of events which makes possible a philosophy of history ; but his own theory, so far as it can be understood and judged, does not seem likely to find more favour than it has already met with.

See Ampére, Ballanche, Paris, 1848; Ste. Beuve, Portraits Con- temporaines, vol. ii.; Damiron, Philosophie de X1X™me Siecle. An admirable analysis of the works composing the Palingénésie is given by Barchou, Revue de deux Mondes, 1831, t. 2. pp. 410-456.

BALLARAT, or BALLAARAT, a large and flourishing city of Australia, in the province of Victoria. Itis situated about 58 miles N.W. of Geelong, with which it is connected by railway, and about 66 miles W.N.W. of Melbourne, at an elevation of 1437 feet above the level of the sea, on a sinall river known as the Yarowee Creek. It consists of three portions,—Ballarat West,

Ballarat East, and Sebas- topol,—each of which has its own municipality and town- hall. Its existence and prosperity are solely due to the gold-fields which were discovered herein 1851. In 1855 it was proclaimed a municipality, and in 1870 Ballarat West was raised to the rank of a city. In 1871 it contained 56 churches, 477 hotels, 10,000 dwellings, 11 banks, 8 iron- foundries, 13 breweries and distilleries, 3 flour-mills, a free public library, a mechanics' institute, a hospital, a '"bene- volent institution," a theatre, and a public garden; while about sixty miles of water-mains and fifty of gas-mains had been laid down. Its population—of very various origin, and including a large number of very degraded Chinese, who are huddled together in a separate quarter—then amounted to 48,156.

BALLAR{ [Betiary], adistrict in the Madras Presidency, lies between 13° 40' and 15° 58' N. lat., 75° 44' and 78° 19' E. long. It is bounded on the N. by the Nizdm's territory, from which it is separated by the Tungbhadra river ; on the E. by the districts of Kadapa and Kamrul ; on the S. by the Mysore country ; and on the W. by Mysore, and the Bombay district of Dharwar. Its extreme length from north to south is 170 miles, and its breadth from east to west about 120 miles. The area of the dis-

| trict, including 145 square miles of the Sandur State, is

estimated at about 11,496 square miles ; according to other returns, the area is 10,857 square miles (excluding Sandur), of which 1004 consists of barren soil, sites of villages, beds of water-courses, &c., and 9852 of lands either actually cultivated or capable of cultivation. The census of 1871 returned the population at 1,652,044, of whom 94 per cent. were Hindus. It is estimated that 941,712, or 71°8 per cent. of the population, live by agriculture. The general aspect of the district is that of an exten- sive plateau between the Eastern and Western Ghats, of an average height of from 800 to 1000 feet above sea- level. The most elevated tracts are on the W., where the surface rises towards the culminating range of hills, and on the §., where it rises to the elevated table-land of Mysore. Towards the centre the surface of the plain presents a monotonous aspect, being almost treeless, and unbroken

save by a few rocky elevations that stand forth abruptly from the sheet of black soil below. The hill ranges in Ballari are those of Sandir and Kampli to the W., the Lanka Malla to the E., and the Copper mountain to the S.W. The last has an elevation of 3148 feet. The district is watered by five hill streams, viz., the Tungbhadr4, formed by the junction of two small rivers, Tung and Bhadrd, the Haggari, Hindri, Ponndr, and Chitravati. The Ponnar is considered a sacred river by the natives. None of the rivers are navigable, and all are fordable during the dry season.

The agricultural produets of the district are cotton, indigo, wheat, rice, sugar-cane, flax, betel, plantain, turmerie, chillies, onions, hemp, coriander, tobacco, areea-nut, eocoa-nut, oil-seeds, &e. The following is a rough cstimate of acreage under different erops :— Food grains, 2,687,000 aeres; oil-seeds, 108,000 aeres; green and garden erops, 36,000 acres; orehards, 18,000 aeres ; cotton, indigo, and sugar-cane, 37,000 aeres ; fallow, 541,000 aeres ; total, 8,922,000 acres. The manufactures of the district consist of eotton goods, tape, carpets, rope, blankets, felts, dyes, oil, sugar and molasses, paper, leather, glass bangles or bracelets, and iron and earthen pots. Cotton, blankets, raw hides, iron, &c., form the articles of export. The ehief mineral products are iron, eopper, lead, antimony, man- ganese, alum,and gun-flints. Among precious stones diamonds are found, the chief diamond mines being at Munimadagu and Wajra- karur. The diamonds are collected in the sandstone breceia and eonglomerate. The mines no longer yield sutlicient profit to be regularly worked, though every now and then diamonds of small value are met with. The revenue of the Ballari district from all sources amounted in 1845 to £257,199; in 1855 to £248,284; and in 1868 to £322,548. The land tax forms the principal souree of revenue. In 1868 it yielded £242,684. More than one-fourth of the lands are held as Zndm, i.e., under grants formerly made for services or for religious purposes. These were very lightly taxed by the native Governments, but the present state of their assessment is not less than that of ordinary lands. The police foree numbered 1122 in 1871, maintained at a eost of £16,012. In 1870-71 the district contained 153 schools, attended by 4274 pupils. It has only seven towns with a population of more than 7000 souls—(1), Ballari, population, including troops in the eantonment, 51,145; (2), Hospetta, 9845 ; (8), Tadipatri, 8182 ; (4), Harpanhalli, 7895; (5), Raidrug, 7734; (6), Emmiganur, 7326; and (7), Yadiki, 7202. Only four municipal towns exist

in the distriet :—1. Balldri—popula- tion, 51,145; municipal income in 1871, £7631 ; expenditure, £7495; rate of taxation, 2s. 33d. per head. 2. Gutti—population, 6033; municipal income, £992; expenditure, £930; rate of taxation, 3s. 3jd. per head. 8. Anantpur—population, 4971; municipal ineome, £794; expenditure, £784; rate of taxation, 3s. 24d. per head. 4. Adoni—munieipal income, £2147 ; expenditure, £1905. Fifty-nine roads, of a total length of 1465 miles, conneet the different towns and villages in the Ballari district; and the Madras Railway, with a branch to Ballarl, passes through it. The climate of Ballari is characterised by extreme dryness, in consequenee of the air pass- ing over a great extent of heated plains, and it has a smaller rain- fall than any other district in South India. The average daily range of the thermometer is from 67° to 83°; average rain-fall for the five years ending 1869, 17 inches. The prevailing diseases are cholera, fever, small-pox, ophthalmia, dysentery, and skin diseases among the lower elasses. Ballari is subject to disastrous storms and hurricanes, and to famines arising from a series of bad seasons. The storms of 1804 and 1851, and the famines of 1751, 1792, 1798, 1808, 1888, 1854, and 1866 still live in the popular memory.

Little is known of the early history of the district. It appears to have been a portion of the ancient kingdom of Vijayanagaram, and on the overthrow of that state in 1564 A.D. by the Mahometans, the tract now forming the dis- trict of Ballarf was split up into a number of military holdings, held by chiefs called Poligirs. In 1635 the Carnatic was annexed to the Bijapur dominions, from which again it was wrested in 1680 by Sivaji, the founder of the Marhatté power. It was then included in the do- minions of Niz4m-ul-mulk, the nominal viceroy of the Great Mughul in the Dakhin, from whom again it was subse- quently conquered by Haidar Ali of Mysor. At the close of the war with Tipu Sultan in 1792, the territories which now form the Balldri district fell to the share of the Nizam of Haidar4bad, by whom it was ceded to the British in 1800, in return for a force of English troops to be stationed at his capital. In 1818 the district of Ballari was constituted as it at present remains. Amidst all these

political convulsions the little state of Sandur, occupy- ing a central position in the Ballari district, and surrounded by a cordon of hills, preserved its integrity. Sandur can only be entered by one of three principal natural passes, viz., the Bhimagundi pass on the N.E., the Ramanagundi pass on the N., and the Oblagund{ pass on the W. Its chief is the representative of one of the most ancient Marhatt& families, and derives a revenue of £4500 from his state. He now holds Sandur as a Jdgir or a military tenure from our Government, but pays no tribute.

BatvAni, the principal town of the above district, is the chief seat of the judicial and revenue establishments, and the headquarters of the military force in the ceded districts consisting of Ballari and Kadapa. The fort rises from a huge mass of granitic rocks, which jut up abruptly to a height of 450 feet above the plain, with a circumference of nearly 2 miles. Its length from north-east to south-west is about 1150 feet. To the E. and §. of the Ballarf rock lies a heap of boulders irregularly piled one on the other, but to the W. is an unbroken surface of sheet-rock, while the N. is walled by bare rugged ridges. Ballari rock is defended by two distinct lines of works, the upper and the lower fort. The upper fort is a quadrangular building on the summit of the rock, with only one way up to it, and deemed impregnable by the Mysore princes. But as it has no accommodation for a garrison, it is now unoccupied by our troops, with the exception of a small guard in charge of prisoners. The ex-Nawdb of Karnul was confined in it for forty years for the murder of his wife. It contains several tanks or cisterns excavated in the rock. Outside the turreted rampart are a ditch and covered way. The lower fort lies at the eastern base of the rock, and measures about half a mile in diameter. It contains the barracks for our troops, the arsenal and commissariat stores, the Protestant church, orphanage, Masonic lodge, post-office, and numer- ous private dwellings. The fort of Ballarf was originally built by one Timmapa, in the 16th century. It was first dependent on the kingdom of Vijayanagaram, afterwards on Bijapur, and subsequently subject to the Nizim and Haidar Ali. The latter improved the fortifications with the assistance of French artisans, whom he afterwards hanged for not building the fort on a higher rock adjacent to it. The cantonment bazar of Ballarf enjoys the reputa- tion of being the best military baz4r in Southern India. To the W. of the rock are the regimental lines for two Native infantry regiments, one European regiment, and one regiment of cavalry. On the KE.

are the jail, the public courts, and the terminus of the branch line of the Madras Railway. Balldri town, including the cantonment, con- tained in 1866 a population of 37,015 souls, of which 13,341 were Hindus, 4178 Mahometans, and 1042 Chris- tians. Population ascertained by the census of 1871, 51,145. Elevation above the sea, 1600 feet. Distance from Bombay, S.E., 380 miles; from Madras, N.W., 270 miles. Lat. 15° 18’ N.; long. 76° 59’ E.

BALLATER, a village of Aberdeenshire, Scotland, on the River Dee, 42 miles W. from Aberdeen. Inits vicinity are the medicinal wells of Pannanich, Balmoral Castle (a summer residence of Queen Victoria), and Ballatrich Farm, where Byron spent part of his boyhood. Ballatrich is a short distance from ‘“ Lachin-y-Gair” (Lochnagar), one of the loftiest of the Grampian range, and the subject of one of Byron’s most beautiful poems.

BALLENSTEDT, a city in the duchy of Anhalt-Bern- burg. It is situated on the Getel in the Harz Forest, in a most picturesque district, and consists of an old and a new town. A fine road, bordered with trees, leads to the castle of the dukes of Anhalt-Bernburg. The city contains about 4395 inhabitants, who are mostly engaged in linen manufactures, gardening, &c. Ballenstedt is the birthplace of Joh. Arndt.

BALLET is a word, the signification of which depends upon the century in which we findit employed. Originally derived from the Greek BadAi€ev, to dance, it has passed through the medieval Latin ballare (with ballator as synony- mous with saltator) to the Italian badlare and ballata, to the French ballet, to the old English word badlette, and to ballad. In old French, according to Roussean, ballet signifies ‘to dance, to sing, to rejoice ;”? and thus it incorporates three distinct modern words, “ ballet, ball, and ballad.” Through the gradual changes in the amusements of different ages, the meaning of the first two words has at length become limited to dancing, and the third is now confined to sing- ing. But, although ballads are no longer the vocal accom- paniments to dances round the maypole, our old ballads are still sung to dance tunes. The present acceptation of the word 6allet is— a theatrical representation in which a story is told only by gesture, accompanied by music which should be characterised by stronger emphasis

than would be employed with the voice. The dancing should be con- nected with the story, but is more commonly incidental. The French word was found to be so comprehensive as to require further definition, and thus the above-described would be distinguished as the ballet @’action or pantomime ballet, while a single scene, such as that of a village festival with its dances, would now be termed a divertissement.

The ballet d’action, to which the changed meaning of the word is to be ascribed, and therewith the introduction of modern ballet, has been generally attributed to the 16th century. Novelty of entertainment wasthen sought for in the splendid courts of Italy, in order to celebrate events which were thought great in their time, such as the marriages of princes, or the triumphs of their arms. Inven- tion was on the rack for novelty, and the skill of the machinist was taxed to the utmost. It has been supposed that the art of the old Roman pantomimi was then revived, vo add to the attractions of court-dances. Under the Roman empire the pantomimi had represented either a mythological‘story, or perhaps a scene from a Greek tragedy, by mute gestures, while a chorus, placed in the background, sang cantica to narrate the fable, or to describe the action of the scene. The question is whether mute pantomimic action, which is the essence of modern ballet, was carried through those court entertainments, in which kings, queens, princes, and princesses took parts with the courtiers; or whether it is of later growth, and derived from professional dancers upon the stage. The former is the general opinion, but an analysis of the only ballet which is known to have been printed in a complete form during the 16th century, would lead to the inference that the court enter- tainments of Italy and France were masques, or masks, which included declamation and song, like those of Ben Jonson with Inigo Jones for the court of James I.

The introduction of the Italian style of ballet into France was on the occasion of the marriage of the Duc de Joyeuse with Mdllc. de Vaudemont, sister to the queen. This was in 1581; and the ballet was printed in 1582, in a small folio of eighty-two leaves, with music, dialogue, engravings of the scene and of the fancy dresses, and full details of the plot. It is entitled Balet Comique de la Royne, because the queen took a part in it, as one of the naiades, with her ladies; but they were only posed upon machinery to be looked at, and neither spoke nor sang. One lady of the court sang a song,

two others a duet, and, again, others a chorus. Jupiter and Mercury each sang a song, but Circe and the rest spoke poetry. The king’s musicians, as tritons, were the mainstays of the music; the ladies and gentlemen of the court appeared in splendid fancy dresses, and danced the entrées, The inventor of the ballet was Baltazarini Belgioioso, who had assumed the name of Baltasar de Beaujoyeux upon his appointment as first musician to

Catherine de Medicis, queen dowager of France. The disuse of dialogue and of vocal music in ballet seems to have been arrived at only by degrees. One of the most complete books upon the subject is by the Jesuit Le Pére Menestrier (Claude Frangois) Des Ballets Anciens et Modernes, 12mo, 1681. He was the inventor of a ballet for Louis XIV. in 1658; and in his book he analyses about fifty of the early Italian and French ballets. His definition is as follows :— "‘ Ballets are dumb comedies, which should be divided into acts and scenes, like other theatrical pieces. Recitations divide them into acts, and the eutrées of dancers are equal in number to the scenes." So recitation had not then been dispensed with. . At length the opinion gained ground that, in stage representations, the actions, feelings, and passions could be more faithfully, gracefully, and intelligibly ex pressed to the cye by pantomimic action, than it would be possible to do to the ear. The art of dramatic expression then became a greater object of study; and, perhaps, from about the middle of the last century, or in the time of Noverre, the spectators have been prepared only by a short printed summary of the story which was to be repre- seuted. (W. CH.)

BALLINA, aseaport and market-town of Ireland, county of Mayo, 18 miles N.N.E. of Castlebar, situated on the River Moy, which is here crossed by two bridges. It has a parish and a Roman Catholic church (the latter being in the suburb of Ardnaree on the opposite side of the river), Baptist and Methodist chapels, a court-house, three branch banks, a workhouse, hospital, dispensary, barracks, and several schools. A convent was erected in 1867. The salmon fishery and fish-curing are important branches of its trade ; and it has also breweries and flour-mills, and manu- factures snuff and coarse linen. The amount of harbour receipts in 1873 was £1266. In 1798 Ballina was for a short time in the possession of the French, under General Humbert. Inthe neighbourhood there is an interesting dolmen, proved by the early annals of Ireland to belong to the 5th century a.p. (vide Fergusson’s Rude Stone Monuments). To the east of the village are the remains of an abbey, with a Gothic door-case in fine preservation (Archdall), Population in 1871, 5551.

BALLINASLOE, a town of Ireland, province of Con- naught, 91 miles W.S.W. of Dublin, The River Suck, an affluent of the Shannon, divides it into two parts; the western being in the county of Galway, the eastern in the county of Roscommon. They are connected by two bridges and a causcway across an island. The town is clean and well built, and contains a handsome church, with a singular octagonal spire springing from scrolls. There are Roman Catholic and Methodist chapels, several public schools, a district lunatic asylum, union workhouse, market-house, a savings bank (established in 1822), several flour-mills, and breweries. In the neighbourhood is Garbally Castle, the seat of the earl of Clancarty. A great annual cattle fair is held here from the 5th to the 9th of October. Its importance may be judged from the fact, that in 1874 there were exposed for sale 18,018 horned cattle and 65,130 sheep. The Western Star is published in the town. Population in 1871, 4619.

BALLOON. See Azronavtics, vol. i. pp. 187-207.

BALLOT, or secret voting, has been employed in poli- tical, legislative, and judicial assemblies, and also in the proceedings of private clubs and corporations. At Athens, the dicasts, in giving their verdict, generally used balls of stone (psephi) or of metal (sponduli). Those pierced in the centre, or black in colour, signified condemnation ; those unpierced, or white, signified acquittal. “The boxes were variously arranged ; but generally a brass box received both classes of votes, and a wooden box received the unused balls. In the assembly, cases of privilegia, such as ostracism,

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the naturalisation of foreigners, or the release of state- debtors, were decided by secret voting. The petalism, or voting by words on olive-leaves, practised at Syracuse, may also be mentioned. At Rome the ballot was introduced to the comitia by the Leges Tabellariae, of which the Lex Gabiana (139 8.c.) relates to the election of magistrates, the Lex Cussia (137 B.C.) to judicia populi, and the Lex Papiria (131 8.c.) to the enactment

and repeal of laws. The wooden tabellae, placed in the cista, or wicker box, were marked U. R. (wde rogas) and A. (antiquo) in the case of a proposed law; L. (d¢bero) and D. (damno) in the case of a public trial ; in the case of an election, puncta were made opposite the names or initials of the candidates. Tabellae were also used by the Roman judices, who expressed their verdict or judgment by the letters A. (absolvo), CU. (condemno), and N, L. (non liquet).!

In Great Britain the ballot was suggested for use in Par- liament by a political tract of the time of Charles II. It was actually used by the Scots Parliament of 1662 in proceed- ingon the "' Billeting Act," a measure proposed by Middleton to secure the ostracism of Lauderdale and other political opponents who were by secret vote declared incapable of public office. The plan followed was this: each member of Parliament wrote, in a disguised hand, on a piece of paper, the names of twelve suspected persons ; the billets were put ina bag held by the registrar; the bag was then sealed, and was afterwards opened and its contents ascertained in the Exchequer Chamber, where the billets were imme- diately burned, and the names of the ostracised concealed on oath. The Billeting Act was repudiated by the king, and the ballot was not again heard of till 1705, when Fletcher of Saltoun, in his measure for a provisional government of Scotland by annual Parliaments in the event of Queen Anne's death, proposed secret voting to protect members from court influence. The gradual emancipation of the British Parliament from the power of the Crown, and the adoption of a strictly representative system of election, have not only destroyed whatever reason may 'once have existed for the ballot in deliberative voting, but have rendered it essential that such voting should be open. It was in the agitations for parliamentary reform at the beginning of the 19th century that the demand for the ballot in parliamentary elections was first seriously made. The Benthamites advocated the system in 1817.2 At the Peterloo Massacre (1819) several banners were inscribed with the ballot. O'Connell introduced a bill on the subject in 1830; and the original draft of Lord John Russell's Reform Bill, probably on the suggestion of Lords Durham and Duncannon, provided for its introduc- tion, Later on Mr Grote became its chief supporter in the House of Commons ; and from 1833 to 1839, in spite of the ridicule cast by Sydney Smith on the " mouse-trap," aud on Mr Grote's '"dagger-box, in which you stab the card of your favourite 'candidate with a

dagger,”3 the minority for the ballct increased from 106 to 217. In 1838 the ballot was the fourth point of the People’s Charter. In the same year the abolition of the land qualification introduced rich commercial candidates to the constituencies. Lord Melbourne’s cabinet declared the question open. The cause, upheld by Macaulay, Ward, Hume (in his resolutions, 1848), and Berkeley, was strengthened by the Report of Lord Hartington’s Select Committee (15th March 1870),to the effect that corruption, treating, and intimidation by priests and landlords took place to a large

1 In Saxony juries still vote by ballot.

? See the powerful article by James Mill, Westminster Rev., vol. xiii,

8 For a description of Mr Grote’s card-frame, in which the card was punctured through a hole, and was thus never in the voter’s hands, see Spectator, 25th February 1837.

“ Parliamentary Papers, 1868-9, R. 852, 352-I.; and 1870, R. 115.

extent at both parliamentary and municipal elections in Iingland and Ireland ; and that the ballot, if adopted, would probably not only promote tranquillity at elections, but protect voters from undue influence, and introduce greater freedom and purity in voting, provided secrecy was made inviolable except in cascs where a voter was found guilty of bribery, or where an invalid vote had been given. At Manchester and Stafford in 1869, tcst ballots had taken place on the Australian principle as practised in Victoria, — the voting card containing the names of all the candidates, printed indifferent colours (for the benefit of illiterate voters), and the voter being directed to score out the names of those he did not support, and then to place the card (covered by an official envelope) in the box. It was found at Manchester that the voting was considerably more rapid, and therefore less expensive, than under the old system; that only 80 cards out of 11,475 were rejected as informal ; and that, the repre- sentatives of candidates being present to check false state- ments of identity, and the public outside being debarred from receiving information what voters had voted, the ballot rather decreased the risk of personation, At Manchester the cards were not

numbered consecutively, as isdone in Victoria, so that (assuming the officials to be free from corruption) no scrutiny could have detected by whom particular votes were given, At Stafford the returning officer stamped each card before giving it to the voter, the die of the stamp having been finished only ou the morning of the election. By this means the possibility was excluded of what was known in the colonies as “ the Tasmanian Dodge,” by which a corrupt voter gave to the returning officer, or placed in the box, a blank non-official ticket, and carried out from the booth his official card, which a corrupt agent then marked for his candidate and gave, so marked, to corrupt voter No. 2 (before he entered the booth), on condition that he also would bring out his official card, and so on ad libitum ; the agent thus obtaining a security for his bribe, unless the corrupt voter chose to disfranchise himself by making further marks on the card.

At the close of 1870 the ballot was employed in the election of members for the London School Board, under the Education Act of that year.

In 1872 Mr Foster’s Ballot Act (35 and 36 Vict. c. 33) introduced the ballot in all parliamentary and municipal elections, except parliamentary elections for universities ; and the code of procedure prescribed by the Act was adopted by the Scotch Education Board in the first School Board election (1873), under “The Education (Scotland) Act, 1872.” It is impossible here to analyse the Ballot Act, which not only abolishes public nominations of candidates, but deals with the offence of personation and the expenses of elections. As regards the ballot, a white paper is used on which the names of the candidates are printed in alphabetical order, the voter filling up with a X the blank on the right hand opposite the name he votes for. The paper, before being given out, is marked by the presiding officer on both sides with an official stamp, which is kept secret, and cannot be used for a secoud election within seven years, The paper is marked on the back with the same number as the counterfoil of the paper which remains with the officer. This counterfoil is also marked with the voter’s number on the register, so that the vote may be identified on a scrutiny ; and a mark on the register shows that the voter has received a ballot paper. The voter folds up the paper so as to conceal his mark, but to show the stamp to the officer, and deposits it in the box, which is locked and sealed, and so constructed that papers cannot. be withdrawn without unlocking it. Papers inadvertently spoiled by the

voters may be exchanged, the officer preserving separately the spoiled papers. If a voter is incapacitated from blindness, or other physical cause, or

makes before the officer a declaration of inability to read, or when the poll is on a Saturday declares himself a Jew, the officer causes the paper to be marked as the voter directs, and keeps a record of the transaction. A voter who claims to vote after another has voted in respect of the same qualification, obtains a (green) paper which is not placed in the box, but preserved apart as a “ tendered ” paper. He must, however, declare his identity, and that he has not already voted. The presiding officer, at the close of the poll, has to account to the returning officer for the papers entrusted to him, the number being made up by—(1) papers in the box, (2) spoiled papers, (3) unused papers, and (4) tendered papers. During the voting (for which schoolrooms and other public rooms are available, and for which a separate compartment must be provided for every 150 electors entitled to vote at a station) agents of candidates are allowed to be present in the polling-station, but they, as well as the officials, are sworn to secrecy as regards who have voted, and for whom; and they are prohibited from interfering with the voter, inducing him to show his vote, or attempting to ascertain the number on the back of the paper. These agents are also present with the returning officer when he counts the papers and the votes, rejecting those papers—(1), which want the official mark on the back ; (2), on which votes are given for more candidates than the voter is entitled to vote for; (3), on which anything except the number on the back is marked or written by which the voter can be identified; (4), which are unmarked, or so marked that it is uncertain for whom the vote is given. The counted and rejected papers, and also the “ tendered” papers, counterfoils, and marked register (which have not been opened), are, in parliamentary elections, transmitted by the returning officer to the clerk of the Crown in Chancery in England, or the sheriff-clerk in Scotland, who destroys them at the end of one year, unless otherwise directed by an order of the House of Commons, or of some court having jurisdiction in election petitions. Such petitions either simply dispute the accuracy of the return on the ground of miscounting, or

wrongous rejection or wrongous admission of papers, in which case the court examines the counted and rejected papers; or make allegations of corruption, &c., on which it may be necessary to refer to the marked counterfoils and ascertain how bribed voters have voted. Since the elections of 1874 much discontent has been expressed, because judges have rejected papers with trifling (perhaps accidental) marks other than the X upon them, and because elections have been lost through the failure of the officer to stamp the papers, For this purpose the use has been suggested of a perforating instead of an embossing stamp, while a dark ground paper with white voting-spaces would make misplaced votes im- possible. The Ballot Act has introduced several new offences, such as forging or fraudulently defacing or destroying a paper or the official mark ; supplying a paper without due authority; fraudulently putting into the box a non-official paper; fraudulently taking a paper out of the station without due authority; destroying, taking, opening, or otherwise interfering with a box or packet of papers then in use for election purposes. ‘These offences, and attempts to commit them, are punishable in the case of officers and clerks with imprisonment for two years, with or without hard labour. In other cases the term of imprisonment is six months.

The ballot being thus wn fait accompli in the United Kingdom, it is now scarcely necessary to indicate the arguments by which it was supported and opposed. It has been found possible to render voting perfectly secret and to provide for a scrutiny. It would be foolish to expect that secret voting will be a perfect security for independent voting. Bribery, treating, and intimidation continue to

be practised, but with diminished effect. still be made conditional on the briber’s success, but the Act is felt to be an expression of national opinion against all interference with individual judgment. that the franchise is a public trust, to the exercise of which a public responsibility should attach, would be conclusive if the “selfish partialities” of the voter were the chief evil. The ballot was declared to lead to universal hypocrisy and deception; and Sydney Smith spoke of “voters, in dominos, going to the poll in sedan-chairs with closely-drawn

Bribery may

The argument

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curtains.” ‘The observed effect of a secret ballot is, however,

gradually to exterminate undue influence and canvassing ; and when the necessity for sccrecy is removed, votes are

not kept secret. ‘The alarm of “the Confessional” seems

to be unfounded, as a Catholic penitent is not bound to

confess his vote, and if he did so, it would be a crime in the confessor to divulge it.

The ballot is used very largely in the British Colonies, and on the Continent. In South Australia, under the Australia, Constitution Act of 1856 and the Electoral Act of 1858, both the Legislative Council and the House of Assembly are elected by manhood suffrage under the ballot, the returning officer putting his initials on the voting card, which the voter is directed, under pain of nullity, to fold go that the officer may not see the vote which is indicated by a cross. The cards are destroyed when the poll is announced; and thus personation, though proved against certain voters for the purpose of punishing them, would not void an electiqn, for there can be no scrutiny before the Court of Disputed Returns. Canvassing has almost disappeared. In Victoria, under the Electoral Act of 1865 (29 Vict. c. 279), both the Legislative Council and the Legislative Assembly are elected practically by manhood suffrage under the ballot, which was introduced in 1856. The officer adds to his initials a number corresponding to the voter’s number on the register, and the cards are pre- served till after the time for petitioning the Committee of Elections and Qualifications has expired, so that a scrutiny may take place of challenged votes. The important Road Boards under the Local Government Consolidation Act of 1869 are also elected by ballot. In Tasmania the chief peculiarity is that (as in South Australia) the card is not put directly by the voter into the box, but handed to the officer

who puts it there (this being thought a security against double voting or voting with a non-official card, and also against the voter carrying away his card) ; here also the cards are destroyed immediately, while in New South Wales, where, as in Victoria, the voting is by scoring out and not by a cross, the cards are kept for five years. The vigorous municipal boards of these colonies are also elected by ballot, which has diminished expense and undue influence very greatly, but has not produced complete secrecy of voting.

In France, where from 1840 to 1845 the ballot, or France. scrutin, had been used for deliberative voting in the Chamber of Deputies, its use in elections to the Corps Législatif was carefully regulated at the beginning of the Second Empire by the Organic Decree of 2d February 1852. Under this law the voting was superintended by a bureau consisting of the deputy returning officer (called president of the section), four unpaid assessors selected from the constituency, and a secretary. Hach voter pre- sents a polling card, with his designation, date of birth, and signature (to secure identity), which he has previously got at the Mairie. This the president mutilates, and the vote is then recorded by a “ bulletin,” which is not official, but is generally printed with a candidate’s name, and given to the voter by an agent outside, the only conditions being that the bulletin shall be “ sur papier blane, sans

| signes extérieurs, et préparé en dehors de Vassemblée.” The

Italy.

Gresce,

United States.

BALLOT

total number of votes given (there being only one member in each electoral district) is checked by reference to ‘la feuille d’appel et inscription des votants,” the law still supposing that each voter is publicly called on to vote. If the voter, when challenged, cannot sign his polling card, he may call a witness to sign for him. The following classes of bulletins are rejected: —“illisibles, blancs, ne contenant pas une désignation suffisante ; sur

lesquels les votants se sont fait connaitre; contenant le nom d’une personne n’ayant pas prété le serment prescrit” (7.e., of a person not nominated). . Only the votes pronounced bad by the bureau in presence of representative scrutineers are preserved, in case these should be called for during the “ Session pour vérification des Pouvoirs.” Practically the French ballot did not afford secrecy, for you might observe what bulletin the voter took from the agent, and follow him up the queue into the polling-place; but the determined voter might conceal his vote even from the undue influence of Govern- ment by scratching out the printed matter and writing his vote. This was always a good vote, and scrutiny of good votes was impossible. The ballot is still used in the elections to the National Assembly, but in the Assembly itself only in special cases, as, ¢.g., in the elec- tion of a “‘rapporteur.” Under the law of 10th August 1871, the conseils généraux (departmental councils) are elected by ballot. In Piedmont the ballot formed part of the free constitutional government introduced by Charles Albert in March 1848 ; it was extended to Italy in 1861. Voting for the Jtalian Chamber of Deputies takes place under the law of 20th November 1859, and in public halls (not booths), to which admission is gained by showing a certificate of inscription, issued by the mayor to each qualified voter. A stamped blue official paper, with a memorandum of the law printed on the back (bolletino spieguto), is then issued to the elector; on this he writes the name of a candidate (there being equal electoral col- Jeges), or, in certain exceptional cases, gets a confidential friend to do so, and hands the paper folded up to the pre- sident of the bureau, who puts it in the box (wrna), and who afterwards presides at the public “squittinio dei suffragi.” Noscrutiny is possible ; canvassing and bribery are rare ; and Cavour thought the ballot had quite nullified the clerical power, at least in Piedmont. Greece is the only European country in which the ball ballot is used. The voting takes place in the churches, each candidate has a box, on which his name is inscribed, one half (white) being also marked “Yes,” the other half (black) “ No.” The voter, his citizenship or right to vote in the eparchy being verified, receives one ball or leaden bullet for each candidate from a wooden bowl, which a clerk carries from box to box. The voter stretches his arm down a funnel, and drops the ball into the “Yes” or “ No” division. The vote is secret, but there is apparently no check on ‘‘ Yes” votes being given for all the candidates, and the ball or bullet is imitable. In the United States a most im- perfect ballot system prevails. Jn many states there is no register, and

therefore personation and double voting are practised. Again, there is no official card, but, as in the Shanty system of New York, candidates' touts give out printed and designed cards, which sometimes fraudulently imitate one another in design, so that ignorant voters are misled. Again, the ballot is generally taken in an engine- house, or shed open to the street, so that mob-intimidation may be used, and votes, as in France, are not practically secret. In Massachusetts, in 1851-2, the Know-nothing or Anti-Irish party, anxious to prevent personation, introduced a secret ballot for state elections, using the Manchester envelope and an official card, with the names of the candidates printed. This led to fraud and was

abandoned, a return being made to the French system. }

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The history of the ballot in Hungary isremarkable. Before 1848 secret voting was unknown there. The electoral law of that year left the regulation of parliamentary elections to the county and town councils, very few of which adopted the ballot. The mode of voting was perhaps the most primitive on record. Hach candidate had a large box with his name superscribed, and painted in a distinguishing colour. On entering the room alone the voter received a rod from 4 to 6 feet in length (to prevent concealment of non-official rods on the voter's person), which he placed in the box through a slit in the lid. By the electoral law of 1874,' the ballot in parliamentary elections in Hungary is abolished, but is made obligatory in the elections of town aud county councils, where votes are given for several persons at once.2 This voting, however, carried on by party-lists on differently coloured cards is practically open. There is a strong feeling in Hungary that the ballot would be worked by the Catholic clergy through the Con- fessional. As most of the electors are freeholders, there is little intimidation. In Prussia, Stein, by his Stadteordnung, or Municipal Corporation Act of 1808, introduced the ballot in the election of the Municipal Assembly (Stadt- verordneten Versammlung). Under the German Constitu- tion of 1867, and the New Constitution of lst January 1871, the elections for the Reichstag are conducted by universal suffrage under the ballot in conformity with the Electoral Law of 3lst May 1869, which also divided Germany into equal electoral districts,

To secure complete secrecy, and to avoid the possibility of fraud and the large expense of printing and counting ballot papers, several ballot machines or registers have been invented. In that of Vassie there was au arrangement of confluent funnels, by which the voter was prevented from dropping more than one ball into the box. In that of Chamberlain the number of votes given was indicated by the ringing of a bell. In that of Sydserff,3 the ball was placed by the sheriff in the common duct, and the voter, by moving a lever, guided it into a channel leading to the box of a particular candidate. Generally, it may be said that these mechanical contrivances have been attempts to make the ball-system secret and accurate, each voter depositing a ball, and the accumulated balls showing the state of the pall. Thisin a large constituency would become unwieldy, and no permanent record of the poll (except the collocation of the balls) would be obtained. A considerable advance is made in the invention of Mr James Davie, Edinburgh, which we select for detailed description. Of this register an essential part is the wooden chamber (4 feet square by 7 feet in height) which the voter, having received a metal ball from the sheriff, enters by a spring-hinged door to which a lever is attached. On one side of the chamber is a box, on the lid of which stand differently coloured cups, marked each with a number and the name of a candidate, Inside the box is a cylinder traversed lengthwise by a spindle, and having at one end a toothed wheel. By a screw-nut the cylinder revolves on and moves along the spindle. On the cylinder is paper divided into spaces, which correspond with the cups, and above this a sheet of carbonised paper as a printing medium. A pinion connects the cylinder with the door-lever, so that the opening of the door drives round the paper one space. A steel type, suspended on an elastic card, is centred to each cup. The voter having placed the ball in a cup, leaves the chamber by another spring-hinged door, which in opening displaces

1 Hungary is now being divided into equal electoral districts.

2 On the other hand, by the 2d of the original bye-laws of the Bank of England, it was provided that the ballot should be used in the general courts “in any question concerning only one person, matter, or thing.”

3 Letters-Patent, No, 63 of 1869.

Hungary.

Germany.

Ballot machines,

the bottoms of the cups, and thus causes the ball to drop on the head of the type, beneath which it presses against the recording sheet on the cylinder. The ball immediately rolls down a groove to the sheriff's desk outside the chamber, where it is handed to the next voter, only one ball being used in connection with each register (unless, of course, there are more votes than one to be given). The closing of the exit door restores the bottoms to the cups. This simple and effectual plan has the merit of secrecy, of immediate detection of fraud (eg., the introduction of a non-official ball to the cup), of rapidity in voting and in counting, and of leaving almost nothing to the voter's presence of mind. The voter can make only one well-defined mark on the paper, and this he can do only in leaving the chamber before the next voter has entered. Mr Davie's invention, which in 1870 received a prize from the Royal Scottish Society of Arts, is obviously not adapted to cumulative voting, but may be worked with any number of candidates under single voting. Although the motion of the cylinder would record in a diagonal direction the series of votes, it would be practically impossible to identify votes from a numbered list of the voters. Ww. C. 8.)

BALLYCASTLE, a seaport town of Ireland, county Antrim, situated on a bay opposite Rathlin island. The town is well built, consisting of two parts, about a quarter of a mile asunder, and connected by a fine avenue. Towards the close of the 18th century, one of the Boyd family devoted himself to the extension and improvement of the town, establishing manufactures, endowing charities, and building churches, and succeeded in producing a temporary vitality. Upwards of £150,000 is said to have been ex- pended upon the pier and harbour; but the violence of the sea overthrew the former, and the latter has been filled with sand. To the east of the town are the remains of an abbey. Population in 1871, 1253.

BALLYMENA, a town of Ireland, county Antrim, on the Braid, an affluent of the Maine, two miles above their junction, It is 33 miles N.N.W. of Belfast, with which it is connected by railway. The town owes its prosperity chiefly to its linen trade, introduced in 1733, which gives employment to the greater part of the inhabitants. It has a parish church, several chapels and schools, a market- house, and four branch banks. There is a newspaper published in the town called the Ballymena Observer. Population in 1871, including Hanyville in the suburbs, Teale

BALLYSHANNON, a seaport and market-town of Treland, county of Donegal, situated at the mouth of the Erne. Lat. 54° 30’ N., long. 8° 11’ W. ‘The river is here crossed by a bridge of fourteen arches, which connects the town with the suburbof Purt. Below the bridge the river forms a beautiful cascade, 150 yards wide, with.a fall at low water of 16 feet. The harbour is a small creek of Donegal Bay, about 600 yards long and 350 yards broad, and is only accessible to small vessels. The town contains a church, several chapels, a bank, a market-house, barracks, and a union workhouse. The salmon fishery is the only important occupation. Previous to the Union Ballyshannon returned two members to the Irish Parliament. Population in 1871, 2958.

BALMEZ, Jarmz LuctEn, a Spanish ecclesiastic, eminent as a political writer and a philosopher, was born at Vich in Catalonia, on the 28th August 1810, and died there on the 9th July 1848. The most important of his works, and that on which his fame principally rests, is entitled £7 Protestantismo comparado con el Catolicismo en sus rela- ciones con la Civilisacion Europea, published 1842-44, a most able defence of Catholicism. It has been translated into French, Italian, German, and English. The best of his philosophical works, which are able expositions of

the old scholastic system of thought, are the Filosofia Fon- damental, 1846, and the Corso de Filosofia lemental, 4 vols. 1847. The Protestantism and Catholicity and the Fundamental Philosophy have both been translated into English (1849, 2 vols. 1857). Nearly all the works are to be had in German and French. See M. de Blanche- Raffin, Jacques Balmés, sa Vie et ses Ouvrages, Paris, 1849.

BALMORAL CASTLE, a residence of Her Majesty Queen Victoria, on the right bank of the River Dee, about 9 miles above Ballater and 50 miles from Aberdeen. The property, which now consists of upwards of 10,000 acres, besides a large tract of hill ground, belonged in its original extent to the Farquharsons of Inverey, by whom it was sold to the Earl of Fife. In 1848 it was leased by the late Prince Consort, and in 1852 was finally pur- chased for a sum of £32,000. The castle, which was erected at Prince Albert's private expense, is of the Scotch baronial style of architecture.

BALNAVES, Henry, a Scottish Protestant, born at Kirkcaldy in Fife, in the reign of James V., and educated at the university of St Andrews. 'There is some doubt both as to the exact date of his birth, which has been fixed as 1520, and as to the rank in society to which he be- longed. He completed his studies on the Continent, and, returning to Scotland, entered the family of the Karl of Arran, who at that time was regent; but in the year 1542 the earl dismissed him for embracing the Protestant religion. In 1546 he was implicated in the murder of Cardinal Beaton, at least he is known to have taken refuge with the conspirators in the castle of St Andrews; and when they were at last obliged to surrender to the French, he was sent with the rest of the garrison as a prisoner to France. During his confinement at Rouen he wrote the work entitled Confession of Faith, to which Knox added marginal notes and a preface; but it was not published till 1584, five years after his death. He returned to Scot- land about the year 1559, and having joined the Congre- gation, was appointed one of the commissioners to treat with the duke of Norfolk on the part of Queen Elizabeth. In 1563 he was made one of the lords of Session, an off ce which he is said to have held for the first time in 1538, and was appointed by the General Assembly, with other learned men, to revise the Book of Discipline. Knox, his contemporary and fellow-labourer, gives him the char- acter of a very learned and pious man. Balnaves died at Edinburgh in 1579.

BALSAM, an oleo-resin or natural compound of resin and essential oil, in such proportions that the substance is in a viscous or semi-fluid condition. The gradations from a solid resin to a limpid essential oil are insensible, and most resins havea balsamic consistency on their exudation, only hardening by exposure to air. It has been proposed to limit the name balsam to such substances as contain cinnamic or an analogous acid in addition to the

volatile oil and resin which turpentines contain alone; but this distinction has not been carried out.

The fragrant balsams which contain cinnamic or benzoic acid may, however, be regarded as a distinct class, allied to each other by their composition, properties, and uses. Those of this class found in commerce are the balsam of Peru, balsam of Tolu, liquid storax, and liquidambar. Balsam of Peru is the produce of a lofty leguminous tree, Myrospermum peruiferum, growing within a limited area in San Salvador, Central America, but now introduced into Ceylon. It is a thick, viscid oleo-resin of a deep brown or black colour and a fragrant balsamic odour. It has been analysed by Kachler, who thus states its percentage com- position, —cinnamic acid 46, resin 32, benzylic alcohol 20. It is used in perfumery, and in medicine as a stimulant application to indolent sores, as well as internally for

asthma and pectoral complaints. Balsam of Tolu is like- wise produced from a species of Myrospermum, M. tolur- Jerum. It is of a brown colour, thicker than Peru balsam, and attains a considerable degree of solidity on keeping. It also is a product of equatorial America, but is found over a much wider area than is the balsam of Peru. Tolu bal- sam consists of a combination of inodorous resin with cinnamic acid, no benzoic acid being present init. It is used in perfumery and as a constituent in cough syrups and lozenges. Lrquid storax is a balsam yielded by Lnqudambar orientalis, a native of Asia Minor. It is a soft resinous substance, with a pleasing balsamic odour, especially after it has been kept for some time. It contains a principle—styrol or cinnamene—to which it owes its peculiar odour, besides cinnamic acid, stryacin, and a resin. Liquid storax is used in medicine as an external application in skin diseases, and internally as an expec- torant. An analogous substance is derived from Liguid- ambar Altingia in Java. Liquidambar balsam is derived from Lnguidambar styraciflua, a tree found in the United States and Mexico. It contains cinnamic acid, but is destitute of benzoic acid.

Of balsams entirely destitute of cinnamic and benzoic constituents the following are found in commerce :—Mecca Balsam or Balm of Gilead,

yielded by the Balsamodendron Berryt (B. gileadense of De Candolle), a tree growing in Arabia and Abyssinia, is supposed to be the balm of Scripture and the BdAcapov of Theophrastus. When fresh it is a viscid fluid, with a penetrating odour, but it solidifies with age. It was regarded with the utmost esteem among the nations of antiquity, and to the present day it is peculiarly prized among the people of the East. Balsam of Coparba or Capivi is a fluid oleo-resin of a pale brown or straw colour, produced from several trees of the genus Copaifera, growing in tropical America. It possesses a peculiar odour and a nauseous persistent tarry taste. Balsam of copaiba contains from 40 to 60 per cent. of essential oil, holding in solution a resin from which capivic acid can be prepared. It is chiefly used in medicine for the treatment of inflammatory affections of mucous surfaces. Under the name of Wood Oil, or Gurjun Balsam, an oleo- resin is procured in India and the Eastern Archipelago from several species of Dipterocarpus, chiefly D. turbin- atus, which has the odour and properties of copaiba, and is used for it in East Indian hospital practice. Wood oil is also used as a varnish in India, and forms an effective protection against the attacks of white ants. A substitute for copaiba is also found in the dark red balsam yielded by Hardwickia pinnata, a leguminous tree.

Canada Balsam.—The oleo-resins obtained from coni- ferous trees are usually termed turpentines, but that yielded by Abies balsamea is known in commerce as Balsam of Canada. It is a very transparent substance, somewhat fluid when first run, but thickening considerably with age, possessed of a delicate yellow colour, and a mild terebinthous odour. According to Fliickiger and Hanbury it contains 24 per cent of essential oil, 60 per cent. of resin soluble in alcohol, and 16 per cent. of resin soluble only in ether. It has been used for the same purposes as copaiba, but its chief uses are for mounting preparations for the microscope and as a varnish.

BALTA, the chief town of a circle of the same name in the Russian government of Podolia. It stands on the Kodima, near its junction with the Bug, and carries on a large trade in cattle and horses and the raw products of the surrounding district. It has two great annual fairs, the more important being held at Whitsuntide and the other in June.

population, which in 1867 numbered 14,528. Balta was in great part destroyed by the Russians in 1780.

BALTARD, Louis Prerrz, a distinguished French architect and engraver, was born at Paris in 1765, and died in 1846. He was originally a landscape painter, but in his travels through Italy was so much struck with the beauty of the Italian buildings, that he changed his profession and devoted himself to architecture. In his new occupation he achieved great success, and was selected to prepare the plans for some of the largest public edifices in Paris. His reputation, however, rests not so much en his practical performances in architecture as on his great skill in the art of engraving. Among the best known of his plates are the drawings of Paris (Paris et ses Monuments, 2 vols. fol., 1803), the engravings for Denon's Egypte, the illustrations of Napoleon's wars (Za Colonne de la grande Armée), and those contained in the series entitled the Grand Prix de ? Architecture, which for some time he carried on alone. He has also gained distinc- tion as an engraver of portraits.

BALTIC SEA. The name by which this inland sea is commonly designated is first found in the 11th century, in the work of Adam of Bremen, entitled Chorographia Scandi-

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Sketch Map of Baltic Sea.

navie. The derivation of the word is uncertain. It seems probable that, whatever may be the etymology of the name Baltic, that of the Great and Little Belts is the same. The Swedes, Danes, and Germans call it the Ostsee or East Sea.

The Baltic is enclosed by Sweden, Russia, the German empire, and Denmark; and it communicates with the North Sea, by the winding channel

which lies between the southern part of the Scandinavian peninsula and the northern peninsula of Schleswig and Jutland. The first part of this channel is in great measure blocked by the islands of Zealand and Fiinen, so as to form the three | narrow passages which are known as the Sound (between

Sweden and Zealand), the Great Belt (between Zealand and Fiinen), and the Little Belt (between Fiinen and Jutland). Each of these forms a distinct communication between the Baltic and the Cattegat, which is the open portion of the channel lying between the coast of Sweden and the eastern side of Jutland ; while the Cattegat opens freely into the Skager Rack, which is the continuation of same open channel, between the southern end of Norway and the north-west coast of Jutland, into the North Sea.

The length of the Baltic Sea, from Swincmiinde in the 8. to Tornea in the N., is nearly 900 miles; and its greatest width, between Karlscrona and Memel, exceeds 200 miles. Its whole area, including the Gulfs of Bothnia aud Finland, is about 160,000 geographical square miles. It runs first in an easterly direction as far as Memel, a distance of 300 miles, and then northwards as far as lat. 59° 21′ N.,a distance of 350 miles, at which point it separates into two great gulfs. One of these, the Gulf of Finland, runs nearly due E.; the other, the Gulf of Bothnia, almost N. The Gulf of Bothnia is 400 miles in length, with an extreme breadth of 120 miles, but where narrowest it does not exceed 40 miles. ‘The archipelago of Aland lies at its entrance. The Gulf of Finland is 280 niles in length, with a mean breadth of 60 or 70 miles.

The depth of the Baltic rarely exceeds 100 fathoms— being greatest between the island of Bornholm and the coast of Sweden, where it reaches 115 fathoms, and least in the neighbourhood of the mouths of large rivers, which bring down a great quantity of earthy matter, especially in the spring, so that in many parts the bottom is being so rapidly raised by its deposit that the mouths of rivers formerly navigable are now inaccessible. This is especially the case in the northern part of the Gulf of Bothnia, above Quarken, where several tracts are now dry land which were Once water ; and also in the neighbourhood of Tornea, where meadows now take the place of waters which were traversed in boats by the French Academicians,

when they were measuring an arc of the meridian. Along the southern coast the shallowness of the harbours is a great obstacle to navigation, especially since they are closed by ice for nearly one-third of the year. On the western side it is not more than 15 fathoms deep; and, in general, it is only from 8 to 10 fathoms. On the S. it nowhere exceeds 50 fathoms. The Gulf of Finland suddenly shallows from 50 or 60 fathoms to 5, or even less. The average depth of the Gulf of Bothnia is not greater than that of the rest of the sea. Numerous rocky islands and reefs, many of them level with the water, render the navigation of this sea extremely dangerous.

The shore of the Baltic is generally low. Along the southern coast it is for the most part sandy,—with sand- banks outside, and sand-hills and plains inland. Where streams come down, there are often fresh-water lakes termed haffs, which are separated from the sea by narrow spits called nehrungs. Two of these haffs are of great extent ; one of them, termed the Frische Haff, lies between Danzig and Kénigsberg, which last town is situated on the part of it most remote from the sea; the other, termed the Kurische Haff, lies between Kénigsberg and Memel, the latter town being situated on the channel connecting the haff with the sea. Near the entrance to the Gulf of Fin- land the coast becomes rocky, and continues to be so for the most part around the gulfs both of Finland and Bothnia, except towards the head of each; the rocks, however, are never high. The shores of the southern part of the Swedish peninsula are mostly high, but not rocky ; at Stockholm, however, there is an archipelago of rocky islands, on some of which the town is partly built.

Drainage Areca.—The Baltic may be considered as the estuary of a great number of rivers, none of them individu-

ally of great size, but collectively draining a very large area, which is estimated at about 717,000 square miles, or nearly onc-fifth of the entire area of Europe. ‘This great drainago arca is remarkable for the small proportion of its boundary that is formed by mountains or high table-lands, —its greater part consisting of land of no considerable elevation, which

slopes down very gradually to its coast-line, and of which a large proportion is covered by lakes. ‘This is especially the character of the drainage area of the Neva, whose waters are immediately derived from the large shallow Lake Ladoga, which receives the contributions of numerous other lakes, Onega being the largest, though Lake Saima in Finland, with its irregular prolongations, is scarcely less extensive. The entire surface drained by the Neva is esti- mated at about 100,000 square miles, or nearly twenty times that of the drainage area of the Thames. Through Lake Onega, the Neva is connected with the Dwina and the Volga by canals, through which small vessels can pass from the Baltic into either the White Sea or the Caspian. The Duna or South Dwina, which discharges itself into the Gulf of Riga, is another important river, draining an area of about 35,000 miles in West Russia, and having a length of 520 miles, of which 405 miles are navigable. The drainage area of the Niemen, which enters the Baltic at Memel, is conterminous with that of the Duna, and is of about the same extent ; this river is navigable for more than 400 miles from its outlet, and communicates with the Dnieper by a canal through which vessels can pass from the Baltic to the Black Sea. The Vistula, which receives the waters of the whole area of Russian and Prussian Poland, flowing past Warsaw into the Baltic at Dantzig, is a very large and important river, having a length of 520 miles, of which 430 are navigable, and a drainage area of 72,000 square miles. And the Oder, rising in the hill districts of Silesia, drains the extensive level areas of Brandenberg and Pomerania, and discharges into an estuary, that may be said to begin from Stettin, the water drawn from an area of 45,000 square miles. Numerous rivers discharge themselves into the Gulf of Bothnia, bringing down water from the mountain ranges of Sweden and Norway ; but their course is comparatively short and direct, with few tributaries, so that, individually, they do not attain any great size. The drainage of the more level southern portion of Sweden is for the most part collected by the great lakes Wener, Wetter, and Malar, of which the first pours its water into the North Sea, and the others into the Baltic. By means of a canal joining Lakes Wener and Wetter vessels can pass directly from the Cattegat into the Baltic.

Climate,—It is not only, however, the extent of its drainage area, but the large proportion borne by the rain and snow which fall upon that area to the amount dissipated by evaporation from its surface, that goes to swell the

aggre- gate of fresh water poured into the basin of the Baltic; for there is probably no inhabited region of the whole globe over which so large a quantity of snow falls, in proportion to its area, as it does in the countrics round this basin. They receive, direct from the Atlantic, a vast amount of moisture brought by its west and south-west winds ; and even the winds which have already passed over the low plains of Jutland and Northern Germany will have parted with little of their moisture before reaching the Baltic provinces of Russia. When these vapour-laden west and south-west winds meet the cold dry east and north-east winds of Siberia, their moisture is precipitated, in summer as rain, and in winter as snow; and owing to the prevalence of a low atmospheric temperature through a large part of the year, the proportion lost by evaporation is extremely small as compared with what passes off from other inland seas. The large excess of the amount of fresh water dis-

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charged into the basin, over that which passes off by evapo- ration from its surface, is indicated by its low salinity, which, however, varies considerably in its different parts and at different seasons of the year. The temperature of the Baltic is remarkable for its range, which is rather that of a terrestrial than of a marine area—this being doubtless owing in great degree to the fact that its shallowness and the low salinity of its water allow a large part of its surface to be frozen during the winter. Nearly the whole of the Gulf of Bothnia, with the land enclosing it on both sides, lies between the January isotherms of 10° and 20°-the former crossing it near its head, and the latter near its junction with the Baltic proper; and the whole of the Baltic proper, with the land enclosing it on the east, south, and west, lies between the January isotherms of 20° and 30°. On the other hand, the July isotherm of 60°, which crosses England near the parallel of 54°, passes across the Gulf of Bothnia near the Walgrund Islands, almost 9° further north ; and the whole of the Baltic proper, with the Gulf of Finland and the southern part of the Gulf of Bothnia, lies between the July isotherms of 60° and 65°. Thus the range between the mean swmmer and mean winter temperatures, which is only about 20° in the British Islands, is about 40° over the Baltic area.

The mean annual temperature of the Gulf of Bothnia ranges between 30° at its northern extremity and 40° at its southern, while that of the Baltic ranges from 40° at its northern boundary to about 46° at its southern.

Formation and Transportation of Ice.—The greater part of the Gulfs of Bothnia and Finland is usually frozen over during the winter, the formation of ice beginning at the head and extending downwards. Masses of ice, conveyed by the currents into the Baltic proper, freeze together as the winter advances, and form vast fields, generally extending on the east side as far south as the islands of Dagé and Oesel, and on the west to the south of Stockholm. It happens sometimes, though rarely, that large portions of the Baltic proper are continuously frozen over ; but naviga- tion is usually interrupted by the blocking up of its bays and harbours with ice, from the latter part of December to the beginning of April. The freezing of the Gulfs of Bothnia and Finland begins earlier and ends later.

The curious phenomenon of the formation of bottom-ae, and its rise to the surface, is more frequently seen in the Baltic and the Cattegat than in the open ocean,— chiefly, it seems probable, on account of the shallowness of these seas. It has been particularly observed by Prof. Nilsson in the Cattegat, off Kullen Point, near the southern extremity of Sweden ; but according to Chydenius it is very common in various parts of the Baltic, having been especially noticed by the fishermen off the Aland Islands. In calm winter weather, water of from 4 to 8 feet deep is often covered in a very short time with small plates of ice, mostly circular in form, varying in diameter from 1 to 5 inches, and having a uniform thickness which never exceeds two lines. These plates can be seen coming up from below, rising edgeways towards the surface, often with such force as to lift them- selves three or four inches out of the water. When they come up in great numbers they are often piled one upon another, and are then usually soon broken, by the action either of waves or of currents, into small pieces, which unite again by regelation so as to form irregular cakes of ice; and these, as soon as the water becomes tolerably still, cohere into a continuous rough sheet. But it sometimes happens that if the plates come up more sparsely, and the weather is very still and cold, they remain unbroken, and the diameter of each increases, sometimes to two feet or even more, When the fishermen

notice these ice-plates coming up from below in large quantities, they at once make for land, as they know that they might otherwise be soon com-

pletely ice-bound. The same thing appears to happen in polar seas in the shallow water near land. Chydenius, who was a member of the Swedish Spitzbergen expedition in 1857, states that on one occasion the surface of the sea, which was previously quite clear of ice, became so covered in the course of half an hour, that it was with difficulty that a boat could be forced through it ; and this although the temperature of the air during the day had not been lower than 4° C., and no wind or stream had brought the ice together.

It does not seem very clear in what way this formation of bottom-ice is to beaccounted for. Bottom-ice has often been noticed in fresh-water lakes and streams; and large plates have been seen to rise to the surface, sometimes with force enough to bring up stones of considerable size,—in one instance a heavy iron chain. In these cases it would seem that the motion of the bottom-water over roughencd surfaccs contributes to its congelation. And in the shallow water near the sea-shore, stones and sea-weeds may be seen covered with ice, like the hoar-frost on trees, before any ice forms on the surface. It is to be remembered that sea- water increases in density down to its freezing point, so that the water cooled at the surface will always go down, the deepest stratum being thus the coldest. And thus, although no lower temperature can be carried down by the water than that to which it has been subjected at the surface, the water that does not freeze at (say) ~2° °5 C. when lying upon water, changes into ice when it comes in con- tact with the irregular solid bottom, perhaps on account of the more ready dissipation, under the latter circum- stances, of the heat set free in the act of congelation.

When ice forms over the shallow bottoms which border parts of the Gulfs of Bothnia and Finland, large blocks of stone are frequently frozen into it; and these, being lifted when the water rises in the early summer, are often trans- ported by currents to considerable distances, finally subsid- ing again to the bottom when the ice melts. In this manner a deposit of rocky fragments, some of them 6 or 8 feet across, is being formed at the bottom of the Baltic outlets; as is known from the fact, that sunken ships which have

been visited by divers in the Sound and in Copenhagen roads have been found covered with such blocks within no very long period. It not urequently happens, moreover, that sheets of ice with included boulders are driven up on the coast during storms, and are thus carried some way inland, being sometimes packed to a height of even 50 feet. A case was described by Von Baer in which a block of granite, whose weight was estimated at between 400 and 500 tons, was thus carried by the ice during the winters of 1837-8; and Forchhammer mentions that the Sound being suddenly frozen over during .an intense frost in February 1844, sheets of ice driven by a storm were heaped upon the shore of the bay of Téarbeijk, and frozen into one mass so as to form a mound more than 16 feet high, which threw down the walls of several houses, and left behind it ridges of sand and pebbles when it thawed. It is apparently, moreover, by similar agencies, that the fringe of rocky islands of all dimensions called the Skér, which lies at a little distance from the shore of many parts of the Baltic, is being gradually modified. Boats and small vessels can sail in smooth water within this skar, even when the sea outside is strongly agitated ; but the navigation is intricate, and the danger from sunken rocks to those not thoroughly acquainted with it is very con- siderable. The diminution which has been noticed from time to time in the depth of the channels, and the appear- ance above water of what were formerly regarded as sunken rocks or reefs, have been regarded as concurring with other evidence to prove that a general rise of land is now going on over this area. But it seems probable, from what has

now been stated, that the increase of hcight and dimensions which has been observed in the reefs and inlets of the skar during the last half century, may be adcquately accounted for by the action of ice, which has piled up (generally on a basis of jixed rock) accumulations of trans- ported dzbris. ,

Rise of Land around the Balttc.—Early in the last century the Swedish physicist Celsius (to whom we owe the invention of the centigrade scale) formed the opinion that the waters both of the Baltic and of the North Sea were gradually subsiding ; and this opinion, though con- troverted by other authorities, was embraced by Linnaeus, It is now clear that many of the facts by which it was sup- ported are explicable by the transporting agency

of rivers and of ice, as already explained ; and it was pointed out by Playfair in 1802, that even admitting the proofs on which Celsius relied, they would rather show that the land is rising, than that the water is receding. During the present century a great deal of attention has been given to this question, on account of its geological interest, by many very able observers ; and the results miay be briefly summarised as follows :—(1.) An elevation of the whole of Norway, from the North Cape to the Naze, has taken place within a comparatively recent period,—as is evidenced by the numbers of raised beaches containing existing shells, which are found at different points along the western coast, fre- quently at a height of 200 feet above the present sea-level, and in some spots at a height of more than 600 feet. As these beaches, where oue lies above another, are not always parallel, it appears that the elevatory action did not take place equally over the whole area ; and the movements were probably intermittent, with long pauses between. (2.) At various points along the coast of the Baltic and the Gulf of Bothnia, alike in Sweden and in Finland, similar collections of shells have been found, belonging to species now in- habiting the basin, and characterised by the peculiar facies to be presently noticed as distinguishing its molluscan fauna from that of the ocean. Such deposits have been found very far inland, and at a height of 230 feet above the sea. Hence it appears that before this upheaval took place, the Baltic must have been separated, as now, froni the North Sea by the mountain ridge of Norway, although it ex- teuded over a considerably larger area of what is at present low-lying land. (3.) Notwithstanding the numerous ob- servations which have been made with a view to ascertain whether any change of level is now going on, the question must be regarded as still undetermined. Little reliance can be placed on occasional comparisons of the height of marks made upon rocks above the sea-level, since, although there are no tides, the height of the water in the basin is subject to considerable variations, from causes to be presently explained. (4.) There is a good deal of evidence, on the other hand, that, towards the southeru extremity of Sweden, there has been a depression of the land since the historic period. In this portion, known as Scania, no elevated beds of recent marine shells have been met with ; in its seaport towns there are streets now at or even below the level of the water, which must have been above it when first built ; and a large stone whose distance from the sea was measured by Linnzus, in 1749, was found 100 feet nearer the water’s edge when its distance was again measured in 1836. Near

Stockholm, again, a fishing-hut, with remains of boats of very antique form and construction, was found, in 1819, at a depth of 60

1 The shells found in the raised beach at Uddevalla by Mr J. Gwyn Jeffreys in 1862, were characterised by him as glacial; but they have been shown to be specifically identical with mollusca now living at Spitzbergen ; and it is probable that when the water was deeper than at present along the coast of Norway, these would have ranged south- wards along thé cold bottom, as they do even now to a certain extent.

feet, covered over with gravel and shell-marl; and it was considered by Sir C. Lyell to be impossible to explain the position of this hut without imagining first a subsidence to the depth of more than 60 feet, and then a re-elevation. On the whole, it appears clear that oscillations of level, not uniform either in direction or in degree, have taken place in various parts of the Scandinavian peninsula within a recent period, whilst in regard to the continuance of any such changes at the present time we have no ccrtain knowledge, though it is considered probable by many of the most distinguished savans both of Sweden and Norway.

Movements of Water in the Baltic.—There is scarcely any tidal movement in the Baltic; for though there are sensible tides in the Skager Rack, these begin to diminish in the Cattegat, and are very trifling in the Sound and Belts, averaging only about a foot at Copenhagen. There is usually a general movement of the upper waters of the Baltic towards the three channels which form its outlet, and a considerable flow of water through them. The large volume of water discharged by the rivers that empty themselves into the upper end of that gulf forms a southward current, which becomes very rapid where it narrows at Quarken (being partly blocked also by the Walgrund Islands), and again where it is obstructed by the Aland Islands, as it enters the Baltic proper. In that part of the basin the current is liable to considerable modifica- tion froin prevalent winds ; but it is usually very perceptible in the spring and early part of the summer, when the snows are melting. On the other hand, when an unusual con- tinuance of north-west wind concurs with high spring-tides to drive the water of the North

Sea into the outlet of the Baltic, a large body of water flows back into its basin, producing a reverse current, which is felt as far as Danzig.

There are also considerable variations in the height of the water, that seem for the most part referrible to three different conditions, which may operate separately or in combination, viz., (1), the seasonal increase and decrease of the amount of water brought down by rivers; (2), the banking-up of the outflow by opposing winds; and (3), variations in atinospheric pressure.

(1.) During the winter months the quantity of fresh water poured into the Baltic by the rivers which discharge themselves into it is greatly reduced by the freezing of their sources; and this is, of course, especially the case with those that empty themselves into the Gulf of Bothnia. Hence the general level of the surface is at its lowest at this season. With the melting of the snow in spring and early summer, however, there is an enormous increase in the quantity of fresh water poured into the basin, and the level of its surface then rises. There is always, of course, a tendency to equalisation of the level of the Baltic with that of the sea outside, by outflow or inflow currents through its three channels of communication; but the narrowness of these prevents that equalisation from being immediate, and it is often interfered with by winds. (2.) The influence of winds in banking up the water at the outlets, and even in reversing the usual currents, is very

‘decided, as has been especially shown by the recent

researches of Dr Meyer of Kiel.? The strongest and most constant surface-outflow is seen during the autumn and winter months, when there is little or no elevation of level, but when the prevalent direction of the wind is such as to drive the Baltic water towards and through the straits. When, on the other hand, the winds prevalent in the North Sea tend to drive its water into the straits, their usual out- current may be reversed ; and this most frequently happens during the spring and summer months, although the excess

c Canetti uiber Physikalische Verhdlinisse des Westlchen Theiles der Ostsee.

water to be discharged is then at its greatest. It some- times happens, especially about the autumnal equinox, that a N.W. gale concurs with a high tide in the Skager Rack to drive its water towards the Baltic, causing it to overflow the lower portions of some of the Danish islands. _ If, then, a southerly wind should carry this water onwards into the Gulf of Finland, the check which it gives to the downflow of the Neva produces disastrous inundations at St Peters- burg. (3.) The influence of atmospheric pressure upon the height of the water in the Baltic is very remarkable. It had long been noticed that its level occasionally rises even as much as 3 feet without any apparent cause, and maintains itself at that height, sometimes only for a few days, but occasionally for several weeks together, and this at all seasons. Schultén, having observed that such elevations of level are preceded by a fall of the barometer, and that when the barometer rises again the water subsides, was led to recognise the dependence of these changes upon converse changes in atmospheric pressure; and this reference was confirmed by observation of the constant proportion borne by one to the other. A similar con- sequence of variation in atmospheric pressure has been observed in the Mediterranean (see MEDITERRANEAN) ; and it has also been noticed in England as a disturbing ele- ment in modifying the height of the tides.

Salimty of Baltic Water.—As might be expected from what las been already stated, the proportion of salt in the water of the Baltic is very much below that of oceanic water, and varies greatly at different seasons. In the Gulf of Bothnia, at the time the river-flow is greatest, the surface water is often so little salt as to be quite drinkable, its sp. gr. having been found as low as 1:004. But it is said to contain at Christmas six times as much salt as at midsummer, showing that when the river supply is at its lowest, its place is taken by a reflux of salt water from the outside ocean. In the Baltic proper there is a very decided difference in salinity between the upper and the lower stratum; the less saline water of the surface flowing towards the outlet over the more saline water beneath, just as the fresh-water current of a great river runs out to sea, even far beyond the sight of land. Thus the proportion of salt in 1000 parts of a sample of surface-water taken near Stockholm being 5919, that of dottom-water, brought up from 120 fathoms, was 7:182; and in like manner the proportion of salt in swface-water at the entrance of the Gulf of Finland being 3°552, that of bottom-water at 30

fathoms' depth was 4°921,—the proportion of salt in North Sea water averaging 32°823 parts in 1000. Nearer the outlet the proportion of salt is greater alike in surface and in bottom-water. From the careful and systematic observations of Dr Meyer (op. cit.), it appears that the sp. gr. of the surface-stratum at Kiel ranges between about 1:0082 in summer and 1-0142 in winter, the latter showing somewhat above half the quantity of salt contained in ordinary sea-water. But if the direction of the prevalent winds during the autumn be such as to maintain a strong surface out-current, and consequently (as will presently appear) a very strong inward under-current, as happens in some years, the maximum of salinity will present itself at that season. The sp. gr. of the deeper stratum ranges at Kiel from 1:0145 to 10190; at Helsingér on the Sound from 1:0190 to 1:0220 ; and at Korsér on the Great Belt from 1:0180 to 1:0243; thus showing it to be principally composed of North Sea water, whose sp. gr. may be taken as 10264,

Currents in the Baltic Straits.—The results of observation of the movements of the upper and under strata of water in the Baltic Straits, strongly confirm the doctrine else- where enunciated (see ATLANTIC) in regard to the potency of slight differences of downward pressure in the production

of under-currents, The prevalent movement of the upper stratum in the Baltic Straits is owtward ; and this concurs with the low salinity of Baltic water to indicate that it is partly an overflow current, produced by the excess of river supply over loss by evaporation, which tends to raise its level. But even when this outward surface-current is strong, there is usually an znward under-current of North Sea water, carrying back into the basin of the Baltic a large proportion of the salt which would otherwise be lost to it; and the existence of this under-current, which has been abundantly established by experimental inquiries, as well as by the observations of divers, is exactly what theory would lead us to predict. or if two columns of water of the same height, but differing in specific gravity, be made to communicate with each other alike at the surface and at the bottom, the lower part of the heavier column, having a greater lateral pressure, will flow towards the lighter, thus tending to produce an elevation of level in the latter, which will rectify itself by a surface-flow in the opposite direction ; and thus a vertical circulation will be maintained, as long as the causes which maintain the difference of salinity remain in operation, Now, as the

salinity in the occanic column may be regarded as practically constant, whilst the salinity of the Baltic column, though not uniform, is kept down by the influx of river-water to a much lower degree, this difference will always exist to a greater or less amount. When, however, the height of the Baltic column is so much raised—either by the excess of its fresh-water supply, or by the reversal of the surface-current by the agency of wind—that the downward pressure of its less saline water exceeds that of the more saline water of the North Sea column, the under-current will be brought to a stand, or its direction will be reversed. Thus it is that when the outward movement of the upper stratum depends rather upon the prevalent winds (as is usually the case during autumn and winter) than upon the elevation of its level within the basin, the inward under-current which supphes its place is strongest and most constant. And itis by this means, much more than by the occasional reversal of the surface-current, that salt is carricd back into the Baltic,—as is proved by the close correspondence shown by Dr Meyer's observations to exist between the predominance of the inward under-current and the elevation of the sp. gr. of the surface-water of the Baltic. On the other hand, it is during the spring and summer months, when the outward movement of the upper stratum is rather an overflow- current, and the salinity of the surface-water is the lowest, that the under-current scts less strongly and less constantly inward,

Zoology.—The fauna of the Baltic may be regarded as that of a large estuary, having a narrow communication with the sea,—its marine inhabitants being such as can adapt themselves to considerable variations in the salinity of its water. Whales rarely enter the Baltic ; but porpoises frequent the neighbourhood of the Danish islands. Seals are obtained in considerable numbers at the breaking up of the ice around Gottland and the Aland Isles. The salmon is among the most abundant fishes of the Baltic proper, ascending its rivers from April to June; and salmon-trout are caught in some of its bays. 'The portion of the Baltic in the neighbourhood of the Danish islands is frequented by various species of Gadide, which do not range further east. In the 14th and 15th centuries there was a consider- able herring-fishery within the Sound and along the coast of Scania (the southern portion of Sweden) ; but this fish seems to have latterly quite deserted the Baltic, and rarely shows itself even in the Cattegat. On the castern coast of Sweden, on the other hand, and in the Gulf of Bothnia, a fish called the

strémling, which is nearly allied to the herring, being chiefly distinguished by its small size, is

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caught in great numbers, and is dried and salted for distant markets. ‘The molluscan fauna of the Baltic is chiefly made up of common shells of our own shores,—such as Cardium, Mytilus, and Littorina, which can bear an admixture of fresh water, together with several proper fresh-water shells, such as Paludina, Neritina, and Lymnea; the marine types, however, being remarkable for their very small size, which is often not above one-third of their usual dimen- sions. There is an entire absence, except in the neighbour- hood of the straits, of such essentially marine types as Buccinum, Ostrea, Pecten, Patella, and Balanus. It is interesting to remark that the Danish Kjokkenmidding contain abundance of oysters, and also of full-sized cockles, mussels, and periwinkles ; from which it may be inferred that even within the human period the outside ocean had freer access to the basin of the Baltic than it has now,— probably through what is now the peninsula of Jutland, which seems at no remote period to have been an archipelago. W. B.C.) BALTIMORE, in Maryland, one of the largest and most flourishing cities in the United States of North America, is situated on the north side of the Patapsco River or Bay, 14 miles above its entrance into the Chesapeake, 37 miles N.E. of Washington, and 100 8.W. of Philadelphia. Lat,

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Ground-Plan of Baltimore.

Northern Centra] Railway Station. . Mount Clare do.

. Camden do.

. St Mary’s College.

. Baltimore College.

Prison.

39° 17’ N., long. 76° 36’ W. The natural advantages of this position were long overlooked by the settlers in the vicinity of the Chesapeake ; and it was only in 1729 that they directed their attention to the place, and laid out a plan of the town. At that time a part of it was under cultivation as a farm, but all the rest was a wilderness. For some years its growth was by no means rapid, as it had to contend with all the obstacles that could be thrown in its way by the jealousy of olderrivals. From an authentic sketch of Baltimore made in the year 1752, it appears that it then contained about twenty-five houses, only four of which were built of brick, the rest being of a more primitive structure. In 1768 it became the county town; and in 1775, according to a census then taken, it contained 564 houses, and 5934 inhabitants. From this time it rose rapidly into importance; and in 1780 became a port of entry, when a custom-house was opened. Previous to this all vessels trading to and from the port had to be entered, cleared, and registered at Annapolis. In December 1796

7. Penitentiary.

8. City Hall.

9. Washington Monument. 10, Battle Monument.

11. Hospital. 12 Lazaretto and Lighthouse.

it obtained an act of incorporation, By the census of 1870 Baltimore contained 267,854 inhabitants.

The city is pleasantly situated on slightly undulating ground, and extends about 44 miles from E. to W., and 34 from N. to 8, covering an area of 10,000 acres. It is divided into two nearly equal parts by a small stream called Jones's Falls, crossed by a number of bridges. The division east of the falls is nominally subdivided into two parts— Fell's Point and Old Town. The former, the most easterly part of the town, is the principal resort of seamen, and is the place where the shipbuilding and manufactures are principally carried on, The Old Town lies to the N. and W. of this. The portion west of the Falls is likewise divided into two parts, the city proper and Spring Garden. The former is the centre of trade, and the residence of the more wealthy inhabitants ; while the latter, which is the extreme south-western quarter, and the lowest and most unhealthy portion of the city, is inhabited by the poorer classes. three universities, several colleges, 122 public schools, a state normal school, a manual labour school, besides nume- rous private schools and academies, an academy of art and science, an infirmary, hospitals, asylums, dispensaries, é&c., three theatres, an opera-house, a museum, and many fine public buildings. The most imposing building in the city is the new city hall, one of the finest structures of the kind in the country. It occupies an entire square of ground, an area of about 26,000 square feet, near the centre of the city, and contains the various municipal offices. The style of architecture is the Renaissance, of which it is a fine specimen.

The entire outer facing of the walls, the portico, and all the ornamental work, are of white Maryland marble ; the 'nner walls and floors are of brick, and are fire-proof. It 18 four stories high, surmounted by a Mansard roof of iron and slate, with a dome and tower of iron on a marble base, rising to the height of 240 feet. The interior is very finely finished. It was begun in 1867, and cost about $2,600,000. Another important public

building is that of the Peabody Institute, founded by the late George Peabody, Esq., of London, and endowed by him to the amount of $1,400,000. It has provisions for a public library, a gallery of art, and a conservatory of music, also for lectures and musical performances. It was incorporated in 1857. One wing of the building, which is immediately contiguous to the Washington monument, is completed, and the remainder is in progress. The completed wing is faced and ornamented with white marble, in a simple but massive and imposing style, and contains the library of over 56,000 volumes (1875), and a hall for lectures, concerts, &c. The custom- house is a spacious building, 225 feet long, by 141 feet wide. ‘The principal room is 53 feet square, and is lighted by a dome 115 feet above the street. On its four sides are colonnades, the columns of which are each a single block of fine Italian marble. Baltimore has several splen- Monu- did monuments, which have acquired for it the name ments. of “the Monumental City.” The largest of these, erected to the memory of Washington, stands on an eminence of 150 feet, and has, with its base, an altitude of 200 feet. It is of white marble ; the base is 50 feet square, and 24 feet in height, surmounted by a Doric column 25 feet in diameter at the base, with a spiral staircase in its interior, and on the summit is a statue of Washington, 13 feet high. The “Battle Monument,” also of white marble, was erected by public subscription in 1815, to the memory of those who had fallen in defence of the city in the previous year. It is 52 feet high; the base is of Egyptian architecture ; the column is in the form of a bundle of Roman fasces, upon the bands of which are inscribed the names of those whom it commemorates; and the whole is surmounted by a female figure, the emblematical genius of the city. The city

Baltimore contains about 200 churches, and has Buildings,

Water- supply

Parks.

Industries,

Harbour.

_ Railways,

is supplied with water from Lake Roland, an artificial

lake about 8 miles north of the city, of a capacity of | 025.

500,000,000 gallons, and from three other reservoirs, with an aggregate storage capacity of about 580,000,000 gallons, the common source of supply being Jones's Falls. There are also numerous public springs and fountains throughout the town. Baltimore has a number of parks and public squares, chief of which is Druid Hill Park, a tract of 700 acres on the extreme north-west of the city, possessing more natural beauties than any other in the United States.

The manufactures and commerce of Baltimore are very extensive and flourishing. There is scarcely a branch of industry that is not prosecuted to some extent in the city or its vicinity. Among these are shipbuilding, iron and copper works, woollen and cotton manufactures, pottery, sugar-refining, petroleum-refining, distilling, saddlery, agri- cultural implement-making, cabinet-making, tanning, dc. In the vicinity of Baltimore is found the finest brick-clay in the world, of which more than 100,000,000 bricks are made annually. The Abbott Iron-works, in the eastern part of the city, have the largest rolling-mills in the United States. An industry peculiar to Baltimore is the packing of oysters in air-tight cans for shipment to all parts of the world. The oysters are taken in the Chesapeake Bay. Fruits and vegetables are also packed in the same way, the entire trade consuming from twenty to thirty million cans annually, 'This city is one of the greatest flour-markets in the Union, and has a large export trade in tobacco. There belonged to the port of Baltimore (30th November 1874) 834 vessels, registering 84,900 tons, of which 66 vessels (22,000 tons) were engaged in foreign, and the rest in the coasting trade. These figures show a considerable reduc- tion from those of 1860, as a result of the war between the States, during which many Baltimore vessels were en- rolled under foreign flags, and have so remained. There are twenty-six banks, with a capital (in 1874) of $14,000,000, and seven savings-banks ; seventeen fire and marine and three life insurance companies, besides many agencies for other companies. The assessed value of taxable pro- perty of all kinds in Paltimore for the year 1870 was $207,181,550, and for the year 1875,

$231,242,313, being an increase of $24,060,763. The harbour, which consists of three parts, is excellent. Its entrance, be- tween Fort M‘Henry and the lazaretto, is about 600 yards wide, with 23 feet of water. This depth is con- tinued with an increased width for a mile and a quarter, to near Fell’s Point. The entrance to the second harbour is opposite Fell’s Point, where the width is contracted to one- fourth of a mile, with a depth of 16 feet. Above this entrance it widens into an ellipse of a mile long, half a mile broad, and 15 feet deep. The third, or inner harbour, has a depth of 14 feet, and penetrates to near the centre of the city. Vessels of the largest class can lie at the wharves near Fell’s Point, Locust Point, and Canton, and those of 500 tons can come into the inner harbour. The harbour is defended by Fort M‘Henry. The railroads of Baltimore are,—-The Philadelphia, Wilmington, and Baltimore line, opened in 1837, length 98 miles; the Northern Central, to Sunbury in Pennsylvania, completed in 1858, length 138 miles; the Baltimore and Potomac to the Potomac River, opened in 1873, length 73 miles, with a branch to Washington (on this road there is a tunnel a mile and three-quarters in length); the Baltimore and Ohio, the main stem of which goes to Wheeling, a distance of 379 miles, opened through in 1853. It has the Parkersburg Division, 104 miles; the Central Ohio Division, to Colum- bus, 513 miles from Baltimore ; and the Lake Erie Division to Chicago, opened in 1874, 878 miles, The city is also traversed by numerous lines of horse-railways for the convenience of local travel. In healthfulness Baltimore is

the fourth city in the Union, its annual death-rate being Its mean annual temperature is 56° Fabr.; the mean summer and winter temperatures 76° and 36° respectively.

BALUCHISTAN, a maritime country of Asia, whose coast is continuous with that of the north-western part of the Indian Peninsula. It is bounded on the N. by Afghanistan, on the E. by Sindh, on the S. by the Arabian Sea, and on the W. by Persia. The frontier between Persia and Baluchistan has been drawn by an English commission, sent out in 1870 under Sir F. Goldsmid, from Gwadur Bay (about 61° 36’ E. long.) northwards, to lat. 26° 15’ N., when it turns eastward to the Nihing River, following which N.

and E. to its sources, it passes on to about 63° 12’ E. long., when it resumes a northerly direc- tion to Jalk. As thus determined, Baluchistan has an area of about 106,500 sq. miles. It extends from lat. 24° 50’ to 30° 20’, and from long. 61° 10’ to 68° 38’; its extreme length from E. to W. being 500 miles, and its breadth 370.

The outline of the sea-coast is in general remarkably regular, running nearly due E. and W., a little N. of lat. 24° 46’ from Cape Monze, on the border of Sindh, to Cape Jewnee, near the River Dustee. It is for the most part craggy, but not remarkably elevated, and has in some places, for considerable distance, a low sandy shore, though almost everywhere the surface becomes much higher inland. The principal headlands, proceeding from E. to W., are Cape Monze or Ras Moarree, which is the eastern headland of Sonmeanee Bay; Goorab Sing; Ras Arubah; Ras Noo, forming the western headland of Gwadel Bay ; Ras Jewnee, forming the eastern point of Gwadur Bay, and Cape Zegin

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Sketch Map of Baluchistan.

at its western extremity. There is no good harbour along the coast, though it extends about 600 miles; but there are several roadsteads with good holding-ground, and sheltered on several points. Of these the best are Son-meanee Bay, Homara, and Gwadur. On the latter are situated a small town and a fort of the same name, and also a telegraph station of the Indo-European line.

Of the early history of this portion of the Asiatic continent little or nothing is known. The poverty and natural strength of the country, combined with the ferocious habits of the natives, seem to have equally repelled the friendly visits of

inquisitive strangers and the hostile incursions of invading armies. The first distinct account which we have is from Arrian, who, with his usual brevity and severe veracity, narrates the march of Alexander through this region, which he calls the country of the Oritz and Gadrosii. He gives a very accurate account of this forlorn tract, its general aridity, and the necessity of obtaining water by digging in the beds of torrents; describes the food of the inhabitants as dates and fish ; and adverts to the occasional occurrence of fertile spots, the abundance of aromatic and thorny shrubs and fragrant plants, and the violence of the monsoon in the western part of Mekran. He notices also the impossibility of subsisting a large army, and the con-sequent destruction of the greater part of the men and beasts which accompanied the expedition of Alexander. At the commenccment of the 8th century this country was traversed by an army of the caliphate.

The country derives its name from the Baluches, but the Brahocs are considered the dominant race, from which the ruler of the country is always selected. From whatever quarter these may have arrived, they eventually expelled, under their leader _Kumbur, the Hindu dynasty, which at that time governed the country, and conquered Baluchistan for themselves. The Baluches are a quite distinct race, and must have arrived in the country at a subsequent period, probably in small bodies, some of which may have come from Syria or from Arabia; in proof of this the Kyheree, for instance,

possess a remarkably handsome breed of horses showing unmistakable Arab blood. Anyhow, so marked is the social distinction between Baluch and Brahoe, that when the khan assembles his forces for war the latter tribes demand, as their right, wheaten flour as a portion of their daily rations, while the Baluch tribes are only entitled to receive that made from a coarse grain called jowar. There is also a Persian colony known as the Dehwars; and a considerable number of Hindus, who appear to have been the first settlers in the Brahoe mountains on their expulsion from Sindh, Lus, and Mekran by the caliphs of Baghdad.

Taking a general view on the subject of the original inhabitants of Baluchistan, we may couclude that they have, from a very early date, been reinforced by emigration from other countries, and from stragglers dropped from the hosts of the numerous conquerors, from Alexander to Nadir Shah, who have passed and repassed through Baluchistan or its neighbourhood on their way toand from India. Thus we find the Saka tribe located on the plains of Gressia, on the borders of Mekran, the ancient Gedrosia, and still further to the west, the Dahoe. These tribes are on the direct line of Alexander’s march ; and we know that tribes of this name from the shores of the Caspian accompanied his army. In Sarawan we find the Sirperra, and Pliny tells us that a tribe called Sarapare resided near the Oxus. Further, on the Dushti-be-doulets, a plain at the northern entrance of the Bolan Pass, we find the Kurds, a name, again, familiar as that of a celebrated and ancient nation. The names of numerous other tribes might be cited to support this view, but it would require too much space to follow up the subject. Both Brahoes and Baluches are Mahometans of the Suni persuasion.

The precise period at which the Brahoes gained the mastery cannot be accurately ascertained ; but it was probably about two centuries ago. The last rajah of the Hindu dynasty found himself compelled to call for the assistance of the mountain shepherds, with their leader, Kumbur, in order to check the encroachments of a horde of depredators, headed by an Afghan chief, who infested the country, and even threatened to attack the seat of government. Kumbur successfully performed the service for which he had been engaged; but having in afew years

quelled the robbers, against whom he had been called in, and finding himself at the head of the only military tribe in the country, he formally deposed the rajah and assumed the government.

The history of the country after the accession of Kumbur is as obscure as during the Hindu dynasty. It would appear, however, that the sceptre was quietly transmitted to Abdulla Khan, the fourth in descent from Kumbur, who, being an intrepid and ambitious soldier, turned his thoughts towards the conquest of Cutch-Gundava, then held by different petty chiefs, under the authority of the Nawabs of Sindh.

After various success, the Kumburanees at length pos- sessed themselves of the sovereignty of a cousiderable por- tion of that fruitful plain, including the chief town, Gundava. It was during this contest that the famous Nadir Shah advanced from Persia to the invasion of Hindustan; and while at Kandahar, he despatched several detachments into Baluchistan, and established his authority in that province. Abdulla Khan, however, was continued in the government of the country by Nadir's orders; but he was soon after killed in a battle with the forces of the Nawabs of Sindh. He was succeeded by his eldest son, Hajee Mohummud Khan, who abandoned himself to the most tyrannical and licentious way of life, and alienated his subjects by oppressive taxation. In these circumstances Nusseer Khan, the second son of Abdulla Khan, who had accompanied the victorious Nadir to Delhi, and acquired the favour and confidence of that monarch, returned to Khelat, and was hailed by the whole population as their deliverer. Finding that expostulation had no effect upon his brother, he one day entered his apartment and stabbed him to the heart. As soon as the tyrant was dead, Nusseer Khan mounted the musnud, amidst the universal joy of his subjects ; and immediately transmitted a report of the events which had taken place to Nadir Shah, who was then encamped near Kandahar. The shah received the intelligence with satisfac- tion, and despatched a firman, by return of the messenger, appointing Nusseer Khan beglerbey of all Baluchistan. This event took place in the year 1739.

Nusseer Khan proved anactive, politic, and warlike prince. He took great pains to re-establish the internal government of all the provinces in his dominions, and improved and forti- fied the city of Khelat. On the death of

Nadir Shah in 1747, he acknowledged the title of the king of Cabul, Ahmed Shah Abdulla. In 1758 he declared himself entirely independent ; upon which Ahmed Shah despatched a force against him, under one of his ministers. The khan, however, raised an army and totally routed the Afghan army. On receiving intelligence of this discomfiture, the king himself marched with strong reinforcements, and a pitched battle was fought, in which Nusseer Khan was worsted. He retired in good order to Khelat, whither he was followed by the victor, who invested the place with his whole army. The khan made a vigorous defence ; and, after the royal troops had been foiled in their attempts to take the city by storm or surprise, a negotiation was pro- posed by the king, which terminated in a treaty of peace. By this treaty it was stipulated that the king was to receive the cousin of Nusseer Khan in marriage ; and that the khan was to pay no tribute, but only, when called upon, to furnish troops to assist the armies, for which he was to receive an allowance in cash equal to half their pay. The khan frequently distinguished himself in the subsequeut wars of Cabul; and, as a reward for his services, the king bestowed upon him several districts in perpetual and entire sovereignty. Having succeeded in quelling a dangerous rebellion, headed by his cousin Beleram Khan, this able prince at length died in extreme old age, in the month of June 1795, leaving three sons and five daughters. He

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was succeeded by his eldest son Muhmood Khan, then a boy of about fourteen years. During the reign of this prince, who has been described as a very humane and indolent man, the country was distracted by sanguinary broils ; the governors of several provinces and districts withdrew their allegiance; and the dominions of the khans of Khelat gradually so diminished, that they now comprehend ouly a small portion of the provinces formerly subject to Nusseer Khan.

In 1839, when the British army advanced through the Bolan Pass towards Afghanistan, the conduct of Mehrab Khan, the ruler of Baluchistan, was considered so treacher- ous and dangerous, as to require “the exaction of retri- bution from that chieftain,” and “ the execution of such arrangements as would establish future security in that quarter.” General Willshire was

accordingly detached from the army of the Indus with 1050 men to assault Khelat. A gate was knocked in by the field-pieces, and the town and citadel were stormed in a few minutes. Above 400 Baluches were slain, among them Mehrab Khan himself ; and 2000 prisoners were taken. Subsequent inquiries have, however, proved that the treachery towards the British was not on the part of Mehrab Khan, but on that of his vizier, Mahomed Hassein, and certain chiefs with whom he was in league, and at whose instigation the British convoys were plundered in their passage through Cutch- Gundava and in the Bolan Pass. The treacherous vizier, however, made our too credulous political officers believe that Mehrab Khan was to blame,—his object being to bring his master to ruin and to obtain for himself all power in the state, knowing that Mehrab's successor was only a child. How far he succeeded in his object history has shown. In the following year Khelat changed hands, the governor established by the British, together with a feeble garrison, being overpowered. At the close of the same year it was reoccupied by the British under General Nott. In 184], Nusseer Khan, the youthful son of the slain Mehrab Khan, was recognized by the British, who soon after evacuated the country.

From the conquest of Sindh by the British troops under the command of the late General Sir Charles Napier in 1843 up to 1854, no diplomatic intercourse occurred worthy of note between the British and Baluch states. In the latter year, however, under the governor-generalship of the late marquis of Dalhousie, the late Gencral John Jacob, C.B., at the time political superintendent and commandant on the Sindh frontier, was deputed to arrange and conclude a treaty between the Khelat state, then under the chieftain- ship of Meer Nusseer Khan, and the British Government. This treaty was executed on the]4th of May 1854, and was to the following effect :—

"That the former offensive and defensive treaty, con- cluded in 1841 by Major Outram between the british Government and Meer Nusseer Khan, chief of Khelat, was to be annulled.

"That Meer Nusseer Khan, his heirs and successors, bound themseives to oppose to the utmost all the enemies of the British Government, and in all

cases to act in subor- dinate co-operation with that Government, and to enter into no negotiations with other states without its consent.

“That should it be deemed necessary to station British troops in any part of the territory of Khelat, they shall occupy such positions as may be thought advisable by the British authorities.

“That the Baluch chief was to prevent all plundering on the part of his subjects within, or in the neighbourhood of, British territory.

“That he was further to protect all merchants passing through his territory, and only to exact from them a transit duty, fixed by schedule attached to the treaty ; and

that, on condition of a faithful performance of these duties, he was to receive from the British Government an annual subsidy of 50,000 rupees (£5000). ”

The provisions of the above treaty were most loyally performed by Meer Nusseer Khan up te the time of his death in 1856. He was succeeded by his brother, Meer Khodadad Khan, the present ruler, a youth of twelve years of age, who, however, did not obtain his position before he had put down by force a rebellion on the part of his turbulent chiefs, who had first elected him, but, not receiving what they considered an adequate reward from his treasury, sought to depose him in favour of his cousin Shere dil Khan. In the latter part of 1857, the Indian rebellion being at its height, and the city of Delhi still in the hands of the rebels, a British officer (Major Henry Green) was deputed, on the part of the British Government, to reside, as political agent, with the khan at Khelat, and to assist him by his advice in maintaining control over his turbulent tribes, This duty was successfully performed until 1863, when, during the temporary absence of Major Malcolm Green, the then political agent, Khodadad Khan was, at the instigation of some of his principal chiefs, attacked, while out riding, by his cousin, Shere dil Khan, and severely wounded. Khodadad fled in safety to a residence close to the British border, and Shere dil Khan was elected and proclaimed khan. His rule was, however, a short one, for, carly in 1864,

when proceeding to Khelat, he was murdered in the Gundava Pass; and Khodadad was again elected chief by the very men who had only the previous year caused his overthrow, and who had lately been accom- plices to the murder of his cousin. Since the above events Khodadad has maintained his precarious position with great difficulty ; but owing to his inability to govern his unruly subjects without material assistance from the British Government, which they are not disposed to give, his country has gradually fallen into the greatest anarchy ; and, consequently, some of the provisions of the treaty of 1854 having been broken, diplomatic relations have been discontinued with the Khelat state since the end of 1874.

The territories of Baluchistan are now comprised undcr the following divisions—Jalawan, Sarawan, Khelat, Mekran, Lus, Cutch-Gundava, and Kohistan.

The most remarkable features of this extensive country are its rugged and elevated surface, its barrenness, and its deficiency of water. The mass of mountains which forms the eastern boundary of that division of Baluchistan called the Kohistan, or mountain territory, lying between the capital, Khelat (lat. 29° I’ 38” N., long. about 66° 39’ E.), and the plain country to the east of it, designated Cutchee, or Cutch-Gundava, is composed of several parallel ranges of limestone rock, in close proximity to each other, having a general strike of N.N.E. to 5.8. W. and a breadth of about 55 miles. This range originates in Afghanistan, and enters Baluchistan north of the Bolan Pass in about 30° N. lat. and about 60° 30’ E. long. under the name Herbooe ; and, after throwing out a branch to the eastward, which touches the River Indus at Sehwan, terminates under the designa- tion of the Hala Mountains, at Cape Monze on the coast of the Arabian Sea, W. of Kurrachee, in about 25° N. lat. and 66° 68’ E. long., thus having a total length of upwards of 300 miles. The highest mountain of this range is the Chehil Tan, bearing about N. by E., 85 miles from Khelat, and attaining an altitude of 12,000 feet above the sea. The western range of the Herbovuc Mountains in this portion of Baluchistan are barren and without timber, and scantily peopled with pastoral tribes of Brahoes, who cmigrate to the plains of Cutchee on the approach of the winter months.

North of the Bolan River and Pass tne Herbovoe Mountains are met, in about lat. N. 30°, by confused ranges

of rough precipitous mountains, which extend to the east- ward with a strike nearly E. and W. to the Sooliman range, in about 29° 5’ N. lat. and about 69° 30’ E. long. This tract is almost entirely inhabited by Murrees, Boogtees, and other tribes of Baluch plunderers, and is bounded on the N. by the province of Sewestan. South of these ranges lies the desert country, which touches the Sindh frontier in 28”.27′ NN. let.

The two principal water-courses which drain the Kohistan portion of Baluchistan E. of Khelat are the rivers Bolan and Moola, the former rising about 60 miles N.E. of Khelat, the latter at Anjeera, lat, 28° 19’ N., long. about 66° 29’ E., about 45 miles south of that city. They both discharge themselves into the plains of Cutchee, the former at Dadur, lat. about 29° 28’ 51” N., long. about 67° 26’ E., and the latter at Kotra near Gundava, lat. 28° 33’ 47” N., long. about 67° 26’ E. There is at all seasons a plentiful supply of clear running water in these streams, which is entirely used up for irrigational purposes on issuing into the plains. They are subject to dangerous floods from sudden storms in the neighbouring mountains during the rainy season. The two easiest and safest passes from Central Asia into India take their names from these streams. South of the Moola the Gaj River issues into the plains, and its waters are also absorbed in cultivation. The Nara issues into the plains near Kujjuk, N.W. corner of Cutch-Gundava, in lat. about 29° 36’ N., and long. about 68° 2’ E.; ordinarily its water is utilized entirely for cultivation in its course through the Afghan province of Seebee; but at periods of heavy rains in the mountains it is liable to burst its banks, and then inundates immense tracts in tle Cutchee desert to the south.

West of Khelat, as far as about 65° 30’ E. long., the mountain ranges have much the same strike, and are of the same nature as those to the eastward, but the ranges are much narrower, more defined, and of a lower altitude. The valleys between them vary from 5 to 15 miles in breadth ; they are quite devoid of trees. The water-courses generally follow the direction of the hills from N. to 8. and in some instances during heavy rains their waters

reach the Arabian Sea; but as a general rule they are absorbed long before they reach the coast, partly in cultivation, but principally by the sandy arid nature of the soil aud excessive dryness of the atmosphere,—due, probably, to the proximity of the great desert west of Kharan, which extends to the confines of Persia. The most important of these water- courses is the Dustee or Mooleanee.

The climate of Baluchistan is extremely various in the different provinces. The soil in general is exceedingly stony. In the province of Cutch-Gundava, however, it is rich and loamy, and so very productive, that, it is said, were it all properly cultivated, the crops would be more than sufficient for the supply of the whole of Balu- chistan. Gold, silver, lead, iron, tin, antimony, brimstone, alum, sal-ammoniac, and many kinds of mineral salts, and saltpetre, are found in various parts of the country. The precious metals have only been discovered in working for iron and lead, in mines near the town of Nal, about 150 miles §.8.W. of Khelat. The different other minerals above enumerated are very plentiful. The gardens of Khelat produce many sorts of fruit, which are sold at a very moderate rate, such as apricots, peaches, grapes, almonds, pistachio-nuts, apples, pears, plums, currants, cherries, quinces, figs, pomegranates, mulberries, plantains, melons, guavas, &c. All kinds of grain known in India are cultivated in the different provinces of Baluchistan, and there is abundance of vegetables. Madder, cotton, and indigo are also produced; and the latter is considered superior to that of Bengal. Great attention is given to the culture of the date fruit in the province of Mekran.

BALUCHISTAN

The domestic animals of Baluchistan are horses, mules, asses, camels, buffaloes, black-cattle, sheep, goats, dogs, and cats, besides fowls and pigeons ; but there are neither geese, turkeys, nor ducks. The wild animals are tigers, leopards, hyenas, wolves, jackals, tiger-cats, wild dogs, foxes, hares, mangooses, mountain goats, antelopes, elks, red and moose deer, wild asses, &c. Of birds they have almost every species to be met with either in Europe or India.

The principal towns in Baluchistan are as follows :— KHELAT is the capital of the whole country ; Mustoong, of the province of Sarawan;

Kozdar, of Jalawan; Beyla, of Beyla; Kej, of Mekran; Bagh, of Cutch-Gundava ; and Dadur and Gundava are towns in the last-mentioned province.

The capital stands on an elevated site 7000 feet above the sea, on the western side of a well-cultivated plain or valley, about eight miles long and two or three broad, a great part of which is laid out in gardens and other enclosures. ‘The town is built in an oblong form, and on three sides is defended by a mud wall, 18 or 20 feet high, flanked, at intervals of 250 yards, by bastions, which, as well as the wall itself,are pierced with numerous loopholes for matchlock-men, The defence of the fourth side of the city has been formed by cutting away perpendicularly the western face of the hill on which it is partly built. On the summit of this eminence stands the palace, command- ing a distinct view of the town and adjacent country. That quarter of the hill on which the khan’s residence is erected has been enclosed by a mud wall, with bastious ; the entrance to it is on the south-western side ; and here, as well as at the city gates, which are three in nuniber, there is constantly a guard of matchlock-men. Both town and citadel are, however, completely commanded by the surrounding hills, and are incapable of offering any resist- ance against artillery. Within the walls there are upwards of 2500 houses, and the number of these in the suburbs probably exceeds one-half of that amount. The houses are mostly built of half-burnt brick or wooden frames, and plastered over with mud or mortar. In general, the streets are broader than those of native towns, and most of them | have a raised pathway on each side for foot-passengers, and have also an uncovered kennel in the centre, which is a nuisance, fron the quantity of filth thrown into it, and the stagnant rain-water that lodges there. The upper stories of the houses frequently project across the street, and thereby render the part beneath them gloomy and damp. This seems a very rude attempt to imitate the bazaars of Persia and Cabul. The bazaar of Khelat is extensive, well fur- nished with every kind of goods; all the necessaries of life may be purchased there at a moderate price. The town is supplied with delicious water from a spring in the face of a hill on the opposite side of a plain, whence it meanders nearly through its centre, having the town and suburbs on one side, and on the other the gardens. It may be remarked of this spring, that the waters, at their immediate issue from the smaller channels, possess a con- siderable degree of tepidity until

after sunrise, when they suddenly become exceedingly cold, and remain so during the day.

We have no data from which we can form an accurate computation of the population of Baluchistan, but it may be estimated at about 400,000. ‘The two great races of Baluch and Brahoe, each subdivided into an infinite number of tribes, are clearly distinguished from each other by their language and appearance. The Baluch, or Baluchekee, language partakes considerably of the idiom of the modern Persian, although greatly disguised under a singularly corrupt pronunciation. The Brahoekee, on the other hand, has nothing analogous to Persian, but appears to contain @

great number of ancient Hinduwee words; and, as it strikes the ear, bears a strong resemblance to the dialect spoken in the Panjaub. The Baluchesin general have tall figures, long visages, and raised features ; the Brahoes, on the contrary, have short, thick bones, with round faces and flat lineaments.

The Baluches are a handsome, active race of men, not possessing great physical strength, but inured to changes of climate and season, and capable of enduring every species of fatigue. In their habits they are pastoral and much addicted to predatory warfare, in the course of which they do not hesitate to commit every kind of outrage and cruelty. Notwithstanding their predatory habits, how- ever, they are considered to be a hospitable people. After the fashion of other barbarous tribes in that part of the world, they will protect and kindly entertain a stranger while their guest, but feel no scruple in robbing and murdering him as soon as he has left their precincts. They are indolent, and unless excited by amusement or war, or compelled to action by some urgent motive, spend their time in idleness, rude dissipation, and the enjoyment of such coarse luxuries as they can procure—in lounging, gambling, smoking tobacco or hemp, and chewing opium. The tenets of their religion,—and still more, perhaps, their poverty,—preserve them from the abuse of fermented liquors. Their principal articles of food are milk in all its forms, the flesh of domestic animals, not excepting that of the camel, and game, including wild asses, the flesh of which is considered a delicacy. Their appetites are vora- cious; they consume incredible quantities of flesh when it can be obtained, and prefer it in a half-cooked

state. They also use grain in the form of bread, and prepared variously otherwise ; but they enjoy most such articles of food or condiment as possess a strong and stimulating flavour, a8 capsicum, onions, and garlic. Their indolence prompts them to keep as many slaves as they can obtain and support. Polygamy is universal. Some of the lower orders have as many as eight women, either as wives or mistresses, and the number is increased in proportion to the rank and means of the man. Wives are obtained by purchase, pay- ment being made in cattle or other articles of pastoral wealth, The ceremony of marriage is performed by the moollah or priest ; and on this occasion, as well as on some others affecting females, practices similar to those of the Levitical law are observed. For instance, in this country, as also among the Afghans, a man is expected to marry the widow of a deceased brother. When a death takes place, the body is watched for three successive nights by assembled friends and neighbours, who spend their time in feasting, so that the ceremony seems intended rather to furnish enjoyment to the living than to render honour to the dead.

The common dress of the Brahoes is a coarse white or blue calico shirt, buttoned round the ueck, and reaching below the knee; their trousers are made of the same cloth, or of a kind of striped stuff called soosee, and puckered round the ankles. On their heads they wear a small silk or cotton quilted cap, fitted to the shape of the skull, and a kummurbund or sash, of the same colour, round their waists. The Baluches wear a similar dress, but a turban on the head and wide trousers unconfined at the ankle. In winter the chiefs and their relatives appear in a tunic of chintz, lined and stuffed with cotton; and the poorer classes, when out of doors, wrap themselves up in a surtout made of cloth, manufactured from a mixture of goats’ hair and sheep’s wool. The women’s dress is very similar to that of the men; their trousers are preposterously wide, and made of silk, or a mixture of silk and cotton.

The fluctuation of power renders it difficult to define precisely the nature of the government of Khelat. During

the reign of Nusseer Khan the whole kingdom might be said to have been governed by a complete despotism ; yet that ruler so tempered the supreme

authority by the privi- leges granted to the feudal chiefs within their own tribes, that, to a casual observer, it bore the appearance of a military confederation, The tribes all exercise the right of selecting their own sirdar, or head ; and the khan has the power of confirming or disapproving of their nomination ; but this power is never exercised, and appears to be merely nominal. The khan of Khelat declares war and makes treaties connected with the whole of Baluchistan, and can order the sirdar of each tribe to attend in person with his quota of troops. Agreeably to a code of regulations framed by one of the earliest princes of the Kumburanee dynasty, the entire administration of justice was vested in the person at the head of the government. ‘The sirdar, however, has the power of adjusting petty quarrels, thefts, and disputed points of every description, among the inhabitants of a kheil or society ; but, in all cases of importance, an appeal lies in the last instance to the khan at Khelat.

The amount of revenue enjoyed by the khan of Khelat is inconsiderable, as the ruling races, Baluch and Brahoe, pay no direct taxes, and their poverty and simple habits prevent them from contributing much indirectly. His income is therefore derived from his resources as a pro- prietor of lands or towns; from a proportion of the produce paid in kind by the Afghan, Dehwar, and Jet cultivators; from dues on direct and transit trade; and from arbitrary exactions, a never-failing mode with EKastern potentates of recruiting an exhausted treasury. Pottinger estimated the amount at 350,000 rupees ; Masson, who had ample means of acquiring information through colloquial channels, at 300,000. At the present date (1875) it is 300,000 rupees or £30,000 at the utmost. With such a revenue it is obvious that no standing army can be main- tained ; and Masson, certainly very competent to the task of acquiring information on this subject, states that Mehrab Khan, “nearly destitute of troops in his own pay, was com- pelled, on the slightest cause for alarm, to appeal to the tribes, who attended or otherwise as suited their whims or convenience.” Pottinger computed the number of available fighting men at 60,000. Mehrab Khan could on no occasion assemble more than 12,000; and in his final struggle for property, power, and life, the number of his troops did not amount to 3000. At the present time (1875) about 40,000 would probably be available if all attended the summons, but the utmost number the khan could collect would be about 10,000. Alldepends upon the state of the treasury, the cause of the war, and

the power the khan may be able to exert over his chiefs. The Baluch soldier is heavily encumbered with arms, carrying a matchlock, a sword, a dagger, and a shield. Pottinger considered them good marksmen, and states that in action they trust principally to their skill in this respect, avoiding close combat; but their readiness in general to close with the British troops shows that he is in this instance mistaken. There were no Brahoes opposed to our forces at the battle of Meanee, nor were there any Baluches from Baluchistan. The levies of the Ameer of Sindh were principally composed of Sindee and Baluch tribes, who had long been settled in Sindh. The greater part serve on foot; but a number, not incon- siderable, have horses. Camels are only used by tribes on the western borders of Baluchistan in their predatory excursions.

BALUE, Jean, a French cardinal, who raised himself from a very mean station to dignity and honours. He was born of very humble parentage at Angle in Poitou, in 1421, and was first patronised by the bishop of Poitiers, He eventually became almoner to Louis XI., and managed to secure a considerable share in the government; but

being detected in treasonable correspondence with the duke of Bourgogne, he was confined by Louis in an iron cage 8 feet square. On his release, however, eleven years after- wards, he was loaded with honours by Sixtus IV., was sent as legate to France, and received the bishopric of Albano. He died at Ancona in 1491.

BALUZE, Etienne, a celebrated French scholar, was born at Tulle on the 24th of December 1630, and died in July 1718. After completing his education at the uni- versity of Toulouse, he was invited by M. de Marca, afterwards archbishop of Paris, to undertake the superin- tendence of his library. De Marca died in 1662, and Baluze, after acting as librarian to Le Tellier and. the archbishop of Auch, obtained in 1607 a similar situation with the famous Colbert, which he retained till 1700, some years after the death of that minister. His reputa- tion and his mastery of French law and antiquities obtained for him in 1670 the professorship of canon law in the royal college, a chair founded expressly for him. On the fall of the Cardinal de Bouillon in 1710, Baluze, who had attached himself to his party, was

removed by a lettre de cachet from Paris, and transferred from Rouen to Blois, Tours, and Orleans in succession. He obtained his recall in 1713, though he never recovered his professorship. Of Baluze's numerous works the best known is the Capitularia Regum Francorum, which is of considerable historical value. The Miscellanea, in 7 vols., contain several curious extracts from manuscripts found by him in the libraries at Paris.

BALZAC, Honoré vs, perhaps the greatest name in the post-Revolutionary literature of France, was born at Tours in 1799, and died in 1858. His date thus corre- sponds with the whole period of the rise, the acme, and the decline of the Romantic school, to which he can scarcely, however, be said to have belonged. It is true that be was inspired by many of the influences that animated Victor Hugo and his followers. Like them he was much occupied by the study of the fantastic element in medizval art, so strongly opposed to the calm and limit of classical litera- ture, like them he reproduced the remoter phases of life and passion, and thought that few subjects were so base or obscure as to be unworthy of artistic treatment. But there is something in the powerful personality of Balzac indicated by the colossal body, by the strong and sensual face, somewhat resembling the profile of the Emperor Nero, which preserved him from the mannerism of any school. He was never successful in reproducing the existence of the past, he was essentially the man of his own day, and La Comédie Humaine is as much the picture of the 19th, as the Divina Commedia is of the 13th century. The passions that move his characters are the intense desire of boundless wealth, of luxury, of social distinction; and though here and there his financiers, his journalists, his political intriguers, his sordid peasantry, are relieved by the introduction of some pure figure, like that of Eugénie Grandet, of David, or of Eve, there are only too many elaborate studies of creatures sunk below the surface of humanity, the embodiments of infinite meanness and nameless sin. He was merely "the secretary of society," he said, and "drew up the inventory of vices and virtues." His ambition was, "by infinite patience and courage, to compose for the France of the 19th century that history of morals which the old civilizations of Rome, Athens, Memphis, and India, have left untold." The consequence of this ambition is, that Balzac's voluminous romances have too often the air of a minute and tedious chronicle, and that the contemporary reader is wearied with a mass

of details about domestic architecture, about the stock exchange, and about law, which will prove invaluable to posterity.

Balzac’s private history, which may be traced through

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many passages of his novels, was a strange and not a happy one. He was early sent from his home in Tours to the college of Vendéme, where he neglected the studies and sports of childhood to bury himself in mystic books aud mystic reveries. He has told the story of his school life in Louis Lambert, how he composed a théorie de la volonté, a theory which was to complete the works of Mesmer, Lavater, Gall, and Bichat. This promising treatise was burned by one of the masters of the school ; and Balzac, falling into bad health, returned home. The next stage in his education was a course of study at the Sorbonne, and of lectures on law. In the offices of avowés and notaries he picked up his knowledge of the by-ways of chicanery,—knowledge which he uses only too freely in his romances. Nature did not mean Balzac for an advocate ; he was constant in the belief in his own genius, a belief which for many years he had all to himself, and his family left him to work and starve, on the scantiest pittance, in a garret of the Rue Lesdiguiéres. There followed ten years of hard toil, poverty, experiments in this and that way of getting a living. These struggles are described in Laceno Cane, in the Peau de Chagrin, and in a series of letters to the author’s sister, Madame de Surville. Balzac found ‘three sous for bread, two for milk, and three for firing ” suffice to keep him alive, while he devoured books in the library of the Arsenal, copied out his notes at night, and then wandered for hours among the scenes of nocturnal Paris. ‘Your brother,” he writes to Madame de Surville, ‘ig already nourished like a great man,—he is dying of hunger.” He tried to make money by scribbling many volumes of novels without promise, and borrowed funds to speculate in the business of printing. Ideas which have since made other men’s fortunes failed in Balzac’s hands, and he laid the foundations of those famous debts which in later life were his torment and his occupation. At length appreciation came, and with appreciation what ought to have been wealth. Balzac was unfortunately as prodigal of money as of labour; he would shut himself up

for months, and see no one but his printer; aud then for months he would disappear and dissipate his gains in some mysterious hiding-place of his own, or in hurried travelling to Venice, Vienna, or St Petersburg. As a child he had been a man in thought and learning ; as a man he was a child in caprice and extravagance. His imagination, the intense power with which he constructed new combina- tions of the literal facts which he observed, was like the demon which tormented the magician with incessant de- mands for more tasks to do. When he was not working at La Comédie Humaine, his fancy was still busy with its characters; he existed in an ideal world, where some accident was always to put him in possession of riches beyond the dreams of avarice. Meantime he squandered all the money that could be rescued from his creditors on sumptuous apparel, jewels, porcelain, pictures. His excesses of labour, his sleepless nights, his abuse of coffee under- mined his seemingly indestructible health. At length a mysterious passion for a Russian lady was crowned by marriage ; the famous debts were paid, the visionary house was built and furnished, and then, “ when the house was ready, death entered.” Balzac died at the culmination of his fame, and at the beginning, as it seemed, of the period of rest to which he had always looked forward.

It is impossible to enter on a detailed criticism of Balzac’s novels. In them he scales every height and sounds every depth of human character,—from the purity of the mys- terious Seraphitus Seraphita, cold and strange, like the peaks of her northern Alps, to the loathsome sins of the Marnefs, whose deeds should find no calendar but that of Hell. In the great divisions of his Comédre, the scenes of private and of public life of the provinces and of the city,

in the philosophic studies, and in the Contes Drolatiques, Balzac has built up a work of art which answers to a medizval cathedral. There are subterranean places, haunted by the Vautrins and “ Filles aux yeux d’or ;” there are the seats of the money-changers, where the Nucingens sit at the receipt of custom; there is the broad platform of everyday life, where the journalists intrigue, where love is sold for hire, where splendours and miseries abound, where the peasants cheat their lords, where women betray

their husbands ; there are the shrines where pious ladies pass saintly days; there are the dizzy heights of thought and rapture, whence falls a ray from the supernatural light of Swedenborg; there are the lustful and hideous grotesques of the Contes Drolatiques. Through all swells, like the organ-tone, the ground-note and mingled murmur of Parisian life. The qualities of Balzac are his extraordinary range of knowledge, observation, sympathy, his steadfast determination to draw every line and shadow of his subject, his keen analysis of character and conduct. His defects are an over-insistance on detail, which hampers and bewilders rather than aids the imagination of his readers ; his tortured style, "'a special language forged out of all the slangs, all the terminologies of science, of the studio, the laboratory, the cowlisses ;" his fondness for dwelling on the morbid pathology of human nature. With all these defects, and with the difficulty of judging any one of his tales separately, because each is only a fragment in the development of the immense Comédie Humaine, Balzac holds a more distinct and supreme place in French fiction than perhaps any English author does in the same field of art. (A. L.

BALZAC, Jean Louis Gurz Dk, a celebrated French writer, was born at Angouléme in 1594, His father was possessed of considerable property, and he himself was early befriended by the Cardinal de la Valette, who took him in his train to Rome. His letters written from that place to his acquaintances and' to many who held a high position at the French court, were expressed so admirably, and showed such powers of eloquence, as to gain for him the highest renown. On his return from Italy he was at once and everywhere received as a master in the art of composi- tion. The most extravagant compliments were showered upon him, and his head appears to have been turned a little by his success. In 1624 a collection of his Letters was published, and was received with great favour by the public. Soon afterwards a direct charge of plagiarism was made against Balzac in a pseudonymous tract, On the conformity of M. de Balzac's Eloquence with that of the Greatest Personages of Past and Present Time. A terribly fierce paper war was excited by this pamphlet ; and Balzac, in disgust, retired to his own estate, where he continued his labour of composition. In 1634 he expressed a desire to enter the Academy, and was at once elected with universal acclamation. He died at Paris in 1654. His fame rests entirely upon the Letters, which, though empty, bombastic, and affected in matter,

are written with great skill, and show a real mastery over the language, They introduced a new style; and Balzac has thus the credit of being the first reformer of French prose, as his contempo- rary Malherbe was the first reformer of French poetry.

BAMBA, a province of Congo, on the western coast of Africa, lying to the S. of the River Ambriz. This district is fertile, abounds in gold, silver, copper, salt, &c., and is said to be thickly populated. Its chief town, which bears the same name, was formerly of considerable importance, the climate being remarkably healthy for that region of Africa.

BAMBARRA, a country of inner Africa, on the Joliba or Upper Niger. The principal towns are Segu, Sansading, Jamima, Mursha, Jabbi, Sai, Kullikoro, Maraca-Duba, and

Damba, in many of which the Mahometans have mosques. For further particulars see ArRicA, vol. i. p. 271.

BAMBARRA, a town of western Africa on a backwater of the Niger, of considerable commercial importance, and situated in a fertile plain, 115 miles 8.8. W. of Timbuctoo. (See Barth's Travels in Central Africa, vol. iv. p. 354.)

BAMBERG, a town of Bavaria, in the circle of Upper Franconia, on the River Regnitz, 3 miles above its junction with the Maine, and 33 miles N. of Nuremberg, with which it is conncccted by railway. It is partially surrounded by walls and ditches, and is divided by the river and Ludwig's canal into three districts, which are connected by handsome bridges. The town is well built, and the streets are well paved and lighted. The cathedral, a noble struc- ture in the Byzantine style of architecture, is surpasscd by few of the kind in Germany. It was founded in 1004 by the Emperor Henry II., and finished in 1012, but was afterwards partially burnt, and rebuilt in 1110. It con- tains the tombs of the founder and his empress Cunigunde, Conrad ITI., Pope Clement IL, &c., and numerous monu- ments and paintings by eminent masters. Among the other public buildings are St Martin's church, the palace (formerly the residence of the prince-bishops), town-house, and theatre. The Benedictine convent of St Michael was turned, in 1803, into a charitable institution for poor citizens known as

Ludwig’s hospital. Bamberg has nume- rous literary and charitable institutions, as the lyceum, gymnasium, polytechnic, normal, and medical schools, a library, museum, picture-gallery, hospital, and workhouse. The trade is considerable; cloths, sealing-wax, leather, tobacco, musical instruments, carriages, &c., are manu- factured, and there are numerous breweries. The whole of the neighbouring district is like a vast garden, and fur- nishes large supplies of liquorice, carrots, aniseed, cori- ander, and other seeds. Bamberg was formerly the capital of an independent bishopric, which was secularized in 1801, and assigned to Bavaria in 1803. Population, 25,738.

BAMBOCCIO. See Larr, PETER VAN.

BAMBOO, a genus (Lumbusa) of arborescent grasses very generally distributed throughout the tropical lands of the globe, but found and cultivated especially in India, China, and the East Indian Archipelago. There is a large number of species enumerated ; but, as is the case with most plants under cultivation, much difficulty is found in distinguishing species from varieties produced by artificial selection, Bambusa arundinacea is the species most commonly referred to. It is a tree-like plant, rising to a height of 40, 60, or even 80 feet, with a hollow stem, shining as if varnished. The stem is extremely slender, not exceeding the thickness of 5 inches in some which are 50 feet high, and in others reaching 15 or 18 inches in diameter. The whole is divided into joints or septa called knots or internodes, the intervals between which in the case of some of the larger stems is several feet. These joints or divisions are formed by the crossing of the vascular bundles of fibres. They produce alternate lateral buds, which form small alternate branchlets springing from the base to the top, and, together with the narrow-pointed leaves issuing from them, give the plant an elegant feathered appearance as it waves in the wind. The rapidity of its growth is surprising. It attains its full height in a few months, and Mr Fortune records the observation of a growth of from 2 to 24 feet in a single day. In Malabar it is said to bear fruit when fifteen years old, and then to die.

The bamboo is cultivated with great care in regular plantations by the Chinese. The plant is propagated by shoots or suckers deposited in pits 18

inches or 2 feet deep at the close of autumn or the beginning of winter. Various expedients are followed to obtain good bamboos ; one of the most usual being to take a vigorous root and transplant

it, leaving only four or five inches above the joint next the ground. ‘The cavity is then filled with a mixture of horse- litter and sulphur. According to the vigour of the root, the shoots will be more or less numerous; they are destroyed at an early stage during three successive years ; and those springing in the fourth resemble the parent tree. The uses to which all the parts and products of the bamboo are applied in Oriental countries are almost endless. The soft aud succulent shoots, when just beginning to spring, are cut over and served up at table like asparagus. Like that vege-table, also, they are earthed over to keep them longer fit for consumption; and they afford acontinuous supply during the whole year, though it is more abundant in autumn. They are also salted and eaten with rice, prepared in the form of pickles, or candied and preserved in sugar. As the plant grows older, a species of fluid is secreted in the hollow joints, in which a concrete substance, highly valued in the East for its medicinal qualities, called tabaxir or tabascheer, is gradually developed. This substance, which has been found to be a purely siliceous concretion, is possessed of peculiar optical properties. As a medicinal agent the bamboo is almost or entirely inert, and it has never been received into the European materia medica. A decoction of the leaves of the plant is, however, employed in the Kast for pectoral affections, and the leaf-buds are said to be diuretic. The grains of the bamboo are available for food, and the Chinese have a proverb that it produces seed more abundantly in years when the rice crop fails, which means, probably, that in times of dearth the natives look more after such a source of food. ‘The Hindus eat it mixed with honey as a delicacy, equal quantities being put into a hollow joint, coated externally with clay, and thus roasted over a fire. It is, however, the stem of the bamboo which is applied to the greatest variety of uses. Joints of sufficient size form water buckets; smaller ones are used as bottles, and among the Dyaks of Borneo they are employed as cooking vessels. Bamboo is extensively used as a

timber wood, and houses are frequently made entirely out of the products of the plant ; complete sections of the stem form posts or columns; split up, it serves for floors or rafters ; and, interwoven in lattice-work, it isemployed for the sides of rooms, admitting light and air. The roof is sometimes of bamboo solely, and when split, which is accomplished with the greatest ease, it can be formed into laths or planks. It is employed in shipping of all kinds; some of the strongest plants are selected for masts of boats of moderate size, and the masts of larger vessels are sometimes formed by the union of several bamboos built up and joined together.

The bamboo is employed in the construction of all kinds of agricultural and domesticimplements, and in the materials and implements required in fishery. Bows are made of it by the union of two pieces with many bands; and, the septa being bored out and the lengths joined together, it is employed, as we use leaden pipes, in transmitting water to reservoirs or gardens, From the light and slender stalks shafts for arrows are obtained; and in the south-west of Asia there is a certain species of equally slender growth, from which writing-pens or reeds are made. A joint forms a holder for papers or pens, and it was ina joint of bamboo that silk-worm eggs were carried from China to Con- stantinople during the reign of Justinian. The outer cuticle of Oriental species is so hard that it forms a sharp and durable cutting edge, and it is so siliceous that it can be used as a whetstone. This outer cuticle, cut into thin strips, is one of the most durable and beautiful materials for basket-making, and both in China and Japan it is largely so employed. Strips are also woven into cages, chairs, beds, and other articles of furniture, Oriental wicker-work in bamboo being unequalled for beauty and

manufacture of the finer varieties of paper. imported to a considerable extent into Kurope for the use

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neatness of workmanship. In China the interior portions of the stem are beaten into a pulp, and used for the Bamboos are

of basket-makers, and for umbrella and walking-sticks. In short, the purposes to which the bamboo is applicable are almost endless, and well justify the opinion that ‘it is one of the most wonderful and most beautiful productions of the tropics, and one of Nature’s most valuable gifts to uncivilized man” (A. R. Wallace, The Malay Archipelago).

BAMBOROUGH, a village in Northumberland, on the sea-coast, 14 miles N. of Alnwick. It was a royal borough previous to the Norman Conquest, and returned two members to parliament in the 23d year of Edward I. Its ancient castle stands close to the sea on an almost perpen- dicular rock, 150 feet in height, and is accessible only on the south-east side. The first erection is ascribed by the Saxon chronicles to King Ida of Northumberland, who is said to have named it Bebbanburh after his queen Bebbe (547 a.p.) The principal events in its early history are the siege by Penda in 642, the ravages of the Danes in 993, the unsuccessful defence by De Mowbray against William Rufus, and numerous sieges during the Wars of the Roses. In the reign of Henry VII. it fell into decay. At length, in the 18th century, it became the property of Lord Crewe, bishop of Durham, who, in 1720, vested the castle and manor in trustees for charitable purposes. In virtue of this bequest a patrol is kept on the coast, apart- ments are provided for shipwrecked seamen, and a store- house for salvage-goods, and granaries are maintained in order to supply corn to the poor at a cheap rate in times of scarcity. An infirmary, a dispensary, and a large library be- queathed by Dr Sharp, are also maintained, while poor chil- dren receive gratuitous education at two “national” schools. Population in 1871, 320in the village, and 3751 in the parish.

BAMBOUK, a country in the interior of Western Africa, situated between the Senegal and its tributary the Faleme, and extending from lat. 12° 30’ to 14° N., and from long. 10° to 12° 30’ W. It is traversed from N.W. to S.E. by the steep and wall-like range of the Tamba-Ura Mountains. The soil in a large part of the country is of remarkable fertility; rice, maize, millet, melons, manioc, grapes, bananas, and other fruits, grow almost without cultivation ; the forests are rich in a variety of valuable trees; and extensive stretches are covered with abundant pasturage of the long guinea-grass. As a natural consequence there is great profusion of animal life. The inhabitants, a branch of the Mandingo race, have made but little progress in

civilization. The one product of their country which really excites them to labour is gold; and even it 1s so common and accessible that the rudest methods of collection are deemed sufficient. The most remarkable deposit is at Natakoo, where a considerable hill seems to be wholly composed of auriferous strata. There is also a good mine at Kenieba. In exchange for the gold, cloth, ornaments, and salt—the last a most valuable article—are imported. The usual beast of burden is the ass, the horse being only possessed by the very wealthiest in the country. Sheep and cattle are both pretty numerous. Unfortunately, the climate is very unhealthy, especially in the rainy season, which lasts for about four months, from July or August. The chief towns are Bambouk, Salaba, and Konkuba. The Portuguese early penetrated into Bambouk, and were even for some time masters of the country ; but the inhabitants made a general rising and completely drove them out. Remains of their buildings, however, are still to be seen. The French, soon after they had formed their settlement on the Senegal, turned their attention to this land of gold. It was not till 1716, however, that Compagnon, under the auspices of De la Brue, the governor of Senegal, succeeded. by great

address, and not without risk, in visiting various parts of the auriferous region; and his explorations were followed up by David, Levens, and others. Raffenel visited the country in 1844, and Pascal, a naval lieutenant, was there in 1859.

See Lubat, Rel. de l’ Afr. occid.; De Golbéry, Voy. en Afr. en 1785; Amédée Tardieu, “ Sénégambie”’ in the Univers pittoresque ; Raffenel, Voy. dans TAfr. occid., 1846 ; Revue algérienne et colo- niale for March 1860; Faidherbe, Chapitres de géographie and An- nuatre de Sénégal.

BAMIAN, a once renowned city in the territory now subject to the Afghans, in 34° 50’ N. lat., 67° 44’ E. long. Its remains lie in a valley of the Hazara country, on the chief road from Kabul towards Turkestan, and immediately at the northern foot of that prolongation of the Indian Caucasus now called Koh-i-Baba (see vol. i. pp. 227, 241). The passes on the Kabul side are not less than 11,000 and 12,000 feet in absolute height, and those immediately to the north but little inferior. The river draining the valley is

one of the chief sources of the Surkhab or Aksarai, an important tributary of the Upper Oxus (itd. p. 241). The prominences of the cliffs which line the valley are crowned by the remains of numerous massive towers, whilst their precipitous faces are for 6 or 7 miles pierced by an infinity of ancient cave-dwellings, some of which are still occupied. The actual site of the old city is marked by mounds and remains of walls, and on an isolated rock in the middle of the valley are considerable ruins of what appears to have been the acropolis, now known to the people as Ghulgulah, But the most famous remains at Bamidn are two colossal standing idols, carved in the cliffs on the north side of the valley. Burnes estimates the height of the greater at 120 feet, the other at half as much. ‘These images, which have been much injured, apparently by cannon-shot, are cut in niches in the rock, and both images and niches have been coated with stucco. There is an inscription, not yet inter- preted or copied, over the greater idol, and on each side of its niche are staircases leading to a chamber near the head, which shows traces of elaborate ornamentation in azure and gilding. The surface of the niches also has been painted with figures. In one of the branch valleys is a similar colossus, somewhat inferior in size to the second of those two; and there are indications of other niches and idols, As seen from the rock of Ghulgtlah, Bamian, with its ruined towers, its colossi, its innumerable grottoes, and with the singular red colour of its barren soil, presents an impressive aspect of desolation and mystery.

That the idols of BAmian, about which so many conjectures have been uttered, were Buddhist figures, is ascertained from the narra- tive of the Chinese pilgrim, Hwen Thsang, who saw them in their splendour in 630 A.D. His description of the position of the city and images corresponds accuratcly with modern reports. He assigns to the greater image, which was gilt (the object, probably, of the plaster coating), a height of 140 or 150 feet, and to the second 100. The latter would seem from his account to have been sheathed with copper. Still vaster than these was a recumbent figure, 2 miles east of Bamian, representing Sakya Buddha entering Nérvdna, t.c., in act of death. This was ‘‘about 1000 feet in length.” No traces of this are alluded to by modern travellers, but in all likelihood it was only formed of rubble plastered (as is the case still with such Nirvana figures in Indo-China), and of no durability. For a city so notable Bamidn has a very obscure history. It does not seem possible to identify it with any city in

classical geography : Alca- andria ad Caucaswm it certainly was not. The first known mention of it seems to be that by Hwen Thsang, at a time when apparently it had already passed its meridian, and was the head of one of the small states into which the empire of the White Huns had broken up. Ata later period Bamidn was for halfa century, ending 1214 A.D., the seat of a branch of the Ghori dynasty, ruling over Tokharistan, or the basin of the Upper Oxus. The place was long besieged, and. finally annihilated (1222) by Chinghiz Khan, whose wrath was exasperated at the death of a favourite grandson by an arrow from its walls, There appears to be no further record of Bamian as a city; but the character of ruins at Ghilgulah agrecs with traditions on

the spot in indicating that the city must have been rebuilt after the time of the Mongols, and again perished. In 1840, during the British occupation of Kabul, Bamian was the scene of an action in which Colonel Denny with a small force routed Dost Mahommed Khan, accompanied by a number of Uzbeg chiefs. (Burnes, Journey to Bokhara; Masson's Journeys, and his papers in the J. As. Soc., Bengal; Julien, Péerins Bouddhistes; EK. Thomas in J. RB. As. Soc., &c.) (H. Y.)

BAMPTON, Rev. Jonny, founder of the series of divinity lectures at Oxford known as the Bampton Lectures, appears to have been born in 1689 and to have diedin 1751. He was a member of Trinity College, Oxford, and for some time canon of Salisbury. His will directs that eight lectures shall be delivered annually on as many Sunday mornings in full term, "between the commencement of the last month in Lent term and the end of the third week in Act term, upon either of the following subjects :—to confirm and establish the Christian faith, and to confute all heretics and schismatics—upon the divine authority of the Holy Scriptures—upon the authority of the writings of the primitive fathers, as to the faith and practice of the primitive Church—upon the divinity of our Lord and Saviour Jesus Christ—upon the divinity of the Holy Ghost—upon the articles of the Christian faith as comprehended in the Apostles' and Nicene Creeds." The lecturer, who must be at least a Master of Arts of Oxford or Cambridge, is chosen yearly by the heads of colleges, and no one can be chosen a second time. 'The series of lectures began in 1780, and has continued to the present time unbroken, with the exception of the years 1834 and 1835, when no lecturers were

appointed, and 1841, when no lectures were delivered. Several of the lecturers have been men of great eminence and ability ; Heber, for instance, was selected in 1815, Whately in 1822, Milman in 1827, Horne in 1828, Hampden in 1832, Goulbourn in 1850, Mansel in 1858, Liddon in 1866. ‘The institution has done much to preserve, at least in some quarters, a high standard in English theology; and the lectures as a whole form a very valuable body of apologetic litera- ture,

BANANA (JMfusa sapientum), a gigantic herbaceous plant belonging to the natural order Afusacee, originally a native of the tropical parts of the East, but now cultivated in all tropical and sub-tropical climates. It forms a spurious kind of stem, rising 15 or 20 feet by the sheathing bases of the leaves, the blades of which sometimes measure as much as 10 feet in length by 2 feet across. The stem bears several clusters of fruit, which somewhat resemble cucumbers in size and form ; it dies down after maturing the fruit. The weight of the produce of a single cluster is sometimes as much as 80 fb, and it was calculated by Humboldt that the productiveness of the banana as com- pared with wheat is as 133 to 1, and as against potatoes 44 to 1. The varieties of banana cultivated in the tropics are as numerous as the varieties of apples in temperate regions, and the best authorities now agree that no specific difference exists between it and the plantain. The fruit is extensively used as food; and in many of the Pacific islands it is the staple on which the natives depend. In its immature condition it contains much starch, which on ripening changes into sugar; and as a ripe fruit it has a sweet but somewhat flavourless taste. From the unripe fruit, dried in the sun, a useful and nutritious flour is pre- pared. The following represents the percentage com- position of the pulp of the ripe fruit :—Nitrogenous matter, 4820; sugar, pectin, &c., 19°657; fatty matter, 0°632 ; cellulose, 0°200; saline matter, 0°791; water, 73:900, An analysis of the flour by Dr Murray Thomson yielded the following results :—Water, 12°33 ; starch, 71:60; gum and sugar, 6°82; nitrogenous matter, 2°01; cellulose, 5-99 ; oil, 0°50 ; salts, 0°64.

BANAT, a district in the south-east of Hungary, con- sisting of the three counties of Thorontal, Temeswar, and Krasso, which has strangely acquired

this title, though it was never governed by a ‘‘ban.” It is bounded by the Theiss, the Maros, and the Danube, forming almost a regular parallelogram. The soil is in many parts a remarkably rich alluvial deposit. Under the Turkish yoke it was allowed to lie almost desolate in marsh and heath and forest ; but Joseph II. determined to render it, if possible, a populous and prosperous district. He accordingly offered land, at a very low rate, to all who were willing to settle within its borders. Germans, Greeks, Turks, Servians, Italians, and Frenchmen responded to his call, and soon developed the agricultural resources of the region. Canals were formed at great expense of labour; marshes and forests were cleared ; and now the Banat is one of the most highly cultivated parts of the Austrian empire. Wheat, barley, oats, rye, rice, maize, flax, hemp, rape, sun-flowers, tobacco, grapes, and, in short, nearly all the productions of Europe, are successfully raised. The climate in summer is very like that of Italy, and in winter is milder than in other parts of Hungary. Nor is it any longer unhealthy, though, in 1777, Born spoke of it with horror as a realm of death, and the account given of it in 1802 by Dr Samucl Clarke was not much better. The scenery is extremely diversificd, from the plains of Thorontal to the snowy mountains of Krasso. The mineral wealth is considerable, including copper, tin, lead, zinc, iron, and especially coal. Among its numerous mineral springs the most important are those of Menadia, which were known to the Romans as Therme Herculis, Not only there but in other parts of the Banat numerous remains of the Roman occupation still exist. The various origin of its inhabitants may still be easily traced,—the separate settlements having kept remark- ably distinct, and in many cases preserving their native languages and customs. The chief town is Temeswar, and other places of importance are Lugos, Kikinda, Becskerch, and Werschitz. Population about 1,500,000.

See Griselini, Versuch einer Gesch. des Temeswar Banats, Vienna, 1785; Hietzinger, Versuch einer Statistik der Militargrenze des

Oesterreich. Kaiserth., Vienna, 1781; Bohm, Geschichte des Teme- swar Banats, Leipsic, 1861; Paget, Hungary, 1855.

BANBRIDGE, a tuwn of Ireland, county of Down, on the Bann, 23 miles S.W. of Belfast, standing on the summit of an eminence. To facilitate

access, a central carriage- way, 200 yards long, has been cut through the main street to a depth of 15 feet, the opposite terraces being connected by a bridge. Banbridge is a neat town, with a handsome church, several chapels, a market-house (built in 1831), and a court-house. It is the principal seat of the linen trade in the county, and has extensive cloth and thread factories, bleachfields, ‘and chemical works. Population in 1871,

5600.

BANBURY, a market-town, municipaland parliamentary borough, and railway junction, in the county of Oxford, 71 miles from London, and a little aaa to the west of the River Cherwell and the Oxford and Birmingham canal. It is well built, and has two or three foundries, several breweries, and some other manufactures, but is chiefly dependent on the neighbour- ing villages which send their agricul- tural produce to its market It was formerly fameus for its cheese, and gives its name to a kind of cake of considerable repute Its ancient cross, now destroyed, is celebrated in the well-known nursery rhyme. During the 17th century the inhabitants of Banbury seem to have been zealous Puritans, and are frequently satirized by contemporary dramatists (Cham-

bers’s Book of Days, vol. ii. p. 316). At a somewhat earlier period the grammar school, which is now defunct, was of such repute as to be chosen as the model for the constitution of the school of St Paul’s. A school of science was erected in 1861. Banbury returns one member to parliament, and the borough (which is partly in Northamptonshire) had, in 1872, a population of 11,726, of whom 4122 were in the town..

BANCA, Banxa, or BancKa, an island off the east coast of Sumatra, and separated from it by the Strait of Banca, lies between lat. 1° 30’ and 3° 7’ S., and long. 105° 9’ and 106° 54’ E. It varies from 8 to 20 miles in breadth, and has an area of 5000 English square miles. Its mines of tin, which were discovered in 1710, are remark- ably productive, and in 1872 yielded no less than 68,148 piculs, the average yield during the previous ten years

being 73,961 piculs. The washing is almost wholly carried on by Chinese, and a large part of the metal finds its way to their country. Iron, copper, lead, silver, and arsenic, are also found in the island. The soil is generally dry and stony, and the greater part of the surface is covered with forests, in which the logwood tree especially abounds. Its mountains, which scarcely exceed 2000 feet in height, are covered with vegetation to.their summits. They are of granitic formation, containing felspar, quartz, mica, and tourmaline. Population, 54,339, including 17,070 Chinese, 37,070 natives, 116 Europeans, and 56 Arabs. Muntak, the capital, has upwards of 3000 inhabitants. “The houses, which mostly belong to Chinamen, are neatly built and well painted ; the streets are kept in good repair, and the whole place has an air of enterprise and thrift” (vide Bickmore’s Last Indian Archip., 1868). There are several other forts on the island. It belongs to the Dutch, who derive from it upwards of 3,000,000 guilders, or £250,000, of annual income, after the expenses of the administration are paid.

BANCROFT, Ricuarp, Archbishop of Canterbury in the reign of James L., distinguished as an inflexible opponent of Puritanism, was born at Farnworth in Lancashire in 1544. He was educated at Cambridge University, studying first at Christ’s College, and afterwards at Jesus College. He took his degree of B.A. in 1567, and that of M.A. in 1570. Ordained about that time, he was named chaplain to Dr Cox, then bishop of Ely, and in 1575 was presented to the rectory of Teversham in Cambridgeshire. The next year he was one of the preachers to the university, and in 1584 was presented to the rectory of St Andrew’s, Holborn. His unquestionable abilities, and his zeal as a champion of the church in those unsettled times, secured him rapid pro- motion, and at length the highest ecclesiastical position in the land. He graduated B.D. in 1580, and D.D. five years later. In 1585 he was appointed treasurer of St Paul’s Cathedral, London. On February 9, 1589, he preached at Paul’s Cross a sermon on 1 John iv. 1, the substance of which was a passionate attack on the Puritans. He described their speeches and proceedings, caricatured their motives, denounced the exercise of the right of private judgment, and set forth the divine right of bishops in such strong language that one of the queen’s councillors held it to amount to a threat against the supremacy of the Crown. Sixteen days after the publication of this ecclesiastical manifesto, Bancroft was made a prebendary of St Paul’s. Within a few years

he was advanced to the same dignity in the collegiate church of Westminster, and in the cathedral church of Canterbury. He was chaplain successively to Lord Chancellor Hatton and Archbishop Whitgift. In May 1597 he was consecrated bishop of London ; and from this time, in consequence of the age and incapacity for business of Archbishop Whitgift, he was virtually invested with the power of primate, and had the sole management of

viz., Hindus, 657,107; Mahometaus, 40,497; Christians, 6. Average density, 230 persons to the square mile. Of the population in 1872, 2897 were landed proprietors, 42,230 agriculturists, and 63,644 non-agriculturists. In some parts the district rises into irregular uplands and elevated plains, interspersed with detached rocks of granite ; in others it sinks into marshy lowlands, which frequently remain under water during the rainy season. The sloping country on the bank of the Jamné is full of ravines. ‘To the 8.E. the Vindhya chain of hills takes its origin in a low range not exceeding 500 feet in height, and forming a natural boundary of the district in that direction. The principal river of the district is the Jamna, which flows from north- west to south-east, along the N.E. boundary of the district for 125 miles. Its most important tributaries within the district are the Ken, Bagain, Paisun{f, and Ohan, all of which take their rise in the Vindhya hills. The principal towns and market villages in the district are Mau, Majhg4on or Rajapur, Marké, Samgard, Augasi, Chilld, and Baragdon, all situated on the bank of the Jamna.

The black soil of the district yields abundant crops of wheat, bar- ley, maize, millet of various sorts, rice, and pulses. Hemp, oil-seeds, sugar, and indigo are also grown, but by far the most important crop is cotton, for which the district is so celebrated that the pro- duce ig distinguished in commerce as ‘‘ Banda Cotton.” ‘The esti- mated acreage under the principal crops—Gram (Cicer arietinum), 138,662 acres; wheat, 134,247 ; maize, 126,198; cotton, 69,667; barley, 60,976 ; rice, 20,987 ; total, 550,787 acres, or 860°52 square miles, ‘I’he total cultivated area of the district is returned at 1390 square miles. The manufactures of Banda consist of coarse cotton-cloth, sackcloth, and stone handles for knives. Iron and building stone form

the only mineral products. The revenue of the district amounted in 1870-71 to £167,488, the expenditure being £63, 425 Since the acquisition of the country by the British, eight settle- ments of the land revenue have been made at different periods. The last (1834-35) of these adjusted the demand at £134,904, and the total collections amounted in 1870-71 to £131,275. In 1871 the regular police force of 620 men was maintained at a vost of £8920, while a rural constabulary of 2552 men was main- tained at the cost of the landholders and villagers. In 1871-72 there were 214 schools in the district, with an average daily attend. ance of 4695 wae expenditure, £2194, of which Government paid £754. Banda district has only two towns containing upwards of 5000 inhabitants, viz., Band4d (27,746) and Girwan (6670). Banda, the headquarters of the district, lies on the right bank of the River Ken, in lat. 25° 28’, long. 80° 23’. Thirty-six miles of the Jalalpur branch of the East Indian Railway lie within the district, and eleven first-class roads afford good means of communication— the most important road, both commercially and for military pur- poses, being that from Manikpur to Chilla. The climate of Banda is cold in the winter months, and terribly hot in summer. Frost is rare, except in the moist land adjoining the rivers; the hot winds frequently cause deaths among the natives from exposure to the mid-day heat. Rainfall in 1870-71, 51°8 inches.

Banda has formed an arena of contention for the successive races who have struggled for the sovereignty of India. Kalinjar town, then the capital, was unsuccessfully besieged by Mahmud of Ghazni in 1023 a.D.; in 1196 it was taken by Kutab-ud-din, the general of Muhammad Ghorf ; in 1545 by Sher Shah, who, how- ever, fell mortally wounded in the assault. About the year 1735 the Raji of Kalinjar’s territory, including the present district of Band4, was bequeathed to Baji Rao, the Marhatta Peshwa; and from the Marhattds it passed by the treaties of 1802-3 to the Company.

BANDA ISLANDS, a group in the East Indian Archipelago, lying to the 8. of Ceram, in lat. 4° 30’ S. and long. 129° 50’ E. ‘They are ten or twelve in number, and have an area of about 7150 square miles. Their volcanic origin is distinctly marked. Banda Lantoir, which derives its name from the lontar or Palmyra palm, is the largest of the group. From the sea this island appears lofty,— its sides being steep, and crowned by a sort of table-land which extends nearly from one end to the other. The whole is one

continuous forest of nutmeg and Canarv trees, the latter being planted to screen the former from the wind. The unhealthiness of Lantoir has prevented it from becoming the seat of government, for which in other respects it would naturally be chosen. The village of Selam contains the ruins of the chief Portuguese settlement. A considerable

ecclesiastical affairs. Among the more noteworthy cases which fell under his direction were the proceedings against Martin Mar-Prelate, Cartwright and his friends, and the pious Penry, whose ‘seditious writings” he caused to be intercepted and given up to the Lord Keeper. In 1600 he was sent on an embassy, with others, to Embden, for the purpose of settling certain matters in dispute between the English and the Danes. This mission, however, failed. Bishop Bancroft was present at the death of Queen Elizabeth. He took a prominent part in the famous con- ference of the prelates and the Presbyterian divines held at Hampton Court in 1604. By the king’s desire he undertook the vindication of the practices of confirmation, absolution, private baptism, and lay excommunication ; he urged, but in vain, the re-inforcement of an ancient canon, “ that schismatics are not to be heard against bishops ;” and in opposition to the Puritans’ demand of certain alterations i doctrine and discipline, he besought the king that care might be taken for a praying clergy ; and that, till men of learning and sufficiency could be found, godly homilies might be read and their number increased. In the capacity of a conimissioner for ecclesiastical causes (1603), he advocated severe measures for the suppression of “ heresy and schism,” treating books against Episcopacy as acts of sedition, and persecuting their authors as enemies of the state. In March 1604, Bancroft, in consequence of the death of the primate, was appointed by royal writ president of Convocation then assembled; and he there presented for adoption a book of canons collected by himself. In the following November he was elected successor to Whitgift in the see of Canterbury. He had now but six years of life before him. He continued to show the same zeal and severity as before, and with so much success that Lord Clarendon, writing in his praise, expressed the opinion that “if Bancroft had lived, he would quickly have extinguished all that fire in England which had been kindled at Geneva.” In 1605 he was sworn a member of the Privy Council. The same year he engaged in a contest with the judges, and exhibited articles of complaint against them before the lords of the council; but these complaints

were overruled. He enforced discipline and exact conformity within the church with an iron hand; and forty-nine ministers of the church were deprived of their livings for disobedience to his injunctions. In 1608 he was chosen chancellor of the University of Oxford. One of his latest public acts was a proposal laid before the parliament for improving the revenues of the church. In the last few months of his life he took part in the discussion about the consecration of certain Scottish bishops, and it was in pursuance of his advice that they were consecrated by several bishops of the English Church. By this act were laid the foundations of the Scottish Episcopal Church. Archbishop Bancroft was “the chief overseer” of the authorised version of the Bible, published within a year of his death. He died at Lambeth Palace, November 2,1610. His literary remains are very few and unimportant.

BANDA, a district of British India, in the Allahabad division, under the Lieutenant-Governor of the North- Western Provinces, lies between 24° 59’ 15” and 25° 55’ 30” N. lat., and 80° 2’ 45” and 81° 38’ E. long. It is bounded on the N. by the district of Fathipur, from which it is separated by the River Jamnd4; on the N.E. by the districts of Fathipur and Allahabad; on the S.E. by the native state of Riwd; on the S. and S.W. by some of the petty states of Bundelkhand ; and on the W. and N.W. by the district of Hamirpur. Area, 3030 square miles, of which 1390 are under cultivation, 848 cultivable but not cultivated, 108 revenue free, and 684 uncultivable waste. The census of 1872 took the area at 2908°68 square miles, and returned the district population at 697,610 souls,—

fort, called Hollandia, commands the harbour. Banda Neira lies S. of Lantoir. It is the seat of the Dutch resident, whose jurisdiction extends not only over the Banda Islands, but also over a part of Ccram and several other small groups. Jort Nassau, which was built in 1609, is the chicf defence of the islands; and to the right and left of it extends the village of Neira. Gunong Api is to the north of Neira, and derives its name—Fire Mountain — from its large cone-shaped volcano, which rises 2320 feet above the level of the sea, and is constantly emitting smoke. The peak was ascended by Professor Reinwardt in 1821, by M. 8. Miiller in 1828, and in 1865 by

Mr Bickmore, who has given an interesting account of the adventure. Eruptions took place in 1586, 1598, 1609, 1615, 1632, 1690, 1696, 1712, 1765, 1775, 1778, 1820, 1824; and earthquakes without eruptions occurred in 1629, 1683, 1710, 1767, 1816, and 1852 On the last occasion the sea swept up in an enormous wave over Fort Nassau. Pulo Way—The Water Island—lies north of Neira. It is about 400 or 500 feet high, consists of coral rock, and is esteemed the healthicst of the group. Pulo Roud or Roon —the Chamber Island—is about four miles further N., and was at onc time the seat of an English "factory." Rosyngain, about seven miles §.E. of Lantoir, is likely to become of some importance for its gold-mines. It was formerly a convict station for Amboyna. Pulo Pisang—Banana Island—two miles N.E. of Neira, produces fine fruits. The other islands Craka, Capella, Sonangy, d&c., are uninhabited. In the space betwcen Banda Lantoir and the islands of Banda Neira and Gunong Api there is a very good harbour, formed with entrances both from the E. and W., which enable vessels to enter it from either of the monsoons. 'These channels are well defended with several batteries, particularly the western one, which is very narrow. Between Gunong Api aud Banda Neira there is a third channel into this harbour from the N., but it is navigable for small vessels only. The principal articles of commerce in the Banda group are nutmegs and mace. 'The native population having been cleared off by the Dutch, the plantations were worked by slaves and convicts till the emancipation of 1860. The introduction of Malay and Chinese labourers has since taken place. The plantations or perken can neither be sold nor divided. About 700,000 tb or upwards of nutmegs are obtained in a year, with a proportionate quantity of mace. The imports are pro- visions, cloth, and iron-ware from Batavia, and various native productions from the Aru Islands, Ceram, &e.

The Banda Islands were discovered and annexed by the Portuguese Abreus about 1511; but in the beginning of the 17th century his countrymen were expelled by the Dutch. In 1608 the English built a factory on Pulo Way, which was demolished by the Dutch as soon as the English vessel left. Shortly after, however, Banda Neira and Lantoir were resigned by the natives to the English, and in 1620 Pulo Roon and Pulo Way were added to their dominions ; but, in spite of treaties into which they had entered, the Dutch attacked and expelled their British rivals. In 1654 they were compelled by Cromwell to restore Pulo Roon, and to make satisfaction for

the mas- sacre of Amboyna; but the English settlers not being adequately supported from home, the island was retaken by the Dutch in 1664. They retained undisturbed posses- sion of their conquests in this quarter of the globe until the year 1796, when the Banda Islands, along with all the other Dutch colonies, were conquered by the British. They were restored by the treaty of Amiens in the year 1800, again captured, and finally restored by the treaty of Paris concluded in 1814. In the Presidency of Banda there are 111,194 inhabitants, of whom 6000 belong to Neira.

See Wallace's Malay Archipelago; Bickmore's Indian Archi- pelago; Linden's Banda en Zijne bewoners, 1873; Trans. of Dutch Geog. Soc., 1874.

BANDELLO, Martgo, an Italian novelist, was born at Castelnuovo, near Tortona, about the year 1480. He received a very careful education, and entered the church, though he does not seem to have prosecuted hig theological course with great zeal. For many years he resided at Mantua, and superintended the education of the celebrated Lucrezia Gonzaga, in whose honour he composed along poem. The decisive battle of Pavia, which gave Lombardy into the hands of the emperor, compelled Bandello to fly; his house at Milan was burnt and his property confiscated. He took refuge with Cesar Fregoso, an Italian general in the French service, whom he accom- panied into France. In 1550 he was raised to the bishopric of Agen, a town in which he resided for many years before his death in 1562. Bandello wrote a number of poems, but his fame rests entirely upon his extensive collection of Movelle, or tales, which have been extremely popular. They belong to that species of literature of which Boccaccio's Decameron and the queen of Navarre's Heptameron are, perhaps, the best known examples. The common origin of them all is to be found in the old Fabliaux of the French Trouveurs, though some well known tales are evidently Eastern, and others classical. Bandello's novels are esteemed the best of those written in imitation of the Decameron, though Italian critics find fault with them for negligeucc and inelegance of style. They have little valuc in a purely literary point of view, and many of them are disfigured by the grossest obscenity. Historically, however, they are of no little interest,

not only from the insight into the social life of the period which they afford, but from the important influence they exercised on the Elizabethan drama. ‘The stories, on which Shake. speare based several of his plays, were supplied by Bandello, probably through Belleforest or Paynter (see Limrock, Quellen des Shakespeare). ‘The same is true of Massinger, Beaumont and Fletcher, and others. The most convenient edition of Bandello is that in 9 vols., 1813.

BANDINELLI, Bartotommezo or Baccio, a Floren- tine sculptor, was born in 1487, and died 1559. His father was an eminent goldsmith, distinguished for his exquisite designs in chasing gold and silver ornaments ; and in this domestic school Bandinelli obtained the first elements of drawing. Showing a strong inclination for the fine arts, he was early placed under Rustici, a sculptor, and a friend of Leonardo da Vinci, with whom he made rapid pro- gress, The ruling motive in his life seems to have been jealousy of Michel Angelo, one of whose cartoons he is said to have torn up and destroyed. Vasari, who gives a very full history of his life, manifests the greatest dislike for his moral character, but at the same time gives him the highest praise as an artist. He is regarded by some as inferior in sculpture only to his great rival, Michel Angelo ; at all events, his productions entitle him to a very high place among Italian sculptors. His best works are the marble colossal group of Hercules and Cacus in the Piazza del Gran Duco; his group of Adam and Eve; his exquisite bassi-rilievt in the choir of the cathedral of Florence; his copy of the Laocoon; and the figures of Christ and Nicodemus on his own tomb. (See Vasari, Lives, iii. 232-296.)

BANDINI, Anceto Marra, an Italian author, was born at Florence on the 25th Sept. 1726. Having been left an orphan in his infancy, he was supported by his uncle, Joseph Bandini, a lawyer of some note. He received his education among the Jesuits, and showed a special inclina- tion for the study of antiquities. His first work was a dissertation, De Veterwm Saltationibus, published in 1749.

Tn 1747 he undertook a journey to Vienna, in company with the bishop of Volterra, to whom he acted in the capacity of secretary. He was introduced to the emperor, and took the opportunity of dedicating to that monarch his

Specimen Intteraturce Llorentine, which was then printing at Florence. On his return he took orders, and settled at Rome, passing the whole of his time in the library of the Vatican, and in those of the Cardinals Passionei and Corsini. The famous obelisk of Augustus, at that time disinterred from the ruins of the Campus Martius, was described by Bandini in a learned folio volume De Obeltsco Augustt. Shortly after he was compelled to leave Rome on account of his health and returned to Florence, where he was appointed librarian to the valuable library bequeathed to the public by the Abbé Marucelli. In 1756 he was preferred by the emperor to a prebend at Florence, and appointed principal librarian to the Laurentian library. During forty-four years he continued to discharge the duties of this situation, and died in 1800, generally esteemed and regretted. On his deathbed he founded a public school, and bequeathed the remainder of his fortune to other charitable purposes. The most important of his numerous works are the Catalogus Codd. MSS. Grec., Lat., Ital., Bib., Laurent., 8 vols., 1767-1778, and the Vita e Lettere d' Amerigo Vespucci, 1745.

BANDON, or BaNnDonsBRIDGE, an inland town and parliamentary borough of Ireland, in the county of Cork, and twenty miles by rail from the county town, is situated on both sides of the River Bandon, which is here crossed by a bridge of six arches. It has two churches, a hand- some Roman Catholic chapel, Protestant and Methodist places of worship, a convent, two market-houses, a spacious quay on the south side of the river, an infirmary, a hospital, a dispensary, several public libraries and reading-rooms, an endowed school, a court-house, a bridewell, and barracks. Its manufactures of woollen and cotton goods have much declined ; but there are distilleries, breweries, tanneries, and flour-mills, Population in 1871, 6131.

BANFF, the county town of Banffshire, is a place of great antiquity ; according to tradition, it was at times the residence of Malcolm Canmore. It was visited by David I. and his son Henry; and there is a charter of Malcolm IV., signed at Banff the eleventh year of his reign, which corresponds with 1163. The church was given to the monastery of Arbroath by William the Lion, and a convent of Carmelite or White Friars is mentioned in a charter by Robert I., 1324. The town is said to have lost many of its ancient grants, but these, it is added, were renewed in 1324 by King Robert the Bruce, and in 1372 by Robert IJ. The natural situation of the

town is beautiful, having its south-eastern exposure on a gentle slope, the wide blue sea on its N., the River Deveron on the E., and on the 8. the richly-wooded country with the magnificent mansion and grounds of the earl of Fife. The streets are well and regularly built and paved, and are remarkable for their cleanliness, The principal buildings are Banff Castle, a plain modern building, belonging to the earl of Seafield, erected upon the site of an old castle, in which Archbishop Sharp was born; the county court buildings; the town-house, surmounted by a spire 100 feet high; a prison; parish church, Episcopal church and parsonage, Free church, United Presbyterian, Independent, Methodist, and Roman Catholic places of worship ; Chal- mers' Hospital; a mason lodge, of tasteful architecture; the academy, a modern edifice of Grecian design, capable of containing 600 scholars, to which there is attached an extensive museum. 'There are large and well-conducted seminaries for young ladies, also several libraries, a club-room, branch banks and a savings-bank, public baths, hotels, custom-house, gas and water works, &c.

The Banffshire Journal, a weekly newspaper, with an ex- tensive circulation, is published on Tuesdays. At one period Banff carried on a considerable manufactory of stockings and linen yarn, A branch of the Great North of Scotland Railway, which leaves Inveramsay Junction and terminates at Macduff, is the direct communication from Aberdeen, and has a station at Bridge of Banff. Another line of railway, which has its terminus at the harbour of Banff, runs in connection with Portsoy, and joins the Great North of Scotland Railway at Grange, near Keith. 'The principal exports are grain, cattle, salmon, herrings, haddocks, pork, butter, and potatoes. The river fishing is the property of the earl of Fife, with a sea-line extending a considerable distance on each side of the river mouth. The burgh is under the jurisdiction of a provost, three bailies, and five councillors, who manage all the town's affairs. Mr Alexander Cassie of London, a uative of Banff, some thirty years ago, left to the poor of the town about £20,000, the interest of which is divided twice a year among the poor. A few years ago, Mr Alexander Chalmers of Clunie, a general merchant and shipowner in Banff, left about £70,000 to build and endow a hospital for sick and destitute. The building, which is near the harbour, has somewhat the appearance of Donaldson's Hospital at Edinburgh.

The town of Macduff, which is fast rising into import- ance, lias a good harbour, branch banks, &c. It is about a mile to the E. of Banff, with which it has communication by a stone bridge of seven arches across the Deveron. Its trade in shipping, &c., is more extensive than that of Banff, to which burgh it was united by the Reform Act. It was an old burgh of barony, called Doune, but soon after it was acquired by the Duff family its name was changed to Mac- duff. A harbour was then erected, and in 1783 it was made a burgh by George III. Macduff is locally situated within the parish of Gamrie, and has an independent municipal government. Banff and Macduff unite with Elgin, Cullen, Inverurie, Kintore, and Peterhead, in sending a member to parliament. Population within the parliamentary bound- aries in 1871,about 4000; municipality,3557. The weekly market-day of Banff is Friday, on which day a corn market is held; and there are two annual fairs.

BANFFSHIRE, a maritime county in the N.E. of Scot- land, lying between lat. 57° 6’ and 57° 42’ N., and long. 2° 15’ and 3° 40’ N., and bounded on the N. by the Moray Firth, E. and 8. by Aberdeenshire, and W. by Morayshire and part of Inverness-shire. It has an arca of 686 square miles, or 439,219 statute acres, its extent from N. to 8. being 50 miles, and from E. to W. 32 miles,—its average breadth not exceeding 14 miles. It contains 21 parishes, and parts of 10 others. Its royal and parliamentary burghs are Banff, Macduff, and Cullen; and its principal harbours are at Banff, Macduff, Cullen, Portsoy, Buckie, and Portgordon. The parliamentary burghs are contri- butory to Elgin, and the county returns a member to par- liament. ‘The parliamentary constituency in 1874-5 was 1737. Many of the schoolmasters, with those of the coun- ties of Aberdeen and Moray, share in Dick’s bequest.

The surface of Banffshire presents a very diversified aspect. The lower district is mostly a fine open country of a rich, deep, and highly-cultivated soil, agreeably diversified with gentle risings and young plantations. The upper district is mountainous and, at a distance, wears a bleak, forbidding appearance. But the scene changes on a nearer approach. Extensive farms are found embosomed in its fertile and well-cultivated glens. Someof the mountains are covered with trees in full luxuriance of growth ; some presenting a beautiful intermixture of rock and copse, while others are covered with brown heath. The Spey flows along its western, and the

Deveron along its eastern boundary ; and both yield a considerable revenue from their salmon-fish-

ings. The principal mountains of Banffshire proper are Benrinnes and the Knockhill; but Cairngorm,Ben Macdhui, and Ben Aven, the highest suminits in Britain, lie on or close to the boundary. The principal noblemen's and gentle- men's seats are Duff House, Cullen House, Park House, Troup House, Forglen House, Drummuir, Kininvie, Bal- venie, Aberlour, aud Rothiemay. Several of these are elegant mansions, and most of them are surrounded by extensive and tastefully laid-out plantations. The natural woods are inconsiderable both in extent and value.

The geology of Banffshire is very closely connected with that of the neighbouring counties of Aberdeen and Moray, from which it is divided by no natural boundaries. Gneiss, and to a greater extent mica slate, form the lowest stratified rocks running nearly south-west from the coast between Cullen and Portsoy to the upper valleys of the Fiddach, Deveron, and Aven rivers. Generally they are fine grained slaty rocks, and form low rounded mountains, of no great beauty, but decomposing into soils of considerable fertility. In many places the mica slate alternates or passes into quartzite, which differs from it chiefly in the almost entire absence of mica, Quartzite in a more independent form is seen on the coast between Cullen and Buckie, and forms also the Durn Hill near Portsoy, the Binn of Cullen, the Knockhill, and much of the high ground to the south. Where it prevails the soil is far from fertile, and the white, weather-beaten mountains have a very sterile aspect. Connected with this series also beds of limestone are very common, and have been quarried in many places, as near Boyne Castle, Sandend, and Fordyce in the north, and in the interior near Keith, Mortlach, and Tomintoul.

Clayslate occurs in considerable abundance in Banfishire, in some places perhaps merely a finer variety of mica slate, in others coarser in texture, or so-called greywacke. Large masses are seen near Boharm, and from Dufftown south to Kirkmichael. It also forms the north coast from Knock Head by Banff, Macduff, and Gamrie, to the Troup Head, often rising into bold, lofty cliffs, and extends south to Gartly. In several places it is wrought

for roofing slates both in this county and in Aberdeenshire. Though no fossils have yet been found in these strata, there is little doubt that they are more or less metamorphosed represen- tatives of the lower portions of the Paleozoic (Silurian and Cambrian) formations.

Resting on these rocks Devonian or Old Red Sandstone and conglomerate beds are seen in a few places. Thus the Morayshire beds cross the Spey near Fochabers, running along the coast to Buckie, and in the Tynet Burn have yielded many characteristic fossil fishes. Gamrie, at the north-east extremity of the county, is also well known for similar remains occurring in calcareous nodules embedded in a bluish grey marly rock, from which they are washed out by a small stream on its way to the sea. The more important species are Cheiracanthus Murchisona, Chetroleprs Uragus, Coccosteus cuspidatus, Diplopterus affinis, Glyptolepis elegans, Osteolepis arenatus, and Pterichthys M: alert. In the interior, near Tomintoul, another large deposit of red sandstone occurs, probably of the same age, but as yet no organic remains have been found in this locality. Indica- tions of still more recent formations are seen in the chalk flints common in the vicinity of Portsoy, and in the Oolite fossils found in the brick clays at Blackpots. The raised beach with recent shells, more than 200 feet above the sea- level, near the old church of Gamrie, is also interesting. As in other parts of Scotland, the surface of the country is covered with masses of boulder clay and stratified drift beds, the materials often derived from a considerable dis- tance and some of the granite boulders several tons in weight.

The most important igneous rock is granite. This rock,

BAN Y Beret

a portion of the great central mass of the Grampians, forms the mountains in the extreme south of the country round the sources of the Aven. Benrinnes also consists of it, and smaller masses are seen in Glenlivet and other locali- ties, The well-known “graphic granite” forms a vein on the coast near Portsoy, and gets its name from the quartz and felspar crystals appearing on the polished surface like rude letters. Syenite, a compound of hornblende and felspar, covers a large district running south from near Portsoy to Rothiemay and Huntly in Aberdeenshire. The serpentine of Portsoy, though long known, and said to have been at one time extensively

wrought and even sent to France as an ornamental stone, is now almost neglected. Rocks of a similar character may be traced pretty much in a south-west direction to near the sources of the Deveron, and from that into the upper parts of the Don in Aber- deenshire.

Some interesting minerals have been found in Banffshire. Among them may be mentioned magnetite, chromite, and asbestos at Portsoy; fluorite near Boharm, at Keith, and on the Avon; also cyanite and chiastolite in clayslate at Boharm. Attempts were made many years ago to work a vein of sulphuret of antimony near Keith; and more recently mines of hematite were opened near Arndilly on the Spey.

The agriculture of Banffshire is conducted upon the newest and most approved principles. The soil, though varying even in adjacent fields, is in general rich and productive, yielding fair crops of wheat, and excellent crops of barley, oats, &c.; and the grass and green crops are equally abundant. About 163,000 acres are under culti- vation, the extent of the farms is in general from 150 to 200 arable acres, independently of moorland and pas- ture-grounds. The duration of leases is nineteen years ; although there are still some individuals who possess on liferent, and a few leases are held for a longer term. The whole of the farms, even the smallest pendicles, are under regular rotations of cropping, generally a five or seven course shift. The fields are well laid out and subdivided, and properly cleaned and manured ; for which last purpose large quantities of lime, bone-dust, and guano, are annually imported. The ridges are all straight ; and the fields, at least many of them, are enclosed with stone dykes or other fences. The swamps and wet grounds have also been drained and cultivated, so as to effect a total revolution in the ancient modes of agriculture within the county. The cattle and stock hold a high character; and there are several herds of pure short-horns and pure polled Aberdeenshire cattle maintained in the county. ‘This district was much indebted to one of the earls of Findlater, who, as early as the year 1754, not only introduced and exemplified, on some of his own farms, the most approved practices then known in England, but held out liberal encouragement to his tenants to follow his example. His descendants, the earls of Sea- field, have also done much to improve the family estates, adding to them many thousands of acres of arable land ; and it may be said with truth that one of the earls was

the greatest planter of trees in Great Britain within the pre- sent century. In 1846 this nobleman received the honorary gold medal of the Highland and Agricultural Society of Scotland, for his vast and thriving plantations of useful timber trees, in the counties of Banff, Moray, and Nairn. From the year 1811 to 1845, he had planted 18,938,224 Scotch firs, 11,904,798 larches, 843,450 hardwoods; mak- ing the enornious aggregate of 31,686,472 forest trees, planted in 8223 acres of enclosed ground,

This county also owes much to the earls of Fife, by whose generous efforts and taste for improvement a vast amount has been done in planting and reclaiming land, by favourable leases to the tenantry, and allowances for draining, &c.

Latterly, improvement has been promoted by agricultural associations, annual premiums being given for the best specimens of live stock and the best productions of the soil. The Banffshire Agricultural Association has two shows yearly for all sorts of stock and produce and agri- cultural implements, with premiums for superiority in various breeds of cattle, poultry, &c. The valued rental of the county is now upwards of £224,250 sterling.

The manufactures of Banffshire are very unimportaut, the inhabitants being principally engaged in agriculture and the rearing of cattle. The salmon-fishery is actively prosecuted on the rivers, and herring and other fisheries on the coast Distilling is largely carried on in Glenlivet and other places; and there is a woollen factory at Keith.

Banffshire was the scene of many bloody conflicts between the Scots and their Danish invaders, From 1624 to 1645 it was the theatre of almost incessant struggles, and the Covenanting troubles of that pcriod, com- bined with the frequent conflicts of the clans, were pro- ductive of serious evils. Several remains of antiquity are pointed out in different parts of the country, such as the sculptured stone at Mortlach, and the churches of Cullen and Fordyce Ruins of castles and traces of encampments are often to be met with, and a great number of cairns and tumuli are also found. Among the distinguished men whom Banffshire has produced, the following may be

men- tioned :—Archbishop Sharp of St Andrews ; George Baird, distinguished for his services as sheriff of the county during the time of the Covenanters; Thomas Ruddiman, the grammarian ; Walter Goodall, the defender of Mary Queen of Scots; Dr Alexander Geddes; and James Ferguson, the astronomer. The population of the county in 1861 and in 1871 was as follows :—

Hovses PERSONS. See = = = Inhabited. Uninhab. Building Male Female Total. 1861 aol 318 92 28,000 31,215 59,215

1871 11,603 370 80 29,867 32,656 62,023

See Robertson's Collections for a History of the Shires of Aberdeen and Banff, Spalding Club ; Shaw's History of the Province of Moray; Cordiner's Antiquities of the North of Scotland; and various statis- tical accounts of Banffshire.

BANGALORE, the administrative capital and most important town of the chief commissionership of Mysore, also alarge military cantonment, situated in 12° 58' N. lat., and 77° 38' E. long. In 1872 the total population of the Bangalore municipality amounted to 191,300; municipal income in 1872-73, £19,090; expenditure, £17,496 ; average rate of taxation, 2s. per head of the population. For the protection of the town, a municipal police, consisting of 22 officers and 124 men, was maintained in 1872-73, at a total cost of £2756. Bangalore commands the pro- vince of Mysore from a military point of view. The eleva- tion of the district on which it stands renders it healthy for English troops ; and a large European and Native force is quartered at the military cantonment,—the Native force in 1872-73 consisting of six regiments of cavalry, number- ing 2095 officers and men, and four regiments of infantry, numbering 2149 officersand men. The principal institution of the town is the Bangalore High School or Central College for the province, attended by between four and five hundred pupils. The average annual charge of educating each pupil in 1872-73 was £3, 4s. 6d, of which £2, 3s. 9d. was con- tributed by the state. Mr Thornton thus writes regarding the history of the town :—

The foundation of the present fort was laid by a descendant of Kemp2-Goud, a husbandman of the neighbouring country, who, probably in the

16th century, had left his native village to avoid the tyranny of the wadeyar of that place, and settled ou aspot a few miles to the north of Bangalore. ‘To the peaceful occupation of a farmer he addei that of a warrior, and his first exploit was the con- quest of this place, where, and at Savendrug, his family subsequently

erected fortresses. Bangalore, with other possessions, was, however, wrested from them by Bijapur. Somewhat later we find it enume- rated among the jdgtrs of Shahji, father of Sivaji, the founder of the Marhatta sway ; and at an early period of his career in the scrvice of the Bijapur state, that adventurer seemed to have fixed his residence there. lt appears to have passed into the possession of Venkoji, one of the sons of Shahji ; but he having occupied Tanjor, deemed Bangalore too distant, especially undcr the circumstances of the times, to be safe. He accordingly, in 1687, entered into a bargain for its sale to Chik Deo, Raja of Mysore, for three lacs of rupees ; but before it could be completed, Kasim Khan, commander of the forces of Aurangzeb, marched upon the place, and entered it almost without resistance. This event, however, had no other

‘result than to transfer the stipulated price from one vendor to

another; for that general, not coveting the possession, immediately delivered it over to Chik Deo on payment of the three lacs. Jn 1758, Nanjiraj, the powerful minister of the Raja, caused Bangalore to be granted, as a jdgér or fief, to Haidar Ali, afterwards usurper of Mysore, who greatly enlarged and strengthened the fort, which, in 1760, on his expulsion from Seringapatain, served as his refuge from destruction. In 1791 it was stormed by a British army com- manded by Lord Cornwallis,

The subsequent history of Bangalore belongs to the general events of Mysore, the province of which it forms the political capital. Bangalore is now one of the hand- somest English stations in India, with noble public build- ings, spacious and artistically laid out gardens, broad smooth roads, well-supervised bazaars, and a good water supply. The markets display almost every sort of English and Indian fruit or vegetable. Bangalore forms the resi- dence of the chicf commissioner of Mysore and the principal

officers of his administration, and is well worthy of its place as the political and military capital of the province.

BANGKOK, a city of Siam, which was raised to the rank of capital in 1769. It is situated on both sides of the River Menam, about 20 miles from the sea, in lat. 13° 38’ N. and long. 100° 34’ E. The river is navigable to the city for vessels of 350 tons, but there isa bar at its mouth, which at the lowest ebbs has only six feet of water, and at no time has more than fourteen. The general appearance of Bangkok is very striking, alike from its extent, the strange architecture of its more important buildings, and the luxuriant greenness of the trees witli which it is profusely interspersed. The streets are in many cases traversed by canals, and the houses raised on piles, while a large part of the population dwell in floating houses moored along the river sides in tiers three or four deep. The nucleus of the city on the eastern bank is surrounded by a wall 30 feet high, and 10 or 12 feet thick, relieved by numerous towers and bastions ; but the rest of the city stretches irregularly for full seven miles along each side of the river, and in some places attains nearly as great a breadth,—the Menam itself being about a quarter of a mile across. All the ordinary buildings are composed of wood or bamboo work ; but the temples and palaces are of more solid construction, and are gorgeously ornamented. The spires, and in some cases the whole edifices, are covered with gilding, or many-coloured mosaic of the most grotesque description, while the roofs are adorned with fantastic ridges and gables. In all there are upwards of a hundred temples in the city and suburbs. The palacc of the “ First King” is enclosed by high white walls, which are about a mile in circumference. It consists of a Jarge number of different buildings for various purposes—tcmples, public offices, seraglios, the stalls for the sacred elephant, and accommo- dation for thousands of soldiers, cavalry, artillery, aud war elephants, an arsenal, a theatre, &c. The hall of audience, in which the throne of the king stands, is situated in the middle of the principal court. The temples are of great richness, floored with mats of silver, and stored with monu- ments and relics. In one of them is a famous jasper statue of Buddha. The population of the city is of various nationalities—Burmese, Peguans, Cambodians, Cochin- Chinese, Malays, Indo-Portuguese, and others, besides the

two predominant classes, the Chinese and Siamese. There is great commercial activity, the principal articles of trade being sugar, pepper, and rice. The supplies of the last article can be brought from a long way inland by means of the river and various canals, such as the Petrio, which joins the Bang-Pa-Kong at Kanat. Cardamoms, timber, and tin are also largely exported. Huropean manufactures are extensively imported, the natives being very ready to adopt new methods and inachinery; and steam-mills for various purposes are being set up. The river is kept clear by a steam-dredger, and iron bridges of European construction are built across the canals. Gas is used in the palaces of the kings and the houses of many of the nobility. A con- siderable number of European firms carry on business in the city, and the English Government maintains a consul, Christian missions, both Protestant and Roman Catholic, are maintained, the latter church having established a bishopric. ‘The population is said to amount to 400,000. The reader will find much curious information on Bangkok in Crawford’s Embassy to Siam, 2 vols, 1830 (plan at p, 214 of vol. ii.) ; Pallegoix’s Description du royawme That, ow Siam,1854; and Bow-

ring’s Siam, 1857. See also Juhresbericht des Vereins fiir Erdk. 2 Dresden, viii. and ix.

BANGOR, a parliamentary borough and market-town of Carnarvonshire, North Wales, nine miles N.E. of Carnar- von, to which it is a contributory borough. mainly of one narrow crooked street of nearly a mile il length, stretching N.E. and 8.W. through a romantic valley between two ridges of rock, It stands near the northern entrance of the Menai Strait, and the beauty of its scenery attracts thousands of visitors every year. The principal buildings are the cathedral, episcopal palace, deanery-house, Roman Catholic chapel, several dissenting meeting-houses, free schools, union poorhouse, infirmary, market-house (1862), assembly rooms, temperance hall, three banks, and railway station. The cathedral is an embattled cruciform structure, with a low massive tower crowned with pinnacles. It occupies the site of a more ancient edifice, originally founded about 525, but destroyed by the English in 1071. It was afterwards rebuilt, but suffered severely in the wars between the Welsh and Henry III.; and in 1402 it was

burned down during the ravages of Owen Glendower. For more than ninety years it remained in ruins. The choir

was rebuilt by Bishop Dean in the time of Henry VII, and the tower and nave were added by Bishop Skeffington in 1532. The principal trade of Bangor consists in the export of slates, which are raised in the quarries six miles distant, and conveyed by a railway to Port Penrhyn, at the mouth of the River Cegid, alittle to the east of the town. This port is accessible for vessels of from 200 to 300 tons at all states of the tide, and has a quay upwards of 300 yards in length. Population of burgh in 1871, 9859. BANGOR, a seaport and market-town of Ireland, county Down, on the south side of Belfast Lough, 12 miles E.N.E. of Belfast. It carries on a considerable trade in cotton and linen and embroidered muslin, and has a bank, a market-house, a parish church, several chapels, and a public library. It is greatly frequented as a bathing-place, especially by the people of Belfast. Remains of an ancient abbey, said to have been destroyed by the Danes in 820, are still to be seen. Population in 1871, 2560. BANGOR, a seaport town in the state of Maine, North America, capital of the county of Penobscot, on the river of that name, at its junction with the Kenduskeag, 60 miles from the sea. Lat. 44°47’ 50” N., long. 68° 47’ W. It was incorporated as a town in 1791, and raised to the rank of a city in 1834. The harbour is spacious, and affords anchorage for the largest vessels at high tide. The chief article of trade is timber, which employs about 2000 ships annually; and there are saw-mills, planing-mills,

It consists .

ship-yards, foundries, and manufactories of furniture. There are numerous good schools arranged on a graduated scale, and churches of about ten different denominations. A theological seminary belonging to the Congregationalists was founded in 1816. A library, instituted in 1843, has upwards of 11,000 volumes. Population in 1870, 18282

BANIALUKA, a town and fortress of Turkey, in the eyalet of Bosnia, situated on the Verbas or Verbitza, a navigable tributary of the Save. {ts warm baths, for which it is still known, would seem, from the antiquities

discovered on the spot, to have been frequented by the Romans. ‘There are upwards of forty mosques in the town, and one of them is regarded as the finest in Turkey. An active trade is carried on, and gunpowder and cloth are manufactured, while in the neighbourhood silver-mining is also prosecuted with success. Banialuka was for a long time the seat of the Bosnian governors, and has been frequently exposed to the vicissitudes of war. In 1688 it was captured for the Austrians by Louis of Baden. Population, 15,000.

BANIM, Jonny, an Irish novelist of great power and ability, was born at Kilkenny in 1798. He received a good education, and ata very early age gave evidence of remarkable genius. In his thirteenth year he entered Kilkenny College, where many other eminent Irishmen have received their training, and devoted himself specially to drawing and painting, in which he became so proficient that he resolved to adopt the profession of an artist. He accordingly proceeded to Dublin and studied for two years

in the schools connected with the Royal Society, where he obtained high prizes. drawing in his native town, and while doing so had the

For some time afterwards he taught

misfortune to fall violently in love with one of his pupils. His affections were returned, but the parents of the young

lady interfered and removed her from Kilkenny. She pined

away and died in two months. The occurrence made a deep impression on Banim’s mind, and this, together with

his exposure to the weather on the night of her funeral,

caused a severe illness which completely shattered his health. After a partial recovery he set out for Dublin and settled finally to the work of literature. He published a poem, The Celts’ Paradise, and had some success as a writer for the stage. During a short visit to Kilkenny he married, and at the same time planned, in conjunction with his brother Michael (born 1796), a series of tales illustrative of Irish life. He then set out for London, the great centre

of literary activity, and supported himself by writing for magazines and for the stage. A volume of miscellaneous essays was published anonymously in 1824, called Revelations of the Dead Alive. In April 1825 appeared the first series of Zales of the O'Hara Family, which achieved immediate and decided success. One of the most powerful of them, Crohoore of the Bull Hook, was by Michael Banim. In 1826 a second series was published, containing what is decidedly one of the best Irish novels in our literature, Zhe Nowlans. John's health had almost en- tirely given way,and the next etfort of the "O'Hara family" was almost entirely the production of his brother Michael. The Croppy, a Tale of 1798, is hardly equal to the earlier tales, though it contains some wonderfully vigorous passages. The Denounced, The Mayor of Windgap, The Ghost Hunter (by Michael Banim), and The Smuggler, followed in quick succession, and were received with con- siderable favour. Banim, meanwhile, had completely broken down in health, and had become much straitened in circumstances. During his absence in France a move- ment to relieve his wants was set on foot by the English press, headed by Sterling in the Zvmes. A sufficient sum was obtained to remove him from any danger of actual waut, and to this Government afterwards added a pension

of £150. He settled in Windgap Cottage, a short distance | reaches the height of 3000 feet. The district has been from Kilkenny ; and there, a complete invalid, he passed | divided by the Dutch into the residency of Kween and the the remainder of his life. His last piece of literary work | sub-residencies of Amuntal and Martapura. The town of was the novel, entitled Mather Connell. He died in July | Martapura was the seat of the sultan from 1771. The 1842, aged 44, Banim's true place in literature is to be | principal productions of the district are gold, diamonds, estimated from the merits of the O'Hara Tales ; his later | coal, pepper and other spices, drugs, edible birds' nests, works, though of considerable ability, are not unfrequently | gum, wax, rattans, &c. The inland portion is covered with prolix, and are marked by too evident an imitation of the forest, while the flat and swampy seaboard is largely occu- Waverley Novels, The Tales, however, show him at his | pied by rice-fields, The inhabitants, who are for the most best ; they are masterpieces of faithful delineation, The | part Dayaks, are roughly

estimated from 300,000 to 600,000. strong passions, the lights and shadows of Irish peasant BANJARMASSIN, the chief town of the above district, also character, have rarely been so ably and truly depicted. The | known as Fort Tatas, is situated about 15 miles from the prevailing quality is a wonderful vehemence, combined with | mouth of the Banjar, in lat. 3° 23’ S., long. 114° 37’ E. a gloominess extending at times to natural phenomena as | The most of the houses are built on piles, as the town is well as to the characters of the tale; the incidents are | subject to frequent inundations. In1700 the East Indian striking, sometimes even horrible, and it is not without | Company established a factory here; but the place was some justice that the authors have been accused of sensa- | found to be unhealthy, and the Company’s servants were tionalism, of straining after melodramatic effect. The | finally attacked by the natives, whom they repulsed with lighter, more joyous side of Irish character, which appears | great difficulty. The settlement was abandoned. The so strongly in Lover, does not receive due prominence from | English again seized Banjarmassin in 1811, but restored it the Banims. (See P. J. Murray, Life of John Banim, | in 1817. The trade consists in the export of the products 1857.) of the surrounding country and the import of cloth, Chinese

BANJARMASSIN, a district in the south-east of | pottery, all kinds of metal goods, opium, tobacco, and salt. Borneo, which was incorporated by the Dutch in consequence | The population is of a very mixed character, and is esti- of the war of 1860, in regard to the succession in the | mated at upwards of 30,000. Of the commercial com- sultanate, which had been under their protection since | munity the Chinese form a very important portion, The 1787. It is watered by the river system of the Banjar, | coal mines, discovered in 1846 at Mount Pengaron, to the and traversed by a chain of mountains that in some places | E., are largely worked by the Dutch.

BANKING

BANK, in its simplest form, is an institution where | endorsed on the deposit note or receipt or accompanying it. money may be deposited for safe keeping ; but banks | If the banker undertakes to pay interest on deposits, the are usually established to lend as well as to receive money ; |

rate varies according to the length of the notice the de- and the profits of a banker are commonly derived from the | positor agrees to give before withdrawing the moncy, the excess of the interest he receives from those indebted to | ability of the banker to deal with it being, of course, him over the interest he allows, so far as he allows any, to | dependent upon the time he may rely upon keeping it. those who have deposited money with him. Early | When money is received on a current or drawing account, denunciations of usury (Exod. xxii. 25) show the antiquity | the customer of the banker draws it out, as he requires, by of the practice of lending money at interest ; but this must | means of orders, to which the specific name cheques is have long preceded the origin of the business of both | given; and, partly for convenience and partly by way of borrowing and lending money. When this first appeared | security against fraud, bankers are in the habit of giving it was not, at least in modern Europe, a distinct profession, | their customers books of forms of cheques consecutively but was undertaken by goldsmiths and dealers in precious | numbered. Cheques are generally payable to the person metals, In the progress of the separation of employments, | in whose favour they are drawn (the payee) or bearer, which is a characteristic of an advancing society, banking | though they are sometimes payable to the payee or order, became a business of its own, which has again been sub- | in which case endorsement by the payee is necessary divided into many branches independently pursued. It | before the money can_be received. By the usage of was, for example, formerly generally allowed to be part of | bankers in the United Kingdom a “crossed ” cheque, that the business of a banker to borrow money by issuing | is, a cheque across the face of which two parallel lines, with promissory notes payable to bearer, which passed from | the name of a banker or the words “ & Co.” inserted hand to hand as money, within the sphere of the operations | between them, have been drawn, has been long held pay- of the banks, and banks thus borrowing money were called | able by the banker on whom it is drawn to the payee alone Banks of Issue ; but it has been contended of late years | or to another banker ; and this usage received the force of that the function of issuing notes passing by delivery as | law by statutes of the present reign (19 and 20 Vict. ¢, 25, money should be reserved for the state, or for some institu- | and 21 and 22 Vict. c. 79). tion controlled and directed by the state; and we shall Bankers lend money by opening credits in their books, have hereafter to notice the controversy that has arisen | against

which their favoured customers may draw to the on this point, and the steps that have been taken in conse- | extent of the credits opened ; by discounting bills; by the quence of it. An explanation of the different species of | purchase of securities ; or by advancing money on securities, banks will also properly be deferred till a later stage, but | &c., &c. It will have been gathered that they also under- it will be convenient here to give a general sketch of the | take the business of collecting the money for cheques, for nature of the business of an ordinary banker. We have bills, and for other securities as they mature, which they said he receives and lends money; he may receive money | may have received from their customers. The labour of either on a deposit or on a current or drawing account. | collection is much facilitated in England by the fact that When money is received on deposit it is commonly repay- bills of exchange are almost invariably made payable in able to the depositor alone, to whom a deposit note or | London, and that every country banker has a correspondent receipt is given; but it may also be paid to any one to ; among the London bankers who collects for him and whom the depositor gives an order on the bank either ; pays for him ; and the London bankers again maintain an

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establishment called the Clearing-house (see p. 328), whcre their clerks mect to effect their interchanges.

Banking appears to have reached a high state of de- velopment among the ancients. The bankers of Greece (rparétirar) and Rome (argentarti, mensarii, nummularit) exercised nearly the same functions as those of the present day, except that they do not appear to have issued notes. They received moncy on deposit, to be repaid on demands made by cheques or orders, or at some stipulated period, sometimes paying interest for it, aud sometimes not. Their profits arose from their lending the balance at their disposal at higher rates of interest than they allowed the depositors. They were also extensively employed in valuing and exchanging forcign moneys for those of Athens, Corinth, Rome, &c., and in negotiating bills of exchange. Iu general they were highly esteemed, and great confidence was placed in their integrity. The rate of interest charged by the bankers was sometimes very

high, but that was not a consequence, as has been alleged, of their rapacity, but of the defective state of the law, which, as it gave every facility to debtors disposed to evade payment of their debts, obliged the bankers to guarantee themselves by charging a proportionally high rate of interest.1 Bauking reappeared in Italy ‘wpon the revival of civilization. The bank of Venice is reputed the first in date in the history of modern Europe; but it did not become a bank, as we understand the term, till long after its foundation. Historians inform us that the republic being hard pressed for money, was obliged, upon three different occasions, in 1156, 1480, and 1510, to levy forced contributions upon the citizens, giving them in return perpetual? annuities at certain rates per cent, The annuities due under the forced loan of 1156 were, however, finally extinguished in the 16th century; and the offices for the payment of the annuities due under the other two loans having been consolidated, eventually became the Bank of Venice. This might be effected as follows :—The interest on the loan to Government being paid punctually, every claim registered in the books of the oftice would be considered as a productive capital ; and these claims, or the right of receiving the annuity accru- ing thereon, must soon have been trausferred, by demise or cession, from one person to another. This practice would naturally suggest to holders of stock the simple and easy method of discharging their mutual debts by transfers on the office books, and as soon as they became sensible of the advantages to be derived from this method of account- ing, bank-money was invented. It will, however, be scen that the establishment thus described was at first no more than the transfer office of a National Debt, transfers of which were accepted at par in discharge of private debts, and it is indced said that the funded debt transferred sometimes commanded an agio or premium above the current moncy of the republic. This establishment was ruined, after passing through many changes, by the invasion of the French in 1797.

The origin of modern banking may be traced to the money-dealers of Florence, who were in high repute as reccivers on deposit and lenders of money in the 14th century ; and banking was indced practised at Florence in the 13th if not in the 12th century. Mr Macleod writes (Banking, vol. i. 289) —

‘©The names of the Bardi, Acciajuoli, Peruzzi, Pitti, and Medici were famous throughout Europe. In 1845 the Bardi and the

1 Boeckh’s Political Economy of Athens, i, 168, &c.; Voyage

d’ Anacharse, cap. 55, passim; Smith’s Dictionary of Greck and Roman

Antiquities, s.v. Argentartt, &e.

2 The annuities of the forced loan of 1480 were to be suspended during periods of war.

3 Cleirac, Du Negoce, de la Banque, &c. (Bordeaux, 1656), pp. 112-117, a scarce and valuable volume.

PAN KING

Peruzzi, the two greatest mercantile houses in Italy, failed. Edward 1II. owed the Bardi’ 900,000 gold florins, which his war with France prevented him paying; and the king of Sicily owed them 100,000 gold florins. The deposits of citizens and strangers with the Bardi were 550,000 gold florins. The Peruzzi were owed 600,000 gold florins by Edward I1I., and 100,000 by the king of Sicily, and the deposits they owed their customers were 350,000 gold florins. The fall of these two great pillars of credit involved that of multi- tudes of other smaller establishments, and, says Villani (Jstor. Fiorent., xii. 55), the community of Florence had never been thrown into such ruin and disorder before. And therenpon he breaks out against the folly of his fellow-citizens entrusting their rhoney to the care of others for the love of gain. The city, however, recovered from this terrible disaster, and we find that between 1430 and 1483 seventy-six bankers at Florence lent 4,865,000 gold florins. At one time Florence is said to have had eighty bankers, but not any public bank.”

The business of banking was not introduced into England till the 17th century, when it began to be undertaken by goldsmiths in London, who appear to have borrowed it from Holland. It was attacked as innovations commonly are. Mr Gilbart, in his History and Principles of Banking, quotes, froin a pamphlet pub- lished in 1676, entitled The Mystery of the New-

Fashioned Goldsmiths or Bankers Discovered, a passage that may be reproduced,—

‘Much about the same time—the time of the civil commotion— the goldsmiths (or new-fashioned bankers) began to receive the rents of gentlemen’s cstates remitted to town, aud to allow them, and others who put cash into their hands, some interest for it if it remained but a single month in their hands, or even a lesscr time. This was a great allurement for people to put money into their hands, which would bear interest till the day they wanted it ; and

they could also draw it out by one hundred pounds or fifty pounds,

&c., at a time as they wantcd it, with infinitely less trouble than if they lad lent it out on either real or personal security. The con-

sequence was that it quickly brought a great quantity of cash into their hands, so that the chief or greatest of them was now enabled to supply Cromwell with money in advance, on the revenues, as his

occasion required, upon great advantages to themselves.” Sir Josiah Child also attacked “that innovated practice of

bankers in London” in his New Discourse of Trade, though he subsequently became himself a banker ; and his

house, Messrs Child & Co., of Temple Bar, and the house of Messrs Hoare, in Fleet Street, still survive as the only

private banks now in existence in London which were established previous to the Bank of England.

Foundation and Early History of the Bank of England.

The Bank of England, which has long been the principal bank of deposit and circulation in Great Britain, and indeed in Europe, was founded in 1694. Its principal projector, Mr William Paterson, an intelligent Scotch gentleman, was afterwards engaged in the ill-fated Darien cnterprise.

Government being at the time much distressed for want of money, partly from the defects and abuses in the system of taxation, and partly from the difficulty of borrowing because of the supposed instability of the Revolutionary establishment, the bank grew out of a loan of £1,200,000 for the public service. The subscribers, besides receiving 8 per cent. on the sum advanced as interest, and £4000 a year as the expense of management, in all £100,000 a year, were incorporated into a society denominated the Governor and Company of the Bank of England. The charter is dated the 27th of July 1694. It declares, amongst other things, that they shall " be capable, in law, to purchase, enjoy, and retain to them and their successors, any moneys, lands, rents, tenements, and possessions whatsoever ; and to purchase and acquire all sorts of goods and chattels whatsoever, wherein they are not restrained by Act of Parliament ; and also to grant, demisc, and dispose of the same.

"That the management and government of the corpora- tion be committed to the governor and twenty-four direc-

tors, who shall be elected between the 25th of March and the 25th day of April each year, from among the members of the company duly qualified.

"That no dividend shall at any time be made by the said governor and company, save only out of the interest, profit, or produce arising by or out of the said capital, stock, or fund, or by such dealing as is allowed by Act of Parliament.

"They must be unatural-born subjects of England, or naturalized subjects ; they shall have in their own name, and for their own use, severally, viz., the governor at least £4000, the deputy-governor £3000, and each director £2000, of the capital stock of the said corporation.

"That thirteen or more of the said governors and direc- tors (of which the governor or deputy-governor must be always one) shall coustitute a court of directors, for the management of the affairs of the company, and for the appointment of all agents and servants which may be necessary, paying them such salaries as they may consider reasonable,

“‘ Kvery elector must have, in his own name and for his own use, £500 or more capital stock, and can only give one vote. He must, if required by any member present, take the oath of stock, or the declaration of stock in case he may be one of the people called Quakers.

“ Four general courts shall be held in every year, in the months of September, December, April, and July. A general court may be summoned at any time, upon the requisition of nine proprietors duly qualified as electors. ‘The majority of electors in general courts have the power to make and constitute bye-laws and ordinances for the government of the corporation, provided that such bye-laws and ordinances be not repugnant to the laws of the king- dom, and be confirmed and approved according to the statutes in such case made and provided.”

The corporation is prohibited from engaging in any sort of commercial undertaking other than dealing in bills of exchange, and in gold and silver. It is authorised to advance money upon the security of goods or merchandise pledged to it, and to sell by public auction such goods as are not redeemed within a specified time.

It was also enacted, in the same year in which the bank was established, by statute 6 William and Mary, c. 20, that the bank “shall not deal in any goods, wares, or merchan- dise (except bullion), or purchase any lands or revenues belonging to the Crown, or advance or lend to their inajesties, their heirs or successors, any sum or sums of money, by way of loan or anticipation on any part or parts, branch or branches, fund or funds of the revenue, now granted or belonging, or hereafter to be granted, to their majesties, their heirs and successors, other than such fund or funds, part or parts, branch or branches of the said revenue only on which a credit of loan is or shall be granted by Parliament.” And in 1697 it was enacted, that the ‘common capital or principal stock, and also the real fund, of the governor and company, or any profit or produce to be made thereof, or arising thereby, shall be exempted from any rates, taxes, assessments, or impositions whatsoever during the continuance of the bank; that all the profit, benefit, and advantage from time to time arising out of the management of the said corporation, shall be applied to the uses of all the members of the said association of the governor and company of the Bank

of England, rateably and in proportion to each member's part, share, and interest in the common capital and principal stock of the said governor and company hereby established."

In 1696, during the great recoinage, the bank was involved in great difficulties, and was even compelled to suspend payment of its notes, which were at a heavy discount. Owing, however, to the judicious conduct of the

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directors, and the assistance of the Government, the bank got over the crisis. But it was at the same time judged expedient, in order to place it in a situation the better to withstand any adverse circumstances that might afterwards occur, to increase the capitalfrom £1,200,000to £2,201,171. In 1708 the directors undertook to pay off and cancel one million and a half of exchequer bills they had circulating two years before, at 44 per cent., with the interest upon them, amounting in all to £1,775,028, which increased the permanent debt due by the public to the bank, including £400,000 then advanced in consideration of the renewal of the charter, to £3,375,028, for which they were allowed 6 per cent. The bank capital was then also doubled, or increased to £4,402,342. But the year 1708 is chiefly memorable in the history of the bank, for the Act pre- viously alluded to, which declared, that during the con- tinuance of the corporation of the Bank of England, "it should not be lawful for any body politic, erected or to be erected, other than the said governor and company of the Bank of England, or of any other persons whatsoever, united or to be united in covenants or partnership, exceed- ing the number of six persons, in that part of Great Britain called England, to borrow, owe, or take up any sum or sums of money on their bills or notes payable on demand, or in any less time than six months from the borrowing thereof." This proviso is said to have been elicited by the Mine Adventurers Company having commenced banking business and begun to issue notes. It will be seen on examination that the proviso did not prohibit the forma- tion of associations for general banking business; it simply forbade the issue of notes by associations of more than six partners; but the issue of notes was regarded as so essen- tial to the business of banking, that it came to be believed that joint-stock banking associations were absolutely pro- hibited in England, and no such

association was founded until after the legislation of 1826 (see p. 322) expressly permitting them to be established. The charter of the Bank of England, when first granted, was to continue for eleven years certain, or till a year's notice after the Ist of August 1705. The charter was further prolonged in 1697. In 1708, the bank, having advanced £400,000 for the public service, without interest, the exclusive privileges of the corporation were prolonged till 1733. And in con- sequence of various advances made at different times, the exclusive privileges of the bank were continued by suc- cessive renewals till the Ist of August 1855, with the proviso that they might be cancelled on a year's notice to that effect being given after the said Ist of August

1855.

We subjoin an acconnt of the successive renewals of the charter, of the conditions under which these renewals were made, and of the variations in the amount and interest of the permanent debt due by Government to the bank, exclusive of the dead weight.

Date of | Conditions under which Renewals were Renewal, | made and Permanent Debt eontracted.

Permanent Debt.

1694 \Charter granted under the Act 5 and 6 Will. III. c. 20, redeemable upon the expiration of twelve months' notice after the Ist August 1705, upon payment by the public to the bank of the de- mand therein specified.

Under this Act the bank ad- vanced to the public £1,200,000 in consideration of their receiving an annuity of £100,000 a year, viz., 8 per cent. interest and £4000 for management…. . a

es 6h (ab

1,200,000 0 0

Carry forward…..... 1,200,000 0 0

Conditions unger which Renewals were made and Permanent Debt contracted.

Date of Renewal.

Brought forward……...

1697 |Charter continued by 8 and 9 Will. III. c. 20, till twelve months' no- tice after Ist of August 1710, on payment, &c.

Under this Act the bank took up and added to their stock £1,001,171 Exchequer bills and tallies.

1708 |Charter continued by 7 Anne, c. 7, till twelve months' notice after Ist of August 1732, on payment, &c.

Under this Act the bank ad- vanced £400,000 to Government without interest, and delivered up to be cancelled £1,775,027, 17s. 10d. Exchequer bills, in con- sideration of their receiving an annuity of £106,501, 13s., being at the rate of 6 per cemt…….....

1713 {Charter continued by 12 Anne, stat. 1, ¢. 11, till twelve months' notice after the 1st of August 1742, on payment, &c.

In 1716, by the 3 Geo. I. ¢. 8, the bank advanced to Government, UUROMPCURCEM Uncen iistemtartyst

And by the same Act the in- terest on the Exchequer bills can- celled in 1780 was reduced from 6 to 5 per cent.

In 1721, by 8 Geo. I.c. 21, the South Sea Company were autho- rized to sell £200,000 Government annuities, and corporations pur- chasing the same at 26 years' purchase were authorized to add the amount to their capital stock. The bank purchased the whole of these annuities at 20 years' PUVCHASE).. 5. .0irererisersrrsseeserssiene

Five per cent. interest was pay- able on this sum to midsum- mer 1727, and thereafter 4 per cent. —

At different times between 1727 and 1788, both inclusive, the bank received from the public, on account of permanent debt, £3,275,027, 175. 10d., and ad- vanced to it, on account of ditto, £3,000,000: Difference….....

Debt due by the public in

1738

1742 |Charter continued by 15 Geo. II. c. 18, till 12 months' notice after the Ist of August 1764, on pay- ment, &c.

Under this Act the bank ad- vanced £1,600,000 without in- terest, which, being added to the original advance of £1,200,000, and the £400,000 advanced in 1710, bearing interest at 6 per cent., reduced the interest on the SlaONS) OIG) JOP Gaiety noe8onogneengdn oor

In 1745, under authority of 19 Geo. II. ¢. 6, the bank delivered up to be cancelled £986,000 of ixchequer bills, in consideration of an annuity of £39,472, being at the rate of 3 per cent…….....

In 1749, the 28d Geo. II. ¢. 6, reduced the interest on the 4 per cent. annuities, held by the bank, to 84 per cent. for seven years from the 25th of December 1750, and thereafter to 3 per cent.

Canny: forwards…

BANKING

Permanent Debt.

£ s. ad.

1,200,000 0 0

2,175,027 17 10

2,000,000 0 0

4,000,000 0 0

9,375,027 17 10

275,027 17 10

9,100,000 0 0

1,600,000 0 0

986,000 0 0

11,686,000 0 0

Date of Renewal,

Conditions under which Renewals were made and Permanent Debt contracted.

Brought forward……...

1764 |Charter continued by 4 Geo. III. c. 25, till twelve months' notice after the Ist of August 1786, on payment, &c.

Under this Act the bank paid into the Exchequer £110,000, free of all charge.

Charter continued by 21 Geo. III. ce. 60, till twelve months' notice after the Ist of August 1812, on payment, &c.

Under this Act the bank ad- vanced £30,000,000 for the public service for three years, at 3 p. cent.

Charter continued by 40 Geo. III. c. 28, till twelve months' notice after the Ist of August 1833, on payment, &c.

Under this Act the bank ad- vanced to Government £3, 000,000 for six years without interest ; but in pursuance of the recommenda- tion of the committee of 1807, the advance was continued, withoutin- terest, till six months after the sig- nature of adefinitive treaty of peace.

In 1816, the bank, under au- thority of the Act 56 Geo. III. ¢. 96, advanced at 3 per cent., to be repaid on or before the Ist of Auousty USB aha merkencra scales

1883 [Charter continued by 3 and 4 Will.

IV. c. 98, till twelve months’ notice after the Ist of August 1855, with a proviso that it may be dissolved on twelve months’ notice after the Ist of August 1855, on payment, &c.

This Act directs that in future the bank shall deduct £120,000 a year from their charge on ac- count of the management of the public debt; and that a fourth part of the debt due by the public to the bank, or £38,671,000, be p01 10010} 0} BARBED Binacenene pena csonctee

Permanent advance by the bank to the public, bearing interest at 3 per cent., independent of the ad- vances on account of dead weight, or other public securities held WRU cease comets vevertesscs seceieers rete

1844 {Charter continued by 7 and 8 Vict. c. 82, till twelve months after the Ist of August 1855,on payment, &.

This Act exempts the notes of the bank from all charge on ac- count of stamp-duty, and directs that in future the bank shall de- duct a further sum of £180,000 a year from the charge on account of the management of the public debt. It also allows notes of the value of £14,000,000 to be issued on securities, separates the bank- ing from the issuing department of the establishment, and effects other important changes.

The Act 24 and 25 Vict. c. 3, pro- vides fresh terms of payment to endure until the 5th April 1886. The amount to be deducted to be £60,000 plus the whole allowance out of profits of issue, making in all at that time £188,078, and now (1875) about £200,000.

The amount to be issued on se- curities was raised to £15,000,000 on 21st February 1866.

1781

1800

1861

Permanent Debt.

£

11,686,000

Oe hs

0 0

8,000,000 0 0

14,686,000 0 0

3,671,000 0 0

11,015,000 0 0

BANKING

The capital of the bank on which dividends are paid has never exactly coincided with, though it has seldom differed very materially from, the permanent advance by the bank to the public. We have already seen that it amounted in 1708 to £4,402,342. Between that year and 1727 it had increased to near £9,000,000. In 1746 it amounted to £10,780,000. From this period it underwent no change till 1782, when it was increased 8 per cent., amounting to £11,642,400. It continued stationary at this sum down to 1816, when it was raised to £14,553,000, by an addition of 25 per cent. from the profits of the bank, under the provisions of the Act 56 Geo. III. c. 96. The Act for the renewal of the charter 38 and 4 Will. IV. c. 98, directed that the sum of £3,671,700, being the fourth part of the debt due by the public to the bank, should be paid to the latter, giving the bank the option of deducting it from its capital. But that has not been done; and after sundry changes, the capital of the bank amounts, as formerly, to £14,553,000.

The Bank of England has been frequently affected by panics amongst the holders of her notes. In 1745 the alarm occasioned by the advance of the Highlanders, under the Pretender, as far as Derby, led to a run upon the bank ; and in order to gain time to effect measures for averting the run, the directors adopted the device of paying in shillings and sixpences! But they

derived a more effectual relief from the retreat of the Highlanders, and from a resolution agreed to at a meeting of the principal merchants and traders of the city, and very numerously signed, declaring the willingness of the subscribers to receive bank-notes in payment of any sum that might be due to them, and pledging themselves to use their utmost endea- vours to make all their payments in the same medium,

During the tremendous riots in June 1780, the bank incurred considerable danger. Had the mob attacked the establishment at the commencement of the riots, the conse- quences might have proved fatal. But they delayed their attack till time had been afforded for providing a force sufficient to insure its safety. Since that period a consider- able military force occupies the bank every night as a pro- tection in any emergency that may occur.

Progress of Banking in England down to Restriction Order of 1797.

The business of banking had meanwhile been undertaken in several of the country towns of England. The still existing bank of Messrs Smith & Co. of Nottingham, the parent of the London establishment of Messrs Smith, Payne, and Smiths, claims to have been established in 1688 ; the Bristol Old Bank (Messrs Baillie, Cave, and Co.) dates from 1750; the Hull Old Bank (Messrs Pease and Co.) from 1754 ; and many other country banks trace back their history to the latter half of the last century. It is believed that all these bankers issued their own notes payable to bearer as part of their business ; and they were not very scrupulous in regard to the magnitude of the sums for which they were given. The Bank of England had not issued any notes for less than £20 previously to 1759, when it commenced the issue of £10 notes; but the country bankers put in circulation notes for such small sums that Parliament enacted, in 1775, that none should be issued for less than £1. In 1777 this minimum limit was further raised to £5, but in spite of this restriction the number and the amount of the issues of the country bankers soon become dangerously multiplied. The ter- mination of the American War was followed by a great industrial and commercial development at home. Agri- culture, commerce, and still more, manufactures, into which Watt and Arkwright’s inventions had been lately intro-

duced, immediately began to advance with a rapidity unknown at any former period. In consequence, that confidence which had either been destroyed, or very much weakened by the disastrous events of the war, was fully re-established. The extended transactions of the country required fresh facilities for carrying them on, and these were supplied in the utmost profusion. The number of banks, which in 1784 was certainly under 150, increased so rapidly, that in 1792 they amounted to about 350. In consequence, a banking office was opened in every market- town and in most considerable villages. And such being the case, it is needless, perhaps, to add, that the prndence, capital, and connections of those who set up these establish- ments were but little attended to. The great object of a large class of traders was to obtain discounts ; and the bankers of an inferior description were equally anxious to accommodate them, All sorts of paper were thus forced into circulation, and enjoyed nearly the same degree of esteem. ‘The bankers and those with whom they dealt had the fullest confidence in each other. No one seemed to suspect that there was anything hollow or unsound in the system. Credit of every kind was strained to the utmost; and the available funds at the disposal of the bankers were reduced far below the level which the magni- tude of their transactions required to render. them secure.

The catastrophe which followed was such as might easily have been foreseen. The currency having become redundant, the exchanges took an unfavourable turn in the early part of 1792. A difficulty of obtaining pecuniary accommodation in London was not long after experienced ; and, notwithstanding the efforts of the Bank of England to mitigate the pressure, a violent revulsion took place in the latter part of 1792 and the beginning of 1793. The failure of one or two gréat houses excited a panic which proved fatal to many more. Out of the 350 country banks in England and Wales, when this revulsiou began, about 300 were compelled to stop payments, and upwards of 50 were totally destroyed, producing by their fall an extent of misery and bankruptcy till then unknown in the country.

Attempts have sometimes been made to show that this crisis was not occasioned by an excess of paper money having been forced into circulation, but by the agitation caused by the war then on the eve of breaking out. But there does not seem to be any good grounds for this

opinion. The symptoms of an overflow of paper—a fall of the exchange, and an efflux of bullion—took place early in 1792, or about twelve months before the breaking out of hostilities,

Suspension of Cash Payments in 1797.

The year 1797 is a most important epoch in the history of English banking. Owing partly to events connected with the war then carried on, to loans to the Einperor of Germany, to bills drawn on the treasury at home by the British agents abroad, and partly, and chiefly, perhaps, to the advances most unwillingly made by the bank to Government, which prevented the directors from having a sufficient control over their issues, the exchanges became unfavourable in 1795, and in that and the following year large sums of specie were drawn from the bank. In the end of 1796 and beginning of 1797, considerable appre- hensions were entertained of invasion, and rumours were propagated of descents having been actually made’on the coast. In consequence of the fears that were thus excited, runs were made on the provincial banks in different parts of the country; and some of them having failed, the panic became general and extended itself to London. Demands for cash poured iu from all quarters upon the bank, which, on Saturday the 25th of February 1797, had only £1,272,000 of cash and bullion in its coffers, with

every prospect of a violent run taking place on the follow- ing Monday. In this emergency, an order in council was issued on Sunday the 26th, prohibiting the directors from paying their notes in cash until the sense of Parliament should be taken on the subject. And after Parliament met, and the neasure had been much discussed, it was agreed to continue the restriction till six months after the signature of a definitive treaty of peace.

As soon as the order in council prohibiting payments in cash appeared, a meeting of the principal bankers, merchants, traders, &c., of the metropolis, was held at the Mansion-house, when a resolution was agreed to, and very numerously signed, pledging, as had been done in 1745, those present to accept, and to use every means in their power to make bank-notes be

accepted, as cash in all trans- actions, This resolution tended to allay the apprehensions that the restriction had excited.

Parliament being in session at the time, a committee was iminediately appointed to examine into the affairs of the bank; and their report put to rest whatever doubts might have been entertained with respect to the solvency of the establishment, by showing, that at the moment when the order in council appeared, the bank was possessed of property to the amount of £15,513,690, after all claims upon it had been deducted. This suspension of cash payments being naturally followed by a withdrawal of gold from circulation, made it necessary to allow of the issue of notes of asmaller denomination than £5, and the statute of 1777 was accordingly also suspended.

Much difference of opinion has existed with respect to the policy of the restriction in 1797 ; but, considering the peculiar circumstances under which it took place, its expediency seems abundantly obvious. The run did not originate in any over-issue of bank paper, but grew entirely out of political causes. So long as the alarms of invasion coutinued, it was clear that no bank paper immediately convertible into gold would remain in circulation. And as the bank, though possessed of ample funds, was without the means of instantly retiring its notes, it might, but for the interference of Government, have been obliged to stop payments,—an event which, had it occurred, might have produced consequences fatal to the public interests.

The error of the Government did not consist in their coming to the assistance of the bank, but iu continuing the restriction aftcr the alarm of invasion had ceased and there was nothing to hinder the bank from safely reverting to specie payments.

It had been generally supposed, previously to the passing of the Restriction Act, that bank-notes would not circulate unless they were immediately convertible into cash. But the event showed that this was not really the case. Though the notes of the Bank of England were not, at the passing of the Restriction Act, declared by law to be legal tender, they were rendered such in practice, by being received as cash in all payments on account of Government, and by the vast majority of individuals. For the first three years of the restriction, their issues were so moderate that they not only kept

on a par with gold, but actually bore a small premium. But in 1801, 1802, and 1803, they were so much increased that they fell to a discount of from 8 to 10 percent. In 1804 they again recovered their value ; and from that year to 1808, both inclusive, they were at a discount of 24 per cent. In 1809 and 1810, however, the directors appear to have embarked on a new course, and to have entirely lost sight of the principles by which their issues had previously been governed; for the average amount of bank-notes in circulation, which had not exceeded 174 millions, nor fallen short of 164 millions, in any one year, from 1802 to 1808, both inclusive, wasin 1809 raised to £18,927,833, and 1810 to £22,541,523. The issues

of country bank papcr were increased in a still greater pro- portion ; and, as there was no corresponding increase of the business of the country, the discount on bank-notes rose from 24 in 1808 to from 13 to 16 per cent. in 1809 and 1810.

This depreciation in the value of bank paper being accompanied by a corresponding fall in the exchange attracted the attention of the public and the legislature. In consequence, the House of Commons appointed, in 1810, a committee to inquire into the subject; and having exainined several witnesses, the committee in their report, which was both an able and a celebrated paper, justly ascribed the fall in the value of bank paper, as compared with gold, toits over-issue ; and recommended, in the view of correcting the existing evil and of preventing its recurrence, that within two years the bank should be obliged to resume specie payments. But this recommenda- tion not being adopted, the over-issue of paper went on increasing. In 1812 it was at an average discount, as compared with bullion, of 20 per cent.; in 1813, of 23 per cent.; and in 1814, when the maximum of depreciation was attained, it was at 25 per cent.

At the period when the restriction on cash payments took place in 1797, it is supposed that there were about 280 country banks in existence; but so rapidly were these establishments multiplied, that they amounted to above 900 in 1813. The price of corn, influenced partly by the depreciation of the currency and the facility with which discounts were obtained, but more by deficient harvests and the unprecedented difficulties which the war threw in

the way of importation, rose to an extraordinary height during the five years ending with 1813. But the harvest of that year being unusually productive, and the intercourse with the Continent being then also renewed, prices, influenced by both circumstances, sustained a very heavy fall in the latter part of 1813 and the beginning of 1814. And this fall having ruined a considerable number of farmers and produced a general want of confidence, such a destruction of provincial paper took place as has rarely been paralleled. In 1814, 1815, and 1816, no fewer than 240 country banks stopped payment ; and eighty-nine com- missions of bankruptcy were issucd against these establish- ments, being at the rate of one commission against every fen and a half of the total number of banks existing in 1813,

The great reduction that was thus suddenly and violently brought about in the quantity of country bank paper, by extending the field for the circulation of Bank of England paper, raised its value in 1817 nearly to a par with gold. The return to cash payments being thus facilitated, it was fixed, in 1819, by the Act 59 Geo. III. c. 78, commonly called Sir Robert Peel's Act, that they should take place in 1823. But to prevent any future over-issue, and at the same time to render the resumption as little burdensome as possible, it was enacted, in pursuance of a plan suggested by Mr Ricardo, that the banks should be obliged, during the interval from the passing of the Act till the return to specie payments, to pay its notes, if required, in bars of standard bullion of not less than sixty ounces' weight. This plan was not, however, acted upon during the period allowed by law; for, a large amount of gold having been accumulated at the bank, the directors preferred recom- mencing specie payments on the 1st of May 1821.

The fluctuations, referred to above, in the value of paper were exceedingly injurious. From 1809 to 1815, the creditors of every antecedent contract, land-holders whose estates had been let on lease, stockholders and annuitants of every description—all, in short, who could not raise the nominal amount of their claims or incomes proportionally to the fall in the value of money, were to that extent losers. The injustice that would have been done to the creditors of the state and of individuals, who had made thcir loans

in gold, or paper equivalent to gold, by raising the denomination of the coin twenty-five per cent., however gross and palpable, would not have been greater than was actually done them in 1814, by compelling them to receive payment of their just debts in paper depreciated to that extent,

It is true, that after a currency has been for a consider- able period depreciated, as much injustice is done by rais- ing, as was previously done by depressing, its value. But there is good reason to doubt whether the depreciation from 1809 to 1815 (for the depreciation of 24 per cent. during the six preceding years is too inconsiderable to be taken into account) extended over a sufficiently lengthened period to warrant the Legislature in departing from the old stan- dard. It is needless, however, to offer any opinion on this rather difficult point, for we have seen that the value of paper was raised in 1816 and 1817 almost to par by acci- dental circumstances without any interference on the part of Government or of the bank. Sir Robert Peel's Act, to which this rise had been ascribed, not being passed till 1819, could have nothing to do with what occurred two or three years previously. Its object was twofold, to redeem the pledge given by Parliament to restore the old standard on the return of peace, and to shut the door against any fresh depreciation of paper.

History of Banking from the Resumption of Cash Payments to the Crisis of 1825.

The resumption of cash payments did not, however, put an end to the vicissitudes of banking. Notwithstanding the ample experience that had been supplied by the occur- rences of 1792-93 and 1814-16, of the mischievous conse- quences of the issue of paper by the country banks, and of their want of solidity, nothing whatever was done, when provision was made for returning to specie payments, to restrain their issues, or to place them on a better footing. The consequences of such improvidence were not long in mauifesting themselves. 'he prices of corn and other agricultural products, which had been greatly depressed in consequence of abundant harvests, in 1820, 1821, and 1822, rallied in 1823, and the country bankers immedi- ately began to enlarge their issues. It is unnecessary to inquire into the circumstances. which conspired, along with the rise of prices, to promote the extraordinary rage for speculation exhibited in 1824 and 1825.

It is sufficient to observe, that in consequence of their operation, confidence was very soon carried ta the greatest height. It did not seem to be supposed that any scheme could be hazardous, much less wild or extravagant. The infatuation was such, that even the most considerate persons did not scruple to embark in visionary and absurd projects ; while the extreme facility with which discounts were procured upon bills at very long dates, afforded the means of carrying on every sort of undertaking. The most worthless paper was readily negotiated. Many of the country bankers seemed, indeed, to have no other object than to get themselves indebted to the public. And such was the vigour and success of their efforts to force their paper into circulation, that the amount of it afloat in 1825 is estimated to have been nearly 60 per cent. greater than in 1823. The con- sequences of this extravagant and unprincipled conduct are well known. The currency having become redundant, the exchanges began to decline in the summer of 1824. The directors of the Bank of England having unwarily entered, in the early part of that year, into an engagement with the Government to pay off such holders of 4 per cent. stock as might dissent from its conversion into a 34 per cent. stock, were obliged to advance a considerable sum ou this account after the depression of the exchange. But despite this circumstance, they might and ought to have

taken measures, in the latter part of 1824 and the earlier part of 1825, by lessening their issues to stop the efflux of bullion. But not being sufficiently alive to the urgency of the crisis, the London currency was not materially diminished till September 1825. The recoil, which would have been less severe had the efforts of the bank to prevent the exhaustion of its coffers taken place at an earlier period, was most appalling. The country banks began to give way the moment thcy experienced a considerably increased difficulty of obtaining accommodation in London, and confidence and credit were immediately at an end. Suspicion having awakened from her trance, distrust had no limits. All classes of depositors made haste to call up the sums they had entrusted to the care of the banks. There was also a run upon them for payment of their notes, not in the view of sending the gold as a mercantile adventure to the Continent, but to escape the loss which it became obvious the holders of country paper would have to sustain. Sauve qui peut was the universal cry ; and the destruction was so sudden and extensive, that in less than six weeks above seventy banking establishments

were swept off, and a vacuum was created in the currency which absorbed from eight to ten millions of additional issues by the Bank of England, at the same time that myriads of those private bills that had previously swelled the amount of the currency, and added to the machinery of speculation, were wholly destroyed.

It may be worth while, perhaps, to observe that it has been alleged, in opposition to what is now stated, that the difficulties of the bank in 1825 were not caused by any excess either of its issues or of those of the country banks, but by the too great amount of the capital, that is of coin and bullion, it had lent; and in proof of this allegation, we are referred to the increase of nearly eight millions in the amount of securities which the bank held in August 1825 over their amount in August 1822, and to the simultaneous decrease of nearly six and a half millions in the amount of bullion in its coffers.1 But a little con- sideration will suffice to show the futility of this statement. No issue of notes can be said to be in itself excessive. Whether it is or is not in excess depends upon its relation to the amount of coin and bullion reserved by the issuing bank in its coffers. The Bank of England enlarged its issues disproportionately and took no steps, or none of sufficient energy, to reduce the amount of notes in circula- tion till long after the exchange had become unfavourable, and bullion was demanded of it for exportation. The accumulation of securities was the necessary result of this radical error. The currency having become redundant in 1824, the notes of the bank were returned upon it for gold, so that its securities were augmented at the same time that its means of dealing with the unfavourable exchange were impaired. It is to be remembered, that the efflux of bullion showed conclusively that, however issued, and whether greater or less than at former periods, the paper afloat was in excess, and that its reduction had become indispensable. And such being the case, it was the duty of the bank directors, as soon as they felt the drain for gold setting steadily against them, to adopt every means in their power, by raising the rate of interest, selling securities, and otherwise, to reduce their issues, and restore

1 Securities of all sorts, 31st August 1822,..... £17,290,510 ” – 3lst August 18265,..... 25,106,030

Excess of Securities, 31st August 1825, over those Heldsonwollsty AeustelS22% 0 |. . cass. -.ccceeee sales £7,815,520 Bullion in Bank, 31st August 1822, ... £10,097,960 A st Aenst el GW, .ccccsmesteneers 3,634,320 Diminution of bullion, ... £6,463,640

On the 28th February 1826, the bullion in the bank amouuted to only £2,459, 510. III. — 41

o22

the exchange to par. And had they done this at a sufficiently early period, it is all but certain the bank would not have lost more than two or three millions of bullion ; whereas, by their following a different line of conduct, and deferring the adoption of vigorous repressive measures till too late a period, it was drained of about seven millions of bullion, and its safety seriously compromised before it could stop the drain.'

Legislation of 1826—Suppression of £1 Notes—Joint- Stock Banks of Issue authorized.

Notwithstanding the fact that nations are slow and reluctant learners, the events of 1825-26, taken in connec- tion with those of the same sort that had previously occurred, produced a conviction of the necessity of doing something that should at least improve the system of country banking in England. But the measures adopted with this view were very far indeed from effectually securing their object. The law of 1708, limiting to six the number of partners in banking establishments issuing notes, was repealed; and it was enacted, that banks with any number of partners might be established for the issue of notes anywhere beyond sixty-five miles from London, and that banks not issuing notes might be established in London itself with any number of partners. The circulation of notes for less than five pounds in England and Wales was at the same time forbidden. It was intended to extend the same prohibition to Scotland and Ireland, but the opposition to the proposal excited in these countries was too strong to be overcome. Sir Walter Scott threw himself zealously into the controversy, and by his Letters of Malachi Malagrowther, helped to make the resistance effectual.

The suppression of £1 notes was advantageous in shutting up one of the principal channels by which the inferior class of country bankers got their paper into circulation, to the frequent loss of the poorer classes; but it is now generally admitted that the balance of argument is in favour of the issue of notes of this denomination by the Bank of England or some agency of the state, under conditions ensuring their convertibility.

The second branch of the banking legislation of 1826 was for some time a comparative failure. Those who supposed that joint-stock banks would be immediately set on foot in all parts of England, were a good deal disap- pointed with the slowness with which they spread for some years after the Act permitting their establishment was passed. The heavy losses occasioned by the downfall of most of the joint-stock projects set on foot in 1824 and 1825, made all projects of the same kind be looked upon for a considerable period with suspicion, and deterred most persons from embarking in them. But this caution gradu- ally wore off ; and the increasing prosperity of the country, and the difficulty of vesting money so as to obtain from it reasonable return, generated anew a disposition to adven- ture in hazardous projects. A mania for embarking in speculative schemes acquired considerable strength in 1834 ; and during 1835 and part of 1836, it raged with a violence but little inferior to that of 1825. It was at first princi- pally directed to railroad projects; but it soon began to embrace all sorts of schemes, and, among others, joint-stock banks, of which an unprecedented number were projected in the course of 1835. The progress of the system was as follows :—

1 It may be observed that Mr McCulloch pointed out in an article in the Scotsman, published in 1825, what would be the inevitable result of the bank allowing the drain of bullion to run its course, viz., that it would be drained of its last sovereign, and obliged to stop payments ; and that it could not avert this result otherwise than by narrowing its issues, and raising the value of the currency. The directors did this at last, but they ought to have done it nearly twelve months sooner.

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BANKING

Banks, Banks.

In 1826 there were registered 6 In 1832 there were registered 10 litt ASW peeeenmerransecence ter oa: il It, LB oo sina MUS bs crease aeesnecececne ere 5 TY TSG idernan sean eneceene conto: 8 ig) S219) are erpenerearantontar isbncc 4 Jit FOG)... .aaeeeres cece 45 iby 1 Sa Ove… Wes. see 3 Nace scescn sre escononee ee a In Se Bier anncionnsteaneemeae, 8 — Tobe sesaas 114

In point of fact, however, the number of banks created in 1835 and 1836 was vastly greater than appears from this statement. It seems that, at an average, each of the 56 banks established in those years, like those previously established, had from four to five branches ; and as these branches transacted all sorts of banking business, and enjoyed the same credit as the parent establishment, from which they were frequently at a great distance, they were, to all intents and purposes, so many new banks; 60 that, instead of 56, it may safely be affirmed that from about 220 to 280 new joint-stock banks were opened in England and Wales in 1835 and 1836, but mostly in the former year.

In January, February, and March 1836, when the rage for establishing joint-stock banks was at its height, the exchange was either at par, or slightly in our favour, showing that the currency was already up to its level, and that if any considerable additions were made to it, the exchange would be depressed, and a drain for bullion be experienced. But these circumstances, if ever they occurred to the managers of the joint-stock banks, do not seem to have had, and could not in truth be expected to have, any ma- terial influence over their proceedings. Their issues, which amounted on the 26th of December 1835 to £2,799,551, amounted on the 25th of June 1836 to £3,588,064, exclusive of the vast mass of additional bills, cheques, and other substitutes for money they had put into circula- tion. The consequences were such as every man of sense might have foreseen. In April 1836 the exchange became unfavourable, and bullion began to be demanded from the Bank of England. The directors, that they might the better meet the drain, raised the rate of interest in June from 4 to 44 per cent., and this not being enough sufficiently to lessen the pressure on the bank for discounts, they raised it in August from 44 to 5 per cent. But

during the whole of this period the country banks went on increasing their issues; and the issues of the joint-stock banks rose from £3,588,064 in June, to no less than £4,258,197 on the 31st of December, being an increase of nearly 20 per cent. after the exchange was notoriously against the country; and the most serious consequences were apprehended from the con- tinued drain for bullion.

It may, perhaps, be supposed that the increased issue of the joint-stock banks would be balanced by a corresponding diminution of the issues of the private banks, and that on the whole the amount: of their joint issues might not be increased. This, however, was not the case. Some private banks were abandoned in 1836, and others incorporated with joint-stock banks; and it is further true, that those which went on managed their affairs with more discretion than their associated competitors. But, from the 26th of September 1835 to the 31st of December 1836, the issues of the private banks were diminished only £159,087, whilst those of the joint-stocks were increased during the same period £1,750,160, or more than ten times the falling off in the others. ;

These statements show the inexpediency of leaving the issue of paper to the unregulated discretion of an indefinite number of competing banks. Its issue ought in all cases to be governed by the state of the exchange, or rather, as already stated, by the influx and efflux of bullion, But previously to 1844, the provincial banks might go on over- issuing for a lengthened period without being affected by a demand for bullion, or even for Bank of England paper.

BANKING

In the end, no doubt, an efflux of the former was sure, by rendering money and all sorts of pecuniary accommoda- tion scarce in the metropolis, to affect the country banks as well as the Bank of England; and then the injury to industry, occasioned by the withdrawal of their accustomed accommodations from a great number of individuals, was severe in proportion to the too great liberality with which they had previously been supplied. This was especially the case in 1836, when the Bank of England, by bolstering up the Northern and Central Bank, averted, though but for a while, the bankruptcy of that establishment, which had no fewer than forty

branches, and, by doing so, is said to have prevented the occurrence of a panic that might have proved fatal to many other joint-stock and private banks. Still, however, the shock given to industrial undertakings, by the revulsion in the latter part of the year, and in 1837, although unaccompanied by any panic, was very severe. All sorts of commercial speculations were for a while completely paralyzed, and there were but few districts in which great numbers of individuals were not thrown out of employment. In Paisley, Birmingham, and most other towns, the distress occasioned by the revulsion was very general and long-continued. And owing to the Bank of England having delayed, in 1838 and the earlier part of 1839, to take efficient measures for the reduction of its issues, despite the unmistakable evidence of their being redundant, the bullion in its coffers was reduced in September 1839 to £2,406,000 ; and, but for the efficient assistance obtained from the Bank of France, its stoppage could hardly have been averted.

Act of 1844—Objections to and Defence of that Act— Suspensions of in 1847, 1857, and 1866.

This perilous experience having again forcibly attracted the public attention to the state of the banking system, Sir Robert Peel was induced to attempt its improvement. The clause in the Act 3 and 4 Will. IV. c. 9, which renewed the bank charter in 1833, gave Parliament power to revise or cancel it in 1845, and thus afforded a legitimate opportunity for the introduction of the new system. It was indispensable, in attempting to obviate tne defects inherent in our currency, to proceed cautiously, to respect, as far as possible, existing interests, and to avoid taking any step that might excite the fears or suspicions of the public ; but the measures which Sir Robert Peel introduced and carried through Parliament in 1844 and 1845, for the improvement of the English banking system, were so skilfully coutrived as to provoke little opposition, at the same time that they effected most important and highly beneficial changes.

The measures in question consisted of the Act 7 and 8 Vict. c. 32, which refers to the Bank of England and the English country banks ; and the Acts 8 and 9 Vict. c. 38, 37, referring to the banks of Scotland andIreland. These statutes were intended to obviate the chances of over-issue, by limiting the

power to issue notes payable on demand, and by making the amount of such notes in circulation vary with the amount of bullion in the possession of the issuers, and this object has been perfectly attained. The statutes have as completely failed to attain a second object con- templated by their author —-that of preventing great and rapid fluctuations in the rate of discount ; and the truth is now recognized, that the power of over-issuing notes is one of many causes which may conduce to variations in the rate of discount and by no means the most efficient of them, In dealing with the Bank of England, Sir Robert Peel adopted the proposal previously made by Lord Overstone,!

‘ 1 In tracts published in 18387 and 1840, and in his evidence before a committee of the House of Commons in the latter year.

for effecting a complete separation between the issuing and banking departments of that establishment, and giving the directors full liberty to manage the latter at discretion, while they should have no power whatever over the other.

The notes of the Bank of England in circulation for some years previously to 1844 rarely amounted to twenty, or sunk so lowas sixteen millions. And such being the case, Sir Robert Peel was justified in assuming that the circula- tion of the bank could not, in any ordinary condition of society, or under any merely commercial vicissitudes, be reduccd below fourteen millions. And the Act of 1844 allowed the bank to issue this amount upon securities, of which the £11,015,100 lent by the bank to the public was the most important item. Inasmuch, however, as the issues of the provincial banks were at the same time limited in their amount, and confined to certain existing banks, it was further provided, in the event of any of these banks ceasing to issue notes, that the Bank of England might be empowered, by order in council, to issue, upon securities, two-thirds, and no more, of the notes which such banks had been authorised to issue. Under this condition, the total secured issue of the bank has (1875) been increased from £14,000,000 to £15,000,000. Lut for every other note which the issue department may at any time issue over and above the maximum amount (£15,000,000) csswed on securities, an equal amount of coin or bullion

must be paid into wits coffers. And hence, under this system, the notes of the Bank of England are rendercd really and truly equivalent to gold, while their inimediate conversion into that metal no longer depends, as it previously did, on the good faith, the skill, or the prudence of the directors. And these important results have been attained without imposing any burden of which any one has any right to complain. Our currency rests on the fundamental principle, that all debts above forty shillings shall be paid in gold. But individuals and associations, including the banking or commercial department of the bank, have the option, if they prefer it, to exchange gold for bank-notes, and to make use of the latter in their dealings with the public. Hence, if A or B goes to the issuers of paper, and gets 100 or 500 notes from them in exchange for an equivalent aniount of gold, it is his own convenience he has exclusively in view. He was at full liberty to use gold, but he pre- ferred exchanging it for notes because he could employ the latter more advantageously. This is the way in which paper is issued under the Act of 1844; and such being the case, it is contradictory to say that it is productive either of hardship or inconvenience.

It is alleged that the new system is injurious by shackling the bank in the use of its credit, and the auswer is, that it does this in order to prevent the greater injury of over- issues of paper. The Act prevents the bank from issuing substitutes for money which do not represent money. It does not absorb or lock up a single sixpence worth of capital, nor does it interfere in any manner of way with its employment. The gold in the issue department of the bank was not purchased by the bank, and does not belong to it. The bank is its keeper, but not its owner. It belongs to the public, or to the holders of bank-notes, who deposited it in the bank in exchange for notes, with and under the express stipulation, that on paying the latter into the bank they should receive back their gold. Any interference with these deposits would be an interference with property held in pledge for others, that is, it would be an act precisely of the same kind with that which exposes private bailees to penal servitude.

But though the bank directors may not lay viclent hands on the property of the public, the bank, it is obvious, has at this moment the same absolute command over its entire capital and credit, that it would have were the Act of 1844

non-existent, Apart from the practice of issuing transfer- able notes, the bank is free from all restraint, and is in precisely the same situation as other banking or mercantile establishments. Its directors may lend or not lend as they please, and may lay down such conditions as they please in regard to the interest and the terms of loans and discounts. In short, they may do whatever they like with their own; but farther they are not permitted to go. They may not substitute shadows for realities. They can- not, whether to assist others, or to relieve themselves from embarrassment, issue a single note except upon a deposit of bullion. But this rule does not operate on the bank only. Tt applies to all individuals and associations. And to relax it in any degree would be—disguise it as one may—to authorize an issue of fictitious or spurious paper, and con- sequently to vitiate the currency and to abuse credit in the way that is sure to be in the end the most disastrous.

This statement shows the groundless nature of the charge which is often made against the Act of 1844, that under its operation the bank runs the risk of being brought to a stop, though it may have some five, six, or even eight millions bullion in its coffers, For it is plain that two things are confounded in this charge, which are quite distinct, and have no necessary connection with each other, viz., the proceedings of the bank in the capacity of issuer of notes, and its proceedings in the capacity of a banking company. In the former capacity it is all but impossible that it should be brought to a stop; and if such a thing should happen, there would not then be an ounce of bullion in its coffers. It is not, however, impossible nor even very improbable, that the bank should be brought, in its mer- cantile capacity, into difficulties, while there may be a large amount of bullion in the issue department. But, though such should be the case, is that any reason why the bank directors should be permitted to draw on funds that do not belong to them, and over which they have no control? Supposing the bank was in difficulties, is it to be allowed to right itself by setting aside the principle of mewm and twum, and seizing on what belongs to others? The directors would be the first to repudiate such a doctrine, which must be rejected by all men who have any sense of honour or regard for character.

Cne of the most plausible objections to the Act of 1844 is that it “ limits the currency ;” that it makes no provision for the increasing demands of the public; and confines us in 1875, when the exports will probably exceed 220 millions, to the same amount of money as in 1844, when the exports did not exceed 583 millions. The simple truth, however, is that the Act allows money to be imported and exported, to be retained or sent elsewhere, just as it is wanted, and what it does limit is the uncontrolled issue of paper represeutatives of money, which experience proved were too often emitted without any reference to the reserves of money kept to maintain the convertibility of the paper issued. The £14,000,000 (now £15,000,000) issued on securities is the only thing that is limited in the Act ; everything else varies with the varying condition and cir- cumstances of the country, including the means by which the use of money may be economized. In the week ending the 7th July 1875, the issue department of the bank had issued notes to the amount of £41,029,955, being no fewer than £26,029,955 over and above the amount authorized to be issued on securities. And if the country had really required a larger supply of money, that is, if more coins, or paper equivalent to coins, could have been absorbed into the circulation without rendering the currency redundant, and depressing the exchange, the additional quantity would have been forthwith supplied. For, under such circumstances, merchants, bankers, and money-dealers, would have realized a certain and imme-

diate profit by carrying bullion to the mint or the bank, that they might obtain coins, or notes, or both, with whith to increase the currency. It is one of the chief merits of the Act of 1844, that, under its agency, the supply of money is not to any extent or in any degree regulated or influenced by the proceedings of the bank or the Government. They have nothing to do in the matter, unless it be to coin the bullion which individuals or firms carry to the mint for that purpose, and to exchange, when called upon, notes for coins, and coins for notes. The supply of money, like that of all non-monopolized articles, is wholly dependent upon, and is determined by the free action of the public. It would, indeed, be quite as true to say, that the Act of 1844 limits the amount of corn, of cloth, or of iron produced in the country, as that it limits the amount of money. It maintains the value of the

notes issued by the bank on a level with the coins for which they are substitutes ; but beyond that its effect is ni. It has nothing whatever to do with the greater or less amount of the coin and notes of trustworthy convertibility put into circulation. That depends entirely on the estimate formed by the public of its excess or deficiency, an estimate which when wrong is sure to be corrected by the exchanges.

We may add, that no inference can ever be safely drawn from the number of notes or coins, or both, afloat in a country, as to whether its currency be, or be not, in excess. That is to be learned by the state of the exchange, or by the influx and efflux of bullion. If the imports of bullion exceed the exports, it shows that the currency is in some degree deficient ; while, if the exports exceed the imports, it shows that the currency is in excess, and that no additions can be made to it without farther depressing the exchange and increasing the drain of bullion. When the imports and exports of bullion are about equal, then of course the currency is at about its proper level. These are the only criteria by which anything can ever be correctly inferred in regard to the deficiency or excess of currency. Its absolute amount affords hardly even a basis for conjec- ture. When there is little speculation or excitement, an issue of 25 or 27 niillions bank-notes may be in excess; while, at another time, and with a different state of trade and speculation, an issue of 35 or 37 millious of notes may not be enough. Except in periods of internal commotion, or when we are disturbed by alarms of invasion, the state of the exchange is the only, as it is the infallible, test of the sufficiency and insufficiency of the currency. We may further state, that those who are in the habit of complaining of the limitation of the currency by the Act of 1844, almost uniformly underrate its amount. We have already seen that, in the week ending the 7th July 1875 the notes issued by the issue department of the bank amounted to £41,029,955, and of these £12,453,415 were in the banking department of the bank, leaving a balance of £28,576,540 in the hands of the general public ; and this latter sum is, we are told, the real amount of the issues. But this is falling into the rather serious blunder of mistaking a part for the whole. The notes in the banking department of the bank make not only a part, but a most important and active part, of the currency of the country. They consti- tute the means, along with the bullion in the same depart- ment, with which the bank carries on her banking business, and are as evidently a portion of the currency as the notes in the

tills of private bankers and the pockets of indi- viduals. The notes in the banking department of the bank must therefore never be omitted in estimating the amount of notes in circulation. The latter, and the notes out of the issue department, are identical ; and, in a general point of view, it matters not a straw whether they are in the hands of the banking department of the bank or of individuals,

BANKING

So far we have dealt with the legislation of 1844 in its bearing on the Bank of England. The desire of Sir Robert Peel reached beyond this, but he was unable to complete his policy. He rightly held that experience had shown that the balance of advantages lay on the side of the sup- pression of all note issues except that of the Bank of England, as reformed by him, or of some similar supple- meutary establishments regulated in the same manner. But it was obviously impossible to prohibit, without com- pensation, the future exercise by country bankers of the rights they had legitimately acquired; and as it was not easy to buy up the existing privileges of the private and joint-stock banks, Sir Robert Peel allowed them to remain under conditions prohibiting their extension, and he appar- ently hoped that country isues would gradually disappear before the rivalry of Bank of England notes. The Act of 1844, accordingly, enacted that no new bank for the issue of notes should be established in any part of the United Kingdom ; and that the maximum issue of notes by the existing country banks of England should in future be limited to the average amount which they had respectively in circulation during the twelve weeks preceding the 27th April 1844. It was also ordered that the names of the partners in joint-stock and other banks should be periodi- cally published. A provision was also enacted under which an issuing bank could resign its privilege by composition with the Bank of England. The existing law was main- tained preventing the issue of any notes other than the Bank of England in London, and the establishment, within sixty-five miles of London of any branch of an English joint-stock bank having the privilege of issue.*

The convertibility of the Bank of England notes has been perfectly maintained since 1844, and the management of English banks, whether private or joint-stock, has been sound and judicious, the cases of failure

among them being few and contrasting strongly with the recurrent epidemics of insolvency of earlier experience. It must, however, be admitted that the variations in the rate of discount charged by the bank have been much more numerous and violent since 1844 than they were before, and on three occasions— in 1847, 1857 1866—it has been judged necessary to authorize a suspension of the Act so far as to allow the bank directors the power to strengthen the banking department by recourse to the reserves of the issue depart- ment. In each case the suspension of the Act arrested and allayed the panic prevailing up to the moment of suspension, and in 1866 it was not, in fact, found necessary to exercise the power to borrow from the issue department which had been conceded to the directors We must proceed to inquire whether the Act of 1844 is to be blamed for the increase in the number of changes of the rate of discount which has since been experienced, and whether this increase and the suspension of the Act in time of trial constitute a reason for its abrogation or for a modification of its provi- sions,

In the first place, the increased number of changes in the rate of discount is more apparent than real. The manage- ment of the Bank of England has become responsive to the movement in the value of money in the open market in a degree unknown before this generation. The rate of dis- count outside the bank changed rapidiy and often before 1844, but its fluctuations were to a large extent prevented from affecting the Bank of England. Previously to the modification of the Usury Laws in 1839, the bank could not charge more for loans than 5 per cent., and for some considerable period after the restriction had been removed the directors, influenced, in part at least, by their accustomed habit on several occasions, permitted the bank to be involved

1 The provisions regulating the issues of Scotch and Irish banks will be found below, p. 332 sqq.

in difficulties which might have been averted by their sooner raising the rate of discount. Strict limitation in the number and class of customers with whom the bank would do business, and a refusal to rediscount bills that had been already discounted by money-dealers, made it possible to keep the

bank rate below the rates of the open market without exposing the resources of the establishment to an exhausting demand.

Next, it is to be observed that the methods of economizing the use of money by the development of banking have been extraordinarily multiplied since 1844. The Bank Act, as we have shown, in no way operates to diminish the supply of money in the country; on the contrary, it tends to increase it, since it forbids any extension of the use of notes issued on credit as a substitute for money. The effect of the Act has therefore been to neutralize rather than to stimulate the process of economy in the use of money to which we have called attention. But the transactions of bankers—the issue of cheques, the negotiation of bills, &c., &e,—have multiplied out of all proportion to the stock of ready money on which they rest, and the mass of transitory credits being constantly increasing while the reserves of cash suffers little change, there naturally and necessarily follows an increased sensibility in the equilibrium of the money market, with constant oscillations in the rate of interest. But although the increase in the number of changes of discount since 1844 has not been as great as may at first seem apparent, and so far as the increase has been real it must be chiefly attributed to the growing disproportion

between the magnitude of transitory credits at any time

existing and the reserve of cash kept on hand, yet it may

be freely admitted that it is not improbable that changes

have froin time to time happened that might not have occurred supposing the separation of the banking and issue departments had not been established. It is evident that if the cash in the two departments had been equally accessible to the bank directors, a withdrawal of money which is now thrown upon one department would not have caused so great a change in the proportion between liabilities and reserve as is now exhibited; and if the directors had reason to believe that the withdrawal was no more than a temporary efflux to the provinces or elsewhere, to be followed by a speedy reflux, they might have been bolder in abstaining from raising the rate of discount. But this action or rather inaction would have been indulged in at the price of a certain risk to the convertibility of the note, which is now

avoided, and if it should appear in the end that the directors had erred in supposing the move- ment of money to be but temporary, they would see reason to regret that they had not been forced to stringent action at the beginning of it. The oscillations experienced in the rate of discount, oscillations which after all indicate nothing more than the natural movement in the value of a medium which is the first to be agitated by changes in value of every other commodity, are cheaply purchased as the price of the permanent and perfect equality of the bank-note and the money it represents. The repeated suspensions of the Act of 1844 in time of trial do, prima facie, present a much stronger argument for the repeal of the statute. Legisla- tion which breaks down upon critical occasions discredits the Legislature that decreed it ; and it is not to be denied that the mere suspension of the Act has more than once operated as a charm to allay feelings of panic among bankers, money-dealers, and merchants. It must also be admitted that Sir Robert Peel, in common with the earlier advocates of the policy of the Act, believed that it would prevent the recurrence of commercial crises. It is strange that such an anticipation should have been entertained. Whoever will reflect on the nature of the organization of credit in the commercial world, and on the timid and self-

protecting instincts of men, especially of capitalists, will be forced to confess that the recurrence of crises must be accepted as inevitable The more highly developed is the economy of money the greater must be the sum which banks and bankers are liable to be called upon to repay on demand or at short notice in proportion to the reserves of money kept in their coffers ; and the greater also must be the amount of bills falling due daily, and largely met as they fall due by the proceeds of bills drawn daily and discounted as drawn. The smoothness of action of the commercial machine evidently depends upon the continu- ance of that confidence which is ordinarily felt by the creditor-class in the solvency of debtors, and any access of distrust may easily produce consequences culminating in a crisis. Bankers who are at once debtors and creditors are necessarily constrained to protect themselves in such periods of defective confidence by declining to meet the applications for loans and discounts which are forced upon them ; and a sharp competition ensues for the possession of the ready inoney that

is available in the market. The pressure is concentrated upon the Bank of. England, and the publicity of the condition of that institution, consequent upon the weekly issue of its balance-sheet, lets all men know the rate of decline of its cash reserve. At such a time an accident may cause the spirit of caution to pass into apprehension and panic. The fear that the cash balances of the banking department may be exhausted incites bankers to hasten to anticipate one another in with- drawing any reserve they nay have kept at the bank, and the rate of diminution of the cash of the department is accelerated. It is obvious that the condition we have described is in its origin independent of any particular regulations adopted with respect to the note-circulation of a coinmunity ; and it has, in fact, been experienced in Great Britain under all varieties of laws, and in the United States, in Northern and Southern Germany, and in the British colonies under an equally wide dissimilarity of currency- regulations. Our history previous to 1844 shows that such a condition may be aggravated, if not precipitated, by an antecedent issue of notes increasing the proportion between the volume of transitory credits and the cash available to meet instantaneous demands; and as long as the issue of notes was unrestricted, bankers could never resist the temptation to make up, by an increase in their issues, any diminution in their available cash, a cause directly provocative of a further diminution by its effect on adverse exchanges, and therefore producing a sharper reaction when the necessity was at last recognised of recover- ing the balance between their cash in hand and their liabilities, The Act of 1844 cannot prevent panic, but it prevents bankers from resorting to causes which aggravate panics, and it moreover supplies a means of allaying the un-reasoning terror in which panics culminate. Were it not for the separation of the issue and the banking departments we should be constrained to witness and tolerate periodical suspension of cash payments, as this would be the only means left of appeasing alarm; and this desperate expedient has been, in fact, employed over and over again, under such circumstances, both in England and elsewhere. The Act of 1844 gives us a less dangerous, though by no means a perfectly harmless, power When the minds of creditors are unhinged, and all are competing for money which is not in existence in sufficient quantities to satisfy their demands, the announcement that the Government has authorized the bank directors to suspend the action of the Act and to fall back on the resources of the issue department operates as acharm. The mere announcement is often enough to put an end to the panic

previously prevailing, the feverish fit passes away, and the customary temper of confidence is more or less slowly restored.

BANKING

We conclude that the existence of the Act of 1844 is justified even when it is suspended, for it provides, in the maintenance of the cash reserves of the issue department, a stock of money, the unlocking of which furnishes the means of arresting panic which would otherwise have to be sought in a periodic suspension of cash payments. It has naturally been asked whether the law might not be saved the apparent discredit involved in its being set aside by an act of the Executive Government, acting on the faith of a subsequent indemnity from Parliament, by the embodinient in it of a power authorizing its suspension under circumstances that provoke its suspension. Mr Lowe, as Chancellor of the Exchequer, introduced into the House of Commons, in 1873, a bill having this object. He proposed that the Bank Act might be suspended by order of the Government of the day when the minimum rate of discount had reached 12 per cent., when the exchanges were favourable to England, and when the governor and deputy-governor of the bank certified that panic had caused a large portion of the bank notes nominally in circulation to be locked up and withdrawn from circulation. The authority of Mr Gladstone's administration had declined when this bill was introduced, and it was not well received. It was con- tended that the conditions proposed by Mr Lowe had not always existed when the Act had been suspended, and they would be so rarely satisfied that the power of suspension promised by the bill could never be exercised. It was further contended that Mr Lowe's attempt was necessarily impracticable. In seeking to define beforehand the con- ditions of suspension of the Bank Act, he tried to define the conditions of a panic; and to attempt to define the con- ditions of that which is in its essence unreasonable was a logical contradiction, A panic has no laws: it has no fixed shape. It is precipitated we know not how; and we are in the midst of it before we are aware. As it is thus impossible to prescribe beforehand the conditions of panic, it may reasonably be thought that' it is better to leave to the Government of the day the responsibility of acting when a panic has demonstrated its existence. Mr Lowe's bill, assailed from many quarters, was withdrawn

without the opinion of Parliament being taken on its merits, and no attempt has been since made to bring the subject before the Legislature. .

We have already said that Sir Robert Peel contemplated an ultimate extinction of all note issues save that of the Bank of England; and he probably expected that the substitution of Bank of England notes for all others would not be long delayed. The progress actually achieved towards this end has been very slow. Out of 204 private banks in England and Wales left by the Act of 1844, with total privileged issues of £5,153,407, no more than 85 have ceased to issue ; and the amount they issued which is now withdrawn was £1,283,041. Of joint-stock banks 18 have ceased to issue £842,453, out of 72 having privi- leged issues of £3,495,446. Only one Scotch bank has ceased to issue notes since the Scotch Act of 1845, and no alteration whatever has taken place in the fixed issues of the Irish banks, It inay be added that the provisions of the Act of 1844, relied upon by Sir Robert Peel for bringing about by arrangement a substitution of Bank of England notes for those of privileged bankers, have been for many years entirely neglected. With these facts before us it is not surprising that, in 1865, Mr Gladstone, as Chancellor of the Exchequer under Lord Palmerston, should have submitted to the House of Commonsa bill dealing with the subject. By it, it was proposed that private banks of issue in England and Wales should be released from the existing restriction that the numbers of partners must not exceed six, and that joint-stock banks should be allowed to come within the circle of sixty-five miles from London upon their

undertaking to pay annually to the Exchequer a duty at the rate of 2 per cent. (altered in committec on the bill first to 1} and then to 1 per cent.) on their average issues, and that thereupon their privileges of issue should be assured to them until 1890 (altered in committee to 1875 and 1880), after which these privileges should cease and determine. The bill was purely permissive; but it was thought by its author that a large proportion of the English banks of issue would placc themselves under its operation, and further legislation would be practicable with respect to the rest. The bill, however, was less and less approved as it became better known, and it was

ultimately withdrawn. From that time no legislation on the subject has been con- templated until the session 1875, when the action of the Scotch banks in establishing head offices in London was followed by an agitation, described in the section on Scotch banks (p. 332), which has resulted in the appoint- ment of a select committee on the law of banking and of note issues.

The Select Committee thus appointed has received a vast mass of evidence on the law and practice of banking and of the issue of notes, but the session has been allowed to close without any attempt being made to report ‘on the subject of the committce’s inquiries, and no practical action is expected to follow the termination of its labours. It must be adinitted that the obstacles to legislation, sup- posing legislation to be desirable, are considerabie. The bankers of the kingdom are largely represented on both sides of the House of Commons, and they are on the whole well contented with the present state of the law, while the great body of the public are profoundly ignorant and uninterested in it. The inaction to be overcome is so great, and the force available is so limited, that nothing will be done except under the influence of a commercial crisis, when almost anything may be done. The aim of economists and statesmen should be to produce a body of authority that may command respect even in the midst of universal agitation ; and the inquiries of the Select Com- mittee to which we have referred might be useful for this purpose, if they had been pursued with any discrimination. As it is, the evidence received by the committee will probably serve as a quarry to which wisdom and unwisdom may equally resort for facts and argunients.

At the risk of stating something that may appear too obviously true to require statement, we would submit that the question, whether bankers should be permitted to issue notes, must be determined upon a balance of opposing con- siderations of expediency. Many of the advocates and supporters of Sir Robert Peel’s legislation of 1844 have said, apparently with a conviction that they were express- ing an axiomatic truth, that the issue of notes was no part of the business of a banker. Mr Gladstone has, within the past session, spoken in this sense. The force of assertions of this kind cannot be admitted. There is no law of nature limiting the action of a banker within the bounds sought to be prescribed; and if we accept as the

definition of a banker a person whose business it is to borrow and Jend money, we cannot but recognize in the issue of transferable notes a most convenient process of earrying on this business. A banker who issues notes borrows so much from the persons from time to time hold- ing them, and this money he has lent to the customers indebted to him. The reasons of convenience which justify a prohibition of the liberty of issue are, first, that experience has shown that this process of borrowing is too potent and too easily abused to the precipitation and aggravation of commercial crises; and, secondly, that the great and almost insuperable difficulty of refusing to receive notes which have obtained general currency makes it most desirable that such notes should possess some

better guarantee than can be always forthcoming of the solvency of private issuers. These are the reasons which prevail to uphold Sir Robert Peel's legislation, and which impel us to consider what means may be discovered of perfecting his policy by the unification of issues through- out the kingdom.

We believe the propagation of clear ideas on the subject of the note currency, and the acceleration of the timc when one currency only shall be in circulation, would both be greatly facilitated by a mechanical and local separation of the issue department from the Bank of England. Much confusion of thought still prevails by reason of the fact that the Bank of England is used as the agent for manag- ing what is now a state issue, resting, so far as it is uncovered by specie, upon state security. If the business of issuing notes were removed bodily from the Bank of England and located in a Government office, and the name of the notes at the same time changed, it could not fail to

'be seen that the business left behind in Threadneedle Strect

differed in no essential particular from that of any other banker in Lombard Street, and much of the superstitious regard of the City for the Bank of England, and trust in its assistance in time of trouble, would be rapidly destroyed. It would then be understood that the cry for ministerial interference at the time of crises and of incipient crises was nothing more

than a claim for the nation to cover with its credit those who had not been prudent enough to main- tain adequate reserves for their own defence ; and, as this would be understood beforehand, it would induce the con- sequence of greater circumspection on the part of dealers in money and a less temptation to rely on extraneous aid. The purcly mechanical act of removing the issue of notes from Threadneedle Street would make the facts of the situation plain, and would bring about an alteration of conduct among London bankers, so that it should conform to the facts thus perccived. It has for some time past been clearly perceived that the delicacy of the condition of the money market in London has been much exaggcrated, and the feverish tendency to crises materially excited, because the cash reserves kept by the London bankers are disproportionately small compared with the amount of their instantaneous liabilities. Competition has, of course, been a considerable element in causing this attenuation of cash reserves. Each joint stock bank has struggled after that increase of credit which follows an increase of dividends ; and the unproductive cash balances on hand have been kept down to the lowest limit. They would, however, never have been reduced to such narrow dimensions but for the reliance placed on the assistance of the Bank of England in the last extremity; and if it were made plain that the Bank of England is itself nothing more than a big joint- stock bank, this reliance would disappear. Many schemes, equally ingenious and chimerical, have been recently put forth for compelling bankers to kecp larger reserves of cash in proportion to their deposits. The true way to remove the danger always threatening us under the system that exists is to produce a conviction among bankers that they must not cxpect help elsewhere if they become distressed through a default in their own reserves of cash.

If the separation of the issue department from the rest of the Bank of England was completed by its transfer to a Government office under the management of State agents, the unification of the issues of the kingdom might be accoinplished by legislation akin to that adopted by the United States in relation to the national banks. Hach bank of issue might be required to withdraw its own notes – and to receive and put out in exchange for them notes emanating from the State establishment, but bearing a statement on their face of the banks through which they were issued. Government securities should be deposited by

the issuing banks for the amounts thus put into circulation, which must not exceed the amount of their existing authorized issues; and the interest on these securities would be paid to the banks, less a fixed charge to defray the cost of preparing and issuing the notes delivered to them. The notes thus issued would be payable at the central State office, and would circulate throughout the kingdom ; but as oftcn as they were brought back to the central office they would be cleared again by the several issuing banks for reissue, unless the latter desired to retired from the arrangement, in which case the issuing bank would redeem the notes it issued, which would be cancelled, and the securities deposited, or a corresponding part of them, would be handed back. It would not be improper to force this plan on the acceptance of the privileged banks of issue, although we believe it would be freely accepted, inasmuch as their notes would at once acquire currency throughout the kingdom without discrimination of locality in exchange for the deposit of security, and the gain they now realize from the issue of notes would be left un- diminished. We must, however, repeat the expression of the conviction that neither this nor any other change of the present system can be regarded as practicable until the impulse of agitating circumstances has stirred up Parlia- ment to face the question.

Different Species of Banks—The Clearing-house—Autho- rization of Banks with Limited Inability.

We have elsewhere hinted at the subdivision of the business of banking which has accompanied the develop- ment of commerce. A banker borrows and lends mouey, but the conditions under which money is borrowed or lent may be extremely various, and the different classes of bankers are distinguished from one another by differences in the rules which they observe in borrowing or lending. Bankers may borrow money on call, at deposit, on deben- tures, at interest, or without interest, and they may lend on open credits, by discounting bills, by advances on mortgage repayable in instalments or otherwise, &c., &c.

Banks of Deposit.—These banks receive money on deposit, that is to say, on conditions that a certain pre- scribed snotice shall be given of the time of withdrawal. They atlow interest, and they usually lend a large pro- portion

of their money on securities which are not at any moment immediately capable of being realized.

Land Mortgage Banks may be classed with banks of deposit, but they are also accustomed to borrow on deben- tures repayable at the end of one, two, three, or a larger number of years, at rates of interest varying with the period of the debenture. These institutions were first started for the purpose of granting facilities to the mortgagers of land. The money received on debentures was lent out again to proprietors and purchasers of land, who repaid their debts by annual instalments. It was in this way that the legislation of Stein was facilitated in Germany ; the peasant being able to obtain at once from the Land Mortgage Bank the capital necessary to redeem the feudal rights of his lord, a debt which he repaid by a series of annual payments often corresponding to what he had pre- viously paid as rent, until he became an absolute unin- cumbered owner of the fields he cultivated.

Credit Companies, such as the Crédit Foncier, the Crédit Mobilier, &c., &c., are strictly analogous to land mortgage banks, except that they invest their funds in loans on the security of general industrial undertakings, to which business they have added the function of negotiators of direct loans between companies formed for the conduct of such undertakings and the capitalist public.

_ Discount Banks and Discount Agencies borrow money on

call or deposit, and lend it cxclusively in the discount of bills and negotiable securities, which they often rediscount with capitalists desirous of investing their money in forms capable of being speedily realized.

Trust Associations borrow money on debentures and in- vest it in the loans of foreign states or similar securities,— the principle of such an association being that the original investor can be secured against the default of any one borrower by the receipt of a high average rate of interest and the general solvency of the rest.

Savings-Banks are institutions established for the receipt of the smaller savings of the poor. As at present existing they are divided into two classes, the Trustees' Savings- banks and the Post Office Savings-banks ; but it seems probable that some rearrangement of their machinery will be made in the next session of Parliament. For further particulars see SAVINGS-BANKS.

Allusion has already been made (ante, p. 316) to the Clearing-house. This institution was established, just a century ago, as a place where the clerks of the bankers in the City of London could assemble daily to exchange with one another the cheques drawn upon and bills payable at their respective houses. Before the Clearing-house existed, each banker had to send a clerk to the places of business of all the other bankers in London to collect the sums payable by them in respect of cheques and bills ; and it is obvious that much time was consumed by this process, which involved also the use of an unnecessary quantity of money and corresponding risks of safe carriage. In 1775 the common centre of exchange was agreed upon. Its use was confined to the bankers,—at that time and long afterwards exclusively private bankers,—doing business within the City, and the bankers in the west end of the metropolis used some onc or other of the City banks as their agent in clearing, a practice which still continues. When the joint-stock banks were first established the jealousy of the existing banks was powerful enough to exclude them altogether from the use of the Clearing-house ; and some years elapsed before this feeling was removed so as to allow them to be admitted.

At first the Clearing-house was simply a place of meeting, but it came to be perceived that the sorting and distribu- tion of cheques, bills, &c., could be more expeditiously conducted by the appointment of two or three common clerks to whom each banker's clerk could give all the instruments of exchange he wished to collect, and from whom he could receive all those payable at his own house. The payment of the balance settled the transaction, and an analysis of the statistics of the Clearing-house by the late Mr Babbage (Jour. Statist. Soc., March 1856), shows that the amount of cash that passed was often less than 4 per cent. of the total sums cleared. Latterly, however, the arrangements of the Clearing-house have been further perfected, so that neither notes nor coin are now required. The Clearing-

house, as well as each banker using it, has an account at the Bank of England ; and the balances due at the close of each day's transactions are settled by transfers from one account to another at the bank.

The use of the Clearing-house was still further extended in 1858, so as to include the settlement of exchanges between the country bankers of England, Before that time each country banker receiving cheques on other country bankers sent them to those other bankers by post (supposing they were not carrying on business in the same place), and requested that the amount should be paid by the London agent of the banker on whom the cheques were drawn to the London agent of the banker remitting them. Cheques. were thus collected by correspondence, and each remittance involved a separate payment in London. In 1858 it was proposed to set up a country clearing-house in

London; but it was suggested by Sir John Lubbock that the existing establishment could accomplish what was desired, and this was eventually done. A country banker now sends cheques on other country banks to his London correspondent, who exchanges them at the Clearing-house with the correspondents of the bankers on whom they are drawn. (Sir John Lubbock, Jour. Statist. Soc., Sept. 1865.) It will be easily understood that an extraordinary economy in the use of coin has resulted from these arrangements ; and in the paper by Sir John Lubbock to which we have referred, he gives statistics showing that out of the sum of a million paid into the bank in which he is a partner, only £21,500 consists of bank notes and £6210 of coin. An ordinary weekly clearing varies from 100 to 130 millions; in 1868 the weekly average was, however, no more than £65,397,075, from which it rose continuously to an average of £116,254,717 in 1873. There was a little falling off in 1874, which is now being recovered.

Up to the year 1858 banking companies could not be constituted with limited liability of partners except by way of privilege under special Acts of Parliament, Royal Charters, or Letters Patent; and although the Bank of England, and the three oldest established banks in Scotland, were thus favoured without any consequent deterioration in the character of their

management, abundant arguments were adduced in deprecation of a general law on the subject. In 1858, however, an Act was passed authorizing the formation and registration of banking companies with limited liability, and also enabling existing unlimited companies to register as associations with a limited liability of partners, subject to a proviso that, if the bank was a bank of issue, the liability of its partners should remain unlimited in respect of such issue. Several banks have been established and registered under this law, and no evil results have been observed to follow.

Present Management of the Bank of England.

When the charter was renewed in 1833, the notes of the Bank of England were made legal tender everywhere in England except at the bank. Of the wisdom of this regulation no doubt can be entertained. Bank-notes are necessarily always equivalent to bullion; and by making them substitutes for coin at country banks, the demand for the latter during periods of alarm or runs is materially diminished, and the stability of the bank and of the pecuniary system of the country proportionally increased.

Since 1826 the bank has established branches in some of the great commercial towns. The mode and terms of conducting business at these have been described as fol- lows :—

**The branch bank at Swansea [and the same is true of those established in other places] is to be a secure place of deposit for per- sons having occasion to make use of a bank for that purpose ; such persons are said to have drawing accounts: to facilitate to the mer- cantile and trading classes the obtaining discounts of good and unexceptionable bills, founded upon real transactions, two approved names being required upon every bill or note discounted ; these are called discount accounts. The applications of parties who desire to open discount accounts at the branch are forwarded to the parent establishment for approval, and an answer is generally received in about ten days. When approved, good bills may be discounted at the branch without reference to London. Bills payable at Swansea, London, or any other place where a branch is established, are dis- counted under this regulation. The dividends on any of the public funds, which are payable at the Bank of England, may be received at the branch by persons who have opened ‘drawing accounts,’ after signing powers of attorney for that

purpose, which the branch will procure from London. No charge is made in this case, except the expense of the power of attorney and the postages incurred in transnlitting it. Purchases and sales of every description of Govern- ment securities are effected by the branch at a charge corresponding to that made by the local bankers where the branch is situated.

by persons having drawing accounts at Swansea, such bills to be advised by the branch ; also for granting letters of credit on London, or on the other branches. The branch grants bills on London, pay- able at scven days' date, without acceptance, for sums of £10 and upwards. Persons having drawing accounts at Swansea may order moncy to be paid at the bank in London to their credit at Swansea, and vice versa, at a charge of 6d. in lieu of postage. The brancli may be called upon to change any notes issued and dated at Swan- sea ; but they do not change the notes of the bank in London, nor receive them in payment, unless as a matter of courtesy where the parties are known. Bank post bills, which are accepted and due, are received at the branch from parties having drawing accounts, and taken to account without any charge for postage; but unac- cepted bank post bills, which must be sent to London, are subject to the charge of postage, and taken to account when due. No interest is allowed on deposits. No advance is made by the branch upon any description of landed or other property, nor is any account allowed to be overdrawn. 'The notes are the same as those issued by the parent establishment, except being dated Swansea, and made payable there and in London. No note issued exceeds the sum of £500, and none are for a less amount than £5."

The Bank of England transacts the whole business of Government. 'She acts not only," says Adam Smith, '"'as an ordinary bank, but as a great engine of state. She receives and pays the greater part of the annuities which are due to the creditors of the public; she circulates Exchequer bills ; and she advances to the Government the annual amount of the land and malt taxes, which aro frequently not paid till some years thereafter."

The Bank of England rarely discounts bills that have more than two, or at most three months to run, and it were well were this rule generally observed by other establish- ments. The discounting of bills at long dates is a

powerful stimulus to unsafe speculation. When individuals obtain loans which they are not to be called upon to pay for six, twelve, or, perhaps, eighteen months, they are tempted to adventure in speculations which are not expected to be wound up till some proportionally distant period; and as these not unfrequently fail, the consequence is that, when the bills become due, there is commonly little or no provi- sion made for their payment. In such cases the discounters, to avert an imminent loss, sometimes consent to renew the bills. But, while a proceeding of this sort is rarely productive of ultimate advantage to either party, the fact of its having taken place makes other adventurers reckon that, in the event of their speculations proving to be less successful than they anticipated, their bills will be treated in the same manner, and thus aggravates and extends the evil.

In other respects, too, the discount of bills at long dates, or their renewal, or the making of permanent loans, is altogether inconsistent with sound banking principles, for it prevents the bankers from having that command over their resources which is advantageous at all times, and indispensable in periods of difficulty or distress.

In the discounting of bills, a great deal of stress is usually laid, or pretended to be laid, on the distinction between those that arise out of real transactions and those that are fictitious or that are intended for accommodation purposes. ‘The former are said to be legitimate, while the latter are stigmatized as illegitimate. But Mr Thornton’ has shown that the difference is neither so well marked nor so wide as many suppose. A notion seems to be generally entertained that all real bills are drawn against produce of one sort or other, which (or its value) is supposed to form a fund for their payment. Such, however, is not always, nor even most commonly, the case. A, for example, sells to B certain produce, four which he draws a bill at sixty days’ date. But prices are rising, trade is brisk, or a spirit of speculation is afloat, and, in a week or two (some- times much less), B sells the produce at an advance to C, who thereafter sells it to D,and so on. Hence it may, and, in fact, frequently does happen, that bills amounting to

1 On the Paptr Credit of Great Britain, cap. 2. Ill. — 42

four, five, or even ten times the value of a quautity of merchandise, have grown out of its successive sales, before the first bill of the series has become due. And not only this, but bills are themselves very frequently rediscounted ; and in this case the credit of the last indorser is generally the ouly thing looked to; and there is not, perhaps, one case in ten in which any inquiries are made in regard to the origin and history of the bills, though they are often of the most questionable description. .

On the whole, therefore, it would seem that the real or presumed solvency of the parties signing a bill, and respon- sible for its payment, is the only safe criterion by which to judge whether it should or should not be discounted. But the fact of a merchant or other trader offering accommoda- tion bills for discount ought unquestionably to excite a suspicion that he is trading beyond his capital. Inquiries of the most searching description should forthwith be instituted ; and unless satisfactory explanations are given, his paper should be rejected. On the same principle, the offering of bills for rediscount ought to awaken suspicions of the bankers and others who resort to so questionable a mode of carrying on business. But, except in so far as a feeling of distrust may be thus very properly excited, there does not appear to be anything in an accommodation bill per se to hinder it from coming within the pale of negotiability. It is a mode of obtaining a loan from a bank ; and when the character of the bill is known to the banker, or is openly declared, it does not appear to be an objectionable mode.

Besides bills avowedly intended for accommodation pur- poses, another and a different variety of such bills is drawn by parties at a distance from each other, often men of straw, and made to appear as if they were bottomed on real trans- actions. Bills of this sort are, it is greatly to be regretted, always current, and often to a large extent. Of course uo person of respectability can be knowingly connected with such bills, which are almost always put in motion either to bolster up some bankrupt concern, or to cheat and defraud the public. But despite the mischief of which they are productive, it appears to be pretty generally supposed that the currency of these bills is an evil which cannot be pre- vented. There can, however, be no real doubt that it may, at all events, be very greatly diminished ; and this desiv- able result would be effected were it enacted that all bills shall henceforth bear upon their face what they really are ; that those that are intended for

accommodation purposes shall have at their head the words “ Accommodation bill ;” and that those only shall bear to be for “ value received ” that have grown out of bona fide transfers of property. An enactment of this sort could not be felt as a grievance by any one unless he had a fraudulent purpose in view. And were the impressing of a false character on a bill made a criminal offence, punishable by several years’ imprison- ment, there is every probability that a formidable check would be given to the issue of spurious bills, and to the manifold abuses to which the practice gives rise.

Bill-discounters who have got fictitious paper on their hands and attempt to get rid of it by concealing its char- acter or representing it in a favourable light make them- selves parties to the fraud. Such conduct is so very flagitious, that when it can be fairly brought home to the parties it should subject them to the severest penalties.

The rates of discount charged by the bank, since its establishment in 1694 down to 1845, were as follows :—

Per cent. From Aug. 8, 1694 to Aug. 30, 1694 on Foreign bills ……. 6 Aug. 30,1694 Jan. 16,1695 Foreign bills……. 4h Oct. 24,1694 Jan. 16,1695 Inland bills ……. 6 Jan. 16,1695 May 19,1695 Foreign bills……. 6 to customers of the bank…... 3

Do. Jan. 16,1695 July 26, 1716 on Inland bills……. 4}

BANKING

Per cent, From May 19, 1695 to Feb. 28, 1704 on Foreign jou oacseon 2! Do. on Foreign bills not payable at the bank 5 Feb. 28, 1704 to June 22, 1710 on Foreign bills……. 5

June 22, 1710 July 26, 1716

July 26, 1716 April 30, 1719

For. & Inland do. 4

April 30,1719 Oct. 27,1720 — Bills…….eee- Oct. 27,1720 Aug, 23,1722 Bills…….0. 4 Aug. 28, 1722 Oct. 18, 1742 Inland bills…..... 5

Do. do. Foreign bills…..... 4 Oct. 18,1742 Dec. 12,1744 Foreign foils'... force Dec. 12,1744 May 1,1746 do. (15d.torun). 4

Do. do, Inland bills …..... 5 May 1,1746 April 5,1773 Foreign Dill Seereetes tO May 1,1746 June 20, 1822 Bills and notes

(95 days to run) 4

June 20, 1822 Dec. 13, 1825 do. 5 Dec. 13,1825 July 5, 1827 do. 5 July 5,1827 July 21, 1836 do. 4 July 21, 1836 Sept. 1, 1836 do. 4} Sept. 1, 1836 July 15, 1838 do. 5 Feb. 13, 1888 May 16, 1839 do. 4 May 16,1889 June 20, 1839 do. 5 June 20, 1839 Aug. 1, 1839 do. 54 Aug. 1, 1839 Jan, 23, 1840 do. 6 Jan. 23,1840 Oct. 15,1840 65 day bills …..... 5 Oct. 15, 1840 June 38,1841 96 day bills…..... 5 June 38,1841 April 7, 1842 do. 5 April 7, 1842 Sept. 5, 1844 do, 4 Sept. 5, 1844 Mar. 18,1845 Bills …....---ss0ss, 2h

Do, do. INTOGESS. 02 ccs eenerenemes

Since 1845 the changes of interest have been, for reasons already given, much more numerous. We give the num- ber of changes in each year-—

In 1845, 2 changes. | In 1855, 7 changes. | In 1865, 14 changes,

1846, 1 ,, 1856, 8 4, 1866, 145 ,,

1847, 10! ,, 1967, © ,, ice? ae ieee, 8; 1868, @ 53 fess, 2

1849, 1 4, 1859, 5 ,, 1869, 7 4,

ie5o, i .,, ican, 9 5, ie70, m0? ,, fo. we ., 1861, 133 ,, ie, 10, 1852, 2 4, 1862, 5 ,, ie, 1.

1853, 6 ,, 1863, 12 ,, 1873, 246 ,,

ies4, @ ,, 1864, 144 ,, 174,12,

The dividends on bank stock, from the establishment of the company to the present time, have been as follows :—

Years. Dividend. Years. Dividend. 1694, 8 per cent. 1828, 8 per cent. 1697, 9 15 1839, 7 Ap 1708,) Varied from 9 to 152. 7 ss 1729, 54 per cent. 1853, 8 35 1730, 6 rs 1856, 95 ;;

1730, 53 53 1859, 84 ,,

2. “6 o 1868, S25; 1728, 5% ” 1864, 97 5, 1747, 5 59 1SG5se vel e 1758, 44 A 1866, 10} ,, 1764, 5 6 1ssf, “10 ;; 1767, 5% a tis Oe oy 1781, 6 ne 1869. 82 1788, 7 fp 1872; 9s 4; 1807, 10 os VS7s, LO;

The Bank of England does not allow, either at the head

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1 Rising from 4 per cent. on 3d April to 8 per cent. on 20th Nov., declining again to 5 per cent. by 24th Dec., and to 3 in 1848.

2 With the exception of one week the rate was high, varying from 4 to 54 from Sept. 1853 to May 1856, from which date it rose to an average of 6 per cent. until Oct. 1857, when it rapidly mounted to 10 per cent. in Dec. 1857, and thence declined to 4 in Feb. 1858. —

37 was the average rate in the spring, and 6 the average in the summer of 1861. ;

4 At the end of 1863 the rate rose to 7 and 8 per cent., and it oscillated about these figures throughout 1864, twice falling to 6, and twice rising to 9 per cent. ‘

5 The average rate in 1865 was 4, but at the close of the year it rose to 6 and 7; and in 1866 it mounted until it reached 10 per cent. on the 15th August, from which it fell to 34 before the end of the year. 6 The crisis in America (see Banking in the United States, p. 341) was followed by a rapid rise from 3 per cent. on the 20th August to 9 per cent. on the 5th Nov., from which the rate receded to 43 before the end of the year.

office in London, or at its branches, any interest on de- posits, and many plausible reasons have been advanced in defence of this rule. They are well stated in the following extract from the evidence of Mr Weguelin, formerly governor of the bank, before the Committee of 1857 :-—

‘“We,” said he, ‘“‘at the Bank of England, have always considered that the proper functions of a banker were to keep the spare cash of his customer, such cash as his customer required for his daily ex- penditure, for the sudden demands of his business, and any acci- dental accumulation which might happen before the customer had occasion to invest it. That is contrasted with the system pursued by the joint-stock banks, The joint-stock bank invites a large deposit by offering a certain rate of interest for the deposit ; in point of fact, the joint-stock bank becomes the investor of the money in- stead of the customer. The customer of a joint-stock bank does not himself invest his own money, but he employs the joint-stock bank to do it, taking the guarantee of the joint-stock bank, and taking, possibly, a lower rate of interest. Now, that system, if applied to the Bank of England, would be, I think, very prejudicial to the public interests. It would, in the first place, force upon the Bank of England to invest its reserves much more closely than it does now. If it had to pay interest upon its deposits, it could only do so by investing them in some securities that would pay a higher rate of interest than that which it pays. Its deposits also are of that particular character which would render it still more inexpedient that they should be closely invested. They consist, in the first place, of Government deposits, which rise from a low rate at one period of a quarter up to five or six millions higher at another period of a quarter, and again collapse to a very low rate at another period. Again, the private deposits consist, to a certain cxtent, of the deposits of the bankers and the joint-stock banks of London. Those deposits are the amounts which those bankers require to work their own business. Consequently, they are not deposits which should be very closely invested by the Bank of England. In times when there is a great accumulation of deposits in the Bank of England, it is because the public are not able at those times to find investments to their mind to employ those deposits; and consequently, it is not at all likely that the Bank of England, if that is the case with the public generally, will be able to find investments

which the public themselves have not been able to do. All these reasons combined would lead me to think, that to force a system upon the Bank of Ingland by which it should be obliged to employ its deposits very closely—mucli more closely than it does at present—would be not only prejudicial and unsafe as regards the Bank of England, but would be prejudicial to the public interest.”—Quwest. 159.

It is, however, obvious that this reasoning is quite incon- clusive, Mr Weguelin shows clearly enough that the directors of the bank would be bound to exercise great caution in the choice and extent of their investments, but he says nothing to explain why they should not, as the managers of a joint-stock company, use every means of profitably extending their business, and it is incontestable that if the bank directors offered to receive deposits at interest, the reputation of the bank would enable them to defy the competition of the other joint-stock banks. The truth is, that the non-allowance of interest is a tradition, of no authority in itself, and operating injuriously in keeping up the delusion that the banking department of the Bank of England is an institution differing essentially in the character of its business from other banks.

Previously to 1786 the bank received an allowance for paying the dividends, superintending the transfer of the stock, &c., of the national debt, at the rate of £562, 10s. a million onits amount. In 1786 this allowance was reduced to £450 a million, the bank being, at the same time, entitled to a considerable allowance for its trouble in receiving contributions on loans, lotteries, &c. This, though long regarded as a very improvident arrangement on the part of the public, was acquiesced in till 1808, when the allowance on account of management was reduced to £340 per million on £600,000,000 of the public debt, and to £300 per million on all that it exceeded that sum, exclusive of some separate allowances for annuities, d&c. The impression, however, was still entertained that the allowances for management should be further reduced, and this has been effected in the interim.

Exclusive of its functions as public banker and manager

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of the public debt, the Bank of England is connected with Government through the circulation. We have secn that it is entitled to issue the sum of £15,000,000 upon secu- rities, that is, on the credit of the funds lent to Govern- ment. But for these the bank receives about 3 per cent. interest, and such being the case, the public is clearly entitled to a portion, if not to the whole amount of the profits realised by the bank on the issue of these £15,000,000. It is difficult to say how much this ought to be. The issue department of the bank seldom re- issues notes, but for the most part destroys them as soon as they are returned to it. This practice is said to be necessary to enable the bank to obviate fraud, by keeping a proper account of the numbers of the notes afloat. An opinion is, however, pretty generally entertained that this might be effected by a less expensive process than that which is now resorted to. And certainly, it seems to be a very wasteful proceeding, that a quantity of newly manufactured notes issued by the bank in the forenoon, and returned to her in the afternoon, should not be re-issued, but consigned to the flames. The Scotch banks are justly censurable for keeping their notes too long afloat, but this is running with a vengeance into the opposite extreme.

In 1861a fresh arrangement wasmade between the Govern- ment and the bank, to endure for 25 years. Under this agreement the bank receives £300 per million on £600,000,000, and £150 per million on the amount of debt above that sum; but from these allowances are deducted £60,000 for exemption from stamp duties and the whole allowance out of profit of issuc, making together nearly £200,000.

It should be observed that the responsibility and expense incurred by the bank, in managing the public debt, are very great. The temptation to the commission of fraud, in transferring stock from one individual to another, and in the payment of the dividends, is well known; and notwith- standing the skilfully devised system of checks adopted by the bank for preventing this, it has frequently sustaincd very great losses by forgery and otherwise. In 1803 the bank lost, through a fraud committed by one of the principal cashiers, Mr Astlett, no less than £340,000; and the forgeries of Fauntleroy, the banker, cost it a still larger sum. At an average of the ten years ending with 1831, the bank lost, through forgeries on the public funds, £40,204 a year.—(Report on Bank Charter, Appen. p. 165.)

Besides the transactions alluded to, the bank entered, on the 20th of March 1823, into an engagement with Government with respect to the public pensions and annuities, or, as they have been more commonly termed, the dead weight. At the end of the war, the naval and military pensions, superannuated allowances, &c., amounted to above £5,000,000 a year.' They would, of course, have been gradually lessened, and ultimately extinguished, by the death of the parties; but it was resolved in 1822 to attempt to spread the burden equally over the whole period of forty-five years, during which it was calculated the annuities would continue to decrease. To effect this purpose, it was supposed that, upon Government offering to pay £2,800,000 a year for forty-five years, capitalists would be found who would undertake to pay the entire annuities, according to a graduated scale previously deter- mined upon, making the first year a payment of £4,900,000, and gradually decreasing the payments until the forty-fifth and last year, when they were to amount to only £300,000. This supposition was not, however, realized. No capitalists were found willing to enter into such distant engagements. But in 1823, the bank agreed, on condition of receiving an annuity of £585,740 for forty-four years, commencing on the 5th of April 1823, to pay, on account of the pensions, &c., at different specificd periods, between the years 1823

and 1828, both inclusive, the sum of £13,089,419.— (4 Geo, IV. c. 22.) This annuity has, in due course of time, expired.

Formerly the business transacted at the bank was so much encumbered with forms and conditions, that the generality of merchants and ordinary people rarely thought of employing it to keep their money or make their pay- ments. But in this respect an entire change has been effected. Cheques, the minimum amount of which was formerly £10, may now be drawn of any amount, great or small; and all sorts of banking business is conducted with facility and despatch, and, it may be added, with perfect security.

The bank opens banking accounts, or, as they are called, "drawing accounts," for the safe custody, and the receipt and payment of cash, not only with merchants and traders, but with all persons who choose to keep their inoney at a banker's and to draw cheques against it. The bank also

takes charge of its customers' bills of exchange, Exchequer bills, and other securities, and does all that is needful either in the collection of bills of exchange, the exchange of Exchequer bills, the receipt of dividends, and so forth, free of any charge. Plate chests, and deed and security boxes, may be deposited free of expense, by customers, for safe custody. The bank looks to the average balance of cash on each account to compensate for the trouble and expense of keeping it, and in this respect the requirements of the bank are certainly not greater than those of ordinary bankers. No particular sum is required to be lodged on opening an account; it is only necessary that the party should be known as respectable, and in a condition to require a banking account. But the bank receives and holds sunis of money for safe custody for parties who have no current accounts.

The following are the regulations under which accounts are conducted :—

1. All letters should be addressed to the chief cashier.

2. It is desirable that drafts should be drawn upon cheques fur- nished by the bank.

- Cheques upon city bankers, eastward of King Street, Cheap- side,—

Paid in by 12 o'clock may be drawn for after 1. Do. – 2 o'clock e " after 3.

4. Cheques paid in after 2, and before 3 o'clock, and cheques upon all other London bankers paid in before 12 o'clock, may be drawn for on the following morning. ;

5. Cheques paid in after 3 o'clock are sent out at 9 the following morning, and may be drawn for as soon as received.

6. Dividend warrants are received at the drawing office until 4 o'clock in the afternoon for all persons having accounts at the bank.

7. It is requested that notice be given at the drawing office of bills accepted payable at the bank, with the date of their maturity.

8. Persons keeping a drawing account with the bank (although not having a discount account) may tender bills for discount through the drawing office. Application for discounts or for advances on stock, Exchequer bills, &c., must be made before 2 o’clock.

9. Bills of exchange and notes not paid when due, will be noted.

10. The bank will make purchases or sales of British or foreign securities upon an order in writing addressed to the chief cashier ; and dividends on stock may be received under powers of attorney granted to the cashiers of the bank.

11. Exchequer bills, bonds, railway debentures, or any other securities may be deposited, and the interest, when payable, will be received and placed to account.

12. Credits paid in to account are received without the bank-book, and are afterwards entered therein without the party claiming them.

13. Notes of country bankers, payable in London, are sent out the same day for payment if paid in before 3 o’clock.

14, The pass-books should be left at the drawing office, at least once a month, to be written up.

15. Where post-bills are required, or a payment is to be made to any office of the bank by cheque ou the Bank of England, the cheque must be presented at the office upon which it is drawn, and ex- changed for an order on the post-bill office, or on the office at which the payment is to be made.

BANKING

[SCOTLAND.

16. Cash-boxes taken in, contents unknown, for such parties as

keep accounts at the bank.

17. A person having a drawing account may have a discount

account; but no person can have the latter without at the same time having the former.

When a discount account is opened, the signatures of the parties are entered in a book kept for that purpose,

and powers of attorney are granted empowering the persons named in them to act for their principals, than 95 days to run are not eligible for discount.

Bills of exchange having more

N.B.—All changes in the residence of persons keeping cash at the

bank are requested to be made known at the drawing office; and it is particularly requested that no gratuities be offered to the clerks of the banking offices, such gratuities being strictly forbidden.

Scotch Banks. The Act of 1708, preventing more than six individuals

from entering into a partnership for carrying on the busi- ness of banking, did not extend to Scotland. quence of this exemption, several banking companies,

In conse-

with numerous bodies of partners, have existed, for a

lengthened period, in that part of the empire.

The Bank of Scotland was projected by Mr John Holland, merchant, of London, and was established by Act of the Scotch Parliament (Will. III., Parl. 1, § 5) in 1695, by the

name of the Governor and Company of the Bank of Scot- land. Its original capital was £1,200,000 Scotch, or £100,000 sterling, distributed in shares of £1000 Scotch,

or £83, 6s. 8d. sterling, each, The Act exempted the

capital of the bank from all public burdens, and gave it the exclusive privilege of banking in Scotland for twenty-one

ears. ‘ts mode of management, were intended to be, and have been, in most respects, similar to those of the Bank of England. The responsibility of the shareholders is limited to the amount of their shares. was increased to £200,000 in 1774, and was enlarged by subsequent Acts of Parliament, the last of which (44 Geo.

The objects for which the bank was instituted, and

The capital of the bank

III. c. 23) was passed in 1804, to £1,500,000, its present, amount.) Of this sum £1,000,000 has been paid up. The

last-mentioned Act directed that all sums relating to the

affairs of the bank should henceforth be rated in sterling money; that the former mode of dividing bank stock by shares should be discontinued ; and that, for the future, it should be transferable in sums or parcels of any amount. On the union of the two kingdoms in 1707, the Bank of Scotland undertook the recoinage, and effected the exchange of the currency in Scotland. It was also the organ of Government in the issue of the new silver coinage in 1817.

The Bank of Scotland is the only Scotch bank consti- tuted by Act of Parliament. It began to establish branches in 1696, and issued notes for one pound as early as 1704, The bank also began, at a very early period, to receive deposits on interest, aud to grant credit on cash accounts, a minute of the directors with respect to the mode of keeping the latter being dated as far back as 1729. It is, therefore, entitled to the credit of having introduced and set on foot the distinctive principles of the Scotch banking system, which, whatever may be its defects, is perhaps superior to most other systems hitherto established. Gene- rally speaking, the Bank of Scotland has been cautiously and skilfully conducted ; and there can be no doubt that it has been productive, both directly and as an example to other banking establishments, of much public utility and advantage.

It may be worth mentioning, that the Act of Will. III. establishing the Bank of Scotlaud, declared that all foreigners who became partners in the bank should by doing so become, to all intents and purposes, naturalised Scotchmen. After being for a long time forgotten, this

a 1 Although the capital of the Bank of Scotland remains, as stated in the text, a power, as yet unused, was conferred on the bank by a private Act passed in 1873 to raise its capital to £3,000, 000.

clause was taken advantage of in 1818, when several aliens acquired property in the bank in order to secure the benefit of naturalization. But after being suspended, the privilege was finally cancelled in 1822.

We subjoin an official abstract of the constitution and objects of the Bank of Scotland, printed in 1857 for the use of the proprietors ;—the terms and model of transact- ing business are, of course, sometimes altered, according to circumstances :—

1. The Bank of Scotland is a public national establishment, erected and regulated by the Legislature alone, and expressly as a public bank in this kingdom,—for the benefit of the nation, and for the advancement of agriculture, commerce, and manufactures, and for other objects of public policy.—(Will. Parl. 1, § 5; 14 Geo. 111. c. 32; 24 Geo. III. c. 8; 32 Geo. III. c. 25; 34 Geo. III. c. 19; 44 Geo. ITl. c. 23.)

2. The statutory capital is at present £1,500,000 sterling. It is raised by voluntary subscription, and has been snbscribed_ for. £1,000,000 has been called for, and paid in.—(44 Geo. III. c.

23.

4 Subscribers, if not under obligations to the bauk, may, at pleasure, transfer their right. If under obligation to the bank, the obligation must be previously liquidated; or the proceeds of the sale, at a price to the

satisfaction of the directors, must be applied towards such liquidation. Transfers arc made by a short assign- ment and acceptance thereof, both in a register appointed for that purpose. The expense, besides the Government stamp, is 11s.— (Will. Parl. 1, § 5.)

4, Bank of Scotland stock may be acquired, in any portions, by ay person, community, or other lawful party whatsoever, without selection, exclusion, or limitation of numbers.—(Will. Parl. 1, § 5; 44 Geo. Ill. c. 23.)

5. Bank of Scotland stock may be conveyed by will, and, if specially mentioned, without expense of confirmation, It cannot be arrested ; the holder's right niay be adjudged. Dividends may be arrested. —(Will. Parl. 1, § 5.)

6. The Bank of Scotland is a public corporation by Act of Parlia- ment. The bank's transactions are distinct from those of the stockholders ; and theirs from those of the bank.—(Will, Parl. 1,

.)

7. The establishment is expressly debarred from any other busi- ness than that of banking.—(Will. Parl. 1, § 5.)

8. The management is vested, by statute, in a governor, deputy- governor, twelve ordinary, aud twelve extraordinary directors. They are chosen annually, on the last Tuesday of March, by the stock- holders having £250 of stovk or upwards. Those above £250 have a vote for every £250, to £5000, or 20 votes. No person can have more than 20 votes. The governor must hold, at least, £2000 of stock; the depnty-governor £1500; and each director £750 [now £1000}. They swear to be eqnal to all persons, and cannot hold any inferior office in the bank.—(Will. Parl. 1, § 5; 14 Geo, III. c. 32; 44 Geo. ILI. c. 23.)

9. The executive part is conducted by a treasurer, secretary, and other public officers, all sworn. All the officers of the Bank of Scotland find dne security.—(Will. Parl. 1, § 5.)

10. The board of directors sits, for the general administration of the bank, at the bank's pnblic head office in Edinburgh. The local business of that district is also conducted at that office. For the local business in the other parts of the kingdom, the bank has its regnlar public officesin the principal towns. Ateach of these offices there is the bank agent or cashier, who gives dune security, and con- ducts the bank's bnsiness for that district in the manner after- mentioned.—(Will. Parl. 1, § 5.)

11. The bank takes in money at all its public offices, on deposit receipts or on current deposit accounts. At the head office drafts on the branches, and at the branches drafts on the other branches and on the head office, are granted. Both at the head office and branches drafts are granted on the London, Dublin, and English and Irish provincial correspondents of the bank. All receipts and drafts are on the bank's engraved forms, and bear to be granted ‘‘ For the Bank of Scotland,” or ‘‘ for the Governor and Company of the Bank of Scotland.” At the head office official documents are signed by the “alg and at the branches by the agents, and all are counter-signed.

Remittances can be made to the principal colonial and continen- tal towns; and bills, payable in the colonies, and in foreign coun- tries, can be negotiated through the bank.—(Resolution of Court, 17938, as since modified.)

N.B.—The bank has always allowed interest on deposits, at a rate varying according to circumstances.

12. Bills on London, Edinburgh, or any town in the United Kingdom, are discounted at all the bank's public offices. The bank's agents judge, in ordinary cases, of the bills presented, so that parties meet with no delay. The bank does not re-issue the bills

which it has discounted.—(Resolution of Court, 23d Feb. 1789, and subsequent modifications.)

13. Government stock and other public funds may be purchased or sold, and dividends thereon may be received through the bank.

14. The bank gives credit on cash accounts at any of its offices, on bond, with security. The security may be personal co-obligants, or such other security as may be specially agreed on. Applications for cash accounts are given in to the office where the cash account is wanted, and must specify the credit desired, and the security pro- posed ; and the individual partners, where co-partueries are proposed. Cash accounts are granted by the directors only, and are not re- called unless by their special authority. _1t is understood that these credits arc not used as dead loans, to prodnce interest only. In the fair conrse of business, the advantage of the bank is consulted by an active circulation of its notes, and by frequent repayments to it in a way least affecting that circulation.—(Resolution of Court, 6th Noy. 1729, and 23d Feb. 1789.)

15. The bank's dividend has been for some time 8 [it has risen till it is now (1875) 14] per cent. per annum on its paid-up capital of £1,000,000 sterling. The dividends are paid regularly twice a year, without expense. They may be drawn either at the bank's head office, or at any of its other offices, as most agreeable to the stockholder.!

The above may suffice as a gencral outline of the mode in which the business of banking is conducted in Scotland.

The Royal Bank of Scotland was established in 1727. Tts original capital of £151,000 has been increased to £2,000,000.

The British Linen Company was incorporated in 1746, for the purpose, as its name implies, of undertaking the manufacture of linen. Butthe views in which it originated were speedily abandoned, and it became a banking com- pany only. Its capital amounts to £1,000,000.

None of the other banking companies established in Scotland are chartered associations with limited responsi- bility, the partners being liable, to the whole extent of their fortunes, for the debts of the firms. The number of partners is in every case considerable. The affairs of the banks are

uniformly conducted by a board of directors, annually chosen by the shareholders.

‘(he Bank of Scotland began, as already stated, to issue £1 notes so early as 1704, and their issue has since been continued without interruption. “In Scotland,” to use the statement given in the Report of the Committee of the House of Commons of 1826 on the Promissory Notes of Scotland and Ireland, “‘ the issue of promissory notes pay- able to the bearer on demand, for a sum of not less than 20s., has been at all times permitted by law; nor has any Act been passed limiting the period for which such issue shall continue legal in that country.”

All the Scotch banks receive deposits of as low a value as £10, and often lower, and allow interest upon them.

The interest allowed by the banks upon deposits varies, from time to time, according to the variations in the cur- rent rate of interest. The aggregate amount of the sums deposited with the Scotch banks in 1874-5 is stated to be £78,401,070.

A witness, connected for many years with different banks in Scotland, and who had experience of their concerns at Stirling, Edinburgh, Perth, Aberdeen, and Glasgow, being examined by the Commons’ Committee of 1826, stated that more than half the deposits in the banks with which he had been connected were in sums from £10 to £200. Being asked what class of the community it is that makes the small deposits, he gave the following answer,—from which it appears that the mode of conducting this branch of the bank business in Scotland has long given to that country most part of the benefits derivable from the estab- lishment of savings-banks :—

1 Now that fundholders may have their dividend warrants sent them by post on notifying a desire to that effect, it is strange that stock- holders in the Scottish banks should be still compelled to make per- sonal application at an office of the bank for their dividends.

‘© Question.—What class of the community is it that makes the smallest deposits ? ;

‘* Answer.—They are generally the labouring classes in towns like Glasgow ; in country places like Perth and Aberdeen, it is from servants and fishermen, and that class of the community who save small sums from theircarnings, till they come to be a bank deposit. There is now a facility for their placing money in the Provident Banks, which receive money till the deposit amounts to £10. When it comes to £10 it is equal to the minimum ofa bank deposit. The system of banking in Scotland is an extension of the Provident Bank system. Half-yearly or yearly those depositors come to the

bank, and add the savings of their labour, with the interest that has accrucd upon the deposits from the previous half-year or year, to the principal ; and in this way it goes on, without being at all reduced, accumulating (at compound interest) till the depositor is able either to buy or build a house, when it comes to be £100, or £200, or £800, or till he is able to commence business as a master in the line in which he has hitherto been a servant. A great part of the depositors of the bank are of that description, and a great part of the most thriving of our farmcrs and manufacturers have arisen from such beginnings.”

The following Table exhibits an account of the different Scotch Banks, their Partners, Branches, Authorized Circulation, Actual Circulation, Coin, &e., in 1874-5 (from Oliver & Boyd’s Almanac and Banks of Issue Report).

| } Price per £100 Stock (per

i- Rest or ivi bitte NAME. Partners. Br, pod Reserve edi oe een! call si oy ikl Fund. 1872. | 1873, | 1874. a5 a5 ES € ek 1695 | Bank of Scotland…..... ceceeseees 1409 | 86 | 1,000,000 | 385,000 134 | 10,632,000 | 287 308 V2 Osa BGC ates oe snesnencsomesensett 1454 105 2,000, 000 500,000 94 10, 068,000 1924 2303 1746 | British Linen Co…....0c.cceeeneee 1209 | 70 | 1,000,000 | 350,000 13+ | 7,708,000 | 288 291 TSO | Commercial Wake…

.csecereevee os 1228 101 1,000, 000 407,114 15+ 9,508,000 296 3819 1825 | National Bank of Scotland…..... 1660 91 1,000,000 400,000 16+ | 10,874,000 | 3807 319 1880 | Union Bank of Scotland…..... 1260 | 116 1,000,000 380,000 15 9,608,000 | 281 292 1825 | Aberdeen Town and County Bank*) 848 4] 252,000 115,000 124+ 1,829,000 154 173 1836 | North of Scotland Bank*..... 1428 | 48 320,000 85,000 114 | 2,465,000 94 11 1888 | ClydeedaleWatike…. 62. ..c.ecescsseoes 1888 79 1,000,000 500,000 164 6,519,000 | 255 284 1839 | City of Glasgow Bank …....-4.. 1273 | 125 | 1,000,000 | 423,000 11 8,162,000 | 208 240 1838 804 wat 125,000 62,5381 14+ 1,048,000 74 8h

Caledianianwbamkey..cceccescesee >.

- The capital of banks marked with an asterisk is in shares:—The Aberdeen Town and County Bank, £7 paid ; North of Scutland

Bank, £4 paid; Caledonian Bank, £2, 10s. paid.

The loans or advances made by the Scotch banks are either in the shape of discounts, or upon cash-credits, or, ag they are more-commonly termed, cash accounts.

A cash-credit is a credit given to an individual by a banking company for a limited sum, seldom under £100 or £200, upon his own security, aud that of two or three individuals approved by the bank, who become sureties for its payment. The individual who has obtained such a credit is enabled to draw the whole sum, or any part of it, when he pleases, replacing it, or portions of it, according as he finds it convenient, interest being charged upon such part only as he draws out. “If a man borrows £5000 from a private hand, besides that it is not always to be found when required, he pays interest for it whether lie be using it or not. His bank credit costs him nothing, except during the moment it is of service to him, and this circumstance is of equal advantage as if he had borrowed money at a much lower rate of interest” (Hume’s “ssay on Balance of Trade). This, then, is plainly one of the most commodious forms in which advances can be made. Cash-credits are not, however, intended to be dead loans ; and they are not granted except to persons in business, or to those who are frequently drawing out and paying in money.

The system of cash-credits has been very well described in the Report of the Lords' Committee of 1826 on Scotch and Irish Banking. 'There is also," say their lordships, "one part of their system which is stated by all the witnesses (and, in the opinion of the Committee, very justly stated) to have had the best effects upon the people of Scotland, and particularly upon the middling and poorer classes of society, in producing and encouraging habits of frugality and industry. The practice referred to is that of cash-credits. Any person who applies to a bank for a cash-credit is called upon to produce two or more com- petent sureties, who are jointly bound; and after a full inquiry into the character of the applicant, the nature of his business, and the sufficiency of his securities, he is allowed to open a credit, and to draw upon the bank for the whole of its amount, or for such part as his daily tran- sactions may require. To the credit of the account he

+ Dividend and bonus.

pays in such sums as he may not have occasion to use, and interest is charged or credited upon the daily balance, as the case may be. From the facility which these cash- credits give to all the small transactions of the country, and from the opportunities which they afford to persons who begin business with little or no capital but their character to employ profitably the minutest products of their industry, it cannot be donbted that the most impor- tant advantages are derived to the whole community. The advantage to the banks that give these cash-credits arises from the call which they continually produce for the issue of their paper,! and from the opportunity which they afford for the profitable employment of part of their deposits. 'The banks are indeed so sensible that, in order to make this part of their business advantageous and secure, it is necessary that their cash-credits should (as they express it) be frequently operated upon, that they refuse to continue them unless this implied condition be fulfilled. The total amount of their cash-credits is stated by one witness to be £5,000,000, of which the average amount advanced by the banks may be one-third.

The expense of a bond for a cash-credit of £500 is 12s. 6d. stamp duty, and a charge of from 5s. to 10s. 6d. per cent. for preparing it.

There have been, on the whole, comparatively few failures among the Scotch banks. In 1793 and 1825, when so many of the English banks were

swept off, there was not a single establishment in Scotland that gave way. This superior solidity appears to have been owing to various causes,— partly to the banks having, for the most part, large bodies of partners, who, being conjointly and individually bound for the debts of the companies to which they belong, go far to render their ultimate security all but unquestion- able, and partly to the facility afforded by the law of Scotland of attaching a debtor's property, whether it con- sist of land or movables, and making it available for the payment of his debts. This last-mentioned circumstance was referred to as follows, in the Report already alluded to :- —

1 The advantage of an increased issue is, however, much reduced, when the authorized issues are exceeded, and cash reserves are kept in hand equal to the excess.

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'* A creditor in Scotland is empowercd to attach the real and heri- table as well as the personal estate of his debtor, for payment of personal debts, among which may be classed debts due by bills and promissory notes ; and recourse may be had, for the purpose of pro- curing payment, to each description of property at the same time. Execution is not confined to the rcal property of a debtor merely during his life, but proceeds with equal effect upon that property after his decease.

"The law relating to the establishment of records gives ready means of procuring information with respect to the real and heri- table estate of which any personin Scotland may be possessed. No

urchase of an estate in that country is secure until the sasine (that is, the instrument certifying that actual delivery has been given) is put on record, nor is any mortgage effectual until the deed is in like manner recorded.

'¢In the case of conflicting pecuniary claims upon real property, the preference is not regulated by tho date of the transaction, but by the date of its record. These records are accessible to all persons ; and thus the public can with ease ascertain the effective means which a banking company possesses of discharging its obligations ; and the partners in that company

are enabled to determine, with tolerable accuracy, the degree of risk and responsibility to which the private property of each is exposed.”

But, on the whole, we are inclined to think that the long familiarity of the inhabitants with banks and paper money, and the less risk that has attended the business of banking in Scotland, have been the principal causes of the greater stability of the Scotch banks. This stability was not, however, everywhere exhibited in the crisis of 1857, when two of the principal Scotch banks, the headquarters of which were in Glasgow, were compelled to stop pay- ments. They had very large capitals, the Western Bank £1,500 000, and the City of Glasgow Bank £1,000,000, with a great many branches, large amounts of deposits, and very numerous and wealthy proprietary bodies, Had the management of the Western Bank displayed anything like ordinary skill and prudence, it might have gone triumphantly through a far more serious trial. But having advanced immense sums to a few firms that never were entitled to any considerable credit, it was so crippled that, for a lengthened period before its stoppage, it was reduced to the expedient of sending up the bills it had discounted in Glasgow to be rediscounted in London; and when this resource failed it, and the other banks declined to come forward to its assistance, nothing remained for it but to shut its doors! On the affairs of the bank being inves- tigated by a committee appointed for the purpose, it was found that they were in a much worse state than any one could have anticipated. The losses exceeded two millions, and were directly attributable to the carelessness and negligence of directors, and the incompetence of the managers appointed by them.

We have already explained the nature of Sir Robert Peel’s Act of 1845 (following that of 1844) dealing with Scotch banks. It allowed the Scotch banks then exercising the privilege of issuing notes to continue to exercise it, without limitation of amount, but subject to the condition, that for every note issued by a bank above its average circulation the year preceding the Ist May 1845 an equal amount in coin should be kept in its coffers. No bank established after the passing of the Act was allowed to issue notes. No change was effected by the Act in the denomi- nation of notes issued, which remained, therefore, of £1 and upwards. Many theorists have urged that £1 notes should be forbidden in Scotland, just as others have argued in favour of their being again put into circulation in England. This question cannot be

settled upon abstract arguments. We have no doubt that the balance of reasoning is in favour of the issue of £1 notes, provided they are issued under regulations securing their convertibility at all times and

S The management of the City of Glasgow Bank was, as compared with that of the Western Bank, prudent and skilfwl. It recommenced and continues business.

under all circumstances, but these regulations are wanting in Scotland. Legislation on the subject should not take the form of suppressing £1 notes entirely, but of with- drawing the privilege of issuing them from the existing banks, and vesting it in a public institution governed by fixed rules analogous to those of the issue department of the Bank of England. When the convertibility of notes is thus made certain, the single valid objection against the issue of those of £1 denomination disappears. It may be added that more than one-half the total issues of the banks established in the Australian colonies consists of £1 notes.

A complaint has been often raised that the Act of 1845 gave the existing Scotch banks a practical monopoly of the business of banking in North Britain, and it must be admitted to be the fact, that only one new bank has been established in Scotland since the passing of the Act, and that bank carried on business fora short time only. It is, however, true that legislation precisely the same has not pre- vented the establishment of new banks in Ireland, and it is doubtful whether the observed fact is rightly attributed to the cause assigned to it. With the exception of London, and some of the larger provincial towns, there have been very few banks established in England since 1836, eight years before the Bank Charter Act; and of the banks established in 1835 and 1836, very many were formed by the conver- sion of pre-existing private banks into joint-stock associa- tions. The truth appears to be that the natural obstacles to the establishment of a new bank in a district already occupied by banks and bankers are alinost insuperable. A bank cannot be successful unless it commands credit ; and those who want a place of safe keeping for their money select establishments that have

been tried and tested through long years. Hence it happens that, though private banks of long standing continue in esteem, the attempts to set up new private banks are most rare ; and, unless the wealth and prosperity of a neighbourhood have rapidly developed, so that capitalists have risen to prominence in it who are not connected as shareholders or directors with existing banks, it is not easy to form joint-stock associations of weight enough to compete with the institutions in pos- session of the field. It is not necessary to refer the absence of new banking companies in Scotland or elsewhere to the legislation of Sir Robert Peel. Though he allowed the Scotch banks to increase indefinitely the issue of their notes, it was upon condition of keeping in hand cash to represent every note above fixed limits ; so that the amount of profit derivable from their issues is not capable of increase, and the value of their privileges will have been strictly included in the selling price of shares in these banks since 1845. As far as the privilege of issue goes, capitalists preparing to start a new banking association in Scotland would be in the same position as in buying shares in an established company; and if they do not start an association of their own, it is from the difficulty of attracting confidence, rather than because they would not enjoy the profits of a privileged circulation for which they would have to pay a full value. It must also be observed that the competition among the existing banks is sufficiently active to have caused them to increase the number of their branches 40 per cent. since 1845.

Another question has been raised in relation to Scotch banks, which was the subject of a keen parliamentary dis- cussion during the past session (1875). It has been men- tioned (ante, p. 322) that English joint-stock banks of issue are debarred from setting up branches in London, or within sixty-five miles of it,a prohibition originally imposed on them in the interest of the Bank of England as a bank of issue. There is no such prohibition affecting Scotch and Irish banks, which can set up offices in London or elsewhere in England subject to the single condition affecting all banking

establishments set up in England since 1844, that notes other than Bank of England notes are not issued at such officcs ; and it is obvious that a Scotch or Irish banking company establishing a head office in London would be

able to give it at once a large agency business, and would be able to feed it continuously with new connections owing to the flow of immigration from Scotland and Ireland to London. Accordingly, the directors of the National Bank of Ireland began to conduct the general business of bank- ing at their head office in London in 1854, and they have subsequently set up seven or eight branches in the metro- polis, each of which is understood to be the centre of much business. This example was so far followed, that the National Bank of Scotland started an office in London in 1864; the Bank of Scotland did the same in 1867; and the Royal Bank in 1874, having obtained a private Act for the purpose. The Clydesdale Bank also opened three branches in Cumberland in 1874. In consequence of this action Mr Goschen brought into Parliament a bill, the object of which was to disable Scotch banks from coming into England, as English joint-stock banks of issue are disabled from coming to London. ‘The bill did not extend to Irish banks, as they were held too firmly settled in the metropolis to be expelled from it. Two arguments were advanccd in favour of this measure: the first, that it was hard that Scotch banks should be permitted to do that which is denied to English joint-stock banks; but it is an easy, and, as it would seem, a conclusive answer to this argument, that English joint-stock banks of issue should be freed from the disability now imposed upon them. Now that an increase in its issue is not a measure of profit to the Bank of England, there is no reason why these country banks of England should not be allowed to set up head offices in London, subject to the law for- bidding the issue of their notes in London. The second argument in favour of Mr Goschen’s measure was, that something ought to be done to hasten that unification of issues which Sir Robert Peel contemplated ; and if the Scotch banks had come to Parliament asking for a liberty they did not possess, there would have been some plausi- bility in this argument. It is to be feared that the whole strength of the support to Mr Goschen’s bill sprang from the jealousy of the existing bankers of London of any intrusion into their domain. Unworthy as this source of opposition was, it prevailed so far as to cause the appoint- ment of a Select Committee of the House of Commons to consider the law and practice of banking, and this Committee’s report has just appeared as these sheets are passing through the press (August 1875).

Banking in Ireland.

“Tn no country, perhaps,” says Sir Henry Parnell, ‘has the issuing of paper money been carried to such an injurious excess asin Ireland. A national bank was established in 1783, with similar privileges to those of the Bank of England in respect to the restriction of more than six partners in a bank, and the injury that Ireland has sustained from the repeated failure of banks may be mainly attributed to this defective regulation. Had the trade of banking been left as free in Ireland as in Scotland, the want of paper money that would have arisen with the progress of trade would in all probability have been sup- plied by joint-stock companies, supported with large capi- tals and governed by wise and effectual rules.

“In 1797, when the Bank of England suspended its payments, the same privilege was extended to Ireland ; and after this period the issues of the Bank of Ireland were rapidly increased. In 1797 the amount of the notes of the Bank of Ireland in circulation was £621,917; in 1810, £2,266,471; and in 1814, £2,986,999.

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“These increased issues led to corresponding increased issues by the private banks, of which the number was fifty in 1804, The consequence of this increase of paper was its great depreciation ; the price of bullion and guineas arose to 10 per cent. above the mint price; and the exchange with London became as high as 18 per cent., the par being 84. This unfavourable exchange was afterwards corrected, not by any reduction in the issues of the Bank of Ireland, but by the depreciation of the British currency in the year 1810, when the exchange between London and Dublin settled again at about par.

“The loss that Ireland has sustained by the failure of banks may be described in a few words. It appears, by the Report of the Committee on Irish Exchanges in 1804, that there were, at that time, in Ireland fifty registered banks. Since that year a great many more have been established, but the whole have failed, one after the other, involving the country from

time to time in immense distress, with the following exceptions—TFirst, a few that withdrew from business; secondly, four banks in Dublin ; thirdly, three at Belfast ; and, lastly, one at Mallow. These eight banks, with the new Provincial Bank and the Bank of Treland, are the only banks now (1827) existing in Ireland.

“Tn 1821, in consequence of eleven banks having failed nearly at the same time, in the preceding year, in the south of Ireland, Government succeeded in making an arrangenient with the Bank of Ireland, by which joint-stock companies were allowed to be established at a distance of fifty miles (Irish) from Dublin, and the bank was permitted to increase its capital from 24 to 3 millions sterling. The Act land 2 Geo. IV. c. 72, was founded on this agreement. But ministers having omitted to repeal in this Act various restrictions on the trade of banking that had been imposed by 33 Geo. II. c. 14, no new company was formed. In 1824 a party of merchants of Belfast, wishing to establish a joint-stock company, petitioned Parliament for the repeal of this Act of Geo. II.; and an Act was accordingly passed in that session, repealing some of its most objcctionable restrictions (5 Geo. IV. c. 73).

“Tn consequence of this Act, the Northern Bank of Belfast was converted into a joint-stock company, with a (nominal) capital of £500,000, and commenced business on the 1st of January 1825. But the restrictions of 33 Geo. II., and certain provisions contained in the Acts 1 and 2 Geo. III., and 5 Geo. IV., obstructed its progress, and they found it necessary to apply to Government to remove them ; and a bill was accordingly introduced, which would have repealed all the obnoxious clauses of the 33 Geo. II., had it not been so altered in the committtee as to leave several of them in force. In 1825 the Provincial Bank of Ireland commenced business with a (nominal) capital of £2,000,000; and the Bank of Ireland has of late established branches in all the principal towns.”

Since Sir Henry Parnell published the pamphlet from which we have taken the foregoing extract, several joint- stock banking companies have been founded in Ireland. The Provincial. Bank, to which Sir Henry alludes, has a paid up capital of £540,000, and has been well and profitably managed. But others have been less fortunate. The Agricultural and Commercial Bank of

Ireland, estab- lished in 1834, with 2170 partners, a paid up capital of £352,790, and many branches, stopped payment during the pressure in November 1836, and by doing so involved many persons in great distress. It appears to have been extremely ill-managed. The auditors appointed to examine into its affairs reported—‘Its book-keeping has been found to be so faulty, that we are convinced no accurate balance-sheet could at any time have been constructed.”

1 Qbservaticns on Paper Money, &c., by Sir Henry Parnell, p. 171.

And they significantly added—‘“ the personal accounts at the head office require a diligent and searching re- vision.”

The Tipperary Joint-Stock Bank, which was established in 1839, and stopped payments in 1855, appears to have been little, if at all, better than a mere swindling engine. Luckily it did not issue notes; and the sphere of its operations was not very extensive. But, so far as its influence went, nothing could be worse, being ruinous alike to the majority of its partners and to the public.

We have in the previous section on Scotch banks men- tioned the fact of the establishment by the National Bank

i of Ireland of a head office and of several branches in

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London. This example has been so far followed by the Provincial Bank that it has also set up a head office in London, without, however, competing for general business in the metropolis. An addition was made to the number of Irish banks in 1864 by the establishment of the Munster Bank (Limited),

having its head office in Cork. It has established upwards of 40 branches, and pays a dividend of 12 per cent. to its shareholders.

We borrow principally from Thom’s Jrish Almanac, the most valuable publication of its class, the following details with respect to the Irish banks in 1875 :—

Account of Joint-Stock Banks existing in Ireland in 1875, their Branches, Capital, Fixed Issues, dc.

; | : | Latest } Reserve 3 we Subscribed Capital. Paid up Capital. Divi- Fund 3 anise od dend and ~~» ae | Miet | P P gerund! keer tees B 4 ” Jer | e-(after las 5 | a Seca Shave Amount, Share | Amount. ened Dividend. re era ws 1783 | Bank of Ireland (Dublin).....ccccccccesecseee 49 | Stock. | 100 | 2,769,230 | 100 | 2,769,280 | 12 /1,072,000 1827 | Belfast Banking Company (Belfast)..... 35 5,000 100 500,000 25 125,000 20 135.966 et », _ (New Shares).... 5,000 | 100 500,000 | 25 125,000 8 ” 1824 Dublin). oint-Stock Banking Company! | 3) | 90,000 | 100 | 2,000,000 | 25 | 500,000 ‘ 12 | 285,000 1864 | Munster Bank, Limited (Cork)..... 41 100,000 10 | 1,000,000 34 350,000 | 12 170,000 1835 | National Bank (London) ....c.cccccccccessseee. 109 | 50,000 50 | 2,500,000 | 30 | 1,500,000 ° 11 133,000 1825 | Northern Banking Company (Belfaust)..... 43 5,000 |92/6/2 461,538 30 150,000 = 15 170,000 a Rs New Shares… 5,000 100 500,000 30 150,000 { 73% t

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1824 | Provincial Bank of Ireland (London).....] 44 || 20:000 | 100 2,040,000 } = 540,000 | 20 | 254,182 1836 | Royal Bank of Ireland (Dublin).....0.. 4 30,000 50 | 1,500,000 10 300,000 15 196,000 1836 | Ulster Banking Company (Belfast)..... 41 100,000 10 | 1,000,000 24 250,000 20 287,500

Bank of Amsterdam.

The Bank of Amsterdam was founded in 1609, on strictly commercial principles and views, and not to afford any assistance, or to intermeddle with the finances of the state. Amsterdam was then the great entrepét of the

commerce of the world, and of course the coins of all Europe passed current in it. Many of them, however, were so worn and defaced as to reduce their general average value to about 9 per cent. less than their mint value ; and, in consequence, the new coins were immediately melted down and exported. The currency of the city was thus exposed to great fluctua- tions; and it was chiefly to remedy this inconvenience and to fix the value or par of the current money of the country, that the merchants of Amsterdam established a “ bank,” on the model of that of Venice. Its first capital was formed of Spanish ducats or ducatoons, a silver coin which Spain had struck in the war with Holland, and with which the tide of commerce had enriched the country it was formed to overthrow. The bank afterwards accepted the coins of all countries, worn or new, at their intrinsic value, and made its own bank-money payable in standard coin of the country, of full weight, deducting a “brassage” for the expense of coinage, and giving a credit on its books, or “ bank-money,” for the deposits.

The Bank of Amsterdam professed not to lend out any part of the specie entrusted to its keeping, but to retain in its coffers all that was inscribed on its books. In 1672, when Louis XIV. penetrated to Utrecht, almost every one who had an account with the bank demanded his deposit, and these were paid off so readily that no suspicion could exist as to the fidelity of the administration. Many of the coins then brought forth bore marks of the conflagra- tion which happened at the Hétel de Ville, soon after the establishment of the bank. This good faith was main- tained till about the middle of last century, when the managers secretly lent part of their bullion to the East India Company and Government. The usual “ oaths of

office ” were taken by a religious magistracy, or rather by the magistracy of a religious community, that all was safe , and the good people of Holland believed, as an article of their creed, that every florin which circulated as bank- money had its metallic constituent in the treasury of the bank, sealed up, and secured by oaths, honesty, and good policy. This blind confidence was dissipated in December 1790, by a declaration that the bank would retain 10 per cent. of all deposits, and would return none of a less amount than 2500 florins.

Even this was submitted to and forgiven. But, four years afterwards, on the invasion of the French, the bank was obliged to declare that it had advanced to the States of Holland and West Friesland, and the East India Company, more than 10,500,000 florins, which sum it was, of course, unable to make up to the depositors, to whom, however, it assigned its claimson the states and the com- pany. Bank-money, which previously bore an agio of 5 per cent. immediately fell to 16 per cent. below current money,

This epoch marked the fall of an institution which had long enjoyed an unlimited credit and had rendered the greatest services. The amount of treasure in the vaults of the bank, in 1775, was estimated by Mr Hope at 33,000,000 florins.?

The Bank of France.

This bank, second in magnitude and importance to the Bank of England only, was originally founded in 1800, but was not placed on a solid and well-defined basis till 1806. Its capital, which was originally fixed at 45,000,000 fr., was raised in the last-mentioned year to 90,000,000 fr., divided into 90,000 shares or actions, of 1000 fr. each. Of these shares, 67,900 have passed into the hands of the public; the remaining 22,100, having been purchased up by the bank out of its surplus profits, were subsequently

1 Storch, Cours d’ Zconomte Politique, tom. iv. p. 102. i 4s

eancelled. Hence its capital amounted, down to 1848, to 67,900,000 fr. (£2,716,000), with a reserve fund, first of 10,000,000 fr., and more recently of 12,980,750 fr. Since 1806 the bank has enjoyed the privilege of being the only institution in Paris entitled to issue notes payable on demand ; and, as will be afterwards seen, it is now the only authorized issuer of such paper in France. Its charter and exclusive privileges have been prolonged and varied by laws passed at different periods.

The bank has established, at different periods since 1817, offices or branches (suwccursales) in different parts of the country. They are managed

nearly in the same way as the parent establishment; but their operations were long on a comparatively small scale. ‘These are exclusive of the departmental banks united, as will be immediately seen, to the bank in 1848.

Notwithstanding the skill and caution with which its affairs have generally been conducted, the revolution of 1848 brought the bank into a situation of extreme danger. It hed to make large advances to the Provisional Government and the city of Paris. And tliese circumstances, combined with the distrust that was universally prevalent, occasioned so severe a drain upon the bank for gold, that to prevent the total exhaustion of its coffers, it was authorized, by a decree of the 16th March 1848, to suspend cash payments, its notes being at the same time made legal tender. But to prevent the abuse that might otherwise have taken place under the suspension, the maximum amount of its issues was fixed at 350 millions. The bank was then also authorized to reduce the value of its notes from 500 fr. to 200 and 100 fr.

Previously to 1848, joint-stock banks, on the model of that of Paris, and issuing notes, had been established in Lyons, Marseilles, Bordeaux, Rouen, and other large cities. And it was then determined that these banks should be incorporated with the Bank of France, and made branches of the latter. This was effected by decrees issued on the 27th April and 2d May 1848, by which the shareholders of the banks referred to (nine in number) were allowed, for every 1000 fr. nominal value of their shares, a share of 1000 fr. nominal value of the stock of the Bank of France. And, in consequence of this measure, 23,351 new shares, representing a capital of 23,351,000 fr., were added to the stock of the Bank of France, making the latter consist of 91,250 fr. divided into 91,250 shares, In 1851 the bank resumed specie payments.

The suppression of the local issues of the departmental banks was, no doubt, a judicious measure, and was indispensable, indeed, to secure the equal value of the paper circulating in different parts of the country. This, however, might have been effected by the mere stoppage of the issues of the departmental banks, without consoli- dating them with the Bank of France. The latter measure is one of which the policy is very questionable ; and there are, as already seen, good grounds for thinking that the banking

business of the departments would have been more likely to be well conducted by local associations, than by branches of the Bank of France. Constant additions have been made to the number of branches, which now exceeds seventy

Owing tothe war with Russia, and still more to the rage for speculation, and the drain for silver to the East that followed it, the Bank of France became exposed to con- siderable difficulties And in the view of strengthening its position, and also, it may be :presumed, of providing a loan for Government, a law was passed (9th June 1857), by which the capital of the bank was increased from 91,250 shares of 1000 fr. each to 182,500 shares of 1000 fr. each. The new shares were assigned to the existing proprietors at the rate of 1100 fr. per share, producing a

total sum of 100,375,000 fr., of which 100 millions were lent to Government at 3 per cent.

Hence the measure, though it added to the credit and security of the bank, made no addition to the means directly at its disposal.

Down to the passing of this law, the bank could not raise the rate of interest on loans and discounts above 6 per cent. But this impolitic restriction was removed, and the bank authorized to charge any rate of interest which she reckoned expedient, except upon advances to Govern- ment, the maximum interest on which was limited to 3 per cent. The bank was farther authorized to issue notes of the value of 50 fr., to make advances on railway shares, &c., ana the charter was extended to 1897.

The management of the Bank of France was severely tried in the latter part of 1864 by the occurrence of a financial crisis at Paris ; and in January 1865 a commission of inquiry was appointed to examine into the principles and practice of banking. There was, however, nothing mysterious or exceptional in the experience of 1864. Speculation had been much stimulated in France by the establishment of companies (Crédit Foncier, Crédit Mobilier, &c.,

&c.) for the undertaking of public works, and much capital was locked up and more pledged towards the com- pletion of enterprises supposed at first to be highly profit- able, but in reality offering a distant and doubtful promise of remuneration. The crisis of 1864 was the dissipation of these delusions, and the voluminous publications of evidence and opinion by the commission of inquiry pro- duced no practical consequences.

The war of 1870-71 could not but have an important influence on the operations of the bank. Successive Governments resorted to it for assistance, which was obtained by increasing the issue of its notes and by giving them a forced currency. The rate of interest, which had been 24 per cent. from May 1867, rapidly rose to 6 and 64, at which it remained with scarcely any variation from 9th August 1870 till late in the year 1872. The rate would probably have risen much higher, but on the 13th August a law was approved suspending the liability of the acceptors of bills current to meet them at maturity, and this suspension was renewed until it was finally with- drawn in July 1871. The amount of unpaid bills held by the bank reached a maximum of 368 millions of francs, but the ultimate loss was extremely small. On the 23d June 1870 the metallic reserve at the bank was 1318} millions of francs, which was reduced to a minimum of 505 millions on the 24th December of the same year. The notes in circulation before the war had been about 1400 millions of francs; but before the end of the year 1870 their volume had increased to 1700 millions; and this again rose to 2000 millions before July 1871, and to 2400 millions before the end of 1871. A law of the 29th December 1871 fixed the maximum at 2800 millions, which was finally raised on 15th July 1872 to a maximum of 3200 millions. The debt of the state to the bank increased concurrently with this increase of issues, which was, indeed, authorized for the purpose of enabling the bank to assist the treasury. On the 26th December 1870 the bank held treasury “bons” to the extent of 174,800,000 francs only, but on the 30th November 1871 it held 1,193,600,000 of these “ bons,” and in August 1872 the amount reached 1,363,100,000 francs. A law of the 21st June 1871, followed by an agreement between the bank and the Government, provided for the repayment of this debt in annual payments of 200 millions, but up to this time (August 1875) the income of the state has never been large enough to provide the whole of this sinking fund. The bank has, however, been able to increase its metallic reserve through the

liquidation of securities and the ac- cumulation of deposits ; so that, after having been reduced.

UNITED STATES.]

as we have said, to 505 millions in December 1870, and uot attaining to more than 634 millions in December 1871, it rose in the same month of 1872 to 793 millions, in 1873 to 820 millions, and in 1874 to 1331, or just the amount at which it stood before the declaration of war. Its volume has, however, continued to increase, and on the 25th March of this year (1875) it stood at 1528 millions; and the forced currency of the notes of the bank might be at any time withdrawn. It must be ad- mitted that the management of the bank throughout these years of difficulty has becn eminently prudent and successful.

The bank is obliged to open a compte courant for any one who requires it, and performs services, for those who have such accounts, similar to those performed for their customers by the banks in London. The bank does not charge any commission on current accounts, so that its only remunera- tion arises from the use of the money placed in its hands by the individuals whose payments it makes. It is probable, therefore, as has been alleged, that this part of the business is but little profitable. ‘The bank also dis- counts bills with three signatures at variable dates, but not having more than three months or ninety days to run. Besides discounting bills, the bank makes advances on stocks and pledges of various kinds, and undertakes the care of valuable articles, such as plate, jewels, title-deeds, d&c., at a charge of 1 per cent. on the value of the deposit for every period of six months and under.

The administration of the bank is vested in a council of twenty-one members, viz., a governor and two sub-gover- nors, nominated by the chief of the state, and fifteen directors and three censors, nominated by the shareholders. The bank has a large surplus capital or rest. In 1848 the dividends only amounted to 75 fr. per share. In 1855 and 1856 they were 200 and 272 fr. on each share. In 1870 they fell to 114 fr., but rose again to 300 fr. in 1871, and to 320 fr. in 1872. In July 1856 the 1000 fr. share of bank-stock was worth 4075 fr.; in July 1857 it had sunk to 2880 fr. It is now (1875) worth about 3850 fr.

Banking in the United States,

Before the late Civil War it had been the uniform practice of the different States of the Union to allow banks to be established for the issue of notes, payable in specie on demand. In cases where the liability of shareholders in banks was to be limited to the amount of their shares, they had, previously to 1838, to be established by Acts of the local legislatures; but, in general, these were easily obtained, and it may be said that banking was quite free, and that, practically, all individuals or associations might issue notes, provided they abided by the rnles laid down for their guidance, and engaged to pay them when pre- sented.

Under this system the changes in the amount and value of the paper currency of the United States were greater than iu any other country, and it produced an unprecedented amount of bankruptcy and ruin.

Between 1811 and 1820, about 195 banks, in different parts of the Union, became bankrupt ; and it is said, in a report by the Secretary of the Treasury of the United States, dated 12th May 1820, that these failures, which mostly happened in 1814 and 1819, produced a state of dis- tress so general and severe that few examples of the like had then occurred.

But bad as this instance was, it was nothing to that which took place subsequently to 1834. The accounts of the aggregate issues of the banks differ a little; but the following statement is believed to be very nearly accurate, viz — .

Years. Notes.

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Now observe. that this sudden and enormous increase took place under the obligation which we are told is quite enough to prevent all abuse of paying notes on demand. The result was what most men of sense must have anticipated, viz., that a revulsion took place, and that every bank within the Union, without, it is believed, a single exception, stopped payment in 1837.

In 1838 such of the banks as had been best managed and had the largest capitals resumed payment in specie. But in 1839 and 1840 a farther crash took place; and the bank-notes afloat, which, as has been seen, amounted to $149,185,890 in 1837, sunk to $83,734,000 in 1842, and to $58,563,000 in 1843. It is supposed that in this latter crash nearly 180 banks, including the Bank of the United States, were totally destroyed. And the loss occasioned, by the depreciation which it caused in the value of stocks of all kinds and of all sorts of property, was quite enor- mous, And yet, vast as that loss was, it was really trifling, as a writer in the American Almanack has stated, compared with “the injury resulting to society from the upheaving it occasioned of the elements of social order, and the utter demoralization of men by the irresistible temptation to speculation which it afforded, ending in swindling to retain ill-gotten riches.”

The evils of the American system were aggravated by the lowness of the notes which most banks issued. ‘This brought them into the hands of retail traders, labourers, and others in the humbler walks of life, who always suffer severely by the failure of a bank.

After 1838 and 1842 various measures were taken in nearly all the States, but principally in New York, to restrain the free action of the banks, and to prevent a repeti- tion of the calamities referred to.

In New York, for example, bauks were divided into two great classes—the incorporated and the free banks. The former, incorporated by a State law, had to conform to certain regulations, and to contribute a half per cent. annually upon their capital to a security fund, which was devoted to the payment of the notes of defaulting banks. But this was a most objectionable plan ; for, in the first place, it did not prevent bankruptcies, and, in the second place, it compelled the well-managed banks to contribute to a fund which went to pay the debts of those that were mismanaged. It consequently declined in favour, and soon become rarely acted upon.

In the other or free banking system, all individuals or associations who chose to deposit securities (minimum amount, $100,000) for their payment were allowed to issue an equal amount of notes. Aud this was certainly by far the more efficient as well as the more popular of the two plans. It was, however, not free from objection ; because, Ist, A longer or shorter, but always a considerable, period necessarily elapses after a bank stops before its notes can be retired; and, 2d, The securities lodged for the notes were necessarily at all times of uncertain and fluctuat- ing value, while, in periods of panic or general distrust, they became all but inconvertible. The Sub-Secretary of the Treasury of the United States animadverted as follows on this plan, in a letter dated 27th Nov. 1854 :—

“ The policy of many of the State Governments has of late years consisted in encouraging the issue of small notes, by sanctioning the establishment of what are popularly called ‘ free banks,’ with deposits of stocks and mortgages for the ‘ultimate’ security of their issues. This ‘ ultimate’ security is, it may be admitted, better than no security at

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redeeming their issues promptly, cause a fall in the value of the stocks and mortgages on ‘the ultimate security’ of which their notes have been issued.

The ‘ultimate’ security may avail something to the broker who buys them at a discount, and can hold them for months or years ; but the labouring man who has notes of these ‘State security banks’ in his possession, finds, when they stop payment, that ‘the ultimate security’ for their redemption does not prevent his losing twenty-five cents, fifty cents, or even seventy-five cents in the dollar.

“Tn a circulating medium we want something more than ‘ ultimate security.” We want also ‘immediate’ security ; we want security that is good to-day, and will be good to- nlorrow, and the next day, and for ever thereafter. This security is found in gold and silver, and in these only.”

The Report of the Superintendent of Banking for the State of New York for 1856 showed that the securities he then held in trust amounted to $39,359,071, which were almost wholly lodged by banking associations and individual bankers.

During the year the securities held in trust for the under- mentioned banks that had become insolvent in 1855 were disposed of. But the sums realized by their sale did not in any case suffice to pay the notes at par; while a period, varying from two to four years, would have to elapse before the affairs of the insolvent banks were finally settled.

Notes Rates of | Expiration of

Names of Banks that failed. redoomerl ee ee Kighth Avenue Bank…..... AMM cseececeier: 94 cents.|May 21, 1861 Farmers’ Bank, Onondaga..| All …..... 85 cents. |Nov. 12, 1859 Jamies’ Bank,....< ... — | SaMML, ca eeuae es 91 cents.JJune 17, 1858

Merchants and Mechanics’ Bank, Oswego…....» All 77 cents. Sept. 28, 1860 New Rochelle, Bank of….. Stock notes.| Par ….. June 17, 1858

New Rochelle, Bank of….. Stock and. estate notes | 81 cents.jJune 17, 1858

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This statemeut set the defective nature of the security system, as administered iu New York, in the elearest point of view. It might, no doubt, have been improved by increasing the proportion of securities to notes. But, owing to the variety of securities that were taken (viz., all manner of bonds and mortgages, state, canal, and railway stocks, &c., &c.), and the uncertainty of their value, a great deal of risk was always incurred in accepting them, and they could never form a proper foundation on which to issue notes.

In 1857 another crash took place, and all the banks in the Union, from the Gulf of Mexico to the frontiers of Canada, again stopped payments.

There had been a rapid increase of discounts since 1851, and that increase was especially great in 1856, and went on augmenting down to August 1857. On the 8th of that month the discounts and advances by the New York banks amounted to $122,077,252, the deposits in their possession being, at the same time, $94,436,417. This was the maximum of both, On the 24th.of August the Ohio Life and Trust Company, which carried on an extensive banking business in New York, stopped payments, and by so doing gave a severe shock to credit and confidence, which the suspension of two or three more banks turned into a panic. Notes being in a certain degree secured, the run upon the banks was principally for deposits, And to meet it they so reduced their discounts and advances, that, on the 17th October, they amounted to only $97,245,826, This sudden

1 The above statements are taken from a paper read by Lord Over- stens to the Committee on Banks,

The mischief is, that it is least available when most | and violent contraction necessarily occasioned the suspension wanted. ‘The very causes which prevent the banks from |

of many of those mercantile houses that had depended on the banks for discounts. And it did this without stopping the drain for deposits, which had

sunk, on the 17th October, to $52,894,623, being a decrease of $41,546,784 in about two months. The universal stoppage of the banks was a consequence of these proceedings. . The Civil War had as one of its consequences the

introduction of a general banking law in the United States, conformable in many respects to the principles of what we have described as the free banking law of New York. At the beginning of the war in 1861, the amount of paper money in circulation was about $200,000,000, of which $150,000,000 had been issued in the loyal States; and the coin in circulation was estimated at $275,000,000. The necessities of the Treasury very soon compelled the Government to borrow from the associated banks of New York, Philadelphia, and Boston, and to issue demand-notes to the extent of $50,000,000,—which, however, were not at first made legal tender. In February 1862 an Act was passed by Congress authorizing the issue of $150,000,000, in Treasury notes of not less than $5 each, out of which, however, $50,000,000 were in lieu of the notes already issued; and this issue was declared to be legal tender except in discharge of customs' duties, and of the payment of interest by the United States on the national debt. It will be easily understood that coin went out of circulation, and a premium on gold was established, which increased as the amount of the Treasury notes was increased by successive legislation, and as national bank-notes came to be issued in pursuance of the law we must proceed to describe. This is the Banking Law of the 25th February 1863, which, as amended by the Act of the 3d June 1864, now continues in force. By this law a Currency Bureau and Comptroller of Currency were appointed in the Treasury Department, with the power to authorize banking associations of not less than five persons subscribing, ex- cept in very small towns, a minimum capital of $100,000, 50 per cent. to be paid up at once, and the remainder within six months. It was enacted that any such association, before commencing business, must transfer to the Treasurer of the United States any United States interest-bearing bonds not less than one-third of the capital stock, and should thereupon receive from the Comptroller of the Currency circulating notes of different denominations in blank, registered and countersigned, equal in amount to 90 per cent. of the current market value of the bonds so transferred, but not exceeding their par value. The whole amount of notes thus issued was not to exceed $300,000,000, one-

half to be apportioned among the States according to their representative population, and the other half to be apportioned with regard to the existing banking capital, resources, and business of the States.

The banks already existing in the several States were rapidly transformed into national banks under the operation of this law, and their previous notes withdrawn in exchange for the new national bank issue. The currency of the Union thus came to consist of the demand-notes of the Treasury, which rose in 1865 to about $450,000,000, and of the notes of:the national banks, which rapidly approached the limit of $300,000,000,—the latter notes passing throughout the Union, whatever the bank through which they were issued, as freely as the former, since the ultimate payment of them was secured by the deposit under the law we have stated, of an adequate amount in United States' bonds at the Treasury. It is not our purpose to trace the subsequent financial history of the States, but the experience of 1873 must be referred to for the instruction it affords, As no sufficient steps were taken after the termination of the war to reduce the swollen value of the

currency, gold remained out of circulation, though with the |

growth of business the premium on it declined to an average rate of 12 per cent.; but no inconvenience was felt from the existence of a pure paper circulation, and the opinion, in fact, arose that the currency thus established was a sure preventive of recurrent panics and exaggerated rates of discount. But in September 1873 the financial house of Jay, Cooke, & Co., having locked up a large amount of capital in railway enterprises not immediately if ever likely to be productive, suspended payments; other financial houses were forced to take the same step, several bauks closed their dvors, and a severe panic set in. The holders of the notes in circulation of the banks that failed were protected by the deposit of bonds at the Treasury, and the notes were never discredited; but the financial distress throughout the Union was excessive, and continued for many months It was practically demonstrated that the national bank law protected the holders of national bank- notes from loss, but atforded no immunity against the occurrence of financial crises.

Banking in Germany.

Banking in Germany, up to the close of the Franco- German War, presented no peculiar features requiring attention. The Bank of Hamburgh was established in 1619, on the model of that of Amsterdam, as a purely deposit bank for the transfer of sums from the account of one individual to that of another ; and its management appears to have been uniformly good. In the several German States banks were authorized under laws peculiar

to each ; and most of them were allowed to issue notes according to regulations varying from State to State. It followed that the notes of each bank were confined to its own neighbourhood ; but the establishment of German unity was followed by a demand for a general banking law, and the establishment of a note currency that might circulate throughout the empire. After some discussion the Act of the 30th January 1875 was passed to satisfy these demands. Under this law an Imperial Bank was established, with an uncovered issue of 250 millions of marks (= £12,500,000) ; and thirty-two banks were re- cognized as possessing rights of uncovered issue to the ex- tent of 135 millions of marks (£6,750,000). The Imperial Bank is, however, allowed to increase its issue, subject to the condition that at least one-third is represented by cash in hand, and the remaining two-thirds by bills not having more than three months to run ; while the other banks may also exceed their authorized issues subject to the payment of 5 per cent. interest on the excess above the authorized limit, plus the cash in hand, and weekly returns are required of the amount in circulation. No note is to be less than 100 marks (£5), and no new right of issue can be conceded except by a law of the empire. The State itself, however, under a law of April 1874, has the right to issue 120 millions of marks in State notes of small denominations. The working of this law has not yet been tested ; but, if we may judge from our own experience, it will not produce any rapid withdrawal of local issues, and the unification of the note currency of the empire will not be accomplished. (@.‘axc.)

BANKRUPTCY. When a person is unable to pay his debts in full, the law of civilized countries adopts some means of satisfying the creditors, as far as they can be satisfied, out of the debtor’s estate, and relieving the debtor himself from pressure which, by his own efforts, he would not be likely to

overcome. The debtor having been declared a bankrupt, his property vests in his creditors for the purpose of being rateably divided among them, and he thereupon starts a new man, entirely relieved from the obligations thus partially satisfied. Such, in general terms, is the process of bankruptcy as observed in modern societies. The law of bankruptcy is, in fact, a modern creation, slowly evolved out of the criminal code in answer to the necessities of a widely-spread industrial life. Early society is unanimous in treating inability to fulfil legal obligations as a most serious offence ; and the harshness of ancient law towards debtors has been explained as a consequence of the fact that a contract was at first regarded as a sort of incomplete conveyance, and creditor and debtor as persous who respectively had and had not fulfilled their legal obligations. The early law of Rome, while prohibiting contracts of usury, still gives the legal creditors the savage reinedy of dividing the carcase of their debtor or selling him and his family into slavery. Severe commercial distress endangering the stability of the state is of frequent occurrence in the history of Rome; but the law against debtors long retained its primitive severity. The Lex Peetelia (about 326 B.c.) enabled a debtor, who could swear to being worth as much as he owed, to save his freedom by resigning his property ; and many years after the legislation of Julius Cesar established the cessio bono- rum as an available remedy for all honest insolvents. The slow development of the law, and the practical difficulties with which each new adjustment was met, are copiously illustrated by the history of bankruptcy legislation in England. The first English statute on bankruptcy (34 and 35 Hen. VIII. c 4) was directed against fraudulent

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debtors, and gave power to the lord chancellor and other high officers to seize their estates and divide them among the creditors. The 13 Eliz. c. 7 restricted bankruptcy to traders, and prescribed certain acts by committing which a trader became a bankrupt. Commissioners appointed by the lord chancellor are to seize the person of the bankrupt and divide his property aniong the creditors. The 4 Anne c. 17 and 10 Anne c. 15 took away the criminal character hitherto borne by the proceedings, and allowed a debtor, with the consent of a majority of his creditors, to obtain a certificate of having conformed to the requisitions of the bankrupt law, which, when

confirmed by the chancellor, discharged his person and his after-acquired property from debts due by him at the time of his bankruptcy. The 6 Geo. [V. c. 16 allows a debtor to procure his own bank- ruptcy (an arrangement previously regarded as fraudu- lent), and introduces the principle of deeds of arrangement between debtor and creditors without a public bankruptcy. The 1 and 2 Will. IV. c. 56 established the Court of Bankruptcy, consisting of six comtissioners, along with four judges as a Court of Review, and appointed official assignees to get in the bankrffpt's estate on behalf of the creditors.

Various other statutes in the next twenty years made unimportant changes in the constitution of the court. In 1847 jurisdiction in bankruptcy was again restored to the Court of Chancery by the appeal being transferred to that court. The Bankrupt Law Consolidation Act, 1849, effected several important alterations in the system. Pro- ceedings were to begin by a petition to the Court of Bankruptcy instead of a fiat out of Chancery. The com- missioners were authorized to award certificates, classified according to the merit of the bankruptcy. In the first class the insolvency was declared to be due to misfortune , in the second, not entirely to misfortune ; and in the third, not at all to misfortune. Certain specified offences deprived the bankrupt of all right to a certificate, and made him

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liable to a criminal prosecution. The object of this arrange- | ment was, of course, to meet fraudulent, or not entirely honest, attempts to obtain the benefit of a discharge of debts under the bankruptcy laws It was not entirely successful, inasmuch as there was no settled principle observed in

classifying the certificates, and the lowest class was, for all practical purposes, as good as the highest. The Act of 1849 also encouraged private arrangements by making a composition, accepted by nine-tenths of a bankrupt's creditors, binding upon the rest; but it was decided subsequently by the courts that, to make such a composi- tion binding, it must be accompanied by a complete cesszo bonorum. The next statute, the Bankruptcy Act, 1861, made non-traders subject to the law of bankruptcy, and empowered a majority in number, and three-fourths in value, of the creditors to bind the minority without a cesszo bonorum. This arrangement was found to lead to private and fraudulent compositions, and in consequence by an Amendment Act in 1868 enlarged powers were given to non-assenting creditors. All this legislation still failed to give complete satisfaction. 'The complete exoneration of after-acquired property was denounced as unfair and likely to invite fraudulent bankruptcies, the system of ar- rangements with creditors was disliked, and the control of creditors over the property of the debtor and proceedings in bankruptcy was felt to be too small, The Bankruptcy Act, 1869, was passed after many unsuccessful attempts to deal with these complaints. It established a new Court of Bankruptcy, consisting of a chief judge, registrars, and other officers. The commissionerships were abolished, and the subordinate staff was to be transferred to the new court. The chief judge in bankruptcy is to be a judge of one of the Superior Courts of Law and Equity ; and hitherto the otfice has been held by one of the acting vice-chancellors. Appeals from the county courts in bankruptcy go to the chief judge, and appeals from the chief judge to the Court of Appeal in Chancery, and thence occasionally to the House of Lords. Official assignees were abolished ; and trustees, who should be creditors, are to be appointed to distribute the bankrupt's estate, while the creditors may appoint a committee of inspection to superintend the opera: tions of the trustees. A comptroller in bankruptcy will receive the trustees' accounts after they have been audited by the committee, and take notice of any irregularity in the proceedings of the trustees. The law of reputed owner- ship was restricted to traders. Voluntary settlements by a trader, except in the case of property accrued in right of his wife, are void as against the trustee if the settler becomes bankrupt within two years after the settlement ; and if he becomes bankrupt within ten years, it must be shown that, at the time of the settlement, he had sufficient property besides to pay his then existing debts, otherwise the settlement becomes void. A covenant

by a trader, although made in consideration of marriage, for future settlement of property not then in any way belonging to him, is void as against the trustee, unless the property has been transferred or paid before the bankruptcy. The Act also introduces im- portant alterations as to the discharge of the bankrupt. A bankrupt will not be discharged unless his estate has paid ten shillings in the pound, or a majority of the creditors (three. fourths in value) declare that the bankrupt is not respon- sible for the deficiency, and that they desire his discharge. If within three years the bankrupt makes up the dividend of ten shillings in the pound, he may have his discharge; and in the meantime his property will be protected from the creditors of the bankruptcy. If he fails to make up this dividend within three years, any debt remaining unpaid will become enforceable against his after-acquired property,—subject, of course, to the rights of creditors subsequent to the bankruptcy. There are provisions for

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compromising the bankruptcy by composition or liquidation by arrangement. The usual criminal clauses have been separated from the new statute of bankruptcy and appear in a separate enactment,—the Debtors' Act, 1869,—and the Court of Bankruptcy has no longer any criminal juris- diction whatever. 'The Debtors' Act abolishes imprison- ment for debt (except in certain cases in which the debt is mostly of the nature of a penalty), and provides for the punishment of certain misdemeanours of fraudulent debtors, whose affairs have come into bankruptcy. The prosecution takes place before the ordinary criminal tribunals. The Bankruptcy Act and the Debtors' Act become—by the repeal of previous statutes relating to insolvency, bank- ruptcy, and imprisonment for debt—a complete record of the legislation now in force on this subject.

Under the new statute all the county courts are consti- tuted local courts of bankruptcy, while for the London district, as defined in the Act, there is the London Bank- ruptcy Court. All these courts are presumed to be the same court, and cases nay be transferred from one to the other if necessary. Subject to this power of transfer, proceedings are to be taken against a debtor in the court of the district in which he resides; and if he does not reside in England and Wales, in the London court. By order of that court, or

by resolution of the creditors, or by certificate of the local judge, cases may be transferred to the London court from any of the local courts. The chief judge, or a local judge, may delegate the powers (except the power of committing for contempt) to the registrar. All the courts of bankruptcy and their officers in England are to act in conjunction with bankruptcy courts in Scotland and Ireland, and with British courts having jurisdiction in bankruptcy elsewhere, the orders of one court being enforceable within the jurisdiction of the others. Section 72 of the Act gives to the new Court of Bankruptcy the important power ‘“‘to decide all questions of priority, and all other questions of law or fact arising in any case of bankruptcy coming within the cognizance of such court, or which the court may deem it expedient or necessary to decide, for the purpose of doing complete justice or making a complete distribution of property in any such case.” By this enlarged jurisdiction the court has power to decide, even as against strangers, questions arising in the bank- ruptcy; and it has been held that it may restrain proceedings in Chancery or at Common Law, and even out of the jurisdiction. The judge may, at the request of parties, or of his own discretion, direct issues of fact to be tried by a jury.

By the Bankruptcy Act, 1861, the special legislation relating to insolvent debtors was abolished. Up to that time traders only had been allowed the relief of bankruptcy, and all other insolvent debtors remained liable to their creditors for the unpaid portion of their debts. They might be kept in prison during the creditor’s pleasure, and any property they might acquire was available for the satisfac- tion of the creditors’ claims. From time to time special Acts were passed for the liberation of insolvent debtors confined in prison, a general Act (53 Geo. III. c. 102) was tried for a limited period and repeated, and finally, by 1 and 2 Vict. c. 110, a court was established for the ‘‘ relief of insolvent debtors,” their discharge, of course, being con- ditional on the surrender of their property for the benefit of their creditors. The principle of the distinction thus maintained between the trader and the non-trader was, that the creditors of the former were to be regarded as to some extent partners in his speculations, while the latter was alone responsible for his insolvency ; and it was feared that the discharge of bankruptcy, if allowed as a means of satisfying private debts, might give great encouragement to extravagance and fraud. On the abolition of the

Tnsolvents' Court in 1861, all insolvent debtors were admitted to the relief of bankrupt's discharge, but a distinction is still made on several important points between traders and non-traders. A schedule to the Act of 1860 gives a list of the different occupations which are to be considered as " trades," and the exception is expressly stated that "a farmer, grazier, common labourer, or workman for him, shall not, nor shall a member of any partnership, association, or company, which cannot be adjudged bankrupt under this Act, be deemed as such a trader for the purposes of this Act." The liability to bankruptcy may therefore be said to be now almost co-extensive with the capacity to make a contract. Persons who cannot make a binding contract, e.g., married women, minors, lunatics, &c., cannot be made bankrupts. But where this incapacity is removed (as for example in the city of London, where by custom a married woman may trade as a femme sole), the liability to bankruptcy will arise.

Proceedings in bankruptcy are now begun by a pctition fiom one or more creditors (claiming not less than £50), alleging that the debtor in question has committed an act of bankruptcy, and praying that he may be adjudged a bankrupt. The following are "acts of bankruptcy :"— (1.) If the debtor has assigned his property to trustees for the benefit of his creditors; or (2), has made a fraudulent con- veyance of any of his property ; or (3), with intent to defeat his creditors, has departed from or remained out of England; or, being a trader, has left his dwelling-house, or begun to keep house, or suffered himself to be outlawed ; or (4), has filed a declaration of inability to pay his debts ; (5.) If execution for not less than £50 has been levied by seizure of goods (in the case of a trader); (6.) If the creditor has served a " debtors' summons" for not less than £50, and the debtor has for three weeks (or if a trader, for seven days) neglected to pay or compound for the same. The adjudication must be asked for within six months of the act of bankruptcy, and the petitioning creditor's debt must be for a liquidated (7.c., ascertained) sum due at law or in cquity, and must not be a secured debt unless the security is given up for the benefit of the creditors. Should the alleged debtor deny his indebtedness, the court may dismiss the summons or direct the issue to be tried by itself or some other competent court ; and

similar proceedings take place when the debtor appears to the creditors' petition and repudiates his indebtedness.

The consequence of adjudication is that all the bank- 1upt's property vests in the registrar of the court, until the appointment by the creditors of a trustee, and thereafter in the trustee. The word property has been expressly defined to include money, goods, things in action, land, and every description of property, whether real or personal, also obligations, ornaments, and "every description of estate, interest, and profit, present or future, vested or contingent, arising out of, or incident to, property as above defined." The adjudication "relates back" to the time of the "act of bankruptcy." The bankrupt may retain the tools of his trade and the necessary clothing and bedding of his family to the extent in all of £20. It is the duty of the trustee to discover, take possession of, realize, and distribute the bankrupt's property ; and, subject to the provisions of the Bankruptcy Act, he must follow the directions of the com- mittee of inspection or the creditors. The bankrupt is required to aid in the administration. He must procure a statement of his affairs, and submit to a public examination thereon, A bankrupt under examination is not, like a witness in other courts, protected from questions tending to inculpate himself, although he cannot be compelled to answer a question whether he has done some specific act clearly of a criminal nature. His answers may afterwards be used as evidence against him on a criminal charge.

The bankrupt cannot now be arrested or imprisoned except for attempts to leave the country, avoid appearance, remove or conceal his goods, &c., or, after adjudication, for removing goods above the value of £5, or failing to attend examina- tion, or committing contempt of court. If a member of the House of Commons is adjudged bankrupt, he becomes incapable of sitting or voting for one year after the adjudication, unless within that time the bankruptcy is annulled or the creditors satisfied. If on the expiration of a year neither of these events has taken place, the court certifies the fact to the speaker, and the seat of the bank- rupt member thereupon becomes vacant. A bankrupt peer is disqualified from sitting or voting in the House of Lords, unless and until his bankruptcy is annulled on the ground that the order of adjudication ought not to have been made, or the bankrupt is discharged by actual payment or satisfaction in the prescribed mode from all debts and

liabilities due at the date of his bankruptcy. The conditions on which a bankrupt may obtain his discharge have been already stated. The discharge releases the bankrupt for all debts provable under the bankruptcy, except debts due tothe Crown, or for offences against the revenue, and debts incurred by means of fraud or breach of trust. The court has power to annul the bankruptcy on various grounds, but in that case all acts properly done by the trustee in reference to the property of the bankrupt will now remain valid. A partnership may be adjudged bankrupt, and the general rule of distribution is that the joint creditors have priority of payment out of the joint or partnership property, and the separate creditors out of the separate estate.

A less public form of bankruptcy is also sanctioned by the Act of 1869. By § 125 it is provided that the credi- tors of a debtor may declare (by a majority in number and three-fourths in value) that his affairs are to be liquidated by arrangement and not in bankruptcy. By § 126 the creditors may, by a resolution under the same conditions, resolve that a composition shall be accepted in satisfaction of the debts due to them by the debtor. If liquidation is resolved on, every creditor, whether having notice of the meeting or not, is absolutely restrained from taking any proceedings for recovering his debt, unless it appears to the court that his debt is prejudicially affected by the resolution; otherwise under liquidation or composition, the court may restrain or permit other legal processes on respect of provable debts as it thinks fit.

Tn Scotland, as in England, the law of bankruptcy arose as a remedy against the frauds of insolvent debtors. It was declared by an Act of the Scottish Parliament (1621, c. 18) that no debtor after insolvency should fraudulently diminish the fund belonging to his creditors, and if a deed of assignment was gratuitously executed after the contract- ing of debt in favour of a near relation or a confidential friend, fraudulent dealing was to be presumed. The Act 1696, c. 5, settled the definition of a notour or notorious bankrupt, a question which had previously engaged the attention of the judges of the Court of Session. The statute defines a “a notour bankrupt” to be any debtor who, being under diligence by horning or caption, at the instance of his creditors, shall be either imprisoned, or retire to the abbey or any other privileged place, or flee or abscond for his personal security, or defend his

person by force, and who shall afterwards be found, by sentence of the Lords of Session, to be insolvent. Bankruptcy as thus defined was, it is said, intended to afford a remedy against fraudulent preference by debtors, and not as the ground-work of a general process of distribution, although by later statutes it became a necessary requisite of every such process.' The exceptions recognized in the Act of 1696, of persons absent from Scotland, and therefore not liable to imprisonment, or of persons exempted therefrom by special privileges,

were removed by later legislation. The English distinction between traders and non-traders, it will be observed, is not recognized in Scotch law. The statute made null and

void all voluntary dispositions, assignations, and other'

deeds at or after or within sixty days before bankruptcy. The principal Bankruptcy Act now in force is the 19 and 20 Vict. c. 79 (amended by 20 and 21 Vict. c. 19, and 23 and 24 Vict. c. 33).

By section 9 of the principal Act, notour bankruptcy is now coustituted—

1. By sequestration (or adjudication in England and Ireland) ; and

2. By insolvency concurring either—(a), with a duly executed charge for payment followed by imprisonment or apprehension, or flight or retreat to sanctuary, by execution of arrestment of debtor's effects, not discharged within fifteen days, by execution of poinding of any of his movables, or by decree of adjudication of any part of his movable estate ; or (0), With sale of effects belong- ing to the debtor under a poinding or under a sequestration for rent, or retiring for twenty-four hours to the sanctuary, or making application for the benefit of cessco bonorum.

Notour bankruptcy continues, in case of sequestration, until the debtor has obtained his discharge, and in other cases until insolvency ceases. Sequestration may be awarded of the estate of any person in the following cases :—

1. Living debtor subject to jurisdiction of Scotch courts, —(a), on his own petition with concurrence of qualified creditors ; or (6), on petition of qualified creditors, provided he be a notour bankrupt, and have had a dwelling-house or place of business in Scotland within the previous year.

2. In the case of a deceased debtor, subject at his death to the jurisdiction of the court,—(a), on the petition of his mandatory; or (), on the petition of qualified creditors

§ 13).

_—* may be awarded either by the Court of Session or by the sheriff. A sequestration may be recalled by a majority in number and four-fifths in value of the creditors, who may prefer to wind up the estate by private arrangement. If the sequestration proceeds, the creditors hold a meeting, and by a majority i value elect a trustee to administer the estate, and three commissoners (being ereditors or their mandatories) to assist and control the administration and declare the dividends. The bankrupt (under pain of imprisonment) must give all the information in his power regarding his estate, and he must be publicly examined on oath before the sheriff; and ‘ conjunct and confident persons” may likewise be examined. The bankrupt may be discharged either by composition or with- out composition. In the latter case (1) by petition with concurrence of all the creditors, or (2) after six months with concurrence of a majority and four-fifths in value of the creditors, or (3) after eighteen months with concurrence of a bare majority in number and value, or (4) after two years without concurrence. In the last case the judge may refuse the application if he thinks the bankrupt has fraudulently concealed his effects, or wilfully failed to com- ply with the law.

The procedure in cessto bonorum is regulated by 6 and 7 Will. IV. c. 56 (which gave jurisdiction to sheriffs) and Act of Sederunt of June 1839. A debtor who is or has been in prison, or has had a warrant of imprisonment served against him, may present a petition setting forth his in- ability to pay his debts, and his willingness to surrender his estate, and praying for interim protection. The debtor is examined by the sheriff on oath, and the creditors may be heard against the petition. A decree of cessio bonorum operates as an assignation of a debtor’s movables to a trustee for behoof of creditors.

The bankrupt under a cessto has no power to insist on his discharge, and there-

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fore cannot protect his subsequent acquisitions against his creditors. By the late statute a majority of the creditors (subject to review by the court) inay, in certain cases, resolve that the bankrupt shall be entitled to apply for a decree of cessto Only, and not to a discharge in the sequestration, and the court may grant the cessio in the sequestration without requiring a new process,

By the Bankruptcy (Ireland) Amendment Act, 1872 (35 and 36 Vict. c. 58), the law of Ireland has been assimilated to the new system established by the English Bankruptcy Act, 1869. (E. R.)

Bankruptcy in the United States.

In the United States, Congress alone has power to pass a bankrupt law which shall have authority throughout the country. The several States may enact such statutes when there is no law of Congress in operation; but these statutes will fully bind only the citizens of the State which enacts it. There is no power to obtain effectual control of property without its limits so as to prevent local prefer- ences ; nor can the State laws discharge contracts due to non-residents. The general Government has made so little use of the power confided to it, that many of the States were obliged to pass bankrupt laws, notwithstanding the imperfection of their operation in some cases, and those, often, the most important in the interests involved. Massachusetts had an excellent system, established in 1838, which is specially mentioned because the Act of Congress is largely drawn from this source. All State laws on the subject are suspended while a general law of bankruptcy is in force.

The first general Bankrupt Act was passed in 1800, and repealed in 1803. In 1841 another law was put in opera- tion, with a special view of meeting the urgent needs of debtors who had been ruined by the commercial revulsion

of 1837-38, and who could receive no effectual relief from local laws. This Act was repealed in thirteen months; but in the meantime a very large number of cases had been dis- posed of, amounting, for exaniple, to 3250 in Massachusetts alone. The law now in operation took effect June 1, 1867. It was framed with much care by a committee of the House of Representatives, of which Mr Jenckes, of Rhode Island, was the chairman and chief working member. Its authors hoped that it would form a permanent addition to the com- mercial jurisprudence of the country.

The administrative machinery is simple. The district courts, which have always had the original jurisdiction of causes in admiralty, revenue, and other national matters, are made courts of bankruptcy. The judge of each district ascertains how many registers are needed for the convenient despatch of causes in his territory, and they are appointed by the chief justice of the United States and the district judge concurrently. The registers have, by law, functions chiefly administrative and ministerial; but they, in fact, hear and decide many judicial questions by consent of the parties, and subject to the revision of the judge. In pro- ceedings in bankruptcy proper, such as adjudications, dis- charges, proof of debts, marshalling assets, there is an appeal from the district to the circuit court, and no farther. Actions at law, or suits in equity, to which assignees in bankruptcy are parties, may be brought either in the State or the Federal courts. If in the latter, the whole case if in equity, or the law points in an action at law, may be carried to the Supreme Court at Washington when the amount in dispute exceeds $5000, or questions of law, which the judges of the circuit court consider doubtful, may be certi- fied by them to the Supreme Court, whatever may be the amount involved ; and all decisions of the highest court of a State, involving questions of law under the Bankrupt Act, may be reviewed by the Supreme Court, if adverse to

the right or title set up under that statute. In some of these various modes the principal questions arising under the Act will in time be settled by the highest judicial authority, and thus uniformity of decision will be secured.

The statute covers the whole ground of bankruptcy and insolvency. It is applied to all debtors, whether traders or not, and to debtors petitioning for

its benefits, as well as to those proceeded against by creditors. Any one who owes $300 may petition, and any such debtor who has committed certain specified acts may be adjudged bankrupt i invitum. The acts of bankruptcy are sub- stantially alike in all such statutes in England and the United States, and tend to prove either fraudulent con- duct or hopeless insolvency, such as concealing property, conveying it fraudulenly, departing the district with intent to defraud creditors, lying in prison for twenty-one days. There is nothing analogous to the trader debtor summons, though the Act of 1800, and the Massachusetts law of 1838, admitted a somewhat similar test of bankruptcy. This law, however, has adopted one which to a consider- able extent supplies this want, by declaring a merchant, trader, banker, broker, manufacturer, or miner to be bank- rupt who has suffered his commercial paper to remain overdue and unpaid for forty days. No other distinction is made between traders and other debtors, excepting that merchants and tradesmen are bound, under pain of being denied their discharge, to keep proper books of account.

The property of the bankrupt is assigned by the judge or register to the persons chosen by the majority in number and value of the creditors—the court having full power to overrule the choice of the creditors, or to add an assignee to those chosen. The assignment is conclusive evidence of the assignees' authority, and cannot be collaterally im- peached on any ground, excepting want of jurisdiction in the bankrupt court, nor in any suit whatever. This most valuable rule was adopted by Massachusetts in 1838, and has saved an enormous amount of useless litigation. There is no danger of injustice from it, because the adjudication against a bankrupt is never made without notice to him, nor without a trial by jury, if he demands one; and any person having an interest adverse to the adjudication has a right to be heard as well as the debtor.

The doctrine of the relation of the assignee's title to an act of bankruptcy committed in the country has not obtained in the United States. That title relates, as in other suits, to the beginning of the proceedings,—that is to say, the day and hour that the petition, whether voluntary or involun- tary, is filed. The most marked difference between the English and American statutes, or rather between the prac- tical working of them, is in the extension given by the latter to the doctrine of preference. By the law of

1867 and its amendments, the assignee can avoid all advantages given to pre-existing creditors within four months (in in- voluntary cases, within two months) before the filing of the petition, if the bankrupt was then insolvent, and intended a preference, and the preferred creditor knew the insolvency and the intent, no matter what pressure, by suit, threat, or otherwise, may have been brought to bear upon the debtor. This law, as construed, operates almost like a relation back of the assignee's title, so far as pre-existing creditors are concerned, unless the payments or settlements have been made in the ordinary course of business, and sometimes, though rarely, when they have been.so made. This rule is a logical development of the law of preference, as estab- lished in Lord Mansfield's time, and still continued in England. When it is considered that a preference is a technical fraud, and may be charged as an act of bankruptcy and as a valid objection to the debtor's discharge, it will be readily seen that the conduct of debtors in failing cir- cumstances must be much restrained and regulated, to the

advantage of the general creditors, by the perils that attend a partial or unfair mode of settlement, or even a struggle to continue business after recuperation has become hope- less. Such was found to be the operation of a similar law in Massachusetts, where it prevailed for more than twenty years before the statute of that State was suspended by the general Bankruptcy Act of 1867.

The discharge of the debtor is granted or refused by the court absolutely. There are no grades or classes of certi- ficates, and no power to suspend action upon the question, and put the debtor on probation. In voluntary bankrupt- cies 30 per cent. must be paid in dividends, or the consent of one-fourth in number and one-third in value of the creditors must be obtained. Any creditor may oppose the decree of discharge for fraud committed or continued within six mouths before the petition, for loss by gaming, and in the case of merchants and tradesmen, as we have seen, for failure to keep suitable accounts. The discharge when granted, is, like the assignment, unimpeachable in any court ; but it may be reviewed within two years by the court that granted it, upon evidence afterwards discovered.

The title, powers, and duties of the assignee, the mode of settling joint and separate estates, and marshalling debts and assets, are substantially similar under the English and American systems. The title of the assignee, however, does not depend at all, in any case, upon the date of the petitioning creditor's debt. The misdemeanours created by the law were taken, with some modifications, from the felonies of the English Act in force in 1867. The mode of compounding with creditors has recently been adopted from the English statute of 1869, and has been largely used with good results,

Whether or not the bankrupt law will take its place as part of the settled policy of the country cannot be easily predicted. It is not likely to be displaced until the exist- ing commercial depression has been relieved. After that time much will depend upon the degree of care and economy with which it is administered, and the readiness of Con- gress to adopt modifications that shall be found to be necessary, but most upon the opinion that the debtors of the country may entertain of its operation. The law was considerably modified in 1874 in the interest of debtors, by making adjudications im ¢nvitum more difficult, and dis- charges more easy ; but the law is still popular with credi- tors, because of the serious check it imposes upon local preferences. It is likewise approved by those lawyers and judges who have had the most to do with its administra- tion ; and it is not improbable that the effect of a few years more of its operation may be to render it indispensable to the commercial world. (3. L.)

BANKS, Srr Josrpn, for upwards of forty years presi- dent of the Royal Society of London, was born in Argyle Street, London, on the 13th of February 1743. He was the only son of William Banks, a gentleman of considerable landed property, whose father had derived his fortune prin- cipally from successful practice as a physician in Lincoln- shire, had been on one occasion sheriff of that county, and had for some years represented Peterborough in parliament. Very little is known of Joseph's early life and education. He appears to have been sent at the age of nine to Harrow, and after spending four years there, was removed to Eton. Here he seems first to have acquired a taste for botanical pursuits, and was accustomed to spend all his leisure hours in the beautiful lanes and fields round the school. He carried the same fondness for natural history to Oxford, where he was

entered as a gentleman commoner of Christ’s College ; and by his exertions a lecturer on natural science was for the first time brought into the university. After taking an honorary degree he left Oxford; and at the age of tventy-one he found himself possessed of ample means,

his father having died in 1761. Three years later he made his first scientific expedition to Newfoundland and Labra- dor, and brought back a rich collection of plants and insects. Shortly after his return, Government resolved to gend out Captain Cook to observe the transit of Venus in the Pacific Ocean, and Banks, through the influence of his friend Lord Sandwich, obtained leave to join the expedi- tion. He made the most careful preparations, in order to be able to profit by every opportunity, and induced Dr Solander, a distinguished pupil of Linneeus, to accompany him. He even engaged draughtsmen and painters to de- lineate such objects of interest as did not admit of being transported or preserved. The voyage occupied three years, and many hardships had to be undergone; but the rich harvest of discovery—many natural phenomena being for the first time brought to light—was more than adequate compensation. Banks was equally anxious to join Cook’s second expedition, and expended large sums in engaging assistants and fumishing the necessary equipment; but, owing to ill-feeling on the part of some Government officials, he was compelled to relinquish his purpose. He, however, employed the assistants and materials he had collected in a voyage to Iceland, returning by the Hebrides and Staffa, the geological formation of which he was the first to describe. In 1778 Banks was elected president of the Royal Society, of which he had been a fellow from 1766. His predecessor had been compelled to resign owing to some disagreement with the court, but Banks was always a favourite with the king. In 1781 he was made a baronet ; in 1795 he received the Order of the Bath; and in 1797 he was admitted to the Privy Council. During the long tenure of his office as president, Sir Joseph did much to raise the state of science in Britain, and was at the same time most assiduous and successful in cultivating friendly relations with scientific men of all nations. His kindness and liberality were beyond praise, and he was most generous in

affording to other naturalists the free use of his vast materials. It has, however, been made matter of objection to him, that from his own predilections he was inclined to overlook and depreciate the labours of the mathematical and physical sections of the Royal Society. Sir Joseph died on the 19th March 1820, at the age of 77. He bequeathed his valuable collections of books and botanical specimens to the British Museum. His only writings are two small tracts of little importance; he seems to have given up his intention of writing an elaborate treatise after the death of his friend and fellow-labourer, Dr Solander, His fame rests mainly on his numerous, discoveries in botany and natural history. See Cuvier, Hloge Historique de M. Banks, 1821.

- BANKURA, a district of British India, within the Bardwan division, under the Lieutenant-Governor of Bengal, situated in 22° and 23° N. lat., and 86° and 87° E. long., bounded on the N. and E. by Bardwan district; on the S. by Midnapur district ; and on the W. by Manbhim district. Bankuré forms a connecting link between the delta of the Ganges on the I. and the mountainous highlands of Chhotaé Nagpur on the W. Along its eastern boundary adjoining Bardwan district the country is flat and alluvial, presenting the appearance of the ordinary paddy lands of Bengal. Going N. and W., however, the surface gradually rises into long undulating tracts ; rice lands and swamps give way to a region of low thorny jungle or forest trees; the ham- lets become smaller and more scattered, and nearly disappear altogether in the wild forests along the western boundary. The principal hills are—M Anji hill, on the south bank of the Damodar; Koro hill, 8. of the foregoing ; Susuni4 hill, W. of Koro; and Behdrinath hill, in the N.W. corner of the district. The rivers are merely mountain torrents—the largest, the Ddmodar, being only navigable by country

boats during the rains. ‘The census of 1872 returned the population of the district at 526,772 souls, inhabiting 2028 villages, and 104,687 houses ; average density of popula- tion, 391 to the square mile. The Hindus numbered 487,786, or 92°6 per cent. of the total population; Maho- metans, 13,500 ; Christians, 70; and persons of unspecified religion, chiefly aboriginal tribes, 25,416.

District area, after recent transfers to and from the districts of Bardwan and Manbhum in 1872, 1346 square miles. Before these transfers the area was returned at 1350 square miles, of which 630 were said to be cultivated, 540 cultivable but not cultivated, and 180 uncultivable waste. Agricultural products—rice, barley, cotton, indigo, oil-seeds, and pulses. Minerals—coal, lime, and building stone. Inits manufactures, the district is notcd for fine descrip- tions of coloured silk cloths. Lxports—ricc, oil-seeds, lac, tamarind, silk cloth, silk cocoons, &c. Imports—English piece goods, salt, tobacco, spices, cocoa-nuts, turmeric, and different kinds of pulses. Chief trading towns and seats of commerce—Bankura, Bishnupur, Rajgraém, and Barjora. Thrce main lines of road traverse the district. The total revenue increased from £40,934 in 1835-36 to £66,392 in 1870-71, and the civil expenditure from £8006 to £17,487 within the same period. Bankura is a permanently settled district. In 1870-71 the district contained 910 estatcs, held by 1351 proprietors, and paying a total Government land revenue of £45,362. Besides the land revenue, the following are returned as the other sources of revenue in 1870-7], viz., assessed taxes, £5455 ; excise, £3167; stamps, £6787; law and justice, £30,478; law charges, £62; and local and provincial funds, £2512. The police force in 1871 numbercd 5681 men, maintained at a cost of £23,656. The district contained 515 schools in 1871~72, at- tended by 14,676 pupils; maintained at a total cost of £4602, of which Government paid £1291. The climate of Bankura is gene- rally healthy, the cold season being bracing, the air wholesome and dry, and fogs of rare occurrence. “Phe temperature in the hot season is very oppressive and relaxing. Rainfall in 1868, 61°25 inches; minimum ‘temperature in the same year, 62°; maximum, 98°. The prevailing diseases in the district are intermittent fever, leprosy, and occasionally diarrhcea and dysentery. Cholera visited the district in an epidemic form in the years 1855, 1860, 1864, 1866-67, and 1869, that of the first year being the severest. Bankura suffered greatly from the famine of 1865-66. Two towns contain a popula- tion of upwards of 5000—1. Bankura, the administrative head- quarters ; population, 16,794 ; municipal income in 1872, £551; expenditure, £476. 2. Bishnupur—population, 18,047; municipal income, £273 ; expenditure, £192. The Bishnupur Raj was one of the largest estates in Bengal in the end of the last century, but it was sold for arrears of revenue shortly after the conclusion of the permancnt settlement in 1793.

BAnxuRA, the principal town of the district of the same name, in 23° 14’N. lat., and 87° 6’ 45” E. long., stands on an elevation on the left bank of the River Dhalkisor. It has a bazar, a spacious building for the accommodation of travellers, and the district courts, school, jail, post-office, &e. In 1872 the population amounted to 16,794.

BANN, a considerable river of Ireland, which rises in the Mourne Mountains, County Down, and falls into Lough Neagh. From this it emerges as the Lower Bann, and, flowing between the counties of Antrini and Londonderry, falls into the Atlantic, four miles 8.W. of Portrnsh, The Upper Bann is navigable for vessels of 50 tons to its junc- tion with the Newry canal, a little above Portadown. The Lower Bann flows in a northerly direction; it is navigable up to Coleraine for vessels of 200 tons, but the bar at its mouth renders it difficult of access in rough weather, and its course is broken by a fall of 13 feet about a mile above Coleraine. The salmon and eel fisheries are of considerable value. Measured in a direct line, the Upper Bann is about 35 miles long, and the Lower 30 miles.

BANNERETS. In the early ages of chivalry there were two kinds of knights, called respectively Bachelors and Bannerets. The former carried pennons terminating in a point or points; the latter, banners,—that is to say, pennons rendered square by having the points ‘cut off. This process of converting the pennon into the banner was done by the sovereign himself on the field of battle, standing beneath his own royal standard displayed. The distinction, awarded for peculiar gallantry, was a very high one; and those who

enjoyed it ranked above all other knights except those of the Garter. ‘The banner bore the coat armour of the ban- neret himself, and served as an ensign for the followers and retainers whom he took with him into the camp or court. The king himself and the greatest nobles were members of the order; aud we have in the Roll of Caerlaverock the blazon of nearly one hundred bannerets (including the king, eleven earls, and the bishop of Durham) who were present with Edward I. in his campaign against Scotland in 1300. The etymology of the word is clear; and Selden, after expressing his opinion that baro is equivalent to wr, remarks that “the

Germans have also the name of banner- heer or panner-heer, as if you would say dominus vexillifer, or the like, or as the title of bauneret" (Zvtles of Honour, part ii, 1, 52). Nevertheless the term banneret, either from simple misapprehension or in order to mark the relative rank of the knight, has been translated baronettus (quasi bavo minor) in some old statutes ; and the historian Walsingham, in describing the prisoners at the battle of Stirling, speaks of Barones et Baronetti vigints duo, &e. Indeed, in a patent granted to Sir Ralph Vane so late as 4 Edward VI1., his grade of banneret is Latinized by Bar- onettus. In France, it is said, the dignity was hereditary ; but in England it died with the person who gained it. On the institution of baronets by King James I, the order dwindled, and at length became extinct. The last banneret created was Sir John Smith, who received the dignity after the battle of Edgehill, for his gallantry in rescuing the standard of Charles I.

BANNOCKBURN, a village of Scotland, on the Ban- nock, an affluent of the Forth, three miles S. of Stirling. In 1871 its population amounted to 2564, principally employed in the manufacture of tweeds and carpets. In the neighbourhood, on the 24th of June 1314, was fought the memorable battle which secured the independence of Scotland, and established Bruce upon the throne. A frag- ment of the " bore stone" in which the royal standard was placed, is still to be seen, protected by an iron framework. At Sauchieburn, in the neighbourhood, James III. was defeated by his subjects in 1488. See ScoTLANnD.

BANSWARA (literally, the forest country), a Rajput feudatory state under the Mewar agency in Rajputana, ex- tends from 23° 10' to 23° 48' N. lat., and from 74° 2' to 74° 41' E. long. It borders on Gujarat, and is bounded on the N. by the native states of Dungarpur and Udaipur or Mewar; on the N.E. and E. by Pratabgarh ; on the 8. by the dominions of Holkar and the state of Jabua; and on the W. by the state of Riwakaénta. Banswdérd State is about 45 miles in length from N. to 8., and 33 miles in breadth from E. to W., and has an area of 1440 square miles, with an estimated population of 144,000 souls. The Mahi is the only river in the state, and great scarcity of water occurs in the dry season. The Mahéardwal, as the chief is called, has, however, undertaken the digging of wells, tanks, &c., to meet this want. The Bansward chief belongs to the family of Udaipur. During the vigour of the Dehli empire Banswara formed one of its dependencies ; on its decline

the state passed under the Marhattds. Wearied out by their oppressions, its chief in 1812 petitioned for English protection, on the condition of his state becoming tributary on the expulsion of the Marhattas. The treaty of 1818 gave effect to this arrangement; England guaranteeing the prince against external enemies and refractory chiefs; he, on his part, pledging himself to be guided by her representative in the administration of his state. There are 33 tributary chiefs or Thakurs of this state, and the whole strength of force kept up in 1870-71 was 617 men. Indian corn, wheat, pulses, rice, and other kinds of millet form the chief products of Banswar4. The revenue of the state amounted to £17,595 in 1870-71, exclusive of £3301 set apart for

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the personal expenditure of the chief and his family. The total expenditure in the same year amounted to £16,745. An annual tribute of £3997, or 50,000 Salimshahi rupees, is paid by the chief to the British Government. The cus- tom of satt, or widow-burming, has long been abolished in the state, but the people retain all their superstitions regarding witches and sorcery; and as late as 1870, a Bhil woman, about 80 years old, was swung to death at Kusalgarh in Banswaré, on an accusation of witchcraft. The perpetrators of the crime were seutenced to five years rigorous imprisonment, but they had the sympathy of the people on their side. The chief town is Banswara, lat. g3° 30’ and long. 74° 24’, situated about 8 miles W. of the Maht 1iver, surrounded by an old disused rampart, and adorned by various Hindu temples, with the battlements of the chief’s palace overlooking it.

BANTAM, a decayed town of Java, formerly capital of a district of the same name, at the north-western extremity of the island, situated on the Bay of Bantam, near the mouth of a river which falls into the bay. It was once a large, rich, and flourishing city, but is now mostly in ruins. It is about 61 miles W. of Batavia, and is situated on a low, swampy beach, surrounded by jungle, and inter- sected by stagnant streams, so that its climate is even more unhealthy than that of Batavia was in the last century. Prior to the Dutch conquest Bantam was a. powerful Maho- metan state, whose sovereign extended his conquests in the neighbouring islands of Borneo and Sumatra. In 1595 the Dutch, under Houtmann, expelled the Portuguese, and

formed their first settlement. An English factory was established in 1603, and continued to exist till the massacre of the agents in 1677. In 1683 the Dutch reduced the sultan to vassalage, built the fort of Spielwyk, and . monopolized the port, which had previously been free to all comers ; and for more than a century afterwards Bantam was one of the most important seats of commerce in the East Indies. In 1811 after Batavia had surrendered to the British, Bantam soon followed; but it was restored to the Dutch in 1814. Two years later, however, they removed their chief settlement to the more elevated station of Serang, or Ceram, seven miles inland, and in 1817 the ruin of Bantam was hastened by an extensive conflagra- tion. The Bay of Bantam was formerly a commodious retreat for vessels; but it is now so choked up with daily accessions of soil washed down from the mountains, as well as by coral shoals extending a considerable way to the eastward, that it is inaccessible to vessels of any con- siderable burden. Long. 106° 3’ E., lat. 6° 4’ 8.

BANTRY, a small seaport situated on Bantry Bay, on the S.W. coast of Ireland, in the county of Cork. Lat. 51° 39’ N., long. 9° 24’ W. The trade of this port, formerly considerable, is now almost confined to the ex- portation of grain. The pilchard fishery was once very productive, but the fish has now deserted the coast. The population, which in 1831 was 4276, had decreased in 1871 to 2441 (including 409 in the island of Whiddy). The bay of the same name is about 25 miles long by 4 to 6 broad, has from 10 to 30 or 40 fathoms of water, and is surrounded by high mountains. It affords a very fine harbour for shipping, and contains two small islands, Bear and Whiddy. In 1796 a French fleet anchored here with the view of in- vading Ireland, and landed eight men, who were imme- diately taken prisoners.

BANU, a district of British Tudia, under the Lieutenant- Governor of the Panjab, lies between 33° 15’ 30” and 32° 10’ 30” N. lat., and 72° 1’ and 70° 27’ E. long. It is bounded on the N. by the Khatabi hills, separating it from the district of Kohat, and by a corner of the Rawal Pindt district ; on the E. by the districts of Jhilam and Shahpur ; on the §. by the district of Derd Ismail Khén ; and on the

W. by the Waziri hills. Total area, 3148 square miles. Population, 287,547: consisting of Hindus, 26,222, or 9°12 per cent.; Mahometans, 260,550, or 90°61 per cent.; Sikhs, 493; others, 282; density of population per square mile, 91. The principal tribes inhabiting the district are— (1.) Waziri Pathans, recent immigrants from the hills, for the most part peaceable, and good cultivators; (2.) Banuchts, inhabitants of Banu proper; (3.) Pathans, criminal and depraved, with all the vices and few of the virtues of their race, but fair cultivators; and (4.) Murat{ Pathans, inhabi- tants of the Erakhel valley, a fine manly race, truthful and industrious.

The Indus flows through the district from north to south, dividing it into two portions. The other streams are the Kuram (which falls into the Indus) and its tributary the Gambila. The course of the Indus is very capricious, and has a tendency to encroach eastwards During inundations its vast body of waters stretches for many miles across the country. Principal crops of Banu district: wheat, barley, gram, and pulses for the spring harvest ; millet, Indian corn, sugar-cane, cotton, and oil seeds, for the autumn harvest. Average produce of land per acre in Ib :—Rice, 369 ft. ; cotton, 100; sugar, 1394; tobacco, 512; wheat, 480; other inferior grains, 640; oil-seeds, 240; fibres, 87. Cultivated area of the district in 1871-72, 450,519 acres; uncultivated and pasture grounds, 414,607 ; cultivable, 58,562 ; uncultivable, 1,092,493 ; total, 1,565,662 acres, or 2446 square miles reported on. Revenue from all sources in 1871-72, £50,218, of which £42,741 was derived from the land. The first regular settlement of the land revenue commenced in 1871—72, and is still (1874) in progress. A police force of 464 men of all grades is main- tained, of whom 395 belong to the imperial, 57 to the municipal, and 12 tothe primitive police. The district contained 33 schools in 1871-72, attended by 1152 pupils. The principal towns are— Trakhel, population, 7446; Kalabagh, 6419 ; Edwardestbad (Banu), 3185; Bhangi-khel, 5339; Nimal, 5010; and Van Bachran, 6178.

BANYAN TREE (Ficus indica, Linn., Urostigma benghalense, Gaspar.) is a native of several parts of the Kast Indies and Ceylon. It has a woody stem, branching to a great height and vast extent, with heart-shaped entire leaves terminating in acute points. Every braneh from the main body throws out its own roots, at first in small tender fibres, several yards from the ground ; but these con- tinually grow thicker until they reach the surface, when they

strike in, increase to large trunks, and become parent trees, shooting out new branches from the top, which again in time suspend their roots, and these, swelling into trunks, produce other branches, the growth continuing as long as the earth contributes her sustenance. On the banks of the Nerbudda, according to Forbes's Oriental Memories, stands a celebrated tree of this kind, which is supposed to be that described by Nearchus the admiral of Alexander the Great. This tree once covered an area so immense, that it has been known to shelter no fewer than 7000 men. Though now much reduced in size by the destructive power of the floods, the remainder is still nearly 2000 feet in circumference, and the trunks large and small exceed 3000 in number.

BAPHOMET, the imaginary symbol or idol which the Knights Templars were accused of worshipping in their secret rites. 'The term is supposed to be a corruption of Mahomet, who in several medieval Latin poems seems to be called by thisname. Von Hammer wrote a dissertation in the Mines de ? Orient, 1818, in which he revived the old charge against the Templars. The word, according to his interpretation, signifies the baptism of Jfetis, or of fire, and is, therefore, connected with the impure rites of the lowest Gnostic sects, the Ophites. Additional evidence of this, according to Von Hammer, is to be found in the architectural decorations of the Templars' churches. An elaborate and, so far as has yet appeared, successful criticism of Von Hammer's arguments was made in the Journal des Savans, March and April 1819, by M. Raynouard, well known as the defender of the Templars. See also Hallam, Middle Ages, c. i. note 15.

BAPTISM. Christian baptism is the sacrament by

which a person is initiated into the Christian Church. The word is derived from the Greek Bamritw, the frequentative form of Bdrrw, to dip or wash, which is the term used in the New Testament when the sacrament is described. In discussing what is meant by baptism, three things have to be inquired into—(1) the origin of the rite, (2) its meaning, or the doctrine of baptism, and (3) the form of the rite itself.

1. The Origin of Baptism.—Christian theologians do not require to go further back than to the New Testament, for there, in the record of our Lord's life, and in' the writings of His apostles, they find all that is required to form a basis for their doctrines. The principal passages in the New Testament in which baptism is described are as follows :—Matt. xxviii. 18-20; Mark xvi. 16 ; John iii. 26; Acts ii. 38, x. 44, f. viii. 16, xix. 1, 7, xxii. 16; Rom. vi. 4; 1 Cor. i, 14-16, vi. 11; Eph. v. 26 ; Col. ii. 12 ; Heb. x. 22, 23, &. From these texts we learn that baptism is specially connected with the gift of the Holy Spirit, with the forgiveness of sins, with our being buried with Christ ; and we are also taught by whom baptism is to be adminis- tered, and who are the proper partakers in the ordinance. It is from a due arrangement and comparison of the con- ceptions in these texts that a doctrine of baptism has been formed. But while theologians do not require to go beyond the New Testment for the origin and meaning of baptism, historical investigation cannot help trying to trace analogies to the rite in Old Testament and even in Pagan history. In the New Testament itself there are two distinct kinds of baptism spoken of —the baptism of John and Christian baptism. 'Treatises on Jewish antiquities speak of the baptism of proselytes; and St Paul applies the term baptism to describe certain Old Testament events, and we find in use among certain Pagan tribes rites strongly resembling Christian baptism, so far as external ceremonies go. Hence the question arises, What is the relation of Christian baptism to these ?

Writers on the antiquities of the Christian church were accustomed to find the source of Christian baptism in the baptism of John, and to assert that John's baptism was simply a universal and symbolical use of the well known ceremony of the baptism of proselytes, and they connected this Jewish rite with Old Testament and even with Pagan lustrations. But this mode of explanation must now be abandoned, It is very difficult to show any real connection between the baptism of John and Christian baptism further than the general relation which all the actions of the forerunner must have had to those of the Messiah. We know very little about the baptism of John, and all attempts to describe it minutely are founded either upon conjecture or upon its identity with the baptism of prose- lytes. Was John's baptism an initiation, and if so, initiation into what? Did Christ baptize in His lifetime, or did Christian baptism properly begin after Christ's death,

and after the mission of the Holy Ghost? What was the formula of John's baptism, and was there any change or growth in the formula of Christian baptism ? (The Tiibingen School, for example, think that the formula in Acts li, is much earlier than the complete and more developed one in Matt. xxviii. 19.) All these questions require to be answered with much more precision than the present state of our information admits of, before we can define the precise relation subsisting between the baptism of John and the baptism of Christ.

The connection between the baptism of John and the Jewish baptism of proselytes, of which a great deal has been made, is also founded on assumptions which cannot be proved. This very plausible theory first assumes that proselytes were baptized from an early time in the Jewish Church, although the Old Testament tells us nothing about

it, and then supposes that John simply made use of this ordinary Jewish rite for the purpose of declaring symbolically that the whole Jewish nation were disfranchised, and had to be re-admitted into the spiritual Israel by means of the same cerenony which gave entrance to members of heathen nations. But the subject of the baptism of proselytes is one of the most hopelessly obscure in the whole round of Jewish antiquities, and can never be safely assumed in any argument ; and the general results of investigation seem to prove that the baptism of proselytes was not one of the Jewish ceremonies until long after the coming of Christ, while there is much to suggest that this Jewish rite owes its origin to Christian baptism. Others again, as Steitz, find the historical basis of baptism in the lustrations or sprinklings with water so often mentioned in the Old Testament, in such symbolical acts as Naaman's bathing in the Jordan, and in various prophecies where purification from sin is denoted by sprinkling, e.g., Ezek. xxxvi. 25-30, Zech. xiii. 1, &c.; but such anticipations can scarcely be called the historical origin of the rite. Many modern writers connect baptism with certain Pagan rites, and point to the lustrations in use in religious initiation among the Egyptians, Persians, and especially the Hindus, but very little can be.made of such far-fetched analogies. Perhaps the most curious instance of this kind is to be found in the double baptism,—the one Pagan and civil, and the other religious and

Christian,—which existed side by side with each other in Norway and Iceland. The Pagan rite was called ‘‘ ansa vatri,” while the name for Christian baptism was “skéro.” The Pagan rite was much older than the introduction of Christianity, and was connected with the savage custom of exposing infants who were not to be brought up. The newly-born infant was presented to the father, who was to decide whether the child was to be reared or not; if he decided to rear it, then water was poured over the child and the father gave it a name; if it was to be exposed, then the ceremony was not gone through. The point to be observed is that, if the child was exposed by any one after the ceremony had been gone through, it was a case of murder, whereas it was not thought a crime if the child was made away with before water had been poured over it and it had been named. The analogy lies in the use of water, the bestowal of the name, and the entrance into civil life through the rite.

Il. Lhe Doctrine of Baptism.—Among the Greek Fathers, for it is there we must look for the beginning of the doctrine, baptism was called by various names, all of which referred to the spiritual effects which were supposed to accompany the rite. For example, a common term for baptism was Iadryyeveria, or regeneration—tfor every Christian was supposed to be born again by the waters of baptism. ‘We fishes,” says Tertullian, “ are born in water, conformable to the name of our Lord Jesus Christ,—x6vs.” (‘Inoots Xpicrds, Ocod Yids, Swrjp =ixGds.) It was also called dwrurpds, or wllumination ; mysterium ; signaculum, or seal of the Lord; character Dominicus; punots or protaywyla, the initiation; epodiov, or viaticum, from its being administered to departing persons; sacerdotiwm latci, or the lay priesthood, because allowed, in cases of necessity, to be conferred by laymen ; the great circumcision, because it was held to succeed in the room of circumcision ; dapov and xdépurpa Kupiov, the gift of the Lord, because it had Christ for its author, and not man; sometimes by way of eminence simply Sépov; reAcfworts and rederH, the consecration and consummation, because it gave men the perfection of Christians, and a right to partake of 76 reAciov, the Lord’s Supper. In studying the statements made by the early Fathers upon baptism, we find not so much a distinct and definite doctrine as gropings toward a doctrine, and it is not until we come to St Augustine that we can find any

strict and scientific theory of the nature and effects of the sacrament. The earlier theologians sometimes make state- ments which imply the most extreme view of the magical effects of the sacrament, and at other times explain its results in a purely ethical way. Thus, for example, Hermas says, —‘ Our life is sanctified by water ;” while Tertullian expressly declares, —‘“ Anima non lavatione sed responsione sancitur.” It should never be forgotten that the abundant use of metaphorical language by the Greek Fathers, and the want of anything like a strictly theological terminology, prevent our finding anything like the precise doctrinal statements which became familiar in the Western Church ; while the prevalence of curious Greek physical speculations, which taught the creative power of water, mingled with and distorted the ideas about the effects of the water in baptism. It was St Augustine, the great theologian of the WesternChurch, who first gave expression to exact dogmatic statements about the nature and meaning of baptism. The real difficulty to be explained was the connection between the outward rite and the inward spiritual change; or to put it more precisely, the relation between the water used and the Holy Spirit who can alone regenerate. The Greek theologians had shirked rather than faced the difficulty, and used terms at one time exaggerating the magical value of the element, at another insisting on the purely ethical and spiritual nature of the rite ; but they never attempted to show in what precise relation the external rite stood to the inward change of heart, It is true that one or two theologians had almost anticipated Augustine’s view, but the anticipation was more apparent than real, for the theology of the Greek Church in this, as in most other doctrines, is greatly hampered by the mystical tendency to represent regeneration and kindred doctrines much more as a species of chemical change of nature than as a change in the relations of the will. Augustine insisted strongly on the distinction between the sacrament itself and what he called the “res sacramenti,” between the inward and spiritual and the outward and material, and by doing so Augustine became the founder of both the modern Roman Catholic and the modern orthodox Protestant views. Apart from certain modifying influences, it would not be difficult for the orthodox Protestant to subscribe to most of Augustine’s views upon baptism, for he insists strongly on the uselessness of the external sign without the inward blessing of the Spirit. But in this doctrine, as in most others, Augustine’s doctrine of the Church so inter- fered as to make practically inoperative his more spiritual views of baptism. The

Church, Augustine thought, was the body of Christ, and that in a peculiarly external and physical way, and just as the soul of man cannot, so far as we know, exert any influence save upon and through the body, so the Spirit of Christ dispenses His gracious and regenerating influences only through the body of Christ, i.e.,the Church. But the Church, Augustine thought, was no invisible spiritual communion. It was the visible kingdom of God, the visible "civitas Dei in peregrinatione per terras," and so entrance into the Church, and the right and possibility of participating in the spiritual benefits which members of the Church can alone enjoy was only possible by means of a visible entrance into this visible kingdom. Thus while Augustine in theory always laid greatest stress upon the work of the Holy Spirit and upon the spiritual side of baptism, he practically gave the impulse to that view of the sacrament which made the external rite of primary importance. It was the Holy Spirit who alone imparted spiritual gifts to the children of God. But the one way by which the benefits of this Spirit could be shared was in the first place through baptism. Baptism was thought to be necessary to salvation, and all who were unbaptized were unsaved. In this way Augustine, while

recognizing the spiritual nature of the sacrament, held views about the importance of the rite which were as strong as those of any Greek theologian who had mingled confusedly in his mind Christian doctrines and the maxims of Pagan philosophy about the creative power cf the element of water. Of course such a doctrine of the im- portauce of the baptism with water had to be modified to some extent. 'There were cases of Christian martyrs who had never been baptized, and yet had confessed Christ and died to confess Him: for their sakes the idea of a baptism of blood was brought forward ; they were baptized not with water, but in their own blood. And the same desire to widen the circle of the baptized led the way to the recog- nition of the baptism of heretics, laymen, and nurses. It was the Augustinian doctrine of baptism which was developed by the Schoolmen, and which now is the substance of modern Roman Catholic teaching. The Schoolmen, whuse whole theology was dominated by the Augustinian conception of the Church, simply took over and made somewhat more mechanical and less spiritual Augustine's doctrine, They were enabled to

give the doctrine a more-precise and definite shape hy accommodat- ing it to the terms of the Aristotelian philosophy. They began by distinguishing between the matter and the form of baptism. Had Augustine had this distinction before him he would probably have called the water the matter, and the action of the Holy Spirit the form which verified and gave shape to the matter ; but the whole idea of the Schoolmen was much more mechanical, the magical idea of the sacra- ment came much more into prominence, and the spiritual and ethical fell much more into the background, and with them, while water was the materia sacramentt, the forma sacramente was the words of the rite,—"I baptize thee," &c., &c. Thus insensibly the distinction between the external rite and the work of the Holy Spirit, which Augustine had clearly before him in theory at least, was driven back into its original obscurity, and while it was always held theoretically that the grace conferred in baptism was conferred by the Holy Spirit, still the action of the Spirit was so inseparably connected with the mechanical performance of the rite, that the external ceremony was held to be full warrant for the inward spiritual presence and power, and it was held that in baptism grace was conferred ex opere operato. The actual benefits which were supposed to colle in this way were, freedom from original sin and forgiveness of it and all actual sins committed up to the time of baptism, and the implanting of the new spiritual life—a life which could only be slain by a deadly sin. The Scholastic doctrine of baptism is the doctrine of the Roman Catholic Church, and the restatements made by Mohler on the one hand, and Jesuit theologians on the other, do not do more than give a poetical colouring to the doctrine, or bring out more thoroughly the magical and mechanical nature of the rite.

The Protestant doctrine of baptism, like the Scholastic or Roman Catholic, is to be traced back to Augustine and his distinction between the sign and the thing signified, and may be looked at as a legitimate development of the Augustinian doctrine, just as that must be considered to be an advance on the doctrine of the early Church Fathers. The early Fathers had confused the sign with the thing signified,—the water with the action of the Holy Spirit, — and could only mark their half-conscious recognition of the distinction by an alternating series of strong statements made now on the one side aud now on the other. Augustine distinguished the two with great clearness, but connected them in an external way by means of his conception of the

visible Church and of baptism as the door leading into it, and this led his followers to pay exclusive attention to the external side, until the thing signified

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became lost in the sign. The Protestant theologians con- nected the two in an wternal way by means of the spiritual conception of faith, and so were able always to keep the sign in due subordination to the thing signified. It is faith —not faith in the seuse of imperfect knowledge, or assent to intellectual propositions, but faith in the sense of personal trust in a personal Saviour, or " fiducia," as the 17th century theologians called it—which so connects the water with the presence and power of the Spirit that the one is the means which the other uses to impart His spiritual grace. In this way baptism is looked upon as one of the means of grace, and grace is imparted through it as through the other means—the Lord's Supper, the Word of God, prayer, &c. Just as the dead letters and sounds of the Word of God are but the signs of the presence and power of His Spirit, and become at Eis touch the living revelation of the Lord, sv in baptism, the outward rite, worthless in itself, becomes the sign and pledge of the presence aud power of the Spirit of God; and as, in the case of the Word of God, it is faith or "fiducia" that on the human side connects the external signs with the inward power of the Spirit, so, in baptism, it is the same faith which unites the water and the Spirit. So far all orthodox Protestants are agreed, but in order to show the historical evolution of the doctrine, it is necessary to notice in a sentence the difference between the Lutheran and the Calvinist doctrines. Luther's own doctrine of baptism changed very much: in the second stage —the stage represented by the tract, De Babyl. Capt. Zecel.—it is not different, in germ at least, from the Calvinist view ; but he afterwards drew back and adopted views much nearer to the Scholastic theory. He was evidently afraid that, if he went too far from the Scholastic doctrine, and insisted too strongly on the importance of faith, he miglit be led on to reject the baptism of infants ; and his later theories are a recoil from that. The question which Luther had to face and answer here was, What is meant by faith, the faith which connects the symbol with the reality, and so appropriates the gifts of God's grace in the sacrament? Is it a faith which begins and ends in the individual act of faith at work in the person that is

baptized 3 or is it a much wider thing with a more universal sig- nificance? Luther did not face this question thoroughly, bnt his recoil from the Reformed theory of baptism seems to show that he would have taken the former answer. Nor did Calvin face the question; but his doctrine of baptisin implies that he would have taken the latter answer. The faith which a man has in Christ, the faith which appropriates, is not the individual's only, but extends far beyond him and his small circle. It is awakened by the Holy Spirit, it comes into being within the sphere of God's saving purpose, Its very existence indicates a solidarité between the individual believer aud the whole Church of God. Hence on the Reformed doctrine, while faith is essential to the right appropriation of the blessing in the rite, there is no need for thoroughly developed faith in those who are baptized. If they are infants, then they are baptized because of the faith of their parents or near relations, or of the congregation before whom the baptism is performed; only those who are the sponsors for the child bind them- selves before God to train up the child to know that it has been baptized, and to appropriate in conscious individual faith the benefits of the ordinance. Such is the Reformed theory of baptism; and it rests upon the ideas of the solidarié of believers, of the prior existence of the Church to the individual believers, and of the ethical unity of the Church. On the other hand, those who hold that the Church is simply the sum of individual men and women, and that it is increased not by the silent widening of the influence of God's saving purpose within mankind, but by individual conversions and by individuals joining the

Church, cannot help regarding infant baptism as a mere mockery. Hence the doctrines of the Anabaptists, Baptists, Mennonites, &c. (see Baptists), who reject infant baptism altogether, and maintain that there can be no valid baptism without the conscious appropriation by an act of faith of the benefits symbolized by the rite. It is to be noticed that the tendency of those who reject infant baptism is to regard the sacrament not so much as a means of grace, but simply as an act symbolical of entrance into the Church, and to approach in this way the views of the Socinians and Remonstrants. Quakers reject baptism altogether along with the sacrament of the Supper.

III. Baptismal Rites.—In the Apostolic and immediately post-Apostolic Church, there was no stated time or place for baptism. Philip baptized the Ethiopian eunuch by the roadside, as soon as he had declared his faith. After- wards, however, Easter, Whitsuntide, and Epiphany were seasons supposed to be specially appropriate for baptism, and the sacrament was not performed at other times save in cases of necessity. Baptism, Tertullian said, had special reference to the death and rising again of our Lord, and also to the mission of the Holy Ghost; and festivals which were connected with these events were specially appropriate for baptism. As soon, too, as churches were built, and congregations formed, baptism became a public act of worship, and was generally performed in baptisteries built adjoining the church, The early Church, like most of the Reformation Churches, condemned private baptism.

In the Apostolic Church the baptismal rite seems to have been a very simple one. ‘Repent and be baptized, every one of you,” was all that Peter thought it necessary to say to those whom he invited to join the Christian Church ; but soon after the Apostolic times baptism became a very elaborate ceremonial. No one could be baptized unless he had submitted to a long and elaborate course of instruc- tion as a catechumen ; and in order to be made a catechumen a ceremony of some length had to be gone through. The candidate was received into the number of the catechumens by the laying on of hands and prayer; and, in the Western Church, salt was given to him, the salis dato being held to be the special sacramentum catechwmenorum. Catechu- mens were permitted to attend public worship at first as hearers only ; afterwards they were permitted to take part in the responses and genuflections of the audience. From these catechumens the candidates for baptism, called com- potentes or electt, were from time to time selected. The baptismal ceremony was a lengthy one. ‘The catechumens were first received, then got their Christian names, then, facing the west, the place of darkness, they renounced the devil and all his works. The priest then exorcised them, by laying his hands upon their heads and breathing into their faces. After the exorcism came the opening of the ears and nose, a ceremony which had special reference to the descent of the Holy Ghost upon Christ in the form of a dove. The catechumens were then anointed with the eatechumen oil, (This part of the ceremony was sometimes gone through after baptism, although it is possible that there were two anointings,

one before and one after.) The officiating priest then repeated the Creed and the Lord’s Prayer, and gave a short explanation of their meaning, and the lengthy ceremony was concluded by the catechumeu repeating the Lord’s Prayer and the Apostles’ Creed. All these ceremonies preceded the special baptismal rite, and commonly occupied more than one day. In the baptismal ceremony the minister first consecrated the water by prayer, and the catechumen was then baptized in the name of the Father, the Son, and the Holy Ghost. The usual mode of performing the ceremony was by immersion. In the case of sick persons (clinic?) the minister was allowed to baptize by pouring water upon the head or by sprinkling. In the

early Church “clinical” baptism, as it was called, was only permitted in cases of necessity, but the practice of baptism by sprinkling gradually came in in spite of the opposition of councils and hostile decrees. ‘The Council of Ravenna, in 1311, was the first council of the Church which legalized baptism by sprinkling, by leaving it to the choice of the officiating minister. The custom was to immerse three times, once at the name of each of the persons in the Trinity, but latterly the threefold immersion was abolished, because it was thought to go against the unity of the Trinity. The words used in baptizing always embodied the formula in the last chapter of St Matthew. But the mode of uttering them varied. In the Western Church the priest uttered the simple formula, but in the Eastern Church the common formula was, Bamrilerar 6 dodA0s tot Geov 6 Sciva cis 76 dvopa Tod rarpos— Apjv —xal Tod viod— Apyv —Kal tod aylov mvevpatos—Apinv—viv Kal dei eis Tods aiavas Tov aidvey. “Any. After immersion the neo- phyte partook of milk and honey to show that he was now the recipient of the gifts of God’s grace ; he was then anointed with oil to show that he was enrolled among the spiritual priesthood, and with the unction was joined the sign of the cross made on the forehead. Then followed the laying on of hands, which latterly, when the episcopate became separate from the presbytery, was done by the bishop, and was the germ of the sacrament of confirmation, In the course of time one or two other symbolical actions were added ; the neophyte was clothed in a white garment— (hence Pentecost, which was the principal baptismal festival, was called Whit sunday)—and a band (chrismale) was put round his head. Inthe Eastern Church there followed the girding of the loins of the neophyte and the crowning of him with a consecrated corona, significant of his entrance into the royal priesthood; in

the Western Church a burning cross was given him. In the various Eastern churches the rites differed somewhat from each other, nor was exact uniformity to be found in the Western Church. It could easily be shown that a great deal of this complex ceremonial took its origin from the introduction of Pagan ceremonies into the Christian worship.

The present form of administering baptism in the Church of Rome is as follows:—When a child is to be baptized, the persons who bring it wait at the door of the church for the priest, who comes thither in his surplice and his purple stole, surrounded by his clerks. He begins by questioning the godfathers, whether they promise in the child's name to live and die in the true Catholic and Apostolic faith ; and what name they would give to the child. Then follows an exhortation to the sponsors, after which the priest, calling the child by its name, asks, " What dost thou demand of the Church?" The godfather answers, '' Eternal life." The priest proceeds, " If thou art desirous of obtaining eternal life, keep God's commandments,—Thou shalt love the Lord thy God," &c. ; after which he breathes three times in the child's face, saying, 'Come out of this child, thou evil spirit, and make room for the Holy Ghost." Then he makes the sign of the cross on the child's forehead and breast, saying, " Receive the sign of the cross on thy forehead and in thy heart ;" upon which, taking off his cap, he repeats a short prayer, and, laying his hand gently on the child's head, repeats a second prayer; then he blesses some salt, and putting a little of it into the child's mouth, he says, " Receive the salt of wisdom." All this is performed at the church door. Afterwards, the priest, with the godfathers aud godmothers, come into the church, and advancing towards the font, repeat the Apostles' Creed and the Lord's Prayer. Arrived at the font, the priest again exorcises the evil spirit, and taking a little of his own spittle, with the thumb of his right hand rubs it on the child's ears and nostrils, repeating as he touches the right

ear, the same word Lphphatha, "be thou opened," which our Saviour made use of to the man born deaf and dumb. Lastly, they pull off its swaddling-clothes, or strip it below the shoulders, during which the priest prepares the oil. The sponsors then hold the child directly over the font, observing to

turn it due east and west; whereupon the priest asks the child whether he renounces the devil and all his works, and the godfather having answered in the affirmative, the priest anoints the child between the shoulders in the form of a cross; then taking some of the consecrated water, he pours part of it thrice on the child's head, at each perfusion calling on one of the persons of the Holy Trinity. The priest concludes the ceremony of baptism with an exhortation. It may be added that the Roman Church allows midwives, in cases of danger, to baptize a child before the birth is completed. A still-born child thus baptized may be buried in consecrated ground.

With regard to the form of baptism used in the Church of England, we shall only mention one or two of the more inaterial differences between the form as it stood in the first liturgy of King Edward, and that in the English Common Prayer Book at present. First, the form of consecrating the water did not make a part of the office in King ldward's liturgy, as it does in the present, because the water in the font was changed and consecrated but once a month. The form itself likewise was something different from that now used, and was introduced with a short prayer that Jesus Christ, upon whom (when He was baptized) the Holy Ghost came down in the likeness of a dove, would send down the same Holy Spirit, to sanctify the fountain of baptism, which prayer was afterwards left out at the second revision. By King Edward's first book the minister was required to dip the child in the water thrice; first the right side, secondly the left, and lastly the face toward the foot. This triple immersion was a very ancient practice in the Christian Church, and was used in honour of the Holy Trinity,—though some later writers say it was done to represent the death, burial, and resurrection of Christ, together with His three days' con- tinuance in the grave. But afterwards, the Arians per- suading the people that the custom denoted a distinct substantiality of the three persons in the Trinity, the or- thodox party discontinued it and used only one single immersion.

By the first Common Prayer Book of King Edward, after the child was baptized the godfathers and godmothers were to lay their hands upon him, and the minister was to put on him the white vestment, commonly called the chrysome, and to say, "Take this white vesture as a token of the innocency which, by God's grace, in this holy sacrament of baptism, is given unto thee, and for a sign whereby thou art admonished, so long as

thou livest, to give thyself to innocence of living, that after this transitory life thou mayest be partaker of the life everlasting.” As soon as he had pronounced these words, he was to anoint the infant on the head, saying, “ Almighty God, the father of our Lord Jesus Christ, who hath regenerated thee by water and the Holy Ghost, and hath given unto thee remission of all thy sins, may He vouchsafe to anoint thee with the unction of His Holy Spirit, and bring thee to the inherit- ance of everlasting life.”

Baptism of the dead seems to have been founded on the opinion that when men had neglected to receive baptism in their lifetime, some compensation might be made for this default by their receiving it after death, or by another being baptized for them. ‘This practice was chiefly in use among various heretical sects.

Hypothetical Baptism was that adininistered in certain doubtful cases, with the formula, “If thou art baptized, I

do not rebaptize; if thou art not, I baptize thee in the name of the Father,” &c.

Solemn Baptism was that conferred at stated seasons. Such in the ancient Church were the Paschal baptism and that at Whitsuntide. This is sometimes also called general baptism.

Lay Baptism we find to have been permitted both by the Common Prayer Book of King Edward, and by that of Queen Elizabeth, when an infant is in immediate danger of death, and a lawful minister cannot be had; but after- wards, in a convocation held in the year 1575, it was unanimously resolved, that even private baptism, in a case of necessity, was only to be administered by a lawful minister. The Scotch Reformed Church also prohibited private baptism by lay persons, but ordained that when any had been thus baptized, the rite was not to be repeated.

The name baptism has been applied to certain ceremonies used in giving names to things inanimate. ‘The ancients knew nothing of the custom of giving baptism to inanimate things, such as bells, ships, and the like. The

first notice we have of this is in the capitulars of Charles the Great, where it is mentioned with censure ; but afterwards it crept by degrees into the Roman offices, Baronius carries its antiquity no higher than the year 968, when the great bell of the church of Lateran was christened by Pope John III, At last it grew to such a height as to form a ground of complaint in the Centum Gravamina of the German nation, drawn up at the diet of Nuremberg in 1581, where the ceremony of baptizing a bell, with godfathers, é&c., to make it capable of driving away tempests and devils, was declared to be a superstitious practice, contrary to the Christian religion, and a mere seduction of the simple people.

Authorities :—Bingham's Origines Ecclesiastice, bks. 10, 11; Grimm's Deutsche Rechisalterthiimer; J. G. Walch, Historia Peedo- baptismi quatuor priorum saculorum; G. T. Vossius, Disput. Vigintt de Baptismo. (Ty Biola

BAPTISTERY (Baptistertum, in the Greek Church pwticTyptov) was a hall or chapel in which the catechumens were instructed and the sacrament of baptism administered. It was commonly a circular building, although sometimes it had eight and sometimes twelve sides, and consisted of an ante-room (zpoavAtos otxos) where the catechumens were instructed, and where before baptism they made their confession of faith, and an inner apartment where the sacrament was administered. In the inner apartment the principal object was the baptismal font (xoAvy$7Opa, or piscina), in which those to be baptized were immersed thrice. Three steps led down to the floor of the font, and over it was suspended a golden or silver dove ; while on the walls were commonly pictures of the scenes in the life of the Baptist. The font was at first always of stone, but latterly metals were often used. Baptisteries belong to a period of the church when great numbers of adult catechumens were baptized, and when immersion was the rule. We find little or no trace of them before Constantine made Christianity the state religion, z.¢, before the 4th century ; and as early as the 6th century the baptismal font was built in the porch of the church and then in the church itself. After the 9th century few baptisteries were built, the most noteworthy of later date being those at Pisa, Florence, Padua, Lucca, and Parma. Some of the older baptisteries were very large, so large that we hear of councils and synods being held in them. It was necessary to make them large, because in the early church it was customary for the bishop to baptize all

the catechumens in his diocese (and so baptisteries are commonly found attached to the cathedral and not to the parish churches), and also because the rite was performed only thrice in the year. (See Barrism.) During the months when there were no

baptisms the baptistery doors were sealed with the bishop's seal. Baptisteries, we find from the records of early councils, were first built and used to correct the evils arising from the practice of private baptism. As soon as Christianity made such progressthat infant baptism became the rule, and as soon as imniersion gave place to sprinkling, the ancient baptisteries were no longer necessary. They are still in general use, however, in Florence and Pisa. The name baptistery is sometimes also given to a kind of chapel in a large church, which served the same purpose. (Cf. Hefele's Concilien, passim; Du Cange, Glossary, article "' Baptisterium ;" Eusebius, Hist. Hccl. x. 4; Bing- ham's Antiquities of the Christian Church, book xi.)

BAPTISTS, a denomination of Christians, distinguished, as their name imports, from other denominations by the views they hold respecting the ordinance of baptism.

The early history of the Baptists, both in this country and on the Continent, is very obscure. In the great awakening of religious thought and feeling which charac- terized the beginning of the 16th century, it was inevitable that amongst those who burst the fetters which bound them to the see of Rome some should be willing to retain as much of the ancient doctrine and practice as they could with a safe conscience, whilst others, rejoicing in their new- found liberty, would desire to cast aside every remnant of what they regarded as superstition, and to advance as far as possible in the path of what they deemed Christian liberty ; nor is it at all to be wondered at that strange and wild theories on matters even remotely connected with religion should spring into life. But amidst all the diver- sities of opinion that existed, it was constantly held by Protestants that "holy Scripture containeth all things necessary to salvation, so that whatsoever is neither read therein nor may be proved thereby, although it be sometime received of the faithful as godly and profitable for an order and comeliness, yet no man ought to be constrained to believe it as an article of faith or repute it requisite to the

necessity of salvation” (Articles of King Edward VI.) We must not be surprised that the right of private judg- ment, which is involved in the principle thus broadly laid down, was nevertheless far from being conceded to the extent that was desired by those who departed farthest from the Church of Rome. In fact, each separate section of Protestants claimed for itself to stand on the ground of holy Scripture, and was prepared to resist alike the tyranny of Rome and what it considered the licence of other bodies of Protestants. Thus it happened that the Baptists, or as their opponents called them, the Ana- baptists (or, as Zwingli names them, Catabaptists), were strenuously opposed by all other sections of the Christian Church, and it was regarded by almost all the early refor- mers to be the duty of the civil magistrate to punish them with fine and imprisonment, and even with death. There was, no doubt, some justification for this severity in the fact that the fanaticism which burst forth in the early times of the Reformation frequently led to insurrection and revolt, and in particular that the leader of the “ peasant war” in Saxony, Thomas Miinzer, and probably many of his followers, were “ Anabaptists.” One result of this severity is, that the records of the early history of the Anabaptists both on the Continent and in this country are very few and meagre. Almost all that is currently known of them comesto us from their opponents. There is, how- ever, much valuable information, together with detailed accounts of their sufferings, in the Dutch Martyrology of Van Braght, himself a Baptist, which bears the title Martelaers Spiegel der Doops-gesinde (2d ed. fol., 1685), an English translation of the latter half of which was published in 2 vols. 8vo, Lond. 1850-53, edited by Dr Underhill, now secretary of the Baptist Missionary Society. Probably

the earliest confession of faith of any Baptist community is that given by Zwingli in the second part of his Llenchus contra C’atabaptistas, published in 1527. Zwiugli professes to give it entire, translating it, as he says, ad verbum into Latin. He upbraids his opponents with not having pub- lished these articles, but declares that there is scarcely any one of them that has not a written (descriptum) copy of these laws which have been so well concealed. The articles arein all seven. The first, which we give in full, relates to baptism :—

“‘ Baptism ought to be given to all who have been taught repent- ance and change of life, and who in truth believe that through Christ their sins ave blotted out (abolita), and the sins of all who are willing (volwnt) to walk in the resurrection of Jesus Christ, and who are willing to be buried with him into death, that they may rise again with him. ‘To all, therefore, who in this manner seek baptism, and of themselves ask us, we will give it. By this rule are excluded all baptisms of infants, the great abomination of the Roman pontiff. For this article we have the testimony and strength of Scripture, we have also the practice of the apostles; which things

bs sinply and also stedfastly will observe, for we are assured of them.”

The second article relates to withdrawment (abstentio) or excommunication, and declares that all who have given themselves to the Lord and have been baptized into the one body of Christ should, if they lapse or fall into sin, be excommunicated. The third article relates to the breaking of bread ; in this it is declared that they who break the one bread in commenioration of the broken body of Christ, and drink of the one cup in commemoration of His blood poured out, must first be united together into the one body of Christ, that is, into the church of God. The fourth article asserts the duty of separation from the world and its abominations, amongst which are included all papistical and semi-papistical works. The fifth relates to pastors of the church. They assert that the pastor should be some one of the flock who has a good report from those who are without. ‘‘ His office is to read, admonish, teach, learn, exhort, correct, or excommunicate in the church, and to preside well over all the brethren and sisters both in prayer and in the breaking of bread ; and in all things that relate to the body of Christ, to watch that it may be established aud increased so that the name of God may by us be glorified and praised, and that the mouth of blasphemers may be stopped.” The sixth article relates to the power of the sword. “ The sword,” they say, “is the ordinance of God outside the perfection of Christ, by which the bad ig punished and slain and the good is defended.” They further declare that a Christian ought not to decide or give sentence in secular matters, and that he ought not to exercise the office of magistrate. The seventh article relates to oaths, which they declare are forbidden by Christ.

However much we nay differ from the points maintained in these articles, we cannot but be astonished at the vehemence with which they were opposed, and the epithets of abuse which were heaped upon the unfortunate sect that maintained them. Zwingli, through whom they come down to us, and who gives them, as he says, that the world may see that they are ‘‘fanatical, stolid, audacious, impious,” can scarcely be acquitted of unfairness in joining together two of them,—the fourth and fifth,—thus making the article treat “ of the avoiding of abominable pastors in the church” (Super devitatione abominabilium pastorum in Ecclesia), though there is nothing about pastors in the fourth article, and nothing about abominations in the fifth, and though in a marginal note he himself explains that the first two copies that were sent him read as he does, but the other copies make two articles, as in fact they evidently are. Tous at the present day it appears not merely strange but shocking, that the Protestant Council of Zirich, which had scarcely won its own liberty, and was still in dread of the persecution of the Romanists, should pass a decree

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ordering, as Zwingli himself reports, that any person who administercd anabaptism should be drowned; and still more shocking that, at the time when Zwingli wrote, this cruel decree should have been carried into effect against one of the leaders of the Auabaptists, Felix Mantz, who had himself been associated with Zwingli, not only as a student, but also at the commencement of the work of Reformation. No doubt the wild fanaticism of some of the opponents of infant baptism seemed to the Reformers to justify their severity. In 1537 Menno Simonis joined himself to the Anabaptists and became their leader. His moderation and piety, according to Mosheim, held in check the turbulence of the more fanatical amongst them. He died in 1561, after a life passed amidst continual dangers and conflicts. His name remains as the designa- tion of the Mennonites, who eventually settled in the Netherlands under the protection of William the Silent, Prince of Orange.

Of the introduction of Baptist views into England we have no certain knowledge. Fox relates that “the registers of London make mention of

certain Dutchmen counted for Anabaptists, of whom ten were put to death in sundry places in the realm, anno 1535 ; other ten repented and were saved." In 1536 King Henry VIII, as "in earth supreme head of the Church of England," issued a pro- clamation together with articles concerning faith agreed upon by Convocation, in which the clergy are told to instruct the people that they ought to repute and take "the Anabaptists' opinions for detestable heresies and to be utterly condemned." The document is given in extenso by Fuller, who further tells us from Stow's Chronicles that, in the year 1538, "four Anabaptists, three men and one woman, all Dutch, bare faggots at Paul's Cross, and three days after a man and woman of their sect was burnt in Smithfield." In the reign of Edward VI., after the return of the exiles from Ziirich, Hooper writcs to his friend Bullinger in 1549, that he reads 'a public lecture twice in the day to so numerous an audience that the church cannot contain them," and adds, 'the Anabaptists flock (confluunt) to the place and give me much trouble." It would seem that at this time they were united together in communities separate from the Established Church. Lati- mer, in 155%, speaks of them as segregating themselves from the company of other men. In Philpott's sixth examination in 1555 we are told that Lord Riche said to him, ' All heretics do boast of the Spirit of God, and every one would have a church by himself, as Joan of Kent and the Ana- baptists." Philpott was imprisoned soon after Mary's accession in 1553; and it is very pleasing to find, amidst the records of intense bitterness and rancour which charac- terized these times, and with which Romanist and Protes- tant alike assailed the persecuted Baptists, a letter of Philpott's, to a friend of his, 'prisoner the same time in Newgate," who held Baptist opinions. His friend had

written to ask his judgment concerning the baptism of:

infants. Philpott in a long reply, whilst maintaining the obligation of infant baptism, yet addresses his correspondent as, " dear brother, saint, and fellow-prisoner for the truth of Christ's gospel ;" and at the close of his argument he says, "T beseech thee, dear brother in the gospel, follow the steps of the faith of the glorious martyrs in the primitive church, and of such as at this day follow the same." During the whole of the 16th century, and through the greater part of the 17th, whatever changes took place in the state church, the Baptists in England, together with other dissenters,

continucd to suffer persecution. Archbishop Sandys, about the year 1576, says: “It is the property of froward sectaries,” amougst whom he classes Anabaptists, “ whose inventious cannot abide the light, to make obscure conven- ticles ;” and though he admits that “ when the gospel is

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persecuted, secret congregations are allowed,” he declares. that as the gospel, ‘‘ strengthened with the civil hand,” is now publicly and sincerely preached, “such stray sheep as

-will not of their own accord assemble themselves to serve

the Lord in the midst of this holy congregation, may law- fully and in reason ought to be constrained thereunto.” There is no doubt that a large number of the Baptists in England at this time came from Holland, but there is little reason to think that Fuller is correct when, after speaking of certain Dutch Anabaptists being seized in 1575, some of whom were banished and two burnt at Smithfield, he adds, ‘we are glad that English as yet were free from that infection.”

About the beginning of the 17th century the severe laws against the Puritans led many dissenters to emigrate to Holland. Some of these were Baptists, and an English Baptist Church was formed in Amsterdam about the year 1609. In 1611 this church published “a declaration of faith of English people remaining at Amsterdam in Holland.” The article relating to baptism is as follows :— “That every church is to receive in all their members by baptism upon the confession of their faith and sins, wrought by the preaching of the gospel according to the primitive institution and practice. And therefore churches consti- tuted after any other manner, or of any other persons, are not according to Christ’s testament. That baptism or washing with water is the outward manifestation of dying unto sin and walking in newness of life ; and therefore in no wise appertaineth to infants.” They hold “ that no church ought to challenge any prerogative over any other ;” “that magistracy is a holy ordinance of God ;” ‘‘that it is lawful in a just cause forthe deciding of strife to take an oath by the name of the Lord.”

The last execution for heresy in England by burning alive took place at Lichficld, April 11, 1612. The con- demned person, Edward Wightman, was a Baptist. Much uncertainty rests on the history of the Baptists during the next twenty years. It would seem that many members of the Brownist or Independent denomination held Baptist views. An independent congregation in London, gathered in the year 1616, included several such persons, and as the church was larger than could conveniently meet together in times of persecution, they agreed to allow these persons to constitute a distinct church, which was formed on the 12th September 1633 ; and upon this most, if not all, the members of the new church were baptized. Another Baptist church was formed in London in 1639, These churches were " Particular" or Calvinistic Baptists. The church formed in 1609 at Amsterdam held Arminian views. In 1644 a Confession of Faith was published in the names of seven churches in London " commonly (though falsely) called Anabaptist," in which were included the two churches just mentioned. The article on baptism is as follows :—'' That baptism is an ordinance of the New Testament given by Christ to be dispensed only upon persons professing faith, or that are disciples, or taught, who, upon a profession of faith, ought to be baptized." "The way and manner of dispensing this ordinance the Scripture holds out to be dipping or plunging the whole body under water." They further declare that ''a civil magis- tracy is an ordinance of God," which they are bound to obey. How well they understood the distinction between the rights of conscience and the rights of the civil magis- trate is shown with remarkable clearness —

'We believe," they say, ''thatin all those civil laws which have been acted by them [the supreme magistracy], or for the present are or shall be ordained, we are bound to yield subjection and obedience unto in the Lord, as conceiving ourselves bound to defend both the persons of those thus chosen, and all civil laws made by them,

with our persons, liberties, and estates, with all that is called ours, – although we should suffer never so much from them in not actively.

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submitting to some ecclesiastical laws, which might be conceived by them to be their duties to establish, which we for the present could not see, nor our consciences could submit unto; yet are we bound to yield our persons to their pleasures."'

They go on to speak of the breathing time which they have had of late, and their hope that God would, as they say, "incline the magistrates' hearts so for to tender our con- sciences as that we might be protected by them from wrong, injury, oppression, and molestation ;" and then they proceed: "But if God withhold the magistrates' allowance and further- ance herein, yet we must, notwithstanding, proceed together in Christian communion, not daring to give place to suspend our practice, but to walk in obedience to Christ in the pro- fession and holding forth this faith before mentioned, even in the midst of all trials and afflictions, not accounting our goods, lands, wives, children, fathers, mothers, brethren, sisters, yea, and our own lives, dear unto us, so that we may finish our course with joy ; remembering always that we ought to obey God rather than men." They end their confession thus: "If any take this that we have said to be heresy, then do we with the apostle freely confess, that after the way which they call heresy worship we the God of our fathers, believing all things which are written in the Law and in the Prophets and Apostles, desiring from our souls to disclaim all heresies and opinions which are not after Christ, and to be stedfast, unmovable, always abound- ing in the work of the Lord, as knowing our labour shall not be in vain in the Lord." The breathing time of which they speak was not of long continuance. Soon after the Restoration (1660) the meetings of Nonconformists were continually disturbed by the constables, and their preachers were carried before the magistrates and fined or imprisoned. One instance of these persecutions will, perhaps, be more impressive than any general statements. In the records of one of the churches at Bristol still existing, and having, now aud for perhaps nearly two centuries, their place of meeting in Broadmead, but at this time meeting in divers places, we find this remark: "On the 29th of November 1685 our pastor, Brother Fownes, died in Gloucester jail, having been kept there for two years and about nine months a prisoner, unjustly and maliciously, for the testimony of Jesus and preaching the gospel. He was a man of great learning, of a sound judgment, an able preacher, having great knowledge in divinity, law, physic, &c.; a bold and patient sufferer for the Lord Jesus and

the gospel he preached." From the same records we learn that on the 25th March 1683, whilst Mr Fownes was preaching in the wood where they were accustomed secretly to meet, they were surrounded by horse and foot. Mr Fownes was taken and committed "to Gloucester jail for six months on the Oxford Act." The record adds, ''the text Brother Fownes had been preaching from was 2 Tim. il 9." There could scarcely have been found a more appropriate text for his last sermon to the congregation,—" Wherein I suffer trouble as an evil doer even unto bonds; but the word of God is not bound."

With the Revolution of 1688, and the passing of the Act of Toleration in 1689, the history of the persecution of Baptists, as well as of other Protestant dissenters, ends. The removal of the remaining disabilities, such as those imposed by the Test and Corporation Acts repealed in 1828, has no special bearing on Baptists more than on other Nonconformists The ministers of the "three de- nominations of dissenters,"—-Presbyterians, Independents, and Baptists,—resident in London and the neighbour- hood, had the privilege accorded to them of presenting on proper occasions an address to the sovereign in state, a privilege which they still enjoy

The Baptists were early divided into two sections,—those -who in accordance with Arminian views held the doctrine

of "General Redemption," and those who, agreeing with the Calvinistic theory, held the doctrine of " Particular Redemption ;" and hence they assumed respectively the names of General Baptists and Particular Baptists. In the last century many of the General Baptists had gradually adopted the Arian, or, perhaps the Socinian theory ; whilst, on the other hand, the Calvinism of the Particular Baptists had in many of the churches become more rigid, and approached or actually became Antinomianism. In 1770 the orthodox portion of the General Baptists formed themselves into a separate association, under the name of the General Baptist New Connection, since which time the "Qld Connection" has gradually merged into the Unitarian denomination. Somewhat later many of the Particular Baptist churches became more moderate in their Calvinism, a result largely attributable to the writings of Andrew Fuller. Up to this time the great majority of the Baptists admitted none either to membership or communion who were not baptized,

the principal exception being the churches in Bedfordshire and Hertfordshire, founded or influenced by Bunyan, who maintained that difference of opinion in respect to water baptism was no bar to com- munion. At the beginning of the present century this question was the occasion of great and long-continued discussion, in which the celebrated Robert Hall took a principal part. The practice of mixed communion gradually spread in the denomination. Still more recently many Baptist churches have considered it right to admit to full membership persons professing faith in Christ, who do not agree with them respecting the ordinance of baptism. Such churches justify their practice on the ground that they ought to grantto all their fellow Christians thesame right of private judgment as they claim for themselves. It may not be out of place here to correct the mistake, which is by no means uncommon, that the terms Particular and General as applied to Baptist congregations are intended to express this differ- ence in their practice, whereas these terms relate, as has been already said, to the difference‘in their doctrinal views. The difference now under consideration is expressed by the terms “strict” and “open,” according as communion (or membership) is or is not confined to persons who, accord- ing to their view, are baptized.

The Baptists early felt the necessity of providing an educated ministry for their congregations. Some of their leading pastors had been educated in one or other of the English universities. Others had by their own efforts obtained a large amount of learning, amongst whom Dr John Gill was eminent for his knowledge of Hebrew. He is said to have assisted Bishop Walton in the preparation of his Polyglot. Mr Edward Terrill, from whose Records we have already quoted, and who died in 1685, left a considerable part of his estate for the instruction of young men for the ministry, under the superintendence of the pastor of the church now meeting in Broadmead, Bristol, of which he was a member. Other bequests for the same purpose were made, and from the year 1720 the Baptist Academy, as it was then called, received young men as students for the ministry amongst the Baptists. Fifty years later, in 1770, a society, called the Bristol Education Society, was formed to enlarge this academy; and it was still further enlarged by the erection of the present Bristol Baptist College about the year 1811. In the North of England a similar Education Society was formed in 1804 at Bradford, Yorkshire, which has since been removed to Rawdon

near Leeds. In the metropolis a college was formed in 1810 at Stepney, and was removed to Regent's Park in 1856. The Pastors' College in connection with the Metropolitan Tabernacle was instituted in 1856. Besides these, the General Baptists have maintained a college since 1797 which at present is carricd on at Chil-

well, near Nottingham. A theological institution, intended to promote the views of the "Strict" Baptists, has lately (1866) been established at Manchester. There is also a Baptist theological institution in Scotland, and there are three colleges in Wales. 'The total number of students in these institutions may be reckoned to be about 200.

The Baptists were the first denomination of British Christians that undertook the work of missions to the heathen, which has become so prominent a feature in the religious activity of the present century. As early as the year 1784, the Northamptonshire Association of Baptist churches resolved to recommend that the first Monday of every month should be set apart for prayer for the spread of the gospel, a practice which has since, as a German writer remarks, extended over all Protestant Christendom, and we may add over all Protestant Missions. Six years later, in 1792, the Baptist Missionary Society was formed at Kettering in Northamptonshire, after a sermon on Isaiah lii, 2, 3, preached by the afterwards celebrated William Carey, the prime mover in the work, in which he urged two points: " Expect great things from God ; attempt great things for God." In the course of the following year Carey sailed for India, where he was joined a few years later by Marshman and Ward, and the mission was established at Serampore. The great work of Dr Carey's life was the translation of the Bible into the various languages and dialects of India. The society's operations are now carried on, not only in the East, but in the West Indies, Africa, and Europe. In 1873 there were employed 87 European missionaries and 229 native pastors and evangelists, at 423 stations,—the total number of members of churches being 32,444. The funds of the society amounted to up- wards of £40,000, exclusive of the amount raised at mission stations. In 1816 the General Baptists established a missionary society, the operations of which

are confined to India. It employs 16 missionaries, male and female, and 16 native preachers, and has an annual income of £14,000.

In regard to church government, the Baptists agree with the Independents that each separate church is complete in itself, and has, therefore, power to choose its own ministers, and to make such regulations as it deems to be most in accordance with the purpose of its existence, that is, the advancement of the religion of Christ. A comparatively small section of the denomination maintain that a ‘plurality of elders” or pastors is required for the com- plete organization of every separate church. This is the distinctive peculiarity of those churches in Scotland and the north of England which are known as Scotch Baptists. The largest church of this section, consisting at present of 484 members, originated in Edinburgh in 1765, before which date only one Baptist church—that of Keiss in Caithness, formed about 1750— appears to have existed in Scotland. The greater number of the churches are united in associations voluntarily formed, all of them determined by geographical limits except the General Baptist Association, which includes all the churches connected with that body. The associations, as well as the churches not in connection with them, are united together in the Baptist Union of Great Britain and Ireland, formed in 1813, This union, however, exerts no authori- tative action over the separate churches. One important part of the work of the union is the collection of information in which all the churches are interested. According to the Baptist Handbook for the present year (1875), there are in the United Kingdom—Baptist churches, 2612; places of worship, 3321; pastors, 1916 ; members, 254,998.

Some of the English settlers in all parts of the world have carried with them the principles and practice of the Baptists. The introduction of Baptist views in America was due to

Roger Williams, who emigrated to Boston, Massachusetts, in 1630. Driven from Massachusetts on account of his denying the power of the civil magistrate in matters of religion, he formed a settlement and founded a state in Rhode Island, and having beconie a Baptist he formed, in 1639, the first Baptist church in America, of which he was also for a short time the pastor. It is impossible here to trace the history of the Baptists in the United States.

In 1873 there are reported—churches, 20,520; ministers, 12,589; members, 1,633,939. The great majority of the churches practise “strict” communion. Their missionary society is large and successful, and perhaps is best known in this country through the life of devoted labour of Dr Judson in Burmah. There are many Baptist churches also throughout British America. In the more recent colonies of Australia and New Zealand a large number of Baptist churches have been formed during the last twenty-five years, and have been principally supplied with ministers from England. (F. w. G.)

BAR, a town of Russian Poland, in the government of Podolia, 50 miles N.E. of Kaminetz. It is situated on the River Kov, an affluent of the Bug, and was formerly called by that name itself. Its present designation was bestowed in memory of Bari in Italy, by Bona Sforza, the consort of Sigismund I. of Poland, who had rebuilt the town after its destruction in 1452 by the Tatars. From 1672 to 1699 it remained in possession of the Turks. In 1678 a con- spiracy of the Polish nobles, Pulaski, Krasinski, and others, against the Russians was formed in the town, which was shortly after taken by storm, but did not become finally united to Russia till the partition of 1793. Eleven fairs are held every year, but the trade of the place is not very great. Population, 8077.

BAR-HEBRAUS. See AnuLraractvs, vol. i. p. 60.

BAR-LE-DUC, or Bar-sur-ORNAIN, the chief town of the department of Meuse in France. It occupies the declivity and base of a hill, in lat. 48° 46’ 8” N., long. 5° 9’ 47” K ,‘on the River Ornain, a tributary of the Marne, 125 miles E. of Paris, and consists of an upper and lower town, the latter being the more modern and respectable of the two. It is a railway station on the Paris-and-Strasburg line, and the Marne-and-Rhine canal passes in the imme- diate vicinity. A college, a normal school, a society of agriculture and arts, and a public library, are among its educational institutions. The only building of mark is the church of St Pierre, which contains a curious figure of a half decayed body in white marble, originally forming part of the mausoleum of Réné of Chalons, Prince of Orange. The castle, which formed the nucleus of the upper town, was built by Frederick I., duke of Lorraine, in the 10th century. Louis XI. got possession of the place and caused it to be fortified in 1474. It was dismantled under Louis XIV. in

1670, but retains a few relics of the ancient works, An extensive traffic is maintained in wood, wine, and wool ; and the manufactures of cotton stuffs, hats, hosiery, leather, and confections, are considerable, the last-mentioned article being especially celebrated. Population in 1872, 15,175. The district of Bar was governed by a series of counts from 959 to 1354, when it was raised to a duchy, which in 1419 was ceded to Réné of Anjou, and hence-forward followed the fortunes of Lorraine. The motto of the dukes, which has been adopted by the town, was Plus penser que dire. Their coins were usually distinguished by two barbels.

BAR-SUR-AUBE, the chief town of an arrondissement in the department of Aube, in France. It is a station on the Paris-and-Mulhouse line, and is situated on the right bank of the River Aube, at the foot of Sainte-Germaine, in a picturesque district, the wine of which is much esteemed. It is a pretty little town, with a few remains of its ancient

fortifications. There are several churches of considerable antiquity—the most remarkable being Saint Maclou. In 1814 Bar-sur-Aube was the scene of several conflicts between Oudinot and the Allied Army, in which the latter ultimately gained the victory. Population in 1872, 4453. Long. 4° 44’ K., lat. 48° 13’ N.

BAR-SUR-SEINHE, the chief town of an arrondissement in the department of the Aube, in France. In the Middle Ages Bar-sur-Seine was a place of considerable importance, and, according to Froissart, contained no fewer than 900 “hotels” or mansions. It was devastated in 1359 by marauders from Lorraine, and suffered greatly in the re- ligious wars of the 16th and 17th centuries. A battle was fought here in 1814 between the French and the Allies. Long, 4° 24’ E., lat, 48° 5’ N. Population in 1872, 2798.

BARA BANKI, a district of British India under the jurisdiction of the Chief Commissioner of Oudh, lies between 96° and 28° of N. lat. and 81° and 82° of E. long. It is bounded on the N.W. by the district of Sitapur; on the N. by Bhardich ; on the N.E. by Gond4; on the E. by Faizabad ; on the S. by Sult4npur and Rai Barelf; and on the W. by Lucknow. The district stretches out in a level plain interspersed with numerous jhzls or marshes. In the

upper part of the district the soil is sandy, while in the lower part it is clayey, and produces finer crops. The principal rivers are the Ghagrd (Gogra), forming the northern boun- dary, and the Gumti, flowing through the middle of the district. Both are navigable by country cargo boats. Area, 1735 square miles, of which 1244 are classified as follows :—821 cultivated, 172 culturable but not cultivated, and 251 unculturable waste. Estimated population in 1869, 875,587, or 650 to the square mile, living in 148,166 houses and 2065 villages; Hindus, 748,061; Mahome- tans, 127,315; Christians, 76. Population in 1872, 1,101,954 souls. Five towns in the district contain over 5000 inhabitants—Nawabganj, 10,496 ; Rudaulf, 12,517 ; Fathipur, 7494; Darfdbid, 5999; and Ramnagar, 5714. Principal crops, and their acreage :—Rice, 132,459 acres ; wheat, 224,583; pulses and other food grains, 304,636 ; oil-seeds, 23,000 ; sugar-cane, 29,586 ; cotton, 509; opium, 3423 ; indigo, 4875 ; fibres, 675 ; tobacco, 6051 ; and vege- tables, 6351 acres. The agricultural stock and beasts of burden in the district consisted in 1871-72 of 83,232 cows and bullocks, 1000 horses, 2590 ponies, 2840 donkeys, 75,928 sheep and goats, 51,060 pigs, 1181 carts, 26,121 ploughs, and 1533 boats. Of the population returned in 1869, 741,989 were agriculturists, and 133,598 non-agricul- turists. The means of communication within the district consist of 337 miles of well-made roads, aud 78 miles of railway were under construction in 1872. Total revenue in 1871~72, £165,662, of which £157,505, or 95 per cent., was derived from the land. The police consist of (1), a regular constabulary force, 490 strong, maintained at a cost of £6812 per annum; and (2), the village watch,

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numbering 9558 men ; total, 10,048, or about 1 to each 100 |

of the population, according to the estimate of 1872. BARAHAT, a town of northern Hindustan, situated in the Himalayas, and within the native state of Garhwal, in 30° 43’ N. lat. and 78° 29’ KE. long. The town was almost destroyed in 1803 by an earthquake—a calamity greatly ageravated by the houses having been built of large stones, with slated roofs. From its central position, it maintains a free communication with all parts of the hills, and those who make the pilgrimage to Gangotri generally halt here and lay in a stock of provisions for the journey. In the neighbourhood stands a curious

trident in honour of Siva. The pedestal is of copper, the shaft of brass about 12 feet, and the forks about 6 feet in length. There is no tradition to show the origin of this curious relic; and although it bears a legible inscription, no one has as yet

deciphered it. The temple in which it was formerly enclosed was destroyed by the earthquake of 1803.

BARANTE, AMABLE GUILLAUME PrRosPER, Baron de Brugiére, an eminent French statesman, and the learned historian of the dukes of Burgundy, was the son of an advocate, and was born at Riom, June 10, 1782. At the age of sixteen he entered the Ecole Polytechnique at Paris, and at twenty obtained his first appointment in the civil service. His abilities secured him rapid promotion, and in 1806 the post of auditor to the council of state was given to him. After being employed in several political missions in Germany, Poland, and Spain, during the next two years, he became prefect of Vienne. At the time of the return of Napoleon I. he held the prefecture of Nantes, and this post he immediately resigned. About this period he married. On the second restoration of the Bourbons he was named councillor of state and Secretary-general of the Ministry of the Interior. About the same time he was elected to the Chamber of Deputies for the two departments of Puy-de-Déme and Loire Inférieure ; but in the following year, in consequence of being under the legal age of a deputy, as required by a new law, he lost his seat. After filling for several years the post of Director-general of Indirect Taxes, he was created, in 1819, a peer of France,- and took an active and prominent part as a member of the opposition in the debates of the Upper Chamber. During the same period the leisure hours which he could spare from his political engagements were devoted to literary studies. After the revolution of July 1830, M. de Barante was appointed ambassador to Turin; whence, five years later, he was transferred in the same capacity to St Petersburg. Throughout the reign of Louis Philippe he remained a supporter of the Government; and after the fall of the monarchy in February 1848, he withdrew from political affairs and retired to his country seat in Auvergne. Shortly before his retirement he had been made Grand Cross of the Legion of Honour. As a scholar his opus

magnum is the Histoire des Ducs de Bourgogne de la Maison de Valois, which appeared in a series of volumes between 1824 and 1828. It procured him immediate ad- mission among the Forty of the French Academy ; and its great qualities of scholarship, impartiality, accuracy, and purity of style, have given him a place among the greatest French historians, Amongst the other literary works of M. de Barante are a Zableaw de la Lnttérature Francaise au dixhuitiéme Siécle, of which several editions were pub- lished; Des Communes et de ’ Aristocratte (1821); a French translation of the dramatic works of Schiller; Questions Constitutionelles (1850); JZtstorre de la Convention Na- tionale, which appeared in six volumes between 1851 and 1853; Histoire du Directoire de la République Frangaise (1855) ; Etudes Historiques et Biographiques (1857); La Vie Politique de M. Royer-Collard (1861), The version of Hamlet for M. Guizot’s Shakespeare was the work of M. de Barante. He spent the last eighteen years of his life in retirement in Auvergne, and died there on November 22,

1866.

BARANYA, a province in the kingdom of Hungary, extending over 1960 square miles. It lies in the angle formed at the junction of the Danube and the Drave, is traversed by offshoots of the Styrian Alps, and contains one city, 13 market-towns, and 341 villages. The in- habitants number about 283,500, and consist of Magyars, Germans, Croatians, and Servians, a large proportion being Roman Catholics. The greater part of the land is fertile, but a portion of it is marshy and unhealthy. The chief products are corn, wine, flax, tobacco, asparagus, and potash. Warm springs are found at Tapoleza, Siklés, and Harkany. There are some valuable quarries of marble and millstones, and numerous coal-mines. The rearing of sheep

and swine is largely engaged in. The province is subdivided into six circles. The capital is Funfkirchen, with a popu- lation of 23,863.

BARANZANO, JEAN ANTOINE, surnamed Redemptus, an eminent natural philosopher and mathematician, was born in Piedmont in 1590, and died at Montargis in 1622. He was a Barnabite monk, and was for a time professor of philo- sophy and mathematics at Annecy. His principal works

are Dranoscopia (1617), De Novis Opinionibus Physicts (1619), Campus Philosophicus (1620). He was greatly esteemed by Lord Bacon, with whom he corresponded, _Bacon's letter to him (Spedding, Letters and Life of Bacon, vii. 374-6) shows that he thoroughly appreciated the new philosophy, and could see its weak as well as its strong points.

BARASAT, a subdivisional town in the district of the 24 Parganas, under the jurisdiction of the Lieutenant- Governor of Bengal, situated in 22° 43' 24" N. lat. and 88° 31' 45" E. long. For a considerable time Baérdsat town was the headquarters of a joint magistracy, known as the "'Bardsat District," but in 1861, on a re-adjustment of boundaries, Barasat district was abolished by order of Government, and was converted into a subdivision of

the 24 Parganas. Population in 1872—Hindus, 6649 ; Mahometans, 5133; Christians, 30; and others, 10; 'total 11,822. Municipal income, £363; expenditure, £289, 4s.; rate of municipal taxation, 74d. per head. It forms a striking illustration of the rural character of the so-called " towns" in Bengal, and is merely an agglomeration of 41 separate villages, in which all the operations of hus- bandry go on precisely as in the adjacent hamlets.
BARATIERE, or Barerrier, JoHN Puri, a very remarkable instance of precocious genius, was born at Schwabach near Nuremberg on the J0th January 1721. His early education was most carefully conducted Ly his father, Francis Baratiere, pastor of the French church at Schwabach, and so rapid was his progress that by the time he was five years of age he could speak French, Latin, and Dutch with ease, and read Greek fluently. He then engaged in the study of Hebrew, and in three years was able to translate the Hebrew Bible into Latin or French, or to retranslate these versions into the original Hebrew. From his reading he collected materials for a dictionary of rare and difficult Hebrew words, with critical and pbilo- logical observations ; and when he was about eleven years old translated from the Hebrew Tudela's Jéinerartum. In his fourteenth year he was admitted Master of Arts at Halle, and received into the Royal Academy at Berlin. The last years of his short life he devoted to the study of history and antiquities, and had collected materials for histories of the Thirty Years' War and of Antitrinitarianism, and for an Inquiry concerning Egyptian Antiquities, His health, which had always been weak, gave way completely under these labours, and he died on the 5th October 1740, aged 19 years

and 8 months. He had published eleven separate works, and left a great quantity of manuscript materials. BARATYNSKI, Jewerenis AxBRaMovitcH, a distin- guished Russian poet, was born in 1792. He was educated at the royal school at St Petersburg, and then entered the army. He served for eight years in Finland, and appears to have got into disgrace on account of some foolish pranks which he had played. During these years he composed his first poem, va, which bears very manifest traces of his residence in Finland. Through the interest of friends he obtained leave from the Czar to retire from the army, and settled near Moscow. There, so far as his broken health would allow him, he devoted his time to poetry, and completed his chief work, The Gipsy, which has been spoken of by critics as the best poem of its kind in the Russian language, and as fully equal, if not superior, to the finest productions of Pouschkin. This was his only work of

any extent; his health gave way completely, and he died in 1844 at Naples, whither be had gone for the sake of the milder climate. A collected edition of his poems appeared at St Petersburg, in 2 vols., in 1835. BARBACENA, a town of Brazil, in the province of Minas-Geraes, situated, at the height of about 3500 feet above the sea, in the Sierra Mantiqueira, 150 miles N.W. of Rio de Janeiro. It has low houses and broad streets, and contains a town-hall, a prison, a hospital, founded in 1852 by Antonio Ferreira Armond, and a “school of inter- mediate instruction,” in which French history and geometry are taught. The trade is principally in gold-dust, cotton, and coffee. Population of town and district, 14,000 BARBADOS, or Barpapozs, the most windward of the Caribbean Tslandg, is situated in lat, 13° 4’ N. and long. 59° 37’ W., 78 miles E. of St Vincent, the island nearest to it in the Caribbean chain. It lies in the track of vessels, and

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Carlisle Bay Needham P%% fo stanns

Sketch Map of Barbados.

is well adapted to be an entrepét of commerce. It has nearly the size and proportions of the Isle of Wight, being 21 miles in length, and about 144 miles in its broadest part. It has a superficial area of 106,470 acres, or about

166 square miles,—70,000 acres (besides grass land) are under cultivation, and nearly 39,000 acres of sugar-cane are annually cut. The island is almost encircled by coral reefs, which in some parts extend seaward nearly three miles. There are two lighthouses, one on the south point and another on the south-east coast. A harbour hght has also been placed on Needham's Point. The harbour, Carlisle Bay, is a large open roadstead. The inner harbour, or careenage, for small vessels, is protected by a breakwater called the Molehead. Barbados presents every variety of scenery,—hill and valley, smooth table-land and rugged rocks. From one point of view the land rises in a suc- cession of limestone and coral terraces, which indicate different periods of upheaval from the sea. From another there is nothing to be seen but a mass of abruptly-rising rocks. The highest elevation, Mount Hillaby, is 114 feet above the level of the sea. The island contains but few

Bridge: town.

History.

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streams or streamlets. The gullies or ravines, the result, no doubt, of volcanic agency, are, however, very numerous, radiating from the high semicircular ridge of the coralline formation in a very regular manner to the west, north, aud south, but not to the east, where the coral rocks end abruptly. 'The chalky soil of the district called Scotland (from its assumed resemblance to the scenery of the Highlands) contains ifwsorea, and is altogether different from the deposits of the coral animals which form the super- ficial area of six-sevenths of the island (91,000 acres). Besides the chalk or marl, sandstone is found in this district. The climate of Barbados is healthy ; the temperature equable. Tor eight months in the year the sea breezes keep it delightfully cool fora tropical country. The extent of cultivation, the absence of swamps (the porous character of the rock immediately underlying the soil preventing accumulations of stagnant water) account for the freedom from miasma. The destruction of the forests may have made the rainfall —upon which successful cultivation depends—somewhat uncertain, but does not seem to have affected it to such an extent as might have been anticipated. The rainfall is caused, apart from elevation, by the exposure of the land to those winds laden with moisture which strike

the island at different periods of the year. The average rainfall of the four years 1753-6 was 55°89 inches; of the twenty five-years 1847-71, 57°74 inches ; of the single year 1873, 51:26 inches. The sugar produc- tion of the island is calculated at 800 hogsheads of 16 ewt. each for every inch of rain.

The N.E. trade-wind blows for three-fourths of the year, and most of the rain comes from the same quarter. March is the driest of the months, and October the wettest ; the average rainfall for the former being 14 inch, and for the latter 9 inches. Leprosy is not uncommon among the negroes, and elephantiasis is so frequent as to be known by the name of “ Barbados leg.”

Bridgetown is the capital and port of the island, and the centre of business activity. It contains about 23,000 inhabitants. Over the creek which received the waters from the heights around the Indians had built a rude bridge. This was known for a long time after the British settlement as the Indian Bridge, but as the settlement grew, and after the old bridge had been replaced by a more solid structure, the place received the name of Bridge- town. The town was destroyed by fire in 1666, and rebuilt, principally of stone, upon a larger scale. It sutfered again from fire in 1766 and 1845. It has a large town-hall. The Government buildings are a handsome pile close to the sea. The town follows the curve of the bay. Behind it the hills begin to rise, forming the first stepping-stone to the higher lands of the interior. At the southern extremity are the extensive buildings for the garrison, Barbados being the headquarters of the troops in the West Indian command.

Opinions differ as to the derivation of the name of the island. It is probably the Spanish word for the hanging branches of a vine which strike root in the earth. In maps of the 16th century the island appears under various names, among which are S¢ Bernardo, Bernardos, Barbu- doso, Baruodos, and Baruwodo. The traces of Indians in this island are more numerous than in any other of the Caribbees. The first recorded visit of Englishmen was in the year 1605, when the crew of the “Olive Blossom” landed, and erected a cross as a memorial of the event, cutting at the same time upon the bark of a tree the words “James, king of England and of this island.” This party of adventurers did not settle, but from the time of their visit the history of Barbados begins. ‘That history has some special features. It shows the

process of peaceful colonization, for the island, acquired without conquest or

bloodshedding, has never since been out of the possession of the British. It was the first English colony where the sugar-cane was plauted. Its colonists have almost from the beginning enjoyed representative institutions, aud the full measure of English freedom. They have always defended their rights with spirit, and shown consistent loyalty to the Crown. The prominence and accessibility of the island have made it important as a military station in the wars with the French and Dutch. And its varying fortunes show the effects of the commercial legislation of England, from the stringent Navigation Laws of Cromwell down to the repeal of the sugar duties in 1874.

The first patent conveying a proprietary interest in Barbados was granted by James I. to Lord Leigh, after- wards earl of Marlborough. In 1624 a ship, belonging to Sir William Courteen, a rich merchant of London, called at Barbados. The country was found to be thickly wooded, and uninhabited, except by a great number of wild hogs. Sir William Courteen, having received a description of the place, sent out two large ships under the authority of Marlborough's patent. One of these, the "John and William," commanded by John Powell, arrived in February 1625, which is therefore the date of the earliest English settlement in the island. The thirty settlers laid the foundation of a town which they called Jamestown, and chose Captain William Deane their governor. But the earl of Carlisle, having obtained from King James in 1624 the warrant for a grant of all the Caribbean Islands, twenty-two in number, agreed, in 1627, to pay the earl of Marlborough £300 a year for his right to Barbados. The patent in favour of Lord Carlisle passed the great seal on 2d July 1627; but during his abseuce on a diplomatic mission soon after, William, earl of Pembroke, the Lord Chamberlain, obtained in the interest of Sir William Cour- teen a grant of several islands, including Barbados. Upon Lord Carlisle's return he obtained the revocation of Lord Pembroke's grant, and the full confirmation of his own rights, pon which he acted in offering to sell parcels of land for an annual payment of 40 Ib of cotton. The Society of London Merchants then obtained from Lord Carlisle a grant of 10,000 acres, and they

appointed Charles Wolferstoue, a native of Bermuda, to proceed with sixty-four persous, and to govern the settlement under a com- mission from the earl. Wolferstone and his party arrived in July 1628 in the bay, kuown thenceforth as Carlisle Bay. ‘The antagonism between the earlier settlers under Courteen’s auspices and Wolferstone’s party broke out into actual fighting. Finding that the validity of his patent was still being disputed, Lord Carlisle obtained a further confirmation of it by the king in April 1629, and at once despatched Sir William Tufton as commander-in-. chief with a sufficient force to subdue the rival settlers… In 1645 Philip Bell became governor, and the real progress of the colony began. Good laws were passed, a judicial system was elaborated ; the island was divided into eleven parishes, and a general assembly formed by two represen- tatives of each parish, elected by a majority of freeholders. A council had been in existence since the time of Wolfer- stone.

The first settlers cultivated maize, sweet potatoes, plan- tains, and yams for their own consumption, and indigo, cotton wool, tobacco, ginger, and aloes for export. Quan- tities of logwood, fustic, and lignum vite were also shipped. But the adaptability of the soil for cane becoming known, ‘ and the necessary knowledge for the manufacture of sugar being obtained, this article at once became the great staple ofthe colony. The value of property very largely increased. The half of an estate of 500 acres, 200 under cane, with buildings and appurtenances, was sold for £7000 about the year 1650, the labourers being slaves from Africa.

It was while the rapid progress of the colony was attracting especial attention, and many persons of family and means, adherents of the royal cause, were finding it a refuge from the troubles at home, that Francis Lord Willoughby of Parham went out as governor, with the con- sent of King Charles II., who had been proclaimed in Barbados as soon as the news of the execution of Charles J. had arrived. Lord Carlisle had died, and his heir had been entrusted with the duty of paying his debts out of the revenue from the island. Lord Willoughby agreed to take a lease from the new earl of the profits of the colony for twenty-one years, to pay Lord Carlisle one-half, and to accept the governorship, including that of the other islands in

the Carlisle grant. Upon his arrival in 1650, notwith- standing the active opposition of a party headed by Colonel Walrond, he procured the passing of an Act acknowledging the king's sovereignty, the proprietary rights of the earl of Carlisle, and his own intcrest derived from the latter. But the Parliament despatched Sir George Ayscue with a squadron and considerable land forces, to reduce the island to submission to its authority. About the same time the famous Navigation Law was enacted, by which foreign ships were prohibited from trading with British colonies, and imports into England and the dependencies were not allowed in foreign bottoms. This restriction had a great effect upon Barbados, which depended upon foreign importation for a great deal of its provisions. Sir G. Ayscue's expedition appeared off Barbados in October 1651. After one unsuccessful attempt, a landing was effected, and Lord Willoughby's force was routed. The counsels of a moderate party in the island, however, prevailed, and a compromise was effected. A treaty was made declaring the authority of the Parliament, but containing provisions not at all unfavourable to the inhabitants, and reserving even to Lord Willoughby his rights in the island. During the Common- wealth prisoners of war were sometimes sent to Barbados. The expedition of 1655 against St Domingo and Jamaica under Penn and Venables was reinforced by a troop of horse and 3500 volunteers from Barbados. At the Restora- tion Lord Willoughby went out once more to Barbados and resumed his office. Several of the faithful adherents of the royal cause in the island were made baronets and knights, but the restrictions upon commercial intercourse which had been imposed by the Parliament were made more stringent. Then doubts began to arise in the minds of the planters as to the title by which they held their estates. They had created by their exertions a very valuable property, and the bare possibility of the earl of Carlisle stepping in and disposscssing them caused much discon- tent. The death of Lord Carlisle brought matters to a erisis, An arrangement was made in 1663 by which the different claimants were satisfied, the proprietary or patent interest was dissolved, and the Crown exercised directly its rights, and undertook the government, although it was not till 1672 that the nomination of the council was taken into the hands of the king. A duty of 44 per cent. upon the produce of the island was levied in 1663 to satisfy the claims and defray the goverument expenses. Lord Willoughby received a new commission, and the only practical change effected in the constitution was that all laws were thence- forward made

subject to confirmation by the king. In 1665 the colony successfully resisted an attack by the Dutch ; but in conducting an expedition against the French in Guadaloupe in 1666, Lord Willoughby was lost in a hurricane, and an eventful and occasionally brilliant career was thus prematurely ended. He was succeeded in the government by his brother, Lord William Willoughby, during whose governorship the division of the Caribbean Islands into Windward and Leeward was made. The hurricane

of 1675 gave a serious clieck to the prosperity of the |

colony. An unsuccessful application was made to the home Government, to remit, on account of the distress that prevailed, the 44 per cent. duty, which pressed very heavily upon the planters. The island had scarcely recovered from the effects of the hurricane when the supply of labour was restricted and its expense increased by the Royal African Company, at the head of which was the duke of York, receiving a charter for the exclusive supply of slaves to the West India Islands. This company had great influence in the appointment of governors; and in consequence of oppressive proceedings and depreciation of the value of property, many families left the island. A number of persons implicated in the duke of Monmonth's rebellion were sent to Barbados and treated harshly. Duties upon sugar were imposed by the mother country, which were increased at the accession of James IL. to 2s. 4d. per cwt. on Muscovado, and to 7s. upon all sugars for common use. From the survey made by governor Sir Richard Dutton in 1683-4, it appears that the population consisted of 17,187 free, 2381 unfree and _ servants (prisoners of war and persons brought from England under engagements for terms of years), and 46,602 slaves. The number of acres in useful possession was 90,517, and of sugar-works 358. These figures show how rapidly, in spite of all difficulties, the colony had grown in sixty years.

The wars in Europe were reproduced upon a smaller scale, though with equal if not greater intensity, among the different nationalities in the West Indies, In such times the seas swarmed with privateers; and freights were so high as to induce the island Legislature to make a vain attempt to regulate them by law. The news of the peace of Ryswick was received with great joy, and matters remained quiet until the declaration of war against France and Spain in 1702 revived privateering in West Indian waters. Events in the

first half of the 18th century do not call for detailed description. It was the custom of the assembly to supplement the salary of the governor (which was paid by the Crown out of the 44 per cent. duty) by special grants, sometimes of large amount. But this did not prevent many constitutional conflicts between the assembly and the executive. During the war which commenced; betwecn England and France in 1756, the West Indies witnessed much fighting, with its attendant suffering. In 1761 a determined attempt was made to break the power of France‘in the archipelago. Barbados entered with enthusiasm into the project. Guadaloupe had been taken in 1759, and. the principal effort now, under Admiral Rodney and General Monckton, was directed against Martinique. In 1762 that island surrendered. Barbados spent £24,000 in raising and equipping her pro- portion of men in the attacking forces ; and in 1765 the House of Commons voted £10,000 as compensation for the expense incurred. By the Treaty of 1763, how- ever, both these islands were restored to France. The constant wars had naturally an injurious effect upon Barbados. During the governorship of the Hon. Edward Hay, who was appointed in 1773, differences of opinion arose as to the state of the island. When the war between England and the American colonies began, the supply of provisions, upon which Barbados depended, necessarily stopped. The assembly addressed a petition to the king, praying for relief; through the interposi- tion of the governor the relief was not immediately granted, but in 1778, when the island was in a very depressed state, the British ministry sent a quantity of provisions for sale at prime cost. With the advent of General Cunninghame as governor another series of con- tentious years began. In the midst of disputes as to the right of the governor to exact certain fees without the consent of the assembly, a hurricane visited the island and

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caused much destruction of property. Parliament in 1782 granted £80,000 for relief, but an attempt to obtain the repeal of the 44 per cent. duty was again unsuccessful. The French were regaining their ascendency in the archi- pelago, and had it not been for the great naval victory won by Sir

George Rodney, Barbados and the remaining British colonies might have fallen to the enemy. As the 18th century closed, the prospect of the great final struggle with France overshadowed the colonies. The Barbadians energetically put themselves in a state of defence, and at the same time voted and privately subscribed money to assist his Majesty to carry on the war. The peace of Amiens, in 1802, relieved anxiety for a brief interval, but hostilities were soon renewed. When in 1805 Napoleon sent a squadron to the archipelago, with 4000 soldiers, the crisis put Barbados on her mettle. The French fleet was suc- cessful in exacting large sums of money from adjacent colonies. Admiral Villeneuve, too, was on his way with a still larger fleet and stronger force. But when Admiral Cochrane arrived off Barbados the safety of the island was secured. Even amid the intense excitement of these events constitutional questions were not forgotten. The governor could only establish martial law when the enemy's fleet was in sight. A premature declaration drew forth a protest from the assembly, and the controversy was only ended when the Home Government asserted the full prerogative of the Crown to impose martial law when necessary for the safety of the island. The most memorable event in 1805 was a flying visit from Lord Nelson in search of a French fleet. In October of the same year the battle of Trafalgar was won, and Bridgetown soon after had its Trafalgar Square and its Nelson statue. In 1809 an expedition sailed from Barbados, under Governor Beckwith, against the French in Martinique. After a bombardment of five days that place was taken. Twelve months later Beckwith similarly attacked Guadaloupe; and when that island was conquered, after some hard fighting, the power of the French in the archipelago was again reduced to its lowest ebb. When the war ended in 1810 in the West Indies, the British were supreme in that region. But danger was threatened from another source. The rupture between Great Britain and the United States in 1812 caused privateering to be resumed to an extent that almost destroyed the commerce of the island, until the abdication of Napoleon and the peace with America in 1814 again brought relief to the colonies. The military history of Barbados ceased at the close of the Peninsular War.

In the meantime Barbadian affairs had attracted notice in Parliament. In 1812 a motion was made in the House of Commons that the 44 per cent. duty should be applied exclusively to local purposes. A considerable

amount of this revenue had been devoted to pensions to persons entirely unconnected with the colony, and it was stated in tho House of Commons that part of the money had been appropriated to the king's household in the reign of William IIT. Nor were the Barbadians themselves back- ward in stating their grievances. In 1813 they protested against the importation of East Indian sugars into Great Britain, and also against the system of patent offices, by which non-resident officials were able to draw large sums from the island for services which they never performed. By Act of the Parliament 6 Geo. IV. c. 114, 1825, foreign com- modities were admitted into the British possessions at mode- raterates of duty if the countries sending those articles would give similar privileges to British ships. As the United States refused reciprocity, the West Indian ports were closed against their vessels, and the United States retaliated by prohibiting all intercourse with British colonies. From the operation of the above-mentioned Act an important constitutional question arose. These duties, levied in the

name of the king, were to be paid into the local treasury for the uses of the colony, but the customs officers, of course appointed from home, received instructions to retain their own salaries from the revenue. This was denounced by the assembly as illegal, and after a long controversy it was agreed, in 1832, that 10 per cent. should be deducted to defray the expense of collecting the tax. Another question arose which illustrates the relations between Eng- land and the colony. By an island Act of 1773, a 2s. 6d. tonnage duty was imposed, but small vessels belonging to residents were only to pay on three voyages a year. Byan Act of Parliament in 1832 this exemption was abolished. The assembly protested and denied the right of Parliament to tax colonies which had representative institutions; but Lord Stanley, in 1833, declared that this right existed, although its exercise was a matter of expediency. After the hurricane of 1831, which was perhaps the severest the island had ever experienced, causing 1591 deaths and a destruction of property estimated at more than a million and a half sterling, another urgent appeal was made for the remission of the 44 per cent. duty, but without effect, although £100,000 was granted by Parliament in 1832 for the relief of the islands which had suffered from the visita- tion; of this sum Barbados took half. By an Act of Parlia- ment passed in 1838, the 44

per ceut. duty was at length removed, after having been in existence for 175 years.

But a social revolution had begun which was destined Slave to change not so much the prosperity of the colony, as the labour.

conditions under which that prosperity arose. From the first settlement, of course, the one great want was labour. As the labour supply increased and became more certain the cultivation expanded, wealth was created, and the importance of the colony grew. In the early days white labour was employed, assisted by Indians obtained from other islands and the mainland of South America, but when the sugar-cane began to be cultivated, negro slaves were imported from Africa. This slave trade, mostly conducted by companies or persons in England, continued until the year 1806, when it was stopped by Act of Parlia- ment. In that year there were 60,000 negroes in the island. This measure was, of course, the first step to the abolition of slavery itself. On the Ist August 1834, the great Act of Emancipation came into force, and four years of apprenticeship began. Out of the 20 millions granted for compensation, Barbados received £1,720,345, being an average payment of £20, 14s. on 83,176 slaves. In conse- quence of the large population and small extent of uncul- tivated land, emancipation had not in Barbados such a relaxing effect upon the industry of the negroes as it had in the more thinly-populated colonies. An efficient system of town and rural police was, however, essential. From the time of emancipation the negroes multiplied rapidly. In 1844, out of a total population of 122,198, at least 90,000 were negroes, among whom females were largely in excess. The population, notwithstanding an occasional epidemic and almost continuous emigration, has continued to increase, as the following census returns will show :—

Year. White. Coloured. Black.

MBO fa cdaveccdetss 15,824 30,059 90,056

1861. . 16,594 36,128 100,005

Sole eas sos ccatass 16,560 39,578 105,904

The density of the population in 1871 was therefore 966 to the square mile. The gross population at the end of 1873 was estimated at 170,000.

Production and commerce have undergone great fluctuations. Trade.

Before the navigation laws the Dutch were good customers, but

subsequently the greater part of the produce has been exported to

England. In 1767 the total exports of sugar were 24,000 hhds.;

in 1805 they were 19,805 hhds. In 1808, probably in consequence

of the stoppage of the slave trade, the exports fell to 13,996 hhds.

In 1834 they were 28,341 hhds., and in 1846, with the prospect of 1, — ue

Govern- ment.

Revenue.

Religion.

Education,

the equalization of the English sugar duties upon slave and free grown sugar, they fell to 21,996 hhds. From 1850 to 1872, the average quautity exported annually was 44,000 hhds. The crop of

1873 yielded only 37,337 hhds. The total values of imports and exports in 1850, 1860, and 1873 were as follows :—

Imports. Exports. TS50 i eececsocee ets SOS £831,534 P36 Oseseetes «igs 941,761 984,294 Te: ee, 88 1,193,814 1,024, 088

Of the imports £365,189 were from the United Kingdom, £171,592 from British Colonies, £485,275 from the United States, and the remainder from

other foreign countries. The exports were thus distributed :—£471,175 to the United Kingdom, £388,791 to British Colonies, and £164,166 to foreign countries, including £125,640 to United States. Of the total exports 65 per cent. consisted of native productions, sugar, molasses, and rum. The balance consists of the transit trade, which contributes largely and increasingly to the commercial business of the island. ‘The number of ships entered from the United Kingdom in 1873 was 74, tonnage, 22,590; from United States, 181, tonnage, 40,725 ; from British North American Colonies, 125, tonnage, 19,283 ; from West Indies and Guiana, 851, tonnage, 44,323. The total number of ships entered was 1406, with a tonnage of 153,400 tons. But in 1878 the crop was defi- cient. The figures for 1875 will show the employment of a much larger quantity of shipping.

Barbados is gradually becoming the central mart for all the Wind- ward Islands, even Trinidad finding it more advantageous to derive her breadstuffs, &c., from this quarter, than to import them direct from the continent. There was formerly an extensive whale-fishery round the island, and recently attempts have been made to revive its importance. Many other fishes would afford an excellent return, but this source of wealth isin great measure neglected. The anchovy is frequently driven up in shoals on the coast. The flying-fish is one of the principal articles in the Bridgetown market ; barracoudas, sharks, and conger-eels are also exposed.

The local government consists of a governor (who is also governor- in-chief of St Vincent, Grenada, Tobago, aud St Lucia); a legisla- tive council (the members of which form as well an executive council), appointed by the sovereign, and holding office during pleasure, and the house of assembly. In former times the council exercised judicial functions, but in 1841 a chief-justice was ap- pointed, and recent improvements have relieved the council of their equity and nearly all their appellate jurisdiction. The island is still divided into 11 parishes, each of which sends two representatives to the assembly. In addition to the parishes, Bridgetown sends two members. The number of voters, with the necessary property qualification, is about 1350. The business of the legislature is con- ducted according to the forms of the English Parliament, even to the election of a speaker to preside over the assembly, the initia- tion of money bills in that house, and the assertion of the right to exclude strangers. Theassemblyis elected annually. Thie revenue

of the island in 1873 was £123,676, derived mainly from import duties, tonnage and port-dues, licences, and rum duty. The ex- penditure was £121,796. The total parochial taxation in 1873 was £31,569, which brings the gross amount of general taxation to £155,245, being at the rate of £1, 9s. 1d. per acre, or 17s. 6d. per head of population. The island is free from debt. The, judicial establishment includes a court of chancery, which is conducted according to the rules, and follows the decisions, of the English court; a court of common pleas, criminal sessions, &c. The common law of England, modified by local enactmeuts, isin force inBarbados.

The Church of England is the prevailing form of religion in the island. In 1871 the population was thus classified :—Church of England, 144,080; Wesleyans, 12,267; Moravians, 4733; and Roman Catholics, 518. Each parish has a rector, and there are twenty-eight curates in the island, all paid by the colonial revenue. The other denominations are also now entitled to grants. In the early days of the plantation, the clergy were paid by one pound of sugar for every acre of land in their parish. The first bishop of Barbados (the diocese including other colonies) was the Right Rev. W. Hart Coleridge, who arrived in 1825, and remained till 1842, when the diocese was divided, and the bishopric of Antigua founded. Trinidad has recently withdrawn from the diocese of Barbados and the Windward Islands, and founded a separate bishopric. Education is extending in Barbados. There were in 1873, 79 primary schools with 8900 scholars on the register, and 67 infant schools, with 5500 scholars, but the average attendance is much smaller. The Government expenditure on these schools for the year was £4000. The principal educational establishment is Codrington College, founded by Colonel Christopher Codrington. He bequeathed two estates, known as Consett’s and Codrington’s, to the Society for the Propagation of the Gospel. They consisted of 763 acres, 3 wind- mills, sugar buildings, 315 negroes, and 100 head of cattle. The society came into possession in 1712. The will declared that the plantations were to be coutinued, and 300 negroes always kept upon them; that professors and scholars were to be maintained; and physic,

chirurgery, and divinity were to be studied and practised. The college was commenced in 1716, and has seen many vicissitudes. One of its principal objects has been the preparation of candidates for holy orders. There are several theological scholarships of the value of £30 per annuin from the college funds, and three of similar value paid by the Colonial treasury. There is a school, recently assisted by the public funds, called the Codrington Collegiate Grammar School, in close connection with the coilege. Harrison's College, in Bridgetown, established on an old foundation, has been liberally supported by the Legislature, and promises useful results, Ligon's History of Barbados, 1657 ; Oldmixon's British Empire in America, 1741; A Short History of Barbados, 1768 ; Remarks upon the Short History, 1768; Poyer's History of Barbados, 1808 ; Capt. Thom. Southey's Chron. Hist. of W. Indies, 1827 ; Schom- burgk's History of Barbados, 1848 ; Griffith Hughes, Nat. History of Barbados ; Maycock's Flora Barbadensts ; Patent Rolls, Public Record Office ; Annual Reports, '' Colonial Possessions ;'' Colonial Office List; Governor Rawson's Report on Population, 1872, and Rainfall, 1874. (J. L. 0.)

BARBAROSSA, meaning red-beard, the name of two celebrated Turkish corsairs of the 16th century. They were the sons of a Roumelian sipahi who had settled in Mitylene after the capture of that island by Mahomet IL, and who appears to have embraced Islamism. The elder of the two is generally called Aruch, Horuk, or Ouradjh ; the name of the younger was Khizr, but he was afterwards called by the sultan Khazr-ed-deen, meaning " one good in the faith," which was corrupted by the Christians into Hayraddin. The brothers early betook themselves to piracy; and after various successes and reverses, they acquired suflicient wealth and renown to enable them to fit out a small fleet with which they ravaged the shores of the Mediterranean, and became the pests of that sea. A richly laden vessel which they presented to the sultan at Con- stantinople procured for them honorary caftans and recognition of their services. About the year 1516, after having been for some time in the service of the bey of Tunis, they began to acquire considerable possessions on the coast of Africa. Hayraddin seized the island of Shershel, and Aruch gained a footing in Algiers. The latter began to extend his conquests into the district of Telmessan or Tlemcen, and was resisted by the Arabs, who summoned the Spaniards of Oran to their assistance. Aruch fell in battle in 1518, and was succeeded at Algiers by

Hayraddin, who, after the reigning prince, Selim, was removed (in what way is somewhat doubtful), consolidated his power by placing himself under the Sublime Porte. Solyman, who was delighted at obtaining so much territory at such a small cost, conferred upon Hayraddin the title of Begler-beg of Algiers. The power of the pirates rapidly increased ; Algeciras, a small island opposite Algiers, was taken from the Spaniards after an obstinate resistance, and was united with the mainland by a mole. The coasts of the Mediterranean were completely at the mercy of Barbarossa, who carried off immense numbers of slaves. In 1533, when Solyman was about to make war upon his great rival, Charles V., Hayraddin joined him with a number of ships. He was received with great honour, and made admiral (capitan-pasha) of the fleet. His greatest exploit was the capture of Tunis, in which he obtained a footing by adopting the cause of a rival prince. As soon as he had deposed Muley Hassan, the reigning sovereign, he seized the town for himself and held it despite the resistance of the people. Charles V., however, sent out a great fleet, under Andrea Doria, who retook the town after a protracted siege. Barbarossa escaped to Algiers, collected his fleet, and again swept the seas. He plundered the coasts of Italy, captured Castelnuova, and inflicted a severe defeat on Doria. He died at Constantinople 4th July 1546. (See Von Hammer, Geschichte des Osmanischen Reaches, iil. 164, seg.; also Blackwood's Magazine, vol. lii.) The Em- peror Frederick I. is very frequently designated by the surname Barbarossa.

BAR—BAR

BARBARY, the general designation of that part of Northern Africa which is bounded on the E. by Egypt, W. by the Atlantic, 8. by the Sahara, and N. by the Mediterranean, and comprises the states of Marocco, Algeria, Tunis, and Tripoli. The name is derived from the Berbers, one of the most remarkable races in the region. (See Arrica, vol. i. p. 251, AucERIA, Marocco, TRIPOLI, TUNIS.

Err waiiio; a fortified city of Spain, in the province of Huesca, on the River Vero, near its junction with the Cinca. It has an interesting cathedral and seven other churches, with several hospitals. It was recovered from the Moors in 1065. The brothers Argensola were born here. The inhabitants are

chiefly employed in tanning and currying leather. Long. 0° 20’ W., lat. 41° 54’ N.

BARBAULD, Mrs Anna Letitia, was born at Kib- worth-Harcourt, in Leicestershire, on the 20th June 1743. Her father, the Rev. John Aikin, was a Presbyterian clergyman, who conducted a private school at that place. He instructed his daughter very carefully, and besides the usual female accomplishments she acquired a good knowledge of Latin and a fair knowledge of Greek. In 1758 Mr Aikin removed his family to Warrington, to act as theological tutor in a dissenting academy there. In 1773 Miss Aikin, at the earnest request of her brother, Dr John Aikin, known as the author of the Hvenings at Home, consented to publish some of her poems. The volume was very successful, four editions being called for in the course of the year. In 1774 she married the Rev. Rochemont Barbauld, a Presbyterian minister, descended from a French Protestant family who had settled in England. He had been educated in the academy at Warrington, and had recently been appointed to a church at Palgrave, in Suffolk. There he began a private boarding-school, in the work of which he was most ably assisted by Mrs Barbauld, who superintended the younger pupils. Among those who passed through her hands, and who looked back with pleasure to the instruction given by her, were Sir William Gell, Lord Denman, and William Taylor of Norwich. The Hymns in Prose and the Harly Lessons were written by her about this time for the use of her young charges, and proved admirably adapted for the purpose of instructing children. ‘They have been frequently reprinted. In 1785 she left England for the Continent with her husband, whose health had been seriously impaired. On their return after a residence of about two years, Mr Barbauld was appointed to a church at Hampstead, where they resided till 1802. In 1792 Mrs Barbauld assisted her brother Dr Aikin in the composition of the popular series Evenings at Home, but, it is said, contributed only a few pieces. In 1795 she published an edition of Akenside’s Pleasures of Imagination, with a critical essay ; and two years later, she edited in a similar manner Collins’s Odes. In 1804, after their removal to Stoke Newington, she pub- lished a selection of papers from the English Essayists, and a selection from Richardson’s correspondence, with a biographical notice. The critical remarks prefixed to these

publications have been much admired; they are generally | In 1810 she ,

judicious, in good taste, and well expressed. published a collection of the British Novelists, with biographical and critical notices. In the following year she published her longest poem, entitled Lighteen Hundred and Eleven, depicting the political and social events of the time, and giving rather a gloomy view of the existing state and future prospects of Britain. The poem is in many respects scarcely worthy of the author's reputation. Mrs Barbauld died on the 9th March 1825; she had been a widow from 1808. A collected edition of her works, with Memoir, was published by her niece, Miss Lucy Aikin, in 2 vols, 1826. (See A. L. Le Breton, Memowr of Mrs

Barbauld, 1874; G. A. Ellis, Memoir of Mrs A. L. Barbauld, 1874.)

BARBER, one whose occupation it is to shave or trim beards. In former times the barber's craft was dignified with the title of a profession, being conjoined with the art ot surgery. In France the barber-surgeons were separated from the perruquiers, and incorporated as a distinct body in the reign of Louis XIV. In England barbers first received incorporation from Edward IV. in 1461. By 32 Henry VIII. c. 42, they were united with the company of surgeons, it being enacted that the barbers should con- fine themselves to the minor operations of blood-letting and drawing teeth, while the surgeons were prohibited from "barbery or shaving." In 1745 barbers and surgeons were separated into distinct corporations by 18 George II. c. 15. The barber's shop was a favourite resort of idle persons ; and in addition to its attraction as a focus of news, a lute, viol, or some such musical instrument, was always kept for the entertainment of waiting customers. The barber's sign consisted of a striped pole, from which was suspended a basin, symbols the use of which is still preserved. The fillet round the pole indicated the ribbon for bandaging the arm in bleeding, and the basin the vessel to receive the blood.

BARBERINI, the title of a powerful family, originally of Tuscan extraction, who settled in Florence during the early part of the 11th century. They acquired great wealth and influence, and in 1623 Maffeo Barberini was

raised to the papal throne as Urban VIII. He made his brother, Antonio, and two nephews, cardinals, and gave to a third nephew, Taddeo, the principality of Palestrina. Great jealousy of their increasing power was excited amongst the neighbouring princes, and Odoardo Farnese, duke of Parma, made war upon Taddeo and defeated the papal troops. After the death of Urban in 1644 his successor, Innocent X., showed hostility to the Barberini family. Taddeo fled to Paris, where he died in 1647; but the others after a short period returned to Italy and had their property restored. The principality of Palestrina is still in the hands of the family; and their magnificent palace and library at Rome give evidence of their wealth and magni- ficence.

BARBEYRAC, JEAN, an able writer on the principles of natural law, was the nephew of Charles Barbeyrac, a distinguished physician of Montpellier, and was born at Béziers in Lower Languedoc, in 1674. He removed, along with his family, into Switzerland after the revocation of the Edict of Nantes, and there studied jurisprudence. After spending some time at Geneva and Frankfort-on-the- Main, he became professor of belles lettres in the French school of Berlin, Thence, in 1711, he was called to the professorship of history and civil law at Lausanne, and finally settled as professor of public law at Groningen. He died in 1744, His first published work of any extent was the curious 7’raité du Jeu, 1709, in which he defends the morality of games of chance. His fame rests chiefly on

‘ the preface and notes to his translation of Putfendorf’s

celebrated treatise De Jure Nature et Gentium. In funda- inental principles he follows almost entirely Locke and Puffendorf ; but he works out with great skill the theory of moral obligation, referring it to the command or will of God. He indicates the distinction, developed more fully by Thomasius and Kant, between the legal and the moral qualities of action | The principles of international law he reduces to those of the !aw of nature, and combats, in so doing, many of the positions taken up by Grotius. He rejects the notion that sovereignty in any way resembles property, and makes even marriage a matter of civil con- tract. Barbeyrac also translated Grotius’s De Jure Belli et Pacis, Cumberland’s De Legibus Nature, and Puffendorf’s

sinaller treatise on obligations. Among his own produc- tions are a treatise, De la Morale des Peres, and a history of ancient treaties, contained in the Supplément au grand corps diplomatique.

BARBIERI, Giovanni Francesco (otherwise called Guxrcrno, from his squinting), an eminent historical painter, was born at Cento, a village not far from Bologna, in 1590. His artistic powers were developed very rapidly, and at the age of seventeen he was associated with Benedetto Gennari, a well-known painter of the Bolognese school. The fame of the young painter spread beyond his native village, and in 1615 he removed to Bologna, where his paintings were much admired. His first style was formed after that of the Carracci; but the strong colouring and shadows employed by Caravaggio made a deep impression on his mind, and for a considerable period his productions showed evident traces of that painter's influence. Some of his latest pieces approach rather to the manner of his great contemporary Guido, and are painted with more lightness and clearness Guercino was esteemed very highly in his lifetime, not only by the nobles and princes of Italy, but by his brother artists, who placed him in the first rank of painters. He was remarkable for the extreme rapidity of his execution; he completed no fewer than 106 large altar pieces for churches, and his other paintings amount to about 144. His most famous piece is thought to be the Sta Petronilla, which was painted at Rome for Gregory XV. and is now in the Capitol, Guercino continued to paint and teach up to the time of his death in 1666. He had amassed a handsome fortune by his labours.

BARBIERI, Paoto ANToNIo, a celebrated painter of still life and animals, the brother of Guercino, was born at Cento in 1596. He chose for his subjects fruits, flowers, insects, and animals, which he painted after nature with a lively tint of colour, great tenderness of pencil, and a strong character of truth and life. He died in 1640.

BARBOUR, Jon, the author of the great Scottish national poem The Bruce, was born, probably in Aberdeen- shire, about the beginning of the 14th century. He was a contemporary of Chaucer and Gower; but so little is known of his life, that the very date of his birth can be only approximately

given as about 1316. In 1357, as we learn from a safe-conduct permitting him to visit Oxford for the purpose of study,! he held the position of arch-deacon of Aberdeen. In 1364 he was again permitted to enter England for a similar purpose,* and in 1368 he received letters of safe-conduct authorizing him to pass through England on his way to France,' whither, it may be conjectured, he was proceeding in order to visit the famous university of Paris. From this date to his death, which took place probably in March 1395, notices of him are slightly more numerous, In 1373 he is described as hold- ing the office of clerk of audit of the king's household.* About the same time he must have been busily engaged in the composition of his great work, for, as he himself tells us, his poem was more than half finished in 1375.

'In the tyme of the compiling Off this buk this Robert wes King ; And off his kynrik passit was Fyve yer ; and wes the yer off grace A thousand, thre hundyr, sevynty And fyve, and off his eld sixty.'®

A sum of ten pounds, which was paid to the poet by the king's orders in 1377,° was in all probability a royal gift on the completion of the work. Barbour seems indeed to

1 Rotult Scotic, i. p. 808.

2 Tbid., i. p. 886.

8 Tbid., i. p. 926.

+ Accounts of the Great Chamberlains of Scotland, vol. ii. p. 19. 5 Barbour's Bruce, p. 274, Jamieson's ed,

8 Kushequer Roiis, No. 82.

' have been well treated by his sovereign ; he received a perpetual annuity of twenty shillings,' which he bequeathed to the dean and chapter of Aberdeen as payment of a yearly mass to be said for his soul), tithes of the parish of Rayne in the Garioch, and a crown wardship,. always a lucrative office in these times. A further bounty of ten pounds a year during life, granted in 1388, was probably a reward on the completion of the poet's

second large work, The Brute. The cessation of payment of this annuity enables us to fix with some accuracy the date of Barbour's death.

The Bruce, which is Barbour's principal poem, although it is almost the sole authority for the events of the period, is not to be considered as merely a rhyming chronicle.® His theme was freedom and the liberation of his country from the dominion of a foreign people. The age of Bruce was the age of Scottish chivalry, and the king himself presented the most perfect model of a valiant knight. With such a crisis and such a hero, therefore, it is not surprising that Barbour should have achieved a work of lasting fame.

The poem begins with an account of the succession to the Scottish crown after the death of Alexander III. In this part of his poem Barbour has made a slight anachron- ism. He makes his hero compete with John Baliol for the crown of Scotland, while it was his grandfather, the Lord of Annandale, who unsuccessfully contested the right. Then follows a lamentable account of the desolation of the country and the oppression of the people by the English. Bruce's energetic actions to free his country, and his romantic adventures, which form so interesting an episode in Scottish history, are narrated with great minuteness, down to the battle of Bannockburn, which is described with all its interesting details. At this point the national epic properly ends ; but Barbour further relates the ex- pedition of Bruce to Ireland, and the exploits of Douglas and Randolph on the borders, and concludes with an account of the deaths of King Robert and his gallant knights.

The next in order of his writings was that before referred to, called The Brute, of which it is believed no MS. exists, unless the supposition of Mr Henry Bradshaw, librarian of the university of Cambridge, be correct, that about 2000 lines of two MS. Zroy-books, by Lydgate, preserved in the Cambridge and Bodleian Libraries, form part of this poem. It appears to have comprised a genealogical history of the kings of Scotland, deducing their origin from the great medieval hero, Brutus, son of Ascanius, and grandson of /Eneas, supposed to have been the first king of Britain. The existence of such a work is fully established by various passages in Wyntown's Cronykul.

‘‘This Nynus had a sone alsua, Sere Dardane lord of Frygia. Fra quham Barbere sutely Has made a propyr Genealogy, Tyl Robert oure secownd kyng, That Scotland had in governyng. ‘Of Bruttus lyneage quha wyll her. He luk the tretis of Barbere, Mad in-tyl a Genealogy Rycht wele, and mare perfytly Than I can on ony wys Wytht all my wyt to yowe dewys.” ‘* The Stewartis oryginale The Archedekyne has tretyt hal In metyre fayre.” 9

It is also referred to by Barbour himself in the following passage :—

- Als Arthur, that throw chevalry Maid Bretane maistres and lady

7 Eachequer Rolls, Nos. 177, 178.

8 It contains the earliest notice of the ancient Celtic poetry of Scot- Jand. See Barbour’s Bruce, p. 438, Jamieson’s ed.

® Cronykil of Scotland, ix. 1, TI. iii, 189, VIII, vii. 143.

BARBOUR

Off twelf kinrykis that he wan ;

And alsua, as a noble man,

He wan throw bataill Fraunce all fre, And Lucius Yber wencusyt he,

That then of Rome was emperour: Bot yeit, for all his gret valour, Modreyt his systir son him slew,

And gud men als ma than inew, Throw tresoune and throw wikkitnes ; The Broite beris thairoff wytnes.” !

The last of the works of Barbour was his Book of Legends

of Sarnts, which contained, as the author tells us— ‘* Storyss of sere haly men That to pless God vs may kene. The manuscript of this work (which was brought to light a few years ago by Mr Bradshaw) is preserved in the library of the university of Cambridge. The Legends are contained in a tall, narrow volume of paper, closely written in an unmistakably Scottish hand,

containing a great many thousand lines in the usual verse of Barbour. This, taken in connection with certain incidental notices which the writer gives of himself, and certain stories which he tells of what happened in his time, leaves little room for doubt as to the author. ‘The following extract from the account of a cure performed by St Ninian upon a native of Elgin may be given as a specimen of these legends :— ‘A lytil tale yit herd I tell

That in to my tyme befel

Of a gudman in Murefe borne

In Elgyne and his kine beforne

And callit vas a faithful man

Vithall thame that hyme knew than

And this man trastely I say

For I kend hyme weile mony day

Johne Balormy ves his name

A man of ful gud fame

And in processe of tyme tyd hyme

Til haf the worme in til his lyme

And wrocht sa in his schank and kne

That bath ware thai lyk tyut to be.” ?

he works of Barbour are interesting in a philological point of view. At one time they were regarded as the first written in what was termed the ancient Scottish, a special language, which was supposed to have been derived directly from the Suio-Gothic, or the Mceso-Gothic of Ul!philas. The extraordinary circumstance, however, was that Barbour and other early

Scottish poets, such as Wyntown, James 1, and Lyndsay, speak of the language as “Inglis.” In The Bruce the following passage occurs :—

‘«This wes the spek he maid perfay As is in Ynglis toung to say.” 8

It is now generally admitted that these poets wrote in a language founded on the Anglo-Saxon of the northern type, and nearly identical with that spoken in the northern half of England, which was general from the Trent to the Forth, and northwards on the eastern coast as far as Aberdeen. In this extensive district a Doric dialect of English was general, and in the 14th century there was no greater difference between the written language of York and ot Eastern Scotland than there is now between the modern speech of Aberdeen and Edinburgh.*

According to Warton,> Barbour has adorned the Eng- lish language by a strain of versification, expression, and poetical imagery, far superior to the age. Dr Nott® remarks that he has given his countrymen a fine example

1 Barbour’s Bruce, p. 20, Jamieson’s ed. In one of the MSS. ol Lydgate is a note—“ Her endis the monk and begynnys Barbour.”

2 National MSS. of Scotland, pt. ii. No. 75.

3 Barbour’s Bruce, iv. p. 252.

4 For an estimate of the position of Barbour in the literature of the period, see Matzner’s Altenglische Sprachproben, iy jo Lhe

5 Hist. of English Poetry, ii. p. 154.

8 Diss. on English Poetry prefixed to Surrey and Wyatt’s Poems, p. 190.

of the simple, energetic style, which resembled Chaucer’s best manner, and wanted little to make it the genuine language of poetry. Simplicity may be said to be the main feature in the plan and conduct of his poems. His story is throughout his first and chief object, and he shows great anxiety lest in any point of the actual adventures he may mislead his reader. He prays that

he may say “nought bot suthfast thing,” and he was the first who did so with some of the graces of the fables of romance. He has, however, a heart for every kind of nobleness. His far- famed encomium on political freedom is distinguished by a manly and dignified strain of sentiment :—

“A ! fredome is a noble thing ! Fredome mayss man to haiff liking, Fredome all solace to man giffis :

He levys at ess that frely levys!

A noble hart may haiff nane ess,

Na ellys nocht that may him pless, Gyff fredome failyhe ; for fre liking Is yharnyt our all othir thing.

Na he that ay hass levyt fre,

May nocht knaw weill the propyrte, The angyr, na the wrechyt dome That is cowplyt to foule thyrldome : Rot gyff he had assayt it,

Than all perquer he suld it wyt,

And suld think fredome mar to pryss Than all the gold in warld that is.”7

The following passage cannot be passed without par- ticular notice; the annals of heroes furnish but few instances of so pleasing a nature, whether it be that heroes seldom stoop to actions of mere benevolence, or that their historians do not think it of much importance to transmit such actions to posterity :—

‘‘The king has hard a woman cry ; He askyt quhat that wes in hy. ‘It is the layndar, Schyr,’ said ane, ‘That her child-ill rycht now has tane, ‘And mon leve now behind ws her ; ‘Tharfor scho makys yone iwill cher’, The king said, ‘ Certis it war pite ‘That scho in that poynt left suld be ; ‘ For certis I trow thar is na man ‘That he ne will rew a woman than.’ Hiss ost all thar arestyt he, And gert a tent sone stentit be, And gert hyr gang in hastily, And othyr wemen to be hyr by, Quhill scho wes deliuer, he baid ; And syne furth on his wayis raid : And how scho furth suld caryit be, Or euir he furth fur,

ordanyt he. This wes a full gret curtasy, That swilk a king, and sa miglity, Gert his men duell on this maner Bot for a pouir lauender.” ®

It has been stated that Barbour presents us with but few studies of natural scenery. His description of spring is, however, worthy of his muse, and contrasts favourably with any of the poetry of the period :—

“This wes in ver, quhen wynter tyde, With his blastis hidwyss to byde, Was our-drywyn, and byrdis smale, As turturis and the nychtyngale, Begouth rycht meraly to syng ; And for to mak in thair singyng Swete notis, and sownys ser,

And melodys plesand to her ;

And the treis begouth to ma

Burgeons, and brycht blomys alsua,

To wyn the helyng off thair hewid,

That wykkyt wyntir had thaim rewid.”

Of Barbour’s Bruce neither the original manuscript nor any contemporary copy is known to exist. It is a some-

7 Barbour’s Bruce, p. 10, Jamieson’s ed. 8 Tbid., p. 320. 9 Jbid., p. 89.

what remarkable circumstance thet the earliest specimen of Barbour’s language is to be found in extracts inserted by Wyntown in his Cronyki, which may be set down as belonging to the year 1440.1. A valuable manuscript of The Bruce is preserved in the Advocates’ Library, Edinburgh, which was penned by John Ramsay in 1489. Ramsay is supposed to be the same person that was after- wards prior of the Carthusian monastery at Perth. This transcript is stated to have been executed at the request of Simon Lochmalony, vicar of Moonsie.

Another manuscript exists in the library of St John's College, Cambridge, and is dated 1487. The handwriting is very like that of the Advocatcs' Library manuscript, and from the initials of the transcriber being J. R., it is supposed that this is another transcript made somewhat earlier by the same scribe. This last manuscript affords perhaps the best readings, but each serves to correct errors and to supply omissions of the other.

The printed editions are almost a century later. The first known edition of The Bruce is believed to have been printed at Edinburgh in 1570-71, but of this only one imperfect copy is known to exist. The next known edition is that printed at Edinburgh by Andro Hart in 1616, only one copy of which is extant. Another edition was printed by Hart in 1620. Kditions were issued by Andrew Anderson, Edinburgh, 1670, 12mo; Robert Saunders, Glasgow, 1672; Robert Freebairn, Edinburgh, 1715 or 1716 (issued with a false title page in 1758); Carmichael and Miller, Edinburgh, 1737. John Pinkerton issued an edition in 1790, printed at London, in 3 vols. 8vo, which he styles "the first genuine edition." It was taken from the Advocates' Library manuscript, but, as his transcript was executed neither by himself nor under his immediate inspection, many gross inaccuracies were suffered to remain uncorrected. Dr John Jamieson printed an edition at Edinburgh in 1820, in 4to. This was a careful print of the Advocates' Library manuscript. Mr Cosmo Innes printed an edition for the Spalding Club in 1856, It was made from a collation of the Advocates' Library and the Cambridge manuscripts. The Rev. W. W. Skeat is at present (1875) engaged in editing an edition for the Karly English Text Society (extra series), 1870-75. This edition is founded on the Cambridge manuscript, carefully collated with the Edinburgh manuscript and with Hart's edition of 1616, and occasionally with Anderson's edition of 1670. (3. SM.)

BARBUDA, one of the lesser Antilles or Caribbean islands, is 10 miles in length by about 8 in breadth, present- ing a very flat surface, covered to a great extent with woods, in which deer abound. Many varieties of shell-fish and other fish are found on the coast, which is also frequented by large flocks of water-fowl. The part of the island under cultivation is fertile; corn, cotton, sugar, tobacco, and indigo are grown ; and the rearing of cattle is one of the principal occupations. So salubrious is the climate that Barbuda serves as a kind of sanitariwm for the adjacent islands. The inhabitants, who

number less than 2000, are mainly negroes. The island was annexed to Britain in 1628, and was bestowed in 1680 on the Codrington family, in whose possession it still remains. The north point is in lat. 17° 33’ N. and long. 61° 43’ W.

BARCA, a maritime district of Northern Africa, which formerly belonged to Tripoli, but was raised in 1869 to be a separate province immediately dependent on Constanti- nople, It extends from the Gulf of Sert (the ancient Syrtes) to the Egyptian frontier, between lat. 30° and 33° N. and between long. 20° and 25° E., and has an area of about 60,700 square miles. This territory is traversed

1 Cronykil of Scotland, book viii. c, 2 and 18.

from east to west by a mountain chain varying in height from 400 or 500 to upwards of 1800 feet. A great part of Barca, particularly towards the coast, is very fertile, abounding with excellent pasturage, and producing large supplies of corn. ‘The chief town is Bengazi.

BARCA, an ancient city in Cyrenaica, and within the above district, to which it gave name. Its ruins are now known as £i/-Jfedinah. It was situated between Cyrene (now Grennah) and Hesperides (now Bengazt), about 11 miles distant from the sea, on the top of the rising ground that overlooks the Syrtes. It was founded about 554 B.c. by a colony from Cyrene, who fled from the ill-treatment of Arcesilaus II., and obtained the co-operation of a nuniber of Libyans. About forty-four years after its foundation it suffered severely from the revenge of Pheretima, the mother of Arcesilaus III., being captured and pillaged by the Persians, to whom she had appealed for assistance, while large numbers of its inhabitants were led captive to Bactria. In the time of the Ptolemies the founding of a new city, Ptolemais, on the sea-coast drew away from the older site a large part of the population; but Barca continued to exist for several centuries after the Christian era, and even seems to have risen again into importance under the Arabs. Theruinsare few, andare thought to be those of the Arab city.

BARCELONA, formerly the capital of the kingdom of Catalonia, and now the chief town of the Spanish province to which it gives its name, isa flourishing city and seaport on the shore of the Mediterranean, in lat. 41° 22’ N. and long. 2° 9’ E., between the rivers Bésos (Batulo) on the north and the Llobregat (ubricatus) on the south, It stands on the sloping edge of a small but fertile plain now covered with villas and gardens. Immediately to the south-east rise the Montjuich hills to the height of 650 feet, crowned by an important fortification ; while on the west, the north, and the north-east, the view is bounded by the heights of San Pedro Martio, Valcanca, and Moncada. Barcelona was formerly surrounded by a strong line of ramparts, and defended, or, more correctly, overawed by a citadel on the north-east, erected in 1715 by Philip V. on Vauban’s principle; but these fortifications being felt as a painful restriction on the natural development of the city, were, in spite of the opposition of the central Govern- ment, finally abolished by the local authorities in 1845. The walls of the moat were utilized for the cellars of the houses which soon occupied the site of the ramparts, and the ground, which had been covered by the citadel, was laid out in horticultural gardens. A rapid extension of the city to the north-west took place, and in 1860 an elaborate plan for the laying out of new districts received the royal sanction. Barcelona thus comprises an old and a new town, differing from each other in many important features, the former still consisting for the most part of irregular and narrow streets, while the latter has all the symmetry and precision of a premeditated scheme. The buildings of the old town are chiefly of brick, from

four to five stories in height, with flat roofs, and other

Eastern peculiarities ; while in the new town hewn stone is very largely employed, and the architecture is often of a modern English style. To the south-east, on the tongue of land that helps to form the port, lies the suburb of Barceloneta. It owes its origin to the marquis de Ja Mina, who, about 1754, did so much for the city, and is regularly laid out, the houses being built of brick after a uniform pattern. The main street or axis of the old town is the Rambla, a favourite resort of the higher classes, which has a fine promenade planted with plane-trees running down the middle, and contains the principal hotels and theatres of the city. Among the most important of

the squares are the Plaza de Palacio, the Plaza Real, and the Plaza del Teatro. The Paseo de San Jnan and the Gardin del

BARCELONA

General to the north-east of the town are being removed. The site of the former is to be occupied by a large market, while the latter is to be absorbed into the Park. Barcelona is the see of a bishop, and, like most Spanish towns, has a large number of ecclesiastical buildings, though by no means So Many as it once possessed. If Barceloneta on

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G Casas Consistoriale. P Market

Ground-Plan of Barcelona.

the one hand, and Garcia, a suburban village, on the other, be included, the number of churches amounts to twenty- seven, and eighteen of these are parrogquas, while no fewer than eighteen convents were still standing in 1873. The cathedral, erected between 1298 and 1448, but not yet finished, is a spacious building in the Pointed style, and contains the tomb of Santa Eulalia, the patron saint of the city. Its stained glass windows are among the finest in Spain, and it possesses archives of great value. Santa Maria del Mar, Santos Justo y Pastor, San Pedro de las Puellas, and San Pablo del Campo, are all churches worthy of mention, San Miguel in Barceloneta, which preserved a curious ancient mosaic and contained the tomb of the marquis de la Mina, has been taken down.

‘The educational institutions of Barcelona have from an eariy period been numerous and important. The university (Universidad Literaria) was originally founded in 1430 by the magistracy of the city, and received a bull of confirma-

tion from Pope Nicholas V. in 1450, possessing at that time four faculties and thirty-one chairs, all endowed by the corporation (vide Capmany’s Memorias). It was sup- pressed in 1714, but restored in 1841, and now occupies an extensive building in the new town. There are, besides, an academy of natural sciences, a college of medicine and surgery, — confirmed by a bull of Benedict XIII. in 1400,— an academy of fine arts, a normal school, a theological seminary, an upper industrial school, an institution for the education of deaf-mutes, a school of navigation, and many minor establishments. Gratuitous instruction of a very high order is afforded by the Board of Trade to upwards of two thousand pupils, The principal charitable founda- tions are the Casa de Caridad, or House of Industry, the Hospital General, dating from 1401, and the Foundling Hospital. The Montes de Piedad are, in fact, mutual bene- fit societies; and that of Nostra Sefiora de la Esperanza has this peculiarity, that loans on deposits are made without interest to necessitous persons, thousands of whom yearly avail themselves of its advantages. The principal civic and commercial buildings are the Casa Consistorial, a fine Gothic hall, the Lonja, or Exchange, dating from 1383, and the Aduana, or Custom-house, built in 1792. At the seaward end of the Rambla is a large ancient structure, the Atarazanas, or Arsenals, which was finished about 1243. A portion of it was recently taken down to give a better view tothe promenade. Remains of the former royal state

| of Barcelona are found in the Palacio Real of the kings of

Aragon, and the Palacio de la Reina. At the highest part of the city, in the Calle del Paradis, are some magnificent columns, and other Roman remains, which, however, are hidden by the surrounding buildings.

The inhabitants of Barcelona are not only an intelligent and industrious, but a gay and pleasure-loving people. Means of public recreation are

abundantly supplied. There are no fewer than fourteen theatres of more or less pretension, the two most important being the Teatro Principal and the Teatro del Liceo. The latter is a very fine building, originally erected in 1845 on the site of a convent of Trinitarian monks, and capable of containing 4000 spectators. A striking feature in Barcelona society is the development of social life; and the number of restaurants and similar places of evening resort is very great. A pleasant promenade is furnished not only by the Rambla but by the Muralla del Mar, or sea-wall, which was largely due to the marquis de la Mina, and is now undergoing extensive alteration by the reclaiming of a strip of land from the port.

Barcelona has long been the industrial and commercial centre of Eastern Spain—a pre-eminence which dates from the 12th and 13th centuries. It was the rival of Genoa and Venice, and in renown its hardy mariners were second to none. The origin of the famous code of maritime laws known as the Consolado del mar is usually, though not with absolute certainty, ascribed to its merchants ; and it is pretty well established that they were the first to employ the method of marine insurance. We find them at an early period trading, not only with the ports of the Mediterranean, but with the Low Countries and England, on the one hand, and with Constantinople and Damascus, Egypt and Armenia, on the other,—entering into treaties with kings and magistracies, and establishing in all important places consuls to look after their interests, The prosperity so deeply rooted continued through numerous vicissitudes till the emancipation of the Spanish American colonies, when a comparative decline setin. This, however, proved only temporary, and, in spite of the disastrous con- sequences of the French invasicn, and the various revolu- tious of the country since then, Barcelona has no need to look back with regret to the past. A great variety of

industries are now carried on—the most important being the spinning and weaving of wool, cotton, and silk. Of the numerous guilds that were anciently formed in the city an interesting list is to be found in Capmany. It carries on a large shipping trade. In 1872 between 700 and 800 foreign vessels, with a tonnage of 360,000 tons, discharged their cargoes in the port. Of these 160 were British. The imports from the colonies are sugar, cotton,

tobacco, rum, wax, dye-wood, &c.; machinery, coals, coke, cotton, wool, thread, and other stuffs, are brought from England ; articles of silk, chemical preparations, pastes and flours of all sorts, objects of fashion, wines and liquors, from France ; petroleum, cotton, and staves from North America; cotton from the Brazils and Smyrna; _ hides from the River Plate ; salt-fish from the North Sea. The export trade is not so extensive, consisting largely of fruits and vegetables, oil, silk, wines, salt, &c. The so-called port of Barcelona was at first only an open beach, slightly sheltered by the neighbouring hills, but at an early period the advantage of some artificial protection was felt. In 1438 we find Don Alphonso V. granting the magistracy a licence to build a mole; and in 1474 the oll de Santa Creu was officially commenced. Long after this, however, travellers speak of Barcelona as destitute of a harbour ; and it is only in the 17th century that satisfactory works were undertaken. Down to a very recent period all the included area was shut off from the open sea by a sand- bank, which rendered the entrance of large vessels impossible. An extension of the former mole, and the con- struction of another from the foot of Montjuich, have embraced a portion of the sea outside of the bank, and a convenient shelter is thus afforded for the heaviest men of war. The depth in this part is about 40 feet, while within the sandbank it is from 18 to 20. Barcelona is well supplied with inland communication by rail, and the traffic of its own streets is largely facilitated by tramway lines running from the port as far as Garcia.

According to traditions preserved by the Roman writers, Barcelona owed its origin, or at least its first importance, to the Carthaginians under Hamilcar Barca, after whom it was called Darcino. It received a Roman colony, and was known by the name of Faventia, After having shared in the various vicissitudes of the barbaric invasions, it became the capital of a dukedom under Louis the Pious, and not long after began to give the title of count toa family that soon made itself independent. In 985 the city was captured by the Moors, but not long after it was recovered by Count Borell. In 1151 Raymund Berenguer married the daughter of Ramiro II. of Aragon, and thus the countship of Barcelona was united to that kingdom by his son. From the successive princes of the line the city recelved many privileges. In 1640 Barcelona was the centre of the Catalonian rebellion against Philip IV., and threw itself under French protection. In 1652 it returned to its

allegiance, but was captured by the duke of Vendéme in 1697. At the peace of Ryswick, in the same year, it was restored to the Spanish monarchy. During the War of the Succession Barcelona adhered to the house of Austria. The seizure of Montjuich in 1705 and the subsequent capture of the city by the earl of Peterborough formed one of his most brilliant achievements. In 1714 it was taken after an obstinate resistance by the duke of Berwick in the interests of Louis XIV., and at-the close of the war was reluctantly reconciled to the Bourbon dynasty. At the commencement of Bonaparte's attempt on the liberty of Spain, the French troops obtained possession of the fortress, and kept the city in subjection. Since then it has shared in most of the revolutionary movements that have swept over Spain, and has frequently been distinguished by the violence of its civic commotions. By the census

of 1857 the population of the city amounted to 180,014, and by an enumeration in 1864 the city and suburbs were found to contain 252,000 persons. (See Manifestacion de mutchos relevantes servicios de Barcelona, Barcelona, 1697 ; Capmany, Memorias historicas sobre Barcelona, 1779-92 ; Chantreau, Lettres de Barcelonne, 1793; Hare, Wanderings in Spain.)

BARCLAY, ALExaNDER, an English poet, was born probably about 1476. His nationality has been matter of much literary dispute, but the evidence on the whole seems to point to the conclusion that, though he spent the greater part of his life in England, he was a native of Scotland. The place of his education is equally doubtful; he studied at one of the great English universities, but at which has not yet been settled by his biographers. He received a benefice from the provost of Oriel College, Oxford, and it might therefore be inferred that he had been a student at that place. But Oxford is nowhere referred to in his writings, whereas Cambridge is mentioned once. He appears to have travelled on the Continent after complet- ing his university course, and on his return received an appointment as chaplain in the collegiate church at Ottery St Mary in Devonshire. He afterwards became a Benedictine monk of the monastery of Ely, and at length assumed the habit of St Francis at Canterbury. Having survived the dissolution of the monasteries, he became successively vicar of Much-Badew in Essex, and,

in 1546, of Wokey in Somersetshire ; and a few months be- fore his death he was presented by the dean and chapter of Canterbury to the rectory of All-Saints in Lombard Street. As he retained some of his preferments in the reign of Edward VL. it is presumed that he must have complied with the changes of the times. He died at an advanced age in the year 1552, and was interred at Croydon. Barclay wrote at a period when the standard of English poetry was extremely low; and, as excellence is always comparative, this circumstance may partly enable us ta account for the high reputation which he enjoyed among his contemporaries. At the same time his best work, being a comprehensive and easily understood satire on the manners of the times, naturally acquired a wide popularity, and was extensively read. The title given to it was the Ship of Fooles, and it was first printed by Pinson in 1509. The original design, and many of the details, were derived from Sebastian Brandt, a civilian of Strasburg, who in 1494 published a poem entitled Das Narren Schyff, which was so well adapted to the taste of the age that a Latin and a French version appeared in 1497, and another French version in 1498. Barclay professes to: have trans- lated ‘oute of Laten, Frenche, and Doche;” but to the original cargo he has added many fools of English growth, Under the representation of a ship freighted with fools of various denominations, the poet exposes the prevalent vices and follies of the age; and although, as Warton remarks, the poem is destitute of plot and the voyage of adventures, the general design was found to possess many attractions. The work is of considerable importance, as giving a clear though by no means pleasing picture of English society and lower class life in the time of Henry VIII., and also as marking a stage in the progress of the English language. Barclay’s vocabulary is essentially that of the people. His other works are—Zhe Castell of Labowre, 1506; The Mirrour of Good Manners, translated from the poem of Mancini De quatuor Virtutibus ; The Egloges ; a version of Sallust ; an Jntroduction to Write and to Pronounce Frenche ; and some small pieces. A catalogue of all these, with full notice of the little that is known concerning Barclay, and ample bibliographical information, is supplied by Mr Jamieson in the introduction to his edition of the Ship of Fools, Edin., 1874.

BpAkC L &Y

BARCLAY, Joun, a distinguished scholar and writer, was born, January 28, 1582, at Pont-a-Mousson, where his father William Barclay (see below) was professor of civil law. Educated at the Jesuits' college, he gave evidence of remarkable ability at an early age, and was only nineteen when he published a commentary upon the Thebais of Statius. The Jesuits were naturally desirous that he should enter their order, but to this both himself and his father were averse. The jealous eumity of the order was roused against them in consequence of this refusal, and in 1603 both left France and crossed over to England. In the following year they returned and settled at Angers, where Barclay's father had been appointed pro- fessor of law. Soon after the death of his father in 1605, Barclay appears to have married, and to have settled in London, where in 1606 he published the second part of his Satyricon, the first part having appeared on his previous visit to England. In 1610 he edited an important treatise left by his father, De Potestate Pape, which involved him in controversy with the famous Cardinal Bellarmin. In 1614 appeared the wittiest and most interesting part of the Satyricon, entitled Icon Animorum, which gives a critical survey of the varied manners and characteristics of the several European nations. It has been frequently reprinted. In 1616, after a short stay in Paris, he proceeded to Rome, where he continued to reside till his death on 12th August 1621. His romance, Argenis, was passing through the press at the period of his death, and it appeared in the course of the same year, Barclay, from what reason is not apparent, failed to attain the position to which his talents seemed fairly to entitle him. His reputation as a writer and scholar was remarkably high among his con- temporaries. Grotius and others have lavished praises on the purity and elegance of his Latin style; his romance was extremely popular; and some of his Latin poems are very happy. 'The idea of the Satyricon, one of his two extensive compositions, is borrowed from Petronius; in the details, however, the work fortunately does not follow that author so closely. It was very extensively read, and has passed through several editions. The Argenzs, a long Latin romance, sometimes looked on as a political allegory, was very popular. Itis said to have been warmly admired by Richelieu and Leibnitz, while Cowper, Disraeli, and Coleridge speak of it in terms of high admiration. The value that was put upon it by Barclay's contemporaries and immediate successors may be gathered from the critical estimate of it given in the Vita Larclazi, prefixed to later editions of the work. ' Habet enim," says the anonymous writer of

the life, “heroicum Tullii vigorem, Laconismum et politicam Taciti, Livii antiquitatem, flosculos puros Petronii, sales fabulosos Nasonis, poeticam Maronica via inferiorem.” There have been numerous editions of the book, which has been translated into almost every European language.

BARCLAY, Jonny, M.D., an eminent anatomist, was born in Perthshire in 1760, and died at Edinburgh in 1826. After the usual routine of parochial education, he completed his academical course at the United College of St Andrews. He subsequently studied divinity there, and was licensed as a preacher by the Presbytery of Dunkeld. Having repaired to Edinburgh in 1789, as tutor to the family of Sir James Campbell of Aberuchill, he began to give his attention to the study of medi- cine, and particularly to human and comparative anatomy. He became assistant to Mr John Bcll, and took the degree of M.D. in 1796, after having defended an inaugural dissertation, De Anima seu Principio Vitali, a subject which occupied his maturer powers towards the close of his life. Immediately aftcr his graduation, he repaired to London, and studied for some time under Dr

Marshall, at that time a very distinguished teacher of anatomy in the metropolis. Soonafter his return to Edin- burgh, he commenced his lectures on anatomy in November 1797, and speedily attracted an audience, which increased considerably in numbers until the period of his retirement, a short time before his death.

Of Barclay’s professional writings, the earliest, we believe, was the article Puys1oLocy, contributed to the third edition of this work. In 1803 he attempted a reform in the language of anatomy, with a view to render it more accurate and precise,—a task for which his acquirements as a classical scholar rendered him peculiarly well qualified. Although the Nomenclature which he published in that year has not been generally adopted, the profession acknowledged the importance of the object which he had in view, as well as the talent and learning with which it was executed. In 1808 he published his Z’reatise on the Muscular Motions of the Human Body, and in 1812 his Description of the Artcries of the Human Body, a work displaying much acute observation and laborious re- search, which may be considered the most practically useful of all his writings. His last

publication, completed only a few years before his death, was An Inquiry into the Opinions, Ancient and Modern, concerning Life and Organization, a work replete with learning and sound original criticism. His introductory lectures published after his death contain a valuable abridgment of the history of anatomy.

BARCLAY, Joun, founder of a small sect in the Scotch Church called Bereans or Barclayites, was born in Perthshire in 1734, and died at Edinburgh in 1798. He graduated at St Andrews, and after being licensed became assistant to the parish minister of Errol in Perthshire. He developed some very peculiar views, which led to a difference with the minister ; andin 1763 he left and was appointed assist- ant to Mr Dow of Fettercairn. In this parish he became very popular, but his opinions, whether as expounded from the pulpit, or as set forth in a paraphrase of some Psalms which he published, failed to give satisfaction to his Pres- bytery. In 1772 he was rejected as successor to Mr Dow, and was even refused by the Presbytery the testi- monials requisite in order to obtain another living. The refusal of the Presbytery was sustained by the General Assembly, and Mr Barclay thereupon left the Scotch Church. He preached in Edinburgh, London, Bristol, and other places, but with no great success. Neither his writings, which were collected in three volumes, nor the sect formed by him, are of much importance. His adherents were called Bereans, because they regulated their conduct as the in- habitants of Berea are said to have done, by diligently searching the Scriptures (Acts xvii. 11).

BARCLAY, RoBexrt, one of the most eminent writers belonging to the Society of Friends, or Quakers, was born in 1648 at Gordonstown in Morayshire. He was sent to finish his education in Paris, and it appears he was at one time inclined to accept the Roman Catholic faith. In 1667, however, he followed the example of his father, Colonel Barclay of Urie, and joined the recently formed Society of Friends. He was an ardent theological student, aman of warm feelings and considerable mental power, and he soon came prominently forward as the leading apologist of the new doctrine. His greatest work, An Apology for the True Christian Divinity, was published in Latin in 1676, and was an elaborate statement of the grounds for holding certain fundamental positions, laid down in the Theses Z’heologice which had been put forward in the preceding year. The most

prominent of the Theses was that bearing on Immediate Revelation, in which the superiority of this Inner Sight to Reason or Scripture is sharply stated. Barclay experienced to some extent the persecutious inflicted on the new society, and was several times thrown into prison. He died in 1690 at the early age of forty-two. His Apology, which is still the most important manifesto of the Quaker society, was translated by himself into English in 1678. ‘Translations of it into foreign languages have also appeared.

BARCLAY, Wituiam, LL.D., a writer on civil law, was born in Aberdeenshire in the year 1541. He spent the early part of his life, and much of his fortune, at the court of Mary queen of Scots, from whose favour he had reason to expect preferment. In 1573 he went over to France, and at Bourges began to study civil law under the famous Cujas. He continued some years in that semi- nary, where he took his doctor’s degree ; and was soon after appointed professor of civil law in the university of Pont- 4-Mousson, recently founded by the duke of Lorraine. The prince afterwards made him counsellor of state and master of requests. In the year 1581 Barclay married Anne de Malleville, a French lady. Their son was the celebrated John Barclay, author of the Argenis. This youth the Jesuits would gladly have received into their society ; but his father refused his consent, and thereby incurred their bitter enmity. He was compelled to leave France, and re- turned to Britain, where King James offered him a consider- able preferment, provided he would become a member of the Church of England. He would not accept the post on this condition, and went back again to France in 1604. Soon after his arrival he was appointed first professor of the civil law in the University of Angers, where he died the year following, and was buried in the Franciscan church. Barclay wasa man of considerable ability, and his legal writings are still valued. In his political opinions he was directly opposed to his illustrious countryman Buchanan, and was a strenuous defender of the rights of kings; his own speculations on the principles of government are best known to some from an incidental confutation by Locke, in his Treatises on Government. His most important writ- ings were :—

De Regno et Regali Potestate, adversus Buchananum, Brutum, Boucherium, et reliquos Monarchomachos, libri scx, Paris, 1600, Ato; In Titulum Pandectarum de Rebus creditis et Jurejurando Commentarti, Paris, 1605, 8vo ; De Potestate Pape ; an et quatenus in Reges et Principes seculares jus et imperium habeat : Liber post- humus, Mussiponti, 1610, 8vo. This work was translated into French, and an English version is printed with the treatise of Sheldon, Of the Lawfulness of the Oath of Allegiance, Lond. 1611, 4to. Barclay's two treatises, De Regno and De Potestate Pape, have repeatedly been printed in the same volume: Hanover, 1612, 8vo; Hanover, 1617, 8vo.

BARCLAY DE TOLLY, Micwarn, a Russian prince and general, highly distinguished in the wars with Napoleon, was bornin Livonia in 1759. He was a descendant of the old Scotch family of Barclay, a branch of whom had settled in Russia in the 17th century. He was adopted by General Vermoulen, and entered a Russian cuirassier regiment when very young. In 1788 and 1789 be served against the Turks, and in the following years against the Swedes and Poles, In 1806, when Russia took up arms against Napoleon, he commanded the advanced guard at the battle of Pultusk. At Eylau he lost an arm, and was promoted to the rank of lieutenant-general. In 1808 he commanded against the Swedes, and in 1809 by a rapid and daring march for two days over the ice he surprised and seized Umeo. In 1810 he was made minister of war, and retained the post till 1813. There was very keen opposition to the appointment of a foreigner as commander-in-chief, and after the defeat of Smolensk, the outcry was so great that he resigned his office and took a subordinate place under the veteran Kutusoff. On the death of the latter he was reappointed to the supreme command, and fought at the battles of Bautzen, Dresden, and Leipsic. He was unable to bring up his forces in time for the battle of Waterloo, but marched into France and took part in the occupation of Paris. He was rewarded for his services by being made ptince and field-marshal He died in 1818 at Insterburg, in Prussia, while on his way to the Bohemian baths.

BAR-COCHEBAS, or Bar-cocHaB (Son of a Star), a celebrated Jewish leader in the insurrection against Hadrian,

131-135 a.p., whose real name was Simeon. The events of his life belong to the history of the Jews.

BARD, from the Welsh bardd, is the name applied to the ancient Celtic poets, though the word is sometimes loosely used as synonymous with poet in general. So far as can be ascertained, the title bards, and some of the privileges peculiar to that class of poets, are to be found only among Celtic peoples. The name itself is not used by Cexsar in his account of the manners and customs of Gaul and Britain, but he appears to ascribe the functions of the bards to a section of the Druids, with which class they seem to have been closely connected. Later Latin authors, such as Lucan (Pkar., p. 447), Festus (De Vero. Sign. s. v.), and Ammianus Marcellinus (bk. xv.), used the term Bardi as the recognized title of the national poets or singers among the peoples of Gaul and Britain. In Gaul, however, the institution soon disappeared; the purely Celtic peoples were swept back by the waves of Latin and Teutonic conquest, and finally settled in Wales, Ireland, Brittany, and the north of Scotland. There is clear evidence of the existence of bards in all these places, though the known relics belong almost entirely to Wales and Ireland, where the institution was more distinctively national. In Wales they formed an organized society, with hereditary rights and privileges. They were treated with the utmost respect, and were exempt from taxes or military service. Their special duties were to celebrate the victories of their people, and to sing hymns of praise to God. They thus gave poetic expression to the religious and national sentiments of the people, and therefore ex- ercised a very powerful influence. The whole society of bards was regulated by laws, said to have been first dis- tinctly formulated by Hywell Dha, and to have been after- wards revised by Gruffydd ap Conan. At stated intervals great festivals were held, at which the most famous bards from the various districts met and contended in song, the umpires being generally the princes and nobles. Even after the conquest of Wales, these festivals, or Evsi-ddfodau, as they were called, continued to be summoned by the English sovereigns, but from the reign of Elizabeth the custom has been allowed to fall into abeyance. They have not since been

summoned by royal authority, but have been revived, and are held regularly at the present time. In Ireland also the bards were a distinct class with peculiar and hereditary privileges. They appear to have been divided into three great sections: the first celebrated victories and sang hymns of praise; the second chanted the laws of the nation; the third gave poetic genealogies and family histories. The Irish bards were held in high repute, and frequently were brought over to Wales to give instruction to the singers of that country.

See Ed. Jones, Relics of the Welsh Bards, 1784; Walker, Memoirs of the Irish Bards, 1786; Owen Jones, Myvyrian Arche-

ology of Wales, 3 vols., 1801-7 ; W. F. Skene, Four Ancient Books of Wales, 2 vols., 1868.

BARDESANES, or Bar Dersan, a celebrated Gnostic, was a native of Edessa in Mesopotamia, and appears to have flourished during the reign of Marcus Aurelius. Very little is known of his life. He is said’to have held a dis- putation with Apollonius, a philosopher in the train of Lucius Verus, and he is!known to have written against the Marcionite and other heresies. There is considerable doubt whether he was ever a disciple of Valentinus, but it is acknowledged that he never ceased to belong to the Christian church. However seriously his principles, if rigidly interpreted, might conflict with the doctrines of Christianity, he did not regard himself as opposed to that faith, and he was generally considered one of its best defenders. He was especially famed for his hymns, fragments of which are still extant. Of his other works

there seems to remain only a treatise On Fate, a portion uf which was preserved by Eusebius (Prep. Evan., vi. 10), while the whole has been printed from a Syriac MS. with English translation by Cureton (Spicilegium Syriacum, Lond. 1855). The system of Bardesanes, so far as it can be gathered from the scanty notices of other writers, had many points in common with that of Valentinus, but shows to an almost greater extent the influence of Oriental imysti- cism and imagery. He begins, as do all the other Gnostics, with postulating the existence of the Unknown God or

Father, the ground of all the forms of being. Alongside of God, and co-existing with Him,—in fact, His necessary shadow,—is vague, unformed, eternal, and unereated Matter. From this dualism springs the possibility of evil in the universe. Evil is not, indeed, correlative and equally necessary with God, but arises from matter. The Eternal Father, through union with His everlastingly produced, but shadowy companion, brings forth the Son, from whose union with the Holy Spirit (Sophia) spring the elements. The combinations of the productive and receptive agents are ealled syzygzes, aud of them there are seven. Bardesanes, who had deeply studied the Chaldean astrology, seems to have discussed at great length the influence of the stars on human action. He vindicated for man, what may, with some stretch of language, be termed a transcendental freedom. His followers were distinguished by the strange opinion they entertained with regard to the body of Christ, which they held to be only phenomenal, not real. Besides the notices of Bardesanes to be found in general works on Gnosticism,—as those of Baur, Matter, Lipsius, and Man- sel,—the following may be consulted :—Hahn, Bardesanes Gnosticus Syrorum primus hymnologus, 1819 ; Hilgenfeld, Bardesanes, der letate Gnostiker, 1864,

BARDILI, CuristopH GoTTrRieD, a German metaphy- sician, distinguished by his opposition to the system of Kant, was born at Blaubeuren in Wiirtemberg, in 1761, and died at Stuttgart in 1808. Of his numerous works the principal is his Llements of Logic (Grundriss der ersten Logik, Stuttgart, 1800). His system has had but little influence in Germany, the celebrated Reinhold being the only adherent of anyimportance. Yet in some respects his ideas opened the way for the later speculations of Schelling and Hegel. He dissented strongly from the Kantian dis- tinction between matter and form of thought, and urged that philosophy should consider only thought in itself, pure thought, which is the ground or possibility of being. The fundamental principle of thought and criterion of certitude was, aecording to him, the law of identity ; logical thinking was real thinking. The matter upon which thought operated was in itself indefinite and unformed, a mere dzetpov, which was rendered definite or took deter- minate forms through the action upon it of thought. Bardili, however, worked out his fundamental idea in an abstraet, one-sided manner. Thought, as econeeived by him, had no power of development in it, and ultimately reduced itself to a species of arithmetical computation. (See on

his system the notices in Michelet, Geschichte der letzten Systeme, Bd. i.,and Erdmann, Versuch einer Geschichte d. neu. Phil., Bd. iii. pt. i.)

BARDSEY (i.¢., Bard's Island), or in Welsh Ynys ENL1I, the Island of the Current, is situated at the northern ex- tremity of Cardigan Bay. It is 24 miles long by 1 broad, with an area of about 370 acres, of which one-third is hilly. The island produces both barley and oats. On the S.E. side there is a harbour which admits vessels of 40 tons. On the north side are the ruins of St Mary's Abbey, said to have been founded by Cadfan in 516, which afforded refuge to great numbers of fugitives during the 7theentury. The lighthouse has a fixed light 129 feet above high water, in lat. 52° 45' N., long. 4° 47' W.

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BARDWAN (sometimes spelled Burdwan), a division or commissionership in India under the Lieutenant-Governor of Bengal, comprising the districts of Bardwan, Hugli with Howrah, Midnapur, Bankurd or West Bardwan, and Bir- bhum, lies between 23° and 25° N. lat. and between 86° and 89° E. long. It is bounded on the N. by the distriet of the Sautdl Pargan4s in the Bhagalpur division, and Murshidabad in the Rajsh4hi division; on the E. by the Presidency districts of Nadiyé, and the 24 Parganas ; on the 8. by the Bay of Bengal, and on the W. by the native tributary state of Morbhanj, and the district of Manbhim in the Chhoté Nagpur division. In 1872 Bardwan divi- sion contained an area of 12,719 square miles, with a popu- lation of 7,286,957, inhabiting 25,842 towns and villages, and 1,468,791 houses; persons per square mile, 573; villages or townships per square mile, 2°03; houses per square mile, 115 ; persons per village, 282 ; and persons per house, 5. The census of 1872 classifies the population of the Bardwdn division as follow :—Hindus—males, 3,051,967; females, 3,164,093; total, 6,216,060, or 85°3 per cent. : Mahometans—inales, 450,103 ; females, 479,288; total, 929,391, or 12°8 per cent.: Christians —males, 2352; females, 2053; total, 4405, or '1 per eeut. : total—males, 3,572,108, or 49 per eent. ; females, 3,714,849, or 51 per eent. ; grand total, 7,286,957,

BarRDWAN, an important district in the division of the same name, under the Lieutenant-Governor of Ben- gal, situated between 23° 53' and 22°46' N. lat., and between 88° 39' and 86° 52' E. long. It is bounded on the N. by

the distriets of Birbhim and Murshidabad, from whieh it is separated by the River Ajai; on the E. by the districts of Nadiyé and Hugl{, the River Bhagirathi separating it from the former; on the 8. by the districts of Huglt and Midnapur; and on the W. by the districts of Bankura and Manbhim. For fiscal purposes the Board of Revenue returns its area at 3150 square miles :— eultivated, 2810 ; cultivable, but not cultivated, 190; and uneultivable, 150. The census of 1872 gives the police area at 3523 square miles, with a population of 2,034,745 souls, inhabiting 5191 villages, and residing in 435,416 houses. Persons per square mile, 578; per village, 392 ; per house, 4:7. Hindus number 1,679,363, or 82°5 per cent.; Mahoietans, 348,024, or 17:1 per cent. ; Chris- tians, 890, or ‘1 per cent. ; and persons of unspecified reli- gion, 6468, or ‘3 per cent.

Bardwan is a flat plain, and its scenery is uninteresting. Chief rivers—the Bhagiratht, Damodar, Ajai, Banka, Kunur, and Khari, of which only the Bhagirathi is navigable by country cargo boats throughout the year. Agricultural products—paddy, indigo, pulses, oil-seeds, sugar-cane, potatoes, tobacco, wheat, onions, garlic, pump- kins, melons, cucumbers, and vegetables of various kinds. Bardwan district is one of the best cultivated in Lower Bengal. Minerals-— iron, copper, lime and sandstone, and above all, coal. The greater portion of the coal-bearing rocks, known as the Damodar or Raniganj field, is enclosed between the Rivers Damodar and Ajai, and lies between 23° 35’ and 28° 45’ N, lat., and 86° 40’ and 87°15’ E. long., at a distance of from about 120 to 160 miles north-west, from Calcutta. The beds are composed of coarsc and fine sandstones and felspathic coal-seams, the latter being frequently continuous over considerable areas. Those known asthe Lower Damodars are coarse conglomerates, with white sandstones and numerous coal-seams of very irregular character. The working of the Raniganj coal (which at present, 1874, is included within the Bardwan district) dates from 1774, when a company was formed by several English gentle- men for the purpose of mining the collieries ; and in the following year 91 tons of Bardwan coal were despatched to Calcutta. In 1860, 49 collieries were worked, chiefly conducted with European capital, and yielded a total out-turn of 318,300 tons. In 1868 the out-turn of the whole coal-field exceeded 500,000 tons. There are now 44 coal-mines at work within the Bardwan district, of which 19 mines turn out more than 10,000 tons of coal apiece per annum. In the

larger and better mines coal is raised by steam from pits and galleries. In the smaller mines or workings coal is raised by hand-labour from open quarries. In the Raniganj coal-field 61 steam engines, with an aggregate of 867 horse-power, are at work. Only one seam (or set of scams) of a less thickness than 84 feet is

worked, and the average thickness of the seams at the Raniganj mines is about 15 or 16 feet. The pits arc mostly shallow, very few being more than 150 feet deep. The Bengal Coal Company, with its mines at Raniganj and westwards, is alone able to raise more than 200,000 tons of coal annually. Silk and cotton cloth, brass utensils, silver and gold ornaments, and indigo, are the principal manufactures of the district. Three indigo factories in Bardwan are conducted with European capital. Articles of trade consist of rice, tobacco, pulses, wheat, oil-seeds, jute, sugar, salt, English and country made cloths, cotton, molasses, timber, and coal. In 1790 the total revenue of the Bardwan district amounted to £508,093, in 1820 to £453,321, and in 1870 (after transfers of a large part of its area to adjoining districts) to £388,773. The expenditure in 1797 amounted to £11,213, in 1820 to £17,338, and in 1870 to £63,435. The land tax is the principal source of revenue, which amounted in 1790 to £503,272, in 1850 (from a reduced area) to £309,618, and in 1870 to £305,806. For the protection of person and property Government maintained in 1871 a regular constabulary force 682 strong, at a total cost of £11,622 a year, besides 11,052 men of the village watch possessing service lands or paid by the vil- lagers. Bardwan contained 939 schools in 1871-72, attended by 21,926 pupils, and costing £4328 annually to the state. For administrative purposes the district is divided into six magisterial subdivisions—Bardwan, Kalnd, Katwd, Bud-bud, Ranfganj, and Jahdnabad, with 22 police circles. Exclusive of the Bardwan city described below, there are seven towns in the district containing a population of more than 5000 souls. They are also municipalities, and are as follows :—1. Kaélna—population: Hindus, 22,463; Mahometans, 3557 ; Christians, 38; others, 1278 ; total, 27,336: municipal income in 1872, £1185; expenditure, £980; rate of taxation, 10gd. per head. 2. Sydmbdzér—population: Hindus, 19,341; Mahometans, 294; total, 19,635: municipal income, £276 ; expenditure, £224; rate of taxation,

33d. per head. 3. Raniganj — population: Hindus, 17,927; Mahometans, 1473; Christians, 178; total, 19,578: municipal income, £871,12s. ; expenditure, £871,12s. ; rate of taxation, 3d. per head. 4. Jahdna- bad: Hindus, 10,222; Mahomctans, 3187; total, 13,409: muni- cipal income, £238, 18s, ; expenditure, £250, 14s. ; rate of taxation per head, 44d. 5. Bali —population: Hindus, 8150; Mahometans, 669; total, 8819: municipal income, £173,4s.; expenditure, £214, 4s.; rate of municipal taxation, 43d. per head. 6. Katwd—popula- tion: Hindus, 6817; Mahometans, 1131; Christians, 15; total, 7963 : municipal income, £513, 14s.; expenditure, £513, 14s. ; rate of taxation, 1s, 34d. per head. 7. Dainhdt—population : Hindus, 7389; Mahometans, 173; total, 7562: municipal in- come, £398, 8s. ; expenditure, £386, 8s. ; rate of taxation, ls. 08d. er head. The Kast Indian Railway and the Grand Trunk road eading to the North-Western Provinces pass through the district, which has also fifteen other roads communicating with the neigh- bouring districts. The climate of Bardwan was considered a few ‘ee back to be the healthiest in Bengal. But an epidemic fever roke out about 1867, and is still (1874) raging in the district. It causes havoc and depopulation among the cultivating classes. The Maharaja of Bardwan, one of the largest landholders in Bengal, has an income estimated at £400,000 to £500,000 sterling a year. Bardwan district was acquired by the East India Company under the treaty with Nawdb Mir Kasim in 1760, and confirmed by the Emperor Shah Alam in 1765. The land revenue was fixed in perpetuity with the zainindars in 1793.

BarpwAy, the principal town of the district of the same name, situated on the route from Calcutta to Benares, and a station on the Hast Indian Railway, lies in 23° 14’ 15” N. lat., and 87° 53° 57” E. long. Jacquemont formerly described Bardw4n town ‘as consisting of an assemblage of crowded suburbs, of wretched huts, with walls of mud, and covered with thatch, having no temples of striking aspect, and few handsome houses.” At the present time Bardwan is a well-built, busy town, with commodious streets, dotted with large tanks, and surrounded by luxu- riant gardens. The Mahdrdja’s palaces are handsome buildings, furnished in the English style, with elegant mirrors and nick-nacks from Paris, and some tolerable oil paintings. Bardwdn forms the headquarters of the civil authorities of the division and district, consisting of the commissioner, the judge, magistrate, and collector, and their European and native assistants, In 1814 the town

contained a population estimated at 53,927 souls; and in 1872, 32,321. Details of population in 1872 :—Hindus, 22,013 ; Mahometans, 9927; Christians, 223 3 persons of unspecified religion, 158; total, 32,321. Municipal income in 1871, £5450; expenditure, £5450; rate of

taxation, 3s. 4$d. per head. In 1695 Bardwan was besieged by a rebel chief of the Great Mughul. The city soon fell into the hands of the besiegers, the Raja was slain in battle outside the walls, and the ladies of his family committed suicide, to avoid falling into the hands of the conquerors. The present Mahdrdjé is a well-educated, liberal-minded man. He maintains a great public school in the town at his own cost, and is ever forward with help in time of distress or famine, as in 1866 and 1874.

BAREGES, a small town situated between two mountain chains in the department of Hautes Pyrénées in France, about 25 miles from Bagnéres de Bigorre. It is celebrated for its warm sulphurous springs, first brought into notice by the visit of Madame du Maintenon in 1676, the tem- perature of which varies from 88° to 111° Fahr. The benefit of the waters is granted to the army at the expense of the Government, which erected a bath-house in 1864. During the winter the town is so exposed to avalanches that only a few of the residents remain. The town gives its name to a silk-fabric (barége) which is principally manufactured in Bagnéres de Bigorre.

BARELI, or Barurtxy, a district of British India in the Rohilkhand division, under the jurisdiction of the Lt.~~Gover~~ nor of the North-Western Provinces, situated between 28° 2’ and 29° 2’ N. lat., and 79° 2’ 30” and 80° 13’ 15” E. long. It is bounded on the N. by Kuméon district and the inde- pendent state of Nepal; on the E. by a portion of the dis- trict of Shahjahanpur, and the district of Lakhimpur in Oudh ; on the S. by the districts of Buddéon and Shahja- hanpur ; and on the W. by the native state of Rampur and Buddon. Barelf is a level country, watered by many streams, the general slope being towards the south. The soil is fertile and highly cultivated, groves of noble trees abound, and the villages have a neat, prosperous look. A tract of forest jungle, called the Tardi, stretches along the extreme north of the district, and teems with large game, such as tigers, bears, deer, wild pigs, &c.

The River Sard4 or Ghagrd forms the eastern boundary of the district, and is the principal stream. Next in importance is the Ramganga, which receives as its tributaries most of the hill torrents of the Kumdon mountains; the principal ones being the Kast Bahgul, Nakatiya, Deuraniya, Saukh4, Sidhé, Dujaura, Kichaha, West Bahgil, Bhakra, Dhakra, and Dhtra&. The Deoha is another great drainage artery, and receives many minor streanis. The Gomati or Gumti also passes through the district. Bareli district has an area of 2976°70 square miles, of which 1845°28 square miles are under cultivation; 727°65 square miles are cultivable, but not actually undcr cultivation ; 25°16 square miles are held revenue free; and 378°60 square miles are returned as uncultivable waste.

The census of 1872 takes the area at 2982 square miles, and returns the population at 1,507,139 souls, inhabiting 3548 villages or townships, and 296,441 houses; density of population per square mile, 505 ; villages or townships per square mile, 1:2; persons per village or township, 425; houses per square mile, 99; persons per house, 5. Of the total population, 1,197,583, or 79°5 per cent., are Hindus; 308,682, or 20°5 per cent., Mahometans; and 536 Christians, or others of unspecified religion. The Mahometans are chiefly the descendants of Yusafzai Afghans, called the Rohill4 Pathans, who settled in the country about the year 1720. The Rohill4s were formerly the ruling race of the tract of country called Rohilkhand, and are men of a taller stature, a fairer complexion, and a more arrogant air than the general inhabitants of the dis- trict. Bishop Heber has described them as follows:— “The country is burdened with a crowd of lazy, profligate, self-called sawdrs (cavaliers), who, though many of them are not worth a rupee, conceive it derogatory to their gen- tility and Pathén blood to apply themselves to any honest industry, and obtain for the most part a precarious liveli- hood by sponging on the industrious tradesmen and far-

mers, on whom they levy a sort of blackmail, or as hangers on to the few wealthy and noble families yct remaining in the province. These men have no visible means of maintenance, and no visible occupation except that of lounging up and down with their swords and shields, like the ancient

Highlanders, whom in many respects they much resemble.” The Rohillds, after fifty years’ precarious independence, were subjugated in 1774 by the confederacy of British troops with the Nawab of Oudh’s army, which formed so serious a charge against Warren Hastings. Their territory was in that year annexed to Oudh. In 1801 the Nawab of Oudh ceded it to the Company in commutation of the subsidy money. During the Sepoy Mutiny of 1857 the Rohill4s took a very active part against the English, but since then they have been disarmed. Both before and after that year, however, the Barelfi Mahometans have distin- guished themselves by fanatical tumults against thc Hindus.

The inhabitants of the district are for the most part poor, but their condition has improved under English rule. which large quantities are exported, form the principal agricultural products of the district. Pilibhit formed an independent district till its incorporation with Bareli in 1842 ; its rice is celebrated all over the N.W. Provinces. Other agricultural products—wheat, barley, cotton, tobacco, maize, millet, pulses, and fruit. The jungle tract of the district produces fine timber, in which a large trade is carricd on. The total revenue of the district for 1870—71 amounted to £246,419, and the civil expenditure to £80,978. By far the greater part of the revenue is derived from the land; the new settle- ment for thirty years was concluded in 1872, Four towns contain a population of upwards of 5000 souls :—1. Bareli—area, 1280 acres, noticed below. 2. Pilibhit—area, 483 acres; population, 29,840 ; municipal revenue (1872), £3291, 6s.; expenditure, £2698, 2s.; rate of taxation, 2s. 24d. per head. 3. Bisalpur—area, 142 acres ; population, 9250; municipal revenue, £282, 8s.; expenditure, £348, 18s, ; rate of taxation, 73d. per head. 4. Anwlah—area, 128 acres; population, 11,158; municipal revenue, £183, 2s. 54d.; expenditure, £224, 15s. 10d.; rate of taxation, 4d. per head. Other minor towns: Faridpur, population, 4940; Sarauli, 4585; Nawabganj, 4418. There are 19 other towns with a population of above 2000. Barelf shows a heavy criminal return, and the police do not appear to be successful in grappling with crime. The regular police con- sists of a force of 4218 men. In 1872 there were 518 schools in the district, attended by 9265 pupils, besides those attending the university college in the town of Bareli.

Barett | Bareilly], the principal place in the district of the same name, situated on the left bank of the Jua, a tributary of the Western Ramganga, in N, lat. 28° 23’, E. long. 79° 28”. It is a large town, with a brisk and lucrative commerce, and manufactures consisting principally of house furnitures, such as chairs, tables, &c. Mr Thornton says, that “besides the hands engaged in this branch of handicraft, there are cotton weavers, dressers, and twisters, manufac- turers of muslins, and also of silks and brocades, dyers and colour-makers, linen and cloth-plaiters, gold and silver lace-makers, jewellers, goldsmiths, and silversmiths, black- smiths, coppersmiths, and tinmen, cutlers, armourers, scal- makers and engravers, turners, saddlers, tailors, &c., &c.” In 1872 Bareli town contained a population of 102,982, of whom 59,036 were Hindus, 43,463 Mahometans, and 483 of unspecified religion. In 1872 the municipal revenue of the town amounted to £6602, 88.; expenditure, £7217, 12s.; rate of municipal taxation, ls. 33d per head of the population. The municipal revenue is derived from octrot duties levicd on articles of food brought for sale into the town. The principal institution in the town is the Barel{ college, intended as a seat of upper class learning for the surrounding districts of the N.W. Provinces. It is con- ducted by a staff of efficient professors from England, and its course includes the subjects for degrces in the Calcutta University. In 1872-73 it was attended by 310 pupils. The cost of the collegedepartmentand upper school amounted to £5836, of which Government contributed £5330,

BARERE DE VIEUZAC, Berrranp, one of the most notorious members of the French National Convention,

Sugar and rice, of

was born at Tarbes in Gascony, September 10, 1755. He was brought up to the profession of the law, and was admitted advocate to the parliament of Toulouse. He wrote several trivial pieces, panegyrics of Louis XVL, Montesquieu, J. J. Rousseau, and others, which obtained prizes from provincial academies, and a dissertation on a Latin inscription which procured him membership of the Academy of Floral Games of Toulouse. Such was the smooth beginning of a career which ultimately became

unparalleled for meanness, cowardice, lying, and atrocious cruelty. At the age of thirty he married. Four years later, in 1789, he was elected deputy by his own province to the States-general, which met in May. He had made his first visit to Paris in the preceding year. His personal appearance, his manners, social qualities, and liberal opinions, gave him a good standing among the multitude of provincial wise-heads then thronging into Paris, eager to be the saviours of France, or at least of themselves. He took his place at first with the monarchical party ; and his glib pen found occupation in the preparation of various reports, and in editing a journal, the Point du Jour, con- taining reports of the debates of the National Assembly. For a time he formed a connection with the House of Orleans, passing over soon to the republican party. Barére appears to have been wholly free from the restraints of conscience or any guiding principle; lis conduct was re- gulated only by the determination to be on the side of the strongest. After the close of the National Assembly he was nominated one of the judges of the newly-instituted Court of Cassation. In 1792 he was elected deputy to the National Convention for the department of the Hautes Pyrénées. At first he took part with the Girondists; but on the trial of the king he voted, with the Mountain, for the king's death " sans appel et sans sursis." He closcd his speech with a scntence which became memorable, "Tarbre de la liberté ne saurait créitre s'il était arrosé du sang du rois." As the Mountain became the strongest party Barére advanced with it, unscrupulously carrying out its extremest projects, and playing a prominent part in the Reign of Terror. The light-heartedness with which he acted in these awful scenes, the fluency and flippancy of his speeches and reports, procured him the title of the " Anacreon of the Guillotine." He supported Robespierre in his atrocious measure against the Girondists, crawled like a slave at the feet of the "incorruptible" Maximilian till the day of his fall, and then advocated his execution without a hearing. It was Barére who had proposed the decree that no quarter should be given to any English or Hanoverian soldier, which was unanimously adopted. This procured him admission by acclamation to the Jacobin Club, from which he had been previously excluded. The decree, however, remained a dead letter. A few months after the fall of the Convention, proceedings were taken against Barére and his colleagues of the Terror, Collot d'Herbois and Billaud-Varennes, and he was sent to the Isle of Oléron. He was removed to Saintes, and thence escaped to Bordeaux, where he lay in concealment for several years. In 1795 he was

elected member of the Council of Five Hundred, but was not allowed to take his scat. When Napoleon Bonaparte was First Consul he was anxious to employ Barére, but Barére refused the overture. It was only for a while, The witling of the Terror became the hireling and the spy of the new tyranny. On the fall of Napoleon, Barére played the part of royalist, but on the final restoration of the Bourbons in 1815 he was banished for life from France, and then withdrew into Belgium and temporary oblivion. After the Revolution of July 1830 he reappeared in France, was reduced by a series of lawsuits to extreme indigence, accepted a small pension assigned him by Louis Philippe (on whom he had heaped

abuse and railing), aud died, the last survivor of the Committee of Public Safcty, January 15, 1841. Two years after his death appeared Mémowres de Bertrand Barre, edited by Hippolyte Carnot and David of Angers. (See Macaulay's article in the Edinburgh Review, vol. lxxix., in which the character and career of Barére! are discussed with characteristic cmphasis and severity.)

BARETTI, Gruseprs, an Italian critic of some distine- tion, was born at Turin in 1716. He was intended by his father for the profession of law, but at the age of sixteen fled from Turin and went to Guastalla, where he was for some time employed in a mercantile house. His Ilcisure hours he devoted to literature and criticism, in which he became expert. . For many years he led a wandering life, supporting himself chiefly by his writings. At length he arrived in London, where he remained for a considerable time. He obtained an appointment as secretary to the Royal Academy of Painting, and became acquainted with Johnson, Garrick, and others of that society. He was a frequent visitor at the Thrales'; and his name occurs repeatedly in Boswell's Life. In 1769 he was tricd for murder, having had the misfortune to inflict a mortal wound with his fruit knife on a man who had assaulted him in the street. Johnson among others gave evidence in his favour at the trial, which resulted in Baretti's acquittal. He died in May 1789, His first work of any importance was the Jtalian Library, London, 1757, a useful catalogue of the lives and works of many Italian authors. The Lettere Famighari, giving an account of his travels through Spain, Portugal, and

France during the years 1761-1765, were well reccived, and when afterwards published in English, 4 vols., 1770, were highly commended by Johnson, While in Italy on his travels Baretti set on foot a journal of literary criticism, to which he gave the title of Prusta Letteraria, the litcrary scourge. It was published under considerable difficulties and was soon discontinued. The criticisms on contemporary writers were sometimes just, but are frequently disfigured by undue vehemence and coarseness. Among his other numcrous works may be mentioned a useful Dictionary and Grammar of the Italian Language, and a dissertation on Shakespeare and Voltaire.

BARFLEUR, called formerly Barbeflot, and in the Latin chroniclers Barbatus Fluctus, an ancient town of Normandy, in France, now in the department of Manche, 15 miles EK. of Cherbourg. It was at one time the seat of an active trade across the Channel, but was ruined and had its harbour filled up by the English in 1346, Cape Barfleur has a lighthouse 271 feet above the sea, in long. 1° 16’ W., lat. 49° 40′ N.

BARHAM, Richarp Harris, a celebrated humourist, better known by his nom de plume of THomas INGoLpsBy, was born at Canterbury, December 6, 1768. At seven years of age he lost his father, who left him a small estate, part of which was the manor of Tappington, so frequently mentioned in the Legends, At nine he was sent to St Paul’s school, but his studies were interrupted by an

1 Summed up thus :— Our opinion then is this, that Barere ap- proached nearer than any person mentioned in history or fiction, whether man or devil, to the idea of consummate and universal de- pravity. In him the qualities which are the proper objects of hatred, and the qualities which are the proper objects of contempt, preserve an exquisite and absolute harmony. In almost every particular sort of wickedness he has had rivals. His sensuality was immoderate; but this was a failing common to him with many great and amiable men. There have been many men as cowardly as he, some as cruel, a few as mean, a few as impudent. There may also have been as great liars, though we never met with them or read of them. But when we put every- thing together, sensuality, poltroonery, baseness, effrontery, mendacity, barbarity, the result is something which in a novel we

should condemn as caricature, and to which, we venture to say, no parallel can be found in history ”

accident which shattered his arm and partially crippled it for life. Thus deprived of the power of bodily activity, he became a great reader and diligent student. In 1807 he entered Brasenose College, Oxford, intending at first to study for the profession of the law. Circumstances, how- ever, induced him to change his mind and to enter the church. The choice seems surprising, for he had from childhood displayed that propensity to fun in the form of parody and punning which afterwards made him a reputa- tion. In 1813 he was ordained and took a country curacy ; he married in the following year, and in 1821 removed to London on obtaining the appointment of minor canon of St Paul’s Cathedral. Three years later he became one of the priests in ordinary of his Majesty’s chapel royal. In 1826 he first contributed to Blackwood’s Magazine ; and on the establishment of Bentley’s Miscellany in 1837 he began to furnish the series of grotesque metrical tales known as Vhe Ingoldsby Legends. These becaine very popular, were published in a collected form, and have since passed through numerous editions. In variety and whim- sicality of rhymes these verses have hardly a rival since the days of Hudibras, But beneath this obvious popular quality there lies a store of solid antiquarian learning, the fruit of patient enthusiastic research by tlic light of the midnight lamp, in out-of-the-way old books, which few readers who laugh over his pages detect. If it were of any avail we might regret that a more active faculty of venera- tion did not keep him from writing some objectionable passages of the Legends. Mis life was grave, dignified, and highly honoured. His sound judgment and his kind heart made him the trusted counsellor, the valued friend, and the frequent peacemaker; and he was intolerant of all that was mean, and base, and false. In politics he was a Tory of the old school ; yet he was the life-long friend of the liberal Sydney Smith, whon: in many respects he singularly resembled. Theodore Hook was one of his most intimate friends. Mr Barham was a contributor to the Ldinburgh Review and the Literary Gazette ; published a novel in 3 vols., entitled My Cousin Nicholas ; and, strange to tell, wrote nearly a third of the articles in Gorton’s Biographical Dictionary. His life was not with- out such changes and sorrows as make

men grave. He had nine children, and six of them died in his lifetime. But he retained vigour and freshness of heart and mind to the last, and his latest verses show no signs of decay. He died in London after a long, painful illness, June 17, 1845, leaving his beloved wife, two daughters, and a son, surviv- ing him. A short memoir, by his son, was prefixed to a new edition of Jngoldsby in 1847, and a fuller Life and Letters was published in 2 vols. in 1870.

BARI, Terra pI, a province of Italy, in the district of Apulia, bounded on the N. by the Adriatic, E. and S.E. by the province of Otrauto, S.W. by Basilicata, and W. by Capitanata. It has an area of 1782 geographical square miles, and is divided into the three districts of Bari, Barletta, and Altamura. Except in the 8S. and 8.W., where branches of the Apennines occur, the surface is generally level. The soil is for the most part calcareous, with a rich covering of loam. The climate is oppressively hot in summer, but very pleasant during the rest of the year. The only considerable river is the Ofanto, or Aufidus ; but, in spite of the lack of irrigation, the province is among the best cultivated in the kingdom, producing abundance of grain, flax, tobacco, cotton, wine, oil, almonds, liquorice, &c. Swine, asses, goats, and sheep with a very fine wool, are numerous; and the salt and nitre works form impor- tant branches of industry. Among the more important towns besides the capital are Barletta, Trani, Bisceglie, Molfetta, Monopoli, and Fasano on the coast, and Andria Ruvo, Nola, Bitonto, and Conversano somewhat inland,

The population, which is densest along the coast, was 604,540 in 1871.

Bani, the ancient Barium, capital of the above province and seat of an archbishop, is situated on a tongue of land projecting into the Adriatic, in lat. 41° 7’ N., and long. 16° 53’ E. It is defended by various fortifications, among which the most important is the citadel, which is about a mile in circumference, and dates from the Norman posses- sion. The general character of the older part of the town is gloomy and irregular, but the newer portion has spacious streets, with handsome buildings. The priory of St Nicolo, built by Robert Guiscard in 1087 to hold the relics of the saint, which had been brought from Myra in Lycia, is interesting for its beautiful

crypt and the tombs of Robert of Bari and Bona Sforza of Poland. The festival of St Nicholas, on the 8th of May, is still attended by thousands ; and his body is believed by the superstitious to supply the Manna di Bari. The cathedral of St Sabino, a fine Gothic structure, was barbarously bestuccoed and transformed by Archbishop Gaeta in 1745. Among the other buildings of importance are the palace of the “Tntendente,” the theatre (a large modern erection), the Lyceum, a college for the education of the nobility, and an “Atheneum.” The commercial importance of Ban has been for some time on the increase ; and its harbour, aug- mented by the building of two moles in 1855, has more recently received a still greater extension, while excellent anchorage is also afforded by its roads, The inhabitants are skilful seamen, and carry on a large traffic in their own ships with different parts of the Adriatic. The exports, which consist chiefly of olive oil, wine, mustard seed, cream of tartar, grain, and almonds and other fruits, were valued in 1872 at £642,818, while the imports of the same year amounted to £249,081. The railway to Brindisi was opened in 1865, and another line has since been extended to Taranto. Bariwm, according to the evidence of its coins, was a place of importance in the 3d century B.c., and had a decided Greek element in its culture; but it never acquired any great influence in the old Roman world, and all allusions to it in the classical authors are of an incidental description. After the fall of the Western empire it was subject in turn to the Greek emperors, to the dukes of Benevento, and to the Saracen invaders. From the last it was delivered in 971 by Louis II., and again in 1002 by the Venetians, who left their Lion of St Mark as an emblem to the city. Not long after it was raised to the rank of capital of Apulia by the Greek emperors, who were soon (1040) compelled to acknowledge it as a free princi- pality under Argyrus. After a four years’ siege it was taken in 1070 by the Normans, who lost it in 1137 to Lothaire, but recovered it a few years later. In 1156 it was razed by William the Bad, and has several times suffered a similar fate. In the 14th century Bari became a duchy, which continued to exist till 1558, when it was bequeathed by Bona Sforza to Philip IT. of Spain.

See Beatillo, Historia de Bart, Napoli, 1637 ; Lombardi, Com- pendio cronologico delle vite degli aretvescovi Baresi, Napoli, 1697.

BARKING, a town of England, county of Essex, 7 miles E.N.E. of London, on the River Roding, not far from the Thames. It was celebrated for its nunnery, one of the oldest and richest in England, founded about 670 by Erkenwald, bishop of London, and restored in 970 by King Edgar, about a hundred years after its destruction by the Danes. The abbess was a baroness ew officio, and the revenue at the dissolution of the monasteries was £1084. The church of St Margaret is an ancient edifice of con- siderable beauty, with some curious monuments ; and the ancient market-house, no longer used, and an embattled gateway, are also worthy of mention. The various dissenting denominations have places of worship in the town,

Population in 1871, 5766, principally engaged in the river traffic and in the cultivation of vegetables for the London market. There is no longer much attention paid to tbe fishery, but various industries have been introduced.

BARLAAM anp JOSAPHAT, Saints. These two saints appear in both the Greek and the Roman Martyrology, in the former under 26th August, in the latter under 27th November. Their story is in the highest degree worthy of note, because it is, in fact, a Christianized ver- ie of the Indian legendary history of the Buddha, Sakya Muni.

The remarkable parallel between Buddhistic ritual, costume, and discipline, and those which especially claim the title of Catholic in the Christian church, has often been recognized, even by the most faithful sons of Rome ;* and though the parallel has perhaps never been elaborated as it might be, some of its more salient points are familiar. Still, many readers may be unaware that Sakya Muni himself, or, as he was by birth, Siddharta, the son of Suddodhana, prince of Kapilavastu (in the north of modern Oudh), has found his way into the Roman calendar as a saint of the church.

The Christian story first appears in Greek among the works of St John of Damascus, an eminent divine, and an opponent of the Emperor Leo the Isaurian in the Iconoclastic movement, who flourished in the early part of the 8th century, and who, before he adopted the monastic life and devoted himself to theology, had held high office at the court of the caliph Abu Jafar Almansur, as his father Sergius is said to have done before him.”

The outline of the Greek story is as follows:—St Thomas had converted the people of India, and after the eremitic life originated in Egypt, many Indians adopted it. But a powerful pagan king arose who hated and persecuted the Christians, especially the ascetics. After this king, Abenncr by name, had long been child- less, a boy greatly desired, and matchless in beauty, was born to him, and received the name of Josaphat. The king, in his joy, summons astrologers to predict the child's destiny. They foretell glory and prosperity beyond those of all his predecessors. One sage, most learned of all, assents, but intimates that the scene of this glory will be, not the paternal kingdom, butanother infinitely more exalted, and that the child will adopt the faith which his father persecutes.

The boy shows a thonghtful and devout turn. King Abenner, troubled by this and by the remembrance of the prediction, selects a secluded city, in which he causes a splendid palace to be built, where his son should abide, attended only by tutors and servants in the flower of youth and health. No stranger was to have access, and the boy was to be cognizant of none of the sorrows of humanity, such as poverty, disease, old age, or death, but only of what was pleasant, so that he should have no inducement to think of the future life; nor was he ever to hear a word of Christ and his religion.

Prince Josaphat grows up in this seclusion, acquires all kinds of knowledge, and exhibits singular endowments. At length, on his urgent prayer, the king reluctantly permits him to pass the limits of the palace, after having taken all precautions to keep painful objects out of sight. But through some neglect of orders, the prince one day encounters a leper and a blind man, and asks of his attendants with pain and astonishment what such a spectacle should mean. These, they tell him, are ills to which man is liable. Shall all men have such ills? he asks. And in the end he returns home in deep depression. Another day he falls in with a decrepit old man, and, stricken with dismay at the sight, renews his questions, and hears for the first time of death. And in how many years, continues the prince, does this fate befall man ? and must he expect death as inevitable? Is there no way of escape? No means of eschewing this wretched state of decay? The attcndants reply as may be imagined ; and Josaphat goes home more pensive than ever, dwelling on the certainty of death, and on what shall be thereafter.

At this time Barlaam, an eremite of great sanctity and know- ledge, dwelling in the wilderness of Sennaritis, divincly warned,

1 It has been alleged that Pére Huc, on returning to Europe, was astonished to find his celebrated journey to Lhasa in the Zndez, on the ground of such recognition. But this seems to be untrue.

2 St John's authorship of the story has been disputed. Prof. Max Miiller, in the paper quoted below, seems to dispose sufficiently of the objections. None of the old editions of St John's works contain the Greek of the story. This, Prof. Miiller states, was first published im 1832 by Boissonade, in his Analecta Greeca, vol. iv.

travels to India in the disguise of a merchant, and gains access to Prince Josaphat, to whom he imparts the Christian doctrine and commends the monastic life. Suspicion arises and Barlaam departs. But all attempts to shake the prince's convictions fail. As a last resource the king sends for Theudas, a magician, who removes the prince's attendants and substitutes seductive girls; but all their blandishments are resisted through prayer. The king abandons these efforts and associates his son in the government, The prince uses his power to promote religion, and everything prospers in his hands. At last Abenner himself yields to the faith, and after some years of penitence dics. Josaphat surrenders the kingdom to a friend called Barachias, and departs for the wilderness. After two years of pain- ful scarch, and much buffeting by demons, he finds Barlaam, The latter dies, and Josaphat survives as a hermit many years. King Barachias afterwards arrives, and transfers the bodies of the two saints to India, where they are the source of many miracles.

Now this story is, in all essentials and in many details, mutatis mutandis, the story of Buddha, For particulars we must refer to the papers of M. Miiller and F. Liebrecht cited below; we can indicate but one example in the prominent episode of Sakya's youth, his education in a secluded palace, his encounter successively with a decrepit old man, with a man in mortal disease and poverty, with a dead body, aud, lastly, with a religious recluse radiant with peace and dignity, and his consequent abandonment of his

princely state for the ascetic life in the jungle. Some of the correspondences in the two stories are most minute, and Prof. Miiller has pointed out that even the phraseology, in which some of the details of Josaphat's history are described, almost literally renders the Sanskrit of the Lalita Vistara.

We have given but the skeleton of the history of Barlaam and Josaphat. It is filled out with episodes and apologues, several of which also have been traced to Buddhist sources, These stories no doubt promoted the vast mediaval popularity of the legend in both the Greek and the Latin Churches. Its first favour in the former seems to have been due to its embodiment in the Lives of the Saints, as compiled anew by Simeon the Metaphrast, a person of disputed age, but not of later date than 1150 a.p. Selections from his work, in which this legend takes the lead, continue to be issued in Romaic as works of popular edification.

At what time the two saints first found their place in the Roman martyrology we have not been able to ascertain, but their story figures at length in the Speculum Historiale of Vincent of Beauvais, and more briefly in the Golden Legend of Jacobus de Voragine, both of the 13th century. There is a church bearing the dedication Divo Losaphat in Palermo, and probably others in other Catholic cities.

The story continued for centuries to be one of the most popular works in Christendom. It was translated into most European tongues, including Bohemian, Polish, and Ice- landic. A version in the last, executed by a Norwegian king, dates from 1204 ; in the East there were versions in (at least) Arabic, Ethiopic, Armenian, and Hebrew ; whilst a translation into the Tagala language of the Philippines was printed at Manilla in 1712. The story was rendered into poems and miracle plays. Moreover, its episodes and apologues have furnished material to poets and story-writers of very diverse ages and characters, e.g., to Boccaccio, to Gower, to the compiler of the Gesta omanorum, to Shake-

speare himself, and to the late W. Adams, author of the King's Messengers.

The identity of the stories of Buddha and St J osaphat was re- cognized by the historian of Portuguese India, Diogo de Couto, as may be seen in his history (Dec. v. liv. vi. cap. 2). In modern times it was first noticed

(according to Prof. M. Miiller) by M. Laboulaye, in the Journal des Débais (21-26 July, 1859); but it was more elaborately set forth by the learned Dr Felix Liebrecht a year later (Jahrbuch fir Roman. und Engl. Lttteratur, ti. p. 314); and was treated with his usual-grace by Prof. Miiller himself in his lecture on the "' Migration of Fables " (see Contemp. Review for July 1870, pp. 588 sg.) (ERA)

BARLETTA, the ancient Bardulum, called in the Middle Ages Barolum, a fortified seaport town of Italy, the scat

of an archbishop, in the province of Terra di Bari. It igs 33 miles N.W. of Bari,in lat.41° 19' 26" N., long. 16° 18'10" E. The town is well built and handsome ; the houses are large, and the streets wide and well paved. It hasa fine Gothic cathedral (8, Maria Maggiore) with a lofty spire, 2 number of churches and convents, an orphan asylum, a college, a theatre, and a colossal statue, supposed by some to be of the Emperor Heraclius, but this is denied by other art critics. The harbour is formed by a mole, on which a lighthouse is erected, and it is commanded by the citadel. It is only capable of admitting small vessels, but the town has a considerable trade in grain, wine, oil, fruit, salt, dre. Barletta was once one of the strongest cities in Italy, and in the 13th and 14th centuries was a favourite residence of the kings of Naples. It was here that the first tourna- ment in that part of Italy was held in 1259, and in 1503 a remarkable combat took place in the neighbourhood between two chosen bands of Italian and French knights, Icd by Colonna and Bayard respectively. Population, 28,613. (See Marullo, Diss. stor. sopra il colosso di Barletta, Naples, 1816.)

BARLEY (Z/fordeum), a most important genus of the cereal plants which belongs peculiarly to temperate regions. Four distinct species of barley, cultivated for the produc- tion of grain, are commonly enumerated,—1st, common or two-rowed barley, Hordeum distichum ; 2d, Bere or Bigg, Hf, vulgare ; 3d, six-rowed barley, H. heatastichum ; and 4th, fan, spratt, or battledore barley, HZ. zeocriton. Of these species, but chiefly of the first two, very many varieties are recognized by cultivators, and new kinds are constantly being introduced. Barley is the most hardy of all cereal grains, its limit of cultivation extending further north than any other; and, at the same

time, it cau be profitably cultivated in sub-tropical countries. The opinion of Pliny, that it is the most ancient aliment of mankind, appears to be well founded, for no less than three varieties have been found in the Jake dwellings of Switzerland, in deposits belonging to the Stone Period. According to Professor Heer these varieties are the common two-rowed (H. distichum), the large six-rowed (H. heatastichum densum),and the small six-rowed (H. heata- stichum sanctum). he last variety is both the most ancient and the most commonly found, and is the sacred barley of antiquity, ears of which are frequently represented plaited in the hair of the goddess Ceres, besides being figured on ancient coins. The cultivation of barley in ancient Egypt is indicated in Exod, ix. 31. Till within recent times barley formed an important source of food in northern countries, and barley cakes are still to some extent eaten. Owing, however, to its poverty in that form of nitrogenous compound called gluten, so abundant in wheat, barley-flour cannot be baked into vesiculated bread; still it isa highly nutritious substance, the salts it contains having a high proportion of phosphoric acid, and on it the Greeks trained their athletes. The following is the composition of barley- meal according to Von Bibra, omitting the salts :—

Re ea sense. ea escaimacnet cree ttete 15 per cent. Nitrogenous compounds…….....s0ece008 12°981 ,, MO INIE a it’s css Cvs oe Pere aaa Neer ae 6°744_ ,, SOCEM a nicovavdesnaseraners ts cutee eminent: 3°200 —,, ‘SMhiC] Ce Ree reenter catenin bO-350) Fy, AEFEUEs cctatnta nese cde dapeateish duc seis AR 2170 4,

Barley is now chiefly cultivated for malting, to prepare spirits and beer’ (see BREWING), but it is also largely employed in domestic cookery. For the latter purpose the hard, somewhat flinty grains are preferable, and they are prepared by grinding off the outer cuticle which forms “pot barley.” When the attrition is carried farther, so that the grain is reduced to small round pellets, it is termed “pearl barley.” Patent barley is either pot or pearl barley reduced to flour. Under the name decoctum hordei, a pre-

paration of barley is included in the British Pharmacopeeia,

which is of value as a demulcent and emollient drink in febrile and inflammatory disorders. For the cultivation of barley, see AGRICULTURE, vol. i. p. 358.

The following table shows the quantities and values of barley imported into the United Kingdom in 1873 :—

Cwts, £

500), E005 (0 ee 1,119,094 408,344 PPM OWICC OU Loccecsesesseccees wsans 182,004 86,366 op UN re 850,011 425,856 », Germany.. 1,138,737 572,640 PILLAGE Gr eiterscicesssagsase cass 1,970,958 966,740 MUU OV ieee hescissnceasceaaseneices vcs 2,905,646 1,187,147 , Wallachia and Moldavia…... 836,606 322,064 io oe 16,510 6,105 ee portemd Witdis….....: 28,554 11,330 Me AU GCLIG:..... eas aveisaes seni pe 110,384 42,546 jy) ume? COUNETICS..... sien 82,559 34,434 oil a 9,241,063 4,013,572

BARLOW, Jort, an Amercian poet and politician, born in 1755 at Reading in Connecticut. In 1774, some years after his father's death, he was entered at Yale College, New Haven, where he soon began to manifest considerable taste for poetry and power of composition. A few small pieces published by him were received with some degree of public favour. During his vacations he had taken part with the colonists in several engagements against the British, and immediately after completing his course, he qualified himself for the church, and was appointed chaplain to a regiment. This post he held till the conclusion of peace between Britain and America, when he settled in the village of Hartford, and began to practise as a lawyer. He also conducted a newspaper, and about the'same time published his best poem, the Vision of Columbus, a vigorous and spirited piece of writing. About the year 1788 he gave up his newspaper and his legal practice, and came to Europe as the agent for a land company. Having discovered that this company was merely a swindling concern, he severed his connection with it, but did not return to America, In London he became acquainted with some of the most advanced liberal thinkers, and published several political tracts of'a decidedly revolutionary character. In 1793, after having been some time in France, he accompanied the Commission of the National Convention, which was sent to organize the newly-acquired territory in Savoy. During his residence in

Paris he engaged in commercial transac- tions, by which he acquired considerable fortune and importance. In 1795 he was appointed American consul at Algiers, and efficiently discharged the duties of that office. In 1805 he returned to America and began to interest himself in the politics of his own country. A pamphlet of his, sketching a plan of national education, was received with great favour. In 1808 he published an enlarged edition of his great poem, under the title Colum- biad. It was magnificently illustrated, but did not achieve the popularity of its predecessor. In 1811 he was ap- pointed minister plenipotentiary to France, with the object mainly of negotiating a commercial treaty and of obtaining compensation for some American property that had been unjustly confiscated. To accomplish this he required a personal interview with Napoleon, and set out to meet the emperor, who was at Wilna. On his way he was attacked with inflammation of the lungs, and died at a Polish village near Cracow, on the 22d December 1812.

BARLOW, Perer, an able writer on pure and applied mathematics, was born at Norwich in 1776, and died in 1862. He received a very ordinary education, but improved himself by his own exertions. In 1806 he was appointed mathematical master in the Woolwich Academy, and filled that post for forty-one years. In 1823 he was made a Fellow of the Royal Society, and two years later received

the Copley medal. He received many distinctions from British and foreign scientific societies. Mr Barlow's prin- cipal works are—Llementary Investigation of the Theory of Numbers, 1811; New Mathematical and Phalosophicat Dictionary, 1814; Essay on Magnetic Attractions, 1820. The investigations on magnetism led to the important practical discovery of a means of rectifying or compensating compass errors in ships. Besides compiling numerous useful tables, Mr Barlow contributed largely to the Hncyclopedia Metropolitana. The most important of his articles are— "Theory of Numbers," ' Mechanics," " Hydrodynamics," "' Pneumatics," ' Optics," '' Astronomy," " Magnetism," and " Electro-Magnetism," along with the huge volume on "' Manufactures."

BARMECIDES, or descendants of Barmak, were a noble Persian family, who attained great power under the Abbaside caliphs. Barmak, the first of

them, was a Ghebre, or Persian fire-worshipper, and is supposed to have been a native of the district of Khorassan. He was introduced to the caliph Abd-ul-Malik, and acquired great power under him. His family prospered, and his grandson, Yahya, was vizier to the caliph El-Mahdy, and tutor of the famous prince Haroun-al-Raschid, celebrated in the Thousand and One Nights. Yahya's sons occupied high offices, one of them, Ja'afar (the Giafar of the Arabian Nights), being vizier and constant companion of Haroun. The caliph, however, conceived suspicions against the Barmecides, and in 802 beheaded Ja'afar with great cruelty, condemned the whole family to prison, and confiscated their property. Oriental historians give a romantic and not improbable reason for the caliph's conduct towards his vizier. Ja'afar had been married to Haroun's favourite sister, Abbasah, on condition that he should never see his wife save in presence of the caliph. He neglected this injunction, and Abbasah bore a son, who was brought up secretly.' The caliph became aware of this, and in his wrath punished Jaafar and all his family. The use of the expression Barmecides' Feast, to denote an imaginary banquet, is drawn from one of the tales in the Arabian Nights, where an entertainment of merely imaginary viands is served up to a hungry man by one of the Barmecides.

BARMEN, a town of Rhenish Prussia, in the govern- ment of Dusseldorf and circle of Elberfeld, on the Bergisch- Markisch railway. It is formed by the combination of a large number of separate villages, which stretch along the northern valley of the. Wupper for a distance of six miles in almost perfect continuity with Elberfeld. The first of these to obtain a separate civic organization was Gemarke, which may thus be regarded as the nucleus of the whole. The rapid development of manufacturing activity, to which the town owes its origin, only dates from the beginning of the 18th century. It is the chief seat of ribbon-weaving in Germany, and manufactures thread, lace, buttons, braids, cotton, cloth, silk stuffs, steel wares, and plated goods. There are also numerous bleachfields, printfields, dyeworks,—famous for their Turkey-red,—soap-works, chemical-works, and potteries. A chamber of commerce and a commercial tribunal hold their sessions in the town, which also possesses an exchange, a music hall, a deaf and dumb asylum, numerous schools, and a variety of churches, The most of the inhabitants are Protestants of various sects. The Thenish-Westphalian Missionary

Society maintains a theological seminary in the town and possesses an ethnographical museum. Population, 74,449.

BARNABAS (81233) was the surname given by the apostles to Joses, ‘‘a Levite, of the country of Cyprus,” who, though like Paul not of the twelve, was with him recognized among the number of the apostles, The name (vids tapaxdyjoews), translated “son of consolation ” in the authorized version (Acts iv. 36), would be better rendered

“son of exhortation” or “of prophecy.” Barnabas is first mentioned in the Acts (iv. 36, 37) as having sold his land and laid the money at the apostles’ feet. He next appears as introducing Paul after his conversion to the other apostles (Acts ix. 27), from which a previous acquaintance has been inferred. Subsequent notices record a year’s residence along with Saul at Antioch, where they “taught much people” (xi. 22-26), a visit to Jerusalem with contribu- tions for the poorer brethren there (xi. 27-30), the ordina- tion of Saul and Barnabas for the work to which they were called by the Holy Ghost (xiii. 2, 3), and a missionary journey of the two apostles to Cyprus and various cities of Asia Minor (xiii. xiv.) When the dissension arose as to the necessity of circumcision, Paul and Barnabas were sent to Jerusalem by the church at Antioch to consult the “‘anostles and elders” on the question (xv. 1-4). Soon after their return to Antioch they resolved to undertake a second missionary journey ; but a difference arose between them in regard to the determination of Barnabas to take his sister’s son, John Mark, along with him. “The con- tention was so sharp between them” (xv. 39) that they separated, Barnabas and Mark going to Cyprus, while Paul and Silas went to Syria and Cilicia. No further account of the career of Barnabas is given in the New Testament, with the exception of one or two incidental allusions in St Paul’s epistles (1 Cor. ix. 6; Gal. ii. 1, 9, 13). Later writings and traditions have attempted to supply what is wanting in the Scriptural narrative, but they contain no facts that can be accepted as historically certain. Accord- ing to Clement of Alexandria, Barnabas was one of the seventy disciples. Various accounts of still later date allege that he studied under Gamaliel along with Saul, that he suffered martyrdom at

Cyprus, and that his body was discovered in the reign of the Emperor Zeno. He is also said to have been the founder and first bishop‘of the church at Milan. The festival of St Barnabas is held on the 11th of June.

BARNABAS, Eptstiz or, and Gosrgt or. See Aposto- LIC FATHERS and GosPELs.

BARNARD CASTLE, a market and manufacturing town and parish in the county of Durham, on the banks of the Tees, 246 miles from London. It consists of one main

street, about a mile long, with a number of smaller ones”

branching off on each side. The principal building in the high street is the town-hall, an octagonal structure dating from 1747. St Mary’s church, built in the 12th century, and restored in 1871, contains some curious monuments ; but the building of chief interest is the castle, from which the town derives its name, and which is the principal scene of Scott’s Hokeby. This was founded in 1132 by Barnard Baliol, an ancestor of the competitor with Bruce for the Scottish crown, and was reduced to a ruinous condition by the siege of 1569, when it was defended for Queen Eliza- beth by Sir George Bowes of Streatlam. The remains still extend over a space of more than six acres. A remarkable building, known as the Bowes’ Mansion and Museum, was in 1874 bequeathed to the town by a descendant of the gallant knight. It contains a valuable collection of works of art, and is one of the finest edifices of the kind in the kingdom. The principal manufactures of Barnard Castle are carpets, woollen cloth, and shoe-thread. The corn- market is one of the largest in the north of England. A line joining the North-Eastern and the London and North Western Railways passes immediately to the north of the town. In the neighbourhood are Rokeby, Egglestone Abbey, Raby Castle, and Lartington Hall. (See Sir Walter Scott’s Rokeby, and Atkinson’s Handbook of Barnard Castle, 1874.)

BARNAUL, a town of Asiatic Russia, in the government of Tomsk, and capital of a circle to which it gives its name.

It is situated in a wide plain which is bounded by off- shoots of the Altai Mountains, and is built on both sides of the Barnaulka River at its confluence with the Ob, in lat. 53° 20′ N., and long. 83° 26’ E. It is the capital of an extensive mining district, and the seat of a board of administration. Besides its numerous smelting-furnaces, it possesses glassworks, a bell-foundry, and a mint; and it has also a library, an observatory, established in 1841, a mining school, a museum with a rich collection of mineral and zoological specimens, and a theatre, in addition to the governor’s residence, the barracks, and other buildings belonging to its civic organization. Barnaul was founded in 1730 by Akynthies Demidoff (to whose memory a monument has been erected), was raised to the rank of a town in 1771, and became capital of the circle in 1822. Population, 12,927.

BARNAVE, ANTOINE Pierre JosepH Marie, one of the greatest orators and noblest actors and victims of the first French Revolution, was born at Grenoble in Dauphiny, October 22, 1761. He was of a Protestant family. His father was an advocate to the parliament of Grenoble, and his mother was a woman of high birth, superior ability, and noble character. He was at once thoughtful and passionate, studious and social, handsome in person and graceful in manners. He was brought up to the law, and at the age of twenty-two made himself favourably known by a discourse pronounced before the local parliament on the division of political powers. Dauphiny was one of the first of the provinces to feel the excitement of the coming revolution; and Barnave was foremost to give voice to the general feeling, in a pamphlet entitled Hsprit des édits enregistrés militatrement le 20 Mai 1788. He was imme- diately elected deputy, with his father, to the States of Dauphiny, and took a prominent part in their debates. A few months later he was transferred to a grander field of action. The States-general were convoked at Versailles for May, 5, 1789, and Barnave was chosen deputy of the Tiers Etat for his native province. He soon made an impression on the Assembly, and became the friend of most of the leaders of the popular party. He took part in the conferences on the claims of the three orders, drew up the first address to the king, and supported the proposal of Sieyés that the Assembly should declare itself National. Though a passionate lover of liberty, he knew that excess is the ruin of liberty, and maintained the necessity for the individual and for the community of both freedom and

restraint. He hoped to secure the freedom of France and her monarchy at the same time. But he was almost unawares borne away by the mighty currents of the time, and he took part in the attacks on the monarchy, on the clergy, on church property, and on the provincial parlia- ments. With the one exception of the mighty Mirabeau, Barnave was the most powerful orator of the Assembly. On several occasions he stood in opposition to Mirabeau. After the fall of the Bastille he wished to save the throne. He advocated the suspensive veto, the system of two chambers, and the establishment of trial by jury in civil causes. His conflict with Mirabeau on the question of as- signing to the king the right to make peace or war was one of the most striking scenes in the Assembly. About this time, after a vehement debate, he fought a duel with Cazalés, in which the latter was slightly wounded. About the close of October 1790 Barnave was called to the presi- dency of the Assembly. On the death of Mirabeau a few months later, Barnave paid a high tribute to his worth and public services, designating him the Shakespeare of oratory. On the arrest of the king and the royal family at Varennes, while attempting to escape from France, Barnave was one of the three appointed to conduct them back to Paris. On the journey he was deeply affected by the mournful fate of these

royal persons, and resolved to do what he could to alleviate their sufferings. In one of his most powerful speeches he maintained the inviolability of the king's person. His public career came to an end with the close of the Con- stituent Assembly, and he returned to Grenoble at the beginning of 1792. His sympathy and relations with the royal family, and his desire to check the downward progress of the Revolution, brought on him the suspicion and perse- cution of the more violent party. At the end of August 1792 he was arrested and imprisoned, and in November 1793 was transferred to Paris. The nobility of his character was proof against the assaults of suffering. "Better to suffer and to die," he said, " than lose one shade of my moral and political character." On November 28 he appeared before the Revolutionary Tribunal, in company with Duport-Dutertre, and two days later they both perished by the guillotine.

BARNES, ALBERT, a theologian of America, specially distinguished as a Biblical expositor, was born at Rome in the state of New York, Ist December 1798, and died at Philadelphia 24th December 1870. In 1820 he graduated at Hamiltou College, and in the same year commenced his studies for the ministry at Princeton Theological Seminary. Soon after taking licence he was called to the Presbyterian church in Morristown, New Jersey, from which he was transferred to the pastoral charge of the first Presbyterian church of Philadelphia in 1830, In 1867 he was com- pelled to resign owing to failing health, Barnes held a prominent place in the New School branch of the Presbyterians, to which he had adhered on the division of the denomination. He was an eloquent preacher, but his wide-spread reputation rests chiefly on his expository works, which have probably had a larger circulation both in Europe and America than any others of their class. Of the well-known Motes on the New Testament it is said that more than a million volumes had been issued at the time of their author's death. The Motes on Job, the Psalms, Isaiah, and Daniel, found scarcely less acceptance. Dis- playing little original critical power, their chief merit lies in the fact that they bring the results of the criticism of others within the reach of general readers. Barnes was the author of several other works of a practical and devo- tional kind.

BARNES, JosHua, an English scholar, born in 1654. In 1695 he was chosen queen's professor of Greek, a language which he wrote and spoke with the utmost facility. One of his first publications was a whimsical tract, entitled Gerania, ora New Discovery of the Lnttle Sort of People called Pygmies. Among his other works are a Life of Edward III., in which he introduces his hero making long and elaborate speeches ; Sacred Poems; the Lnfe of Oliver Cromwell the Tyrant ; some dramatic pieces ; a poetical paraphrase on the history of Esther, in Greek verse, with a Latin translation, &c. He also published editions of Huripides, Anacreon, and Homer's Iliad and ad with notes and a Latin translation, He died in

BARNET, or Cuiprinc Barnet, a market-town in the county of Hertford, 11 miles from London, on the great uorthern road, Near it, in 1471, was fought the decisive battle between the houses of York and Lancaster, in which the great earl of Warwick fell. The parish church dates from the 15th century, and the free school was founded by Elizabeth in 1573. The market, held on

Monday, is large ; and there are great cattle fairs. In the neighbourhood is the village of East Barnet, with a very ancient church. Population of parish in 1871, 3375.

BARNEVELDT, Jan van OLpEN, Grand Pensionary of Hollaud, who played a great part and rendered the most signal services to his country in the long conflict with

Philip II, of Spain, was born in 1547, He was a native of Amersfoort in the province of Utrecht, and could boast of a long line of noble ancestors. Endowed with superior abilities, he was educated for the profession of the law, and commenced practice as an advocate at the Hague in 1569, He sympathized deeply with his countrymen in their resolution to throw off the hated yoke of Spain, and served as a volunteer at the sieges of Haarlem and Leyden, In 1575 he married; and in the following year he was appointed to the honourable post of counsellor and chief- peusionary of Rotterdam. In 1585, when, in consequence of the assassination of the sagacious and resolute leader of the Dutch, and the general success of the Spaniards under the Prince of Parma, the cause of the ‘patriots seemed almost hopeless, Barneveldt was chosen head of an embassy to Qucen Elizabeth, to ask for her assistance and to offer her the sovereignty of the United Provinces. The queen agreed to give aid both in money and in men, but refused to accept the sovereignty. An expedition was sent under the command of Dudley, earl of Leicester, on whom the Dutch conferred supreme and absolute authority. Barne- veldt was then raised to the high office of advocate-gene- ral of Holland and West Friesland. Dissatisfied and indignant at Leicester’s incompetence, arrogance, and mismanagement, he endeavoured to limit his powers. For this purpose he succeeded in persuading the States to appoint Maurice of Nassau, the young son of the late Prince of Orange, stadtholder and captain-general of Holland and Zealand, thus contributing to place in the highest position the man who was afterwards to become his great antagonist. Leicester was recalled at the close of 1586. In the course of a few years Barneveldt, by his prudence and energy in administration, succeeded in restoring order and materially improving the financial affairs of the States. He proposed to resign in 1592, but at the urgent entreaty of

the States retained his post. In 1598 he was sent on an embassy to Henry IV. of France, the object of which was to strengthen and maintain the friendship of France and the United Provinces. In 1603, on the accession of James I. to the throne, Barneveldt was again sent to England as head of an embassy, and in conjunction with the French ambassador, M. de Rosny, afterwards duke of Sully, negotiated an arrangement for further assistance against the Spaniards. In 1607, having first insisted on and obtained a recognition of the independence of the Provinces, he began negotiations with Spain with a view to establish a truce. He had to contend against the opposition of the stadtholder and the army, and to suffer from unmerited popular suspicions of taking bribes from the Spanish court. But he triumphed over all difficulties, and on April 9, 1609, the famous twelve years' truce was concluded. From this time Maurice was his sworn foe. The two men were leaders of two great political parties, and the struggle between them was embittered by the admixture of theological and ecclesiastical controversy. In the strife then going on between the Gomarites (the Calvinistic party) and the Arminians, Maurice sided with the former, while Barneveldt supported the latter. Maurice was aiming at the sovereign power ; Barneveldt resolutely maintained the freedom of the republic. The clerical party, who looked up to Prince Maurice as their chief, were bent on getting the Calvinistic system established as the state religion, and on refusing to tolerate any other system ; Barneveldt and the Arminians contended that each province should be free to adopt the form which it preferred. Barneveldt was the consistent champion of the supremacy of the civil authority, and "the prime minister of Protestantism" (Motley). The con- vocation of a National Synod was proposed by the party of the stadtholder and resisted by Barneveldt. When dis- turbances broke out against the Arminians, Maurice refused

to suppress them, and disarmed the militia organized for the purpose by Barneveldt. The former now assumed the chief power. An interview took place on August 17, 1618, between the advocate and the stadtholder; each adhered resolutely to his own views, and the meeting remained fruitless. Barneveldt, with his friends Grotius and Hoo- gerbeets, was arrested and imprisoned on the 29th. In November following, in pursuance of the

command of Prince Maurice, the famous Synod of Dort assembled. A few days later the trial of the prisoners began before a special commission, The proceedings were illegal; the accusations against Barneveldt were fully disproved, but he was unjustly found guilty and sentenced to death. This sentence was unscrupulously confirmed by the clerical synod. It was a foregone conclusion, and Barneveldt had seen clearly that there was no hope for him. On the 14th of May 1619, just five days after the closing of the synod, the venerable statesman and patriot, then in his seventy- first year, was beheaded at the Hague. He met his fate without a word of regret, without a sign of fear. His calm courage and his tenderness of heart are attested by a letter, still extant, written to his wife a few hours before his execution. Besides his wife, Maria van Utrecht, Barne- veldt left two sons and two daughters. Four years after their father's death the sons took part in a plot against Prince Maurice; one of them made his escape and entered the service of Spain, the other was arrested and beheaded

An elaborate history of The Life and Death of John of Barneveld, with a View of the Primary Causes and Movements of the Thirty Years' War, by J. lL. Motley, author of the Rise of the Dutch Re- public, appeared in 1874.

BARNSLEY, or Brack Barnsiey, mentioned in Domesday Book as Bernesleye, a town and municipal borough in the West Riding of Yorkshire, 171 miles from London and about 11 north of Sheffield. It is situated on rising ground to the west of the River Dearne, in a district of considerable natural beauty The manufacture of iron and steel, and the weaving of linen and other cloth, arc the two principal industries; but there are also bleachfields, printfields, dyeworks, sawmills, cornmills, and malt-houses ; and the manufacture of giass, needles, and wire is still carried on. The last-mentioned industry dates from the reign of James I., and was for a long time the staple of the place. There are large coal-fields in the neighbourhood, which, indeed, extend under the town; and these afford employment to considerable numbers. The coal is largely exported to London and Hull, for domestic and other purposes, the coke formed from it also being in great demand. Besides the means of communication afforded by several railway lines, Barnsley has the advantage of two canals, the one known as the Barnsley-and-Wakefield and the other as the Dearne-and-Dove. Among the more important of its public buildings are the church of

St Mary’s, St George’s (built in 1823), St John’s (1858), the county court (1861), and the bank (1861). There are a number of educational and benevolent institutions of some importance ; the free grammar school dates from 1665, a subscription library was started in 1808, and a philosophical society was founded in 1828. In 1862 a handsome park of about 20 acres was presented to the town by the widow of Joseph Locke, M.P. About a mile from the town are the ruins of Monk Bretton, a Cluniac priory. Population in

1871, 23,021.

BARNSTABLE, a seaport town, and capital of the county of the same name, in the state of Massachusetts, North America. It is situated on the south side of a bay of the same name, which opens into Cape Cod Bay, and is 65 miles 8.E. of Boston. The population, which is largely sea-faring, amounted in 1870 to 4793.

BARNSTAPLE, a market and borough town of England, county of Devon, 40 miles N.W. of Exeter. It is situated on the River Taw, 6 miles from its month, but has always

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Arms of Barnstaple.

been considered a seaport. The stream, which is only navigable for small craft, is here crossed by an ancient stone bridge of 16 arches, and by a railway bridge on the IIfra- combe line. The town is handsome and well built; it was incorporated in the reign of Henry I., and has returned two members to parliament since the time of Edward I. The woollen trade, for which it was once famous, has now entirely declined ; but it manufactures lace, sail- cloth, and fishing-nets, and has extensive potteries, tan- neries, sawmills, and foundries, while shipbuilding is also successfully carried on. The public buildings and institutions include a large church, a guildhall (1826), a music hall, a free grammar school, a literary institute, national and charity schools, an infirmary (1832), aud a dispensary, and the finest

market-place in the West of England. The poet Gay was born in the vicinity, and received his education at the grammar school here, which at an earlier period had numbered Bishop Jewel among its alumni. Population in 1871, 11,659. Barnstaple is a town of considerable antiquity, and was erected, it is said, by Athelstan into a borough. At the time of the Norman Conquest it numbered between forty and fifty burgesses. Joel of Totness, to whom it was transferred, built a castle and founded a priory of Cluniac monks. In 1588 the town was able to furnish three vessels against the Spanish Armada.

BAROCCHIO, or BaRozzi, Giacomo DA VIGNOLA, architect, born at Vignola in the Modenese territory, in 1507. He succeeded Michel Angelo as the architect of St Peter's, and executed various portions of that fabric, besides a variety of works in Rome and other parts of Italy. The designs for the Escorial were also supplied by him. He is the author of an excellent work on the Jive Orders of Architecture. His character as a man was worthy of his genius; for to his extensive acquirements and exquisite taste were superadded an amenity of mauners and disposition and a noble generosity, that won the affection and admiration of all who knew him. He died in 1573, at the age of sixty-six.

BAROCCTI, or Barocco, FEDERIGO, painter, was born in 1528 at Urbino, where the genius of Raphael inspired him. In his early youth he travelled to Rome, where he painted in fresco, and was warmly commended by Michel Angelo. He then returned to Urbino, where, with the exception of some short visits to Rome, he continued to reside till his death in 1612. He acquired great fame by his paintings of religious subjects, in the style of which he to some extent imitated Correggio. His own followers were very numerous, but according to Lanzi, carried their master's peculiarities to excess. Barocci also etched from his own designs a few prints, which are highly finished, and executed with great softness and delicacy. (See Lanzi, Hist. of Painting, i. 440.)

BARODA, a city of British India, the capital of the native state known as the Gaikwér's dominions, is situated near the River Biswamintri, in 22° 16' N. lat., and 73° 14' E. long. The Government of Bombay exercises a political

Principle.

BA h—

superintendence over the Gaikwar, and a British political agent resides at Baroda. The town is fortified, but has no great strength. Thornton states the population at 140,000. Barod4 contains the chief court of the state, the Gaikwar himself presiding in appeals from the decisions of the other courts in his territory. The town contains only one higher class school, the High School,—attended in 1872 by 658 pupils, of whom 155 were learning English, 221 Marhathi, and 282 Gujrathi. There are also two vernacular schools in the town. The late Gaikwdr, Malhar Rao, was installed in 1871. The princes of Baroda date their im- portance from the Marhatta confederacy, which in the last century spread devastation and terror over India. Shortly after 1721 the ruling chief, one Pelaji, carved a fertile slice of territory out of Gujarat. Another enjoyed the title of “Leader of the Royal Troops” under the Peshwa. During the last thirty-two years of the century the house fell a prey to one of those bitter and unappeasable family feuds which are the ruin of great Indian families. In 1800 the inheritance descended to a prince feeble in body and almost idiotic in mind. British troops were sent in defence of the hereditary ruler against all claimants ; a treaty was signed in 1802, by which his independence of the Peshwd, and his dependence on our own Government, were secured. Three years later these and various other engagements were cousolidated into a systematic plan for the administration of the Baroda territory, under a prince with a revenue of three quarters of a million sterling, per- fectly independent in all internal matters, but practically kept on his throne by subsidiary British troops. Since then the history of the Gaikwars has been very much the same as that of most territorial houses in India: an occa- sional able minister, more rarely an able prince ; but, on the other hand, a long dreary list of incompetent heads, yenal advisers, and taskmasters oppressive to the people. Of late years they have been more than usually unfortunate. Family feuds raged fiercer than ever, and the late Gaikwar was long imprisoned by his brother, the former ruler, on a charge of attempted fratricide. The miserable scan- dals of the Barodé Raj need not be revived here. Suffice it to say, that Malhar Rado found himself suddenly brought from prison and placed upon the throne, and that his conduct as ruler was what might have

been expected in such a case. Frequent complaints of his mismanage- ment and oppression were brought before the British Government, and in 1873 a commission of English officers was appointed to inquire into the affairs of the state, and its management by the Gaikwdr. Since then mis- rule has advanced with a rapid foot. After one or two feints at reforming his government, the Gaikwar returned to his old courses, An attempt in 1874 to poison the British Resident at his court brought affairs to a crisis, and early in 1875 the Gaikwér was tried by a mixed com- mission of eminent British officers and natives of rank. A unanimous verdict was not obtained touching the particular attempt at poisoning ; but Lord Northbrook, as Viceroy of India, found it necessary to depose the Gaikwar, and to appoint another member of the Baroda family to rule in his stead.

BAROMETER, the instrument by which the weight or pressure of the atmosphere is estimated. The barometer was invented by Torricelli, a pupil of Galileo, in 1643. It had shortly before been found, in attempting to raise water from a very deep well near Floreuce, that, in spite of all the pains taken in fitting the piston and valves, the water could by no effort be made to rise higher in the pump than about 32 feet. This remarkable phenomenon Tor- ricelli accounted for by attributing pressure to the air. He reasoned that water will rise in a vacuum only toa certain height, so that the downward pressure or weight of

the column of water will just balance the pressure of the atmosphere ; and he further argued that if a fluid heavier than water be used it will not rise so high in the tube as the water. To prove this, he selected a glass tube about a quarter of an inch in diameter and 4 feet long, and her- metically sealed one of its ends; he then filled it with mercury and, applying his finger to the open end, inverted it ina basin containing mercury. ‘The mercury instantly sank to nearly 30 inches above the surface of the mercury in the basin, leaving in the top of the tube an apparent vacuum, which is, indeed, one of the most perfect that can yet be produced, and is called after this great experimenter, the Torricellian vacuum. He next converted the mercurial column into a form suited for observation by bending the lower end of the tube, thus constructing what has since bcen called the siphon barometer.

The fundamental principle of the barometer cannot be better illustrated than by his experiment (see fig. 2). In truth, a scale is all that is re- quired to render this simple apparatus a perfect barometer.

The heights of the columns of two fluids in equilibrium

are inversely as their specific gravities ; and as mercury is

10,784 times heavier than air, the height of the atmosphere

would be 10,784 times 30 inches, or nearly five miles, if it were composed of layers equally dense throughout. But since air becomes less dense as we ascend, owing to its great elasticity and the diminished pressure, the real height of the atmosphere is very much greater. of luminous meteors, it has been inferred that the height is at least 120 miles, and that, in an extreniely attenuated form, it may even considerably exceed 200 miles.

Various fluids might be used in constructing barometers. Fluids If water were used, the barometric column would be about 35 used, feet long. The advantages, however, which water barometers might be supposed to possess in showing changes of atmo- spheric pressure on a large scale, balanced by a serious objection. above the column of water is far from being a vacuum, being filled with aqueous vapour, which presses on column with a force varying with the temperature. temperature of 32° Fahr. the column would be depressed half an inch, and at 75° a foot. meters the space at the top of the column is one of the most perfect vacuums that can be produced, the best fluid for the construction of barometers is mercury. It is there- fore the only fiuid used where scientific accuracy is aimed at, Pure mercury must be used in filling the tubes of barometers ; because if it be impure, the density will not be that of mercury, and, consequently, the length of the

From observations

are more than counter- The space in the tube

the At a

Since in mercurial baro-

columns will not be the same as that of a column composed of pure mercury alone. Even should the density happen

to be the same as that of pure mercury the impurities

would soon appear, impeding the action of the fluid as it rises and falls, and thus rendering the instrument unfit for accurate observation. In filling barometer tubes, air and moisture get mixed with the mercury, and must be expelled by boiling the mercury in the tube. It being essential that the mercury be quite freed from air and moisture, no barometer should be used till it has been well ascertained that this has been done. Some time after the instrument has been hung in an observing position, let it be inclined gently and with care, so that the mercury may strike against the top of the glass tube ; if there is no air within, a sharp metallic click will be heard, but if the sound is dull, the air and moisture have not been entirely expelled. If the mercury should appear at any time to adhere some- what to the tube and the convex surface assume a more flattened form, it may be concluded that air or moisture is present. If on examining the mercury with a lens minute bubbles are visible, air is present. In all these cases the instrument must be rectified.

Air-trap.

Siphon barometer.

Cistern barometer,

The best barometers are usually fitted with an az-trap, originally proposed by Gay-Lussac for the purpose of arresting the ascent to the Torricellian vacuum of any air that may have found its way into the column by the cistern. The air-trap is fitted into the tube somewhere between the scale and the cistern. Barometers furnished with an air-trap can be conveyed from place to place with more safety, and they remain longer in good working order.

There are two classes of barometers—Siphon Barometers aud Cistern Barometers. The Siphon Barometer (fig. 1) consists of a tube bent in the form of a siphon, and is of the same diameter throughout. A graduated scale passes along the whole length of the tube, and the height of the barometer is ascertained by taking the difference of the readings of the upper and lower limbs respectively. This instrument may also be read by bringing the zero-point of the graduated scale to the level of the surface of the lower limb by means of a screw, and reading off the height at once from the surface of the upper limb. This barometer requires no correction for errors of capillarity or capa- city. Since, however, impurities are contracted by the mercury in the lower limb, which is usually in open contact with the air, the satisfactory working of the instru- ment comes soon to be seriously interfered with,

Fig. 2. shows the Cistern Baro- meter in its essential and its simplest form. ‘This barometer is subject to two kinds of error,

Fig, 2.—

the one arising from capillarity, Ye. 1.— iC and the other from changes in ,,“Pho? Girone Barometer. Barometer,

the level of the surface of the cistern as the mercury rises and falls in the tube, the latter being technically called the error of capacity. Ifa glass tube of small bore be plunged into a vessel containing mercury, it will be observed that the level of the mercury in the tube is not in the line of that of the mercury in the vessel, but somewhat below it, and that the surface is convex. The capillary depression is inversely proportional to the diameter of the tube. If the diameter of the tube be 0:1 inch, the capillary depression of mercury in boiled tubes, or error of capillarity, is 0°070 inch; if 0°2 inch, the error is 0°029 inch; if 0°3 inch, it is 0°014 inch ; and if 0‘5 inch, it is only 0°003 inch. Since capillarity depresses the height of the column, cistern barometers require an addition to be made to the observed height, in order to give the true pressure, the amount depending, of course, on the diameter of the tube.

The error of capacity arises in this way. The height of the barometer is the perpendicular distance between the surface of the mercury in the cistern and the upper surface of the mercurial column, Now, when the barometer falls

from 30 to 29 inches, an inch of mercury must flow out of the tube and pass into the cistern, thus raising the cistern level ; and, on the other hand, when the barometer rises, mercury must flow out of the cistern into the tube, thus lowering the level of the mercury in the cistern. Since the scales of barometers are usually engraved on their brass cases, which are fixed (and, consequently, the zero-point from which the scale is graduated is also fixed), it fol- lows that, from the incessant changes in the level of the cistern, the readings would be sometimes too high and sometimes too low, if no provision were made against this source of error.

BAROMETER

A simple way of correcting the error of capacity is— to ascertain (1) the neutral point of the instrument, or that height at which the zero of the scale is exactly at the height of the surface of the cistern, and (2) the rate of error as the barometer rises or falls above this point, and then apply a correction proportional to this rate. In many of the barometers used on the Continent the surface area of the cistern is 100 times greater than that of the tube, in which case the crror is small, and can, besides, be easily cal- culated. This is a good barometer for ordinary observers, inasinuch as no error arises in bringing the surface of the mercury of the cistern to the zero-point of the scale, which one requires to have some skill as a manipulator and good light to do correctly. Another way of getting rid of this error is effected by the Board of Trade Barometer, con- structed originally by Adie of London. In this barometer the error of capillarity is allowed for in fixing the zero- point of the scale, and the error of capacity is obviated by making the scale-inches not true inches, but just so much less as exactly to counterbalance the error of capacity.

But the instrument in which the error of capacity is satisfactorily (indeed, entirely) got rid of is Yortin’s Barometer. F¥ig. 3 shows how this is effected. The cistern is formed of a glass cylinder, through which the level of the mercury may be seen. The bottom is made like a bag, of flexible leather, against which a screw works, At the top of the interior of the cistern is a small piece of ivory, the point of which coin- cides with the zero of the scale. By means of the screw, which acts on the flexible cistern bottom, the level of the mercury can be raised or depressed so as to bring the ivory

point exactly to the sur- face of the mercury in the cistern. In some barometers the cistern is fixed, and the ivory point is brought to the level of the mercury in the cistern by raising or depressing the scale.

What is called the Jvteroy Durometer is only a modified form of the siphon barometer, with the lower limb blown into a moderately-sized bulb, resembling a cistern in some respects, and thus giv- ing a larger range to the readings of the upper limb. It is only suited for scientific purposes. The common Wheel Barometer, the popular form of the weather glass, is also a modification of the siphon barometer. A small weight, glass or iron, floats on the mercury in the lower limb; to this weight a thread is attached, which is led round a horizontal axis, a small weight being suspended at its free extremity to keep it tight. The float rises and falls with the fluctua- tions of the barometer, and a pointer fixed to a horizontal axis being turned by this means indicates the height of the barometer by figures on a dial. Since the mercury only rises or falls in the open end of the siphon to the extent of half the oscillation, a cistern is added to the top of the upper limb to increase the amount of the oscillation in the lower limb. This form of the barometer is only suited for very rough purposes, since large and uncertain errors arise from the shortening and lengthening of the thread with the varying dampness or dryness of the air, and from the friction of the different parts of the mechanism of the instrument.

Since in working out the great atmospheric problem of the force of the wind in its relation to the barometric gradient (z.¢., the differences of the pressures at different places, reduced to the same level) readings from about the

Fic. 8.—Fortin’s Barometer.

Fortin’s barometer

popular, not for |

Wheel barometer,

—

Howson’s barometer.

Sympiezo- meter,

BAROMETER

hundredth of an inch (0°010), or even less, require to be observed and stated with great accuracy, the extreme importance of accurate sensitive barometers will be apparent,—instruments not only possessing a great range of scale, but a scale which will truly indicate the real atmospheric pressure at all times. The two barometers which best satisfy this requirement are King’s Barometer, which has been in use for many years at the Liverpool Observatory, and Howson’s Barometer. Fig. 4 shows the essential and peculiar parts of Howson’s baro-

meter. A is the barometer tube, which is of

large diameter, and longer than ordinary in order

to admit of a greater length of range. B is a movable cylindrical cistern, having attached to its

bottom a long hollow tube or stalk ¢, hermetically

sealed, springing to a height of about 28 inches

above the fixed level of the mercury in the cistern.

This stalk terminates a little below the upper

level of the mercury, and its upper end is thus

exposed to no more downward pressure than

that of the mercury above it; consequently,

there is an excess of upward pressure of the air

which tends to raise the cistern. When the ex-

cess of upward pressure is exactly balanced by

the weight of the cistern with its stalk and con-. tained mercury up to 6, an equilibrium will be

established, which will keep the apparatus sta-

tionary or hanging in suspension. If now the

atmospheric pressure acting on the cistern be

increased, and if the thickness of the glass tube

A be supposed to be nothing, the cistern would

continue to ascend to an indefinite extent, since

there is nothing to stop it. But as the glass is 4

substance of some thickness, mercury is displaced

by the glass as it is plunged further into the cis- {| j_ tern; and as it thus offers a resistance to the pig 4 ascent of the cistern, the cistern will come to rest Howson's

when the quantity of mercury displaced is equi- Barometer valent to the increase of pressure. The extent of range which this barometer possesses over the ordinary baro- meter is determined by the ratio of the internal area of the tube A to that of the annulus of glass which bounds it,—the range increasing as the internal area is increased, or as the thickness of the glass is diminished.

The liability of the barometer to be broken in carriage is great. This risk is considerably lessened in the Board of Trade Barometer, which has the tube very much reduced in diameter for a part of its length, breakage from "pumping" being so much lessened thereby that the instrument may be sent as a parcel by rail, if only very ordinary care be taken in the carriage. 'This is essentially the principle of the Marine Barometer, which, however, has

the tube still more contracted. For rougher modes of transit an ingeniously constructed iron barometer has been invented by Mr T, Stevenson, C.E.

The sympiezometer was invented by Adie of Edinburgh. It consists of a glass tube, with a small chamber at the top and an open cistern below. The upper part of the tube is filled with air, and the lower part and cistern with glycerine. When atmospheric pressure is increased, the air is compressed by the rising of the fluid; but when it is diminished the fluid falls, and the contained air expands. To correct for the error arising from the increased pressure of the contained air when its temperature varies, a thermometer and sliding-scale are added, so that the instrument may be adjusted to the temperature at each observation. It is a sensitive instrument, and well suited for rough purposes at sea and for travelling, but not for exact observation. It has been for some time superseded by the Aneroid, which far exceeds it in handiness,

portability, and correctness. invented by Vidi, and patented in England in 1844, action depends on the effect produced by the pressure of the atmosphere on a circular metallic chamber partially exhausted of air and hermetically sealed. Fig. 5 represents the internal construction, as seen when the face is removed, but with the hand still attached. a is a flat circular metallic box, having its upper and under surfaces corrugated in concentric circles. ‘This box or chamber being partially exhausted of air, through the short tube 6, which is sub- sequently made air-tight by soldering, constitutes a spring, which is affected by every variation of pressure in the external atmosphere, the corrugations on its surface increas- ing its elasticity. At the centre of the upper surface of the exhausted chamber there is a solid cylindrical projection a, to the top of which the principal lever cde is attached, as shown in the drawing. ‘This lever rests partly on a spiral spring at d; it is also supported by two vertical pins, with perfect freedom of motion. The end e of the lever is attached to a second or small lever f, from which a chain g extends to h, where it works on a drum attached to the axis of the hand, connected with a hair spring at /, changing the motion from vertical to horizontal, and regulating the hand, the attachments of which are made to

Fia, 5.—Aneroid Barometer.

the metallic plate 7. The motion originates in the corru- gated elastic box a, the surface of which is depressed or elevated as the weight of the atmosphere is increased or diminished, and this motion is communicated through the levers to the axis of the hand at A. The spiral spring on which the lever rests at d is intended to compensate for the effects of alterations of temperature. The actual movement at the centre of the exhausted box, from whence the indications emanate, is very slight, but by the action of the levers this is multiplied 657 times at the point of the hand, so that a movement of the 220th part of an inch in the box carries the point of the hand through three inches on the dial. The effect of this combination is to multiply the smallest degrees of atmospheric pressure, so as to render them sensible on the index.

The instrument requires, however, to be repeatedly com- pared with a mercurial barometer, being liable to changes from the elasticity of the brass chamber changing, or from changes in the system of levers which work the pointer. Though aneroids are constructed showing great accuracy in their indications, yet none can lay any claim to the exact- ness of mercurial barometers. The mechanism is liable to get fouled and otherwise go out of order, so that they may change 0°300 inch in a few weeks, or even indicate pressure so inaccurately and so irregularly that no confidence can be placed in them for even a few days, if the means of com- paring them with a mercurial barometer be not at hand,

The Aneroid Barometer was Aneroid Ttg barometer.

Self-regis- tering barometers.

Materials.

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Of the self-registering barometers, the best are those which accomplish this object by photography. This is done by concentrating the rays of a gas flame by means of a lens, so that they strike the top of the mercurial column. A sheet of prepared paper is attached to a frame placed behind a

screen, with a narrow vertical slit in the line of the rays. The mercury being opaque throws a part of the paper in the shade, while above the mercury the rays from the flame pass unobstructed to the paper. The paper being carried steadily round on a drum at a given rate per hour, the height of the column of mercury is photographed continuously on the paper. From the photograph the height of the barometer at any instant may be taken. King's, Hardy's, Hough's, Hipp's, and Thorell's self-register- ing barometers may also be referred to as giving continuous records of the pressure. In all continuously registering barometers, however, it is necessary, as a check, to make eye-observations with a mercury standard barometer hang- ing near the registering barometer from four to eight times daily.

In constructing the best barometers three materials are employed, viz. :— (1) brass, for the case, on which the scale is engraved ; (2) glass, for the tube containing the mercury ; and (3) the mercury itself. Brass is the best material for the case and scale, inasmuch as its co-efficient of expansion is well known, and is practically the same though the alloy be not in all cases exactly alike. It is evident that if the co-efficient of expansion of mercury and brass were the same, the height of the mercury as indicated by the brass scale would be the true height of the mercurial column. But this is not the case, the co-efficient of expan- sion for mercury being considerably greater than that for brass. The result is that if a barometer stand at 30 inches when the temperature of the whole instrument, mercury and brass, is 32°, it will no longer stand at 30 inches if the temperature be raised to 69°; in fact, it will then stand at 30°1 inches. This increase in the height of the column by the tenth of an inch is not due to any increase of pressure, but altogether to the greater expansion of the mercury at the higher temperature, as compared with the expansion of the brass case with the engraved scale by which the height is measured. In order, therefore, to compare with each other with exactness barometric observations made at different temperatures, it is necessary to reduce them to the heights at which they would stand at some uniform temperature. The temperature to which such ob- servations are now almost everywhere reduced is 32° Fahr.

The following is Schumacher's formula for computing the corrections for baroineters, whose heights are noted in English inches, for temperature ¢, according to Fahrenheit's scale :-——

mt — 82°) — s(t – 62°)

ee TE T4m(t- 827)’ where h = height of barometer, m = expansion of mercury for 1° Fahr. = 0:0001001,

s = expansion of brass for 1° Fahr. = 0°00001041. The standard temperature of the English yard being 62° and not 32°, it will be found in working out the correc- tions from the above formula that the temperature of no correction is not 32° but 28°°5. If the scale be engraved on the glass tube, or if the instrument be furnished with a glass scale or with a wooden scale, different corrections are required These may be worked out from the above formula by substituting for the co-efficient of the expansion of brass that of glass which is assumed to be 0°00000498, or that of wood, which is assumed to be 0. Wood, how- ever, should not be used, its expansion with temperature being unsteady, as well as uncertain.

If the brass scale be attached to a wooden frame and be free to move up and down the frame, as is the case with

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many siphon barometers, the corrections for brass scales are to be used, since the zero-point of the scale is brought to the level of the lower limb; but if the brass scale be Jjixed to a wooden frame, the corrections for brass scales are only applicable provided the zero of the scale be fixed at (or nearly at) the zero line of the column, and be free to expaud upwards. In siphon barometers, with which an observation is made from two readings on the scale, the scale must be free to expand in one direction. Again, if only the upper part of the scale, say from 27 to 31 inches, be screwed to a wooden frame, it is evident that not the corrections for brass scales, but those for wooden scales must be used. No account needs to be taken of the expansion of the glass tube containing the mercury, it being evident that no correction for this expansion is required in the case of any barometer the height of which is measured from the surface of the mercury in the cistern.

In fixing a barometer for observation, it is indispens- Position of able that it be hung in a perpendicular position, seeing barometer,

that it is the perpendicular distance of the surface of the mercury in the cistern and that of the top of the column which is the true height of the barometer. Hence it is desirable that the barometer swing in position ; or if this be attended with risk or inconvenience, it must be seen that it be clamped or permanently fixed in a position exactly vertical. The surface of the mercurial column is convex, and in noting the height of the barometer, it is not the chord of the curve,—an error not unfrequently made,—but its tangent which is taken. This is done by setting the straight lower edge of the vernier, an appendage with which the barometer is furnished, as a tangent to the curve. The vernier is made to slide up and down the scale, and by it the height of the barometer may be read true to 0°002 or even to 0°001 inch. See VERNIER.

In hanging a barometer the following points should be attended to:—(1), That it be hung so that the mercurial column be quite perpendicular ; (2), that the scale be about 5 feet high, for facility of reading; (3), that the whole instrument, particularly the scale and the cistern, be hung in a good light ; and (4), that it be hung in a position in which it will be exposed to as little fluctuation of tempera- ture as possible. A wall heated by a flue, and positions which expose the instrument to the heat of the sun or to that of a fire, are very objectionable. It is to be kept in mind that no barometric observation can be regarded as good unless the attached thermometer indicates a temperature differing from that of the whole instrument not more than a degree. For every degree of temperature the attached thermometer differs from the barometer, the observation will be faulty to the extent of about 0°003 inch, which in discussions of diurnal range, barometric gradients, lunar range, and many other questions, is a serious amount.

Before being used, barometers should be thoroughly examined as to the state of the mercury, the size of cistern (so as to admit of low readings), and their agreement with some known standard instrument at different points of the scale. The pressure of the atmosphere is not expressed by the weight of the mercury sustained in the tube by it, but by the perpendicular height of the column. Thus, when the height of the column is 30 inches, it is not said that the atmospheric pressure is 14‘7 tb on the square inch, or the weight of the mercury filling a tube at that height whose transverse section equals a

square inch, but that it is 30 inches, meaning that the pressure will sustain a column of mercury of that height.

The height of the barometer is expressed in English Barometric In France and most readings.

inches in England and America. European countries, the height is given in millimétres, a millimétre being the thousandth part of a métre, which equals 39°37079 English inches. Up to 1869 the barometer

was given in half-lines in Russia, which, equalling the twentieth of an English inch, were readily reduced to English inches by dividing by 20. The metric barometric scale is now used in Russia. Ina few countries on the Continent the French or Paris line, equalling 0°088814 inch, still continues to be used. Probably millimétre and English inch scales will soon be exclusively in use. The English measure of length being a standard at 62° Fahr., the old French measure at 61°°2, and the metric scale at 32°, it is necessary, before comparing observations made with the three barometers, to reduce them to the same temperature, so as to neutralize the inequalities arising from the expansion of the scales by heat.

The barometer is a valuable instrument as an indicator of coming weather, provided its readings be interpreted with intelligence. High pressures generally attend fine weather, but they not unfrequently accompany wet stormy weather ; on the other hand, low pressures, which usually occur with wet and stormy weather, not unfrequently ac- company fine mild weather, particularly in winter and in the northern parts of Great Britain. The truth is, the barometer merely indicates atmospheric preSsure directly, whilst it indicates weather only inferentially. The chief points to be attended to are its fluctuations taken in con- nection with the wind and the state of the sky, but above all, the readings of the barometer as compared with those at neighbouring places, since it is difference of pressure, or the amount of the barometric gradient, which deter- mines the strength of the wind and the weather generally.

Barometrical Measurements of Heights.

The decisive experiment by which Pascal established the reality of atmospheric pressure suggested to him the method of measuring heights by means of the barometer. The first attempts to effect this were necessarily rude and _ inaccurate, since they went on the assumption that the lower mass of air is of uniform density. The discovery, however, of the actual relation sub- sisting between the density of air and its elasticity by Boyle in England, and about the same time by Mariotte in France, laid a sure foundation for this branch of atmospheric physics —the relation being that, at the same temperature, the pressure of a gas is exactly proportional to its density.

The truth of this law may be shown by the following experiment. ‘ake a glass tube, of equal bore throughout, closed at one end, and bent in the form of a siphon (fig. 1), and let us suppose that it contains in the closed limb a portion of air AB, shut off from the atmosphere by mercury filling the lower portion of the tube, and that the enclosed portion of air exists at the ordinary pressure of the atmosphere or 30 inches. In this case the mercury in each limb, being subject to the same pressure, will stand at the same level. If we now pour mercury into the long limb (fig. 2) till the level in this limb stands 30 inches above the level in the closed limb, the additional mercury will tend to compress the air in A’B’ with a pressure equal to that exerted by a column of 30 inches of mercury. In the latter case, therefore, the air is subjected tu a pressure of two atmospheres, or 60 inches, while in the former it was only subjected to a pressure of one atmosphere or 30 inches. It will be found that the space A’B’ under the pressure of two atmospheres is only half the space AB where the pressure is only one atmospbere. If mercury had been

filled in till the difference of level of the mercury in the two limbs was 60 inches, or a pressure of three atmospheres, the space occupied by the air in the closed limb would have been only a third of the original space when the pressure was only that of one atmosphere. Generally, Boyle’s law or Mariotte’s law is this:—The volume of a gas varies inversely as the pressure. Since the same quantity of air has been experimented with, it follows that the density is doubled with a pressure of two atmospheres, and trebled with that of three, and hence the pressure of a gas 1s proportional to its density.

This law, however, only holds provided the temperature is the same. The familiar illustration of a bladder, partially filled with air, expanding on being placed near a fire, shows that if the pressure remains the same,—the pressure in this case being that of the atmosphere,—the gas will occupy a larger space if its temperature be raised. If the temperature be increased and the air be confined so as to occupy the same space, the pressure will be increased.

The relation between the temperature and pressure of gases was first discovered by Gay-Lussac; and more recently our knowledge of this branch of the subject has been greatly enlarged by the beautiful and accurate experiments of Regnault. From those experiments it has been concluded that the co-efficient which denotes increase of elasticity for 1° Fahr. of air whose volume is constant equals ‘002036 : and that the co-efficient which denotes increase of volume for 1° Fahr. of air whose elasticity is constant equals ‘002039, It may further be added that the co-efficient of expansion for carbonic acid gas, hydrogen, and all other gases, is as nearly as possible the same.

When a fluid is allowed to evaporate in the exhausted receiver of an air-pump, vapour rises from it until its pressure reaches a certain point, after which all further evaporation is arrested. This point depends on the nature of the fluid itself and on the temperature, and it indicates the greatest vapour pressure possible for the fluid at the particular temperature. Regnavlt has shown the amount of the vapour pressure of waterat different temperatures, thus—

Temp. Max. Pressure Temp. Max. Pressure Fahr, of Vapour, Fahr. of Vapour – inch. é inch, 0 0°044 50 0°361 10 0°068 60 0°518 20 0°108 70 0°733 30 0°165 80 1°023 40 0°248 90 1°410

If gases of different densities be put into the same vessel it is found that they do not arrange themselves according to their densities, but are ultimately diffused through each other in the most intimate manner. Each gas tends to diffuse itself as in a vacuum, the effect of the presence of other gases being merely to retard the process of their mutual diffusion. As regards the atmosphere, evaporation goes on until the maximum vapour pressure for the tem- perature has been attained, at which point the air is

said to be saturated, and whilst the temperature remains the same further evaporation is arrested. Thus, at a tempera- ture of 50° evaporation goes on until the vapour pressure reaches 0°36] inch, but if the temperature were raised to 60° the process of evaporation would be renewed, and go on till the vapour pressure rose to 0°518 inch. If at a vapour pressure of 0‘518 inch the temperature were to fall from 60° to 50°, the air would no longer be capable of retaining the whole of the aqueous vapour in suspension, but the surplus part would be condensed and fall as rain. In the change from the aeriform to the liquid state a quantity of latent heat is given out. The yet uncertain effect of these changes, particularly the change of form from the aeriform to the liquid state, on the pressure, temperature, and movements of the air, renders it peculiarly desirable that barometeric observations for the determination of

heights should not be made when clouds are forming or rain is falling.

Dalton has shown! that air charged with vapour is specifically lighter than when it wants the vapour ; in other words, the more vapour any given quantity of air has in it the less is its specific gravity ; and Sir William Thomson has shown 2 that the condensation of vapour in ascending currents of air is the chief cause of the cooling effect being so much less than that which would be experienced by dry air, From these ascertained effects of aqueous vapour in modifying the pressure and temperature of the atmosphere, the importance in the barometric measurement of heights of full and accurate observations of the hygrometry of the atmosphere and of the weather will be apparent.

Since the equilibrium of the vapour atmosphere is being constantly disturbed by every instance of condensation, by the ceaseless process of evaporation, and by every change of temperature, and since the presence of oxygen and nitrogen greatly obstructs the free diffusion of the aqueous vapours, it follows that Dalton’s law of the independent pressure of the vapour and the dry air does not absolutely hold good. From the constant effort of the vapour to attain to a state of equilibrium there is, however, a

con- tinual tendency to approach this state. Since the equal diffusion of the dry air and the vapour is never reached, observations can only indicate local humidity, and therefore as regards any considerable stratum of air can only be regarded as approximate. Though particular observations may often indicate a humidity wide of the mark, yet in long averages a close approximation is reached, except in confined localities which are exceptionally damp or dry. Hence in observations for the determination of heights, the results of a long-continued series of observations should be employed, and those hours should be chosen whose mean is near the daily mean.

The most recent results arrived at by Regnault are the best, but it is to be regretted that the whole subject of the hygrometry, both as regards the methods of observation and the methods of discussing the observations, is still in an unsatisfactory state. This consideration, taken in connec- tion with our defective knowledge of the relation of aqueous vapour to radiant heat, of the mode of its diffusion both vertically. and horizontally, and of the influence exerted by its condensation into cloud and rain, and with our ignorance of the merely mechanical effects of ascending, descending, and horizontal currents of air in increasing or diminishing barometric pressure, renders it evident that heights deduced from barometric observations can only be regarded as approximate. It is much to be desired, in stating results, that the limit of error were taken into account, and the nearest round number in accordance therewith should alone be given as the calculated result. Thus, it is a mistake to give as the height of a place 1999 feet when the calculation is based wholly on barometric observations, and the limit of error amounts to 30 feet or more. The height 2000 should be given as the result.

The correction for decrease of gravity at the higher station, as compared with the force of gravity at the lower station or at sea-level, must also be taken into account. Its amount is small, being, roughly speaking, only about 0°001 inch per 400 feet. Since:the force of gravity is diminished in proportion to the square of the distance from the centre of gravity, the rate of its decrease with the height varies 1n different latitudes.

that the force of gravity diminishes at a less rapid rate as we ascend at the equator than it does at the poles. Now,

1 Meteorological Observations and Essays, 2d ed., p. 100. 2 Mem. Lit. and Phil. Soc. Manchester, vol. ii. 38d series, p, 131.

Places at the equator being farther from the earth’s centre than places at the poles, it follows

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since at the equator gravity diminishes less rapidly with the height, the air at any given height will exert a higher pressure there than anywhere else on the globe at the same height as compared with what it does at the sea-level of the latitude. Hence a subtraction requires to be made at the equator, and the amount to be subtracted diminishes

as we proceed into higher latitudes, till it falls to zero at latitude 45°, where the force of gravity is assumed to be the mean. which constantly increases till it reaches the maximum at the poles. feet less than 0°001 inch in Great Britain, and less than

For higher latitudes an addition is required This correction is also small, being for 1000

0-003 at the equator and the poles. Various formule for the barometrical measurement of

heights, based on these principles, have been given by Laplace and others, not a few of them being unnecessarily refined and intricate when the real character of the data is taken Riihlmann 8 is given as the simplest and best, being based on the most recent results which have been arrived at :—

into consideration. The following formula by

+t” h=18400-2(1-00157 + 0°003675—5) oo” ve 1+0°378—— } (1+0-002628 cos. 2)

Q2+h b’ (1+ gs7siz0) 98: 7 Le eal)

in which } is the difference in métres of level between the two stations; ¢’ and ¢” the temperature centigrade of the air at the two stations; b’ and b” the heights of the barometer in millimatres, corrected for temperature and for all instru- mental errors; o’ and o” the elastic force of the mean of the latitudes of the two stations; and z the height of the lower station above the sea. Making—

vapour ; ®

fat? A=log. 18400, 2(1-00157 + 0°008675)—5—

0°378f0 a” O=log. | 14+ a+a) ts

D=log. { 1+0 002628 cos. 2p hs

Qe+h E=log. 1+ §378150 ! : Riihlmann has calculated the values A, C, D, and E for the different values of the respective arguments, which are

given in the tables appended to the work. From formula (1) we obtain—

log. h=log. {log. b’— log. bt +(A+C+D+E). . « (2).

It is assumed that the whole stratum of air between the two heights is in a state of rest, and that the means of the temperature and humidity observed at the two stations are the means respectively of the stratum of air between them.

If great accuracy is desired, both barometers must be read from the zeros of their scales, and the observations must be corrected for all merely instrumental errors, and must be made strictly at the same time or times, seeing that a very small error, arising either from imperfect observa- tions, or from their not being comparable, produces a com- paratively large error in the calculated results. wea

In deducing heights from long-continued observations it should be ascertained that the barometers and observations are good, and observations should if possible be used which have been made at the same hours of the day and during the same years. Observations at different hours of the day

are not comparable, since, owing to our imperfect knowledge of the differences of daily barometric range, the a SO

8 Die Barometrischen Hihenmessungen und thre Bedeutung fir die Physik der Atmosphitre, von Dr Richard Riithlmann, Leipsic, 1870.

necessity for the application of any so-called corrections for daily range must necessarily lead to error. The comparison should also only be between observations made during the same years, since the means of different years often differ widely from cach other. Thus the difference of height between two places at which barometrical observa- tions were made, from 1830 to 1859 and from 1850 to 1869 respectively, could be more accurately ascertained from the ten years' averages from 1850 to 1859 during which observations were made at both places, than from the longer averages of thirty and twenty years. Inattention to this point has often led to error, especially in cases where at one of the places only a few years were available. To secure greater accuracy, the calculations should be made on the mean for the year, the two extreme mouths, January and July, and that month during which the distribution of pressure is most uniform over the region where the places are situated, Owing to the great differences in the distri- bution of atmospheric pressure in different parts of the globe (see ATMOSPHERE), comparison of the observations at the higher station with those at more than one lower station is in some cases indispensable. Thus, if it were desired to compute the height of Dovre, in Norway, barometrically, it should be compared both with Christiania and with Christiansund on the west coast; for if compared with Christiania alone the calculated height would be too high, and if with Christiansund too low, the reason being that the mean annual pressure diminishes from Christiania to Christiansund. The same remark applies to a large portion of Hindustan and to many other regions of the globe.

The more special precautions to be taken in deducing heights from one or a few observations, that is, from such data as travellers observe, are these :— that the observations be made in as settled weather as possible, at those hours of the day, at least, at which observations are made at the nearest meteorological stations, and be repeated as long as possible from day to

day; that the barometcr hang perpendicularly and in shade; and that the observations be not made till the whole instrument has acquired the temperature of the surrounding air. For, for every degree which the temperature indicated by the attached thermo- meter differs from the temperature of the whole instrument, there is an error of about 0°003 inch.

From their portability and handiness the aneroid baro- meter, and the thermometer for ascertaining the point at which water boils, are of great use in determining heights,— the thermometer, if properly managed, being the more accu- rate of the two. Since, owing to the sluggishness with which the aneroid often follows the changes of pressure, espe- cially low pressures, its readings should not be recorded till it has hung for some hours at the place of observation, and if this be not possible, the time which elapsed from arriving at the place and making the observations should be stated. It may not be unnecessary to add that every opportunity which preseuts itself should be taken of comparing it with a standard mercurial barometer, owing to the variations, irregular or permanent, to which aneroids are subject, and that the instrument should always be read in one position, since the difference between the reading in a horizontal position and the reading in a vertical position is often considerable.

At apressure of 29-905 inches distilled water boils at 212°. The temperature of the boiling point varies with the nature of the vessel. hus, if the interior of the glass vessel be varnished with shell-lac, the temperature may rise to 221°; and if iron filings be dropped into the water, the temperature is lowered. But in all these cascs the temperature of the vapour arising from the water is as nearly as possible the same. Hence in making observations with the thermometer for hypsometrical purposes, the

instrument is not plunged into the water, but the whole instrument, bulb and stem, are by an apparatus used for the purpose plunged into the vapour arising from the boil- ing water. The degrees on the thermometer used are greatly enlarged, thus admitting of a minute subdivision of the scale and, consequently, of very precise readings. The following are a few of the barometric heights corresponding to different temperatures at which distilled water boils, taken from Regnault’s tables revised by Moritz :—

Boiling Point, Barometer, Boiling Point. Barometer.

“ inches. ” inches. 21 20°33. 205 25°990 210 28°751 204 25°465 209 28°180 203 94°949 208 27°618 202 24°449 207 27066 201 23°943 206 26°523 200 23°453

The temperature of the vapour of the boiling water being observed, the pressure is ascertained from the table, whence the height may be calculated, just as in the case of pressures obtained by means of a mercurial barometer.

The remark made by Sir John Leslie many years ago still holds good, that it is prepostcrous, in the actual state of physical science, to effect any high refinement in the for- mula for computing barometrical heights. What is required on the part of the computer of heights from barometrical observations is carefully to weigh the limzts of error duc to the instrument and methods of observations, to the hour of the day and the month of the year (see ATMOSPHERE, p. 28), and to the degree of unsettledness of the weather at the time the observations were made, and to give effect to these in the calculated results. From inattention to these simple considerations a large proportion of important heights given in works of travel and of physical geography arc very errone- ously stated, and consequently requirc careful revision.

For very rough approximations to the real height from observations of pressure and temperature, Sir G. B. Airy has prepared a table showing the differences of level corre- sponding to differences of pressure. It is from this table that the heights corresponding to pressures engraved on many aneroids are usually taken. The heights read off from the pressures should be corrected for observations of tem- perature carefully taken at the upper and lower stations, the mean of these two observations being assumed as the mean of the stratum of air occupying the interval between the two heights. (A. B.)

BARON. The origin and primary import of this term have been much contested. Menage derives it from the Latin dar, a word which we find used in classical Latin to signify “a simple” or “foolish man” (Cec. Hin., ii. 23), Another form of the same word appears to be varo, to which Lucilius gives the meaning “a stupid man,” “a blockhead,” Forcellini observing that its primary sense is “a block of tough, hard wood.” But with greater pro- bability Graff derives the word baron from the old German Bar = Mann,

freier Mann. The word seems related to the Spanish waron, which means “a male,” “a noble person,” and its root may be found in the Sanskrit véra. Like the Greek dvfp and the Latin vir, the word baron signifies man in general and also a husband—the old legal expression baron and feme being equivalent to our ordinary phrase “man and wife.”

In modern English usage the term is particularly applied to a member of the lowest order of the peerage, but in ancient records (as Lord Coke observes) the barony included all the (titular) nobility of England, because all noblemen were barons though they might possess a higher dignity also ; and the great council of peers, in which were included dukes, marquesses, and earls, as well as barons, was styled simply the “ Council de Baronage.” In like manner we

speak of the “ barons’ wars,” and “the barons” who signed Magna Charta, although nobles of higher rank joined in both, and it is usual in summoning to the Upper House a peer’s son in the lifetime of the father to give, for the occasion, a separate existence to the latter’s barony.’ Thus Earl Fortescue sat in the House of Lords during his father’s lifetime as baron of Castle Hill, county Devon— the barony held with his father’s earldom. The fiction is still maintained when a commoner is raised directly to one of the higher grades of the peerage, as in the case of Admiral Jervis, who was created at the same time Baron Jervis and Earl St Vincent.

The origin and comparative antiquity of barons have been the subject of much research amongst antiquaries. The most probable opinion is that they were the same as our present lords of manors; and to this the appellation of court-baron, given to the lord’s court, and incident to every manor, seems to lend countenance. ‘The term baron had, therefore, originally a very extensive meaning, being applicable to all tenants-in-chief of the Crown, whether holding by knight service or by grand serjeantry. But the latter only were in the narrower sense the king’s barons, and as such possessed both a civil and criminal jurisdiction, each in his curia baronis, and were entitled to seats in the great council of the nation. “For,” says Sir H. Nicolas, “it was the principle of the feudal system that every tenant should attend the court of his immediate superior ; and hence it was that he who held per baroniam,

having no superior but the Crown, was bound to attend his sovereign in his great council or parliament, which was, in fact, the great court baron of the realm" (Historic Peerage of England, ed. Courthope, p. 18). The lesser barons—those, namely, who held by knight service—were also occasionally summoned to parliament, but upon no fixed principles, and "the irregularity of passing over many of them when councils were held for the purpose of levying money, led to the provision in the Great Charter of John, by which the king promises that they shall be summoned through the sheriff on such occasions" (Hallam, Mzddle Ages, iii. 213). Both these classes, but the former especially, might be entitled to the appellation of Barons by Tenure; but it is evident that the mere possession of a barony (i. ¢., thirteen knights' feces and a quarter) did not give its possessor an absolute right to a seat in parliament, and, of course, all such baronies must have been swept away by the Act of 12 Car. I]. c. 24, abolishing feudal tenures and whatever depended thereupon. But from the reign of Henry III. (49th year) the barons were summoned to attend the king in council or parliament by writ, and thus the dignity ceased to be territorial and became altogether personal. And although the writ, whether addressed to ancient barons or to those who had not before been peers of parliament, contained no words of limitation to the heirs of the person summoned, yet it was laid down by Coke, and has always been accepted, that it ennobles the blood of the person summoned, and that thus the barony becomes heritable by heirs, male or female. A further change by King Richard II. in the 11th year of his reign, when he created John Beauchamp de Holt baron of Kidderminster by letters patent, and since that date this mode of conferring the dignity of a baron has been pursued. Dugdale states that the solemn investiture of barons created by patent was performed by the king himself, by enrobing the peer in scarlet, and this form continued till 13 Jac. I, when the lawyers declared that the delivery of the letters patent without ceremony was sufficicnt. The letters

1 The practice commenced, as Dugdale states, the 22 Edw. IV., but came into more general use in the latter part of the 17th century. It will be understood that it was designed to ''accelerate the possession " of a dignity, and not to create a second.

patent express the limits of inheritance of the barony. The usual limit is to the grantee and heirs male of his body; occasionally (as in the case of Lord Brougham) in default of male issue, to a collateral male relative ; and occasionally (as in the case of Lord Nelson) to the heirs of a sister. The coronation robes of a baron are the same as those of an earl, except that he has only two rows of spots on each shoulder; and, in like manner, his parliamentary robes have but two guards of white fur, with . rows of gold lace; but in other respects they are the same as those of other peers. King Charles IJ. granted to the barons a coronet, having six large pearls set at equal distances on the chaplet. A baron's cap is the same as a viscount's. His style is Right Honourable; and he is addressed by the king or queen, Right Trusty and Well Beloved.

Barons of the Hxchequer, six judges (a chief baron and five puisne barons) to whom the administration of justice is committed in causes betwixt the king and his subjects relative to matters of revenue. Selden, in his Titles of Honour, conjectures that they were originally chosen from aniong the barons of the kingdom, and hence their name.

Barons of the Cinque Ports (originally Hastings, Dover, Hythe, Romney, and Sandwich) were (prior to 1831) members of the House of Commons, elected by the Cinque Ports. two for each port. Their right to the title is recog- nized in many old statutes, but in 1606 the use of the term in a message from the Lower House drew forth a protest from the peers, that "they would never acknowledge any man that sitteth in the Lower House to the right or title of a baron of parliament" (ZLords' Journals). These ports are now under the jurisdiction of a warden.

Baron and Feme, in the English Law, a term used for husband and wife, in relation to each other, who are accounted as one person. Hence, by the old law of evidence the one party was excluded from being evidence for or against the other in civil questions, and a relic of it is still preserved in the criminal law,

Baron and Feme, in Heraldry, is when the coats-of-arms of a man and his wife are borne per pale in the same escutcheon,—the man's being always on the dexter side, and the woman's on the sinister. But in this case the

woman is supposed not to be an heiress, for then her coat must be borne by the husband on an escutcheon of pretence. See HERALDRY. (0. ToR3)

BARONET, a name originally given to the lesser barons mentioned in the preceding article, but now confined to the lowest grade of our hereditary nobility. The order was instituted by King James I. in 1611, at the suggestion of Sir Robert Cotton, to whom the plan had been submitted by Sir Thomas Sherley of Wiston, its actual inventor. Originally, the creation of this order was merely an expedient to raise money, and the cost of a baronetcy in each case amounted to £1095, exclusive of the fees. The money thus raised was professedly destined for the defence and maintenance of the new plantation in the province of Ulster, but it actually passed at once into the king's exhausted exchequer. According to the instruc- tions given to the commissioners appointed for admitting to the new dignity, none were eligible but 'men of quality, state of living, and good reputation, worthy of the same, and, at the least, descended of a grandfather (by the father's side) that bore arms, and who have also of certain yearly revenue" —£1000 per annum. The number created at first was 200, and the king engaged for himself, his heirs, and successors, that this should not be exceeded; and for himself also promised that no vacancies in the original number should be filled up. Charles I. disregarded the stipulated limitation, and the original terms have never since been carried out. The first twenty patents issued

were dated 22d May 1611, and begin with that given to Sir Nicholas Bacon (son of the lord keeper) whose descendant still retains the position of premier baronet of Hingland.

Baronets take precedence according to the dates of their patents, conformably to the terms of which no intermediate honour between baron and baronets can be established, and they rank above all knights except those of the Garter. The title or prefix of Sir is granted them by a peculiar clause in their patents, and until 1827 they could claim for themselves and the heirs male of their bodies the honour of knighthood. All baronets are entitled to bear in their coats-of-arms, either in a canton or an escutcheon at their choice, the arms of Ulster, viz., a bloody hand.

Baronets of Scotland, called also Baronets of Nova Scotwa. __This order of knights-baronets was instituted by Charles I. in the year 1625, when the first person dignified with the title was Sir Robert Gordon of Gordonstone, a younger son of the earl of Sutherland. The professed object of the institution was to encourage the plantation and settlement of Nova Scotia in North America ; hence the king granted to each of them a certain portion of land in that province, which they were to hold of Sir William Alexander, after- wards earl of Stirling, with precedency to them and their heirs-male for ever, before all knights called equates aurati, all lesser barons called /airds, and all other gentlemen, except Sir William Alexander, his Majesty's lieutenant in Nova Scotia, his heirs, their wives and children. It was further provided that the title of Sir should be prefixed to their Christian name, and Baronet added to their surname ; and that their own and their eldest sons' wives should enjoy the title of Lady, Madam, or Dame. The baronets of Scotland had assigned to them as an addition to their armorial bearings the ensign of Nova Scotia, viz., argent, a cross of St Andrew, azure, to be borne in a canton or in escutcheon; but in 1629, after Nova Scotia was sold to the French, this privilege was changed into permission to wear a badge about their necks pendent from an orange- tawny silk ribbon.

Malone has given the following curious note upon this subject, in his learned Life of Dryden, prefixed to his edition of the prose works of that writer :—

'When the order of baronets was first established in 1611, King James engaged that they should not exceed two hundred. However, towards the close of his reign, that number being completed, and the creation of baronets being found a useful engine of Govcrnment (the courtier by whose influence the title was obtaincd receiving usually £1000 for the grant), it was not lightly to be parted with. A scheme, therefore, of creating Baronets of Scotland was deviscd, which, it was conceived, would be no infraction of the originai com- on to confine the grants to a limited number ; and as the English

aronets were created under the great seal of England, for the re- duction of Ulster in Ireland, so the Scottish baronets were created under the great seal of Scotland, for the reduction of Acadia, or Nova. Scotia. The scheme,

however, was not carried into execution by King James ; but early in the reign of his successor several Scot- tish baronets were made. From this statemcnt it appears that there is no more necessity for calling a baronet roster under the rreat seal of Scotland (whether he be an Englishman or Scotchman), a Baronet of Nova Scotia, than there is to denominate one created under the great seal of England a Baronet of Uister.”—(Malone’s Dryden, vol. i. pp. 28, 29.)

After the Union with England in 1707 the baronets of Scotland charged their arms with the Ulster badge, being created as baronets of the United Kingdom.

Baronets of Ireland.—This order was likewise instituted by King James I. in the 18th year of his reign, for the same purpose and with the same privileges within the kingdom of Ireland as had been conferred on the analogous order in England; for which also the Irish baronets paid the same fees into the treasury of Ireland. (Gace Ey)

BARONIUS, Cmsar, the great church historian, was born on the 31st October 1538 in the district of Naples. His parents, Camillo de Barono or Barouio and Porcia

Trebonia, were of noble birth. He was educated at Veroli and Naples, where his favourite studies were theology and jurisprudence. In 1557 he accompanied his father to Rome, and found himself in the midst of the reactionary enthusiasm which did much to restore Italy, in spite of the efforts of her reformers, to the papal authority. There he was brought in contact with Philip Neri, a man who then and since has done much to reconcile the speculative student with the Church of Rome, and to provide for him work in her service to which he can give his whole heart. Neri had just founded the Italian Oratory, the model of many another, and he and hig monks had vowed to devote themselves to student lives, and to dedicate their whole power of study to the Roman Catholic Church. Among the theological studies pursued in the oratory, church his- tory and ecclesiastical biography held a prominent place, the greater part of every forenoon being sct apart for these subjects. In this small congregation Baronius found a

congenial home, and his superior, Philip Neri, soon saw that he had secured a coadjutor who would make his ora- tory all he had hoped it would become. The alarm caused by the first Protestant church history, the Magdeburg Centuries, gave his studies a special direction, and, as he told Pope Sixtus V., he was urged by his own desires, and the encouragement of Neri, to attempt to answer the Magdeburg divines. This was the origin of the Annales Ecclesiastici, his great work, which occupied thirty laborious years. These Annales, the first and in many respects the most important historical work which the Roman Catholic Church has produced, begin with the birth of Christ and end with the year 1198. The book is not properly history ; it is annals rather, as everything is subordinated to chro- nology. The year is first given, then the reigning Pope and the year of his reign, then the emperors of the Kast and West, and, after its institution, the name and year of the emperor of the Holy Roman empire. This chronological form had one advantage—theology was kept as much as possible in the background, and the facts of history were the most important part. The Annales have thus become very important to every student of church history whether Protestant or Roman Catholic. While Baronius was engaged in his great work he was encouraged by several marks of papal favour. He was named pronotarius of the papal chair; in 1596 he was elected a cardinal ; and he was afterwards chosen to fill the much-coveted post of librarian of the Vatican. He died on the 30th of June 1607. ‘The best and most useful edition of his works is that of Mansi, in 38 vols. fol.; it gives Pagi’s critica historico-theologica, or corrections of Baroutus, at the foot of each page. The best text is the Antwerp edition om Leno;

BARQUISIMETO, a city of Venezuela, and since 1830 the capital of the province of Nueva Segovia, is situated on a confluent of the Portuguesa, which belongs to the northern part of the Orinoco system. The surrounding district is fertile, and produces excellent coffee, cocoa, and sugar; and the climate is healthy and pleasant. Bar- quisimeto was founded in 1522 by Juan de Villegas, principally for the exploration and working of gold-mines supposed to exist in the neighbourhood ; and at first it received the name of Nueva Segovia in honour of his native city. The commercial advantages of its situation soon raised it to considerable prosperity. In 1807 it had about 15,000 inhabitants ; but on the 26th of March 1812, it was totally destroyed by an earthquake. It has since been regularly rebuilt, and, in spite of the

disastrous effects of the revolutionary wars, has recovered its position. Among its public buildings may be mentioned a college and several schools. The inhabitants are partly engaged in the rearing of horses and mules. Population in 1873, 25,664.

BARR, a town in Alsace, 18 miles 8.W. of Strasburg, situated on the eastern slope of the Vosges, at the mouth of the Ulrichthal. Wool and cotton spinning, and the manufacture of pottery, crystal, and soap, are its principal industries; and an active trade is carried on in wine, brandy, vinegar, cattle, and wood. The town is mentioned as early as the 8th century. It was burned by the troops of the Cardinal of Lorraine in 1592; in 1678 it suffered from a severe conflagration; and in 1794 it was greatly damaged by the cxplosion of the arsenal. There is a tepid mineral spring in the neighbourhood, and, on the Odilienberg, which rises above the town, are the ruins of the convent of St Odilia, which was founded in the 7th century Population, 5651.

BARRA, or Barray (from the Scandinavian Baraey, isle of the ocean), one of the Hebrides or Western Isles of Scotland, forming part of Inverness-shire. It lies about 5 miles §.W. of South Uist, and is 8 miles in length by from 2 to 4 miles in breadth. The parish comprehends a number of smaller islands and islets,—Berneray, Flodday, Fluda, Hellisay, Mingalay, Watersay, &c.,—and is estimated to contain 4000 acres of arable land, and 18,000 of meadow and hill pasture. The cod, ling, and herring fisheries are considerable; and the coasts abound with shell-fish, especially cockles, which have sometimes afforded food to the inhabitants in times of famine. On Barra Head, the highest point of Berneray, is a lighthouse with an intermit- ting light 680 fcet above high water, in lat. 56° 48’ N., long. 7° 38’ W. There are several remains of interest in the island of Barra, as the churches at Kilbar, the castle of the M‘Neils at Kishmul, “‘ Danish” forts and “ Druidical ” circles. Population of island (chiefly Gaelic-speaking Roman Catholics) in 1871, 1563; of the parish, 1753.

BARRACKPUR, a magisterial subdivision and town of British India, in the district of 24 Pargands, under the Lieutenant-Governor of Bengal. Barrackpur SuBpIviston was formed in 1858. It consists of the single police circle of Nawdbganj, and contains an area of 42 square miles, with 51

villages, 16,057 houses, and a total population of 68,629, of whom 47,709, or 69°5 per cent., are Hindus ; 19,600, or 28°6 per cent., are Mahometans; 1281, or 1‘9 per cent., arc Christians ; and 39 are of other religions. Proportion of males to total population, 52:2 per cent. ; persons per square mile, 1626; villages per square mile, 1:21; persons per village, 1346; houses per square mile, 380 ; persons per house, 4°3. In 1870-71 the subdivision contained one magistrate’s court, with a regular police of 195, and a village watch of 88 men. The separate cost of administration amounted to £2101.

BaRRACKPUR Town and CANTONMENT, situated on the Hugli, 15 miles above Calcutta, in 22° 45’ 40” N. lat., and 88° 23’ 52” KE. long. ; area, 889 acres, or 1°39 square miles. Population, according to the experimental census of 1869 —males, 5730; females, 2914; total, 8644. Population, as ascertained by the general census of 1872 :—Hindus— males, 3207; females, 1745; total, 4952: Mahometans —males, 1987 ; females, 1561 ; total, 3548: Christians— males, 766; females, 297; total, 1063: others—males, 21; females, 7; total, 28. Total of all denominations— males, 5981 ; females, 3610 ; totalin 1872, 9591. Muni- cipal income in 1872, £235, 9s. 6d.; expenditure, the same ; taxation, 5$d. per head. Major Smyth says in his Survey Report of the 24 Pargands District (1857) :— “The natives call it ‘ Chanak,’ from the circumstance of Job Charnock, the founder of Calcutta, having erected a bungalow and established a small bazdr there [in 1689}. Troops were first stationed there in 1772, from which time it has acquired the name of Barrackpur. The cantonment is situated on the left bank of the Hugli ; it has also a large bazdr and several large tanks, and also a parade ground.

There are usually four regiments of Native infantry can- toned in the lines. To the south of the cantonment ig situated the park, created by the taste and public spirit of Lord Wellesley. Within the park is situated the Govern- ment House, a noble-looking building, commenced by Lord Minto, and enlarged into its present state by the Marquis of Hastings. The park is beautifully laid out, and contains a small menagerie.” Its most interesting feature is now Lady Canning’s tomb. Within the last few years com- modious two-storied brick barracks have becn constructed for the British troops, and have

materially added to the health and comfort of the soldiers. The military bazar is situated a short distance from the Sepoy lines, and is care- fully supervised by the authorities. The military force stationed in the cantonment, on-the 1st March 1873, was as follows :—LEnglish troops, 18 officers, and 395 non- commissioned officers and rank and file; Native, 12 Eng- lish and 21 Native officers, with 877 non-commissioncd officers and men; total of all ranks, European and Native,

1323,

Barrackpur played an important part in the two Sepoy mutinies of 1824 and 1857, but the details of these belong to the general history of British rule in India.

BARRACKS are groups of buildings constructed for the accommodation of soldiers. The word, which was formerly spelt “baracks ” or ‘‘baraques,” is derived from the Spanish “ barracas,” meaning the little huts or cabins used by the fishermen on the sea-shore, or for soldiers in the field. The French call them “casernes,” meaning lodgings for soldiers. Barracks of a temporary character, commonly called “‘ huts,” have ordinarily been constructed by troops on & campaign as winter quarters, or when for any length of time in “standing camp,”’—they being accommodated when in the field under other circumstances in tents, or else, if not provided with tents, bivouacing without cover.

In time of peace barracks were formerly only provided for troops in fortified places termed “ garrisons,” soldiers elsewhere being provided with quarters by being billeted on public-houses. The apprehension of disturbances, and risk of the troops being too much mixed up with the populations of the localities in which they might be stationed, mainly led to the construction of barracks in or near towns in England about the year 1792. In the first instance the Deputy-adjutant-general was charged with the building and fitting up of barracks. In 1793 the same officer was appointed “ Superintendent-general of barracks,” and subsequently “ Barrack-master-general.” In 1806 the barrack establishment was placed under the direction of a board of four commissioners, of whom one was generally a military man. About the year 1825 the duke of Wellington arranged for the construction and maintenance of barracks to be given over to the corps of

Royal Engineers. The custody and equipment of barracks, with the supply of fuel and light to the troops quartered in them, were then made and remained, until recently, the duty of the “ barrack department,” which consisted of barrack-masters and barrack-sergeants.

The duties connected with barracks in the British ser- vice are now arranged as follows :—

Construction, maintenance, and supply of fixtures; also custody nd POSTMAN E a cece essu cation nestor

Equipment with supplies of all kinds, giving and taking over ; also custody when furnished but WMO CCUIER Tayacsnecemondemmere anaes

Royal Engineer Department.

Control Department.

Q. M. General’s Department, under the orders at head- quarters of the Field-Marshal Commanding-in- Chief, and in districts or at foreign stations of the Gen-

(eral Officer Commanding.

Distribution of troops to barracks

The duties connected with the construction of barracks are under the supervision of the Inspector-general of Fortifications, who is also Director of Works to the War Department. He is assisted in these duties by a Deputy and two Assistant-directors of Works, and a professional staff.

The arrangement and composition of barracks vary according to the arm of the service to be accommodated in them ; thus for the cavalry, horse and field artillery, Royal Engineers, train and transport branch of the army service corps, stables are required ; and it is usual to provide for the unmarried non-commissioned officers and men over their horses, a troop of cavalry or a division of field artillery being placed in a separate block of

two stories in height. Horse and field artillery also require gunsheds and work- shops for artificers, such as collarmakers, wheelers, &c. All mounted troops require forge and shoeing accommodation as well as saddlers' shops. Garrison artillery and com- panies of Royal Engineers can be accommodated in similar barracks to those for infantry, but the latter require an ample provision of workshops for artificers, with store accommodation for materials, &c.

Not fifty years since, in the West Indies, men slept in barracks in hammocks touching each other, only 23 inches of lateral space being allowed for each man. At the same time: in England the men slept in wooden beds, with two tiers, like the berths of a ship, and not unfrequently each bed held four men. Now, each soldier has an iron bed- stead which turns up in the middle, forming a seat for the day-time, and only two rows of beds are allowed in barrack- rooms, and the principle of providing one window for every two beds is carried out in all new barracks.

The best size for a barrack-room is now considered to be 60 or 62 feet long, by 20 feet wide, and about 12 feet: high. The number of men each room is to contain is painted on the door; and in barracks of modern construction each barrack-room has attached to it—

(1.) A small (single) sergeant's room, with fire-place, cupboard, and small window looking into the men's room.

(2.) An ablution room, with basins, water-taps, and a fixed pan in which the feet can be washed.

(3.) A night urinal, with water for flushing laid on.

Barracks are washed once a week, and on intermediate days the rooms are dry-scrubbed. The walls and ceilings are limewashed by the troops twice a year. The general periodical painting of all barrack buildings is performed twice externally and once internally in every eight years. Formerly, barrack buildings were placed on very limited areas, and even a whole regiment was lodged in one house built in the form of a square, with the quarters of the officers on one side for the better supervision of the men ; but the Barrack and Hospital Improvement Commission recommended that the men should

be divided in numerous detached buildings, so placed as to impede as little as possible the movement of air and the action of the sun’s rays.

For barracks, as a general rule, buildings of two stories in height are preferred to those of three stories, but three- story buildings may be adopted where space is limited and land very costly. Buildings of two stories are less expensive than those of only one story in height, and the general atrangement, when the former mode of construction is adopted, is more compact. The selection of a site for a barrack requires great care and circumspection. This duty is performed in the first instance by the Commanding Royal Engineer of the district, or an officer appointed by him ; but the ground proposed is also reported on by an Army medical officer as well as subsequently by the General Officer commanding the district, the final approval resting with the Secretary of State for War.

The following important points have to be considered in the selection of a site, viz.:—(1.) That the ground is suitably situated ; (2.) That it is sufficient for the number and nature of troops to be placed in the barracks ; (3.) That it is not commanded by higher ground within range of rifle fire; (4.) That the subsoil is good and healthy ; (5.) That water can be easily obtained for drinking, washing, and cooking; (6.) That drainage and sewerage can be carried out; (7.) That gas can be laid on.

A barrack should not as a rule be placed in the midst of a populous town, nor should it be too far distant from one. If in the midst of a town it would not be likely to be healthy or well placed in respect to keeping up discipline ; if too far off the men quartered in it may become dissatisfied with the service. A barrack should be surrounded with a defensible wall; there should be as few entrances as possible, and these should be provided with strong, well- barred gates.

In the new barracks now under construction for brigade depots, the armouries are generally placed in defensible ‘“‘ keeps,” the outer or boundary walls being flanked by caponnieres. In arranging the position of buildings on a design for a barrack, the axis of each of those intended for occupation by troops should be north and south, so as to allow the sun’s rays to fall on both sides, One building should in no case obstruct the light from another. The distance of buildings should not be less than their own

height from each other. The position selected for any new building or buildings in an existing or a proposed barrack is reported on by a board of officers, consisting of the head of the department, officer commanding a regiment, or other responsible officer who is to occupy the building when erected, an officer not under the rank of captain, and the commanding Royal Engineer or other engineer officer, a medical officer attending to advise the board. On the completion of a new building or barrack, it is also reported on by a board of officers before being taken over for occu- pation.

In 1854-55 public attention was called to the necessity for sanitary improvement in the barracks belonging to Great Britain, and an inquiry was instituted by the Barrack and Hospital Improvement Commission, which was succeeded by the Army Sanitary Committee. The result of the inquiries so made has been a great improvement of the quarters of the troops, which has tended largely to decrease the sickness previously prevalent among them,

The principal improvements have been as follows, viz. :—At least 600 cubic feet, and from 56 to 60 superficial feet, are now allotted to every single non-commissioned officer and man in permanent bar- racks, it being considered as important that a soldier should have his full ration of air as of food. In wooden huts 400 cubic feet are reckoned sufficient. At least 1000 cubic feet are allotted to every single non-commissioned officer and man in hot climates. About 1600 cubic feet are allotted to every horse, and since the introduction of ventilation, as well as proper sanitary arrangements in stables, glauders have almost entirely disappeared from the army. Married non-commissioned officers and men have special accommodation, with one or two rooms each, according to the size of the rooms or rank of the occupant. Iu the latest buildings small washing-rooms have been provided, in addition to two rooms for each family. A laundry and infaut school are provided for every compound of married soldiers' quarters. The principal medical officer is now charged with seeing that the regulations for protecting the health of troops in barracks are carricd out. Each regimental medical officer has also to see to this mattcr, as well as that every soldier has a separate bed ; that the beds are placed at a proper distance from the wall, and arc well aired; and that the windows are opened every morn- ing. Barrack-rooms are warmed in two ways, viz., by radiant heat from an open

fire, and by warm air obtained from an air chamber behind, and heated by the fire. Much attention has been paid of late years to the improvement of the means of cooking the meals of soldiers. Hither steel boilers and Deanc's ovens or " Warren's" apparatus are now ordinarily provided for this purpose. Every headquarter barrack now has a gymnasium and also a chapel school, as well as a sergeants' mess cstablishment. Besides a canteen with

a separate bar for the sale of groceries, one room is provided for re-creation, with a coffee bar attached, and another room for reading, with a small book-room attached to it, where the library is stored, and from which books are issued. Where there are several barracks at the same station, the sick are usually treated in a garrison hos- pital ; but where there is only one barrack, a regimental hospital forms a part of it. 1200 cubic feet are allowed at home for each patient treated in military hospitals, and about 1800 cubic feet in those coustructed in hot climates. The proportion of hospital ac-commodation now allowed at home stations is 6 per cent. on the accommodation of the barrack or barracks to which such hospital is attached. A surgery, store accommodation, a separate infection ward, hospital sergeant's quarters, sick-orderly's rooms, and a mmortuary, are provided as part of an hospital establishment. There is also, whenever practicable, a garden, where the convalescents can sit out, or take exercise in fine weather. At the main entrance to every barrack a regimental guard-room is-placed, which, besides a

good room for the guard, provided with a wooden bed on an iron –

frame, contains a prisoners' room, and also a few separate cells for the detention of such prisoners as require to be kept apart. A proportion of '* provost cells" are also constructed in large barracks, where soldiers are confined when ordered or sentenced to imprison- ment for short periods. In headquarter cavalry barracks a riding school, ordinarily 150 feet long and 50 feet wide, is provided ; also one or more maneges for out-door training. In smaller barracks, for mounted troops only, manéges are provided for equitation exer- cise. Mifle ranges are now considered to. be necessary adjuncts to all except small barracks, but sometimes the troops have to be

moved to a distance for this purpose, owing to local difficulties pre- venting practice being carried on. In barracks of modern construc- tion, a separate house or quarter containing about six rooms is provided for a commanding ollicer,and two rooms with a kitclien (or servant's room) for each field officer, or officer holding relative rank as such, and for each quarter-master. Other officers have one room each, with a compartment screened or curtained off for sleeping and dressing, a servant's room for brushing and cleaning being provided for every two or thrce officers. A mess establishment is attached to every officers' barrack, which is constructed in proportion to the numbers to be quartered in the barracks. Where the headquarters of a regiment are stationed, a billiard-room is usually allowed as part of the mess establishment. A good supply of water is one of the first requisites in a barrack, and it is preferable to obtain it, if possible, from the water-works of the locality, rather than from wells, which are liable to become polluted from soakage, leakage of drains, or other causes. Barracks should have high-level tanks, to contain one or two days' supply of water, as a reserve, or in case of fire, and firc-cocks should be fixed in suitable places. Fire-engines, with an ample supply of hosc and also ladders, are always supplied for use in barracks, The sewers or drains of a barrack should, if possible, discharge into the main or branch sewers of the locality, but if none such exist, irrigation of land inay be resorted to, or earth closets can be adopted, and the liquid drainage only be disposed of by irrigation, or such other means as may be practicable. All drains should be properly trapped and ventilated. Soil-pipes of water- closets should also be ventilated by means of small pipes carried up above the roof of the main building; pipes of the size of ordinary gas-pipes will suffice for this purpose, allowing the escape of foul gas into the outer air. Overflow or other water-pipes should on no account be connected directly with a drain, but should discharge into an open or surface channel, or over a trap or grating. Gas is ordinarily laid on to barracks both externally and internally, the quantity con- sumed being checked by a meter or meters. It is usually obtained by agreement from any public gas-works in the locality, but at cer- tain large stations the War Department have their own gas-works. At ccrtain large stations where large bodies of troops are quartered, churches are provided in addition to or in place of chapel schools. The latter are used for the services of the men of different persua- sions in succession; the former are sometimes similarly used, but are more generally restricted to the Church of

England or other specific religious persuasion. Sometimes military cemeteries are —o but more generally the soldiers are buried in those of the ocalities where they may be quartered. Wherever there is sufficient ground about or near a barrack, as at Eastney, near Portsmouth, soldiers may have portions for gardening allotted them.

The funds for the construction and maintenance of barracks are included in Vote 13 of the army estimates,

and the average aniounts so provided for them during the past three years have been as follows :—

Part 1, MV onkagovers6000) ~~ia5.55….~~.:enve sadec. coeur £102,198 Part 2, New works and alterations under £1000 …... 68,040 Part 3, Ordinary and current repairs ….....0060. 210, 455

£380, 693

The funds for the equipment of barracks are provided

BAR—BAR

in Vote 12, for the departmental staff in Vote 9, and for supplies of fuel and light in Vote 10 of the army esti- mates. (Cc. By.) BARRAS, Pau Francois JEAN NicoLas, CoMTE DE, a distinguished actor in the great French Revolution, was born in June 1755. He was a descendant of a noble family in Provence, and at an early age entered the army. He was twice in India with his regiment, but retired from the service after attaining the rank of captain. Like many others, he saw in the Revolution a good opportunity for retrieving his fortunes, which had been ruined by his extravagance and dissipation ; and his penetration enabled him to foresce the certain fall of the royalist party. He threw in his lot with the revolutionists, and speedily distinguished himself by his vigour and hardihood. When clected a member of the National Convention, he gave an uncompromising vote for the king’s death ; and at the siege of Toulon, where for the first time he met Napoleon, his energetic measures contributed much to the success of the French arms. Robespierre, who hated Barras for his dissolute habits, and feared him for his boldness, endea- voured to have his name included in one of his

prescription lists, but, on the 9th Thermidor 1794 Barras completely overthrew his power. His success from this period was secured; after the 13th Vindémiaire 1795, he was nomi- nated general-in-chief ; and after the affair of the 18th Fructidor 1797, in which Augereau played a prominent part, he was practically dictator. Bonaparte's coup d'état of the 18th Brumaire 1799 changed the whole aspect of affairs. Barras, seeing that resistance to his powerful protégé was useless, gave in his resignation, and retired to his country seat. His latter years were spent in various intrigues, in which he showed a strong leaning towards the royalist party. Hedied in 1829. The character of Barras has little in it that is worthy of admiration. He was dissolute in private life, and can scarcely be said to have had any definite public policy. At the same time he was courageous, prudent, and, on occasions, an able speaker. BARRHEAD, a town of Scotland, county of Renfrew, three miles S. of Paisley, and 8 miles 8.W. of Glasgow on the Caledonian Railway line between that city and Kil. marnock, It has rapidly increased since about 1840, and formed a junction with the neighbouring villages of Dove- cothall, Cross Artherlie, and Grahamston. The principal employment is spinning, weaving, and bleaching. Popu- lation in 1871, 6209. BARRI, GrraLtp px, commonly called Giraldus Cambrensis, an historian and ecclesiastic of the 12th and 13th centuries, was born at the castle of Maenor Pyrr near Pembroke, probably in 1147. By his mother he was descended from the princes of South Wales, and the De Barris were one of the most powerful Welsh families. Being a younger brother, and intended for the church, he was sent to St David's, and educated in the family of his uncle, the bishop of that see. When about twenty years of age he was sent to the University of Paris, where he continued for some years, and, according to his own account, became an excellent rhetorician and lecturer. On his return in 1172 he entered holy orders, and was made archdeacon of Brecknock. Having observed with much concern that his countrymen the Welsh were very backward in paying tithes of wool and cheese, he applied to Richard, archbishop of Canterbury, and was appointed his legate in Wales for remedying this and other disorders. Barry excommunicated all, without distinction, who refused to compound matters with the church, and, in particular, delivered over bodily to the evil one those who withheld the tithes. Not satisfied with enriching, he also attempted to reform the clergy. He delated an aged archdeacon to the archbishop, for the unpardonable crime of matrimony ;

and on his refusing to put away his wife he was deprived of his archdéaconry, which was bestowed upon the zealous legate. On the death of his uncle, the bishop of St David's, in 1176, he was elected his successor by the chapter; but this choice having been made without the permission and against the will of Henry II., Girald prudently declined to insist upon it, and went again to Paris to prosecute his studies. He speaks with exultation of the prodigious fame which he acquired by his eloquent declamations in the schools, and of the crowded audiences who attended them. Having spent about four years at Paris, he returned to St David's, where he found everything in confusion; and on the temporary retirement of the bishop, which took place soon after, he was appointed administrator by the advice of the archbishop of Canter- bury, and governed the diocese in that capacity till 1184, when the bishop was restored. About the same time he was called to court by Henry II., appointed one of his chaplains, and sent into Ireland with Prince John, by whom he was offered the united bishoprics of Fernes and Leighlin. He would not accept them, and employed his time in collecting materials for his Zopography of Ireland, and his history of the conquest of that island, which was completed in three books in 1187. In 1188 he attended Baldwin, archbishop of Canterbury, in his progress through Wales, preaching a crusade for the recovery of the Holy Land,— an employnient in which he tells us, with his usual modesty, that he was far more successful than the primate, adding significantly, that the people were most affected with Latin sermous (which they did not understand), melting into tears, and coming in crowds to take the cross. On the accession of Richard J. in 1189, he was sent by that monarch into Wales to preserve the peace of the country, and was even: joined in commission with William Long- champ, bishop of Ely, as one of the regents of the kingdom. He failed, however, to improve this favourable opportunity ; and having fixed his heart on the see of St David's, the bishop of which was very old and infirm, he refused the bishopric of Bangor in 1190, and that of Llandaff the year following. But in 1192 the state of public affairs became so unfavourable to Barri's interest at court that he determined to retire. He proceeded to Lincoln, where William de Monte read lectures in theology with great applause ; and here he spent about six years in the study of divinity, and in composing several works. At last the see of St David's,

which had long been the object of his ambition, became vacant, and he was unanimously elected by the chapter, but met with so powerful an adversary in Hubert, archbishop of Canterbury, that it involved him in a litigation which lasted five years, cost him three journeys to Rome, and ended in his defeat in the year 1203. Re- tiring from the world, he spent the last seventeen years of his life in studious privacy. His MSS. are preserved in the British Museum, the library at Lambeth, and the Bod- leian Library.

Of his published works, the best known is his Jtinerarium Cam- brie, of which a translation, illustrated with annotations, and accompanied with a life of the author, was published by Sir Richard Colt Hoare, in two splendid quarto volumes, in 1806 The complete works are being published under the direction of the Master of the Rolls, with full introductions,—Giraldi Cambrensis Opera, edited by J. S. Brewer and Mr Dimock, 6 vols., 1861-75; the seventh and last volume has not yet appeared.

BARRINGTON, Joun SuHuTE, FIRST Viscount, a noble- man distinguished for theological learning, was the youngest son of Benjamin Shute, merchant, and was born at Theobald, in Hertfordshire, in 1678. He received part of his educa- tion at the University of Utrecht; and, after returning to England, studied law in the Inner Temple. In 1701 he published several pamphlets in favour of the civil rights of Protestant dissenters, to which class he belonged. On the

recommendation of Lord Somers, he was employed to induce the Presbyterians in Scotland to favour the union of the two kingdoms, and in 1708 he was rewarded for this service by being appointed to the office of commissioner of the customs. From this, however, he was removed on the change of administration in 1711 ; but his fortune had, in the meantime, been improved by the bequest of two considerable estates,—oue of them left him by Francis Barrington of Tofts, whose name he assumed by Act of Parliament, the other by John Wildman of Becket. Barrington now stood at the head of the dissenters. On the accession of George I. he was returned member of par- liament for Berwick-upon-Tweed ; and in 1720 the king raised him to the Irish peerage, by the title of Viscount Barrington of Ardglass. But having unfortunately engaged in the Harburg lottery, one of

the bubble speculations of the time, he incurred the disgrace of expulsion from the House of Commons in 1723,—a punishment which was considered greatly too severe, and was thought to be due to personal malice on the part of Walpole. In 1725 he pub- lished his principal work, entitled Miscellanea Sacra, or a New Method of considering so much of the History of the Apostles as is contained in Scripture, in an Abstract of their History, an Abstract of that Abstract, and four Critical Lissays, 2 vols, 8vo,—afterwards reprinted with additions and corrections, in 3 vols. 8vo, 1770, by his son, the bishop of Durham. In the same year he published An Zssay on the Several Dispensations of God to Mankind. He was the author of various other tracts, chiefly on subjects relating to religious toleration. He died in 1734. Of his large family four were distinguished.

The eldest, W1LL1amM WILDMAN, second Viscount Bar- rington (born 1717, died 1793), held important Government offices. From 1755 to176L he was secretary at war, from 1761 to 1762 chancellor of the exchequer, from 1762 to 1765 treasurer of the navy, and from 1765 to 1778 secretary at war again. He resigned in that year, receiving a hand- some pension. In 1782 he held office for a short time as postmaster-general.

The Hon. Darnzes Barrineton, the third son, born in 1727, was a distingished antiquary and naturalist. He was educated for the profession of the law, and after filling various posts, was appointed a Welsh judge in 1757, and afterwards second justice of Chester. He never rose to much eminence at the bar, but he showed his knowledge of the law as a subject of liberal study by a valuable publication, entitled Observations on the Statutes, chiefly the more ancient, from Magna Charta to 21st James I. cap. 27, with an Appendix, being a proposal for new-modelling the Statutes, 1766, 4to, a work which has a high reputation among historians and constitutional antiquaries. In 1773 he published an edition of Orosius, with Alfred’s Saxon version, and an English translation with original notes. His Tracts on the Probability of reaching the North Pole, 1775, 4to, were written in consequence of the northern voyage of discovery undertaken by Captain Phipps, after- wards Lord Mulgrave. In them he has accumulated a variety of evidence favourable to his own opinion of the practicability of attaining the object in which that voyage had failed; and it is not improbable that his views and arguments had some effect in determining the

Government at a later period to renew the attempt. Mr Barrington's other writings are chiefly to be found in the publications of the Royal and Antiquarian Societies, of both of which he was long an assiduous miember, and of the latter vice- president. Many of these were collected by him in a quarto volume entitled Miscellanies on various Subjects, 1781. Among the most curious and ingenious of his papers, are his Experiments and Observations on the Singing of Birds, and his Lssay on the ras of Birds. He

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died on the 14th March 1800, and was buried in the Temple church.

SAMUEL BARRINGTON, the fourth son, was born in 1729, and died in 1800. He entered the navy at an early age, and in 1747 had worked his way to a post-captaincy. He was distinguished for his bravery and skill, and in 1778 attained the rank of rear-admiral. He held command for some time in the West Indies, and repulsed a superior French force at Sta Lucia.

SHUTE BARRINGTON, the youngest son, was born in 1734, and died in 1826. He was educated at Eton and Oxford, and after holding some minor dignities, was made bishop of Llandaff in 1769. In 1782 he was translated to Salisbury, and in 1791 to Durham. He published several volumes of sermons and tracts, and wrote the political life of his brother, Viscount Barrington.

BARRISTERS, in England, are the highest class of lawyers who have exclusive audience in all the superior courts. Every barrister must be a member of one of the four ancient societies called Inns of Court, viz., Lincoln's Inn, the Inner and Middle Temples, and Gray's Inn. The existence of these societies as schools can be traced back to the 13th century, and their rise is attributed to the clause in Magna Charta, by which the Common Pleas were fixcd at Westminster instead of following the king's court, and the professors of law were consequently brought together in London. Associations of lawyers acquired houses of their own in which students were educated in the common law, and the degrees of barrister (corresponding to apprentice or bachelor) and sergeant (corresponding to

doctor) were conferred. These schools of law are now represented by the Inns of Court, which still enjoy the exclusive privilege of calling to the bar, and through their superior order of benchers control the discipline of the profession.

Every person not otherwise disqualified may be admit- ted as a student of law by passing a general examination in London, or on producing evidence of his having passed a public examination at a university. The year is divided into four terms, and every student must keep twelve terms before he can be called to the bar.

duct, whether occurring in the course of professional practice or not, which they may deem unworthy of the rank of barrister.

The peculiar business of barristers is the advocacy of causes in open court, but in England a great deal of other business falls into their hands. They are the chief con- veyancers, and the pleadings (1.e., the counter statements of parties previous to joining issue) are in all but the simplest cases drafted; by them. There is, indeed, a separate class of conveyancers and special pleaders, being persons who have kept the necessary number of terms qualifying for a call, but who, instead of being called, take out licences to practise under the bar. There are still a few persons who act under such special licences, but in general conveyancing and special pleading form part of the ordinary work of a junior barrister. The highcst rank among barristers is that of king’s or queen’s counsel. They lead the case in court, and give opinions on cases submitted to them, but they do not accept conveyancing or pleading, nor do they admit pupils to their chambers. Precedence among queen’s counsel, as well as among outer barristers, is determined by seniority. The order of sergeants at law still exists, but no new appointments have recently been made, and it will probably be allowed to become extinct, the title of queen’s counsel being generally preferred. Sergeants rank after queen’s counsel. Although every barrister has a right to practise in any court in England, it will be found, in fact, that each special class of business has its own practitioners, so much so indeed, that the bar may almost be said to

be divided into several professions. The most marked distinction is that between barristers practising in Chancery and barristers practising in the courts of Common Law. ‘The fusion of Law ‘and Equity contemplated by the Judicature Act, 1873, may be ex- pected in course of time to break down this distinction ; but for many years there has been a complete separation between these two great branches of the profession. There are also subordinate distinctions in each branch. Counsel at Common Law attach themselves to one or other of the circuits into which England is divided, and may not practise elsewhere unless under special conditions. In Chancery the queen’s counsel for the most part restrict themselves to one or other of the courts of first instance (those of the Vice-Chancellors or Master of the Rolls). Business before the court of Admiralty, the court of Probate and Divorce, the Privy Council, and parliamentary committees, exhibits, though in a less degree, the same tendency to specialization. In sone of the larger provincial towns there are now local bars of considerable strength. In Manchester and Liverpool alone there are believed to be between seventy and eighty practising barristers ; and the probable extension of this system cannot fail to have a most important influence on the future character of the profession. The bar of Ireland exhibits in its general arrangements the same features as the bar of England. Every Irish barrister must have kept at least six terms in one of the English Inns of Court. There is no connection whatever between the Scotch and English bars.

Counsel is not answerable for anything spoken by him relative to the cause in hand and suggested in the client’s instructions, even though it should reflect on the character of another and prove absolutely groundless, but if he mention an uutruth of his own invention, or even upon instructions if it be impertinent to the matter in hand, he is then liable to an action from the party injured. Counsel may also be punished by the summary power of the court or judge as for a contempt, and by the benchers of the inn to which he may belong on cause shown.

The rank of barrister is a necessary qualification for nearly all offices of a judicial character, and a very usual

BAR

qualification for other important appointments. Not only the judgeships in the Superior Courts of Law and Equity at home and in the colonies, but nearly all the magistracies of minor rank—recorderships, county court judgeships, &c., —are restricted tothe bar. The result isa unique feature in the English system of justice, viz., the perfect harmony of opinion and interest between the bar as a profession and all degrees of the judicial bench.

Revising Barristers are counsel of not less than seven years' standing appointed to revise the lists of parliamentary voters.

Barristers cannot maintain an action for their fees, which are regarded as gratuities, nor can they, by the usage of the profession, undertake a case without the intervention of an attorney.

BARROS, Joao bE, a celebrated Portuguese historian, was born about 1496, and died in 1570. In 1522 he was appointed governor of St George del Mina, on the coast of Guinea. 'Three years after, the king recalled him to court, and made him treasurer of the Indies. This appointment furnished him with the materials necessary for the composi- tion of his valuable history, entitled Asta Portuguesa, the first decade of which he published in 1552, the second in 1558, and the third in 1563 ; the fourth was not published till 1615. Several authorshave continued the work, so that it extends to twelve decades. The best edition is that published at Lisbon, in 1778, in 9 vols. 8vo.

BARROW-IN-FURNESS, a borough, port, and parish in the hundred of Lonsdale, North-West Lancashire, situated opposite the island of Walney, at the extreme point of the peninsula of Furness, which lies between Morecambe Bay and the estuary of the Duddon. It is distant 35 miles from Lancaster and 91 from Carlisle. The area of the borough, which includes Walney and the islets at its south end, is 17,000 acres, of which 8155 are land, the rest being sand and water.

The town has had a remarkable rise. The veins of pure hematite iron ore in the district, now so extensively wrought, have long been in repute; and more than a hundred years ago, a small traffic was carried on in the ore, with the addition by-and-by of pig-iron, which early began to be

manufactured in the vicinity of the mines,~~—the branch of the channel, now converted into docks, serving as a harbour, and the beach as a quay, for the shipment of the material brought down from the mines and charcoal furnaces. But atthe beginning of the present century the annual export was only about 1000 tons, and then, and for many years after, though the trade went on increasing, the place was the merest hamlet, the population so recently as 1847 being only 325. It may be said that the railway has created the modern town. By the opening in 1846 of the first short section of the Furness Company's line, from the mines near Dalton to Piel pier and Barrow, the trade of the district received a great impetus, and it rapidly developed with the various extensions of the railway, till in 1857, by the carrying of the line over Morecambe sands, through communication was established between Barrow and Carnforth. When the railway was opened the ship~~ ments of ore had risen to 60,000 tons a year, while within five years afterwards there left by sea and rail a total of 250,000, which again, within other five years, increased to 450,000 tons. The next great onward step was the establishment at Barrow, in 1859, of the iron-works of Messrs Schneider and Hannay, followed in 1864 by the commencement of steel-works, the two being united in 1866 under "The Barrow Hematite Steel Company (Limited)." In 1867 there were opened the Devonshire and Buccleuch docks, constructed at a comparatively small cost by the enclosure of the channel between the mainland and a small island, on which shipbuilding works have since been

erected. The docks comprise an area of above 60 acres, are entered from Walney Channel by a gateway 60 feet wide, give a uniform depth of 24 feet, the stone quays being 14 miles long, and the wharves supplied with hydraulic cranes, one of which is capable of lifting 100 tons. Within a few years after the opening of the docks various impor- tant branches of industry were introduced, by means of which the town has both been consolidated and increased. The census of 1871 gives a return of 17,992, while a census for municipal purposes, November 1874, showed a population of over 40,000. The inhabited houses at the same period numbered about 6000, the rateable value of the borough being £144,000. The town owes much of its prosperity to the enterprise of the dukes of

Devon- shire and Buccleuch, and also to the foresight, zeal, and practical ability of Sir James Ramsden, managing director of the Furness Railway Company ahd first mayor of the borough, who in 1872 received the honour of knighthood as an acknowledgement of the value of his work, while a massive bronze statue in the centre of the town, raised about the same time by voluntary contributions, testifies to the appreciation of his services by the community.

A great part of the town lies low, much of it being built on ground reclaimed from the sea. It is well laid out, according to a fixed plan, in regular streets running at right angles, viz., north and south, and east and west. About £19,000 have already been expended on approaches and general road improvements. Not many public buildings can be looked for, but among others are the North Lonsdale Hospital; the Workmen's Club and Institute, the gift of Mr H. W. Schneider, and others; swimming baths, presented by Sir James Ramsden; a town-hall and large covered market, besides churches, schools, and banks.

The first place among the public works must be assigned to those of the Barrow Hematite Steel Company. Their iron-works have sixteen blast furnaces constructed so as to save the waste gases, which are utilized in heating the boilers and hot-air ovens. At the steel-works, which are the largest in Great Britain, are eighteen converters for making Bessemer steel. The amount of ore used is about 460,000 tons annually, of which the company's own mines yield upwards of 350,000 tons. There is an annual produce of 250,000 tons pig-iron, and 110,000 tons of steel, 80,000 tons of the latter being rails. In the pro- cesses about 500,000 tons of coke and coal are consumed annually; and the company employ at their works and iron-mines nearly 5000 men, besides a large number at coal-mines which they also work.

The works of the Jron Shipbuilding Company (capital, a quarter of a million), lying between the docks and Walney Channel, cover an area of 50 acres, with a frontage of 1050 feet, where ten vessels of the largest size can be laid down. When the works are in full operation, 6000 men will be employed. There is also a graving-dock of the largest size.

The Barrow Flax and Jute Company have an extensive jute work adjoining the docks, and communicating with the railway. It covers an area of 14 acres, has an imposing and attractive exterior, and is beautifully and elaborately fitted up with the greatest possible regard to efficiency and comfort. The works employ 2000 hands. Besides the above there are large engineering-works, waggon-works, saw- mills, bri¢k-works, and a steam corn-mill.

The trade of the port is indicated by the character of the public works. The imports are chiefly timber, coal, jute, and general produce. Ore, steel rails, and pig- iron are chief among the exports. In 1874 the vessels entering the port numbered 1620, with a tonnage of 347,800 tons register. An extension of dock accommodation is being provided in a series of basins, to be called the Ramsden dock, with a water area of 200 acres, Passenger

steamers run daily to Belfast, and there is also a regular service to Glasgow and to the Isle of Man. By rail there is connection with Whitehaven, and with the London and North-Western and Midland systems, with branches to the Lake district.

Barrow is in the diocese of Carlisle. Besides the Church of England, which has three places of worship, there are the following churches :—the Presbyterian, Congregational, Wesleyan, Methodist New Connexion, Baptist, and Primi- tive Methodist.

The town received a charter of incorporation in 1867, when a council of sixteen was nominated, that number being doubled by an Act obtained in 1875. The supply of water comes from Kirkby Moor, the water-works as well as the gas-works being the property of the corporation. A cemetery has been provided at a cost of £25,000, with three chapels. A complete and thorough plan of drainage is being carried out, partly on the separate system. There is a fire brigade under the corporation, and at the entrance to the harbour there is a life-boat station. The police are those of the county. Several newspapers are published ; and there are branches of various banking establishments, some of them occupying large and handsome buildings.

The extensive and interesting ruins of Furness Abbey, founded by Stephen in 1127, lie within the borough, over two miles from the heart of the town. They are beauti- fully situated in a small wooded valley, with a hotel and railway station close by. On Piel island is the Pile of Fouldrey, or Piel castle, the ruin of a castle built in 1327 by the abbot of Furness.

BARROW, Isaac,:an eminent mathematician and divine, was the son of Thomas Barrow, a linen draper in London, where he was born in 1630. He was at first placed for two or three years at the Charter-house school. There, however, his conduct gave but little hopes of his ever suc- ceeding as a scholar, for he was inattentive and extremely fond of fighting. But after his removal from this establish- ment, his disposition took a happier turn; and having soon made considerable progress in learning, he was in 1643 entered at St Peter's College, and afterwards at Trinity College, Cambridge, where he applied himself with great diligence to the study of literature and science, especially of natural philosophy. He at first intended to adopt the medical profession, and made some progress in anatomy, botany, and chemistry, after which he studied chronology, geometry, and astronomy. He then travelled in France and Italy, and in a voyage from Leghorn to Smyrna gave proofs of great personal bravery ; for the ship having been attacked by an Algerine pirate, Barrow remained upon deck, and fought with the utmost intrepidity, until the pirate, unprepared for the stout resistance made by the ship, sheered off and left her to pursue her voyage.

At Smyrna he met with a most kind reception from the English consul, Mr Bretton, upon whose death he after- wards wrote a Latin elegy. From this place he proceeded to Constantinople, where he received similar civilities from Sir Thomas Bendish, the English ambassador, and Sir Jonathan Dawes, with whom he afterwards contracted an intimate friendship. While at Constantinople he read and studied the works of Chrysostom, ouce bishop of that see, whom he preferred to all the other Fathers. He resided in Turkey somewhat more than a year, after which he pro- ceeded to Venice, and thence returned home through Germany and Hollandin 1659. Immediately on his reach- ing England he received ordination from Bishop Brownrig, and in 1660 he was appointed to the Greek professorship at Cambridge. When he entered upon this office he intended to have prelected

upon the tragedies of Sophocles ; but he altered his intention, and made choice of Aris- totle's rhetoric. His lectures on this subject having

been lent to a friend who never returned them, are irre- coverably lost. In July 1662 he was elected professor of geometry in Gresham College, on the recommendation of Dr Wilkins, master of Trinity College, and afterwards bishop of Chester; and in May 1663 he was chosen a fellow of the Royal Society, at the first election made by the council after obtaining their charter. The same year the executors of Mr Lucas, who, according to the terms

'of his will, had founded a mathematical chair at Cam-

bridge, fixed upon Barrow as the first professor; and although his two professorships were not inconsistent with each other, he chose to resign that of Gresham College, which he did on the 20th May 1664. In 1669 he resigned his mathematical chair to his illustrions pupil Isaac New- ton, having now determined to renounce the study of mathematics for that of divinty. Upon quitting his pro- fessorship Barrow was only a fellow of Trinity College; but his uncle gave him a small sinecure in Wales, and Dr Seth Ward, bishop of Salisbury, conferred upon him a prebend in that church. In the year 1670 he was created doctor in divinity by mandate; and, upon the promotion of Dr Pearson, master of Trinity College, to the see of Chester, he was appointed to succeed him by the king's patent, bearing date the 13th February 1672. In 1675 Dr Barrow was chosen vice-chancellor of the university. He died on the 4th of May 1677, in the 47th year of his age, and was interred in Westminster Abbey, where a monument, sur- mounted by his bust, was soon after erected by the contributions of his friends. By his English contemporaries Barrow was considered a mathematician second only to Newton. Continental writers do not place him so high, and their judgment is probably the more correct one. He was undoubtedly a clear-sighted and able matheniatician, who handled admirably the severe geometrical method, and who in his Afethod of Tangents approximated to the course of reasoning by which Newton was afterwards led to the doctrine of Ultimate Ratios; but his substantial contribu- tions to the science are of no great importance, and his lectures upon elementary principles do not

throw much light ou the difficulties surrounding the border-land between mathematics and philosophy. His Sermons have long enjoyed a high reputation; they are weighty pieces of reasoning, elaborate in construction and ponderous in style.

His scientific works are very numerous. The most important are :—1. Huclid's Hlements; 2. Huclid's Data; 8. Optical Lectures, read in the public school of Cambridge ; 4. Thirteen Geometrical Lectures; 5. The Works of Archimedes, the Four Books of Apol- lonius's Conic Sections, and Theodostus's Spherics, explained in a New Method ; 6. A Lecture, in which Archimedes's Theorems of the Sphere and Cylinder are investigated and briefly demonstrated; 7. Mathematical Lectures, read in the public schools of the University

of Cambridge. The above were all written in Latin. His English works have been collected and published in four volumes folio.

BARROW, Sir Joun, Bart., was born near Ulverston, in Lancashire, June 19, 1764. His early opportunities of instruction were limited ; but by self-education he matured those powers which eventually were turned to so good an account. He displayed at an early age a decided inclina- tion for mathematical pursuits. He passed some years of his youth as superintending clerk of an iron foundry at Liverpool, and he afterwards taught mathematics at an academy in Greenwich. While in the latter situation he was fortunate in obtaining, through the interest of Sir George Staunton, a place in the first British embassy toChina, He wag thus enabled to put his foot on the first step of the lad- der of ambition; but each step in his subsequent career may be fairly said to have been achieved by himself The account of the embassy published by Sir George Staunton records many of Barrow's valuable contributions to litera- ture and science connected with China. This work, together with his own subsequently published volume of

travels, is ample evidence how well his time had been employed Few persons could, within the space of a few inonths, overcome all the practical difficulties of such a language as the Chinese ; but Barrow soon began to con- verse in it, and acquired a complete knowledge of its theory. His

papers on this subject in the Quarterly Review (to which periodical he was for many years a very frequent contributor) contain a very admirable account of that singular language.

Although Barrow ceased to be personally connected with Chinese affairs after the return of the embassy in 1794, he always continued to take a lively interest in them, and on critical occasions was frequently consulted by the British Government. His services were secured by Lord Macartney in his important and delicate mission to settle the govern- ment of the newly-acquired colony of the Cape of Good Hope. Barrow was entrusted with opening communica- tions with the Kaffres, in which he displayed a spirit, judgment, and humanity, which unfortunately were less conspicuous in subsequent transactions with those tribes. The two volumes of his history of the colony made the publie fully acquainted with the extent, capacities, and resources of that important, but till then little understood, acquisition of the British Crown, There is little doubt that it was the perusal of this valuable work which mainly decided Lord Melville to appoint Barrow, though then a perfect stranger to him, as his second secretary of the Admiralty. Barrow's subsequent career for forty years at the Admiralty (embracing the whole period of the war with France), will be for ever historically associated with the civil administration of the British wavy for the same period. He enjoyed the esteem and confidence of all the eleven chief lords who successively presided at the Admiralty Board during that period, and more especially of King William IV., while lord high admiral, who honoured him with tokens of his personal regard. Barrow was a fel- low of the Royal Society, and had the degree of LL.D. The honour of a baronetcy was conferred on him by Sir Robert Peel in 1835; the letter in which the honour was announced acknowledged, in highly gratifying terms, his literary and scientific eminence, and his "long, most able, and most faithful public service."

Besides the works already mentioned, Barrow published the lives of Lord Macartney, Lord Anson, Lord Howe, and Peter the Great ; and he was also the author of several valuable contributions to the seventh edition of the Encyclopedia Britannica.

He retired from public life in 1845, in consideration of his advanced years, although still in vigorous possession of all the mental and bodily powers

required for the due discharge of the functions of his office. In the course of the three following years his vital energies gradually declined, but he nevertheless continued so fully in the enjoyment of his faculties, writing a history of the modern Arctic voyages of discovery, of which he was a great promoter, as well as his autobiography, published in 1847, that his friends and relatives entertained no apprehension that his end was so near. He expired suddenly on the 23d November 1848, in the 85th year of his age, much honoured and respected by his friends and the public at large.

BARROWS. The custom of constructing barrows, or mounds of stones or earth, over the remains of the dead was the most characteristic feature of the sepulchral systems of primitive times. Originating in the common sentiment of humanity, which desires by some visible memorial to honour and perpetuate the memory of the dead, it was practised alike by nations of high and of low development, and continued through all the stages of culture that preceded the introduction of Christianity. The primary idea of sepulture appears to have been the

provision of a habitation for the dead; and thus, in its perfect form, the barrow included a chamber or chambers where the tenant was surrounded with all the prized possessions of his previous life. A common feature of the earlier barrows is the enclosing fence, which marked off the site from the surrounding ground. When the barrow was of earth, this was usually effected by an encircling trench or a low vallum. When the barrow was a stone structure, the enclosure was usually a circle of standing stones. Sometimes, instead of a chamber formed above ground, the barrow covered a pit excavated under the original surface, in which the interments had been made. In later times the mound itself was frequently dispensed with, and the interments made under the natural surface, within the enclosure of a trench, a val/wm, or a circle of standing stones. Usually the great barrows occupy conspicuous sites; but in general the external form is no index to the internal construction, and gives no absolute indication of the nature of the sepulchral usages. Thus, while the long barrow is characteristic of the Stone Age, it is impossible to tell without direct examination whether it may be

chambered or unchambered, or whether the burials within it nay be those of burnt or of unburnt bodies.

In England the long barrow usually contains a single chamber, entering by a passage underneath the higher and wider end of the mound. In Denmark the chambers are at irregular intervals along the body of the mound, and have no passages leading into them. The long barrows of Great Britain are often from 200 to 400 feet in length by 60 to 80 feet wide. Their chambers are rudely but strongly built, with dome-shaped roofs, formed by overlapping the successive courses of the upper part of the side walls. In Scandinavia, on the other hand, such dome-roofed chambers are unknown, and the construction of the chambers as a rule is megalithic, five or six monoliths supporting a capstone of enormous size. Such chambers denuded of the covering mound, or over which no covering mound has been raised, are popularly known in England as “ cromlechs” and in France as “dolinens.” ‘The prevailing mode of sepulture in all the different varieties of these structures is by the deposit of the body in a contracted position, accompanied by weapons and implements of stone, occasionally by ornaments of gold, jet, or amber. Vessels of clay, more or less ornate in character, which occur with these early interments of unburnt bodies, are regarded as food vessels and drinking cups, differing in character and purpose from the cinerary urns of the Cremation Period in which the ashes of the dead were deposited.

The custom of burning the body commenced in the Stone Age before the long barrow or the cromlech, with their contracted burials, had passed out of use. While cremation is rare in the long barrows of the south of England, it is the rule in those of Yorkshire and the north of Scotland. In Ireland, where the long barrow form is all but unknown, the round barrow, or chambered cairn, prevailed from the earliest Pagan period till the introduction of Christianity. The Irish barrows occur in groups in certain localities, which seem to have been the royal cemeteries of the tribal confederacies, whereof eight are enumerated in an ancient Celtic manuscript on Pagan cemeteries. The best known of these was the burial-place of the kings of Tara. It is situated on the banks of the Boyne above Drogheda, and consists of a group of the largest cairns in Ireland. One of these, at New Grange, is a huge mound of stones and earth, over 300 feet in

diameter at the base, and 70 feet in height. Around its base are the remains of a circle of large standing stones. The chamber, which is 20 feet high in the centre, is reached by a passage 70 feet in length. (See illustration, vol. ii. p. 384,)

As in the case of the long barrows, the traditional form

of the circular chambered barrows was retained through various changes in the sepulchral customs of the people, and we find it used both iu connection with burnt and with unburnt burials. It was the natural result of the practice of cremation, however, that it should induce a modification of the barrow structure. The chamber, no longer regarded as a habitation to be tenanted by the deceased, became simply a cist for the reception of the urn which held his ashes. The degradation of the chamber naturally produced a corresponding degradation of the mound which covered it, and the barrows of the Bronze Age, in which cremation was the rule, are smaller and less imposing than those of the Stone Age, but often surprisingly rich in the relics of the lifeand of the art workmanship of the time. In addi- tion to the varied and beautiful forms of implements and weapons,—frequently ornamented with a high degree of artistic taste,—armlets, coronets, or diadems of solid gold, and vases of elegant form and ornamentation in gold and bronze, are not uncommon. ‘The barrows of the Bronze Period, like some of those of the Stone Age, appear to have been used as tribal or family cemeteries. In Denmark as many as seventy deposits of burnt interments have been observed in a single mound, indicating its use asa burying- place throughout a long succession of years.

In the early Iron Age there was a partial return to the more massive construction of the earlier periods. Some- times chambers are found formed of timber instead of stones, in which the bodies were deposited unburnt, although the custom of cremation was largely continued. In Scandinavia both of these modes of sepulture lingered till the close of the Pagan time, One of the latest examples of the great timber-chambcred barrow is that at Jellinge in Jutland, known as the barrow of Thyre Danebod, queen of King Gorm the Old, who died about the middle of the 10th century. It isa mound about 200 fcet in diameter, and over 50 feet in height, containing a chamber

23 feet long, 8 feet wide, and 5 feet high, formed of massive slabs of oak. Though it had been entered and plundered in the Middle Ages, a few relics, overlooked by its original violators, were found when it was recently reopened, among which were a silver cup, ornamented with the interlacing work characteristic of the time, and some personal ornaments. It is highly illustrative of the tenacity with which the ancient sepulchral usages were retained even after the introduction of Christianity that King Harald, son and successor of Gorm the Old, who is said to have Christianized all Denmark and Norway, followed the Pagan custom of erecting a chambered tumulus over the remains of his father, on the summit of which was placed a rude pillar-stone, bearing on one side the memorial inscrip- tion in Runes, and on the other a representation of the Saviour of mankind distinguished by the crossed nimbus surrounding the head. The Kings' Hows at Upsala in Sweden rival those of Jellinge in size and height. In the chamber of one of them, which was opened in 1829, there was found an urn full of calcined bones; and along with it were some ornaments of gold showing the characteristic workmanship of the 5th and 6th centuries of the Christian era. Along with the calcined human bones were bones of animals, among which those of the horse and the dog were distinguished. In much earlier times the favourite horse or dog of the deceased was frequently deposited in Etruscan tombs, and the custom continued in Northern Europe until cremation, and the barbarous rites which usually accompanied it, were abolished by the stringent prohibitions of the Christian church.

Comparing the results of the researches in European barrows with such notices of barrow-burial as may be gleaned from early writings, we find them mutually illus- trative.

BARROWS

The Homeric account of the building of the barrow of Hector (Zl. xxiv.) brings vividly before us the scene so often suggested by the examination of the tumuli of pre- historic times. During nine days wood was collected and brought, in carts drawn by oxen, to the site of the funeral pyre. Then the pyre was built and the body laid upon it. After burning for twenty-four hours the smouldering embers were extinguished with libations of wine. The white and calcined bones were then picked out of the ashes by the friends and placed in a metallic urn, which was deposited in a hollow grave, or cist, and covered over with large well- fitting stones. Finally, a barrow of great magnitude was heaped over the remains, and the funeral feast was cele- brated. The obsequies of Achilles, as described in the Odyssey, were also celebrated with details which are strik- ingly similar to those observed in tumuli both of the Bronze and Iron Ages. The body was brought to the pile in an embroidered robe, and jars of unguents and honey were placed beside it. Sheep and oxen were slaughtered at the pile. The incinerated bones were collected from the ashes and placed in a golden urn along with those of Patroclus, Achilles's dearest friend. Over the remains a great and shapely mound was raised on the high headland, so that it might be seen from afar by future generations of men.

Herodotus, describing the funeral customs of the Scy- thians, states that, on the death of a chief, the body was placed upon a couch in a chamber sunk in the earth and covered with timber, in which were deposited all things need- ful for the comfort of the deceased in the other world. One of his wives was strangled and laid beside him, his cup- bearer and other attendants, his charioteer, and his horses, were killed and placed in the tomb, which was then filled up with earth, and an enormous mound raised high over all. The barrows which cover the plains of ancient Scythia attest the truth of this description. A Siberian barrow, described by Demidoff, contained three contiguous chambers of unhewn stone. In the central chamber lay the skeleton of the ancient chief, with his sword, his spear, his bow, and a quiver full of arrows. The skeleton reclined upon a Sheet of pure gold, extending the whole length of the body, which had been wrapped in a mantle broidered with gold and studded with precious stones. Over it was

extended another sheet of pure gold. In a smaller cham- ber at the chief's head lay the skeleton of a female, richly attired, extended upon a sheet of pure gold, and similarly covered with a sheet of the same metal. A golden chain adorned her ncck, and her arms were encircled with brace- lets of pure gold. Ina third chamber, at the chief's feet, lay the skeleton of his favourite horse with saddle, bridle, and stirrups.

So curiously alike in their general features were the sepulchral usages connected with barrow-burial over the whole of Europe, that we find the Anglo-Saxon Saga of Beowulf describing the chambered tumulus with its gigantic masonry "held fast on props with vaults of stone," and the passage under the mound haunted by a dragon, the guardian of the treasures of heathen gold which it con- tained. Beowulf's own burial is minutely described in terms which have a strong resemblance to the parallel passages in the Jdiad and Odyssey. There is first the pre- paration of the pile, which is hung round with helmets, shields, and coats of mail, Then the corpse is brought and laid in the midst; the pile is kindled, and the roaring flame rises, mingled with weeping, till all is consumed. Then, for ten long days, the warriors labour at the rearing of his mighty mound on the headland, high and broad, to be seen afar by the passers by on land and sea.

The pyramids of Egypt, the mausolea of the Lydian kings, the sepulchres of the Atreidz at Mycene, and the Etruscan tombs at Cere and Volci, are lineally descended

BA R—

from the chambered barrows of prehistoric times, modified in construction according to the advancement of architec- tural art at the period of their erection. There is no country in Europe destitute of more or less abundant proofs of the almost universal prevalence of barrow-burial in early times. It can be traced on both sides of the basin of the Mediterranean, in Northern Africa, and in Asia Minor, across the plains of Mesopotamia, in the valley of Cabul, and throughout Western India. But more extended research in the archeology of these vast regions is needed to enable us to correlate their ancient remains with those of the European continent.

In the New World as well as in the Old, the same customs prevailed over vast areas from a very remote period. In the great plains of North America the dead were buried in barrows of enormous magnitude, which occasionally present a remarkable similarity to the long barrows of Great Britain. In these mounds cremation appears more frequently than inhumation ; and both are accompanied by implements, weapons, aud ornaments of stone and bone. The pottery accompanying the remains is often elaborately ornamented, and the mound builders were evidently possessed of a higher development of taste and skill than is evinced by any of the modern aboriginal races, by whom the mounds and their contents are regarded as utterly mysterious,

It is not to be wondered at that customs so widely spread and so deeply rooted as those connected with barrow-burial should have been difficult to eradicate. In fact, compliance with the Christian practice of inhumation in the cemeteries sanctioned by the church,was only enforced in Europe by capitularies denouncing the punishment of death on those who persisted in burying their dead after the Pagan fashion or in the Pagan mounds. Yet even in the Middle Ages kings were buried with their swords and spears, and queens with their spindles and ornaments ; the bishop was laid in his grave with his crosier and comb, his chalice and vestments; and clay vessels filled with charcoal (answering to the urns of heathen times) are found with the interments in the churches of France and Denmark.

See Bateman, Zen Years' Diggings ; Davisand Thurnam, Crania Britannica ; Thurnam, ''Ancieut British Barrows," in Archwologia; Canon Greenwell, Dr Angus Smith, and J. Anderson, ''On Cairns in Argyle and Caithness," in Proceedings of the Society of Anti- quartes of Scotland ; Petrie, Histories and Antiquities of Tara, and Round Towers of Ireland; Worsaae's Antiquities of Denmark, trans- lated by Thoms; Nicolaysen, Norske Fornlevninger ; Montelius, La Suede Préhistorique; Cochet, La Normandie Souterraine ; Squier and Davis, Ancient Monwments of the Mississippi Valley ; Stevens, Flint Chips; Ferguson, Stone Monwments of all Cowntries. (J. AN.)

BARROW'S STRAITS, a portion of the channel which runs W. from Baffin's Bay through the islands of the Arctic archipelago to Melville

Sound. It lies between 73° 45’ and 74° 40’ N. lat., is about 200 miles in length, and has an average breadth of 60 or 70 miles. In many places it is upwards of 200 fathoms in depth. The coasts on both sides are generally steep and rugged, with numerous bays and inlets, the most important of which is the Prince Regent Inlet, which runs 8. into the Gulf of Boothia.

BARRY, Sir Cuar.es, a distinguished English architect, was born at Westminster, May 23, 1795. After pursuing his elementary professional studies for six years as apprentice to a firm of architects at Lambeth, he set out, in 1817, on the customary foreign tour, visiting Greece and Italy, Egypt and Palestine, and enriching his memory and imagination by the study of the great buildings and remains of former ages. On his return to England in 1820 he settled in London, and was not slow in attaining distinction. One of the first works by which his abilities as an architect became generally known was the church of St Peter at Brighton,—an attempt in Perpendicular Gothic,

completed in 1826. He built many other churches; but the marked preference for Italian architecture, which he acquired during his travels, showed itself in various impor- tant undertakings of his earlier years. In 1831 he erected the Travellers’ Club in Pall Mall, a splendid work in the Italian style, and the first of its kind builtin London. In the same style and on a grander scale, he erected, some years later, the Reform Club. It is unnecessary to par- ticularize the numerous private mansions on which he was engaged, one of the latest and most magnificent of which was Bridgewater House, the town residence of the earl of Ellesmere. Birmingham possesses one of his best works in the buildings of King Edward’s grammar school, in the Tudor style. For Manchester he designed the Athenzeuin, in the Italian style; and for Halifax, the town-hall. He was engaged for some years in reconstructing the Treasury buildings, Whitehall. But his masterpiece, and perhaps, notwithstanding all unfavourable criticism, the masterpiece of English architecture of the 19th century, is the new palace at Westminster. After the destruction of the old houses of parliament by fire in October 1834, Barry was the successful competitor for erecting the new palace. The first stone was laid in the spring of 1840; the

work was steadily carried on in the face of many difficulties, and through a maze of private dissensions and public complaints, and it was at length completed in 1860. Twenty years seemed long in passing, but once past the time assuredly will no more seem too long to have been cinployed in the erection, or, we might say, allowed for the growth of this stately and beautiful pile, one of the truest glories of the bauks of the Thames. Barry was elected A.R.A. in 1840, and R.A. in the following year. His genius and achieve- ments were recognized by the representative artistic bodies of the principal European nations; and his name was enrolled as a member of the academies of art at Rome, Berlin, St Petersburg, Brussels, and Stockholm. He was chosen F.R.S. in 1849, and was knighted by the Queen in 1852. He died suddenly at Clapham, near London, May 12, 1860, and his remains were interred in Westminster Abbey. In 1867 appeared a life of Sir Charles Barry by his son, Dr Alfred Barry, principal of King's College, London. A claim was thereupon set up on behalf of Mr A. Welby Pugin deceased, who had been Barry's assistant, to a much larger share in the work of designing the West- minster Palace than was admitted in Dr Barry's narrative. The controversy raged for a time, but without substantiating Mr Pugin's claim.

BARRY, Jamzs, an eminent painter, was born at Cork on the 11th October 1741. His father had been a builder, and, at one time of his life, a coasting trader between the two countries of England and Ireland. To this business of trader James was destined, and he actually made, when a boy, several voyages; but these being forced upon him, he on one occasion ran away from the ship, and on all others manifested such an aversion to the life and habits of a sailor, as to induce his father to relinquish all hopes of him in this line, and to suffer him to pursue his inclinations, which led strongly towards drawing and study. At the schools in Cork to which he was sent, he was distinguished above his school-fellows by his talents and industry ; his habits differed from those of ordinary boys; he seldom mixed in their games or amusements, but during play-hours stole off to his own room, where he worked at his pencil, or studied some book that he had borrowed or bought. As his industry was excessive, his advances in the acquisition of knowledge were rapid, and he was regarded as a prodigy by his school-fellows. About the age of seventeen he first attempted oil painting, and between that and the age of twenty-two, when he first went to Dublin, he produced several large pictures, which decorated his father's house,

and represented subjects not often chosen by young artists, such as Auneas escaping with his family from the flames of Troy, Susanna and the elders, Daniel in the lions' den, &c. At this period he also produced the painting which first brought him into public notice, and gained him the acquaint- ance and patronage of Edmund Burke. The picture was founded on an old tradition of the landing of St Patrick on the sea-coast of Cashel, and of the conversion and bap- tism of the king of that district by the patron saint of Ire- land. Barry's manner of treating it was such as to gain for him the applause and admiration of the connoisseurs of London, where it was exhibited in 1762 or 1763.

By the liberality of Burke and his other friends, Barry, in the latter part of 1765, was enabled to proceed to the Continent, where he remained till the beginning of 1771, studying his art with an enthusiasm which seemed to augur the highest success, and making observations on the dif- ferent chefs @auvre of Italy with equal independence of judgment and nicety of discrimination. He proceeded first to Paris, then to Rome, where he remained upwards of three years, from Rome to Florence and Bologna, and thence home through Venice. His letters to the Burkes, giving an account of Michel Angelo, Raffaelle, Titian, and Leonardo da Vinci, show a complete insight into the characteristic merits of their works, and would make us wonder (if the case were at all singular) how he could enter with such force, delicacy, and feeling, into excellences of which he transplanted nothing into his own works.

Even in copying from the antique he manifested the same aversion to labour, or to that kind of labour which, by showing us our defects, compels us to make exertions to remedy them. He made all his drawings from the antique by means of a delineator, that is, a mechanical instrument, to save the trouble of acquiring a knowledge both of form and proportion. Barry painted two pictures while abroad, his Adam and Eve, and his Philoctetes. The first of these he sent home as a specimen of his pro- gress in the art. It does not appear to have given much satisfaction. His Philoctetes he brought home with him. It is a coarse, unclassical performance,—the direct opposite, indeed, of all that he thought it to be. Soon after his return to

England he produced his picture of Venus, which has been compared, though with little justice, to the Galatea of Raffaelle, the Venus of Titian, and the Venus de Medici. In 1773 he exhibited his Jupiter and Juno on Mount Ida, which was much praised by some critics of that day. His Death of General Wolfe, in which the British and French soldiers are represented in very primitive costumes, was considered as a falling off from his great style of art, the painting of Greek subjects, and, accordingly, it is said to "' have obtained no praise." His fondness for Greek costume was assigned by his admirers as the cause of his reluctance to paint portraits,—as if the coat were of more importance than the face. His fastidiousness in this respect, and his frequent excuses or blunt refusals to go on with a portrait of Burke which he had begun, caused a misunderstanding with his early patron, which does not appear to have been ever entirely made up. The difference between them is said to have been widened by Burke's growing intimacy with Sir Joshua Reynolds, and by Barry's feeling some little jealousy of the fame and fortune of his rival "in a humbler walk of the art." About the same time he painted a pair of classical subjects, Mercury inventing the lyre, and Narcissus looking at him- self in the water, the last suggested to him by Burke. He also painted an historical picture of Chiron and Achilles, and another of the story of Stratonice, for which last the duke of Richmond gave him a hundred guineas. In 1773 it was proposed to decorate the interior of St Paul's with historical and sacred subjects; but the plan fell to the

ground, from not meeting with the concurrence of the bishop of London and the archbishop of Canterbury. Barry was much mortified at the failure, for he had in anticipation fixed upon the subject he intended to paint,— the rejection of Christ by the Jews when Pilate proposes his release. In 1773 he published An Inquiry into the real and wmaginary Obstructions to the Acquisition of the Arts in England, vindicating the capacity of the English for the fine arts, and tracing their slow progress hitherto to the Reformation, to political and civil dissensions, and, lastly, to the general direction of the public mind to mechanics, manufactures, and commerce. In the year 1774 a proposal was made, through Mr Valentine Green, to Reynolds, West, Cipriani, Barry, and other artists, to ornament the great room of the Society for the Encourage- ment of Arts, Manufacturers, and Commerce, in the

Adelphi, with historical and allegorical paintings. This proposal was at the time rejected by the artists themselves ; but, in 1777, Barry made an offer to paint the whole on condition of being allowed the choice of his sub- jects, and being paid by the society the expenses of canvas, paints, and models. His offer was accepted, and he finished the series of pictures at the end of seven years, instead of two, as he had proposed to himself, accomplishing his task to the entire satisfaction of the members of the society, who granted him two exhibitions, and at different periods voted him 50 guineas, their gold medal, and 200 guineas, Of the six paintings making up the series, only one, that of the Olympic Games, shows any artistic power.

Soon after his return from the Continent Barry had been chosen a member of the Royal Academy; and in 1782 he was appointed professor of painting, in the room of Mr Penny, with a salary of £30 a year. The lectures which he delivered from the chair were full of strong sense and wholesome advice, both to the students and academi- cians. Among other things, he insisted much on the necessity of purchasing a collection of pictures by the best masters as models for the students, and proposed several of those in the Orleans collection. This recommendation was not relished by the academicians, and quarrels arose, which reached such a height, that, in 1799, Barry was expelled from the academy, soon after the appearance of his Letter to the Dilettantc Society, a very amusing but eccentric publication, full of enthusiasm for his art and at the same time of contempt for the living professors of it. After the loss of his salary, a subscription was set on foot by the earl of Buchan to relieve him from his difficulties, and to settle him in a larger house to finish his picture of Pandora. The subscription amounted to £1000, with which au annuity was bought, but of this he was prevented from enjoying the benefit, for, on the 6th of February 1806, he was seized with a pleuritic fever, and died on the 22d of the same month. On the 14th of March his remains were interred in the cathedral of St Paul’s.

As an artist Barry is more distinguished for the strength of his conceptions, and for his resolute and_ persistent determination to apply himself only to great subjects, than for his skill in designing or for beauty in his colouring. His ideas were generally fine, but the realization of them was almost without exception unsuccessful. His drawing is rarely good, his colouring

frequently wretched. ‘This curious contradiction in his artistic powers was in complete harmony with his general character. He was extremely impulsive and unequal; sometimes morose, sometimes sociable and urbane ; jealous of his contemporaries, and yet capable of pronouncing a splendid eulogy on Reynolds.

BARS, a province of Hungary, in the district watered by the Neutra, Gran, and Zsitva, which belong to the northern part of the system of the Danube. It is for the most part mountainous and has great mineral wealth,

especially in gold and silver. The most remarkable mines are those of Skleno and Vihnye. The chicf towns are Kremnitz or Kérmécz Banya, and Neusohl or Besztercze- Banya. Population in 1869, 137,191, mostly Roman Catholics

BARTAN, a town in Asiatic Turkey, situated near the mouth of the Bartan-su, which was known to the Greeks asthe Parthenius, and formed part of the boundary between Bithynia and Paphlagonia. The town is built on two low limestone hills, and has its streets paved with blocks of that material. It carries on a considerable trade with Constantinople, which might be increased were it not for the obstruction of the harbour by a bar. Population betwecn six and seven thousand.

BARTAS, GUILLAUME DE SALLUSTE DU, a French poet, was born in 1544, and died in 1590 of wounds received in the battle of Ivry. He was employed by Henry IV. of France in England, Denmark, and Scotland ; and he com- manded a troop of horse in Gascony, under the Marshal de Martingan. His principal work, La Sepmaine, a poem on the creation of the world, which has long since fallen into oblivion, once enjoyed a high reputation, thirty editions of it having been printed within six years after its appearance. Its religious tone and rather fanciful style made it a great favourite with English writers of the time, by whom the author was always designated as the divine Du Bartas, and placed on an equality with Ariosto. Spenser, Hall, and Ben Jonson, all speak in the highest terms of what seems to us a most uninteresting poem. King James VI. tried his “‘prentice hand” at the translation of Du Bartas’s poem L’Uranie, and the compliment was

returned by the French writer translating, as La Lepanthe, the monarch's poem on the battle of Lepanto. Joshua Sylvester, one of the Spenserian poets, translated the Sepmaine in 1598, and the work in its English form was extremely popular and exercised no slight influence on English literature. Du Bartas published a second Week in 1584; portions of itand of the first were translated by Th. Hudson, William Lisle, and Thomas Winter.

BARTFELD, or BArtra, a town of Hungary, county of Saros, on the River Tepla. It has some trade in wine, corn, linen and woollen goods, paper, &c., and is noted for the mineral springs in the vicinity, the water of which is largely exported. Its Gothic church is adorned with numerous artistic treasures, and its archives are rich in ancient documents. Population, 5303.

BARTH, Heinricu, a distinguished African explorer, was born at Hamburg, February 16, 1821. At the age of eighteen he went to Berlin, and completed his education at the university of that city. After a year of study he set out to travel in Italy and Sicily, returning to Berlin in 1841, and continuing his studies for three years. He took his degree in 1844, and yielding to a desire, which had long possessed him, to explore the countries lying on the Mediterranean, he made his first visit to North Africa in 1845. Before setting out he had visited London and Paris, and made himself acquainted with the Arabic language. He reached Tunis, Tripolis, Benghasi, explored Cyrenaica, and travelled down the valley of the Nile. On his return journey he was attacked and wounded by robbers. In 1847 he travelled in Egypt and Palestine, and in Asia Minor and the islands off its coasts, and from Constauti- nople returned through Greece to Berlin. For a time he was engaged there as Privat-docent, and in preparing for publication the narrative of his Wanderungen durch die Kiistenldnder des Mittelmeeres, which appeared in 1849. At the suggestion of Bunsen and Ritter he entered with enthusiasm into the project of the English expedition for the exploration of Central Africa, and set out with Overweg in November 1849. Five years were devoted to their

explorations, and Barth did not arrive in Europe till September 1855. His account, entitled Heise und Hntdeck- ungen in Nord- und Centralafrika, appeared in 5 vols., between 1855 and 1858, and was followed by a

collection of Central African vocabularies (1862-64). Dr Barth had not yet exhausted his energies as a traveller. In 1858 he undertook another journey in Asia Minor, and in 1862 visited Turkey in Europe.- In the following year, having returned to Berlin, he was appointed professor of geography at the university, and president of the Geographical Society. He died at Berlin, November 25, 1865.

BARTH, or Bart, JEAN, son of a fisherman of Dunkirk, was born in 1651 and died in 1702. He served, when young, in the Dutch navy, but when war broke out between Louis XIV. and Holland, he entered the French service. He gained great distinction in the Mediterranean, where he held an irregular sort of commission, not being then able from his low birth to receive a command in the navy. His success was so great, however, that he was made a lieu- tenant. He rose rapidly to the rank of captain, and then to that of admiral. The peace of Ryswick put a close to his active service. Many anecdotes are narrated of the courage and bluntness of the uncultivated sailor, who became the popular hero of the French naval service. (Richer, Vie de Jean Bart, 1780, and many editions since ; Vanderest, Histoire de Jean Bart.)

BARTHELEMY, Avucustr MARSEILLE, a French satiri- cal poet, was born at Marseilles in 1796, and died in 1867. After having established some local reputation as a poet he went to Paris, where by one of his first efforts, Le Sacre de Charles X., 1825, he gained the favour of the court. His energies, however, were soon enlisted in the service of the opposition party. In 1826 appeared the clever poli- tical satire, Le Villéliade, a mock heroic poem, the joint production of Barthélemy and his constant friend Méry, also a native of Marseilles. The success was immediate and pronounced ; fifteen editions were called for during the year, and the authors cleared nearly £1000. A rapid succession of political squibs and satircs was now poured forth by the authors, one of the most remarkable being Napoléon en Egypte, 1828, which passed through nearly a dozen editions in a year. In 1829 Barthélemy had become so offensive to the Government that he was imprisoned and find 1000 franes. The Revolution of 1830 liberated him; and in company with Mery, he cclebrated the triumph of the people in one of their most brillant efforts, L’ Insurrection. During the next two years Barthé- lemy, though enjoying for a time a pension from Louis Philippe, did

not cease his attacks on the Government and its nuinisters. In 1832, however, he made a curious change, the motive for which is not clear, but the effect of which was seriously to impair, almost to destroy his influence. In that year he published an anonymous poem, supporting some acts of the Government which were peculiarly obnoxious to the Liberal party, and, on the work being attacked, defended it openly. For the next few years he cnjoyed a handsome pension from the Government, and refrained from all satirical writing. He again resumed his old style in 1844, but without the former success. From that date he contented himself with merely occasional poems. f

BARTHELEMY, Jean Jacques, a celebrated French writer, was born on the 20th January 1716, at Cassis, a little seaport on the shores of the Mediterranean. He was educated, first at the college of the Oratory in Marseilles, and afterwards at that of the Jesuits in the same city. While completing the course of study requisite for the church, which he intended to join, he devotcd much attention to Oriental languages, in which he became very proficient. After assuming the ecclesiastical habit, he

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resided with his family at Aubagne, and during this period of his life was introduced by his friend, M. Cary of Marseilles, to the study of classical antiquities, particularly in the department of numismatics. In 1744 he repaired to Paris, carrying with him a letter of introduction to M. Gros de Boze, perpetual secretary of the Academy of Inscriptions and Belles Letters, and keeper of the medals. He became assistant to De Boze, and on the death of the latter in 1753, was appointed his successor. In the following year he was enabled to pay a visit to Italy, and spent some time in that country, inspecting its rich treasures of classical remains. While on his journey he made the acquaintance of the French ambassador, M. de Stainville, afterwards duc de Choiseul, and of his wife. The minister conceived a great regard for Barthélemy, and on his accession to power loaded the scholar with benefits. In 1759 he gave him a pension on the archbishopric of Albi; in 1765 he conferred on him the treasurership of St Martin de Tours, and, in 1768, made him secretary- general to the Swiss

guards, In addition to these sources of revenue, the abbé enjoyed a pension of 5000 livres on the Mercure de France. His income, which was thus considerable, was well employed by him; he supported and established in life three nephews, and gave largely to indigent men of letters. In 1789, after the publication of his great work, he was elected a member of the French Academy, one of the highest honours to which a French author aspires. During the troubled years of the Revolu- tion, Barthélemy, from his position and habits, took no share in any public affairs. Yet he was informed against and arrested as an aristocrat. So great, however, was the respect felt for his character and talents, that the Com- mittee of Public Safety were no sooner informed of the arrest, than they gave orders for his immediate release. Barthélemy died soon after, on the 30th April 1795.

The great work on which Barthélemy's fame rests appeared in 1788, and was entitled Voyage du jcwne Anacharsis en Grece, dans le miliew du quatriéme siecle avant Vere Chrétienne. He had begun it in 1757, and, during an uninterrupted succession of thirty years, occupied his leisure hours in bringing it to maturity. The hero, a young Scythian, descended from the famous philosopher Anacharsis, whose name he bears, is supposed to repair to Greece for instruction in his early youth, and after making the tour of her republics, colonies, and islands, to return to his native country and write this book in his old age, after the Maccdonian hero had overturned the Persian empire. In the manner of modern travellers, he gives an account of the customs, government, and antiquities of the country he is supposed to have visited; a copious introduction supplies whatever may be wanting in respect to historical details ; whilst various dissertations on the music of the Greeks, on the literature of the Athenians, and on the economy, pursuits, ruling passions, man- ners, and customs, of the surrounding states, supply ample informa- tion on the subjects of which they treat. The author, indeed, is not profound ; and the young Scythian seldom penetrates much be- low the surface. But his remarks are commonly judicious, and to considerable erudition He unites singular skill in the distribution of his materials, and a happy talent for presenting his subject in the most agreeable and attractive form. The assumed character is so admirably sustained throughout, that we can scarcely persuade our- selves we are not perusing a book of real travels, and communing with an actual personage who has recorded his observations and ex- perience for the instruction and

improvement of his countrymen. Modern scholarship has superseded most of the details in the Voyage, but the author himself did not imagine his book to be a register of accurately ascertained facts; he rather intended to afford to his countrymen, in an interesting form, some knowledge of Greek civilization. The Charicles of Becker is a more recent attempt in a similar direction, but, though superior in scholarship, it wants the charm of style which is the principal quality in the Anacharsis.

BARTHEZ, or Bartuhks, Paunt Josrepu, one of the most celebrated physicians of France, was born on the 11th of December 1734, at' Montpellier. He received his early education at Narbonne and Toulouse,and soon gave decisive indications of the great talents with which nature had endowed him. He commenced the study of medicine at Montpellier in 1750, and in 1753, when he had only at-

tained his nineteenth year, he received his doctor's degree. He afterwards occasionally visited Paris, where he attracted the notice and acquired the friendship of the most distin- guished literati of the period. In 1756 he obtained the appointment of physician to the military hospital in Normandy attached to the army of observation commanded by Marshal d'Estrées. A severe attack of hospital fever com- pelled him to leave this post; but the numerous cases which had come under his notice furnished materials for several papers contributed to the Memoirs of the Academy of Sciences. In 1757 his services were required in the medical staff of the army of Westphalia, where he had the rank of consulting physician. After his return to Paris he acted for some time as joint editor of the Journal des Savans aud the Encyclopédie Méthodique. In 1761 he obtained a medical professorship at Montpellier, in which his abilities as a teacher soon shone forth with unrivalled lustre. His success was the more honourable, inasmuch as his colleagues—Lamure, Leroy, and Venel—were men of distinguished reputation, and had raised the school to a high pitch of celebrity.

In 1774 he was created joint chancellor of the university, with the certainty of succeeding singly to the office on the death of the colleague, which happened in 1786. He afterwards took the degree of doctor in civil law, and

was appointed counsellor to the Supreme Court of Aids at Mont- pellier. In 1780 he was induced to fix his residence in Paris, having been nominated consulting physician to the king, with a brevet of counsellor of state, and a pension of a hundred louis. Honours were now heaped upon him ; he was admitted free associate to the Academies of Scicnces and of Inscriptions, and appointed first physician to the duke of Orleans, in the room of Tronchin. His reputation increased in proportion as his merits were displayed on a wider theatre. He practised as a physician at Paris for nearly ten years, and received the most flattering testi- monials of public approbation.

The outbreak of the French Revolution compelled Bar- thez to leave Paris. He lost considerable part of his fortune, and retired to Carcassonne, where he devoted himself to the study of theoretical medicine. It was in this retreat that he gave to the world his Nouvelle Mécanique des a ouvemens de lV Homme et des Animaux, which appeared im 17:98.

On the re-establishment of the College of Medicine at Montpellier, Barthez was naturally looked upon as the person most likely to revive its former fame. But age and infirmity operated to dissuade him from resuming the laborious office of teacher, and he was accordingly nominated honorary professor. In 1802 he received several marks of favour from the new government under Bonaparte; he was nominated titular physician to the Government, and afterwards consulting physician to the emperor, and meniber of the Legion of Honour.

His 7’raitement des Maladies Goutteuses, in two vols. 8vo, appeared in 1802, and he afterwards occupied, himself in preparing for the press a new edition of his Zlémens de la Science de 1 Homme, of which he just lived to see the pub- lication. His health had been declining for some years before his death, which took place soon after his removal to Paris, on the 15th of October 1806, in the 72d year of his age. He bequeathed his books and manuscripts to M. Lordat, who, in consequence, published two volumes of Consultations de Médicine, Paris, 1810, 8vo, to which he prefixed a preface of his own. Another posthumous work of Barthez, the 7’raté du Beau, preceded by some account of his life, was edited in 1807 by his brother, M. Barthez de Marmoricéres.

Barthez has enjoyed a much higher reputation on the Continent than in England, where, indeed, his writings

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are comparatively little known. His principal work is the Nouveaux Hilémens de la Science de Il' Lomme, in which he unfolds his doctrine of the vital principle, or formative force. He was one of the strongest opponents of the theory which would explain the phenomena of life by physical or chemical laws. (See Lordat, Lxposition de la doctrine médicale de P. J. Barthez, 1818.)

BARTHOLINUS, Gasparp, a learned Swede, born in 1585, at Malmoé. His precocity was extraordinary ; at three years of age he was able to read, and in his thirteenth year he composed Greek and Latin orations, and delivered them in public. When he was about eighteen he went to the University of Copenhagen, and he afterwards studied at Rostock and Wittemberg. He then travelled through Germany, the Netherlands, England, France, and Italy, and was received with marked respect at the different universities he visited. In 1613 he was chosen professor of medicine in the University of Copenhagen, and filled that office for eleven years, when, falling into a dangerous illness, he made a vow, that if it should please God to restore him, he would apply himself solely to the study of divinity. He recovered, observed his vow, and soon after obtained the professorship of divinity, with the canonry of Rotschild. He died on the 13th of July 1630, after having written nearly fifty works on different subjects.

BARTHOLINUS, Tuomas, a physician, son of the above, was born at Copenhagen in 1619. He studied medicine at Leyden for three years (1637-40). He then travelled into France, and resided two years at Paris and Montpellier, in order to improve himself under the distin- guished physicians of those universities ; after which he visited Italy, remained three years at Padua, and then went to Basel, where he obtained the degree of doctor in philosophy. Returning to Copenhagen, he was appointed professor of mathematics in 1647, and next year was nominated to the chair of anatomy, for which he was better qualified. This he held for thirteen years,

distinguishing himself by several observations respecting the lacteal and lymphatic vessels, shortly after their discovery by Olaus Rudbeck. His close application, however, having affected his health, he resigned his chair in 1661, and retired to a little estate at Hagestaed, near Copenhagen, where he hoped to spend the remainder of his days in peace; but his house having been burnt in 1670, his library, with all his books and manuscripts, was consumed. In consideration of this loss the king appointed Bartholinus his physician, with a handsome salary, and exempted his land from all taxes ; the University of Copenhagen also chose him for their librarian; and, in 1675, he was honoured with a seat in the grand council of Denmark. He died on the 4th of December 1680. He wrote Anatomia Gaspardi Bartholint Parentis, novis Observatronibus primum locupletata, 8vo ; De Monstris in Natura et Medicina, 4to; Schedion de Armillis Veterum, proesertim Danorum, 8vo ; and several other works.

BARTHOLOMEW, Sr (“22A 72, son of Talmai), one of the twelve apostles, generally supposed to have been the same as Nathanael (John i. 45). He was a native of Cana in Galilee (John xxi. 2), and was introduced by Philip to Jesus, who, on seeing him approach, at once pronounced that eulogy on his character which has made the name Nathanael almost synonymous with sincerity. He was a witness of the resurrection and the ascension, and returned with the other apostles to Jerusalem. Of his subsequent history we have little more than vague traditions, According to Eusebius (Hist. Hccles., v. 10), when Pantaenus went on a mission to the Indians (towards the close of the 2d century), he found among them the Gospel of Matthew, written in Hebrew, which had been left there by the apostle Bartholomew. Jerome (De Vir. Illustr., c. 36) gives a

similar account. But the name Indians is applied by ancient writers to so many different nations, that it is difficult to determine the scene of Bartholomew’s labours, Mosheim (with whom Neander agrees) is of opinion that it was a part of Arabia Felix, inhabited by Jews, to whom alone a Hebrew gospel could be of any service. According to the received tradition, this apostle was flayed alive and crucified with his head downwards, at Albanopolis in Armenia, or, according to Nicephorus, at Urbanopolis in Cilicia. A spurious gospel which bears his name is in the

catalogue of apocryphal books condemned by Pope Gelasius. The festival of St Bartholomew is celebrated on the 24th of August.

BARTOLINI, Lorenzo, an Italian sculptor, was born in 1777, of very humble parents, at Vernio in Tuscany. After various vicissitudes in his youth, during which he had acquired great skill and reputation as a modeller in alabaster, he came to Paris in 1797. He there studied painting under Desmarets, and afterwards sculpture under Lemot. The bas-relief Cleobis and Biton, with which he gained the second prize of the Academy in 1803, at once established his fame as a sculptor of first-rate ability, and gained for him a number of influential patrons. He executed many minor pieces for Denon, besides busts of Méhul and Cherubini. His great patron, however, was Napoleon, for whom he executed a colossal bust, and who sent him to Carrara to found a school of sculpture. He remained in Carrara till after the fall of Napoleon, and then took up his residence in Florence, where he continued to reside till his death in 1850. His works, which include an immense number of busts, are numerous and varied. The best are, perhaps, the group of Charity, the Hercules and Lichas, and the Faith in God, which exem- plify the highest types of Bartolini's style. By the Italians he is ranked next to Thorwaldsen and Canova,

BARTOLOZZI, Francesco, a distinguished engraver, was born at Florence in 1725, or, according to some authorities, in 1730. He was originally destined to follow out the profession of his father, who was a silversmith ; but he mauifested so much skill and taste in designing that he was placed under the superintendence of two Florentine artists, who instructed him in painting. After devoting three years to that art, he went to Venice and studied engraving under the famous Joseph Wagner. He made very rapid progress, and executed some works of considerable importance at Venice. He then removed for a short time. to Rome, where he completed a set of engravings representing events from the life of St Nilus, and after returning to Venice, set out for London in 1764. For nearly forty years he resided in London, and produced an enormous number of engravings, the best being those of Clytie, after Annibale Carracci, and of the Virgin and Child, after Carlo Dolce. A great proportion of them are from the works of Cipriani and Angelica Kauffmann. Bartolozzi also contributed a number of plates to Boydell's Shakespeare Gallery. In 1802 he was invited to Lisbon to

superintend a schoo] of engraving in that city. He remained in Portugal till his death, at an advanced age, about the year 1816.

BARTOLUS, professor of the civil law at the University of Perugia, and the most famous master of the dialectical school of jurists, was born in 1314, at Sasso Ferrato, in the duchy of Urbino, and hence is generally styled Bartolus de Saxo Ferrato. His father was Franciscus Severi, and his mother was of the family of the Alfani. He studied the civil law first of all under Cinus at Perugia, and afterwards under Oldradus and Jacobus de Belvisio at Bologna, where he was promoted to the degree of doctor of civil law in 1334. His great re- putation dates from his appointment to a chair of civil

law in the University of Perugia, 1343, where he lec- tured for many years, raising the character of the law school of Perugia to a level with that of Bologna. He died in 1357 at Perugia, where a magnificent monument recorded the interment of his remains in the church of San Francisco, by the simple inscription of ‘“‘ Ossa Bartoli.” Bartolus has left behind him a great reputation, and many writers have sought to explain the fact by attri- buting to him the introduction of the dialectical method of teaching law; but the dialectical method had been em- ployed by Odofredus, a pupil of Accursius, in the previous century, and the successors of Odofredus had abused it to an extent which has rendered their writings in many instances unprofitable to read, from the subject matter being overlaid with dialectical forms. It was the merit of Bartolus, on the other hand, that he employed the dialectical method with advantage as a teacher, and discountenanced the abuse of it ; but his great reputation is more probably owing to the circumstance that he revived the exegetical system of teaching law (which had been neglected since the ascendency of Accursius), in a spirit which gave it new life, whilst he was enabled to impart to his teaching a practical interest, from the judicial experience which he had acquired whilst acting as assessor to the courts at Todi and at Pisa before he undertook the duties of a professorial chair. His treatises On Procedure and On Hvidence are amongst his most valuable works, whilst his Commentary on the Code of Justinian has been in some countries regarded as of equal authority with the code itself.

BARTON, Bensamin Smirn, M.D., an Anerican naturalist, who was the first professor of botany and natural history in a college in the United States. He was born in Pennsylvania in 1766, studied for two years at Edinburgh, and afterwards graduated at Géttingen. He settled at Philadelphia, and soon obtained a considerable practice. In 1789 he was appointed to the professorship above mentioned in Philadelphia College; he was made professor of materia medica in 1795, and on the death of Dr Rush in 1813 he obtained the chair of practical medicine. In 1802 he was chosen president of the American Philoso- phical Society. Barton was the author of various works on natural history, botany, and materia medica. By his lectures and writings he may be said to have founded the American school of natural history. He died in 1815.

BARTON, Etizapetu, the “Maid of Kent,” belonged to the village of Aldington in Kent. She was a pious, nervous, and enthusiastic person, subject to epilepsy ; and her enthusiasm, unfortunately for herself, took a political turn at a somewhat critical period in English history. When all England was excited with the attempts made by Henry VIII. to obtain a divorce from Queen Catherine, Elizabeth Barton saw visions and heard speeches, all of which related to the contemplated divorce. These she confided to her parish priest, Richard Masters, and he made them known to Dr Bockling, a canon of Canterbury. Through these men they became widely known, and were everywhere proclaimed to be divine revelations. The chapel at Aldington became the centre of many pilgrimages, and the scene of many excited and tumultuous assemblies. Elizabeth Barton was comnionly believed to be a prophetess, and was called the “‘holy maid of Kent.” Meanwhile her visions continued ; she saw letters written in characters of gold sent to her by Mary Magdalene, which contained both revelations and exhortations. Among other things she declared that it was revealed to her that if the coutem- plated divorce took place, the king would be a dead man within seven months. The principal agents for the Pope and for Queen Catherine lent themselves to fan the ex- citement. Even such men as bishops Fisher and Warham and Sir Thomas More corresponded with the Maid of Kent.

At last the king's wrath was aroused. In 1533 Elizabeth with her principal supporters, Masters, Bockling, and several others, were examined before parliament, and sentenced to be executed. She was beheaded at Tyburn, April 21, 1534. (Cf. Burnet's History of the Reformation in England ; Lingard's History ¢f England.)

BARUCH, son of Neriah, was the friend and amanuensis of the prophet Jeremiah. After the temple at Jerusalem had been plundered by Nebuchadnezzar, he wrote down Jeremiah's prophecies respecting the return of the Baby- lonians to destroy the state, and read them in the temple before the assembled people at the risk of his life. The roll having been burned by the king's command, Jere- miah dictated the same again. When the temple was destroyed, Baruch went to Egypt with Jeremiah, having been blamed as the prompter of the threatening prophecies uttered by the latter. Nothing certain is known as to his death,—some accounts representing him as dying in Egypt, others in Babylonia. The Talmud adopts the latter opinion, making him the instructor of Ezra, to whom he is said to have communicated the traditions he had received from Jeremiah.

The Book or Barucu belongs to the Apocrypha, accord- ing to Protestants, and to the deutero-canonical produc- tions, according to Roman Catholics.

There is hardly sufficient cause for dividing the book, as some critics suggest, between two writers. The author of iii. 9-v. 9 uses Isaiah as well as Jeremiah in two places. A new paragraph undoubtedly begins at iii. 9, which has little connection with the preceding con- text, and differs from it perceptibly both in matter and form; yet it has the same general object. From reproof the language passes to hope and Messianic happiness, and it becomes livelier and more elevated. It is purer Greek without doubt. The supposed traces of Alexandrian cul- ture are somewhat indistinct. Wisdom is not spoken of in the Alexandrian manner (iii. 24), but rather in the same way as in Sirach, which is Palestinian.

Much difference of opinion prevails regarding the original language. Some are for a Greek original, others for a Hebrew one; while Fritzsche and Ruetschi think that the first part was composed in Hebrew, the second in Greek. The original seems to have been Hebrew, though Jerome says that the Jews had not the book in that language; and Epiphanius asserts the same

thing. The testimony of the former resolves itself into the fact that the original had been supplanted by the Greek; and that of the latter is not of much value, since he gives Baruch, along with Jeremiah and the Lamentations, in a second list of the canonical books.1 We rely on the statement that the work was meant to be publicly read in the temple (i. 14) as favourable to a Hebrew original, as well as on the number and nature of the Hebraisms, which are sometimes so peculiar that they cannot be resolved into the authorship of a Greek-speaking Jew. That the writer was a Pales- tinian appears from various passages, such as ii, 17, " For the dead that are in the graves, whose souls are taken from their bodies, will give unto the Lord neither praise nor righteousness;" '" Hearken, O ye that dwell about Zion" (iv. 9); "Ye have forgotten the everlasting God that brought you up; and ye have grieved Jerusalem that nursed you" (iv. 8). Both the latter passages betray a Palestinian. Besides, the conception of Wisdom in iii, 12, &c., is Palestinian rather than Alexandrian ; for the words in iii. 37 do not refer to the incarna- tion of the Logos, but to personified Wisdom, as in Sirach xxiv. 10. This points to a Hebrew original. The version seems to be free, especially in the latter part.

1 Hoeres., viii. 6; compare De Mens. et Pond., c. 23; ibid., c. 5.

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Who was the translator? A comparison of the Septuagint translation of Jeremiah with that of Baruch will suggest the answer. 'The agreement between the two is remarkable. Constructions, phrases, and words are the same in them, so that we may coujecture with Ewald and Hitzig that the same translator appears. The words BadilZw, dmrocrody, xoppooivn, youpiapa, Seoparys, drouxiopds, dvoya prov eruxaAecoOat ext Tu are common to both. The LXX. ver- sion of Jeremiah was not made till the Ist century B.c. or later ; and Theodotion's translation or recension of it in the second. It is some confirmation of the opinion that Greek was not the original when marginal notes are found in the Hexaplar-Syriac version printed by Ceriani, in which the Hebrew is repeatedly referred to. Nothing seems to disprove the assumption that Theodotion, from whose version that of Paul of Tela was taken, had the Hebrew original before him.

Though Baruch professes to have written the book, a later writer speaks in his name. Jeremiah's faithful friend is said to have composed it at Babylon. This view is untenable on the following grounds :—

1. The work contains historical inaccuracies. Jeremiah was living in the fifth year after the destruction of Jeru- salem, yet the epistle is dated that year at Babylon. It is unlikely that Baruch left Jeremiah, since the two friends were so united. According to Baruch i. 3, Jeconiah was present in the great assembly before which the epistle was read, whereas we learn from 2 Kings xxv. 27 that he was kept a prisoner as long as Nebuchadnezzar lived. Joakim is supposed to be high priest at Jerusalem (i, 7). But we learn from 1 Chron. vi. 15 that Jehozadak filled that office the fifth year after Jerusalem was destroyed. In i, 2 there isanerror. The city was not burned when Jehoiachim was carried away. And if the allusion be to the destruc- tion of the city by Nebuchadnezzar, the temple and its worship are supposed still to exist ini. 8-10. The parti- culars narrated are put into the fifth year of the exile; yet we read, "Thou art waxen old in a strange country" (iii. 10).

2. Supposing Baruch himself to have been the writer, books later than his time are used in the work. Nehemiah is followed, as in ii. 11 (comp. Nehem. ix. 10). But Hichhorn's language is too strong in calling the contents '"'a rhapsody composed of various writings belonging to Hebrew antiquity, especially Daniel and Nehemiah." 4

The date of the work is given indefinitely in i. 2, '' In the fifth year, and in the seventh day of the month, what time as the Chaldeans took Jerusalem, and burnt it with fire." The natural meaning of these words is, " The fifth year after the destruction of Jerusalem by Nebuchadnezzar," not "the fifth year of Jehoiachim's captivity." The day is given, not the month; and therefore De Wette conjectures that ére: should be py'; but MS. authority is against him. It is probable that the name of the month has dropped out, a.¢., Sivan. The Palestinian abode of the writer is pretty clear, especially from the melancholy view of death pre- sented in ii. 17, iii. 19, resembling that in Psalms vi. 6, Ixxviii, 18, ciii. 29. In Alexandria the Jews had attained to a clear idea of immortality, in Palestine not. The translation was made in Egypt, which accounts for various expressions savouring of

Alexandrianism, as in ili, 23, 24, 26. There are evident points of contact between Daniel and Baruch, as appears from Baruch i. 15-18, which agrees almost verbally with Daniel ix. 7-10. So ii. 1, 2 coincide with Daniel ix. 12, 13; and ii, 7-17 with Daniel ix.13-18. Hitzig thinks the two authors were identical, but this can hardly be allowed ; for the tone and atmosphere of Baruch bear no perceptible trace of the

1 Eunleitung in die apokryphischen Schriften des A. T., p. 382.

Syrian persecutions or Maccabean struggle. Daniel bor- rowed from Baruch pretty closely in some passages. We suppose that the translator was separated from the author by a considerable period, probably 200 years. Perhaps the author lived about 300-290 B.c.

According to Jerome and Epiphanius, the Jews did not receive the book into their canon ; nor is it in the lists given by Josephus, Melito, and others. It has been thought, however, that Origen considered it canonical, because in his catalogue of sacred books he gives Lamentations and “the epistle” along with Jeremiah; and Jeremiah’s epistle formed a part of Baruch. The testimony of Origen on this point is perplexing; but it is conceivable that some Jews may have thought very highly of the book in his time, though its authority was not generally admitted among their co-religionists.2 From the position which the book occupied in the Septuagint, 7.e., either before or after Lamentations, it was often considered an appendix to Jeremiah by the early Christians, and was regarded in the same light, and of equal authority. Hence the words of it were often quoted as Jeremiah’s by Irenzeus, Clemens Alexandrinus, and Tertullian. Cyril of Jerusalem reckons it with the canonical books, among the ai Oeorvedaror or Ocior ypapai; and the epithets so applied cannot be ex- plained away by Protestants. .

The versions are the two Latin, a Syriac, and an Arabic. The Latin one in the Vulgate belongs to a time prior to Jerome, and is tolerably litcral, Another, somewhat later, was first published by Jos. Maria Caro in 1688, and was reprinted by Sabatier, side by side with the ante-Hieronyniian one, in his Bibliorum Sacrorum Latine Versiones Antique.> It is founded upon the preceding one, and is less literal. The Syriac and Arabic versions, printed in the London Polyglott, are literal. The Hexaplar-Syriac version, made by Paul, bishop of Tela, in the beginning of the 7th century, has been

published by Ceriani.4 The most convenient editions of the Greek text are Tischendorf's, in the second volume of his Septuagint, and Fritzsche's in Labri Apocryphi Veteris Testamenti Greece, 1871. (See David- son's Introduction to the Old Testament, vol. ill. ; Kurzge- fasstes Exegetisches Handbuch zu den Apokryphen des alten Testaments, erste Lieferung; Ewald's Geschichte des Volkes Fsrael, vol. iv.; De Wette's Hinleitung, §§ 321-323; Welte's Einleitung in die heiligen Schriften des A. T., zweyter Theil, dritte Abtheilung.)

Epistle of Jeremy.—An epistle of Jeremiah's is often appended to Baruch, forming the sixth chapter. Accord- ing to the inscription, it was sent by the prophet by God's command to the Jews who were to be carried captive to Babylon. The writer describes the folly and absurdity of idolatry in a declamatory style, with repetitions somewhat like refrains. Thus, in verses 16, 23, 29, 65 occurs the sentence, '' Whereby they are known not to be gods ; there- fore fear them not ;" ''How should a man then think and say that they are gods," in 40, 44, 56, 64, 69; " How then cannot men perceive that they be no gods," in 49, 52, These and other repetitions are unlike Jeremiah's. The concluding verse is abrupt.

All the relation this epistle has to Jeremiah is, that the contents and form are derived from Jeremiah x. 1-16 and xxix. 4-23. Its combination with Baruch is purely accidental. It could not have been written by Jeremiah, though many Catholic theologians maintain that it was. The Hellenist betrays himself in a few instances, as when he speaks of kings, verses 51, 53, 56,59. Though Welte tries to prove that the epistle was written in Hebrew, which is

2 See Welte's note on this point in Herbst's Hinleitung, erster Theil pp. 14, 15.

3 See vol. ii. p. 734, &e.

4 Monumenta Sacra et Profana, tom. i. fascic. 1.

consistent with Jeremiah's authorship, his arguments are invalid. The original is pure HellenisticGreek. The warning against idolatry bespeaks a

foreigner living out of Palestine. The place of its origin was probably Egypt; and the writer may have lived in the Maeeabean period, as we infer from his making the exile last for seven generations, ¢.e., about 210 years. Jeremiah, on the contrary, gives the time as 70 years in round numbers. The oldest allusion to the epistle is commonly found in 2 Maeeab. ii. 2, where a few words are similar to the fourth verse of our epistle. But the appropriateness of the supposed reference is doubtful.

The old Latin version of the epistle, published by Saba- tier, which is in the Vulgate, is literal. The Syriac is freer. ‘The Arabic is more literal than the Latin. Both are in the London Polyglott. The Hexaplar-Syriac was published by Ceriani. (s. D.)

BARYTES, or Baryta, an oxide (BaO) of the metal barium, usually prepared from the two most common ores of the substance, the sulphate and the earbonate of baryta. It is a highly eaustic alkaline poisonous body, which with water forms a hydrate of baryta. On a commercial scale baryta is prepared from the native carbonate (Witherite) by exposing the mineral, mixed with one-tenth of its weight of lamp black, to a very high heat. It is now largely employed in the beet sugar manufacture for sepa- rating crystallized sugar from the molasses, A. solution of the hydrated oxide, under the name of baryta-water, is of very great use in the chemical laboratory for precipitating metallic oxides, and on account of its sensitiveness to carbonic acid. Sulphate of baryta, or heavy spar, the cawk of miners, is a inineral of very high specific gravity (4°59), found abundantly in veins in the mountain limestone of England and frequently associated with metallic ores. When reduced to powder the white varieties are sometimes used as a pigment, but the powder is more frequently applied as an adulterant to white lead. Heavy spar is also used in the manufacture of pottery. The powdered earbonate of baryta is used to some extent in the manufac- ture of glass, taking the place of a part of the alkali in plate glass, and of some portion of red-lead in flint glass. Cassel green, or Rosenstiehl’s green, is a pigment manu- faetured from the ealcined manganate of baryta. Both the nitrate and the ehloride are of great value as ehemical reagents. The nitrate and chlorate are also used to pro- duce a green light in pyrotechny.

BASE BALL, a game which holds the same position in the United States of America as ericket does in Great Britain. It was founded on the old British game of rounders, though many additions and alterations have been made. Americans do not appreciate the patience of Englishmen, and do not care to witness a erieket match which may extend to three days, and then remain undecided, whereas the average time of a base ball match is from two hours to two hours and a half. The first regular base ball society was the old Knickerbocker Club, founded at New York in the autumn of 1845; and for fifteen years the sphere of play was very limited. In the spring of 1860 the Excelsior Club was inaugurated at Brooklyn, New York, and the amateur element, in contradistinction to the profes- sional, gave a marked impetus to the pastime. This club was second to none in the United States of America, either in social standing or as correct exponents of the game. The secession of the Confederate Statcs soon after, and the sanguinary eivil war which followed, was a serious interrup- tion to national or other sports, and base ball beeame almost obsolete till the season of 1865. Then it began to spread throughout the Union, and to be recognized as a profession, not a few devoting their whole time to it and being paid for their services. Now there are hundreds of games played for every one ten years since, In the

summer of 1874 the Boston Base Ball Club and the Athletic Base Ball Club of Philadelphia crossed the Atlantie and —— a series of exhibition matehes in England and reland ; but, as anticipated, the pastime did not find favour with Englishmen or take root in British soil. The seene chosen for the pastime should be a clear level picee of turf, not less than 500 feet by 350 feet. The following diagram shows the laying out of the ground.

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os Baseman ge” . y vi Foul. i 8 oi | Ball~Post Right-shorl- Stop Ball ~ Post – Sto, MS 2”OB8aseman P Right-sielder Left fi eben Contre fielder OUT-FIELD

Diagram illustrating the Game of Base Ball.

The position of the bases and base lines may be likened to a 90 feet square shaped diamond. The first point to be selected is the rear angle of the home base, which should be not less than 90 feet from the most suitable end of the ground, and equi-distant from each side. Lay out this base 1 foot square, and from the frout apex measure 127 feet 4 inches in a straight line down the ground, and the point reached will be the centre of the second base, ‘Take a cord, 180 feet long, fixing one end on the front angle of the home base, and the other on the centre of the second base. By hauling the centre of this cord taut on the two sides, two isosceles right angled triangles will be formed, and the 90 feet square completed. Standing on the home base and looking down the ground, the apex of the triangle on the right hand is the centre of the first base, and of that on the left hand the centre of the third base. 48 feet from the front angle of the home base has then to be measured down the diagonal of the square, in order to fix the centre of the pitcher’s position, which is 6 feet square. Lastly come the foul ball posts, which are on a line with the home and first bases, and home and third bases, and not less than 100 feet from the centres of first and third bases respectively.

Formerly, nine a side was the usual number of players ; but, latterly, an additional man has been introduced as right short-stop, and the sides inereased to ten. Their positions are marked in the above diagram. ‘The theory of the game is that one side takes the field, and the other goes in. ‘The pitcher then delivers the ball to the striker, who endeavours to hit it in sueh a direction as to elude the fielders, and enable him to run round all the base lines home without being put out. If he succeeds a run is scored. When three players are put out the fielding side come in ; and after nine innings have been played the side which have seored the most runs wins the game. The rules are voluminous and minute, but the pith of them may be gleaned from the following résumé :—

The ball must weigh not less than 5 ounces or more than 5} ounces avoirdupois, must be not less than 9 inches or more than 9} inches in circumference, and must be composed of 1 ounce avoirdupois of vulcanized india-rubber, covered with worsted and leather, red being the most suitable colour for the latter. The bat must be circular in shape, not exceeding 24 inches in diameter at any part, or 42: inches

in length, and must be made exclusively of wood. ‘The bases shall be 1 foot square, the first, second, and third consisting of white canvas

bags securely fastened to the ground, and the home hase of white stone or marble, level with the ground, and with one angle facing the pitcher. Unless five innings on each side are eoncluded it is no game. No game can be drawn, unless play is stopped by darkness or the weather, when the score of the two sides is even. The pitcher’s position shall be within a 6 feet square, the front of which shall be 45 feet from the centre of the home base, and the centre equi- distant from the centre of first and third bases, each angle being marked by a flat iron or stone plate 6 inches square. In delivering the ball, the pitcher must not move either foot outside the limits of the square, and the hand must not be raised higher than the hip. All balls delivered over the home base, and at the height requested by the striker, are fair balls. All other balls are unfair or called balls, and if three occur in succession the striker is allowed to take the first base, and any other players move on a base accordingly. A striker may, bowever, take an unfair ball at his own risk. Balk- ing, or pretending to deliver the ball and not doing so, is inadmis- sible, and any player, on first, second, or third base, is allowed to run a base whenever balking is attempted. If, after being warned by the umpire, three balks are made during the same innings, the out side at once forfeit the game.

The catcher’s duty is to catch all balls pitched to the striker. He stands close to the striker’s position when the pitching is slow, and some 50 feet off when it is swift. He

must be a sure catch in order to catch the striker out when opportunity occurs, and a swift and accurate thrower of the ball to the basemen. The pitcher is the most responsible person on the out side. His great object is to deceive the striker as to where a ball is coming, and he must therefore have full command over the ball, besides possessing the nerve to face any catches hit straight at him. ‘The first, second, and third basemen must all be sure catchers, swift and accurate throwers, and good judges of which bases

to send the ball to in order to put an opponent out. The short-stop must be an active man, of great coolness and judgment, a general backer up of the in-field. He is placed near the line from second to third base. The right, centre, and left fielders must all be sure catchers, good long distance throwers, aud active runners. Right short-stop is generally the captain of the side, and is available either in this position or anywhere else where an extra hand is required. Having less work to do than any other fielder, he has better opportunities of attending to his general duties of supervision. The usual positions of all the fielders are defined in the diagram. The catcher, pitcher, first and third basemen, and short-stop comprise the in-field ; the remainder the out-field.

The pastime requires good catching, throwing, and run- ning powers, combined with courage, nerve, good judgment, and quick perception of what to do in the field. ‘The great draw-back is so much being left to the umpire, and his decision being so frequently called for. Hardly a ball is pitched or struck, or a base run without his being called on for a decision under some rule or other, whereas the details of the game should be so plain and clear as only to call for an umpire’s decision under exceptional circumstances. The attitude of the striker is not an elegant one, and the pitcher is allowed to keep the former’s muscles too long on the stretch before actually delivering the ball. Base ball is a quicker and more lively pastime than the great English national game of cricket, which is the chief thing to be said in its favour. (H. F. W.)

BASEDOW, Jonann Brernuyarp, a German author, born at Hamburg 11th September 1723, was the son of a hairdresser. He was educated at the Johanneum in that town, where he came under the influence of the well-known rationalist, H. S. Reimarus, author of the Wolfenbiittel fragments. In 1744 he went to Leipsic to study theology, and gave himself up entirely to the instructions of Professor Crusius, and to the study of philosophy. This at first induced sceptical notions ; a more profound examination of the sacred writings, and of all that relates to them, brought him back to tke Christian faith, but, in his retirement, he formed his belief after his own ideas, and it was far from orthodox. He returned to Hamburg, where in 1749, M. de Quaalen, privy-councillor of Holstein, appointed him preceptor to his son. Basedow now began to exhibit his really remarkable powers as an educator

of the yonng, and acquired so much distinction that, in 1753, he was chosen professor of moral philosophy and _belles- lettres in the academy of Soroé in Denmark. On account of his theological opinions he was removed from this post and transferred to Altona, where some of his published works brought him into great disfavour. He left off giving lessons without losing his salary ; and, towards the end of 1767, he abandoned theology to devote himself with the same ardour to education, of which he conceived the project of a general reform in Germany. He began by publishing An Address to the Friends of Humanity, and to Persons in Power, on Schools, on Education, and tts Influence on Public Happiness, with the Plan of an Elemen – tary Treatise on Human Knowledge, Hamburg, 1768. He proposed the reform of schools and of the common methods of instruction, and the establishment of an institute for

qualifying teachers,—soliciting subscriptions for the print- ing of his elementary work, where his principles were to be explained at length, and illustrated by plates. The subscriptions for this object amounted to 15,000 thalers (£2250), and in 1774 he published his Hlementary Work, a complete system of primary education, intended to develop the intelligence of the pupils and to bring them, so far as possible, into contact with realities, not with mere words. ‘The work was received with great favour, and Basedow obtained means to establish an institute for education at Dessau, and to apply his principles in training disciples, who might spread them over all Germany. Little calculated by nature or habit to succeed in an ‘employment which requires the greatest regularity, patience, and attention, he, however, engaged in this new project with all his accustomed ardour. The name of Philan- thropin appeared to him the most expressive of his views; and he published at Leipsic in 1774 a pamphlet entitled The Philanthropinon founded at Dessau, containing the details of his plan. He immediately set about carrying it into execution ; but he had few scholars, and the success by no means answered his hopes. Nevertheless, so well had his ideas been received that similar institutions sprang up all over the land, and the most prominent writers and thinkers openly advocated the plan. Had Basedow been a man of ordinary tact, his success would have been com- plete. But his temper was intractable, and his manage- ment was one long quarrel with

his colleagues. The institution was finally shut up in 1793. Basedow died at Magdeburg on the 25th July 1790. Notices of his life and works have been published by Rathmann (1791) and Meyer (1791-2).

BASEL, BAur, or Baste (the first being the German, the others the French and Old French forms of the name), a canton in the N.W. of Switzerland, with au area of 184 English square miles. It is bounded on the N.W. by Alsace, N. by the grand-duchy of Baden, E. by the canton of Aargau, and 8. and 8.W. by those of Solothurn and Berne. The canton is traversed by the Jura chain, the highest peaks of which rise to from 4000 to 5000 feet. With the exception of the Rhine and its tributaries,—the Birse and the Ergolz,—there are no streams of any magui- tude. The soil is for the most part fertile and well culti- vated, the mountain sides affording excellent pasturage. The principal pursuits of the people are agricultural and pastoral, though here and there, as at Liestal, Sissach, and Miinchenstein, coal-mining is carried on. The chief mauu- factures are ribbons, woollen, linen, and cotton goods, and iron and steel wares. Politically the canton consists of two divisions, one urban and the other rural (Basel-stadt and Basel-landschaft), each with its own constitution and laws. The former sends two members to the National Council ; its legislative power is in the hands of a Great Council which consists of 134 members, chosen for six years, and its executive power belongs to a Lesser Council of 15 members, In the rural division the legislative body (or Landrath) is chosen for three years, and has the ultimate authority over all departments; the executive council con- sists of five members elected for the same period ; it sends three members to the National Council. The prevailing language is German. Population of Basel-stadt in 1870, 47,760, and of Basel-landschaft, 54,721.

Base, or BAug, the capital of the above canton, and, next to Geneva, the largest city in Switzerland, is situated on both sides of the Rhine, 43 miles N. of Berne, in lat. 47° 33’ N., and long. 7° 35’ E. Great Basel, or the city proper, lies on the south side of the river, and is connected with Little Basel on the north side by a handsome bridge 800 feet long, which was originally erected in 1229. The city is generally well-built, but there are fewer

remarkable edifices than in many other Continental cities of similar size. The fine old Gothic cathedral, founded 1010, still stands, and contains a number of interesting monuments, besides the tombs of Erasmus, CEcolampadius, and other eminent persons. A re-decoration was skilfully effected in 1852-1856. Among other ecclesiastical buildings of interest may be mentioned St Martin's, restored in 1851; St Alban's, formerly a monastery ; the church of the Bare-footed Friars, which now serves as a store house; Elizabeth's Church, of modern erection ; and St Clara's in Little Basel. The town-hall was built in 1508 and restored in 1826. A post-office, a new bank, and Besides the university,

an hospital are of recent erection.

880 yards

THEDRAR SS i R 'oct a n E —™

Ni 1

Plan of Basel.

A, Peter's Platz

B, Market.

C, Barfusser Platz.

D, Zoological Gardens. which was founded by Pope Pius IZ. in 1459, and reorganized in 1817, Basel possesses a public library of 95,000 vols., with a valuable collection of MSS., a picture- gallery, a museum, a theological seminary for missionaries (established in 1816), a gymnasium, an industrial school, a botanical garden, an orphan-asylum, an institution for deaf- mutes, and various learned societies. Of these may be mentioned the Society for the Propagation of Useful Knowledge, founded in 1777 by Iselin, the Society of Natural History, the Society of National Antiquities, and the Bible Society, which dates from 1804 and was the first of the kind on the Continent. Basel is the seat of an active transit-trade between France, Germany, aud Switzer- land, and possesses important manufactures of silk,

linen, and cotton, as well as dyeworks, bleachfields, and iron- works, the most valuable of all being the ribbon-trade. It has railway communication with both south and north. The Baden line has a station in Little Basel; and the central station for the Swiss and Alsace railways lies to the south-east of the city proper. Basel was the birthplace of Euler, Bernouilli, Iselin, and perhaps of Holbein; and the names of Erasmus, Cicolampadius, Grynzeus, Merian, De Wette, Hagenbach, and Wecknernagel, are associated with the university. Population in 1870, 44,834.

Basel (Bastlia) first appears in the 4th century as a Roman military post. On the decay of the neighbouring city of Augusta Rauracorum, the site of which is still marked by the village of Augst, it began to rise into im- portance, and, after numerous vicissitudes, became a free city of the empire about the middle of the 10th century, and obtained a variety of privileges and rights. In 1356 the most of its buildings were destroyed by an earthquake.

E, Botanical Gardens F, University G, Town-Hall H, Armoury.

In 1392 the town of Little Basel was acquired from the bishop by purchase. From 1431 to 1443 the meetings of a General Council were held in the city (see next article). After the battle of St Jacob in 1444, in the immediate neighbourhood, Basel was visited by the plague, and its population considerably diminished. In 1501 it became a member of the Swiss Confederacy ; and it was one of the chief seats of the Reformation movement. The position of the city exposed it to many dangers during the Thirty Years' War and the subsequent disturbances of the neigh- bouring states ; but in spite of all it continued to flourish. A peril of a more critical kind arose from within. The quasi-aristocratic Government of the city appropriated all political rights, and left the inhabitants of the rural dis- tricts unrepresented,—which gradually led to much discon- tent on the part of the latter, and ultimately to actual rebellion. It was not till 1833 that peace was firmly restored by the complete separation of the canton into the two divisions of Sasel-studt and SBasel-landschajt, the former being allowed to include not only the city proper, but also the comimunes of

Reihen, Bettingen, and Klein- Hiiningen. The capital of the rural division is Liesthal, with (in 1870) a population of 3873.

BASEL, THE Councin or (1431-1443), was the last of the three great rcforming councils of the 15th century, coming after the councils of Pisa (1409) and Constance (1414-18). In these three councils the aim of the majority was to reform the church by destroying the absolute supremacy of the Pope, and by curbing the rule of the Roman curia; and the acts of these councils were all designed to re-establish the power of the episcopate by asserting the supremacy of cecumenical councils. At Pisa these aims were only indicated ; at Constance they were so far successful that schismatic popes were deposed, and the council practically showed its superiority to the Pope by bestowing the papal chair on Martin V.; aud although the fathers of Constance were compelled to separate before they could do much else in the way of reform, they practically laid the foundation by insisting that councils should be held frequently, and by ordering a new council to be called at the end of five years. The couucil summoned in obedience to this command was the Council of Basel, but the results of its meeting were simply to show the helpless- ness of the episcopate and the power of the Roman curia. At Basel the labours of Pisa and Constance were undone, and after this council thoughtful men began to see that the church could not be reformed without destroying the Papacy.

The Council of Basel was summoned by Martin V. (1431). He first appointed it to meet at Pavia, then at Siena, but Basel was at last fixed upon. At the very beginning Martin died, but his successor, Eugenius IV., sanctioned all his decrees; and the council accordingly met at Basel on the 23d of July 1431, under the presidency of Cardinal Julian Cesarini. At first all went well. The bishops took care so to arrange the organization of the council and its method of procedure as to make it a true and fair representative of the whole Catholic Church. The members of the council were divided into four equal classes, each consisting of about the same number of cardinals, archbishops, bishops, abbots, &c., and each completely organized, with its president, secretaries, and other officers. This was done to neutralize the votes and prevent the intrigues of the Italian bishops, who were very numerous, and for the most part under the power of the Roman curia. To each of the four was assigned the investigation of a

special class of subjects. | Each section met separately in its own hall thrice a week. Each section elected three of its number to form a committee of business. One-third of this committee was changed every month. All the

business had to pass through this committee, and it sent down special subjects to be discussed in each of the sec- tions. When the section had discussed the matter it sent its decision with the reasons of it to each of the other sections, who then discussed the matter and gave their opinion upon it. If three sections were agreed upon it, the subject was brought before tle whole council for general discussion and a final decision.

The three subjects which were specially assigned to this council were the reunion of the Greek and Latin Churches, the reconciliation of the Bohemians, and the reform of the church according to the resolutions come to at Constance. Soon after the beginning of the council the Roman curia took alarm at the zeal and determination of the assembled bishops, and by intrigues compclled.the Popc, who was really anxious for reform, to do all he could to hinder the work of the fathers at Basel. Eugenius twice tried to dis- solve the council; but it resisted, maintaining that a council being superior to the Pope could not be dissolved, and the Pope yielded. The bishops refused to admit the Pope’s legates until they admitted the supremacy of the council and promised to obey its decrees.

The first business to which the members addressed them- selves was to curb the power of the Pope and of the Roman curia, They tried to do this by attempting to stop the flow of money from all parts of Europe to Rome. They abolished the annates ; they declared it illegal in a bishop to send the sum of money commonly presented on his investiture, &e.; and they passed many laws to restrain the luxury and vice of the clergy. These proceedings so alarmed Eugenius that he resolved either to bring the council within the reach of his influence or to dissolve it. The occasion for inter- ference arose out of a debate which the subject of reunion with the Greek Church gave rise to. The Emperor John Palzeologus, induced principally by fear of the Turks, had written both to the Pope and to the council on the subject of the reunion of Christendom, and both had entertained his proposals. ‘The majority, however, of the bishops in the council maintained that this subject could not properly be discussed in Italy, and that the deliberations must take

place in France, Savoy, or Basel, far from the influence of the Pope. Tothis Eugenius would not agree; and when the council decided against him, he resolved to assemble another council, which met first at Ferrara and afterwards at Florence.

The rest of the proceedings of the Council of Basel is simply a record of struggles with the Pope. In 14387 the council ordered the Pope to appear before them at Basel. The Pope replied by dissolving the council; the bishops, backed by the emperor and the king of France, continued their deliberations, and pronounced the Pope contumacious for not obeying them. When Eugenius tried to take away the authority of the council by summoning the opposition Council of Florence, the bishops at Basel deposed him. Eugenius replied by a severe bull, in which he excommunicated the bishops, and they answered by electing a new Pope, Amadeus, duke of Savoy, who assumed the name of Felix V. The greater part of the church adhered to Eugenius, but most of the universities acknowledged the authority of Felix and the Council of Basel. Notwith- standing the opposition of Eugenius and his adherents, the Council of Basel continued to pass laws and decrees until the year 1443; and when the bishops separated they declared publicly that they would reassemble at Basel, Lyons, or Lausanne. In 1447 Eugenius died and was succeeded by Nicholas V., who tried to bring about a reconciliation between the partics in the church. A compromise was effected, by which Felix resigned the pontificate, and the fathers of Basel having assembled at Lausanne, ratified the abdication of Feliv, and directed the church to obey

Nicholas, while Nicholas confirmed by his sanction the

acts and decrees of the Council of Basel.

Hefele’s Conciliengeschichte, vol. v. ; Mansi, Concilia, vol. xxix’: Mneas Sylvius, De Concilio Basiliense. The Acts of the Council are preserved in MS. in Paris and in Basel. (T.M.1L.)

BASHAN, a country lying on the east side of the Jordan valley, towards its northern extremity, often mentioned

in Jewish history The Hebrew form of the name is }3

or 1¥33, represented in Greek by Bacdy and Bacavins |

(LXX. and Epiphanius), or more frequently by Baravaca (Josephus, Ptolemy, Eusebius, &.). The name is under- stood to be derived from a root signifying fertile, or, according to some, basaltic ; and in some of the ancient versions of the Old Testament it is occasionally rendered by a word indicating fertility; thus, in Ps. xxii. 13, the LXX. gives for Bashan zioves, Aquila gives Auapoi, Syin- machus, ovriarot. When we first hear of this region in the days of Abraham it is occupied by the Rephaim, whose chief city is Ashteroth Karnaim (Gen. xiv. 5). These Rephaim, with kindred tribes spread over the trans-J ordanic region, were in great part subdued and supplanted by the children of Lot (Deut. ii, 10, 11, 19-21), who in their turn were invaded and displaced by the Amorities (Num. xx. 26-30). By this people, at the time of the Exodus, the whole region north of the Arnon was occupied; and they formed two kingdoms, the more northerly embracing all Bashan and a part of Gilead (Deut. iit. 8,13; Josh. xii. 4, 5). Og, who is described as a man of gigantic stature, belonging to the race of the Rephaim, was, at the time referred to, the ruler of this kingdom ; and having come out against the Israelities, he was overthrown in battle at Edrei, one of his own cities. Subsequently, his country became the allotment of the half tribe of Manasseh (Josh. xiii. 29-31).

The information given in connection with the Israelitish conquest enables us to define with considerable exactness the limits of the ancient Bashan. ‘Tiowards the west it included Golan (Deut. iv. 43; Josh. xx. 8, xxi. 27), a name which to the present day has continued attached to the district, the Jaulin, lying on the east of the Jordan, in its upper course; while towards the east, it reached to Salchah (Deut. iii 10, &c.), the modern Salkhat, situated ou the south-eastern slope of the Haurén mountains. On the south it is represented as immediately adjoining the country of Gilead, whose northern boundary is known to have been the river Jarmuk, and on the north, it is expressly said to have extended to Mount Hermon (Deut. iv, 48, xxxili, 22; Josh. xii. 5, xiii, 11, 12). Within the limits thus indicated, may be pointed

out the towns and other localities mentioned as belonging to Bashan. _Ashta- roth, Og's metropolis, doubtless the Ashteroth Karnaim of Gen. xiv. 5, called also Beeshterah (cf. Josh. xxi. 27, and 1 Chron. vi. 71), has been sought in various places, especially in Tel Ashtereh (see Newbold, Jour. Geog. Soc., vol. xvi.), but has now, with much probability, been identified (by Wetzstein, Reisebericht tiber Haurdn, p. 110) with the well-known 'Busrih, the Bostra of the Latins, whose position admirably adapts it for a capital city, and whose ruins attest its ancient splendour. drei, already mentioned, is to be identified with DerAt, on the west of Busrah (Wetzstein, op. czt., p. 47, 77). The position of Golan and Salchah has been indicated, while Kenath (Num. xxxii. 42) is recovered in the modern Kunawat (Porter, Five Years in Damascus, vol. ii. p. 111). The region of Argob will be referred to immediately.

Within the same limits lie the provinces included by Josephus in the Bashan of the Israelites (cf. Ant. Jud., iv. 53 SM; HE. Fede 6, Be Te, 5), and recognized generally by the Greek and Roman writers. They are four—Gaulonitis, Trachonitis, Auranitis, and Batanea, answering as nearly as possible to the natural divisions of

the country. The first, Gaulonitis, deriving its name from the ancient Golan, and coincident more or less cxactly with the modern Jaulin already mentioned, forms the westeru division, extending from the Jordan lakes to the Haj road. It is spoken of as divided into two sections, the territory of Gamala, or Gamalitis, and the territory of Sogana (Bell. Jud., iv. 1,1). It forms a fertile plateau, diversified on its northern half by a range of low, richly-wooded hills, the Tell él Faras, which descends from Mount Hermon. The second, Trachonitis (mentioned Luke iii. 1), lay east of the preceding, and adjoined the territory of Damascus, as well as Auranitis and Batanwa (Ant. Jud., i. 6, 45 xv. 10,1). This leads us to the remarkable tract, now called the Lejah, forming one of the two Trachénes, or rocky volcanic districts, lying south and east of Damascus, mentioned by Strabo (Geog. xvi. p. 520). Inscriptions, moreover, have been found in the Lejah (see Burckhardt, Z'ravels in Syria, p. 117), which attest that the district was called Trachén. In this province we may with confidence recognize "the

region of Argob," so often mentioned in the Old Testa- ment, as included in the country of Bashan (Deut. iii. 4, 13, 14; 1 Kings iv. 13), The arguments for this identification are,—1st, The etymology of the word Argob (see Gesenius and Fiirst, sub voce); 2d, the descriptive term usually conjoined with the name, chebel Argob, indicating a tract clearly defined and measured off, and applied elsewhere to the line of the sea coast, which the boundary of the Lejah resembles (cf. Porter, op. cit., vol. ii. p. 241); 3d, by the Targumists the name Argob is rendered Zrachéna (Lightfoot, Chorographical Notes, § 4). The third province, Auranitis, presents a name known both in ancient andin modern times. In Ezekiel (xlvii. 16, 18) mention is made of Haurdn (in the LXX. Avparizis), as a locality on the border of the land of Israel. The name is found also on the inscriptions of Assyria, under the form Havranu (Schrader, Die Keilinschriften und das A. T., p. 237), and it is common in Arabian writers, In regard to its modern use Porter says (Jour, Sac. Lat., July 1854, p. 303), "' The name Hauran is at present applied by those at a distance to the whole country east of Jaulén and Jeidfir. By the people of that country, however, it is used in a much more restricted sense, and is given only to the fertile plain on the south of the Lejah, with the narrow strip on the west. The whole of this district is perfectly flat, with-little conical hills at intervals. The soil is the most fertile in Syria, admirably adapted to the produetion of wheat." (Cf Burckhardt, op. cit., p. 285). The fourth district is Batanzea, a name obviously derived from, and often used by Josephus and others co-extensively with, the old name Bashan. It has, however, a special application to the district lying on the east of the Lejah and of the Hauran plain, including the central masses of the Jebel ed- Druz or Haurén mountain (apparently the Alsadamus or Alsalamus mons of Ptolemy, and, perhaps, the Salmon of Ps. lxviii. 14; see Reland, Palestina, p. 458 ; Wetzstein, op. ctt., p. 90) and its eastern slopes. To this portion of the kingdom of Bashan, the name Ard-el-Bathanyeh is still applied by the natives. Says Porter (op. cit., p. 305), "One of the most intelligent Druzes I met with in my whole journey, told me the whole mountains were com- prehended in the Ard-el-Bathanyeh."

The history of Bashan, after its conquest by the Israelites, merges into the general history of that nation, and of Western Asia. It is last mentioned in the Old Testament, in 2 Kings x. 33, in connection with the attacks made by Hazael, the king of Damascus, upon the territory of Israel. Throughout the

Psalms and the Prophets, Bashan is celebrated for its fertility and luxuriance, its rich pastures, its strong bulls, its fatlings ‘‘ of rams, of lambs, and of goats, of bullocks ;” its oaks and its firs (Ps. xx.

12; Amos iv. 1; Isa. ii. 13; Jer. 1.19; Ezek. xxxix. 18, xxvii. 6); and its extraordinary fertility is attested by the density of its population (Deut. ni. 4, 5, 14)—a density proved by the unparalleled abundance with which ruined towns and cities are now strewn over the whole country. In the disturbed period which followed the breaking up of the empire of Alexander, its possession was an object of continual contest. “ Idumzan princes, Nabathzan kings, Arab chiefs, ruled in their turn.” The central portion of the country, Trachonitis, early became a refuge for outlaws aud haunt of robbers, a character for which it is singularly fitted by nature, and which it retains to the present day. (Cf. Josephus, Ant. Jud., xv. 1; xvi. 9, 2; Strabo, Geog., xvi. p. 520; Gul. Tyr., Host., xv. 10.) In Arabian tradi- tion Bashan is regarded as the country of the patriarch Job (see Abulfeda, Hist. Anterslamica, p. 27, 208, and esp. Wetzstein, in Delitzsch, Das Buch .Job, p. 507, f-); and it holds a prominent place in authentic Arabian history as the seat of the dynasty of the Ghassanides (see Caussin de Perceval, L’ Histoire des Arabes, vol. ii. 202, f ; Wetzstein, op. cit.. 121, f.). At the present day the Haurdn is one of the seats of that singular people, the Druzes (see Druzss). Both in its natural and its archeological aspects, the country of Bashan is full of interest. ‘The Jebel ed-Druz, which rises to nearly 6000 feet in height, is a congeries of extinct volcanoes, and the products of eruption from this source, spread over the adjoining plains, have given to the soil that character of fertility for which it has been in all uges remarkable. (Cf. Lyell, Principles of Geology, 9th ed., p. 394.) This volcanic soil, we are told, yields on the average, in some places, eighty returns of wheat, and a hundred of barley (Wetzstein, op. cit., p. 30.) The mountains themselves are richly clothed, at least on their western side, with forests of various kinds of trees, among which the evergreen oak is especially abundant. The Lejah is one of the most remarkable regions on the earth’s surface. “Tt is,” says oue of the latest observers (Burton, Unew- plored Syria, vol. i. p. 164), “in fact a lava bed; a stone torrent poured out . . . over the ruddy yellow clay and the limestone floor of the Hauradn valley,

high raised by the ruins of repeated eruptions, broken up by the action of fumaroles or blow holes, and cracked and crevassed when cooling by earthquakes, and by the weathering of ages." (See also Burckhardt, op. cit., p. 112; Porter's Fwe Years in Damascus, vol. ii, p. 241; Wetzstein, op. crt., p. 25.) In regard to the architectural monuments of the Haurin, the "striking feature," says Count de Vogué (Recovery of Jerusalem, p. 423), "is the exclusive use of stone. The country produces no wood, and the only rock which can be obtained is a basalt, very hard aud very difficult to work." The walls are formed of large blocks, carefully dressed, and laid together without cement, and often let into one another with a kind of dovetail. Roofs, doors, stairs, and windows, are all of stone. This, of course, imparts to the buildings great massiveness of appearance and great solidity, and in multitudes of cases the houses, though "without inhabitant," are as perfect as when first reared. Since buildings so strong are apparently capable of enduring for any length of time, and since some of these are known, from the inscriptions upon them, to date from before the commencement of the Christian era, it is not unnatural to regard them as, in fact, the work of the earliest known inhabitants of the land, the Amorites or the Rephaim. (See Ritter, Paldst. and Syrien, 11. 964, Porter, Giant Cities, p. 79,f.). This, however, is contested, on the ground that the extant inscriptions and the archi- tectural style point to a much later date, and must be regarded as at least unproved. (See Wetzstein, op. cit., p. 103 ; Fergusson, in Atheneum, July 1870, p. 148; Burton, op. cit., vol. i. p. 192.) Many inscriptions have been

found in this region,—most of them composed in Greek, a considerable number in two forms of Shemitic writing (the Palmyrenian or Arameean, and the Sinaitic or Nabathzan), and some in an unknown character, resembling the Himyaritic. Arabic inscriptions are numerous on buildings of more recent date. The oldest recognizable Greek record bears the name of Herod the Great ; and the Nabathzan kings, of the dynasty of Aretas, who reigned from about 100 u.c. at Bozrah have also left memorials.

To the works on this region above referred to the following may be added : —Seetzen, Reisen durch Syrien; Buckingham, J'raveis among the Arab Tribes; Graham, Jour. Geog. Soe., vol. xxviii.; De Vogue, Syrie Centrale;

Waddington, Inscriptions Grecgues de la Syrie; Freshtield, Travels in the Central Caucasus and Bashan. ais NUL)

BASHKIRS, a people who inhabit the Russian govern- ments of Orenburg, Perm, and Samar, and parts of Viatka, especially on the slopes and confines of the Urai, and in the neighbouring plains. The Bashkirs are a Tatarized Finnish race, and are called Hestyak by the Kirghiz, in allusion to their origin from a mixture of Ostyaks and Tatars. The name Bashkir or Bash-kfrt appears for the first time in the beginning of the 10th century in the writings of Ibn-Foslan, who, describing his travels among the Volga-Bulgarians, mentions the Bashkirs as a warlike and idolatrous race. The name was not used by the people themselves in the 10th century, but is a mere nickname. It probably points to the fact that the Bashkirs, then as now, were distin- guished by their large, round, short, and, possibly, close- cropped heads. Of European writers the first to mention the Bashkirs are Plano-Carpini and Rubruquis. These travellers, who fell in with them in the upper parts of the River Ural, call them Pascatir, and assert that they spoke at that time the same language as the Hungarians. Till the arrival of the Mongolians, about the middle of the 13th century, the Bashkirs were a strong and independent people, and troublesome to their neighbours, the Bulgarians and Pechenegs. At the time of the downfal of the Kazan kingdom they were in a weak state. In 1556 they volun- tarily recognized the supremacy of Jussia, and, in conse- quence, the city of Upha was founded to defend them from the Kirghiz, and they were subjected to a fur-tax. In 1676 they rebelled under a leader named Seit, and were with difficulty reduced ; and again in 1707, under Aldar and Kisyom, on account of ill-treatment by the Russian officials. Their third and last insurrection was in 1735, at the time of the foundation of Orenburg, and it lasted for six years. In 1786 they were freed from taxes ; and in 1798 an irregular army was formed from among them. They are uow divided into thirteen cantons, and each canton into yfrts or districts, the whole being under the jurisdiction of the Orenburg governor- general. In military matters they are subject to an Ataman, chosen from the generals of the army; but in civil affairs the ydrts and cantons are administered by Bashkir officials. They main- tain a military cordon, escort caravans through the Kirghiz steppes, and are employed in various other services. By mode of life the Bashkirs are divided into settled and nomadic. The former, who are not distinguishable from the inhabitants of the Tatar

villages, are engaged in agriculture, cattle-rearing, and bee-keeping, and live without want, The nomadic portion is subdivided, according to the districts in which they wander, into those of the mountains and those of the steppes. Almost their sole occupation is the rearing of cattle; and they attend to that in a very negligent manner, not collecting a sufficient store of winter fodder for all their herds, but allowing part of them to perish. The Bashkirs are usually very poor, and in winter live partly on a kind of gruel called yfiryu, and badly prepared cheese named skirt. They are hospitable but suspicious, apt to plunder, and to the last degree lazy…They have

large heads, black hair, eyes narrow and flat, small fore- heads, ears always sticking out, and a swarthy skin. In general, they are strong and muscular, and capable of enduring all kinds of labour and privation. They profess Mahometanism, but are little acquainted with its doctrines. In intellectual development they do not stand high.

See Semenoff, Slovar Ross. Imp. s. v.; Frahn, ‘‘ De Baskiris,” in Mém, del Acad. de St Petersburg, 1822; and Florinsky, in Wesi- nik Evropt, 1874.

BASIL THE GREAT, an eminent ecclesiastic in the 4th century. He was a leader in the Arian controversy, a distinguished theologian, a liturgical reformer; and _ his letters to his friends, especially those to Gregory of Nazian- zus, give a great amount of information about the stirring period in which he lived. Basil came of a somewhat famous family, which gave a number of distinguished supporters to the church of the 4th century. His eldest sister, Macrina, was celebrated for her saintly life; his second brother was the famous Gregory of Nyssa; his youngest was Peter, bishop of Sebaste; and his eldest brother was the famous Christian jurist Naucratius. It has been observed that there was in the whole family a tendency to ecstatic emotion and enthusiastic piety. Basil was born about 330, at Czesarea in Cappadocia. While he was still a child, the family removed to Pontus; but he soon returned to Cappadocia to live with his mother’s relations, and seems to have been brought up by his grandmother Macrina. It was at Czesarea that he became acquainted with his life-long friend Gregory of Nazianzus, and it was there that he began that interesting correspondence to which reference has been made. Basil did not from the

first devote himself to the church. He weut to Constanti- nople in pursuit of learning, and spent four or five years there and at Athens. It was while at Athens that he seriously began to think of the church, and resolved to seek out the most famous hermit saints in Syria and Arabia, in order to learn from them how to attain to that enthusiastic piety in which he delighted, and how to keep his body under by maceration and other ascetic devices. After this we find him at the head of aconvent near Arnesi in Pontus, in which his mother Emilia, now a widow, his sister Macrina, and several other ladies, gave them- selves to a pious life of prayer and charitable works. He was not ordained presbyter until 365, and his ordina- tion was probably the result of the entreaties of his ecclesi- astical superiors, who wished to use his talents against the Arians, who were numerous in that part of the country, and were favoured by the Arian emperor, who then reigned in Constantinople. In 370 Eusebius, bishop of Ceesarea, died, and Basil was chosen to succeed him. It was then that his great powers were called into action. Czesarea was an important diocese, aud its bishop was, ex officio, exarch of the great diocese of Pontus. Basil was threatened with confiscation of property, banishment, and even death, if he did not relax his regulations against the Arians ; but he refused to yield, and in the end triumphed. He died in 379. The principal theological writings of Basil are his De Speritu Sancti and his three books against Eunomius. He was a famous preacher, and we possess at least seventeen homilies by him on the Psalms and on Isaiah. His principal efforts as a reformer were directed towards the improvement of the Liturgy (the Laturgy of the Holy Basil), and the reformation of the monastic orders of the East. (Cf. the Benedictine editions of the works of Basil the Great.)

The name Basin also belongs to several distinguished churchmen besides Basil the Great. (1.) Basil, bishop of Ancyra (336-360), a semi-Arian, highly favoured by the Emperor Constantine, and a great polemical writer ; none of his works are extant. (2.) Basil of Seleucia

(fl. 448-458),. a bishop who shifted sides continually ia the Eutychian controversy, and who wrote extensively ; his works were published in Paris in 1622. (3.) Basil of Ancyra, fl. 787; he opposed image worship at the

second council of Niczea, but afterwards retracted. (4.) Basil, the founder of a sect of mystics who appeared in the Greek Church in the 12th century (¢f Anna Comnena, Alewiad, bk. 15).

BASILICA, a term denoting (1) in civil architecture, a court of law, or merchants' exchange, and (2) in ecclesias- tical architecture, a church of similar form and arrangement.

The name basilica, Baowduxy (sc. orod or addy), "a royal portico," or "hall," is evidence of a Greek origin. The portico at Athens in which the second archon, épywv Baowrcds, sat to adjudicate on matters touching religion, and in which the council of Areopagus sometimes met, was known as the orod Bactdewos or BacArxy (Pausan., i. 3, § 1; Demosth., Aristog:t., p. 776; Plato, Charmid., ad init.; Aristoph., Ecclesiaz., 685). From this circumstance the term appears to have gained currency as the designation of a law-court, in which sense it was adopted by the Romans. The introduction of bastlicew into Rome was not very early. Livy expressly tells us, when describing the conflagration of the city, 210 B.c., that there were none such then,— "neque enim tum basilicee erant" (xxvi. 27). The earliest named is that erected by M. Porcius Cato, the censor, 183 B.C, (Liv., xxxix. 44), and called after its founder basilica Poreia. When once introduced this form of building found favour with the Romans. As many as twenty basilice are recorded to have existed within the walls of Rome, erected at different periods, and bearing the names of their founders, e.g.—dmilia, Julia, Sempronia, Ulpia or T'rajani, &c. The basilicas were always placed in the most frequented quarter of the city, in the immediate vicinity of a forum, and on its sunniest and most sheltered side, that the merchants and others who resorted thither might not suffer from the severity of the weather (Vitruv., De Architect., v. 1). Originally, the basilicas, like the Royal Exchange in London and the Bourse at Antwerp, were unroofed, consisting of a central area surrounded simply by covered porticoes, without side walls, Subse- quently, side walls were erected and the central space was covered by a roof, which was generally of timber, the beams being concealed by an arched or coved ceiling, orna- mented with lacunaria.

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Fic. 1.—Basilica at Pompeii. 4, Altar.

5. Tribunal. 6. Chalcidica.

1. Portico. 2. Hall of Basilica. 3. Side aisles, with galleries over. In plan the basilicas were large rectangular halls, the length of which, according to the rules laid down by Vitruvius (wbi sup.), was not to be more than three times or less than twice its width. In any cases where, from the necessity of the locality, the length exceeded these propor- tions, the excess was to be masked by the construction of small apartments (chalcidica) at the further end, on both sides of the tribunal, On each side of the central area was one, or sometimes, as in the Ulpian and A!milian basilicas, two rows of columns. These were returned at either end, cutting off a vestibule at one extremity, and the tribunal or court proper, forming a kind of transept,

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BASILICA

elevated above the nave, at the other. Above the aisles thus formed (porticus) were galleries, formed by a second row of columns supporting the roof, approached by external staircases, for the accommodation of the general public— meh on one side, women on the other (Plin., Lpist., vi. 33). They were guarded by a parapet wall (plutews) between the columns, high enough to prevent those in the galleries from being seen by those below. Sometimes, as in Vitruvius's own basilica at Fanum, and in that at Pompeii, instead of a double there was only a single row of columns, the whole height of the building, on which the roof rested. In this case the galleries were supported by square piers (parastate) behind the main columns. The building was lighted with windows in the side walls, and at the back of the galleries. In the centre of the end-wall were the seats of the judge and his assessors, generally

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occupying a semicircular apse, the prector’s curule chair standing in the centre of the curve. When the assessors were very numerous (according to Pliny, u.s., they sometimes amounted to one hundred and eighty), they sat in two or three concentric curves arranged like the seats of a theatre The advocates and other officials filled the rest of the raised platform, divided from the rest of the building bya screen of lattice-work (cancelli). In the centre of the chord of the apse stood an altar on which the judices took an oath to administer true justice. The tribunal sometimes ended square instead of apsidally. This is so in the basilica at Pompeii (see the plan annexed), where the tribunal is parted from the body of the hall by a podium bearing 2 screen of six columns, and is flanked by staircases to the galleries and by the chalcidica. The larger and more magnificent basilicas

| were sometimes finished with an apse at each extremity.

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Fic. 2.—Interior view of Trajan’s Basilica (Basilica Ulpia), as restored by Canina.

The plans of Trajan’s basilica usually give this arrangement. The fragment of the ground-plan in the marble tablets pre- served in the Capitol, usually called that of the Aimilian,

but really, as Canina has shown, that of the Ulpian basilica, also shows an apse, designated (Atriwm) Libertatis. This, we know from many ancient authorities, was the locality

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Fic. 3. —Ground-Plan of Trajan’s Basilica (Basilica Ulpia).

that it was 174 feet in breadth, and more than twice as long as it was broad. (The plan and supposed internal arrangements will be seen in the annexed woodcuts from Canina.) The nave, 86 feet in breadth, was divided from

for the manumission of slaves ; and, therefore, the tribunal wust have been at the other end, and, doubtless, also apsidal. The basilica of Trajan was one of the largest and most magnificent in Rome. From its existing remains we learn

the double aisles by rows of granite columns, 35 feet high. An upper row of columns in front of the galleries above the aisles supported a ceiling, covered with plates of gilt bronze. The total internal height was about 120 feet. The walls were cased with white marble from Luna. It was paved with giallo antico and purple breccia. A side court, which enclosed the well-known menniorial column to Trajan, was flanked by libraries, Bibliotheca Greca and Latina (Sidon. Apollinaris, Lpzgr., ix. 16).

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Fia. 4.—Section of the Basilica of Constantine or Maxentius (Temple of Peace).

The basilica of Maxentius (or of Constantine), usually known as the Temple of Peace, in the Forum at Rome, was on an entirely different plan from those already described. The internal colonnades were dispensed with, the central space being covered by a vast quadripartite brick vault, in three bays; and the aisles were roofed with three huge barrel vaults, each 72 fect in span. Columus were only used for ornament. The tribunal was apsidal. Its width was 195 feet, but it was 100 feet shorter than Trajan’s basilica, The ground-plan of a small but interesting basilica, of which the foundations remain at Otricoli (Ocriculum), is given by Agincourt (pl. lxxiii. No. 100). The nave is of four bays; beyond the aisles there is an addi- tional aisle of annexed buildings or chaleidica; the apse is internal. A good example of a provincial basilica remains at Treves. Itis a plain hall, about 90 feet long,

the walls being 100 feet high, without aisles, and it has an apsidal tribunal elevated considerably above the floor. Under the empire, when architectural magnificence reached an hitherto unparalleled height, basiliee formed a part of the plan of the palaces erected by the emperors and nobles of Rome (Vitruv., vi. 81). A beautiful example ona small scale, the Baszlica Jovis, has been recently excavated in the ruins of the palace of the Caesars on the Palatine. Only the lower part of the walls remains, but the arrangements of the building are singularly perfect, even to the pierced marble cancelli, and throw the clearest light on the con- struction of these halls.

On the establishment of Christianity as the imperial religion, these vast halls furnished exactly what was wanted for the religious assemblies of the Christian community. The basilica was, in fact, a ready-made church, singularly adapted for its new purpose. The capacious nave accom- modated the ordinary congregations, the galleries or aisles the females and the more dignified worshippers; while the raised tribunal formed the bema, or sanctuary, separated by lattice-work from the less sacred portion below, the bishop and his clergy occupying the semicircular apsis. The prastor's curule chair became the episcopal throne, the curved bench of his assessors the seat for the presbyters of the church. The inferior clergy, readers, and singers took the place of the advocates below the tribunal; while on the site of the heathen altar rose the holy table of the Eucharistic feast, divided from the nave by its protecting lattice-work screen, from which were suspended curtains guarding the sacred mysteries from the intrusive gaze of the profane.

The words of Ausonius to the Emperor Gratian, in which he speaks of " the basilicas once full of business, but now

of prayers for the emperor's preservation " (Grat. Actio pro Consulatu), are a testimony to the general conversion of these civil basilicas into Christian churches. We know this to have been the case with the basilicas of St Cross (S. Croce in Gerusalemme) and St Mary Major's at Rome, which were halls in the Sessorian and Liberian palaces respectively, granted by Constantine to the Christians. We may adduce also as evidence of the same practice a passage from the theological romance known as The Recognitions – of

Clement (bk. x. ch. 71), probably dating from the early half of the 3d century, in which we are told that Theophilus of Antioch, on his conversion by St Peter, made over “the basilica of his house” fora church. But however this may have been, with, perhaps, the single exception of St Cross, the existing Christian basilicas were erected from the ground for their sacred purpose. At Rome the columns, friezes, and other materials of the desecrated temples and public buildings furnished abundant materials for their construction. The decadence of art is plainly shown by the absence of rudimentary architectural know- ledge in these reconstructions. Not ouly are colunins of various heights and diameters made to do duty in the same colonnade, but even different orders stand side by side— (¢.g., Ionic, Corinthian, and Composite at St Mary’s in the Trastevere) ; while pilasters assume a horizontal position, and serve as entablatures, as at St Lawrence’s. There being no such quarry of ready-worked materials at Ravenna, the noble basilicas of that city are free from these defects, and exhibit greater unity of design and harmony of proportions. In all cases, however, the type of the civil basilica, which had proved so suitable for the requirements of Christian congregations, was adhered to with remarkable uniformity.

An early Christian basilica may be thus described in its main features:—A porch supported on pillars (as at St Clement) gave admission into an open court or atrium, sur- rounded by a colonnaded cloister (St Clement, Old St Peter’s, St Ambrose at Milan, Parenzo). In the centre of the court stood a cistern or fountain (cantharus, phiale), for drinking and ablutions. In close contiguity to the atrium, often to the west, was the baptistery, usually octagonal (Parenzo). The church was entered through along narrow porch (narthex), beyond which penitents, or those under ecclesiastical censure, were forbidden to pass. The narthex was sometimes internal (St Agnes), sometimes an external portico (St Lawrence’s, St Paul’s). Three or four lofty door- ways, according to the number of the aisles, set in marble cases, gave admission tothe church. The doors themselves were of rich wood, elaborately carved with scriptural sub- jects, or of bronze similarly adorned and often gilt, Magnificent curtains, frequently embroidered with sacred figures or scenes, closed the entrance, keeping out the heat of summer and the cold of winter.

The interior consisted of a long and wide nave, often 80 feet across, terminating in a semicircular apse, with one or sometimes (St Paul's, Old St Peter's, St John Lateran) two aisles on each side, separated by colonnades of marble pillars supporting horizontal entablatures (Old St Peter's, St Mary Major's, St Lawrence's) or arches (St Paul's, St Agnes, St Clement, the two basilicas of St Apollinaris at Ravenna). Above the pillars the clerestory wall rose to a great height, pierced inits upper part bya range of plain round-headed win- dows. The space between the windows and the colonnade (the later triforium-space) was usually decorated with a series of mosaic pictures in panels (Old St Peter's, St Paul's, St Mary Major's, St Apollinaris within the walls at Ravenna). The upper galleries of the secular basilicas were not usually adopted: in the West, but we have examples of this arrangement at St Agnes, St Lawrence's, and the Quattro Santi Coronati. They are much more frequent in the East. The colonnades sometimes extended quite to the end of

the church (St Mary Major's), sometimes ceased some little distance from the end, thus forming a transverse aisle or transept (St Paul's, Old St Peter's, St John Lateran). Where this transept occurred it was divided from the nave by a wide arch, the western face and soffit of which were richly decorated with mosaics, Over the crown of the arch we often find a bust of Christ or the holy lamb lying upon the altar, and, on either side, the evangelistic sym- bols, the seven candlesticks, and the twenty-four elders. Another arch spanned the semicircular apse, in which the church always terminated. This was designated the arch of triumph, from the mosaics that decorated it representing the triumph of the Saviour and His church. The conch or semi-dome that covered the apse was always covered with mosaic pictures on a gold ground, usually paintings of our Lord, either seated or standing, with St Peter and St Paul, and other apostles and saints, on either hand. The beams of the roof were generally concealed by a flat ceiling, richly carved and gilt. The altar, standing in the centre of the chord of the apse on a raised platform, reached by flights of steps, was rendered conspicuous by a lofty canopy supported by marble pillars (céborvwm, baldacchino), from which depended curtains of the richest materials. Beneath the altar was the confessiv, a subterranean chapel, contain- ing the

body of the patron saint, and relics of other holy persons. This was approached by descending flights of steps from the nave or aisles. The confessco in some cases reproduced the original place of interment of the patron saint, either in a catacomb-chapel or in an ordinary grave, and thus formed the sacred nucleus round which the church arose. We have good examples of this arrangement at St Peter's, St Paul's, St Pudenziana, and St Lawrence. It was copied, as we will see hereafter, in the original cathedral of Canterbury. The bishop or officiating pres- byter advanced from his seat in the centre of the semicircle of the apse to the eastern side (ritually) of the altar, and celebrated the Eucharist with his face to the congregation below. At the foot of the altar steps a raised platform occupying the upper portion of the nave formed a choir for the singers, readers, and other inferior clergy. This oblong space was separated from the aisles and from the western portion of the nave by low marble walls or railings. From these walls projected ambones, or pulpits with desks, also of marble, ascended by steps. That for the reader of the gospel was usually octagonal, with a double flight of steps westward and eastward. 'That for the reader of the epistle was square or oblong.

The exterior of the basilicas was usually of a repulsive plainness. The vast brick walls were unrclieved by orna-

Fic, 5.—Exterior view of St Apollinaris in Classe, Ravenna.

ment, without any eompensating grace of outline or beauty of proportion. An exception was made for the west front,

which was usually covered with plates of marble mosaics or painted stucco (Old St Peter's, St Lawrence's). This part was frequently crowned with a hollow projecting cornice (St Lawrence's, Ara Cceli). But in spite of any decorations the external effect of a basilica must always have been heavy and unattractive. The annexed view of St Apollinaris in Classe at Ravenna affords a typical example.

To pass from general description to individual churches, the first place must be given, as the earliest and grandest examples of the type, to the world-famous Roman basilicas ; those of St Peter, St Paul, and St John Lateran, ' omnewm urbis et orbis ecclesiarum mater et caput." It is true that no one of

these exists in its original form, Old St Peter’s having been entirely removed in the 16th century to make room for its magnificent successor ; and both St Paul’s and St John Lateran having been greatly injured by fire, and the last named being so completely modernized as to have

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lost all interest. Of the two former, however, we pos- sess drawings, and plans, and minute descriptions, which

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ception of the ori-

Peter’s, from the woodcuts annexed it will be seen that the church was entered through a vast colonnaded atrium, 212 feet by 235 feet, with a fountain in the centre,—the atrium being preceded by a porch mounted by a noble flight of steps. The church was 212 feet wide by 380 feet long; the nave, 80 feet in width, was six steps lower than the side aisles, of which b there were two on r each side. The four i. fis: : Mees 3 h eg ie ¥ia. 7.—Ground-Plan of the original Bas-

3 : ilica of St Peter’s at Rome. two Corinthian a, Porch. h, Altar, protected by a

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6, Atrium. double screen. columns. Those next c, Cloisters. 1, Bishop’s throne in the nave supported d, Narthex. centre of the apse.

: : e, Nave. k, Sacristy. horizontal entabla- #7 Aisies.) Dorm, at Hanetiads

tures. The inner co- g, Bema, m, Church of St Andrew, lonnades bore arches, with a second clerestory. The main clerestory walls were divided into two rows of square panels

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containing mosaics, and had windows above. The transept projected beyond the body of the church,—a very un- usual arrangement. 'The apse, of remarkably small dimen- sions, was screened off by a double row of twelve wreathed columns of Parian marble, of great antiquity, reported

Fia. 8.—Sectional view of the old Basilica of St Peter, before its destruction in the 15th century.

*to have been brought from Greece, or from Solomon's Temple. The pontifical chair was placed in the centre of the curve of the apse, on a platform raiscd several steps above the presbytery. To the right and left the seats of the cardinals followed the line of the apse. At the centre of the chord stood the high altar beneath a ciborium, resting on four pillars of porphyry. Beneath the altar was the subterranean chapel, the centre of the devotion of ss === large a portion of the Chris- § tian world, believed to con- 4 tain the remains of St Peter; | a vaulted crypt ran round * the foundation wall of the apse in which many of the popes were buried. The roof showed its naked beams and rafters.*

The basilica of St Paul without the walls, dedicated 324 a.D., rebuilt 388-423, remained in a sadly neglected state, but substantially un- altered, till the disastrous fire of 1823, which reduced the nave to a calcined ruin. Its plan and dimensions were almost identical with those of St Peter's, as will be seen from the annexed woodcuts. Its double aisles were formed

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Fra. 9.—Ground-Plan of St Paul's, Rome, before its destruction by

fire. by four colonnades, each of 4g, narthex. d, Altar, twenty Corinthian pillars, 33% Nave sa feet high, all supporting °' pt pi arches. Of these pillars twenty-four were of the best period

of Roman art, taken from the mausoleum of Augustus, or from the basilica Aimilia. The contrast between them and those of the 5th century, standing side by side with them, shows how greatly art had declined. As at St Peter's, the walls above the arches were lined with a double row of mosaic panels, below which was a band of circles containing portraits of the popes, from St Peter downwards. The transept was parted from the nave by a solid wall, with openings pierced in it, and in later times was divided down the middle by a transverse colonnade. The high

BASILICA

altar rose above a crypt, or confessio, traditionally believed to be the catacomb of Lucina, a noble Roman Christian matron, to which the body of the apostle Paul had been

St Paul's

removed 251 a.p. The narthex was external.

f Rome.

The only parts of the modernized five-aisled basilica of St John Lateran (of which we have a plan in its original state, Agincourt, pl. Ixxiii. No. 22) which retain any interest, are the double vaulted aisle which runs round the apse, a most unusual arrangement, and the baptistery. Ihe latter is an octagonal building standing some little distance from the basilica to the

south. Its roof is supported by a double range of columns, one above the other, encircling the baptismal basin sunk below the floor.

Of the three-aisled basilicas the best example is the Liberian or St Mary Major's, dedicated 365, and re- constructed 432 a.p. Its internal length to the chord of the apse is 250 feet, by 100 feet in breadth. The Ionic pillars of grey granite, uniform in style, twenty on each side, form a colonnade of great dignity and beauty, unfortunately broken towards the east by intrusive arches opening into chapels. The clerestory, though modern, is excellent in style and arrangement. Corinthian pilasters divide the windows, beneath which are very remarkable mosaic pictures of subjects from Old Testament history, generally supposed to date from the pontificate of Sixtus IIL, 432-440. The face of the arch of triumph pre- sents also a series of mosaics illustrative of the infancy of our Lord, of great value in the history of art. 'I'he apse is of later date, reconstructed by Paschal I. in 818.

The Sessorian basilica, now St Cross (Santa Croce in Gerusalemme), is of exceptional arrangement. Originally a hall of the palace known as Sessorium, it was granted by Constantine for the purposes of Christian worship, and a vast apse, nearly the whole breadth of the hall, was added at the cast cnd. The side walls are pierced by two tiers of large arched openings, originally communicating with a second range of aisles. Of these the lower range has been built up, but the upper is still open, forming im- mense windows.

Among the remaining basilicas of Rome those of St Lawrence (8. Lorenzo fuori le Mura) and St Agnes deserve special mention, as exhibiting a gallery corresponding to those of the civil basilicas and to the later tmforium, carried above the aisles and returned across the west end. The architectural history of St Lawrence's is curious. When originally constructed, 578-590, it consisted of a short nave of six bays, with an internal narthex the whole height of the building. In the 13th century Honorius III. dis- orientated the church, by pulling down the apse, and erecting a nave of twelve bays on its site and beyond it, thus con- verting the original nave into a square-ended choir, the level being much raised, and the magnificent Corinthian columns half buried. As a consequence of the church being thus shifted completely round, the face of the arch of triumph, turned away from the present

entrance, but towards the original one, is invested with the usual mosaics (Agincourt, pl. xxviii. Nos. 29, 30, 31). The basilica of St Agnes, 625-638, of which we give a plan and section, is a small but interesting building, much like what St Lawrence's must have been before it was altered. From

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the fall of the ground the upper galleries are on a level with the road at the east end, and were originally entered from

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1. Steps down to the 3. Nave. 5, Altar. church. 4, Side aisles with gal- 6. Bishop's throne. 2. Narthex. leries above. 7, 7,7. Modern chapels.

it, St Cross originally had similar galleries above the

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Fra. 12.—Section of Basilica of St Agnes at Rome.

_ Though inferior in size, and later in date than most of the basilicas already mentioned, that of St Clement is uot surpassed in interest by any one of them. This is due to its having retained its original ritual arrangements and church-fittings more perfectly than any other. These fittings have been removed from the earlier church, lying below the existing building, which at some unknown date and for some unrecorded reason, was abandoned, filled up

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Fra. 13.—Plan of Basilica of St Clement in Rome.

1, Porch ; §. Aisle for women. 2. Atrium 6. Chorus cantorum. 3. Nave 7, Altar

4, Aisle for men 8. Gospel ambo

9 Epistle ambo 10. Confessio 11. Bishop's throne.

with earth, and a new building erected upon it as a founda- tion. The most probable account is that the earlier church was so completely overwhelmed in the ruin of the city in 1084, when Robert Guiscard burnt all the public buildings from the Lateran to the Capitol, that it was fouud simpler

and more convenient to build a new edifice at a higher level, than to repair the old one. The annexed plan and view show the peculiarities of the existing building. The church is preceded by an atrium, the only perfect example remaining in Rome, in the centre of which is the cantharus, or fountain for ablutions. The atrium is entered by a

eastwards. To the west of it stands the great Paschal candlestick, with a spiral shaft, decorated with mosaic. Opposite, to the south, is the epistle-ambo, square in plan, with two marble reading-desks facing east and west, for the reading of the epistle and the gradual respectively. The sanctuary is raised two steps above the choir, fron: which it is divided by another portion of the same marble screen. The altar stands beneath a lofty ciboriwm, supported by marble columns, with a canopy on smaller shafts above. It retains the rods and rings for the curtains to run on, Behind the altar, in the centre of the curved line of the apse is a marble episcopal throne, bearing the monogram of Ana- stasius who was titular cardinal of this churchin 1108. The conch of the apse is inlaid with mosaics of quite the end of the 13th century. The subterranean church, disinterred by the zeal of Father Mullooly, the prior of the adjacent Irish Dominican convent, is supported by columns of very rich marble of various kinds. The aisle walls, as well as those of the narthex, are covered with fresco-paintings, of various dates from the 7th to the 11th century, in a mar- vellous state of preservation. (See St Clement, Pope and Martyr, and his Basilica in Rome, by J oseph Mullooly, O.P., Rome, 1873).

Out of Rome the most remarkable basilican churches are the two dedicated to St Apollinaris at Ravenna. They are of smaller dimensions than those of Rome, but the desigu and proportions are better. The cathedral of this city, a noble basilica with double aisles, erected by Archbishop Ursus, 400 a.p. (Agincourt, pl. xxiiL, No. 21), was unfortunately destroyed on the erection of the present tasteless building. Of the two basilicas of St Apollinaris, the earlier, 8. Apollinare Nuovo, originally an Arian church erected by Theodoric, 493-525, measuring 315 feet in length by 115 feet in breadth, has a nave 51 feet wide, separated from the single aisles by colonnades of twenty- two pillars, supporting arches, a small prismatic block bearing a sculptured cross intervening with very happy effect between the eapital and the arch. The clerestory wall is not stilted to the excessive height of the Roman examples. Below the windows a continuous band of saintly

figures, male on one side and female on the other, advancing in stately procession towards Our Lord and the ler Mother respectively, affords one of the most beautiful examples of mosaic ornamen- tation to be found in any church. The design of the somewhat later and smaller church of St Apollinaris in Classe, 538-549 a.D., measur- ing 216 feet by 104 feet, is so similar that they must have proceeded from the same archi- tect (Agincourt, pl. lxxiii., No 35).

The cathedral on the island of Torcello near Venice, ori- ginally built in the 7th cen- tury, but largely repaired circa 1000 a.p., deserves special attention from the fact that it preserves, in a more perfect state than can be seen elsewhere, the arrangements of the seats in the apse. The bishop's throne occupies the centre of the arc, approached by a steep flight of steps. Six rows of stone benches for

15.—Arches of St Apolli- nare Nuovo, Ravenna.

the presbyters, rising one above another like the seats in a theatre, follow the curve on either side,—the whole being The alige: stands on a

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singularly plain and almost a.

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Fia. 16. had of 'Basilica, Torcello, 'with Bishop's throne and seats for the clergy. From a drawing by the late Lady Palgrave, platform ; the sanctuary is divided from the nave by a screen of six pillars, The walls of the apse are inlaid with plates of marble. The church is 125 feet by 75 feet.

The narrow aisles are only 7 feet in width.

Another very remarkable basilica, less known than it deserves to be, is that of Parenzo in Istria, curca 542 a.v. Few basilicas have sustained so little alteration. From the annexed ground-plan it will be seen that it retains its atrium, and a baptistery, square without, octagonal within, to the west of it. Nine pillars divide each aisle from the nave, some of them borrowed from earlier buildings. The capitals are Byzantine. The choir occupies the three easternmost bays. The apse, as at Torcello, retains the bishop's throne and the bench for the presbyters apparently unaltered. The mosaics are singularly gorgeous, and the apse walls, as at Torcello, are inlaid with rich marble and mother-of-pearl. The dimensions are small,—121 feet by 32 feet. (See Kunstdenkmale des Oesterreichischen Kaiser- stadts, by Dr G. Heider and others).

BASILICA

In the Eastern church, though the erection of St Sophia at Constantinople introduced a new type which shaaet

Fira, 17,—Ground-Plan of of Cathedral of "RERE, Istria.

a, Cloistered atrium.

d@, Chorus eantorum. h, Belfry. +, Narthex. e, Altar. 4, Chapel of St Andrew, b, Nave. f, Bishop's throne. c, ¢, Aisles. g, Baptistery.

entirely superseded the old one, the basilican form, or as it was then termed dromuical, from its shape being that of a race-course (dromos), was originally as much the rule as in the West. 'The earliest church of which we have any clear account, that of Paulinus at Tyre, 313-322 a.p., described by Eusebius (#7. #., x. 4, § 37), was evidently basilican, with galleries over the aisles, and had an atrium in front. That erected by Constantine at Jerusalem, on the site of the Holy Sepulchre, 333, followed the same plan (Euseb., Vet. Const., ili. c. 29), as did the original churches of St Sophia and of the Apostles at VES Both these buildings have entirely _

passed away, but we have an excellent example of an Oriental basilica of the same date still standing in the church of the Nativity at Bethlehem, rebuilt by Justinian in the 6th century. Here we find an oblong atrium, a vestibule or narthex, double aisles with Corinthian columns, and.a transept, each end of which terminates in apse, in addition to that in the usual position. Beneath the centre of the tran- sept is the subterranean church of the Nativity (De Vogué, Les Eglises dela Terre Sainte, p. 46). sh

Constantinople still preserves a basilican church of the 5th cen- gee rg a – tury, that of St John Studios, tee pis, Abert 463, now a mosque. It has a 1, Narthex. 2. Nave. 3, 3. Aisler. nave and side aisles divided by columns supporting a hori- zontal entablature, with another order supporting arches forming a gallery above. 'There is the usual apsidal ter- mination. The chief difference between the Eastern and Roman basilicas is in the magnitude of the galleries, This is a characteristic feature of Eastern churches, the galleries being intended for women, for whom privacy was more studied than in the West (Salzenberg, Altchrist. Baudenk- male von Constantinople).

Other basilican churches in the East which deserve no- tice are those of the monastery of St Catherine on Mount Sinai built by Justinian, that of Dana between Antioch and Bir of the same date, St Philip at Athens, Bosrah in Arabia, Xanthus in Lycia, and the very noble church of St Demetrius at Thessalonica. Views and descriptions of most of these may be found in Texier and Pullan's Byzantine Architecture, Couchaud's Choix d'Eglises Byzan- tines, and the works of the count de Vogué. We may refer to

Fergusson's History of Architecture for views and plans and description of the very interesting early minia- ture Christian basilicas, some of which are probably the earliest existing Christian buildings in the Mediterraneau provinces of Africa. The same work (p. 640) also gives an account of the early French basilica, dating from the

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BASILICA

6th or 7th century, known as the Basse Guvre at Beauvais ; as well as (pp 550-552) of those belonging to the 8th or 9th century, in the neighbourhood of the Lake of Con- stance at Reichenau and Romain Motier, and at Granson on the Lake of Neufchatel.

The first church built in England under Roman influence was the original Saxon cathedral of Canterbury. From the aunexed ground-plan, as conjecturally restored by Professor

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Fig. 19.—Ground-Plan of the original Cathedral at Canterbury, as restored by Willis. G, Our Lady's altar H, Bishop's throne. K, South tower with altar. L, North tower containing school. M, Archbishop Odo's tomb.

A, High altar.

B, Altar of our Lord. C, C, Steps to crypt. D, Crypt.

rt Chorus cantorum

Willis from Eadmer's description, we see that it was au aisled basilica, with an apse at either end, containing altars standing on raised platforms approached by steps. Beneath the eastern platform was a crypt, or confessio, containing relics, "fabricated in the likeness of the confessionary of St Peterat Rome" (Eadmer) The western apse, dedicated to the Blessed Virgin, contained the bishop's throne. From this and other indications Willis thinks that this was the original altar end, the eastern apse being a subsequent addition of Archbishop Odo, circa 950, the church having been thus turned from west to east, as at the already- described basilica of St Lawrence at Rome The choir, as at St Clement's, occupied the eastern part of the nave, and like it was probably enclosed by breast-high partitions. There were attached towers to the north and south of the nave. The main entrance of the church was under that to the south. At this suthdure, according to Eadmer, " all disputes from the whole kingdom, which could not legally be referred to the king's court, or to the hundreds and counties, received judgment." The northern tower con- tained a school for the younger clergy.

There remains one other English basilican church to be mentioned, that of Brixworth in Northamptonshire, probably erected by Saxulphus, abbot of Peterborough, circa 690 a.p. It consisted of a nave divided from its aisles by quadrangular piers supporting arches turned in Roman brick, with small clerestory windows above, a short chancel terminating in an apse, outside which, as at St Peter's at Rome, ran a circumscribing crypt entered by steps

from the chancel. At the west end was a square tower, the lower story of which formed a porch.

Authorities :—Vitruvius, De Architectura, v. i; the same, trans- lated, with notes, by W. Wilkins, R.A.; Gell, Pompetana ; Mont- faucon, Antiquités Eupliquées, iii. 178 ; Canina, Edifiedi di Roma Antica ; Donaldson, Architectura Numismatica ; Ciampini, Vetert Monumentt; Allatius, De Recent. Grac. Templis, ep. ii. § 3 ; Seroux d'Agincourt, L' Histoire de [Art par les Monwmens ; Bunsen and Plattner, Beschreibung der Stadt Rom; Gutensohn and Knapp, Basil- tken ; Hubsch, Altchristliche Kirche ; Letarouilly, Edisices de Rome moderne; Von Quast, Altchristliche Bauwerke von Ravenna; Texier and Pullan, Byzantine Architecture; De Vogué, Eglises de la Terre Sainte; Couchaud, Lglises Byzantines; Fergusson, History of Architec- twre; Milman, History of Christianity, ii. 289-342; ili. 373. (E. V.)

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BASILICA, a code of law, drawn up in the Greek language, with a view to put an end to the uncertainty which prevailed throughout the empire of the East in the 9th century as to the authorized sources of law. This uncertainty had been brought about by the conflicting opinions of the jurists of the 6th century as to the proper interpretation to be given to the legislation of the Emperor Justinian, from which had resulted a system of teaching which had deprived that legislation of all authority, and the imperial judges at last were at a loss to know by what rules of law they were to regulate their decisions. An endeavour had been made by the Emperor Leo the Isaurian to remedy this evil, but his attempted reform of the law had been rather calculated to increase its uncertainty ; and it was reserved for Basilius the Macedonian to show himself worthy of the throne, which he had usurped, by purifying the administration of justice and once more reducing the law into an intclligible code. There has been considerable controversy as to the part which the Emperor Basilius took in framing the new code. 'There is, however, no doubt that he abrogated in a formal manner the ancient laws, which had fallen into desuetude, and the more probable opinion would seem to be, that he caused a revision to be made of the ancient laws which were to continue in force, and divided them into forty books, and that this code of laws was subsequently enlarged and distributed into sixty books by his son

Leo the Philosopher. A further revision of this code is stated to have been made by Con- stantinus Porphyrogenitus, the son and successor of Leo, but this statement rests only on the authority of Theodorus Balsamon, a very learned canonist of the 12th century, who, in his preface to the Nomocanon of Patriarch Photius, cites passages from the Basilica, which differ from the text of the code as revised by the Emperor Leo. The weight of authority, however, is against any further revision of the code having been made after the formal revision which it underwent in the reign of the Emperor Leo, who appointed a commission of jurists under the presidency of Sympathius, the captain of the body-guard, to revise the work of his father, to which he makes allusion in the first of his Novella. This latter conclusion is the more probable from the circum- stance, that the text of the code, as revised by the Emperor Leo, agrees with the citations from the Basilica which occur in the works of Michael Psellus and Michael Atta- liates, both of them high dignitaries of the court of Con- stantinople, who lived a century before Balsamon, and who are silent as to any second revision of the code having taken place in the reign of Constantinus Porphyrogenitus, as well as with other citations from the Basilica, which are found in the writings of Matheus Blastares and of Con- stantinus Hermenopulos, both of whom wrote shortly after Balsamon, and the latter of whom was far too learned a jurist and too accurate a lawyer to cite any but the official text of the code.

Authors are not agreed as to the origin of the terin Basilica, by which the code of the Emperor Leo is now distinguished. The code itself appears to have been origi- nally entitled The Revision of the Ancrent Laws (7 avaxd-Oapors TeV radaLev vopov) ; next there came into use the title 4 éfyxovraBiBdos, derived from the division of the work into sixty books: and finally, before the conclusion of the 10th century, the code came to be designated 5 Baoidixds, or Ta Bacidixd, being elliptical forms of 6 Bactrixds vépos and ra BacrsKa vopipa, namely the Imperial Law or the Imperial Constitutions. This expla- nation of the term " Basilica" is more probable than the derivation of it from the name of the father of the Emperor Leo, inasmuch as the Byzantine jurists of the 11th and 12th centuries ignored altogether the part which the Emperor Basilius had taken in initiating the legal reforms,

which were completed by his son ; besides the name of the father of the Emperor Leo was written Bactdeos, from which substantive, according to the genius of the ancient Greek language, the adjective BaovAxds could not well be derived.

No perfect MS. has been preserved of the text of the Basilica, and the existence of any portion of the code secms to have been ignored by the jurists of Western Europe, until the important bear- ing of it upon the study of the Roman law was brought to their attention by Viglius Zuichemus, professor of the Roman law in the university of Padua, in his preface to his edition of the Greek Paraphrase of Theophilus, published in 1533. A century, however, elapsed before an edition of the sixty books of the Basilica, as far as the MSS. then known to exist supplied materials, was published iu seven volumes, by Carolus Annibal Fabrotus, under the patron- age of Louis XIII. of France, who assigned an annual stipend of two thousand livres to the editor during its publication, and placed at his disposal the royal printing-press. This edition, although it was a great undertaking and a work of considerable merit, was a very imperfect representation of the original code. A newly restored, and far more complete text of the sixty books of the Basilica, has recently issued from the press of Johannes Ambrosius Barth at Leipsic, iu six volumes, edited by Professor Charles William Ernest Heimbach of the university of Jcna, assisted by his brother Gustavus Ernest Heimbach. This is one of the nost important literary works of the 19th century. The learned editor lived long enough to witness the completion of the text of the Basilica by the publication of the fifth volume in 1850. He died in 1865, leaving behind him

a valuable historical introduction to the code, and a manual of its"

contents, which are printed in the sixth and last volume, published at Leipsic in 1870, Several MSS., which contain portions of the code or of works bearing directly on the code, have been available for this edition, which were not accessible to Fabrotus when he published his edition in 1647. Amongst others may be mentioncd— MS. Coislin 151, of the 11th century, now in the Bibliotheque Nationale in Paris, which came direct from Mount Athos into the hands of Chancellor Seguier, and which contains a general index of the contents of the sixty books of the Basilica ; MS. Coislin

152, of the 13th century, also in the Bibliotheque Nationale in Paris ; a Palimpsest MS. of the Holy Sepulchre (70d ayiov rdpov), which was discovered in 1838 by Dr C. Ik. Zacharie von Lingenthal, in the palace of the patriarch of Jerusalem in Constantinople. The text of four books of the Code has been restored by Dr C. K. Zacharix von Lingenthal from this MS., and is printed in an appendix to the third volume of Heimbach's edition. A further MS. deserves notice, being No. 853 in the Vatican Library at Rome ; it belongs to the 14th century, and is the only MS. which eontains the work known as Zipucitus. This MS. has been very carcfully col- lated by Gustavus Ernest Heimbach, and the text of a portion of Tipucitus has bcen printed from this MS. in the appendix to the second volume of Heimbach's edition, the remaining portions of the work having been incorporated by Heimbach into the text of the re- stored code. It may seem strange that so important a body of law as the Basilica should not have come down to us in its integrity, but a letter has been preserved, whieli was addressed by Mark the patriarch of Alexandria to Theodorus Balsamon, from which it appears that copies of the Basilica were in the 12th century very scarce, as the patriarch was unable to procure a copy of the work. The great bulk of the code was an obstacle to the multiplication of copies of it, whilst the necessity for them was in a great degrce superseded by the publication from time to time of synopses and encheiridia of its contents, coniposed by the most eminent jurists, of which a very full account will be found in the Histoire du Droit Byzantin, by the advoeate Mortreuil, published in Paris in 1846.

BASILICATA, or, as it is also called, Porenza, a province of Italy, bounded on the N. by Capitanata, N.E. by Terra di Bari, E. by Otranto and the Gulf of Taranto, S. by Calabria Citra, S.W. by the Mediterranean, W. by Principato Citra, and N.W. by Principato Ultra. It has an area of 4120 English square miles, and is divided into the four districts of Lagonegro, Matera, Melfi, Potenza. The population in 1871 was 500,543, In the N.W. of the territory the Apennines divide into two branches, the one running eastward to Terra di Bari, and the other southward to Calabria. The principal rivers are the Bradano, Basento, Salandrella, Agri, and Sinno, all flowing into the Gulf of Taranto. The principal productions are maize, wine, linen, hemp, and tobacco; swine, goats, and sheep, are numerous ; and the produce of the silkworm forms a con- siderable branch of industry. 'The cotton plant thrives

well on low grounds near the sea. The chief towns are Potenza, Melfi, Francavilla, Rionero, and Tursi.

BASILIDES, one of the most celebrated of the Gnostics, flourished probably about 120 a.p. Extremely little is known of his life. He is said to have becn born in Syria and to have studied at Alexandria, and this is probably correct. There is, to some extent, a corresponding uncertainty with regard to the precise doctrines held by him. Of these there are two distinct expositions, the one given chiefly by Irenzeus, which has been long before the world, the other contained in the Philosophowmena of Hippolytus, discovered in 1842. According to Irenzus, the system of Basilides strongly resembled that of Valentinus. The first principle or root of all things, was the supreme God, the unknown and unborn Father. From Him emanated in succession vots, Adyos, Ppdvycts, copia, and évvapis. From the last, according to Irenzeus, sprang the powers who created the first heaven; according to Clemens Alex., however, from dvvayis sprang dixatooivy and cipyvy, and these seven with the Father formed the first Ogdoad, or octave of existence. From them emanated other powers, by whom the second heaven was made, and so on in succession, each system being a more shadowy type or reflex of the original ogdoad. The number of heavens was 365, whence the whole series was called Abraxas, or Abrasax, a name frequently applied to the lower deity, or even, as by Tertullian, to the supreme God, The powers of the lowest heaven, of whom the chief was called the dpywyv, created the earth. This dpxwv is the God of the Jews, and against Him the other powers were arrayed. To alleviate the misfortunes of the earth, the vods, or first emanation, became incarnate and descended upon earth. The vots as incorporeal could not suffer death ; accordingly, he changed forms with Simon of Cyreue, and stood by the cross, laughing at his enemies, while Simon suffered in his place. Salvation is spiritual, pertains only to the soul; outer actions are not in themselves good or bad. That Basilides taught this doctrine of moral indifference is not perfectly clear, but Irenzeus reports that his disciples acted up to it.

The exposition given by Hippolytus is widely different. According to the account he gives, Basilides started neither with a dualism of God and

matter or evil, nor with a theory of emanation. His first principle was God, the unknown, incompreheusible, unspeakable, non-existent one, of whom nothing can be predicated, for no words are adequate to express His essence. This non-existent God, by the exercise of what may be called volition, created the mavoTeppia, or seed, which contained in itself the germs of all things. In this chaotic mass, which strongly resembles the opotomepy of Anaxagoras, there is a mixture of elements,—ovyxio1s dpxixy, —and at the same time are embedded in it three degrees of kinds of divine sonship, consubstantial with the Deity. The first kind is refined and pure, the second gross, the third requiring purification. As all things naturally tend towards God, the first sonship ascended and sat beside the Father. The second also strove to ascend by means of the Spirit, which is to him as a wing, but he could not rise quite to the Deity, and occupied an inferior position, while the wing or spirit formed the firmament. The third sonship still remained immersed in matter. Then from the world seed there burst forth the great apywv, or ruler, who ascended as far as the firmament, and, imagining that there was nothing beyond, glorified himself as the brightest and strongest of all beings. -This ruler, who is sometimes called Abraxas, but whose true nanie is ineffable, produced a son wiser and better than himself, by whose aid he laid the foundations of the world. The seat of their rule is called the Ogdoad, and it extends through all the ethereal region down to the moon's sphere,

where the grosser air begins. This lower dominion is ruled by a second. and inferior dpxwv, the God of the Jews, who also had produced a son; and their seat is called the Hebdomad. Meanwhile, the third sonship, which is truly the spiritual element in the elect, is tied to matter, and is in need of deliverance. Freedom is given by tho truth, z.¢., by a knowledge of the true system of things, and it is given by a series of illuminations. First the mind of the son of the Great Archon is enlightened, and he instructs his father, who learns with fear and repentance that there is a sphere of being higher than his own. The light then passes to the son of the Archon of the Hebdomad, who likewise instructs his father. Finally, the mind of Jesus is illuminated, and he instructs those of mankind who are able to receive the truth. There are thus three great stages in the world's religious history, each

being an advance on its predecessor. These periods are the Ante-Jewish, the Jewish, and the Christian. All the souls capable of receiving the light ascend upwards, while their bodies return to the primeval chaos; the minds of all others are shrouded in eternal night, the darkness of ignorance. For the relation

- *of Basilides to other Gnostics, and for the interpretation of*

his intensely symbolic impressions, see GNosTIcs.

The earlier accounts of Basilides, such as those of Neander, Baur 'in the Ohristliche Gnosis), and Matter, were based for the most part on Ireneeus. The discovery of the Philosophoumena threw unexpected light on the subject, and the later expositions generally follow Hippolytus as the exponent of the original system of Basilides. Hilgenfeld still retains the older view. Full information is to be found in Baur, Kirchengeschichte, i.; Lipsius, Gnosticismus ; Uhlhorn,

Das Basilideanische System; Mansel, Gnostic Heresies.

BASILISK,—faciricxos of the Greeks, and Tsepha (cockatrice) of the Hebrews,—a name applied by the ancients to a horrid monster of their own imagination, to which they attributed the most malignant powers and an equally fiendish appearance. The term is now applied, owing to a certain fanciful resemblance, to a genus of Lizards belonging to the family Iguanide, the species of which are characterized by the presence of a membranous bag on the crown of the head, which they can distend or contract at will, and of a fin-like ridge along the back and part of the tail. Both appendages are admirably adapted for aiding the basilisk in swimming, while they do not impede its movements on land,—its mode of life being partly aquatic, partly arboreal. 'The Mitred Basilisk occurs in Guiana, the Hooded Basilisk in Amboyna.

BASINGSTOKE, a market and borough town in the county of Hants, 45 miles from London. It occupies a pleasant situation, and has a good trade in corn and malt, which has been greatly facilitated by the canal which joins the rivers Wey and Thames. The parish church, St Michael's, is a spacious and hand- some structure, dating from the reign of Henry VIII. In

the neigh- bourhood is Basing House, remark- able for its defence by the marquis of Winchester against the Parliamentary forces in 1645. Population in 1871, 5574.

BASKERVILLE, Joun, a celebrated printer, and the introducer of many improvements in type-founding, was born at Wolverley in Worcestershire in 1706, and died in 1775. About the age of twenty he became a wiiting-master at Birmingham, and he seems to have had a great.talent for caligraphy and carving in stone. While at Birmingham his attention was attracted te the business of japanning, which he took up with great zeal. He made some important improvements in the process, and gained a considerable fortune. About the year 1750 he began to make experiments in type-founding, and soon succeeded in

Arms ot basingstoke,

producing types much superior in distinctness and elegance to any that had hitherto been employed. He then set up a printing-house, and published his first work, a Virgil in royal quarto. Horace, Terence, Catullus, and others were also printed by him. These books are admirable specimens of typography; and Baskerville is deservedly ranked among the foremost of those who have advanced the art of printing. He did not print many works, as the sale did not meet his expectations; after~ 1765, indeed, he seems to have put forth very little. Specimens from the Baskerville press are not easily had, and are of considerable value.

BASKET, a utensil made of twigs, rushes, or strips of wood, as well as of a variety of other materials, interwoven together, and used for holding or carrying any commodity. Modern ingenuity has applied many substances before unthought of to the construction of baskets, such as iron and even glass. But wicker-work being the oldest as well as the most universal invention, it alone will be treated of in the present article. The process of interweaving twigs, seeds, or leaves, is practised among the rudest nations of the world ; and as it is one of the most universal of arts, so also does it rank among the most ancient industries, being probably the origin of all the textile arts of the world. A: bundle of rushes spread out may be compared to

the warp of a web, and the application of others across it to the woof, also an early discovery; for basket-work is literally a web of the coarsest materials. The ancient Britons appear to have excelled in the art of basket-making, and their baskets were highly prized in Rome as we learn fron Martial (xiv. 99) :-—

“ Barbara de pictis veni bascauda Britannis ; Sed me jam mavult dicere Roma suam.”

Among many uncivilized tribes at the present day baskets of a superior order are made and applied to various useful purposes. The North American Indians prepare strong water-tight “‘ Wattape” baskets from the roots of a species of Abies, and these they frequently adorn with very pretty patterns made from the dyed quills of their uative poreupine, Lrethizon dorsatum. ‘The Indians of South ‘America weave baskets equally useful from the fronds of the Carnahuba and other palms. The Kaffres and Hottentots of South Africa are similarly skilful in using the Ilala reed and the roots of plants; while the tribes of central Africa and the Abyssinians display great adroitness in the art of basket-weaving.

_ Basket-making, however, has by no means been confined to the fabrication of those simple and useful utensils from which its name is derived. Of old, the shields of soldiers were fashioned of wicker-work, either plain or covered with hides; and the like has been witnessed among modern savages. In Britain the shields of the ancient warriors, and also their huts, even up to the so-called palaces of the Saxon monarchs, were made of wicker-work ; and their boats of the same material, covered with the skins of animals, attracted the notice of the Romans. Herodotus mentions boats of this kind on the Tigris and Euphrates, but with this difference, that the former seem to have been of the ordinary figure of a boat, whereas the latter were round and were covered with bitumen. Boats of this shape, about 71 feet in diameter, are used at the present day on these rivers ; and boats of analogous construction are employed in crossing the rivers of India which have not a rapid current. Nothing can be more expeditious or more simple than the fabrication and materials of these vessels, if they merit that name. One may be made by six men in as many hours,—ouly two substances, hides and bamboo, almost always accessible,

being used. Window screens, perambulators, chairs, &c., are now largely made of basket-

work, and the light pony basket carriages in general use are the representatives of the Continental Holstein waggon of the early part of the century, which was a two-horse bas- ket carriage of considerable size. In Berlin and Kiel there now exist large factories of " Korb Mébel," devoted to the manufactare of basket-work chairs, tables, stands, frames, screens, &c., and the use of this description of furniture is very general in Continental houses.

The materials which are actually employed in the con- struction of basket-work are numerous and varied, and to the principal of these allusion will be made below. As it is, however, from various species of willow that the largest supply of basket-making materials is produced, we shall first confine our attention to this source. Willows for basket-work are extensively grown in Holland, Belgium, France, and Germany, whence large quantities are exported to Great Britain and even to the United States. The willows of France are highly esteemed by basket-makers as firm, clean rods; and the Dutch produce are lowest in value, being soft and pithy. No Continental rods equal those of English growth for their tough and leathery texture, and the finest of all basket-making willows are now cultivated in large quantities in the valleys of the Thames and the Trent. Jt was only in the early part of this century that any considerable atteution was given in Britain to the cultivation of willows suitable for basket-making ; and the industry was first stimulated by premiums offered by the Society for the Encouragement of Arts and Manufactures. Mr Phillips of Ely was one of the most successful early cultivators of willows, and to his exertions we owe the introduction of a valuable willow, the Brown Norfolk, Salix triandra. Mr Phillips's observations and experiments largely contributed to place the willow cultiva- tion on a satisfactory commercial basis, and a similar service was rendered in Scotland by Mr Sheriffs; but the systematic maintenance of willow holts has not been con- tinued in Scotland. One of the most sucessful growers of willows at the present day is Mr William Scaling of Basford, Notts, who cultivates a salictum of about 100 acres in

extent. Mr Scaling has the advantage of being a practical basket-maker, and the facts which follow regarding the growth and varieties of basket-willows are chiefly gleaned from his pamphlets on willow cultivation.

The genus Salix, to which all willows and _ osiers belong, is extremely complex in its botanical characters, and the species and varieties, as systematically arranged, are very numerous, 'Those cultivated for basket-making Mr Scaling divides into four classes. The first class, which alone get the name of willows among basket-makers, includes the rods of six or seven different species, all of which Mr Scaling classes with Salix fragilis. The "willows" yield inferior basket-rods, having a tendency to throw out side-shoots which makes the rods " rough." 'The second class comprises the osiers, including about forty varieties used by basket-makers all grouped around the osier, Salix viminalis, and these form the staple of basket-making materials. In the third class, which are known in the trade as "Spaniards" or Spanish willows, are included about thirty varieties which are classed under Salix amygdahina, The "Spaniards" comprise some of the most useful basket-willows, the wood being more dense and elastic than is the case with osiers. The fourth class com- prise the bitter willows, of which Salix purpurea is taken as the type, and the rods they yield are known as " whip- cord," "swallow tail," or "one-yard." These are the finest of all willows for basket-making, and owing to their bitterness they are not attacked by rabbits and hares, which frequently do much damage to all other varieties.

It was long supposed that willows flourish nowhere but with abundance of water. Undoubtedly the osier class

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thrive well with a considerable degree of humidity, but a dry well-drained soil is best suited for all hard-wooded varieties, or the laying out of a willow holt, Mr Scaling recommends that the land should be well drained, cleared and tilled to a depth of about one foot. Willows are propa- gated solely from cuttings, which retain their vitality long, and strike with great facility. The cuttings are made about 9 inches long, and two or three may be obtained from a single rod. They should be planted in rows from 16 to 18 inches apart, the plants in each row being placed at intervals of from 8 to

12 inches according to the size of the willow under cultivation ; and the entire length of the cutting should be pushed into the ground. The planting may be done at any time from late autumn to early spring during the period of plant rest, when the ground is free from frost. At the end of each year the shoots are to be cut down close to the ground, manure is laid on between the rows and ploughed in, and the soil should be kept as open and free from weeds as arable land. The produce of the first year will, as a rule, be of little value; nevertheless, in Mr Scaling's opinion, it is of consequence that the rods should be cut down. 'he second year's crop should yield a good return ; in the third year the plants are at their best, and for the ten following years they should exhibit undiminished productiveness, after which they gradually decline in strength. 'The entire cost of a salictum per acre Mr Scaling estimates, for the first year, at £33, 12s., and the return at £8, 12s. The outlay for the next two years he gives as £7, 5s. and £6, 15s., but the crops of these years should yield £17 and £22, just covering the cost of planting, which is the ordinary calculation of growers. The rods intended for basket-making are either taken entire, cut from the root, split asunder, or stripped of their bark, according to the work to be produced; but in all cases they are previously soaked in water, and indeed sometimes boiled. The stripping is performed by drawing the willows through a bifurcated iron implement called a brake, which removes the bark, and the willows we then cleaned, as far as necessary, by manual operation with a knife. When they are boiled previous to peeling a very nice light brown colour is developed in the wood by the action of the tannin contained in the bark, and rods thus prepared are much more durable than those peeled white. Next they are exposed to the sun and air, and afterwards placed in a dry situation. But itis not the less necessary to preserve willows with their bark in the same manner; for nothing can be more injurious than the humidity inherent in the plant; and previous to use they must be soaked some days in water also. The barked or white osier is then divided into bundles or faggots according to size ; the larger being reserved to form the strong work in the skeleton of the basket, and the smaller for weaving the bottom and sides. Should the latter be applied to ordinary work, they are taken whole ; but for implements of slight and finer texture, each osier is divided into splits and skains of different degrees of size. Splits are osiers cleft into four parts, by means of an implement employed for that purpose called a cleaver, which is a wedge-shaped tool inserted at the point or top end of the

rod and run down through its entire length. ‘These are next drawn through an implement resembling the common spoke-shave, keeping the grain of the split next the iron or stock of the shave, while the pith is presented to the steel edge of the instrument, which is set in an oblique direction to the wood: and in order to bring the split into a shape still more regular, it is passed through another implement called an upright, consisting of a flat piece of steel, each end of which is fashioned into a cutting edge, like that of an ordinary chisel. The flat is bent round, so that the two edges approach each other at a greater or less interval by

means of regulating screws, and the whole is fixed into a handle. By passing the splits between the two edges they are reduced to skaius, the thickness of which is determined by the interval between the edges of the tool.

The implements required by a basket-maker are few and simple. They consist, besides the preceding, of knives, bodkins, leads for keeping the work steady while in pro- cess; and where the willows are workedas rods a heavy piece of iron called a beater is employed to beat them close as they are woven in. On the Continent, where fancy baskets are made, blocks are required on which the webs of wicker-work are set to particular shapes.

An ordinary basket is made by preparing the requisite number of osiers, auld preserving their length considerably greater than that of the finished work. They are ranged in pairs on the floor parallel to each other, at small intervals, in the direction of the longer dia- meter of the basket; and this may be called the woof,—for, as we have said, basketwork is literally a weh. These parallel rods are then crossed at right angles by two of the largest osiers, with the thick ends towards the workman, who places his foot upon them; and being each woven alternately over and under the parallel pieces first laid down, they are by that means confined in their places. The whole now forms what is technically called the slath, which is the foundation of the basket. Next the long end of one of the two rods is taken and woven under and over the pairs of short ends all round the bottom, until the whole be woven in. The same is done with the other rod, aud then additional long osiers are also woven in, until the bottom be of sufficient size, and the woof be occupied by them. Thus the bottom or foundation on which the superstructure is to be raised is finished ; and this latter part is

accomplished by sharpening the large ends of as many long and stout osiers as may be necessary to form the ribs or skeleton. These are forced or plaited, "scallumed, " between the rods of the bottom from the edge towards the centre, and are turned up, "upset," in the direction of the sides ; then other rods are woven in and out between each of them, until the basket is raised to the intended height, or, more correctly speaking, the depth it is to receive. The edge or brim is finished by turning down the perpendicular ends of the ribs, now protruding and standing up, over each other, whereby the whole is firmly and compactly united. A handle is adapted to the work by forcing one or more rods called bale sticks, sharpened at the end and cut to the requisite length, down the weaving of the sides, close together ; and they are pinned fast, or tied by means of the rods used in twisting over the bale rods, about two inches from the brim, in order that the handle, when completed, may be retained in its

roper position. The osiersare then either bound or plaited in such

ashion as pleases the taste of the artist. This is the most simple kind of basket, from which others differ only in finer materials and nicer execution ; but in these there is considerable scope for taste and fancy, and implements are produced of extreme neatness and ingenuity in construction. The skains are frequently smoked and dyed either of dull or brilliant colours, and by intermixing them judiciously, as also by varnishing over the colour, a very good effect ig produced. ~

From the simplicity of this manufacture, a great many individuals, independent of professed basket-makers, are occupied in it; and it affords suitable employment to the blind in the several asylums and workshops established for their reception in this and other countries.

In addition to willows, a large variety of other materials is employed in the fabrication of wicker-work. Among the most important of these are splits of various species of bamboo, with which the Japanese and Chinese manufacture baskets of unequalled beauty and finish. The bamboo wicker-work with which the Japanese sometimes encase their delicate egg-shell porcelain is a marvellous example of manipulation, and they and the Chinese excel in the appli- cation of bamboo wicker-work to furniture. The '" canes" or rattans of commerce, stems of species of Calamus and

Demonorops are scarcely less important as a source of basket materials, In India “ Cajan ” baskets are extensively made from the fronds of the Palmyra palm, Borassus flabelliformis ; and this manufacture has in recent years been established in the Black Forest of Germany, where it is now an important and characteristic staple. Among the other materials may be enumerated the odorous roots of the Khus-Khus grass, Anatherum muricatum, and the leaves of various species of screw pine, used in India and

the East generally. The fronds of the palm of the Seychelles Islands, Lodoicea seychellarum, are used for very delicate basket-work in those islands. Strips of the New Zealand flax plant, Phormium tenax, are made into baskets in New Zealand. Esparto fibre is used in Spain and Algeria for rude fruit baskets. Various species of Maranta yield basket materials in the West Indies and South America; and the Tirite, a species of Calathea, is also similarly employed in Trinidad. Baskets are also ° frequently made from straw, from various sedges (Cyperus), and from shavings and splints of many kinds of wood.

In the basket trade special centres are recognized as the headquarters of varicus styles of work met in the markets. Thus Birmingham is recognized as the source of wicker perambulators ; in Southport boiled willows are used, and the brown baskets for gardening and market purposes are produced, and at Castle Donnington, in Derbyshire, the flat skain work seen in fishing-baskets, &c., is chiefly made. In the department of Aisne, France, the berceawnette or bassinet is very largely manufactured, and in Verdun much basket-work is specially prepared to suit the English market, in which the French manufacturers are able freely to compete. ‘The Black Forest and other German manu- facturers produce enormous quantities of light elegant baskets, which are largely exported. In Austria lacquered and varnished baskets are made in imitation of gold, silver, and steel, and Viennese card baskets, &c., are frequently ornamented with plaques of painted porcelain inserted in the centre.

BASNAGH, Jacquzs, pastor of the Walloon Church at the Hague, was born at Rouen in Normandy on the 8th of August 1653. He was the son of Henri

Basnage, one of the ablest advocates in the parliament of Normandy. At the age of seventeen, having acquired a good know- ledge of the Greek and Latin authors, as well'as of the English, Spanish, and Italian languages, he went to Geneva, where he began his theological studies under Mestrezat, Turretin, and Tronchin; he completed them at Sedan, under the professors Jurieu and Leblanc de Beaulieu. He then returned to Rouen, where he was received as pastor in September 1676 ; andin this capacity he remained till the year 1685, when, the exercise of the Protestant religion being suppressed at Rouen, he obtained leave of the king to retire to Holland. He settled at Rotterdam, and continued a minister pensionary there till 1691, when he was chosen pastor of the Walloon Church of that city. In 1709, the pensionary Heinsius secured his election as one of the pastors of the Walloon Church at the Hague, intending to employ him not only in religious but also in civil affairs. Accordingly he was engaged in a secret negotiation with Marshal d'Uxelles, plenipotentiary of France at the congress of Utrecht,—a service which he executed with so much success, that he was afterwards intrusted with several important commissions, all of which he discharged with such ability and address that Voltaire said of him that he was fitter to be a minister of state than the minister of a parish, The Abbé Dubois, who represented France at the Hague in 1716, in negotiating a defensive alliance between France, England, and the States- General, received instructions to consult with Basnage; they accordingly acted in concert, and the alliance was concluded in January 1717. His numerous published works, which are mostly in French, include—The History of the Religion of the Reformed Churches ; Jewish Anti- quitees, The History of the Old and New Testament ; Dis- sertation on Duels, &c. He died on the 22d September

1723.

BASQUE PROVINCES (Provwncras Vascongadas). The three Spanish provinces known by this name, which are distinguished from all the other divisions of Spain by

the character, language, and manners of the inhabitants, and by the enjoyment of political privileges which make the form of their government

nearly republican, are Biscay (Vizcaya), Guipuzcoa, and Alava. 'The territory occupied by them is in the form of a triangle, bounded on the N. by the Bay of Biscay, S. by Soria, E. by Navarra and part of France, and W. by Santander and Burgos. It com- prises an area of 2958 square miles; population in 1857, 414,146. These three provinces are more particularly described under their respective heads. The French Basque provinces now form the arrondissements of Bayonne and Mauleon. The Basque language, which is also prevalent in Navarre, is still spoken by about 600,000 Spaniards and French. Its native name is Lskuara. It cannot be classed with any Indo-European or Semitic tongue, and appears to be of earlier origin, presenting some grammatical analogies with Mongol, North Anierican, and certain East African languages. The forms of ordinary grammar are therefore imperfectly applicable to it. The substantive has no distinction of gender; it is made to express, by means of an extensive system of affixes, all the ordinary declen- sional and conjugational relations, and many which in other languages can only be expressed by periphrasis. The termination of a word may thus express together mood, tense, person, number, the case and number of the object, and also the sex, rank, and number of the individuals addressed, besides other relations. Foreign words are thus easily assimilated, but with modifications to suit the Basque ear, the latter varying according to local dialect. Diminutives and other general affixes increase the delicacy of expression, and a wide range of speech is early acquired by the natives. Compound words are readily formed by mere juxtaposition, or by elision of syllables, with peculiar modifications for euphony. The article has two forms—a for the singular, ak for the plural —aflixed to the substantive. There appears to be no genuine Basque word beginning with r. In the usual structure of the sentences the noun, with the article affixed, occupies the first place; it is followed by the adjective, then the adverb, next the verb, and lastly the object with its prepositional affix. No written Basque is known of earlier date than the 15th century, and little genuine literature exists; the orthography is therefore arbitrary, and the earliest writings are difficult to inter- pret. All that has yet been noticed regarding manners, customs, institutions, and legends may be paralleled by those of other Pyrenean peoples, or traced to foreign influences. But, through their moral qualities, physical situation, and historical cicumstances the Basques have built up and preserved a body of customs and institutions highly original in the mass. ach province is governed by a parliament composed of

representatives selected partly by election, partly by lot, among the householders of each country parish or town. A deputation, named by the parliament, ensures the strict observance of the special laws and customs of the province, and negotiates with the representative of the Spanish Crown. Delegates from the three parliaments meet annually to consider the common interests of the provinces; they employ a seal representing three interlaced hands, with the uiotto Iruracbat, "the three are one;" but no written federal pact exists. Much speculation regarding the origin of the Basques has been indulged in without sufficient special knowledge. The belief that they originally occupied great part of Spain and Southern France, founded on the apparently Basque character of certain local names, is very generally accepted. The best introduction to all Basque questions is Bladé's tudes sur Vorigine des Basques, which sums up the literature of the subject to 1870. 2léments de Grammaire Basque, by L. Géeze, Bayonne, 1873, is a

.good practical grammar and vocabulary with exercises : ve >

the Dictionnaire Basque Frangais of Van Eyss is a par- ticularly instructive lexicon.

BASS ROCK, an islet of greenstone and trap tuff, about a mile in circumference, on the coast of East Lothian near the entrance of the Firth of Forth, in 56° 4' N. lat., and 2° 37' W. long. Purchased from the Lauder family by Charles I. in 1671, it was afterwards converted into a place of confinement for state prisoners, and during the religious troubles of Scotland numbered among its captives Peden, Blackadder, and other Covenanting leaders. At the Revolution a party of King James's adherents got posses- sion of the island, and held out after the whole of Great britain had submitted. Dismantled of its fortifications in 1701, the Bass Rock again became private property, and is now farmed for the sake of the sea-fowls that resort thither during the breeding season. See The Bass Rock, its Civic and Keclesiastical History, dc. (Edin. 1848), by M'Crie, Hugh Miller, Anderson, Fleming, and Balfour.

BASS'S STRAITS, the channel which separates Tas- mania from Victoria. It is about 180 miles in length from E. to W., and about 140 from N. toS. The navi- gation of the strait is rendered dangerous in some parts by groups of barren islands and coral reefs scattered through it. It bears the name of Bass, the surgeon of a man-of-war, who was the first to discover, in 1798, indications of a channel between Tasmania and the neighbouring island-continent.

BASSAHIR, a Rajput hill state in Hindustén, under the political superintendence of the Lientenant-Governor of the Panjab, situated between 30°56' and 32° 8' N. lat., aud 77° 34' and 78° 52' E. long. Jt is bounded on the N. by the Spiti valley, on the E. by Chinese Tartary, on the S by the district of Garhwal, and on the W. by several small hill states. The aspect of the country is very hilly, and it is nowhere less than 4000 feet above sea-level. Principal rivers, the Pabur and Satlej. Estimated population, 90,000; chief towns and villages, Rampur, Chini, Songlé, and Morang. Agricultural products—wheat, opium, and Indian corn. Manufactures—blankets, shawls, and woollen cloths. Estimated gross revenue of the state, £5000 a year. Tri- bute paid by the chief to the British Government, £394, 10s. per annum. Estimated military force of the state, 100 men.

BASSANO, a city of Italy in the province of Vicenza. It stands on the river Brenta, over which there is a bridge 180 feet in length, built by Palladio. It is surrounded with walls, and has six gates, one of which, also by Palladio, is very much admired. In the centre of the town is the tower of Ezzelino, which now contains a library and armoury. The town contains thirty-five churches (some of them with fine paintings), several religious houses, and other public edifices. It has extensive silk-mills, besides manufactures of cloth, paper, straw hats, copper wares, &e. ; and the printing establishment of 8. Remondini is one of the most extensive in Italy. In 1796 Bonaparte defeated the Austrian general Wurmser in the neighbourhood, and various skirmishes took place between the two forces in 1801, 1805, 1813. Maret derived from the town his title of duke of Bassano. Population, 13,254.

BASSANO, Giacomo pa Ponts, a Venetian painter, born in 1510 at Bassano. He was educated by his father, who was himself an artist, and then

completed his studies at Venice. On the death of his father he returned to Bassano, and settled there. His subjects were generally peasants and villagers, cattle, and landscapes, with some portraits and historical designs. His figures are well designed, and his animals and landscapes have an agreeable air of simple nature. His compositions, though they have net much eloquence or grandeur, have abundance of foree and

truth ; the local colours are well observed, the carnations are fresh and brilliant, and his chiaroscuro and perspective are unexceptionable. He is said to have finished a great number of pictures; but his genuine works are somewhat rare and valuable,—many of those which are called originals being copies either by the sons of Bassano, or by others. He died in 1592, aged eighty-two. Bassano's style varied con. siderably during his lifetime. He naturally was at first a copier of his father, but his productions in this style are not of great value. He was then strongly attracted by the lightness and beautiful colouring of Titian, and finally adopted the style which is recognized as hisown. Although he painted few great pictures, and preferred humble subjects, yet his altar-piece of the Nativity at Bassano is estimated highly by the best judges, and in Lanzi's opinion is the finest work of its class in existence.

BASSE-TERRE, the capital of St Christopher's, one of the British West India Islands. Population, 8500. See SAINT CHRISTOPHER'S.

BASSE-TERRE, formerly the capital of Guadeloupe, one of the French West India Islands, Population, 9480. See GUADELOUPE.

BASSEIN, a British district on the eastern coast of the Bay of Bengal, under the jurisdiction of the Chief Commis- sioner of Burmah, lies between 15° and 18°N. lat., and 94° and 96° KE. long. It is bounded on the N. by the dis- tricts of Kyouk Phoo and Myanoung, on the E. by the district of Rangoon, and on the 8. and W. by the Bay of Bengal. A mountain range called the Anouk-phet Toung- myeng stretches through the district from north to south along the coast. The principal river of the district is the Trawadi, which debouches on the sea at its eastern extremity through a delta intersected with salt water creeks, among which the Pymalaw, Deay Pyoo,

Thekadoung, and Nga Woon or Bassein River rank as important arms of the sea. Shagay-gyee and Engyay-gyee are the only two lakes in the district. The delta of the Irawadi forms, wherever cul- tivable, a vast sheet of rice, with cotton, sesamum, and tobacco as subsidiary crops. Bassein district has an area of 8954 square miles, of which only 351 are cultivated. In 1871-72 the population amounted to 316,883, residing in 65,722 houses, and inhabiting 1554 villages, of whom 213,816, or 67 per cent. were Buddhists, 78,684 abori- gines, 20,810 Christians, 2119 Mahometans, 723 Hindus, and 12 Parsfs. Density of population, 34:03 per square mile. The population consisted of 31,369 agriculturists, and 285,464 non-agriculturists. Total revenue in 1870- 71, £118,672, of which £36,676, or 30 per cent., was derived from land. Principal towns and villages in Bassein—(1), Bassein, population 19,577; (2), Lay- myethna, 5325; (3), Pantanaw, 5876; (4), Yaygyee, 4893; (5), Nga-thainkhyoung, 3178; (6), Kang-yeedaing, 1500, (7), Shweloung, 1317; (8), Myoung-mya, 1477; (9), Nga-poo-tau, 981; and (10), Kyoon-pyaw, 1655.

BassEIN, the principal place of the district of the same name, situated in 16° 45’ N. lat., and 94° 50’ E. long., on tbe eastern bank of the Bassein River, one of the main arteries by which the waters of the Irawadi discharge themselves into the sea. It forms an important seat of the rice trade, and has great capabilities both from a mercantile and a military point of view, as it commands the great outlet of the Irawadi. It fell before the British arms, in May 1852, during the second Burmese war. Since then the town population has rapidly increased, and numbered 19,577 in 1871, chiefly fishermen, craftsmen, traders, and persons connected with the rice commerce.

BASSELIN, Outvisr, an old French poet or writer of verses, was born in the Val-de-Vire in Normandy about the middle of the 14th century, and died about 1418 or 1419. He was by occupation a fuller, and had a mill on

the small river Vire. His songs were sprightly and joyous, and became famous. The modern Vaudevilles take their origin and name from them, and were originally called Vaux-de-Vire, vaux being the plural of val; though, according to Ménage, the word is derived from a small town Vaux near the Vire. Basselin’s poems were collected and published in the 16th century by

Jean le Houx, and have since been re-edited by M. Asselin in 1811, and by M. Travers in 1833. The latest edition, that by P. L. Jacob, 1858, contains some other poems in addition to those of Basselin.

BASSI, Lavra Maria Caterina, an Italian lady, eminently distinguished for her learning, was born at Bologna in 1711. On account of her extraordinary attain- ments she received a doctor's degree, and was appointed professor in the philosophical college, where she delivered public lectures on experimental philosophy till the time of her death. She was elected member of many literary societies, and carried on an extensive correspondence with the most eminent European men of letters. She was well acquainted with classical literature, as well as with that of France and Italy. In 1738 she married Giuseppe Verrati, a physician, and left several children. She died in 1778.

BASSIANUS, Joannes, a distinguished professor in the law school of Bologna, the pupil of Bulgarus and the master of Azo. Little is known of his origin, but he is said by Carolus de Tocco to have been a native of Cremona. The most important of his writings which have been preserved is his Summary on the Authentica, which Savigny regards as one of the most precious works of the school of the Gloss-writers. Joannes, as he is generally termed, was remarkable for his talent in inventing ingenious forms for explaining his ideas with greater precision, and perhaps his most celebrated work is his "' Law-Tree," which he entitled Arbor Arborum, and which has been the subject of numerous commentaries. The work represents a tree, upon the branches of which the various kinds of actions are arranged after the manner of fruit. The civil actions, or actiones strictt juris, being forty-eight in number, are arranged on one side, whilst the equitable or pretorian actions, in number one hundred and twenty-one, are arranged on the other side. A further scientific division of actions is made by him under twelve heads, and by an ingenious system of notation the student is enabled to class at once each of the civil or preetorian actions, as the case may be, under its proper head in the scientific division. By the side of the tree a few glosses were added by Joannes to explain and justify his classification. His Lectures on the Pandects and the Code, which were collected by his pupil Nicolaus Furiosus, have unfortunately perished.

BASSOON, a musical wind instrument of the reed order, made of wood, and played through a bent mouth- piece of metal. It has a compass of about three octaves, from B flat below the bass staff to C in the treble staff, and may thus be regarded as the bass instrument corre- sponding to the oboe and clarinet. See Musica InstRv- MENTS.

BASSO-RILIEVO. See Arto Rivievo and Reuter.

BASTAR, a feudatory state in the Central Provinces of British India, situated between 20° 10’ and 17° 40’ of N. lat., and 80° 30’ and 82° 15’ of E. long., bounded on the N. by the Kanker zamindari and the Raipur district; on the E. by the Bendra Nawagarh zamindari and Raipur, Jaipur state, and Sabari River; on the S. by the Sironcha district ; and on the W. by the Indrévat{ River and the Aheri zamindari. Extreme length of the state, 170 miles; extreme breadth, 120 miles; area, estimated at 13,000 square miles. Total population, 78,856, consisting of—- Hindus, 29,060 ; Musalmans, 1704; aboriginal tribes of Gond origin, 48,092. Among the latter, the Marids are a

timid, quiet, docile race, and although addicted to drinking are not quarrelsome. They inhabit the densest jungles, and are very shy, avoiding contact with strangers, and fly- ing to the hills on the least alarm ; but they bear a good character for honesty and truthfulness. They are very scantily dressed, wear a variety of trinkets, with a knife, hatchet, spear, bow and arrow, the ouly weapons they use. Their hair is generally shaved, excepting a topknot; and when not shaved it gets into a matted, tangled mass, gathered into a knot behind or on the crown. The Maris, a class of the Mérids, live in still denser jungles, and have little or no communication with the outside world. The Marids and the Jhuri4s are supposed to be a subdivision of the true Gond family. All the aboriginal tribes of Bastar worship the deities of the Hindu pantheon along with their own national goddess Danteswart.

The eastern part of Bastar is a flat elevated plateau, from 1800 to 9000 feet above the level of the sea, the centre and north-west portions are very mountainous, and the southern parts are a mix- ture of hill and plain. On the plateau there are but few hills; the streams run slowly, and the country is a mixture of plain and undulating ground covered by dense sd forests. Principal moun- tains of the district—(1), A lofty range which separates it from the Sironcha district; (2), a range of equal height called the Bela Dila lying in the centre of the district; (8), a range ruuning north and south near Narayanpur; (4), Tangri Dongri range, running east and west; (5), Tulsi Dongri, bordering on the Sabari River and the Jaipur state. There is also a small range running from the River Indravati to the Godavari. The Indravati, the Sabari, and the Tl or Talper, are the chief rivers of the district; all of them affluents of the Godhwart The soil throughout the greater portion of Bastar consists of light clay, with an admixture of sand, suited for raising rice and wet crops. Rice, sugar, and a little wheat and gram are the agricultural products of Bastar. In the jungles the Marias and Maris rear kosra (Panicwm ttalicum) and other inferior grains. The aboriginal races generally follow the migratory system of tillage, clearing the jungle on selected patches, and after taking crops for two or three years abandoning them for new ground. Maris do not use the plough; nor do they possess buffaloes, bullocks, or cows; their only agricultural implement is a long-handled iron hoe. Lac, resin, wax, galls, horns, rice, a red dye called sendrt, wild arrow-root, molasses, teakwood, and tasar-silk cocoons, are the chief staples of export. 'The imports, which considerably exceed the exports, consist of salt, piece-goods, brass utensils, cocoa-nuts, pepper, spices, opium, turmeric, cotton, wheat, &c. Iron-ore is found towards the eastern portion of the state, but is not much worked; gold is also found in certain places. Bastar is divided into two portions-—that held by the Raja or chief himself, and that pos- sessed by feudatory chiefs under him. There is not a single made road within the principality. The climate of Bastar is unhealthy— fever, smallpox, dysentery, diarrhea, and rheumatism being the prevailing diseases. Jagdalpur, Bijapur, Madder, and Bhupalpatnam are the only places of any note in the dependency, the first-named being the residence of the Raja and the chief people of the state. The grossest ignorance and superstition prevail, and the people live in constant fear of being bewitched or ruined by malicious magicians. The family of the Raja

of Bastar claims to be of the purest Rajput blood, and traces its origin to Warangal in the Dakhuin, about the commencement of the 14th ceutury. The revenue of Bastar is supposed to be £3610; the tribute paid by the chief to the British Government is £305, 12s.

BASTARD is a person born out of lawful wedlock, z.e., Whose parents have not been married previous to his birth. The rules by which legitimacy is determined vary chiefly as to the effect to be assigned to the subsequent marriage of the bastard's parents. The law of Scotland, and of most Continental countries, following the rules of the civil and canon law, legitimizes the bastard whose parents afterwards marry. The same principle was at one time advocated by the clergy in England, but summarily rejected by the famous statute of Merton (20 Hen. IIL c. 9). The English law, however, takes no account of the interval between the marriage and the birth; provided the birth happens after the marriage, the offspring is legitimate. The presumption of law is in favour of the legitimacy of the child of a married woman, and at one time it was so strong that Lord Coke held that 'if the husband be within the four seas, te, within the jurisdiction of the king of

England, and the wife hath issue, no procf shall be admitted to prove the child a bastard unless the husband hath an apparent impossibility of procreation." It is now settled, however, that the presumption of legitimacy may be rebutted by evidence showing non-access on the part of the husband, or any other circumstance showing that the husband could not in the course of nature have been the father of his wife's child. If the husband had access, or the access be not clearly negatived, and others at the same time were carrying on a criminal intercourse with the wife, a child born under such circumstances is legitimate. If the husband had access intercourse must be presumed, unless there 'is irresistible evidence to the contrary. Neither husband nor wife will be permitted to prove the non-access directly or indirectly. Children born after a divorce a mensa et thoro will be presumed to be bastards unless access be proved. A child born so long after the death of a husband that he could not in the ordinary course of nature have been its father is illegitimate. The period of gestation is

presumed to be abowt nine calendar months ; and if there were any circumstances from which an un- usually long or short period of gestation could be inferred, special medical testimony would be required. A marriage between persons within the prohibited degrees of affinity was before 1835 not void, but only voidable, and the ecclesiastical courts were restrained from bastardizing the issue after the death of either of the parents. Lord Lyndhurst's Act declared all such existing marriages valid, but all future marriages between persons within the pro- hibited degrees of consanguinity or affinity were made null and void, and the issue illegitimate. (See Marrrace.) By 21 and 22 Vict. c. 93, application may be made to the Court of Divorce and Matrimonial Causes (in Scotland to the Court of Session by action of declarator) for a declara- tion of legitimacy and of the validity of a marriage.

The law relating to the maintenance of bastard children is governed by a considerable number of statutes passed during the present reign, the Acts of 1872 and 1873 being the last. 'The mother of a bastard may summon the putative father to Petty Sessions within twelve months of the birth (or at any later time if he is proved to have contri- buted to the child's support within twelve months after the birth), and the justices, after hearing evidence on both sides, may, if the mother's evidence be corroborated in some material particular, adjudge the man to be the putative father of the child, and order him to pay a sum not exceed- ing five shillings a week for its maintenance, together with a sum for expenses incidental to the birth. No such order is to be valid after the child is dead or reaches the age of thirteen, but the justices may in the order direct the payments to be continued until the child is sixteen years of age. 'The putative father may appeal to Quarter Sessions. Should the child afterwards become chargeable to the parish, the sum due by the father may be received by the parish officer. When a bastard child, whose mother has not obtained an order, becomes chargeable to the parish, the guardians may proceed against the putative father for a contribution. The mother of an illegitimate child is entitled to its custody in preference to the father.

The rights of a bastard are only such as he can acquire; for civilly he can inherit nothing, being looked upon as the son of nobody, and sometimes called jfilius nullous, sometimes filius popult. This, however, does not hold

as to moral purposes, e.g., he cannot marry his mother or bastard sister. Yet he may gain a surname by reputation though he has none by inheritance, and may even be made legitimate and capable of inheriting by the transcandent power of an Act of Parliament. All other children have their primary settlement in their father's parish; but a bastard has his in the parish where he was born, unless

such birth has been procured by fraud, or has happened under an order of removal, in a state of vagrancy, in the house of correction, or under certificate ; for in law he has no father. The incapacities attaching to a bastard consist principally in this, that he cannot be heir to any one; for being nullius filius, he is therefore of kin to nobody, and has no ancestor from whom an inheritable blood can be derived. Therefore, if there be no other claimant upon an inheritance than such illegitimate child, it escheats to the lord. And as bastards cannot be heirs themselves,~~so neither can they have any heirs but those of their own bodies ; for as all collateral kindred consists in being derived from the same conimon ancestor, and as a bastard has no legal ancestor, he can have no collateral kindred, and consequently no legal heirs, except such as claim by a lineal descent from himself. And hence, if a bastard purchase land, and die seised therefor without issue and intestate, the land escheats to the lord of the fee. Originally a bastard was deemed incapable of holy orders, and disqualified by the fact of his birth from holding any dignity in the church ; but this doctrine is now obsolete, and in all other respects there is no distinction between a bastard and another man. By the law of Scotland a bastard is not only excluded from his father's succession, because the law knows no father who is not marked out by marriage; and from all heritable succession, whether by the father or mother, because he cannot be pronounced lawful heir by the inquest in terms of the brief; but also from the movable succession of his mother, because he is not her lawful child, and legitimacy is implied in all succession deferred by the law. But a bastard, although he cannot succeed jure sanguinis, may succeed by destination, where he is specially called to the succession by entail or testament. In Scot~~ land, as in England, a bastard can have no legal heirs except those of his own body; and hence, failing his lawful issue, the king succeeds to him as last heir. In Scotland bastards may

be legitimized in two ways; either by the subsequent intermarriage of the mother of the child with the father, as already mentioned, or by letters of legitimization from the sovereign. With respect to the last, however, it is to be observed, that letters of legitimization, be their clauses ever so strong, cannot enable the bastard to succeed to his natural father; for the king 'cannot, by any prerogative, cut off the private right of third parties. But, by a special clause in the letters of legitimation, he may renounce his right to the bastard's succession, failing descendants, in favour of him who would have been the bastard's heir had he been born in lawful wedlock, such renunciation encroaching upon no right competent to any third party. Formerly bastards in Scotland without issue of their own could not make a will, but this disability was removed by 6 Will. IV. c. 22. If bastards or other persons without kindred die intestate without wife or child, their effects go to the king as ultimus heres; but a grant is usually made of them by letters patent, and the grantee becomes entitled to the administration.

The conflict of laws on the subject of legitimization by subsequent marriage yields some curious results. Thus, in the case of Burtwhistle v. Vardill, it was decided that a child born in Scotland of parents domiciled there, not married till after his birth, is legitimate by the law of Scotland, but cannot take real estate in England as heir. Again, a domiciled Scotchman had a son born in Scotland and then married the mother in Scotland. The son died seised of land in England, and it was held that the father could not inherit from the son. A domiciled Englishman, putative father of a child born in France of a French woman, having afterwards acquired a French domicile, married the mother and acknowledged the child as legi- timate in the mode prescribed by the law of France. It

was held that he could not legitimize the child so as to enable it to share in a bequest to his children by a person in England. The law of England, while adinitting the general maxim that the status of legitimacy must be tried by the law of the country where it originates, holds that the succession to real property must be determined by the lex loci ret site ; so that, for example, a legitimized Scotchman would be recognized as legitimate in England, but not legitimate so far as to take lands as heir.

The statistics of illegitimacy present some striking differences and uniformities, but it is only in the case of Scotland that we can be reasonably certain of the accuracy of the figures. The status of the child is not recorded in the English system of registration, but is a matter of inference from the facts stated by the parents. In 1873 illegitimacy varied in Scotland as follows. The proportion of illegitimate births was—

In the Insular rural districts…..... 54 per cent. », Mainland rural districts…..... WOE TAs me memiallet ovitehy.c y scacset-acueeete re ses Baan oan Fp WANE TOWMS) «cc ccisecscccssee sree stace iO) wae a USUI Dal MO WAS re… essere nteeee ess OUIe . V5,

In the counties the percentage varied from 4 in Shetland, Ross, and Cromarty, 5 in Nairn, and 6°5 in Sutherland, to 11-1 in Forfar, 11:4 in Roxburgh, 13°7 in Kincardine, 14 in Aberdeen, 15°8 in Banff, 15°8 in Elgin and Dumfries, and 18°4 in Wigtown. Similar variations are shown by English statistics for 1859. Compare the highest (Cum- berland, 11°4; Norfolk, 10°7; Westmoreland, 9°7) with the lowest (Monmouth and Middlesex, 4°7 ; and Surrey, 5). The metropolis stands at 4:2. With these local variations may be contrasted the steadiness with which the general average of illegitimacy is maintained. In England, for example, during nineteen years (1841-1859) the percentage fluctuated between 6°37 and 7, and during the last thirteen years of the period between 6-4 and 6°8. The returns of the Registrar-General show rather more fluctuation in Scotland during the period for which we have statistics (1855-1873), the figures being 7°8 in 1855, 8°5 in 1856, steadily rising to 10 in 1863, and 10-2 in 1866, and then steadily falling to 9°] in 1872, and 9 in 1873. The statistics of different countries, so far as any proper comparison can be made between them, show differences equally remarkable. 'Ihe order in which they stand, would be something like the following :—Sardinia (illegitimates), 2°091 per cent.; Hol- land, 3°96; Spain, 5°6; Switzerland, 5-9; Tuscany, 6; England, 65; Finland, Belgium, Sicily, France, 7°8; Prussia, 7 to 8; Austria, Norway, Scotland, 9; Denmark, Sweden, Hanover, Iceland, Saxony, 15; Wtirtemberg, Bavaria, 20 (from Mr Lumley's paper in the Journal of the Statistical Society for June 1862). It will be seen that these differences cannot be explained on any consideration of religious belief or

education. An inquiry made in Prussia in 1849 yielded the following results. The proportion of illegitimate to legitimate births was—

Among Protestants …....c:scscccssesseecrereveeseees 1 to 10°78 ppb CeisaDIGS! Genpnao coonnes deacanoenendoseooconoeTe 1 to 16°35 py MRCMMOMUECS, 00.50. e ces cs ene cs wenerensecereens 1 to 57°88 Bp diGaluis) ap sona0no baboon aapuapnppocc oon pagcodEoo Gor 1 to 40

English and Scotch returns show that the proportion of illegitimacy is smaller in the town than in the country districts, but the same feature is not observed in Con- tinental towns, as appears from the following returns, which, however, can in most cases be regarded as approximations only :—

In London the proportion is…..... 4°2 per cent. ibyembovedaein, JUSCY5) yy ganeeennbedonn: dL 45 Liverpool, Fass e etineesteeereccs 4 ws Manchester, ,, Si eacbaannnonsenee OM an Leeds, Ain acbocuncaenntiacs 64,

428

1861 the proportion is 8°6 -In Glasgow, 1873 v – on4 per eent.

Edinburgh, ie i Ge “s

«. $1851 26°75 Paris, 1858 is 26°35 ” St Petersburg, 1828-29 _,, 18°80 aS Stockholm, 1831-35, Pr 40°7 – Vienna, 1851, 7 51°7 ee Milan, ,, 3 84°0 ~ Prague, ,, a 46°7 3

(E. BR.)

BASTI, a district of British India, in the Benares divi- sion, under the jurisdiction of the Lieutenant-Governor of the N.W. Provinces, situated between 26° 23’ and 27° 30’ N. lat., and 82° 17’ and 83° 19°30" E. long. It is bounded on the N. by the independent state of Nepal, on the E. by the district of Gorakhpur, on the S. by the Ghagré River, and on the W. by the district of Gond4 in Qudh. The district stretches out in one vast marshy plain, draining towards the south-east, and traversed by the Rapti, Kuna, Bangangd4, Masdih, Jamwér, Ami, and Katnehid rivers. The tract lying

between these streams consists of a rich alluvial deposit, more or less subject to inundations, but producing good crops of wheat and barley. Area of the district, 2787 square miles; population in 1872, 1,472,994 souls, residing in 6911 villages or townships, and 248,268 houses. The Hindus numbered 1,247,201 ; the Mahometans, 225,784; Christians, &c., 9 only. 'The Hindus, principally Rajput, belong to various clans. No manufacturing communities exist in the district, the entire population being cultivators. Rice and millet are the chief agricultural products. In 1870-71 the total revenue of the district amounted to £141,630, of which £132,274, or 93 per cent., was from land ; the total expen- diture amounting to £9518, 12s. The chief towns are— Mihdawal, population 8124; Basti, population 5087. The cost of the regular police force (exclusive of the village watch) wag £15,896. In 1872-73 Basti contained 185 schools, attended by 6810 pupils. The land revenue settlement was made for thirty years in 1864, with that of the district of Gorakhpur, of which Basti formed a part till 1865, when it was erectcd into a separate district.

BASTIA, a fortified town and seaport on the eastern coast of the island of Corsica, and the capital of an arrbn- dissement. Lat. 42° 41' 36" N., long. 9° 27' 22" KE. It occupies a very picturesque situation, rising from the sea in the form of an amphitheatre ; but the town itself is ill- built, and the streets are narrow and crooked. The harbour, which is defended by a citadel, has a narrow and difficult entrance. Bastia is the seat of a royal court for the island, and of tribunals of commerce and primary jurisdiction, and has a theatre, a military and a civil hospital, a communal college, a model school, a museum, and a library of 30,000 volumes. Its principal manufactures are soap, leather, liqueurs, and wax; and it exports oil, wine, coral, and various other products, being the principal seat of the import and export trade of the island. Bastia dates from the building of the Genoese Castle by Lionello Lomellino in 1383, and derives its name from the Bastion of St Charles. Under the Genoese it was long the principal stronghold in the north of the island, and the residence of the governor ; and, in 1558, it was the first town attacked by the French. On the division of the island in 1797 into the two departments of Golo and Liamone, Bastia remained the capital of the former; but when the two were again united Ajaccio obtained the superiority, The city was taken by the English in 1745,

and again in 1794. Popula- tion, 21,535. (See view in Lear's Jour. in Corsica, 1870.)

BASTIAT, FREDERIC, the son of a merchant of Bayonne, was born in that town on the 19th of June 1801. After

being educated at the Colleges of Saint-Sever and of Soréze, he entered in 1818 the counting-house of his uncle at Bayonne. Here his intensely active mind soon began to interest itself in the study of the principles of commerce, but he felt no enjoyment in the practical routine of mercantile life, and in 1825 retired to a property at Mugron, of which he became possessor on the death of his grandfather. Thus withdrawn from society, he devoted himself with eagerness to meditation and study, mastering the English and Italian languages and literatures, speculat- ing on the problems of philosophy and religion, digesting the doctrines of Adam Smith and Say, of Charles Comte and Dunoyer, cultivating music, experimenting in farming, and talking over all that he read, thought, and desired, with his able, dearly loved, and life-long friend, M. Felix Coudroy. He welcomed with enthusiasm the Revolution of 1830. In 1831 he became a justice of peace of Mugron, and in 1832,a member of the Council-General of the Landes. In 1834 he published his first pamphlet. In 1840 he visited Spain and Portugal, and spent a few weeks in London. Between 1841-44 three pamphlets appeared from his pen, all, like his first brochure, on questions of taxation affecting local interests. During this period an accidental circumstance led him to become a subscriber to an English newspaper, the Globe and Traveller, through which he was made acquainted with the nature and pro- gress of the crusade so vigorously and skilfully carried on by the Anti-Corn-Law League against Protectionist doctrines and practices. After closely studying the move- ment for two years he resolved to make his countrymen aware of its history and significance, and to inaugurate, if possible, a similar movement in France. To prepare the way he contributed in 1844 to the Journal des Hcono- mistes an article "Sur Vinfluence des tarifs Anglais et Frangais," which attracted great attention, and which he followed up by others, including the first series of his brilliant Sophismes Economiques.

In 1845 he came to Paris in order to superintend the publication of his Cobden et la Ligue, ou Vagitation Anglaise pour la liberté des échanges, and was very cordially received by the economists of the capital; from Paris he went to London and Manchester, and made the personal acquaint- ance of Cobden, Bright, and other leaders of the league. When he returned to France he found that his writings had been exerting a powerful influence ; and in 1846 he assisted in organizing at Bordeaux the first French Free Trade Association. 'The rapid spread of the movement soon required him to abandon the sweet and fruitful leisure of his beloved Mugron for the feverish and consuming activity of Paris. During the eighteen months which followed this change his labours were prodigious. He acted as secretary of the central committee of the associa- tion, organized and corresponded with branch societies, waited on ministers, procured subscriptions, edited a weekly paper, the Libre-Hchange, contributed to the Journal des Hconomistes, and to three other periodicals, addressed meetings in Paris and the provinces, and delivered a course of lectures on the principles of political economy to students of the schools of law and of medicine. The cause to which he thus devoted himself, with a zeal and a self- denial most admirable in themselves, but fatal to his own health and life, appeared for a time as if it would be as successful in France as in England; but the forces in its favour were much weaker and those opposed to it were much stronger in the former country than in the latter, and this became always the more apparent as the struggle proceeded, until it was brought to an abrupt end by the Revolution of February 1848. This event allowed the socialism and communism which had been gathering and spreading in secret during the previous thirty years to

show themselves openly and boldly in singularly favourable circumstances. Louis Blanc, Victor Considérant, Pierre Leroux, J. P. Proudhon, and other representatives of these theories laboured zealously and effectively to gain to them the needy and uneducated masses of their countrymen, and to discredit as utterly evil the existing order of society. In this grave crisis Bastiat nobly performed his duty. Although exhausted by the far too heavy labours in which he had been engaged, although robbed of his voice by the malady which was preying upon him, so that he could do but little to defend

the truth from the tribune of the Con- stituent Assembly, he could still suggest wise counsels in the Committee of Finance of which he was vice-president, and he could still use his pen with a vigour and dexterity which made him capable of combating single-handed many opponents.

He wrote in rapid succession a series of brilliant and effective pamphlets and essays, showing how socialism was connected with protection, and exposing the delusions on which it rested. Thus within the space of two years there appeared Propriété et Loi, Justice et Fraternité, Propriété et Spoliation, L' Etat, Baccalauriet et Socialisme, Protec- tionisme et Communisme, Capital et Rente, Maudit Argent, Spoliation e Loi, Gratwité du Credit, and Ce qu'on voit et cequon ne voit pas. While thus occupied he was meditating the composition of a great constructive work, meant to renovate economical science by basing it on the principle that "interests, left to themselves, tend to harmonious combinations, aud to the progressive preponderance of the general good." The first volume of this work Les Harmonies Economiques was published in the beginning of 1850. In the autumn of that year, when working on the second volume, the increase of his malady compelled him to repair to Italy. After lingering at Pisa and Florence he reached Rome, but only to die there on the 24th of December 1850, in the fiftieth year of his age. An affecting account of the last days of this illustrious martyr to the cause of econontical science and political justice was published by his friend, M. Paillottet.

The life-work of Bastiat, in order to be fairly appreciated, requires to be considered in three aspects. (1.) He was the advocate of free trade, the opponent of protection. The general theory of free trade had, of course, been clearly stated and solidly established before he was born, and his desire to see its principles acted on in France was quickened and confirmed by the agitation of the Anti-Corn-Law League for their realization in England, but as no one denies it to have been a great merit in Cobden to have seen so distinctly and comprehensively the bearing of economical truths which he did not discover, no one should deny it to have been also a great merit in Bastiat. He did far more than merely restate the already familiar truths of free trade. He showed as no one before him had done how they were applicable in the various spheres of French agriculture, trade, and commerce. Now, the abstract theory of free trade is of comparatively

little value ; its elaboration so as to cover details, its concrete application, and its varied illustration are equally essential. And in these respects it owes more, perhaps, to Bastiat than to any other economist. In the Sophismes Economiques we have the completest and most effective, the wisest and the wittiest exposure of protectionism in its principles, reasonings, and consequences which exists in any language. (2). He was the opponent of socialism. In this respect also he had no equal among the economists of France. He alone fought socialism hand to hand, body to body, as it were, not caricaturing it, not denouncing it, not criticizing under its name some merely abstract theory, but taking it as actually presented by its most popular representatives, considering patiently their proposals and arguments, and proving conclusively that they proceeded on false principles,

reasoned badly, and sought to realize generous aims by foolish and harmful means. Nowhere will reason find a richer armoury of weapons available against socialism than in the pamphlets published by Bastiat between 1548 and 1850. These pamphlets will live, it is to be hoped, at least as long as the errors which they expose. (3). He attempted to expound in an original and independent manner political economy as a science. In combating, first, the Protec- tionists, and, afterwards, the Socialists, there gradually rose on his mind a conception which seemed to him to shed a flood of light over the whole of economical doctrine, and, indeed, over the whole theory of society, viz., the harmony of the essential tendencies of human nature. The radical error, he became always more convinced, both of protec- tionism and socialism, was the assumption that human interests, if left to themselves, would inevitably prove antagonistic and anti-social, capital robbing labour, manu- 'factures ruining agriculture, the foreigner injuring the native, the consumer the producer, &c.; and the chief weakness of the various schools of political economy, he believed he had discovered in their imperfect apprehension of the truth that human interests, when left to themselves, when not arbitrarily and forcibly interfered with, tend to harmonious combination, to the general good. Such was the point of view from which Bastiat sought to expound the whole of economical science. The sphere of that science he limited to exchange, and he drew a sharp distinc- tion between utility and value. Political economy he defined as the theory of value, and value as " the relation of two services exchanged." The latter

definition he deemed of supreme importance. It appeared to him to correct what was defective or erroneous in the conflicting definitions of value given by Adam Smith, Say, Ricardo, Senior, Storch, &c., to preserve and combine what was true in them, and to afford a basis for a more consistent and developed economical theory than had previously been presented. It has, however, found little acceptance, and Roscher, Cairnes, and others seem to have shown it to be ambiguous and misleading. A consequence of it ou which he laid great stress was that the gratuitous gifts of nature, whatever be their utility, are incapable of acquiring value,—what ig gratuitous for man in an isolated state remaining gratuitous for him in a social condition. Thus, land, according to Bastiat, is as gratuitous to men at the present day as to their first parents, the rent which is paid for it—its so- called value—being merely the return for the labour and capital which have been expended on its improvement. li the general opinion of economists he has failed to establish this doctrine, failed to show that the properties and forces of nature cannot be so appropriated as to acquire valuc. His theory of rent is nearly the same as Mr Carey's, 2.¢., decidedly anti-Ricardian. His views on the growth of capital and interest, on landed property, competition, con- sumption, wages, and population, are independent, and, if not unqualifiedly true, at least richly suggestive. His Guvres Completes are in 7 vols. The first contains an interesting Memoir by M. Paillottet. The following articles on Bastiat may be specified,—Reybaud's in the Revue des Deux Mondes, Sept. 1, 1858 ; Macleod's in his Dictionary of Political Economy; and that of Cairnes in the Fortnightly Review, Oct. 1, 1870. There is a good state- ment of his distinctive views in Kautz, Geschichte der National-Oekonomik, ii. 578-584. His Harmonies have been well translated by Dr P. J. Stirling. (R. F.) BASTILLE (from bastir, now bdtzr, to build), in the earlier use of the word, was any fortified building form- ing part of a system of defence or attack; and the name was especially applied to several of the principal points in the ancient fortifications of Paris. In the reign of king John, or even earlier, the gate of Saint Antoine was flanked

by two towers; and in 1369 Hugues Aubriot, at the com- mand of Charles V., changed it into a regular bastille or fort by the addition of six others of massive structure, the whole united by thick walls and surrounded by a

ditch 25 feet wide, Various extensions and alterations were afterwards effected; but the building remained substan- tially what it was made by the vigorous provost, a strong and gloomy structure, with eight stern towers. As the ancient fortifications of the city were superseded, the use of the word bastille asa general designation gradually died out, and it became restricted to the castle of Saint Antoine, the political importance of which made it practically, long before it was actually, the only bastille of Paris, The building had originally a military purpose, and it appears asa fortress on several occasionsin French history. When Charles VIE. retook Paris from the English in 1436, all his opponents in the city took refuge in the Bastille, which they were prepared to defend with vigour, but the want of provisions obliged them to capitulate. In 1588 the duke of Guise took possession of the Bastille, gave the command of it to Bussy-Leclerc, and soon afterwards shut up the whole parliament within its walls, for having refused their adherence to the League. When Henri IV. became master of Paris he committed the command of the Bastille to Sully, and there he deposited his treasures, which at the time of his death amounted to the sum of 1,870,000 livres. On the 11th of January 1649, the Bastille was invested by the forces of the Fronde, and, after a short cannonade, capitulated on the 13th of that month. The garrison consisted of only twenty-two men. The Frondeurs concluded a peace with the court on the 11th of March ; but it was stipulated by treaty that they should retain possession of the Bastille, which, in fact, was not restored to the king till the 21st of October 1651. In that year took place the famous fight of the Porte St Antoine between Condé and Turenne, on which occasion the forces of Condé owed their safe retreat into Paris to the cannon of the Bastille.

At avery early period, however, the Bastille was em- ployed for the custody of state prisoners, and it was ultimately much more of a prison than a fortress. Accord- ing to the usual account, which one is tempted to ascribe to the popular love of poetical justice, the first who.was incarcerated within its walls was the builder himself, Hugues Aubriot. Be this at it may, the duke of Nemours spent thirteen years there in one of those iron sages which Louis XI. called his jildettes ; and Jacques d'Armagnac, Poyet, and Chabot were successively prisoners. It was not till the reign of Louis XIII. that it became recognized as a regular place of confinement; but from that time till

its destruction it was frequently filled to embarrassment with men and women of every age and condition.

Of the treatment of prisoners in the Bastille very various accounts have been given even by those who speak from personal experience, for the simple reason that it varied greatly in different cases. The prisoners were divided into' two main classes, those who were detained on grounds of precaution or by way of admonitory correction, and those who lay under presumption or proof of guilt. The former were subject to no investigation or judgment, and the length of their imprisonment depended on the will of the king; the latter were brought to trial in the ordinary courts or before special tribunals, such as that of the Arsénal,—though even in their casc the interval between their arrest and their trial was determined solely by the royal decree, and it was quite possible for a man to grow old in the prison without having the opportunity of having his fate decided. Until guilt was established, the prisoner was registered in the king's name, and—except in the case of state prisoners of importance, who were kept with greater strict-

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ness and often in absolute isolation—-he enjoyed a certain degree of comfort and freedom. Visitors were admitted under restrictions; games were allowed; and, for a long time, at least, exercise was permitted in open parts of the interior. Food was both abundant and good, at least for the better class of prisoners; and instances were not unknown of people living below their allowance and, by arrange- ment with the governor, saving the surplus. When the criminality of the prisoner was established, his name was transferred to the register of the "commission," and he became exposed to numerous hardships and even barbarities, which, however, belonged not so much to the special organization of the Bastille as to the general system of criminal justice then in force.

Among the more distinguished personages who were con- fined in this fortress during the reigns of Louis XIV., XV., and XVI, were the famous Aan of the Iron Mask, Fouquet, the Marshal Richelieu, Le Maistre de Sacy, De Renneville, Voltaire, De Latudc, Le Prévost de Beaumont, Labour- donnais,

Lally, Cardinal Rohan, Linguet, and La Chalotais. While no detestation is too great for that system of "royal pantheism" which led to the unjust and often protracted imprisonment of even men of great ability and stainless character, it is unnecessary to give implicit credence to all the tales of horror which found currency during the excitement of the Revolution, and which historical evidence, as well as a priorz considerations, tends to strip of their more dreadful features, and even in many cases to refute altogether. Within the last twenty or thirty years much light of an unexpected kind has been shed on the history of the Bastille from the pages of its own records. These documents had been flung out into the courts of the building by the Revolutionary captors, and after suffering grievous diminution and damage were finally stored up and forgotten in the vaults of the library of the (so-called) Arsénal. Here they were discovered in 1840 by Frangois Ravaisson, who has since devoted himself, with rare patience, learning, and ability, to their arrangement, elucidation, and publication. Of the extent and value of his investigations some idea may be formed from the fact that the six volumes published cover only the interesting period from 1659 to 1681.

At the breaking out of the Revolution the Bastille was attacked by the Parisians; and, after a vigorous resistance, it was taken and razed to the ground on the 14th July 1789. At the time of its capture only seven prisoners were found in it. A very striking account of the siege will be found in Carlyle's French Revolution, vol. i. The site of the building is now marked by a lofty column of bronze, dedicated to the memory of the patriots of July 1789 and 1830. It is crowned by a gilded figure of Mercury spreading his pinions in the act of flight.

See the Histories of the Bastille by Renneville (7 tom. 12mo, 1713-24), Fougeret (8vo, 1833), Dufey de l'Yonne (8vo, 1834), and Arnould (7 tom. 8vo, 1843-44) ; and the Memoirs of Linguet (12mo, 1821, new ed.), Carra(3 tom. 8vo, 1787), Charpentier (3 tom. 8vo, 1789), and Latude (edited by Thierry, 3 tom. 18mo, 1791-92); also Francois Ravaisson, Les Archives de la Bastille, (6 vols. 8vo, 1866-73) ; and Charles Louandre, in Revue des Deux Mondes, 1874.

BASTWICK, Dr Jonny, born at Writtle, in Essex, in 1593, was a physician at Colchester, whose celebrity rests on his strong opposition to the Roman

Catholic ceremonial. About 1633 he printed in Holland a Latin treatise, entitled Elenchus Religionis Papistice, with Flagellum Pontificis et Episcoporum Latialium; and as the English prelates thought themselves aimed at, he was fined £1000 in the High Commission Court, excommunicated, and prohibited from practising physic, while his books were ordered to be burnt, and the author himself consigned to prison. Instead of

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recanting, however, he wrote Apologeticus ad Presules Anglicanos, and another book called Zhe Litany, in which he exclaimed vehemently against the proceedings of that arbitrary court, and charged the bishops with an inclina- tion to popery. Prynne and Burton coming under the lash of the Star-chamber court at the same time, they were all censured as turbulent and seditious persons, and condemned to pay a fine of £5000 each, to be set in the pillory, to lose their ears, and to undergo imprisonment for life in remote parts of the kingdom. The parliament in 1640 reversed these proceedings, and ordcred Bastwick a reparation of £5000 out of the estates of the commissioners and lords who had persecuted him. 'The civil commotions which ensued prevented his receiving this solatewm for his sufferings ; but, in 1644, his wife had an allowance ordered for her own and her husband's maintenance. The place and time of his death are unknown. He seems in his later years to have shown bitter opposition to the Independents. '

BAT, the common name of a well marked group of Mammals forming the order Cheiroptera (1.e., wing-handed), distinguished from all other members of their class by the possession of true organs of flight. These consist of a delicate membrane stretching from limb to limb on both sides of the body, enclosing the greatly elongated digits of the hand, and in many cases extending beyond the pos- terior limbs so as to include the tail. Their whole struc- ture bears evidence of special adaptation to the purpose of sustained flight, while their mode of progression on the ground is as awkward as thcir aerial movements are graceful. The eyes of the bat are usually small, but the organs of the other senses in most cases attain extraordinary develop- ment, 'The external ear is generally large, as in the

Long- eared Bat of Britain (Plecotus awritus), in which it is equal to the entire length of the body. In the group to which the Horse-shoe Bats (I2hinolophus ferrum equinum) belong, the nose is surrounded with leaf-like appendages, the purpose of which is by no means well determined, but which, probably, are as useful to the organ of smelling as is the greatly clongated auricle to that of hearing. In all bats the wing-membrane affords a vast expansion of the sense of touch, which is of such exquisite delicacy that bats which have been deprived of their sight, and as far as possible of hearing and smelling, are yet able by it alone to fly about in perfect security, avoiding, with apparent ease, all the obstacles that may be placed in their way. By Pliny and other early naturalists the bat, although known to suckle its young, was placed among Birds, and was generally regarded as a creature of ill omen, a superstitious feeling by no mcans extinct at the present day. Virgil, in speaking of the Harpies, generally understocd to have been bats, describes thein as "' diree obscenzeque volucres." Our English ancestors formed a more correct estimate of the zoological position of these creatures as indicated by the name " flitter-mouse," still given to the bat in many parts of Britain. Bats are nocturnal or crepuscular in their habits, remaining suspended by day in the darkest recesses of woods and caverns, or in the most inaccessible parts of unfrequented buildings, and coming forth at twilight in search of food. 'This in the species found in Europe and America consists mainly of insects; while one species at least, the Vampire of America, sucks the blood of other mammals, although its powers in this respect have probably been much exaggerated. 'The Fruit-eating Bats (Pteropus) are confined to the warmer regions of Asia and Africa, and among these are to be found the largest members of the order, thus the Kalong of Java (Pteropus javanicus) measures 5 feet betwecn the tipsof its wings. In countries where the winter cold is sufficiently severe to cut off their usual sources of food, bats hibernate. Collecting in

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enormous numbers in their usual retreats and suspending themselves by their hind limbs, they become torpid, and remain so till the return of spring, bringing with it a revival of insect life, restores them to their wonted activity. About 130 species of bats are known, and these are widely distributed over every quarter of the globe, extending as far northward as

latitude 60°; all the larger forms, however, occur in the warmer regions of the earth. Bats are found in most of the islands of the Indian and Pacific Oceans, forming in many of them the only indigenous mammals, a fact readily explained when viewed in connec- tion with their remarkable power of flight. Fossil remains of insectivorous Cheiroptera have been found in the Eocene and later Tertiary deposits. See MAMMALIA.

BATAVIA, a large city and seaport on the north coast of the island of Java, and the capital of all the Dutch settlements in the East. It is situated on both sides of the river Jacatra or Tjiliwong, in a swampy plain at the head of a capacious bay. The streets are for the most part straight and regular, and many of them have a breadth of from 100 to 200 feet. In several cases there is a canal in the centre lined with stone, and defended by low parapets or banks, while almost every street and square is fringed with trees. The old town has greatly changed from what it was in the 18th century. It was then surrounded by strong fortifications, aud contained a number of important buildings, such as the town-house (built in 1652 and restored in 1706), the exchange, the infirmary and orphan asylum, and the European churches. But the ramparts were long ago demolished, and most of the public edifices have either fallen into decay or bcen converted into magazines and warehouses. The great church which was finished in 1760, at an expense of £80,000, had to be taken down in consequence of its foundation having given way. Canals have been filled up, streets have been altered, and the general character of the place considerably modified. All the European inhabitants, except those immediately connected with the shipping, have removed to the New Town, which has been gradually formed by the integration of Weltevreden (Well-content), Molenvliet (Muill-stream), Rijswijk (2ice-town), Noordwijk (orth-town), Koningsplein (King's square), and other suburban villages or stations. The situation of this modern part is higher and healthier ; and the grandeur and varicty of its buildings far surpass anything to be found in the older section of the city. The misplaced imitation of Dutch arrangements has been happily avoided, and the natural advantages of the situation and climate have been turned to account. The houses are frequently separated from each other by rows of trees.

As the chief city of the Dutch colonies in the East, Batavia contains numerous buildings connected with the civil and military organization

of.the Government. The chambers of the Council of the East Indies occupy a spacious edifice in Rijswijk, and the governor-gencral's hotel, or town-residence, is situated in the same quarter. In the district of Weltevreden are the new palace, the barracks, and the artillery school, as well as the military and civil hospital, which can accommodate 600 patients, and not far off is the Frederik-Hendrik citadel, which was built in 1837. Further inland, at Meester Cornelis (known for its lake), is a school for under-officers. The Koningsplein is a large open square for military manceuvres, about 390 feet long and 250 feet broad, surrounded by mansions of the wealthier classes. Noordwijk is princi- pally inhabited by lesser merchants and subordinate officials. There is an orphan-asylum in the district of Parapatta, and a poor-house (Diaconie armenhaus) in Molenvliet. Besides those already mentioned, Batavia has various educational and scientific institutions of note. In 1851 the Government founded a medical school for

Javanese, and in 1860 the "Gynimasium William III." in which a comprehensive education is bestowed. A society of arts and scicnces was established in 1778, a royal physical society in 1850, and a society for the promotion of industry and agriculture in 1853. In addition to the Transactions of these societies—many of which contain valuable contributions to their respective departments in their relation to the East Indies—a considerable number of publications are issued in Batavia. Aniong miscellaneous buildings of importance may be mentioned the public-hall known as the Harmonie, the freemasous' lodge, the theatre, the club-house, and several fine hotels.

The population of Batavia is very varied,—the Dutch residents being a comparatively small class, and greatly intermixed with Portuguese and Malays, Here are found members of the different Indian nations, originally slaves ; Moors and Arabs, who are principally engaged in naviga- tion, but also inhabit the Rua Malacoa district, and trade in gold and precious stones ; Javanese, who are cultivators ; and Malays, chiefly boatmen and sailors, and adherents of Mahometanism. But, perhaps, the most important Asiatic element is the Chinese, who are both numerous and industrious. They were long greatly oppressed by the Dutch Government in various

paltry ways, and in 1740 they were massacred to the number of 12,000, But in spite of all this they have maintained their position, and now enjoy a happier lot. In 1832 the population was found to consist of 2800 Europeans, 80,000 natives, 25,000 Chinese, 1000 Arabs, and 9500 slaves, a total of 118,300 persons. The nuinber of inhabitants is at present much less.

Batavia is still a great commercial depdt, though it has had to contend against the rivalry of Singapore. The bay is rendered secure by a number of islands at its mouth, and is capacious enough for a much larger traffic than it has ever seen; but it unfortunately grows very shallow towards the shore. Ships of 300 or 400 tons anchor about a mile and a half out; the river is navigable a couple of miles inland for vessels of 30 or 40 tons, but the entrance is narrow, and requires continual attention to keep it open.

The exports from Batavia to the other islands of the archipelago, and to the ports in the Malayan peninsula, are rice, sago, coffee, sugar, salt, oil, tobacco, teak timber and planks, Java cloths, brass wares, &c., and European, Indian, and Chinese goods. The produce of the Eastern Islands is also collected at its ports for re-exportation to India, China, and Europe,—namely, gold-dust, diamonds, camphor, benzoin, and other drugs; edible bird-nests, trepang, rattans, bees' wax, tortoise-shell, and dyeing woods from Borneo and Sumatra ; tin from Banca; spices from the Moluccas; fine cloths from Celebes and Bali ; and pepper from Sumatra. From Bengal are imported opium, drugs, and cloths; from China, teas, raw silk, silk piece-goods, varnished umbrellas, coarse China wares, nankeen, paper, and innumerable smaller articles for the Chinese settlers. British manufactures also are largely introduced. The number of British ships that entered in 1870 was 103, with a tonnage of nearly 31,000 tons, the total number of vessels of all nationalities being 783, with a tonnage of nearly 194,000.

Almost the only manufactures of any iniportance are the distillation of arrack, which is principally carried on by Chinese, the burning of lime and bricks, and the baking of pottery ; and even the brick-making is in a decaying condition. The principal establishment for monetary transactions is the Java Bank, established in 1828 with a capital of £500,000; but there are also agencies belonging to the Bank of Rotterdam, and the Chartered Bank of India, Australia, aud China, as well as a public savings bank.

The Government has a naval establishment at the island

of Onrust, about six miles from the city ; and among its other accomniodations is a large iron floating dock capable of holding vessels 400 feet long. Since 1869, however, entrance has bcen refused to merchant ships, which, cousequently, feel the lack of proper docks in the harbour, Proposals to build these and to extend the harbour, though frequently under discussion, have had no result. Tram- ways were introduced into the city in 1867, and are greatly patronized by the native population, A railway to Buitenzorg, where the Government botanical gardens arc situated, was opened in 1871, the distance being about 40 — miles inland,

Batavia owes its origin to the Dutch general John Petersen Coen, who, in 1619, took the town of Jacatra (which had been built on the ruins of the old Javanese town of Sunda Calappa), destroyed it, and founded in its stead the present city, which soon acquired a flourishing trade and increased in importance. The ruins of Jacatra are to be found between Batavia and Anjol. In 1699 Batavia was visited by a terrible earthquake, and the streams were choked by the mud from the volcano of Gunong Salak (7244 feet high), by which the climate was so affected that the city became notorious for its unhealthi- ness, and was in great danger of being altogether aban- doned. In the twenty-two years from 1730 to 1752, 1,100,000 deaths are said to have been recorded. General Daendals, who was governor from 1808 to 1811, caused the ramparts of the town to be demolished, and began to form the nucleus of a new city at Weltevreden. By 1816 nearly all the Europeans had lcft the old town. In 1811 a British armament was sent against the Dutch settlements in Java, which had been incorporated by France, and to this force Batavia surrendered on the 8th of August. It was restored, however, to the Dutch by the treaty of 1814.

See Stavorinus, Voyages to the East Indies; Barrow, Voyage to Cochin China ; Sir George Staunton, Embassy to China; Daendel, Staat der Nederl. O. Ind. Bezittungen; Junghuhn, Reisen der Java; Thorn, Mem. of the Conquest of Java ; Sir 8, Raflles, History of Java; Temminck, L' Inde Archip.; Veth, Woordenboek v. Nederl. Ind.

BATES, Wii11aM, D.D., aneminent Nonconformist divine, born in November 1625. He was admitted to Emmanuel College, Cambridge, and removed thence to King's College in 1644. He was one of the commissioners at the con- ference in the Savoy, for reviewing the public liturgy, and was concerned in drawing up the exceptions to the Book of Common Prayer. Notwithstanding thishe was appointed chaplain to Charles II. soon after the Restoration, and became minister of St Dunstan'sin the West ; but he was afterwards deprjved of his benefice for nonconformity. Bates was of an amiable character, and enjoyed the friendship of the Lord-Keeper Bridgeman, the Lord-Chan- cellor Finch, the earl of Nottingham, and Archbishop Tillotson. He published Select Lives of Illustrious and Pious Persons, in Latin; and after his death all his. works, except his Select Lives, were printed in one vol. fol.; again in 1723; and in 4 vols. 8vo, in 1815. He died in July 1699, in the 74th year of his age.

BATH, the chief town of Somersetshire, and, from the elegance of its buildings and the beauty of its situation, one of the finest citics in England, is situated mainly on the right bank of the river Avon, though a considerable exten- sion has also taken place on the left. Communication be- tween the two portions is afforded by several bridges, of which the most important are the Pulteney, the North Parade, the Cleveland, and the Grosvenor Suspension. The heights and slopes of the great western oolitic range, that rise like an amphitheatre from the river valley, are covered with the terraces and crescents of the city; it contains many fine public walks, and the vicinity presents a great variety of beautiful landscape. Its sheltered position rendcrs the climate mild and agrecable. The houses are

mostly built of white freestone. Jointly with Wells, Bath is the head of a diocese, which is co-extensive with the county of Somerset. The Abbey Church isa handsome

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Sketch Ground-Pian of Bath.

1. Guildhall. 5. Market. 8. Cross Bath.

2. Assembly Rooms. 6. Pump-Room. 9, Hot Bath Pump-Room. 3. Theatre. 7. King’s and Queen’s | 10, Kingston Baths.

4. Post-Office. Bath, 11. Royal Private Baths.

cruciform edifice, dating from 1499, with a quadrangular tower 162 feet high rising from the point of intersection. It is 210 feet in length from E. to W., and 126 in breadth from N. to 8. The west front contains a curious representation of the founder’s dream of the angels ascending and de- scending on Jacob’s ladder. In the in- terior are the tombs of Quin, Nash, Mal- thus, Broome, Melmoth, and numerous F

minor celebrities; while several of the == monuments are from the chisels of Bacon, Chantrey, and Flaxman. The church has been recently restored under the direc- tion of Sir Gilbert Scott, at a cost of – £20,000. There are about thirty other Device of Bishopric. parish churches or’ chapels in Bath, as well as numerous nonconformist places of worship. St Swithin’s, Walcot, may be mentioned as containing the tombs of Christopher Anstey and Madame d@’Arblay. Among the most important educational institutions are the Free Grammar School, founded by Edward VI.; the Somersetshire College, estab- lished in 1858 ; the Royal School, for the education of the daughters of military officers, founded in 1865 ; the Bath College in Sydney

Place; the School of Art; the Romen Catholic College at Prior Park, which was formerly the mansion of Ralph Allen, the friend and patron of Fielding ; and the Wesleyan College at Kingswood. There are several buildings of considerable pretension connected with the baths from which the town derives its name. The springs supply six distinct establishments, namely, the King's, Queen's, Hot, Cross, Abbey, and Grand Pump Room Hotel baths. Of these the oldest is the King's,

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which was enclosed in 1236. The pump-room is 85 feet in length by 56 in breadth and 34 in height ; it contains a marble statue to Beau Nash. The Queen's was built in 1597; and the Cross Bath dates from 1790. The temperature varies in the different springs from 117° to 120° Fahr., and the specific gravity of the hot bath is 1-002. Dr Daubeny in 1833 found that the daily evolution of nitrogen gas amounted to 250 cubic feet ; and Professor Ramsay has calculated that if the mineral ingredients of the waters were solidified they would form in one year a column 9 feet in diameter and 140 feet in height. The principal substances in solution are sulphates of lime and soda and chlorides of sodium and magnesium. The waters are very beneficial in cases of palsy, rheumatism, gout, leprosy, neuralgia, sciatica, chorea, diseases of the liver, and cutaneous and scrofulous affections. The influx of visitors, varying from 10,000 to 14,000 during the season, has greatly stimulated the adornment of the town. The Assembly rooms, built by Wood the younger, at a cost of £20,000, were opened in October 1771, and for elegance, comfort, and convenience, are not surpassed by any similar rooms in the kmgdom. The theatre, which is one of the best out of London, was opened in 1863, the former building having been burnt in 1862. The Literary and Scientific In- stitution, founded in 1826, is a handsome building of the Dorie order, and contains a laboratory, a lecture-room, a museum (with numerous Roman antiquities and ornitho- logical specimens), and an extensive library, in which is the Chapman collection illustrative of the history of Bath. The Rev. Leonard Blomefield (late Jenyns) has presented his fine library of natural history and science (including his herbarium) to the institution, The Guild-hall, with an elegant Grecian front,

was founded in 1766; and the wnarket-halls were reconstructed about 1863. Among the charitable institutions are the Mineral Water Hospital, opened in 1742, and extended in 1861; the Royal United Hospital, opened in 1826; Bellot's Hospital, which dates from 1611, though the present building was erected in 1859 ; St Catherine's Hospital, founded by Edward VL; St John's, founded by Bishop Fitz Joceline in 1174; and the Ear- and-Eye Infirmary, established in 1837. There are six banks, besides a savings-bank. The Sydney gardens have been open since 1795, and are frequently employed for public exhibitions and amusements; the Victoria Park, opened by the queen, when Princess Victoria, in 1830, is such as any city might be proud of. The corporation consists of a mayor, fourteen aldermen, and forty-two coun- cillors, and the town returns two meni- bers to parliament. Several newspapers are published weekly. The Great Western Railway connects Bath with London, Bristol, Salisbury, Wells, Wey- mouth, &c., from the first of which it is 107 miles distant ; the Midland line City Arms.

is connected with Bath by a junction at Mangotsficld ; and ready access to the south has recently been obtained by the opening of the Somerset and Dorset line. The Kennet and Avon canal, which joins the Thames at Reading, affords water communication with the metropolis. The population of the municipal borough was 54,240 in 1851, 52,528 in 1861, and 52,557 in 1871, nearly 60 per cent. of the last number being females. In 1871 the parliamentary borough contained 53,704 persons.

According to the legend to which the inhabitants ad- hered till the middle of the 18th century, Bath was founded by the British king Bladud; but its origin cannot be historically traced to an earlier date than the 1st century, when the Romans established here the city of Ague Solis, numerous remains of which have at various times been

discovered. During the Saxon period the chief events in its annals are the foundation of an abbey by Offa in 775, and the coronation of Edgar in 973. In the reign of William Rufus the city was reduced to ashes, but it soon recovered its prosperity under its abbot John of Villula, and his successors.

Richard Coeur de Lion granted its first charter as a free borough, and about the same time the foundations were laid of its wool manufactures. 'In 1297 the city was first represented in parliament ; in 1447 it obtained a charter from Henry VL., and one from Queen Elizabeth in 1590. In the 18th century it became the most fashionable watering-place in England, and was greatly extended under the direction of the architects Wood.

See Warner's History and Antiquities of Bath, 1801 ; Mainwar- ing's Collectanea; C. P. Russell, On the Growth of Bath, read before the Arch. Inst., 1858; Ancient Landmarks of Bath, by C. E. Davis; Wright's Hist. Guide to Bath, 1864 ; Harle's Guide to Bath, 1864; Lyell's Inaugural Address before Brit. Assoc., 1864 ; Sir G. Jackson's Archives of Bath, 2 vols., 1873; Peach, Rambles about Bath, 1875 ; Scarth, Aquce Solis, or Notices of Roman Bath, 1864.

BATH, a city and port of the United States of North America, chief town of the county of Sagadahock in Maine. It is situated on the W. bank of the Kennebec, about twelve miles from the sea, and forms a station on the branch railway from Brunswick to Rockland. The prosperity of the town depends almost entirely on its ship- ping and fisheries; and its manufacturing industries are nearly all auxiliary to the one department of shipbuilding, in which it competes with the chief American centres of the trade. It hasa fine custom-house built of granite. The city was settled in 1756, incorporated in 1780, and raised to the rank of a city in 1850. Population (1870), 7371.

BATH, Knicuts or THz. See Heratpry and Kyicur- HOOD.

BATHGATE, a town of Scotland, in the county of Linlithgow, 19 miles from Edinburgh, and 26 from Glas- gow, with both which it has direct communication by railway. The town is irregularly built, and has no buildings of importance except a well-endowed academy. The district is rich in limestone, coal, shale, and ironstone, which afford employment to a large part of the population. Paraffin and chemicals are extensively manufactured, and there are

lass-works and flour-mills. Population (1871), 4491.

BATHS. In the ordinary acceptation of the word a bath is the immersion of the body in a medium different from the ordinary one of atmospheric air, which medium is usually common water in some form. In another sense it includes the nature of the different media that may be used, and of the various arrangements by which they are applied. Perhaps the simplest method of presenting a general view of the whole subject is first to give an outline of the history of baths in all ages, and next to give some account of the principles on which baths act on the human system.

Ancient Baths.—Bathing, as serving both for cleanliness and for pleasure, has been almost instinctively practised by nearly every people. The most ancient records mention bathing in the rivers Nile andGanges. From an early period the Jews bathed in running water, used both hot and cold baths, and employed oils and ointments. So also did the Greeks ; their earliest and commonest form of bathing was swimming in rivers, and bathing in them was practised by both sexes. Warm baths were, according to Homer, used after fatigue or exercise. "The Athenians appear for a long time only to have had private baths, but afterwards they had public ones: the latter seem to have originated among the Juacedemonians, who invented the hot-air bath, at least the form of it called after them, the Laconicum. Although the baths of the Greeks were not so luxurious as those of some other nations, yet effeminate people were accused among them of using warm baths in excess; and the bath servants appear to have been rogues and thieves, as

in later and larger establishments. The Persians must have had handsomely equipped baths, for Alexander the Great admired the luxury of the baths of Darius.

But the baths of the Greeks, and probably of all Eastern nations, were on a small scale as compared with those which eventually sprung up among the Romans. In early times the Romans used after exercise to throw theinselves into the Tiber. Next, when ample supplies of water were brought into the city, large piscine, or cold swimming baths, were constructed, the earliest of which appear to have been the piscina publica (312 B.c.), uear the Circus Maximus, supplied by the Appian aqueduct, the lavacrum of Agrippina, and

a bath at the end of the Clivus Capi- tolinus. Next, small public as well as private baths were built ; and with the empire more luxurious forms of bathing were introduced, and warm became far more popular than cold baths.

Public baths or balnee were first built in Rome after Clodius brought in the supply of water from Preneste. After that date baths began to be common both in Rome and in other Italian cities; and private baths, which gradu- ally came into use, were attached to the villas of the wealthy citizens. Meecenas was one of the first who built public baths at his own expense. After his time each emperor, as he wished to ingratiate himself with the people, lavished the revenues of the state in the construction of enormous build- ings, which not only contained suites of bathing apartments, but included gymnasia, and sometimes even theatres and libraries. Such enormous establishments went by the name of therme. The principal therm were those of Agrippa 21 B.0., of Nero 65 a.v., of Titus 81, of Domitian 95, of Commodus 185, of Caracalla 217, and still later those of Diocletian 302, and of Constantine. The technical skill dis- played by the Romans in rendering their walls and the sides of reservoirs impervious to moisture, in conveying and heat- ing water, and in constructing flues for the conveyance of hot air through the walls, was of the highest order.

The Roman baths contained swimming baths, warm baths, baths of hot air, and vapour baths. The chief rooms (which in.the largest baths appear to have been mostly distinct, whereas in smaller baths one chamber was made to do duty for more than a single purpose) were the fol- lowing :—(1.) The apodyterium or spoliatorium, where the bathers undressed ; (2.) the alipteriwm or wactuarium,where oils and ointments were kept (although the bathers often brought their own pomades), and where the alpte anointed the bathers; (3.) The jfrigidariwm or cool room, cella frigida, in which usually was the cold bath, the piscina or baptisterium ; (4.) The tepidariwm, a room moderately heated, in which the bathers rested for a time, but which was not meant for bathing; (5.) The calzdarvwm or heating room, over the hypocaustum or furnace; this in its com- monest arrangement had at one end a warm bath, the alveus or calida lavatio ; at the other end in a sort of alcove was (6.) The sudatorium or laconicwm, which usually had a labrum or large vessel containing water, with which bathers sprinkled themselves to

help in rubbing off the perspira- tion. In the largest baths the laconicum was probably a separate chamber, a circular domical room with recesses in the sides, and a large opening in the top; but there is no well-preserved specimen, unless that at Pisa may be so regarded. In the drawing of baths from the therme of Titus (fig. 1), the laconicum is represented as a small cupola rising in a corner of the calidarium. It is known that the temperature of the laconicum was regulated by drawing up or down a metallic plate or clypeus. | Some think that this clypeus was directly over the flames of the hypocaustum, and that when it was withdrawn, the flames must have sprung into the laconicum. Others, and apparently they have Vitravius on their side, think that the clypeus was

drawn up or down only from the aperture in the roof, and that it regulated the temperature simply by giving more or less free exit to the hot air. The question must for the present remain unsettled ; if the laconicum was only one end of the calidarium, it is difficult to see how that end of the room was kept so much hotter than the rest of it; on the other hand to have had flames actually issuing from the laconicum, must have caused smoke and soot, and have been very unpleasant. The most usual order in which the rooms were employed seems to have been the following, but there does not appear to have been any absolute uniformity of practice then, any more than in modern Egyptian and Turkish baths. Celsus recommends the bather first to sweat a little in the tepidarium with his clothes on, to be anointed there, and then to pass into the calidarium ; after he has sweated freely there he is not to descend into the solium or cold bath, but to have plenty of water poured over him from his head,—first warm, then tepid, and then cold water,—the water being poured longer over his head than on the rest of the body; next to be scraped with the strigil, and lastly to be rubbed and anointed.

The warmest of the heated rooms, 7.e., the calidarium and laconicum, were heated directly from the hypocaustum, over which they were built or suspended (swspensura) ; while from the hypocaustum tubes of brass, or lead, or pottery carried the hot air or vapour to the walls of the other rooms. The walls were usually hollow, so that the hot air could readily circulate.

- The water was heated ingeniously. Close to the furnace, about 4 inches off, was placed the culidarium, the copper (ahenum) for boiling water, near which, with the same interval between them, was the copper for warm water, the tepidarium, and at the distance of 2 feet from this was the receptacle for cold water, or the frigidarium, often a plastered reservoir. A constant communication was kept up between these vessels, so that as fast as hot water was drawn off from the calidarium a supply was obtained from the tepidarium, which, being already heated, but slightly reduced the temperature of the hotter boiler. The tepidarium, again, was supplied from the frigidarium, and that from an aqueduct. In this way the heat which was not taken up by the first boiler passed on to the second, and instead of being wasted, helped to heat the second—a principle which has only lately been introduced into modern furnaces. In the case of the large thermz the water of an aqueduct was brought to the castellum, or top of the build- ing, and was allowed to descend into chambers over the hypocaustum, where it was heated and transmitted in pipes to the central buildings. Remains of this arrangement are to be seen in the baths of Caracalla, The general plan of such buildings will be more clearly understood after an examination 2f the accompanying illustrations. In the

SUDATIO

Fic. 1.—Roman Baths.

well-known drawing (tig. 1) found in the baths of Titus, the name of each part of the building is inscribed on it. The small dome inscribed laconicum directly over the furnace, and haying the clypeus over it, will be observed in the corner

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of the chamber named concamerata sudatio. The vessels for water are inscribed, according to thair temperature, with the same names as some of the chambers, frigidarium, tepi- darium, and calidarium.

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The baths of Pompeii (as shown in fig. 2) were a double set, and were surrounded with tabernz or shops, which are marked by a lighter shade. There were streets on four sides ; and the reservoir supplying water was across the street in the building on the left hand of the cut. There were three public entrances—2la, 216, 21c-—to the men's baths and one to the women's. The furnaces (9) heated water, which was conveyed on one side to the larger baths of the men, on the other to the women's. Entering from the street at 21c there was a latrina on the left hand (22). From this it was usual to proceed to a court (20) surrounded by pillars, where servants were in attendance. There is some doubt as to the purpose to which the room (19) was devoted. Leaving the hall a passage conducted to the apodyterium or dressing-room (17), at one end of it is the frigidarium, baptisterium, or cold plunge bath (18). Entering out of the apodyterium is the tepidarium, or warming-room (15), which most probably was also used as the alipterium or anointing-room. From it bathers passed into the hot room or calidarium (12), which had at one end the alveus or calida lavatio (13), at the other end the labrum (14). This end of the calidarium served as the laconicum. The arrange- NT AN ments of the women's baths were similar, but on a smaller scale. The calidarium (5) had the labrum (7) ut one end, and the alveus (6) was in one side of the room. The general arrange- ments of a calidarium are well illustrated by the ac- Fre. 3.—Section of Bath discovered at companying section (fig. on re showing the calidarium 3) of a bath discovered at '

Tusculum. The disposition of the parts is the same as at Pompeii. We here have the calidarium supported on the pillars of the fornax, the suspensura. The alveus (3) is

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at one end, and the labrum (4) at the other. (1) and (2) are the vessels for water over the fornax; and the pas- sages in the roof and walls for the escape of heated air will be observed,

A clear idea of the relative position of the different rooms, and some slight indication of their ornamentation, will be obtained from the accompanying woodcut (fig. 4), The flues

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BI ge MB ee CALDARIUM

FRIGIDARIUM TEPIDARIUM— Fic. 4.—Section of Baths of Pompeii.

under the calidarium and the labrum (1) may be observed, as also the opening in the roof above. (2), (3), and (4) mark the vessels for water which are placed between the men’s baths on the left and the women’s on the right.

The arrangements of the therme were mainly those of the balnez on a larger scale. Some idea of their size may be gathered from such facts as these, that in the baths of Diocletian one room has been transmuted into a church of most imposing proportions, and that the outside walls of the baths of Caracalla extend about a quarter of a mile on each of the four sides. A visit to the remains of the baths of Titus, of Diocletian, or of Caracalla impresses the mind strongly with a sense of the vast scale on which they were erected, and Ammianus’s designation of them as pro- vinces appears scarcely exaggerated, It is said that the

baths of Caracalla contained 1600, and those of Diocletian

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Fria. 5.—Ground-Plan of the Baths of Caracalla.

3200 marble seats for the use of the bathers. In the largest of the therme there was a stadium for the games of the young men, with raised scats for the spectators. There were open colonnades and seats for phil osophers and literary men to sit and discourse or read their productions aloud, or for others to discuss the latest news, Near the porticoes, in the interior open space, rows of trecs were

BATHS

planted. 'There was a spheeristerium, or place for playing ball, which was often over the apodyterium ; but it must be confessed that the purposes of many portions of these large edifices have not been made out in as satisfactory a way as those of smaller baths. A more definite idea of the therme can be best got by an examination of the accom- panying plan of the baths of Caracalla (fig. 5). A good deal of the plan is conjectural,—the restorations being marked by lighter shading.

At the bottom of the plan is shown a long colonnade, which faces the strect, behind which was a series of chambers, supposed to have been separate bathing-rooms. Entering by the opening in its centre, the visitor passes what was probably an inner colonnade round the main building. Passing in by

either of the gates (2, 2), he reaches the large chamber (8), which has been variously called the natatio or large swimming bath, or the tepidarium. The great central room (4) in al] probability was the calidarium, with two labra (6, 6) on opposite sides, and with four alvei, one in each corner, represented by small circular dots. (9) has been regarded by some as the laconi- cum, although it appears very large for that purpose. The rooms (15, 15) have been variously described as baptisteria and as Jaconica. Most authors are agreed in thinking that the large rooms (18) and (16) were the spheristeria, or places for playing ball.

Returning to the outside, (1) and (18) and the corresponding places on the other side, are supposed to have been the exedre for philoso- phen and places corresponding to the Greek xysti. (20) and (19)

ave been considered to be servants' rooms. (22) was the stadium, with raised seats for the spectators. The space between this and the large central hall (9) was planted with trees, and at (21) the aque- duct brought water into the castellum or reservoir, which was on an upper story. There were upper stories in most portions of the building, and in these probably were the libraries and small theatres. | The magnificence of many of the therme and their luxu- _ rious arrangements were such that some writers, as Seneca, are quite lost in their descriptions of them. The piscing _ were often of immense size,—that of Diocletian being 200 | feet long,—and were adorned with beautiful marbles. The halls were crowded with magnificent columns, and were ornamented with the finest pieces of statuary. The walls, it has been said, were covered with exquisite mosaics that imitated the art of the painter in their elegance of design and variety of colour. The Egyptian' syenite was encrusted with the precious green marbles of Nu- midia. The rooms contained the works of Phidias and Praxiteles. A perpetual stream of water was poured into capacious basins through the wide mouths of lions of bright and polished silver; water issued from silver, and was received on silver. 'To such a pitch of luxury have we reached," says Seneca, "that we are dis- satisfied if we do not tread on gems in our baths."

The richer Romans used every variety of oils and pomades (smeg- mata); they scarcely had true soaps. 'The poorer class had to be content with the flour of len- tils, an article used at this day 1 the Alipterium. for the same

purpose by Orientals. Tbe most import- ant bath utensil was the strigillus, a curved instru- ment made of metal, with which the skin was scraped and all sordes removed.

The bath servants assisted in anointing, in using | the strigillus, and in various other menial offices. The |

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Fi¢.6.1—Ringon which are suspended some of the articles in use

poorer classes had to use their strigils themselves. The

1 The figure represents four strigils, in which the hollow for collect- ing the oil or perspiration from the body may be observed. There is also a small ampulla or vessel containing oil, meant to keep the strigils smooth, and a small flat patera or drinking vessel, out of which it was customary to drink after the bathing was finished.

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various processes of the aliptz seem to have been carried on very systematically.

The hot baths appear to have been open from 1 p.m. till dark. It was only one of the later emperors that had them lighted up at night. When the hot baths were ready (for, doubtless, the plunge baths were available at an earlier hour), a bell or ws was rung for the information of the people. Among the Greeks and Romans the eighth hour, or 1 o'clock, before their dinner, was the commonest hour for bathing. The bath was supposed to promote appe- tite, and some voluptuaries had one or more baths after dinner, to enable them to begin eating again; but such excesses, as Juvenal tells us, occasionally proved fatal. Some of the most effeminate of the emperors are said to have bathed seven or eight times in the course of the day. In early times there was delicacy of feeling about the sexes bathing together ; even a father could not bathe with his sons, but latterly, under most of the emperors, men and women often used the same baths, There frequently were separate baths for the women, as we see at Pompeii, or at

Badenweiler; but although respectable matrons would not go to public baths, promiscuous bathing was common during the empire

The public baths and therme were under the more immediate superintendence of the ediles. The charge made at_a public bath was only a quadrans or quarter of an as, about half a forthing. Yet cheap though this was, the emperors used to ingratiate themselves with the populace, by making the baths at times gratuitous.

Wherever the Romans settled, they built public baths ; and wherever they found hot springs or natural stufe, they made use of them, thus saving the expense of heating, as at the myrteta of Baix, or the aque solis of Bath. In the cities there appear to have been private baths for hire, as well as the public baths ; and every rich citizen had a set of baths attached to his villa, the fullest account of which is given in the Letters of Pliny, or in Ausonius's Accownt of a Villa on the Moselle, or in Statius's De Balneo Htrusco, Although the Romans never wholly gave up cold bathing, and that practice was revived under Augustus by Antonius Musa, and again under Nero by Charmis (at which later time bathing in the open sea became common), yet they chiefly practised warm bathing (calida lavatio). This is the most luxurious kind of bathing, and when indulged to excess, is enervating, 'The women were particularly fond of these baths, and were accused, at all events in some provincial cities, of drunkenness in them.

The unbounded licence of the public baths, and their connection with modes of amusement that were con- demned, led to their being to a considerable extent proscribed by the early Christians The early fathers wrote that bathing might be practised for the sake of cleanliness or of health, but not of pleasure; and Gregory the Great saw no objection to baths being used on Sunday. About the 5th century many of the large thermz in Rome fell into decay. The cutting off of the aqueducts by the Huns, and the gradual decrease of the population, contributed to this. Still it is doubtful whether bathing was ever disused to the extent that is usually represented. It was certainly kept up in the East in full vigour at Alexandria and at Brusa. Hot bathing, and especially hot air and vapour baths, were adopted by the Mahometans; and the Arabs brought them with them into Spain. The Turks, at a later time, carried them high up the Danube, and the Mahhometans

spread or, it may be more correct to say, revived their use in Persia and in Hindustan. The Crusaders also contributed to the spread of baths in Europe, and hot vapour baths were specially recommended for the leprosy so prevalent in those days. After the commencement of the 13th century there were few large cities in Europe without hot vapour baths.

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We have full accounts of their regulations,—how the Jews were only allowed to visit them once a week, and how there were separate baths for lepers. In England they were called hothouses. Erasmus, at the date of the Reformation, spoke of them as common in France, Germany, and Belgium; he gives a lively account of the mixture of all classes of people to be found in them, and would imply that they were a common adjunct to inns. They seem after a time to have become less common, though Montaigne mentions them as being still in Rome in his day. In England the next revival of baths was at the close of the 17th century, under the Eastern name of Hummuns, or the Italian name of Bagnios. As these, like more recent revivals of them, were avowedly on the prin- ciple of the Turkish baths, that species of bath must be briefly noticed. But before doing so, we must observe that there were several considerable epochs in the history of baths, one in the commencement of the 18th century, when Floyer and others recalled attention to cold bathing, of which the virtues had long been overlooked. In the middle of the century also, Russell and others revived sea-bathing in England, and were followed by others on the Continent, until the value of sea-bathing became fully appreciated. Later in the same century the experiments of Currie on the action of complete or of partial baths on the system in disease attracted attention; and though forgotten for a while, they have borne abundant fruit in more recent times.

Modern Baths.—It is uncertain how far the Turkish and Egyptian and even the Russian baths are to be regarded merely as successors of the Roman baths, because the principle of vapour baths has been known to many nations in a very early period of civilization. Thus the Mexicans and Indians were found using small vapour baths. The ancient inhabitants of Ireland and of Scotland had some notion of their use, and the large vapour baths of Japan, now so extensively employed, are probably of independent

origin. We extract at some lengthaccounts of Turkish and of Russian baths, as they illustrate the practices of the ancient Roman and of modern Turkish baths. The first is taken from Lane's work On the Modern Egyptians :—" The building consists of several apartments, all of which are paved with marble, chiefly white. The inner apartments are covered with domes, which have a number of small glazed apertures for the admission of light. The bather, on entering, if he has a watch or purse, gives them in charge to the keeper of the bath. The servant of the bath takes off his shoes, and supplies him with a pair of wooden clogs. The first apartment has generally three or four leewans (raised parts of the floor used as couches) cased with marble, and a fountain of cold water, which rises from an octagonal basement in the centre. One of the leewans, which is meant for the higher classes, is furnished with cushions or mats.

"In warm weather bathers usually undress in this rcom ; in winter they undress in an inner room, called the bey- towwal, or first chamber, between which and the last apartment there is a passage often with two or three latrines off it. This is the first of the heated chambers, It gene- rally has two raised seats. The bather receives a napkin in which to put his clothes, and another to put round his waist ; this reaches to the knees, a third, if he requires it, is brought him to wind round his head, leaving the top of it bare ; a fourth to put over his chest, and a fifth to cover his back. When the bather has undressed, the attendant opens to him the door of the inner and principal apartment. This in general has four leewans, which gives it the form of a cross, and in the centre a fountain of hot water rises from a small shallow basin. The centre room, with the adjoining ones, forms almost a square. The beytowwal

already mentioned is one of them. Two small chambers which adjoin each other, one containing a tank of hot water, the other containing a trough, over which are two taps, one of hot and one of cold water, occupy the two other angles; while the fourth angle of the square is occupied by the chamber which contains the fire, over which is the boiler.

"The bather having entered this apartment soon per- spires profusely from the humid heat which is produccd by the hot water of tanks and fountains,

and by the steam of the boiler. The bather sits on one of the marble seats, or lies on the leewan, or near one of the tanks, and the operator then commences his work. The operator first cracks aloud every joint in the body. He makes the vertebrae of the back and even of the neck crack. The limbs are twisted with apparent violence, but so skilfully, that no harm is ever done. The operator next kneads the patient's flesh. After this he rubs the soles of the feet with a kind of rasp of baked clay. There are two kinds of rasps, one porous and rough, one of fine smooth clay. Those used by ladies are usually encased in thin embossed silver. The next operation is rubbing the bather's flesh with a small coarse woollen bag, after which the bather dips himself in one of the tanks. He is next taken to one of the chanibers in the corner, and the operator lathers the bather with fibres of the palm tree, soap and water. The soap is then washed off with water, when the bather having finished washing, and enveloped himself in dry towels, returns to the beytowwal and reclines. Here he generally remains an hour to an hour and a half, sipping coffee and smoking, while an attendant rubs the soles of the feet and kneads the body and limbs. The bather then dresses and goes out."

The following description of a Russian bath is from Kohl's Russia :—"The passage from the door is divided into two behind the check-taker's post, one for the male, one for the female guests. We first enter an open space, in which a set of men are sitting in a state of nudity on benches, those who have already bathed dressing, while those who are going to undergo the process take off their clothes. Round this space or apartment are the doors leading to the vapour-rooms, The bather is ushered into them, and finds himself in a room full of vapour, which is surrounded by a wooden platform rising in steps to near the roof of the room. The bather is made to lie down on one of the lower benches, and gradually to ascend to the higher and hotter ones. The first sensation on entering the room amounts almost to a feeling of suffocation. After you have been subjected for some time to a temperature which may rise to 145°, the transpiration reaches its full activity, and the sensation is very pleasant. The bath attendants come and flog you with birchen twigs, cover you with the lather of soap, afterwards rub it off, and then hold you over a jet of ice cold water. The shock is great, but is followed by a pleasant feeling of great comfort and of alleviation of any rheumatic pains you may have had. In regular establishments you go after this and lie down on a bed for a time before issuing forth, But the

Russians often dress in the open air, and instead of using the jet of cold water, go and roll themselves at once in the snow."

Turkish baths have, with various modifications, become popular in Europe. The Russian baths were introduced into most German towns about half a century ago. They had a certain limited amount of popularity, but did not take firm root. Another class practically owes its origin to Dr Barter and Mr Urquhart. It professed to be founded on the Turkish bath, but in reality it was much more of a hot air bath, z.e., more devoid of vapour than either Roman or Turkish baths ever were, for it is doubtful whether in any case the air of the laconicum was free from vapour,

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These baths, with their various modifications, have become extremely popular in Great Britain, in Germany, and in Northern Europe, but have, curiously enough, never been used extensively in France, notwithstanding the familiarity of the French with Turkish baths in Algiers.

In England hot air baths are now employed very exten- sively. They are often associated with Turkish and electric baths, and with the usual processes of hydropathic treat- ment.

Bathing among the ancients was practised in various forms. It was sometimes a simple bath in cold or in tepid water; but at least, in the case of the higher orders, it usually included a hot air or vapour bath, and was followed by affusion of cold or warm water, and generally by a plunge into the piscina. In like manner the order varies in which the different processes are gone through in Turkish baths in modern Europe. Thus in the new baths in Vienna, the process begins by immersion ina large basin of warm water. Sudation is repeatedly interrupted by cold douches at the will of the bathers, and after the bath they are satisfied with a short stay in the cooling-room, where they have only a simple sheet rolled round them. In Copenhagen and in Stockholm the Oriental baths have been considerably modified by their association with hydro- pathic practices.

This leads us to notice the introduction of hydropathy. Although cold baths were in vogue for a time in Rome, warm baths were always more popular.

Floyer, as we have seen, did something to revive their use in Eugland ; but it was nearly a century and a half afterwards that a Silesian peasant, Priessnitz, introduced, with wonderful ° success, a variety of operations with cold water, the most. important. of which was the packing the patient in a wet sheet, a process which after a time is followed by profuse sudation. Large establishments for carrying out this mode of bathing and its modifications have within the last thirty years been erected in many places on the Continent and in Great Britain, and have enjoyed a large share of popularity.

But the greatest and most important development of ordinary baths in modern times has taken place in England, and has been extending gradually to the Continent. The English had long used affusion and swimming baths freely in India. Cold and hot baths and shower baths have been introduced into private houses to an extent never known before ; and, from 1842 downwards, public swimming baths, besides separate baths, have been supplied to the public at very moderate rates, in some cases asso- ciated with wash-houses for the poorer classes. Their number has increased rapidly in London, and in the prin- cipal Continental cities. Floating baths in rivers, always known in some German towns, have become common where- ever there are flowing streams. The better supply of most European cities with water has aided in this movement.

Ample enclosed swimming baths have of late years been

erected at many sea-side places. When required, the water, if not heated in a boiler, is raised to a sufficient temperature by the aid of hot water pipes or of steam; and gas has been utilized for heating small quantities of water for baths in private houses. As to separate baths they used to be of wood, painted; they are now most frequently of metal, painted or lined with porcelain enamel, The swimming baths are lined with cement, tiles, or marble aud porcelain slabs ; and in some of the newest baths a good deal of ornamentation and painting of the walls and ceiling of the apartments, in imitation of the ancients, has been attempted.

We have thus traced in outline the history of baths through successive ages down to the present time. The medium of the baths spoken of thus far has been water, vapour, or dry hot air. But baths of more complex

nature, and of the greatest variety, have been in use from the earliest ages. The best known media are the various mineral waters and sea-water. These, and baths impreg- nated with their gases, cannot here be considered in detail ; we can do little more than enumerate a few of the artificial baths. Of baths of mneral substances, those of sand are the oldest and best known; the practice of arenation or of burying the body in the sand of the sea-shore, or in heated sand near some hot spring, is very ancient, as also that of applying heated sand to various parts of the body. Within the last few years establish- ments have been introduced into various European cities where hot dry sand is methodically applied. Baths of peat earth are of comparatively recent origin, and are little used out of Germany. The peat earth is carefully pre- pared and pulverized, and then worked up with water into a pasty consistence, of which the temperature can be regulated before the patient immerses himself in it.

There are various baths that may be termed chemical, in which chlorine or nitromuriatic acid is added to the water of the bath, or whcre fumes of sulphur are made to rise and envelop the body.

Of vegetable baths the number is very large. Leys of wine, in a state of fermentation, have been employed. An immense variety of aromatic herbs have been used to impregnate water with. Of late years fuci or sea-weed have been added to baths, under the idea of conveying into the system the iodine which they contain ; but by far the most popular of all vegetable baths are those made with an extract got by distilling certain varieties of pine leaves. They are pleasant and stimulating.

The strangeness of the baths of anzmal substances, that have been at various times in use, is such that their employ- ment seems scarcely credible. That baths of milk or of whey might be not unpopular is not surprising, but baths of blood, in some cases even of human blood, have been used ; and baths of horse dung were for many ages in high favour, and were even succeeded for a short time by baths of guano.

Electrical or galvanic baths have been popular of late years, in which galvanic action is communicated to the patient while in baths.

Baths also of compressed air, in which the patient is subjected to the pressure of two or three atmospheres, have been in use at certain places for some years.

A sun bath (cnsolatio or heliosis), exposing the body to the sun, the head being covered, was a favourite practice among the Greeks and Romans, This list of artificial baths might be readily increased.

We have hitherto spoken of general baths, but there are many varieties of local ones, the use of which has become somewhat more definite than it used to be, before the principles of hydropathy were understood. Some of these are affusion, half-baths, full baths, sitz baths, wave baths, local baths, shower and spray baths, douches, fomentations, injections, wrapping up in the wet sheet. Some of these processes, though by no means of novel origin, require a few words of explanation.

Douches were used by the ancients, and have always been an important mode of applying water to a circum- scribed portion of the body. They are, in fact, spouts of water, varying in size and temperature, applied with more or less force for a longer or shorter time against particular parts A douche exercises a certain amount of friction, and a continued impulse on the spot to which it is applied, which stimulate the skin and the parts beneath it, quicken the circulation of the capillaries, and thus favour the absorption of abnormal deposits. It wakes up the slumbering activity of the tissues and helps to remove congestions from the deeper seated organs. The

effects of the douche are so powerful that it cannot be applied for a long time continuously. After every two or three minutes there should be an interval in its use. It is obvious that a douche is capable of many local applica- tions, on the description of which it is here impossible to enter. Nor need we say that the douche must be used with great care in the case of nervous and excitable people, and better not at all when any irritation or inflammation is present. Douches are invaluable in old neuralgias, in the sequele of rheumatism, and in thickened joints.

The alternation of hot and cold douches, which for some unknown reason has got the name of Zcossazse, is a very powerful remedy from the strong action and reaction which it produces, and is one of very great value. The

shower bath may be regarded as a union of an immense number of fine douches projected on the head and shoulders. It has been long in use in England, and produces a strong effect on the nervous system. An ingenious contrivance for giving circular spray baths, by which water is pro- pelled laterally in fine streams against every portion of the surface of the body, is now found in most establishinents.

To all these modes of acting on the cutaneous surface and circulation must be added dry rubbing, as practised by the patient with the flesh glove, but much more thor- oughly by the bath attendants, if properly instructed.

Action of Baths on the Human System.—We shall now inquire shortly into the theory of the operation of the baths and of the bathing processes, of which we have briefly traced the history.

The primary operation of baths is the action of heat, and cold on the cutaneous surfaces through the medium of water.

The first purpose of baths is simply that of abstersion and cleanliness, to remove any foreign impurity from the surface, and to prevent the pores from being clogged by their own secretions or by desquamations of cuticle. It need scarcely be said that such objects are greatly promoted by the action of the alkali of soaps and by friction ; that the use of warm water, owing to its immediate stimulation of the skin, promotes the scparation of sordes; and that the vapour of water is still more efficient than water itself.

'It has been supposed that water acts on the system by being absorbed through the skin. The question has been frequently discussed ; but the great majority of observers believe that, under ordinary circumstances, no water is absorbed, or if any, so minute a quantity that it is not worth considering. And further, as we have alluded to medicated baths, it is proper to say that, according to the latest authorities, no foreign bodies, under the ordinary circumstances of a bath, are absorbed into the system ; although when a portion of skin has been entirely cleared of its sebaceous secretion, it is possible that a strong solution of salts may be partially absorbed. In the case of medicated baths we therefore only look (in addition to the action of heat and cold, or more properly to the abstrac- tion or communication and

retentien of heat) to any stimulant action on the skin which the ingredients of the bath may possess.

The powerful influence of water on the capillaries of the skin, and the mode and extent of that operation, depend primarily on the temperature of the fluid ; for the influence of the mechanical pressure on the body of the water of a bath, which has been calculated at nearly one pound on each square inch of the surface, has never been accurately determined. Baths have therefore to be considered according to their temperature ; and the effects of cold and of hot baths have to be studied. But we may as well first point out one or two general facts. The human system bears changes of temperature of the air much better than changes of the temperature of water. While the temperature of the

air at 75° is perhaps too warm for the feelings of many people, a continued bath at that temperature is felt to be cold and depressing. Again, a bath of 98° to 102° acts far more excitingly than air of the same temperature, both because, being a better conductor, water brings more heat to the body, and because it suppresses the perspiration, which is greatly augmented by air of that temperature. Further, a temperature a few degrees below blood heat is that of indifferent baths, which can be borne longest without natural disturbance of the system.

Cold baths act by refrigeration, and their effects vary according to the degree of temperature. The effects of a cold bath, the temperature not being below 50°, are these :— there is a diminution of the temperature of the skin and of the subjacent tissues; the blood at first rises in temperature nearly 4°, but soon subsides again, this diminution of

temperature of the blood usually not taking place in the ©

bath, but shortly after leaving it. There is a certain feeling of shock diffused over the whole surface, and if the cold is intense it induces a slight feeling of numbness in the skin. It becomes pale and its capillaries contract. The further action of a cold bath reaches the central nervous system, the heart and the lungs, as manifested by the tremor of the limbs it produces, along

with a certain degree of oppression of the chest and a gasping for air, while the pulse becomes small and sinks. After a time reaction takes place, and brings redness to the skin and an increase of temperature.

The colder the water is, and the more powerful and depressing its effects, the quicker and more active is the reaction. Very cold baths, anything below 50°, cannot be borne long. Lowering of the temperature of the skin may be borne down to 9°, but a further reduction may prove fatal. The diminution of temperature is much more rapid when the water is in motion, or when the bather moves about; because, if the water is still, the layer of it in immediate contact with the body gets warmed to a certain degree.

The effects of hydropathy depend on the power of abstracting heat from the body, and of stimulating it by the application of cold water. The action is depressing or exciting, according as the withdrawal of heat or the stimu- lation predominates.

A great deal depends on the form of the bath; thus one may have—(1.) Its depressing operation,—with a loss of heat, retardation of the circulation, and feeling of weari- ness, when the same water remains in contact with the skin, and there is continuous withdrawal of heat without fresh stimulation. This occurs with full or sitz baths, with partial or complete wrapping up the body in a wet sheet which remains unchanged, and with frictions practised without removing the wet sheets. (2.) Its exciting operation,—with quickening of the action of the heart and lungs, and feeling of glow and of nervous excitement and of increased muscular power. 'These sensations are produced when the layer of water next the body and heated by it is removed, and fresh cold water causes fresh stimulus. These effects are produced by full baths with the water in motion used only for a short time, by frictions when the wet sheet is removed from the body, by douches, shower baths, bathing in rivers, &c. The depressing operation comes on much earlier in very cold water than in warmer ; and in the same way the exciting operation comes on faster with the colder than with the warmer water. The short duration of the bath makes both its depressing and its exciting action less ; its longer duration increases them ; and if the baths be con- tinued too long, the protracted abstraction of animal heat may prove very depressing.

We shall not attempt to give more than those few hints about hydropathic processes, and shall merely remark that, under them the system is subjected to alternate periods of

excitement and of rest. There is persistent lowering of the temperature of the body, with contraction of the capillaries and local anemia. This is succeeded by the reverse, or by local hyperemia. There is powerful excitement of the vascular and nervous systems. The processes of absorption and of excretion are stimulated. There is a great increase of perspiration. The transformation of tissue is materially quickened.

We must next consider the operation of warm baths of different temperatures.

Tepid, 85° to 95°,—The effects of a bath of this tem- perature are confined to the peripheral extremities of the nerves, and are so slight that they do not reach the central system. 'There is no reaction, and the animal temperature remains unchanged. Baths of this kind can be borne for hours with impunity.

Warm baths from 96° to 104°.—In these the action of the heat on the peripheral surface is propagated to the central

system, and causes reaction, which manifests itself in

moderately increased flow of the circulating fluids to the surface, and in an increased frequency of pulse. It appears to supply a slight stiinulus to the renewal of tissue.

With a hot bath from 102° up to 110° the central nervous and circulating systems are more affected. The frequency of the pulse increases rapidly, the respiration becomes quickened, and is interrupted by deep inspirations. The skin is congested, and the retained animal heat bursts out, causing a profuse perspiration.

Very hot bath.—Everything above 110° feels very hot ; anything above 120° almost scalding. Baths of from 119° to 126° have caused a rise of 2° to 44° in the temperature of the blood. Such a bath can only be borne for a few minutes. It causes violent reflex action on the heart and the arterial system, excessive congestion of the skin, and violent perspiration.

In the use of hot baths a certain amount of vapour reaches the parts of the body not covered by the water, and is also inhaled.

Vapour baths produce profuse perspiration, and act in cleansing the skin, as powerful hot water baths do. Vapour, owing to its smaller specific heat, does not act so fast as water on the body. A vapour bath can be borne for a much longer time when the vapour is notinhaled. Vapour baths can be borne hotter than water baths, but can- not be continued so long, as vapour, being a bad con- ductor, prevents radiation of heat from the body. A higher heat than 122° is not borne comfortably. The vapour bath, though falling considerably short of the temperature of the hot air bath, heats the blood considerably more.

fot air baths differ from vapour baths in not impeding the respiration as the latter do, by depositing moisture in the bronchial tubes. The lungs, instead of having to heat the inspired air, are subjected to a temperature above their own. Hot air baths, say of 135°, produce more profuse perspiration than vapour baths. If very hot, they raise the temperature of the body by several degrees.

Vapour baths, hot air baths, and many hydropathic processes agree in producing violent sudation, and also fre- quently in subjecting the body, while ina state of perspiration, to the action of water of a comparatively low temperature. Of perspiration we shall only say, that it is sensible and insensible : 30 oz. may be considered to be about its average amount in the twenty-four hours ; of this, which is chiefly water, about 4 of an oz. consists of urea and of other peculiar substances. A man has been known to lose 3 Ib in a Russian bath; some think more may be lost. As per- spiration eliminates water and effete matter from the system, and also aids in respiration, it is obvious that its regulation must have an important effect on the economy.

In comparing the general effects of hot and cold baths, it

BAT—BAT

may be said that while the former tend to check cutaneous transpiration, the latter favour it. It is supposed, but is scarcely proved, that cold baths, by the stimulus they give, increase the reaction of the gastric and other fluids of the stomach, and of the alimentary canal, and that warm baths rather serve to retard it. Either hot or cold baths, but especially the latter, favour the secretion of urme. Whether warm or cold baths, like the breathing of hot or cold air, have any effect on the exhalation of carbonic acid has not been determined.

The warm bath causes swelling and congestion of the capillaries of the surface in the first instance; when the stimulus of heat is withdrawn their contraction ensues. A cold bath, again, first causes a contraction of the capillaries of the surface, which is followed by their expansion when reaction setsin. A warm bath elevates the temperature of the body, both by bringing‘a supply of heat to it and by preventing the radiation of heat from it. It can be borne longer than a cold bath. It draws blood to the surface, while a cold bath favours internal congestions, There is in both cases increased oxidation or waste of the tissues ; but with the warm bath there is less call made on the system, as oxidation depends chiefly on increased heat, which in the case of the warm baths is artificially supplied. The reason why a man when much exhausted feels a hot bath refreshing, while he cannot bear a cold one, may be that the increased heat conveyed to him by the warm bath helps the process of oxidation, and thus relieves his system. Cold refreshes by exciting the functions, heat by physically relicving their action; a hot bath calms by reducing the loss of heat, and by supplyimg a certain amount of it. Very hot baths, it is true, act like cold baths, as stimulants to the heart and nervous centres; but they do it more gradually and with lcss shock to the system than culd baths. The general result of this comparison would show that warm are a milder remedy than cold baths, and are applicable often when the system does not possess power of reaction sufficient to make the use of the latter expedient.

As regards the use of baths simply for the promotion of health, it follows, from what has been stated, that warm baths are best suited for the delicate,

for the very young, and for the old; cold baths for the strong and active, in whom the powers of reaction are unimpaired. It would be out of place to say much here about the use of baths in medicine. Warm baths according to their degree of heat are of great value in relaxing spasms, in calming the nervous system, and in neuralgias, chronic rheumatism, and gout. Turkish baths are useful in these last affections, and wherever it is of importance that there should be free action of the skin. Cold baths, again, are more useful when the system requires tonics, and when it can bear the shock of cold affusion; when diseases of the system, especially of the nervous system, are more functional than organic. It is obvious that the cold-water cure, including, as it does, copious sudation, combines in a certain degree the effects of both kinds of baths.

But baths often produce injurious effects when used injudiciously. Long continued warm baths are soporific, and have owing to this action often caused death by drown- ing. The effects of very hot baths are swimming in the head, vomiting, fainting, congestion of the brain, and, in some instances, apoplexy.

The symptoms seem to point to paralysis of the action of the heart. It is therefore very evident how cautious those should be, in the use of hot baths, who have weak hearts or any obstruction to the circulation. Fat men, and those who are full-blooded or predisposed to epilepsy, should avoid them. Protracted indulgence in warm baths is relaxing, and has been esteemed a sign of effeminacy in all ages. Sleepiness, though it will not follow the first immersion in

a cold bath, is one of the effects of protracted cold baths ; depression of the temperature of the surface that exceeds 9° becomes dangerous. 'The risk in cold baths is congestion of the internal organs, as often indicated by the lips getting blue. Extremely cold baths are, therefore, very unsafe wherever there is a tendency to internal congestion ; and. they are always dangerous, when the system is cxhausted by fatigue.

We shall conclude with a few words of advice about ordinary bathing for hygienic purposes :—Wherever it is practicable, bathing should be over

before 1 p.m. It is not to be thought of when the stomach is loaded, or after much wine. The shorter the bath is, especially if the water be cold, and the bather cannot swim, the better,—say five minutes. He should swim if possible, and then a quarter of an hour is long enough. Bathing should not be practised more than once a day. When one is over-heated, but not exhausted, it is advisable to bathe at once, without waiting to cool. After hot air or vapour baths care must be taken that cold be not caught, although the more enthusiastic advocates of such baths declare that there is no risk of this.

For the literature of baths in earlier periods we would refer to the Architecture of Vitruvius, and to Lueian's Hippias ; to A. Baecius, De Thermis Veterum (in Grevii Thesaur. Antiquitat. Roman., 1694, vol. xii.); to Cameron's Roman Baths, London, 1772; to Gell's Pom- peianad, London, 1886; to Bechi, Aluseo Borbonieo, ii. 49-52; to Beeker's Gallus, and to the article " Balnez " by Rieh, in Dr Smith's Dietion- ary of Greek and Roman Antiquities. Some of the more important works on the use of water externally are those of Floyer, Enquiry into the Right Use of Water, London, 1697; F. Hoffman, De Aqua Medieina Universalt, Halle, 1712; Lucas, Theory and Use of Baths, Dublin, 1772; James Currie, Afedical Reports on the Effects of Water, Liverpool, 1788; Mareard, Ueber die Natur wnd die Gebraueh der Bader, Hanover, 1793. Some of the best works on Hydropathy are those of I. Johnson and Petri, and the very eomplete Afanuals of Fleury and of Beni Barde. There are many separate brochures on Turkish baths by Urquhart, Brereton, Haughton, Barter, Bar- tholomew, Luther, and a separate work by Sir John Fife. A eon- siderable amount of information regarding bathing may also be found in Dunlop's Philosophy of the Bath. (J. M.)

BATHURST, a town of New South Wales, on the Macquarie River, 122 miles W.S.W. of Sydney, with which it is connected by railway. It stands in a fertile plain on the western side of the Blue Mountains, and is the centre of an important gold field. Founded in 1815 by Governor Macquarie, and named in honour of Lord Bathurst (the third earl), it soon became a place of con- siderable size, and was raised to the rank of a municipality in 1862. It is built in rather a spacious style, with broad and regular streets running at right angles, Many of the buildings are large and handsome; and it

possesses numerous churches and schools, a theatre, a hospital, aud various societies. Population in 1871, 5030.

BATHURST, ALLen BatuurRstT, Ear oy, a distinguished statesman in Queen Anne's reign, was born in the year 1684. After completing his education at Cambridge, he was elected in 1705 to represent the borough of Cirencester. He distinguished himself particularly in the struggles and debates relative to the union of England and Scotland, firmly supporting a measure which he thought calculated to strengthen the Government and add to the prosperity of the country. Though he was content to act a subor- dinate part in the opposition planned by Harley and St John, his intimate friends, in order to sap the credit of the duke of Marlborough and his adherents, nevertheless he did good service to his party by arraigning, with more eloquence than truth, the conduct of the gencral aud of tle earl of Godolphin, whom he accused of lavishing the treasures of the nation on conquests more splendid than serviceable. The loss of the battle of Almanza, which happened about this time, seconded his efforts and those of his associates in dispelling what they called the intoxication of former successes, and disparaging achievements which

reflect immortal hononr on the British name. But his personal regard for Lord Somers, president of the council, suffered no abatement, although they were of different opinions in politics; and when Somers was deprived of office, Bathurst acted with such tenderness and delicacy as to preserve his esteem in a private station. In con- sideration of his zeal and services, the queen, in 1711, advanced him to the peerage by the title of Baron Bathurst, of Battlesden, in Bedfordshire. In the Upper House he distinguished himself by impeaching the directors of the notorious South Sea scheme, and by resisting the bill brought in against Atterbury. He was a determined opponent of Sir Robert Walpole; and when, after an obstinate struggle, that minister was forced to resign his various posts, Lord Bathurst was sworn of the privy council, and made captain of the gentlemen pensioners, an office which he resigned in 1744. In 1757 he was appointed treasurer to George IIT. (then Prince of Wales), and con- tinued in the list of privy councillors at

that monarch's accession to the throne; but, on account of his advanced age, he declined to take any further part in politics,

Lord Bathurst was not less distinguished as a patron of literature than as an active statesman. Congreve, Vanburgh, Swift, Prior, Rowe, Addison, Pope, Arbuthnot, Gay, and niost of the men of genius of his own time, cultivated his friendship, and were proud of his correspondence. Pope, in his Hpistle on the Use of Riches, which is addressed to Lord Bathurst, compliments his friend in some highly char- acteristic lines. Sterne also speaks of him in terms of affectionate admiration. He received further elevation to an earldom in 1772, and lived to see his second son Henry promoted to the peerage by the title of Baron Apsley, and several years lord high chancellor of Great Britain. By his marriage with Catherine, daughter of Sir Peter Apsley, Lord Bathurst had four sons and five daughters. He died after a few days' illness, at his seat near Cirencester, Sep- tember 16, 1775, in the ninety-first year of his age.

BATHURST, Ratpu, uncle of the preceding, was born in the year 1620. He studied divinity in Trinity College, Oxford; but, on the breaking out of the civil war, he changed the course of his studies, and, applying himself to medicine, took tle degree of doctor in that faculty. By dint of assiduous application, he soon rose to eminence in his profession; and in the time of the Commonwealth was appointed physician to the state. At the Restoration, however, he quitted the practice of physic; was elected a fellow of the Royal Society, and president of his college ; and, having entered holy orders, was made chaplain to the king, and afterwards dean of Wells. Soon after, he filled the office of vice-chancellor of Oxford, and was nominated by King William and Queen Mary to the see of Bristol ; but this honour he declined. To the accomplishments of an orator, philosopher, and poet, he added an inexhaustible fund of wit. idicule—of which he was an absolute master—was the weapon with which he used to correct the delinquents of his college. His poetical pieces in the Muse Anglicane are excellent of their kind; he wrote also several other poems, both in English and Latin. He died June 14, 1704, in his eighty-fourth year. (Life and Remains, by Th. Warton, 1761.) | BATHYCLES, a Greek sculptor, born at Magnesia on the Meander, known for his sculptures on the throne of the statue of Apollo at Amycle near Sparta, which Pausanias saw and describes (iii 18, 6). His date is

uncertain, but cannot well be later than between 563-549 B.C. The statue itself existed before his time. For an attempt to reconstruct this throne see Brunn, hein. Musewm (new series), vol. v. p. 325.

BATON-ROUGE, a town in the state of Louisiana, North America, situated on a bluff on the left bank of the

Mississippi, 120 miles above New Orleans. It has a court house, state penitentiary, national arsenal and barracks, military hospital, deaf and dumb asylum, and state univer- sity. Baton-Rouge was one of the first settlements of the French. In 1849 it was made the capital of the state, but has since given place to New Orleans. Occupied by the Federal troops after the capture of that city, it was defended in 1862 by General Williams against the attack of the Confederates under Breckenridge. Populationin 1870, 6498.

*BATONI, Pomprzo Grrotamo, a native of Lucca, who was regarded in Italy as a great painter in the 18th century, and who unquestionably did much to rescue the art from the intense mannerism into which it had fallen during the century preceding. His paintings, however, are not of the highest order of merit, though they are generally graceful, well designed, and harmoniously coloured. *JLis best production is thought to be his group of Peace and War. Batoni painted an unusual number of pictures, and was also celebrated for his portraits. Hoe was born in 1708, and died at Rome in 1787,*

BATRACHIA. See Amputsia, vol. i. p. 750.

BATRACHUS, according to Pliny (xxxvi. 42), the name of a Greek architect who, along with Sauras (both natives of Sparta), was employed by Metellus in the construction of certain temples in Rome. The story goes that, being forbidden to inscribe their names on the buildings, these two architects gained their end by placing the figures of a frog (batrachos) and a lizard (sawra) on the base of the columns. But it is possible that the fanciful use of such figures for ornament in later times may have led to the invention of both the names.

BATTALION is the tactical unit of infantry. It is the term applied to the most numerous body of dismounted men which one commanding officer can personally super- intend. It consists of from four to ten companies, is always commanded by a field officer, and has a normal war strength of about 1000 men. Two or more battalions con- stitute a regiment; two or more regiments a brigade; two or more brigades a division; two or more divisions a corps @armée; and two or more corps d'armée an army. In the British service, however, there are several regiments cou- sisting of but one battalion. See Army.

BATTAS, a people in the northern portion of Sumatra, which regards itself as the oldest in the island, and is dis- tinguished by a pertinacious adherence to ancient customs. The Batta is of middle height, his colour is a light brown, and his hair is black and is worn long. He is dirty in his dress and dwelling, and eats any kind of food that presents itself, though he lives chiefly on rice. A little iron-work, earthenware, and cloth constitute the only industrial products of the tribe. The houses are of wood, roofed with palm-leaf ribs; and the villages are defended by earthen walls and bamboo palisades. The people show a very peaceful disposition, but are valorous when occasion demands. Cannibalism is practised.

Satta or Batak Language.-—Up to the publication of Dr H. N. van der Tuuk's essay Over schrift en uttspraak der Tobasche taal (1855), the first fruits of an eight years' residence amongst the Battas, our knowledge of the Batak language was confined to lists of words more or less complete, chiefly to be found in Marsden's Jfiscellaneous Works, in Junghuhn's Battdlander, and in the Tijdschrift van het Batanaasch Genootschap, vol. ili. (1855). By his exhaustive works (bataksch Leesboek, in 4 vols., 1861-2; Bataksch-nederduitsch Woordenboek, 1861; Tobasche Spraak- kunst, 1864-7) that eminent Dutch savant has made the Batak language the most accessible of the various tongues spoken in Sumatra. According to him, the Batak language is nearest akin to the Old Javanese and Tagal, whereas a recent writer (A. Schreiber, Die Battas in threm Verhdltniss

zu den Malaien von Sumatra, 1874) has endeavoured to prove its closer affinity with the Malay proper. Like most languages spoken by less civilized tribes, the Batak is poor in general terms, but abounds in terms for special objects. The number of dialects is three, viz, the Toba, the Mandailing, and the Dairi dialects; the first and second have again two subdivisions each, The Battas further possess six peculiar or recondite modes of speech, such as the hata andung, or language of the wakes, and the hata poda, or the soothsayer's language. A fair acquaintance with reading and writing is very general among them. Their alphabet is said, with the Rejang and Lampong alphabets, to be of Indian origin. The language is written on bark or bamboo staves from bottom to top, the lines being arranged from left to right. The Batak literature consists chiefly in books ou witchcraft, in stories, riddles, incantations, &c., and is mostly in prose, occasionally varied by verse. See on it the fourth volume of the Batak Leesboek, or Reader, above mentioned.

BATTERING RAM (Aries), a military engine used before the invention of gunpowder, for beating down the walls of besieged fortresses. It consisted of a long heavy beam of timber, armed at the extremity with iron fashioned something like the head of a ram. In its simplest form the beam was carried in the hands of the soliders, who assailed the walls with it by main force. The improved ram was composed of a longer beam, in some cases extending to 120 feet, shod with iron at one end, and suspended, either by the middle or from two points, from another beam laid across two posts. This is the kind described by Josephus as having been used at the siege of Jerusalem (B. J., iii. 7, 19). It was covered over with a roof, shell, or screen of boards (called the testwdo) to protect the men employed in working it from the stones, darts, and other miissiles discharged by the besieged from the walls. It was also provided with wheels, which greatly facilitated its operations. A hundred soldiers at a time, and sometimes even a greater number, were employed to work it, and the parties were relieved in constant succes- sion, Josephus says that no wall could resist the continued application of the ram.

BATTERY is the tactical unit of artillery. Itis the term applied to the largest number of fully equipped mobile guns which can be personally superintended by one man. Batteries may be divided into the four classes of

horse, field, mountain, and position artillery batteries. In England, France, and Germany batteries consist of six guns; in Austria and Russia of eight guns each. The guns of horse field artillery are drawn by from four to eight: horses, the usual number being six. Hach battery has a certain number of men told off for the service of the gun called gunners, and others to manage the draught called drivers. In the horse artillery the gunners are mounted on horses, in field batteries they are carried on the limbers and waggons, in mountain and position bat- teries both gunners and drivers usually walk. Both horse and field battcries are recognized tactical units of an army, and are maintained in an efficient state in time of peace. Position batteries are organized generally in time of war, are possessed of the heaviest guns consistent with mobility, and are useful in certain special cases, such as the attack or defence of a fortified position, the bombardment of a town, &c. Mountain batteries consist usually of hght guns mounted on the backs of mules, and are adapted solely for warfare in mountainous countries. See ARTIL- tury. The term battery is also applied to the companies of dismounted artillerymen necessary to fight fortress and siege guns; to separate groups of guns in permanent works; and to the earthworks constructed for the protection of guns in Siege Operations.

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BATTERY, as a law term, is the unlawful beating of another. See AssauLr, vol. ii p. 724.

BATTEUX, Cuaruzs, a French writer on philosophy and the principles of literature, was born near Vouziers in 1713, and died in 1780. In 1739 he came to Paris, and after having taught with success in the colleges of Lisieux and Navarre, was appointed to the chair of Greek and Roman philosophy in the College of France. In 1746 he published his treatise Beaux Arts réduits & une méme Principe, in which he extended the Aristotelian definition of the art of poetry to art of all kinds. His Cowrs de Belles-Lettres, 5 vols., 1765, was afterwards included with some minor writings in the large treatise Principes de la Littérature, 1774, The rules for composition there laid down are, perhaps, too methodical and pedantic. His philosophical writings were La Morale d'Lpicure turée de ses propres écrits, 1758, and the Histoire de Causes Premicres, 1769, a survey of the

history of philosophy which is by no means devoid of merit. In consequence of the freedom with which he attacked in this work the abuse of authority in matters of philosophy, he was removed from his professorial chair, His last and most extensive work was a Cours études & Vusage des éléves de Vécole militarre, 45 vols.

BATTICALOA, the chief town of a district in the Kastern Province of Ceylon, situated on an island in lat. 7° 44' N. and long. 81° 52' E. It is of importance for its haven and the adjacent salt lagoons. The inhabitants are principally natives; but there is a fort and an English settlement. Population of town, 3353, and of district, 93,220.

BATTLE, an engagement between two armies, as dis- tinguished from the skirmishes, or minor actions, fought between their smaller sections. A battle is said to be general, where the whole, or the greater part, of each army is brought into action; and partial, where only brigades, divisions, or some corps d'armée out of several upon the ground, are engaged. However the numbers may vary, the great principles to be applied in delivering battle are at root in all ages the same. It is no doubt true that, in the circumstances under which battles are fought, there is nothing invariable; on the contrary, it is scarcely pos- sible to suppose two cases alike in every particular, or even resembling each other in all their leading features. From the very nature of things, the minor data of the problem are variable ; but the grand principles—those which de- pend on moral elements—continue immutably the same. On the other hand, the material elements which enter iuto the calculations of a general are constantly changing ; and it.is this cireumstance which affords scope for the exercise of his genius, his sagacity, and his military science. But it would be manifestly absurd to maintain that, because the lesser conditions are so frequently altered, the great principles of the art are changed with them. The issue of battle is indeed always uncertaiu,—because the calcula- tions of the general may be defective, his combinations unscieutific, his foresight limited, or his temperament rash and impetuous ; and because, even where none of these causes of failure exist, events which no human sagacity could have divined or provided against may occur to defeat the wisest plans. But all this implies that if every contingency could have been foresccn and properly met, the result would not have becn doubtful, and that the grand chances

are always ou the side of him who, being provided with sufficient means for his end, forms his plan with the greatest sagacity, and executes it with corrc- sponding vigour and ability. For, variable as the results of battles appear, decisive success has in all ages followed the combinations of great commanders ; and victory in the long-run has seldom failed to pay homage to science. And this is because those principles which science has established as universally applicable depend on certain fixed laws in

human nature, which ages have not changed since history was first written. That undisciplined forces, for example, are easily shaken by panic arising out of any such sudden disaster as the fall of their general, was as true in the day when Ahab, for this reason, disguised himself at Ramoth- Gilead as it isnow. That infantry, thoroughly broken up and exposed on open ground, may be taken or destroyed by a very inferior number of cavalry, was illustrated no less by Hannibal at Cann than by Murat's charge round the allied right at Dresden. The feeling that there was no safe retreat open in case of disaster was as fatal to the Persians at Marathon as to the French at Leipsic. The crushing effect of heavy columns pressing against a line (which, as only the outer part of the column can act, is purely moral) was quite as conspicuous in the victory of Epaminondas at Mantinea as when Napoleon cut his enemy's centre through at Austerlitz. Above all, military history, from the earliest times, proves two facts of prime import- ance to commanders in every action: the one, that the best troops become unsteady when their flank is gained, just as a single man in a struggle desires to face fairly the adversary about to rush on him; the other, that a comparatively small body coming fresh into action with troops exhausted by the exertions and nervous tension of a battle, has an advantage over much larger numbers. And being thus fixed, these principles obviously yield certain general rules, to which every prudent commander of any age strives to conform. Circumstances may lead him to violate them, but the examples of Leipsic and Waterloo are there to prove that, even with the greatest of generals, the result may be ruinous. In the first case, the French were forced to fight with their backs toa river; in the second, by a combination they were not prepared for their flank was struck by the Prussians when they

were fully engaged with Wellington in front ; and total defeat ensued in both.

A battle is not only the most imposing, but also the most important event in war. It is the consummation to which all previous combinations necessarily tend ; it is that grand act which may decide the fate of empires as well as armies. The highest and dearest interests of nations, nay, even of huinanity itself, may be involved in its issue. It cannot, therefore, be uninstructive to look briefly at the theory of those received principles by the skilful application of which the fate of battles has in all ages been determined.

All the methods in which a battle can be fought may be reduced to three for abstract purposes, each governed by a distinct principle The first, the purely defensive, consists in waiting for the enemy, in a position chosen for the purpose, the object being simply that of maintaining it snecessfully against him. Theorists almost universally condemn this, and that with good apparent reason; for there is something peculiarly trying to the moral endurance of even the best troops in feeling that they are pinned to one spot to await the assaults of the enemy without any prospect of retaliation. 'But the rule is not without exceptions, as is plainly proved by comparing the two great examples of purely defensive actions fought during the campaigns of 1862-63 in America,— Fredericksburg and Gettysburg. The defender in each case was perfectly successful, beating off his assailant with tremendous loss ; but the results were very opposite. Lee's victory at Fredericksburg stopped, indeed, the advance upon Richmond for the time, but did not seriously affect the course of the war. Meade, on the other hand, by beating the Confede- rates off at Gettysburg, completely turned the tide of the campaign, and compelled Lee to abandon all idea of invading the North and commence a difficult retreat to Virginia ; while thenceforth Washington was saved from all danger of being separated from the states that supported the union. This was because the position maintained at Fredericksburg

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was no more than one point ona single line of advance direct upon Richmond, whereas that of Gettysburg was so completely the key to the whole of the campaign of Mary- land, that, whilst it was held by Meade, it

was impossible for Lee to advance beyond it or any part of the north-eastern states. The failure to carry it therefore paralyzed the whole scheme of the Confederates for transferring the burden of the struggle to hostile soil. And from a com- parison of the varying consequences of these actions, so similar in their course, it will be seen that the defensive battle is justified only when the position to be maintained is one of vital consequence for the enemy to seize in order to carry on further operations with success. Lee has been fairly condemned by even friendly critics for not turning his defensive attitude at Fredericksburg into an offensive on the repulse of the enemy's attack. No one blames Meade for the like conduct at Gettysburg, because his holding his ground fully accomplished all that it was necessary for him to do. But such an instance as this last, it should be added, can but rarely occur.

The second system is the entirely offensive,—in plain words, the attacking the enemy wherever found, with all force available. As it carries with it the moral power which in all ages is found to accompany, until some decided check occur, bodies of disciplined men moving freely forward to the assault, and as it gives the leader the power of choosing the weaker points of his adversary's line on which to concentrate his blows, so it has ever been the favourite with bold and skilful generals leading good troops. Frederick and Napoleon alike preferred it, and won some of their chiefest victories by using it freely. Wellington employed it with marked success in the latest phases of the Peninsular War in 1813-14. Grant adopted it avowedly in his great struggle with Lee in Virginia in 1864, And the Prussians fought on this principle through- out the two great wars of 1866 and 1870-71. History, however, shows that it is only fully justified when the attacking general has a force decidedly superior either in numbers or in moral power; or when, as in the famous case of Frederick at Leuthen, he possesses such extraordinary skill in manceuvring as to give him all the advantages 'of long odds, althongh engaged against superior numbers, It has the serious defect that if the defence prove more successful than was expected, the assailant may have to bring up successively and exhaust all his forces, and thus leave himself without any reserve to meet a sudden onset from the opposite side. In such case defeat probably entails the complete wreck of the hitherto offensive army, and with it possibly the loss of the campaign.

It is for this reason that prudent commanders are wont, where the choice lies with them, to select the third mode, the defensive-offensive, or a combination of the two pre- ceding. This consists in taking up a position with the design of awaiting the adversary's attack on it, but also of watching the opportunity afforded by the exhaustion of his army in its assaults, or by his extending it too widely in choosing the best points from which to make them, in order to pass suddenly to the offensive. Wellington is justly famous for the success with which he employed this form of action, But it is one of the highest tests of geueralship to know exactly when most fitly to use either. And as Napoleon won three at least of his most striking victories, —Marengo, Austerlitz, and Dresden,—by passing at the right moment suddenly from an apparently passive attitude of defence to a vigorous offensive, so Wellington, after all the world had come to regard him as great only on the defensive, used the strictly offensive form, with the like success, at Vitoria, Orthez, and Toulouse, the last of these three actions being one of such apparent temerity as can hardly be paralleled in modern history, and yet perfectly

justified by his instinctive knowledge of the demoralized state of the enemy whose position he undertook to force. Marlborough, who as a fighter of great battles has never been surpassed, and who, like Wellington, led a mixed army of English and allies, appears to have always had a decided preference for the offensive;—so little does nationality supply any just rule for selecting either. Marlborough's choice, in all probability, was adopted from the compara- tively passive attitude of his various adversaries at Blenheim, Ramillies, and Malplaquet, which tempted a bold offensive on his part. Lee, though certainly addicted to the strictly defensive, which was suited to his inferiority of numbers and to the strong uature of the ground he usually occupied, had the true instinct (as was especially shown in his great' victory at Chancellorsville) of seizing any special opportunity offered by the carelessness of an adversary who brought against him apparently overwhelming forces. And in the late war, although the German generals elsewhere continually took that bold offensive which was justified at first by superior numbers, and later by the increasingly high spirits of their troops, yet in the most important and bloodiest action of the whole. Mars-la-Tour,

they were con- tent, after it had been well begun by their own attack, to pass to the completely defensive,—it being evident that by merely maintaining the position they had taken up across the French line of retreat from Metz, all the immediate advantage possible from victory would be won.

On the whole, therefore, it may be affirmed that no theory is sound which prescribes or forbids the use of any of the three methods, or lays down strict rules for the applica- tion of any of them. Defence is, however, the natural attitude of the weaker party, as Clausewitz, the greatest of all theoretical writers on war, has carefully pointed out. Under what conditions it is to be accepted, or how long ad- hered to when once assumed, are problems which it requires true genius to grapple with successfully ; for they can only be solved rightly according to the circumstances of the hour, perhaps of the moment. To see a crucial instance illustrated by a failure, we may look at Gravelotte. There Bazaine was forced by the case to fight on the defensive. An opportunity occurred in the day, on the decided repulse of the German right-wing under Steinmetz, of striking such a counterblow as, from Napoleon's hand, would probably have forced a victory over even the great odds possessed by the German commander. But Bazaine had no spark of the instinctive genins needed. He lost the opportunity, and with it the battle,— the loss entailing the last hope of rescuing his host from the dangerous and indeed ignominious position in which previous errors of judgment had placed it.

In conclusion, in order to demonstrate the undying truth of the main principle of battle, which is that, the general conditions being equal, the moral advantage is invariably at the outset with the offensive rather than the defensive,— with the army that feels itself moving forward rather than that which stands still,—it is well to refer to the recent discussion on the effect of breech-loading arms. It was almost universally assumed by theorists, especially by those of Prussia herself, when she first put the needle-gun into her soldiers' hands, that the power of the new weapon would be most perceptible in defence, for which its more rapid fire seemed so specially adapted. The Prussian instructions, drawn up before 1866, avowedly followed this view Those who compiled them overlooked the fact that the moral power of the weapon would of itself tend to carry those who

bore it forward, and add an additional advantage to those the assailant had before in his greater show of vigour and activity, and his power of searching out the weaker parts of his enemy's position and throwing his troops in force upon them. History has reversed the Prussian theory, and proved afresh how powerful for victory

is the moral element in the soldiers' charactcr. For, out of the opening events of 1866, and the vast encouragement the Prussians experienced in their first collisions with Benedek's army, has been evolved the most audacious and ageressive series of actions any nation ever fought. Certain Prussian writers have since the war of 1870-71 gone almost to the opposite extreme, and claimed absolute superiority for the offensive under all circumstances, forgetting that, against a stronger army, or even one perfectly equal in all other respects and well posted, it must inevitably be as dangerous as it proved when confidently tried by Napoleon's marshals against British troops under Wellington.

The various so-called "orders of battle " of which theore- tical writers treat, believing that they see a close similarity in the dispositions of well-led armies from the days of the Grecians down to our own, are, so far as such similarity really exists, founded entirely on one or other of the moral elements already mentioned, above all, on the desire to gain the enemy's flank. The late General Winfield Scott, one of the few cominanders who could boast that he had more than once seen the back of English infantry in fair fight, declared that this desire is so instinctive that it is impossible to array two bodies of disciplined troops against each other without one at least soon striving for this advantage. But so far as this and other like universal principles are applied to the actual drawing up of an army at any period in a special order of battle, the arrangements must in practice vary with the arms and discipline. This subject, in fact, forms part of that special art which treats of the handling of troops in the presence of the enemy, and falls under the head of "tactics," for which see the article War. The mechanism of battles must vary continually ; the great leading principles we have spoken of cannot change.

See Jomini, Traité des Grandes Opérations Militaires ; The Archduke Charles's Strategy (2d and 8d vols.) ; Rogniat, Considera- tions de l' Art de lu Guerre ; Clausewitz's work On War; Bogu- slawski's V'actical Deductions from the War of 1870-71 ;-Schertt's Studien, 'Die Schlacht;" above all, Napoleon's criticisms on other generals in his Memoirs. (CLG Gh)

BATTLE, a market-town in the county of Sussex, on the South-Eastern Railway, 86 miles from London. It is situated in a valley, and consists of one street. Its name is derived from. the conflict in 1066, which insured to William the Norman the crown of England. The abbey founded by him forms a most magnificent pile of ruins, and the ancient gatehouse is still in good preservation. The place is now celebrated for its gunpowder manufac- tories. Population of the parish in 1871, 3495.

BATTUS, the founder of the Greek colony of Cyrene in Libya, whither he had been directed by the oracle at Delphi (about 650 B.c.). The Greeks who accompanied him were, like himself, natives of Thera (Santorin), and partly des- cended from the race of the Minyz. The origin of the colony as told in Thera (Herodotus, iv. 150) was as follows : —

Grinus, king of that island, had gone attended by Battus and others to consult the oracle at Delphi, and was told by it to " found a city in Libya." They knew not where Libya was, and could take no action. Seven years after there fell a drought on Thera, and the oracle, being again questioned, repeated the command to found a town in Libya. Messengers were now sent to Crete to see if any one there knew where this district was. They meta fisherman, Corobius, who said that he had once been driven to Platea, an island of Libya, whither he agreed to conduct them. To make sure, they went with him; and having landed on Platea, they again, leaving Corobius

there with provisions for some months, returned to Thera to collect

colonists, of whom as many as two 50 oared galleys could convey set out with Battus as their leader. In Cyrene itself, however, a different story of the origin of the colony was told. Etearchus, it was said, king of Axus in Crete, having marricd a second wife, who persuaded him to get rid of Phronime, the daughter of his first wife, agreed with a merchant from Thera that he

should take her in his ship and let her down into the sea. The merchant, true to the letter of his bargain, let her down, but with a rope about her by which he drew her up again, and took her to Thera, where she married

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Polymnestus, a descendant of the Minyw, and bore him a son, who, because of his stuttering, was called Battus. On growing to man- hood, Battus inquired at the oracle of Delphi about his voice, and when told to "found a town in Libya," was unable to understand the response. Afterwards, owing to misfortunes, the Therewans sent to Delphi for advice, and were again ordered to send a colony to Cyrene, under Battus, which they now did, landing first in Platea, and afterwards removing to Cyrene itself.

Herodotus (iv. 155) thinks that the name of Battus, being the word for "king" in Libya, had been applied to the leader of the colony after his arrival there, and that it had no reference to his stuttering. Battus having ruled forty years (about 630-590 B.c.) was succeeded by his son Arcesilaus, who, after a reign of sixteen years, of which nothing is known, was followed by Battus 11. Of this dynasty, known as the Battiade, the names were alternately Battus and Arcesilaus, there being, as the oracle predicted, probably after the fact, four of each. Under Battus I1., surnamed the Prosperous, the population of Cyrene was increased by a large number of colonists from all parts of Greece invited by a promise of land. To find land for all it was necessary to dispossess many of the native Libyans, who therefore sought and obtained the aid of an Egyptian army, which, however was completely defeated. Amasis, the next king uf Egypt, proved friendly to Cyrene. The reign of Areesilaus 1]. (about 554-544 3.c.) is known only for the disastrous battle with the Libyans, who had been stirred to revolt by his brothers, in which he lost 7000 hoplites. He himself soon after fell ill, and was strangled by his brother Learchus. The disgrace of the ruling family being increased by the fact that the next heir, Battus IIL, was lame, the oracle at Delphi was consulted, and advised that affairs should be placed in the hands of Demonax of Mantinea, who distributed the people into three tribes, and arranged a form of self-government for them. LBattus, retaining the royal lands and sacred offices of a king, acquiesced. Not so his wife Pheretime and son Arcesilaus, who bestirred themselves,—the former in

Cyprus, the latter in Samos,—to raise forces to recover the sovereignty, and ultimately succeeded; but in his success Arcesilaus II1. forgot the commands of the oracle (Herod., iv. 163), and, among other cruelties to the vanquished, burned alive a number of them who had escaped to a tower. To avoid the consequences he retired to the town of Barca, but was there slain in the market-place by some fugitives from Cyrene. His mother, Pheretime, who had been regent in his absence, now obtained from Aryandes, the Persian satrap of Egypt, an army to take vengeance on the people of Barca. After a fruitless siege of nine months (Herod., iv. 200) a treaty of peace was solemnly sworn to by the Persian general, and was instantly broken in spirit, though not in letter, when the gates of Barca were thrown open. Pheretime, ruthless in her cruelties towards those who had been connected with her son's murder, herself died soon after, a wretched death, in Egypt. Of Battus IV. nothing is known. Arcesilaus IV., with whom the dynasty ended (about 460-445 B.0.), obtained twice the victory in the chariot race at the Pythian games, and for this was cele- brated by Pindar in two odes (Pyth., iv. and v.).

BATU, a thickly-wooded island lying off the north- western coast of Sumatra, 40 miles in length by 10 in average breadth, almost immediately under the equinoctial line. Coeoa-nuts, oil, and trepang are exported. It is the seat of an active voleano. The inhabitants are a colony from the island of Nias.

BATUM, a seaport town of Asiatic Turkey, in the pashalic of Trebizond, and 110 miles N.E. of the city of that name, It is situated on the Black Sea, not far from the mouth of the Chorak, and the harbour is the safest and most important on the eastern coast. There is deep water close to the shore, and protection is afforded by the high

overhanging cliffs of a spur of the Gouriel Mountains. The situation of the town is marshy and unhealthy; and the place itself is "filthy in the extreme." It is now the seat of a mutessarif, or deputy-governor; and the Turkish authorities are fortifying it with several strong batteries. A dilapidated ronak, or governor's house, two mosques, and a Greek church are almost the only buildings that relieve the meanness of the squalid-

looking huts; but the natural and political position of the place render it of commercial and military importance. There is a custom- house, a Russian consulate, and a steamer agency ; and the Russian steamers regularly use the harbour as a port of transshipment, their own harbour at Poti being insecure. A considerable contraband trade is carried on across the frontiers, as well as a moderate amount of regular exporta- tion by sea. The population does not exeeed 2000, BAUDELAIRE, CuHartzs, who would have been pleased to be considered as a master in the French Satanic school of poetry, was born at Paris in April 1821. He was the son of a nan of some distinction, who had been the friend of Condorcet and of Cabanis. The poet's life contained no episode more important than a voyage to the East Indies, where he resided for some time, and whenee he brought perhaps the Oriental languor and the curious delight in perfumes which make themselves felt in many of his verscs. Baudelaire returned to Paris while still a very young man, and sought the literary, or at least what is called the Bohemian society of the capital. He admired M. Théophile Gautier, as M. Gautier had admired Victor Hugo, and his poenis are all conceived in the school of Romanticism. Romanticism, or, to define it rather widely, the school of revolt against French academic taste, the search for remote experiences, the artistic reproduction of the excesses and vagaries of passion, found in Baudelaire its most reckless disciple. Some portions of his verses, Les Fleurs du Mal, appeared originally in the Jtevue des Dews Mondes, and when they were published in a volume, had the misfortune to attract the notice of the police. When so many low unwholesome works were published without scandal, it was an error to attract notice to the verses of Baudelaire. The chief notes of his poetry are a perverse delight in loathsome subjects, a curious reaction towards Christianity and repentance, a pleasure in the last refine- ments of art, above all an unsleeping self-consciousness and affectation. Less unpleasant than his Fleurs du Mal, are his exquisite and gem-like Petits Poémes en Prose, and his volumes of subtle and ingenious criticism. Baudelaire died in 1867 at the age of forty-six, after along illness. He will possibly be best remembered for his translation of the works of Edgar Allen Poe, one of the most accurate and bril- liant translations in literature. The impression left on the reader by Baudelaire's life and industry is rather a painful one. It is difficult to be blind to the fact that he lived for notoriety, and that he preferred to gain notoriety by a distinguished activity in the least wholesome fields of letters.

His poems represent the high-water mark of the tide of Ronianticism ; and it may be hoped that the taste for lepers and corpses in poetry will now gradually decline. The best edition of his works, prose and verse, is that published by Michel Levy, Paris. Some of his suppressed poems were printed in Brussels, under the title Les Hpaves. BAUHIN, Gasparp, the son of an eminent French physician, who had to leave his native country on becom- ing a convert to Protestantism, was born at Basel in 1560. Early devoting himself to medicine, he pursued his studies at Padua, Montpellier, and some of the celebrated schools in Germany. In his journeys through various parts of Europe he collected a number of plants which had escaped his elder brother's notice. Returning to Basel in 1580, he was admitted to the degree of doctor, and gave privatc lectures

in botany and anatomy. In 1582 he was appointed to the Greek professorship in that university, and in 1588 to the chair of anatomy and botany. He was afterwards made city physician, professor of the practice of medicine, rector of the university, and dean of his faculty. He published several works relative to botany, of which the most valuable is his Pinax Theatri Botanici, sew Index in Theophrasti, Dioscoridis, Plinii, et botanicorum qui a seculo scripserunt opera, 4to. The confusion that began to rise at this time from botanical writers describing the same plant under differ- ent names rendered such a task highly necessary ; and though there are many defects in the execution, the Pexax of Bauhin is stilla useful key to all the writers before his time. Another great work which he planned was a Theatrum Botanicum, meant to be comprised in twelve parts folio, of which he finished three ; only one however was published. He also gave a very copious catalogue of the plants growing in the environs of Basel, and edited the works of Matthio- lus with considerable additions. He likewise wrote on anatomy ; his principal work on this subject is Theatrum Anatomicum infinitis locis auctum, 4to, Frankfort, 1621, which is a kind of pinax of anatomical facts and opinions. He died in 1624.

BAUHIN, Jzan, brother of the above, was born at Basel in 1541. He studied at Tiibingen under the celebrated botanist Fuchs, and afterwards travelled with Conrad Gesner, and collected plants in the Alps, in France, and in

Italy. He first practised medicine at Basel, where he was elected professor of rhetoric in 1566. He then resided for some time at Yverdun, and in 1570 was in- vited to be physician to the'duke of Wiirtemberg at Mont- béliard, —-a situation in which he spent the remainder of his life. He devoted his time chiefly to botany, on which he bestowed great labour. He likewise prosecuted other branches of natural history, and published an account of Medicinal Waters throughout Hurope. His great work on plants was not completed at his death, which happened in 16138. A society at Yverdun published in 1619 the " Pro. dromus;" but it was not till 1650 and 1651 that the work itself appeared, in three vols. folio, entitled Historia Plantarum nova et absolutissima, cum auctorum consensu et dissensu cuca eas. It was long considered a standard work, and, with all its defects, it entitles its author to a high place among the founders of botanical science.

BAUME, Antotnp, a French chemist, distinguished for his success in the practical application of the science, was born at Senlis in 1728. He was the son of an innkeeper, and had to contend with the disadvantages of a defective education, in spite of which he prosecuted his scientific researches with great success. He was apprenticed to the eslebrated chemist Geoffroy, and in 1752 was admitted a member of the college of pharmacy; soon after he was appointed professor of chemistry at that establishment. He carried on a commercial establishment in Paris for the preparation, on an extensive scale, of drugs for medicine and the arts, such as the acetate of lead, the muriate of tin, merenrial salts, and antimonial preparations. At the same time he published a number of papers on chemical science, and on arts and manufactures. He established the first manufactory of sal-ammoniac in France, a substance which before that time had been obtained from Egypt. He was the first also who devised and set on foot a process for bleaching raw silk. Having acquired a competency by the success of these different undertakings, he retired from trade, and devoted his time to the application of chemistry to the arts. He improved the process for dyeing scarlet at the manufactory of the Gobelins, and announced a cheap process for purifying saltpetre. By the Revolution he lost his fortune, but this calamity, instead of disheartening him, Stimulated him to resume his trade. He was chosen o

correspondent of the Institute in 1796, and died in 1804, at the age of seventy-six. Many of his papers are published in the Memoirs of the

Academy of Sciences. Of his separate publications, the following may be mentioned here: Dis- sertation sur UEther, in 12mo; Plan d'un Cours de Chimie Expérimentale, 1757, in 12mo ; Opuscules de Chimie, 1798, in 8vo; EBlémens de Pharmacie Théorique et Pratique, 2 vols. Svo; Chimie Expérimentale et Raisonnée, 3 vols. 8vo,

1773.

BAUMGARTEN, ALEXANDER GoTTLIEB, a Gcrman philosopher, born at Berlin in 1714. He studied at Halle, and afterwards became professor of philosophy at Frankfort on the Oder, in which city he died in the year 1762. He was a disciple of Leibnitz and Wolff, and was particularly distinguished for his zesthetical speculations, having been the first to develop and establish the Theory of the Beautiful as an independent science. Baumgarten, of course, is not to be looked upon as the founder of esthetics, but he did good service in severing it from the other philosophic disciplines, and in marking out a definite object for its researches. 'The very name (MWsthetics) which Baumgarten was the first to use for thescience of the Beautiful, though now very generally adopted for the sake of convenience, indicates the imperfect and partial nature of his analysis, pointing as it docs to an element so variable as feeling or sensation as the ultimate ground of judgment in questions pertaining to beauty. The principal works of Baumgarten are the following: Disputationes de nonnullis ad poema pertinentibus ; disthetica; Metaphysica; thica philo- sophica; Initia philosophice practice prime. For an account of his speculations on the theory of the Beautiful see AlsTuHeTics, vol. i. p. 217.

BAUMGARTEN-CRUSIUS, Lupwie Friepricu Orro, a distinguished German theologian, was born in July 1788 at Merseburg. In 1805 he entered the university of Leipsic, and studied theology and philosophy. In 1812 he was appointed extraordinary professor of theology at Jena, where he remained to the end of his life, rising gradually to the head of the theological faculty. Inthe midst of his labours as professor and author, he was strack down by apoplexy, and died on the 31st May 1843. Baumgarten-Crusius lectured on almost all the theological disciplines, with the exception of church history ; but his great strength lay in the treatment of the history of dogma. His com- prehensive knowledge, accurate

scholarship, and wide sympathies gave peculiar value to his lectures and treatises on the development of church doctrine. His published works were very numerous, the most important being— Lehrbuch der Christlichen Sittenlehve, 1826; Grundzige der biblischen Theologie, 1828; Lehrbuch der Dogmen- geschichte, 1832 ; Compendium der Dogmengeschichte, 1840. The last, perhaps his best work, was left unfinished, but was completed in 1846 by Hase from the authov's notes. Commentaries on several of the books of the New Testa- ment, gathered from his papers, were also published after his death.

BAUR, FERDINAND CurristraN, the distinguished leader of the Modern Tiibingen School of Theology, was born in the neighbourhood of Cannstadt.on the 21st June 1792. The son of a Wiirtemberg pastor he entered, at the age of thirteen, the well-known seminary at Blaubeuren, to which his father had some years before been transferred as deacon. Thence he passed, in the year 1809, to the university at Tiibingen. Solid and somewhat reserved in character, he was indefatigable in his studies, but did not come prominently to the front till near the close of his academic career. His intellectual development proceeded slowly from step to step. For a time he was attracted and considerably influenced by the study of Bengel, the great head of the preceding orthodox school, which had given

Tiibingen its reputation in the 18th century. Both Bengel himself in his noble personality, and the historical chara:ter of his critical labours on the New Testament, remarkable for their time, had a 'charm for the youthful student of the 19th century. With historical interest Baur combined a special interest in the philosophy of religion, but as yet without betraying any opposition to the supernatural stand- point of the older theology. His earliest literary produc- tion—a review of Kaiser's Biblical Theology (Bengel's Archiv fiir Theologie, ii, 656) in 1817—shows nothing of this opposition. It required a change of circumstance, as well as a new impulse of intellectual excitement, to direct his thoughts into the bolder current, in which they were destined to run, and in their course so largely to affect the stream of contemporary thought.

In 1817 he was called as professor to Blaubeuren, which he had left as a pupil eight years before. It was his

business here to direct the historical and philosophical .

studies of the youth, and his keen and comprehensive genius soon found a congenial subject of investigation in the relations of Christianity to preceding modes of thought. The result of his investigations appeared in his Symbolzk und Mythologie, in 1824, This was his first elaborate work, the precursor of all his special studies in religious history and the development of religious thought. Anti- mated by a thorough and enlightened spirit of learning, and valuable as a contribution to the knowledge of classical antiquity, it was yet dominated by a theological interest, and showed how truly this was the prevailing bias of the author's mind. It showed, moreover, how from this early period he combined, in almost equal force, the three great elements of culture—philological, philosophical, and theological-—- which his later works discovered in such maturity.

This publication drew attention to Baur's marked abilities, and, on a vacancy occurring in the theological faculty at Tiibingen, he was promoted after some hesitation to the chair of historical theology in that famous university, destined from his labours to acquire a yet more notable reputation. This took place in 1826; and for thirty-four years Baur's life was passed at Tiibingen in an unceasing round of academic work,—while his name continued to gather from his successive writings an increasing lustre and influence. All accounts agree in testifymg to his mar- vellous industry and unceasing toil of research, his con- scientiousness and self-sacrifice as a teacher, and the unobtrusive enthusiasm and dignity with which he dis- charged all the duties entrusted to him, not only as a pro- fessor, but as for some time the head of the Sti/t, or college of residence for the Protestant divinity students. His theological opinions, trenchant and alarming as they must have sometimes appeared, never made any separation betwixt him and his colleagues in the thevlogical faculty. All acknowledged his power and earnestness; and the multitudes who thronged his lecture rooms carried the impulses of his thought throughout Germany and Switzer- land. His manner was somewhat reserved and silent ; all his enthusiasm was put into his work, and was felt more as an underglow

animating his lectures and writings than as a demonstrative power creating a temporary noise. He lived for theological science: nothing else seems to have occupied him or drawn him aside. When we add to this the fact that any faith in supernatural religion, with which he began his labours as a professor, ere long dis- appeared, and that the great aim of all his studies and researches was to find the natural factors or principles out of which Christianity arose in the world, there is presented to us a strange picture of theolugical enthusiasm It may seem an incousistent and unhappy picture. Yet there is something heroiv if alsa pathetic in such intense application

to the study of Christian phenomena, and such thorough and earnest aims to reach the truth regarding them, with- out the faith which witnesses to the reality of a personal divine life, behind the phenomena and revealed in them.

Baur at first, like almost all his contemporaries, owned the influence of Schleiermacher. The Glaubenslehre of the latter, which appeared in 1821, is said to have affected him deeply, and moulded his thonght for some time. But there was too little affinity betwixt the men,—the one inystic and spiritual, the other intellectual and objective, —to permit this influence to be permanent. From Schleiermacher Baur passed to Hegel, whose commanding genius laid its spell upon him as upon others. The Hege- lian philosophy became the permanent and _ pervasive element of his intellectual life. Its great doctrine of opposites, or of extreimes finally terminating in a conciliation, is found more or less to underlie all his thought, and to furnish the key to his most daring speculations on the origin and growth of Christianity.

It was not, however, till nearly ten years after his settle- ment at Tiibingen that lis theological views underwent a decided change, and that the special tendency known as that of the Modern Tiibingen School was fully developed. The earlier period of Baur's academic life was not unfruitful, but did not mark him off in any striking manner. Even his treatise on the Christ-party in the Corinthian Church and the Antagonism betwixt the Pauline and Petrine Chris. tianity, which appeared in 1831, and which may be said to contain the germs of his future system, was published peaceably

(in the Z%ibingen Zeitschrift) along with the effusions of Sleudel, one of his co-professors most devoted to supernaturalism. His answer to Mohler's famous Sym- bokk (1833) attracted a widespread reputation, and fixed attention upon him as one of the ablest defenders of German Protestantism. Masterly and ingenious as Moéhler's book was, it was felt that Baur had not only fairly met but overthrown its chief position. Eut with all his reputation as a powerful writer and controversialist, he had hardly as yet made his mark as a new thinker.

The second and distinctive period of his intellectual developinent is dated from the year 1835, when Strauss's Leben Jesu appeared, and spread commotion in the theo- logical mind of Germany. In the same year Baur pub- lished his great work on Gnosticism, in which he had obviously quite passed beyond the influence of Schleier- macher. A brief work on the So-called Pastoral Hpistles inthe same year showed him at work in an independent critical direction, and ready to take a new start in theo- logical inquiry, 'This start, or at least the lengths to which it carried him, have been by many attributed to the effect of Strauss's work. But he has himself plainly denied this, and clanmmed an independent origin for his own specula- tions. 'J had begun," he says (Kirchengeschichte des 19 Jahrhunderts, 395), "my critical inquiries long before Strauss, and set out from an entirely different point of view. My study of the two epistles to the Corinthians led me first to seize clearly the relation of the apostle Paul to the other apostles. I was convinced that in the letters of the apostle themselves there was enough from which to infer that this relation was something very different from that usnally supposed,—that, in short, instead of being a relation of harmony it was one of sharp opposition, so much so that on the part of the Jewish Christians the authority of the apostle was held everywhere in dispute. A closer investigation of the Pseudo-Clementine homilies, to whose significance in reference to the earliest period of Christian history Neander first drew attention, led me to a clearer understanding of this opposition ; and it always became more evident to me that the contrast of the two parties in the Apostolic and sub-Apostolic age must be traced

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not merely in the formation of the Petrine tradition but as having exercised au important influence upon the com- position of the Acts of the Apostles."

This supposed conflict betwixt Petrinism and Paulinism, or, in other words, betwixt Jewish and Gentile Christianity, lies at the foundation of all Baur's critical labours. His speciality as a New Testament scholar and critic was the firmness with which he laid hold of what he believed to be the only genuine foundation of historical Christianity in St Paul, and his four great epistles to the Corinthians, to the Galatians, and to the Romans. 'These epistles were to him alone unchallengzable as the authentic writings of the great apostle of the Gentiles, and the antagonism of which he made so much appeared to him everywhere to pervade them. The epistles to the Ephesians, to the Colossians, and to the Philippians, and the short letter to Philemon, were at the best doubtfully genuine. They seemed to him to bear traces of a later Gnosticism in many of their expressions, while he altogether rejected the apostolical character of the Pastoral Epistles. These letters, as well as the Acts of the Apostles, were to him writings not of the Ist but of the 2d century, proceeding not from the Pauline School, but from the Catholic and Concilia- tory School, which towards the middle and end of the 2d century sought to adjust and harmonize the earlier conflicting elements of Petrinism and Paulinism. This impress of conciliation and compromise appeared to him to be specially stamped upon the Acts of the Apostles, and to be the true explanation of the relations there depicted betwixt St Peter and St Paul.

Such were the views advocated by Baur in a succession of writings on the Pastoral Epistles (1835) and the Epistle to the Romans (1836); but especially in his great work on the Apostle Paul (1845), which may be said to sum up the result of his critical labours on the Pauline writings.

Then in a further series of critical investigations he turned his attention to the Gospels. He dealt with them as a whole, "their relation to one another, their origin, and character," in a treatise which appeared in 1847, and in 1851 he devoted a special volume to the gospel of St Mark, 'The result of his investigations in this direction was to satisfy him that all the Gospels owe their origin more or less to the same tendencies or traces of party design, which he everywhere discovers in the first Christian age. Our present Gospels are not, in his view, the most ancient documents of the kind

possessed by the church. Before them there was a primary cycle of evangelical tradition, known by various names—as the gospel of the Hebrews, of St Peter, of the Ebionites, of the Egyptians, &c. In the existing canon the Gospel of St Matthew resembles those earlier narratives most closely. It reproduces most com- pletely the character of the primitive Jewish Christianity,

yet not without important later modifications. The Gospel.

of St Luke is, of course, of Pauline origin, yet also retouched with a view to the conciliatory tendencies of the Church of the 2d century and the influence of the Petrine tradition. That of St Mark is of later date than either, and bears the most evident traces of adaptation. Of all the gospels it is the most suspected by the Tiibingen School. The Fourth Gospel, on the other hand, is a definite work, but of the 2d, not of the 1st century. An examination of its contents, its mode of composition, and its general plan clearly reveals its dogmatic and idealistic character. The histurical data are merely a background to the speculative ideas which it unfolds. The prologue by itself is sufficient proof of its logical methud and purpose, while the contrasts which everywhere pervade it betwixt light and darkness, life and death, the Spirit and the flesh, Christ and the children of the devil. and the dramatic force and propriety with which these contrasts are handled throughout, point to

the same conclusion. Further, the differences betwixt the Apocalypse and the Fourth Gospel are held to show con- clusively that they could not have proceeded from the same author,

In addition to these critical labours Baur distinguished himself by a series of elaborate historical monographs on special doctrines of Christianity, for example his {cstory of the Doctrine of the Atonement in 1838, and his History of the Doctrine of the Trinity and Incarnation, in 3 volumes, in 1841-3, His unceasing activity further produced a Handbook of the History of Dogma in 1847, an interesting tract on the Chief Epochs of Ecclesiastical History (1852), an adinirable digest of his general views on the origin and growth of the early church under the title of The Christian Church of the First Three Centuries (1853). A further volume of general Church History from the 4th to the 6th century, appeared from his pen just

before his death (1859), and subsequently three volumes containing the History of the Church of the Middle Ages (1861), the History of the Church of more recent times (1863), and the Christian History of the 19th century (1863). Finally, in 1865, appeared Lectures on the Iistory of Christian Dogma.

His death took place on the 2d December 1860. He lies buried in the cemetery at Tiibingen, not far from the poet Uhland, with the simple inscription on his tomb, "F.C. Baur, Theolog."

Such an amount and variety of authorship sufficiently show Baur's indefatigable industry and enthusiasm as a theologian ; and when it is remembered that all his works are of a strictly scientific character indicating everywhere original research, and a penetrating and systematic intel- ligence which never slumbers, however it may be mistaken, it is evident that there are few names in the recent history of theology that claim more significance than that of Ferdinand Christian Baur. Of the value of his labours and the extent to which his theological views may be said to have verified themselves in the modern. mind which has continued profoundly agitated by the problems which he started, this is not the place to speak. It need only be said that, while many of lis opinions are strongly contested, and some of the most enlightened recent investi- gations prove that he has greatly exaggerated the anta- gonisms of the carly church, and post-dated most of the writings of the New Testament, it is at the same time admitted by all advanced scholars that he has, even, in his exaggerations, contributed to a clearer view of the great principles at work in the 1st and 2d centuries and tlie lines of spiritual movement along which the Christian church moved to its historical formation and development. No student since Baur can fail to recognize the distinctive influences of Jewish and Gentile Christianity, and the extent to which this distinction, and in some cases anta- gonism, are impressed upon the New Testament writings. To him also and his school must be attributed the modern idea that the surest historical foot-hold of Christiauity 1s in the four great Fauline epistles. These, more than any other New Testament writings, lie in the clear dawn of the sun-rise which enlightened the world. The Gospels remain, not indeed ina mist of unauthentic story, but in comparative shadow. They come only gradually into the light after a long dim undergrowth in the rich soil of Primitive

Christiauity. There is much to be said against Baur's views of their later origin in the 2d century. The more this century is studied the less does it seem capable of originating such marvellously fresh products of spiritual intelligence. But it is not the less certain that the Synoptic Gospels took their present form only by degrees, and that while they have their root in the Apostolic Age and the Apostolic mind, they are also fashioned by later

'influences, and adapted to special wants in the Early

Church. They are the deposits, in short, of Christian tradition, handed down first of all, and probably for a con- siderable period, in an oral form, before being committed to writing in such a form as we now have them. This, which is now an accepted conclusion with every historical school of theologians in England no less than in Germany, conserva- tive no less than radical, is largely the result of the Tiibingen investigations. It may have been understood before, but its historical significance was not appreciated. In short, if we distinguish Baur's method from his special opinions it is hardly possible to overrate his influence as a theologian. His professed method was to seek for the solution of great spiritual as of great intellectual phenomena in a closer and more minute study of all the documents and data purporting to record or explain these phenomena, and to run out such lines of fact as he found to their true consequences. His great genius and learning enabled him to read the meaning of certain features of Primitive Christianity hitherto imperfectly discerned, and to point future inquirers along the true road of discovery. Un- happily, his own opinions were influenced not merely by his study of facts, but by a great speculative system which dominated his intelligence, and prevented him from seeing what still seems to most minds not less informed than his own the only credible explanation of the vast spiritual movement whose forces and developments occupied his lifelong study. Sag. BAUTAIN, Lovis Eucine Martz, a French philosopher and theologian, was born at Paris in February 1796, and died in October 1867 At the Ecole Normale he came under the influence of Cousin, whose views on most philosophic points he at first accepted. In 1816 he adopted the profession of higher teaching, and was soon after

called to the chair of philosophy in the University of Strasburg. He continued in this position for many years, delivering a parallel course of lectures as professor of the literary faculty in the same city. The strong reaction against merely speculative philosophy, which carried away such men as De Maistre and De Lamennais, was not without influence on Bautain. In 1828 he took orders, and resigned his chair at the university. For several years he remained at Stras- burg, lecturing at the Faculty and at the College of Juilly ; but in 1849 he set out for Paris as vicar of the diocese. At Paris he obtained considerable reputation as an orator, and in 1853 was made professor of moral theology at the theological faculty. This post he held till his death. Bautain is rather a scholastic than a modern philosopher. His view of the relation between reason and faith is essen- tially the same as that of Anselm and his great successors. Revelation is supposed to give materials which could not otherwise have been attained by the human mind, and philosophy supplies the scientific exposition or evolution of these facts. Theology and philosophy thus form one com-

prehensive science; yet the system is far removed from Rationalism. Bautain in fact, like Pascal, Newman, and others, depreciates reason in order to exalt faith. He points out, following chiefly the Kantian criticism, that reason is limited in application, and can never yield know- edge of things as they are in themselves. But in addition to reason, we have, according to him, another faculty which may be called Intelligence, and through which we are put in connection with the world of spiritual and invisible truth. This intelligence does not of itself yield a body of truth ; it merely contains the germs of the higher ideas, and these seeds are made productive by being brought into contact with revealed facts. This fundamental conception Bautain works out in detail in the departments of psycho- logy and morals. His works, to which we can only refer, are well deserving of attention. The most important of them are—Philosophie du Christianisme, 1833 ; Psychologie Expérimentale, 1839 (new edition entitled Lsprit Humain et ses Hacultés, 1859) ; Philosophie Morale, 1842; Religion et Inberté, 1848; La Morale de ’Evangile comparée aus divers systémes de Morale, 1855.

BAUTZEN (in Wendish Budissin, which is equivalent to “town ”), the capital of Saxon Upper Lausatia, occupies an eminence on the right bank of the Spree, 680 feet above the level of the sea, and 32 E.N.E. from Dresden. Lat. 51° 11’ 10’ N., long. 14° 25’ 50” E. The town is weli

| built and surrounded by walls, and has extensive suburbs

partly lying on the left bank of the river. It has a cathe- dral which is used by both Protestants and Roman Catholics, and five other churches, a handsome town-house,an orphan-asylum, several hospitals, a mechanics’ institute, a famous gymnasium, a normal and several other schools, and two public libraries, Its general trade and manufac- tures are cousiderable, including linen, cotton, and woollen goods, tobacco, leather, paper, saltpetre, gunpowder, &c. Population in 1871, 13,165. Bautzen was already in existence when Henry the Fowler conquered Lausatia in 928. It became a town and fortress under Otto I, his successor, and speedily attained considerable wealth and importance, for a good share of which it was indebted to the pilgrimages which were made to the “Arm of St Peter,” preserved in one of the churches. It suffered greatly during the Hussite war, and still more during the Thirty Years’ War, in the course of which it was besieged and captured by the Electoral Prince, John George (1620), fell into the hands of Wallenstein (1633), and was burned and taken by the Electoral Prince of Saxony. At the Peace of Prague in 1635 it passed with Lausatia to Saxony asa war indemnity. The battle of Bautzen was fought here on the 21st and 22d of May 1813, between the French under Napoleon and the allied forces of Russia and Prussia, in which, after severe losses on both sides, the latter were defeated.

BAVARIA

y AVARIA (in German, Bayern), a kingdom of Southern Germany, forming part of the German Empire, con- sists of two distinct portions, Bavaria proper and the Pala- tinate of the Rhine, which are separated by the grand duchies of Baden and Hesse. Bavaria proper contains an area of about 26,895 miles, and the Palatinate rather less than 2282, making the whole extent of the kingdom about 29,177 square miles.

The frontier of Bavaria proper on the north-east, towards Bohemia, consists of a long range of mountains known as the Béhmerwald; while the north is occupied by the Fichtelgebirge and the Frankenwald, which separate Bavaria from Reuss, Meiningen, and Hesse-Darmstadt. The ranges

last named seldom exceed the height of 3000 or 4000 feet ; but the ridges in the south, towards the Tyrol, form part of the system of the Alps, and frequently attain an elevation of 9000 or 10,000 feet. On the west it is bounded by Wiirtemberg, Baden, and Hesse-Darmstadt. The whole of the country belongs to the basins of the Danube and the Main; by far the greater portion being drained by the former river, which, entering from Swabia as a navig- able stream, traverses the entire breadth of the kingdom, with a winding course of 200 miles, and receives in its passage the Iller, the Lech, the Isar, and the Inn from the south, and the Naab, the Altmiihl, and the Wérnitz from the north. The Inn is navigable before it enters the

Forest.

Agricul. ture,

Bavarian territory, and afterwards receives the Salza, a large river flowing from Upper Austria. The Isar does not become navigable till it has passed Munich; and the Lech is a stream of a similar size. The Main traverses the northern regions, or Upper and Lower Franconia, with a very winding course, and greatly facilitates the trade of the provinces. The district watered by the southern tribu- taries of the Danube consists for the most part of an extensive plateau, with a mean elevation of 2390 feet. In the mountainous parts of the country there are numerous lakes, and in the lower portions considerable stretches of marshy ground, The climate of Bavaria differs greatly

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Sketch Map of Bavaria Proper.

according to the character of the region, being cold in the vicinity of the Tyrol but warm in the plains adjoining the Danube and the Main. On the whole, the temperature is in the winter months considerably colder than that of Eng- land, and a good deal hotter during summer and autumn. The extent of forest is more than twice that of the land under wood in Great Britain. It forms more than a fourth of the total area of Bavaria, while in Britain the proportion is less than a twenty-sixth, This is owing to various causes—the extent of hilly and moun- tainous country, the thinness of the population, and the necessity of keeping a given extent of ground under wood for the supply of fuel. Nearly a third of the forests are public property, and furnish a considerable addition to the revenue, They are principally situated in the provinces of Upper Bavaria, Lower Bavaria, and the Upper Palatinate. The level country, including both Lower Bavaria (extending northwards to the Danube), and the western and middle parts of Franconia, is very productive in rye, oats, wheat, barley, and millet, and also in hemp, flax, hops, madder, and (in warm situations) in vines. The last are grown chiefly in the vicinity of the Lake of Constance and on the banks of the Main, in the lower part of its course, while the most extensive hop-growing district is central Franconia. Potatoes are cultivated in all the provinces, but especially in the Palatinate and in the Spessart district, which lies in the north-west within a curve of the Main. The southern division of Swabia and Upper Bavaria, where pasture-land

_ predominates, form a cattle-breeding district, and the dairy

produce is extensive, no less than 11,000 tons of cheese and 2386 tons of butter being sold in the course of a year. The former finds a market all over Germany, and is also

exported to Austria, France, and other countries, while Northern Germany is the chief consumer of the latter. The greater proportion of the land throughout the kingdom is in the hands of peasant proprietors, the extent of the separate holdings differing very much in different districts. The largest peasant property may be about 170 English acres, and the smallest, except in the Palatinate, about 50.

According to the returns for 1863 the number of cattle Live Stock.

in the kingdom was 3,185,688 ; sheep, 2,058,638 ; swine, 926,522 ; and goats, 150,855. Oxen are largely employed in agricultural operations instead of horses, The cattle, as

a general rule, are kept in sheds, and not pastured in the fields.

Of mineral deposits Bavaria possesses a great variety. Minerals.

The quantity of iron ore is very large both in the south and north, the number of mines being between 200 and 300. Coal-mines are likewise numerous, especially in the districts of Amberg, Kissingen, Steben, Munich, and the Rhine Palatinate. The produce in 1867 was nearly 351,000 tons. Of quicksilver there are several mines, chiefly in the Palatinate of the Rhine; and small quantities of copper, manganese, and cobalt are obtained. There are numerous quarries of excellent marble, alabaster, gypsum, and building stone; and the porcelain-clay is among the finest in Europe. To these may be added graphite, emery, steatite, barytes, felspar, and ochre, in considerable ‘quantities ; excellent lithographic stone is obtained at Solnhofen ; and gold and silver are still worked to an insignificant extent.

Salt is annually prepared on a large scale, being obtained partly from brine springs and partly from mines, The principal localities are Halle, Berchtesgaden, Traun- stein, and Rosenheim. The gross production in 1866 was 41,119 tons, and the value at the works amounted to £62,869. In the following year the Government monopoly, which had existed so long, was abolished, and free trade was established in salt between the members of the customs-union, a change which has led to a considerable import of salt from Prussia.

A great stimulus was given to manufacturing industry Manufac- in Bavaria by the law of 1868, which abolished the last '7s.

remains of the old restrictions of the guilds, and gave the whole country the liberty which had been enjoyed by the Rhine Palatinate alone. The chief manufacturing centres are Nuremberg and Munich for hardware, and Augsburg for cloth goods; but various other towns are rising into importance. In Franconia are numerous paper-mills, and saw-mills are naturally common in the forest districts. A considerable quantity of glass is manufactured, especially in the Béhmerwald, and wooden wares are largely pro- duced at Ammergau and Berchtesgaden. The preparation of the favourite national drink forms an important industry,— the breweries throughout the kingdom numbering upwards of 5000. Among the most remarkable are the breweries of Erlangen. Other articles of manufacture are leather, tobacco, and earthenware.

The exports from Bavaria consist chiefly of salt, timber, Trade.

cattle, pigs, corn, and madder ; and the imports comprise sugar, tobacco, raw cotton and cotton-goods, silks and linen, iron and iron-wares. As most of the imports are introduced indirectly through other Zollverein states, no custom-house register is kept of the total amount.

The highroads in Bavaria extend in all over 9000 Communi- In 1869 there were rather more than 1600 miles tion.

miles, of railway in operation, and nearly 300 were in course of construction, The greater proportion is in the hands of the Government, and the remainder belongs to the Eastern Company and the United Railway

Companies of the Rhine Palatinate. The principal canal in the kingdom is the Ludwigs-canal, which connects the Rhine with the Danube, extending from Bamberg on the Regnitz to Dietfurt on

National character,

Govern- ment.

Revenue.

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the AltmiihL There is an extensive network of telegraphs, all of which belong to, and are worked by, the Govern- ment post-office.

The Bavarians proper form a distinct section of the German race, speaking a well-defined dialect of the High German , but a large portion of the population of the country is of Swabian origin. The national character resembles that of the Austrians, being generally marked by fidelity and loyalty. In matters of religion they are credu- lous and even superstitious ; and the will of their superiors is received by the lower orders with great deference both in political and ecclesiastical affairs. Independence of thought and action have, however, been gradually increas- ing; and now that the country has become part of the German empire, a rapid transfusion of intellectual and political life is apparently taking place.

The present form of government is founded partly on long-established usage and partly on a constitutional act, passed in May 1818, and modified by subsequent acts, of which the most important was passed in 1848-9. The monarchy is hereditary, with a legislative body of two houses. The title of the sovereign is simply king of Bavaria; that of his presumptive heir is crown-prince of Bavaria. The executive power is vested altogether in the king, whose person is declared inviolable, the responsibility rests with the ministers, whose functions are nearly the same as those of ministers in England ; and there are offices for foreign affairs for the home department, for religion and education, for the treasury, the army, and the administration of justice. These are all situated in Munich, the capital. The upper house of the Bavarian parliament, known as the Chamber of the

Reichsrdthe, comprises the princes of the blood-royal, the two archbishops, the barons or heads of certain noble families, a Roman Catholic bishop and Protestant clergyman appointed by the Crown, and any other members whom the king may nominate either as hereditary peers or as coun- sellors for life ; but these last must not exceed a third of the hereditary members. The lower house, or Chamber of Representatives (Wahlkammer), consists of about 150 deputies, who formerly were chosen in definite proportions from the different classes of the community, an eighth part from the nobility, another eighth from the clergy, a fourth part from the burghers, and the remaining half from the landed proprietors ; but since 1848 they may be selected without any such restrictions. A general election takes place once in six years, one deputy being allowed for every 7000 families in the kingdom. The election, however, is indirect,—electoral proxies, or Wahlmdnner, to whom the real election is entrusted, being chosen by the general body of electors at the rate of one proxy toevery 500 men. The king generally convenes the parliament once a year, and by the constitution it is obligatory on him to do so at least once in three years.

The following is a statement of the budget for the year 1874-5, in marks (equal to 1s. sterling) :—

REcEIPTs. Direct Taxes. Marks, Team dita tartan cccadaocteteee oo 11,438,323 Tax on buildings…..... 1,995,086 Tax on licences …..... 2,820,000 Tax om capital…..... ccc. 1,628,571 DEX Om IMCOMPE,.. .....cese0s 857,148

18,739,123

Indirect Taxes, Registration uc cctiscsese 10,889,006 VOID iy cn xe gaten «: 8, 286, 029 DOE Cheha: gs. dese Seas i CO BH CUBVORI TS UM eich cons 1,344,171 a 38,246,343 Carry forward, 51,985, 466

BAVARIA

Brought forward, 51,985, 466 Royalties and State Establishments. Mines and Salt-works…..... 8,788, 285 Colma genres conenetmars < oenee. 245,045 AMIWAYSW. ..cccseescenes seo MOS EON EDT Rosteothicemee.. oe… eee 7,705,261 Telographs:....ccs mee. Eeeiagoge Ludevig gama…

.2siyscacevaee 188,581 SUNOS Hess ec eeosiecaee eee dette 437,772 ———— 76 91,9 Domains)... eee. eee BORON Specit) duties nncmvencmntn ee 55,366 Olen, Rete eri… coaniices nuns mene eae: 598,188 Surplus of eleventh financial period…..... 10,851,428 TatpnOTteh BIR 05s 6.5.5 asaacnes so sna ceeten 34,580,760 Share of French indemnity…..... 857,143 Motall tewelptsna…...eesesues 212,051,868 Marka, or £10,602,593 DISBURSEMENTS. Pt os cn gy Maar 27,581,400 CiViIBlist: Beever. ce digcccceorehee eee 5,415, 470 Conmicilfon stateremannincess eres tenes: 104,955 Parliamentary expenses …....0cc0eees 346,006 Royal household and foreign affairs. ..... 671,091 SMISEL COR vee nicer econ vescOOD ee ABIES B AR onapeonnceceerneecoseanconue see daatanocs 2,359,553 Religion and education….....0.6 se 18, 476, 318 Contribution to imperial funds,..... 14,747,691 ENT ssacucaa tenant eelecaics eee eee 34,580,760 Pensions to widows and orphans…..... 1,689,771 Reserve tun: x. cesccnsae canneries 899,409 ROGAN serene a5 Pee ee CSTR 186,846,594

Expenses of administration… 75,205,274

212,051,868 Marks, or £10,602, 598

The Bavarian army forms, since the 23d November Army.

1870, a separate portion of the army of the German empire, with a distinct administration; but its organiza- tion is subject to the general imperial rules, and in time of war it is placed under the command of the emperor, It comprises two corps d'armée, each divided into two divi- sions. In time of peace its infantry consists of 26,590 men, distributed in sixteen regiments; besides which there are ten battalions of chasseurs, 5500 strong, and thirty-two battalions of landwehr ; the cavalry numbers 7200 men divided into ten regiments, and the artillery amounts to 5528 men in six regiments ; there are also two' battalions of pioneers and as many of the military train. In time of war the total force is raised to 149,892, or rather more than trebled.

The districts of Lower Bavaria, Upper Bavaria, and the Religion.

Upper Palatinate are almost wholly Catholic, while in the Rhine Palatinate, Upper Franconia, and especially Middle Franconia, the preponderance is on the side of the Pro- testants. The exercise of religious worship in Bavaria is altogether free. The Protestants have the same civil rights as the Catholics, and the sovereign may be either Catholic or Protestant. Of the Roman Catholic Church the heads are the two archbishops of Munich-Freising and Bamberg, and the six bishops of Eichstidt, Spire, Wiirzburg, Augs- burg, Regensburg, and Passau, of whom the first three are suifragans of Bamberg. The "Old Catholic" party has recently taken considerable hold of the country, and has organized congregations in all the more important towns. Among the Protestants the highest authority is the general consistory of Munich. The proportion of the different religions in 1871 was as follows: —Roman Catholics, 3,464,364 ; Protestants, 1,342,592; Jews, 50,662 ; lesser Christian sects, 5453; other religions, 379.

Bavaria was formerly as backward in regard to educar

Provinces.

Popula- tion.

BAVARIA

tion as Austria, or any part of the south of Germany; but latterly considerable efforts have been made to lessen the prevailing ignorance. At Munich there are scientific and literary academies, as well as a university, a lyceum, a gymnasium, and other public schools. The university has a very numerous attendance of students, ranking third in the new German empire; and there are two provincial universities on a small scale, one (Catholic) at Witrzburg, the other (Protestant) at Erlangen in Franconia. In the kingdom at large there are ten lyceums, twenty-eight gymnasia, about sixty progymnasia, besides ten normal, twenty-six trade, three polytechnic, and upwards of 7000 common schools. These certainly form a great contrast to

the indifference and neglect of former times; and the

Government continues to evince much solicitude for the diffusion of instruction. Technical schools here, as in other parts of Germany, have been

established for the purpose of affording to mechanics more suitable education than they could otherwise obtain, including mathematics, mechanics, drawing, chemistry, architecture, &c. These schools are supported by the commune, aided when necessary by the province, and commissioners are annually sent by Govern- ment to examine and report upon them to the minister of trade. The course extends over three years, from the age of twelve to fifteen, after which pupils may enter one of three polytechnic schools, where a still higher course of instruction is imparted, also extending over three years ; but engineers have a special fourth year's course. A build- ing school was established at Munich in 1828, and is chiefly intended for carpenters and masons, who are there instructed in architecture, drawing, geometry, stone-cutting, modelling ornaments, &c.

The duchy of Bavaria during the Middle Ages consisted

_of the southern half of the present kingdom, and lay almost

all to the south of the Danube, extending about 100 miles from that river to the Tyrol, and somewhat more from Swabia on the west to Austria on the east. The addition in 1623 of the Upper Palatinate, a province of full 3000 square miles, to the north of the Danube, gave the elector a territory of about 15,000 square miles, with a population of less than 1,000,000, which in a century and a half had increased to about 1,500,000. In 1778 the succession of the Rhenish branch of the reigning family added the Pala- tinate of the Rhine, and in 1806 a large augmentation was effected by Napoleon, who presented the king with the districts of the Lower Main and the Rezat, and with part of those of the Upper Main and the Upper Danube ; not to mention Tyrol, which was afterwards restored to Austria. Some slight changes have taken place in the exteut of the kingdom since then ; but its general character has not been affected. The most important cession of recent years was that of part of Franconia in 1866 to Prussia, amouuting to 291 square miles, with a population of 32,976 inhabitants. The following table gives the present and former division of the kingdom and its population in 1818, 1846, and 1871 respectively :—

| Population. Old Circles. New Circles.

ing. i? ae a | Miles.) 1818. 1846, 1871.

Isar Upper Bavaria —|6556/585, 467/705, 544 841, 707 Lower Danube | Lower Bavaria 4141/450, 895/543, 709/608, 789 Regen Upper Palatinate |3717/403, 481/467,606 497,861 Upper Main Upper Franconia |2692)394,954 501,163 541,063 Rezat Middle ,, 2906|437,838 527, 866 583,666 Lower Main | Tower ,, 3230|501,212 592, 080/586, 132 Upper Danube | Swabia 36511487, 951,558, 436/582, 773 Rhine Rhine Palatin at [2282

446,168 608, 470 615,035

The total population in 1871, including the troops then absent in France, amounted to 4,863,450. The density

453

of population varics considerably in the different districts from about 273 inhabitants to the square mile in the Pala- tinate to 128 in Upper Bavaria. As represented by the increase of each successive census the growth of the popu- lation is rather slow, but a large amount of emigration to America and elsewhere has to be taken into account. A very considerable number of the people are urban, as may be seen from the following list of principal towns (arranged in the order of the circles) with their populations :—

; Munich (capital) 169,693

Ue eT en ee rae ene: a 13,157 Wan S liu teneneseeeeeentee . 14,140

Lower Bavaria…..... RaSsaeeneamncan cea seneeet 13,379 Streuli Gite csneestdsens select 11,150

F Ratisbon (or Regensburg)... 29,185

Unies Palaninate…. ens ithe Oe a ee ISERIES conon BecoonoooROOOLe 25,738

Upper Francotiia’... < Bayreutht’.....0ccesrscees 17,841 Ol) aun eee are Pr er Ina ch 16,010

INADA HE aoepnnononpnoeceo OG 83,214

- *: Ihibed eanpeeneeaccccemencndcope sas 24,577 Middle Franconia … IATL CENG tin anodenepao BoSncee ee 12,636 She Lana g2h Nl gemengannnanypoonbes tec i 51)*

WaUTZ IOUS. ie vais contest oss coereete 40,005

Lower Franconia. ... ¢ Schweinfurt….....2… 10,325 ee eeetehaoccette 9,212

: TEST ass nescceederneeses css Wlgumen SWAB... sseees soos Kempten sss ssscsecsecs scenes 11,228 Kaiserslautern. c00 17,896

Palatine Gt WRodedhaNel.. « SyetiGeoaedonoesenonibeennese.cqoooe 13, 223 INIGWStAGIUE mn oasis veline ss nattiens 9, 320

The name in German, Bayern, or Baiern, is derived, History.

like Latin Boiaria, from Boii, the name of a Celtic people by whom the country, which then formed part of Rhetia, Vindelicia, and Noricum, was inhabited in the time of Augustus, After the fall of the Roman power the natives were governed by chieftains of their own till the era of Charlemagne, who subjugated this as well as most other parts of Germany. After his death Bavaria was governed by one of his grandsons, whose successors bore the title of Margrave, or Lord of the Marches. In the year 920 the ruling margrave was raised to the rank of duke, which continned the title of his successors for no less than seven centuries. During this period Bavaria was connected with Germany nationally by language and politically as a frontier province, but in civilization was almost as back-ward as Austria, and was greatly behind Saxony, Franconia, and the banks of the Rhine. At last, in 1620, the reign- ing duke, having rendered great service to Austria against an insurrection in Bohemia, received an important accession of territory at the expense of the Elector Palatine, and was appointed one of the nine electors of the empire. His successors continued faithful members of the Germanic body and allies of Austria until 1771, when the elector Max Emanuel began to assist Louis XIV. of France by threatening and attacking Austria, so as to prevent her from co-operating efficiently with England and Holland. This induced the duke of Marlborongh, in the spring of 1704, to march his army above 300 miles from the banks of the Meuse to invade Bavaria, the fate of which was decided by the battle of Blenheim on the 13th August 1704, For ten years from this date the elector and his remaining forces served in the French armies, and his country was governed by imperial commission uutil the

peace of Utrecht, or more properly that of Baden, in 1714, reinstated him in his dominions.

His son Charles Albert, who succeeded him in 1726, untaught by these disasters, renewed his connection with France; and, in 1740, on the death of the emperor of Germany, came forward as a candidate for the imperial crown. He obtained the nomination of a majority of the electors, and overran a considerable part of the Austrian territory ; but his triumph was of short duration, for the armies of Maria Theresa not only repulsed the Bavarians,

but obtained in 1744 possession of the electorate. The | of his disagreement with the spirit of his times, abdicated elector died soon after, and his son Maximilian Joseph | in March 1848 in favour of his son Maximilian II. It recovered his dominions only by renouncing the preten- | was not long before the difficulties of the new king were sions of his father. distinctly brought to view by the insurrection of the demo-

Bavaria now remained tranquil above thirty years, until | cratic party in Westphalia. By the assistance of Prussia 1777, when, by the death of Maximilian, the younger line | the rising was quelled, and punishment was so ruth- of the house of Wittelsbach, the line which had long ruled | lessly inflicted by the tribunals that the trials became in Bavaria, became extinct. The next heir was Charles | known as the bloody assizes. An anti-liberal reaction Theodore the Elector Palatine, the representative of the | set in, and many of the political gains of former years elder line of Wittelsbach ; but Austria unexpectedly laid | were consequently lost. In 1864 King Louis was succeeded claim to the succession, and took military possession of | by his son of the same name (Louis II.); and at this time part of the country. This called into the field, on the side | the great question on the future hegemony of Germany of Bavaria, Frederic II. of Prussia, then advanced in years ; | was being agitated throughout the country. In the war but, before any blood had been shed, Austria desisted from ; of 1866 the Bavarian Government and people threw in her pretensions, on obtaining from Bavaria the frontier ; their lot with Austria, shared in the contest, and were district which bears the name of Innviertel, or the Quarter | involved in the

defeat and loss. On the withdrawal of of the Inn. Austria from the German confederation a change of policy

|

Bavaria again remained at peace until the great contest | was introduced, and the Government veered round to between Germany and France began in 1793, when she | the interests of Prussia, a course which was confirmed by was obliged to furnish her contingent as a member of the | the Franco-German War of 1870, when Bavaria took an empire. During three years her territory was untouched ; | active part with Prussia against thecommon enemy. Much but in the summer of 1796, a powerful French army under | ferment, however, remained in the country, and religious Moreau occupied her capital, forced her to sign a separate | elements were introduced into the political discussions. treaty with France, and to withdraw her contingent from | The clerical, or, as it styles itself, the patriot party, is the imperial army. The next war between France and | opposed to Prussian influence, and contends for " particu- Austria, begun in 1799, ending disastrously for the latter, | larism," wishing to maintain a greater degree of independ- the influence of France in the empire was greatly | ence for Bavaria than seems to be compatible with strengthened, so that, when the Austrians once more took | imperial unity. Fora number of years the Government up arms, in 1805, Bavaria was the firm ally of France, | has been in the hands of the Liberal party. Thus a series and for the first time found advantage in the connection,— | of the most important measures have been passed with a its elector, Maximilian Joseph, receiving from Napoleon | liberal tendency, and the country is being gradually the title of king and several additions of territory. assimilated to the more advanced states of Northern

Bavaria continued to support the French interest with | Germany. The focus of the Liberal party is the Palatinate her best energies till 1813, when, on condition of her late | of the Rhine, while the ' patriots" are mainly recruited acquisitions being secured to her, she was led to join the | from the districts of Old Bavaria. The decisive triumph Allies, and her forces contributed largely to the ultimate | of the former was marked by the treaty of November 23, defeat of Bonaparte. In 1818 Maximilian presented his |

1870, between Bavariaand the Confederation of Northern country with a constitution, of rather a mixed character, | Germany, which was followed by the recognition of the in which an attempt was made at once to satisfy the | king of Prussia as the head of a new German empire. growing desire for political liberty and to maintain | At the same time a greater degree of independence was the kingly power. At the same time several beneficial | granted to Bavaria than to the other members of the measures, such as the abolition of ,.serfdom, were effected | Confederation ; it was freed from the domiciliary surveil- in the earlier sessions of the new parliament. 'In 1825 | lance of the empire, and allowed to retain the administration Maximilian was succeeded by his son Louis, who dis- | of its own postal and telegraph systems, while its army has tinguished himself as a promoter of the fine arts, but proved | a separate organization, and during peace is under the himself destitute of political capacity, and in consciousness | command of the Bavarian king.

BAXAR, or Buxar, a town of Hindustan, in the province | Khan's jewels, which I was informed amounted to between of Behar, district of Shahébdd, on the south bank of the | twoand three millions." Population in 1872, 13,446. Ganges, in 25°32' N. lat., 84°3' E. long. The fort, though of BAXTER, ANDREW, an able metaphysician, the son of small size, was important from its commanding the Ganges, | a merchant in Old Aberdeen, was born in 1686 or 1687, but is now dismantled. The place is distinguished by a | and educated at King's College there. After leaving the celebrated victory gained on the 23d October 1764 by the | university he acted for some years as tutor to various young British forces under Major (afterwards Sir Hector) Munro, | gentlemen, among others to Lord Gray, Lord Blantyre, over the united armies of Sujd4-ud-Daulah and Kasim Ali | and Mr Hay of Drummelzier. In 1733 he published, in Khan. The action raged from 9 o'clock till noon, when | quarto, but without date, An Inquiry into the Nature of the enemy gave way. Pursuit was, however, frustrated | the Human Soul, wherein its immateriality is deduced from by Sujé-ud-Daulah sacrificing a part of his army to the | the principles of reason and philosophy. In 1741 he went safety of the remainder. A bridge of boats had been con- | abroad with Mr Hay, and resided several years at Utrecht, structed over a stream about 2 miles distant from the field | from which place he made excursions into Flanders, France, of battle, and this the

enemy destroyed before their rear | and Germany. He returned ‘to Scotland in 1747, and had passed over. Through this act 2000 troops were | resided at Whittingham, in Haddingtonshire, till his death, drowned, or otherwise lost; but destructive as was this | which occurred on April 23,1750. His principal work, proceeding, it was, says Major Munro, “the best piece of | besides the Znquiry, was a short dialogue entitled Matho, generalship Sujd-ud-Daulah showed that day, because if I | seve Cosmotheoria puerilis, Dialogus in quo prema elementa had crossed the rivulet with the army, I should either | de mundi ordine et ornatu proponuntur, &c. ‘This was have taken or drowned his whole army in the Karamnasé, | afterwards greatly enlarged, and published in English in and come up with his treasure and jewels, and Kasim Ali ‘ two volumes 8vo. In 1750 was published an appendix to

BAXTER

his Inquiry into the Nature of the Human Soul, in which he endeavoured to remove some difficulties which had been started against his notions of the vis inertie of matter, by Maclaurin, in his Account of Sir Isaac Newton’s Philoso- phical Discoveries. To this Baxter prefixed a dedica- tion to John Wilkes, with whom he had formed acquaintance abroad. The Inquiry is a work of no small ability. The author begins by examining, after the principles of the Newtonian philosophy, the properties of matter. All, save one, result from forces which act on matter. The one essential property of matter is its inac- tivity, vis inertic, or resistance to motion. From this single fact it at once follows that all action or movement must be the effect of some immaterial cause, z.¢.,of God. The spon- taneous motions of the body are not of the same kind as the mechanical movements of the external universe, and are accordingly to be ascribed to a special immaterial force, or spirit, the soul. From the immateriality of the soul its immortality is, of course, deduced. Nor does the conscious existence of the soul depend upon that of the body ; it lives after death. Baxter supports his argumeut by a long analysis of the phenomena of dreams, which he ascribes to direct spiritual influence, and finally attempts to prove that matter is not eternal, A second edition of the Znquiry was published in 1737, and a third in 1745.

. BAXTER, Ricwarp, one of the most eminent of English divines, styled by Dean Stanley "the chief of English Protestant Schoolmen," was born at Rowton in Shrop- shire, at the house of his maternal grandfather, on November 12, 1615. His family connections were favourable to the growth of piety. But his early education was much neglected, and he did not study at any university, a circumstance worthy of notice, con- sidering the eminent learning to which he afterwards attained. His best instructor wasa Mr John Owen, master of the Free School at Wroxeter. His diligence in the ac- quirement of knowledge was remarkable ; and from the first he had a strong bent towards the philosophy with which religion is concerned,—Mr Francis Garbet of Wroxeter being the director of these studies. Yor a short time his attention was turned to a court life, and he went to London under the patronage of Sir Henry Herbert, master of the revels, to follow that course ; but he verysoon returned home with a fixed resolve to cultivate the pursuit of divinity. Practical rather than speculative theology seems to have occupied his mind, and he therefore presented himself for ordination without any careful examination of the Church of England system. He was nominated to the mastership of the Free Grammar School, Dudley, in which place he com- menced his ministry, having been ordained and licensed by Thornborough, bishop of Worcester. His popularity as a preacher was, at this early period, very great; and he was soon transferred to Bridguorth, where, as assistant to a Mr Madstard, he established a reputation for the vigorous discharge of the duties of his office.

During this time he took a special interest in the controversy relating to Nonconformity and the English Church. He soon, on some points, became alienated from the Church ; and after the requirement of what is called "the et cetera oath," he rejected Episcopacy in its English form. He could not, however, be called more than a moderate Nonconformist; and such he continued to be throughout his life. Though commonly denominated a Presbyterian, he had no exclusive attachment to Presby- terianism, and often manifested a willingness to accept a modified Episcopalianism. Al forms of church government were regarded by him as subservient to the true purposes of religion.

One of the first measures of the Long Parliament was to effect the reformation of the clergy; and, with this view,

a committee was appointed to receive complaints against them. Among the complainants were the inhabitants of Kidderminster, a town which had become famous for its ignorance and depravity. This state of matters was so clearly proved that an arrangement was agreed to on the part of the vicar, by which he allowed £60 a year, out of his income of £200, to a preacher who should be chosen by certain trustees. Baxter was invited to deliver a sermon before the people, and was unanimously elected as the minister of the place. This happened in 1641, when he was twenty-six years of age.

His ministry continued, with very considerable intcrrup- tions, for about nineteen years; and during that time he accomplished a work of reformation in Kidderminster and the neighbourhood which is as notable as anything of the same kind upon record. Civilized behaviour succeeded to brutality of manners; and, whereas the professors of religion had been but small exceptions to the mass, the unreligious people became the exceptions in their turn. He formed the ministers in the country around him into an association for the better fulfilment of the duties of their calling, uniting them together irrespective of their differ- ences as Presbyterians, Episcopalians, and Independents. The spirit in which he acted may be judged of from The eeformed Pastor, a book published in relation to the general ministerial efforts he promoted. It drives home the sense of clerical responsibility with extraordinary power. The result of his action is that, to this day his memory is cherished as that of the true apostle of the district where he laboured.

The interruptions to which his Kidderminster life was subjected arose from the condition of things occasioned by the Civil War. Worcestcrshire was a cavalier county, and a man in Baxter's position was, while the war continued, exposed to anuoyance and danger in a place like Kidder- minster. He therefore removed to Gloucester, and after- wards settled in Coventry, where he for the most part remained about two ycars, preaching regularly both to the garrison and the citizens. After the battle of Naseby he took the situation of chaplain to Colonel Whalley's regiment, and continued to hold it till February 1647.

His connection with the Parliamentary army was a very characteristic one. He joined it that he might, if possible, counteract the growth of the sectaries in that ficld, and maintain the cause of constitutional government in opposition to the republican tendencies of the time. He regretted that he had not previously accepted an offer of Croinwell to become chaplain to the Ironsides, being confident in his power of persuasion under the most difficult circumstances. His success in converting the soldiery to his views does not seem to have been very great, but he preserved his own consistency and fidelity in a remarkable degree. By public disputation and private conference, as well as by preaching, he enforced his doctrines, both ecclesiastical and political, and shrank no more from urging what he conccived to be the truth upon the most powerful officers than he did from instructing the meanest followers of the camp. Cromwell shunned his society ; but Baxter having to preach before him after he had assumed the Protectorship, chose for his subject the old topic of the divisions and distractions of the church, and in subsequent interviews not only opposed him about liberty of conscience, but spoke in favour of the monarchy he had subverted. There is a striking proof of Baxter's insight into character in his account of what happened under these circumstances. Of Cromwell he says, "I saw that what he learned must be from himself." It is worthy of notice that this intercourse with Cromwell occurred when Baxter was summoned to London to assist in settling "the fundamentals of religion," and made the memorable declaration in answer to the objection, that

what lie had proposed as fundamental " might be subscribed by a Papist or Socinian." "So much the better," was Baxter's reply, "and so much the fitter it is to be the matter of concord."

After the Restoration in 1660 Baxter settled in London. He preached there till the Ejectment Act took effect in 1662, and was employed in seeking for such terms of com- prehension as would have permitted the moderate dissenters with whom he acted to have remained in the Church of England. In this hope he was sadly disappointed. There was at that time on the part of the rulers of the church no wish for such comprehension, and their object, in the negotiations that took place, was to excuse the breach of faith

which their rejection of all reasonable methods of concession involved. The chief good that resulted from the Savoy Conference was the production of Baxter's Re- formed Liturgy, a work of remarkable excellence, though it was cast aside without consideration. The same kind of reputation which Baxter had obtained in the country he secured in the larger and more important circle of the metropolis. The power of his preaching was universally felt, and his capacity for business placed him at the head of his party. That he should have been compelled by the activity of party spirit to remain outside the National Church is to be deeply regretted. He had, indeed, been made a king's chaplain, and was offered the bishopric of Hereford, but he could not accept the offer without virtually assenting to things as they were; after his refusal he was not allowed, even before the passing of the Act of Uniformity, to be a curate in Kidderminster, though he was willing to serve that office gratuitously. Bishop Morley even pro- hibited him from preaching in the diocese of Worcester. The whole case illustrates afresh the vindictive bitterness of ecclesiastical factions in the heat of party contests, and especially in the hour of secular triumph.

From the Hjectment of 1662 to the Indulgence of 1687, Baxter's life was constantly disturbed by persecution of one kind or another. He retired to Acton in Middlesex, for the purpose of quiet study, and was dragged thence to prison on an illegal accusation of keeping a conventicle. He was taken up for preaching in London after the licences granted in 1672 were recalled by the king. The meeting- house which he had built for himself in Oxendon Street was closed against him after he had preached there but once. He was, in 1680, seized in his house, and conveyed away at the risk of his life; and though he was released that he might die at home, his books and goods were distrained. He was in 1684 carried three times to the sessions' house, being scarcely able to stand, and without any apparent cause was made to enter into a bond for £400 in security for his good behaviour.

But his worst encounter was with Judge Jeffreysin May 1685. He had been committed to the King's Bench Prison for his Paraphrase on the New Testament, which was ridiculously attempted to be turned into a seditious book, and was tried before Jeffreys on this accusation. The scene of the trial is well known as among the most brutal perversions of justice which have

occurred in England. Jeffreys himself acted like an infuriated madman; but there were among his blackguardisms some sparks of intelligence.

Mr Rotheram, one of his counsel, said that Baxter frequently attended divine service, went to the sacrament, and persuaded others to do so too, as was certainly and publicly known; and had, in the book charged against him, spoken very moderately and honourably of the bishops of the Church of England. " Baxter for bishops !" Jeffreys exclaimed, 'that's a merry conceit indeed; turn to it, turn to it." Upon this, Rotheram read out:—" That great respect is due to those truly called to be bishops among us," or to that purpose. "Ay," said Jeffreys, "this is your Fresbyterian cant—

truly called to be_bishops—that is himself and such rascals, called to be bishops of Kidderminster and other such places, bishops set

apart by such factious, snivelling Presbyterians as himself. A Kidderminster bishop he means, '

That was sharp, however coarse ; for, putting the case vulgarly, it was "a Kidderminster bishop" that Baxter meant. He was sentenced to pay 500 marks, to lie in prison till the money was paid, and to be bound to his good behaviour for seven years. It was even asserted at the time that Jeffreys proposed he should be whipped at the cart's tail through London. The old man, for he was now seventy, remained in prison for two years.

During the long time of oppression and injury which followed the Ejectment, Baxter was sadly afflicted in body. His whole life was indeed one continued disease, but in this part of it his pain and languor had greatly increased. Yet this was the period of his greatest activity as a writer. He was a most voluminous author, his separate works, it is said, amounting to 168. A considerable proportion of these, including folios and quartos of the most solid descrip- tion, were published by him while thus deprived of the common rights of citizenship. How he composed them is matter of wonder. They are as learned as they are elabo- rate, and as varied in their subject as they are faithfully composed. Such treatises as the Christian Directory, the Methodus Theologie Christiane, and the Catholic Theology, might each

have occupied the principal part of the life of an ordinary man. One earthly consolation he had in all his troubles; he was attended upon by a loving and faithful wife, whom he had married in the Ejectment year. She was much younger than himself, and had been brought up as a lady of wealth and station; but she adhered to him in all his wanderings, sharing his sufferings, and following him to prison; and she has her reward in that Breviate of the Life of Mrs Margaret Baxter, which, while it records her virtues, reveals on the part of her husband a tenderness of nature which might otherwise have been unknown.

The remainder of Baxter's life, from 1687 onwards, was passed in peace and honour. He continued to preach and to publish almost to the end. He was surrounded by attached friends, and reverenced by the religious world. His saintly behaviour, his great talents, and his wide influence, added to his extended age, raised him to a position of unequalled reputation. He died in London on the 8th of December 1691, being seventy-six years old, and was buried in Christ Church. His funeral was attended by a very large concourse of people of all ranks and professions, including churchmen as well as dissenters. A similar tribute of general esteem was paid to him nearly two cen- turies later, when a statue was erected to his memory at Kidderminster in July 1875. On that occasion clergy of all denominations, among whom the bishop of Worcester and the dean of Westminster were conspicuous, took part in the proceedings.

There are few persons of whom we can form a more distinct conception than we can of Richard Baxter, His face is quite familiar to us. His thin and stooping figure we seem to have seen. We can imagine the glance of his piercing eye. Who has not smiled at the intensity of his argumentative nature? He thought every one was amenable to reason—bishops and levellers included. See him contending with the military sectaries in the church at Chesham, from morning to night, when "he took the reading-pew, and Pichford's cornet and troopers took the gallery." Follow him, undeterred by his former want of success, to the church at Bewdley, where he disputed all day with Mr Tombs about infant baptism. Read his correspondence with Dr John Owen relative to the union of Presbyterians with Independents, in which his eagerness amusingly contrasts with Owen's hesitation. Watch him hour after hour in hand-to-hand controversy with Dr

Guuning at the Savoy Conference, when all the town looked at them as at two boxers in a ring. These are but specimens of other like exhibitions. And yet he was as far as possible from being a quarrelsome man. It was in charity for his opponents that he fought. His pertina- city in contention was the fruit of the sincerity of his aims. He must have been a delightful companion to those who shared his religious or scholastic sympathies. How pleasant and profitable it would have been to witness the intimate intercourse at Acton between him and Sir Matthew Hale! He was at once a man of fixed belief and large appreciation, so that his dogmatism and his liberality sometimes came into collision. There was a universality in his genius which distinguishes him from most other men. His popularity as a preacher was deservedly pre-eminent ; but no more diligent student ever shut himself up with his books. He was singularly fitted for intellectual debate, but his devotional tendency was cqually strong with his logical aptitude. Some of his writings, from their meta- physical subtilty, will always puzzle the learned; but he could write to the level of the common heart without loss of dignity or pointedness. His Reasons for the Christian Religion is still, for its evidential purpose, better than most works of its class. His Poor Man's Family Book is a manual that continues to be worthy of its title. His Saints' Everlasting Rest will always command the grateful admiration of pious readers. Perhaps no thinker has exerted so great an influence upon. Nonconformity as Baxter has done, and that not in one direction only, but in every form of development, doctrinal, ecclesiastical, and practical. He is the type of a distinct class of the Cliris- tian ministry,—that class which aspires after scholarly training, prefers a broad to a sectarian theology, and adheres to rational methods of religious investigation and appeal. The rational element in him was very strong. lie had a settled hatred to fanaticism. Even Quakerism he could scarcely endure. An infusion of ideal sentiment would have been beneficial to the conduct of his life, as well as to his expositions of truth. The ministers of whom le was the type are to be found in all divisions of the Christian church, but with characteristic modifications, Sometimes their rationalism is most distinctive, sometimes their learning, sometimes their sympathetic feeling. But Baxter excels most of the men he thus represents in his union of those qualities, as well as in the intense sense of religion by which he was

actuated. Religion was with him all and in all,—that by which all besides was measured, and to whose interests all else was sub- ordinated.

A good Life of Baxter, by the Rev. William Orme, was prefixed to his Practical Works (published in 23 volumes) ; Dr Calamy abridged his Zife and Times. The abridgment forms the first volume of the account of the ejected ministers, but whoever refers to it should also acquaint himself with the reply to the accusations which had been brought against Baxter, and which will be found in the second volume of Calamy's Continuation. Sir James Stephen's interesting paper on Baxter, contributed origin- ally to the Hdinburgh Review, is reprinted in the second volume of his Hssays. The best recent estimates of Baxter are those given by Principal Tulloch in his English Purt- tanism and its Leaders, and by Dean Stanley in his address at the inauguration of the statue to Baxter at Kidderminster. But most valuable of all is Baxter's autobiography, called Reliquie Baxteriane, or Mr Richard Baxter's Narrative of the most memorable Passages of his Life and Times. It is almost as real as a personal knowledge of its subject could have been. The account he gives at the end of Part I. of the spiritual changes he had undergone will never cease to be regarded as a rare and profoundly

interesting instance of faithful self-knowledge, and it has served the cause of Christian charity more, probably, than any treatise ever written on the subject.

There are two testimonies to Baxter's worth which, though they have frequently been quoted, cannot be omitted from any fair notice of him. Dr Barrow said that "his practical writings were never mended, and his controversial ones seldom confuted," and Bishop Wilkins asserted that "if he had lived in the primitive time he had been one of the fathers of the church,"

BAYARD, Pierre pu TERRAIL, CHEVALIER DE, was born, of a noble family, at the chateau Bayard, Dauphiné, in 1476. He served as a page to the duke of Savoy until Charles VIII., attracted by his graceful bearing, placed him among the royal followers under the count de Ligny. As a youth he was distinguished for comeliness, affability of manner, and skill in the

tilt-yard. In 1494 he accom- panied Charles VIII. into Italy, and was knighted after the battle of Fornova, where he had captured a standard, Shortly afterwards, entering Milan alone in pursuit of the enemy, he was taken prisoner, but was set free without a ransom by Ludovic Sforza. His powers and daring were conspicuous in the Italian wars of this period. On one occasion it is said that, single-handed, he made good the defence of a bridge over the Garigliano against about 200 Spaniards, an exploit that brought him such renown that Pope Julius II. sought to entice him into the Papal service, but unsuccessfully. The captaincy of a company in the royal service was given lim in 1508, and the following year he led a storming party at the siege of Brescia. Here his intrepidity in first mounting the rampart cost him a severe wound, which obliged his soldiers to carry him into a neighbouring house, the residence of a nobleman, whose wife and daughters he protected from threatened insult. On his recovery he declined a gift of 2500 ducats, with which they sought to reward him. At this time his general was the celebrated Gaston de Foix, who acted greatly in accordance with his advice, and, indeed, fell at the battle of Ravenna through neglecting it. In 1513, when Henry VIII. of England routed the French at the battle of the Spurs, Bayard, in trying to rally his country-men, found his escape cut off. Suddenly riding up to an English officer who was resting unarmed, he summoned him to yield, and the knight complying, Bayard in return gave himself up to his prisoner. He was taken into the English camp, but on relating this gallant incident was immediately set free by the king without ransom. On the accession of Francis J. in 1515 he was made lieutenant- general of Dauphiné ; and after the victory of Marignano, to which his valour largely contributed, he had the honour of conferring knighthood on his youthful sovereign. When war again broke out between Francis I. and Charles V., Bayard, with 1000 men, held Méziéres, a town which had been declared untenable, against an army of 35,000, and after six weeks compelled Nassau to raise the siege. This stubborn resistance saved Central France from invasion, as the king had not then sufficient forces to with- stand the imperialists. All France rang with the achievement. Parliament thanked Bayard as the saviour of his country; the king made him a knight of the order of St Michael, and commander in his own name of 100 gens d'armes, an honour till then reserved for princes of the blood. After allaying a revolt at Genoa, and striving with the greatest assiduity to check a pestilence in Dauphiné, Bayard was sent, in 1523, into Italy with

Admiral Bonivet, who, being defeated at Rebec, implored him to assume the command and save the army. He repulsed the foremost pursuers, but in guarding the rear at the passage of the Sesia was mortally wounded. He had himself placed against a tree that he might die facing the

enemy, and to Bourbon, who came up and expressed pity for him, he replicd, "My lord, I thank you, but pity is not for me, who die a true man, serving my king; pity is for you who bear arms against your prince, your country, and your oath" He expired aftcr repeating the Miserere. His body was restored to his friends and interred near Grenoble, Chivalry, deprived of fantastic extravagance, is perfectly mirrored in the character of Bayard. He combined the merits of a skilful tactician with the romantic heroism, piety, and magnanimity of the ideal knight-errant. Even adversaries experienced the fascination of his virtues, and joined in the sentiment that he was, as his contemporaries called him, "Le chevalier sans peur et sans reproche." (Qf. Walford's Chevalier Bayard.)

BAYAZID, or Basazip, a city of Turkish Armenia, in the pashalic of Erzeroum, 50 miles 8.S.W. of Erivan, situated on the side of a rugged mountain that forms, as it were, a bastion of the Ala-dagh chain. It contains two churches, three mosques, and a monastery, that of Kara Killeesea, which is famous for the beauty of its architecture, as well as for its antiquity and grandeur. The summit of the mountain is occupied by the ruinous Ak Serai, or palace, which was built by Mahmoud Pasha. The Pasha's tomb, a work of considerable richness, is in the neighbouring mosque. The position of the town, on the frontiers of Turkey and Persia and on the high road between Armenia and Azerbi- jan, gives it a certain importance. It was captured by the Russians in 1828 and again in 1854, when they destroyed the fortifications on their departure. The population, which has decreased greatly within the last forty years, now numbers about 5000. Long, 43° 26' E., lat. 39° 24' N,

BAYEUX, formerly the capital of the Bessin, and now the chief town of an arrondissement in the department of Calvados, in France. It is situatéd in a

fruitful valley on the River Aure, 17 miles W.N.W. of Caen. Many of its houses are of considerable antiquity, especially in the Rue St Malo and Rue St Nicholas, one in the former street being a fine specimen of the woodwork of the 15th century. The cathedral is a majestic edifice for the most part of the 12th century, though the crypt probably dates from the time of Odo (1047). There are said to be no fewer than 2976 capitals in its construction, all sculptured differently. Bayeux is the seat of a bishopric, and has tribunals of primary jurisdiction and commerce, a communal college, and an extensive library. The former episcopal palace is now the town-house, and the seminary is turned into barracks. The chief manufactures are linen and cotton goods, hosiery, lace, and pottery. Important fairs are held for the sale of horses and cattle. Under the Romans the town bore the name of Augustodurus, and was the seat of a military establishment. During the Middle Ages it was frequently burnt, and passed from one lordship to another till it was incorporated in the duchy of Normandy. Nothing, perhaps, has done more for its fame than the possession of the Norman tapestry, which is now deposited in the town-house, It consists of a strip of linen 200 feet long by 20 inches wide, worked in coloured worsted, and contains fifty-eight distinct scenes counected with the life of William the Conquerer. Seven colours only are em- ployed, dark and light blue, red, yellow, buff, and dark and light green. In spite of the doubts that have been cast on the date of this tapestry, it seems almost certain that it is contemporaneous with the events it depicts, and it may even possibly be, as tradition would have it, the work of Queen Matilda herself. (See Bruce's Bayeux Tapestry, Ato, 1855 ; Freeman's Norman Conquest ; Macquoid's Through Normandy, 1874.)

BAYLE, Pierre, author of the famous Historical and Critical Dictionary, was born on the 18th November 1647,

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BAY—BAY

at Carlat-le-Comte, near Foix, in the south of France. He was educated at first by his father, a Calvinist minister, and was afterwards sent to an academy at Puy-Laurens, where he studied with such assiduity as seriously to injure his health. After a short residence at home he entered a Jesuit

college at Toulouse. While there he devoted much of his time to controversial works on theology, and ended by abjuring Calvinism and embracing the Roman Catholic In this, however, he continued only seventeen months, abruptly resuming his former religion. To avoid the punishment inflicted on such as relapsed from the Catholic Church, he withdrew to Geneva, where he resumed his studies, and for the first time became acquainted with the philosophical writings of Descartes. For some years he acted as tutor in various families; but in 1675, when a vacancy occurred in the chair of philosophy at the Protes- tant university of Sedan, he was prevailed upon to compete for the post, and was successful. In 1681 the university at Sedan was suppressed, but almost immediately afterwards Bayle was appointed professor of philosophy and history at Rotterdam. Here in 1682 he published his famous letter on comets, and his critique of Maimbourg's work on the history of Calvinism. The great reputation achieved by this critique stirred up the envy of Bayle's colleague, Jurieu, who had written a book on the same subject, and who afterwards did all in his power to injure his former friend. In 1684 Bayle began the publication of his Nouvelles de la République des Lettres, a kind of journal of literary criticism, which was continued with great success for several years. In 1690 appeared a work entitled Avis aux Réfugiés, which Jurieu attributed to Bayle, whom he attacked with the bitterest animosity. After a long quarrel Bayle was deprived of his chair in 1693. He was not much depressed by this inisfortune, being at the time closely engaged in the preparation of his great Dictionary, which appeared in 1697. A second edition was called for in 1702. The few remaining years of Bayle's life were devoted to miscellaneous writings, arising in many instances out of criticisms made upon his Dictionary. He died on the 28th December 1706, after some months' suffering from chest disease, which he would not permit to interfere with his literary labours, Bayle's erudition, despite the low estimate placed upon it hy Leclerc, seems to have been very considerable. He was an ardent student, and his reading was varied and extensive. Asa critic he was second to none in his own time, andeven yet one can admire the lightness and delicacy of his touch, and the skill with which he handles his subject. The Mowvelles de la hépublique des Lettres was the first thorough-going attempt to popularize literature, and it was eminently successful. The Dictionary, however, is Bayle's master- piece, and in it appear to perfection his various qualities, —extensive and curious information, fluency of style,

and that light sceptical spirit which has became closely associated with his name. Bayle's scepticism is of a peculiar kind. It is not a distrust of the power of human knowledge grounded on a scientific investigation of the nature of thought in itself. It is rather the scepticism of the literary man of the world, who in his reading has encountered so many opposing and well-supported arguments on all sub- jects, that he feels inclined to hold that no certainty can ever be attained. On this account, perhaps, his sceptical criticism, though it did much to liberate thought from the bonds of authority, has had little influence on pure philo- sophy. Examples of Bayle's critical mode of investigation may be seen in his articles on the Greek sceptical philoso- phers, particularly those on Pyrrhonism, Zeno, Carneades, and Chrysippus.

See Des Maizeaux, Vie de Bayle; Feuerbach, Picrre Bayle, 1838; Damiron, Philosophie en France au xvii™ Siecle.

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BAY—BAGZ

BAYONET. See Arms anp ARrmovr, vol. ii. p. 558.

BAYONNE, probably the ancient Lapurdum, Bacotium civitas, or Baioticum, a first-class fortified city of France, and the capital of an arrondissement, in the department of the Lower Pyrenees. It is well built, and agreeably situated at the confluence of the Nive and Adour, about three miles from the sea. A bar at the mouth of the river, with 13 or 15 feet of water at spring tides aud 9 to 11 feet at neaps, formerly prevented large vessels from entering except at high water; but works have been in progress by which the obstruction will be greatly lessened, if not alto- gether removed. The citadel is one of the fincst works of Vauban, and the cathedral is a large and elegant Gothic structure of the 12th century. Bayonne is the seat of a bishopric, and has courts of primary jurisdiction and com- merce, an exchange, a miut, a theatre, naval and commercial docks, and schools of commerce and navigation, as well as distilleries, sugar-refineries, and glass-works. It is like- wise the centre of the 13th military division, and possesses one of the finest arsenals in France, and a military hospital for 2000 patients. Its export trade is' considerable, par- ticularly in grain,

wine, fish, chocolate, liqueurs, cream of tartar, hams, rosin, turpentine, and timber. The Nive and Adour divide the town into three ncarly equal parts, com- municating with each other by bridges. Great Bayonne, which lies on the left bank of the Nive, contains the old castle; Little Bayonne, where the new castle stands, is situated between the Nive and the Adour; and Saint Esprit, formerly a suburb, occupies the right bank of the Adour. The last is inhabited almost exclusively by Jews. Bayonne, though often besieged, has never been taken, and is one of the few places that refused to participate in the massacre of St Bartholomew. 'The last siege was by the English in 1814, and was interrupted by the news of Napoleon's surrender. The bayonet derives its name from this place, where it is said to have been invented. Population in 1872, 26,335.

See Balasque and Dulaurens, Btudes Historiques sur la ville de Bayonne, 8 vols., which treats of the history down to 1451.

BAZA (the medieval Bastiana), a city of Spain in the province of Granada, situated in a fruitful valley in the Sierra Nevada, not far from the river of its own name. In the time of the Moors it was one of the three most important cities in the kingdom of Granada, carrying on an extensive trade, and numbering no fewer than 50,000 inhabitants. It was captured by the Spaniards in 1489 after a seven months' siege. The city still contains various remains of Moorish architecture, as well as its ancient church, which had been converted into a mosque ; and in the neighbouring plain have been discovered from time to time numerous relics of antiquity, both Roman and inedieval. The principal trade of the place is at present in hemp; its population numbers 7270. It is the birth- place of Ribera, the historian of Granada. In 1810 Soult defeated a large Spanish army in the immediate vicinity.

BAZARD, Armanp, a French socialist, the founder of a secret political society in France, corresponding to the Carbonari of Italy, and a warm adherent of St Simon, was born at Paris in 1791. He took part in the defence of Paris in 1815, and afterwards occupied a subordinate situation in the prefecture of the Seine. About the year 1820 he united some patriotic friends into a society, which was called Amis de la Vérité. From this was developed a complete system of Carbonarism, the peculiar principles of

which were introduced from Italy by two of Bazard's friends. Bazard himself was at the head of the central body, and, while taking a general lead, contributed exten- sively to the Carbonarist journal, L'Aristarque. An unsuccessful outbreak at Belfort ruined the society, and the leaders were compelled to conceal themselves. Bazard,

after remaining for some time in obscurity in Paris, came to the conclusion that the ends of those who wished well to the people would be most easily attained, not through political agitation, but by effecting a radical change in their social condition. This train of thinking naturally drew him towards the socialist philosophers of the school of St Simon, whom he joined. He contributed to their journal, Le Producteur ; and in 1828 began to give public lectures on the principles of the school, which were well attended. His most important work, however, was the first volume of the Luxposition de la Doctrine de St Simon (2 vols., 1828- 30), by far the best account of that peculiar phase of socialism. The second volume was chiefly by Enfantin, who along with Bazard stood at the head of the society, but who was superior in metaphysical power, and was prone to push his deductions to extremities. The two leaders differed in opinion with regard to the emancipation of women, which Bazard disapproved. An open quarrel took place in 1831, and Bazard found himself almost deserted by the members of the society. He attacked Enfantin violently, and in a warm discussion between them he was struck down by apoplexy. Aftcr lingering for a few months he died on the 29th July 1832.

BAZIGARS, a tribe of Indians, inhabiting different parts of the peninsula of Hindustan. They are recognised by several appellations, as Bazigars, Panchpiri, Kunjra, or Nats; they follow a mode of life distinguishing them from the Hindus, among whom they dwell; they abstain from intermixing their families with the Hindus, and from any intercourse by which they can be united. They are dis- persed throughout the whole of India, partly in wandering tribes, partly adhering to fixed residences, but the greater proportion lead a noniadic life.

The Bazigars are divided into seven castes ; but besides those who are united into sects or castes, there are indi- viduals who wander about

endcavouring to pick up a pre- carious livelihood. Although.the Bazigars are distinguished by their manners and customs from the natives of Hindustin, their features do not certainly discriminate them as a scparate race. Some of their women are reputed very beautiful, and are thence sought after in those temporary alliances common in the Hast. The Bazigars more especially distinguished by that name are the most civilized of the whole; they are Mahometans in food, apparel, and religion. The Panchpifri profess no system of faith, in preference adopting indifferently that of any village whither their wanderings may guide them. Some traverse the country as Mahometan fakirs, and live on the chance bounty of devotees ; and a particular association among them, of bad repute or abject superstition, has been accused of sacrificing human victims. The chief occupation of the Bazigars seems to consist in feats of address and agility to amuse the public, in which both males and females are equally skilful. The former are extremely athletic, and the women are taught dancing, which, instcad of the graceful motions seen in the north, consists principally of a display of lascivious gestures. Most of the men are adroit jugglers, tumblers, and actors. Both males and females pursue a sys- tematic course of debauchery, so that few live beyond forty, and many do not attain their thirtieth year. From the pursuits of the females being productive to their parents, their marriages are deferred to a later period than is usual in India. The females who do not attend the juggling exhibitions of the men, or their feats of activity, practise physic and cupping, and perform a kind of tattooing on the skin of the Hindus of their own sex, called godnd. The men, besides their usual occupations, collect medical herbs, which are prepared by their wives as curatives, especially of the complaints of their own sex. Jn this manner, or by the sale of trinkets, they find employment in the towns,

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though these occupations afford them but a precarious sub- sistence. Some tribes also go about exhibiting wild beasts, or offering for sale mats fabricated by themselves. Before the establishment of the British Government in Bengal, the Bazigars were subject to the arbitrary exactious of a tax- gatherer, whom they greatly dreaded, and the apprehension of the

renewal of that officer's powers has proved a consider- able impediment to investigating their manners and customs.

The Baztgars are supposed to present many features analogous to the gipsies scattered over Europe and Asia, where they subsist as a race distinct from all the other inhabitants of the countries frequented by them. The Bazigars, as well as the gipsies, have a chief or king ; each race has a peculiar language, different from that of the people among whom they reside; and the analogy of the languages is so decided, that it is difficult to deny that they have had a common origin. Another resemblance, which has probably been lost in the lapse of time, is supposed to consist in the three-stringed viol introduced into Europe by the jugglers of the 13th century, which is exactly similar to the instrument now used in Hindustan. Disjoined, these analogies may not carry conviction of the identity of the European gipsies with the Indian Bazfgars ; but, on combining the whole, it does not seem unlikely, that if Asia was their original country, or if they have found their way from Egypt to India, they may also have emigrated farther at a period of remote antiquity, and reached the boundaries of Europe.

BAZZI, Giovanni. See Soppoma.

BDELLIUM, a fragrant gum-resin of a dark-reddish colour, bitter and pungent to the taste. It is closely allied to myrrh, and like it is produced from one or more species of Balsamodendron,—the Googul resin, or Indian bdellium, yielded by B. mukul, being considered by Dr Birdwood to be the bdellium of Scripture, and the BdeAXAcov of Dioscorides. Bdellium is little imported into Europe, but it is exten- sively used in Indian pharmacy, both human and veterinary ; and it is, like myrrh, employed for incense in temples. A variety of the gum-resin known as African bdelliuin is produced on the East African coast, but nothing is cer- tainly known regarding its botanical source.

BEACHY HEAD, a promontory on the coast of Sussex, between Hastings and Brighton, near which the French de- feated the English and Dutch fleet in 1690. It consists of a perpendicular chalk cliff 530 feet high. A lighthouse, with a revolving light 285 feet above high-water mark, was

erected in 1828 on the second cliff to the westward, in long. 0° 1’ E.,, lat. 50° 44’ N.

BEACONSFIELD, a market-town in the county of Buckingham, 23 miles from London, on the road to Oxford. It consists of four streets crossing each other at right angles, and before the opening of the railways was rather a busy place. At one time, indeed, it was the seat of a considerable manufacture of ribbons. The poet Waller and Edmund Burke lived in the neighbourhood, and both are buried in the town. Beaconsfield gave the title of viscountess to the late wife of the Right Hon. B. Disraeli. Population of parish in 1871, 1524.

BEAD, a small globule or ball used in necklaces, and made of different materials, as pearl, steel, garnet, coral, diamond, amber, glass, rock-crystal, and seeds, The Roman Catholics make great use of beads in rehearsing their Ave-Marias and Pater-nosters, and a similar custom obtains among the religious orders of the East. A string of such beads is called a rosary. Glass beads were used by the Spaniards to barter with the natives of South America for gold when they first established themselves on that continent, and to this day they are a favourite article of traffic with all savage nations. Beads of glass are seut in enormous quantities to Zanzibar, and to all other ports

from which a trade with the interior of Africa is carried on, as they form almost the only convenient medium of exchange with the native tribes. The qualities and varieties recognized in the Zanzibar market are said to number more than 400, and the trade there is almost entirely in the hands of the Banyans. Large quantities are also sent to India, the Eastern Archipelago, and the Polynesian Islands; and in the more primitive parts of Europe beads are in considerable demand. Under the name of bugles a very great quantity of small, mostly cylin- drical, beads are used in lace-making, and for the ornamen- tation of ladies’ dresses, the demand in this form fluctuat- ing greatly according to the demands of fashion. Venice is the principal centre of the manufacture of glass beads of all kinds. The exports therefrom during the ten years ending with 1871 amounted to 313,201 quintals, of the value of 61,240,296 Italian lire. In the manufacture of ordinary beads, as conducted at Venice, rods or canes of glass of the colour

and quality desired first are drawn out, either pierced or unpierced. The rods may either be of transparent glass, or of opaque coloured enamel glass (smaltz), or may have complex patterns produced by the twisting of threads of coloured glass through a transparent body, characteristic of Venetian glass. From these rods rounded beads are pinched off, and the more costly kinds, made in imitation of precious stones, &c.,are cut and faceted. Imitation pearls, the making of which forms an impor- tant part of the bead industry, are blown by the blow- pipe from a milky-white glass. The pearly lustre is com- municated by the infiltration of a substance obtained from the scales of the bleak Leuciscus alburnus. The more costly imitation pearls receive several coats of the pearly substance, and have weight and solidity added by filling up the interior of the pearl with wax. Gold, silver, and various coloured lustres are frequently substituted for the pearly substance in the manufacture of blown beads. BEAN, the seed of certain leguminous plants cultivated for food all over the world, and furnished chiefly by the genera Haba, Phaseolus, Dolichos, Cajanus, and Soja. The common bean, in all its varieties, as cultivated in Britain and on the continents of Europe and America, is the produce of the Faba vulgaris. The French bean, kidney bean, or haricot, is the seed of the Phaseolus vulgaris; but in India several other species of this genus of plants are raised, and form no small portion of the diet of the in- habitants. From the genus Dolichos, again, the natives of India and South America procure beans or pulse, of no small importance as articles of diet, such as the D. ensiformes, or sword bean of India, the Lima beans, &c. Besides these there are numerous other pulses cultivated for the food both of man and domestic animals, to which the name beans is frequently given. The common bean is even more nutritious than wheat ; and it contains a very high proportion of nitrogenous matter under the form of legumin, which amounts on an average to 24 per cent. It is, however, a rather coarse food, and difficult of digestion, and is chiefly used to feed horses, for which it is admirably adapted. In England French beans are chiefly, almost exclusively, used in the green state ; the whole pod being eaten as a table vegetable, or prepared as a pickle. Itis wholesome and nutritious; and in Holland and Germany the pods are preserved in salt by almost every family for winter and spring use. The green pods are cut across obliquely, most generally by a machine invented for the purpose, and salted in barrels. When wanted for use they are steeped in fresh water to remove the salt, and broiled or stewed; they form an agreeable addition to

the diet at a time when no other vegetable may be had. Under the name of carob beaus or locusts, the legume of Ceratonia siliqgua is cultivated on the shores of the Mediterranean

and used as food for cattle. The shells of the carob bean contain a large proportion of sugar, and are often con- guined as a dainty by children. These beans were formerly supposed to be the locusts eaten by John the Baptist, and hence have been called St John's bread. The Tonka, or Tonquin bean, is the produce of Dipterix odorata, a legu- minous seed with a fine odour, used in perfumery and largely for scenting snuff. The Calabar ordeal bean is a highly poisonous leguminous seed. 'There are also several non-leguminous seeds to which the popular name bean is attached. Among these may be mentioned the sacred Egyptian or Pythagorean bean (Velumbiwm speciosum), and the Ignatius bean (probably Strychnos multijlora), a source of strychnine. For the cultivation, &c., of the common bean, see AGRICULTURE, vol. i. p. 360. The ancient Greeks and Romans made use of beans in gather- ing the votes of the people, and for the election of magis- trates. A white bean signified absolution, and a black one condemnation. Beans had a mysterious use in the lemuralia and parentalia, where the master of the family, after washing his hands three times, threw black beans over his head nine times, continuing to repeat the words, "'T redeem myself and my family by these beans."

BEAR, the common name of the Urside, a typical family of Plantigrade Mammals, distinguished by their massive bodies, short limbs, and almost rudimentary tails. With the single exception of the Honey Bear, all the species have forty-two teeth, of"which the incisors and canines closely resenible those of the purely carnivorous mammals; while the molars, and especially that known as the " carnassial," have their surfaces tuberculated so as to adapt them for grinding vegetable substances. As might have been sup- posed from their dentition, the bears are truly omnivorous ; but most of the family seem to prefer vegetable food, including honey, when a sufficient supply of this can be had. The Grizzly Bear, however, is chiefly carnivorous ; while the Polar Bear, in a state of nature, is believed to be almost wholly so. The strength and ferocity of different species and of different individuals

of the sare species seem to depend largely on the nature of their diet,—those restricted to purely vegetable food showing an approach to that mildness of disposition characteristic of herbivorous animals,

Bears are five-toed, aud are provided with formidable claws, but these are not retractile as in the cats, and are thus better fitted for digging and climbing than for tearing. Most of the bears climb trees, which they do in a slow, lumbering fashion, and, in descending, always come hind- quarters first. The Grizzly Bear is said to lose this power of climbing in the adult state. In northern countries the bear retires during the winter season into caves and the hollows of trees, or allows the falling snow to cover it, where it remains dormant till the advent of spring, about which time the female usually produces her youug. These are born naked and blind, and it is commonly five weeks before they see, or become covered with hair. Before hibernating they grow very fat, and it is by the gradual consumption of this fat—known in commerce as _ bear's grease—that such vital action as is necessary to the con- tinuance of life is sustained.

The bear family is widely distributed, being found in every quarter of the globe except Australia, and in all climates, from the highest northern latitudes yet reached by man to the warm regions of India and Malaya. In the north-west corner of Africa the single representative of the family found on that continent occurs. Of the remaining apecies described in Gray's recent monograph of this family, three are European, six American, and eight Asiatic ; while one species—the Polar Bear—is common to the Arctic regions of both hemispheres. In addition to these, the

best known species are peculiarly rich in varieties. Bears have been recently divided into three groups,—sea bears, land bears, and honey bears.

(1.) Sea bears, of which the Polar or White Bear (Thalassarctos maritimus) is the only species known, are dis- tinguished from the other groups by having the soles of the feet covered with close-set hairs,—a beautiful instance of special adaptation to the wants of the creature, the bear being thereby enabled to walk more securely on the slippery ice. In the whiteness of its fur also, it shows such an assimilation in colour to that of surrounding

nature as must be of considerable service in concealing it from its prey. 'The food of the White Bear consists chiefly of seals and fish, in pursuit of which it shows great power of swimming and diving, and a considerable degree of saga- city. It also feeds on the carcases of whales, and on birds and their eggs, and is said to eat berries when these can be had. 'hat it can sustain life on a purely vegetable diet is proved by instances on record of its being fed for years on bread only, in confinement. These bears are strong swim- mers, Captain Sabine having found one ' swimming powerfully forty miles from the nearest shore, and with no ice in sight to afford it rest." They are often carried on floating ice to great distances, and to more southern lati- tudes than their own, no fewer than twelve Polar bears having been known to reach Iceland in this way during one winter. The female always hibernates, but the male may be seen abroad at all seasons. In bulk the White Bear exceeds all other members of the family, measuring nearly 9 feet in length, and often weighing 1600 fb.

(2.) Land bears have the soles of the feet destitute of hair, and their fur more or less shaggy. Of these the Brown Bear (Ursus arctos,—'Apxros of Aristotle) is found in one or other of its varieties all over the temperate and north temperate regions of the eastern hemisphere, from Spain to Japan. Its fur is usually of a brownish colour, but there are black, blackish-grey, and yellowish varieties. It is a solitary animal, frequenting the wooded parts of the regions it inhabits, and living on a nixed diet of fruits, vegetables, honey, and the smaller animals. In winter it hibernates, concealing itself in some hollow or cavern. It does not seek to attack man; but when baited, or in defence of its young, it shows great courage and strength, rising on its hind legs and endeavouring to grasp its antagonist in an embrace. Bear-baiting, till within comparatively recent times, was a favourite sport throughout Europe, but along with cock- fighting and badger-baiting, has gradually disappeared before a more humane civilization. It was a favourite pastime aniong the Romans, who imported their bears froin Britain, a proof that the animal was then comparatively abundant in that country ; indeed, from reference made to it in early Scottish history, the bear does not appear to have been extirpated in Britain before the end of the 11th century. It is now foundin greatest abundance in Norway, Russia, and Siberia, where the bear hunt is the favourite sport, and where, when dead, its remains are highly valued. Among the Kamchatkans "the skin of the bear," says a

traveller, “ forms their beds and their coverlets, bonnets for their heads, gloves for their hands, and collars for their dogs. The flesh and fat are their dainties. Of the intestines they make masks or covers for their faces, to protect them from the glare of the sun in the spring, and use them as a substitute for glass, by extending them over their windows. Even the shoulder-blades are said to be put in requisition for cutting grass.” In confinement the Brown Bear is readily tamed ; and advantage has been taken of the facility with which it can sustain itself on the hind feet to teach it to dance to the sound of music. It measures 4 feet in length, and is about 24 feet high.

The American Black Bear (Ursus americanus) occurs

throughout the wooded parts of the North American con- tinent, whence it is being gradually driven to make room for man. It is similar in size to the Brown Bear, but its fur is of a soft even texture, and of a shining black colour, to which it owes its commercial value. At the beginning of the present century Black Bears were killed in erormous numbers for their furs, which at that time were highly valued. In 1803 the skins imported into England numbered 25,000, but the imports have since decreased to one-half of that number They are chiefly used for military accoutrements, This isa timid animal, feeding almost solely on fruits, and lying dormant during winter, at which period itis most frequently killed. It isan object of superstitious reverence tothe Indians, who never kill it without apologizing and deploring the necessity which impels them to do so.

The Grizzly Bear (Ursus ferox) approaches the Polar Bear in size, while it excecds that, and all other American mammals, in ferocity of disposition and in muscular strength. It is said to attack the bison, and has been known to carry off a carcase weighing 1000 tb for a con- siderable distance to its den, there to devour it at leisure. It also eats fruit and other vegetables. Its fur is usually of a yellowish brown colour, coarse and grizzled, and of little value commercially, while its flesh, unlike that of other bears, is uneatable even by the Indians. It is found in greatest abundance on the eastern slopes of the Rocky Mountains. The Syrian Bear (Ursus syrtiacus) occurs on Mount Lebanon and throughout Syria, and is probably the species

mentioned in Scripture as having destroyed the " forty-and-two children" who mocked Elisha, It is of a dirty yellowish colour, and feeds mainly on vegetables, The Bruang or Malayan Bear (//elarctos malayanus) is of a jet black colour, with a white semilunar mark on the chest, and attains a length of 44 feet. Its food consists almost solely of vegetables and honey, but the latter is its favourite food,—the extreme length and pliability of the tongue enabling it to scoop out the honey-combs from the hollows of trees. It is found in the Malay Peninsula and Islands, and is readily tamed.

(3.) Honey bears are distinguished from the other groups by the absence of two upper incisors, and the very extensile character of the lips. Of these there is but one species, the Sloth or Honey Bear (Jfelursus labiatus), This animal, from its striking outward resemblance toa sloth, was, when first brought to this country, described as a species of Brady- pus. Itis about the size of the Brown Bear, is covered with long, black hair, and is of extremely uncouth aspect. It inhabits the mountainous regions of India, is readily tamed, and is the bear usually exhibited by the Hindoo jugglers, It feeds on fruits, honey, and white ants.

Fossil remains of extinct bears first occur in strata of the Plioceneage. Those of the Great Cave Bear(Ursus spelwus), found abundantly in certain caverns of Central Europe and Asia, show that it must have exceeded in size the Polar Bear of the present day. Its remains arc also found in similar situations in Britain associated with those of an allied species (Ursus priscus).

BEAR LAKE, Great, an extensive sheet of fresh water in the north-west of Canada, between 65° and 67° N. lat., and 117° and 123° W. long. It is of a very irregular shape, has an estimated area of 14,000 square miles, and is upwards of 200 feet above the sea. The Bear Lake River carries its waters into the Mackenzie River.

BEARD. The tradition that Adam was created with a beard (which may be described as bushy rather than flowing), is recorded on ancient monuments, and especially on an antique sarcophagus, which is one of the ornaments of the Vatican. The Jews, with the Orientals generally, seem to have accepted the tradition fora law. The beard

was a cherished and a sacred thing. Israel brought it safe out of the bondage of universally shaven Egypt, and the beard was the outward and visible sign of a true man. To rudely touch his beard was to cruelly assail his dignity. Children and other kinsfolk might gently touch it as a sign of love ; a fugitive might reverentially raise his hand to it when praying for succour; and he who put his hand on his own beard and swore by it bound himself by the most solemn of oaths, to violate which would render him infamous among his fellow-men. To touch the beard in the allegiance of love established peace and trustfulness between the two parties. When Joab went in to Amasa he took the beard of the latter to kiss him, saying the while, "Art thou in health, my brother?". Therefore it was that Amasa took no heed of the sword in Joab's hand, which Joab at once thrust beneath the other's fifth rib. The Scriptures abound with examples of how the beard and its treatment interpreted the feelings, the joy, the sorrow, the pride, or the despondency of the wearer.

Although the Jews carried their beards with them from their bondage in Egypt, the Egyptians were not at all insensible of the significance of that appendage. They did not despise the type of manhood, Accordingly, on days of high festival they wore false beards, as assertions of their dignity in the scheme of creation, and they repre- sented their male deities with beards " tip-tilted" at the ends. The general reader having laudable curiosity on this matter may be safely referred to the pages of Hero- dotus,—a writer who has much to say pertinently to the subject, and who, after being maligned as the second father of lies, is now praised for his modesty, and relied on for his trustworthiness.

The modern Mahometans, especially those who have most come in contact with Europeans, have a good deal fallen away from old conservative ideas respecting the beard. Once, this glorious excrescence, as it was held to be, was made, by the followers of Islam, a help to salva- tion. The hairs which came from it in combing were preserved, broken in two, and then buried. The breaking was a sort of stipulation with some angel who was supposed to be on the watch, and who would look to the safe passage of the consigners of the treasure into the paradise of never-failing sherbet and

ever-blooming houris. The first sultan who broke through the orthodox oppression of beardedness was Selim I. (1512-20). This act was a violent shock to the whole body of the faithful, and especially of the Mufti. 'The very highest priest alone could dare to remonstrate with so absolute a monarch. Selim put aside the remonstrance with a joke. "TI have cut off my beard," he said, "in order that my vizier may have nothing to lead me by!" Buta crafty minister can find on the face of the most beardless and cruel of despots wherewithal to lead him in the way the minister would have him go. Still, the fact that the Prophet never let razor reap a harvest on his chin, for possession of the hairy produce of which all Islam would have fought with affectionate fury, long made, and still makes, the beard a part of religion. The sultan and the shah, chiefs of the two parties in their church, have pretty fair apologies for beards; but this is far below the bearded glories of the days before the Prophet, when the kings of Persia tied up their bearded plaits with gold thread, and the princes of Nineveh went abroad with beards curled and oiled, like the Assyrian bulls themselves. It has been said that in Asia wars have been proclaimed on alleged grievances connected with shaving. 'Tartars and Persians, and Chinese and Tartars, are reported to have resorted to sanguinary arbi- tration on the question of clipping or shaving. Probably they who declared the war were as clever in finding a pretext as the more civilized aggressors of much later days.

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BEARD 463

If we turn to Europe and begin with classical times, having— the wealth of Ormus and of Ind, Or where the gorgeous East, with richest hand, Showers on her kings barbaric pearl and gold, —

we may remember that the Greeks and Romans once styled as barbarians, or bearded, unshaven savages, all nations who were out of the pale of their own customs and religion. Nevertheless, the young Roman, anxious for beard and moustache, used to apply the household oil to his chin and cheeks, in order to bring thcreon that incipient fringe which would entitle him to be called "barbatulus." The full-furnished man was "barbatus." It

was not till the beard ceased to be universally worn, and Sicilian barbers set up in Rome (about 300 3.c.), that the Romans began to apply the word, translated "barbarous," to the rude men and manners of the early ages, and of the beard universal, But, after all, we may still see, in old counter-feit presentments, that the fashionable, clipped beard of young Roman "swells" in the last days of the Republic, and of some of the emperors from the time of Hadrian, is not nearly so majestic as the flowing hair depending from the chin of Numa Pompilius. Nero offered some of the hair of his beard to Jupiter Capitolinus, who could have furnished a dozen emperors froin his own. Homer, Virgil, Pliny, Plutarch, Strabo, Diodorus, Juvenal, Persius, are among the writers who furnish material for a volume on beards. One Roman emperor, Julian, wrote a work on the subject, which is commonly supposed to be as fierce a denunciation against beards, as King James's Blast was against tobacco; but Julian in his JfLtsopogon, or Hnemy of the Beard, descants satirically ' with pleasure and even with pride," says Gibbon, "on the length of his nails and the inky blackness of his hands, protests that although the greatest part of his body was covered with hair, the use of the razor was confined to his head alone, and celebrated with visible complacency the shaggy and populous beard which he fondly cherished, after the example of the philosophers of Greece." Persius undoubtedly associated wisdom with the beard. He exhausted the whole vocabulary of praise when he designated Socrates by the term Magister Barbatus. In this, however, there is less wit than in the rejoinder of the young anibassa- dor to a king, who had expressed his wrath at having a beardless youth sent to him as an envoy. "If," said the latter, "my master had thought you would have laid 80 much account on a beard, he would have sent you a goat,"

The most notable circumstance in the history of the beard among the Greeks is that of its abolition,—in the Macedonian army, at least, for strategic reasons. Alex- ander the Great abolished the beards of his soldiers, for the sufficient reason that they gave handles to their enemies whereby to lay hold of them. The Macedonian warriors probably obeyed with reluctance; but obedience was as much a matter of course as it was with the Ephori who, by Lacedemonian law, had to undergo what seemed the ridiculous ceremony of being shaved, merely to show their ready obedience to legal

enactment. As they were mortal men, it may be supposed that acquisition of office was happy compensation for the loss of a beard.

Goth is equivalent for the older term of Barbarzan. One is abuut as unjust in its application as the other. Gothic rudeness is often illustrated by the case of the "ugly rush" made by the northern warriors into the Capitol, where the conscript fathers sat in silence and fearlessness, waiting events. One of these unlettered soldiers lifted his hand to the beard of an old legislator, who, taking it for insult, smote the Goth to the ground. Let us do the Goth the justice of believing that, awed by

the stern mute majesty of the senators, he raised his hand reverentially to the beard. At all events, the taking it with such prompt and painful action was dearly paid for in the swift retaliation which followed.

If the phrase be not too light for use, we would say that as beards existed before barbers, the Europeans, like all other people, were originally a bearded people. The beard is perhaps more general now in Germany than elsewhere in Europe ; and Germany affords an exainple of the longest beard known, out of fairy story, in the person of the painter Johan Mayo, whose beard was so long that when he stood upright it still trailed on the ground ; accordingly, he often doubled it up in his girdle. Germany knows him as John the Bearded, just as it docs one of its emperors as Frederick Barbarossa; but many nations, ancient and modern, can boast of men and monarchs who have been nicknamed from their beards.

When Peter the Great levied a tax on Russian beards, he was only following a precedent which once existed in England. Noble chins were assessed at a rouble; your commoner chin ata copec. It caused commotion, and there was much compulsory shaving of those who did not pay. Beards are not now valued in Russia. He who wears one seems to acknowledge that he has no very high place in the social scale. On the other hand, beards were highly treasured in Spain till the time of Philip V., who was unable to cultivate one. As was to be expected, this infirmity set the fashion of affecting the infirmity; but beardless dons were wont to exclaim with a sigh, " Since we have lost our beards, we have lost our souls!" Thus, they unconsciously adopted something akin to the super- stition of the Roskolniki, a sect of schismatics who obstin- ately maintained that the divine image resided in

the beard. Portugal was not behind Spain in appreciating the beard. When the Portuguese admiral, Juan de Castro, borrowed a thousand pistoles from the city of Goa, he lent in pledge one of his whiskers, 'saying, " All the gold in the world cannot equal this natural ornament of my valour." In these modern days one would not think much of the security of such a matcrial guarantee, nor of the modesty of the admiral who might have the face to offer it.

As Spaniards denuded their chins becanse their king could not grow a beard, so the French grew beards, long after they had gone out of fashion, because their king found it necessary to do so. Francis the First, having wounded his chin, concealed the ugly scar by covering it with a beard; and all loyal chins forthwith affected to have sears to conceal. But when fashion and loyalty were united the beard was carefully tended. It was not as in the time of the idle, helpless, and long haired kings, who were less potential than their chief officers, when the wild, dirty, and neglected beard was a type of that majesty, made up of shreds and patches, which used to be paraded before the people on a springless cart. Three hairs from a French king's beard under the waxen seal stamped on royal letter or charter, were supposed to add greater security for the fulfilment of all promises made in the document itself. In course of time fashion complimented majesty ; a certain sort of moustache was called a "royale," and the little tuft beneath the lower lip was known by the term " imperiale." As a rule, the French chin assumed the appearance of that of the king for the time being. The royal portrait reflects a general fashion from which only the disloyal or the indifferent departed. On the subject of shaving, Talleyrand once drew a fine distinction. Rogers asked him if Napoleon shaved himself. "Yes," replied the statesman; 'one born to be a king has some one to shave him; but they who acquire kingdoms shave themselves." Tradition has exaggerated accounts of bearded prisoners in the Bastille, but there was an official there whose duty consisted in

keeping the captives without beards. Some years before the Revolution the celebrated lawyer and political writer Linguet was incarcerated there. On the morning after his being locked up, an individual entered his room who

announced himself as the barber of the Bastille. ‘“‘ Very well,” said the sharp-witted Linguet, “as you are the barber of the Bastille—rasez-la.”

Among the men of whom it was said of old that they would be known by their love for one another, the beard has been a cause of much fierce uncharitableness. The Greek Church, advocating the beard, and the Roman Church, denouncing it, were not more forgetful of ever- blessed charity than the Belgian Reformers, the close-shaven of whom wished the bearded members to be expelled as non-Christians. The tradition concerning the Master whom both proposed to follow was logically pleaded by the wearers of beards. As a general rule, in the earlier time, the-man who wore his hair short and his beard long, was accounted as at least bearing the guise of respectability,— looking like a priestly personage. There is a series of medals of the popes at Naples, from Clement VII. (1523- 34) to Alexander VIII. (1689-91). All these are bearded, Clenient’s beard is long and dark ; Alexander wears beard aud moustaches. Perhaps Clement Giulio de’ Medici set the fashion. Certain it is that a few years before, his kinsman, Giovanni de’ Medici, Leo X. (1513-22), was always close-shaven, and beards were not to be seen on the chin of Leo’s clerics and courtiers.

In the 13th century beards are said to have first come into fashion in England. If we may judge from the 15th century brasscs in England, few men of distinction enough to be so commemorated wore beards. Hotspur’s fop had his “chin new reaped.” In the reign of Henry VIII. the fashion had so revived among lawyers that the authorities of Lincoln’s Inn prohibited wearers of beards from sitting at the great table, unless they paid double commons; but in all probability this was before that sovereign ordered (1535) his courtiers to “ poll their hair,” and he let that crisp beard grow which is familiar to us all. Thence came a fiscal arrangement; beards were taxed, and the levy was graduated according to the condition of the wearer. Inthe Burghmote Book of Canterbury (quoted in Notes and Queries) there is the following entry :—“ 2nd Ed. vi. The Sheriff of Canterbury and another paid their dues for wearing beards, 3s. 4d. and 1s. 8d.” In the next reign, and in the year 1555, Queen Mary sent four agents to Moscow ; all were bearded, but one of them, a certain George Killingworth, was especially distinguished by a beard 5 feet 2 inches long, at sight of which a smile crossed the grim features of Ivan the Terrible himself. George’s beard was

thick, broad, and yellow; and, after dinner, Ivan played with it, as with a favourite toy. Most of the Protestant martyrs were burnt in their beards. Sir Thomas More, on the other hand, put his out of the way, as he laid his head on the block, with the innocent joke so well known. Elizabeth introduced a new impost with regard to beards. Every beard of above a fortnight's growth was subject to a yearly tax of 3s. 4d. The rate was as heavy as the law authorizing it was absurd. It was made in the first year of her reign, but it proved abortive. Fashion stamped it out, and men laughed in their beards at the idea of paying for them. The law was not enforced, and the Legislature left the heads of the people alone till much later times, when necessity and the costs of war put that tax on hair-powder which even now contributes a few thousands a year to the British Exchequer. The Vandyke beard, pointed (as Charles the First and the illustrious artist, with most cavaliers, wore it), was the most universally worn for a time. Beaumont and Fletcher, in the Queen of Corinth, make allusion, doubtless, to a fashion of wearing

BEARD

moustache and beard, common to the reign of the first Janics as well as that of Charles. "¢ His beard Which now he puts i' the posture of a T,— The Roman T. Your T beard is the fashion, And twofold doth express th' enamoured courtier As full as your fork-carving traveller." John Taylor, the water-poet, notices the T beard, and mentions at least a score of the various ways of wearing beards in his time, not forgetting the contemporary proverb, "Beard natural, more hair than wit." Hudibras, in text and notes, affords numerous illustrations of this subject. The general idea that beards did not come back with the monarchy does not seem to be correct, if the old song (date 1660) is to be trusted— 'Now of beards there be such a company, Of fashions such a throng, That 'tis very hard to treat of the beard, Tho' it be never so long." Soon after this time, however, the beard in England was everywhere kept down by the razor. At the close of last century the second Lord Rokeby (Mat. Robineau) endeavoured to restore the fashion. " His beard," says a contemporary, "' forms one of the most conspicuous traits of his person." But too short a period had elapsed since Lord George Gordon, the hero of "the Riots," had turned Jew and let his beard grow, to allow of any favour being awarded to an appendage which

seemed a type of infamy. To the literature of the beard a remarkable addition was made in the present century by James Ward, R.A.,, the celebrated animal painter. Mr Ward published a Defence of the Beard, on Scriptural grounds; he gave eighteen reasons why man was bound to grow a beard, unless he was indifferent as to offending the Creator and good taste ; for the artist asserted himself as much as the religious zealot, and the writer asked, "What would a Jupiter be without a beard? Who would countenance the idea of a shaved Christ !" Mr Ward had what the French call " the courage of his opinions," and wore a beard of the most Jupiter-like majesty. Mr Muntz, M.P. for Birmingham, followed the example, but it was not adopted by many others. A new champion, however, appeared in 1860, but on peculiar ground. ' Theologos" expressed his views in the title-page of his work, namely,—Shaving: a breach of the Sabbath, and a hindrance to the spread of the Gospel. A carrying out of the views of the writer would lead to the full practice which prevailed among the Essenes, who never did on the Sabbath anything whatever that they wereinthe regular habit of doingonotherdays. 'Theologos" points out that God gave the beard to man as a protection for his throat and chest; and, he adds, with the most amusing simplicity, " Were the beard in any other position its benefit and purpose might be doubted ; but situated where it is, no physiologist will dare to deny its intention." Since this naive assertion was made, the beard, but not as a consequence, has grown into favour; and though not universal, it is at least general, and a familiar sight to us all.

There is a disagreeable branch of the subject, demanding only a passing word, namely, bearded women, herma- phroditic creatures, who have occasionally been found in all conditions of life, from princesses in " marble halls" to objects shown in exhibition-rooms or in vans at country fairs.

*—'*You should be women," says Macbeth,*

' And yet your beards forbid me to interpret That you are so." Sir Hugh Evans expressed the suspicion which attached to a bearded woman, when he said of Falstaff, disguised as Mother Prat, "By yea and no, I think the 'oman is a witch*

indeed; I like not when a ’oman hasa great peard; I spy a greatpeard under her muffler.” The detestation with whicha bearded woman and a red-haired man were visited in France is almost savagely illustrated in the following old lines :— ‘ Homme roux et femme barbue, De trente pas loin le salue, Avecque trois pierres au poing, Pour t’en aider & ton besoing.”’ (5. Do.)*

BEARN, formerly a small frontier province in the south of France, now included within the department of Basses-Pyrénées, was bounded on the W. by Soule and Lower Navarre, on the N. by Chalosse, Tursan, and Astarac, E. by Bigorre, and 8S. by the Pyrenees. Its name can be traced back to the town of Beneharnum, which first appears in the Antonine Itinerary. The popu- lation is mainly of Basque origin, with possibly a certain mixture of Greek blood from the ancient colonies of that people. The Basque language, in spite of the diffusion of French, is still maintained in the district ; and it is asserted that traces of old Hellenic names are not infrequent. Béarn begins first to take rank as a separate viscounty under Louis the Pious. From its first viscounts, who were descended from the dukes of Gascony, it passed about 1134, by failure of the male line, to the Catalonian family of Moncado; and after the people, who were hostile to all connection with Spain, had several times chosen their own leaders, it passed to the family of Foix, from whom it was transmitted through the houses of Grailly and D’Albret to the Bourbons, who, in the person of Henry, IV., made it an apanage of the crown of France. It was not till 1620, however, that it was formally incorporated ; and even till 1790 it continued to be governed by its own constitution

‘or system of Fors, which only exists in the form in which

it was drawn up in 1288, though mention is made of it as early as 1080. The parliament of Béarn consisted of two sections, the first composed of the clergy and the nobles, and the second of mayors and councillors (or jwrats) from forty-two towns or communities. It met every year, and was always presided over by the bishop of Lescar. A body of commissioners, called the abrégé des états, or epitome of parliament, was selected from the members — twelve fron the nobles and twelve from the third estate— for the purpose of deciding any business that might demand attention during the time between the regular sessions. The administration of justice devolved in the

last resort on a cour majour, or greater court, which was changed by Henry d'Albret intu a sovereign council under the presidency of the chancellor of Navarre and Béarn, and afterwards, by Louis XIII., into a parlement of the ordinary type. Histories of Béarn have been written b Belloy (1608), Marca (1640), D'Olhagaray (1609), Faget de Baure (1818), Mazure (1839).

BEATON, Davin, archbishop of St Andrews and cardinal, was a younger son of John Beaton of Balfour in the county of Fife, and is said to have been born in the year 1494. He was educated at the universities of St Andrews and Glasgow, and afterwards studied at Paris. His first preferment was the parsonage of Campsie and the chancellorship of the church of Glasgow, to which he was presented in the year 1519 by his uncle Jaines Beaton, then archbishop of Glasgow. When James Beaton was translated to St Audrews he resigned the rich abbacy of Arbroath in his nephew's favour, under reservation of one half of the revenues to himself during his lifetime. The great ability of Beaton and the patronage of his uncle ensured his rapid promotion to high offices in the church and kingdom. He was sent by King James V. on various missions to France, and in 1528 was appointed keeper of the privy seal, He took a leading part in the negotiations

connected with the king's marriages, first with Magdalen of France and afterwards with Mary of Lorraine. At the French court he was held in high estimation by King Francis I., and was presented to the bishopric of Mirepoix in Languedoc, to which he is said to have been consecrated on 5th December 1537. On the 20th of December 1538 he was appointed a cardinal priest by Pope Paul III., under the title of St Stephen in the Cclian Hill. He was the only Scotsman who had been named to that high office by an undisputed right, Cardinal Wardlaw, bishop of Glasgow, having received his appointment from the Anti- pope Clement VII. On the death of Archbishop James Beaton in 1539, the cardinal was raised to the primatial see of Scotland. He showed his sense of the additional responsibility he had now undertaken by requesting the Pope to relieve him, to some extent, by the nomination of a suffragan or coadjutor in the diocese of St Andrews; and this was effected by the appointment to that office of William: Gibson, dean of Restalrig, who received consecra- tion as titular bishop of Libaria.

Beaton was one of King James's most trusted advisers, and is said to have taken a part in dissuading him from his proposed interview with Henry VIII. at York. On the death of James in December 1542 he attempted to assume office as one of the regents for the infant sovereign Mary, founding his pretensions on an alleged will of the late king ; but his claims were disregarded, and the Earl of Arran, head of the great house of Hamilton, and next heir to the throne, was raised to the regency. 'The cardinal was imprisoned by order of the regent, but after some time was set at liberty. He was subsequently reconciled to Arran, and in September 1543 crowned the young queen at Stirling. Soon afterwards he was raised to the highest office under the regent, that of Chancellor of Scotland, and was appointed legate a latere by the Pope. The cardinal, in virtue of the latter dignity and of his primatial authority, claimed precedence over Archbishop Dunbar of Glasgow, even within the precincts of the cathedral of St Kentigern. This led to an unseemly brawl between the attendants of the two archbishops, as set forth in a formal complaint made by the cardinal to the Pope, and related at more length aud with characteristic glee by Knox. The attention, however, of the cardinal was directed to matters of more importance than disputes with a brother metropolitan.

The two questions which agitated Scotland at this time were the struggle for ascendency between the supporters of English and French influence, and that between the friends of the hierarchy and the teachers of the Reformed opinions, —questions which frequently became complicated in consequence of the assistance given by France to the bishops, and the encouragement which, for political reasons, the king of England secretly gave to the adherents of the Reformation. In this contest the cardinal supported the interests of France, resolutely opposing the selfish intrigues of King Henry and his party, which had for their object the extinction of the ancient independence of the Scottish kingdom and its subjection to the supremacy of England. Had he been content with this he would, have won for himself the gratitude of his countrymen ; but his evil deeds as an ecclesiastic made them overlvok his patriotic exertions as a statesman. During the lifetime of his uncle he had taken his share in the persecuting policy of the hierarchy, and the same line of conduct was still more systematically adopted after his elevation to the primacy. Having won over the regent to his opinions he became more open and severe in his

proceedings. The popular accounts of the persecution are no doubt exaggerated, and it sonietimes ceased for considerable periods so far as capital punishments were concerned, When the sufferers were of humble rank

general attention was not much directed to them. It was otherwise when a more distinguished victim was selected in the person of George Wishart. 'This preacher, whose ecclesiastical opinions resembled those of Patrick Hamilton and Hamilton's teacher, Francis Lambert, returned to Scotland after an absence of several years about the end of 1544. His sermons produced a great effect, and he was protected by several of the barons who were leading men in the English faction. These barons, with the knowledge and approbation of King Henry, were engaged in a plot against the cardinal, in which his assassination was con- templated as the speediest mode of removing the chief obstacle to the influence of England. Of the reality of the plot and the intentions of the conspirators there can be no doubt: whether Wishart was aware of these has been a matter of controversy during the present century. There are strong suspicions against him but no sufficient evidence ; and all the presumptions which may be drawn from his personal character are entirely in his favour. The cardinal, though ignorant of the details of the plot, perhaps sus- pecting Wishart's knowledge of it, and in any event desirous to seize one of the most eloquent supporters of the new opinions, endeavoured, with the aid of the regent, to apprehend him, but was baffled in his efforts for some time. He was at last successful in seizing the preacher, and bringing him a prisoner to his castle of St Andrews. On the 28th of February 1546 Wishart was brought ta trial within the cathedral church, before the cardinal and other ecclesiastical judges, the regent deelining to take any active part. He defended his opinions with temper and moderation; but as he admitted certain of them which were held by his judges to be heretical, he was condemned to death and burnt.

The persecution of Wishart, and the meekness with which he bore his sufferings, produced a deep effect on the mind of the Scottish people, and

the cardinal became an object of general dislike. Those who hated him on other grounds were encouraged to proceed with the design they had formed against him. Naturally resolute and fearless, he seems to have undervalued the strength and character of his enemies, and even to have relied on the friendship of some of the conspirators. He crossed over to Angus, and took part in the magnificent ceremonials of the marriage of his illegitimate daughter with the heir of the Earl of Crawford. On his return to St Andrews he took up his residence in the castle. The conspirators, the chief of whom were Norman Leslie, Master of Rothes, and William Kirkaldy of Grange, contrived to obtain admission at daybreak of the 29th of May 1546, and murdered the cardinal under circumstances of horrible mockery and atrocity. The assassination excited very different feelings among the partisans on either side. The zealous adherents of the Church of Rome, as a matter of course, viewed it as a cruel murder aggravated by sacrilege ; the most violent of the Protestant party justified and even applauded it. Those who, without any strong feelings either way, disliked the cardinal on account of his arrogance and cruelty, spoke of the deed as a wicked one, but hardly professed to regret the victim. Ignorant of the treasonable designs of his enemies, viewing him as the champion of ecclesiastical Supremacy, and attributing to him all the evils of the unsuccessful war with England, they looked upon his death as an advantage to the Scottish kingdom. The men of that. age were too much accustomed to such violent deeds to entertain a great abhorrence of assassination, and such feelings and crimes were not confined to the adherents of the Reformation. A few years afterwards Martinuzzi, the cardinal archbishop of Gran, was murdered by the express command of a Roman Catholic prince, Ferdinand, king of the Romans, brother of the Emperor Charles V.

BEA—BEA

The character of Beaton has already been indicated. As a statesman he was able, resolute, and in his general policy patriotic. As an ecclesiastic he maintained the privileges of the hierarchy and the dominant system of belief conscientiously, but always with harshness and some- times with cruelty. The immoralities of the cardinal, like his acts of persecution, were exaggerated by his oppo- nents; but his private life was undoubtedly a scandal to religion and the church, and has only the poor excuse that it was

not worse than that of most of his order at the tine. The authorship of the writings ascribed to him in several biographical notices rests on no better authority than the apocryphal statements of Dempster. (G. G.)

BEATTIE, James, a Scottish poet and writer on philosophy, was born at Laurencekirk on the 25th October 1735, His father, a small farmer and shopkeeper, died when he was very young ; but an elder brother took charge of the boy, and observing his aptitude for learning sent him to Marischal College, Aberdeen, where he gained a bursary. In 1753 he was appointed schoolmaster of Fordoun, at the foot of the Grampian hills, amongst splendid scenery, which impressed itself deeply on Beattie's somewhat poetical mind. In 1758 he obtained a situation as under- master in the grammar school, Aberdeen, and two years later he was made professor of moral philosophy at Mari- schal College. Here he became closely acquainted with Reid, Campbell, Gerard, and others, who formed a kind of literary or philosophical society, in which speculative questions, above all the views of Hume, were canvassed and criticized. In 1770 Beattie published his Hssay on the Nature and Immutability of Truth, in which he attacked Helvetius and Hume, and advocated the doctrine after- wards familiarly known as that of Common Sense. The work had an astonishing success, and its author, when on a visit to London in 1773, was received with the greatest honour by the king himself. About the same time he received a pension of £200 a year. In 1773 and 1774 le published the first and second parts of The Minstrel, which were received with great favour, and gained for the authora fresh accession of popularity. His later writings are partly literary, such as the Hssays, 1766; Dissertations, 1783, partly philosophical ; Hvidences of Christianity, 1781; Elements of Moral Science, 1790-93. Beattie was unfor- tunate in his domestic life. His wife, whom he married in 1767, was afflicted with insanity, a disease which she appears to have inherited from her mother. Two sons, all his family, died just as they were attaining manhood. The elder, James Hay Beattie, a young man of great promise, who at the age of nineteen had been associated with his father in the professorship, died in 1790. The younger brother died in 1796. Beattie never recovered his second blow. His mind was nearly overthrown by it ; his spirit was completely broken, and although he still lectured, he neither wrote nor studied. In 1799 he was attacked with palsy, and continued to suffer from that disease for three years. He died on the 18th

August 1803. Beattie's fame rests now solely on his poems. The much celebrated Hssay on Truth is a work of no philoso- phic ability, and is disfigured by the violent and intem- perate language of the author. His other writings on philosophical subjects, such as the Hlements of Moral Science, are excessively weak, and have fallen into well- deserved oblivion. Zhe Afinstrel, however, is a work which will always retain a considerable share of popular favour. The ground-plan is simple and well conceived,—to trace the development of poetic genius in a youth from his earliest years up to the time when he becomes able to take his place as a minstrel. There runs through the poem a fine © vein of quiet reflection, interspersed with animated de- scriptions of natural scencry. The versification is smooth

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and melodious. W. Forbes, 1806.)

BEAUCAIRE (ic, Bellum Quadrum, the beautiful square),a town of France, department of Gard, and arrondissement of Nimes. Lat, 43° 48' 32" N., long. 4° 38' 50' E, It is situated on the right bank of the Rhone, opposite Tarascon, with which it is connected by a magni- ficent suspension-bridge of four spans and 1456 feet in length. The town is generally well built, but has no public buildings worthy of notice, and the streets are narrow and crooked. Its ancient castle of Bellicadro is now in ruins. It gives name to the canal which communicates with the sea, and also connects it with the Languedoc canal, forming part of the line of communication between the Rhone and the Garonne. It is also connected with Nimes and Alais by a railway opened in 1839. The manufactures are few and unimportant. The town derives its celebrity from the great July fair, which has been held here annually since the 13th (or 14th) century, and to which merchants come from all parts of Europe, and even from Persia and Armenia. The extensive meadow, called Magdalen's, on the banks of the Rhone, is set apart for the gathering, and almost every kind of article, whether of convenience or luxury, is there exhibited. Though the fair is now less frequented than formerly, it is said that still as many as 100,000 persons attend. There are stone quarries in the neighbourhood of the town, and the manufacture of linen and woollen stuffs is carried on. Population in 1872,

7858.

Beaucaire occupies the site of the ancient Ugernwm, and several remains of the Roman city havc been discovered, as well as (in 1734) the road that led from Nimes. It was a fortress in the Middle Ages, and belonged in succession to the counts of Arles, the archbishops of Axles, the counts of Toulouse, and the viscounts of Narbonne. In the 12th century it is frequently mentioned by the troubadours. Presented in 1215 to Simon de Montfort, it was next year taken possession of by Count Raimund VI. ; and in 1226 Louis VIII. made himself master of it. In the wars of the Leagne it suffered severely, and in 1632 its castle was destroyed by Richelieu.

BEAUCHAMP, Atpyonsz ps, French historian and man of letters, was born at Monaco in 1767, and died in 1832. In 1784 he entered a Sardinian regiment of marines, but on the outbreak of war with the French Republic, he refused to fight in what he considered an unjust cause, and was imprisoned for several months, After being liberated he took up his residence in Paris, where he obtained a post in one of the Government offices. On the fall of Nobespierre, Beauchamp was transferred to the bureau of the minister of police, and charged with the superintendence of the press This situation opened up to him materials of which he made use in his first and most popular historical work, LHustowre de la Vendée et des Chouans, 3 vols., 1806. The book, received with great favour by the people, was displeasing to the authorities. The third edition was con- fiscated ; its writer was deprived of his post, and in 1809 was compelled to leave Paris and take up his abode in Rheims In 1811] he obtained permission to return, and again received a Government appointment. This he had to resign on the Restoration, but was rewarded with a on pension, which was continued to his widow after his

eath.

Beauchamp wrote extensively for the public journals. His his- torical and biographical works arc numerous and important. The best known of them are :—Histoire de la Conquéte du Pérou, 1807 : Histoire du Brésil, 1815; Histoire de la Révolution du Piémont, 1823 ; Vie de Lowis XVIII., 1821. The Mémoires de Fouché have also been ascribed to him.

BEAUHARNAIS, Evens pr, step-son of Napoleon I. was born at Paris, September 3, 1781. His father, the Vicomte Alexander de Beauharnais, had been a member of the National Convention, and for some time commanded the republican army of the north. His want of success in

(See Life of Beattie, by his friend Sir

the field, however, brought him under the suspicion of the Revolutionary leaders ; he was tried on a charge of treason, and was executed on 23d June 1794. After the marriage of Napoleon with the Vicomtesse Josephine Beauharnais, her son Eugéne accompanied the army of Italy and acted as aide-de-camp to his step-father, by whom he was treated with the greatest affection and favour. He was rapidly promoted ; and after the establishment of the empire, was made prince and viceroy of Italy. In 1806 he was adopted by Napoleon. During the great campaign of 1809 he had the command of the Italian army, and by his skilful con- duct materially contributed to the success of the emperor. In 1812 he commanded a corps of the grand' army; and after the departure of Napoleon and flight of Murat, had the éntire charge of the broken French forces. The disas- trous campaigns of 1813 and 1814 deprived him of his viceroyalty, aud he retired to Munich, the capital of the king of Bavaria, whose daughter he had married in 1806. There he continued to reside, with the title of duke of Leuchtenberg, till his death in 1824,

BEAUMANOIR, Purupre pkg, a distinguished writer on French law, was born in the early part of the 13th century, and died in 1296. The few facts known regarding his life are to be gathered from legal documents in which his name occurs. From these it appears that in 1273 he filled the post of bazldc at Senlis,and in 1280 held a similar office at Clermont. He is also occasionally referred to as presiding at the assizes held at various towns. His great work is entitled Cowtwmes de Beawvoisis, and was first published by De la Thaumassiére in 1690. A second edition, with introduction, was published by Beugnot in 1842. It is regarded as one of the best works bearing on old French law, and was frequently referred to with high admiration by Montesquieu.

BEAUMARCHAIS. Prerret Aveustin Caron, better known by his acquired title De Braumarcuais, the most distinguished French conic dramatist next to Moliére, andaman of much importance during the pre-Revolutionary period,~~was born at Paris in 1732. His father, who was a watchmaker, brought him up to the same trade. He was an unusually precocious and lively boy, shrewd, saga~~ cious, and, like his sisters, passionately fond of music, and imbued with a strong desire for rising in the world, At the age of twenty-one he invented a new escapement for watches, which was pirated by a rival maker. Young Caron at once published his grievance in the newspapers, and had the matter referred to the Academy of Sciences, who decided in his favour. This affair brought him into notice at court; he was appointed, or at least chose to dub himself, watchmaker to the king, who had called him in to examine Mme. de Pompadour's watch. His handsome figure and cool assurance soon began to make their way at court, where he so earnestly desired to obtain a footing. Nor was it long before his wish was accomplished. 'The wife of an old court official, conceiving a violent passion for young Caron, persuaded her husband to make over his office to his rival, and on her husband's death, a few months later, married the handsome watchmaker. Caron at the same time assumed the title De Beaumarchais; and four years later, by purchasing the office of secretary to the king, obtained a title of nobility.

While cmployed at court his musical talents brought him under the notice of the king's sisters, who engaged him to teach them the harp. In this way he obtained access to the best society of the court, and by a fortunate accident was enabled to make use of the princesses' friendship to confer a slight favour on the great banker Paris-Duverney, Duverney testified his gratitude in a most substantial manner ; he bestowed shares in several of his speculations upon Beaumarchais, and the latter, whose business talents

were of a high order, soon realized a handsome fortune. In 1764 he took a journey to Spain, partly with commercial objects in view, but principally on account of the Clavijo affair, which was afterwards made famous by the Goezman memoirs, and by Goethe's drama. {Four years later he made his first essay on the stage with the sentimental drama Eugénie, which was

followed after an interval of two years by Les Deuw Amis. Neither had more than moderate success, and it was clear that, though the author might be unaware of it, his strength did not lie in the grave and sentimental. Meantime the clouds of the first great storm in Beaumarchais's life were gathering round him. He was very generally disliked as an upstart, and there were many ready to seize the first opportunity of hurling him from the position he had attained. Duverney, his great benefactor, died in 1770; but some time before his death a duplicate settlement of the affairs between him and Beaumarchais had been drawn up, in which the former acknowledged him- self debtor to the latter for 16,000 francs. Duverney's heir, Count la Blache, a bitter enemy of Beaumarchais, denied the validity of this document, though without directly stigmatizing it as a forgery. The matter was put tc trial. Beaumarchais gained his cause, but his adversary at once carried the case before the parliament, and in the early part of 1773 that body was preparing to give its decision on the report of one of its members, M. Goezman. Beaumarchais was well-nigh in despair ; ruin stared him in the face; he was looked upon not only with dislike but with suspicion and contempt. Worst of all, he was unable to obtain an interview with Goezman, in whose hands his fate rested. At last, just before the day on which the report was to be given in, he was informed privately that, by presenting 200 louis to Mme. Goezman and 15 to her secretary, the desired interview might take place; if the result should prove unfavourable the money would be refunded. The money was sent and the interview obtained; but the decision was adverse, and 200 louis were returned, the 15 going as business expenses to the secretary. Beaumarchais, who had learned that there was no secretary save Mme. Goezman herself, insisted on restitution of the 15 louis, and the lady, in her passion, denied all knowledge of the affair. Her husband, who seems not to have been cognisant of the transaction at first, and who, doubtless, thought the defeated litigant would be easily put down, at once brought an accusation against him in parliament for an attempt to corrupt a judge. The battle was fought chiefly through the Jfémozres, or reports published by the adverse parties, and 'in it Beaumarchais's success was most complete. All his best qualities were drawn forth by the struggle; his wit, energy, and cheer- fulness seemed to be doubled ; and for vivacity of style, fine satire, and broad humour, his famous J/émoires have never been surpassed. Even Voltaire was constrained to envy them. Nor was the effect of the struggle apparent only in Beaumarchais himself. He was

attacking the parliament through one of its members, and the parliament was the universally detested body formed by the chancellor Maupeou. The Mémoires were, therefore, hailed with general delight ; and the author, from being perhaps the most unpopular man in France, became at once the idol of the people. The decision in the case, however, so far as law went, was against him. The parliament condemned him au bldme,—.e., to civic degradation ; but he obtained restitution of his rights within two years, and finally triumphed over his adversary La Blache.

During the next few years his employment was of a somewhat singular nature. He was engaged by the king in secret service, principally to destroy certain scurrilous pamphlets concerning Mme. du Barry, the publication of which had been threatened. His visits to England, on

these missions, in which he was very successful, led him to take a deep interest in the impending struggle between the colonies and the mother country. His sympathies were entirely with the Americans; and by his unwearied exer- tions he succeeded in inducing the French Government to give ample, though private, assistance in money and arms to the insurgent colonists. He himself, partly on his own account, partly as an agent, carried on an enormous traffic with America. During the same period he had laid the foundations of a more enduring fame by his two famous comedies, the best of their class since those of Moliére. The earlier, Le Barbier de Seville, after a short prohibition, was put on the stage in 1775. The first representation was a complete failure. Beaumarchais had overloaded the last scene with allusions to the facts of his own case and the whole action of the piece was laboured and heavy. But with undaunted energy he set to work, cut down and remodelled the piece in time for the second representation, when it achieved a complete success. The intrigues which were necessary in order to obtain a licence for the second and more famous comedy Le Mariage de Figaro are highly amusing, and throw much light on the unsettled state of public sentiment at the time. The play was completed in 1781, but the opposition of Louis XVI. who saw its dangerous tendencies, was not overcome till 1784. The comedy had an unprecedented success. The principal character in both plays, the world-famous /igaro, is a completely original conception; and for mingled wit, shrewdness, gaiety, and philosophic reflection, may not unjustly be ranked alongside of the great

Tartuffe. To English readers the Figaro plays are generally known through the adaptations of them in the grand operas of Mozart and Rossini; but in France they long retained popularity as acting pieces. Beaumarchais's later produc- tions, the bombastic opera Zarare, and the drama The Guilty Mother, which was very popular, are hardly worthy of his genius.

By his writings Beaumarchais contributed greatly, though quite unconsciously, to hurry on the events that led to the Revolution. At heart he hardly seems to have been a republican, and the new state of affairs did not benefit him. His popularity had been somewhat lessened by the affairs Bergasse and Mirabeau, and his great wealth and spleudid mansion exposed him to the enmity of the envious. A speculation into which he entered, to supply the Convention with muskets from Holland, proved a ruinous failure. He was charged with treason to the Republic, and was obliged for some time to take refuge in Holland and England. His memoirs entitled, Mes Six Epoques, detailing his sufferings undcr the Republic, are not unworthy of the Goezman period. His courage and happy disposition never deserted him; he was gay and hopeful up to the time of his death, which took place suddenly in May 1799.

Loménie, Beaumarchais et son Temps, 1856; Eng. trans. of the same by H. S. Edwards, 4 vols., 1856. Beaumarchais's works

— been published by Gudin, 7 vols., 1809; and by Furne, 6 vols.,

1827.

BEAUMARIS (formerly Bornovor, and deriving its present French name of Beau Marais from Edward L), a borough and market-town of Anglesea, North Wales. It is situated on the Bay of Beaumaris, at the northern entrance of the Menai Straits, in lat. 53° 16' N., long. 4° 5' W. The town consists of several streets; and at the extremity of the principal one stands the castle. This fortress was built by Edward I. about 1295. It covers a great extent of ground, but its imposing effect is somewhat lessened by its low position, which was so designed that the fosse might communicate with the sea, so that vessels might unload beneath the walls. The chapel, dedicated to

the Virgin, is a spacious structure, containing several fine monuments. A free school was founded here in 1603. The principal buildings are the town-hall, county hall, prison, custom-house, assembly-room, and national school. Beaumaris has no manufactures and comparatively little

trade, but is much frequented as a bathing-place. It unites with Holyhead, Amlwch, and Llangefni in return- ing a member to parliament. The bay affords good anchorage, having seven fathoms of water at the lowest ebb. Population in 1871, 2291.

BEAUMONT AND FLETCHER

HE critical memoir prefixed by Mr Dyce to the only good and scholar-like edition of Beaumont and Fletcher

has summed up once for all, in fulness of perfect order, what little can now be known of their lives. It may suffice here to extract from this complete and careful record a few main facts and necessary dates, taking as little note as need be of any supplementary or hypothetical matters. Six or seven years before the birth of his brother in art, John Fletcher was born in December 1579 at Rye in Sussex, and baptized on the 20th of the same month. Richard Fletcher, his father, afterwards queen's chaplain, dean of Peterborough, and bishop successively of Bristol, Worcester, and London, was then minister of the parish in which the son was born who was to make their name immortal. That son was just turned of seven when the dean distinguished and disgraced himself as the spiritual tormentor of the last moments on earth of Mary Stuart. When not quite twelve he was admitted pensioner of Bene't College, Cambridge, and two years later was made one of the Bible-clerks: of this college Bishop Fletcher had been president twenty years earlier, and six months before his son's admission had received from its authorities a first letter of thanks for various benefactious, to be followed next year by a second. Four years later than this, when John Fletcher wanted five or six months of his seventeenth year, the bishop died suddenly of over much tobacco and the displeasure of Queen Elizabeth at his second marriage,—this time, it appears, with a lady of such character as figures something too frequently on the stage of his illustrious son. He left eight

children by his first marriage in such distress that their uncle, Dr Giles Fletcher, author of a treatise on the Russian commonwealth which is still held in some repute, was obliged to draw up a petition to the queen on their behalf, which was sup- ported by the intercession of Essex, but with what result is uncertain. From this date we know nothing of the fortunes of John Fletcher, till the needy orphan boy of seventeen reappears as the brilliant and triumphant poet whose name is linked for all time with the yet more glorious name of Francis Beaumont, third and youngest son of Sir Francis Beaumont of Grace-Dieu, one of the justices of the Common Pleas,—born, according to general report, in 1586, but, according to more than one apparently irrefragable document, actually born at least a year earlier. The first record of his existence is the entry of his name, together with those of his elder brothers Henry and John, as a gentleman-commoner of Broadgates Hall, Oxford, now supplanted by Pembroke College. But most lovers of his fame will care rather to remember the admirable lines of Wordsworth on the "eager child" who played among the rocks and woodlands of Grace-Dieu; though it may be doubted whether even the boy's first verses were of the peaceful and pastoral character attributed to them by the great laureate of the lakes. That passionate and fiery genius which was so soon and for so short a time to "shake the buskined stage" with heroic and tragic notes of passion and of sorrow, of scorn and rage and slighted love and jealousy, must surely have sought vent from the first in fancies of a more ardent and ambitious kind; and it would be a likelier conjecture that when Frank Beaumont (as we know

on more authorities than one that he was always called by ©

his contemporaries, even in the full flush of his adult fame— "never more than Frank," says Heywood) went to college at the ripe age of twelve, he had already committed a tragedy or two in emulation of Zamburlaine, Andronicus, or Jeronymo. The date of his admission was 4th February 1597; on April 22d of the following year his father died ; and on the 3d of November 1600, having left Oxford without taking his degree, the boy of fifteen was entered a member of the Inner Temple, his two brothers standing sponsors on the grave occasion. But the son of Judge Beaumont was no fitter for success at the bar than the son of Bishop Fletcher for distinction in the church: it is equally difficult to imagine either poet invested with either

gown. ‘Two years later appeared the poem of Salmacis and Hermaphroditus, a voluptuous and voluminous expan- sion of the Ovidian legend, not on the whole discreditable to a lad of seventeen, fresh from the popular love-poems of Marlowe and Shakespeare, which it naturally exceeds in long-winded and fantastic diffusion of episodes and conceits. At twenty-two Beaumont prefixed to the magnificent masterpiece of Ben Jonson some noticeable verses in honour of his “dear friend” the author; and in the same year (1607) appeared the anonymous comedy of The Woman-Hater, usually assigned to Fletcher alone; but being as it is in the main a crude and puerile imitation of Jonson’s manner, and certainly more like a man’s work at twenty-two than at twenty-eight, internal evidence would seem to justify, or at least to excuse, those critics who in the teeth of high authority and tradition would transfer from Fletcher to Beaumont the principal responsibility for this first play that can be traced to the hand of either. As Fletcher also prefixed to the first edition of Volpone a copy of commendatory verses, we may presume that their common admiration for a common friend was among the earliest and strongest influences which drew together the two great poets whose names were thenceforward to be for ever indivisible. During the dim eleven years between the death of his father and the dawn of his fame, we cannot but imagine that the career of Fletcher had been unprosperous as well as obscure. From seven- teen to twenty-eight his youth may presumably have been spent in such painful struggles for success, if not for sustenance, as were never known to his younger colleague, who, as we have seen, was entered at Oxford a few months after Fletcher must in all likelihood have left Cambridge to try his luck in London; a venture most probably resolved on as soon as the youth had found his family reduced by the father’s death to such ruinous straits that any smoother course can hardly have been open to him. Entering college at the same age as Fletcher had entered six years earlier, Beaumont had before him a brighter and briefer line of life than his elder. But what- ever may have been their respective situations when, either by happy chance or, as Mr Dyce suggests, by the good offices of Jonson, they were first brought together, their intimacy soon became so much closer than that of ordinary brothers that the household which they shared as bachelors was conducted on such thoroughly communistic principles as might have satisfied the most trenchant theorist who ever proclaimed, as the cardinal point of his doctrine, a complete and absolute community of bed and board, with

all goods thereto appertainimg. But in the year following that in which the two younger poets had united in homage to Jonson, they had entered into a partnership of more importance than this in "the same clothes and cloak, d&vc.," with other necessaries of life specified by Aubrey. In 1608, if we may trust the reckoning which seems trust- worthiest, the twin stars of our stage rose visibly together for the first time. The loveliest, though not the loftiest, of tragic plays that we owe to the comrades or the successors of Shakespeare, Philaster, has always been regarded as the first-born issue of tlieir common genius. The noble tragedy of Thierry and Theodoret has generally been dated earlier and assigned to Fletcher alone ; but we can be sure neither of the early date nor the single author- ship. The main body of the play, comprising both the great scenes which throw out into full and final relief the character of either heroine for perfect good or evil, bears throughout the unmistakable image and superscription of Fletcher ; yet there are parts which for gravity and steady strength of style, for reserve and temperance of effect, would seem to suggest the collaboration of a calmer and more patient hand ; and these more equable and less passionate parts of the poem recall rather the touch of Massinger than of Beaumont. In the second act, for example, the regular structure of the verse, the even scheme of the action, the exaggerated braggardism which makes of the hero a mere puppet or mouthpiece of his own self-will, are all qualities which, for better or for worse, remind us of the strength or the weakness of a poet with whom we know that Fletcher, before or after his alliance with Beaumont, did now and then work in common. Even the Arbaces of Beaumont, though somewhat too highly coloured, does not "write himself down an ass," like Thierry on his first entrance, after the too frequent fashion of Massinger's braggarts and tyrants; does not proclaim at starting or display with mere wantonness of exposure his more unlovely qualities in the naked nature of their deformity. Compare also the second with the first scene of the fourth act. In style and metre this second scene is as good an example of Massinger as the first is of Fletcher at his best. Observe especially in the elaborate narrative of the pretended self-immolation of Ordella these distinctive notes of the peculiar style of Massinger; the excess of parenthetic sentences, no less than five in a space of twenty lines; the classical common-place of allusion to Athens, Rome, and Sparta in one

superfluous breath; the pure and vigorous but somewhat level and prosaic order of language, with the use of certain cheap and easy phrases familiar to Massinger as catchwords; the flat and feeble terminations by means of which the final syllable of one verse runs on into the next without more pause or rhythm than in a passage of prose; th» general dignity and gravity of sustained and measured expression. 'These are the very points in which the style of Massinger differs from that of Fletcher ; whose lightest and loosest verses do not overlap each other without sensible distinction between the end of one line and the beginning of the next; who is often too fluent and facile to be choice or forcible in his diction, but seldom if ever prosaic or conventional in phrase or allusion, and by no means habitually given to weave thoughts within thoughts, knit sentence into sentence, and hang whole paragraphs together by the help of loops and brackets, From these indications we might infer that this poem belongs altogether to a period later than the death of Beaumont; though even during his friend's life it appears that Fletcher was once at least allied with Massinger and two lesser dramatists in the composition of some play now unknown to men. .

Hardly eight years of toil and triumph, of joyous and glorious life, were spared by destiny to the younger poet

between the date assigned to the first radiant revelation of his genius in Philaster and the date which marks the end of all his labours. On the 6th of March 1616 Francis Beaumont died,—according to Jonson and tradition, " ere he was thirty years of age," but this we have seen to be inconsistent with the registry of his entrance at Oxford. If we may trust the elegiac evidence of friends, he died of his own genius and fiery overwork of brain ; yet from the magnificent and masculine beauty of his portrait one should certainly never have guessed that any strain of spirit or stress of invention could have worn out so long before its time so fair and royal a temple for so bright and affluent a soul. A student of physiognomy will not fail to mark the points of likeness and of difference between the faces of the two friends; both models of noble manhood, handsome and significant in feature and expression alike ;— Beaumont's the statelier and serener of the two, with clear thoughtful eyes, full arched brows, and strong aquiline nose, with a

little cleft at the tip; a grave and beautiful mouth, with full and finely curved lips; the form of face a long pure oval, and the imperial head with its " fair large front" and clustering hair set firm and carried high with an aspect at once of quiet command, and kingly observation: Fletcher's a more keen and fervid face, sharper in outline every way, with an air of bright ardour and glad fiery impatience; sanguine and nervous, suiting the complexion and colour of hair; the expression of the eager eyes and lips almost recalling that of a noble hound in act to break the leash it strains at;—two heads as lordly of feature and as expressive of aspect as any gallery of great men can show. That spring of 1616, we may note in passing, was the darkest that ever dawned upon England or the world; for, just forty-eight days afterwards, it witnessed, on the 23d of April, the removal from earth of the mightiest genius that ever dwelt among men. Scarcely more than a month and a half divided the death-days of Beaumont and of Shakespeare. Some three years earlier by Mr Dyce's estimate, when about the age of twenty-eight, Beaumont had married Ursula, daughter and coheiress to Henry Isley of Sundridge in Kent, by whom he left two daughters, one of them posthumous. Fletcher survived his friend just nine years and five months; he died "in~ the great plague, 1625," and was buried on the 29th of August in St Saviour's, Southwark ; not, as we might have wished, beside his younger fellow in fame, who but three days after his untimely death had added another deathless memory to the graves of our great men in Westminster Abbey, which he had sung in such noble verse. Dying when just four months short of forty-six, Fletcher had thus, as well as we can now calculate, altogether some fourteen years and six months more of life than the poet who divides with him the imperial inheritance of their common lory. ; The perfect union in genius and in friendship which has made one name of the two names of these great twin brothers in song is a thing so admirable and so delightful to remember, that it would seem ungracious aud unkindly to claim for either a precedence which we may be sure he would have been eager to disclaim. But if a distinction must be made between the Dioscuri of English poetry, we must admit that Beaumont was the twin of heavenlier birth. Only as Pollux was on one side a demigod of diviner blood than Castor can it be said that on any side Beaumont was a poet of higher and purer genius than Fletcher ; but so much must be allowed by all who have eyes and ears to discern in the fabric of their common work a distinction without a difference. Few things are stranger

than the avowal of so great and exquisite a critic as Coleridge, that he could trace no faintest line of demar- cation between the plays which we owe mainly to Beaumont

and the plays which we owe solely to Fletcher. To others this line has always appeared in almost every case unmis- takable. Were it as hard and broad as the line which marks off, for example, Shakespeare's part from Fletcher's in The Two Noble Kinsmen, the harmony would of course be lost which now informs every work of their common genius, and each play of their writing would be such another piece of magnificent patchwork as that last gigantic heir of Shakespeare's invention, the posthumous birth of his part- ing Muse which was suckled at the breast of Fletcher's as a child of godlike blood might be reared on the milk of a mortal mother—or in this case, we might sometimes be tempted to say, of a she-goat who left in the veius of the heaven-born suckling somewhat too: much of his nurse Amalthea. That question however belongs in any case more properly to the study of Shakespeare than to the present subject in hand. It may suffice here to observe that the contributions of Fletcher to the majestic temple of tragedy left incomplete by Shakespeare show the lesser workman almost equally at his best and at his worst, at his weakest and at his strongest. In the plays which we know by evidence surer than the most trustworthy tradition to be the common work of Beaumont and Fletcher, there is indeed no trace of such incongruous and incompatible admixture as leaves the greatest example of romantic tragedy—for Cymbeline and the Winter's Tale, though not guiltless of blood, are in their issues no more tragic than Pericles or the Tempest—an unique instance of glorious imperfection, a hybrid of heavenly and other than heavenly breed, disproportioned and divine.. But throughout these noblest of the works inscribed generally with the names of both dramatists we trace on every other page the touch of a surer hand, we hear at every other turn the note of a deeper voice, than we can ever recognize in the work of Fletcher alone. Although the beloved friend of Jonson, and in the field of comedy his loving and studious disciple, yet in that tragic field where his freshest bays were gathered Beaumont was the worthiest and the closest follower of Shakespeare. In the external but essential matter of ex- pression by rhythm and metre he approves himself

always a student of Shakespeare's second manner, of the style in which the graver or tragic part of his historical or romantic plays is mostly written ; doubtless, the most perfect model that can be studied by any poet who, like Beaumont, is great enough to be in no danger of sinking to the rank of a mere copyist, but while studious of the perfection set before him is yet conscious of his own personal and proper quality of genius, and enters the presence of the master not as a servant but asa son. 'The general style of his tragic or romantic verse is as simple and severe in its purity of note and regularity of outline as that of Fletcher's is by comparison lax, effusive, exuberant. The matchless fuency and rapidity with which the elder brother pours forth the stream of his smooth swift verse gave probably the first occasion for that foolish rumour which has not yet fallen duly silent, but still murmurs here and there its suggestion that the main office of Beaumont was to correct and contain within bounds the over-flowing invention of his colleague. The poet who while yet a youth had earned by his unaided mastery of hand such a crown as was bestowed by the noble love and the loving "envy" of Ben Jonson was, according to this tradition, a mere precocious pedagogue, fit only to revise and restrain the too liberal effusions of his elder in genius as in years. Now, in every one of the plays common to both, the real difficulty for a critic is not to trace the hand of Beaumont, but to detect the touch of Fletcher. Throughout the better part of every such play, and above all of their two masterpieces, Philaster and The Maid's Tragedy, it should be clear to the most sluggish or cursory of readers that he has not to do with the author of

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Valentinian and The Double Marriage. In those admirable tragedies the style is looser, more fluid, more feminine. From the first scene to the last we are swept as it were along the race of a running river, always at full flow of light and buoyant melody, with no dark reaches or perilous eddies, no stagnant pools or sterile sandbanks ; its bright course only varied by sudden rapids or a stronger ripple here and there, but in rough places or smooth still stirred aud sparkling with summer wind and sun. But in those tragic poems of which the dominant note is the note of Beaumont's genius a subtler chord of thought is sounded, a deeper key of emotion is touched, than ever was struck by Fletcher. The lighter genius is palpably subordinate

to the stronger, and loyally submits itself to the impression of a loftier spirit. It is true that this distinction is never grave enough to produce a discord: it is also true that the plays in which the predominance of Beaumont's mind and style is generally perceptible make up altogether but a small section of the work that bears their names conjointly ; but it is no less true that within this section the most precious part of that work is comprised. Outside it we shall find no figures so firmly drawn, no such clearness of outline, no such cunning of hands as we recognize in the three great studies of Bellario, Evadne, and Aspatia. In his male characters, as for instance in the parts of Philaster and Arbaces, Beaumont also is apt to show something of that exaggeration or inconsistency for which his colleague is perhaps more frequently and more heavily to blame; but in these there is not a jarring note, not a touch misplaced ; unless, indeed, a rigid criticism may condemn as unfeminine and incongruous with the gentle beauty of her pathetic patience the device by which Aspatia procures herself the death desired at the hand of Amintor. This is noted as a fault by Mr Dyce; but may well be forgiven for the sake of the magnificent scene which follows, and the highest tragic effect ever attained on the stage of either poet. That this as well as the greater part of those other scenes which are the glory of the poem is due to Beau- mont might readily be shown at length by the process of comparison. The noble scene of regicide, which it was found expedient to cancel during the earlier years of the Restoration, may indeed be the work of Fletcher; but the part of Evadne must undoubtedly be in the main assigned to the more potent hand of his fellow. There is a fine harmony of character between her naked audacity in the second act and her fierce repentance in the fourth, which is pot unworthy a disciple of the tragic school of Shakespeare ; Fletcher is less observant of the due balance, less heedful of the nice proportions of good and evil in a faulty and fiery nature, compounded of perverse instinct and passionate reaction. From him we might have had a figure as admirable for vigour of handling, but hardly in such perfect keeping as this of Beaumont's Evadne, the mur- deress-Magdalen, whose penitence is of one crimson colour with her sin. Nor even in Fletcher's Ordella, worthy as the part is throughout even of the precious and exquisite praise of Lamb, is there any such cunning touch of tenderness or delicate perfume of pathos as in the parts of Bellario and Aspatia. These have in them a bitter sweet- ness, a subtle pungency of mortal sorrow and tears of divine delight, beyond the reach of Fletcher. His highest studies of

female character have dignity, energy, devotion of the heroic type; but they never touch us to the quick, never waken in us any finer and more profound sense than that of applause and admiration. There is a modest pathos now and then in his pictures of feminine submission and slighted or outraged love ; but this submission he is apt to make too servile, this love too dog-like in its abject devotion to retain that tender reverence which so many ! generations of readers have paid to the sweet memories of

Aspatia and Bellario. To excite compassion was enough for Fletcher, as in the masculine parts of his work it was enough for him to excite wonder, to sustain curiosity, to goad and stimulate by any vivid and violent means the interest of readers or spectators. The single instance of noble pathos, the one scene he has left us which appeals to the higher and purer kind of pity, is the death of the child Hengo in Bonduca,—a scene which of itself would have sufficed to enrol his name for ever on the list of our great tragic poets To him we may probably assign the whole merit of that fiery and high-toned tragedy, with all its spirit and spleudour of national and martial passion; the conscious and demonstrative exchange of courtesy between Roman and Briton, which is one of the leading notes of the poem, has in it a touch of overstrained and artificial chivalry characteristic of Fletcher; yet the parts of Cara- tach and Pcenius may be counted among the loftiest and most equal of his creations. But no surer test or better example can be taken of the distinctive quality which denotes the graver genius of either poet than that supplied by a comparison of Beaumont's Triumph of Love with Fletcher's Zriumph of Death. ach little play, in the brief course of its single act, gives proof of the peculiar touch and special trick of its author's hand: the deeper and more delicate passion of Beaumont, the rapid and ardent activity of Fletcher, have nowhere found a more noticeable vent for the expression respectively of the most tender and profound simplicity of quiet sweetness, the most buoyant and impatient energy of tragic emotion.

In the wider field of their comic 'or romantic drama it is yet easier to distinguish the respective work of either haud. The bias of Fletcher was towards mixed comedy ; his lightest and wildest humour is usually crossed or tem- pered by an infusion of romance; like Shakespeare in this one point

at least, he has left no single play without some touch on it of serious interest, of poetic eloquence or fancy, however slight and fugitive. Beaumont, evidently under the imperious influence of Ben Jonson's more rigid theories, seems rather to have bent his genius with the whole forcc of a resolute will into the form or mould prescribed for comedy by the elder and greater comic poet. The admir- able study of the worthy citizen and his wife, who introduce to the stage and escort with their applause The Knight of the Burning Pestle through his adventurous career to its untimely end, has all the force and fulness of Jonson's humour at its best, with more of freshness and freedom. In pure comedy, varied with broad farce and mock-heroic parody, Beaumont was the earliest as well as the ablest disciple of the master whose mantle was after- wards to be shared among the academic poets of a younger generation, the Randolphs and Cartwrights who sought shelter under the shadow of its voluminous folds. The best example of the school of Jonson to be found outside the ample range of his own work is The Scornful Lady, a comedy whose exceptional success and prolonged popu- larity must have been due rather to the broad effect of its forcible situations, its wealth and variety of ludicrous incidents, and the strong gross humour of its dialogue, than to any finer quality of style, invention, or character. Tt is the only work of Beaumont and Fletcher which a critic who weighs the meaning of his words can admit to be as coarse as the coarsest work of Ben Jonson. They are prone, indeed, to indulge elsewhere in a wanton and exuberant licence of talk; and Fletcher, at least, is liable to confuse the shades of right and wrong, to deface or efface the boundary lines of good and evil, to stain the ermine of virtue and palliate the nakedness of vice with the same indecorous and incongruous laxity of handling. Often, in mere haste to despatch the business of a play, to huddle up a catastrophe or throw qut some particular scene

into sharp and immediate relief, he will sacrifice all secin- liness and consistency of character to the present aim of stage effect, andithe instant impression of strong incident or audacious eloquence. His heroines are too apt to utter sentiments worthy of Diana in language unworthy of Doll Tearsheet. But in this play both style and sentiment are throughout on a lower level, the action and emotion are of a baser kind than usual; the

precept of Aristotle and the practice of Jonson have been so carefully obscrved and exaggerated that it might almost be said to offer us in one or two places an imitation not mercly of the sorrier but of the sorriest qualities of human nature ; and full as it is of spontaneous power and humorous invention, the comedy extolled by the moral Steele (with just so much of reserva- tion as permits him to deprecate the ridicule cast upon the clerical character) is certainly more offensive to artistic law and esthetic judgment by the general and ingrained coarseness of its tone, than the tragi-comedy denounced by the immoral Dryden as exceeding in licence his own worst work and that of his fellow playwrights ; an imputation, be it said in passing, as groundless as the protest pleaded on their behalf is impudent ; for though we may hardly agree with the uncompromising panegyrist who commends that play in particular to the approval of 'the austere scarlet" (remembering, perhaps, that Aristophanes was the chosen bedfellow of Chrysostom), there is at least no such offence against art or taste in the eccentricity of its situations or the daring of its dialogue. The buoyant and facile grace of Fletcher's style carries him lightly across quagmires in which a heavier- footed poet, or one of slower tread, would have stuck fast, and come forth bemired to the knees. To Beaumont his stars had given as birthright the gifts of tragic pathos and passion, of tender power, and broad strong humour; to Fletcher had been allotted a more fiery and fruitful force of invention, a more aerial ease and swiftness of action, a more various readiness and fulness of bright exuberant speech. The genius of Beaumont was deeper, sweeter, nobler than his elder's : the genius of Fletcher more brilliant, more supple, more prodigal, and more voluble than his friend's. Without a taint or a shadow on his fame of such imitative servility as marks and degrades the mere hench- man or satellite of a stronger poct, Beaumont may fairly be said to hold of Shakespeare in his tragedy, in his comedy of Jonson; in each case rather as a kinsman than as a client, as an ally than as a follower: but the more special province of Fletcher was a laud of his own discovering, where no later colonist has ever had power to settle or to share his reign. With the mixed or romantic comedy of Shakespeare it has nothing in common except the admix- ture or alternation of graver witb. lighter interest, of serious with humorous action. Nothing is here of his magic exaltation or charm of fairy empire. The rare and rash adventures of Fletcher on that forbidden track are too sure to end in pitiful and shameful failure. His crown of praise is to have created a wholly new and wholly

delightful form of mixed comedy or dramatic romance, dealing merely with the humours and sentiments of men, their passions and their chances; to have woven of all these a web of emotion and eveut with such gay dexterity, to have blended his colours and combined his effects with such exquisite facility and swift light sureness of touch, that we may return once and again from those heights and depths of poetry to which access was forbidden him, | ready as ever to enjoy as of old the fresh incomparable charm, the force and ease and grace of life, which fill and animate the radiant world of his romantic invention. Neither before him nor after do we find, in this his special field of fancy and of work, more than shadows or echoes of his coming or departing genius, Admirable as are his

tragedies already mentioned, rich in splendid eloquence and strong in large grasp of character as is the Roman history of The false One, full of interest and vigour as is the better part of Mollo Duke of Normandy, and sublime in the loveliness of passion as is the one scene of perfect beauty and terror which crowns this latter tragedy, Fletcher nay claim a yet higher and more special station among his great dramatic peers by right of his comic and romantic than by right of his tragic and historic plays. Even in these he is more a romantic than a tragic poet. The quality of his genius, never sombre or subtle or profound, bears him always towards fresh air and sunshine. His natural work is in a midday world of fearless boyish laughter and hardly bitter tears. There is always more of rainbow than of storin in his skies; their darkest shadow is but a tragic twilight. What with him is the noon of night would seem as sunshine on the stage of Ford or Webster. There is but one passage in all these noble plays which lifts us beyond a sense of the stage, which raises our admiration out of speech into silence, tempers and trans- figures our emotion with a touch of awe. And this we owe to the genius of Beaumont, exalted for an instant to the very tone and manner of Shakespeare's tragedy, when Amintor stands between the dead and the dying woman whom he has unwittingly slain with hand and tongue. The first few lines that drop from his stricken lips are probably the only verses of Beaumont or Fletcher which might pass for Shakespeare's even with a good judge of al "This earth of mine doth tremble," &c.

But in Fletcher's tragedy, however we may be thrilled and kindled with high contagious excitement, we are never awed into dumb delight or dread, never pierced with any sense of terror or pity too deep or even deep enough for tears. Even his Brunhalts and Martias can hardly persuade us to forget for the moment that "they do but jest, poison in jest."

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trained up under Ben Jonson as the high interest and graduated action of the serious part of the play are characteristic of his more earnest genius. Among the purely romantic plays of Fletcher, or those in which the comic effect is throughout subordinate to the romantic, The Knight of Malta seems most worthy of the highest place for the noble beauty and exaltation of spirit which informs it with a lofty life, for its chivalrous union of heroic passion and Catholic devotion. This poem is the fairest and the first example of those sweet fantastic paint- ings in rose-colour and azure of visionary chivalry and ideal holiness, by dint of which the romance of more recent days has sought to cast the glamour of a mirage over the darkest and deadliest "ages of faith." The pure and fervent eloquence of the style is in perfect keeping with the high romantic interest of character and story. In the same class we may rank among the best samples of Fletcher's workmanship Zhe Pilgrim, The Loyal Subject, A Wrfe for a Month, Love's Pilgrimage, and The Lover's Progress,—tich all of them in exquisite writing, in varied incident, in brilliant effects and graceful or passionate interludes, In The Coxcomb and The Honest Man's Fortune—two plays which, on the whole, can hardly be counted among the best of their class—there are tones of homelier emotion, touches of a simpler and more pathetic interest than usual; and here, as in the two admirable first scenes between Leucippus and Bacha, which relieve and redeem from contempt the tragic burlesque of Cupid's Revenge, the note of Beaumont's manner is at once discernible.

Even the most rapid revision of the wo « done by these great twin poets must impress every capable student with a sense of the homage due to this living witness of their large and liberal genius. The loss of their names from the roll of English poetry would be only less than the loss of the few greatest inscribed on it. Nothing could supply the want of their tragic, their comic or

romantic drama ; no larger or more fiery planet can ever arise to supplant or to eclipse the twin lights of our zodiac. Whatever their faults of shortcoming or excess, there is in their very names or the mere thought of their common work a kind of special aud personal attraction for all true lovers of high dramatic poetry. There is the glory and grace of youth in all they have left us; if there be also somewhat too much of its graceless as well as its gracious qualities, yet there hangs about their memory as it were a music of the morning, a breath and savour of bright early manhood, a joyous and vigorous air of free life and fruitful labour, which might charm asleep for ever all thought or blame of all mortal infirmity or folly, or any stain of earth that may have soiled in passing the fect of creatures half human and half divine while yet they dwelt among men. For good or for evil, they are above all things poets of youth; we cannot conceive of them grown grey in the dignity of years, venerable with the authority of long life, and weighted with the wisdom of experience. In the Olym- pian circle of the gods and the giants of our race who on earth were their contemporaries and corrivals, they seem to move among the graver presences and figures of sedater fame like the two spoilt boys of heaven, lightest of foot and heart and head of all the brood of deity. Shakespeare may have smiled as Jonson may have nodded approval of their bright swift work, neither of these great elders grudg- ing his praise to the special charm which won for it a pre- ference during one generation at least even over their own loftier and weightier verse; and indeed the advance in natural ease, in truth and grace of dialogue, is alike mani- fest whether we turn to such of their comic characters as Valentine and Don John, Rutilio and Monsieur Thomas, from the Truewit of Jonson or even from the Mercutio of Shakespeare ; the one too stiff with classic starch, the

other too full of mere verbal catches and forced conccits, to persuade us that either can in any age have fairly represented the light free talk and facile humour of its youth, In another field than this Beaumont and Fletcher hold as high and sccure a station of their own as any poet of their race. In perfect workmanship of lyrical jewellery, in perfect bloom and flower of

song-writing, they equal all compeers whom they do not excel; the blossoms of their growth in this kind may be matched for colour and fragrance against Shakespeare's, and for morning freshness and natural purity of form exceed the finest grafts of Jonson. The Faithful Shepherdess alone might speak for Fletcher on this score, being as it is simply a lyric poem in semi-dramatic shape, to be judged only as such, and as such almost faultless; but in no wise to be classed for praise or blame among the acting plays of its author, whose one serious error in the matter was the submission of his Dryad to the critical verdict of an audience too probably in great part composed of clowns and satyrs far unlike the loving and sweet-tongued sylvan of his lovely fancy. And whether we assign to him or to Beaumont the divine song of melancholy (mestius lacrymis Simonideis), perfect in form as Catullus and profound in sentiment as Shelley, which Milton himself could but echo and expand, could not heighten or deepen its exquisite intensity of thought and word alike, there will remain witness enough for the younger brother of a lyric power as pure and rare as his elder's.

The excess of influence and popularity over that of other poets usually ascribed to the work of Beaumont and Fletcher for some half century or so after their own time has perhaps been somewhat overstated by tradition. Whatever may have been for a season the fashion of the stage, it is certain that Shakespeare can show two editions for one against them in folio; four in all from 1623 to 1685, while they have but their two of 1647 and 1679. Nor does one see how it can accurately or even plausibly be said that they were in any exact sense the founders of a school either in comedy or in tragedy. Massinger, for some years their survivor, and in some points akin to them as a workman, cannot properly be counted as their disciple ; and no leading poet of the time had so much in common with them as he. At first sight, indeed, his choice of romantic subject and treatment of foreign stories, gathered from the fertile tale-tellers of the south, and ranging in date from Boccaccio to Cervantes, may seem to mark him out as a member of the same school; but the deepest and most distinctive qualities of his genius set it far apart from theirs ; though undoubtedly not so far that any discrepancy or discord should impair the excellence or injure the keep- ing of works in which he took part with Fletcher. Yet, placed beside theirs, the tone of his thought and speech seems by comparison severe as well as

sober, and sad as well as severe. ‘Their extravagant and boyish insanity of pro- strate royalism is not more alien from his half pensive and

BEAUNE, the chief town of an arrondissement in France, in the department of Cote-d’Or, situated on the River Bourzeoise, twenty-three miles 8.S.W. of Dijon, on the railway from Paris to Lyons. The town is of poor appearance, but has several buildings of interest, such as the churches of Nétre Dame and Saint Pierre, both of the 12th century, the hospital, founded by Nicholas Rollin in 1443, and the belfry of the old town-house. Of more modern erection are the public baths, the theatre, the communal college, and the library. Iu the 18th century there were no fewer than seven monastic buildings in the town besides a Bernardine abbey, a Carthusian convent,

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tion. as a pupil who copied their style in water-colour ; his

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| half angry undertone of political protest than his usually careful and complete structure of story from their fre- quently lax and slovenly incoherence of character or plot, than his well composed and proportioned metre from their lighter and looser melodies, than the bitter insistence and elaborate acrimony of his judicial satire on hypocrisy or oppression from the gaiety or facility of mood which suffers them in the shifting of a scene to redeem their worst

‘ characters by some juggler’s trick of conversion at the last moment allowed them to wind up a play with universal reconciliation and an act of oblivion on all hands. They could hardly have drawn with such steady skill and explicit finish an Overreach or a Luke; but the strenuous and able work of Massinger at its highest point of success las no breath in it of their brighter and more immediate inspira- Shirley, on the other hand, may certainly be classed

best tragedy and his best comedy, The Z’rattor and The Lady of Pleaswre, might pass muster undetected among the plays of Fletcher, and might fairly claim to take rank above the lowest class of these. In the finest work of

Middleton we recognize an almost exact reproduction of Fletcher's metrical effects,;—a reverberation of that flowing music, a reiteration of those feminine final notes. In his later tragi-comedies, throughout his masterpiece of Women beware Women, and in the noble scenes which make up the tragic or serious part of The Changeling or The Spanish. Gipsy,—wherever, in a word, we find the admirable but unequal genius of this poet at its best—we find a likeness wholly wanting in his earlier and ruder work, which undoubtedly suggests the influence of Fletcher. Other instances of imitation, other examples of discipleship, might perhaps be found among lesser men of the next generation; but the mass of succeeding playwrights began in a very short time to lower the style and debasc the scheme of dramatic poetry; and espccially to loosen the last ties of harmony, to deface the very form and feature of tragic verse. In Shirley, the last and least of those in whom the lineal blood of the old masters was yet discernible, we find side by side with the fine ancestral indications of legitimate descent exactly such marks of decadence rather than degeneracy as we might have antici- pated in the latest heir of a long line which began with the rise of Marlowe, 'son of the morning," in the highest heaven of our song, to prepare a pathway for the sun. After Shakespeare there was yet room for Beaumont and Fletcher ; but after these and the other constellations had set, whose lights filled up the measure of that diviner zodiac through which he moved, there was but room in heaven for the pallid moonrise of Shirley; and before this last reflex from a sunken sun was itself cclipsed, the glory had passed away from our drama, to alight upon that summit of epic song whence Milton held communion with darkness and the stars. (A.7e. 82)

and a society of priests engaged in educational pursuits. Beaune enjoys considerable commercial prosperity as the principal seat of the Burgundian wine-trade; it also manufactures cloth, cutlery, and leather, and has dye-works, flour-mills, and distilleries. Population in 1871, 10,415.

Beaune appears as a fortified place as early as the 7th century, and for some time was the capital of a separate duchy. United to Burgundy in 1227, it became the first seat of the Burgundian par- liament, or Jours Générauc, and was the residence of several of the dukes. On the death of Charles the Bold, it sided with his daughter, but was besieged and taken by Louis XI. in 1478. It suffered severely in the wars of the League, prospered in the reign

of Henry IV., and was greatly injured by the revocation of the Edict of Nantes.

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BEAUSOBRE, Isaac psx, a learned Protestant writer, of French origin, was born at Niort in 1659, and after studying theology at the Protestant Academy of Saumur, was ordained at the age of twenty-two. He was forced into Holland to avoid the execution of a sentence con- demning him to make the amende honorable for having broken the royal signet, which was put upon the door of a church of the reformers to prevent the public profession of their religion. He went to Berlin in 1694, and was made chaplain to the king of Prussia, and counsellor of the royal consistory. He died in 1738, aged seventy-nine, after having published several works, among which may be mentioned—(1.) Défense de la Doctrine des Réformés, sur la Providence, sur la Prédestination, sur la Grace, et sur ' Hucharistie (Magdeburg, 1694-8); (2.) A translation of the New Testament, with Notes, jointly with M. Lenfant (1718), much esteemed among Protestants ; (3.) Dusserta- tion sur les Adamites de Bohéme, a curious work ; (4.) Histoire Critique de Manichée et du Manichéisme, 2 tom. 4to (Amst., 1734-9), a very learned and valuable work, discussing, as Gibbon observes, "many deep questions of Pagan and Christian theology, and forming a rich treasury of facts and opinions;" (5.) Several dissertations in the Bibliotheque Britannique. Beausobre had strong sense with profound erudition, and was one of the best writers of his time, and he preached as he wrote, with spirit and ability.

BEAUVAIS, a town of France, capital of an arrondisse- ment in the department of Oise, situated in 49° 26' N. lat. and 2° 14' E. long., about 45 miles N. of Paris, in a valley at the junction of the Avelon and the Therain. The town is irregularly built, but possesses several edifices of historical and architectural interest. Chief among these is the cathedral of Saint Pierre, begun in 1225, continued at intervals till the 16th century by various ambitious projectors, and still incomplete. Its stained glass windows are both ancient and beautiful, though they are rivalled by those of Saint Etienne, another of the older churches in the town. Contiguous to the cathedral is a basilica of the 6th century, one of the oldest buildings of the kind in France. 'The episcopal palace, now used as a court-house, was built in the 16th century. Among the secular buildings are the town-house, dating from 1754, the college, which was formerly an Ursuline convent, a library with up- wards of 15,000 volumes, a natural history museum, a theatre, a

hospital, and barracks. The industry of Beauvais comprises, besides the weaving of tapestry, which dates from 1664, the manufacture of velvet and various kinds of cotton and woollen goods, leather, and earthen- ware. An extensive trade is carried on in grain and wine, and the products of the industrial establishments. Beauvais was known to the Romans as Casaromagus, and took its present name from the Gallic tribe of the Bellovaci, whose capital it was. In the 9th century it was erected into a countship, which about 1013 passed to the bishops of Beauvais, who ultimately became peers of France. In 1346 the town had to defend itself against the English, who again besieged it in 1433, The siege which it suffered in 1472 at the hands of the duke of Burgundy was rendered famous by the heroism of the women, under the leadership of Jeanne Hachette, whose memory is still cele- brated by a procession on the 14th of October (the feast of Ste Angadréme), in which the women take precedence of the men. Population in 1871, 15,542.

BEAVER, the English name of a genus of Mammals belonging to the order Rodentia, the two known species of which are among the largest members of that group. Both beavers, European and American, measure about 2 feet in length, exclusive of the tail, which is about 10 inches long, and are covered with the fur to which they owe their

chief commercial value. This consists of two kinds of hair,— the one close-set, silky, and of a greyish colour; the other much coarser and longer, and of a reddish brown. Beavers are essentially aquatic in their habits, never travelling by land unless driven to it by necessity. Their hind feet are webbed to the nails, and in swimming those only are used, the front legs remaining motionless by the side. They differ from all other rodents in possessing a broad horizon- tally flattened tail, somewhat oval in form and covered with scales, which they use as an aid to their progress through the water, and not as a trowel for plastering their mud houses as was formerly supposed. The front incisor teeth in each jaw have a sharp chisel-like edge, and are 50 formed as to preserve this through life. They consist of an outer layer of orange-coloured enamel, and a broad inner layer of a softer substance. As the creature gnaws, the softer material is worn away more rapidly than the enamel, which thus protrudes in a sharp ridge. There is a continuous growth at the roots of those teeth to repair the constant waste

that goes on at the cutting edge, so that should one of the incisors be destroyed, the opposite tooth, meeting with no check to its enlargement, will grow to an enormous length ; and beavers have been found in which this abnormal growth had proved fatal by preventing the other teeth from coming together. The enamel is exceed- ingly hard; and, until superseded by English files, those teeth, fixed in wooden handles, were used by the North American Indians in carving their weapons of bone. The question whether the American and European beavers are the same or different species, has given rise to some con- troversy; but it is now generally conceded, chiefly on anatomical grounds, that they are distinct, although in outward appearance they are almost identical.

The European Beaver (Castor fiber) was at one time an in- habitant of the British Isles, having been found, according to Pennant, in certain Welsh rivers as late as the 12th century, while fossil remains of it occur in various parts of the country. In Scandinavia beavers are now extinct,—the last known specimen having been killed in 1844. Isolated pairs are still occasionally met with on the banks of the Rhone, the Weser, and the Elbe; and a considerable number are to be found in one of the parks belonging to the emperor of Austria, on the banks of the Danube, where they are strictly preserved. They also occur, though sparingly, in Russia and Poland, in the streams of the Ural Mountains, and in those which flow into the Caspian Sea. They are said to live in burrows on the banks of rivers, like the common water rat, and to show little of the archi- tectural instinct so conspicuous in the American species; this, however, is probably more owing to unfavourable external conditions than to want of the faculty, for there is at least one well-authenticated instance of a colony of beavers, on a small stream near Magdeburg, whose habi- tations and dam were exactly similar to those found in America.

The American Beaver (Castor canadensis) extends over that part of the American continent included between the Arctic circle and the tropic of Cancer; owing, how- ever, to the gradual spread of population over part of this area, and still more to the enormous quantity of skins that, towards the end of last century and the beginning of the present, were exported to Europe, numbering about

200,000 annually, this species was in imminent danger of

extirpation. More recently the employment of silk and of the fur of the South American Coypu in the manufacture of hats, so lessened the demand for beaver skins that the trapping of these animals became unprofitable ; and being thus little sought after for many years, they have again become abundant in such of their old haunts as have not yet been occupied by man, so that the trade in beaver

skins has now nearly attained its former proportions. Solitary beavers, always males, and known as "old bachelors," or idlers, are found inhabiting burrows similar to those seen in Europe. These are generally found in the neighbourhood of new townships, and are supposed to be individuals that have remained after the colony had broken up, or that from some cause or another have been expelled from the society of their fellows. The American Beaver, however, is essentially social, inhabit- ing lakes, ponds, and rivers, as well as those narrow creeks which connect the lakes together. They generally, however, prefer flowing waters, probably on account of the advantages afforded by the current for transporting the materials of their dwellings, They also prefer deepish water, no doubt because it yields a better protection from the frost. When they build in small creeks or rivers, the waters of which are liable to dry or to be drained off, instinct leads them to the formation of dams. These differ in shape according to the nature of particular localities. Where the water has little motion the dam is almost straight; where the current is considerable it is curved, with its convexity towards the stream. The materials made use of are drift wood, green willows, birch, and pop- lars ; also mud and stones intermixed in such a manner as must evidently contribute to the strength of the dam; but there is no particular method observed, except that the work is carried on with a regular sweep, and that all the parts are made of equal strength. 'In places," says Hearne, "which have been long frequented by beavers undisturbed, their dams, by frequent repairing, become a solid bank, capable of resisting a great force both of ice and water; and as the willow, poplar, and birch generally take root and shoot up, they by degrees form a kind of regular planted hedge, which I have seen in some places so

tall that birds have built their nests among the branches." Their houses are formed of the same materials as the dams, with little order or regularity of structure, and seldom contain more than four old, and six or eight young beavers. It not unfrequently happens that some of the larger houses have one or more partitions, but these are only posts of the main building left by the sagacity of the builders to support the roof, for the apartments, as some call them, have usually no communication with each other except by water. The beavers carry the mud and stones with their fore-paws, and the timber between their teeth. They always work in the night, and with great expedition. They cover their houses late every autumn with fresh mud, which freezing when the frost sets in, becomes almost as hard as stone, and thus neither wolves nor wolverines can disturb their well-earned repose.

The favourite food of the American Beaver is the plant called Nuphar luteum, which bears a resemblance to a cabbage stalk, and grows at the bottom of lakes and rivers. They also gnaw the bark of birch, poplar, and willow trees. But during the bright summer days which clothe even the far northern regions with a luxuriant vegetation, a more varied herbage, with the addition of berries, is consumed. When the ice breaks up in spring they always leave their embankments, and rove about until a little before the fall of the leaf, when they return again to their old habitations, and lay in their winter stock of wood. They seldom begin to repair the houses till the frost sets in, and never finish the outer coating till the cold becomes pretty severe. When they erect a new habitation they fell the wood early in summer, but seldom begin building till towards the end of August.

The flesh of the American Beaver is usually eaten by the Indians and the Canadian voyageurs ; and when roasted in the skin it is esteemed a delicacy. It is said to taste like pork. The castoreum of the beaver is a substance con-

tained in two pyriform sacs, situated near the organs cf reproduction, of a bitter taste, and slightly foetid odour, at one time largely employed as a medicine for derangement of the nervous system, as hysteria, &c., but now little used. Fossil remains of both beavers are found in the Tertiary beds of the continents still inhabited by them, accompanied in each case by remains

of an extinct species. The latter appear from their remains to have been much larger than those now cxisting.

BECCAFUMI, Domenico, was a distinguished painter of the school of Siena at the beginning of the 16th century. In the early days of the Tuscan republics Siena had been in artistic genius, and almost in political importance, the rival of Florence. But after the great plague in 1348 the city declined ; and though her population always comprised an immense number of skilled artists and artificers, yet her school did not share in the general progress of Italy in the 15th century. About the year 1500, indeed, Siena had no native artists of the first importance; and her public and private commissions were often given to natives of other cities. ut after the uncovering of the works of Raphael and Michel Angelo at Rome in 1508, all the schools of Italy were stirred with the desire of imitating them. Among those accomplished men who now, without the mind and inspiration of Raphael or Michel Angelo, mastered a great deal of their manncr, and initiated the decadence of Italian art, several of the most accom- plished arose in the school of Siena. (See articles Peruzzi and Soppoma.) Among these was Domenico, born about 1488, of a peasant, one Giacomo di Pace, who worked on' the estate of a well-to-do citizen named Lorenzo Beccafumi. Seeing some signs of a talent for drawing in his labourer's son, Lorenzo Beccafumi took the boy into his service and presently adopted him, causing him to learn painting from masters of the city. Known afterwards as Domenico Beccafumi, or by the nickname of Mecarino, signifying the littleness of his stature, the peasant's son soon gave proof of extraordinary industry and talent. In 1509 he went to Rome and steeped himself in the manner of the great men who had just done their first work in the Vatican. Return- ing to his native town, Beccafumi quickly gained employ- ment and a reputation second only, if second, to Soddoma. He painted a vast number both of religious pieces for churches and of mythological decorations for private patrons, many of which are still to be seen where they were executed. But the work by which he will longest be remembered is that which he did for the celebrated pave- ment of the cathedral of Siena. For a hundred and fifty years the best artists of the state had been engaged laying down this pavement with vast designs in commesso work,— white marble, that is, engraved with the outlines of the sub- ject in black, and having borders inlaid with rich patterns in many colours. From the year 1517 to

1544 Beccafumi was engaged in continuing this pavement. He made very ingenious improvements in the technical processes employed, and laid down multitudinous scenes from the stories of Ahab and Elijah, of Melchisedec, of Abraham, and of Moses. These are not so interesting as the simpler work of the earlier schools, but are much more celebrated and more jealously guarded. Sueh was their fame that the agents of Charles I. of England, at the time when he was collecting for Whitehall, went to Siena expressly to try and purchase the original cartoons. But their owner would not part with them, and they are now the property of the cathedral works. The subjects have been engraved on wood, by the hand, as it seems, of Beccafumi himself, who at one time or another essayed almost every branch of fine art. He made a triumphal arch and an immense mechanical horse for the procession of Charles V. on his entry into Siena. In his later days, being a solitary liver and con-

tinually at work, he is said to have accelerated his death by over-exertion upon the processes of bronze-casting. He died in 1551. (Vasari, ed. Lemonnier, x. 176-197 ; Ugurgieri, Pompe Sanese ; G. Milanesi, Document, &c.)

BECCARIA, Cesar Bonesana, Marquis, a celebrated writer on the principles of jurisprudence and national economy, was born at Milan in the year 1735. He was educated in the Jesuit College at Parma, and showed at Srst a great fondness and aptitude for mathematics. The study of Montesquieu seems to have directed. his attention towards economical questions ; and his first publication (in 1762) was a tract on the derangement of the currency in the Milanese states, with a proposal forits remedy. Shortly after, in conjunction with his friends the Verris, he formed a literary society, and began to publish a small journal, in imitation of the Spectator, called 2 Café. In 1764 Beccaria published his brief but justly celebrated treatise Dei Delitti e delle Pene (On Crimes and Punishments ”). The weighty reasonings of this work were expounded with all the additional force of a clear and animated style. It pointed out distinctly and temperately the grounds of the right of punishment, and from these principles deduced certain propositions as to the nature and amount of punishment which

should be inflicted for any crime. The book had a surprising success. Within eighteen months it passed through six editions. It was translated into French by Morellet in 1766, and published with an anonymous commentary by Voltaire. An English translation appeared in 1768, and other countries followed the example. Many 'of the reformsin the penal codes of the principal Kuropean nations are traceable to Beccaria's treatise. In November 1768 the marquis was appointed to the chair of public law and economy, which had been founded expressly for him at the Palatine College of Milan. His lectures on political economy, which are based on strict utilitarian principles, are in marked accordance with the theories of the English school of economists. They are published in the collection of Italian writers on political economy (Scrittort Classict Italiani, vols. xi. and xii.) In 1771 Beccaria was made a member of the supreine economic council; and in 1791 he was appointed one of the board for the reform of the judicial code. In this post his labours were of very great value. Hedied in1793, A notice of his life will be found prefixed to his lectures, referred to above.

BECCARIA, QGrovanni Barrisra, a distinguished electrician and practical astronomer, was born at Mondovi on the 2d of October 1716, and entered the religious order of the Pious Schools in 1732. He became professor of experimental physics, first at Palermo and then at Rome, and was appointed to a similar situation at Turin in 1748. He was afterwards made tutor to the young princes de Chablais and de Carignan, and continued to reside principally at Turin during the remainder of his life. In May 1755 he was elected a fellow of the Royal Society of London, to which he afterwards communicated several papers relating to his favourite pursuits. He died on the 27th of May 1781. Beccaria's name is associated with no great discovery in physical science ; but he did much, both in the way of experiment and exposition, to spread abroad the researches of Franklin and others in the science of electricity. His own experiments, which were skilfully conducted, demonstrated a number of curious facts bearing on the relations of electricity to meteorological phenomena, to chemical action, and to some other points which have been since more thoroughly investigated. His principal work was the treatise Dell Hlettricismo Artificiale e Naturale, 1753, which was translated into English in 1776. He also contributed a number of papers to the Philosophical Transactions. – In

1759 he was commissioned to measure an are of the meridian in the neighbourhood of Turin.

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The result, which he published in the Gradus Taurinensis, 1774, is not now considered perfectly correct.

BECCLES, a market-town and municipal borough, in the county of Suffolk, on the right bank of the River Waveney, 32 miles N.N.E. of Ipswich. It consists of several streets, is well built, and contains a fine old parish church, enlarged and repaired in 1859, several dissenting chapels, a free school, founded in the reign of James 1., a free grammar school, a handsome town-hall, a custom- house, and a corn exchange. Maltingis carried on to some extent; and by means of the river, which is navigable from Yarmouth, a considerable trade in coals and produce is carried on. The incorporation of the town dates from 1584. Population in 1871, 4844.

BECERRA, Gaspar, a distinguished Spanish painter and sculptor, was born at Balza in 1520. He studied at Rome, it is said under Michel Angelo, and assisted Vasari in painting the hall of the Concelleria. He also contributed to the celebrated anatomical plates of Valverde. After his return to Spain he was extensively employed by Philip IL, and decorated many of the rooms in the palace at Madrid with frescoes. He also painted altar pieces for several of the churches, most of which have been destroyed. His fame asa sculptor almost surpassed that asa painter. His best work was a magnificent figure of the Virgin, which was destroyed during the French war. Becerra died in 1570. The most competent judges assign to him the chief share in the establishment of the fine arts in Spain.

BECHE-DE-MER, or TREPANG, an important food luxury among the Chinese, Japanese, and other Eastern peoples, connected with the production of which a very considerable commerce exists in the Eastern Archipelago, the coasts of New Guinea, and generally on the coral reefs of the Pacific. It consists of several species of echinoderms, generally referred to the genus Holothuria ; but very many varieties, widely distributed in Eastern seas, are prepared and sold in Chinese and Japanese markets. The creatures, which exist on coral reefs, have bodies from 6 to 15 inches long,

shaped like a cucumber, hence a name they receive, — sea cucumbers. The skin is sometimes covered with spicules or prickles, and sometimes quite smooth, and with or without "teats" or ambulacral feet disposed in rows. Five varieties are recognized in the commerce of the Pacific Islands, the finest of which is the " brown with teats," which are worth, at the place of their preparation, £30 per ton. The large black, which come next in value, bring £25 per ton; the small black £20, red bellied £15, and white £12. The finest of these sell for as much as £100 per ton in China, where they are used in the gelatinous soups, which form an important article of food in that empire. The preparation of the creatures when caught is very simple. They are boiled for about twenty minutes, after which they are split up and gutted, when they are ready for drying. The drying is conducted in large sheds on hurdles placed above a brisk fire. The dried Béches-de- mer being very hygrometric, it is necessary that they be immediately packed up and shipped on the conclusion of the drying process; and unless they are thoroughly dry decomposition sets in rapidly and destroys the entire cargo.

BECHER, Jonann JoacaiM, a celebrated chemist, born at Spire in 1635. His father, a Lutheran clergyman, died while he was very young, and the boy was compelled to support himself by teaching. He was a diligent student, and acquired a very extensive acquaintance with chemistry and allied sciences. In 1666, after having travelled through some parts of Europe, he was made professor of medicine at Mentz. He then removed to Munich, where he superintended the magnificent laboratory. His some-what turbulent and unbending disposition obliged him to leave Bavaria, and he proceeded to Vienna, where he gained

the friendship of Zinzendorf. Ue was made member of the council of commerce, and proposed various commercial schemes to the Austrian Government. He soon quarrelled with Zinzendorf ; and about 1678 we find him at Haarlem. After a short time he visited England and Scotland, inspecting their mines. He died in 1682, it is said at London. He wrote many works, the principal of which are—(1), Physica Subterranea, which was printed at Leipsic in 1708 and 1739, in 8vo, with a small treatise by E. Stahl, entitled Specimen Becherianum ; (2), Eaperimentum chymicum

novum, 8vo ; (3), Character pro Notitia Linguarum universali; (4), Institutiones Chymice, sew Manuductio ad Philosophiam Hermeticam, 4to; (5), Institutiones Chymice, seu Gidipus Chemicus, 12mo; (6), Laperimentum novum ac curtosum de Miniaria arenaria perpctua, &e. In some respects he anticipated Stahl, whose phlogistic theory is an extension of what he says, He was also the discoverer of boracic acid.

BECHWANA, or Betsuana, the name of a nation extending over a large tract of the interior of South Africa, lying between 22° and 28° S. lat. and 22° and 29° E. long. There are remains as well as traditions indicating that they once occupied lands further to the south and north of their present boundaries. The country is bounded on the W. by what may be called the southern Sahara ; on the Ik. by the Limpopo, and on the N. by the Matebele, a tribe which escaped the power of the Chaka, the bloody chief of the Zulus. The country, though hilly and undulating, abounds in grassy plains and considerable forests of acacia. 'lrees, however, are scarce, as the grass is generally burned off every year; and the young wood is thus not allowed time to grow. The natives also, in order to get fresh garden ground and obtain branches to raise their houses and make fences, are constantly destroying trees, and thus increasing the dryness and sterility of the country. It is evident, from the dry beds of what were once rivers and from remains of ancient forests, that, at an early period, the country must have been abundantly watered. From the many cattle folds and walls of defence scattered over the country, and ruins of ancient towns, it is also evident that at that period stone-dykes were very common.

The number of the Bechwana has been variously estimated, and according to some amounts to more than 200,000. Their language is copious, with but few slight dialectic differences, being entirely free of the Hottentot elements found in the Katfre and Zulu. The power of the language which, like the Kaffre and Zulu, belongs to the Ba-nta family, formerly unwritten, may be conceived when it is known that, besides elementary and educational works, the whole of the Bible has been translated into it and is now read by thousands.

The Bechwana are divided into numerous tribes, all inde- pendent of each other, and each governed by its own chiefs and councillors. 'The names of

some of the principal tribes are Batlapee, Barolong, Bangwaketse, Bakhatla, Bakuena, Bamangwato, and Batauana, the last living near the lake Ngami, first visited by Dr Livingstone. There are numerous minor divisions, with laws and customs very similar. With the exception of the Balala (the poor inhabiting the country), they are not nomadic, but live in towns of considerable size, containing from 5000 to 40,000. Doubtless, their former warlike habits had the tendency to induce them to congregate for security ; for latterly they live, for the sake of agriculture and pasturage, in many formerly uninhabited places.

Though from time immemorial they had been engaged in constant strife with each other, and thus inured to warfare, they were no match for the warlike Kaffre and butchering Zulu and Matebele. Since the introduction of Christianity among the Bechwana, their clannish strifes have ceased ;

and, being a people of industrious habits, and acute observers of whatever may increase their property and comfort, they go in great numbers to Cape Colony and other parts where they can obtain labour and wages, being prized as servants, This enables them to return enriched to their homes in a few years.

The government of the Bechwana may be said to be both mon- archical and patriarchal, and of a comparatively mild character, the king, as chief, seldom exercising his individual authority inde- pendent of his councillors and subordinate chiefs. They have their public assemblies (parliaments), but only when circumstances, chicfly in reference to war, require. These are generally characterized by great freedom of speech, and sometimes the king's shortcomings are unsparingly dealt with. All is taken in good part, and there is no interruption of the speaker occupying the arena. The king gener- ally closes the meeting with a long speech, referring to the subjects which each speaker had either suj;ported or condemned, not forget- ing to endcavour to clear his own character of any imputation. These public assemblies are now of very rare occurrence.

The Bechwana are well formed, dark brown or bronze, and the majority handsome and not assimilated to the negro type. In most the lower part of the face projects, but the skull exhibits no difler- ence from the European type, and many have broad high foreheads, while there is nothing to be seen

like the bent-out legs of the negro. The lips are generally thicker than in Europeans, and many have the nostrils wider. The hair is not wool, but simply hair curled and frizzled. They possess the knowledge of smelting iron and copper ore, and make hoes for husbandry, spears, battle-axes, tools, and a great variety of ornaments, chiefly of brass and other alloys. They prepare the skins of animals, and fabricate a variety of utensils. Agriculture and house-building (in which more skill and labour are required than with African huts in general, the houses being always round and admirably adapted to resist high and stormy winds) are the work of the women, while the men make the garments, hunt, and go to war when required.

The wealth of the Bechwana consists in their cattle, which they tend with the greatest care, manifesting a shrewd discrimination of localities and pasture suited to oxen, sheep, and goats. Living in a warm climate, they require few garments; but, though to a Kuropean they appear scantily dressed, both sexes are strictly decent, and are disgusted by the comparative nudity of the Kaffre and Matebele. Circumcision is practised, and for that purpose youths are selected from 10 to 18 years of age ; these retire from the towns, the place in which they are being cousidered sacred till the season of seclusion, a month or more, is over, when they are allowed to return to their friends, and are looked on as men ready to go to war. The people have many ceremonies and superstitions, believing in the influence of witchcraft and charms, but no one of these has the most remote reference to religion. They have no knowledge whatever of idols, or anything intended to represent an,invisible power, and consequently have nothing of areligious character. They do not possess a vestige of worship. With regard to a divine Being their ideas are vague in the extreme. The name mortmo, from mo, a personal pronoun, and rimo, from gorimo (above), instead of being applied to something or some one heavenly—the Creator, Upholder, and Ruler of all —is ap- plied to something that does harm, that inflicts death, or, according to some, a noxious creature that sometimes emerges from a hole to do mischief. So little do the natives care about it, that it never enters into their minds to have recourse to a charm, or anything of a fetish character, to ward off the influence it might be thought to possess, They never allow their thoughts to pierce beyond the moment of death, which is to them the finale of man's existence. Among some of the intcrior nations there is a belief in the manes of dead kings of note, but not of the commonalty. Dr Moffat was

once present when Moselekatse, the king of the Matabele, in a meeting in the midst of his nobles, in the dark, consulted the spirit of Machobane, his long deceased father. Whatever worship the Bechwana of old may have had, they have none now, not even of any of the animals—the fish, crocodile, monkey, &c.—from which some of the tribes are named. They have a superstitious dread of some things, which, in most if not in all cases, originates with the rainmaker. This is a notable character among all the interior tribes, and possesses supreme influence over the native mind. He has only to speak and it is done, whatever his orders may be. He pretends to give medicine to the clouds, and has recourse to all sorts of tricks and demands on his impatient dupes in order to gain time. Very frequently, when all fails, he falls a sacrifice to their wrath.

The country of the Bechwana south of the tropic of Capricorn is healthy, and admirably suited for pulmonary complaints. The temperature ranges from zero to 105°, and when it exceeds this, as it sometimes does, heavy thunderstorms follow, and not un- frequently hail falls of great size. The principal products are a variety of species of millet (Holews Sorghum), kidney beans, pumpkins, water melons, sweet reed, &c.

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BEC—BED

The resources and capabilities of the country are small. Hitherto the exports have been principally ostrich feathers, ivory, and cattle ; but the first two are become very scarce since the introduction of the horse and rifle. The elephant is now found principally in the regions where the tsétse fly abounds, and where horses cannot live, while the ostrich betakes itself to the deserts. (R. M.)

BECK, or Brsx, Davin, an eminent portrait painter, born in 1621, at Arnheim in Quelderland. He was trained by Vandyck, from whom he acquired the fine manner of pencilling and sweet style of colouring peculiar to that great master. He possessed likewise that freedom of hand and readiness, or rather rapidity of execution, for which Vandyck was so remarkable, insomuch that when King Charles I. observed the expeditious manner of Beck's painting, he exclaimed, "' Faith! Beck, I believe you

could paint riding post." He was appointed portrait-painter and chamberlain to Queen Christina of Sweden, and he executed portraits of most of the sovereigns of Europe to adorn her gallery. He lived in the highest favour with his royal mistress, and with difficulty obtained a short leave of absence from her court. He died soon after (1656) at the Hague, not without suspicion of having been poisoned.

BECKER, WitHEetm ADo;F, a classical archeologist of distinction, was born at Dresden in 1796. He was at first destined for a commercial life, but was, in 1812, sent to the celebrated school at Pforta, whence, in 1816, he passed to the University of Leipsic. Here he had the good fortune to study under the famous Hermann. After holding subordin- ate posts at Zerbst and Meissen, he was, in 1836, appointed extraordinary professor of classical archeology at Leipsic ; and six years later he was raised to the professorship of antiquities in the same university. He died at Meissen in September 1846. The works by which Becker is most widely known are the Gallus, oder rémische Scenen aus der Zeit des Augustus, 1838, and the Charicles, oder Builder aligriechischen Sttte, 1840. The author shows not only a complete mastery of Greek and Roman antiquities, but a very happy faculty of imparting life to the dry bones of thescience. Both works have been translated into English. Perhaps more useful for scholars is the great Handbuch der vim. Alterthiimer, 5 vols. (1843-64), completed after Becker's death by Marquardt, and of which a second and enlarged edition is now in course of publication.

BECKET, or A Brecxrt, THomas. See A BECKET, vol. im ol.

BECKFORD, Wit11AM, an English author, the son of Alderman Beckford, who was noted for his manly reply to George III. on the presentation of an address from the city of London, was born in 1761. At the age of nine he inherited a large fortune from his father ; and in early life he travelled in Italy, Sicily, Spain, and Portugal, and resided some time near Cintra, where he had a princely residence. Ye afterwards returned to England, and after selling his old house of Fonthill began to build a magnificent residence there, on which he expended in about eighteen years the sum of £273,000. This, together with its splendid library and pictures, he sold to Mr Farquhar in 1822; but soon after one of the towers, 260 feet high, fell,

destroying part of the villa in the ruins. Beckford, however, began the erection of another lofty structure on Lansdowne-hill, near Bath, where he continued to reside till his death in 1844. He was a powerful and original writer. His first work, Brographical Memoirs of Extraor- dinary Painters, which appeared in 1780, was a slight sarcastic jeu d'esprit. In 1784 he published in French the singular tale entitled History of the Caliph Vathek, which soon afterwards appeared in English, and has taken its place as one of the finest productions of richly luxuriant imagination. In 1834 his first Continental tour appeared under the title of Letters from Italy, with Sketches of Spain and Portugal, a work never, perhaps, surpassed for

striking description and refined sarcasm. His latest pro- duction, published in 1835, was entitled Jvecollections of an Excursion to Alcobaza and Batallia in 1794. All these works exhibit cultivated taste and a remarkable power of vivid description. He left two daughters, the eldest of whom was married to the 10th duke of Hamilton.

BECKMANN, Jowann, the author of the History of Inventions, was born in 1739 at Hoya in Hanover, where his father was postmaster and receiver of taxes. His mother, who was left a widow before he was seven years of age, sent him to school at Stade; and in 1759 he repaired to the University of Gottingen with the intention of studying theology, which, however, he soon abandoned in favour of natural science. The death of his mother in 1762 having deprived him of his former means of support, he accepted, at the offer of Busching, the professorship of natural history in the Lutheran Academy, St Petersburg. This office he soon relinquished, and journeyed through Sweden, where he inspected the manner of working the mines, and formed the acquaintanceship of Linnzus ai Upsala. In 1766 he was appointed professor at Géttingen. There he lectured on various arts and on political and domestic economy, and was in the habit of leading his students into the workshops that they might acquire a practical as well as a theoretical knowledge of different processes and handicrafts. While thus engaged he deter- mined to trace the history and describe the present condition of each of the arts and sciences on which he was lecturing, being perhaps incited by the Bibliothece of Haller. But even Beckmann's industry

and ardour were unable to overtake the amount of study necessary for this task. He therefore confined his attention to several practical arts and trades; and to these labours we owe his Notices on the History of Discoveries in the Common Arts of Life,—a work in which he relates the origin, history, and recent condition of the various machines, utensils, &c., employed in trade and for domestic purposes. In 1772 Beckmann was elected a member of the Royal Society of Gottingen, and he contributed valuable scientific disserta- tions to its proceedings until 1783, when he withdrew from all further share in its work. After having been admitted into almost all the learned societies of Germany, and after having impressed on the minds of his numerous students a tendency to pursuits of practical utility, Beck- mann died on the 3d of February 1811. His works display great natural sagacity, as well as profound and varied research. Besides the History of Inventions he wrote an interesting, but unfinished, Lcstory of the Earliest Voyages made in Modern Times, and produced editions of a work ascribed to Aristotle, of the Wonderful Histories of Anti- gonus Carystius, and of Marbodius's Z'reatise on Stones. These editions display a rare union of physical knowledge with philological learning. Beckmann was a man of extreme modesty ; and his candour and sincerity, as well as his affability to those who studied under him, were acknow- ledged with one consent by his colleagues and his scholars.

BEDARRIEUX, a town of France, in the department of Hérault, situated on the River Orb, with a station on the branch railway from Béziers to Graissesac. It isa neat and well-built town, and carries on a variety of industries, among the most important of which are the weaving of cotton and woollen cloth and the manufacture of hats, paper, leather, and oil; while at Clairac in the neighbourhood there are glass-works and a copper-foundry. Most of the produce is exported to Africa and the Levant. Not far from the town there is a thermal establishment open all the year round. In the end of the 18th century the population was only 250; in 1872 it was 8985.

BEDDOES, Tuomas, a physician and scientific writer, was born at Shiffnall, in Shropshire, 13th April 1760.

From his infancy he was remarkable for his love of books. His father, who was a tanner, wished him to follow the same calling ; but, mainly through his grandfather's recogni- tion of his abilities, he was educated for one of the learned professions. After studying at Bridgnorth grammar school and Plymhill, in Staffordshire, he entered, when about sixteen years of age, at Pembroke College, Oxford. There he proved hinself an excellent linguist, while especially devoting himself to science. Having taken his bachelor's degree at twenty-one, he studied at London for the medical profession under Sheldon, In1783he became master of arts, and in 1784 he removed to Edinburgh, where he remained about three years. In 1784 he published a translation of Spallanzani's Dissertations on Natural Iistory, and in 1785 produced a translation, with original notes, of Bergman's Lssays on LHlective Attractions. He took his degree of doctor of medicine at Oxford in 1786, and, after visiting Paris, where he became acquainted with Lavoisier, was appointed reader in chemistry at Oxford University. His lectures there attracted large and appreciative audiences; but his advocacy of the French Revolution exciting a clamour against him, he resigned his readership in 1792, and took up his abode with a friend at Ketley, in Shropshire. While resident there he published Observations on the Nature of Demonstrative Evidence, in which he maintains that geometry is founded on experiment, and the istory of Isaac Jenkins, a story which powerfully exhibits the evils of drunkenness, and of which 40,000 copies are reported to have been sold. He endeavoured for many years subsequently to realize his project of a pheumatic institution, in which the efficacy of certain gases in curing diseases could be tested. While working for this object he was assisted by the father of Maria Edgeworth, Richard Lovell Edgeworth, one of whose daughters became his wife in 1794. He was ultimately enabled, by the liberality of Wedgwood, to establish the proposed institu- tiun (1798), and was fortunate in securing as its superin- tendent Mr (afterwards the famous Sir Humphrey) Davy, who had already given proofs of uncommon endowments, and many of whose discoveries were made in its laboratory. Among the first results of the pneumatic institution was the discovery of the chemical properties of nitrous oxide, in regard to which, as in many other cases, Beddoes showed himself over-sanguine and speculative. The original aim of the institution was gradually abandoned ; it became an ordinary sick-hospital, and was relinquished by its projector in the year before his death, which occurred in 1808. Beddoes was aman of great powers and

wide acquirements, which he directed to noble and philanthropic purposes. He strove to effect social good by popularizing medical knowledge, a work for which his vivid imagination and glowing eloquence eminently fitted him. In his manner of theorizing he considerably resembled his contemporary, the once celebrated Erasmus Darwin. Besides the writings mentioned above, he was the author of Political Pamphlets (1795-97), a popular Lssay on Consumption (1779), which won the admiration of Kant, an Hssay on Fever (1807), and Lygeia, or Essays Moral and Medical (1807). A life of Beddoes by Dr John E. Stock was published in TSO:

BEDDOES, Tuomas Lovett, a modern English dramatist of peculiar and almost unique genius, was the son of the preceding, and was born at Clifton, 20th July 1803. He received his education at the Charter House, and subsequently at Pembroke College, Oxford, at both of which places he displayed a rugged independence of character, combined with eccentricity of demeanour and an aversion to the ordinary course of study. While still an undergraduate, he published his Bride's Tragedy, a piece less characterized by originality than his subsequent

performances, and altogether in the taste of the Elizabethan revival of the day initiated by the publication of Lamb's Specemens, The notice it obtained from Barry Cornwall and other representatives of this school, encouraged him to devote himself altogether to the cultivation of dramatic poetry ; and he speedily produced a number of superb fragments, ranging down from the ambitious but unfinished sketches for tragedies to be entitled Torrismond and J'he Second Brother, to short descriptive passages of a few lines each, unsurpassed for originality of conception and con- densed force. His genius, unfortunately, though highly poetical, was in no respect dramatic ; he entirely lacked the power of constructing a plot and deducing character from action; and his endeavours to achieve a complete work proved abortive until 1829, when the strangely fascinating but fantastic and incoherent drama of Death's Jest-Book, or The Fool's Tragedy, was laboriously put together froni a series of abortive attempts. By this time Beddoes had become a resident in Germany, and a zealous student of physiology, which, by affording another outlet for that intense curiosity

respecting the mysteries of life and death which had hitherto been the mainspring of his poetical efforts, greatly contributed to repress the external manifes- tations of his genius. Dissatisfaction with his tragedy, which he never cared to publish during his lifetime, and the gradual disuse of his native language, conspired to reduce him to silence. He led for several years an unsettled life on the Continent, devoted to anatomical research, and actively participating in liberal and demo- cratic movements in Germany and Switzerland, until his death in 1849 from the effects of anaccident. His literary remains were published in 1891 by his friend Mr Kelsall, with a most interesting memoir, and copious selections from his graphic and striking correspondence, which is distinguished by all the characteristics of his verse, Beddoes is a poet for poets, and few other readers will enjoy him. He is "of imagination all compact;" his works scarcely contain a single passage of purely subjective feeling. He is, perhaps, the most concrete poet of his day ; the most disposed to express sentiment by imagery and material symbolism. In this he resembles Keats, and may be termed a Gothic Keats, the Teutonic counterpart of his more celebrated contemporary's Hellenism. The spirit of Gothic architecture seems to live in his verse, its' grandeur and grotesqueness, its mystery and its gloom. His relation to the Elizabethan dramatists, moreover, is nearly the same as that of Keats to the Elizabethan pastoral poets; but the resemblance is one of innate temperament: he borrowed nothing, either from his Eliza- bethan precursors or the chief objects of his admiration among his contemporaries, Keats and Shelley. The want of constructive power which mars his dramas is even more prejudicial to his lyrics; but some few songs, where the right key-note has been struck from the first, rank among the most perfect in our language. 'The leading features of Beddoes's personal character were uncompromising inde- pendeuce, sterling integrity, and a thorough disdain for the opinion of the world. His life was entirely devoted to ideal aims, and his tastes were of the most simple and philosophic character. The asperity of his demeanour repelled strangers, but he was highly valued by the few whose intimacy he condescended to encourage.

BEDE, Bepa, or Bzpa (commonly called The Venerable Bede), the father of English history, the most learned English- man and most eminent writer of his age, was born about the year 673, in the neighbourhood of

Monkwearmouth, in the N.E. of the county of Durham. The story of his life is told by himself at the conclusion of his most famous and most important work: "Thus much of the Ecclesiastical History of Britain, and more especially of the English

nation, as far as I could learn cither from the writings of the ancients, or the tradition of our ancestors, or of my own knowledge, has, with the help of God, been digestcd by me, Bede, the servant of God, and priest of the monastery of the blessed apostles Peter and Paul, which is at Wear- mouth and Jarrow ; who being born in the territory of that same monastery, was given, at seven years of age, to be educated by the most reverend Abbat Benedict, and after- wards by Ceolfrid ; and spending all the remaining time of my life in that monastery, I wholly applied myself to the study of Scripture; and, amidst the observance of regular discipline, and the daily care of singing in the church, I always took delight in learning, teaching, and writing. In the nineteenth year of my age I reccived deacon's orders; in the thirtieth, those of the priesthood. From which time, till the fifty-ninth year of my age, | have made it my business, for the use of me and mine, to compile out of the works of the vencrable Fathers, and to interpret and explain according to their meaning these following pieces" (a list of his writings follows). The two associated monasteries here mentioned were founded by Benedict Biscop on the lands between the Wear and the Tyne granted to him by King Ecgfrith. This learned and pious abbot was " the first person who irtro- duced in England constructors of stone edifices, as well as makers of glass windows" (Will. of Malmesb.) But a greater honour attaches to him as having collected in his visits to Rome a large quantity of valuable books, which, deposited in the noble buildings he erected, had much to do with the extensive learning of his celebrated pupil. Bede, after three years at Wearmouth, removed with the Abbot Ceolfrid to the newly-founded Jarrow monastcry, where he pursued to the close of his life those studies in every department of literature and science within his reach, the results of which we have in his numerous works. Bede's industry was marvellous, alike in acquiring and in communicating his stores of knowledge. Besides the usual manual labours of the monastery, the duties of the priest, and his additional occupation as a teacher, he succeeded in

writing upwards of forty distinct treatises, which together form what may be looked upon as an early encyclopedia. Of these treatises twenty-five are on Biblical subjects, including commentaries on most of the books of the Old and New Testament and the Apocrypha. The remainder consist of lives of saints and martyrs ; lives of the Abbats of this Monastery ; his Ecclesiastical History of our Island and Nation ; treatises on The Nature of Things, astronomy, chronology, arithmetic, medicine, philosophy, grammar, rhetoric, poetry, music ; together with a Book of Hymns, and a Book of Epigrams in heroic or elegiac verse. While exhibiting little original thought or discovery, except in his historical works, and partaking of the credulity of his time, Bede excels in good judgment, and in thoroughly digesting aud clearly arranging and expounding, in simple Latin, what he gathered in his wide range of reading in classical and theological authors. His Biblical works are principally made up of extracts from the Fathers, especially from St Augustine—his interpretations following the allegorical modc of the Middle Ages, as suggested by his own declara- tion: " He who knows how to interpret allegorically will see that the inner sense excels the simplicity of thc Ictter, as apples do leaves." The scientific treatises are founded on the Bible, and the scieuce of the ancients as contained in such writers as Pliny. Bede's historical works, on the other hand, and especially his great historical work, are remarkable for the patience indicated in the search after all trustworthy sources of information, for his careful statement of these various sources, for the sincerity and love of truth manifest throughout, and for the pleasant artlessness with which the story is told.

In the pursuit of knowledge Bede declined the dignity of abbot ; for, he said, " the office demands household care, and household care brings with it distraction of mind, which hinders the prosecution of learning." But his reputation as a scholar, combined with "aptness to teach," made very famous the school of Jarrow, where it is recorded 600 monks, besides strangers from a distance, were at one time in attend- ance. 'The influence and authority of the modest teacher on Tyneside were acknowledged throughout the West of Europe, of which Northumbria became now for a period the literary centre. By the renown of its schools, its libraries, and its learning, chiefly represented by him, that kingdom had some recompense for the height of military glory it had reached in Bede's youth, and from which it had recently fallen at Nechtansmere. Pope Sergius, by a letter to

Coelfrid, sought Bede's presence and counsel at Rome, but it is almost certain the invitation was uot acted upon. In another way, we can scarcely doubt, he efficiently helped the Papal court. Born about ten years after Rome gained her final victory over Jona at the Synod of Whitby, and four years after Theodore arrived at Canterbury to complete the ecclesiastical conquest, the character and writings of Bede must have strengthened the dominion of the hierarchy in the North of England. His positive efforts may have becn confined to his three treatises on the time of celebrating Easter—one of the main questions in dispute. But indirectly, his historical works had the same tendency, exalting, as they do, the missionarics from Italy, while not ignoring the zealous labours of the followers of Columba. In himself, too, the people of Northuinbria, the scene of contest, beheld one who brought honour to them as a fellow-countryman,—-honour for which, at the same time, they were indebted to the now dominant church that had given him his training and opportunities of study. History, confirmed by the evidence of his writings, is loud in praise of Bede's humble piety as well as his learning. A long letter of his pupil Cuthbert has been preserved, giving a simple and touching account of his death, which probably took place in 735. Though "' he suffered in his stomach, and drew his breath with pains and sighs," he was fullof thanksgiving and rejoicing, singing psalms, conversing with his pupils, and dictating an Anglo-Saxon translation of the Gospel according to John. He was buried in the church at Jarrow, but his bones were stolen by a monk from Durham and placed beside those of St Cuthbert. There they continued until the middle of the 12th century, when they were enclosed in a splendid shrine by Bishop Pudsey. This shrine was demolished and the relics scattcred in the reign of Henry VIII., there only remaining now at Durham the Latin inscription, which concludes with the well-known line—

'¢Hac sunt in fossa Bede venerabilis ossa."

The origin of the title " Venerable" cannot be traced, but it appears as early as 836 ; and succeeding ages have gladly owned the justness of the appellation. For centuries his theological and educational works held a high position as authorities and even as text-books. The chief monument of his labours and erudition is his Heclesiastical Hvstory, which gives us the

most and the best of our knowledge of the history of England until 731, four years before his death.

Bede's works were published in 6 vols. fol., Paris, 1544, 1545, 1554, editions now rare ; 8 vols. fol., Basel, 1568, and Cologne, 1612 and 1688; 12 vols. 8vo, with English translation, edited by Dr Giles, London, 1848-44. MSS. of the History are at Cambridge and Brit. Mus. Alfred translated it into Anglo-Saxon. Other translations are by Stapelton, 1565 ; John Stevens, 1723; and W. Hurst, 1814. Stevens's translation improved, edited by Giles, is published along with the Anglo-Saxon Chronicle, in Bohn's Anti- quarian Library, 1847. All the historical works translated by Stevenson form part of vol. i. of The Church Historians of England,

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BEDELL, Wit11AM, bishop of Kilmore and Ardagh, in Ireland, was born at Black Notley, in Essex, in 1570. He was educated at Cambridge, took orders, and, after leaving the university, settled for some years as clergyman in Bury St Edmunds. He was then appointed chaplain to Sir H. Wotton, English ambassador at Venice. In that town Bedell remained for eight years, acquiring great reputation as a scholar and theologian. He translated the Book of Common Prayer into Italian, and was on terms of closest friendship with Sarpi (Fra Paolo), the famous historian of the Council of Trent. In 1615, some time after his return to England, he was appointed to the rectory of Hornings- heath, in Suffolk, which he held for twelve years. He was then called to the provostship of Trinity College, Dublin, and relinquished that office after two years for the united bishoprics of Kilmore and Ardagh. As bishop he won the respect and love of his people by the uprightness and purity of his conduct. He set himself diligently to reform the abuses of his diocese, and personally undertook the duties generally discharged by the bishop's lay chancellor. In 1641, when the Protestants were being massacred in the Irish rebellion, Bedell's house was not only left un- touched, but became the place of refuge for many fugitives. In the end, however, the rebels insisted upon the dismissal of all

who had taken shelter in his house, and on the bishop's refusal he was seized and imprisoned with some others in the ruined castle of Loughboughter. Here he was detained for several weeks, and when released, rapidly sank from the effects of exposure on his weakened constitution. He died on the 7th February 1642. His life was written by Burnet.

BEDFORD, the county town of Bedfordshire, a municipal and parliamentary borough and market-town, situated in u fertile vale on both sides of the River Ouse, which is here crossed by a handsome stone bridge of five arches, It is 50 miles N.W. of London, and has excellent railway accommodation as well as a navigable river. It is a station on the main line of the Midland Railway. The town consists chiefly of one long wide strcet, intersected by smaller ones at right angles. It is well built, and numerous villas and small streets have been erected on the west side since the opening of the Midland main line in 1868. It has five parish churches, four of which con- tain architectural features of interest. St Paul's has lately undergone considerable restoration, and the tower and spire have becn rebuilt. St Peter's has been enlarged, but the ancient tower remains, in which are to be seen examples of Saxon work. St Mary's has a fine Norman tower, but the remaindcr of the church has at different times been restored. St John's has also been restored, but the original tower remains. St Cuthbert's is a recent erection in the Norman style. A district church, dedicated to the Holy Trinity, was opened in 1841. There are also Inde- pendent, Methodist, Baptist, Roman Catholic, and other chapels. Bedford, in proportion to its size, has more public endowments than any other place in the kingdom, for which it is chiefly indebted to Sir W. Harper, Lord Mayor of London in 1561, who founded here a free school, and conveyed for its support, and for portioning poor maidens, a piece of ground in London, the surplus, if any, to be given to the poor. This ground has gradually risen in value so as now to produce nearly £14,000 annually. It supports grammar, modern, preparatory, and other schools. Formerly much of this large endowment was appropriated to elcemosynary purposes, which did not tend to the elevation of the character of the people; but since the enactment of a scheme of the Endowed Schools Com- mission in 1874, the whole amount is expended upon the schools, except a small proportion for the endowment of

forty-five alms-houses. The grammar school has eight exhibitions of £70 per annum each, at Oxford, Cambridge,

or Dublin. Among the public buildings are the schoois, the shire-hall, the jail, the infirmary, the county library aud assembly rooms, and the new corn exchange. The com- mercial prosperity of this town is greatly aided by the works of the Messrs Howard and others, for the manufac- ture of agricultural implements, &c. 'There are also manufactures of straw and lace in the neighbourhood. Bedford is governed by a mayor, six aldermen, and eighteen councillors ; and it sends two members to parliament. It is exceptionally well provided with sanitary appliances, having a new complete system of sewerage and water-works ; and the sewage is conveyed to a farm about a mile from the town and utilized at once for growing crops of grass, roots, and corn. Population in 1871, 16,850. BEDFORD LEVEL, the name given to a flat district on the eastern coast of England, comprising the greater part (amounting to 450,000 acres) of the marshy district called the Yens, the whole Isle of Ely in Cambridgeshire, and a portion of the north of that county, 30,000 acres of Sutfolk, 63,000 acres of Norfolk, 57,000 of Huntingdon, about 8000 of Northamptonshire, and the south-eastern portion of Lincolnshire. The extent of the whole tract is 60 milcs in length, from Milton in Cambridge to Toynton in Lincoln ; its breadth is about 40 miles, from Peterborough in Northampton to Brandon in Suffolk. The boundary on three sides is irregular, giving it something of a horse-shoe shape, with the opening terminated by the sea on the north.

This district obtained its present name from the agreement of Francis earl of Bedford, the principal landholder, and thirteen other adventurers, with Charles I. in 1634, to drain the level, on condi- tion of receiving 95,000 acres of the reclaimed land. The district has within historic times undergone remarkable changes. In the time of the Romans it was a dense forest, which, as a stronghold of the Britons, those invaders destroyed. It then became a swamp, through which the lazy waters of the Ouse, the Welland, the Nene, and Wisbeach, crept to the sea. In the 13th century the sea here, as in other parts of N.W. Europe, burst its boundaries, and the inundated land became a pestilential swamp. The first attempt to drain this morass seems to have

been made in the year 1436, and embankments and ditches were forined at a great expense. These, however, were swept away during the ensuing winter by the flood- ing of the River Ouse. Another partial attempt at drainage was made by Bishop Moreton in the reign of Henry VIL., but this also proved a failure. An Act was passed in the 44th year of Queen Klizabeth for effecting its reclamation ; but the first effectual at- tempt at reclaiming it was not made until 1634, as already men- tioned, and many embankments and canals were constructed at various intervals at an expense above one million sterling, Three years after the agreement of the earl of Bedford and his partners with the king, after an outlay of £100,000 on the part of the com- pany, the contract was annulled, on the fraudulent plea that the works were insufficient; and an offer was made by King Charles to undertake its completion on condition of receiving 57,000 acres in addition to the amount originally agreed on. 'his unjust attempt was frustrated by the breaking out of the civil war ; and no further attempt at drainage was made till 1649, when the Parliament rein- stated the earl of Bedford's successor in his father's rights. After an additional outlay of £300,000, the adventurers received 95,000 acres of reclaimed land, according to the contract, which, however, fell far short of repaying the expense of the undertaking. In 1664 a royal charter was obtained to incorporate the company, which still exists, and carries on the concern under a governor, 6 bailiffs, 20 conservators, and a commonalty, each of whom must possess 100 acres of land in the level, and has a voice in the election of officers. The conservators must each possess not less than 280 acres, the governor and bailiffs each 400 acres. The original adventurers had allotments of land according to their interest of the original 95,000 acres ; but Charles II., on granting the charter, took care to secure to the crown a lot of 12,000 acres out of the 95,000, which, how- ever, is held under the directors, whereas the allotments are not held in eommon, though subject to the laws of the corporation. The level was divided in 1697 into three parts, called the North, Middle, and South Levels—the second being separated from the others by the Nene and Old Bedford rivers.

Since then extensive works have at different times been carried on to complete the drainage of this district ; but the most effectual are under the Acts of 1827 and 1829, for " Improving the outfall of the Nene," "The Nayigation of the Wisbeach," and "The Em- banking of the Salt Marshes

between the canal called Kinderley Cut and the sea." Vessels of 200 to 300 tons burden can now

come up to the town of Wisbeach at all tides, and those of from 500 to 600 tons at spring tides. The draining of the lower lands, which, like the Dutch Polders, are below low-water mark, was carricd on by windmills, but these have now been almost superseded by steam-engines; in the North Level the drainage is effected by sluices. As the result of these extensive operations, the level now abounds in rich pasture and corn lands.

BEDFORDSHIRE, one of the south midland counties of England, surrounded by the counties of Buckingham, Northampton, Huntingdon, Cambridge, and Hertford. It is the fourth smallest county, containing only 295,509 acres or 461 square miles. Its extreme length from north to south is about 47 miles, and its width 21 miles. The great Ousc, which flows through the county eastward, is navi- gable from Bedford to the sea at King's Lynn. The Mid- land and Great Northern Railways intersect the county, also the Bletchley and Cambridge branch of the London and North-Western. The surface of the county is for the most part level, but the northern half is undulating, with a subsoil generally of boulder-clay and Oxford-clay. A fine tract of land south of Bedford is bounded by a range of lower-greensand running east and west, presenting beautiful woodland scenery, parallel to which, along the Hertford- shire border, the Chiltern chalk range rises to 500 feet above the sea-level and 400 feet above the level of Bedford, The county is generally devoted to corn-growing, but the Ouse valley has a large breadth of rich pasturage, and all along the west side of the Great Northern railway is a sandy loam, on which onions, potatoes, and market produce are grown. Agricultural implement and other engineering works employ about 1000 hands at Bedford and Luton ; while the female industry of the county is pillow-lace, and in the south straw-plait. The plait is made up, chiefly at Dunstable and Luton, into hats and bonnets, which are ex- ported to all parts of the world. Luton is the most populous town in the county, slightly exceeding the county town of Bedford. The county rate assessment is £585,840, and the expenditure in 1873 was £11,802. The county be- longs to the diocese of Ely, and coincides with the arch-

deaconry of Bedford. It contains 9 hundreds and 124 parishes. 1t is in the Norfolk circuit, and assizes are held twice a year. A court of quarter-sessions sits at Bedford, and the petty sessional divisions are seven. 'Two members are returned to parliament for the county and two for the town of Bedford. 'The titles derived from the county are that of duke to the house of Russell, and of baron of Bletsoe to the family of Lord St John, and the largest landowners are the duke of Bedford and Mr Whitbread of Southill. The most distinguished residence in the county is Woburn Abbey (duke of Bedford), near the town of that name. It was formerly a Cistercian abbey, granted at the Reformation by Henry VIII. to the family of Russell, the fourth duke of which house erected the present edifice, It is a very grand and capacious pile, situated in an extensive park, and is furnished with a large and valuable collection of paintings and statues. Luton Hoo is also an extensive mansion, which was reconstructed and improved for the third earl of Bute by the brothers Adam. A library, 146 feet in length, furnished with a valuable collection of books, and a large selection of paintings of some of the first masters, chiefly of the Italian school, are its distinguishing ornaments. Besides these there are other mansions which are highly deserving of notice, especially that of Mr Whitbread at Southill; Wrest Park, belouging to the Dowager Countess Cowper, Hawnes House, to the Rev. Lord John Thynne ; Sutton, to Sir John M. Burgoyne ; and Qakley House, to the marquis of Tavistock.

There are a general infirmary and fever hospital at Bedford; ncar Aresey is the Three Counties Lunatic Asylum (for Beds, Herts, and Hunts) provided for 685 patients ; et Carlton is the juvenile county reformatory ;

at' Kempston the county school (300 boys), also the Military Brigade Depét. Connected with the county are the militia (18th Light Infantry), the duke of Manchester's cavalry volunteer corps, and the rifle volunteers.

The population of the county stood at the four last decennial enumerations as follows :—

Year. Males. Females. Total. Houses,

1841, 52,190 55,746 107,936 21,964 1851, 59,941 64,587 124,478 25,461

1861, 63,940 (leo 4G 135,287 28,314

1871, 69,046 77,211 146,257 32,099

In the year 1871 the number of agricultural labourers was 15,962, of straw-plaiters 23,508 (90 per cent. being females), and of lacemakers 6051, all females. The towns and their populations in 1871 were as follows:—Luton, 17,317 ; Bedford, 16,850 ; Leighton-Buzzard, 4696 ; Dun- stable, 4558 ; Biggleswade, 4244.

When the Romans landed in Britain Bedfordshire formed a portion of the district of the Cattieuchlani, whose sovereign or chief, Cassibelenus or Cassivelaunus, com- . manded the united forces which opposed Julius Cesar. When, in the year 310, the Emperor Constantine ruled the whole isiand, and divided it into five provinces, Bedford- shire was included in the third division called Flavia Cesartensis, and remained so till the final abandonment of Britain by the Romans. Under the Saxon heptarchy it formed part of the kingdom of Mercia, until with the rest of the island it was united to the kingdom of the West Saxons, which was divided by Alfred into counties, hundreds, and tythings, when this county first received its present name.

There are many remains of Roman, Saxon, and Norman antiquities. 'Traces of a Roman station are to be seen at Sandy near Potton, and at Maiden-Bower near Dunstable. Leighton-Buzzard, or Beaudesert, is supposed to have been a Romancamp. The ancient Icknield and Watling Streets passed through the county; and the remains of both may be definitely traced, as well as of some others constructed by the Romans.

BEDNOR, a town of Hindustan, in the territories of the Raja of Mysore, situated in 13° 50' N. lat., and 75° 6" E. long. In 1645 the seat of government of the Rajas of Ikeri was transferred to this place ; as the inhabitants of the former capital removed with the court, Bednor became a city of great importance, containing, it is said, 20,000 houses, besides huts. It was taken and plundercd by Haidar Ali in 1763, who ordered it to be called Haidar- nagar. It is still, however, known by its original name of Bednor. At that time it was estimated at 8 miles in cir- cumference. In 1783 it surrendered to a British detach- ment under General Matthews, but being

shortly after invested by Tipu Sultan, the garrison capitulated on con- dition of safe conduct to the coast. Tipu violated the stipulation, put General Matthews and the principal officers to death, and imprisoned the remainder of the force. At Tipu's death it contained 1500 houscs, besides huts. The district of Bednor is situated on the summit of that range of hills, the Western Ghats, which overlooks the pro- vinces of Canara aud Malabar. In consequence of its elevation above the sea, and the steepness of the mountain chain, which rises like a wall to the height of 4000 or 5000 feet, the clouds of the south-west monsoon are here inter- cepted, and their contents precipitated on the table-land in deluges of rain, which continue for six months in the year, and are extremely favourable to vegetation. Its products are pepper, betel-nut, cardamums, and sandal wood. Cattle of small size are also bred. The imports are salt, rice, cocoa-nuts, oil, turmeric, and cotton cloths.

BEDOUINS, the portion of the Arab race that live in the desert in tents, See Anapia, vol. ii. p. 246, 7

HE bee, from its singular instincts, its active industry, and the useful products resulting from its labours,

has, from the remotest times, attracted general attention and interest. No nation upon earth has had so many historians as this remarkable class of insects. The patience and sagacity of the naturalist have had an ainple field for exercise in the study of the structure, physiology, and domestic economy of bees ; their preservation and increase have been objects of assiduous care to the agriculturist ; and their reputed perfection of policy and government have long been the theme of admiration, and have supplied copious materials for argument and allusion to the poet and the moralist in every age. It is a subject that has been celebrated by the muse of Virgil, and illustrated by the philosophic genius of Aristotle. Cicero and Pliny record

that Aristomachus devoted sixty years to the study of

these insects; and Philiscus is said to have retired int) a remote wood, that he might pursue his observations on thein without interruption. A very great number of authors have written express treatises on bees, periodical works have been published relating exclusively to their manage- ment and economy; and learned societies have been established for the sole purpose of conducting researches on this subject.

In so complicated a branch of natural history, correct observation and induction require laborious and long- continued efforts. But, on the subject of bees, the inquirer after truth had, besides, many obstacles to encounter from the very general diffusion of errors, which had been transmitted without due examination from one author to another. The history of the opinions of successive writers sufficiently proves how gradual and slow has been the growth of an accurate knowledge of these insects,—what is now known being the result of the persevering labours of ages. The accuinulation of curious and interesting facts, indeed, which has accrued from the researches of Swam- merdam, Maraldi, Reaumur, Schirach, Huber, Dzierzon, and Von Siebold, constitutes almost anew science. It will there- fore be proper, in this place, to give a connected and sys- tematic account of the natural history of the bee; and the principal features of internal conformation will be described along with the particular functions. Our descriptions will apply, more especially, to the common and best-known species, the Apis mellifica, which is the one particularly prized on account of the rich products it affords.

We shall begin with a brief account of the different sorts of bees inhabiting the hive, and of the respective offices of each; we shall then proceed to consider their comparative physiology, including the leading particulars relating to the functions of their various organs, sensitive powers, in stincts, secretions, and diseases. We shall also explain the theory of parthenogenesis and the impregnation of queens, and shall follow the bees in their different labours, from the period when the swarm has settled in a new habitation,—detailing the complex structure of their combs, their curious processes of architecture, and the pains they bestow on rearing their progeny, and in sending forth new swarms; and, in the last place, we shall notice the best systems of modern bee-keeping, and give some account of hives and apiarian implements.

The leading feature in the natural history of bees, and one which distinguishes them from almost all other insects, is their singular distribution into three different kinds, con- stituting to all appearance so many different modifications of sex. The drone (fig. 1), which is characterized by a thicker body, a round head, a more flattened shape, and

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more obtusely terminated abdomen, within which are con- Functions tained the inale organs of generation, is undoubtedly the of the

male of the species. It is distinguished also by the

absence of a sting, and by the humming noise that accom- panies its flight.

The queen-bee (fig. 2), which is aneqnivo-

Fig. 2.—Queen-Bee. Fic, 3.—Worker Bee.

cally recognized as the female, is larger than any of the others, has the abdomen of greater length, and is provided with a sting aud two ovaria of considerable size. The worker bees (fig. 3) compose the third class, and are dis- tinguished by the smallness of their size, their lengthened proboscis, the peculiar structure of their legs and thighs, which are adapted to the collection of certain materials obtained from vegetables, and by the apparent absence of every trace of generative organs,—we say apparent, because, as will be shown, rudiments of ovaria do exist, which, however, are not perceptible without a very minute and careful dissection. Till recently the worker bees were regarded as devoid of sex, and were accordingly termed neuters, It is their function to perform all the laborious offices for the community, to construct the interior of their habitation, to explore the country in search of nourishment and other materials, to collect and bring them to the hive, and apply them to different purposes, to attend upon the queen, and supply all her wants, to defend the hive from the attacks of depredators, aud to carry on hostilities against the various enemies of the tribe. The life of the queen is chiefly engrossed with the duties of laying eggs. The drones producing neither wax nor honey, and depending on the rest for their subsistence, are idle spectators of the others'

labours. but important duty of impregnation, since they perish when this purpose is accomplished. There is commonly only one perfect queen existing at a time within each hive, and she usually appears to be treated by all the other bees with every mark of affection and of deference. The number of workers is very different in different hives ; sometimes there are only a few thousands; at other times from twenty to forty, or even fifty thousand. The drones, even in the spring, seldom compose more than one-thirtieth or one-fortieth of the whole; and, at other seasons, there are none to be found in the hive when a fertile queen is present. In order to form some estimate of the number of bees which can occupy a certain space, Hunter counted what number of drowned bees could be contained in an alehouse pint, and found it to be 2160; so that if a swarm were to fill two quarts, their numbers would be nearly 9000. Reaumur, with the same view of ascertaining their numbers, employed the more accurate method of weighing them; he found that a collection, weighing one ounce, consisted of 336 bees, and, therefore, that 16 ounces, or one pound, would consist of 5376 bees.

Fic. 1.—Drone.

They appear to be formed only for the momentary.

drones, queens, and workers,

Notwithstanding the difference in conformation, instincts, Real sex

and offices between the queen-bee and the workers, it is of the

*now established on the most incontrovertible evidence that ¥°™**™*

they both originally proceed from the same kind of egg or larva, which is capable of being converted, according to

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vutrition.

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Organs for collecting food,

Proboscis.

BE E

circumstances, either into a worker or a queen. It has been proved that the former, although exhibiting no appear- ance of sexual organs on a superficial examination, are in reality females, and have the rudiments of these organs, which, however, not being developed, are incapable of exercising their proper functions, although it sometimes happens that they become sufficiently so to enable a worker to lay unfecundated eggs. It may be remarked that the idea of the worker bees being radically females had been suggested long ago by Dr Warder in his Monarchy of Bees, in which he terms them " True Amazons ;" but no atten- tion had been paid to his opinion. The real merit of this great discovery, which affords a key to a multitude of hitherto inexplicable facts, unquestionably belongs to Schirach. When first announced to the world it was received with suspicion by the greater number of natura- lists, and with complete incredulity by others. It was, indeed, at variance with the whole tenor of the observations of Swammerdam, Maraldi, and Reaumur. Wilhelmi, the brother-in-law of Schirach, though an eye-witness of the experiments from which this theory had been deduced, for a long time refused to admit the doctrine, but at length became one of its most strenuous supporters. It is noticed in a vein of sarcastic ridicule by John Hunter in his otherwise excellent paper on bees in the Philosophacal Transactions. Needham wrote a Memoir for the Imperial Academy of Brussels in 1777 for the express purpose of refuting it, and he then inveighs in strong language against those naturalists who had deigned to give it the least countenance. Bonnet, after exercising a laudable scep- ticism, and making a diligent inquiry, in which he displays a genuine spirit of philosophy, yielded a reluctant assent. But the truth of the doctrine has since been placed beyond the reach of controversy by a multiplied series of obser- vations and experiments in different parts of Europe and. America,

In considering the physiology of the bee, the first function that claims our notice is that of nutrition. The food of bees is principally of two kinds, namely, the fluid secretions of vegetables contained in the nectaries of the flowers, and the dust of the anthers, which has been termed by botanists the pollen, but which, when collected by the bees, has received a variety of appellations, such as farina, bee-bread, &c. Occasionally, however, we find bees feeding upon other saccharine substances besides honey, such as honey-dew, syrup, &c.

The organs by which they collect food are extremely complex, comprising instruments adapted to the reception of liquid aliment as well as those fitted for the division of solid materials. Reaumur has given a most elaborate description of these organs, and corrects some errors into which Swammerdam had fallen. For the purpose of taking up fluids, bees are provided, in common with all hymen- opterous insects, with a long and flexible proboscis or trunk, which may be considered as a lengthened tongue, though, strictly speaking, it is formed by a prolongation of the under lip. It is not tubular, as Swammerdam had supposed, but solid throughout; and the minute depression at its extremity is not the aperture of any canal through which liquids can be absorbed. The trunk of the bee per- forms strictly the office of a tongue, and not that of a tube for suction; for when it takes up honey or any other fluid aliment, the under or the upper surfaces are more imme- diately applied to it, and rolled from side to side, and the bee thus licks up what adheres to it, while the extremity of the trunk is frequently not applied at all to the substance taken up. The trunk is supported on a pedicle, which admits of being bent back or propelled forwards, and thus can retract or stretch out the trunk to a considerable extent. Protection is given to it by a double sheath ; the exter-

parts, on which account Fabricius termed quinquefida.

nal part consisting of two scales furnished by the expansion of one of the portions of the labial palpi, and the internal formed by the prolongation of the two external portions of the jaw. The whole member thus consists of five principal it lingua

For the purpose of mechanically dividing solid materials, Mandibles

the mouth is furnished with two strong mandibles and four palpi ; ereat use in enabling the insect to seize and break down hard substances for other purposes. all these parts are of larger dimensions than in the other kinds. of concave scales with sharp edges ; they are fixed to the ends of the jaws, and play horizontally as in other insects. Reaumur describes and delineates a large aperture above the root of the proboscis, which is so surrounded with fleshy parts as not to be readily seen unless the proboscis be extended and bent downwards. mouth or orifice of the gullet; on the upper side of which, and of course opposite to the root of the proboscis, a small fleshy and pointed organ is seen, which he regards as the tongue, assisting in the deglutition of the food. Through this orifice, itis presumed, all the aliment, whether liquid or solid, passes; the former being conveyed to it by the trunk, which, by its contractile power, presses forward the fluids it has collected between itself and the inner sheath,

they are but little employed in eating, but are of In the worker bee

The teeth are two in number, and have the form

This he considers as the

and the latter being received directly after its comminution

by the teeth, behind which it is situated. Latreille,

however, whose authority is great on a point of this nature, thinks that Reaumur has deceived himself with regard to such an aperture, and disbelieves its existence. He con- ceives that the food simply passes on by the sides of the tongue, finding its way from thence into the cesophagus and so on to the stomach.

The bee has two stomachs. The first isa large transparent Stomacks. membranous bag, pointed in front and swelling out into two pouches behind. It performs an office in some respects analogous to that of the crop in birds ; for it receives and retains for a time the fluid of the nectaries, which does not appear to differ in any respect from honey. Hunter observes

that whatever time the contents of this reservoir may be retained he never found them altered so as to give the idea of digestion having taken place. The coats of this reservoir are muscular, by which means it is capable of throwing up the honey into the mouth, so that it is regurgitated into the honey cells or imparted to other bees. None of it ever passes out from the extremity of the trunk as Swammerdam had believed. For the purpose of diges- tion a second stomach is provided, which takes its origin from the iniddle of the two posterior lobes of the former, and is of a lengthened cylindrical shape. Its communica- tion with the intestine is not direct, but takes place by a projecting or inverted pylorus, thickest at its most prominent part, with a very small opeming in the centre, of a peculiar construction. This inward projecting part is easily seen through the coats of the reservoir, especially if full of honey. A similar kind of structure takes place at the communica- tion of the first with the second stomach, and having the properties of a valve, must effectually prevent all regurgita- tion from the latter into the former.

The pollen, or fertilising dust of flowers, is collected by Collection the bees for the purpose of feeding the young. It is stored of Pollen. in the cells until required, and then partly digested by the nurses with honey, and a kind of chyle formed of it. When natural pollen cannot be obtained the bees will eagerly take farina, either of rye, chestnuts, or pease, as a substitute, which appears to answer the same purpose. The bees, by means of the pencil of hair which grows on the tarsi, first collect a certain quantity of pollen, and then

Wax.

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knead it together into a ball, and place it in the space situated at the middle joint or tibia of the hinder leg, which has been termed the basket. ‘This portion of the leg is smooth and concave, somewhat like the bowl of a spoon, with stout hairs of moderate length rising from its left edge and nearly straight. Other hairs on the right side are much longer and are curved, rising up with a high arch and crossing more than half the width of the hollow, making a large basket-like enclosure for a load of pollen. In order to gather large quantities at once, the bees are sometimes observed to

roll their bodies on the flower, and then brushing off the pollen which adheres to them with the feet, form it into two masses, which they dispose of as before mentioned ; and it is said that in moist weather, when the particles of pollen cannot be readily made to adhere, they return to their hive dusted all over with pollen, which they then brush off with their feet. The part in Nature's economy thus unconsciously performed by the bee in common with other insects is most unportant. By this means the pollen is carried from flower to flower, or from the stamens to the pistils, and plants are made fertile which without such aid would often remain barren.

It was long the received opinion that wax was but a modification of pollen, which required for this conversion only a slight pressure and a kind of kneading by the feet of the bees. But it has been completely proved, by the researches of Duchet, Hunter, and Huber, that wax is a secretion from the abdomen of the bee, and that it depends uot at all on the pollen which the insect may con- sume (indeed, it is doubtful if it consumes any), but on the quantity of honey or other saccharine substance which it receives into its stomach. 'The first light thrown on this subject was in a letter of Wilhelmi to Bonnet in 1768, in which he says that wax, instead of being ejected by the mouth, exudes from the rings which enclose the posterior part of the body. Of this we may satisfy ourselves by drawing out the bee from the cell in which it is working with wax, by means of the point of a fine ueedle; and we inay perceive, in proportion as the body is elongated, that the wax will make its appearance under the rings in the form of small scales. Duchet, in his Culture des Abeilles, gives a full statement of the principal circumstances attend- ing the production of wax, which he very justly ascribes to the conversion of honey into this substance in the body of the bee. These facts appear to have been entirely over- looked till the subject was again brought forward by Hunter, in his paper in the Philosophical Transactions for 1792. Huber was engaged in prosecuting his inquiries on this subject at the same period with Hunter, and discovered, in 1793, the existence of regular receptacles or pouches, from the coats of which the wax is secreted, and within which it accumulates till its edges raise the scales, and become apparent externally. These plates of wax are withdrawn by the bee itself, or some of its fellow-labourers, and are applied in a manner hereafter to be described.

Huber has shown, by a series of well-conducted experi- ments, that, in a natural state, the quantity of wax secreted i3 in proportion to the consumption of honey, but that an equal or even greater quantity will be formed if the bee be fed on a solution of sugar in water. Warmth and rest promote this process of secretion ; for the bees, after feeding plentifully on saccharine food, hang together in a cluster without moving, for several hours, at the end of which time large plates of wax are found under the abdominal rings. This happened when bees were confined and restricted from any other sort of nourishment, whilst those that were fed on pollen and fruits alone did not produce any wax. In the second volume of Huber's Mowvelles Observations sur les Abeilles, he describes minutely the anatomy of the pouches or receptacles for the wax, which

are parts peculiar to the working bees, being totally absent in the males and queens. The cavities are lined with a membrane, which presents a number of folds, forming an hexagonal net-work, not unlike the appearance in the second stomach of ruminant quadrupeds, and evidently destined to perform fhe office of secretion.

Among the secretions peculiar to the bee, the poison Poison,

which is poured into the wounds made by the sting deserves to be noticed. It is said to owe its mischievous efficacy to certain pungent salts. If a bee is provoked to strike its sting against a plate of glass, a drop of poison will be discharged ; and if this is placed under a microscope, the salts may be seen to concrete, as the liquor dries, into clear, oblong, pointed crystals. pointed tubular instrument, open along the whole length of its upper surface, this opening being closed by two slender horny barbs each having about ten serrations on its outer edge. 'These barbs are not projected in advance of the sting as usually described, neither are they within the sting, but complete its outer tubular surface, down the centre of which the poison is injected from a little bag at the root of the sting. The serrations prevent the worker bee from withdrawing its sting from an enemy ; and, con- sequently, it is torn from the body, with a portion of the intestines, causing the death of the bee.

Respiration is effected by means totally different froin Functious

those which are usual in the higher classes of the Animal °! Kingdom. As the blood, or fluid corresponding to the blood, cannot be presented to the air in any separate organ, the air must be conducted to the blood wherever such a fluid is met with. For this purpose trachez, or air-tubes, having several external openings or spiracles, are made to ramify like arteries, and are distributed in an infinite number of branches to every part of the body. The con- dition of a hive of bees in which many thousand inuividuals, full of animation and activity, are crowded together in a confined space, having no communication with the external air but by means of a very small aperture in the lowest part, which aperture is frequently obstructed by a throng of bees passing in and out during sultry weather, would without some precautions be of all possible conditions the one least favourable to life. Bees cannot exist in an impure atmosphere any more than creatures of a larger growth.

And on examining the air of a populous hive it is found Ventilation scarcely to differ in purity from the surrounding atmosphere. % the hive

The means by which this is effected observation has shown is by the rapid vibration of the bees' wings, a certain number being told off to imitate the action of flying, for which purpose they fasten themselves with their feet to the floor of the hive, so that the whole effect of that impulse which, were they at liberty, would carry them forwards with considerable velocity is exerted on the air, which is therefore driven backwards in a powerful current. Some bees occasionally perform these ventilating motions on the outside of the hive, near the entrance, but a still greater number are employed in this office within doors. Sometimes twenty are thus occupied at once, and each bee continues its motions for a certain time, occasionally for nearly half an hour, and is then relieved by another, which takes its place. So rapid a motion of the wings is thus produced that they cannot be seen except at the two extremities of the arc of vibration, which is at least one of 90°. This is the occasion of that humming sound which is constantly heard from the interior of the hive when the bees are in a state of activity. The immediate cause of these actions is probably some impression made on their organs by the presence of vitiated air, for a bee may be made to

ventilate itself by placing near it substances which have to it an unpleasant odour.

The connection between an active respiration and a high

The sting consists of a finely- Sting.

tion

BEE

Tempera- temperature is remarkably exemplified in bees, among tare of the which, in consequence of their collecting together in large

Ine numbers, the heat is not readily dissipated, and admits | kind of language which seems to be susceptible of a great also of being easily ascertained by the thermometer. | variety of modifications, capable of supplying every sort of Hunter found it to vary from 73° to 84° Fahr. ; and Huber | information for which they have occasion. observed it on some occasions to rise suddenly from about The sense residing in the antennz appears to be on many Visicn. 92° to above 104° occasions supplementary to that of vision, which in bees, as Sensitive The physiology of the external senses in a class of | in other insects, is less perfect than in the larger animals. powers. animals of a nature so remote from our own species must | During the night, therefore, they are chiefly guided in necessarily be very imperfectly understood by us. The | their movements by the former of these senses. In full infinite diversity of character presented by the different | daylight, however, they appear to enjoy the sense of vision tribes of insects, as well as of other animals, naturally sug- | in great perfection. A bee alights unerringly on the flowers gests the idea that external objects produce on their sentient | in search of nectar or pollen, and as truly at its own hive's organs impressions widely different from those which they | entrance on its arrival there. When returning from the communicate to ourselves. The notions we form of their | fields to its hive it seems to ascertain the proper direc- senses must not only be liable to great inaccuracy, but may | tion by rising with a circular flight into the air; it then often be totally inadequate representations of the truth. | darts forward with unfailing precision, passing through the A finer organisation and more

subtile perceptions would | air in a straight line with extreme rapidity, and never alone suffice to extend the sphere of their ordinary senses | failing to alight at the entrance of its own hive, though to an inconceivable degree, as the telescope and the micro- | whether its course be determined by vision alone we are scope have with us extended the powers of vision. But | unable to say. they possess in all probability other organs appropriated to Their perceptions of heat and cold are extremely delicate. Percep- unknown kinds of impressions, which must open to them | The influence of the sun's rays excites them to vigorous tions of avenues to knowledge of various kinds to which we must | action. Great cold will reduce them to a state of torpor, aes ever remain total strangers. Art has supplied us with | and inferior degrees of cold are unpleasant to them; a many elaborate modes of bringing within our cognizance | temperature of 40° Fahr. will so benumb a bee as to de- some of the properties of matter which nature has not | prive it of the power of flight, and it will soon perish immediately furnished us with the means of detecting. | unless restored to a warmer atmosphere. When, however, But who will compare our thermometers, spectroscopes, or | bees are in the usual winter's cluster in the hive, they will hygrometers, "however elaborately constructed, with those | beara very great degree of cold without injury. In America refined instruments with which the lower orders of animals, | hives often stand where the external temperature is as and particularly insects, are so liberally provided ? low as 20° below zero, and from the condensed vapour Functions § The antenn, which are so universally met with in this | within the hive, the bees may be found in a solid lump of a class of animals, are doubtless organs of the greatest | ice, and yet, with returning spring, they awake to life and

importance in conveying impressions from without. Their continual motion, the constant use which is made of them in examining objects, the total derangement in the instincts of those insects which have been deprived of them, point them out as exquisite organs of sense. To impressions of touch arising from the immediate contact of bodies they are highly sensitive, but their motions evidently show that they are affected by objects at some distance. They are, no doubt, alive to all the tremulous movement of the sur- rounding air, and probably communicate perceptions of some of its other qualities. Composed of a great number of articulations, they are exceedingly flexible, and can readily embrace the outline of any body that

the bee wishes to examine, however small its diameter. Newport, in a paper published in the Transactions of the Entomological Society, says he is convinced from experiments that the antennz are auditory organs ; and that however varied may be their structure, they are appropriated to the perception and transmission of sound. The majority of modern physiologists and entomologists coincide in this view, and the weight of authority in favour of it is certainly very great, comprising as it does Sulzer, Scarpa, Schneider, Borkhausen, Bonsdorf, Carus, Straus- Durckheim, Oken, Burmeister, Kirby and Spence, Lespés, and Hicks. Nevertheless, other eminent entomologists, as, for instance, Lyonet, Kiister, Robineau-Desvoidy, Vogt, and Erichson, regard these organs as the seat of smell, The question may be considered as yet undetermined, and it is possible that they are the organs of some sense of which we know nothing, and which we consequently cannot describe. It is by these instruments that the bee is enabled to execute so many works in the interior of the hive, from which the light must be totally excluded. Aided by them it builds its combs, pours honey into its magazines, feeds the larve, and ministers to every want which it appears to discover and judge of solely by the sense of touch. The antennz appear also to be the

principal means employed for mutual communication of impressions. The different modes of contact constitute a

activity. The degree of cold which bees can endure has not been ascertained, though it is no doubt considerable. They survive the winter in many cold parts of Russia, in hollow trees, without any atteution being paid to them ; and their hives are frequently made of the bark of trees, which does not afford a very complete protection from the effects of frost. Many bees which are thought to die of cold in winter die in reality of famine or damp. A rainy summer and cold autumn often prevent their laying in a sufficient store of provisions; and the hives should, therefore, be carefully examined in the after-part of the season, and the amount of food ascertained. Mr White judiciously obscrves, that bees which stand on the north side of a building whose height intercepts the sun's beams all the winter will waste less of their provisions than others which stand in the sun;

for, coming forth seldom, they eat little, and yet are as forward in the spring to work and swarm as those which had twice as much honey left with them the preceding autumn. They show by their conduct that they are sensible of changes in the state of the weather for some time before we can perceive such alterations. Sometimes when working with great assiduity they will suddenly desist from their labours, none will stir out of the hive, while all the workers that are abroad hurry home in crowds, and press forward so as to obstruct the entrance of the hive. Often, when they are thus warned of the approach of bad weather, we can distinguish no alteration in the state of the atmosphere. Gathering clouds sometimes produce this effect on them ; but perhaps they possess some species of hygrometrical sense unconnected with any impression of vision. Huber supposes that it is the rapid diminution of light that alarms them, for if the sky be uniformly overcast they proceed on their excursions, and even the first drops of a shower do not make them return with any great precipi- tancy.

Taste and smell.

Hearing.

“usual manner.

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Their taste is, perhaps, the most imperfect of their senses. They use scarcely any discrimination in the collec- tion of honey from different flowers. They are not repelled by the scent or flavour of such as are extremely offensive to our organs, and scruple not to derive supplies from such as are highly poisonous. In some districts in America it is well known that honey acquires in this way very dele- terious properties. The qualities of honey are observed to vary much according to the particular situation from which it is obtained. In their selection of flowers they are guided by the quantity of honey they expect to meet with, and in no respect by its quality. That gathered from ivy blossoms in England is sometimes so bitter and nauseous as to be useless for our eating, although the bees consume it readily. But their smell must be sufficiently acute to enable theni to discover honey at great distances, and in concealed situations direct experiment has indeed proved this to be the case. Huber found that they proceeded immediately

towards boxes which contained honey con- cealed from view ; and such, in fact, is the situation of the fluid of the nectaries in flowers. Some odours, and especially all kinds of smoke, are highly obnoxious to them ; and this is also the case with ammonia and other volatile chemical agents, upon receiving the impression of which they immediately sct about ventilating themselves in the The odour of the poison of their sting produces similar effects, exciting them to immediate rage and hostility. It has been observed that bees recoguize the presence of a stranger in their hive by the smell; and in joining two stocks into one, if the bees are united without precautions, a battle will probably ensue. To obviate this bee-keepers are in the practice of strongly scenting both families by means of peppermint, tobacco smoke, or other strong-smelling agent; this overpowering the bees' natural scent, they are unable to distinguish their own party from the intruders, and peace is insured. The sense of vision does not appear to aid thcin, for where Ligurians are added to common black bees the effect is the same, although in colour the two varieties are very different. In the introduction of an alien queen to a stock it is also usual to imprison the new sovereign within the hive which she is to rule until she has acquired the peculiar scent of her future subjects, who will then make no objections to her, while had she been at once set at liberty she would probably have met her death.

Although it is clear that insects possess the power of sinell, yet the particular organ of this sense has never been accurately ascertained, and the opinions of naturalists have been much divided on the subject. These opinions have been supported more by arguments drawn from the analogy of what happens in other classes of animals than by direct experiment on insects themselves. We know that in all animals respiring by means of lungs, the organs of smell arc placed at the entrance of the air-passages; and it has often been concluded that in like manuer the stigmata, or the orifices of the air-tubes, are the seat of this sense in insects. Huber's opinion was that in the bee this sense resides in the mouth itself, or in its immediate vicinity. Here, indeed, would be its proper station if this faculty be intended, as we may reasonably suppose it to be, to apprise the individual of the qualities of the food prior to its being eaten. When the mouth of a bee was plugged up with paste, which was allowed to dry before the insect was set at liberty, it reinained quite insensible to the same odours to which it had before manifested the strongest repugnance.

It is generally supposed that bees pussess the sense of hearing. The common practice of making a loud noise by drums and kettles in order to attract a swarm is founded gn this supposition, But the evidence is by no means |

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conclusive, for we find that they are not disturbed by a loud clap of thunder, or by the repozt of a gun, or by any other noise that may happen to arise round them. Sir John Lubbock, who has made a great many observations in this direction, says that he could never find them take notice of any sound he made even when it was close to them. He tried them with a violin, dog whistle, shrill pipe, and set of tuning forks, also by shouting, &c., close to their heads, but in spite of his utmost efforts the bees took no notice, not even by a twitch of the antennx show- ing they heard. It is, however, certain that they are capable of emitting a variety of sounds which appear expressive of anger, fear, satisfaction, and other passions ; and it would seem that they are even capable of communi- cating certain emotions to one another in this manner. Huber observed that the young queens not yet liberated from their cocoous sent forth a peculiar piping sound, and this is answered by the old queen, who apparently must hear the note of her aspiring rival.

A certain cry or humming noise from the queen will strike with sudden consternation all the bees in the hive, and they remain for a considerable time motionless and stupified. Hunter has noticed a number of modulations of sound emitted by bees under different circumstances, and has instituted an inquiry concerning the means employed by them in producing these sounds; for an account of this see his paper in the Philosophical T'rans- actions,

If the function of sensation in insects be involved in doubt Instinct.

and obscurity, the knowledge of those more interior faculties, which are the springs of voluntary action, is hid in still deeper mystery. Buffon refuses to allow bees any portion of intelligence, and contends that the actions we behold, however admirably they are directed to certain ends, are in fact merely the results of their peculiar mechanism. Other philosophers, such as Reaumur and Brougham (Works, vol. vi.), have gone into the opposite

extreme, aud have considered them as endued with extra- ordinary wisdom and foresight, as 'animated by a disin- terested patriotism, aud as uniting a variety of moral and intellectual qualities of a higher order. The truth, no doubt, lies between these overstrained opinions; but it is nevertheless extremely difficult to decide in what degree these respective principles operate in the production of the effects we witness. .The term instinct should properly be regarded, not as denoting a particular and definite principle of action, whose operation we can anticipate in any new or untried combination of circumstances, but as expressive of our inability to refer the phenomena we contemplate to any previously known principle. Thus the actions which an animal performs in obedience to the calls of appetite are not properly said to be instinctive ; uor can the term be applied to actions which are the consequence of acquired knowledge, and of which the object is with certainty forc- seen by the agent. But when an animal acts apparently under a blind impulse, and produces effects useful to itself or to the species, which effects it could not have previously contemplated as resulting from those actions, it is then customary to say that it is under the guidance of instinct, that is, of some unknown principle of action. It will be proper, therefore, to keep this distinction in view in judging of the voluntary actions of the lower animals.

In no department of natural history is it more neccssary to be aware of the proper import of the term instinct, than in studying the phenomena presented by the bee ; for no- where is it more difficult to discrininatc between the regular operation of implanted motives and the result of acquired knowledge and habits. The most striking feature of their history, aud the one which apparently lays the foundation for those extraordinary qualities which raise them above

Prepara- tion of the hive,

Propolis,

ke

the level of other insects, is the disposition to social union. It may in general, indeed, be remarked, that animals which associate together so as to form large communities, display a higher degree of sagacity than those

which lead a solitary life Thisis especially observable among insects. The spider and Formica leonts may exhibit particular talents, or practise particular stratagems in the pursuit and capture of their prey ; but their history is limited toa single generation, «nd embraces none of those interesting relations which exist between individuals composing the gregarious tribes, such as the ant, the wasp, and the bee. Among these we trace a community of wants and desires, and a mutual intelligence and sympathy, which lead to the con- stant interchange of good offices, and which, by introducing a systematic division of labour, amidst a unity of design, leads to the execution of public works ona scale of astonish- ing magnitude. The attachment of bees to their hive, which they defend with a courage and self-devotion truly admirable, their jealousy of intruders, their ready co- operation in all the labours required for the welfare of the community, their tender care of their young, the affection and homage which they bestow on their queen, imply qualities such as we could hardly persuade ourselves could animate 2 mere insect, on which we are in the habit of proudly looking down as placed in one of the lowest orders of created beings

We shall content ourselves at present with these general observations, as the instances which serve to illustrate their noral and intellectual character belong properly to the history of the different processes they follow in the con- struction of their combs, the hatching and rearing of their progeny, and the mode of conducting their migrations. To these subjects, therefore, we shall now proceed; and in order to present the most connected and complete account of their economy, we shall begin the history from the period when a new swarm has just occupied a hive, and when all the arrangements for their habitation, and the construction of the cells in which their eggs and provisions are to be deposited, are yet to be effected.

The first care of the worker bees, on their settlement in their new abode, is to clean it out thoroughly. While one set of bees is thus employed, another is distributed about the country in order to procure the proper materials for blocking up the small holes and chinks of the hive, and for laying a firm foundation for the edifice which is to be con- structed within it. The substance which is principally employed in this preliminary stage is propolis, a species of glutinous resin, of an agreeable aromatic odour, and

reddish-brown colour, in process of time becoming darker, and acquiring a firmer consistence. According to the analysis of Vauquelin (Mém. Soc. Agricult. Departem. Seine), it is composed chiefly of resin, with a small propor- tion of wax, and of acid and aromatic principles. It is soluble in alcohol, ether, and oils, both fixed and volatile, and tinges the solvent of a beautiful red colour. Cadet has since ascertained in it the presence of benzoic and gallic acids. Reaumur had not been able to discover from what plants the bees collect this substance. Riem asserts that it is chiefly from pines and other trees of the fir kind. The observations of Huber have assisted in the solution of this question. On placing branches of the wild poplar tree before the hive, he found that the bees eagerly seized upon the varnish which exudes from the buds ; and examining the chemical properties of this varnish, he identified it with the propolis with which the inside of the hive is lined.

The propolis adheres so strongly to the legs and feet of the bee which has collected it, that it cannot be detached without the assistance of its fellow-labourers. For this purpose the bee that is loaded presents its legs to the workers in the hive, which carry off with their jaws this

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adhesive substance, and immediately apply it, while yet ductile, all round the interior of the hive, and particularly over all the projecting parts; hence its name, of Greek derivation, signifying before the city. In like manner all the foreign bodies that are introduced into the common habitation and are too heavy for removal are covered over with this resinous substance. If a snail, for instance, should happen to introduce itself into the hive, after despatching it with their stings, they encrust it over with propolis. ;

The next object of their labours is the construction of Construc- the combs, the future receptacles for the eggs with which eee the mps.

the quecn is pregnant and which are now to be laid. The material employed is wax ; and the bees, for the purpose of secreting this, are actively employed in collecting honey. When they have filled their crops with honey they hang together in a thick cluster from the top of the hive, and thus remain in a state of inactivity for a considerable period, during which time

the sccretion of wax is proceed- ing. It may be secn collected in laminz under the abdo- niinal scales, whence it is removed by the hind legs of the bee, transferred to the fore legs, and from thence taken up by the jaws. In this operation they are often assisted by their companions, who even sometimes directly seize upon the wax from under the abdomen of those who are before them. When a sufficient quantity of material has thus been collected together, the process of building is com- meuced ; but in ordcr to understand the subsequent opera- tions it ig necessary to have a correct idea of the form of the cells which compose the combs. We shall, therefore, proceed to give some account of the structure when it has attained its perfect state.

The combs of a bee-hive are formed in parallel vertical Forms of strata, each of which is about an inch in thickness, the the combs

distance between the surfaces of adjoining strata being about half an inch, a space which allows for the passage of the becs over both surfaces. 'The combs generally extend the whole breadth of the hive, and nearly the whole length from the top tothe bottom. They consist of thin partitions which enclose hexagonal cells, opening on both surfaces of the comb and closed by a partition which is common to those on both sides, and occupies the middle distance between the two surfaces. This partition is not, however, a plane, but is composed of a collection of rhombs. Three and sometimes four of these rhombs incline to one another at a certain augle from the bottom of each ccll, which thus has the shape of a flattened pyramid, of which the base is towards the mouth of the cell. The geometric form of each individual cell is therefore a hexagonal prism, termi- nated by a trihedral pyramid, the three sides of which are rhombs which meet at the apex by their obtuse angles, and, forming oblique angles with the sides of the prism, truncate a portion of these, and convert them from rect- angles, which they would be in a regular prism, into trapeziums. Of the two angles of these trapeziums adjoining the base of the pyramid one must be acute and the other obtuse, the acute angle of one trapezium being next to the acute angle of the adjoining trapezium, and the obtuse angle being in like manner next to another obtuse angle of the preceding trapezium ; so that in going round the base we meet with pairs of acute and of obtuse angles alternately succeeding each other. The two adjoining acute angles of the trapezium are

adjoining to two of the terminal rhombs which here present their acute angles, so that at these points a solid angle of four planes is formed, all the angles being acute. Each pair of obtuse angles of the trapezia, on the other hand, are adjacent to the obtuse angle of one of the rhombs only, thus composing a solid angle of three planes of which the angles are all obtuse ; and these two kinds of solid angles succecd one another 62—III

Geometric properties of the cells.

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alternately all round the base of the pyramid, there being three of each kind and six in all. The axis of each cell coincides not with the axis of the cell on the opposite surface, but with one of its angles; so that each of the three obtuse angles at the base of the terminal pyramid cor- responds to the central parts of three of the cells on the opposite side, and each of the sides of the pyramid which closes a cell on one side contributes in part to the enclos- ing of three of the cells on the opposite side. We may easily satisfy ourselves that such is the case by piercing the centres of each of the three planes which close the bottom of a cell with a pin, when on turning the comb the three pins will be found to have passed into three different cells on the opposite side.

A structure of this kind is obviously the one of all others calculated to afford the greatest space for each cell with the same quantity of materials. It is easy to perccive, in the first place, that in a plane surface, when a number of small spaces are to be divided by partitions, the hexagonal form is the one which comprehends the largest space com- patible with the extent of the lines which enclose them; for the equilateral triangle, the square, and the regular hexagon, are the only regular forms that admit of being joined together in the same plane without leaving interstices ; and the proportion of the area to the periphery in every polygon increases as the figure consists of a greater number

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estimates the saving of wax by partitions so constructed, above what would be required for a flat partition, at one- fourth of the wax which would be

wanted to complete the truncated sides of the cells, so as to form them into rectangles. L'Huillier, in the Memoirs of the Berlin Academy, has given a demonstration which is remarkable for its simplicity, and for its involving none but elementary propositions ; he values the economy of wax at +, of the whole wax employed. Le Sage, as appears from the life of that philosopher by Professor Prevost, has shown that this celebrated problem reduces itself to the finding of the angle at which two planes with a given inclination (such as 120°) can be cut by a third plane, so as to make all the angles resulting from the section equal to one another.

But a more essential advantage than even the economy of wax results from this structure, namely, that the whole fabric has much greater strength than if it were composed of planes at right angles to one another ; and when we consider the weight they have to support when stored with honey, pollen, and the young brood, besides that of the bees themselves, it is evident that strength is a material requisite in the work.

It has often been a subject of wonder how such diminutive insects could have adopted and adhered to so regular a plan of architecture, and what principles can actuate so great a multitude to co-operate, by the most

effectual and systematic mode, in its completion. Buffon Buffon's has endeavoured to explain the hexagonal form by the a of uniform pressure of a great number of bees all working at j7° "O7®

. – : ; ; a tion of the the same time, exerted equally in all directions in a limited combs,

of sides, and is, thercfore, greater in the hexagon than in either of the other two. The truth of this proposition was perceived by Pappus ; and even its application to the subject of the honeycomb was made by that ancient geometrician.

But the determination of the form and inclination that should be given to the partitions that close the bottom of the cells, and which may, of course, belong equally to those on both sides cf the comb, is a problem much more complicated and difficult of solution. It has exercised the skill of several modern mathematicians of great eminence. Reaumur proposed to Kénig,

pupil of the celebrated Bernouilli, and an expert analyst, the solution of the problem :—To find the construction of a hexagonal prism terminated by a pyramid composed of three equal and similar rhombs (and the whole of given capacity), such that the solid may be made with the least possible quantity of materials ;—which in other words was asking him to determine the angles of the rhombs that should cut the hexagonal prism so as to form with it the figure of the least possible surface, since the hexagon being given, this decided both their dimensions and their intersections with the sides of the cell. Maraldi had previously measured the angles of the rhombus and found them to be 109° 28' and 70° 32' respectively ; but Konig was not aware of this until after he had solved the problem, and assigned 109° 26' and 70° 34' as the angles, when he had sent him the Memoirs of the Academy of Sevence for 1712, containing Maraldi's paper; and Kénig was equally surprised and pleased to find how nearly the actual measurement agreed with the result of his investiga- tion. The measurement of Maraldi is correct, and the bees have, with rigorous accuracy, solved the problem, for the error turns out to be in Kénig's solution. The construc- tion of cells, then, is demonstrated to be such that no other that could be conceived would take so little material and labour to afford the same room.

Boscovich, who has also given a solution of the same problem, supposes that the equality of inclination of the planes gives greater facility to the construction of the comb, and might, therefore, be a motive of preference, indepen- dently ofthe greater economy of wax. Maclaurin has offered a solution of this problem, and has demonstrated by simple geometry, that the most advantageous form is that which results from the supposed equality of the three plane angles forming the solid angles at the base. He

space ; and illustrates his theory by supposing a number of similar cylinders compressed together, and taking the form of hexagonal prisms by the uniform expansion of each. The analogy of the forms produced by the law of crystal- lization,—of the figures assumed by various organs in the animal and vegetable world, such as the skin of the bat, and the inner coat of the second stomach of ruminant quadrupeds,—is also adduced by this captivating but superficial writer in support of his argument. But however plausible this theory may at first sight appear, it will not stand the test of a serious examination. The explana- tion he has attempted applies no further

than to the inclination of the sides of the cells; but he did not take into account, perhaps from not having studied the subject mathematically, the inclinations and forms of the planes which close each cell, and so curiously conspire on both sides to serve a similar office, while they at the same time accurately fulfil a refined geometrical condition. But it is sufficient confutation of the whole theory to show, that it is directly at variance with the actual process employed by the insects in the construction of their combs.

It might be supposed that bees had been provided by nature with instruments for building of a form somewhat analogous to the angles of the cells; but in no part, either of the teeth, antenne, or feet, can any such correspondence be traced. Their shape in no respect answers to that of the rhombs, which are constructed by their means, any more than the chisel of the sculptor resembles the statue which it has carved. The shape of the head is indeed triangular, but its three angles are acute, and are different from that of the planes of the cells. The form of the plates of wax, as they are moulded in the pouches in which this substance is secreted, is an irregular pentagon, in no respect affording a model for any of the parts which compose the honeycomb. Hunter, observing that the thickness of the partition was nearly equal to that of the scale of wax, thought that the bees apply these scales immediately to the formation of the partition, by merely cementing them together. Reaumur, notwithstanding the use of glass hives, had not been able to discover the mystery of their process

of architecture, but inferred, from what he saw, that the wax was rejected from the stomach in the form of a white frothy liquor. No naturalist, indeed, prior to Huber, had been able to follow these insects in their labours, on account of their crowding together in a thick mass while they are building; but the expedients resorted to by that philosopher have unfolded the whole process, which he has given with great detail in the second volume of his Observations sur les Abeiles. Huber witnessed the whole of their actions, and saw that each bee drew out, with its hind feet, one of the plates of wax from under the scale where it was lodged, and carrying it to the mouth in a vertical position, turned it round, so that every part of its edge was made to

pass in succession under the cutting edge of the jaws; it was thus soon divided into very small fragments, while at the same time a frothy liquor was poured upon it from the tongue, so as to form it into a perfectly plastic mass. This liquor gave the wax a whiteness and opacity which it did not possess originally, and rendered it at the same time tenacious and ductile. A quantity of wax thus prepared for use is accumulated, and applied to further the work in the manner we are presently to describe.

But, in considering the process by which the comb is formed, a circumstance should be pointed out, which seems not to have been particularly noticed by any author except Huber, and yet it is one of essential importance in studying this process of architecture, namely, that the cells in the outside row on each side are of a form very different from those of the subsequent rows. As they take their origin from a plane surface, two of the sides necessary to complete the hexagon are cut off by this plane, so that the general form of the orifice is pentagonal; and the bottom of the cells on one side is composed of two equal rhombs only, and on the other side of two trapezoidal planes, with one thomb. Such a modification of shape was necessary, in order to prepare the way for the regularly-formed cells which were to follow.

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comb, while it is in progress of construction, has a semi- lenticular shape, broader at the top, and tapering below and towards the sides. Jt extends downwards, however, more rapidly than in any other direction, and its surfaces do not become parallel to each other till the last stage of the building process. When this is completed, the whole is further strengthened by an additional coating of propolis round the margin of all the cells; and the junctions of every plane, both of the sides and bottoms of the cells, are also soldered together by a lining of the same substance. The edges of the combs are also secured in their situations by being glued to the side of the hive and supported by fresh abutments of propolis. Sometimes a mixture of wax and propolis, manufactured by the bees themselves, is employed as the cementing material. The first coating of this compound substance is denominated Commosis by Pliny, and described as having a bitter taste; the secoud, or the Prssoceros of the same author, is stated to be of a thinner

consistence, and more adhesive than the former i while the third substance, or Propolis, is completely solid.

The cells recently constructed are white, but become gradually darker, and, when very ancient, are almost black. It is therefore easy to distinguish in a hive the successive periods of formation of different portions of the combs. From the researches of Huber, it appears that these varia- tions of colour are not owing to any changes in the wax itself, but to additional coatings of a peculiar varnish, consisting of propolis and a colouring matter. The latter differs materially from propolis, being wholly insoluble in alcohol. _It loses its colour by the action of nitric acid or the light of the sun. Its origin has not yet been discovered, nor has the mode in which it is applied been clearly made out, although Huber presumes, from his observation, that the bees spread it by means of their mandibles, since he has seen them rub these against the sides of the cells, and noticed that they acquired a yellow colour from the operation.

The foundations of the combs are laid by the bees raising a solid block or plate of wax of a semicircular form. In this they scoop out a small vertical channel, of the size of an ordinary cell. The sides of this channel are then strengthened by additions of wax. On the opposite side two other channels are formed, one on each side of the plane opposite to the former channel. The extremities of

Royal cells are only formed when it is necessary that Royal queens should be reared, either from their being required cells. to lead off swarms, or from the fact of the colony being queenless through accidental circumstances.

The comb of the hive may be said to be the furniture Cell and storehouse of the bees, which by use must wear out; linings. but, independently of this, it will in time become unfit for

these channels, which at first present a curved outline, are then fashioned into straight walls, forming an angle at each vertex. The bottom of each cell being thus sketched out, the design is completed by raising walls round the sides. Different bees generally work on the opposite sides at the same time, and appear to have some perception of the thickness of the partitions, and of the situation of the opposite walls, in which they are perhaps guided by slight prominences, occasioned by the depressions which cor- respond to them on the other side ; and they scrape off the wax in those places where

its thickness is greatest, that is, where the bees on the other side had accumulated ma- terials. In this way, then, in constructing the successive tows, the axis of each cell will be found to occupy the most retiring parts of the partition, and will be opposite to the junction of three of the opposite cells.

Soon after the bees have completed the foundations, and constructed a few of the cells of the central comb, they begin two others, one on each side, at the proper distance, and in this manner continue to form others in succession, in proportion as the former are advanced. Their object at first seems to be to extend the surface of the work so as to admit of the greatest possible number of workers being employed at one and the same time. In this way, then, the work proceeds from all points at once, new cells being begun before the former are completed, so that the whole

use, by the accumulation of cocoons, which are never removed. 'These line the whole cell, sides, and bottom. Hunter counted above twenty different linings in one cell, and found the cell about one-quarter or one-third filled up.

Lord Brougham made some interesting observations on the cells of bees. By boiling the comb in alcohol after it had been bred in, he succeeded in dissolving the wax, leaving the lining ouly, which was found to be an extremely thin transparent or semi-transparent film, resembling gold-beaters' skin, without a wrinkle. The linings from old cells with thick walls kept the shape of the cells most distinctly. They had angles and planes as well defined as those of wax in the new comb, but they did not consist of a single film like the cells where one brood only had been raised. They had one film within another, and could be separated, so that as many as five or six could be extricated from the same cell; each of these had the hexagon form, and the first two, and sometimes three, had the rhomboidal form of the base also, but the innermost ones had the rhom- buses less and less distinctly marked, till the last one or two of all had spherical instead of pyramidal bases. The film adhered so closely to the wax as to defend it from the action of the solvent and even from that of heat, preventing it from melting for a considerable time. The film fitted the wax cells so completely that there never was found the least wrinkle or laxity, each being tensely

stretched in all its parts without any interval in any part. The whole of each cell was one entire piece of film going all round the prisin and all through the pyramid without any breach, section, or joining ; neither maceration nor even boiling in turpentine, ether, or caustic potash had any effect on the film.

A film of the same substance, transparent but consider- ably thicker, was found to line the queen-cells, assuming the pear or flask-like shape of the wax, and a very remark- able fact was observed. The film was not always in the inside; it sometimes lay imbedded in the wax, at least a layer of wax was laid over it of sensible thickness, indeed cousiderably thicker than some plates of the common cell, and sometimes much thicker. As a queen-cell is never used but once, never more than a single film can be found in it. How this lining is formed has never been satis- factorily determined, but it must be in one of two ways, —either by the larva forming a cocoon round itself and of an oblong figure inside, sufficient to contain it when it changes its position from a coil perpendicular to the axis of the cell into an oblong worm placed in the axis, or by the larva lining the walls of the ccll. In the former case the cocoon, originally made somewhat of the shape of the larva, must afterwards be applied by it or by the chrysalis so as to line and adhere to the walls; in the latter case the walls are lined at first by the act of weaving or spinning. But there are difficulties attending both these hypotheses and the inferences to which they lead—inferences in either case as extraordinary, to say the least, as anything observed in the economy of the bee. If the cocoon is formed loose and round, then, when the transformation takes place, the pupa must press against every part of the cell, so as to apply the film all round and equally in every part. The extraordinary part is the perfect adaptation of the cocoon to the cell. There is no wrinkle whatever. It fits exactly in every part, both the planes and the dihedral angles and the trihedral angles. The extreme fineness of the texture may facilitate its fitting so many different shapes. But how is the size sufficient and not more than sufficient in any one place? If we only consider what extreme complexity and difficulty there would be in forming a cocoon —which should increase at every hair's breadth, and increase in a ratio varying at different points, and should, on reaching its maximum size,

continue after- wards stationary in dimensions—we shall be convinced how insuperable the difficulties of the workmanship would be to any artist ever so expert or careful. But even this is not all, for as the web is to be afterwards by the sup- position applied to the circumscribed walls, the extent of the curved surface of the cocoon inscribed must be less than that of the surface which it is afterwards to line if that curve is wholly concave to the axis, in other words, if it have no points of contrary flexure. In order, therefore, that it may be exactly equal to the walls which it is to fit exactly, the cocoon must be of a form wholly different from that of the larva that made it. It must be convex at some points and concave at others to the larva; it must be loose and baggy, and the progress of its bagging or being loose must vary at every point in order that when applied to the walls it may exactly fit them at every part. The performance of such a work by the larva appears scarcely conceivable. Astonishing as the known and ascertained works of the perfect insect are, this would surpass them in a proportion that might almost be called infinite. If we adopt the second inference, we get rid entirely of the former difficulty ; for the operation of forming the film upon the walls is certainly much more easy. With the utmost nicety and precision, there is never a break to be found, and there is no part thicker than the rest, so that but one layer is applied everywhere ; and the larva knows so ac

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curately where it has begun as always to Icave off on coming round to that point without ever going again over the same ground for half a hair's breadth. The material is also very remarkable. A very high magnifying power shows no threads or separate pieces of any kind; in the great bulk of the texture, it is for the most part solid and perfectly transparent. There are interspersed irregularly a few fibres, but it should seem as if the whole was a mucilage spread over the walls rather than any webs of woven threads. But though the difficulties attending the other theory are not found in this, it has difficulties of a different kind and equally startling. The first that strikes us immediately is the use of the cocoon formed on the waxen walls. The cell was already made, and of the required form and dimensions, in which the larva could be lodged and grow and undergo its transformations. How was the lining it with the film to assist the process? If the cocoon had been of another form and wrapt round the larva, it might have served some such

purpose of covering or support; but here the cocoon exactly fits the cell and in nowise alters its form, and only by an exceedingly small portion its capacity. And how are the second and subsequent cocoons to be accounted for? The cell had been already completely lined with the film, and the additional lining could add nothing to the advantage, whatever it was, which the first lining gave the larva and chrysalis. (See Brougham's Works, vol. vi. pp.

312-364.)

Such is the general outline of the architectural labours of the bee. A number of modifications are, however, met

with, adapting them to various purposes and to new cir- °

cumstances. The cells are required to be of different sizes for the nurture of different sorts of larvee. The smallest, which are also the most numerous, are appropriated to the larvee of the working bees; a larger sort receive those of the males; and a small number of very large cells are destined for the education of the young queens, and are therefore called royal cells. The first set are generally five and one-third lines in depth, and two and a half in diameter ; the second are from seven to seven and a half lines in depth, and three and three-fourths in diameter ; while the royal cells are above one inch 'deep, one-third of an inch wide, and their walls are much thicker than those of any other cells. Other cells, again, are set apart as magazines of honey or of pollen; they are made deeper than the common cells, sometimes as deep as two inches, and their axes are inclined to the horizon, so that their mouths are in the highest part, that their liquid contents may be more easily retained. When these are filled they are closed up by the bees with a wall of wax, and opened only when necessity requires.

The regularity of the cells is often disturbed in conse- quence of the admixture of rows of larger cells with those of smaller dimensions ; but the pyramidal partitions are adapted by successive gradations to these changes, so that in many rows of what may be called cells of transition, the bottom presents four planes instead of three, two being trapeziums, and the other two irregular hexagons. These irregularities are met with chiefly in the combs most distant from the central one. When an abundant supply of

honey induces the bees to lay up a large quantity in store, they build up for this purpose the walls of common cells, so as to give them a greater depth. The royal cells are often raised from the ruins of a number of other cells, which are destroyed to make room for them ; they are usually built on the edge of some of the shorter combs, and often in the very centre of the hive. Sometimes there is but one; at other times as many as sixteen have been counted in the same hive. They are formed of a mixture of propolis and wax; their form is oblong, resembling that of a pear; their position is always vertical, so that

Different kinds of ells,

Cells of transition.

Impregna- tion,

Partheno- genesis,

“BEE

when tlicy rise from the midst of other cells, they are placed against the mouths of those cells, and project beyond the common surface of the comb. ‘They are perfectly smooth on the inner surface, while their outer side is covered with a kind of hexagonal fret-work, as if intended for the founda- tion of regular cells

The impregnation of the queeu-bee was formerly in- volved in the deepest obscurity, and has given rise to a multitude of very fanciful opinions, Some have denied that any intercourse with the male was necessary for the fecundation of the eggs. Swammerdam supposed that the mere effluvia proceeding from the males where they were collected in clusters was sufficiently active to produce this effect by penetrating the body of the female. Huber proved by decisive experiment that no such consequence resulted from these effluvia. Maraldi imagined that the eggs were fecundated by the drones after being deposited in the cells in the same way that the spawn of fishes is rendered prolific by the milt. Mr Debraw of Cambridge gave an account, in a paper published in the Philoso- plical Transactions, of a milk-like fluid he had seen in the cells. But this

appearance Huber showed to be a mere optical illusion arising from the reflection of light at the bottom of the cells. When the males are excluded from the hive the qucen is as fertile and the eggs as prolific as when they are present. Hattorff supposed that the queen is capable of impregnating herself, an opinion which was supported by Schirach and Wilhelmi, and was even favourably received by Bonnet, as it in some measure accorded with his discoveries respecting the aphis, Linneus was of opinion that an actual union between the sexes took place, and Reaumur fancied he had seen this happen within the hive. 'There is, however, great reason to think he was mistaken. It has since been clearly proved that copulation takes place in the air during flight, and if the queen is confined to the hive either by bad weather, or malformation or mutilation of her wings, although she may be surrounded by drones, she never becomes impregnated ; and if she does not find a mate within three weeks of her birth, the power of sexual intercourse seems to become lost. If a hive containing a virgin queen be attentively watched on fine days the queen will be observed preparing for her matrimonial flight, and after having attentively surveyed her home so as to be able to recognize it again she flies to a considerable height in the air ; and if her errand is successful, in half an hour she returns to the hive with unequivocal proofs of the intercourse that has taken place, for she has in fact robbed the drone of the organs concerned in this operation ; and the drone, thus mutilated, is left to perish on the ground. From its being necessary that the queen should fly to a distance in order to be impregnated, Huber infers the necessity of a great number of drones being attached to the hive, that there may be a sufficient chance of her meeting oue of them during her aérial excur- sion,

The phenomenon that sometimes occurred in a bee-hive, of the queen laying eggs that produced males only, had for ages puzzled philosophers without any satisfactory solution, and it was reserved for Dzierzon to promulgate a new and startling theory of reproduction, which, in the words of its distinguished author, is said to have '" explained all the phenomena of the bee-hive as perfectly as the Copernican hypothesis the phenoniena of the heavens." D2zierzon first expressed his views upon the reproduction of bees in the year 1845. 'The principal points of this theory may be shortly expressed thus :—Ist, That the queen (female bee), to become good for anything (2.e., to breed workers), must be fertilized by a drone (the male),

and that the copulation takes place only in the air; that drone eggs do not require fecundation, but that the co-operation of the drone is abso-

lutely necessary when worker bees are to be produced ; that in copulation the ovaries are not fecundated, but the senlinal receptacle (or spermatheca), a little vesicle or sac opening into the oviduct, which in the young queen is filled with a limpid fluid, is saturated with semen, after which it is more clearly distinguishable from its white colour; and that the supply of semen reccived during copulation is sufficient for her whole lifetime. The copulation takes place once for all, and (as already stated) only in the open air; therefore no queen which has been lame in her wings from birth can ever be perfectly fertile, that is, capable of pro- ducing both sexes, as copulation never takes place in the interior of the hive. 2d, All eggs which come to maturity in the ovaries of a queen-bce are only of one and the same kind, and when they are laid without coming in contact with the male semen, become developed into male bees. This theory of Dzierzon's has since been amply confirmed by numberless experiments, although what power the queen possesses (or how she excrcises it) of determining what eggs shall reccive fecundation and what not, is yet a mystery. Certain it is that when the queen lays an egg ina drone cell, a drone is produced; and Von Siebold, who made many most skilful microscopical examinations of eggs, affirms that among fifty-two eggs taken from worker cells, examined by him with the greatest care and conscientiousness, thirty-four furnished a positive result, namely, the existence of seminal filaments, in which movements could even be detected in thrce eggs; and among twenty-seven eggs from drone cells, examined with the same care and by the same method, he did not find one seminal filament in any single egg either exter- nally or internally. On the passage of the eggs from the ovary through the oviduct they pass the opening of the spermatheca, from which some eggs receive a portion of the scminal fluid, —these produce workers ; other eggs pass without receiving the fluid,— these produce drones. What it is that governs the deposition or non-deposition of the seminal fluid ou the egg is unknown. It has been sug- gested that the smaller diameter of the worker cells exerts some mechanical pressure on the queen's organs, which may cause the seminal fluid to be

extruded as the egg passes, while the drone cells being larger this pressure is not by them 'exerted, and the egg passes unfccundatcd. If the spermathcca of an impregnated queen be examined under the microscope its contents will be found to contain many thousands of spermatozoa, the characteristic move- ments of which are very visible. The contents of the spermatheca of a virgin or drone-breeding queen, similarly examined, will be found a limpid fluid only without a trace of spermatozoa,

The fact that the eggs of an unimpregnated queen will hatch aud produce drones may be easily verified, and is now undisputed. By depriving a colony of its queen late in the year, a young queen will be reared ; and the drones having been killed long before, no impregnation can take place, yet the queen will infallibly lay eggs which hatch into drones; these eggs are laid indiscriminately in drone and worker cells, the bees bred in the latter being stunted in their growth. If now the spermatheca be examined, no spermatozoa will be found present. 'The same result will be found if, in the summer, the virgin queen be deprived of her wings and so made unable to fly.

If the impregnation of the queen be delayed beyond, as Retarded elsewherc stated, the twenty-first day of her life, she impregna- becomes incapable of receiving impregnation, and begins 4%

soon after to lay the eggs of drones, and produces no other kind of eggs during her life. This very curious and unexpected fact was discovered by Huber; and has been satisfactorily established by his very numerous and varied experiments, although its explanation is perhaps

attended with insuperable difficulties. The abdomen of a queen that is unimpregnated is much more slender than that of one which is completely fertile; but, on dissection, the ovaries are found expanded and full of ova.

One of the most remarkable facts concerning the genera- tion of bees, is the existence occasionally of prolific workers, the discovery of which we owe to Reims. Although it was doubted by Bonnet, its reality has been fully confirmed by the researches of Huber and subsequent observers, and it

explains what was before inexplicable—the production of eggs in hives absolutely destitute of a queen. It is also remarkable that the eggs thus produced are always those of drones, but this is explained by the fact that these fertile workers have not received, and, in fact, are unable to receive, impregnation from the drone. The origin of these abnormal egg-layers is accounted for from their having passed the larva state in cells contiguous to the royal oues, and from their having at an early period devoured some portion of the stimulating jelly which was destined for the nourishment of the royal brood, their ovaries thus receiving a partial development; or when a colony is deprived of its queen late in the autumn, and an attempt to raise a queen from some unknown cause has failed, a larva has sufficiently advanced to develop into a fertile worker.

As soon as a sufficient number of cells have been con- structed, the queen begins to deposit her eggs. Unlike most insects the queen-bee deposits eggs ten or eleven months in the year in temperate climates, although it is probable this is not the case when the winter is much more severe than in Britain. Young queens ordinarily commence ovipositing thirty-six hours after impregnation. What power, if any, the queen has in determining the sex of her eggs is unknown, but, as already noticed, eggs that will produce workers or queens will always be found laid in worker cells, and those that will produce drones will also be found in their appropriate cells. A queenof a new swarm will rarely produce drones the first year; instinct, seemingly, teaching her they will not be required. In the early spring, if a clean empty piece of drone comb be put iuto the centre of the brood nest, the queen will usually fill it with drone eggs, and this circumstance is taken advantage of by scientific apiarians to secure a supply of drones for the impregnation of early hatched queens. When the eggs are about to hatch, the bees eagerly seek for that species of nourishment on which the larvee are to be fed. This con- sists of pollen with a proportion of honey and water, which is partly digested in the stomach of the bees, and made to vary in its quality according to the age of the young. The egg of a bee is of a lengthened oval shape with a slight curvature and of a bluish white colour. It is hatched without requiring any particular attention on the part of the bees, except that a proper temperature be kept up, in which case three days are sufficient for the exclusion of the larva. This has the appearance of a small white worm without feet, which remains generally coiled up at the bottom of the

cell. The bees feed it with great assiduity with the kind of chyle above described, and in every respect exhibit towards it the greatest care and atten- tion, Hunter says a young bee might easily be brought up by any person who would be attentive to feed it. As it grows up it casts its cuticle like the larve of other insects. In the course of five or six days it has attained its full size, and nearly fills the cell in which it is lodged. It now ceases to eat, and the bees close up its cell with a covering of wax, or rather an admixture of wax and propolis, which they possess the art of amalgamat- ing. During the next thirty-six hours the larva is engaged 1n spinuing its cocoon, and in three days morc it assumes the pupa state. It is now perfectly white, and every part

of the future bee may be distinguished through its trans—

parent covering. In the course of a week it tears asunder

its investing membrane, and makes its way through the outer

wall of its prison in its perfect form. Reckoning from the

time that the egg is laid, it is only on the twenty-first day

of its existence that this last metamorphosis is completed.

No sooner has it thus emancipated itself than its guardians assemble round it, caress it with their tongues, and supply

it plentifully with food. They clean out the cell which it

had been occupying, leaving untouched, however, the

greater part of the web, which thus serves to bind together

still more firmly the sides of the comb. The colour of the

bee when it quits the cell is a light grey. For several

days, sometimes a week or two after birth, the worker bees First oceu- occupy themselves within the hive, not flying abroad during pations that

time, their principal employment then being that of ae nurses ; and many old observers thought them a different i class altogether from the honey-gatherers and wax-makers.

The metamorphosis of the male bee follows the same Metamor course, but requires four days longer for its completion, Phosis of occupying twenty-five days from the time of the egg being 'Be drone. laid to the attainment of the perfect state.

When from the egg or young larva it is the intention of Metamor-

the bees to raise a queen, their attention is more incessantly phos of bestowed upon it, the cell being enlarged as elsewhere '2° (ee. described. It is supplied with a peculiar kind of food, which appears to be more stimulating than that of ordinary bees. It has not the same mawkish taste, and is evidently acid. It is furnished to the royal larva in greater quantities than can be consumed, so that a portion always remains behind in the cell after the transformation. As a proof that any worker egg or young larva not more than three days old may be made to produce a queen, the experimenter has only to supply to such an one a portion of royal jelly, and the nurses will enlarge its cell and continue so to feed it, when in due time a queen will be produced. The growth of the larva and the development of all its organs are very much accelerated by this treatment, so that in five days it is prepared to spin its web, and the bees cnclose it by building up a wall at the mouth of its cell. The web is completed in twenty-four hours ; two days and a half are spent in a state of inaction, and then the larva transforms itself into a pupa. It remains between four and five days in this state, and thus on the sixteenth day after the egg has been laid, the perfect insect is produced. When this change is about to take place, the bees gnaw away part of the wax covering of the cell till at last it becomes pellucid from its extreme thinness. This not only must facilitate the exit of the bee, but may possibly be useful in permitting the evaporation of the superabundant fluids. .

But the queen bee, although perfectly formed, is not Rivalship always at liberty to come out of her prison, for if the of the queen-mother be still in the hive waiting a favourable 1°°™ state of the weather to lead forth another swarm, the bees do not suffer the young queens to stir out; they*

even strengthen the covering of the cell by an additional coating of wax, perforating it with a small hole through which the prisoner can thrust out her tongue in order to be fed by those who guard her. The royal prisoners continually utter a kind of plaintive cry, called by bee-keepers " piping," and this appears to be answered by the mother queen. The modulations of this piping are said to vary. The motive of this proceeding on the part of the bees who guard them is to be found in the implacable hatred which the old queen bears against all those of her own sex, and which impels her: to destroy without mercy all the young queens that come within her reach. The workers are on this account very solicitous to prevent her even approaching the royal cells while there is any prospect of a swarm being about

to issue. They establish themselves as a guard around these cells ; and, forgetting their allegiance on this occasion, actually beat her off as often as she endeavours to come near them. If, on the other hand, the swarming season is over, or circumstances prevent any further swarms from being sent off, the bees do not interpose any obstacle to the fury of the old queen, which immediately begins the work of destruction, transfixing with ler sting one after the other the whole of the royal brood, while they are yet confined in their cells. It is observed by Huber, that the royal larvee construct only imperfect cocoons, open behind,

fro in the combs with evident marks of impatience. The heat of the hive is increased by their tumultuous move- ments ; it sometimes rises suddenly on these occasions from 92° to above 104°. A general buzz is heard throughout the hive. This state of things occurs from time to time for some days before the swarm is actually on the wing ; and the interval is occupied in making preparations for the approaching expedition ; provisions are collected in greater quantity by the workers. Hunter killed several of those that came away, and found their crops full, while those that remained in the hive had their crops not nearly so.

and enveloping only the head, thorax, and first ring of the abdomen ; and he conceives that the intention of Nature in this apparent imperfection is,

that they may be exposed

On the day on which the swarm quits the hive, few of Departure the workers roam to any distance, but several are seen per- of the forming circles in the air round the hive. The noise is on S¥”™

Swarming.

to the mortal sting of the queen, to whom they may be given up as a sacrifice.

When the old queen has taken her departure along with the first swarm, the young queens are liberated in succes- sion, at intervals of a few days, in order to prevent their attacking and destroying one another, which would be the infallible consequence of their meeting. This exterminating warfare is prevented by the vigilance of the bees which guard them, so long as new swarms are expected to go off. When a young queen is liberated, she is, like others of her sex, anxious to get rid of her rivals, and even at that early age seeks to destroy her sisters, which are still confined in the other royal cells; but as often as she approaches them she is bit, pulled, and chased without ceremony by the sentinels. But when the season is too far advanced for swarming, or if two or more queens should happen to emerge at the same moment, they mutually seek each other and fight till one is killed, and the survivor is immediately received as the sovereign of the hive. The bees, far from seeking to prevent these battles, appear to excite the combatants against each other, surrounding and bringing them back to the charge when they are disposed to recede from each other, and when either of the queens shows a disposition to approach her antagonist, all the bees forming the cluster instantly give way to allow her full liberty for the attack. The first use which the conquering queen makes of her victory is to secure herself against fresh dangers by destroying all her future rivals in the royal cells ; while the other bees, which are spectators of the carnage, share in the spoil, greedily devouring any food which may be found at the bottom of the cells, and even sucking the fluid from the abdomen of the pupe before they toss out the carcasses.

We are now to direct our attention to the migrations of bees, by which new colonies similar to that which had originally peopled the parent hive are

founded. The final causes of this phenomenon are sufficiently obvious, but it does not so clearly appear to what circumstances it is immediately owing. The increasing population of a hive probably occasions inconvenience from want of room; the increase of heat and the greater vitiation of the air become still more serious as the summer advances, The spring is, accordingly, the commencement of the swarming season. No swarming, indeed, will ever take place while the weather is cold, or until the hive is well stocked with eggs. The queen-bee, in consequence of the great number of eggs she has been laying, is now reduced to a more slender shape, and is well fitted for flight; her aversion for the royal brood, which she seems to foresee will in a short time become able to dispute the throne with her, and the vain attempts she makes to destroy them in the cradle, in which attempts she ig invariably repelled by the bees who guard them, produce in her a constant restlessness and agitation which, as Huber represents it, rises to a degree of delirium. This frenzy, from whatever cause it may originate, is communi- cated to the workers ; they may be seen hurrying to and

a sudden hushed, and all the bees enter the hive; this silence announces their immediate departure. A few workers appear at the door, turn towards the hive, and striking with their wings, give, as it were, the signal for flight, All those which are to accompany the expedition rush towards the door, and issue forth with wonderful rapidity, rising in the air and hovering for some time, as if in order to wait for the assemblage of the whole troop ; then, having selected a rallying point, generally on some tree or bush, some alight, being joined immediately by others until the whole number is collected in one mass of bees. It does not always happen that the queen is the first to alight or is with the cluster at all; but if she be not there the bees soon discover it and disperse in search of her—if they fail to find her they return to the parent hive. Thither the queen sometimes, from weakness or other causes, returns, and is immediately attended by the rest. But if the weather be fine, the expedition is only deferred for one or two days, and they again take their departure. If their return be owing to the loss of their queen, they remain a fortnight or longer before the attempt to migrate is renewed, and then the swarm is much larger than before, which renders it probable that they have waited for the queen that was to go off with the next swarm. Sometimes, when everything indicates an approaching emigration, the passage of a cloud across the sun will suspend all their operations, and

the previous bustle gives place to a state of perfect calm. But, if the day be not far advanced, the breaking out of sunshine will renew the commotion, and determine the moment of actual flight.

The swarm having rested for some time on the first landing-place, and collected the whole of its numbers, soars again in the air, keeping in a close phalanx, and directing its course with great velocity to the spot which their guides had selected,—giving out, at the same time, a loud and acute-toned hum by the action of their wings.

The parent hive, thus deserted by its queen and a large proportion of its inhabitants, is busily occupied in repair- ing its loss. The bees which remain quietly pursue their

labours; the young brood, soon arriving at maturity, Succession quickly fill up every deficiency ; and young queens, being of swarms.

allowed their liberty, one after the other, conduct in their turns new swarms, in the same manner as the first. The second swarm is not sent off till after the space of from five to ten days after the first. The following swarms succeed quicker to each other, but consist of smaller numbers than the earlier ones. If it happen that two queens are found in a swarm, either the swarm divides itself into two, and have separate destinations, or a single combat between the queens decides on which of them the empire is to devolve. Sometimes, indeed, they appear not to perceive each other, and the parties belonging to each construct separate combs within the same hive ; but no sooner do these combs come in contact, and thus give occasion to the queens meeting each other, than a contest begins which terminates only by the death of one of the rival queens.

Massacre of the drones.

Provision for the winter.

Mutual de- predations,

Successive swarms are sent off as long as the increase of population permits; and the number thus produced in a scason depends on a variety of circumstances, such as the abundance of flowers, the warmth of the climite, and capacity of the hive. Bosc, while he was French consul in Carolina, found a stock of bees in the woods which had been robbed of its wax and honey by the negroes ; he con- trived to convey the bees in his hat to a hive in his garden. He obtained from this hive eleven swarms before the end of autumn; and these, again, gave him the samme number of secondary swarms, so that by the end of the year he had twenty-two hives stocked from the one he had thus saved from destruction. In Britain a hive commonly sends off only two and sometimes three swarms in the course of the summer; and prudent apiarians will be satisfied with one swarm only, returning all subsequent ones to the parent hive, which would otherwise become very weak. When bar-frame hives are used, the issue of after-swarms is easily and surely prevented by destroying all queen-cells but one after the issue of the first swarm.

Very few drones accompany the new colonies, so that almost all those produccd in the spring remain in the hive. But when the queens are impregnated, and no new swarms are about to take place, the workers, who had till then suffered them to live unmolested in the hive, are on a sudden seized with a deadly fury towards them, and a scene of carnage ensues. This usually happens in June, July, or August. They chase thcir unhappy victims in every quarter, till they seek a refuge at the bottom of the hive, where they collect in crowds, and are indiscriminately, and without a single exception, massacred by the working bees, who, with implacable fury, bite, maim, and throw them out of the hive. So great is their antipathy to all the race of drones, that they destroy, at the same time, the male eggs and larvae, and tear open the cocoons of their pup, in order to devote them to one common destruction. This sacrifice of the males is not, however, the effect of a blind and indiscriminating instinct; for if a hive be deprived of its queen, the massacre does not take place, while the hottest persecution rages in all the surrounding hives. In this case the males are allowed to survive the winter.

Having thus got rid of the useless mouths which con- sumed, without any advantage to the public, a large portion of their provisions, the bees spend the remainder of the summer in collecting stores of honey and of pollen for

the ensuing winter. Their gleanings are now less abundant than in the spring, and require more labour in the search and collection. But at this season the leaves of many kinds of trees, which are covered in the morning with a saccha- rine fluid that exudes from them, furnish them with a species of nourishment, which, though of very inferior quality to the nectarial fluid, still contributes to their support. Fruit is also attacked by bees, after the cuticular covering has been broken through by birds or snails. They also find nutriment in the honey-dew, which is an excrementitious fluid deposited on the leaves of plants by certain species of aphides. Often, however, these resources fail, and the hive is threatened with famine. On these occasions the distressed bees frequently betake themselves to plunder; and if a weak or queenless hive can be dis- covered they begin a furious onset, which costs great numbers their lives. If the invaders should fail in their attempt to force the entrance they retreat, and are not pursued by those whom they have assailed; but if they succced in making good the assault, the war continues to rage in the interior of the hive until one side finds itself beaten, in which case, should the conquerors be the invaders, the invaded will generally join their forces, and help their late enemies to carry of their plunder, and at once become members of the lately hostile hive.

BE E

The life of a queen-bee will sometimes extend to three Length of or four ycars, but her fertility decreases after her second life.

breeding season. When absent from the hive on her matrimonial excursions she very often becomes a prey to a bird, and not seldom on her return mistakes her hive, when she is probably killed by the stranger bees, or by the queen on whose territory she has intruded. Drones seldom die a natural death; there is no evidence of the duration of the lives of individuals, but normally they are hatched about May and slaughtered by the workers in June, July, or August ; should the hive be queenless, however, the workers do not harin the drones, and some will then live far into the winter or even to the following spring. The life of a worker is greatly dependent on the season of the year and the amount of labour performed. The modern method of introducing a fertile Ligurian queen (Apis ligustica) into a queenless stock of the common black bee (Apis meliifica), in order to obtain

pure stocks of the former variety, has plainly demonstrated the short life of the worker bee. If the Ligurian queen be introduced in May, when bees are busy and work abundant, in from six to eight weeks thereafter scarcely a black bee will be found in the hive, although at the time of the introduction multitudes of young larves were present, which probably would not all be fully deve- loped for nearly three weeks ; therefore, in the season of hardest work, the inhabitants of the hive would seldom attain the age of six weeks. But if the experiment of the queen's introduction be deferred until October, then not until the following May will the black bees have become extinct. And it isa curious fact that if a hive be deprived of its queen in October (and none other supplied), then the workers, having no labour to perform either in replen- ishing stores or attending on the larve, will possibly in May be found still living, although somewhat reduced in numbers. Such a colony, however, generally becomes a victim to robbers when the activity of spring arrives, for a queenless stock rarely makes much defence of its stores. In fine winter days, when the sun shines brightly, numbers of bees are tempted abroad, which easily become benumbed by cold, fall to the ground, and die. Inscctivorous birds also make victims of great numbers at such times, other insect food being scarce ; so that, probably, in winter and early spring, more workers die from accident than by natural decay. The fecundity of the queen-bee is, however, adequate not only to repair these losses, but to multiply the population in a very high progression, Apvs ligustica has the reputation of being more prolific than A. mellifica ; and a young and vigorous queen will, in the fine weather of a warm May and June, deposit as many as 2000 eggs per day for several weeks in succession, and tls fertility is of much longer continuance in America and other warm climates than in England. In England, eggs are deposited and young reared ten or eleven months in the year, when the colony is strong in numbers and well supplied with stores; but the increase in the cold months seldom equals the decrease by deaths.

The loss of the queen is an event which has the most Loss of the marked intluence on the conduct of the workers. Although queen.

the queen is constantly an object of attention and of affection to the whole community, they are not immediately sensible of her absence when she is removed from the hive. The ordinary labours are continued without

interruption, and it is not till a whole hour has elapsed that symptoms of uneasiness are manifested, and it is even then only partially displayed. The inquictude begins in one part of the hive, the workers become restless, abandon the young which they were feeding, run to and fro, and, by striking each other with their antenne, communicate the alarming intelligence very quickly to their companions. The ferment soon extends to the whole community; the bees rush

Rearing supernum- erary queens,

BEE

precipitately out of the hive, and seek for their lost queen in every direction This state of confusion continues for a day or two, after which tranquillity is again established ; they return to their labours; and, selecting an egg, or one of the larve that is not more than three days old, they break down two of the contiguous cells, sacrificing the larve con- tained in them, and proceed to build up one royal cell from their ruins. They then supply the worm with the food necessary to promote its quick growth, and leaving untouched the rhomboidal bottom thcy raise around it a cylindrical enclosure In three days the larva has grown to such a size as to require an extension of its lodging, and must inhabit a cell nearly of a pyramidal figure, and hanging perpendicularly. A new pyramidal tube is there- fore constructed with the wax of the surrounding cells, which is soldered at right angles to the first, and the bees, working downwards, gradually contract its diameter from the base, which is very wide, to the point. In proportion as the worm grows, the bees labour in extending the cell, and bring food, which they place before its mouth and round its body, forming a kind of coiled zone around it. The worm, which can move only in a spiral direction, turns incessantly to take its food before its head; it insensibly descends, and at length arrives at the orifice of the cell. It then transforms itself into a pupa, is enclosed with a covering of wax, as before described, and, in the space of ten to sixteen days the original loss is thus repaired by the birth of a new queen. Schirach found that, if a number of bees be confined with even a single larva, which in the natural course would have become a worker bee, they immediately set about giving it the royal education above described, and thus raise it to the dignity of queen.

The discovery that queens may be reared at will has been confirmed by recent experiment, and is now largely taken advantage of by apiarians both in Europe and America, to facilitate the making of artificial swarms and otherwise increase the production of bees. By the aid of small frame hives called nucleus boxes, which only materi- ally differ from the larger or mother hive by containing frames less in number and in size (generally three), a stock of fertile queens is kept on hand ready to supply any colony requiring a sovereign, or to exchange an old queen for a young one, or a Ligurian queen for an ordinary English one. An example of the method of rearing these queens is as follows :—A full comb containing young worker larvze and eggs is taken, with all its attendant bees, and placed in the centre of the nucleus box, flanked on both sides by other combs containing honey. Sufficient young bees, which have not flown, are now added to cover well the brood comb, in order that proper heat may be kept up to mature the brood. As soon as the members of this small com- munity find themselves without a queen, a dreadful uproar ensues ; and, probably, should there be bees among them who know their way home, they will desert, but enough will usually remain to carry on the desired work ; if not, more young bees must be added. These may be known by their fresher and greyerappearance. After a few hours the commotion will subside, and the bees will proceed to the construction of royal cells, and take proper care for the feeding and hatching of the larve selected for royal honours. Generally on the second day, the foundations of royal cells are perceptible, the number of these vary from one or two to as many as sixteen. In from ten to sixteen days, according to the age of selected eggs or larvae, the young queens will arrive at maturity ; and as the first at liberty will destroy the others if allowed, the apiarian in good time cuts out the sealed royal cells, which are dis- tributed by grafting on other combs into newly-formed nuclei, or into such hives as require a queen. The young queens, on their emergence from the pupa state, are now

each at the head of a colony, where they remain until they become fertile in the natural way, and are then ready for such purposes as they are required for.

In Switzerland, Italy, and Germany a large business is Imported done in Ligurian queen-raising for export. Great numbers of (cens.

those queens come to England and America in little wooden boxes, accompanied by sufficient workers to develop enough heat. The price in Italy varies, accarding to the season, from five francs in October to twelve francs in March ; but few are raised until May, owing to the difficulty of their obtaining impregnation. To overcome this difficulty in the autumn some colonies are purposely kept queenless, whose drones remain in existence.

The advantage of The advan-

having fertile queens at the bee-master's disposal is very tages of

great. usually mature, and has to become impregnated. Should unfavourable weather ensue, a still further delay occurs ; and the virgin queen, on her excursion, is liable to be lost or killed. Should no such accident occur, it may still be two or three weeks before ovipositing again commences, and this in the very height of the breeding season ; while if the skilful bee-master, first taking the precaution to destroy any existing queen cells, can immediately, on the issue of the swarm, introduce the queen and her rctinuc from a nucleus hive, no time is lost, and probably 20,000 to 40,000 eggs will be deposited in the time that would otherwise have been lost. By this system of nucleus queen-rearing, it may be fairly calculated that the increase of population may be doubled. While the hive remains without a queen swarming can never take place, be the hive ever so crowded.

Huber has made the singular observation that two queens, however inveterate may be their mutual hostility, never actually destroy each other, and that when in the course of their contest they are placed in such a relative position that each has it in her power to strike a mortal blow on the other with its sting, they suddenly separate, and part with every appearance of being panic-struck. The final cause of the instinct that prompts this conduct is sufficiently obvious, as, without it, the hive would be altogcther deprived of a queen.

Bees recognise the person of their own queen.

When a swarm issues the young qnecn is not SUPpernum- erary

queens.

Queen eombats.

If a Alien

stranger enter the hive, they seize and surround her until queens.

a ball of bees is formed one or two inches in diameter ; in which imprisonment the unfortunate monarch is kept until death puts an end to her misery, for it is very remarkable the bees seldom sting a queen. A hive that has lost its queen may, however, by certain precautions be induced to accept a substitute. The most common way of attaining success in this operation is to imprison the stranger queen in a small cage of wire gauze or perforated zinc; this being suspended between two central combs or fixed upon one, the bees become accustomed to the odour and appear- ance of their new sovereign, and after the lapse of one or two days will readily accept her. Ifasupernumerary queen be introduced into the hive, she is laid hold of by the bees and presented to the reigning queen, while a ring is formed by the bees, who continue to be spectators, and even promoters of the combat, in which one or other of the queens is destined to perish. Schirach and Reims had imagined that, in these circumstances, the stranger met her death from the hands of the working bees, but this mistake has bcen corrected by Huber, who gives the account above stated.

We have next to relate the results of experiments of a Effects of more cruel kind, which illustrate several points in the mutila-

physiology of these insects. wings of the queen did not interfere with her laying eggs, and the workers did not show her the less attention on account of her being thus mutilated. Of course, if the MULE No

The amputation of the four tions.

operation be performed before she is impregnated, she remains barren, since it is necessary for the sexual congress that she should fly out of the hive. The amputation of a single antenna appeared to be productive of no bad conse- quence of any kind ; but the removal of both the antennsz was followed by singular effects. The queen which had suffered this operation ran about in apparent confusion, dropping her eggs at random, and was incapable of directing her tongue with precision to the food that was offered her. At times she appeared desirous of escaping from the hive ; and wheu this was prevented, she returned in a state of delirium, was indifferent to the caresses of the workers, and received another similarly mutilated queen that was pre- sented to her without the least symptom of dislike. The workers, on the other hand, received the stranger queen with great respect, although the first still remained in the hive. A third qucen, not mutilated, was next introduced; she was very ill received and immediately detained and kept a close prisoner, being evidently regarded as an intruder. When the queen deprived of her antennz was allowed to quit the hive, she was followed by none of the workers, and was abandoned to her fate.

The wasp and the hornet have long been known as the determined enemies of the bee, committing great ravages among these weaker insects ; they attack them individually, but oftener commit their aggressions in large armies, on which occasions numbers perish on both sides. In some parts of America wasps have multiplied to so great a degree as to render it impossible to rear bees. Among quadrupeds the ant-eater occasionally devours them. The bear and the badger overturn the hives, and plunder their contents. Rats and mice are very formidable enemies, as they attack the bees at all seasons, and especially during the torpid state of the insects, when they are incapable of revenging the aggression. The woodpecker may succeed in breaking through the hive, and then speedily destroys all its inhabitants; the swallow, the sparrow, the tit- mouse, the cuckoo, the Merops apiaster, or bee-eater, and poultry of every kind, prey upon them separately. Accord- ing to Bose, they are also food for the shrikes and for

the Falco apivorus. Lizards watch for them, and seize them as they alight near the hive. Toads occasionally devour them. They are in some danger from the larger kinds of spiders, and of Jzbellule, as also from the Philanthus apworus of Fabricius. But the most insidious and de- structive enemies of these insects are moths, two species of which, Galleria mellonella and Achroia grisella, insinuate themselves into the hive, and deposit their eggs on the combs in such numbers, that the hive is soon overrun with the larvee, the combs destroyed, and the bees event- ually foreed to vacate the hive. In America and in Italy these moths are much more troublesome than in England. On the Continent of Europe bees are also troubled with a parasite called the bee-louse (Braula ceca), some- times as many as 50 or 100 being found on a single bee, and as they live by suction they are great pests. This insect is not frequently found in England except accom- panying imported Ligurian bees.

Bees are subject to few diseases, but these few are some- times veryfatal. Dysentery occasionally commits great havoc in a hive, and is usually caused by the neglect of sanitary measures, by close confinement, want of ventilation, and damp. Dysenteryis indicated bythe appearance of the excre- ment within the hive, which the bees in a healthy state are particularly careful to exclude. It is often induced by the bees being forced into undue excitement in cold, ungenial weather. The disease known generally by the name of "foul brood" is the most fatal of all; it is highly contagious,—the infection from its presence remaining in the hives, combs, and honey long after the bees are exterminated. Dysentery

is a disease of the perfect insects only. Foul brood is con- fined to the larva, which, having grown to near maturity, die and putrefy after being sealed over by the bees. The workers seem totally unable to remove the foul mass which thus remains to spread infection all around. The seed of the disease is believed to lie in the presence of the spores of a microscopical fungus (Micrococcus), and long scientific discussions and experiments have been made on the Con- tinent to demonstrate this, particularly by Drs Preusz and Schénfeld. The devastation caused in apiaries by this disease .is sometimes fearful. Dzierzon relates that, in 1848, he had nearly the whole of his

colonies destroyed by it, more than 500 being destroyed, and only 10 escaping. Quinby also, in America, has lost as many as 100 stocks in a single year by this pestilence. And when once fully developed a total destruction of all hives and combs infected appears to be the only way of eradicating it. Honey from a foul brood hive will carry the germs of the disease to any bees which may consume it. The presence of this disease may be detected by the foul smell emanating from the hive, and from the circumstance of many cells remain- ing covered longer than naturally occurs when there are living pupz within them.

In the management of bees a great deal must, of course, depend on supplying them with an abundant pasture. A rich corn country is well known to be to them as a barren desert during a great portion of the year. Hence the judicious practice of shifting them from place to place according to the circumstances of the season. It was the advice of Celsus that, after the vernal pastures were con- sumed, bees should be transported to places abounding with autumnal flowers ; and in accordance with that advice they were in ancient times annually carried from Achaia to Attica, and from Eubcea and the islands of the Cyclades to Scyrus. In Sicily, also, they were brought to Hybla from other parts of the island. So also in Scotland, so soon as the " bright consummate flowers " of summer are on the wane, the people of the Lowlands despatch their hives in cart-loads to the blooming heather of the mountain pastures, where a never-ending paradise of sweets is spread before them. It is, indeed, to be regretted that our moor- lands are not more utilized for this object than they are. The very air of the Highland hills is often redolent with rich perfume, giving earnest of a bountiful harvest ; only a solitary bee is seen here and there, labouring with wearied wing among the inexhaustible stores of nature, and scarcely able to regain with its burden its lonely shieling in the distant vale. Considering the poverty of the peasantry, and their frequent want of occupation, it is to be lamented that so easy and pleasant a source of emolument should be so much neglected by them. In consequence of this neglect a large sum is paid every year to foreign nations for articles that could be raised at home, in every respect superior, with very little outlay either of labour or of capital.

We learn from Pliny that the practice of removing bees from place to place was frequent in the Roman territories. "As soon," he says, "as the spring

food for bees has failed in the valleys near our towns, the hives of bees are put into boats, and carried up against the stream of the river in the night, in search of better pasture. The bees go out in the morning in quest of provisions, and return regularly to their hives in the boats, with the stores they have collected. This method is continued till the sinking of the boats to a certain depth in the water shows that the hives are sufficiently full; and they are then carried back to their former homes, where their honey is taken out of them." And this is still the practice of the Italians who live near the banks of the Po, the river which Pliny instanced particularly in the passage above quoted.

Pasturage,

Bee keep- ing in different countries.

BEE

M. Maillct relates, in his description of Egypt, that, "in spite of the ignorance aud rusticity which have got possession of that country, there yet remain in it several footprints of the industry and skill of the ancicnt Egyptians. One of their most admirable contrivances is sending their bees annually into distant countries, in order to procure sustenance, at a time when they could not find any at home, and afterwards bringing them back, —like shepherds who should travel with their flock, and make them feed as they go. It was observed by the ancient inhabitants of Lower Egypt, that all plants blossomed, and the fruits of the earth ripened, above six weeks eatlier in Upper Egypt than with them, They found that the same law applied to their bees ; and the means they then made use of to enable these usefully industrious insects to reap advantage from the more forward state of nature there, were exactly the same as are now practised for the like purpose in that country. About the end of October, all such inhabitants of Lower Egypt as have hives of bees, embark them on the Nile, and convey them up that river into Upper Egypt, observing to time the journey so that they arrive there just wheu the inundation is withdrawn, the lands have been sown, and the flowers begin to bud. The hives thus sent are marked and num- bered by their respective owuers, and placed pyramidally in boats prepared for the purpose. After they have remained some days at their furthest station, and are supposed to have gathered all the wax and honey

they could find in the fields within two or three leagues around, their conductors convey them in the same boats two or three leagues lower down, and there leave the laborious insects as long time as is necessary for them to collcct all the riches of this spot. Thus the nearer they come to the place of their more perma- nent abode, they find the productions of the earth, and the plants which afford them food, forward in proportion. In fine, about the beginning of February, after having travelled through the whole length of Egypt, gathering all the rich produce of the delightful banks of the Nile, they arrive at the mouth of that river, towards the ocean, from whence they originally set out. They are now returned to their several homes, great care being taken to keep an exact register of every district from which the hives were sent in the beginning of the season, their numbers, the names of the persons who sent them, and likewise of the mark or number of the boat in which they were placed."

In many parts of France floating bee-houses are also common ; there are on board one barge three to five score of bee-hives, well defended from the inclemency of an accidental storm. The owners allow their barges to float gently down the river, the bees continually choosing their flowery pasture along the banks of the stream, and thus a single floating bee-house yields the proprietor a consider- able income. They have also a method of transporting their bees by land which is well worth imitation. Those hives being selected whose combs are firm and not: likely to be broken by jolting, thirty to forty of them are carefully packed in tiers in a cart, which proceeds slowly on its travels. If the season be sultry, they journey only at night, the hives being covered up with a cloth. On arriv- ing in a suitable locality the hives are taken out of the cart, set upon the ground, and the bees go forth in search of food. In the evening, as soon as they are all returned, the hives are shut up, and being placed again in the cart they proceed on their journey. When the caravan has arrived at its destination, the colonies are distributed in the gardens or fields adjacent to the houses of the different peasants, who, for a very small remuneration, undertake to look after them.

On the continents of Europe and America bee-keeping is carried on in a much larger and more scientific manncr than in the United Kingdom, where the cottagers still, in the greater majority of instances, use only the ancient straw skep or hive, and know no other method of depriving the colonies of

their stores than the barbarous and wasteful practice of smothering them with brimstone. In Russia the province of Pultowa boasts of 500,000, and Ekater- inoslaw has 400,000 hives. In Western Russia the industry chiefly flourishes in the province of Kowno, whcre the Tchmude tribe are almost wholly engaged in bee-keeping ; and in EKastern Russia the Finnic tribe are enthusiastic apiarians. In Siberia bee-keeping is mostly carried on about the Altai mountains, and in Caucasia by the Meretinzes and Grusinians. In Southern Russia artificial hives are used, while in North Russia the bees are kept in

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a natural manner in the forests. The principal reasons why bee-culture is so industriously carried onin Russia are, first, because the peasants use honey instead of sugar, and, secondly, because wax tapers, to the value of 1,200,000 roubles are required for the churches. Mr Buschen states that the quantity of honey annually produced in European Russia is 600,000 to 700,000 ib. In Hungary and Ger- many apiaries of 2000 to 5000 colonies are said to be not in- frequent; aud great numbers are in the autumn often found congregated together on the heaths. In 1873 the aggregate number of stocks in Germany, including Hanover and Hesse Cassel, was found to be 1,453,764 stocks ; Bavaria alone had 338,897. The German Government eucourages bce culture in every possible manner; teachers, paid by the state, travel throngh the rural districts teaching the best methods of cultivation; and all schoolmasters, before receiving their diplomas, have to pass an examination in this subject. Bee- clubs in the villages are common, money for prizes and expenses being in part supplied by the Government. The result of this fostering care is that Germany produces many skilful apiarians, who contribute greatly to our knowledge of thescience. In the United States bee-farming is largely carried on as a distinct trade, every scientific appliance being eagerly brought into use. The country also seems to be particularly productive of honey-secreting flowers, and consequently large harvests are gathered. In 1874 one bee- farm alone, that of Mr Harbison, situated in San Diego county, California, produced 150,000 ib of honey, of a market value of $30,000, from 2000 stocks of bees. The honey-bee of both varieties (Apis medlifica and A. ligustica) has also been

introduced into South Africa and New Zealand, where it flourishes amazingly.

Apiaries and Hives.

Having thus given at considerable length the natural Apiaries history of the hive-bee, we proceed to describe the most 4nd hives.

approved hives, &c., in use in a well-managed apiary. Greater attention to this useful appendage to the cottage would not only be productive of commercial advantage, but would tend to improve the condition of the peasantry. It is not generally known, indeed, what profitable results may be obtained, at a trifling expense of time and labour, from bee-keeping. Even supposing the first cost of a swarm to be one guinea, which is a high price, the cottager, with proper care and management, will clear, in five years, a net profit of nearly £60, and have besides, at the end of that period, ten good stocks of bees in his garden.

The principal objects to be considered in the construction and management of an apiary, are, first, to secure the prosperity and multiplication of the colonies, and then to increase the amount of their productive labour, and to obtain their products with facility and with the least possible detriment to the stock. The apiary should afford to the bees shelter against moisture and the extremes of heat and of cold, and especially against sudden vicissitudes of temperature. The hives should render every facility for constructing the combs and rearing the young; they should allow of every part of the combs being occasionally in- spected, and of their being removed when necessary; and, while due attention is paid to economy, they should be made of materials that will insure durability. Much ingenuity has been displayed by different apiarians in the construction of hives to unite in the greatest possible degree all these advantages; but thcre is still great room for improvement on the hives that are in common use.

While some cultivators of bees have been chicfly anxious to promote their multiplication, and prevent the escape of the swarms in the natural way by procuring what are termed "artificial swarms," wluch is effected by various means, others have taken into consideration only the

abundance of the products which they yield, and the best way of extracting them from the hive, without showing any particular solicitude as to the preservation of the bees themselves; still another class of apiarians have had more particularly in view the prosecution of researches in the natural history and economy of bees. The hive invented by Huber was in his time a great advance for the purpose last named He gave it the name of "ruche en livre ou en feuillets" from its opening and shutting somewhat in the manner of the leaves of a book. It had, however, many inconveniences which are remedied in some hives of more modern construction, and Huber's leaf-hive is now rarely used, although it may claim the distinction of having been the first of the frame hives which are now, with many modifications, generally acknowledged to be the only ones capable of giving the maximum of prosperity to the bees and producing a large honey harvest, combined with affording facilities for observation and manipulation. The old cylindrical straw skep or hive is still generally used among the cottagers of England, although abandoned in many other countries. While very excellent for warmth and ventilation, it has the disadvantage that its interior is inaccessible for information; and the fixity of its combs precludes many manipulations which the skilful apiarian is called upon to perform. This was well known to the ancients, who, to remedy it, fitted the crowns of their hives with movable wooden bars, from which the bees built their combs, but still they were attached by their sides to the hive and required to be cut away before they could be removed,—these operations greatly disturbing the bees. In 1851, Dzierzon in Germany, and Langstroth in America, two of the most skilful apiarians of the present day, simul- taneously designed or invented the bar-frame hive, the principle of which, with many varieties of detail, is found in all the best hives now in use. A well-known English example of this kind of hive is the '"' Woodbury" (fig. 4), named after its designer, Mr Woodbury of Exeter. This consists of a square wooden box, 144 inches in diameter (inside measure), and 9 inches deep, covered by a top or crown-board either loose or lightly screwed down. This board has a circular hole in the centre, 24 inches in dia- meter, for feeding purposes, and when not in use is covered with perforated zinc or a block of wood. The floor-board is 18 inches square, with an entrance cut in it 'forming a channel about 4 inches wide and 3ths of an inch deep. At the part where the

front of the hive crosses it gradually slopes upwards inside the hive. An alighting- board for the bees is fixed to the front of the floor-board opposite the entrance, and projects 3 or 4 iiches; a wouden ridge-roof covers all. The interior of the hive is fitted with ten frames; they re made of light lath, about Zths of an inch wide, the top bars being ths and the sides and bottom rails ;5,ths of an inch in thickness respectively. The top bars are 15} inches in length, and project into notches cut into rabbets at the back and frout of the hive to receive them. The rabbetsare 3ths of an inch deep, and the notches in them are of the same depth, so that the projections in the bars rest flush in them, leaving a space of $ths clear above the frames, over which the bees can travel. The ten frames occupy equal portions of the interior space ; if this be divided into ten equal divisions, the centre of each will be exactly the point at which the centre of each bar-frame should rest; these points will be 1,%, inches

Fia. 4.—-The Woodbury Frame Hive.

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apart. In these frames it is intended that the bees shall build their combs ; aud when they have done so, any frame may be quietly lifted out of the hive with all the bees upon it, whether for examination or for division of the stock for an artificial swarm. 'To induce the bees to build straight in the frames a thin strip of comb is usually attached to the underside of the top bar, or a thin line of molten wax poured down the centre of the bar will answer the purpose, as the bees will follow the guide thus laid. For the purpose of providing storage-room for honey an upper storey, called a "super," is added to the hive, of the samo diameter but of less height, 3 to 5 inches usually sufficing, as when filled it may be taken off and an empty one substi- tuted. Before a super be placed in position, the crown-board should be removed, and a thin board, called an "adapter," substituted ; this, in place of the round central hole, has near each side a long aperture, =3,ths of an inch wide, which gives passage to the workers, but not to the queen and drones—the latter being useless there, and it being desirable the queen should not oviposit in the super.

Elegant supers are made of glass globes, or propagating glasses, which the bees will readily use if enticed into them by a few pieces of clean white

comb.

Many improvemeuts have been made on the Woodbury hive, tending still further to the comfort and well-being of the bees, as well as to the furtherance of scientific study; and, perhaps, the hive that may be said to combine most of these advantages is one designed by Mr Frank Cheshire, and known as the "Cheshire Hive" (figs. 5 and 6).

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Fria. 5.—The Cheshire Frame Fic. 6.—Section of Cheshire Hive.

Hive.

To afford the becs the maximum of comfort and to economize their heat. the walls of this hive are made double, enclosing an air space. 'The Woodbury frames are used, but rest on the thin edge of a strip of zine within the hive at the back and front, which prevents the bees fixing them with pro- polis. The floor-board is constructed to slide in a groove beneath the hive, and the entrance can be enlarged or diminished at pleasure by a pair of sliding-shutters; the hive is complete with stand and roof, and altogether leaves little to be desired.

The adoption of frame hives has greatly facilitated the scientific study of the insects' habits, the artificial multiplication of colonies, and the appropriation of their surplus stores without injury to the bees. It is quite a secondary consideration what size or pattern of frame is used, or how the frames are suspended in the hive, provided the principle of movable frames be adopted ; and although much ingenuity has been exercised by scientific men to design a hive embracing every possible advantage regardless of

cost, the roughest timber and coarsest workmanship will give as good results as the most elaborate. Frame hives are exceedingly well calculated for procuring artificial

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swarms. 'They allow us to judge by inspection whether the population be sufficient to admit of division, if the brood be of the proper age, if drones exist or are ready to

- be produced for impregnating the young queens,—all of

Honey- extractors.

which circumstances are material to the success of the operation. Wooden hives are generally made square, but not invariably so. The " Stewarton hive" (fig. 7), largely and successfully used in Scotland, is octagonal, and the " Quinby hive" of America is much deeper from ' back to front than it is wide. The Stewarton is not properly a frame, but a bar-hive, although frames are sometimes fitted to it. It usually | consists of three octagon breeding- boxes, 14 inches in diameter by 6 inches deep, each furnished with nine bars placed equidistant, the spaces between being occupied by movable slides of wood working in grooves in the bars. The hive has shuttered windows back and front, handles to lift, and hooks to weigh with, as well as little buttons to prevent displace- ment ; each breeding-box has an en- trance-way 4 inches wide and half an inch high, with a sliding-door to close it wholly or par- tially. There are also two supers or honey boxes, the same diamieter as the stock boxes, but only 4 inches deep ; these are furnished with wider bars, seven in numiber, and a floor- board completes the whole, which, being made of but 4 inch wood, requires protection from the weather.

For those persons who are unable to handle bees with impunity, but are yet desirous of studying their economy, a glass covered observatory hive has been deemed a necessity. Several have been desigued for this purpose, but none of them have been found to be a healthy abode for the bees,—glass being a cold and ungenial material, on which the moisture of the hive condenses during the winter to the detriment of health of the inhabitants. In

the summer, however, bees may be kept in a glass hive without great loss, although with no gain; such a hive may be constructed of a double sash, thickly glazed back and front, of just sufficient width for one comb only and space to allow the bees free passage over both sides of the comb,

Fig. 7.—The Stewarton Hive.

24 inches in diameter, which will permit the bees access to.

the super, and afford facilities to the bee-master for feeding his stock. The capacity of these hives should be about a bushel, when the apiary is situated in a good honey locality.

To a German apiarian we are indebted for the invention of a machine called the honey-extractor, which, with some subsequent improvements, forms a most important aid in large apiaries to increase the yield of honey. By this appliance the frames of full honeycomb are in a few seconds emptied of their contents without injury to the combs,

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which are ready at once to be returned to the hive to be refilled, thus saving to the bees great labour in comb- building, and enabling them to take the utmost advantage of a favourable honey-time, which usually is but short. Honey is saved too, which the bees eat in comb-building ; for it has been calculated that bees consume 20 tb of honey in producing 1 tb of wax. There are various patterns of the machine, but the principle of all may be said to be the same, that of centrifugal force. The apparatus consists of a cylindrical metal reservoir, with a tap at the bottom ; and within is contained a perpendicular quadrangular frame, two sides of which are covered with wire-netting, and against these the full honeycombs, with their cells previously uncapped, are placed. This framework is then set revolving by means of a handle and cog-wheels, or other motive power, when the honey is flung out against the sides of the cylinder, and the combs completely emptied to be returned to the bees to clean and refill. The loss of this honey, and the excitement caused by the cleaning the wet combs, seem to induce the bees to work their hardest to replace their stores ; and with a strong colony an enormous amount of honey is obtainable in a good locality

and season, It has been recorded that one stock in America gathered 600 tb in a single season, and harvests of 200 ib and 300 ib are not uncommon there.

Bee-Keeping.

We shall now give a short exposition of the modern, humane, and scientific system of bee-kceping, which is probably destined at no distant day to supersede the igno- rance and cruelty of past ages,

A description has already been given of examples of the Stocking a best movable bar and frame hives, and the system they frame hive,

represent should alone be adopted, ¢.e., every comb in the hives should be movable and interchangeable. In stocking these it is usual, first, to hive the swarm in an old-fashioned straw skep; and in the evening, after all the bees are quietly settled, suddenly to shake them down against the entrance of the hive or on the top of the frames, when the astonished insects will immediatly take refuge in their future home. Should continuous bad weather occur after hiving a swarm, the bees must be fed, for, as they have as yet no stores, they will otherwise starve.

For feeding bees a niultitude of appliances have been Feeding invented, but they may all give place to a common wide bees.

mouth pickle bottle ; this is filled with syrup, the mouth tied over with a double foid of net, or placed inverted cn a piece of perforated zine or vuicanite over the feeding-hole of the crown-board of the hive. The supply ean be regu- lated to the bees by the number and size of the holes through which they are allowed to suck. In cold weather when much moisture would be hurtful in the hive, barley- sugar may be advantageously used as a substitute for syrup. The former is made by boiling, for ten minutes, 2 ib of loaf-sugar in a pint of water, a little vinegar being added to prevent crystallization. The prosperity and profit of an apiary in a great measure depend on judicious feeding. It is bad economy to stint the bees in food. In the early spring slow and continuous feeding (a few ounces of syrup each day) will stimulate the queen to oviposit, by which means the stocks are rapidly strengthened and throw oft early swarms. Upon the emergence of

these, ifa young fertile queen be immediately supplied, the hive is ready again to swarm in aremarkably short time. Itisa singular fact that if stimulating feeding has been for some time pursued, and the supply be intermitted and nothing coming in from the fields, the bees will destroy all the young larvee and eggs, instinct seeming to teach the wise insects that the cails on the resources of the colony in the way of food for the young will be more than it can bear.

Water.

Honey harvest.

Artificial swarming.

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An abundant supply of water is essential to the healthy condition of bees. 'They consume a large quantity, and often stop to drink at the edge of stagnant pools, and seem even to prefer putrid and urinous waters to purer streams, as if their saline and pungent qualities were grateful to them.

Where the bee-keeper has the use of a honey-extractor, and a large produce of honey is his desideratum, the combs can be emptied as fast as they are filled; and at the close of the season the bees may be deprived of the whole of their honey if syrup be supplied to them in its plave. This is of much less value, and answers every purpose for winter stores. No hive should be trusted to the exigencies of winter with a less weight of sealed comb than 15 hb. Hency may also be gathered into supers; and the bees in good seasons will readily build their combs there,

_ but should be enticed to do so with a few picces of nice

white decoy-comb placed within. The management of the Stewarton hives may be described as follows :—Two of the breeding-boxes having had their bars furnished with guide-comb, are lashed together, the sliding-door of the upper one run in and the slides of the lower withdrawn, when the two boxes become virtually one; a prime swarm of bees is introduced, and eight or ten days thereafter, another prime swarm being hived in the third breeding-box,

it is placed under the other two. The lower of the two first boxes, now the central, has its door run in and the slides of the lower withdrawn. The second swarm of bees will soon run up and fraternise with the others ; and the next morning the lowermost box may be removed, and the entrance opened of the oneabove. The space provided by the two boxes will be found ample for breeding ; and when full, the strong stock formed by the double swarm will soon be glad to occupy the super then to be added, to which communication should be afforded by withdraw- ing the outer slide on each side only. Should the season prove favourable the super will soon be filled, and when nearly so another should be placcd on the top, and the first may be removed as soon as the honey cells are sealed over. All supers must be warmly wrapped up or padded, or the bees will be found reluctant to occupy them.

By the judicious management of supers, and the use of the honey-extractor, swarming may be in a great measure controlled ; for if many swarms issue, the result must be that little honey will be gathered ; all the energies of the reduced population being exerted to procure food for and attend to the young A super put on the hive before the bees have made preparations for swarming by the construc- tion of queen cells, &c., will generally prevent swarming, but not invariably, The bee-keeper must, therefore, decide whether he prefers an increase of his stocks or a large honey harvest, and manage his bees accordingly.

It often happens that bees give every indication of an inten- tion to swarm, and cluster idly outside the hive in large numbers for days or even weeks beforethey really emigrate, — all this time keeping their owner in suspense ; and possibly the swarm comes off at last without being observed. This is very tantalising, but may all be prevented by means of artificial swarming, the mode of proceeding for which varies according to the kind of hive in use. Considering, first, straw skcps, the common hive of the country, the operation to be pursucd is known as "driving." This is not new, having been described by Dr Warder in the last century, The mode usually adopted is as follows :—Towards noon, on a fine day, when many of the bees are abroad, inject at the hive's entrance a puff or two of tobacco smoke, and with the hands give a smart smack on each side, The effect is that the whole of the inhabitants are struck with extreme terror ; and after, perhaps, an

alarmed sally to the entrance, every bee rushes to the cells to fill itself with honey. Allowing two or three minutes for them to effect their

_mellifica) is supposed to be of Asiatic origin.

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purpose, the hive is boldly inverted and an empty hive of the same size placed on it mouth to mouth. A long towel is now bound round the junction to confine the bees, and the operator, with two sticks or the palms of his hands, keeps up a continuous smart rapping on the sides of the full hive, and after a few minutes the bees will all stream up into the empty hive, generally not more than fifteen minutes having elapsed before the first hive is denuded of its inhabitants, It should now be placed on the stand of some other strong stock (previously removed), whose returning bees will form a population to nurse the young and rear a queen if one be not supplied by the apiarian. If the swarm is to be at once sent away to a distance exceeding 14 miles, the hive may be returned to its old stand, and so be peopled by the remainder of its old inhabitants who were at work. But if the swarm is to reinain near, it should be placed on the old stand, as the bees, on their next flight, will return to the locality they know so well. "Driving" should also be pursued in the autumn, when it is desired to appropriate the honey of the hive. The driven bees should then be added to another stock, which they will advantageously strengthen. Where frame hives are in use, the following method may be adopted :—TFirst, lift out the frames and search until the queen be found, when she, with the frame she is on, must be placed in the centre of a new hive, and be flanked on both sides by another comb as full of sealed brood as can be obtained. Fill up both hives with new frames furnished with empty combs, or guide-combs only if the former be not available, and shake into (or before the entrance of) the hive where the queen is sufficient bees to form a large swarm. Many will fly back to their old home, but all the young bees will remain. 'This hive should then be removed to some distance and the old one replaced. If the swarm is to be sent to a distance, the bees may be simply shaken off the combs into (or in front of) a new hive (taking care the queen is with them), which should be temporarily placed on the spot where the old one has just stood. The bees will enter it, and when all is quiet it should be removed and the old one

reinstated. The bees that return from the fields will form a population for the domicile which they will find in the familiar place. Before in any manner operating on bees, it is advisable to puff a little smoke into the hive. This alarms them and causes them to fill their honey-pouches, and a bee in this state never volunteers an attack ; but it is always prudent to cover one's face and hands, as home-returning bees are sometimes inclined to resent the disturbance to their family. India-rubber gloves, with gauntlets and veil of leno, will afford ample protection ; the latter should be a simple bag, open at top and bottom, but with half a yard of elastic sewn in the top, through which should be passed the crown of a broad-brimmed hat; the coat should be buttoned over the lower part. Bee-keepers who meddle much with their bees soon become accustomed to stinging and do not suffer much. Experiments have been made to ascertain the number of stings required to inoculate the blood, and it has been stated that about thirty, at the rate of three or four a day, will suffice, after which the effect of the bee-poison is trivial. Persons unaccustomed to the poison, however, often suffer severely.

We conclude by observing that the honey-bee (Apis It was imported from Europe to America, where it is now found wild in great numbers, and at a vast distance from human habitations. An excellent treatise, Zhe Honey-Bee, tts Natural [listory, Physiology, and Management, was pub- lished in 1827 by Dr Edward Bevan. It contains some of the best practical remarks on the subject that are any- where to be met with, and gives a fair account of the labours of the author's predecessors, Reaumur, Hunter,

Huber, Keys, Vicat, and Dunbar. The Rev. I. I. Langstroth, of New York, has also written a very excellent volume on The [ive and Honey-Bee. To Pastor Dzierzon, the Baron von Berlepsch, and Von Siebold of Germany, we are indebted for many accurate and valuable observa-

tions on physiology and hive management; and a Manual | of Bee-keeping, written in 1875 by Mr John Hunter, |

| secretary of the British Beekeepers' Association, contains ' much practical information on scicntific and profitable bee- | keeping. We may add that the above association, estab- | lished in 1874 under the presidency of Sir John Lubbock, | is the first vigorous effort made in England to extend and improve this neglected although valuable branch of rural econoiny. (O. B,)

BEECH, a well-known tree, the Fagus sylvatica. For | the cultivation and properties of it see ARBORICULTURE, vol. ii. p. 317. The name beech is from the Anglo-Saxon boc, bece, or beoce (Ger. Buche, Swedish, bok), words meaning at once a book and a beech-tree. The connection of the beech with the graphic arts is supposed to have originated in the fact that the ancient Runic tablets were formed of thin boards of beech-wood. "The origin of the word," says Prior (Popular Names of British Plants), "is identical with that of the Sanskrit 6046, letter, bdkds, writings ; and this correspondence of the Indian and our own is interest- ing as evidence of two things, viz., that the Brahmins had the art of writing before they detached themselves from the common stock of the Indo-European race in Upper Asia, and that we and other Germans have received alpha- betic signs from the East by a northern route, and not by the Meditcrranean." Beech-mast, the fruit of the beech- tree, was formerly known in England as buck; and the county of Buckingham is so named from its fame as a beech-growing country. Buckwheat (Bucheweizen) derives its name from the similarity of its angular seeds to beech-mast. The generic name Fagus is derived from dye, to eat ; but the #yyds of Theophrastus was probably the sweet chest- nut (wsculus) of the Romans. Beech-mast has been used as food in times of distress and famine; and in autumn it yields an abundant supply of food to park-deer and other game, and to pigs, which are turned into beech-woods in order to utilize the fallen mast. In France it is used for feeding pheasants and domestic poultry. Well-ripened beech-mast yields from 17 to 20 per cent. of a non-drying oil, suitable for illumination, and said to be used in some parts of France and other Continental countries in cooking, and as a substitute for butter

BEECHEY, Freperick Winu1aM, a distinguished naval officer and navigator, son of Sir William Beechey, R.A., was born in London, in 1796. In 1806, at the age of ten, he entered the navy, and was for several years engaged in active service during the wars with France and America. In

1818 he served under Franklin in Buchan's Arctic expedition, of which at a later period he published a nar- rative ; and in the following year he accompanied Parry in the "Heela." In 1821 he took part in the survey of the Mediterranean coast, under the direction of Captain, after- wards Admiral, Smyth. He and his brother, H. W. Beechey, made an overland survey of the north coast of Africa, of which a full and valuable account was published in 1827. In 1825 he was appointed to the "Blossom," which was intended to explore Behring's Straits in concert with Franklin and Parry. He passed Behring's Straits and penetrated as far as lat. 71° 23' 31" N., and long. 156° 21' 30" W., reaching a point only 146 miles west of that reached by Franklin's expedition frum the Mackenzie River. The whole voyage lasted more than three years ; and in the course of it Beechey discovered several islands in the Pacific, and an excellent harbour near Cape Prince of Wales. A full narrative of his voyage was published in 1825-28. From 1835 to 1847 Captain Beechey was em- ployed on the coast survey of South America and Ireland. He was then appointed by Government to preside over the Marine Department of the Board of Trade. In 1854 he

was made rear-admiral, and in the following year was elected president of the Geographical Society. He died on the 29th Nov. 1856.

BEECHEY, Sir Wittiam, R.A., a fashionable portrait- painter, born at Burford in December 1753, was originally bred as a conveyancer, but a strong love for painting induced him to become a pupil at the Royal Academy in 1772. Some of his smaller portraits gained him consider- able reputation ; he began to be employed by the nobility, and in 1793 became associate of the Academy. In the same year he was made portrait-painter to Queen Charlotte, an appointment which increased his celebrity. He painted the portraits of the members of the royal family, aud of nearly all the most famous or fashionable persons of the time. What is considered his finest production is a review of cavalry, a large composition, in the foreground of which he introduced portraits of George III., the Prince of Wales, and the duke of York, surrounded by a brilliant staff on horseback. It was painted in 1798, and obtained for the artist the honour of knighthood, and the rank of R.A. The earlier portraits of Beechey were carefully drawn and well finished ; but in his later days the extent of his employment rendered him

less careful in his design. His works are generally vigorous, but are wanting in grace and dignity. He was a good, but not an eminent portrait

painter. He died in January 1839, at the advanced age of eighty-six. BEELZEBUB. The name of the supreme god among

all the Syro-Phcenician peoples was Baal, 7.¢., lord or owner ; and by adding to it zebub, insect, the proper naine Baal- zebub was formed, the god of Ekron according to 2 Kings i. 2, the fly-god, the averter of insects, similar to the Zevs dmropuos, putaypos, and the Hercules puiaypos; so that Clemens Alexandrinus speaks of a Hercules dopuos worshipped in Rome. Hug's hypothesis that this Philis- tine god was the dung-beetle, the Scarabeus pillularius, worshipped in Egypt, cannot be accepted. Beelzcbub was so named not from his form, but from his supposed power of driving away noxious flies. In the New Testament the word is applied to Satan, the ruler or prince of the demons (Matt. x. 25, xii. 24, 27; Mark iii, 22; Luke xi, 15,18, 19). But the best Greek MSS. read Beed€e- BovA, Beelzebul, in the Gospels,—an orthography followed by the latest critical editions, though the Syriac and Vul- gate versions have Beelzebub, which is also recommended by Jerome. What is the origin of Beelzebub? The most obvious derivation of it is Diayoys, Baal (or lord) of the dwelling, a name of Saturn among the Pheenicians, accord- ing to Movers, synonymous with }\ ¥'2"2Y3. So it may mean Baal of the heavenly dwelling or habitation, just as Satan is termed in the epistle to the Ephesians (ii. 2) " prince of the power of the air." Others suppose that Beelzebul arose from Beelzebub by a pun on the part of the later Jews, who wished to throw ridicule on idols by forming the appellation lord of dung,—?21 or 22 meaning dung in the Targumic and Talmudic dialects. This is improbable, because Beelzebul was not a current name in Jewish litera- ture. Somewhat different is the opinion of Lightfoot, based upon various Talmudic passages, in which zebul,

dung, or a dunghill, is applied to an idol or idolatry and the verb ?2}, to dung, to sacrificing to an idol,' so that SaarSya is not a proper name, but a general and common onc, equivalent to the lord of wdolatry, prince of the demons, the most devilized of all devils=dpywv r&v daoviwv. In this way the word Oyo has the secondary sense of dol, and Baalzebul has no

connection with the proper name Beelzebub. The passages in question are far from support- ing the hypothesis. Zebul is not a Hebrew word. It has not the sense of idol in Chaldee. In the Targums zebel has no other signification than dung. A nickname or opprobrious epithet is not a real name or the signification of a word properly so called. All that the quotations fairly imply is, that an ignominious name was sometimes given to idols or idolatry, dung, or a thing of dung. Hence Light- foot and those who follow him, such as Gesenius and Schleusner, are in error. If zebul be a part of the name Beelzebul added to it designedly, it is more probable that it was meant to express contempt for a leading god of the heathen. But it is exceedingly doubtful whether it was common as early as the New Testament. According to the Gospels, the Jews attributed the power of expelling demons which Jesus possessed to his connection with Satan, the ruler of the demons; and their notions of Satanic influence forbid the idea of applying the name dung-god (if such was its meaning) to a being like the devil. We reject the two leading derivations of the word Beel- zebul, whether that sanctioned by Lightfoot and Buxtorf, lord of dung, which is adopted by Fritzsche and De Wette ; or lord of the dwelling, followed by Paulus, Jahn, and Hitzig. Meyer ingeniously supposes that the latter is favoured by the words of Matthew x. 25, where oixodec- rérns is thought to be assigned to Jesus significantly, in allusion to BeeAfeBovA; and as deomérys corresponds to YB, an analogous word must be found for ofkos, viz.,

Dia, The reasoning, however, is fallacious. The reading in Matthew x. 25 is not certain,—Lachmann following the Vatican MS. in giving r@ olxodeomdry instead of the usual rov oikoSerrdrnv. Then, again, the passage is unique in saying that the Jews gave Jesus the surname Beelzebul. We learn from Matth. xii, 24 that they said he cast out demons "by Beelzebul, prince of the demons," which does not agree with x. 25, but is a more intelligible and likely statement. That they actually called Jesus Beelzebul is a doubtful assertion, notwithstanding Meyer's affirmation to the contrary. The change of the final letter from 0 to/ seems to have been accidental. Such alterations are not unusual, as Bab-el-mandel from Bab-el-mandeb, Rabbuli from Rabbuni, Ambakum from Habakkuk. J, being a softer sound than 6, was a natural change. Why the name Beelzebul was applied to Satan at the time of Christ is obscure. Probably it originated in no specific reason. The appellation of a leading god was readily transferred

to the devil. It is therefore idle to inquire on what grounds the Jews assigned to the Beelzebub of Ekron the peculiar position of "prince of the demons." The Philistine god had become but a name.

*Lightfoot's Hore Hebreice et Talmudice, Works, vol. ii. pp. 188, 189, 429, ed. Strype, 1684; Selden, De dis Syris, Syntagma, ii. cap. vi. p. 301, &c., ed. Lugd. Bat. 1629 ; Gesenius, articles **Bel" and "Beelzebub" in Ersch und Gruber's Encyclopacdie ; Buxtorf, Lexicon Chaldaicum Talmudicum et Rabbinicum, pp. 388, 334; Winer's Realwérterbuch, s. vv. "Baal," "Beelzebub ;" Merx in Schenkel's Bibel-lexicon, vol. i. p. 8329; De Wette's Kritisch-exege- tisches Handbuch ins N. T.; Meyer's Kommentar ueber das Neue Lestament ; Movers's Die Pheenizier, i. p. 260. (S. D.)*

BEER. See Brewine. BEERSHEBA, now Bir-zs-Szsa, a place in the southern-

? See Hierosol. Berachoth, fol. 12,13; and Midrash Shir, fol. 2. 1.

most part of Canaan, 27 miles §.E. from Gaza, celebrated for the sojourn of the patriarchs. The name, signifying the well of the oath, was bestowed in allusion to the cove- nant made there betwecn Abraham and Abimelech, and is frequently referrcd to in the Scriptures in describing the extent of the country—"from Dan to Beersheba." The place is mentioned by Eusebius and Jerome in the 4th century as a large village, and the seat of a Roman garrison, At a later period it seems to have been one of the episcopal cities of Palestine, and some of its churches were standing in the 14th century. Hardly any remains of its buildings are now left, but its two wells are still open, and afford an abundant supply of pure water, which stands in the larger at a depth of 444 feet, and in the smaller at a depth of 12. (See Robinson's 2esearches, i. 301.) BEET. A considerable number of varieties of the genus Beta (Nat. Ord. Chenopodiaceew) are cultivated for use on account of their large fleshy roots. The beets which aro grown as root-plants, under the names of mangel-wurzel or mangold, field-beet, and garden beet, are generally supposed to be cultivated varieties of the sea-beet (B. maritima). The cultivation of beet as a field crop is treated under AGRICULTURE (vol. i. p. 381); and in relation to the production of sugar,

for which purpose certain varieties of beet stand next in importance to the sugar cane, see Sugar. The garden-beet has been cultivated from very remote times as a salad plant, and for general use asa table vegetable. The variety most gencrally grown has long, tapering, carrot-shaped roots, the "flesh" of which is of a uniform deep red colour throughout, and the leaves brown- ish red. It is boiled and cut into slices for being eaten cold ; and it is also prepared as a pickle, as well as in various other forms. Beet is in much more common use on the Continent as a culinary vegetable than in Great Britain, where it has, however, been cultivated for upwards of two centuries. The leaves of the white Sicilian beet and the Swiss chard beet, both varieties of Beta cicla, are used for: salads and otherwise as culinary vegetables. BEETHOVEN, Lupwice vay, is in music what Shake- speare is in poetry, a name before the greatness of which all other names, however great, seem to dwindle. He stands at the end of an epoch in musical history, marking its climax; but his works at the saine time have ushered in a new phase of progress, from which everything that is great in modern music has taken its rise. This historic side of his genius will have to be further dealt with when the progress of musical art is traced inits continuity, (See article Music, historic section.) At present we have to con- sider Beethoven chiefly as a man and an individual artist, showing at the same time the reciprocal relations between his life and his work. For although the most ideal artist in that most ideal of arts—music—he is always inspired by the deepest sense of truth and reality. The grand note of sadness resounding in his compositions is the reverberation of personal suffering. He was a great artist only because he was a great man, and a sad man withal. The family of Beethoven is traceable to a village near Lowen in Belgium, in the 17th century. In 1650 a member of this family, a lineal ancestor of our composer, settled in Antwerp. Beethoven's grandfather, Louis, owing to a quarrel with his family, left Belgium for Germany, and came to Bonn in 1732, where his musical talents and his beautiful voice did not long remain unnoticcd. The archbishop of Cologne, an art-loving prelate, received him amongst his court-musicians ; and the same position after- wards was held by Ludwig's son, Johann, our composer's father. The latter was married to Maria Magdalena Keverich, daughter of a cook, and widow of a valet-de-chambre of the elector of Tréves. The day of our composer's birth is uncertain; he was baptised Dec. 17, 1770, and received

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the name of his paternal grandfather Louis, or, in its Ger- manized form, Ludwig. Beethoven himself seems to have considered the 16th December of the said year his birthday, but documentary evidence is wanting. At one period of his life he believed himself to have been born in 1772, being most likely deceived on the point by his father, who tried to endow his son and pupil with the prestige of mira- culous precocity. No less uncertain than the date is the exact place of the great composer's birth; two houses in Bonn claim the honour of having been the scene of the important event. The youth of Beethoven was passed under by no means happy circumstances. His father was of a rough and violent temper, not improved by his passion for intoxicating drink, nor by the dire poverty under which the family laboured. His chief desire was to reap the earliest possible advantage from the musical abilities of his son, who, in consequence, had at the age of five to submit to a severe training on the violin under the father's super- vision, Little benefit was derived from this unsystematic mode of instruction, which, fortunately, was soon abandoned for a more methodical course of pianoforte lessons under a musician of the name of Pfeiffer. Under him and two other masters, Van der Eden and Neefe, Beethoven made rapid progress as a player of the organ and pianoforte ; his proficiency in the theoretical knowledge of his art the aspiring composer soon displayed in a set of Varia- tions on a March published in 1783, with the inscrip- tion on the title-page, "par un jeune amateur, Louis van Beethoven, dgé dix ans," a statement the inaccuracy of which the reader will be able to trace to its proper source. In 1785 Beethoven was appointed assistant of the court- organist Neefe ; and in a catalogue raisonné of the musicians attached to the court of the archbishop, he is described as "of good capacity, young, of good, quiet behaviour, and poor." The elector of Cologne at the time was Max Franz, a brother of the Emperor Joseph, who seems to have recognized the first sparks of genius in the quiet and little communicative youth. By him Beethoven was, in 1787, sent for a short time to Vienna, to receive a few lessons from Mozart, who is said to have predicted a great future for his

youthful pupil. Beethoven soon returned to Bonn, where he remained for the next five years in the position already described. Little remains to be said of this period of apprenticeship. Beethoven conscientiously studied his art, and reluctantly saw himself compelled to alleviate the difficulties of his family by giving lessons. This aversion to making his art useful to himself by imparting it to others remained a characteristic feature of our master dur- ing all his life. Of the compositions belonging to this time nothing now remains; and it must be confessed that, compared with those of other masters, of Mozart or Handel, for instance, Beethoven's early years were little fertile with regard either to the quantity or the quality of the works produced. Amongst the names connected with his stay at Bonn we mention only that of his first friend and protector, Count Waldstein, to whom it is said Beethoven owed his appointment at the electoral court, and his first journey to Vienna. To the latter city the young musician repaired a second time in 1792, in order to complete his studies under Haydn, the greatest master then living, who had become acquainted with Beethoven's talent as a pianist and composer on a previous occasion. The relation of these two great men was not to be fruitful or pleasant to either of them. The mild, easy-going nature of the senescent Viennese master was little adapted to inspire with awe, or even with sympathy, the fiery Rhenish youth. Beethoven in after life asserted that he had never learned anything from Haydn, and seems even to have doubted the latter's intention of teaching him ina proper manner. He seems to have had more confidence in the instruction of Albrechst-

berger, a dry but thorough scholar. He, however, and all the other masters of Beethoven agree in the statement, that being taught was not much to the liking of their self- willed pupil. He preferred acquiring by his own toilsome experience what it would have been easier to accept on the authority of others. This autodidactic vein, inherent, it seems, in all artistic genius, was of immense importance in the development of Beethoven's ideas and mode of ex- pression.

In the meantime his worldly prospects seemed to be of the brightest kind. The introductions from the archbishop and Count Waldstein gave him admittance to the drawing- rooms of the Austrian aristocracy, an aristocracy unrivalled by that of any other country in its appreciation of

artistic and especially musical talent. Vienna, moreover, had been recently the scene of Mozart's truimphs ; and that prophet's cloak now seemed to rest on the shoulders of the young Rhenish musician. It was chiefly his original style as a pianist, combined with an astonishing gift of improvisation, that at first impressed the amateurs of the capital; and it seems, indeed, that even Haydn expected greater things from the executive than from the creative talent of his pupil. It may be added here, that, according to the unanimous verdict of competent witnesses, Beethoven's greatness as a pianoforte player consisted more in the bold, impulsive rendering of his poetical intentions than in the absolute finish of his technique, which, particularly in his later years, when his growing deafness debarred him from self-criticism, was somewhat deficient.

As a composer Beethoven appeared before the public of the Austrian capital in 1795. In that year his Three Trios for Pianoforte and Strings were published. Beetho- ven called this work his Opus 1, and thus seems to disown his former compositions as juvenile attempts unworthy of remembrance. He was at that time twenty-five, an age at which Mozart had reaped some of the ripest fruits of his genius. But Beethoven's works are not like those of the earlier master, the result of juvenile and all but unconscious spontaneity ; they are the bitter fruits of thought and sor- row, the results of a passionate but conscious strife for ideal aims. Before considering these works in their chief features, we will add a few more remarks as to the life and character of their author. The events of his outward career are so few and of so simple a kind that a continuous narrative seems hardly required. The numerous admirers whom Beethoven's art had found amongst the highest circles of Vienna,—Archduke Rudolf, his devoted pupil and friend, amongst the number,—determined him to take up his permanent residence in that city, which henceforth he left only for occasional excursions to Baden, Médling, and other places in the beautiful surroundings of the Austrian capital. It was here, in his lonely walks, that the master received new impulse from his admiring intercourse with nature, and that most of his grandest works were conceived and partly sketched. Except for a single artistic tour to Northern Germany in 1796, Beethoven never left Vienna for any length of time. A long-projected journey to England, in answer to an invitation of the London Philharmonic Society, was ultimately made impossible by ill-health. Beethoven's reputation as a

composer soon became established beyond the limits of his own country, notwithstanding the charges of abstruseness, unpopularity, and the like, which he, like most men of original power, had to submit to from the obtuse arrogance of contem- porary criticism. The summit of his fame, so far as it manifested itself in personal honours conferred upon him, was reached in 1815, when Beethoven celebrated by a Symphony the victories of the Allies over the French oppressor, and was rewarded by the applause of the sovereigns of Europe, assembled at the Congress of Vienna.

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In the same year he received the freedom of that city, an honour much valued by him. After that time his imme- diate popularity began to some extent to decline before the ephemeral splendour of the composers of the day ; and the great master seemed henceforth to speak more to coming generations than to his ungrateful contemporaries. When, however, on rare occasions he emerged from his solitude, the old spell of his overpowering genius proved to be unbroken. In particular, mention must be made of that memorable Academie (concert) in 1824, at which his 9th Symphony, and parts of the grand Missa Solemnis, were performed, producing a storm of applause—inaudible, alas! to the composer, who had to be turned round by one of the singers to realize, from the waving of hats and handkerchiefs, the effect of his work on the excited multitude.

The last-mentioned incident leads us to one of the most tragic features of Beethoven's life. By the bitter irony of fate, he who had given to thousands enjoyment and eleva- tion of the heart by the art of sound, was himself deprived of the sense of hearing. The first traces of beginning deafness showed themselves as early as 1797, and were per- ceived by the master with an anxiety bordering on despair. Physicians and quacks were consulted with eagerness, but all their efforts (partly impaired, it must be confessed, by the unruly disposition of the patient) proved unable to stem the encroaching evil. The Royal Library of Berlin pos- sesses a melancholy collection of ear-trumpets and similar instruments, partly made expressly for Beethoven to assist his weakened sense, but all to no avail. In his latter years conversation with him could. be carried on by writing only, and of the

charms of his own art he was wholly deprived. But here, again, the victory of mind over matter,—of genius over circumstance,— was evinced in the most triumphant manner. It has been asserted, not without reason, that the euphonious beauty of some of Beethoven's vocal compositions has suffered through his inability to listen to them; but how grand is, on the other hand, the spectacle of an artist deprived of all intercovrse with what to him in this world was dearest, and yet pouring forth the lonely aspirations of his soul in works all the more sublime as we seem to hear in them the voice of the inner- most spirit of mankind, inaudible to the keen ears of other mortals. If in this manner the isolation of Beethoven further sublimated his efforts as an artist, it, on the other haud, poignantly intensified his sufferings as a man. His was a heart open to the impressious of friendship and love, and, in spite of occasional roughness of utterance, yearning for the responsive affection of his kind. It is deeply touching to read the following words in the master's last will, written during a severe illness in 1802 :—' Ye men," Beethoven writes, '"'who believe or say that I am inimical, rough, or misanthropical, how unjust are you to me in your ignorance of the secret cause of what appears to you in that light. . . . Born witha fiery, lively temper, and susceptible to the enjoyment of society, I have been compelled early to isolate myself and lead a lonely life ; whenever I tried to overcome this isolation, oh ! how doubly bitter was then the sad experience of my bad hearing, which repelled me again; and yet it was impossible for me to tell people, 'Speak louder, shout, for I am deaf.'"

Domestic troubles and discomforts contributed in a minor degree to darken the shadow cast over our master's life by the misfortune just alluded to. Although by no means insensible to female beauty, and indeed frequently enraptured in his grand, chaste way, with the charms of some lady, Beethoven never married, and was, in con- sequence, deprived of that feeling of home and comfort which only the unceasing care of refined womanhood can bestow. His helplessness and ignorance of worldly matters

completely exposed him to the ill-treatment of servants, frequently, perhaps, excited by his own morbid suspicions and complaints. On one occasion the great master was discovered with his face bleeding from the scratches

inflicted by his own valet. It was from amidst such surroundings that Beethoven ascended to the sublime eleva- tion of such works as his Missa Solemnis or his 9th Symphony. But his deepest wounds were to be inflicted by dearer and nearer hands than those of brutal domestics. Beethoven had a nephew, rescued by him from vice and misery, and loved with a more than father's affection. His education the master watched with unceasing care. For him he hoarded with anxious parsimony the scanty earnings of his artistic Jabour. Unfortunately, the young man was unworthy of such love, and at last disgraced his great name by an attempt at suicide, to the deepest grief of his noble guardian and benefactor.

Beethoven died on March 27, 1827, during a terrible thunderstorm. It ought to fill every Englishman's heart with pride that it was given to the London Philharmonic Society to relieve the anxieties of Beethoven's deathbed by a liberal gift, and that almost the last utterances of the dying man were words of thanks to his friends and admirers in this country.

Beethoven's compositions, 138 in number, comprise all the forms of vocal and instrumental music, from the sonata to the symphony,—-from the simple song to the opera and oratorio. In each of these forms he displayed the depth of his feeling, the power of his genius; in some of them he reached a greatness never approached by his predecessors or followers. His pianoforte sonatas have brought the technical resources of that instrument to a perfection previously unknown, but they at the same time embody an infinite variety and depth of emotion. His nine symphonies show a continuous climax of development, ascending from the simpler forms of Haydn and Mozart to the colossal dimensions of the Choral Symphony, which almost seems to surpass the possibilities of artistic expansion, and the subject of which is humanity itself with its sufferings and ideals. His dramatic works—the opera /delio, and the overtures to Lymont and Coriolanus—display depth of pathos and force of dramatic characterization. Even his smallest songs and pianoforte-pieces reflect a heart full of love, and a mind bent on thoughts of eternal things.

Beethoven's career as a composer is generally divided into three periods of gradual progress. We subjoin a list of his most important compositions, grouped according to the principle indicated.

The first period extends to the year 1800. At the beginning we see Beethoven under the influence of his great predecessors, Haydn and Mozart, but progressing in rapid strides towards independence of thought and artistic power. To this time belong Three Trios for Pianoforte and Strings, Op. 1; Sonata for Pianoforte in E flat, Op. 7; Trio for Pianoforte and Strings in B flat, Op. 11; Sonate Pathétique ; First Concerto for Pianoforte aud Orchestra in C, Op. 15; Adelaida (composed 1797); also the celebrated Septuor, Op. 20, and the First Symphony, Op. 21 (the last two works published in 1800).

The secoud pericd, from 1800-1814, marks the climax of formal perfection. The works of this time show the highest efforts of which music as an independent art is capable. We mention the Mass in C, Op. 86; our master's only opera, /idelio, and his overture and incidental music to Goethe's Zgmont ; the Symphonies, Nos. 2-8, amongst which those called the Pastoral, the Hroica,! and those

1 This symphony was originally written in celebration of Napoleon, at that time consul of the French Republic. When Beethoven heard of his assuming the imperial title, he tore off the dedication and trampled it under foot.

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in C minor and A major deserve special mention ; Concerto for the Violin, Op. 61; Concerti for the Pianoforte, Nos. 3-5 ; Overtures to Prometheus, Coriolanus, Fidelio, avd King Stephen ; also numerous sonatas for the pianoforte, quartets, quintets, and other pieces of chamber music.

The third period may be described as that of soetic music,—a distinct poetic idea becoming the moving prin- ciple before 'which the forms of absolute music have to yield. Beethoven has, by the works belonging to this class, ushered in a new phase of music, as will be further shown in the historical sketch of the art. We name that unequalled master-piece of symphonic art, the Ninth or Choral Symphony ; the Missa Solemnis ; the Sonatas for Pianoforte, numbered respectively Op. 101, 102, 106, 109, 110, 111; the

marvellous Quartets for Strings, Op. 127, 130, 132, 135; also the 33 Variations on a Valse by Diabelli, Op. 120.

For fuller information on the great master's life and works than our limited space has permitted us to give, we refer the reader to the biographical and critical works of Schindler, Thayer, Nohl, Marx, and Nottebohm. (F. un.)

BEETLE, a name commonly applied to those insects which form the order Coleoptera (" sheathwinged"), and which are readily distinguished from all others by the nature of the two upper wings. These are formed of a hard, horny substance known as chitin ; and, although use- less in flight, they serve as shields for the protection of the delicate wings underneath, while in many cases their hard- ness protects the beetle itself from the attacks of insecti- vorous birds. In some instances the elytra, as those upper wings are called, are firmly soldered together, and such species are thus rendered incapable of flight. Owing to the beauty of many of the exotic species, and the ease with which they can be preserved, beetles have been collected with great diligence by entomologists, so that nearly 80,000 species, it is estimated, have already been described. Among the members of so large a group it need hardly be said that the greatest diversity exists in form and habits. They are all, however, provided with a masticatory mouth ; and in such predatory species as the Tiger Beetles, the mandibles are largely developed, and often armed with acute teeth. Many of them are carnivorous, feeding on other insects, and on decaying animal matter; but the larger proportion live on' the fruits, leaves, and stems of plants, in many instances doing great damage to cereal crops and forest trees. In Germany, in the year 1783, a million and a half of trees are said to have been destroyed in the Harz Forest alone by means of two small species of wood-boring beetles ; and in North America at the present time the potato crop is being annually blighted by the devastations of the larvee of what is known as the Potato Beetle(Doryphora decemlineata). Beetles undergo complete metamorphosis, passing from the larva to the pupa stage, in which they sometimes remain for several years before emerging as full-formed insects; others, however, undergo all the changes from egg to beetle ina few months. Many of those insects, such as the Goliath and Hercules Beetles, attain gigantic proportions, measuring often 6 inches long, exclusive of antenne, and 2 inches broad ; and many bear on the upper surface of thcir bodies

curious horn-like pro- jections. Others, as the Diamond Beetle of Brazil, are adorned with the most brilliant colours, showing a beautiful metallic lustre; and the elytra of such species are now largely used by jewellers in the manufacture of personal ornaments. See INsxcts.

BEGAS, Kart, a distinguished German historical painter, was born at Heinsberg in 1794, and died in 1854, His father, a retired judge, destined him for the legal profession, but the boy's tastes pointed definitely in another direction. Even at school he was remarked for his wonderful skill in

drawing and painting, and in 1810 he was permitted to visit Paris in order to perfect himself in his art. He studied for eighteen months in the atelier of Gros, and then began to work independently. In 1814 his copy of the Madonna della Sedia was bought by the king of Prussia, who was attracted by the young artist, and did much to advance him. He was engaged to paint several large Biblical pictures, and in 1825, after his return from Italy, continued to produce paintings which were placed in the churches of Berlin and Potsdam. Some of these were historical pieces, but the majority were representations of Scriptural incidents. Begas was also celebrated asa portrait paiuter, and supplied to the royal gallery a long series of portraits of eminent Prussian men of letters. At his death he held the post of court painter.

BEGBAZAAR, or BrrBazaar, a town of Asiatic Turkey, in the Anatolian province of Angora, situated on the Sangarius or Sakaria, about 52 miles W. of the provincial capital. Its houses are two stories in height, and roofed with shingles. Carpet-weaving is carried on in the town, and rice, cotton, and fruits are cultivated in the neighbour- hood. The pears that are sold in Constantinople as the produce of Angora are really grown by the people of Begbazaar. Numerous remains of ancient works in marble are found throughout the town. Population, 4750.

BEGHARDS anp BEGUINES. The nature and history of the Beghards is one of the obscurest problems in medieval times, and nothing very certain has been ascertained, During the Middle Ages there were formed, alongside of the regular orders, companies of men and women who devoted themselves to a religious life, but did not bind themselves bystrictvows. The design was to enable men and women, who did not mean to separate

themselves entirely from the world, to lead, nevertheless, what, in the Middle Ages, was esteemed the religious life. Such com- panies were the Tertiarii of the Dominican and Franciscan orders, and at first the Beghards and Beguines were similarly constituted. The first notices we have of them tell us that, in the end of the 12th century, in several of the towns of the Netherlands, companies of women formed themselves together, under a simple rule, for the purpose of taking care of the sick and for other charitable objects. They were generally widows and maidens of high rank, and were called Beghinz, or Beguine, or Beguttz. The origin of the word is very obscure. Some time later, companies of men were formed in a similar way, and under the same rule. They took no vows, and were at liberty to leave the company when they liked. The men were called Beghards, In the 14th century these Beghards seem to have attached themselves to the Franciscans, and to have been instru- mental in exciting to revolt that portion of the order which rebelled against the Pope. For some period, indeed, the terms Fratricelli or Spirituales (the two names for the rebel Franciscans) are used synonymously with Beghards. It is believed that the Arabian pantheism of Averroes had became diffused among many of the mystical sects, and that societies, originally purely religious, had become partly political. We know, at all events, that, in the 14th century, the Beghards were in close alliance with the communistic and pantheistic "' Brethren of the Free Spirit." Clement V. denounced them at the Council of Vienna, and launched two bulls against them; the Inquisition was ordered to suppress them ; and Pope John XXII., while he protected the Beguines, persecuted the Beghards. Such Beghards as still remained were absorbed in the Tertiarii of the Franciscans in the 17th century ; but small communities of Beguines—Beguinages, as they are called—still exist in the Netherlands, and in their organization are somewhat similar to many Anglican sisterhoods. (Cf Mosheim, De Beghardis et Beguinabus, the book upon the subject,

and Hahn's Geschichte der Ketzer im Mittelalter, For the meaning of the word see Du Cange, Goss.)

BEHAR, a province of British India, under the jurisdic- tion of the Lieutenant-Governor of Bengal, situated between 24° and 28° N. lat., and 83° and 89° E. long. It comprises the districts of Champaran, Tirhut, Shahabad, Saran, Patna, Purniah, Bhdgalpur, and the Santaél pargands; and is bounded on the N. by the independent kingdom of Nepal; on the E. by the Rajshahi and Bardwan divisions of Bengal proper; on the S. by the Chhotaé Nagpur division ; and on the W. by the North-Western Provinces. The general aspect of the country is flat, except in the district of Monghir, where detached hills occur, and in the south-east of the province, where the Rajmahal and Santal ranges abut upon the plains.

Behar abounds in great rivers, such as the Ganges, with its tributaries, the Ghagra, Gandak, Kusi, Mahananda, and Son. The Ganges enters the province near the town of Baxar, flows eastward, and passing the towns of Dinajpur, Patna, Monghir, and Colgong, leaves the province at Rajmahal. It divides the province into two almost equal portions; north of the river lic the districts of Saran, Champaran, Tirhut, Purniah, and part of Monghir and Bhagalpur, and south of it are Shahabad, Patna, Gaya, the Santal parganas, and the rest of Monghir and Bhagalpur. The Ganges and its northern tributaries are navigable by country boats of large burden all the year round. The Son (the most important of the southern tribu- taries) enters the province in the extreme south-west, and forming for a short distance its boundary in that direction, flows north, past Rhotasgarh and Arah, separating the districts of Shahabad from those of Gaya and Patna, and joins the Ganges opposite Chapra. It has a very wide bed, and pours down its waters with great velocity during the rains. The principal hills within the province are the Moher hill in the district of Gaya, 1620 feet; Santal pargana hills, 800 to 1600 feet; Rajrnahal and Monghir hills, 1500 feet; and

tajgarh hill in Patna, 1200 feet above sea-level.

Behar Province contains eight districts, with an area of 42,417 square miles, and a total population in 1872 of 19,736,101 souls, inhabiting 48,285 villages or townships, and 3,252,036 houses; persons per square mile, 465; per village, 409. The males num- bered 9,797,649, or 49°6 per cent., and the females, 9,938,452, or 504 per cent., of the total population. Of the

provincial popula- tion, 16,526,850, or 83°7 per cent., were Hindus ; 2,636,053, or 13°4 per cent., Mahometans; 54 Buddhists; 8063 Christians; and 565,081, or 2°9 per cent., of unspecified religion, mostly aborigines. Of the male adults, 3,613,231 are returned as agricul- turists, and 2,489,557 non-agriculturists. The aboriginal tribes consist of the Bhars, Cherus, Dhangars, Kanjhars, Kharwars, Kols, Mals, Naiyas, Nats, Paharias, Santals, and Tharus. The census of 1872 returned 49 towns as containing upwards of 5000 inhabitants, particulars of which will be found in the accounis of the districts within which they are situated. Rice, wheat, barley, pulses, maize, and various kinds of millets, form the principal food-grains of the province. Rice is the main staple of food; but in elevated and dry localities, wheat, maize, millet, and peas are substituted. Potatoes, cabbages, &c., were introduced by Kuropeans, and are now largely cultivated. Many kinds of fruits and vegetables are also produced. The commercial staples consist of oil-seeds, opium, indigo, sugar, cotton, and saltpetre. Upwards of 800,000 tons of oil-seeds were exported from Behar in 1872. he principal marts for oil-seeds are Revelganj, in the Saran district, and Roshra in Tirhut. The cultivation of opium is a Government monopoly, and no person is allowed to grow the poppy except on account of Government. The Behar Opium Agency has its headquarters at the town of Patna. Annual engagements are entered into by the cultivators, under a system of pecuniary advances, to sow a certain quantity of land with poppy, and the whole produce in the form of opium is delivered to Government at a fixed rate. The area under poppy cultivation in the Behar Agency in 1872 amounted to 330,925 acres. The Behar indigo, generally called Tirhut indigo, yields about one-half of the total produce of that dye which is annually exported from Calcutta. In the Bhagalpur division there are 44 factories, yielding on an average about 500 tons of indigo a year. In the Patna division, indigo cultivation is almost entirely confined to the north of the Ganges, in the districts of Tirhut, Saran, and Champaran, which in 1872 contained 104 factories, including outworks, and yielded 1958 tons of the dye. The indigo industry is almost entirely conducted by Europeans, and the total capital invested in the business in Behar is estimated at upwards of a million sterling. Large quantities of sugar arc exported, but the cotton grown in the province is not sufficient for the requireinents of the people, and has to be supplemented by imports of raw cotton and English piece

gvois. Saltpetre is largely refined in Tirhut, Saran, and Champaran, and is exported both by rail and river to Caleutta; the quantity

exported by river in 1872 being 22,749 tons. The manufactures of less importance are tasar-silk, paper, blankets, brass utensils, fire-arms, carpets, coarse cutlery and hardware, leather, ornaments of gold and silver, &c. Of iinerals—lead, silver, and copper exist in the Bhagalpur division, but the mines are not worked. One coal-mine is worked in the Santal pargands. Before the construc- tion of railways in India, the Ganges and the Grand Trunk road afforded the sole means of communication froin Calcutta to the North-Western Provinces. But now the railroad is the great high- way which connects Upper India with Lower Bengal. The East Indian Railway runs throughout the length of the province ; total length of rail, upwards of 500 miles. Besides the Grand 'Trunk road, the other important roads in the province are—(1), Road from Synthia Railway Station to Bhagalpur; (2), Darjiling road, from Karagola to Siliguri; (3), from Shahrghati on the Grand Trunk road to Patna city, and thence to Tirhut town. There arc also many local roads under the management of the district road committees. The gross revenue of the province in 1872 amounted to £1,596,952, of which £1,184,906, or 74 per cent., was from land. In 1872 the 8 districts of the province were divided into 37 executive subdivisions, and contained 52 civil judges and 80 magistrates. The total police force (regular, municipal, and village) consists of 60,028 men; cost, £210,943. In 1872 there were 215 Government and aided schools, attended by 9454 pupils, and maintained at a total cost of £17,835, of which Government contributed £10,328. These are exclusive of unaided schools. The census of 1872 returned the total number of schools, aided and unaided, in the province at 4781. Bengali is the language in the eastern part of the province; but Hindi, one of the dialects of Sanskrit, is the language of the rest. The Mahometan population use Hindustani or Urdu, a language of modern origin, formed from the fusion of Persian and Arabic with Hindi. The climate of Behar is very hot from the middle of March to the end of June, when the rains set in, which continue till the end of September. The cold season, from October to the

first half of March, is the pleasantest time of the year. The total rainfall in 1872 varied from 82 to 60 inches in different localities ; minimum temperature in December, 53°; inaximum in May, 105°.

In ancient times Behar comprised the dominions of the kings of Magadha, who at one time were the lords para- mount of India, and whose court is represented as one of the most brilliant that ever existed. Alexander the Great when he invaded India intended to push his conquests to Palibothra, the capital of Magadha, whose monarch he heard could oppose him with 30,000 cavalry, 600,000 infantry, and 9000 elephants. Their highest point of grandeur was supposed to have been attained at the time of Seleucus Nicator, one of the immediate successors of Alexander, who invaded Magadha. According to the Greek historians he was victorious, but this is doubtful, as he relinquished all the Macedonian conquests to the east of the Indus, and gave his daughter in marriage to Chandra Gupta, the reigning king. At this time Magasthenes was appointed to represent him at Magadha court. The Magadha monarchs encouraged arts and learning, constructed roads, and sent their fleets across the Bay of Bengal to colomse Java, Bali, and other islands in the Indian Archipelago. The Magadha kingdom flourished from the 4th century before the Christian era to the 5th century after it. But ancient Behar is far more celebrated in anvuther respect. Six centuries before the Christian era it was the cradle of Buddhism when that religion was in its infant state. It sent its missionaries to Ceylon, China, Thibet, and Tartary, and the religion thev taught is still followed by 300 millions of people. Behar is a sacred spot in the eyes of the Chinese and other Buddhist nations. In 1202 a.p. Behar fell into the hands of the Mahometans without a struggle, and from this time it formed one of the three subahs or provinces under the rulers of Bengal. In the time of Akbar it comprised the seven sarkdrs of Monghir, Champdran, Hajipur, Saran, Tirhut, Rohtds, and Behar. It came into the possession of the East India Company with the acquisition of the Diwdnf in 1765, when the province was united with Bengal. In 1857 two zamindars, Umar Sinh and Kumar Sink, rebelled against the British Government, and for some months held the ruinous fort of Rohtds against the English.

BeHak, a magisterial subdivision, and a town of Patna district. The Suspiviston was formed in 1846. It has

an area of 792 square miles, with a total population of 570,888 souls, the average population per square mile being 72]. Brnar Town is situated in 25° 10’ N. lat., and 85° 35’ E. long. It was formerly the capital of a subah or governorship under the Mahometans, but at present it is merely a subdivisional town. Population in 1872 :— Hindus, 31,006 ; Mahometans, 13,282; others, 7; total, 44,295. Munieipal income, £1100 ; expenditure, £1120 ; rate of taxation, 6d. per head of population.

BEHBEHAN, a town of Persia, in the province of Fars, pleasantly situated in the middle of a highly-cultivated plain, which is watered by the Rivers Zab and Jerahi. The walls are about three miles in eireumferenee ; and there ig a castle called Kal4h Naranj, or Orange Castle, in the 8.E. corner. The population is variously estimated at 10,000 and at 4000, the latter more probably correct, as the place has suffered from plague and oppression.

BEHEM, or Beuarm, Martin, a well-known navigator and cartographer, was born at Nuremberg about 1436. Having entered the service of Portugal, he was appointed, in 1484, to act as geographer in the expedition of Diego Cam to the western coast of Afriea, and on his return to Lisbon received the honour of knighthood in reward for his services. He was afterwards employed by the king in various capaeities, and visited the eapital from time to time in conneetion with his engagements ; but, after his marriage in 1486, his principal residenee seems to have been at Fayal, in the Azores, where his father-in-law, Job Huerter, held the rank of governor of the Flemish colony. On a visit to his native city in 1492, he construeted a terrestrial globe, in whieh he incorporated the discoveries of Mareo Polo and other recent travellers, The globe is still preserved in the family, and has frequently been reprodueed by engraving. (See Doppelmayr, List. Nachricht v. Nurnberg. Mathem. u. Kiinstler, 1730; Pigafetta, Prem. voy. autour du Monde, 1802; and atlas to Vivien de Saint Martin’s Hist. de la Geog., 1874.) Behem’s scientific attainments have been very variously estimated,—some plaeing hii in the very first rank among the geographers of his time, while others maintain that he hardly reaeled the level of the ordinary Portuguese ehart-makers. Blunders of 16 degrees are found on his globe in the localization of places which he himself visited, while in the

eontemporaneous maps errors of nore than one degree were comparatively rare. It is generally agreed that he had no share in Transatlantic discovery, and though Columbus and he were in Portugal at the same time, no conneetion between the two has been established. He died at Lisbon in 1506, or, according to his tombstone, 1507.

See Murr, Diplomat. Gesch. des bcriihmten Rittcrs Bchaim, 1778; Humboldt, Ari. Untersuchungen, 1886; Ghillany, Gesch. des Scefuhrers M. Behaim, 1858; Lelewell, Geog. dw moyen age, 1857 ; Petermann's Afittherl., 1858; Peschel, Zettalter der Entdeckungen,

and Gesch. der Erdkunde, 1865 ; Breusing, Zur Gesch. der Geogr.,

1869.

BEHISTUN, Biusutun, or Bisutun, the aneient Paghi- stan (Mons Bagistanus), a precipitous mountain or rock in Persia, remarkable for the extensive inscriptions of a very early date still preserved on some parts of its escarpment. It lies 27 miles E. of Kirmanshah, in the provinee of Irak Ajemi1, The principal inscription is euneiform, and relates to the victories of Darius Hystaspes, who is represented in a seulptured eentre-piece as receiving the homage of a number of eaptives, upon one of whom he has planted his foot. The labour expended on the work must have been very yreat. 'The surface of the rock has been earefully smoothed, and pieees have had every ereviee or hollow filled up with lead; the aeeuraey and regularity of the eharacters is almost unexampled, and the whole of the tablets have been earefully eoated with a silieeous varnish to preserve them from the weather Of the other

inseriptions the first is in Greek and the second in Arabic, but neither is of any great importance. It was not till 1846 that the Darius tablets were translated by Sir Henry Raw- linson, who has given a complete account of his labours in the Journ. Roy. As. Soc. The prineipal notiee of Behistun in the Greek or Roman writers is that of Diodorus Siculus, who tells how Semiramis visited the place on her march from Babylon to Eebatana, and caused her own image to be sculp- tured on the rock. He interprets the

name of the mountain by Ads dpos, the Hill of Jove, which is not very different from that proposed by modern scholars—'" the dwelling of the gods." (See Journ. R. Geog. Soc., 1839 ; Journ. Roy. As. Soc., vols, x. and xii.; Ker Porter's Z"ravels ; Benfey's Keilinschroften, 1847.)

BEHMEN, Jacon. See BoEHME.

BEHN, Aprura, an English authoress of some celebrity, was born of a good family in Canterbury in the reign of Charles I., probably in 1642. Her father, whose name was Johnson, having received the appointment of lieutenant- gencral of Surinam, proeeeded to the West Indies, taking with him his whole family. Mr Johnson died on the voyage; but his family reaehed Surinam, and resided there for some years. Here Aphra learned the history, and acquired a personal knowledge, of the Ameriean prinee Orounoeo and his beloved Imoinda, whose adventures she has related in her novel Oroonoco. On her return to London she is said to have married Mr Behn, a merchant of Dutch extrac- tion residing in that city, of whom nothing but the name has ever been known, if anything more even existed. The wit and abilities of Mrs Behn brought her into high estimation at court, and Charles IJ. employed her to trans- act some affairs of importance abroad during the Duteh war. For this purpose she went to Antwerp, where she skilfully eontrived to penetrate so far into the secrets of state as to aecomplish the objects of her mission ; and in the latter end of 1666, by means of the influenee she had gained over one Van der Albert, she wormed out of him the design formed by De Ruyter, in eonjunetion with the family of the De Witts, of sailing up the Thames and burn- ing the English ships in their harbours. This she com- municated to the English eourt, but although the event proved her intelligence to have been well founded, it was at the time disregarded,—-which eircumstance, together with the disinelination shown to reward her for her services, determined her to drop all further thoughts of political affairs. She returned to England, and had a narrow eseape on the voyage home, the vessel in which she sailed having foundered. From this period she appears to have supported herself by her writings. Her works are nume- rous, and all of them are of a lively and amatory character. Her dramas are sometimes well eonstrueted, but they are among the worst speeimens of the later Stuart literature. Of her short tales, or novelettes, the only one possessing any merit is the story of

Oroonoco, which was made the basis of Southerne's most popular tragedy. Mrs Behn died on the 16th of April 1689, and was interred in the eloisters of Westminster Abbey. Her works have passed through many editions, the latest being that published by Pearson, 1872.

BEHRING'S ISLAND, the most westerly of the Aleu- tian group in the North Pacifie, in 55° 22' N. lat., 166° E. long. It is rocky and desolate, and is only remarkable as being the place where the navigator Behring was wrecked and died in 1741. Population 2500.

BEHRING'S STRAIT, the narrow sea between the N.E. part of Asia and the N.W. part of North America, conneeting the North Pacific with the Aretie Ocean, At the narrowest part, East Cape in Asia approaches within about 36 miles of Cape Prinee of Wales on the American shore. The former is in 66° 6' N. lat., 169° 38' W. long. ; and the latter in 65° 46' N, lat., 168° 15' W. long. North

and south of these points the coasts on both sides rapidly diverge. They are steep and rocky, and considerably indented. The Asiatic coast, extending from Cape Serdtzy to Cape Chukotzky, a distance of about 400 miles, presents several large and commodious bays. The strait is in general from 23 to 30 fathoms in depth, and contains a few small islands known as the Diomede Islands. Haze and fogs greatly prevail, and the temperature is low. 'The strait derives its name from Vitus Bering or Behring, a German in the Russian service, who discovered it in the year 1728. It was subsequently explored and described with great accuracy by Captain Cook, in 1788. (See Arctic Papers for Expedition of 1875.)

BEIRA, a province of Portugal, bounded on the N. by the provinces of Traz-os-Montes and Minho, E. by Spain, S. by Alemtejo and Portuguese Estremadura, and W. by the Atlantic. Area about 8586 square miles. Population in 1871, 1,294,282. It is adininistratively divided into the districts of Aveiro, Coimbra, Vizeu, Guarda, and Castello Branco, while it is popularly regarded as consisting of the three sections of Beira-Alta or Upper Beira, Beira- Baixa, or Lower Beira, and Beira-Mur, or Maritime Beira. Except along the coast, the surface is for the most part mountainous,

—the highest point, in the Serra de Estrella, being 7524 feet. Besides the Douro, which is far the largest, the Aguada, the Mondego, the Vouga, and the Zezere are the principal rivers, The soil, except in the valleys, is dry and rocky, and large stretches are covered with -heath. The principal agricultural productions are maize, wheat, garden vegetables, and fruit. The olive is largely cultivated, the oil forming one of the chief articles of export; and good wine is also produced. In the flat country between Coimbra and Aveiro the marshy land is laid out in rice-fields, or in pastures for herds of cattle and horses. The rearing of sheep is not so well attended to as formerly, except in Upper Beira. In the neighbourhood of Lamego swine are reared in considerable numbers, and furnish the well-known Lisbon hams. There is compara- tively little manufacturing industry in the province, with the exception of the production of woollen cloth, which occupies a large part of the population in the district of Castello Branco or Covilhao. Silver and lead ores exist in the mountains, but are neglected. Iron, coal, and marble are worked to some extent, and millstones are quarried in some places. Salt is obtained in considerable quantities from the lagunes along the coast. There is a striking difference of character between the inhabitants of the lower and more elevated regions of Beira, the former being sociable and courteous, if also indolent and lax in morals 5 while the latter are grave and reserved, hardy and industri- ous. 'The principal towns in the province are Coimbra, Vizeu, Aveiro, Omar, and Lamego. The heir-apparent to the throne of Portugal has the title of Prince of Beira.

BEIT EL FAKIH (i.e, House of the Saint), an un- walled town in Arabia, in the province of Yemen, 77 miles N.E. of Mocha, and about 17 from the coast, in 43° 23' KE. long., 18° 32' N. lat. It is situated on a barren, sandy plain, protected against the predatory incursions of the Arabs by a castle, in which the governor resides. It was founded in the 17th century by the inhabitants of the seaboard town of Alafaka, who were led to seek a new settlement from their once famous harbour being rendered useless by coral banks ; and it soon became the greatest sent of the coffee-trade in the world. 'The prosperity of the city was considerably diminished under the Wahabees and Mehemet Ali of Egypt, though even during his domination it is stated to have had 39,000 inhabitants. It is still engaged in the coffee-

trade, and also deals in incense, gum, and pearls, Most of the common houses are mere grass-roofed huts, but here and there are ancient stone

buildings. The most remarkable of these is the mosque of Akhmed-Ibn-Musa, which is older than the city itself, The principal ports at which the exports are shipped are Lohaya, about 32 miles N.W., and Hodeida, 37 miles 8. Population, 8000.

BEJA, a city of the province of Alemtejo, in Portugal, 36 miles 8. of Evora. It is surrounded with walls, is the see of a bishop, and contains about 6600 inhabitants, who are for the most part occupied in cultivation, and especially in breeding cattle.

BEJAR, a fortified town of Spain, in the province of Salamanca, situated on the River Cuerpo de Hombre, in a deep and fertile valley of the Sierra de Bejar, about 45 miles 8. of the provincial capital. Its streets are narrow, but well paved, and most of the houses are old. 'The manufacture of cloth is carried on, and there is a consider- able trade in cattle at the annual fair. There are saline springs, with a temperature of 104° to 108° F. A ducal family takes its title from the city, and has a palace with- in its walls. Population, 10,683.

BEKE, Cxyarves Tizstoye, a distinguished English traveller, geographer, and Biblical critic, was born in London, October 10, 1800. Educated for the pursuits of commerce, he afterwards studied law for a short time at Lincoln's Inn, but finally devoted himself to the study of historical, geographical, and ethnographical subjects. The first-fruits of his researches appeared in his work entitled Origunes Biblice, or Researches in Primeval History, which was published in 1834. As an attempt to reconstruct the early history of the human race from geological dates, it naturally raised a storm of opposition on the part of those who felt it their duty to defend the traditional readings of the book of Genesis. For about two years (1836 to 1838) Dr Beke held the post of British Consul in Saxony. From that time till his death his attention was devoted to geographical studies, chiefly of Africa and the Nile Valley. Aided by private friends, he visited Abyssinia in connec- tion with the political mission under Major Harris, and explored

districts which up to that time had remained unknown to Europeans. The valuable results of this journey, which occupied him from 1840 to 1848, he gave to the world in 1845 in the work entitled Abyssinia, a Statement of Facts, &e. Once again, after an interval of more than twenty years, he went to Abyssinia, for the purpose of obtaining from King Theodore the release of Mr Rassam and other British captives. In this he succeeded, but the king afterwards changed his mind and continued to detain the prisoners. In 1848 he made an unsuccessful attempt to explore the Upper Nile; his labour was repaid, however, by a large amount of information about the countries which he traversed. The ardour with which he pursued his chosen path was shown by his undertaking in his seventy-fourth year a journey to Palestine, for the purpose of determining the real position of Mount Sinai. He conceived that it was on the eastern side of the Gulf of Akabah ; and his exploration convinced him that his view was right. It has not, however, commended itself to general acceptance. Dr Beke died at Bromley, in Kent, July 31, 1874.

Dr Beke's writings are very numerous. Among the more impor- tant, besides those already named, are—An Essay on the Nile and its Tributaries, 1847; On the Sources of the Nile, 1849; and The British Captives in Abyssinia, 1865. He contributed a large num- ber of Afemoirs and Papers to the Royal Geographical Society, the British Association, the Philological Society, the Athenewm, the Archeologia, the Edinburgh New Philosophical Journal, &c., &c. He was a fellow of the Royal Geographical Society, and for his con- tributions to our knowledge of Abyssinia received its gold medal, and also that of the Geographical Society of France. For his Origincs Biblicee the degree of Ph.D. was conferred on him by the University of Tiibingen. He was also a fellow of the Society of Antiquaries. In 1870 he received the grant of a pension on the civil list.

BE K—

BEKES, a market-town of Hungary, formerly a royal free city, and the capital of the county of the same name, situated at the confluence of the White and Black Kéris, 14 miles N.N.W. of Gyula, which is now the capital. The inhabitants, principally Calvinists, amount to 22,500, and are chiefly engaged in agriculture and the rearing of cattle. Count Wenkheim has a fine

castle in the town, which was at one time strongly fortified. Long. 20° 41’ 37” E., lat. 46° 46’ 16” N.

BEKKER, BattHazar, a celebrated Dutch divine, was born in Friesland in 1634, He was the author of several works in philosophy and theology, which from their freedom of thought and critical rationalism excited considerable enmity against him. His most celebrated pro- duction was the work entitled Die Betooverde Wereld, or The World Bewitched, in which he examined critically the phenomena generally ascribed to spiritual agency, and exposed with much force the many absurdities regarding the power of Satan that had become articles of Christian faith. The odiwm theologicum was fiercely roused by this book, and Bekker was deposed from the office of the ministry. He resided at Amsterdam till his death in

1698.

BEKKER, or Wourr, Exizapeta, a Dutch novelist, was born in 1738. She was married to Adrian Wolff, a Reformed clergyman, but is always known under her maiden name. After the death of her husband in 1777, she resided for some time in France, with her close friend, Agatha Deken. She was exposed to some of the dangers of the French Revolution, and, it is said, escaped the guillotine only by her great presence of mind. In 1795 she returned to Holland, and resided at the Hague till her death in

1804. Her novels were written in conjunction with |.

Agatha Deken, and it is somewhat difficult to determine the exact qualities contributed by each. The Historie van William Levend (1785), Historie van Sara Burgerhart (1790), Abraham Blankaart (1787), Cornelie Wildschut (1793-96), have been extremely popular. Some of them have been translated into German and French.

BEKKER, ImmaNvEL, a distinguished philologist, was – born at Berlin in 1785, and died 7th June 1871. He completed his classical education at the university of Halle under the famous F. A. Wolf, who was accustomed to speak of him as his most promising pupil. In 1810 he was appointed to a professorship in the university of Berlin. For several years, between 1810 and 1821, he travelled in France, Italy, England, and parts of Germany,

examining classical manuscripts and gathering materials for his great editorial labours. Some detached fruits of his researches were given in the Anecdota Greca, 3 vols., 1814-21; but the full result of his unwearied industry and ability is to be found in the enormous array of classical works edited by him. The most famous are Plato, 10 vols.,1814—21 ; Oratores Attic', 7 vols., 1823 ; Aristoteles (the Berlin edition), 4 vols., 1831-36 ; Thucydides, 3 vols., 1821 ; Aristophanes, 3 vols., 1825; Seatus Empiricus, 1842. He also edited 24 volumes of the Byzantine historians. Bekker confined himself entirely to textual recension and criticism, and contributed little to the extension of general scholarship. He was well read in the old French litera- ture, particularly that of Provence, and contributed many papers on it to the Memoirs of the Berlin Academy.

BEL. See Baau.

BEL, or Brexius, Marrutas, an Hungarian divine and historian, was born in 1684, and was educated partly at Halle. In 1719 he was made rector of the evangelical Lyceum at Presburg, where he remained till his death in 1749. His great work was the History of Hungary (Notitia Hungarie nove historico-geographica), 4 vols., 1735-42, which was not completed. Other works devoted to the

history of his native country are—Hungarie antique et nove prodromus, 1723; Adparatus ad Historiam Hungaria, 1735-46. He also wrote on the literature of the Hungarians.

BEL AND THE DRAGON, one of the apocryphal books of the Old Testament. See ApocrYPHA.

BELA, or Beyza, a town of Baluchistan, capital of the province of Lus, on the north-eastern bank of the River Poor- ally, 293 miles N. of Khelat. Long. 66° 4' E., lat. 26° 1' N. About one-third of the town in the western quarter is encompassed by a mud wall. The streets are narrow ; but from the elevated situation of the town, and its rocky site, they are always clean, even in wet weather. The bazaar is very neat. 'The governor's residence is

surrounded by a castellated mud-wall, which also encloses a dome-covered mosque. Population about 5000.

BELBEIS, or Betseys, a town of Upper Egypt, in the province of Kelyubieh, on the eastern arm of the Nile, 28 miles N.N.E. of Cairo. It was formerly considered the bulwark of the kingdom on that side, and was defended by strong fortifications, but these were suffered to fall into decay till 1798, when Napoleon ordered them to be putin repair. In 1163-4 it was besieged for three months by the Crusaders under Amalric, who at length, in 1168, captured and pillaged it. The present population is not supposed to exceed 5000.

BELEM, a town of Portugal, now regarded as a suburb of Lisbon. See Liszon.

BELFAST, the chief manufacturing and commercial town of Ireland, a municipal and parliamentary borough, the capital of Ulster, and, since 1850, the county town of Antrim, in which, with the exception of the large suburb of Ballymacarret on the other side of the river, it is

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1. Prince's Dock. 2. Clarendon Doek, 3. Queen's Bridge, 4. Albert Bridge. 6. Trinity Church.

6. St Ann's Church.

7. St George's Chureh.

8. Christ Church.

9. St Malachi's Cathed. 10. Academical Institute,

11. Linen Hall,

12. Commereial Bdgs, 13. Custom House,

14. Town-Hall. 15. Central Rail. Sta, mainly comprised. It is situated in lat. 54° 36' 8-5" N., and long. 5° 55' 53:7" W., at the mouth of the Lagan, which flows into Belfast Lough (Carrickfergus Bay), and is built on an alluvial deposit and land reclaimed from the sea, the greater portion of which is not more than 6 feet above high-water mark. It was thus for a long period ex- posed to occas onal inundations, and was somewhat subject to epidemics ; but its situation, improved by drainage, has become more healthy, while the environs are agreeable and picturesque.

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The etymology of the name and the origin of the town are equally uncertain, and there is not a single monument of antiquarian interest upon which to found a conjecture. About the beginning of the 16th century Belfast is described as a "town and fortress," but it was in reality a mere fishing-village in the hands of the house of O'Neil. This sept had all along been opposed to the English, and had forfeited every baronial right ; but in 1552 Hugh O'Neil of Clandeboye promised allegiance to the reigning monarch, and obtained the castle of Carrickfergus, the town and fortress of Belfast, and all the surrounding lands. His turbulent successors having been routed by the English, the town and fortress fell into the hands of Sir Thomas Smyth, a favourite of Queen Elizabeth, but were afterwards forfeited by him to the Lord-Deputy Sir Arthur Chichester, who, in 1612, was created Baron Chichester. At this time the town consisted of about 120 houses, mostly built of mud and covered with thatch, while the castle, a two- storied building, was roofed with shingles. In 1632 Thomas Wentworth, Earl Stafford, was appointed first lord-deputy of Ireland, and Belfast soon shared largely in the benefits of his enlightened policy, receiving, among other favours, certain fiscal rights which his lordship had purchased from the corporation of Carrickfergus. Two years after the rebellion of 1641 a rampart was

raised round the town, pierced by four gates on the land side. In 1662, as appears by a map still extant, there were 150 houses within the wall, forming five streets and as many lanes; and the upland districts around were one dense forest of giant oaks and sycamores, yielding an unfailing supply of timber to the woodmen of Carrickfergus. ”

Throughout the succeeding fifty years the progress of Belfast surpassed that of most other townsin Ireland. Its merchants, in 1686, owned forty ships, of a total carrying power of 3300 tons, and the customs collected were close upon £20,000. When King William arrived at Belfast in 1690 there were only two placcs of worship in the town, the old corporation church in the High Street, and the Presbyterian meeting-house in Rosemary Lane,—the Roman Catholics not being permitted to build their chapels within the walls of corporate towns.

At the commencement of the 18th century Belfast had become known as a place of considerable trade, and what was then thought a handsome, thriving, and well-peopled town, with many new houses and good shops. During the civil commotions which so long afflicted the country, it suffered less than most other places; and it soon after- wards attained the rank of the “greatest town for trade in the north of Ireland.” James Blow and Co. introduced letterpress printing in 1696, and in 1704 issued the first copy of the Bible produced in the island. In September 1737, Henry and Robert Joy started the Belfast Mews Letter, which not only still maintains its existence, but has long been at the head of the Irish Conservative press. Twenty years afterwards the town contained 1800 houses and 8549 inhabitants, 556 of the latter being members of the Church of Rome. It was not, however, till 1789 that Belfast obtained the regular communication, which towns of less importance already eujoyed, with Dublin by stage coach,—a fact which is to be explained by the badness of the roads and the steepness of the hills between Newry and Belfast.

The increased freedom of trade with which Ireland was favoured, the introduction of the cotton manufacture by Robert Joy in 1777, the establishment in 1791 of ship- building on an extensive scale by William Ritchie, an energetic Scotchman, combined with the rope and canvas manufacture already existing, supplied the inhabitants with employment,

and increased the demand for skilled labour. The population now made rapid strides as well by ordinary

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extension as by imniigration from the rural districts. At the close of last century there were about 20,000 inhabi- tants in the borough, and this total had risen in 1821 to 37,277, in 1831 to 53,287, in 1841 to 70,447, in 1851 to 87,062, in 1861 to 121,602, and in 1871 to 174,412— males 79,815, and females 94,597. In 1875 the popula- tion is estimated at 200,000. At the last census the fol- lowing were the religious professions of the population, viz., Presbyterian, 60,249; Catholic, 55,675 ; Episcopal, 46,423 ; Methodist, 6775; Unitarian, 1498; and various, 3892. The number of persons who could read and write at the same date was 95,986; who could read, only 71,700 ; and who were illiterate, 46,726, or about 27 per cent. of the whole. 'The number of houses in 1871 amounted to 29,918, viz., inhabited, 27,961; uninhabited, 1761; and building 196.

Belfast Lough is exceedingly picturesque, whether entered by the Antrim or by the Down side of the channel. The outer harbour is one of the safest in the kingdom, great improvements having been made within the last thirty years on the more immediate entrance to the port. The course of the Lagan, which runs past the quays and down to Gramoyle, was originally most tortuous and somewhat difficult to navigate; but, about 1840, the late William Dargan was employed to make a straight cut from the lower part of the harbour and to deepen the channel, so that ships of large draught can be brought to the quays, which extend for about a mile below Queen's Bridge on both sides of the river. There are also seven extensive docks and tidal basins supplied with the necessary con- veniencies for the shipping. The following table of vessels entered inwards shows the increase of shipping frequenting the port: —

Year, eet | Tonnage. Year. pete Tonnage.

1728 370 9,180 1845 38655 445,537

1786 770 34,287 1855 5izalal 768,505

1805 840 64,585 1861 6737 902,578

1825 2069 183,441 1871 8218 | 1,223,821 1835 2950 | 290,769 1873 8417 | 1,897,407

The exports from Belfast being largely conveyed by steamer to London, Liverpool, and Glasgow, and thence trans-shipped to their destinations, do not appear in the Board of Trade returns, as only the direct business with foreign countries, which does not reach any consider- able amount, is registered in those tables. Thus other ports get credit for business which rcally belongs to Belfast. The best illustration of this is afforded by the Board of Trade returns for 1858. Belfast is there stated to have exported goods that year to the amount of £9,344, while the actual sum was £8,569,504. In 1810 the total value of exports was £2,904,820, and in 1835 £4,341,794; in 1852 the amount was £6,573,198, and for 1866 it ran up to £11,915,000. For some years past no official data have been published on this subject, but it may be safely estimated that the gross value of the exports from Belfast exceeds £20,000,000 annually.

The amount of customs and excise collected at the port in 1762 was £32,900, and in 1810 the sum was £428,174. As trade increased with London and Liverpool, a large share of the duties on goods disposed of in Belfast was paid to the merchants of those ports. In 1821 the customs amounted to £306,243, and in 1848 to £376,767. The customs paid in Belfast in 1851 reached £369,415, which, added to that paid in London and Liverpool (£184,750), made a total of £554,165. During the year 1874 the duty paid in Belfast on tea, wine, spirits, and tobacco, amounted tow 1,215,191.

For nearly a century past the flax manufacture of Ulster

has been gradually concentrating itself in Belfast. troduction there in 1830, by T. and A, Mulholland, of machinery for the spinning of linen yarn, was followed by a rapid extension of the industry, and in 1841 there were 240,000 spindles at work. The succeeding ten years showed still greater increase. In 1851 there were 561,000 spindles in operation throughout

Ireland, 630,000 in 1861, and 903,000 in 1871, of which about four-fifths had been set up in Belfast. Linen yarns from Belfast form a consider- able item in the total export of manufactures, For some time after the trade was started, the average annual export was only about 1,000,000 tb weight ; but in 1850 five times that quautity was despatched ; in 1862, 15,685,600 ib, and in 1864, 24,075,520 ib,

The weaving of linen by means of power-looms, though long carried on in Dundee, Leeds, and other great seats of manufacture, is of comparatively recent introduction into Belfast,—being hardly known there five-and-twenty years ago. In 1859, however, there were 3000 looms engaged ; in 1866 there were 10,500, and that number has now (1875) increased to about 12,500. A number of these have been fitted up for the damask trade, but the great proportion are used for plain linens, "sets" of which of great fineness are worked. The extent of the linen trade may be indicated by the number of persons employed, which amounted in 1871 to 8507, or about 5 per cent. of the population.

Cotton-spinning, which at one period formed a most extensive industry in Belfast, has greatly fallen off,—nearly all the mills having been converted to the spinning of flax.

The enterprise of the citizens of Belfast was well sup- ported by the liberal system of tenure for building purposes granted by the late Lord Donegall and his predecessors. Sites for mills, factories, and other public works were obtained on very reasonable terms, and for all religious and charitable objects those lords of the soil bestowed ground free of rent. In 1851 the places of worship in Belfast open for service belonged—11 to the Episcopalians, 21 tu Presbyterians, 8 to Wesleyans, and 4 to Roman Catholics, Since then there has been a large increase in the number : and there are now 19 Episcopalian churches, 28 Presby- terian, 16 Wesleyan Methodist, 6 Roman Catholic, 3 Unitarian, and 7 or 8 belonging to various other sects,

The River Lagan is crossed by three bridges, of which the principal is the Queen's Bridge, opened in J anuary 1843, and built on the site of the Old Long Bridge, which dated from 1686. Like most modern towns which have rapidly risen through commerce and manufactures, Belfast cannot boast of

many architectural beauties. It would seem as if its people had been too deeply absorbed in the bustle of business to think of asthetic superfluities. More recently, however, a higher style of building has been adopted ; and some of the warehouses and shops show great taste in design and finish of workmanship.

The public buildings most worthy of notice are the White and Brown Linen Halls, the Corn Exchange, the Commercial Buildings, the Museum, the Albert memorial monument, the Northern, Belfast, Ulster, and Provincial Banks, the new theatre, the town-hall, and the range of buildings containing the offices for the customs, the inland revenue, and the postal departments. The county lunatic asylum is in the suburbs of the town; and in the neigh- bourhood of Queen's College there is an extensive and well- kept botanic garden.

The chief educational establishments are the Royal Academical Institution, the Queen's College (built of brick in the Tudor style and opened in 1849), the Government School of Design, the General Assembly's College, the Catholic Institute, and the Wesleyan Institute; and alto- gether, in proportion to its extent, no town in the king-

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The in- | dom is better supplied with educational appliances than

Belfast.

Belfast is governed by a corporation of 40 members— a mayor, 10 aldermen, and 29 councillors ; and all matters connected with the docks and shipping are under the harbour commissioners, an important body elected by the ratepayers. The borough returns two members to par- liament, and the county assizes are held there, as well as the quarter sessions, recorder's court, and petty sessions.

BELFORT, Bérort, or Beprort, a second-class fortified town of France, was formerly in the department of Upper Rhine, and capital of an arrondissement; but since the peace of 1871, it has given name to a separate territory not as yet incorporated with any department. It is

situated on the left bank of the Sauvoureuse, 38 miles S.S.W. of Colmar, at the intersection of several important roads and railways, by which it maintains a considerable trade with Gerniany and Switzerland. It contains a handsome church, —St Cristophe, erected in the 18th century,—a college, a large public library, a synagogue, a theatre, and an hospital. There are several iron foundries, and iron-wire and tin-plate factories; and the manufacture of hats and leather is also carried on. Belfort, however, derives its chief importance from the citadel and entrenched camp, which render it one of the most valuable military posts on the French frontier, defending as they do the entrance into the country through the opening between the Vosges and the Jura. The citadel dates from the 13th century, and the town itself was first regularly fortified in 1688 by Vauban. In November 1870 siege was laid to the place by the German forces, but the French garrison managed to hold out till the 16th of February 1871, when they capitulated with the sanction of the Government, and marched out with the honours of war. The conquerors finally evacuated the place in July 1871. At the census of 1872 the population of the town was found to be

8014.

BELGAM [Brtcaum], a district of British India in the Bombay Presidency, extending from 15° 30' to 16° 15' N. lat., and 74° to 76° 30' E. long. It is bounded on the N. by the state of Miraj, on the N.E. by the Ralddgi collectorate, on the E. by the states of Jaémkhandi and Mudhol, on the 8. by the collectorates of Dharwar and Kanara, on the S.W.~~by the Portuguese territory of Goa, and on the W. by the states of Sdwantwdri and Kolhapur. The principal rivers, none of which are navigable, arethe Krishna, flowing through the northern ; the Ghataprabha, through the centre; and the Malaprabha, through the southern portion of the collectorate. To the N. and E. the country is open and well cultivated, but to the S. it is intersected by spurs of the Sahyddri range, thickly covered in some places with forest. Area, 4591 square miles. Population, 938,750 souls, or 204 to the square mile; 57 per cent. Hindus, 7°5 per cent. Mahometans, 5 per cent. Buddhists, 'OD Christians, and '01 Parsis. Marathi and Kanarese are both spoken, the former chiefly in the W. and S. of the district, and the latter in the N. and E. The chief occu~~ pation of the people is agriculture, the other industries being spinning and weaving, manufactures in wood and metals, pottery, and

shoemaking. There is also a consider- able trade in cloth and silk. The principal agricultural products are rice, tawdri, ragi, wheat, bdjra, sugar-cane, barley, and pulses. Tobacco is cultivated to a small extent. The entire revenue of the district amounts to £233,371, of which £179,321 is derived from the land revenue, and £17,597 from the local fund cess. Of the remainder £15,444 is derived from stamps, £14,996 from excise, assessed taxes yield £2344, and forests £3669. Ofa total area of 4591 square miles, 1894-63 square miles are re- turned as cultivable, and 1729°7, or 374 per cent. of the

total area, are actually under cultivation. The last scttle- ment of the land revenue was made for a period of thirty years at various times between 1848 and 1864. The total imperial cxperditure in the district amounts to £98,097. The following towns have a population of more than 5000 inhabitants :—Belgaum, 26,947 ; Gohak, 12,612; Athani, 11,588; Nipdni, 9371; Temkanmardi, 5296; Hougal, 9001; Sankeshwar, 8905; Sawadati, 8180; Murgod, 7181; Ketur, 7166; Sdadalgi, 6863; Manoli, 6232 ; Chikadi, 6184; Nandighar, 5748; Hukéri, 5364; and Konganoli, 5143. Municipalities have been established in the first five of these towns, the necessary revenue being raised by octrot dues, except in the case of Temkanmardi,

where a house tax has been levied. 'The district contains 113 schools, with an attendance of 7624 pupils, or 0°8 of the entire population. Of the total number of schools, 2, with an attendance of 198 pupils, are private institutions, recciving Government aid. There is a stipendiary police of 684 men. The Kurirs, a wandering and thieving tribe, the Kamais, professional burglars, and the Baruds, cattle- stealers and highwaymen, are special criminal classes. Of these the Baruds are the most troublesome. The district of Belgam was ceded to the East India Company by the Peshwa, under the treaty of June 1817, for the maintenance of a subsidiary force to be provided by the British Govern- ment.

BELGIUM

ELGIUM (Fr. Belgique, Ger. Belgien), is one of the smaller of the European states, among which it ranks

16th in point of area and 8th according to population. It lies between lat. 49° 30’ and 51° 30’ N., and long. 2° 32’

English Miles bo £0

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and 6° 7’ E.; and is bounded on the N. by Holland, E. by Dutch Limbourg, Luxembourg, and Rhenish Prussia, 8. and S.W. by France, and N.W. by the North Sea. It is somewhat triangular in form, the longest side—that which

Sketch Map of Belgium.

adjoins France—being 384 miles in length. The length of its other boundaries are,—towards Holland 268 miles, Germany 59, Luxembourg 80, and the North Sea 41. Its greatest length from N.W. to 8.E. (from Ostend to Arlon) is 174 miles, and its greatest breadth from N. toS. 105. It has an area of 2,945,593 hectares, equal to 7,278,968 English acres, or 11,373 square miles,—being about one-eighth of the area of Great Britain. This country is divided into nine provinces,-Antwerp in the N., West and East

Flanders and Hainault in the W., Namur in the S, Luxembourg in the 8.E., Liége and Limbourg in the E., and Brabant in the centre.

Belgium is in general a very flat country having few Physical elevations, and these rarely exceeding 2000 feet in height. features.

They are principally to be found in the E. and S.E., while the N. and N.W. parts of the country bear a considerable resemblance to Holland. ‘The elevations of Belgium take their rise in France, and extend generally in a N.E. diree-

BELGIUM

tion. A chain proceeding from the neighbourhood of the sources of the Saone separates the waters of the Meuse from those of the Moselle, passes Arlon and N eufchateau, then extends in a north-eastern direction towards Bastogne, and finally enters Prussia. A branch of this chain goes off at Neufchateau, procecds northward towards Lidge, passes St Hubert, and separates the Ourthe from the Meuse. A part of the Ardennes also extends into Belgium, and separates the basin of the Meuse from that of the Scheldt. It procceds in a north-eastern direction, passing Fontaine PEvéque, Gembloux, Ramillies, and Tongres, then, gradually decreasing in height, it turns northward to Asch, and after- wards N.W. to Hechtal, Lommel, and Turnhout. A series of heights on the frontier of France, near Chimay, extends in a N.W. direction towards Namur, and separates the Meuse from the Sambre.

The provinces of Liége, Luxembourg, and Namur present the greatest irregularities of surface. This part of the country is intersected by numerous ravines and streams with steep and rocky banks, by deep valleys, and by ridges of hills, which often have precipitous and rocky escarpments. The vegctation here is of a very poor and languid character. The greater part of the region is covered with dense forests, marshy and uncultivated plateaus or poor pasture land, and corn is very rarely cultivated. Descending towards the coast the forests become less extensive ; and rye, oats, aud potatoes take the place of the pasture land. In the western and north-western provinces are extensive and well-watered plains, which, from their great fertility and the high state of their cultivation, are the boast of the Belgians and the admiration of strangers.

In the provinces bordering on the sea the land is in some placcs so low as to require to be protected from inundation by dikes, These parts are called polders. Numerous places along the banks of the rivers are also protected by embankments; these are called interior polders. About a sixtieth part of the kingdom (50,000 hectares, or 193 square miles) is thus artificially gained from the sea and rivers.

The coast of Belgium is said to be undergoing a change similar to that of Scandinavia,—in some parts a gradual clevation, and in others a gradual depression. Nieuport is said to be on the axis of this change, from which,

northward to the mouth of the Scheldt, the sea is continually gaining upon the land, while southward to Pas de Calais it is losing.

The principal rivers are the Scheldt, Meuse, and Yzer, with their tributaries, The Scheldt is navigable during its entire course through Belginm, and has a general direction fron S.W. to N.E., passing through the province of Hainault, along the eastern boundary of West Flanders, traversing East Flanders, and finally forming the boundary between the provinces of East Flanders and Antwerp. Its entire length throngh Belgium is 108 miles. The Meuse has a course nearly parallel to that of the Scheldt, traversing the provinces of Namur, Liége, and Limbourg. It is 115 miles in length, during the whole of which it is navigable. The small river of Yzer, which enters the sea at Nieuport, is navigable for about 26 miles, The navigable rivers, connected with the Scheldt are,—the Dyle, which after receiving the Nethe at the village of Rumpst, takes the name of Ruppel, and joins the Scheldt nearly opposite to Ruppelsmonde ; the Great and Little Nethe, which after their junction take the name of Nethe, and fall into the Dyle; the Demer, also an afflucnt of the Dyle; the Dender, which enters the Scheldt at Dexndermonde; the Durme, which joins it ncar Thielrode ; and the Lys at Ghent. The entire navigable length of these streams is 230 English miles. The navigable rivers of the Meuse are the Amblere and the Vesdre, affluents of the Ourthe ; the Ourthe, which joins the Meuse at Lidge ; and the Sambre, which joins it

old

at Namur. The navigable length of these is 142 miles. The small river of Yperlee, which joins the Yzer, is navigable for about 9 miles. The other streams are the Scnne, the Haine, the Semoy, and the Lesse.

Besides these navigable rivers, Belgium has a number of Cana's.

canals for inland navigation, some of which are uscd also forirrigation, They are twenty-nine in number, and their entire length is 605,440 metres, or 376 English miles, The principal of these are the canals—from Bruges to Ostend, from Brussels to Charleroi, from Bocholt to Heren-" thal, from Brussels to Willebroeck, from Ghent to Bruges, from Liége to Maestricht, from Maestricht to Bois-le-Duc, from Pommeroeul to Antoing, from

Plasschendaele to Nieuport, the Louvain canal, the Lieve, and the Moevaert. Each of these canals is upwards of 12 miles in length, and the longest, that from Brusscls to Charleroi, upwards of 46 miles. The entire length of the river and canal navi- gation of Belgium is 1006 English miles.

Belgium possesses a number of mineral springs, the principal of which are the hot springs of Chaudfontaine, situated about five miles from Liége, and the mineral spring of Tongres; but the most celebrated waters are those of Spa. he ferruginous springs of Huy were formerly in considerable repute, but are now little used.

The climate of Belgium is similar to that of England, Climate.

but is a little colder in winter and hotter in summer. In the south-eastern parts the atmosphere is more pure and bracing than in the lower parts towards the N.W., whcre it is frequently damp and hazy. Frost rarely appears before the middle of October or after the middle of April. Observations made at Brussels from 1833 to 1872 give the mean annual temperature as 50°°6 Fahr.,—the mean maxi- mum being 57°°2, and the mean minimum 44°:1 Fahr. During that period there were no frosts in the five months from May to September inclusive, and snow fell only cight times in May and four times in October. The average number of foggy days annually, from 1833 to 1862, was 60, and with thunder 15. The annual average of days on which rain fell was 197, and the quantity of rain 28-04 inches, or 3 inches less than the rainfall at London.

The population of Belgium in 1831 was 3,785,814 ; in Population.

1840, 4,073,162; in 1850, 4,426,202; in 1860, 4,731,957, and in 1873, 5,253,821, being 2,645,147 males and 2,608,674 females, 'The following table shows the popnla- tion of the different provinces in each of the years 1831, 1850, and 1873 (31st December) :—

1831, 1850. 1873.

PATIIGV CI [Diar ie vaicigsieeise sce este 349,942 420,556 513,543 BRANDAM Bec vaasscinns ecencatvonn 561,828 734,617 922,468 Hast Flanders…..... 742,978 783, 450 854,366 West Flanders …..... 608,

226 631,137 682,921 TINA sisacienenee aestconene 613,179 733,740 932,086 USO OM re cc ce cccaezaeautnteses 375,030 467,848 623,165 Iban UNA? 5 connqunoeds conden 160,090 188,198 202,922 [Gibco SYS55¢2ocononee anno 160,762 192,588 206, 069 ENEMA eyeteie niece tastes = onns BUS 274,078 316,331

8,785,814 4,426,202 5,253,821

The principal towns are—Brussels, with 180,172 inhabi- tants; Antwerp, 141,910; Ghent, 128,424; Liége, 113,774; Bruges, 48,113; Verviers, 38,875; Tournay, 31,923 ; Malines, 38,540; Louvain, 32,314.

Belgium is the most densely populated country of Europe, having on an average 178 inhabitants to the square kilometre, which is equivalent to 461 to the square mile. The density differs greatly in the several provinces, being as high as 285 per square kilometre in East Flanders, 281 in Brabant, and 250 in Hainault ; andas low as 86 in Namur, 84 in Limbourg, and 47 in Luxembourg. The general census of 1866 gives 134,001 as under one year of ages 549,077 between one and five years, and 494,332 between five and ten; while 299,711 were from sixty to seventy, 115,216 from seventy to eighty, 23,890 from eighty to ninety, 1292 from ninety to a hundred, and 12 a hundred and upwards. The number of

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unmarried persons was 3,011,566, of married persons 1,528,548, of widowers and widows 287,724. As regards their places of birth, 3,348,506 had been born in the same commune in whieh they lived; 1,381,281 had been born in another commune of the same province; 288,672 had been born in another province of the kingdom, 13,044 in the ceded districts of Luxembourg or Limbourg, 26,485 in other parts of Holland, 32,021 in France, 20,701 in Germany, 3008 in England, and 2892 in other countries. In 1878 the births were 17,708, being 87,128 males, and 83,580 females, or 104 males to 100 females,—giving one birth to every 30°3 of the

population, and 151 births to a hundred deaths. Of the births 158,585 were legitimate and 12,128 illegitimate, or 13 legitimate births to 1 illegitimate. The proportion, however, varies much in the different provinces, being 7°S to 1 in Brabant, and 87 to 1 in Luxembourg. The number of marriages that took place was 40,598, and of deaths 112,878. Of the latter, 24,282 were under one year, and 16,730 betwecn one and five years of age ; 315 males and 62 females were by suicide, 2068 were from accidents, and 69 were murdered. The immigrations were 15,792, and the emigrations 7981.

The languages spoken in Belgium are French or Walloon (a dialect of the ancient French), and Flemish or Dutch. French is the language of the upper and educated classes, and is generally understood even in the Flemish parts of the kingdom. In 1866 those speaking French or Walloon

amounted to 2,041,784; Flemish or Dutch, 2,406,991 ;

French and Flemish, 308,361 ; German, 35,356 ; French and German, 20,448; Flemish and German, 1625; and the three languages, 4966. The French or Walloon is the prevailing language in the provinccs of Hainault, Liége, Luxembourg, and Namur; the Flemish or Dutch in Antwerp, Brabant, the two Flanders, and Limbourg.

Since the formation of Belgium into an independent state, the Government has taken a laudable interest in all that concerns the advancement and happiness of the people ; and not being trammelled by a respect for old laws or useless customs, it has adopted, as far as possible, the most improved systems of other countries. The whole system of government is based upon the broadest principles of rational freedom and liberality. All power emanates from the people, and cau be exercised only according to law. The people are upon a strict equality in the eye of the law ; personal liberty is guaranteed to all, as well as entire frecdom in opinion and in religious worship. ~All the religious sects are endowed by the state, and large grants are also given annually for educational and charitable purposes. Home is inviolable, nor can any one be deprived of his property unless for the good of the state and for a suitable indemnity. Justice is open to all, as well as the means of education, and the benefits of the public charities. The press is free, and civil death is abolished. Any one may address petitions to the public authorities signed by one or more persons.

‘Trial by jury is established for all criminal and political charges, and for offences of the press. The contents of letters are inviolable, and the post-office is responsible for all letters committed to it.

The government is a constitutional representative and hereditary monarchy. The legislative power is vested in the king, the chamber of representatives, and the senate. The judicial power is exercised by fixed tribunals, freed from. all authoritative influences, judging publicly, and assigning reasons for their decisions. Affairs exclusively provincial or communal are managed by the provincial or communal councils

The royal succession is in the direct male line in the order of primogeniture, to the exclusion of females and their descendants. ‘The king’s person is declared sacred, and his ministers are held responsible for the acts of the Government. No act of the king can have cffect unless countersigned by one of his ministers, who thus becomes the responsible party. The king convokes, prorogues, and dissolves the chambers, and makes rules and orders necessary for the execution of the laws, but has no power to suspend or dispense with the execution of the laws

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themselves. He nominates to civil and military offices, and commands the sea and land forces. He declares war, and concludes treaties of peace, of alliance, and of com- merce,—comimunicating the same to the chambers as far as may be consistent with the interest and safety of the state. He sanctions and promulgates the laws, and has the power of remitting or reducing the punishments pronounced by the judges, except in the case of his ministers, to whom he can extend pardon only at the request of one of the chambers. In default of male heirs the king may nominate his suc- cessor with the consent of the chambers. The regency can only be conferred upon one person, and no change in the constitution can be made under his rule.

The people are represented in the Legislature by the Chambers,

Chamber of Representatives and the Senate, the members of which are chosen by the people. Each chamber deter- mines the manner of exercising

its own powers, and every session nominates its president and vice-presidents, and forms its bureau. No petition can be presented personally ; and every resolution is adopted by the absolute majority, except in some special cases, when two-thirds of the votes of the members are required to be favourable ; in the casc of an equality of votes the proposition is thrown out. The chambers meet annually in the month of November, and should sit for at least forty days ; but the king has the power of couvoking them on extraordinary occasions, and of dissolving them either simultaneously or separately. On dissolution a new election must take place within forty days, and a meeting of the chambers within two months. An adjournment cannot be made for a period exceeding one month without the consent of the chambers.

The Chamber of Representatives is composed of deputies Chamber of chosen directly by the people paying a certain amount of Representa- The number of deputies is fixed according to tives.

direct taxes, the population, and cannot exceed one member for every 40,000 inhabitants; at present they amount to 124. To be eligible for membership it is necessary to be a Belgian by birth or to have received the grand naturalization, to be in the possession of the civil and political rights of the kingdom, to have attained the age of twenty-five years, and to be resident in Belgium. The members not residing in the town where the chamber sits receive, during the session, an indemnity of 200 florins (£16, 13s. 4d.) each per month. 'The members are elected for four years, one-half going out every two years, except in the case of a dissolution, when a general election takes place. This chamber has the parliamentary initiative and the preliminary vote in all cases relating to the receipts and expenses of the state, and to the contingent of the army.

The electors of the Chamber of Representatives have genate,

also the nomination of the members of the Seuate. To be eligible as a senator it is necessary to be a Belgian by birth or to have received the grand naturalization, to be in the enjoyment of civil and political rights, to be domi- ciled in Belgium, to be forty years of age, and to pay at least 1000 florins (£84) of direct taxes. In those pro- vinces where the number of those paying 1000 florins of taxes docs not amount to one in every 6000

inhabitants, this proportion is made up by those paying the highest amouut below that sum. ‘he permanent deputations of the provincial councils annually prepare a list of those who are eligible tothe Senate. In 1874 the number of these was 453. At the age of eighteen the heir-presumptive to the throne has a seat in the Senate, but he has no voice in its deliberations till he attain the age of twenty-five. ‘The senators receive no indemnity. They are elected for eight years, one-half going out every four years, except in the case of a dissolution. The Senate is composed of half as many members as the Chamber of Representatives, the number at present being 62.

Ministers.

Naturaliza- tion.

Divisions.

Provincial govern- ment,

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In order to be a general elector it is necessary to be a Belgian by birth or to have received the grand naturaliza- tion, to be twenty-one years of age, and to pay dircct taxes to the amount of at least 20 florins (33s. 4d.) In 1874 the total number of general electors was 111,135, or at the rate of 21°15 per 1000 of the population.

The king appoints and dismisses his ministers at pleasure. No member of the royal family can be a minister, uor any but a Belgian, or one who has received the grand natu- ralization. Ministers have a right of admission to the chambers, and may demand a hearing; but they have no voice in the deliberations unless they are members. The chambers can at any time require the presence of the ministers. No act or writing by the king can free a minister from responsibility. The Chaniber of Represen- tatives has the power of accusing the ministers, and of bringing them before the court of cassation, which alone has the right of judging them, in all cases of offences cominitted in the exercise of their functions. There are six ministers, viz., of foreign affairs, of the interior, of justice, of finance, of war, and of public works.

Naturalization is of two kinds, the one conferring on the foreigner all the civil and political rights belonging to a Belgian, with certain exceptions specified by law, such as the right to vote in the choice of members for the legisla- tive chambers or of sitting there; to obtain these the grand naturalization is requisite. The registration-fee for the former is 500 francs; for the latter, 1000. Since 1831 only 47 have received the grand naturalization and 1527 the ordinary.

For civil purposes the provinces are divided into 26 arrondissements, 204 justice-of-peace cantons, and 2528 communes ; and for military purposes, into 41 arrondisse- ments, 303 military cantons, and 2568 communes. '

In each province is a governor named directly by the king, for the purpose of superintending and securing the due execution of the laws, and a provincial council, coni- posed of Belgian citizens at least tweuty-five years of age, residing in the province, and in the enjoyment of civil and political rights. The number of members of each provincial council is made to depend upon the population, and varies in the different provinces from one for every 11,500 of the population in Brabant and Hainault, to one for every 5000 in Limbourg and Luxembourg. Each canton, however, is entitled to be represented by at least one member, and the number of members for each canton depends upon the population according to the scale fixed for the province. The total number of members in 1874 was 559,—Antwerp council having 58; Brabant, 73; East Flanders, 80; West Flanders, 69; Hainault, 76; Liége, 67; Limbourg, 40; Luxembourg, 41; and Namur, 55. The electors of the inembers of the provincial councils were formerly the same as the electors of the legislative chambers, but in 1872 the provincial franchise was lowered, and the number of electors in 1874 was 219,619, or 41:80 to 1000 inhabitants. A pro- vincial elector requires to be a Belgian or to have received naturalization, and to pay taxes to the amount of 20 francs (16s.) Members of the chambers, governors, and persons in the employment of the stete or province, are ineligible as councillors. The councils have an annual session of not more than four weeks; but the king can convoke them on extraordinary occasions. Those not residing in the provincial capital receive an indemnity during the session. Each provincial council appoints a permanent deputation for conducting business in the interval between the sessions, particularly in matters requiring immediate attention. It is

composed of six members chosen for four years, one-half going out every two years.

These councils are of the highest importance to the country. They watch over the interests of their several

olT provinces, prepare the budgets, direct taxation, and super- intend public works. They give a healthy impulse to agriculture, trade, and commerce ; direct the construction of roads, canals, and bridges; and extend the benefits of education and religion throughout the country. The com- munes have the power of appeal to the king if they consider themselves aggrieved by any of the acts of the provincial council, or of the permanent deputation.

Matters exclusively communal are managed by communal councils, The councillors are Belgian citizens in the full enjoyment of civil and political rights, and, except in some special cases, resident in the commune. They are elected for six years, one-half going out every three years. The number of the councillors is from 7 to 31, in proportion to the population of the commune, which varies from under 1000 to upwards of 70,000 inhabitants. Communal electors require to be Belgians or to have received naturalization, and to pay taxes to the amount of 10 francs (4s.) The total number of electors in 1874 was 347,441, being 66°13 per 1000 of the population. Communes with less than 20,000 inhabitants have two aldermen, and those having more than that number have four. There is also in each com- mune a burgomaster, who, as well as the aldermen, is chosen by the king from among the members of the com- munal council.

Full liberty is guaranteed to all in the exercise of the public or private rites of their worship; nor does the state interfere in any way in matters of religion, except where the public safety may be concerned or the laws infringed. Almost the entire population of Belgium is Roman Catholic, there being only about 15,000 Protestants and 3000 Jews, The ministers of each denomination are paid by the state, —the amount so paid in 1873 being 4,648,757 francs, or £185,950, of which Roman Catholics received 4,568,200 francs, Protestants 69,336, Jews 11,221.

The kingdom is divided into six Roman Catholic dio- ceses,—the archbishopric of Malines, and the bishoprics of Bruges, Ghent, Li¢ge,

Namur, and Tournay. The arch- bishopric has three vicars-general, and a chapter of twelve canons; and each of the bishoprics, two vicars-general, and a chapter of eight canons, In 1873 there were 156 deaneries, 233 rectories, 2788 chapels of ease, 148 public chapels, and 1745 vicariates.

The temporal affairs of the churches are managed by a vestry-board and a board of wardens. There is an ecclesi- astical seminary in each diocese, and scholarships are annually given by the state to certain of the students upon the presentation of the chief of the diocese. The state also contributes to the salaries of the professors by an annual grant to each of the seminaries, except that of Liége which has suflicicut funds otherwise. The provinces are bound to provide and maintain suitable buildings for these semi- naries. There area number of religious houses in Belgium for males and females, whose lives are spent in pious con- templation, teaching, and visiting the sick. The number of these houses in 1866 was,—for males 178, and for females 8144; the number of persons in the former was 2991, and 15,205 in the latter.

Communal govern-

ment.

Religion.

Roman

Catholics.

The Protestant Evangelical Church is under a synod, Protest- composed of the clergymen of the body and a representa- ants.

tive from each of the churches. It sits in Brussels once a year, when each member is required to be present, or to delegate his powers to another member. The Anglican Church has eight pastors and as many chapels in Belgium, —three in Brussels and one in each of the towns Antwerp, Bruges, Ghent, Ostend, and Spa.

The Jews have a central synagogue at Brussels, three Jews.

branch synagogues of the first-class at Antwerp, Ghent, and Liége, and two of the second-class at Arlon and Namur. The civil and religious affairs are conducted by a

consistory of nine members, six of whom are appointed by the central, and one by each of three first-class synagogues. The grand rabbi, who is at the head of this body in Bel- gium, is, ew officio, a member of the consistory.

The Belgian Government has shown itself thoroughly alive to the great importance of a general diffusion of education among the people. Numerous public schools and literary and scientific institutions are established through- out the country, supported out of the communal, provincial, or Government funds. Different classes of inspectors are appointed to visit and report upon the state of education in their various districts. Prizes, scholarships, and other rewards are bestowed upon those that distinguish them- selves most in the prosecution of their studies. Religious and moral instruction is under the direction of the sect to which the majority of the pupils belong; but those con- nected with other sects may be exempted from attendance on this course, Normal schools have also been established for the purpose of securing trained and efficient teachers. The schools are open to all, and gratuitous instruction is provided for those who may not otherwise have the means of acquiring it. Yet, with all these advantages, there are still many among the lower classes growing up in ignorance. According to the census of 1866, out of a population of 4,827,833, only 2,279,891 were able to read and write, giving, if we exclude all of seven years of age and under, only 58 per cent. of the population. This proportion varied considerably in the different provinces, being as high as 77 in Luxembourg and 71 in Namur, and as low as 48 in East and 51 in West Flanders. In 1843 only 49 per cent. of those who took part in the balloting for the militia were able to read and write; in 1853, 56; in 1863, 62; and in 1873, 74. Ont of 42,313 in 1873, 8678 were un- able to read or write, 2027 could read but could not write, 13,887 were able to read and write, and 16,836 had re- ceived a superior education. This shows that it is not enough merely to provide the means of education in order to secure an educated population. In the industrial locali- ties the parents are generally anxious to get their children admitted as soon as possible into workshops and manufac- tories, and in rural districts they are engaged in tending cattle or in field labour.

The educational institutions may be divided into four classes, viz., primary, middle, superior, and special.

A law passed in 1842 enacted that there should be at least one primary school in every commune, except in certain cases where primary education is already sufficiently provided for by private schools, or where one school may serve for several neighbouring communes. The communes may also adopt one or more private schools, possessing the legal qualifications, to occupy the place of the communal school. The branches taught are reading, writing, and the elements of arithmetic ; the rudiments of the language spoken in the locality,—French, Flemish, or German ; moral and religious instruction; and the legal system of weights and measures, in most schools taught practically. In many of the schools gymnastics, music, the elements of drawing, the outlines of history and geography, and the rudiments of the natural sciences, are also taught. The communes are obliged to afford gratuitous instruction to all the children within their bounds whose parents are in poor circumstances or are otherwise unable to educate them. The primary schools are under the surveillance of the communal authorities and Government inspectors ; and the imparting of moral and religious instruction is superintended by delegates from the religious bodies. Each province has a general inspector of the primary schools, who is appointed by the king, and inspects, at least once a year, all the communal schools in his district. Under him are the cantonal inspectors, who must visit the schools in their dis-

tricts at least twice a-year. In 1872 the primary schools sub- mitting to inspection were—communal, 3949 ; adopted, 469 ; private, 18; and boarding, 22; besides which there were 990 private schools and 230 boarding schools not under inspec- tion. Of the inspected schools 1353 were for boys, 1284 for girls, and 1821 for both sexes; and of the non-inspected 267 were for boys, 693 for girls, and 261 for both sexes. The total number of primary schools was 5678, giving on an average 2°21 schools to each commune, and 1°13 to each 1000 of the population. The total number of scholars attending these schools was 618,937 (or 12°3 per cent. of the population), of whom 313,165 were boys and 305,772 girls; 518,141 were

at inspected schools, and 100,796 at non-inspected. The number of scholars attending the communal schools was 449,940, of whom 325,432 were instructed gratuitously; and attending the adopted schools 63,594, of whom 42,521 were receiving gratuitous instruc- tion. The total number of teachers and assistants was 10,629, of whom 5394 were males and 5235 females; of these, 4656 males and 2977 females were in the communal or adopted schools. The teachers in the communal schools are appointed by the communal councils, which have the power of suspending them for a period not exceeding three months, the Government decreeing as to their absolute dis- missal or reinstatement. They are required to have at- tended, for at least two years, the classes of a normal school.

Besides the primary schools properly so called, there are in many localities other establishments where primary instruction is communicated, as the infant, adult, manu- facturing schools, &c. The infant schools are for children between two and six years of age. There were in 1872, 780 of these schools, of which 212 were communal, 220 private but under inspection, and 348 private and non- inspected. The total number of pupils was 78,181.

In the adult schools the branches taught are generally the same as in the communal primary schools. The com- munal councils are invited to establish such schools, and of late years considerable progress has been made in this direction. In 1863 the uumber of adult schools was 1194, with in all 188,890 scholars; and in 1872, 2351, with 199,957 scholars. In the latter year 1454 of the schools were communal, 74 private inspected, and 823 private non-inspected. Of the scholars 98,558 were males, and 101,399 females ; 56,880 were at commnnal schools, where 54,630 were receiving gratuitous instruction, and 7362 at adopted schools, where 7179 were gratuitously instructed. There are also primary schools annexed to prisons, hospitals, and depéts of mendicants, and reform schools. The number of these in 1872 was 97, and of scholars 6485. Consider- able sums are given by Government for providing food, clothing, and other necessaries for the poor children attend- ing the primary and infant schools.

The expenses of public primary education fall in the first instance on the commune ; and in case of insufficiency of funds, the province, and finally the state, come to its assistance. Each commune, however, must contribute a

sum equal to at least two per cent. upon its direct taxa- tion before being entitled to claim any assistance from the province or state. The total expenditure for public primary education was,—in 1848, 2,651,639 francs; in 1853, 4,465,411; and in 1863, 9,372,259. In 1872 it was 16,200,843 or £648,033, of which 1,326,659 francs were school fees received, 506,512 public or private donations, 5,863,561 were contributed by the communes, 1,584,010 by the provinces, and 6,643,415 by the state.

The middle schools are divided into two classes, those Middle supported by the Government, and those maintained by the schools.

communes. The former are of two kinds—(1), the royal athenzeums, called also the middle superior schools; and (2), the middle inferior schools, or the middle schools properly

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so called, including the former superior primary, as well as the schools formerly known as industrial and commer- cial schools.

There are ten royal athenzeums, two in Hainault, and one in cach of the other provinces, viz. in the towns of Antwerp, Brussels, Bruges, Ghent, Mons, Tournay, Lidge, Hasselt, Arlon, and Namur. In each of these are two courses, the one for the lumanities and the other for a professional education. The professional course is divided into a lower division, comprehending a course of three classes, each of onc year, and an upper division, with three sections, the commercial, industrial, and scientific, each divided into two classes, and extending over two years. In 1872 the number of students at the athenzeums was 3562, of whom 623 were in the preparatory classes, 1157 in the humanity section, and 1782 in the professional.

In the state middle schools the courses are arranged so as to occupy three years. To some is annexed a prepara- tory section, making a year more. The number of these schools in 1872 was 50, with 9012 scholars,

The communal middle schools are of two grades, a first and second,—the former embracing 17 schools, the latter 16. They ought to be based upon

the same principles, and teach the same branches as the royal atheneums and middle schools. In 1872 the number of scholars in the first or higher grade of schools was 1381, of whom 239 were in the preparatory classes, 730 in the humanity section, and 412 in the professional, The number of scholars in the lower grade of schools was 1828, of whom 1274 were in the lower sections and 554 in the higher. Most of these schools have libraries, museums of natural history, and cheinical laboratories attached to them. There are in addition to these 75 unendowcd colleges, of which 45 are Episcopal and 11 Jesuit.

The educational staff consists of a prefect of studies in the athenzeums, and a rector in the middle schools, pro- fessors, regents, and masters. The prefects, professors, rectors, and regents are nominated by the king, and the masters and teachers by the minister of the interior. The diploma of a professor agregé of cither degree is bestowed by a special jury after a searching examination. It is given without regard to the place where the candidate has studied. The prefects and rectors reside on the premises, and have the general direction and management of the institutions over which they are placed. Each has to report annually as to the state and condition of the institution under his care, and to register the conduct and progress of the scholars.

The middle, like the primary schools, are subjected to a regular system of inspection. The literary and scientific branches are under the superintendence of two inspectors and an inspector-general nominated by the king, To one of the inspectors is especially confided the mathematical and natural sciences, and to the other the humanities ; the other branches, as history, geography, and the com- mercial sciences, may be committed to either of the inspectors or to the inspector-general. The inspector has to examine and report upon the state and discipline of each establishment, the methods employed in teaching, the progress made by the pupils, and the merit and zeal of the teachers. The conseil de prefectionnement for the direction and improvement of middle education is composed of from eight to ten members, mostly professors in the universities, presided over by the minister of the interior or his deputy, and meets at least four times a year. A general competi- tion takes place annually among the scholars of the athe- neeuins and colleges receiving grants from Government, to which, however,

scholars from other establishments may be admitted. Thé examinations are both written and oral ; and the rewards are of three kinds, prizes, accessits, and honourable mention.

The amount contributed by the state to the athenseums in 1872 was 467,575 francs, to the state middle schools 418,589, and to the communal middle schools 184,079. The amount contributed by the communes to the athenzeums was 291,937 francs, to the state middle schools 169,320, and to the communal middle schools 232,359.

The superior instruction establishments are the four Universi-

universities,—two belonging to the state, at Ghent and Liége, the free university at Brussels, and the Catholic university at Louvain.

Each of the state universities has faculties of philosophy and literature, science, law, and medicine. In each there are 8 professors in philosophy, 9 in the sciences, 7 in law, and 8 in medicine. One or two additional professors may be added to each of the faculties in case of necessity. The professors are nominated by the king, and cannot exercise any other profession without the consent of the Govern- ment,

Attached to each university are a number of agregés named by the king. Their title is honorary, and they are chosen from among those students who have most distin- guished themselves at the public competitions or final examinations, from professors of middle instruction, or from members of the civil or military body of engineers, They are nominally attached to one of the facultics, but are not prohibited from exercising any of the liberal p.ofessions, and in case of any of the professors being unable to per- form his duties, a substitute is chosen from among the agregés attached to that faculty.

The universities are undcr the management of a rector, a secretary, deans of faculty, the senatus academicus, and the board of assessors. The rector is nominated by the king for three years, and has the direction of all academic matters. The secretary is appointed annually by the king from a list of two candidates nominated by the senatus academicus. The deans of the faculties are chosen annually by the professors of each faculty, and have the right of

convoking the professors of their faculty. The senatus and the board of assessors are convoked by the rector ; the former is composed of the professors, uuder the presidency of the rector, and the lattcr of the rector, secretary, and the deans of faculty.

Each student pays annually for enrolment 15 frances, and then takes out a ticket for the branches of the course in which he intends to take his examinations. For philosophy and literature, and for law, the annual ticket costs 250 francs, and 200 francs for the other faculties. The instructions are given in the French language. Subsidies are accorded by Government to the universities for the libraries, botanical gardens, cabinets, &c.; but the towns of Liége and Ghent are bound to maintain the buildings. The sum granted by the state to the two universities in 1873 was 937,919 francs.

Attached to the university of Ghent is a school for civil engineers. The preparatory course extends over two years, and comprehends the mathematical, physical, and natural sciences necessary to the subsequent courses. The special course is divided into two sections, the one for engineers of roads and bridges, and the other for architectural engineers. This course continues for two or three years. The third course, which lasts for three years, is for industrial engineers or persons engaged in arts or manufactures. They are instructed in the application of the various sciences to the arts and manufactures, particularly to the mechanical arts.

Similar to the above is the mining school attached to the university of Liége. The first course is preparatory to the other two. The special course includes all the branches necessary to a mining engineer. 'The third course is for those desirous of obtaining a knowledge of mining, min-

Special schools,

Normal schools.

erals, &c., more particularly as connected with the arts and manufactures. This last course extends over three years.

The free university of Brussels has faculties of philosophy and literature, of science, of law, and of medicine, courses in which are given by ordinary and extraordinary professors and agregés. Each student pays annually 15 francs for enrolment, and a fee of 200 or 250 francs for the courses in any of the faculties. The fee for single classes is gene- rally 50 francs. An annual subsidy of 10,000 francs is allocated to the university by the provincial council of Brabant, and the permanent deputation has the right of annually presenting ten youths of the province for gratui- tous instruction. A subsidy of 50,000 francs is also allo- cated annually by the communal council of Brussels. The university is governed by an administrative council, com- posed partly of permanent members and partly of menibers chosen annually by the professors of the four faculties and the former students of the university. This council is pre- sided over by the burgomaster of Brussels, who has a casting vote in its proceedings.

The Catholic university of Louvain is governed by a grand rector, nominated and revocable by the episcopal body.

A competition takes place annually among the scholars of superior instruction, and at these competitions two gold inedals are given in each of the faculties. There are also twelve travelling scholarships given annually, tenable for two years, to such students as have taken their doctor's degree with the highest distinction and wish to travel, to enable them to visit foreign countries ; and about sixty bur- saries of 400 francs each are given annually to poor students to enable them to prosecute their studies. Besides these there are connected with the universities a number of private bursaries, the management and bestowal of which are in the hands of particular persons or corporations in terms of the acts of foundation.

The special educational institutions of Belgium are of various kinds, and are generally in a very efficient state. They include (in addition to the engineering and mining schools already mentioned) normal schools, military schools, navigation schools, &c., and academies and schools of design, painting, sculpture, music, de.

There are two Government normal schools for primary teachers, one at Lierre and the other at Nivelles.—the former having twelve and the latter thirteen professors, with arector each. The course extends over three years,

and during the last year of attendance the pupils are exercised in teaching in the primary schools of the town. There are also seven episcopal normal schools, in which similar branches are taught, except that the principles of the Catholic religion are more particularly inculcated. The chief diocesan nominates the rectors and professors. The course lasts for four years. Besides these there are several private normal schools for males and females, one or more institutions for

the training of female teachers by each province, and normal

primary sections attached to the middle schools of Bruges, Ghent, Huy, Virton, and Couvin.

Bursaries of 200 francs each are annually given by Government to assist poor students attending the normal schools; and students of promise, who have taken diplomas at either of the Government primary normal schools, may be admitted to the normal school of middle instruction at Nivelles. The course here is for two years. There are also for the training of teachers for the superior middle institutions, the normal school of the humanities at Liége, and the normal school of the sciences at Ghent. Candi- dates for admission must be young men of superior talents, qualifying them to perform creditably the duties of pro- fessor, and they must pass certain examinations, The branches taught in both schools extend over three years. In the school at Liége there are fourteen bursaries of 500 francs each, given to the poorer students, the recipients becoming bound to act as professors in one of the middle schools for five years. There are five bursaries of 500 francs in connection with the school at Ghent.

. There is a military school at Brussels for training officers Military for the army. The number of scholars in 1873 was 129. Schools.

The courses are divided into two sections; the one, which extends over two years, is preparatory to the second, which also extends over two years, and is divided into special branches qualifying for the infantry, cavalry, or marines. A school has been established in Lierre for the purpose of educating the sons of the military forthe army. The course extends over five years, and the pupils generally enter the army about the age of sixteen. They are placed in the army according to their proficiency, some as sub-

officers and corporals, others as common soldiers. The pupils in 1873 were 252.

Each regiment has a regimental school for training young men in the army for subalterns, and a number of evening schools for affording the means of education to the soldiery. Attendance at one of these schools is obli- gatory on all subalterns and corporals whose education is not complete, according to their position.

There is at Messines a Royal Institution for the educa- tion of daughters of military men who have died or been disabled in the service of their country. They are admitted from seven to fourteen years of age, and remain till their eighteenth year. They are instructed in branches necessary to qualify them as governesses, teachers, domestic servants, &ec., and situations are provided for them on leaving.

Schools of navigation have been established at Antwerp and Ostend for furnishing properly educated masters for merchant vessels, where instruction is given gratuitously. Certificates of qualifications as master or mate are given by a jury of examiners. There has also recently been formed at Antwerp a superior institute of commerce to afford instruction, theoretical and practical, in the com- mercial sciences, the course extending over two years,

A Government agricultural institute was established at Gembloux in 1860 for affording theoretical and prac- tical instruction in agriculture and kindred subjects. There are seven professors and three assistants, and a demonstrative gardener. The course lasts for three years. Students in 1873, 71. There is a similar institution at Ghent, which in 1873 had 31 students. A school of practical horticulture and arboriculture was established at Vilvorde in 1855, which in 1873 had 29 students; the course is for three years. A similar institution at Gend- brugg has been closed since 1871. There is also a veteri- nary college at Brussels with, in 1873, 84 students. The course is for four years.

The academies and schools of design, painting, sculpture, Academies.

éc,, are divided into three classes :—1. The royal academies of the fine arts, in which painting, sculpture, architecture,

Academies of fine arts

Musical conserva- tory.

Learned societies.

’ members.

_ Academy of science

BELGIUM

and engraving are taught in the most efficient manner; 2. Academies of design established in the principal towns, and giving instructions in designing, architecture, and the prin- ciples of geometry and perspective drawing ; 3. Schools of design established in all the larger towns for instructing young persons and artisans in the elements of designing and architecture. In 1873 there were 76 such academies and schools in the kingdom, having 9966 pupils.

~The Royal Academy of the Fine Arts at Antwerp is principally intended to afford gratuitous instruction in painting, sculpture, architecture, and engraving, and to propagate and encourage a taste for the fine arts. In 1873 there were 1666 scholars. A competition in one of the branches of the fine arts is annually held in Antwerp, the laureate at which receives a pension of 3500 francs annually for four years, to enable him to perfect himself in his art in Germany, France, and Italy. The second prize is a gold medal of 800 francs. The Royal Academy of the Fine Arts at Brussels is an institution similar to that at Antwerp. Instruction is gratuitous, and the vacancies are filled up by competition. .

The Royal Musical Conservatory at Brussels is under the direction of the minister of the interior, aided by a com- mission of seven members nominated by the king, with the burgomaster of Brussels as honorary president. The instruction is gratuitous, and includes vocal and instru-

mental music, composition, and the Italian language. The number of scholars in 1873 was 529. There are six bursaries of 250 francs, and ten of 125 francs, in connec- tion with thisinstitution. There is a similar establishment at Liége, with (in 1873) 694 scholars. Music, both vocal and instrumental, is much cultivated in Belgium; and musical schools and societies are established in almost all the principal towns and throughout the country. In 1873 there were, besides those mentioned, 108 musical schools and societies, with 7440 members. A competition in musical composition takes place every two years at Brussels, the laureate receiving a pension of 3500 francs for four years, to enable him to study in France, Germany, and Italy. The second prize is a gold medal of the value of 300 francs,

Belgium possesses a great number of learned societies, as the Royal Medical Academy, the Royal Academy of Science, Literature, and Art, &c. The Royal Medical Academy has its seat at Brussels. It is divided into six sections, and has 36 titular and 18 assistant members, with 24 corresponding and an indefinite number of honorary Each of the sections has certain branches of medical science assigned to it. The academy answers any questions that may be proposed to it by the Government, upon matters connected with public hygiene, and makes researches in all subjects connected with or tending to advance medical science. Gold medals are given annually for the best essays on prescribed subjects. It receives an annual grant of 20,000 francs from the state.

The Royal Academy of Science, Literature, and Art also has its seat at Brussels. It is divided into three classes, for the sciences, literature, and the fine arts; the first two are each subdivided into two sections, and the last into branches, for painting, sculpture, engraving, architecture, and music. Each class is composed of 30 members, 50 foreign associates, and not more. than ten native corre- spondents. Each class proposes annually certain subjects for essays, to which gold medals of the value of 600 francs are adjudged. The academy receives an annual grant of 40,000 francs from the state. Connected with this academy is a royal commission of history for the purpose of searching for and editing old chronicles and documents tending to throw light upon the early history of the country. There has also just (1875) been instituted by the king a prize of

25,000 francs (£1000) to be given annually for the best work published on a subject previously announced of interest to Belgium, Every fourth year the competition is to be open to foreigners.

There is a Government inspector-general of science, literature, and art, who has the general superintendence of that department, under the minister of the interior. Under him are two administrative boards, the one for literature and science, and the other for the fine arts.

The Royal Observatory for astronomical and meteoro- logical observations is under the management of a director and three assistants. In the observatory are instruments specially provided by Government for the use of young men desirous of making meteorological or astronomical observations.

The Royal Museum of Brussels, for the reception of objects in natural history belonging to the state, is under the direction of a council of five members appointed by the king. There is also a museum of industry, containing models and plans of machines used in arts, manufactures, and agriculture. Annexed to this museum is a school where instruction is given gratuitously in the coustruction of such machines. It possesses a chemical laboratory, library, &c. There is also a royal museum of war instru- ments at Brussels, and in 1870 a royal botanic garden was laid out for aiding in the study of botany and horticulture. The royal museum of painting and sculpture is under the direction of a commission, composed of a president and six members nominated by the king, and charged with the collection of works of ancient and modern masters for the museum. A triennial exhibition of works of living artists, Belgian and foreign, in painting, sculpture, engraving, architecture, and lithography, is held at Brussels, There are similar exhibitions held in Antwerp, Ghent, Lidge, Bruges, &c. The geographical establishment at Brussels has a con- siderable collection of books and maps, a garden, a herb- arium, collections of rocks, lava, fossils, &c.

Besides the libraries belonging to diffcrent societies, associations, &c., there are a number of public libraries in Belgium. The principal of these is

the royal library of Brussels, It contained in 1871 about 301,500 volumes, 22,221 manuscripts, 53,556 engravings, and 19,517 medals and coins. This is the only library that receives copies of copyright works. The public library of Ghent is connected with the university. It has 80,000 volumes and 600 manuscripts, besides pamphlets, &c. The Liége public library has 68,000 volumes, about 26,000 pamphlets, and 430 manuscripts. The public library of the Louvain university is the most ancient in Belgium, and is particularly rich in works of ancient history, theology, and literature, including Hebrew, Greek, Latin, and Oriental. These libraries are open daily for consultation, and in almost all of them volumies are lent out at the discretion of the con- servators.

The archives of Belgium contain a great number of interesting and valuable documents connected with the history of the country. These are carefully preserved, classified, and catalogued. The general archives of the kingdom at Brussels contain upwards of 100,000 documents, and the archives of Antwerp upwards of 70,000, Those at Bruges, Ghent, Liége, Mons, Namur, Tournay, Hasselt, and Arlon are ancient and important. The archives of the city of Bruges, at one time the grand commercial entrepdét of Europe, contain a number of valuable papers bearing upon the events of which this city was the theatre in the Middle Ages. Unfortunately, they do not go further back than 1280, the previous documents having been all destroyed by an extensive fire in that year.

The benevolent and charitable institutions of Belgium are numerous and open to all. The duty of supporting

6

Royal ob- servatory.

Museums.

Public libraries.

Archives,

Charitable institu- tions,

them falls in the first instance upon the commune, after- wards upon the province, and finally, in case of necessity, upon the state. They are divided into three classes tea(1.) Those affording assistance or an asylum to the poor in case of age, infirmity, disease, want of work, &e., including dispensaries, foundling and maternity hospitals, deaf-mute and blind institutions, &c.; (2.) Those more particularly designed for the prevention and suppression of vagabondage and beggary, as depdts of mendicity and reform schools; and (3.) Those specially intended to foster a spirit of in- dependence and foresight among the working classes, as savings-banks, and assurance and mutual assistance so- cieties.

Every town of importance and many of the rural com- munes have hospitals for the aged, infirm, and indigent. Asylums for incurables are also numerous, but much less so than the former. Farm hospitals have been established in the rural communes of the two Flanders, where the inmates contribute by work to their own maintenance. They form small agricultural colonies of old people and children, mutually assisting each other. The products of the farms generally suffice for their maintenance.

Foundling hospitals are established in Antwerp, Brussels, Louvain, Bruges, Ostend, &c. The children generally remain only for a short time in the hospitals. They are pensioned out to inhabitants of the rural communes till their twelfth year, at which period the wardship of the hospital terminates. Inspectors are appointed to visit the children quarterly, to report upon their physical condition, see that they are attending school, &c. There are mater- nity hospitals at Brussels, Louvain, Ghent, Liége, Bruges, Nieuport, and Tournay, in several of which courses of midwifery are given. Maternity societies for aiding females with money, medicine, &c., are formed in many of the towns. There are a number of lunatic asylums, which in 1873 had in all 6801 patients, of whom 5024 were paupers. A colony of lunatics has been formed in the commune of Gheel, province of Antwerp, where, under the direction of a permanent committee, they are pensioned out among the inhabitants, and generally employed in agricultural labours. There are also

a number of insti- tutions for the education of the deaf and dumb and the blind.

To prevent the misery, and frequently the crime, arising from the want of employment among the working classes, charity workshops have been established in Ghent, Liége, and other towns. These are accessible to all workmen without employment and in poor circumstances. The able-bodied are paid according to their work, and the aged and infirm according to their necessities. The workshops of apprenticeship and improvement are intended not only to supply work to the unemployed, but principally to initiate the people in the exercise of new or improved branches of industry, and to instruct the young men in some trade or profession by which they may be able to gain an honest livelihood. They have been found of great benefit to many of the poorer classes who would otherwise have been brought up as vagrants and beggars. The apprenticeship generally lasts from four to six months. Similar to these are the manufacturing schools, intended principally for girls, where they are employed in the manu- facture of lace, é&c. state and partly by the province and commune, but many of them are private. In 1872 there were of these insti- tutions—29 communal, 144 private but subject to inspec- tion, and 294 non-inspected. 'The total number of persons was 26,739, of whom 1067 were in communal establish- ments, 9649 private inspected, and 16,023 non-inspected ; 25,565 were females and 1174 males.

There are three depdts of mendicity or workhouses in

These are supported partly by the

the kingdom, at Bruges, Hoogstraeten, and Reckheim. In 1873 they contained 1819 persons. A reform school was founded in Ruysselede in 1848 for male vagrants and mendicants under eighteen years of age. It contains about 500 members, employed in cultivating a large farm of 128 hectares. At a short distance is a similar institu- tion for 400 girls and infants, between two and seven years of age. There isalso a similar school for girls and infants at Beernem.

In each commune is a bureau de bienfarsance, for assist- ing the poor with money, food, clothing, &c., and, where there are no hospitals, providing them with medical attendance and medicines. It also contributes to the maintenance and education of poor children, foundlings, deaf-mutes, and lunatics. There are also Monts de Prété, or charitable institutions for lending money to the poor upon the security of pledges, in twenty of the larger towns. Caisses de prévoyance, both general and special, and mutual aid societies—to succour the members in sickness, pay their funeral expenses, and aid their families—are numerous.

The judicial system of Belgium consists of courts and Judicial tribunals of various kinds, as the court of cassation, the system.

courts of appeal, and of assize, tribunals of primary instance, of commerce, &c. The court of cassation or annulment sits at Brussels, and is divided into two chambers, the one for civil and the other for criminal matters. It is com- posed of a president-general, a president of the chamber, and fifteen councillors. It decides upon appeals against judgments pronounced in the other courts and tribunals in contravention of legal forms. There are three courts of appeal: one at Brussels, for the provinces of Antwerp, Brabant, and Hainault; another at Ghent, for the two Flanders ; and a third at Liége, for Li¢ge, Limbourg, Luxembourg, and Namur. In the capital of each province is a court of assize, composed of a councillor, deputed from one of the courts of appeal, who presides, and two judges chosen from among the presidents and judges of the primary tribunal, where the court is held. Crimes, graver misdemeanours, political offences, and abuses of the press are judged by the courts of assize. In each judiciary arrondissement is a tribunal of primary instance, judging in misdemeanours belonging to the correctional police, in civil matters, and in commercial affairs where there is no commercial tribunal. The number of judges varies from three to ten in each tribunal. Tribunals of commerce are established by law in several principal towns. They judge definitively in civil matters of not more than 2000 francs, but above that sum their decisions are subject to appeal, as in the tribunals of primary instance. In several of the manufacturing towns are councils of prud' hommes, composed of master tradesmen and workmen. They decide in all questions and disputes arising between masters and workmen. For all criminal and political cases, as well as offences of the

press, trial by jury is established. The jury is composed of twelve persons chosen by lot froma leet of thirty. Justices of the peace and judges of the tribunals are chosen directly by the king. The councillors of each court of appeal, and the presidents and vice-presi- dents of the tribunals of primary instance in its district, are chosen by the king from two double lists of candidates, the one presented by the court of appeal, and the other by the provincial council. The councillors of the court of cassation are named by the king from two double lists, the one presented by the senate, and the other by the court of cassation. The judges are appointed for life, and cannot be suspended or deposed but by a judgment. They cannot hold any salaried office under the Government, or, at least, must perform the duties of it gratuitously. The duties of public minister at the court of cassation are exercised by a procurator-general, and two advocates.

Police.

Prisons.

Agricul- ture.

general ; and by a royal procurator with substitutes before each of the tribunals of primary instance and courts of assize and appeal.

Councils of war are held in the chief place of each province, with the exception of Limbourg, which is joined to Liége, and of Luxembourg, which is united with Namur. They decide in crimes and misdemeanours committed in their provinces by the military of a rank not higher than captaiz. The military court for the whole of Belgium has its seat at Brussels. It is composed of five members, one of whom is a councillor of the appeal court of Brussels, delegated annually to preside; the rest are general or superior officers chosen by lot every month. All officers of a grade superior to that of captain are amenable to this court. It also decides on appeals from the provincial or other military courts.

Besides the ordinary police, there are commissaries of police, royal procurators, juges d'instruction, &c. The com- missaries of police, and in

the communes where these are wanting the burgomasters or delegated aldermen, are specially charged with searching out and proving all con- traventions of the police laws. The royal procurators are charged with discovering and prosecuting for all offences coming within the jurisdiction of the courts of assize or the correctional tribunals of police. There is at least one juge

instruction, or examining judge, in each arrondissemydp.

who is specially charged with the collection of evidence, and with bringing the culprit before the tribunal. There is a council chamber composed of at least three judges, including the juge d'instruction, for the preliminary examination of culprits.

The prisons are of three kinds—(1), central prisons ; (2), houses of surety; and (3), houses of arrest. The central prisons are—(1), the central penitentiary at Ghent for different classes of criminals ; (2), the penitentiary at Louvain, on the solitary system, for prisoners condemned to more than one year's imprisonment, except those con- demned to imprisonment for life; (3), the penitentiary and reformatory for young criminals at Namur; (4), the penitentiary and reformatory at St Hubert for young delinquents belonging to the rural population, acquitted but put at the disposal of Government; (5), the branch penitentiary and reformatory at Namur for young criminals and young delinquents, acquitted, belonging to the town populations, The number in the prisons in 1873 was 1568, in the reformatories 751. The houses of surety are established in the capital of each province, where there is a court of assize, and the houses of arrest are in the capital of each arrondissement, the seat of a court of primary instance, where there is not already a house of surety. In these houses are confined the prisoners whose term does not exceed six months if the prison is a common one, and three years if on the solitary system. The number of prisoners in these prisons in 1873 was 2437. In connec- tion with many of these, schools, workshops, and circulating libraries have been established. The prisoners are employed in various kinds of work. Those condemned to compulsory labour receive no remuneration, but those condemned to solitary or correctional imprisonment receive a part of the produce of their labour, which in the case of the latter is frequently applied in mitigation of

their punishment. Premiums are also given for good conduct, zeal, and progress in their labours.

Since 1830 the agricultural state of the country has been much improved. A superior council of agriculture is specially charged with the promotion and superintendence of the agricultural interests of the country; and in each of the provinces a commission of practical men is nomi- nated to encourage the introduction of improvements in the different branches of agriculture and report annually upon

the state of agriculture in their provinces. Every five years a grand agricultural exhibition of horses, cattle, agricultural implements, and produce is held in Brussels, at which a number of gold and silver medals, &c., are given as prizes. Local exhibitions are also held frequently in the various districts.

The agriculturists above twelve years of age, including female servants, form one-fourth of the entire population. Females are extensively engaged in agricultural work, being to the males as 61 to 100. In 1866 the number of horses was 283,163 ; of cattle, 1,242,445; sheep, 586,097; swine, 632,301. To improve the breeds of horses a Government stud of stallions is maintained at Tervueren.

The cultivated land of Belgium amounts to 2,663,753 hectares, or 6,582,123 acres, of which 1,339,795 hectares are in the hands of the proprietors, and 1,323,958 are let to tenants. In West Flanders four-fifths are in the hands of tenants; in Luxembourg nearly five-sixths are in the hands of the proprietors; and in most of the other provinces about one-half is let to tenants. The land is divided into numerous and mostly small patches (nearly 600,000). Of these 43 per cent. do not exceed 50 ares; there are 12 per cent. not exceeding one hectare, or 24 acres, 29 per cent. not exceeding 5 hectares, 74 per cent. not exceeding 10 hectares, and less than 8 per cent. of greater extent. The Belgians,

particularly in Flanders, are averse to the introduction

of improvements in their agricultural operations, and their implements are generally rude and clumsy. Their lands are, however, cultivated with great care and are very productive. Of the cereal crops rye is the most ex- tensively cultivated, and forms an important article of food for the working classes. Wheat and oats are also extensively cultivated, the former particularly in the pro- vinces of Hainault, Brabant, and West Flanders. Com- paratively little barley is raised. Hops, chicory, tobacco, rape and other oleaginous plants, hemp, flax, madder, beet, &c., are common. Of these the most extensively cultivated is flax, principally in the two Flanders.

.Tobacco was much more extensively grown a few years

ago than at present ; it is now almost entirely confined to the two Flanders and Hainault. The chicory plant is principally raised in Hainault. The cultivation of beet for the extraction of sugar is continually increasing, and numerous establishments have been formed for its prepara- tion. The leguminous plants, pease, beans, and tares, are used principally as fodder for cattle; the most common are beans. The beet root is even more extensively cultivated as fodder than as an industrial plant, particularly in the provinces of West Flanders, Liége, Hainault, and Brabant. Potatoes are largely grown in all the provinces; and, next to potatoes, turnips are the most extensively cultivated of the alimentary roots. The fallow ground, formerly con- siderable, is now only of small extent, being principally sown in fodder crops. Clover is the principal fodder crop. The number of hectares occupied with the principal crops in 1866 were—wheat, 283,542; oats, 221,743; rye, 288,966; barley, 43,617 ; beans, 24,263; pease, tares, &c., 13,645 ; potatoes, 171,397; flax, 57,045; colza, 26,412; beet root for sugar, 18,074 ; turnips, carrots, &c., 28,806 ; hemp, hops, chicory, tobacco, &c., 13,775. Vegetable gardens occupied 37,329 ; meadow, 365,805 ; fallow, 53,891.

Belgium is rich in various kinds of minerals, as coal, Minerals,

iron, calamine, &c., which form a valuable source of employ- ment to many thousands of its inhabitants.

The coal may be divided into two great basins. ‘The western basin is the most important, and has an estimated extent of 90,051 hectares (or about

222,400 acres),— 75,725 in the province of Hainault, and 14,326 in Namur. The extent of the eastern bed is estimated at 44,062 hectares,—41,745 in the province of Lidge, and 2317 in

Manu- factures.

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Namur. All varieties, from anthracite to the richest gas- coal, are found. In 1873 there were 285 coal-mines in the country, employing 107,902 persons, and producing 15,778,401 tons of coal valued at 337,637,360 francs. The iron districts are the arrondissement of Charleroi, and the provinces of Namur, Liége, and Luxembourg. Besides the iron-mines in Charleroi, Hainault contains a copper- mine, commenced in 1849, and calamine and blende mines. Tron is also found in small quantities in the arrondisse- ments of Mons and Tournay. In Namur the iron ore is rich and plentiful, and constitutes the principal mineral wealth of the province. Veins of lead and zinc are also wrought to a considerable extent. The iron-mines of Luxembourg are much inferior to those of Namur. The principal are those of Durbuy, Ruette, Grandcourt, Halanzy, and Musson. The ferruginous basins of Theux and La Reid are of the greatest importance, both as public works, and from the quantity of ore that they furnish. Lead and zine: are found here almost always in the same bed. Alumiferous schist is common in several parts of the province. In 1873 the different metallic mines yielded 13,952 tons of blende, 28,630 of calamine, 11,280 of lead, 36,651 of pyrites, and 503,563 of buddled iron ore. The number of workmen employed in these mines was 3758. Under the minister of the interior the mines are superintended by a corps of mining engineers ; each of the six mining districts has an ordinary engineer, and each of the two divisions a chief engineer. A sub-engineer is appointed over a certain number of mines.

Marble is abundant in many parts of Belgium ; and the black marbles, as those of Dinant and Gochene, may rival the finest productions of other countries. There are also numerous quarries of freestone, granite, limestone, slate, &c. The principal quarrying provinces are Namur and Hainault. In 1873 there were 2230 quarries in the country, employing 22,435 men, and yielding the value of 38,353,171 franes.

The number of works in 1873 for the preparation of iron was 331; steel, 3; lead, 7 ; copper, 6; zinc, 1; alum 1; glass, 72; and 41,845 workmen were engaged. The value of the iron manufactures was upwards of 246,000,000 francs ; glass, 46,000,000; zinc, 38,000,000; steel, 7,700,000 ; copper, 6,000,000 ; lead, 4,700,000, de.

Notwithstanding many vicissitudes, flax, the most ancient, still forms one of the most important branches of industry in the country. In 1866, 57,045 hectares of land were occupied in the cultivation of flax, and a considerable number in hemp. The declared value of flax and hemp yarn imported in 1872 was 10,427,000 frances; of flax yarn exported, 80,904,000; of hemp, 7,155,000; and of flax and hemp cloths, 37,170,000.

Cotton also forms an important branch of industry, which is at present in a more flourishing condition than at any former period. In 1872 the value imported of raw cotton was 57,241,000 francs; cotton yarn, 5,214,000; and cotton cloths, 12,754,000; the value exported of cotton yarn, 6,358,000 ; cotton cloths, 19,083,000.

The manufacture of woollens forms also an important branch of industry. The wool for this purpose is principally imported from Prussia, Saxony, &c., the native produce being small in quantity and chiefly used in hosiery. In 1872 the value of the wools imported was 160,079,000 francs; yarn, 6,902,000; manufactured stuffs, 23,814,000 ; exported wool, 10,291,000; yarn, 64,523,000 ; manufac- tured stuffs, 44,850,000.

In 1866 the numbers employed in the various flax,hemp, woollen, and cotton manufactures, were 114,547 males and 71,111 females. The chief of the other manufactures are silk, lace, ribbons, beer, spirits, vinegar, sugar, salt, bricks and tiles, porcelain, earthenware, glass, crystal, paper,

leather, ropes, &c. In 1872 the excise duties on beer and vinegar amounted to 15,547,605 francs; spirits, 16,946,225; foreign wines, 4,765,800; and sugar, 7,516,388.

In 1850, 2165 sailing and steam vessels, of 314,797 tons, Commerce,

entered Belgium; in 1860, 3780 vessels of 667,287 tons ; in 1870, 5658 vessels, of 1,575,293 tons; and in 1872, 6134 vessels, of 1,878,106 tons. Of the last 3082 were steam vessels, of 1,158,484 tons. In 1850 the number of ves- sels that left Belgium was 2214, tonnage 235,745 ; in 1860, 3959, tonnage 694,225; in 1870, 5406, tonnage 1,534,513; and in 1872, 6241, tonnage 1,907,530. Ofthe last 3081 vessels, with 1,169,254 tons, were steamers. The numbers and tonnage of vessels entering from and leaving for different countries in 1872 were as follows :—

INWARDS. OUTWARDS.

Vessels.) Tonnage. Vessels.) Tonnage,

England…....| 8176 | 848,779 || England…..... 4178 |1,214,979 RUSS. cco see 444 | 178,871 || Sweden and 544 | 194.364 Sweden and 638 | 155.597 Norway… 35

Norway… ! United States,.} 121 94,790 United States..} 178 | 116,622 |} Germany…..... 236 79,780 Argentine Rep.| 169 | 95,575 || France…..... 209 | 65,913) Germany…....| 912 | 87,785)) Russia…..... 148 56,646 JMEMTOS G poneecone 218 ; 62,182 || Argentine Rep.| 44 38,309 Chili and Peru 50,514

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Expressed in millions of francs the value of the imports in 1850 was 236; of the exports, 263 ; of goods in transit, 206: in 1860—imports, 516; exports, 469; in transit, 408: in 1870—imports, 520; exports, 690; in transit, 857: and in 1872—imports, 1277 ; exports, 1051; in transit, 1049. Of the imports in 1872, 315 were from France, 230 from England, 164 from Holland, 158 from the German Zollverein, 80 from the United States, 77 from the Argen tine Republic, 62 from Russia, 35 from Uruguay, 24 from Brazil, and 23 from Sweden and Norway. Of the exports 320 were to France, 237 to England, 223 to the German Zollverein, 120 to Holland, 18 to Switzerland, 17 to the Hanseatic towns, 14 to the United States, 12 to Italy, and 1] to Russia. Of the goods in transit 434 were from the German Zollverein, 321

from France, 96 from England, and 92 from Holland ; 341 were to the German Zollverein, 245 to England, 237 to France, and 121 to Hol- land. The values of the principal articles of merchandise imported for home consumption expressed in millions of francs were—wool, 160; grain of all kinds, 126; raw hides, 715 iron ore and cast and wrought iron, 61; cotton, 57; resins, 48; minerals and metals, 47 ; coffee, 42; wood for building, 41; grease and tallow, 37; silks, 30; horned cattle, 29; oleaginous seeds, 29; woollen stuffs, 23; fermented liquors, 21; oils, 17; machinery, 10. The values of the principal exports were—coal, 85 ; flax, 80; wrought iron, 69; woollen yarn, 64; raw hides, 53; woollen stuffs, 44 ; raw sugar, 41; machinery, 39; flax and hemp stuffs, 37 ; grain of all kinds, 37 ; flax and hemp yarn, 31; grease and tallow, 25; paper, 21; resins, 21; unwrought zinc, 21; coke, 20; cotton stuffs, 18; glass and crystal wares, 17 ; wool, 16; candles, 15; butter, 14; arms, 13. The values of the principal goods in transit were—flax and hemp stuffs, 204; wool, 147; woollen stuffs, 102; haberdashery and hardware, 39; silks, 38; cast and wrought iron, 35; cotton, 33; grain of all kinds, 30; coffee, 23; woollen yarn, 20; flax and hemp yarn, 19; cattle, sheep, swine, 18; cotton stuffs, 17; fermented liquors, 16; glass and crystal wares, 16; machines, 13. In 1872 the exports from Belgium to the United Kingdom were £13,211,044, and the imports from the United Kingdom to Belgium £6,499,062.

There are twenty-three chambers of commerce and manufacture established in the principal towns, the members of which are nominated by the king from a triple list of

Chambers

of com- merce.

Public companies.

Public debt.

BELGIUM

candidates presented to him by the chambers. The members of each vary in number from nine to twenty-one, one-third going out annually. They present

to the Govern- ment or legislative chambers their views as to the best ineans of increasing the commercial and industrial pros- perity of the country, report annually upon the state of their districts, and give useful information or direction to the provincial or civic authorities under their administra- tion. There is a superior council of industry and com- merce, composed of two delegates chosen annually by each of the chambers of commerce of Antwerp, Brussels, Ghent, Lidge, Mons, and Charleroi, one elected by each of the other chambers of commerce, and a certain number of members chosen by the king, not exceeding a third of the others. The president and two vice-presidents are nominated by the king for each session. The council considers matters affect- ing commerce and industry, and such questions connected therewith as may be submitted to it by the Government. Belgium possesses a great number of commercial and financial associations, joint-stock companies for carrying on public works or other enterprises, assurance companies, private banking companies, railway companies, &c. It has eight commercial exchanges, under the direction of Govern- ment, namely, in Antwerp, Brussels, Ghent, Bruges, Ostend, Mons, Termondc, and Louvain. In 1822 the General Society for the Encouragement of National Industry was formed at Brussels, under a royal charter for 27 years, which has since been extended to 1875 and 1905. It has a social capital of 15,500,000 florins, divided into shares of 500 florins each, bearing interest at 5 per cent. The administrative body consists of a governor, six directors, a secretary, and a treasurer. It discounts bills, receives money at interest, grants loans and advances on titles and other deposits, &c. The National Bank, instituted by charter granted in 1850 and renewed 1872, has its seat at Brussels, and has branches in all the provincial capitals and several other towns. Its capital is 50,000,000 francs, in shares of 1000 francs each. It pays a dividend of 5 per cent. upon the shares, and one-third at least of the profits exceeding 6 per cent. goes to form a sinking fund. The administra- tion consists of a governor nominated by the king, six directors, and a council of censors. The banking operations are superintended by aGovernment commissary ; and areport upon its state is presented to the Government every month. The state funds are deposited in this bank. The Bank of Belgium, chartered in 1835, has a capital of 50,000,000 francs. Its seat is at Brussels. The Bank of Flanders, established in Ghent, has a capital of 10,000,000 francs.

REVENUE.

1871.

1870. 1872.

Francs. Francs. Francs. 19,176,009 | 19,272,846 | 20,258,082 12,174,694 | 12,404,060 | 13,230,057 | Trade licences.……..:0s00 4,374,797 | 5,108,814 | 5,509,728 WARGIIEOR TIMIMOS.... ..000ee0000s 440,020 528,251 572,377 Custom duties.…... ....| 22,057,152 | 20,839,578 18,943,388 Excise duties .. ..| 29,495,085 | 25,219,641 | 27,024,218 'Sis valj0) (HRN KSI aapsagoppesneoboge 39,633,635 | 44,806,269 | 49,277,477 Domains, Forests, &c.…....| 3,444,497 | 2,418,004 | 2,555,137 JHOSE-OMNCOM sr) ~~*n..cloeesennes 4,114,555 | 5,128,506| 4,723,594 Railways, &.....*~~*-200++ 41,825,081 | 57,172,844 | 58,428,526 Miscellaneous. .....0665 11,839,645 | 18,486,213 } 10,970,612 Reimbursements.…..... 1,961,882} 1,885,067 | 1,859,493 TOMA ascccceeove veneers [200,587,002 1207, 708,998 213,852,689*

{ }

The public debt of Belgium at the end of 1873 amounted to 966,920,513 francs or £38,676,820. Except the share of the old debt of the Netherlands which fell to it, most of the national debt has been incurred in the construction of railways and other works of public utility.

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After England, there is no country in Europe where, Roads.

in proportion to its extent, the roads are more numerous or better kept than in Belgium. 'They are of three kinds,— those maintained by the state, and those by the provinces and communes. 'The total length of the two latter cannot be given with accuracy ; that of the first is 1187 leagues.

A bill was passed in 1834 authorizing the establishment Railways.

of a system of railroads, of which Malines was to form the centre, and the line from Brussels to Malines, opened May 5, 1835, was the first railway in operation on the Continent. The Government railways are wrought on account of the Government, and are under special administration. The total length of the various lines of railway in operation in 1873 was 616 leagues (of 5000 metres), of which 125 leagues belonged to the state, and 543 were conceded to others ; of the former 117 leagues were double lines. The amount expended by Government in the construction of rail- ways to the end of 1873 was 361,287,299 francs, or £14,451,491.

Tn 1849 a system of postage was introduced into Belgium similar to that in this country. In 1873 the total number of letters that passed through the post-office was 55,654,859 , newspapers, 52,771,524; and packets of printed matter, 25,697,33. In 1860 the numbers were—letters, 23,960,846 ; newspapers, 26,358,020; and book parcels, 6,668,452.

Postage.

The first electric telegraph, which was that betwccn Telegraphs.

Brussels and Antwerp, was introduced into the country in 1846 by an English company. A law passed in 1850 authorized the Government to purchase this, as also to establish telegraphs on all the lines of railway. The tele- grams sent out in 1873 were 1,739,817 to different parts of the country, and 676,393 to other countries, besides 153,330 in transit.

For an account of the Belgian army and civic guard, see Army, vol. ii. p. 615.

The following table shows the annual income and expenditure for various years :—

Income. Expenditure. HISAIA capes ent 198,810,508 fr. 195,185,657 fr. UBSON. .ccaceuseve TBD Fey ff SN 118, 730,904 ILSKO)0) saeeepeenocet 155,621,571 159,025,377 SGI: acnenes cee 169,055,072 188,798,737 MSO. wevcccese 190,537,002 216,907,800 AGW Alle Bapemernrienc 207,705,998 238, 191, 223 e704 spa ceenerecs 218, 852,689 251,974,513

The details of the revenue and expenditure of the last three of these years, arranged under their several heads, are as follows :—

EXPENDITURE.

1870. 1871. 1872.

Francs. Francs. Francs. 1P Yui) Ih 6(6 (2) 0)5 penpecneopeneododoD 42,680,891 | 47,628,458 | 48,765,178 IPGiOSVOII) gaopeud sasannpaDbodue 4,367,879 | 4,366,898 | 4,288,619 ANUS DOG, gagameeeanceneenoccanosdn 14,620,711 | 14,515,530 | 14,473,638 Foreign affairs …...-..0.:06 3,819,005 | 4,277,056} 4,374,445 Ibalueralope' 4, dacenanepoannancvadns 13,179,716 | 14,056,431 | 14,714,366 IBA IIC WORKS cents nasseses 39,804,463 | 51,082,306 | 59,341,272 DTM scenic nc ceseannine wacdat | 59,116,612 | 44,005,577 | 39,590,955 JM EN NES! oopoggonsdoansaescudeods 18,308,096 | 13,545,257 | 13,936,198 Deficiencies & Repayments 946,553 889,598 | 1,408,490 Special services…….. 25,068,874 | 43,924,117 | 51,086,352

216,907, 800 288,191,228 |251,974,533

In the time of the Romans this portion of the Nether- lands was included in Gaul, and formed part of that division of it which was known as Gallia Belgica. It was inhabited mostly by Celtic tribes, but there were also not afew ofGermanrace. 'The lattcr were subsequently largely

Revenusa and Ex- penditure.

History.

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increased by irruptions from the north, so that in the 5th and 6th centuries, under the rule of the Franks, they formed the principal element of the population. For several centuries the history of the Franks is the history of the Netherlands. Afterwards the country was divided into a number of independent duchies, counties, and free cities. Among these may be mentioned the duchies of Brabant, Limbourg, and Luxembourg, the counties

of Flanders, Hainault, and Namur, the bishopric of Liége, the lordship of Malines, &c. Of these the county of Flanders rose to be superior to all the others, and became distinguished for its industry and commercial activity. In 1385 the male line of the counts of Flanders became extinct, and their possessions passed into the hands of the dukes of Burgundy, who soon after, in various ways, came into possession of the whole of the Netherlands. In order to strengthen their power they sought to repress the spirit of liberty, and to do away with the free institutions that had sprung up in the country ; but notwithstanding this the people continued to increase in wealth and prosperity, and industry and commerce flourished more and more among them, In 1477 Mary of Burgundy, only daughter and heiress of Charles the Bold, married the Archduke Maximilian, son of the Emperor Frederick IV., and thus the Netherlands came into the possession of the House of Austria. Maximilian succeeded to the imperial throne in 1493, and the following year he resigned the government of the Netherlands to his son Philip, then a youth of seventesn years of age. The latter, in 1496, married Joanna, daughter of Ferdinand and Isabella of Castile, and died in 1506, leaving to succeed him a son who afterwards became Charles V. During the reign of this monarch the Protestant religion began to spread in the country, though its adherents were subjected to much persecution. His son and successor, Philip II. of Spain, by his cruel persecu- tions and his attempt to establish the Inquisition in the country, drove the people into open rebellion. The duke of Alva, who was sent at the head of a Spanish army to reduce them to subjection, perpetrated upon them the most horrid cruelties, devastating the country in every direction, and erecting scaffolds in every city. At length the northern portion of the Netherlands succeeded in establishing its independence, and became the republic of the Seven United Provinces, while the southern portion, or Belgium, continued under the rule of Spain. In 1598 Philip ceded Belgium to his daughter Isabella and her husband the Archduke Albert, under whom it formed a distinct and independent kingdom. Attempts were then made to restore the prosperity of the country and improve its internal condi- tion ; but, unfortunately, Albert died without leaving issue in 1621, and the country again fell into the hands of Spain.

For many years Belgium continued to share in the declining fortunes of Spain; and in the wars that broke out between that power and France and Holland, it was exposed to the first attack, and peace was usually

purchased at the expense of some part of itsterritory. By the treaty of the Pyrenees (1659) the county of Artois, Thionville, and other districts were ceded to France. Subsequent French conquests, confirmed by the peace of Aix-la-Chapelle (1668), took away Lille, Charleroi, Oudenarde, Courtray, and other places. These were, indeed, partly restored to Belgium by the peace of Nimeguen (1679); but, on the other hand, it lost Valenciennes, Nieuport, Cambray, St Omer, Ypres, and Charlemont, which were only in part recovered by the peace of Ryswick (1697). After the con- clusion of this last treaty the Spanish Government attempted to restore prosperity to Belgium by the introduc- tion of new customs laws, and by other means, particularly by the construction of canals to counteract.the injury done to

its commerce by the closing of the navigation of the Scheldt by the Dutch. But these attempts were of little avail in consequence of the breaking out of the War of the Spanish Succession, which was only brought to an end by the peace of Utrecht in 1713. By this treaty Belgium was assigned to Austria, and took the name of the Austrian Netherlands, Yet such was the enfeebled state of the country that Holland retained the right, which had been conceded to her during the late war, of garrisoning the principal fortresses on the French frontier, and her right to close the navigation of the Scheldt was also recognised. In 1722 a commercial company was formed at Ostend by Charles VI., but this was sacrificed in 1731 to the jealousy of the Dutch. During the Austrian War of Succession almost the whole country fell into the hands of the French, but was restored to Austria by the peace of Aix-la-Chapelle (1748). Belgium was undisturbed by the Seven Years' War (1756-63), and during the long peace which followed enjoyed considerable prosperity under the mild rule of Maria Theresa, whose repre- sentative here, Prince Charles of Lorraine, conducted affairs with great judgment and moderation, Theempressdid much for the advancement of education, founding, among other institutions,the Belgian Academy of Sciences, and opposed the undue power of the clergy. Her son and successor, Joseph II., got into difficulties with Holland, and compelled that power to withdraw her garrisons from the frontier towns, but was unsuccessful in his attempts to free the navigation of the Scheldt. It was, however, in his attempts to reform internal abuses that he failed most signally here as in other parts of

his dominions. He excited the religious feelings of the people against him, by attempting to curb the power of the priests, and he offended the states by seeking to overturn the civil government. Numbers of the malcon- tents left the country,and organized themselves as a military force in Holland. As the discontent became more general the insurgents returned, took several forts, defeated the Austrians at Turnhout, and overran the country. On11th December 1789, the people of Brussels rose against the Austrian garrison, and compelled it to capitulate, and on the 27th the states of Brabant declared their independence. The other provinces followed, and, on 11th January 1790, the whole formed themselves into an independent state under the name of United Belgium, with a congress to manage its affairs. After the death of Joseph II. his successor, Leopold IL., issued a proclamation on 3d March 1790, wherein he promised the restoration of the former constitution if the people would return to their allegiance. This, however, they refused to do, and they also rejected the proposal of a congress to meet at the Hague for the settlement of their differences. In the end of November, therefore, a strong Austrian army was sent into Belgium, and the country was subdued without any great opposition. The constitution as it existed at the end of the reign of – Maria Theresa was restored, an amnesty was proclaimed for past offences, and the opposition of the states was put down. The short period of peace which followed was terminated by the breaking out of the war with revolutionary France. The battle of Jemappes (7th Nov. 1792) made the French masters of the country to the south of Liége; and the battle of Fleurus (26th June 1794) put an end to the Austrian rulein Belgium. The treaty of Campo Formio (1797) and the subsequent treaty of Luneville (1801) confirmed the conquerors in the possession of the country, and Belgium became an integral part of France, being governed on the same footing, receiving the Code Napoleon, and sharing in the fortunes of the Republic and of the Empire. (See Francz.) After the fall of Napoleon and the conclusion of the first peace of Paris (80th May 1814), Belgium was for some months ruled by an Austrian governor- general, after which it was united with Holland under

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Prince William Frederick of Nassau, who took the title of king of the Netherlands (23d March 1815). The Congress of Vienna (31st May 1815)

determined the relations and fixed the boundaries of the new kingdom ; and the new constitution was promulgated on the 24th of August following, the king taking the oath at Brussels, Sept. 27. The union, however, was not a particularly fortunate or happy one. It was brought about by the allied powers with little regard to the wishes or inclinations of the people, their main object being to form here a strong kingdom to serve as a check upon the ambitious designs of France. The character, habits, language, and religion of the Belgians were all against such an alliance. Through their conuec- tion and intercourse with France they had acquired much of the spirit, habits, and ideas of the people of that country ; while the slow, staid, conservative habits and ideas of the Dutch were repugnant tothem. The Belgians were chiefly engaged in agriculture and the manufactures, while the Dutch were mainly given to commerce and the fisheries. The French was the common language of Belgium, at least in the higher circles and in all public proceedings. But the principal difficulty arose from the difference in religion. The Roman Catholic clergy of Belgium were from the first opposed to a union with a Protestant country like Holland, and the great mass of the people were very ignorant, and much under the influence of the priests Nevertheless, had a mild and conciliatory policy been adopted by the Dutch it would have done much to remove or lessen these difficulties This, however, was not done. Belgium was regarded too much in the light of a conquered country, at whose expense they might lawfully enrich themselves. Though the population of Belgium was 3,400,000 and that of Holland only 2,000,000, the latter had as many repre- sentatives in the States-general as the former. This fre- quently rendered decision on important legislative questions a matter of extreme doubt and difficulty. In matters that affected, or were believed to affect, the two countries in different or opposite ways, the decision often depended on the accidental absence of a member on the one side or the other. The use of the French language was also attempted to be abolished in all Government and judicial proceedings. The great majority of the public offices were filled by Dutchmen, and the government was conducted principally in the interests of Holland. In 1830, of the seven Govern- ment ministers only one wes a Belgian; in the ministry of the interior, of 117 officials only 11 were Belgians ; in the ministry of war, of 102 officials only 3 were Belgians ; and among 1967 officers of the army, only 288 were Belgians. The partisans of Holland attempt to explain away these facts, but with only very partial

success ; both sides, however, acquit the king of any intentional unfair- ness, and consider that he was led to act as he did by force of circumstances. The Belgians admit that he always manifested a sincere regard for their welfare, but accuse him of giving too ready an acquiescence to what they tauntingly called the schemes of their Dutch cousins. Notwithstanding these drawbacks Belgium enjoyed during her union with Holland a degree of prosperity that was quite remarkable. The mineral wealth of the country was largely developed, the iron manufactures of Liége rapidly advanced in prosperity, the woollen manufactures of Verviers received a similar impulse, and many large establishments were formed at Ghent and other places where cotton goods were fabricated which rivalled those of England and far surpassed those of France. The extensive colonial and foreign trade of the Dutch furnished them with new markets for their produce ; while the opening of the navigation of the Scheldt raised Antwerp to a place of the first commercial importance. The Government also did much in the way of improving the internal communications

O27

of the country, in repairing the roads and canals, aud form- ing new ones, deepening and widening rivers, and the like. Nor was the social and intellectual improvement of the people by any means neglected. A new university was formed at Liége, normal schools for the instruction of teachers were instituted, and numerous elementary schools and schools for higher instruction were established over the country. That the Government should take upon itself the direction and regulation of the education of the people was particularly hateful to the priests, still more so were the attempts subsequently made to improve the education of the priests themselves. The king had determined that no priest should be inducted who had not passed two years in the study of the liter humaniores before his ordination ; and he appropriated a college at Louvain for that purpose, some of the professors in which were not priests, but laymen and Protestants. This gave great offence to the prelates and clergy, and some of the former, who had indulged in very intemperate language, were prosecuted. These pro- ceedings were at the time applauded and encouraged by the active party of the Liberals, but afterwards these saw it

their interest to join with the most bigoted of the Roman Catholics against the Government. With the view of termi- nating these differences the king in 1827 entered into a concordat with the Pope, settling the right of nomination to the bishoprics, and providing that the education of the priests should be under the control of the prelates, but that in the seminaries professors should be appointed to teach the sciences as well as what related to ecclesiastical matters. This, however, was far from satisfying the more violent of the clergy; andthe two most opposite parties, the Catholic Ultramontanes and the French Liberals, united their efforts to effect the overthrow of the Government. The Liberals ° affected a zeal for the Catholic faith, and urged the clergy to make extravagant demarids upon the Government, which they knew if granted would be hurtful to it, and if refused would increase the agitation then going on. Brussels was at this time, too, a city of refuge for the intriguing and discontented of almost every country of Europe, and the press teemed with libels not only against the Belgian Government, but also against almost every other, so that the people were constantly kept in a high state of political excitement, At length the Government took proceedings against some of the more notorious of the inflammatory writers, and several of them were banished from the kingdom.

Matters were in this state when the news of the success of the Paris revolution of 1830 reached Belgium. Num- bers of the propagandists came to Brussels, where they paraded the streets and talked loudly in the public places of the glories of the Revolution and of the future des- tinies of France. 'The first outbreak occurred on the 25th of August, just a month after the commencement of that of Paris. A play, called Za Mwette, which abounds in passages well calculated to inflame the populace in their then excited state, was performed in the theatre, and when the curtain fell the audience rushed out into the street shouting, "Imitons les Parisiens." They were speedily joined by others, and the mob at once proceeded to deeds of violence, destroying or damaging a number of public buildings, manufactories, and private houses. The guards and posts in the centre of the city were overcome or quietly surrendered; the troops were drawn out, but they were too few in number to contend with the insurgents, and they either retreated to their barracks or were withdrawn to the upper part of the city, where they piled their arms in front of the king's palace, and renounced al] attempts at suppressing the tumult. A number of the more influential and the

middle- class citizens now enrolled themselves into a burgher guard for the protection of life and property, and to interpose in

a manner between the contending parties. The intelligence of these events in the capital soon spread throughout the provinces ; and in most of the large towns similar scenes were enacted, commencing with plunderings and outrages by the mobs, followed by the institution of burgher guards for the maintenance of peace. The burgher guard of Brussels was most anxious to terminate the dispute without recourse being had to extreme measures, They demanded the dismissal of the minister, Van Maanen, who was obnoxious to the people, and a separate administration for Belgium without an entire separation of the two countries. The Government neither agreed to make these concessions nor did it resolve upon actual force, but adopted a sort of middle course which, by allowing things to go on, ended in converting a popular riot into a complete revolution. The heir-apparent, the prince of Orange, was sent on a peaceful mission to Brussels, but furnished with such limited powers as, in the circumstances, were utterly inadequate. On his arrival a conference was held, which extended over several days ; and at the final meeting on 3d Sept., when a number of the members of the States-general were present, the prince had become so convinced that nothing but a separate administration of the two countries would restore tranquillity, that he promised to use his influence with his father to bring about that object—the persons present on their part assuring him that they would heartily unite in maintaining the dynasty of the House of Orange. The king summoned an extraordinary States- general, which met at the Hague, 13th Sept., and was opened by a speech from the throne, which was firm and temperate, but by no means definite. The proceedings of the body were dilatory, and the conduct of the Dutch deputies exasperated the people of Belgium beyond measure. The moderate party in the country gradually lost their influence, and those who were in favour of violent. measures prevailed, while the warlike demonstrations made by the troops kindled a feeling of animosity and stimulated pre- parations for defence. Although the States were still sitting at the Hague, the king's army was gradually approaching Brussels. It consisted of 14,000 well-appointed troops under the command of Prince Frederick ; but its movements were too tardy if

force was to be employed, and it was entirely out of place if conciliatory measures were to prevail. On 20th September the council resolved to take possession of Brussels, believing that the inhabitants were eager to receive the troops, and that their presence there would tend to restore peace ; and orders were sent to Prince Frederick to that effect. On the 23d the troops advanced towards the city, and, with little opposition, occupied the upper or court portion of it, which is situated on a hill, by which the rest of the town is commanded. The fighting continued for three days without any definite result, when the prince ordered aretreat. The news of this soon reached Ghent, Bruges, Ostend, and other towns, which at once declared in favour of separation. A Provisional Government was formed at Brussels, which declared Belgium to be an independent state, and summoned a national congress for the regulation of its affairs. The council of the king now consented to separate administra- tions for the two kingdoms, but it was too late to restore peace. Antwerp was the only important town which remained in the hands of the Dutch, and the army on leaving Brussels had fallen back on this town. In the end of October an insurgent army had arrived before the gates, which were opened by the populace to receive them, and the troops, under General Chassé, retired within the citadel. A truce was concluded between the parties, but the Belgian officers were unable to restrain the fury of the populace who, with such weapons as they had, attacked the citadel. The general ordered a cannonade and bombardment of the

town, which continued for two days, destroying a number of houses and large quantities of merchandise. A suspen- sion of hostilities then took place, but the misrepresentations and exaggerations of the proceedings which spread did much to inflame the minds of the Belgians still farther against the Dutch.

A convention of representatives of the five great powers met in London, in the beginning of November, at the request of the king of the Netherlands, but its attention was mainly directed to bringing about peace, and through it both sides were brought to consent to a cessation of hostilities. On the 10th November the national congress assembled at Brussels, consisting of

200 deputies chosen from the different provinces. Three important questions were decided by that assembly :—(1.) The independence of the country,—carried unanimously ; (2), a constitutional hereditary monarchy,—by a majority of 174 against 13 in favour of a republic; and (3), the perpetual exclusion of the Orange Nassau family,—by a majority of 161 against 28 in favour of delay. On 20th December the conference of London proclaimed the dissolution of the kingdom of the Netherlands, at the same time that it claimed for itself the right of interfering even against the will of both countries to regulate the conditions of partition. On the 28th of January 1831 the congress proceeded to the election of a king, and out of a number of candidates the choice fell on the duke of Nemours, second son of Louis Philippe, but he declined the office. The congress then resolved on the election of a regent as a temporary measure, and they selected Baron Surlet de Chokier, who was installed on the 25th of February. This, however, did little to restore . tranquillity to the country, and the partisans of the prince of Orange were still actively intriguing in his favour. At length, in the month of April, a proposition was privately made to Prince Leopold of Saxe-Coburg, widower of the Princess Charlotte of England, with the view of ascertaining whether, if chosen, he would accept the crown. It is remarkable that though his name was mentioned he was not among the number of candidates brought forward on the previous occasion. He answered in the affirmative, but strictly abstained from giving any authority to exertion being made in his favour. After many stormy discussions the election at length took place on the 4th of June, when 152 votes out of 196, four only being absent, determined that Prince Leopold should be proclaimed king of the Belgians, under the express condition that he "would ac- cept the constitution and swear to maintain the national independence and territorial integrity." Leopold at once accepted,and made his public eutry into Brusselson the 21st, when he was received with great cordiality. Hesubsequently visited other parts of the kingdom, and was everywhere re-ceived with demonstrations of loyalty and respect. While this was going on news suddenly arrived that the Dutch were preparing to invade the country with a large army. This had been brought together so secretly that the Belgians were unaware of its existence till it was about to cross the frontier. It comprised 45,000 infantry and 6000 cavalry, with 72 pieces of artillery, while Leopold could scarcely bring forward 25,000 men to oppose it. On the 2d of August the whole of the Dutch army had crossed the frontier.

Leopold collected his forces, such as they were, near Louvain in order to cover his capital. The Dutch army advanced to the attack (9th August), and though the king displayed great bravery and determination, he was unable to impart his spirit to his undisciplined troops, who were speedily routed, the king himself and his staff making a narrow escape from being taken prisoners. He, however, made good his retreat to the capital; and a French army, which was ready to enter the country, then advanced, and the Prince of Orange saw the necessity of

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retreating. A convention was concluded between him and the French general, in consequence of which he returned to Holland and the French army repassed the frontier,

Leopold now proceeded with vigour to strengthen his posi- tion, and to restore order and confidence. French officers were selected for the training and disciplining of the army, the civil list was arranged with economy and order, and the other branches of the public service were reformed or rearranged. He kept on the best terms with the Roman Catholic clergy and the Roman Catholic nobility ; and his subsequent marriage with a daughter of the French king (9th August 1832), and a contract that the children of the marriage should be educated in the Roman Catholic faith, did much to inspire confidence in his good intentions. While these things were going on the conference in London was engaged in determining the terms of peace, and a pro- ject of a treaty for the separation of the two states was drawn up and declared to be " final and irrevocable." The first basis of separation had determined that the grand- duchy of Luxembourg, which belonged to the king of Holland as grand-duke, should continue to belong to Holland. By the subsequent treaty of the eighteen articles, Belgium received the nght to treat for the purchase or redemption of Luxembourg from Holland on fair terms. These articles were adopted by the Belgian congress in July 1831, but the king of Holland rejected them, and followed up his rejection, as we have seen, by the invasion of Belgium. The terms of the treaty which followed this invasion were much more favourable to Holland than those of the previous one ; for the feeble resistance that Belgium had beeu able to make had affected very unfavourably the directing powers, who considered

that, in the interests of the peace of Europe, their first duty was to strengthen the defensive power of Holland. The new proposals, there- fore, caused great excitement in Belgium, and met with much opposition ; but, eventually, they were adopted by a majority of 59 to 38 in the Chamber of Representatives, and 35 to 8 in the Senate.

The treaty was signed on 15th November, and its condi- tions were embraced in twenty-four articles. By these .articles the grand-duchy of Luxembourg was to be divided, but the fortress of Luxembourg was to remain in the hands of the king of Holland as grand-duke, who was also to receive a portion of Limbourg for the part of Luxembourg ceded to Belgium. The district of Maestricht was also partitioned, the fortress of that name remaining with Holland ; the Scheldt was to be open to the commerce of both countries ; and the national debt was apportioned— to Belgium sixteen thirty-firsts, and the rest to Holland. It was also declared that Belgium " shall form an independent and perfectly neutral state."! This agreement was ratified by the Belgian and French sovereigns on the 20th and 24th November, by the British, 6th December ; but the Austrian and Prussian sovereigns did not accede to it till 18th April 1832, and the Russian not till 4th May. The Dutch still continued to protest against it, and maintained their possession of Antwerp. After fruitless efforts on the part of the great powers to obtain their acquiescence, France and England resolved to have recourse to force. On the 5th November, therefore, their combined fleets sailed for the coast of Holland, and on the 18th, a French army, under the command of Marshal Gérard, crossed the Belgian frontier to besiege Antwerp. The garrison con- sisted of only about 5000 men, while the besieging foree numbered 60,000. Operations commenced 30th November, and the siege in a military point of view is a memorable one. The garrison surrendered to the

! See Parliamentary paper, Aug. 1870,—WNetherlands, Belgium, and Luxembourg Treaties of 1831. 1839, and 1867.

French on 23d December, on the 31st the fortress was handed over to the Belgians, and some days after- wards the French troops recrossed the frontier. Long and complicated diplomatic negotiations followed, but

matters were at length adjusted, and on the 21st of May 1833 a convention was agreed to and signed by all the parties. The House of Orange still numbered many partisans in Belgium, whose proceedings embarrassed the Government ; and in Brussels, and some of the other towns, the people rose up against them, pillaging the houses of some of the leaders, and were appeased with difficulty. The king now gave his attention to the improvement of the manufactures and commerce of Belgium ; and on Ist May 1834 he sanctioned the law which was to create the first railroad on the continent of Europe. ; In 1835 the alien bill gave rise to considerable discus- sion, but it was at length carried. Its object was to give Government the power to send out of the kingdom, or to compel to reside in a particular place, any foreigner whose conduct was calculated to endanger the public peace. In 1836 au Act to regulate the municipal form of government in the towns and communes was passed. The election of the members of the municipal councils was continued in the citizens, but the appointment of the burgomaster and magistrates was vested in the king from among the members of the councils. The manufactures and commerce continued to flourish and extend, and the formation of railways was actively carriedon. As Holland had not yet acceded to all the conditions of the twenty-four articles, Belgium still kept possession of the whole of Limbourg and Luxembourg except the fortress of the latter, with a smal] area round it, which was occupied by Prussian troops. 'These territories had been treated in every way as a part of Belgium, and had sent representatives to both chambers. Great indignation was therefore felt at the idea of their being separated, when Holland, on 14th of March 1838, signi- fied its readiness to accept the conditions of the treaty. The chambersargued that Belgiumhad been induced to agree to the twenty-four articles in 1832 in the hope of thereby at once terminating all harassing disputes, but that as Holland did not then accept them, the conditions were no longer binding, and the circumstances were now quite changed. They urged that Luxembourg in effect formed an integral part of their territory, and that the people were totally opposed to a union with Holland. They offered to pay for the territory in dispute, but the treaty gave them no right of purchase, and the proposal was not entertained. The two chambers unanimously voted addresses to the king, expressing a hope that the integrity of Belgium would be maintained. Similar addresses were sent from all parts of the country, and the people were roused to a great state of excitement. The king was at

one with his people, and every preparation was made for war. But the firmness of the allied powers, and their determination to uphold the conditions of the treaty, at last brought the king, though with extreme reluctance, to give in to their views, After violent discussions the Chamber of Repre- sentatives gave its adhesion on 19th March 1839, and some days later the Senate followed the example. The treaty was signed at London on the 19th of April. The annual payment by Belgium for its share of the national debt, which had been fixed at 8,400,000 florins, was reduced to 5,000,000 florins, or £416,666, with quittance of arrears prior to lst January 1839, When this excitement was at its height the Bank of Brussels failed, and much misery and distress among the people was the result. This was immediately followed by the failure of the Brussels Savings- Bank, but the Government instantly came forward and guaranteed the claims thereupon, amounting to 1,500,000

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The Belgian revolution owed its success to the union of the Roman Catholics and the Liberals; and the king had been very careful to maintain the alliance between these two parties. This continued to be the character of the Government up to 1840, but by degrees it had been becoming more and more conservative, and was giving rise to dissatisfaction. A ministry was formed on more liberal principles, but it clashed with the Catholic aristocracy, who had the majority in the Senate. Disputes arose which caused great excitement among the people, and the cabinet resigned. A new ministry was then formed, under M. Nothomb, of a unionist or mixed kind. In 1842 a new law for the organization of public primary instruction was passed, which, however, did not meet with the approval of the clergy. In 1844 a commercial treaty was concluded with the German Zollverein; and soon after similar treaties were formed with France and Holland. The Nothomb ministry retired in 1845, and for seven months M. Van de Weyer attempted to carry on affairs with a mixed ministry; but he found it impossible to maintain harmony among the different factions. A Catholic administration was then formed, which was attacked with the greatest fury by the Liberals. The latter summoned a Liberal congress to meet at Brussels

(14th June 1846), composed of delegates from the different Liberal associations throughout the country. Three hundred delegates met and deliberated with the greatest calmness, drawing up an Act of Federation and a programme of Belgian Liberalism. The elections of 1847 gave a majority in favour of the Liberals ; the cabinet resigned, and a Liberal administration took its place and formally announced a new policy. Hence it happened that when next year France was in revolution and her king a fugitive, Belgium remained calm and unshaken. When the news reached Brussels the king convoked a council of his ministers and offered to resign if they thought that it would avert calamity or conduce to the public welfare. The ministers replied that a constitu- tional monarchy was best fitted for the people, and that a republic was neither according to their wishes nor adapted to their character. The democratic societies of Brussels attempted a revolutionary movement, but met with little success, At this time a new electoral law was issued lower- ing the franchise to 20 florins' worth of property (33s. 4d.), by which the number of electors was at once doubled ; and soon after another law reduced the qualification for muni- cipal councils to 46 francs (36s.) These timely concessions gave general satisfaction, and completely disarmed the extreme democratic party ; so that when an expedition was organized in Paris against the throne of Leopold, with the countenance and aid of certain members of the French Government, it met with no sympathy and totally failed in its object. On the night of the 24th March the conspira- tors, to the number of about 800 French and 100 Belgians, arrived at Quievrain by train, but they were at once sur- rounded by the military and peasants and made prisoners. Alarmed at this attempt the Government strongly reinforced the frontier towns with troops, and was thus able to repulse a more formidable invasion that took place a few days later. Belgium, however, suffered severely from the shock given to commercial credit and general industry. The discounts at the bank, which in 1847 had been 160,200,000 francs, sank, in 1848, to 86,900,000 franes, and the current accounts fell from 183,000,000 francs to 96,000,000 francs. The panic soon rendered the paymeut of notes in cash impossible; and the Government, by a law passed 28th March 1848, suspended cash payments, and authorized the bank to issue inconvertible notes to a limited extent. By this scasonable measure public credit was restored, and industry speedily revived.

The attention of the Government was now largely

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directed to the stimulating of private industry and the carrying out of public works of great practical utility, as the extension of railways and the opening up of other internal means of communication. Commercial treaties were also entered into with various countries with the view of providing additional outlets for industrial pro- ducts. The king also songht as much as possible to remove from the domain of politics every irritating question, believing that a union of the different parties was most for the advantage of the state. In 1850 the qnestion of middle class education was settled. In August of that year the whole country between Brussels and the French frontier suffered greatly from excessive rains ; the country for many leagues was flooded, many lives were lost, and the destruction of property was very great. On 25th Septem- ber the king laid the foundation stone of a monument in Brussels to commemorate the national congress which in 1831 had fashioned the new destinies of the country, and on 11th October the queen died. In 1852 the Liberal cabinet was overthrown, and a ministry of conciliation was formed. A bill was passed authorizing the army to be raised to 100,000 men including reserve. The elections of 1854 modified the parliamentary situation by increasing the strength of the Conservatives ; the ministry resigned and a new one was formed under M. de Decker, of moderate Catholics and Progressives. At the Paris conference of 1856, which settled the peace with Russia, the French minister, Count Walewski, complained of Belgium per- mitting to issue from its press publications the most hostile and insulting to France and her government, in which revolt and assassination were openly advocated. The remarks caused great indignation in Belgium. In 1857 violent discussions took place between the Liberal party and the Roman Catholics on the question of the administration of charities throughout the kingdom. – Since 1830 the administration of these had been vested in the secular power, and the Catholic party had long sought to get this power into their own hands. When, therefore, M. de Decker, who supported their views, became head of the niinistry, the priests made every exertion, even by bribery, to influence the elections so as to obtain a majority in their favour. In April the ministry of M. de Decker brought in a bill practically abolishing the existing law on

the subject. The bill met with the most violent opposition ; the discus- sions, which extended over 27 sittings and were charac- terized by great animosity, revealed a growing spirit of exaction and intolerance on the part of the clergy ; but eventually it was carried by a majority of 60 to 41. The result caused great excitement among the people, the Liberal deputies were cheered, and the principal Catholic speakers hooted and insulted. The agitation extended to the provinces, and the military had to be called out to restore peace. Eventually the bill was withdrawn, and the ministers gave in their resignations. The elections for the communal councils gave a great majority in all the im- portant towns in favour of the Liberals. A new Liberal ministry was formed under M. Rogier. In 1860 the com- munal octrois, or the taxes on articles of food brought into the towns, were abolished ; and in 1863 the navigation of the Scheldt was made free. This last year, also, a treaty of commerce and navigation was concluded with England. The elections of July 1864 gave a majority to the Liberals in the Chamber of Representatives, and the ministry of M. Rogier continued in office.

On the 10th December 1865 King Leopold died, after a reign of 34 years. He was greatly beloved by his people, and much respected by the other sovereigns of Europe. He was repeatedly chosen to decide in international dis- putes; and the grievances of hostile Governments were not unfrequently submitted to him. His well-known

honesty and integrity of purpose, his reflective and well- balanced intellect, his habit of close and accurate reasoning, his grave and serious deportment, all eminently fitted him for the office of arbiter. To him Belgium owed much. In difficult circumstances and critical times he managed its affairs with great tact and judgment; by conciliatory measures he reconciled and kept at peace opposing factions ; and by his well-known devotion to the best interests of the country he secured the confidence and esteem of all classes of the people. He was succeeded by his eldest son Leopold IL., who was immediately proclaimed king, and took the oath to the constitution on 17th December. In 1866 a body of English volunteers, to the number of 1100, . visited Belgium by invitation, and niet with a most cordial

reception from the king and all classes of the people, and took part in the Tir National. The following year a body of Belgian volunteers, numbering about 2400, came over to England, where they were warmly welcomed, and engaged in the shooting contests at Wimbledon. In 1868 serious riots took place in the mining districts, which were not put down till the military had been called out ; the effective army was raised from 80,000 to 100,000 men, and the yearly contingent from 10,000 to 12,000. Attempts were also made to obtain a revision of the elementary education law of 1842.

On the outbreak of the war between France and Germany in 1870, Belgium saw the difficulty and danger of her posi- tion, and lost no time in providing for contingencies, A large war credit was veted, the strength of the army was raised, and large detachments were moved to the frontier. The feel- ing of danger to Belgium also caused great excitement in Fngland, particularly after the contents of the secret treaty —which revealed the aggrandising schemes of France against Belgium—became known. The British Government de- clared its intention to maintain the integrity of Belgium in accordance with the treaty of 1839, and it induced the two balligerent powers to sign treaties to that effect. In the event of either power violating the neutrality of Belgium, England was to co-operate with the other in such manner as might be mutually agreed upon to secure the integrity of the country. It was at first feared that Pelgian territory might be violated by the necessities of one or other of the belligerents, but this was not the case. A considerable portion of the French army routed at Sedan did, indeed, take refuge in Belgian territory ; but they laid down their arms according to convention, and were "interned" in the king's dominions

In 1870 the Liberal party, who had been in power for thirteen years, was overthrown by a union of the Catholics with the Radicals or Progressionists, joined by not a few Liberals, to whom the opposition of the Government to certain reforms had given offence. A ministerial crisis followed, which was terminated by the advent to ottice of a Catholic cabinet, at the head of which was Baron d'Anethan. A new election took place in August 1870, which gave them a majority in both houses,—a result brought about in no small degree by the excitement consequent on the breaking out of the Franco-German war. 'The Baron

BELGRADE (in Servian, Bielgorod, or White Town),

the capital of the Servian principality, situated at the |

confluence of the Save and the Danube, on the right bank of the latter stream, opposite the Austrian town and fortress of Semlin Lat. 44° 47’ N., long. 20° 28’ E. It is built both on, and at the side of, a northern spur of the Avala heights, the rocky sumniit being crowned by its ence famous citadel, which still remains very much as it

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d’Anethan steered his course prudently, and incrcased the power of the Ultramontanes considerably by carrying o reform bill, which widened the basis of representation as regarded the provincial and communal councils, by intro- ducing large masses of the Catholic lower orders to the privilege of the franchise. It added nearly one-half to the number of electors for the provincial councils, and morc than a fourth to those for the communal councils. The Liberals were very much dissatisfied ; and towards the end of the year the mob in Brussels took up the question, and tumults broke out which the police and civic guard had to put down by force. They demanded the dismissal of the ministers, to which the king at length consented; and a new ministry was formed under M. de Thenx. The communal elections of 1872 were the occasion of a sharp strnggle throughout the kingdom between the church party and the Liberals, but success remained chiefly witb the latter. The elections of June 1874 resulted in a con- siderable reduction of the Ultramontane majority within the Senate and the Chamber of Representatives, without actually converting it into a minority. In July of that year a conference of representatives of the leading powers of Europe was held in Brussels, with the view of introduc- ing certain changes in the usages of war, but no definite result was arrived at. In May and June 1875, religious disturbances broke out in various parts, which were attended with serious consequences. At Brussels, Ghent, and other places, religious processions, which partook of the character of party demonstrations, were attacked by mobs of the populace, and many persons were injured. These disturbances were only put a stop to by energetic measures on the part of those in authority, and the inflic- tion of severe punishments on the delinquents.

The attention of foreign states has of late been particu- larly directed to Belgium, in consequence of certain remon- strances addressed to it by Germany on the subject of its international relations and its duties towards foreign powers, This arose from an obscure Belgian, named Duchesne, having written to a French archbishop, offering to assassi- nate Prince Bismarck for a consideration. He was taken and tried by the Belgian Government, but it was found that the law had provided no punishment for the offence which he had committed. This led to a remonstrance on the part of the German Government, which was couched in such terms as to afford ground for the gravest fears, on the part of Belgium and of foreign states, as to what might be the result. The correspondence, however, was carried on in a friendly spirit on both sides, satisfactory explana- tions followed, and the Belgian Government passed a measure making such offences as that of Duchesne criminal.

See Alison's History of Ewrope; The Belgie Revolution of 1830, by C. White, 2 vols., 1835 ; Belgium and the Twenty-four Artieles, by C. White, 1838; Histoire de la Belgique, by Theodore Juste, 2 vols. 4to, 1853; La Revolution Belge de 1830, by Th. Juste, 2 vols., 1872; Memoirs of Leopold I., by Th. Juste, 2 vols., London, 1868; Napoleon III et la Belgique, by Th. Juste, 1870 ; Memoirs of Van de Weyer, by Th. Juste, 2 vols., 1871; Zhe Annual Register for various years; Annuaire Statistique de la Belgique, 1874 ; Alma- nach Royal de Belgique, 1875. (D. K.)

was left by Prince Eugene, except that on the E., S., and W. the glacis has been changed into a promenade. The town was formerly divided into three parts, namely, the Old Town, the Rassian Town (Sava mahala or Save-district), and the Turkish town (Dorcol, or Cross-road). A great change has, however, taken place in the course of the present century, and the old divisions are only

| partially applicable, while there has to be added the

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Tirazia, an important recent suburban extension along the line of the aqueduct or Zvraz. Since 1869 great activity has been shown in building, and the Old Town is gradually being regulated according to a definite plan.

The general appearance of the place is growing nore and more EHuropean; its mosques and minarets, protected from actual demolition by a Turkish treaty, are falling into ruin from neglect. As the seat of the Servian Government, and the residence of the prince and the archbishop, Belgrade possesses a royal and an episcopal palace, a foreign and a home office, and other public buildings. Its educational institutions are remarkably numerous, consisting of a high school, several normal schools, a gymnasium, a theological seminary, a military academy, an industrial school, and an upper school for girls. There is a theatre devoted to the development of the national drama; and in the same building with the high school there is preserved a valuable collection of national antiquities as well as an extensive library. Besides the mosques, the ecclesiastical buildings include a cathedral and several Greek churches, a Roman Catholic chapel in the Austrian embassy, and an evangelical church. Among places of historical interest are the ruins of Prince Eugene's palace, and the monument in the Topjidere park on the spot where Prince Michael was assassinated in 1868. The citadel has been already mentioned; a commandant's resi- dence, barracks, and a military hospital are among its sub- sidiary buildings. 'Though its situation is highly conducive to mercantile activity, the commerce of Belgrade is not so great as would naturally be anticipated. It holds, however, direct commercial relations not only with Vienna and Con- stantinople but with Manchester. There are only two monetary establishments, one known as the " First Bank," and the other a bank of credit. The principal industrial products of the city are cotton-stuffs, carpets, leather, and fire-arms. Belgrade is identified with the ancient Stngi- dunum, and was the station of the Legio IV. Flavia Felix. It has from its earliest existence been a place of military importance, and in modern times has sustained many sieges, aud repeatedly passed from the hands of the Austrians to those of the Turks. It was taken by Soliman Il. in 1521, and retaken by the Austrians in 1688, but again lost in 1690. In 1717 it surrendered to Prince Eugene. The imperialists retained it till 1739, when the Turks invested and reduced it. Austria again took it in 1789, but it was restored at the peace of 1791. In the year 1806 the Servian insurgents succeeded in carrying it. In 1862 it was bombarded from the citadel on account of a contest raging between' the Turkish and Servian inhabitants, but five years later it was completely evacuated by the foreign forces, and the citadel received a garrison of Servian soldiers. The only mark of

Turkish occupation is the banner which continues to be shown from its walls along with the national colours, T'opulation in 1872, 26,674. BELIEF (rior, Fides, Kot, Glaube), with its synonyms Assurance, Confidence, Conviction, Credence, Trust, Per- suasion, Faith, is in popular language taken to mean the acceptation of something as true which is not known to be true, the mental attitude being a conviction that is not so Sstroug as certainty, but is stronger than mere opinion. For the grounds of such conviction, ordinary language refers at once to probable as opposed to intuitive or demonstra- tive evidence. Such popular phrases do not, of course, amount to a definition of belief; but this is not to be expected from them, especially if, as may be laid down with some confidence, no logical definition of the process be possible. It may be described and marked off from similar or contrasted states, but a rigidly scientific defini- tion of what appears to be a simple, ultimate fact is not attainable. The general explanation, however, is so far

unsatisfactory in that it throws no light upon the most interesting question with regard to belief, its province, and does not tell us what are the objects of belief as opposed to those of knowledge. To answer this it is necessary to describe somewhat more miuutely the mental process under examination.

1, Unfortunately for purposes of analysis, the word belief is used in a variety of relations which seem at first sight to have but little in common. We are said to believe in what lies beyond the limits of our temporal experience, in the supersensible, in God and a future life. Again, we are said to believe in the first principles or ultimate © verities from which all trains of demonstration must start ; as conditions of demonstration, these are themselves inde- . nonstrable, and are therefore objects of belief.1 We receive by belief perceptions of single matters of fact, which from their very nature cannot be demonstrated.? We believe from memory the facts of past experience; we have expectation or belief in future events. We accept truths on the evidence of testimony; and finally, we believe that our actual consciousness of things is in harmony with reality. From this unsystematic arrangement of objects of belief it will be possible to eliminate certain classes by noting in the first instance what we are not said to believe, but to

know. By knowledge may be understood generally the conviction of truth which rests on grounds valid for all intelligence, and which is expressed in proposi- tions necessary both for our thinking and for reality. At the same time we are commonly and correctly said to know states of consciousness when they are immediately present, together with their differences, similarities, connections, and relations to self. Whatever is necessarily connected with pre- sent experience, and can be logically deduced from it, is also matter not of belief but of knowledge. Again, we know all propositions of apodictic certainty, such as those of mathematics and logic. Mathematical propositions carry us beyond mere thinking; the laws which flow from the relations of space and time are not only thought but known to be true of all objects of sensible experience, for no objects whatsoever can form part of that experience save under these quantitative conditions. It is therefore an error to say that we believe abstract mathematical laws apply to objects ; we know this with absolute certainty. So also our cognizance of logical principles, such as the laws of identity and contradiction, is matter of knowledge, of insight, not of belief. It would appear, therefore, that know- ledge extends to facts immediately present in conscious- ness, and to certain relations true of all facts of sensible experience ; but in neither of these classes of cognition does there seem to be given an absolute guarantee for the eaist- ence of any fact which is not immediately before us. That one object presented to us is known seems to give no actual knowledge that another object ideally connected with it has at the same time real being. Mathematical and logical laws are absolutely true of all experience to which they apply, but this truth gives no certainty that there will be experience. If there be objects of experience at all, they

'must be subject to mathematical and logical law; but the

question remains, is there any ground, absolutely necessary and compelling assent, for holding that there will be such experience.? This is an old matter of debate ; it lies at

1 This has been pointed out by a long line of thinkers, from Aris- totle to Jacobi and Hamilton.

2 So knowledge through the senses is called Ofenbarwng by Jacobi and Lotze (Mikrokosmus, iii. 548). :

8 Of. Lotze, Mik, iii. 547. ' When one affirms that every object of thought is identical with itself, that the same under the same con- ditions has the same consequences, under different conditions different consequences, that a cause precedes every effect, —all these are universal truths, which tell us, indeed, what must be or take place if there should*

the very root of the distinction between knowledge and philosophical belief, and leads directly into the deepest problems of metaphysical science, its solution depending upon the answer given to the doubt whether or not our thinking is merely formal, receiving materials and working them up in forms which may have no correlates in reality. Hume, who in this connection has given the impulse to all subsequent British thinking, laid his finger with unerring precision on the crucial point, and deliberately relegated all matters of fact to the province of belief According to him, knowledge never passes beyond immediate intuition of ideas and their relations. Whenever we touch upon real existence, past or future. belief, not knowledge, is our instrument. An adequate discussion of the difficulty would lead beyond the limits of the present inquiry; it may suffive to indicate generally what can be said ou one typical point of the debate. Is the supposition of a causal connection among phenomena merely belief, or is it a necessary condition of knowledge? If the latter, then our thinking carries us with apodictic certainty beyond present experience of facts, for every causal judgment is, zpso facto, universal, and therefore extends to all or any time. Now, no proof of the universality of Jaw among phenomena can ever be given from empirical grounds, for all such attempts virtually involve the very principle in question. It is a necessary presupposition, without which knowledge would be impossible. Its contrary is certainly not self-contradic- tory, if by self-coutradiction be meant impossibility of tepresentation, for chaos can be pictured; but the power of imagination is surely not the criterion of truth, It is the power of knowing objects that is in question, and the non-existence of the causal relation among phenomena would render actual experience impossible, Objects cannot be known save under this supposition. A similar line of argument directed towards others of the notions involved in what Kant has called synthetical judgments a priori, would show that such notioiis are constitutive of our ex- perience, that thought penetrates deeply

into phenomena, aud that phenomenal relations are but types of the forms of real cognition. It might, of course, still be maintained that all these synthetical propositious are only formal,—are only true if experieuce be given,—and that a wide field is still left for belief. Under certain conditions this may be admitted. A doubt as to the very existence of experi- ence is hardly a valid argument, but that there should be specific connections of phenomena, permanent and con- stant—that, for example, the same cause should continue to have the same effects—may seem not quite a matter of knowledge. The real element of doubt in such a case is not, however, whether the same cause under the same conditions shall give the same effects, but whether in any definite instance we have attained a thorough knowledge of the cause itself, and whether the conditions will recur. The first of these doubts is overcome in the ordinary pro- gress of knowledge; the other concerns the empirical appearance of the effects, relates therefore to what may be called the contingent, and forms the object of belief.

It follows from what has been said that we exclude from the province of belief primitive truths and facts of immediate experience, with such phenomena, past or future, as are connected causally or by rational links with facts immediately known. There is still a wide field left for belief. (a.) In the stage of knowledge which we call sensible coguition belief introduces itself; for conscious- ness, which unhesitatingly affirms the correspondence of its content with reality, readily exhibits its falsity when sub- mitted to analysis. The belief, though firm, is shown to

be « case of their application, but which tell us nothing of the real existence of any case.”

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be erroneous,—to be merely the rapid summation of a number of signs, which themselves do not come clearly before consciousness, and are therefore accepted without examination. (b.) In memory of our own past experience belief is involved. When I remember, I have present to consciousness ideas which represent past reality. ‘To have ideas simply is to imagine ; to have ideas which we are con- vinced represent past experience is to have imagination plus belief, z.e.,to remember. It should be observed that we are frequently said to trust our memory, to believe that what we

remember is true. This phraseology is objectionable ; we cannot properly be said to ¢rust our memory, we simply use it. In the very fact of remembering is involved the reference to past reality which is the essence of belief. (c.) We believe testimony, z.¢., we accept as true facts not in our experience, and which possibly may never be. In this case our belief is, that under certain conditions we should have the experience which from the testimony we can picture to ourselves, (d.) Expectation, so far as merely contingent elements are concerned, is a pure case of belief.

2. So far as we have yet seen, all objects of belief have been or may be objects of knowledge ; and the most promi- nent distinction between the two is the presence in the one of an actual intuition and its absence in the other. This distinction, however, as we have pointed out, is not absolute; all thinking of reality is not belief. Belief is rather the thinking of reality which is determined by grounds not necessarily valid for all intelligence, but satis- factory for the individual thinker. The difference between imagination and the thought of some reality does not seem capable of further analysis ; it expresses an ultimate fact. Attempts, however, have been made to work out a psycho- logy of belief, and to point out the characteristics differen- tiating ideas believed in from mere pictures of the mind. These have been generally due to British thinkers; and, since the time of Hume, the problem has become one of consider- able importance. Locke, who marked out very carefully the province of belief and cousidered its grounds, made no attempt to analyse the state itself. Hume,! however, puts the question clearly before himself aud returns an unhesi- tating answer. " As it is certain,' he says, "there is a great difference betwixt the simple conception of the existence of an object and the belief of it, and as this difference lies not in the parts or composition of the idea which we conceive, it follows that it must be in the manner in which we conceive it. When we are convinced of any matter of fact, we do nothing but conceive it along with a certain feeling, different from what attends the reveries of imagination." 'This feeling is nothing bunt a firmer con- ception or a faster hold that we take cf the object." "This manner of conception arises from a customary con- junction of the object with something present to the memory or senses." From the last sentence to the elaborate theory of James Mill is but a short step. According to Mill, belief is a case of constant association; an idea is believed which is irresistibly called up in connection with present experience. Thus in

memory, the ideas of the past experience are irresistibly associated with the idea of myself experiencing them, and this irresistibility constitutes belief. Expectation, again, is the irresistible suggestion by present experience of a consequent or train of consequents. And to memory and expectation all ordinary cases of belief may be reduced.

Both these theories are defective in the same point,—the analysis of what is meant by object in general, and, con- sequently, of what is involved in thinking of an object. Hume's is open to the special objection that he makes the

1 A theory somewhat similar to that of Hume is worked out by Mr Bagehot, Contemporary Review, April 1871.

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difference between the believed and imagined idea the same as that between impression and idea, which is an ultimate distinction, and yet holds the difference to be merely one of degree. In Mill's account of memory it may be pointed out that the ideas of past experience, and of myself as having had the experience, contain in themselves the very element which is supposed to be got out of their conjunction, With regard to expectation it is clear that ideas irresistibly suggested by present experience are by no means necessarily believed, and further, that many of our beliefs do not'arise from any such association. J. 8. Mill,? who subjects the association theory of belief to a searching examination, comes to the conclusion that the distinction between thinking of a reality and representing to ourselves an imaginary picture is ultimate and primordial. With his opinion later investigators, as Mr Sully,? concur. Professor Bain, in opposition to other psychologists, holds that belief is not so much an intellectual state as a " phase of our active nature, otherwise called the will." "It is a growth or development of the will under the pursuit of intermediate ends." When, for instance, we perform certain acts as means towards a desired end with as mucli vigour as if we were realizing the end itself, "we are in a very peculiar situation, not implied in desire." This situation is belief, which is essentially 'an anticipation of the pleasure" of attaining the end. Belief being a form of activity, our primitive state is one of complete confidence. The inind is filled with its present experience, and con- fidently believes that

the future will resemble it. Ideas are so strongly taken up by the mind that they are accepted as real, and influence the will. The various disappoint- ments of this primitive confidence give rise to definite avoidances of certain actions, and to pursuit of others, in order to-@Scape pain or gain pleasure. Action directed towards these intermediate ends involves, or rather is, belief. This theory has to explain expectation and memory. With regard to the first, "'we make light of the difference between the conceived future and the real present ;" or in other words, "we are disposed to act in any direction where we have never been checked." Our primitive disposi- tion to act is equivalent to full expectation. It may be pointed out that this explanation throws no light on ex- pectation of events in which our activity could by no possibility be involved. But the theory seems to break down entirely when applied to memory. 'There is first to be explained the fact of memory, and then it has to be shown how reference to activity is contained in it. "In surrendering our mind to the idea still remaining, and so imparting a momentary quasi-reality, we have an experience possessing the characteristic features of present reality." 'We really make no radical ditference between a present and a proximate past." This, in the first place, would apply only to certain cases of memory. Secondly, impart- ing a quasi-reality is not an explanation of the peculiar phenomenon of an idea representing the past. It is an error, even on Professor Bain's own principles (see note to Afill's Analysis, i. 342; Emotions and Will, 2d ed. 525), to speak of belief in a present reality, while here memory is explained as a pseudo-realization of the ideas. Nor is he more successful in referring memory to activity. To identify my remembrance of having run up against a wall to avoid a carriage with the conviction that, should such a danger recur, I should again run up against the wall (see Emotionsand Will, 2d. ed.,554),is absurd. The whole theory seems but an instance of a not uncommon error in psycho- logy,—the confusion of the test or measure of a thing with the thing itself. Belief is truly a motive to action, and all

1 Notes to J. Mill's Analysis, i. Cf. Dissertations, iii. 2 Sensation and Intuition. (On the Development of Belief.)

® It is so defined by Bain (Ment. and Moral Sc., 372), who finds |

that has been said of it by Professor Bain would hold good of it in this relation ; to identify the two is to run together totally distinct processes.

Modern German psychology has not approached the pro- blem of belief from the same side as the English. Beneke alone, by his analysis of tact (see Lehrbuch der Psych., § 158, and System der Logik, i. 268, seg.), has opened up a somewhat fresh vein of thinking. His hints have been carried out by Germar (Die alte Streitfrage, Glauben oder Wissen, 1856), who gives the following definition of belief : "Tf the consciousness (of the truth of what we think) arises from tact, and therefore without consciousness of the factors or grounds through which it is produced, it is called belief; it is elevated to knowledge when these factors are brought before consciousness" (p. 58).4 In general the example of Kant has been followed, who looked upon the question as belonging not so much to psychology as to the theory of knowledge. His own discussion of the subject and his distinction between JLeinen, Glauben, and Wissen have powerfully influenced later thought. Accord- ing to him, Glauwbe (belicf, in the sense of des as opposed to Credulitas, Foi as opposed to Croyance) should be con- fined to such propositions as rest on grounds subjectively not merely sufficient but necessary ; that is to say, the pro- positions believed in are recognized as the demands of our moral or practical reason, and their truth can never be disproved, for such disproof would be radically inconsistent with the moral nature which we are conscious of possessing, Our confidence in their truth is unwavering and practi. cal, ze, leading to action; for without them we could not act in conformity with our moral uature. Never- theless, of the objects of such propositions we can never have scientific knowledge.

3. Kant's distinction of Aeinung and Glaube leads us directly to the one species of belief which has not yet been considered. All objects of belief, so far as has yet appeared, might come within our temporal experience ; but we are said to believe in the supersensible, which from its very defini- tion seems to surpass experience and, consequently, know- ledge. To such belief the name faith is properly restricted, and in its nature it differs somewhat from the belief hitherto discussed. There is not, of course, included in it the specifically theological notion of faith as Piducia (que est apprehensio meritt WcavOpdrov appropriativa ad me et te in individuo) ; it corresponds

rather to the Votitia and Assen- sus, Which are also elements in theological faith, and may be defined as the subjective expression of man's relation to God. When understood in this sense, religious belief is by no means a mere feeling, though it contains feeling as one of the stages in its development, for mere feeling is in itself blind and valueless, whereas faith is intelligent or rational. Nor is it a blank faith which would have the same value whatever were the objects believed in, for religious belief has a definite content ; it is the acceptation of certain facts and truths and the active realization of them. As its content is definite (for if it were not so, the religions of Christ and of Mahomet, of Buddha and of Zoroaster, would stand on the same level, all having sub- jective faith or conviction), belief of necessity involves knowledge, rational construction of the facts believed. Faith is but the lower stage of completed insight, and in its own development follows the natural order of progress in knowledge, which begins with fecling aud intuition, rises through concrete representation into logical connection,

great difficulty in reconciling his theory with ordinary phraseology. Such an expression as the following has a curious ring :—" Belief is identical with the activity or active disposition, at the moment, and with reference to the thing believed."'—(Note to Analysis, i. 395.)

4 With this view may be compared much of what is said by J. H. Newman, Grammar of Assent ; see specially 73, 281.

and finally culminatcs in rational cognition. So religious belief, which is primarily little more than a vague feeling of something over aud beyond the present state of exist- ence, combined with the dim sense of our own finite and dependent condition, gradually rises to a higher stage, and in its efforts to attain some cognizance of the supersensible, begins even to attach itself to natural objects. But as it can find in these no satisfaction, it is compelled to con- struct some representations of the supernatural which shall harmonize with our spiritual wants. In the formation of these religious ideas we are not left without help, nor are they to be looked upon as mere figments of the mind. The revelation which has been given in nature, both physical and moral, and in the special experience to which the name is

more frequently applied, furnishes matter which is laid hold of and pressed into the service. Religious belief or faith always attaches itself to representa- tions, intuitions, or facts; it gives what Newmau has called Real as opposed to Notional Assent. But it is not the less necessary that faith should be raised to insight, and that we should construe in terms of thought what religious experience brings before us as direct intuition. There must be theology as well as religion. Nothing is believed which is not held to be so connected with the rational nature of man as irretrievably to injure that nature should its truth be overthrown. This is not to put know- ledge in place of faith, if knowledge be understood to apply only to the logically necessary ; nor is it to assert that what have been called truths of revelation could have been discovered by natural reason. Knowledge, however, can- not be confined to the abstract understanding ; and nothing is more delusive than the total opposition of revelation and reason. ‘ What is there in the nature of things," says Augustine, " that God has done unreasonably ?" To affirm that reason does not of itself discover the truths of reve- lation, is simply to bring against it the reproach it may well bear, that it does not create experience. Reason has not to make new facts, but to accept given experience, and evolve from it the pure elements of thought which it con- tains, and in which its truth consists. Faith, therefore, precedes knowledge, as Anselm used to say; but its priority is that of time, not of authority.!

4, There remains to be taken into account the interesting question of the grounds and motives for belief. It is, of course, necessary to distinguish between these two; the cause of a belief may not be exactly a reason for it. Belief, though natural, is not always rational, but frequently rests with happy wuconsciousness on foundations utterly inade- quate to its support. But if we disregard this distinction and include both causes and reasons under the title principles of belief, these may be divided into three classes — (l1), Testimony ; (2), Feelings, Desires, or Wishes ; (3), Evidence of Reason. These are rarely dissevered in actual practice. Testimony, to the reception of which the name belief is frequently restricted, is familiar enough to require no extended notice. Our natural tendency is to accept all testimony as true; it is experience alone that teaches caution. Where from the nature of the case no such experience is to be had, credulity settles down into firm and ineradicable conviction. The majority of men would be astonished to find how much their belief depends upon the society into which they have been

born and in which they live. Dogmas at first forced upon a people gradually become ingrained in the minds of those brought up in habitual contact with them. There is hardly a limit to the possibility of instilling beliefs through continued custom, and no resistance to analysis is so strong as that offered by mere customary opinion, which has impercep-

1 See Scotus Erigena, De Divis. Natur., i. 69.

tibly introduced itself into the very life's blood of those who share it.

The feelings, though not so directly a source of convic- tions as testimony, exercise an extensive and complex influence on belief. It has always been a popular saying that a man believes what he wishes—that "the wish is father to the thought;" and there can be no doubt that the supcrior force given to an idea by the concentration on it of desire or affection, causes it to bulk so largely in consciousness as to exclude the thought of its non-realiza- tion.- The very idea of a result opposed to what we earnestly desire is unpleasant enough to make us resolutely shut it out of sight. This, however, is but a partial and limited effect. We know very well that our belief is only occasionally swayed by our wishes, and that necessity too often constrains us to believe what we willingly would not. Our volition cannot directly compel belief. But the feelings play a more important part; for it is by their means primarily that we stretch beyond the field of direct knowledge and complete our limited experience with what we feel to be necessary for the harmony of our moral and religious nature. We believe that without which our nature would be dissatisficd, and this belief takes its rise in the feelings, —the blind expressions of intellectual want,— which form the first stage towards completed insight.

It is hardly necessary to do more than refer to the rational grounds for belief. Wherever our knowledge of any object or law is incomplete, belief is ready to step in and fill up the gap by some hypothesis, which is in conformity with our experience, is rationally connected with the facts to be explained, and is not yet known to be true. Great portions of our so-called scientific knowledge are nothing but rational belief.—hypotheses unverified, perhaps even unverifiable,—and the settlement of the conditions

or legitimacy of such presumptions forms the principal part of inductive logic.

Besides the works already referred to, the following treat of belief in general :—Fechner, Drei Motive und Grunde des Glaubens, 1863; Ulrici, Glauben und Wissen, Spekulation und exacte Wissenschaft, 1858; of religious belief in particular, in addition to works on dogmatic theolegy or philosophy of religion:—Schwarz, Das Wesen der Religion, 1847; Asher, Der religitse Glaube, 1860; J. Késtlin, Der Glaube, 1860; Venn, Hulsean Lectures for 1869. (R. AD.)

BELISARIUS (Sclavonic, Beli-tzar, " White-Prince "), the greatest general of the Byzantine empire, was born about 505 a.p., at Germania, on the borders of Illyria. As a youth he served in the body-guard of Justinian, who appointed him commander of the Eastern army. He won a signal victory over the Persians in 580, and success- fully conducted a campaign against them, until forced, by the rashness of his soldiers, to join battle and suffer defeat in the following year. Recalled to Constantinople, he married Antonina, a profligate, daring woman. During the sedition of the " green" and "blue" parties of the circus he did Justinian good service, effectually crushing the rebels who had proclaimed Hypatius emperor. In 533 the conimand of the expedition against the Vandal kingdom in Africa, a perilous office, which the rest of the imperial generals shunned, was conferred on Belisarius. With 15,000 mercenaries, whom he had to train into Roman discipline, he took Carthage, defeated Gelimer the Vandal king, and carried him captive, in 534, to grace the first triumph witnessed in Constantinople. In reward for these services Belisarius was invested with the consular dignity, and medals were struck in his honour. At this time the Ostrogothic kingdom, founded in Italy by Theodoric the Great, was shaken by internal dissensions, of which Justinian resolved to avail himself. Accordingly, Belisarius invaded Sicily ; and, after storming Naples and defending Rome for a year against almost the entire strength of the Goths in Italy, he concluded the war by the capture of

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Ravenna, and with it of the Gothic king Vitiges. So con- spicuous were Belisarius's heroism and military skill that the Ostrogoths offered to

acknowledge him Emperor of the West. But his loyalty did not waver; he rejected the pro- posal and returned to Constantinople in 540. Next year he was sent to check the Persian king Nushirvan; but, thwarted by the turbulence of his troops, he achieved no decisive result. On his return to Constantinople the intrigues of Antonina, whom he had confined ou account of her illicit amours, caused him to be stripped of his dignities and condemned to death, and he was only pardoned by humbling himsclf before his imperious consort. The Goths having meanwhile reconquered Italy, Belisarius was despatched with utterly inadequate forces to oppose them. Nevertheless, during five campaigns his strategic skill enabled him to hold his enemies at bay, until he was removed from the command, and the conclusion of the war entrusted to his rival Narses. Belisarius remained at Constantinople in tranquil retire- ment until 559, when an incursion of Bulgarian savages spread a panic through the mctropolis, and men's eyes were once more turned towards the neglected veteran, who placed himself at the head of a mixed multitude of peasants and soldiers, and repelled the barbarians with his wonted courage and adroitness. But this, like his former victories, stimulated Justinian's envy. The savionr of his country was coldly received and left unrewarded by his suspicious sovereign. Shortly afterwards Belisarius was accused of complicity in a conspiracy against the emperor ; his fortune was confiscated, and himsclf flung into prison. His last years are shrouded in uncertainty, as they are not dealt with in the circumstantial history of Procopius ; but he seems to have been liberated and reinstalled in the enjoy- ment of his hard-won honours before his death in 565. The fiction of Belisarius wandering as a blind beggar through the streets of Constantinople, which has been adopted by Marmontel in his Bélisatre, and by various painters and poets, seems to have been invented by Tzetzes, a writer of the 12th century. Gibbon justly calls Belisarius the Africanus of New Rome. But for his successes, which were achieved with most insignificant means, the effete Byzantine empire would have been dismembered among Vandals, Persians, and Goths. He was merciful as a con- queror, stern as a disciplinarian, enterprising and wary as a general ; while his courage, loyalty, and forbearance seem to have been almost unsullied. Like Corbulo, the faithful general of Nero, he was suspected and persecuted by an ungrateful master; and, like him, he restored the old dis- cipline to the troops and the ancient lustre to the Roman arms i @ corrupt

and nervelessage. (Cf. Mahon's Life of Belrsarius ; Finlay's Greece under the Romans ; Procopius ; Gibbon's Decline and Fall, ch. 41-43.)

BELIZE, the capital of British Honduras, and the only trading-port in the colony. It is situated on the sea-coast, at the mouth of a river of the same name, in lat. 17° 29' N. and long. 88° 8' W. It consists of one principal street along the shore with a number of offshoots, is for the most part well built, and has a governor's house, a fort, a court- house, a jail, a Gothic church, a hospital, and a number of schools, The exports are principally mahogany, rose- wood, cedar, logwood, cocoa-nuts, fustic, and sugar. In 1872, 379 vessels, most of them British, with a total tonnage of 32,345 tons, entered the port. Regular steam- boat communication has been established with Kingston, Jamaica. The population is about 5000.

BELKNAP, Jeremy, an American clergyman and author, was born at Boston in 1744 and died in 1798. He was educated at Harvard University, where he graduated in 1762. In 1767 he was called to a Congrega- tional church in Dover, New Hampshire, and remained there for twenty years. He then removed to the Fedcral

| Street church in Boston, which he held till his death.

His principal works are—History of New Hampshire, 3 vols., 1784-92 ; American Biography, 2 vols., 1794-98 ; The Foresters, 1792.

BELL (fron pelvis, a basin or foot-pan, Pes lavare), an open percussion instrument varying in shape and material, but usually cup-like or globular and metallic, so constructed as to yield one dominant note. This definition excludes on the score of sound the cauldrons of Dodona (Dodonai lebetes of the Greek oracular temples), and also the Chinese or Indian gongs, and, on the score of shape, all drums, cymbals, the metal plates of the Romans, and resonant bars of metal or wood still used by many savage tribes.

Antiquaries have worried themselves and their readers about the antiquity of bells and to small purpose. It is doubtful whether the bells of gold (Exod. xxviii. 32, 35) were anything but jangling ornaments of some kind worn by

the high priest ; but Mr Layard believes that he has found some small bronze bells in the palace of Nimrond. We may gather generally that small bells long preccded large ones, which latter, however, were used in India and China long before they were known in Europe.

The Romans used bells for various purposes, Lucian, 180 A.D., mentions an instrument (Clepsydra) mechanically constructed with water, which rang a bell as the water flowed to measure time. Bells summoned the Romans to the public baths; they were also used in processions, and so passed naturally into the service of the Western Church. The first recorded application of them to churches is ascribed by Polydore Vergil to Paulinus (circa 400 a.p.) He was bishop of Nola, a city of Campania (hence nola and campana, the names of certain bells). It has been maintained that Pope Sabinianus, 604, first used church bells; but it seems clear that they were introduced into France as early as 550. In 680 Benedict, abbot of Wearmouth, imported them from Italy ; and in the 7th century, Bede mentions them in England. St Dunstan hung many in the 10th century; and in the llth they were not uncommon in Switzerland and Germany. It is incredible that the Greek Christians, as has been asserted, were anacquainted with bells till the 9th century ; but it is certain that, for political reasons after the taking of Constantinople by the Turks, in 1453, their use was forbidden, lest they should provide a popular sigual for revolt.

Several old bells are extant in Scotland, Ircland, and Wales ; the oldest are often quadrangular, made of thin iron plates hammered and rivetted together. Dr Reeves of Lusk described in 1850 St Patrick's bell preserved at Belfast, called Clog an eadhachta Phatraic, "the bell of St Patrick's will." It is 6 inches high, 5 broad, 4 deep, adorned with gems and gold aud silver filagree-work ; it is inscribed 1091 and 1105, but is probably alluded to in Ulster annals in 552. For Scotch bells, see Ldlustrated Catalogue of Archeological Museum, Edinburgh, for 1856.

The four-sided bell of the Irish missionary St Gall, 646, is preserved at the monastery of St Gall, Switzerland. In these early times bells were usually small; even in the 11th century a bell presented to the church at Orleans weighing 2600 ib was thought large. In the 13th century larger bells were cast. The bell, Jacqueline of Paris, cast 1400, weighed 15,000 ib; another

Paris bell of 1472, 25,000 ib; and the famous Amboise bell at Rouen, 1501, 36,364 Ib. But there we have reached the threshold of the golden age of bells, of which more anon.

Before we enter on the history and manufacture of the bell in Europe it is worth while to enumerate the different kinds of bells named by Hieronymus Magius in his work De Tintinnabulis :—1. Tintinnabulum, a little bell, otherwise called tixnzolwm, for refectory or dormitory, according to Belethus, but Durandus names squzlla for the

refectory ; 2. Petastws, or larger '" broad-brimmed hat " bell ; 3. Codon, orifice of trumpet, a Greek hand-bell ; 4. Nela (see ante), a very small bell, used in the choir, accord- ing to Durandus; 5. Campana (see ante), a large bell, first used in the Latin churches in the stecple (Durandus), in the tower (Belethus); 6. Squdlla, a shrill little bell. We read of cymbalum for the cloister (Durandus), or campanella for the cloister (Belethus) ; nolwla or dupla in the clock; s¢gnwm in the tower. There was also a bell called corrigiuncula, to summon the monks at scourging tine.

We shall now give a brief account of the manufacture of the bell proper, z.c., the church bell of the last five cen- turies. It must not be supposed that the early bell-founders understood all the principles of construction, mixture of metals, lines, and proportions which go to form our notion of a good bell. As the Amati or Stradiuarius violin is the result of innumerable experiments extending over centuries, so the bells of Van den Gheyn (1550) and Hemony (1650) disengaged themselves after ages of empirical trials as the true models, and supplied the finished type for all succeeding bell-workers.

Bell-metal is a mixture of copper and tin in the propor- tion of 4 to 1. In Henry IIL's reign it was 2 to 1. In Mr Layard's Nineveh bronze bells, it was 10 to 1. Zine and lead are used in small bells. The thickness of the bell's edge is 115th of its diameter, and its height is twelve times its thickness.

Bells, like viols, have been made of every conceivable shape within certain limits. The long narrow bell, the quadrangular, and the mitre-shaped in Europe at least indi- cate antiquity, and the graceful curved-inwardly-

midway and full trumpet-mouthed bell indicates an age not earlier than the 16th century.

The bell is first designed on paper according to the scale of measurement, Then the crook is made, which is a kind of double wooden compass, the legs of which are respec- tively curved to the shape of the inner and outer sides of the bell, a space of the exact form and thickness of the bell being left betwixt them. The compass is pivotted on a stake driven into the bottom of the casting-pit. A stuffing of brickwork is built round the stake, leaving room for a fire to be lighted inside it. The outside of this stuffing is then padded with fine soft clay, well mixed and bound together with calves' hair, and the inner leg of the compass run round it, bringing it to the exact shape of the inside of the bell. Upon this core, well smeared with grease, is fashioned the false clay bell, the outside of which is defined by the outer leg of the compass. Inscriptions are now moulded in wax on the outside of the clay-bell ; these are carefully smeared with grease, then lightly covered with the finest clay, and then with coarser clay, until a solid mantle is thickened over the outside of the clay bell. A fire is now lighted, and the whole baked hard ; the grease and wax inscriptions steam out through holes at the top, leaving the sham clay bell baked hard and tolerably loose, between the core and the cope or mantle. The cope is then lifted, the clay bell broken up, the cope let down again, enclosing now between itself and the core the exact shape of the bell. The metal is then boiled, and run molten into the mould. A large bell will take several weeks to cool. When extticated it ought to be scarcely touched, and should hardly require tuning. This is called its maiden state, and it is one so sought after that many bells are left rough and out of tune in order to claim it.

A good bell, when struck, yields one note, so that any person with an ear for music can say what it is. This note is called the consonant, and when it is distinctly heard the bell is said to be "true." Any bell of moderate size (little bells cannot well be experimented upon) may be

tested in the following manner :—Tap the bell just on the curve of the top, and it will yield a note one octave above the consonant. Tap the bell about one quarter's distance from the top, and it should yield a note which is the quint or fifth of the octave. Tap it two quarters and a half lower, and it will

yield a teerce or third of the octave. Tap it strongly above the rim where the clapper strikes, and the quint, the tierce, and the octave will now sound ei yielding the consonant or key-note of the ell.

If the tierce is too sharp the bell's note (ze., the con- sonant) wavers between a tone and a half-tone above it; if the tierce is flat the note wavers between a tone and a half-tone below it; in either case the bell is said to be "false." A sharp tierce can be flattened by filing away the inside of the bell just where the ticrce is struck; but if the bell when cast is found to have a flat tierce there is no remedy. The consonant or key-note of a bell can be slightly sharpened by cutting away the inner rim of the bell, or flattened by filing it a little higher up inside, just above the rim. (See H. R. Haweis's Music and Morals, 5th edition, p. 429.)

The quality of a bell depends not only on the casting and the fineness and mixture of metals, but upon the due proportion of metal to the calibre of the bell. The larger the bell the lower the tone; but if we try to make a large E bell with metal only enough for a smaller F bell, the E bell will be puny and poor. It has been calculated that for a peal of bells to give the pure chord of the ground tone or key-note, third, fifth, and octave, the diameters are required to be as thirty, twenty-four, twenty, fifteen, and the weights as eighty, forty-one, twenty-four, and ten.

The history of bells is full of romantic interest. In civilized times they have been intimately associated, not only with all kinds of religious and social rights, but with almost every important historical event. Their influence upon architecture is not less remarkable, for to them indirectly we probably owe all the most famous towers in the world. Grose in his Antiquities observes, " 'Towers at first scarcely rose above the roof, being intended as lanterns for the admission of light, an addition to the height was in all likelihood suggested on the more common usc of bells."

Bells early summoned soldiers to arms, as well as citizens to bath or senate, or Christians to church. They sounded the alarm in fire or tumult ; and the rights of the burghers in their bells were jealously guarded. Thus the chief bell in the cathedral often belonged to the town, not to the cathedral chapter. The curfew, the Carolus, and St Mary's bell in the Antwerp tower all belong to the town ; the rest are the property of the chapter. He who

commanded the bell commanded the town; for by that sound, at a moment's notice, he could rally and concentrate his adherents. Hence a conqueror commonly acknowledged the political importance of bells by melting them down ; and the cannon of the conquered was in turn melted up to supply the garrison with bells to be uscd in the suppression of revolts. Many a bloody chapter in history has been rung in and out by bells.

On the third day of Easter 1282, at the ringing of the Sicilian vespers, 8000 French were massacred in cold blood by John of Procida, who had thus planned to free Sicily from Charles of Anjou. On the 24th of August, St Bartholomew's day, 1571, bclls ushered in the massacre of the Huguenots in France, to the number, it is said, of 100,000. Bells have rung alike over slaughtered and ransomed citics; and far and wide throughout Europe in the hour of victory or irreparable loss. At the news of Nelson's triumph and death at Trafalgar, the bells of Chester rang a merry peal alternated with one deep toll, and similar

striking incidents could be indefinitely multiplied. It was, however, in the low countries of Belgium and Holland, distracted with incessant civil wars, that, for purely political reasons, bells acquired unique importance.

But their religious and civil uses may be further noticed. The Ave Mary bell tolled at 6 and 12 to remind men of prayer to the Virgin ; the vesper bell for evening prayer ; the compline was for the last service of the day. The sanctus, often a handbell, rung at the sacrifice of the mass ; the passing bell, at death. The curfew (cowvre feu), introduced by the Conqueror into England, rang at 8 o'clock to extinguish all lights. In many parts of the country and in university towns at 8 and 6 o'clock bells are still rung. At Antwerp cathedral we find the Cloche de Triomphe, by Dumery ; sixteen bells at Sotteghem and several at Ghent and elsewhere bear the same maker's name. The Horrida, or ancient tocsin at Antwerp, said to date from 1316, is long- shaped and is now unused, 'The curfew in the same tower rings at 5, 12, and 8, The Santa Maria (44 tons) first rang when Carl the Bold entcred Antwerp 1467. St Antoine is another celebrated bell, and the

favourite Carolus, given by Charles V. (74 tons), is made of copper, silver, and gold, and valued at £20,000. At Strasburg we have the Holy Ghost bell, with motto, "O Rex glorie Christe veni cum pace," and date 1375, 3 nonas Augusti (8 tons), only rung when two fires are seen in the town at once, The recall or storm bell warns travellers in the plain of the storm coming from the Vosges Mountains. The Thor or gate beil, for shutting and opening gates of the city, has been cast three times (1618, 1641, and 1651); it bears the following inscription :—

'Dieses Thor Glocke das erst mal schallt Als man 1618 sahlt Dass Mgte jahr regnet man Nach doctor Luther Jubal jahr

Das Bés hinaus das Gut hinein Zu linten soll igr arbeit seyn."

The Mittags, or 12 o'clock bell, taken down in the French Revolution, bore the motto—-

' Vox ego sum vite Voco vos—orate—venite."*

From all this it will appear that these Continental bells acquired a strong personality from the feelings and uses with which they were associated ; and, indeed, they were formally christened with more ceremony than we give to christening our ships, and were then supposed to have the power of driving away evil spirits, dispersing storms, é&c.

Bell-founding attained perfection in Holland in the 16th and 17th centuries; and the names of Hemony, Dumery, and the Van den Gheyus stand out as the princes of the art. Countries, and are plentiful at Amsterdam, Bruges, Ghent, Louvain, Mechlin, and Antwerp. These bells are frequently adorned with bas reliefs of exquisite beauty, such as feathers, forest leaves, fruit, flowers, portraits, or dancing groups, and inscribed with Latin, sometimes bad, but strong, quaint, and often pathetic. We give the preference to Hemony's small bells, and to Van den Gheyns's large ones. The names of Deklerk, Claes Noorden and Johann Albert de Grave (1714), Claude and Joseph Plumere (1664), Bartholomew Goethale (1680), and Andrew Steiliert (1563) also oceur in Belgium. The following illustrate the nature of inscriptions and mottoes common in Belgium :—" Non sunt loquelze neque

sermones audiantur voces eorum, F, Hemony, Amstelodamia, 1658 ;” “ Laudate Dominz omnes gentes, F. Hemony, 1674;” and .on a Ghent bell—

““Mynem naem is Roelant Als ick clippe dan ist brandt Als ick luyde dan is storm in Vlenderland.”

eir ells are still heard throughout the Low are at Boston church, Lincolnshire, Worcester cathedral,

LL

A common inscription runs—

“Funera plango, Fulgura frango, Sabbata pango, Excito lentos, Dissipo ventos, Paco cruentos.”

A few other inscriptions which occur on bells in France and England may be quoted. ‘The bell in the cathedral at Rouen, already mentioned, which was melted down by the Revolutionists in 1793, bore the words—

“Je suis George d’Ambois Qui trente cinque mille pois Mais lui qui me pesera Trente six mille me trouvera.” Bells of the parish church at Winnington, Bedfordshire, had—

‘“‘ Nomina campanis hac indita sunt quoque nostris.” Ist bell.—“ Hoc signum Petri pulsatur nomine Christi.”

od 3; ‘ Nomen Magdalene campana sonat melode.” 3d, ‘* Sit nomen Domini benedictum semper in eum.” 4th ,, ‘* Musa Raphaelis sonat auribus Immanuelis.” Sth ., ** Sum Rosa pulsata mundique Maria vocata.”*

By an old chartulary it appears that the bells of the Priory of Little Dunmow, in Essex, were in the year 1501 new cast and baptized— “‘Prima in honore Sancti Michaelis Archangeli. Secunda in honore Sancti Johannis Evangelisti Tertia in honore 8. Johannis Baptisti. Quarta in honore Assumptionis beate Marie. Quinta in honore sancte Trinitatis et omnium sanctorum.” In the little sanctum at Westminster, Edward III. built a clocher, and placed in it bells for St Stephen’s chapel, round the largest of

which was cast— "King Edward made mee thirtye thousand weight and three Take me down and wey mee, And more you shall fynd mee." Some of the music played on the carillon clavecin is still extant. We may specially mention the morccaua fugués discovered by the Chevalier van Elewyck, in the

archives at Louvain, the work of the celebrated organist and carilloncur Matthias van den Gheyn (published by _ Schott and Co., Brussels and London).

This music is as fine in its way as Bach or Handel. . Quite lately several carillons have been put up in

England ; and one (1875) is in contemplation for St Paul's cathedral.

The new carillon machinery by Messrs Gillett and Bland of Croydon, now employed almost everywhere in connection with clocks and carillons, is incomparably superior to anything of the kind on the Continent, By its aid the hammer, which falls on the outside of the bell, is raised mechanically instead of by the action of the fist or finger on the key; and all that the stroke on the key does is to let it slide off like a hair-trigger, and drop on the bell. Thus the touch of the modern carillon clavecin bids fair to rival that of the organ. The same firm hasalso invented a bell piano. The chief carillons in England at present

Bradford town-hall, Rochdale town-hall, and Shoreditch, Several good peals of bells in London are immortalized in the common nursery rhyme— "'Gay go up and Gay go down, To ring the bells of London town.' Bell-ringing by rope is still a popular art in England. The first regular peal of bells in this country was sent in'

1456 by Pope Calixtus III, to King's College, Cambridge,

and was for 300 years the largest peal in England. At the beginning of the 16th century sets of eight bells were hung in a few large churches, In 1668 a famous work on bells, Zintinalogia, by T. W. [White], appeared, introducing a sort of bell-notation by printing the bells 1, 2, 3,. 4, &c., on slips of paper in different orders according to the changes rung. Of these

changes there is a great variety, spoken of technically as hunting, dodging, snap- ping, place-making, plain-bob, bob-triple, bob-major, bob- major reversed, double bob-major, grandsire-bob-cator, é&e.,

BELL O39

The following numbers show how three bells can ring six Cianges—1y O33”), SB 52 1, 84 258,153, 1, 25 8, 2, ke Four bells ring four times as many as three, z.e., twenty- four ; five bells ring five times as many as four, or 120. And it may thus be shown that it would take ninety-one years to ring all the changes upon twelve bells at two strokes a second ; whilst twenty-four bells would occupy

‘more than 117 billions of years!

Bell-ringing is conducted as follows :—Ropes hang through holes in the bell-chamber, and are usually fastened to a wheel for leverage, round which the rope passes. There is a great knack in handling the rope. ‘The first half-pull “drops” the bell, the second “ sets” it; it next swings up to the slur-bar, then it swings down and up to the other side, the clapper striking as it ascends, Tight bells make the most perfect peal, tuned in the diatonic scale.

Bells are struck in three ways,—-(1) with a hammer on the outside, let off either by a tambour or revolving drum, similar in appearance to the prickly cylinder of a musical box, which drum can be fitted with tunes or chimes by musical nuts or spikes, and altered at will; (2) the bell can algo be struck by hand, as in the common stand of small bells to be seen occasionally in the London streets, the player having a hammer in each hand; or (3) the clapper may strike the bell internally, either being pulled by a rope, the bell being stationary, or by the bell swinging to and fro. If the hammer or clapper be too light the tone of the bell is not properly drawn; if too heavy it will pulverize or crack the bell in time.

Great reforms are needed in the hanging of bells, a

subject to which the Americans have given much atten-

tion. What Messrs Gillett and Bland are in England with reference to carillon machinery, the Meneelys of New York are to the ordinary mechanism and hanging of bells. There is hardly a cathedral tower in England where the hanging of one or more bells, or the oscillation of the tower, is not justly complained of. When a bell is hard to ring it is usually on account of its hanging. 'The leverage is wrongly applied; the wood-work is crowded against the masonry, and many of the finest towers have thus become unsafe.

There are a few bells of world-wide renown, and several others more or less celebrated. 'The great bell at Moscow, Zzar Kolokol, which, according to the inscription, was cast in 1733, was in the earth 103 years, and was raised by the Emperor Nicholas in 1836. The present bell seems never to have been actually hung or rung, having cracked in the furnace. Photographs of it are now common, as it stands on a raised platform in the middle of a square. It is used asa chapel. It weighs about 440,000 ib; height, 19 feet 3 inches ; circumference, 60 feet 9 inches ; thickness, 2 feet ; weight of broken piece, 11 tons. The second Moscow bell, the largest in the world in actual use, weighs 128 tons. The great bell at Peking weighs 53 tons; Nanking, 22 tons; Olmutz, 17 tons; Vienna (1711), 17 tons; Nétre Dame (1680), 17 tons; Erfurt, one of the finest bell metal, 13 tons; Great Peter, York Minster, which cost £2000 in

"1845, 10 tons; St Paul's, 5 tons; Great Tom at Oxford, 7

tons; Great Tom at Lincoln, 5 tons. Big Ben of the Westininster clock tower (cracked) weighs between 13 and 14 tons; it was cast by George Mears under the direction of Edward Beckett Denison in 1858. Its four quarters were cast by Warnerin 1856. The Kaiserglocke of Cologne cathedral, lately recast (1875), weighs 25 tons. .

On the varied uses past and present of small bells a volume might be written. Octaves of little bells have been introduced into organs and utilized in the orchestra. Handringers are still common throughout the eountry—one man with a bell fitted with a clapper, in each hand,

ringing but two notes of the tune in his turn. Upright stands of bells without clappers, struck with wands, may often be seen in the streets. Bells for

horses, dogs, cows, sheep, &c., have already been alluded to. In Italy and elsewhere they are often made of baked earth ; these have a very sweet sound, and cost about a penny. For sledges and harness they are of metal, and worn usnally in bunches.

Whilst some uses of bells have gone out, new ones have come in. A few instances will give the reader some idea of the indefinite number of services to which they have been applied. The expression to curse with book, bell, and candle, alludes to an old form of exorcism, in which the bell was used to scare the evil spirit—a function also attributed to larger bells. Bearing the bell alludes to the prize of a silver bell usually given at horse-races to the winner; hence comes what is, after all, only the bell reversed and used asa drinking vessel—the prize cup. 'The diving-bell no more comes within the scope of the present article than the dome of a mosque. Certain uses of small bells are fast disappear- ing. The dustman's bell is now seldom heard. The town- crier, with his " Oh, yes" (oyez, hear ye), has been banished tothe provinces. The 5 o'clock postman, with his hand-bell to collect letters, went out when the present postal system camein. On the other hand the muffin-bell, the railway-bell, the dock-bell, the half-hour bells at sea, and the stage-bell survive; whilstnew applications, unknown to our forefathers, have been introduced. Few people are aware that house- bells worked with wires are scarcely 100 years old. Long before them, no doubt, handbells had to a great extent super- – seded the use of the horn, whistle, rattle, clapping of hands, and hammering on the door with a stick, and fir-ebells were in frequent use. The old bell-pulls, which still linger in country inns and mansious, have been replaced by spring handles in the walls, and these are disappearing from hotels and clubs in favour of clectric bells, now so common in railway stations in connection with the telegraph. A current of electricity sets a small hammer in motion, and, in the dark, the stream of sparks between the hammer and bell is clearly visible. In a word, then, it is plain that the whole of civilized life is set to bell music in one shape or another ; and although the more important uses of bells have been enumerated, time would fail to mention all their lowly but not less useful functions,—-such as the familiar dinner-bell, yard-bell, school-bell, factory-bell, jail-bell, small portable cupola spring-bell (pressed with the hand), spring signal door-bell (used in shops), safety-bell on swinging coil (fastened to shutters or doors) ; and, not to forget the nur- sery, the coral

and bells, bell-rattles—which call to mind, and are probably relics of, the old fool's cap and bells and fool's wand with its crown of jingling baubles, or it may be that the fool's baubles are copies of the child's play- things.

The Rev. H. T. Ellacombe, author of various works on bells, gives in his Chiming a complete catalogue of bell literature. (H. R. H.)

BELL, Dr ANnpREw, a clergyman of the Church of

England well known for his philanthropic efforts in the Dr A. Bell.

cause of education, and more particularly for his success in extending the monitorial system of instruction in schools, was born at St Andrews in 1753. He graduated at the university of that town, and afterwards spent some years in America. In 1789 he was chaplain at Fort St George, and minister of St Mary's church, Madras. While in this position he occupied himself with instructing the orphan children of the military asylum, and having been obliged

Sir C. Bell.

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from scarcity of teachers to introduce the system of mutual tuition by the pupils, found the scheme answer so well that he became convinced of its universal applicability. In 1797, after his return to London, he published a small pamphlet explaining his views. No public attention was drawn towards the plan till the following year, when Mr Joseph Lancaster, a dissenter, opened a school in South- wark, conducting it in strict accordance with Bell's prin- ciples. The success of the method, and the strong support given to Lancaster by the whole body of dissenters, gave immense impetus to the movement. Similar schools were established in great numbers; and the members of the Church of England, becoming alarmed at the patronage of these schools resting entirely in the hands of dissenters, resolved to set up similar institutions in which church principles should be inculcated. In 1807 Dr Bell was called upon to organize a system of schools in accordance with these views. For his valuable services he was in some degree recompensed by his perferment to a prebend of Westminster,

and to the mastership of Sherborn Hospital, Durham. He died in 1832 at Cheltenham, and was buried in Westminster Abbey. His great fortune was bequeathed almost entirely for educational purposes. Of the £120,000 given in trust to the provost of St Andrews, two city ministers, and the professor of Greck in the university, half was devoted to the founding of the important school, called the Madras College, at St Andrews; £10,000 was left to each of the large cities, Edinburgh, Glasgow, Leith, Inverness, and Aberdeen, for school purposes ; and £10,000 was also given to the Royal Naval School. (See Southey's Life of Dr Bell.)

BELL, Srr Cuarurs, K.H., the youngest son of the Rev. William Bell, a clergyman of the Episcopal Church of Scotland, was born at Edinburgh, November 1774. His mother Margaret Morice, the elder daughter of an Epis- copal clergyman, was remarkable for her piety and general accomplishments, and she exercised a powerful influence over her gifted sons. The father, William Bell, after a life of contending with difficulties, died on 20th of Sep- tember 1779, aged seventy-five, leaving his wife and six children very slenderly provided for, Of these six children, three became distinguished men, namely, John Bell, the anatomist and surgeon; George Joseph Bell, professor of the law of Scotland in the University of Edinburgh ; and Charles Bell, the subject of this notice. After having studied two years at the High School and two years more at the University of Edinburgh, Charles embraced the pro- fession of medicine and devoted himself chiefly to the study cf anatomy, under the direction of his brother John, who was twelve years older, and who had already earned a reputation as an anatomist and surgeon. Regarding his early education, he wrote, in 1839, on a copy of Petti- grew's Medical Portrait Gallery, opposite a remark that he had been educated at the High School,— Nonsense ! I reccived no education but from my mother, neither read- ing, writing, ciphering, nor anything else." At school and college he does not appear to have distinguished himself, except by his facility in drawing, a hereditary gift acquired from his mother. It was not until he entered on the study of anatomy that he gave evidence of possessing those talents which soon made him a worthy rival of his brother John.

His first work, entitled A System of Dissections, explaining the Anatomy of the Human Body, the manner of displaying the Parts, and their Varieties in

Disease, was published in Edinburgh in 1798, while the author was still a pupil. The " Introduction" to this work shows much originality of thought, and an aptitude for devising new methods of preparing animal structures for dissection and demonstra- tion, The volume is illustrated by numerous engravings from original drawings, and the text is clear and precise in

language. For many years this work was considered to be a valuable guide to the student of practical anatomy.

On the Ist of August 1799 he became a fellow of the Royal College. of Surgeons of Edinburgh. At that time the fellows of the college were in rotation surgeons to the Royal Infirmary of Edinburgh. In this position Bell soon gave evidence of great ability. He dissected, drew, described, mounted preparations of anatomical, physio- logical, or pathological value, improved on the modes of operating in surgery known at that time, and invented a method of making models of morbid parts, of which specimens may still be seen in the museum of the college.

In 1802 he published a series of engravings of original drawings, showing the anatomy of the brain and nervous system. These drawings are remarkable for artistic skill and finish, They were taken from dissections made by Bell for the lectures or demonstrations he gave on the nerv- ous system as part of the course of anatomical instruction of his brother. In 1804 he wrote volume iii. of Zhe Anatomy of the Human Body, by John and Charles Bell. This volume contains the anatomy of the nervous system, and of the organs of special sense.

In 1804 a new arrangement was made regarding the attendance of surgeons at the Edinburgh Infirmary ; and Bell, probably as being junior in the profession, was excluded from the hospital. He proposed to the managers to pay £100 a year, and to transfer to them, for the use of the students, the museum he had collected, on condition that he should be " allowed to stand by the bodies when dissected in the theatre of the infirmary, and to make notes and. drawings of the diseased appearances." This enthusiastic proposal was rejected, and the conscquence was that Bell went to London in November 1804,

From that date, for nearly forty ycars, he kept up a regular correspondence with his brother George, much of which has recently been published (Letters of Sir Charles Bell, &c., 1870). The earlier letters of this correspondence show how rapidly he rose to distinction in a field where success was difficult, as it was already occupied by such men as Abernethy, Sir Astley Cooper, and Cline. He quickly made acquaintance with most of the scientific men of the day, and apparently won friends in the highest social, professional, and artistic- circles. After having lodged in Fludyer Street for some months, he settled in Leicester Street, Leicester Square, and immediately commenced a course of lectures on anatomy and surgery. Here he also located his museum, which was sent to him from Edinburgh ; and his letters indicate that this was the subject of much interest to scientific and professional men. He lectured to painters, directed private dissections, gave demonstrations to surgeons, and gradually acquired a surgical practice.

Before leaving Edinburgh in 1804, he had written his work on the Anatomy of Expression. It was published in London soon after his arrival, and at once attracted attention. His practical knowledge of anatomy and his skill as an artist qualified him in an exceptional manner for such a work, The object of this treatise was to describe the arrangements by which the influence of the mind was propagated to the muscular frame, and to give a rational explanation of the muscular movements which usually accompany the various emotions and passions. One special feature of the author's system was the importance attributed to the respiratory arrangements as a source of expression. He also showed how the physician and surgeon might derive information regarding the nature and extent of important diseases by observing the expression of bodily suffering. This work, apart from its value to artists aud psychologists, is of interest historically, as there is no doubt the investigations of the author into the nervous supply of the muscles of expression induced him to prosecute inquiries which led to

his great discoveries in the physiology of the nervous system.

In 1807 Bell first published his idea of a new anatomy of the brain, in which he announced the discovery of the different functions of the nerves

corresponding with their relations to different parts of the brain. It is now difficult to imagine the confusion which prevailed in the minds of anatomists and physiologists regarding the functions of the various nerves prior to this discovery. The nerves had been noticed by anatomists from the earliest times, and they were divided into cranial and spinal nerves, according as they originated from the brain or spinal cord. Some were supposed to carry from the brain the mandates of the will, while others communicated to the sensorium impres- sions made on their extremities, which resulted in con- sciousness. It was supposed, however, that the same nerve, even at the same time, might in some mysterious way transmit either motor or sensory impressions in opposite directions. When a nerve was cut, the parts beyond the incision were found to be destitute of sensibility, and to be beyond the influence of the will. It was con- sequently correctly inferred to be the cord through which volition acted on the muscles, and through which sensory impressions were transmitted to the sensorium. The idea of two sets of filaments functionally different in the same nerve was not then entertained. Boerhaave asserted that there were two kinds of spinal nerves, the one serving for motion and the other for the use of the senses. Haller states, " I know not a nerve which has sensation without also producing motion." 'The first Monro held a similar opinion, and he believed al! those spinal nerves which passed through a ganglion to be motor nerves.

To Sir Charles Bell we owe the discovery that in the nervous trunks there are special sensory filaments, the office of which is to transmit impressions from the periphery of the body to the sensorium, and special motor filaments which convey motor impressions from the brain or other nerve centre to the muscles. He also showed that some nerves consist entirely of seusory filaments and are there- fore sensory nerves, that others are composed of motor filaments and are therefore motor nerves, whilst a third variety contain both kinds of filaments and are therefore to be regarded as sensory-motor. Furthermore, he indicated that the brain and spinal cord may be divided into separate parts, each part having a special function—one part mini- stering to motion, the other to sensation, and that the origin of the nerves from one or other or both of those sources endows them with the peculiar property of the division whence they spring. He also demonstrated that no motor nerve ever passes through a ganglion. Lastly, he showed both from theoretical considerations and from the result of

actual experiment on the living animal, that the anterior roots of the spinal nerves are motor, while the posterior are sensory. These discoveries as a whole must be regarded as the greatest in physiology since that of the circulation of the blood by the illustrious Harvey. It not only was a distinct and definite advance in scientific know- ledge, but from it flowed many practical results of much importance in the diagnosis and treatment of disease, It is not surprising that Bell should have announced it to his friends with exultation. On 26th November 1807 we find him writing as follows to his brother George :—"I have done a more interesting nova anatomia cerebri humani than it is possible to conceive. I lectured it yesterday. I pro- secuted it last night till one o'clock ; and I am sure it will be well received." On the 31st of the same month he writes—' I really think this new anatomy of the brain will strike more than the discovery of the lymphatics being absorbents."

In 1807 he produced a System of Comparative Surgery

founded on the basis of anatomy. This work indicates the author's idea of the science of surgery. He regarded it almost wholly from an anatomical and operative point of view, and there is little or no mention of the use of medicinal substances. It placed him, however, in the highest rank of English writers on surgery.

In 1809 he relinquished his professional work in London, and rendered meritorious services to the wounded from Corufia, who were brought to the Haslar Hospital at Portsmouth. In 1810 he published a series of Letters concerning the Diseases of the Urethra, in. which he treated of stricture from an anatomical and pathological point of view.

In 1812 he was appointed surgeon to the Middlesex Hospital, and a few years afterwards professor of anatomy, physiology, and surgery to the College of Surgeons of London. He was also for many years teacher of anatomy in the school of Great Windmill Street, no longer in exist- ence. He acted as surgeon to the hospital for twenty-four years, and delivered many courses of lectures on surgery in that institution. In 1815 he did good public service by devoting all his skill and time to the wounded after the battle of

Waterloo. On the formation of University College, Gower Street, he was asked to place himself at the head of the medical department, This appointment he held for only a short time, when he resigned in conse- quence, it is said, of dissensions in the senate. :

In 1816, 1817, 1818, he published a series of Quarterly Reports of Cases in Surgery, treated in the Middlesex Hospital, in the Cancer Establishment, and in Private Practice, embracing un Account of the Anatomical and Pathological Researches in the School of Windmill Street. In 182L he issued a volume of coloured plates with descriptive letterpress, entitled Lllustrations of the Great Operations of Surgery, Trepan, Hernia, Amputation, and

Lithotomy. In 1824 appeared An Laxposition of the Natural

System of Nerves of the Human Body; being a Republica- tion of the Papers delwered to the Royal Society on the subject of the Nerves. In the same year he wrote Observa- tions on Injuries of the Spine and of the Thigh Bone. In 1832 he wrote a paper for the Royal Society of London on the " Organs of the Human Voice," in which he gave many illustrations of the physiological action of these arts.

' Of an eminently pious and reflective mind, he was often in the habit of pointing out in his lectures what he regarded as evidences of creative design to be found in the anatomy of the bodies of animals. These he embodied in a treatise on Animal Mechanics, written for the Society for the Diffusion of Useful Knowledge. The executors of the earl of Bridgewater selected him as a fit person to main- tain the argument which it was the purpose of that noble- man's bequest to have published. Sir Charles wrote in 1833—The Hand: its Mechanism and Vital Endowments as evincing Design. Along with Lord Brougham he anno- tated and illustrated an edition of Paley's Natural Theo- logy, published in 1836, in which he followed out his favourite line of thought.

The Royal Society of London awarded to him in 1829 the first annual medal of that year given by George IV. for discoveries in science ; and when William IV. ascended the throne, Charles Bell received the honour of

knighthood along with a few other men distinguished in science and literature.

The chair of surgery in the University of Edinburgh was offered to him in 1836. When the offer was inade he was regarded as one of the foremost scientific men in London, and he had a large surgical practice. But his opinion was " London is a place to live in, but not to die in ;" and he accepted the appointment. In Edinburgh he did not earn great local professional succcss ; and, it must be confessed,

he was not appreciated as-he deserved. But honours came thick upon him. On the Continent he was spoken of as greater than Harvey. It is narrated that one day Roux, a celebrated French physiologist, dismissed his class without a lecture, saying " C'est assez, Messieurs, vous avez vu Charles Bell." .He held the Edinburgh chair from 1836 to 1842. During his professorship, in 1838, he published the Institutes of Surgery, arranged in the order of the Lectures delivered in the University of Edinburgh ; and in 1841 he wrote a volume of Practical Lssays, two of which "On Squiuting," and "On the Action of Purgatives," are of great value.

Sir Charles Bell died at Hallow Park near Worcester on Thursday, 28th April 1842, in his sixty-eighth year; and he lies under the yew tree in the peaceful churchyard of Hallow. His epitaph, written by his life-long friend Lord Jeffrey, summarizes his character as follows :—" Sacred to the memory of Sir Charles Bell, who, after unfolding, with unrivalled sagacity, patience, and success, the wonderful structure of our mortal bodies, esteemed lightly of his greatcst discoveries, except only as they tended to impress himself and others with a deeper sense of the infinite wisdom and ineffable goodness of the Almighty Creator. He was born at Edinburgh 1774; died, while on a visit of friendship, at Hallow park, in this parish, 1842 ; and lies buried in the adjoining churchyard," (J. G. M.)

BELL, Gzorce Josrern, brother of the preceding, was born at Edinburgh on the 20th of March 1770. At the age of eight he entered the High School, but he received no university education further than attending Tytler's lectures on civil history, Stewart's course of moral philosophy, and Hume's lectures on the law of Scotland. He became a member of the Faculty of Advocates in 1791, and was one of the earliest and most attached friends of Francis Jeffrey. In 1804 he published a Z'reatise on the Law of Bankruptcy in Scotland, in 2 vols. 8vo, which was gradually enlarged in subsequent editions, till at length a fifth edition was pub- lished in 1826, in 2 vols. 4to, under the title of Commen- tarves. on the Law of Scotland and on the Principles of Mercantile Jurisprudence—an institutional work of the very highest excellence, which has guided the judicial delibera- tions of his own country till the present time, and has had its value acknowledged by such eminent jurists as Story and Kent. In 1821 he was unanimously elected professor of the law of Scotland in the University of Edin- burgh ; and in 1831 he was appointed to one of the prin- cipal clerkships in the Supreme Court. He was in 1833 placed at the head of a commission to inquire into the expediency of making various improvements in the Scottish bankruptcy law ; and in consequence of the reports of the commissioners, chiefly drawn up by himself, many beneficial alterations have been made in this department of the law. He died on the 23d September 1843. A seventh edition of the Commentaries, edited by J. Maclaren, advocate, appeared in 1870. Bell's smaller treatise, Principles of the Law of Scotland (6th edit. 1872), has long been a standard text-book for law students. The Illustrations of the Principles is also a work of high value.

- BELL, Henry, a mechanical engineer, well known for his successful.application of steam-power to the propulsion of ships, was born at Torphichen, in Linlithgowshire, in 1767. Having received the ordinary education of a parish school, he was apprenticed to his uncle, a millwright, and, after qualifying himself as a ship-modeller at Bo'ness, went to London, where he found employment under Rennie, the celebrated engineer. Returning to Scotland in 1790, he first settled as a carpenter at Glasgow and afterwards removed to Helensburgh, on the Firth of Clyde, where his wife superintended a large inn, together with the public baths, while he pursued his mechanical projects, and also

found occasional employment as an engineer. It was not until January 1812 that he gave a practical solution of the difficulties which had besct all previous experimenters, by producing a steamboat (which he named the " Comet,") of about 25 tons, propelled by an engine of three-horse power, at a speed of seven miles an hour. Although the honour of priority, by about four years, is admitted to belong to Robert Fulton, an American engineer, there appears to be uo doubt that Fulton had received very material assistance in the construction of his vessel from Bell and others in this country. A handsome sum was raised for Bell by subscription among the citizens of Glasgow ; and he also received from the trustees of the River Clyde a pension of £100 a year. He died at Helensburgh, 14th November 1830, and a monument was erected to his memoty at Dunglass, near Bowling, on the banks of the Clyde.

BELL, Henry Guassrorp, was born at Glasgow in H. G. Bell,

1805, and received his education at' the High School of that city. He afterwards studied at Edinburgh and became intimate with Moir, Hogg, Wilson, and others of the bril- liant staff of Llackwood's Magazine, to which he was drawn by his political sympathies. In 1828 he became editor of the Ldinburgh Literary Journal, which proved unsuccessful. He passed to the bar in 1832. In 1836 he competed unsuccessfully against Sir William Hamilton for the chair of logic and metaphysics in Edinburgh University, and three years afterwards was appointed sheriff-substitute of Lanarkshire, an oftice which he held until 1867, when he succeeded Sir Archibald Alison in the post of sheriff-prin- cipal of the county. During his early life he had been a versatile author of poems and prose sketches, but his literary activity was checked after he applied himself seriously to law. In 1831 he published Summer and Winter Hours, a volume of poems, of which the best known is that on Mary Queen of Scots. He further defended the cause of the unfortunate queen in a prose Life. A preface which he wrote to the works of Shakespeare contains some acute and original criticism. His Romances and other Poems (1866) display deeper thought and less fervour than his former works, but are mainly interesting as evidence of latent poetic genius, the development of which was pre- vented by attention to other pursuits. Bell's

literary tastes did not affect his industry in his profession, and, on the other hand, his legal labours never dulled his early affection for poetry and painting. He deserves to be held in kindly remembrance for his readiness to assist youthful literary aspirants. During many years he took an active interest in social questions, especially in promoting educational and sanitary reforms. He died in January 1874,

BELL, Joun, of Antermony, a Scottish traveller in the John Bell,

first half of the last century, was born in 1691, and edu- cated for the medical profession, in which he took the degree of M.D. In 1714 he set ont for St Petersburg, where, through the introduction of a countryman, he was nominated medical attendant to Valensky, recently ap- pointed to the Persian embassy, with whom he travelled from 1715 to 1718. The next four years he spent in an embassy to China, passing though Siberia and the great Tatar deserts. He had scarcely rested from this last journey when he was summoned to attend Peter the Great in his perilous expedition to Derbend and the Caspian Gates. The narrative of this journey he has enriched with interesting particulars of the public and private life of that remarkable prince. In 1738 he was sent by the Russian Government on a mission to Constantinople, to which, accompanied by a single attendant who spoke Turkish, he proceeded, in the midst of winter and all the horrors of a barbarous warfare, returning in May to St Petersburg. It appears that after this he was for several years estab- lished as a merchant at Constantinople, where he married

John Bell,

Robert Bell.

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in 1746. In the following year he retired to his estate of Antermony in Scotland, where he spent the remainder of bis life. He died in 1780. His travels, published at Glasgow, in 2 vols. 4to, 1763, were speedily translated into French, and widely circulated in Europe.

BELL, JoHN, anatomist and surgeon, was born at Edinburgh, 12th May 1763. He had the merit of being the first in Scotland who applied with success the science of anatomy to practical surgery. While still a young man he established, in the face of much opposition, an anatomical theatre in Surgeon Square, where he attracted largeaudiences by his admirable lectures on anatomy, physiology, and surgery, in which he was assisted by his younger brother Charles. After his exclusion from the infirmary (to which reference has been made in the notice of Sir Charles Bell), he ceased to lecture, and devoted his time to study and practice. He died at Rome in 1820, while on a tour in Italy for the benefit of his health. To great skill in his profession he united high and varied mental abilities and extensive learning.

His principal works are :—Anatomy of the Human Body, 3 vols. Svo, 17938-1802; Discourses on the Nature and Cure of Wounds, 2 vols. 8vo, 1793-95; Principles of Surgery, 8 vols. 8vo, 1801 ; and several volumes of Engravings illustrative of Human Ana- tomy. His Observations on Ilaly were published by his widow in 1825.

BELL, Ropers, editor of the Annotated Evlition of the British Poets, was an Irishman by birth and education, but a Londoner by a long residence of nearly forty years. He was born at Cork in 1800, and was educated at Trinity College, Dublin, With the tasks of a subordinate in a Government office at Dublin he combined literary pursuits, editing a political journal and contributing to periodicals. Jn 1828 he settled in London, and literature was thence- forward the business of his life. As journalist he edited the Atlas for several years; and afterwards the Monthly Chromele, Mirror, and Home News. Of his early under- takings the more important were the volumes which he compiled for Lardner's Cabinet Cyclopedia, including the Lives of British Admurals, in continuation of Southey's work ; Lives of British Poets ; a History of Russia ; and the continuation of Sir James Mackintosh's Wistory of England. We made himself favourably known as a novelist by The Ladder of Gold and Hearts and Altars. Among his other works are a Life of Canning, Wayside Pictures in France, Belgium, and Germany, three five-act comedies, and a volume entitled Memorials of the Civil War, based on the Fairfax Correspondence. He earned a higher place and a more enduring reputation by his Annotated

Edition of the British Poets, of which the first volume appeared in 1854. The series was carried through twenty-nine volumes. The works of each poet are prefaced by a carefully-prepared memoir, and accompanied by explanatory and illustrative notes, of a really helpful and often indispensable kind. In his earlier years Bell had taken a leading part in found- ing the Dublin Historical Society. In the course of his London life he became an active director of the Royal Literary Fund. He was also chosen F.S.A. In private life he was highly esteemed and warmly loved for his open-heartedness, his genial temper, and his generous readiness to give aid to fellow-workers who might be in need. He died in London, at the age of sixty-seven, April 12, 1867.

BELLA, Sterano DE La, engraver, was born at Florence in 1610. He was apprenticed to a goldsmith ; but some prints of Callot having fallen into his hands, he began to turn his attention entirely towards engraving, and studied the art under Canta Gallina, who had also been the instruc- tor of Callot. By the liberality of Lorenzo de' Medici he was enabled to spend three years in study at Rome. In 1642 he went to Paris, where Cardinal Richelieu engaged him to go to Arras and make drawings of the siege and

taking of that town by the royal army. After residing a considerable time at Paris he returncd to Florence, where he obtained a pension from the grand duke, whose son, Cosmo, he instructed in drawing. He died in 1664. His productions were very numerous, amounting to over 1400 separate pieces,

BELLADONNA, Dwatz, or Deapity NIGHTSHADE (Atropa Belladonna), a tall bushy herb of the natural order Solanacee, growing to a height of 4 or 5 feet, having leaves of a dull green colour, with a black shining berry fruit about the size of a cherry, and a large tapering root. The plant is a native of Central and South Europe, extending into Asia, and it is also found in waste places and hedge- rows of Britain, though it is a doubtful native. The entire plant is highly poisonous, and accidents not unfrequently occur through children and unwary persons eating the attractive-looking fruit. Its leaves and roots are largely used in medicine, on which account the plant is cultivated, chiefly in South Germany, Switzerland, and France. Both roots and leaves contain the poisonous alkaloid atropia, but in practice the roots

only are employed for its extrac- tion. ‘The proportions in which atropia is present in the roots range between 0°6 and 0:25, the roots of young plants being always richest in the alkaloid. The percentage found in leaves is much more uniform, being about 0°47,. and extracts and tinctures of the leaves are therefore of much more constant strength than if prepared from roots. Preparations of belladonna and atropia are used in medi- cine as anodynes in local nervous pains,—atropia being frequently hypodermically injected but rarely taken inter- nally. They are also of great value in ophthalmic practice on account of their peculiar property of producing dilata- tion of the pupil, either when painted around or dropped into the eye. Belladonna is also used as an antispasmodic in hooping-cough and spasmodic coughs generally, and for various other medicinal purposes. A remarkable anta- gonism between the physiological action of atropia and the alkaloid of the calabar bean has been experiment- ally worked out by Dr Thomas R. Fraser (Zrans. Roy. Soe, Ed., 1870-1). To a more limited extent also an anta- gonism between atropia and morphia and other alkaloids has been established; and the researches on these sub- stances, and on the mutual action of alkaloids generally, have been continued in experiments conducted by Dr J. G. M‘Kendrick, reported to the British Medical Associa- tion in 1874,

BELLAI, or Betntay, GUILLAUME DU, lord of Langey, a French general, who signalized himself in the service of Francis L, was born at Glatigny in 1491. He was con- sidered the ablest captain of the time, and his great abilities as a negotiator occasioned the remark of the Eimperor Charles V., that ‘“‘ Langey’s pen had fought more against him than all the lances in France.” He was sent in 1537 as viceroy into Piedmont, where he took several towns from the imperialists. His address in penetrating into the most secret designs of the enemy was extraordinary, and he spared no expense for that end. He was extremely active in influencing some of the universities of France to give a judgment agreeable to the desires of Henry VIII., when that prince wished to divorce his queen in order to marry Anne Boleyn. lLangey composed several works, the most remarkable of which was the history of his own times (Adémoires, 1753, 7 vols.) He died in 1543, and was buried in the church of Mans, where a noble monument was erected to his memory.

BELLAMY, Jacozus, a Dutch poet, was born at Flush- ing in 1757. He was apprenticed when young to a baker, but his abilities were discovered by a clergyman named De Water, who exerted himself in the boy's behalf, and obtained sufficient assistance to send him, in 1782, to

the University of Utrecht. In 1785 appeared his Vader- landsche Gezangen, which at once gained him the highest reputation as a poet. Three years previously a small volume of his, Gezangen miner Jeugd, published under the pseudonym Zelandus, had attracted considcrable atten- tion. His longest and, in the opinion of many, his best work is the poetic romance Loosje, 1784. Bellamy was one of the first to create a new and original literature in Holland ; his songs have had wide circulation and great popularity.

BELLARMINE (Ital. Bernarmino), Ropert FRANcts Romuvs, Cardinal, Catholic theologian and polemic, was born, October 4, 1542, at Montepulciano, in Tuscany. He was destined by his father for state service, but his inclina- tions were too strong to be restrained, and at the age of eighteen he entered the Society of Jesus. After studying in various colleges for some years, he was appointed by the order to lecture on theology at the famous university of Louvain. His seven years' residence in the Low Countries brought him into close relations with modes of thought differing essentially from his own, and so compelled him to define his theological principles more clearly and sharply than before. On his return to Italy he received from Gregory XIII. an appointment in the newly-founded C'ol- legium Romanum, and began to deliver lectures on the prin- cipal points of difference between the Roman Catholic and other forms of faith. Out of these lectures grew his famous work, Disputationes de Controversis Christiane Fidei adversus hujus temporis Heereticos (3 vols., 1581, 1582, 1593), for long the finest polemical writing on the Catholic side, and still worthy of consideration. It was replied to at the time by Chemnitz, Gerhard, and Chamier, and con- tinued for many years to furnish occasions of attack to Protestant theologians. So highly were Bellarmine's abilities rated, that he was selected to accompany, in the capacity of divine or theologian, the legation sent into France in 1590 by Sixtus V. In 1599 he was, much against

his will, raised to the dignity of cardinal, and two years later was made archbishop of Capua. He resigned the archbishopric in 1605, being detained in Rome by the desire of the newly- elected Pope Paul V. About the same time he had a con- troversy with James I. of England, who, after the discovery of the Gunpowder Plot, had passed severe laws against Roman Catholics. In 1610 he published his work De Potestate summi Pontificis in rebus Temporalibus, directed against William Barclay, in which he asserted boldly and un- disguisedly the doctrine of the Pope's temporal sovereignty. For some years before his death, which occurred at Rome, 17th September 1621, he held the bishopric of his native town. Bellarmine, whose life was a model of Christian asceticism, is one of the greatest theologians, particularly in the department of polemics, that the Romish Church has ever produced. His works, which are very numerous, are written in an easy perspicuous style. The most important are the Disputatio de Controversiis, the De Potestate summt Pontificis, Institutiones Hebraice Lingue, De Scriptoribus Ecclesiasticis, De Ascensione Mentis in Deum. A life of Bellarmine, founded on an autobiography, was written by Fulligato, 1624.

BELLAY, Joacuim pv, an eminent French poet and member of the Pleiad, was born late in 1524, at Lyré, on the left bank of the Loire, not far from Angers. In the absence of documents we are thrown upon the autobio- graphical passages in his poems for information about the events of his life, and these, fortunately, are copious. From these, and especially from the beautiful Latin elegy addressed to his friend Jean Morel, we learn that, deprived early of both his parents, he was left to the mercy of an elder brother, who allowed him to be brought up without ether education than what his own ardent spirit supplied.

Before he reached manhood this brother also died, and Joachim found himself at the head of the family, a vigorous, matly, but half-cultured youth. Suddenly he was struck down by illness; and, confined for many months to his bed, he softened the long hours of suffering by fervent study ; he now read the Latin and Greek poets for the first time, and felt a passionate desire to imitate them in French. In 1548, having to a great measure recovered his health, he happened to meet Ronsard in an inn in Poitiers,

and a friendship instantly sprang up between them that ceased only with Du Bellay's death. He joined the six poets, who, under Dorat, were forming a society, the Pleiad, for the creation of a French school of Renaissance poetry ; and his first contribution to it was a prose volume, the famous Deffence et Illustration de la Langue francoise, which remains one of the earliest and most perfect picces of literary criticism in existence, aud overweighs in positive value much of his actual poetry. This appeared in 1549, and was followed within a twelvemonth by two volumes in verse, the Lecueil de Poésie, and the collection of love- sonnets called Z'Olive. The latter celebrate, in the manner of Petrarch, the loveliness of a semi-mythical mistress, understood to bea Parisienne, and by name Viole, of which Olive is an anagram, The /tecueil caused a quarrel with Ronsard, about which much speculation has been wasted, and which still remains obscure. It seems that Ronsard had invented a new form of the ode, which he allowed Du Bellay to see in manuscript. Ronsard's book was delayed in publication, and Du Bellay's odes, written after his metrical pattern, appeared first. Ronsard's natural and passing vexation has been exaggerated into a law-suit ; but the friends were soon on the old affectionate footing. In L'Olive Du Bellay was the first French writer to use the sonnet with fluency. After he had translated two books of the Aineid, which appeared in 1552, the yearning he had always felt to visit Italy was appeased by his being sent to Rome in 1550 as secretary to his influential relative, Cardinal du Bellay, and he remained in that city four years and a half. At first, however, he was miserable enough. Everything around him was displeasing to him and jarred on his refined and sometimes sickly nerves. At last he fell violently in love with a lady, whose real name was Faustine, but whom he celebrates under the poetical title of Columba and Columbelle. In his Latin poems this sincere and absorbing passion burns like a clear flame, more veiled though no less burning in his French Regrets. Be- fore he won her she was shut up from his sight by her old and jealous husband. Frenzied with grief and desire, burning with fever, exhausted with watching and physical suffering,—for his health was still very delicate——Du Bellay walked day and night to and fro before the house. At last, mysteriously enough, she is given to him ; and the Latin poems end in rapturous delight. At this point, however, and possibly for this reason, he was hurried back to Paris, where he became canon of Nétre Dame in June 1555. He returned by Venice, the Grisons, and Geneva, and.

was received by his friends in France with transport. He set himself to literary labour of various kinds, publish- ing his Latin poems and his French sonnets called Les Antiquitez de Rome, in 1558, and his greatest lyrical work, the egrets, in 1559. In the latter year, however, a calumny deprived him of the protection of the cardinal, and threw him into the deepest distress and embarrassment. The nature of this charge is not known, but it must have quickly passed away, for later on in that year we find him preparing a new volume of poems, Les Jeux Kustiques, for the press, and nominated archbishop of Bordeaux. He did not live to enjoy this distinction, for on the Ist of January 1560, be died of apoplexy, and was baried in Nétre-Dame de Paris, Like Ronsard he was very deaf,

His collected works did not appear until 1568, The early death of the French Ovid, as he has been called, was a serious loss to European literature, for Joachim du Bellay was at the height of his power, and still rapidly advancing. His poems have a force, an occasional sublimity, and a direct pathos for which we look in vain among his contem- poraries ; and none but Ronsard excelled him in facility and grace. His most famous poem, Un Vanneur de Blé aux Vents, one of the loveliest lyrics of the age, was written shortly before his death, and appeared in the Jeux Rustiques in 1560; it is nominally a paraphrase from the Latin of Naugerius. The standard edition of the French works of Joachim du Bellay is that published in 2 vols. by Lemerre in 1866, and edited by Ch. Marty- Laveaux. Spenser translated sixty of Du Bellay's Roman sonnets into English, and published them in 1591. A very delicate essay on the poet will be found in Mr W. H. Pater's Studies in the History of the Renaissance,

1873.

BELLE-ISLE-EN-MER, an island on the W. coast of France, belonging to the department of Morbihan. It is about 10 miles in length by 4 or 5 in breath, and is divided into the four communes of Palais, Bangor, Porte Philippe, and Locmaria. The inhabitants are principally engaged in agriculture and the fisheries, and in the preservation of sardines, anchovies, &c. The breed of draught horses in the island is highly prized. The chief town, Palais, is a military town of the first class, and possesses a port which

is accessible to vessels of 300 tons. It is evident that Belle-isle must have been inhabited from a very early period, as it possesses several rude stone monuments of the class usually called Druidic. The Roman name of the island seems to have been Vindilis, which in the Middle Ages became corrupted to Guedel. In 1572 the monks of the abbey of St Croix at Quimperlé sold the island to the Retz family, in whose favour it was raised to a marquisate in the following year. From 1761 to 1763 it was held by English troops. Under Napoleon I. the refortification of the island was undertaken, but it was never completed. In the state prison of Nouvelle Force at Palais political prisoners have been at various times confined. The popu- lation of Palais in 1870 was 3375, of the island rather under 10,000. The lighthouse is situated in 47° 18' 43" N. lat. and 3° 4' 43" W. long.

BELLEAU, Remy, French poet of the Renaissance, and member of the Pleiad, was born at Nogent-le-Rotrou in 1528. He became attached to the Elbceufs, and accom- panied the head of the family in the expedition against Naples in 1557, where he did good military service. On his return he was made tutor to the young Charles, marquis d'Elbceuf, who, under Belleau's training, became a great patron of the muses. Belleau was extremely learned in the newly-discovered literature of Greece and Rome, and joined the young group of poets with ardour. In 1556 he published the first translation of Anacreon which appeared in French, but this work had no great success. He first became famous through his commentaries to Ronsard's Amours in 1560, notes which evinced delicate taste and prodigious learning. Like Ronsard and Du Bellay, he was extremely deaf. His days passed peacefully in the midst of his books and friends, and terminated on the 6th of March 1577. His body was buried in the nave of the Grands Augustins de Paris, and was borne to the tomb on the pious shoulders of four illustrious poets, Ronsard, J. A. de Baif, Philippes Desportes, and Amadis Jamyn. His greatest work is La Bergerie, a pastoral in prose and verse, written in a faded rococo style, in imitation of Sannazaro, but containing, as Sainte-Beuve says, some adorable things. Belleau was the French Herrick, full of picturesqueness, warmth, and colour, but of doubtful taste and wanting in

passion. His skies drop flowers and all his air is perfumed, but one becomes weary at last of this excess of sweetness. Extremely popular in his own age,

he became undeservedly forgotten in the next. Regnier said, “ Belleau ne parle pas comme on parle 4 la ville;” and his lyrical beauty was lost on the trim 17th century. His complete works were collected in 1578, and contain, besides the Anacreon, La Bergerie, and miscellaneous odes and sonnets, a comedy entitled Za Meconnue, in short rhymed lines, which is not without humour and life. This was one of the earliest productions of the French stage. The best edition of Remy Belleau is that published by Jannet in 1867, in 3 vols., and edited by A. Gouverneur.

BELLENDEN, Jouy, a Scotch poet, and the translator of Boece’s History, was born about the beginning of the 16th century, probably in East Lothian. He appears to have been educated, first at the University of St Andrews and then at that of Paris, where he took the degree of doctor. From his own statement we learn that he had been in the service of James V. from the king’s earliest years, and that the post he held was clerk of accounts. It was at the request of James that he undertook his translations of Boece and of Livy. As a reward for his labours he was appointed to the archdeaconry of Moray, and was also made a canon of Ross. Belleuden, who was a strenuous oppo- nent of the Reformation, is said to have died at Rome in 1550. His translation of Boece, which is a remarkable specimen of Scottish prose, distinguished by its freedom and vigour of expression, appears to have been first pub- lished in 1536. The best edition is that superintended hy Mr Maitland, 2 vols, 4to, Edin., 1821. The same gentle- man edited for the first time (Edin., 1822) Bellenden’s translation of Livy, which extends only to the first. five books. The few poetical remains exhibit considerable taste and skill in versification.

BELLENDEN, Wittiam, a distinguished classical scholar, who flourished during the early part of the 17th century, is said to have been a professor at the University of Paris. Nothing is known with certainty of his life, except that he held the office, probably a sinecure, of Master of Requests. The first of the works by which he is known was published in 1608, with the title Ciceronis Princeps, Rationes e Consilia bene gerendi firmandique Imperi, ex tis repetita que ex Ciceronis defluxere fontibus in libros xvi. de State Rerum Romanarum, qui nondum lucem acceperunt. Itisa laborious compilation of all Cicero’s remarks on the origin and principles of regal government, digested and syste- matically arranged. In 1612 there

appeared a similar work, devoted to the consideration of consular authority and the Roman senate, Cceronis Consul, Senator, Sena- tusque Romanus. His third work, De Statu Prisci Orbis, 1615, is a good outline of general history. All three works were combined in a single large volume, entitled De Statu Libri Tres, 1615, which was first brought into due notice by Dr Parr, who, in 1787, published an edition with a preface, famous for the elegance of its Latinity and the vehemence of its politics. The greatest of Bellenden's works is the extensive treatise published posthumously in 1633, Gulielna Bellendenit Scott, Magistrti supplicum Libellorum Augusti Regis Magne Britannie, de tribus Luminibus Romanorum libri sexdecom. The book is un- finished, and treats only of the first luminary, Cicero ; the others intended were apparently Seneca and Pliny, probably the younger. It contains a most elaborate history of Rome and its institutions, drawn from Cicero, and thus forms a well-arranged storehouse of all the historical notices con- tained in that voluminous author. It has been suspected that Middleton was indebted for much of the information contained in his Life of Cicero to Bellenden's little known work,

BELLEROPHON (BedAepoday or BeAXepoddyrys), in Greek: Legend, a local hero of Corinth, but partly also con- nected with, and partly similar to, Perseus, the local hero of the neighbouring Argos, the points of likeness being such as to suggest that they had originally been one and the same hero, while the difference in their exploits might result from the rivalry of the two towns. Both are con- nected with the sun-god Helios and with the sea-god Poseidon, the symbol of the union being the winged horsc Pegasus. Bellerophon was a son of Glaucus of Corinth, who is spoken of as a son of Poseidon, and in some way himself a marine deity. To account for the name, 2.e., "slayer of Belleros," an otherwise unknown hero of this name was invented. But it is by no means certain that '"'Belleros" is a personal name; it may mean nothing more than "monster."

The first act of Bellerophon was to capture the horse Pegasus, when it alighted on the Acrocorinth to drink at the fountain of Peirene, with a bridle which he found by his side on awaking from sleep beside the altar of

Athene, where he had laid himself down on the advice of a seer Polyidus. The goddess had appeared to him in a drcam, reached him a golden bridle, and told him to sacrificc a white bull to his father Poseidon. The next incident occurs in Tiryns, at the court of Preetus, whose wife, Sthenebcea (or Anteia, as Homer calls her), failing to seduce Bellerophon, charges him with an attempt on her virtue (Z/éad, vi. 150-211). Preetus now sends him to lobates, his wife's father, the king of Lycia, with a letter or sealed tablet, in which were instructions, apparently by means of signs, to take the life of the bearer. Arriving in Lycia, he was received as a guest and entertained for nine days. On the tenth, being asked the object of his visit, he handed the letter to the king, whose first plan for complying with it was to send him to slay the Chimera, a monster which was devastating the country. Its fore-part was that of a lion, its hindpart that of a serpent; a goat's head sprang from its back, and fire was vomited from its mouth. Beller- ophon, mounted on Pegasus, kept up in the air out of the way of the Chimera, but yet near enough to kill it with his spear, or as he is at other times represented, with his sword or with a bow. He was next ordered out against the Solymi, a hostile tribe, and after- wards against the Amazons, from both of which expeditions he not only returned victorious, but also on his way back slew an ambush of chosen warriors whoin Iobates had placed to intercept him. His divine origin was now proved; the king gave him his daughtei in marriage ; and the Lycians presented him with a large and fertile estate on which he lived, and reached the pinnacle of happiness, surrounded by two sons, Isander and Hippolochus, and one daugh- ter, Laodamia. But, as in the case of Hercules, the gods now punished him with frenzy. His son Isander fell in battle; his daughter was slain by Artemis; and hc himself wandered in the ' plain of madness" (wedfov 'AAnfov). The cause of his misfortune, Pindar (Isthm., vii. 44; Olymp., xiii. 91) says, was his ambitious attempt to mount to the heavens on Pegasus. :

The early relations between Lycia and Argolis are attested by the tradition that the walls of Mycenz had been built by Cyclopes from Lycia. In both districts the worship of the sun-god had exercised great influence in very early times. The two most frequent representations of Bellerophon in ancient art are (1) when he slays the Chimeera, and (2) when he departs from Argos with the letter. Among the first is to be noted a terra-cotta relief

from Melos in the British Museum, where also, on a vase of black ware, is what seems to be a representation of his escape from Sthenebeea. >

BELLEVILLE, a city of the United States of America, capital of the county of St Clair in Illinois, situated about 14 miles S.E. of St Louis on a rising ground, in the midst of a fertile district. It is a thriving commercial and manufacturing city, well supplied with water, and in the immediate neighbourhood of coal deposits. Its industrial establishments comprise breweries, flour-mills, distilleries, foundries, and a woollen factory, and it possesses a court- house, banks, a high school, a convent for the education of young ladies, and various other institutions. There is a sufficient number of German inhabitants to maintain one

daily and two weekly papers in their native language. Population in 1870, 8146.

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BELLEY, the capital of an arrondissement in the depart- ment of Ain, France, is situated near the Rhonc, 39 miles east of Lyons. It is the seat of a bishopric founded in 412, and contains an episcopal palace, a cathedral, an ecclesias- tical school, a museum, and a public library. The principal industries are the weaving of cotton goods and the culture of the silk-worm. Important fairs are held for the sale of cattle aud horses. In the vicinity are found the best lithographic stones in France. Belley is a place of con- siderable antiquity, and preserves the remains of a Roman temple. It was the capital of the district of Bugey, which maintained its separate constitution down to the Revolu- tion.' The neighbourhood is remarkable for its objects of interest both natural and historical, such as the cascades of Glandieux, the intermitting fountain of Grouin, and the Carthusian abbeys at Arviéres and Portes. Population in

1872, 3902.

BELLINIT, the name of an honourable Venetian family. Three members of this family fill a great place in the history of the Venetian school of painting in the 15th century and at the beginning of the 16th. In their hands.

the art of Venice was developed from a condition more:

primitive and archaic than that of any other school in Italy, and advanced to the final perfection of Giorgione and of Titian. The first distinguished member of the family was—

1. Jacopo Betrini. When Gentile da Fabriano, one of the most refined and accomplished of the religious painters of the Umbrian Apennines, came to practise at Venice, where art was backward, several young men of the city took service under him as pupils. Among these were: Giovanni and Antonio of Murano, and Jacopo Bellini. The Umbrian master left Venice for Florence in 1422, and the two brothers of Murano stayed behind and presently founded a school of their own. (See Vivarini.) But: Jacopo Bellini followed his teacher to Florence in the capacity of famulus. It was the time when a new spirit had just broken out in Florentine art, and when the leaders of that sclool—Ghiberti and Donatello, Andrea del Castagno, Paolo Uccello, Masaccio—had made immensé progress in many ways at once,—in the sciences of anatomy and perspective, in classical grace and style, in the truth and sincerity of nature,—so that from them the young Venetian found much more to learn than even from his Umbrian teacher as to the possible perfections of the art. The little evidence left us proves that he made good use of his opportunities. But his works are as rare as the events of his life, after his service in Florence with Gentile da Fabriano, are uncertain. That service presently got him into trouble. The Umbrian, as a stranger coming to paint in Florence, was jealously looked on. One day a group of young Florentines took to throwing stones into his shop, and the Venetian pupil ran out and put them to flight with his fists. Thinking this might be turned against him, he went and took service on board the galleys of the Florentine state ; but, returning after a year, he found he had in his absence been tried for assault and condemned in a heavy fine. He was arrested and put in prison, but the matter was afterwards compromised upon a public act of penance to which Jacopo submitted. Whether he accom- panied his master to Rome in 1426 we cannot tell, but there is evidence to show that he was practising on his own account in Venice in 1430, and probably as soon as 1427. Neither can we fix the date of his marriage; but it was

-probably about the time of his retyrn to his native state,

for we know that he had grandchildren before 1458. The remainder of his life was spent between Venice, Verona, and Padua. At Venice, besides ‘other work, he painted a great series from the lives of Christ and the Virgin in the church of St John the Evangelist. This has entirely

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perished. In the cathedral of Verona there was, until it was destroyed by the barbarism of the 18th century, an important Crucifixion from his hand. In the archbishop's palace of the same city another Crucifixion still remains, but greatly injured. At Padua Jacopo appears to have lived several years, and to have founded there a school which became the rival of the school of Squarcione. There his sons, Gentile and Giovanni, grew up ; there his daughter Niccolosia found a husband in Andrea Mantegna, the most famous of the scholars of Squarcione. (See Man- TEGNA.) In Jacopo Bellini the Venetian school had not yet found its special and characteristic manner. But he holds a position of great importance, as having been the first to fertilize Venetian soil with the science and genius of Florence. From no extant pictures of his can his manner be judged so well as from the book of his sketches, which has become the property of the British Museum. This, in spite of fading and decay, is a unique and invaluable possession, containing a vast number of original studies tinted or drawn with pen or ink, and including composi- tions from Scripture and the lives of the saints, from classical fable, and from natural history in surprising variety.

2. GenTILE Betiint was the elder of the two sons of Jacopo. To the precise date of his birth we have no clue. Both he and his brother Giovanni served together under their father Jacopo as his pupils as long as he lived. After his death each of them practised his art indepen- dently in their native city; but a warm and unbroken affection is recorded to have always subsisted between the brothers. In 1464 Gentile was commissioned to paint the doors of the great organ in St Mark's with figures of the four saints—Mark, Jeromc, Theodore, and Francis. The next year he painted for the church of Sta Maria dell' Orto a picture of the apotheosis of Lorenzo Giustiniani, patriarch of Venice. From 1465 until 1474 we cannot trace his occupations with precision, though there are several extant works that can be assigned to the interval. On the 21st of September 1474, he was appointed to restore and renew the existing painted decorations in the hall of the Great Council in the Ducal Palace. These were in part frescoes, the work of his father's master, Gentile da Fabriano. Some of them Gentile Bellini restored, and some were so ruined that he had to destroy them and put in their place new work of his own, The practice of painting in oil upon canvas had lately been brought to Venice by Antonello of Messina, The new medium, besides

yielding richer effects, resisted damp and salt better than the old; and all the painters of Venice were eagerly learning its use. Gentile adopted it in the hall of the Great Council. In 1479 the Sultan Mahomet sent word to the Signoria of Venice that he desired the services at Constantinople of a good painter of their state, at the same time inviting the doge to the wedding of his son. The doge declined to go, but the Signoria chose Gentile Bellini to be sent with two assistants at the expense of the state and to paint for the Turk, first electing his younger brother Giovanni to fill his place in the works at the Ducal Palace until he should return. He was admir- ably received, and painted the portraits of the sultan and many of his officers, besides that picture of the reception of a Venetian embassy by the grand vizier which is now at the Louvre (No. 68). It is a well-known and doubtful story how the sultan alleged that a picture of Gentile's showed an imperfect knowledge of the appearance of the muscles of the neck after decapitation, and to convince the painter had a slave decapitated in his presence, and how this madc Gentile uncomfortable and anxious to get away. He returned at the end of 1480, bringing gifts and honours ; and from that time he and Giovanni were engaged

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together for the state on the decoration of the great hall- Gentile painted there four great subjects from the story of Barbarossa, which unhappily perished in the fire of 1577. It is recorded that in 1486 the young Titian entered his workshop as a pupil. Three of the most important of his works date from the last five or six years of the century, and were done for the school of St John the Evangelist at Venice. They represent the cure cf a sick Venetian by a relic of the cross, the procession in honour of the same relic in the piazza of St Mark, and the miracle of the recovery of the relic from the Grand Canal (Academy of Venice, Nos. 543, 555, 529). In 1506 Gentile was so busy as to write that he could not accept a commission proposed by Francesco, marquis of Mantua. The next winter he fell sick, and made his will, bequeathing his father's sketch-book above described to his brother Jobn, on condition that the brother should finish the picture of the Sermon of St Mark which the sick man had then on hand. He died on the 23d of February 1507. It is by his science and spirit in the treatment of animated and dignified processional groups, with many figures and architecture of

masterly perspective, that we chiefly know Gentile Bellini. He is a workman of infinite precision, and a fine colourist, though his manner has some of the hardness of the earlier times. To conduct the school of Venice to its final liberty and splendour was the work of his younger brother, the great .

3. GIovaNNI BELuini. His birth it is no less impossible to fix with accuracy than that of his brother. His earliest work, done at Padua, shows strongly the stern influence of his brother-in-law Andrea Mantegna.. The National Gallery has a Christ on the Mount, painted by Giovanni, probably about 1455, and apparently in direct competition with a picture of the same subject by Mantegna himself, similarly couccived, which belongs to the Baring Gallery. The characteristics of the style formed at Padua by Man- tegna and Giovanni Bellini, and maintained by the former all his life, are a great intensity and vehemence of expres- sion, an iron severity and unmatched firmness and strength of draughtsmanship ; a tendency, in draperies, to imitate the qualities of sculpture ; a love of the difficulties of perspec- tive; a leaning towards the antique, which these masters learned to transform and reanimate with a more passionate energy and an austerer strength of theirown. Of the two, Bellini is always the more reserved and simple, the more inclined to work from nature and the less from the antique, and he has the richer choice in colour; but there are works in which they are indistinguishable. The period when Bellini painted in this first manner and in tempera may be roughly fixed (though there is often great uncertainy as to the dates of his pieces, and though at all times he seems occasionally to have recurred to his early practice) between 1455 and 1472. It is probable that the famous picture of the Cir- cumcision now at Castle Howard, which was repeated more than once by the master himself, and many times over by his pupils and assistants, was painted before this date. The altar pieces on a great scale, which are the noblest monument of his middle period, were certainly painted after it. Of these the chief were the Virgin and Saints, in a chapel of the church of Saints Giovanni and Paolo at Venice, which perished along with Titian's Peter Martyr in the fatal fire of 1867; a great Coronation of the Virgin, inthe church of St Dominic at Pesaro; a Transfiguration, now in the muscum of Naples ; a Virgin and Saints, painted for the church of 8. Giobbe, now in the Academy at Venice (No. 36). These, and the multitude of Madonnas and other devotional pictures painted by Giovanni Bellini during the thirty years following his

change of manner and adoption of the oil medium, are among the noblest products of the re- ligious art of the world. They stand alone in their union of

splendour with solemnity ; they have the manful energy of Mantegna without his harshness, and the richness of Gior- gione without his luxury. Succeeding pictures show an increase of this richness, and a character more nearly tender. An altar piece, painted for the church of San Zaccaria, seems to indicate a transition, and that the venerable master is acquiring all the softer splendour and keeping pace with Giorgione and Titian, the young pupils of the school. Nay, at the very close of his career, Bellini left the old devo- tional cycle in which he had produced works so moving and august, and painted for Alphonso of Ferrara a myth- ology in the most gorgeous manner of the ripe Venetian school, This is the Feast of the Gods, now at Alnwick Castle, a picture to which Titian set the finishing touches, and to which the companion, by Titian himself, is now at Madrid. Bellini died on the 29th of November 1516, full of years and honours. We have seen that he was associated with his brother in the decoration of the Great Hall of the Council in 1479. In 1483 he was appointed Pittore del Dominio, and exempted from the charges of his guild. All the painters of the state at one time or another were associated with him or passed through his school. Among the most distinguished of his scholars and assistants who will not need separate mention, we may name Marco Basaiti and Vincenzo Catena, many of whose works pass for their master's. He was the honoured associate of statesmen and men of letters. In 1506, when Albert Direr visited Venice, where he was subject to some annoy- ances, lhe found the noble old man not only the most courteous of the Venetian artists in his reception of a stranger, but the best in his profession ('der best im geniell"').

Many pictures in various galleries pass as portraits of one or other of the Bellini. But of those that are styled likenesses of Giovanni, none can be proved authentic, while the only certain portrait of Gentile isa medal by Camelio. (Vasari, ed. Lemonnier, vol. v. pp. 1-28; San- sovino, Ven. descr.,

125, seg. ; Ridolfi, i. 90-99 ; Crowe and Cavalcaselle, History of Painting in North Italy, vol. 1. pp. 100-193.) (8. C.)

BELLINI, Lorenzo, physician and anatomist, was born at Florence in 1643. After completing his studies in general literature he went to Pisa, where, assisted by the generosity of the grand duke Ferdinand IT., he studied under two of the most learned men of that age, Oliva and Borelli, the former of whom instructed him in natural philosophy and the latter in mechanics. He likewise studied medicine under Redi, and mathematics under Marchetti. At the early age of twenty he was chosen professor of philosophy at Pisa, but did not long continue in this office; for he had acquired such a reputation for skill in anatomy, that the grand duke procured him a professorship in that science, and was himself a frequent auditor at his lectures. After a long residence in Pisa, he was invited to Florence and appointed physician to the grand duke Cosmo. He was also made senior consulting physician to Pope Clement XI. Bellini died in 1703, in the sixtieth year of his age. His works were published in a collected form in 1708 (2 vols. 4to), and reprinted in 1732.

BELLINI, Vincenzo, one of the most celebrated operatic composers of the modern Italian school, was born at Catania in Sicily, November 3, 1802. He was descended from a family of musicians, both his father and grandfather having been composers of some reputation. After having received his preparatory musical education at home, he entered the conservatoire of Naples, where he studied sing- ing and composition under Tritto and Zingarelli, He soon began to write pieces for various instruments, as well as a cantata and several masses and other sacred compositions. His first opera, Adelson e Savina, was performed in 1824

at a small theatre of Naples ; his second dramatic work, Bianca e Fernando, saw. the light two years later at the San Carlo theatre of the same city, and made his name known in Italy. His next work, // Pirata, was written for the celebrated Scala theatre in Milan, to words by Felice Romano, with whom Bellini formed a union of friendship to be severed only by his death. The splendid rendering of the music by Tamburini, Rubini, and other great Italian singers, contributed greatlyto the success of the work,

which at once established the European reputation of its composer. Almost every year of the short remainder of his life witnessed the production of a new operatic work, each of which was received with rapture by the audiences of France, Italy, Germany, and England, and some of which retain their place on the stage up to the present day. We mention the names and dates of four of Bellini's operas familiar to most lovers of modern Italian music, viz. :—J Monteccht e Capuleti (1829), in which the part of Romeo has been a favourite with all the great contraltos of the last seventy years; La Sonnambula (1831); Norma, Bel- lini's best and most popular creation (1832), and J Puri- tant (1834), written for the Italian opera in Paris, and to some extent under the influence of French music. In 1833 Bellini had left his country to accompany to England the great singer Pasta, who had created the part of his Sonnambula. In 1834 he accepted an invitation to write an opera for the national Grand Opera in Paris. While he was carefully studying the French language and the cadence of French verse for the purpose, he was seized with a sudden illness and died at his villa in Puteaux near Paris, September 21, 1835. This unexpected interruption of a career so brilliant sheds, as it were, a gloom of sadness over the whole of Bellini's life, a sadness which, moreover, was foreshadowed by the character of his works. His operatic creations are throughout replete with a spirit of gentle melancholy, frequently monotonous and almost always undramatic, but at the same time irresistibly sweet, and almost disarming tke stern demands of higher criticism which otherwise would be compelled to reprove the absence of both dramatic vigour and musical depth. To the feature just mentioned, combined with a rich flow of cantilena, Bellini's operas owe their popularity, and will owe it as long as the audiences of our large theatres are willing to tolerate outrages on rhyme and reason if sung by a beautiful voice to a pleasing tune. In so far, how- ever, as the defects of Bellini's style are characteristic of the school to which he belongs, they fall to be con- sidered in a general treatment of the whole subject. See Music.

BELLINZONA, or BretiEnz, one of the three towns which are the capital in turn of the Swiss canton of Tessin or Ticino, It is built on two hills, one on each side of the Ticino at the entrance of the Riviera valley, and is so situated as completely to bar the passage by that route between Italy and Germauy. Its fortifications, which were of great strength during the Middle

Ages, have been partially re- stored. There are three castles, the Castello Grande, Cor- bario, and Di Mezzo, which belonged to the three cantons of Uni, Unterwalden,and Schwyz respectively ; the first of these is now used as an armoury and prison. The abbey church is a fine building of the 16th century, and contains some paintings of value. The Augustinian convent is now used as a Government house. The inundations of the river are prevented from injuring the town by a large dyke, built by the French in the reign of Francis I. A considerable transit trade is carried on with Italy, and there is a famous manufacture of acgua di cedro from the blossom and rind of the orange. Bellinzona was in existence at least as early as 1242, when it was conquered by Otto Visconti. It was long an object of contest between the Swiss and the

Milanese ; in the 15th century it was the scene of a famous battle, in which the Swiss were defeated; and it finally passed into the hands of the three cantons of Uri, Uuter- walden, and Schwyz after the battle of Marignano in 1515, Population in 1870, 2051.

BELLMAN, Kart MiKaet, the greatest lyrical poet of Sweden, was korn at Stockholm on the 4th of February 1740. His father, who held a responsible official position, was descended from a family that had already distin- guished itself in the fine arts; his mother, a gifted and beautiful woman, early instructed him in the elemeuts of poetry and music. When quite a child he suddenly de- veloped his extraordinary gift of improvising verse, during the delirium of a severe illness, weaving wild thoughts together lyrically, and singing airs of his own composition. From this time he gave himself up to the poetic art, and reccived great encouragement from the various eminent men who met round his father's table, among whom was Dalin, the favourite poet of the day. As early as 1757 he published a book of verse, a translation of Schweidnitz's Evangelical Thoughts of Death, and for the next few years wrote a great quantity of poems, imitative for the most part of Dalin. In 1760 appeared his first characteristic work, Zhe Moon, a satirical poem, which was revised and edited by Dalin. But the great work of his life occupied him from 1765 to 1780, and consists of the collections of dithyrambic odes known as Fredman's Lpistles and Fredman's Songs. These

were not printed until 1790. The mode of their composition was extraordinary. No poetry can possibly smell less of the lamp than Bellman's. He was accustomed, when in the presence of none but confidential friends, to announce that the god was about to visit him. He would shut his eyes, take his zither, and begin to improvize a long Bacchic ode in praise of love or wine, and sing it to a melody of his own invention. The genuineness of these extremely singular fits of inspira- tion could not be doubted. The poems which Bellman wrote in the usual way were tame, poor, and without character. The Fredman's Epistles glow with colour, ring with fierce and mysterious melody, and bear the clear impress of individual genius. These torrents of rhymes are not without their method; wild as they seem, they all conform to the rules of style, and among those that have been preserved there are few that are not perfect in form. The odes of Bellman breathe a passionate love of life; he is amorous of existence, and keen after pleasure, but under all the frenzy there is a pathos, a yearning that is sadder than tears. The most dissimilar elements are united in his poems ; in a bacchanal hymn the music will often fade away into a sad elegiac vein, and the rare picturesqueness of his idyllic pictures is warmed into rich colour by the geniality of his humour. He is sometimes frantic, sometimes gross, but always ready, at his wildest moment, to melt into reverie. A great Swedish critic has remarked that the voluptuous joviality of Bellman is, after all, only "sorrow clad in rose-colour," and this underlying pathos gives his poems their undying charm. His later works, The Temple of Bacchus, a journal called What you Will, a religious anthology entitled Zion's Holiday, and a translation of Gellert's Fables, are comparatively unimportant. He died on the 11th of February 1795. Several statues exist of Bellman. One represents him naked, crowned with ivy, and striking the guitar; the best is the splendid colossal bust by Bystrom, which adorns the public gardens of Stockholm, which was erected by the Swedish Academy in 1829. Bellman hada grand manner, a fine voice, and great gifts of mimicry, and was a favourite companion of King Gustavus III. The best edition of his works is one lately published at Stockholm, edited by J. G. Carlén,

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BELLONA, in Roman Mythology, the goddess of war, corresponding to the Greek Enyo, and called now the sister or daughter of Mars, now his charioteer or his nurse. Her worship appears to have been promoted in Rome chiefly by the family of the Claudii, whose Sabine origin, together with their use of the name of " Nero," has suggested an identification of Bellona with the Sabine war goddess Nerio. Her temple at Rome, founded by Appius Claudius Cecus, 296 B.c., stood in the Campus Martius, near the Flaminian Circus, and outside the gates of the city. It was there that the senate met to discuss the claims of a general to a triumph, and to receive ambassadors from foreign states. In front of it was the col/umna bellica where the ceremony of declaring war was performed. From this native Italian god- dess is to be distinguishad the Asiatic Bellona, whose wor- ship was introduced into Rome from Comana,in Cappadocia, apparently by Sulla, to whom she had appeared, urging him to niarch to Rome and bathe in the blood of his ene- For her a new temple was built, and a college of priests (Bellonarii) instituted to conduct her fanatical rites, the prominent feature of which was to lacerate themselves and sprinkle the blood on the spectators. To make the scene more grim they wore black dresses from head to foot,

BELLOT, JosErpu Ren#, one of the heroes and victims of Arctic exploration, was born at Paris, March 18, 1826, At the age of fifteen he entered the Naval School, in which he studied two years, and earned a high reputation. He distinguished himself in the French expedition vf 1845 against Tamatave in Madagascar ; and although he was not yet twenty he received the cross of the Legion of Honour at the close of that year. He was afterwards attached to the staff of the station, was promoted to the rank of Enseigne de Vaisseau in November 1847, and in 1851. obtained permission to join the English expedition then preparing to go out, under the command of Captain Kennedy, in search of Sir John Franklin. On this occasion he displayed great courage, presence of mind, and self- devotion, rendered important services, and made the discovery of the strait, which bears his name, between Boothia Felix and Somerset Land. Early in 1852 he was promoted lieutenant. In the same year he accompanied, as a volunteer, the expedition sent out by the English Government under Captain Inglefield on the same quest. His intelligence, his devotion to duty, and his courage won him the esteem and admiration of all with whom he was associated. While

making a perilous journey with two comrades across the ice, for the purpose of communicating with Captain Inglefield, he was overtaken by a storm, August 21, and being blown into an opening between the broken masses of ice was seen no more. III, and an obelisk was erected to his memory in front of Greenwich Hospital.

BELLOWS anp BLOWING-MACHINES are machines for producing a current of air, chiefly in order to assist the combustion of a fire.

The common bellows now in use probably represents one of the oldest contrivances for this purpose. It consists of two flat boards, of oval or triangular shape, connected round their edges by a piece of leather so as to form an air chamber. 'The leather is kept from collapsing, on separation of the boards, by two or more hoops, which act like the ribs in animals. The lower board has a hole in its centre covered inside by a leather flap or valve opening inwards ; it has also fastened to it a metal pipe or nozzle, of smaller aperture than the valve. On raising the upper board, the air from without lifts the valve and enters the cavity ; then on pressing down the top board, this air is compressed, shuts the valve, and is driven through the pipe with a velocity corresponding to the pressure.

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The blast here is, of course, not continuous, but in puffs, —- 4 certain interval being needed for refilling the bellows after each discharge. This drawback was remedied by the invention of double bellows. To understand their action, it is only necessary to conceive an addition board with vilve, like the lower board of the single bellows, attached by leather under this lower board. Thus two similar cavities are obtained, separated by the lower board of what was the single bellows. The lowest board is held down by a weight, and. another weight presses the top board. When the lowest board is raised it forecs air into the upper cavity, and the valve of the middle board prevents return of this air. The lowest board being then depressed, air enters the lower cavity from without, and this in its turn is next forced into the upper cavity. The weighted top board is meanwhile continuously pressing the air of the upper cavity through the nozzle.. While the blast thus obtained is continuous, it is not wholly free from irregu- larities.

The common smiths' bellows, made on the principle just indicated, are generally of circular forin, as shown in figs. 1 and 2. A is the blast pipe, B the movable lowest

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Fias. 1 and 2.—Common Smiths' Bellows.

board, C the fixed middle board (into which the pipe is inserted), and D the movable upper board pressed by a weight. The lowest board is moved by means of the lever L and the chain H working on the roller R. The weight required to produce a certain force of blast is easily deter- mined ; if the diameter of the bellows be 1 foot, the area will be 113-19 inches, and the upper board will require a weight of 56°5 ib for a blast equivalent to a pressure of 4 tb on the square inch, or a velocity of 207 fect per second, which is well suited for a smith's forge. By a simple arrangement for altering the diameter of the pipe the force of the blast may be varied.

It may be noted that in some parts of the Continent a simple form of bellows is made of two wooden boxes, each open on one side, and the one just fitting into the other. The open sides being opposed to each other, the upper

enclosing box is made to move up and down over the:

other, with which it is jointed at one part, and which is provided with a nozzle, and a valve opening inwards. The change of capacity produces a blast. There is con- siderable loss of air, however, from the boxes not exactly fitting.

The blowing-machines now almost exclusively used for blast furnaces are of the cylinder and piston type (which is the principle adopted, it may be remarked, in a small hand bellows used by the Chinese). At first the blowing cylinders were single-acting, that is to say, they had the power of propelling a blast only when the piston was moving in one direction. With two or more of these blowing cylinders attached to one crank-shaft, worked by

a water-wheel, a tolerably steady pressure of air was obtained. But in these and other respects considerable progress has been realized.

The cylinder-engines of the present day (which are generally driven by steam) may be classed in two chief systems, according as the cylinder is placed horizontally or vertically. Inthe former case the stcam and blast cylinders . are usually in one line, the same rod carrying the pistons of both, and being guided on both sides, while a fly-wheel is employed as regulator, In the vertical systems the steam and blowing cylinders are sometimes similarly connected, but, in the larger engines, they are generally placed one at each end of a beam connecting their pistons. The vertical engines have been most popular in England and in some parts of the Continent (as Silesia), but the other type (almost exclusively used in Westphalia and on the Rhine) is now adopted in several English works.

The general action of many of these machines may be illustrated by the large blowing engine at the Dowlais iron-works, erected in 1851. Fig. 3 is a representation of

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— { ohm Fic, 3.—Section of Cylinder of Blowing Engine.

its blast cylinder, the piston of which, made air-tight by packing, is moved by the oscillating beam of the engine. The cover of the cylinder, and also its bottom, have several openings, furnished with valves v, which open inwards. Other valves v', above and below, open into a lateral chamber B, which is connected by the aperture O to the different tuyeres of the furnaces, Suppose, now, the piston is at the top and begins to be forced down. The air in the upper part of the cylinder becomes more and more rarefied, and the difference of density between it and that of the blast: in chamber B, causes the upper valve v to be applied firmly to the metallic surface before which it is hung. The upper valves v, on the other hand, will be raised by the external air which enters to compensate the rarefaction. The same motion of the piston compresses the air below it, causing the lower valves v (which open inwards) to be firmly closed, while the valve v' will be raised and admit the air into chamber B, whence it passes to the furnace. When the piston is raised the reverse takes place ; the lower portion of the cylinder receives air from without, and the upper discharges its air through the pipes leading to the furnace. Thus a nearly continuous flow is obtained. 'To ensure regularity the pipe O is made to communicate with a closed reservoir of wrought iron, where the variations are destroyed by the elasticity of the air itself, The cylinder here figured is 144 inches in diameter, with a stroke of 12 feet, and discharges about

BELLOWS

44,000 cubic feet per minute, at a pressure of 34 Ib to the square inch,

Where it is desirable to make small blast engines do the work of large ones, compensating smallness of size with velocity, it becomes necessary that the air valves be moved otherwise than by the simple action of the air itsclf. The best form of such an arrangement is that devised by Mr Slate, in which there is an annular slide valve placed outside the blast cylinder; it receives its motion from a crank connected with the fly-wheel shaft. Thus, with lap and lead of the valve properly proportioned, a high velocity can be attained, and the tremor and jar that are observable in some of the larger engines are entirely absent. Two

such engines working together, with their cranks at right

angles, give such a uniform blast that no regulator of any kind is needed. In Fossey's engine, which appeared in the Exhibition of 1862, the slide valves are replaced by discs with radial perforations, which are put in slow rotatory motion by gearing connected with the main shaft.

The blast engines with slide valves, however, have not proved so advantageous in practice as was anticipated, owing to the large amount of friction on the valve surfaces, greater liability to derangement, and the wear and tear resulting from such rapid motion.

As a recent example of engines of the vertical type, with steam and air cylinders in one linc (which have now come a good deal into use in the north of England) we may briefly notice the compound cylinder blowing engines at the Lackenby Iron-Works, Middlesborough. These engines were described by Mr Alfred Hill before the Institution of Mechanical Engineers in 1871. Fig 4 (copied from the drawings by permission of the Institute and of Mr Hill) presents them in vertical section. |

They consist of a high pressure non-condensing engine and a low pressure condensing engine, the latter supplied by steam from the former,—this atrangement being adopted for economical reasons. A is the high pressure cylinder (32 inches in diameter) and C the low pressure (80 inches). Both engines have a stroke of 54 inches F and a peculiarity is that they are coupled by cranks placed directly opposite each other instead of, as usual, at right angles,—a light fly-whecl being relied on to carry them over the dead centres. This secures a better balance of the engines, and expansion of the steam in both cylinders in the most advantageous manner ; it also obviates the danger of breakages common in the case of right-angle cranks, which probably arises from the tendency to sudden accelera- tion of one engine over the other at the commencement of each stroke,—full steam pressure being then upon both pistons simultaneously, whilst the resistance of the blast pressure 1s acting against only one of the blowing pistons. In the blowing cylinders B, the inlet valves in the bottom are circular disc valves of leather, eighteen in number. The inlet valves T on the top of the cylinder are arranged in ten rectangular boxes, having openings in their vertical sides, inside which are hung leather flap valves. 'The box covers are made hollow, and are carried down between the backs of the leathern

flaps (so as to diminish the air-space as much as possible). The outlet valves o for air are ten in number, at each end of the cylinders, and are hung against flat gratings, which are fixed round the circumference of the cylinder. Enclosing each cylinder is an air-tight wrought-iron case M, into which the blast is delivered, and a branch at one side (not shown in figure) conveys the blast to the main. The area of the inlet valves is 860 square inches, or about 1th the area of the piston ; that of the outlet valves is about th. For details of the balanced slide valves of the steam cylinders, the surface condenser D, the circulating pump E, the air-pump F, the feed pumps G, &c., we must refer to Mr Hill's paper.

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The capacity of each blowing cylinder is 157 cubic feet:; consequently, the total quantity of blast supplied from both

Fia, 4.—Vertical Section of Lackenby Blowing Engines.

cylinders at the regular speed of 24 revolutions per minute is 15,072 feet per minute, measured at atmospheric pressure ; thus the supply of blast, including loss by leakage, amounts to 190,000 cubic feet per ton of iron made. The pressure of blast in the blast-main is very free from fluctuations, —owing, doubtless, to its large size, 124 times the joint capacity of the two blowing cylinders. The indicated power of the engine is found to give a total of 290 horse ; that of the two blowing cylinders 258,

Among the more powerful blowing engines of piston and cylinder type at present in use, may be mentioned, besides that at Dowlais referred to above, those of Woolwich dockyard, employed for supplying air to forty forge fires, the Kirkless Hall engines, constructed from Robert Wilson's designs for the Wigan Iron and Coal Company, and the seven engines of Schneider and Co. at Creusot, three of which are horizontal engines of an old type, and the other four direct-acting vertical engines. Descriptions of these will be found in various standard works on metallurgy and engineering. For a description of the large blowing and exhausting engines lately constructed for the new Post- Office in London, see Hngineering, 20th February 1874.

An ingenious mode of obtaining a blast is adopted in Savoy, Carniola, and in some parts of America; it is the trompe or water-blowing engine. A flow of a few yards of water is required. From the bottom of a reservoir water is admitted, by removal of a plug from a conical: shaped aperture, into a large vertical wooden pipe, which terminates below in a wind chest. The water, falling

in streamlets, carries down with it air drawn in through sloping holes near the top of the pipe. The wind chest below has an opening for escape of the water, and the air passes out from another part, in a regular stream, by a nozzle pipe. 'To facilitate separation of the water and the air, it is found advantageous to fix a small platform under the bottom of the pipe, on which the water may impinge in its fall. The tension of the blast is determined by the height from which the water falls; but this height seldom exceeds 27 feet, which gives a pressure of from 14 to 2 bb to the square inch. While the blast obtained is very equable, there is the serious drawback that the air supplied is always more or less laden with moisture. The action of the trompe has been investigated by Mr Rodwell (Philoso- phical Mag., 1864, 1867).

Another kind of blowing engine, in which water is employed, is that invented by Mr Street ; in its simpler form it consists of a barrel-shaped vessel, supported hori- zontally by the two ends of its axis. The cylinder is divided longitudinally by a plane extending from the middle of the internal surface above (the barrel being in its position of rest) to near the opposite side. Suppose the cylinder partly filled with water and made to turn a little way round on its axis, the air on one sidc will be compressed by the water, while that on the other will be rarefied. A valve opening outwards from the condensed side admits the air to a cavity from which a nozzle pipe proceeds, while a valve opening inwards on the rarefied side admits external air. With additional and correspond- ing valves, the process is repeated on the reverse oscillation of the cylinder. Thus by swinging the cylinder from side to side, by a crank and rod connected with the engine, alternate puffs of air are propelled into a regulative air chest of special construction, which then supplies a steady blast.

Fan-blast machines are frequently employed, especially to urge the fire of steam boilers, and in puddling and reheating, and in the cupola furnaces where anthracite is burnt, or coke used for remelting pig-iron in foundries. In one common form the fan consists of four spokes of a rimless wheel, tipped with vanes and made to rotate ina cylindrical chest, in which it has often a slightly eccentric position. There are openings on both sides round the spindle for admission of air, which, sucked in by the centrifugal action of the fan as it quickly rotates, flows towards the vanes, and is driven through an exit pipe attached to another part of the cylinder.

There are numerous varieties of these engines. An American machine, introduced into England a few years ago by Mr Ellis, has found considerable favour. It is represented in section in fig. 5. It consists of an iron cylindrical casing A, open about a fourth part of its circumference (a to 6) for admission of air, and an exit pipe B. Inside the casing is another cylinder, placed eccen- trically to it, and which always fits close up against the wooden packing C. This cylinder acts as driver for the three fan blades or pistons D, which are capable of passing out and in through longitudinal slits in its circumference, There is a shaft passing through the small cylinder, and concentric with it at the ends, but cranked in the middle part so as to become concentric with the casing. The inner cylinder revolves round the axis of the ends of the shaft, and on the cranked part revolve the fan blades or pistons, driven by the cylinder. The outer extremities of the fan blades follow closely the inside face of the casing. The crank is placed opposite to the point where the inner cylinder touches the inside of the casing, always retaining, it must be remembered, the same position; when passing this point, the blades are wholly withdrawn inside the cylinder, but when passing the opposite point they are thrust out to the fullest extent, and are always working into or out of the inner cylinder as it revolves. The air

is thus continually being drawn in at the upper opening, compressed, and delivered by the lower one

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Fia. 5.—Section of an American Blowing-Machine.

The rotary blower, invented by Messrs Root of Con- nersville, Ind., is one which has of late years found extensive use both in America and Europe. The arrange- ment differs in some essential features from that of the ordinary fan ; it acts by regular displacement of the air at each revolution, as shown in fig 6,

Among the exhibits at a recent exhibition of the Franklin Institute in America, was shown a new form of blower, acting much on the same principle as the Root blower, but, according to the report of the committee, offering certain advantages over the latter. From a cross section of the chamber it appears that three drums of equal size are enclosed in it, two ina line below and one above; the upper one is provided with wings, and the two lower have wide slots along their entire length, allowing the wings to enter in the course of rotation. The function of the two lower drums is to supply alternately abutments to prevent the escape of the air. They are caused to revolve in proper relation with the motion of the upper drum by spur-wheels on the journals, which mesh into another spur-wheel on the shaft of the upper drum. In the moving parts of this machine there are no parts that come into actual contact except the teeth of the spur-wheels. The report allows the

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tary Blower.

superiority of this rotary blower of Baker, inter alia, as regards durability, little pulsation, absence of internal fric- tion and of the need of lubrication, suitability for blowing either hot or cold air, and less power required fur the amount of air discharged. A fuller account of it will be found in the American Artisan for March 1875.

For the arrangement of bellows in organs see the article Ora@aN. (A. B. M.)

BELLUNO, the ancient Belunwm, is the cavital of a province of Northern Italy, and the scat of a bishop, situated at the confluence of the Piave and

the Ardo, in long. 12° 8’ 46” KE. and lat. 46’ 7’ 46” N. Besides the cathedral, which was built by Palladius, there are fifteen churches, a theological seminary, a gymnasiuni, a theatre, and a library. A society of arts and sciences and a cham- ber of commerce have their meetings in the city. Water is supplied from the neighbouring hills by a remarkable aqueduct. The principal industries are the manufacture of silk, wax, leather, and pottery ; and a considerable trade is carried on in wood. Population, 15,509.

BELON, Pierre, French naturalist, was born about 1517 at the hamlet of Soulletiére, in Maine. He studied medicine at Paris and took the degree of doctor. He after- wards travelled in Germany, and heard some lectures at the famous University of Wittenberg. On his return to France he was taken under the patronage of the Cardinal de Tour- non, who furnished him with means for undertaking an extensive scientific journey. Belon started in 1546, travelled through Greece, Asia Minor, Egypt, Arabia, and Palestine, and returned in 1549. A full account of his travels, with illustrations, was published in 1553. It passed through several editions, and was translated into Latin and German. Belon, who was highly favoured both by Henry IL. aud by Charles IX., was assassinated one evening in April 1564, when coming through the Bois de Boulogne. Besides the narrative of his travels he wrote several scientific works of considerable value, particularly the Histoire Naturelle des Estranges Poissons, 1551, and LP Histoire de la Nature des Oyseaux, 1555.

BELPASSO, a town of Sicily, on the slopes of Etna, in the proviuce of Catania, and about 8 miles from the city of that name. In 1669 it was destroyed by an eruption. The inhabitants rebuilt their town on a new site at Mezzo Campo, but, finding the locality unhealthy, they afterwards returned to their original position. Population, 7620.

BELPER, a market-town of Derbyshire, situated on the banks of the Derwent, which is here crossed by a stone bridge. It is 7 miles north of Derby, on the Midland Railway. For a considerable period one of the most flour- ishing towns in the country, it is principally indebted for its prosperity to the establishment of cotton-works by Messrs Strutt in 1777. It also manufactures linens, silks, hosiery, nails, and earthenwares; it has three

churches, several chapels for Independents, Methodists, Baptists, &c., a mechanics' institution, and a subscription library. In the neighbourhood arc the remains of a mansion where John of Gaunt used to reside. Population (1871), 8527.

BELSHAM, Tuomas, a Unitarian clergyman, was born at Bedford in 1750. He was educated at the Dissenting Academy at Daventry, where for seven years he acted as assistant tutor. After three years spent in a charge at Worcester, he returned as head of the Daventry Academy, a post which he continued to hold till 1789, when, having adopted Unitarian principles, he resigned all connection with the institution. He superintended during its brief existence a new college at Hackney, and was then called to the charge of the Gravel Pit congregation, which had been formerly held by the famous Priestley. In 1805 he was appointed to the Essex Street chapel, where he remained till his death in 1829. Belsham's first work of

importance, Zeview of Mr Wilberforces Treatise entitled Practical View, 1798, was written after his conversion to Unitarianism. His most popular work was the Evidences of Christianity ; the most important was his trauslation and exposition of the Epistles of St Paul. He was also the author of a work on philosophy, Elemeits of the Ph7lo- sophy of the Human Mind, 1801, which is entirely based on Hartley's psychology. Belsham is one of the most vigorous and able writers on the Unitarian side.

BELSHAM, Witu1am, brother of the preceding, was born in 1752, and died in 1827. His productions were mainly historical and political writings, advocating the politics of the Whig party. Several detached historical treatises were collected together, and published in 1806 under the title, History of Great Britain to the conclusion of the Peace of Amiens in 1802, 12 vols.

BELSHAZZAR, the name of a Babylonian prince mentioned in the book of Danicl. According to the account in the fifth chapter of Daniel, Belshazzar was king of Babylon at the time of the capture of the city by the Medes and Persians, and was slain when the city was surprised during a festival. No ancient historian mentions the name of Belshazzar among the successors of Nebuchad- nezzar, and there has been considerable controversy as to the identity of the unfortunate monarch. The successors of Nebuchadnezzar,

according to the copyists of Berosus, were as follows :—Evil-merodach, two years, son of Nebuchadnezzar; Neriglissar, or Nergalsharezer, four years, son-in-law of Nebuchadnezzar ; Laborosoarchod, nine months, son of Neriglissar ; Nabonidus, seventeen years, not of the royal family. Niebuhr and some others identified Belshazzar with Evil-merodach ; other scholars with Nerig- lissar ; and a third section, including Ewald and Browne, identified him with Nabonidus. There is no necessity now to argue against these and similar views, as they are set aside by the Babylonian cuneiform inscriptions, which show that Bel-sar-uzur, or Belshazzar, was the name of tha eldest son of Nabonidus, the last king of Babylon. In some of his latter inscriptions Nabu-nahid or Nabonidus nientions his eldest son Bel-sar-uzur in such terms as to lead to the inipression that the young prince was associated with himself on the throne; and this explains several difficulties between the historians and the book of Daniel with respect to the capture of Babylon. After the defeat. of the Babylonian forces Nabonidus fled to Borsippa, while the young prince Belshazzar was left in charge of Babylon, the capital, which was closely besieged by the Medes and Persians. The historians all say that Nabonidus, the last king of Babylon, submitted to the conquerors at Borsippa after the taking of his capital, while the book of Daniel states that Belshazzar was slain on the night of the capture of Babylon. These two statements have been supposed to contradict each other, but we now know that they refer to two totally distinct princes whose fates were quite different. The inscriptions of Nabonidus which mention Belshazzar are found on clay cylinders from Mugheir and other Chaldean sites, and they were first discovered and published by Sir Henry Rawlinson, to whom we owe this rectification in ancient history. One of these passages in a prayer reads: " Me Nabu-nahid, king of Babylun, from sin against thy great divinity, do thou save me, and health and long days numerous do thou multiply. And of Bel-sar-uzur,—my eldest son, the delight of my heart in the worship of thy great divinity, his heart do thou establish, and may he not consort with sinners." The other texts are after the same form, and give no new details as to Belshazzar,—the account in the fifth chapter of Daniel containing all that is known of his history. The numerous works written on this subject before the discovery of the cuneiform inscriptions are

now of little value; all that is known with any certainty on the matter will be found in Rawlinson's G'reat dfon- archies, 2d edition, vol. iii.

BELT, Great, and Littte Bett, two straits which connect the Baltic Sea with the Cattegat. The former, with a depth of from 5 to 20 fathoms, and 2 breadth of about 15 miles, runs, from 8.8.E. to N.N.W., between the islands of Zealand and Fiinen; while the Little Belt, which is only about half as wide, with a narrow entrance from the Cattegat, separates Fiinen from the mainland of Schleswig. The navigation of both is rather dangerous for large vessels, owing to the number of sandbanks and small islands ; and on that account the Sound, which lies to the east, is the channel preferred by shipping.

BELTANE, or Better, a festival originally common to all the Celtic peoples, of which traces were to be found in Treland and the Highlands of Scotland down to the begin- ning of the present century. The name is compounded of bel or beal, the Celtic god of light, and tim or teine, meaning fire. The principal Beltane celebration was held annually in the beginning (geuerally on the first day) of May, though the name is also applied toa similar festival which occurred in the beginning of November. According to Cormac, archbishop of Cashel about the year 908, who furnishes the earliest notice of Beltane, it was customary to kindle, in very close proximity, two fires, between which both men and cattle were driven, under the belief that health was thereby promoted and disease warded off. (See Zransactions of the Irish Academy, xiv. pp. 100; 122, 123.) Of the celebration in more recent times an account is given by Armstrong in his Gaelic Dictionary, s. v. "Bealtainn." The whole subject is fully treated by J. Grimm in his Deutsche Mythologie, c. Xx.

BELUCHISTAN. See BaLucnistan.

BELVEDERE, a town of Italy, in the province of Calabria Citra, on the Mediterranean, 32 miles N.W. of Cosenza. It possesses a castle and a maidens' hospital, and is beautifully situated on the slope of a hill. Population between 5000 and 6000.

BELZONI, Giovanni Battista, one of the most enter- prising and successful Egyptian explorers, was born of humble parentage at Padua in 1778. When about eightecn years of age he appears to have removed to Rome, and for a short time became a monk. In 1798 the occupation of the city by the French troops drove him from Rome. He wandered through Holland, and in 1803 came to England. Here for some time he was compelled to find subsistence for himself and his wife, an Englishwoman, by exhibiting on the streets athletic exercises and feats of agility. Through the kindness of Mr Salt, who was ever afterwards his patron, he was engaged at Astley's amphitheatre, and his circumstances soon began to improve. In 1812 he set out on his travels, passing through Lisbon and Madrid to Egypt, where his friend, Mr Salt, was British consul. He was desirous of laying before the pasha Mehemet Ali a hydraulic machine for raising the waters of the Nile. Though the experiment with this engine was successful, the design was abandoned by the pasha, and Belzoni resolved to continue his travels. He visited Thebes and removed with great skill the colossal statue, commonly called young Memnon, which he shipped for England. He also pushed his investigations into the great temple of Hdfoo, visited Elephantina and Phils, discovered the temple of Abusimbel, made excavations at Carnac, and opened up a splendid tomb in the Beban-el-Molouk. He was the first to penetrate into the second great pyramid of Ghizeh, and the first to visit the oasis west of Lake Meris. In 1819 he returned to England and published in the following year a most interesting account of his travels and discoveries. He also exhibited for some time at the Egyptian Hall fac-

similes of the great tomb at Beban-el-Molouk. In 1823 he again set out for Africa, intending to penetrate to Tim- buctoo. He reached Benin, but was seized with dysentery at a village called Gato, and died December 3, 1823.

BEMBO, Pierro, Cardinal, was born at Venice on the 20th of May 1470. While still a boy he accompanied his father to Florence, and there acquired a love for that Tuscan form of speech which he afterwards cultivated in preference to the dialect of his native city. Having com- pleted his studies, which included two years' devotion to Greek under Lascaris at Messina, he chose the ecclesiastical profession. After a considerable time spent in

various cities and courts of Italy, where his learning already made him welcome, he accompanied Julio de' Medici to Rome, where he was soon after appointed secretary to Leo X. On the Pontiff's death he retired, with impaired health, to Padua, and there lived for a number of years engaged in literary labours and amusements. In 1529 he accepted the office of historiographer to his native city, and shortly afterwards was appointed librarian of St Mark's. The offer of a cardinal's hat by Pope Paul III. took him in 1539 again to Rome, where he renounced the study of classical litera- ture and devoted himself to theology and classical history, recelving before long the reward of his conversion in the shape of the bishoprics of Gubbio and Bergamo. He died on the 18th of January 1847. Bembo, as a writer, is the beau ideal of a purist. The exact imitation of the style of the genuine classics was the highest perfection at. which heaimed. This at once prevented the graces of spontaneity and secured the beauties of artistic elaboration. One can- not fail to be struck with the Ciceronian cadence that guides the movement even of his Italian writings.

His works include a History of Venice from 1487 to 1513, dia- logues, poems, and what we would now call essays. Perhaps the most famous are a little treatise on Italian prose, and a dialogue entitled Gi Asolani, in which Platonic affection is explained and recommended in a rather long-winded fashion, to the amusement of the reader who remembers the relations of the beautiful Morosina with the author. The edition of Petrarch's Italian Poems, published by Aldus in 1501, and the Zerzerime, which issued from the same press in 1502, were edited by Bembo, who was on intimate terms with the great typographer. See Operede P. Bembo, Venice, 1729; Casa, Vita di Bembo, in 2d vol. of his works.

BENARES, a division, district, and city of British India, under the jurisdiction of the Lieutenant-Governor of the N.W. Provinces. EBrnares Division lies between 24° and 28° N. lat., and 82° and 85° E. long. It is bounded on the N. by Oudh, the Dudb, and Bundelkhand ; on the E. by Nepal; on the 8. by Bengal; and on the W. by Riwa. It comprises the districts of Mirzdpur, Ghazipur, Azimgarh, Basti, and Gorakhpur ; has an area of 18,314 square miles ; and a total population in 1872, of 8,178,147, of whom 7,286,415, or 89:1, were Hindus ; 889,335, or 10°9, Mahometans; 1797 Christians and others.

Benares, a District of British India, in the division of the same name, under the jurisdiction of the Lieutenant- Governor of the N.W. Provinces, lies between 25° 7’ and 25° 32’N. lat., and 82° 45’ and 83° 38’ E. long. It is bounded on the N. by the British district of Jaunpur, on the N E. by Ghazipur, on the 8,E, by Shéhabad, on the S. and S.W. by Mirzdpur, and on the W. by Mirz4pur and Jaunpur. The surface of the country is remarkably level, with nume- rous deep ravines in the calcareous conglomerate. This substratum when burnt affords good lime, and forms an excellent material for roads in its natural state. The soil is a clayey or a sandy loam, and very fertile, except in the tracts called Usur, which are impregnated with soda, nitre, and other salts.

Principal rivers—the Ganges ; the Karamnas4, which separates Benares district from that of Shahabad ; the Gumtt, separating it from Jaunpur and Ghazipur; the Barna-ndla, which falls into the Ganges near Benares city. Area, 996°19 square miles, of which 738 are under cultivation, 33°39 cultivable but not actually under cultiva-

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tion, and the rest uncultivable waste. Population in 1872, 793,699, —0 percent. being Hindus, 10 per cent. Mahometans, and Chris- tians, &c., numbering 345. Principal crops—wheat, barley, pulsc of various kinds, millet, maize, oil-seeds, tobacco, safflower, opium, sugar-cane, and castor-oil sced. Manufactures — sugar, opium, indigo, cotton cloth, coarse woollens, silk, and leather. Principal roads—(1), From Calcutta to Benares, and thence towards Alla- habad ; (2), a continuation of the Calcutta road through the town of Benares to the Sikro! cantonment, and thence towards Jaunpur ; (8), from Ghazipur to Mirzapur by Sikrol; and (4), from Benares city to Chanar. The East Indian Railway passes through the district, and the Ganges is navigable all the year round. Gross revenue in 1870-71, £140,617, of which £89,286, or 63 per cent., was derived from land. In 1872-73 the district contained 542 schools, attended by 12,782 pupils. Only two towns in the district contain above 5000 inhabitauts, viz., Benares and Ramnagar. The climate of Benares is cool in winter, but very warm in the

hot season. Mean temperature in 1872, 77°6° Fahr.; average annual rainfall for the nine years ending 1872, 34°03 inches.

From a very remote period Benares formed the seat of a Hindu kingdom, said to have been founded by one Kasi Raja, 1200 years B.c. Subsequently it became part of the kingdom of Kanauj, which in 1193 a.p. was conquered by Muhammad of Ghor. On the downfall of the Pathan dynasty of Dehli, about 1599, it was incorporated with the Mughul empire. On the dismemberment uf the Dehli empire it was seized by Safdar Jang, the Nawab Vazir of Oudh, by whose grandson it was ceded to the East India Company by the treaty of 1775. The subsequent history of Benares contains two important events,—the rebellion of Chait Sinh, occasioned by the unjust demands of Warren Hastings for money to carry on the Marhatté war; and the mutiny of the Native regiments in 1857, on which occasion the energy and coolness of the European officials (chiefly of General Neill) carried the district successfully through the storm.

BENARES, the most populous city in the North-Western Provinces, and the headquarters of the commissioner of the division, is situated on the north bank of the Ganges, in 25° 7' N. lat. and 83° 4' E. long. According to the census of 1872, the population amounted to 175,188, viz., 89,763 males, and 85,425 females,—133,549, or 76:23 per cent. being Hindus; 41,374, or 23°77 per cent., Mahometans ; others, 265, Gross municipal income in 1871, £16,069 ; expenditure, £14,331; average rate of municipal taxation, ls. 10d. per head.

_ The town of Benares—the religious centre of Hinduism —is one of the most ancient cities on the globe. The Rev. Mr Sherring, in his Sacred City of the Hindus (1868), states—" Twenty-five ceuturies ago, at the least, it was famous. When Babylon was struggling with Nineveh for supremacy, when Tyre was planting her colonies, when Athens was growing in strength, before Rome had become known, or Greece had contended with Persia, or Cyrus had added lustre to the Persian monarchy, or Nebuchadnezzar had captured Jerusalem and the inhabitants of Judea had been carried into captivity, she had already risen to great- ness, if not to glory. Nay, she may have heard of the fame of Solomon, and have sent her ivory, her apes, and her peacocks to adorn his palaces; while partly with her gold he may have

overlaid the temple of the Lord." Hiouen Thsang, the celebrated Chinese pilgrim, visited Benares in the 7th century a.p., and described it as containing thirty Buddhist monasteries, with about 3000 monks, and about a hundred temples of Hindu gods. Even after the lapse of so great a time the city is still in its glory, and as seen from the river it presents a scene of great picturesqueness and grandeur. The Ganges here forms a fine sweep of about 4 miles in length, the city being situated on the outside of the curve, on the northern bank of the river, which is the most elevated. It is about 3 miles in length, by 1 in breadth, rising from the river in the form of an amphitheatre, and is thickly studded with domes and

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minarets. The bank of the river is entirely lined with stone, and there are many very fine ghdts or landing-places built by pious devotees, and highly ornamented. These are generally crowded with bathers and worshippers. Shrines and temples line the bank. The internal streets are so winding and narrow that there is not room for a carriage to pass, and it is difficult to penetrate them even on horseback. Their level is considerably lower than the ground-floors of the houses, which have generally arched rows in front, with little shops behind them ; and above these they are richly embellished with verandahs, galleries, projecting oriel windows, and very broad over-hanging eaves supported by carved brackets. The houses are built of Chandar stone, and are lofty—none being less than two stories high, most of them three, and several of five or six stories. The Hindus are fond of painting the outside of their houses a deep red colour, and of covering the most conspicuous parts with pictures of flowers, men, women, bulls, elephants, and gods and goddesses in all the multiform shapes known in Hindu mythology. The number of temples is very great; they are mostly small, and are placed in the angles of the streets, under the shadow of the lofty houses. Their forms are not ungraceful, and many of them are covered over with beautiful and elaborate carvings of flowers, animals, and palm branches, rivalling in richness and minuteness the finest specimens of Gothic or of Grecian architecture.

Benares, having from time immemorial been a holy city, contains a vast number of Bréhmans, who either subsist by charitable contributions, or are

supported by endowments in the numerous religious institutions of the city. Hindu religious mendicants, with every conccivable bodily deform- ity, literally line the principal strects on both sides. Some have their legs or arms distorted by long continuance in one position ; others have kept their hands clenched until the finger nails have pierced entirely through their hands. But besides an immense resort to Benares of poor pilgrinis froin every part of India, as well as from Thibet and Burmah, numbers of rich Hindus, in the decline of life,. retire thither to pass the remainder of their days, or temporarily to wash away their sins in the sacred water of the Ganges. These devotees lavish large sums in indis- criminate charity, and it is the hope of sharing in such pious distributions that brings together the concourse of religious mendicants from all quarters of the country.

Besides its religious interest, Benares is important as a wealthy city and a place of considerable trade ; the bazdrs are filled with the richest goods, and there is a constant bustle of business in all the principal streets. A large trade is carried on in the sugar, saltpetre, and indigo which are produced in the district. Silk and shawls are manu- factured in the city ; and Benares is especially famous for its gold embroidered cloths, called Kinkdb (Kincob), and for its gold filagree work. A large quantity of English piece goods here finds a market, being either sold for consumption in the neighbourhood, or sent to other parts of the country. The principal English institution in Benares is the Govern- ment or Queen's College, as it is called, conducted by a staff of professors from England. There are two distinct and separate departmevits in the college—Sansknt and English. The Sanskrit college was founded by Governinent in 1791. There are three missions in Benares—the Church of England, the London, and the Baptist Missionary Society. The mission in connection with the Church of England was established in 1817. The mission has a church capable of holding between 300 and 400 persons, two normal schools for training Christian teachers, a large college, and several girls' schools. The mission of the London Missionary Society was inaugurated in 1821, and is situated in the suburbs of the city. A substantial church was. erected

about 1846. The mission of the Baptist Missionary Society was founded in 1817, originally as an outpost of the Serampur mission. It maintains an orphanage for the support and education of native children. With regard to the civil station, which is situated a short distance from the town, Mr Sherring says,—

*‘*The foreign residents of Benares live chiefly at Sikrol, an exten- sive suburb on the north-west side of the city. This station is divided by the Barna River, to the south of which the greater por- tion of the military cantonments, and buildings connected therewith, are situated, and likewise the Knglish church, Government college, medical hall, the old mint, the residence of the Maharaja of Benares, the missionaries of the Church of England and of the London and the Baptist Societies, the courts of the civil and sessions judge, the deputy-judge, and the judge of small causes. ‘I’o the north of the river are the houses of the civil officers of Government, the courts of the commissioner of the division, and of the collector and other magistrates of the district ; several bungalows inhabited by deposed Rajas and other natives ; the Wards’ Institution, for the residence of sons of native noblemen under special charge of Government, and while pursuing their studies at Queen’s College; the beautiful public gardens, supported by subscription ; the swimming bath ; the jail, in which as many as 1700 prisoners are sometimes confined ; the lunatic asylum, with 110 patients ; the blind and leper asylum, with 130 inmates, founded in 1825 by Raja Kali Sankar Ghoshal; and the cemetery. A hospital and four dispensaries are situated in various of the city, and afford gratuitous relief to numerous patients*

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BENAVENTE, a decayed town of Spain, in the pro- vince of Zamora, situated on a gentle eminence near the River Esla. It formerly gave title to the Pimentals, a powerful family of counts, which is now merged in that of the dukes of Osufia. The ancient castle still exists in a ruinous condition. Among the numerous churches, for which the town was once remarkable, are Santa Maria del Azogue, dating from the 12th and 13th centuries, and San Juan del Mercado, which once belonged to the Kuights-Templars, and

still contains some very old sepul- chral monuments. Silk-spinning is carried on by the inhabitants, who number 4536.

BENBOW, Joun, English admiral, the son of a Shropshire gentleman, was born at Shrewsbury about 1650. He went to sea when very young, and at the age of thirty became master of a merchantman. When trading to the Mediterranean in 1686, he beat off a Sallee pirate with such bravery that James IT., who took a keen interest in ships and seamen, made him captain of a man-of-war. On the accession of William III. he was employed to protect English commerce in the Channel, a duty which he vigilantly discharged. After taking part with great intrepidity in the bombardment of St Malo (1693), and superintending the blockade of Dunkirk (1696), he sailed in 1698 for the West Indies, where he compelled the Spaniards to restore several English vessels which they had seized. On his return he was appointed vice-admiral, and was frequently consulted by the king. In 1701 he was sent again to the West Indies, a station declined by his seniors from fear of the French strength in these waters. In August 1702 his ship, the " Breda," gave chase off Santa Martha to a French squadron under Du Casse; and although unsupported by his consorts, he kept up a running fight for five days with the most stubborn courage. While boarding the sternmost French vessel he received two severe wounds ; and shortly afterwards his right leg was shattered by a chain-shot, despite which he remained on the quarter- deck till morning, when the flagrant disobedience of the captains under him, and the disabled condition of his ship, forced him reluctantly to abandon the chase. After his return to Jamaica, where his subordinates were tried by court-martial, he died of his wounds on November 4, 1702. He possessed inflexible resolution and great naval skill, and secured his high rank through his unaided merits. (Of. Yonge's Hist. of the British Navy, vol. i.; Campbell's British Admirals, vol. iii.)

BEN—BEN

BENCH, or Banc, has various legal significations.

FREE-BENCH signifies that estate in copyhold-lands which the wife, being espoused a virgin, has, after the decease of her husband, for her dower, dum sola et casta fuerit, according to the custom of the manor. With respect to this free-bench different manors have different customs.

QUEEN's BENcH is one of the three superior courts of Common Law at Westminster, the others being the Conimon Pleas and the Exchequer. Although for many years these tribunals have possessed co-ordinate jurisdiction, there are a few cases in which each possesses exclusive authority, and in point of dignity precedence is given to the Court of Queen's Bench, the Lord Chief-Justice of which is also styled Lord Chief-Justice of England, and is the highest permanent judge of the Crown. All three courts trace their origin to the aula regia. The Court of Exchequer attended to the business of the revenue, the Common Pleas to private actions between citizens, and the Queen's Bench retained criminal cases and such other jurisdiction as had not been divided between the other two courts, By 11 Geo. IV. and 1 Will. IV. c. 70, § 8, the Court of Exchequer Chamber was constituted as a court of appeal for errors in law in all three courts. Like the Court of Exchequer the Queen's Bench assumed, by means of an ingenious fiction, the jurisdiction in civil matters, which properly belonged to the Common Pleas. The functions peculiar to the Queen's Bench are its jurisdiction in criminal matters, and the general control it exercises over inferior magistrates and other public officers. Of late years the court has consisted of one Lord Chief-Justice and five puisne judges. Under the Judicature Act, 1873, the Court of Queen's Bench becomes the Queen's Bench Division of the High Court of Justice; and appeals will in future be taken to the Court of Appeal instead of the Exchequer Chamber.

The Court of Common Pleas is sometimes called the Common Brncu.

Sittings in Bane (in the courts of Common Law) are the sittings of the full court for the hearing of motions, special cases, &c., as opposed to the nist prius sittings for trial of facts, where usually only a single judge presides,

BENCHERS, in the Inns of Court, the senior members of the society, who are invested with the government of the body to which they belong.

BENCOOLEN, the chief town of a Dutch residency in the S.W. of Sumatra. It is situated on the coast at the mouth of a river of the same name, in 3° 50' S. lat, and 102° 3'. E. long. The locality is low and swampy, and most of the houses are raised on bamboo piles. The bay is a mere open roadstead fringed with coral reefs, and landing is difficult on account of the surf. A lighthouse has been recently erected by the Dutch authorities. At one time

there was a very exteusive trade carried on with Bengal, the Coromandel coast, and Java, but it has greatly declined. The principal exports are pepper and camphor. The town, which was formerly 6 miles to the north, was removed to its present site in 1714. It is defended by a fort ; and possesses an old and a new government-house, a council chamber and treasury, a hospital, &c. The church was destroyed by an earthquake in 1833. Bencoolen was formerly the chief establishment possessed by the English East India Company in the island, and for a few years constituted a distinct presidency. In 1719 the settlers were expelled by the natives, but were soon per- mitted to return. In 1760 all the English settlements on the coast of Sumatra were destroyed by a French fleet under Comte d'Estaing. They were afterwards re-estab- lished and secured to the British ; but in 1825 they were finally ceded to the Netherlands in exchange for the Dutch settlements on the continent of India. Population of the district in 1871, 160 Europeans and 128,343 natives.

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BEN—BEN

BENDER, a town of Russia, the capital of a district in the province of Bessarabia, situated on the right bank of the Dniester, 35 miles from Kisheneff, in 46° 49' N. lat. and 29° 29' E. long. It possesses three Greek churches, a Roman Catholic church, a dissenting place of worship, four synagogues, and a mosque. Its industrial establish- ments include a tobacco-factory, candle-works, and brick- kilns. An important trade is carried on by means of its harbour on the Dniester and the road that leads to Odessa, — the greater part of the ships discharging their cargoes here to be conveyed by land to Odessa and Jassy. 'The prin- cipal articles of trade are corn, wine, wool, cattle, tallow, and especially timber, which is floated down the Dniester. The citadel is separated from the town by an eminence, which bears the name of the Suwaroff mound ; in its eastern part is a wooden castle with towers. There are also four suburbs to the town, which in 1867 had a population of 24,443, the greater proportion of them being Jews. As early as the 12th century the Genoese had a settlement on the site of Bender. The Moldavians called the place Teegeen, and the name of Bender was only bestowed by the Turks in the end of the 14th century. In

1709 Charles XIL, after the defeat of Poltava, collected his forces here in a camp which they called New Stockholm, and continued there till 1711. Bender was thrice taken by the Russians,— by Panim in 1770, Potemkin in 1789, and Meyendorf in 1806,—but it was not held permanently by Russia till the Bucharest peace of 1812.

BENDER-ABBASI, a town of Persia in the province of Kirman, on the northern shore of the Persian Gulf, in 27° 13' N. lat. and 56° 7' E. long., about 12 miles N,W. of the island of Ormuz. It is surrounded with walls, but the houses are of a very poor description. The old Dutch factory is still standing, and serves as the occasional resi- dence of the Imam of Mascat, to whose domain the town belongs. There is a comparatively small trade in the export of tobacco and fruits and the import of cotton-cloth and pottery. The port is shallow and inconvenient; and it is evident that changes of the coast line by silting up and denudation have considerably altered the character of the place since the time when, under the name of Gombrcen, it ranked as one of the first seaports of Persia. In 1612 the Portuguese had established Fort Komoran here, but it was destroyed in 1614, and they were expelled by Shah Abbas I. The English, however, were permitted to build a factory, and about 1620 the Dutch obtained the same privilege. On the capture of the island of Ormuzin 1622 by the English and Persians, a large portion of its trade was diverted to the town, which derived its name of Bender- Abbasi, or Harbour of Abbas, from the shah. During the rest of the 17th century the traffic was very great, all the neighbouring nationalities and merchants from the principal countries of Europe frequenting its markets ; but in the 18th century this prosperity declined, and most of the trade was removed to Bushire. In 1759 the English factory was destroyed by the French ; and though it was afterwards re-established, it has long been abandoned. The ruins of the factory and other buildings lie to the west of the present town. Population about 9000.

BENEDICT, Sr, the founder of the celebrated Bene- dictine order, is the most illustrious name in the early history of Western monasticism. To him more than to any other the monastic system, which was destined to exercise such an influence for centuries, owes its extension and organization. Benedict was born at Nursia in Umbria about the year 480. He belonged toan old Italian family, and was early sent to Rome to be educated. But the

disorder and vices of the capital drove him into solitude while still a youth. It was a time of public peril and social ruin. 'The Roman empire was crumbling to pieces,

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shaken by the successive inroads of barbarians, and a prey to every species of violence and corruption. Young Bene- dict fled from the wickedness around him. He gave up his literary studies and preferred to be wisely ignorant (scienter nesciens), This is the statement of his biographer Gregory the Great, from whom come all the details that we know of Benedict's life. It is needless to say that many of these details are of such a character that it is impossible fur modern historical criticism to accept them in their literal meaning. It is of no use, however, trying to disentangle the truth from the falsehood. 'The reader can easily make allowance for the imaginative exaggerations of the story.

When Benedict fled from Rome he took refuge in a solitary gorge formed by the Anio, in its picturesque course, about 40 miles from the city. There, in a dark inacces- sible grotto near Subiaco, he found seclusion and shelter. A neighbouring monk supplied him with food let down by a rope, with a small bell attached, which gave notice of the approach of the food. Once the devil broke the rope, but his malice was foiled by the pious ingenuity of the monk. Other and graver dangers assailed him. The Evil Oue took the shape of a beautiful woman, with whose image the youthful recluse had been familiar in Rome, and so worked upon his senses that he was on the point of abandoning his solitude in search of the beauty which haunted him. But summoning all his fortitude he stripped himself of the vestment of skins which was his only covering, rushed naked amongst the thorns and briars which grew around his retreat, and rolled himself amongst them till he had extinguished the impure flame which devoured him. No impulses of sensual passion ever revisited him. But trials of a different kind assailed him. After spending about three years in retirement a neighbour- – ing convent of monks insisted upon choosing him as their head. He warned them of the severity of the rule he would be bound to exercise, but they would not be dissuaded from their purpose. Hehad hardly commenced his office, however, when they broke out into fierce resent- ment against him, and

attempted to poison him, The cup containing the poison was no sooner taken into the hands of Benedict than it burst asunder; and, calmly reproving them for their ingratitude, he left them and withdrew once nore into his solitude.

By this time, however, the fame of Benedict had spread, and it was impossible for him to remain inactive. Multi- tudes gathered around him, and no fewer than twelve select cloisters were planted in the lonely valley of the Anio and on the adjacent heights. Young patricians from Rome and elsewhere were attracted to these fraternities ; and amongst them one of the name of Maurus (St Maur), who began to share in popular esteem something of the sanctity and miraculous endowments of Benedict, and who was destined to be his successor. But with increasing fame came also jealousy of his position and duties. A renewed attempt was made by an envious priest to administer poison to the saint; and, miraculous interposi- tions having again come to his rescue, the same priest, by name Florentius, had recourse to the diabolical device of sending seven lewd girls within the precincts of the monastery, to seduce the monks by their gestures and sports. Benedict determined to depart from a neighbour- hood so full of danger, notwithstanding the long period of thirty years during which he had laboured to consecrate it and spread abroad the blessings of an ascetic Christianity. He journeyed southwards, and at length settled at Monte Cassino, an isolated and picturesque hill near the source of the Liris. There at this time an ancient temple of Apollo still stood, to which the ignorant peasants brought their offerings. Benedict, in his holy enthusiasm, proceeded

to demolish the temple and to erect in its place two oratories, one to St John the Baptist and the other to St Martin, whose ascetic fame had travelled to Italy from the south of Gaul. Around these sacred spots gradually rose the famous monastery which was destined to carry the name of its founder through the Christian world, and to give its laws, as Milman says, "to almost the whole of Western monasticism."

Benedict survived fourteen years after he had began this great work. His sanctity and influence grew with his years, in illustration of which it is told

how the barbarian king Totila, who made himself master of Rome and Italy, sought his presence, and, prostrating himself at his feet, accepted a rebuke for his cruelties, and departed a humbler and better man. His last days were associated with the love and devotion of his sister Scolastica, who too had forsaken the world and given herself to a religious life with an enthusiasm and genius for government hardly less than his own. She had established a nunnery near Monte Cassino ; but the rules of the order permitted the brother and sister to meet only once a year. He had come to pay his accustomed visit. They had spent the day in devout converse, and, in the fulness of her affection, Scolastica entreated him to remain, and " speak of the joys of heaven till the morning." Benedict was not to be prevailed upon, when his sister burst into a flood of tears, and bowed her head in prayer. Immediately the heavens became overcast ; thunder was heard, and the rain fell in torrents, so that it was impossible for Benedict to depart for the night, which was spent in spiritual exercises. Three days later Benedict saw in vision the soul of his sister entering heaven, and in a few days afterwards his own summons came. He died standing, after partaking of the holy communion, and was buried by the side of his sister.

The Benepictines, or followers of St Benedict, were those who submitted to the monastic rule which he insti- tuted. This rule will be generally described in the article on Monasticism. It is sufficient to say here that its two main principles were labour and obedience. It was the dis- tinction of Benedict that he not mcrely organized the monks into communities, but based their community-life, in a great degree, on manual labour, in contrast to the merely medi- tative seclusion which had hitherté been in vogue both in the East and the West. Probably, not even the founder himself foresaw all the prospective advantages of his law, which was destined not merely to make many a wilder- ness and solitary plave to rejoice with fertility, but to ex- pand, moreover, into a noble intellectual fruitfulness, which has been the glory of the Benedictine order. The law of obedience was absolute, but was tempered by the neces- sity on the part of the superior of consulting all the monks assembled in a council or chapter upon all important business. The abbot or superior was also elected by all the monks, whose liberty of choice was unrestricted. No right of endowment properly subsisted within the mon- astery ; and the vow of stability once undertaken after the expiry of the year of novitiate could never be recalled. Food and clothing were of the simplest

kind, and all duly regulated ; and the intervals of labour were relieved by a continually recurring round of religious service from prime to evensong. The Benedictine rule spread almost univer- sally in the West,—not in rivalry of any other rule, but as the more full and complete development of the monastic system. In France and England especially it took rapid root; and "in every rich valley, by the side of every clear and deep stream, arose a Benedictine abbey"—a centre of local good and Christian civilization. See ABBEY. (ae)

a BENEDICT. Fourteen popes bore the name of Bene- ict—

Benepict I. (573-8) succeeded John III., and occupied

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the Papal clair during the incursions of the Lombards, and during the series of plagues aud famines which followed these invasions. (Paul. Diacon., De Gest. Longob., 11. 10.)

Benepict II, (684-685) succeeded Leo IT., but although chosen in 683 he was not ordained till 684, because the lzave of the Emperor Constantine was not obtained until some months after the election. (Paul. Diacon., op. cit. vi. 53.)

Benepict III. (855-858) was chosen by the clergy and people of Rome, but the election was not confirmed by the Emperor Lothair, who appointed an anti-pope, Anastasius. Benedict was at last successful, and the schism helped to weaken the hold of the emperors upon the popes. The mythical Pope Joan is usually placed between Benedict and his predecessor Leo IV.

Benepict IV. (900-903).

Benepict V. (964-965) was elected by the Romans on the death of John XII. The Emperor Otho did not approve of the choice, and carried off the pope to Hamburg, where he died.

Benepict VI. (972-974) was chosen with great cere- mony and installed pope under the protection of the Emperor Otho the Great. On the death of

the emperor the turbulent citizens of Rome renewed their outrages, and the pope himself was strangled by order of Crescentius, the son of the notorious Theodora.

Benepict VII. (975-983) belonged to the noble family of the counts of Tusculum, and governed Rome quietly for nearly nine years, a somewhat rare thing in those days.

Benepict VIII. (1012-1024), also of the family of Tusculum, was opposed by an auti-pope, Gregory, who compelled him to flee from Rome. He was restored by Henry of Saxony, whom he crowned emperorin 1014. In his pontificate the Saracens began to attack the southern coasts of Europe, and effected a settlement in Sardinia. The Normans also then began to settle in Italy.

Benepict IX. (1033-1056), the son of Alberic, count of Tusculum, and nephew of Benedict VIII., obtained the Papal chair by simony. He was deposed in 1044, and Sylvester was chosen in his stead. The result was a long and disgraceful schisin (cf. Mittler, De Schismate in Eccl. Rom. sub Pontif. Bened. IX.)

Benepicr X. (1058-9) scarcely deserves to be reckoned a pope. He reigned nine months. It is important, how- ever, to remember that his election is one of the latest made by Roman factions, and under his successor the mode of election by the cardinals was adopted.

Benepict XI, (1303-1304) succeeded the famous Boni- face VIII., but was unable to carry out his Ultramontane policy. He released Philip the Fair of France fron the excommunication laid on him by Boniface, and practically ignored the bull Unam Sanctam. The popes who imme- diately succeeded him were completely under the influence of the kings of France, and removed the Papal seat from Rome to Avignon.

Benepict XII. (1334-1342) succeeded Pope John XXII, but did not carry out the policy of his predecessor. He practically made peace with the Emperor Louis, and as far as possible came to terms with the Franciscans, who were then at war with the Roman see. He was a reforming pope, and tried to curb

the luxury of the monastic orders, but without much success. (Baluze, Vita Pontif. Avenion., 1.)

Benepict XIII. Two popes assumed this title—(1.) Peter de Luna, a Spaniard, who was chosen by the French cardinals on the death of Clement VII. in 1394. On the death of Urban V. in 1389 the Italian cardinals had chosen Boniface [X.; the election of Benedict therefore perpetuated the great schism. The greater portion of the church refused to recognize him, and in 1397 the French Church, which had supported him, withdrew from allegiance to both popes, and in 1398 Benedict was imprisoned in his own palace at

Avignon. The Council of Constance brought this state of matters to an end. Bencdict abdicated in 1417, but was recognized by Scotland and Spain until his death in 1424. His name does not appear in the Italian list of popes, (Cf. Dupuy, Mist. du Schisme, 1378-1428). (2.) Vincenzo Marco Orsini, who succeeded Innocent XIII. in 1724. He at first called himself Benedict XIV., but afterwards altered the title. He was a reforming pope, and endeavoured to put down the luxury of the Italian priesthood and of the cardinalate. He died in 1730.

Benepict XIV. (1740-1758) belonged to a noble family of Bologna. Elected to the Papal chair in a time of great difficulties, chiefly caused by the disputes between Roman Catholic nations about the election of bishops, he managed to overcome most of them. The disputes of the Holy See with Naples, Sardinia, Spain, Venice, and Austria were settled. Perhaps the most important act of his pontificate was the promulgation of his famous laws about missions in the two bulls, Luv quo singulari and Omnium solicitu- dinum. In these bulls he denounced the custom of accom- modating Christian words and usages to express heathen ideas and practices, which had been extensively done by the Jesuits in their Indian aud Chinese missions. The consequence of these bulls was that most of the so-called converts were lost to the church.

BENEFICE, a term first applied under the Roman empire to portions of land, the usufruct of which was granted by the emperors to their soldiers or

others for life, as a reward or benejicium for past services, and as a retaincr for future services. A list of all such beneficia was recorded in the Book of Benefices (Liber Beneficiorum), which was kept by the principal registrar of benefices (Primiscrinius Bene- jiciorum). In imitation of the practice observed under the Roman empire, the term came to be applied under the feudal system to portions of land granted by a lord to his vassal for the maintenance of the latter on condition of his rendering military service; and such grants were originally for life only, and the land reverted to the lord on the death of the vassal. In a similar manner grants of land, or of the profits of land, appear to have been made by the bishops to their clergy for life, on the ground of some extraordinary merit on the part of the grantee. The validity of such grants was first formally recognized by the Council of Orleans, 511 a.p., which forbade, how- ever, under any circuinstances, the alienation from the bishoprics of any lands so granted. The next following Council of Orleans, 533, broke in upon this principle, by declaring that a bishop could not reclaim from his clergy any grants made to them by his predecessor, except- ing in cases of misconduct. This innovation on the ancient practice was confirmed by the subsequent Council of Lyons, 566, and from this period these grants ceased to be re- garded as personal, and their substance became annexed to the churches,— in other words, they were henceforth enjoyed jure tituli, and no longer jure personal. How and when the term beneficia came to be applied to these episcopal grants is uncertain, but they are designated by that term in a canon of the Council of Mayence, 813.

The term benefice, according to the canon law, implies always an ecclesiastical office, propter quod bene- Jicium datur, but it does not always imply a cure of souls. It has been defined to be the right which a clerk has to enjoy certain ecclesiastical revenues on condition of dis- charging certain services prescribed by the canons, or by usage, or by the conditions under which his office has been founded. 'These services might be those of a secular priest with cure of souls, or they might be those of a regular priest, a member of a religious order, without cure of souls ; but in every case a benefice implied three things : 1. An obligation to discharge the duties of an office, which

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is altogethe1 sviritual; 2. The right to enjoy the fruits attached to that office, which is the benefice itself ; 3. The fruits themselves, which are the temporalities. By keep- ing these distinctions in view, the right of patronage in the case of secular benefices becomes intelligible, being in fact the right, which was originally vested in the donor of the temporalities, to present to the bishop a clerk to be admitted, if found fit by the bishop, to the office to which those temporalities are annexcd. Nomination or presenta- tion on the part of the patron of the benefice is thus the first requisite in order that a clerk should become legally entitled to a benefice. The next requisite is that he should be admittcd by the bishop as a fit person for the spiritual office to which the benefice is annexed, and the bishop is the judge of the sufficiency of the clerk to be so admitted. By the early constitutions of the Church of England a bishop was allowed a space of two months to inquire and inform himself of the sufficiency of every presentee, but by the ninety-fifth of the canons of 1604 that interval has been abridged to twenty-eight days, within which the bishop must admit or reject the clerk. If the bishop rejects the clerk within that time he is liable to a duplex guerela in the ecclesiastical courts, or to a quare umpedit in the common law courts, and the bishop must then certify the reasons of his refusal. In cases where the patron is himself a clerk in orders, and wishes to be admitted to the benefice, he must proceed by way of peti- tion, instead of by deed of presentation, reciting that the benefice is in his own patronage, and petitioning the bishop to examine hin and admit him. Upon the bishop having satisfied himself of the sufficiency of the clerk, he proceeds to institute him to the spiritual office to which the benefice is annexed, but before such institution can take place, the clerk is required to make a declaration of assent to the Thirty-nine Articles of Religion and to the Book of Common Prayer according to a form pre- scribed in the Clerical Subscription Act, 28 and 29 Vict. c. 122, to make a declaration against simony in accord- ance with that Act, and to take and subscribe the oath of allegiance according to the form in 31 and 32 Vict. c. 72. The bishop, by the act of institution, commits to the clerk the cure of souls attached to the office to which the benefice is annexed. In cases where the bishop himself is patron of the benefice, no presentation or petition is requircd to be tendered by the clerk, but the bishop having satisfied himsclf of the sufficiency of the clerk, collates him to the benefice and office. It is not necessary that the bishop himself should personally institute or collate a clerk, he may issue a fiat to his vicar-general, or to a

special commissary for that purpose. After the bishop or his commissary has instituted the presentee, hc issues a mandate under seal, addressed to the archdeacon or som? other neighbouring clergyman, authorizing him to induct the clerk into his benefice,—in other words, to put him into legal possession of the temporalities, which is done by some outward form, and for the most part by delivery of the bell-rope to the clerk, who thereupon tolls the bell. This form of induction is required to give the clerk a legal title to his " beneficium," although his admission to the office by institution is sufficient tv vacate any other benefice which he may already possess.

By the Lateran Council of 1215, which was received by the Church of England, no clerk can hold two benefices with cure of souls, and if a beneficed clerk shall take a second benefice with cure of souls, he vacates ipso facto his first benefice. Dispensations, however, could be easily obtained from Rome, before the reformation of the Church of England, to enable a clerk to hold several ecclesiastical dignities or benefices at the same time, and by 25 Henry VIII. c. 21, the power to grant such dispensations, which had been exercised previously by the court of Rome, was

transferred to the archbishop of Canterbury, certain ecclesi- astical persons having been declared by a previous statute (21 Henry VIIL. c. 13) to be entitled to such dispensations. The system of pluralitics carried with it, as a necessary consequence, systematic non-residence ou the part of many incumbents, and delegation of their spiritual duties in respect of their cures of souls to assistant curates. The evils attendant on this system were found to be so great that in 1838 an Act of Parliament, 1 and 2 Vict. c. 106, was passed to abridge the holding of benefices in plurality, and it was enacted that no person should hold under any circumstances more than two benefices, and this privilege was made subject to the restriction that his benefices were within ten statute miles of each other. By a subsequent Act, 13 and 14 Vict. c. 98, the restriction has been further narrowed, and no spiritual person may now hold two bene- ficcs except the churches of such benefices are within three miles of each other by the nearest road, and the annual value of one of such benefices does not exceed one hundred pounds.

By this statute the term benefice is defined to mean benefice with curc of souls and no other, and therein to comprehend all parishes, perpetual curacies, donatives, endowed public chapels, parochial chapelries, and chapelries or districts belonging or reputed to belong, or annexed or reputed to be annexed, to any church or chapel.

A benefice is avoided or vacated-—1, by death ; 2, by resignation, if the bishop is willing to accept the resignation; 3, by cession, upon the clerk being instituted to another benefice or some other prefer- ment incompatible with it; 4, by deprivation and sentence of an ecclesiastical court ; 5, by act of law in consequence of simony ; 6, by default of the clerk in neglecting to rea:l publicly in the church the Book of Common Prayer, and to declare his assent thereto Ae months after his induction, pursuant to 13 and 14 Car.

- Cc Vi.

The ainiet of benefices with or without cure of souls in the Church of England, before the first statute to abridge pluralities was passed in 1838 (1 and 2 Vict. c. 106), was about 11,000, 'I'hese benefices were served by some 10,000 clergy, of whom rather more than 5000 were incumbents holding one or more livings, and some of them altogether non-resident ; the remainder were assistant curates, for the most part residing in one parish and having full charge of another. The effect of the Pluralities Act in the course of about 30 years has been to produce a remarkable and most salu- tary chang:. It was computed in 1867 that the parochial benetices were 12,888 in number, and the parochial clergy 17,869, of whom 4981 only were assistant-curates, The patronage of 6403 of these benefices was in private hands, whilst the patronage of 6485 was at the disposal of the Crown, or of public bodies or public functionaries. An approximate statement of the yearly value of all the benefices in England and Walcs, the number of which has undergone a con- siderable increase since 1867, was drawn up in 1874 by Mr J. K. Aston for a select committee of the House of Lords on Church Patronage. From this statement it appears that the yearly value of all the benefices in public patronage is about £1,825,805, whilst the valne of those in private patronage is about £1,893, 226 ; but in Mr Aston's opinion these estimates are below the actual value. (OP E))

BENEKE, Friepricu Epuarp, a distinguished German psychologist, was born at Berlin on the 17th February 1798. He was educated under Bernhardi at the Gymna sium Fredericianum, and studied at the universities of Halle and Berlin. He directed his attention in the first instance to theology, coming under the influence of Schleiermacher and De Wette, but afterwards to pure philosophy, studying particularly English writers, and the German modifiers of Kantiauism, such as Jacobi, Fries, and Schopenhauer. In 1820 he published his Theory of Knowledge, his Empirical Psychology as the Foundation of all Knowledge, and his inaugural dissertation De Veris Philosophie Initvis. In all these writings appeared very strongly his fundamental view, that philosophical speculation must be limited to the facts of inner experience, and that a true psychology, which is the basis of all knowledge, must be formed by treating these facts according to the rigid methods of physical science. His marked opposition to the philosophy of Hegel, then dominant in Berlin, came

to the front still more clearly in the short tract, Mew Foundation of Metaphysics, intended to be the programme for his lectures as privat-docent, and in the able treatise, Ground-work of a Physic of Hthics, written in direct antagonism to Kant's Metaphysic of Ethics, and attempting to deduce ethical principles from a basis of empirical feel- ing. In the same year (1822) his lectures were prohibited at Berlin, according to his own belief through the influence of Hegel with the Prussian authorities, who also prevented him from obtaining a chair from the Saxon Government. He retired to Géttiugen, lectured there for some years, and was then allowed toreturn to Berlin. In 1832 he received an appointment as Professor Hxtraordinarius in the university, which he continued to hold till his death. On lst March 1854 he disappeared from his home; and some months later his body was found in the canal uear Charlottenburg. There was some suspicion that he had committed suicide in a fit of mental depression.

Beneke was a most prolific writcr, and besides the works men- tioned above, published large treatises in the sevcral departments of philosophy, botli pure and as applied to education and ordinary life. A coniplete list of his

writings will be found in the appendix to Dressler's cdition of the Lehrbuch der Psychologie des Naturwissen- schaft, 1861.

The distinctive peculiarity of Beneke's system consists, first, in the firmness with whicli he maintained, and the eonsistency with which he carried out the proposition, that in empirical psychology is to be found the basis of all philosophy ; and secondly, in his rigid treatment of mental phenomena by the genetic, or, as Professor Bain has ealled it, the natural history method. According to him, tlie formed or perfected mind with its defined faculties is a develop- meut from simple clements, and the first problem of philosophy is the determination of these elements and of the laws or proccsses by which the development takes place. In his Neue Psychologie (essays iii., vili., and ix.), he elearly inarked out his position with regard to his predecessors and conteniporaries, and both there and in the in- troduction to his Lehrbuch, signalized as the two great stages in the progress of psychology the negation of innate ideas by Locke, and of faculties, in the ordinary acceptation of the term, by Herbart. The.next step was made by himself, when he insisted that psycho- logy must be treated as onc of the natural sciences. As is the case with them, its content is given by experience alone, and differs from theirsonly in being the object of the internal as opposed to the ex- ternal sense. But bya scicntific psychology Beneke in no wise meant what is now almost invariably thought of under that designation, a psychology founded on physiology. These two sciences, in his opinion, had quite distinet provinces, and gave no mutual assistance. Just as little help is to be expected from the science of the body as from mathematics and metaphysics, both of which had been pressed by Herbart into the service of psychology. The trne mcthod of study is that applied with so much success in the physical scienccs, — critical examination of the given experience, and reference of it to ultimate eauses, which may not be themselves perceived, bunt are nevertheless hypotheses necessary to account for the facts. (See on method, Newe Psych., essay i.)

Beneke, therefore, starting from the two assumptions that there is nothing, or at least no formed product, innate in the mind, and that definite faculties do not originally exist, and from the fact that our minds nevertheless actually have a definite content and definite modes of action, proceeds to state somewhat dogmatically his scientifically verifiable hypotheses as to

the primitive eondition of the soul, and the laws according to which it develops. Originally the soul is possessed of, or is, an immense variety of powers, faculties, or forces (coneeptions which Beneke, in opposition to Herbart, holds to be metaphysically jnstifiable), differing from one another only in ten- acity, vivacity, receptiv, and grouping. These primitive imma-ity terial forces, so closely united as to form but one being (essence), acquire definiteness or form through the action upon them of stimuli or excitants from the outer world. This action of external impres- sions which are appropriated by the internal powers, is the first fundamental process in the genesis of the completed mind. If the union of impression and faculty be sufficiently strong, consciousness (not seZf-consciousness) arises, and definite sensations and perceptions begin to be formed. These primitive sensations, liowever, are not to be identified with the sensations of the special senses, for each of these senses is a system of many powers which have grown intoa definite unity, have been educated by experience. From various facts of ordinary experience it must be concluded that a second fundamental process is incessantly going on, viz., the formation of new powers of faculties, which takes place principally during ae. The third and most important process results from the fact that the combination between stimulus and power may be weak or strong.

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If weak, then the two elements are said to be movable, and they may flow over from one to another of the already formed psychical products. Any formed faculty does not cease to exist on the re- inoval of its stimulus; in virtue of its fundamental property, ten- acity, it sinks back as a trace (Spur) into unconsciousness, whence it may be recalled by the application to it of another stimulus, or by the attraction towards it of some of the movable elements or newly-formed original powers. These traces and the flowing over of the movable elements are the most iniportant conceptions in Beneke's psychology ; by means of them he gives a rationale of re-production and association, and strives to show that all the formed faculties are simply devclopments from traces of earlier processes. Lastly, similar forms, according to the degree of their similarity, attract one another or teud to form closcr combinations.

All psychical phenomena are explicable by the relation of impres- sion and power, and by the flow of movable elements; the whole process of mental developnient is nothing but the result of the action and interaction of the above simple laws. In general this growth may be said to take the direction of rendering more and more definite by repetition and attraction of like to like the originally indcfinite activities of the primary faculties. Thus the sensations of the special senses are gradually formed from the primary sensuous feel- ings (Sinnliche Hmpfindungen) ; concepts are formed from intui- tions of individuals by the attraction of the common elements, and the consequent flow towards them of movable forms. Jndgment is the springing into consciousness of a concept alongside of an intui- tion, or of a higher concept alongside of a lower. Reasoning is merely a more complex judgment. Nor are there special faculties of judging or reasoning. The nnderstanding is simply the mass of concepts lying in the background of unconscionsness, ready to be called up and to flow with force towards anything closcly connected with them. Kven memory is not a spccial faculty; it is simply the fundameutal property of tenacity possessed by the original faculties. The very distinction between the great classcs, Knowledge, Feeling, and Will, may be referred to elementary differences in the original relations of faculty and impression.

To follow Beneke into the details of any one of his psychological developments would be impossible within moderate compass. It my be sufficient to say, that on nearly all questions concerning the psychical mechanism, his works contain a mass of unusually rich and instructive material. Thcy are particularly deserving of care- ful comparison with the association psychology of modern British thinkers, most of whose results and processes will be found there thoroughly handled and worked into a comprehensive system.

In logic, metaphysics, and ethics, Beneke's speculations are completely dependent on the results of the psychological analysis. Thns thinking has been by him separated into analytical and synthetical. 'The first, which consists essentially in the subsump- tion of one concept undcr another, is the subject of elementary, pure, or formal logic, which, as an art, has to lay down the universal rules according to which such subsumption takes place. Logical reasoning, which adds nothing to our knowledge, but merely clears

it np, is at bottom a substitution of one notion for another. In the elaborate theory of syllogism, founded on this principle, Beneke to some extent anticipates Hamilton's New Analytic. (It cannot, however, be thought that Hamilton borrowed his principle from Beneke, as the latter seems to have suspected ;—sce Dressler's re- mark, Lehrbuch der Psy., 299. The two approached the matter from quite different sides, and the peculiarity of Hamilton's system, the definite, explicit, quantification of the predicate, is by no means necessarily implied in anything said by Beneke.) Synthetical thinking, on the other hand, leads to new knowledge, but in its progress it makes use of principles involving the relation of thought to existence, and which, therefore, find justification in metaphysics. In that science Beneke's fundamental proposition is that in inner experience we cognize things as they are, whereas in outer experience we only know their effects. Real being is given in our intuitions, from which we gradually form a notion of self, and then of other conscious beings like ourselves. The inference to the real existence of external things is an unconscious reasoning, involving the same elements as the inference to the existence of other conscious beings. The relations which give definiteness and universality to experience, such as substance and cause, are known directly in inner experience, in the systematic relations of the several psychical clements, and are transferred by us to outer beings. In this part of his meta- physical theory Beneke owes much to Schleiermacher. _

In his ethical theory, which is worked out with great fulness, and which was, in his own opinion, his most valuable contribution to philosophy, Beneke is thoroughly empirical. The worth of an object is defined to be the degree of pleasurable fecling with which it affects us, and ethical judgments are founded on the relations of worth among the feelings with which we regard objects. There is a gradation of moral worth, because there are higher and lower faculties ; and, as the mental constitutions of all men are funda- mentally alike, this gradation of worth becomes a norm or general tule for estimating moral qualities. An estimate founded on this normal scale appears as morally necessary, or as duty.

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The special value of Beneke's works, as has been already said, consists in the many specimens of acute psychological analysis scattered throughout them. Asa complete explanation of psychical facts, the theory seems singularly defective. The original hypo- theses, peculiar to Beneke and on which the whole depends, are hastily assumed, are never subjected to critical examination, and after all, lke Locke's earlier theory, rest on a clumsy mechanical metaphor. As is the case with all empirical theories of mental development, the higher categories or notions, which are apparently shown to result from the simple elements, are rcally presupposed at every step. Particularly unsatisfactory is the account of conscious- ness, which is said to arise from the union of impression and faculty. The necessity of consciousness for any mental action whatsoever is apparently granted, but the conditions involved in it are never discussed or referred to. So too the explanation of the origin of the notions, substance and cause, always a crucial test for an em- pirical theory, is completcly irreconcilable with the fundamental principle of the system. The same defect appears in the account of ethical judgment; no amount of empirical fact can ever yield the notion of absolute duty. 1t is not, perhaps, to be altogether attri- buted to the ideal character of German speculation, that Bencke has been almost entirely neglected, and that his results have found acceptance mainly with practical teachers. Undoubtedly, for the science of education his minute analysis of tempcrament and care- ful exposition of the means whereby the young, unformed inind may be trained are of infinite value ; but the truth of many of his doc- trines on these points lends no snpport to the fundamental hypo- theses, from which indeed they might be almost entirely severed.

Among German writers, not professed followcrs of Beneke, but who have been largely influenced by him, may be mentioned Ueberweg (particularly in the first part of his Logic) and Fortlage. In England, perhaps the only writer who shows traccs of acquaint- ance with his works is Morell (Introd to Mental Philosophy). 'Nhe most eminent members of the scliool are Dressler (whose Beneke oder Scelenlehre als Noturwissensehaft is an admirable cxposition), Dittes, and Raue. The compendium by the last- nained author has passed through four cditions in Germany, and has been translated into French, Flemish, and English. The English translation, Ele- ments of Psychology, 1871, gives a lucid and succinct view of the whole system. (R. AD.)

BENEVENTO, a city of Italy, the capital of a province, situated on a hill near the confluence of the Calore and the Sabato, 32 miles N.E. of Naples. The town is surrounded by walls, and was formerly defended by a castle of the 12th century, which now contains Government offices and a prison. It occupies the site of the ancient Beneventum, and is largely built of its ruins. Except Rome, few cities can boast of so many remains of antiquity. Of these the most beautiful and perfect is the arch of Trajan, erected in 114 a.v., 53 feet in height, and consisting of a single arch of Parian marble of the Corinthian order, highly orna- mented with basso and alto rilievos, which represent various events in the reign of that emperor. Itnow forms one of the gates of the city (Porta Aurea). Of the amphitheatre the remains, now known as Grottoni di Mappa, are in a very ruinous condition, and the arena is occupied by houses of a mean description. Benevento is the see of a bishop, and has a cathedral of the 12th century in the Lombardo-Saracenic style, in front of which is an. Egyptian obelisk of granite covered with hiero- glyphics. Among its other buildings may be mentioned the town-hall, the diocesan seminary, the lyceum, which was formerly a Jesuit college, and several hospitals. The principal manufactures are leather, parchment, and plated goods. A considerable trade is carried on in grain.

Beneventnm, or, as it was originally called, Maloeis or Maleven- tnm, seems to have beeu of Sanmite foundation. In 268 B.c. it was colonized by the Romans, who had probably been in possession of it for some time. During the second Punic war two of the most important battles were fought in the neighbourhood. It con- tinued to be a very flonrishing city till the close of the empire, and from its position on the Via Appia, it often comes into notice. About 545 a.p. it was sacked by Totila, but before long had re. covered its prosperity. Being raised to the rank of a duchy by Alboin, king of the Lombards, it continued in possession of its own dukes till 1053, when the emperor, Henry III., who had rendered himself master of the city, exchanged it with Leo IX. for the bishopric of Bamberg. From that time it continued in Papal pos-

session till 1806, when the Emperor Napoleon I. bestowed it, with the title of prince, on Talleyrand. Ill, — 71

Plate IV.

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ENGAL (or, as it is often more precisely designated, "Lower Bengal"), the largest and most populous of

the twelve local governments of British India, comprising the lower valleys and deltas of the Ganges and Brahmaputra, lies between 19° 18' and 28° 15' N. lat., and between 82° and 97° E. long. Excluding Assam, which was erected into a separate administration in February 1874, Bengal now in- cludes the four great provinces of Bengal Proper, Behar, Orissa, and Chhota or Chutiéd Nagpur ; and forms a Lieu- tenant-Governorship with an area of 203,473 square miles, and a population of 64,444,379 souls. Including Assam, which, until the spring of 1874, was a part of Bengal, the area was 248,231 square miles, and the population 66,856,859. This great lieutenant-governorship, excluding Assam, contains one-third of the total population of British India, and yields a revenue of £17,687,072, or over one- third of the aggregate revenues of the Indian empire. It is bounded on the N. by Assam, Bhutan, and Nepal; on the S. by Burmah, the Bay of Bengal, and Madras ; on the W. by an imaginary line running between it and the adjoining lieutenant-governorship of the North-Western Provinces, and by the plateau of the Central Provinces ; and on the E. by the unexplored mountainous region which separates it from China and Northern Burmah. The terri- tory, thus hemmed in, except at its north-western angle, by the unchangeable land-marks of nature, consists chiefly of two broad river valleys. By the western one, the Ganges brings down the wealth and the accumulated waters of Northern India. The eastern valley forms the route by which the Brahmaputra, after draining the Thibetan pla- teau far to the north of the Himélayas, and skirting round their passes not far from the Yangtse-Kiang and the great river of Cambodia, ends its boisterous journey of 1800 miles. These valleys, although for the most part luxuriant alluvial plains, are diversified by spurs and peaks thrown out from the great mountain systems which wall them in on the north-east and south-west. They teem with every product of nature, from the fierce beasts and irrepressible vegetation of the tropics, to the stunted barley which the hill-man rears, and the tiny furred animal which he hunts within sight of the

unmelting snows. Tea, indigo, turmeric, lac, waving white fields of the opium-poppy, wheat and innumerable grains and pulses, pepper, ginger, betel-nut, quitiine and many costly spices and drugs, oil-seeds of sorts, cotton, the silk mulberry, inexhaustible crops of jute and other fibres; timber, from the feathery bamboo and

coronetted palm to the iron-hearted sd/ tree—in short,

every vegetable product which feeds and clothes a people, and enables it to trade with foreign nations, abounds. Nor is the country destitute of mineral wealth. The districts near the sea consist entirely of alluvial formations; and, indeed, it is stated that no substance so coarse as gravel occurs throughout the Delta, or in the heart of the pro- vinces within 400 miles of the river mouths. But amid the hilly spurs and undulations on either side, coal, and iron and copper ores, hold out a new future to Bengal, as capital increases under the influence of a stable governmeut, and our knowledge of the country becomes more exact. The coal-fields on the west have for exactly a century been worked by English enterprise; in 1868 they yielded 564,933 tons, and more in the two following years. In the east, the coal measures of Assam, which province was separated from Bengal in 1874, still await the opening out of the country and improved facilities of transport. The climate varies from the snowy regions of the Himalayas to the tropical vapour-bath of the Delta and the burning

winds of Behar. The ordinary range of the thermometer on the plains is from about 52° Fahr. in the coldest month to 103° in the shade in summer. Anything below 60° is considered very cold; and by care in the hot weather the temperature of well-built houses rarely exceeds 95°. The rainfall also varies greatly; from 500 to 600 inches per annum at Chard Punji (Cherra Poonjee) on the range between Silhet and Assam, to an average of about 37 inches in Behar, and about 65 inches on the Delta.

Tue Rivers.—But the secret of Bengal is its rivers. These untaxed highways bring down, almost by the motive power of their own current, the crops of Northern India to the sea-board,—an annual harvest of wealth to the trading classes, for which the population of the Lower Provinces neither toil nor spin. Lower Bengal, indeed, exhibits the two typical stages in the life of a great river. In the nor- thern districts the rivers, like our English

ones, run along the valleys, receive the drainage from the country on either side, absorb broad tributaries, and rush forward with an ever increasing volume. But near the centre of the pro- vinces the rivers enter upon a new stage of their career. Their main channels bifurcate, and each new stream so created throws off its own set of distributaries to right and left. The country which they thus enclose and intersect forms the Delta of Bengal. Originally conquered by the fluvial deposits from the sea, it now stretches out as a vast dead level, in which the rivers find their velocity checked, and their current no longer able to carry along the silt which they have brought down from Northern India. Tho streams, accordingly, deposit their alluvial burden in their channels and upon their banks, so that by degrees their beds rise above the level of the surrounding country. In this way the rivers in the Delta slowly build themselves up into canals, which every autumn break through or over- flow their margins, and leave their silt upon the adjacent flats. Thousands of square miles in Lower Bengal annually receive a top-dressing of virgin soil, brought free of expense a quarter of a year's journey from the Himéalayas,—a system of natural manuring which renders elaborate til- lage a mere waste of labour, and which defies the utmost power of over-cropping to exhaust its fertility. As the rivers creep further down the Delta, they become more and more sluggish, and their bifurcations and interlacings more complicated. he last scene of all is a vast amphibious wilderness of swamp and forest, amid whose solitudes their network of channels insensibly merges into the sea. Here the perennial struggle between earth and ocean goes on, and all the ancient secrets of laud-making stand disclosed. The rivers, finally checked by the dead weight of the sea, deposit their remaining silt, which emerges as banks or blunted promontories, or, after a year's battling with the tide, adds a few feet or, it may be, a few inches to the fore- shore.

The Ganges, which enters on the western frontier, and runs diagonally across Bengal, gives to the country its peculiar character and aspect. About 200 miles from its mouth it spreads out into numerous branches, forming a large delta, composed, where it borders on the sea, of a labyrinth of creeks and rivers, running through the dense forests of the Sundarbans, and exhibiting during the annual inundation the appearance of an immense sea. At this time the rice fields to the extent of many hundreds of square miles are submerged. 'The scene presents to a European eye a panorama of

singular novelty and interest ; —rice fields covered with water to a great depth; tho

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ears of grain floating on the surface; the stupendous embankments, which restrain, without altogether prevent- ing, the excesses of the inundations; and peasants in all quarters going out to their daily work with their cattle in canoes or on rafts. The navigable streams which fall into the Ganges intersect the country in every direction, and afford great facilities for internal communication. In many parts boats can approach by means of lakes, rivulets, and water-courses, to the door of almost every cottage. The lower region of the Ganges is the richest and most productive portion of Bengal, abounding in valuable pro- duce. Another mighty river by which Bengal is intersected is the Brahmaputra, the source of whose remotest tributary is on the opposite side of the same mountains which give rise to the Ganges. These two rivers proceed in diverging courses until they are more than 1200 miles asunder ; and again approaching each other, intermix their waters before they reach the ocean. The other principal rivers in Bengal are the Ghagra, Son, Gandak, Kusi, Tisti; the Hugli (Hoogly), formed by the junction of the Bhagirathi and Jalangi; and farther to the west, the Damodar and Rupna- rayan ; and in the south-west, the Mahanadi, or great river of Orissa. In a level country like Bengal, where the soil is composed of yielding and loose materials, the courses of the rivers are continually shifting, from the wearing away of their different banks, or from the water being turned off by obstacles in its course into a different channel. As this channel is gradually widened the old bed of the river is left dry. The new channel into which the river flows is, of course, so much land lost, while the old bed con- stitutes an accession to the adjacent estates. Thus, one man's property is diminished, while that of another is enlarged or improved ; and a distinct branch of jurisprud- ence has grown up, the particular province of which is the definition and regulation of the alluvial rights alike of private property and of the state.

Tue Propite.—Within the provinces under the Lieu- tenant-Governor of Bengal dwell a great congeries of peoples, of widely diverse origin, speaking different lan- guages, and representing far separated eras of

civilisation. They amounted in 1872 (including Assam, which then formed part of Bengal), to 66,856,859 souls, or over a million and a quarter more than the whole inhabitants of England and Wales, Sweden, Norway, Denmark (with Jutland), Greece, and all the Ionian Islands, with the total white population, Indians and Chinese, of the United States. The problem of government in Bengal, however, is not one of numbers. It is intensified and infinitely complicated by the fact, that while this vast population is ruled by a single head, it consists of elements so dissimilar as to render it impracticable to place them under any one system of administration. They exhibit every stage of human progress, and every type of human enlightenment and superstition,—from the sceptical educated classes, represented by the Hindu gentleman who distinguishes himself at a London Inn of Court and harangues the British public in the Brighton Pavilion, or from a metro- politan platform, to the hill chieftain, who lately sacrificed an idiot on the top of a mountain to obtain a favourable decision in a Privy Council appeal. A large section of the people belongs to the august Aryan race, from which we ourselves descend, having a classical language more kin- dred to our own than those of the Welsh or Scottish Highlanders. We address the Deity and His earthly representatives, our father and mother, by words derived from roots common to the Christian and the Hindu. Nor does the religious instinct assume a wider variety of mani- festations, or exhibit a more striking series of metamor- phoses, among the European than among the Indian branches of the race. Theodore Parker and Comte are

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better known to the rising generation of Hindus in Bengal than any Sanskrit theologian. On the same bench of a Calcutta college sit youths traincd up in the strictest

theism, others indoctrinated in the mysteries of the Hindu trinity and pantheon, with representatives of every link in

the chain of superstition—from the harmless offering of

flowers before the family god to the cruel rites of Kall, whose altars in the most civilised districts of Bengal, as lately as the famine of 1866, were stained with human blood. 'Indced, the very word Hindu is one of absolutely indeterminate meaning. The census officers employ it as a convenient generic to include 424 millions of the popu- lation of Bengal, comprising elements of transparently distinct ethnical origin, and separated from each other by their language, customs, and religious rites. But Hinduism, understood even in this wide sense, represents only one of many crecds and races found within Bengal. The other great historical cultus, which, during the last twelve cen- turies, did for the Semitic peoples what Christianity accomplished among the European Aryans, has won to itself one-third of the whole population of Bengal. The Muhammadans exceed 204 millions of souls; and the Lieutenant-Governor of Bengal is, so far as numbers go, as great a Musalman power as the Sultdn of Turkey himself. Amid the stupendous catastrophes of the seasons, the river inundations, famines, tidal waves, and cycloncs of the lower provinces of Bengal, the religious instinct works with a vitality unknown in European countries, where the forces of nature have long yielded to the control of man. Until the British Government stepped in with its police, and canals, and railroads, between the people and what they were accustomed to consider the dealings of Providence, scarcely a year passed without some terrible manifestation of the power and the wrath of God. Marhatté invasions from Central India, piratical devastations on the sea-board, banditti who marched about the interior in bodies of 50,000 men, floods which drowned the harvests of whole districts, aud droughts in which a third of the population starved to death, kept alive a sense of human powerlessness in the presence of an Omnipotent fate with an intensity which the homilies of a stipendiary clergy fail to awaken. Under the Muhammadans a pestilence turned the capital into a silent wilderness, never again to be re-pcopled. Under our own rule, it is estimated that 10 millions perished within the Lower Provinces alone in the famine of 1769-70; and the first surveyor-general of Bengal entered on

his maps a tract of many hundreds of square miles as bare of villages, and "depopulated by the Maghs."

PoruLar Rericions.—The people of Bengal, thus con- stantly reminded by calamity of a mysterious Supreme Power, have always exhibited dcep earnestness in their own modes of propitiating it, and a singular susceptibility to new forms of faith. Great tidal waves. of religion have again and again swept over the provinces within even the brief period of the Christian era. Isl4m was one of many reformed creeds offered to them, and several circumstances combined to render its influence more widely spread and more permanent than that of its rivals. It was the creed of the governing power ; its missionaries were men of zeal, who spoke to the popular heart ; it brought the good news of the unity of God and the equality of man to a priest- ridden and a caste-ridden people. Above all, the initiatory rite made relapse impossible, and rendered the convert aud his posterity true believers for ever. Forcible conversions are occasionally recorded, with several well-known instances of Hindus becoming apostates from their ancient faith to purchase pardon for crimes. Such cascs, however, were few in number, and belonged to the higher ranks. It would also appear that a Mughul adventurcr now and then

circumcised off hand the villages allotted to him in fief. But it was not to such measures that Islam owed its per- manent success in Bengal. It appealed to the people, and it derived the great mass of its converts from among the poor. It brought in a truer conception of God, a nobler ideal of the life of mau, and offered to the teeming low castes of Bengal, who had sat for ages despised and abject on the outermost pale of the Hindu community, free entrance into a new social organisation. So far as local tradition and the other fragmentary evidence which survives enable a modern inquirer to judge, the creed of Muhammad was here spread neither by violence nor by any ignoble means. It succeeded because it deserved to suc- ceed. Nevertheless, it has conspicuously failed to alter the permanent religious conceptions of the people. The initiatory rite separated the Musalmans from the rest of the Bengali population, and elevated the heterogenous low-caste converts into a respectable community of their own.

But the proselytes brought their old superstitions with them into their new faith. Their ancient rites and modes of religious thought reasserted themselves with an intensity that could not be suppressed, until the fierce white light of Semitic monotheism almost flickered out amid the fuligi- nous exhalations of Hinduism. A local writer, speaking from personal acquaintance with the Musalman peasantry in the northern districts of Lower Bengal, states that not one in ten can recite the brief and simple 'almd or creed, whose constant repetition is a matter of almost unconscious habit with Muhammadans. He describes them as "a sect which observes none of the ceremonies of its faith, which isignorant of the simplest formulas of its creed, which worships at the shrines of a rival religion, and tenaciously adheres to practices which were denounced as the foulest abominations by its founder." Fifty years ago these sen- tences would have truly described the Muhammadan peasantry, not only in the northern districts, but through- out all Lower Bengal. In the cities, or amid the serene palace life of the Musalmaén nobility and their religious foundations, a few Maulvis of piety and learning calmly carried on the routine of their faith. But the masses of the rural Musalmans had relapsed into something little better than amongrel breed of circumcised low-caste Hindus. Since then, one of those religious awakenings so character- istic of India has passed over the Muhammadans of Bengal. Itinerant preachers, generally from the north, have wandered from district to district, calling on the people to return to the true faith, and denouncing God's wrath on the indif- ferent and unrepentant. A great body of the Bengali Musalmdns have purged themselves of the taint of Hin- duism, and shaken off the yoke of ancient rural rites. The revival has had a threefold effect—religious, social, and political. It has stimulated the religious instinct among an impressionable people, and produced an earnest desire to cleanse the worship of God and His prophet from idolatry. This stern rejection of ancient superstitions has widened the gulf between the Muhammadans and the Hindus. Fifty years ago the Bengali Musalmans were simply a recognised caste, less widely separated from the lower orders of the Hindus than the latter were from the Kulin Brahmans. There were certain essential points of differeuce, of a doctrinal sort, between the Hindu and Muhammadan villager ; but they had a great many rural customs and even religious rites in common. The Muhammadan hus- bandman theoretically recognised the one Semitic God; but in a country subject to floods, famines, the devastations of banditti, and

the ravages of wild beasts, he would have deemed it a simple policy to have neglected the Hindu festivals in honour of Krishna and Durg4. The Bengali peasantry no longer look to their gods, but to the officer in

charge of the district, for protection ; and when he fails |

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them, instead of offering expiatory sacrifices to Kali, they petition Government, or write violent letters to the verna- cular press. The reformed Muhammadan husbandmen now stand aloof from the village rites of the Hindus. They have ceased to be merely a separate caste in the rural or- ganisation, and have become a distinct community, keeping as much apart from their nominal co-religionists of the old unreforied faith as from the idolatrous Hindus. This social isolation from the surrounding Hindus is the second effect of the Musalm4n revival in Bengal. Its third result is political, and affects ourselves. A Muhammadan like a Christian revival strongly reasserts the duty of self- abnegation, and places a multitude of devoted instruments at the disposal of any man who can convince them that his schemes are identical with the will of God. But while a return to the primitive teachings of Christ means a return to a religion of humanity and love, a return to Muhamma- dan first principles means a return to a religion of intoler- ance and aggression. 'The very essence of Musalman Puritanism is abhorrence of the Infidel. The whole conception of Isl4m is that of a church either actively militant or conclusively triumphant— forcibly converting the world, or ruling with a rod of iron the stiff-necked unbeliever. 'he actual state of India, where it is the Musalmans who are in subjection, and the unbeliever who governs them, is manifestly not in accord with the primitive ideal; and many devout Muhammadans of the reformed faith have of late years endeavoured, by plots and frontier attacks, to remove this anomaly. The majority are not actively hostile, but they stand aloof from our institutions, and refuse to coalesce with the system which the British Government has imposed on Bengal. Their rebel camp beyond our frontier has forced us into three expedi- tions, which has broken their military power; and the calm, inexorable action of the courts has stamped out the chronic abetiment of rebellion by Muhammadans within Bengal.

Besides the 424 millions aggregated uuder the name of Hindus, and the 204 millions of Musalmans, a great residue remains, 'These consist, with the exception of two very small bodies of Christians and Buddhists, of semi-aboriginal and distinctly non-Aryan races. They number over 3} millions, equalling almost exactly the population of Scot- land. These peoples dwell, for the most part, among the lofty ranges and primeval forests which wall in Bengal on the north, east, and south-west, or upon the spurs and hilly outworks which these mountain systems have thrown forward upon the lowlands. Some of them represent the simplest types of social organisation known to modern research. Their rudimentary communities are separated by religion, custom, and language from each other and from the dwellers on the plains) Many of them, till lately, looked upon war as the normal condition of human society, and ou peace as an unwelcome temporary break in their existence. For ages they have regarded the lowland Hindus as their natural enemies, and in turn have been dealt with as beasts of chase by the more civilised inhabi- tants of the valleys. Within the present generation human sacrifice continued to be an obligatory rite among them — a rite so deeply graven upon their village institutions, and so essential to the annually recurring festivals of their religious year, as to seriously occupy the Indian legis- lature, and to require a special agency to suppress it. To this day instances of the detestable practice occur ; and their extreme jealousy of anything like foreign rule renders it the wisest policy to leave them as much as possible under their own hamlet communities and petty chiefs. Nevertheless, they form the most hopeful ma- terial yet discovered in Bengal for the humanising in- fluences of Christianity, and of that higher level of

morality and religious hope which Christian missions | tion. The total cost of government was only £6,338, 968,

represent.

GovERNMENT.—Nor are the diversities in race and reli- gion among the 66% millions of Bengal less marked than their different capacities for self-government, and the vary- ing degrees to which they can be subjected to administrative control. They exhibit every stage of political develop- ment,

from the great municipality based upon English models, with powers of self-taxation and a public debt of its own, down to the primitive hill-hamlet, which pays no rent, acknowledges no higher tenure than the aboriginal one of priority of occupation, clings to its ancient system of nomadic husbandry, and is scarcely aware of any power superior to that of its own tribe fathers. Including Assam, which up to February 1874 formed a part of Bengal, the territories under the Lieutenant-Governor consist of five great provinces, each of which speaks a language of its own, and has a separate political and ethnical history. For administrative purposes these five provinces are divided into 58 districts, of which 36 are regulation districts, whose advanced state has rendered it expedient to place them under the complete system of Anglo-Indian law; while 22 are non-regulation districts, in which this has not yet been found practicable. The latter contain territories of three distinct classes. The first of them consists, for the most part, of newly-acquired territory, to which the general regulations have never been extended in their entirety. The second, of tracts inhabited by primitive races specially exempted from the operation of the regulations, to whom a less formal code of law is better adapted. The third, of senti-independent or tributary states, administered, or partly administered by British officers. The management of the whole is firmly concentrated in a single man, the Lieu- tenant-Governor of Bengal, who is answerable to the Govern- ment of India, and through it to Her Majesty's ministers and Parliament. His responsibility is divided by no executive council, as in Madras or Bombay. All orders issue through his secretaries in his own name; and although his policy is subject to the watchful control of the Govern- ment of India, represented by the Viceroy, yet to the Lieutenant-Governor personally belongs the reputation or disgrace of a successful or an inglorious administration. In making laws for his people he is assisted by a legislative eouncil, composed partly of his principal officers, partly of leading members of the non-official European and Native communities. In his legislative, as in his executive func- tions, a power of control, amounting if needful to veto, rests with the Government of India—a power which, from the English talent for harmonious proconsular rule, is very seldom exercised. The administration is conducted by a body of covenanted civilians, supplemented by a few military officers in the less civilised districts, and aided by a staff of subordinate officials. The civilians are appointed direct from England, enter into a bond with the Secretary of

State, and give securities for the discharge of their highly responsible duties. In 1871 they numbered 260 men. The military officers belong to the staff corps of the Bengal army, and are employed to the number of 52 in the backward tracts, which do not require so exact an administration, and cannot afford to pay for the cost of it. The subordinate district officials are appointed in Bengal by the Lieutenant-Governor, and consist chiefly of natives and Anglo-Indians; but several departments, such as the educational, telegraph, and public works, are now officered to a certain extent by gentlemen engaged direct from England. The revenues raised in the territories under the Lieutenant-Governor of Bengal amounted in 1871-72 to £17,687,072. Of this sum, £16,713,636 accrued from the imperial taxes laid on by the Government of India, and £973,436, from provincial, municipal, and rural taxa-

leaving a surplus from this single one of the Indian local governments of £11,348,104. It is scarcely too much to say, that so long as the British power retains the port of Caleutta and the rich provinces under the Lieutenant- Governor of Bengal, it would have sufficient revenue to effect the reconquest of India if any accident should happen in the Panjdb or north-west. The vast income which the Lower Provinces yield is not altogether derived from their people. China pays an annual tribute of over 5 millions in the shape of opium duty, and the inland parts of India contribute about a third of a million to the eustoms of Bengal. Taking the total thus obtained from other terri- tories at a little over 6 millions, the population under the Lieutenant-Governor of Bengal pays, in round figures, 114 millions a year, or about 3s. 5d. a head. This includes imperial, provincial, municipal, and rural taxation of every sort.

The return which the Government gives for this light taxation may be briefly summed up as follows :—It assures to the provinces absolute protection from foreign enemies. The army employed in the territories under the Lieutenant- Governor of Bengal numbers only 11,554 officers and men, exclusive of a detachment of Madras Native infantry stationed at Cattack, in Orissa, and numbering about 600 men—making a gross total of troops in Bengal of about 12,000 men. Of this small force 4662 are massed in Calcutta and its environs, with a view to their proximity to the sea-board, rather than with an eye to the internal requirements of the country ; 6892

guard the frontiers, with detachments on the line of railway, which now forms the great highway of Bengal ; a detachment of about 600 effective troops of the Madras Native infantry is stationed in Orissa. Taking 12,000 as the total military force stationed in Bengal, 3000 consist of European troops and English officers, and 9000 of Native officers and men. The Government is a purely civil one, the existence of any armed force being less realised than in the quietest county of England; and of the 66} millions of people under the Lieutenant-Governor of Bengal, probably 40 millions go through life without once seeing the gleam of a bayonet or the face of a soldier. Internal order and protection to person and property are secured by a large army of police. This force consists of two elements: a regular constabulary introduced by the English Government, numbering 33,913 men in 1871, and costing £584,059 to the state ; and an indigenous police developed out of the rural watch of the ancient Hindu commonwealth, numbering 184,645 men, and costing £435,336 a year, paid by grants of land, or by the villages and landowners. The total number of the Bengal police amounts therefore to 217,558, or one man to every 307 of the population; and, excluding uninhabited swamps and hill jungles, about one policeman to each square mile of area. This minute supervision costs just over a million sterling a year, being at the rate of £4, 2s. 14d. per square mile, or 3d. per head of the population.

A great system of state education has been rapidly developed since 1854. In 1871-72 the Governnmient and aided schools numbered 4383, with 7292 teachers, and 163,280 pupils,—maintained at a total cost of £194,716, of which Government contributed rather under one-half, or £89,649. The total annual cost of education per pupil was £1, 12s, 9d., of which Government bore under one-half, or 15s.; the remainder being obtained from school fees, local subscriptions, &c. Besides these, there were 10,907 ascertained schools not recéiving aid from the state, with 11,026 teachers, and 169,917 pupils. In addition to these, there is a vast number of petty hedge schools in Bengal, of which no statistics exist. The total of state and ascertained

private schools in 1871, was 15,290, with 18,318 teachers, and 333,197 pupils.

The cheapness of labour, as compared with European countries, enables the Government to perform its other functions at an cqually small cost. It has brought courts very near to the door of the peasant, and established a system of registration by which proprietary rights and transfers are cheaply and absolutely ascertained. A great department of public works has spread a network of roads over the country, connecting Bengal by railways with other parts of India, and, in districts which specially require it, ig endeavouring to exercise some degree of control over the rivers and the natural water-supply, on which the safety of a tropical people depends. An organised system of emigration watches over the movements of the landless classes, from the overcrowded or unfertile districts of the west to the rich under-populated territories on the east,

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and to colonies beyond the seas. Charitable dispensaries and a well-equipped medical department struggle to con:- bat the diseases and epidemics which from time imme- morial have devastated the Delta, and place the opera- tions of European surgery within the reach of the poorest peasant. The whole cost of civil administration for the 66? millions of Bengal amounts, as already stated, to £6,338,968, or under Is. 11d. per head. An unfet- tered vernacular press makes known the views of the people to their rulers, and municipal institutions are | developing the ancient Hindu capacity for self-govern- iment from the village to the municipal stage of human society. Locat Divisions.—The following table exhibits the four provinces at present under the Lieutenant-Governor | of Bengal, along with Assam, which until February 1874 ‘ was within it.

Area, Population, and Languages of the Five Provinces of Lower Bengal (including Assam) in 1872.

rentin Average | Percent- | Percent- Provinces. a Population. Hyon ees ie mu le Languages, ad sq. mile. area. [population Deneale occ ucceneeee tee eee ee 94,539 | 36,769,735 389 38°08 55°00 | Bengali and Hindustani. 1 Bye) UO We rion co Ame Carecameanonnaa anccdonsaree 42,417 | 19,736,102 465 17:09 29°52 | Hindustani and Hindi. Orissa (including the Tributary States), | 23,901; 4,317,999 181 9°63 6°46 | Uriya, and aboriginal tongues and patois. C@hotasNigoury.usaheetencesants

csccssuce es 43,901 | 3,825,571 87 17°69 5°72 | Bengali and aboriginal tongues. Assam (separated in 1874), ...000..e0- 43,473 | 2,207,453 51 17°51 3°30 | Assamese, Bengali,and aboriginal tongues. Mo tales, vcceecosees 248,231 | 66,856,859 269 106°00 {100:00

The word Brencat is derived from Sanskrit geography, and applies strictly to the country stretching south- wards from Bhagalpur to the sea. The ancient Banga formed one of the five outlying kingdoms of Aryan India, and was practically conterminous with the Delta of Bengal. It derived its name, according to the etymo- logy of the Pandits, from a prince of the Mahabharata, to whose portion it fell on the primitive partition of the country among the Lunar race of Dehli. But a city called Bangala, near Chittagong, which, although now washed away, is supposed to have existed in the Muhammmadan

period, appears to have given the name to the European | world. The word Bangdél4 was first used by the Musal- | mans ; and under their rule, like the Banga of old Sanskrit |

times, it applied specifically to the Gangetic delta, although the latter conquests to the east of the Brahmaputra were eventually included within it. In their distribution of the country for fiscal purposes, it formed the central province of a governorship, with Behar on the N.W., and Orissa on the S.W., jointly ruled by one deputy of the Dehli emperor. Under the English the name has at different periods borne very different significations. Francis Fernandez applies it to the country from the extreme east of Chittagong to Point Palmyras in Orissa, with a coast line which Purchas csti- mates at 600 miles, running inland for the same distance, and watered by the Ganges. 'This territory would include the Muhammadan province of Bengal, with parts of Behar and Orissa. The loose idea thus derived from old voyagers became stereotyped in the archives of the East India Com- pany. All its north-eastern factories, from Balasor, on the Orissa coast, to Patnd, in the heart of Behar, belonged to

the " Bengal Establishment," and as our conquests crept | higher up the rivers, the term came to be applied to the |.

whole of Northern India. The Presidency of Bengal, in contradistinction to those of Madras and Bombay, eventu- ally included all the British territories north of the Central Provinces, from the mouths of the Ganges and Brahmaputra to the Himalayas and the Panj4b. The term Bengal con- tinucs to be officially employed in this sense by the military

last forty years the tendency to a more exact order of civil administration has gradually brought about a corresponding precision in the use of Indian geographical names. The North-Western Provinces date their separate existence from 1831. Since that year they stand forward under a name of their own as the North-Western Provinces, in contra- distinction to the Lower Provinces of Bengal. Later annexations have added new territorial entities, and the northern Presidency is now mapped out into four separate governments— the North-Western Provinces, Oudh, Panjab, and Lower Bengal. Three of the provinces of the present Lieutenant-Governorship of Bengal—namely, Bengal proper, Behar, and Orissa—consist of great river valleys ; the fourth, | Chhoté or Chutid Nagpur, is a mountainous region which separates them from the Central India plateau. Orissa embraces the rich deltas of the Mahdnadi and the neigh- bouring rivers, bounded by the Bay of Bengal on the 8.E., and walled in on the N.W. by tributary hill states. Pro- ceeding westward, the province of Bengal proper stretches along the coast from Orissa to British Burmah, and inland from the sea-board to the Himalayas. Its southern por- tion is formed by the united deltas of the Ganges and Brahmaputra; .its northern consists of the valleys of these great rivers and their tributaries. Behar lies on the north-west of Bengal proper, and comprises the higher valley of the Ganges, from the spot where it issues from the territories of the Lieutenant-Governor of the North-Western Provinces. Between Behar and Orissa, but stretching further westward and deep into the hill country, lies the province of Chhotaé or Chutid Nagpur.

ADMINISTRATIVE Drvistons.—For adniinistrative pur- poses, the Lieutenant-Governorship of Bengal, excluding the recently separated province of Assam (see under that heading), is divided into 47 districts. The details of the area and population of these, presented in the following table, are taken, with few exceptions, from the census returns of 1872 :—

department of the Government of India. But during the | | |

BENGAL 567 Areca— Population | District, square Population. liindus, Muhammadans. | Christians. Others. per square; Jand Nevenue. miles, mile. BENGAL PROPER. 1. Bardwan, ... 8,523 | 2,034,745 1,679,363 348,024 890 6,468 578 | £306,454 DR OBUMIBUITAS coc ccsevesscssevneeoe 1,346 526,772 487,786 13,500 70 25,416 391 45,065 SW MBAROMMUUS) .ssccejqeceees coe «oe 1,344 695,921 576,908 111,795 249 6,969 518 e223 AD PMEIGING IOC cee eancsn ave ser ene 5,082} 2,540,963 2,285,568 157,047 613 97,735 500 203, 409 5: Hugli with Hewrah, ... 1,424] 1,488,556 1,186, 435 299,025 bayer) 513 1,045 144,848 6. 24 Parganas, Rreen ee sinus ii 2,788 | 2,210,047 1,307,087 887,853 leyiow 1,340 793 2,440 ep CAICIUCAS ccccuesedeessre sess 447,601 291,194 Tea. 21,356 1,920 55,950 170, 287 RMNIACUIVENS) sacnewesesieecosens aceue 3,421 1,812,795 821,032 984,106 5,977 1,680 530 105, 080 OMUIESSOL GS corcac ceesmnveas eaves 3,658 | 2,075,021 915,413 1,151,936 1,142 6,530 567 103,184 10. Murshidabad, ... none 2,578 1,353,626 733, 056 603,564 537 16, 469 525 135,883 ES DD TMAPUT,, cacees.. ceseoe ses : 4,126 1,501,924 702, 235 793, 215 270 6,203 364 175,566 OR MMIC, ecessnes notetee se steens 1,813 676, 426 356, 298 310,890 43 9,195 BVici 32,414 13}, Rajshahi, 1a seen elee ae 2,234 1,310,729 286,870 1,017,979 103 Baaiiid 587 102,681 14, Rangpur, eatehe uivaiann a eat He 3,476 2,149,972 857,298 1,291,465 73 1,136 619 96, 662 115}, JEVO@A, Genonnonsesngsoneuesuogd 1,501 689, 467 130,644 556,620 22 2,181 459 44,160 GMaMlaMOMIENe a cecrysmsseuteaas oases 1,966) 1,211,594 361,314 847,227 98 2,955 616 24,066 NMED ATOM cies secs sissies ones 1,234 94,712 69,831 6,248 556 18,077 77 6,376 Se Jalpaigurt,? Meee drasnesndens 2,906 418,665 182,375 144, 980 36 594 144 26,547 HO: KorchiBehans? as..c…...0s0s 1,307 532,565 Details not available. 407 si On ADACCH, saiseowcsars cosierene anne 2,897 1,852,993 793,789 1,050,131 7,844 1,229 640 48,996 21. Faridpur, not bnganation DanGreos 1,496 1,012,589 420,988 588,299 463 2,839 677 32,764 DEF MBAKAEGATIN, waccrccsnes evevedaes 4,985 | 2,377,483 827,393 1,540, 965 4,852 4,223 482 151,128 23. Maimansinh,..... .....06 6,293 2,349,917 817,963 1,519,635 124 12,195 373 84,955 OAR TS VG tetera rai avceiaaarineaes « a atte 5,383 1,719, 539 859, 2384 854,131 159 6,015 319 48,311 oe COMGHICOMG occ

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15,798| 1,073,475 87| £29,279 Grand Total, ... 194,4173| 64,444,379 40,854,088 | 20,414,305 91,225 | 2,426,254 331 | £3,796,888

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1 The census of the Duars of Jalpaiguri was taken in 1869-70, at the time of the land settlement, and the details of the population, according to religion, were not ascertained for this part of the district. The details, therefore, do not agree with the total population.

2 Census taken at the time of settlement. Details not ascertained.

3 This area is exclusive of 5341 square miles of unsurveyed Sundarbans, and one or two minor tracts; total area of all Bengal, 203,473

square miles.

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Principal Crops.—The chief products of the province have been already enumerated. 'The great staple crop is rice, of which there are three harvests in the year,—the boro, or spring rice; dus, or autumn rice; and dman, or winter rice. Of these the last or winter rice is by far the most extensively cultivated, and forms the great harvest of the year. The dman crop is grown on low land. In May, after the first fall of rain, a nursery ground is ploughed three times, and the seed scattered broadcast. When the seed-lings make their appearance another field is prepared for transplanting. By this time the rainy season has thoroughly set in, and the field is dammed up so as to retain the water. It is then repeatedly ploughed until the water becomes worked into the soil, and the whole reduced to thick mud. The young rice is then taken from the nursery, and trans- planted in rows about 9 inches apart. If, by reason of the backwardness of the season, the nursery ground cannot be prepared by the sowing-time in April or May, the 4man rice is not transplanted at all. In such a case the husband- men in July or August soak the paddy in water for one day to germinate, and plant the germinated seed not in a nursery plot, but in the larger fields, which they would otherwise have used to transplant the sprouts into. It is very seldom, however, that this procedure is found neces- sary. Aman rice is much more

extensively cultivated than dus, and in favourable years is the most valuable crop, but being sown in low lands is liable to be destroyed by exces- sive rainfall, Harvest takes place in December or January. Aus rice is generally sown on high ground. The field is ploughed when the early rains set in, ten or twelve times over, till the soil is reduced nearly to dust, the seed being sown broadcast in April or May. As soon as the young plants reach 6 inches in height, the land is harrowed for the purpose of thinning the crop and to clear it of weeds. The crop is harvested in August or September. Boro, or spring rice, is cultivated on low marshy land, being sown in a nursery in October, transplanted a month later, and harvested in March and April. An indigenous description of rice, called urt or jaradhdn, grows in certain marshy tracts. The grain is very small, and is gathered for con- suinption only by the poorest. No tabulated statistics of cultivation exist; but in 1872-73 the quantity of rice exported from Bengal to foreign ports amounted to 288,955 tons, of the value of £1,685,170. Oil-seeds are very largely grown over the whole of Bengal, particularly in the Behar and Assam districts. The principal oil-seeds are sarisha(mustard), tid (sesamum), and tzs?, or masina (linseed). Exports of oil-seeds are principally confined to linseed, of which 107,723 tons were exported in 1872-73, of the value of £1,077,348. Jute (pat or kosta) now forms a very important commercial staple of Bengal. The cultivation of this crop has rapidly increased of late years. Its prin- cipal seat of cultivation is Eastern Bengal, where the sup- perior varieties are grown, The crop grows on either high or low lands, issown in April, and cutin August. In 1872 the area under jute cultivation in Bengal was estimated at 925,899 acres, and the yield at 496,703 tons. Jute exports from Bengal amounted in 1872-73 to 353,097 tons, value £4,127,943. Jute manufactures, in the shape of gunny bags, cloth, rope, &c., were also exported to the value of £187,149. Indigo cultivation and manufacture is princi- pally carried on with European capital. In Bengal proper the industry has languished of late years, and the area under indigo cultivation greatly fallen off. In Behar, on the other hand, the area of indigo lands has increased. The annual out-turn for all Bengal is estimated at about 75,000 maunds, valued at nearly two millions sterling. Two

crops of indigo are raised in the year: one sown in April

or May before the setting in of the rains, and cut in August or September ; the other sown in October as the waters

subside, and cut in the following July. The crop of 1872 was considerably above the average, the total exports amounting to 5962 tons, of the value of £2,704,080. Tea cultivation is the other great industry carried on by European capital. The cultivation is principally confined to Assam, which province was recently separated from the Lieutenant-Governorship, and to the northern Bengal dis- trict of Darjiling. In the other localities in which tea is grown, Chhot' Nagpur and Chittagong, cultivation is at present only carried on ona small scale. Tea cultivation has enormously extended of late years, and the gardens are, as a general rule, well filled with plants, highly cultivated and carefully managed. Including Assam, the total area held under the Waste Land Rules by persons connected with the tea industry, amounted in 1872 to 804,582 acres. Of this area 70,341 acres are returned as actually cultivated with tea, but this 1s probably too low an estimate. The exports of tea in 1872-73 amounted to 17,641,070 hb, valued at £1,567,561. Besides what is exported, there is an increasing local consumption of Indian tea. In 1860 the total out-turn of tea did not exceed one million Ib. The cultivation of opium is a Government monopoly; no person is allowed to grow the poppy except on account of the Government. The manufacture is carried on at two separate agencies,—that of Benares in the North-Western Provinces, of which the head station is at Ghazipur; and — that of Behar, with its head station at Patné. Annual engagements are entered into by the cultivators, under a system of pecuniary advances, to sowa certain quantity of land with poppy, and the whole produce in the form of opium is delivered to Government ata fixed rate. The area under poppy cultivation in the Behar agency, situated entirely within Bengal, in 1872, amounted to 330,925 acres; in the Benares agency to 229,430 acres, total, 560,355 acres. The number of chests of opium sold at the Government sales in Calcutta in 1872, was 42,675, the amount realised was £6,067,701, and the net revenue, £4,259,376. The cultivation of the cinchona plant in Bengal was introduced as an experiment about 1862, in a valley of the Himdlayas in Darjiling district, and the enter- prise has already attained a point which

promises success. There are now (1874) about 2000 acres of Government cinchona plantations in Darjiling.

MINERAL Propucts.—aA brief. statement has already been given of the principal minerals of Bengal. The coal mines of Raniganj, within Bardwdn district, however, demand somewhat more special notice. In this field there were, in 1872, altogether 44 mines worked, of which 19 turn out more than 10,000 tons of coal per annum apiece. In the larger and better mines, coal is raised by steam power from pits and galleries ; and in the smaller mines or work- ings, by hand labour from open quarries. Inthe Raniganj coal-field alone, 61 steam engines, with an aggregate of 867 horse-power, are at work. Only one seam or set of seams of less thickness than 84 feet is worked, and the average thickness of the seams at the Raniganj mines is about 15 or 16 feet. The pits are mostly shallow, very few are more than 150 feet deep. The Bengal Coal Company, with its mines at Radniganj and westwards, is able to raise from them 220,000 tons of coal annually. Salt manufacture was formerly a Government monopoly, principally carried on along the sea-coast of Orissa and in Midnapur district. An account of the manufacture of salt by means of evapora- tion by fire is given in the account of Bauasor (q.v.) The process of manufacture by means of solar evaporation will be described in the account of Puri district. Government abandoned its monopoly of salt manufacture many years ago, and it is now carried on by private parties on their own account, subject to a Government duty in Bengal of 8s, Sd. a ewt. levied at the place of production. Salt duties

vary in different parts of India, necessitating the main- tenance of expensive aud cumbrous customs lines. This year (1874) an attempt has been inade towards the abolition of the Orissa customs line, by means of a graduated scale of salt duty within Orissa, rising by degrees from the Madras duty of 4s, 10d. a cwt. in the extreme south of the province, to the Bengal duty of 83. 8d. a cwt. in the extreme north. At the present day the greater quantity of salt consumed in Bengal is imported by Liverpool ships from the Cheshire mines. In 1872 the Bengal salt duty yielded a net revenue of £2,610,286.

TRADE.—No complete statistics of the internal trade of Bengal exist. The Ganges, the Brahmaputra, and on a much smaller scale, the Mahanadi in Orissa, with the Eastern Bengal Railway and the great East Indian Line, form the main arteries of commerce. From these main channels a network of minor streams, and a fairly adequate although not yet complete system of raised roads, radiate to the remotest districts. The chief articles of internal traffic are the vegetable and mineral productions enumerated above. The larger transactions of commerce are conducted in the great cities, such as Calcutta and Patna, and in a number of purely market centres, such as Nawdbganj and Sirdjganj, which have recently grown up under British rule. The smaller operations of trade are effected by means of village markets and countless Adts or open air weekly bazirs in every district. The external trade of Bengal is practi- cally confined to Calcutta. There are about ten other ports on the Bay of Bengal, the most important of which is the rice port of Chittagong. But for general purposes the foreign and interportal commerce of Calcutta maybe taken to re- present that of the province. In 1871-72 it stood thus: exports from Calcutta, £32,771,152; imports, £21,365,677 ; total, £54,136,829. The chief articles of export are rice, opium, indigo, jute, tea, oil-seeds, silk, cotton, and fibres. Chief imports, Manchester goods, woollens, salt, coal, iron, metals, liquors, and oilmen's stores.

History.—tThe history of so large a province as Bengal forms an integral part of the general history of India. (See Inp1a.) The northern part, Behar, formed a powerful kingdom in Sanskrit times, and its chief town, Patna, is identified as the Palibothra of the Greeks. 'The Delta or southern part of Bengal lay beyond the ancient Sanskrit polity, and was governed by a number of local kings belonging to a pre-Aryan stock. The Chinese travellers, Fa Hiang in the 5th century, and Hiouen Thsang in the 7th century, found the Buddhist religion prevailing through- out Bengal, but already in a fierce struggle with Hinduism— a struggle which ended about the 9th or 10th century in the general establishment of the latter faith. Until the end of the 12th century Hindu princes governed in a number of petty principalities, till, in 1199, Muhammad Bakhtiyar Khilji was appointed to lead the first Musalman invasion into Bengal. The Muhammadan conquest of Behar dates from 1200 a.p., and the new power speedily spread south- wards into the Delta. From about this date until 1340 Bengal was ruled by

governors appointed by the Muham- madan emperors in the north. From 1340 to 1539 its governors asserted a precarious independence, and arrogated the position of sovereigns on their own account. From 1540 to 1576 Bengal passed under the rule of the Pathan or Afghan dynasty, which commonly bears the name of Sher Shah. On the overthrow of this house by the power- ful arms of Akbar, Bengal was incorporated into the Mughul empire, and administered by governors appointed by the Dehli emperor, until the treaties of 1765, which placed Bengal, Behar, and Orissa under the administration of the East India Company. Until 1854 Bengal remained under the Governor-General of India as governor, his place being supplied, during his absence in other parts of India,

by a deputy-governor from among the members of his council. By the statute 16 and 17 Vict. cap. 95, these two great offices were separated, and Bengal erected into a Lieutenant-Governorship. The first lieutenant-governor was appointed in 1854, and the constitution of the Government of Bengal still continues on this basis, except that the lieu- tenant-governor is now appointed subject to the approval of Her Majesty. In a brief sketch like the present it is impossible to attempt further historical details beyond a bare list of the successive rulers, and the dates of their accession.

Frrst Perron. Karly Muhammadan Conquerors of Bengal.

A.D. ARE. Governors of Bengal. pe eg us ae 1204| 600|Bakhtiyar Khilji Kutab John 1206] 602)/Muhammad Sheran Do. Do. 1208, 605/Ali Mardan Do. Do. 1212) 609/Ghyas Uddin Altamsh Do. 1227| 624)Nasir Uddin Do. Henry ITI. 1230, 627/Ala Uddin Do. Do. 1237) 634/Tughan Khan Sultana Rizia Do. 1244) 642)Taimur Khan Bahram II. Do.

: ; ; Nasir Uddin 1246) 644/Saif Uddin i hesanad Do. 1253] 651|/Mulk Uzbek Do. Do. 1257] 656\Jalal Uddin Do. Do. 1258) 657|Irsilan Khan Do. Do. 1260) 659|Tatar Khan Do. Do. 1277| 676)Tughral Khan Balin Edward I. 1282} 681) Nasir Uddin Do. Do. 1325) 725\Kadr Khan (Muhammad IJ. |Edward II.

SeconD PrERIoD. Independent Muhammadan Kings of Bengal. 1340| 741/Fakir Uddin Muhammad III. |Edward I11.

1343, 748’\ Ilyas Shah Do. Do. 1358| 760,Sikandar Shah Firuz III. Do. 1367| 769 Ghiyas Uddin II. Do. Do. | 1378] 775 Sultan Asalatin Do. Do.

1383] 785)\Sams Uddin Do. Richard II. 1385} 787|Raja Ganes Do. Do.

1392) 794 Jalal Uddin Muhammad IV. Do.

1409) 812/Ahmad Shah Mahmud III. Henry IV. 1426} 830|Nasir Shah Mubarik II. Henry VI.

1457] 862|Barbek Shah Beloli Ladi Do. 1474| 879, Yusaf Shah Do. Edward IV. 1482) 887|Fathi Shah Do. Do. | 1491| 896’Sultan Shahzadeh Sikandar Henry VII. | 1492! 897\Firuz Shah Do. Do. 1494| 899|M4hmud Shah Do. De 1495] 900) Muzaffar Shah Do. Do.

1499} 905, Husain Shah Do. Do.

1520] 927)Nasirat Shak Ibrahim Henry VIfI

1533\ 940 Mahmud Shah Humayun Do. THIRD PERIOD,

Bengal under Afghan or Pathan Dynasty. (Sher Shdh.) 1539] 946)Khizir Khan Sher Shah Henry VIII. 1545| 952)/Muhammad Sur Salim Shah Do.

1555) 962)/Bahadur Shah Muhammad Adil|Mary 1560] 968\Jalal Uddin Do. Elizabeth 1564) 971|Sulaiman Kerani | Do. Do. 1573\ 981|\Daud Khan Akbar Do.

1576

1580 1582 1584 1589 1606 1607

1579,

FourTH PERIOD.

Governors of Bengal under the Mughul Dynasty.

984 Khan Jahan 987 Muzaffar Khan 988 Raja Todarmal 990 Khan Azim 992 Shahbaz Khan 997, Raja Mansinh

1016 Jahangir Kuli

1015 Kutal Uddin Kokaltash

Akbar Eli abeth Do. Do. Do. Do. Do. Do. Do. Do. Do. Do.

J ahangir James I

| Do. Do.

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Fourtn PErtop —Continued.

Kings of

A.D. | A.H. Governors of Bengal. cena England.

. i 1608]1017|Shaikh Islam Khan Jahangir James I, 1613/1022| Kasim Khan Do. Do. 1618/1028)lbrahim Khan Do. Do. 1622/1032;\Shah Jahan Do. Do. 1625/1033'Kbanazad Khan Do. Charles I. 1626/1035| Mukarrain Khan Do. Do. 1627/1036|Fidar Khan Do. Do. 1628/1037|Kasim Khan Jabuni Shah Jahan Do. 1632/1042|Azim Khan Do. Do. 1637/1047|Islam Khan Mushedi Do. Do. | 1639)1049\Sultan Shuja Do. Do. 1660,1070|Mar Jumla Aurangzeb Charles 11. | 16641074|Shaist' Khan Do. Do. 1677/1087|Fidat Khan Do. Do. | 1678/1088/Sultan Muhammad Azim) Do. Do. 1680'1090\Shaista Khan Do. Do. | 1689,1099|[brabim Khan II. Do. Williain 111. 1697/1108)Azim Ushan Do. Anne 1704.1116|Murshid Kult Do. George II. 17251139|Shuja Uddin Khan Muhammad Shah} Do. 1739'1151|Sarfaraz Khan Do. Do. 1740,1153'Ali Vardi Khan Do. Do. 17561170 Siraj Ud Daula Alamgir Do.

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The above chronology is taken from Stewart's History of Bengal.

Firtu PEriop.

Governors of Bengal and Glovernors-General of India under the Kast India Company, 1765-1854.

1765, Lord Clive; 1767, Harry Verelst ; 1769, John Cartier ; 1772, Warren Hastings; 1785, Sir John Macpherson; 1786, Marquis Cornwallis; 1798, Sir John Shore (Lord Teignmouth) ; 1798, Sir Alured Clarke (pro. tem.); 1798, Marquis Wellesley ; 1805, Marquis Cornwallis ; 1806, Earl of Minto; 1813, Marquis of Hastings ; 1823, John Adam (pro, tem.); 1823, Earl Amherst; 1828, Lord William Cavendish Bentinck ; 1835, Sir Charles Metcalf; 1836, Earl Auckland; 1842, Karl of Ellenborough ; 1844, Viscount Hardinge ; 1848, Marquis of Dalhousie.

SixtH PERtop. Bengal under Ineutenant-Governors, 1854-1874.

Sir Frederic Halliday ; Sir John Peter Grant ; Sir Cecil Beadon ; Sir William Grey; Sir George Campbell; Sir Richard Temple.

English connection with Bengal.—The East India Com- pany formed its earliest settlements in Bengal in the first half of the 17th century. These settlements were of a purely commercial character. In 1620 one of the Company's factors dates from Patn4; in 1624-36 the Company estab- lished itsclf, by the favour of the emperor, on the ruins of the ancient Portuguese settlement of Pippli, in the north of Orissa; in 1640-42 the patriotism of an English sur- geon, Mr Gabriel Boughton, obtained for us establishments at Balasor, also in Orissa, and at Hugli, some miles above Calcutta. The vexations and extortions to which the Company's early agents were subjected more than once almost induced them to abandon the trade, and in 1677-78 they threatened to witlidraw from Bengal altogether. In 1685, the Bengal factors, driven to extremity by the oppression of the Mughul governors, threw down the gauntlet ; and after various successes and _hair-breadth escapes, purchased from the grandson of Aurangzeb in 1696, the villages which have since grown up into Calcutta, the metropolis of India During the next fifty years the \inglish had a long and hazardous struggle alike with the Mughul governors of the province and the Marhatta armies

which invaded it. In 1756 this struggle culminated in the great outrage known as the Black Hole of Calcutta, followed by Clive's battle of Plassey and capture of Cal- cutta, which avenged it. That battle, and the subse- quent years of confused fighting, established our military supremacy in Bengal, and procured the treaties of 1765, by which the provinces of Bengal, Behar, and Orissa passed

under our administration. To Warren Hastings (1772-85) belongs the glory of consolidating our power, and convert- ing a military occupation into a stable civil government. To another member of the civil service, John Shore, after- wards Lord Tcignmonth (1786-93), is due the formation of a regular system of Anglo-Indian legislation. Acting through Lord Cornwallis, then Governor-General, he ascer- tained and defined the rights of the landholders in the soil. These landholders under the native system had, for the most part, started as collectors of the revenues, and gradu- ally acquired certain prescriptive rights as quasi-proprietors of the estates entrusted to them by the Government. In 1793 Lord Cornwallis declared their rights perpetual, and made over the land of Bengal to the previous quasi-proprie- tors or zaminddrs, on condition of the payment of a fixed land tax. This great piece of legislation is known as the Permanent Scttlement of the Land Revenue. Bunt the Cornwallis code, while defining the rights of the proprie- tors, failed to give adequate recognition to the rights of the under-tenants and the cultivators. His Regulations formally reserved the latter class of rights, but did not legally define them, or enable the husbandmen to enforce them in the courts. After half a century of rural disquiet, the rights of the cultivators were at length carefully formulated by Act X. of 1859. This measure, now known as the land law of Bengal, effected for the rights of the under-holders and cultivators what the Cornwallis code in 1793 had effected for those of the superior landholders. The status of each class of person interested in the soil, from the Government as suzerain, through the zaménddrs or superior landholders, the intermediate tenure-holders, aud the under- tenants, down to the actual cultivator, is now clearly defined. The Act dates from the first year after the transfer of India from the Company to the Crown; for, meanwhile, the mutiny had burst out in 1857. The trans- actions of that revolt chiefly took

place in Northern India, and will be found under the article on the North-Western Provinces ; the uprising, although fierce and for a time perilous to our supremacy, was quickly put down. In Bengal it began at BARRACKPUR (qg.v.), WaS communicated to Dacca in Eastern Bengal, and for a time raged in Behar, producing the memorable defence of the billiard-room at Arrah by a handful of civilians and Sikhs,—one of the most splendid pieces of gallantry in the history of the British arms. Since 1858, when the country passed to the Crown, the history of Bengal has been one of steady and peaceful progress. The two great lines of railway, the East Indian and the Eastern Bengal, have been completed; and a third, the Northern Bengal Railway, is now in progress. Trade has enormously expanded ; new centres of commerce have sprung up in spots which not long ago were silent jungles; new staples of trade, such as tea and jute, have rapidly attained importance ; and the coal-fields and iron ores are beginning to open up prospects of a new and splendid era in the internal development of the country.

The best account of Bengal as at present coustituted is to be found in the adininistration reports of Sir George Campbell, K.C.S.1., when lieutenant-governor of Bengal, in 1871-72 and 1872-73. These reports are of an official character, and embody the results of the census of 1872. Among non-official works Colonel Dalton's great volume on The Ethnology of Bengal holds a conspicuous place, This splendid quarto condenses the personal observations of a long career spent among the people. Stewart's History of Bengal, a work which was admirable when first published, is now fifty years out of date, and stands in much need of re-editing. The jonrnals of the Asiatic societies in London, Paris, and especially Calcutta, are still the great storehouses for original research. The Calcutta Review contains many valuable articles, which the index to its first fifty volumes renders easily available. The present writer has endea- voured in his Annals of Rural Bengal, and in his two volumes on Orissa; or, the Vicissitudes of an Indian Province under Native and British Rule, to present to the general reader the result of his re scarchcs with regard to this part of India. (W. W. H.)

BENGAZI, a seaport town on the northern coast of Africa, and capital of the province of Barca, is situated on a narrow strip of land between the Gulf of Sidra and a salt lake, in 30° 7’ N, lat. and 20° 3’ E. long. Though for the most part poorly built, it has one or two buildings of some pretensiou—au ancient castle, a mosque, a Franciscan monastery, Guvernment buildings, and barracks. The wells in the town being brackish, drinking ~~water has to be brought from the village of Sowani. The harbour is almost rendered useless by accumulations of sand, and ships have to discharge by means of lighters. Legitimate trade has recently been neglected by the inhabitants, who find it more profitable to furnish slaves to the Alexandrian mar~~ ket. ‘The exports, which consist chiefly of sheep, wool, barley, wheat, butter, and salt, amounted in 1874 to £279,000, while the imports, of which the most important item is cloth goods, were valued at £162,600. Consuls are maintained at Bengazi by England and Italy, and France is represented by a vice-consul, The population, estimated in 1862 at 6000 or 7000, has since undergone various fluctuations, and suffered especially from an epi- demic in 1872.

BENGEL, Joun Apert, a celebrated Biblical scholar and critic, was born at Winnenden, in Wiirtemberg, on the 24th June 1687. His father, who was one of the ministers of that town, having died when Bengel was only six years old, his education was taken in hand by a friend of his father named Spindler, who having afterwards be- come a master in the gymnasium at Stuttgart, carried the boy thither with him, and superintended his education until he entered the University of Tiibingen in the year 1703. While at the university, the works to which, among others, he gave special attention as private studies were those of Aristotle and Spinoza, and so thoroughly did he make himself acquainted with the metaphysics of the latter, that he was selected by one of the professors to prepare materials for a treatise De Spinosismo which the pro- fessor afterwards published. He himself used to express his “ great thankfulness for the benefit which he had de- rived from the study of metaphysics and mathematics, in respect of the clearness of thought which they imparted, which was of the utmost value to him in the analysis and exposition of the language of Scripture.” After taking his degree, Bengel devoted himself to the study of theology, to which the grave and religious tone of his mind, deep- ened and strengthened by his early training and discipline, naturally inclined him. Like other young men of

thought- ful character, before and since, he had to struggle with doubts and difficulties of a religious nature, and he alludes, with much feeling, to the " many arrows which pierced his poor heart, and made his youth hard to bear." It is in- teresting to know that at this early date his attention was directed to the various readings of the Greek New Testa- ment, and that one cause of his mental perplexities was the difficulty of ascertaining the true reading among the great number of those which were presented to his notice. In 1707 Bengel entered the church, and was appointed to the parochial charge of Metzingen-unter-Urach. Here he remained only one year, and during that time devoted himself to the study of the writings of Spener, Arndt, A. .H. Franke, and Chemnitz. The profound impression which the works of these men made upon his mind was never effaced, and may be traced in that vein of devotional, not to say pietistic, feeling which runs through all his religious compositions. In 1708 Bengel was recalled to Tiibingen to undertake the office of Repetent or theological tutor. Here he remained until 1713, when he was appointed the head of a seminary recently established at Denkendorf and intended as a preparatory school of theology. Before entering on his duties there, he made a literary journcy

O71 through the greater part of Germany, to acquaint himself with the various systems of education which were in use, in order to qualify himself for the better discharge of his official duties. In prosecuting the journcy he visited with laudable impartiality the seminaries of the Jesuits as well as those of the Lutheran and Reformed Churches. Among other places he visited Heidclberg and Halle, and had his attention directed at the former city to the canons of Scrip- ture criticism published by Gerhard von Mastricht,. and at the latter to Vitringa's Anacrisis ad Apocalypsin. The in- fluence exerted by these upon his theological studies will be apparent when we come to notice his works upon the criticism and interpretation of Scripture. For twenty- eight years—from 1713-1741—he discharged his import- ant duties as head of the school of Denkendorf with dis- tinguished ability and success, devoting all his energies to the religious and intellectual improvement of his students. It is impossible to read the extracts from his diary and correspondence, which have been preserved, without being struck with the spirit of fervent piety, combined with sagacity and good sense, which characterized his manage- ment of the institution. These twenty-eight years were the period of Bengel's greatest intellectual activity,

many of the works on which his reputation rests being included within them. Jn 1741 he was appointed prelate of the cloister of Herbrechtingen, an office which he held for eight years. In 1749 he was raised to the dignity of consis- torial counsellor and prelate of Alpirsbach, with a residence in Stuttgart. Bengel henceforth devoted himself to the discharge of his duties as a member of the consistory. A question of considerable difficulty was at that time occu- pying the attention of the church courts, viz., the manner in which those who separated themselves from the church were to be dealt with, and the amount of toleration which should be accorded to meetings held in private houses for the purpose of religious edification, The civil power (the duke of Wiirtemberg was a Roman Catholic) was disposed to have recourse to measures of repression, while the mem- bers of the consistory, recognizing the good effects of such meetings, werc inclined to concede a considerable degree of liberty. Bengel exerted himself on the side of the latter. The admirer of Spener, the founder of the collegia pietatis, could not but show himself favourably disposed to meetings held for religious purposes, and while main- taining the rights and privileges of the church, he was an advocate for all reasonable freedom being accorded to those who felt themselves bound on grounds of conscience to withdraw from her communion. 'The good effects of this policy may be seen at this day in the attitude taken up by those who in Wiirtemberg have separated from the church. Bengel's public position necessarily brought him into contact with many individuals of celebrity, by whom he was consulted on all important theological and ecclesi- astical questions. Ina single year he received no fewer than 1200 Ictters. In the year 1751 the University of Tiibingen, his own alma mater, conferred upon him the degree of doctor of divinity. Bengel's life was now drawing to a close. He died, after a short illness, in 1752, aged sixty-five years and four months. He himself is reported to have said, "'J shall be forgotten for a while, but I shall again come into remembrance ;" and his favourite pupil Oetinger re- marked of him, " His like is not left in Wiirtemberg."

The works on which Bengel's reputation rests as a Biblical scholar and critic are, his edition of the Greek New Testament, and his Gnomon or Exegetical Commentary on the same.

(A.) His edition of the Greek Testament was published in 4to at Tiibingen in 1734, and in 8vo at Stuttgart in the same year, but without the critical apparatus. So early as 1725 he had given an account in his Prodromus Novi Testamenti Graeci recte cauteque adornandi of the principles on which his intended edition was to be based. In preparation for his work Bengel was able to avail himself of the collations of upwards of twenty MSS., none of them, however,

*O72 of great importance, twelve of whieh had been collated by himself. In constituting the text, he imposed upon himself the singular restriction of not inserting any various reading which had not al- ready been printed in some preceding edition of the Greek text. From this rule, however, he deviated in the case of the Apocalypse, where, owing to the corrupt state of the text, he felt himself at liberty to introduce some readings on manuseript authority. In the lower margin of the page he inserted a selection of various read- ings, the relative importance of whieh he denoted by the first five letters of the Greek alphabet in the following manner :—a was em- ployed to denote the reading which in his judgment was the true one, although he did not venture to place it in the text ; 6, a read- ing better than that in the text; y, one equal to the textunl read- ing; Sand e, readings inferior to those in the text. Stephens's division into verses was retained in the inner margin, but the text was divided into paragraphs. The text was followed by a critical apparatus, the first part of which consisted of an introduction to the criticism of the New Testament, in the thirty-fourth section of which he laid down and explained his celebrated canon, " Proclivt Scriptiont prestat ardua"' ('*The more difficult reading to be pre- ferred to that which is more easy"), the soundness of which, as a general principle, has been recognized by succeeding critics, al- though it was objected to by his great opponent Wetstein, who, nevertheless, found " himself ultimately obliged to lay down some- thing nearly to the same effeet'"' (Scrivener). The second part of the critical apparatus was devoted to a consideration of the various readings, and here Bengel adopted the plan of stating the evidence both against and in favour of a particular reading, thus placing before the reader the materials for forming a judgment. It isa proof of Bengel's great critical sagacity that he was the first de- finitely to propound the theory of families or recensions of MSS. His investigations had led him to see that a certain affinity or re- semblance existed amongst many of the authorities for the*

Greek text—MSS., versions, and ecelesiastical writers ; that if a peculiar reading, ¢.g., were found in one of these, it was generally found also in the other members of the same class; and this general re- lationship seemed to point ultimately to a common origin for all the authorities which presented such peculiarities. Although dis- posed at first to divide the various documents into three classes, he finally adopted a classification into two—the African, or older family of documents, and the Byzantine, or more recent class, to which he attached only a subordinate value. The theory was afterwards adopted by Semler and Griesbach, and worked up into an elaborate system by the latter critic. Bengel's labours on the text of the Greek Testament were received with great disfavour in many quarters. Like Walton and Mill before him, he had to encounter the opposi- tion of ignorant and fanatical individuals who believed that the certainty of the Word of God was endangered by the importance attached to the various readings, as if the received text were pos- sessed of infallible authority. One of his opponents, Provost Kohl- reif, publicly challenged him to put the enemies of criticism to silence by adniitting that even the various readings were given by inspiration, in order to meet the necessities of various classes ot readers! Wetstein, on the other hand, accused him of excessive caution in not making freer use of his critical materials. In answer to these strictures, Bengel published a Defence of the Greck Text of his New Testament, which he prefixed to his Harmony of the Four Gospels, published in 1786, and which contained a sufficient answer to the misrepresentations, especially of Wetstein, which had been brought against him from so many different quarters. 'The text of Bengel long enjoyed a high reputation amongst scholars, and was frequently reprinted.

- (B.) The other great work of Bengel, and that on which his reputation as an exegete is mainly based, is his Gnomon, or Exe- getical Annotations on the New Testament, published in 1742. It was the fruit of twenty years' labour, and exhibits with a pregnant brevity of expression, which, it has been said, " condenses more mat- ter into a line than can be extracted from pages of other writers," the results of his study of the sacred volume. He modestly entitled his work a Gnomon or index, his object being rather to guide the reader to ascertain the meaning for himself, than to save him from the trouble of personal investigation. The prineiples of interpreta- tion on which he proceeded were, to import nothing znto Scripture, but to draw owt

*of it everything that it really contained, in con- formity with grammatico-historical rules; not to be hampered by dogmatical considerations ; and not to be influenced by the symboli- cal books. Bengel's hopes that the Gnomon would help to rekindle a fresh interest in the study of the New Testament was fully rea- lized. It has passed through many editions (latest 1850), has been translated into German and into English, and is still one of the books most highly prized by the expositor of the New Testament. It is a striking testimony to its value that John Wesley largely availed himiself of it in writing his Expository Notes wpon the New Lestament, 1755, saying that Re *"believed he would mueh better sorve the interests of religion by translating from the Gnomon than by writing many volumes of his own notes." Later commentators have not failed to follow Wesley's example,*

Besides the two works already described, Bengel was the editor or author of many others, elassical, patristic, ecclesiastical, and expository, which our limits do not allow us to diseuss. We can only name two, viz., Ordo Temporum, a treatise on the chronology of Scripture, in which he enters upon speculations regarding the end of the world, and an Hxposition of the Apocalypse, which en- joyed for a time extraordinary popularity in Germany, and was translated into several foreign languages.

For full details regarding Bengel the reader is referred to the Memoir of his Life and Writings, by J. C. ¥. Burk, translated into English by Rev. R. F. Walker, London, 1837. (F. C.)

BENGUELA, a country on the western coast of Africa, situated to the south of Angola, between 10° and 17° §. lat., and extending from the River Coanza to the Cunene, which is otherwise known as Nourse, Rio das Trombas, Rio dos Elephantes. The country rises from the coast inwards till it attains a decidedly mountainous character. There is great abundance both of vegetable and animal life; and the higher regions contain mines of copper, silver, iron, and salt. The inhabitants belong to the Congo race and speak the Bunda language. In 1617 the Portuguese under Manoel Cerveira Pereira founded the town of 8. Felhpe de Benguela near the mouth of the Cavaco, on the Bahia das Vacas (Santo Antonio, or Cone's Bay), in 12° 34' §. lat. and 13° 20' E. long. It was long the centre of an important trade,

especially in slaves, but has now greatly declined. There is but little traffic, and no manufactures. Besides the churches of S. Felipe and S. Antonio, the hospital, and the fortress, there are only a few stone-built houses. The uegro town of Catombela, about 8 miles distant, is in a more flourishing condition. A short way below Benguela is Bahia Tarta, where salt is manufactured and sulphur excavated. 'fhe town of Old Benguela is situated about 130 miles to the N. ; and about 80 miles in that direction lies the Presidio of Novo Redondo, where fortifications were crected in 1769. Among the more important inland towns are Bihé, Bai- lundo, and Caconda, in the last of which the Portuguese have long had a fortress. The southern portion of Ben- guela forms the separate government of Mossamedes, of which the capital of the same name is situated on the Bay of Mossamedes at the mouth of the River Béro (Rio das Mortes). The bay was formerly called Angra do Negro, and received its present designation in honour of Baron Mossamedes about 1785. The town, which is known to the natives as Mossongo-Bittolo, was not founded till 1840, The population of the whole territory of Ben- guela is estimated at about 140,000.

BENICARLO, a city of Spain, in the province of Cas- tellon, on the coast of the Mediterranean. It is surrounded by ancient walls, and has a ruined castle. 'The manufacture of brandy is carried on, and the town is celebrated for its red wine, which is annually exported to Bordeaux for mixing with clarets and other French wines. The value of wine exported in 1869 was £9500. Population, 7000.

BENIN, a country, city, and river of Western Africa, to the west of the main channel of the Niger. The name was formerly applied to the whole stretch of coast from the Volta, in 0° 40' E. long., to the Rio del Rey or Riumbi, in 8° 40' E. long., including what is now known as the Slave Coast, the whole delta of the Niger, and a small portion of the country to the eastward ; and some trace of this earlier application remains in the name of Bight of Benin, still given to that part of the sea which washes the Slave Coast. The kingdom of Benin seems at one time to have been one of the most powerful of Western Africa, and was known to Europeans in the 17th century as the Great Benin. Budagry and Lagos, now British posses- sions, are both Beninese colonies. Benin has now been long in a state of decline, and the

territory is broken up into independent states of no individual importance. Such coherence, indeed, as still exists is rather ethnographical

than territorial ; but it may be regarded as bounded on the E. by the Niger, N. by the Yoruba country, and W. by Egba. The soil is highly fertile and produces palms, rice, beans, maize, kokos,plantains, cotton, sugar, and Guinea pepper, in great abundance. The papaw and African plum grow wild, and excellent tobacco can be raised. Many parts of the country are covered with almost im- penetrable forests and swamps, but towards the north there is fine pasture land, in which the natives rear both cattle and horses. of considerable value. Of trees the cotton wood, the tamarind, and the mangrove are the most frequent. The population is pretty dense, and it is said that in the most flourishing state of the kingdom the king could collect 100,000 men. His rule is absolute, and he is revered by his subjects as a species of divinity. It is a crime to believe that the king cither eats or sleeps ; and all offences against him are punished with the utmost severity. The religion and mythology agree with the great system of Yoruba and Oro; the chief god is wor- shipped with human sacrifices to an appalling extent. The people, at the same time, do not indulge in wanton cruelty ; they usually stupefy the victims before putting them to death. The houses, at least of the better classes, are built on a plan similar to that of the Romans, with a regular atriwm aud implumiwm. The Beninese weave their cotton into a fine kind of muslin, which is worn in huge bulging petticoats by people of wealth, while the lower orders are content with a simple Beluko or kilt. The capital of the kingdom, or city of Benin, is situated about 734 miles inland from the mouth of the Rio Formoso or Benin River, about 5° 35’ E. long. and 6° 25’ N. lat. It covers a large extent of ground, but is so broken up into separate portions by intervening spaces of jungle, that no proper estimate can be formed of its popula- tion. The Obwe, or King’s quarter, alone is supposed to have upwards of 15,000 inhabitants; but at the time of Burton’s visit in 1862 many of the houses were empty and falling to ruin. The next city in importance is Wari(Owari, Awerri, or Owheyre, called Jaku by the natives), which is situated about 130 miles §.S.E. of the capital, and some 7 or 10 miles from the sea, on an island surrounded by a branch of the Niger distinguished by the same name. It was formerly described as consisting of

two parts about half a mile distant from each other, but now consists of one long and straggling line along the shore. The popu- lation previously stated at 5000 is reduced by Burton to 2000. The town, however, has its own king, who has long asserted his independence of the monarch of Benin. The houses are neatly built of clay, coloured with red ochre, and frequently ornamented with rudely carved pillars. The port of Gwato (or as it is variously called, Gato, Agatho, or Agatton) lies about 30 miles N.N.E. of the mouth of the Benin River, is a place of some import- ance for the palm-oil trade, and has a special interest as the place where Belzoni, the traveller, died and was buried. Numerous factories are scattered along the creeks of the delta for the purposes of trade, but all the larger European settlements have disappeared. Since the abolition of the slave trade the chief export of the country is palm-oil, in return for which salt, silk stuffs, guns and gunpowder, coral (which is the official decoration of the higher dignities), beads, iron, brass, and brandy are im- ported. The common internal currency is the cowrie-shell.

The River Benin, called by the natives Uwo Ko Jakri, or Outlet of Jakri, is about two miles broad at its mouth ; but it is crossed by a very extensive bar of mud and sand, on which there is only 12 feet of water at spring tides. Ships of 60 tons can ascend as far as Gwato.

Benin was discovered by the Portuguese about the year 1485, and they carried on for some time a brisk trade in slaves, who were

carried to Elmina, and sold to the natives of the Gold Coast. John III. of Portugal, however, prohibited this traffic ; and, as the situation was found very unhealthy, the scttlement was ordered to be withdrawn. Many traces of the Portuguese occupation arc still to be found, and one of the most striking proofs of their infiu- ence is the fact that a corrupt Lusitanian dialect is still speken by the older natives. The Dutch afterwards established factories, and maintained them for a considerable time, chiefly with a view to the slave trade. In 1788 Captain Landolphe founded a factory called Barodo, near the native village of Obobi, for the French Compagnie d'Oywheré; and it lasted till 1792, when it was destroyed by the English. See Bosman's Description of the Coast of Guinea im 1705 (in vol. xvi. of Pinkerton's Voyages); William Smith's New Voyage to Guinea, 1744; Adams's Remarks

on the West Coast of Afriea, 1823; Clappertun's Second Hapedition, 1829; Lander's Travels, 1832 ; Burton's My Wanderings in West Africa, 1863.

BENJAMIN (813, Sept. Bena), the youngest son of the patriarch Jacob, by Rachel. His mother, dying in childbed, gave him the name Benoni, "Son of my pain," which was changed by his father to Benjamin, mcaning probably "Son of the right hand," that is, "Son of pros- perity" (Gen. xxxv. 16-18). Of his personal history little is recorded. He was the favourite of his father and brothers, and seems to have becn of an amiable though somewhat weak character. In this respect he strikingly contrasts with the tribe, whose history was foretold in the dying prophecy of Jacob, " Benjamin shall ravin as a wolf" (Gen. xlix. 27). The tribe of Benjamin, though the least numerous of Israel, became nevertheless a consider- able race. In the desert it counted 35,400 warriors (Num. i. 37), and at the entrance of Israel into Canaan even as many as 45,600 (Num. xxvi. 41). The portion allotted to this tribe was encompassed by the districts of Ephraim, Dan, and Judah. In the time of the judges the tribe of Benjamin became involved in a civil war with the other eleven tribes, which terminated in its almost utter ex- tinction, 600 men alone escaping (Judges xix., xx.) The tribe speedily revived, however; in the time of David it numbered 59,434 able warriors, and in that of Asa, 280,000. This tribe had the honour of giving the first king to the Jews, Saul being a Benjamite. After the death of Saul, the Benjamites declared themselves for his son Ishbosheth, until, after the assassination of that prince, David became king of all Israel. David having expelled the Jebusites from Zion, and made it his own residence, the close alliance that previously existed between the tribes of Benjamin and Judah was cemented by the cir- cumstance that, while Jerusalem belonged to the district of Benjamin, that of Judah was immediately contiguous to it. At the division of the kingdom after the death of Solomon, Benjamin espoused the cause of Judah, and they formed a kingdom by themselves. Indeed, the two tribes stood always in such a close connection as often to be included under the single name Judah.

BENJAMIN, of Tudela, in Navarre, a celebrated Jewish rabbi of the 12th century, whose Jtenerary is a literary curiosity. He visited Constantinople, Egypt, Assyria, and Persia, penetrating to the frontiers of China. He was credulons, but his work contains some curious notices of the couutrics he

visited. It was translated from the Hebrew into Latin by Arias Montanus in 1575, and appeared in a French version by Baratier in 1734, and again in 1830. The latest English translation is that by Asher, 1840.

BENNET, Henry, Earl of Arlington, a distinguished statesman in the reign of Charles II., was born of an ancient family in Middlesex, in the year 1618. In the beginning of the civil war he was appointed under- secretary to Lord Digby, secretary of state. He afterwards entered himself as a volunteer for the royal cause, and did the king good service, especially at Andover in Hampshire, where he was severely wounded. He was made secretary to the Duke of York, received the honour of knighthood from Charles II. at Bruges in 1658, and was sent as envoy

to the court of Spain. Upon the return of the king to England he was called home, made keeper of the privy purse, and principal secretary of state In 1670 he was of the council distinguished by the title of the Cabal, and one of those who advised the shutting up of the exchequer. In 1672 he was made Earl of Arlington and Viscount Thetford, and soon after knight of the garter.

"Henry Bennet, Lord Arlington, then secretary of state, had, since hc came to manhood, resided principally on the Continent, and had learned that cosmopolitan indifference to constitutions and religions which is often observable in persons whose life had been pane in vagrant diplomacy. If there was any form of government he liked, it was that of France. If there was any church for which he felt a preference, it was that of Rome. He had some talent for conversation, and some talent also for transacting the ordinary business of office. He had learned, during a life passed in travel- ling and negotiating, the art of accommodating his language and deportment to the society in which he found himself. His vivacity in the closet amused the king; his gravity in debates aud confer- ences imposed on the public ; and he had succeeded in attaching to himself, partly by services and partly by hopes, a considerable number of personal retainers.' — (Macaulay's Hist., vol. i. pp. 220-21.)

He died in 1685. His Letters to Sir William Temple were published after his death.

BENNETT, James Gorpon, American journalist, originator and editor of the Mew York Lerald, was by birth a Scotchman. He was born at Newmills in Banff- shire, about 1800. Destined for the priesthood in the Roman Catholic Church, he was educated in a seminary at Aberdeen But it became evident that he was naturally unfit for the priestly calling ; and his aversion ripened into a determination to escape from it. The reading of Frank- lin's Autobiography led him to resolve on emigration to America, and in the spring of 1819 he sailed for the New World. Landing at Halifax, he earned a poor living there for a short time by giving lessons in French, Span- ish, and bookkeeping ; he passed next to Boston, where starvation almost threatened him till he got employment in a printing-office; and in 1822 he went to New York. An engagement as translator of Spanish for a newspaper took him for a few months to Charleston, South Carolina. On his return to New York he projected a school, gave lectures on political economy, and did subordinate work for the journals In 1825 he made his first attempt to establish a journal of his own; and the next ten years were occupied in a variety of similar attempts, which proved futile. During that period, however, he became Washington correspondent of the Jnguirer; and his letters, written in imitation of the letters of Horace Walpole, attracted attention. Notwithstanding all his hard work and his resolutely abstemious life, he was still a poor man. It was not till 1835 that he struck the vein which was to reward and enrich him. On May 6 of that year appeared the first number of a small one-cent paper, bearing the title of New York Merald, and issuing from a cellar, in which the proprietor and editor played also the part of salesman. 'He started with a disclaimer of all principle, as it is called, all party, all politics ;" and to this he certainly adhered. By his immense industry and practical sagacity, his un- scrupulousness, variety of news, spicy correspondence, supply of personal gossip and scandal, the paper became a great commercial success. Bennett continued to edit the Herald till his death. The successful mission of Stanley to Central Africa in search of Dr Livingstone, of whom nothing had long been heard, was undertaken by his desire and at his expense; and he thus showed in the last year of his life the inextinguishable spirit of enterprise which had animated him throughout his whole career. He died at New York, June 2, 1872.

BENNETT, Joun Hucuss, for twenty-six years professor of the institutes of medicine at Edinburgh University, was born in London on the 31st August

1812. He was edu-

cated at Exeter, and being destined for the medical pro- fession was articled to a surgeon in Maidstone. In 1833 he began his studies at Edinburgh, and in 1837 graduated with the highest honours. During the next four years he studied in Paris and Germany, and on his return to Edin- burgh in 1841 published a work on cod-liver oil, the recom- mendation of which as a reniedy in all consumptive diseases made his name widely known. In 1848 he obtained the chair of institutes of medicine, having already gained high reputation as an extra-academical lecturer and teacher. In 1871 his health gave way; he retired to the south of France, and in 1874 resigned his professorship. In August 1875 he was able to be present at the meeting of the British Medical Association in Edinburgh, on which occasion he received the degree of LL.D. 'The fatigue he then underwent brought on a relapse, and he was com- pelled to have the operation of lithotomy performed. He sank rapidly and died on the 25th September. Professor Bennett was an able teacher, and his original investiga- tions entitle him to a high place in the history of medicine. His publications are very numerous, including many articles in medical journals and several exhaustive treatises. Of these the best known are Clinical Lectures, 1858 (5th ed., 1868); Zreatise on Physiology, 1858, contributed to the 8th edition of the Lncyclopedia Britannica; Teat- book of Physiology, 1870.

BENNETT, Sm WitLti1am STERNDALE, was considered, for more than the last 20 years of his life, the head of the musical profession in England by the unanimous verdict of both English and foreign musicians. At his death he received the highest honour England can confer upon her sons—a grave in Westminster Abbey. He was born in 1816 at Sheffield, where his father was organist. Having lost his father at an early age, he was brought up at Cambridge by his grandfather, from whom he received his first musical education. In 1826 he entered the Royal Academy of Music, and remained a pupil of that institution for the next ten years, studying pianoforte and composition under Cipriani Potter, Dr Crotch, W. H. Holmes, and C. Lucas. It was during this time that he wrote several of his most appreciated works, not uninfluenced it seems by the contemporary movement of niusical art in

Germany, which country he frequently visited during the years 1836-42. At one of the Rhenish musical festivals in Diisseldorf he made the personal acquaintance of Mendelssohn, and soon afterwards re- newed it at Leipsic, where the talented young Englishman was welcomed by the leading musicians of the rising generation. He played at one of the celebrated Gewand- haus concerts his third pianoforte concerto, which was received by the public in a manner flattering both to the pianist and the composer. We still possess an enthusiastic account of the event from the pen of Robert Schumann, whose genial expansive nature was always open to new impressions. He never tired of Bennett's praise, whom he pronounced to be "the most musical of all English- men," and whom, in a private letter, he goes so far as to call "an angel of a musician." But even Schumann could not wholly conceal from himself the influence which Men- delssohn's compositions exercised on Bennett's mode of utterance, an influence which precluded the possibility of an original development to a degree alinost unequalled in the history of music, excepting perhaps tlie case of the Danish composer Niels W. Gade, who like Bennett was attracted to Leipsic by the fame of Mendelssohn, and who like him offercd his own artistic individuality at the shrine of the German composers genius. According to a tradition, the late Professor Hauptmann, after listening to a composition by Gade, is said to have pronounced the sarcastic sentence, "This sounds so much like Mendelssohn, that one might

almost suppose it to be written by Sterndale Bennett." It would lead us too far on the present occasion to point out how, by this subservicncy of the leading English musician to a foreign composer, the national development of English art was impeded in a deplorable manner. His great success on the Continent established Bennett's posi- tion in England. He settled in London, devoting himself chiefly to practical teaching. For a short time he acted as conductor of the Philharmonic Society, in which capacity, however, he earned little success. He was made musical professor at Cambridge in 1856, and in 1868 principal of the Royal Academy of Music. In 1871 he received the honour of knighthood. He died in 1875. Owing most likely to his professional duties lis latter years were not fertile, and what he then wrote was not superior, scarcely equal, to the productions of his youth. The

principal charm of Bennett's compositions (uot to mention his abso- lute mastery of the musical form) consists in the tender- ness of their conception, rising occasionally to sweetest lyrical intensity, but also bordering now and then on that ex- cessive sentimentalism from which his master Mendelssohn kept not always aloof. that Bennett's was a thoroughly refined nature, incapable of grand dramatic pathos, but also free from all inartistic pandering to the taste of the vulgar. Barring the opera, Bennett tried his hand at almost all the different forms of vocal and instrumental writing. As his best works in various branches of art, we mention, for pianoforte solo, and with accompaniment of the orchestra, his three sketches, The Lake, the Millstream, and the Fountain, and his 3d pianoforte concerto ; for the orchestra, his Symphony in G minor, and his overture The Naiads ; and for voices, his cantata The May Queen, written for the Leeds festival in 1858. He also wrote a sacred cantata, The Woman of Samaria, first performed at the Birmingham Musical Festival in 1867. Shortly before his death he produced a sonata called the Maid of Orleans, an elaborate piece of programme-music, descriptive of the deeds and sufferings and the final triumph of the French 'heroine according to Schiller's tragedy.

BENSERADE, Isaac pz, a French poet, was born in 1612 at Lions-la-Forét in Normandy. He made himself known at court by his verses and his wit, and had the good fortune to please the cardinals Richelieu and Mazarin. He wrote—l. A Paraphrase upon Job; 2. Verses for Ballets or Interludes ; 3. Rondeaux upon Ovid; 4. Several Tragedies. A sonnet of his, which he sent to a young lady with his paraphrase on Job, having been placed in competition with the Urania of Voiture, a dispute on their relative merits long divided the whole court and the wits into two parties, who were respectively styled the Jobelons and the Uranists. Some years before his death in 1691 Benserade retired to Chantilly, and devoted himself to a translation of the Psalms, which he nearly completed.

BENSON, Georcs, a learned dissenting minister, was born at Great Salkeld, in Cumberland, in 1699. His mental capacity was so precocious, that at 11 years of age he was able to read the Greek Testament. He afterwards studied at an academy at Whitehaven, whence he removed to the University of Glasgow.. In 1721 he was chosen pastor of a congregation of dissenters at Abingdon, in Berkshire, where he continued till 1729, when he became

the choice of a congregation in Southwark ; and in 1740 he was appointed by the congregation of Crutched Friars colleague to the learned Dr Lardner. His Defence of the

easonableness of Prayer appeared in 1731, and he after- wards published Paraphrases and Notes on the Epistles to the Thessalonians, Timothy, Titus, and Philemon, adding dissertations on several important subjects, particularly on inspiration. In 1735 he published his [Wistory of the

It must, however, bc acknowledged °

First Planting of Christianity, in 2 vols. 4to, a work of great learning and ability. He also wrote the Reasonable- ness of the Christian Religion, the History of the Life of Jesus Christ, a Paraphrase and Notes on the Seven Catholic Epistles, and several other works, which gained him great reputation as a scholar and theologian. He died in 1763.

BENTHAM, Jeremy, was born on the 15th February 1748, in Red Lion Street, Houndsditch, London, in which neighbourhood hisgrandfather and father successively carried on business as attorneys. His father, who was a wealthy man, and possessed at any rate a smattering of Greek, Latin, and French, was thought to have demeaned himself by marrying the daughter of an Andover tradesman, who afterwards retired to a country house near Reading, where young Jeremy spent many happy days. The boy's talents justified the ainbitious hopes which his parents entertained of his future. When three ycars old he read eagerly such works as Rapin's History, and began the study of Latin. A year or two later he learnt the violin and French conversation. At Westminster school he obtained a reputation for Greek and Latin verse writing; and he was only thirteen when he was matriculated at Queen's College Oxford, where his most important acquisition seems to have been a thorough acquaintance with Sanderson's logic. He became a B.A. in 1768, and in the same year entered at Lincoln's Inn, and took his seat as a student in the Queen's Bench, where he listened with rapture to the judgments of Lord Mansfield. Te managed also to hear Blackstone's lectures at Oxford, but says that he imme- diately detected the fallacies which underlay the rounded periods of the future judge. –

Bentham's family connections would naturally have given him a fair start at the bar, but this was not the career for which he was preparing himself. He spent his time in making chemical experiments and in speculating upon legal abuses, rather than in reading Coke upon Littleton and the Reports. On being called to the bar he "found a cause or two at nurse for him, which he did his best to put to death," to the bitter disappointment of his father, who had confidently looked forward to seeing him upon the woolsack. The first fruits of Bentham's studics, the Fragment on Government, appeared in 1776. This masterly attack upon Blackstone's praises of the Eng- lish constitution was variously attributed to Lord Mans- field, Lord Camden, and Lord Ashburton. One important result of its publication was that, in 1781, Lord Shelburne called upon its author in his chambers at Lincoln's Inn. Henceforth Bentham was a frequent guest at Bowood, where he saw the best society, and where he met Miss Caroline Fox, to whom he afterwards made. a proposal of marriage. In 1785 Bentham started, by way of Italy and Constantinople, on a visit to his brother, Sir Samuel Bentham, who became a general in thc Russian service ; and it was in Russia that he wrote his Defence of Usury. Disappointed in the hope which he had entertained, through a misapprehension of something said by Lord Lansdowne, of taking a personal part in the legislation of his country, he settled down to the yet higher task of discovering and teaching the principles upon which all sound legislation must proceed. His fame spread widely and rapidly. He was made a French citizen in 1792 ; and his advice was respectfully received in most of the states of Europe and America, with many of the lcading men of which he maintained an active correspondence. His ambition was to be allowed to prepare a code of law for his own or some foreign country. During nearly a quarter of a century he was engaged in negotiations with Govern- ment for the erection of a " Panopticou," which would render transportation unnecessary. The scheme was eventually abandoned, and Pentham received £23,000 by

way of compensation. In 1823 he established the West- minster Review. Some idea of the extent of Bentham's literary labours may be derived from the fact that his Works, as edited with biographical notices by Dr Bowring in 1843, fill eleven volumes octavo, of closely printed double columns.

Bentham died on the 6th of June 1832, in his 85th year, at the house in Queen's Square Place, which he had occupied for fifty years. In accordance with his directions, his body, after being dissected in the pre- sence of his friends, was embalmed, and is still preserved, seated in his wonted dress, in University College, London.

Bentham's life was a happy one of its kind. His con- stitution, weakly in childhood, strengthened with advancing years so as to allow him to get through an incredible amount of sedentary labour, while he retained to the last the fresh and cheerful temperament of a boy. An ample inherited fortune permitted him to pursue his studies undistracted by the necessity for making a livelihood, and to maximize the results of his time and labour by the employment of amanuenses and secretaries. He was able to gather around him a group of congenial friends and pupils, such as the Mills, the Austins, and Bowring, with whom he could discuss the problems upon which he was engaged, and by whom several of his books were practically rewritten, from the mass of rough though orderly memoranda which the master had himself prepared. Thus, for instance, was the Rationale of Judicial Evidence written out by J. S. Mill, and the Book of Fallacies by Bingham. The services which Dumont rendered in recasting, as well as translating, the works of Bentham were still more important.

The popular notion that Bentham was a morose visionary is far removed from fact. It is true that he looked upon general society as a waste of time, and that he disliked poetry as " misrepresentation"; but he intensely enjoyed conversation, gave good dinners, and delighted in music, in country sights, and in making others happy. These features of Bentham's character are illustrated in the graphic account given by the American minister, Mr Rush, of an evening spent at his house in the summer of the year 1818. "If Mr Bentham's character is peculiar," he says, "so is his place of residence. It was a kind of blind-alley, the end of which widened into a small, neat courtyard. There by itself stands Mr Bentham's house. Shrubbery graccd its area, and flowers its window-sills. It was like an oasis in the desert. Its name is the Herinitage. Mr Bentham received me with the simplicity of a philosopher. I should have taken him for 70 or upwards. Everything inside the house was orderly. The furniture seemed to have been unmoved since the days of his fathers, for I learned that it was a patrimony.

A parlour, library, and dining-room made up the suite of apartments. In each was a piano, the eccentric master of the whole being fond of music as the recreation of his literary hours. It is a unique, romantic-like homestead. Walking with him into the garden, I found it dark with the shade of ancient trees. They formed a barrier against all intrusion. The company was small, but choice. Mr Brougham ; Sir Samuel Romilly; Mr Mill, author of the well-known work on India; M. Dumont, the learned Genevan, once the associate of Mirabeau, were all who sat down to table. Mr Bentham did not talk much. He had a benevolence of manner suited to the philan- thropy of his mind. He seemed to be thinking only of the convenience and pleasure of his guests, not as a rule of artificial breeding as from Chesterfield or Madame Genlis, but from innate feeling. Bold as are his opinions in his works, here he was wholly unobtrusive of theories that might not have commended the assent of all present. When he did converse it was in simple language, a con- trast to his later writings, where an involved style and the

use of new or universal words are drawbacks upon the speculations of a genius original and profound, but with the faults of solitude. Yet some of his earlier productions are distinguished by classical terseness."—(Residence at the Court of London, p. 286.) Bentham's love of flowers and music, of green foliage and shaded walks, comes clearly out in this pleasant picture of his home life and social surroundings.

Whether or no he can be said to have founded a school, his doctrines have become so far part of the common thought of the time, that there is hardly an educated man who does not accept as too clear for argument truths which were invisible till Bentham pointed them out. His sensitively honour- able nature, which in early life had caused him to shrink from asserting his belief in Thirty-nine articles of faith which he had not examined, was shocked by the enormous abuses which confronted him on commencing the study of the law. He rebelled at hearing the system under which they flourished described as the perfection of human reason. But he was no merely destructive critic. He was deter- mined to find a solid foundation for both morality and law, and to raise upon it an edifice, no stone of which should be laid except in accordance with the deductions of the severest

logic. This foundation is "the greatest happiness of the greatest number," a formula adopted from Beccaria. The pursuit of such happiness is taught by the "utilitarian" philosophy, a phrase used by Bentham himself in 18062, and therefore not invented by Mr J. S. Mill, as he supposed, in 1823. In order to ascertain what modes of action are most conducive to the end in view, and what motives are best fitted to produce them, Bentham was led to construct marvellously exhaustive, though somewhat mechanical, tables of motives. With all their elaboration, these tables are, however, defective, as they omit some of the highest and most influential springs of action. But most of Bentham's conclusions may be accepted without any formal profession of the utilitarian theory of morals. They are, indeed, merely the application of a rigorous common sense to the facts of society. That the proxi- mate ends at which Bentham aimed are desirable hardly any one would deny, though the feasibility of the means by which he proposes to attain them may often be ques- tioned; and much of the new nomenclature in which he thought fit to clothe his doctrines may be rejected as unnecessary. To be judged fairly, Bentham must be judged as a teacher of the principles of legislation. With the principles of private morals he really deals only so far as is necessary to enable the reader to appreciate the impulses which have to be controlled by law.

As a teacher of legislation he inquires of all institutions whether their utility justifies their existence. prepared to suggest a new form of institution by which the needful service may be rendered. While thus engaged no topic is too large for his mental grasp, none too small for his notice ; and, what is still rarer, every topic is seen in its due relation to the rest. English institutions had never before been thus comprehensively and dispassionately surveyed. Such improvements as had been necessitated were mere makeshifts, often made by stealth. The rude symmetry of the feudal system had been long ago destroyed by partial and unskilful adaptations to modern commercial life, effected at various dates and in accordance with various theories. The time had come for deliberate reconstruction, for inquiring whether the existence of many admitted evils was, as it was said to be, unavoidable; for proving that the needs of society may be classified and provided for by contrivances which shall not clash with one another because all shall be parts of a consistent whole. This task

Bentham undertook, and he brought to it a mind absolutely free from professional or class feeling, or any other species of

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prejudice. He mapped out the whole subject, dividing and subdividing it in accordance with the principle of "dichotomy." Having reached his ultimate subdivisions he subjects each to the most thorough and ingenious discussion. His earlier writings exhibit a lively and easy style, which gives place in his later treatises to sentences which are awkward from their effort after unattainable accuracy, and from the newly-invented technical nomenclature in which they are expressed. Many of Bentham's phrases, such as "international," "utilitarian," " codifica- tion," are valuable additions tc our language; but the majority of them, especiaily those of Greek derivation, have taken no root in it. His neology is one among many instances of his contempt for the past and his wish to be clear of all association with it. His was, indeed, a typically logical, as opposed to an historical, mind For the history of institutions, which in the hands of Sir Henry Maine is becoming a new and intcresting branch of science, Bentham cared nothing Had he possessed such a knowledge of Roman law as is now not uncommon in England, he must doubtless have taken a different view of many subjects. The logical and historical methods can, however, seldom be combined without confusion ; and it is perhaps fortunate that Bentham devoted his long life to showing how much may be done by pursuing the former method exclusively. His writings have been and remain a store- house of instruction for statesmen, an armory for legal reformers. '" Pillé par tout le monde," as Talleyrand said of him, "'il est toujours riche." To trace the results of his teaching in England alone would be to write a history of the legislation of half a century. Upon the whole administrative machinery of government, upon criminal law, and upon procedure, both criminal and civil, his influence has been most salutary; and the great legal revolution which has just accomplished the fusion of law and equity is not obscurely traceable to the same source. Those of Bentham's suggestions which have hitherto been carried out have affected the matter, or contents, of the law There seems at length some reason to

hope that his suggestions for the improvement of its form and expression are about to receive the attention which they deserve. The services rendered by Bentham to the world would not, however, be exhausted even by the practical adoption of every one of his recommendations. There are no limits to the good results of his introduction of a true method of reasoning into the moral and political sciences.

The best edition of Bentham's works is that edited by Dr Bowring, in 11 vols. 8vo, the publication of which was completed in 1843. It contains a selection from his cor- respondence, and some biographical statements. (1. E. H.)

BENTINCK, Lorp Witiiam Grorce FREDERICK CAVENDISH, better known as Lord George Bentinck, the second son of the fourth duke of Portland, by Henrietta, sister to the Viscountess Canning, was born Fcbrnary 27, 1802. He was educated at Eton, and at Christ Church, Oxford ; after which he entered the arnry, and served for several years in the Guards, On retiring from the army, he acted for some time as private secretary to his uncle Mr Canning, then prime minister; in which capacity he gave proofs of high ability for the conduct of public business. In 1828 he succeeded his uncle Lord William Bentinck as member for Lynn-Regis, and continued to represent that constituency during the remaining twenty years of his life. 'Till within three years of his death Lord George Bentinck was little known out of the sport- ing world. His early attempts at public speaking afforded no indication of the abilities which the subsequent course of political events served to develop so conspicuously. His failures in the House of Commons seem to have dis- couraged him from the attempt to acquire reputation as a

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politician. The natural energy of his character, however, found scope in another arena. As one of the leaders on "the turf," he was there distinguished by that integrity, Judgment, and indomitable determination, which, when brought to bear upon matters of weightier importance, placed him, with a rapidity almost unexampled, in the foremost rank of British senators. On his first entrance into parliament he belonged to what may be called the moderate Whig party, and voted in favour of Catholic

emancipation, as also for the Reform Bill, though he opposed some of its principal details. Soon after, how- ever, he joined the ranks of the Opposition, with whom he sided up to the important era of 1846. When, in that year, Sir Robert Peel openly declared in favour of free trade, the advocates of the corn-laws, then without a leader, after several ineffectual attempts at organization, discovered that Lord George Bentinck was the only man around whom the several sections of the Opposition could be brought to rally. His sudden elevation to so pro- minent a position took the public mind by surprise ; but he soon gave convincing evidence of powers so formidable, that the position of the Protectionist party at once assumed an imposing aspect. Towards Sir Robert Pcel, in particular, his hostility was marked and uncompromising. Believing, as he himself expressed it, that that statesman and his political colleagues had " hounded to the death his illustri- ous relative" Mr Canning, he combined with his opposi- tion as a political leader a degree of personal animosity that gave additional force to the poignancy of his invectives. On entering on his new position, he at once abandoned his favourite pursuits, disposed of his magnificent stud, forsook all connection with the turf, and devoted his whole time and energies to the laborious and trying duties of a parlia- mentary leader. Apart from the question of the corn- laws, his politics were strictly independent. In opposition to the rest of his party, he supported the bill for removing the Jewish disabilities, aud was favourable to the scheme for the payment of the Roman Catholic clergy in Ireland by the landowners. As he had held no high office under Government, his qualifications as a statesman never found scope beyond the negative achievements of a leader of Opposition; but it may be safely affirmed that nothing but his untimely death could have debarred him from acquiring a distinguished position among the statesmen of Britain. This event, caused by the rupture of a vessel in the heart, took place suddenly on the 21st September 1848, while his lordship was procceding on foot to visit a friend in the country.—(See Lord George Bentinck ; a Polt- tical Biography, by B. Disraeli, 1851.)

BENTIVOGLIO, Giovannl, was born at Bologna about ° 1438, seven years before the murder of his father Anni- bale, then the chief magistrate of the republic. In 1462 Giovanni contrived to make himself master of the state, which he continued to rule with a stern sway for nearly half a century ; but his encouragement of the fine arts, and his decoration of the city by

sumptuous edifices, gilded his usurpation. He was finally expelled by Pope Julian IL, in 1506, and died in the state of Milan at the age of sevellty.

BENTIVOGLIO, Gurpo, Cardinal, an eminent states- man and historian, was born at Ferrara in 1579. After studying at Padua, he went to reside at Rome, and was received with great favour by Pope Clement VITI., who made him a prelate. He was sent as nuncio into Flanders, and afterwards to France ; and when he returned to Rome he was intrusted by Louis XIII. with the management of the French affairs at. that court. In 1621 he was made a cardinal, and in 1641 received the bishopric of Terracina. He was the intimate friend of Pope Urban VIII, and on the death of Urban public opinion marked out Bentivoglio

for his successor. He died suddenly, however, before the élection took place. His principal works are, Della Guerra dt Fiandria, 1632-39 ; Relazioni di G. Bentivoglio in tempo delle sue Nunziature di Fiandria e di Francia, 1631; Memorie, 1648 ; Lettere, 1631.

BENTLEY, Ricuarp (born, 1662; died, 1742), was born at Oulton, a township in the parish of Rothwell, in the West Riding of Yorkshire. His grandfather had suffered in person and estate in the royal cause, and the family were in consequence in reduced circumstances. Bentley's mother, the daughter of a stonemason in Oulton, was a woman of excellent understanding and some educa- tion, as she was able to give her son his first lessons in Latin. From the grammar school of Wakefield Richard Bentley passed to St John's College, Cambridge, being admitted subsizar in 1676. He afterwards obtained a scholarship, but never succeeded to a fellowship, being appointed by his college, before he was twenty-one, head-master of Spalding grammar school. In this post he did not remain long, being selected by Dr Stillingfleet, Dean of St Paul's, to be domestic tutor to his son. This appoint- ment introduced Bentley at once to the society of the most eminent men of the day, threw open to him the best private library in England, and brought him into familiar intercourse with Dean Stillingfleet, a man of sound under- standing, who had not shrunk from exploring some

of the more solid and abstruse parts of ancient learning. The example of such a patron seconding his natural inclinations drew Bentley into a course of thorough reading, which, however, took a philological rather than a philosophical direction. The six years which he passed in Stillingfleet's family were employed, with the restless energy character- istic of the man, in exhausting the remains of the Greek and Latin writers, and laying up those stores of knowledge upon which he afterwards drew for his various occasions.

In 1689 Stillingfleet becanie bishop of Worcester, and Bentley's pupil went to reside at Oxford in Wadham College, accompanied by his tutor. Bentley's introduc- tions, and his own merits, placed him at once on a footing of intimacy with the most distinguished scholars in the university—Mill, Hody, Edward Bernard. Here he revelled in the MS. treasures of the Bodleian, Corpus, and other college libraries. He projected, and occupied himself with collections for, vast literary schemes. Among these are specially mentioned a corpus of the fragments of the Greek poets, and an edition of the Greek lexicographers. But his first publication was in connection with a writer of much inferior note. The Oxford press was about bring- ing out an edition (the edztio princeps) of the Chronicle of 'John Malalas, from the unique MS. in the Bodleian ; and the editor, Dr Mill, had requested Bentley to look through the sheets, and make any remarks on the text. 'This originated Bentley's Lpistola ad Millium, which occupies less than one hundred pages at the end of the Oxford Malalas (e Theatro Sheldoniano, 1691, 8vo). This short tractate at once placed Bentley at the head of all living English scholars. The ease with which, by a stroke: of the pen, he restores passages which had been left in hope- less corruption by the editors of the Chronicle, the certainty of the emendation, and the command over the relevant material, are in a style totally different from the careful and laborious learning of Hody, Mill, or Chilmead. To the small circle of classical students it was at once apparent that there had arisen in England a critic, whose attain- ments were not to be measured by the ordinary academical standard, but whom these few pages had sufficed to place by the side of the great Grecians of a former age. Un- fortunately this mastery over critical science was accom- pamed by a tone of self-assertion and presumptuous con- fidence, which not only checked admiration, but was

calculated to rouse enmity. Dr Monk, indeed, Bentley's biographer, has charged him with an indecorum of which he was not guilty. "In one place," writes Dr Monk, "he accosts Dr Mill as & "Iavvdéov, an indccorum which neither the familiarity of friendship, nor the licence of a dcad language, can justify towards the dignified head of a house." But the object of Bentley's apostrophe is not his correspondent Dr Mill, but his author John Malalas, whom in another place he playfully appeals to as ''Syrisce." From this publication, however, dates the origin of those mixed feelings of admiration and repugnance which Bentley through his whole career continued to excite among his contemporaries.

In 1690 Bentley had taken deacon's orders in the Established Church. In 1692 he was nominated first Boyle lecturer, a nomination which was repeated in 1694. He was offered the appointment a third time in 1695, but declined it, being by that time involved in too many other undertakings. In these first series of lectures he endea- vours to present the Newtonian physics in a popular form, and to frame them into a proof of the existence of an in- telligent Creator. The second serics, preached in 1694, has not been published, and is believed to be lost. Scarcely was Bentley in priest's orders before he was preferred to a prebendal stall in Worcester cathedral. And, in 1693, the keepership of the royal library becoming vacant by the death of Henri de Justel, great efforts were made by his friends to obtain the place for Bentley. But, though there was a High Church candidate (Edmund Gibson) backed by the archbishops, the court interest prevailed, and the place was given to Mr Thynne. Mr Thynne, however, wanted only the salary and not the office, and was prevailed on to cede the place to Bentley for an annuity of £130 for life, the whole emoluments being but £200 and apartments in St James's Palace. To these preferments were added, in 1695, a royal chaplaincy, and the living of Hartlebury. He was also about the same time elected a fellow of the Royal Society. And the recognition of Continental scholars came in the shape of a dedication, by Greevius (John George), prefixed to a dissertation of Albert Rubens, De vita Th. Mallia, published at Utrecht in 1694.

While these distinctions were being accumulated upon Bentley, his energy was making itself felt in many and various directions, His first care was the royal library, the queen's library, as it was commonly called. He made great efforts to retrieve this collection from the dilapidated condition into which it had been allowed to fall. He employed the mediation of the earl of Marlborough to beg the grant of some additional rooms in the palace for the books. The rooms were granted, but Marlborough charac- teristically kept them for himself. Bentley enforced the law against the publishers, and thus added to the library nearly 1000 volumes which had been neglected to be delivered. He was commissioned by the University of Cambridge to obtain Greek and [atin founts for their classical books, and he had accordingly cast, in Holland, those beautiful types which appear in the Cambridge books of that date. He assisted Evelyn in his Vumismata. All Bentley's literary appearances at this time were of this accidental character. We do not find him settling down to the steady execution of any of the great projects with which he had started. He designed, indeed, in 1694, an edition of Philostratus, but easily abandoned it to Olearius, " to the joy," says F. A. Wolf, "of Olearius and of no one else." He supplied Gravius with collations of Cicero, and Joshua Barnes with a warning as to the spuriousness of the Epistles of Euripides, which was thrown away upon that blunderer, who printed the epistles and declared that no one could doubt their genuineness but a man " perfricti

froutis aut judicii imminuti." Bentley supplied to Gre- vius's Callimachus a masterly collection of the fragments.

The Dissertation on the Epistles of Phalaris, the work on which Bentley's fame in great part rests, originated in the same casual way. Wotton being about to bring out a second edition of his book on Anczent and Modern Learning, claimed of Bentley the fulfilment of an old promise to write a. paper exposing the spuriousness of the Hprstles of Phalaris. This paper was resented as an insult by the Christchurch editor of Phalaris, Hon. Charles Boyle, afterwards earl of Orrery. Assisted by his college friends, Boyle wrote a reply, "a tissue," says Mr Dyce, "of superficial learning, ingenious sophistry, dexterous malice, and happy raillery." The reply was hailed by

the public as crushing, and went immediately into a second edition. It was incumbent on Bentley to rejoin. This he did, in what Porson styles "that immortal dissertation," to which no answer was, or could be, given.

In the year 1700, Bentley, then in his 38th year, received that main preferment which, says De Quincey, "was at once his reward and his scourge for the rest of his life.' The six commissioners of ecclesiastical patronage unanimously recommended Bentley to the Crown for the headship of Trinity College.

Trinity College, the most splendid foundation in the University of Cambridge, and in the scientific and literary reputation of its fellows the most emiuent society in either university, had, in 1700, greatly fallen from its high estate. It was not that it was more degraded than the other colleges, but its former lustre made the abuse of endow- ments in its case more conspicuous. The eclipse had taken place during the reaction which followed 1660, and was owing to causes which were not peculiar to Trinity, but which influenced the nation at large. The names of Pearson and Barrow, and, greater than either, that of Newton, adorn the college annals of this period. But these were quite exceptional men. They had not inspired the rank and file of fellows of Trinity with any of their own love for learning or science. Indolent and easy-going clerics, without duties, without a pursuit, or any conscious- ness of the obligation of endowments, they haunted the college for the pleasant life and the good things they found there, creating sinecure offices in each other's favour, jobbing the scholarships, and making the audits mutually pleasant. Any excuse served for a banquet at the cost of "the house," and the celibate imposed by the statutes was made as tolerable as the decorum of a respectable position permitted. To such a society Bentley came, obnoxious as a Johniau and an intruder, unwelcome as a man of learning, whose interests lay outside the walls of the college. Bentley replied to their concealed dislike with open contempt, and proceeded to ride roughshod over their little arrangements. He inaugurated many beneficial reforms in college usages and discipline, executed extensive improvements in the buildings, and generally used his eminent station for the promotion of the interests of learning, both in the college and in the university. But this noble energy was attended by a domineering temper, an overweening contempt for the feelings, and even for

the rights, of others, and an unscrupulous use of means when a good end could be obtained. Bentley, at the summit of classical learning, disdained to associate with men whom he regarded as illiterate priests. He treated them with contumely, while he was diverting their income to public purposes. The continued drain upon their purses—on one occasion the whole dividend of the year was absorbed by the rebuilding of the chapel—was the grievance which at last roused the fellows to make a resolute stand. After ten years of stubborn, but ineffectual resistance within the college, they had recourse, in 1710, to the last remedy—an

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appeal to the visitor. Their petition is an ill-drawn invective, full of general complaints, and not alleging any special delinquency. Bentley's reply (Zhe Present State of

'rinity College, &c., 8vo, Lond. 1710) is in his most crushing style. The fellows amended their position, and put in a fresh charge, in which they articled fifty-four separate breaches of the statutes as having been committed by the master. Bentley, called upon to answer, demurred to the bishop of Ely's jurisdiction, alleging that the Crown was visitor. He backed his application by a dedication of his Horace to the lord treasurer (Harley). The Crown lawyers decided the point against him; the case was heard, and a sentence of ejection from the mastership ordered to be drawn up, but before it was executed the bishop of Ely died, and the process lapsed.

This process, though it had lasted nearly five years, was only a prologue to the great feud, the whole duration of which was twenty-nine years. Space will uot allow of its vicissitudes being here followed. It must suffice to say that Bentley was sentenced by the bishop of Ely (Greene) to be ejected from the mastership, and by Convocation to be stripped of his degrees, and that he foiled both the visitor and the university.

Bentley survived the extinction of this thirty years' war, two years, Surrounded by his grandchildren, he ex- perienced the joint pressure of age and infirmity as lightly as is consistent with the lot of humanity. He continued to amuse himself with reading; and though nearly confined to his arm-chair, was able to enjoy the society of his friends, and several rising

scholars, Maitland, John Taylor, his nephews Richard and Thomas Bentley, with whom he discussed classical subjects. He was accustomed to say that he should live to be 80, adding that a life of that duration was long enough to read everything worth reading. He fulfilled his own prediction, dying, of a pleurisy, 14th July 1742, when he was a few months over 80. Though accused by his enemies of being grasping, he left not more than £5000 behind him. A few Greek MSS., brought from Mount Athos, he left to the college library ; his books and papers to his nephew, Richard Bentley. Richard, who was a fellow of Trinity, at his death in 1786, left the papers to the college library. The books were acquired, by purchase, by the British Museum.

Of his personal habits some anecdotes are related by his grandson, Richard Cumberland, in vol. i. of his Memovrs (Lond. 1807). The hat of formidable dimensions, which he always wore during reading to shade his eyes, and his preference of port to claret, are traits embodied in Pope's caricature (Dunciad, b. 4), which bears in other respects little resemblance to the original. He did not take up the habit of smoking till he was 70. He held the archdeaconry of Ely with two livings, but never obtained higher prefer- ence in the church. He was offered the (then poor) bishopric of Bristol, but refused it, and being asked what preferment he would consider worth his acceptance, replied, "That which would leave him no reason to wish for a removal."

Dr Bentley married, in 1701, Joanna, daughter of Sir John Bernard of Brompton. Their union lasted forty years. Mrs Bentley died in 1740, leaving a son, Richard, and two daughters, one of whom married, in 1728, Mr Denison Cumberland, grandson of Richard Cumberland, bishop of Peterborough, and father of Richard Cumber- land the dramatic author.

The Life of Richard Bentley, by Bishop Monk (4to, Lond. 1830; 2d ed., 2 vols. 8vo, 1833), gives in full de- tail an interesting account of the Trinity College feud, and the other incideuts of his hero's life. But, though himself a Greek scholar of celebrity and an editor of Euripides, Dr Monk appears to have had but an imperfect compre-

hension of the consummate genius and vast acquiremeuts of the subject of his biography. He regrets that Bentley wasted his time upon conjectural criticism, instead of ap- plying himself to the deistical controversy. The Remarks upon a late Discourse of Ireethinking, by Phileleutherus Lipsiensis, 8vo, 1713, to which Dr Monk alludes, is indeed a very characteristic picce of writing; but it gives no more idea of what Bentley was as a master of ancient learn- ing than does his pamphlet, The Present State of Trinity College, quoted before. Indeed, of all Bentley's publica- tions there is not one which can be taken as an adequate sample of the critic, as a work at once monumental and characteristic. Bentley is most imperfectly represented by any one of his books. They have all the same occa- sional stamp. This is the case not only with the most popular of these, the Dissertation on Phalaris. The Hora- tius of 1712 was brought out to propitiate public opinion at a critical period of the struggle with the fellows of Trinity ; the proposals for a recension of the New Testa- ment text, 1720, had a similar origin; the Zerentius of 1725 was occasioned by his resentment of Hare's conduct. The Ailton was undertaken at the request of Queen Caro- line, but also at an anxious conjuncture of the great quarrel. Nearly all his lesser performances were called forth by friends invoking his aid for their own schemes. What he wrotc, he wrote with rapidity, rather with precipitation. If we try to form our idea of the man, not from this or that extempore effusion, but from all that he did or was, we shall find that Bentley was the first, perhaps the only Englishman who can be ranked with the great heroes of classical learning. Before him we have only Selden to name, or, in a more restricted field, Gataker and Pearson. But Selden, with stupendous learning, wanted that which Bentley shared with Scaliger or Wolf, the freshness of original genius and confident mastery over the whole region of his knowledge. "Bentley is not," says Mahly, "one among the great classical scholars, but he inaugurates a new era of the art of criticism. He opened a new path. With him criticism attained its majority. When scholars had hitherto offered suggestions and conjectures, Bentley, with unlimited control over the whole material of learning, gave decisions." The modern German school of philology, usually so unjust to foreigners, yet does ungrudging homage to the genius of this one Englishman. Bentley, says Bunsen, ' was the founder of historical philology." And Bernays says of his corrections of the 7'ristia, " corrup- tions which had hitherto defied every attempt even of the nightiest, were removed by a touch of the fingers

of this British Samson." The English school of Hellenists, by which the 18th century was distinguished, and which con- tains the names of Dawes, Markland, Taylor, Toup, Tyr- whitt, Porson, Dobree, Kidd, and Monk, was the creation of Bentley. And even the Dutch school of the same period, though the outcome of a native tradition, was in no small degree stimulated and directed by Bentley's example. Ruhnken has recorded the powerful effect produced upon the young Hemsterhuys by Bentley's letter to him on the occasion of his Pollux; at first humiliated to despair by the revelation to him of his own ignorance; then stimu- lated to higher effort by the consideration that commenda- tion from such a man was not words of mere compliment.

Bentley was a source of inspiration to a following genera- tion of scholars. Himself, he sprang from the earth without forerunners, without antecedents. Self-taught, he created his own science. It was his misfortune that there was no contemporary guild of learning in England by which his power could be measured, and his eccentricities checked. In the Phalaris controversy his academical adversaries had not sufficient knowledge to know how absolute their defeat was. Garth's couplet—

BEN—BEN

*'*So diamonds take a lustre from their foil, And to a Bentley 'tis we owe a Boyle "— expressed the belief of the wits, or literary world, of the time. It was not only that he had to live with inferiors, and to waste his energy in a struggle forced upon him by the necessities of his official position, but the wholesome stimulus of competition and the encouragement of a sym- pathetic circle were wanting. In a university where the instruction of youth, or the religious controversy of the day, were the only known occupations, Bentley was an isolated phenomenon, and we can hardly wonder that he should have flagged in his literary exertions after his ap- pointment to the mastership of Trinity. All his vast acquisitions and all his original views seem to have been obtained before 1700. After this period he acquired little, and made only spasmodic effurts—the Horace, the Terence, and the Miton. The prolonged mental concentration, and mature meditation, of which alone a great work can be born, were wanting to him.*

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BENZOIC ACID, an organic acid present in large quantity in gum benzoin, and found also in dragon's blood (the resin of Calamus Draco) and some allied substances, It is, besides, prepared by numerous reactions from organic substances, being now largely made from naphthalin, one of the products of the distillation of coal tar. Benzoic acid is extracted from gum benzoin by the process of sub- limation. The resin, coarsely powdercd, is submitted to a heat of 300° Fahr. in a close vessel, by which the acid is expelled and may be condensed in receivers. By the sublimation process the acid carries away with it a small portion of essential oil, which gives its peculiar sweet odour to sublimed benzoic acid. It may also be separated

from gum benzoin by boiling the powdered gum in lime, filtering off the compound of resin and lime, and concentrating the remaining solution of benzoate of calcium, from which benzoic acid is precipitated by hydrochloric acid. The benzoic acid may then be purified by sublimation, but thus prepared it is destitute of odour. It crystallizes into beautiful white silky flexible needles, and yields on heating an acrid, irritating vapour which excites coughing. It is distinguished from the closely allied substance, cinnamic acid, by withstanding the action of boiling dilute nitric acid, which changes the other into bitter alinond oil, the hydride of benzoyl. Benzoic acid is rarely employed in inedicine alone, but in composition as benzoate of ammonia it acts as a stimulant of mucous membranes, and is occé.- sionaliy given in chronic bronchial affections. It is an

ingredient in some officinal tinctures, such as the com- pound tincture of camphor, and ammoniated tincture of opium.

BENZOIN, Gum, sometimes called Gua BENJAMIN, a fragrant gum-resin obtained from Styrax Benzoin, a tree of considerable size, a native of Sumatra and Java, and introduced into Siam, Borneo, &c. The gum-resin is obtained by making incisions in the bark of trees after they have attained six years of age, when the benzoin exudes, and after hardening in the air is carefully scraped off with a knife. A tree produces on an average about 3 tb annually for 10 or 12 years, The produce of the first three years is known as " head" benzoin, and is esteemed the finest and most valuable ; that produced in later years goes by the nate of " belly" benzoin ; and after the trees are cut down a small quantity of a dark-coloured and very inferior quality is obtained, which is called "foot" benzoin. In commerce the gum-resin is distinguished as Siam or Sumatra benzoin, according to the localities from which it is derived. Siam benzoin is generally regarded as the best, and of it two varieties are distinguished. The finest qua- lity is Siam benzoin "in tear," it being in small flattened drops, from the size of an almond kernel downwards. "Lump" Siam benzoin consists of agglutinated masses of such tears, or of tears inbedded ina darker coloured resinous matrix. Tear benzoin varies in colour from a pale yellow to a reddish-brown colour, and lump benzoin has a con- glomerate-like structure from the

dissemination of almond- shaped tears throughout the substance. Sumatra benzoin has neither so strong nor so agreeable an odour as that of Siam, but the finest qualities are not found in the English market, being bought up for use in the religious rites of the Greek Church in Russia. Sumatra benzoin occurs in larger rectangular masses of a greyish tint, with few large tears in it, but containing small white opaque pieces, with chips of wood and other inipurities, in a translucent matrix. Benzoin is composed of a mixture of three resins, distin- guished by their behaviour towards solvents, and of benzoic acid, with sometimes cinnamic acid in addition; in some specimens of Sumatra benzoin cinnamic acid has been found entirely replacing benzoic acid. Usually benzoin contains from 12 to 18 per cent. of benzoic acid, the opaque white portions containing less than the brown resinous substance. It also contains traces of a highly odorous essential oil, like styrol, the aromatic oil present in storax. 'The quan- tity of benzoin exported from Sumatra in 1871 was about 16,000 cwt., while Siam sent out only 405 cwt., but very great quantities are used as incense in the religious ceremonies of the East, which indeed is the principal object for which it is brought into the commerce of Western nations. In medicine benzoin is seldom administered except as an adjunct to pectoral medicines. A compound tincture of benzoin is applied to flabby ulcers, and to excised wounds after the edges have been brought together. In these con- nections benzoin has a popular reputation under the name of Friars' or Monks' Balsam, which is a compound tincture of benzoin, aud it forms an ingredient in court or black sticking-plaster. Benzoin diminishes the tendency towards rancidity in fats, a circumstance turned to account in the Adens benzoatus of pharmacy.

BERANGER, PIERRE JEAN DE, the national song-writer of France, was born at Paris on the 19th August 1780. The aristocratic particle before the name was a piece of groundless vanity on the part of his father, which the poet found useful as a distinction. He was descended, in truth, from a country innkeeper on the one side, and, on the other, from a tailor in the Rue Montorgueil. Of edu- cation, in the narrower sense, he had but little. From the roof of his first school he beheld the capture of the Bas- tille, and this stirring memory was all that he acquired.

Later on he passed some time in a school at Péronne, founded by one Bellenglise on the principles of Rousseau, where the boys were formed into clubs and regiments, and taught to play solemnly at politics and war. Béranger was president of the club, made speeches before such members of Convention as passed through Péronne, and drew up addresges to Tallien or Robespierre at Paris. In the meanwhile he learncd neither Greek nor Latin—not even French, it would appear; for it was after he left school, from the printer Laisney, that he acquired the ele- ments of grammar, His true education was of another sort. In his childhood, shy, sickly, and skilful with his hands, as he sat at home alone to carve cherry stones, he was already forming for himself those habits of retirement and patient elaboration which influenced the whole tenor of his life and the character of all that he wrote. At Péronne he learned of his good aunt to be a stout republi- can ; and from the doorstep of her inn, on quiet evenings, he would listen to the thunder of the guns before Valen- ciennes, and fortify himself in his passionate love of France and distaste for all things foreign. Although he could never read Horace save in a translation, he had been edu- cated on Z'elemaque, Racine, and the dramas of Voltaire, and taught, from a child, in the tradition of all that is highest and most correct in French.

After serving his aunt for some time in the capacity of waiter, and passing some time also in the printing office of one Laisuey, he was taken to Paris by his father. Here he saw much low speculation and. many low royalist intrigues. In 1802, in consequence of a distressing quar- rel, he left his father and began life for himself in the garret of his ever memorable song. For two years he did literary hackwork, when he could get it, and wrote pas- torals, epics, and all manner of ambitious failures. At the end of that period (1804) he wrote to Lucien Bonaparte, enclosing some of these attempts. He was then in bad

health, and in the last stage of misery. His watch was

pledged. His wardrobe consisted of one pair of boots, one greatcoat, one pair of trousers with a hole in the knee, and "three bad shirts which a friendly hand wearied itself in endeavouring to mend." 'The friendly hand was that of Judith Frere, with whom he had been already more or less acquainted since 1796, and who continued to be his faithful companion

until her death, three months before his own, in 1857. She must not be confounded with the Lisette of the songs; the pieces addressed to her (La Bonne Vieille, Maudit Printemps, &c.) are in a very different vein. Lucien Bonaparte interested himself in the young poet, transferred to him his own pension of 1000 francs from the Institute, and set him to work on a Death of Nero. Five years later, through the same patronage, although indirectly, Béranger became a clerk in the university at a salary of another thousand.

Meanwhile he had written many songs for convivial occasions, and " to console himself under all inisfortunes ;" some, according to M. Boiteau, had been already published by his father; but he set no great store ou them himself ; and it was only in 1812, while watching by the sick-bed of a friend, that it occurred to him to write down the best he could remember. Next year he was elected to the Caveau Moderne, and his reputation as a song-writer began to spread. Manuscript copies of Les Gueux, Le Sénateur, above all of Le Roi d' Yvetot, a satire against Napoleon, whom he was to magnify so much in the sequel, passed from hand to hand with acclamation, It was thus that all his best works went abroad; one man sang them to another over all the land of France. He was the only poet of modern times who could altogether have dispensed with printing.

His first collection escaped censure. '" We must pardon

many things to the author of the Ro? d' Yvetot," said Louis XVIIL The second (1821) was more daring. The apathy of the Liberal camp, he says, had convinced him of the need for some bugle call of awakening. This publication lost him his situation in the university, and subjected him to a trial, a fine of 500 francs, and an imprisonment of three months Imprisonment was a small affair for Ber- anger. At Sainte Pélagie he occupied a room (it had just been quitted by Paul Louis Courier), warm, well-furnished, and preferable in every way to his own poor. lodging, where the water froze on winter nights. He adds, on the occasion of his second imprisonment, that he found a cer- tain charm in this quiet, claustral existence, with its regu- lar hours and long evenings alone over the fire. This second imprisonment of nine months, together with a fine and expenses amounting to 1100 francs, followed on the appearance of his fourth

collection. The Government pro- posed through Laffitte that, if he would submit to judg- ment without appearing or making defences, he should only be condemned in the smallest penalty. But his pub- lic spirit made him refuse the proposal ; and he would not even ask permission to pass his term of imprisonment in a Maison de Santé, although his health was more than usually feeble at the time. " When you have taken your stand in a contest with Government, it seems to me," he wrote, "ridiculous to complain of the blows it inflicts on you, and impolitic to furnish it with any occasion of gene- rosity." His first thought in La Force was to alleviate the condition of the other prisoners.

In the revolution of July he took no inconsiderable part. Copies of his song, Le Vieux Drapeau, were served out to the insurgent crowd. He had been for long the intimate friend and adviser of the leading men; and dur- ing the decisive week his counsels went a good way towards shaping the ultimate result. '" As for the repub- lic, that dream of my whole life," he wrote in 1831], "I did not wish it should be given to us a second time unripe." Louis Philippe, hearing how much the song- writer had done towards his elevation, expressed a wish to see and speak with him ; but Béranger refused to present himself at court, and used his favour only to ask a place for a frieud, and a pension for Rouget de VIsle, author of the famous Marseillaise, who was now old and poor, and whom he had been already succourmg for five years.

In 1848, in spite of every possible expression of his reluctance, he was elected to the assembly, and that by so large a nuinber of votes (4471) that he felt himself obliged to accept the office. Not long afterwards, and with great difficulty, he obtained leave to resign. This was the last public event of Béranger's life. He continued to polish his songs in retirement, visited by nearly all the famous men of France. He numbered among his friends Chateau- briand, Thiers, Laffitte, Michelet, Lamennais, Mignet. Nothing could exceed the amiability of his private charac- ter ; so poor a man has rarely been so rich in good actions ; he was always ready to receive help from his friends when he was in need, and always forward to help others. His correspondence is full of wisdom and kindness, with a smack of Montaigne, and now and then a vein of pleasantry that will remind the English reader of Charles Lamb. He occupied some of his leisure in

preparing his own memoirs, and a certain treatise on Social and Political Morality, intended for the people, a work he had much at heart, but judged at last to be beyond his strength. He died on

the 16th July 1857. It was feared that his funeral would .

be the signal for some political disturbance; but the Government took immediate measures, and all went quietly. The streets of Paris were lined with soldiers and full of townsfolk, silent and uncovered. From time to time cries arose :-—~“‘ Honneur, Honneur a Béranger /”

BER—BER

The songs of Béranger would searcely be called songs in England. They are elaborate, written in a clear and sparkling style, full of wit and incision. It is not so much for any lyrical flow as for the happy turn of the phrase that they claim superiority. Whether the subject be gay or serious, light or passionate, the medium remains untroubled. The special merits of the songs are merits to be looked for rather in English prose than in English verse. He worked deliberately, never wrote more than fifteen songs a year and often less, and was so fastidious that he has not preserved a quarter of what he finished. "I am a good little bit of a poet," he says himself, "clever in the eraft, and a conscientious worker, to whom old airs and a modest choice of subjects (Je coin ow je me suits confiné), have brought some success." Nevertheless, he makes a figure of importance in literary history. When he first began to cultivate the chanson, this minor form lay under some contempt, and was restricted to slight subjects and a humorous guise of treatment. Gradually he filled these little chiseled toys of verbal perfection with ever more and more of sentiment. From a date comparatively early he had determined to sing for the people. It was for this reason that he fled, as far as possible, the houses of his influential friends, and came back gladly to the garret and the street corner. Thus it was, also, that he came to acknowledge obligations to umile Debraux, who had often stood between him and the masses as interpreter, and given him the key-note of the popular humour. Now, he had observed in the songs of sailors, and all who labour, a prevailing tone of sadness ; and so, as he grew more masterful in this sort of expression, he sought more and more after what is deep, serious, and constant in the thoughts of common men. The evolution was slow ; and we can see in his own works examples of every stage, from that of witty indifference in fifty pieces of the first collection, to that of grave and even tragic feeling in Les Sou- venirs du Peuple or Le Vieux Vagabond. And this innovation in- volved another, which was as a sort of prelude to the great romantic movement. For the chanson, as he says himself, opened up to him a path in which his genius could develop itself at ease ; he escaped, by this literary postern, from strict academical requircments, and had at his disposal the whole dictionary, four-fifths of which, according to La Harpe, were forbidden to the use of more regular and pretentious poetry. If he still kept some of the old vocabulary, some of the old imagery, he was yet accustoming people to hear moving subjects treated in a manner more free

and simple than here- tofore ; so that his was a sort of conservative reform, preceding the violent revolution of Victor Hugo and his army of uncompromising romantics. He seems himself to have had glimmerings of some such idea ; but he withheld his full approval from the new move- ment on two grounds :—first, because the romantie school misused somewhat brutally the delicate organism of the French language ; and second, as he wrote to Sainte-Beuve in 1832, because they adopted the motto of " Art for art," and set no object of public usefulness before them as they wrote. For himself (and this is the third point of importance) he had a strong sense of political respon- sibility. Public interest took a far higher place in his estimation than any private passion or favour. He had little toleration for those erotic poets who sing their own loves and not the common sorrows of mankind, " who forget," to quote his own words, "for- get beside their mistress those who labour before the Lord." Hence it is that so many of his pieces are political, and so many, in the later times at least, inspired with a socialistic spirit of indigna- tion and revolt. Itis by this socialism that he becomes truly modern, and touches hands with Burns.

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BERAR, a province of British India, forming a Com- missionership, is situated between 19° 30' and 21° 46' N. lat., and 76° and 79° 13' E. long. Area, about 17,500 square miles; population, 24 millions. The province consists of the districts assigned to the British Govern- ment by his Highness the Nizdm of Haidarabad, under the treaties of 1853 and 1861. These districts are Amrdoti, Elichpur, Wun, Akol4, Buldand, and Basim. Berar province is bounded on the N. and KE by the Central Provinces, on the 8. by the Nizdm's dominions, and on the W. by the Nizdm's territory, the Bombay district of Khandesh, and by the Central Provinces. The Ajanté

range intersects the whole province from W. to E., and divides it into two distinct sections—the Payanghét or lowland country, bounded on the N. by

the Gawilgarh range of the Sdtpurd hills, which form the northern boundary between Berar and the Central Pro- vinces, and on the §. by the Ajanté range, and the Balaghat or upland country of the Ajanta hills, occupying the whole southern part of the province. The Payanghat is a wide valley running up eastward between the Ajanta range and the Gawilgarh hills, from 40 to 50 miles in breadth. This tract contains all the best land in Berar, it is full of deep, rich, black alluvial soil, called regdr, of almost inexhaustible fertility, and it undulates just enough to maintain a natural system of drainage. Here and there are barren tracts where the hills jut out far into the plain, covered with stones and scrub jungle, or where a few isolated flat-topped hills occur. There is nothing picturesque about this broad strip of alluvial country, it is destitute of trees except near the villages close under the hills; and apart from the Purnd, which intersects it from east to west, it has hardly a perennial stream. In the early autumn it is one sheet of cultivation, but after the beginning of the hot season, when the crops have been gathered, its monotonous plain is relieved by neither verdure, shade, nor water, The aspect of the country above the passes which lead to the Bal4ghdt is quite different. The trees are finer and the groves more frequent than in the valley below ; water is more plentiful and nearer to the surface. The highlands fall southwards towards the Nizdm's country by a gradual series of ridges or steppes. The principal rivers of the province are the Tapti, which forms a portion of its north-western boundary; the Purnd, which intersects the valley of the Payanghdét; the Wardha, forming the whole western boundary line ; and the Péin-gang4, marking the southern boundary for nearly its whole distance. The only natural lake is the Salt Lake of Sund4r. There are no large tanks or artificial reservoirs.

The total area of the province in 1869-70 was returned at between 17,000 and 18,000 square miles, of which about one-half is culti- vated, one-fourth cultivable but not cultivated, and the remaining one-fourth uncultivable waste. The great crops are cotton of a superior quality, and jodr or millet. he acreage under the differ- eut crops in 1869-70 is thus returned—Jodr,

1,812,693 acres ; cotton, 1,409,480; wheat, 478,438; pulses, 498,009; bajrd, 117,278 ; rice, 44,793 ; linseed, 61,394; hemp, 8978; kardi, 57,192; tobacco, 32,284; castor oil, 2605; sugar cane, 7947; opium, 247 ; other crops, 829,992; total, 5,356,275 acres, or 8369 square miles. The uncultivated products consist of dyes, gums, fruits and roots of various trees and creepers, honey and beeswax, and jungle fibres. The land settlement of the province is now being made for a period of thirty years, based upon the Bombay system of survey and settlement according to fields. Manufactures arc very few, and consist principally of cotton cloth, mostly of coarse quality, stout carpets, saddlery, and a little silk weaving. In 1869-70 the total value of the imports was returned at £7,350, 085, and the exports at £5,755,399. For internal communication six first-class roads have been constructed out of the general revenues of the province :—(1), From Amrdoti to Elichpur, 31 miles ; (2), from Badnera to Morsi, 384 ; (3), from Karinjé to Murtizdpur, 21 ; (4), from Badnera to Amraoti, 5 ; (5), from Akola to Basim, 50 ; (6), from Akola to Akot, 31 miles. The Nagpur branch of the Great Indian Peninsular Railway traverses the province from east to west for about 150 miles, with short off-shoots to the great cotton marts of Khamgaon and Amraott.

The census of 1867 returned the total population of Berar pro- vince at 2,231,565 souls, dwelling in 495,760 houses, comprising 5694 towns and villages; average density of population, 128 per square mile ; avcrage number of persons per house, 4°5 ; proportion of males in total population, 51°7 per cent. Classified according to religion, the Hindus number 1,912,561, or 85°70 per cent. of the total population; Mahometans, 154,951, or 6°94 per cent. ; aborigines, 168,059, or 7°36 per cent. ; Christians, 903; Parsts, 75 ; and Jews, 16. The Mahometan population of the province is descended from the men who originally accompanied from the north the Musalman invaders of the Deccan. Among the aboriginal tribes, the most numerous are the Gonds, Ands, Korkus, Kolis, and Kolams. The principal towns in the province are—(1.) Elichpur, the capital of the old kingdom, and still the most populous town, although not a place of any commercial importance, popula- tion 27,782 ; (2.) Amrdoti, the richest town in the province, and a rising and flourishing seat of commerce, pop. 23,410 ; (3.) Akola,

pop. 12,236; (4.) Akot, a large cotton mart, pop. 14,606 ; (5.) Karinja, pop. 11,750 ; (6.) Khamgaon, a large and prosperous cotton mart, pop. 9432.

The total imperial revenue of Berar province in 1869-70 amounted, to £704,109, of which the land revenue gave £457,343 ; excise, £114,513; salt wells, £650; miscellaneous, £39,413 ; stamps, £45,947 ; forests, £18,462 ; and customs (salt), £27,780. Local funds and cesses amounted to £132,229, or a total revenue from imperial and local sources for the province of £836,338. For the protection of person and property Berar province contains 67 police stations, with 61 outposts—total strength of regular police, 2613 of all ranks, exclusive of the village watch. The only troops located in the province are those of the Haidarabad contingent. At Elichpur a regiment of infantry with a detach- ment of cavalry and a battery of artillery is stationed ; infantry detachinents are also stationed at Amrdaoti and Akola, The provi- sion for edueation consisted in March 1870 of 341 schools, attended by 14,898 pupils. Of these 2 are high schools, one at Akold and one at Amraoti, with 217 pupils ; 44 middle-class schools with 3747 pupils; 267 primary schools with 10,148 pupils ; 27 female schools with 730 pupils ; and 1 Normal school for the training of masters.

The climate of Berar differs very little from that of the Deccan generally, except that in the Payanghat valley the hot weather is exceptionally severe. Here the freshness of the cold season vanishes after the crops have been taken off the ground, but the heat does not very sensibly increase until the end of March. From May 1st, until about the middle of June when the rains set in, the sun is very powerful, but without the scorching winds of upper India. The nights are comparatively cool. During the rains the air is moist and cool. In the Balaghat country above the Ajanta hills the thermometer always stands much lower than in the valley. The average rainfall for the whole province is said to be about 27 inches in the valley, and above 30 inches in the Balaghat highlands. In 1869 the rainfall registered in each of the six districts aver- aged 33 inches for the whole province. The average mean tem- perature registercd at Akola in the same year was nearly 81° Fahr,

The early history of Berar belongs to that of the Deccan. The province suffered repeated invasions of Mahometans from the north, and on the collapse of the Bahmani dynasty in 1526, Berar formed one of the five kingdoms under independent Mahometan princes, into which the Deccan split up. In the beginning of the seventeenth century the province was invaded by Prince Murad Mirza, son of the Emperor Akbar, and annexed to the Dehli empire. It did not long enjoy the blessings of tranquillity, for on the rise of the Marhatt4é power about 1650, the province became a favourite field of plunder. In 1671 the Marhatt4 general, Pratap Rado, extended his ravages as far east as Karinjd, and exacted from the village officers a pledge to pay chauwth. In 1704 things had reached their worst; the Marhattas swarmed through Berar " like ants or locusts," and laid bare whole districts. They were expelled in 1704 by Zulfikar Khan, one of Aurang- zeb's best generals, but they returned incessantly, levying black-mail in the shape of chauth and sardeshmukhi, with the alternative of fire and sword. Upon the death of Aurang- zeb the Marhattas consolidated their predominance in Berar, and in 1817 their demand for chauth, or a fourth, and sardeshmukht, or a tenth of the revenue of the province, was conceded by the governor. But in 1720-24 the viceroy of the Deccan, under the title of Nizdm-ul-mulk, gained his independence by a series of victories over the imperial generals, and from that time till its cession to England in 1853, Berar was always nominally subject to the Haidarabad dynasty. The Mahratta rulers posted their officers all over the province, they occupied it with their troops, they collected more than half the revenue, and they fought among themselves for possession of the right to collect ; but, with the exception of a few pargands ceded to the Peshwa, the Niz4m maintained his title as de jure sovereign of the country, and it was always admitted by the Marhattas. In the Marhatté war of 1803, the British under General Wellesley, afterwards the duke of Wellington, assisted by the Nizim, crushed the Marhatta power in this part of the country, by utterly defeating them at Argéon on the 28th November 1803, and a few days afterwards at Gdwilgarh, On the 19th December

1803 the Marhatta chief signed a treaty, in which he resigned all claim to territory and revenue west of the Wardha, but retained Narnalé and

Gawilgarh in his posses- sion. By this treaty the whole of Berar was made over in perpetual sovereignty to the Nizam. From that time till 1848 the history of the province consists of a long list of internal dissensions and civil wars. These troubles reduced the state to the verge of bankruptcy. The pay of the Nizam's irregular force, maintained under the treaty of 1800, fell into arrears, and had to be advanced by the British Government. There were also other unsatisfied claims of the Government on the Nizam, and in 1853 his whole debt amounted to £450,000. Accordingly, in that year anew treaty was concluded with the Niz4m, under which the existing Haidardb4d contingent force is main- tained by the British Government, in lieu of the troops which the Nizam had been previously bound to furnish on demand in time of war ; while for the payment of this con- tingent and other claims on the Nizdm, districts then yielding a gross revenue of £500,000 per annum, includ- ing the present province of Berar, were assigned to our Government. By this treaty his highness was released from the obligation of furnishing a large force in time of war ; the contingent ceased to be a part of the Nizam's army, and became an auxiliary force kept up by the British Governnient for the Nizdm's use. The treaty was revised in 1860, and as a reward for services rendered by the Nizan in 1857, two of the districts formerly assigned to us were restored to him, and the territory of the Raja of Surdpur, which had been confiscated in consequence of the rebellion of the chief, was added to the Nizd4m's dontinions.

BERARD, Fripric, a French physician and writer on psychology, was born at Montpellier in 1789. He was educated at the famous medical school of that town, and afterwards proceeded to Paris, where he was for some time employed in connection with the Dictionnaire des Sciences Médicales. He returned to his native city in 1816, and published a work upon the principles of the school of Montpellier. In 1823 he was called to a chair of medicine at Paris, which he held for three years, being then nomi- nated professor of hygiene at Montpellier. His health gave way under his labours, and he died, in 1828, at the early age of 39. A posthumous work, Hsprit des Doctrines Médicales de Montpellier, was printed in 1830. Bérard's most important production is his treatise, Des Rapports du Physique et du Moral. According to him, consciousness or internal perception reveals to us the existence of an im- material thinking, feeling, and willing subject, the self or soul. Alongside of this there is the vital force, the nutritive power, which

uses the physical frame as its organ. 'The soul and the principle of life are in constant reciprocal action, and the first owes to the second, not the formation of its faculties, but the conditions under which they are evolved. (See Damiron, Phil. en France au XIX™ Siecle.)

BERBER, or Ex-MrEcuErer, a town of considerable size on the east bank of the Nile, some distance below the confluence of the Atbara, in about 18° N, lat. and 34° E. long. It is of importance as one of the main stations on the direct route from Khartoum to Cairo, and as the starting place of caravans for Suakin, on the eastern coast.

BERBERA, one of the most important seaports on the coast of the Somali country, in East Africa, 160 miles E.S.E. of Zeyla, and nearly opposite Aden, in 10° 26' N. lat. and about 45° 4' FE, long. It seems at one time to have been a town of some size, as there are still remains of an aqueduct extending inland for several miles ; but its permanent inhabitants have for a long period been very

few. From November to April, however, it becomes the general resort of from ten to twenty thousand persons from all the neighbouring countries. The Habr-auel-Somali, in whose district the town is situated, come down to the place in the beginning of October, with poles and mats and skins, and of these slight materials erect huts and ware- houses, which are reuted from them by the merchants, who begin to arrive as soon as the south-west mousoon changes into the north-east wind. The chief disadvantage of the locality is that water has to be brought a distance of several miles from the wells of Baraka. (See J. &. G. Soc., 1849, p. 54, et seg.; Petermann's Iittheil. 1860, p. 427, and 1873, p. 40; Bollet. d. Soc. Geogr. Ital., 1873.)

BERBICEH, the eastern division of British Guiana. GUIANA.

BERCHEM, or BercHEM, NICHOLAS, an eminent painter, born at Haarlem in 1624. He received instruction from his father, and from the painters Van Goyen, Wils, and Weeninx. His pictures, of which he produced an immense number, were in great demand, as were also his etchings and drawings. His landscapes are highly esteemed ; and mauy of them have

been finely engraved by John Visscher, an eminent artist in his own line. The distinguishing characteristics of Berchem's works are—breadth and just distribution of lights, grandeur of the masses of shadow, truth and simplicity of the figures, just gradation of distances, brilliancy and transparency of colouring, correct- ness of design, and elegance of composition. He died in

1683.

BERCHTESGADEN, or BrRcHTOLSGADEN, a small town, beautifully situated on the south-eastern confines of Bavaria, and long celebrated for its extensive mines of rock-salt, which were worked as early as 1174. Fresh water is brought into the mine, and, acting upon the salt rock, becomes brine. It is then run off in pipes to a reservoir in the vicinity; whence, by two hydraulic machines, it is raised 1500 feet, and conducted to Traun- stein and Rosenheim, about forty miles farther inland. The town contains three old churches, and some good houses, Its inhabitants, amounting to 1760, are principally employed in the mines and in the manufacture of salt, while others are engaged in making those toys and other small articles of wood, horn, and ivory, for which the place has long been famous. The vicinity comprehends the most picturesque portion of Bavaria. The district of Berchtes- gaden was formerly an independent spiritual principality, founded in 1109, and secularized in 1803. The abbey is now a royal castle, and in the neighbourhood a hunting- lodge was built by King Max IT. in 1852.

BERDIANSK, a seaport town of Russia, in the govern- ment of Taurida, situated on the north-west shore of the Sea of Azoff, near the entrance of the River Berdianka into the Berdiansk Gulf, in 46° 45' N. lat. and 36° 47' E. long. Berdiansk was founded in 1827, at the suggestion of Vorontzoff, and by the following year was a regular settle- ment, which in 1835 was recognized as a town, and raised in 1842 to be capital of a circle. In 1838 its population was 3200, which had, in spite of the damage done to the town in 1855 by the English fleet, increased in 1860 to 9762. At that time it possessed two Greek churches and one Lutheran, and a Jewish and a Karaite synagogue. Its secular buildings comprised a custom-house, a hospital, a public library, and a theatre. The principal industries of the

place are the making of bricks and tiles, the boiling of tallow, and the manufacture of macaroni. Asa port it is of great importance. The roads are protected from every wind, except the south, which occasions a heavy surf; but this disadvantage has been lessened by the formation of a mole in 1863. Another inconvenience of the situation, however, is the rapid filling up of the port, which renders necessary

See

the removal of the wharves from time to time nearer to the sea. The chief articles of export are wheat, barley, linseed, rapeseed, rye, and oats; and the imports include hardwares, fruits, oil, and petroleum, the last-named being used for thie lighting of the town. Large deposits of coal exist-in the basin of the Azoff, and Berdiansk would afford the greatest facilities for its exportation. In the immediate neighbour- hood are valuable salt-lagoons. Population in 1867,

12,223.

BERDICHEFF, a town of Russian-Poland, in the gov- ernment of Kieff, 24 miles from Jitomir, on the Gnilopyat, aud not far froin the borders of Volhynia, to which it historically belongs. It consists of about a dozen main streets aud a large number of cross lanes, by far the largest proportion of the houses being built of wood or brick. Besides the cathedral of the Assumption, finished in 1832, there are three or four other Greek churches, several syna gogues, and places of worship for Roman Catholics and others, besides a Carmelite convent. The market, the ex- change, the theatre, the Jewish almshouse, and the Elizabeth hospital, are among the most important secular buildings. A large number of schools are maintained An extensive trade is carried on, both with the surrounding country and with Germany, in peltry, silk goods, iron and wooden wares, salt-fish, grain, cattle, and horses. Five great markets are held yearly, the most important being on 12th June and 15th August. Among numerous minor industries may be mentioned the manufacture of tobacco, soap, candles, oil, bricks, and leather. The population amounted in 1867 to 52,563, the Jews forming about 50,000 of the whole number,

Berdicheff is a place of some antiquity. In the treaty of demar- cation between the Lithuanians and the Poles in 1546, it is assigned to the former. In the 16th century the Kievan waiwode, Yanut Teeshkevitch, built a castle in the village ; and in 1627 he founded a monastery for Carmelite monks, to which he shortly afterwards presented the castle, The monks built themselves a crypt, and, as Berdicheff was subject to the incursions of Cossacks and Tatars, surrounded their monastery with rampart and ditch. In 1647, however, it was taken and plundered by Chmelnetzki, and the

monks who had escaped did not return till 1663, and only obtained |

possession of their former property in 1717. In 1765 Stanislas Augustus, at the request of Prince RKadzevil, allowed the city to hold ten yearly markets, and from that date its commercial prosperity began. In 1768 Casimir Pulavski, leader of the confederacy of Barr, fled, after the capture of that city, to Berdicheff, and there, with 700 men, maintained himself during a siege of 25 days. During the Polish domination, Berdicheff was in the Vratislau Waiwodeship; after its annexation to Russia it was assigned to Jitomir and Volhynia ; and in 1845 it was raised to be capital of a circle. In the beginning of the 18th century it had passed from the Teeshkevitch to the Zavpsh family, and from them was transferred by a marriage settlement to the Radzevils.

BERENGARIUS, a celebrated medieval theologian, was born at Tours, 998 ap. He was educated in the famous school of Fulbert of Chartres, and early acquired a great reputation for learning, ability, and piety. Appointed in 1031 superintendent of the cathedral school of his native city, he taught with such success as to attract pupils from all parts of France, and powerfully contributed to diffuse an interest in the study of logic and metaphysics, and to introduce that dialectic development of theology which is designated the scholastic. The earliest of his writings of which we have any record is an Exhortatory Discourse to the hermits of his district, written at their own request and for their spiritual edification. It shows a clear discernment of the dangers of the ascetic life, and a deep insight into the significance of the Augnstinian doctrine of grace, About 1040 Berengar was made arch- deacon of Angers. It was shortly after this that rumours began to spread of his holding heretical views regarding the sacrament of the

supper. He had submitted the doc- trine of transubstantiation (already generally received both

by priests and people, although it had been first unequivo- cally taught and reduced to a regular theory by Paschasius Radbert only in 831) to an independeut examination, and had come to the conclusion that it was contrary to reason, unwarranted by Scripture, and inconsistent with the teach- ing of men like Ambrose, Jerome, and Augustine. He did not conceal this conviction from his scholars and friends, and through them the report spread widely that he denied the common doctrine respecting the Eucharist. His early friend and school companion, Adelmann, arch- deacon of Liége, wrote to him letters of expostulation on the subject of this report in 1046 and 1048; and a bishop, Hugo of Langres, wrote (about 1049) a refutation of the views which he had himself heard Berengar express in conversation. Berengar's belief was not shaken by their arguments and exhortations, and hearing that Lanfranc, the most celebrated theologian of that age, strongly approved the doctrine of Paschasius and condemned that of Ratramnus, he wrote to him a letter expressing his surprise, and urging him to reconsider the question. The letter arriving at Bec when Lanfranc was absent at Rome, was sent after him, but was opened before it reached him, and brought under the notice of Pope Leo IX. Because of it Berengar was condemned as a heretic, without being heard, by a synod at Rome and another at Vercelli, both held in 1050. His enemies in France cast him into prison; but the bishop of Angers and other powerful friends, of whom he had a considerable number, had sufficient influ- ence to procure his release. At the Council of Tours (1054) he found a protector in the Papal legate, the famous Hildebrand, who, satisfied himself with the fact that Berengar did not deny the real presence of Christ in the sacramental elements, succeeded in persuading the assembly to be content with a general confession from him

' that the bread and wine, after consecration, were the body

and blood of the Lord, without requiring him to define how. 'Trusting in Hildebrand's support, and in the justice of his own cause, he presented himself at the Synod of Rome in 1059, but found himself surrounded by fierce and superstitious zealots, who forced him by the fear of death to

signify his acceptance of the doctrine "that the bread and wine, after consecration, are not merely a sacra- ment, but the true body and the true blood of Christ, and that this body is touched and broken by the hands of the priests, and ground by the teeth of the faithful, not merely in a sacramental but in a real manner." He had no sooner done so than he bitterly repented his weakness ; and act- ing, as he himself says, on the principle that "to take an oath which never ought to have been taken is to estrange one's self from God, but to retract what one has wrong- fully sworn to, is to return back to God," when he got safe again into France he attacked the transubstantiation theory more vehemently than ever. He continued for about sixteen years to disseminate his views by writing and teaching, without being directly interfered with by either his civil or ecclesiastical superiors, greatly to the scandal of the multitude and of the zealots, in whose eyes Berengar was "ille apostolus Satanz," and the academy of Tours the " Babylon nostri temporis." An attempt was made at the Council of Poitiers in 1075 to allay the agitation caused by the controversy, but it failed, and Berengar narrowly escaped death in a tumult raised by fanatics. Hildebrand, now Gregory VII., next summoned him to Rome, and, in a synod held there in 1078, tried once more to obtain a declaration of his orthodoxy by means of a con- fession of faith drawn up in general terms ; but even this strong-minded and strong-willed Pontiff, although sincerely anxious to befriend the persecuted theologian, and fully alive to the monstrous character of the dogma of transub-

-stantiation as propounded by Pope Nicholas IT. and

Cardinal Humbert at the synod held in 1059, was at length forced to yield to the demands of the multitude and its leaders; and in another synod at Rome (1079), finding that he was only endangering his own position and reputa- tion, he turned unexpectedly upon Berengar and com- manded him to confess that he had erred in not teaching a change as to substantial reality of the sacramental bread and wine into the body and blood of Christ. ' Then," says Berengar, " confounded by the sudden madness of the Pope, and because God in punishment for my sins did not give me a steadfast

heart, I threw myself on the ground, and confessed with impious voice that I had erred, fearing the Pope would instantly pronounce against me the sentence of condemnation, and, as a necessary consequence, that the populace would hurry me to the worst of deaths." He was kindly dismissed by the Pope not long after, with a letter recommending him to the protection of the bishops of Tours and Angers, and another pronouncing anathema on all who should do him any injury or call him a heretic. He returned home overwhelmed with shame aud bowed down with sorrow for having a second time been guilty of a great impiety. He immediately recalled his forced confession, and besought all Christian men "to pray for him, so that his tears might secure the pity of the Almighty." He now saw, however, that the spirit of the age was against him, and hopelessly given over to the belief of what he had combated as a delusion. He withdrew, therefore, into solitude, and passed the rest of his life in retirement and prayer on the island of St Come near Tours. He died there in 1088. In Tours his memory was held in great respect, and a yearly festival at his tomb long commemorated his saintly virtues.

Berengar left behind him a considerable number of followers, All those who in the Middle Ages denied the substantial presence of the body and blood of Christ in the Eucharist were commonly designated Berengarians. These so-called Berengarians differed, of course, in many respects from one another, even in regard to the nature of the supper. Berengar's own views on the subject may be thus summed up :—1. That bread and wine should become flesh and blood and yet not lose the properties of bread and wine was, he held, contradictory to reason, and there- fore irreconcilable with the truthfulness of God. A change which would leave behind the properties or predicates of bread and wine, yet take away their substances, the subjects of these predicates, seemed to him inherently incredible. In working out the proof of this position he showed very considerable dialectical skill. At the same time he em- ployed so many arguments, based on what is called nominalism, that his theory of the Eucharist has been described by M. de Remusat as " nominalism limited to a single question." 2. He admitted a change (conversio) of the bread and wine into the body of Christ, in the sense that to those who receive them they are transformed by grace into higher powers and influences—into the true, the intellectual, or spiritual body of Christ—so as to sustain and impart the life eternal. Christ does not

descend from heaven to be portioned out by the hands of priests and received into the mouths of communicants, but the hearts of true believers ascend to Christ in heaven, receive into themselves his true and imperishable body, and partake thereof in a spiritual manner. The unbelieving receive the external sign or sacramentum ; but the believing receive in addition, truly although invisibly, the reality represented by the sign, the res sacrament:. Berengar draws his reasons for this view from Scripture. In confirmation of its correctness he adduces the testimonies of the earlier church teachers. 3. He rejected the notion that the sacra- ment of the altar was a constantly renewed sacrifice, and held it to be merely a commemoration of the one sacrifice

of Christ. 4. He dwelt strongly on the importance of men looking away from the externals of the sacrament to the spirit of love and piety which they presuppose, and the divine power and gracc, through the operation of which alone they can become channels of religious life. The transubstantiation doctrine seemed to him full of evil, from its tendency to lead men to overvalue what was sensuous and transitory in the sacrament, and to neglect what was spiritual and eternal. 5. He rejected with in- dignation the miraculous stories told to confirm the doctrine of transubstantiation. He saw in these legends unworthy inventions originated to awe and influence ignorant and superstitions minds. On this account he was falsely accused of denying miracles altogether. 6. Reason and Scripture seemed to him the only grounds on which a true doctrine of the Lord's supper could be rested. He had a confidence in reason very rare in the 11th century, but was no rationalist. He attached little importance to mere ecclesiastical tradition or authority, and none to the voice of majorities, even when sanctioned by the decree of a Pope. In this, as in other respects, he was a precursor of Protestantism.

The opinions of Berengar are to be ascertained from the works written in refutation of them by Adelmann, Lanfranc, Guilmund, &c.; from the fragments of the De sacr. cena adv. Lanfr. liber, edited by Stiudlin (1820-29) ; and from the Liber posterior, edited by A. F. and F, T. Vischer (1834). See also the Berengarius Twron- ensis of Lessing (1770), and especially of Sudendorf (1850) ; the Church Histories of Gieseler, ii. 896-411 (Eng. transl.), and Nean- der, vi. 221-260 (Eng. transl.); Prantl's Geschichte der

Logik, ii. 70—75, and Hauréau's Histoire de la Philosophie Scolastique, i, 225- 238, (R. F.)

BERENICE, an ancient city on the western shore of the Red Sea, in 23° 56' N. lat. and 35° 34' E. long., near the head of the Sinus Immundus or Foul Bay. It was founded or enlarged by Ptolemy II., and grew into great importance as an entrepét for the trade between Asia and Africa. Its harbour was sheltered on the north-east by an island that had topaz deposits, and in the neighbourhood were emerald mines. The ruins of a temple in the Egyptian style, but with Greek ornaments, are among the most important discovered on the site.

BERENICE, the name of several Egyptian and Jewish princesses. The two most generally known are—

1, BeRENIcE, the daughter of Magus, king of Cyrene, and the wife of Ptolemy Euergetes, of Egypt. During her hus- band's absence on an expcdition to Syria, she dedicated her hair to Venus for his safe return, and placed it in the temple of the goddess at Zephyrium. The hair having by some unknown means disappeared, Conon, the mathematician, explained the phenomenon in courtly phrase, saying that it had been carried to the heavens and placed among the stars. The name Coma Berenices, applied to a constellation, commemorates this incident. Only a few lines remain of the poem in which Callimachus celebrated the transforma- tion, but there is a fine translation of it by Catullus.

2. Berenice, daughter of Agrippa I., king of Judza, and born probably about 28 a.p. She was first married to her uncle, Herod, after whose death she lived for some years with her brother Agrippa, not without scandal. Her second husband was Polemo, king of Cilicia, but she soon deserted him, and returned again to Agrippa, with whom she was living when Paul appeared before him at Ceesarea. During the devastation of Judea by the Romans, she fas- cinated Titus, whom she accompanied to Rome, and who would willingly have married her had it not been for the hatred cherished by the people against the Jewish race.

BEREZINA, a river of Russia, in the government of Minsk, forming a tributary of the Dnieper. It rises in the marshes of Boresoff, and has a

course of more than 330 miles, for the most part through low-lying but well-

wooded country. Its width increases from 40 or 60 feet near Bobruisk to 100 feet at the mouth of the Svesloch, one of its western tributaries. As a navigable river, and forming a portion of the great canal system which unites the Black Sea with the Baltic, it is of great importance for the commerce of the country, but unfortunately it is sub- ject to severe floods. The principal ports along its course are Boresoff, Berezino, Yakshetzce, Bobruisk, and Parichi. In history the river has been rendered famous by the cross- ing of the army of Napoleon in 1812. See Stucken- berg's Jydrographie, iii, and Candle; Giildenstadt's Reise.

BEREZOFF, a town of Asiatic Russia, capital of a circle in Tobolsk, 700 miles N. of that city, situated on three hills on the left bank of the Sosna, 13 miles above its mouth, and on the Bogul, a tributary of the Sosna, iu 63° 55' N, lat. and 64° 7' E. long., at a height of 297 feet above the sea-level. Berezoff was founded in 1593 for the collection of taxes near the Ostyak settlement of Simgtit-Bozh, which means in Russian Berezovi-Gorod, or Birch-town. Berezoff was more than once exposed to destructive conflagrations, as, for example, in 1719. In the second quarter of the 18th century Berezoff was appointed a place of banishment for certain important royal families. In 1727 Prince Men- schikoff was sent thither with his sons and two daughters, of whom the eldest, Mary, was the first bride of Peter IL; and in 1730 he was followed by Prince Ivan Dolgoruki, with his wife, father, mother, three brothers and three sisters, of whom Catherine was the second bride of Peter Il. In 1742 General Osterman was sent to Berezoff with his wife, and died there in 1747. Jn 1782 the town was raised to the rank of chief town of a district of the Tobolsk government. Jn 1808 it was again burned down. In 1860 it had two stone churches, a cathedral called the Resurrection of the Lord, near which lie buried Mary Menschilkoff and some of the Dolgorukis, and the church of Our Lady's Conception, built on the site of the Menschikoff building. There are in the town a departmental school, a lazaretto, and a stranger's hospital. The trade, which is of considerable importance, consists of furs, mammoth bones, dried and salted

fish, &c. There is a yearly market, in which the transactions amount to £9000. Population in 1860, 1462.

BERG (Ducatus Montensis), a former duchy of Germany, on the right bank of the Rhine, bounded on the N. by the duchy of Cleves, E. by the countship of Mark and duchy of Westphalia, and on the 8. and W. by the bishopric of Cologne. Its area was about 1188 square miles, The district was raised in 1108 to the rank of a countship, but did not become a duchy till the 14th century, after it had passed into the possession of the Jiilich family. On the extinc- tion of this house in 1609, Austria laid claim to the duchy as an imperial fief; but, in keeping with the wishes of the inhabitants, it was administered conjointly by the electors of Saxony and Brandenburg and the Elector Palatine till 1624, when by the Diisseldorf treaty the last of the three obtained the sole authority. In 1806 it was bestowed by Napoleon, along with the duchy of Cleves and other pos- sessions, on Murat, who bore the title of grand duke of Berg ; and after Murat's elevation to the throne of Naples, it was transferred to Louis, the son of the king of Holland. By the Congress of Vienna in 1815 it was made over to Prussia, and now forms a flourishing part of her territory,

BERGAMA, a town of Asia Minor, with 2500 in- habitants. See PERGAMUS.

BERGAMO, a northern province of Italy, bounded on

the N. by Sondrio, E. by Tyrol and Brescia, 8. by Cre- mona, and W. by Milan and Como. The northern portion is mountainous and well wooded, while the southern belongs to the alluvial plain of Lombardy. To the N. and

W. of Lake Iseo thcre are numerous mineral wells, the most important of which are those of Trescoro. Marble is abundant in the mountains, and there are valuable iron mines. Atan early period the wealth of the capital appears to have been increased by the working of copper mines in the district. (See Finazzi, Sulle antiche miniere di Ber- gamo, Milan, 1860.) The vine and flax are largely grown, and the culture of the silk-worm is extensively carried on. The people speak a rough dialect, and are liable to

be laughed at by the other Italians. The two stock cliaracters of popular Italian comedy, Harlequin or Truffaldino and the sly Brighella, were both at one time represcnted as natives of the Bergamo district.

BERGAMO, the capital of the above province, is situated between the Brembo and Serio, two tributaries of the Adda, 39 miles N.E. of Milan, on the railway that runs from Venice to the Lake of Como, It consists of a new and an old town, the latter known as the Citta, or city, being built on a hill, while the former, or Borgo S. Leonardo, occupies the level ground below. On the eastern side there aire also two important suburbs, 8. Caterina and Palazzo. Bergamo is the seat of a bishop and a prefect, and pos- sesses a school of art known as the Accadenia Carrara, a museum, a lyceum, a library contained in the Palazzo Vecchio or Broletto, a musical institute, two theatres, and various scientific societies. There are also a lunatic asylum, a hospital, and other charitable institutions. Among its numerous churches may be mentioned S. Maria Maggiore, which dates from 11738, and the neighbouring Colleoni chapel, the old Arian church of San Alessandro della Croce, S. Bartolommeo, aud 8. Grata. The principal objects of industry in the city are silk, cotton, and woollen goods, iron-wares, waxcloth and wax candles, and playing cards. A large fair, called the Fiera di 8. Alessandro, is annually held in the new town. It dates from the 10th century, and is of great importance, especially for the silk trade. Bergamo, or Bergomum, was a municipal town during the Roman empire, and, after being destroyed by Attila, became one of the most flourishing citics of the Lombard kings, who made it the capital of a duchy. In the 15th century it was appropriated and fortified by the Venetians. In 1509 it was occupied by Louis XII. of France, wlio retained it for seveu years, and then restored it to Venice. In 1796 the French again made themselves masters of the city, and constituted it the capital of their department of Serio. Bergamo was the birthplace of Tiraboschi, Rabini, and Donizetti. Population, 37,363.

BERGAMOT, O11 or, an essential oil obtained from the rind of the fruit of a species of Citrus, regarded by Risso as O. bergamia, but not generally believed to constitute a distinct species. The bergamot is a small tree with leaves and flowers like the bitter orange, and a round fruit nearly 3 inches in diameter, with a thin lemon-yellow smooth rind. The tree is cultivated in the neighbourhood of Reggio, in Calabria, whence the entire supply of

bergamot oil is drawn. The oil is contained in small vesicles in the rind, from which it can be expressed by simple pressure in the hand. An old method of obtaining the oil, now almost superseded, is by skinning the fruit, and pressing the outside of the rind against a sponge. The rind being turned over so that the outside becomes concave, the vesicles are easily ruptured by hand pressure against the sponge, which absorbs the oil as it escapes. 'The oil is now obtained by placing several fruits in a saucer-shaped apparatus, the surface of which is cut into radiating sharp-edged grooves. Against the sharp edges of this dish the fruits are rapidly revolved by means of a heavy cover placed above it, which is moved by a cog wheel. The oil vesscls are ruptured by pressure against the knife edges, and the oil which exudes falls through small perforaticrs in the bottom into a vessel

placed underneath. It is allowed to rest till a greasy sub- stance—bergamot camphor—deposits, after which it is bottled for use. Bergamot oil is a limpid greenish-yellow fluid of a specific gravity of 0°869, of a powerful but plea- sant citrine odour and an aromatic bitterish taste. It con- sists of a mixture of two essential oils, the most volatile of which isa pure hydrocarbon isomeric with oil of turpen- tine; the other, containing oxygen, being regarded as a hydrate of lemon oil. The chief use of bergamot oil is in perfumery and as a flavouring material in cookery.

BERGEN, a city and seaport on the west coast of Nor- way, capital of the province of South Bergen, in 5°29' N. lat. and 60° 23' E. long. It is situated on a rocky promontory at the head of a deep bay called the Vaag, hasa fine harbour with two good entrances, and is surrounded by hills, some of which attain the height of 2000 feet. Towards the sea it is defended by the ancient fortress of Bergenhuus, the citadels of Fredericksberg and Sverresberg, and some lesser works, The appearance of the town, which rises in the form of an amphitheatre and is generally well built, is decidedly picturesqne, with its wooden houses painted of various colours. It contains a cathedral, several churches, of which the oldest, St Mary's, dates from the 12th cen- tury, hospitals, a lazaretto, a national museum, a diocesan college, a naval academy, a school of design, public lib- raries, various charitable institutions, and a theatre. It is the seat of a bishopric, and possesses a

tribunal of secondary jurisdiction and one of the three public treasuries of Nor- way. Bergen has a considerable export trade, which con- sists of stockfish, lobsters, fish-roes, herrings, whale oil, horns, skins, rock moss, and timber, and is chiefly carried on with the northern countries of Europe. In 1867 the number of steamships that entered the port was 164, with a tonnage of 28,454, The imports of that year amounted to £92,600, and the exports to £344,000. Bergen was founded in the 11th century by Olaf the Peaceful, king of Norway. In 1445 the Hanseatic League established a factory in the city, and continued to have almost the sole control of the trade till 1558, when it was expelled by the Norwegians, who found its presence oppressive. There is still a kind of German colony in the place, which keeps up the Hanseatic tradition, and the old German church, hospital, and "factory" or contor are still extant, the latter furnishing excellent warehouse accommodation, A large part of the town was burnt down in 1855, and has since been rebuilt in a more regular and open manner. It is the second largest town in Norway. Population (1870),

30,252,

BERGEN-OP-ZOOM, a town of Holland, in the pro- vince of North Brabant, situated on both sides of the River Zoom, near its confluence with the East Scheldt, in 51° 29' N. lat. and 4°17' E. long. It is about 15 miles N. of Autwerp, and 22 W.S.W. of Breda. The houses are well built, the market-places and squares handsome and spacious. It possesses a port and an arsenal, and contains a town- house, a Latin school, and au academy of design and archi- tecture. The tower of the old castle is remarkable for an increase of its breadth from the bottom upwards, and for its liability to be rocked when struck by a strong wind, There are numerous tile-works and potteries of fine ware; and a

considerable trade is carried on in anchovies caught in the Scheldt.

In the 13th eeuturv Pergen-op-Zoom became the seat of Count Gerhard of Wesemael, who surrounded it with walls. In 1533 it was erected by Charles V. of Germany into a marquisate, which was suecessively held by the families of Berghes, Merode, Witthem, s'Heerenbergh, Hohenzollern, Tour d'Auvergne, and Sulzbaeh, and thus passed to the house of Bavaria, whieh, however, in 1801 abdi- cated its rights in favour of the Dutch republic. In

1576 the town joined the United Netherlands, and was shortly afterwards fortified. In 1588 it was unsuccessfully besieged by the duke of Parma (see

Motley's United Netherlands, chap. xx.), and in 1605 it was sud: denly attacked by Du Terail (Zéid. ehap. xliv.) In 1622 it defied the utmost attempts of Spinola, who was forced to abandon the enterprise after a siege of ten weeks and the loss of 1200 men. Its fortifications were greatly strengthened in 1688 by Cooehoorn, who, it was believed, had almost rendered it impregnable ; and in 1725 they were further extended. In 1747, however, the town was taken by the Freneh general Lowendal. Restored at the end of the war, it was again in 1795 taken by Pichegru. 'The English, under Sir Thomas Graham, afterwards Lord Lynedoch, in March 1814 made an attempt to take it by a coup de main, but were driven baek with great loss by the French, who, however, surrendered the place by the treaty of peace in the following May.

BERGERAC, the chief town of an arrondissement in the department of Dordogne, in France, situated in a fer- tile plain, 30 miles 8.S.W. of Périgueux, on both banks of the Dordogne, which is here crossed by a fine bridge of five arches and rendered navigable by a large dam, The town is rather poorly built, and, in spite of its age, con- taius no monuments of antiquarian interest. It is, how- ever, a place of great industrial activity, has a communal college, tribunals of primary jurisdiction and commerce, and a public library ; and manufactures paper, iron and copper wares, hats, hosiery, and leather. The wines of the neighbourhood are in good repute, and form an important article in the trade of the town, which is principally car- ried on with Bordeaux and Libourne. Bergerac owes its origin to the abbey of St Martin, which was founded in 1080, and during the English invasious it played au im- portant part asa fortress. In the 16th century it was a very flourishing and populous place, but most of its inhabi- tants having embraced Calvinism it suffered greatly during the religious wars. Its fortifications and citadel were de- molished by Louis XIII. in 1621, and it was injuriously affected by the revocation of the Edict of Nantes. Popu- lation in 1872, 8679.

BERGMANN, Torzern Onor, Swedish chemist and naturalist, was born at Catherinberg, West Gothland, in 1735, At the age of seventeen he entered the University of Upsala, and distinguished himself by extraordinary assi- duity in study, directing his attention more particularly to the natural sciences. During a residence at home rendered necessary by his weak health, he employed himself in ccl- lecting specimens of insects and plants, which he forwarded to Linuzus, who was much pleased with them. In 1756 he gained great reputation by his memoir on the Coccus aquaticus, which, contrary to the opinion of Linnzus, he proved to be nothing but the ovum of a certain species of leech, Some years later he was made professor of physics at Upsala, and published numerous scientific memoirs. In 1767 the chair of chemistry and mineralogy having become vacant through the resignation of Wallerius, Bergmann resolved to become a candidate. He had not hitherto de- voted special attention to chemistry, but in a very short period by incredible application he produced as evidence of his fitness for the post a paper on the composition of alum, which is still regarded as a masterpiece. He was appointed to the chair, which he held till his death in 1784. In 1776 he had declined an offer from the king of Prussia inviting him to settle in Berlin. Bergmann was an un- usually acute and sagacious analytical chemist, and made extensive and constant use of the laboratory. He described very carefully the properties of carbonic acid gas, and gave a valuable analysis of mineral waters. His researches in mineralogy, to which he applied his geometrical knowledge, were even more important, and led the way to Hauy's discovery and classification. The theory of elective or chemical affinities, which he worked out very fully, has had great influence in the history of chemistry. A collection of Bergmann's papers was published from 1779 to 1783, Opuscula Physica et Chemica, 6 vols. They have been translated into French, German, and English,

PH REKELEY

BERKELEY, a market-town in the county of Gloucester, near the River Severn, on the Midland Railway. It is pleasantly situated on a gentle eminence, in a rich pastoral vale to which it gives name, and which is celebrated for its dairies, produciug the famous cheese known as " double Gloucester." The town hasa handsome church, a grammar school, a town- hall, a market-house, and some trade in coal, timber, malt, and cheesc.

Berkeley was the birthplace of the celebrated Dr Jenner, whose remains are interred in the church. Berkeley castle, on an eminence §8.E. of the town, was built in the reign of Henry IJ. out of the ruins of a nunnery which had been in existence some time before the Conquest. It suffered considerably during the civil wars of the 17th century, but is still one of the noblest baronial castles existing in England. It is noted as the scene of the barbarous murder of Edward II. Since the time of Henry II. it has been in the hands of the Berkeley family. Population of the parish in 1871, 4607,—about a fourth of the number being in the town.

BERKELEY, Grorer, bishop of Cloyne, one of the most subtle and original English metaphysicians, was born on the 12th March 1685, at Dysert castle, on the banks of the Nore, about two miles below Thomastown, Ireland. Not much is known of his family, who seem to have been connected with the noble English house of the same name. His father, William Berkeley, was an officer of customs, and appears to have had at one time the rank of captain in the army. We know next to nothing of the mental character of either him or his wife. George, their eldest son, was entered in 1696 at the fainous Kilkenny school, of which he was not the only pupil afterwards distinguished. He was remarkably well advanced in studies for his years, and in 1700 was qualified to matriculate at Trinity College, Dublin. There, for the first time, we begin to have a fair knowledge of the circumstances in which he was placed, and of the peculiar mental qualities with which he was endowed. From his own account, and from the few notices of coutemporaries, we can gather that his was a mind of peculiar subtilty, keen to probe to the very founda- tion any fact presented to it, and resolutely determined to rest satisfied with no doctrine which had only the evidence of authority or custom, and was not capable of being realized in consciousness. This turn of mind naturally led him somewhat off the beaten track of university studies ; he was not understood by his college companions, and began to be looked upon as either the greatest dunce or the greatest genius in the university. To such a reputation his eccentricity of manner, which scems to have resulted froin his occasional absorption or passionate enthusiasm, largely contributed. Of the greatest importance for the development of his rare powers in a definite direction was the general condition of thought at the time of his residence at Dublin. The older text-books of physics and philosophy were no doubt in use (Dublin in this

respect has always been conservative), but alongside of them the influences of the new modes of thinking were streaming in. The opposed physical systems of Descartes and Newton had begun to be known; the new and powerful calculus was being handled ; the revolution in metaphysical speculation inaugurated by Descartes had reached Dublin: and, above all, the Lrst great English work on pure philosophy, the Essay of Locke, had been trauslated into Latin, and its doctrines were being eagerly and minutely discussed by the young Trinity College students. Add to this the undoubted influence exercised by the presence in Dublin of such men as the university provost, Peter Browne, afterwards bishop of Cork, and King, archbishop of Dublin from 1703, and it will readily be seen that Berkeley, to use Professor Fraser's words, 'entered an atmosphere which was beginning to be charged with the elements of reaction

against traditional scholasticism in physics and in .neta- physics." — Although more competent than any man of his time to appreciate these new movements of thought, Berkeley did not neglect the routine work of the university. He hada

distinguished career, was made scholar in 1702, took his

B.A. degree in 1704, and obtained a fellowship in 1707. That his interest, however, was mainly directed towards subjects purely philosophical, is evidenced partly by the share he took in setting afloat a speculative society in which the problems suggested by Descartes and Locke seem to have been discussed with infinite vigour, but, above all, by his Common Place Book, containing his thoughts on physics and philosophy from about the year 1703. 'This curious document, one of the most valuable autobiographical records in existence, throws a flood of light on the growth of Berkeley's own conceptions, and enables us to understand, far more clearly than we otherwise could, the significance of his first published works. In the Common Place Book, if in any writing, is to be found the keen consciousuess of possessing a fresh, creative thought, the application of which will change the whole aspect of speculative science. The very first sentences refer to some new principle, and the whole book thereafter is occupied turning over and over again the new conception, showing the

different aspects it assumes, and the various applications it has, bringing it face to face with possible objections, and critically con- sidering the relation in which it stands to the fundamental thoughts of his great predecessors, Descartes, Malebranche, and Locke. So far as reading goes, the Common Place Book shows but a slight acquaintance with ancient or scholastic philosophies ; it is evident that the author does not appreciate Spinoza; he does not refer to Leibnitz ; Malebranche is frequently mentioned, but hardly in such a way as to manifest sympathetic understanding of him ; Norris, the English follower of Malebranche, seems to be unnoticed; More and the Mystics, when referred to, are quoted on isolated points, and to their system the young philosopher evidently felt no attraction. Descartes and Locke, above all the latter, are his real masters in specula- tion, and it is from the carcful consideration of their systems that the new principle has sprung to light. And what is this principle? As Professor Fraser has said, there are many ways of expressing it, and Berkeley himself has never given any very definite enunciation. To put it ina form as nearly as possible resembling the statements in the Common Place Book, it may be expressed in the pro- position that no existence is conceivable and therefore possible which is not either conscious spirit or the ideas (t.e., objects) of which such spirit is conscious. Existing things consist of ideas or objects perceived or willed, while perception and volition are inconceivable and impossible save as the operations of mind or spirit. In the language of a later philosophy, the priuciple is that of the absolute synthesis of subject and object; no object exists apart from mind. Mind is therefore the deepest reality ; it is the prius both in thought and in existence, if for the moment we assume the popular distinction between these two. From this primitive truth, which, it seems to Berkeley, merely requires careful consideration in order to be at once accepted, he never wavers. Let attention be but confined to the only possible meaning which existence can have, and, Berkeley thinks, the principle must appear self-evident. Thus he puts in a new light the perennial problems of philosophy, and instead of discussing the nature and relations of assumed entities, such as matter, substance, or cause, would ask us to consider whether or not these have auy significance apart from the perceptions or volitions of conscious spirit, what in that case they do mean, and whether the supposed difficulties conuected with them do

not vanish when their true interpretation is thoroughly grasped. Of all these difficulties that concerned with the nature of matter is of greatest importance to Berkeley. From misconceptions of the true nature of material sub- stance have flowed, according to him, the materialism, scepticism, and infidelity which disfigured the age; and all these are completely banished by the new principle. The applications of his principle and his own inclinations led Berkeley into other departments of science which he was not so well qualified to handle The first result of the principle, as he conceived it, is undoubtedly empiricism in the theory of cognition. The ultimate elements of know- ledge are the minima of consciousness, presentative or representative ; pure thought and abstract ideas are not capable of being realized by the mind, and are therefore impossible. The only mathematical processes to which these minima can be subjected are addition and subtraction ; and consequently great part of the Common Place Book is occupied with a vigorous and in many points exceedingly ignorant polemic against the fundainental conceptions of the fluxional and infinitesimal calculus, a polemic which Berkeley carried on to the end of his days.

He soon began to appear as an author. In 1707 he published two short tracts on mathematics, and in 1709 the New Theory of Vision, in which he applied his new principle, though without stating it explicitly. The new theory is a critical examination of the true meaning of the externality which is apparently given in visual conscious- ness, and which, to the unphilosophical mind, is the strongest evidence of the independent existence of outer objects. Such visual consciousness is shown to be ulti- mately a system of arbitrary signs, symbolizing for us certain actual or possible tactual experience—in fact, a language which we learn through custom. The difference between the contents of the visual and the tactual con- sciousness is absolute; they have no element in common. The visible and visual signs are definitely connected with tactual experiences, and the association between them, which has grown up in our minds through custom or habit, rests upon, or is guaranteed by, the constant conjuriction of the two by the will of the Universal Mind. But this synthesis, whether on the objective side as the universal thought or course of nature, or on the subjective side as mental association, is not brought forward prominently by

Barkeley. It was at the same time perfectly evident that a quite similar analysis might have been applied to tactual consciousness, which does not give externality in its deepest significance any more thau visual; but it was with deli- berate purpose that Berkeley at first drew out only one side of his argument. In 1710 the new doctrine received its full statement in the Principles of Human Knowledge, where externality in its ultimate sense as independence of all mind is considered; where matter, as an abstract, un- perceived substance or cause, is shown to be an impossible and unreal conception ; where true substance is affirmed to be conscious spirit, true causality the free activity of such a spirit, while physical substantiality and causality in their new meaning are held to be merely arbitrary but constant relations among phenomena connected subjectively by suggestion or association, conjoined objectively in the Universal Mind In ultimate analysis, then, nature is conscious experience, and forms the sign or symbol of a divine, universal intelligence and will.

In the preceding year Berkeley had been ordained as deacon, and in 1711 he delivered his Discourse on Passive Obedience, in which he deduces moral rules from the intention of God to promote the general happiness, thus working out a theological utilitarianism, which may with advantage be compared with the later expositions of Austin and Mill. From the year 1707 he had been engaged as

college tutor ; in 1712 he paid a short visit to England, and in April of the following year he was presented by Swift at court. His splendid abilities and fine courteous manners, combined with the purity and uprightness of his character, made him a universal favourite. While in London he published his Dialogues (1713), a more popular exposition of his new theory; for exquisite facility of style these are perhaps the finest philosophical writings in the English language. In November of the same year he became chaplain to Lord Peterborough, whom he accom- panied on the Continent, returning in August 1714. He travelled again in 1715 as tutor to the son of Dr Ashe, and was absent from England for five years. On his way home he wrote and sent to the French Academy the essay De Motu, in which is given a full account of his new con- ception of causality, the fundamental and all-

compreheusive thought in his philosophy. In 1721, during the disturbed state of social relations consequent on the bursting of the the great South Sea bubble, he published an Essay towards preventing the Ruim of Great BPritain, which shows the intense interest he took in all practical affairs. In the same year he returned to Ireland as chaplain to the duke of Graf- ton, and was made divinity lecturer and university preacher. In 1722 he was appointed to the deanery of Dromore, a post which seems to have entailed no duties, as we find him holding the offices of Hebrew lecturer and senior proctor at the university. The following year brought him an unexpected addition of fortune, Miss Vanhomrigh, Swift's Vanessa, having left him half her property. It would appear that he had only met her once at dinner. In 1724 he was nominated to the rich deanery of Derry, but had hardly been appointed before he was using every effort to resign it in order to devote himself to his enthusiastically conceived scheme of founding a college in the Bermudas, and extending its benefits to the Americans. With in- finite exertion he succeeded in obtaining from Government a promise of £20,000, and, after four years spent in pre- paration, sailed in September 1728, accompanied by some friends and by his wife, daughter of Judge Forster, whom he had married in the preceding month. Their destina- tion was Rhode Island, where they resolved to wait for the promised grant from Government. Three years of quiet retirement and study were spent in the island. Berkeley bought a farm, made many friends, and endeared himself to the inhabitants. But it gradually became apparent that Government would never hand over the promised grant, if indeed they had ever seriously contemplated doing so. Berkeley was therefore compelled reluctantly to give up his cherished plan. Soon after his return he published the fruits of his quiet studies in Alciphron, or the Minute Philosopher (1733), a finely written work in the form of dialogue, critically examining the various forms of free- thinking in the age, and bringing forward in antithesis to them his own. theory, which shows all nature to be the language of God. The work was extremely popular. In 1734 he was raised to the bishopric of Cloyne, and at once went into residence. The same year, in his Analyst, he attacked the higher mathematics as leading to freethink- ing; this involved him in a hot controversy. The Quervst, a practical work in the form of questions on what would now be called social or economical philosophy, appeared in three parts, 1735, 1736, 1737. In 1744 was pub- lished the Siris, partly occasioned by the controversy with regard to tar-water, but rising far above

the petty circum- stance from which it took its rise, and in its chain of reflections revealing the matured thoughts and wide reading of its author, while opening up hidden depths in the Berkeleian metaphysics. In 1751 his eldest son died, and in 1752 he removed with his family to Oxford for the sake of his son George who was studying there. On the even-

ing of the 14th January 1753, he expired suddenly and painlessly in the midst of his family. And thus quietly closed one of the purest and most beautiful lives on record. His remains were deposited in Christ Church, Oxford.

Although Berkeley's new principle is susceptible of brief state- ment, it is by no means equally possible to give in short compass an adequate account of its systematic application to the several pro- blems of philosophy. It may be sufficient here to indicate gene- rally the relation of the new conception to preceding systems, and to inquire how far the principle is metaphysically justifiable. In the philosophies of Descartes and Locke a large share of attention had been directed to the idea of matter, which was held to be the abstract, unperceived background of real experience, and was sup- posed to give rise to our ideas of external things through its action on the sentient mind. Knowledge being limited to the ideas produced could never extend to the unperceived matter, or substanee, or cause which produced them, and it became a problem for specula- tive science to determine the grounds for the very belief in its existence. Philosophy seemed about to end in scepticism or in materialism. Now Berkeley put this whole problem in a new light by pointing out that a preliminary question must be raised and answered. Before we deduce results from such abstract ideas as cause, substance, matter, we must ask what in reality do these mean,—what is the actual content of consciousness which cor- responds to these words? Do not all these ideas, when held to represent something which exists absolutely apart from all know- ledge of it, involve a contradiction? Are they not truly, when so regarded, inconceivable, and mere arbitrary figments which cannot possibly be realized in consciousness? 1n putting this question, not less than in answering it, consists Berkeley's distinct originality as a philosopher. The essence of the answer, as has been already seen, is that the

universe is inconceivable apart from mind, —that exist- ence, as such, denotes conscious spirits and the objects of conscious- ness. Matter and external things, in so far as they are thought to have an existence beyond the circle of consciousness, are im- possible, inconceivable, absurd. External things are things known to us in immediate perception. To this conclusion Berkeley seems, in the first place, to have been led by the train of reflection that naturally conducts to subjective or egoistic idealism. It is impos- sible to overstep the limits of self-consciousness ; whatever words 1 use, whatever notions I have, must refer to and find their meaning in facts of consciousness. And there can be no doubt that in certain earlier aspects of his theory, where, for example, it appears as a mere analysis of what is meant by reality, it does not rise above this subjective stand-point. But this is by no 'means the whole or even the principal part of Berkeley's philosophy ; it is essentially a theory of causality, and this is brought out gradually under the pressure of difficulties in the first solution of the carly problem. To merely subjective idealism, sense percepts difier from ideas of im- ie in degree, not in kind ; both te to the individual mind.

o Berkelcy, however, the difference is fundamental; sense ideas are not due to our own activity, they do not result from our will; they must therefore be produced by some other will,—by the divine intelligence. Sense experience is thus the constant action upon our minds of supreme active intellect, and is not the consequence of dead inert matter. It might appear, therefore, that sensible things had an objective existeuce in the mind of God ; that an idea so soon as it passes out of our consciousness passes into that of God. This is an interpretation, frequently and not without some justice, put upon Berkeley's own expression. But it is not a satisfactory account of his theory. Berkeley is compelled to see that an imme- diate perception is not a thing, and that what we consider per- manent or substantial is not a sensation but a group of qualities, which in ultimate analysis means sensations either immediately felt or such as our experience has taught us would be felt in conjunction with these. Our belief in the reality of a thing may therefore be said to mean assurance that this association in our minds between actual and possible sensations is somehow guaranteed. Further, Berkeley's own theory would never permit him to speak of possible sensations, meaning by that the ideas of sensations called up to our minds by pre- sent experience. He could never have held that these afforded any explanation of the

permanent existence of real objects. His theory is quite distinct from this, which reallyamounts to nothing more than subjective idealism. External things are produced by the will of the divine intelligence; they are caused, and caused in a regular order ; there exist in the divine mind archetypes, of which sense experience may be said to be the realization in ourfinite minds. Our belief in the permanence of something which corresponds to the association in our minds of actual and possible sensations means belief in the orderliness of nature ; and that is merely assurance that the universe is pervaded and regulated by mind. Human science is occupied in endeavouring to decipher the divine ideas which find realization in our limited experience, in trying to interpret the divine language of which natural things are the words and letters, and in striving to bring human conceptions into harmony with the divine thoughts.

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Instead, therefore, of fate or necessity, or matter, or the unknown, a living, active mind is looked upon as the ceutre and spring of the universe, and this is the essence of the Berkeleian metaphysics.

It may be safely said that the deeper aspects of Berkeiey's new thought have been almost universally neglected or misunderstood. Of his spiritual empiricism only one side has becn accepted by later thinkers, and has been looked upon as the whole. The subjective mechanism of association which with Berkeley is but part of the true explanation, and is dependent on the objective realization in the divine mind, has been received as in itself a satisfactory theory. Sunt Cogitationes has been regarded by thinkers who profess them- selves Berkeleians as the one proposition warranted by conscious- ness ; the empiricism of his philosophy has been eagerly welcomed, while the spiritual intuition, without which the whole is to Berkeley meaningless, has been cast aside. For this he is himself in no small measure to blame. The decper spiritual intuition, present from the first, was only brought into clear relief in order to meet difficulties in the earlier statements ; and the extension of the intuition itself beyond the limits of our own consciousness, which completcly removes his position from mere subjectivism, rests on foundations uncritically assumed, and at first sight irreconcilable with certain positions of his system. The necessity and

universality of the judgnients of causality and substantiality are taken for granted; and there is no investigation of the place held by these notions in the mental constitution, The relation between the divine mind and finite intelligence, at first thought as that of agent and recipient, is complicated and obscure when the necessity for explaining the permanence of real things comes forward. The divine archetypes, according to which sensible experience is regulated and in which it finds its real objectivity, are different in kind from mere sense ideas, and the question then arises whether in these we have not again the 'things as they are," which Berkeley at first so coutemptuously dismissed. He leaves it undetermined whether or not our know- ledge of sense things, which is never entirely presentative, in- volves some reference to this objective course of nature or thought of the divine mind. And if so, what is the nature of the notions necessarily implied in the simplest knowledge of a thing, as distinct from mere sense feeling? hat in knowing objects certain thoughts are implied which are not presentations or their copies, is at timcs dimly seen by Berkeley himself; but he was content to propound a question with regard to those notions, aud to look upon them «s merely Locke's ideas of relation. Such ideas of' relation are in truth the stumbling-block in Locke's philcsophy, and Berkeley's empiri- cism is equally far from accounting for them.

With all these defects, however, Berkeley's new conception marks a distinct stage of. progress in human thought. His true place in the history of speculation may be scen from the simple observation that the difficulties or obscurities in his scheme are really the points on which later philosophy has turned. He once for all lifted the problem of metaphysics to a higher level, and, in conjunction with his great successor, Hume, determined the form into which later metaphysical questions lave been thrown.

The classical edition of Berkeley's works is that by Professor Fraser (4 vols. —vols. i.-iii.,. Works; vol. iv., Life, Letters, and Dissertation on his Philosophy, Clarendon Press, 1871), who has been the first, there and in various essays, to exhibit the true form of Berkeley's philosophy. Sec also Ueberweg's notes to his translation of the Principles (1869); Krauth's American edition of the Principles, with Prof. Fraser's introduction and notes, and a translation of those of Ueberweg; Collyns Simon, Universal Immaterialism (1847); Nature and Elements of the External World (1862) ;

Friedrich, Ueber Berkeley's Idealismus (1870). Discussions on various points of Berkeley's doctrine will be found in Fichte's Zetésehrift, vol. lvi. sgg.; Mill's Dissertations, vols. ii. and iv.; Huxley, Critiques and Addresses, p. 320, sqq.; Ferrier, Remains, vol. ii. Two adverse reviews of the Theory of Vision may also be noted—Bailey, Review of Berkeley's Theory of Vision (1842) ; and Abbott, Sight and Tcueh (1864) ; with the last may be compared Monck, Space and Vision. (R. AD.)

BERKHAMPSTEAD, Great, a market-town of Eng- land, in the county of Herts, 26 miles N.W. of London, on the Junction Canal and the North-Western Railway. It has a spacious cruciform church, with a tower of the 16th century, a market-house, erected in 1860, which in- cludes a corn exchange and a library, a grammar school, a free school, several almshouses, a jail, &c. Straw-plaiting and the manufacture of small wooden wares are the prin- cipal industries. The town is of considerable antiquity, and was one of the royal residences under the Mercian kings, a distinction which it again enjoyed under Henry II. The castle, at that time a fortress of some importance, was bestowed on the Black Prince, and since then the manor has remained an apanage of the successive princes of

Wales. The poet Cowper was born in the rectory in 1731. Population in 1872, 4083.

BERKSHIRE, one of the south-eastern counties of England, bounded on the N.E. by Buckinghamshire, from which it is separated by the Thames; N. by Oxfordshire and a small portion of Gloucester; W. by Wilts; S. by Hants; and 8.E. by Surrey. It is of a very irregular figure, extending from east to west fully 60 miles; while from north to south, in its widest part, it is about 35 miles, and in its narrowest part, at Reading, not more than 7. Area, 450,132 acres.

In respect to the character of its surface and soil, the county may be conveniently regarded as consisting of two divisions—the eastern, containing the six districts east and inclusive of Bradfield, and the western, embracing the re- maining six districts. The surface of the eastern division is partly level and partly undulating, and in many places, as at Windsor, it is

beautifully wooded. The highest ground is at Bagshot Heath, a sandy plateau 460 feet high, at the south-east corner of the county. The character of the soil in the eastern division is considered poorer than in the west, and consists mostly of blue clay and gravel, resting on a chalk formation. In this division, tillage, dairy farming, and manufacturing are more extensively pursued than in the other, and it is consequently more thickly populated. The western or upland division contains a large proportion of elevated ground, and its soil is a reddish gravelly loam. Here a line of chalk hills, reaching from Aldworth to Ashbury (which includes the Ilsley Downs), runs east and west, separating the two fertile valleys of the Kennet and the Thames. Another range of chalk downs, known as the Cuckamsley Fills, extends from the neighbour- hood of Wantage to the border of Wiltshire, the highest point being White-Horse Hill, 893 feet high. In this part of the county the rearing of sheep is largely carried on, while in the district of Hungerford, which is situated in the basin of the Kennet, the soil allows a large breadth of tillage, and a greater number of persons are engaged in agricultural pursuits there than any other district in the county.

Wheat and beans are extensively cultivated ; and a species of peat found on the banks of the Kennet yields ashes that are of great value to the soils near that river, In the vales of Kennet and White-Horse dairy farming predominates. Near Faringdon pigs are extensively reared, and the breed is celebrated. The estate of Pusey, in the district of Far- ingdon, presents one of the best examples of high class farming, while in the eastern division the model farms in the district of Wokingham, the property of John Walter, Esq., M.P. for the county, may be referred to as the best specimens of the recent improvements in agriculture. Mr Walter's mansion at Bearwood, too, is an instance of a bar- onia! residence seldom equalled in extent and admirable disposition.

Few parts of England are better supplied with the faci- lities of water communication than the couuty of Berks. It is connected by means of the Thames with London on the one hand, and on the other with the Severn at two separate points on that river ;—one through the Thames and Severn canal, some miles below Gloucester, the other through the River Kennet and the Kennet and Avon canal by Bath and Bristol. Besides the navigable rivers, it enjoys the benefit of the Wilts and Berks canal, which connects the

Thames at Abingdon with the Avon at Trow- bridge in Wiltshire, and communicates with the Kennet and Avon canal. The other rivers, which all finally fall into the Thames, are the Ock, the Loddon, the Enborne, and the Lambourn.

The turnpike roads are generally good. The principal of these are the roads from London to Bath and Oxford,

BERKSHIRE

both of which enter the county at Maidenhead, and soon afterwards separate, the former running S.W. to Read- ing, the latter nearly N.W. to Henley. Eight branches of railway intersect the county, viz., the Great Western, from Maidenhead to Reading, and from Reading to Shrivenham ; the branch from Didcot to Hincksey and Oxford ; the Berks and Hants railway branches from Reading to Morti- mer and Basingstoke, and from Reading to Newbury and Hungerford ; the Reading, Guildford, and Reigate line; and the Reading, Wokingham, and Staines branch of the South-Western Railway.

Berkshire is not a manufacturing county, although the woollen manufacture was introduced here as long ago as the time of the Tudors. There are some paper-mills, par- ticularly in the neighbourhood of Newbury, and an exten- sive biscuit manufactory at Reading. The chief trade consists in agricultural produce.

From its vicinity to the metropolis, the salubrity of the climate, and the general beauty of the country, few counties have more numerous seats of the nobility and gentry than are to be found in Berkshire. Among these stands pre- eminent the royal castle of Windsor, the favourite residence of our monarchs during many centuries. There may also be mentioned Wytham Abbey (earl of Abingdon); Ash- down Park and Hamstead Marshall (earl of Craven) ; Coleshill (earl of Radnor); Shrivenham House (Viscount Barrington); Easthampstead Park (marquis of Downshire) ; Englefield House (R. Benyon, Esq., M.P.); Aldermaston House (Higford Burr, Esq.) ; South Hill Park (Rt. Hon. Sir W. G. Hayter, Bart.) ; Pusey House (Syduey Bouverie Pusey, Esq.); Bearwood (John Walter, Esq., M.P.); and Lockinge House (Col. Loyd Lindsay, V.C., M.P.)

The county comprises 20 hundreds, 6 municipal boroughs, and 142 parishes, besides 14 others chiefly or partially in- cluded in Berks. The county is in the diocese of Oxford and the ecclesiastical province of Canterbury. It forms an archdeaconry by itself, and is divided into the four rural deaneries of Abingdon, Newbury, Reading, and Walling- ford. It is in the Oxford circuit, and the assizes are held at Reading. County courts are held at Abingdon, Far- ingdon, Hungerford, Maidenhead, Newbury, Reading, Wallingford, Wantage, Windsor, and Wokingham.

Berkshire returns 3 members to parliament for the county, 2 for the borough of Reading, and 1 for each of the boroughs of Abingdon, Wallingford, and Windsor.

At the three decennial enumerations the population of the county was as follows :—

Houses. Population, one MSSM), coc .0 0002. BORO 170,065 5 ipeit.2…ce 37,394 176, 256 4 TGA lanppaconanes 41,82] 196,475 10

The chief increase has taken place in the eastern division of the county, where the density of the population amounted in 1871 to about 1 person to 1°5 acre; while in the western it was 1 person to 3'D acres. The principal towns in the county are Reading (pop. 32,324), Windsor (11,769), Newbury (6602), Maidenhead (6173), Abingdon (5799), Wantage (8295), and Wallingford (2972). The popula- tion of the parliamentary districts differs from the above, as these districts include persons located beyond the bound- aries of the boroughs.

Antignities, both Roman and Saxon, are nunierous in various parts of this county. Watling Street enters Berk- shire from Bedfordshire at the village of Streatley, and leaves it at Newbury. Another Roman road passes from Reading to Newbury, where it divides into two branches, one passing to Marlborough in Wiltshire, and the other to Cirencester in Gloucestershire. A branch of Icknield Street passes from Wallingford to Wantage. Near Wan

.tage is a Roman camp, of a quadrangular form ; and there are other remains of encampments at East Hampstead near Wokingham, at Pusey, on White-Horse Hill, and at Sino- dun Hill, near Wallingford. At Lawrence

Waltham thcre isa Roman fort, and near Denchworth a fortress said to have been built by Canute the Dane, called Cherbury Castle. Barrows are very numerous in the downs in the N.W. of the county, particularly between Lambourn and Wantage. Dragon Hill is supposed to have been the burying-place of a British prince called Uther Pendragon, and near to it is Uffington Castle, supposed to be of Danish construction. On White-Horse Hill, in the same vicinity, is the rude figure of what is called a horse, although it bears a greater resemblance to a greyhound. It has been formed by cut- ting away the turf and leaving the chalk bare. It oc- cupies nearly an acre of land, and is said to have been executed by Alfred to celebrate a victory over the Danes in the reign of his brother Ethelred, in the year 872. This memorial, not having been "scoured" for many years, is nearly obliterated by the growth of the turf over the chalk. It is part of the property of the earl of Craven.

Berkshire comprehended the principality inhabited by the Atrebates, a tribe of people who originally migrated from Gaul. Under the Romans it formed part of Britannia Prima, and during the Saxon heptarchy was included in the kingdom of the West Saxons. When Alfred divided the country into shires, hundreds, and parishes, it obtained the name of Bersescire, which was subsequently changed to that which it now bears. It was frequently the scene of military operations from the time of Offa down to the troubles in the reign of Charles I. During the civil war two battles were fought at Newbury. In 1643, after a siege, Reading was taken by the Parliamentary forces, and the Royalist party were expelled from the whole of the county except Wallingford.

BERLIN is the chief city of the province of Brauden- burg, the capital of the kingdom of Prussia, and since 1871 the metropolis of the German empire. It is situated in 52° 30' 16" N, lat. and 13° 23' 16" E. long., and lies about 120 feet above the level of the Baltic. Its longest day is 16 hours 47 minutes ; its shortest day is 7 hours 36 minutes. Its average annual temperature is 48'2° Fahr., the maximum recorded heat being 99'5° in 1819, and the maximum cold —16:1° Fahr. in 1823. The average rain- fall is 21°74 Prussian inches, and Berlin has on the average 120 rainy, 29 snowy, and 17 foggy days in a year.

The city is built on what was originally in part a sandy and in part a marshy district on both sides of the River Spree, not far from its junction with the Havel, one of the principal tributaries of the Elbe. By its canals it has also direct water communication with the Oder. The Spree rises in the mountain region of Upper Lusatia, is navi- gable for the last 97 English miles of its course, enters Berlin on the §.E. as a broad sluggish stream, retaining an average width of 420 feet, and a depth of 6 or 7 feet, until it approaches the centre of the city, where it has a sudden fall of 4 feet, and leaves the city on the N.W., after receiving the waters of the Panke, again as a dull and sluggish stream, with an average width of only 160 feet, but with its depth increased to from 12 to 14 feet. Within the boundaries of the city it feeds canals, and divides into branches, which, however, reunite. The river, with its canals and branches, is crossed by about 50 bridges, of which very few have any claim to architectural beauty. Among these latter may be mentioned the Schlossbriicke, built after designs by Schinkel in the years 1822-24, with its eight colossal figures of white marble, representing the ideal stages of a warrior's career. The statues are for the most part of high artistic merit. They stand on granite pedestals, and are the work of Drake, Wolff, and other

eminent sculptors. The Kurfiirstenbritcke is another bridge which merits notice, on account of the equestrian bronze statue of the Great Elector by which it is adorned.

The etymology of the word " Berlin" is doubtful. Some derive it from Celtic roots—ber, small, short, and lyn, a lake. Others regard it as a Wend word, meaning a free, open place. Others, again, regard it as coming from the word werl, a river island, Professor Paul Cassel, in a recently published dissertation, derives it from the German word " Brihl," a marshy district, and the Slavonic termina- tion "in;" thus Briihl, by the regular transmutation Biirhl (compare Germ. bren-nen and Eng. burn), Biirhlin. The question is likely to remain in the stage of more or less probable conjecture.

Similar obscurity rests on the origin of the city. The hypotheses which carried it back to the early years of the Christian era have been wholly abandoned. Even the Margrave Albert the Bear (d. 1170) is no longer unquestion- ably regarded as its founder, and the tendency of opinion now is to date its origin from the time of his great-grand- sons, Otho and John. When first alluded to, what is now Berlin was spoken of as two towns, Coln and Berlin. The first authentic document concerning the former is from the year 1237, concerning the latter from the year 1244, and it is with these dates that the trustworthy history of the city begins. Fidicin, in his Diplomatische Beitrdge zur Geschichte der Stadt Berlin, vol. iii., divides the history of the town, from its origin to the times of the Reformation, into three periods, The first of these, down to the year 1307, is the period during which the two towns had a separate administration ; the second, from 1307 to 1442, dates from the initiation of the joint administration of the two towns to its consummation. The third period extends from 1442 to 1539, when the two towns embraced the reformed faith.

Name.

Origin.

In the year 1565 the town had already a population of Progress,

12,000. About ninety years later, after the close of the Thirty Years' War, it had sunk to 6000, At the death of the Great Elector in 1688, it had risen to 20,000. The Elector Frederick III., afterwards King Frederick I., sought to make it worthy of a royal "residence," to which rank it had been raised in 1701. From that time onwards Berlin grew steadily in cxtent, splendour,and population. Frederick the Great found it, at his accession in 1740, with 90,000 inhabitants. At the accession of Frederick William IV. in 1840 it had 331,894, and in the month of July 1874, thirty-four years later, the population had nearly trebled, the exact numbers in that year being 949,144. The two original townships of Coln and Berlin have grown into the sixteen townships into which the city is now divided, cover- ing about 25 English square miles of land, and Berlin now takes its place as the fourth, perhaps the third, greatest city in Europe, surpassed only by London, Paris, and possibly Vienna. Its importance is now such that a bill, at present

submitted by the Government to the consideration of the Legislature, proposes to raise it to the rank of a province of the kingdom.

Progress and prosperity have, however, been chequered by reverses and humiliations. The 17th century saw the Imperialists and Swedes, under Wallenstein and under Gustavus Adolphus, as enemies, within its walls ; the 18th century, the Austrians and Russians, during the Seven Years' War; the 19th century, Napoleon I. and the French; and the year 1848 witnessed the bloody scenes of the March Revolution. But the development of constitutional government, and the triumphs of 1866 and 1870, have wiped out the memory of these dark spots in the history of the Prussian capital.

The town has grown in splendour as it has increased in nuinbers. Daniel, in the fourth volume of his Handbook

III. — 75

Public buildings

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of Geography, gives the number of its public buildings as 700. Of thesc, its churehes are the struetures whieh lay claim to the highest antiquity, four of them dating from the 13th and 14th centuries. But in respeet of its ehurehes, both in their number and their beauty, Berlin is, relatively speaking, probably the poorest of the eapitals of Christen- dom. It has only 48 churches and chapels belonging to the State Chureh, 5 Roman Catholie churehes and ehapels, 8 foreign and free chapels, and 3 synagogues, to satisfy the religious wants of a million of people. Nor are these over-filled. Dr Sehwabe, the statistician, fixes the number of aetual worshippers in all the churches on an average Sunday at less than 2 per cent. of the entire population. On the Ist of Deeember 1871 the different creeds were

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BERLIN

found to be represented in the following proportions :— 732,351 were Protestants of the State Chureh, 2570 Dis- senters, 51,517 Roman Catholics, 36,015 Jews, 34 of non- Christian creeds, 3854 persons whose creed was uncertain.

In secular public buildings Berlin is very rieh. Enter- ing the city at the Potsdam Gate, traversing a few hundred yards of the Leipzigerstrasse, turning into the Wilhelm- strasse, and following its course until it reaehes the street, Unter den Linden, then beginning at the Brandenburg Gate and going along the Unter den Linden until its termina- tion, there will be seen within the limits of half an hour's walk the following among other buildings, many of them of great architectural merit :—The Admiralty, the Upper House of the Prussian Legislature, the Imperial Parlia-

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V.BARTHOLOMEW Sc.

Plan of Kerlin.

A, Schloss Brticke (Castle Bridge)

B, Lange or Kurfiirsten Brticke.

C, Monument to Frederick the Great. D, Monument to Frederick William

4, Palace of Princes Alexander and George.

5. Ministry of the Interior,

6. Aquarium.

7. Russian Embassy.

8. Royal Academy

9, University.

10. Palace of the Emperor.

ment, the War Office, the residence of the Minister of

Commerce, the palaces of Prince Carl and the Princes

Pless and Radziwill, the Foreign Office, the Imperial Chan-

cery, the palaces of the Ministers of the Royal House and

of Justice, the palaces of the Princes Alexander and George,

the Brandenburg Gate, the Royal School of Artillery and

Engineering, the residences and offices of the Ministers of

the Interior and of Worship, the Russian Embassy, the

Great Areade, the Netherland Palaee and the palace of the

Emperor, the Royal Academy, the University, the Royal

Library, the Opera, the Arsenal, the palaee of the Crown

Prince, the palaee of the Commandant of Berlin, the Castle

Bridge, the Aeademy of Architecture, the Castle, the

1. British Embassy. 2. Admiralty. 3. Industrial (Gewerbe) Museum.

11. Royal Library. 12. Opera. 13. Koénigswache.

. Miinze (Mint) . Royal Theatre. . Circus (Renz).

14. Zeughaus (Arsenal) 21. Palace of the General Staff.

15. Palace of the Crown Prince. 22. Kammergericht (Chamber).

16. Palace of the. Commandant of 23. Count Raezynski's Picture Gallery. Berlin. 24. Catholic Hospita!

17. Bauakademie (Architecture).

Gallery. Ata short distance from this line are the Ex- change, the Rathhaus, the Mint, the Bank, and the Royal Theatre. Further away are the various barracks, the palace of the general staff, and the eight railway termini. Berlin differs from other great capitals in this respect, that with the exception of the castle,—a large building enclosing two courts, and containing more than 600 rooms, and which dates back in its origin to the 16th century,—all its public buildings are comparatively modern, dating in their present form from the 18th and 19th centuries. The public buildings and monuments which render it famous, sueh as the palaees, museums, theatre, exehange, bank, rathhaus, the Jewish synagogue, the monuments and co-

25, Infirmary

Cathedral, the Old and New Museums, and the National | lumns of victory, date almost without exception from later

Streets.

Hospitals.

Statistics of popula- tion,

BERLIN

than 1814, the close of the great conflict with Napoleon L The Exchange, finished in 1863, at a cost of £180,000 sterling ; the Synagogue, a proud building in Oriental style, finished in 1866, at a cost of £107,000; and the

Rath- haus, finished in 1869, at a cost of £500,000 sterling, in- cluding the land on which it stands, are the most recent of its great buildings. The New National Gallery is nearly completed, and the Imperial Bank is being rebuilt. It is probable that no city in the world can show so large a number of fine structures so closely clustered together.

Up to a very recent date Berlin was a walled city. Those of its ninetecn gates which still remain have only an historical or architectural interest. The principal of these is the Brandenburg Gate, an imitation of the Propy- lea at Athens. It is 201 feet broad and nearly 65 feet high. It is supported by twelve Doric columns, each 44 feet in height, and surmounted by a car of victory, which, taken by Napolcon to Paris in 1807, was brought back by the Prussians in 1814. It has recently been enlarged by two lateral colonnades, each supported by 16 columns.

The streets, about 520 in number, are, with the excep-

tion of the districts in the most ancient part of the city,

long, strait, and wide, lined with high houses, for the old typical Berlin house, with its ground floor and first floor, is rapidly disappearing. The Unter den Linden is 3287 feet long by 160 broad. The new boulevard, the Koniggratz- erstrasse, is longer still, though not so wide. The Fried- richstrasse and the Oranienstrasse exceed 2 English miles in length. The city has about 60 squares. It has 25 theatres and 14 large halls for regular entertainments. It has an aquarium, zoological garden, and a floral institution, with park, flower, and palm houses. It has several hospi- tals, of which the largest is the Charité, with accommo- dation for 1500 patients. The Bethany, Elizabeth, and Lazarus hospitals are attached to establishments of Pro- testant deaconesses. The St Hedwig's hospital is under the care of Roman Catholic sisters. The Augusta hospital, under the immediate patronage and control of the empress, is in the hands of lady nurses, who nurse the sick without assuming the garb and character of a religious sisterhood. The people's parks are the Humboldt's Hain, the Friedrich's Hain, the Hasenheide, and, above all, the Thiergarten, a wood covering 820 Prussian acres of ground, and reaching up to the Brandenburg Gate.

As has been seen, the population has trebled itself within the last 34 years, naturally not so much by the excess of births over deaths, as by an unbroken current of immigra- tion. In 1873 the births were 35,954, the deaths 26,427, leaving an excess of 8527 births. But the increase in the population of the city in the same year was 50,184, leaving 41,657 as the increase through the influx from without. It will thus be seen at a glance that only a minority of the population are native Berliners. In the census of 1867 it was found that, taking the population above 20 years of age, only one-third were natives of the city. The immi- gration is almost exclusively from the Prussian provinces, and among these principally from Brandenburg and from the eastern and north-eastern provinces. In 1871 it was tound that out of every 10,000 inhabitants, 9725 were Prus- sian subjects, 165 were from other German states, 55 from foreign lands, and 47 were of a nationality not ascertained. The foreign element almost vanishes, and the German element is represented principally by the north, so that in blood and manners Berlin remains essentially a north- eastern German city, 7.¢., a city in which German, Wend, and Polish blood flows commingled in the veins of the citizens. In past times Berlin received a strong infusion of foreign blood, the influence of which is perceptible to the present day in its intellectual and social life. Such names as Savigny, Lancizolle, De la Croix, De le Coq, Du

Bois-Reymond, tell of the French refugees who found a home here in the cold north when expelled from their own land. Daniel, in his Geography, vol. iv. p. 155, says that there was a time when every tenth man in the city was a Frenchman. Flemish and Bohemian elements, to say no- thing of the banished Salzburgers, were introduced in a similar manner. Add to these the 36,013 Jews now resi- dcut in the city, and the picture of the commingled races which make up its population is pretty complete.

The 826,341 inhabitants of the city were found at the census of 1871 to be living in 14,478 dwelling-houses, and to consist of 178,159 households. These numbers show that the luxury of a single house for a single family is rare, and this holds good also of the wealthier classes of the people. These numbers fall far short of the present (1875) number of houses and of

households, as will be seen from the fact that the value of the household property of the city in 1874 exceeded that of 1871 by £18,000,000 sterling, of which the greatest part falls to newly-built houses or houses enlarged. In 1871 the average number of persons comprised in a household was found to be 4°6, the number of households dwelling in a house 12:3, and the number of persons dwelling in a house 57:1. These numbers throw light on the moral and social life of the city, and compared with the past, show the change in the domestic habits of the people. In 1540 the average number of inmates in a house was 6, in 1740 it was 17, in 1867 it had risen to 32, and in 1871 to 57. Between the years 1864 and 1871 the one-storied houses of the city decreased 8 per cent., the two and thrce-storied houses 43 per cent., while the number of four-storied houses increased 11 per cent., and the five-storied and higher houses 50 per cent. With the increase of high houses, the underground cellar dwellings, which form so striking a feature in the house architecture of the city, increase in a like proportion, and these and the attics are the dwellings of the poor, In 1867 there were 14,292 such cellar dwellings, in 1871 they had increased to 19,208. Taking the average of 1867— 4 inmates to a cellar dwelling—we get 76,832 persons living under ground, In 1871 there were 4565 dwellings which contained no room which could be heated. This class of dwelling had doubled between the two census years of 1867 and 1871. Taking 3 inmates (the ascer- tained average of 1867) to such a dwelling, we have 13,695 persons who pass the winter in unheated dwellings, in a climate where the cold not unfrequently sinks below the zero of Fahrenheit. Of the remaining dwellings of the city, 95,423 had only one room which could be heated. This number, at 4 persons to a dwelling, give us an insight into the domestic life of 381,692 of the inhabitants of the city; that is, with the 13,695 persons meutioned above, of nearly half the population. Such dwellings engender no feeling of home, and the habits of the people are in a certain sense nomadic. In 1872, 74,568 changes of dwell- ing took place, involving an expense at a very moderate calculation of £158,900. In the poorer townships there were 70 removals to every 100 dwellings !

The rate of mortality is high. In 1873, a favourable year, it was 28 to every 1000 of the population, Taking the deaths as a whole, 58 per cent. were of children under 10 years of age. The rate of mortality is on the increase. Professor Virchow, in a report to the municipal authorities, stated that,

dividing the last 15 years into periods of 5 years each, the general mortality in each of the three periods was as 5,7,9. The mortality of children under 1 year in the same three periods was as 5, 7, 11; that is, it had more than doubled. In the year 1872, out of 27,800 deaths, 11,136 were of children under 1 year.

The city is well supplied with water by works con- structed by an English company, which have now become

Police.

Schools.

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the property of the city. English and German companies supply the city with gas. A system of underground drainage is at present in proccss of construction. Internal communication is kept up by means of tramways, omni- buses, and cabs. In 1873 there were 54 tram-carriages, 185 omnibuses, and 4424 cabs licensed, scrved by 10,060 horses.

Berlin is governed by the president of police, by the municipal authorities, and in military matters by the governor and commandant of the city. The police presi- dent stands under the minister of the interior, and has the control of all that stands related to the maintenance of public order. The municipal body consists of a burgomaster- in-chief, a burgomaster, a body of town councillors (Stadt- rithe), and a body of town deputies (Stadtverordnete). For municipal purposes the city is divided into 16 town- ships and 210 districts. For police purposes the work is divided into six departments, and an extra department for the fire brigade and strect cleaning, and the town into six larger and fifty smaller districts. At the head of each larger district is a police captain, at the head of each smaller district a police lieutenant.

With the exception of a few of the higher schools, which

are under the direct supervision of the provincial authori- | ties, the Berlin schools are either under the direct supervi- .

sion of the municipal body or of its committee for school purposes. The schools, public and private, are divided into higher, middle, and elementary. In 1872 there were 24 higher public schools. Of these, 10 were gymnasia or schools for the highest branches of a learned education. In these schools there were 138 classes and 5073 pupils, of whom 2142 werc over, and 2931 under, 14 years of age. The second class of high schools, the so-called Realschulen, give instruction in Latin, but otherwise devote almost exclusive attention to the departments of mathematics, science, history, modern languages, and the requirements of the higher stages of general or commercial life. Of this class of school there were also 10, with 148 classes, 5770 pupils, of whom 1931 were over, and 3839 under, 14 years of age. The remaining 4 high schools were for girls, with 54 classes, 2522 pupils, of whom 529 were over, and 1993 under, 14 years of age. In addition to these public schools there were 7 higher schools for boys, with 55 classes and 2098 pupils, and 36 higher schools for girls, with 243 classes and 6629 pupils.

Within the last five years (1875) no new school of this class has been established, but several are in process of erection. Between 1869 and 1873 the city voted about £328,747 sterling for the purchase of sites, and for enlarging and rebuilding schoolsof this class ; and the sum stillrequired for schools of this class, up to 1877, is £352,500 sterling.

The total number of schools of all sorts, higher, middle, and elementary, public and private, in 1872, was 232, with 1072 boys' classes, 1009 girls' classes, and 4 mixed classes— together, 2085 ; attended by 50,316 boys, 44,959 girls— together, 95,275 children, of whom 7309, or 7°35 per cent., were over 14 years of age. The extent to which the schools are used under the law of compulsory educa- tion is very difficult to determine. In 1867 there were 103,383 children of the school age, but only 71,814, or 69°5 per cent., were in the schools. Dr Schwabe, by a criticism of these numbers, reduces the percentage of uon- attendance to 13 per cent., and maintains that even these are not all to be regarded as absolutely without instruc- tion. In 1871 it was found that out of every 10,000 per- sons of 70 years of age and upwards, there were 1529 who could neither read nor write; and that out of a like num- ber from 60 to 70, there were 860; 50 to 60, 446; 40 to 50, 234; 30 to 40, 158; 25 to 30, 155; 20 to 25, 71; 15 to 20, 58; and from 10 to 15, 48.

The scholastic life of Berlin culminates in its university,

BERLIN

which is, of course, not a municipal, but a national institu- University,

tion. It is, with the exception of Bonn, the youngest of the Prussian universities, but the first of them all in in- fluence and reputation. It was founded in 1810. Prussia had lost her celebrated university of Halle, when that city was included by Napoleon in his newly created "kingdom of Westphalia." It was as a weapon of war, as well as a nursery of learning, that Frederick William JII., and the great men whose names are identified with its origin, called it into existence, for it was felt that knowledge and religion are the true strength and defence of nations. William v. Humboldt was at that time at the head of the educational department of the kingdom, and men like Fichte aud Schleiermacher worked the popular mind. It was opened on the 15th of October 1810. Its first rector was Schmalz; its first deans of faculty, Schleier- macher, Biener, Hufeland, and Fichte. Within the first ten years of its existence it counted among its professors such names as De Wette, Neander, Marheineke ; Savigny, Eichhorn ; Béckh, Bekker, Hegel, Raumer, Wolff, Niebuhr, and Buttmann. Later followed such names as

Hengsten- berg and Nitzsch; Homeyer, Bethman-Hollweg, Puchta, Stahl, and Heffter; Schelling, Trendelenburg, Bopp, the brothers Grimm, Zumpt, Carl Ritter; and at the present time it can boast of such names as Twesten and Dorner; Gneist and Hinschius ; Langenbeck, Bardeleben, Virchow, and Du Bois-Reymond ; von Ranke, Mommsen, Curtius, Lepsius, Hoffman the chemist, and Kiepert the geographer. Taking ordinary, honorary, and extraordinary professors, licensed lecturers (privatdocenten), and readers together, its present professorial strength consists of 15 teachers in the faculty of theology, 14 in the faculty of law, 63 in the faculty of medicine, and 96 in the faculty of philosophy— together, 188. The number of matriculated and un- matriculated attendants on the various lectures averages 3000 in the summer term, and 3500 in the winter. Dur- ing the last two or three years, however, the number has been steadily decreasing. Berlin, in point of numbers, still stands at the head of the Prussian universities, but no longer of the German universities, being now outstripped by Leipsic.

In addition to its schools and its university, Berlin is rich in institutions for the promotion of learning, science, and the arts. It has a Royal Academy of Sciences, with 46 members, 23 in the class of physics and mathematics, and 23 in the class of philosophy and history. It was founded on the 11th of June 1700, and the name of Leibnitz is associated with its foundation. It was raised to the rank of a Royal Academy by Frederick the Great in 1743. Berlin has also a Royal Academy of Arts, consisting of 39 ordin- ary members (1875), under the immediate protection of the king, and governed bya director and a senate, com- posed of 15 members in the departments of painting, sculpture, architecture, and engraving, and 4 members in the section for music. Berlin has also its academy for vocal music, and its royal high school for music in all its branches, theoretical and applied, and learned bodies and associations of the most various kinds. It has 9 public libraries, at the head of which stands the royal library, with 710,000 volumes and 15,000 manuscripts. In addi- tion to these, there are 15 people's libraries established in various parts of the city.

Berlin possesses eight public museums, in addition to the Museums.

Royal Museums and the National Gallery. The Royal Mu- seums are the Old and the New Museums. The former, which stands on the north-east side of the Lustgarten, facing the castle, is the most imposing building in Berlin. It was built in the reign of Frederick William IIL, trom designs by Schinkel. Its portico, supported by 18 colossal Tonic columns, is reached by a wide flight of steps. The museum covers 47,000 square feet of ground, and is 276

Monu- ments.

departments.

‘William ITI. in the Lustgarten.

BERLIN

teet long, by 170 feet wide and 61 feet high. The back and side walls of the portico are covered with frescoes, from designs by Schinkel, executed under the direction of Cor- nelius, and representing, in mythical and symbolical figures, the world’s progress from shapeless and chaotic to organic and developed life. The sides of the flight of steps support the well-known equestrian bronze groups of the Amazon by Kiss, and the Lion-slayer by Albert Wolff. Under the portico are monuments of the sculptors Rauch and Schadow, the architect Schinkel, and the art critic Winckel- mann. ‘The interior consists of a souterrain, containing the collection of antiquities, and of a first floor, entered from the portico through bronze doors of artistic merit, made after designs by Stiiler, weighing 74 tons, and executed at a cost of £3600. This floor consists of a rotunda, and of halls and cabinets of sculpture. The second floor, in a series of cabinets running round the entire building, con- tains the national collection of paintings. These are divided into three classes,—the Italian, French, and Spanish ; the Dutch, Flemish, and German ; and the Byzautine, Italian, Dutch, and German pictures down to the end of the 15th century—each of the classes being chronologically arranged. The gallery, then containing 1300 paintings, was enriched in 1874 by the valuable pictures of the Suermondt gallery, purchased by the nation at a cost of £51,000. The Suermondt gallery was rich in pietures of the old Nether- land and German schools, and of the Dutch and Flemish schools. It also contained a few Spanish, Italian, and French pictures.

The New Museum is connected with the Old Museum by a covered corridor. In its interior arrangements and decoration it is undoubtedly the most splendid structure in the city. Like the Old Museum, it has three floors. The lowest of these contains the Ethnographical and Egyp- tian Museums and the Museum of Northern Antiquities. In the first floor, plaster casts of ancient, medizval, and modern sculpture are found in thirteen halls and in three On the walls of the grand marble staircase, which rises to the full height of the building, Kaulbach's renowned cyclus of stereochromic pictures is painted, re- presenting the six great epochs of human progress, from the confusion of tongues at the Tower of Babel and the dispersion of the nations to the Reformation of the 16th century. The uppermost story contains the collection of engravings and the gallery of curiosities.

The National Gallery is an elegant building, after de- signs by Stiiler, situated between the New Museum and the Spree, and is intended to receive the collection of mo- dern paintings now exhibited provisionally in the apart- ments of the Academy.

The public monuments are the equestrian statues of the Great Elector on the Lange Briicke, erected in 1703; Rauch's celebrated statue of Frederick the Great, "probably the grandest monument in Europe," opposite the eniperor's palace, Unter den Linden; and the statue of Frederick In the Thiergarten is Drake's marble monument of Frederick William III. ; and

'in the neighbouring Charlottenburg, Rauch's figures of the

same king and the Queen Louise in the mausoleum in the Park. A second group of monuments on the Wilhelm's Platz commemorates the generals of the Seven Years' War ; and a third, in the neighbourhood of the Opera, the generals who fought against Napoleon I. On the Kreuz berg, the highest spot in the neighbourhood of Berlin, a Gothic monument in bronze was erected by Frederick William III. to commemorate the victories of 1813-15; aud in the Kénigsplatz the present emperor has erected a column of victory in honour of the triumphs of 1864, 1866, and 1870. This monument rises to the height of 197 feet, the gilded figure of Victory on the top being 40 feet high.

Literature, science, and art are represented in different parts of the city by statues and busts of Rauch, Schinkel, Thaer, Beuth, Schadow, Winckelmann, Schiller, Hegel, Jahn ; while the monuments in the cemeteries and churches bear the names of distinguished men in all departments of political, military, and scientific life.

Next to Leipsic, Berlin is the largest publishing centre Publica- in Germany. In the year 1872 there were 1540 works tions.

published in Berlin, of which 20 per cent. had to do with literature, 15 per cent. with philology and pedagogy, 14 per cent, with law and politics, 7 per cent. with history, 6 per cent. were military works, 5 per cent. theological, 5 per cent. had to do with agriculture, and 4 per cent. with medi- cine. Turning to journals and periodical literature, 265 newspapers and magazines, daily, weekly, or monthly, ap- peared in the same year. The political journals in Berlin do not, however, sustain the same relation to the political life of Germany as do the political journals of London and Paris to that of England and France.

Berlin is not only a centre of intelligence, but is also Manufac- Its trade tures.

an important centre of manufacture and trade. and manufactures appear to be at present in a transition state—old branches are dying out, and new branches are springing into existence. Direct railway communica- tion between the corn lands of north-eastern Germany, Poland, and Russia on the one hand, and the states of Central and Western Germany on the other, have deprived Berlin of much of its importance as a centre of trade in corn and flour. In like manner the spirit trade and manu- facture have suffered. The 20,892,493 litres exported in 1870 had sunk to 9,737,597 litres in 1872. On the other hand, for petroleum, Berlin has become an emporium for the supply of the Mark of Brandenburg, part of Posen, Silesia, Saxony, and Bohemia. Silk and cotton manufac- ture, which in former times constituted a principal branch of Berlin manufacture, has died out. As late as 1849 Berlin had 2147 silk looms; now it has few or none. Woollen manufacture maintained its ground for a time, occupying about 8000 looms and 11,404 workmen as late as 1861. In 1874 the number of hands employed in spinning and weaving in all branches had sunk to 2918. The chief articles

of manufacture and commerce are locomotives and machinery ; carriages; copper, brass, and bronze wares ; porcelain ; aud the requisites for building of every descrip- tion. The manufacture of sewing-machines has assumed large proportions, from 70,000 to 75,000 being manufac- tured annually. According to the report of the Govern- inent inspector of factories for the city of Berlin, presented

-to the minister of trade and commerce, the number of

persons employed in all the Berlin factories in the year 1874 was 64,466. By a "factory" was understood any wholesale manufacturing establishment employing more than 10 persons. In 1874 there were 1906 such factories at work, employing 51,464 males and 11,004 females above 16 years of age; 1137 males and 760 females under 16 and above 14 years of age; and 66 male and 14 female children under 14 years of age. The manufacture of steam- engines and machinery occupied 14,737 persons; brass- founding, metallic belt and lamp manufacture, 9074 ; car- pentry, joinery, and wood-carving, 4548 ; printing, 3620 ; spinning and weaving, 2918; sewing-machines and tele- graphic apparatus, 2788; the finer qualities of paper, 2585 ; porcelain and ware, 1741; dyeing, 1712; gas-works, 1518; tobacco and cigars, 1477; manufacture of linen garments, 1355 ; pianos and harmoniums, 1198; dressmaking and artificial flowers, 1127 ; brewing, 1061. None of the other branches found occupation for 1000 persons. The value of the annual exports to the United States of articles of Berlin manufacture has risen to about £1,000,000 sterling. The exports to the Brazils, the Argentine Republic, and,

Japan are also increasing. Berlin is growing in importance as a money market and centre of industrial undertakings. The Berlin Cassenverein, through which the banking houses transact their business, passed £1,351,988,967 sterling through its books in 1872, as compared with £644,431,255 sterling in 1871. In 1872, 23 new banking establish- ments were enrolled in the trade register, with a capital of £7,565,000 sterling; and in the same year 144 new joint-stock companies were enrolled, representing a capital of £18,000,000 sterling. Since that time the tide of

enterprise has ebbed, but the majority of these under- takings continue to exist.

In the progress of its growth Berlin has lost much of its original character. The numerical relations of class to class have been greatly modified. New political insti- tutions have sprung into existence, of which the Berlin of the early years of Frederick William IV. had not a trace. It has become the seat of a parliament of the realm, and of a parliament of the empire. Manufacture and trade have come to absorb 70 per cent. of the entire population. But these have also changed their character ; old branches which constituted a marked feature of its commercial and manufacturing activity have almost suddenly died out, while new branches have with equal rapidity more thau supplied their place. While the commercial and manufac- turing element has thus increased, other elements have undergone a relative decline. The learned professions and the civil service numbered in 1867 7:9 per cent. of the population. In 1871 the proportion had sunk to 6:11, and since then the percentage has gone on decreasing. In this altered state of affairs Berlin will have to cherish and nurture the scientific, educational, ethical, and religious elements in her life with double care, not only to keep up her old reputation abroad, but also for the purpose of pre- venting the degeneration of her people at home.

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BERLIOZ, Hector, by far the most original composer of modern France, was born in 1803 at Céte-Saint-André, a small town near Grenoble, in the department of Isere. His father was a physician of repute, and by his desire our composer for some time devoted himself to the study of the same profession. At the same time he had music lessons, and, in secret, perused numerous theoretical works on coun- terpoint and harmony, with little profit

it seems, till the hearing aud subsequent careful analysis of one of Haydn's quartets opened a new vista to his unguided aspirations. A similar work written by Berlioz in imitation of Haydn's masterpiece was favourably received by his friends, From Paris, where he had been sent to complete his medical ~~studies, he at last made known to his father the unalter~~ able decision of devoting himself entirely to art, the answer to which confession was the withdrawal of all further pecuniary assistance In order to support life Berlioz had to accept the humble engagement of a singer in the chorus of the Gymnase theatre. Soon, however, he became recon- ciled to his father and entered the Conservatoire, where he studied composition under Reicha and Lesueur. His first important composition was an cpera called Les Francs- Juges, of which, however, only the overture remains extant. In 1825 he left the Conservatoire, disgusted, it is said, at the dry pedantry of the professors, and began a course of autodidactic education, founded chiefly on the

works of Beethoven, Gluck, Weber, and other German masters. About this period Berlioz saw for the first time on the stage the talented Irish actress Miss Smithson, who was then charming Paris by her impersonations of Ophelia, Juliet, and other Shakespearean characters. The young enthusiastic composer became deeply enamoured of her at first sight, and tried, for a long time in vain, to gain the responsive love or even the attention of his idol. To an incident of this wild and persevering courtship Berlioz's first symphonic work, Episode de la Vie d'un Artiste, owes its origin, It describes the dreams of an artist who, under the influence of opium, imagines that he has killed his mistress, and in his vision witnesses his own execution. It is replete with the spirit of contem- porary French romanticism and of self-destructive Byronic despair. A written programme is added to each of the five movements to expound the imaginative material on which the music is founded. By the advice of his friends Berlioz once more entered the Conservatoire, where, after several unsuccessful attempts, his cantata Sardanapalus (1830) gained him the first prize for foreign travel, in spite of the strong personal antagonism of one of the umpires, During a stay in Italy Berlioz composed an overture to King Lear, and Le Retour & la Vie, ~~—a sort of symphony, with intervening poetical~~

~~declamation between the single movements, called by the composer a melologue, and written in continuation of the Zpisode de la Vie dun Artiste, along with which work it was performed at the Paris Conservatoire in 1832. Paganini on that occasion spoke to Berlioz the memorable words : "Vous commencez par ot les autres ont fini." Miss Smithson, who also was present on the occasion, soon afterwards consented to become the wife of her ardent lover. The artistic success achieved on that occasion did not prove to be of a lasting kind. Berlioz's music was too far remote from the cur~~ rent of popular taste to be much admired beyond a small circle of esoteric worshippers. It is true that his name became known as that of a gifted though eccentric com- poser; he also received in the course of time his due share of the distinctions generally awarded to artistic merit, such as the ribbon of the Legion of Honour and the member- ship of the Institute. But these distinctions he owed, perhaps, less to a genuine admiration of his compositions than to his influential position as the musical critic of the Journal des Débats (a position which he never used or abused to push his own works), and to his successes abroad. In 1842 Berlioz went for the first time to Germany, where he was hailed with welcome by the leading musicians of the younger generation, Robert Schumann foremost amongst them. The latter paved the way for the French composer's success, by a comprehensive analysis of the Hpisode in his musical journal, the Veue Zeitschrift fiir Musik. Berlioz gave successful concerts at Leipsic and other German cities, and repeated his visit on various later occasions—in 1852, by invitation of Liszt, to conduct his opera, Ben- venuto Cellini (hissed off the stage in Paris), at Weimar ; and in 1855 to produce his oratorio-trilogy, L'Hnfance du Christ, in the same city. This latter work had been pre- viously performed at Paris, where Berlioz mystified the critics by pretending to have found one part of it, the "Flight into Egypt," amongst the manuscript scores of a composer of the 17th century, Pierre Ducré by name. Berlioz also made journeys to Vienna (1866) and St Petersburg (1867), where his works were received with great enthusiasm, He died in Paris, March 9, 1869.

Berlioz has justly been described as the French representative of musical Romanticism, and his works are in this respect closely con- nected with the contemporary movement in literature known by that name. The atlinity between him and Victor Hugo, for in- stance, is undeniable, and must be

looked for deeper than in the fantastic eccentricities and breaches of the established form common

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to both. His ready acknowledgment of congenial aspirations in foreign countries, so adverse to French natural prejudice, may be cited as another essentially "romantic" feature in Berlioz's character. In his case, however, the predilection for English literature, as shown in the choice of several of his most important subjects trom Shakespeare, Byron, and Walter Scott, may be to some extent explained from his connection with Miss Smithson, a striking in- stance of the relation between life and art in a man of high creative faculty.

The second powerful element in Berlioz's compositions is the in- fluence of Beethoven's gigantic works. The grand forms of the German master's symphonies impressed him with competitive zeal, and what has been described as the " poetical idea" in Bcethoven's creations soon began to run riot in the enthusiastic mind of the young medical student. But, in accordance with the aversion of his national character to indistinct ideal notions, he tried to con- dense the poetical essence of his inspiration in the tangible shape of a story, and in this manuer became the father of what is generally called ' programme-music.' Whether the author of such works as Harold en Italie, or the Episode de la Vie d'un Artiste, may lay claim to the prophet's cloak is difficult to decide ; he must at any ratc be accepted as a man strong in his own convictions, "a swallower of formulas," and faithful ally in the great cause of nature versus traditional artificiality, of Shakespeare against pseudo-classicism. Under such circumstances we can hardly be surprised at seeing Berlioz appreciated sooner and more lastingly in Germany than in his own country. Schumann and Liszt were, as we have men- tioned, at various periods amongst the foremost promoters of his music. We subjoin a list of the more important works by Berlioz not mentioned above, viz., the symphonies Jomdéo et Juliette (1834), aud Damnation de Faust (1846); the operas Béutrice et Bénédict (1862), and Les Troyens (1866); a Requiem, and Tristia, a work for eliorus and orchestra, writtcn on the death of his wife. Of his spirited literary productions we mention his Voyage musical en Allemagne et en Italie*

(1845), Les Soirées d'Orehestre (18538), A travers Chant (1862), and his incomparable Zraité d' Instrumenta- tion (1844), The characteristics of Berlioz's literary style are French verve and esprit, occasionally combined with English humour and German depth of idea. The time has hardly yet arrived for judging finally of Berlioz's position in the history of his art. His original ideas, his poetical intentions, nobody can deny; the question is whether he possesses genuine creative power to carry out these in- tentions, and, first of all, that broad touch of nature which leads from subjective feeling to objective rendering, and which alone can establish a lasting rapport between a great artist and posterity. To decide this question the performances of his works have as yet, un- fortunately, been too few and far between. In England, particu- larly, only a very small fraction of his compositions has been heard. (F. H.)

BERMUDAS, Somers's IsLanps, or SumMER Isnanps, a group in the Atlantic Ocean, the seat of a British colony, in lat, 32° 20' N. and long. 64°50' W., about 600 miles E. by S. from Cape Hatteras on the American coast. They lie to the south of a coral reef or atoll, which extends about 24 miles in length from N.E. to 8.W., by 12 in breadth. The largest of the series is Great Bermuda, or Long Island, enclosing on the east Harrington or Little Sound, and on the west the Great Sound, which is thickly studded with islets, and protected on the north by the islands of Somerset, Boaz, and Inland. The remaining members of the group, St George's, Paget's, Smith's, St David's, Cooper's, Nonsuch, &c., lie to the east, and form a semicircle round Castle Harbour, The islands are wholly composed of a white granular limestone of varioas degrees of hard- ness, from the crystalline '" base rock," as it is called, to friable grit. It seems that they are in a state of subsid- ence and not of elevation. The caves which usually appear in limestone formations are well represented, many of them running far into the land and displaying a rich variety of stalagmites and stalactites. Among the less ordinary geo- logical phenomena may be mentioned the " sand glacier" at Elbew Bay. The surface soil is a curious kind of red earth, which is also found in ochre-like strata throughout the limestone. It is generally mixed with vegetable matter and coral sand. There is a total want of streams and wells of fresh water, and the inhabitants are dependent on the rain, which they collect and preserve in tanks. The climate of the Bermudas

has a reputation for unhealthiness which is hardly borne out, for the ordinary death-rate is only

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22 per 1000. Yellow fever and typhus, however, have on some occasions raged with extreme violence, and the former has appeared four times within the space of thirty years. The maximum reading of the thermometer is about 85:8, and its minimum 49,—the mean annual temperature being 70° Fahr., and that of March 65° Vegetation is very rapid, and the soil is clad in a mantle of almost perpetual green. The principal kind of tree is the so-called ‘“‘ Bermudas cedar,” really a species of juniper, which furnishes timber for small vessels. The shores are fringed with the man- grove; the prickly pear grows luxuriantly in the most barren districts ; and wherever the ground is left to itself the sage-bush springs up profusely. The citron, sour orange, lemon, and lime grow wild; but the apple and peach do not come to perfection. The loquat, an introduction from China, thrives admirably. The gooseberry, currant, and raspberry, all run to wood. The oleander bush, with all its beauty, is almost a nuisance. The soil is very fertile in the growth of esculent plants and roots ; and a consider- able trade has grown up within recent years between Bermudas and New York, principally in arrowroot, of excellent quality, onions, Irish potatoes, and tomatoes. Regular steam communication between the island and that city is maintained, the Government subsidizing the vessels. The total value of the export of these articles in 1872 was £64,030. Medicinal plants, as the castor-oil plant, aloe, and jalap, come to great perfection without culture; and coffee, indigo, cotton, and tobacco are also of spontaneous growth. Tobacco curing ceased about 1707. Few oxen or sheep are reared in the colony, a supply being obtained from North America; but goats are kept by a large number of the inhabitants. The ass is the usual beast of burden. The indigenous Mammalia are very few, and the only Reptilia are a small lizard and the green turtle. Birds, how- ever, especially aquatic species, are very numerous,—one of the commonest being the c¢ardinal-grosbeak. The list in- cludes the cat-bird, blue-bird, kingfisher, ground-dove, blue heron, sandpiper, moorhen, tropic bird, and Carolina crake. Insects are comparatively few ; but ants swarm destructively in the heat of the year, and a species of ant-lion, a cicada (scissor-grinder), and the chigre or

jigger, are common. Fish are plentiful round the coasts, and the whale-fishery was once an important industry. Gold-fish, introduced from Demerara, swarm in the ditches.

There are two towns in the Bermudas, St George's, founded in 1794, and Hamilton, founded in 1790, and in- corporated in 1793. The former was the capital till the senate and courts of justice were removed by Sir James Cockburn to Hamilton, which being centrally situated, is much more convenient. The streets of St George's are close and narrow, and the drainage bad. It is a military station, the barracks lying to the east of the town, The population is about 2000. Hamilton, in the Great Bermuda, at the bottom of a bay which is entered by Trenblin's Narrows, consists of an irregular half-street fronting a line of wharves. Its principal buildings include a court-house, a legislative assembly house, a council room, a library (1839), a jail, and a large church. About a mile from the town is Langton, the governor's residence. In Inland Island is situated the royal dockyard and naval establish- ment. A hospital stands on the highest point, and a lunatic asylum has also been built. The bay is defended by a breakwater. On Boaz Island there is a convict station. A causeway, opened in 1871, runs from St George's through Longbird Island westward, across Castle Harbour. The harbour of St George's has space enough to accommodate the whole British navy ; yet, till deepened by blasting, the entrance was so narrow as to render it almost useless. A marine slip was constructed in 1865, with a capacity of 1200 tons. The chief military establishment is at Prospect

Hill. The Government consists of a governor appointed by the Crown, and a privy council of nine members appointed by the governor. The House of Assembly consists of thirty- six members, who receive salaries. The Acts are usually passed for a definite period, and require to be renewed from time to time. Much of the judicial administration is left to unpaid magistrates. The currency of the colony, which had formerly twelve shillings to the pound sterling, was assimilated to that of England in 1842. The colony is ecclesiastically attached to the bishopric of Barbados. Both Presbyterians

and Wesleyans are en- dowed. There are numerous schools, and in 1847 an educational board was established ; but the general educa- tional condition is unsatisfactory. Of 2600 children be- tween the ages of five and six, only about 1500 attend school. Sunday schools are of much greater importance than in England, and most of them have libraries. The revenue of the islands in 1872 was £33,256, inclusive of £1500 raised by loan; the gross expenditure was £32,236; and the public debt amounted to £17,330. The population in 1850 was 11,092, of whom 4669 were whites; by the census of 1871 it had increased to 12,121.

The discovery of the Bermudas resulted from the shipwreck of Juan Bermudez, a Spaniard (whose namc they now bear), when on a voyage from — to Cuba with a eargo of hogs, about the year 1522. Henry May, an Englishman, suffered the same fate in 1593; and lastly, Sir George Somers shared the destiny of the two pre- eeding navigators in 1609. Sir George was the first who established a settlement upon them, but he died before he had fully accomplished his design. In 1612 the Bermudas were granted to an offshoot of the Virginia Company, which consisted of 120 persons, 60 of whom, under the eommand of Mr Henry More, proceeded to the islands; and an accession of inhabitants was gained during the civil wars, many having sought a refuge from the tyranny of the ruling party in this distant sanctuary. Into the details of the history we cannot enter, but the following items are important. The first souree of colonial wealth was the growing of tobacco; and at a later period the pro- duce of the salt-lagoons at Turk's Island became a main article of trade. In 1726 Berkeley chose the Summer Islands as the seat of his projected missionary establishment. The first newspaper, the Bermuda Gazette, was published in 1784. See W. F. Williams, Hist. and Stat. Account of the Bermudas, 1848 ; Godet, Bermuda, ats History, &c., 1860.

BERN, or BErne, a canton of Switzerland, situated between 46° 19' and 47° 30' N. lat., and between 6° 50' and 8° 28' E. long. It extends from the Freuch and Alsace frontier south-east through the heart of the Confederacy to Valais, by which it is bounded on the §., while it has the cantons of Basel, Soleure, Aargau, Lucerne, Unterwalden, and Uri on the E., and Vaud, Freiburg, Neufchatel on the W. Bern is the second largest canton of Switzerland, its surface being estimated at 2562 square miles. The

population in 1870 amounted to 506,465, of whom 436,304 were Protestants, and 66,015 Catholics, while 1401 were Jews. German was spoken in 83,693 families, and French in 16,646, the latter language prevailing in the N.W. The canton is naturally divided into three regions, in which the climate varies with the elevation. The southern part, called the Oberland, is for its scenery the most attractive part of all Switzerland. Many of the grandest mountains of the Alpine system—such as the Grimsel, the Finsteraar- horn, the Schreckhorn, the Wetterhorn, the Eiger, and the Jungfrau—lie along the frontier chain, and numerous offshoots and valleys of great beauty stretch northward towards the central part of the canton. This latter district consists for the most part of an undulating plain, inter-spersed with lesser chains and hills,—the soil being fertile and well cultivated. The north is occupied with the ranges of the Jura system. The principal river in the canton is the Aar, which drains by far the larger proportion of its surface, either directly or by means of its numerous tributaries. Of these, the most important are the Saane, from the §.; the Thiele, which forms the outlet of the

lakes of Bienne and Neufchatel; and the Emme, which gives its name to the beautiful Emmenthal. The northern corner of the canton is divided between the basins of the Rhone and the Rhine. On the upper course of the Aar are the two lakes of Brienzand Thun. The mineral wealth of the country is neither extensive nor varied; but iron- mines are worked, and gold is found in the River Emme. Quarries of sandstone, marble, and granite are abundant. The pastures in the Oberland and the Emmenthal are excellent, and cattle and horses of the best description are largely reared. The latter district also produces cheese of excellent quality, which is exported to Germany and Italy. Fruit is extensively cultivated in the central region and in the neighbourhood of the lakes of Brienz and Thun ; the vine is principally grown to the north of Lake Bienne. In the forests, which are of considerable importance, the prevailing trees are the fir, the pine, and the beech. The industrial productions of the canton are cotton, woollen and flaxen stuffs, leather, watches, and wooden wares of all kinds. Bern is divided into thirty bailiwicks or prefectures, each with a local administrator, The capital is Bern, and the other chief towns are Bienne or Biel, Thun, Burgdorf or Berthoud, Porrentruy or Pruntruit, and Délémont or Delsberg. The highest legislative authority is the Great Council, the members of which

are chosen in proportion to the nuniber of the people; and the executive power is in the hands of a lesser council of nine members, chosen by the Great Council for a space of four years. The educa- tional institutions in the canton comprise a university and two gyninasiums in the capital, and progymnasiums and colleges at Biel, Thun, Burgdorf, Neuenstadt, Porrentruy, and Délémout. There is a deaf and dumb institution at Frienisberg, aud a cantonal lunatic asylum at Waldau, about a mile from Bern.

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SCALE OF ONE HALF MILE 1c 0 4

| fi] f In Plan of Bern.

BERN, the capital of the above canton, and, since 1848, the permanent seat of the Government and Diet of the Swiss Confederation. It is situated in 46°47’ N. lat. and 7° 25’ E. long., at an elevation of 1710 feet above the sea, on a sandstone peninsula, formed by the windings of the Aar, which is crossed on the south side of the city by an exten- sive weir, aud further down passes under four bridges connecting the peninsula with the right bank. It is one of the most characteristically Swiss towns; some of the streets are broad and regular, the houses being well built with hewn stone; in others a peculiar effect 1s pro- duced by the presence of lines of arcades down the sides. Prominent among the public buildings is the Federal Council Hall, or Bundes-Rathhaus, a fine structure in the

Florentine style, which was completed in 1857. The upper story is occupied by a picture gallery of some value. The town-hall dates from 1406, and was restored in 1861. Among the ecclesiastical buildings the first place is held by the cathedral, a richly-decorated Gothic edifice, begun in 1421 and completed in 1573, from the neighbourhood of which a splendid view of the Alps is obtained. Educational institutions are very numerous, comprising a university, founded in 1834, which is attended by 250 students, a

gymnasium, and a veterinary school. Attached to the university are a botanical garden and an observatory ; and there are, besides, a valuable museum, a public library of 45,000 volumes, especially rich in works relating to Swiss history, and several literary and scientific societies. Among the charitable establishments are two large hospitals (the Inselspital and the Biirgerspital), a foundling hospital, two orphan asylums, and a lunatic asylum. Another asylum was erected in 1854, about 2} miles from the city. The penitentiary is capable of containing 400 prisoners. Among other buildings of interest are the granary, which, till 1830, used to be stored with corn in case of famine ; the clock tower, with its automatic pantomime; the arsenal, with its mediaeval treasures; the mint; and the Murtner Gate. The most frequent ornament throughout the city is the figure of the bear, in allusion to the mythical origin of the name of Bern; and the authorities still imaiutain a bear's den at municipal expense. Although, properly speaking, not a commercial city, Bern carries on some trade in woollen cloth, printed calico, muslin, silk stuffs, straw hats, stockings, and other articles of home manufactnre. The climate is severely cold in winter, owing to the elevation of the situation. The population, which is mainly Protestant, was 36,000 in 1870.

Bern was founded, or at least fortified, by Berthold V. of Zahringen, about the end of the 12th or beginning of the 13th century, and gradually became a refuge for those who were oppressed by feudal exactions in the ncighbouring countries. In 1218 it was declared a free imperial city by the Emperor Frederick II. At first its constitution was purely democratic ; but in 1293 a legislative body of 200 citizens was appointed, which formed the germ of one of the most remarkable oligarchics in modern European history. The extension of territory, gradually etfected by the valour of the Bernese, rendered necessary a more elaborate and rigid organization than that which had sufficed while the limits of the city were almost the limits of the state; and the power of the nobility at home was strengthened by every new success against the enemies of the city. The blow that decided the fate of Bern was struck at Laupen on June 21, 1339, when Rudolph von Erlach beat the allied army of the neighbouring states. It continued to flourish, and in 1852 joined the Swiss Confederation. A fire destroyed the city in 1405, but it was rebuilt on the same plan. In the 17th century the gradually increasing aristocratic tendency reached its climax. The adoption of new

burghers was forbidden, and the burghers proper were carefully distinguished froni those who were merely permanent inhabitants of the city; the burghers were divided into those capable of holding office in the state and those destitute of that privilege ; and the privileged class itself, which, by 1785, numbered only 69 families, was subdivided into a higher and a lower grade. This élite grew more and more exclusive and domineering, and at last hecame unendurable to their humbler fellow-citizeus. In 1748 the discontent made itself evident in a formidable conspiracy, of which the unfortunate Henzi was one of the leaders. The conspiracy was crushed, but the opposition broke out through other channels. At last the Frencli Revolution came to submerge the aristocracy in a general Helvetian republic; and when the flood had passed the ancient landmarks could not be replaced, though a restoration was attempted with at first an appearance of success. The Liberal party has long been the strongest in the canton, which has at last returned almost to democracy ; for, in 1870, the referendum was introduced, by which it is agreed that all laws, after being discussed by the Great Council, shall first receive the sanction of the people before they come into force.

BERN ADOTTE, JeEan-BaptisTE-J ULES, afterwards K1ne Cuarues XIV. of Sweden and Norway, was the son of a lawyer at Pau in Béarn, and was born January 26, 1764. He was destined by his parents for the law, but chose the profession of arms, and enlisted in 1780 as a private in

the royal marines. When the Revolution swept away the arbitrary distinction of classes, and opened up to all alike the path of preferment, the abilities of Bernadotte were speedily acknowledged. In 1792 he was made a colonel, in the following year a general of brigade, and soon after a general of division. In the campaigns of the Rhine and of Italy his military talents found ample scope for display ; and his diplomatic abilities had also been tested as ambas- sador at the court of Vienna. During Bonaparte's absence in Egypt Bernadotte was appointed minister of war. He reorganized the whole army, and prepared the way for the conquest of Holland. Notwithstanding the rivalry that all along existed between him and Napoleon, Bernadotte was made a marshal on the establishment of the

empire. He was also nominated to the government of Hanover, and took part in the campaign of 1805 at the head of a force of 20,000 men. He distinguished himself at the battle of Austerlitz, and in 1806 he was created prince of Poute- Corvo. Jn 1810 the death of Prince Augustenburg of Sweden having left the throne of that kingdom without an heir, the Swedish States in Council nominated Bernadotte as successor to Charles XIII. of Sweden, a distinction for which he was scarcely less indebted to his nobility of character than to his military talents. During the great campaigns of 1813 and 1814 Bernadotte joined the coalition against Napoleon, and it was his Swedish contingent that mainly decided the battle of Leipsic. It is stated, on good authority, that he had formed the ambitious design of succeeding the emperor on the French throne. As crown prince of Sweden he devoted his whole energies to the welfare of his adopted country. Owing to the infirmities of the king he was intrusted with the entire conduct of the government. On the death of Charles XIII., in February 1818, Bernadotte ascended the throne. For the events of his administration, so conducive to the prosperity of that country, the reader is referred to the article SwepEN. He died at Stockholm, March 8, 1844, leaving an only son, Oscar, who succeeded him.

BERNARD, St, one of the most illustrious Christian teachers and representatives of monasticism in the Middle Ages, was born at Fontaines, near Dijon, in Burgundy, in 1091. The son of a knight and vassal of the duke of Burgundy who perished in the first crusade, Bernard may have felt for a time the temptations of a military career, but the influence of a pious mother and his own inclina- tions towards a life of meditation and study led him to the cloister. While still a youth he is said to have been "marvellously cogitative" ('mre cogitativus," St Bern. Op., vol. ii. col. 1063), and the ascendency of his mind and character were soon shown. He joined the small monas- tery of Citeaux in 1113 when twenty-two years of age, and such were the effects of his own devotion and eloquent enthusiasm in commending a religious life, that he drew after him not only his two younger brothers, but also his two elder ones, Guido and Gerard, both of whom had naturally taken to soldiering, and the elder of whom was married and had children. The effect of his preaching is said to have been that " mothers hid their sons, wives their husbands, companions their friends," lest they should be drawn, away by his persuasive earnestness.

The monastery of Citeaux had attracted St Bernard not only on account of its neighbourhood (it was ouly a few miles distant from Dijon), but by its reputation for auste- rity. The monks were few and very poor. They were under an Englishman of the name of Stephen Harding, originally from Dorsetshire, whose aim was to restore the Benedictine rule to its original simplicity and give a new impulse to the monastic movement. In Bernard, Harding found a congenial spirit. No amount of self-mortification could exceed his ambition. He strove to overcome his

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bodily senses altogether and to live entirely absorbed in religious meditation. Sleep he counted a loss, and com- pared it to death. ood was only taken to keep him from fainting. The most menial offices were his delight, and even then his humility looked around for some lowlier employment. Fortunately he loved nature, and found a constant solace in her rocks and woods. "Trust one who has tried it," he writes in one of his epistles, "you will find more in woods than in books; trees and stones will teach you what you can never learn from masters." ("Experto crede : aliquid amplins invenics in silvis quam in libris; ligna et lapides docebunt te quod a magistris audire non possis," Hpist. 106.)

So ardent a nature soon found a sphere of ambition for itself, The monks of Citeaux, from being a poor and unknown company, began to attract attention after the accession of St Bernard and his friends. The fame of their self-denial was noised abroad, and out of their lowliness and abnegation came as usual distinction and success. The small monastery was unable to contain the inmates that gathered within it, and it began to send forth colonies in various directions. St Bernard had been two years an inmate, and the penetrating eye of the abbot had discovered beneath all his spiritual devotion a genius of rare power, and especially fitted to aid his measures of monastic re- form. He was chosen accordingly to head a band of devotees who issued from Citeaux in 1115 in search of a new home. This band, with Bernard at their head, jour- neyed northwards till they reached a spot in the diocese of Langres—a thick-wooded valley, wild and gloomy, but with a clear stream running through it. Here they settled and laid the foundations

of the famous abbey of Clairvaux, with which St Bernard's name remains associated in his- tory The hardships which the monks endured for a time in their new abode were such as to drive them almost to despair, and their leader fell seriously ill, and was only rescued from what seemed impending death by the kind compulsion of his friend William of Champeaux, the great doctor of the age, who besought and received the direction of Bernard for a year from his superior at Citeaux. Thanks to his considerate friend the abbot of Clairvaux was forced to abandon the cares of his new establishment, and in retirement and a healthful regimen to seek renewed health. The effect was all that could be desired, and in a few years Bernard had not only recovered his strength, but had begun that marvellous career of literary and ecclesiastical activity, of incessant correspondence and preaching, which was to make him in some respects the most influential man of his age.

Gradually the influence of Bernard's character began to extend beyond his monastery. His friendship with William of Champeaux and others gave currency to his opinions, and from his simple retreat came by voice or pen an autho- rity before which many bowed, not only within his own order but within the church at large. This influence was notably shown after the death of Pope Honorius II. in 1130. Two rival popes assumed the purple, each being able to appeal to his election by a section of the cardinals. Christendom was divided betwixt the claims of Anacletus II. and Innocent IJ. The former was backed by a strong Italian party, and drove his adversary from Romie and even from Italy. Innocent took refuge in France. The king, Louis the Fat, espoused his cause, and having summoned a council of archbishops and bishops, he laid his commands on the holy abbot of Clairvaux to be present also and give the benefit of his advice. With reluctance Bernard obeyed the call, and from the depths of seclusion was at once plunged into the heart of the great contest: which was afflict- ing the Christian world. The king and prelates put the question before him in such a way as to invite his decision

and make him arbiter. After careful deliberation he gave his judgment in favour of Innocent, and not only so, but from that time forward threw himself with characteristic fervour and force into the cause for which he had declared. Not only France, but England, Spain, and Germany were won

to the side of Innocent, who, banished from Rome, in the words of St Bernard, was "accepted by the world." He travelled from place to place with the powerful abbot by his side, who also received him in his humble cell at Clairvaux. Apparently, however, the meanness of the accommodation and the scantiness of the fare (one small fowl was all that could be got for the Pope's repast), left no wish on the part of Innocent or his retinue to continue their stay at Clairvaux. He found a more dainty recep- tion elsewhere, but nowhere so powerful a friend. Through the persuasions of Bernard the emperor took up arms for Innocent ; and Anacletus was driven to shut himself up in the impregnable castle of St Angelo, where his death opened the prospect of a united Christendom. A second anti-pope was elected, but after a few months retired from the field, owing also, it is said, to St Bernard's influence. A great triumph was gained not without a struggle, and the abbot of Clairvaux remained master of the ecclesiastical situation. No name stood higher in the Christian world. The chief events which fill up his subsequent life attest

the greatness of his influence. These were his contest

with the famous Abelard, and his preaching of the second crusade.

Peter Abelard was twelve years older than Bernard, and had risen to eminence before Bernard had entered the gates of Citeaux. His first intellectual encounter had been with Pernard's aged friend William of Champeaux, whom he had driven from his scholastic throne at Paris by the superiority of his dialectics. His subsequent career, his ill-fated passion for Heloise, his misfortunes, his intellectual restlessness and audacity, his supposed heresies, had all shed additional renown on his name; and when a council was summoned at Sens in 1140, at which the French king and his nobles and all the prelates of the realm were to be pre- sent, Abelard dared his enemies to impugn his opinions. St Bernard had been amongst those most alarmed by Abelard's teaching, and had sought to stir up alike Pope, princes, and bishops to take measures against him. He did not readily, however, take up the gauntlet thrown down by the great hero of the schools. He professed himself a " stripling too unversed in logic to meet the giant practised in every kind of debate." But "all were come prepared for a spectacle," and he was forced into the field. To the

amazement of all, when the combatants met and all seemed –

ready for the intellectual fray, Abelard refused to proceed with his defence. After several passages considered to be heretical had been read from his books he made no reply, but at once appealed to Rome and left the assembly. Probably he saw enough in the character of the meeting to

-assure him that it formed a very different audience from

those which he had been accustomed to sway by his sub- tilty and eloquence, and had recourse to this expedient to gain time and foil his adversaries. Bernard followed up his assault by a letter of indictment to the Pope against the heretic. The Pope responded by a sentence of con- demnation, and Abelard was silenced. Soon after he found refuge at Cluny with the kindly abbot, Peter the Venerable, who brought about something of a reconciliation betwixt him and Bernard. 'The latter, however, never heartily forgave the heretic. He was too zealous a churchman not to see the danger there is in such a spirit as Abelard's, and the serious consequences to which it might lead.

In all things Bernard was enthusiastically devoted to the church, and it was this enthusiasm which led him at last into the chief error of his career. Bad news reached

France of the progress of the Turkish arms in the East. The capture of Edessa in 1144 sent a thrill of alarm and indignation throughout Christian Europe, and the French king was urged to send forth a new army to reclaim the Holy Land from the triumphant infidels. The Pope was consulted, and encouraged the good work, delegating to St Bernard the office of preaching the new crusade. Weary with growing years and cares the abbot of Clairvaux seemed at first reluctant, but afterwards threw himself with all his accustomed power into the new movement, and by his marvellous eloquence kindled the crusading madness once more throughout France and Germany. Not only the French king, Louis VII., but the German emperor, Conrad ITI., placed himself at the head of a vast army and set out for the East by way of Constantinople. Detained there too long by the

duplicity of the Greeks, and divided in counsel, the Christian armies encountered frightful hard- ships, and were at length either dispersed or destroyed. Utter ruin and misery foliowed in the wake of the wildest enthusiasm. Bernard became an object of abuse as the great preacher of a movement which had terminated so disastrously, and wrote in humility an apologetic letter to the Pope, in which the divine judgments are made as usual accountable for human folly. This and other anxieties bore heavily upon even so sanguine a spirit. Disaster abroad and heresy at home left him no peace, while his body was worn to a shadow by his fasting and labours. It was, aS he said, 'the season of calamities." Still to the last, with failing strength, sleepless, unable to take solid food, with limbs swollen and feeble, his spirit was uncon- querable. ' Whenever a great necessity called him forth," as his friend and biographer Godfrey says, "his mind conquered all his bodily infirmities, he was endowed with strength, and to the astonishment of all who saw him, he could surpass even robust men in his endurance of fatigue." He continued absorbed in public affairs, and dispensed his care and advice in all directions often about the most trivial "as. well as the most important affairs. Finally the death of his associates and friends left him without any desire to live. He longed rather "to depart and be with Christ." To his sorrowing monks, whose earnest prayers were sup- posed to have assisted his partial recovery when near his end, he said, " Why do you thus detain a miserable man ? Spare me. Spare me, and let me depart." He expired August 20, 1153, shortly after his disciple Pope Eugenius III.

His character appears in our brief sketch as that of a noble enthusiast, selfish in. nothing save in so far as the church had become a part of himself, ardent in his sym- pathies and friendships, tenacious of purpose, terrible in indignation. He spared no abuse, and denounced what he deemed corruption to the Pope as frankly as to one of his own monks. He is not a thinker nor a man in advance of his age, but much of the best thought and piety of his time are sublimed in him to a sweet mystery and rapture of sentiment which has still power to touch amidst all its rhetorical exaggerations.

His writings are very numerous, consisting of epistles, sermons, and theological treatises. The best edition of his works is that of Father

Mabillon, printed at Paris in 1690 in 2 vols. folio, and reprinted more than once—finally in 1854 in 4 vols. 8vo. His life, written by his friend and disciple Godfrey, is also contained in this edition of his works. (at)

BERNARD, James, professor of philosophy and mathe- matics, and minister of the Walloon church at Leyden, was born at Nions, in Dauphiné, September 1, 1658. Having studied at Geneva, he returned to France in 1679, and was chosen minister of Venterol, in Dauphiné, whence he afterwards removed to the church of Vinsobres, As he

continued to preach the Reformed doctrines in opposition to the royal ordinance, he was obliged to leave the country and retired to Holland, where he was well received, and appointed one of the pensionary ministers of Gouda. In July 1686 he commenced his Histoire Abrégée de Europe, which he continued monthly till December 1688. In 1692 he began his Lettres Historiques, containing an account of the most important transactions in Europe ; he carried on this work til] the end of 1698, after which it was continued by others. When Leclerc discontinucd his Bibliotheque Universelle in 1691, Bernard wrote the greater part of the twentieth volume and the five follow- ing volumes. In 1698 he collected and published Actes et Neégociations de la Paix de Ryswic, in four volumes 12mo, In 1699 he began a continuation of Bayle's Nouvelles de la République des Lettres, which continued till December 1710. In 1705 he was unanimously elected one of the ministers of the Walloon church at Leyden; and about the same time he succeeded M. de Valder in the chair of philosophy and mathematics at Leyden. In 1716 he pub- lished a supplement to Moreri's Dictionary, in two volumes folio. The same year he resumed his Nouvelles de la République des Lettres, and continued it till his death, on the 27th of April 1718. Besides the works above men- tioned, he was the author of two practical treatises, one on late repentance, the other on the excellence of religion.

BERNARD, Simon, French general of engineers, and aide-de-camp to Napoleon, was born at Délein 1779. He was educated at the Ecole Polytechnique, and entered the army in the corps of engineers. He rose rapidly, and served for some time as aide-de-camp to Napoleon. Sub-

sequently to the emperor's fall he emigrated to the United States, where he exccuted a number of extensive military works, consisting of vast canals, numerous forts, and 1400 leagues of frontier fortifications. He returned to France after the Revolution of 1830, and in 1836 was secretary at war to Louis Philippe. He died in 1839.

BERNARDIN, Sr, of Siena, a celebrated preacher, was born at Massa Carrara in 1380. His family, the Albizeschi, was noble, and his father was chief magistrate of Massa. He lost both parents before his eighth year, and was educated by his aunt, a pious woman. After completing his course of study he passed some years as a voluntary assistant in the hospital of Scala, and in 1404 entered the order of St Francis. His eloquence as a preacher made him celebrated throughout Italy, nor was his fame diminished by his visit to the Holy Land, from which he returned with fresh zeal. Three cities, Siena, Ferrara, and Urbino, successively sought the hon- our of having him as their bishop, but without avail. In 1438 he was made vicar-general of his order in Italy. He died on the 20th May 1444, at Aquila in Abruzzo. His canonization took place in 1450 by the order of Nicholas VY. A collection of lis works was published in 1571 by Rudolfi, bishop of Sinigaglia.

BERNAY, the chief town of an arrondissement in the department of Eure, in France, on the left bank of the Charentonne, 26 miles W.N.W. of Evreux. It is beautifully situated in the midst of green wooded hills, and still justifies Madame de Stael's description— "Bernay is a basket of flowers." Of great antiquity, it still possesses numerous quaint wooden houses and several ancient ecclesiastical buildings of considerable interest. The abbey church is now used as a market, and the abbey, which was originally founded by Judith of Britanny about 1017, and underwent a restoration in the 17th century, serves for municipal and legal purposes. The glass-work in the church of Nétre Dame de la Couture is of great antiquarian interest. Among the industrial establishments of the place are cotton, woollen, and ribband factories :

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aud the trade is chiefly in horses, grain, and flax. The town, which was formerly fortified, was besieged by Duguesclin in 1378; it was taken by the

English in 1418 and again in 1421, and by Admiral de Coligny in 1563. The fortress was razed in 1589. Population in 1872,

5806.

BERNBURG, a city of Anhalt in Germany, and for- merly the capital of the now incorporated duchy of Anhalt- Bernburg. It consists of three parts, the Altstadt or old town, the Bergstadt or hill-town, and the Neustadt or new town,—the Bergstadt on the right and the other two on the left of the River Saale, which is crossed by a rather massive stone bridge. It is a well-built city, the principal public buildings being the Government house, the church of St Mary, the Gymnasium, and the house of correction. The castle, formerly the ducal residence, is in the Berg- stadt, defended by moats, and surrounded by beautiful gardens. 'The industries of the town include the manu- facture of snuff, paper, starch, and pottery ; and a con- siderable traffic is carried on, especially in grain, both by river and by railway. Bernburg is of great antiquity. The Bergstadt was fortified by Otto III in the 10th century, and the new town was founded in the 13th. For a long period the different parts were under separate magistracies, the new town uniting with the old in 1560, and the Berg- stadt with both in 1824. Prince Frederick Albert removed the ducal residence to Ballenstedt in 1765. Population in 1872, inclusive of the domain and the suburb of Wal- dau, 15,709.

BERNE. See Brrn.

BERNERS, Juriana, prioress of Sopewell nunnery, near St Albans, was the daughter of Sir James Berners, who was beheaded in the reign of Richard IJ. She was celebrated for her beauty, her spirit, and her passion for field sports. To her is attributed the Treatyse perteynynge to Hawkynge, Huntynge, and Fysshynge with an Angle ; also a right noble Treatyse on the Lygnage of Cot Armours, endynge with a Treatyse which specyfyeth of Blasynge of Armys, printed in folio by Wynkyn de Worde in 1496. The first and rarest edition, printed at St Albans in 1486, does not contain the treatise on fishing. Haslewood, who published an edition of the work (in fac-simile of that of Wynkyn de Worde) in 1811, folio, London, has examined with the greatest care the author's claims to figure as the earliest female

writer in the English language. His pre- liminary dissertations contain all the scanty information that is to be had concerning her.

BERNI, Francesco, Italian poet, was born about 1490 at Lamporecchio, in Bibbiena, a district lying along the Upper Arno. His family was of good descent, but exces- sively poor, At an early age he was sent to Florence, where he remained till his i9th year. He then set out for Rome, trusting to obtain some assistance from his uncle, the Cardinal Bibbiena. The cardinal, however, did nothing for him, and he was obliged to accept a situation as clerk or secretary to Ghiberti, datary to Clement VII. The duties of his office, for which Berni was in every way unfit, were exceedingly irksome to the poet, who, however, made himself celebrated at Rome as the most witty and inven- tive of a certain club of literary men, who devoted them- selves to light and sparkling effusions. So strong was the admiration for Berni's verses, that mocking or burlesque poems have since been called poesze bernesca. About the year 1530 he was relieved from his servitude by obtaining a canonry in the cathedral of Florence. In that city he died in 1536, according to tradition poisoned by Duke Alessandro de' Medici, for having refused to poison the duke's cousin, Ippolito de' Medici; but considerable obscurity rests over this story. Berni stands at the head of Italian contic or burlesque poets, For lightness, sparkling wit,

variety of form, and flucnt diction, his verses are unsur- passed. Perhaps, however, he owes his greatest fame to the recasting (2zfacumento) of Boiardo's Orlando Innamo- rato. The enormous success of Ariosto's Orlando Furtoso had directed fresh attention to the older poem, from which it took its characters, and of which it is the con- tinuation. But Boiardo's work, though good in plan, could never have achieved wide popularity on account of the extreme ruggedness of its style. Berni undertook the revision of the whole poem, avowedly altering no senti- ment, removing or addiug no incident, but simply giving to each Jine and stanza due gracefulness and polish. His task he completed with marvellous success; scarcely a linc reinains as it was, and the general opinion has pronounced decisively in favour of the revision over the original. To cach canto he prefixed a few stanzas of reflective verse in the manner of Ariosto, and in one of these

introductions he gives us the only certain information we have concern- ing his own life. It should be noticed that Berni appears to have been favourably disposed towards the Reformation principles at that time introduced into Italy, and this may explain the bitterness of some remarks of his upon the church. The first edition of the Rifacimento was printed posthumously in 1541, and it has been supposed that a few passages either did not receive the author's final revision, or have been retouched by another hand. The Opere Burlesche have been published separately. A vartial translation of Berni's Orlando was published by W. 5. Rose, 1823. (See for full information Panizzi's Boiardo,

1830-381.)

BERNINI, Giovanni Lorenzo, an Italian artist, born at Naples in 1598, was more celebrated as an architect and a sculptor than as a painter. At a very early age his great skill in modelling introduced him to court favour at Rome, and he was specially patronized by Maffeo Barberini, after- wards Pope Urban VIII., whose palace he designed. None of his sculptured groups at all come up to the promised excellence of his first effort, the Apollo and Daphne, nor are any of his paintings of particular merit. His busts were in so much request that Charles I. of England, being unable to have a personal interview with Bernini, sent him three portraits by Vandyck, from which the artist was enabled to complete his model. His architectural designs, including the great colonnade of St Peter's, brought him perhaps his greatest celebrity. Louis XIV., when he con- templated the restoration of the Louvre, sent for Bernini, but did not adopt his designs.' The artist's progress througli France was a triumphal procession, and he was most liberally rewarded by the great monarch. He died at Rome in 1680, leaving a fortune of over £100,000. Few artists have had so wide renown in their own day; timc has enabled us to judge more accurately of his merits,

BERNOULLI, or Bernovit1t, a name illustrious in the annals of science, belonging to a family of respectability, originally of Antwerp. Driven from their country during the oppressive government of Spain for their attachment to the Reformed religion, the family sought first an asylum at Frankfort (1583), and afterwards at Basel, where they ultimately obtained the highest distinctions. Jn the course of a century eight of its members

successfully cultivated various branches of mathematics, and contributed power- fully to the advance of science. The most celebrated of the family were James, John, and Daniel; but, for the sake of perspicuity they may be considered as nearly as possible in the order of family succession.

I. James BERNOULLI was born at Basel on the 27th December 1654. He was educated at the public school of Basel, and also received private instruction from the learned Hoffmann, then professor of Greek. At the conclu- sion of his philosophical studies at the university, some

Bye HNO ULL"

geometrical figures, which fell in his way, excited in him a passion for mathematical pursuits, and in spite of the opposition of his father, who wished him to be a clergyman, he applied himself in secret to his favourite science. In 1676 he visited Geneva ou his way to France, and sub- sequently travelled to England and Holland. While at Geneva he taught a blind girl several branches of science, and also how to write; and this led him to publish A Method of Teaching Mathematics to the Blind. At Bordeaux his Universal Tables on Dialling were constructed; and in London he was admitted to the meetings of Boyle, Hooke, Stillingfleet, and other learned and scientific men.

On his final return to Basel in 1682, he devoted himself to physical and mathematical investigations, and opened a public seminary for experimental physics. In the same year he published his essay on comets, Conamen Novi Systematis Cometarum, which was occasioned by the appear- auce of the comet of 1680. This essay, and his next publication, entitled Dz Gravitate ditheris, were deeply tinged with the philosophy of Descartes, but they contain truths not unworthy of the philosophy of the Principia.

James Bernoulli cannot be strictly called an independent discoverer ; but, from his extensive and successful applica- tion of the calculus, he is well deserving of a place by the side of Newton and Leibnitz. As an additional claim to remembrance, he was the first to solve Leibnitz's problem of the isochronous curve, and to determine the catenary, or curve formed by a chain suspended by its two extremi- ties, which he also showed to be the

same as the curva- ture of a sail filled with wind. This led him on to another curve, which, being formed by an elastic plate or rod fixed at one end and bent by a weight applied to the other, he called the elastic curve, and which he showed to be the same as the curvature of an impervious sail filled with a liquid. In his investigations respecting cycloidal lines and various spiral curves, his attention was directed to the loxo- dromic and logarithmic spirals, in the last of which he took particular interest from its remarkable property of repro- ducing itself under a great variety of conditions.

In 1696 he proposed the famous problem of isoperi- metrical figures, and offered a reward for its solution. This problem eugaged the attention of British as well as Continental mathematicians ; and its proposal gave rise to a painful quarrel between the brothers. John offered a solution of the problem; his brother pronounced it to be wrong. John then amended his solution, and again offered it, and claimed the reward. Jaines still declared it to be no solution, and soon after published his own. In 1701 he published also the demonstration of his solu- tion, which was accepted by De l'Hépital and Leibnitz. John, however, held his peace for several years, and then dishonestly published, after the death of James, another incorrect solution; and not until 1718 did he admit that he had been in error. Even then he set forth as his own his brother's solution purposely disguised.

In 1687 the mathematical chair of the University of Basel was conferred upon James ; and in the discharge of its duties he was so successful as to attract students from other countries. Someof his pupils became afterwards pro- fessors in the universities of Germany. He was once made rector of his university, and had other distinctions bestowed on him. He and his brother John were the first two foreign associates of the Academy of Sciences at Paris ; and, at the request of Leibnitz, they were both received as members of the Academy of Berlin. In 1684 he had been offered a professorship at Heidelberg ; but his marriage with a lady of his native city led him to decline the invitation. Intense application brought on infirmities and a slow fever, of which he died on the 16th of August 1705, with the resignation of a Christian and the firmness

of a philosopher. Like another Archimedes, he requested that, as a monument of his labours and an emblem of his hope of a resurrection, the logarithmic spiral should be engraven on his tombstone, with these words, /adem mutata resurgo.

James Bernoulli wrote elegant verses in Latin, German, and French ; but although these were held in high cstima- tion in his own time, it is on his mathematical works that his fame now rests. These are—(1.) Jacobi Bernoulli Basiliensis Opera, Geneve, 1744, 2 tom. 4to; (2.) Ars Conjectandi, opus posthumum : accedunt tractatus de Serte- bus Infinitis, et epistola (Gallice scripta) de Ludo Pile Feticularis, Basilie, 1713, 1 tom. 4to.

II. Jonn Bernovuttut, brother of the preceding, was born at Basel on the 7th August 1667. His education was begun at six years of age; and after finishing his literary studies he was sent to Neufchatel to learn commerce and acquire the French language. But at the end of a year he renounced the pursuits of commerce, returned to the Uni- versity of Basel, and was admitted to the degree of bachelor in philosophy, and a ycar later, at the age of 18, to that of master of arts. In his studies he was aided by his clder brother James. Chemistry, as well as mathematics, seems to have been the object of his early attention; and in the year 1690 he published a dissertation on effervescence and fermentation. The same year he went to Gencva, wherc he gave instruction in the differential calculus to Fatio de Duiller, and afterwards proceeded to Paris, where he en- joyed the society of Malebranche, Cassini, De Lahire, and Varignon. With the Marquis de l'Hépital he spent four months at his country house in the study of the higher geometry and the resources of the new calculus. His inde- pendent discoveries in mathematics are numerous and important. Among these were the exponential calculus, and the curve called by him the linea brachistochrona, or line of swiftest descent, which he was the first to deter-' mine, pointing out at the same time the beautiful relation which this curve bears to the path described by a ray or particle of light passing through strata of variable density, such as our atmosphere. On his return to his native city he studied medicine, and in 1694 took the degrce of M.D. At this period he married into one of the oldest families in Basel; and although he had declined a professorship in Germany, he now accepted an invitation to

the chair of mathematics at Groningen (Commercium Philosophicum, epist. xi. and xii.) There, in addition to the learned lectures by which he endeavoured to revive mathematical science in the university, he gave a public course of experi- mental physics. During a residence of ten years in Gron- ingen, his controversies were almost as numerous as his discoveries. His dissertation on an electrical appearance of the barometer first observed by Picard, and discussed by John Bernoulli under the name of mercurial phosphorus, or mercury shining in vacuo (Diss. Physica de Mercurio lucente in vacuo), procured him the notice of royalty, and engaged him in controversy. Through Leibnitz he re- ceived from the king of Prussia a gold medal for his sup- posed discoveries ; but Hartsoeker and some of the French academicians disputed the fact. The family quarrel about the problem of isoperimctrical figures above mentioned began about this time. In his dispute with his brother, in his controversies with the English and Scotch mathe- maticians, and in his harsh and jealous bearing to his son Daniel, he showed a temper mean, unfair, and violent. He had declined, during his residence at Groningen, an invitation to Utrecht, but accepted in 1705 the mathce- matical chair in the university of his native city, vacant by the death of his brother James ; and here he remained till his death. His inaugural discourse was on the "new analysis," which he so successfully applied in investigating

various problems both in pure and mixed mathematics, At the request of the magistracy of Basel he applied himself to correct the relaxed discipline of the university.

He was several times a successful competitor for the prizes given by the Academy of Sciences of Paris; and the subjects of his essays were, the laws of motion (Discours sur les Lois de la Communication du Mouvement, 1727), the ellip- tical orbits of the planets, and the inclinations of the plane- tary orbits (Hssac d'une Nouvelle Physique Céleste, 1735). In the last case his son Daniel divided the prize with him. Some years after his return to Basel he published an essay, entitled Nouvelle Théorte de la Maneuvre des Vaisseau. It is, however, his works in pure mathematics that are the permanent monuments of his fame. D'Alembert acknow- ledges with

gratitude, that ‘ whatever he knew of mathe- matics he owed to the works of John Bernoulli.” He was a member of almost every learned society in Europe, and one of the first mathematicians of a mathematicalage. He was a8 keen in his resentments as he was ardent in his friendships ; fondly attached to his family, he yet disliked a deserving son; he gave full praise to Leibnitz and Euler, yet was blind to the excellence of Newton. Such was the vigour of his constitution that he continued to pursue his usual mathematical studies till the age of eighty. He was then attacked by a complaint at first apparently trifl- ing; but his strength daily and rapidly declined till the Ist of January 1748, when he died peacefully in his sleep.

His writings were collected under his own eye by Cramer, professor of mathematics at Geneva, and published under the title of Johannis Bernoullé Operi Omnia, Lausan. et Genev. 4 tom. 4to. His interesting correspondence with Leibnitz appeared under the title of Gud. Lecbnitd et Jo- hannis Bernoulli Commercium Philosophicum et Mathemati- cum, Lausan. et Genev. 1745, 2 tom. 4to.

III. Nicnotas Bernouts, the eldest of the three sons of John Bernoulli, was born in 1695, His early indications of genius were carefully cherished. At the age of eight he could speak German, Dutch, French, and Latin. _ When his father returned to Basel he went to the university of that city, where, at the age of sixteen, he took the degree of doctor in philosophy, and four years later the highest degree in law. Meanwhile the study of mathematics was not neglected, as appears not only from his giving instructions in geometry to his younger brother Daniel, but from his writings on the differential, integral, and exponential calculus, and from his father considering him, at the age of twenty-one, worthy of receiving the torch of science from hisown hands. (“ Lampada nunc tradam filio meo natu maximo, juveni xxi. annorum, ingenio mathe- matico alusque dotibus satis instructo,” Com. Phil. ep. 223). With his father’s permission he visited Italy and France, and during his travels formed friendship with Varignon and with Riccati, one of the first mathematicians of Italy. The invitation of a Venetian nobleman induced him again to visit Italy, where he resided two years, till his return to be a candidate for the chair of jurisprudence at Basel. He was unsuccessful, but was soon afterwards appointed to a similar office in the University of Bern. Here he resided three years, his happiness

only marred by regret on account of his separation from his brother Daniel, with whom he was united in sentiment and pursuits. Both were appointed at the same time professors of mathe- matics in the Academy of St Petersburg; but this office Nicholas enjoyed for little more than eight months. At the end of July 1726 he was cut off in the prime of life by a lingering fever. Sensible of the loss which the nation had sustained by his death, the Empress Catherine ordered him a funeral at the public expense. Some of his papers are published in his father's works, and others in the Acta Eruditorum and the Comment. Acad. Petropol.

BERNOULLI

IV. Dante BeRNouuut, the second son of JohnBernoulli, was born 9th February 1700, at Groningen. He studied medicine and became a physician, but his attention was early directed also to geometrical studies. The severity of his father's manner was ill calculated to encourage the first efforts of one so sensitive ; but fortunately, at the age of eleven, he became the pupil of his brother Nicholas. He afterwards studied in Italy under Michelotti and Mor- gagni. After his return, though only twenty-four years of age, he was invited to become president of an academy then projected at Genoa ; but, declining this honour, he was, in the following year, appointed professor of mathematics at St Petersburg. In consequence of the state of his health, however, he returned to Basel in 1733, where he was appointed professor of anatomy and botany, and after- wards of experimental and speculative philosophy. In the labours of this office he spent the remaining years of his life. He had previously published some medical and botani- cal dissertations, besides his Haxercitationes quedam Mathe- matice, containing a solution of the differential equation proposed by Riccati and now known by his name. In 1738 appeared his Hydrodynamica, in which the equi- librium, the pressure, the reaction, and varied velocities of fluids are considered both theoretically and practically. One of these problems, illustrated by experiment, deals with an ingenious mode of propelling vessels by the reaction of water ejected from the stern. Some of his experiments on this subject were performed before Maupertuis and Clairaut, whom the fame of the Bernoullis had attracted to Basel. With a success equalled only by Euler, Daniel Bernoulli gained or shared no less than ten prizes of the Academy of Sciences of Paris, 'The first, for a memoir

on the con- struction of a clepsydra for measuring time exactly at sea, he gained at the age of twenty-four; the second, for one on the physical cause of the inclination of the planetary orbits, he divided with his father; and the third, for a communication on the tides, he shared with Euler, Mac- laurin, and another competitor. The problem of vibrating cords, which had been some time before resolved by Taylor and D'Alembert, became the subject of a long discussion conducted in a generous spirit between Bernoulli and his friend Euler. In one of his early investigations he gave an ingenious though indirect demonstration of the problem of the parallelogram of forces. His labours in the decline of life were chiefly directed to the doctrine of probabilities in reference to practical purposes, and in particular to economical subjects, as, for example, to inoculation, and to the duration of married life in the two sexes, as well as to the relative proportion of male and female births. He retained his usual vigour of understanding till near the age of eighty, when his nephew James relieved him of his public duties. He was afilicted with asthma, and his retirement was relieved only by the society of a few chosen friends. In the spring of 1782, after some days' illness, he died, like his father, in the repose of sleep. Excluded by his professional character from the councils of the republic, he nevertheless received all the deference and honour due to a first magistrate. He was wont to mention the following as the two incidents in his life which had afforded him the greatest pleasure,—that a stranger, whom he had met as a travelling companion in his youth, made to his declaration 'Iam Daniel Bernoulli" the incredulous and mocking reply, " And I am Isaac Newton ;" and that, while entertaining Kénig and other guests, he solved with- out rising from table a problem which that mathematician had submitted as difficult and lengthy.

Like his father, he was a member of almost every learned society of Europe, and he succeeded him as foreign associate of the Academy of Paris. Several of his investi- gations are contained in the earlier volumes of the St

Petersburg Memoirs ; and his separately published works are—(1.) Dissertatio Inaugur. Phys. Med. de Respiratione, Basil., 1721, 4to; (2.) Positiones Anatomico-Botanice, Basil., 1721, 4to ; (3.) Lxercitationes

quedam Mathematice, Venetiis, 1724, 4to; (4.) Lydrodynamica, Argentorati, 1738, 4to.

VY. JoHN BERNOULLI, the youngest of the three sons of John Bernoulli, was born at Basel on the 18th May 1710. He studied law and mathematics, and, after travelling in France, was for five years professor of eloquence in the university of his native city. On the death of his father he succeeded him as professor of mathematics. He was thrice a successful competitor for the prizes of the Academy of Sciences of Paris. Huis prize subjects were, the capstan, the propagation of light, and the magnet. He enjoyed the friendship of Maupertuis, who died under his roof while on his way to Berlin. He himself died in 1790. His two sons, John and James, are the last noted mathe- maticians of the family.

VI. NicHoLas BERNOULLI, cousin of the three preceding, and son of Nicholas Bernoulli, one of the senators of Basel, was born in that city on the 10th October 1687. He visited England, where he was kindly received by Newton aud Halley (Com. Phil. ep. 199), held for a time the mathematical chair at Padua, which Galileo had once filled, and was successively professor of logic and of law at Basel, where he died on the 29th of November 1759. He was editor of the Ars Conjectandi of his uncle James. His own works are contained in the Acta Hruditorum, the Giornale de' Letterati d'Italia, and the Commercium Philosophicum.

VII. Joun Bernovxu, grandson of the first John Bernoulli, and son of the second of that name, was born at Basel on the 4th December 1744. He studied at Basel and at Neufchatel, and when thirteen years of age took the degree of doctor in philosophy. At nineteen he was appointed astronomer royal of Berlin. Some years after, he visited Germany, France, and England, and subse- quently Italy, Russia, and Poland. On his return to Berlin he was appointed director of the mathematical de- partment of the academy. Here he died on the 10th July 1807. His writings consist of travels and astronomi- cal, geographical, and mathematical works. In 1774 he published a French translation of Euler's Llements of Algebra. He contributed several papers to the Academy of Berlin.

VIII. James BERNOULLI, younger brother of the pre- ceding, and the second of this name, was born at Basel on the 17th October 1759. Having

finished his literary studies, he was, according to custom, sent to Neufchatel to learn French. On his return he studied law and took a degree. 'This study, however, did not check his heredi- tary taste for geometry. The early lessons which he had received from his father were continued by his uncle Daniel, and such was his progress in the exact sciences that at the age of twenty-one he was called to undertake the duties of the chair of experimental physics, which his uncle's advanced years rendered him unable to discharge. He afterwards accepted the situation of secretary to Count de Brenner, which afforded him an opportunity of seeing Germany and Italy. In Italy he formed a friend- ship with Lorgna, professor of mathematics at Verona, aud one of the founders of the Italian society for the encouragement of the sciences. He was also made corre- sponding member of the Royal Society of Turin; and, while residing at Venice, he was, through the friendly representation of Fuss, admitted into the Academy of St Petersburg. In 1788 he was named one of its mathe- matical professors. In the following year he married a daughter of Albert Euler, son of the illustrious Euler.

This marriage was soon tragically dissolved by the death of the husband, who was drowned while bathing in the Neva in July 1789. Several of his papers are contained in the first six volumes of Nova Acta Acad. Scien. Imper. Petropol., in the Acta Helvetica, in the Memoirs of the Academies of Berlin and Turin, and in his brother John's publications. He also published separately some juridical and physical theses, and a German translation of J/émoires du Philosophe de Merian.

BEROSUS was a Chaldean priest who lived in the time of Alexander the Great and his immediate successors. He translated the history of his native country, Babylonia, into the Greek language, and dedicated the work to one of the Greek kings of Syria named Antiochus, His work is principally known through the fragments of Polyhistor and Apollodorus, two writers in the lst century before = Christian era, who are quoted by Eusebius and Lyn- cellus.

The work of Berosus professed to commence with the creation of the universe, and the history was carried down to his own time. A few

quotations at second or third hand, and the bare outlines of his system of chronology, are all that has been transmitted to us through the copyists of Berosns ; but the close connection throughout between his story and the Bible, and the knowledge that he drew his information from the records of Babylonia, have always invested these fragments with great importance,— an im- portance which has been increased of late, since the dis- covery of several cuneiform inscriptions confirming different parts of his history.

The history of Berosus first described the chaos before the creation, presided over by the female Thalatth or Omoroca (the chaotic sea), called Tiamat and Tisallat in the inscriptions ; she was destroyed by Belus, and then the gods created the heavens and the earth. After this he gave the chronology of the Babylonian kingdom as follows :—

Years

10 kings before the flood…..... 432,000. 86 kings after the flood…..... 34,080 or 33,091.

(SheGi, [e(chigyol RabalersveenennenAl poBannee 224, or 234, or 190. 11 other monarchs….....(nuniber lost, in margin 48.) #9 Chaldean kings …..... 458.

SPA TAUIA WIMMS,. .....e. ec cce esc es 245, ASTOCMET KAM GS seine d sa)-ises ae mee

6.

After these reigned in Chaldea, Pul. —

The later part of the scheme of Berosus is lost, but detached extracts are quoted by some ancient historians.

In comparing the notices of Berosus with the Baby- lonian and Assyrian inscriptions, considerable difficulty is met with on account of the deficient information on both sides. The absence of chronological landmarks in the in- scriptions, and the doubts as to the length of the third and fourth periods of Berosus, are serious difficulties in the way of the chronology, but in the

absence of more satis- factory information the list of Berusus must be taken as the framework of Babylonian chronology.

The first period of Berosus, reaching from the creation to the flood, is said to have included 10 reigns and 432,000 years. The last two of these names are the only ones found with any certainty in the cuneiform inserip- tions,—these are Ubara-tutu and Adra-hasis, the Otiartes and Xisuthrus of Berosus. The deluge, which closed this period, is described in Berosus, and in the cuneiform in- scriptions of the Izdubar legends.

The next period given by Berosus includes 86 kings, and a period of 34,080 or 33,091 years,—the number is uncertain, and certainly unhistorical. It is probable that the later sovereigns of this period were historical, and some of the names which are preserved are ordinary Baby- lonian compounds. Three nimes in a fragment of Baby-

lonian chronology appear to belong to this period,—these are Ilu-kassat, Mulagununna, Abilkisu, who are given as successive sovereigus ; and there is another probable king of the period, Izdubar, who most likely represents the Biblical Nimrod. During this period the language and people of Babylonia are supposed to have been Tura- nian, and in round numbers it may be said to end about 2400 B.o.

About 2400 B.c., according to Berosus, Babylonia was overrun by a conquering tribe called by him " Medes." He has preserved in connection with this event the name of Zoroaster, and has given the dynasty 8 kings, the length of the period being placed variously at 234, 224, and 190 years. Where our authorities differ so much we can only make shift with a round number, and say the period was probably about 200 years, from 2400 to 2200 B.c, There is one name in the inscriptions supposed to belong to this period,—that of Kudur-nanhundi, king of Elam, who con- quered Babylonia about 2280 B.c. Nothing is known as to the race here called Medes by Berosus, but it is con- jectured that they were Elainites.

The next period of Berosus included 11 kings, the dura- tion of the dynasty not being preserved. In the margin we have the number 48 years, but

nothing is known of the origin of this number, and it appears too small for 11] kings. Perhaps we may provisionally allow about 200 years for this dynasty, 2200 to 2000 z.c. Nothing is known of the race or names of the monarchs.

About 2000 3.c. commenced a period including, accord- ing to Berosus, 49 kings and 458 years. The kings are called Chaldean, and appear to correspond with a famous line of sovereigns reigning at the cities of Ur, Karrak, and Larsa, commencing with the reign of Urukh, king of Ur. The centre of Babylonian power in their time lay in the south of the country, and many of the well-known temples and other buildings in this region were raised during their dominion. One of the monarchs in this period bore the name of Sargon; he was very celebrated, and of him a story is related similar to that of the infancy of Moses. He is said to have been concealed by his mother in an ark and floated on the River Euphrates. This great period ended with the defeat of Rim-agu, king of Larsa, by Hammurabi, who established a new dynasty, and made Babylon the capital about 1550 B.o.

The dynasty founded by Hammurabi appears to be the Arabian line of Berosus, which lasted under 9 kings for 245 years. Many of the kings of this pcriod are known from the inscriptions. hey first had extensive relations with the Assyrians, and about 1300 B.c, Tugulti-ninip, king of Assyria, conquered Babylon, and expelled the last Arab monarch. From this time commenced the direct influence of Assyria in Babylonia, and the period of this dynasty is counted by Berosus as 526 years. It probably ended with the time of Pul, a great king and conqueror, about whose personality and date there is much difference of opinion.

The next epoch in Babylonian history is that of Nabo- nassar, whose era commenced 747 3.c. From his time the history of Babylonia presents a constant serics of con- quests by the Assyrians, and revolts against them by the Babylonians, down to the time of Nabopolassar, who, after quelling a revolt in Babylonia, was made ruler of the country by the king of Assyria, and afterwards revolting against his master took Nineveh in concert with the Medes. :

Nebuchadnezzar, son of Nabopolassar, who ascended the throne of Babylon 605 B.c., was one of the most celebrated kings in history, and is meutioned

at length by Berosus, Who then notices the revolutions at Babylon until the taking of the city by Cyrus 539 B.c.

BER—BER

The history of Berosus continued down to the con- quest of Alexander the Great, and the reign of his patron Antiochus, .

The writings and notices of Berosus were collected and published in Germany by Richter in 1825, and in England by Cory, in his Ancient Fragments. Later and excellent extracts and notices have been given by Canon Rawlinson and M. Lenormant, while the chronology of Berosus has exercised the ingenuity of Brandis, Oppert, Lenormant, Rawlinson, Hincks, and many other scholars. There is. how- ever, no probability that any published system has correctly restored the dates of Berosus; the materials are at present insufficient for such a work. (G. 8.)

BERRI, Coartes Ferprnanp, Duc px, younger son of Charles X. of France, was born at Versailles on the 24th Jan. 1778. With his father, then Comte d'Artois, he had to leave France, and for several years served in the army of Condé. He afterwards joined the Russian army, and in 1801 took up his residence in England, where he re- mained for thirteen years. During that time he married an English lady, by whom he had two children. The marriage was cancelled for political reasons in 1814, when the duke set out for France. His frank, open manners gained him some favour with his fickle countrymen, which was increased by his marriage in 1816 with the Princess Caroline Ferdinande Louise of Naples. Qn the 13th of February 1820 he was mortally wounded, when leaving the opera-house with his wife, bya man named Louvel. Seven months after his death the duchess gave birth to a son, who received the title of duke of Bordeaux. She was coinpelled to follow Charles X. in his retirement from France after July 1830, but it was with the resolution of returning speedily and making an attempt to secure the throne for her son. In April 1832 she landed near Mar- seilles, but receiving no support, was compelled to make her way towards the ever-loyal districts of La Vendée and Bretagne. Her followers, however, were defeated, and after much suffering, she was betrayed to the Government and imprisoned in the castle of Blaye. Here she gave birth to a son, the fruit of a secret marriage contracted with an Italian nobleman, son of the

Marchese Lucchesi Palli, The announcement of this marriage at once deprived the duchess of the sympathies of her supporters. She was no longer an object of fear to the French Government, who released her in June 1833. She set sail for Sicily, and from that time till her death in April 1870 lived a retired life with her husband and his relatives.

BERRYER, Pirrre ANvToINnE, a French advocate and parliamentary orator, was born at Paris, January 4, 1790, in the midst of the agitating events of the first year of the great Revolution. Berryer's father was an eminent advo- cate and parliamentary counsellor. The son was educated at the Collége de Juilly, on leaving which he adopted, in deference to his father's wishes, the profession of the law ; but his own leaning at that time was to the church. After completing the usual course of professional studies, he was admitted advocate in 1811, and in the same year he married. In the great conflict of the period between Napoleon I. and the Bourbons, Berryer, like his father, was an ardent Leyitimist ; and in the spring of 1815, at the opening of the campaign of the Hundred Days, he followed Louis XVIII. to Ghent asa volunteer. After the second Restoration he distinguished himself as a courageous advocate of moderation in the treatment of the military adherents of the emperor. He was engaged, in conjunc- tion with his father and Dupin, in the unsuccessful defence of Marshal Ney before the Chamber of Peers; and he under- took alone the defence of General Cambronne and General Debelle, procuring the acquittal of the former and the pardon of the latter. Proceedings were soon after com-

menced against him for some assertions in one of his speeches, but he escaped with nothing more severe than a censure by the Council of Advocates. By this time he had a very large business as advocate, and was engaged on behalf of journalists in many press prosecutions. He stood forward with a noble resolution to maintain the freedom of the press, and severely censured the rigorous measures of the police department. In 1830, not long before the fall of Charles X., Berryer was elected a member of the Chamber of Deputies. He appeared there as the cham- pion of the king, and encouraged him in his tyrannical course. After the Revolution of July, when the Legitimists withdrew in a body, Berryer alone retained his seat as

deputy ; and though avowedly the friend of the deposed king, he took an independent course, not making himself an unscrupulous partizan, but guided in his advocacy or his opposition by reason and prudence. He was one of the influential men who resisted, but unsuccessfully, the abolition of the hereditary peerage. He advocated trial by jury in press prosecutions, the extension of municipal franchises, and other liberal measures. In May 1832 he hastened from Paris to see the duchess of Berri on her landing in the south of France for the purpose of organizing an insurrection in favour of her son, the duke of Bor- deaux, since known as the count of Chambord. Berryer attempted to turn her from her purpose; and failing in this he set out for Switzerland. He was, however, arrested, imprisoned, and brought to trial as one of the in- surgents. He was immediately acquitted. In the follow- ing year he pleaded for. the liberation of the countess ; made a memorable speech in defence of Chateaubriand, who was prosecuted for his violent attacks on the Government of Louis Philippe; and undertook the defence of several Legitimist journalists. In 1834 he defended two deputies in a Government prosecution for libel, and the same year opposed the passing of a new rigorous law against political and other associations. Among the more noteworthy events of his subsequcut career were his defence of Louis Napoleon after the ridiculous affair of Boulogne, in 1840, and a visit to England in December 1843, for the purpose of formally acknowledging the pretender, the duke of Bordeaux, then living in London, as Henry V., and lawful king of France. This proceeding brought on him the cen- sure of M. Guizot, then first minister of Louis Philippe. Berryer was an active member of the National Assembly convoked after the Revolution of February 1848, again visited the pretender, then at Wiesbaden, and still fought in the old cause. This long parliamentary career was closed by a courageous protest against the coup d'état of December 2,1851. After a lapse of twelve years, however, he appeared once more in his forsaken field as a deputy to the Corps Législatif. Meanwhile he had been a diligent promoter of the much talked of fusion of the two branches of the Bourbon family, and had distinguished himself at the bar by great speeches on the trial of Montalembert in 1858, and in the civil proceedings set on foot by M. Patterson against Jerome Bonaparte in 1860. Berryer was elected member of the French Academy in 1854. A visit paid by this famous orator to Lord Brougham in 1865 was made the occasion of a banquet given in his honour by the benchers of the Temple and of Lincoln's Inn. In November 1868 he

was removed by his own desire from Paris to his country seat at Augerville, and there he died on the 29th of the same month.

BERTHOLLET, Ciauper Lovts, one of the most dis- tinguished chemists of the French school, was born at Talloire, near Annecy, in Savoy, in 1748. He studied first at Chambery, and subsequently at Turin, where he took his degree as a physician. In 1772 he settled at Paris, and soon became the medical attendant of Philip,

duke of Orleans. By the publication of a volume of chemical essays, he gained such reputation that he was admitted in 1781 into the Académie des Sciences. He was appointed Government superintendent of the establishment for the improvement of dyeing; and in 1791 he published his essay Sur la Teinture, a work that first systematized and chemically explained the principles of the art. It was translated into English by Dr William Hamilton, 1794. Berthollet early adopted the chemical views of Lavoisier, and took part with him in the formation of a new system of chemical nomenclature. He confirmed and extended the discoveries of Priestley on ammonia, discovered ful- munating silver, and greatly extended our knowledge of the dephlogisticated marine acid of Scheele, for which the name of oxymuriatic acid was then proposed, and which is now termed chlorine. It was he who in 1785 first proposed to apply it to bleaching. He discovered the remarkable salt now called chlorate of potash; and we owe to him also an excellent essay on the chemical constitution of soaps. Berthollet's contributions to chemistry are scattered through the pages of the Journal de Physique, Annales de Chimie, Mémoires de VInstitut, and Mémoires d'Arceuil. At the commencement of the French Revolution the scarcity of saltpetre for the manufacture of gunpowder was much felt; and Berthollet was placed at the head of a commission for intproving the processes for obtaining and purifying this important product within the territory of France. Soon afterwards we find him one of a commission for improving the processes in the smelting of iron, and con- verting it into steel. In 1792 he was appointed a director of the mint, and in 1794 he became a member of the committee on agriculture and the arts; while he filled the office of teacher of chemistry in the Polytechnic and Normal

Schools of Paris, and took an active part in the remodel- ling of the National Institute in 1795. In the following year Berthollet and Monge were appointed heads of a commission to select in Italy the choicest specimens of ancient and modern art, for the national galleries of Paris. In 1798 Berthollet accompanied General Bonaparte to Egypt. On the overthrow of the Directory he was made a senator and a grand officer of the Legion of Honour. Under the empire he was created a count, and he sat as a peer on the restoration of the Bourbons. His last work was his curious essay on Chemical Statics (1803), in which he controverted the views of Bergman. Berthollct was a man of great modesty and unostentatious manners. For some years he lived retired at Arcueil, especially after the misconduct and suicide of his only son. He died at Paris of a painful malady bravely borne, November 6,

1822.

BERTHOUD, FrErprinanp, a celebrated Swiss chrono- meter-maker, was born in Neufchatel. The date of his birth is variously given as 1725, 1727, and 1729. His father was an architect, and the son was intended for the church ; but, showing a taste for mechanics, he was placed under an experienced workman to be instructed in clock and watch making, and was afterwards sent to Paris to improve himself in the knowledge and practice of the art. He settled in Paris in 1745, and applied himself to the making of chronometers, an art which was then in its infancy. He soon attained distinction for the excellence of his workmanship and the accuracy of his chronometers. Fleurieu and Borda, by order of the French Government, made a voyage from La Rochelle to the West Indies and Newfoundland for the purpose of testing them, and they found that they gave the longitude with an error of only a quarter of a degree, after a cruise of six weeks. Satisfac- tory results were also obtained in the expedition of Verdun, Borda, and Pingré, which was appointed to try these chronometers and those of his only rival, Le Roy. Sully,

an English watchmaker established in Paris, was the first who in that city attempted the construction of chronometers for finding the longitude; and this he did in 1724. In 1736 the chronometers of the English artist Harrison were tried at sea. In France, however, there were no chrono- meter-makers of note after Sully, till Pierre le Roy and Ferdinand Berthoud, between whom there was some dis- cussion about the priority of their discoveries and improve- ments. Ferdinand Berthoud's chronometers were long the most esteemed of any in France. Louis Berthoud, his nephew and successor, introduced some improvements, and made chronometers of a smaller size and therefore more portable. Berthoud was a member of the French Institute, a fellow of the Royal Society of London, and a member of the Legion of Honour. He was regular in his habits, and retained the use of his faculties to the last. He died of hydrothorax, at his country house, in the valley of Mont- morency, in 1807, aged about eighty. The principal of his published works are Hssazs sur l' Horlogerie, 2d edit., 1786, 2 vols. 4to ; two Tracts on Chronometers, 1773 ; De la Mésure du Temps, 1787, 4to; Les Longitudes par la Mésure du Temps, 1775, 4to; a Tract on Chronometers, 1782, 4to; Hustowre de la Mésure du Temps par les Hor- loges, 1802, 2 vols. 4to; L' Art de conduire et de régler les Pendules et les Montres,1760,12mo. The tract last named, containing directions suited to general readers for regu- lating clocks and watches, passed through several editions.

BERTINORO (identified, on conjecture, with the ancient Forum Druentinorum), a city of Italy, in the province of Emilia and district of Forli, the seat of the bishop of the united dioceses of Forlimpopoli and Bertinoro. It stands on a hill, below which the River Ronco flows, aud is cele- brated for the excellence of its wine. Population, 6540. Long. 12° 2' 30" E., lat. 44° 8' 34" N.

BERWICK, James Frrzsamus, DuKE oF, marshal and peer of France, was a natural son of James, duke of York, afterwards Jamies IT. of England, by Arabella Churchill, sister of the great duke'of Marlborough. He was born at Moulins, August 21, 1670. He received his education in France, studying successively at Juilly, at the College of Plessis, and at the College of Fléche. At the age of fifteen, his father having succeeded to the throne, he was sent to learn the business of a soldier under the famous general of the

empire, Charles of Lorraine. He served his first campaigns in Hungary, and was present at the siege of Buda and the battle of Mohacz. In 1687 he returned to England, was made a Knight of the Garter, and created duke of Berwick. After the Revolution he served under James IT. in the campaign in Ireland, was in one engage- ment severely wounded, and was present at the battle of the Boyne. For a short time he was left in Ireland as commander-in-chief, but his youth and inexperience unfitted him for the post, and he was a mere puppet in stronger hands. In 1692 he was recalled to France, and took service in the French army. He fought under Marshal Luxembourg in Flanders, took part in the battles of Steinkerk and Landen (Neerwinden), and was taken prisoner at the latter. He was, however, immediately exchanged for the duke of Ormond, and afterwards he served under Villeroi. In 1696 the duke of Berwick took a prominent part in a plot for a Jacobite insurrection, but the scheme came to nothing. In 1702 he served under the duke of Burgundy, and in the following year became naturalized as a Frenchman. In 1704 he first took com- mand of the French army in Spain. So highly was he now esteemed for his courage, abilities, and integrity, that all parties were anxious to have him on their side (Loge, by Montesquieu). From Spain he was recalled to take the command against the Camisards in Languedoc, and when on this expedition he is said to have carried out

with remorseless rigour the orders which he received from Versailles. About this time he was created marshal of France. He was then sent again to Spain to retrieve the affairs of that kingdom, and to prop up the tottering throne. In April 1707 he won the great victory of Almanza, an Englishman at the head of a French army, over the earl of Galway (comte de Ruvigny), a Frenchman at the head of an English army. The victory established Philip V. on the throne of Spain, although neither he nor his rival, the archduke, was present at the battle. Berwick was made a peer of France and grandee of Spain. In 1708 he became commander-in-chief of the armies of France in Spain, in Flanders, on the Rhine, and on the Moselle. Through the four following years he gained fresh laurels by his masterly defence of Dauphiné, and in 1713 he returned to Spain and took Barcelona. Thrce years later he was appointed military governor of the province of Guienne.

In 1718 he found himself under the necessity of once more entering Spain with an army; and this time he had to fight against Philip V., the king who owed chiefly to his courage and skill the safety of his throne. One of the marshal's sons, known as duke of Liria, was settled in Spain, and was counselled by his father not to shrink from doing his duty and fighting for his sovereign. Many years of peace followed this campaign, and Marshal Berwick was not again called to serve in the field till 1733. He advised and conducted in 1734 the siege of Philipsburg on the Rhine, and while the siege was going on was killed by a cannon-shot, June 12 of that year. Cool, self-possessed, and cautious as a general, Marshal Berwick was at the same time not wanting in audacity and swiftness of action in a real crisis. He was careful of the lives of his men, and was also a rigid disciplinarian. Lord Bolingbroke pro- nounced him the best great man that ever existed. Montes- quieu said, 'In the works of Plutarch I have seen at a distance what great men were; in Marshal Berwick I have seen what they are." He married in 1695 a daughter of the earl of Clanricarde, by whom he had the son already mentioned. He married a second wife in 1699, by whom he had another son, known as Marshal Fitz-James. The Mémoires of Marshal Berwick, revised, annotated, and con- tinued by the Abbé Hosk, were published by the marshal's grandson in 1778. An untrustworthy compilation bear- ing the same title had been published about forty years earlier.

BERWICK-UPON-TWEED, a seaport town and muni- cipal and parliamentary borough, at the mouth of the Tweed, in 55° 46' N. lat. and 1° 59' W. long., 300 miles N. by W. from London, and 47 E.S.E. from Edinburgh. Berwick proper is built chiefly on the declivity and flat sunimit of an elevation rising abruptly from the north side of the river. The liberties of the borough, commonly called ' Berwick Bounds," containing an area of nearly eight square miles, extend to the N. and W., and form the N.E, extremity of England. The borough also includes (since 1835) the townships of Tweedmouth and Spittal on the south side of the river,—the latter a fishing and watering place on the cvast, the former a manufacturing village connected with Berwick by a bridge. The town has a pleasing appearance from the neighbouring heights, especially at full tide,—sea and river, ramparts, bridges and pier, buildings ancient and modern, and the red-tiled roofs of the houses contributing to the view. The principal streets are wide,

well built, and well paved, there being a remarkable absence, in so ancient a town, of narrow streets and old houses.

Berwick is one of the few remaining walled towns in the United Kingdom. The present ramparts were built in the reign of Elizabeth. 'To the north and east they are formed of earth faced with stone; bastions with cavaliers are

placed at intervals, and a ditch, now dry, extends to the river. Fronting the river are four-gun and six-gun batteries defending the entrance to the harbour, and a twenty-two-gun battery commanding the south side. These ramparts, which are perforated by five gateways, are

Scale of % Mile

Plan of Berwick-upon-Tweed.

generally in good repair, but since 1822 have been destitute of guns save for volunteer practice. The circuit is about 1 mile 3 furlongs; that of the older walls was more than 2 miles. The ruins of the latter, built by Edward I., and also surrounded by a ditch, enclose the suburbs of Castlegate, and the Greens,—the fishermen's quarter. The Bell Tower, from which alarms were given, and which is least dilapi- dated, has been recently secured from further decay. Between the extremity of these old walls and the Tweed are the remains of the old castle, which was allowed to become a ruin after the union of the crowns. There are no traces of the churches, monasteries, or other ancient buildings of the town. The barracks, built in 1719, accommodate nearly 600 nien; but they are now occupied only by militia, and the governor'sehouse has become a private dwelling.

The chief public buildings are the town-hall, finished in

Arms of Berwick.

1760, a stately building, surmounted by a spire 150 feet high, which contains a peal of eight bells; the new jail, erccted in 1849 ; the corn exchange, which is the principal public hall, opened in 1858; a new infirmary; two assembly rooms ; Masonic and Good Templar halls. The parish church is a plain Gothic building, without steeple, of the time of Cromwell. It was thoroughly and taste- fully renovated in 1855. The patronage belongs to the dean and chapter of Durham. A week-day lectureship is in the patronage of the Mercers' Company, London. There are also in the borough, including Tweedmouth and Spittal, three other churches connected with the Church of England, three with the Church of Scotland, four United Fresbyterian, two English Presbyterian, two Methodist, one Baptist, and one Roman Catholic. The only church building worthy of notice is Wallace Green United Presby- terian Church, opened in 1859. New cemeteries were opened at Berwick in 1855, and at Tweedmouth in 1858.. The town is well supplied with educational institutions ; and a local museum was established in 1867, where lectures are delivered during the winter. The town and suburbs have four public reading-rooms, and three newspapers are published. Two bridges connect the town with the south side of the Tweed. The older, which is very substantial, was finished in 1634, having taken twenty-four years in building. It has fifteen arches, and is 924 feet long, but only 17 feet wide. The other, situated a quarter of a mile up the river, is a magnificent railway viaduct, 126 feet high, with twenty-eight arches, which extends from the railway station—a castellated building on part of the site of the old castle—to a considerable distance beyond the river, This bridge was opened by Queen Victoria in 1850.

The Tweed is navigable as far as the old bridge, and the tide flows seven miles further. The entrance to the harbour has been improved and protected by a stone picr, built about sixty years ago, which stretches half a mile 8.E. from the north bank of the river's mouth, and has at the extremity a lighthouse with two fixed lights. The depth of water at the bar is 17 feet at ordinary tides, 22 feet at spring tides, but the channel is narrow, a large rocky portion of the harbour on the north side being dry at low water.

The ancient charter of the borough of Berwick was confirmed by various sovereigns from Edward I. to James I., who added new officers and privileges, but especially gifted to the burgesses all the lands within the

liberties which were not private property. These lands, amounting to 3077 acres, or two-thirds of the whole, are partly divided into farms, partly into meadows occupied or let by the resident freemen and freemen's widows. The annual value of a meadow, seniority determining the allocation, ranges at present from £11, 5s. to £2, 98. 3d. The roll of freemen contains about 1000, of whom 368 are

resident. The total rental of the corporation's property is now about £10,800. Since the Municipal Reform Act, 1835, the borough has been governed by six aldermen and eighteen councillors; and in 1842 "the power of life and death" was removed from the Quarter Sessions to the Newcastle Assizes. The custom of specially men- tioning Berwick-on-Tweed after Wales, though abandoned in Acts of Parliament, is still retained in certain proclama- tions. The title of " county in itself " also helps to recall its ancient history. It is the seat of a Poor Law Union, and the rateable value of the borough (1875) is £53,195. Berwick has sent two members to the English parliament since the reign of Mary. The registered electors number 1285, of whom 368 may vote as freemen, about 200 being doubly qualified. Population in 1871, 8731, or, including the conjoined townships (Tweedmouth, 2809, and Spittal,

1742), 13,282.

Of the origin or early history of Berwick nothing is known. It probably sprung into importance during the long struggle between the Scots and Saxons for the possession of Lothian and the Merse. Egfrid, king of Northumbria, seeking to extend his boundary be- yond the Forth, was routed at Dunnichen, 685, and driven back to the Tweed. But it was not until the battle of Carham, 1018, that the latter river was finally secured as the boundary, and Berwick obtained the frontier position to which it owes its fame. It seems rapidly to have grown in size, wealth, and influence. Its name occurs as a royal burgh in the reigu of Alexander J., along with Edinburgh, Roxburgh, and Stirling, and with them, from David I., it elected the tribunal which from their number was called the "Court of the Four Burghs." The castle of Berwick was one of the strongholds given up to Henry II. of England to be security for the homage due by William the Lion

as the price of his liberty, but it was restored with the others by Richard Cceur-de-Lion in 1189. At Berwick took place several of the conferences held be- tween Edward I. and the competitors for the Scottish crown, and his decision in favour of Baliol was given in the castle, Nov. 1292. Four years later Edward marched north to punish his rebellious vassal, and began his invasion by an attack upon the town which was at once the key of the kingdom and its commercial capital. The English king, familiar with the place, and infuriated by the repulse of his fleet in the river, led the land attack in person. Being very slightly fortified the town was speedily stormed, and no mercy was shown to the inhabitants. One memorable incident is recounted. A company of trading Flemings held out against the besiegers in their fortified building, the Red Hall, until it was set on fire. They were bound by their charter to defend it to the last een against the English, and they perished in the flames. Berwic never recovered commercially from the massacre and pillage of this terrible Good Friday. Its efforts again to rise were hindered by the ever-renewed Border warfare, and it gradually sunk to the rank of an ordinary market-town.

On Edward's return from his victorious march through Scotland, he determined to make the town impregnable with stone walls, but before his commands could be accomplished it was recaptured by the Scots as a consequence of the English defeat at Stirling Bridge. On Edward's approach the following year, however, the Scots re- tired, and during the remainder of his reign it continued in the hands of the English. Here, in 1805, one quarter of Wallace's body was exposed, and shortly afterwards the countess of Buchan was suspended in a cage from one of the castle towers, as a punish- ment for courageously performing the privilege of her family by placing the crown on King Robert Bruce at Scone. Edward II. spent the winter of 1310 at Berwick after an ineffectual invasion of Scotland. Here, too, on June 11, 13814, the great English army assembled which was defeated a fortnight later at Bannockburn. Jn 1318 the town, now well fortified, was captured by Bruce, through the help of one of the garrison ; a siege by Edward, which followed, rendered famous by the engines einployed both in the river and land attacks, was not successful. It remained in the hands of the Scots till 1833, when it was besieged by Edward III., and the hope of relief by the Scottish army being disappointed by their defeat at Halidon Hill, about 2 miles from Berwick, the town and

castle were immediately, according to agreement, delivered up to the English king. The next 130 years saw Berwick occasionally attacked by the Scots, and sometimes with success, but they held it only for short periods until 1461, when Henry VI., in gratitude for refuge after the battle of Towton, made it over to them. In 1482, during the disputes between James III. and his nobles, it surrendered to the English army, and was never retaken by the Scots. Henceforward it occupied in Scotland, in relation to Eng- land, the position for long of Calais in France—an important strong-hold, the sole remnant of wide-spread conquest. This position

explains the possession by Berwick, until the union of the crowns, of a civil and military establishment (with lord-chancellor, lord- chamberlain, Domesday Book, governors of town and castle, &¢.) rescmbling that of a small kingdom. It was that appointed by Edward I. for all Scotland, and was ready to expand, as it had been compelled to contract its sphere, should more territory be again acquired north of the Tweed.

BERWICKSHIRE, a maritime county of Scotland, forming its §.E. extremity, bounded N.E. by the German Ocean, N. by Haddington, W. by Midlothian, 8.W. by Roxburgh, 8. by the Tweed, which separates it from Northumberland, and S.E. by the liberties of the town of Berwick. Its greatest length from E. to W. is 314 miles; its greatest breadth 194; area about 464 square miles, or 297,161 acres. It is naturally divided into three districts, Lauderdale, or the valley of the Leader, in the W.; Lammermuir, the upland district occupied by the hills of that name, in the N.; and the Jerse (probably a corruption of " March" or borderland), the largest district, occupying the 8.E. of the county. The Lammermuirs are a range of round-backed hills, whose average height is about 1000 feet, while the highest summit, Sayrs Law, reaches 1753 feet. From these hills the Merse stretches to the S. and E., and is a comparatively level tract of country, traversed, however, from N.W. to §.E. by distinct parallel ridges. The coast line is lofty, rocky, and precipitous, broken by ravines, and not accessible, except at Eyemouth harbour, for small vessels, and at one or two other places for fishing-boats. St Abb's Head, a peninsular promontory with a light- house upon it, rises to nearly 300 feet. The Eye is the only river of the

county which falls into the sea. The others—the Leader, the Eden, the Leet, and the Whiteadder with its tributaries, the Blackadder and the Dye —all flow into the Tweed. Of these the largest and most important is the Whiteadder, which has its source on the East-Lothian side of the Lammermuirs, and, following a sinuous course of 35 iniles, falls into the Tweed within the " Bounds" of Berwick. The climate of Berwickshire is chiefly influenced by its maritime position. The winter is seldom severe in the lowland districts; but spring is generally a trying season on account of the east winds, which often continue intosummer. Drainage has remedied the former excessive humidity, and the climate is now excellent, in relation both to the health of the inhabitants and to the growth of vegetation.

Berwickshire, geologically, consists of Silurian rocks in the hilly region, Devonian or Old Red Sandstone in the south- west, and carboniferous limestone in the Merse. Large masses of porphyritic and trap rock occasionally occur, of which St Abb's Head is an example. The sea-cliff to the north-west of the mouth of the Eye is formed of con- glomerate or pudding-stone. There is an interesting and somewhat famous geological appearance at a point called Siccar, near Cockburnspath, where the sea has laid open very plainly the junction of the primary and secondary strata.

The soils of Berwickshire are extremely various. On the same farm a great diversity may be found. Along the rivers is a deep rich loam, resting on gravel or clay, chiefly the former. The less valuable clay soil of the Merse has been much improved by the effective system of drainage which is everywhere carried out. The more sandy and gravelly soils are suitable for the turnip crops, which are a marked agricultural feature of the county. To these soils the landlords and tenants of Berwickshire have applied themselves with such intelligence, mutual good-will, liberality, and spirit, that the county now stands in the first rank in regard to agriculture. The farms are large, and are commonly held by a nineteen years' lease. Nowhere is farming conducted more scientifically or with better success. According to the agricultural returns for 1874, the total acreage under all kinds of crops, bare fallow, and grass,

was 192,138, or more than three-fifths of the entire area. Of this, 63,526 acres were under corn crops, 34,155 under green crops, 56,940 under clover and grasses, and 36,858 permanent pasture, meadow, or grass not broken up in rotation (exclusive of heath or mountain land), The average extent of land occupied by each occupant was 194 acres. Wheat was grown on 6373 acres; barley or bere, on 21,469; oats, on 33,130; potatoes, on 2593; turnips and swedes, on 30,345. Of live stock there were 5356 horses, 16,979 cattle, 285,578 sheep, 4527 pigs. Though about the twentieth in size of the Scottish counties, Berwickshire stands fifth in the number of acres under corn crops, fifth also in green crops, and ninth in the number of sheep. The farm-buildings are convenient and well built. These include cottages for the farm-labourers, or hinds, and their families,—the ordinary staff consisting of a steward, a shepherd, and a number of ploughmen propor- tionate to the size of the farm. The farm-labourers, who are physically well developed, are as a whole a frugal, industrious, intelligent race. They are somewhat migratory in their habits, being too ready to move froin place to place year after year. This feature in their character, which they may have by inheritance as Borderers, has admirably fitted them for colonial life, to which the lack of employment in mining or manufactures in the county has largely drawn the surplus population. |

The minerals of Berwickshire are insignificant. Coal, copper ore, and ironstone exist in such small quantities that attempts to work them have been abandoned ; and the lime- stone is at too great a distance from a coal district to warrant competition with theadjoining counties. The Tweedsalmon fisheries are productive of an important trade, and are so subject to vicissitudes that much attention has been paid to them by means of legislative enactments. Thelesser rivers of the Merse are held in high esteem by anglers. Besides Eyemouth therearethree villages—Burnmouth, Coldingham Shore, and Cove—engaged in the sea-fisheries, which are of considerable and increasing value. Cod, haddock, herring, ling, lobsters, and crabs are the principal produce. Berwickshire cannot boast of many manufactures, Earlstoun sends out ginghams and woollen cloths, At Cumledge, also, on the Whiteadder, there is a factory for heavy woollen cloths ; and four miles further down the river, at Chirnside Bridge, is one of the largest paper mills in Scotland. The other manufactures are all connected with agriculture, such as distilleries, breweries, tanneries, &c.

The trade is also mainly agricultural. Fairs are held at Duuse, Lauder, Coldstream, Greenlaw, and Oldhamstocks; but the sales of cattle and sheep are now mostly accomplished at the weekly or fortnightly auction marts at Reston, Dunse, and Earlstoun. The grain markets are held at Dunse and Earlstoun. Berwick, from which the county derives its name, is still its chief market-town. There is, however, no legal or fiscal connection between the county and the borough.

The early history of Berwickshire is to a great extent bound up with that of the ancient frontier town ; from its position it also suffered much during the Border wars. The inost noteworthy antiquities are Coldingham Priory in the KE. and Dryburgh Abbey inthe S.W. They were burnt in the same year, 1545, during the barbarous inroad of the English army under the earl of Hereford. About four miles N. from Coldingham are the ruins of Fast Castle ("The Wolf's Crag" of the Bride of Lammermoor), situated on a peninsular cliff, 120 feet by 60, and 70 feet above the sea. A little further north is tle Pease or Peaths Bridge, built by Telford, in 1786, over the deep glen which forms the celebrated pass—of old one of the strongest natural defences of Scotland. Near it is Cockburnspath Tower, once a strong fortress, now inruins. In the west of Berwickshire, besides Dryburgh, there are, at Earlstoun, the remains of the ancient

tower "The Rhymer's Castle," the traditional residence of Thomas Learmont, commonly called Thomas of Ercildoune or Thomas the Rhymer. About a mile from Earlstoun is Cowdenknowes, on a hill above which grew the '" bonnie broom" of the old song. None of it now remains, it having been gradually encroached upon by the plough, and the last of it killed by the severe frost of 1861-62. Hume Castle, the ancient seat of the Home family, also towards the west, has a most commanding view, and is itself visible from nearly every part of the county. Traces of Roman occupa- tion and of ancient British settlements exist in various parts of the Merse. Edin's or Etin's Hall, on Cockburn Law, about four miles north of Dunse, still goes under the name of the Pech's or Pict's House. There are many large mansions throughout the county, the principal being Thirlestane Castle (earl of Lauderdale), Mertoun House (Lord Polwarth), Mellerstain and

Lennel House (earl of Haddington), Nesbit (Lord Sinclair), Dunse Castle (Hay), Wedderburn and Paxton (Milne Home), Lees (Sir John Marjoribanks),{Ladykirk (Baroness Marjoribanks), Ayton Castle (Mitchell Innes), Hirsel (earl of Home). The chief towns are Greenlaw, the county town, with a population of 823; Dunse, 2618 ; Lauder, 1046, a royal burgh, which unites with the Haddington group of burghs in returning a member to parliament; Coldstream, 1724; and Eye- mouth, 2324, the only seaport of the county. There is one sheriff for the three border counties of Berwick, Rox- burgh, and Selkirk, and a sheriff-substitute holds his court in Duuse. Justice of the Peace courts are held at Cold- stream and at Ayton, and a burgh court at Lauder. The county is divided into thirty-one parishes, and it returns one member to parliament. Population of Berwickshire, 36,486—umales, 17,414 ; females, 19,072. .

The fauna and flora of Berwickshire have been care- fully described by the late Dr George Johnston, and further information may be obtained regarding these from the Transactions of the Berwickshire Naturalists Club.

BERYL, a mineral species which includes, in addition to what are ordinarily known as beryls, the aquamarine or precious beryl and the emerald. The similarity between the beryl and the emerald was pointed out by Pliny, and the ouly points of distinction are the green colour of the emerald and the somewhat superior hardness of the beryl. The colour of the emerald is generally believed to be due to the presence of a minute portion of oxide of chromium, although M. Lewy asserts, from analysis of Muzo emeralds, that it is really owing to the presence of organic matter. Their composition is—

Beryl Emerald. Siac Meereriseaacs iawveianeeaeens akepte 67°00 68°50 PANIIT N UAeictessistscsscccceeseeecense Ocal 15°75 (CONTGIIVGN cc tiacemaaentecaceoteeicene meen) 12‘50 C@MOMMAMVORIGE,.., «20. s. <0saeees 0°00 0°30 ROTA ORG Clvicsss sas acisviedeinlees sites’ 1°00 1°00 Bit Ream Nerasreg rst gonias ray mtioneaen os 0°50 0°25

The metal glucinum, from its presence in the beryl, is sometimes termed beryllium. The beryl crystallizes in six- sided prisms with the crystals often deeply striated in a longitudinal direction ; its harduess in the mineralogical scale is from 7°5 to 8, and its specific gravity from 2°67 to

2‘732. Leaving out of account the emerald, the colours of the beryl range from blue through soft sea green to a pale honey yellow, and in some cases the stones are entirely colourless. The aquamarine is so named on account of its bluish green colour, “ qué viridetatem puri maris imitan- tur” (Pliny, V. H., xxxvii. 20). The chrysoberylus, chry- soprasus, and clrysolithus of ancient jewellery appear to some extent at least to have been names applied to different shades of beryl. The beryl was highly prized for use in jewellery by the Romans, by whom it was cut into six-sided prisms (cylindrv) and mounted as ear-drops, Some of the

finest examples of ancient Greek and Roman gem engraving are found executed in beryl. ‘The grandest intaglio extant of the Roman period is upon an aquamarine of the extraordinary magnitude of 24 by 24 inches: the bust of Julia Titi signed by the artist EYOAOC ETIOTE!. For nearly a thousand years it formed the knosp of a golden reliquiary presented by Charlemagne to the abbey of St Denys, in which it was set with the convex back uppermost, being regarded as an invaluable emerald” (King’s Precious Stones, Gems, and Precious Metals). The great abundance of aquamarine and other forms of beryl in modern times has very much depreciated its value for use in jewellery, but it is still set in bracelets, necklaces, &c., and used for seals. he finest aquamarine known isa large stone, in size and shape somewhat like a small calf’s head, weighing 18 ib, the property of the emperor of Brazil. A beryl weighing 2900 ib and another of 1076 Ib weight have been found at Grafton, New Hampshire, in the United States; but these gigantic stones are opaque, and of no value for jewellery. Beryl is found widely disseminated, occurring, among other localities, in Siberia, Canjargum in Hindustan, Rio San Matteo in Brazil, Ehrenfriedersdorf in Saxony, and Schlackenwald in Bohemia. In the United Kingdom it occurs in the Mourne Mountains, county Down ; in the neighbourhood of Killiney, county Dublin ; in county Wicklow ; in several places in Cornwall; and in Aberdeenshire in the granite of Rubislaw (Davidsonite) ; besides occurring in the alluvium of the upper reaches of the Dee and Don. In the United States it is found in the states of New Hampshire, Maine, Massachusetts, Con- necticut, and Pennsylvania.

BERZELILUS, Jons Jaxos, one of the most illustrious of modern chemists, was born on the 20th of August 1779, at a farm near Wafversunda, in Ostergdtland, Sweden. At the age of nine he was left an orphan in the charge of his stepfather, A. Elmark of Ekeby, a learned and amiable man, gifted, too, it would seem, with some prophetic insight, for one day he said to the child, "Jakob, I think you will tread in the footsteps of Linnaeus, or be another Cartouche!" From that day a desire for distinction as a man of science awoke in the child's breast. In 1793 Berzelius entered the gymnasium school at Linképing, where he made rapid progress. During his holidays, spent in the country, he met a man who instructed him in the elements of entomology, and thus gave a fresh impetus to his scientific proclivities. 'The latter soon developed into a passion, and under Hfornstedt at Linképing progressed rapidly till he left the college in 1796, and proceeded to the University of Upsala. In 1798 he began to study chemistry under Professor Afzelius; and although in those days the lectures were without practical experiments and extremely uninteresting, he became more and more absorbed in the study. In 1800 he was called to Stockholm as assistant to the royal physician, Dr Hedin, and his success as a practical chemist began. The Italian, Volta, had in 1800 invented the galvanic battery which bears his name; and Berzelius was one of the first persons in Europe to observe the greatness of this discovery. In 1802 he published a treatise on the subject. In 1803 he became professor of physics, and by his lectures rapidly founded a new, a rational school of physiology, and threw new light on many difficult points connected with the chemical and physical characteristics of animal life. In the same year he published his Lissay on the Division of Salts through Galvanism, in which he propounds the electro-chemical theory, the honour of first laying down which is divided between Berzelius and Davy. In conjunction with Hisinger, Berzelius then published in numbers T'reatises on Physics, Chemistry, and Mineralogy, a work of the greatest value for science. Honour after

honour was heaped upon him; in 1810 he was called to be a member of the Medical College of Sweden; in 1808 he was elected president of the Academy of Sciences. Two years later he brought out his famous treatise On the Lixed Proportions and Weights of Atoms. Ue then took up mineralogy with special ardour, and published his Treatise on the Blowpipe; he set up for himself a regularly graduated chemical system of minerals, and the » value of this was felt to be so great that the Royal Society of London voted him its gold medal for it. After incessant labour he retired, in 1832, from his professorship at Stock- holm, having never been connected as teacher with any of the universities. In 1842, while he was engaged in a chemical experiment, an explosion took place and he was much injured, but recovered and continued to work on till the close of his days. He died August 7, 1848. After Linneeus, his is considered to be the greatest name in science of which Sweden can boast.

BES, the name of an Egyptian god, apparently the same as that of the city Bessa. He is stated to have been worshipped and to have had an oracle at Abydos accord- ing to Ammianus Marcellinus,' and according to others at Antinoe or Antinoopolis. The name Bes is found in Egyptian monuments attached to a god clad in a lion's skin, the head and skull of the animal covering his head and con- cealing his features ; his legs are bowed like Ptah, and his whole appearance is grotesque, resembling in other respects the Greek Hercules. This god is represented at a later period in various attitudes and actions, in adoration to Harpocrates, styled his lord or master, playing on the tambourine, the triangular harp, and other musical instru- ments, brandishing swords, and at the Roman period armed in the paludamentum and holding a sword and buckler. Although supposed to be a form of Typhon he is quite distinct from Set, the ass or gryphon-headed god. For head attire Bes often wears a kind of cornice surmounted by four or five feathers of the hawk. He does not appear among the deities of Egypt till about the 19th or 20th dynasty, and is apparently of foreign origin, being found on the coins of Gaulos, with Phoenician legends, as if belonging to that people and a form of Baal. He appears in the Ritual as the guardian of the 20th Pylon or doorway of the Aahlu or Elysian fields, with his mystical

names. His head generally surmounts the little cippi of Harpocrates, and some texts ally him with the god Amen. A temple in Nubia, built by Tirhakah about 690 8.c., has its columns in shape of this god. His figures and busts are common in Egyptian art of a later age, and individuals were called after him both in earlier and later times.?

BESANQON, a city of France, capital of the department of Doubs, 45 miles E. of Dijon, on the River Donbs, which flows round it on three sides. It is well protected by strong fortifications and a citadel on an almost impregnable rock, 410 feet above the river. The town is in general well built, and has three main streets running from N. to 8. The principal buildings are the Gothic cathedral of St Jean, a court-house, a town-hall, the Granvelle palace, the royal college, an arsenal, a large hospital, barracks, a theatre, a library of 300,000 volumes, a museum and picture gallery, and several handsome fountains. Among the numerous Roman remains are a triumphal arch erected in honour of Crispus Ceesar, son of Constantine, a theatre, and an amphitheatre. Besancon is the see of an arch- bishop, has tribunals of primary jurisdiction and commerce, and is the head court for the departments of Doubs, Jura, aud Haute Sadne. It possesses also a university-academy, a diocesan seminary, a royal academy of science and

1 Ammian, Marcell., xix. 164; Jablonski, Panth., v.c. 7; Wilkin- son, Afanners and Customs, vol. iv. p. 441. 2 Birch, Gallery of Antiquities, p. 47.

belles-lettres, a lyceum, an antiquarian museum, a society of agriculture, and schools of medicine, artillery, and design, besides two deaf and dumb institutions. The chief branch of industry is the manufacture of watches and jewellery. There are also some considerable breweries and manufactories of carpets, porcelain, hardware, Seltzer-water, artificial flowers, &c. Besancon enjoys a good position for the commerce between France and Switzerland. Population in 1872, 39,868. Long. 5° 56’ 26” E., lat. 47° 14’ 12” N.

Besancon is a place of great antiquity. Under the name of Vesentio, it was, in the time of Cesar, the chief town of the Sequani. Under the Roman emperors it was rich and prosperous, and Aurelian especially had a great

liking for the place. Many of the streets still bear the old Roman names. It was frequently destroyed and rebuilt during the Middle Ages, and the present city stands twenty feet above the original level. Inthe 12th century it passed with the rest of Franche-Comté to the German empire, and was made a free city by Frederick I. In 1584, Granvilla, the minister of Charles V. became archbishop of the see, and afterwards founded a university in the town, which existed till the Revolution. By the treaty of Westphalia, Besangon was made over to Spain, and many traces of Spanish occupation still remain. In 1660 Louis XIV. besieged it in person, and it was assigned to France by the peace of Nimeguen. In 1814 and 1815 it was invested and bombarded by the allies; and in the war of 1870-71 it formed an important position in the move- ments of the French army.

BESKOW, BernuarpD von, Baron, the Swedish drama- tist, was born at Stockholm, April 19, 1796. Beskow's first book, Poetical Hfforts, published in 1818, made a favourable impression with the public, and he wrote the prize poem for the Swedish Academy some years later. His dramas, however, are his chief claim to remembrance ; the best are Torkel Knutsson, Hrik XIV., Birger and his Race, and Gustavus Adolphus in Germany. Torkel Knuts- sow 1s considered the finest drama that Swedish literature possesses. In the highest sense of the word, these are not, however, dramas at all, since they lack unity and fail in the developmeut of character, but they are grandiose historical studiesin a dramaticform. Beskow's poetry is over-decorated with phrases, and becomes the prey of sonorous antithesis. Besides lyrical and dramatic poetry, Baron von Beskow distinguished himself in history, philosophy, politics, and travels. In 1828 he was elected president of the Swedish Academy, and became an enthusiastic and liberal patron of national poetry and art. Céhlenschlager translated his dramas into Danish, and various persons rendered them into German. He died on the 17th of October 1868.

BESSARABIA, a government in the S8.W. of European Russia, on the borders of Austria and the Danubian princi- palities, with an area, since the cessions of the Paris peace in 1856, of 14,577 English square miles. 'Till the last Eastern war Bessarabia occupied the whole space between the Dniester and the Pruth from the Austrian frontier to the Black Sea. The northern portion of Bessarabia is mountainous, the southern flat and low,—

the limit between the two being marked by the so-called upper Trajan wall, an artificial elevation executed, according to some, in the end of the 2d century a.D., under Trajan, but, according to others, in the 3d century, under Probus. This wall extends from the confluence of the Botna with the Dniester to the Pruth. In northern or mountainous Bessarabia two systems of elevations may be distinguished. The first is an immediate offshoot of the Carpathians, and occupies the whole of Khoteen, or the north-western district of the government. It rises about 450 feet above the valley of the Dniester, and consists of strata of Paleeozoic formation, sandstones, schists, and limestones. 'The second system is especially extended in the very middle of Bessarabia, and may be called the Yassa-Orgievian range. It consists of limestone of secondary formation, and its highest point is Mount Megura, about 20 miles §. of Bielitz, between Bakhmut and Poltava. The low portion of Bessarabia stretches south from the Trajan wall, with a length of 133

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miles and a breadth of 33, and is well known asthe Budjak steppes. The surface is perfectly level ; and the soil, except in the region along the shore, consists of a thick bed of loam. 'The province is washed on its eastern parts by the Black Sea only for the distance of 20 miles to the south of the estuary of the Dniester. Its only seaport is that of Akerman, situated on the estuary of the Dniester. This river divides Bessarabia from Kherson and Podolia for a distance of almost 600 miles, The shores of the Dniester are in general high and steep, and numerous bars obstruct its channel, particularly at Yampol and Bakat. On the Bessarabian bauk are situated the towns Khoteen, Cosoka, aud Bender; and thirteen natural harbours for ships are counted along this side of the river. Among the principal tributaries are the Reuth, the Ikel, the Buik, and Botna. Another important stream is the Pruth, of which the left shore skirts the province for a distance of more than 140 miles, 'The navigation on the Pruth is not important ; its course is impeded by bars and falls. The only important lakes in the government lie along the coast of the Black Sea in the Akerman district. Marshes extend along the Reuth and its tributaries, and there are also some along the Botna ; they offer no great obstacles, however, to free communication. Bessarabia up to 1856 possessed great quantities of sedimental salt; but after the cessions of

the Black Sea coast and the salt lakes, the quantity obtained, which formerly exceeded 60,000 tons, almost came to nothing. The climate of Bessarabia is temperate. The medium annual temperature of Keesheneff, 230 feet above the sea-level, is 50° Fahr.; the temperature of the warmest month, about 73°; of the coldest, about 20°. In the valley of the Dniester the climate is in general much healthier than in that of the Pruth; the climate of the north-west is much colder, and spring commences there ten days later.

In all the upper part there are forests, consisting princi- pally of beech, oak, aud sorb, besides small quantities of birch. The chief forest region lies along the heights of the Orgieff and Yassa districts about the Megura Mountains, and extends thence east to the Dniester and south-west to KXeesheneff. The Khoteen hills are almost all covered with timber. 'The three northern districts, Khoteen, Bielitz, and Soroka, are especially suited for agriculture, and may be regarded as the granary of Bessarabia. The two intermediate districts of Orgieff and Keesheneff, though possessing a sufficiently fertile soil, are pre-eminently woodland ; while the two southern, Bender and Akerman, although also fertile, have a steppe-like character, and are better adapted to the rearing of cattle.

Bessarabia, in keeping with its position near the Danube, playcd an important historic part in ancient times, especially in the begin- ning of our era, when it served as a key to the eastern approaches of the Byzantineempire. And thus, from immemorial times, nations were ceaselessly alternating with nations within its borders. The original inhabitants were the Cymri, suceeeded by the Scythians. Herodotus, who had been in the Greek colonies of the Black Sea, relates that near the mouth of the Dniester (Tyras) there lived the Tyritians, possessing on the estuary of that river the town of Tyras (Oxeia or, aecording to Pliny, Ophiusa). In the 2d century after Christ Bessarabia was occupied by the Geti and offshoots from the Bastrom, and in 106 a.p., the Geti were conquered by Trajan. After this subjugation of the land by the Romans, the present Bessarabia went along with Walachia, Moldavia, and Transylvania, to compose Dacia. In the 3d century appeared the Goths, recently converted to Christianity. In the 5th century Bessarabia was over- run by the Huns; after the Huns, in the end of the 5th century, arrived the Avars and the Bulgarians; and last of all came the Slavonians (Lutichi and Tevertzi), who built themselves the town

of Bielgorod. In the 7th ceutury appeared the race of the Bessi from whom the country acquired its present name. In the 9th cen- tury arrived the Ugrians; in the 10th the Pechenegs; in the 11th the Kumans, the Uses, and the Polovtzians; and in the 13th the Mongolians, under the leadership of Batia. In this last century, also, the Genoese founded their colonies ou the shores of the Dniester. In 1367 Bessarabia formed a part of Moldavia. In 1508 the south-

ern portion of the country, or Budjak, fell under the power of the Turks; and in 1560 there settled in that district 30,000 Nogaitzians, who had devastated northern Bessarabia, then inhabited by Roum- . anians. These Nogaitzians aequired the name of the Bielgorod horde. Russian armies occupied Bessarabia during all the Turkish wars in the 18th century, and again in 1806-12, when it was united to Russia by the Bukharest treaty. By the Paris convention of 1856, Russia ceded the districts of Ismael and the greater part of the Cagul to Turkey, and these now form a part of Roumania. At present the government is divided into seven districts, those of Keesheneff, Akerman, Bender, Orgieff, Soroka, Khotcen, and Yassa. Bender and Akerman are subdivided into five cantons, each of the others into four. In 1860 the population numbered 988,481, and had a very varied ethnographical character. The principal portion consisted of Moldavians, desccndants of the ancient Dacians. The Russnayks or Galicians and Reyani (that is, those who have inhabited the reyas provinces of the Turkish empire), amounted to 130,000, mostly found in the districts of Khoteen, Soroka, Yassa, and Orgieff. Malo-Russians (or Little Russians) began to settle in the country in the 17th century, and now number 70,000. The Bul- garians began their immigration from the Turkish provinces in 1806-12, afterwards in 1830-34, and finally after 1856; they nuinber 60,000. These eolonies are administratively divided into three circles :—the Upper Budjak, consisting of 19, the Lower Budjak of 19, and the Ismael of 5. The Germans began to settle in Bes- sarabia in 1814. 'Their colonies, to the number of 25, are situated n the Akerman distriet, along the River Cogalnika. The Jews, who number 70,000, live partly in the eities Keesheneff, Khoteen, &e., but are also settled in 16 agricultural colonies. The Gypsies, or Zigan, amount to 10,000. They live a wandering life; but in

the Akerman district two villages, Pharaonofo and Kaera, are permanently inhabited by them. A considerable number of Arme nians and Greeks have also settled in the country during the present century.

BESSARION, JoHannzs, titular patriarch of Constanti- nople, and one of the illustrious Greek scholars who con- tributed to the great revival of letters in the 15th century, was born at Trebizond in 1389, or, according to others, in 1395. In 1423 he entered the order of St Basil, and studied under the celebrated Platonic scholar, George Gemistus Pletho. In 1437 he was made archbishop of Nicaea by John Palzologus, whom he accompanied to Italy in order to briug about a union between the Greek and Latin Churches. At the councils held in Ferrara and Florence Bessarion supported the Roman Church, and gained the favour of Pope Eugenius, who invested him with the rank of cardinal. From that time he resided per- manently in Italy, doing much, by his patronage of learned men, by his collection of books and manuscripts, aud by his own writings, to spread abroad the new learning. He held in succession the archbishopric of Siponto and the bishoprics of Sabina and Tusculum. In 1463 he received the title of patriarch of Constantinople ; and it was only on account of his Greek birth that he was not elevated to the Papal chair. For five years he was legate at Bologna, and he was engaged on embassies to many foreign princes, among others to Louis XI. of France in 1471. Vexation at an insult offered him by Louis is said to have hastened his death, which took place, on the 19th November 1472, at Ravenna. Bessarion was one of the most learned scholars of his time. Besides his translations of Aristotle's Meta- physics and of Xenophon's Memorabilia, his most important work is a treatise directed against George of Trebizoud, a violent Aristotelian, and entitled Zn Calumniatorem Pla- tonis. Bessarion, though a Platonist, is not so thorough- going in his admiration as Pletho, and rather strives after a reconciliation of the two philosophies. His work, by opening up the relations of Platonism to the main questions of religion, contributed greatly to the extension of specu- lative thought in the department of theology.

BESSEGES, a town of France, in the department of Gard, 20 miles north of Alais by railway, of importance for its coal and iron mines and blast- furnaces. Population in

1872, 8036.

_BESSEL, Frrepricn WitneEtm, a distinguished Prus- Slan astronomer, was born at Minden on the 22d July

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1784, At an early age he was placed in the counting- house of a merchant at Bremen. His strong desire to obtain a situation as supercargo on a foreign voyage led him to the study first of navigation and then of mathema- tics. He devoted himself with the utmost ardour to mathematical and astronomical calculations, and in 1804 undertook the reduction of the observations made on the comet of 1607. Hisresults were communicated to Olbers, who warmly praised the young astronomer, and in 1806 recommended him for the post of assistant to Schréter in the observatory at Lilienthal. In 1810, after his reputation had been much extended by various memoirs, treating par- ticularly of cometary orbits, he was appointed director of the new observatory then being founded by the king of Prussia at Konigsberg. He was at the same time made professor of astronomy and mathematics in the university of that town. Bessel, from his keen practical intelligence, thorough acquaintance with all instrumental appliances, and complete mastery of the methods of calculation, was admir ably fitted for the post of observer. The establishment at Konigsberg was one of the best of its kind, and its observa- tions, published continuously from 1813, are of great value. In 1818 Bessel completed a task on which he had beeu engaged for several years—the reduction of Bradley's price- less but neglected Greenwich observations. The results were published in the volume entitled Pundamenta Astro- nomic, the importance of which for astronomical science cannot be overrated. By its publication the author at once took his place among the first astronomers of Europe; he was received with honour by the various foreign scientific societies, and was made a privy councillor by the king of Prussia. Of his later labours in practical astronomy perhaps the most important is his determination of the parallax of the star 61 Cygni, accomplished by methods of extreme ingenuity and delicacy. The Tabule Regiomontane, 1830, and Astronomische Untersuchungen, 2 vols., 1841-42, are continuations of the undamenta. His memoirs, contained in the Astronomische Nachrichten, are exceedingly numerous, A volume of

Popular Lectures was published by Schumacher after the death of the author in 1846.

BETEL NUT. The name betel is applied to two different plants, which in the East are very closely associated in the purposes to which they are applied, The betel nut is the fruit of the Areca or betel palm, Areca Catechu, and the betel leaf is the produce of the betel vine or pan, Chavica Betel, a plant allied to that which yields black pepper. The areca palm is a graceful tree, which appears to be indigenous over a wide area in the East, including Southern India, Ceylon, Siam, the Malay Archipelago, and the Philippine Islands, in the whole of which it is extensively cultivated, The fruit of the palm is about the size of a small hen's egg, and within its fibrous rind is the seed or so-called nut, the albumen of which is very hard and has a prettily mottled grey and brown appearance, The chief purpose for which betel nuts are cultivated and collected is for use as a niasti- catory,—their use in this form being so wide-spread among Oriental nations that it is estimated that one-tenth of the whole human family indulge in betel chewing. For this use the fruits are annually gathered between the months of August and November, before they are quite ripe, and deprived of their husks. They are prepared by boiling in water, cutting up into slices,and drying in the sun, by which treatment the slices assume a dark brown or black colour. When chewed a small piece is wrapped up in a leaf of the betel vine or pan, with a pellet of shell lime or chunam ; and in some cases a little cardamom, turmeric, or other aromatic is added. The mastication causes a copious flow of saliva of a brick-red colour, and gives the mouth, lips, aud gums of the chewer a repulsive appearance. The habit blackens the teeth, but it is asserted by those addicted to

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it that it strengthens the gums, sweetens the breath, and stimulates the digestive organs. Among the Orientals betel is offered on ceremonial visits in the same manner as wine is produced on similar occasions by Europeans. Betel nuts are further used as a source of catechu, which is pro- cured by boiling the nuts in water. The water of the first boiling becomes red and thick, and when this is inspissated after the removal of the nuts it forms a catechu of high astringency and dark colour called in Bombay

“Kossa.” The nuts are again boiled, and the inspissated juice of the second decoction yields a weaker catechu of a brown or reddish colour. SBetel nuts are used to some extent in the United Kingdom as the source of a charcoal tooth-powder, which, however, has no special virtue, and they are also employed by turners for ornamental purposes, and for coat buttons on account of the beauty of their structure. Recently thoy have come into repute as a vermifuge, and have been admitted into the Supplement to the British Pharmacopeia (1874) asa cure for tape-worm. The quantity of betel nuts consumed in the Hast is enormous. Ceylon alone exports about 70,000 cwt. annually ; Travancore has upwards of a million of trees, the average produce of each being 300 nuts annually, or about 6000 tons in all; Sumatra is little less productive, and the small island of Penang, named from the Malayan name for the tree, is estimated to contain half a million trees. The nuts of other species of Areca are used by the poorer classes in the East as substitutes for the genuine betel nut.-

BETHANY (i.e, probably, the “House of Dates”), a village, now called El’ Azariyeh, or Lazarich, nearly two miles E.S.E. from Jerusalem, on the eastern slope of the Mount of Olives, at a height of 2208 feet above the sea. The whole importance of the place is derived from its connection with New Testament history, it being never mentioned in the Old Testament or Apocrypha. It was the residence of Lazarus and his sisters, a favourite retreat of the Saviour, and the scene not only of his greatest miracle but also of his ascension. From the 4th century down to the time of the Mahometan invasion several ecclesiastical buildings were erccted on the spot, but of these no distinct traces remain. Lazarieh is a poor village of about twenty families, with few marks of anti- quity ; aud there is no reason to believe that the houses of Mary and Martha and of Simon the Leper, or the sepulchre of Lazarus, still shown by the monks, have any claims to the names they bear.

BETHEL (i.e, in Hebrew, the “ House of God”), origi- nally called Luz, an aucient city of Palestine, on the borders of the tribe of Benjamin, eleven English miles north of Jerusalem. Of the origin of its new name two accounts are given in Genesis, both of them, however, connecting it with the history of Jacob. After the conquest of Canaan by the Israelites Bethel became a resting-place of the ark, and at a later date it was chosen as a

royal residence and a seat of idolatrous worship by several of the renegade kings. Jt seems to have continued to flourish down into the Christian era, some remains still existing of its ecclesiastical buildings. Its ruins, which now bear the name of Beitin, occupy about three or four acres.

BETHESDA was a pool or public bath in Jerusalem, where miraculous cures were believed to be performed ; now usually identified with the Birket Israel, near St Stephen's Gate. See JERUSALEM.

BETHLEHEM (i.e., in Hebrew, the "' House of Bread "), a small town in Palestine, situated on a limestone ridge, about six miles from Jerusalem, on the main road to Hebron. It was a place of great antiquity; and, under the name of Ephrata is mentioned in the history of Jacob. From the book of Ruth, which contains the romantic story of some of its inhabitants, it would appear to have had special con-

nection with the land of Moab. At a later date it became famous as the birthplace of David, but does not seem to have received any special favours at his hand. It was fortified by Rehoboam ; and the neighbouring inn of Chimham seems to have become a regular rendezvous for travellers proceeding to Egypt. Almost complete obscurity, however, was gathering round it when it became one of thie world's most memorable spots—the birthplace of the Saviour. Desecrated during the reign of Hadrian by a grove of Adonis, the traditional scene of the nativity (a grotto on the eastern part of the ridge) was enclosed by the Empress Helena with a noble basilica, which still stands, surrounded by the three convents successively erected here by the Greek, Latin, and Armenian Churches. In the neighbourhood is still shown the traditional grotto where Jerome spent a portion of his life busy with his Latin translation of the Scriptures. Captured by the Crusaders in the 11th century, Bethlehem was made an episcopal see ; but the bishopric soon sank into a titular dignity. The present village is well built and clean, and the inhabitants, who number about 3000, profess Christianity. The carving of crucifixes and other sacred mementoes gives employment to a number of persons.

BETHUNE, the chief town of an arrondissement in the French department of Pas de Calais, situated on a rock above the River Brette, 16 miles N.N.W. of Arras. It is strongly fortified, and its defences are partly the work of Vauban. It has a tribunal of primary jurisdiction, a com- munal college, a Gothic church, two hospitals, and mauu- factures of linen, cloth, and beer. The trade, chiefly in grain, cheesc, linen, and oil, is facilitated by the canal, which unites the Lawe with the Lys. The town, which dates from the 11th century, was taken by the allied forces in 1710, and restored to France by the treaty of Utrecht. Population in 1872, 4594.

BETLIS, Brruis, or Bepuis, a town of Turkish Armenia, in the Sandjak of Mfsh, situated near the south-west corner of Lake Van, in a highly cultivated valley, which is watered by the Bitlis-chai, a sub-tributary of the Tigris. Partly owing to the irregularity of the ground, the houses are scattcred Without much attention to order, and most of them are surrounded with gardens or orchards. The castle of the Bey, a straggling structure, is situated on the lava rock that bounds the valley ; while in the centre of the town, on an eminence so steep that it is only accessible by a road winding round it, stand the ruins of an ancient fortress of great strength. Betlis is a great seat of the dancing dervishes, who have twelve convents in the place. The Armenians, who form about a fourth of the population, have four churches and as many monasteries, and the Mahometans possess numerous nosques and medresses. A considerable trade is carried on, as well as the manufacture of gold and silver wares, the weaving of cotton-cloth and carpets, and the preparation of tobacco. According to an Armenian tradition Betlis was founded by Alexander the Great. In 1514 it became a Turkish possession, and it has

| for about three centuries been held as a fief by a Kurdish

family. The population is variously estimated at from 10,000 to 12,000.

BETTERTON, Tuomas, the best English actor of his time, was the son of Mr Betterton, under-cook to King Charles I., and was born at Westminster in 1635. He was apprenticed to Mr Rhodes, a bookseller near Charing Cross. Rhodes, who had been wardrobe-keeper to the theatre in Blackfriars, obtained in 1659 a licence to set up a company of players at the Cockpit in Drury Lane; and there Betterton made his first appearance on the stage. On

the opening of the new theatre in Lincoln's-Inn-Fields in 1662, Sir Wilham Davenant, the patentee, engaged Betterton and all Rhodes's company to play in his Siege of

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Rhodes. Betterton became a great favourite with the king, and was sent to Paris to examine the French stage, with a view to the introduction of improvements. According to Cibber it was after his return that shifting scenes were first used in the English theatre instead of tapestry. In 1670 Betterton married Mrs Sanderson, a good actress of the same company; and the marriage was a very happy one. In 1698, when he had just lost the little money he had laid by, he was enabled by the aid of his friends to erect a new playhouse in the Tennis Court in Lincoln's-Inn- Fields. It was opened in 1695 with Congreve's Love for Love. But in a few years the profits greatly fell off; and Betterton, iufirm through age, and labouring under violent attacks of the gout, determined to quit the stage. On his retirement the public gave him a benefit-night, when, though upwards of seventy, he played the part of Valentine in the comedy of Love for Love: the profits are said to have amounted to upwards of £500. His performance of Ham- let after this time is particularly mentioned in the Zatler. In the spring of 1710 he made his last appearance on the stage in his celebrated part of Melantius in Zhe Afaid's Tragedy. A rash attempt to reduce the swelling of his limbs by external applications threw the gout into his head, and he died on the 28th of April. His body was interred with much ceremony in the cloisters of West- minster. Betterton was author of several dramatic works which were popular in their day. An estimate of his character and abilities is given in the Apology for my Own Infe, &c., of his friend and rival Colley Cibber. BETTINELLI, Saverio, Italian Jesuit and littérateur, was born at Mantua on the 18th of July 1718. After studying under the Jesuits in his native city and at Bologna, he entered the society in 1736. He taught the belles-lettres, from 1739 to 1744, at Brescia, where the Cardinal Quirini, Count Mazzuchelli, Count Duranti, and other scholars, formed an illustrious academy, He next went to Bologna to pursue the study of divinity, and there he enjoyed the society of many learned and literary men. At the

age of thirty he went to Venice, where he became professor of rhetoric, and was on friendly terms with the most illustrious persons of that city and state. The superintendence of the college of nobles at Parma was entrusted to him in 1751; and he had principal charge of the studies of poetry and history, and the entertainments of the theatre. He reinained there eight years, visiting, at inter- vals, other cities of Italy, either on the affairs of his order, for pleasure, or for health. In 1755 he traversed part of Germany, proceeded as far as Strasburg and Nancy, and returned by way of Germany into Italy, taking with him two young sons or nephews of the prince of Hohenlohe, who had requested hint to take charge of their education. He made, the year following, another journey into France, along with the eldest of his pupils; and during this excur- sion he wrote his famous Lettere dieci di Virgilio agli Arcadi, which were published at Venice with his sciolti verses, and those of Frugoni and Algarotti. The opinions maintained in these letters against the two great Italian poets and particularly against Dante, created him many eue- mies, and embroiled him with Algarotti. In 1758 he went into Lorraine, to the court of King Stanislaus, who sent him on a matter of business to visit Voltaire. him with a copy of his works, with a flattering inscription in allusion to Bettinelli's Letters of Virgil. From Geneva he returned to Parma, where he arrived in 1759. He afterwards lived for some years at Verona and Modena, and he had just been appointed professor of rhetoric there, when, in 1773, the order of Jesuits was abolished in Italy. Bettinelli then returned into his own country, and resumed his literary labours with new ardour. The siege of Mantua by the French compelled him to leave the city, and he

Voltaire presented.

retired to Verona, where he formed an intimate friendship with the Chevalier Hippolito Pindemonti. In 1797 he returned to Mautua. Though nearly eighty years old he resumed his labours and his customary manner of life. He undertook in 1799 a complete edition of his works, which was published at Venice in 24 vols. 12mo. Arrived at the age of ninety years, he still retained his gaiety and vivacity of mind, and died on the 13th September 1808. The works of Bettinelli are now of little value. The only

one still deserving remembrance, perhaps, is the Resor- gumento negli studj, nelle Arti e ne' Costumi dopo tl Mille, a sketch of the progress of literature, science, the fine arts, industry, &c., in Italy.

BETTING may be defined as the staking or pledging between two parties of some object of material value on the issue or contingent issue of some event or contest. The pursuit (it can hardly be termed a pastime, science, or art) of betting has been in vogue from the earliest days of civilization, commencing in the East with royal and noble gamblers, and gradually extending itself westwards and throughout all classes. In all countries where the English tongue is spoken betting is now largely indulged in; and in the United Kingdom it has spread to such an extent amongst all grades of society during the last twenty years that the interference of the Legislature has been found necessary. The evils it has been productive of are too well known to call for comment here, and the principles require to be treated solely from matheniatical and legis- lative points of view.

The first principle of all betting is that " you cannot win where you cannot lose." Accordingly no bets are " play or pay" except those on certain events enumerated below, or unless such a stipulation is laid down at the time the bet is made. Betting may be divided into " bookmaking" and "backing." The former consists in laying the odds, and, theoretically speaking, secures a small though certain profit, were all debts paid and the number of starters for the event large. During the first half of the 19th century book- making was a far more lucrative business than now, because betting was confined to the wealthier classes and bad debts were fewer. Also, betting commenced many months before a great race, and so the bookmaker had more opportunities of laying against all the entries, whereas most betting on play or pay events is now done just before the start. Taking the St Leger (always a play or pay event) of 1875, the following table represents a £100 book opened a week before the race, according to the Continental betting quotations, September 7, 1875. Those marked t did not eventually start.

6 to 1 against Gilbert. ..... £100 to £16 18 4 Viel weessus DSLRs Teeaacteee eect Py wey eS sl 55 tenbohiberirey… g. fo Uaeae as

OF Wnendnonclite… .. op tO IO OF © 105,14) BONS ehcceecnces # 10 9 0 12,,1 4 ‘Bay of Naples….. » ton 8 78 1 Fy ey Oe RS IMR op ue Ow) MGT, all i, IS SVTMOUM,, «ster crasiece’ som COmmO BOO ‘ 20,1 |, Wew Holland… vy, 0 oD 10 =0 25 ,,1 +4, #Breechloader …... yy tO) 4 20) 0 25 ,,1 +,, 1Perkin Warbeck. ,, to 4 0 0 2) 4,1 ‘,, Creer ccncass. ‘Winner. 25 4,1 4 tG@laventont …..... mw wo ef OF de,, 1 ,, Repentance Colts, ., eto 93 — 0e7 Somali Salvaton. sateen ny uo 8 O 7 40.,,1 4, (Sambilegeny…... 5 sto 2 1080 400,20 eet lem ples banks. 1 acon 2 ORO) DOF ML sj emelesconenenecr ye 4 tO! ROO 50,, 1 ,, ‘Garterly Bell… 4.) to 2.0080 50,,1 ,, ‘+tSister to Musket. ,, to 2 0 0 L120) W256

In this instance twenty hurses are quoted in the betting. As- suming that the bookmaker finds a customer to back each of these, and that he encounters no bad debts, he receives £120, 2s, 6d., and has to pay £100 to the person with whom he laid £100 to £4

BE T—BE T

against Craigmillar, the winner. This leaves a gain of £20, 2s. 6d. or 203 per cent., but even then travelling and other expenses have not been taken into consideration, and the fewer horses that are backed the less accordingly will be the bookmaker’s profit. In fact, the non-backing of any one horse in this instance materially reduces the profit. ‘The race in question was particularly favour- able for bookmakers, both because so many horses were scratched (representing a gain of £26, 17s. 10d.), and because at the date supposed the winner was at such long odds. At the actual start the odds against the beaten horscs were 9 to 2, and 6, 7, 9, 10, 12, 20, 25, 25, 50, and 66 to 1 respectively, and against the winner 20 to 8. This will be found to leave the bookmaker, had he com- menced his book the day of the race,“a profit of £1, 12s. 6d. only, and had the first favourite won there would have been a loss of £5, 11s. 11d. There were 178 entries for this St Leger, and if the book had been opened many months before the race, and the book- maker had been able to obtain customers, the favourites would have been backed at longer odds, bringing less profit from this source, but then more eventual non-starters are backed, which is certain profit. The chief principles of bookmaking are the same, whether the number of starters for an event be unlimited, or two only, though, in the

latter case, there is no certain profit, as there are not sufficient starters to enable the bookmaker to save his stake. His only chance then is that he has been circumspect enough to have laid his odds on the winner.

“‘ Backing” is a very plain matter, but in the long-run invariably a losing method of betting. It simply consists in taking the odds laid by a bookmaker against one or more starters for any event. If it be a play or pay event, and the possible starter be scratched, the backer loses his money at once. Although a backer may become possessed of such special information as may enable him to win large sums occasionally, his losses will in the long-run exceed them. In fact, the bookmaker virtually keeps a bank against him.

‘“‘Hedging” consists in laying off at shorter odds part of the sums various starters may have been backed for. Thus, a backer has taken £50 to £1 about A, B, and C respectively for a play or pay event some time before the date fixed for the contest. A turns out a non- starter, so there is a certain loss of £1. At starting the odds have come down to say 2 to 1 against B, and 3 to 1 against C. So the backer lays £50 to £25 against B, and £50 to £16, 13s. 4d. against C. If neither wins he receives £41, 13s. 4d., out of which he has to pay £3 to the bookmaker, leaving a profit of £88, 13s. 4d. Should B win he receives £50 from the bookmaker, and £16, 13s. 4d. on account of C’s defeat, out of which he has to pay £2 to the bookmaker on account of A and C, and the £50 he has laid against B, so the profit left is £14, 13s. 4d. Should C win, the hedger receives £50 from the bookmaker, and £25 on account of B’s defeat, out of which he has still to pay the bookmaker £2 on account of A and B, and the £50 he has laid against C, so the profit left is £23.

The only events that are now play or pay are the Derby, Oaks, St Leger, Two Thousand Guineas, One Thousand Guineas, Cesarewitch, and Cambridgeshire Stakes, the Ascot, Goodwood, and Doncaster Cups, and all handicaps above £200 value, with two forfeits, the minor whereof is not less than £5. In all other betting the backer is entitled to a start for his money, unless the contrary is stipulated at the time the bet is made.

In the United Kingdom betting has been the source of considerable legislation during the past thirty years. Curiously enough, by the 9th of Queen Anne, if any one gained over £10 by betting, the loser was entitled to

pursue for repayment of the stake if he had paid it, and if he did not do so within three months any one might sue for treble the amount with costs. After it had become a dead letter some informers raked up this Act in 1844, and the result was the insertion of a clause in the Gaming Act, 8 and 9 Vict. c. 109, annulling the old statute. Dur- ing the next seven years betting on horse races increased to an enormous extent. 'List shops," where the proprietors

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kept a bank against all comers, and backers could stake their money in advance on a horse, sprung up in the. metropolis and large towns, leading to many acts of flagrant dishonesty. Sir Alexander Cockburn, then attorney-general, accordingly introduced the Betting Houses Act, 16 and 17 Vict. c. 119, whereby all houses or places kept for such purposes were brought under the above-mentioned Gaming Act, and might be proceeded against as a common nuisance and contrary to law,—heavy penalties being incurred by the owners, occupiers, or advertizers of such houses or places. Betting on race-courses, or at Tattersall's and similar private clubs, where money is not received in advance, was not meant to be interfered with. For some time this legislation had the desired effect till attempts were made to evade it by receiving money through the post. These were successful till the summer of 1869, when the Government suddenly bestirred itself, and several prosecutions took place. As the Act, however, did not extend to Scotland, the betting- house keepers removed there or went abroad, and their adver- tisements at such addresses were still legal. This led to 87 Vict. c. 14, extending 16 and 17 Vict. c. 119 to Scotland, and making all advertisements of betting-houses, whether in or out of the United Kingdom, illegal. It came into force on 31st July 1874, and almost exterminated the receiving of money in advance, especially as it is now enforced very strictly.

In 1866 a system of betting, termed Paris mutuels, was started in France. It consisted of agencies where any one may back a probable starter for any sum or sums he pleases, The whole of the money thus staked on all starters is added together, a commission deducted by the agent for his trouble, and the balance divided in " equal shares," or Paris mutuels, amongst those

who have backed the victor. In this instance the agent's gain is, of course, certain. It has been found, however, that unlicensed opportunities of staking money in advance have produced the same evils in France as in England. During the past three years the French Government have taken the matter up strongly, and betting-houses and agencies are now as effectually doomed on the French as on the English side of the Channel.

In the United States betting is also illegal. Under the Gambling Act, whenever any money has been staked for a bet, either side can sue the stakeholder and recover his portion of the money, either before or after the bet has been decided, Owing, however, to the strong public senti- ment which naturally condemns such a course, proceedings against stakeholders are excessively rare. Any voter betting on the result of an election forfeits his franchise, yet the heaviest betting in the States is on elections, and the betters go unchallenged to the poll. (Hu. F. W.)

BETUL, a hilly district of British India, in the Central Provinces, comprising the westernmost section of the great Satpurd plateau, situated between 21° 20' and 22° 35' N. lat., and 77° 20' and 78° 35' E. long, It is bounded on the N. by the Hoshangabad district and the Makrai territory, on the E. by the district of Chhindwara, on the 8. by the commissionership of West Berars, and on the W. by the district of Hoshangabad. The area is about 4118 square miles; the population, as ascertained by the census of 1866, 258,335. In 1872 the population had increased to 284,055, of whom 168,788 were Hindus, 4555 Mahometans, 937 Buddhists and Jains, 19 Christians, and 109,756 aborigines ; population, 69 per square mile. The mean elevation "of the district above the sea is about 2000 feet. The country is essentially a highland tract, divided naturally into three distinct portions, differing in their superficial aspects, the character of their soil, and their geological formation. The northern part of the district forms an irregular plain of the sandstone formation. It is a well-wooded tract, in many places stretching out in charming glades like an English

park, but it has a very sparse population and little culti- vated land. In the extreme north a line of hill rises abruptly out of the great plain of the Narbada valley. The central tract alone possesses a rich soil, well watered

by the Machna and Sampna rivers, almost entirely cultivated and studded with villages. To the south lies a rolling plateau of basaltic formation (with the sacred town of Multdi, and the springs of the River Tapti at its highest point), extending over the whole of the southern face of the district, and finally merging into the wild and broken line of the Ghats, which lead down to the plains. This tract consists of a succession of stony ridges of trap rock, enclosing valleys or basins of fertile soil, to which cultivation is for the most part confined, except where the shallow soil on the tops of the hills has been turned to account.

The principal rivers of the district are the Tapti, Wardha, Bel Machna, Sampna, Morar, and Tawd. The Tapti rises a few miles from Multai, traverses the southern part of the district, and then plunges into the gorge of the Satpura hills, formed on the one side

by the Chikalda hills of Berar, and on the other side by the wild Kalibhit hills of Hoshangdbid. The Wardha can hardly be called

a river of the district, as it merely takes its rise in the Satpura hills .

on the south-eastern boundary. The River Bel also rises in the high plateau of Betul, and forms one of the chief affluents of the Kanhan. The Machna and Sampna rise among the bills that shut in the rich basin of the district. They unite their waters at the town of Betul, force their way through the Satpurd range, and join the Tawd near Shahpur. The Moran rises in the Sétpura hills within the district, and enters Hoshangibad near the town of Seoni. The Tawa rises in Chhindwara, and flowing for a short distance through the north- east corner of this district, eventually joins the Narbadd above Hoshangabid. These are the rivers of importance ; but throughout the district, and more especially amid the trap formation, there are a number of sinaller streains useful for irrigation. The principal agricultural products of the district are wheat and pulses, more than three-fourths of the open lands being devoted to these crops. The other products are cotton, rice, millet, rye, sugar-cane, and opium. The area under sugar-cane cultivation is estimated at 2400 acres, the juice extracted from it being exported in its raw state. The principal agricultural tribe is the Kunbis, many of whom are modern immigrants from Northern India. The aboriginal Gonds are found in all the wild jungle villages, where they follow the nomadic system of

cultivation known as the déhya. Extensive forests occupy some 700 square miles of the district area, and yield teak and other good timber. Coal occurs in many parts of the district, but is not worked, as except at one place not a single seam has been found exceeding 3 feet in thickness, and it is doubtful if a seam of that thickness can be profitably mined in India. District revenues in 1868-69—land revenue, £19,159 ; excise, £7219; assessed taxes, £1136 ; forests, £1218 ; stamps, £2748; total, £31,475. Strength of regular constabulary and town police, 333 men; cost, £3857 per annum.

Little is known of the early history of the district except that it must have been the centre of the first of the four ancient Gond kingdoms of Kherla, Deogarh, Mandla, and Chanda. According to Farishta, these kingdoms engrossed in 1398 all the hills of Gondwana and adjacent countries, and were of great wealth and power. About the year 1418 Sultan Husain Shah of Mdélwa invaded Kherld, and reduced it toa dependency. Nine years later the Raja rebelled, but although with the help of the Bahmini kings of the Deccan he managed for a time to assert his independence, he was finally subdued and deprived of his territories. In 1467 Kherl4 was seized by the Bahmini king, but was after- wards restored to Mélwa. A century later the kingdom of Malwa became incorporated into the dominions of the emperor of Delhi. In 1703 a Musdlman convert of the Gond tribe held the country, and in 1743 Raghuji Bhonsla, the Marhatta ruler of Berar, annexed it to his dominions. The Marhattds in the year 1818 ceded this district to the East India Company as payment for a contingent, and by the treaty of 1826 it was formally incorporated with the British possessions. Detachments of British troops were Stationed at Multai, Betul, and Shahpur to cut off the retreat of Apd Sahib, the Marhatta general, and a military force was quartered at Betul until June 1862.

BET—BEU

The ruined city of Kherl4 formed the seat of government under the Gonds and _ preceding rulers, and hence the dis- trict was, until the time of its annexation to the British dominions, known as the " Kherlé Sarkér." The town of Multai contains an artificial tank, from the centre of which the Tapti is said to take its rise; hence the reputed sanctity of the spot, and the accumulation of temples in its honour.

The climate of Betul is fairly salubrious. Its height above the plains and the neighbourhvod of extensive forests moderate the heat, and render the temperature pleasant throughout the greater part of the year. During the cold season the thermometer at night falls below the freezing point; little or no hot wind is felt before the end of April, and even then it ceases after sunset. The nights in the hot season are comparatively cool and pleasant. During the monsoon the climate is very damp, and at times even cold and raw, thick clouds and mist enveloping the sky for many days together. The average annual rainfall is 40 inches. In the denser jungles malaria prevails for months after the cessation of the rains, but the Gonds do not appear to suffer much from its effects. Travellers and Strangers who venture into these jungles run the risk of fever of a severe type at almost all seasons of the year.

BETWA, a river of India, which rises in the native state of Bhopal in Malwa, and after a course of 360 miles, for the most part in a north-easterly direction, falls into the Jamna at Hamirpur in 25° 57' N. lat. and 80° 17' E. long.

BEUDANT, Francois Surprce, a French mineralogist and geologist, was born at Paris in 1787, and died in 1862. He was educated at the Polytechnic and Normal schools, and in 1811 was appointed professor of mathematics at the Lycée of Avignon. Thence he was called, in 1813, to the Lycée of Marseilles to fill the post of professor of physics. In the following year the royal mineralogical cabinet was committed to his charge to be conveyed into England, and from that time his attention seems to have been directed principally towards geology and cognate sciences. In the year 1818 he undertook, at the expense of Government, a geological journey through Hungary, and the results of his researches, Voyage Minéralogique et Géologique en Hongrie, 3 vols, 4to, with atlas, published in 1822, established for him a European reputation. He was about the same time appointed to the professorship of mineralogy in the Paris Faculty of Sciences. His treatises on physics (Zraité de Physique, 6th ed., 1838) and on mineralogy and geology (Cours Elémentaire de Minéralogie et Géologie, 1841) were very popular. Beudant also, when holding the post of inspector of the university, published a valuable French grammar. ,

BEULE, Caartes Ernest, a French archeologist and man of letters, was born at Saumur 29th June 1826,and died 4th April 1874. He was educated at the Ecole Normale, and in 1852 was sent to Athens as one of the professors in the Kcole Frangaise established there. At first distinguished as a man of fashion, he afterwards devoted himself with intense vigour to archeological researches. He had the good fortune to discover the propylea of the Acropolis, and his work, L'Acropole d'Athénes (2 vols. 1854), was published by order of the minister of public instruction. Promotion and distinctions followed rapidly upon his first successes. He was made doctor of letters, chevalier of the Legion of Honour, professor of archeology at the Bibliothéque Impériale, member of the Academy of Inscriptions, and perpetual secretary of the Academy of Fine Arts. Like too many French men of letters, he joined eagerly in political affairs, with which the last few years of his life were entirely occupied. The most important of his writings are tudes sur le Péloponnese, 1855; Les Monnaves ad' Athénes, 1858 ; Histoire de la Sculpture avant Phidias, 1864 ; Histoire de Art Grec, 1870.

BEU—BEY

BEUTHEN, the chief town of a circle in the government of Oppeln in Prussian Silesia, on the railway between Oppeln and Cracow, abont 50 miles from the former. It is the centre of the mining district of Upper Silesia, and its population, which numbered 15,711 in 1871, is mainly engaged in mining operations. Cloth and linen weaving, however, is also carried on. Beuthen is an old town, and was formerly the capital of the lordship of Beuthen, which belonged to the counts of Donnersmark. It is fre- quently called Ober Beuthen to distinguish it from the following.

BEUTHEN, or Nireprer BreuTHEN, a town in the government of Liegnitz, in Silesia, on the Oder, and the capital of the mediatized principality of Carolath-Beuthen. The chief industries of the place are straw-plaiting, boat- building, and the manufacture of pottery; and a con- siderable traffic is carried on by means of the river. Population in 1871, 3826.

BEVERLEY, a market and borough town in the East Riding of Yorkshire, about a mile from the River Hull, with which it communicates by means of a canal called the Beverley Beck. It consists principally of one long wide street, upwards of a mile in length, and terminated by an ancient gateway.

The magnificent collegiate church of St John is in size and splendour superior to many cathedrals. Having been erected at different times it exhibits various styles of Gothic architecture. The west front is said by Rickman to be the finest of itskind in England, It is 334 feet in length from east to west; the breadth of the nave and side aisles is 64 feet ; the transept is 167 feet long ; and the two towers at the west end are 200 feet in height. One of its most remarkable monuments is the Percy shrine. St Mary's church is also an exceedingly handsome and spacious Gothic building. The market-place, which com- prises an area of nearly 4 acres, is ornamented with an octangular market-cross. The grammar school is of great antiquity, and has two fellowships, six scholarships, and three exhibitions at St John's College, Cambridge. There are several national and two infant schools, a blue-coat school, a mechanics' institute, a news-room, several banks, a theatre, a jail, and acattle-market. There is a large trade in grain, timber, and coal. The tanning of leather is the principal industry ; but there are also several important manufactories of agricultural implements and of artificial manures, as well as whiting-factories, corn and linseed mills, and breweries and malt-kilns. It formerly returned two members to parliament, but was disfrauchised in 1870. Population of municipal borough in 1871, 10,218.

BEVERLEY, a seaport of Massachusetts in the United States, situated ona branch of Ann Harbour, and connected with Salem by a bridge built in 1788. Tt is 16 miles N.E. of Boston, on the Eastern Railway, and is connected with Gloucester by a branch line. The principal industry is the manufacture of shoes; and a considerable number of people are employed in the coasting trade and fisheries. Popula- tion in 1870, 6507.

BEVERLEY, Jonny or, a celebrated prelate, who flourished during the 7th and 8th centuries, was born at Harpham in Northumbria. He received his education at Canterbury, and after his return to the north was the instructor of the Venerable Bede. In 685 he was made bishop of Hagolstad or Hexham, and two years later was promoted to the archbishopric of York. He resigned his see in 717, and retired to a college which he had founded some years before at Beverley, where he died in 72]. He was celebrated for his scholarship as well as for his virtues. The following works are ascribed to him:—Pro Luca Lxponendo (an exposition of Luke); Homilice in Hvangelia

; Lpistole ad Herebaldum, Audenam, et Bertinum ; Epistole ad Holdam abbatissam.

621

BEWDLEY, a market and borough town in the parish of Ribbesford, in the connty of Worcester, 129 miles from London, on the Severn Valley Railway. It is well built, and stands on an eminence near the River Severn, over which there is an elegant bridge, erected in 1797. It has a town-hall, a free grammar school, and several charities ; and manufactures combs, brass and iron wares, leather, and malt. Jt returns one member to parliament. Population of parliamentary borough in 1871, 7614.

Bewdley, or, as it was formerly called, Beaulieu, was a place of some importance in the 13th century, and had the right of sanc- tuary for those who shed blood. Henry VII. built a palace in the town for his son Arthur, who was married there by proxy to Cathe- rine of Aragon ; but no remains of the building, which was greatly injured during the wars of the 17th century, can now be traced. The town, whieh was incorporated by Edward IV., formerly be- longed to the Marehes of Wales, but was assigned to Worcester- shire by Henry VIII.

BEWICK, Tuomas, who may be considered as the reviver of wood-engraving in England, was born at Cherry- burn, near Newcastle-on-Tyne, in August 1753. His father rented a small colliery at Mickleybank, and sent his son to school at Mickley. He proved a poor scholar, but showed, at a very early age, a remarkable talent for drawing. He had no tuition in the art, and no models save natural objects. At the age of fourteen he was apprenticed to Mr Beilby, an engraver in Newcastle. In his office Bewick engraved on wood for Dr Hutton a series of diagrams illustrating a treatise on mensuration. He seems thereafter to have devoted himself entirely to engraving ou wood, and in 1775 he received a premium from the Society for the Encouragement of Arts and Manufactures for a woodcut of the " Huntsman and the Old Hound." In 1784 appeared his Select Fables, the engravings in which, though far surpassed by his later productions, were incomparably superior to anything that had yet been done in that line. The Quadrupeds appeared in 1790, and his great achievement, that with which his name is inseparably associated, the British Birds, was published from

1797-1804. Bewick, from his intimate knowledge of the habits of animals acquired during his constant excursions into the country, was thoroughly qualified to do justice to his great task. Of his other productions the engravings for Goldsmith's Zraveller and Deserted Village, for Parnell's Hermit, for Somerville's Chase, and for the collection of Fables of Msop and others, may be specially mentioned. Bewick was for many years in partnership with his former master, and in later life had numerous pupils, several of whom gained distinction as engravers. He died on the 8th November 1828. (Life and Letters of T. Bewick, by T. Landseer, 2 vols. pt. 8vo, Té7 1.)

BEYLE, Marrze-Henri, better known as De Stendhal, the most celebrated of his many noms de plume, was born at Grenoble on the 23d January 1783. His father was an avocat at the parliament of Grenoble, and his family, though not noble, was of good descent. His early education was conducted mainly by priests, who seem to have misunder- stood his very peculiar character, and for whom he ever afterwards entertained a profound aversion and contempt. At the age of twelve he was sent to the Ecole Centrale, newly established at Grenoble, aud continued in attendance for four years, during which time he distinguished himself in all his studies. In 1799 he was preparing to become a candidate for the Ecole Polytechnique when his plans were disturbed by an offer from M. Daru, a distant relative, of some appointment connected with the ministry for war. In the following year he accompanied M. Daru to Milan, on the chance of some suitable post offering itself. He was present at the battle of Marengo; and carried away, apparently, by the military enthusiasm consequent on

Napoleon's brilliant victories, he suddenly enlisted as quartermaster in a dragoon regiment. In a month's time le was made sub-lieutenant, and for about a year and a half acted as aide-de-camp to General Michaud. But the routine of garrison life, to which he was soon afterwards condemned, made him heartily tired of a military career. On the conclusion of the peace of Amiens (1802) he threw up his commission, and went to reside with his family at Grenoble. From them he obtained means to take up his abode in Paris, where for some time he continued to devote himself to study and

literary work. In 1805 he suddenly accepted a situation as clerk in a mercantile house at Marseilles, and remained there nearly a year,—in fact, till the actress, for whose sake he had taken this curious step, married a wealthy Russian. In the following year he again accompanied M. Daru into Germany, and was appointed to superintend the possessions of the emperor in Brunswick. Whatever German he learnt there was afterwards completely forgotten. In his official capacity as connected with the commissariat he took part in the ill-fated Russian campaign of 1812, and remained loyal to the fallen emperor. He declined to lay himself out for employment under the new régime, and retired to Milan, where he resided till 1821. His early works, chiefly on painting and music, date from this period of his life. The Lettres écrites de Vienne sur Haydn, suwies @une Vie de Mozart, dc., which appeared in 1814 under the pseudonym of Alexandre César Bombet, were mainly plagiarized from Carpani. With some slight alterations the work was reproduced in 1817 as Vies de Haydn, Mozart, et Metastase. In the same year he published, under various assumed names, /istoire de la Peinture en TItulie, which contains some good but unsystematic criticism, and Rome, Naples, et Florence en 1817. In 1821 he was compelled to return to France, an unfounded suspicion that he was a French spy having somehow arisen at Milan. During the following nine years he resided at Paris, and gradually began to acquire his high reputation as an accomplished litterateur and man of the world. He was an admirable talker and full of anecdote, which in his opinion ought to form the staple of conversa- tion. His fine analytic powers were displayed to full advantage in the curious work, De Amour, which he published in 1822, but the book did not find an appreciative audience. The Vie de Rosstnt, which followed, was more successful; and the pamphlet Racine et Shakespeure did good service for the cause of Romanticism in its struggle with the rigid classical canons of older French literature. In 1829 appeared his Promenades dans Rome, full of informa- tion, criticism, and original observation, but somewhat chaotic in form. He was appointed consul at Trieste in 1830, and three years later he quitted that place with the greatest joy for a similar post at Civita Vecchia. There he remained till 1841, with frequent absences, one extending from 1836 to 1839, during which he paid a short visit to London. In 1841 his health gave way, and he returned to Paris, where he died on the 22d March 1842. Beyle, during his lifetime, was known to but a very small circle of readers ; within the last twenty years, however, his popularity has greatly increased, and his

many fine powers have received due recognition. It is not probable that he will ever have a very ex- tended influence; his writings are "caviare to the general," and can only be appreciated by those qualified to take pleasure in the cynical reflections of mere egotism. For Beyle's philosophical creed, so far 'as he can be said to have had one, was materialism, and his ideal of humanity esthetically refined selfishness. His strength lay in keen criticism and in acute psychological analysis, qualities which gave value to his writings on art, but debarred him from success in the department of fiction. His principal novels, Le Rouge et le Noir, and La Chartreuse de Parme, fell comparatively dead, though the latter was received with extravagant eulogy by Balzac, and has recently become more popular. His genius was too analytic to be

suited for romaice writings ; the novels want consistency of plot and motive power in the characters. La Chartreuse, however, the

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best of them, gives an admirable picture of the involved intrigues of a small Italian court, a subject with which Beyle was specially qualified to deal. The peculiar value of all his writings consists in the amount of thinking which they excite, though it must be confessed that the subjects are frequently unworthy of the attention devoted to them. The fullest account of Beyle is that by A. A. Paton, Henry Beyle, a Critical and Biographical Study, 1874. See also Colomb's prefaces to La Chartreuse and the Romans et Nou- velles, Mérimée's preface to the Correspondance Inedite, and Sainte- Beuve's articles in the Causerics du Lundt.

BEYROUT, Berrovt, or Barrut, the most important seaport town of Syria, on the coast of the Mediterranean, in the pashalic of Acre, 57 miles W.N.W. of Damascus. It is situated on rising ground on the northern side of the promontory of the Jebel-er-Rosheh, which forms the spacious bay of St George's, a short distance to the west of the mouth of a stream to which it gives its name—Nahr- Beirut, the ancient Magoras. The surrounding hills consist of reddish sand, interspersed with rocks, and covered with a light soil. The roadstead to the N.E. of the town is sheltered from the 8.W. wind, but is exposed to the W. and the N.W. 'The ancient harbour is now choked up, and all that remains of the artificial erections is a pier or causeway at

the N.W. extremity of the town, at which boats can discharge. It is supported on arches of unequal size, and is partly constructed of ancient marble columns, many of which still stand along its front, and are used for mooring the lesser vessels. In 1874 the authorities determined to construct a small harbour, and £10,000 was allotted for the purpose. The city proper is an irregular square, open towards the sea, and surrounded on the land sides by a substantial tower-flanked wall, built by Djezzar Pasha, At the N.W. corner are two castellated buildings, built on the rocks. The streets are wider than is usual in Syrian towns, and are paved with large stones; the houses are for the most part lofty and spacious. Formerly, there were deep channels of water flowing down the middle of the streets, but these have been removed. The suburbs of the city, which extend around it with a radius of a mile and a half, are beautifully situated, interspersed with gardens, and planted with fruittrees. During the hot season the wealthier inhabitants remove inland to the villages of Beit-Miry, Brumanah, or Shemlin, on the lower slopes of the Lebanon. Besides the mosques, bazaars, and other native buildings with which it is provided, the city of Beyrout possesses numerous European edifices and institutions. There are six Roman Catholic convents or monasteries, with churches and schools attached, and the sisters of charity maintain an orphanage and hospital. The Prussians support a well-organized school, under the management of a Protestant sisterhood, and the American missionaries have, among other establishments, a hospital and medical school. A girl's school was begun in 1860 by Mrs Thompson, and a ragged school in 1863. A native Christian community has been for some time in existence ; and in 1847 a native society of arts and sciences was established. Formerly regarded as the port of Damascus, Beyrout has now become by far the more important of the two cities. It is the seat of various consular establish- meuts, and possesses a quarantine, a custom-house, and post-offices. It exports silk, wool, bitumen, rags, sponges, and skins, and imports European goods for a large part of Syria. In 1871 the value of the exports, which were destined chiefly for France and England, was £530,000 ; while that of the imports, which were mainly from Eng- land and Germany, amounted to £1,240,000. The coasting trade, carried on by small native craft, consists principally of timber, firewood, charcoal, and straw.

BEZ—BEZ

pleted in 1874 an extensive system of water-works, by which a large supply is brought from the Nahr-el-Kelb (the Dog River or Lycus), a distance of 9 miles; the aqueduct is taken at one place through a tunnel 1040 yards long, and the water is brought to two reservoirs at the entrance of the town, each of a capacity of 110,000 cubic feet; public fountains, barracks, and mosques are supplied free of charge. The population is of a various character, comprising Druses, Maronites, Greeks, Turks, Arabs, and other races or nationalities. It was greatly increased about 1860 by an immigration of Christian natives who had fled from persecution in Mount Lebanon, Hasbeya, and Damascus. Estimated at only 15,000in 1838, the number of inhabitants had risen in 1871 to 70,000.

Beyrout is a place of great antiquity, and may perhaps be iden- tified with the Bantiah of the Pheenicians. Fora time at least it was under the supremacy of Sidon. Destroyed by Trypho, the Syrian usurper, about 140 B.c., it was restored by the elder Agrippa about 41 A.p., raised to the rank of a Roman colony, and adorned with an amphitheatre and various splendid buildings. In the 3d century it became the seat of a school of jurisprudence, which long maintained its reputation, and was attended by several eminent men. During the reign of Justinian, in fact, Beyrout was the only place in the empire, except Rome and Constantinople, where law was permitted to be taught, and of the three the Syrian school, under the management of Theophilus and Dorotheus, appears to have stood highest in general estimation. But the injury inflicted on the city by an earthquake in 551 led to the removal of the school to Sidon, and not long after the building in which it had been held was totally consumed by fire. In the time of the Crusades Beyrout again rose into importance, and was captured by Baldwin I. in 1211, after a two.months' siege. Early in the17th century it became a chief seat of the Druses, who retained their possession till 1763, when it was betrayed into the hands of the Turks. In 1772 it was bom- barded and plundered by a Russian fleet, and in 1840 it was nearly destroyed by the attack of the English under Admiral Stopford.

BEZA, THEODORE, or more correctly DE Bizz, was born at VWezelai in Burgundy on the 24th July 1519. His family was of good descent, and his parents were noted for their piety and generosity. While an infant le was adopted by his uncle, Nicholas de Beza, a counsellor of the parliament of

Paris, who took his nephew to live with him, and superintended his education with the greatest care. At the age of ten he was put under the tuition of Melchior Wolmar, a German, who residcd at Orleans. Beza studied under him for seven years at Orleans and at Bourges, and from him received the impulse which guided his after life, Wolmar, who was an excellent scholar, belonged to the Reformed Church, and his pupil not only learned from him the principles of the Reformed faith, but acquired the habit of diligent and critical study of Scripture. After the return of Wolmar to Germany in 1535, Beza with great reluctance departed for Orleans in order to begin the study of law. His tasks lay altogether in the direction of classics and poetry, and to this period of his life must be referred the composition of many of the liccntious poems, the publication of which cost him so much regret, and has brought upon him such calumny. After four years he obtained the degree of licentiate in law, and leaving Orleans, took up his abode in Paris. He was young, ardent, and poetical, of high rank, surrounded with friends, and amply supplied with funds,—for, though he was not in orders, he enjoyed the proceeds of two benefices. It was small wonder that under these circumstances he should have yielded to the temptations of Paris, and have eagerly seized the pleasures that presented themselves. But the extent of his dissipation has been enormously exaggerated ; more particularly has his connection with the woman whom he afterwards married been the occasion of calumny and mis-representation. A severe illness at last recalled to his mind the teachings of his old master Wolmar, and brought clearly before him the contrast his conduct presented to them. Immediately on his recovery, in October 1548, he

retired to Geneva, publicly fulfilled his promise to marry the woman with whom he had formerly lived, and joined the Reformed Church. In the following year he was made professor of Greek at the academy of Lausanne, where he remained for ten years, communicating frequently with Calvin at Geneva. During this time he completed Clement Marot's French translation of the Psalms, and began the extended labours on the New Testament, which resulted in his famous translation and commentary. His venera- tion for Calvin, already great, was strengthened by closer

intercourse; he vigorously defended the execution of Servetus; and in 1558 he gladly removed to Geneva. He was appointed professor of Greek in the academy, and assisted Calvin in his theological lectures. Soon by his vigorous teaching, his numerous writings, and his success in foreign embassies, he came to be looked upon as the most prominent man in the church of Geneva next to Calvin ; and after the death of the latter in 1564, he was nominated his successor as teacher of theology, and gene- rally recognized as the leader of the Calvinist party. His enormous activity enabled him not only to manage the internal affairs of the church, and to carry on the important negotiations with France and other powers, but also to compose several theological works of considerable value. Old age did not rob him of his energy; for in 1597 he was able to give a satirical refutation of the story spread about by the Roman Catholics that he had apostatized on his death-bed, He resigned all his official functions in 1600, and died on the 13th October 1605, at the advanccd age of 86.

Beza's works were very numerous, and some of them, such as Histoire eeclésiastique des égliscs réformées du royaume de France, Confessio, Traetationes Theologice, are still of value. His reputa- tion, however, rested, and still perhaps rests, on his editions and translations of the New Testament, which did much for the cause of the Reformation. See Schlosser, Leben des T'heodor Beza, ete., 1809; Baum, Theodor Beza, 2 vols., 1843-51 (incomplete).

BEZIERS, a city of France, in the department of Hérault, the capital of an arrondissement of the same name, It is beautifully situated on a hill, on the left bank of the River Orbe, where it is joined by the Languedoc canal, 38 miles S,W. of Montpellier. It is surrounded by old walls flanked with towers, round which is a promenade planted with trees, and has a fine old Gothic cathedral, Saint Nazaire, dating from the 12th, 13th, and 14th centuries, several churches, an old episcopal palace, now used for the Government offices, a communal college, an agricultural society, a theatre, and a public library. It manu- factures silk stockings, starch, gloves, brandy, confectionery, paper, leather, and glass,and hasaconsiderabletrade. Béziers is of great antiquity, and has the remains of an amphi- theatre, a causeway across the marsh of Cap-estang, and other Roman works. The Romans established a colony there, and it was the headquarters of the seventh

legion, under the title of Beterra Septiemanorum. The present name occurs in the form fesara as early as Festus Avienus (5th or 6th century). The town was completely destroyed in 1209 by the forces of Simon de Montfort in the crusade against the Albigenses, on which occasion 60,000 persons were massacred. 'The walls of the town were rebuilt in 1289 ; but it again suffered severely in the civil and reli- gious wars of the 16th century, and all its fortifications were destroyed in 1632. Population in 1872, 30,067.

BEZIQUE, a game at cards (probably from Sp. beséco, little kiss, in allusion to the meeting of the queen and knave, an important feature in the game). 'There is a group of card games which possess many features in com- mon. The oldest of these is mariage, then follow brus- quembille, Vhomme de brou, briscan or brisque, and cing-cents.

Bézique (also called best and besigue) appears to have been founded on these; it is, in fact, brisque played with a double pack, and with certain modifications rendered neces- sary by the introduction of additional cards.

In playing bézique, two packs of cards from which the twos, threes, fours, fives, and sixes have been rejected, are shuffled to- gether and used as one. The packs should have backs similarly coloured or ornamented.

The players cut for deal, and the highest bézique card deals. The cards rank as follows :—Ace, ten, king, queen, knave, nine, cight, sevell.

The non-dealer cuts the pack to the dealer, who reunites the separated packets, and deals three cards to his adversary, three to himself, then two to each, and again three to each. The top card of those remaining (called the stock) is turned up for trumps. The stock is placed face downwards between the players, and slightly spread. The players then take up the cards dealt to them, and the non-dealer plays any card out of his hand, and the dealer plays a card to it from his hand, the two cards thus played constituting a trick. There is no restriction as to the card to be played; the second player need not follow suit, nor win the trick. If he wins the trick by playing a higher card of the suit led, or a trump, the lead falls to him. In case of ties the leader wins. Whocver wins the trick leads to the next; but before playing

again each player takes a card from the stock, and adds it to his hand, the winner of the trick taking the top card of those face downwards, and his adversary the next card. This alternate playing and drawing a ecard each continues until the stock (including the trump card or card exchanged for it, which is taken up last) is exhausted. The tricks remain face upwards on the table, but must not be searched during the play of the hand.

The objects of the play are—1. To promote in the hand various combinations of cards, which when declared entitle the holder to certail scores; 2. To win aces and teus; 8. To win the so-called last trick.

A declaration can only be made by the winner of a trick imme- diatcly after he has won it, and before he draws from the stock. It is effected by placing tho declared cards (one of which at least must not have been declared before) face upwards on the table. Declared cards are left face up on the table ; but they still form part of the hand, and can be led or played just as though they had not been declared. A player is not bound to declare, although he may win a trick and hold scoring cards. A card led or played cannot be declared. More than one declaration may be made to one trick, provided no card of one combination forms part of another that: is declared with it. Thus four knaves and a marriage (see table of scores) may be declared at the same time; but a player canuot de- clare king and queen of spades and knave of diamonds together to score marriage and bézique with those three cards. He must first declare one combination, say bézique ; aud when he wins another trick he can score marriage by declaring the king. A declaration caunot be made of cards that have already all been declared. Thus, if four knaves (one being a bézique knave) and four queens (one be» ing a bézique queen) have been declared, the knave and queen already declared cannot be declared again as bézique. To scare all the combinations with these cards, after the knaves are declared and another trick won, bézique must next be made, after which, on winning another trick, the three queens can be added, and four queens scored. Again, if a sequence in trumps is declared, marriage of the king and queen on the table cannot afterwards take place. To score both, the marriage should be declared first, and after win- ning another trick the remaining sequence cards should be added. Lastly, a card once declared can only be used again in declaring in combinations of a different class. For example: the bézique

queen can be declared in bézique, marriage, and four queens ; but having once been declared in single bézique, she cannot form part of another single bézique ; having been married once, she cannot be married again ; and having taken part in one set of four queens, she canuot take part in another.

The seven of trumps may be either declared or exchanged for the turn-up after winning a trick, and before drawing. When ex: changed, the turn-up is taken into the player's hand, and the seven put in its place. The second seven is, of course, declared, as it would be absurd to excliange one seven for another. A seven when declared is not left on the table, but is simply shown.

Lable of Bézique Scores.

Seven of trumps,! turned up, dealer marks….....0…006 10 Seven of trumps, declared or exchanged, player marks…. 10 Marriage (king and queen of any suit) declared…..... 20 Royal marriage (king and queen of trumps) declared…... 40

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1 Some players do not turn up a card for trumps, but make the trump suit depend on the first marriage declared. The turning up rule is the best. :

BEZIQUE

Bézique® (queen of spades and knave of diamonds) de-

clared Double bézique? (all the four bézique cards) declared…... 500 Four aces (any four, whether duplicates or not), declared 100

Fowr keags (any four) Weclared …....ccscovaccconseoecencoetetan 80 four queens (any four) declared ….....2seecscrcaveseeve 60 Four knaves (any four) declared ….....ccsseseevennnnaeces 40 Sequence (ace, ten, king, queen, knave of trumps) de- CHUTES... ococuditnes ots anenss 1» 50105 ee en eee eee 250 Aces and tens, in tricks, the winner for each one marks 10 Last trick,® the winner marks,.....s0ssccecccesavees vente 10*

The winner of the last trick can declare anything in his hand (subject to the limitations with regard to declaring already ex- plained). After this all declarations cease. The winner of the last trick takes the last card of the stock, and the loser the turn up card (or seven exchanged for it). All cards on the table, that have been declared and not played, are taken up by their owners. The last eight tricks are then played, but the rules of play alter. The winner of the last trick Ieads. The second player must follow suit if able, and must win the trick if able, and if not able to follow suit, he must win the trick if he can by trumping. The winner of the trick leads to the next. The tricks are only valuable for the aces and tens they may contain. If a player revokes in the last eight tricks, or does not win the card led, if able, the last eight tricks belong to his adversary.

When a decal is over, the non-dealer in the previous hand deals, and so on alternately until the game is won by one of the players reaching 1000. All tlie scores are reckoned by tens, but there is no reason why thcy should not be reckoned by units, the game in that case being 100 up. The score may be kept by means of a bézique board and pegs, or by a numbered dial and hand, or by counters.

PreNA.Ltizs.—If the dealer gives too few cards the number must be completed from the stock, or the non-dealer, not having looked at his cards, may have a fresh deal.

If the dealer gives his adversary too many cards the player who has too many must not draw until his number is reduced to seven.

If the dealcr gives himself too many cards the non-dealer may draw the surplus cards and add them to the stock, unless the dealer has looked at his hand, when he is liable to the penalty for playing with nine cards (¢nfra).

A card exposed in dealing gives the adversary the option of a fresh deal.

If a player draws out of his turn, and the adversary discovers the error before he draws, he may add 20 to his score, or deduct 20 from his adversary's.

If the winner of a trick when drawing lifts two cards, the adver- sary may have them exposed, and take his choice. If the loser of a trick lifts two cards, the adversary may look at the one improperly lifted, and at the next draw that card and the next are turned face up, and the player not iu fault has his choice of them.

It a player plays with seven cards his adversary may add 20 to his own score, or deduct 20 from the offender's. The player with a card short must take two cards at his next draw.

If at any time during the play of the hand one player is found to hold nine cards, the other having but eight, the adversary of the player with nine cards may add 200 to his own score, or deduct 200 from the offender's. The player with nine cards must play to the next trick without drawing.

There is no penalty at two handed bézique for exposing a card from the hand, or for leading out of turn. At three or four handed bézique, a card exposed or led out of turn must remain on the table, and uothing can be subsequently declared in combination with it.

- *When clubs or hearts are trumps, the bézique cards are queen of spades and knave of diamonds. When spades or diamonds are trumps, the bézique cards are queen of clubs and knave of hearts. Some players object to this alteration, but it is a great improvement to the game.*

3 If single bézique is declared first, and then the two other bézique cards added, 500 is scored in addition to the 40 already scored ; but if all four are declared together only 500 can be scored, and not 540.

4 The winner of a trick containing two aces or two tens, or one of each, of course marks 20. The best plan is to score aces and tens im- niediately they are won ; but some players only score them at the end of the hand. When this mode is adopted, the winner of a trick con- taining an ace or ten takes the tricks on the table and turns them face downwards in front of himself, and after the hand is over looks through his packet to ascertain the number of aces and tens it contains. When scoring in this way it occasionally happens that both players can score out, in which case precedence is given to the winner of the so-called last trick.

5 The so-called last trick is the last before the stock is exhausted. When two cards of the stock, viz., the trump and another card, remain on the table, the player winning the trick is said to win the last trick, notwithstanding that there are still eight tricks to be played.

BEZLOeU

When a card is led out of turn, if all the other players play to it, the error cannot be rectified.

THREE AND Four Hanpep Bizique.—When three play, three packs are used together. All play against each other. The dealer deals to his left; the player first dealt to has the first lead. The rotation of dealing goes to the left. A second double bézique, counting 500, may be declared to a bézique on the table, which has already been used for double bézique. Triple bézique scores 1500. All the cards of the triple bézique must be on the table at the same time and unplayed to a trick. All may be declared together, or a double bézique may be added to a single one, or a third bézique may be added to a double bézique already declared. The game is 2000 up. In playing the last eight tricks, the third hand, if not able to follow suit, nor to win the trick by trumping, may throw away any card he

leases.

: When four play, four packs are shuffled together and used as one. The players may score independently, or they may play as partners. A second double bézique or triple bézique may be scored as before ; to form them the béziques may be declared from the hand of either partner. A player may declare when he or his partner takes a trick. In playing the last eight tricks, the winner of the last trick and the adversary to his left play their cards against each other, and then the other two' similarly play theirs.

Hints to PLayers.—The following hints, which merely touch on the elements of the play, may assist the beginner :—

The lead is, as a rule, disadvantageous. Therefore do not win the trick unless—(1) you want to declare ; or (2) you wish to make an ace or ten of the suit led; or (3) an ace or a ten is led which you desire to win.

Sevens, eights, and nines in plain suits are valueless. In trumps they should be kept to obtain the lead with. It is very important to keep one small trump in hand if possible. Knaves also are of but little value (except bézique and trump knaves), and may be thrown away freely.

It is of more importance to win aces and tens or to make tricks with them than at first sight appears. Experienced players prefer a number of small scores to sacrificing them for the chance of a large one. Therefore it is not considered good play as a rule to go for four aces unless you have three, and are in no difficulty as to your play. Rather make tricks with the aces, and especially capture tens with them. Whenever you are second player, and can win a trick with a ten, take it, except in trumps, of which the ten is kept for sequence.

When in difficulties, lead an ace or a ten in preference to a king or queen. As arule, if you try for aces, you have to sacrifice some other score, and are pretty sure to lose some of the aces after declar- ing them.

If driven to lead an ace or a ten, and your opponent does not win it, lead another,

- Endeavour to recollect in what suits the aces and tens have been played, so that, when leading, you may choose suits of which the most aces and tens are out. Similarly, if your adversary declares aces, avoid leading the suits of the declared aces ; and, in discard- ing, retain those cards which are least likely to be taken by aces and tens.

Having a choice between playing a possible scoring card, or a small trump, or a,card that you have declared, generally play the last so as to conceal your hand.

- Do not part with a sequence card early in the hand, even if you have a duplicate, as Playing it shows that you are likely to hold the duplicate, and you thus free your opponent's game, as he will im- mediately use his trump sequence cards to win all the aces and tens you lead.

Also, do not part with bézique cards until near the end of the hand, even after declaring bézique, because by so doing you give up all chance of

double bézique. If you draw or hold a third bézique card, sacrifice éverything, even sequence cards, for the chance of a double bézique.

Avoid declaring combinations which show your adversary that he cannot make sequence or double bézique. By keeping him in the dark you hamper his game, and are very likely to cause him to refrain from trumping your aces or tens. For example, if early in the hand you hold two trump queens and two bézique queens, you should postpone declaring them as long as possible, or even sacrifice the score altogether.

You may often judge during the play of the hand what combina- tions your adversary is going for. Thus, if he discards kings he is probably strong in queens, and vice versa. If in doubt as to whether you should keep kings or queens, you of course choose the combina- tion he is not trying for. With attcntion and experience it is surprising how much may be inferred as to your adversary's game, and how greatly your own line of play may be thus directed.

It is as a rule right to win the last trick, in order to prevent the adversary from declaring, for which purpose lead the ace of trumps. When within a few tricks of the end of the hand, you may often prevent your opponent from scoring sequence by leading out your high trumps.

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In playing the last eight tricks your object is simply to make as many aces and tens as you can, and to win those of your adversary.

PotisH Biizique (also called Open Bézique and Lild- niski) differs from ordinary bézique in the following par- ticulars :—

Whenever a scoring card is played, the winner of the trick places it face upwards in front of him (the same with both cards if two scoring cards are played to a trick), forming rows of aces, kings, queens, knaves, and trump tens (called open cards). Cards of the same denomination are placed overlapping one another lengthwise from the player towards his adversary to economise space. When a scoring card is placed among the open cards, all the sevens, eights, nines, and plain suit tens in the tricks are turned

down. Open cards cannot be played a second time, and can only be used in de- claring. Whether so used or not they remain face upwards on the table until the end of the hand, including the last eight tricks. A player can declare after winning a trick and before drawing again, when the trick won contains a card or cards, which added to his open cards complete any combination that scores. Every declara- tion must include a card played to the trick last won. Aces and tens must be scored as soon as won, and not at the end of the hand. The scven of trumps can be exchanged by the winner of the trick containing it ; and if the turn-up card is one that can be used in declaring, it becomes an open card when exchanged. The seven of trumps when not exchanged is scored for by the player winning the trick containing it.

Compound declarations are allowed, 7.¢., cards added to the open cards can at once be used, without waiting to win another trick, in as many combinations of different.classes as they will form with the winner's open cards. For example: A has' three open kings, and he wins a trick containing a king. Before drawing again he places the fourth king with the other three, and scores 80 for kings. This is a simple declaration. But suppose the card led was the queen of trumps, and A wins it with the king, and he has the following open cards—three kings, three queens, aud ace, ten, knave of trumps. He at once declares royal marriage (40); four kings (80); four queens (60) ; and sequence (250) ; and scores in all, 430. Again: ace of spades is turned up, and ace of hearts is led. The second player has two open accs, and wins the ace of hearts with the seven of trumps and exchanges. He scores for the exchange, 10; for the ace of hearts, 10; for the ace of spades, 10; and adds the aces to his open cards, and scores 100 for aces; in all, 130. If a declara- tion or part of a compound declaration is omitted, and the winner of the trick draws again, he cannot amend his score.

The ordinary rule holds that a second declaration cannot be made of a card already declared in the same class. Thus: a queen once married cannot be married again ; a fifth king added to four already. declared does not entitle to another score for kings.

The fundamental point to be borne in mind is, that no declara- tion can be effected by means of cards held in the hand. Thus: A having three open qucens and a queen in hand cannot add it to his open cards. He must win another trick containing a queen, when he cau declare queens.

Declarations continue during the play of the last eight tricks just the same as during the play of the other cards.

The game is 2000 up. After each deal it is advisable to shuffle thoroughly ; otherwise a number of small cards will run together in the stock, and impair the interest of the game. It is also advisable to adopt the change in the bézique cards recommended for ordinary bézique, otherwise the scores of one hand may run very high, and of the other very low, which spoils the game. The lcad is even more disadvantageous than at ordinary bézique. It is important not to lead cards that can be won by bézique cards. It 1s often advisable to win with a high card though able to win with a low one; thus having king, nine of a suit of which the eight is led, if you win the trick, you should take it with the king. It is not of so much consequence to win aces and tens (especially the latter) as at ordinary bézique. It is a difficult point in the game to decide whether to win tricks with sequence eards, on the chance of event- ually scoring sequence, or to reserve trumps forthe last eight tricks. As arule, if the hand is well advanced, and you are badly off in trumps, win tricks with sequence cards, and especially if you have duplicate sequence cards make them both. If badly off in trumps towards the end of a hand, and your adversary may win double bézique, keep in hand an ace or ten of the bézique suits, as when it comes to the last eight tricks (in which suit must be followed), you may prevent the score of double bézique.

Granp Biziqus (also called Chinese Bézique) is played like ordinary bézique, except as follows :—

Four packs are shuffled together and used as one, and nine cards are dealt to each player, by three at a time to each. When a com- bination is declared, and one of the cards composing it is played away, another declaration can be completed (after winning a trick) with the same cards. Thus: A declares four aces, and uses one to win a trick, or throws one away. A has a fifth ace in hand and wins a

trick, he can add it to the three remaining declared aces, and score four aces again, and so on. Marriages can be declared over and over again ; thus king, quecn of hearts are declared, and the player draws another king of hearts. Heplaysthe declared king and wins the trick, he can then marry the queen again. Some players object to this, calling it bigamy ; but if only permitted after the declared king is played, it is not bigamy, but the marriage of a widow. Bézique follows the same rulc: if, say, the knave is played away, another knave makes another bézique ; and so on with double and triple bézique, if the former declared cards which remain unplayed can be matched from cards in hand to make the requisite combinations. Sequence can be declared over and over again, and compound declarations made among the declared cards are now generally allowed. The sevens of trumps do not count, nor does the last trick, or at all events these only count by agreement. The game is 8000 up. The great points to aim at are to declare four aces or sequence, which can then be declared over and over again, if fresh aces or sequence cards are taken into hand (the duplicate sequence cards being first played away).- With fair chance of sequence every- thing else, even aces or chance of double bézique, should be sacri- ficed. (H. J.)

BHAGALPUR, a division or commissionership of British India, under the Lieuteuant-Governor of Bengal, comprising the districts of Bhagalpur, Monghir, Santal Parganas, and Purniah, lies between 23° and 27° N. lat., and 85° and 89° E. long. It is bounded on the N. by the independent state of Nepal and the British district of Darjiling; on the E. by the districts of Jalpaiguri, Dinajpur, Maldah, Murshidabad, and Birbhim; on the 8S. by the districts of Birbhim, Ménbhtim, and Hazarfbagh; and on the W. by the districts of Gaydé, Patnd4, and Tirhut. According to thé census report of 1872, Bhagalpur division contained an area of 18,685 square miles, with a total population, of 6,613,358 (¢.e., 354 to the square mile), in- habiting 19,247 villages and 1,801,497 houses. Of this population, 4,925,714, or 74:5 per cent., are Hindus; 1,121,630, or 17:0 per cent., Mahometans;

2469 Chris- tians ; 53 Buddhists ; 563,492, or 8°5 per cent., of unspeci- fied religion, chiefly consisting of aboriginal tribes.

BuAGatpur, a district of British India in the division of the same name, under the Lieutenant-Governor of Bengal, situated between 26° 35' 30" and 24° 32' 39" N. lat., and 87° 33' 51" and 86° 21' 32" E. long. It is bounded on the N. by the independent state of Nepal, on the E. by the districts of Purniah and the Santal Parganas, on the S. by the Santal Pargands and Hazaribagh, and on the W. by the districts of Monghir and Tirhut. Bhagalpur is a long and narrow district, divided into two unequal parts by the River Ganges. In the southern portion of the district the scenery in parts of the hill-ranges and the high- lands which connect them is very beautiful. The hills are of the primary formation, with fine masses of contorted gneiss. The ground is broken up into picturesque gorges and deep ravines, and the whole is covered with fine forest trees and a rich undergrowth. Within this portion also lie the lowlands of Bhagalpur, fertile, well planted, well watered, and highly cultivated. The country north of the Ganges is level, but beautifully diversified with trees and verdure. Three fine rivers flow through the district—the Ganges, Kusi, and Ghagri. The Ganges runs a course of 60 miles through Bhaégalpur, is navigable all the year round, and has an average width of three miles. The Kust rises in the Himélayas and falls into the Ganges near Colgong (Kahlgdon), within Bhagalpur. It is a fine stream, navigable up to the foot of the hills, and re- ceives the Ghagri eight miles above its debouchure.

j The census of 1872 disclosed a population of 1,826,290 souls, inhabiting 2739 towns or villages ; and 329,372 houses, giving an average of 422 per square mile, 667 per village, and 5°5 per house. Of the total population, 1,639,949, or 89°8 per cent., are Hindus; 169,426, or 9°3 per cent., Mahometans; 532 Christians; 19 Buddhists; 16,364, or 9 per cent., of unspecified religions, chiefly of aboriginal tribes, consisting of hillmen, Nats, Santals, &c. In the early days

of British administration these hill people gave much trouble. They were the'original inhabitants of the conntry whom the Aryan

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conquerors had driven back into the barren hills and unhealthy forests. This they avenged from generation to generation by plundering and ravaging the plains. The efforts to subdue or restrain these marauders proved fruitless, till Angustus Cleveland, the collector of Bhagalpur in the latter half of last century, wou them by mild measures, and successfully made over the protection of the district to the very hill people who a few years before had been its scourge. Rice, wheat, barley, oats, Indian corn, various kinds of millet, pulses, oil-seeds, tobacco, cotton, indigo, opium, flax and hemp, and sugar-cane, are the principal agricultural pro- ducts of Bhagalpur district. The jungles afford good pasturage in the hot weather, and abound in lac, silk cocoons, catcchu, resin, and the mahudé fruit, which is both used as fruit and for the manu- facture of spirits. Iron, gold, coal, and' building stone are found, but no iron or coal is at present smelted or worked. Gold is washed from the river sand in small particles. Silk cloth, called tasar, and pots similar to Chinese ware, are the principal manufactures of Bhagalpur. Principal seats of trade—Bhagalpur, Ghoghd, Colgong (Kahlgaon), Pirpainti, and Sultanganj on the East Indian Railway; Umarpur, Puraini, Chandpur, Belhar, Jaipur, Kataria, Sabalpur, Paujwara, and Chandan, in the south of the district ; and Bihpur, Krishnaganj, Muraliganj, and Pratapganj north of the Ganges. Besides nine principal roads with a total length of 868 miles, which form the means of external and internal communication, 62 miles of the East Indian Railway connect Bhagalpur with Calcutta and Upper India. For administrative purposes Bhagalpur district is divided into four magisterial subdivisions, viz., the headquarters subdivision, and those of Banki, Madhupura, and Supul; and for police purposes into twelve thdnds. A regular police, 600 strong, was maintained in 1872 at a total cost of £9569, or an average of one man to every 7°06 square miles,, and 2979 of the population. Besides the regular policc there were, in 1872, 3666 village watch- men, supported at an estimated cost of £5700, paid by the land- holders and villagers, exclusive of the service lands which they enjoy rent free. 'lhe total net revenuc of the district, in 1870-71, amounted to £139,545, of which £72,161, or 51'71 per cent., was derived from the land ; expenditure, £82,570. For the education of the people there were, in 1872, 14 Government and aided schools, attended by 876 pupils, and maintained at a total cost of £2313, of which Government contributed £929. The unaided schools num- bered 814, attended by 3593 pupils. The climate of Bhagalpur partakes of the character both of the

deltaic districts of Bengal and of the districts of Behar, between which it is situated. The hot season sets in about the end of March, continues till the beginning of June, the temperature at this time rising as high as 110° Fahr. The rains usually begin at the cnd of June and last till the middle of September ; average annual rainfall, 55 inches. The cold season commences at the beginning of November and lasts till March. During December and January the temperature falls as low as 41° Fahr. The average annual temperature is 78°. Bhagalpur formed a part of the ancient Sanskrit kingdom of Anga. In later times it was included in the powerful Hindu kingdom of Magadha or Behar, and in the 7th century A.D. it was an independent state, with the city of Champa for its capital. It afterwards formed a part of the Mahometan kingdom of Gaur, and was subsequently subjugated by Akbar, who declared it to be a part of the Dehli empire. Bhagalpur passed to the East India Company by the grant of the Emperor Shah Alam in 1765. (W. W. H.)

BuHAGALPUR, the principal town of the district and division of the same name, situated on the right bank of the Ganges, here seven miles wide, in 25° 11' N. lat. and 87° E. long. The town is two miles in length and a mile in width, but les in a low, open valley, and consists of scattered market-places meanly built. Its most interesting objects are two ancient round towers, each about 70 feet high. Adjacent to the town are the two Cleveland monu- ments, one erected by Government, and the other by the Hindus, to the memory of tle civilian, who, at the end of last century, "'by conciliation, confidence, and benevo- lence, attempted and accomplished the entire subjection of the lawless and savage inhabitants of the Jungleterry of Rajmahal." Bhagalpur is the headquarters of the com- missioner of the division and of the judge and collector of the district; it is also a station of the East Indian Railway. Its Government school was attended by 361 pupils in 1872. In the same year the town contained a population of 69,678 souls, of whom 50,673, or 72 per cent., are Hindus; 18,455, or 26 per cent., Mahometans; 19 were Buddhists, 342 Christians, and 189 unclassified. Municipal income, in 1872, £2951, 6s.; expenditure, £3470, 14s. ; incidence of municipal taxation, 103d. per head of the town population.

BHAMO, or Banmo (in Chinese, Tstnacat), a city of Upper Burmah, situated in 24° 16' N. lat. and 95° 54! 47" E. long., on the left bank of the Irawady, a short distance below its confluence with the Tapeng, and about 300 miles up the river from Mandalay the capital. It was formerly a very flourishing city, and the chief town of a Shan prin- cipality ; and though greatly decayed, it is still the seat of a Burmese governor and the centre of a considerable trade. At the time of Dr John Anderson's visit in the year 1868 (Hxpedition to Western Yunnan, 1871), it consisted of about 500 houses of sun-burnt brick, and had an estimated population of 2500, partly Shans and partly Chinese. The latter possess a temple and theatre, and there were remains of ancient pagodas and other buildings. Jn the neighbourhood are ruins of two cities, called Tsam- penago, both of considerable extent. Special attention has been directed to Bhamé as an important position for the development of commerce between British India and Western Yunnan, no fewer than four practicable routes leading eastward from the city to Momein.

BHANDARA, a district of British India, under the jurisdiction of the Chief Commissioner of the Central Provinces, situated between 20° and 22° N. lat., and 79° and 81° E. long. It is bounded on the N. by the districts of Seont and Balaghat, on the E. by the district of Raipur, 'on the 8. by the district of Chand4é, and on the W. by the district of Nagpur. To the north, north-east, and east, a natural boundary line is marked out by lofty hills, inhabited by Gonds and other aboriginal tribes, while the west and north-west are comparatively open. Small branches of the Satpura range make their way into the interior of the district. The Ambagarh, or Sendurjhart hills, which skirt the south of the Chandpur pargana, have an average height of between 300 and 400 feet above the level of the plain. The other elevated tracts are the Balahf hills, the Kanheri hills, and the Nawegaon hills. The Waingangdé is the principal river in the district, and the only stream that does not dry up in the hot weather,—its affluents within the district being the Bawantharl, Baghnadi, Kanhan, and Chulban. There are 3648 small lakes and tanks in Bhandara district, whence it is called the "lake region of Nagpur ;" they afford ample means of irrigation. More than one-third of the district lies under jungle, which yields gum, medicinal fruits and nuts, edible fruits, lac, honey, and the blossoms of the mahud tree (Bassia latifolia), which are eaten by the poorer classes, and used for the

manu- facture of a kind of spirit. Tigers, panthers, deer, wild hogs, and other wild animals abound in the forests, and during the rainy season many deaths occur from snake-bites.

Bhandara district eontains an assesscd area of 3148°6] square miles, or 2,015,114 acres, of which 819,922 acres were under culti- vation in 1869; 30,845 acres, grazing lands ; 550,922 acres, culti- vable but not under eultivation; and 613,425 acres uneultivable waste. The eensus of 1872 gave the total area of the district at 3922 square miles, and returned the population at 564,819 (144 to the square milc), residing in 106,121 houses and 1589 villages. Of the total population, 472,151, or 83°60 per cent., were Hindus ; 10,696, or 1°89 per cent., Mahometans; 520 Buddhists or Jains ; 61 Christians; and 81,379, or 14°41 per cent., were aboriginal tribes of unspecified religion. The Hindu population is chiefly divided into the following eastes:—Bralinans, " Pardesis," or foreigners (generally Rajputs), Ponwars, Lodhis, Kunbis, Koris, Kalals, Telis, Dhimars, Koshtis, Goaras, and Dhers. The inhabit- ants are rude and unpolished in their manners, and slothful in their habits. The agricultural products of the district eonsist of rice, wheat, grain, pulses, peas, sugar-cane, oil-seeds, and eotton ; the following being an estimate of the acreage under different crops :-— rice, 548,019 aeres; wheat, 86,064; otlier food grains, 147,982 ; oil-seeds, 27,068 ; sugar-cane, 12,561; fibres, 197; tobacco, 558 ; and vegetables, 2128 acres—total, 819,477 acres, or 1280°43 square miles. Iron is the ehief mineral product. Gold is also found in the bed of the Son Nadi, but does not repay the trouble of searching for it. Laterite, shale, and sandstone oceur all over the district— the largest quarries being near Bhandara town, at Korambi, and in the Balahi hills. Native cloth, brass wares, pot-stone wares, cart-

whecls, straw and reed baskets, and a small quantity of silk, form the only manufactures of the district. Cotton, salt, wheat, rice, oil-seeds, hardware, English piece goods, tobuceo, silk, dyes, and eattle, are its chicf articles of import ; and eountry cloth, tobacco, and hardware its exports. The Great Eastern Road is the only well-raised, bridged, and metalled road in the district ; but there arc also five or six second-class roads, unmetalled and

unbridged, but levelled, and sloped at the crossings of water-courses. 'The revenue demand for 1868-69 amounted to £40,296, 8s. from land, £5592, Qs. from excise, £3774, 18s. from stamps, £2558, 10s. from forests, £5051, 10s. from assessed taxes—total, £57,268, 8s. The regular police force of 442 inen was inaintained in 1868 at a cost of £5584, 10s., exclusive of the village watch. In 1868 the distriet con- tained 38 Government and 78 private schools, aflording instraction to 7109 boys and 215 girls. Four towns have upwards of 5000 inhabitants: (1.) Bhandar4a—population, 11,438; munieipal ineome, £486; expenditure, £645, 6s.; rate of taxation, 10}d. per head; (2.) Tumsal—population, 7367; municipal income, £1305; expenditure, £554, 10s.; rate of taxation, 3s. 64d. per head; (8.) Mohari—population, 6183; municipal revenue, £198; expenditure, £244, 2s. ; rate of taxation, 72d. per head; (4.) Pauni—population, 8976 ; munieipal revenue, 174, 10s.; expenditure, £233, 18s.; rate of taxa- tion, 43d. per head. Bhandaré district contains 25 semi-independent chiefships, having an area of 1509 square miles, and a population of 166,005 souls in 1866. These little states are exempted from the revenue system, and only pay.a light tribute. Their territory, how- ever, is included within the returns of area and population above given. 'he climate of Bhandara is unhealthy,—the prevailing diseases being fever, small-pox, and cholera. Nothing is known of the early history of the distriet. 'Tradition says that at a remote period a tribe of men, ealled the Gaulis or Gaulars, overran and eonquered it. At the end of the 17th century it belonged to the Gond Raja of Deogarh. In 1788 it was conquered by the Marhattas, who governed it till the year 1854, when it lapsed to the British Government, the Raja of Nagpur having died without an heir.

BHANDARA, the principal town and headquarters of the district of the same name, is situated on the Wainganga, about 38 miles east of Nagpur. The town is kept neat and clean, is well drained, and is considered healthy. In 1872 it contained a total population of 11,433 souls, of whom 9657 were Hindus, 1450 Mahometans, 58 Bud- dhists and Jains, 54 Christians, and 214 of unspecified religion. Jor income, &c., see above. The town enjoys a considerable trade in cotton cloth and the local hardware.

BHANG, an East Indian name for the hemp plant, Cannabis sativa, but applied specially to the leaves dried and prepared for use as a narcotic

drug. The hemp plant,

.as cultivated in the Bengal Presidency and the North-West

Provinces, yields a peculiar resinous exudation, which is altogether wanting in the hemp grown on account of its fibre in European countries. For this resinous exudation, in which its virtues as a drug reside, hemp is cultivated in Kashmir, Bokhara, Yarkand, and Central Asia generally, besides North India, and in certain parts of East Africa, where, according to Captain Burton, it is grown " before every cottage door." In India the products of the plant for use as a narcotic and intoxicant are recognized under the three names and forms of Bhang, Gunja or Ganja, and Churrus or Charas. Bhang consists of the larger leaves and capsules of the plant on which an effloresence of resinous matter has occurred. The leaves are in broken and partly agglutinated pieces, having a dark-green colour and a heavy but not unpleasant smell. Bhang is used in India for smoking, with or without tobacco ; it is prepared in the form of a cake or manjan, and it is made into an intoxicating beverage by infusing in cold water and straining. Gunja is the flowering or fruit-bearing tops of the female plants. It is gathered in stalks of several inches in length, the tops of which form a matted mass, from the agglutination of flowers, seeds, and leaflets by the abundant resinous exudation which coats them. Churrus is the resinous substance separated from the plant. According to Dr O'Shauglinessy it is obtained by men dressed in leathern aprons brushing forcibly through the growing stalks, and the resin which thereby adheres to the leather is scraped off with knives. It is stated that in Nepal the

leather covering is dispensed with, and the resin gathered on the naked bodies of coolies, who brush through the standing stalks. Dr Royle says, "the glandular secretion is collected from the plants on the hills by the natives pressing the upper part of the young plants between the palms of their hands, and scraping off the secretion which adheres." The preparation known as hashish among the Arabs is similar to the gunja of India, and is used in the same manner. The use of preparations of hemp among the Mussulman and Hindu population of India is very general; and the habit also obtains among the population

of Central Asia, the Arabs, and Egyptians, extending even .

to the negroes of the valley of the Zambesi and the Hottentots of South Africa. The habit appears to date from very remote times, for Herodotus says of the Scythians, that they creep inside huts and throw hemp seeds on hot stones. The seeds "soon send forth a virulent intoxicating smoke, which fills the close tent, and the people inside, being overpowered with the intoxicating effects, howl with excitement and delight." The observations of Dr O'Shaugh- nessy on the effects of the drug on the native population of India led him to conclude that it alleviates pain, and causes a remarkable increase of appetite, unequivocal aphrodisia, and great mental cheerfulness. Its violent effects are delirium of a peculiar kind, and the production of a cata- leptic condition. Sir Robert Christison says, that "for energy, certainty, and convenience, Indian hemp is the next anodyne, hypnotic, and antispasmodic to opium and its derivatives, and often equal to it." Preparations are used in British pharmacy in the form of tincture and extract prepared from gunja, and it is understood to form an ingredient in the patent medicine chlorodyne.

BHARAICH, a distriet of British India, under the jurisdiction of the Chief Commissioner of Oudh, situated between 28° 23' and 27° 4' N. lat., and 82° 11' and 81° 9' E. long. It is bounded on the N. by the independent state of Nepal, on the E. and S.E. by the district of Gonda, on the S.W. by the district of Bara Banki, and on the W. by the districts of S{t4pur and Kherf. Bhardich district consists of three tracts:—(1), in the centre, an elevated triangular plateau, projecting from the base of the Himalayas for about 50 miles in a south-easterly ~~*direction—average breadth 13 miles, area 670 square iniles ; (2), the great plain of the Ghagra, on the west, about 40 feet below the level of the plateau; and (3), on the east, another lesser area of depression. The Z'ardz, or the forest and marshy tracts along the southern slopes of the Hima*~~ *layas, gradually merge within the district into drier land, the beds of the streanis become deeper and more marked, the marshes disappear, and the country assumes the ordin- 'ary appearance of the plain of the Ganges. The Ghagrd skirts the district for 114 miles; and the Rapti, with its branch the Bhakla, drains the high grounds.*

District area, 2398 square miles, since the redistribution of terri- tory in 1869; prior to this its area was 2682 square miles. In 1872 the district contained a total population of 774,640 souls, re- siding in 121,905 houses and 1965 villages ; of which 676,313 were Hindus, 98,124 Mahometans, and 40 Christians, and the rest of unclassified religions. Of the Hindu population the Brahmans number 71,215 ; Kshatriyas, 20,514; Ahirs, 91,479; Chamars, 56,329; Kurmis, 79,723. Principal crops and estimated acreage :—rice, 167,000 acres; Indian corn, 76,000; wheat, 73,000; barley, 84,000; and rape-seed, 25,000 acres. Besides these, other kinds of oil-seeds, pulses, sugar, cotton, opium, indigo, fibres, tobacco, and vegetables are also cultivated. Total assessed arca of the district, 1,848,104 acres'; of which 836,441 are under cultivation, 511,663 cultivable grazing land, and 187,247 uncultivable waste. Land tax, £114,507 ; rate per cultivated acre, 2s. 9d. Of the population 495,751 are agri- culturists, aud 278,889 non-agriculturists. There are no manufac- tures of any?note in the district, but each large village has its little colony of weavers, and fireworks are made in Bhardich and Nan- para, Revenue in 1871, £130,000; of which £116,000, or 89 per cent., was derived from the land. District civil expenditure, £10,147, The last land revenue settlement was completed in 1871,

and expires at different periods between 1897 and 1901. The regular police number, besides the village watch, 465 men, maintained at a cost of £5850. Education is backward. The central school at Bharaich has 105 pupils; and 8 Anglo-vernacular, with 41 ver- nacular village schools throughout the district, have 1649 pupils. Principal towns :—(1.) Bharaich, built on the extreme edge of the plateau described above, where it sinks sharply down upon the plains of Oudh; height above sea-level, 420 feet; population, 18,889 ; municipal income in 1871, £2177, 14s.; rate of taxation, 2s. 84d. per head ; (2.) Nanpara, population, 6858 ; municipal in- come in 1871, £337, 8s.; rate of taxation, 113d. per head; (3.) Jainal, population, 4510.

BHARTPUR, or BuuRtporg, a native state of RAjputana in Upper India, under the political superintendence of the British Government, lying between 26° 48' and 27° 50' N. lat., and 76° 54' and 77° 49' E. long. It is bounded on the N. by the British district of Gurgion, on the N.E. by

Mathura, on the E. by Agra, on the S. and S.W. by the Rajput states of Karauli and Jaipur, and on the W. by the state of Alwar. Length from north to south, about 77 miles; greatest breadth, 50 miles; area, 1974 square miles. The country is generally level, about 700 feet above the sea. Small detached hills, rising to 200 feet in height, occur, especially in the northern part. These hills contain good building stone for ornamental architecture, and in some of them iron ore is abundant. The Bangangd is the only river which flows through the state. It takes its rise at Manoharpur in the territory of Jaipur, and flow- ing eastward passes through the heart of the Bhartpur state, and joins the Janina below Agra.

In 1871-72 the population of Bhartpur amounted to 743,710 souls, consisting chiefly of Jats professing Hinduism, to which tribe the Raja or chief of the state belongs. The Jats are one of the ancient Indo-Germanic races of India; by religion, Musalmans in the west of Hindustan, Hindus in the east, and Sikhs in the Panjab. The Jats make excellent cultivators, hardworking, thrifty, and energetic in the arts of peace as in those of war. Principal crops :—Wwheat, Indian corn, cotton, pulses, and sugar. The want of water is much felt ; but the soil, though in many places sandy, is rendered highly productive by well-irrigation. The saline tracts yield salt of an inferior quality. Chief routes :—Mathura to Mhau (Mhow) via Bhartpur town; Mathura to Nasirabdd, through Bhartpur town ; Mathura to Alwar, through Dig town; Agra to Ferozpur, through the towns of Bhartpur, Dig, and Kumbher ; Agra to Ajmir, by Waer. Principal towns :—Bhartpur, Dig, Wéer, Kunibher, and Biana.

Bhartpur rose into importance under Straj Mall, who bore a conspicuous part in the destruction of the Dehli empire. Having built the forts of Dig and Kumbher in 1730, he received in 1756 the title of Raéj4, and subse- quently joined the great Marhatté army with 30,000 troops. But the misconduct of the Marhattd leader induced him to abandon the confederacy, just in time to escape the murderous defeat at Paniput. Suraj Mall raised the Jat power to its highest point; and Colonel Dow, in 1770, estimated the Raja's revenue (perhaps extravagantly) at £2,000,000, and his military force at 60,000 or 70,000 men. In 1803 the East India Company concluded a treaty, offensive and defensive, with Bhartpur. In 1804, how- ever, the Raja assisted the Marhattds against the British. The English under Lord Lake captured the

fort of Dig and besieged Bhartpur, but was compelled to raise the siege after four attempts at storming. A treaty, concluded on 17th April 1805, guaranteed the Raja's territory ; but he became bound to pay £200,000 as indemnity to the East India Company. A dispute as to the right of the succession again led to a war in 1825, and Lord Comber- mere captured Bhartpur with a besieging force of 20,000 men, after a desperate resistance, on the 18th January 1826. The fortifications were dismantled, the hostile chief being deported to Benares, and an infant son of the former Raja installed under a treaty favourable to the Company. In 1853 the Bhartpur ruler died, leaving a minor heir. The state came under British management, and the administration has been improved, the revenue increased,

a system of irrigation developed, new tanks and wells con- structed, and an excellent system of roads and public buildings organized. In 1871-72 the revenue of the Bhartpur state amounted to £261,957. For educational purposes one college and 147 schools, with 3908 students, are maintained at an annual expenditure of £1821. The military force of the state consists of 1500 cavalry, 1500 infantry, and 200 artillery. The police force numbers 2200 men. Owing to the hot winds blowing from Raj putana, the climate of Bhartpur is extremely sultry till the setting in of the periodical rains. Bhartpur city, the capi- tal, lies in 27° 12' N. lat. and 85° 49' E. long.

BHATGAON, a town of Northern India, in the Nepal valley, situated in 27° 37' N. lat. and 85° 22' BK. long. It is a celebrated place of Hindu superstition, the favourite residence of the Brahmans of Nepal, and contains more families of that order than either Katmandu or Patu. It contains 12,000 houses, and its palace and buildings gene- rally are of a more striking appearance than in other Ne- palese towns. The town is said to possess many Sanskrit libraries.

BHATNIAR, or Buartis, a people of the northern part of Hindustan, inhabiting the tract of country now included within the British district of Hissar, formerly called Bhatiana, the eastern frontier of which is situated 125 miles north-west of Dehli. The Bhattis present many peculiarities in manners and customs, distinguishing them from the other people of Hindustan. 'They consist of two distinct races—the one being composed of

Mahometans of Rajput descent, who constitute the influential class, and who report among themselves that their ancestors emigrated some centuries ago from the district of Jasalmir, and after various vicissitudes settled in the Bhatnidr country; the other comprising the common people, known as Jats, who have adopted the religion of their superiors, and are con- sequently treated with great moderation. Most of these people are descended from dwellers on the western bank of the Satlej, who were invited by a Raja of the Bhattis to cross the river and settle in his country. Though tillers of the soil, the Bhattis are more generally characterized as shepherds ; and though they are mostly restricted to the territory whence their name is derived, various tribes of them are to be found in the Panjab, and they are also scattered over the high grounds to the east of the Indus.

Notwithstanding they are Mahometans, their customs are in some respects at variance with those observed by the majority of the followers of the prophet, particularly in the females appearing, without reserve, unveiled in public, and in their associating openly with the men. The wives of the Rajput chiefs form an exception.

The territory above described, anterior to British sway,

was under the dominion ofa prince or Raja, whose authority was acknowledged by inferior chiefs. This potentate could bring 20,000 or 30,000 men into the field, but they were quite undisciplined, and despised the necessary principle of subordination. His revenue arose chiefly from the plunder his troops secured; for their wars were directed more to predatory purposes than to open contest, aud the Raja, instead of repressing the ravages of this immense banditti, willingly participated in the spoils. – While under the influence of native rule the Bhattis appear to have formed a collection of hordes of freebooters. They have been described as of a cruel, savage, and fero- cious disposition, entertaining an abhorrence of the usages of civilized life—thieves from their earliest infancy, and during their predatory incursions into the neighbouring districts, not scrupling, though unresisted, to add murder to robbery.

Many of the Bhattis appear to be constantly changing their residence from place to place as subsistence fails.

Their exports are horses, camels, bullocks, buffaloes, and ghi; occasionally they sell some surplus grain above what is necessary for their own consumption, but their traffic is very inconsiderable. A large portion of the country is unproductive, but along the banks of the River Ghagar, from Bhatnidr to the town of Sirsa, and also in the vicinity of the Naiwal (Nal4, or watercourse), the soil is uncommonly rich, aud well adapted for cultivation. The inundations of these rivers fertilize their banks, aud the subsidence of the waters leaves a broad margin prepared for plentiful crops of wheat, rice, and barley, which amply reward the labours of the husbandinan.

The former capital of the Bhattis was Bhatnidr, which lies in a situation almost inaccessible to an enemy, for no water is to be procured within 12 miles but what supplies the inhabitants. It was taken, however, in 1398 by Timur, more recently by the military adventurer George Thomas, and finally in 1805 by the Raja of Bikanir, who still retains authority over it. The principal town is Sirsa, between which and Bhawalpur a route for commercial pur- poses has been opened. Numbers of the Bhattis have emigrated from their native country to establish them- selves in the western parts of the dominions of Oudh ; and several families of them are to be met with in Rohilkhand. They are practised travellers, and well trained to emigra- tion by the laborious journeys undertaken in crossing the great desert to the west of their territories. During the independence of their native rulers, expeditions were fre- quently made in large parties for the purpose of preda- tory incursions on peaceable countries more remote ; and these banditti displayed both skill and determination in attaining their object. Camels previously laden with provisions were despatched to different stations in the desert, which is about 130 miles in breadth, and their loads deposited there. The most intelligent of the party about to follow were then selected as guides, and enforced the most implicit obedience on their companions during the journey, which closed at the frontier of the hostile country, or rather that against which their hostility was directed. The guides by long experience became expert. without compass or landmark, and seldom failed to con- duct the party to the appointed station where the provi- sions were deposited, and thence across the remainder of

the desert in safety. If accidentally they missed the points of rendezvous, or those where alone their necessities could be relieved, they were exposed to inevitable destruc- tion. The adventurers steered their course by the sun in the day-time, and by the polar star at night ; and by similar aids they were enabled to retrace the way they had travelled.

The history of the Bhattis has attracted the notice. of few European authors. They seem to have carried on frequent wars with neighbouring states, and were the most formidable enemies opposed to the Raja of Bikanir. The latter, however, invaded their territories in the beginning of the present century, and obtained some temporary advantages. He erected a fortress in Batinda, now a pos- session of the Raja of Patialé, and this contributed to overawe them for a time, and repressed their incursions into his own dominions, as, independently of the garrison, he stationed a large body of cavalry in the fort, whose frequent sallies and captures of cattle annoyed the Bhattis so much that they contemplated a total emigration from their own country. Bnt George Thomas, the military adventurer already noticed, an Irishman by birth, who, endowed with singular talents and intrepidity, had founded for himself an independent state in the north-west of India, was then at war with the province of Bikanir. Having reached its frontiers, the Bhattis solicited his alliance, and, to induce him to espouse their cause the more readily, offered him 40,000 rupees if he would reduce the obnoxious

fort. In the prosecution of the war several actions ensued, and various fortresses were taken; but it would appear that one of the Bhatti chiefs at variance with General Thomas commenced hostilities against him about the period now alluded to; and in this new warfare with his late allies his forces were so much reduced by repeated en- counters, that, being scarcely able to stand an engagement, he fortified his camps. The Bhattis, after frequent attacks, withdrew their troops by night; whereupon General Thomas took aud burned Fathiabéd and other places, and might have occupied the whole country, had not a neigh- bouring chief concluded an alliance with the Bhattis, and sent 1000 cavalry to their aid. General Thomas retreated to Jaijar, a town within his own territory, leaving the Bhattis in possession of their capital.

The triumphs of the British arms proved fatal to the European adventurers who at that period had established theniselves in Northern India, and the arrangements made with Sindia brought the British into contact with the country of the Bhattis, against whom they were compelled in 1810 to march a force, which expelled the chief, and transferred the greater part of the territory to his son, who had voluntarily proceeded to the British camp.

BHAWALPUR, a feudatory state in North-Western India, under the political jurisdiction of the Lientenant- Governor of the Panjab, lyiug between 27° 41' and 30° 25' N. lat., and 69° 30' and 73° 58' E. long. It is bounded on the N. by Sind and Panjdb, on the E. and §.E. by the British district of Hissar and the Rajput states of Bikanir and Jasalinfr, and on the S.W. by Sind. The state con- tains an estimated area of about 22,000 square miles ; greatest length from N.E. to 8.W., 310 miles; greatest breadth, 110 miles. Only a sixth part of the total area is capable of cultivation.

Thornton thus describes the geueral aspect of the state :—' Bhd- walpur is a remarkably level country, there being no considerable eminence within its limits, as the occasional sand-hills, seldom ex- ceeding 50 or 60 feet in height, cannot be considered exceptions. The cultivable part extends along the river line for a distance of about 10 miles in breadth from the left or castern bank. In the sandy part of the desert beyond this strip of fertility both men and beasts, leaving the beaten path, sink as if in loose snow. Here, too, the sand is raised into ever-changing hills by the force of the wind sweeping over it. In those parts of the desert which have a hard level soil of clay, a few stunted mimosas, acacias, and other shrubs are produced, together with rue, various bitter and aromatic plants, and occasionally tufts of grass. Much of the soil of the desert appears to be alluvial; there are numerous traces of streams having formerly passed over it, and still, where irrigation is at all practicable, fertility in the claycy tract follows; but the rains are scanty, the wells few and gencrally 100 fect deep or mire."

The Ghara, a great stream formed by the united waters of the Bias and Satlej, the Indus, and the Panjnad, are the principal rivers of the state, affording a continuous river-line of 300 or 350 miles in length. In 1872 the population was estimated at 472,791, the majority of whom are Mahometans, consisting of Jats of Hindu descent, Beluchis, and Afghans.

The principal products are woollen and cotton cloths, silk goods, indigo, cereals, alum, saltpetre, &c. These form the principal exports ; the imports are inconsiderable. Value of external trade in 1872, £358,000; internal trade, £444,700. Principal trade routes:—(1), From Bikaénir to Central Asia vita Bhawalpur ; (2), from Jasdlmir to Afghdnistin; (3), from Bhéa-walpur to Sind. Jn 1872 the gross revenue of the state was re- turned as £197,344; estimated military force, 2679. Principal towns— Bhawalpur, the" capital, situated on a branch of the River Ghara ; Ahmadpur, Uch, Khanpur, and Michindbdd.

The state was a dependency of the Durdn{ kingdom till its dismemberment, when Bhawalpur became inde- pendent. On the rise of Ranjit Singh, the khan of Bhawalpur tendered his allegiance to the British Govern- inent, and received a life-pension of £10,000 per annum for his services in the Sikh war. The present ruler is a minor (1875), and the state is now under British manage- ment, under which it has greatly prospered. The Panjab Administration Report for 1871-72 states that on the death

j of the late chief, when Bhawalpur came under British _

management, "the treasury was empty, the Government in debt, the army disorganized, the canals, on which cultiva- tion mainly depends, neglected, while a general sense of insecurity; prevailed ; but now (1871-72) there is a cash balance of £80,000 in hand, the state debts have been paid off, the revenue has reached £200,000 a year (or double what it was three years ago), while the ordinary expendi- ture is about £160,000, the canals have been greatly in- creased in number and efficiency, waste lands have been brought under cultivation, population has increased, and the army has been reorganized."

BHIL, a tribe and a British political agency in Central India. The political agency comprises the following nativ states :—(1.) Dhar, revenue in 1871-72, £60,000, expen diture £55,000 ; (2.) Bakhtnagar, revenue £5933, expen-diture £4495 ; (3.) Jabud, revenue £11,000, expenditure the same; (4.) Alfréjpur, revenue £12,095, expenditure £10,783 ; (5.) Matwash, revenue £620, expenditure £334 ;. (6.) Jobat, revenue £1500, expenditure £1200 ;

(7.) Kati- ward ; (8.) Ratanmall; (9.) Amjherd, Dektan, SAgar, Bang, Bankanir, and Mandwan, belonging to Sindhié; and (10.) Pitlawad and Chikdldé, belonging to Holkér. The Bhil agency comprises an area of 8160 square miles, with a population of 240,000 souls, and consists of—(1) Manpur Pargana (British) ; (2.) Barwdnt state (under British manage- inent in 1871-72); (3.) Jamnid, Rajgash, Garhi, and other Bhumid chiefdoms; (4.) Holkar's districts south of the Vindhyan range ; and (5.) Dewas or Bagod Parganda. The Bhil agency was formed in 1825, when the Bhil corps was organized, with a view to utilizing the warlike instincts of the Bhil tribes. This brave body of men have done good service, and gradually put down the predatory habits of their countrymen. The Bhil tribes chiefly inhabit the rocky ranges of the Vindhya and Sdtpur4 mountains, and the banks of the Narbadé and the Taptf. In common with other hill tribes, the Bhils are supposed to have been aborigines of India, and to have been driven to their pre- sent fastnesses at the time of the Hindu invasion. They are of dark complexion and diminutive stature, but active, and capable of enduring great fatigue. Vurious efforts have been made by the British Government to reclaim this people froin their predatory habits, and in 1869-70 the official report stated that "the Bhils of Manpur are becoming reconciled to the life of cultivators, though not yet willing to take out leases."

BHOPAL, a British political agency in Central India, comprising 31 native administrations classified as follows :—

First, Bhopal, a treaty state, its ruler having the power of life

and death; second, Rajgarh and Narsinghgarh, the rulers of which receive salutes, and exercise independent civil and cri- minal jurisdictiou, but submit proceedings in cases of heinous crime for the political agent's review; third, Kilchipur, Kurwal, and Maksvidnagar, the chiefs of which receive no salute, but possess independent authority, except in heinous offences ; fourth, Pathari, Basaud4, and Muhammadgarh, lesser chiefships, under the more direct supervision of the political agent ; Larawat, the chief of this is a jégérddr or holder of a grant of land under life tenure, and is subor- dinate to the political agent in all matters of administration; fifth, sixteen petty chiefs called thdkurs and jdgirdars ; sixth, four districts of

other native states not within the jurisdiction of this agency. The Bhopdél political agency is subordinate to the Central India agency.

BuopdL, a native state in Malwa in Central India, under the political superintendence of the British Go- vernment, lying between 22° 32’ and 23° 46’ N. lat., and 76° 25’ and 78° 50’ E. long. It is bounded on the N. by the state of Gwalior and the British district of Bairsia, on the N.E. and S.E. by the Sagar and Ner-

bada territory, ou the 8.W. by the possessions of Holkar and Sindhid, and on the N.W. by Sindhia’s districts and Omatwara. Length of the state from E. to W., 157 miles; breadth from N. to §., 76 miles; estimated area, 6764 square miles. The surface of the country is uneven, being traversed by the Vindhya ranges, a peak of which near Raysen is upwards of 2500 feet above sea-level. The general inclination of the country is towards the north, in which direction most of the streams of the state flow, while others, passing through the Vindhyan range, flow to the Narbad4. The population of the state is estimated at 663,656, comprising Hindus, Mahomet- ans, and the Gonds, an aboriginal tribe. Principal crops : wheat, Indian corn, oil-seeds, pulses, opium. Chief routes: (1), from Sagar through the town of Bhopal to the British cantonment of Mhow; (2), from Bhilsé to Hoshangabad and thence to Mhow ; (3), from Hoshangdébad to Nimach ; (4), from Jabalpur through Hoshangabad to Mhow. Prin- cipal towns: Bhopal the capital, Jslamnagar, Ashta, Sihor, and Raisen. In 1871-72 the annual income of the state was estimated at £240,000. Bhopal state was founded in 1723 by Dost Muhammad Khan, an Afghan adventurer. In 1818 a treaty of dependence was concluded between the chief and the British Government. Since then Bhopal has been steadily loyal to the British Government, and during the mutiny it rendered good services. The present ruler is a lady, aud both she and her mother, who preceded her as head of the state, have displayed the highest ca- pacity for administration. Both have been appointed Knights of the Star of India, and their territory is the best governed native state in India.

BHUTAN, an independent kingdom in the Eastern Himalayas, between 26° and 28° N. lat., and 89° and 93° E. long. It is bounded on the N. by Thibet;

on the E. by a tract inhabited by various uncivilized independ- ent mountain tribes; on the S. by the British province of Assam, and the district of Jalpdiguri; and on the W. by the independent native state of Sikim. The whole of Bhutan presents a succession of lofty and rugged moun- tains abounding in picturesque and sublime scenery. "The prospect," says Captain 'Turner, "between abrupt and lofty prominences is inconceivably grand ; hills clothed to their very summits with trees, dark and deep glens, and the high tops of mountains lost in the clouds, con- stitute altogether a scene of extraordinary magnificence and sublimity." As might be expected from its physical structure, this alpine region sends out numerous rivers in a southerly direction, which, forcing their passage through narrow defiles, and precipitated in cataracts over the precipices, eventually pour themselves into the Brah- maputra. One torrent is mentioned by Turner as falling over so great a height that it is nearly dissipated in mid-air, and looks from below like a jet of steam from boiling water. Of the rivers traversing Bhutan, the most considerable is the Manas, flowing in its progress to the Brahmaputra under the walls of Tasgaon, below which it is unfordable. At the foot of Tasga4on Hill it is crossed by a suspension bridge. The other principal rivers are the Machu, Tchin- chu, Torsha, Maiichi, and Dharla.

Previous to the British annexation of the Dwars from Bhutan, the area of the kingdom was reckoned at 20,000 sq. miles. The population of the country now remaining to Bhutan was estimated in 1864 at 20,000 souls. Later information, however, points to a larger figure. The people are industrious, and devote themselves to agricul- ture, but from the geological structure of the country, and from the insecurity of property, regular husbandry is limited to comparatively few spots. The people are oppressed and poor. '"' Nothing that a Bhutié possesses is his own," wrote the British envoy in 1864; "he is at all

times liable to lose it if it attracts the cupidity of any one more powerful than himself. The lower classes, whether villagers or public scrvants, are little better than the slaves of higher officials. In regard to them no rights of property are observed, and they have at once to surrender anything that is

demanded of them. ‘There never was, I fancy, a country in which the doctrine of ‘ might is right’ formed more completely the whole and sole law and cus- tom of the land than it does in Bhutan. No official receives a salary ; he has certain districts made over to him, and he may get what he can out of them; a certain portion of his gains he is compelled to send to the Darbar; and the more he extorts and the more he sends to his superior, the longer his tenure of office is likely to be.” Captain Pemberton thus describes their moral condition— ‘“T sometimes saw a few persons in whom the demoralizing influences of such a state of society had yet left a trace of the iniage in which they were originally created, and where the feelings of nature still exercised their accustomed in- fluence, but the exceptions were rare, and although I have travelled and resided amongst various savage tribes on our frontiers, I have never yet known a people so wholly degraded as the Bhutids.” Physically the Bhutids are a fine race, although dirty in their habits and persons. ‘Their food consists of meat, chiefly pork, turnips, rice, barley-meal, and tea made from the brick-tea of China. Their favourite drink is chong, distilled from rice or barley and millet, and Marwd, beer made from fermented millet. A loose woollen coat reaching to the knees, and bound round the waist by a thick fold of cotton cloth, forms the dress of the men ; the women’s dress is a long cloak with loose sleeves. The houses of the Bhutids are of three and four stories ; all the floors are neatly boarded with deal ; and on two sides of the house is a verandah ornamented with carved work generally painted. The Bhutids are neat joiners, and their doors, windows, and panelling are perfect in their way. No iron-work is used ; the doors open on ingenious wooden hinges. The appearance of the houses is precisely that of Swiss chalets, picturesque and com- fortable—the only drawback being a want of chimneys, which the Bhuti4s do not know how to construct. The people nominally profess the Buddhist religion, but in reality their religious exercises are confined to the pro- pitiation of evil spirits, and the mechanical recital of a few sacred sentences. Around the cottages in the moun- tains the land is cleared for cultivation, and produces thriving crops of barley, wheat, buckwheat, millet, mus- tard, chillies, &c. Turnips of excellent quality are exteusively grown ; they are free from fibre and remark- ably sweet. ‘The wheat and barley have a full round grain, and the climate is well adapted to the production of both European and Asiatic vegetables. Potatoes have been introduced. The Bhutids lay out their fields in a series of terraces cut out of the sides of the

hills; each terrace is rivetted and supported by stone embankments, sometimes twenty feet high. Every field is carefully fenced with pine branches, or protected by a stone wall. A complete system of irrigation permeates the whole culti- vated part of a village, the water being often brought from a long distance by stone aqueducts. Bhutids do not care to extend their cultivation, as an increased revenne is exacted in proportion to the land cultivated, but devote their whole energies to make the land yield twice what it is estimated to produce. The forests of Bhutan abound in many varieties of stately trees. Among them are the beech, ash, birch, maple, cypress, and yew. Firs and pines cover the mountain heights; and below these, but still at an elevation of eight or nine thousand feet, is a zone of vegetation, consisting principally of oaks and rhododendrons. The cinnamon tree is also found. Some

of the roots and branches 'vere cxamined by Turmer during his journey to Thibet; but the plant being neither in blossom nor bearing fruit, it was impossible to decide whether it was the true cinnamon or an inferior kind of cassia, The leaf, however, corresponded with the descrip- tion given of the true cinnamon by Linnens. The lower ranges of the hills abound in animal life. Elephants are so numerous as to be dangerous to travellers ; but tigers are not common, except near the River Tisté. Leopards abound in the Hah valley; deer everywhere, some of them of a very large species. The musk deer is found in the snows, and the barking deer on every hill side. Wild hogs are met with even at great elevations. Large squirrels are common. Jears and rhinoceros are also found. Pheas- auts, jungle fowls, pigeons, and other small game abound. The Bhutids are no sportsmen. They havea superstitious objection to firmg a gun, thinking that it offends the deities of the woods and valleys, and brings down rain. A species of horse, which seems indigenous to Bhutan, and is used as a domestic animal, is called téngan, from Tangastan, the general appellation of that assemblage of mountains which constitutes the territory of Bhutan. It is peculiar to this tract, not being found in any of the neigh- bouring countries of Assam, Nepal, Thibet, or Bengal, and unites in an eminent degree the two qualities of strength and beauty. 'The tdngan horse usually stands about thirteen hands high, is short bodied, clean-limbed, deep in the chest, and extremely

active, his colour usually inclining to piebald. In so barren and rude a country the manufac- turing industry of its people is, as might be expected, in a low stage, the few articles produced being all destined for home consumption. These consist of coarse blankets and cotton cloths made by the villagers inhabiting the southern tract. Leather, from the hide of the buffalo, imperfectly tanned, furnishes the soles of snow boots. Circular bowls are neatly turned from various woods. A small quantity of paper is made from a plant described as the Daphne papyrifera. Swords, iron spears, and arrow-heads, and a few copper caldrons fabricated from the metal obtained in the country, complete the list of muanufactures. The foreign trade of Bhutén has greatly declined. In 1809 the trade between Assam and Bhutan amounted to £20,000 per annum, the lac, madder, silk, evendi cloth, and dried fish of Assam, being exchanged for the woollens, gold-dust, salt, musk, horses, and silk of Bhutén. At present very little trade is carried on by Bhutén with the neighbouring countries. The military resources of the country are on an insignificant scale. Beyond the guards for the defence of the various castles, there is nothing like a standing army. The total military force was estimated by the British envoy in 1864 at 6000. The climate of Bhutan varies according to the difference of elevation. At the time when the inhabitants of Pundkhd (the winter resi- dence of the Rajas) are afraid of exposing themselves to the blazing sun, those of Ghas4 experience all the rigour of winter, and are chilled by perpetual snows. Yet these places are within sight of each other. The rains descend in floods upon the heights; but in the vicinity of Tasi- sudon, the capital, they are moderate; there are frequent showers, but nothing that can be compared to the tropical rains of Bengal. Owing to the great clevation and steep- ness of the mountains, dreadful storms arise among the hollows, often attended with fatal results. Ilistory.—Bhutan formerly belonged to a tribe called by the Bhutids Tephu, generally believed to have been the people of Kuch Behar. About two hundred years ago some Thibetan soldiers subjugated the Tephus, took pos- session of the country, and settled down init. At the head of the Bhutén government there are nominally two supreme. authorities, the Dharm Raja, the spiritual head,

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and the Deb Raja, the temporal ruler. To aid these Rajas in administering the country, there is a council of permanent ministers, called the Lenehen. Practically, however, there is no government all. Subordinate officers and rapacious governors of forts wield all the power of the state, and tyranny, oppression, and anarchy reign over the whole country. The Dharm Raja succeeds as an incarnation of the deity. On the death of a Dharm Raja a year or two elapses, and the new incarnation then re- appears in the shape of a child who generally happens to be born in the family of a principal officer. The child establishes his identity by recognizing the cooking utensils, &e., of the late Dharm Rajd; he is then trained in a monastery, and on attaining his majority is recognized as Raja, though he exercises uo more real authority in his majority than he did in his infancy. The Deb Raja is in theory elected by the council. In practice he is merely the nominee of whichever of the two governors of East and West Bhutdn happens for the time to be the more powerful. The relations of the British with Bhutan com- menced in 1772, when the Bhutids invaded the principality of Kuch Behar, a dependency of Bengal. The Kuch Behar Raja applied for aid, and a force under Captain James was despatched to his assistance ; the invaders.were ex- pelled and pursued into their own territories. Upon the intercession of Teshu Lama, then regent of Thibet, a treaty of peace was concluded in 1774 between the East India Company and the ruler of Bhutan. In 1783 Captain Turner was deputed to Bhutan, with a view of promoting commercial intercourse, but his mission proved unsuccess- ful. From this period little intercourse took place with Bhutdn, until the occupation of Assam by the British in 1826. It was then discovered that the Bhutids had usurped several tracts of low land lying at the foot of the mountains, called the Dwars or passes, and for these they agreed to pay a small tribute. They failed to do so, how- ever, and availed themselves of the command of the passes to commit depredations within the British territory. Cap- tain Pemberton was accordingly deputed to Bhutan to adjust the points of difference. But his negotiations yielded no definite result; and every other means of obtaining redress and security proving unsuccessful, the Assam Dwars were wrested from the Bhutids, and the British Government consented to pay to Bhutén a sum of £1000 per anunm as compensation for the resumption of their tenure, during the good behaviour of the Bhutids. Con- tinued outrages and aggressions were, however, committed by the Bhutids on British subjects in the Dwars. Not- withstanding repeated remonstrances and threats, scarcely

a year passed without the occurrence of several raids in British territory headed by Bhutid officials, in which they plundered the inhabitants, massacred them, or carried them away as slaves. In 1863 Mr Ashley Eden was sent as an envoy to Bhutan to demand reparation for these ontrages. He did not succeed in his mission; he was subjected to the grossest insults; aud under compulsion signed a treaty giving over the disputed territory to Bhutan, and making other concessions which the Bhutan Government demanded. On Mr Eden's return the viceroy at once disavowed his treaty, sternly stopped the former allow- ance for the Assam Dwars, and demanded the immedi-

ate restoration of all British subjects kidnapped during

the last five years. The Bhutids not complying with this demand, the Governor-General issued a proclamation, dated the 12th November 1864, by which the eleven Western or Bengal Dwars were forthwith incorporated with the Queen's Indian dominions. No resistance was at first offered to the annexation; but, suddenly, in January 1865, the Bhutids surprised the English gar- rison at Diwdngiri, and the post was abandoned with

the loss of two mountain train guns. This disaster was soon retricved by General Tombs, and the Bhutids were compelled to sue for peace, which was concluded on the 11th November 1865. The Bhutin Government formally ceded all the cightcen Dwars of Bengal and Assam, with the rest of the tcrritory taken from them, and agreed to liberate all kidnapped British subjects. As the revenues of Bhutan mainly depended on these Dwars, the British Government, in return for these concessions, undertook to pay the Deb and Dharm Rajas annually, subject to the condition of their continued good behaviour, an allowance beginning at £2500 and rising gradually to a maximuni of twice that amount. Since that time nothing of importance has occurred, and the annexed territories have settled down into peaceful and prosperous British districts.

BIAFRA, a tract of country on the coast of Western Africa, ou a bay or bight of the same name. Lander, in descending the Niger, arrived in the Bight of Biafra, and thus left no doubt that the system of inter-ramified

river-channels, extending from Benin to Biafra, constitutes the delta of that river. The Bight of Biafra, or Mafra, is the most eastern part of the Gulf of Guinea, between Capes Formosa and Lopez; it contains the islands of Fernando Po, Prince's, and St Thomas's.

BIANCHINI, Francis, a learned Italian astronomer aud antiquary, was born at Verona in 1662, of a noble and ancient family. He was educated at Padua, and de- voted himself especially to mathematics and classics. In 1684 he went to Rome, and was made librarian to Cardinal Ottoboni, afterwards Pope Alexander VIII. He was made canon of Sta Maria de la Rotonda, and afterwards of St Lorenzo in Damaso. His first work seems to have been a treatise directed against the Copernican system; it was published about 1680. In 1697 appeared the first and only volume of his Universal History, coming down to the close of the Assyrian empire. His later works, with the exception of the Hesperi et Phosphori nova Phenomena, a series of observations on Venus, were chiefly upon the ruins excavated on the Via Appia and Mount Palatine. He died in 1729.

BIAS, a river of India, one of the five great streams of the Panjab, rises in the Bhotang Pass at the head of the Kulu valley, at an elevation of 13,000 fcet above the sea. It flows southwards, traversing the Kulu valley for 75 miles, then turning westward passes through the native state of Mandi, and after a winding course of about 125 miles enters the Kangr4 district at Mirthal, a few miles north of Baijndth. Thence it runs nearly due west, drain- ing and fertilizing the Kangra valley throughout its wholc length, till, finding a break in the Siwdlik hills, it turns sharply southwards and debouches upon the plains of the Panjab. From this point it runs nearly due south-west until its junction with the Satlej, about 30 miles above Ferozpur. In its course through the Panjab it skirts the districts of Gujrat, Amritsar, and Lahor to the north, and Hoshiarpur and Jallandhar to the south. Length of the Bias from its rise to its junction with the Satlej, 350 miles. The levels show a fall for the first 75 miles of 60 feet per mile; throughout the Mandi state, 40 feet; and from Mirthal to the Satlej, a distance of 150 miles, 10°06 feet per mile. In its passage through the plains the Bids flows along a broad and sandy bed, its northern bank being well defined, but the south bank sloping and shallow. There can be but little doubt that at no distant period the Bids flowed in a different channel, and emptied itself into the

Chendb, near Multan. The old bed is clearly trace- able in the Ldhor, Montgomery, and Multan districts. According to native tradition, the river deserted its old bed in Sambat 1807, or 1750 a.p.

BIAS, a native of Priene, one of the seven sages of

Greece, was the son of Teutamus, and flourished about the middle of the 6th century B.c. He was one of the most eloquent speakers of his time, and is celebrated as having never used his talents for purposes of mere gain, but as having devoted them to the service of the injured and oppressed. Many stories are told illustrative of the nobility of his character in this and other respects. Ac- cording to one of these, when his native town was taken by an enemy, and the inhabitants were carrying off what- ever seemed to each most valuable, one of them, observing Bias without any burden, advised him to follow his example. "Tam doing so," said he, "for I carry all my valuables with me." His fellow-citizens honoured him with a splendid funeral, and dedicated to him a sanctuary which they called Teutamium. He is said to have written au heroic poem on the affairs of the Ionians, in order to show them how they might be most prosperous. A great number of the short, pithy, ethical sayings or apophthegms character- istic of the Greek sages are ascribed to Bias. Of these a few specimens may be given—" Be slow to enter on an undertaking, but when you have begun, persevere to the end;" "Know, and then act;" "Hear much, speak little ;" "Do not praise an unworthy man on account of his wealth ;" "Take (¢.¢., gain your end) by persuasion, not by force ;" "He is unfortunate who cannot bear mis- fortune ;" "So order your affairs as if your life were to be both loug and short." Bias is the author of the famous and often imitated reproof to the impious sailors, who in the midst of a tempest were calling ou the gods—" Be quiet," said he, 'lest the gods discover that you are here." (Diog. Laert., i. 82-88 ; Stobseus, Floril. ; Mullach, Frag. Ph, Gree., i. 203, sqq.)

BIBERACH, a town of Wirtemberg, in the circle of the Danube, a capital of a bailiwick 23 miles 8.S.W. of Ulm. {t is situated on the River Riss, a small tributary of the Danube, partly on level ground and partly on hills, and still

has a somewhat medizeval appearance from the remains of its ancient walls and towers. Its principal church dates from the 12th century, aud it possesses a hospital with very extensive endowments. The maiu objects of its varied industry are toys, cloth goods of diffcrent kinds, lace, paper, and leather ; and there are also bell-foundries and breweries. In the neighbourhood is the watering- place called Jordansbad. Biberach appears as a village in the Sth century, and in the 15th it became a free imperial city. During the Thirty Years' War it underweut various vicissitudes, and was for a good while held by the Swedes. In 1707 it was captured and put to ransom by the French, who afterwards, in 1796 and 1800, defeated the Austrians in the neighbourhood. In 1803 the city was deprived of its imperial freedom and assigned to Baden; and in 1806 it was transferred to Wiirtemberg. Biberach is the birthplace of the sculptor Natter and the painter Neher ; and Wieland, who was born at the neighbouring village of Oberholzheim, spent a series of years in the town.

BIBIRINE, or Breserrrne, an alkaloid obtained from the bark and fruit of the greenheart tree, Mectandra Kodiei, called bibiru or sipiri in Guiana, where the tree grows. The alkaloid was discovered about the year 1835 by Hugh Rodie, a surgeon resident in Demerara, who found it possessed great efficacy as a febrifuge, and it was recommended by him as a substitute for quinine. The sulphate of bibirine has a place in the British phar-macopeeia, and is in considerable use in medicine as a bitter tonic and febrifuge. Bibirine has been shown by Walz to be apparently identical with an alkaloid obtained from the common box, Buaus sempervirens, called buxine, and this opinion is to some extent confirmed by Dr Fliicki- ger. The sulphate of bibirine found in commerce is a dark brown substance in thin translucent scales.

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BIBLE

HE word Bisuz, which in English, as in' Medixval Latin, is treated as a singular noun, is in its original Greek form a plural,—ra BiBdrAta, the (sacred) books,— correctly expressing the fact that the sacred writings of Christendom are made up of a number of independent records, which set before us the gradual development of the religion of revelation, The origin of each of these records forms a distinct critical problem; and for the discussion of these questions of detail the reader is referred to the articles on separate Biblical books. The present article seeks to give a general account of the historical and literary conditions under which the unique literature of the Old and New Testaments sprang up, and of the way in which the Biblical books were brought together in a canonical collection and handed down from age to age. The Biblical development is divided into two great periods by the manifestion and historical work of Christ. In its pre-Christian stage the religion of revelation is represented as a covenant between the spiritual God and His chosen people the Hebrews. In accordance with this and in allusion to Jer. xxxi. 31, Jesus speaks of the new dispcusation founded in His death as a new covenant (2 Cor. xi. 25). Hence, as early as the 2d century of our era the two great divisions of the Bible were known as the books of the Old and of the New Covenant respectively. Among Latin- speaking Christians the Greek word for covenant was often incorrectly rendered testament, and thus Western Christen- dom still uses the names of the Old and New Testaments. Oxp TestaMent.—Struggle and Progress of Spuritual Religion, Priests, Prophets, d&c.—The pre-Christian age of the Biblical religion falls into a period of religious produc- tivity and a subsequent period of stagnation and mainly conservative traditions. The period of productivity is also a period of contest, during which the spiritual principles of the religion of revelation were involved in continual struggle with polythcistic nature-worship on the one hand, and, on the other hand, with an uuspiritual conception of Jehovah as a God whose interest in Isracl aud care for His sanctuary were independent of moral conditions. In this long struggle, which began with the foundation of the theocracy in the work of Moses, and did not issue in con- clusive victory until the time of Ezra, the spiritual faith was compelled to show constant powers of new develop- ment,—working out into cver clearer form the latent con- trasts between true and false religion, proving

itself fitter than any other belief to supply all the religious needs of the people, and, above all, finding its evidence in the long providential history in which, from the great deliverance of the Exodus down to the Captivity and the Restoration, the reality of Jehovah's kingship over Israel, of His redeeming love, and of His moral government, were vindi- cated by the most indisputable proofs. As it was only the deliverance from Egypt and the theocratic covenant ot Sinai that bound the Hebrew tribes into national unity, the worship of Jehovah was always acknowledged as the national religion of Israel. But from Joshua to Samuel national feeling was far weaker than tribal jealousy; and in the political disintegration of the people the religion of Jehovah seemed ready to be iost in local superstitious.

Priests and During this period the chief centre of monothcism was the

prophets.

sanctuary and priesthood of the ark; and it was from the priestly circle that Samuel arose to reunite the nation by recalling it to the religion of Jehovah, and thus to prepare the way for the splendid age of David and Solomon. But though Samuel was by education a priest, it was not as a priest, but as a prophet that he accomplished this work.

In all ages a priesthood is conservative, not creative; and it was only as a growing and creative power that the still undeveloped spiritual religion could live. While it was the business of the priest faithfully to preserve religious traditions already acknowledged as true and venerable, the characteristic of the prophct is a faculty of spiritual intui- tion, uot gained by human reason, but coming to him as a word from God himself, wherein he apprehends religious truth in a new light, as bearing in a way not manifest to other men on the practical necessities, the burning questions of the present. Unlike the priesthood, the prophets never formed a regular guild. It was an axiom that the gift of prophecy was bestowed by the inward and immediate call of Jehovah. But from the time of Samuel we find a regular succession of prophets working out the spiritual problems of the national faith with ever increasing clearness, and gathering round them, sometimes in regularly formed com- munities, a circle of disciples and sympathizers which, though never, pérhaps, numerically considerable, embraced the names of David and other leaders of Hebrew history, and

impressed the stamp of prophetic influence on every part of the national life. From this time the priests hold only the second place in the history of the Old Testament religion; sometimes they even appear as the opponents of the prophetic party, whose progressive ideas are distasteful to their natural conscrvatism and aristocratic instincts. But on the whole, the more enlightened ministers of the central sanctuary continued to share with the prophets the

task of upholding a lofty religious tradition, and not unfre-.

quently both characters were united in one person. It was, in fact, only through the priests that the ideas of the prophets could receive public sanction in the ordinances of religion, as it was only through rulers like David, or Heze- kiah, or Jehu, that they could influence the political conduct of affairs.

A just insight into the work of the prophetic party in Israel was long rendered difficult by traditional prejudices. On the one hand the predictive element in prophecy reccived undue prominence, and withdrew attention from the influence of the prophets on the religious life of their own time; whilc, on the other 'hand, it was assumed, in accordance with Jewish notions, that all the ordinances, and almost, if not quite, all the doctrines of the Jewish church in the post-canonical period, existed from the carliest days of the theocracy. The prophets, therefore, were conceived partly as inspired preachers of old truths, partly as pre- dicting future events, but not as leaders of a great develop- ment, in which the rcligious ordinances as well as the religious beliefs of the Old Covenant advanced from a relatively crude and imperfect to a relatively mature and adequate form.

The proof that this latter view, and not the traditional conception, is alone true to history depends on a variety of arguments which cannot here be reproduced. That the religious ideas of the Old Testament were in a state of growth during the whole prophetic period became manifest as soon as the laws of grammatico-historical exegesis were fairly applied to the Hebrew Scriptures. That the sacred

False views of prophecy.

ordinances were subject to variation was less readily The pro- admitted, because the admission involved a change of view phets and

as to the authorship of the Pentateuch ; but here also the facts are decisive.. For example, the law in Exod. xx. 24, ff, contemplates the worship of Jehovah on other altars than that of the central sanctuary (cf. Deut. xxxiii. 19). This practice, accordingly, was followed by Samuel, and was fully approved by Elijah (1 Kings xix. 14). But the worship

the law.

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BIBLE

of Jehovah on the high places or local sanctuaries was constantly exposed to superstitious corruption and heathen admixture, and so is frequently attacked by the prophets of the 8th century. It was undoubtedly eunder their

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Close of the Old Testament Development. Formation of the Canon.—The struggle between spiritual and unspiritual The Exile religion was brought to a crisis when the prophetic predic-9>4 Re- tions of judgment on national sin were fulfilled in the fall rena,

influence that Hezekiah abolished the high places. The abolition was not permanent; but in the reign of Josiah, the next reforming king, we find that the principle of a single sanctuary can claim the support not only of prophetic teaching, but of a written law-book found in the temple, and acknowledged by the high priest (2 Kings xxii., xxiii.) The legislation of this book corresponds not with the old law in Exodus, but with the book of Deuteronomy. But perhaps the clearest proof that, during the period of pro- phetic inspiration, there was no doctrine of finality with regard to the ritual law any more than with regard to religious ideas and doctrines, lies in the last chapters of Hzekiel, which sketch at the very era of the Captivity an outline of sacred ordinances for the future restoration.

of the kingdom of Judah. The: merely political worship of Jehovah as the tutelary god of the state was now reduced to absurdity. Faith in the covenant God was impossible except on the principles of spiritual belief. Nor did the restoration by Cyrus affect this result. No political future lay before the returning exiles, and continued confidence in the destiny of the race was not separable from the religious ideas and Messianic hopes of the prophets. 'To obey the law of Jehovah and patiently to await the coming Deliverer was the only distinctive vocation of the com- munity that gathered in the new Jerusalem; and after a period of misfortune and failure, in which the whole nation seemed ready to collapse in despair, this voca- tion was clearly recognized and embodied in permanent

From these and similar facts it follows indisputably, that the true and spiritual religion which the prophets and like- minded priests maintained at once against heathenism and

institutions in the reformation of Ezra and Nehemiah (445 Reforma B.c.) But with this victory the spiritual religion passed tion and

into a stationary state. The spirit of prophecy, long , 0 he

against unspiritual worship of Jehovah as a mere national deity without moral attributes, was not a finished but a growing system, not finally embodied in authoritative documents, but propagated mainly by direct personal efforts. At the same time these personal efforts were accompanied and supported by the gradual rise of a sacred literature.

decadent, expired with Malachi, the younger contemporary of Nehemiah ; and the whole concern of the nation from this time downwards was simply to preserve the sacred inheritance of the past. The Exile had so utterly broken all continuity of national life, that that inheritance could only be sought in the surviving monuments of sacred

Rise of a Though the priestly ordinances were mainly published by literature. To these, more than to the expiring voice of Fe re oral decisions of the priests, which are, in fact, what is | prophecy in their midst, the founders of the new theocracy

Hebrew patriotism had its root. And, indeed, the literary | under the general title of The Prophets, the historical books geeond

diffusion of spiritual ideas was not confined to the direct | of Joshua, Judges, Samuel, Kings (Zarlier Prophets), and canon. poe efforts of priests and prophets. In spite of the crass and | the four prophetic books of Isaiah, J eremiah, Ezekiel, and religion.

usually meant by the word Jaw (Torah) in writings earlier than the Captivity, there can be no reasonable doubt that the priests possessed written legal collections of greater or less extent from the time of Moses downwards. Again, the example of Ezckiel, and the obvious fact that the law- book found at the time of Josiah contained provisions which were not up to that time an acknowledged part of the law of the land, makes it probable that legal provisions, which the prophets and their priestly allies felt to be necessary for the maintenance of the truth, were often embodied in legislative programmes, by which previous legal tradition was gradually modified. Then the prophets; especially when they failed to produce immediate reforma- tion, began from the 8th century, if not still earlier, to-commit their oracles to writing; and these written pro- phecies—circulating widely in a nation which had attained a high degree of literary culture, and frequently cited by later seers—disseminated prophetic teaching in a permanent form. Long before this time music and song had been prac- tised in the prophetic circle of Samuel, and were introduced under David into the service of the sanctuary. Another important vehicle of religious instruction was the written history of the nation, which could not fail to be generally set forth in the theocratic spirit in which all loftier

unspiritual character of the mass of the people, the noblest traditions of national life were entwined with religious con- victions, and the way in which a prophet, like Amos, could arise untrained from among the herdsmen of the wilderness of Judah, shows how deep and pure a current of spiritual faith flowed among the more thoughtful of tho laity. Prophecy itself may from one point of view be regarded simply as the brightest efflorescence of the lay element in the religion of Israel, the same element which in subjective form underlies many of the Psalms, and in a shape less highly developed tinged the whole proverbial and popular literature of the

nation; for in the Hebrew commonwealth popular literature had not yet sunk to represent the lowest impulses of national life.

turned for guidance. The books that had upheld the exiles' faith, when all outward ordinances of religion were lacking, were also the fittest teachers of the restored com- munity. Previous reformers had been statesmen or prophets. Ezra is a scribe who comes to Jerusalem armed, not with a fresh message from the Lord, but with "the book of the law of Moses." This law-book was the Penta- teuch, and the public recognition of it as the rule of the theocracy was the declaration that the religious ordinances of Israel had ceased to admit of development, and the first step towards the substitution of a canon or authoritative collection of Scriptures for the living guidance of the prophetic voice. A second step in the same direction is ascribed to Nehemiah by a tradition intrinsically probable, though of no great external authority. He, it is said, collected a library which, besides documents of temporary importance, embraced "the books about the kings and prophets, and the writings of David" (2 Mac. ii. 13.) Certainly a complete body of the remains of the prophets, with an authentic account of the history of the period of: their activity, must soon have been felt to be scarcely second in importance to the law; and so Nehemiah may very well be supposed to have begun the collection which now forms the second part of the Hebrew Bible, embracing,

the twelve minor prophets (Latter Prophets). The mention of the writings of David implies that Nehemiah also began the formation of the third and last part of the Hebrew

canon, which comprises, under the title of Ketubum (Scrip- Third tures, Hagiographa), the Psalms, Proverbs, Job, the five cn0M-

Megillot or rolls (Canticles, Ruth, Lamentations, Eccle- siastes, Esther), and, finally, Daniel, Ezra, Nehemiah, and Chronicles. It is certain, however; that this part of the collection was not completed till long after Nehemiah's time ; for to say nothing of the disputed dates of Ecclesiastes and Daniel, the book of Chronicles contains genealogies which go down at least to the close of the Persian period. The miscellaneous character of the Ketubim seems, in fact, to show that after the Law and the Prophets were

Number of canonical books,

Alexan- drian canon.

The Chroni- cles.

636 a closed, the third part of the canon was open to receive additions, recommended either by their religious and _his- torical value, or by bearing an ancient and venerable name, And this was the more natural because the Hagiographa., had not the same place in the synagogue service as was accorded to the Law and the Prophets,

The time and manner in which the collection was abso- lutely closed is obscure. The threefold division of the sacred writings is referred to in the prologue to the Wisdom of Sirach (Hcclesiasticus) about 130 B.c., but Jewish tradition indicates that the full canonicity of several books, especially of Ecclesiastes, was not free from doubt till the time of the famous R. Akiba, who perished in the great national struggle of the Jews with the Emperor Hadrian (Mishna, Jadaim, 3; Hdaiot, 5). The oldest list of canonical books, given by Josephus (c. Apion., i. 8), is of somewhat earlier date. Josephus seems to have had quite our present canon; but he took Ruth along with Judges, and | viewed Lamentations as part of the book of Jeremiah, thus counting twenty-two books instead of the twenty-four of the Talmudic enumeration and of the present Hebrew Bible. There is other evidence that only twenty-two books were reckoned by the Jews of the first Christian century; and it appears that this number was accommodated to that of the letters of the Hebrew alphabet. Even in the time of Jerome, Ruth and Lamentations were not uniformly reckoned apart. The expansion of the Talmudic twenty- four to the thirty-nine Old Testament books of the English version is effected by reckoning the minor prophets one by one, by separating Ezra from Nehemiah, and by subdividing the long books of Samuel, Kings, and Chronicles. In this reckoning, and in the very different order of the books, we follow in the main the Alexandrian Greek and Vulgate. Latin versions. But the Alexandrian differed from the Hebrew canon in more important points. The line of distinction between inspired and human writings was not so sharply drawn ; and the Greek Bible not only admitted additions to several of the Hagiographa, but contained other

apocryphal books, of some of which Greek wag the original tongue, while others were translations of Hebrew or Aramaic writings. See ApocrYPHaA.

In turning now to a literary and critical survey of the Old Testament books, we shall find it convenient to depart from the division of the Hebrew canon, in favour of a classification suggested by the order of the books followed in the English version and inmost other translations. The Old Testament literature is made up of historical, poetico- didactic, and prophetic writings, and under these three heads we will arrange what remains to be said on the subject.

Historical Books.—These form two parallel series of sacred history. The books from Genesis to Kings give a continuous story (with some episodical additions) from the creation to the fall of the kingdom of Judah. The book of Chronicles covers the same ground on a narrower plan, contracting the carly history into genealogical lists, and occupying itself almost entirely with the kingdom of Judah, and especially with matters connected with the temple and its worship. The narrative of the chronicler is continued in the books or rather book of Ezra and N ehemiah, which incorporates original memoirs of these two reformers, but otherwise is so exactly in the style of the Chronicles that critics are practically agreed in ascribing the whole to a single author, probably a Levite, who, as we have already seen, cannot have written before the close of the Persian empire. The questions that are raised as to the work of the chronicler belong less to the general history of Biblical literature than to special introduction. We pass on, therefore, to the larger and more important series. The Pentateuch and the so-called earlier prophets form together a

single continuous narrative. It is plain, however, that the whole work is not the uniform production of one pen, but that in some way a variety of records of different ages and styles have been combined to form a single narrative, Accordingly, Jewish tradition bears that Moses wrote the Pentateuch, Joshua the book named after him, Samuel the book of Judges, and so forth, As all Hebrew history is anonymous,—a sure proof that people had not yet learned to lay weight on questions of authorship,—it is not probable that this tradition rests on any surer ground than con- jecture; and, of course, a

scribe who saw in the sacred books the whole outcome of Israel's history would naturally leap to the conclusion that the father of the Law was the author of the Pentateuch, and that the other leaders of Israel's history could not but be the writers of a great part of the Scriptures. A more careful view of the books them- selves shows that the actual state of the case is not so simple. In the first place, the limits of the individual books are certainly not the limits of authorship, The Pentateuch as a law-book is complete without Joshua, but

as a history it is so planned that the latter book is its!

necessary complement. (Cf, for example, Exod. xvi. 35, Josh, v: 12; Gen. 1. 24, 25; Exod. xiii. 19; Josh. xxiv. 32.) In truth, an author who wrote after the occupaticn of Canaan could never have designed a history which should relate all God's promises to Israel and say nothirg of their fulfilment. But in its present shape the Pentateuch is certainly subsequent to the occupation, for it uses geo: graphical names which arose after that time (Hebron, Dan), refers to the conquest as already accomplisked (Deut. ii. 12, of Num. xv, 32; Gen. xii. 6), and even presupposes the existence of a kingship in Israel (Gen. xxxvi. 31), And with this it agrees, that though there are marked differences of style and language within the book of Joshua, each style finds its counterpart in some section of the Pentateuch. In the subsequent books we find quite similar phenomena. The last chapters of Judges cannot be separated from the book of Samuel, and the earlier chapters of Kings are obviously one with the foregoing narrative ; while all three books contain passages strikingly akin to parts of the Pentateuch and Joshua (cf, for example, the bock of Deuteronomy with Josh. xxiii, 1 Sam. xii, 1 Kings viii.) Such phenomena not only prove the futility of any attempi to base a theory of authorship on the present division into books, but suggest that the history as we have it is not one narrative carried on from age to age by successive addi- tions, but a fusion of several narratives which partly covered the same ground and were combined into unity by an editor, This view is supported by the fact, that even as it now stands the history sometimes gives more than one account of the same event, and that the Pentateuch often gives several laws on the same subject. Of the latter we have already had one example, but for our present argu- ment the main point is not diversity of enactment, which may often be only apparent, but the existence within the Pentateuch

of distinct groups of laws partly taking up the same topics. Thus the legislation of Exod. xx.—xxiii. is partly repeated in ch. xxxiv., and on the passover and feast of unleavened bread we have at least six laws, which if not really discordant, are at least so divergent in form and conception that they cannot be all from the same pen. (Exod. xii. 1-28, xiii. 3-10, xxiii. 15, xxxiv. 18; Lev. xxii. 5-14, Deut. xvi.) Of historical duplicates the most celebrated are the twofold history of the creation and the flood, to which we must recur presently. The same kind of thing is found in the later books; for example, in the account of the way in which Saul became king, where it is scarcely possible to avoid the conclusion that 1 Sam. xi. 1-11 should attach directly to ch. x. 16 (cf. x. 7). But the extent to which the historical books are

Senesis to Kings— a single history,

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Duplicate histories.

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Priestly,

prophetic, and popu- Jar narra-

tives,

BIBLE

made np of parallel narratives which, though they cover the same period, do not necessarily record the same events, was first clearly seen after Astruc (1753 a.p.) observed that the respective uscs of Jehovah (Lorp) and Elohim (God) as the name of the Deity afford a criterion by which two documents can be dissected out of the book of Genesis. That the way in which the two names are used can only be due to difference of authorship is now generally admitted, for the alternation corresponds with such important duplicates as the two accounts of creation, and is regularly accompanied through a great part of the book by unmistakable peculiarities of language and thought, so that it is still possible to reconstruct at least the Elokim document with a completeness which makes its original independence and homogeneity matter of direct observation. 'The character of this narrative is annalistic, and where other material fails blanks are supplied by genealogical lists. Great weight is laid on orderly development, and the name Jehovah is avoided in the history of the patriarchs in order to give proper contrast to the Mosaic period (cf Gen' xvii. 1; Exod. vi. 3); and, accordingly, we find that the unmistakable secondary marks of this author run through the whole Pentateuch and Joshua, though the exclusive use of Elohim ceases at Exod. vi. Of course the disappear- ance of this criterion makes it less easy to carry on an exact reconstruction of the later parts of the documeut ; but on many points there can be no uncertainty, and it is clearly made out that the author has strong pricstly tendencies, and devotes a very large proportion of his space to liturgical matters. The separation of this document inay justly be called the point of departure of positive criticism of the sources of the Old Testament ; and present controversy turns mainly on its relation to other parts of the Pentateuch. Of these the most important are—l. The Jehovistic narrative, which also begins with the crea- tion, and treats the early history more in the spirit of prophetic theology and idealism, containing, for example, the narrative of the fall, and the parts of the history of

Abraham which are most important for Old Testament :

theology. That this narrative is not a mere supplement to the other, but an independent whole, appears most plainly in the story of the flood, where two distinct accounts have certainly been interwoven by a third hand. 2. Many of the finest stories in Genesis, especially great part of the history of

Joseph, agree with the Elohim-document in the name of God, but are widely divergent in other respects. Sines the researches of Hupfeld, a third author, belonging to northern Israel, and specially interested in the ancestors of the northern tribes, is generally postulated for these sections. His literary individuality is in truth sharply marked, though the limits of his contributions to the Pentateuch are obscure.

It will be remembered that we have already seen that three currents of influence run through the Old Testament development,—the traditional lore of the priests, the teaching of the prophets, and the religious life of the more enlightened of the people. Now, in the three main sections of the early history just enumerated we find the counterpart of each of these. The priestly narrative of the Elohist, the prophetic delineation of the Jehovist, the more picturesque and popular story of the third author, embody three tendencies, which are not merely personal but national, and which constantly reappear in other parts of Hebrew literature. Up to the book of Joshua all three run side by side. But the priestly interest found little scope in the subsequent history ; and from the time of the

Judges we can generally distinguish only sections marked by-

prophetic pragmatism and others which, though distinctly religious and even theocratic, are, so to speak, written from a layman's stand-point. The latter comprise a large part

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of Judges, and by far the greatest part of Samuel, as well as the beginning of Kings. To the modern mind this part of the narrative, which is rich in colour and detail, is by far the most interesting, and it is with sincere regret that we pass at 1 Kings xi. to a division of the history for which the chief sources—cited as the Chronicles of the Kings of Israel and Judah respectively—treat almost exclusively of the outer political life of the nation, In striking contrast to the uniformity of this narrative are the interspersed histories of Elijah and other northern prophets. These histories are very remarkable in style and even in language ; and, containing some of the noblest passages of the Old Testament, form one of many proofs of the unusual literary genius of the kingdom of Ephraim; But how are these

various narratives related to each other? This question is not easy toanswer. In general the third or lay element of the history seems to stand nearest to the events recorded, and even, perhaps, to form the direct basis of the prophetical matter ; while, occasionally, old lists of names and places, poetico-historical picces, and the like, form a still deeper stratum in the story. (Poetical pieces in the Book of the Wars of Jehovah, Num. xxi. 14; Book of Jashar [the upright], Josh. x. 13; 2 Sam. i. Lists like 2 Sam. xxiii.) Whether the same hands or only the same tend- encies as appear in the non-Levitical parts of Genesis run on as far as the book of Kings, is a question which, though answered in the affirmative by Schrader and others, cannot be viewed as decided. Even the date of these elements of the Pentateuch is obscure; but in the 8th century Hosea refers quite clearly to passages of both, Thus far there is tolerable agreement among critics ; but the Levi- tical or Elohistic history is the subject of violent controversy, which, however, turns mainly on the analysis of the legal parts of the Peutateuch. These contain other elements besides those already enumerated, of which we need only mention the brief code which follows the Decalogue in Exod. xx.—xxiii., and the great repetition of the law in a prophetic spirit which occupies the major part of Deu- teronomy. Both these codes may be called popular in tone. They are precepts not for the priests, but for the whole people ; and the former is the fundamental sketch of the whole theocratic constitution, which the latter develops and to some extent alters. Now the book of Deuteronomy presents a quite distinct type of style which, as has been already mentioned, recurs from time to time in passages of the later books, and that in such a connection as to suggest to many critics since Graf the idea, that the Denteronomic hand is the hand of the last editor of the whole history from Genesis to Kings, or, at least, of the non-Levitical parts thereof. This conclusion is not stringent, for a good deal may be said in favour of the view that the Deuteronomic style, which is very capable of imitation, was adopted by writers of different periods. But even so it is difficult to suppose that the legislative part of Deuteronomy is as old as Moses. If the law of the kingdom in Deut. xvii. was known in the time of the Judges, it is impossible to com- prehend Judg, viii. 23, and above all 1 Sam. viii. 7. That the law of high places given in this part of the Pentateuch was not acknowledged till the time of Josiah, and was not dreamed of by Samuel and Elijah, we have already seen. The Deuteronomic law is familiar to Jeremiah, the younger contemporary of Josiah, but is referred to by no

prophet of earlier date. Andthe whole theological stand-point of the book agrees exactly with the period of prophetic literature, and gives the highest and most spiritual view of the law, to which our Lord himself directly attaches his teaching, and which cannot be placed at the beginning of the theocratic development without making the whole history unintelligible. Beyond doubt the book is, as already hinted, a prophetic legislative programme ; and if the author put

The laws of the Pen- tateuch,

Deutero- nomy.

+ his work in the mouth of Moses instead of giving it, with

Ezekiel, a directly prophetic form, he did so not in pious fraud, but simply because his object was not to give a new law, but to expound and develop Mosaic principles in relation to new needs. And as ancient writers are not accustomed to distinguish historical data from historical deductions, he naturally presents his views in dramatic form in the mouth of Moses.

one in the Hebrew and one in the Septuagint translation, the discrepancies are of such a kind that criticism of the text and analysis of its sources are separated by a scarcely perceptible line.

Poetical Books.—The origin of some leading peculiarities of Hebrew poetry has been recently referred by Assyriologists to Accadian models ; but however this may be, the key to

the whole development of the poetical literature of Israel is Charactey- found in the same psychological characteristics of the race istics of which are impressed on the vocabulary and grammatical Hebrew

If then the Deuteronomic legisla- tion is not earlier than the prophetic period of the 8th and 7th centuries, and, accordingly, is subsequent to the

elements

of the Pentateuchal history which we have seen to be known to Hosea, it is plain that the chronology of the com- position of the Pentateuch may be said to centre in the question whether the Levitico-Elohistic document, which embraces most of the laws in Leviticus with large parts of Exodus and Numbers, is earlier or later than Deuteronomy. The answer to this question turns almost wholly on archeological inquiries, for there is, perhaps, no quate con- clusive reference to the Elohistic record in the prophets before the Exile, or in Deuteronomy itself. And here arises the great dispute which divides critics, and makes our whole construction of the origin of the historical books uncertain. The Levitical laws give a graduated hierarchy of priests and Levites; Deuteronomy regards all Levites as at least possible priests. Round this difference, and points allied to it, the whole discussion turns. We know, mainly from Ezek, xliv., that before the Exile the strict hierarchical law was notin force, apparently never had been in force. But can we suppose that the very idea of such a hierarchy is the latest point of liturgical development ? If so, the Levitical element is the latest thing in the Pentateuch, or, in truth, in the historical series to which the Pentateuch belongs; or, on the opposite view, the hierarchic theory existed as a legal programme long before the Exile, though it was fully carried out only after Ezra. As all the more elaborate symbolic observances of the ritual law are bound up with the hierarchial ordinances, the solu- tion of this problem has issues of the greatest importance for the theology as well as for the literary history of the

structure of the language. The Hebrew tongue is sensuous, mobile, passionate, almost incapable of expressing an abstract idea, or depicting a complex whole with repose and symmetry of parts, but fit to set forth with great subtilty individual phases of nature or feeling. It is the speech of a nation whose naturally quick perceptions minister to an emotional temperament aud an imperious will, which subordinates knowledge to action and desire, and habitually coutemplates the universe through the medium of personal feeling or practical purpose. To speak with the philosophers, the Hebrew character is one of predominant subjectivity, eager to reduce everything to a personal standard, swift to seize on all that touches the feelings or bears directly on practical wants, capable of intense

effort and stubborn persistence where the motive to action is personal affection or desire, but indisposed to theoretical views, unfit for contemplation of things as they are in themselves apart from relation to the thinker. In the poetry of such a nation the leading current must necessarily be lyrical, for the lyric is the natural vehicle of intense and immediate personal feeling. The earliest Hebrew poems are brief, pregnant expressions of a single idea, full of the fire of passion, full, too, of keen insight into nature, in her power to awake or sustain human emotion; but recording this insight not with the pictorial fulness of western art, but in swift, half-formed outlines, in metaphor piled on metaphor, without regard to any other principle of proportion or verisimilitude than the emotional harmony of each broken figure with the dominant feeling. Such a poetry could not but find its highest scope in the

Old Testament. service of spiritual religion. The songs in Exod. xv. and Landmarks

Fusion of | And now a single word on the way in which these various | Judg. v. prove the early origin of a theocratic poetry ; but in the

: = . : : : ; : : -7 history of several elements, mirroring so many sides of the national life, and | the proper period of Hebrew psalmody begins with David, 5504, rere dating from so various ages, came to be fused into a single | and its history is practically the history of the Psalter. jyric—the narrative, Listory, and yet retained so much of their own identity. | Here, as in the case of the historical books, we have to begin Psalms.

‘he Semitic genius does not at all lie in the direction of organic structure. In architecture, in poetry, in history, the Hebrew adds part to part instead of developing a single notion. The temple was an aggregation of small cells, the longest Psalm is an acrostic, and so the longest Biblical history is a stratification and not anorgauism. This process was facilitated by the habit of anonymous writing, and the accompanying lack of all notion of anything like copyright. If a man copied a book it was his to add and modify as he pleased, and he was not in the least bound to distinguish the old from the new. If he had two books before him to which he attached equal worth, he took large extracts from both, and harmonized them by such additions or modifica- tions as he felt to be necessary. But in default of a keen sense for

organic unity very little harmony was sought in points of internal structure, though great skill was often shown, as in the book of Genesis, in throwing the whole material into a balanced scheme of external arrangement. On such principles minor narratives were fused together one after the other, and at length in exile a final redactor com- pleted the great work, on the first part of which Ezra based his reformation, while the latter part was thrown into the second canon. The curious combination of the functions of copyist and author which is here presupposed did not wholly disappear till a pretty late date ; and where, as in the books of Samuel, we have two recensions of the text,

by questioning the tradition contained in the titles, which ascribe seventy-three Psalms to David, and besides him name as authors Asaph, the sons of Korah, Solomon, Moses, Heman, Ethan. Again the tendency is to refer as much as possible to familiar names. 'There is no reason to believe that any title is as old as the Psalm to which it is prefixed, and some titles are certainly wrong ; for example, the author of the elegy on Saul and Jonathan could not possibly have written Ps. lxxxvi., which is a mere cento of reminiscences from other poems. On the other hand the titles are not purely arbitrary. They seem to supply useful hints as to-the earlier collections from which our present Psalter was made up. The Korahite and Asaphite Psalms may probably have been derived from collections in the hands of these families of singers; and the so-called "Psalms of David" were very likely from collections which really contained poems by David and other early singers. The assertion that no

Psalm is certainly David's is hyper-sceptical, and few David.

remains of ancient literature have an authorship so well attested as the 18th or even as the 7th Psalm. These, along with the indubitably Davidic poems in the book of Samuel, give a sufficiently clear image of a very unique

'genius, and make the ascription of several other poems to

David extremely probable. So, too, a very strong argu- ment claims Psalm ii. for Solomon, and in later times we have sure landmarks in the psalms of Habakkuk (Hab. iti.)

Parallelism or sense: rhythm.

Poetical wisdom— the Mashal.

BIBLE

and Hezekiah (Isa. xxxvili.) But the greater part of the lyrics of the Old Testament remain anonymous, and we can only group the Psalms in broad masses, distinguished by diversity of historical situation and by varying degrees of freshness and personality. As a rule the older Psalins are the most personal, and are not written for the congre- gation, but flowfrom a present necessity of individual (though not individualistic) spiritual life. This current of productive psalmody runs apparently from David down to the Exile, losing in the course of centuries something of its original freshness and fire, but gaining a more chastened pathos and a wider range of spiritual sympathy. Psalm I., obviously composed during the desolation of the temple, marks, perhaps, the last phase of this development. 'The epoch of the return was still not without poetic freshness, as some of the so-called Songs of Degrees (Pilgrim-songs 1) prove. But on the whole the Psalms of the second temple are only reflections of old ideas, cast mainly in directly liturgical form, or at least embodying the experience of the nation rather than of the individual. The date of the latest Psalms is much disputed. Most lines of evidence suggest that the collection was complete before the latest books of the canon were written, but many expositors find in in- dividual Psalms (44, 74, 79, 83, &c.) clear traces of the Maccabee age.

Through the whole period of Hebrew lyric, represented not only by the Psalter, but by the Lamentations, tradi, tionally ascribed to Jeremiah, and by various scattered pieces in Prophets (e.g., Isa. xii.) and in historical books (eg., Num. xxi. 17; 1 Sam. ii.), there is little change in form and poctic structure. From first to last the rhythm consists not in a rise and fall of accent or quantity of syllables, but in a pulsation of sense, rising and falling through the parallel, antithetic, or otherwise balanced members of each verse. (So-called Hebrew Parallelism; better, Sense- rhythm.) Beyond this one law of rhythm, which is itself less an artificial rule than a natural expression of the prin- ciple, that all poetic utterance must proceed in harmonious undulation, and not in the spasm of unmodulated passion, the

Hebrew poet was subject to. no code of art, though strophical arrangements, sometimes marked by a refrain, are not uncommon; while poems of acrostic structure (alphabetic Psalms) are found not exclusively in the most recent literature (Ps. ix, x. form a single undoubtedly old acrostic). The later are on the whole longer than the earlier poems, But this is due not to increased constructive power, but to a diffuser style, a less vigorous unity of feeling and thought, and a tendency to ring many varia- tions on one key. A wider range of artistic :power ap- pears in the Song of Solomon, a lyrical drama, in which, according to most critics, the pure love of the Shula- mite for her betrothed is exhibited as victorious over the seductions of Solomon and his harem. As _ the motive of the piece is political as well as ethical, it is most naturally assigned to the early period of the northern kingdom.

The remaining poetical books of the Old Testament belong to a different category. Unfit for abstract specu- lation, valuing no wisdom that is not practical, and treasuring up such wisdom in sententious rhythmical form,—enforced by symbol and metaphor, and warm with the breath of human interest,—the Hebrew is a poet even in his philosophy. Side by side with the ode the earliest Hebrew literature shows us the: Mashal; or similitude, sometimes in the form of biting epigram (Num. xxi. 27, #.) or sarcastic parable (Judg. ix. 8, 2 Kings xiv. 8), sometimes as the natural vehicle of general moral teaching. The greatest name in the early proverbial wisdom of Israel is that of Solomon (1 Kings iv. 32), and beyond doubt many of his aphorisms are to be found in

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the book of Proverbs. The last two chapters are ascribed to other names, and part of the collection was not put in shape till the time of Hezekiah (xxv. 1), who can have had no infallible criterion of authorship by Solomon, and must not be credited with critical intentions. In truth, the several sections of the book are varied enough in colour to make it plain that we have before us the essence of the wisdom of centuries, while the introductory address in chapters i.—ix. shows how a later age learned to develop the gnomic style, so as to fit it for longer compositions. The fundamental type of Hebrew philosophy remains, however, unchanged, even in

Yet this book is not all Salomonic. Proverbs.

the book of Ecclesiastes, which bears every mark of a very Ecclest-

late date, long after the Exile. and creative development, alike in point of form and of

On the other hand, a fresh astes.

thought, is found in the book of Job, which, in grandly Job.

dramatic construction, and with wonderful discrimination of character in the several speakers, sums up the whole range of Hebrew speculation on the burning question of Old Testament religion, the relation of affliction to the justice and goodness of God and to the personal merit and demerit of the sufferer. Like the other noblest parts of the Old Testament, the book of Job has a comparatively early date. It was known to Jeremiah, and may be plausibly referred to the 7th century Bc.

In the book of Job we find poetical invention of incidents, attached for didactic purposes to a name apparently derived from old tradition. There is no valid a priort reason for denying that the Old Testament may contain other examples of the same art. generally viewed as a casein point. viewed as a fiction by many w critics ; but on this view a boo in the New Testament, ang suspected by the Christian d&wgll as by the Jewish Church, must sink to the rank 6 an agocryphal production.

In the poetical as inthe historical books anonymous writing is the rule ; and along with this we observe great freedom on the part of readers and copyists, who not only made verbal changes (cf. Ps. xiv. with Ps. liii.), but com- posed new poems out of fragments-of others (Ps. cviii. with lvii. and lx.) Ina large part of the Psalter a later hand has systematically substituted Elohim for Jehovah, and an imperfect acrostic, like Ps. ix., x., cannot have proceeded in its present form from the first author. Still more remarkable is the case of the book of Job, in which the speeches of Elihu quite break the cpnuection, and are almost universally assigned to a later hand.

Prophetical Books.—We have already seen that the earliest prophecies of certain date are of the 8th century, though there is a probability that Joel flourished in the 9th century, in the reign of Joash of Judah, and that the

opening verses of Amos are cited from his book. On the other hand, the old school of prophecy, whose members from Samuel to Elisha were men of action rather than of letters, was not likely to leave behind it any written oracles. The prophets generally spoke under the immediate influence of the Spirit or " hand of Jehovah." What they wrote was secondary, and was, no doubt, greatly abridged. The most instructive account of the literary activity of a prophet is given in Jer. xxxvii Jeremiah did not begin to write till he had been more than twenty years a prophet. Some prophetic books, like that of Amos, seem to have been composed at one time and with unity of plan. Other prophets, like Isaiah, published several books summing up portions of their ministry. In one or two cases, especially in that of Ezekiel, the prophet writes oracles which were apparently never spoken. Before the Exile there was circulation of individual prophetic books, and earlier prophets quote from their predecessors. But the task of

et over sceptical hich'finds no recognition Mose canonicity was long

The book of Jonah is Jonah. ther, too, has been Esther.

Freedom taken by copyists,

Literary activity of prophets,

collecting and editing the remains of the prophets was

we have the great Assyrian prophets, Isaiah with his Assyrian hardly undertaken till the commencement of the second

younger contemporary Micah, the powerful supporters of prophets.

Prophecies indeed, more important to have an oracle authenticated by | perhaps, in captivity, and foretold the fall of Nineveh, are often the name of its author than to know the writer of a history | Then comes Zephaniah about the time of the Scythian anonymous: 5r qa Psalm, and many prophets seem to have prefixed their | ravages, followed by the prophets of the Chaldean period ; Chaldean names to their works. But other prophecies are

*quite | first Habakkuk and then Jeremiah and Ezekiel, men of aperiod. . anonymous, and prophets who quote earlier oracles never | heavier spirit and less glowing poetic fire than Isaiah, no give the author's name. (A famous case occurs, Isa, xv., xvi., | longer upholding the courage of Judah in the struggle with where in xvi. 13, for sence that tume read long ago.) Now | the empire of the East, but predicting the utter dissolution all the remains of prophecy, whether provided with titles | of existing things, and finding hope only in a new covenant or not, were ultimately arranged in four books, the fourth | —a new theocracy. In the period of Exile more than one of which names, in separate titles, twelve authors; while | anonymous prophet raised his voice; for not only the the first three books are named after Isaiah, Jeremiah, | " Great Unnamed" of Isa. xl.~~lxvi., but the authors of Ezekiel, and actually mention no other names in the titles | other Babylonian prophecies, are probably to be assigned of the several prophecies of which they are made up. But | to this time. In the new hope of deliverance the poetic is it safe to assume that every anonymous prophecy in these | genius, as well as the spiritual insight of prophecy, awakes books must be by the author of the next preceding prophecy | to fresh life, and sets forth the mission of the new Israel to which has a title? Certainly any such assumption can only | carry the knowledge of the Lord to all nations. But the be provisional, and may be overthrown by internal evidence. | spirit of the new Jerusalem had little in common with Internal But internal evidence of date, it is said, cannot apply to | these aspirations, and in Haggai, Zechariah, and Malachi, The latest evidence prophetic books in which the author looks in a supernatural | prophecy retains not much of its old power except an un~~ *proplitm aoe way into the future. The value of this argument must be | compromising moral earnestness. The noble poetry of the tested by looking more closely at the actual contents of the | old prophets, which even in the time of Ezekiel had begun prophetic books. The prophecies contain—1st¢, reproof of | to give way to plain prose, finds no counterpart in these present sin ; 2d, exhortation to present duty ; 3d, encourage- | latest oracles; and imaginative power is shown, where it ment to the godly and threatening to the wicked, based on | still exists, in the artificial structure of symbolic visions. the certainty of God's righteous purpose. In this last con- | No important new ideas are set forth, and even the tonc of nection prophecy is predictive. It lays hold of the ideal | moral exhortation sometimes reminds us more of the elements of the theocratic conception,*

and depicts the way | rabbinical maxims of the fathers in the Mishna, than of the in which, by God's grace, they shall be actually realized in | prophetic teaching of the 8th century. And as if the spirit a Messianic age, and in a nation purified by judgment and | of prophecy foresaw its own dissolution, Malachi looks not mercy. Butin all this the prophet starts from present sin, | to the continued succession of prophets, but to the return present needs, present historical situations. There is no | of Elijah as the necessary preparation for the day of the reason to think that a prophet ever received a revelation | Lord. In this sketch of the prophetic writings we find no _. which was not spoken directly and pointedly to his own | place for the book of Daniel, which, whether composed in Daniel. time. If we find, then, that after the prophecy of Zechariah | the early years of the Persian empire, or, as modern i.—viii., which is complete in itself, there begins at ch. ix. a | critics hold, at the time of the Maccabee wars, presents so new oracle, quite distinct in subject and style, which | many points of diversity from ordinary prophecy as to speaks of an alliance between Judah and Israel as a thing | require entirely separate treatment. It is in point of form subsisting in the prophet's own time, which knows no | the precursor of the apocalyptic books of post-canonical oppressor later than Assyria and Egypt, and rebukes forms | Judaism, though in its intrinsic qualities far superior to of idolatry that do not appear after the Exile ;—if, in short, | these, and akin to the prophets proper. the whole prophecy becomes luminous when it is placed a Further History of the Old Testament Canon in the little after the time of Hosea, and remains absolutely dark | Jewish Church.—Under this head we confine ourselves if it is ascribed to Zechariah, we are surely entitled to let it | to points which lead up to the reception of the Old Testa- speak for itself. When the principle is admitted other | ment by Christendom. These are mainly two:—(1), the applications follow, mainly in the book of Isaiah, where the | history of the Hebrew text, which we now possess only in anonymous chapters, xl.—lxvi., cannot be understood in a | the recension established by Jewish scribes at a time later natural and living way except by looking at them from | than the Christian era; (2), the history of those versions the historical stand-point of the Exile. Then arises a | which arose among Jews, but have influenced Christendom. Titles. further question, whether all ¢zt/es are certainly authentic The Text of the Old Testament.—Semitic alphabets have Theconson- and conclusive ; and here, too, it is difficult to answer by | no full provision for distinguishing

vowels, aud the oldestantal text. an absolute affirmative. For example, in Isa. xxx. 6, the | writing, before orthography became fixed, was negligent in title, “The burden of the beasts of the south,” interrupts | the use even of such vowel-letters as exist. For a long the connection in a most violent way. This is nota solitary | time, then, not only during the use of the old Pheenician instance, but on the whole the titles are far more trust- | character, but even after the more modern square or Baby- worthy in the prophecies than in the Psalms, and partly | lonian letters were adopted, the written text of the Bible on this account, but mainly from the direct historical | was consonantal only, leaving a certain scope for variety of bearing of prophetic teaching, we can frame a completer | pronunciation and sense. But even the consonantal text history of written prophecy than of any other part of Old | was not absolutely fixed. The loose state of the laws of Northem ‘Testament literature. We have, on the one hand, a series | spelling and the great similarity of several letters made prophets. of prophets—Amos, Hosea, and the anonymovs author of | errors of copying frequent. The text of Micah, for

canon; and by this time, no doubt, many writings had been lost, others were more or less fragmentary, and the tradition of authorship was not always complete. It was,

Zech, ix.—xii—who preached in the northern kingdom, but are not descendants of the school of Elisha, which had so decayed under court favour from the dynasty of Jehu, that Amos had to be sent from the wilderness of Judah to take up again the forgotten word of the Lord. In Judah proper

the reformation of Hezekiah, labouring one in the capital, the other in the country district of the Philistine border. To the Assyrian period belongs also Nahum, who wrote,

example, is often unintelligible, and_many hopeless errors are older than the oldest versions. But up to the time of

the Alexandrian version, MSS. were in circulation which Plurality of differed not merely by greater or less accuracy of trans-Tecensions.

cription, but by presenting such differences of recension as

Received or Massoretic text.

Vowel- points.

Septuagint.

BIBLE

could not arise by accident. The Greek text of Jeremiah is vastly different from that of the Hebrew Bible, and it is not certain that the latter is always best. In the books of Samuel the Greek enables us to correct many blunders of the Hebrew text, but shows at the same time that copyists used great freedom with details of the text. For the Pentateuch we have, in the copies of the Samaritans, a third recension, often but not always closely allied to the Greek. The three recensions show important variations in the chronology of Genesis; and it is remarkable that the Book of Jubilees, a Jewish treatise, which cannot be much older than the Christian era, perhaps not much older than

the destruction of the Jewish state, sometimes agrees with

the Samaritan or with the Alexandrian recension. Up to this time, then, there was no absolutely received text. But soon after the Christian era all this was changed, and by a process which we cannot follow in detail, a single recension became supreme. The change was, no doubt, connected with the rise of an overdrawn and fantastic system of interpretation, which found lessons in the smallest peculiarity of the text; but Lagarde has made it probable that no critical process was used to fix the standard re- cension, and that all existing MSS. are derived from a single archetype, which was followed even iu its marks of deletion and other accidental peculiarities. (Lagarde, Anmerkn. zur griech. Uebersetzung der Prov., 1863, p. 1 ; of. Néldeke in Hilgenfeld's Zeitschr., 1873, p. 445.) 'Then the received text became the object of farther care, and the Massorets, or " possessors of tradition" with regard to the text, handed down a body of careful directions as to the true orthography and pronunciation. 'The latter was fixed by the gradual invention of subsidiary marks for the vowels, &c., an invention

developed in slightly divergent forms in the Babylonian and Palestinian schools of Jewish scholarship. The vowel points were not known to Jerome, but the system was complete before the 9th century, presumably several hundred years before that time. All printed Bibles follow the Western punctuation, but old Karaite MSS. with the Babylonian vowels exist, and are now in course of publication. It is from the Massoretic text, with Massoretic punctuation, that the English version aud most Protestant translations are derived. Older Chris- tian versions, so far as they are based on the Hebrew at all (Jerome's Latin, Syriac), at least follow pretty closely the received consonantal text.

Jewish Versrons.—Versions of the Old Testament became necessary partly because the Jews of the Western Dispersion adopted the Greek language, partly because even in Pales- tinue the Old Hebrew was gradually supplanted by Aramaic. The chief seat of the Hellenistic Jews was in Egypt, and here arose the Alexandrian version, commonly known as the Septuagint or Version of the LXX., from a fable that it was composed, with miraculous circumstances, by seventy- two Palestinian scholars summoned to Egypt by Ptolemy Philadelphus. In reality there can be no doubt that the version was gradually completed by several authors and at different times. The whole is probably older than the middle of the 2d century B.c. We have already seen that the text that lay before the translators was in many parts not that of the present Hebrew. The execution is by no means uniform ; and, though there are many good render- ings, the defects are so numerous that the Greek-speaking Jews, as well as the large section of the Christian church which long depended directly or indirectly on this version, were in many places quite shut out from aright understand- ing of the Old Testament. Nevertheless, the authority of the version was very great, its inspiration was often asserted, and its interpretations exercised a great influence on Jewish and Christian thought, though among the Jews it was to a certain extent displaced by the version of the

proselyte Aquila (2d century of our era), which followed with slavish exactness the letter of the Hebrew text.

Among the Jews who spoke Aramaic, translations into Targums.

the vernacular accompanied, instead of supplanting the use of the original text, which was read and then orally paraphrased in the synagogues by interpreters or Methur- gemanim, who used great freedom of embellishment and appheation. This practice naturally led to the formation of written Targums, or Aramaic translations, which have not, however, reached us in at all their earliest form. It used, indeed, to be supposed that the simple and literal Targum of Onkelos on the Pentateuch was earlier than the time of Christ. But recent inquirers have been led to see in it, and in the linguistically cognate Targum on the Prophets (Targum of Jonathan), products of the Babylonian schovls, in which the frecdom of the early paraphrastic method was carefully avoided. Upon this view the date of these Targums is some centuries after the Christian cra. On the other hand, an older style of paraphrase is pre- served in the Palestinian Targus, which nevertheless contain in their present form elements later than the Baby- lonian versions. The Targum of Pseudo-Jonathan on the Pentateuch is apparently the latest form of the free Pales- tinian version, full of legendary adornments and other additions to the text. Other fragments of Palestinian translation, known as the Jerusalem Targum, and referring to individual passages of the Pentateuch and Propliets, probably represent an earlier stage in the growth of the Aramaic versions. There are also Targums on the Hagio- grapha, which, however, have less importance, and do not seem to have had so changeful a history. The Targums as a whole do not offer much to the textual critic. 'They are important, partly from the insight they give into au early and in part pre-Christian excgesis, partly from their influence on later Jewish expositors, and through them on Christian versions and expositions. In some cases the literal or Babylonian Targums have a text differing from the Massoretic. But it is not unlikely that if we had a satisfactory text of the Targums (towards which almost nothing has hitherto been done), these variations would find their explanation in the Eastern text and the Assyrian punctuation.

New Txstament.—Jelation of the Karliest Christianity to the Literary and Intellectual Actwity of the Age.—In the literature of Palestine at the time of Christ we distinguish a learned and a popular element. The learned class or scribes were busy on their twofold structure of Halacha, or legal tradition and inference, supplementing and " hedg- ing in" the Pentateuchal law, and Haggada, or fantastic exegesis, legendary, ethical, or theosophic,

under which the religious directness of the Old Testament almost wholly disappeared, The popular religious literature of the day seems again to have been mainly apocalyptic. (See APocALypTic LirERATURE.) The people never wearied of these mysterious revelations couched in strange symbolic and enigmatic forms, and placed in the mouths of ancient patriarchs and worthies, which held forth golden visions of deliverance and vengeance in a shape which, because crasser and earthlier, was also more palpable than the spiritual hopes of the old prophets. Beyond the limits of Palestine thought took a wider range. In adopting the Greek language the Hellenistic Jews had also become open to the influences of foreign speculation, and the schools of Alex- andria, whose greatest teacher, Philo, was contemporary with the foundation of Christianity, had in great measure exchanged the faith of the Old Testament for a complicated system of metaphysico-theological speculations upon the Absolute Being, the Divine Wisdom, the Logos, and the like, which by the aid of allegorical interpretation were made to appear as the true teaching of Hebrew antiquity.

Ilh. — 81

The serikes,

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Popular apoca- lyptic.

Hellenism,

Jesus and the scribes.

Paul and the Juda- izers.

Christian prophecy and apoca- lyptic.

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To these currents of thought the relation of the earliest Christianity, entirely absorbed in the one great fact of the manifestation of God in Christ

crucified, risen, and soon to return in glory, was for the most part hostile, when it was not merely superficial. With the spirit of the scribes Jesus had openly joined issue. In the legal tradition of the elders he saw the commandment of God annulled (Matt. xv.) It was His part not to destroy but to fill up into spiritual completeness the teaching of the old dispensation (Matt. v.) ; and herein He attached himself directly to the prophetic conception of the law in Deuteronomy (Matt. xxii. 37, 7) And not only in His ethical teaching but in His personal sense of fellowship with the Father, and in the inner con- sciousness of His Messianic mission, Jesus stood directly on the Old Testament, reading in the Psalms and Prophets, which so vainly exercised the unsympathetie exegesis of the scribes, the direct and unmistakable image of His own experience and work as the founder of the spiritual king- dom of God (cf. especially, Luke xxiv. 25,7.) Thus Jesus found His first disciples among men who were strangers to the theological culture of the day (Acts iv. 13), cherishing no literature but the Old Testament witness to Christ, and claimiug no wisdom save the knowledge of Him. At first, indced, the church at Jerusalem was content to express its new life in simple exercises of faith and hope, without any attempt to define its relation to the past dispensation, and without breaking with the legal ordinances of the temple. But the spread of Christianity to the Gentiles compelled the principles of the new religion to measure themselves openly with the Judaism of the Pharisees. In the heathen mission of Paul the ceremonial law was ignored, and men became Christians without first becoming pro- selytes. The stricter Pharisaically-trained believers were horror-stricken. The old apostles, though they could not refuse the right hand of fellowship to workers so manifestly blessed of God as Paul and Barnabas, were indisposed to throw themselves into the new current, and displayed considerable vacillation in their personal conduct. Paul and his associates had to fight their own battle against the constant efforts of Judaizing emissaries, and the rabbinical training acquired at the feet of Gamaliel enabled the apostle of the heathen to meet the Judaizers on their own ground, and to work out the contrast of Christianity and Pharisaism with a thoroughness only possible to one who kuew Pharisaism from long experience, and had learned the gospel not from the tradition or teaching of men but by revelation of Jesus Christ (Gal. i. 12).

The relation of the first Christians to the current apoca- lyptic was of a different kind. The Messianie hopes already current among the first hearers of the gospel were unquestionably of apocalyptic colour. And though the contents of Christian hope. were new, and expressed them- selves in a revival of prophetic gifts (1 Cor. xii, 10; Acts xi. 27, &c.), it was not a matter of course that apocalyptic forms should be at once dropped, especially as Old Testa- anent prophecy itself had inclined in its later stages towards an increasing concreteness in delineating the Messianic kingdom, and so had at least formed the basis for many apocalyptic eonceptions. The apocalyptic books continued to be read, as appears from the influence of the book of Enoch on the epistle of Jude; and after the new spirit of prophecy had died away a Christian apocalyptie followed the Jewish models. But the way in which a genuine Christian prophecy, full of "the testimony of Jesus" (Rev. xix. 10), retained not a little of the apocalyptic manner (mainly, it is true, in dependence on the book of Daniel), appears clearly in the Revelation of John, which, whether we accept the prevalent tradition of its apostolic authorship, or, with sone ancients and many moderns, ascribe it to a different John, is at least an undisputed monument of the

prophecy of the apostolic age (according to modern critics, earlier than the fall of Jerusalem).

The influence on Christianity of Hellenistic philosophy, and, in general, of that floating spirit of speculation which circulated at the time in the meeting-places of Eastern and Western thought, was for the most part later than the New Testament period. Yet the Alexandrian education of a man like Apollos could not fail to give some colour to his preaching, and in the epistle tothe Hebrews, whose author, a nan closely akin to Paul, is not a direct disciple of Jesus (Heb. ii. 3), the theological reflection natural to the second generation, which no longer stood so immediately under the overpowering influence of the manifestation of Christ, is plainly affected in some points by Alexandrian views. In the case of other books the assertion of foreign speculative influences is generally bound up with the denial of the authenticity of the book in question. That the gospel of John presents a

view of the person of Christ dependent on Philonic speculation is not exegetically obvious, but is simply one side of the assertion that this gospel is an unhistorical product of abstract reflection. In the same way other attacks on the genuineness of New Testament writings are backed up by the supposed detection of Orphic elements in the epistle of James, and so forth.

Motives and Origin of the first Christian Literature.— We have seen that the earliest currents of Christian life and thought stood in a very secondary relation to the intellectual activity of the period, The only books from which the Apostolic Church drew largely and freely were those of the Old Testament, and the Christian task of proclaiming the gospel was not iu the first instance a literary task at all. The first writings of Christianity, therefore, were of an occasional kind, The care of so many churches compelled Paul to supplement his personal cfforts by epistles, in which the discussion of incidental questions aud the energetic defence of his gospel against the, Judaizers is interwoven with broad applications of the fundamental principles of the gospel to the whole theory and practice of Christian life. In these epistles, and generally in the teaching of Paul and his associates, Christian thought first shaped for itself a suitable literary vehicle. It was in Greek that the mission to the Gentiles was carried on, for that language was everywhere understood. Already in the mouths of Hellenistic Jews and in the translation of the Old Testa- ment the cow", or current Greek of the Macedonian period, had been tinctured with Semitic elements, and adapted to express the ideas of the old dispensation. Now a new modification was necessary, and soon in the circle of the Pauline churches specifically Christian ideas became inseparably bound up with words which to the heathen had a very different sense. Whether the epistolary way of teaching was used upon occasion by the older apostles before the labours of Paul is not clear; for most scholars have declined to accept the ingenious view which sees in the epistle of James the earliest writing of the New Testa- ment, The other epistles are certainly later, and the way in which several of them are addressed, not to a special com- munity in reference to a special need but to a wide circle of readers, seems to presuppose a formed custom of teach- ing by letter which extended from Paul not only to so like- minded a writer as the author of Hebrews (Apollos or Barnabas 4) but to the old apostles and their associates.

Besides epistles we have in the New Testament a solitary book of Christian prophecy and a fourfold account of the gospel history, with a continuation of the third gospel in the Acts of the Apostles. The origin and mutual relations of the gospels form at the present moment the field of numerous controversies which can only be dealt with in separate articles. or two points of general bearing.

Hellenistic thought in the church,

The epis- tles.

We must here confine ourselves to one'

Synoptic gospels.

Papias.

BIBLE

Jewish disciples were accustomed to retain the oral teaching of their masters with extraordinary tenacity and verbal exactness of memory (Mishna, Aboth, iii. 8; Edaioth, i. 3), and so the words of Jesus might for some time be handed down by merely oral tradition. But did the gospel continue to be taught orally alone up to the time when the extant gospels were written? or must we assume the existence of earlier evangelical writings form- ing a link between oral tradition and the narratives we now possess? The earlicst extcrnal evidence on this point is given in the prologue to Luke's gospel, which speaks of many previous essays towards a regularly digested evangelical history on the basis of the tradition (whether exclusively oral or partly written is not expressed) of eye- witnesses who had followed the whole course of Christ's ministry. It scems to be implied that if the eye-witnesses wrote at all, they, at least so far as was known to Luke, did not compose a regular narrative but simply threw together a mass of reminiscences. This understanding of the words of the evangelist agrees very well with the uni- form tradition of the old church as to the second gospel, viz, that it was composed by Mark from material furnished by Peter. This tradition goes back to Papias of Hierapolis, about 150 a.p., but it is a fair question whether the second gospel as we have it is not an enlarged

edition of Mark's original work. On the other hand ecclesiastical tradition recognizes the apostle Matthew as the author of the first gospel, but does so in a way that really bears out the statements of Luke. For the tradition that Matthew wrote the first gospel is always combined with the state- nent that he wrote in Hebrew (Aramaic), But from the time of Erasmus the best Greek scholars have been con- vinced that the gospel is not a translation. Either, then, the whole tradition of a directly apostolic Aramaic gospel is a inistake, caused by the existence among the Judaizing Christians in Palestine of an apocryphal " Gospel according to the Hebrews," which was by them ascribed to Matthew, but was, in fact, a corrupt edition of our Greek gospel ; or, on the other hand, what Matthew really wrote in Aramaic was different from the book that now bears his name, and only formed an important part of the material from which it draws, The latter solution is naturally suggested by the oldest form of the tradition; for what Papias says of Matthew is that he wrote 7a Adya, the oracles,—an expression which, though much disputed, seems to be most fairly understood not of a complete gospel but of a collection of the words of Christ. Andif so, all the carlicst external evidence points to the conclusion that the synoptical gospels are non-apostolic digests of spoken and written apostolic tradition, and that the arrangement of the earlier material in orderly forin took place only gradually and by many essays. With this the intcrual evidence agrces. 'The three first gospels are often in such remarkable accord even in minute and accidental points of expression, that it is certain either that they copied one another or that all have some sources in common. The first explanation is inadequate, both from the nature of the discrepancies that accompany the agreement of the three narratives, and from the impossibility of assigning absolute priority to any one gospel. For example, even if we suppose that the gospel of Mark was used by the other two authors, or conversely that Mark was made up mainly from Matthew and Luke, it is still necessary to postulate one or more earlier sources to explain residuary phenomena. And the longer the problem is studied the more general is the conviction of critics, that these sources cannot possibly have been merely oral.

It appears from what we have already seen, that a considerable portion of the New Testament is made up

- writings not directly apostolical, and a main problem

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of criticism is to determine the relation of these writings, especially of the gospels, to apostolic teaching and tradition. But behind all such questions as the relative priority of Matthew or of Mark, the weight to be assigned to the testimony of Papias, and so forth, lies a series of questions much more radical in character by which the whole theo- logical world is at present agitated. Can we say of all the New Testament books that they are either directly apostolic, or at least stand in immediate dependence on genuine

apostolic teaching which they honestly represent? or must Tibingen we hold, with an influential school of modern critics, that a school.

large proportion of the books are direct forgeries, written in the interest of theological tendencies, to which they sacrifice without hesitation the genuine history and teaching of Christ and his apostles? There are, of course, positions intermediate to these two views, aud the doctrine of tend- encies is not held by many critics even of the Tiibingen school in its extreme form. Yet, asa matter of fact, every book in the New Testament, with the exception of the four great epistles of St Paul, is at present more or less the subject of controversy, and interpolations are asserted even in these. The details of such a controversy can only be handled in separate articles, but a few general remarks may be useful here.

The arguments directed by modern critics against the External genuineness or credibility of New Testament books do not evidence.

for the most part rely much on external evidence. Except in one or two cases (particularly that of 2d Peter) the external evidence in favour of the books is as strong as one can fairly expect, even where not altogether decisive. We shall see when we come to speak of the canon that, towards the close of the 2d century, the four gospels, the Acts, thirteen epistles of Paul,

the first epistles of Petcr and Jolin, and the book of Revelation, were received in the most widely separated churches with remarkable unanimity. Before this time the chain of evidence is less complete. All our knowledge of the period that lies between the apostles and the great teachers of the Old Catholic Church towards the close of the 2d century is fragmentary. We possess but scanty remains of the literature, and the saine criticism which seeks to bring down many New Testament books into this period questions the genuineness of many of the writings which claim to date froni the first half of the 2d century, aud so are appealed to by conservative writers. Bnt on the whole, what evidence does exist is of a kind to push back all the more important writings to an early date.

rejecting. Yet the fairest writers of the school (Hilgenfcld, Keim) admit that it was known to Justin Martyr in the middle of the 2d century, though they think that besides our four gospels he had a fifth of apocryphal character. But references of an earlier date can hardly be denied ; and the gospel may be traced almost to the beginning of the century by the aid of fragments of the Gnostic Basilides and of the epistles of Ignatius. The Tiibingen school, indeed, maintain that the fragments preserved by Hip- polytus are not from Basilides, but from a later writer of his school, and utterly reject the Ignatian epistles. But it cannot be said that they have proved their case beyond dispute. They have at most shown tbat, if the gospel must on other grounds be taken as spurious, the external evidence may be pushed aside as not absolutely insuperable. On the other hand they try to bring positive proof that ccrtain books were unknown in circles where, if genuine, they must have circulated. But sucha negative is in its very nature difficult to prove. Probably the strongest argument of the kind is that brought to show that Papias did not know the gospel of John. But we know Papias only through Eusebius ; and though the latter

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The gospel of John, for example, is one of The fourth the books which negative critics arc most determined in 8°sPel.

is careful to mention all references to disputed books, it does not appear that it was part of his design to cite testimony to a book so universally allowed as John's gospel. And Papias does give testimony to the first epistle of John, which is hardly separable from the gospel. On the whole, then, we repeat that, on the most cardinal points, the

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supplement to the synoptical gospels which can only be understood as resting on true apostolic reminiscence ? (4.) Whether the external evidence for the several books and the known facts of church history leave time for the suc- cessive evolution of all the stages of early Christianity which the theory postulates 2

external evidence for the New Testament books is as stroug as can fairly be looked for, though not, of course, strong enough to convince a man who is sure @ priori that this or

The Christian Canon of the Old and New Testaments,—- Christian We have already seen that the Apostolic Church continued canon — to use as sacred the Hebrew Scriptures, whose authority Old Testa-

The Tiibin- gen theory.

that book is unhistorical and must be of late date.

The strength of the negative critics lies in internal evidence. And in this connection they have certainly directed attention to real difficulties, many of which still await their explanation. Some of these difficulties are not properly connected with the Tiibingen position. The genuineness of 2d Peter, which, indeed, is very weakly attested by external evidence, was suspicious even to Erasmus and Calvin, and no one will assert that the Pauline authorship of lst Timothy is as palpable as that of the epistle to the Romans. So, again, it is undeniable that the epistle to the Colossians and the so-called epistle to the Ephesians differ considerably in language and thought from other Pauline epistles, and that their relation to one another demands explanation. But in the Tiibingen school all minor difficulties, each of which might be solved in detail without any very radical procedure,

are brought together as phases of a single extremely radical theory of the growth of the New Testament. The theory has two bases, one philosophical or dogmatical, the other historical; and it cannot be pretended that the latter basis is adequate if the former is struck away. Philosophically the Tiibingen school starts from the position so clearly laid down by Strauss, that a miraculous interruption of the laws of nature stamps the narrative in which it occurs as unhistorical, or, at least, as more cautious writers put the case, hainpers the narrative with such extreme improbability that the positive evidence in favour of its truth would require to be much stronger than it is in the case of the New Testament history. The application of this proposition makes a great part of the narrative of the Gospels and Acts appear as unhistorical, and therefore late; and the origin of this late literature is sought by regarding the New Testament as the monument of a long struggle, in the course of which an original sharp antagonism between the gospel of Paul and the Judaizing gospel of the old apostles was gradually softened down and hannonized. The analysis of the New Testament is the resurrection of early parties in the church, each pursuing its own tendency by the aid of literary fiction. In the genuine epistles of Paul on the one hand, and in the Revelation and some parts of Matthew on the other, the original hostility of ethnic and Jewish Christianity is sharply defined ; while after a series of intermediate stages the Johannine writings present the final transition in the 2d century from the contests of primitive Christianity to the uniformity of the Old Catholic Church. This general position has been developed in a variety of forms, more or less drastic, and is supported by a vast mass of speculation and research; but the turning points of the controversy may, perhaps, be narrowed to four questions—(1.) Whether in view of Paul's undoubted conviction that miraculous powers were exercised by himself and other Christians (1 Cor. xii. 9, f; 2 Cor. xii. 12) the miracle criterion of a secondary narrative can be maintained? (2.) Whether the book of Acts is radically inconsistent with Paul's own account of his relations to the church at Jerusalem, and Whether the antithesis of Peter and Paul is proved from the epistles of the latter, or postulated in accordance with the Hegelian law of advance by antagonism? (3.) Whether the gospel of John is necessarily a late fiction, or does not rather supply in its ideal delineation of Jesus a necessary

derived fresh confirmation from the fulfilment of the pro- phecies in Christ. The idea that the Old Testament revela- tion must now fall back into a secondary position as compared with inspired apostolic teaching was not for a moment entertained. Still less could the notion of a body of New Testament Scriptures, of a collection of Christian writings, to be read like the Old Testament in public worship and appealed to as authoritative in matters of faith, take shape so long as the church was conscious that she had in her midst a living voice of inspiration. The first apostolic writings were, as we have seen, occasional, and it was not even matter of course that every epistle of an apostle should be carefully preserved, much less that it should be prized above his oral teaching. Paul certainly wrote more than two epistles to the Corinthians, and even Papias is still of opinon, when he collects reminiscences of apostolic sayings from the mouths of the elders, that what he reads in books cannot do him so much good as what he receives "from a living and abiding voice." Nay, the very writers who are the first to put Old and New Testa- ment books on a precisely similar footing (e.g., Tertullian) attach equal importance to the tradition of churches which had been directly taught by apostles, and so were presumed to possess the 'rule of faith" in a form free from the difficulties of exposition that encumber the written word, In the first instance, then, the authoritative books of the Christian church were those of the Old Testament; and in the time of the apostles and their immediate successors it was the Hebrew canon that was received. But as most churches had no knowledge of the Old Testament except through the Greek translation and the Alexandrian cauon, the Apocrypha soon began to be quoted as Scripture. The feeling of uncertainty as to the proper numbcr of Old Testament books which prevailed in the 2d century is illus- trated by an epistle of Melito of Sardis, who journeyed to Palestine in qucst of light, and brought back the pre- sent Hebrew canon, with the omission of the book of Esther. In the 3d century Origen knew the Hebrew canon, but accepted the Alexandrian additions, apparently because he considered that a special providence had watched over both forms of the collection. Subsequent teachers in tle Eastern Church gradually went back to the Hebrev# canon (Esther being still excluded from full canonicity by Athanasius and Gregory of Nazianzns), dis- tinguishing the Alexandrian additions as dveyryvwoxdpeva— books used for ecclesiastical lessons. In the Western Church the same distinction was made by scholars like Jerome, who introduced for merely ecclesiastical

books the somewhat incorrect name of Apocrypha; but a laxer view was very prevalent and gained ground during the Middle Ages, till at length, in opposition to the Protestants, the Council of Trent accepted every book in the Vulgate translation as canonical.

We turn now to the New Tcstament collection.

Scripture—was closely connected with regular use in public worship, and so the first step towards a New Testament canon was doubtless the establishment of a custom of reading in the churches individual epistles or gospels. The first beginnings of this custom must have been very early. The reference to Luke in 1 Tim. vy, 18 is disputed, and

The New Testa- idca of canonicity—the right of a book to be cited as Mentca.on.

Antilego- mena,

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2 Pet. iii. 16 is usually taken as one of many arguments against the genuineness of that epistle ; but a citation from Matthew is certainly referred to as Scripture in the epistle of Barnabas. But such recognition of an individual gospel is a long way removed from the recognition of an apostolic canon. The apostolic writings continued to be very par- tially diffused, and readers used such books as they had access to, often failing to distinguish between books of genuine value and worthless forgeries. For most readers were very uncritical, and there was an enormous floating mass of spurious and apocalyptic literature, including recensions of the gospel altered by heretical parties to suit their own views. It was perhaps in contest with the heretics of the 2d century that the necessity of forming a strict list of rcally authoritative writings came to be clearly felt ; and it is remarkable that heretics, generally hostile to the Old Testament, seem to have been among the first to form collections of Christian writings for themselves. Thus Marcion, in the middle of the 2d century, selected for himself on dogmatical grounds ten Pauline epistles, and a gospel which seems to have been based on Luke. Up to this time perhaps no formal canon of sacred writings had been put forth by the Catholic Church. But in the

second half of the century the notion of an authoritative New Testament collection appears in full development, and there is an amount of agreement as to the contents of the canon, which implies that, in spite of the loose way in which apocryphal books circulated side by side with genuine works, the church had no great difficulty in drawing a sharp line between the two classes when this was felt to be necessary, At the time of the great teachers of the close of the 2d century (Irenzus, Tertullian, Clement) we find a twofold collection, the Gospel and the Apostles. The Gospel comprises the four evangelists; and this number was already so absolutely fixed as to admit of no further doubt.

Quite beyond dispute were also the main books of the Apostolicon, the Acts, thirteen epistles of Paul, 1st Peter, 1st John, and the Apocalypse. The Muratorian fragment which contains a list twenty or thirty years older than the 3d century omits Ist Peter, but adds Jude, 2d and 3d John (2), and (as a disputed book) the Apocalypse of Peter. The Shepherd of Hermas might also be read, but it is pointed out that it is of quite recent date and not of prophetic or apostolic authority. From this time forward, then, the controversy is narrowed to a few books, occupying a middle position between the large mass of our present New Testament, which was already beyond dispute, and the spurious literature which was quite cxcluded from ecclesiastical use. Absolute uniformity was not at once attainable, for various churches had quite independent usages ; and, as we see from the Muratorian canon, a book might receive a certain ecclesiastical recognition without being, therefore, viewed as strictly canonical. This dubious margin to the canon wasof very uncertain limits, and Clement of Alexandria still uses many apocryphal books which found no acknowledgment in other parts of the church. Gradually the list of books which have even a disputed claim to authority is cut down. In the time of Eusebius the Shepherd of Hermas was still read in some churches, and several other books—the Epistl2 of Barnabas, the Actsof Paul, the Revelation of Peter, the Teachings of the Apostles— appear as‘controverted writings. But all these are plainly on the verge of rejection, while, on the other hand, 2d and 3d John, Jude, James, and 2d Peter are gradually gaining ground. This process continued to go on without inter- ruption till at length the whole class of disputed books (antilegomena) melted away, and only our present canon was left on the one hand, and books of no anthority or repute upon the other. Thus the

Council of Laodicea was able wholly to forbid the ecclesiastical use of uncanonical

books (360 a.p.) and the only uncertain point remaining in the tradition of the Eastern Church was the position of the Apocalypse, which had gradually fallen into suspicion, and was not fully reinstated till the 5th century. The Western Church, on the other hand, was long dubious as to the epistle to the Hebrews, which was received without hesitation in the East, as the Apocalypse continued to be in the West. The age of Augustine and Jerome saw the close of the Western canon.

Transmission and Diffusion of the Bible in the Christian Church before the Invention of Printing.

Under this head we have to speak—Ist, of the transmission of the original text ; 2d, of the ancient versions,

1. THe OxicinaL Text—Old Testament.-—The vapid spread of Text of Christianity among the Gentiles of the West made Greek the sacred O. T,

language of Christendom. Not only is Greek the language of the New Testament, but it was in the Septuagint version that the Old Testament was first circulated in the most important Gentile churches. Hebrew was almost unknown even to learned Christians, and in fact the current (Jewish as well as Christian) doctrine of the inspiration of the Septuagint, and a suspicion that the Hebrew text had been falsified by the Jews, made the study of the original appear unprofitable. A juster view of the value of Hebrew studies was formed by the two greatest scholars of the patristic period, Origen and Jerome. But the Septuagint continued to enjoy an authoritative place in the Eastern Church ; and the Latin Church, though it finally adopted Jerome's translation from the Hebrew in place of the older translation from the Greek, was not led by this change to take any interest in further study of the original. 'The Hebrew Bible continued to be the peculiar possession of the Jews, of whose labours in fixing and transmitting a standard text we have already spoken. It was not till the beginning of the 16th century that Christian scholars began to take a lively interest in the " Hebrew verity;"

and what has been done since that time to repair so many centuries of neglect belongs to the history of the printed text or of exegesis.

New Testument.—The original copies of the New Testament Text of writings were probably written on papyrus rolls, and were so soon N, T.— worn out by frequent use, that we do not even posscss any historical external They must, however, have been written features.

notice of their existence. in wnetal or large capital letters, without division of words or punctuation, without accents, breathings, &c., and probably with- out any titles or subscriptions whatever. The earliest transcripts comprised only portions of the New Testainent, the gospels being oftencst copied, and the Pauline oftener than the catholic epistles. Even after the canon became fixed, MSS. of the whole New Testa- ment, or of the whole Greek Bible, were comparatively rare. The order of the several books was not quite fixed ; but the catholic epistles generally followed the book of Acts. It may also be uoted that in the oldest MSS. the epistle to the Hebrews precedes the pastoral epistles. In course of time various changes were intro- duced in the externals of the written text. Parchment and vellum took the place of papyrus, and form the material of the oldest extant copies. 'The uncial character held its ground till about the 10th century, when the use of a cursive or running hand became general. Attempts to indicate the punctuation go back as far as the 4th or 5th century. The oldest MSS. use for this purpose an occasional simple point, or a small blank space in theline. Another system was to write the text in short lines (a7fxo1) accommodated to thesense. The author of this stichometry was Euthalius of Alex- andria in the second half of the 5th century, who applied it to the epistles and Acts. The same plan was altcrwards extended to the gospels ; but vellum was too costly to allow of its general adoption. The present system of punctuation was first used in printed books. Breathings and accents were not in common use down to the end of the 7th century; but occasional traces of them seem to occur con- siderably earlier.

Another device for the more convenient use of the New Testa- ment was the division of the text into sections of various kinds. The gospels were divided by Ammonins of Alexandria (220 a.p.) into short chapters (Ammonian sections, re@dAaia), constructed to facilitate the comparison of

corresponding passages of the scveral gospels. These sections are marked on the margin of most MSS. from the 5th century onwards ; and in gencral a reference is also given to the so-called canons of Eusebius, which are a kind of index to the sections, enabling the reader to find the parallel passages. Another division of the gospels into larger sections (rfrAo, breves) is also found in MSS. of the 5th century, and a similar division of the other books into chapters (kepdAaia) came into use not munch later. The chapters of the Acts and the catholic epistles were the work of Euthalius. Our present chapters are much later. They were invented by Cardinal Hugo of S. Carus in the 13th century, were first applied to the Latin Bible, and are still unknown in the

Various readings

The MS3.

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Eastern Church. The present system of verses first appears in the edition. printed by Robert Stephens in the year 1551.

The titles and subscriptions of the New Testament books are another point on which a succession of changes has taken place. The oldest MSS. have much shorter titles thau those which the English version adopted from the later Greek text; and the sub- scriptions, with their would-be historical information, are not only late, but worthless. Those appended to the epistles of St Paul are attributed to Enthalius.

More important than these external matters are the variations which in course of time crept into the text itself. Many of these variations are mere slips of eye, ear, memory, or judginent on the part of a copyist, who had no intention to do otherwise than follow what lay before him. But trauscribers, and especially early transcribers, by no ineans aimed at that minute accuracy which is expected of a modern critical editor. Corrections were made in the interests of grammar or of style, slight changes were adopted in order to remove difficulties, additions came in, especially from parallel narratives in the gospels, citations from the Old Testament were made more exact or more complete. 'That all this was donc in perfect good faith, and

simply because no strict conception of the duty of a copyist existed, is especially clear from the almost entire absence of deliberate falsification of the text in the interests of doctrinal controversy. To detail all the sources of various readings would be out of place; it may suffice to inention, in addition to what has been already said, that glosses, or notes originally written on the margin, very often ended by being taken into the text, and that the custom of reading the Scriptures in public worship naturally brought in liturgical additions, such as the doxology of the Lord's Prayer; while the commencement of an ecclesiastical lesson torn from its proper context had often to be supplemented by a few explanatory words, which soon caine to be regarded as part of the original,

p to a certaiu point the various readings due to so many different causes constantly became more and more numerous; but the number of independent readings which could arise and be per- petuated was limited by various circumstances. A general simi- larity necessarily prevailed in associated groups of copies, which were either derived from the same archetype, or written by the same copyist, or corrected by comparison with a single celebrated MS. Causes such as these, contbined with local peculiarities of style and taste, and with the fact that the New Testament, like Christianity itself, was sent forth from central mother churches to newly-formed communities all around, gave a decided local colour- ing to the text current in certain regions ; so that we are still able to speak in a general way of an Alexandrian, a Western, a Byzan- tine, and perhaps also (with Tischendorf) of an Asiatic text. But of course no ancient local text remained uninfluenced by copies from other regions, The comparison of copies became more and more extended in range as the church grew and consolidated into a homogeneous form; and though old readings, which had obtained a firm hold in certain eoununities, were not easily eradicated, it at length became almost impossible for any important new error to escape detection. Most variations of any consequence which are found in existing MSS. are known to be as old as the 4th century, and other readings existed then which no MS. is known to contain.

The variations of early copies were most completely smoothed into uniformity in the later byzantine MSS., after the Mahometan conquest had overthrown Greek learning in Syria and Keypt. 'The scribes of

Constantinople spent great pains on the text in accordance with their own notions of what was proper, and gave it a form which is certainly smoother, correcter, and more uniform than that of older MSS. But precisely these peculiarities show that this late recension is remote from the original shape of the New 'Testa- ment writings, and compel us to seek the true text by study of early MSS., especially of the still existing uncial copies.

The manuscripts are of six classes, containing respectively the gospels, the Acts with the catholic epistles, the Pauliue epistles, the Apocalypse, the ecclesiastical lessons from the gospels, the lessons from the Acts and epistles. Copies belonging tu the last two classes are called lcctionaries, and lectionaries of the gospels are called evangelistaria. Each MS. is referred to by critics by a special mark. Uncial MSS. are denoted by a capital letter, A standing for the Codex Alexandrinus, B for the Vaticanus, and soon, Cursives and lectionaries are denoted by Arabic numerals. It is to be observed that the same letter in a different part of the New Testament does not necessarily refer to the same MS. Thus Cod. D of the gospels and Acts is the Codex Beze, but D of the Pauline epistles is the Claromontanus. 1f we reckon fragments, the number of uncial MSS. is 56 of the gospels, 14 of the Acts, 6 of the catholic epistles, 15 of the Pauline epistles, 5 of the Apocalypse. But many of these are extremely short fragments. The number of cursives and lectionaries is cnormous, so that altogether there are nearly a thousand MSS. for the gospels, and as many more for the rest of the New Testament. Not nearly all the cursive copies have been thoroughly examined, and most of them have small value, though some comparatively recent MSS. are important from the

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BIBLE

fact that they represent an ancient text. Lectionaries, even when uncial, are little esteemed by most critics. Greco-Latin codices which have the Greek and Latin in parallel columns were formerly suspected of correcting the Greek text by the Latin, but their value is now generally recognized.

The oldest copies of the Greek Testament are the Codex Sinaiticus (S) and the Codex Vaticanus (B), both of the 4thcentury. Next in age come the

Alexandrian manuscript (A) and the Codex Ephraemi ©, both of which are referred to the 5th century. All of these copies were originally complete Bibles, with the Old as well as the New Testament. & is still complete as regards the New Testament; A and B have lacune; C is very imperfect, and barely legible, the ancieut writing having been almost removed by a medisval scribe to make way for the writings of Ephraem Syrus. ss, A, B, C, are the four great first-rate uncials, and will be found more fully described in separate articles. Besides these there are one or two fragments as old as the 5th century (I, I>, T).

A quite peculiar place is held by the Greco-Latin Codex Bezee at Cambridge (D), which dates from the 6th century, but presents a text full of the most singular interpolations. 'The other uncials of the gospels are less important, either from their fragmentary state or from the character of their text. The later uncials are hardly more valnable than good cursives.

The most important MS. of the Acts, in addition to those already mentioned, is K, the Codex Laudianus, Greco-Latin of the 6th century, in the Bodleian at Oxford. For the Pauline epistles we may mention D, or Codex Claromontanus, at Paris, also Greco- Latin of the 6th century, and H, or Codex Coislinianus, of the same century, of which there are 12 leaves at Paris and 2 at St Petersburg. Uncial authority is most scanty for the Apocalypse, for which the Vaticanus is defective. B of the Apocalypse is an uncial of the 8th century.

2, THE CHRISTIAN VERSIONS.—We have seen that the carly church adopted the LXX., not so much in the character of a version, as in that of an authoritative original. Although sevezal attempts were made in the 2d century of our era to produce a better Greck rendering of the Old Testament, not one of these seems to have had its origin in the Catholic Church. Aquila was a Jew, whose closely verbal rendering was designed to serve the subtilties of Rabbinic exegesis. Symmachus and Theodotion were probably Ebionites. 'The former was an excellent master of Greek, who happily corrected many clumsy renderings of the LXX., but inclined too much to paraphrase, and to the obliteration of characteristic tigures and bold expressions. Theodotion made less extensive changes, aud aimed only at necessary corrections. His rendering of Daniel was so manifest an

improvement that it entirely displaced the old version, and is still regularly printed as part of the LXX.

ln the Christian Church the importance of these new versions, and the unsatisfactory condition of the LXX.—which, apart from its original defects, had been much corrupted in successive transcrip- tions—were first clearly set forth by Origen in his Hexaplar edition of the Old Testament. This great work takes its name from the six columns in which it was arranged, containing respectively the Hebrew in the proper character, the same in Greek letters, the versions of Aquila, Symmachus, and Theodotion, and a text of the LXX,, partly corrected by comparison of MSS., partly emended by recourse to the Hebrew. The variations of several less important versions were also noted. 'The complete Hexapla was too huge a work to be transcribed and circulated as a whole. It lay in the library at Ceesarea, and was only occasionally consulted by scholars ; but the column containing Origen's emended text of the LXX. was pub- lished in separate transcripts by Eusebius and Pamphilus, and attained so great a circulation that in the Palestinian churches, as we learn from Jerome, it quite displaced the older text. In com-

osing his Hexaplar text, Origen was careful to distinguish: lis own improvements from the original LXX. by the use of asterisks and other marks. In later copies these marks were unfortunately often omitted. The Hexaplar text became mixed up with the true LXX., and the modern critic is sometimes tempted to forget how much the Eastern Church owed to this first attempt to go back to the Hebrew Old Testament, in his impatience at the obliteration by the adoption of Hexaplar corrections of important divergences of the LXX. from tle Massoretic text. Our knowledge of the other columns of Origen's great edition is fragmentary, and is derived partly from citations in ancient authors, partly from notes in MSS. of the Hexaplar LXX., or of the Syriac translation of it composed by Paul of Tela (616 The best collection of these fragments is that editel by Field (Origenits Hexaplorum que supersunt, Oxford, 1867-1875).

The first origin of translations of the Christian Scriptures into the vernacular of non-Hellenic churches is involved in much obscurity. Apart from the probable existence of early Aramaic gospels, there is no sure trace

of a Christian literature in any other tongue than Greek till late in the 2d century. Even in the churches of Gaul, Greck was the recognized language of Christian authorship. In Rome the literary use of Greek extended into the 8d century ; and in the earliest days of the Roman Church, Greek was the language of public worship. Even in remoter districts the demand

Uncial copies,

Greek versions,

Origen's Hexapla,

Syriac It is scarcely probable that cither of these versions is older than | edification of the unlearned was secured by reading the lessons in versions, the middle of the 2d century. The Syriac, which claims to be first | the vulgar tongue, as well as in Syriac or Coptic; and, accord- considered, was already an old version, containing obsolete expres- | ingly, the numerous Christian Arabic versions are mainly taken not sions, in the time of 8. Ephraem, who died 373 a.p. Internal | from the original tongues, but from the versions whose use they marks of antiquity are found in the relation of the Old Testament | were designed to supplement. In like manner the rise of the New- to a very early Jewish exegesis, and especially in the omission from | Persian language and literature produced a Persian version of the the New Testament of 2 Peter, 2 and 3 John, Jude, and Revelation. | Syriac New Testament. Of parts of the Old Testament there are On the other hand, there is no certain reference to this version by | Arabic and Persian translations directly from the Hebrew, but authors earlier than Hpliraem ; and the data afforded by the history | these are the work of Jewish scholars. 'Ihe Arabic versions of the of the canon, and by a comparison of the earliest remains of Syriac | Pentatcuch and Isaiah, by R. Saadias Gaon, in the 10th century, literature—the hymns of Bardesanes, who died about 225-—are not | areamong the most important monuments of ancient Jewish learning. sufficient to supply the lack of direct information. Some critics In the West as in the Kast the disintegration of the Roman Later still date the version from the beginning of the 2d century, while | empire was associated with the rise of new national dialects, and Western others would bring it down into the 8d. Even the close of the 3d | Latin ceased to be understood by the laity. But the Roman Church versions. century has been named; but this view

rests on the unlikely sup- | was too intent on the preservation of her homogeneous organization, ‘en that the omission of five New Testament books was due to | her visible unity of worship, to allow the vulgar tongnes to snpplant ater theological influences, and was not an original peculiarity of | the old liturgical language, or even to introduce a bilingual service. the version. The translation is, on the whole, excellent. The Old | The use of the Bible in a form intelligible to the illiterate was Testament is taken from the Hebrew, and, though sometimes | shifted from the sphere of public worship to that of private edifica- dependent on Jewish exegesis, and in other parts strongly influ- | tion and instruction ; and for the latter purpose the necessities of a enced by the LXX., is decidedly superior to the Targums. The | barbarous age seemed to demand explanatory paraphrases, Bible Peshito was the received version in all branches of the much: | narratives in metre, and the Jike, rather than literal renderings of divided Syrian churches. But it did not stand alone. The | the whole Scriptures. Thus, in the Anglo-Saxon Church, Caednion’s Ifexaplar version of Paul of Tela, and the slavishly literal Philox- | poctical version of the Bible history dates from 664 aA.p., while enian (508 A.p.—revised a century later by Thomas of Hharkel), | the carliest prose translations of parts of the Latin Lible (gospels, were presumably designed in the service of Biblical criticism. | psalms, &c.) do not seem to be older than tbe 8th century. 1n More obscure is the origin and purpose of the fragmentary version | Germany, in like manner, metrical versions of the gospel are of the gospels published by Cureton in 1858, and by him supposed | among the earliest attempts to convey the Bible to the people. to be older than the Peshito. Ottfrid’s harmony of the gospels in High German, and the poem Latin In the history of the Old Latin version almost nothing is certain, | called Héliand (Saviour), in Old Saxon, date from the 9th century; versions. save that it originated in Africa, before the time of Tertullian, and | and the prose translation of the so-called Gospel Harmony of Tatian that it assumed such Protean shapes in the hands of transcribers | —from the Latin of Victor of Capua—belongs to the same age. A that it 1s tu this day uncertain whether several distinct versions are | complete and literal translation of the Vulgate existed in Germany not included in the general name of the Old Latin. Jcrome, in- |.perhaps as early as the beginning of the 14th century. Among deed, speaks only of great variations between copy aud copy; but | uations whose speech was desccnded from the vulgar Latin, the Augustine tells us

that the “Itala” is to be preferred to the other | work of translation naturally began later. The earlicst remains of Latin interpretations. Hence MSS. of the Old Latin are often | Romance versions are thought to be as old as the 11th century ; called copies of the Itala; but in truth no one knows what the | but the work of translation assumed important dimensions mainly Jtala is, for it is mentioned only by Augustine, and by him only once. | in connection with the spirit of revolt against the Church of Kome A version which at best was a rude and over-literal rendering of | which rose in the 12th and 15th centuries. The study of the Bible the Greek Bible, in an unpolished provincial dialect, and which had | in the vulgar tongue was a characteristie of the Cathari and not even that fixed form which is so necessary in a Bible for ecclesi- | Waldenses, and the whole weight of the church’s authority was astical use, could not continue to serve the needs of the great Latin | turned against the use of the Scriptures by the laity. The prohibi- Church ; and towards the close of the 4th century a work of revision | tion of the Bible in the vulgar tongue, put forth at the Council of was undertaken at the instance of Damasus, bishop of Rome, by | Toulouse in 1229, was repeated by other councils in various parts Jerome, the most learned of the Western doctors. Jerome began by | of the church, but failed to quell the rising interest in the Scrip- correcting the New Testament, making only such changes as seemed | tures. 1n England and in Bohemia the Bible was translated by the absolutely imperative. In the Old Testament he first revised the | reforming parties of Wyclif and Huss ; and the early presses of the Psalter after the LXX., producing the version known as the Roman | 15th century sent forth Bibles, not only in Latin, but in French, Psalter from its adoption in the Roman liturgy. A second revision, | Spanish, Italian, German, and Dutch. based on the Hexaplar text, forms the Gallican Psalter, long used in Gaul and other churches beyond the Alps. Then Jerome pro- The Printed Text. ceeded to revise other books on the basis of the Hexaplar Greek ; but, finding this half-measure unsatisfactory, he finally rendered Though the Latin Bible was the first book printed, the original Printe:t the Old Testament directly from the Hebrew. ‘The work was com- | text was for some time neglected. The Jews of Italy led the way Hebrew pleted 405 a.p., and though often dependent on Aquila, and | with several editions of parts of the Old Testament, commencing Bibles, especially on Symmachus, it bears high witness to the scholarship | with the Psalter of 1475. The beautiful edition of Soncino (1488) was of the author,

and is perhaps the best of the ancient versions. In | the first complete Hebrew Bible, and was soon followed by the edition spite of its merits the new version was much attacked, and made | of Brescia, used by Luther (1494). At length Christians interested way in public estimation by very slow degrees. It was not till the | themselves in the work. The Antwerp printer, Daniel Bomiberg, 9th centnry that the Old Latin was entirely superseded in the | established a Hebrew press in Venice, from which he sent forth a Roman Church, and the circulation of the old and new versions side | series of Bibles and other books. The famous Rabbinical Bible of by side was long a fertile source of corruptions in the text of both. | 1517, edited by Felix Pratensis, a converted Jew, is known as the At length the complete supremacy of Jerome's Latin was marked | first Bomberg Bible, and is especially valuable for the text of the by the transference to it of the name of the Vulgate Version, which | Targums, which it prints in parallel coluinns with the Hebrew. The in older times was given to the LXX. second Rabbinical Bible of Bomberg was edited by Kk. Jacob Other The Egyptian versions (Memphitic in the dialect of lower Egypt, | Chayim (who also became a Christian), and contains the first printed Eastern Thebaic or Sahidic for upper Egypt) supplied the needs of the only | edition of the Massora, with a text carefully corrected in accordance versions, great Christian population of the early church which was not able | with Massoretic precepts. This edition at once attained a great

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for a vernacular Bible can hardly have come from the educated and reading classes, but arose rather from the custom of reading lessons from Scripture in the congregation. The earliest Christian transla- tions are the Peshito or '' Simple" version in Syria, and the Old Latin in Africa, monuments of the early vigour of two great churches on the eastern and western outskirts of Hellenic culture.

to use the Greek, the Latin, or the Syriac. The most recent inquirers are disposed to believe that Egypt received the Bible in the vernacular almost as soon as Syria. The version was taken from the Greek, which was also the source of various later transla- tions—the Ethiopic, the Armenian (5th century), the Georgian (6th century), the Slavonie (9th century)—fruits of

the gradual diffusion of Christianity in the remotest regions of the ancient world. The Gothic version of Ulfilas—the earliest written monument of the Teutonic languagés—is of the 4th century, and was also from the Greek. Only fragments of tliis translation remain to us, mainly in the famous silver-lettered MS. of the 5th or 6th century (Codex Argenteus) in the library of Upsal.

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Thus far the history of the versions records the triumphs of Christianity. The Arabic versions, on the contrary, owe their origin to the spread of Islam, when the language of the conquering Sara- cens displaced the ancient dialects of Syria and Egypt. This change did not diminish the authority of the old ecclesiastical versions, or displace them from their position in the services of the church. The

reputation. It was several times reprinted, and most subsequent editions are directly or indirectly dependent on it. The only early edition which rivals its fame is the Complutensian Polyglott, pub- lished at Alcala in 1517, at the expense of Cardinal Ximenes. The Hebrew of this polyglott exhibits a peculiar text, independent of the Italian editions. Later editions of the Hebrew Bible present little or no advance on the early prints ; and most recent editions are decidedly inferior. Of Hebrew Bibles, with various readings from MS. authority, the best known are Kennicott's (Oxford, 1776, 1780) and De Rossi's (Parma, 1784, 1788). The latter collection is by far the best, but neither has done much for the improvement of the text. In fact the differences between really good MSS. are

Printed text of New Testa- ment.

Recent versions,

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generally very minute ; and where the eurrent text is corrupt it is not from MSs., but from the versions, or from eonjecture, that help must be sought. On the other hand, a more accurate edition of the Massoretic text is certainly wanted. But such an edition must pay special regard to vowel

points and actents, which Kennicott and De Rossi neglect, and must consult MSS. of the Massora as well as of the text. The most valuable edition which notes variations not affecting the consonantal text is the Mantuan Bible of 1742, 1744, with the notes of Norzi (R. Jedidiah Solomon of Norcia). The best receut texts are S. Baer's Leipsic editions of Genesis (1869), Psalms (1861), and Isaiah (1872). Among easily accessible editions of the whole Old Testament, those of Jablonsky (Berlin, 1699) and J. H. Michaelis (Halle, 1720) have the best reputation.

The Greek New Testament was first printed in the Complutensian Polyglott (1514), but a delay in the publication euabled Froben of Basel to preoccupy the market with an edition hastily prepared by Erasmus from very recent codices. In subsequent editions a good many changes were made, partly after the Complutensian text, and in the third edition (1522) the spurious passage, 1 John v. 7, appeared for the first time. But it was still a recent and therefore an un- satisfactory text that was represented, and this radical defect was not corrected by the editors who followed Erasmus, though some of. them, and notably Th. Beza, possessed, and to some extent used, better MSS. than Erasmus consulted. Their beauty and conveni- ence, rather than the merit of their text, procured a great currency for the editions of Robert Stephens (O mirificam editions, 1546, 1549 ; royal edition, 1550), and his text of 1550, or the Elzevir text of 1624, which, though mainly based on Beza, is very nearly identical with the other, eame to be regarded as the "received text," which subsequent editors were long afraid to change. But materials for a better text were gradually accumulated by Walton in the London Polyglott (1657), Curectleus (1658), Fell (1675), ani above all by John Mill in his great edition of 1707. These labours were viewed with much jealousy by the hyper-orthodox ; and cven as late as 1751, Wetstein, after long and most valuable studies, could find a publisher only on eonsideration that his amendments on the received editions should not stand in the text. Some iniportant steps, however, were taken in the interval between Mill and Wetstein. Bentley sketched in 1720 the plan of au edition which should restore the text of the 4th century ; and Bengel in 1734 actually published au amended text, though readings which had not been given in any previous edition were admitted only in the Apocalypse. Benget was the first who classed MSS. under families, as Asiatic and African respectively. The next great critical editor after Bengel and Wetstein was J.

J. Griesbach, whose chief edition appeared 1796, 1806. Griesbach gave an exaggerated importance to the doctrine of families of MSS.; and his edition was constructed on the principle of adhering to the received text, unless the reasons to the contrary were irresistible; but his industry and critical skill give him a very high place among editors. Griesbach was followed by the Roman Catholic Scholz, whose labours were more pretentious than valuable; and at length the great critic Lachmann (1842, 1850) threw aside all traditional re- spect for the received text, and sought to restore the text of the 4th century by the aid of a very small number of select MSS., together with the Latin versions as given in the oldest copies, and the citations of the earliest fathers. The idea was fruitful, though the inaterial employed was too scanty. Since Lachmann published his edition our knowledge of the most ancient authorities has been greatly increased.. New MSS, have been added, notably Tischendorf's §; and the MSS. formerly known have becn edited or collated with much greater accuracy. The most distinguished labourers in this work were Tischendorf and Tregelles. In addition to numerous editions and collations of ancient copies, Tischendorf put forth a series of critical editions, of which the eighth (Leipsic, 1865-1872) contains the completest critical commentary yet published. The great edition of Tregelles (1857-72) rests exclusively on the most ancient authority, resembling Lachmann's work in conception, though using much more copious materials, This edition, as well as Tischendorf's VIII., lacks the prolegomena, both editors having been struck down by paralysis before their work was complete.

The recent versions, subsequent to the invention of printing and the revived study of the original tongues, demand a word in con- clusion. New Latin versions naturally accompanied many of the early editions of the original text. Thus Frasmus gave many cor- rections of the Vulgate in his Greek Testament, the Complutensian gives an interlinear version of the LXX., the Genoa Polyglott Psalter of 1516 gives renderings both of the Hebrew and of the Chaldee. Even such works as these, designed as they were for scholars, gave offence from their appearance of undermining the authority of the Vulgate; and it was the Reformation, in its revolt against mere human authority, that first demanded open circulation of vernacular versions from the original tongues. From the time of Luther's version (New Testament, 1522; complete Bible, 1534) we may distinguish four classes of versions.

Ist, Versions adopted by Protestant countries or churches. Such

BIBLE

are Luther's Bible in Germany; the Dutch Bible of the Commission of the Synod of Dort, 1637; the English Authorized Version of 1611; the Genevan French Bible, formed by successive revisions of Olivetan's version of 1585; the Danish of 1550, based on Luther, revised in 1607, 1647 ; the Swedish, 1541. Most of these national Bibles were preceded by earlier Protestant versions, which they supersede, See especially Wxettsn Bisur. Revisions of the na- tional versions have of late years been undertaken in Norway, Holland, and Germany, as well as in England.

2d, Versions which never held any other place than that of private eontributions to Biblical exegesis. Such are—among older works— the Latin Old Testament of Junius and Tremellius, and the New. Testament of Beza. These versions belong to the history of exegesis.

od, Missionary versions.

4th, Roman Catholic versions. The Council of Trent declared the Vulgate version authentic, and forbade interpretations of Scripture not in conformity with the consent of the fathers. Vernacular versions subject to these restrictions were published as the antidote to Protestant Bibles. Such are the Rhemish and Douay versions in English. Other Roman Catholic versions owe their origin to evangelical tendencies within the church, Jansenism, in particular, produced the French version of De Sacy (Mons, 1667), and otherwise stimulated the study of Scripture.

Jaterature.—Full discussion of some of the topics glanced at in this article must be sought in treatises on individual books or critical problems of the Old and New Testainents. But on most points it will be sufficient to refer to works on Biblical Introduction. The history of this branch of theology with lists of the principal older books—some of which, including the writings of R. Simon, Carpzov, and Kichhorn, are still of value—is given in most recent works on the subject. Of these it may be sufficient to mention for the Old Testament—De Wette's Linleitung, rewritten by Schrader (Perlin, 1869), full of condensed information; Bleek's posthumous Zinleitung (3d edition,

1870), less complete in detail and now rather behind date, but very clear and instructive; Keil's Linleitung (3d edition, 1873), which is strictly conservative. The two last are translated. Kuenen's Listorisch-Kritisch Onder- zoek, of which there is a French translation, is very full, but the author has considerably changed his views in the Llistory of the Religion of Israel (Haarlem, 1869-70) of which there is an English translation, Ewald's History of Israel is important, and is also accessible to the English reader; with it must be taken his books on the Prophets and Poets of the Old Covenant. Recent English literature on the Old Testament is not very remarkable, but Dr 8. Davidson's Introduction gives a full account of foreign investigations. The history of the Old Testament in the Christian church has been written by L. Diestel (Geschichte des Alten Testamentes, u.s.w., Jena, 1869). For the New Testament, De Wette, Bleek, and Davidson may again be consulted. A very instructive book is Reuss's Geschichte der Heiligen Schriften Neuen Testaments (5th edition, Bruns- wick, 1874), The most recent general work proceeding from the Tiibingen school is Hilgenfeld's Mistorisch- Kritische Hinleitung in das Neue Testament (Leipsic, 1875). On the canon there are several important works by Credner in German, and an English History of the Canon of. the New Festament, by Dr Westcott (4th edition, 1875). On the text of the New Testament the English reader may con- sult Tregelles's volume, contributed to Horne's [ntroduction (1856), and Scrivener's Plain Introduction to the Criticism of the New Testament (2d edition, 1874). Le Long's Bibliotheca Sacra, continued by Masch (Halle, 1778-1790), gives a full account of editions of the original text and versions, which may be supplemented by reference to De Rossi's Annales Hebreeo-typographict (XV. Cent., Parma, 1795; MDI. to MDXL., Parma, 1799), and Reuss's Bibliotheca Novi Testamenta Grect (Brunswick, 1872). Detailed references to other recent books will be found in the works already cited. (Ww. RS.)

BIBLE SOCIETIES

BIBLE SOCIETIES, associations for extending the circulation of the Holy Scriptures. Fora long period this object has been pursued to a considerable extent by several religious institutions, such as the Society for the Propaga- tion of the Gospel in Wales, formed by the Rev. Thomas Gouge, one of the two thousand ministers ejected by the Act of Uniformity in 1662; the Society

for Promoting Christian Knowledge, founded in 1698; the Society for sending Missionaries to India, established in the year 1705 by Frederick IV., King of Denmark, and which numbered among its agents the celebrated missionary, Christian Frederick Schwartz; the Society for Promoting Christian Knowledge in the Highlands and Islands of Scotland, formed in Edinburgh in 1709; the Moravian Missionary Society, founded in 1732; the Book Society for Promoting Religious Knowledge among the Poor, which was formed in London in 1750, and numbered among its earliest friends Dr Doddridge and the Rev. James Hervey; and the Religious Tract Society, founded in 1779. But the first British association which had in view the single purpose of disseminating the Scriptures was the NAVAL AND Minitary Bree Soctery, established in the year 1780, which has done immense service to the army and navy of Great Britain. The sphere of its opera- tions, however, was comparatively limited, and in 1804 the BRITISH AND FoREIGN BisiE Soctrery, the greatest agency ever devised for the diffusion of the Word of God, was founded. 'I'he proposal to institute this association origi- nated with the Rev. Mr Charles of Bala, whose philan- thropic labours in Wales were greatly impeded by the scarcity of the Scriptures in the principality, and it was largely fostered at the outset by members of the com- mittee of the Religious Tract Society. The exclusive object of the British and Foreign Bible Society is to pro- inote the circulation of the Scriptures, both at home and abroad, and its constitution admits the co-operation of all persons disposed to concur in its support. The committee of management consists of 36 laymen, 6 of them being foreigners resident in or near the metropolis, and of the remaining 30, one-half are members of the Church of England, and the other half members of other Christian denominations.

The proceedings of this society gave rise to several controversies, one of which related to the fundamental law of the society to circulate the Bible alone without notes or comments. On this ground it was vehemently attacked by Bishop Marsh and other divines of the Church of Eng- land, who insisted that the Prayer-Book ought to be given along with the Bible. Another controversy, in which the late Dr Andrew Thomson of Edinburgh took a prominent part, related to the circulation on the Continent, chiefly by affiliated societies, of the Apocrypha along with the canonical books of Scripture In 1826 it was resolved by the committee that the fundamental law

of the society be fully and distinctly recognized as excluding the circulation of the Apocrypha, This step, however, failed to satisfy al] the supporters of the society in Scotland, who pro- ceeded to form themselves into independent associations. A third serious controversy by which the society has been agitated, was occasioned by the alleged inaccuracy of some of the translations issued under its authority; and a fourth referred to the admissibility of non-Trinitarians to the privilege of co-operation, The refusal of the society in 1831 to alter its constitution so as formally to exclude such persons, led to the formation of the Trinitarian Bible Society. This has, however, been exceedingly limited in its operations, and the original society stands unrivalled.

By a law of the British and Foreign Bible Society, no translations are adopted or circulated in the languages of the United Kingdom except the Authorized Version. For other countries the best ancient

or received versions are printed ; and in tne casc of new translations, every effort is made to ascertain their strict fidelity and general literary merit. Most of the versions for countries not yet cnlight- encd by Christianity are made: by resident missionaries ; and these the society prints at the instance of the missionary societies for whose usc they are chiefly intended. These versions are made, wherever practicable, from the original Hebrew or Greek text. The society has had a share, direct or indirect, in the translation, print- ing, or distribution of Scriptures in 210 languages or dialects, the number of versions thus printed being 269. Altogether the society has put into circulation nearly 74 million Bibles, Testaments, and Portions (7.¢., single books of the Bible); and its expenditure for this purpose has amounted to £7,750, 000.

In the course of 1874 there were issued from the society's depéts, at home and abroad, no fewer than 2,619,427 Bibles, Testaments, and Portions. The free income for 1874-5 amounted to £119,093, 7s. 7d.; adding the contributions for special objects, and the pro- ceeds by sale of Scriptures, a total is reached of £222,191, 5s. 6d. The payments for translating, printing, and circulating the Scrip- tures were only £691 in the first year of the society's existence ; while in 1874-75 they were £217,390, 18s. 1d.

Immediately after the foundation of the society an extensive cor- respondence was opened with ministers and laymen in all parts of the world.

Auxiliary and Branch Societies were gradually formed in every district of the United Kingdom and in the colonies. These became centres whence the Scriptures might be obtained at cost price, and in cases of special need at even less. There are at present in the United Kingdom 4496 auxiliaries and branches, besides 1208 in the British colonies. Many of these are managed by ladies. Juvenile associations have also been organized in many localities,

Agents have been appointed both at home and abroad to investi- gate local requirements, to supply information for the guidance of the committee, and to suggest the best means of carrying out the great purpose of the society.

Depots for the sale of Scriptures have likewise been opened in almost every town of England, and in many places abroad.

Colportage is employed to some extent in England, and very largely on the Continent and in India.

Grants to Societies are made on various conditions. When applied for by missionary societies and philanthropic institutions, copies of the Scriptures are supplied very freely ; while grants of money and paper are made to other societies in aid of the translation and printing of the Scriptures, when good reasons are secn for the ex- penditurc.

It may be added that the society does not encourage the gratuitous distribution of Bibles and Testaments, cxcept under peculiar cir- cumstances.

The first English New Testament printed by the society was issued in September 1805. Stereotype printing had just been intro- duced ; and this invention, coupled with the society's plan of sell- ing the Scriptures at a very low price, brought about a speedy and general reduction in the price of English Bibles. Besides this indirect benefit which has thus been secured to English readers, the investigations and exertions of the society first

revealed, and then relieved, the great scarcity of Bibles which had previously existed. To show what the deficiency was, it may be mentioned that in 1812 inquiry was made into the case of 17,000 familics in the metropolis, when it was discovered that half of them did not possess a Bible at all.

he efforts of the society in India are organizcd upon a scale and with a completeness scarcely rivalled clsewhere. Buble circulation in India owes its origin mainly to the zeal of the Serampore mis- sionaries, especially of Carey, Marshman, and Ward, whose labours had begun shortly before the Bible Society was formed. It was stimulated by the exertions of Dr Claudius Buchanan, and by the establishment of the college at Fort William. Gradually auxiliary societies were formed at important centres—such as Caleutta, Bom- bay, Madras, Allahabad, &c. One of these auxiliaries alone —that at Madras—circulated in 1874-75 over 120,000 copies, and employed 55 native colporteurs. The assistance afforded by the society to India and Ceylon in grants of money, paper, and books—including £27,230 supplied to Dr Carey and his associates—amounts to no less a sum than £361,193.

When the society began to inquire into the state of the Continent, the dearth of Scriptures was found to be greater, if possible, than at home. Thus, in Lithuania, among 18,000 Germans, 7800 Polish, and 7000 Lithuanian families, not a Bible was to be found. One half of the population of Holland appeared to be without the Scrip- tures. In Poland a Bible could hardly be obtaincd at any price. In the district of Dorpat (Esthonia), containing 106,000 inhabitants, not 200 Testaments were to be found, and there were Christian pastors who did not possess the Scriptures in the dialect in which they preached. Into Iceland, with a population of 50,000, of whom almost all could read, not above 40 or 50 copies had penetrated ; while in Sweden a single auxiliary found 13,900 families totally

unprovided. III. — 82

Such was the state of things abroad when the soeiety was estab- lished. Correspondence was at once opened with well-known men like Oberlin,

Knapp, and Herzog; the society's foreign secre- tary and agents personally visited the districts, and various sub- sidiary societies were formed. The highest patronage was cften obtained for these, the emperor of Russia, the kings of Prussia, Bavaria, Sweden, and Wiirtemberg, and many others, entering heartily into the work. Some of the soeieties thus formed were, however, suppressed through the influence of Rome. More than 15,000,000 copies have been printed by them up to the present time.

Of all the foreign Bible societies, by far the most remarkable was that established in Russia, in the year 1812, under the presidency of Prince Galitzin, and with the direet approval and support of the Emperor Alexander I. An imperial ukase was issued, giving formal sanction to the project ; all communities joined to speed it on its way ; 289 auxiliaries were rapidly formed; the Scriptures were printed in nearly 30 languages, including Modern Russ; 861,000 copies were eirculated ; and at the time of its suspension in 1826 it had been aided by the British and Foreign Bible Society to the extent of £16,833.

Besides thus encouraging.Bible circulation through friendly'counsel and pecuniary aid, the British and Foreign Bible Society has done and is doing a direct work on the Continent, some illustration of which may be gathered from the following particulars :—

The first French Bible printed by the society was prepared for the prisoners of war in 1805. After the peace was concluded, measures were taken to form centres of Bible circulation through the country. As a result of these movements, various Bible societies sprang up. Depots have also been opened in Paris and many other large towns; and special provision has been made for the provincials of the west, by the preparation of Basque and Breton versions. Thcre have been printed by the society, in the French tongue, upwards of seven and a half million eopies of the Scriptures.

In 1835, when Mr W. P. Tiddy went out as agent for the society in Belgium, hardly a Bible was to be found in the country, and evangelistic efforts were rare, through the vehement opposition which they eneountered. A staff of colporteurs was appointed, and through their efforts a large supply of Scriptures was distributed. This led to the formation of several Protestant eommunities.

The society's agent in Germany superintends the movements of between 60 and 70 colporteurs, and reports a yearly cireulation of about 300,000 eopies. The services rendered during the Franeo- Prussian war were so signal as to call forth not only the grateful appreciation of the Germans, but a written acknowledgment from the emperor, who is himself an annual subseriber to the society.

Efforts were made by Dr Pinkerton in 1816 to establish a National Bible Soeiety for Austria ; but through the influence of the Pope the emperor was induced to reject the proposal. A new beginning was made in 1850, when in less than two years 41,659 copies of the Scriptures, in German, Bohemian, and Hungarian, were put into eirculation, Fresh opposition was, however, soon awakened, and the authorities ordered the whole stock on hand to be withdrawn from the eountry. In compliance with this order, Mr E. Millard, the soeiety's agent, retired to Prussia, where he laboured for several years with marked success. After a while he was permitted to return to Vienna, and to open depdts at such centres as Pesth, Trieste, Klausenburg, and Prague. By these means, and through a large staff of colporteurs, he has issued during the past ten years 1,250,000 eopies.

Very little direct work was done in Italy until the Revolution of 1848. Then the society gladly hailed the opportunity of entering the country; but soon the door was again closed. The Pope issued an eneyclical in 1849, in which the condemnation of Bible societies was emphatically repeated. As a consequence, 3000 New Testa- ments, just printed at Florence, were seized, presses were eonfiseated, paper and type carried off, and the society's agent eompelled to retire. All this is now altered. The headquarters of the society's Italian agency are at Rome, and the Scriptures are distributed from depéts and by colporteurs in all parts of the peninsula.

Little could be done in Spain prior to the Revolution of 1868, which threw open the country and established religious liberty. All available means were then adopted for printing and eireulating the Spanish Bible. The issues from the Madrid depot have ex- eeeded half a million copies, but during the recent civil troubles the movements of the colporteurs have been much restricted.

Between 300,000 and 400,000 copies of the Scriptures have been printed in the Portuguese tongue.

Mr Paterson paid a visit to Sweden in 1809 on behalf of the society, and found the poor almost entirely without the Scriptures. Thus in one dioeese 10,000 families were discovered without a Bible in their possession. An agency was established in 1831. Special grants have been made to the army aud navy, and for the students in the universities. The total issues sinee 1832 have been over 2,000,000, and that in a population of less than 4,000,000.

To give even an outline of the work done by the British and Foreign Bible Soeiety in the more remote parts of the world would be to write a volume. All the great missionary societies are its

debtors. {Its undenominational eharacter has secured what could hardly otherwise have been attained—the use of the same version by missionaries of different churehes ; and it has often proved a healcr and a peace-maker abroad, while it has been a bond of union at hone. To the linguist and to the comparative philologist its operations are of intense interest ; and the boon conferred on the thought and language of many nations through its versions of the Seriptures is well-nigh inestimable.

The EpinpurcH Brsite SoctEry originated in the con- troversy respecting the circulation of the Apocrypha, and was composed of Protestants professing their belief in the doctrine of the Holy Trinity, and disposed to co-operate in promoting the dissemination of the Scriptures.

The ScorrisH BrBLE SocrEry was instituted upwards of forty ycars ago. At the time of its establishment, the other Bible societies in Scotland employed their funds chiefly in circulating the Scriptures in foreign countries. This association was intended exclusively for the distribu- tion of the Bible at home, and its funds were at first derived from collections made in the parish churches within the Synod of Lothian and Tweeddale.

The Scotch Bible societies were amalgamated in 1861, and took the name of the NationaL Bisie Socrery oF ScoTLanD. During the year 1874 the society

issued 340,908 Bibles, Testaments, and “ Portions,” its receipts, including the proceeds of sales, amounting to £26,840.

The first Bible society in America is believed to have been established by a few Baptists in New York in 1804 ; its object was to purchase and lend Bibles for a month at atime. The PHILADELPHIA Bratz Socrery, which was instituted December 12, 1808, was for some years the only association in the country for the gratuitous distribution of the sacred Scriptures. The AMERICAN BrBiE Society was formed at New York, May 8, 1817. It has numerous auxiliaries throughout the several states of the Union. In 1875 its income amounted to $577,569. Its issues during that year were 926,900 Bibles and Testaments, and since its formation 31,893,332.

Among other societies may be mentioned the Brsie TRANSLATION Society, whose versions embody the views of the Baptists, and the PortEusiAN Bipie Soorrty (named from Bishop Porteus), for the circulation of Bibles marked so as to show the practical bearing of each chapter.

It is believed that there are altogether about 70 Bible societies in the world. The issues of the 7 leading societies may be summarized as follows -—

The British and Foreign Bible Society…..... 73, 750,538 The American Bible Society …..... see , o1,893,052 The National Bible Society of Scotland…... 4,563,669 The Prussian Bible Soeiety at Berlin…..... , 4,083,418 The Hibernian Bible Society…..... Ree Oya fatentl The Wiirtemberg Bible Society…..... ..... 1,279,966 The Netherlands Bible Society …..... . 1,258,643

NG) isi te aeterre tie, em rcictc 120,792,142

The monopoly of the right to print the Bible in England is still possessed by the Universities of Oxford and Cam- bridge, and her Majesty’s printer for England. But after a controversy, which was carried on for some time with great warmth (1840-41), the prices of the common Bibles and Testaments were greatly reduced, and they have gradually attained their present remarkable cheapness.

In Scotland, on the expiry of the monopoly in 1839, Parliament refused to renew the patent, and appointed a Bible Board for Scotland, with power to grant licences to print the Authorized Version of the Scriptures. This step produced a great reduction in the price of the sacred volume, and its circulation was considerably increased.

See Owen's History of the First Ten Years of the British and Foreign Bible Society; Bible Triumphs, a Jubilee Memorial for the British and Foreign Bible Society; Brown's History of the Bible Society, 1859. (R. B. G.)

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BIBLIOGRAPHY

HE term Bibliography has passed through different meanings. The B.BAdypados of the Greeks, like the librarius of the Romans, was a mere copyist. When the name bibliographie was adopted by the French, it was used, as late as the middle of the last century, to signify skill in deciphering and judging of ancient manuscripts. Its special application to printed books may be said to date from the Brbliographie Instructive of De Bure in 1763; not that he appears to have coined the new meaning of the term, but his work first popularized the study which the growth of libraries and the commerce in literature had created.

Bibliography, thus understood, may be defined' as the science of books, having regard to their description and proper classification. Viewing books simply as vehicles of learning, it would undoubtedly be correct to extend our inquiry to the period when the only books, so called, were manuscripts. And such is, in fact, the view adopted by bibliographers like Peignot, Namur, and Hartwell Horne. But a survey so extensive is open to practical objections. In the first place, bibliograpby as a science was unknown until long after printing had laid its first foundations, and indeed made it a necessity, with requirements increasing with the multiplied productions of the press. The materials for comparative study were wanting in an age when books were regarded as isolated treasures, to be bought at prices corresponding with their scarcity. In the second place, the critical study and

comparison of ancient manuscripts, their distribution into families deduced from one or more archetypes, and the investigation of ancient systems of writing, embrace a subject so wide in its scope and special in its character, that convenience of treatment, confirmed as it is by the facts of history, would alone suggest the propriety of distinguishing between manuscript and printed bibliography. This distinction it is here proposed to observe, the subject of MSS. being reserved for the article PaLMOGRAPHY, the name which in its maturity it received.

Amid much variety of treatment in detail, two main divisions underlie the general study of bibliography, viz., material and literary, according as books are regarded with reference to their form or their substance. The former belongs chiefly to the bookseller and book-collector; the latter to the literary man and the scholar. Material bibliography treats of what Savigny terms the " dussere Biicherwesen," or the external characteristics of books, their forms, prices and rarity, the names of the printers, the date and place of publication, and the history of particular copies or editions. It involves a knowledge of typography, not, indeed, as a mechanical process, but in its results, and, in fact, of all the constituent part of books, as a means of identifying particular productions. Its full development is due to the gradual formation of a technical science of books. Considerations of buying and selling, which were first reduced to a system in Holland, and afterwards advanced to their present complete form in France and England, gave an impetus to this branch of bibliography. The growth of private libraries, especially during the last century in France, promoted a passion among rich amateurs for rare and curious books; and literary antiquarians began to study those extrinsic circumstances, apart from the merit of their contents, which went to determine their marketable value, and to reveal the elements of rarity.

Literary, or, as it is sometimes called, intellectual bibliography treats of books by their contents, and of their connection in a literary point of view. It has been sub- Givided into pure and applied, according as its functions

became more complex with the spread of printed books and the increasing requirements of learning. Catalogues expanded into dictionaries, whose object was to acquaint literary men with the most important works in every

branch of learning. Books were accordingly classified by their contents, and the compiler had to distinguish between degrees of relative utility, so that students might know what books to select. This duty, which devolved in most cases on men of learning, has led French writers in particular to exaggerate the province of bibliography. "La bibliographie," says Achard, " étant la plus étendue de toutes les sciences, semble devoir les renfermer toutes ;" and Peignot describes it under his proposed title of Bibliologie, as "la plus vaste et la plus universelle de toutes les connaissances humaines." We know of no excuse for such pretensions beyond this, that books represent, in its transmissible form, the sum total of all kinds of knowledge. The bibliographer has to determine the genuineness, not the authenticity of a book; its identity of authorship or publication, not the correctness of its contents. When he pronounces judgment on its intrinsic merits he usurps the office of the critic. Some works, indeed,—like Baillet's Jugemens des Savans, sur les Principauz Ouvrages des Auteurs, augmentés par M. de la Monnoye, 8 vols., Amst., 1724; Blount's Censura Celebriorum Auctorum, London, 1690; Morhof's Polyhistor Literarvus, Philosophicus, et Practicus, the best edition of -which is that of Fabricius in 1747; the Onomasticon Literarvum of Saxius, Utrecht, 7 vols., 1759-90 ; and the Censura Lateraria of Sir Egerton Brydges, 10 vols., 1805-9,—are collections of critical bibliography of extreme value to the literary historian; but there is a wide difference in design between compilations even of this kind and works devoted to original criticism. In like manner the proper objects of classification have been neglected by many bibliographers, who have indulged in refinements of method, not as a means of facilitating reference, but for the purpose of illustrating a philosophical system of learning. Pretensions such as_ these, have, unfortunately, done much to discredit bibliography as a science of practical application, by investing it with a false air of mystery, and exposing it to the charge of empiricism. Its real value, in a literary aspect, depends on the recogni- tion of its purpose as ancillary to the study of literature ; not, in short, as an end, but as a means to the attainment of knowledge, by the investigation of its sources.

France must be regarded as the real mother of biblio- graphy. Italy was the field in which book-collections first began on a large scale, and that country can boast of names like Magliabecchi, Apostolo Zeno, Bandini, Audiffredi, Mazzuchelli, and Morelli, besides provincial works like Moreni's

Bibliografia della Toscana, and Gamba's Serie dt Testt. But the labours of French bibliographers, especially after Naudé, converted a study, more or less desultory, into a science and a systematic pursuit. In Germany, poor in public and almost destitute of private libraries, biblography has been studied almost exclusively in its literary aspect. Belgium has shown much recent activity; but neither Holland, Spain, nor Portugal can show any modern work of importance. In England the paucity of bibliographers is the more to be regretted from the wealth of her resources, Richard de Bury, in his Philobzblion, had descanted on the charms of book-collecting as early as the 14th century ; but Blount's Censura, published in 1690, was the only regular

1 The term bibliognoste originated with the Abbé Rive; words similarly compounded, and involving fanciful niceties of distinction, are common among French writers on this subject (Peignot).

treatise on bibliography up to that date. Oldys, whose British Iibrarian first appeared in 1737 but was never completed, was among the first in this country to divert the public taste from an exclusive attention to new books, by making the merit of old ones the subject of critical discussion; and Maittaire, who was second master of Westminster School, and who died in 1747, first established the study of bibliography in England ona solid basis. The labours of Dibdin we shall have occasion frequently to refer to; they mark a new phase of bibliography in England which followed the opening up of the Continent after the great war with France. The science in America has been cultivated only recently; but the names of Cogswell, Ticknor, and Jewett are already well-known to biblio- graphers.

I The Constituent Parts of Books, and Differences of Editions.

The history of the materials used for early manuscripts— a subject fruitful in research—lies outside the limits we have proposed for bibliography as the study of printed literature. Fortunately for the spread of books, in the modern sense of the term, the invention of printing was preceded by the important discovery of the art of making paper from linen rags. The precise date of this discovery is not known, nor are writers agreed as to the country

in which it was made; but it seems to be ascertained that this kind of paper was in general use in Europe before the end of the 14th century. Caxton and the other early English printers appear to have used paper of foreign manufacture. Such questions, among others, as the relative priority of different editions, or the productions of different presses, are frequently to be determined by a comparison of the constituent elements of the books themselves; but the subject is too technical to be noticed in detail. The question as to the origin of printing belongs strictly to a consideration of that art; but as its history and its progress are illustrated by the productions of different presses, the bibliographer will find much matter of interest in the principal works devoted to the subject. Prominent among these are the Monumenta Typographica of Wolfius, Ham- burg, 1740; Meerman's Origines Typographic ; Prosper Marchand's Histoire de Vorigine et des premiers progres de PImprimerie, 1740,—a valuable supplement to which was published by M. Mercier, Abbé de Saint Leger, in 1773, and republished in 1775; and Lambinet's Recherches his- toriques, littératres, et critiques sur Vorigine de V Imprimerie, first published at Brussels in 1799.

An accurate knowledge of the different forms of books is necessary to the bibliographer, as without it no book can be correctly described; and however easy such knowledge may appear, it is yet certain that errors in this respect have been committed even by experienced biblio- graphers, and that doubts have been entertained as to the existence of editions, owing to their forms having been inaccurately described.1_ These mistakes generally proceed from this, that there are different sizes of paper com- prehended under the same name. But the water-lines in the sheets afford a test, as they are uniformly perpendicular in the folio and octavo, and horizontal in the quarto and duodecimo sizes. In the infancy of printing the sizes were generally folio and quarto, and some have supposed that no books were printed in the smaller forms till after 1480; but M. Peignot instances many editions in the smallest forms of an earlier date; as may be seen in the article "Format" of the supplement to his Dictionnaire de Bibliologie. The subject of water-marks is treated at length in Sotheby's Principia Typographica.

1 See Boulard, Traité Hlémentatre de Bibliographie, pp. 38, 39.

The respective merits of different editions can be ascertained often only by minute inquiries. It is a principal object of the bibliographical dictionaries, to be afterwards mentioned, to point out those editions of important works which such inquiries have discovered to be the best. There are many particulars in which one edition may differ from or excel another. There may be differences or grounds of preference in size, in paper, and in printing. Later revision by the author may give his work, when it comes to be reprinted, a complexion differing largely from what it had at the first; while the first edition exhibits his orginal thoughts as they came fresh from his pen. One edition may derive its superiority from being furnished with notes, an index, or a table of contents. Plates make great differences in the value of editions, and even in the value of copies of the same edition. In the beautifully engraved edition of Horace by Pine, a small error in the first impressions serves as a test whether any copy contains the best engravings of those elegant vignettes which illustrate that edition. The medal of Augustus, on page 108 of the second volume, has in the first copies the incorrect reading Post Hst instead of Potest; this was rectified in the after impressions; but as the plates had meanwhile sustained some injury, the copies which show the incorrect reading are of course esteemed the best. Dibdin, in his Bibliomania, points out this as an instance of preference founded on a defect ; but the real ground of preference is the superiority of the impressions, ascertained by the presence of this trifling defect. There are sometimes differences between copies of the same edition of a work.? Walton's Polyglot Bible is a celebrated instance. The printing of that great work, for which Cromwell liberally allowed paper to be imported free of duty, was begun in 1653 and completed in 1657, and the preface to it in some copies contains a respectful acknowledgement of this piece of patronage on the part of the Protector ; but in other copies the compliment is expunged, and replaced by some invectives against the republicans,—Walton having on the Restoration printed another pre- face to the copies which had not by that time been dis- posed of.'

IT. Harly Printed Books.

The first productions to which the name of Books has been applied, were printed, not with movable types, but from solid wooden blocks. These consisted of a few leaves only, on which were impressed images of saints

and other historical pictures, with a text or a few explanatory lines. The ink was of a brownish hue, and glutinous quality, to prevent it front spreading. These are known by the namo of Image Books, or Block Books, and are generally supposed to have succeeded the earlier impressions for playing cards, which are dated back to the end of the 14th century. Strictly speaking, they were the immediate precursors, rather than the first specimens of typography ; in fact, they mark the transition to that art from engraving. Peignot puts their number at seven or eight, but others have extended it to ten. They belong chiefly to the Low Countries, and were often reprinted, as is generally thought, during the first half of the 15th century, and, indeed, after*

2 The Voyage to Cadiz is sometimes wanting in Hakluyt's Vaviga- tions, 1598-1600. A reprint is often inserted to supply this want, which may-be known from the original by its having only seven para- graphs in p. 607, vol. i., whereas the original has eight. The ort- ginal ends on p. 619, the reprint on p. 620.

3 See vol. i. of Dr Clarke's Bibliographical Dictionary for some curious details on this point.

- *Mr Holt, who contends that printing preceded engraving, ascribes the date of 1423 on the St. Christopher to a forgery for 1493, and asserts that no copy of the Biblia Pauperum was known before 1485, See Votes and Queries, 4th series, ii. 265.*

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the discovery of printing, properly so called. One of the miost celebrated is the Biblia Pauperum,' consisting of forty leaves, printed on one side, so as to make twenty when pasted together, on which passages from Scripture are represented by means of figures, with inscriptions. It appears to have been originally intended for the use of those poor persons who could not afford to buy complete copies of the Bible. Some fugitive sheets still attest the primitive attempts at printing, in the modern sense of the word. The Letters of Indulgence of Pope Nicholas V., two editions of which, on a small sheet of parchment, were printed in 1454, fix the earliest period of the impression of metal types, with a date subjoined.? The earliest known book, however, of

any magnitude, and probably the first thus printed, was the undated editio princeps of the Bible, com- monly known as the Mazarin Bible, from a copy having been found by De Bure in the library of the Cardinal. It is undated, but authorities generally concur in ascribing it to a period between 1450 and 1455. The work is usually divided into two volumes, the first containing 324, and the second 317 pages, each page consisting of two columns. The characters, which are Gothic, are large and handsome, and resemble manuscript. No fewer than twenty copies are known to be extant.2 The first printed book with a date is the Psalter of Fust and Schéffer, printed at Mentz in 1457, as a somewhat pompous colophon announces. It was found, in 1665, in the Castle of Ambras, near Iunsbruck, where the Archduke Francis Sigismund had collected a quantity of MSS. and printed books, taken chiefly from the library of Corvinus. A few other copies are in existence, one of which was bought under Louis XVIII. for the Royal Library at Paris for the sum of 12,000 francs. Whether the types employed were wooden or metallic has been disputed between Van Praet and Didot. As a specimen of early priuting the work is magnificent ; it contains richly embellished capitals in blue, red, and purple.

Besides these monuments of infant typography, a special interest attaches to the productions of the 15th century. They are usually known as Incunabula, a term applied to them by modern German writers. Brunet, following Santander, estimates their number at 18,000 or 20,000 ; but itis probable that niany duplicates are included in this reckoning. They came into demand chiefly at the beginning of the last century, and especially about 1740, at the third centenary of printing. The passion for them at first was indiscriminate, but preference afterwards was given to the presses of Mayence, Bamberg, Cologne, Strasburg, Rome, and Venice.

As regards these early printed books, a knowledge of typography is necessary to the bibliographer, to enable him to verify their identity. A brief reference to some of their leading peculiarities must suffice here. The printer's name,

1 So called first by Heinecken, [dée générale d'une collection complete @ Estampes, 8vo.,1771. Dibdin, in his Bibl. Spenceriana, and Ottley, in his History of Engraving, have given fac-similes of the figures in several of the

block-books. See also Falkenstein's Geschichte der Buchdruckerkunst in threr Entstehung und Ausdildung, 4to, 1840 ; Schelhorn's Amen. Lit.; the works of Maittaire, D. Clement, Fournier, Meermann, Papillon, and De Bure; and J. P. Berjeau's Catalogue tllustré des livres xylographiques, 1865. Heinecken was the chief authority until recently, when his views, especially on the chronology of the block-books, have been much contested. Sotheby's Principia Typo- graphica, 3 vols., 1858, is the most important work on this subject in late years. The author has also attempted to elucidate the character of the water-marks of the period.

2 Dibdin's Bibl. Spencer., i. xliv.

3 Before the discovery of the Mazarin Bible, the Bamberg Bible of Pfister generally passed for the first printed book. Schelhorn has written a treatise maintaining its priority of age. As to the Mazarin Bible, see an article by Dibdin in Valpy's Classical Journal, No. 8. The kind of types employed upon it has been the subject of much dispute.

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and the date and place of printing were at first omitted, the printer imitating the reticence of the copyist, and the book being a mere fac-simile of the manuscript, In Germany and the Low Countries few dated books are found before 1476 or 1480. Title-pages appear to have come in a few years later; none of Caxton's works, with one doubtful exception, have any. 'Titles to chapters were first used in the Lpistles of Cicero, 1470. According to Palmer, the use of signatures, or letters at the bottom of the page to guide the bookbinder in the arrangement of the sheets, began with Zarot in a Terence printed by him at Milan in 1470. Marolles ascribes them to John of Cologne, who printed at Venice in 1474, and the Abbé Rive to John Koelhof, a printer of Cologne. They were in use in that city in 1475, and at Paris the next year, but were not employed by Caxton until 1480. Catch-words, which, like signatures, preceded the numbering of pages, are found in MSS. of the 11th century, and were first applied to printing by Vindelin de Spira at Venice. Their purpose, to direct the binder, had been previously supplied by Registers, or alphabetical tables of the first word of chapters, which were introduced about 1469. The earliest system of numbering was applied, not to pages, but to leaves, a large Roman figure being placed at*

the top of the recto in each leaf. The characters were uniformly Gothic—the foundation of our Black- letter—until 1467, when Gothic was supplanted by the Roman type, introduced in that year at Rome, and improved on by Jenson at Venice. It was first used in England by Pynson. Jtalics were first used by Aldus in his Virgil of 1501; they are said to have been suggested to him by Petrarch's writing, and were employed to compress matter into his small octavos without the inconvenience of abbre- viations. Hebrew characters began at Soncino, in the duchy of Milan, in 1482, and at Naples in 1487. The only points first used were the colon and full stop; but Aldus improved punctuation by giving a better shape to the comma and adding the semicolon. With Caxton oblique strokes took the place of commas and periods. The form of the earliest books was chiefly folio and quarto. Almost every page aboundedin abbreviations or contractions. Blank spaces were left for capitals and the first letters of periods, which were afterwards filled up by the illuminator. The Basel press was noted for its ornamental initials; and Calliergus at Rome and the Paris printers excelled in decorative printing of this kind. The taste for embellish- ment led to ornamental title-pages about 1490, the usual ornament at first being the "author at his desk." The custom of coloured frontispieces appears to have pre- vailed until the end of last century. Decorated borders appear in the first page of some of Sweynheim and Pan- nartz's productions ; few ornaments, however, were intro- duced into the body of the text before the first Hebrew publications.® The Aulus Gellius of 1469 by the same printers is cited as the first book with a preface ; and their Apuleius of the same year contains the earliest marginal notes. For further information on the characteristics of early printed books the reader will do well to consult Palmer's General History of Printing (a work ascribed chiefly to George Psalmanazar); Jungendres, De Notis Characteristics Librorum a Typographic: Incunabulis ad annum 1500 wmpressorum,; and Marolle's Recherches sur U Origine des Signatures et des Chiffres de Page.

4 The date was sometimes computed by Olympiads, as in the Ausonit Epigrammata, printed at Venice in 1472. Middleton, who has written to prove that the Oxford EHapositio S. Jeronimi of 1468 contains a falsified date, quotes, as an example, the Decor Puellarum of Jenson, at Venice, which is dated 1461, instead of 1471, in order, he says, to give priority to the printer over John de Spira, whose first work appeared in 1469 (Works,

iii. 236). v5 a ie class of books see De Rossi's Annales Hebrao-Typographict,

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The devices of the early printers are of importance to the bibliographer, since questions occur as to the early editions which can only be ascertained by discovering the printer's name. The invention of marks or vignettes is ascribed by Laire (Index Inbrorum Sac. XV., ii. 146) to Aldus; he traces them to a Greek Psalter of 1495. A device, however, consisting of two shields occurs in Fust and Schoffer's Bible of 1462. They were not used by Ulric Zell, the first printer at Cologne, nor by the fathers of the Paris or Venetian presses. Monograms or ciphers were frequently employed, with initial letters of names or other devices curiously interwoven, and these furnish a trustworthy clue to identity. The monograms of the Early English printers are explained in Ames's 7'ypogra- phical Antiquitees. Of the devices of different presses the best fac-similes are given in Dibdin's Bibliographical Decameron, vol. ii, Orlandi's Origine e Progressi della Stampa, Bologna, 4to, 1722, is a work of indifferent merit. The Thesaurus Symbolorum ac Emblematum of Scholtz, published at Nuremberg in 1730, and Spoerlius's Jntro- ductio in Notitiam insignium Typographorum, of the same year, are the best and most interesting authorities on this subject.

The itncunabula of the various early presses have been treated separately by different writers. Schwarz in 1740 and Wurdtwein in 1787 reviewed the productions of the Mentz press. Those of Nuremberg were noticed by Réder in 1742; anda catalogue of them, in the library of that town, was compiled by Saubert in 1643. In Italy, the Roman press is represented by Michael Canensio in 1740, aud more particularly by Audiffredi in 1783, who after- wards extended his researches to all early Italian produc- tions. The books issued from Milan between 1465 and 1500 have been noticed by Saxius; the Parmese editions by Affo in 1791; those of the Spiras at Venice by Pelle- grini in 1794; those of Friuli by Bartolini in 1798; and those of Ferrara by Antonelli in 1830. The early Paris press has been copiously treated by Chevillier, and that of Lyons by Péricaud, 1840, For Spain there is Caballero in 1793; and the works. printed in the Low Countries are reviewed at length in Meermann's Uttvindung den Bock- drukkonst,

Amsterdam, 1767. Herbert, Ames, and Dibdin well-nigh exhaust the subject of early English bibliography. The different collections of imcunabula in public or private libraries have been noticed in more or less detail. Seemiller in 1785 catalogued upwards of 1800 editions of the 15th century at Ingolstadt.. Those in the Magliabecchian library at Florence have been described by Fossi (or rather Follini) in 1793-95. The collection of Lomenie de Brienne is known through the labours of the elder De Bure and his continuator, Laire; and the treasures of Count Boutourlin were catalogued by Audin de Rians. Lambeth library contains many specimens, which have been noticed by Maitland ; and the splendid collection of Earl Spencer at Althorp has met with a worthy exponent in Dibdin.

For more general information on this subject the reader may con- sult the following works :—IJndex Librorum ab inventa Typographia ad annum 1500, dwm notis, 2 vols. 1791. This work, by Laire, is one of the most useful of its kind, and it has the advantage of four indexes, which furnish a ready reference to its contents. De Bure, in the seventh volume of his Bibliographie Instructive, has given a list of 15th century books, classed in the order of the dif- ferent towns. M. La Serna Santander's Dictionnaire Biblio- graphique choisi du quinziéme siecle, 3 vols., 1805, is a very learned and exact work, and, like Laire's Index above mentioned, em- braces only the rarest and most interesting publications of the 15th century. See also the Lettres del' Abbé de St. L. (Mercier de St. a re ee eee ee

1 Bibliotheca Spenceriana. To this were afterwards added his Aides Althorpiane, with a supplement, 1822, and the volume on the Cassano Library, with a general index, 1823. The beauty of the

fac-similes alone would entitle these works to the front rank of books on bibliography.

BIBLIOGRAPHY

Leger), aw Baron de H. (Heiss), Paris, 1785. Maittaire's Annales Typographic ab artis invente origine is a mine of learning and re- search. The first volume, published in 1719, embraces the period from the origin of printing to 1500, but his researches into printed literature extended in the third volume to 1557 ; and there is an appendix which affords a partial

continuation to 1664, A supple- ment to this elaborate work, by Denis, in 2 vols. 4to, appeared at Vienna in 1789, and contains 6311 articles omitted by Maittaire. Panzer's Annales Typographicit was founded on the preceding work, and consisted of eleven volumes, which were published at Nuremberg between 1793 and 1803. It was intended to be limited to the 15th century, but, after the appearance of the fifth volume, the period was extended to the year 1536. German publications were reserved for a separate work, which bears the title of Annalen der dltcren deutschen Literatur. The Repertorium Bibliographicum of Lud. Hain, 4 vols. 1826-88, contains an alphabetical list of no less than 16,299 books printed during the 15th century, which are described with rare minuteness and accuracy. 'The author's labours were terminated by death, when he had advanced as far as UG. The addition of bibliographical notices, pointing out first editions and books of remarkable rarity and price, woul: have much enhanced itsinterest andvalue. The Literatur d. ersten 100 Jahrenach d. Erfin- dung d. Typographie, by Chr. F. Harless, wasp ublished at Leipsic in 1840. Its object differs from that of the preceding works, in making the notice of early editions subordinate to his purpose of illustrat- ing thercby the transition and progress of contemporary learning.

Ill. Rare and Curious Books.

This branch of what Ebert terms "restricted" biblio- graphy belongs peculiarly to the book-collector and book- seller, if regard be had especially to the inclinations of purchasers, the actual demand, and the marketable value of books. Rarity and price depend very much on each other; rarity makes them dear, and dearness makes them rare. Hallam asserts that the price of books was reduced four-fifths by the inventing of printing. From a letter of Andreas, bishop of Aleria, to the pope, in his preface to the Lpistles of Jerome, it would seem that 100 golden crowns was the maximum demanded for a valuable MS., and that the first printed books were sold for about 4 golden crowns a volume. At any rate, one natural etfect of printing was to restrict the number of rare books to a separate class. Cailleau, who has been followed by most other writers on this subject, distinguishes between absolute and relative rarity. 'The former term is applied to those books or editions of which only a small number has been printed. Such for the most part are works printed for private circulation, as those of the

Strawberry Hill Press, which are very scarce and enormously dear. 'This class of English books is treated in the Bibliographical Catalogue of Books, privately printed, by John Martin, 1834, repub- lished, with additions, in 1854, 8vo. Much of the value attached to editions of the 15th century arises from the limited number of impressions. They were seldom more than 300; John of Spira printed only 100 copies of his Pliny and Cicero ; and printers had the example of Sweyn- heim and Pannartz, who were reduced to poverty by their surplus copies, to avoid exceeding the current demand. Suppressed works belong to the same category, in propor- tion to the success of prohibition. Others owe their scarcity to accidental destruction ; as, for instance, the second volume of Hevelius's Machina Celestis, 1679, which would have shared the fate of the remainder of his works, on the burning of his house, had the author not previously given some copies to his friends. At the great fire of London in 1666 there were some works of Dugdale, among other writers, as well as the first volume of Prynne's Records of the Tower, of which only a few copies escaped; but their value has been reduced by subsequent impressions. The same kind of rarity attaches to Hdztions de luae, chiefly made for rich amateurs ; to large paper copies and tall copies, i.e, copies of a work published on paper of ordinary size and barely cut down by the binder ; and to books printed on coloured paper. A list of the last-named is given by Duclos and Cailleau, and reprinted by Horne in his

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Introduction to Bibliography. It includes an edition of Sterne's Sentimental Journey, three copies only of which were printed at Paris in 1802, on rose-coloured paper, and the complete Works of Voltaire, edited by Beaumarchais (Kehl, 1785), twenty-five copies of which were struck off on blue paper, after some had been requested by Frederick the Great for his own use, on account of the weakness of his eyesight. Vellum copies, again, have been much prized by collectors. They belong to the early days of printing, especially to the Aldine, Verard, and Giunti presses, and to those of the first English printers. Few were made between the latter half of the 16th and the beginning of the last century; but the art was revived in France by Didot and Bodoni, and the folio Horace of 1799 by the former is a chef d'ceuvre of its kind. The Royal Library at Paris has a sumptuous

collection of vellum copies, which have been elaborately described by Van Praet.1 At the sale of the M'Carthy library, the Psalter of Fust and Schoffer on vellum was bought by Louis XVIII. for 12,000 franes. The libraries of Earl Spencer and the duke of Devonshire contain the finest specimens in this country. The relative rarity of books is due to a variety of causes, chiefly con- nected with the peculiar nature of their contents. Among works of this kind, generally speaking, are local histories, lives of learned men, books of antiquities, or of curious arts, those written in languages little known, macaronic treatises, and catalogues of private libraries. Works like the Acta Sanctorum, in 53 volumes, however accessible in public though not in private libraries, are rare in this sense of the term. The class of publications known as Ana, con- taining the sayings and doings of men great in their day, has become comparatively scarce. The first of these was the Scaligerana of 1666. The public fastened upon them at first with avidity, but the number of such productions created in time a distaste for them (see Ana, vol. i., pp. 784-5). Burton's Anatomy of Melancholy, which fascinated Dr Johnson, is an instance of undeserved neglect. For a long time it fell into disuse, and from being a waste-paper book, became extremely rare, until reprinted in recent times. Fugitive pieces, like political broadsides, share the penal- ties of an ephemeral interest. The King's Pamphlets, so called from having been presented by George III. to the British Museum, are the largest collection of this kind in England. It owes its origin to the industry of the book- seller Thomason.?

In a literary sense, a book, to deserve the title of rare, should be a work of some merit, and not one whose obscurity is due to its worthlessness. Curious books, however, depend very much on the pleasure of the curious ; and the follies and caprice of collectors are summed up in the word Bibliomania. Some copies of Tuberville's Book of Hunting, 1611, were bound in deer-skin; Mr Jeffery, the bookseller, enclosed Mr Fox's historical work in fox's- skin; and a story is told of Dr Askew having caused a book to be bound in human skin, for the payment of which he was prosecuted by the binder. German bibliographers reproach us with an undue passion for book curiosities. Bibliomania forms the title of an amusing work by Dr Dibdin, who, though accused of a leaning to this weakness, knew well how to value the intelligent study of books. The practice was satirized as early as the time of Brandt,

1 Catalogue des livres imprimés sur Velin de la Bibliotheque du Rot, 1822-28, 6 vols. See his supplemental catalogue of similar books in other libraries, 1824, 4 vols. royal 8vo. Panzer, as he informs us in his Essai sur I' Histoire du Parchemin et du Velin, 1812, intended, but did not execute, a comprehensive work on vellum curiosities. See also Schelhorn's Amen. Litter., vol. i.

2 See Oldys's Dissertation on Pamphlets, and the Icon Libellorum of Myles Davis, a résumé of which is given in Disraeli's Amenities of Literature. Aungervyle de Bury admitted Panjleti exigui into his library.

(see his Ship of Fools.) It prevailed in England chiefly during last century, and reached its height at the sale of the duke of Roxburghe's library in 1812. The time, however, has passed away when the passion for collecting rare and curious books, without regard to their usefulness, merit, or beauty, was too often a failing with well-educated persons. The love of uncut and large-paper copies of vellum and first editions, and of illustrated books, has been better regulated since book-madness was attacked by the Abbé Rive, Dibdin, Dr Ferrier, and the Rev. James Beresford; and modern book-clubs like the Rox- burghe (1812), the Bannatyne (1823), the Maitland (1823), and the Surtees (1834) Societies, the Abbotsford Club (1834), and the Early English Text Society, have done aan service to bibliography by reprinting scarce old ooks.

Detached notices of rare and curious books are to be found in the catalogues of private libraries, especially those compiled by French writers during the last century. Beloe's Anecdotes of Literature contains much interesting matter on scarce books and their prices. The following, however, are the chief works on this subject:—Hal- lervord's Bibliotheca curiosa, Frankfort, 1687 ; Beyer's Memoria historico-critice librorum rariorwm, Dresden and Leipsic, 1784; Vogt's Catalogus historico-criticus librorum rariorum, the best edition of which appeared at Frankfort in 1798. The author applies the epithet rare with more judgment than his predecessors. A supplement to his work was the Florilegium historico-criticum librorum rartorum of Gerdesius, first published in 1740, and again in 1768. The Bibliotheque curicuse, ou Catalogue raisonné des livres rares et difficiles &

trouver, by D. Clement, Gottingen, 1750- 60, is compiled ona more extensive plan than any of the preceding. Although consisting of 9 volumes 4to, it only extends to the letter H, terminating there in consequence of the author's death. Clement is generally blamed for a very profuse and inaccurate ap- plication of his own nomenclature; his notes, moreover, are crammed with citations, and tediously minute, but they abound with curious morsels of literary history, and it is to be regretted that the work was not completed. S. Engel, Bibliotheca Selectissima, Bern, 8vo, 17438; T. Sinceri, Notitia historico-critica librorum rariorwm, Frank- fort, 1753; Bibliographie Instructive, ow Traité de la connaissance des livres rares et singuliers, by W. F. De Bure, Paris, 1763-68, 7 vols. This work did much to popularize bibliography in France. The author criticizes parts of Clement's dictionary, but recognizes the general merit of that work. De Bure published a supplement in 1769, containing a catalogue of rare and curious books in the library of Gaignat. Dictionnaire typographique, historique, et critique, des livres rares, cstimés, et recherches en tous genres, par J. B. L. Osmont, 2 vols. 8vo, Paris, 1768. This work contains a fuller account of Italian books than the preceding. Dictionnaire bibliographique, historique, et critique, des livres rares, précieuzt, singuliers, etc., by André Charles Cailleau, 3 vols. 8vo, Paris, 1790. This work was compiled, according to M. Barbier and others, by the Abbé Duclos, and was republished in 1800, with a supple- mentary volume, by M. Brunet. Notes are affixed to unpriced books, stating their value. Bibliotheca Librorum rartorum Univer- salis, by Jo. Jac. Bauer, 7 vols. 8vo., 1770-91. Peignot in his Répertoire des Bibliographies spcciales, curteuscs, et instructives, 8vo, Paris, 1810, has written on the elements of rarity, and the different classes of rare books.

IV. The Classics.

Fortunately for the preservation of ancient literature, the discovery of printing coincided very closely with the full development of that zeal for classical learning, which had begun with the 15th century. To Italy belongs the chief glory of first embodying, in an imperishable form, those materials which the industry of Poggio and others had rescued from the dust of monastic libraries. Jn rapid succession the first editions of the classics issued from Italian presses; no less than fifty of these are enumerated by Panzer. Apuleius, Aulus Gellius, Cesar, Liwy, Lucan, Virgil,*

and portions of Cicero, were printed by Sweynheim and Pannartz at Rome before 1470; while the rival press of the Spiras at Venice boasted of Plautus, Zacctus,

3 At this sale the Valdarfer Boccaccio of 1471 fell to the Marquis of Blandford, after a spirited competition with Earl Spencer, for £2260.

4 Hallam's Zit. of Htrope, i. 146 ; Roscoe's Lorenzo de Medict.

Priscian, Sallust, Catullus, Tibullus, and Propertius, From Brescia came Lucretius, from Vicenza, Claudian ; Ferrara and Naples gave birth to Martial and Seneca. In Ger- many, France, and the Low Countries, on the other hand, the progress at first was slow. Few classics were printed out of Italy before 1480, or, indeed, until the last ten years of that century. The De Officiis of Cicero, it is true, had appeared at Mentz in 1465,—the first portion of any classical work committed to the press, unless precedence is given to the De Oratore of Sweynheim and Pannartz at Subiaco. But with that exception the first impressions of Terence and Valerius Maximus at Strasburg, and of Sallust, and, perhaps, Florus at Paris, are all that Cis- alpine presses contributed of that kind within the period under review. 'The first appearance of Velleius Pater- culus at Basel and of Anacreon and MMenander at Paris was not until the next century was well advanced. In Spain the first classical book was a Sallust of 1475. In Eng.and, the earliest was a Terence, printed by Pynson in 1497; but, besides that, Virgil, Sallust, and Cicero's Offices, together with two Greek books, were the only classics published down to 1540, A complete edition of Cicero, printed in 1585 at London, was the chief Latin work up to that date. A neat edition of Homer's Iliad appeared in 1591, and the first impression of Herodotus in this country came out in the same year at Cambridge. Our early printers were content with French translations for their versions and abridgments; and Gawin Douglas, in the preface to his translation of Virgil, records his indig- nation at the injustice done to the "divine poet" by the second-hand translation of Caxton.

Most of the Latin classics had appeared in print before the art was employed on any Greek author. This was due rather to the want of adequate

editorship than to any indifference to Greek in Italy; for the taste for that language had steadily increased since the arrival of the learned Greeks from Constantinople, and the want of printed editions became general before the close of the 15th century. To Aldus belongs the glory of ministering to that desire, by publishing, in quick succession and with singular beauty and correctness, almost all the principal authors in that tongue. Beginning in 1494 with Muszus's Hero and Leander, he printed before 1516, the year of his death, upwards of sixty considerable works in Greek litera- ture. The list includes the first impressions of Aristophanes, Herodotus, Theocritus, Sophocles, Thucydides, Euripides, Demosthenes, Pindar, and Plato, The editio princeps of Aristotle is the finest of his productions, Himself, in several cases, editor as well as printer, he had the assist- ance of the most learned scholars of the day; and the handy size of his octavos, which he substituted for the more cumbrous quartos after his removal from Venice, added to the popularity of his editions. Within two years after Aldus commenced his labours, Greek printing began at Florence with the works of Callimachus,! Apollonius Rhodius, and Lucian ; at Rome, however, the earliest work was the Pindar of Calliergus in 1515.2 At Paris the first Greek press of importance was established in 1507 by Gourmont, but the days of its chief celebrity date from his successors Colines and Stephens. Aldus, though the most prolific, was not the earliest Greek printer. The first entire work in that language was the Grammar of Con- stantine Lascaris, printed by Zarot at Milan in 1476. Homer's Batrachomyomachia was the earliest printed Greek classic; his complete works first appeared in the

1 This editio princeps is among the scarcest of Greek capital letter productions, : ' 3 Roscoe's Leo X., ii. 257-8. Greek types, according to Panzer, had first been used in a treatise of Jerome, printed at Rome in 1468; and detached passages are found in some of the first copies of Latin authors.

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Florence Homer of 1488, a volume which, Gibbon observes, "displays all the luxury of the typographical art." Besides these works, the Orations of Isocrates had appeared in 1493, Aldus has been unduly eulogized by his

biographer, M. Renouard,? who has represented him as having given an entirely new direction to the art of printing, and indeed to the literary taste of Europe. His taste for Greek he had imbibed from the age: he saw that there was a great and growing want of Greek books, and his peculiar 'praise lies in this, that he applied himself to supply it with much more constancy and skill and with much more learning than any other printer of that period. His preface to Aristotle's Organon, published in 1595, amply recognizes the demand for Greek books. " Those," he says, "who cultivate letters must be supplied with books necessary for that purpose ; and till this supply is obtained I shall not be at rest." 4

*The absolute rarity of the first editions of the classics it is difficult to determine with precision. They have been — much prized by collectors, especially during last century, though their price has fluctuated considerably at different times. The date of some, as for instance, of Juvenal, Q. Curtius, and Horace, is conjectural; and the last-named is one of four classics,—Lucan, Plutarch, and Florus being the other three,—of which the printer is unknown. The Naples edition of /Zorace of 1474 is called by Dibdin * the "rarest classical volume in the world," and it was chiefly to possess this book that Earl Spencer bought the famous library of the duke of Cassano. Of the first edition of Lucretius only two copies are believed to exist; and not one in its integrity of Azzoguidi's editio princeps of Ovid. On the other hand, there are several classical authors, of whom the second and even later impressions are far the most valuable and scarce. The intrinsic merit of the editiones principes of the classics is too unequal to admit of any general description. Their chief value, in a literary sense, consists in the security afforded by printing against the further progress of transcriptional error; but it would be a great mistake to imagine that the text was then finally established. Maittaire gives precedence to their authority as equivalent to that of the MSS. from which they were taken, but the question obviously turns on the character of those MSS. themselves. Later discoveries and the progress of critical research confirm the testimony of many of the first editors, in their prefaces,° regarding the insufficiency and mutilated character of their materials. Thus Greevius observes of the celebrated editio princeps of Cicero's De Officits by Fust, that it was printed from a very inaccurate manuscript. Schelhorn, in his Amcnitates Interarie, insists, with good reason, on the want of collation*

among the first editors. Frequently the first manuscript that offered itself was hastily committed to the press, in order to take advantage of the recent discovery ; and fragments of different manuscripts were patched together to form Opera Omnia editions, without regard to the relative authority of their contents. On the other hand there are first editions which represent a single lost archetype, and whose value, therefore, cannot be exaggerated, while others

3 Annales del Imprimerie des Aldes, Paris, 1825, and third edition in 1834, Renouard afterwards published a similar work on the family of the learned printers, Robert and Henry Stephens, Annales de ? Imprimerie des Estiennes, Paris, 1837, 2 vols. 8vo.

4 The preface is translated in Roscoe's Leo X., i. 110. ;

5 The bibliography of first editions of the classics is treated copiously by this writer in his Introduction to the Classics, his Bibl. Spenceriana, and his Catalogue of the Cassano Collection. The prices of many valuable first editions at a sale in London in 1821 are given at the end of the last-mentioned work. See alsoa curious chapter on " First Editions" in Marchand's Histoire de V Imprimerie. ' }

8 These prefaces have been edited by Botfield, with an introduction of some merit.

represent copies of undoubted merit. La Grange assures us, in the preface to his French translation of Seneca, that le never, in any case of difficulty, consulted the first edition of 1475, without finding a solution of his doubts. The fact is that each editio princeps must be judged by itself. It is to such scholars as Turnebus, Muretus, and Lipsius

that we owe a juster estimate of their relative value, than

prevailed in the early days of printing. Victorius has been called the " Sospitator Ciceronis ;"' and the real restorers of Greek learning are to be found in Scaliger, Casaubon, Budeus, Camerarius, and Stephens. The text

of the classics has been slowly and laboriously constructed, and in soine cases, a8 with Aristophanes, Dion Cassius, and Pliny, among others, a manuscript, discovered in modern times, has superseded entirely the authority of early editions. This branch of the subject is fully treated in an article in the Hdinburgh Review on 'Classical Manuscripts and First Editors" (Jan. 1873).

Sets of the classics, more or less complete, have been published at different times, and for different purposes. Among the earliest and most important are the Delphin editions, prepared, by order of Louis XIV., at the instance vf the duke de Montausier, for the use of the Dauphin. The duke had been in the habit of studying the classics on his campaigns, and the want of books of reference appears to have suggested to him the idea of a uniform series of the principal classics, with explanatory notes and illustrative comments. On his becoming governor tothe Dauphin, the scheme was carried into execution; and Huet, bishop of Avranches, a preceptor of the prince, was entrusted with the choice of authors and editors, and with the general supervision of the series. A list of the editors is given by Baillet in his Critiques Grammairiens. The collection, which, including Danet's Dictionary of Antiquities, extends to sixty-four volumes quarto, is of very unequal nierit ; but the copious verbal indices, which were added by the direction of Huet, afford a useful means of refcrence to particular passages. Only Latin classics, however, are included in the series; and '"' it is remarkable," as Dr Aikin observes, "that Lucan is not among the number. He was too much the poet of liberty to suit the age of Louis XIV." The entire collection, enlarged with the notes of the Variorum editions, was republished in 1819-1830, by A. J. Valpy, forming in all 185 vols., 8vo. These Variorum classics number upwards of 400 volumes, and were cdited in the course of the 17th and 18th centurics. A complete collection is very rare; Peignot mentions one belonging to M. Mel de Saint-Ceran, which was sold for 3000 livres. For the names of the authors and com- mentators see De Bure's Bibliographie, vol. vii. p. 680, and Osmont's Dictionnaire, vol. i. p. 411. The editions most prized by collectors are the Elzevirs and the Foulises. The Llzevirs, or properly Elseviers, were a family of famous printers and booksellers at Amsterdam, no fewer than fifteen of whom carried on the business in succession from 1580 to 1712. Their Pliny (1635), Virgil (1636), and Cicero (1642), are the masterpieces of their press

; the last of the family brought out editions in12mo and 16mo.! A full list of their publications is given in Brunet's Afanvel, vol. v.,ad fin. The Annales de Imprimerie Hlsevirienne, by Pieter, 1851 and 1858, supersedes the authority of previous works on that subject, and contains much curious research, The project of reprinting the Elzevir editions, which originated in 1743 with the Abbé Lenglet-Dufresnoy, led to the famous Barbow collection, commenced by Cou- stelier and continued by Joseph Gaspard Barbou, one of the family of Paris printers and booksellers of that name,

1 Without disparaging the Elzevirs, it must be remembered that their texts were mere re-impressions, and did not rest, like those of Aldus and the Stephens, on ancient MSS.

and extending finally to 76 volumes in 12mo. Lemaire's Bibliotheca Classica Latina, 1819-26, which was dedicated to Louis XVIII., is one of the best collections of Latin classics which exists in France, although the list of authors is incomplete, and the notes far too voluminous. The whole series extends to 154 volumes in 8vo. The editions of Robert and Andrew Foulis, printers at Glasgow, were the finest which Britain produced during the 18th cen- tury. Their chef d'wuvre was the Horace of 1744, each printed sheet of which, probably after the example of Robert Stephens at Paris, was hung up in the college of Glasgow, and a reward offered for the discovery of any error.

Among the most useful bibliographical accounts of the classics may be mentioned the following:—A View of the Various Editions of the Greek and Roman Classics, with Remarks, by Dr Harwood,—this work, first published in 1775, is still a convenient manual of re- ference ; Degli Autori Classict, sacri e profani, Graci et Latint, Biblioteca portatile, 2 vols., Venice, 1793, a con:pilation of the Abbé Boni and Bartholomew Gamba, and containing a translation of the preceding ; Dibdin's Introduction to the Knowledge of Rarc and Valuable Editions of the Classics, first published in 1802, and greatly enlarged in subsequent editions, containing a full account of Polyglot Bibles, of the Greek and Latin editions of the Septua- gint and New Testament, and of lexicons and grammars; A Manual of Classical Bibliography, by J. W. Moss, 2 vols., 1825, noticing at length the different

translations of the classics, the prices obtained for the rarer editions at public sales being also specified; 4A View of the English Editions and Translations of Greek and Latin Authors, by Brugemann, London, 1797; Engelmann's Bibliotheca Seriptorum Classicorum, Leipsic, 1847-58, containing an account of German editions between 1700 and 1852, while Greek and Latin classics printed in Germany and France are noticed in the Tépertoire de la littérature ancicnne, by F. Scholl, Paris, 1808; Handbuch der Classischen Intcratur, by G. D. Fuhrmann, Halle, 1807-10, 5 vols. 8vo. ; Hebenstreit's Dictionartwm, Vienna, 1828 ; and the Handbuch der Classischen Bibliographic, Leipsic, 1830-34, —all of them works of considerable merit. The improved editions, by Harless and Ernesti, of the Bibliothcea Groca and Bibliotheca Latina of Fabricius are well known as immense magazines of classical lore, but they extend over a much wider 'field of inquiry than is embraced by bibliography.

V. Anonymous and Pseudonymous Books.

Books of this class originate, generally speaking, either from the necessities or the caprice of authorship.? Their number, however, has been such as to occupy, at an early tine, the attention of bibliographers. In 1669 Frederick Geisler, professor of public law at Leipsic, published a dissertation, De Nominum Mutatione, which he reprinted in 1671, with a short catalogue of anonymous and pseudo- nymous authors. About the same time, a similar but more extensive work had been undertaken by Vincent Placcius, professor of morals and eloquence at Hamburg, which was published in 1674 with the title De Scriptis et Scriptoribus anonymis atque pseudonymis Syntagma, in which the writer invited information from learned men in Europe. Four years later, John Decker, a German lawyer, published his Conjecture de Scriptis adespotis, pseudepi- graphis, et supposititics, which was republished in 1686, with the addition of two letters on the same subject, one by Paul Vindingius, a professor at Copenhagen, and the vther by the celebrated Peter Bayle. In 1689 appeared the Centuria plagiariorum et pseudonymorum of Jolin Albert Fabricius, as well as a letter to Placcius from John Mayer, a clergyman of Hamburg, under the title—Disser- tatio Hpistolica ad Placcium, qua anonymorum et pseudony- morum farrago exhibitur. The complete fruits of Placcius's researches were published after

his death in a folio volume at Hamburg in 1708, by Matthew Dreyer, a lawyer of that city. The work was now entitled Zheatrum Anonymorum

et Pseudonymorum ; and, besides an Introduction by Dreyer

and a Life of Placcius by Fabricius, tt contains, in an

2 Baillet, in his Jugemens des Savans, i. 1690, notices on motives for concealed authorship. Ti 83

Appendix, the before-noticed treatises of Geisler and Decker with the relative letters of Vindingius and Bayle, aud the Dissertation of Mayer. This elaborate work con- tains notices of six thousand books or authors; but it is ill-arranged ana frequently inaccurate, besides being cumbered with citations and extracts, equally useless and fatiguing

The subject of false and fanciful names attached to books had been undertaken in France by Adrien Baillet, nearly about the same period that Placcius commenced his inquiries. I. 1690 this author published his Auteurs Déguisés ; but this is little more than an introduction to an intended catalogue which Baillet never completed, being deterred, as Niceron says, by the fear lest the expo- sure of concealed authors should in some way or other involve him in trouble In this piece, which was reprinted in the sixth volume of De La Monnoye's edition of Baillet's Jugemens des Savans, there are some curious literary anecdotes, especially with reference to the passion which prevailed after the revival of letters for assuming classi- cal names. In Italy these names were so generally introduced into families, that the names of the saints, hitherto the common appellatives, almost disappeared from that country.

The taste for this kind of research, which the work of Placcius had diffused in Germany, produced several supple- ments to it in that country In the De Libris anonymis et pseudonymis Schediasma, published by Christopher Augustus Neumann in 1711, there is a dissertation on the question, Whether it is lawful for an author cither to withhold or disguise his name? which question he decides in the affirmative But the most considerable of these sup- plements was that published in 1740 by John Christopher Mylius, librarian at Hamburg. It contains a reprint of the Schediasma of Neumann, with remarks, and a list of 3200 authors, in addition to those noticed by Placcius. The notices of Mylius, however, are limited to books in Latin, French, and German. The younger De Bure occupied himself partially with these researches: his omissions were supplied by M. Née de la Rochelle in

his Table destinée & la Recherche des Livres anonymes qui ont été annoncé's dans la Bibliographie Instructive, Paris, 1782. The names of several anonymous writers were discovered by Rollin in his Zvaité des Ftudes, by Jordan in his Histoire d'un voyage littéraire fait cn 1783; and by Bayle in his Réponse aux Questions dan provincial. In 1758 the Abbé de la Porte published his France littéraire,| which was republished with large additions in 1769 by the Abbé de Hebrail. Both editions contain numerous errors, many of which, unfortunately, were reproduced by Ersch, librarian of the university at Jena, in his enlarged publication of 1797-1806, a work in other respects of solid merit and utility. The Dictionnaire des Anonymes of the Abbé Duclos is serviceable but incomplete; it has been abridged by Fournier in his Dictionnaire portatif de Bubliographie, Paris, 1805,

Among later authorities may be mentioned Weller's Maskirte Literatur der dlteren und neueren Sprachen, Leipsic, 1858, and Die falschen und fingirten Druckorte, 1858, and the Dictionnaire des Pseudonymes, by G. Heilly, 1869. Conspicuous in merit is the Ductionnaire des Ouvrages Anonymes et Pseudonymes, by M. Barbier, librarian to Napoleon L., the last edition of which is as recent as 1872. It comprises a vast number of articles, but the plan does not extend to foreign productions, except those

} Quérard's France Littéraire, Paris, 1846, contains a copious list of such works from 1700 to 1845.

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which have been translated into French. His labours have been supplemented and improved upon by De Manne, in his Nouveau Dictionnaire of 1868, and by Quérard in his Supercheries littéraires dévoilées 1847-53. The list of anonymous writers in France includes Pascal, La Roche- foucauld, and Cardinal Richelieu. The authorship of Montesquieu's Esprit des Lois was disguised, on its appearance in 1748, as was the Anti-Machiavel, written by Frederick II. of Prussia, and published by Voltaire, who himself wrote several works anonymously. For Italian lit zrature there are Vine. Lancetti's Psewdonima, published at Milan in 1836; and Melzi's Diztonario di Opere AnonimeePseudonime di Scrittort Italiani, Milan, 1848-59.? In England the practice of anonymous writing, in spite of the example of journalism, has never largely prevailed ; but the Zetters of

Junius are a conspicuous example of authorship successfully concealed. The Lece Homo is a recent instance among the works of current celebrity. The Handbook of Fictitious Names, by Olphar Hamst, London, 1868, is a useful and amusing guide, especially to English authors of the lighter literature of this century. Works of this class, however, are most applicable to countries in which the liberty of the press has been most restricted.

VI. Condemned and Prohibited Books.

Books supposed hurtful to the interests of government, religion, or morality have been sometimes condemned to the flames, sometimes censured by particular tribunals, and sometimes suppressed, Such methods of destruction have been followed in various countries, with regard both to their own and to foreign productions ; and lists have been published from time to time of the works so interdicted.

Heathen antiquity supplies some instances of the burning of obnoxious books, such as the reported destruction of the works of Pythagoras at Athens, and of astrological works, as well as the writings of Labienus, by Augustus at Rome. Some Greek works, alleged to have been found in the tomb of Numa in 181 3B.c., and ascribed to him, were burnt by order of the Senate ; the story of their discovery, however, is a mere fabrication. Tacitus mentions a History by Cremutius Cordus, which the Senate, to flatter Tiberius, condemned, because it designated C. Cassius the last of the Romans.? Diocletian, according to Eusebius, caused the Scriptures to be burnt, but the early Christian Church was not slow in following the example of intolerance, and the charge of heresy was a ready instrument for putting down works alleged to be injurious to the faith. The first recorded instance is that of Arius, whose writings were condemned to the flames at the Council of Niczea, Constan- tine himself threatening with death those who should harbour any copies. The same fate befell the works of Nestorius at the Council of Ephesus, and those of Eutyches at Chalcedon. Pagan works were prohibited at the Council of Carthage in 400. Aristotle was forbidden by the church in the 13th century, but the restriction was relaxed in favour of the universities by Pope Nicholas V. A list of prohibited books is found in a decree of a council at Rome as early as 494.4 But the chief rigours of persecu- tion began with the Inquisition, and the crusade against literature

increased in severity with the multiplication of books through the press, In 1515 the Council of Lateran at Home appointed clerical ceusers to examine all works before publication, as if, to use Milton's indignant remcn- strance, "' St Peter had bequeathed to them the keys of the

2 See Petzholdt's chapter on " Maskirte Literatur," in his Bibliotheca Bibliographica.

3 See the chapter on " Book-Censors" in Beckmann s History of Inventions.

4 Labbe's Cone. ii., col. 938-94,

press as well as of Paradise." In 1543 Caraffa issued an order that no book should be printed without leave from the Inquisition, and booksellers were, accordingly, required to send in catalogues, Brunet mentions, however, a list of prohibited authors, prepared by order of Charles V., which was printed at Brussels in 1540, and is the earliest of its kind. An Index generalis scriptorum interdetorum was published by the Inquisition at Venice in 1543, and similar catalogues followed from the universities of Paris and Louvain, The first Index of the Court of Rome appeared in 1558, and was reprinted in 1559. The subject was discussed at the Council of Trent, who delegated the right of supervision to the Pope, and the result was the Index Tredentinus of Pius TV.,—the first strictly Papal Index,— which was printed by Aldus at Home in 1564. Thence began a long series of literary proscriptions, which was continued by the Congregation of the Index,? and of which one of the immediate effects was to drive printing to Switzerland and Germany. The right of dictating what books should or should not be read was a consequence of the claims of the Papacy over the conscience and morals of mankind; and the vitality of persecution has been preserved withit the Romish Church by the consistent exercise of such pretensions. The bibliography of these Expurgatory Indexes has been copiously treated. Among the earlier victims were Galileo and Copernicus; and English literature is represented by such names as Gibbon, Robertson, Bacon, Hallam, Milton, Locke, Whately, and J. Stuart Mill. In Spain the power of the Inquisition, provoked by the invasion of. Lutheranism, was wielded by Fernando de Valdes, whose catalogue of 1559 formed the model

of that issued by Pius IV. in the same year. An edict of Philip II. was published at Antwerp in 1570, and a general Index of all books suppressed by royal authority appeared at Madridin 1790. It is noticeable that Smith's Wealth of Nations has been proscribed in that country, "on account of the lowness of its style and the looseness of its morals" A list of books suppressed in France between 1814 and 1850 has been edited by Pillet. For the more general notices of prohibited literature, we refer our readers to Klotz's De Lnbris auctoribus suis fatalibus, 1761 ; to Struvius's Bibliotheca Hist. Litter. vol. iii. c. 9; to the Dissertations in the seventh volume of Schelhorn's Amenitates Interarie, which contain much curious infor- mation ; to Brunet's Livres Supprimés et Condamnés ; and to Peignot's Dictionnaire Critique et Bibliographique des principaux Livres condamnes au feu, supprimés, ou censurés, 2 vols., Paris, 1806. This last work is agreeably written, and gives a copious list of authorities on the subject; but its enumeration of principal works is far from complete, and comparatively few English books are mentioned.

A comprehensive account of works condemned or sup- pressed in England has yet to be written, but an article in the Ldinburgh Review supplics some interesting materials on this subject. Peacock's Precursor, which the author burnt with his own hand, is an early instance, before the invention of printing. The "war against books,"® however, began under Henry VIII., the sudden-*

1 Liberty of Unlicensed Pronting.

2 A complete list of their catalogues is given in Petzholdt's Brdl. Bibliogr., "' Verbotene Literatur."

3 See the Index Librorum prohibitorum a Pontijicis auctoritate, in usum Bibliothecee Bodleianw, by Tho. James, 1627; Francus, De Papistarum Indicibus, Leipsic, 1684; Thesaurus Bibliographicus ex Indicibus Librorum prohibitorum congestus, Dresden, 1748. Carnot, in 1826, published a complete list of all books condemned by the court of Rome from the date of printing to 1825, with the dates and decrees of their condemnation. The best known, though not the latest, edition of the Zndex was issued by Pius VII. in 1819,

4 “Suppressed and Censured Books’ vol. exxxiv, July,1871.

6 See the final chapter in Disraeli’s Amenities of Literature. A

ness of whose breach with Rome is shown by the circum- stance that, whereas in 1526 anti-popcry books were con- demned as heretical, in 1535 all books favouring popcry were decreed to be seditious. Several of the carly trans- lations of the Bible were suppressed,—Tyndal’s version among others. As many copies of that work a3 the superior clergy could buy up, were publicly burnt at St Paul’s on Shrove Tuesday, 1527, Fisher, bishop of Rochester, preaching a sermon on the occasion. An edition of the Bible was suppressed for a misprint, the printer having omitted the word “not” in the seventh commandment, but a copy survives in the Bodleian. A general burning of unlicensed books was ordered by the king in 1530, the Supplication of Beggars, a well-known invective against Wolsey, being included in the list. Another catalogue was issued in 1546 by proclamation, and the Act 3 and 4 Edward VI. made a raid against missals and books of devotion The regulations of the Star Chamber in 1585 claimed the power of licensing and seizing books, and their scrutiny was as rigorous as that of the Inquisition. Never- theless the reign of Elizabeth was fruitful in “schismatic and libellous tracts.”® A notable offender was Cardinal Allen’s Admonition, containing a furious attack on the queen, of which a copy remains in the British Museum ; and the famous Martin-Marprelate tracts raised a storm of opposition. In 1607 DrCowell’s Law Dictionary was burnt by order of the House of Commons, for its assertions of divine right in favour of James I.; and the King’s Book of Sports incurred the same fate at the hands of the Puritans in 1644. The persecutions of the Star Chamber include the punishment of Prynne for his Histriomastix, and the still more barbarous mutilation of Dr Alexander Leighton for his two works, Zhe Looking Glass of the Holy War, 1624, and Zion’s Plea against the Prelacy, 1628. Milton’s KixovoxAdorys and the Defensio pro Populo Anglicano were suppressed after the Restoration. Defoe’s Shortest Way with the Dissenters was burnt by Farliament in 1703; and sixty years later Wilkes’s orth Briton incurred the same fate. The last instance of authorized book-burning in Great Britain was in 1779, when the Commercial

Restraints of ireland considered, by the Hon. Hely Hutchinson, was given to the flames.

This branch of bibliography has a peculiar interest to the literary historian. It serves to indicate, for the most part, periods of political excitement or religious intolerance. Fortunately, however, the efficacy of persecution has been frustrated by the disseminating power of the press. Punitis ingentis, gliscit auctoritas, is the reflection of Tacitus ; and experience has abundantly proved that it is easier to destroy an author than his book. Melancholy as are the records of literary martyrdom, there remains this satisfac- tion that, in the main, the policy of oppression has defeated its own ends.

VII. Catalogues and Bibliographical Dictionaries,

The first catalogues, after the invention of printing, were those of the carly printers, who, as booksellers, published sale-lists of their works, to attract the attention of the learned. The most ancient of these cataloyi officinales—the humble predecessors of Bohn's gigantic catalogue—is a simple leaf, entitled Libri G'reeci impressi, printed by Aldus in 1498. The list consists of fourteen articles, distributed into five classes, — grammar, poetry, logic,

curious list of Lutheran works prohibited in England is given in Strype's Hecl. Memorials, i. 165.

6 The registers of the Stationers' Company contain entries of books ordered for " immediate conflagration" in 1599. See Notes and Queries, 8d series, xii. 436. Volume ii. of Wood's Athen. Oxon. was burnt at Oxford in 1693 by the apparitor of the university, for some alleged reflections on the memory of Lord Clarendon,

philosophy, and theology, and may be regarded as one of the first attempts to apply a system of classification to printed books. Its interest is enhanced by its containing the price of the books advertised for sale. 'The increasing cominerce in literature was at once a cause and a conse- quence of similar catalogues ; and the example of Aldus was followed by the Stephens, and by

Colines, Wechell, and YVascosan, and other French printers of the first half of the 76th century, whose lists are given in vols. ii. and ii. of Maittaire's Annales Typographict, the divisions of subjects increasing with the spread of printed literature. In England the earliest known sale-list of printed books was published by Andrew Maunsell, a London bookseller, in 1595, and contains the titles of many works now lost or forgotten. In 1554 or 15641 appeared the first printed catalogue of the Frankfort book-fair, published by George Weller, a bookseller at Augsburg; and in 1604 it was followed by the general Easter catalogue, printed by per- mission of the Government. These catalogues of the different book-fairs were collected together in 1592 by Cless —whose researches included all books printed since 1500 —and by Draudius in his Bibliotheca Classica (1611), The same has been done by Georgi in his Biicher Lexicon (1758), a catalogue of all works printed in Europe up to

1750.

*The growth of the book-trade naturally promoted the spread of collections; and towards the end of the 17th, and especially during the 18th century, book-catalogues of every description multiplied rapidly. Their progress is copiously treated of in Nichols's Literary Anecdotes, vol. iii, pp. 608-693.2 Most private collections, at first, appear to have been bought and sold en bloc; and it was through the catalogues, compiled in many instances by learned and well-qualified librarians, that a more critical and discriminat- ing estimate of their contents was formed. P. Garnier in 1678 prepared an excellent catalogue of the library of the Jesuit Collége de Clermont at T*aris, using the materials, like other bibliographers after him, for a classified system of his own. Dr Johnson and Oldys were the joint editors of the Bibliotheca Harleiana, which they prepared for Osborne the bookseller, who bought the library of the earl of Oxford ; and Maittaire drew the scheme of arrangement. The earliest catalogues of public libraries were simple inventories, disposed in alphabetical order, with, at most, a few biographical notices interspersed ; yet they paved the way, in the hands of Conrad Gesner, for the study of "pure" bibliography. The compilation of catalogues raisonnés was deferred till the 18th century, when the labours of French librarians or booksellers, such as Piget, Prosper Marchand, Martin, Barrois, Baillet, and the De Bures, created by that means a public taste for*

books. The greatest work of this kind was the French Lurbliotheque Royale, begun in 1739, and finished in 10 vols. in 1753. Part i., relating to printed books, was superintended by the Abbés Sallier and Boudot. Ina perfect catalogue raisonné alphabetical arrangement is dispensed with; every work occupies its proper place in regard to the light it throws on the subject treated, and the ground traversed by the author. " Catalogues of this sort," says Dibdin, "are to biblio- graphers what reports are to lawyers;' and Maittaire terms them " proces-verbaux littéraires, servant 4 decider une infinité de questions qui s'élévent sur la bibliologie." The consolidation of these detached catalogues was a conse- quence of the increased requirements of learning, and the Bibliothece, or registers of particular libraries, supplicd the

1 Le Mire (Mireus), as quoted by Fabricius, says 1554; Labbe, Reimann, and Heumann, quoting from the same source, say 1564.

_? See also Cailleau's Dict. Bibliographique ; Dibdin's Bibliomania, 95-193, notes; and the "Catalogue des Bibliothéques Particuliéres" at the end of Bibliog. Universelle (Manuels-Roret), Paris, 1857.

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first materials for a general dictionary of reference. Biblio- graphy, thus represented, is the codex diplomaticus of literary history, with a field of research co-extensive with the innummerable productions of the press. But a uni- versal dictionary of this kind is but a dream of biblio- graphers; nor would any single compiler be equal to the task. The Bibliotheca Universalis of Gesner in 1545 is the earliest and almost the only effort of this nature. His work professed to include the titles of all known books, existing or lost, but he confined himself to those in Hebrew, Greek, and Latin. The first volume is classed alphabetically, according to the authors' names; the second contains a distribution of subjects, and is divided into nineteen books, Balthazar Ostern, in 1625, published a Bibliotheque Universelle, or catalogue of printed books from 1500 to 1624.

'said Oldys, " how many authors have we whv are consuming

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their time, their quiet, and their wits, in searching for either what is past finding, or already found." A catalogue, in short, might be made of superfluous writings by authors who have dug in mines of literature already exhausted. The tendency, however, of inodern bibliography is fortunately to subdivide the field of literature; and the student of any special department of learning need be at no loss for authorities to consult. Bale's llustriam Majoris Britannic Scriptorum Summarium (1458), John Pits's De Academicis et Illustribus Anglie Scriptoribus (1619), Bishop Tanner's Bibliotheca Britannico-Hibernica (1748), and Nicolson's Historical Libraries, 4to, 1776, are the earliest catalogues, ona large scale, of our national literature. A list of Saxon writers, by Wanley, forms the second volume of Hickes's Thesaurus. A Critical Dictionary of English Literature and British and American Authors, by 8. A. Allibone, 3 vols., 1859-1872, is an industrious work. The Bublio- grapher's Manual of English Literature, by W. T. Lowndes, is indispensable to the collector ; and for a first attempt of the kind, displays a singular degree of accuracy and research. His British Librarian, or Book Collector's Guide, 1839, purported to give a classed catalogue of books on English literature printed in Great Britain; he lived, however, to complete only six numbers of the division— Religion and its History. Dr Adam Clarke's Bebliographical Dictionary, 6 vols. 1803, is restricted to works in the learned and Eastern languages; his Brbliographical Miscellany, published in 1806 as a supplement, contains, among other matter, a full account of the English transla- tions of the classics. To foreign literature belong, among others, Quérard's La France Littéraire, and the Bibliotheque Historique of Le Long; the Bibliotheca Belgica of J. F. Foppens, 2 vols. 1739; Bubliotheca Hispana, Nova et Vetus, by Nicholas Antonio, 1783-88; Haym's Biblioteca Italiana ; Worm's Danske, Norske, og Islandske Leerde Lexicon, 1771-84; Nyerup and Kraft's Almindeligt Litteratur Lexicon, 2 vols., 1820; Georgi's Allgemeines Europdisches Biicher-Leaxicon, 1742-58 ; and others which space forbids us to enumerate.

The works devoted to special branches of knowledge form a host in themselves, and we can only mention a few of them, by way of illustration. To theology belong such works as Le Long's Bibliotheca Sacra, 1723, and the Bibliotheca Theologia Selecta, by Walchius, 1757, as well as his Bibliotheca Putristica, new edition, 1834. Judaic literature is represented

by Fiirst, and Hebrew writers by Wolfius, 1715-33. Lipenius, a learned German divine of the 17th century, devoted separate Bibliothece to theology, law, philosophy, and medicine, which were collected in his Bibliotheca Realis. His Bibliotheca Juridica has received several supplements by other writers, and is much the most valuable of his series. Bridgman's Legal Bibliography, and the valuable work of M. Camus, Lettres sur la profession d' Avocat et Bibliotheque choisie des Lwres de Droit, deserve especial notice. The Bibliotheca Historica of Meusel relates to historical works of all ages and nations. An excellent catalogue of books of voyages and travel is given in the Bibliothéque Universelle des Voyages, by M. Boucher de la Richarderie, 6 vols., Paris, 1808. Dr Young's Cata- logue of Works relating to Natural Philosophy, the Cata- logus Bibliothece Historie Naturalis Josephi Banks, by Dr Dryander, and Engelmann's Bibliotheca Historico- naturalis, Leipsic, 1846 (supplement, 1861); the Biblio- theca Mathematica of Murhard, Lalande's Bibliographie Astronomique, and the Buibliographie Agronomique, are leading works, written on the same principle of selection. British Topography was treated by Gough in 1780, and by Upcott in 1818. Nisard's Histowre des Livres populatres, ou de la Littérature du Colportage, 1854, a curious and amusing work, may also be mentioned. ittinger's Beblzo-

graphie Biographique contains a copious catalogue of purely biographical works.

For a comprehensive work of reference on special biographies we cannot do better than refer our readers to the Bibliotheca Bibliographica, by Dr Julius Petzholdt Leipsic, 1866. Part i. relates to works on bibliography ; part ii. to the bibliography of different nations ; and part iii. to works connected with special branches of learning, which are classified into leading divisions. The Jépertowre Bibliographique Universel of M. Peignot is a useful but ill- arranged work; it dates back, moreover, to 1812. The progress of knowledge and research, especially with regard to scientific subjects, obviously throws works of this descrip- tion soon out of date to the student, who desires to be acquainted with the most recent as well as the

earlier authorities. As landmarks, however, of the state of knowledge at different epochs, thcy are full of interest to the literary bibliographer.

VIII. On the Classification of Books.

The different methods, adopted from time to time, of classing books according to their subject matter, has occasioned a variety of so-called systems of bibliography, which it is important to notice, but which space forbids us to describe in detail. A distinction must be observed between a scheme of arrangement applied to a particular library, and limited therefore by its contents, and one which embraces in its divisions and subdivisions the entire range of literature. Nothing, on either head, is learnt from the Greeks and Romans ; the classed catalogue of the library of St Emmeran at Ratisbon, compiled in 1347, and con- taining twelve divisions, is cited as the earliest specimen of its kind. (See Lrpraries.) The most ancient system, in the wider seuse of the term, is ascribed to the Chinese, who in the 13th century distributed the field of human knowledge into classes numbering from fourteen to twenty, with sectional subdivisions to each.

Classificd systems suggested by or devised for particular libraries after printing had multiplied their contents, originated chiefly with librariaus or compilers of catalogues. In 1587 Jean Baptiste Cardona wrote four treatises on the principal librarics of his day. His description of the library of the Escorial was followed in 1635 by Arias Montanus, whose catalogue divided the books there according to languages, separating MSS. from printed works, and distributed the whole into sixty-four classes. Their number was reduced by Casiri in his Bibliotheque Arabico- Espagnole de 0 Escurial, Madrid, 1760. In 1631 John Rhodius proposed a scheine for the arrangement of the university library at Padua, which has been recently published in the Serapewm by Dr Hoffman, from a manu- script found in the town library at Hamburg, under tlic title of Hin bibliothekarisches Gutachten abgegeben im Jahre, 1631. His method is very similar to that of Claudins Clement, in his Afuset sive Bibliothece tam private quan publice exstructio, instructio, cure usus, 1635.

1 David Kéller's Sylloge aliquot scriptorum de bene ordinanda et ornanda bibliotheca, 1728, contains a full account of authorities up to

F. Rostgaard published in 1697 a Projet dune nouvelle méthode pour dresser un catalogue, which serves to illustrate the difference between arranging a catalogue and a library. Naudé finds fault with the far-fetched refinements of his predecessors, and his divisions have the merit of being more simple and precise. "It is certain,". says Mr Edwards, "that a good catalogue will require a much more minute classification than would be either useful or practicable in the presses of a library."? A confusion between these two distinct objects has largely pervaded the "system" of even later writers, who have supposed the same nicety and exactness to be equally necessary and equally practicable in both. Where there is a classed catalogue, the grand objects of a systematic arrangement are sufficiently provided for, independently of the location of the books on which so much fanciful lore has been expended. _If there be no classed catalogue, it is tolerably clear that, for purposes of convenient and ready refcrence, a minute classification of books on the shelves, however accurate, may tend only to bewilder and confuse. Simplicity is the readiest mcans to aid the memory and abridge the labour of the librarian ; and this object can be attained by a much more elementary division of books than could be tolerated in any classified catalogue extending to details.

These remarks apply largely to the ordinary system of modern French bibliographers, the origin of which is variously ascribed to Bouillaud, Garnicr, and Martin. Priority of date appears to belong to Bouillaud, for his Bibliotheca Thuana, or sale-catalogue of the famous library of De Thou, had existed in MS. some time before it was editcd by Quesnel in 1679. His system cmbraces five classes, theology, jurisprudence, history, philosophy, and literature,~~—the last including heterodox and miscellaneous works. The catalogue by P. Garnier of the library of Clermont, entitled Systema Bibliothecee Collegii Parisiensis Socvetatis Jesu, was published two years previously. The headings embrace 461 subdivisions, of which 74 belong to theology, 88 to philosophy (a class clumsily and coufusedly arranged), 227 to history, and 72 to jurisprudence. In 1709 appeared Prosper Marchand's system, developed in his Catalogus bibliothece Joachimi. Faultrier. In his preface he attacks the system of Naudé, and, after treating of the different methods, viz., the order of nature, of nations, of languages, of time, and~~

~~alphabetical, sums up his divisions into theology, or divine knowledge ; philosophy, or human knowledge, separated into belles lettres and sciences; and history, or' the knowledge of events. Bouillaud's system, as modified by Marchand, was adopted by Gabriel Martin in most of the catalogues, amounting to nearly 150, which he published between 1711 and 1760, and, afterwards, with some enlargement of subdivisions, by De Bure in his Bibliographic Instructive. The result of their successive labours, which is known as "the system of the Paris booksellers," is the one commonly adopted in France, and consists of theology, jurisprudence, sciences and arts, literature, and history. Some changes, it is true, were afterwards proposed. M. Ameilhon, in a paper published in 1799 in the Memoirs of the French Institute, suggested as primitive classes, —grammar, logic, morals, jurisprudence, metaphysics, physics, arts, belles lettres, and history,—his Revolutionary sympathies induc~~ ing him to discard theology from the list. But the system, finally elaborated by Martin, survived to govern the classification of the principal libraries in his country. Of a we me that date. A chapter of Morhof's Polyhistor is devoted to the same subject, See also Leibnitz, Op. Omn., ed. 1768, vol. v ; and Baillet's

Jugemens des Savans. Aimé Martin's Plan dune Bibliotheque Uni- verselle appeared in 1837.

. \ E. Edwards, Memoirs of Libraries, ii. 783. See his chapter on Classificatory Systems."

the various innovations, the system of Daunow in his Mémowe sur la Classification des Livres dune grande Bibliotheque, 1800, is frequently cited as the best. Since then the Paris scheme has been modified by bibliographers like Barbier, Achard, and Brunet; by M. Merlin in his catalogue of the library of Baron Silvestre de Sacy (1842) ; and by M. Albert, in his Récherches sur les principes fondu- mentaua de la classification d'une Bibliotheque, Paris, 1847. Olenin's system (1808), for the Imperial library at St Petersburg, separated sciences from arts, and introduccd philology as a distinct class. Dr Conyers Middleton in 1723 submitted a scheme to the senate of Cambridge for the classification of the university library ; the classes pro- posed by him being these—theology, history, jurisprudence, philosophy, mathematics, natural history, medicine,

belles lettres (litere humaniores), and miscellaneous. Hartwell Horne's Outlines for the Classification of a Library, based on the Paris system, were submitted about the same time to the Trustees of the British Museum. A. serviceable "Scheme for Town Libraries" is embodied in the chapter of Mr Edward's book previously quoted.

Of the more gencral "systems," based on a survey of the ficld of human knowledge, and not immediately directed to the requirements of a library, a brief notice must suffice. The earliest system, in this sense of the word, is com- monly ascribed to Conrad Gesner, the founder, as Dibdin calls him, of pure bibliography. Yet he was, in fact, pre- ceded, however feebly, by Alexo Vanegas, whose work, published at Toledo in 1540, forms the first imperfect type of future efforts of that kind. His divisions are fourfold, viz.: 'Original —of the harmony between predestination aud free will; Matural—of the philosophy of the visible world ; /'ational—of the function and use of reason; Revealed—of the authority of the Scriptures." Gesner's, however, was the first compreheusive attempt at a general encyclopedia of literature, constructed in the form of a catalogue. His system was first published in 1548 as an index of matters to his Bibliotheca Universalis, under the title of Pandectarum sive Partitionum Universalium Libri XXI.? Florian Trefler, a Bavarian Benedictine, published at Augsburg in 1560 a Méthode de classer les Livres, which Peignot describes as "plus que mediocre." In 1587 ap- peared the Tableaux accomplis de tous les arts libéraux, by Christofle de Savigny, which Brunet asserts was the model of Bacon's " Encyclopeedical Tree," but which was substan- tially the system of Gesner. The well-known speculations of Bacon as to the genealogy of knowledge were embodied by D'Alembert in his Discours préliminaire a 0 Encyclo- pédre Méthodique, Amst., 1767. They were also made the basis of other schemes by Regnault-Warin, Laire, Ferrario, and especially Peignot, whose system was divided into three primitive classes, viz., history, philosophy, and imagination, with the addition of bibliography, as an intro- ductory class. Girard's system was embodied in an Lincyclopédie ou Dictionnaire raisonné des Sciences, des Arts, et des Métiers, edited in 1751 by Diderot and d'Alembert, the latter of whom undertook the part relating to mathe- matics. Camus in 1798 took man in a state of nature, and then classed his library in the order in which this "man of nature" is supposed to form his impressions of the universe. The divisions of Thiébaut in 1802 comprised—(1), Con- naissances

instrumentales ; (2), Connaissances essentielles ; and (3), Connaissances de convenances, and were founded on a somewhat similar principle to that adopted in 1822 by the Marquis Fortia d'Urban, in his Vouveau Systeme de Bibliographie alphabétique, who prefaced his classes with

3 For a full account, see the article "Gesner" by Cuvier, in the Biographie Universelle. His Bibliotheca was reprinted, and greatly enlarged, by Simler, in 1574, Conrad Lycosthenes afterwards published an abridgment, and a supplement was added by Verdier.

encyclopedias, Ampére, in 1834, in his Zssaz sur la Philosophie des Scrences, has disfigured his system with a needlessly technical nomenclature.

Much unnecessary refinement has been expended by German writers on this subject. The system of Leibnitz, however, in 1718, is well suited to practical purposes. His leading classes are these—theology, jurisprudence, medicine, intellectual philosophy, mathematics, natural philosophy, philology, history, and miscellaneous! The scheme of the Jena Repertoriwm, published in 1793, contains 16 primitive classes, and no less than 1200 sub- divisions. The system of Denis, formerly keeper of the imperial library at Vienna, was developed iu his Linleitung in die Biicherkunde, 2d edition, 1795 ; he classifies learning into theology, jurisprudence, philosophy, medicine, matlie- matics, history, and philology. Krug's system followed in 1796, and Schleiermacher's in 1852. Wuttig's Universal- Bibliographie, 1862, aimed at embracing in a systematic survey the collected literature of the current time.

In England the classification of learning has been treated as a branch of philosophy rather than of biblio- graphy. Locke's ssay on the Human Understanding contains, in book iv. c. 21, a ' Division of the Sciences ;" and Bentham has an " Essay on Nomenclature and Classi- fication" in his Chrestomathia, though it dozs not appear that he intended it to apply to the distribution of books. Coleridge, in his Universal Dictionary of Knowledge,

1817, aimed at combining the advantages of a philosophical and alphabetical arrangement, and adopted four leading classes, viz.,—pure sciences, mixed sciences, history, and literature, including philology Lord Lindsay's Progression by Antagonism, 1845, contains another method, based on his theory of the divisions of human theught.

For further information on this branch of the subject the reader is referred to Peignot's article on "Systeme" in his Dictionnaire de Pibliologie, and especially to the chapter on " Bibliographical Systems" in Petzholdt's Bibliotheca Bibliographica, Leipsic, 1866. Many of the above-nained schemes, particularly those of high, philosophical preten- sions, are fanciful in theory, and quite unsuitel to the practical requireinents of a catalogue of reference. The seven classes of Denis were based on the words of Solomon, " Wisdom hath builded a house; she hath hewn out her seven pillars ;" and Naudé mentions a writer who proposed to class all sorts of books under the three heads of morals, scicuces, and devotion; and who assigned, as the grounds of this arrangement, the words of the Psalinist, Descipli- nam, Bonitatem, et Scientam doce me, There are obvious objectious to all bibliographical systems which aspire to follow the genesis and remote affinities of the different branches of knowledye. The truth is that, when biblio- graphers speculate in this field with a view to catalogue- making, they entirely forget their proper province and objects, The compilation of a good catalogue of an exten- sive library is quite difficult enough, without indulging in refined abstractions on the genealogy of human knowledge.

As regards works and collections which cannot with propriety be limited to any one division of knowledge, it would be advisable to refer them to an additional or miscellaneous class, as has, in fact, been done by some writers. Camus proposes to enter such works in the class in which their authors most excelled ; but this plan would obviously produce much confusion, While, however, a miscellaneous class might properly indicate the collective editions of an: author's works, yet his separate treatises should be entered under the subjects to which they belong. A system of cross-reference is in many cases unavoidable,

1 Tdea Leibnitiana Bibliothece Publics secundum classes scientiarum ordinande (Works, vol. v.)

if completeness of general design is to be combined with the cardinal object of a classed catalogue, namely, that of showing what has been written by the authors specified therein on the different branches of knowledge as they may be best arranged.

IX. Bibliography im General.

It has been our object in this article to institute such a division of the subject, as should enable us to point out the best sources of information in regard to all its branches, Some works still remain to be noticed which treat gene- rally of all inatters relating to bibliography, though their scope and purpose differ according to the view of the science adopted by the writer. A comprehensive and judicious digest of bibliographical lore is still wanted, but there are several works which may be consulted with advantage. Cailleau's Hssaz de Bibliographic, appended to his Dictionnaire of 1790, isaninteresting treatise. The Linlettung in die Biicherkunde of M. Denis, 1795—96, is an excellent work divided into two parts, the first of them relating to bibliography, and the second te literary history. The Zracté Llémentaire de Bibliographie, by 8. Boulard, Paris, 1806, was intended to serve as an intro- duction to all works on that subject written up to the date of its appearance. The labours of Peignot, besides his works on suppressed and rare books already noticed, include—(1), the Manuel Bibliographique, ou Essai sur la connoissance des livres, des formats, des éditions, de la maniore de composer une Bibliotheque, etc., 1801; and (2), the Dictionnatre raisonné de Bibliologie, 2 vols. 8vo, 1802. The plan of this work, as Brunet admits, is well conceived, and furnishes a convenient mode of reference. Bibliography is certainly indebted to this industrious compiler, but his details have in many respects been rendered obsolete by subsequent research, and his vague notions of the scope and objects of lis study have frequently led him into con- fusion and extravagance, A Manuel du Bibliophile, by the saine author, appeared at Dijon in 1823. The Cours Elémentaire de Bibliographie, by C. ¥. Achard, Marseilles, 3 vols. S8vo, 1807, derives its chief value from its excellent summary of the different systems of classification applied to books. We learn from the introduction, that M. Francois de Neufchateau, when Minister of the Interior, ordered the

librarians of all the departinents to deliver lectures on bibliography, but that the plan, which indeed appears fanciful, entirely failed, the librarians having been found quite incapable of prelecting upon their vocation. The Introduction to the Study of Bibliography, by Thos. Hartwell Horne, 2 vols. in 1, 8vo, London, 1814, is per- haps the most useful book of this kind in the English language, though the compiler would have done better to restrict himself to printed books, instead of ranging dis- cursively over the whole field of MS. literature. His book is chiefly translated and compiled from French bibliographi- cal works, and will be found useful to those who have not access to them. Besides some excellent specimens of early typography, it contains full lists of authorities on bibliography and literary history, and a copious account of libraries both British and foreign. The Studio Biblio- graphico, by Vincenzo Mortillaro, Palermo, 1832, is an Italian treatise of considerable merit. P. Namur's Biblio- yraphie paleoyraphico-diplomatico-bibliogique, Liége, 1838, embraces many subjects outside the province of bibliography proper. The Jzbrarvan's Manual, by Reuben A. Guild, New York, 1858, is a compendious book of reference for the student in search of authorities. Enough has been said to show that the different branches of bibliography havebeen treated with considerable industry ; but there is room for further effort, if bibliographers will recognize the chief value of their science as the handmaid of literature. (=. F. 7.)

BIBULUS. Th2 best-known of those who bore this surnanie, which belonged to the Gens Calpurnia at Rome, was Marcus Calpurnius Bibulus, elected consul with Julius Ciesar, 59 B.c. He was the candidate put forward by the aristocratical party in opposition to L. Lucceius, who was of the party of Caesar, and bribery was freely used (with the approval, says Suetonius, of even the rigid Cato) to secure his election. But he proved no match for his able colleague. He made an attenipt to oppose the agrarian law introduced by Ceesar for distributing the lands of Campania, but was overpowered and even personally ill-treated by the violence of the mob. After making vain complaints in the senate, he shut himself up in his own house during the remaining eight months of his consulship, taking no part in public business beyond fulminating edicts against Czesar's proceedings, which only provoked an attack upon his house by a mob of Cesar's partizaus. When the

interests of Casar and Pompey became divided, Bibulus supported the latter, and joined in proposing his election as sole consul (52 B.c.) Next year he went into Syria as proconsul, and claimed credit for a victory gained by one of his officers over the Parthians, who had invaded the province, but which took place before his own 'arrival in the country. After the expiration of his goverument there, Pompey gave him the command of his fleet in the Ionian Sea. Here also he proved himself utterly incapable ; distinguishing himself chiefly by the cruel burning, with all their crews on board, of thirty transport vessels which had conveyed Cesar from Brundisium to the coast of Epirus, and which he had captured on their return, having failed to prevent their passage. He died soon afterwards of fatigue and mortification. By his wife Portia, daughter of Cato, afterwards married to Brutus, he had three sons. The two eldest were murdered in Egypt by some of the soldiery of Gabinius; the youngest, Lucius Calpurnius Bibulus, fought on the side of the republic at the battle of Philippi, but surrendered to Antony soon afterwards, and was by him appointed to the command of his fleet. He died while governor of Syria under Augustus.

BICHAT, Mariz-Francois-X vier, a celebrated French anatomist and physiologist, was born at Thoirette in the department of Ain, in 1771. His father, who was himself a physician, was his first instructor. He entered the College of Nantua, and afterwards studied at Lyons. In mathematics and the physical sciences he made rapid pro- gress. Becoming passionately fond of natural history he ultimately devoted himself to the study of anatomy and surgery, under the guidance of Petit, chief surgeon to the Hdtel Dieu at Lyons. He resumed for a time his early studies, restricting himself, however, within such limits as did not interfere with his medical pursuits. Petit soon discerned the superior talents of his pupil, and, although the latter had scarcely attained the age of twenty, employed him constantly as his assistant. The revolutionary disturb- ances compelled Bichat to fly from Lyons and take refuge in Paris about the end of the year 1793. He there became a pupil of the celebrated surgeon Desault. One day, volunteering to supply the place of an absent pupil who was to have recapitulated the lecture of the day before, he acquitted himself so admirably that Desault was strongly impressed with his genius; and from that time Bichat became an inmate in his house, and was treated as his adopted son. For two years he actively participated in all the labours of Desault, prosecuting at the

same time his own researches in anatomy and physiology. The sudden death of Desault in 1795 was a severe blow to Bichat. His first care was to acquit himself of the obligations he owed his benefactor, by contributing to the support of his widow and her son, and by conducting to a close the fourth volume of Desault's Journal de Chirurgie, to which

he added a biographical memoir of its author. His next object was to reunite and digest in one body the surgical doctrines which Desault had published in various periodical works, Of these he composed, in 1797, the book entitled Giueres Chirurgicales de Desault, ow Tableau de sa Doctrine, et de sa Pratique dans le Traitement des Maladies Externes, a work in which, although he professes only to set forth the ideas of another, he develops them with the clearness and copiousness of one who is a master of the subject. He was now at liberty to pursue the full bent of his genius, and, undisturbed by the storms which agitated the political world, he directed his full attention to surgery, which it was then his design to practise. We meet with many proofs of his industry at this period in the Recueil de lu Société Médicale d'Emulation, an association vf which Bichat was one of the most active members. In 1797 he began a course of anatomical demonstrations, and his success encouraged him to extend the plan of his lectures, and boldly to announce a course of operative surgery. Bichat's reputation was now fully established, and he was ever after the favourite teacher with the Puris students. In the following year, 1798, he gave, in addition to his course on anatomy and operative surgery, a separate course of physiology. A dangerous attack of hemoptysis interrupted for a time these heavy labours ; but the danger was no sooner past than he plunged into new engagements with the same ardour as before. He had now scope in his physiological lectures for a fuller exposition of his original views on the animal economy, which excited much attention in the medical schools at Paris. Sketches of these doc- trines were given by him in three papers contained in the Memoirs of the Société Jfédicale d'Hmulation. The doctrines were afterwards more fully developed in his Traité sur les Membranes, which appeared in 1800. In the notes to a small work, in which he gave in a condensed form the lessons of Desault on the diseases of the urinary passages, are found the germs of many of Bichat's peculiar views.

His next publication was the Hécherches Physiologiques sur la Vie et sur la Mort (1800), which consists of two dissertations. In the first he explains his classification of functions, and traces the distinction between the animal and organic functions in all its bearings. In the second he investigates the connection between life and the actions of the three central organs, the heart, lunys, and brain. But the work which contains the fruits of his must profound and original researches is the Anatomie Générale, published in 4 vols. 8vo in 1301.

Before Bichat had attained the age of eight-and-twenty he was appointed physician to the Hétel Dieu, a situation which opened an immense field to his ardent spirit of inquiry. In the investigation of diseases he pursued the same method of observation and experiment which had characterized his researches in physiology. He learned their history by studying them at the bedside of his patients, and by accurate dissection of their bodies after death. He engaged in a serics of examinations, with a view to ascertain the changes induced in the various organs by disease, and in less than six months he had vpened above six hundred bodies. He was anxious also to deter- mine, with more precision than had been attempted before, the effects of remedtal agents, and instituted with this view a series of direct experiments on a very extensive scale. In this way he procured a vast store of valuable materials for his course of lectures on the Materia Medica, the com- pletion of which was prevented by his death; but a great part of the facts were embodied in the inaugural disserta- tions of his pupils. Latterly, he also occupied himself with forming a new classification of diseases.

Bichat commenced a new work on anatomy, in which

the organs were arranged according to his peculiar classi- fication of their functions, under the title of Anatomie Descriptive, but he lived only to publish the first two volumes. It was continued ou the same plan, and com- pleted in five volumes by his assistants MM. Buisson and Roux. His death was occasioned by a fall from a stair- case at the Hétel Dieu, which threw him into a fever. Exhausted by excessive labour, and cnfcebled by constantly breathing the tainted air of the dissecting-room, he sank under the attack and died on the 22d July 1802, attended to the last by the widow of his

benefactor, from whom he had never been separated. His funeral was attended by above six hundred of his pupils, and by a large number of the physicians of Paris. His bust, together with that of Desault, was placed in the Hotel Dieu by order of Napoleon. BICYCLE. As the derivation of the term implies, the chief component parts of this machine consist of two wheels. The word is applied to those two-wheeled machines which have been brought to their present state of perfection for human locomotion during the past five years. Shortly after the close of the great Continental war in 1815, the first bicycle was introduced into England from France. It was at the best an awkward affair, composed of a couple of heavy wooden wheels of cqual diameter, one behind the other, and joined together by a longitudinal wooden bar on which the rider's seat was fixed, the mode of propulsion being the pushing the feet against the ground. That such a cumbersome method of locomotion soon died a natural death is not to be wondered at. For the next fifty years no real progress was made, as various kinds of levers and other attempted appliances were found too intricate. In 1869 M. Michaux of Paris conceived the idea of making the front or driving wheel much larger than the hind wheel; and very soon afterwards, M. Magee, another Parisian, still further improved bicycles by making them entirely of steel and iron. The principle of crank action attached to revolving axles having also become developed, the pastime of bicycling was entirely revolutionized. India- rubber tyres and strong beaks were brought into requisition to relieve jolting ; and now-a-days a crack racing bicycle with a driving-wheel from 55 to 60 inches diameter does not exceed 50 tb in weight, or about half the weight of one of the old wooden machines. 'Tricycles have been tried, but no great amount of speed will ever be got out of them until the friction and weight can be materially reduced. The diameter of the front or driving wheel of the modern bicycle varies from 24 to 5 feet, according to the length of the rider's legs. When it is meant for racing, most of the component parts are lighter, and the rest for relieving the legs when going down hill is dispensed with. The rider sits astride a small saddle, and the motive power is obtained from the feet working the crank treadles attached to the revolving axle of the driving-wheel. There being no lateral support to the machine, the first thing to be Icarnt is balancing, after which it is best to begin riding down a gentle gradient without using the treadles. Steering, which is managed by a transverse handle attached to the driving-wheel and placed in front of the rider, should

be mastered in the same manner, after which the feet and legs may be brought into play on the treadles and speed gradually acquired. Falls are inevitable at first, and they ave best avoided by slightly turning the driving-wheel in the direction the machine is inclining, not the contrary way. Care must be taken to keep all bearings, dc., oiled from time to time, in order to prevent friction and so lessen speed. With the exception of skating, bicycling is the quickest means of locomotion that man possesses. A fair bicyclist can outstrip a horse in a day, whilst an expert can do so in an hour. Dicycling has rapidly grown in favour during the past two ycars; and long tours are

now made with the greatest ease. Where the roads are fairly level, and in a tolerably good state of repair, the bicycle is unsurpassed as a means of self-locomotion. In hilly and mountainous countries, where there are no made roads, or where they are much broken up and heavy, it is uext to useless, although india-rubber tyres to a certain extent relieve the jolting over rough ground. Lightness, great strength, and the best of workmanship are necessary in the manufacture of bicycles in order to prevent serious accidents, It is in the two former requisites that steel and india-rubber have such an advantage over iron and wood.

As a proof of the perfection to whieh bieyele-riding has now been brought, the following best performances on record, over a prepared cinder path, may be mentioned, viz. :—

Miles. Hours. Min. See. Miles. Heurs. Min. Sec. 3 0 1 32% 10 0 384 4]

4 0 2 192 2) 1 2 38

1 0 3 0 30 1 52 48

2 0 6 ol 40 Br él 48 3 0 9 58 50 3 9 Pal

4 0 138 192 60 4 11 24 5 0 16 41 70 4 56 3

6 0 20 55 80 5 46 48

7 0 24 23 90 6 42 all 8 0 28 5 100 i 33 43 9 0 81 D, 106 4 58 544

The last of these, as one of the London daily journals remarked, fairly ranks as "the most extraordinary performance on reeord of any man, animal, or maehine." 'The distance from Tunbridge to Liverpool, 234 miles, has been aecomplished in 18 hours 35 minutes. A hundred miles a day, over fair roads, has often been aehieved for several days together, and many such journeys are reeorded. A ride of 800 miles, from London to John O'Groats, was made ing}4 days, over unexceptionally hilly and heavy roads, in June 1873.

BIDA, an inland town of Africa, situated in about N. lat. 9° 5' and E. long. 6° 5', sixtecn miles N. of the River Niger or Quorra, and lying N.N.W. of the town of Egga. Bida, which was visited by Dr Baikie in 1862, is a large towu, the capital of the kingdom of Nupe.

BIDDLE, Joun, frequently called the father of English Unitarianism, was born in 1615 at Wotton-under-Edge in Gloucestershire. He was educated at the grammar school of his native town, and then proceeded to Magdalen Hall, Oxford. He graduated as bachelor of arts in 1638 and as master in 1641, and was then appointed to the niastership of the free school in the city of Gloucester. While con- ducting this school in an admirable manner he diligently prosecuted his theological studies; and the results he arrived at were of such a nature as to draw down upon him the reprobation of the civic authorities. He circulated privately a tract called Twelve Arguments drawn out of Scripture, wherein the commonly-received opinion touching the deity of the Moly Spirit rs clearly and fully refuted ; and towards the close of 1645 he was summoned before the Parliamentary committee then sitting at Gloucester. By them he was committed to prison, though he was at the time labouring under a dangerous fever. Je was released on bail after an imprisonment of some duration, and was then called before the Parliament, which desired to inquire into his views. After .tedious proceedings Diddle was committed to custody, in which he remained for five years, During that time the Assembly of Divines at Westminster had discussed his opinions, and in defence he published his Twelve Arguments. The book was at once ordered by Parliament to be seized and burned by the hangman. Notwithstanding this, Biddle issued two tracts, one a Confession of Fatth

with regard to the Holy Trinity, the other Testimonies of Irenceus, &e., concerning the one God and the Persons of the Holy Trinity. 'These were sup- pressed by Government, and the Assembly of Divines eagerly pressed for the passing of an Act by which heretics like Biddle could be put to death. This, however, was resisted by the army, and by many of the Independent Parliamentarians ; and after the death of the king, Biddle

was allowed to reside in Staffordshire under surveillance. In 1651 the general Act of Oblivion gave him complete freedom, and his adherents soon began the practice of meeting regularly for worship on Sundays. They were called Biddellians, or Socinians, or Unitarians, the name which has now become associated with their opinions. Biddle was not left long in peace. He translated some Socinian books, among others the Life of Socinus, and published two catechisms, which excited a fury of indigna- tion against him. He was summoned before the Parliament and imprisoned. The dissolution of that body again set him at liberty for a short time, but he was presently brought up for some expressions used by him in a discus- sion with a Baptist clergyman. He was put upon trial, and was only rescued by Cromwell, who sent him out of the way to one of the Scilly Islands, and after three years released him. But in 1662 he was again arrested, and fined £100. As he was unable to pay this sum, he was at once committed to prison, where fever, caused by the pestilential atmosphere, carried him off on the 22d Sep- tember 1662.

BIDEFORD, a municipal borough, market-town, and seaport, in the county of Devon, eight miles S.W. of Barnstaple, with which it is connected by railway. It is situated on the slopes of two hills which rise from the banks of the River Torridge, near its confluence with the Taw, about four miles from the sea. The two portions of the town are united by a bridge of fourteen arches, built, it is said, in the 14th century, and widened in 1864. The bridge forms a favourite promenade, and is endowed for its repair with lands that produce an aunual rent of £300 or £400. Many of the houses in the town are built in the ancient fashion with bricks and wooden framework. The old church of St Mary, with the exception of the tower, was

taken down and rebuilt in 1864, and the town-hall is also of modern erection. In addition to these buildings Bideford possesses several large churches and schools, a union workhouse, assembly-rooms, a hospital for aged poor, a reading-room, and a literary and scientific institution. Bideford was already a place of some size under the Saxons, received the right of holding a market in 1271, and was made a free borough in 1573. In the 16th and 17th centuries it was a place of great trade, and in some respects was only exceeded by Exeter and London. The weaving of silk was introduced in 1650, and after the revocation of the Edict of Nantes received extensive development from some French refugees. Bide- ford now manufactures earthen wares, ropes, sails, and leather, builds ships, and has a considerable trade both domestic and foreign. Vessels of 500 tons can come up to its quay. It exports oak-bark, graih, and its own manufac- tures, and imports timber from Canada and the Baltic, with fruits, wines, and brandies from the south of Europe. The value of its imports was, in 1873, £13,310. Anthracite, coarse potters' clay, and a mineral paint are found in the neighbourhood. Population of municipal borough in 1871,

6969.

BIDPAI, more commonly known under the corrupted name of Pilpay, is the supposed author of a famous collec- tion of Hindu fables. Nothing is known of Bidpai be- yond the name, which, indeed, occurs only in the Arabic version, but the history of the collection of stories is curious and interesting. The origin of them is undoubtedly to be found in the Pantcha Tantra, or Five Sections, an exten- sive body of fables or apologues. A second collection, called the Mitopadesa, has become more widely known in Europe than the first, on which it is apparently founded. In the 6th century a.p., a translation into Pehlvi of a number of these old fables was made by Barzuyeh, a phy- sician at the court of Nushirvan, king of Persia. No traces

of this Persian translation can now be found, but nearly two centuries later, Abdallah-ibn-Mokaffah translated the Persian into Arabic ; and his version, which is known as the " Book of Kalilah and Dimna," from the two jackals in the first story, became the channel through which a knowledge of the fables was transmitted to Europe. It was translated into Greek by Simeon Sethus towards the close of the 11th century; his version, however,

does not appear to have been retranslated into any other European language. But the Hebrew version of Rabbi Joel, made somewhat later, was translated into Latin by John of Capua, and in that form became widely known. Since then the fables have been translated into nearly every European tongue. There are also versions of them in the modern Persian, Malay, Mongol, and Afghan languages.

See Wilson's analysis of the Pantcha Tantra, in the Mem. of the Royal Asiat. Soc., i.; De Sacy's introduction to his edition of the Kalilah and Dina, 1816; articles by the same in Notices et Extr. des MSS. de la Bib. du Rot, vols. ix. and x.; Wolff, Bidpai's Fabeln, 2 vols. 1837; Loiseleur des Longchamps, Essai sur les Fables Indiennes, 1838; Benfey, Pantcha Tantra, 2 vols. 1859.

BIEL (or in French Brenne), a town of the canton of Bern, in Switzerland, situated at the foot of the Jura Mountains, near the northern end of the lake to which it gives its name. It is well built, and possesses a town-housc of some antiquity, a remarkable church, a hospital, a gymna- sium, and an industrial school. There is considerable industrial activity in Biel, especially in the manufacture of cotton, leather, iron wire, and watches. Founded in the 1]th or 12th century, Biel continued under the authority of the bishopric of Basel till the beginning of the 15th, when it formed an alliance with Bern, Soleure, and Freiburg. Its defence against the French in 1798 is commemorated by an obelisk on a neighbouring eminence. Its incorpora- tion with Basel dates from 1815. Population, '8113.

BIEL, Gasriet, frequently but erroneously styled the last of the scholastics, was born at Spire about the middle of the 15th century. He held for some time a pastoral charge at Mainz, and afterwards removed to Urach. On the foundation of the University of Tiibingen in 1477 he was appointed to the professorship of theology, and was twice afterwards promoted to the dignity of rector. Some years before his death, in 1495, he entered a religious fra- ternity. Biel was a follower of William of Occam, and professes only to develop systematically the principles of his master. His great work, Collectorium super Lubros Sententiarum G'. Occami (1508, 1512, and various dates), is an admirably clear and cousistent account of the nominalist doctrine, and presents the complete system of scholastic thought regarded from that point of view. The strong empirical individualism of the

work, tending necessarily to limit the province of reason and extend that of faith, together with scattered utterances on special points, which gained for Biel the title of Papista Antipapista, had con- siderable influence in giving form to the new doctrines of Luther and Melanchthon. From its lucidity and relative completeness Biel's work is the best specimen of the final aspect of scholasticism. His other works have also been frequently reprinted. With regard to the title Ultimus Scholasticorum, often bestowed on Biel, it has been pointed out by all the best authorities that such a designation is quite inappropriate ; scholasticism did not cease even in Germany with Biel, and it continued to flourish long after his time in the universities of Spain. (Stéckl, PAzl. d. Mittelalt., ii. § 269; Roscher, Ges. d. Nationaldkonomik, pp. 21-28.)

BIELAU, frequently distinguished as Langen Bielau, the longest village in the Prussian monarchy. It is situated in the government of Breslau in Silesia, on a tributary of the Piela, and extends for a distance of rather more than four miles. Its industrial establishments are numerous

and important, the cotton manufactory alone employing 2000 looms ; while bleaching, dyeing, printing, tile-making, and sugar-refining are all extensively carried on. 'There is an old castle in the village belonging to Count Sandreczky. Population in 1871, 13,070.

BIELAYA TSERKOV (<.e., White Church), a township of Russia, in the government of Kieff, 32 miles S.8.W. of Vasilko, on the main road from Kieff to the Crimea, in 49° 47' N. lat. and 30° 7' E. long. First mentioned in 1155, Bielaya Tserkov was destroyed during the Mongolian in- vasion, but afterwards recovered its prosperity. In 1550 a castle was built in the town by Prince Prunsky, waiwode of Keiff, and various immunities were bestowed on the inhabitants. A Polish army occupied the place in 1651, and from that time it was alternately subject to Poland and to independent hetmans. In 1774 it received a charter from Stanislas Augustus, and in 1793 was united to Russia. The principal buildings of Bielaya Tserkov include two Greek churches, one Roman Catholic church, two syna- gogues, a hospital, and a gymnasium (founded in 1846). In commercial activity the town only yields to Kieff, Berdicheff, and Uman—-the chief articles of trade

being cattle and grain. There are eleven annual fairs, three of which last for ten days each. The sales at these fairs amount to up- wards of £28,000. Population in 1860, 12,075, of whom 7349 are Jews.

BIELEFELD, a town in the Prussian province of West- phalia, the capital of a circle in the government of Minden. It is situated at the foot of the Osning, and consists of two portions, separated by the River Lutter, which were first united into one town in 1520. Among its public buildings and institutions are the old town church, with a curious carved altar piece, the town-house, the gymnasium, and the provincial industrial school, On the height above the town is the old castle of Sparrenberg, for a long time employed as a prison. It was founded about the 12th century, and originally bore the name of Lowenberg. Bielefeld is the centre of the Westphalian linen trade, and contains exten- sive factories and bleachfields. The Ravensberg factory has upwards of 24,000 spindles, and the Vorwarts, 10,700. Tobacco, glass, cement, cast-iron, leather, tiles, &c., are also manufactured in the town. Bielefeld is mentioned as early as the 9th century, as Belanvelde, and rose into importance in the 11th or 12th as the capital of the countship of Ravensburg. It joined the Hanseatic league in 1270, and about the same time began to engage in the linen manufacture, which was greatly extended during the 16th and 17th centuries by a number of refugees from the Netherlands. In 1666 the town passed with the count- ship to the duchy of Brandenburg. Population in 1871,

21,834.

BIELEFTP, a town of Russia, in the government of Tula, and 82 miles from that city, on the left bank of the Oka, in 53° 48’ N. lat. and 35° 9’ E. long. It is first mentioned in 1147 ;. it belonged to Lithuania in the end of the 14th century ; and in 1468 it was raised to the rank of a princi- pality, dependent on that country, by Basil Romanovitch, who had come thither from Odoeff. In the end of the 15th century this principality began to separate from Lithuania and attach itself to the Grand Duchy of Moscow; and by the peaceful treaty of Ivan III. with Alexander the Lithuanian Bieleff was ultimately united to Russia. In the 16th century it suffered greatly from the Tatars, especially in the years 1507, 1512, 1530, 1536, and 1544. In 1538 Ivan the Terrible exiled Prince John of Bieleff to Vologda, and in 1565

declared the lordship his own property. In 1607 Nikivitch Romanoff, general of the Emperor Basil Ivanovitch, gained a complete victory in the ueighbourhood against the rebellious Prince Mosalsky. Transferred in 1708 from the Smolensk to the Kievan government, Bieleff passed

in 1719 to the Bielgorod district of Orloff, and in 1777 was made a departmental town of the government of Tula. In 1826 the Empress Elizabeth Alexievna died in Dieleff on her way from Taganrog to St Petersburg. The buildings of the town include nineteen churches and two monasteries, a hospital, a widow's asylum, a foundling institution, an almshouse, a prison, and a theatre. A public library was founded in 1858 in memory of Basil Zhukovsky, who was born in a neighbouring village. The industrial establish- ments comprise tallow-boiling premises, oil manufactories, a tannery, a sugar-refinery, a distillery,&c. Jn extent of trade Bieleff ranks next in the government to Tula—the most important articles being grain, hemp, oil, and tallow. A great fair is held from the 28th of August to the 10th of September. The population in 1860 was 8063, by far the greater proportion belonging to the Greek Church.

BIELGOROD (i.e., White Town), a town of Russia, in the government of Kursk, 87 miles §.8.W. from that city, in 50° 36' N. lat. and 36° 37' E. long., on the right bank of the North Donetz, near the confluence of the Vizelka, It occupies a high chalk hill, from which are annually quarried about 112 tons. The date of the founding of Bielgorod is uncertain, because it has been confounded with two other places of the same name. In Karamsin's History it is mentioned that the Grand Duke Theodore Ivanovitch in 1593 sent to found Bielgorod on the ruins of Siever ; and it is certain that ancient remains are still to be seen in this city. Inthe 17th century Bielgorod suffercd ceaselessly from Tatar incursions, against which, by command of the Emperor Michael Theodorovitch, there was built (from 1633 to 1740) an earthen wall, with twelve forts, extending upwards of 200 miles from the Vorskla to the Don. These defences were called the Bielgorod line, along which, in the reign of Alexias Michaelovitch, there were settled emigrants from Cherkas, Zimbar, Corsun, and clsewhere. In 1666 an episcopal see was established in the town, and the archbishops lived there till 1833, when

they were trans- ferred to Kursk. In 1779 Bielgorod was made the chief town of acircle in the Kursk government. There are two cathedral churches in the place, Trinity and Assumption, both built in the 16th century, as well as fifteen other churches, two monasteries, a theological seminary, an alms-house, and a hospital. In 1862 a bank was established with a capital of between £10,000 and £15,000. Only a few of the houses are built of stone. Wax-candles, tallow- candles, leather, soap, and bricks are manufactured, and a considerable trade is carried on in grain and cattle. There are three annual fairs on the 10th Friday after Easter, the 29th June, and 15th August respectively. Population in 1860, 11,722, almost all belonging to the Greek Church.

BIELITZ, a town of Austrian Silesia, in the circle of Teschen, on the Biala River, a sub-tributary of the Vistula, and opposite the Galician town of Biala, with which it is connected by a bridge. It is the seat of the superin-tendent of all the Protestants in Moravia, and the residence of the Sulkowsky family, in favour of whom the lordship of Bielitz was raised to a duchy in 1754. The castle is a fine building of some antiquity, surrounded by a beautiful park. The principal industries of the town are the spin- ning of flax and the printing and dyeing of cloth, the last especially being carried on with great success. A valuable traffic is maintained not only in the produce of the factories but also in Hungarian wine and Galician salt. The town was founded in the 13th century, and in the 15th and 16th was a fortified place. It is connected by means of a branch line with the Kaiser. Ferdinand Northern Railway. Population in 1869, 10,721.

BIELLA, a town of Italy, in the province of Novara, 38 miles N.E. of Turin, with which it is connected by rail. It is built partly on the slope of a hill and partly on the

banks of two small strcams called the Cervo and Aurena,— the palatial old houses of the upper portion being now inhabited by the poorer classes. Several of the streets have arcades along the sides. It is the seat of a bishop, and has a cathedral, an episcopal palace, and a theological seminary. The principal industries are the manufacture of cloth and paper, and the trade consists mainly in oil, chestuuts, and silk. Population in 1870, 11,935.

BIELOPOLI, a town of Russia in the government of Kharkoff, near the Vuira and Kriuga, 37 miles N.W. from the town of Sum, in 51° 9' N, lat., and 34° 19' E long. It was founded in 1672. A very extensive trade in wheat, salted fish, salt, pitch, and timber is carried on by the inhabitants, who number upwards of 12,000. BIELOSTOK (in Polish Bratystox), a town of Russia, in the government of Grodno, in 53° 8' N, lat. and 23° 9'

E. long., 50 miles S.W. of Grodno on the River Biela, a

tributary of the Suprasla. Founded in the 14th century it was long an important proprietary village belonging to the Veselovskis. In the 17th century it passed to the Branetskis, at whose solicitation Augustus ITI., in 1749, raised it to the rank of a borough and gave it civic rights. This increased its prosperity, and after the third partition of Poland in 1793, the Prussian Government, to whom it had been assigned, made it the seat of an administrative department. By the peace of Tilsit in 1807, Bielostok was given to Russia along with the department of the samc name, which in 1808 was divided into the four districts of Bielostok, Bielsk, Sokol, and Drogotchin. The public buildings of Bielostok comprise a Greek and a Roman Catholic church, several synagogues, a hospital, a castle (used as a prison), a gymnasium, an institution for the daughters of the nobility, and various other schools. There are three cloth factories and an extensive brewery ; cotton and wool-spiuning are beth carried on, and leather, oil, soap, and tallow are manufactured. There is also an important trade in grain, wond, and various industrial articles, In 1860 the population was 16,544, no fewer than 11,288 being Jews.

BIENHOA, the capital of one of the six provinces of Lower Cochin-China, situated about 20 miles to the north- west of Saigon, on a canal that connects it with that city. It was captured by the French admiral Bonard in 1861, and is now one of the fortified posts in the French posses- sions. Sugar-mills were started in 1869 by an English company; but, owing to the jealousy of the Anamites, they had soon to be closed. The population of the " Inspection " of Bienhoa is 19,260.

BIEZHETZ, a town of Russia, in the government of Tver, and 181 miles from that city, situated on the right bank of the Mologa, in 57° 46' N. lat. and 36° 48' E. long. On the left bank of the river lies the suburban village

of Shtap, ehiefly inhabited by the lower orders. Biezhetz is mentioned in the chronicles of 1137. On the fall of Novgorod, to which it had belonged, it was incorporated with the grand-duchy of Moscow; and in 1771 it was added to the government of Tver. Candles, leather, brandy, beer, flour, malt, oil, and bricks are all manufactured ; but a more important branch of industry is the making of. bags for grain and flour. There are two weekly markets and two annual fairs. Population in 1860, 5423.

BIGAMY, according to the statute now in force (24 and 25 Vict. c. 100, § 57), is the offence committed by a person who " being married shall marry any other person during the life of the former husband or wife." In the canon law the word had a rather wider meanirtg, and the marriage of a widow came within its scope. At the Council of Lyons (1274 a.p.) bigamists were stripped of their privilege of clergy. This canon was adopted and explained by thé English statute 4 Edward I. st. 3, c. 5; and bigamy, there-

forc, became a usual counterplea to the claim of benefit of clergy. However, by 1 Edward VI. c. 12, § 16, every person entitled to the bencfit of clergy is to be allowed the same, "although he hath been divers times married to any single woman or single women, or to any widow or widows, or to two wives or more." A bigamous marriage, by the ecclesiastical law of England, is simply void. By the statute 1 James I. c. 11, confirmed by later statutes, the offence was made a felony. It js immaterial whether the second marriage has taken place within England and Ireland or elsewhere, and the offence may be dealt with in any county or place where the defendant shall be appre- hended or be in custody. The following clause embodics the necessary exceptions to the very general language used in the definition of the offence :—~~" Provided that nothing in this sectien contained shall extend to any second marriage contracted elsewhere than in England and Ireland by any other than a subject of Her Majesty, or to any person marrying a second time whose husband or wife shall have been continuously absent from such person for the space of seven years then last past, and shall not have been known by such person to be living within that time, or shall extend to any person who at the time of. such second marriage shall have been divorced from the bond of the first marriage, or to any person whose former marriage shall have been declared void by any court of competent jurisdiction." The punishment is penal servi~~ tude for not more than seven

nor less than five years, or imprisonment with or without hard labour, not exceeding two years. A valid marriage must be proved in the first instance in order to support a charge of bigamy. A voidable marriage, such as were marriages between persons within the prohibited degrees before 5 and 6 Will. 1V. c. 54, will be sufficient, but a marriage which is absolutely void, as all such marriages now are, will not. For example, if a woman marty B during the lifetime of her husband A, and after A's death marry C during the lifetime of B, her marriage with C is not bigamous, because her marriage with B was a nullity. In regard to the second marriage (which constitutes the offence) the English courts have held that it is immaterial whether, but for the bigamy, it would have been a valid marriage or not. An uncle, for example, cannot marry his niece; but if being already married he goes through the ceremony of marriage with her he is guilty of bigamy. In an Irish case, however, it has been held that to constitute the offence the second marriage must be one which, but for the existence of the former marriage, would have been valid. With reference to the case in which the parties to the first marriage have been divorced, it may be observed that no sentence or act of any foreign country can dissolve an English marriage a vinculo for grounds on which it is not liable to be dissolved a vinculo in England (R. v. Lolley, in Russell and Ryan's Criminal Cases, 237). Hence, a divorce a vinculo for adultery, in a Scotch court, of persons married in England is not within the statute.

In Scotland, at the date of the only statute respecting bigamy, that of 1551, cap. 19, the offence scems to have been chiefly considered ina religious point of view, as a sort of perjury, or violation of the solemn vow or oath which was then used in contracting marriage ; and, accordingly, it was ordained to be punished with the proper pains of perjury. But this injunction has not in every instance been complied with; and, from considerations of policy or expediency, the court has long been in the habit of in- flicting an arbitrary punishment, suited, as nearly as may be, to the degree of guilt brought home to the prisoner. Neither marriage need be regular, but it is not yet settled whether a marriage constituted by habit and repute, or by promise subseguente copula, can be relevantly libelled in a

charge of bigamy. The parties to the first marriage must, of course, have been lawfully entitled to marry. It isa good defence that the accused was divorced from his first wife before contracting the second marriage, even though the decree should afterwards have been set aside, unless it has been obtained corruptly and set aside for that reason. It is also a good defence that, at the time of contracting the second marriage, the accused had reasonable grounds for believing the other spouse to be dead. To constitute the crime of bigamy, it is not necessary that the second marriage should be such that, but for the first marriage, it would have been legal. The punishment is imprisonment, and occasionally penal servitude.

BIGNON, Jerome, a French lawyer, was born at Paris in 1589. He was uncommonly precocious, and under his father's tuition had acquired an immense mass of knowledge before he was ten years of age. In 1600 was published a work by him entitled Chorographie, ow Description de la Terre Sainte. The great reputation gained by this book introduced the author to Henry IV., who placed him for some time as a companion to the duke of Vendéme, and afterwards made him tutor to the Dauphin. In 1604 he wrote his Dascourse on the City of Rome, and in the follow- ing year his Summary Treatise on the Llection of the Pope. He then devoted himself to the study of law, wrote in 1610 a treatise on the precedency of the kings of France, which gave great satisfaction to Henry IV., and in 1613 edited, with learned notes, the Formule of the jurist Mar- culfe. In 1620 he was made advocate-general to the grand couucil, and shortly afterwards a councillor of state, and in 1626 he became advocate-general to the parliament of Paris. In 1641 he resigned his official dignity, and in 1642 was appointed by Richelieu to the charge of the royal library He died in 1656.

BIGORDI, Domenico, See GHIRLANDAIO.

BLIJAINAGAR, or BrsANAGAR, an ancient city in the south of India, once the capital of a great Hindu empire, but now in ruins, situated on the south bank of the Tumbhadra River, directly opposite to Aunagundi, in 15° 19 N. lat. and 76° 32' E. long. The city has been enclosed with strong stone walls on the east side, and is bounded by the river on the west, the circumference of the whole appearing to be about eight miles. The streets of this city, from 30 to 40 yards wide, can be traced between the immense piles of rocks

crowned with pagodas; and one street yet remains perfect. The building of this metro- polis was begun in 1336. Between the kings of the principality, of which it was the capital, and the Mahometan sovereigns of the Deccan constant hostility was maintained.

In 1564 Ram Raja, the king of Bijainagar, was totally |

overthrown on the plains of Telikoté, by a combination of the four Mahometan sovereigns of the Deccan, who imme- diately marched to the metropolis, which they abandoned to pillage. From that time it has lain in ruins. BIJAPUR, or Brsarpur, in Southern India, the ancient capital of an independent sovereignty of the same name, and once an exteusive, splendid, and opulent city, but now retaining only the vestiges of its former grandeur. It is situated in a fertile plain, in 16° 50' N. lat. and 75° 48' E. long., and is a place of great extent, consisting of three dis- tinct portions—the citadel, the fort, and the remains of the city. The citadel, a mile in circuit, is a place of great strength, well built of the most massive materials, and en- compassed by a ditch 100 yards wide, formerly supplied with water, but now nearly filled up with rubbish, so that its original depth cannot be discovered. It was built in 1489, by Yusaf Adil Shéh, the founder of the dynasty of Bijépur. The fort consists of a rampart flanked by numerous towers, a ditch, and a covered way. Its defences, which are not less than six miles in circumference, were completed by Ali

Adil Sh4h in 1566. The interior formerly contained the king's palace, the houses of the nobility, large magazines, . and extensive gardens. At present, though considerable portions of the area are covered with buildings or ruins, there is room for corn-fields and exteusive enclosures. Outside the fort are remains of a vast city, now for the most part in ruins, but the innumerable tombs, mosques, caravanserais, and other edifices, which have resisted the havoc of time, afford abundant evidence of the ancicnt splendour of the place. . It is asserted by the natives that Bijapur contained, according to authentic records, 1600 mosques and nearly 1,000,000 houses. The number of houses is certainly overrated ; that of the mosques, in the opinion of recent travellers, is no exaggeration. The outer wall of the city on the western side runs nearly south and north, and is of great extent. It is

built of stone, is of prodigious thickness, and is about 20 feet in height, with a ditch and rampart; and at intervals of 100 yards are capacious towers, built of large hewn stones. The whole is now in a ruinous condition,—the wall and the towers having in many places fallen into the ditch, and in other parts being covered with rubbish. Several mosques and mauso- leums, adorned with all the embellishments of Eastern architecture, are still to be seen in Bijapur. The fort in the interior is adorned with many of these edifices, in rather better preservation than the outworks. Among these is the great mosque, which is 97 yards long by 55 broad. The wings, which are 15 yards broad, project 73 yards from the north and south ends, enclosing on three sides, with the body of the mosque, a large reservoir of water and a fountain. The mausoleum of Sultan Muhammad Shah is a plain building, 153 feet square, over which is rearcd a dome 117 fcet in diameter at its greatest concavity, and called by the natives the grand cupola. The mosque and mausoleum of Ibrahim Adil Shah, king of Bijapur, which was probably completed about the year 1620, is said to have cost £1,700,000, and to have occupied thirty-six years in its construction. It is built ona basement 130 yardsin length by 52 in breadth, and raised 15 feet. On thisisa plain build- ing, 115 feet by 76, covered by an immense dome raised on arches. The mausoleum is a room 57 fcet square, enclosed by two verandahs, 13 feet in breadth and 22 feet in height. There are, besides, many other public buildings more or less injured by time and the violence of the Marhattas. Almost all the buildings, the palaces of the fort excepted, are of massive stone, and in the most durable style ; and at the same time the workmauship is minutely elegant. Among the curiosities of the capital is the celebrated monster gun, stated to be the largest piece of cast brass ordnance in the world. It was captured froin the king of Ahmadnagar by the king of Bijapur about the middle of the 17th century. An inscription on the gun recording that fact was erazed by Aurangzeb, who substituted the present inscription, stating that he conquered Bijapur in 1685. The city is well watercd, having, besidcs numerous wells, several rivulets running through it. After the dissolution of the great B&hmani dynasty of the Deccan in 1489, a race of independent sovereigns arose, who ruled over the new kingdom of Bijapur, extending

‘on the east.from the confluence of the Bhima and the

Krishna to the sea-coast, on the west from Goa to Bombay. Their rule endured through several generations, until at

length, in 1650, Shah Jahan compelled them to become

tribntary to the empire ; and shortly after, their monarchy was totally subverted by his successor Aurangzeb. The city and territorwof Bij4pur remained annexed to Dehli till 1724, when the NizAm established his independence in the Deccan, and included BijApur within his dominions. His sway over this portion of his acquisitions, was, how- ever, of brief duration ; for, being defeatcd by the Peshwa

in 1760, he was constrained to purchase peace by its cession to the Marhattés. Upon the fall of the Peshwa in 1818, Bijdpur passed into the hands of the British, and was by them included in the territory assigned to the Raja of Satara.

The place, as already intimated, is rich in monuments of the bygone period when Bijapur was the capital of a powerful and flourishing Mahometan kingdom. Such traces of the past it is always desirable to preserve to the greatest possible extent, as they furnish the best com- mentary upon the history of the times in which they were raised, and, indeed, constitute their history, so far as manners are concerned. It is fortunate that their value was duly appreciated by the late Raja of Satara, who took great pains to preserve them; and that the British Govern- ment, participating in the same feeling, has, since the country passed into its possession, manifested great zeal in rescuing these magnificent relics from the ravages of time. Bijapur is distant 130 miles S.E. of Satara, and 245 S.E. of Bombay. .

BIJNAUR, a district of British India, under the Lieu- tenant-Governor of the North-West Provinces, lying be- tween 29° 1’ and 29° 58’ N. lat., and 78° 1’ and 78° 55’ E. long., is bounded on the N.E. by the British district of Garhwal, on the E. and S.E. by the British district of Morddébad, and on the W. by the British districts of Mirat, Muzaffarnagar, and Saharanpur. The aspect of the country is generally a level plain, but the northern part of it rises towards the Himalayas, the greatest eleva- tion being 1342 feet above

the sea-level. The Koh and Ramgangé are the only streams that flow through the district.

Population in 1872, 787,152 souls, inhabiting 158.583 houses, and 2002 villages or townships. Area of the distriet, 1902 square niles; persons per square mile, 388; per village, 368: and per house, 4°6. The Hindus numbered 498,601, or 67 per cent. of the total population; Mahontetans, 248,455, or 88 per cent.; and Christians and others of unspecified religions, 96 souls. Of the area of the distriet (namely, 1902°94 square miles), 1036°14 square niles are under cultivation ; 432°63 square iniles cultivable, but not actually under cultivation ; and the remainder uncultivable waste. Principal crops :—Sugar-eane, cotton, rice, pulses, o1l-seeds, and different kinds of millet. Principal lines of road :—(1.) Najib-abad to Hardwar and Srinagar; (2.) Mirat to Bijnaur, Kiratpur, and Najibabad ; (3.) Bijnaur to Nagindand Barapur ; (4.) Najibabad to Nagina, Nehtaur, Chandpur, and Bashté; (5.) Moradabad to Sahora, Nagina, and Najibabad; and (6.) Nurpur to Dhampur, Sherkot, and Afzalgash, on to Kalagash. In 1870-71, the total revenue of Bijnaur distriet amounted to £148,958, of which £127,316, or 88 per eent., was derived from land. For the protection of person and property, a regular police foree of 486 strong is main- tained, exelusive of the village watch. In 1872-73, Bijnaur distriet contained 834 sehools, attended by 5819 pupils. The following thirteen towns contain a population exceeding £00 souls :—(1.) Bijnaur, the headquarters town of the distriet, in 29° 22’ 36" N. lat. and 70° 10’ 30” E. long.; population, 12,865 ; municipal income in 1872, £1040, 16s.; expenditure, £681, 8s.; rate of taxation, 1s. 73d. per head: (2.) Siohara, population, 8340; municipal ineome, £94, 18s. 4d.; expenditure, £88, 8s. 6d.: (3.) Sahaspur, population, 6309; not a municipalt own: (4.) Najibabad, population, 17,418 ; municipal revenue, £1584, 4s.; expenditure, £1425, 16s.: (5.) Shir- kot, population, 12,586 ; municipal revenue, £173, 14s. 5d.; expen- diture, £130, 17s. 4d.: (6.) Dhanipur, population, 6555 ; muni- eipal revenue, £521, 16s.; expenditure, £429, 12s.: (7.) Mandawar, population, 7622 ; municipal revenue, £86, 19s. 3d.; expenditure, £115, 18s. 8d.: (8.) Afzalgash, population, 8350; municipal re- venue, £100, Is. 1d.; expenditure, £115, 18s. 11d.: (9.) Nahtor, population, 9392; municipal revenue, £147, 8s. 1d.; expenditure, £84, 3s. 7d.: (10.) Jahalu, population, 5979 ; not amunicipal town: (11.) Chandpur, population, 12,033 ;

municipal income, £506, 12s. ; expenditure, £878, 2s.: (12.) Nagin, population, 19,696 ; municipal Ineome, £925, 12s.; expenditure, £779, 16s.: (13.) Kiratpur, popu- lation, 9579 ; municipal income, £117, 14s.; expenditure, £91, 12s.

Until the latter part of the 18th century Bijnaur belonged to the brave Rohilla Afghans, whose subjugation forms so deep a blot on the career of Warren Hastings. In 1774 the mercenary arms of Britain subjected this people to the oppressive rule of the Nawab

of Oudh, who in turn ceded the district to the East India Coin- pany in 1802.

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BIKANIR, a native state of RAjputdnd, under the political superintendence of the British Government, lies between 27° 30’ and 29° 55’ N. lat., and 72° 30’ and 75° 40’ E. long. It is bounded on the N. by the Panjab, on the E. by the British districts of Haridnd and Shek4éwati, on the S. by the native state of Jodhpur or Marwar, and on the W. by the native states of Jasalmér and Bhawalpur. Length of the state from E. to W. 200 miles; breadth, 160 miles; area, 17,676 square miles. The natural aspect of the country is one desolate tract, without a single per- manently running stream. Its surface is overspread with undulating sand-hills, of from 20 to 100 feet above the average level, and so loose that men and quadrupeds stepping off the beaten track sink as if in snow. Two streams, the Katuri and Gagar attempt to flow through this dismal region, but are lost in its sands. Water is very scarce, and is raised from wells of frem 250 to 340 feet in depth. A few shallow salt lakes are filled by rain water, but they dry up on the setting in of hot weather, leaving a thick crust of salt on their beds, which is used for commercial and domestic purposes. The population of the state has been estimated at 539,000, consisting chiefly of Jats, RAjputs (to which race the chief belongs), and other Hindu tribes, inhabiting 1814 villages, which, according to Elphinstone, are composed of “a few round huts of straw, with low walls and conical roofs, like little stacks of corn.” Bajré and moth (two species of millet) and water melons are almost the only agricultural

products. The inhabitants are very poor. They live chiefly by pasturage,—rearing camels, and horses of a fine brecd, which fetch good prices. From the wool which their sheep yield they manufacture every article of native dress and good blankets. The other industries are leather work, sugar-refining, goldsmith's work, iron, brass, copper, stone masonry, tanning, weaving, dyeing, and carpentry. In 1870-71 the total revenue amounted to £111,546, and the expenditure to £123,196. The state is in debt, and is said to be badly managed, the present Maharajé being entirely guided by favourites. The military force of the state amounts to 5000 regulars, horse and foot. Bikanir was invaded by the adventurer George Thomas in 1799, who levied from the Rajé a black mail of £20,000. The Raja entered into a treaty of dependence with the British Government in 1818. Principal towns — Bikdnir, the capital, Churu, Rajgarh, Ratangarh, and Reni. The town of Bikanir is surrounded by a stone wall, 6 feet thick, 15 to 30 feet high, and 34 miles in circuit, with five gates and three sally-ports. Estimated population, 60,000. The citadel is half a mile north-east of the city, and is surrounded by a rampart with bastions.

BILASPUR, a district of British India, in the Central Provinces, forms the northern section of the Chhattisgarh plateau, and is situated between 21° 45' and 23° 10'N, lat. and 81° 30' and 83° 15' E. long. It is bounded on the N. by the native states of Rewd4 and Korid; on the E. by the Udaipur tributary state of Chhoté Nagpur, and the district of Sambalpur; on the S. by the Raipur district ; and on the W. by the hilly tracts of Mandla and Balaghat. Extreme length of the district north and south, 106 miles ; extreme breadth from east to west, 136 miles; area, 7798 square miles. Bilaspur district forms the upper half of the basin of the River Mahanadi. It is almost enclosed on the north, west, and east by ranges of hills, while its southern boundary is generally open and accessible, well cultivated, and closely dotted with villages embedded in groups of fruit trees. The principal hills are—(1), the Maikal range, situated in the north-western extremity of the district; (2), a chain of hills forming part of the Vind- hyan range, on the north; (3), the Korba hills, an offshoot of the Vindhyas, on the eastern boundary ; and (4), the Sondkhan block of hills, in the vicinity of the Mahdnadi

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River. The Mahdnadi is the principal river of the district, and governs the whole drainage and river system of the surrounding country. It takes its rise in a mountain- ous region which is described as the wildest of all wild parts of the Central Provinces, crosses the Bildspur boundary near Seoriudrain, and after a course of 25 miles in the south-eastern extremity of the district enters Sambalpur district. Within Bilaspur the river is everywhere navigable for six months in the year. Minor rivers—the Sakri, Hamp, Tesud, Agar, Mauiari, Arpd, Kharod, Lildgar, Jonk, and Bareri. The most important affluents of the Mahanadi are the Seonath and Hasdu. Besides the natural water supply afforded by the rivers, Bilaspur abounds in tanks, — these nuinbering 7018, as shown in the settlement statistics. The census of 1872 disclosed a total population of 715,398, of whom 435,379, or 60°86 per cent., are Hindus; 7024, or '98 per cent., Mahometans ; 6 Buddhists; 37 Christians ; and 272,952, or 38°15 per cent., belong to aboriginal tribes, such as Gonds, Kanwars, Bhumias, Binjwars, Dhanwars, &c. Among the Hindus, the Chdmars and Pankas deserve particular notice. The former, who form the shoemaker and leather-dealing caste of the Hindu community, had always been held in utter contempt by the other Hindu castes. But between 1820 and 1830 a religious movement, having for its object their freedom from the trammels of caste, was inaugurated by a member of the caste, named Ghas{ Das, who preached the unity of God and the equality of men. Ghasi Das gave himself out as a messenger of God; he prohibited the adoration of idols, and enjoined the worship of the Supreme Being without any visible sign or representation. The followers of the new faith call themselves Satncmis, or the worshippers of Satnim or God. They do not keep the Hindu festivals, and they defy the contempt of the Brahmans. Ghasi Das, the founder of the faith, was their first high priest. He died in 1850; his son succeeded ~~him, but was assassinated (it was said by the Hindus), and the grandson is the present high priest. The Chamars in Bilaspur number 164,388, or 21 per cent. of the total population. The Paukas, who forni about a sixth of the population, are all Kabirpanthis, or followers of Kabir, a religious reformer of the 15th century. There is no great difference between the Kabir Pankés and the Satnamis. They both abstain from meat and liquor, marry at the age of puberty, ordinarily celebrate their ceremonies through the agency of the elders of their own caste, and bury their dead. The Pankas worship the Supreme Being under the name of Kabir, and the Chémars under the name of Satnam ; while each~~

~~community has a high priest to whom reverence is paid. At present the majority of the Pankas are culti~~ vators, though formerly all were weavers. 'The Gonds are the most numerous among the aboriginal tribes, the census of 1872 returning them at 107,359, or 15 per cent. of the total district population ; but so great an intermixture has taken place between them and the Hindu races that they have lost their language and most of their ethnical characteristics, such as the flat forehead, squat nose, pro- minent nostril, dark skin, &c., and are scarcely distin- guishable from the other classes of the Hindu labouring population. In addition to some of the Hindu deities which they worship, the Gonds have their own gods—Bara Deva and Dula Deva. The Kanwéars are the next largest section of the aboriginal population, and number 28,419 souls. The upper class among them claim to be Rajputs, and are divided into numerous septs. Although an aboriginal tribe, the census returns them as a Hindu caste. All the northern landholders of Bilaspur belong to this tribe, which consequently occupies an influential position.

Rice, wheat, pulses, oil-seeds, and cotton are the chief agricultural staples. The census of 1872 returns the total area of the district

at 7798 square miles, of which 2089 square miles are under cultiva- tion. The following is the approximate acreage under different crops :—Rice, 882,218 acres; wheat, 79,203; other food grains, 225,448; oil-seeds, 56,039; sugar-cane, 6888; cotton, 72,922 ; opium, 124; tobacco, 2317; and vegetables, 12,329; total, 1,337,483 acres, or 2089°81 square miles. Of the population, 438,880 live by agriculture, while 276,518 are non-agriculturists. The chief wealth of the district consists in its agricultural produce, and it is not inaptly termed " the land of plenty " by the Banjdrds or traders, who find here an inexhaustible store of surplus produce for export. Scarcity of food is almost unknown. Coal and iron are the minerals of the district; the former is not worked, and the latter but very slightly, the annual out-turn being reported at about 15 tons only. Sandstone, for building purposes, is quarried near Bildspur and Seorinardin. The forests produce timber, edible and medicinal roots and plants, lac and tasar-silk cocoons. Imports in 1867-68—sugar, £5274; metals and hardware,

£10,985; English piece-goods, £11,194; cattle, £9240 ; miscellaneous, £10,531 ; total, £47,224. Exports—rice (as ascertained), £8659 ; wheat, £6803 ; other edible grains, £150; cotton, £16,407; molasses, £297; oil-seeds, £18; lac, £15,603 ; miscellaneous, £5609 ; total, £53,546. Among local industries the most important is the weaving trade. It is estimated that cotton and silk cloths to the value of £95,000 are every year manufactured. The traffic routes of the district are five in number, the three most important of which are rugged and inaccessible, un- fit for wheeled carriages, admitting export or import only by means of pack-bullocks during six months of the year. The other two are simply tracks across the hills and through the jungle. The revenue divisions of the district correspond with its physical features; the hilly area, covering about 5000 square miles, is almost entirely held by large landed proprietors called Zaminddrs, who have always occupied a somewhat independent position. The open country, with an area of 3000 square miles, is known as the Khdlsd jurisdic- tion, or the tract under direct revenue management through Govern- ment officers. Pendra, Matin, Uprora, Kendé, Lapha, Chhiurt, Korba, Champa, Sakti, Bhatgdon, Bildigarh, Katangi, Pandaria, Kawarda, and Madanpur, are the 15 Zamtnddrts comprising the hilly area, of which Sakti and Kawarda have been acknowledged as feudatories. Bilaspur, Mungeli, and Seorinarain are the three par- gands in the Khdisd tract. In 1868-69, the revenues of the district were as follows :—Land-tax, £27,195; excise, £892; stamps, £2234; forest, £434 ; assessed taxes, £1222 ; total, £31,977. or the pro- tection of person and property, Government maintained in 1868-69 a regular police of 310 officers and men, at a total annual cost of £4363, besides the village watch or rural constabulary. The execu- tive staff of the district consists of the deputy-commissioner, with two assistants and several sub-collectors. Bilaspur contained, in 1868-69, 33 Government and 58 private schools, attended by 3076 pupils. Besides Bilaspur, to be separately noticed below, there are only four towns of any importance in the district :—Ratanpur, the seat of the ancient Rajas, situated at the base of the Kenda, off- shoots of the Vindhyan range, highly attractive to antiquarians and archeologists on account of its great antiquity; it is now in a dilapidated and deserted state. Population, 5111. Mungeli, a rising market-town, situated on the banks of the River Agar. Pop- ulation, 3542. Kawarda, population, 6590. Seorinarain, on the Mahanadi, a favourite residence of the Ratanpur court in former days, contains a temple of the Hindu god Narayan, from which it

derives its name. Population about 1500. The climate of the dis- trict, though relaxing, is not oppressive. Cholera occasionally breaks out in the epidemic form, being generally disseminated by the Jagannath pilgrims from Central India, whose route to Orissa lies through the district. Fever and smallpox also prevail.

The early history of the district is very obscure. From remote ages it was governed by kings of the Haihai dynasty, known as the Chhattisgarh Rajas, on account of thirty-six forts, of which they were the lords. A genealo- gical list of kings of this dynasty has been carefully kept up to the fifty-fifth representative in the year 1740, when the country was seized without a struggle by the Marhattas of Nagpur. From 1818 to 1830 Bilaspur canie under the management of the British Government, the Marhatta chief of Nagpur being then a minor. In 1854 the country finally lapsed to the British Government, the chief having died without issue. During the Sepoy mutiny a hill chief of the district gave sume trouble, but he was speedily captured and executed.

BitdAspur, the chief town of the district of the same name, is situated on the south bank of the River Arpa. It is said to have been founded by a fisherwoman, named Bildsa, three hundred years ago, and still retains her name, The place, however, came to note only about one

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hundred years ago, when a Marhattaé official took up his abode there, and began to build a fort which was never completed. In 1862 it was made the headquarters of the district, and is now a rising town. It lies in 22° 2’ N. lat. and 82° 5’ E. long) The population was estimated in 1870 at 6290, but Bilaspur is not mentioned in the census of 1872 as containing upwards of 5000 inhabitants.

BILBAO, one of the principal cities of Spain, and capital of the province to which it gives its name, is situated in 43° 14’ N. lat. and 2° 56’ W. long., in a small but beautiful and fertile valley, bounded on threc sides by mountains, about six miles from the sea, on the banks of the River Ansa,

which is also known as the Nervion, or, in Basque, as the Ibaizabal. The old town lies on the left bank, while the new town, which is by far the more important, rises on the right in handsome terraces. Communication across the river is afforded by several bridges, of which the oldest, San Antonio, is of stone, and dates from the 14th century ; the sccond was finished in 1827, the third in 1847, and the fourth, an iron structure, in 1868. The houses in the principal streets are built of hewn stone, and are several stories high, with projecting eaves that give shelter both from sun and rain. Many of the streets are very narrow, and they have an appearance of cleanliness and quiet. For a long time no carts or carriages were permitted to enter the city for fear of polluting and injuring the pavement, and the trausport of goods was carried on in trucks, The principal promenades are the Paseo del Arenal, which lies along the right bank of the river, the Campo Volantin in the same neighbourhood, and the Paseo de los Caiios, so called from its forming the roof of the great aqueduct for conveying the water of the river to the town. The public buildings comprise several churches, of which the oldest, Santiago, is of earlier date than the city itself, the town- hall, the palace of the Diputacion Provincial, an arsenal, a hospital, a theatre, and an abattoir. Of the educational institutions the most important are the Colegio General de Vizcaya, a nautical academy, and the schools supported by the board of trade for gratuitous instruction in design, architecture, languages, and mathematics. A bank of issue and discount was founded in 1857. The industrial estab- lishments include iron and steel foundries (for which the town was at one time famous), anchor-forges, potteries, glass-works, paper-mills, and a cotton factory ; and leather, sail-cloth, ropes, and tobacco are also manufactured. The exports cousist mainly of grain and flour, iron, zinc, and lead ore, wine, madder, liquorice, lamb and goat skins, chestnuts, and oil, The wool trade has ceascd for many years, and shipbuilding has greatly declined. A great stimulus was given to the import trade by the construction of the Bilbao and Tudela railway, which was completed in 1863; but the prosperity of the place is hindered by its distance from the sea. Large sums of money have been spent in improving the river, but ships of any size have to discharge at Portugalete, the average depth on the bar being 13} feet at high tides. In spite of this disadvantage, however, Bilbao ranks as one of the principal trading ports in Spain. In 1870 the total tonnage of the ships that entered was 160,952, and the value of the imports amounted to £2,075,900. There is regular steam

communication with Londonand Liverpool. Population, 17,649. Bilbao, or Belvao, was founded about 1300 by Don Pedro Lopez de Haro, and soon rose into importance. It was captured by the French in 1795, and was again held by them from 1808 to 1813. During the Carlist contest it was gallantly defended against Zumalacarregui in 1835.

BILDERDIJK, Wiitem, a modern Dutch poet, by some considered to be the most eminent that his country has produced, was born at Aimsterdam in 1756. In 1776, alter completing a wide course of study at Leyden Univer-

sity, he gained the prize from the Leyden Socicty of Art for his poem on the Influence of Poetry on States and Governments. In the following year he gained another prize for his poem Love of Fatherland, and in 1779 he translated the @dipus Tyrannus of Sophocles. In 1786 he left Holland on account of the disturbed state of public affairs, and after residing some time in Germany crossed to England, where he remained till 1806. Returning then to his uative country he was received with great favour by the new king Louis Napolcon, who made him president of the recently founded Institute of Holland. He died on the 18th December 1831. His finest poetical works are the Buitenleven, or Rural Life, a free imitation of Delille ; De Mensch, similarly taken from Pope; Die Zrekte der Geleerden, the Maladies of the Learned; Die Ondergang der eerste Wereld, the Destruction of the First World. Some of his dramatic and epic poems are also highly esteemed. His second wife, besides some original work, translated the Roderick of Southey, who was very intimate with Bilderdijk, and resided for some time with him.

BILE. See Puysionoey.

BILFINGER, Grorcz BeRNHARD, was born on the 23d January 1693, at Cannstadt in Wiirtemberg. His father was a Lutheran minister. By a singularity of constitution, hereditary in his family, Bilfinger came into the world with twelve fingers and as many toes. From his earliest years he showed the greatest inclination to learning. He studied in the schools of

Blaubeuern and Bobenhausen, and afterwards entered the theological seminary of Tiibingen. The works of Wolff, which he studied in order to learn mathematics, soon inspired him with a taste for the Wolffian philosophy and that of Leibnitz,—a passion which made him neglect for some time his other studies. Returning to theology, he wished at least to try to connect it with his favourite science of philosophy ; and iu this spirit he composed the treatise entitled Dilucida- tiones Philosophice, De Deo, Anima Humana, Mundo, &c. This work, containing nothing original, but giving an admirably clear representation of Wolff's philosophy, met with great success, and contributed to the advancement of the author, who was appointed soon after to the office of preacher at the castle of Ttbingen, and of reader in the school of theology. He soon after left for Halle, in order to attend the lectures of Wolff; and, after two ycars of study, returned to Tiibingen, where the Wolffian philosophy was not yet in favour. Je found his protectors there cooled, saw his lectures deserted, and perceived himself shunned, from the dislike of his new doctrines; his ecclesiastical views also suticred from the same cause. By the intervention of Wolff he received an invitation to Petersburg, where Peter I. wished to appoint him professor of logic and metaphysics, and member of his new academy. He was received in that city, where he arrived in 1725, with the consideration due to his abilities. The Academy of Scicnces of Paris having proposed about this time the famous problem on the cause of gravity, Bilfinger gained the prize, which was a thousand crowns. His reputation was so niuch increased by this success that he was almost immediately recalled to his native country by the Duke Eberhard Ludwig of Wiirtemberg. He quitted St Petersburg in 1731, and in 1735 the Duke Charles Alexander appointed him privy councillor. After careful preparation Bilfinger entered on the duties of his new office, and soon approved himself one of the best and most enlightened ministers that his country had yet produced. Under his wise administration the commerce, public instruction, and agriculture of Wiirtemberg flourished, and the state was raised to a position it had not before attained. Bilfinger died at Stuttgart on the 18th Feb-. ruary 1750.

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BILL 673

BILL meaus generally a statement in writing, and is derived from the Latin dala. The word is used in a great many special applications.

Brix, in Parliament, is a form of statute submitted to cither House, which, after passing both Houses and receiv- ing the royal assent, becomes an Act. The modern system of legislating by means of bill and statute appears to have been introduced in the reign of Henry VI., superseding the older mode of proceeding by petitions from the Commons, assented to by the king, and afterwards enrolled by the judges. A bill consists of a preamble, reciting the necessity for legis- Jation, and clauses which contain the enactments. The procedure with regard to bills is much the same in both Houses. Leave having been obtained, the bill is presented by the member in charge of it, and the first reading is usually allowed without opposition. At the second reading the principle of the bill is placed in issue ; the usual form of amendment is that the bill be read a second time that day three or six months, the direct rejection of bills being incompatible with the courtesy of the House. The next stage is the committee, in which the different clauses are gone through in detail by the House sitting under the presidency of a chairman of committces. Two principles inust be observed in reference to amendments :—(1), The amendment niust not be irrelevant to the subject-matter of the clause ; nor (2), must it propose to leave out all the words of the clause after the initial "That " in order that new words may beintroduced. The bill having been fully considered the committee rises, the speaker resumes the chair, and the chairman of committee reports the bill to the House, which is up to this time supposed to be ignorant of the proceedings of the committee. A bill may be referred to a select committee (the course followed with private bills) or recommitted as often as the House desires. On the third reading the judgment of the House is expressed on the entire bill as it leaves the hands of the committee ; and after the third reading the motion that the bill do pass is usually allowed without opposition. The bill is then communicated to the other House, where it passes through the same stages. Should the one House make amendments ona bill sent up by the other, the latter considers the amend- ments, and if they are not agreed to the bill is laid aside, or postponed for three or six months, or a message is sent with reasons for disagreement, or a conference

between the Houses is requested. Having' passed through both Houses the bill receives the royal assent, and therewith the "complement and perfection of a law." Bills are divided into public and private; the latter includes every bill for "the particular interest or benefit of any person or persons," whether individuals or corporations. They are brought in upon the solicitation of parties interested, and the payment of fees is an indispensable element of their progress. Occasionally there is some difficulty in assigning

_a bill to its proper class, ¢.g., in bills relating to the metro-

polis, which, on account of the magnitude of the interests involved, are sometimes treated as public bills, although having, according to the definition, a purely private character. Private bills are subject to special regulations, and in case of opposition the proceedings before the select committces assume the form of an ordinary litigation. The chairman of comimittees in the Lords, and the chairman of ways and means in the Commons, are required to watch unopposed bills. Certain bills can only originate in one or other of the two Houses, e.g., money bills in the House of Commons, and bills for the restitution of honours and blood in the House of Lords; and any bill concerning the privileges of either House should originate in the House to which it relates.

A Bitt or ExcHANGE is definedas "an uncondivional writ- ten order from A to B, directing B to pay to C a sum certain

of money therein named." A is called the drawer, B the drawee, and C the payee. When the drawer has undertaken to pay the bill lie is called the acceptor. Contrary to the general rule in the law of England the benefit of a contract arising on a bill of exchange is assignable, and consideration will be presumed unless the contrary appear. Bills of exchange are believed to have been in use in the 14th century, but the first recorded decision of an English court regarding them occurs in the reign of James I. The courts long regarded them with jealousy as an exccption to the common law, and restricted their use to theclass of merchants, but their obvious utility overcame the scruples of the judges. The law on this subject has been evolved in a long series of judicial decisions. The following are a few of its leading principles :—A bill to betransferable must containa direction to the

order of the payee or to bearer. If payable to order it mnst be transferred by endorsement; but if to bearer, it may be transferred by mere delivery. A blank endorse- ment (eg., the mere signature of the endorser) makes the bill payable to bearer; a special endorsement directs payinent to a person named, or his order. Every endorser of a bill is in effect a new drawer, and is liable to every succeeding holder in default of acceptance or payment. Just as the original drawer contracts to pay the payee, if the acceptor do not, so the endorser contracts that, if the drawer shall not pay the bill, he, on receiving due notice of the bill being dishonoured, will pay the holder what the drawee ought to have paid. An erfdorsement is held to admit " the signature and capacity of every prior party," and an endorser, in default of acceptance or payment, has a right of action against all those whose naines were on the bill when it was endorsed to him. When a bill is trans- ferred by delivery without endorsement it is generally regarded as sold, and the instrument is taken with all its risks. There are, however, some exceptions to this rule, as in the case of payment by bill for a precedent debt, &c., and the transferor will be held responsible if he knows at the time of sale that the bills are good for nothing. When a bill is payable to bearer it circulates like money, and the bona fide possessor is considered the true owner. Bills should be presented as soon as possible to the drawer or his agent for acceptance, which must be in writing on the bill. They should be presented for payment at the proper time, and the laws of commercial countries usually allow three days of grace after the day on which the bill becomes due. If the bill is not duly presented by the holder, the antecedent parties are relieved from liability. If the bill is not accepted, or after acceptance not paid, the holder must give notice of dishonour to the antecedent parties within a reasonable time, otherwise their liability will be discharged. When a foreign bill is dishonoured the custom of merchants requires that it should be protested. The protest is a solemn declaration by a notary written under a copy of the bill that payment or acceptance has been demanded and refused. Bills and notes, by the usage of trade, carry interest from the date of maturity. If in an action on a bill it turn out that the bill has been lost, the action may still be maintained provided that an indemnity is given against the claims of any other persons upon the instrument. The Act 18 and 19 Vict.c.67, gives a summary process to the plaintiff in an action on a bill of exchange or promissory note commenced within six months after the same has become due or payable. Unless the defendant has obtained leave to

appear and has appeared to the action, the plaintiff may sign final judgment for the amount with costs. The defendant, if he wishes to defend the action, must pay the money into court or show by affidavit such facts as may be sufficient to induce the judge to give him leave.

Foreign Bills (as distinguished from Inland Bills) are

bills drawn or payable abroad. By 19 and 20 Vict. c. 97, § 7, bills or notes drawn on one part and payable in any other part of the British Isles are inland bills. Foreign bills are usually drawn in sets or parts, each containing a condition to be payable only so long as the others continue unpaid.

When a bill is accepted by the drawee without considera- tion, and merely in order that the drawer may be able to raise money upon it, it is called an accommodation bill. Both parties are liable to the holder; but, as betwcen them- selves, the drawer is the principal and the acceptor a sort of surety. When acceptance has been refused and the bill protested, a stranger may accept it "supra protest, in honour of the drawer or endorser." The effect of this is to render the acceptor liable if the drawer does not pay, and the party for whose honour it was made, and parties ante- cedent to him, become liable to the acceptor. Payment for the honour of one of the parties may likewise be made by a mere stranger when a bill has been protested for non-payment, who thereupon acquires a claim against such person and all those to whom he could have resorted.

The negotiability of promissory notes and bank cheques is for the most part regulated by the same principles as bills of exchange. A promissory note is a " promise in writing to pay a specified sum at a time therein limited, to a person therein named or his order or to bearer." Cheques which are inland bills of exchange drawn on a banker have become subject to certain peculiar usages. Sec EXcHANGE.

A Bitt or LApING is a document signed by the master of a general ship and delivered to the owners of goods conveyed therein. It is usually made out in several parts or copies, of which the shipper retains one and sends one or more to the consignee, while the master keeps one for his own guidance. The following is the usual form :— Shipped in good order and well conditioned by [A. B,, merchant] in and upon the good ship called [The Good Intent], whereof [C. D.] is master for this present voyage, and now riding at anchor in the [Port of Southampton], and bound to [Cadiz in Spain, twenty cases of hardware and fifty bales of cotton goods|, being marked and numbered as in the margin, and are to be. delivered in the like good order and well conditioned at the aforesaid port [of Cadiz], the act of God, the Queen's enemies, firc, and all and every other dangers and accidents of the seas, rivers, and naviga- tions of whatever kind or nature whatsoever excepted, unto [Z. F., merchant], or to his assigns, he or they paying freight for the said goods [ ] per case, and [per bale freight, with primage and average accustomed. In witness whereof, &c. .

Every bill of lading requires a sixpenny stamp. By the mercantile law a bill of lading is a negotiable instrument, and the property in the goods may be transferred by endorsement. By 18 and 19 Vict. c. 111, every consigner of goods named on a bill of lading, and every endorser to whom the property of the goods mentioned therein passes by reason of the consignment or endorsement, shall have transferred to and invested in him all rights of suit, and be subject to the same liabilities in respect of the goods as if the contract contained in the bill of lading had been made with himself.

A Bit oF Saxe is an assignment of personal property. It is frequently made by way of security, the property re- maining in possession of the vendor. For the protection of creditors from secret or fraudulent sale, the Bills of Sale Act, 1854, and the Amendment Act, 29 and 30 Vict. c. 96, were passed. By these Acts a bill of sale of personal chattels made at any time by a defendant in an action will be void as against a plaintiff on whose behalf a writ of execution in such action shall be sued out and delivered, so far as

regards any personal chattels in defendant's possession at or after the time of executing such writ, unless such bill of sale shall be duly registered for

public inspection in the Court of Queen's Bench within twenty-one days of its date. The registration must be renewed once in every five years during the subsistence of the security.

BILL In CHANcERY. A suit in the Court of Chancery was generally commenced by a bill, addressed to the lord chancellor, containing a statement of the plaintifi's case, and praying for relief. Bythe Chanccry Amendment Act, 1862, it is enacted that 'every bill shall contain as concisely as may be, a narrative of the material facts, matters, and circumstances on which the plaintiff relies; such narrative being divided into paragraphs numbered con- secutively, and each paragraph containing as nearly as may be a separate or distinct statement or allegation ; and shall pray specifically for the relief which the plaintiff may con- ceive himself entitled to, and also for general relief." By the Judicature Act, 1873, a new form of procedure is established for all the superior courts. See ACTION. (E. R.)

BILLETING. The law as to billeting soldiers is regulated by the provisions of the Annual Mutiny Act (38 Vict. c. 7, §§ 63-67). Constables of parishes and places, police officers, high constables, and other chief officers and magistrates may billet officers and soldiers on actual service, with their horses and baggage, in victualling house, inn, hotel, livery stable, ale-housc, or the house of any seller of wine by retail to be drunk in such house, or the houses of persons selling brandy, spirits, strong waters, cider, or metheglin by retail ; but no officer or soldier shall be billeted in any private houses, or in any canteen under the authority of the War Department, nor on persons keeping taverns only being vintners of the city of London, nor on distillers, nor on shopkeepers whose principal dealing is more in other goods than in brandy and strong waters, so as such distillers and shopkeepers do not permit tippling in such houses. If the victualler has not sufficient accommodation in his own house he must find it in the immediate neighbourhood. The following sums are allowed as compensation :—For hot meal, to be supplied each day to soldiers on the march, 10d., with 23d. for a bed; for other soldiers, entitled to bed, candles, use of fire and cooking utensils, 4d. per diem for each soldier ; for ten pounds of oats, twelve of hay, and eight of straw, 1s, 9d. per diem. Military officers must not act as justices in billeting.

BILLIARDS is a well-known indoor game of skill, played on a rectangular table with ivory balls, which are driven into pockets and against each other according to certain defined rules, Of the origin of billiards compara- tively little is known,—some considering that the game was invented by the French, and others that it was improved by them out of an ancient German diversion. Even the French themselves are doubtful on this point ; for, while it is generally asserted that Henrique Devigne, an artist, who lived in.the reign of Charles IX., gave form and rule to the pastime, the Dictionnaire Universel and the Académie des Jeux ascribe its invention to the English. Bouillet in the first work says—" Billiards appear to be derived from the game of bowls. It was anciently known in England, where, perhaps, it was invented. It was brought into France by Louis XIV., whose physician recommended this exercise." In the other work quoted we read—" It would seem that the game was invented in England." Strutt, a rather doubtful authority, notwith- standing the reputation attained by his Sports and Pastimes of the People of England, considers it probable that it was the ancient game of Paille-maille on a table instead of on the ground or floor,—an improvement, he says, '" which answered two good purposes: it precluded the necessity of

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the player to kneel or stoop exceedingly when he struck the bowl, and accommodated the game to the limits of a chamber." Whatever its origin, and whatever the manner in which it was originally played, it is certain that it was common in the time of Shakespeare, who makes Cleopatra, in the absence of Antony, invite her attendant to join in the pastime—

_ " Let us to billiards : Come, Charmian."—Ant. and Cleo. Act. ii. se. 5.

Billiards was originally played, it seems, in a method even now adopted in the rustic gaine of Rural Billiards, by driving a ball through a ring which revolved on a pin or stick fixed to the table or floor. In Cotton's Compleat Gamester, published in 1674, we are told that this "most gentile, cleanly, and ingenious game" was first played in Italy, though in another page he mentions Spain as its birthplace. At that date billiards must have been well

enough known, for we are told that "for the excellency of the recreation, it is much approved of and played by most nations of Europe, especially in England, there being few towns of note therein which hath not a public billiard table, neither are they wanting in many noble and _ private families in the country." Since Cotton every compiler of books on games has had more or less to say about billiards ; though, curiously enough, Hoyle, who is often quoted as an authority, makes no mention whatever of the game. It is only in the later editions and continuations of Hoyle that billiards, bagatelle, cricket, &c., find place. It is not, indeed, till our own day that anything like a scientific treatise on billiards has appeared, or that the game itself has been lifted out of the tavern—whence, in spite of its historians' praises, it gradually descended—to its present more favoured position as a harmless and amusing indoor game.

The Table-—The shape of the table has varied from time to time, probably to suit the dimensions of the room in which it was placed. At first it was sqnare, with a hole or pocket at each corner to receive the balls driven forward with a cue or mace; then it was lengthened and provided with two other pockets; and occasionally it has been made round, oval, triangular, or octagonal, with or without pockets according to the game required. The cannon game in France is played on a pocketless table 8 feet by 4; the same game of the United States is played on a table 10 feet by 6, commonly made without pockets; but in England the regular table of the clubs and public rooms is a massive structure of timber, with a bed or surface of slate or metal 12 feet long by 6 feet wide, or two equal squares of 5 feet 104 inches across within the cushions. Tt is covered by a fine green cloth, and surrounded by elastic india-rubber cushions, at the junctions of which are netted pockets—one at each corner, and one midway at each of the longer sides. The table must be perfectly level and sufficiently firm to prevent vibration ; and its usual height from the floor to the surface is 3 feet. The space required between table and wall is at least four feet. Smaller tables for use in private houses have lately been introduced. Whether large or small, each table is provided with a baulk line and semicircle and several marks or spots to regulate the mode of play. The baulk line is drawn straight across the table 28 inches from the bottom or lower cushion, and from it is struck a semicircle of from 21 to 23 inches in diameter. In the middle of the baulk line is the baulk spot, and in the middle of the table the

centre spot. Thirteen inches from the top cushion is the red-ball spot, and half-way between the centre and the top cushion is the pyramid spot,—all these spots being on a line which, if drawn from end to end, would divide the table into two oblong halves. .

Games.—The principal games are three in number,—

billiards proper, pyramids, and pool; and from these spring a variety of others. The object of the player in each game, however, is to drive one or other of the balls into one or other of the pockets, or to cause the striker's ball to come into successive contact with two other balls. The one stroke is known as a hazard, the other as a cannon ; and from hazards and cannons, together with misses, forfeitures, and foul strokes, are reckoned the points of the game. When the ball is forced into a pocket the stroke is called a winning hazard ; when the striker's ball falls into a pocket after contact with the object ball, the stroke is a losing hazard ; and these hazards count two or three to the player's score according as they are made from the white or the red ball—two points for the white, three for the red. 'Two points are scored for the cannon, three for a coup —a term used when the player's ball runs into a pocket without striking a ball; and one point for a miss, whether given purposely or accidentally. These strokes are all made with a cue, which is a long stick of ash, or other hard wood, gradually tapering to the end, which is tipped with leather and rubbed with chalk to prevent it slipping off the surface of the ball struck. The mace or hammer-headed cue, ouce common, is no longer used, even by ladies. The cue is taken in the right hand, generally between the fingers and thumb, and not grasped in the palm; and with the left hand the player makes a bridge, by resting the wrist and the tips of the fingers on the table, arching the latter, and extending the thumb in such a way as to allow a passage in which the cue may slide. The player then proceeds with his game, according to the following rules :—

Billiards proper, or the English game, consists of winning and losing hazards, cannons, and forfeitures. It isusually played 50 or 100 points, reckoned as already explained, three for each red hazard, two for each white hazard, and two for each cannon. Public matches between adepts are played 100, 500, or 1000 up, but the rules which govern them are the same. The remarks within brackets are ex- planatory.—1. The game of billiards

proper commences by stringing for the lead and choice of balls. [The players standing behind the baulk line, strike each a ball from the semicircle up to the top cushion, and he whose ball on its return stops nearest the bottom cushion has the choice of lead and balls.] 2. The red ball is placed on the spot at the commencement of the game, and replaced when it is pocketed or forced over the table. [“ Breaking the balls” is the replacing them as at the beginning of a game. The balls are said to be “ broken” when the first player has struck the red or given a miss ; and the player’s ball when off the table is said to be ‘fin hand.”] 8. The player who makes one stroke ina game must finish that game or consent to lose it. [lntended to meet cases of dispute.] 4. In the case of foul strokes, the adversary has the option of either allowing the striker to proceed, of having the ball replaced, or of breaking the balls. No score can be reckoned for a foul stroke. [The following are foul strokes If the player move a ball in the act of striking ; if he play with the wrong ball ; if he touch a ball twice in making a stroke ; if he play at a ball while itis running ; if he touch a ball with his hand, cue, or person, otherwise than is necessary for the stroke; if he in any way touch his oppo- nent’s ball.] 5. If the adversary neglect to observe or to claim a foul stroke, the player proceeds with his game, and all the points he makes are marked. 6. If a ball spring from the table and hit a bystander, go as to prevent it falling to the floor, it is considered off the table. [The penalty in such a case is that the othcr player goes on, or if the ball has not struck another ball before flying off the table, the loss of threc points, as for a coup.] 7. Balls lying within the baulk line cannot be played at with a ball in hand, ex- cept the player whose ball is in hand first play at a cushion beyond or outside the baulk line. 8. A line-ball cannot be played at by the striker whose ball is in hand, other than by playing his ball out of baulk against a cushion. [A line-ball is when the centre of the ball’s surface lies exactly on the line across the table. The marker or umpire must decide as to whether such ball is within or without the line.] 9. A ball in hand striking a ball in baulk with- out having been first played out of baulk, must be replaced and played over again. 10. All misses must be given with the point of the cue. [This rule is sometimes neglected, and the player allowed to give his miss with the butt end of his cue.] 11. Should the spot be occupied so that the red ball cannot be placed on it after being pocketed, it must be placed on the centre spot, or, if that also be occupied, on the

pyramid spot. [In some clubs the custom is to place the red ball on the centre spot, or on the baulk line spot, ac-

cording to agreement.] 12. No points are reckoned for a ball or balls forced off the table after contact with the object-ball, and the adversary goes on without breaking the balls. 13. If the balls be changed in the course of play, no cannon or hazard made with such changed bali can be scored ; the balls must be broken, and all points made with the wrong ball deducted from the striker's score. [ln such case, however, the adversary has the privilege of playing with the changed ball, of re-changing the balls and playing on from their respective positions, or of having the balls broken.] 14. The player whose ball is in hand cannot score, unless he play his ball out of Laulk before striking the objcct-ball. [ln such case the stroke must vs re-made.] 15. If in drawing back his cue from a ball on the brink of a pocket the striker hole his ball, he loses three points, as fora coup. 16. A ball accidentally moved by the marker or a looker-on must be replaced. 17. A ball wilfully removed or obstructed in its course causes the loss of the offender's game. 18. If the striker's ball lie touching his opponent's ball, or the red ball, no score on that side can follow. [After the stroke the next player proceeds with his game, either by breaking the balls, or playing from the spot where his ball stopped. When balls touch, the player may either run into a pocket, or play on toa third ball; then the red is spotted and the adversary plays on from baulk; or if the first player fail to do either, the balls remain as they fall, and the other goes on.]

These, with the exception of some remarks about the conduct of strangers, the payment of wagers, and so on, are the rules by which the English game of billiards is universally governed. The principal modifications of this game are the four-handed game, which is ordinary billiards by four players in sides of two, each player being allowed to instruct his partner; & la royale, or the game of three ; the white winning game, consisting entirely of winning hazards ; the white losing game; the red winning game ; the red losing game; the cannon game; and the American game. This last is played with four balls, two white and two coloured, and consists entirely of winning hazards and cannons. There is also a Russian game, called carline

or caroline, not unlike American billiards; a German game, Waurst-partie, in which a certain number of balls are placed in a row across the table; the Spanish, or skittle game, which the Germans call Kugel-partie ; and French billiards or the cannon game formerly universal on the Continent, and now very popular in the United States, where the best players are Frenchmen or men of French ex- traction. Of these games, however, it is unnecessary to speak, as they are all much inferior to billiards, and can be easily played by any one familiar with the established English game. The lesser varieties of billiards—choice of balls, in which each player selects the ball he plays with ; bricole, in which the player strikes his ball against a cushion and endeavours to reach his opponent's ball from the rebound ; bar-hole, so called from a pocket or pockets being barred or stopped for one of the players; one pocket to five; winning against losing ; the nomination game, which is ordinary billiards, in which the player is obliged to name his stroke before attempting it, and failing to make it gains nothing, or gives unnamed cannons and hazards to his opponent; the commanding game ; the go-back game, which is played by an adept against a tyro, the latter scoring all he makes and the former going back to nothing every time his adversary makes a winning or losing hazard ;—all these are so barren of interest and so seldom played as barely to deserve mention.

As to the science of the game, there is really little to be taught in books ; practice and instruction from an adept will better enlighten a tyro as to the mysteries of the side- stroke, the drag, the screw, the following ball, the spot- stroke, &c., than any amount of verbal explanation. It may, however, be as well to refer briefly to these several points, in order to render this notice as complete as the Space at command will admit.

'The side-stroke is made by striking the object-ball on the side with the point of the cue. The effect of such a mode of striking the

hall is to make it travel to the right or to the left, according as it 1s struck with a winding or slightly circular motion; and its pur-

pose is to cause tke ball to proceed in a direction more or less slant- ing than is usual, or ordinary, when the ball is struck in or about the centre of its circumference. Many hazards and cannons, quite imnpossible to be made with the central stroke, are accomplished with ease and certainty by the side-stroke. In the hands of a dex- terous player this stroke is both elegant and effective. The screw, or twist, is made by striking the ball low down, with a sharp, sud- den blow. According as the ball is struck nearer and ncarer to the cushion, it stops dead at the point of concussion with the object- ball, or recoils by a series of reverse revolutions, in the manner familiar to the schoolboy in throwing forward a hoop, and causing it to return to his hand by the twist given to its first impetus. The following-ball is made by striking the bali high, with a flowing or following motion of the cue. Just as the low-stroke impedes the motion of the ball, the follow expedites it.. In the drag the ball is struck low without the sudden jerk of the screw, and with less than the onward push of the follow. The spot-stroke is a winning hazard made by pocketing the red ball in one of the corners from the spot. The great art is, first, to make sure of the hazard, and next, to leave the striking ball in such a position as to enable the player to make a similar stroke in one or other of the corner pockets. To such perfection has the spot-stroke been brought, that the winning hazard has been repeated more than two hundred and fifty times consecutively. W. Cook, the finest of English players, on November 29, 1873, in a game with the ex-champion, Joseph

Bennett, made a break of 936, the longest on record. In this great performance Cook made, in all, no fewer than 292 spot-hazards, 260 of which were made consecutively. John Roberts, jun., of Manchester, has also made an extraordinary break, 800, the majority by the spot- stroke. Without the spot-hazard, the longest break hitherto made is probably less than 200. ale

The perfection of billiards is to be found in the nice combination of the various strokes, in such fashion as to leave the balls ina favourable position after each individual hazard and cannon ; and this perfection can only be attained by the most coustant and un- remitting practice. ,

Pyramids is played by two or four persons—in the latter case in sides, two and two. It is played with fifteen balls, placed close together in the form of a triangle or pyramid, with the apex towards the player, and a white striking ball. The centre of the apex ball covers the second or pyramid spot, and the balls forming the pyramid should lie in a compact mass, the base in a straight line with the cushion.

Pyramids is a game entirely of winning hazards, and he who suc- ceeds in pocketing the greatest number of balls wins. Usually the pyramid is made of fifteen red or coloured balls, with the striking ball white. This white ball is common to both players. Having decided on the lead, the first player, placing his ball in the baulk- semicircle, strikes it up to the pyramid, with a view either to lodge a ball in a pocket or to get the white safely back into baulk. Should he fail to pocket a red ball, the other player goes on and strikes the white ball from the place at which it stopped. When either succeeds in making a winning hazard, he plays at any other ball he chooses, and continues his break till he ceases to score; and so the game is continued by alternate breaks until the last red ball is pocketed. The game is commonly played for a stake upon the whole, and a proportionate sum upon each ball or life,—as, for instance, 3s. game and Is. balls. The player wins a life by pocket- ing a red ball or forcing it over the table ; and loses a life by run- ning his own, the white, ball into a pocket, missing the red balls, or intentionally giving a miss. In this game the baulk is no pro- tection ; that is to say, the player can pockct any ball wherever it lies, either within or without the baulk line, and whether the white be in hand or not. This liberty

is a great and certain advantage under many circumstances, especially in the hands of a good player. It is not a very uncommon occurrence for an adept to pocket six or eight balls in a single break. Both Cook and Roberts have been known, indeed, to pocket the whole fifteen. If four persons play at pyramids, the rotation is decided by chance, and each plays alternately,—partners, as in billiards, being allowed to advise each other, each going on and continuing to play as long as he can, and ceasing when he misses a hazard. Foul strokes are reckoned as in billiards, except as regards balls touching each other. If two balls touch, the player proceeds with his game and scores a point for every Winning hazard. When all the red balls but one are pocketed, he who made the last hazard plays with the white and his opponent with the red ; and so on alternately, till the game terminates by the holeing of one or other ball. The pyramid balls are usually a little snialler than the billiard balls; the former are about 2 inches in diameter, the latter 2,4, inches to 24 inches.

Losing Pyramids, seldom played, is the reverse of the last-named game, and consists of losing hazards, each player using the same striking ball, and taking a ball from the pyramid for every losing

hazard. As iu the other game, the baulk is uo protection. Another variety of pyramids is known as Shell-out, a game at which any number of persons may play. The pyramid is formed as before, and the company play in rotation. For each winning hazard the striker receives from each player a small stake, and for each losing hazard he pays a like sum, till the game is concluded by pocketing the white or the last coloured ball.

Pool, a game which may be played by two or more persons, consists entirely of winning hazards. ach player subscribes a certain stake to form the pool, and at starting has three chances or lives. He is then provided with a coloured or numbered ball, and the game commences thus :— The white ball is placed on the spot and the red is played at it from the haulk semicircle. If the player pocket the white he receives the price of a life from the owner of the white; but if he fail, the next player, the yellow, plays on the red; and so on alternately till all have played, or till a ball be pocketed.

When a ball is pocketed the striker plays on the ball nearest his own, and goes on playing as long as he can score.

The oruer of play is usually as follows :—The white ball is spotted ; red plays upon white; yellow upon red; then blue, brown, green, black, and spot-white follow in the order of succession nained, white playing on spot-white. The order is similar for a larger number, but it is not common for more than seven or eight to join in a pool. The player wins a life for every ball pocketed, and receives the suin agreed on for each life from tlie owner of that ball. He Zoses a life to the owner of the ball he plays on and misses ; or by making a losing hazard after striking such ball; by playing at the wrong ball; by running a coup; or by forcing his ball over the table. Rules governing the game provide for many other incidents. A ballin baulk may be played at by the striker whose ball is in his hand. If the striker's ball be angled—that is, so placed in the jaws of the pocket as not to allow him to strike the previously-played ball—he may have all the balls except his own and the object ball removed from the table to allow him to try bricole froin the cushion. In some clubs and public rooms an angled ball is allowed to be moved au inch or two from the corner; but with a ball so removed the player must uot takea life. When the striker loses a life, the next in rota- tion plays at the ball nearest his own ; but if the player's ball happen to be in hand, he plays at the ball nearest to the centre spot on the baulk line, whetherit bein oroutof baulk. In sucha case the striker cin play from any part of thesemicircle. Any ball lying in the way of the striker's ball, and preventing him from taking fair aiin and reaching the object-ball, must be removed, and replaced after the stroke. If there be any doubt as to the nearest ball, the distance must be measured by the marker or umpire ; and if the distance be equal, the ball to be played upon must be decided by chance. If the striker first pocket the ball he plays on and then runs his own into a pocket, he loses a life to the player whose ball he pocketed, which ball is then to be considered in hand. The first player who loses all his three lives can "star;" that is, by paying into the pool a sum equal to his original stake, lie is entitled to as many lives as the lowest number on the marking board. Thus if the lowest number be two, he stars two; if one, he stars one. Only one star is allowed in a-pool ; and when there are only two players left in, no star can be purchased. The price of cach life must be paid by the player losing it, immediately after the stroke is made; and the stake or pool

is finally won by the player who remains longest in the game. In the event, however, of the two players last left in the pool having an equal number of lives, they may either play for the whole or divide the stake. The latter, the usnal course, is fol- lowed except when the combatants agree to play out the game. When three players are left, each with one life, and the striker mikes a miss, the two remaining divide the pool without a stroke— this rule being intended to meet the possible case of two players combining to take advantage of a third. When the striker has to play, he may ask which ball he has to play at, and if being wrongly informed he play at the wrong ball, he does not lose a life. In clubs and public rooms it is usual for the marker to call the order and rotation of play : " Red upon white, and yellow's your player ;" and when a ball has been pocketed, the fact is notified—" Brown upon blue, and green's your player, in hand ;"' and so on till there are only two or threc players left in the pool.

There are some varieties of the game which need brief mention.

Single Pool is the white winning hazard game, played for a stake and so much for each of three or more lives. Each person has a ball, usually white and spot-white. The white is spotted, and the other plays on it from the baulk semicircle ; and then each plays alternately, spotting his ball after making a hazard. For each winning hazard the striker receives a life; for each losing hazard he pays a Jife ; and the taker of the three lives wins the game. No star is allowed in single povl. The rules regulating pool are observed.

Nearest Ball Pool is played by any number of persons with the ordinary coloured balls, and in the same order of succession. All the rules of pool are followed, except that the baulk zs a protection. The white is spotted, and the red plays on it; after that each striker plays upon the ball nearest the upper or outer side of the baulk line; bat if all the balls lie within the baulk line, and the striker's ball be in hand, he must play up to the top cushion, or place his ball on the spot. If his ball be not in hand, he plays at the nearest ball, wherever it may lie.

Black or Everlasting Pool is played by any number of persons in the ordinary way, except that the game is for lives only, without a subscribed stake. After the coloured balls are distributed a black ball is placed on the

centre spot. At this the first striker plays. Any player, having pocketed a coloured ball, may play at the black ; and if he succeed in holing it, he receives not only the life he took from the coloured ball, but the value of a life from eacli player. On the coutrary, if he make a losing hazard off the black ball, miss it, or force his own ball off the table, le pays a life to each player. No ball can be removed to allow the striker to play on the black, but the latter may be removed to allow the striker to play at the proper object-ball. Any person may join the pool at any time, but cannot play in that round; and he may, on giving notice of his intention, retire at the end of a clear round, until which time his ball reinains on the table, and stands its chance witli the rest. The price per life is determined, as in the other pool games, previously to commencing; and it is usual for the marker or leader of the game to notify the conclusion of each clear round.

Skittle Pool is played by any number of persons with three balls, a red and two white, and twelve skittles—ten of which are white, and two black. The skittles and balls are arranged, according to a set design, on the table, and the game is played for small stakes deter- mined by the number of skittles knocked over, after striking at a ball. It is an amusing, but unscientific game, encumbered with rules which cannot be understood without a diagram.

Penny Pot is the last of the pool games needing notice. It is played as ordinary pool, with the same order of rotation, by any number of players. Instead, however, of subscribing for a pool, and confining each player to three lives, there is no subscribed stake, and the players play on as long as they like, a penny being paid by the owner to the taker of each life; winning hazards re- ceiving, and losing hazards, misses, and coups paying ; each player proceeding in turn as in regular pool.

Much inight be written on the scientific principles of the side- stroke, the angles of incidence and reflection, &c.; but the theories advanced on these topics would lead us farther into the region of mathematics than is necessary for a description of the several games played on the billiard table. The scientific features of billiards are discussed at more or less length in several of the following works :— Practical Treatise on the Game of Billiards, by E. White, 1807 (this was partly a translation of a French

treatise, published in 1805, and partly a compilation from the article in the Académie Universelle des Jeux, issued in the same year, and since frequently re-edited anil reprinted) ; Le Musée des Jeux, Paris, 1820; The Noble Game of Billiards, by Monsieur Mingaud, Paris, 1834; a translation of the same, by John Thurston, London, 1835; Kentfield on Billiards, London, 1839, founded principally on the foregoing works ; Bil- liards, Game 500 wp, by Edward Russell Mardon, London, 1849 ; Turner On Billiards, a series of diagrams with instructions, Not- tingham, 1849; The Billiard Book, by Captain Crawley, London, 1866-75; Roberts On Billiards, 1868 ; Practical Billiards, by Fred. Hardy, edited by W. Dufton, 1867 ; Billiards, by Joseph Bennett, ex-champion, 1873. There are besides numerous handbooks of more or less value. (Gh 18, 1)

BILLITON, or Burtone, an island of the East Indies, belonging to the Dutch, situated between Sumatra and Borneo, in lat. 3° 8. and long. 108° E. It is of a circular form, about 50 miles in length by 45 in breadth ; and has an area, according to Melvill van Carnbée, of 2500 square miles. The weather is subject to rapid changes; but the usual temperature varies from 80° to 87° Fahr. The nights are very cool. The surface in the north is hilly, —Tadjem, the highest peak, being 3280 feet in height. The sea-coast is inaccessible and surrounded with rocks, and the best harbour is still that at the chief town of Tandjong Padan. The navigation between the island and Borneo is very dangerous. Horses, buffaloes, cattle, sheep and goats, ducks, geese, fowls, and pigeons are the domestic animals of Billiton ; and among its wild animals are deer, goats, jackals, monkeys, civet-cats, tiger-cats, and porcupines. The seas furnish a superabundance of fish. On the rocks along the coast are found tortoises, trepang, and edible birds'-nests, which are articles of export, The forests supply wood of

different kinds for shipbuilding, in which the inhabitants are very expert. There are important mines both of iron and tin, the former being used in the island and the latter exported to the Netherlands. The quantity of tin obtained in 1871 was 49,850 picols, or 60,532 cwts. The chief im- ports are rice, cotton goods, pottery, and cocoa-nuts. The population in 1871 amounted to 19,837, of whom only 59 were Europeans. The natives are of

middle height and strongly built, and have expressive features. The island was formerly under the sultan of Palembang, by whom it was ceded to the English in 1812. As no mention was made of it in the treaty between the English and Dutch in 1814, the former at first refused to renounce their possession, and only recognized the Dutch claim in 1824. Till 1852 it was deperdent on Banka, but at that date was raised to a sub-residency.

See Tijdschrift v. Nederl. Indié, vols. xii. and xv.; Court's Relations of Brit. Gov. with the State of Palembang, 1821 ; Crooc-

kewit, Banka, Malakka, en Billiton, 1852; Veth, Woordenbock van WNederl. Indié, 1869.

BILMA, or Kawar, a town in the heart of the African desert, and the capital of the wandering tribe called the Tibboos. The place is mean and poor, surrounded with a mud wall. In its vicinity are a number of lakes, the waters of which, on evaporation by the heat of the sun, yield a quantity of very pure and fine salt, which is the object of an extensive and important trade with the countries in Central Africa. The largest of these lakes is at Agram, situated about four miles to the westward. Near Bilma is a small circular spot, kept green by a fine spring, but immediately to the south begins the most dreary part of the African desert, over which the caravans travel for fifteen days

without discovering the slightest trace of vegetable life.

During Nachtigal's visit in 1870 the temperature during the day rarely sank below 113° Fahr.

BILSA, a town of Hindustdn, in the territory of Gwalior or the possessions of Sindhid, situated on the Betwé River in lat. 23° 30' N. and long. 77°50' E. It is enclosed with a stone wall, and defended by'square towers and a ditch. The suburbs without the walls are not very extensive, but the streets are spacious, and contain some good houses. The town and the surrounding country are celebrated all over India for the excellent quality of the tobacco, which is bought up with great eagerness and exported. Population about 8000. Distance south from Gwalior, 190 miles.

BILSTON, formerly Bitsreron, a market-town of Eng- land, in the county of Stafford, 24 miles S.E. of Wolver- hampton, indebted for its importance to the iron trade, which it carries on in various departments. In the vicinity are very productive mines of coal and ironstone, as well as sand of the finest quality for casting, and grinding- stones for cutlers. Bilston contains numerous furnaces, forges, rolling and slitting mills for the preparation of iron, and a great variety of factories for japanned and painted goods, brass-work, bells, and similar articles. The town itself is very irregularly built ; but it has some handsome buildings, as St Leonard's and St Mary's chapels, and the Roman Catholic chapel. The population of township, which is under an improvements commission, and forms part of the parliamentary borough of Wolverhampton, was, in 1871, 24,188.

BINGEN, the ancient Bingium, a town of the grand- duchy of Hesse-Darmstadt, in the province of Rhenish Hesse, 15 miles W. of Mentz. It is situated almost opposite Riidesheim, on the left bank of the Rhine, at the conuuence of the Nahe (or Nava), which is crossed near its mouth by an iron railway bridge resting' on old Roman foundations. A considerable trade is carried on in wine, grain, and cattle; and tobacco, starch, and leather are manufactured, A short way down the Rhine is the

Bingerloch, a famous'whirlpool, the dangers of which were almost removed by blastings undertaken by the Prussian Government in 1834; while about half-way between it and the town rises on a rock, in the middle of the stream, the tower of Bishop Hatto. Ona height immediately to the south-east is the ruined castle of Klopp, originally founded by Drusus, and higher still on the Rochusberg the celebrated chapel of St Roch. Population in 1871, 5938.

BINGHAM, Josepu, a learned scholar and divine, was born at Wakefield in Yorkshire, in September 1668. He was educated at University College, Oxford, of which he was made fellow in 1689, and college tutor in 1691. A sermon preached by him from the university pulpit, St Mary's, on the meaning of the word " Person" in the Fathers, brought upon him a most unjust accusation of heresy. He was compelled to give up his fellowship and leave the university; but he was immediately presented by Dr Jolin

Radcliffe to the rectory of Headbournworthy, near Winchester. In this country retirement be began his laborious and valuable work entitled Origines Ecclesiastice, or Antiquities of the Christian Church, the first volume of which appeared in 1708 and the tenth in 1722. Notwith- standing his learning and merit, Bingham received no higher preferment than that of Headbournworthy till the year 1712, when he was collated to the rectory of Havant, near Portsmouth, by Sir Jonathan Trelawney, bishop of Win- chester. Nearly all his little property was lost in the great South Sea bubble of 1720. He died August 17, 1723.

BINGLEY, a thriving market-town in the West Riding of Yorkshire, on the River Aire, 54 miles from Bradford, on the Midland Railway. The inhabitants are principally engaged in manufactures of worsted, cotton, paper, and iron. The town is well built, and has a neat church, a grammar school, aud several charities. The population of the Local Board District, which includes a part of Mickle- thwaite, was 9062 in 187].

BINNEY, Tuomas, an English Nonconformist divine, was born at Newcastle-on-Tyne in 1798, and died February 24, 1874. After spending seven years in the employment of a bookseller he entered the theological college of Wym- ondley, Herts, with the view of studying for the ministry. His first pastoral charge was that of the Congregational church at Newport, Isle of Wight, to which he was in- ducted in 1824. five years later—in 1829 —he accepted a call to the historic Weigh House chapel, London. Here he at once established what proved to be a lasting popu- larity, and it was found necessary to build a much larger place of worship on Fish Street Hill, to which the congre- gation removed in 1834. Au address delivered on the occa- sion of the laying of the foundation stone of the new building was afterwards published, with an appendix containing a strongly worded opinion as to the baneful influence of the Church of England, which naturally gave rise to much angry comment and a prolonged and bitter controversy. Throughout his whole career Binney was a vigorous and intelligent opponent of the state church principle, but those who inferred from one, perhaps unguarded, statement that he was a narrow-minded political dissenter did him injus- tice. His liberality of view and breadth of ecclesiastical sympathy entitle him to rank on questions of Nonconformity among the most distinguished of the school of Richard Baxter. Accordingly,

in his later years he was not only recognized by. general consent as the foremost name among all sections of English Nonconformists, but maintained friendly relations with many of the leading dignitaries of the Established Church. He continued in the active dis- charge of the duties of the ministry, though latterly with the help of a colleague, until 1871, when he resigned. In 1845 he paid a visit to Canada and the United States, and in 1857 he set out on a tour to the Australian

Scopo of Biology.

The pro- perties of living matter.

BIN—

colonies, which extended over a period of two years. Though he not infrequently fell markedly below: his own standard of excellence, Binney excrcised an influence as a preacher, especially with young men, such as few have wielded for so long a period. A manly, vigorous intellect, fearless independence of judgment, a lively imagination, showing itself chiefly in frequent flashes of happy illustra- tion, a keen, sarcastic humour chastened but of deliberate purpose not altogether repressed, a direct forcible style, a commanding presence, and a pleasant musical voice suffi- ciently account for his popularity. He was the pioncer in a much needed improvement of the forms of service in Nonconformist churches, and gave a special impulse to con- gregational psalmody by the publication of a book entitled The Service of Song in the House of the Lord. Of numerous other works the best known is his Js it Possible to Make the Best of Both Worlds? an expansion of a lecture delivercd to young men in Exeter Hall, which attained a circulation of 30,000 copies within a year of its publication. A very happy specimen of his peculiar powers as an author is his Money, a Popular Haposition in Rough Notes (1864), which also had a large circulation,

BINTANG, one of the islands which mark the south side of the Strait of Singapore. The latter is the exit towards China and Siam of the' great channel which we call the Straits of Malacca. Bintang lies between 104° 13'

and 104° 40’ E. long., with a central latitude of 0° 52’ N. It has an area of about 440 square miles, and is surrounded by mauy rocks and small islands, making navigation dangerous. The soil is not fertile, and much of it is swampy. ‘The chief product is gambir, of which upwards of 4000 tons are annually exported, with pepper and some other spices and fruits. The island is a good deal visited by Malay and Chinese traders. The highest hill in it is 1385 feet high, and there are five rivers, but these navi- gable only by small boats.

Bintang is mentioned by Marco Polo under the name of Pentam, which is not far from the genuine Malay name Bentdn, said to mean a half-moon, and to apply properly to the mountain just mentioned. The name appears on a medieval Javanese inscription, as that of one of the numerous kingdoms conquered by the sovereigns reigning at Majapahit, in Java.

After the Portuguese conquest of Malacca (1511), the expelled Mahometan dynasty took up its residence on Bintang, where it long cherished pirates. The island still belongs nominally to the repre- sentative of these kings of Malacca, whom we usually style the sul- tan of Johdér, the Dutch the sultan of Lingen. Supremacy is, how- ever, claimed ‘and exercised by the Dutch, whose port of Rhio or Rioww, founded as a rival to Singapore, stands on a small island off the western coast of Bintang. :

Bintang, regarded as the residence of the expelled sultans of Malacca, is the Bintaéo whereof Camoens speaks as the persistent foe of Portuguese Malacca —

“ No reino de Bintdo,.que tantos danos Teré a Malaca muito tempo feitos.”*

BIOLOGY

HE Biological sciences are those which deal with the phenomena manifested by living matter ; and though it is customary and convenient to group apart such of these phenomena as are termed mental, and such of them as are exhibited by men in society, under the heads of Psychology and Sociology, yet it must be allowed that no natural boundary separates the subject matter of the latter scicnces from that of Biology. Psychology is

inseparably linked with Physiology; and the phases of social life exhibited by animals other than man, which sometimes curiously fore- shadow human policy, fall strictly within the province of the biologist.

On the other hand, the biological sciences are sharply marked off from the abiological, or those which treat of the phenomena manifested by not-living matter, in so far as the properties of living matter distinguish it absolutely from all other kinds of things, and as the present state of knowledge furnishes us with no link between the living and the not-living.

These distinctive properties of living matter are—

1. Its chemical composition—containing, as it invariably does, one or more forms of a complex compound of carbon, hydrogen, oxygen, and nitrogen, the so-called protein (which has never yet been obtained except as a product of living bodies) united with a large proportion of water, and forming the chief constituent of a substance which, in its primary unmodified state, is known as protoplasm.

2. Its uniwersal disintegration and waste by oxidation ; and its concomitant remtegration by the intus-susception of new matter.

A process of waste resulting from the decomposition of the molecules of the protoplasm, in virtue of which they break up into more highly oxidated products, which cease to form any part of the living body, is a constant con-comitant of life. There is reason to believe that carbonic acid is always one of these waste products, while the others contain the remainder of the carbon, the nitrogen, the hydrogen, and the other elements which may enter into the composition of the protoplasm.

‘fhe new matter taken in to make good this constant

loss is either a ready-formed protoplasmic material, supplied

| by some other living being, or it consists of the elements of protoplasm, united together in simpler combinations, which consequently have to be built up into protoplasm by the agency of the living matter itself. In either case, the addition of molecules to those which already existed takes place,

not at the surface of the living mass, but by interposition between the existing molecules of the latter. If the processes of disintegration and of reconstruction which characterize life balance one another, the size of the mass of living matter remains stationary, while, if the re- constructive process is the more rapid, the living body grows. But the increase of size which constitutes growth is the result of a process of molecular intus-susception, and there- fore differs altogether from the process of growth by accre-

| tion, which may be observed in crystals and is effected purely by the external addition of new matter—so that, in the well-known aphorism of Linnzus, the word " grow,"

| as applied to stones, signifies a totally different process from

| what is called " growth" in plants and animals,

| 3. Its tendency to undergo cyclical changes.

| In the ordinary course of nature, all living matter pro- ceeds from pre-existing living matter, a portion of the latter being detached and acquiring an independent existence. The new form takes on the characters of that from which it arose; exhibits the same power of propagating itself by means of an offshoot ; and, sooner or later, like its pre— decessor, ceases to live, and is resolved into more highly oxidated compounds of its elements.

Thus an individual living body is not only constantly changing its substance, but its size and form are under- going continual modifications, the end of which is the death and decay of that individual; the continuation of the kind being secured by the detachment of portions which tend to run through the same cycle of forms as the parent. No fornis of matter which are either not living, or have nof been derived from living matter, exhibit these three pro- perties, nor any approach to the remarkable phenomena defined under the sccond and third heads. But in addi-

| tion to these distinctive characters, living matter has some

ditional by temperature.

other peculiarities, the chief of which are the dependence of all its activities upon moisture and upon heat, within a limited range of temperature, and the fact that it usually possesses a certain structure, or organization.

As has been said, a large proportion of water enters into

ditioned by the composition of all living matter; a certain amount of

drying arrests vital activity, and the complete abstraction of this water is absolutely incompatible with either actual or potential life. But many of the simpler forms of life may undergo desiccation to such an extent as to arrest their vital manifestations and convert them into the semblance of not-living matter, and yet remain potentially alive. That is to say, on being duly moistened they return to life again. And this revivification may take place after months, or even years, of arrested life.

The properties of living matter are intimately related to Not only does exposure to heat sufficient to decompose protein matter destroy life, by demolishing the molecular structure upon which life depends; but all vital activity, all phenomena of nutritive growth, movement, and reproduction are possible only between certain limits of temperature. As the temperature approaches these limits the manifestations of life vanish, though they may be recovered by return to the normal conditions; but if it pass far beyond these limits, death takes place.

This much is clear; but it is not easy to say exactly what the limits of temperature are, as they appear to vary in part with the kind of living matter, and in part with the conditions of moisture which obtain along with the temperature. The conditions of life are so complex in the higher organisms, that the experimental investigation of this question can be satisfactorily attempted only in the lowest and simplest forms. It appears that, in the dry state, these are able to bear far greater extremes both of heat and cold than in the moist condition, Thus Pasteur found that the spores of fungi, when dry, could be exposed without destruction to a temperature of 120°-125° C. (248°-257° Fahr.), while the same spores, when moist, were all killed by exposure to 100° C. (212° Fahr.) Ou the

other hand, Cagniard de la Tour found that dry yeast might be exposed to the extremely low temperature of solid carbonic acid (—60° C. or —76° Fahr.) without being killed. In the moist state he found that it might be frozen and cooled to — 5° C, (23° Fahr.), but that it was killed by lower temperatures. How- ever, it is very desirable that these experiments should be repeated, for Cohn's careful observations on Bacteria show that, though they fall into a state of torpidity, and, like yeast, lose all their powers of exciting fer- mentation at, or near, the freezing point of water, they are not killed by exposure for five hours to a temperature below — 10° C. (14° Fahr.), and, for some time, sinking to 18°C. (—0°4 Fahr.) Specimens of Spiridlwm volutans, which had been cooled to this extent, began to move about some little time after the ice containing them thawed. But Cohn remarks that Huglenw, which were frozen along with them, were all killed and disorganised, and that the same fate had befallen the higher Jxfusoria and otifera, with the exception of some encysted Vortv- cell, in which the rhythmical movements of the contrac- tile vesicle showed that life was preserved.

Thus it would appear that the resistance of living matter to cold depends greatly on the special form of that matter, and that the limit of the Huglena, simple organism as it is, is much higher than that of the Bacterium,

Considerations of this kind throw some light upon the apparently anomalous conditions under which many of the lower plants, such as Protococcus and the Diatomacew, and some of the lower animals, such as the Radiolaria, are observed to flourish. Protococcus has been found, not only

on the snows of great heights in temperate latitudes, but covering extensive areas of ice and snow in the Arctic regions, where it must be exposed to extremely low tem- peratures,—in the latter case for many months together ; while the Arctic and Autarctic seas swarm with Diatomacee and Iadiolaria. It is on the Diatomacew, as Hooker has well shown, that all surface life in these regions ultimately depends ; and their enornious multitudes prove that their rate of multiplication is adequate to meet the demands made upon thein, and is not seriously impeded by the low

temperature of the waters, never much above the freezing point, in which they habitually live.

The maximum limit of heat which living matter can resist is no less variable than its minimum limit. Kiihne found that marine Amohe were killed when the tempera- ture reached 35° C, (95° Fahr.), while this was not the case with fresh-water Amebce, which survived a heat of 5°, or even 10°, C. higher, And Actinophrys Lichornii was not killed until the temperature rose to 44° or 45° ©. Didymium serpula is killed at 35° C.; while another Myxomycete, dithalium septicum, succumbs only at 40° C,

Cohn ("Untersuchungen iiber Bacterien," Beitrdige zur Biologie der Pflanzen, Heft 2, 1872) has given the results of a series of experiments conducted with the view of ascertaining the temperature at which Bacteria are de- stroyed, when living in a fluid of definite chemical com- position, and free from all such complications as must arise from the inequalities of physical condition when solid particles other than the Bacteria co-exist with them. The fluid employed contained 0-1 gramnie potassium phos- phate, 0°1 gr. crystallised magnesium sulphate, 0'1 gr. tri- basic calcium phosphate, and 0°2 gr. ammonium tartrate, dissolved in 20 cubic centimetres of distilled water. If to a certain quantity of this "normal fluid" a small pro- portion of water containing Bacteria was added, the multiplication of the Bacteria went on with rapidity, whether the mouth of the containing flask was open or hermetically closed. Hermetically-sealed flasks, contain- ing portions of the normal fluid infected with Bacteria, were submerged in water heated to various temperatures, the flask being carefully shaken, without being raised out of the water, during its submergence.

The result was, that in those flasks which were thus subjected, for an hour, to a heat of 60°-62° C. (140°-1438° Fahr.), the Bacterra underwent no development, and the fluid remained perfectly clear. On the other hand, in similar experiments in which the flasks were heated only to 40° or 50° C, (104°-122° Fahr.), the fluid became turbid, in consequence of the multiplication of the Bacteria, in the course of from two to three days.

Both in Kiihne's and in Cohn's experiments, which last have lately been confirmed and extended by Dr Roberts of Manchester, it was noted that

long exposure to a lower temperature than that which brings about immediate destruction of life, produces the same effect as short ex- posure to the latter temperature. 'Thus, though all the Bacterva were killed, with certainty, in the normal fluid, by short exposure to temperatures at or above 60° C. (140° Fahr.), Cohn observed that, when a flask containing in- fected normal fluid was heated to 50°-52° C. (122°-125° Fahr.) for only an hour, the consequent multiplication of the Bacteria was manifested much earlier, than in one which had been exposed for two hours to the same temperature.

It appears to be very generally held that the simp.er vegetable organisms are deprived of life at temperatures as high as 60° C. (140° Fahr.); but Alge have been found living in hot springs at much higher temperatures, namely, from 168° to 208° Fahr., for which latter surprising fact we Lave tke high authority of Descloiseaux. It is no ex-

planation of these phenomena, but only another mode of stating them, to say that these organisms have become "accustomed" to such temperatures. If this degree of heat were absolutely incompatible with the activity of living matter, the plants could no more resist it than they could become " accustomed " to being made red hot. Habit may modify subsidiary, but cannot affect fundamental, conditions,

Recent investigations point to the conclusion that the immediate cause of the arrest of vitality, in the first place, and of its destruction, in the second, is the coagulation of certain substances in the protoplasm, and that the latter contains various coagulable matters, which solidify at differ- ent temperatures. And it remains to be seen, how far the death of any form of living matter, at a given temperature, depends on the destruction of its fundamental substance at that heat, and how far death is brought about by the coagulation of merely accessory compounds,

It may be safely said of all those living things which are large enough to enable us to trust the evidence of microscopes, that they are heterogeneous optically, and that their different parts, and especially the surface layer, as con- trasted with the interior, differ physically and chemically ; while, in most living things, mere heterogeneity is exchanged for a definite structure,

whereby the body is distinguished into visibly different parts, which possess different powers or functions. Living things which present this visible structure are said to be organized ; and so widely does organization obtain among living beings, that organized and ding are not unfrequently used as if they were terms

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in virtue of which it undergoes internal changes, modifies external objects, and is modified by them; and

(4.) Its form, place, and powers are the effects of cer- tain causes.

In correspondence with these four aspects of its subject, biology is divisible into four chief subdivisions—I. Mor-

pHoLocy ; IJ. Distrisution; III. Puaystonoey; IV. ARTIOLOGY.

J. MorpHotoey.

So far as living beings have a form and structure, they fall within the province of Anatomy and Histology, the latter being merely a name for that ultimate optical analysis of living structure which can be carried out only by the aid of the microscope.

And, in so far as the form and structure of any living being are not constant during the whole of its existence, but undergo a series of changes from the commencement of that existence to its end, living beings have a Develop- ment. The history of development is an account of the anatomy of a living being at the successive periods of its existence, and of the manner in which one anatomical stage passes into the next.

Finally, the systematic statement and generalization of the facts of Morphology, in such a manner as to arrange living beings in groups according to their degrees of like- ness, is Zaxonomy.

The study of Anatomy and Development has brought to light certain generalizations of wide applicability and great importance.

of co-extensive applicability. This, however, is not exactly accurate, if it be thercby implied that all living things have a visible organization, as there are numerous forms of living

1. It has been said that the great majority of living Most plants beings present a very definite structure. Unassisted vision and ani-

aud ordinary dissection suffice to separate the body of any ™#s are aggregates

matter of which it cannot properly be said that they possess either a definite structure or permanently specialized organs: though, doubtless, the simplest particle of living matter must possess a highly complex molecular structure, which is far beyond the reach of vision.

The broad distinctions which, as a matter of fact, exist between every known form of living substance and every other component of the material world, justify the sepa- ration of the biological sciences from all others. But it must not be supposed that the differences between living and not-living matter are such as to justify the assumption that the forces at work in the one are different from those which are to be met with in the other. Considered apart from the phenomena of consciousness, the phenomena of life are all dependent upon the working of the same physical and chemical forces as those which are active in the rest of the world. It may be convenient to use the terms " vitality" and " vital force" to denote the causes of certain great groups of natural operations, as we employ the names of "electricity" and "electrical force" to denote others ; but it ceases to be proper to do so, if such a name implies the absurd assumption that "electricity" and "vitality" are entities playing the part of efficient causes of electrical or vital phenomena. A mass of living proto- plasm is simply a molecular machine of great complexity, the total results of the working of which, or its vital pheno- mena, depend,—on the one hand, upon its construction, and, on the other, upon the energy supplied to it; and to speak of "vitality" as anything but the name of a series of operations is as if one should talk of the "horologity" of a clock.

Living matter, or protoplasm and the products of its

tion of the metamorphosis, may be regarded under four aspects :—

(1.) It has a certain external and internal form, the latter being more usually called structure ;

(2.) It occupies a certain position m space and in time ;

(3.) It is the subject of the operation of certain forces,

of the higher animals, or plants, into fabrics of different sorts, which always present the same general arrangement in the same organism, but are combined in different ways in different organisms. The discrimination of these com- paratively few fabrics, or tisswes, of which organisms are composed, was the first step towards that ultimate analysis of visible structure which las become possible ouly by the recent perfection of microscopes and of methods of pre- paration.

Histology, which embodies the results of this analysis, shows that every tissue of a plant is composed of more or less modified structural elements, each of which is termed a cell ; which cell, in its simplest condition, is merely a spheroidal mass of protoplasm, surrounded by a coat or. sac —the cell-wall—which contains cellulose. In the various tissues, these cells may undergo innumerable modifications of form—the protoplasm may become differentiated into a nucleus with its nucleolus, a primordial utricle, and a cavity filled with a watery fluid, and the cell-wall may be vari- ously altered in composition or in structure, or may coalesce with others. But, however extensive these changes may be, the fact that the tissues are made up of morphologically distinct units—the cells—remains patent. And, if any doubt could exist on the subject, it would be removed by the study of development, which proves that every plant commences its existence as a simple cell, identical in its fundamental characters with the less modified of those cells of which the whole body is composed.

But it is not necessary to the morphological unit of the plant that it should be always provided with a cell-wall, Certain plants, such as Protococcus, spend longer or shorter periods of their existence in the condition of a mere spher- oid of protoplasm, devoid of any cellulose wall, while, at other times,

the protoplasmic body becomes enclosed within a cell-wall, fabricated by its superficial layer.

Therefore, just as the nucleus, the primordial utricle, and the central fluid are no essential constituents of the

morphological unit of the plant, but represent results of its metamorphosis, so the cell-wall is equally unessential; and either the term "cell" must acquire a merely technical significance as the equivalent of morphological unit, or some new term must be invented to describe the latter. On the whole, it is probably least inconvenient to modify the sense of the word " cell."

The histological analysis of animal tissues has led to

results and to difficulties of terminology of precisely the-

same character. In the higher animals, however, the modifications which the cells undergo are so extensive, that the fact that the tissues are, as in plants, resolvable into an aggregation of morphological units, could never have been established without the aid of the study of development, which proves that the animal, no less than the plant, com- mences its existence as a simple cell, fundamentally iden- tical with the less modified cells which are found in the tissues of the adult.

Though the nucleus is very constant among animal cells, it is not universally present ; and among the lowest forms of animal life, the protoplasmic mass which represents the morphological unit may be, as in the lowest plants, devoid of a nucleus. In the animal, the cell-wall never has the character of a shut sac containing cellulose ; and it is not a little difficult, in many cases, to say how much of the so- called "'cell-wall" of the animal cell answers to the " pri- mordial utricle" and how much to the proper "cellulose cell-wall" of the vegetable cell. But it is certain that in the animal, as in the plant, neither cell-wall nor nucleus are essential

constituents of the cell, inasmuch as bodies which are unquestionably the equivalents of cells—true morphological units—are mere masses of protoplasm, de- void alike of cell-wall and nucleus.

BIOLOGY

The development of the organism as a whole, therefore, repeats in principle the development of the cell. It isa progress from a general to a special form, resulting from the gradual differentiation of the primitively similar mor- phological units of which the body is composed.

Moreover, when the stages of development of two animals are compared, the number of these stages which are similar to one another is, as a general rule, proportional to the closeness of the resemblance of the adult forms; whence it follows that the more closely any two animals are allied in adult structure, the later are their embryonic conditions distinguishable. And this general rule holds for plants no less than for animals,

The broad principle, that the form in which the more complex living things commence their development is always the same, was first expressed by Harvey in his famous aphorism, "'Omne vivum ex ovo," which was intended simply as a morphological generalization, and in no wise implied the rejection of spontaneous generation, as it is commonly supposed to do. Moreover, Harvey's study of the development of the chick led him to promulgate that theory of " epigenesis," in which the doctrine that develop- ment is a progress from the general to the special is im- plicitly contained.

Caspar F. Wolff furnished further, and indeed conclu- sive, proof of the truth of the theory of epigenesis ; but, unfortunately, the authority of Haller and the speculations of Bonnet led science astray, and it was reserved for Von Baer to put the nature of the process of development in its true light, and to formulate it in his famous law.

3. Development, then, is a process of differentiation by which the primitively similar parts of the living body become more and more unlike one another.

For the whole living world, then, it results :-—that the

This process of differentiation may be effected in several Modes of morphological unit—the primary and fundamental form of

ways. differentia- tion.

life—is merely an individual mass of protoplasin, in which no further structure is discernible ; that independent living forms may present but little advance on this structure ; and that all the higher forms of life are aggregates of such morphological units or cells, variously modified.

Moreover, all that is at present known tends to the con- clusion, that, in the complex aggregates of such units of which all the higher animals and plants consist, no cell has arisen otherwise than by becoming separated from the pro- toplasm of a pre-existing cell; whence the aphorism "Omnis cellula e cellula."

It may further be added, as a general truth applicable to nucleated cells, that the nucleus rarely undergoes any considerable modification, the structures characteristic of the tissues being formed at the expense of the more super- ficial protoplasm of the cells; and that, when nucleated cells divide, the division of the nucleus, as a rule, precedes that of the whole cell.

(1.) The protoplasm of the germ may not undergo divi- sion and conversion into a cell aggregate ; but various parts of its outer and inner substance may be metamorphosed directly into those physically and chemically different materials which constitute the body of the adult. This occurs in such animals as the Jnfusoria, and in such plants as the unicellular Alga.

(2.) The germ may undergo division, and be converted into an aggregate of cells, which cells give rise to the tissues by undergoing a metamorphosis of the same kind as that to which the whole body is subjected in the preceding case,

The body, formed in either of these ways, may, as a whole, undergo metamorphosis by differentiation of its parts, and the differentiation may take place without reference to any axis of symmetry, or it may have reference to such an axis. In the latter case, the parts of the body which become dis- tinguishable may correspond on the two sides of the axis

Develop- 2. In the course of its development every cell proceeds | (bilateral symmetry), or may correspond along several lines menta from a condition in which it closely resembles every other | parallel with the axis (radial symmetry).

oa — cell, through a series of stages of gradually increasing The bilateral or radial symmetry of the body may be tion, divergence, until it reaches that condition in which it pre- | further complicated by its segmentation, or separation

sents the characteristic features of the elements of a special tissue. The development of the cell is therefore a gradual progress from the general to the special state.

The like holds good of the development of the body as a whole. However complicated one of the higher animals or plants may be, it begins its separate existence under the form of a nucleated cell. This, by division, becomes con- verted into an aggregate of nucleated cells: the parts of this aggregate, following different laws of growth and multiplication, give rise to the rudiments of the organs ; and the parts of these rudiments again take on those modes of growth and multiplication and metamorphosis which are needful to convert the rudiment into the perfect structure.

by divisions transverse to the axis, into parts, each of which corresponds with its predecessor or successor in the series.

In the segmented body, the segments may or may not give rise to symmetrically or asymmetrically disposed pro- cesses, which are appendages, using that word in its most general sense.

And the highest degree of complication of structure, in both animals and plants, is attained by the body when it becomes divided into segments provided with appendages ; when the segments not only become very different from one another, but some coalesce and lose their primitive distinct- ness; and when the appendages and the segments into

Taxonomy,

which they are subdivided similarly become differentiated and coalesce.

It is in virtue of such processes that the flowers of plants, and the heads and limbs of the Arthropoda and of the Vertebrata, among animals, attain their extraordinary diversity and complication of structure.

In some complex organisms, the process of differentiation, by which they pass from the condition of aggregated embryo cells to the adult, can be traced back to the laws of growth of the two or more cells into which the embryo cell is divided, each of these cells giving rise to a particular por: tion of the adult organism. Thus the fertilized embryo cell in the archegonium of a fern divides into four cells, one of which gives rise to the rhizome of the young fern, another to its first rootlet, while the other two are con- verted into a placenta-like mass which remains embedded in the prothallus.

The structure of the stem of Chara depends upon the different properties of the cells, which are successively derived by transverse division from the apical cell. An inter-nodal cell, which elongates greatly, and does not divide, is succeeded by a nodal cell, which elongates but little, and becomes greatly subdivided; this by another inter-nodal cell, and so on in regular alternation. In the same way the structure of the stem, in all the higher plants, depends upon the laws which govern the manner of division and of metamorphosis of the apical cells, and of their continuation in the cambiwm layer.

In all animals which consist of cell-aggregates, the cells of which the embryo is at first composed arrange them- selves by the splitting, or by a process of invagination, of the blastoderm into two layers, the epiblast and the hypoblast,

between which a third intermediate layer, the mesoblast, |

appears, and each layer gives rise to a definite group of organs in the adult. Thus, in the Vertebrata, the epiblast gives rise to the cerebro-spinal axis, and to the epidermis and its derivatives ; the hypoblast, to the epithelium of

the alimentary canal and its derivatives ; and the mesoblast, to all the intermediate structures. The tendency of recent inquiry is to prove that the several layers of the germ evolve analogous organs in invertebrate animals, and to indi- cate the possibility of tracing the several germ layers back to the blastomeres of the yelk, from the subdivision of which they proceed.

It is conceivable that all the forms of life should have pre- sented about the same differentiation of structure, and should have differed from one another by superficial charac- ters, each form passing by insensible gradations into those most like it. In this case Taxonomy, or the classification of morphological facts, would have had to confine itself to the formation of a serial arrangement representing the serial gradation of these forms in nature.

It is conceivable, again, that living beings should have differed as widely in structure as they actually do, but that the interval between any two extreme forms should have been filled up by an unbroken series of gradations ; in which case, again, classification could only effect the formation of series— the strict definition of groups would be as impos- sible as in the former case.

As a matter of fact, living beings differ enormously, not

only in differentiation of structure, but in the modes in which that differentiation is brought about; and the in- tervals between extreme forms are not filled up in the exist- ing world by complete series of gradations. Hence it arises that living beings are, to a great extent, susceptible of classi- fication into groups, the members of each group resembling one another, and differing from all the rest, by certain definite peculiarities.

No two living beings are exactly alike, but it is a matter of observation that, among the endless diversities of living things, some constantly resemble one another so closely that it is impossible to draw any line of demarca- tion between them, while they differ only in such characters ay are associated with sex. Such as thus closely resemble one another constitute a

morphological species ; while dif- ferent morphological species are defined by constant char- acters which are not merely sexual.

The comparison of these lowest groups, or morphological Species, with one another, shows that more or fewer of them possess some character or characters in common— some feature in which they resemble one another and differ from all other species—and the group or higher order thus formed is a genus. The generic groups thus constituted are susceptible of being arranged in a similar manner into groups of successively higher order, which are known as families, orders, classes, and the like.

The method pursued in the classification of living forms is, in fact, exactly the same as that followed by the maker of an index in working out the heads indexed. In an alphabetical arrangement, the classification may be truly termed a morphological one, the object being to put into close relation all those leading words which resemble one another in the arrangement of their letters, that is, in their form, and to keep apart those which differ in structure. Headings which begin with the same word, but differ otherwise, might be compared to genera with their species ; the groups of words with the same first two syllables to families ; those with identical first syllables to orders ; and those with the same initial letter to classes. But there is this difference between the index and the Taxonomic arrangement of living forms, that in the former there is none but an arbitrary relation between the various classes, while in the latter the classes are similarly capable of co-ordination into larger and larger groups, until all are comprehended under the common definition of living beings.

The differences between "artificial" and "natural " classi- fications are differences in degree, and not in kind. In each case the classification depends upon likeness ; but in an artificial classification some prominent and easily observed feature is taken as the mark of resemblance or dissemblance ; while, in a natural classification, the things classified are arranged according to the totality of their morphological resemblances, and the features which are taken as the marks of groups are those which have been ascertained by ob- servation to be the indications of many likenesses or un- likenesses. And thus a natural classification is a great deal more than a mere index. It is a statement of the marks of similarity of organization ; of

the kinds of struc- ture which, as a matter of experience, are found universally associated together; and, as such, it furnishes the whole foundation for those indications by which conclusions as to the nature of the whole of an animal are drawn from a knowledge of some part of it.

When a paleontologist argues from the characters of a bone or of a shell to the nature of the animal to which that bone or shell belonged, he is guided by the empirical morphological laws established by wide observation, that such a kind of bone or shell is associated with such and such structural features in the rest of the body, and no

Artificial and natura} classifica- tion.

Geographi- Living beings occupy certain portions of the surface of | only that there has been a succession of species, but that cal distri- the earth, inhabiting either the dry land or the fresh or | the general nature of that succession has been the same all bution. —_ salt waters, or being competent to maintain their existence | over the globe; and it is on this ground that fossils are in either. In any given locality, it is found that those | so important to the geologist as marks of the relative age different media are inhabited by different kinds of living | of rocks. beings ; and that the same medium, at different heights The determination of the morphological relations of the in the air and at different depths in the water, has dif- | species which have thus succeeded one another is a problem ferent living inhabitants. of profound importance and difficulty, the solution of which, Moreover, the living populations of localities which differ | however, is already clearly indicated. For, in several cases, considerably in latitude, and hence in climate, always pre- | it is possible to show that, in the same geographical area, a sent considerable differences. But the converse proposition | form A, which existed during a certain geological epoch, is not true ; that is to say, localities which differ in longi- | has been replaced by another form B, at a later period ; tude, even if they resemble one another in climate, often | and that this form B has been replaced, still later, by a have very dissimilar faune and flore. third form C. When these forms, A, B, and C, are com- It has been discovered by careful comparison of local | pared together they are found to be organized upon the faunz and flor that certain areas of the earth's surface | same plan, and to be very similar even

in most of the de- are inhabited by groups of animals and plants which are | tails of their structure; but B differs from A by a slight not found elsewhere, and which thus characterize each of | modification of some of its parts, which modification is these areas. Such areas are termed Provinces of Distribu- | carried to a still greater extent in C. tion. There is no parity between these provinces in extent, In other words, A, B, and C differ from one another in Progressive nor in the physical configuration of their boundaries; and, | the same fashion as the earlier and later stages of the Spectaliza- in reference to existing conditions, nothing can appear to | embryo of the same animals differ ; and in successive epochs pce be more arbitrary and capricious than the distribution of | we have the group presenting that progressive specializa- jife in living beings. tion which characterises the development of the individual. time. Geological The study of distribution is not confined to the present | Clear evidence that this progressive specialization of distribu- order of nature; but, by the help of geology, the naturalist | structure has actually occurred has as yet been obtained in tion. ‘ . . : opie is enabled to obtain clear, though too fragmentary, evidence | only a few cases (e.g., Hguide, Crocodilia), and these are of the characters of the faunz and flore of antecedent | confined to the highest and most complicated forms of life ; epochs. The remains of organisms which are contained | while it is demonstrable that, even as reckoned by geolo- in the stratified rocks prove that, in any given part of the | gical time, the process must have been exceedingly slow. earth’s surface, the living population of earlier epochs was Among the lower and less complicated forms the evi- different from that which now exists in the locality ; and | dence of progressive modifications, furnished by compari- that, on the whole, the difference becomes greater the | son of the oldest with the latest forms, is slight, or absent ; farther we go back in time. The organic remains which are | and some of these have certainly persisted, with very little found in the later Cainozoic deposits of any district are | change, from extremely ancient times to the present day. always closely allied to those now found in the province | It is as important to recognize the fact that certain forms of distribution in which that locality is included ; while in | of life have thus persisted, as it is to admit that others have the older Cainozoic, the Mesozoic, and the Paleozoic strata, | undergone progressive modification. the fossils may be similar to creatures at present living in It has been said that the successive terms in the series Geographi-

some other province, or may be altogether unlike any which | of living forms are analogous in all parts of the globe. rear now exist. But the species which constitute the corresponding or J ient Continuity In any given locality, the succession of living forms may | homotamic terms in the series, in different localities, are not faune and of succes- appear to be interrupted by numerous breaks—the asso- | identical. And, though the imperfection of our knowledge flore. pn ciated species in each fossiliferous bed being quite distinct | at present precludes positive assertion, there is every reason fk eh time, from those above and those below them. But the ten- | to believe that geographical provinces have existed through-

others. And it is these empirical laws which are embodied and expressed in a natural classification.

dency of all palzontological investigation is to show that these breaks are only apparent, and arise from the incom- pleteness of the series of remains which happens to have been preserved in any given locality. As the area over which accurate geological investigations have been carried on extends, and as the fossiliferous rocks found in one locality fill up the gaps left in another, so do the abrupt demarcations between the faunez and flores of successive epochs disappear—a certain proportion of the genera and species of every period, great or small, being found to be continued for a longer or shorter time into the next suc- ceeding period. It is evident, in fact, that the changes in the living population of the globe which have taken place during its history, have been effected, not by the sudden replacement of one set of living beings by another, but by a process of slow and gradual introduction of new species, accompanied by the extinction of the older forms.

It is a remarkable circumstance, that in all parts of the globe in which fossiliferous rocks have yet been examined, the successive terms of the series of living forms which

have thus succeeded one another are analogous. The life of the Mesozoic epoch is everywhere characterized by the abundance of some groups of species of which no trace is to be found in either earlier or later formations ; and the like is true of the Paleozoic epoch. Hence it follows, not

out the period during which organic remains furnish us with evidence of the existence of life. The wide distribu- tion of certain Paleozoic forms does not militate against this view ; for the recent investigations into the nature of the deep-sea fauna have shown that numerous Crustacea, Echinodermata, and other invertebrate animals, have as wide a distribution now as their analogues possessed in the Silurian epoch.

III. Purystonoey.

Thus far living beings have been regarded merely as definite forms of matter, and Biology has presented no considerations of a different order from those which meet the student of Mineralogy. But living things are not only natural bodies, having a definite form and mode of struc- ture, growth, and development. They are machines in action; and, under this aspect, the phenomena which they present have no parallel in the mineral world.

The actions of living matter are termed its functions; and these functions, varied as they are, may be reduced to

Living

beings as machines in action.

Classifica- tion of faretions.

Physiologi- cal units,

BIOLOGY

three categories, They are either—(1), functions which affect the material composition of the body, and determine its mass, which is the balance of the processes of waste on the one hand and those of assimilation on the other. Or (2), they are functions which subserve the process of re- production,

which is essentially the detachment of a part endowed with the power of developing into an independent whole. Or (3), they are functions in virtue of which one part of the body is able to exert a direct influence on another, and the body, by its parts or as a whole, becomes a source of molar motion. The first may be termed susten- tative, the second generative, and the third correlative functions,

Of these three classes of functions the first two only can be said to be invariably present in living beings, all of which are nourished, grow, and multiply. But there are some forms of life, such as many Mungi, which are not known to possess any powers of changing their form; in which the protoplasm exhibits no movements, and reacts upon no stimulus; and in which any influence which the different parts of the body exert upon one another must be transmitted indirectly from molecule to molecule of the common mass. In most of the lowest plants, however, and in all animals yet known, the body either constantly or temporarily changes its form, either with or without the application of a special stimulus, and thereby modifies the relations of its parts to one another, and of the whole to surrounding bodies ; while, in all the higher animals, the different parts of the body are able to affect, and be affected by, one another, by means of a special tissue, termed nerve. Molar motion is effected on a large scale by means of another special tissue, muscle; and the organisin is brought into relation with surrounding bodies by means of a third kind of special tissue—that of the sensory organs— by means of which the forces exerted by surrounding bodies are transmuted into affections of nerve,

In the lowest forms of life, the functions which have been enumerated are seen in their simplest forms, and they are exerted indifferently, or nearly so, by all parts of the protoplasmic body; and the like is true of the functions of the body of even the highest organisms, so long as they are in the condition of the nucleated cell, which constitutes the starting point of their development. But the first pro- cess in that development is the division of the germ into a number of morphological units or blastomeres, which, eventually, give rise to cells; and as each of these pos- sesses the same physiological functions as the gerin itself, it follows that each morphological unit is also a physio- logical unit, and the multicellular mass is strictly a com- pound organism, made up of a multitude of

physiologically independent cells, The physiological activities manifested by the complex whole represent the sum, or rather the resultant, of the separate and independent physiological activities resident in each of the simpler constituents of that whole.

The morphological changes which the cells undergo in the course of the further development of the organism do not affect their individuality ; and, notwithstanding the modification and confluence of its constituent cells, the adult organism, however complex, is still an aggregate of morphological units. Nor is it less an aggregate of physio- logical units, each of which retains its fundamental inde- pendence, though that independence becomes restricted in various ways.

Each cell, or that element of a tissue which proceeds from the modification of a cell, must needs retain its sustentative functions so long as it grows or maintains a condition of equilibrium; but the most completely meta- mnorphosed cells show no trace of the generative function, and many exhibit no correlative functions. On the other

hand, those cells of the adult organism which are the un- metamorphosed derivatives of the germ, exhibit all the primary functions, not only nourishing themselves and growing, but multiplying, and frequently showing more or less marked movements.

Organs are parts of the body which perform particular functions. In strictness, perhaps, it is not quite right to speak of organs of sustentation or generation, each of these functions being necessarily performed by the morphological unit which is nourished or reproduced. What are called the organs of these functions are the apparatuses by which certain operations, subsidiary to sustentation aud genera- tion, are carried on.

Thus, in the case of the sustentative functions, all those organs may be said to contribute to this function which are concerned in bringing nutriment within reach of the ultimate cells, or in removing waste matter from them ; while in the case of the generative function, all those organs contribute to

the function which produce the cells from which germs are given off ; or help in the evacuation, or fertilization, or development of these germs.

On the other hand, the correlative functions, so Jong as they are exerted by a simple undifferentiated morphological unit or cell, are of the simplest character, consisting of those modifications of position which can be effected by mere changes in the form or arrangement of the parts of the protoplasm, or of those prolongations of the proto- plasm which are called pseudopodia or cilia, But, in the higher animals and plants, the movements of the organism and of its parts are brought about by the change of the form of certain tissues, the property of which is to shorten in one direction when exposed to certain stimuli. Such tissues are termed covtractile ; and, in their most fully developed condition, muscular, The stimulus by which this contraction is naturally brought about is a molecular change, either in the substance of the contractile tissue itself, or in some other part of the body; in which latter case, the motion which is set up in that part of the body must be propagated to the contractile tissue through the intermediate substance of the body. In plants there seems to be no question that parts which retain a hardly modified cellular structure may serve as channels for the transmis- sion of this molecular motion ; whether the same is true of animals is not certain. But, in all the more complex animals, a peculiar fibrous tissue—nerve—serves as the agent by which contractile tissue is affected by changes occurring elsewhere, and by which contractions thus ini- tiated are co-ordinated and brought into harmonious com- bination. While the sustentative functions in the higher forms of life are still, as in the lower, fundamentally de- pendent upon the powers inherent in all the physiological units which make up the body, the correlative functions are, in the former, deputed to two sets of specially modified units, which constitute the muscular and the nervous tissues,

When the different forms of life are compared together Division of as physiological machines, they are found to differ ag physiologi-

machines of human construction do. In the lower forms, the mechanism, though perfectly well adapted to do the work for which it is required, is rough, simple, and weak ; while, in the higher, it is finished, complicated, and powerful. Considered as machines, there is the same sort of difference

between a polype and a horse as there is between a distaff and a spinning-jenny. In the progress from the lower to the higher organism, there is a gradual differentiation of organs and of functions. Hach function is separated into many parts, which are severally entrusted to distinct organs, To use the striking phrase of Milne-Edwards, in passing from low to high organisms, there is a division of physiological labour. And exactly the same process is observable in the development of any of the higher organ-

isms; so that, physiologically, as well as morphologically,

resembling the parent depends on an inttuence exerted by Sexual re-development is a progress from the general to the special.

living matter different from the germ. This is gamogenesis, production.

Conditions of exist- ence.

Thus far, the physiological activities of living matter have been considered in themselves, and without reference to anything that may affect them in the world outside the living body. But living matter acts on, and is powerfully affected by, the bodies which surround it; and the study of the influence of the "conditions of existence" thus deter- mined constitutes a most important part of Physiology.

The sustentative functions, for example, can only be exerted under certain conditions of temperature, pressure, and light, in certain media, and with supplies of particular kinds of nutritive matter; the sufficiency of which supplies, again, is greatly influenced by the competition of other organisms, which, striving to satisfy the same needs, give rise to the passive "struggle for existence." The exercise of the correlative functions is influenced by similar condi- tions, and by the direct conflict with other organisms, which constitutes the active struggle for existence. And, finally, the generative functions are subject to extensive modifi- cations, dependent partly upon what are commonly called external conditions, and partly upon wholly unknown agencies.

or sexual generation. Looking at the facts broadly, and without reference to many exceptions in detail, it may be said that there is an inverse relation between agamogenetic and gamogenetic reproduction. In the lowest organisms gamogenesis has not yet been observed, while in the highest agamogenesis is absent. In many of the lower forms of life agamogenesis is the common and predominant mode of reproduction, while gamogenesis is exceptional; on the contrary, in many of the higher, while gamogenesis is the rule, agamogenesis takes place exceptionally. In its simplest condition, which is termed " conjugation," sexual generation consists in the coalescence of two similar masses of protoplasmic matter, derived from different parts of the same organism, or from two organisms of the same species, and the single mass which results from the fusion develops into a new organism.

In the majority of cases, however, there is a marked morphological difference between the two factors in the process, and then one is called the male, and the other the female element. The female element is relatively large, and undergoes but little change of form, In all the higher

Reproduc- § In the lowest forms of life, the only mode of generation | plants and animals it is a nucleated cell, to which a greater tion by at present known is the division of the body into two or | or less amount of nutritive material, constituting the food- = and More parts, each of which then grows to the size ard | yelk, may be added.

mation: assumes the form of its parent, and repeats the process of The male element, on the other hand, is relatively small. agamo- multiplication. This method of multiplication by /isscon | It may be conveyed to the female element by an out- genesis. ig properly zalled generation, because the parts which are | growth of the wall of its cell, which is short in many

separated are severally competent to give rise to individual organisms of the same nature as that from which they arose.

In many of the lowest organisms the process is modified so far that, instead of the parent dividing into two equal parts, only a small portion of its substance is detached, as a bud which develops into the likeness of its parent. This is generation by gemmation. Generation by fission and by

gemmation are not confined tv the simplest forms of life, however. On the contrary, botn modes of multipli- cation are common not only among plants, but among animals of considerable complexity.

The multiplication of flowering plants by bulbs, that of annelids by fission, and that of polypes by budding, are well-known examples of these modes of reproduction. In all these cases, the bud or the segment consists of a multi- tude of more or less metamorphosed cells. But, in other instances, a single cell detached from a mass of such un- differentiated cells contained in the parental organism is the foundation of the new organism, and it is hard to say whether such a detached cell may be more fitly called a bud or a segment—whether the process is more akin to fission or to gemmation.

In all these cases the development of the new being from the detached germ takes place without the influence of other living matter. Common as the process is in plants and in the lower animals, it becomes rare among the higher animals. In these, the reproduction of the whole organism from a part, in the way indicated above, ceases. At most, we find that the cells at the end of an amputated portion of the organism are capable of reproducing the lost part ; and, in the very highest animals, even this power vanishes in the adult; and, in most parts of the body, though the undifferentiated cells are capable of multi- plication, their progeny grow, not into whole organisms like that of which they form a part, but into elements of the tissues,

Throughout almost the whole series of living beings, however, we find concurrently with the process of agamo- genesis, or asexual generation, another method of genera- tion, in which the development of the germ into an organism

Alge and Fungi, but becomes an immensely elongated tubular filament, in the case of the pollen cell of flowering plants. But, more commonly, the protoplasm of the male cells becomes converted into rods or filaments, which usu- ally are in active vibratile movement, and sometimes are pro- pelled by numerous cilia. Occasionally, however, as in many NVematoidea and Arthropoda, they are devoid of mobility.

The manner in which the contents of the pollen tube affect the embryo cell in flowering plants is unknown, as no perforations through which the contents of the pollen tube may pass, so as actually to mix with the substance of the embryo cell, have been discovered ; and there is the same difficulty with respect to the conjugative processes of some of the Cryptogamia. But in the great majority of plants, and in all animals, there can be no doubt that the substance of the male element actually mixes with that of the female, so that in all these cases the sexual pro cess remains one of conjugation; and impregnation is the physical admixture of protoplasmic matter derived from two sources, which may be either different parts of the same organism, or different organisms.

The effect of impregnation appears in all cases to be Immediate

that the impregnated protoplasm tends to divide into por- tions (blastomeres), which may remain united as a single

cell-aggregate, or some or all of which may become separ tion,

rate organisms. A larger or shorter period of rest, in many cases, intervenes between the act of impregnation and the commencement of the process of division.

As ageneral rule, the female cell which directly receives the influence of the male is that which undergoes division and eventual development into independent germs; but there are some plants, such as the Floridew, in which this is not the case. In these the protoplasmic body of the trichogyne, which unites with the molecular spermatozoids, does not undergo division itself, but transmits some influ- ence to adjacent cells, in virtue of which they become subdivided into independent germs or spores.

There is still much obscurity respecting the reproductive processes of the Infusoria ; but, in the Vorticellide, it would appear that conjugation merely determines a condition of

the whole organism, which gives rise to the division of the endoplast or so-called nucleus, by which germs are thrown off; and if this be the case, the process would have some analogy to what takes place in the Floridee.

On the other hand, the process of conjugation by which two distinct Diporpe combine into that extraordinary double organism, the Diplozoon paradoxwm, does not directly give rise to germs, but determines the development of the sexual organs in each of the conjugated individuals ; and the same process takes place in a large number of the Jnfusoria, if what are supposed to be male sexual elements in them are really such.

The process of impregnation in the Floridee is remark- ably interesting, from its bearing upon the changes which fecundation is known to produce upon parts of the parental organism other than the ovum, even in the highest animals and plants.

The nature of the influence exerted by the male element upon the female is wholly unknown. No morphological distinction can be drawn between those cells which are capable of reproducing the whole organism without im- pregnation, and those which need it, as is obvious from what happens in insects, where eggs which ordinarily re- quire impregnation, exceptionally, as in many moths, or regularly, as in the case of the drones among bees, develop without impregnation, Even in the higher animals, such as the fowl, the earlier stages of division of the germ may take place without impregnation.

In fact, generation may be regarded as a particular case of cell multiplication, and impregnation simply as one of the many conditions which may determine or affect that process. In the lowest organisms, the simple protoplasmic mass divides, and each part retains all the physiological pro- perties of the whole, and consequently constitutes a germ whence the whole body can be reproduced. In more ad- vanced organisms, each of the multitude of cells into which the embryo cell is converted at first, probably retains all, or nearly all, the physiological capabilities of the whole, and is capable of serving as a reproductive germ ; but as division goes on, and many of the cells which result from division acquire special morphological and physiological properties, it seems not improbable that they, in proportion, lose their more general characters. In proportion, for

example, as the tendency of a given cell to become a muscle cell or a car- tilage cell is more marked and definite, it is readily con- ceivable that its primitive capacity to reproduce the whole organism should be reduced, though it might not be alto- gether abolished. If this view is well based, the power of reproducing the whole organism would be limited to those cells which had acquired no special tendencies, and conse- quently had retained all the powers of the primitive cell in which the organism commenced its existence. The more extensively diffused such cells were, the more generally might multiplication by budding or fission take place ; the more localized, the more limited would be the parts of the organism in which such a process would take place. And even where such cells occurred, their development or non- development might be connected with conditions of nutri- tion. It depends on the nutriment supplied to the female larva of a bee whether it shall become a neuter or a sexually perfect female; and the sexual perfection of a large pro- portion of the internal parasites is similarly dependent upon their food, and perhaps on other conditions, such as the temperature of the medium in which they live. Thus the gradual disappearance of agamogenesis in the higher animals would be related with that increasing specialization of function which is their essential characteristic ; and when it ceases to occur altogether, it may be supposed that no cells are left which retain unmodified the powers of the primi- tive embryo cell, The organism is like a society in which

every one is so engrossed by his special business that he has neither time nor inclination to marry.

Even the female elements in the highest organisms, little as they differ to all appearance from undiffcrentiated cells, and though they are directly derived from epithelial cells which have undergone very little modification from the condition of blastomeres, are incapable of full develen- ment unless they are subjected to the influence of the male element, which may, as Caspar Wollff suggested, be compared to a kind of nutriment. But it isa living nutri- ment, in some respects comparable to that which would be supplied to an animal kept alive by transfusion, and its molecules transfer to the impregnated embryo cell all the special characters of the organism to which it belonged.

The tendency of the germ to reproduce the characters of its immediate parents, combined, in the case of sexual generation, with the tendency to reproduce the characters of the male, is the source of the singular phenomena of hereditary transmission. No structural modification is so slight, and no functional peculiarity is so insignificant in either parent that it may not make its appearance in the offspring. But the transmission of parental peculiarities depends greatly upon the manner in which they have been acquired, Such as have arisen naturally, and have been hereditary through many antecedent generations, tend to appear in the progeny with great force; while artificial modifications, such, for example, as result from mutilation, are rarely, if ever, transmitted. Circumcision through in- numerable ancestral generations docs not appear to have reduced that rite to a mere formality, as it should have done, if the abbreviated prepuce had become hereditary in the descendants of Abraham ; while modern lambs are boru with long tails, notwithstanding the long-continued prac- tice of cutting those of every generation short. And it remains to be seen whether the supposed hereditary trans- mission of the habit of retrieving among dogs is really what it seems at first sight to be; on the other side, Brown-Séquard's case of the transmission of artificially induced epilepsy in guinea-pigs is undoubtedly very weighty.

Although the germ always tends to reproduce, directly or indirectly, the organism from which it is derived, the result of its development differs somewhat from the parent. Usually the amount of variation is insignificant ; but it may be considerable, as in the so-called " sports ;" and such variations, whether useful or useless, may be trans- mitted with great tenacity to the offspring of the subjects of them.

In many plants and animals which multiply both

Hereditary

trans- mission.

Variation,

The alter.

asexually and sexually, there is no definite relation be- nation of

tween the agamogenetic and the gamogenetic phenomena. The organism may multiply asexually before, or after, or concurrently with, the occurrence of sexual generation.

But in a great many of the lower organisms, both animal and vegetable, the organism (A) which results from the impregnated germ produces offspring only agamo- genetically. It thus gives rise to a series of independent organisms (B, B, B, . . .), which are more or less different from A, and which sooner or later acquire generative organs, From their impregnated germs A is reproduced. The pro- cess thus described is what has been termed the "alterna- tion of generations" under its simplest form,—for example, as it is exhibited by the Salpe. In more complicated cases, the independent organisms which correspond with B may give rise agamogenetically to others (B,), and these to others (Bz), and so on (eg., Aphis). But, however long the series, a final term appears which develops sexual organs, and reproduces A. The "alternation of genera- tions" is, therefore, in strictness, an alternation of asexual with sexual generation, in which the products of the one process differ from those of the other.

genera- tions.

Individu- ality.

Causes of the phe- nomena of life.

Origin of living matter— abiogenesis and bio- genesis.

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The J/ydrozoa offer a complete series of gradations between those cases in which the term B is represented by a free, self-nourishing organism (eg., Cyanwa), through those in which it is free but unable to feed itself (Caly cophoride), to those in which the sexual elements are developed in bodies which resemble free zodids, but are never detached, and are mere generative organs of the body on which they are developed (Cordylophora).

In the last case, the “ individual” is the total product of the development of the impregnated embryo, all the parts of which remain in material continuity with one another The multiplication of mouths and stomachs in a Cordylophora no more makes it an aggregation of different individuals than the multiplication of segments and legs in a centipede converts that Arthropod into a compound animal, The Cordyluphora is a differentiation of a whole into many parts, and the use of any terminology which implies that it results from the coalescence of many parts into a whole is to be deprecated.

In Cordylopnora the generative organs are incapable of maintaining a separate existence; but in nearly allied HHydrozoa the unquestionable homologues of these organs become free zodids, in many cases capable of feeding and growing, and developing the sexual elements only after they have undergone considerable changes of form. Mor- phologically, the swarm of JJeduse thus set free from a Hydrozoon are as much organs of the latter, as the multi- tudinous pinnules of a Comatula, with their genital glands, are organs of the Echinoderm. Morphologically, there- fore, the equivalent of the individual Comatula is the Hydrozoic stock + all the Jfedusce which proceed from it.

No doubt it sounds paradoxical to speak of a million of Aphides, for example, as parts of one morphological indivi- dual; but beyond the momentary shock of the paradox no harm is done. On the other hand, if the asexual Aphides are held to be individuals, it follows, as a logical conse- quence, not only that all the polypes on a Cordylophora trce are “ feeding individuals,” and all the genital sacs “cenerative individuals,” while the stem must be a ‘stump individual,” but that the eyes and legs of a lobster are “ocular” and “locomotive individuals.” And this conception is not only somewhat more paradoxical than the other, but suggests a conception of the origin of the com- plexity of animal structure which is wholly inconsistent with fact.

TV. AiTioLoey.

Morphology, Distribution, and Physiology investigate and determine the facts of Biology. Aitiology has for its object the ascertainment of the causes of these facts, and the explanation of biological phenomena, by showing

that they constitute particular cases of general physical laws. It is hardly needful to say that etiology, as thus conceived, is in its infancy, and that the seething controversies, to which the attempt to found this branch of science made in the Origin of Species has given rise, cannot be dealt with in the limits of this article. At most, the general nature of the problems to be evolved, and the course of inquiry needful for their solution, may be indicated.

In any investigation into the causes of the phenomena of life, the first question which arises is, whether we have any knowledge, and if so, what knowledge, of the origin of living matter ?

In the case of all conspicuous and easily-studied organ- isms, it has been obvious, since the study of nature began, that living beings arise by generation from living beings of a like kind; but before the latter part of the 17th cen- tury, learned and unlearned alike shared the conviction that this rule was not of universal application, and that multitudes of the smaller and more obscure organisms were

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produced by the fermentation of not-living, and especially of putrefying dead matter, by what was then termed gener- atio cequivoca or spontanea, and is now called abzogenesis. Redi showed that the general belief was erroneous in a multitude of instances ; Spallanzani added largely to the list ; while the investigations of the scientific helmintholo- gists of the present century have eliminated a further category of cases in which it was possible to doubt the applicability of the rule " omne vivum e vivo" to the more complex organisms which constitute the present fauna and flora of the earth. Even the most extravagant supporters of abiogenesis at the present day do not pretend that organisms of higher rank than the lowest Pung: and Protozoa are produced otherwise than by generation from pre-existing organisms. But it is pretended that Bacteria, Torule, certain Fungi, and " Monads" are developed under conditions which render it impossible that these organisms should have proceeded directly from living matter.

The experimental evidence adduced in favour of this proposition is always of one kind, and the reasoning on which the conclusion that abiogenesis

occurs is based may be stated in the following form :—

All living matter is killed by being heated to » degrees.

The contents of the closed vessel A have been heated to nm degrees.

Therefore, all living matter which may have existed therein has been killed.

But living Bacteria, &c., have appeared in these contents subsequeiitly to their being heated.

Therefore, they have been formed abiogenetically.

No objection can be taken to the logical form of this reasoning, but it is obvious that its applicability to any particular case depends entirely upon the validity, in that case, of the first and second propositions.

Suppose a fluid to be full of Bacteria in active motion, what evidence have we that they are killed when that fluid is heated to 2 degrees? There is but one kind of con- clusive evidence, namely, that from that time forth no living Bacteria make their appearance in the liquid, sup- posing it to be properly protected from the intrusion of fresh Bacteria. The only other evidence, that, for example, which may be furnished by the cessation of the motion of the Bacteria, and such slight changes as our microscopes permit us to observe in their optical characters, is simply presumptive evidence of death, and no more conclusive than the stillness and paleness of a man in a swoon are proof that he is dead. And the caution is the more neces- sary in the case of Bacteria, since many of them naturally pass a considerable part of their existence in a condition in which they show no marks of life whatever save growth and multiplication.

If indeed it could be proved that, in cases which are not open to doubt, living matter is always and invariably killed at precisely the same temperature, there might be some ground for the assumption, that, in those which are obscure, death must take place under the same circum- stances. But what are the facts? It has been pointed out at the commencement of this article, that the range of high temperatures between the lowest, at which some living things are certainly killed, and the highest, at which others

certainly live, is rather more than 100° Fahr., that is to say, between 104° Fahr. and 208° Fahr. It makes no sort of difference to the argument how living beings have come to be able to bear such a temperature as the last mentioned ; the fact that they do so is sufficient to prove that, under certain conditions, such a temperature is not sufficient to destroy life.

Thus it appears that there is no ground for the assump- tion that all living matter is killed at some given tempera- ture between 104° and 208° Fahr,

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But, further, there is very strong reason for believing that the influence of temperature on life is greatly modified, first, by the nature of the medium in which organisms are placed, and, secondly, by the length of time during which any given temperature is kept up.

On this point recent experiments made by Dr Roberts of Manchester are of great importance. He found, for example, as every other careful experimenter has done, that ordinary infusion of hay boiled for a few minutes was sterilized, that is to say, no development of Bacteria took place in it, however long it might be kept; while if the infusion was rendered alkaline with ammonia or liquor potasse, it was not sterilized except after an exposure to the heat of boiling water for more than an hour. Some- times it became productive after two hours, and once after three hours of such exposure. Is it to be imagined that, in the case of the alkalized hay infusion, the heat applied really killed the Bacteria which existed in the infusion, and that Bacteria of – identically the same kind were generated afresh out of the dead matter? or is it more probable that the powers of resistance of the Bacteria to heat were simply increased by the alkalinity of the infusion? The statement of the questions surely render it unnecessary to answer them.

Dr Roberts further proves that there are two factors in the induction of sterilization, the degree of heat on the one hand, and the duration of its application on the other. A longer exposure to a lower temperature was equivalent to a shorter exposure to a highertemperature. 'For example, speaking roughly, an exposure of an hour and a half to a heat of 212° Fahr. appeared to be equivalent to an ex- posure for fifteen minutes to a heat of 228° Fahr."!

It is hard to conceive what explanation can be offered of this fact, except that, under the conditions of the experiment, the organisms were either all affected by the first incidence of the heat in such a way as only to arrest some of their vital functions, and to leave a potentiality of life in them, such as exists in some kinds of dried living matter ; or that they individually differed very much in their powers of resistance, and that some were able to withstand heat much longer than others.

Under these circumstances it will be evident, that no experimental evidence that a liquid may be heated to n degrees, and yet subsequently give rise to living organisms, is of the smallest value as proof that abiogenesis has taken place, and for two reasons :—Firstly, there is no proof that organisms of the kind in question are dead, except their permanent incapacity to grow and reproduce their kind; and secondly, since we know that conditions may largely modify the power of resistance of such organisms to heat, it is far more probable that such conditions existed | in the experiment in question, than that the organisms

were generated afresh out of dead matter.

Not only is the kind of evidence adduced in favour of abiogenesis logically insufficient to furnish proof of its occurrence, but it may be stated as a well-based induction, that the more careful the investigator, and the more complete his mastery over the endless practical difficulties

| which surround experimentation on this subject, the more certain are his experiments to give a negative result ; while positive results are no less sure to crown the efforts of the

clumsy and the careless. Abio- It is argued that a belief in abiogenesis is a necessary cao ene corollary from the doctrine of Evolution, This may be true Pe we a of the occurrence of abiogenesis at some time ; but if the evolution, present day, or any recorded epoch of geological time, be in question, the exact contrary holds good. If all living beings have been evolved from pre-existing forms of life, it is

1 Proceedings of the Royal Society, No. 152, p. 290.

enough that a single particle of living protoplasm should once have appeared on the globe, as the result of no matter what agency. In the eyes of a consistent evolutionist any further independent formation of protoplasm would be sheer waste.

The production of living matter since the time of its first appearance, only by way of biogenesis, implies that the specific forms of the lower kinds of life have undergone but little change in the course of geological time, and this is said to be inconsistent with the doctrine of evolu- tion. But, in the first place, the fact is not inconsis- tent with the doctrine of evolution properly understood, that doctrine being perfectly consistent with either the progression, the retrogression, or the stationary condition of any particular species for indefinite periods of time; and secondly, if it were, it would be so much the worse for the doctrine of evolution, inasmuch as it is un- questionably true, that certain, even highly organized, forms of life have persisted without any sensible change for very long periods. The Yerebratula psittacea of the Persistent present day, 'or example, is not distinguishable froin that types of of the Cretaceous epoch, while the highly organised Teleo- in stean fish, Beryx, of the Chalk differed only in minute specific characters from that which now lives. Is it seri- ously suggested that the existing Terebratule and Beryces are not the lineal descendants of their Cretaceous ancestors, but that their modern representatives have been inde- pendently developed from primordial germs in the interval ? But if this is too fantastic a suggestion for grave con- sideration, why are we to believe that the Globigerine of the present day are not lineally descended from the Cretaceous forms? And if their unchanged generations have succeeded one another for all the enormous time represented by the deposition of the Chalk and that of the Tertiary and Quaternary deposits, what ditliculty is there in supposing that they may not have persisted unchanged for a greatly longer period ?

The fact is, that at the present moment there is not a shadow of trustworthy direct evidence that abiogenesis does take place, or has taken place, within the period during which the existence of life on the globe is recorded. But it need hardly be pointed out, that the fact does not in the slightest degree

interfere with any conclusion that may be arrived at deductively from other considerations that, at some time or other, abiogenesis must have taken place.

If the hypothesis of evolution is true, living matter must have arisen from not-living matter ; for by the hypothesis, the condition of the globe was at one time such that living matter could not have existed in it,? life being entirely incompatible with the gaseous state. But living matter once originated, there is no necessity for another origina- tion, since the hypothesis postulates the unlimited, though perhaps not indefinite, modifiability of such matter.

Of the causes which have led to the origination of living The origin matter, then, it may be said that we know absolutely of species. nothing. But postulating the existence of living matter endowed with that power of hereditary transmission, and with that tendency to vary which is found in all such matter, Mr Darwin has shown good reasons for believing that the interaction between living matter and surround- ing conditions, which results in the survival of the fittest, is sufficient to account for the gradual evolution of plants and aninals from their simplest to their most complicated forms, and for the known phenomena of Morphology, Physiology, and Distribution.

2 It makes no difference if we adopt Sir W. Thomson's hypothesis, and suppose that the germs of living things have been transported to our globe from some other, seeing that there is as much reason for supposing that all stellar and planetary components of the universe are or have been gaseous, as that the earth has passed through this stage.

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The causes of varia- tion.

Develop- ment a recapitula- tion of ancestral history.

Phylogeny.

Paleonto- logy the historical basis of the doc- trine of evolution.

Mr Darwin has further endeavoured to give a physical explanation of hereditary transmission by his hypothesis of Pangenesis ; while he seeks for the principal, if not the only, cause of variation in the influence of changing conditions.

It is on this point that the chief divergence exists among those who accept the doctrine of Evolution in its general outlines. 'Three views may be taken of the causes of variation :—

a. In virtue of its molecular structure, the organism may tend to vary. This variability may either be indefinite, or may be limited to certain directions by intrinsic condi- tions. In the former case, the result of the struggle for existence would be the survival of the fittest among an indefinite number of varieties ; in the latter case, it would be the survival of the fittest among a certain set of varieties, the nature and number of which would be predetermined by the molecular structure of the organism.

6. The organism may have no intrinsic tendency to vary, but variation may be brought about by the influence of conditions external to it. And in this case also, the varia- bility induced may be either indefinite or defined by in- trinsic limitation.

c. The two former cases may be combined, and variation may to some extent depend upon intrinsic, and to some extent upon extrinsic, conditions.

At present it can hardly be said that such evidence as would justify the positive adoption of any one of these views exists.

If all living beings have come into existence by the gradual modification, through a long series of generations, of a primordial living matter, the phenomena of embryonic development ought to be explicable as particular cases of the general law of hereditary transmission. On this view, a tadpole is first a fish, and then a tailed amphibian, pro- vided with both gills and lungs, before it becomes a frog, because the frog was the last term in a series of modifica- tions whereby some ancient fish became an urodele amphi- bian; and the urodele amphibian became an anurous amphi- bian.

In fact, the development of the embryo is a recapitu- lation of the ancestral history of the species.

If this be so, it follows that the development of any organism should furnish the key to its ancestral history ; and the attempt to decipher the full pedigree of organisms from so much of the family history as is recorded in their development has given rise to a special branch of biological speculation, termed phylogeny.

In practice, however, the reconstruction of the pedigree of a group from the developmental history of its existing members is fraught with difficulties. It is highly probable that the series of developmental stages of the individual organism never presents more than an abbreviated and condensed summary of ancestral conditions; while this summary is often strangely modified by variation and adaptation to conditions ; and it must be confessed that, in most cases, we can do little better than guess what is genuine recapitulation of ancestral forms, and what is the effect of comparatively late adaptation.

The only perfectly safe foundation for the doctrine of Evolution lies in the historical, or rather archzological, evidence that particular organisms have arisen by the gradual modification of their predecessors, which is fur- nished by fossil remains. That evidence is daily increasing in amount and in weight; and it is to be hoped that the comparison of the actual pedigree of these organisms with the phenomena of their development may furnish some criterion by which the validity of phylogenetic conclusions, deduced from the facts of embryology alone, may be satis- factorily tested.

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VEGATABLE. |

LIMITS AND CLASSIFICATION OF THE VEGETABLE KINGDOM.

The fundamental difference which separates the vege- table kingdom from the animal kingdom is to be found in the modes of nutrition which obtain in each. If we compare a plant and animal reduced to their simplest terms, and consisting, therefore, in each case of a single cell, t.¢., of a minute mass of protoplasm invested with a cell-wall, while the unicellular plant draws its nutri- ment by simple imbibition through the cell-wall from the surrounding medium—a process which implies that all its uutriment passes into it in a liquid form—the unicellular animal is able to take in solid nutriment by means of interruptions in the continuity of the cell-wall, and is also able afterwards to reduce this solid food, if of a suitable composition, to the liquid state. And not merely is there a difference of this kind in the mode, there is also one no less important, although less general, in the materials of nutrition. While under present terrestrial conditions those substances, or chemical combinations, which are required for the nutrition of animal organisms, are, as far as we know, nowhere spontaneously produced —that is to say, nowhere apart from the influence of living organisms—materials derived wholly from the in- organic world are sufficient to sustain directly nearly the whole of vegetable life, and therefore, indirectly, of all other life as well. Roughly speaking, while plants are able to use for the purposes of nutrition binary compounds, such as carbon dioxide (CO,), water (H,O), and ammonia (NH,), animals are essentially dependent on the same elements as enter into these compounds, but mostly in a higher state of chemical aggregation than the binary. Plants, therefore, are the " hewers of wood and drawers of water" for other living things. And this property which they so largely possess of constructing, from materials not directly available for animal nutrition, substances which are so, is found to be uniformly attended with the presence of a peculiar green colouring matter, known as chlorophyll, with which a portion of the protoplasm of their cells is tinged. Many plants, however, such as the whole group of Fungi, as well as some flowering plants, draw their nutriment from compounds derived from other organisms, and therefore in a higher state of chemical aggregation than those the green plants make use of. So far they approach animals in the mode of their nutrition.

At first sight it might seem a probable hypothesis that the part played by green plants is one which has always been filled by them from the earliest appearance of life upon the earth. It must, however, be noticed that the

presence of chlorophyll in the organism depends upon a specialization of some only of its constituent cells, and of part only of the protoplasmic contents of those cells. The inference, which appears to be justified by general biologi- cal principles, is that such a specialization is not a thing of primary origin, but has been gradually attained. We are thus, therefore, led to the supposition that the very earlie:t plants—probably belonging to the same stock as the very oldest animals—were destitute of chlorophyll, and were nourished, as Fungi are now, by the imbibition of sub- stances fitted for their nutrition, but which, in the cond:- tions that accompanied the first appearance of life upon the earth's surface, were produced independently of any organisms. The development of chlorophyll would, there- fore, on this view, have to be regarded as a later acquire- ment.

It is necessary to bear some considerations of this kind in mind in order to clearly apprehend the relation to one another of the different phases of nutrition which the vegetable kingdom includes. The plants, for example, which

we collectively term Fungi may, and probably do, include descendants of the original stock which existed before plants possessed chlorophyll at all. No doubt also Fungi com- prise plants which are destitute of the chlorophyll possessed by their near allies, in consequence of the degeneration due to a parasitic mode of life. Amongst Flowering Plants we cannot doubt that this has been the case with Cuscuta, Orobanche, Lathroea, and many others. But besides plants which are actually parasitic, there are other degradcd allies of green plants, which are content to work up again the imperfectly broken down products of decay. Such plants are termed Saprophytes; many examples of them exist amongst the Orchidacee, such as Neottia, Hpipogium, and Corallorrhaza. They live upon the products of the decom- position of vegetable matter, and have more or less com- pletely lost the characteristic green tint of chlorophyll, which would be useless to them if they possessed it. But perhaps the most curious case of the occasional disposition of even green plants to seize upon nutritive matter in an available state of chemical aggregation, is that which is met with in the numerous examples now known of insectivorous plants.

In these latter cases we certainly find morphological adaptation of considerable complexity for purposes of nutrition. But in the vegetable kingdom generally this is certainly the exception rather than the mle. In the animal kingdom it is very different. Amongst plants, however, adaptations of structure which have reference to reproduction assume far greater importance, and these have to a large extent to be relied upon for taxonomic purposes.

Even in the highest plants the physiological division of labour is very small compared with the extent to which it exists amongst animals. From plants of the simplest structure up to the most complicated, the plan of nutrition retains the same broad features. There are few physiolo- gical facts of real importance to be observed ii. the highest terms of the series which inay not be equally well studied in the lower.

Amongst such of the lower plants as are aquatic in their mode of life the protoplasm of individual cells is often broken up into fragments, very minute in size, which are set free in the surrounding fluid, and being furnished with czlia or motile filamentous prolongations of their protoplasm, rapidly disperse themselves over a consider- able area. Such locomotive organisms are usually called zoospores. After a time each is invested with a cell-wall composed of cellulose; this differs entirely in composi- tion from protoplasm, especially in containing no nitrogen. The production of the cell-wall is not therefore to be regarded as a modification of any part of the proto- plasm, but as a segregation of particles of cellulose which were intermixed with it; such a segregation goes on repeatedly, wherever life exists in plant tissues. Starch, which is identical in ultimate composition with cellulose, we know to be fabricated from inorganic materials in the chlorophyll-granules (which are specialized portions of protoplasm) under the influence of light. Cellulose is derived from the starch so manufactured, and is dispersed in a state probably of molecular stibdivision throughout the protoplasm.

The cellulose wall is not apparently essential to the con- ception of a vegetable cell, but it is, perhaps, not going too far to say that its existence has conditioned almost all the histological and morphological peculiarities of plant con- struction. The cell, as already pointed out, although bounded

with what is relatively a tough and even rigid cell-wall, is by no means debarred from further nutrition and growth. If destitute of chlorophyll, it may take in nutrient matter, which only requires some moderate elaboration to suit it for incorporation with the protoplasm. Tf,

on the other hand, chlorophyll be present, it will do a good deal of preliminary work in preparing the substances which then, as before, the protoplasm will further appro- priate and work upon. In either case the protoplasm of the cell will grow, and as the processes which have been described are generally accompanied by the imbibition of fluid, the cell-wall is subjected in consequence to a con- siderable tension. The cell-wall, under these circumstances, grows also, and the experiments of Traube seem to show that, given the conditions under which it is known to take place, this growth is almost entirely a physical process. Carried beyond a certain point, tension must result in rupture ; but just short of this there appears to be a limit at which the intercalation of new molecules of cellulose is permitted, and so the surface of the cell-wall is enlarged. In Wdo- gonvum there is a peculiar arrangement in which fracture actualy does take place repeatedly. A circular cleft is formed, which is repaired within by the apposition of an annular splice.

To the growth of a cell so conceived there would seem to be no limit, and in the Siphophycee, of which Vaucheria is a well-known type, there is apparently none. The vege- tative portion of these organisms, however complicated, is always formed by the extension of a single cell; the pro-‘ toplasm is continuous throughout every part, and except when zoospores are formed is never segmented.

This, however, is a rare arrangement. Generally speak- ing, there comes a time when the protoplasm, by a phase of contractility, divides itself into two masses, and between these a partition of cellulose is formed in the same way as the coat of the naked zoospores already alluded to. Each cell so formed possesses all the capacity for nutri- tion and growth which the whole possessed. It divides therefore in its turn, and in this way we get the first in- dication of an aggregate of cells. In the lower plants the cell is

complete in itself; in tue higher, its independence is more or less merged in that of the others with which it is associated.

This aggregation seems to begin in a purely mcchanical way. In Pleurococcus, for example, cell division repeated a few times may produce aggregation of, at any rate, four cells. If it were not that the adhesion of these cells seems afterwards to fail, there would be no reason why the mere process of cell division should not produce larger aggregates, But the cell-wall common to two adjacent cells splits through its middle lamina, and the two neighbouring cells part company. In Hydrodictyon we have a remarkable example of the formation of an aggregate synthetically, owing to the action of some cause which is quite imperfectly under- stood, but which is probably purely physical. An enor- mous number of zoospores are formed from the contents of a parent cell, and these, after tumultuously moving within its cavity, come to rest, and at the same time arrange themselves in the well-known net-like fashion which is characteristic of the full-grown plant. The mechanical persistence of aggregates of cells formed by normal cell division is obviously the step which led to the evolution of such organisms as Volvox and Ulva, since these are merely aggregates of simple types, such as Chlamydococcus and Pleurococcus,

At first the independence of the individual agsregated cells would be little impaired. Ina Spirogyra or Oscilla- torva, for example, the number of cells present in a fila- ment is probably a matter which does not affect the cells themselves individually, and which conversely they have no power of influencing. The constituent cells might go on dividing, and so form filainents of unlimited length, but which occasionally would be liable to be broken up by arbitrary accident. In Cladophora, however, the cells of a filament cease after a time to divide transversely, and

branch by the production of lateral swellings, which are elongated and then divided off by cellulose partitions. It seems reasonable to suppose that branching in this case simply means that one part of the cell-wall is weaker, less fitted to withstand internal tension, than the rest. If the cell-wall were uniform it would stretch uniformly, and the want of uniformity in the cell-wall may probably be traced to its being part of an aggregate. The string of

cells is mvored by one end, and any motion of the water will cause it to assume an oblique position. It is then unequally influenced by gravity and by light, and these two forces are known to be competent to modify growth in an unsymmetrical manner under such circumstances.

Reasoning of this kind will at any rate suggest the way in which the specialization of individual cells would be a result of their aggregation. With this specialization they would lose an increasing amount of their capacity for in- dependent existence. Specialization of function will, of course, be reflected in corresponding morphological modifi- cations, and thus a mechanical aggregate of independent cell elements gradually passes into a physiological aggregate of interdependent ones.

One obvious penalty of specialization is the loss of the power of reproduction by individual cells when detached. Amongst plants, however, even the highest types preserve some measure of it. It is sufficient to adduce the common horticultural method of propagating Begonias from fragments of the leaves. Such a mode of reproduction in one of the highest plants is essentially the same as that which exists in Pleurococcus, and although reproduction from fragments of structures so specialized as a leaf is comparatively rare, there are in almost all plants provisions for agamogenesis, which depend upon the retention by fragments of the organism of this capacity for independent existence. And it may even happen that the perpetuation of the race for consider- able periods may come to depend upon such a property. One of the most striking instances of this is the distri- bution over the British Isles of the American water-weed (Anacharis), of which, nevertheless, only the female plant exists in this country. If we had the male, we should have a good instance (and others might be given) of gamo- genesis and agamogenesis proceeding side by side in in- dividuals of the same generation, although probably not without the two processes reacting upon one another. Throughout the vegetable kingdom, however, we find gamo- genesis and agamogenesis occurring in separate generations, which are often extremely different. The two modes of reproduction are then subject to a cyclical arrangement, and the comparison of the forms under which this alter- nation of generations occurs in different groups throws a good deal of light upon their taxonomic relations. It will be convenient to use the word "Sporophore" for the

agamo- genetic generation, in which special cells (spores) are de- tached from the parent to serve as a means of propagation ; while for the gamogenetic generation, in which conjuga- tion takes place, or in which special cells (oospheres) are fertilized by antherozoids, and become oospores, "Oophore" may be employed.

Our present knowledge has rather added to than dimi nished the difficulty of devising evenaplausible phylogenetic classification of the vegetable kingdom. Greater success has, however, been attained in establishing the primary and larger secondary groups, so as to allow us to feel some confidence that they are really natural assemblages. The relation of these groups to one another is a problem, the more than approximate solution of which will probably have to be some time postponed. Many of them appear to represent the later developments of simpler types or aggre- gates than anything.that these groups at present contain. The Hguisetacew, for example, are extremely ancient, yet

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we know of no form, living or extinct, which enables us to trace the connection of their very remarkable organiza: tion with that of other groups. In the animal kingdom the "recapitulation theory" steps in, and obtains from the study of the development of the organism that kind of information which is wanting amongst plants as to the simpler ancestral forms of the different vegetable types. This information, however, is drawn in the animal king- dom to a large extent from the phenomena presented by the differentiation of the sustentative organs of the embryo. For reasons already pointed out, there is nothing analogous to this amongst plants, where the rapid extension of sur- face is usually the primary object to be attained. 'The earliest stages in the development of any plant are subject to conditions so simple that there is little room for special- ization, and the economy of nutrition has probably gene- rally led to the suppression of recapitulative structural details.

On the other hand, if we derive little help from re- capitulation in studying the process of development in plants, from the unicellular stage of spore or

oospore, it proves extremely suggestive, if we take in the whole cycle comprised between two processes of gamogenesis, and com- pare the relations to one another of the gamogenetic and agamogenetic generations, or using the nomenclature intro- duced above, of the Oophore and Sporophore,

THALLOPHYTA.

Endlicher, in 1836, divided the vegetable kingdom into Thallophyta and Cormophyta ; and these divisions still hold good, though it is by no means easy to frame characters which will strictly limit them. With the exception of the absence in the one, and presence in the other, of the 'opposition of stem and root," none of the distinctions which Endlicher pointed out are available now. Through- out the greater part of the Thallophyta anything like a distinct segmentation of an axis furnished with lateral appendages is altogether wanting. As thus limited by the absence of a clear differentiation of root, stem, and lateral appendages, this sub-kingdom comprises an assemblage of plants, which were divided by Bishop Agardh, in 1821, into the three well-known groups of Alge, Fungi, and /ichens. And to these, for reasons which will be presently pointed out, must be added the hitherto problematical group of Characee.

It has long been seen that, with respect to the three former groups, it was impossible to assign morphological characters which would separate them strictly one from the other. Accordingly, Berkeley and Lindley were compelled to fall back on distinctions of a physiological kind.

There are several grounds on which this arrangement appears to need reconsideration.

Contrasting, in the first place, Alge and Fungi, we now know that the plants belonging to the former group in- variably contain chlorophyll, while those belonging to the latter are equally devoid of it. In their morphological aspects, however, the two groups present a remarkable parallelism.

Now, the importance of the presence or absence of chlorophyll, and the difference in the mode of life which results, would have greater weiglit for classificatory pur- poses, were we not familiar with instances in other parts

of the vegetable kingdom in which it proves to have no value at all, Amongst flowering plants we are acquainted with many cases where plants closely allied in structure to

others in which chlorophyll is normally developed, are entirely destitute of it. These considerations have re- cently led Cohn and Sachs to treat Fungi and Alge as an assemblage of organisms the classification of which is to be attempted on purely morphological grounds. But the assemblage of plants formed by Alge and Fungi which thus appear to require classification anew, has been further increased by the addition of two other groups, both re- garded quite recently as entirely distinct. In 1868 Schwen- dener proposed his now well-known theory as to the true nature of Lichens; and although his views have been vigorously attacked, chiefly by writers who seemed to feel that they had a vested interest in their autonomy, the weight of testimony, in the case of those who have examined the matter in a wider spirit, has been to strongly confirm Schwendener's hypothesis. Lichens must now be regarded as composite structures, partly consisting of an alga, partly of a fungus. Quite lately Sachs has pointed out (in the 4th edition of his Lehrbuch der Botantk) that Characee may be compared with the structure and mode of reproduction of sone of the Floridece.

Sachs has proposed a classification of the Thallophyta, which appears to be the best that our present knowledge admits of. He divides them into four classes—Protophyta, Zygosporee, Oosporee, and Carposporee.

1. The Protophyta include the simplest plants, and those in which at present gamogenesis is not known to occur. In the Cyanophycee the protoplasm of the cells is destitute of a nucleus, and, besides containing chlorophyll, is tinged with a peculiar bluish colouring matter, known by the name of phycocyan. In Palmellacee this peculiar pigment is absent. Euglenee is a group of well-known but little understood organisms, which must also be placed here provisionally. To these must be added Schizomycetes (Bacteria), which are the agents of putrefactive changes in nitrogenous organic matters, and Saccharomyces (yeast), which bring about the phenomena known as "fermentation." The Schizomycetes appear to be allied in some respects to Chroococcacee: and Oseillatoriacee amongst the Cyanophycee.

The true posi- tion of Saccharomyces must for the present be held as pro- blematical; we are still without evidence to conclusively decide in favour either of its autonomy or of its being a peculiar condition of a member of some group of Fungi of more complex development.

2. The Zygosporee are an assemblage of organisms, none of the members of which attain any high degree of morphological complexity, and in all the subordinate divisions of which the simplest form of gamogenesis, known as conjugation, has been observed to take place. Conjugation only differs from the normal process of fer- tilization in the two protoplasmic bodies which take part in it being precisely similar in bulk andform. Till Thwaites pointed out the contrary in 1848, it was not supposed to be entitled to recognition as a sexual process. But fer- tilization, as ordinarily understood, only differs in the two conjugating bodies being unlike—that is, in their having undergone differentiation into antherozoid and Oosphere, the male and female bodies respectively.

The Zygosporee may be divided, perhaps artificially, into two groups, according as the conjugating cells are motile or non-motile.

In many of the simpler green Algw it has long been known that two kinds of zoospores, differing in size, are produced. To these the terms macrozoospore and micro- zoospore may be applied. The function of the macrozoo- spores is purely agamogenetic. The microzoospores, on the other hand, meet in pairs, and fuse into a single pro- toplasmic body, which Areschoug has termed a zygoz0o- spore.

The process was first observed by Pringsheim in Pan-

dorina. It has also been observed in Chlamydomonas. On these grounds Sachs has placed the whole group of the Volvocinacee amongst the Zygosporee. This has, however, been reasonably objected to by Cohn, inasmuch as in £u- dorina as described by Carter, and in Volvow as observed by himself, there is a true process of fertilization by means of

antherozoids, and not a simple conjugation. It may be allowed, therefore, provisionally to break up the Volvo- cinacec, or rather to restrict the name to the two last-named genera, which may then be removed to the next class, using that of Pandorinee for Volvocinaceous forms, which only exhibit conjugation. Hydrodictyee should probably be placed here, and also Confervacecee and Ulvacece in which the conjugation of zoospores has been observed by Ares- choug.

Sachs has proposed to associate with the Zygosporee the Myxomycetes, in which the formation of the plasmodium is a kind of complex conjugation. Closely allied in some respects to the Myxomycetes are Chytridinee and, more doubtfully, Protomyces.

In the second division, in which the conjugating cells are non-motile, must be placed all the more familiar instances of the process—the Desmidiew, the Diatomacee, the Zygne- macece, and the Zygomycetes as a fungoid type.

3. The Oosporee must include the Volvocinacee, in the limited sense already explained, and also Spharoplea—a form divorced on much the same grounds from Confervacee. Fucus affords the best known type of reproduction belong- ing to this group. The antherozoids are ciliate bodies dis- charged from antheridia ; the oospheres are naked proto- plasmic masses originally contained in oogonia. The antherozoids gather round them in such numbers as to impart to them a movement of rotation. They eventually completely blend with the oosphere, which becomes sur- rounded with a coat, and sinks to the bottom of the fluid in which it has hitherto been suspended. It is now an oospore, and speedily undergoes a process of cell division, which gives rise to an individual of the new generation. Near the Fucacee a place must probably be assigned to the Phwosporee. The remaining groups which fall into Oosporee are Celoblaste and Cdogoniew. Cceloblaste have their protoplasm unsegmented throughout the vegeta- tive portions of the organism. They include forms which are partly algoid, such as Vaucheria and the Siphophycece generally, partly fungoid, as Peronosporee and Saprolegniece. In all other respects, except the presence or absence of chlorophyll, they closely agree with one another, and the

consideration of this fact has led, perhaps more than any other fact, to the breaking down of the barrier between Alge and Fungi.

4, The Carposporece' agree with the Oosporee in so far that the two sexual organs contribute in very different proportions to the formation of the sexual product. While the male only stimulates its development, the female supplies the material for the whole subsequent growth.

The female organ, or carpogonium, may consist of one or more cells. The male organ varies very considerably in the different subordinate groups. Fertilization may, as in the Oosporece, be effected by antherozoids (which may be actively motile or passively locomotive), or by a kind of conjugation, or even by a mere apposition of the male organ and subsequent diffusion of the fertilizing medium. The product of the act of fertilization is sometimes a single cell developing directly into a new individual (Chara). In other cases the fertilized female organ produces zoospores, and still more commonly a multicellular mass in which spores are finally developed. This involves an alternation of the generations of the type of that met with in the sporocarp of Muscinee.

1 See Sachs's Lehrbuch, 4th ed. pp. 240-243.

And we may have every grade of development, from the simplest case, in which the sporocarp appears as a mere appendage of the parent plant of inconsiderable dimensions, to the most extreme condition in the other direction, in which the sporocarp is capable of independent growth, and therefore represents a second generation which is entirely distinct (sporophore). The sporocarp also differs essen- tially from the oospore in the fact that cells contribute to its formation which have not been directly influenced by fertilization, and that in consequence the part of the fruit which produces the spores is surrounded by what—for want of a more convenient term—we may call the pericarp, in which no spores are developed, and which serves as a mere protective investment, or is subsequently drawn upon for purposes of nutrition. In Phycomyces, which belongs to Zygosporee, it is noteworthy that there is a kind of anticipation of the development of a protective investment to the zygospores.

The principal types of the Carposporee include all the more highly developed forms both of Alge and Fungi.

In Coleochetee the carpogonium terminates in an open canal, and fertilization is effected by motile antherozoids.

In Floridee, in the simplest type (Vemalion), the car- pogonium resembles that of Coleochetew, only the terminal tube (trichogyne) is closed and not open. Fertilization is effected by passively motile antherozoids, which adhere to the trichogyne. In Ceramiew the carpogonium, even before fertilization, consists of numerous cells, a lateral row of which—the trichophore—bears the trichogyne. Neither trichogyne nor trichophore, however, take any part in the de- velopment of the sporocarp. 'The pericarp is produced by a process of budding from cells beneath the carpogonium.

In the genus Dudresnaya the process of fertilization be- comes very complicated, and in fact involves a double pro- cess, of which the first stage consists in the application of antherozoids to a trichogyne; and the second in the de- velopment from below the trichophore of a " conducting filament" which conveys the fertilizing influence to the terminal cells of a number of small branches, with which it successively conjugates; at each point of conjugation a sporocarp is developed. Amongst the Ceramiec there is something comparable to this double process ; the fer- tilizing influence which is conveyed by antherozoids to the trichogyne must afterwards be communicated by a process of diffusion from the trichophore to the cell from which the spores are developed.

Characece are now to be regarded as a reduced type of Carposporec. The carpogonium is supported by two basal cells with oblique septa, which it seems quite reasonable to accept as the rudiments of a trichophore. There is, of course, no trichogyne, and fertilization is effected by motile antherozoids, and the pericarp is developed before instead of after this process. In Chara the main axis is clothed with a peculiar cortical tissue, which grows over it from the nodes, aud is clearly comparable with that which exists in the Ceramice.

Fungi contribute to the Carposporee the Ascomycetes, cidiomycetes, and Basidiomycetes. In the first and last of these groups the existence of a

sexual process preceding the development of the sporocarp is now known. Ascobolus has been studied by Janczewski, and the essential features of the sexual process are closely comparable to those of Ceramiee. The carpogonium consists of a row of cells; the terminal one is fertilized by the ramified " pollinodium," and from the central cell of the carpogonium a number of

filaments branch out which bear the asci, while the peri-.

carp is formed by the branching of the mycelium below

the carpogonium. | Lichenes, in 80 far as the hyphe and fructification are

concerned, are essentially ascomycetous fungi. Their

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gonidia are referable to different groups of alge. 'The two sets of organisms live together in a kind of modified com- mensality. The alge are able to sustain their companion fungus without succumbing to the demands of its nutrition.

CoRMOPHYTA.

Alternation of generations exists amongst the Zhadllo- phyta. But, as in Qidogoniwm, it assumes the form of an occasional occurrence of gamogenesis after more or less prolonged periods of agamogenesis ; a series of sporophores is interrupted by the intercalation of anoophore. Amongst the Cormophyta, however, we have generally a regular alter- nation of oophore and sporophore. Both may, however, propagate themselves by the detachment of more or less specialized gemme. But apart from this, the agamogenetic production of spores and the gamogenetic production of oospores regularly follow one another.

Cohn, in a classification of Cryptogams published in 1872, established the groups Bryophyta and Pteridophyta, which, added to Phanerogame,

constitute the groups into which Cormophyta appear best susceptible of division.

1. Bryophyta.—In such a case as Gidogoniwm, sporophore and oophore each attain a tolerably equal degree of vegetative development. In others, however, this may be very much curtailed in one or the other generation. Amongst the Zhallophyta the sporophore not uncommonly suffers this reduction. Thus in Mucor the zygospore only develops a short filament, which terminates in a spo- rangium filled with spores. If we suppose the filament suppressed, the spores belonging to the second generation will. be produced directly from the oospore itself. Thus, amongst the Celoblaste, in Cystopus the oospore produces zoospores, and, according to Cienkowski, this is also the case with Volvor. In such cases the oospore itself is the sporophore. Amongst the Bryophyta there is an alternation of generations which is hardly less abridged. The oophore— which in Hepatice is often a thalloid body, while in mosses it is a leafy plant—bears female organs (archegonia) and male organs (antheridia). The oospore, or fertilized central cell of the archegonium, gives rise to a complicated struc- ture which produces the spores. The first division of the oospore appears to be inclined to the axis of the arche gonium. 'The sporophore is retained in a kind of attach- ment to the oophore, and never attains to any vegetative development of its own. From the fact that the vege- tative structure of some Hepatice is thalloid and leafless (Aneura), while in others (Marchantia) leaves are present in a very reduced condition, it may be inferred that the former have lost their leaves rather than that they repre- sent an original leafless condition. The ancestral type of the Bryophyta was probably more like a moss than like any of the Hepatice. And it is worth while considering what claims Chara may have to be regarded as a transition from the Thallophyta, of which it is an anomalous type in its possession of distinct lateral appendages to the axis. Cohn placed it amongst the Bryophyta; but its removal to the Zhallophyta probably assigned it its true position. The investment of the carpogoniuim, however, cannot have more than an analogy with an archegorium. 'The fertilized carpogonium (sporocarp) might perhaps be regarded as a very reduced form of that of the Bryophyta, producing only a single spore. It is certainly an interesting and it may be a significant point, that the spore of Characew produces in germinating a filamentous chain of cells, appa rently comparable to the protonema of

mosses, and from this the fully developed sexual plant is produced as a lateral bud.

2. Pteridophyta are sharply divided from Bryophyta by the high vegetative development of the sporophore and

gradually increasing suppression of that of the oophore. This never, however, as in the succeeding group, com- pletely loses its independence of the sporophore.

The whole direction of the attempts at classifying the Pteridophyta, which correspond to the so-called vascular Cryptogaims, has been completely changed by Fankhauser's discovery of the long-sought reproduction of Lycopodium. It proves to be totally unlike that of Selaginella, which, from the close agreement that exists between the two types in every otlicr respect, it might have been expected to closely resemble. On the contrary, in the formation of a monceci- ous subterranean prothallus, it may be compared to Ophio- glossee. Yet, as Sachs has pointed out, it is impossible to use this striking divergence for the purpose of breaking up a group of plants which in all respects is perfectly cou- gruous. The anomaly of forms so closely allied, exhibiting two modes of gamogenesis, has now, however, found a parallel amongst the /%licales, in which group Rhizocarpece seem to find their proper place.

The Pteridophyta are divisible into three probably natural classes, which may be briefly defined by the following characters, in themselves, no doubt, artificial :—

i Filicales.—Leaves highly developed and bearing humerous sporangia.

li, Mquesetacee.—Leaves rudimentary, reduced to sheaths on the barren stems, the fertile ones bearing 5-10 spor- angia.

iii. Dichotome.—Leaves small, simple; sporangia soli- tary.

The Filvcales include, according to the arrangement pro- posed by Sachs, three orders, In St¢pulate the sporangia are not trichomes, but are either wholly endogenous pro- ducts as in Ophioglossum, or are formed from cellular pro- tuberauces, and the tissue beneath the epidermis takes part in the formation of spores (Marattiacew) In Filices pro- per the sporangia are, as already mentioned, trichomes, and these are developed upon the normal fronds. In Rhizocarpee the sporangia are borne by metamorphosed leaves, which are united into a capsular body in a way com- parable to that in which carpels bearing ovules are united into a syncarpous ovary. The germination of the spores also presents important differences in the different orders amongst the Stepulate. In Ophioglossacee it gives rise to a tuberous moncecious oophore (prothallium), destitute of chlorophyll. In Osmunda the prothallium exhibits some tendency to become dicecious; it resembles the normal type of prothallium in ferns, but has a kind of mid-rib, and produces adventitious shoots from marginal cells. These shoots become detached, and constitute a mode of agamogenesis. Such a structure cannot fail to recall the thalloid Hepaticw, which also possess a mode of agamo- genesis by means of gemmules (¢.g., Marchantia). In Rhizocarpee the dicecious condition of the oophore has been carried so far that it is indicated even in the spores themselves; the microspores are male, the macrospores female. In Salvinia there is a rudimentary prothallium bearing the antheridia; and a last trace of such a structure appears to exist in Jarszlea and Pilularia. The macro- spore also develops a prothallium, in which numerous archegonia are produced, one only of which is fertilized. The development of the prothallium is so far external to the macrospore that it effects its rupture at the apical papilla. In the RAczocarpee the development of the oophore has been almost entirely compressed within the limits of the spore.

Pe india call for little remark as regards the oophore.

It is dicecious, and irregularly branched, but in other respects there is a close agreement with the oophore of ferns.

The Dichotome present in the morphology of the oophore

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a parallel series with the Milicales. The Lycopodiacee develop from the single form of spores which they possess a moncecious subterranean prothallium like that of Ophio- glossee. The Ligulate (comprising Selaginella and Isoetes) produce, like Rhizocarpew, microspores and macrospores. In this group the suppression of the oophore is carried still further ; the microspores possess, according to Millardet, the merest rudiment of a male prothallium. The macrospores produce a female prothallium, which is an endogenous structure in even a higher degree than in the Rhizocarpew. The first divisions of the oospore have not as yet been sufficiently studied. But while in Ferns proper, Zqwise- tacee and Ophioglossacee, the first septum is more or less inclined to the axis of the archegonium, it is parallel with it in Rhizocarpee (a position into which a very oblique inclination would readily pass), while in Selaginella it is at right angles with it.

3. Phanerogame.—In at any rate two. of the three groups of the Pteridophyta we see that the progressive tendency of the oophore (prothallium) is to lose its inde- pendence. In Ophioglossew, Filices, and Hquisetacew, its growth, independent of the spore, often continues fora con- siderable period. In Rhizocarpew and Lycopodiacew, where male and female spores are produced, the oophore remains attached to the spore, although protruding from it. In Isoetes it fills the cavity of the macrospore as a mass of tissue, and the bounding wall is only ruptured to allow the access of the antherozoids to the archegonia. In the Phanerogame even so small an assertion of independence as this is suppressed. The macrospore (embryo-sac) is never detached from the sporophore previous to fertiliza- tion, and the oophore, which is moderately developed in the Gymnosperme, but in the Angiosperme is reduced to the merest rudiment, always remains eutirely enclosed within the macrospore.

In the Gymnosperme the endosperm is the homologue of the prothallium (oophore). The so-called "corpuscula" are the archegonia, or rather the central cells of reduccd arche- gonia (secondary embryo-sacs of Henfrey). The neck of the archegonium is represented by the "rosette" first described by Hofmeister. Strasburger has pointed out that a small portion of the contents of tle central cells is divided off at the upper end, and this is the rudiment of the canal cell which, running the length of the neck of the

archegonium in the Bryophyta and Pteridophyta, leaves a pervious track by its deliquescence for the access of the antherozoids to the central cell, Strasburger considers all the rest of the contents of the embryo-sac to be the equivalent of the oosphcre. The result of fertilization is to cause a trans- verse partition of the lower part of the oosphere, as in Selaginella. From the lower cell thus constituted, by suc- cessive longitudinal and transverse partitions, the suspensors are developed, the ends of each of which bear an embryo. It is noteworthy that the development of a suspensor as an intermediate structure between the fertilized oosphere and the embryo is also met with in Selaginella.

It only remains to point out, as far as they are understood, the comparable structures in Angiospermae. Here the pro- thallium (oophore) has completely disappeared, unless we regard, with Sachs, the "antipodal cells" as a last rudi- mentary trace; their appearance is, however, inconstant. Within the embryo-sac (macrospore) "embryo-vesicles" are formed, usually two or three in number. One of these is the oosphere, and may be compared to the central cell of an evanescent archegonium, to which another of the " embryo- vesicles" performs the function of a canal cell; for while it is that which is usually in nearest proximity to the pollen tube, it only apparently transmits the fertilizing influence. In a few cases this dormant embryo-vesicle is replaced by a somewhat more highly developed arrangemen-—the*

filamentary apparatus—the homology of which, with a canal cell, is more obvious.

The foregoing sketch indicates, in a very brief manner, the outlines of the classification of the vegetable kingdom,

which has been constructed in the light of the most recent |

studies of the comparative structure of different types. It is sufficient to say, that a detailed consideration of the new relations in which many of the groups now stand to one another by no means diminishes, but strongly confirms, the soundness of the arrangement.

The following table gives the classification in a synoptic form :—

VEGETABILIA. Suzn-Kinapom A. THALLOPHYTA.

With Chlorophyll. Without Chlorophyll. (ALG.) (Funct)

Class 1. PRoropHyTa.

i. Cyanophycee. i. Schizomycetes. Chroococcaceee. Oscillatories, &c.

Palimellacec.

[? Euglenece.]

ii. li, Saccharomyces.

Class 2. ZyGosPoRES. a, Conjugating cells motile.

i, Pandorinee. i, Myxomycetes. [? Hydrodictyez.]

. Confervacece.

iii. Ulvacece.

li. Chytridinec.

B. Conjugating cells non-motile.

Conjugate. [? Protomyces.]

Desmidiex, &c.

iv. iii. Zygomycetes. Mucorini, &c.

Class 3. OoSPOREA. i. Volvocinee.

ii. Spheroplee.

iii. Ceeloblaste. i. Coeloblastee. Siphophycee. Ancylistes.

iv. Bidogoniec. Saprolegniee.

v. Fucacce. Peronosporese [Pheospore.]

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Class 4. CARPOSPOREA. With Chlorophyll. Without Chlorophyll. (ALG.) (FuNGt.)

i. Ascomycetes. Lichenes, &e. ii. Aeidiomycetes.

i, Coleocheetew.

ii, Aloridec. Nemaliec. Ceramiex, &e.

lil. Characce.

Sus-Kincpom B. CORMOPHYTA. Series I. BryopHyrTa.

Class 1. Musci.

Class 2. Hepaticee.

jii. Basidiomycetes.

Series II. PrerrpoPHyTa.

Class 1. Filicales.

i. Stipulate. Ophioglossez. Marattiaceee.

h. Filices.

iii. Rhizocarpec.

Class 2. Equisetaceze.

Class 3. Dichotome.

i. Lycopodiaccee. Lycopodiez. Psilotes. VPhylloglossez.

ii. Ligulate. Selaginellez. Isoetec.

Series ITT. PHANEROGAM. Class 1. Gymnosperme.

Ciass 2. Angiospermee.

i. Monocotyledones, li. Dicotyledones.

See 4 Text-Book of Botany, Morphological and Physiolugical, by Julius Sachs (3d edition), translated by A. W. Bennett, assisted by W. T. Thiselton Dyer ; Lehrbuch der Botanik, von Dr Julius Sachs, vierte Auflage; Quarterly Journal of Microscopical Science, new series, vols, 1.—xv. (WwW. T. T. D.)

BION, the second of the three Greek bucolic poets, was born in the neighbourhood of Smyrna,—according to Suidas, at Phlossa on the River Meles. The few facts known to us of his life are to be gathered from the beautiful "Eurdqpios Biwvos of his friend and scholar Moschus. From his account it appears that Bion left his native country aud, during the latter part of his life, resided in Sicily and cul- tivated the form of poetry peculiarly associated with that island. He was contemporary with Theocritus and some- what older than Moschus. His death was due to poison, administered to him by some jealous rivals who afterwards suffered the penalty of their crime. The subjects of his verses are described by Moschus as " Love and Pan ;" but though his works are included in the general class of bucolic poetry, they have little of the pastoral imagery and description characteristic of Theocritus. They breathe a more refined air of

sentiment, and show traces of the over- strained reflection frequently observable in later develop- ments of pastoral poetry. The longest and best of his ex- tant works is the Lament for Adonis (’Eurddws ’Addvidos), the prototype of many modern poems, His other pieces are short and in many cases fragmentary. Two of the Idylls (xix. and xx.) of Theocritus are frequently ascribed to him. Pion aud Moschus are edited separately by Hermann (1849)

and Ziegler (1869). The best annotated editions are those of Heindorf (1810), Meineke (1856), Ahrens (1855-9), Fritsche (1870), all of which contain also the works of Theocritus, The Lpitaphius Adonidis is edited separately by Ahrens, 1854.

BIOT, Jean Baptiste, French physicist, was born at Paris, 2lst April 1774. After leaving school he served for a short time ,in the artillery, but again resumed his studies at the Ecole Polytechnique. He distinguished himself in mathematics, and was appointed to a professor- ship at Beauvais. ‘There he carried on his researches with the greatest assiduity, and gained the acquaintance and friendship of Laplace, from whom he solicited and obtained the favour of reading the proof-sheets of the Mécanique Céleste. In 1800 he was recalled to Paris as professor of physics at the Collége de France. Three years later he was elected a member of the Academy of Sciences, a dis- tinction rarely accorded to one so’ young as he was. In 1803 Biot, in concert with Arago, investigated the refract- ing properties of gases, and in the following year accom- panied Gay-Lussac in his balloon ascent. He was again associated with Arago in the great undertaking of the measurement of an arc of the meridian in Spain, and at a later date (1817-18) he crossed over to Britain and m2a-

sured carefully the length of the seconds’ pendulum along an are extending to the extreme north of Shetland. In 1814 he was made a chevalier of the Legion of Honour, an order of which he became a commander in 1849. He was a member of the French Academy and of the Academy of Inscriptions and Belles-Lettres, as well as of most foreign scientific societies. In 1840 he received the Rumford gold medal for his researches in polarized light. He died at an advanced age in 1862. Biot’s researches extended to almost every

branch of physical science ; but his greatest discoveries were made in the department of optics, mainly in connection with the polarization of light. He had a thorough command of the best methods of analysis, and applied mathematics rigidly and successfully to physical phenomena. His various dissertations in the Memoirs of the Academy are very numerous; a selection of the more valuable was published in 1858. His systematic works— Traité Elémentaire d'Astronomie Physique (1805, 3d ed., 1841-57, 6 vols.), Tracté de Physique (1816, 4 vols.), Précis Lilémentatre de Physique Expérimentale (1817, 3d ed., 1824, 3 vols.),—are of great merit, though necessarily in some respects behind the present state of physical science.

BIR, or Brresik (the former being its Arabic and the latter its Turkish name), a town of Asiatic Turkey, in the pashalik of Rakka, built on the side of a chalky range of hills that skirts the left bank of the Euphrates, about 90 miles N.E. of Aleppo, in long. 38° 6' E., and lat. 36° 48' N. It consists of about 2000 houses, surrounded by a dilapidated wall-and protected by the citadel of Kalai-Beda, which, with its earthquake-shattered interior, occupies a precipitous eminence cut off from the town. Bir is situated on the main route from Aleppo to Orfa, Diarbekr, and the Persian frontier, and had formerly a considerable trade with Baghdad by means of the river. Itis nowa post and telegraph station. A ferry seems to have crossed the river at this spot from time immemorial, Abraham himseli having made use of it, according to tradition, on his passage from Haran to Canaan. The town is identified with the ancient Birtha or Britha, where the emperor Julian rested on his march to Maogamalcha, and found quarters for his army in one extensive palace. In the English Euphrates expedition Bir was frequently visited, Fort William, one of the principal places of rendezvous, being about 2 miles further down on the other side of the river. (See view in Chesney's Narrative of Euphrates Expedition, 1868.)

BIRBHUM, a district of British India, within the Bardwan division, under the lieutenant-governor of Bengal, situated between 24° 23'-10" and 23° 34' 54" N. lat., and 88° 3' 54" and 87° 7' 41" E. long. It is bounded on the N. by the districts of Santal Pargands and Bhdgalpur ; on the E. by the districts of Murshid4bdd and Bardwan ; ou the 8. by the River Ajai, separating it from the district of Bardwd4n; and on the W. by the districts of the Santal Parganas. The census of 1872 returned the area of the district at

1344 square miles, and the total population at 695,921 souls, residing in 2471 villages and 159,904 houses, Pressure of population per square mile, 518; per village, 282; per honse, 4°3. Of the total population, 576,908, or 82°9 per cent., were Hindus ; 111,795, or 16:1 per cent., Mahometans; 249 Christians; and 3440, con- sisting principally of aboriginal tribes, of unspecified religions. The eastern portion of the district is the ordi- nary alluvial plain of the Gangetic Delta ; the western part consists of undulating beds of laterite resting on a rock basis, and covered with small scrub jungle. The Ajai, Bakheswar, and Mor or Maurakshi, are the principal rivers of the district, but they are merely hill streams and only navigable in the rains. Tice, wheat, sugar-cane, pulses, oil-seeds, and mulberry form the agricultural products of the district. The chief manufactures are silk, silk cloth, and

lacquered ware. The principal seats of trade are Dubrajpur, Tla4mbazaér, Bolpur, Sinthi4, Purandarpur, Krinnahdr, Mu- hammad Bazar, and Ahmadpur. The total net revenue of the district in 1870-71 amounted to £97,979 ; the civil ex- penditure to £27,278. The land tax forms the most important item of revenue. In 1870-71 it amounted to £73,261, paid by 556 estates, held by 2036 proprietors, under the Permanent Settlement as in other parts of Bengal. The district and municipal police force amounted to 320 officers and men, at a total cost of £5895in 1871. Besides these there were 8554 men of the village watch, maintained at a total cost of £23,074, paid by service lands and by the villagers. In 1872 Birbhim contained 604 schools, attended by 9338 pupils, costing £989 to the state for the education of its people. There are seven principal roads in the district, the total mileage being 191, and the average cost of their maintenance £1784. Thirty-three miles of the East Indian Railway lie within the district. Until lately Birbhum was considered to be the healthiest district in Bengal ; but during the past few years epidemic fever has made havoc among the rural population of the eastern por- tion of the district.

Bfrautm, or Sunt, the principal town and administrative headquarters of the district of the same name, is situated in 23° 54’ 25” N. lat., and 87° 34’ 23” E. long. In 1872 it contained a population of 9001, of whom 6746 were

Hindus, 2056 Mahometans, 187 Christians, and 12 of unspecified religions. Municipal income of the town in 1871, £483, 18s.; expenditure, £473, 8s.; rate of muni- cipal taxation, 1s. 8d. per head.

BIRCH (Betula), a genus of arboraceous plants consti- tuting the principal portion of the natural order Betulacee. The various species of birch are mostly trees of medium size, but several of them are merelyshrubs. They are as a rule of a very hardy character, thriving best in northern latitudes,—the trees having round, slender branches, and serrate deciduous leaves, with barren and fertile catkins on the same tree and winged seeds. The bark in most of the trees occurs in fine soft membranous layers, the outer cuticle of which peels off in thin white papery sheets. The common birch (B. alba) grows throughout the greater part of Europe, and also in Asia Minor, Siberia, and North America, reaching in the north to the extreme limits of forest vegetation, and stretching southward on the European con- tinent as a forest tree to 45° N. lat., beyond which birches occur only in special situations or as isolated trees. It is one of the most wide-spread and generally useful of forest trees of Russia, occurring in that empire in vast forests, in many instances alone, and in other cases mingled with pines, poplars, and other forest trees. The wood is highly valued by carriage-builders, upholsterers, and turners, on account of its toughness and tenacity, and in Russia it is prized as firewood and a source of charcoal, A _ very extensive domestic industry in Russia consists in the manufacture of wooden spoons, which are made to the ex- tent of 30,000,000 annually, mostly of birch. Its pliant and flexible branches are made into brooms ; and in ancient Rome the fasces of the lictors, with which they cleared the way for the magistrates, were made up of birch rods.

with very effective patterns. By dry distillation the bark yields an empyreumatic oil, called déogott in Russia, used in the preparation of Russia leather ; to this oil the peculiar pleasant odour of the leather is due. The bark itself is used in tanning; and by the Samoiedes and Kamchatkans it is ground up and eaten on account of the starchy matter it contains. A sugary sap is drawn from the trunk in the spring before the opening of the

leaf-buds, and is fermented into a kind of beer and vinegar. The whole tree, but especially the bark and leaves, has a very pleasant resinous odour, and from the young leaves and buds an essential oil is distilled with water The leaves are used as fodder in northern latitudes The species which belong peculiarly to America (B. lenta, excelsa, nigra, pupyracea, &e.) are generally similar in appearance and properties to B. alba, and have the same range of applications. The largest and most valuable is the black birch (B. lenta), found abundantly over an extensive area in British North America, growing 60 to 70 feet high, and 2 to 3 feet in diameter. It is a wood most extensively used for furniture and for carriage building, being tough in texture and bearing shocks well, while much of it has a handsome grain, and it is sus-

ceptible of a fine polish. The bark, which is dark brown or

reddish, and very durable, is used by Indians and back- woodsmen in the same way as the bark of B. alba is used in Northern Europe. Concerning the canoe or paper birch (B. papyracea), which some regard as a variety of the white birch, Mr Bernard R. Ross, of the Hudson's Bay Company, writes :—"'The canoe or paper birch is found as far north as 70° N. on the American continent, but it becomes rare and stunted in the Arctic circle. Itis a tree of the greatest value to the inhabitants of the Mackenzie River district in British North America. Its bark is used for the con- struction of canoes, and for drinking-cups, dishes, and baskets. From the wood, platters, axe handles, snow-shoe frames, and dog sledges are made, and it is worked into articles of furniture which are susceptible of a good polish. The sap which flows in the spring is drawn off and boiled down to an agreeable spirit, or fermented with a birch-wine of considerable alcoholic strength. The bark is also used by the Christianized American Indians as a substitute for paper." A species (B. Bhojputtra) growing on the Hima- layan Mountains, as high wp as 9000 feet, yields large quantities of fine thin papery bark, extcnsively sent down to the plains as a substitute for wrapping-paper, for covering the "snakes" of hookahs, and for umbrellas. It is also said to be used as writing paper by the mountaineers ; and in Kashmir it is in general use for roofing houses. BIRCH, Tuomas, historical and biographical writer, and one of the early trustees and benefactors of the British Museum, was born in London, November 23, 1705. He was the son of a coffee-mill maker, and was to have

followed his father's business; but his active mind and ambition of higher pursuits led him into the paths of literature. His parents were members of the Society of Friends, and therefore he had not the advantages of a university training. But by persevering application to study and to teaching he qualified himself for the ministry of the Church of England. In 1728 he obtained a curacy, and in the same year he married. His wife died in the following year. He was ordained priest in December 1731, and was soon after recommended to the favour of Philip Yorke, then attorney-general, afterwards Lord Chancellor and earl of Hardwicke, to whom he owed his successive preferments in the church. His first benefice was the vicarage of Ulting in Essex. In 1734 he was appointed domestic chaplain to the earl of Kilmarnock, who was beheaded for his share in the rebellion of °45. He afterwards held successively benefices in Pembrokeshire, Gloucestershire, and the eity of London. His last church

preferment was to the rectory of Depden in Essex, to which he was presented in February 1761. In his latter years he was appointed chaplain to the princess Aielia. His literary attainments procured him election as a fellow of the Royal Society in February 1735, and in the following December he was chosen a member of the Society of Antiquaries. Hc held the office of Secretary to the Royal Society for thirteen years 1752-1765. From the university of Aberdeen he received the degrees first of M.A., and afterwards (1753) of D.D. The degree of D.D. was also conferred on him about the same time by the archbishop of Canterbury. Dr Birch was engaged in a large number of literary undertakings. His appetite and his capacity for hard work were extraordinary. Besides his diversified labours of compilation and editing, he transcribed many volumes in the library of Lambeth Palace, and carried on an extensive correspondence with literary men. He was an early riser; and amidst all his labours he found time to take part in social enjoyments. He was only in his sixty-first year when he was killed by a fall from his horse in Hampstead Road, January 9, 1766. He bequeathed his books and manuscripts, with part of his pictures and prints, to the British Museum. The rest of his property, in value about £500, he gave to be invested in Government securities, the interest to be applied in augmenting the salaries of the three assistant librarians. His principal

publications were—l. The General Dictionary, His- torical and Critieal, including a new translation of Bayle, and inter- spersed with several thousand new lives, in 10 volumes fol., 1734- 1741. 2. Thurloe's State Papers, 7 vols. folio, 1742. 3. Dr Cud- worth's Intelleetual System, improved from the Latin edition of Mosheim ; his Discourse on the true Notion of the Lord's Supper ; and two Sermons, with an Account of his Life and Writings, 2 vols. 4to, 1743. 4. The Life of the Honourable Robert Boyle, 1744, prefixed to an edition of that philosopher's works. 5. Zhe Lives of Illustrious Persons of Great Britain, to accompany the engrav- ings of Houbraken and Vertue, 1747-1752. 6. dn Inquiry into the Share which King Charles 1. had in the Transaetions of the Earl of Glamorgan, 1747, 8vo. 7. An edition of Spenser's Faery Queen, 1751, 3 vols. 4to, with prints from designs by Kent. 8. The Mis- ecllaneous Works of Six Walter Raleigh, with his Life, 1751, 2 vols. 8vo. 9. Lhe Theological, Moral, Dramatic, and Poetical Works of Mrs Catherine Cockburn, with a Life, 1751, 2 vols. 8vo. 10. The Life of Dr Tillotson, Arehbishop of Canterbury, eompiled chiefly from his Original Papers and Letters, 1762, 8vo. 11. Milton's Prose Works, 1758, 2 vols. 4to, with a Life. 12. Memoirs of the Reign of Queen Elizabeth, from the year 1581 ttl her death ; illustrated from the original papers of Anthony Bacon, Esq., and from other MSS., 1754, 2 vols. 4to. 18. The History of the Royal Society of London, 1756 and 1757, 4 vols. 4to. 14. The Life of Henry Prince of Wales, eldest son of James I., compiled ehiefly from his own apersand other MSS., 1760, 8vo. 15. The Letters, Specehes, ke., of Lord Chancellor Bacon. His numerous communications to the Royal Society may be seen in the Philosophical Transactions. BIRD, Wi11aM, an English composer, and one of the best organists of his time, was born about 1540, and died at London, 4th July 1623. He was appointed organist of Lincoln cathedral in 1563; and in 1575 he and his master Tallis were gentlemen of the chapel royal, and organists to Queen Elizabeth. Bird was the earliest English composer of madrigals, and some of his numerous sacred composi- tions are still much esteemed. Most of them were pub- lished during his lifetime under a patent from Qucen Elizabeth, which secured to him and Tallis the sole right to print and sell music. Between 1575 and 1611 there were issued under this patent eight different collections of his works, with such titles as Cantiones Sacre ; Gradualia ; Psalmes, Songs, and Sonets, &c. The vocal canon Von nobis Domine, generally attributed to him, is well known, and often sung. He also wrote a number of pieces for Queen

Elizabeth's Virginal Book, and other similar collec- tions. In his compositions there is a freedom and elegance rarely found in the music of his period. A full account of Bird's life by E. F. Rimbault is prefixed to one of his Masses, published by the Musical Antiquarian Socicty.

ANATOMY OF BIRDS.

N the consideration of the Anatomy of Birds, classi- fication will be quite a secondary matter, and merely employed for the elucidation of internal structure. Some sort of grouping, however, is indispensable; and that is accordingly adopted, as the most convenient for the morpho- logist, which was first proposed by Professor Huxley,! with the introduction of certain modifications rendered necessary by the present writer's own researches—researches, it may be added, which have been carried on in constant com-

munication with that investigator.

_ A little examination will show that the groups made by consideration of any, even the most important, morpho- logical modifications, cannot be superimposed upon groups made by reference to the whole sum of the characters of the Bird. This may be easily explained. About half the known Birds, 5000 or thereabouts, belong, according to G. R. Gray, to Professor Huxley's group, the Coraco- morphe. 'These birds undergo a peculiar metamorphosis of the naso-palatal structures, and are called by Pro- fessor Huxley the Mgithognathe on that account. Now all the Coracomorphe have the egithognathous palate, but so also have the Cypselide, or Swifts, which are placed by this author with the Humming-birds aud Goatsuckers, both of which groups are simply schizognathous. Moreover, below the Passerine types, and only next above the Semi- struthious Tinamous, we find the Hemipods, Zurnicide, or Lurnicimorphe, and these have an egithognathous palate. So also has another type, Z'hznocorus, which lies on the same low zoological level as the Hemipods. This latter bird is essentially a small Geranomorph, but it is below the true Cranes, and unites in its palate

characters belonging to the Ostriches below it and the Passerines which ascend, zoologically, far above it.

The difficulty of applying this very valuable morpho- logical grouping, and making it fit in with one that is more general and distinctively zoological (that is, having reference to every character, external and internal), does not take away anything of real value from it. To the anatomist such a mode of viewing the various types is perfectly natural, however hard it may be to satisfy the pure zoologist as to its great value. Certainly, the struc- tures of the skull and face govern the whole body, as it were; every other part of the organism corresponds to what is observable there. Nor must it be forgotten that the true mode of studying any kind of creature is that of its development; and the head undergoes the most remark- able morphological changes,

In the following scheme we have added one new mor- phological group to Professor Huxley's classification. This group includes the Woodpeckers and Wrynecks, Picidee and Yungide. Zoologically it forms the family Celeo-morphe (Huxley); its morphological term is Sawrognathee (Parker).

1 On the Classifieation of Birds; and of the taxonomic value of the modifications of certain of the cranial bones observable in that class," Proceedings of the Zoological Society, April 11, 1867, pp. 415-472. This classifieation is somewhat modified in a later paper by the same author, in which a very masterly description is given of the Gallinaceous group (Alectoromorphe, Huxley), " On the Classifiea- tion and Distribution of the Alectoromorphe and Heteromorphe," ibid., May 14, 1868, pp. 293-319. The same author repeats, in essentially the same form, the original elassification in his Anatomy of the Verte- brated Animals (1871, p. 272). The materials from whieh the modi- fied views here given have been taken are in a series of contributions by Mr Parker to the Transactions of the Linnean and Zoological Societies now (1875) passing through the press. For figures of the skeleton see Mr Eyton's Osteologia Avium.

Every one who has laboured at the anatomy of this class must have been struck by its marvellous uniformity ; almost countless numbers of species are found passing insensibly into one another, and differing in the slightest manner. The best modern zoologists are at times almost at their wits' end to

know by what characters they may distinguish their genera and species. 'This has been well put by Professor Huxley (Anat. of Vert. dnim.) He says (p. 272)— Though this class contains a great number of specific forms, the structural modifications which they present are of comparatively little importance; any two birds which can be selected differing from one another far less than the extreme types of the Lacertilia, and hardly more than the extreme forms of the Chelonia, do. Hence the characters by which the following groups" (see subjoined table) "are separated appear almost insignificant when compared with those by which the divisions of the Reptilia are indicated, "

MorpPHOLOGICAL CLASSIFICATION OF BiRDS.

A. The metacarpals not ankylosed together. The tail longer than the body.

I, Saurura. 1. Archwopterygide.

B. The metacarpals ankylosed together. shorter than the body. A. The sternum devoid of a keel.

The tail considerably

II. RatTira.

a. The wing with a rudimentary, or very short, humerus, and with not more than one ungual phalanx. a. A hallux. 2. Apterygide (the Kiwis). B. No hallux. 3. Dinornithide (the Moas). 4. Casuartide (the Cassowaries and Emeus). b. The wing with a long humerus, and with two ungual phalanges. a, The ischia uniting immediately beneath the saerum, and the pubes free. 5. Rheide (the American Ostriches). 8. The ischia free, and the pubes uniting in a ventral symphysis. 6. Struthionide (the Ostriches), B. The sternum provided with a keel."

III. CarinatTa

a. The vomer broad behind, and interposing between the pterygoids, the palatines, and the basi-sphenoidal rostrum (Dromeeognathee).

7. Tinamonrphe (the Tinamous).

b. The vomer narrow behind; the pterygoids and pala- tines articulating largely with the basi-sphenoidal rostrum.

a. The maxillo-palatines free. ? i. The vomer pointed in front (Schizo-nathee).

8. Charadriomorphe (the Plovers),

9. Cecomorphe (the Gulls). 10. Spheniscomorphe (the Penguins). 11. Geranomorphe (the Cranes).4

12. Alcctoromorphe (the Fowls). 18. Pteroclomorphe (the Sand-Grouse), 14. Peristeromorphe (the Pigeons). 15. Heteromorphe (the Hoazins). 16. Coccygomorphee (part), (the Goatsuckers).

? The keel is but little developed in Strigops (Psittacida), in Didus (Dididee), and in Aptornis (Rallide).

3 Professor Huxley here gives in a note two exceptions, namely, Crax and Dicholophus. The latter bird, the Cariama, is, however, as Mr Parker has shown, a low, gruiform, rapacious bird, having its maxillo-palatines united by suture, and being an example of a bird with imperfect direct desmognathism.

4 With the exeeption of Thinocorus, see below.

17. Trochilomorphe (the Humming-Birds).

ii. The vomer truncated in front (AMgi- thognathes).

18. Geranomorphe (part), (the exceptional sub- family T'hinocorine, Thinocorus).

19. Turnicomorphe (the Hemipods).

20. Cypselomorphee (the Swifts).

21. Coracomorphee (the Passerines).

iii, he vomerine halves permanently dis- tinct, and the maxillo-palatines ar- rested (Saurognathes).

22. Celeomorphe (the Woodpeckers).

8. The maxillo-palatines united, either by coa- lescence with the ossified septum nasi; or, 2d, by meeting at the mid-line and form- ing a suture ; or, 3d, in the fullest degree, by complete ankylosis of the right and left plates.

23. Aetomorphe (the Birds of Prey). 24, Psittacomorphee (the Parrots). 25. Coccygomorphe (the Cuckoos, Kingfishers, and

Trogons).

26. Chenomorphe (the Anserine Birds). 27. Amphimorphe (the Flamingoes). 28. Pelargomorphe (the Storks).

29. Dysporomorphee (the Cormorants).

The above scheme is a nail in a sure place ; and on it, for the present, we may hang all that we know, or are learning, of the anatomical structure of this class of Verte- brates. That which relates to the Carinate must, how- ever, be regarded merely as a /ist of Birds having a similar facial structure.

For the general ornithologist it is very suggestive and helpful, and will save him from looking merely on outward appearances; for the study of structure and development is looking into the heart of the matter.

THE SKULL.

To both the zoologist and the paleontologist an ex- planation of the skeleton will be of the greatest value, for the framework must of necessity be correlated to the nervous system, and also govern the development of the muscles. It will here form the first and the largest part of our work. And as all things in the skeleton are con- formed to the modifications of the skull,

and, moreover, as the skull is the most knotty problem to the morphologist, it will receive the attention due to its superior importance.

Instead of describing the adult skull, and then showing how it develops, it would seem to be better to follow the stages of its growth, and thus see the meaning of the parts, and what metamorphic changes take place to give it its adult characters. Space will not permit any detail of the general embryology of the Bird, but the skull will be described from the time when the rudiments of the chondro-cranium are first fairly visible, that. is, about the fifth day of incubation.'

As the Schizognathous type of skull, such as is seen in the Fowl, is the simplest variety found in the Carinate, it will be the most convenient for comparison with that of the Ratite and the Tinamous (the Dromeognathous variety) below, and the Desmognathous, and other kinds seen in Birds above the Gallinacee in the zoological scale.

The Cranium of the Fowl—First Stage.—The chondro- cranium may be seen at the end of the fourth and the begin- ning of the fifth day of incubation, although the cartilage has as yet but little consistence, its cells being imperfectly soldered together. The head of the skull at this stage still

1 The whole development of the Chick is explained in a masterly and lucid manner by Messrs Foster and Balfour in their excellent work, The Elements of Embryology, London: Macmillan and Co. Part L,, 1874. The description of the fowl's skull here given is principally from Mr Parker's paper, Phil. Trans., 1869, plates 81-87, pp. 755-807. For a detailed description of the anatomy of birds, see Dr H. G. Bronn's Klassen und Ordnungen des Thierreichs, 1869, 6te Band, IY, Abtheilung, " Vogel."

broad plate of tis-

shows the "visceral clefts;" and it is bent upon itself by what is called the mesocephalic flexure. When the membranous roof of the skull and the brain

are removed at this stage, the whole floor is not seen from above, the fore-part being bent under and looking backwards.

In the hinder half of the skull- floor, behind the eyeballs, we see a

sue (fig. 1, comp. fig. 4, %v.) which , is passing rapidly {F from the condition \ of stellate cells into proper hyaline cartilage.

This plate is divided at the mid- line by a straight, somewhat beaded rod of soft indif- ferent tissue, which does not chondrify ;

an ¥ c

it is rounded at 1t8 Frq.1—skull of Chick after four days of incuba- a 1 tion, with head three lines long, firs stage, from

fore – end. This above, X 9 diameters. Most of the brain has been

truly azygous part removed, c.v.1., i bop: aytog rin ~~

- *tary space; tr., trabecule cranii; /g., lingula forme*

is the notochord bby fumetion of trabecule with the parachordal

(n.c.), or primary cartilages on each side of notochord (n.c.); @., eye:

axis of the skeletal

parts of the em-

cl., cochlea; g., quadrate cartilage ; h.s.c., horizontal semicircular canal; 5, foramen ovale; 9, hypoglos- sal nerve,

bryo ; it lies directly beneath the neural axis, and is one of the parts earliest visible to the embryologist. The broad plate on each side is seen to be hollow, and to contain a pear-shaped diverticulum of the primordial car-sac (cl.), which is planted, as it were, in the very sub- stance of the basal plate, at its middle. The outer granular covering of the ear-sac becomes

cartilage, and so does the basal plate—the "investing mass" of Rathke, the " parachordal cartilage " of Huxley."

But the process by which these two separate morpho- logical territories become converted into solid cheese-like cartilage is carried on blindly, as it were, and no distine- tion of parts is at present traceable; evident differentiation of morphological territories is often Jate in the higher types of vertebrata. The tissue which surrounds the spinal chord where this part passes into the brain is still soft ; it will chondrify soon to form the occipital arch. The bulbous end of the notochord ends a little behind an oval membranous space or fontanelle in the skull-floor—the pituitary space (pt.s.). Near the end of the notochord, on each side, the cartilage suddenly narrows, for here we are in front of the impacted ear-sacs; at this part a bending of the narrow anterior end of the parachordal rounded notch (5) is formed, over which the trigeminal nerve passes. The anterior margin of the notch (after- wards formed into the foramen ovale) is formed by the cartilage; its actual extremity looks forward and outward, towards the eyeball. At present the bands which are continued forward, surrounding the pituitary space, are superimposed upon, and indistinct from, the ends of the parachordal cartilages; in the next stage they will be seen more distinctly. These flat bands of dense granular tissue are the trabecule crani of Rathke (tr.), and they were supposed by him to be mere continuations of the para- chordal bands, an error corrected some years ago by Pro- fessor Huxley. These little rafters of the cranium bend gently round the oval pituitary space; they then com-

8 See Huxley on " Menobranchus," Proceedings of Zoological Society, March 17, 1874, p. 197.

pletely unite into a broad inter-nasal plate, which is bent over upon itself so as to appear on the under surface of the face.

The inter-nasal plate is arched and winged—the rudi-

ch. cbr bbr bh.

Fic. 2.-The same as fig. 1, seen from below. fin., fronto-nasal plate; n., external nostril: m., mouth; mz.p., maxillo-palatine, containing pterygo-palatine bar (pg. pu.); mk., Meckel's rod, or free mandibular bar; c.4., cerato- hyal; 0.4., basi-hyal; c.br. cerato-branchial; e.dr., epi-branchial; 0.07, basi- branchial; 1, 2, 3, lst, 2d, and 8d visceral clefts.

mentary condition of the nasal sacs, the apertures of which are seen beneath the arched part below (fig. 2, 2.)

The trabecule, antero-inferiorly, become free again ; these free extremities are the ventral ends of this the first visceral arch; they form the pith of the flat, emarginate rudimentary ned. This part is called the " fronto-nasal process " (fig. 2, f.n.)

On the sides of the face behind the mouth are seen slits (fig. 2, 1, 2, 3); these are the "visceral clefts," which are always developed in embryonic vertebrata. Between these clefts the tissue of the '"mesoblast" is thickening into cartilaginous rods; these rods are the post-oral vis- ceral arches, the rudiments of the lower jaw and hyoid bone. But beneath the eye is seen an arcuate bar of tissue more solid than its surroundings ; this is the pterygo-palatine rod. It is developed in the maxillo-palatine pro- cess of the mandibular or first post-oral arch ; it represents the bar of cartilage which, in the Frog, connects the man- dibular suspensorium with the ethmoidal region."

The jirst visceral arch, then, runs along in front of the parachordal cartilages ; the trabeculae cranii are its right and left moteties. The second arch can only be under- stood by reference to the development of the lower types of Vertebrata; for in the Shark, Skate, Newt, and Frog the pterygo-palatine portion is not a distinct cartilage, but runs forward as a process of the suspensory part of the lower jaw. But this early division of a visceral arch into an antero-superior and a postero-inferior bar is very constant in the next or second visceral arch from the Skate up to Man. Let it be remembered that the cartilaginous stage is the second; in the first stage the skeletal parts are membranous. They are formed of soft stellate cells in the mesoblast.?

At present the subocular pterygo-palatine bar is very little denser than the tissue in which it is imbedded, but the mandible itself is fast passing into cartilage. Already it is in two pieces, a suspensory piece (figs. 1 and 2, g.), and a free rod (mk.); the upper piece becomes the quad- rate, and the lower, longer part the articulo-Meckelian bar. The processes of the tuberous upper piece are indistinct, but it is sinuous below where it articulates with the thick

1 See article AmPursia, vol. i. p. 755, fig. 9, between pd. and AO. : 2 See Foster and Balfour's work, p, 223.

end of the free bar. These bars nearly, but not quite, meet in the rudimentary chin, the ventral end of the lower jaw. Properly speaking, the hyoid arch is composed of two visceral arches ; but the term is now applied strictly to the first of these, namely, the second visceral, or the arch of the tongue. At present this arch has, with the one in front of it, its antero-superior piece quite soft ; it, too, is late in its development. The two lower pieces (fig. 2, ¢.4.) form the skeleton of the tongue. They are the cerato- hyals, and between these is a small basi-hyal (.4.) answer- ing to the first basi-branchial of a Fish. The third post-oral arch is very similar, but it is larger, and its upper piece is already fast chondrifying. That corresponds to the first epi-branchial of a Fish, the lower piece to the first cerato- branchial, and the median wedge to the second basi- branchial,'

Cranium of Fowl—Second Stage.—In from twenty-four to thirty hours, or about the beginning of the sixth day of incubation, the chondro-cranium of the chick has under- gone sundry and notable changes, A sectional view (fig. 3)

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Fia. 3.—Head of Chick, second stage, after five days of incubation; Iength of head, 4 lines; x 6 diameters; a vertical section. c.v.l, ¢.v.2, ¢ v.3, Ist, 2d, and $d cerebral vesicles; 1, 2, localitics of first and sccond nerves (olfactory and optic); pn., prenasal cartilage; eth., ethmoid; a.cl., anterior clinoid wall; p.cl., posterior clinoid wall; n.c., notochord; 0.c., occipital condyle (from this point to p.cl. the cartilage is parachordal); ¢0., exoccipital; «c., internal carotid artery; pa. palatine; pg., pterygoid region; mk. Meckcl's cartilage; c.h., cerato-hyal; 6.h., basi-hyal; p.s., presphenoidal region.

shows that the hinder and front cartilages, parachordal

and trabecular, are applied to each other unconformably,

the parachordal tracts rising high between the second and third cerebral vesicles, and forming the posterior pituitary wall, a shelving structure in which the axial skeleton ends.

A bird's-eye view of the hinder skull-floor at this stage (fig. 4) shows that the dorsal or hinder ends of the trabe- culz have opened out, like a pair of callipers, and that the out-turned ends of the parachordal cartilages are fused with the inner margin of these apices. The bud-shaped process, which has almost freed itself from the rest, opposite the bulbous end of the notochord, is the true apex of the first visceral bar, or trabecula ; in the next stage it is far more distinct and instructive. Turning again to the vertical section (fig. 3), we see that the commissure of the trabe- cule, or inter-nasal plate, has now become a high wall of cartilage, separating not only the nasal sacs, but also the eyeballs.*

That part of the septum which now looks, not only downwards, but is also turned somewhat backward (fig. 3, eth.), will ultimately lie in the upper part of the nasal and frontal regions. A new thing has appeared, namely, an

3See Parker "On the Salmon's Skull," PAd. Trans., 1873, plate 6, fig. 3. See also plate 2 of the same paper for the subdivision, in a Teleostean Fish, of the hyoid arch,

4This corresponds to the flattened, narrow mesethmoid of Meno- branchus. See AMPHIRIA, vol. i. pp. 756, 757, figs. 11, 12.

azygous cartilaginous bud at the mid-line of the fronto- nasal process ; it is about to become the axis of the beak, and will turn forwards and upwards. This is the prenasal or basi- trabecular cartilage, a notable morphological element up _ here, amongst the Birds, and down amongst the lower or cartilaginous types of Fishes. At the present it corre- sponds exactly to the state of the Green Turtle's skull (chondro- cranium) at the time of hatching, and in that type it stops at

this stage, not raising 4.0

itself into a forth- standing rostrum.

The mouth, which in ae. \ the first stage was a wee.

Fre. 4, Skull of Chick whose head was five lines long, morc than half of bird's-eye view, x 12 diameters. Lettering as above, with addition of i.v., investing mass, or parachordal cartil- age; ¢.c., internal carotid artery; 8, foramen for vagus nerve. Here the lingula (/g.) shows the apex of the trabccule externally.

large four-sided cleft, with produced corners, and clean beneath the head, as in a Skate, is now a space, the axis of which points more forward than downward, a good step towards its eventual direction. The further development of the facial arches will be best studied in older specimens at the end of this, the second stage; but at its commence- ment there is wanted the condition of the antero-superior segment of the hyoid, or second post-oral arch. This has not been worked out in the Fowl's chick, but in an embryo of the House Martin (Chelidon urbica), corresponding to the stage given in our third figure as to development.

In this instance the quadrate and articular Meckelian cartilages have acquired very nearly their proper form (fig. 5, ¢., ar., mk.), the suspensorial part having a free for-

vA SSC.

Fic. 5.—Facial arches of House Martin (Chelidon urbica), middle of incubation, x 20 diameters. g., quadrate, with orbital process or 'pedicle' in front, "otic process" behind, and articular facet below; am., articular part of mandible; mk., Meckel's cartilage (cut through); m.st., medio-stapedial (the line from the letters only reaches half-way to this bar); s.s¢., supra-stapedial ; e.st., extra-stapedial; i.st., infra-stapedial (soft); st.A., stylo-hyal; ¢.2o., tym- panle wing of exoccipital; tg., tongue; c.Ay. cerato-hyal; 6.hy., basi-hyal; b.br., basi-branchial; 67, 1, 1st branchial or thyro-hyal.

ward and inward looking process, the "pedicle," and a backward turned process, the "otic process," articu-

lating with the auditory sac (this is drawn as cut away in part, and only that which is conjoined to the occi- pital cartilage (t.e.0.) is given). Just below and behind the otic process of the quadrate, exactly where in riper embryos we find the fenestra ovalis, having fitted into it the elegant oval base of the 'columella auris," there is in this iustance a curious trowel of cartilage, continuous by the upturned end of its handle with the very substance of the ear-capsule. The solid sickle-shaped cartilage be- hind this is the "' tympanic wing" of the exoccipital (¢.¢.0.) Here we have the wanting upper and anterior segment of the hyoid arch, corresponding to the separately developed pterygo-palatine bar, its 'serial homologue." The blade or free end of the trowel is concave on the under side, and is thick above and at its margin on the outside; it is pointed above and below. A ligament connects the upper point with the ear-capsule behind the quadrate, and an- other tract of soft indifferent tissue reaches downwards to a small bar of cartilage, which looks backwards and a little downwards. This little cartilage (st.h.) is only connected with the distal piece (c.hy.) by fibrous tissue ; it is the stylo- hyal, and corresponds to what is permanent in the Crocodile. The bar itself is the " medio-stapedial" (m.s¢.); it will soon segment itself off from the ear-capsule, bringing away with it an oval piece of the periotic wall; that oval part is the true stapes. The broad part of the

“blade” is the extra- stapedial, and on it will be stretched the membrani tym- pant. It precisely corresponds now with that of that old Lacertian Hatteria or Sphenodon.}

The “stylo-hyal” will soon be conjoined to the extra- stapedial plate, and the (afterwards) chondrified band will be the “ infra-stapedial.”?

In a few hours the changes that have taken place in the chick’s skull are very noticeable and important; these are recorded as the end of the second stage.

A side view of the chondro-cranium (fig. 6), the mem-

eh —h\ FP: “Le_f

alo~ oC. atx: | pH. Peary a Bae OF

Fia 6.—Skull of Chick, second stage, head 5 lines long, X 6 diameters. Outer view, with brain and roof removed to show chondro-cranium. Letters as in figs. 1-4, with the addition of a/.w., alinasal cartilage; al.s., aliseptal; a/.e., aliethmoidal; p.p., pars plana; a.s., alisphcnoid; pf, post-frontal (sphenotie region); s.o., super-occipital; st., stapes; 7ir., foramen rotundum; 7p.s.c. pos- terior semicircular canal.

brano-cranium above the brain being removed, shows how fast the life-processes are moulding the embryonic head into the fashion seen in the adult; no trace of bone has appeared, save in the sides of the mandible. The roof of the skull never chondrifies, but is covered in by secondary bones. Like the skull of an adult Shark or Skate, the whole chondro-cranium is one continuous structure—all save the post-oral arches. The auditory mass is now environed by cartilage stretching over the back of the head—the occipi- tal, and by wing-like growths that wall-in the bulk of the brain behind the eyes—the alisphenoid (a.s.) The high

1 See Huxley “ On the Representatives of the Malleus and Incus of the Mammalia in the other Vertebrata,” Proc. Zool. Soc., May 27, 1869, pp. 394-397, figs. 1-4.

2 For a comparison of these parts with the ossicwla auditus of the Mammal, see also Parker " On the Structure and Development of the Skull in the Pig," Phil. Trans., 1874, p. 331.

orbito-nasal wall is one continuous plate of cartilage, seem- ingly only a crest upgrowing from the coalesced tract of the trabecule. The arched wings of this part, which we saw in the first stage, can be seen to be marked off into three regions—an aliethmoid (al.e.), an aliseptal (a/.s.), and an alinasal (al.n.); in the latter is the external nostril, and dividing the eye from the nose is a flat partition, the pars plana (p.p.) Between the nasal openings and their cur- tains and valves, the prenasal cartilage (p.n), still arcuate, is yet rising in front; whilst, behind and above, the great middle wall (eth.) terminates by a bud of cartilage, which marks the fore-end of the cranial cavity, aud the groove on each side below this is for the nerve of smell (1). The oval pituitary space has become a neat round opening, through which the internal carotid arteries enter; it never chondrifies below, and has to be floored afterwards by secondary bone. The upper hyoid element (st.) has now freed itself from the periotic cartilage, bringing away so much as serves for the dilated dorsal end, and thus leaving an open window (fenestra ovalis), to which this forms the accurately fitted shutter. In front of this small cartilage, the quadrate (g.) shows almost its adult form, and the double lower condyle fits into a sinuous concavity on the end of Meckel's cartilage (mk.) This free bar—the mandible—sends backwards a posterior, and inwards an internal angular process. The later and feebler pterygo- palatine sickles are now formed internally of small thin- walled spheroidal, and externally of fusiform, cells of a larger size. They ossify before chondrification can take place.

Interposed between the skin of the palate and fauces below and the basis cranii above, is a thick mat of granu- lar tissue, which does not, however, chondrify, but ossifies as the parasphenoid and basi-temporal bones.

Cranium of Fowl—Third Stage.—After about three or four days, that is, about the middle of the second week of incubation, the chondro-cra- nium has not only undergoue great changes in size and form, it is also now beginning to become an osteo-cranium. All that is cartilaginous has

acquired a neat finish (figs. 7, 8); the occipital condyle (o.c.) is perfect; the super-occipital arch is complete (fig. 8, s.0.) 5 and bone is forming in three places in the occiput (7.c., ¢.0.), and the bone (pa.s.) which un- derlies the orbital septum has grafted itself upon the carti- lage of the basi-sphenoidal region. That bone, the para- sphenoid (7.6.s.), and the other investing bones, are now grow- ing in the tissue between the skin and the cranio-facial ele- ments ; those that can be seen below are shown in figure 8, the remainder can be de- oe scribed in riper stages. downward bend (not shown in the figure) of the prenasal rostrum (p.n.) is but gentle ; this long spatulate continua- tion of the base of the orbito- rudiment of the basi-occipital. nasal septum, the " basi-trabecular bar," or foremost key- stone piece of the body, is now at its fullest height of growth, and ready to decline. It is now the accurate

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The Fic. 7.—Skull of Chick, third stage, part of basal region, from above,

x 18 diameters, a.s., root of ali- sphenoid; 0.s., basi-sphenoid. The notochord (n.c.) is seen to lie in an open space in front—the posterior basi-cranial fontanelle—and to be bony behind; the bony matter is the

counterpart of the axis of the cutwater of such Fishes as the Skate, Saw-fish, and Shark. Those who look for the under-

fm.

Fre. 8.—Skull of Chick, third stage, under view, X 10 diameters, large prenasal cartilage p.n, which, behind, runs into the septum nasi, are seen the premaxillaries (px.) These are the commencement of a chain of splints running to the quadrate (g.), viz., mx., maxillary; mz.p., its inner proccss; /., jugal; g/., quadrato-jugal. Within these are—pa, palatine; pg., pterygoid ; r.bs.,

a7) Around the

rostrum of pasi-sphenoid (parasphenoid); this is spreading into the basi-sphenoidal region, flanked by the lingule, and above and behind are the ali-sphenoids (a.s.) In the broad part are the following, viz., 0.,, basi-temporals ; ty, tympanic cavity; fm., foramen magnum; 0.¢.0., the bony exoccipitals; BGs, super-occipital. Other letters as above. lying unity of the various types may here see how fit this unpaired rod is to have modelled on it all kinds of beaks of Birds. On this bar a tri-radiate patch of bone is formed right and left, leaving it as yet uncovered below, above, and at the fore- end, These are the young premaxillaries, and are bones that in most Birds, as in Osseous Fishes, over- shadow and starve the upper jaw-bones, or . maxillaries proper, so large, relatively, in most other types. Already they bave each a palatine, a nasal, and a dentary process. The machinery of the first post-oral i is shown (fig. 8), all save the free mandible, which will be described in a more advanced stage. The quadrate (g.) is ossifying; the ptery: goid and palatines (pg., pa.) are ossified; they are very simple bars, Between the premaxillary and the quadrate are bones that have been formes in the outer part of the "maxillo-palatine process" of the embryo; they are the feeble maxillary, with its ingrowing maxillo-palatine plate, and the still feebler jugal and quadrato-jugal (mx., mx.p.,

dos Gd)

On the mid-line a grooved style of bone, the rustrum of the parasphenoid, carries the rounded lower edge of the

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inter-orbital septum, and has grafted itself upon the cartilage of the pituitary ring, causing it also to ossify. On each side, behind these new bony patches, a free tongue of cartilage is seen. These tongues are the apices of the trabecular bars. They are better seen in the partial view (fig. 7). Underflooring the fore-half of the main skull base, close behind the pituitary ossifications, the thick mat of sub-mucous tissue is fast becoming bony. There is a right and left squarish patch, very large and elegant; in the grooved mid-line a few osseous points are also seer, ready to grow right and left into the two plates, and to make them one. These are the basi-temporals

(0.t.) They soon coalesce with the ossifying basi-sphenoid above, and they represent the handle of the dagger-shaped para- sphenoid of the Frog.1_ The super-occipital region (8.0.) is still soft, and the exoccipitals do not reach to the condy- loid foramina (9). They begin at the hole for the vagus, and run to the selvedge at the foramen magnum (8, fm.) The kidney-shaped transverse condyle (0.c.) has in its substance the diminishing notochord (n.c.), which, however, is better seen in the partial upper view (fig. 7, n.c.) This figure shows that the notochord has tried, as it were, to break up into three fusiform segments. The hinder of these is enclosed in an ectosteal sheath, which will affect with bony growth the neighbouring cartilage, right and left, to form the basi-occipital. The fore-part is narrower, and lies in an open space, the counterpart of the mem- branous floor (" posterior basi-cranial fontanelle "— Rathke), which lies behind the pituitary space in the Snake's embryo. On each side of the middle notochordal spindle are seen the elegant mammillary elevations caused by the enclosed cochlew (cl.) The internal carotids (t.c.) are seen creeping through the pituitary hole, and on each side the ossification has been set up, which forms the true endo-skeletal basi-sphenoid. Ou each side of the posterior pituitary or clinoid wall, the cartilage is pinched in to let the great trigeminal nerves pass over; but two parts of intensest interest are seen on each side of these shallow notches. These are the apices of the trabeculze (lg.), free-ended, curved tongues of cartilage, with dark cells in their interior, and fixed to the out-turned anterior ends of the parachordal cartilages, just where the new bony matter is seen. The meaning of these parts that make the pituitary region was not seen at the time by the author of the paper we are quoting (Parker "On the Fowl's Skull"); further research was needed, and his figures are of much greater value than his descriptions.

Cranium of Fowl—Fourth Stage.—At the beginning of the third week of incubation the chondro-cranium is not only perfect as to form, but it has also so much increased its bony territories as to make it very useful for comparison with chondrosteous skulls of the lower types. When every investing bone has been removed, we get such a structure as is shown (from above) in fig. 9. Here the cranial basin has a short and fenestrate floor, and doubly-winged sides, which are gently scooped above, and form a pair of sym- metrical ledges on which the widest part of the brain rests ; whilst the floor dips much lower down, where the medulla oblongata and the pituitary

body rest. The scooped fenestrate alisphenoids (a.s.) look inward, but fail to reach the median line by a great space, which space is filled in by no orbital wings, such as we should see in a Lizard, Turtle, or Mammal. The whole orbital region is, in the skull, a steep wall, having a retral crest on its fore-part, this crest being the rudiment of the large sheet of cartilage (tegmen cranii), which is thrown over the brain in the young Salmon.? This wall (p.s.), this crest, and the elegant cartilaginous awning in front of the crest, containing valves

1 See article AMPHIBIA, vol. i, p. 753, fig. 5, p.s. 2 See "Salmon's Skull," op. cit., plate 4, fig. 2, écr.

and folded curtains of most cunning construction (see figs. 10 and 11)—all these have grown out of that inter-nasal

va

Fic. 9.—Skull of Chick, fourth stage, head nearly 1} inch long, beginning of third week, X 4 diameters. The additional letters arc—a.sf, alisphenoidal fenestra; p.b,f, posterior basi-cranial fontanelle; pro., prootic bone; @s.c., anterior semicircular canal; t.eo., tympanic wing of exoccipital; 6.0, basi-occipital; 5a, foramen rotundum; 5, foramen ovale.

plate formed by the trabecule as their commissure (figs. 1 and 2, tr.)

Morphologically considered, these are added and distinct elements, but their differentia- tion from the trabecule can- not be seen well until now, and even now it is imperfect. The leafy coverings of cartilage are seen to dip down on each side of the prenasa!. spatula in front, and the cartilage at this part forms a coiled, valvular nose-lid —the '"alinasal re- gion." From this, in its in-

Ppe

side, there hangs a curtain, ql] Fie. 10.—-Skull of Chick, fourth stage.

a transversely veitical section through the external nostrils, «x 8 diameters. s.n., septum nasi; al.n., alinasal; n.td., alinasal turbinal, i.n.w., lateral nasal wall; n.pc., nasal processes of premaxillaries; d.pz., dentary processes of the same; p.px., palatine processes of the same; pa., palatine; mz., maxillary. On each side of the thick base of the septum the nasal nerves are seen.

of cartilage (fig. 10, n.tb.), the "alinasal turbinal." It curves towards the septum, and then turns upwards below to become parallel to the inturned nasal wall (2.m.w.) Behind the ali- nasal comes the aliseptal region (a/.s.); and when cut across at the notch behind it and the hinder part of the roof, it shows a doubly coiled outgrowth, the "inferior turbinal" (fig. 11, 2.) The hinder region or " aliethmoid " is the true olfactory region ; the roof suddenly turns inward, and is coiled upon itself, so as to form the bagpipe-shaped upper turbinals, whose swollen faces look inwards to the mesethmoid. Behind their inturned part they send down a cartilaginous curtain, the pars plana, or antorbital plate, the fore-face of which

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does not develop any obvious "middle turbinal" as in Man.

*The differentiation of distinct morpholo- gical regions, which did not become obvious in the membrano-cranium, can now be seen to some extent in the well- developed cartilage. As in the Ratitw, the orbito-nasal septum was, in the second stage, a continuous sheet of car- tilage.**

Looking upon the trabecule as the first facial arch, correlated to and supplied by the orbito-nasal nerve, we see why there should be a segmentation of this Fae uppermost and foremost part of the face into a suspensorium and a free arch, such as is seen next behind in the mandible.

This segmentation has commenced, and, oddly enough, that part of the trabecular commissure which will be absorbed has not lost its original flap-

shape (see fig. 12, pe, cfic., $.v.l.) The hour- glass- shaped —_ window 7.07 here formed by meta- morphic action will be- come a notch in a day or two, and the flat region of the trabeculae will be absorbed. Thus we get the Tinamine stage ;? for in that inter- mediate form between the Ratite and Carinate types—the Tinamou— the metamorphic pro- cesses are stayed mid- way, and the bird is a native, so to speak, of the Struthio-Gallinaceous "marches." Beneath the retral ethmoidal spike is seen the olfactory groove (1.); whilst in front of the cranio-facial fenestra (c.f.c.), the orbito-nasal nerve (n.n.) grooves the septum, gets bridged over by it, and creeps down to its own proper facial bar—the trabecule. And the result of the metamorphosis in this Carinate bird is the formation of a pear-shaped fenestra (7.0) between the eyeballs, This window was not cut out by Nature in a fit of economy (as the mere teleologists vainly speak), but is a fairly com- menced separation of the common crest of the coalesced trabeculz from the ethmoid forwards and the presphenoid behind (p.¢., p.s.)

The notch behind the cartilaginous frame of this window is formed by membrane into the optic foramen.

1 See Parker "On Ostrich Skull," Phil, Trans., 1866, plate 7,

fig. 2, p.e., and plate 8, fig. 10, p.e. 2 "On Ostrich Skull," plate 15, fig. 8, s.7., p.¢., efic.

Fie. 11.—Another section from the same Chick, further back, X 8 diameters. 2.¢6., inferior turbinal; al.s., aliseptal; n., nasal bone.

Fig. 12.—Axial part of the same skull, x 4 diameters. The new letters are n.n., groove for nasal nerve; cfc, cranio-facial cleft; $.vJ., supe'-vomerine lamina; p.e.. perpen- dicular ethmoid; 7.0.7, inter-orbital fen- estra; 0.8., orbito-sphenoid.

b.s.) meet below the fenestra. Underneath the inter-orbital plate the parasphenoid balk (quite distinct) is seen, and underneath the basal bones

the basi-temporal slab (0.2.) Turning again to the bird's-eye view (fig. 9.), we see that the notochord is now enclosed in a spearhead-shaped bone, the basi-occipital (b.0.) It is ridged above by the enclosed notochord, and, behind, the swelling halves of the condyle (0.c.) are seen. This. basal bone is truncated in front, and forms the hinder margin of the wide rounded " pos- terior basi-cranial fontanelle" (p.b,f.) On each side are the exoccipitals (¢.0.), and, above, the perfected occipital arch has a pair of super-occipitals (s.0.) as in man. The outer occipital region is grooved to receive the investing bones, and has tympanic wings to enlarge and protect that cavity. On each side of the fore-part of the basi-occipital is seen the cochlea (cl.) ; and in the ledge above the main periotic bone, the prootic (pro.) is largely spreading (the two lesser ossicles are appearing, but will be better shown in the next stage). The foramen ovale (5) is very large ; it is bounded behind by the prootic, and in front by the alisphenoid (a.s.) This " great wing" has a large central fenestra, round which the bone has crept. In somewhat younger specimens this bony matter was in two patches, one above and another below the fenestra. The same thing may be seen in arboreal birds, as the Common Sparrow.

The stem of the alisphenoid almost meets its fellow- process over the posterior clinoid wall (p.cl.) In the stem is seen a "foramen rotundum." Outside, the ali- sphenoid has a thick, secondary, post-frontal (sphenotic) wing (p.f.) The round pituitary space is walled in with bone. Its secondary parasphenoidal floor has been removed. We reserve a description of the fast-growing roof bones for the next stage, when they are most instructive for comparison with those of Fishes and Reptiles.

Cranium of Fowl—Fifth Stage-—In a day or two after

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Fig. 13.—Ripe Chick's head, 14 inch long; lower view, < 3 diameters. The additional letters are v., vomer; 4., lachrymal; /., frontal; ew., eustachian open- ing; prp., posterior pterygoid processes; sqy., squamosal

hatching, the skull of the chicken is excellent for com- parison; as in Cattle, so in the Fow] and its relations, " their young ones are in good liking" as soon as they appear ; hence they are strong in bone and sinew very early, the growth-processes taking place rapidly.

The under view (fig. 13) shows, behind the orbits, a strong cranial box. Synchondroses of the remainder of the chondro- cranium divide the endo-skeletal bone-territories ; and that organic attraction which causes the perfect correlation of the shallow with the deeper layers of the mesoblast, has given us here bony encasements, that not only fill in what was wanting in the chondro-cranium, but also overlie and double the strength of the ossified cartilage itself. All is neat and finished now, and now is the nick of time in

Fia. 14.—Horizontal section of skull-base of same Chick, X 4 diameters. a.t.r., anterior tympanic recess; st, stapes; 7, portio mollis passage (meatus in- ternus).

which can be seen most of the sutures, so soon to be

obliterated by the almost universal ankylosis that takes place

afterwards—a process by which Nature, in the Bird, rapidly fills in nearly all her footprints. Here she is as hard to bind as Proteus himself ; and the morphological worker is often sore bestead to catch all the transformations. If the chick were to retain throughout life its present form of face, it would much resemble a Hemipod. We have seen

how its skull becomes metamorphosed from a lower into a

higher and a still higher type day by day.

This basal view shows that the bony pieces of the occipital arch are fast forming a strong ring, after the manner of a vertebra. The keystone piece (s.0.) is now one bone, with the remains of the suture above. The notochord still exists in the basal piece (0.0.), and is seen in the condyle, the dimple of

which is caused by it. The basi-temporal plate (0.¢.) is now a low triangle, with its base behind ; the base is, as it were, gnawed, the jagged edge joining the overlying spheno-occipital by a squamous suture. This thick plate is emarginate in front, below the meeting of the eustachian tubes (ew.), and this notch is the mark of the original symmetry of this double bone. Grooved gently at the mid-line, the basi-temporal is mammillate on each side, these elegant swellings being due to the cochlee that are encysted in the ossifying cartilage above. Behind, it is eared, and over these ears the internal carotids creep as they seek the pituitary space ready to form the "circle of Willis." The bone above and in front of the basi-temporal is a compound of the rostral parasphenoid and the proper basi-sphe- noid. Altogether, this is a very extensive and multi- form element. Directly in front of the basi-temporal it is scooped at the meeting of the eustachian tubes—diverticula of the first visceral cleft. In front of that part the rostrum is soon a free structure, grooved for the inter- orbital septum ; but behind and above the basi-temporal the bony mass is all one, and it has an upper and a lower wing on each side behind the strong wall which it has built around the pituitary well. The upper of these wings are ossifications of that cartilage which we saw was

formed by coalescence of the sub-apical part of the trabecule with the fore-end of the parachordal plates.

The large posterior basi-cranial fontanelle has now be- come the deep chink which exists as a ditch between these post-pituitary banks (fig. 14, pb.) On the upper surface the chink reaches the basi-occipital; in the horizontal section (fig. 14) it is cut away behind.

The lower and outer pair of wings of the basi-sphenoid are very large (figs. 13 and 14); they build, on each side, the anterior tympanic recess (a.t.7.), and their starting point of growth is from the free apices of the trabecule, which are thus feathered with these large coiled laminz of periosteal bone that enclose another diverticulum of the first visceral cleft, which lies over the eustachian passage.

Close in front of the eustachian groove the soldered part of the rostrum widens into a pair of projections, and, upon these, obliquely placed facets of cartilage are attached for articula- tion with counterpart cartilages on the pterygoid bones (pg.)

These perfectly distinct cartilages are the result of a peculiar metamorphosis of the outstanding (basi-pterygoid) spurs of the trabeculae. In the Aatite, as in Lizards and Serpents on the one hand and Mammals on the other, these external pterygoid plates or processes are a direct out-growth of cartilage, the posterior conjugational spurs that grow out for union with the pterygo-palatine arcade.! Like the subdivision of the ethmo-trabecular wall, this segmentation of originally continuous cartilage is of the highest morphological importance. Several other things of this kind will be found in this class, where the Vertebrate pattern has beenspecializedand metamorphosed to its highest degree, as if to produce types that should be as ¢magines in relation to the forms beneath them. The remainder of the rostrum just runs, pointed, to the edge of the cranio-facial cleft (fig. 16, 7.0.8. to a.p.) In front of this notch the septum nasi is seen, narrow and rounded, and it terminates below in the starving prenasal (s.n.,.».) Around and in front of that rod the now single premaxillary clings; it has its under surface grooved to the end, where that rod lay, its sides developed into the sharp dentary region (fig. 13, d.pa.),and its under part growing backwards as two nearly parallel bands, the palatine processes (p.px.), that articulate with the palatine bones (pa.) These latter bones run backwards in the same gently diverging manner, and then curve inwards to be tied the one to the other, before they bend outward again, foot-like, to articulate with the pterygoids(pg.) These palatines are very simple ; they give off from their main bars merely a scooped lamina, growing towards the skull base, becoming the ethmo-palatine in front; and this part articu- lates with a splint of the trabecular arch, the small styli- form vomer (v.), which is notched behind, bluntly pointed in front, and primarily azygous.

The pterygoids (pg.) are stout little bony mallets, with a pad, as if of leather —the cartilaginous articular meniscus. Where each bone glides on the similarly padded trabecular region these facets look upwards and inwards. The end of the palatine is articulated by strong fibres to a sinuous notch on the fore-end of the pterygoid. This notch is bounded by the basi-pterygoid

facet below, and by a stunted " meso-pterygoid process" above, which rides over the palatine. It is arrested in the Gallinacee, and never becomes segmented off (see below). The hinder end of the pterygoid is scooped below to articulate with the counterpart knob on the front face of the quadrate. A joint cavity is formed here. Above that joint, and looking upwards and forwards, is a very stunted " epi-pterygoid " process, which clings to, and is strongly strapped upon, the quadrate by fibrous tissue.

1 See Phil. Trans. 1866, plate 7, fig. 4, a.p.; and ibid., 1874, plate 34, fig. 2, e.pg.

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The large quadrate bone (figs. 13 and 15, gy.) has its | these are the frontals (/.), which form the upper crescent of

free pedicle or orbital process still soft above. Its otic | the large circle of the eye.

FO,

Fig. 15.—Same skull, side view, X 3 diameters. Letters as above, with the addition of—p., parietal, d., dentary, su, surangular, a., angular, p.a.p., posterior angular process; #.a.p., internal angular process; a, artlculare.

process has a larger rounded head for the squamosal

(sq.), and a lesser rounded head for the prootic within.

In front of the otic process is a sort of trochanter or spur.

Below, the articular facet is somewhat divided, by a shal-

low fossa, into an outer larger and an inner lesser facet.

The otic process passes through the front of the tympanic

cavity (first cleft), and becomes involved in the membrane

thereto attached, namely, the membrana tympani. It was mistaken by anatomists of the last generation for the true tympanic bone. Behind this bone (see fig. 13) there are seen two holes, the inner of them leads to the auditory fenestree (ovalis and rotunda), and the outer is the opening into a gallery which communicates, by means of diploé, with one on the other side. These are the "upper tym- panic recesses," and have their counterparts in the Croco- dile. Besides the pterygoid and palatine, in that part of the mandibular arch which is folded over the mouth,

—for the first post-oral enfolds itself to make all the lower

and much of the upper jaw,—there are in the outer part

of the maxillo-palatine process three bones formed on each side, as we have seen.

The first of these is the bony tchthyic maxillary (mz.), with a bony foot, that grows inwards and backwards in a falcate manner, to articulate with the sides of the fore-end of the vomer. These are the maxillo-palatine processes (mx. p.) Behind the maxillary, overlapping its jugal pro- cess, is the styloid jugal (j.); and behind this, and over- lapping it, the quadrato-jugal, which is hooked to fit in the side of the base of the quadrate behind (q/., q.) There is a small joint cavity at this place,

The side view (fig. 15) illustrates the above description ; but it also shows much that is not visible below. The section (fig. 16) helps us still further.

The roofing bones are now well seen; the largest of

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They flatten in front, where

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Fra. 16.—Longitudlnally vertical section of the same skull. showing axlal parts, cranial cavity, and inner view of mandible, x 3 dlamctcrs. t.of., inter-orbitai space, or "fenestra;" a.p., anterior pterygoid process, or "basi-pterygold ;" op., opisthotic; a.s.c., anterior semicircular canal; s.c., sinus canal; sp., splenial bone. The small bony centre between the prootic (pro.) and the super-occipltal (s.0.) is the cpiotic.

they are overlapped by the nasals and nasal processes of the premaxillaries (n. pw.)—a peculiarly ornithic character amongst the higher vertebrata. The orbital rim is very neat and perfect ; the main part of the bone, covering the hemisphere, is a convex radiating scale. Inside the orbit the bone sends inwards a thin scooped orbital process (7.), on whose convex surface the sloping brain rests. This fails to invest the fontanelle, and the orbito-sphenoids, as yet, are not. The somewhat oblong and also convex parietals (p.) stop up the gap as far as to the occipital arch ; they are much smaller than the frontals. Both the parietals and frontals are flanked and in some degree over- lapped by the squamosals (sq.), which are more irregular in shape than, but are fully as large as, the parietals. Half the inner face is seen within (fig. 16, sg.); the whole upper edge behind is hidden in this view, and much of the lower part, which forms a strong eave over the huge ear-mass. The lower edge has a cup for the quadrate main head. On the outside (fig. 15) there is to be noticed a variable cartilaginous tract; it takes in all the elegant crescentic tympanic wing of the exoccipitals (¢.¢.0.), and also runs in front of and between the ex- and super-occipitals (¢.0., s.0.) Between the two bones is the posterior opisthotic region ; in front of the exoccipital is the epiotic region. From the inside the imbrication of the cranial and auditory bones is seen to be very regular and remarkable. Running round and across, behind and below the posterior margin of the frontal, we see the fenestrate alisphenoid (a.s.) underskirt- ing the orbital plate of the frontal, then the hollowed inner face of the squamosal, and behind and above that the scooping of the parietal. Below the same, and also behind it, we have—ahove, two bones, the prootic in front

and the super-occipital behind. But the latter takes in all the breadth behind, whilst below the prootic are two, the upper the smaller; the lesser bone is the opisthotic, the larger, rounding the foramen magnum at its sides, is the ex- occipital (op., ¢.o.) These are infero-lateral elements. Be- low the whole are the basi-sphenoid and the basi-occipital, both of them underfloored by the basi-temporal (6.0., 0.1.) So much tilted backwards is the auditory mass that the crown of the anterior canal (a.s.c.) is imbedded in the super- occipital. In a Lizard, Snake, or Turtle that part would be first enclosed in a separate epiotic bone, which would be soon confluent with the super-occipital. But in these high Sauropsida the epiotic is a small, Jate centre, formed behind the commencement of the anterior canal in the front part of the recess in which the " flocculus" lies. Also the opisthotic is small, but is distinct for three or four months; it is a wedge of bone, flat-faced within, forming a straight suture with the hind edge of the prootic, and externally runs as a fine thread of bone between the two fenestre of the labyrinth. We do not see this bone behind until afterwards, and it soon coalesces with the exoccipital, first with it and afterwards with the prootic, as in Lizards and Snakes! After the elements of the chondrifying cranium have run into each other, the enclosed ear organs, by their copious growth, and also by their having many diverticula, such as the cochlea and canals, trespass on neighbouring territories, so that whilst the cochlez burrow into the parachordal region, the semi- circular canals find room in the occipital arch.

In the Osseous Fish ("Salmon's Skull," Pad. Trans., 1873, plate 5, fig. 8, sp.o.) there is a large bone called the "' post-frontal" by Cuvier ; in the Bird it often occurs, and looks like a secondary wing on the great sphenoidal wing (alisphenoid). In the Fish it covers the ampulla of the anterior canal; in the Bird it is in front of it and of the whole labyrinth. This bone, the "sphenotic," is ossified at the time of hatching.

The anterior sphenoidal region is all soft as yet (figs. 15 and 16, p.s.); and the great mesethmoidal wall (p.e.) covers only a third of its own proper territory. It now reaches to the notch; nearly to the roof also, but not to the para sphenoid. The cartilage it is ossifying is continued as an isthmus connecting the parts behind and in front of the notch (cranio-facial hinge). Through this notch (fig, 16, n.tb.) we see the swollen upper turbinal; and

the nasal canal and bridge for the fore-part of the trabecular nerve is secn near the hind margin of the steep and well-formed septum nasi (s.n.), which has projecting from it the lessen- ing rostrum (p.n.) Bridging over the notch, and let into the fore-edge of the frontal, are the never-coalesced nasal processes of the premaxillaries. Outside these, on each side (never in the middle in a Bird), are the nasals (fig. 15, n.) They are curious twisted bones, two-bladed in front to bind round the alinasal cartilages (a/.n.) and outer nostril (e.m.); behind, they twist a little downwards the inner edge of their flat end. Tied by fibres to the side of the narrowed end of the frontal, and to that part of the nasal which is imbedded into it, is the lachrymal (fig. 15, /.) Its main part is the super-orbital, and this sends down- wards a facial process, narrow and sigmoid. Within the lachrymal is the pars plana (p.p.), a subquadrate curtain, which is persistently cartilaginous in the Fowl, whose nasal labyrinth, unlike that of many birds, scarcely ossifies at

1 The nomenclature of these parts is wrong in Mr Parker's paper on the "' Fowl's Skull," Phil. Trans., 1869; but he named their ele- ments correctly in his former paper on the "Struthious Skull," @id., 1866. Researches into the growth of the Reptilian skull have helped to correct the error. He has found a true " pterotic" in the Sparrow- Hawk (Monthly Micros. Jour., Feb. 1, 1873); that was the name given by him to the fowl's epiotic, whilst the latter name was applied to the posterior face of the opisthotic.

all, except the main dividing wall, the perpendicular ethmoid, which always early becomes solid.

The free mandibular bars are now continuous at their fore or lower end ; the long and strong dentaries (figs. 15 and 16, d.) early coalesce. In front they cover the attenuat- ing Meckel's cartilage (mk.); this, however, grows on behind, and its inner process (c.a.p.) is ossifying as the " articulare," the only endo-skeletal bone in the mandible. Behind, outside, and a little within, we see an upper and a lower splint, the surangular and the angular (su., a.), and on the inner side, further forwards, the oblong splenial (sp.); but in this bird there has not been found a "coronoid," common in certain groups

of Birds, besides Snakes, Lizards, and Crocodiles. In this and in other things the Fowl is

often found wanting as to special elements.

The changes in the hyoid arch can be left until we come to the adult stage.

Cranium of fowl—Sixth Stage.—This stage, which is

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Fia. 17—End view of skull of a Chicken three weeks old, sixth stage, x 8 diameters. Here the opisthotic bone appears in the occipital region, as in the adult Chelonian. Letters as above; s.c., the opening of the sinus-canal.

that of chickens less than a month old, is introduced to show

the occipital region from behind (fig. 17). This end view

shows much that is ornithically characteristic. The sub- ject was a somewhat starved chicken, whose retardation of growth caused a lingering of the ankylosis, which so soon removes all landmarks. Even now the great fontanelle, or membranous roof of the basin-like chondro-cranium, is barely covered by the still scant frontals and parietals (f., p.) ; their flanking by the big squamosals (sq.), and the projec- tion beyond these of the sphenotics, are well shown. A wholly cartilaginous epiotic region is still seen ; it runs also inwards to the foramen magnum (/.m.), and still skirts the tympanic ala (e.o.) But on the upper and outer edge of the exoccipital a small plot is taken from the great ex- occipital. 'This is the appearance through the cartilage of the opisthotic (op.); and this represents the permanent condition of the occipital arch in the Chelonia, which shows

a free posterior face of the opisthotic above and outside the

exoccipital. This view also shows how the skull is double-

floored by the addition of the basi-temporal slab to the

ossifying chondro-cranium (0.t., 6.0.)

Cranium of Fowl—Seventh Stage—In chickens two months old, a section of the skull shows all the sutures except those lost by early fusion of the three para-sphe- noidal elements with the compound basi-sphenoidal ossify- ing cartilage. The periotic elements are all distinct, not only from each other, but also from their surroundings (Phil. Trans. 1869, plate 85, fig. 1.) The bony orbito-nasal wall (perpendicular ethmoid) has grown by metamorphosis of the cartilage up to, and somewhat over and under, the inter-orbital fenestra; thus half of this large septum is bony. There is no osseous presphenoid, but instead of the true orbito-sphenoids two osseous centres have appeared on

the post-orbital fontanelle, the foremost being the smaller bone ; these help the orbital plate of the frontal to cover the eycball with bone. In front of the doubly notched ethmoidal wall the face is connected with the skull by a narrow band of cartilage, which is never quite severed in this type, Thus the fore-face lifts on the skull in har- mony with the depression of the mandible, by means of the elasticity of the parts, for, as we have seen, the firm splints above—nasals and nasal processes of the pre- maxillaries—are let into the frontal by their fibrous, lathy ends.

Cranium of Fowl—LHighth Stage—Chicks Three Months old.—Many sutures still remain at this stage, but those between the occipital and periotic elements are fast filling up (Phil. Trans., 1869, plate 85, figs. 4-7, p.794). Wemustrefer the reader to the work above cited for the details ; no stage shows the exquisite architecture of the ornithic skull more lucidly than this. The synchondroses are reduced to fine lines or sutures, and the size of the object is of great importance, as tending to make a difficult study easy to the observer.

Cranium of Fowl—Ninth Stage.—In chickens of the first winter, eight or nine months old, nearly full-sized, but yet succulent even in their skeleton, many things are to be observed (op. cit., plates 86, 87, figs. 1-3, p. 795).

On the roof the sagittal suture is only obliterated in the parietal region, and the super-occipital still retains an uppernotch. The occipital and auditory regionshave entirely coalesced—the opisthotic with the exoccipital first,

and then with the prootic; but the little epiotic seems to melt into the common mass of the ankylosing super-occipital and prootic, without any precedence either way. All the sutures across the cranio-facial hinge are still visible, namely, those made by the frontals, lachrymals, nasals, and nasal processes of the premaxillaries, in their relations. Where the frontals diverge by narrowness in front, behind the nasal processes of the premaxillaries, there the ethmoid is seen becoming fast bony from the substance of the perpendicular plate, and not by a separate upper bone, as in the Struthiontde.! As to the facial bones, they yet retain much distinctness, and the prenasal and Meckelian rods still linger. The articular end of the latter rod is now ossifying fast, the two angular processes, so large in this type, are now bony. The fast coalescing roof and the coalesced floor are now of great thickness, and the diploé in this type is coarse (op. cit., plate 86, fig. 14). In all these growing stages, tracing bone by bone, as it appears, we have not yet met with the presphenoid, nor seen the be- haviour of the great ethmoidal wall in relation to the hinder skull. In the most advanced winter chickens these things are to be seen (fig. 18, p.s., p.e., bs.)

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Fig. 18.—Skull of young Fowl of first winter, ninth stage, side view, x 14 diameters. o.s. 1 and o.s. 2, the two small orbito-sphenoidal eentres above the small presphenoid p.s., whieh is only partially ossified at present. The sutures at this stage are very instructive. The fore-face has been removed, and the anterior edge of the perpendieular ethmoid (p.e.) is the posterior boundary of the eranio-facial cleft.

1 Phil. Trans., 1866, plate 8, fig. 10, eth., p.e.

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The presphenoidal region is merely that band of car- tilage which lies partly above, but mainly behind, the fenestra (7.0,f.) A small ossicle has appeared in it close below the second orbito-sphenoid (p.s., 0.8. 2), the foremost orbito-sphenoid (0.8. 1) has coalesced with the perpendicu- lar ethmoid.

From that bone the rostrum of the parasphenoid is still distinct (r.b.s.), but the perpendicular plate has now reached the basi-sphenoid (p.ec., 6.s.), and betwecn them, and below the still soft lower part of the presphenoid, there is a high vertical suture. This suture, and this steep bony wall beneath the presphenoid, are of the greatest interest to the morphologist. We saw that the basi- sphenoid was compound, having in it, besides the para- sphenoidal elements as investing parts, both the para- chordal ends and the trabecular apices. So it is, for the Bird's skull runs over, or rather is built upon, the mar- vellously metamorphosed jirst visceral arch —the arch formed by the primordial " trabeculz cranii." Counting from the spine, we have three cranial sclerotomes in the osseous stage. The jirst is formed on a notochordal and parachordal foundation ; this is the " basi-occipital."" The next is formed on a foundation partly parachordal and partly facial— the basi-sphenoid. The third is the " pre- sphenoid," and it is tilted up over the forth-growing trabecular arch, the elements of which early coalesce at the mid-line, and the common crest of which is not, for a long time, in any way actually separate from the approximat- ing roofs of the nasal sacs.

Fic. 19.—Skull of an old Fowl, tenth stage, > 14 diameters, upper view. Above the line from n. is seen the large two-spurred nasal, the processes of whiech— upper and lower—are marked n.p., the cartilaginous structures of the nose are not figured.

Cranium of Fowl— Tenth Stage.—In old birds we find au intense degree of ankylosis, and yet certain sutures are persistent to old age, or at least show some chink or mark of their original separateness. In this the Fowl agrees with most birds, but, being at no great height above the

Struthionide, it is not the strongest example of whata Bird's skull may be. In a bird's-eye view we see the separate- ness of the nasals, the nasal processes of the premaxillaries, the fore-cnd of the frontals, the top of the cthmoid, and the lachrymals (fig. 19, n.pa., n., f., eth., 1.) Below (fig. 20), the premaxillaries still have sutures with the palatinesand maxil- laries, and the latter has its jugal process, the jugal itself, and the quadrato-jugal, all distinct (px., pa., mx., 7., QJ.)

Fid. 20.—The same skull, basal view. Here the slenderness of the upper facial rods is in strong contrast with the massiveness of the skull itself. This skull is unusually schizognathous, the vomer (v.) being very small, and the maxillo- palatine processes (ma.p.) much aborted.

Moreover, the quadrate (¢.), pterygoid (pg.), the pala- tines, and of necessity the mandible—all these retain their joints, and traces of the union of the mandibular splints are long retained (fig. 21, d., av.) So also do the elements of the hyoid arch, soon to be described, remain separate.

The whole cranial box, and all the inter-orbital region, have become one bone, whilst the various fontanelles are filled in. In the specimen which has been figured the inter-orbital fenestra (i.0,f.) 1s partly open, but it is often obliterated. Also we see that free periosteal bony growths have bridged over the temporal fossa, the post-frontal or "'sphenotic" having met and coalesced with a zygomatic process of the squamosal (p,f., sg.) In the lower view we still see the notochordal dimple on the transverse occipital condyle (0.c.), and the hinder margin of the basi- temporal plate is still traceable in front of the passages for the vagus and the internal carotid burrows (2.c.) This thick bony mass is totally ankylosed to the basi-sphenoidal region above. The prootic and alisphenoidal regions are land-marked below by the foramen ovale (5), which is some- times, as in Fishes, divided into two by a bony bar. So free is the bony growth that the basi-temporal has coalesced with the temporal wing of the exoccipital (0.4, ¢.0.), and in front of this bridge we see a number of passages, burrows, galeries, windows, &c., leading above to the upper tym- panic recess, in front to the anterior tympanic recess, below that to the eustachian opening, and on the middle of

the inner face of the drum cavity a large hole which leads to the two fenestra, The various bones of the palate are

Fic, 21.—The same skull, side view, with the mandib.e a little dislocated. Here the temporal fossa is bridged over by the junction of the post-frontal and squamosal processes (p,7, 87.) The processes of the mandible (i.a.p., p.a.p.) are characteristic of this type, and of the Anserine.

scarcely in the least changed in form or relative size since the time of hatching (fig. 20), and the copious growths of cartilage belonging to the nasal labyrinth are always soft ; these are not figured in the adult skull. There are, how- ever, a few bony centres, the feeble representatives of the ossifications found amongst higher birds in this region. Thus, close in front of the broad wall-top of the ethmoid, in the substance of the septum nasi, there are two small ossicles, and on each side a similar bony point; the rest remained unossified, all save a small part of the attached margin of the pars plana.

The attenuated remains of the second post-oral, and the larger third post-oral arch, contain persistent cartilage. The elegant "columella auris" (fig. 22) is bony where it fits into the fenestra ovalis (s¢.), and the shaft, up to its rays (m.st.), also; but the short, notched supra-stapedial (s.st.), the tongue-shaped and fenestrate extra-stapedial (e.st.), and the slender, combined infra-stapedial and stylo- hyal (i.st.), all these are still cartilaginous! The rest of the second post-oral is reduced to the arrowhead-shaped lingual bone, the coalesced and partly ossified cerato-hyals (c.h.), and an elegant ridged phalangiform basi-hyal (6.A.) The free cnd of the combined glossal piece is soft. There is no tympanic in the Fowl; only in the Peafowl have we found one, and it is behind the membrane. The next arch, the thyro-hyal (first branchial in [chthyopsida), is composed of two almost equal rods; the upper is only ossified in its

1 Sometimes, even in the Fowl, the infra-stapedial has a spatulate stylo-hyal at its free end (see Professor Huxley's figure, Proc. Zool. Soc., May 27 1869, p. 399, fig. 5 B, 7. S.)

distal third, and the lower is mainly bony; their basal | gnathous, A®githognathous, and Saurognathous varieties

piece is largely soft behind (fig. 15, ¢.67., c.br., 6.67.)

*The skull of the Fowl, and of the Alectoromorphe generally, differs in certain re- spects from that of other Schizognathe. IntheG'allinacee, f- as in the desmognathous Lapaces, the vomer is single; in Pigeons and Sand-Grouse it is absent ; 5 5; in all the others with open palates it is composed of two halves soldered more or less together. Some of the Schizo- gnathe possess an "os uncina- tum "—as the Albatross and the Gull—a bone to be described hereafter ; and others possessa * pair of bones attached to the double vomer, namely, the " septo-maxillaries," known in aS Reptiles as the so-called "inferior Fie. 22.~—Auditory "columella" of turbinals." 'These bones, very hic ninth stage, X 6. aia small in all Birds, have been st. stapes; mst, medio-stapedial found by Mr Parker at the top exubdiieael: (a. nies eee" and the bottom, as it were, of tlsingend ot ths later Be the schizognathous series; that dilated than in this specimen; f, is, in the Hummin g-bir d (Pata- fenestra in extra-stapedial plate, gona gigas), and in the Kagu (Rhinochetus jubatus). The latter is a Gruine bird, lying on the margin of the group towards the Night-Herons, whilst the Humming- birds are certainly amongst the most specialized types. All the Schizo- gnathee, except the Fowl tribe, have "'meso-pterygoids." In certain Schizo- |} gnathe there is an "inferior labial" | § on the edge of the mandible, namely, \4 in the Rallide (e.g., Fulica atra and . Gallinula chloropus). These were & found by the writer many years ago. Upper labials have not as yet turned up in these types, although they have been figured carefully in the Rhea (Phil. Trans., 1866, plate 10, fig. 14, on each side of 7.6.s., close under the inferior turbinal 7.¢.), and the Rhea is a much lower type than the birds under notice. As in the Gallinacee, the Schizognathe generally have little development of the tympanic ring, but in Mgialitis hiaticula there is one large and three or four lesser bones on each side; they occur in Numenmius arquata.*

A full and adequate idea of the degree of the metamorphosis of a Vertebrate skull attained to in Birds can only be obtained by observation of what is to be seen in that of the higher arboreal types. But some of the Carinate are

half Struthious, and they possess that low kind of skull which is called " Dromzo- gnathous," best seen in Dromceus, the Emeu.t This kind of skull once understood, the relation of that of the Fowl to that of types far above and far below it will be clearly seen; for we must describe the Desmo-

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Fic. 23.—"Os hyoides of adult Fowl, tenth stage, x 14 diameters. c¢.h, cerato- hyals (confluent); 6.2., the so-called basi-hyal, an- swering to the first basi- branchial of a Fish; b.67., basi branchial,oruro-hyal, answering to the rest of the basi-branchial serics of a Fish; c.br., e.6r. to- gether form the thyro- hyal, answering to the first cerato- and epi-branchials of a Fish.

1 Phil. Trans., 1866, plates 1]—-13.

| late with the pterygoid

also.

The DroMmoGNatHous Type—Cranium of Tinamus variegatus.—Professor Huxley (Clas. of Birds, p. 425) says, "The Dromeognathous birds are represented by the single- genus Znramus, which (as Mr Parker has shown) ? has a completely struthious palate. In fact, the vomer is very broad, and in front unites with the maxillo-palatine plates, as in Dromeus, while behind it receives the posterior extremities of the palatines and anterior ends of the ptery- goid bones, which thus are prevented, as in the Ratite, from entering into any extensive articu- lation with the basi- sphenoidal rostrum. The basi- pterygoid processes spring from the body of the sphenoid [they are not segmented plates of cartilage attached to the parasphenoid, as in the true Carinate (see above)|, not from the rostrum, and they articu-

very near the distal or outer ends of the latter bones." In the Fowl, as we have just seen, the fore-end, or main part of the pterygoid, glides on the rostral plate. 'The head of the quadrate bone is single, as in the Struthious Birds (Parker, lc.' To this we may add that the basi-tempo- rals are very feebly de-

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veloped, as we find from sO

examination of threeadult Fic, 24.—Skull of Tinamus variegatus, auult,

palatal view, x 2 diameters, The greater part of the jugal bars and the quadrate pones have been removed. r.b.s., fore-end of parasphenoidal rostrum; a.p., anterior pterygoid process (basi-ptery goid).

species :—Z'. robustus, 7. vartegatus, and 7. brasi- liensis sive major.®

If Professor Huxley's description be compared with the accompanying figure (24) of the Tinamine skull this variety will be easily understood; the lettering is the same as in the figures of the Fowl's skull. For further details the reader is referred to Mr Parker's Memoirs above referred to, especially that on the Struthious types (Phil. Trans. 1866, plates 7-15).

The DesmoanatHous Type of Skull.—This kind of skull occurs in such a variety of families that, notwith- standing its importance to the morphologist, it is not of so great a value to the zoologist. Nor indeed is it quite equal to some of the groups in value, being due to a

2 A note is given below as follows :—"On the Osteology of Gallin- aceous Birds and Zinamous(Transactions of the Zoological Society, vol. v. 1864). Sundevall, however, had already said of Timamus, Rhynchotus, and Crypturus, 'Struthiones parvos referunt.'"" The last two are merely sub-genera of Tinamus.

3 The writer hopes to show the development of this type of skull at some future time ; an embryo of Rhynchotus rufescens is treasured up for this purpose.

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condition arising rather from an excess of osseous deposits than from any very striking metamorphosis of primordial elements. 'The skull of the Schizognathe easily runs, as it were, into this type; whilst it crops up among

such simple palates as those of the Fowl tribe, namely, in Craw globi- cera; and Zalegalla Lathami in old age is nearly desmo- gnathous. So also on the Ardeine borders of the Gruide, the Kagu (Rhinochetus jubatus),) is almost a Night-Heron, and nearly desmognathous. In another region Vyctibius almost comes across to the gigantic Goatsuckers (Podargus) and the Oil-bird (Steatornis). (See Huxley, Clas. of Birds, p. 456.) Inthe paper just referred to (p. 453) the Desmo- gnathe are thus described :—" Those Cuvierian Gralle and Natatores which are not schizognathous, the Accipitres or Raptores, the Scansbres [excluding the Picide], and among the Passeres, most of the /isstrostres, all the Syndactyli, and Upupa, may be termed desmognathous. In these birds the vomer is often abortive, or so small that it dis- appears from the skeleton. When it exists it is always slender, and tapers to a point anteriorly. The maxillo- palatines are united across the middle line, either directly or by intermediation of ossifications in the nasal septum. The posterior ends of the palatines and anterior ends of the pterygoids articulate directly with the rostrum, as in the preceding division" [the Schizognathe].

It is possible to make several important divisions in the kind and degree of desmognathism, as follows, namely—

a. Direct—In Falcons and Geese, the maxillo-pala- tines meet below at the mid-line, as in the Mammal. Two sub-varieties of this form occur, as in the Falcon, where the nasal septum is ankylosed to this hard palate, and in the Goose, where it remains free.

b. Indirect.—This is very common, and is best seen in Eagles, Vultures, and Owls. The maxillo-palatines are ankylosed to the nasal septum, but are separated from each other by a chink.

c. Imperfectly direct.—This is where the maxillo-palatine plates are united by harmony-suture and not by coalescence. Example—Dicholophus cristatus. In young Falcons and Hawks the palate is at first indirect, is then imperfectly direct, and at last perfectly direct.

d. Imperfectly indirect.—Here the maxillo-palatines are closely articulated with, and separated by, the "median septo-maxillary," but there is no ankylosis, Example— Megalama asiatica,

e. Double Desmognathism.—This is seen in Podargus, where the palatines as well as the maxillaries largely coalesce below; to a less extent this is seen also in the larger Hornbills (Buceros). (Huxley, op. cit., pp. 445, 446, figs.

27, 28.

Fe ae a compound form, in which the egitho- gnathous skull becomes desmognathous, is seen in certain Coracomorphe (Gymnorhina, &c.), a8 will be shown below.

Professor Huxley's remark, that the vomer, "when it exists, 1s always slender, and tapers to a point anteriorly" (p. 435), is modified by a note he gives on the same page with regard to the broad emarginate vomer of Malco. It has a similar, but not equal, enlargement in front in the Sacred Ibis (Zhresciornis athiopicus), and the knife-shaped vomer of the Duck tribe is often thick at the infero-anterior angle, as may be seen in Wdemia nigra, Querquedula caudacuta, and Mareca penelope, but the vomer of the Chenomorphe is compound, and the antero-superior bone, whose lower angle in part is enlarged, is the median septo- maxillary: this may be seen in young Geese, and in the adult Crested Screamer (Chawna chavaria).

Here it will be necessary, in order to show the value of these types of skull, to insert Professor Huxley's masterly

'See Trans. Zool. Soc., vol. vi. plates 91 and 92.

6 im Ds

[ANATOMY.

handling of the modifications of the desmognathous skull. and the groups in which it is present. It is open to us, however, to modify some statements of his and to superadd others, for the observation of which the present writer has had much greater leisure, and the advantage of having dwelt long on the subject.

At page 460 (op. cit.) we read: 'Not fewer than seven groups of families appear to me to be clearly distinguish- able in this subdivision, viz., the Chenomorphe, the Ampii- morphe, the Pelargomorphe, the Dysporomorphe, the Aetomorphe, the Psittacomorphe, and the Coccygomorphe."

1. The Chenomorphe.—"The lachrymal region is re- markably long [save in the Screamer (Chauna)]. The basi-sphenoidal rostrum has oval, sessile, basi-pterygoid facets, like those of the

2. The Amphimorphe.—' The genus Phenicopterus is so completely intermediate between the Anserine birds on the one side and the Storks and Herons on the other, that it can be ranged with neither of these groups, but must stand as the type of a division by itself. Thus the skull has the long lachrymo-nasal region, the basi-pterygoid facets [not so; see op, cit., p. 437, where they are truly said to be rudimentary—they are the merest prickles], the prolonged and recurved angles of the mandibles, the laminated horny-sheath of the Chenomorphe ; but the maxillo-palatines are spongy [scarcely more so than in the Swan et hoc genus omne of the Anserines and Anatines], and the general structure of the rostrum is quite similar to that found in the Storks and Herons." The nasals are thoroughly Anserine, having their crura separated by a rounded notch; their palatines are quite Anserine, but are broader behind, being exactly like those of the Screamer ; and yet they cut off the meso-pterygoid, which coalesces with the palatine. This the Storks and their allies do; the Chenomorphe do not. The pterygoids are like those of Z'hresciornis and Platalea, but the vomer is intermediate between that of the Goose and the Spoonbill. The orbital processes of the palatines, or ' ethmo-pala- tines," run together as arched laminz from the body of the bone to the maxillo-palatine floor. They are very shell- like at first, and are attenuated in front. They coalesce together, and send down a bony keel of exquisite thinness in their hinder part. There is a part separate from the rest in front, just where they begin to narrow; this is obviously the mcdian septo-maxillary. Behind, where the palatines shoot below the rostrum of the sphenoid, each bone sends down a lamella; each of these is bound to its fellow by fibrous tissue, and between these the vomer is wedged ; the thin plate belongs mutually to the palatines and the azygous vomer. In all the ordinary Chenomorphe the ethmo-palatine spurs are long;

in Pheenccopterus enormously so; in the Screamer they are very short. Hence the palato-vomerine structures of the Amphimorphe are Anserine, but much modified. So also in the hyoid apparatus ; and the huge glosso-hyal is, although cartila- ginous, the true counterpart of that of a Swan.

SKULL. |

3. The Pelargomorphe.—" There are no basi-pterygoid processes, and the palatines usually unite for a greater or less distance behind the posterior nares; but they send down no vertical plate from their junction." In the Ardeide they do not unite; in all these forms the coalesced part is short as compared with that of the Cormorants and Pelicans ; in both Scopus and Balceniceps the ankylosed part is carinate below (Trans. Zool. Soc., vol. iv. plate 65, fig. 1, pal.) "The maxillo-palatines are large and spongy. The angle of the mandible is truncated," except in Platalea and Jbts. The vomer is smallish and cultrate in Ciconta nigra; larger by far, cultrate, and pedate at the end in Thresciornis ethiopicus ; as large in Platalea leucorodia, but pointed in front aud carinate below. Even in the last of these forms, in a half-grown individual, no sign of a median suture was seen. 'The vomer of Scopus is sharply cultrate above and rounded below; it reaches beyond the maxillo-palatine mass. In Baleniceps (op. cit., p. 808, plate 65, fig. 1, v.) the vomer is like that of Scopus and Ciconea, but it is actually smaller than either. In most of these Ciconian and Ibidine types! the vomer is evidently azygous, but in all the skulls of Ardedde@ now before the writer, viz., one or two species of each of the following genera, Ardea, Botaurus, Nycticorax, Garzetta, Tigrisoma, the vomer is double, large, and charadrian.

In Ardea cinerea the vomer is coalesced behind with the long, elegant, bicarinate palatines, and in front runs its point in between thefree retral lobes of the maxillo-palatines. The moieties have each a rounded keel, and those keels run parallel at first and then run into each other in front ; above, the two halves form a deep fossa, in which the sub-carinate parasphenoid glides. The edges of this trough are roughly tuberculated and turned over, like the rim of a cup; the primary suturc between the halves is retained behind for half the length of the bone. In several Ardecde an additional maxillary bone—the " post- maxillary "—-is formed behind the

angle of the maxillary. It is small in Ardea garzetta and Botaurus stellaris, and of good size in Botaurus viridis and Nycticorax ardeola. This bone was first found by Mr Parker in the Emeu. In Zigrisoma leucolophum there is a pair of "inter- palatines," as in the Duck tribe. In the Pelagomorphe the charadrian type reaches its culmination ; yet the most exquisite forms, such as the Egrets and smaller Bitterns, and the most gigantic, as the Adjutant, are evidently specializa- tions of a type similar to the pluvialine Schizognathe.

4, The Dysporomorphe.2—" The rostrum is long and pointed, and more or less curved ; and the external nasal apertures are very small, There are no basi-pterygoid pro- cesses. The palate bones unite for a considerable distance behind the posterior nares, and send down a vertical crest at their junction. The maxillo-palatines are large and spongy. The angle of the mandible is truncated."

The inferior crest of the combined palatines is largest in Pelecanus, above, in Phalacrocorax and Sula, this plate is grooved for the sphenoidal rostrum, but in the Pelican there arises a huge crest, and the rostrum of the sphenoid rises rapidly out of its way. Here the secondary palatine arch has the same habit as the primary trabecular arch—a modification constant in birds in the latter. All the parts in front of the very mobile cranio-facial hinge are molten together into one mass, aud the nasal labyrinth is in its most aborted state.

In Phalacrocorax the perpendicular ethmoid is of small antero-posterior extent. There is no presphenoid, but merely a small V-shaped orbito-sphenoidal band of bone

- *Baleniceps has the head of a Stork, but its body is largely Ardeine. ? Dysporus, a generic name applied to the Gannets by Illiger.*

above the optic passage. The same structure is seen in Iimantopus and Eurypyga. In the Cormorant an oblong ossicle lies on the commencement of the zygoma. It is large in P. carbo, and small in P. graculus. A still larger ossicle has heightened the zygoma in Swla alba. This is the "post-

maxillary." In Sula alba the basi-temporals are as little developed as in the Dromazde, less than in any other Carinate bird. Behind each moiety there is a large oval opening, not far in front of the occipital condyle ; this exposes the loose diploé within. The small eustachian tubes open at a little distance from each other, in a wide shallow fossa, on the part where the three elements of the parasphenoid meet. In both the Pelican and the Cormo- rant there is an elegant, crescentic, lipped, free margin to the very Ardeine basi-temporal plate. In Sula alba the columella auris is very long and bent. It has a small cartil- aginous extra-supra-stapedial process, and a long attenuated cartilaginous infra-stapedial, terminated by a bony fusiform stylo-hyal. The hinge for the mandible is very far back in Sula, whose cranio-facial hinge almost rivals that of the Parrot and Toucan. In the Cormorant the mandibular articulation is almost carried as far back as in the Croco- dile. In Sula alba the zygoma is very thick in front, and is suddenly reduced to an extremely thin bar, where it passes into the upper beak.

5. The

a. Perfect indirect Desmognathism. Sarcorhamphus papa, Aquila (sp. pl., including IHelotarsus ecaudatus), Gyps fulvus, Neophron percnopterus, Asio otus, Asio accipitrinus, Aluco flammeus, Ketupa ceylonica, Athene noctua, Strix stridula, Elanus ceruleus. b. Imperfect direct Desmognathism. Dicholophus cristatus. c. Perfect direct Desmognathism.

Falco percgrinus, Falco tinnunculus, Falco esalon, Accipiter nisus, Butco vulgaris, Circus cyancus, Haliastur indus.

With regard to the basi-pterygoid processes, they are most aborted in Dicholophus, Helotarsus, and Gyps. They reappear as aborted prickles or knobs in some Eagles, in Neophron, Llanus, Circus, and Accipiter, and in the young of these they are rather large. In Haliastur indus they are large, rounded flaps, with uo cartilage on their end. Then come Gypogeranus, the Cathartide, and the Owls, in which they are constant. Jn all the Owls, as in Pigeons and some of the Turnicide (see Trans. Zool. Soc., vol. v. plate 34, fig. 2, m.o.f.), the slow growth of the occipital region of the chondro-cranium leaves a membranous space over the foramen magnum. This is not, or is very rarely

filled up by even the bony growths; it remains as the " median occipital fontanelle."

The vomer in this group is of great interest, being ex- tremely variable, and often having a supplementary bone attached. It is azygous. The palatines also, which have rounded posterior angles and double keels, often have a medio-palatine where they unite, and also receive the meso-pterygoid spur. In some types, as Gyps fulvus, the large rounded palatine flap is partly severed off as a 'transpalatine." Where the ascending lamine of the palatines meet below the sphenoidal rostrum, there a bony deposit takes place; this, if truly azygous, is a medio- palatine ; if oblique, it is one of the meso-pterygoids, which, in the Rapaces, get between the palatines, coalesce with each other, and form a keystone, as in Ulula stridula. In others, as the young of Falco tinnunculus and the adult Helotarsus ecaudatus, there is one small, obliquely-placed ossicle in the front of the palatine suture. In Meophron percnopterus there is one free meso-pterygoid attached to the right hinder fork of the vomer. In Dicholophus cristatus there is a large medio-palatine wedged in in front, and to it the cultrate, fenestrate, and pedate vomer is attached. In the Falcons the vomer is pedate, and, in the larger kinds, fenestrate. In Ulula stridula there is a small vomer attached to a small medio-palatine, and having over it an equally small median septo-maxillary. The latter bone is large in Asto otus, and small in Neophron percnopterus, Circus cyaneus, and Haliastur indus. The vomer is most aborted in the Eagles and Vultures (often absent) ; but it is long in Veophron. We have found a small bony wedge (oblique meso-pterygoid) in Sarcorhamphus papa. Professor Huxley's figure of the skull of Gypogeranus is deficient in not showing a small vomer (fig. 24, p. 442). A specimen sent to him by the writer (after the paper appeared) has this little bone distinct. The frowning brow is obtained in these birds by a huge super-orbital process of the lachrymal in Dicholophus, G'yps, and Falco. In many kinds (Hawks, &c.) there is a distinct super- orbital at its extremity. The eyeball, with its massive bony rim, is quite equal in Dicholophus to that of the diurnal Rapaces generally. Its hyoid also is thoroughly Raptorial. Its

glossal (double) piece is spatulate, and, like that of its congeners, approaches the glosso-hyal of the Parrots in breadth. Unlike its congeners, the Cariama has its nasal septum but little ossified ; and it possesses an "os uncinatum," propping up the pars plana, as in the Gull, Albatross, and many other birds.

A description of the palate of the Sparrow-Hawk (Accipeter nisus, will illustrate that of Raptorial birds generally, aud also the meaning of the term desmognathous.! The speci- men figured (fig. 25) was a half-developed nestling. Its round occipital condyle, and the various foramina (8, 9), are shown in the occipital region, and outside and above this arch are seen the hinder face of the opisthotic (op.), and in front of the tympanic ala of the exoccipital (¢.0.) there is an uncinate bone in relation with the prootic, opisthotic, squamosal, and exoccipital, where they all meet together, This is the "'pterotic" (pto.), a huge bone in Osseous Fishes, and walling-in much of the labyrinth. In Serpents only a film of ectosteal bone represents it, and in Lizards such a plate appears, overlapping cartilage which has begun to calcify. It develops and becomes part of the paratic process. The basi-temporal plate (6.2.), the rostrum, with its arrested basi-pterygoids (b.pg.), are shown, and on each side the double condyle of the quadrate (q.), characteristically placed transversely. The zygoma is composed of thin needles of bone (qj, j.); the

1 See Monthly Microscopical Journal, Feb. 7, 1873, p. 45, plate 5, fig. 2. A paper by the same writer in the Linnean Transactions, 1875, may be consulted for copious illustrations of the Desmognathe.

zygomatic process of the maxillary is, behind, bound up with the jugal and quadrato-jugal, and in front passes into the upper dentary region, half overlapped by the

rO. Fie. 25. Skull of nestling Sparrow-Huwk (Acctpiter nisus), palatal view, X 2 diameters. The circular space on each side of the basi-temporal (6.¢.) is the

opening of the anterior tympanic recess. The meso-pterygoids (m.pg.) show

part of their lower face on the post-palatine region; the basi-ptery goids (6.pg.)

are mere knobs, and the common eustachian opening is scen between them.

The maxillo-palatine plates (ma.p.) are dotted to show their spongy character. dentary process of the premaxillary (px.) The dentary edge of the maxillary sends inwards the maxillo-palatine plate (ma.p.), which meets its fellow at the mid-line, and also grows retrally and superiorly into an elegant shell-like mass.

The right and left plates lie edge to edge, as in the adult Cariama, and are imperfectly direct in their desmo- gnathism, The palatine processes of the premaxillaries bind the fore-ends of the palatines, which in turn bind under the maxillo-palatine plates. The gap in front is filled with the fast ossifying septum nasi; it is pedate in front, and behind sends out a process on each side; these spurs ankylose afterwards with the maxillo-palatine plates, and they with each other. The palatine bones (pa.), strap- like, widen backwards, and then gently narrow to the end, leaving no sharp postero-external angle. The wedge of bone which has been fretted off from the fore-end of each of the rod-like pterygoids (pg.) binds on the postero- superior edge of each palatine, and the inner plate of these bones covering the under surface of the sphenoidal rostrum imperfectly, allows part of these bony wedges—the " meso- pterygoids " (m. pg.)—to be seen from below. The bird has all the periotic bony centres, viz., five, as in Osseous Fishes ; it has distinct cartilaginous orbital ale, which are, like the presphenoid, separately ossified, besides an azygous ossification in membrane belonging to the same category.

6. The Psittacomorphe.—The uniformity of this group of Desmognathe is as remarkable as the variability of the last, and yet it is potent in genera and species. "The rostrum (see op. cit., p. 465) is arched and hooked at the extremity, and is regularly articulated with the frontal region of the skull." Therefore we find that the cranio- facial cleft is complete—a state of things not often occur- ring. The development of this type has not been observed, yet we can interpret the metamorphic results by other

types. ‘“‘Basi-pterygoid processes [and vomers] are want- ing. The palatines are vertically elongated posteriorly, while anteriorly they are horizontally flattened, and movably united with the rostrum. The maxillo-palatines are spongy. The lachrynial and post-orbital bend towards one another, and frequently unite below the orbit.” This is by the intervention of a large “os uncinatum,” which is best seen in small types, such as Psephotis multicolor, and Agapornis pullaria, where this part does not unite with the post-frontal. In Microglossa, Calyptorhynchus, Plycto- lophus, Melopsittacus, &c., the temporal fossa is also bridged over by junction of the zygomatic process of the squamosal with the os uncinatum. “The orbital process of the quadrate bone is very small, and its distal presents only one facet (which is compressed from side to side, and convex from before backwards) for the mandible. The rami of the latter are deep, and pass into one another by a rounded symphysis.” The glosso-hyal is spatulate, and the basi-hyal is alate behind. In the fore-face are some things worth noting. The septum nasi is a thick wall of bone ; the ale nasi are soft in Psephotis multicolor; they have an annular ossicle found in them in Melopsittacus undulatus ; whilst in Paleornis torquata this part is largely ossified and ankylosed to the upper jaw, and the alinasal turbinal is partly calcified. In one small kind we saw the trace of a small medio-palatine. The pars plana is narrow and ossified, and is ankylosed to the lachrymal ; the inferior turbinal is soft.

7. The Coceygomorphe.—This is another polymorphic group, and is not in any sense, either zoologically or mor- phologically, the equivalent of the last. Yet it is almost impossible to separate the families by any character of importance. If the Podargus must be linked with the Kingfisher, the Goatsucker and its allies cannot be re. moved, notwithstanding their schizognathous palate. Here, however, we are dealing with the desmognathous forms. Professor Huxley makes four sub-groups, and then remarks (p. 467): “It appears to ma not improbable that it may hereafter be desirable to divide this group into four.” The characters of the skull are thus given (p. 466): “The rostrum presents very various forms, and may be movably articulated with the skull. Basi-pterygoid processes are present in only one genus (Z’rogon).” |

The Oil-bird (Steatornis caripensis) has very large basi-pterygoids, thus connecting the Goatsuckers with Podargus. 'The maxillo-palatines are usually more or less spongy. The palatines are not developed into vertical plates, but are, as usual, horizontally flattened. The distal end of the quadrate has the ordinary form." The vomer is small in Hornbills, Toucans, and Scythrops ; but they have a second bone in front of the azygous vomer, viz., the "'median septo-maxillary," as in the Goose tribe and others. In Podargus, when the lower palatine floor—like that of a Mammal—is cut away, there are to be seen three small ossicles; the first of these is the vomer, the others are medio-palatines. In Megalema the vomer is very large and forked in front. In the Kingfishers and Hoopoes there is no vomer ; there is a trace in Corythaix. The palatines may be rounded behind as in Cuculus and Buceros, have a retral spur to the transpalatine part as in Rhamphastos Alcedo, and Upupa, or be very broad, with a large passerine transpalatine angle, as in Podargus.?

1 For a figure of this skull, see Professor Reinhardt's paper on the "Os uncinatum'"' ("Om en hidtil ukjendt Knogle 1 Hovedshallen hos Turakoerne Musophagides, Sundev," Sertryk af "Videnskabelage Meddelelser fra den Naturhistoriske Forening 1 Kjibenhawn," 1871). In this paper figures are given of the skull of Corythaiz, Musophaga, Schizorhts, and Trogon.

2 See Professor Huxlev's figures, those of M. Reinhardt just referred to, and Dr Murie's valuable papers "On the Skeleton of Todus," Proc. Zool. Soc., May 21, 1872, plate 55, pp. 663-630 ; "On the

The AGITHOGNATHOUS Type—Craniumof theRook.—This | figure and its description must do duty for the whole of the Agithognathe, which, with a little cutting and contriv- ing, may be made to cover the Coracomorphe entirely, with enough at its corners also to be superimposed upon the Swifts and the Hemipods, and that remarkable charadrian bird, Zhinocorus.3 It is worth while to remember that these types are actually the highest, the most metamor- phosed, and the most specialized ; not so high in some respects as the Mammal, yet no Mammal comes near them in adaptive modification, not even the one which has the taste to admire, and the wit to describe

them. We learn from no less an authority than Mr G. R. Gray that of the 10,000 known birds half belong to this group ; the Old World types of which, more especially, are such accom- plished creatures. The WVectarinia is the smallest, and the Raven the largest of this huge, but morphologically very uniform, group.

The skull of a fledgling Rook (fig 26) illustrates the highest bird of this type; the occipital condyle (0.c.) is hemisphe- rical, the _basi- temporal plate (6.¢.) is an almost transverse band of bone, the rostrum of the parasphe- noid (pas.) is without any de- veloped basi-ptery- goids, the cranio- facial hinge is nearly perfect, but the nasals and nasal processes of the premaxillaries are thin splints set into the frontals ; they do not form a perfect hinge.

The palatines are developed into

cartilage at their

2 3 +, Fic. 26.—Skull of nestling Rook (Corvus frugilegus), hinder angle) this palatal view, natural size. The prenasal region is a large flap and, (».n.) is trifoliate; the median rod, looking for- atu a ’ wards, is the remains of the prenasal or basi-trabecu- ossifying late and tar bar; the lateral leaves of cartilage, looking back- wards, are the recurrent ventral extremities of the separately, has trabecular cornua: between the alinasal turbinals time to become the base of the septum nasi retains its flatness; it

: f inter-1 i t of the trabeculae.

chondrified first is formed by the inter-nasal part o e trabecule

(t.pa.); the pterygoids (pg.) are phalangiform, and lose their meso-pterygoid spur, which soon coalesces with the palatines. The maxillo-palatine processes are hooked and flattened, and often enlarged at their inner extremity, so as to become pneumatic.

But the distinguishing character of the type is the union

Genus Colius," The Ibis, July 1872, plate 10, pp. 261-280; " On the Motmots," Jbis, Oct. 1872, plates 13-15, pp. 383-412; "On the Upupide," Jbis, April 1873, plates 5-7, pp. 181-211.

3 For descriptions of the skulls of Passerine birds, see Parker on the "Skull of the Crow," Monthly Micr. Jour., Nov. 1, 1872; on that of the "Tit" (Parus), ibid., Jan. 1, 1873 ; and on that of the "Thrush," ibid., Mar. 1, 1873. See also, as referred to by Professor Huxley, Nitzsch's article " Passerine" in Ersch and Gruber's Encyclopedie, 1840, and his paper, "Ueber die Familie der Passerinen," in the Zeitschrift fiir die Gesammten Naturwissenschaften, 1862. As the figure given above is of a young bird, the reader is also referred to Professor Huxley's 'Palatal View of the Raven's Skull" (op. cat., p. 451, fig. 32); of that of the " Grosbeak," fig. 33 ; and of the " Swift," fig. 34. See also Murie "On Fregilupus," Proc. Zool, Soc., June 16, 1874, plates 61, 62.

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of the vomers with the alinasal wall and turbinal, and the possession, by the embryo bird at least, of a pair of " upper labials," corresponding to the ter upper pair in Snakes, Sharks, and Skate ; the vomers are either partial or entire ossification of these cartilages, Besides these, there re- appear in most of the Aigithognathe the so-called "inferior turbinals," or nostril-bones of the Snake and Lizard, and these are attached to the shoulders of the double, and generally, ox-face-shaped vomer.!_ The nasal labyrinth is very large in the Rook, but does not differ in essentials from that of the Fowl, above described.

The septum nasi (s.n.) retains much of its original flat- ness below, and is thus alate ; the vomer (v.) of the young bird is broad and grooved above; in the old bird, ossifi- cation running some distance along the alinasal wall and alinasal turbinal (z.tb.), the bone becomes not only emar. ginate, but also very massive in front. In the Lark (Alauda arvensis) this bony matter in the macerated skull leaves huge goat-horn processes to the fore-angles of the vomer. AXgithognathism occurs in different degrees ; thus, we may have its morphological conditions—

a. Incomplete: as in Turnix.

b. Complete var. 1: Pachyrhamphus, Pipra. c. Complete var. 2: Corvus, Alauda.

d. Compound: Gymnorhina, Artamus.

a. Incomplete. Here the large ‘“labials” are imper- fectly ossified by the two vomers, and these bones are only strongly attached to the nasal labyrinth by fibrous tissue.

6. Complete var.1. In these cases the labials are often only imperfectly ossified by the vomerine centres ; these centres also are distinct from those ossifying the alinasal cartilages ; but the union of these parts is perfect.

c. Complete var. 2. In these cases the labials are often small and completely ossified by the vomers; but the bony deposit runs riot into the alinasal wall and turbinal, so that in the adult all distinction of the parts may be lost.

d. Compound. Here the flat arcuate end of the maxillo- palatine is free, but the mass of that plate meets its fellow of the opposite side and coalesces with it, and with a highly ossified nasal septum. In these Southern types the “transpalatine” is a long spike, as in the Alcedide. In all these varieties the septo-maxillaries may, and do mostly, occur, They cannot always be found.?

Concluding our remarks upon this morphological type, its value is shown by this—that it is exactly superimpos- able upon the Coracomorphe, if we reject the bird that shows its initial or imperfect condition, as the Hemipod, and stubbornly hold to the popular view that Swifts are a kind of Swallow—

for as to their nobler part, their head, they are merely a variety of that type. 'Thus the zoologist and the morphologist may here join hands.

The Sauroanatuous T'ype—Cranium of the Picus Minor.—This group, Professor Huxley's Celeomorphe (op. cit. 448 and 467), is so remarkable and difficult of deter- mination, that although our author saw clearly many most important characters (quite sufficient for the elimination of

1 There is not space here to give illustration of all these details ; but papers by Mr Parker are now (1875) appearing in the Transactions of the Linnean and Zoological Societies, in which these structures are copiously illustrated.

2 Professor Huxley (op. cit., p. 472) was as unfortunate in his specimen of Menura asin that of Trochilus (see p. 468, where these birds are said to have their vomer truncated, whereas it is spiked) ; for in Mr Garrod's specimens of the Lyre-bird's skulls the maxillo palatines are large bony plates, like those of ordinary Coracomorphee The vomer of Menura is exactly like that of the Chough (Fregilus graculus), and also of many young Coracomorphe, for the two moieties do not necessarily form a re-entering angle or notch in front; that is often largely due to the osseous growth creeping into the alinasal cartilages. Menura has one character of great importance, viz., it retains the super-orbital chain of ossicles, like Psophia and the Tinamide.

this group from the Coccygomorphe), yet the materials at hand were not sufficient for a perfect account of this type of skull. A fellow-worker has had fuller opportunities.® Like the Parrots, these birds form a relatively small and neat group; the most outlying forms are Picumnus and Yunx, but these form no obstruction to their classification. Mr Parker's proposed morphological term for these birds is Saurognathe, and the two terms can be superimposed, Celeomorphe being their zoological name. Professor Huxley saw that these birds were not desmognathous ; that their vomerine moieties remained distinct ; that their maxillo- palatines are but little

*developed ; and that supernumerary bones on the inner edge of the palatines in Picus minor corresponded to the curious bars that are seen in the larger kinds. He also, with quick insight, says that their palate exhibits a " degradation and simplification of, the Agitho- gnathous structure." This is strictly true; the elementary parts are the same, but in the Woodpeckers they retain a very Reptilian distinctness, and even arrest of growth. Yet with that arrest there is combined a modification and nietamorphosis of certain parts, such as is undergone by no other type. They are in some respects the most simple and embryonic, and in others the most highly specialized birds in the whole class. Their basi-pterygoids are arrested their basi-temporal region large and wide. 'Two or three tympanics on each side help to form their remarkable cowrie-shaped ear-drum, which is mainly built up by the basi-temporals and exoccipitals. The lower end of the quadrate has the usual form; the bone itself is short; the pterygoids are long, slender, angular, and forked; the lower and foremost fork is the meso-pterygoid element, which does not become segmented off, and thus their pterygoids answer to that of a Snake or Lizard, and reach to the vomer.**

The palatines (fig. 27, pa.) have their postero-external

Fic. 27.—Palatal view of skull of a nestling of Picus mtnor, X 4 dalameters. t.pa. inter-palatine spur; s.mz.. septo-maxillary ; m.pa., medio-palatine.

3 See Mr Parker's paper "On the Picide," inthe Linnean Transac- tions, 1875, series 2, vol. i. plates 15: 4 See Ciiinther "On Hattera," Phil. Trans.,

1867, plate 1, fig 2, p. 5. :

SKULL. |

angle either rounded or obtuse-angled. The post-palatine region is bevelled off remarkably; but in Prcumnus minutus, the lips of this part are greatly developed, as in the lower Passerines of South America ;! but in them this marked region appears to be always ossified directly from the main bone, whilst in Picumnus it is a separate ossifica- tion—a perfectly unique thing, as far as the writer's know- ledge goes. 'he broad main part of the palatine suddenly narrows at its first third, the remaining two-thirds being the long splintery prepalatine, opposite the beginning of which the inner lip runs

into an “ inter-palatine” spike (z.pa.) The ethmo-palatine processes are extremely long in the nestling of Yunxz, and very short in that of Picus minor (e.pa.) They are the free anterior ends of that ascending plate which lies under the parasphenoidal rostrum. These plates are united by a cartilaginous commissure, dagger-

shaped, which ossifies as the most marked medio-palatine

(m.pa.) seen in the class. The prepalatine band passes between the dentary and palatine spurs of the premaxillary (px.), as in the adult fowl. Oddly enough, they run on the inner side of the palatal process of the premaxillary in most of the Agithognathe. This is an after-modification, for in the young of Struthio camelus and Gallus domesticus the fore-end of the one and the hinder end of the other process are broad, and the two unite by suture. In the higher birds the processes overlap on either side, but orderly as to natural groups. The free end of the pre- maxillary palatine process looks backward to the free inter-palatine spur in the young (fig. 27) ; but in old birds, as may well be seen in Gecinus viridis, Picus analis, and P. major, these parts are formed into delicate bridges of bone, which also are thrown along to the ethmo-palatines. This is done by the vomerine series. The “ septo-maxil- laries” are not single conchoidal plates of bone, as in the Snake and Lizard; but are broken up into grains, which melt into each other again, Even the vomer itself is double on each side in Gecinus viridis, whilst in Hemilo- phus fulvus there are three septo-maxillaries on the left side and five on the right. These ossicles lie on the inner side of the palatines, and are normally connected behind by means of the vomer to the ethmo-palatine ; where normal ornithic ankylosis takes place in adult birds, there these curious length-wise bridges are formed. Yet this is only part of their complexity, for median septo-maxillaries appear, two of them in Gecinus, and these are found in the substance of long, right and left, labial cartilages. These do not ossify in Hemilophus, but unite at the mid-line; in Gecinus they overlap largely to gain the mid-line. In the game species, to add to the complexity, a large shell of bone, from the inturned alinasal wall, becomes more or less free of its own origin, and unites to the vomerine series, All this has been seen and explained by writing and by figures.?

The maxillo-palatine processes scarcely grow inwards at all in Picumnus ; in Yunwx they are rather larger; larger still in Picus minor (fig. 27, map.) Where they are largest, as in Gecinus, they just rest upon the outer edge of the palatines, covering nearly halftheir width. In all, the under face of the maxillary has an open pneumatic space at this part. But, as if to fill up that which was wanting, a separate palatine plate appears on the inner edge of the maxillary further forward, only on the left side, however (fig. 27, p.mx.) This is a semi-oval wedge of bone, and has its symmetrical counterparts in several families of the Coracomorphe, viz., Emberiza, Cardinalis, &c.

These birds are saurognathous in other respects, e.g., their nasal labyrinth is unusually simple. The " inferior

1See Parker '(On githognathe," part i., Zool. Trans., 1875, plates 54-62.

2 Tbid., "On the Picide," op. cit.

vue

turbinal," which has three coils in Rhea and Tinamus, and two in most birds, is in Gecitnus merely bi-alate; in Yunx it makes less than a single turn, whilst the alinasal turbinal of that bird has two turns, and that of Gecinus one. Gecinus is in all respects the most specialized, Picumnus the most embryonic,and Yunx the most passerine of the Celeomorphe. Also, in Gecinus the nasal labyrinth is most ossified, and in Yunx least. In Gecinus the "columella auris " has two supra-stapedial spurs and two infra-stapedial bands, which have united with the tongue- shaped stylo-hyal: this has in it a bony centre. The small cerato-hyals early coalesce into one arrowhead- shaped bone, and then comes a very long, highly ossified, and elastic basi-hyal, with no uro-hyal behind it. Joined to this are a pair of lower thyro-hyals, half its length ; but the upper pieces are four times the length of the lower, and they, passing first down the sides of the upper part of the neck, again turn gently upwards and forwards, plough- ing themselves a furrow on the skull top, and deflecting gently to the right nasal roof, where they end.

All these things being considered, it will seem contra- dictory now to assert the great uniformity of the skulls of Birds, and indeed of the Birds themselves. Yet so it is; and the countless modifications that offer themselves for observation are gentle in the extreme. One form often is seen to pass into another by almost insensible gradations. One thing is certain, namely, that an anatomist not familiar with this class, and coming to its study fresh from the Reptiles, would find himself at fault at every turn ; for he would see changes altogether as great as if he had passed from the Helminthoid types, and fron: mere Jarve and pupe of the Insects to the (to him supposably) unthought-of imagines that spring from those low and worm-like stages.

In the rest of the Birds' organization abundant evidence of the same specialization will be seen. The mind fails to desire more beauty or to contemplate more exquisite adaptations. An almost infinite variety of Vertebrate life is to be found in this class. Of its members some dig and bury their germs, which rise again in full plumage, whilst others watch and incessantly feed their tender brood in the shady covert or '"'on the crags of the rock and the strong place." In locomotion some walk, others run, or they may wade, swim, pluuge, or dive, whilst most of them " fly in the open firmament of heaven."

Tur VERTEBRAL CoLUMN, Rips, AND STERNUM.®

The spinal column of birds contains numerous and well- ossified vertebrae, a considerable number of which (more than six) are ankylosed together to form a sacrum. Of the vertebrze which enter into the composition of this com- plex bone, however, not more than from three to five can be regarded as the homologues of the sacral vertebre of a Crocodilian or Lacertilian Reptile. The rest are borrowed, in front, from the lumbar and dorsal regions ; behind,

3 See Parker "On the Osteology of Gallinaceous Birds and Tina- mous," Trans. Zool. Soc., vol. v., 1863 ; ""On the Systematic Position of the Crested Screamer (Chauna chavaria),' Proc. Zool. Soc., Dec. 8, 1863 ; "On the Osteology of Aficroglossa alecto," tbid., Feb. 28, 1865; "On the Osteology of the Kagu (Rhinochetus jubatus)," Trans, Zool, Sec., vol. vi. Huxley " On the Classitication of Birds," Proc. Zool. Soc., April 11, 1867;

“On the Alectoromorphe,” ibid., May 14, 1868; “The Anatomy of Vertebrate Animals,” 1871, p. 272. M. Edmond Alix, Zssai sur ’ Appareil Locomoteur des Oiseaux, Paris, 1874,—a most important work. The writer will often use the “very words”’ of Professor Huxley, despairing, as he does, of coming near that excellent writer, either in condensation or order. The working student will find the axial skeleton of the Ostrich most profusely and beautifully illustrated in Professor Mivart’s paper (Zrans. Zool. Soc., vol. viii. part 7). Every ornithologist will be grateful for that piece of work.

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from the tail. The cervical region of the spine is always long ; and its vertebra, which are never fewer than eight, and may be as many as twenty-three, are, for the most part, large in proportion to those of the rest of the body.

The atlas is a relatively small, ring-like bone; and the transverse ligament may become ossified and divide its aperture into two—an upper for the spinal cord, and a lower for the odontoid process of the axis vertebra. The os odontoideum is always ankylosed with the second vertebra, and constitutes a peg-like odontoid process.

The spines of the succeeding cervical vertebre are often obsolete, and are never very prominent in the middle region of the neck. The anterior faces of their elongated vertebral centra are conver from above downwards, and concave from side to side; whilst the posterior faces are cylindrical, slightly excavated from above downwards, and convex from side to side. (The contrary of this is stated in Professor Huxley’s Verteb. Anim., p. 276, where the author, by a lapsus memoric, puts it vice versa.) Hence, in vertical section the centra appear opisthocelous ; in horizontal section, procelous, and not the contrary, as is stated by our author ; and the structure is exceedingly characteristic of birds. The under surfaces of the centra frequently give off median inferior processes. In the Katie it is obvious that the cervical vertebrae have short transverse

Fic. 28,—A eervieal vertebra from the middle of the neck of a Foul; natural size. a, side view; 0, upper view; c, lower view; pr.2, pre-zygapophyses ;

pl.z., post-zy gapophyses.

processes and ribs, disposed very much as in the Crocodilia.

For, in young birds, the anterior end of the lateral face of

each vertebra bears two small processes, an upper and a

lower ; and this expanded head of a styliform rib is articu-

lated with these by two facets, which represent the

capitulum and the tuberculum (Huxley, op. cit., p. 276).

In the chicken of the Emeu (Dromcus nove-hollandic) the

writer, in 1843, carefully worked out and figured these parts.

Of the twenty cervical vertebre only the atlas and axis were

devoid of distinct ribs ; this individual was six weeks old.

These riblets were bony wedges, with a sharp point ; but

that was free, and the thick upper end was jammed in

between upper and lower transverse processes (diapophysts and parapophysis). The last but one of the ribs became suddenly larger, and the last was two-thirds the size of its successor—the first dorsal. Then followed six large ribs on each side, the last two floating. The vertebra bearing the last of these, and twenty more, are closely embraced by the fore-and-aft growth of the ilium, and form the so-called sacrum. Of the twenty vertebrae between the first over- lapped bone with a floating rib and the nine ribless caudals, there are five with free ribs, small, and hatchet-shaped, quite like those in the neck of the Crocodile. These, from being attached to a parapophysial cup near the fore-end of the centrum, get more forward, and wedge in between then own vertebra and the one in front. The next four vertebra, which give exit to the sacral plexus (or at least to most of it), have no ribs, and are very broad and short. They develop lamellar upper

transverse processes, but thei spines are aborted. Then come eleven vertebre, in front of the free caudal, that have short ribs ; the first two pairs are ankylosed already, then four pairs are distinct, and the remaining five have their ribs ankylosed, and then

becoming shorter and more pedate externally, get further |

backwards on the centrum. Thus, in a Bird as old as six weeks after hatching, there are eighteen pairs of cervi- cal, and nine pairs of so-called sacral ribs still distinct. Moreover, the ribs are quite aborted on the first and second cervical, on the four érwe sacral,—perchance, the next after this is also sacral,—and on all the caudal vertebree which have ouly papilliform transverse processes. There are fifty- five vertebre in all in the Emeu, thus:—cervical, twenty ; dorsal, five ; dorso-lumbar (the first with a large rib and really the sixth dorsal), six; sacral (proper), four; uro- sacral, eleven ; caudal, nine. We shall return to these data in describing the sacrum of the Fowl.

With age the cervical ribs (of the Ratitw) may become completely ankylosed. In Apteryx australis one, below, remains free; in Struthio camelus, two ; and in Dromeus nove-hollandie, three ; and then they appear like transverse processes, perforated at the base by a canal, which, as in the Crocodilia, contains the vertebral artery and vein, and the main trunk of the sympathetic nerve. The cervical ribs and transverse processes are similarly disposed in very young Carinate ; but infthese birds their form frequently becomes much modified in the adult, and they develop prolonga- tions which extend downwards and inwards, and protect the carotid artery or arteries. The neural arches have well-developed pre- and post-zygapophyses. The ribs of one or two of the posterior cervical vertebra become elongated and freely movable in the Cavinate, as in the Ratite.

The first dorsal vertebra is defined as such by the union of the ribs with the sternum by means of a sternal rib, which not only, as in the Crocodilia, becomes articulated with the vertebral rib, but is converted into complete

bone, and is connected by a true articulation with the margin of the sternum. The number of the dorsal vertebree (reckon- ing under that head all the vertebra, after the first dorsal, which possess distinct ribs, whether they be fixed or free) varies. The centra of the dorsal vertebre either possess cylindroidal articular faces, like those of the neck, as is usually the case ; or more or fewer of them may have their faces spheroidal, as in the Penguins [Plovers (and their kin Vanellus cristatus, Totanus fuscus, &c.), Gulls, Cormorants, and Parrots]. In this case the convex face is anterior, the concave, posterior. They may, or may not, develop in- ferior median processes [which may be simple, as in the Cormorant, where they exist on several lower cervical, on all the dorsal, and in five sacro-lumbar; or they may bifurcate into two broad, bony leaves, as in Colymbus]. They usually possess well-marked spinous processes [which begin in the two or three lower cervicals]. Sometimes they are slightly movable upon one another [bound strongly, in many cases, by ossified tendons of great strength and elasticity |; sometimes they become ankylosed together into a solid mass. [When this takes place the last cervical is ankylosed to the three first dorsal, as in the fowl, the fourth remaining free, and the fifth coalescing with the lumbar ; or, as many as five may ankylose together, leaving one free, and the last ankylosed to the lumbar, as in Falco cesalon. But this number often differs with age, as may be seen in different individuals of Psophia crepitans, and other, more typical, Cranes.])

It is characteristic of the dorsal vertebrze of Birds that the posterior, no less than the anterior, vertebra present a facet or small process on the body, or lower part of the arch, of the vertebra for the capitulum of the rib, while the upper part of the neural arch gives off a more elongated process for the tuberculum. Thus, the transverse pro- cesses of all the dorsal vertebrae of a Bird resemble those of the two anterior dorsals of a Crocodile, and no part of the vertebral column of a Bird presents transverse pro- cesses with a step for the head of the rib, like those of the

VERTEBR&. |

great majority of the vertebrae of Crocodilia, Dinosauria, Dicynodontia, and Pterosauria. [The triangular facets for the tubercular processes are scarcely scooped; those for the capitular are neat, round, shallow cups.]

*The dis- crimination of the proper lumbar, sacral, and anterior caudal vertebree, in the ankylosed mass which constitutes the so- called "sacrum" of the Bird, is a matter of considerable difficulty. The general arrange- ment is as follows :—The most anterior lumbar vertebra has a broad transverse process, which corresponds in form and position with the tubercular transverse process of the last dorsal. In the succeeding lumbar vertebrz the process extends downwards ; and in the hindermost [the ¢hird] it is continued from the centrum, as well as froin the arch of the vertebra, and forms a_ broad mass which abuts against the ilium.' This process might well be taken for a sacral rib, and its vertebra for a proper sacral vertebra. But, in the first place, I find no distinct ossification in it [there are five of these lumbar vertebra in the Emeu, two more than in the Fowl, and they all have distinct ribs; and the ribless vertebra are five in the Fowl and four in the Emeu]; and, secondly, the nerves which issue from the intervertebral foramina in front of and behind the vertebra enter into the lumbar Fis. 29. —The "sacrum" o. a é 3 oe young Fowl; natural size, seen plexus, which gives origin to from below.' d.l., dorso-lumbar, the crural and obturator nerves, * 8#°"#h ¢ caudal vertebrae. and not into the sacral plexus, which is the product of the nerves which issue from the intervertebral foramina of the proper sacral vertebree in other Vertebrata. Behind the last lumbar vertebra follow, at most, five vertebra which have no ribs; but their arches give off horizontal, lamellar processes, which unite with the ilia. [In the Emeu these four vertebree show uot the least trace of ribs, and are flat bricks uf bone, below, jammed together like the cervical centra of a Cetacean.| The nerves which issue from the intervertebral foramina of these vertebrae unite to form the sacral plexus, whence the great sciatic nerve is given off ; and I [Professor Huxley] take them to be the homologues of the sacral vertebrae of the Reptilia. The deep fosse between the centra of these vertebra, their transverse processes, and the ilia, are occupied by the middle lobes of the kidneys. If these be the true sacral vertebre, it follows that their successors are anterior caudal. 'They have expanded upper transverse processes, like the proper sacral vertebree ; but, in addition, three or four of the most anterior of these vertebre possess ribs, which, like the proper sacral ribs of Reptiles, are suturally united, or ankylosed proximally, with both the neural arches and the centra of these vertebre ; while, distally, they expand and abut against the ilium. The ankylosed caudal vertebraee may be distinguished as wro-sacral. We now give a table*

showing the number of bones in the so-called sacrum of Birds—so many vertebre as are covered by the ilia and ankylosed together. Here the

1 Jt would be more proper to say that ossification extends into and

from the centrum as well as from the neural arch. The process, like other processes, exists before the centrum is differentiated from the arch by ossification (Huxley).

| bre in the Swan's tail.

distinction between dorsal and lumbar is, that the former possess elongated ribs; and the table will show forms of extreme length and of extreme shortness, for a Bird; and also, as in the Fowl, of a medium type. Most of the in- stances are derived from the sacral bones of young Birds,

d. F 8. 1.3. Total. Dromeus novee-hollandic … 1 5 4 ie t=. OR CUR US GLO scree, ctr a Socen es 2 5 4 tO = 21 Colymbus glacialis and i = C. septentrionalis …..... 2 : 6 au Gallus domesticus…...0..0.00. 1 3 5 6 «= 23 ACEO ASPOA Mies Soctes seat sas 1 2 4 6. = de UDPUPAEDODBS occ aie seiseneisiouer 1 2 3 a | Cypselus CPUs… .....00 scoes 2 1 3 Oo = ay

In both the Hoopoe and the Swift the first of these sacrals has an outstanding rib-process, In the Swift the rib on the second of the enclosed dorsals is very long, and its flanking rib nearly reaches the sternum. 'he next or third vertebra, the lumbar, has below it, neither reaching to it above, nor by its sternal piece to the sternum below, another rib ; it-is two-thirds the size of its predecessor, and only occurs on the right side. This will show how, by grada- tions the most gentle, the vertebre and their ribs are specialized in each particular type, and also how very arbi- trary is our nomenclature.

The Swan has eight free vertebrae behind the wro-sacral, and as the last of these is in these types composed of ten vertebrze originally, there are

primarily twenty-seven verte- The caudal vertebrae which suc- ceed the wro-sacral may be numerous and all distinct from one another, as in Archeopteryx, or few and distinct, as in Khea ; but more generally, only the anterior caudal vertebre are distinct and movable, the rest being ankylosed into a ploughshare-shaped bone or pygostyle, which sup- ports the tail feathers and the uropygial gland, and some- times, as in the Woodpecker and some other Birds expands below into a broad polygonal disk.

The centra of the movable presacral vertebra of Birds are connected together by fibro-cartilaginous rings, which extend from the circumference of one to that of the next. Each ring is continued inwards into a disk, with free an- terior and posterior faces—the meniscus. The meniscus thins towards its centre, which is always perforated. The synovial space between any two centra is, therefore. divided by the meniscus into two very narrow chambers, which communicate by the aperture of the meniscus. Some- times the meniscus is reduced to a rudiment; while, in other cases, it may be united, more or less extensively, with the faces of the centra of the vertebrae. In the caudal region the union is complete, and the meniscus altogether resembles an ordinary intervertebral cartilage.

A ligament traverses the centre of the aperture of the meniscus, and in the Duck contains the intervertebral portion of the notochord. As Jager has shown, it is the homologue of the odontoid ligament in the cranio-spinal articulation, and of the pulpy central part of the inter- vertebral fibro-cartilages in Mammalia. All the verte- bral ribs in the dorsal region, except, perhaps, the very last free ribs, have widely separated capitula and tubercula. More or fewer have well-ossified uncinate processes attached to their posterior margins, as in the Crocodilia [and Hat- teria. These are separate, both as cartilage and as bone, at first; we haveonly failed to find them in the Crested Screamer (Chauna chavaria). Among the Ratite they are very small and few in number; in the Emeu and in the Apteryx they are large; they evidently correspond with the un- severed rib-flaps of the little Ant-eater (Parker's Shoulder-*

- *Professor Huxley's figure (80, p. 278) only shows five uro-sacral, there are siz in the Fowl.*

3 “Das Wirbelkorpergelenk der Vigel,” Sitzungsberichte der Wiener Akademie, 1858.

girdle and Sternum, plate 22, figs. 19, 20).] The ver- tebral ribs are completely ossified up to their junction with the sternal ribs.

Tue STERNUM, LiMB-GIRDLES, AND Limps.?

The sternum in Birds is a broad plate of cartilage which is always more or less completely replaced in the adult by membrane bone.? It begins to ossify by, at fewest, two centres, one on each side, as in the Ratitw. In the Carinate it usually begins to ossify by five centres, of which one is median for the keel, and two are in pairs for the lateral parts of the sternum. Thus the sternum ofa Chicken is at one time separable into five distinct bones, of which the central keel-bearing ossification (fig. 30) is termed the

Fra. 80,—-Sternum of a Chick (@allus domesticus) three days old, lower view, xX three diameters. The cartilage is shaded and dotted, and the bony centres are light and striated. The front external processes are the “costals,” and are ossified each by a pleurosteon; the median front process is the rostrum, and on each side of it are seen the coracoid grooves. The fore-part of the middle, most of which is earinate, is ossified already by the lophosteon; the forked xiphoids on each side are cach largely occupied by a metosteon; on the right side the sternal ribs are shown.

lophosteon, the antero-lateral piece which articulates with

the ribs, plewrosteon, and the postero-lateral bifurcated piece,

metosteon.

[In Zurnix there are two more centres, mesiad of the pleurostea, these are the coracostea ; in Dicholophus the median part suddenly dilates, behind, into a heart-shaped flap of cartilage, which has au endosteal patch, the wrosteon. |

Though the sternum, in most Birds, seems to differ very much in form from that of the Reptilza, it is rhomboidal in the Caswartide, where it differs from the Reptilian sternum chiefly in the greater proportional length of its posterior sides, the absence of median backward prolongations, and

1 See Harting, L' Appareil Episternal des Oiseaux, Utrecht, 1864; Parker, "On Baleniceps rex," Trans. Zool. Soc., vol. iv. plates 66, 67; "On Gallinaceous Birds and Tinamous," 7. 7. S., vol. v. plates 35~41 ; "On the Kagu," 7. Z. S., vol. vi. plates 91, 92; Shoulder- girdle and Sternwm, plates 13-18; Huxley, "On the Alectoro- morphe," P. Z.8., May 14, 1868 ; Anatomy of Vert. Anim., p. 280; Owen, "On Alca impennis, L.," T. Z. S., vol. v. p. 317, plates 51, 52 ; "On the Osteology of the Dodo," 7. Z. S., vol. vi. plates 15-24, and T. Z. 8., vol. vii. plates 64, 65; "On Dinornis," 7. 7. S., vol. vii. plates 7-9 ; 'On Aptornis defossor," T. Z. S., vol. vii. plates 42, 43, and 7. Z, S., vol. viii. plates 14-16 ;. Murie, "On Geopsittacus occidentalis," Proc. Zool. Soc., Feb. 27, 1868, p. 163; "On Scotopelia peli," Jour. Anat. and Phys., vol. vi. p. 170, plate 11; "On Todus," Proc. Zool, Soc., May 21, 1872, pp. 664-680, plate 55; "On Colius," Zhe Ibis, July 1872, pp. 263-280, plate 10; "On the Motmots," Ibis, Oct. 1872, pp. 883-412, plates 18-15; "On the Upupide," Ibis, April 1873, pp. 181-211, plates 5-7; "On Fregilupus," Proc. Zool. Soc., June 16, 1874, pp. 474-488, plates 61, 62; M. Edmond Alix., Essai sur Cappareil locomoteur des Oiseaux, Paris, 1874.

- *These statements do not apply to Archeopteryx ; its structure is very imperfectly known (Huxley).*

BIRDS

[ANATOMY.

*the convexity of its ventral surface. But in other Birds, and notably in many Carinate, the antero-lateral edges, which are grooved to receive the coracoids, form a much more open angle than in the Reptilia, while the postero-lateral edges become parallel or diverge: and a wide, straight, or convex transverse edge takes the place of the posterior angle. 'T'wo, or four, membranous fontanelles may remain in the posterior /: moiety of the sternum when * ossification takes place, and give rise to as many holes, or*

deep notches, separating slender pro- cesses in the dry skeleton. All these correspond with so many divisions of the xiphoid process of the sternum in Mammalia, and hence are called middle, internal, and external xiphoid processes. Sometimes a median process, rostrum or manubrium Fre. 31.—A side view of the Chick's j ' sternum, showing the perfora- (figs. 30, 31), 18 developed from tion through the rostrum, and the the anterior angle of the stermum, $¢7 and, aenltion of te and its antero-lateral angles are (posterior) "xiphoid processes" developed into costal processes, sions. In this, asin the lower which may bear the articular Yfew, the, great size of the surfaces for more or fewer of the ; ribs. The two last-named structures are very distinct in the Coracomorphe, or Passerine Birds.

The extent to which the keel of the lophosteon is de- veloped in the Carinate birds varies very much. In Strigops it is rudimentary ; in birds of powerful flight, as well as in those which use their wings for swimming, it is exceedingly large.

The pectoral arch presents a long, narrow, and recurved scapula (fig. 32), without any supra-scapula, and a coracoid

Fra, 32.—-Shoulder-girdle of adult Fowl, nat. size; oblique side view inverted} sc. scapule; co., coracoids; 7, clavicles; Ap., hypoeleidium, or inter-clavicle; gi, glenoidal eavity.

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(co.), fitted by its proximal end in the groove in the antero- lateral edge of the sternum. The inner ends of the coracoids often overlap, as in Lacertilia ; otherwise the shoulder-girdle is unlike that of any of the Reptilia, except the Pterosauria. The coracoid is usually completely ossified, and presents no fontanelle. There is no distinct epicoracoid. The two bones take nearly equal shares in the formation of the glenoidal cavity, and usually remain unankylosed and distinct in this region.

In the Ratite the long axis of that part of the scapula which lies near the glenoidal cavity is parallel or coincident with that of the coracoid, and the two bones become com- pletely ankylosed. But in all the Carimate the long axis of the scapula forms an acute, or only slightly obtuse angle

(Ocydromus, Didus) with that of the coracoid. A small bone, the scapula accessoria, is developed on the outer side of the shoulder-joint in most Coracomorphe and Celeomor phe.

In the Carimate the, glenoidal end of the scapula is divided into two portions: a glenoidal process, which expands to form the upper part of the glenoidal cavity, and to unite with the coracoid ; and an acromial process, which gives attachment to the outer end of the clavicle. The glenoidal end of the coracoid is in like manner divided into two portions: a glenovdal process, which unites with the scapula, and a clavicular process, which articulates with the outer surface of the clavicle near its outer end. The clavicular process of the coracoid does not represent the procoracoid of Lacertilia; rudiments of that bone unite with the clavicle. In the Matite there is no distinct clavicular process ; but the anterior part of the coracoid, near the glenoid cavity, may be produced and separated by a uotch or fontanelle from the rest, or developed down to the sternum (in Struthio) as a lacertilian procoracoid. There is no trace of clavicles in Apteryx, Rhea, Struthio, and some Parrots; but in the latter there is generally an ossified, distinct, short procoraoid. In the Emeu and in some Carinate (Didus, Rhumphastos toco, Corythatx buffoni, Buceros albirostris), the clavicles remain distinct from one another, or connected only by fibrous tissue ; but in the majority of Birds they are very early ankylosed together, and with the representative of the inter-clavicle, in the middle line, into a single bone, the furculum, the strength of which bears a pretty close relation to the exertion required of the wings in flight or in natation. In the Passerine Birds the scapular end of the clavicle is enlarged by a procoracoid rudiment of cartilage, which ossifies separately, producing the expansion above and in front called epocverdium.

A median process (hypoclerdvwm) is frequently developed from the inter-clavyicular part of the furculum, and this inay be united with the carina of the sternum by strong fibrous tissue, or even by continuous ossification, In Opisthocomus1 the furculum is ankylosed with the manu- brial part of the sternum on the one hand, and with the coracoids on the other. Ankylosis of the furculum with the coracoids has also been observed in Didus,? and with both keel and coracoid in Sregata aquila (Shoulder- girdle and Sternum, p 15, 1; sce also the actual specimen in the museum of Col. Surg. Eng.)

The fore-limb of a Bird, when in a state of rest (fig. 33), exhibits a great change of position, if it be compared with that of an ordinary Reptile; and the change is of a character similar to, but in some respects greater, than that which the arm of a man presents when compared with the fore-limb of a quadrupedal Mammal. The humerus lies parallel with the axis of the body, its proper ventral

1 Huxley " On the Alectoromorphe," p. 306, figs. 8 and 9. 2 Owen "On the Dodo," YLrans. Zool. Soc., vol. vi. part 2, p. 63, plate 20, fig. 4.

surface looking outwards. The fore-arm is in a position midway between pronation and supination, and the

Fig. 33.—Bones of Fowl's right wing, adult, nat. size. h., humerus; , radius;

- *w, ulnar; 2"., u'., radial and ulnar carpal bones; with the three digits I, II.III.*

mianus is bent back upon the ulnar side of the fore-arm in a position not of flexion but of abduction. .

In ordinary Birds the proximal end of the humerus is expanded, and its articular head transversely elongated. Its ventral face is convex, and provided with a strong preaxial ridge, which gives attachment to the pectoral muscle. The proper dorsal face is concave from side to side, especially towards the postaxial margin, where the pheumatic aperture occurs in those birds which have the humerus hollow. The distal end is expanded, and the articular surface for the radius is a convex facet, directed obliquely inwards on its ventral face. In this respect the Bird's humerus exaggerates a feature of that of the Lizard's.

In the Fatite these peculiarities are very feebly, or not at all, marked, the humerus being a slender, cylindrical, slightly-curved bone. In the Casuartide, Dinornithide, and Apterygide, the forelimb is extraordinarily reduced, and may become rudimentary. In the Penguins and, to

a less degree, in the Great Auk, the humerus becomes flattened from side to side, the proximal end is singularly modified, and at the narrow distal end the articular sur- tace for the radius lies completely in front of, and rather above, that for the ulna.

The ulna, which often presents a series of tubercles, indicating the attachment of the secondary quill feathers, is usually a stronger and a longer bone than the radius. There are only two carpal bones, one radial and one ulnar. There is one exception to this, namely, in the Screamer (Chauna chavaria), which has three carpals on the left side, the lower arcuate bone having two representatives.

In the Apterygide and in the Casuaride there is but one complete digit in the manus. It appears to answer to the second of the pentadactyle limb, and is provided with a claw. In the Struthtonide and Rheide, and in all the Carinate, there are three digits in the manus, which answer to the pollex and the second and third digits of the pentadactyle fore-limb ; and the metacarpal boncs of these digits are ankylosed together. As a rule the meta- carpal of the pollex is much shorter than the other two ; that of the second digit is strong and straight; that of the third is more slender and bowed, so as to leave an inter- space between itself and the second, which is often filled up by bony matter. The pollex has two phalanges, and the second of them is, in many birds—Jthea, the Screamer, &c.—pointed, curved, and ensheathed in a horny claw. The second digit has two and sometimes three phalanges, as in the Swan; and the terminal phalanx is similarly pro- vided with a claw in sundry birds, ¢.g., the Swan and hea. In the Ostrich both the pollex and the second digit are unguiculate. The third digit possesses one phalanx, besides its ankylosed metacarpal, and is always devoid of a claw.

It is a singular circumstance that the relative proportions of the humerus and the manus should present the most marked contrast in two groups of birds which are alike remarkable for their powers of flight. These are the Swifts and Humming-birds, in which the humerus is short and the manus

long, and the Albatrosses, in which the humerus is long and the manus relatively short.

In the Penguins the pollex has two free phalanges, and its metacarpal bone (which is distinct in the young birds) ankyloses with that of the second digit. The third metacarpal is slender and straight. The bones of the inanus are singularly elongated and flattened.

Fic. 34.—Pelvis and caudal vertebra of adult Fowl. side view, natural size.

The pelvis of a Bird (fig. 34) is remarkable for the great elongation, both anteriorly and posteriorly, of the iliac bones (i/.), which unite with the whole length of the edges of the sacrum, and even extend forwards over the

il, lium; ¢s., ischium; pb., pubis; d.l, dorso-lumbar vertebr; cd., caudal vertebre; am., acetabulum.

posterior ribs of the dorsal region. Below, each iliac bone forms a wide arch over the acetabulum (am.), the centre of which is always closed by fibrous tissue, so that in the dry skeleton the bottom of the acetabulum is always per- forated by a wide foramen. An articular surface on the ilium, on which the great trochanter of the femur plays, is called the antetrochanter. In all ordinary birds the ischium (vs.), which broadens towards its hinder end, extends back nearly parallel with the hinder part of the ilium, and is united with it by ossification posteriorly. The ischiosciatic interval is thus converted into a foramen. The pubis (pb.) enters by its dorsal or acetabular end into the formation of the acetabulum, and then passes backwards and downwards as a comparatively slender, curved bone, nearly parallel with the ischium. It is united with its fellow only by fibrous tissue. Very few birds present any important variation from this structure of the pelvis. In Zimamus,1 Casuarius, Dromeus, Apteryx, Dinornis, the ischium is not united with the backward extension of the ilium by bone. In Rhea the ischia unite with one another beneath the vertebral column ; and the verte- bre in this region, that is, from the true sacral to the end of the

iliac roof, become undistinguishable, being formed into a long slender uro-sacral style. In Struthio alone, among Birds, do the pubes unite in a median ventral symphysis (see Mivart, 7. Z. S., vol. i. part 7, pp. 434, 435, figs. 72, 73). Another not less remarkable circum- stance in the Ostrich is that the 3lst to the 35th vertebrae inclusively (counting from the atlas) develop five lateral tuberosities. The three middle tuberosities are large, and abut against the pubis and theischium. In these vertebra, as in the dorsal vertebree of the Chelonia, the neural arch of each vertebra shifts forward, so that half its base arti- culates with the centrum of the next vertebra in front, and the tuberosities in question are outgrowths, partly of the neural arch, and partly of the juxtaposed vertebral centra between which it is wedged. Hence in young Ostriches the face of each tuberosity exhibits a triradiate suture. Asmall bone is sometimes found on the ventral edge of the pubis, at its middle ; this has been supposed to repre- sent a marsupial bone (Garrod, P. Z. S., Mar. 1872, p.

359).

The upper articular head of the femur is rounded, and its axis is almost at right angles with the body of the bone; a structure which is not found in ordinary Reptilia, but exists in the [guanodon and other Ornithosce- lida. The shaft is re- latively short and thick, and the two terminal condyles are large and elongated antero-poste- riorly, A prominent ridge, which plays be- tween the proximal ends of the tibia and fibula, ig apparent upon the posterior and _ inferior surface of the outer condyle. A similar ridge is faintly developed in some Lacertilia, and is well marked in the Dinosaurian Reptiles. A patella is usually present, but it is some- times absent, and may be double. ;

The fibula of Birds (fig. 36, F.) is always imperfect,

1 Parker, Trans. Zool. Soc., vol. v. plate 39.

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ending in a mere style below. Generally, it is decidedly shorter than the tibia, but it has the same length as that bone in some Penguins. The tibia (t.), or rather " tibio-tarsus," is a highly characteristic bone. Its proximal end is expanded, and produced anteriorly, into a great cnemial process (which may be variously subdivided), as in Dinosauria. The distal end is terminated by a well-marked pulley-like articular surface, which is inclined some- what forwards as well as downwards. Not unfrequently there is an oblique bar of bone on the anterior face, just above the pulley, beneath which the long ex- tensor tendons pass.

The extremity of the cnemial process in Struthio, Rhea, and Dromceus is ossified as an epiphysis ; and in young birds the whole of the distal articular end of the bone is separated from the rest by a suture, and also appears tu be an epiphysis. But it is, in fact, as Professor Gegenbaur ! has proved, the proximal division of the tarsus (apparently representing only the astragalus of the other Vertebrata), which exists in the embryo as a separate car- tilage, and, as it ossifies, ankyloses with the tibia. The so-called tibia of a bird is therefore, properly speaking, a tibio- tarsus.

In all Birds, even in Archeopteryz, the fifth digit of the pes remains unde- ee ae ele veloped ;? and the second, third, and front view, natural fourth metatarsals are ankylosed to- S¥3 'or [PPer com gether, and by their proximal ends, with dyles; im, troch- a bone, which is a distinct cartilage in jedge forth abule the foetus, and represents the distal di- oe bee oniee vision of the tarsus. Thus a tarso-meta- is not seen in this tarsus is formed (fig. 37). The distal "°" ends of the metatarsals remain separate, and offer convex articular surfaces to the proximal phalanges of the digits.

In the Penguins, large apertures lie between the several metatarsals of the adult tarso-metatarsus; and in other birds more or less considerable passages persist between the middle and lateral metatarsals proximally, and the middle and outer distally. In most birds the middle meta- tarsal does not remain parallel with the others, but its proximal end inclines a little backward, and its distal end a little forward. Hence the two apertures on each side of its proximal end may lie at the bottom of a fossa, or run into one in front, while they remain distinct behind.

Again, in most Birds the posterior face of the proximal end of the middle metatarsal, and the adjacent surface of the tarsal bone, grow out into a process which is commonly, but improperly, termed " calcaneal." The inferior surface of this hypo-tarsus is sometimes simply flattened, sometimes traversed by grooves or canals for the flexor tendons of the digits.

When a hallux exists, its metatarsal bone is usually in- complete above, and is united to the ligament by the inner or the posterior surface of the tarso-metatarsus, In the Frigate-bird (Phaethon), and in Steatornis, the hallucal meta- tarsal is remarkably long. The genus Phaethon stands alone, as far as we know, in having the hallucal metatarsal ankylosed with the others.

In many of the Alectoromorphe a spur (calcar), con-

1 See " Archiv. fiir Anat.," in Phys. Jahrgang, 1863, and Huxley,

on ' Dinosaurs," Q. Jour. Geol. Soc., Nov. 10, 1869. 2 In his earlier papers, Mr Parker mistook the bony core of the cock's spur for the first, thus making the proper hallux the eecond toe.*

sisting of a bony core ensheathed in horn, is developed on

the inner side of the metatarsus, and becomes ankylosed

with the metatarsal of the second digit ; in some there are CME

As™ Fig. 36.—Left tibia and fibula of a large young Fowl, side view. ¢., tibia; Ff, fibula; As, astraga- lus; cn., cnemia] process.*

Fig. 37,—Tarso-metatarsi of a large young Fowl, front view, natural size. ts., tarsal bone; ¢t.m.s., triple tarso~- metatarsal] rod, with the first meta-tarsal] seen below on the right hand, but partly out of view on account of its backward position.

two spurs. In a few birds, similar spurs (Palamedea), or

osseous excrescences (Pezophaps), are developed in relation

with the metacarpus.

The normal number of the pedal phalanges in Birds is (as in ordinary Lacertilia) two, three, four, five, reckoning from the hallux to the fourth digit. Among the few Birds which constitute exceptions to the rule are the Swifts, in which the third and fourth toe have only three phalanges each (2, 3, 3, 3), and the Goatsuckers, in which the fourth toe only has the number reduced (2, 3, 4, 4)—not 2, 3, 4, 3, as Professor Huxley (op. cit.) puts it for Caprimulgus. Mr Parker has figured the fourth toe of the Sand-grouse (Syrrhaptes) with only three, but he speaks (op. cit., p. 203) of only one as wanting in that toe.

Many Birds have only three toes by suppression of the hallux. In the Ostrich, not only the hallux, but the phalanges of the second digit, are suppressed, and the distal end of the second metatarsal is reduced to a mere

rudiment. Hence the Ostrich has only two toes (which answer to the third and fourth of the pentadactyle foot), with four phalanges in the inner and five in the outer, though the inner toe is far the longer and the stronger.

In most four-toed Birds the hallux is turned more or less completely backwards, and the other three digits forwards, But in many Aetomorphw (especially the Owls) the outer toe can be turned outwards, or even backwards, at will. And in the Parrots, Toucans, Cuckoos, Woodpeckers, and other so-called "Scansorial" Birds, the outer toe is per- manently reversed. Under these circumstances the distal end of the outer metatarsal may be divided into two dis- tinct articular surfaces. In the Trogons there are two toes in front and two behind, as in the Parrots; but it is the second toe which is turned backwards. Lastly, in the Swifts, the Dysporomorphe, aud the Spheniscomorphe, the hallux is directed more or less forwards, so that all four toes are turned to the front.

As a general rule, the osseous tissue of Birds is remark- ably dense and hard. Before hatching, the bones are solid and filled with vascular medulla; but after birth, more or fewer of the bones are always excavated by prolongation of cavities containing air, which lie in their neighbourhood.

Such air cavities are always found in the skull, in connec- tion with the nasal and auditory passages, and they may extend through all parts of the skull, with the exception of the jugal arch, which, however, is pneumatic in the Toucan and Hornbill. In many birds, Apteryx, Penguin, Divers (and Gulls, according to Professor Huxley ; but this is a mistake, their spinal column far into the sacrum is pneumatic; Larus canus shows this well), and the smaller Song-birds, no other bones than those of the skull are pneumatic; but in most birds the air-sacs of the lungs send prolongations into the bones of the rest of the trunk- skeleton, seldom into the caudal vertebra, as in Balwniceps, the Adjutant, Hornbill, &c. In the Hornbills the whole skeleton is pneumatic; in a large number of birds the humerus alone of the limb-bones contains air; in the diurnal Raptores, the femur also. It is proper to remark that the amount of pneumaticity of bones by no means follows the development of the powers of flight. In the Ostrich, for example, the bones are far more extensively pneumatic than in the Gull.

In some cases, prolongations of the air-sacs extend beneath the integument,

Tue Mvuscuszs.

In the space allotted to the writer, there is merely room for justice to be done to one category of organs ; and as the skeleton, and especially the skull, is of most direct import- ance to the zoologist and paleontologist, and as its form determines, as it were, all other organs, they being correlated with it and answering to it, it seemed to be that on which election should fall for the fuller treatment. An ¢mpartial description of all the systems of organs would have resulted in the merest outline for each. For the muscles, Professor Huxley's abstract must serve.!

The cutaneous muscles of Birds are well developed, and form broad expansions in various parts of the body. Special

1 Anat. Vert. Anim., p. 300. For an almost exhaustive biblio- graphy of writings on the muscular system of birds, see M. Edmond Alix's Essai sur l Appareil locomoteur des Oiseaux, pp. 367-878. This list begins with Aldrovandus, 1581, and ends with Goverod, 1873, 1874. We miss, however, Macgillivray's excellent description, with figures, of the muscles of flight, Brit. Birds, vol. i. plate 3, pp. 35-46; and another by Professor Rolleston,

“On Muscles connected with the Shoulder-joint,” Trans. Linn. Soc., vol. xxvi. pp. 610-629. See also Owen “On the Apteryx,’ Trans. Zool. Soc., vol. vii. p. 381, pl. 46. But the most important work for reference is that of M. Alix himself (op. cit., pp. 373-471, plates 1-8, “ Appareil actif de la Locomotion ”).

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bundles of muscular fibres pass to the great quill feathers of the tail and wings, and others to the patagium, a fold of integument which stands between the trunk and brachium behind and between the brachium and ante-brachium in front. In correspondence with the slight mobility of the dorsal vertebra, the episkeletal and hyposkeletal muscles of the spine attain a considerable development only in the neck and in the tail. Owing to the great size of the sternum, the abdominal muscles are usually small, and the internal oblique may be absent. A diaphragm, consisting of bundles of muscular fibre,? which pass from the ribs to the aponeurosis, covering the ventral face of the lungs, is developed in all Birds, but attains to the greatest degree of completeness in the fatite, and especially in Apteryz. The muscles of the limbs are remarkably modified by the excessive development of some of those found in other Vertebrata, and the suppression of others.

Thus in all birds possessing the power of flight, the pec- toralis major, the chief agent of the downward stroke of the wing, is very large and thick, taking its origin from the whole length, and a great part of the depth, of the keel of the sternum. The elevation of the wing is chiefly effected by the pectoralis secundus (levator humeri ; or p. medius, Macg., plate 3, figs. 4, 5), which arises beneath (within and over, in the standing bird) the foregoing muscle, and passes over the inner side of the scapulo-coracoid articulation as over a pulley, to reach the humerus. The muscles of the fore-arm and digits are reduced, in accordance with the peculiar modification of the skeleton of these parts. In the hind limb of most birds there is a singular extensor muscle, which arises from the pubis, and ends in a tendon which passes to the outside of the knee-joint and terminates in the leg by uniting with the flexor digitorum perforatus. The result of this arrangement is that the toes are flexed whenever the leg is bent upon the thigh, and

consequently the roosting bird is held fast upon his perch by the weight of his own body.

THE BRAIN.

In Birds, as in Reptiles, the cerebro-spinal axis is angu- lated at the junction of the spinal cord with the medulla oblongata, the latter being bent down towards the ventral side of the body. The region on which the nerves of the anterior and posterior extremities originate is enlarged in Birds. In the lumbar enlargement the posterior columns of the cord diverge and give rise to the sinus rhomboidalis, which is a sort of repetition of the fourth ventricle, the dilated central canal of the spinal cord being covered merely by a thin membrane, consisting chiefly of the ependyma and arachnoid. The brain fills the cavity of the skull, and presents a well-developed cerebellum ; a mesencephalon, divided above into two optic lobes; and relatively large prosencephalic hemispheres, which attain a considerable size but never conceal the optic lobes. The transverse fissures of the cerebellum are distinct, and the lateral appendages of the cerebellum, or flocculi, become well defined, and are wedged, as in many of the lower Mammalia, in cavities of the side walls of the skull, arched over by the anterior vertical semicircular canal.

There is no pons Varolit, in the sense of transverse fibres connecting the two halves of the cerebellum, visible upon the ventral surface of the mesencephalon. The optic lobes contain ventricles ; these are thrown down to the sides of the base of the brain, and are connected over the agueductus Syloii by a broad commissural band. Each prosencephalic lobe contains a lateral ventricle (continuous through the

2 See Macgillivray, Brit. Birds, vol. ii. plate 11, fig. 1, v.v.v.

3 See J. Alph. Borelli, De Motu Animalium, Rome, 1680-1682, Lugd. Bat. 1865; and Bibliotheca Anatomica, Geneva, 1685, plate 82, figs. 4-7.

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*foramen of Munro with the third ventricle), which is little more than a fissure between the very thin inner wall of the lobe and its thick outer part, which contains the corpus striatum. The corpora striata are united by an anterior commissure, which is not of large size. The thinning of the inner wall of the lobes, from the margin of the foramen of Munro backwards, which gives rise to the fissure of Bichat in the Mammalia, extends for a very short distance in the Sauropsida, even in Birds. The olfactory lobes are usually elongated, and contain ventricles continuous with those of the prosencephalic hemispheres. In all the Sawropsida the motor nerves of the tongue pass through a foramen in the occipital bone. Hence twelve pairs of cranial nerves are present, except in the Ophidia, which posscss no spinal accessory nerves. 'The lateral cutaneous branches, so gene- rally sent to the trunk by the pneumogastric in the Ichthyopsida, are absent, but the pneumogastric gives a recurrent branch to the larynx. 'he third, fourth, and sixth nerves arise quite independently of the fifth, The sympathetic is well developed.**

ORGANS OF SENSE.

Birds possess nasal glands, which attain a large size, and lie more usually upon the frontal bone, or in the orbits, than in the nasal cavity. In the Snakes and Lizards these bones lie between the septo-maxillaries above and the vomers below. In Birds, wherever placed, the duct opens near the same region as in the Reptiles. In many kinds, especially Passerines, the bones that should cover them are really present, but are rudimentary and attached to the vomer. 'These are the septo-maxillaries.

The eye in many Birds, as in the extinct Ichthyosaurta, attains very great absolute and relative dimensions, Birds possess, like many Reptiles, a nictitating membrane.? In the Lizards a short, thick muscle (bursalis) is attached to the inner and posterior wall of the orbit, and ends in a fibrous sheath. A tendon, one end of which is attached to the presphenoidal region of the inner wall of the orbit, passes backwards through the sheath, and then forwards, to be attached to the nictitating membrane. When the muscle contracts, it necessarily pulls the latter over the eye. A Harderian gland is always developed, and a lachrymal gland very generally, but not always. In the Chelonia, muscular fibres (forming the so-called pyramdalis muscle)

arise from the inner side of the eyeball, and, arching over it at the optic nerve, are inserted partly into the outer edge of the nictitating membrane, partly into the lower eyelid. The Crocodilia have a pyramidalis muscle taking the same origin and course; but it sends no fibres to the lower eyelid, its tendon being inserted alto- gether into the nictitating membrane. The third arrange- ment, which in a manner brings together the first and the second, is that seen in Birds. A pyramidalis muscle, arising from the inncr and under surface of the eyeball, soon ends in a tendon which sweeps round the upper and outer surfaces of the sclerotic to the nictitating membrane, as in the Crocodiles. But there is also a bursalis muscle, which however arises, not, as in Lizards, from the wall of the orbit, but from the upper surface of the sclerotic itself,

1 See Owen, Art. ' Aves," Oyclop. Anat. Phys., pp. 298, 299; Macgillivray, Brit. Birds, vol. i. p. 48, and vol. iii. plate 18; Owen '¢On Brain of Apteryx," Trans. Zool. Soc., vol. vii. plates 45 and 46, p. 881. For the development of the Fowl's brain, see Foster and Bal- four's Elem. of Embryology; see also Huxley, Anat. Vert. Anim., p. 301, figs. 90, 91.*

2 See Macgillivray, Brit. Birds, vol. iii., plate 17, p. 146, for excel- lent figures and descriptions of the Bird's eye; also Owen, article " Aves," Cyclop. Anat. and Phys., p. 303. For its development, Foster and Balfour's work, p. 97. The Bird's eye being a more highly specialized Repétilian organ, its condition in the lower types of the Sauropsida is also given in the text.

whence it passes backwards and ends in a fibrous sheath which encloses the tendon of the pyramidalis. The con- traction of the muscle necessarily tends to draw the tendon of the pyramidalis away from the optic nerve. A tubercle is sometimes developed from the sclerotic above the en- trance of the optic nerve, and prevents the tendon of the pyramidalis from shifting forwards and inwards. The eyeball is always turned by four recti and two oblique muscles. The superior oblique does not pass over a pulley. The Chelonia and most Lacertilia have a more or less com- pletely developed retractor or

choanoid muscle. A ring formed of bony plates is developed in the fore-part of the sclerotic in Lacertilia, Chelonia, Ichthyosauria, Dicyno- dontia, Pterosauria, and Aves ; but not in Ophidia, Plesio- sauria, or Crocodilia. The iris and tensor choroidet contain striated muscular fibres. A pecten is very generally de- veloped. It attains a large size, and becomes much plaited in Aves, Even in Birds, the sclerotic is cartilaginous.

In the organs of hearing, also, the Bird is best studied as a culmination of the Sawropsida.

Only Crocodilia and Aves possess a rudiment of an ex- ternal ear. The Ophidia and the Amphisbenoidea have no tympanic cavity. In some Chelonia, in Sphenodon, and in the Chameleons, the tympanic membrane is covered by integument, but a tympanic cavity exists. In Lacertila the tympanic cavities communicate by wide openings with the pharynx ; but in Chelonia, Crocodilia, and Aves, the communicating passages, reduced in size, become eustachian tubes. In the Chelonia these curve backwards, downwards, and inwards, round the quadrate bones, and open separ- ately on the roof of the mouth. In the Crocodilia there are three eustachian tubes —one median, and two lateral. In Aves therc is but one eustachian aperture, answering to the median of the Crocodilia ; and, as in the latter group, each eustachian tube usually traverses the osseous base of the skull to join its fellow in the common aperture.

The stapes is a columelliform bone, the outer end of which is attached to the tympanic membrane when the latter is developed, but lies among the muscles when there is no tympanic cavity (Snakes and Amphisbenc). All Sauropsida possess a fenestra rotunda, as well as a fenestra ovalis; and all have a cochlea, which is never coiled spirally, and is more rudimentary in the Chelonca than in other groups. Three semicircular canals, an anterior and a posterior vertical and an external horizontal, are con- nected with the membranous vestibule. In Aves, the anterior vertical canal is very large in proportion to the others, and the adjacent crura of the two vertical canals overlap before they unite with one another.

ALIMENTARY ORGANS,

Well-developed sub-lingual, sub-maxillary, and parotid glands appear in Birds, and the sub-lingual glands attain an immense size in the Woodpeckers (Macg., Brit. Bards, vol. iii. plate 15). The tongue varies greatly, being some- times obsolete (as in the Crocodile). It is small in the Totipalmate and in Baleniceps. It is generally sagitti- form and papillate at the base; but it is thick, and even emarginate in the Rapaces (Macg., Brit. Bards, vol. iu. plates 19, 20). Inthe Picide (op. cit., plate 15), where the hyoid bones are extremely elongated and the tongue pre- hensible to a marvellous degree, the true lingual part is a sinall arrow-head, covered with a prickly, horny sheath , these prickles are reverted, like a Snake's teeth.

The alimentary canal of Birds may have several dilata-

3 See Macgillivray, Brot. Birds, vol. iii. plate 18, figs. 2 and 3, p. 156 ; Owen, article " Aves," in Cyclop. Anat. and Phys., p. 308, fig. 141. For development, see Foster and Balfour's work, p. 111; Huxley on ' Incus and Stapes," p. 898 ; and Parker, yar. loc,

tions above the intestine; the latter is divisible into small and large, and the last always terminates in a cloaca. It is invested by a peritoneal coat, which follows the curva- tures of the intestine. In most Birds, as in the Croco- diles, the pyloric and cardiac apertures are approximated. In many Crocodilia and Aves (e.g., Ardeide) there is a pyloric dilatation before the commencement of the duo denum. In the Alectoromorphe, in Eagles and Hawks amongst the Aetomorphe, and in Pigeons, the cesophagus is enlarged into a "crop." In the latter it is bilobate and symmetrical (Macg., op. cit., vol. i. plate 7).

In the Crocodilia and in Aves the walls of the stomach are vcry muscular, and the muscular fibres of each side radiate from a central tendon or aponeurosis. The thick- euing of the muscular tissue of the stomach attains its maximum in the Graminivorous Birds; and it is accom- panied by the development of the epithelium into a dense and hard coat, adapted for crushing the food of these ani- mals. Birds commonly aid the triturating power of this gastric mill by swallowing stones; but the habit is not

confined to them, Crocodiles having been observed to do the same thing.' Birds are further remarkable for the development of a broad zone of glands in the lower part of the cesophagus, which is usually dilated, and forms a proventriculus, connected by a narrow neck with the gizzard (gigerrum). In Sula alba and Phalacrocorax carbo, the writer, long ago, saw this zone to be imperfect. In these birds the gullet is very capacious from the pharynx down- wards, but the proventriculus is still more so,—it is a large " paunch."

Some Ophidia have a cecum at the junction of the small intestine with the large; and two such ceca, which some- times attain a large size, are generally developed in Aves. In this class, also, the small intestine not unfrequently presents a czcal appendage, the remains of the vitelline duct. The writer's drawings show this in Gallinula chlo- ropus, Ardea cinerea, and Colymbus septentrionalis. The duodenum of Birds constantly makes a loop, within which the pancreas lies, as in the Mammalia.

The liver in the Sauropsida almost always possesses a gall bladder, which is usually attached to the under surface of the right lobe, but in Ophidia is removed to some dis- tance from it.

A peculiar glandular sac, the bursa Fabricii, opens into the anterior and dorsal region of the cloaca in Birds."

THe HEART.

In Birds, the venous and arterial blood currents com- municate only in the pulmonary and systemic capillaries. The auricular and ventricular septa are complete (see Owen, "Aves," p 330), as in the Crocodilia; but the right ven- tricle only gives off the pulmonary artery, the left aortic arch has disappeared, and the right arch (the 4th of that side in the embryo) becomes the most important of all the arches. 'I'he septum of the cavum pulmonale becomes a great muscular fold, and takes on the function of an auri- culo-ventricular valve. At the origin of the pulmonary artery, and at that of the aortic arch, tlree semilunar valves are developed

1 See Sir S. Baker's Zsmailia, vol. i. p- 295 'The stomach con- tained about five pounds' weight of pebbles (in a Crocodile 12 feet 3 inches long in its

entire length), as though it had fed upon flesh resting upon a gravel bank, and had swallowed the pebbles that adhered." This intrepid traveller seems to be unaware that the Crocodile has a strong gizzard.

- *Besides copious unpublished materials on this subject from his own dissections, the writer is largely indebted to Macgillivray's most valuable work, so full of illustrations of the digestive organs of Birds ; also to Prof. Owen's article " Aves" (op. cit.) ; te Prof. Huxley he owes form and order. For the development of these parts the reader*

is still directed to Foster and Balfour's work, as also of the parts yet to be described.

BIRDS

[ANATOMY.

In Aves there is no renal portal system, and the anterior abdominal vein opens into the inferior vena cava, close to the heart. Nevertheless, a median trunk, which is given off from the caudal vein, carries a considerable proportion of its blood directly into the hepatic portal system. The pericardium of the Bird is thin, but of a firm texture, and

adheres by its extcrnal surface to the surrounding air-cells. (Owen, " Aves," p. 330.)

RESPIRATORY AND VoCAL ORGANS.3

"In Birds there are distinct thyroid, cricoid, and arytenoid car- tilages, which may be more or less completely ossificd. Sometimes an cpiglottis is added.4 The voice of Birds, however, is not formed in the larynx, but in the syrinx or lower larynx, which may be de- veloped in three positions :—1. At the bottom of the trachea, from the trachea alone; 2. At the junction of the trachea and bronchi, and out of both ; 3. Inthe bronchialone. The syrinx may be altogether absent, as in the Ratitw and the Cathartide or American Vultures. The commonest form of syrinx is the second mentioned above, or the bronchi-tracheal syrinx. It is to be met with in all our common Song Birds, but is also completely developed in many Birds, such as the Crows,

which have no song. In its commonest condition this form of syrinx presents the following characters: The hindermost rings of the trachea coalesce, and form a peculiarly formed chamber, the tympanwm. Immediately beyond this the bronchi diverge, and from their posterior wall, where one bronchus passes into the other, a vertical fold of the lining membrane rises in the middle line towards the tympanum, and forms a vertical scptwm between the anterior apertures of the two bronchi. The anterior edge of this septum is a free and thin membrana semilunaris, but in its interior a cartilaginous or osseous frame is developed, and becomes united with the tympanum. The base of the frame is broad, and sends out two cornua, one along the ventral, and the other along the dorsal edge of the inner wall of the bronchus of its side, which in this part of its extent is membranous and elastic, and receives the name of the membrana tympaniformis interna.

"The bronchial 'rings' opposite this are necessarily incomplete internally, and have the form of arches embracing the outer moiety of the bronchus. The second and third of these bronchial arcs are freely movable, and elastic tissue accumulated upon their inner surfaces gives rise to a fold of the mucous membrane, which forms the outer boundary of a cleft, bounded on the inner side by the membrana semilunaris.

'The air forced through these two clefts from the lungs sets these elastic margins vibrating, and thus gives rise to a musical note, the character of which is chiefly determined by the tension of the elastic margins and the length of the tracheal column of air. The muscles, by the contraction of which these two factors of the voice are modified, are extrinsic and intrinsic. The former are possessed by Birds in general, and are nsually two pairs, passing from the trachea to the furcula and to the sternum (Macg,, vol. ii. plate 12, fig. 8, d.d., ¢.¢.; and vol. iii. plate 15, m.m., n.n.) Some Birds possessing a broncho-tracheal syrinx such as has been described, as the Alcctoromorphe (see Macg., vol. ii. plate 12, fig. 8, 7.), Cheno- morphe, and Dysporomorphe, have no intrinsic muscles. Most others have one pair, attached on one side to the rings of the trachea above, and to the tympanum, or the proximal bronchial arcs below (Macg., vol. ii. plate 12, figs. 1, 2; and vol. iii, plate 19). The majority of the Coracomorphe (Macg., vol. ii. plates 10, 11) have five or six pairs of intrinsic syringeal muscles, which pass from the trachea and its tympanum to the movable bronchial

arcs.5 The Parrots have no septum, and only three pairs of intrinsic muscles.

“The tracheal syrinx only occurs in some Amcrican Coraco- morphe. The hinder end of the trachea is flattened, and six or seven of its rings above the last are interrupted at the sides, and held together by a longitudinal ligamentous band. These rings are excessively delicate, so that the part of the trachea is in great part membranous. The bronchial syrinx occurs only in Steatornis and Crotophaga.

3 We shall here give Professor Huxley’s excellent abstract of what is known upon this subject up to this time ; but the reader is referred to Joh. Miiller’s work, “ Researches on the Comparative Anatomy of the Vocal Organs of Birds,” Berlin Acad., June 1845, and Ann. and Mag. N. H., vol. xvii. p. 499. Macgillivray has many excellent illus- trations and descriptions of these parts ; and the writer followed him step by step many years ago.

- *For a clear description of the exquisite structure of the tracheal rings in Birds, see Macg., vol. ii. p. 34. They are often thoroughly ossified, and are notched above and below, both before and behind ; and alternate ridges allow a marvellous amount of overlapping, the edges being well bevelled ; each ring is an ellipse.*

> Macgillivray (op. cit., vol. ii. pp. 26,28) was afraid to be thought overstating the number of these intrinsic muscles. He understated them, not thoroughly making out their divisional lines.

ANATOMY. |

***In the genus Cinywxis, among the Chclonia, and in some species of Crocodilus (C. acutus, c.g.), the trachca is bent upon itsclf. Similar flexures attain an extraordinary development in many Birds, and may lie outside the thorax under the integument (Tctrao urogallus, some species of Crax and Penelope); in the cavity of the thorax (some Spoonbills); under the body of the sternum, in a large chamber hollowed out of the keel (sonie Swans and Cranes) ; even in a sort of cup formed by the median process of the furcula (Nwmida cristata). In the Emeu some of the rings of the trachea are incomplete in front, and bound the aperture of an air-sac which lies in front*

of the trachea. Some Birds (Aptenodytes, Frocellaria) have the trachea divided by a longitudinal septum, as in Sphargis among the Chelonia. The tracheal tympanum is greatly eularged in Cephalopterus, and in many Ducks, Geese, and Divers ; and in these aquatic birds the enlargement is more marked in the inales, and is usually symmetrical, the left side being generally the larger."

a In Aves the lungs are firmly fixed on each side of the vertebral column, the dorsal surface of cach lung being moulded to the super- jacent vertebre and ribs, The muscular fibres of the diaphragm arise from the ribs outside the margins of the lungs, and form the vertebral column, and end in an aponeurosis upon the ventral surface of the lungs. Fach bronchus enters its lung ncarer the centre than the anterior edge, and, immediately losing its car- tilaginous or bony rings, dilates, and then traverses the lung, gradually narrowing to the posterior edge of that viscus, where it terminates by opening into the posterior air-sac, which gene- rally lies in the abdomen. From the inner side of the bronchus canals are given off, one near its distal end, and others near its entrance into the lung, which pass directly to the ventral surface of the lung, and there open into other air-sacs. Of these there are four. Two, the anterior and the posterior thoracic, lie in the ventral face of the lung in the thorax. The other two are situated in front of its anterior end, and are extra-thoracic. The external and superior is the cervical; the internal and inferior the inter-clavicular (Macg., vol. ii., p. 17, fig. 107). This last unites into one cavity with its fellow of the opposite lung. Thus there are altogether nine air-sacs; two posterior or abdominal, four thoracic, two cervical, and one inter-clavicular. Other large canals given off from the bronchus do not end in air-sacs, but those which pass from the inner side of the bronchus run along the ventral surface, and those on the outer side along the dorsal surface of the lung. Here they give off at right angles a series of secondary canals, and these similarly emit still smaller tertiary canals, and thus the whole substance of the lung becomes inter- penetrated by tubuli, the walls of the finest of which are minutely sacculated. The different systems of tubuli are placed in communication by perforations in their walls. In most birds these air-sacs (except the anterior and posterior thoracic, which never communicate with any cavity but that of the lungs) are in communication with a more or less extensively ramified system of air passages, which may extend through a great many of the

bones, and even give off subcutaneous sacs. Thus the inter- clavicular air-sac generally sends a prolongation into each axilla, which opens into the proximal end of the humerus, and causes the cavity of that bone to be full of air. When the sternum, the ribs, and the bones of the pectoral girdle are pneumatic, they also receive their air from the inter-clavicular air-sacs, The cervical air-sacs may send prolongations along the vertebral canal of each side ; which supply the bodies of the cervical vertebree, and communicate with elongated air-chambers in the spinal canal itself. When the dorsal vertebre are pneumatic they communicate with the system of the cervical air-sacs, The abdominal air-sacs send prolongations above the kidneys to the sacral vertebra and to the femora, whence these bones, when they are pneumatic, receive their air. The pulmonary air-sacs and their prolongations do not communicate with the air cavities of the skull, which receive their air from the tympana and the nasal chambers. In some Birds (Passerinw) the air is conducted from the tympanum to the articular piece of the mandible by a special bony tube, the siphoniwm [the largest of the tympanic chain, and having the general anatomical relations of the ichthyic ‘ interopercular.’]”

RENAL AND REPRODUCTIVE ORGANS.

The kidneys of Birds are composed of a number of lobules of unequal sizes, and these are packed in the concavities of the pelvis, in the same manner as the lungs are packed in the regular intercostal spaces of the upper part of the thorax. The ureters, as in the Reptiles, open directly into the cloaca; but there is no urinary bladder. The bursa Fabrictt opens into the cloaca above its hinder part.

The testes lie on each side the foremost lobes of the kidneys. They are very small in mid-winter, and largest by the middle of April. In the embryo Bird there are two

oviducts. ‘The duct of Miiller on the right side (that on the left side with the corresponding ovary generally dis- appearing) remains in the female as the oviduct. In the

male it is almost entirely obliterated on both sides" (Foster and Balfour, p. 168).

INTEGUMENT AND FEATHERS.!

"The exoskeleton of Birds consists almost entirely of epidermic structures in the form of horny sheaths, scales, plates, or feathers. No Bird possesses dermal ossifications, unless the spurs, which are developed upon the legs and wings of some species, may be regarded as such.

The feathers are of various kinds. Those which exhibit the most complicated structure are called penne, or contour feathers, because they lie on the surface and determine the contour of the body. In every penna the following parts are to be distinguished :—a main stem (scapus) form- ing the axis of the feather, and divided into a proximal hollow cylinder, partly imbedded in a sac of the derm, called the calamus, or quill; and a distal veatllwm, or vane, consisting of a four-sided solid shaft, the rachis, which extends to the extremity of the feather, and bears a num- ber of lateral processes, the barbs. The calamus has an inferior aperture (wmbzdlicus inferior), into which the vascular pulp penetrates, and a superior aperture (umbilicus superior), situated on the under surface of the feather at the junction of the calamus with the scapus. The barbs are narrow plates, tapering to points at their free ends, and attached by their bases on each side of the rachis. The edges of these barbs are directed upwards and down- wards, when the vexelwm of the feather is horizontal. The interstices between the barbs are filled up by the barbules,—pointed processes, which stand in the same relation to the barbs as the barbs do to the rachis. The barbules themselves may be laterally serrated and termi- nated by little hooks, which interlock with the hooks of the opposed barbules. In very many Birds each quill bears two vexilla; the second, called the after-shaft (hypo- rachis), being attached on the underside of the first close to the superior umbilicus. The after-shaft is generally much smaller than the chief vexillum ; but in some Birds, as the Casuariide, the two are of equal size, or nearly so. Muscles pass from the adjacent integuments to the feather sac, and by their contraction erect the feather. The other kinds of feathers differ from the penne, in having the barbs soft and free from one another, when they constitute pennoplume, or plumule (down), accord- ing as the scapus is much or little developed.

When the scapus is very long, and the vexillum very small or rudi- mentary, the feather is termed a jilopluma.

The contour feathers are distributed evenly over the body only in a few Birds, as the Ratite, the Penguins, and some others. Generally, the pennz are arranged in definitely circumscribed patches or bands, between which the integument is either bare or covered only with down. These series of contour feathers are termed pteryle, and their interspaces apterza.

*In some Birds, such as the Herons, plumule of a peculiar kind, the summits of which break off into a fine dust or powder as fast as they are formed, are developed upon certain portions of the integument, which are termed powder-down patches.**

1 This abstract is taken (by the author's permission) from Professor Huxley's Anatomy of Vertebrated Animals, pp. 274, 275. Fora full account of these structures, see Nitzsch's Pterylography, translated from the German by Dr P. L. Sclater, F.R.S., Ray Soc., 1867.

2 See Bartlett, "On the Baleniceps," Proc. Zool. Soc., March 26, 1861, pp. 1-4; axd Murie "On the Dermal and Visceral Structures of the Kagu, Sun-Bittern, and Boat-Bill," Trans. Zool. Soc., 1871, plate 56, pp. 465-492 ; in this valuable paper the powder-down vatches are also shown in Podaraus and Cacatua.

Supposed Triassic Birds,

The integument of Birds is, for the most part, devoid of glands; but many Birds have a peculiar sebaceous gland developed in the integument which covers the coccyx. This uropygial gland secretes an oily fluid, which the Bird spreads over its feathers by the operation of "preening." The excretion passes out by one or two apertures, commonly situated upon an elevation, which may or may not be provided with a special circlet of feathers.

In various Birds (e.g., the Turkey) the integument about the head and neck develops highly vascular and sometinics erectile processes (combs, wattles).

Within the extremely narrow space of an article like the present, the merest abstract of most of our present orni- thotomical knowledge can be given. A mere list of the published works on the subject would fill most of the space allotted to the writer. We will conclude by giving Professor Huxley's masterly comparison of the Bird class and that of the Reptiles below with the Mammalia above them (see Proc. Zool. Soc., April 11, 1867). The writer has modified some assertions from later papers by the same author :—

"That the association of Birds with Reptiles into one primary group of the Vertebrata, the SAUROPSIDA, is not a mere fancy, but that the necessity of such a step is as plain and demonstrable as any position of taxonomy can be, appears to me to be proved by an enumeration of the principal points in which Aves and Reptilia agree with one another and differ from the Mammalia.

***1, They are devoid of hair.*

'2. The centra of their vertebre have no epiphyses.

'¢3, Their skulls have single occipital condyles,

'<4, The prootic bone either remains distinct throughout life, or unites with the epiotic and opisthotic after these on become ankylosed with the supra-occipital and exoccipital.

"5. The malleus is not subservient to the function of hearing, as [one of the] ossicula auditus.

"+6. The mandible is connected with the skull by the intermedia- tion of a quadrate bone [which represents the upper bulbous part, with the 'manubrium' of the malleus of Mammalia].

'67 Kach ramus of the mandible is composed of a number of separate ossifications, which may amount to as many as six in all. (Of these the articulare represents the [antero-inferior part of the] malicus of Mammajia).

‘©8, The apparent ‘ankle-joint’ is situated not between the tibia and the astragalus, as in the Mammalia, but between the proximal and distal divisions of the tarsus.!

“9, The brain is devoid of any corpus callosum,

“10, The heart is usually provided with two aortic arches ; if only one remains, it is the right.

“11. The red blood-corpuscles are oval and nucleated.

‘©12. The cavities of the thorax and abdomen are never separated by a complete diaphragm.

**©13, The allantois, which is highly vascular, is very large, and envelops the embryo ; but no villi for placental connection with the parent are developed upon it.*

“14, There are no mammary glands.” (W. K. P.)

FOSSIL BIRDS.

Footprints, or casts of footprints, at the time of their discovery and long afterwards supposed to be those of Birds, were found about the year 1835 in the Triassic forma- tion of the valley of the Connecticut in New England, and were described by Messrs Deane and Marsh. Subsequently Professor Hitchcock and Mr Warren contributed to the elucidation of these tracks, which were ascribed to various genera of the Class that received the names of Amblonyz, Argozoum, Brontozoum, Grallator, Ornithopus, Platypterna, Tridentipes, and others. No portion of any of the animals to which these traces are due seems to have been met with,?

1 See Gegenbaur, Archiv fur Anatomie (1863), and Untersuchungen zur vergleichenden Anatomie (1864).

2 The only known bones from this deposit were exhibited by Pro- fessor W. B. Rogers at the meeting of the British Association in Bath (Rep. Br. Ass. 1864, Trans. Sect., p. 66).

and the best American paleontologists are now inclined _to attribute them rather to Dinosaurian Reptiles than to Birds. Whatever may be throught of the rest, it appears most likely that the creatures designated as Platypterna and Tridentipes were certainly not ornithic. Brontozowm must have been a colossal animal, its footprint measuring about 162 inches in length and its stride some 8 feet.

An enormous space of time separates these reputed Oolitic Ornithichnites, as they are called, from the first undoubted Birds. fossil Bird. This was discovered in 1861 by Andreas Wagner in the lithographic slate of Solenhofen in Bavaria, belonging to the Oolitic series, and is commonly known by the name of Archcopteryx,? though that of Gryphosaurus

Fic. 88.—Slab containing remains of Archeopteryx, from the original in the © British Museum, Reduced.

was given by its original describer to the at present unique specimen now in the British Museum. Unfortunately deficient in some very important parts—such as the head and nearly all the sternal apparatus—it has others in ex- cellent preservation. It was about the size of a Rook (Corvus frugilegus), and along with the greater portion of the skeleton, impressions of many of its feathers, parti- cularly the quills, are plainly visible. Its most obvious peculiarity is the presence of a long Lizard-like tail, com- posed of twenty vertebrae ; but from each of these springs a pair of well-developed rectrices. A scarcely less remark- able feature is that afforded by the extremity of the wings, whereit would appear that there was a free digit answering to the pollex. The many Reptilian characters of this wonder- ful creature cannot be noticed in this treatise, though their value must be fully admitted; but since the appearance of Professor Owen's description of the specimen (Phil. Trans. 1863, p. 33), nobody has hesitated to receive it as @ true Bird, though one which exhibits an extraordinary dis- similarity from all other known members of the Class. To make any suggestion as to the more immediate affinities and habits of Archwopteryx were vain. It at present

3 Herr Hermann von Meyer had previously described a fossil feather from the same formation, to the owner of which he gave this name. Its specific, generic, not to say ordinal, identity with the creature whose remains were

subsequently found is of course problematical, but the received laws of nomenclature fully justify the common usage.

Cretaceous Birds.

FOSSIL FORMS, |

Fie. 39.—Portion of the slab containing remains of Archwopteryz, showing the extremity of the tail, with a pair of feathers springing from each vertebra. Natural Size,

the bearer's economy of its singular tail, which one would think must have been a clumsy appendage, and this notion is perhaps justified by the certainty that similar tails had gone out of fashion when the next birds known to have existed flourished.

These are from the Cretaceous formation, and as in that freshwater-deposits are few in number, it is not surprising that true ornithic remains are in them exceedingly rare. Many fossils that were formerly thought to have been the remains of Birds have since been determined as belonging to Reptiles (Pterodactyls),—among them the Cimoliornes

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as a Swan, and its remains were discovered in the Middle Marl of New Jersey. The sixth was apparently one of the Lamicole; and the seventh was probably allied to the Rallide.

The Eocene period furnished a still greater number of Eocene ornitholites. First, perhaps, in bulk is that known as Gas¢- Birds.

ornis paristensis, found by M. Gaston Planté, and soon after by M. Hébert, in a conglomerate beneath the Plastic Clay of Bas-Meudon. Much difference of opinion obtains as to the affinities of this Bird, which was at least as large as an Ostrich ; but M. Alphonse Milne-Edwards,! after re-viewing the evidence of others and studying the specimens obtained,

considers it (Dict. Univ. d'Hist. Nat. ed. 2, May 1869) most nearly allied to the Anatide, from which, how- ever, it differs in so many important characters that it cannot be included among them according to any taxo- nomic scheme as yet proposed. One may presume, he adds, that it was incapable of flight, though able to swim. Other birds of huge stature lived at a time not much later. Dr Bowerbank has referred the fragment of a tibia from Sheppey, which was a little smaller than that of an Emeu, toa genus Zithornis. On this Mr Seeley has founded his Megalornis, the Lithornis to which Professor Owen, in 1841, had applied the former name, being regarded as re- sembling a Vulture. This naturalist has also described the fragmentary cranium of a large Bird, combining Dinornithic and Struthious characters, from the same locality, under the name of Dasornis (Tr. Zool. Soc. vii. p. 145), and he has further added from Sheppey (Quart. Journ. Geol. Soc. xxix. p. 511) @ yet more remarkable form to those previously known from Britain, in the Odontopteryx toliapicus—

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Fig. 40.—Remains of head of Odontopteryx, from the original in the British Museum; side view; natural size.

diomedea, from the Chalk of Maidstone, which Dr Bower- | ® creature having its jaws armed with true teeth, and

bank has not hesitated to refer to his Pterodactylus gigan- teus. But in 1858 Barrett discovered, in the Upper Green- sand of Cambridge, remains described by Mr Seeley in 1866 (Ann. and Mag. Nat. Hist. ser. 3, xviii. p. 100) under the name of Pelagornis barretti,—which, we must bear in mind, has nothing to do with the genus Pelagornis established by M. Lartet (Comptes Rendus, 1857, p. 740), —~and these remains, renamed Lnaliornis in 1869 by Mr Seeley (Index to Rep. on Second. Reptiles, &c.), seem to be those of areal Bird, having some resemblance to a Penguin. have been found by Professor Marsh in the United States of America, and they have been referred to at least six genera—Apatornis, Graculavus (4 spp.), Hesperornis, Ichthyornis, Laornis, Paleotringa (3 spp.), and Telmat- ornis (2 spp.) The first and fourth of these were about as large as a Pigeon, or larger, are from the Cretaceous shale of Kansas, and differ from all known Birds in having biconcave vertebree and, possibly, teeth, whence the latter

has been made the type of a distinct Subclass, to which the name of Odontornithes is applied. The second belongs to the Steganopodes; the third seems to have been related to the Colymbide. The affinities of the

Belonging to the same epoch also Bird-fossils .

in this respect resembling Professor Marsh's Ichthyornis,

Fig. 41.—Remains of head of Odontopteryx, seen from above.

concluding that it was a warm-blooded, feathered, and winged biped, web-footed, and a fish-eater. From Sheppey,

1 The writer cannot name this distinguished naturalist without acknowledging the very many tokens of friendship received at his hands in connection with the present subject, while the summary of fossil ornithology here given is in a great measure due to the article cited in the text a few lines further on. Further details are taken from his magnificent Recherches Anatomiques et Paléontologiques pour servir & Uhistotre des Otseaux Fossiles de la France, Paris, 1867-71, The writer has also to express his thanks to Mr Seeley for valuable assistance in this portion of the article.

ii, = =

~Paris Basin.

' called by Mr Seeley (Ann. and

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too, were long ago detected portions of a Kingfisher (Halcyon), and a bird allied to the Gulls or Terns (Laride), while a continuation of the same formation at Highgate has supplied a sternum which has been referred to the Herons (Ardeide). The freshwater beds at Hempstead, in the Isle of Wight, have furnished remains

Mag. Nat. Hist. ser. 3, xviii. p. 109) Ptenornis—a form of doubt- ful affinity; and that palzonto- logist has described from those Pe age Messe 9 of Hordwell a tibia, apparently j f Struthious, under the name of Macrornis. In

the schist of Plattenberg at Glarus a nearly complete skeleton, perhaps belonging to the Passeres, was discovered, and called by Von Meyer Protornis (since renamed by Pro- fessor Gervais Osteornis), and other undetermined frag- ments of birds' bones, with impressions of their feathers, have been found in several beds of about the same age in France.

The fossils of the Paris Basin and its coeval deposits deserve, however, fuller notice. First brought to light at Montmartre towards the end of the last century, many of the remains fell under the notice of Cuvier, and were by him determined in a manner more or less exact. Following his investigations, the labours of MM. Gervais, Blanchard, and Desnoyers considerably added to our knowledge of these ornitholites, till finally M. Alphonse Milne-Edwards, having carefully gone over all the specimens discovered, refers them to the genera Agnopterus, Cormoranus (1.¢., Phalacrocorax), Coturnia (2 spp.), Falco, Gypsorns, Lepto- somus (a form now only known from Madagascar), Limosa, Paleocircus,Paleortyx,Pelidna, Rallus, Sitta, and Tringa(?). Of these are extinct the first, which seems to have been in some measure allied to the Flamingoes (Phenicopteride) ; the fifth, a Ralline form ; and the eighth and ninth, belong- ing to the diurnal Birds-of-prey and the G'alline respec- tively. The footprints of at least seven more species of birds have also been recognised in the same beds, so famed for the remains of Anoplotherium, Palcotherium, and their contemporaries, which were resuscitated by the great Cuvier. The marl-beds of Aix in Provence, belonging to this epoch, have yielded fossil eggs and feathers, but as yet no bones of Birds; and to the same period must probably also be assigned the lacustrine calcareous deposits of Armissan, in Languedoc, whence M. Gervais has recovered the remains of a Tetrao. Near Apt, also in Provence, some traces of birds seem to have been found, but their bad condition has hin- dered their determination. In the marls of Ronzon, in Auvergne, several ornitholites have been found by M. Aymard, who refers them to the genera Camascelus, Dolv- chopterus, Elornis (3 spp.), and Teracus. Of these the first was declared to be allied to the Plovers (Charadriide), the second to the Gulls, the third to the Flamingoes, and the fourth to be a Falconine; but M. A. Milne-Edwards considers the first and second to be probably identical. From the same beds M. Gervais has eggs and imprints of feathers, as well as a pelvis, referred by him to Mergus, but regarded by M. A. Milne-

Edwards as a Sula; while Dr Fraas has found remains of a Harrier and a Cormorant on the top of the Swabian Alp. Finally, in North America Professor Marsh has described the remains of no less than five species of birds, varying in size from a Flamingo to a sinall Woodcock, but all referred by him to a genus Alet- ornis, from the Eocene deposits of Wyoming (Am. Journ. Se. ser. 3, iv. p. 256).

The Miocene formation has yielded by far the greatest

number of ornitholites, especially in France, and for want Mioceve of space they can be barely named here. From lacustrine Birds. deposits in Bourbonnais and Auvergne, the remains of nearly fifty species of birds have been distinguished. Be- sides Palwortyx, already mentioned (3 spp.), Palelodus (5 spp.), Pelargopsis, Ibidopodia, Hlornis, Hydrorns, and Colymboides are extinct genera to which these fossils are referred. Palwlodus is perhaps the most remarkable of them—a generalized form, unquestionably allied to the F'la- mingoes, but presenting some characters of the Limicole, and at least one feature now only found in Podiceps and Colymbus. Pelargopsis and Ibidopodia were Stork-like, while Hlornis seeras to have been Scolopacine ; Hydrornis must be placed near the Gulls, and Colymboides among the Divers. The rest can be referred to the existing genera— Aquila, Milvus, Bubo, Psittacus (a very noteworthy fact, since no Parrots are now to be found in the Palzarctic Region) Picus, Motacilla, Passer, Columba, Rallus, Pheni- copterus, Grus, Ibis, Totanus, Tinga, Larus, Phalacro- corax, Sula, Pelecanus, and Anas. A very considerable number of forms identical with these have been recovered from the neighbourhood of Mentz, while many ornitholites, whether fossil bones, foot-prints, or impressions of feathers, are supplied by freshwater formations near Berne, and in Provence and Languedoc, belonging to this epoch. The bone-beds of Sanson, in Gascony, are also very productive. Here we have as extinct forms Homolopus, allied to the Picidwe, Necrornis, which seems to belong to the JMuso-

phagide—a family now limited to Africa—and Palwoper-

dix (3 spp.), a Gallinacean ; while among existing genera we have represented Aguila, Haliaetus, Strix, Corvus, Phasianus (2 spp.)—a genus generally supposed to have been introduced into Europe in historic times—Rallus, Numenius, Ardea, and Anas. Passing thence to Greece, the remains of birds have been found at Pikermi in Attica —a Phasianus, a Gallus—somewhat larger: than G. son- nerati (the presumed ancestor of our Barndoor-fowl), and a large Grus. In the Tertiary deposits of the lower ranges of the Himalaya, the interesting discovery of an apparently true Struthio (Ostrich) has been made, with an Argala, and possibly a large species of Phaeton. From Steinheim, also, but perhaps of a somewhat later period, the remains of eight species of birds (belonging to the genera Lbs, Ardea, Palelodus, Anas, and Pelecanus) have been determined by Dr Fraas,! three of which seem to be specifically iden- tical with those first discovered in France. In the Miocene of North America, Professor Marsh has detected bones of Meleagris, Sula, Pufinus, and Uria, all existing genera, but the first is especially suggestive, since it is now one of the most characteristic forms of the New World. From the Lower Tertiary of the same continent he has also described a Bubo and an extinct genus Uintornis, probably related to the Picidew (Am. Journ. Sc. ser. 3, iv. p. 259).

The Pliocene epoch is far less rich than the preceding Pliocene in ornitholites, and what have been found are less well Birds. determined. In France, the existence of a Bird-of-prey and several Water-birds has been indicated, but a species of Gallus from Auvergne seems to be the only form estab- lished, At C&hningen, in Baden, remains have been found, and referred to Scolopaa and Anas (probably also to Anser), while from Radoboj, in Croatia, the almost entire foot of a bird has been assigned to Pringilla by Hermann von Meyer, who has further detected in Ger- many a fossil humerus, on which he founds a genus Ardeacites, allied to the Herons. From the Pliocene of North America Professor Marsh has described remains of an Aquila, a Grus, and a Phalacrocorax.

The Postpliocene of the same continent has rewarded

1 Die Fauna von Steinheim, Stuttgart, 1871.

Postplio- cene Birds.

Cave Birds,

Kitchen- middens.

Lake- dwellings.

English Fens,

FOSSIL FORMS. |

the same paleontologist with two more species of If eleagris, another Grus,andan Uria. In Enrope, beds of that epoch have not furnished very many ornitholites, while such as are known have been insufficiently studied. A G'allus, how- ever, seems to have been found at Paris by M. Gervais, and other portions of the same bird have been recognized from the caves of Aquitaine by M. A. Milne-Edwards. Near Quedlinburg, remains referred to Crows, Sparrows, Swallows, a Bustard, and a Gull, have been recognized, as well as an apparent Vulturine from Magdeburg. Hermann von Meyer has indicated from the valley of the Lahn, Crows, Thrushes, Partridges, and Ducks, as well as a Vumida from Salzbach. A small Owl, too, has been found at Kost- ritz. In England, remains of a Swan and a Cormorant have occurred in the diluvial beds of Grays in Essex, and an Owl of middle size in the Norwich Crag, which may, however, be of Pliocene age; while in France the cele- brated gravels of St Acheul have supplied a bone believed by M. A. Milne-Edwards to belong to the Grey Lag-Goose (Anser cinereus), to which species, also, an egg found in brick earth at Fisherton, near Salisbury, has been referred by Mr Blackmoor, who in the same bed found another egg, supposed to have been that of Anas boschas (Hdinb. N. Phil. Journ, N.S. xix. p. 74).

A great number of Birds' bones have been discovered in caves, and among them some bearing marks of human workmanship. In France we have first a large and extinct species of Crane (Grus primigenia), but more interesting than that are the very numerous relics of two species, the con- cumitants even now of the Reindeer, which were abundant in that country at the period when this beast flourished there, and have followed it in its northward retreat. These are the Snowy Owl (Nyctea scandiaca), and the Willow Grouse (Lagopus albus). But here it seems unnecessary further to

particularize the genera, much less the species, hitherto discovered in the caves of Europe generally, though doubt- less they deserve far greater attention than they have yet received. One exception, however, must be made in the case of Cygnus falconeri, a gigantic Swan from the Zebug cavern in Malta (Z'rans, Zool. Soc. vi. plate 30). The caves of South America yielded to the laborious explora- tions of Lund no less than thirty-four species of Birds, of which the greater part are identical with those now existing in the same country ; but some have become extinct, and of these the most notable are a large Craz and a large Rhea.

SUBFOSSIL BIRDS,

The next ancient Birds' bones known to us in the northern hemisphere are probably those of the Danish kitchen-middens, These reveal the existence (very likely, the abundance) of two species, long since banished from the spots where their remains are found—the Capercally (Tetrao urogallus), and the Great Auk or Gare-fowl (Alca empennis). Just as the Lagopus albus in the south of France indicates a subarctic or subalpine country with its normal fauna and flora, so does the former of these shew the coexistence with it of pine-forests in Denmark, though on other evidence it is plain that such forests cannot have existed there for many centuries. The latter, of which more must be said hereafter, does not perhaps prove more than that the surrounding seas, though cold, were free from ice in summer time.

The Birds' bones hitherto recovered from the ruins of the lake-dwellings in Switzerland are all of species which now occur more or less commonly in the same neighbourhoods, and are therefore of comparatively little interest.

On the other hand, the Fens of East Anglia have yielded proofs of a form now extinct not only in England, but even in Northern Europe.

humeri, one from Norfolk and the other most likely from the Isle of Ely, are preserved in the museums of the Uni- versity of Cambridge. Whether the species be identical with either of those which now inhabit some parts of

Southern Europe is undetermined ; but it was undoubtedly a true Pelecanus, and apparently only differed from P. onocrotalus in its somewhat larger size.

At an uncertain but (geologically speaking) recent epoch Mada- in Madagascar, there flourished huge birds of Struthious gascar.

affinities. The first positive evidence of their former existence was made known in 1851 by M. Is. Geoffroy St.- Hilaire, who gave the name of pyornis maximus to the species which had laid an enormous egg, sent to Paris a short time before; and the discovery of some bones of corresponding magnitude soon after proved to all but the prejudiced the kinship of the producer of this wonderful specimen, which not unnaturally recalls the mythical Roc that figures so largely in Arabian tales. Three, if not four, well-marked species of this genus have now been character- ized from remains found in the drifted sands of the southern part of that island.

Next we must turn to our antipodes.

of from native report by Mr W. Colenso in 1838, and next year Mr R. Taylor obtained "part of a fossil toe" (Ann. Nat. Hist. xiv. p. 82). In the same year, however, and before news of this discovery was published, Mr Rule placed in Professor Owen's hands the fragment of a bird's femur, which the latter exhibited and described at a meet- ing of the Zoological Society, 12th November 1839. Other examples soon came to England, and at a meeting of the same society, 24th January 1843, that learned anatomist applied the name of Dinornis novee-zealandie to the newly-found monster (Proc. Zool. Soc. 1843, p. 8). A few months later he was able to pronounce that he had distinguished the remains of five species of the genus (tom. cit. p. 144); and the memoir subsequently published in the Society's Transactions proved to be the first of a series unrivalled in its kind and fortunately still in progress. Bones innumerable have since been obtained, together with portions of the skin, showing the scales of the tarsus and the feathers of the body, to some of which adhered the tendons and bits of dried muscle, stones from the crop, and eggs, a few of the last containing remains of the embryo. At least eleven good species seem to have been discovered ; and these, according to one of the latest authorities, Dr Haast (Addr. Phil. Inst. Canterb. 5th March 1874, p. 6), may be grouped in two families—Dinornithide proper, having the

back-toe obsolete, and comprising the restricted genus Dimornis (spp. 5) and Mionornis (spp. 2); and Palapterygide, possessing a hallux, and including the genera Palapteryx (spp. 2) and Luryapterysx (spp. 2). It used to be taken as proved that all these birds flourished within quite recent times, and sanguine naturalists have even hoped that explorations would shew that all of them were not extinct ; but, though there is abundant evidence to prove that they were the contemporaries of man in New Zealand, Dr Haast most strongly urges that the race of man who hunted and fed upon the " Moa"—for such name was applied to its bones by the natives—lived long before the Maori settlement of the islands. Here thereis no room for his arguments (Trans. NV. Zeal. Inst.), and prudence will perhaps suggest a suspension of judgment on this point. In the same formation as those which hold the relics of these wonderful birds have been found, but far more seldom, remains of others not less interesting. First there is Harpagornis, a Bird-of-prey, of stature sufficient to have made the largest Dinornis its quarry. Then we have Cnemiornis, a gigantic Goose—possibly related to the genus

This is the Pelican, of which two | Cereopsis, with Aptornis and Notornis—two Ralline forms,

In New Zealand New birds' bones of gigantic size seem to have been first heard Zealand,

Dodo.

Solitaire of

Réunion.

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the first allied to Ocydromus, and the last, which has sur- vived to our own day, though most likely extirpated within the last fifteen years, much resembling Porphyrio In company with these fossil or sub-fossil remains are often associated bones of other forms, which now seem doomed to destruction but still exist. Finally must be mentioned Dromeornis australis,*

an extinct Struthious bird, which formerly inhabited Australia, and was allied to Dromeus, the well-known Emeu.

BIRDS RECENTLY EXTIRPATED.

From the consideration of Fossil Birds we are natu- rally led to treat of those which have been extirpated in moderu times, and are made known to us by evidence of various kinds, and more or less old. 'The most re- markable of these is the Dodo (Didus ineptus), which, on the discovery of Mauritius by the Portuguese under Mascaregnas in the beginning of the 16th century, was found to inhabit that island. Voyagers have vied with cach other in describing or depicting its uncouth appear- ance, and its name has almost passed into a byword ex- pressive of all that is effete. Clumsy, flightless, and defenceless, it soon succumbed, not so much to the human invaders of its realm as to the domestic beasts which accompanied them, and there gaining their liberty, un- checked by much of the wholesome discipline of nature, ran riot, to the utter destruction (as will be seen) of no in- considerable portion of the Mauritian fauna. The latest known testimony of the Dodo's existence is furnished by the copy of a journal (now in the British Museum) kept by one Benjamin Harry, mate of the ship " Berkley Castle," which shews that it survived until July 1681. It had its life most likely sometime longer, but of this there is no evidence forthcoming. For a century and a half all that was known of it was derived from the quaint and some: times qnestionable accounts of early voyagers ; certain pictures, mostly by Dutch artists—for the bird was not unfrequently sent alive to Europe, and the traffic of the East Indies was then chiefly in the hands of the Nether- landers—which pictures, however grotesque, were doubtless for the most part faithful portraits; and a few scattered relics—a foot in the British Museum, a head and foot at Oxford, a perfect skull at Copenhagen, and a fragmentary one at Prague. Still these (or indeed the Danish speci- men alone) were enough to enable Professor Reinhardt to determine the affinity of the lost bird to the Pigeons, an alliance not before surmised, but one which scarcely anybody now disputes. In 1866, however, Mr George Clark of Mauritius discovered in the peat of a pool (the Mare aux Songes) in that island an abundance of Dodos' bones (Zbis, 1866, p. 141) ; and these, when trans- mitted to Europe, informed naturalists as to nearly every

part of its osseous structure, which was soon after de- scribed in detail by Professor Owen (Zrans. Zool. Soc. vi. p. 49).

But the Dodo is not the only member of its family that has vanished. 'The little island which has succes- sively borne the name of Mascaregnas, England's Forest, Bourbon, and Réunion, and lies to the southward of Mauritius, had also an allied Bird, now dead and gone. Of this not a relic has been handled by any naturalist. The latest description of it, by Du Bois in 1674, is

1 A second species now referred to Votornis is the Gallinula alba of Latham, which lived on Lord Howe's (and probably Norfolk) Island. No specimen is known to have been brought to Europe for more than eighty years, and only one is believed to exist—namely, in the museum at Vienna (Ibis, 1878, p. 44, plate 10). Recent enquiries, made at the present writer's request, have failed to furnish any result. The a doubtless extinct. (Cf. Rowley, Ornithological M iscellany, pp. 38-48.)

meagre in the extreme, and though two figures—one by Bontekoe (circa 1646), and another by Pierre Witthoos (ob. 1693) have been thought to represent it (Trans. Zool. Soc. vi. p. 373, plate 62), their identification is but conjectural. Yet the existence of such a bird is indubitable.

Far to the eastward of these two sister islands lies a Solitaire of

yt My syy Mee ry

¥ic. 43.—The Solitaire of cal (Pezopheys solitarius), From Leguat's gure.

third—Rodriguez. Here there formerly lived another Didine bird, sufficiently distinct from the Dodo of Mauri-

Fra. 44.—Extinet Crested Parrot of Mauritius (Lophopsittacus mauritianus). From a tracing by M. A. Milne-Edwards of the original

drawing in a MS. Journal kept during Wolphart Harmanszoon's voyage to Mauritius (a.p. 1601- 1602), penes H. Schlegel (Proc. Zool. Soc. 1875, p. 350). Reduced.

tius to form a genus of its own—Pezophaps solitarius, the

Rodriguez,

EXTIRPATED FORMS. |

Solitaire of Leguat, a Huguenot exile who, passing some time in 1691-93 on that island, has left, with a very in- ferior figure, a charmingly naive account of its appearance and habits, the general truth of which has been amply substantiated by Mr Edward Newton's discovery in large numbers of its bones (Phil. Trans. 1869, p. 327); and a nearly complete skeleton of either sex may be seen in the museum of the University of Cambridge, by the side of the most perfect specimen existing of that of its bulkier relative, the Mauritian Dodo.

BIRDS

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a somewhat abnormal Starling (Fregilupus) existed until some forty years ago (Proc. Zool. Soc. 1874, p. 474), and its skin and skeleton are among the treasures of three or four museums. Perhaps, also, there were other Ralline birds, but the evidence on this lead is inconclusive. In Rodriguez, the greater part of its original avifauna has vanished. There was a small but peculiar Owl (Athene murivora), a big Parrot (Necropsittacus rodericanus), a Dove (Erythroena ? sp. ign.), a large brevipennate Heron (Ardea megacephala), and a singular Rail (Aiserythrus leguatt)—

Other lost Nor does this group of Didine birds contain all the lost | in some respects allied to the Mauritian Aphanapteryx— — forms of the Mascarene islands. From Mauritius have | besides other birds of which we know from old voyagers, irdas.*

though their remains have not yet been determined (as those of the species above mentioned have been) from the numerous caverns of the island. A second Parrot, or rather Parrakeet (Paleornis exsul), still exists, but in very small numbers, and the unique specimen known was obtained in the year 1871.

With the examples of these Causes of Mascarene Islands before us, it ¢xtirpa- is not without reason that we “°™

= OLE rt se TS ee im SS

B, Left Tibia of Aphanapleryz, hind and inside. views, From the original at Cambridge.

Fia. 45.—These figures reproduced from The Ibis, 1869, by permission of the Editor. Natural size.

disappeared at least two species of Parrot, a Dove, a large Coot, and a second Ralline bird, abnormal, flightless, and long-billed—Aphanapterye. A painting of this last was found by Von Frauenfeld in the emperor's library at Vienna, and some of its bones, rescued by Mr Edward Newton from the peat of the Mare aux Songes, have been fully described by M. A. Milne-Edwards. Remains of the Coot and one of the extinct Parrots were found also in the same spot, while skins of the other Parrot and of the Dove still exist in a few museums. Réunion, also, once had other birds new lost, and so had Rodriguez. In the former,

C, Right Tarso-metatarsus of Aphanapieryz, front and inside views. From the original at Cambridge.

suppose a like fate to have be- fallen many of the feathered inhabitants of other places ex- posed to similar ravages. We cannot read the accounts not merely of the earliest voyages to the Antilles, but even of those performed within the last hundred years, without being aware that the writers met with many Birds which are not now known to inhabit them. These lost species, there is some ground for believing, were mainly, if not wholly, peculiar to the locality, and after having made good their existence, maybe, for ages, fell easy and helpless victims to the forces which European civilization

brought into play. Chief among these forces was fire. In all coun- tries and at all times it has been the habit of colonists to burn the woods surrounding their settlements — partly to clear the ground for future crops, and partly (in tropical climates especially) to promote the salubrity of thcir stations. When fire was set to the forest and bush of a small island, the whole of which could be burnt at once, the disastrous effect on its fauna can easily be conceived. Even the animals which happened to escape the conflagration itself would speedily starve, owing to the at least tem- porary destruction of the native flora whence, either directly or indirectly, they derived their wonted sustenance. Thus in certain of the Virgin Islands the " dead" shells of many species of terrestrial Gasteropods are everywhere found in astounding numbers, while not a living individual of several of the species has ever been met with by the conchologists

1 Proc. Zool. Soc. 1875, pp. 89-42.

of our day. The only assignable cause of the extinction of these creatures lies in the fact that these islands ure known to have been laid waste by fire. The shells have

resisted destruction but how many more animals must have

the period just mentioned was long subsequent to that in which the primeval woods of the islands were burnt. What, then, must not have been the changes which the forest-fires produced 1

If this be not enough we may cite the case of the

French islands of Guadeloupe and Martinique, in which, according to M. Guyon (Comptes Rendus, Ixiii. p. 589), there were once found six species of Psittact, all now exterminated ; and it may possibly be that the Maccaws stated by Mr Gosse (B. Jamaica, p- 260) and Mr Marsh (Proc. Acad. N.S.

Phalad. 1863, p. 283) to have formerly frequented certain parts of Jamaica, but not apparently noticed there for some twenty-five or thirty years, have fallen victims to colonization and its consequences.

Mention has already been made of the Gare-fowl Gare-fowl (Alca impennis), whose bones have been found in or Great | @ the kitchen-middens of Denmark, and more lately Auk. in similar deposits in Caithness. This species, nearly allied to our common Razor-bill (A. torda), but flightless and about twice as big, seems to have become extinct since 1844, in which year perished without leaving a trace of their existence? Even | the last two examples known to have lived were taken on at the present time, few parts of the world so overrun by | a rocky islet-—one of a group called Fuglaskér, or Fowl-

Fia. 46,— Distal portion of mandible of Lophopsittacus, lower and upper view. From speci- men in the British Museum. These figures reproduced from Zhe /bis, 1866, by permission of the editor. Natural size.

Tost Birds of Antilles.

people of European descent are from a naturalist's point of view so little known as the West-India Islands.

Fra. 47.—Extinct Starling of Réunion (Fregi'upus varius), udapted from figures by Daubenton, Levaillant, and others. Reduced.

less is known of their state a century ago; and it would be a long and wearisome task to collect from old voyages the meagre, scattered, and often inaccurate information they contain as to the zoology of these islands. One ex- ample may, perhaps, be sufficient. Ledru accompanied an expedition sent out in 1796 by the French Government to the West Indies. In his work he gives a list of the birds he found in the islands of St Thomas and St Croix (Voyage aux. Isles de Teneriffe, é&c., Paris, 1810, ii. p. 29). He enumerates fourteen kinds of birds as having occurred to him then, Of these there is now no trace of eight of the number ; and, if he is to' be believed, it must be supposed that within fifty or sixty years of his having been assured of their existence, they have become extinct.1 And yet

1 One of the survivors (a Parrakeet, Conurus xantholemus) was &

skerries, off the south-west point of Iceland. Ten years

Still | before, one had been caught alive at the entrance of Water-

ford harbour; and in 1821 or 1822 one was taken near St Kilda, to which lonely island, as appears from old authors, the bird had been accustomed to resort in the breeding season. In 1812 a pair were killed at Papa- Westray, which was also a breeding station of the species, and the stuffed skin of one of them is preserved in the British Museum, while that of the Waterford specimen may be seen in the museum of Trinity College, Dublin. In the Feroes the species was formerly common, but it certainly ceased from appearing there about the beginning of the present century. In the Iceland seas there are three localities called after the bird's name, but on only one of them has it been observed for many years, having probably been as long extirpated in the rest as in the Feroes. On the locality where it continued latest, there is ample evi- dence to show that it once was plentiful. There was a large skerry—the Geirfuglaskér proper—on which, in 1813, the crew of a Fxroese vessel made a descent and slaugh- tered a large number of Gare-fowls ; but this, like the rest of the group, was a place very difficult of access, and, in 1821, Faber, the well-known faunist of Iceland, failed to land upon it, though some of his companions reached the Geirfugladrangr, a smaller islet lying further to seaward. In 1830 the large skerry, through a submarine volcanic eruption, disappeared beneath the waves, and immediately after a colony of Gare-fowls was discovered on another rock lying nearer the mainland, and known as Eldey.? In the course of the next fourteen years, not fewer probably than sixty birds were killed on this newly-chosen station, and a nearly corresponding number of eggs were brought off ; but the colony gradually dwindled until, as above said, in 1844 the last two were taken (Jdis, 1861, p. 374).

In Greenland, for the last three hundred years, the Gare- fowl has only been known as an occasional straggler, but it would appear that in 1574 a party of Icelanders found it so plentiful at a spot on the east coast—since identified

few years ago restricted to a single hill-top in St Thomas, and so re- duced in numbers that the present writer was ridiculed by many of the inhabitants for believing that such a bird ever existed in the island. Found, however, it was at last, but it must be regarded as verging upon extinction.

2 Whether on the subsidence of the large skerry another portion of the birds which frequented it colonized the outermost islet is not known, for this spot does not seem to have been visited by any human being since Faber's time, more than fifty years ago.

with Danell's or Graah's Islands—that they loaded one of their boats with their captives. All recent explorations of this inhospitable coast prove the utter vanity of the notion that the Gare-fowl is able there to find an asylum.

But it was in the seas of Newfoundland that this species, known to the settlers and fishermen as the " Penguin,"— a corruption of the words " pin-wing,"—-was most abun- dant, as a reference to Hakluyt's and similar collections of voyages will prove. In 1536, or forty years after the dis- covery of the country, we find an island taking its name from the bird, and others are even now so called. English and French mariners alike resorted to these spots, driving the helpless and hapless birds on sails or planks into a boat, "as many as shall lade her," and salting them for provision. 'The French crews, indeed, trusted so much to this supply of victual, as to take, it is said, but "small store of flesh with them." 'This practice, we learn from Cartwright (Journal, &c., iii. p. 55), was carried on even in 1785, and he then foresaw the speedy extirpation of the birds, which at that time had only one island left to breed

past, according to the best-informed American ornitho- logists, not a single example has been met with in any of the markets of the United States, where formerly it was not at all uncommon at the proper season, and the last known to the writer to have lived was killed by Col. Wed- derburn in Halifax harbour in the autumn of 1852.1 This bird, the Anas labradora of the older ornithologists, was nearly allied to the Eiders (Somateria), and

like them used to breed on rocky islets, where it was safe from the depre- dations of foxes and other carnivorous quadrupeds. 'This safety was however unavailing when man began yearly to visit its breeding-haunts, and, not content with plundering its nests, mercilessly to shoot the birds. Most of such islets are, of course, easily ransacked and depopulated. Having no asylum to turn to, for the shores of the main- land were infested by the four-footed enemies just men- tioned, and (unlike some of its congeners) it had not a high northern range, its fate is easily understood. No estimate has yet been made of the number of specimens existing in museums, but it is believed to be not very great.

Another bird which has become extinct within the last Philip

few years is one of a group of Parrots (estor) peculiar to ar arrot.

upon. In 1819, Anspach reported their entire disappear- ance, but it is possible that some few yet lingered. On Funk Island, their last resort, rude enclosures of stones

Labrador Duck.

are, or recently were, still to be seen, in which the " Pin- wings" were impounded before slaughter; and a large quantity of their bones, and even natural mummies, pre- served partly by the antiseptic property of the peat and partly by the icy subsoil, have been discovered. One of the last has furnished the chief materials from which the osteology of the species has been described (Zrans. Zool. Soc. v. p. 317). Some 70 specimens of the bird's skin, about as many eggs, and nearly half-a-dozen more or less perfect skeletons, with detached bones of perhaps an hun- dred individuals, are preserved in collections; but even if there be any truth in the various reports of the appearance of the species since 1844 (some of which seem to rest on fairly good testimony), so that it may still survive, it is obvious that its rediscovery will most likely seal its fate. Far less commonly known, but apparently quite as cer- tain, is the doom of a large Duck which even fifty years

Fic. 48, —Pied Duck (Somateria labradora), male and female, From specimens

in the British Museum. Reduced.

ago was commonly found in summer about the mouth of the St Lawrence and the coast of Labrador, migrating in winter to the shores of Nova Scotia, New Brunswick, New England, and perhaps further southward. For many years

Fig. 49.—Phillip-Island Parrot (Nestor productus). British Museum. Reduced,

From specimen in the

the New-Zealand Subregion, and though some of its con- geners still exist in the less-frequented and alpine parts of that country, this species (VV. productus) seems to have been confined to Phillip Island. 'The last known to have lived, according to information supplied to the writer by Mr Gould, was seen by that gentleman ina cage in London about the year 1851. Not much more than a dozen speci- mens are believed to exist in collections.

BIRDS PARTIALLY EXTERMINATED,

From Birds which have recently become altogether extinct we naturally turn to those that have of late been extirpated in certain countries though still surviving elsewhere. Several such instances are furnished by the British Islands. First there is the Crane (Grus communis) which in Turner's time (1555) was described as breeding in our fens. 'Then the Spoonbill (Platalea leucorodia), said by Sir Thomas Browne

1 It is needless to observe that no one at that time had any notion of its approaching extinction.

(1688) to breed in Suffolk, as it formerly had done in Norfolk. The Capercally (Tetrao urogallus) we know to have frequented the indigenous pine-forests of Ireland and Scotland. In the former it had most likely become extinct soon after 1760, and in the latter not much later. Nota single specimen of the British stock of this bird is knowu to exist in any museum,

but the species has been success- fully introduced from Sweden into Scotland during the last forty years, and is now certainly increasing in num- bers. The Bustard (Otis tarda), which once tenanted the downs and open country of England from Dorset to the East Riding of Yorkshire, vanished from Norfolk, its last stronghold as a British Bird, in 1838. From other counties it had before disappeared. It is well worthy of note that all the four species just mentioned were pro- tected to a certain degree by Acts of Parliament, but these laws ouly gave immunity to their eggs and none to the parent-birds during the breeding season, thus shewing how futile is the former when conipared with the latter, since there are very many species whose nests from time out of mind have been and are yearly pillaged without any dis- astrous consequences arising from the practice.'

It would be impossible here to name the many Birds which, once numerous in the British Islands, have now so much diminished as to be rightly considered scarce, or to recount the various causes to which their diminution is due. The persecution of Birds-of-prey seems to have begun with the keepers of poultry, to whom the Kite (Aftlvus ictinus) and the Hen-Harrier (Circus cyaneus) were a sore trouble," but it has been actively followed up by game-preservers, and this to their own cost, as the ravages of the Grouse-disease testify.3 To the reclaiming of waste lands, the enclosure of open spaces, and the greater care bestowed on timber trecs (by removing those that being decayed are much

BIEDSs

[GEOGRAPHICAL

exotic species which it has been attempting to introduce have, almost without exception, failed to establish themselves. The efforts made in some British colonies—particularly in Australasia—are unfortunately too likely not to be success- ful; and, when their own peculiar fauna has been. half extirpated, our fellow-subjects at the antipodes will pro- bably have good reason to lament the extraordinary senti- ment that has led them to introduce from other countries birds which, in the absence of their natural checks, will be nothing else than a positive nuisance; for so reckless is the manner in which they have been imported, that species possessing few or exceedingly doubtful recommendations to begin with have been carried

over in abundance, and some of these cannot fail to become permanent settlers equally with those for the transportation of which the would-be "acclimatizers" might find themselves excused. All, however, in the battle of life will contribute first to the subdual and by degrees to the disappearance of the original inhabitants, which had hitherto constituted a fauna, from a scientific point of view, perhaps the most interesting on the face of the globe.

GEOGRAPHICAL DISTRIBUTION OF BIRDS.

It is admitted by nearly all naturalists that the study of the extinct organisms of any country leads the investigator of them to a proper appreciation of its existing flora or fauna; while, on the other hand, a due consideration of the plants or animals which may predominate within its bounds cannot fail to throw more or less light on the changes it has in the course of ages undergone. That is to say that the Distribution of forms in Time is a subject so much connected with the Distribution of forms in Space, that the one can hardly be separated from the other.

Granting this as a general truth, it must yet be acknow- Scarcity of ledged as a special fact, which some of the preceding Ornithic paragraphs will perhaps have foreshadowed, that in fossil ios

infested with insects) must, however, be attributed the extermination or rarification of far more species than the direct action of man has been able to effect. Still what

we lose in one direction we gain in auother, and while Birds- of-prey and Wild-fowl are being banished, the smaller denizens of the woodlands, gardens, and arable fields are unquestionably more numerous than ever. The change is, of course, not satisfactory to the naturalist or to the lover ° of wild scenery, but to some extent it seems inevitable ; yet well directed laws for the protection of those birds which suffer worst in the unequal contest may delay their impending fate, and preserve to our posterity the most pleasing features of many a landscape and the 'grateful opportunities of studying many a curious and interesting species. Thanks, perhaps, to the stronger constitution of most Palearctic Birds, the votaries of what is called "'acclimatiza- tion" have obtained little success in these islands, for the

1The singular wisdom of the old command (Deut. xxii. 6)—the most ancient "game-law" (using the term in its widest sense) in existence—has here a curious exemplification.

2'The Bohemian Schaschek, who visited England about 1461, says he had nowhere seen so many Kites as around London Bridge (102. Lit. Ver. Stuttgart, vii. p. 40). And the statement is confirmed by Belon (Obs. ad. fin. Clus. Exot. p. 108), who says that they were scarcely more numerous in Cairo than in London, feeding on the garbage of the streets and even of the Thames. From the same writer (I/ist. Nat. Oyseaux, p. 131) it would seem that at that time (1555) they, and Ravens also, were protected by law in the City! The Hen-Harrier's name is enough to shew what was thought of it in days when it abounded.

3 Jn Transbaikalia, the Bearded Vulture (Gypactus barbatus), which was formerly common, has of late been completely exterminated, through persecution prompted by the desire to obtain its feathers, which are highly valued.— Von Middendorff, Sibir. Reise, iv. p. 851.

"The extermination from Europe of the Francolin (Francolinus vulgaris) has been treated at some Jength by Lord Lilford (Jbis, 1862, p. 352) without his being able to assign any cause for the fact.

> Report from the Select Committee on Wild Birds' Protection, cc. (House of Commons), 1873. Appendix, pp. 188-193.

Ornithology we have as yet but scanty means of arriving at any precise results which will justify bold generalization in the matter of aviarian distribution. Remains of extinct forms of Birds are, compared with those of other classes of Vertebrates, exceedingly scarce, and in accordance, there- fore, with the prevalent practice of naturalists they have been but little investigated. If we except France and New Zealand—and in the latter no fossil ornithic relics can be assigned to any very ancient epochs—little has been done. he discovery in the former of somewhat early remains of Birds, allied to those which we at present only know as denizens of a tropical region, and the recognition of far later remains of species identical with those that now flourish in arctic lands, merely corroborates what is from numerous sources within the knowledge of every geologist—the vicissitudes, namely, of which that part of Europe has had experience. Though in this quarter of the globe we now have no indigenous Struthious Birds, the former existence of Struthious Birds even in England proves very little, because we know that some of such birds (the species of South-American Rhea, for instance) can main- tain themselves in lands which are subject to a climate as fitful, if not as severe, as our own. All that can be justly inferred thence is that Struthious Birds were not formerly confined to their present limits, and possibly that such birds once pervaded the greater part of the earth's surface. The Archwopteryx and Odontopteryx from their singularity prove nothing in respect of Geographical Distribution. Perhaps in the whole range of zoology there is no class from the fossil remains of which we learn less as regards the physical history of our planet than we do from the Birds. We, therefore, have to turn to the other side of the ques- tion of Distribution, and try to find out whether the

evidence, which is from one point of view so evidently deficient, may not be supplied by inquiry into existing avifaune and this, in other words, signifies that a know- ledge of the Geographical Distribution of living Birds becomes a matter of prime necessity to every one who

been elsewhere in great part replaced by more highly developed structures. The lower rank in the scale of its most characteristic animals seems to be indisputable, and, therefore, with the Australian Region it appears most proper to begin.®

would intelligently exercise the calling of an ornithologist. I. Tus AustRatian Recion is most trenchantly divided Avsrna-

Zoological Thus driven to a kind of extremity, the student of Birds, | from the Indian, which, from a geographical and possibly Ltn

Distribu- however, cannot but regard with the most lively satisfac- | from a geological point of view, seems to be conterminous Recon.

tion ae tion the circumstance that to one of his brethren is due the | with it, by the narrow but deep channel which separates

at of merit of having first truly pointed out the great Zoogeo- | the small islands of Bali and Lombok, and will be found Boundaries.

Birds, graphical Regions of the globe—a fact not a little surpris- | to determine the boundary between two entirely distinct ing when we reflect that the outlines of Distribution Jaid | portions of the earth's surface. Midway along this channel down in 1857 by Mr Sclater1 had reference only to the | we may draw aline in our imagination, and continue it in a most vagrant Class of animals in creation ; yet these out- | north-north-easterly direction up the Strait of Macassar, lines have, not merely in the main, but to a very great | dividing the much larger islands of Celebes and Borneo. extent in detail, met with the approval of nearly all those | A considerable interchange of animal forms in the two zoologists who have since studied the subject in its bear- | islands last named is indeed to be observed, and even a ing upon the particular Classes in the knowledge of which | slight intermingling of the productions of the two former they themselves stand pre-eminent. seems now to be going on; but the inosculation is so much

General Without infringing upon what must be deemed the | less in degree than that which obtains between any other

principles. generalities of biological Distribution, it is proper to | two Regions, while the characteristic, not to say peculiar, observe that Mr Sclater's success is to be attributed to the | zoological types which occupy either side of this line are method in which his investigations were carried on—a | so divergent, that it may be fairly considered a harder and method in which he had but few predecessors. Instead of | faster line than any that can elsewhere be found. Between Wallace's looking at the earth's surface from the point of view which | Bali and Lombok, as above stated, it has been shewn by Line. the geographer would take of it (a point of view which | Mr Wallace to be all but perfect, and in his honour this had hitherto been adopted by most writers), mapping out | boundary, as real in the abstract as though it existed the world according to degrees of latitude and longitude, | in the concrete, has been most justly named after the determining its respective portions of land and water | naturalist and traveller who first saw and recognized its entirely regardless of the products of either element, or | importance—' Wallace's Line." As above indicated, this adhering to its political divisions—time-honoured as they | line becomes less definitive as it proceeds further northward ; were,—he endeavoured to solve the question simply as a | and though we know it to pass between the Philippine zoologist should, by taking up the branch of the subject | Islands and Sanguir, and again between the former and with which he was best acquainted, and by pointing out and | the Palau group, its further progress in that direction defining the several Regions of the globe in conformity | cannot as yet be set down with precision, though it pro- with the various aspects of ornithic life which they present. | bably runs to the westward of the Ladrones. But here- But herein there was at once a grave difficulty to be | abouts we lose sight of it, until we arrive at the Sandwich encountered. Birds being of all animals most particularly | Islands, to the northward of which it must pass, since for adapted for exteuded and rapid locomotion, it became | reasons presently to be given at greater length that archi- necessary for him to eliminate from his consideration those | pelago must be confined within the Australian Region, groups, be they large or small, which are of more or less | Southward from Lombok the boundary of the Region rounds universal occurrence,? and to ground his results on what |*

the western coast of Australia, and then strikes off in a was at that time commonly known as the order Jnsessores | south-easterly direction to encompass New Zealand and its or Passeres, comprehending the orders now generally dif- | dependencies. Arrived here it must be drawn so as to ferentiated as Passeres (vere), Picarie, and Psittact. include all of what is commonly known as Polynesia,

The six On this basis then Mr Sclater was enabled to set forth | though the characters of the intermittent chain of islets

ens that the surface of the globe exhibited siz great Regions, | lying parallel to and just to the southward of the Tropic of

each in a marked manner differing from all the rest, though the difference was not always equally important. These Regions he termed respectively the Palearctic, Ethiopian, Indian, Australian, Nearctic, and Neotropical ; and though it is on all accounts better to preserve the names he bestowed on them, it does not seem convenient to follow the order in which he placed them. Thus the Australian Region appears not only to differ more from the others than they do among themselves, but its differences are of a kind which, when its fauna is considered as a whole, suggest a striking peculiarity, namely, that many of the forms of animal life therein found are the direct and not very much modified descendants of types which may very likely at an early period of our planet's history have pre- dominated over every land, but of types which have since

1 Journal of the Proceedings of the Linnean Society, Zoology, ii. pp. 180-145. It is much to be regretted that the author of this most valuable essay has never sanctioned its republication in another and improved form. Many of its details, and some of its principles even, are now known to be incorrect, but for the time at which it ap- peared it was a marvellous production.

- *Not but that even in the most widely-spread groups are contained others—sub-families, genera, or species strictly limited to certain localities. Some of these will be noticed further on.*

Capricorn, and a few scattered reefs to the northward of the equator (between long. 108° and 115° W.), are at present insufficiently determined. After encircling, how- ever, the Low Archipelago and the Marquesas, the boundary trends to the north-west, and includes, as before stated, the Sandwich Islands ; but thence its precise direc- tion cannot now be traced, owing to the obscurity which veils the numerous islets of the North Pacific Ocean, which

3 The writer has to acknowledge with hearty thanks the very singular mark of confidence conferred on him by his eminent friend Mr A. R. Wallace, who has allowed him to peruse in manuscript the greater part of a work on the Geographical Distribution of Animals, the early publication of which can hardly fail to place this most interesting subject in the position it undeniably deserves, but a position to which it has never yet attained through the absence of any treatise of like character. The value of the favour thus bestowed upon him the writer cannot overestimate.

4 This name was first given by Professor Huxley (Proc. Zool. Soc. 1868, p. 313), but as it is hardly a geographical term, it will accord- ingly make no appearance on any save a so-called " physical" map. The value of the discovery above mentioned, of which no one had ever dreamt till it was made by Mr Wallace, seems to justify proper notice from chartographers, and it might be well, therefore, to dignify the channel between Bali and Lombok—named on some maps Lombok Strait—by the appellation of "Wallace's Strait."

lie between that group and the coast of Asia. All that can be said for certain is, that it does not comprise the Aleutian Islands, the empire of Japan, or

the Loochoos.

Though the characteristic Mammals of the Australian Region are in every way highly remarkable, entirely com- prehending as they do one of the three Subclasses (Ornitho- delphia) and nearly all of a second (Didelphaa), by far the largest portion of the area it covers is weak if not absolutely wanting in Mammalian life, and the zoological features which mark the Region as a whole are perhaps better exhibited by its Birds than by any other Class of its fauna. This being the case, it may be excusable in this place to dwell longer upon this Region than upon the rest. True it is that we have no Subclass of birds, like the Ornithodelphia among Mammals, which is restricted to the Region; but, on the other hand, the instance of the Didelphia, to which allusion has just now been made, is here almost exactly paralleled by that of the Struthious Birds—the Ratite, to call them by the name now very gene- rally applied to them by the zoologists who recognize them as forming one of the two primary divisions or Subclasses, we may term them, of the Class Aves. All the existing Ratite (with the exception of the species of two forms, the Ostriches of Africa and South America, belonging to the genera Struthio and Rhea, and comprising at most but five species) are found within the Australian Region and nowhere else. But further, the Ratite of the Region are more widely distributed throughout its area than are the De delphia, since the former extend from Ceram, in lat. 4° 8. and long. 180° E., to New Zealand in lat. 45° S. and long. 175° E., if not a little further, while the Dedelphia stop short at lat. 44° S. and long. 155° E.? But if we take the birds alone, and compare the two Subclasses into which the existing or recent members of the Class are divided, we find the Australian Region remarkable for its ornithic singularity. The smaller of these two Subclasses, the Ratite, contains six very natural groups—which might well be called Orders—including, according to the most exaggerated computation of their number, less than 40 species, while the larger Subclass, the Carinate, though perhaps not including more truly natural groups, comprehends some 10,000 species. Now, out of the six groups of this smaller Subclass, four are absolutely restricted to the Australian Region, and these four groups contain all but, at the highest estimate, as above stated, five of the species known to belong to the Subclass; thus we should be able to regard the 35 species of recent Latte of the Region (a

number which is clearly far too large) as the proportional equivalent of an avifauna of more than 8000 species (8750).

Leaving, however, such a calculation as this, which indeed cannot as yet be more than an approximation to the truth, we must consider first the remaining ornithic features of the Region asa whole, and then those of its parts. With respect to each of those subjects, it will be evident to every one that a further division is at once incumbent upon us. The prevalent zoological features of any Region are of two kinds—negative and positive. It is therefore just as much the business of the zoogeographer, who wishes to arrive at the truth, to ascertain what groups of animals are wanting in any particular locality (altogether independently of its extent) as to determine those which are forthcoming there.

1 Of course, as regards polymorphism, no comparison can be made between the Ratite and the Didelphia, the latter presenting a very great variety and the former a very great sameness of structure and habit, though if it be true, as seems to be most likely the case, that Dinornis and its allies were absolutely devoid of wings, we should in them have a divergence from the normal ornithic type which is alto- gether unique in the whole Class, and for its singularity might well be set off against the multifariousness exhibited by the Didelphia.

BIRDS

[DISTRIBUTION.

Of course, in the former case it would be absurd to regard as a physical feature of any great value the absence from a district of groups which do not occur except in its imme- diate neighbourhood ; but when we find that certain groups,

though abounding in some part of the vicinity, either sud-

denly cease from appearing or appear only in very reduced

numbers, and occasionally in abnormal forms, the fact

obviously has an important bearing. Now, as has been above stated, mere geographical considerations, taken from

the situation and configuration of the islands of the so-

called Indian or Malay Archipelago, would indicate that they extended in an unbroken series from the shores of the Strait of Malacca to the southern coast of New Guinea, which confronts that of North Australia in Torres Strait, or even further to the eastward.

induce the belief that all the countless islands, be they

large or small—and some of them are among the largest on the globe—were but a southern prolongation of the But it has been already stated that so A very

far from this being the case a very definite barrier is definite q boundary

mainland of Asia.

interposed. A strait, some 15 miles or so in width, an separating the two fertile but otherwise insignificant islands of Bali and Lombok, makes such a frontier as can hardly be shewn to exist elsewhere. The former of these two islands belongs to the Indian Region, the latter to the Australian, and between them there is absolutely no true transition— that is, no species are common to both which cannot be easily accounted for by the various accidents and migrations that in the course of time must have tended to mingle the productions of islands so close tooneanother. 'The faunas of the two are as absolutely distinct as those of South America and Africa, and it is only because they are sepa- rated by a narrow strait instead of the broad Atlantic that they have become so slightly connected by the interchange of a few species and genera.

Now, first, of the forms of Birds which are prevalent Indian forms wanting

throughout the Indian Region, but are entirely wanting in the Australian, we have at once the Bulbuls (Zxzd@), very characteristic of most parts of Africa and Asia, with the allied group of Phyllormithide, which is peculiar

to the Indian Region; the widely-spread families of Barbets (Megalemide) and Vultures (Vultwride); and the Phea- sants (Phasianide), which attain so great a development in various parts of the Asiatic continent and islands that there must their home be regarded as fixed, though some species are found very far removed from the focus of the family.? Some naturalists would add the Finches (Fringillide), but the real position of the so-called "Finches" of Australia must at present be considered extremely doubtful, and it may prove that they are the direct descendants of the more generalized group whence sprang both the true Fringillide and the Ploceide, if, indeed, these can justifiably be kept apart. Then, of forms which are but weakly represented, we have the otherwise abundant Thrushes (Zwrdide®), and, above all, the Woodpeckers (Picidw), of which some 4 species, or at most 5, out of more than 300, just cross*

2 The separation of this family from the Tetraonide (Partridges and Grouse), though hitherto almost universally recognized, seems to be a very questionable proceeding, and, so far as the present writer is aware, is one that can only be maintained by structural characters, which though patent in their extreme forms, appear to vanish in those which are intermediate (of. Proc. Zool. Soc. 1868, pp. 300, 801) ; but for the purposes of this treatise it is of little consequence, since the Tetraonide: are but very feebly represented in the Australian Region. »

3 It is almost certain that no satisfactory limits can be laid down between this family and the Warblers (Sylviide), but, as in the case mentioned in the last note, the result would hardly be affected by combining the two families, since the Sylviide@ have comparatively few, members in the Region now under notice. }

4 There are said to be Dendrotypes analis in Lombok, Muelleripicus fulwus and Yungipicus temmincki in Celebes, ¥. moluccensis in the

Indeed, the very name Australasia, often applied to this part of the world, would

here,

Character- istic fami- lies.

Papuan Subregion.

Timorese province,

AUSTRALIAN REGION. |

the boundary and occur in Lombok, Celebes, or the Moluccas, but are absolutely unknown elsewhere in the Region.

Turning to the families which by their presence char- acterize the Australian Region, we find those which are peculiar to it to be perhaps, if not more numerous, yet more remarkable than the peculiar families of any other Region. Nearly 20 such might here be enumerated. One, the Honeysuckers (M€eliphagide), is most characteristic, and, abounding in genera and species, extends to almost every part of the region, yet only a single species oversteps its limits, crossing the sea from Lombok to Bali? Other peculiar families are much more confined, and, since by their means (as will presently appear) the various sub- divisions of the Region may be more clearly marked out, further notice of them may be for the present deferred. But the positive characteristics of the Region as a whole are not its peculiar forms alone; there are at least 4 families which, being feebly represented elsewhere, here attain the maximum of development. Such are the Thickheaded Shrikes (Pachycephalide), the Caterpillareaters (Campephagide), the Flowerpeckers (Dicwide), and the Swallow-Flycatchers (Artamide). Besides these, 3 or per- haps 4 groups, though widely distributed throughout the world, arrive in the Australian Region at their culmination, presenting an abundance of most varied forms. These are theWeaver-birds (Ploceide),and the Moreporks(Podargide), if they can be properly separated from the Mringillide and the Caprimulgide respectively, but especially the King- fishers (Alcedinidw) and the Pigeons (Columbide), the species belonging to the two last obtaining in this Region a degree of prominence and beauty which is elsewhere un- equalled,

Without going into greater detail, the Australian Region may be roughly said to be composed of four Subregions, to which the names of Papua (or New Guinea), Australia proper, New Zealand, and Polynesia may perhaps be at- tached. The boundaries of some of these Subregions are, as may be expected, not well defined; and, indeed, it is obvious that much must be

done in the way of geographi- cal exploration before the investigation of zoologists will mark out their limits with positive accuracy. Especially is this true in respect of the first of these Subregions, which in certain parts shows a complication of characters that for want of space could hardly here be explained, if, in- deed, according to our present information, they can be explained at all.

(1.) Zhe Papuan Subregion, the chief province of which is formed by New Guinea and its dependencies, comprises, besides the large and imperfectly-known island whence its name is derived, three other provinces, which may be named the Timorese, the Celebesian, and the Moluccan. The fauna of the Timor group seems to be made up of contributions from Java, belonging to the Indian region, the Moluccas, and Australia. Of nearly 100 genera and 160 species of Land-birds only, which are here found, an equal proportion appears to be related to the Birds of the Indian Region and to those of Australia proper—some 30 genera being distinctly traceable to each. The Indian in- fluence is made evident by the presence of about 27 genera which have crossed the strait from Bali into Lombok. Of these, 12 are known to stop short at Flores, but the inter-

Moluccas, and ¥. otarius there or perhaps in the Sunda Islands. It 1s quite likely, however, that further investigation will add to the number,

1 This term is here advisedly used in a restricted sense, excluding the genus Zosterops and its allies, which are often included under it by systematists,

- *This is Ptilotis limbata, a species which is common from Timor to Lombok.*

vening island of Sumbawa has not yet been ornithologically explored, and 13 of them reach Timor. In all there may be, disregarding birds of wide distribution, some 30 species of Indian origin, with nearly 20 thereto allied, but, on the other hand, more than 60 which are derived from Australia, thus indicating a greater affinity to the latter country. There is one genus of

Kingfishers (Caridona) known only from Lombok and Flores, but no doubt represented in Sumbawa, and a genus of Pigeons (Lewcotreron) is almost limited to this group.

The Celebesian province is known to be inhabited by Celebesian more than 200 species, belonging to about 150 genera, province.

Of the Land-birds, 9 genera and nearly 70 species are abso- lutely confined to the principal island, but 20 more are found also in the Sula and Sanguir islands, making nearly 90 species peculiar to this Subregion. Of those which are not peculiar, Lord Walden? estimates that about 55 are of Indian and 22 of Australian origin, the remainder being common to both Regions, and thus the Indian influ- ence is very strong in this quarter, pointing to an immi- gration from the north and west. Of the less wide genera of Celebes, more than 20 are common to Borneo and Java, and nearly as many to Timor or the Moluccas—again showing a preponderance of Indian over Australian types ; but, since the Bornean and Javan species consist of only about one-quarter of those which are characteristic of those islands, while the Moluccan and Timorese genera form nearly one-half, the proportion which has been drawn from the rest of the Australian Region is clearly greater than that which has flowed in from the Indian. The most important family of Meliphagide, however, which, as before remarked, is so highly characteristic of the Australian Region, is here represented by a single species only (Myzomela chloroptera), and the fact requires due acknowledgment. On the other hand, some 8 Indian families which are very important in Borneo and Java are altogether absent, and the non-appearance of a still greater number of Moluccan forms is also worthy of note. The conclusion at which Mr Wallace arrives from these and some other circumstances is that Celebes, during the existing epoch, has never been united by extensive land with either side, but has received an influx of immigrants from each. Of the genera found in Celebes itself 9 are peculiar, 3 more occur in one other island only, and 1 (which is likely to be eventually dis- covered in Celebes) is as yet known but in the Sula group. Of these 13 genera peculiar to the Subregion, about one- third are modifications of Australian forms. The Sula Islands show a considerable blending of faunas; out of nearly 40 species of Land-birds, more than one-half are identical with or allied to those of Celebes; but 3 Moluccan genera,

unknown to Celebes, occur here. We have now to consider the Papuan province.

Papuan Subregion, has been until lately almost entirely un- explored, and even at the present day its interior has been but scarcely and cursorily visited by civilized foreigners. Yet out of nearly 350 species of Land-birds, belonging to 125 genera, which are known to us from this country, 300 species are exclusively peculiar to it, and 36 genera are either peculiar or only just extending to North Australia. Of the remaining genera, 38 are peculiar to the province, 45 are characteristically Australian, 9 more especially be- long to the Malay Archipelago generally, being as much Australian as Indian. Only 7 are typically Indian, but with a discontinuous distribution, while 25 have a wide range. The chief features of the province to be noted are the extraordinary development therein of the Cassowaries

% Transactions of the Zoological Society, viii. pp. 23-118,

The Papuan – island of New Guinea, which is the centre of the whole Province.

(Caswartide),' the richness and specialization of the King- fishers (Alcedinide), Parrots (Psittaci), and Pigeons (Co- lumbide), its Birds-of-Paradise (Paradiseide), Honeysuckers (Meliphagide), and some remarkable Flycatchers (Musci- capide). It hasseveral marked deficiencies compared with Australia, among which are the Warblers (Syluizde), Babblers (Timeliide), Finches or Weaver-birds (Mringillide or Plo- ceidce) —according as we are disposed to treat those groups —certain Parrots (Platycercine), and Diurnal Birds-of-Prey (Falconide), and, above all, the Emeus (Dromeide), About 9 genera are especially Malayan, and nearly as many more have apparently the same origin, but, curiously enough, are not found in the intervening Moluccan province. Thus it will be seen that the avifauna of New Guineais pre-eminently that of the Australian Region, and that it has many peculiar developments of Australian types; but that there has also been an infusion of Malayan forms, of which one group is spread pretty uniformly over the whole Archipelago, if not beyond it; while another group presents a rare instance of discontinuous distribution—not appearing

in an interven- ing space of 1000 miles across, though that space is full of islands to all appearance habitable by such forms. The birds of Papua are, as a whole, remarkable for their brilliancy of plumage, one-half of the species occurring there being so distinguished, and no less than 12 genera are decorated by the metallic colouring of their feathers. The Birds-of-Paradise, the Racquet-tailed Kingfishers, the largest and smallest of the Parrot tribe, namely, Calypto- rhynchus and Nasiterna, and the great Crowned Pigeons (Goura) are very characteristic among its productions.

The chief dependencies of New Guinea require some little notice. These are the Aru Islands in the west, and New Britain and New Ireland in the east, with the Solomon Tslands as still more distant outliers in the same direction, and the Louisiade group in the south. The first, sepa- rated by 150 miles of sea from Papua, has over 100 species of Land-birds, of which, however, about four-fifths have been found also on the mainland; but among those which are peculiar are two of the finest Paradiseede—one of them belonging to a distinct genus (Cicinnurus)—and there is the very suggestive fact, as asserted, of two species of Casuarius occurring in the group. Of the ornitho- logical features of New Britain and New Ireland not much is known, save that the former is inhabited by a species of Cassowary, and that both are intimately connected with New Guinea. The avifauna of the Solomon Islands is in some degree better understood, and 30? well-authenticated

1 The importance which must be attached to the distribution of Ratite as compared with Carinate birds, to say nothing of the interest- ing fact that the known number of species of Caswarius has been raised from one to nine in the course of a very few years, makes it advisable here to give a list of the 9 species, with the localities (so far as they have been ascertained) they inhabit, as announced to the Zoological Society of London, 16th February 1875, by Mr Sclater, to whose ee the author owes the sight of a proof sheet of the communica-

ion :—

C. galeatus, Ceram.

C. papuanus, Northern New

Guinea. C. westermannt, Jobie Island. C. uniappendiculatus, New Guinea.

C. picticollis, Southern New Guinea.

C. beccarit,Wokan, Aru Islands.

C. bicarunculatus, Aru Islands.

C. australis, North Australia.

C. bennett, New Britain.

A species of Cassowary has been said to occur in the Solomon Islands,

and if so, one would think it likely to be distinct, but the only example

alleged to have come from that group which has been examined proved

to be C. bennetti.

It would seem not at all unreasonable that in dividing the Papuan Subregion into provinces we should be guided by the distribution of this remarkable genus. In that case, not only would Ceram be an- nexed to the Papuan province, but the Cape-York district severed from the Australian and added to the Papuan Subregion.

? As stated in the preceding note, a Caswarius is said to be found in the Solomon Islands, and, however contrary to expectation, would seem to be of the same species as that which inhabits New Britain.

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species of Land-birds, with 1 peculiar Rallus, have been found there. Of those 30, 16, or more than half, are known to be peculiar, while 3 more probably are so: 5 species occur in New Ireland as well; 1 is common also to New Caledonia and the New Hebrides, 1 to the Louisiade Archi- pelago,

and the remaining 4 have a wider distribution in the Papuan Subregion, to which unquestionably the group belongs.

The Molucean province, completing this Subregion and Moluccen consisting of many rather widely detached islands, which Province.

lie for the most part between those forming the provinces already described, extends probably from Timor-leat in the south to the Sanguir group in the north, and includes the considerable islands of Ceram, Bouru, Gilolo, and Morty. About 200 species of Land-birds are now known from this province, and they may be assigned to over 80 genera. Of the species about 15 are common to the Indian region, but more than twice as many to the Papuan province, and some 140 are peculiar, of which the most significant are the Casuarius of Ceram. Of the genera of Land-birds 2 only—Semioptera, a remarkable Bird-of-Paradise, and Lycocorax, an aberrant Crow—are peculiar; but there is also in Gilolo a brevipennate genus of Rails (Habroptila) to which the same epithet will apply. One genus is common to Ceram and Celebes, and another is found in Australia, whence possibly it is a migrant, while 30 genera are charac- teristic of the Papuan Subregion, and nearly 40 more, of more or less wide range, are found in and probably derived from New Guinea. Finally, there are some 12 genera which do not occur in New Guinea, and belong wholly or mainly to the Indian Region, but there are only 3 characteristically Indian types met with in the Moluccas, and all of them are there represented by distinct and well-marked species. The avifauna of the Moluccan province is therefore thoroughly that of the Papuan Subregion, and is no less clearly derivative from that of New Guinea, but not fewer than 11 forms of Birds-of-Paradise (Paradiseide), with more than 12 other characteristically Papuan genera, are wanting, and therefore, in Mr Wallace's opinion, it would seem as though the province is not a fragment of any old Papuan territory, a supposition supported by the fact that most Moluccan birds are very distinct from their repre- sentatives in New Guinea. Amongst the most character- istic forms are the scarlet Brush-tongued Parrots (Lorius and Jos), found, it is believed, in every island of the group, but not in the Celebesian or Timorese provinces. One species of Hos from Siau and Sanguir intimates that those islands belong to the province. clectus, another scarlet Parrot, but belonging to a different family, also is equally characteristic with the

Parrots just mentioned. Asa rule, the birds of the Moluccan province are larger and more conspicuous than the allied species from neighbouring parts.

On the whole, the avifauna of the Papuan Subregion Subregion.

presents some very remarkable features, but most of them must be here briefly treated by way of summary. Un- questionably its most distinctive characteristic is to be found in the presence of the Birds-of-Paradise(Paradisetde), which are almost peculiar to it; for, granting that the Bower-birds (Chlamydera and others) of Australia should be classed in this family, it must be admitted that they are very abnormal, or perhaps, to take firmer ground, that they are far less highly specialized than the beautiful and extraordinary forms which are found, and found only within very restricted limits, in the various islands of the Subregion. It would be easy, if space allowed, to dwell at length on the many points of interest with respect to those wonderful birds, though in truth we know but little of them.

3 Sce preceding footnotes.

Australian Subregion.

Polynesian Subregion.

AUSTRALIAN REGION, |

(2.) The Australian Subregion is limited to the great insulated continent which bears that name, with its ap- pendage Tasmania or Van Diemen's Land, and possesses, on the whole, a very homogeneous fauna—so much so, indeed, that at preseut it would be almost impossible to subdivide it into provinces, Influenced in the north by its proximity to the rich and varied Papuan Subregion,? its ornis rapidly becomes modified towards the south. Out of some 630 species or more, nearly 490 are Land-birds, and not more than one- twentieth of them are found elsewhere, so that its peculiar species bear a greater proportion to the rest than is the case in the Papuan Subregion. Though the western, and espe- cially the north-western, parts of the country, which have been as yet but imperfectly investigated, will no doubt yield more results on further examination, it is already evident that

the greatest animal wealth of Australia lies towards the east. 'The western portion seems to have but 2 peculiar genera (one of questionable value)—a nocturnal Parrakeet (Geopsittacus), and a Weaver-bird (Lmblema), which is apparently not very far removed from others of the same group. In the north, as already stated, there is a considerable admixture of genera from the Papuan Sub- region, which do not proceed beyond the tropic, and of these Casuartus is a striking example. The genus Xerophila, of uncertain affinity, is confined to South Australia; and the extreme limits of the Subregion, that is Tasmania, possess in addition only 1 genus, Hudyptes, belonging to the marine family of the Penguins (Spheniscide), which inhabit gener- ally the sub-antarctic seas; but the Land-birds, which are few in number, are specifically identical with those of Australia proper. This is even the case with the Emeu (Dromeus), and the import of this fact is as significant ? as would be a corresponding example drawn from the class Mammalia, since, in regard to means of locomotion, birds incapable of flight are on a par with terrestrial mammals. As a whole, Australia is rich in Parrots (Psittact), having several very peculiar forms; but Picarians (Picarie) of all sorts— certain Kingfishers (Alcedinide), perhaps, excepted —are few in number, and the Pigeons (Colwmbide) are also com- paratively scarce. Australia, however, possesses two extra- ordinary families of abnormal Passeres—the Lyre-birds (Menuride) and the Scrub-birds (Atrichiide)—which, so far as is at present known, stand by themselves, though it is possible that the latter have a somewhat distant ally in the genus Orthonyx, or even in the South-American family Pteroptochide. The number of peculiar or characteristic genera of Passeres is, however, too great to be here enume- rated; and there are many singular forms of Coluwmbide. Among the more curious forms of Land-birds other than those may be especially remarked JLipoa among the Galline (Megapodiide), and Tribonyx among the Gralle (Rallide), while Pedionomus is a form referred by some systematists to the first and by others to the second of those Orders. The presence of a Bustard (Hupodotis) pre- sents a curious example of interrupted distribution, since none of that family (Otidide) are found nearer than India.

(3.) The Polynesian Subregion, though so vast, extend- ing as it does from one tropic to the other throughout ninety degrees of longitude: (from long. 140° E. to long. 130° W.), at that part of the earth's surface where degrees

of longitude are broadest, possesses generally a very uniform avifauna, It may possibly be partitioned into four or five provinces; but if so, the products of the first of them,

1 The Peninsula of Cape York possesses a Casuarius, as already noticed, and other grounds are not wanting for the supposition that has been entertained that zoologically it belongs to the Papuan Sub- region.

5 Its significance is increased by the fact that the Emeu of West Australia is distinct from that of the east. The Emeu is extinct in Tasmania.

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(4)

containing the Palau? (commonly called Pelew), the Caro- line, and most likely the Ladrone Islands, are at present too imperfectly known for any useful results to be drawn from them. 'Then we have the New Hebrides and New Caledonia forming another province; after which comes the third, or Central-Polynesian province, comprising the Fijian, Tongan, and Samoan groups; next the numerous clusters fron Cook's' Islands to the Marquesas, including the Society Islands and the whole of the Low Archipelago, which may perhaps form a fourth province; and lastly, the Sandwich or Hawaiian Islands. The first of these pro- vinees (so to call them) possesses in the Palau Islands a Reed-Warbler, which seems to form a peuliar genus (Psama- thia), while another kindred form belongs to the widely- spread genus (Acrocephalus) that our own English bird does, and occurs there, and there alone, so far as we know, throughout the whole Subregion. The like may be said of a Goatsucker (Caprimulgus). 1 other typically Poly- nesian genus is found; 1 is common to the Papuan, and 1 to the Malayan (Indian) Subregion. The second pro- vince shows some transition from the Papuan to the Australian Subregion. Out of 30 genera of Land-birds, 18 are typically Australian, 13 are also Polynesian: about 5 go no further to the eastward. 3 species of Aplonis, a genus of uncertain affinity, but generally classed with the Starlings (Sturnide), seem to link this province to the Central-Polynesian, and a very remarkable and apparently very generalized form of Gralle—the Kagu (Rhinochetus), which seems to have half-a-dozen scattered alliances—is peculiar to New Caledonia. From the third province

only some 50 genera and some 150 species of Land-birds are known. Aspecies of Cuckow (Ludynamis tactensis) ranges over the whole of this as well as the next district so far as the Marquesas, as also does perhaps an abnormal Warbler (Tatare), On the other hand, the Samoan group has in the Manu-mea or Tooth-billed Pigeon (Didunculus) a form which alone makes a distinct family of Columba;° and another island of the same group, Savai, produces a mos peculiar brevipennate Water-hen (Pareudiastes), which it deemed worthy of generic separation from Gallinulas The fourth province, which (if it may be recognized as such) may be called the Eastern-Polynesian, comprelends, as above stated, the countless islands which surround the Low Archipelago. Respecting these we have little precise information—two meagre lists of birds from Hua- heine, one of the Society group, and a catalogue obviously not complete of those of the Marquesas, appearing to furnish nearly all our available material. The latter group possesses a rather remarkable Pigeon, said to be peculiar to it, but perhaps also found in the former ; and though closely allied to Carpophaga, it has been elevated to generic rank under the name of Serresius, The last province is that of the Sandwich Islands, which, notwithstanding that their ornithology has never been thoroughly worked out, seem to present some conspicuous differences from any other; and it is almost a matter of opinion whether, small as is the known avifauna of the group, it should not be regarded as constituting a sepa- rate Subregion rather than as a province of Polynesia. The ascertained Land-birds are but 18 in number, Of these 3 are Birds-of-prey, and 1 of them, the Pandion(1) solitarius of Cassin, is only known in collections by a unique specimen. The other 2 are widely-distributed

3 Dr Finsch is understood to be especially engaged on the birds of this group of islands, to our knowledge of which he and Dr Hartlaub have already contributed much.

4 Tt is, however, found in Australia, and even in the south of that country,

5 It is possible, however, that Otidiphaps, which is supposed to come from New Guinea, may also belong to the Didunculida,

New Zealand Subregion.

species of Owls (Strigidw). There are no Psittact or Picaria. The LPasseres consist of 15 well-established species, all peculiar to the group, and belong to 10 generic forms, only 1 of which, the cosmopolitan Corvus, is known to occur elsewhere. The remainder are restricted to the Hawaiian Islands, and may be referred to 2 families—one the almost universally distributed Flycatchers (Muscicapida), and the other the Honeysuckers (Meliphagide), which, as has been said before, are preeminently characteristic of the whole Australian Region; but it is to be observed that the most of the species are remarkable for the extraordinary form of their bill, so that they may ultimately be found to constitute a special section of the family, if they be not considered to forma distinct one (Drepanide). There are also two peculiar species of Water-birds—a Coot (Fulica alai), and the well-known Sandwich-Island Goose (Bernicla sandvicensis), which has been very commonly domesticated in Europe. The Hawaiian Archipelago has thus a larger proportion of peculiar genera and species than any other group in the Subregion, from which fact Mr Wallace infers, and no one can doubt the truth of the observation, the great antiquity of its isolation.

(4.) Zhe New-Zealand Subregion, however, is, and to all appearance long has been, more isolated still, probably, indeed, longer isolated than any other portion of the globe. Beside the three larger islands, known in the aggregate as New Zealand, numerous satellites belong to the Subregion, as Lord Howe's, Norfolk, and Kermadoc Islands, with the Chatham, Auckland, and Macquarrie groups. At the highest estimate the Subregion contains about 150 existing species of birds, of which more than 60 are Land- birds, belonging to about 34 genera, 16 of the latter being peculiar, and there may be some 5 genera of Water-birds, making 21 in all. Of the others 4 are widely spread, but the rest (9 in number) are characteristically those of the Region. Most of the genera occurring elsewhere are here represeuted by peculiar species, but then 5 are common to Australia, Some 7 or 8 are alsoallied to Australian species, and there are 4 Australian and 1 Polynesian species. Therefore every degree of similarity to Australia is to be found. Of peculiar genera it will suffice to say that 2 (Myiomotra and AMiro) belong to the Warblers (Syi- vide), 1 genus(Z'urnagra) perhaps comes under the Babblers (Timelude), and 2 genera (Xenicus and

Acanthositta) may be referred to the Creepers (Certhiide). The Paride have 1 genus (Certhiwparus), and the Meliphagide 3 genera (Prosthemadura, Pogonornis, and Anthornis). The Starlings (Stwrnide) are represented by Callas, Creadion, and the very abnormal—or perhaps it would be better to say generalized—Heterolocha. An entire and very distinct family (Strigopide) of Parrots is certainly peculiar, and it may probably be justifiable to regard the genus WVestor as constituting a second. There is also an Owl, which has been usually considered the type of a genus (Sceloglauz) ; and the Kallide present two very remarkable forms—the Wood-hens (Ocydromus) and the Takahe (Wotornis), the last almost, if not quite, extinct. The widely-spread family of Plovers (Charadriide) have two not less singular generic developments—Z'hinornis and the extraordinary Wrybill, Anarhynchus. Among the Ducks (Anatide), Hymenole- mus is a very curious form ; and, finally, among the Ratite we have the whole family of weird-looking Kiwis (Aptery- gide), represented by three or four species, which are totally unlike any other existing birds. In all, there is a wonderful amount of specialization, though perhaps in a very straight line from generalized forms ; but the affinity to Australian or Polynesian types is in many cases clearly traceable, and it cannot be supposed but that these last are of cognate origin with those of New Zealand. A very long period of isolation must have been required to produce

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the differences so manifestly to be observed, but a few forms seem at rare intervals to have immigrated, and this immigration would appear to be kept up to our own day, as shewn by the instance of Zosterops lateralis, which is said to have lately made its first appearance, and to have established itself in the country, as well as by the fact of two Cuckows, the widely-ranging Hudynamis taitensis and Chrysococcyx lucidus, which are annual visitors.

The most extraordinary ornithic feature of New Zealand, however, is unquestionably the former existence of the gigantic birds of the families Dinornithide and Palaptery- gide, with a few other contemporary forms. These, however, having been already mentioned there is no need to dwell

further upon them. As a whole, the avifauna of New Doom of

Zealand must be regarded as one of the most interesting and New Zea- avi-

instructive in the world, and the inevitable doom which is ! awaiting its surviving members cannot but excite a lively regret in the minds of all ornithologists. This regret is quite apart from any question of sentiment; if it were otherwise, it could not be defended against that sentiment which prompts our colonial fellow-subjects indiscriminately to steck their fields and forests, not only with the species of their mother-country, but with all the fowls of heaven, whencesoever they can be procured. The regret we express arises from the thought that just as we lament our ignor- ance of the species which in various lands have been extirpated by our forefathers, so our posterity will want to know much more of the present ornis of New Zealand than we can possibly record ; for no one nowadays can pretend to predict the scope of investigation which will be required, and required in vain, by naturalists in that future when New Zealand may be one of the great nations of the earth.

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Qe

II. Tur Neotropican Recron, though presenting cer- Neorro- tain affinities to the Australian, and the only one which PICAL Re-

can be said to be zoologically allied to it, is yet almost as distinct in its character therefrom as it is geographically distant. Excepting towards its northern limits, where it

meets and inosculates with the Nearctic Region, the bound- Bound- aries,

ary of the Neotropical Region is simple enough to trace, comprehending as it does the whole of South America from Cape Horn to the Isthmus of Panama and all Central America, and reaching in North America to somewhere about the twenty-second parallel of north latitude ; besides including the Falkland Islands to the south-east,) and the Galapagos under the equator to the west, as well as the whole of the Antilles or West-India

Islands up to the Florida Channel, which separates them from the peninsula of that name. Though over none but the remotest corners

GION,

of this sufficiently large area is the supreme Class of animals Importance formed (as we have found it to be the case throughout by ofits Birds.

far the greater portion of the Australian Region) by the Birds, yet they here play a part of very great importance, owing to the comparatively scanty number of Mammalian types. Among these last, however, there are two remark- able groups—the Pedimana, containing the only members of the Subclass Dedelphia which occur at the present day

1 Tt may even be questionable whether Tristan da Cunha, though lying nearer to the African coast, should not be referred to the Neo- tropical rather than to the Ethiopian Region. On this lone spot but four species of Land-birds are known to occur, all of which are peculiar —two of them even generically. One is a Finch (Crithagra insularis), belonging, it is true, to a genus very well represented in Africa ; but the second (Nesospiza acunhez) is the type and sole member of a genus which, whether it be considered a Finch or a Bunting, is said by Dr Cabanis, its describer, to have unquestionable similarity to some South American forms (Journ. fiir Orn. 1873, p. 154). The third bird is a Thrush (Nesocichla eremita), like the last, peculiar both in species and genus to the island, and apparently having no relation to anything Ethiopian ; while the fourth is a peculiar species of brevipennate Water-hen (Gallinula nesiotis), which may have been derived from either continent,

General character- istics of its ornis.

NEOTROPICAL REGION. |

out of the Australian Region, und the Ydentata, an Order which, though found also in Africa and India, attains in South America the summit of its development in variety and number of forms; and we cannot adduce any cxamples of Orders or Suborders from the Class Aves, the circum- stances of which will exactly match those of these three groups of Mammalia. The

nearest approach, perhaps, is made in one way by the South-American Ratite birds, of which one entire group, consisting of at most three species (Rheidee), is peculiar to the region, and thus to some extent parallels the case of the Pedumana ; but while these last also invade the Nearctic Region, the former are not even spread over the whole of continental South America, being limited

we learn that of the 1997 species just mentioned, 1070 only belong to the higher Suborder (Polymyode), leaving 927 to the two lower Suborders (Oligomyode and Tracheo- phone) ; or to speak in round numbers, out of 2000 specics of the highest Order of birds, a little more than one-half belong to its highest section, while nearly one-half belong to its two lower sections. This is a state of things which exists nowhere else on the globe ; for, except in Australia, where a few but uncertain number of purely indigenous and peculiar non-polymyodous Passeres are found, and in the Nearctic Region whither one family of Oligomyode has evidently been led by the geographical continuity of its soil with that of the Neotropical Region, such forms do not occur elsewhere.

to its colder portion. Moreover, so far as Orders have been

Accordingly their disproportionate Omithic generally understood and accepted by ornithologists among

prevalence in South America and its neighbouring lands develop-

Carinate Birds, there is no one of wide range which can | points unerringly to the lower rank of the ornis of the ae compare with the overwhelming development of the Eden- | region as a whole, and therefore to the propriety of taking ies :

tates in the Neotropical Region. On the other hand, it must be observed that the Region claims all the Tinamous (7%za- mide)—the Dromeognathe of Professor Huxley—which, if we were to follow his arrangement established

on palatal characters, it would seem necessary to regard as the equivalent of an Order; and also a single very remarkable form (Opisthocomus), which he has satisfactorily shown to be so unlike every other that it can only be conveniently classed by itself… Of these forms the Tinamide certainly, and Opisthocomus probably, are of comparatively low de- velopmental rank, in that respect resembling certain char- acteristic Australian groups; but the similarity between the avifaunas of the two Regions seems to be further borne out by the same fact being observable of other South- American families, forming what may be called the lower Suborders? of Passeres, to which the names of Oligomyodce and Tracheophone have been attached, and these, if not altogether originating in the Neotropical Region, are with- out doubt therein most abundantly produced. The signi- ficance of this fact is enhanced when we remember that, as has been said before, to consider rightly the problem of the distribution of birds, we must in the main rely on the Passeres, as affording on the whole the surest ground for our investigations. Now, taking the latest, nay, the only, complete list of Neotropical birds—that published by Messrs Sclater and Salvin ® in 1873, we shall see that there are 8 Passerine families peculiar to the Region, of which 3 belong to the Tracheophone, 4 to the Oligomyode, and 1 only to the Polymyode or Oscines. Or, if we look to the entire number of species given in that work as inhabiting the Region, we find it to be 3565. Of these, 1997, or a good deal more than half, belong to the Order Passeres—a large proportion truly, but one that (from other causes not germane to our present investigation, and therefore to be just now disregarded) need not especially excite our wonder. But the characteristic nature of the avifauna of the Region is more clearly brought out when

1 To recognize these Orders, Crypturi and Opisthocomi, however, it becomes logically necessary to recognize many other groups in like manner, and thus to raise the number of Orders in the whole Class to at least two dozen, or nearly four times as many as most ornithologists have been usually willing to admit, a proceeding which naturally lowers the differential standard, and renders a comparison between "Orders" of Aves and "Orders" of Mammalia or Reptilia almost impossible.

- *The term "Suborder" should very possibly not be used here, at least in a technical sense. The Passeres seem to be properly divisible into two*

great groups—one containing the genus Menura, the other all the rest, except most likely Atrichia, which there is some reason to Suppose may be found to form a third group. Whenever these groups shall receive names, they ought to be regarded as Suborders, but in the meantime, with this explanation, perhaps no harm will follow from calling the sections Polymyode (the Oscines of some writers), Oligomyode, and Tracheophonee " Suborders."

3 Nomenclator Avium Neotropicalium, &c., Auctoribus P. L, Sclater ef O. Salvin, Londini: 1873.

*it next in order to that of the Australian Region, the general fauna of which is admittedly the lowcst in the world. It is believed that much the same result would follow from a similar examination of other Orders, especially the Picarie; and Professor Huxley has urged with his wonted perspicuity the alliance of the two Regions just named, basing his opinion in great measure on the evidence afforded by the two sections into which the true Galline are divisible, the Peristeropodes and the Alectoropodes, the former composed of the families Megapodiide, almost wholly Australian, and the Cracide, entirely Neotropical, but citing also other weighty evidence in favour of his conclusion.**

Leaving, however, this matter as in some degree hypo- thetical, though its probability can hardly be denied, we have as genera, families, or perhaps evcn larger groups a great many very remarkable forms which are characteristic of or peculiar to the Neotropical Region in part, if not as a whole.

being peculiar to the New World, extend their range into the Nearctic Region, but are there so feebly developed that their origin may be safely ascribed to the southern portion of America. First in point of importance comes the extra- ordinarily beautiful family of Humining-birds (7'rochilide), with nearly 120 genera (of which only 5 occur in the Nearctic Region), and more than 400 species. Then the Tyrants (Tyrannide), with more than 70 genera (8 of which range into the northern Region), and over 300 species. 'To these follow the Tanagers (Tanagride), with upwards of 40 genera (only 1 of which crosses the border), and about 300 species; the Piculules (Dendrocolaptide), with as many genera, and over 200 species;

the Ant- Thrushes (Formicariide), with more than 30 genera, and nearly 200 specics; together with other groups which, if not so large as those just named, are yet just as well defined, and possibly more significant, namely, the Tapaculos (Ptero- ptochide), the Toucans(Rhamphastide), the Jacamars (G'al- bulide), the Motmots (Momotide), the Todies (Todide), the Trumpeters (Psophiide), and the Screamers (Pala- medeidce) ; besides such isolated forms as the Seriema (Cariama) and the Sun-Bittern (Hurypyga).

Having thus briefly indicated some of the chief charac- Division

teristic and for the most part generally distributed forms as Sub- egions.

of the Neotropical avifauna, we have next to consider the separation of the Region into Subregions and provinces, Herein we find far greater difficulty than we had to en- counter in treating of the preceding (the Australian) Region, the geographical peculiarities of which marvellously lend themselves to its comparatively easy partition, while the isolation of its several portions contributes in an extraor-

4 Proceedings of the Zoological Society, 1868, pp. 294-819.

Of families we find 23, or maybe more, Character absolutely restricted thereto, besides at least 8 which, istic faimi-

1es,

Physical features of 8. America.

Limits of the six Sub- regions,

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dinary degree to the process. But compared with the remaining Regions of the globe, the Neotropical, as it will be essayed to show in the sequel, presents, perhaps, no greater difficulty in this respect than others do. The Sub- regions (one excepted), however, cannot be said to be well defined, for no natural boundaries are to be found for them, and we must trust solely to the presence or absence of certain forms of Bird-life in marking out their

limits. This is, of course, the most proper zoological method of proceeding, but in sonie cases it tends to make the divi- sions rather more than less arbitrary, and in all cases de- pendent upon the amount of investigation which has been bestowed on the several districts. The physical features of the continent of South America are very varied, and caunot be said to assist us much or at allin our task. The proximity of its southern extremity to an ocean wherein at one season of the year floating ice abounds, gives that portion a rigorous climate, and the presence of the grand chain of the Andes, the highest save one in the world, prolongs beyond the equator those characteristics of a mountainous or even an alpine tract, which override any that are commonly associated with degrees of latitude. This range, the great Cordillera, has also a remarkable effect first on the climatological properties of the whole country, and then on its vegetation, which, of course, acts directly on its animal inhabitants. Running as the Andes do pretty nearly longitudinally, and lying near the western coast of the coutinent, the warm, moist winds from the Atlantic sweep across its eastern and wider portion, unim- peded in their course by any considerable high land, till they are attracted by the summits of the giant range, and, precipitating their fertilizing showers on its lofty slopes, supply the brimming floods of some of the largest rivers of the world. Westward of the chain is in great part a desert, at least down to lat. 10° S., though much of this was, prior to the conquest of Peru by the Spaniards, care- fully irrigated and highly luxuriant. A few other arid tracts are found, but compared with most other continents the proportion of desert-land is small, aud the valleys of the majestic rivers which roll their course to the Atlantic are clotned with the most extensive virgin forests in the world. To these varied physical conditions seem due the chief differences which are observable in the avifauna of the component parts of the South-American continent, which, rich as it is beyond that of all other countries in genera and species, displays yet a considerable uniformity in its larger groups of Birds.

The Subregions into which that portion of the earth at present under consideration can be most conveniently separated seem to be stx in number —four of them included within the continent of South America, and two lying be- yond its limits.1 But the confines of these continental Subregions, as has been above hinted, are of the vaguest. It is doubtful whether any

amount of local knowledge will ever justify the zoogeographer in drawing an absolute line of demarcation between any two of them. At present our information certainly does not permit us to do more than indicate the general direction of such boundaries ; not that we believe that their existence may not be legitimately assumed. Beginning with the apex of the continent, we have a Subregion, extending from Cape Horn to somewhere north of Bahia Blanca on its castern coast, whence its boun- dary runs in a north-westerly direction, passing to the east- ward of Mendoza, and then northward along the eastern and higher slopes of the Andes until it crosses the equator,

1 Tn arriving at this conclusion the author wishes to acknowledge the kind assistance he has received from his old friend Mr Salvin, F.R.S., whose long-continued study of American, and especially Neo- tropical, forms of birds has placed him in the front rank of authorities on the ornithology of the New World.

and, after trifurcating on either side of the valleys of the Magdalena and its confluent the Cauca, returns along the western slopes of the lofty Cordillera, until it trends sea- ward and reaches the Pacific coast of South America some- where about Truxillo, in lat. 7°. This Subregion, for a reason presently to be given, may be called the Patagonian, though its northern extremity lies so far removed from its eponymic territory. Next we have what may be called the Brazilian Subregion, marching with the foregoing until somewhere near Potosi in Bolivia, whence it turns to the north-east, and, avoiding the watershed of the Amazons, strikes, perhaps, the Paranahyba, through or along which it makes its way to the Atlantic. Then comes the enor- mous basin of the Amazons—the Mediterranean of South America, as the dwellers on its banks fondly call it—which, though forming an important part of the Brazilian Empire, seems undoubtedly to be a distinct Subregion from that to which this last name has been applied, and may justly be denominated the Amazonian. Yet, be it remembered, that, its peculiarities not being observable on the higher tributaries of the mighty river, its upper waters must be regarded as draining land which belongs to

the fourth Subregion—of which more immediately. Continuous to the southward with the Brazilian boundary the western frontier of the Amazonian Subregion seems to turn off before the eastern confines of the Patagonian Subregion are reached, and, leaving a space intervening, it pursues a generally northward course, at a lower level, on the western bank of the Huallaga, and crossing the great stream whence it derives its name, in somewhere about long. 77° W. and lat. 5° S., it pursues its way towards the mouth of the Orinoco. The fourth and last Subregion of South America includes all that is left of the continent, and perhaps may be most fitly named the Subandean.? This begins in the south with the narrow slip of land before mentioned as intervening between the comparatively low-lying Ama- zonian Subregion and that portion of the Patagonian which runs along the lofty Peruvian Andes, and is believed to extend from the frontiers of Bolivia to the table-land of Ecuador, rounding, on the one hand, the forked extremity of the Patagonian Subregion to the westward until it meets the Pacific at Truxillo, stretching over 500 miles of sea to the Galapagos Islands, under the equator, and, on the other hand, following the Amazonian boundary to the Atlantic, while it comprehends the islands of Trinidad and Tobago, as well as those which lie on the northern coast of South America, Besides portions of the states already named, it includes Nueva Granada and Venezuela till it reaches the Central-American Subregion in the Isthmus of Panama. This fifth Subregion stretches on the west northward about as far as Guaymas on the east coast of the Gulf of Cali- fornia, and on the east to the Rio Grande, which forms the boundary of Mexico and Texas, but the Nearctic Region dips down along the central table-land till near Queretaro, a little to the northward of the city of Mexico, and thence southward along the higher ridges to an almost indefinite extent. The sixth Subregion is composed of the Antilles, with the important exception of Trinidad and Tobago, and its limits being capable of easy geographical circumscrip- tion, further consideration of them may be for the present deferred.

The difficulty of distinguishing these several Subregions is indeed very great ; and it is not only possible, but highly probable that even in a few years further exploration will enjoin a large amount of rectification of their frontiers. It

2 In some respects it corresponds with what has been commonly called the "Columbian" Subregion; but that name, having been used in a special and more restricted sense, might give rise to some mis- understanding. As will be seen, it comprehends far more than the former United States of Columbia.

Distribu- Of the families of Birds peculiar to the Neotropical Region | birds —3 belonging to the family Lmberizide, 1 to Icteride, tion of twenty-four in number, according to Messrs Sclater and | 5 to 7'yrannide, 8 to Dendrocolaptide, 4 to Pteroptochida, cata Salvin—the distribution may be tabulated as follows :— 3 to Lrochilide, 1 to Psittacide, 1 to Halcomde, 1 to ce Lc og See aN ose ee Columbide, 2 to Tinamide, and 1 to Rhede. Of the rest Subregion. to 1 Sub-|to 2 Sub-|to 3 Sub-|to 4 Sub-|to 5 Sub-ito all Sub-| | there are 3 genera of Charadriide (as restricted), 1 of region. | regions. | regions, | regions. | regions.| regions. | | which (Zudromias) is doubtfully identical with a genus of Patagonian Sara i's 1 1 leg the Old World; 2 genera of the peculiar family Lhinoco- Brazilian …..... 0 4 1 8 5 0 ride; Chionis, an antarctic form ; 2 genera of Scolopacida, Amazonian …..... 1 0 1 8 5 0 one peculiar, the other (Rhynchea) rather widely spread Subandean …..... 1 l 2 8 5 Y over Australia, India, and Africa; 2 genera of Anatide Central-American| 0 1 1 7 5 0 " "te: : Hee : : feciicn …... 0 0 0 9 0 oth peculiar; 2 genera of Laride, one peculiar, the other belonging to subpolar seas; 1 genus of the cosmopolitan This table will serve to shew the close alliance of the Poduipedide; and 3 genera of Spheniscide, a family four middle Subregions to one another in their most | limited to the Antarctic or Subantarctic Ocean. But remarkable forms, and, at the same time, the singularity | further into particulars want of space forbids our going, displayed by the Patagonian and Antillean Subregions; | save to remark on a very peculiar and instructive case

while it will also make evident that no family peculiar to | offered by Hustephanus, a genus of Trochilide. Of this Humming-

the Region is found in all its Subregions. section of Humming-birds there are three known species— birds of Patagonian (1.) The Patagonian Subregion, lying chiefly at the | one, ZH. galeritus, found in Chile, evidently its mother- Juan Fer- Subregion. southern extremity of the continent, seenis

to present the | country, but also "occurring from 400 to 600 miles from 22"?

NEOTROPICAL REGION. |

must be remembered too that where, in the preceding paragraphs, "lines" of demarcation have been spoken of, such lines are in truth tracts of country often from one to two hundred miles in breadth, and in most cases there is no hope that the boundaries will ever attain any great degree of precision. Some advance of knowledge in this direction will no doubt accrue as the elevation and contour of hills and table-lands become more accurately laid down; but at first the effect of this increase to our information will certainly be to complicate matters, by shewing the existence within one Subregion of spurs, isolated spots, or enclosed areas belonging to another, and as yet unsuspected. Still the amount of light thrown on the Neotropical Region by the persevering labours of the eminent ornithologists before named, seems to deserve being brought to a focus ; and accordingly the following summary is now offered in the hope that some of the characteristics of the avifauna of the Region may thereby be more readily comprehended.

greatest affinity to that in which the Australian avifauna reaches its climax. This is shewn not only by the pre- valence in it, alone of all the Neotropical Subregions, of the Ratitee, which wander over its solitudes, and the Penguins (Spheniscide), which haunt its shores; but by the low, generalized, and peculiar forms like Thinocorus and Attagis ainong the widely-varying Limicole, and the Pteroptochide (though some few species of this family occur elsewhere in South America) among the Passeres. The family of Plantcutters (Phytotomide) is almost peculiar, only just intruding upon Southern Brazil. Of the more characteristic families of Birds of the New World, some 3 only (Dendroco- laptide, Formicariide, and Trochilide) shew themselves in any great abundance, while but 2 others, which are feebly represented, occur within the ill-defined limits of its southern province, Patagonia,—the rest of its terrestrial, and still more of its littoral or maritime, avifauna consist- ing of families, or groups of families, which are nearly cosmopolitan. On the pampas of La Plata we find the number of characteristic Neotropical forms much increased, but still the poverty of the Argentine ornis is of the most marked kind when compared with the wealth

of the more fertile tracts which lie on its northern and eastern frontiers. In La Plata we have but 2 other familes (Tyrannide and Palamedeide) coming under this category that are at all well developed. Mniotiltide, Vireonide, and Cerebidee do not appear at all, and Zanagride but in small numbers. As has been said already, the Subregion extends northward along the chain of the Andes, and with this extension it

1 The Thinocoride may be questioned as having a real existence. The writer would be inclined to include it in the cosmopolitan family of Charadriide.

seems proper to take in their arid and barren western slopes as well as a portion of the tract lying between that range and the sea, so as to include Chile and a considerable slice of Peru. But even by so doing we gain but little. No more of the characteristically Neotropical forms mount these lofty ascents in any multitude, nor are we able to add any forms of very wide distribution. However, through- out the whole Subregion many genera, and species with- out number, which are absolutely peculiar, occur, and thus aid in stamping the quality of the tract. Indeed, the very presence of the Struthious family Rhecdw, with its two or three species, would serve alone to do this; and as its head- quarters are in Patagonia, that country becomes of sufficient importance to give its name to the Subregion of which it forms at most but a moiety.

Entering more into details, we find the Patagonian Sub- region possessing about 46 genera of birds not found else- where in South America. Of these 30 are strictly Land-

the mainland on both of the chief islets of the little Juan- Fernandez group ——Masatierra and Masafuera ; but each of these limited spots has besides its own peculiar species of the genus——the former /. fernandensis and the latter Z. ley- boldt. This alone would present nothing at all unparalleled elsewhere ; but it is curious that while both sexes of the more widely- ranging £. galeritus have a green plumage, the males of the other two have a brilliant red colour, and generally resemble each other, though the

females of each differ more decidedly. Supposing, as we may justly do, that all these species have descended from a common ancestor, Mr Sclater has shewn? the probability that £. galeritus represents the appearance of the parental stock that in bygone times colonized the Juan-Fernandez cluster, of which £. fernandensis, now peculiar to Masa- tierra, and the most aberrant from the original form, is the progeny of the earliest settlers, and £&. leyboldi, confined to Masafuera, is the descendant of a later immigration, while, still more recently, £. galeritus has found its way to both islets, and in each yet possesses its normal characters.

Passing over, as not affording anything especially remark- able, the chain of islands, from Chiloe to Cape Horn, in which the range of the Andes plunges into the Southern Ocean, though alongside of it lie Tierra del Fuego and its satellites, which form an important adjunct to the South-

Peculiar genera,

American continent, our attention is turned to the Falk- Birds of lands, an interesting and considerable group of islands Falkland situated over 200 miles to the north-east of the historic Islands.

Strait of Lemaire. Here we find 18 species of Land-birds— 7 belonging to the order Accipitres and 11 to Passeres. Of

- *Ibis, 1871, pp. 180-183. ri*

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Brazilian Subregion.

Amazonian Subregion,

746 BIRDS [DISTRIBUTION.

these some 5 species are peculiar—2 belonging to Phkrygilus (Emberizide), 1 to Cinclodes (Dendrocolaptida), 1 to Musct- saxicola (Tyrannide), and 1 to Milvago (Falconide). Of Water-birds there is a peculiar species of Chloephaga (Anatide), and there are, or until recently were, about half-a-

dozen species of Penguins (Spheniscidw), some of which, though not resorting exclusively to these islands, may be fairly regarded as finding there their chief breeding- quarters. Of the ornithology of South Georgia, a group of islands lying some 1300 miles east of Staten Island, and nearly in the same latitude, and doubtless belonging to the Patagonian Subregion, as well as of the South Shet- lands, no particulars are available.

(2.) The Brazilian Subregionhas only recently had removed from it the valley of the Amazons and its tributaries. The boundaries, so far as they can be traced, have been already given. This Subregion is not characterized by the pre- sence of any family of Birds peculiar to it alone, but among those families which are found in only two Subregions of the Neotropical Region it possesses 3 in common with the Patagonian,—Phytotomide, Cariamide, and Rheide,—the first and last only in its southern districts, and 1 in com- mon with the Central-American—Oxyrhamphide. Of the peculiarly Neotropical families occurring in three Sub- regions only, it has but 1, Pteroptochide, the range of which is shared by the Patagonian and the Subandean. When we come to families of four Subregions, we find the Bra- zilian invaded by the almost cosmopolitan Sylwvide, which also inhabit the Subandean, Central-American, and Antil- lean, and possessing in common with the Amazonian, Sub- andean, and Central-American not fewer than 8 —Pipride, Momotide, Galbulide, Bucconide, Rhamphastide, Cracide, Heliornithide, and Parride-—the last of which is, how- ever, widely distributed in other regions, besides, Pala- medeidee, which occurs also in the Patagonian, Amazonian, and Subandean Subregions. The chief justification for considering the Brazilian Subregion apart from the Ama- zonian is perhaps to be sought in the presence within the limits of the former of 5 families, Sylviide, Oxyrhamphide, Phytotomide, Pteroptochide, and Cariamide, which are not found in the latter, while on the other hand, 5 families, Capitonide, Opisthocomide, Hurypygide, Psophide, and Qdicnemide,' inhabit the latter without occurring in the former ; add to which the fact, that of the families found in only two of the Neotropical Subregions not one is com- mon to the Brazilian and Amazonian.

In this Subregion we have 42 peculiar genera, 1 belong- ing to Syluude, 4 to Tanagride, 2 to Hmberizide, 3 to Tyrannide, 2 tu Pipride, 5 to Cotingide, 6 to Dendroco- laptide, 3 to Formicartide, 2 to Pteroptochide, T to Trochi-

lide, 2 to Caprimulgide, and 1 to each of the families Picide, Momotide, Galbulide, Psittacide, and Tinamide. The number of peculiar species is, however, far too great to be here enumerated. There are no islands of any im- portance belonging to this part of South America.

(3.) Lhe Amazonian Subregion, comprehending the val- ley of the Amazons and its affluents (except their elevated sources among the Andes) as well as the right bank of the Orinoco and, of course, the intervening country, has been but lately separated from the preceding, and the rea- sons for here considering it distinct have just been briefly stated. They are not, indeed, those which first prompted the division, which was established mainly, if not entirely, on account of the peculiarity of most of the species of Birds? found within its ill-defined borders as before given ; but on whichever ground we proceed we may be pretty sure that its separation is justifiable. We have here 2

; u The propriety of considering the Stone-Curlews to form a family distinct from the other Plovers (Charadriide) is very questionable. 2 Cf. Sclater and Salvin, Proceed. Zool. Soc. 1867, pp. 598-596.

families peculiar—Opisthocomide—already mentioned as forming almost a distinct Order, but composed of a single species, the Hoactzin, and the Psophude or Trumpeters, now a-days regarded as distant allies of the Cranes (Gruide), but presenting many remarkable and unique features. This family also contains but one single genus, including some half-dozen species, the respective range of each appearing, singularly enough, to be separated by rivers. Amazonia pos- sesses no family in common with but one other Neotropical Subregion, but it shares 3 with the Central-American and Subandean. These are Capitonide, Eurypygide, and (dicnemide, of which the second only is peculiar to the Region, the first and last being widely distributed. The families which it shares with three other Subregions have been already enumerated, as well as those which by their presence or absence distinguish it from the Brazilian Sub- region. The peculiar genera remain to be pointed out. These are but 27 in number: 2 belong to Icteride, 3 to Pipride and Cotingide respectively, 2 to Dendrocolaptide, 7 to Formicariide, 2 to each of Trochilide and Galbulide, 1 to Ardeide and Palamedeide, 2 to Cracide and the genera Opisthocomus and Psophia

before mentioned. There is another genus also which is worthy of remark, Chena- lopex, belonging to the Anatidw, not found elsewhere in the New World, but common to the Ethiopian Region. Space will not admit of our entering further upon the con- sideration of the ornithic peculiarities of Amazonia, but perhaps it may be said to form the most self-contained Sub- region of the whole continental area of which we are now treating, and we may expect that with the progress of zoo- logical exploration its boundaries may be laid down with tolerable precision. 'There are no islands which can be attached to Amazonia.

(4.) The Subandean Subregion, from what has been Subandean

previously indicated of its extent, will be readily seen to Subregion. offer the most varied conditions of existence of any part of the Neotropical Region, and we shall not therefore be sur- prised to find its ornis at once rich and remarkable. It might perhaps now, and some day probably will, be broken up into two or more provinces, not to say separated into distinct Subregions, but the means for such partition are at present wanting. Yet there is only one family of Birds peculiar to it, the Steatornithide, composed of a single species, the Guacharo or Oil-bird (Steatornis caripensts), confined to a very few localities in its eastern portion. In common with Central America, but not elsewhere met with in the Region, it has of Neotropical families Cinclide and Alaudide, though the latter of these two widely- ranging families is but poorly represented by a single spe- cies (Otocorys chrysoleema), apparently the survivor of an old population (all, or nearly all, of which has perished), stranded, as it were, on the high lands of Columbia. Those families which it possesses that are common to but two other Neotropical Subregions have already been named, and it will be enough to repeat that 1 of them extends to the Patagonian and Brazilian, and the remaining 3 to the Amazonian and Central-American. In like manner have been enumerated the families which are also found in but three other Subregions—1l it has in common with the Amazonian, Brazilian, and Patagonian ; 8 with the Central- American, Amazonian, and Brazilian; while 1 of these (Parride) is also found in very distant parts of the world, and 1, also a family of extremely wide range, with the Brazilian, Central-American, and Antillean Subregions.

The genera peculiar to the Subandean Subregion are exceedingly numerous, amounting to no fewer than 72.

These may be apportioned as follows: 1 to Troglodytide, 4 to Cerebide, 10 to Tanagride, 5 to Emberizide, 1 to Icteride, 2 to Tyrannide and Pipride respectively, 3 to Cotingide, 1 to each of Dendrocolaptide and Formicarud@,

38 (!) to Trochilidw, 1 to the peculiar family Steatornith, ide, and 1 to Preide, Strigide, and Cracide respectively- The enormous differential development of the peculiarly New-World family Z'rochalide calls for some remark, and is only approached (as will presently be seen) by that which has occurred in Central America, The habitat of some of these forms of Humming-birds, whether genera or species— and the latter are wonderfully numerous—is extremely restricted. That of Loddigesia mirabilis, long since de- scribed from a still unique specimen in the Loddiges col- lection, is Chachapoyas in northern Peru, and though pos- sibly more pains has been taken to discover it and compass the capture of other examples than has been the case with any other Bird, it has not been again met with. Its haunts may, therefore, be safely presumed to be especially confined. Two species of Oreotrochilus (O. chimborazo and O. pichin- che) have their abode almost limited to the slopes of the lofty mountains whence they take their name, and nearly as much may be said of. others. The Tanagers (Zana- gride)— birds of varied form, and generally of exquisite plumage-~also frequent this Subregion in great force, and among them there is here found, perhaps, the greatest amount of differentiation, both generic and specific.

Of the hundreds of other curious ornithological charac- teristics of the Subregion which might easily be cited, no more can here be given, but a brief notice of the avifauna

to the remarkable ornis of this archipelago, and here it was, as he has told us, that there dawned upon him from its consideration that theory of '" Natural Selection" which has transformed the whole aspect of biology, and, whether wholly or partially accepted, has placed the science upon a new and higher pedestal. Later researches, indeed, have shown the nonexistence of some of the peculiarities which this eminent observer believed, on what was then good evidence, he had determined; but these refer to the re-stricted distribution of several of the species among the different islands, and are not of any such importance as to affect his general results, while doubtless, had his visit to this "little world within itself," as he appropriately calls it, been of longer duration, he would have become aware of these minor facts. The strictly-speaking Land-birds of the Galapagos seem to be some 30 in number, of which about 26 are Passeres, Among these, 1 only, Dolichonyx oryzwvorus (belonging to the family cter'd@), and obviously a straggler, is identical with a species of the mainland, while 2,0 Dendroeca (Mniotiltide), and a Progne (Hirundinide), have been by some considered to be distinct species, by others but local races,—which means, of course, that from one cause or another isolation has not yet modified them so as to depart greatly from their congeneric continental forms,—but the remaining 23 (1) are peculiar, and, what is especially worthy of notice, no fewer than 18 (4), or

Trinidad of its extreme points seems to be required. It has now been | nearly three-fourths of the whole number, belong to the end for some time fully admitted by all competent authorities | four peculiar genera. 'There is also a peculiar species of Tobago. that the islands of Trinidad and Tobago, which the geo- | Buzzard, agreeing closely in every habit and even in tone grapher might be inclined to class with the Antillean chain, | of voice with the carrion-eating Polybori, and originally

must be regarded as being truly portions of the South- | described as the type of a distinct genus under the name American continent, detached in comparatively recent times, | of Cracirex galapagoensis. Apparently, too, there is a

and even now only separated from Venezuela by a compa- | distinct and peculiar Barn-Owl (Aluco punctatissimus), but

ratively shallow sea, Neither of these islands has a single | alongside of it we have the widely-spread Short-eared Owl

peculiar species,! and except, perhaps, some stragglers from | (As?o accipttrinus), though examples of this last are said to

the north, not one which is not also found on the nearest | present in these islands sufficient difference to justify the mainland, though, of course, many inhabitants of the neigh- | bestowal upon them of a distinct specific name. Among

bouring continent do not pass either the Dragon's or the | Water-birds, the Rallide and Ardeide furnish, the former Serpent's Mouth, as the two narrow channels which cut | one and the latter two, species not known elsewhere. A

off Trinidad from South America are called. We may | remarkable fact, also, is the asserted existence of a peculiar

presume that the various islands, Margarita, Curacao, and | species of Flamingo (Phenicopterus glyphorhynchus), seeing

Oruba, which lie off the northern coast of Venezuela, also | that most of the birds of this genus have a very extended

belong to this Subregion, though scarcely anything is known | distribution, A Penguin also (Spheniscus mendiculus) is

of their animal products. at present only known from the Galapagos; but consider-

Very different from this state of things is that which | ing the range of other forms of this family (Spheniscida),

obtains at the opposite extremity of the Subregion. The | we should, perhaps, be premature in as yet pronouncing Galapagos. interesting group of volcanic islands known as the Gala- | it a peculiar species, though the existence of a Penguin at

pagos present not nierely a large number of peculiar species,

all under the equator raises a presumption that such may be the case.

but 4 peculiar genera of Land-birds; 1.of these, Certhidea, belongs to the Cerebide, and the other 3, Geospiza, Ca-

*There is, however, one feature in the avi- Their Sub- fauna of these islands which should not be overlooked. regional Notwithstanding that the Galapagos are here placed as **S!gnation*

marhynchus, and Cactornis, seem to come into the family Emberizide.2 It was Mr Darwin who first drew attention

1 Trinidad has about 350 species—one of them (Psittacula cingu- lata) was thought to be peculiar, but Mr Salvin informs the writer that it has lately been procured in Guiana. The nearest approach, perhaps, to peculiarity is in a Thrush, which was originally described as being specifically distinct, under the name of Turdus xanthoscelus, but its claims to that consideration are now disallowed.

+ A very considerable amount of uncertainty, which at present can- not be removed, though it produces some confusion, appertains to the right position of many of the New-World forms of so-called Buntings (Hmberizide) and Finches (Fringillide). The writer is fully inclined to believe that the distinctness of these two families, which among forms of the Old World has long been recognized, and that almost without difficulty, can be fairly established, since it seems to rest on good osteological characters; but the American genera have not yet been sufficiently examined to allow of many of them being allotted without much doubt. This uncertainty will most likely in time be removed, unless—and such a probability cannot be denied —some of the New-World forms turn out to be so much generalized as to fill up the gap which now presents itself between the two groups as observed in the Old World. Meanwhile, the consequent inconvenience is un- avoidable,

forming an outlying portion of the Subandean Subregion, the fact must not be concealed that their ornis seems to have no very special or intimate relation thereto, All that can be averred of it is that it is American. In the sub- region just named, as has been above shown, the Z'rochi- lide attain their maximum of development, yet no Hum- ming-birds are found in this

archipelago. So also with the Tanagride, of which there are abundant Subandean repre- sentatives, the Dendrocolaptide, Formicarude, and other characteristic Neotropical families. In the Galapagos none of them are found. It is true that the presence of a species of the South-American genus Pyrocephalus, and of a genus of the Neotropical family Cerebidew, may be a set off on the other side; but on the whole, it seems quite likely that the relations of this isolated, equatorial province (for so it is entitled to be deemed) are as near to the north as to the south, if not nearer, and it is quite possible that, having its ornithological characters only in view, future zoogeographers may think fit to ally it to the former rather

Central- American Subregion.

than the latter. But the affinities of its Reptilian fauna point toa connection, however remote in point of time, with South America, and accordingly the Galapagos are here left in that Region to which they have been commonly assigned.

(5.) The Central-American Subregion is the next to be considered, and in treating of it we become aware of a dis- turbing force which renders impossible the laying down for it of anything like a definite frontier. This disturbing force is the entrance, as before intimated, of a Nearctic fauna which runs along the backbone, so to speak, of the Sub- region to an unknown but variable extent ; for part of this Nearctic fauna ebbs and flows according to the season of the year, in winter possibly creeping down the mountain- sides, and being strongly reinforced by immigrants from the north, but in summer retiring northward and perhaps up- ward, so as to occupy only the most lofty ridges. Yet that two Subregions here unite and inosculate is certain ; but in considering the Central-American avifauna, we have to guard ourselves against this periodic stream of northern immigrants, and cannot deal with it precisely in the same way as we have done those Subregions further removed from the influence which is here so strongly manifested. In Central America, though its ornis is of the richest, we find not a single peculiar family of Birds, and those which it, toa more or less limited extent, shows with the other Subregions of the Neotropical Region have been already named, except the Ampelide, a small but widely-

ranging family of the northern hemisphere, which it has in common with the Antillean Subregion. 5 other families, however, Paride, Sittide, Certhiide, Laniude, and Meleagride, be- longing also to the Nearctic Region, occur here. Of genera which are not found elsewhere in the Region, it seems to have 93, but 47, or just more than half, of them are also found in the Nearctic Region; and therefore to obtain any- thing like a true notion of the Central-American ornis, it will be necessary to keep the two categories apart. Taking first those which are absolutely peculiar, we have 2 belong- ing to Turdide, 1 to Troglodytide, 2 to Mniotiltide, 1 to each of Vireonide, Ampelide, and Tanagride, 3 to Emberi- zidce,1 1 to Icteridw, 2 to Cormide and Tyrannide respec- tively, 1 to Cotingide, 2 to Formicariide, 19 to Trochi- lide, 2 to Momotide, 1 to each of Trogonde, Cuculide, and Psittacide, 2 to Cracide, and 1 to Tetraonide. Then, taking those not found elsewhere in the Neotropical Region, but inhabiting the Nearctic, we have, as occurring in Central America, 1 belonging to Zwrdide, 2 to Syl- viide, 3 to Paride, 1 to each of Sittide and Certhtide, 2 to Troglodytide and Mniotiltide respectively, 1 to Laniide, 2 to Ampelide, 14 to Hmberizde,! 3 to Fringillide, 2 to Icteride, 1 to each of Tyrannide, Trochilide, Picide, and Cuculide, 2 to Strigide and Anatide respectively, 1 to each of Columbide and Melea- gride, 2 to Tetraonide, and 1 to Charadride.

Nicely balanced as these numbers are, they shew a result which might well have been expected from the physical and geographical configuration of the country, while the numbers of other families peculiar to the Neo- tropical Region, though shared by some of its Subregions, as already given, prove incoutestably the propriety of including Central America with that Region; and this would come out even more plainly did our limits permit of the investigation being extended to species, though so many northern forms here find their winter-quarters. It remains to remark that almost the only island of any im- portance belonging to the Subregion is Socorro, the largest of a small group lying to the westward of Mexico in lat. 18° 30’ N., and long. 111° W. Here out of 9 species of Land-birds, 4 have been described as peculiar, 2 others are

1 See preceding footnote.

elsewhere known as occurring only on the Tres Marias, a little group some 250 miles nearer the mainland, and 1 is regarded as a local race of a continental species, leaving but 2 (both Birds-of-prey) which cannot be deemed auto-) chthonous. The still more remote Cocos Island, lying in lat. 5° 33' N., and long. 87° W., from which one peculiar . species of Coccyzus (Cuculide) is known, may belong just | as likely to the Subandean as to the Central-American Sub-

region.

(6.) The Antillean is the only one of the Neotropical Sub- Antillean

regious the precise boundaries of which can be definitely Subregion, laid down ; and it is in many respects one of the most sug- gestive and interesting, comparatively small though it be. Extending from Cape San Antonio de Cuba in the west to Barbadoes in the east, its greatest length is only about 1700 miles, and from Abaco, one of the Bahamas, in the north to Grenada in the south, it does not cover 15 degrees of latitude, while within these limits the proportion of land to water, being less than 98,000 square miles, is very in- considerable. 'The unbroken chain of islands which are commonly known as the "' West Indies "—though that term rightly includes not only all of the "Spanish Main," but an indefinite extent of coast lying both north and south of the ancient dominions of the Catholic King in the New World—forms, geographically, a second line of connection between the two halves of the American continent, sepa- rated from the great western isthmus by the deep waters of the Caribbean Sea and the Gulf of Mexico, and at once suggests a former communication by land with Yucatan at the one extremity and with Venezuela at the other, to say nothing of a possible junction with Florida. Yet, as will presently be shewn from a consideration of the peculiar forms of Bird-life which have grown up along the chain, any such communication, if it ever existed, must have been exceedingly remote in point of time ; for narrow as are the channels between Cuba and the opposite coast of Central America, between the Bahamas and the south-western peninsula of North America, and between Grenada and Tobago (the last belonging zoologically, as has been already demonstrated, to South America), the fauna of the Antillean chain, instead of being a mixture of that of the almost contiguous countries, differs much

from all, and exhibits in some groups a degree of speciality which may be not unfitly compared with that of oceanic islands. Except such as are of coral formation, the Antilles are hilly, not to say mountainous, their summits rising in places to an elevation of 8000 feet, and nearly all, prior to their occupation by Europeans, were covered with luxuriant forest, which, assisting in the collection and condensation of the clouds brought by the trade winds, ensured its own vitality by precipitating frequent and long-continued rains upon the fertile soil, Under such condi- tions we might expect to find an extremely plentiful animal population, one as rich as that which inhabits the same latitudes in Central America, not many degrees fur- ther to the west; but no instance perhaps can be cited which shows more strikingly the difference between a con- tinental and an insular fauna, since, making every allowance for the ravages of cultivation by civilized man, the contrary is the case, and possibly no area of land so highly favoured by nature is so poorly furnished with the higher forms of animal life. Here, as over so large a portion of the Australian Region, we find Birds constituting the supreme class—the scarcity of Mammals being accounted for in some measure as a normal effect of insularity.

Glancing at the entire chain, we may first set aside the Bahamas, a succession of emerged coral-reefs founded on, and to the south and east surrounded by, shoals or banks, broken only here and there by deeper channels; and then

| by drawing a line to the south of the islands of St Croix

Character- istic fami- lies and genera,

NEOTROPICAL REGION.]

and St Bartholomew, we find that this line divides the chain into two groups of distinct character—that lying to the southward and eastward, almost identical with the " Windward Islands" of some geographers,! which, except- ing Antigua and Barbadoes, are almost entirely volcanic, while no direct trace of recent volcanic action is known in the group lying to the northward and westward. These three divisions, however natural in appearance, can hardly be affirmed to form as many zoological provinces, owing to the absolute dearth of information respecting many of them, and

the insufficient amount which has been received of the remainder. 'Taking the whole of the Antillean Subregion, the Bahamas, Cuba, Jamaica, St Croix, St Thomas, Som- brero, St Bartholomew, Guadeloupe, Dominica, Martinique, and St Lucia are the only islands of the ornithology of which we have anything more than what may be called a casual account ; and hence, though valuable observations respecting some of the rest have been placed on record by travelling naturalists, any attempt to separate the Sub-region into proper provinces would necessarily be of the erudest kind, and here cannot be made, though doubtless such provinces will eventually be defined with precision. Still enough is known of the Birds of this Subregion to enable us to draw some conclusions, though certain of them seem especially likely to be overset by further in- vestigation. It is inhabited by some 41 families, 1 of which (Zodide) is not found elsewhere, 2 more (Cwrebide and Cotingide) are confined to the Neotropical Region, 8 (Mniotiltidee, Vireonide, Tanagride, Icteride, Tyrannide, Trochilide, Cathartide, and Aramid) are common to that and the Nearctic Region, but are peculiar to the New World, and 30 are of much more general distribution, but 2 of these (Trogonide and Fregatide) are not found in the Nearctic Region, and, as the above numbers show, there is no family common to that Region and the Antillean Sub- region without also occurring in other parts of the Neo- tropical Region. On the whole, therefore, the affinity of the Subregion to the Neotropical rather than to the Nearctic Region is fully made out. About 140 genera are found in the Antilles, of which 30 are peculiar to it, being a considerably larger proportion than is elsewhere found in the Neotropical Region. Of these 30 genera, which are all Land-birds, 4 belong to Turdide, 1 to each of Mniotil-tide, Vireonide, Ampelide, and Cerebide, 2 to Tana- gride and Emberizide respectively, 1 to each of Icteride and Tyrannide, 5 to Trochilide, 1 to Caprimulgide, 2 to Picide, 1 to Todide, 2 to Trogonide, Cuculide, and Strigide respectively, and 1 to Columbide.2 Be- sides these, 21 more, which it is perhaps unnecessary to particularize, do not exceed the limits of the Neotropical region, while 5 others, belonging respectively to the families Cypselide, Fregatide, Anatide, Columbide, and Fallide, occur both here and elsewhere in that Region without reaching the Nearctic except as stragglers. Peris- soglossa, belonging to the family Mniotiltide, is the only genus common to the Nearctic Region and the Antillean Subregion without occurring elsewhere in the Neotropical Region, all the remaining Antillean

genera inhabiting both North and South America, The distribution of some of

1 In the language of others, the " Windward Islands" begin with Martinique and so continue to Trinidad, while the remainder of the Lesser Antilles, lying eastward of Porto Rico, are called the " Leeward Islands." Other authorities name all the smaller islands so far as St Thomas "Windward Islands," and those further westward the "Leeward." Creoles appear to apply these terms relatively to their own habitation, just as the dweller on the bank of a river speaks of "up stream" and "down stream" with sole reference to the position he occupies on the margin; and it might be wished, though that were vain, that the use of terms so little definite should be abandoned.

- *This genus (Starnenas) has been said, however, to occur in the Florida Cays, but the statement seems doubtful,*

the peculiar genera merits a little attention, for 19 out of the 30 are confined to a single island, or nearly-connected group of islands. Thus, Cuba has 6 believed to be re- stricted to its soil; Jamaica, 7; Hispaniola, 2; and the so-called "' Windward Islands," probably 4; while none are known to be absolutely limited to the Bahamas, to Porto Rico, or the Virgin Islands. It is possible, indeed, that Hispaniola and Porto Rico, if as well explored as Cuba aud Jamaica have been, might tell a very different story.

Pursuing the subject further, and entering, so far as Resident space will allow, upon a consideration of details, we find and mi-

that there are of Land-birds about 200 resident species, and nearly 90 which are not resident, but migratory. These last belong to about 55 genera, of which some 40 have no resident insular representatives, while those migrants per- taining to genera which possess permanent residents are nearly all as much Neotropical as Nearctic in character. Most of these, so far as is known, visit Cuba only, where over 80 are recorded as occurring,

while but 30 reach Jamaica. The number, however, in tle island last named, and in others, would most likely be not inconsiderably increased did competent observers but exist, though the fact that a well-known species like the Humming-bird of eastern North America (Z'rochilus colubris) does not seek its winter-abode in any of the islands except the Bahamas and Cuba, tends to lessen the force of such a supposition, and points to our actual knowledge being not very far wrong. Among the more interesting of peculiar forms is one genus of Z'urdide (Mimocichla), which is represented by 4 distinct species, found in the Bahamas, Cuba, Jamaica, and Hispaniola respectively. Another genus of the same family (Margarops) has a species ranging from Hispaniola to the Virgin Islands, and a second species inhabiting Martinique and St Lucia only, these two islands possess- ing at the same time a third and peculiar genus (Lham- phocinclus), containing but a single species, common to both, while they also have another genus (Cinclocerthia), a distinct species of which inhabits either island, though a third species of the same is found in Guadaloupe and Nevis. The genus Certhiola, belonging to the Cerebide, is remarkable in that it occurs in nearly every island ex- cept Cuba; but what seems to be still more extraordinary is that the species found in the Bahamas (C. bahamensis), and there alone in the whole Subregion, also occurs in Cozumel, an island off the coast of Yucatan, though Cuba intervenes. The distribution of Spindalis, one of the Tanagride, resembles that of Mimocichla, above noticed, only that here Porto Rico also has its distinct representa- tive species. Of the peculiar genera of Humming-birds, Hulampis has 2 species —one ranging from St Lucia to Nevis, but the second extending northward to St Thomas. Arthurus, a very remarkable form, is restricted to Jamaica, while Mellisuga is common to that island and Hispaniola— each of these genera consisting of but one species only, and the last is the smallest known bird. Orthorhynchus seems to have 3 species, one extending from St Thomas to Dominica, a second (perhaps barely separable) common to Martinique and St Lucia, and a third to St Vincent and Barbadoes ; and, finally, Sporadinus has one species in Cuba and at least one of the Bahamas, a second species in Hispaniola, and a third in Porto Rico. Of genera of Humming-birds, which are not confined to the Antilles, Lampornis, a widely-ranging genus, has two species peculiar to Jamaica and Porto Rico respectively ; while a third extends from Hispaniola to St Thomas. Calypte, which has two species in Mexico, has a third peculiar to Cuba, while

Doricha is represented in two of the Bahamas (New Providence and Inagua) by as many distinct species; the other three described species of the form inhabiting Central America, and none, so far as known, occurring in

Cuba; and thus we have afforded us another case of interrupted generic distribution somewhat like though not quite so extraordinary as that of Certhiola already noticed. In all, about 17 species of Zrochilidew are found in the Antilles, of which only one, and that of exceptionally developed migratory habits, occurs elsewhere. The pecu- liar family Zodid@w has been already mentioned ; and it is only necessary here to remark that the single genus Z'odus which it contains seems to have 5 species, one limited to each of the large islands, Cuba, Jamaica, Hispaniola, and Porto Rico, the fifth being from an unknown locality.? Much the same has to be said of Saurothera, a genus of Cuculide, which is represented by a distinct species in each of these four islands, while another genus of the same family, Hyetornis, with one species, is peculiar to Jamaica. The 7'rogonide have two genera, Prionoteles and Temnotrogon, each with a single species, the former peculiar to Cuba, and the latter, which exhibits a remarkable affinity to the African genus Hapaloderma, to Hispaniola. Pseudoscops, a genus of Strigide, is peculiar to Jamaica, but Gymnoglaux, belonging to the same family, has one species limited to Cuba, while a second extends from Porto Rico to some of the Virgin Islands. Cuba also, besides a widely-ranging species of Kestrel (Zinnunculus), has a second species which is peculiar to the island. Jamaica, on the other hand, seems to have no Kestrel at all.

Any speculations as to the former history of the Antilles derived from our imperfect knowledge of their existing ornis would be vain. It is enough to perceive, as the preceding facts will show, that there must here have been no ordinary amount of upheaval and subsidence, of turning land into water and water into land, to account for the present distribution of their avifauna. More wonderful than any evidence given by the Birds, is that which is afforded by other Classes. It is asserted that Solenodon, an Antillean genus of Insectivorous Mammals, has its nearest ally in a Malagasy form ; and a splendid Butterfly, found only in Jamaica (Urania sloanit), belongs to a genus of which while two other species are known

from Central and South America respectively, the only other genus re- sembling it is one that inhabits Madagascar.

BIRDS

[DISTRIBUTION.

that it seems possible to count for this region, only 1, Chameide, is peculiar, and the validity of the grounds on which this has been established as such may be open to question; 44 of them are also Palearctic; and the remaining 18 are common to the Neotropical Region, of which last number at least 4 (Trogonide, Plotide, Fregatide, and Phaetontide) have a much more extended range. Thus there are 14 peculiarly American families left. These are Mniotiltide, Cerebide, Tanagride, Vire- onde, Icteride, Tyrannide, Trochilide, Momotide, Aride, Cathartide, Cracide, Meleagride, Tantalide, and Aramide. But the propriety of here admitting Z''rogonde (mentioned above) and MJomotide is very doubtful ; for, though included by Dr Coues, they are omitted by Professor Baird from his Morth American Birds, the most recent work on the subject. The claim of Cerebide@ to be con- sidered Nearctic is also slender, resting on the fact that a small colony of the Sugar- bird which inhabits the Bahamas (Certhiola bahamensis) has established itself on one of the Florida Cays. The Aride are represented in the Region by a single species only—the long-known Carolina Parra- keet (Conurus carolinensis); and the Tanagridw, a family containing upwards of forty genera, have but one genus (Pyranga), exemplified by four or five species, out of about a dozen, which occur within its limits.

On the other hand, the peculiarly American families best represented in the Nearctic Region seem to be four in number,—Mniotiltidw, by 13 genera and about 50 species, Vireonide by 1 genus and 14 species, Jcteridw by 8 genera and 21 species, and Zyrannide by 8 genera and 26 species. 'The first of these, however, can alone be re- garded as eminently characteristic of the Region, since that affords a home to all but 3 of the genera, but at the same time, only about one-half of the described species occur there. None of the rest can compare with it in this respect, Vireontde having 5 genera and 50 species, /cte- ride@ 24 genera and 105 species, and J'yrannide 71 genera and 324 species in the Neotropical Region.

Coming now to the genera of Nearctic birds, we may put the number perhaps at 330, of which 24 seem to be peculiar to the Region ; 2 of them belong to Turdida,

Nearctio III, Tux Nearcric Recion comprises all that is left of | 1 to Chamaide, Paride, Troglodytide, and Motacillide REGION, the American continent, after the Neotropical Region has | respectively, 5 to Hmberizidw, 2 to Corvide, 1 to each of Bound- been taken off, and certain outlying groups of islands, such | Picide, Falconide, and Columbide, 5 to Tetraonide, and ae as the Aleutian chain, with its immediate dependencies, | 1 to Scolopacide, Anatide, and Laride respectively. But it and the Bermudas—none of them, however, being of any | is perhaps worth remarking that the families Hmberizid@ and great importance,—as well as the circumpolar lands lying | Tetraoncde, here most abundantly represented by genera, westward of long. 60° W.,and Greenland. The confines of | are still more abundantly represented in like manner else- these two Regions, as before stated (page 748), are as yet | where. In the Neotropical Region we have some 30 and Relations but vaguely traced. All that is known for certain is that | in the Old World some 15 genera of the former, which are to other the more northern runs considerably southward along the | not found in the Nearctic Region ; and the Old World has ra highlands of Central America, and that its influence, as | some 30 genera of the latter which are not found in the determined by the presence of resident genera of northern | New. On the other hand it must be admitted that if we extraction, is perceptibly felt on the summits or slopes of | subdivide the American Tetraonide into sections or sub- the mountains, at least so far southward as lat, 20° N. | families, we find that while one of those sections, the Odon- In the lowlands the boundary lies much further towards | tophorine, is peculiar to America, the balance as regards the north, and, perhaps, in general terms, may be placed | the other, Z'etraonine, is clearly in favour of its greater somewhere about lat, 25° N., while both in lowlands and | development in North America, where we have 3 genera highlands, as above explained, the northern influence | absolutely peculiar, as well as 3 others which are also varies with the seasons of the year, being greatest in | found in the Palearctic Region. With this Region, indeed, winter, when the migratory birds, which breed in the | the Nearctic has about 128 genera in common, having 178 Nearctic Region, have turned their flight southward, and |

which are also Neotropical. Returning to these last pre- least in summer, when they have retired to their northern | sently, it may be advisable here to give some particulars of General homes. If the avifauna of the Neotropical Region could, | those which are common to both sides of the North Atlantic. gia in a wide sense, be truly termed homogeneous, much | 1 belongs to each of the families Zurdide and Cinchde ;

more is this the state of the case with the Nearctic. Of the 63 families? of Birds, which is the highest number 1 A bird of this group was one of those asserted by Ledru to have

formerly occurred in St Thomas (page 734). ? Three of these (Hamatopodide, Recurvirostride, and Phalaropod-

3 to Syluiide, 2to Paride, 1 to Sittide, Certhiide, Troglo- dytide, and Alaudide respectively, 2 to each of MMota-

ee, ee eee

ide) are not regarded as good families by the writer. They are all

common also to the Palearctic Region.

NEARCTIC REGION. |

clude and Hirundinide, 1 to Ampelide and Laniide respectively, 7 to Mringillide, 2 to Emberizide, 3 to Cor- vide, 1 to each of Cypselide and Alcedinide, 3 to Picide, 9 to Strigide, 10 toLalconide, 1 to Columbide, 3 to Tetra- onde and Charadrude respectively, 2 to each of Hema- topodide, Recurvirostride, and Phalaropodide, 7 to Scolo- pacide, 1 to Ibidide and Platalecde respectively, 4 to Ardeide, 1 to Gruide, 5 to Rallide, 1 to Phenicopteride, 18 to Anatide, 1 to each of Sulidw, Pelecanide, and Phalacrocoracide, 6 to Larude, 3 to Procellariide, 1 to each of Colymbide and Podicipedide, and 10 to Aletde.1 Thus it will be seen that no less than 57, or more than one- sixth of the whole 330 genera, are purely Land-birds, —a very large proportion.

The genera which occur both in the Nearctic and Neotro- pical Regions, without appearing in the Palzearctie, must be divided into two categories in order to arrive at a just estimate of the relations of the avifaunas of the first two. These categories consist of those genera which, being only winter visitants to the southern Region, do not breed there, and those which may fairly be called common to both. The latter need perhaps no further attention, after what has been previously said of the Central-American Subregion (p. 748), but the former require some notice. Of those in this category 1 genus belongs to each of the families Syluude and Troglodytide, 8 to Mniotiltide, 6 to Embe- rizide, 1 to Icteride, Trochilide, Picide, and Columbide respectively, 6 to Scolopactde, and 1 to Phalaropodide— 27 in all. These must, of course, be considered charac- teristic of the Nearctic Region, and might, indeed, be not inappropriately added to the 24 genera which are, as already said, peculiar thereto; but even if this be done, we find the number of peculiar and characteristic genera (taken together) of the Nearctic Region to be only 51—a smaller number than that of the genera of Land-birds alone (57) which are common to the Palearctic, and considerably less than half the number of all genera which are found on both sides of the Atlantic (128), while the remaining genera which are strictly common to the Neotropical (151) is much larger again. Thus, regarded simply from an orni- thologist's point of view, what we call the Nearctic "Region" seems to have no right to be considered one of the primary Regions of the earth's surface, and to be of less importance than some of the Subregions of the Neotropical Region, as may be shewn more plainly by the following table :—

Whole No. Peculiar of Genera of | Genera of

Birds. Birds, Patagonian Subregion….. ..... 290 46 Brazilian Sr oatac OOo | 43 Amazonian 3 ree ae | 373 | 7 Subandean So iakuosccc sonnet. 469 | 72 Central-American,, ... 464 | 46 Antillean A oc acc eee 140 30 Wearciie Region….....s00… 330 | 24

It is not, however, intended here to question the validity of the Nearctic Region in a zoogeographical sense. If that position could be successfully disputed, it must be done on more than ornithological grounds, and a consideration of them would be out of place in this article. It is enough to

mention that though the Mammals would possibly lead to much the same conclusion as the Birds do, yet the lower Classes of Vertebrates—Reptiles, Amphibians, and Fishes —would most likely have a contrary tendency, while the present writer is quite unable to guess at the result which would be afforded by the Invertebrates. Now, as in map-

1 Of many American Birds, especially Water-birds, which from time to time occur as stragglers in Europe, no account has here been taken, and, of course, they will not be reckoned in our computation of Pale- arctic genera.

ping out the world into zoological Regions all animals have to be regarded, he has no wish to disturb the scheme which has been so generally approved, but contents himself with pointing out that the case for its adoption is not in this particular instance strengthened by the evidence given by the Class Aves.

A great majority of the Nearctic families and genera of Division

Birds appear to be generally distributed throughout all the "Subregions," or perhaps it would be better to call them "provinces," into which ingenuity can separate the Region. And on this account, as well as from what has been urged in the preceding paragraph, it seems unnecessary to treat of each " Subregion" or " province" so fully as has hitherto been done in the present article. Indeed such districts are not easily defined, and their definition rests rather on differences of species than of higher groups, as we have found to be the case in discussing the several component parts of the other Regions we have considered. Professor Baird, in a masterly treatise on this and another subject,? would first divide that portion of North America which constitutes the Nearctic Region into two principal sections, the Eastern extending from the Atlantic sea-board west- ward across the Alleghany Mountains and over the valley of the Mississippi and its fertile prairies to about long. 100° W., where the sterile plains begin. The western boundary of this division, however, is not sharply defined, nor does it coincide with any meridian line, but lies some- what obliquely and interdigitates with the eastern confines of the next division by extending westward along the river- bottoms. Marching with this irregular frontier we

have the second, or Western, great division reaching thence to the shores of the Pacific, and though the character of its avi- fauna is much the same through and beyond the Rocky Mountains to the eastern slope of the Sierra Nevada and Cascade Mountains of California and Oregon, it changes somewhat on their western slope and thence to the sea, exhibiting modifications which may warrant further sepa- ration into a truly Western and a Central subdivision—thus making in all three provinces for the whole of the more southern part of the Nearctic Region, while each of them shews, as might be expected, indications of additional change, subject in great measure to the degree of latitude under which any particular locality in them may lie. Having thus pointed out the three provinces into which this portion of the Region can be separated, it may be well to cull from Professor Baird's investigations of the subject

some further details. The boundary of the Eastern pro- Allegha- vince, which, taking up an old name, we may perhaps an pro-

term the ' Alleghanian"—from the principal mountain range within its limits,—starts from the Gulf of Mexico, near the eastern border of Texas, pcrhaps between the rivers Brazos and Sabine, and following the course of the former to the great American Desert, in about long. 100° W., runs northward, forced sometimes more or less west- ward, especially along the Platte, and sometimes eastward. It crosses the Platte between Forts Kearney and Laramie, and apparently intersects the Missouri about Fort Lookout. Reaching the southern frontier of the Dominion of Canada, it rapidly inclines to the westward, and including the valleys of the Saskatchewan and the Athabasca, it crosses the Rocky Mountains, and, cutting the river Yukon below the junction of the Pelly and the Porcupine, loses itself in the wilds which border the Arctic Ocean. Since the

Middle province—on which as yet no more precise name Middle has been bestowed—lies for the most part between the Province.

Alleghanian and the Western or "Californian," as it has been entitled, the boundaries of this last had best, so far 2" The Distribution and Migrations of North American Birds," Amert-

can Journal of Science and Arts, ser. 2, vol. xli, pp. 78-90, 184-192, 337-347 (January, March, and May, 1866).

Californian northward is somewhat indefinite.

province.

Canadian province,

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families.

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as is possible, be given. Its extent both southward and The avifauna of Cape San Lucas, at the extremity of the peninsula of Old or Lower California, is said to be thoroughly that of the "Middle" province, but whether the whole of that pro- montory is to be reckoned as belonging thereto, or only its eastern border, is not known. It appears, however, that some of the most characteristic forms of the Middle province find their way to the Pacific coast through a break in the mountains opposite to San Diego, and it is to be remarked that the difference between the species of birds found at Cape San Lucas (of which about a score are absolutely peculiar) and of Mazatlan, though separated only by the breadth of the Gulf of California, is very great. Northward the boundary of the Californian province probably runs along the Sierra Nevada and the Cascade Mountains before named, so that its extent is contracted to a mere strip along the coast, while still further to the north, in British Columbia, no precise details of its limits have as yet reached this country. But it would seem that in Alaska, as will presently be stated at greater length, an avifauna presenting many very different characters from any found elsewhere in America is reached, for here we encounter a number of genuiue Palearctic forms.

But these are not all the zoological provinces into which this part of North America can be separated. A fourth, of especially Arctic type, occupies the northern portion of the continent, and gradually melts away into the rest, extend- ing far to the southward along the highest ranges, even to Fort

Burgwyn, in lat. 37° N., if not beyond. This province may be called the "Canadian," from the ancient colony of that name constituting so large a portion of it, but its limits must be confessed to be indefinite in a high degree. The eastern half, at least, of the British possessions in North America are herein included, and the province may be deemed to extend across Davis's Strait to Greenland.

In noticing these provinces, the results of Professor Baird's researches have been, with little deviation, mainly adopted, but his enquiries have been largely supplemented by the more recent investigations of Mr J. A. Allen, who has admirably carried out the further subdivision of the Eastern, or, as it has been termed, the Alleghanian province, together with part of what has just been denominated the Canadian. Regarding the whole eastern half of the con- tinent as one province, he recognises in it the existence of seven distinct ornithological faunas, namely, the Floridan, the Louisianian, the Carolinan, the Alleghanian, the Canadian, the Hudsonian, and the American-Arctic, comparing them also with the distribution therein of Mammals and Reptiles.? To describe more fully the boundaries of these faunas would be to enter on matters too special for our present purpose, and it must suffice to direct attention to this essay of Mr Allen's, which, like others of his,? though their titles may seem to indicate for them but a limited scope, has, in truth, a very general bearing.

The provinces above named (and naturally the districts which they comprise) appear to be characterized rather by the presence or absence of certain species of widely-spread genera than by the presence or absence of the genera themselves, and much less of families, but it seems expe- dient to notice some of the chief exceptions to general distribution in the latter of these groups. First we have the peculiar family of Chamceide, restricted so far as is knowu to the coast-district of California, where it is repre- sented by a single genus and a single species; and then

1 Bulletin of the Museum of Comparative Zotlogy at Harvard College, vol. 1i. pp. 387-407.

2 Memoirs of the Boston Society of Natural History, vol. 1. pp. 448-526, and Bulletin of the Museum of Comparative Zodlogy, vol. iii. pp. 113-183.

among families of greater range, the Cwrebidw, already introduced to us as a Neotropical group, but in the Nearctic Region existing only in the case of the colony of a species of Certhiola before noticed; the Arzde@, nowadays almost limited to Western Louisiania, Arkansas, and Florida, but formerly known along the whole valley of the Mississippi to the verge of the Great Lakes, and even occasionally penetrating to Pennsylvania and the State of New York; the Cathartide, of which one genus (Pseudogryphus), having for its sole species one of the largest birds of flight, the Californian Vulture (P. californianus), is confined to the Pacific coast from a little north of the Columbia River to the Colorado, extending eastward to the Sierra Nevada, while of another genus (Cathartes) one species ranges from the Strait of Magellan to the Saskatchewan, but a second hardly strays further northward than North Carolina, and does not occur on the Pacific coast of the United States ; the Turkeys (Meleagride), found only to the eastward of the Rocky Mountains, and now extinct in most of the settled districts of Pennsylvania, New England, and Canada; the Wood-Ibises (Tantalide), belonging to the southern country from the Colorado eastward, and so far to the north as the State of Ohio and the Carolinas ; the Spoonbills (Plataleide), with apparently much the same range as the last, but more limited towards the north, being of only accidental occurrence on the Lower Mississippi and in the Carolinas; the Courlans (Aramid), frequenting in this region only the shores of the Gulf of Mexico and the coast of Florida ; the Flamingoes (Phenicopteride), with haunts nearly as much confined, though occasionally reaching South Carolina; the Pelicans (Pelecanide), having one species abundant in the Western and only by chance occurring in the Middle and Eastern states, while a second is of strictly marine habit, and is found on the coast of California, and in the Gulf of Mexico and the shoals of Florida. The single representative of the Darters (Plotida) in summer reaches North Carolina and Illinois, but that of the Frigate-birds (/'regatide) is confined to the shores of the great Gulf, while that of the Tropic-birds (Phaetontida) not only haunts the same waters but also finds a nursery in the Bermudas ; the species of Divers (Colymbide) breed only in the north—Halifax, in lat. 45° N., being perhaps their most southern limit of

reproduction ; while, finally, the Auks (Alcide), Sea-birds of northern range, exhibit a most remarkable development of genera, species, and individuals on the rocky cliffs and islets which rise from the North Pacific.

Reference has already been made to the peculiarity of Alaska.

the avifauna of Alaska—Russian America, as it was for- merly called,—and its character needs brief notice. The list of Birds observed in this territory, as given by Messrs Dall and Bannister,' seems after due revision to number 210 species. Of these 96 are Land-birds, belonging to 63 genera, whereof 20 at the outside are peculiarly American, while of the remaining 43, which are common to the Nearctic and Palearctic Regions, 3 are found nowhere else in the New World but in Alaska, and their occurrence there does not preclude us from setting them down as being emphatically Palearctic forms. Two of them are actually represented by species common throughout the greater part of Asia and Europe, as is the case with Budytes flavus, a Yellow Wagtail, and Phylloscopus borealis, a Willow-Wren, while the third is a peculiar species of Bullfinch, Pyrrhula cassint. Of the whole 96 species of Land-birds, 23, or nearly one-fourth, are common to the two Regions. The Water-birds, amounting to 115 species, are referable to 63 genera, of which only 4 (all belonging to Scolopacidee) are

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3 Transactions of the Chicago Academy of Sciences, vol. i. pp. 267-

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NEARCTIC REGION. |

peculiarly Nearctic, though of the species 58 are truly American against 52 common to both Regions, one of these last, however, not having been found elsewhere in the New World, while the home of 5 seems doubtful. These numbers will show the great influence of Palearctic forms on Alaska, and it only remains to be said that some of the ordinary summer-migrants thither would seem to arrive there from Asia, as the Wagtail and Willow-Wren just mentioned, to which should possibly be added the Wheatear (Saaicola ceenanthe), for though that species is known as a regular annual visitant to

Greenland and Labrador (where it breeds), and almost annually appears as a straggler on the eastern coast of the United States, the flocks which throng the stony hill-tops of Alaska in spring are not likely to have performed a north-west passage from Europe, and indecd it is stated that specimens from Norton Sound differ considerably in dimensions from those obtained in Green- land. All these Birds are unseen in British Columbia, and as all are migratory, the inference that they make some part of Asia their winter-quarters is almost irresistible. After all, perhaps there is nothing very surprising in this, when we consider the narrowness of the channel! by which in these longitudes the New World is divided from the Old,

belong, none are peculiar to the Palzarctic Region, while 2— Zonotrichia, one of the Hmberizide, and Rhodostethia, one of the Laridce—are peculiar to the Nearctic. If we take the species, we find that of the 63 inhabitants, those peculiar to the New World amount to 11, while those not elsewhere dwelling out of the Old are only 5. But, on the other hand, the Sea-Eagle (Haliaetus), the Ringed Plover (Zgia- litis), and the Snipe (Scolopax) which breed in Greenland are those of Europe instead of their American congeners ; and the Wheatear (Sawxicola), the Sanderling (Calidris), the Knot (Tringa canutus), and the Bernacle Goose (Bernicla leucopsis) would appear to cross the Atlantic from the east, while 43 out of the 63 inhabitant specics are every bit as much Palearctic as Nearctic; and 2 more, the Ptar- migan (Lagopus rupestris) and Barrow's Duck (Clangula astandica) breed abundantly in Iceland. Following the western coast-line (for of the eastern we know little) to the Arctic circle,? we find the proportion of forms which are comnion to the Palzarctic Region increase, until in lat. 75° N. or thercabouts, there are (so far as our means of infor- mation will allow us to judge) no species of Birds which have not been known to occur, and only about 5 which have not been known to brecd, in the Old World.

and it would seem that it is almost within the confines of the Arctic circle that, apart from circumpolar specics, the connection of the faunas of the two continents is closest.

It has been already stated that 128 out of the 330 Similarity Nearctic genera, or more than one-third, are common also of Nearetie

; 3 : : and Pale- to the Palearctic Region. This will serve to shew the great eccine

Aleutian At any rate, the Aleutian Islands, though they look like | similarity of the two; and if we investigate the specics, fauna, and Pry- stepping-stones from the one to the other, do not appeat | the similarity is still to a great extent borne out. Taking Sa: to be used as a route of communication ; for Mr Dall calls | the number of Nearctic species at 700 (which is perhaps especial attention to the fact that no intrusion of Asiatic | an exaggeration), and that of the Palearctic at 850 (which forms occurs towards the western end of the chain, while | is certainly under the mark), we find that, exclusive of observing that its avifauna beyond Oonalaska is reinforced | stragglers, there are about 100 common to the two Regions. by several Arctic species not possessed by more eastern | Nearly 20 more are Palearctic but occasionally occur in islands." America, and about 50 are Nearctic which from time to Northward of the Aleutians lies a little volcanic group | time stray to Europe or Asia. But this is not the only known as the Prybilov Islands, whose coasts are frequently | ground of the resemblance. Of many genera the species encumbered by ice, and there only 40 species of | found in the New World are represented in the Old by Birds have as yet been found, while those which breed are | species which often no one but an expert can distinguish. about 12in number, and among them a Sandpiper (Z'ringa | Of such representative or parallel species, somewhere about ptilocnemis), apparently peculiar to St Paul's Island, the | 80 might be enumerated ; and thus the relation of the two largest of the group. Only one of the characteristically | regions may be concisely stated :— Palearctic forms, and this also a Water-bird (Limosa —. i ies ee ee uropygialis), which appear but in Alaska, seems li to eh bec | (say) 700. a ere (say) 850. occur —a fact which points yet again to the more northern | Species of one ne re ee connection of the two continents by way of Cape Prince-of- gion represented by (...) 39, Species identical in| (0.99, Wales and the East Cape (Vostochni) of Asia. eT wt forms (9) Pee EE ras Pe Bermudas. We have next to turn to another group of islands, | pajmarctic species oc- Nearctic species occa- situated in a different ocean, and in formation very unlike

casionally found in } (say) 20. — sionallyfoundin the (say) 50. that last considered. These are the Bermudas, a cluster of | the Nearctic Region Palearctic Region.. low coral-reefs rising from the Atlantic, about 600 miles IV. Tue Pauzarctic Recion begins with the Atlantic Paua- from Cape Hatteras, the nearest point on the eastern coast | [Islands (the Azores, Canaries, and Madeiras) and includes 48¢T!C of North America. They possess but few Land-birds, and that portion of North-west Africa which was formerly not a single peculiar species, yet they play by no means | ;nown as the Barbary States, the whole of Europe and its Bound- an unimportant part as a resting-station to the flocks of | jslands—from Iceland and Spitsbergen to those of the aries. migrants as they retreat southward from their northern | Mediterranean—Asia Minor, Palestine, Persia, Afghanistan, homes in Labrador and Greenland, and, though less often, | and all the rest of the Asiatic continent lying to the north on their northward journey in spring. Only about 6 Land- | ward of the Himalaya Mountains and of a line drawn birds are resident, and about as many Water-birds are | gs though it was a prolongation of that range to the east- Biowl wo breed there: but'the nuwiber of stragglers is |... —. .. large, and includes two or three of undoubtedly Huropean 3 Pcople are apt to forget that Cape Farewell, the most southerly extraction. point of Greenland, lies in the latitude which cuts the Shetlands and Greenland. Greenland is the last portion of the Nearctic Region to | passes far to the south of Iceland; and a large portion of the

which we shall especially invite attention, and there though the character of the avifauna is certainly that of the New World, yet that of the Old is very influential. 'Out of the 45 genera to which the feathered inhabitants of Greenland

- *Behring's Strait is said also to be very shallow, which fact is sug- gestive as to a still ercater interchange of animal life in past ages.*

2 Proceedings of the Californian Academy of Sciences, 14th March

1874,

country though undoubtedly exposed in the highest degree to the rigours of an Arctic climate, is situated outside the Arctic circle.

4 Professor Baird, in the essay before cited, has reasonably accounted for this disproportionate reciprocity between Europe and America; but perhaps something more than he has allowed must be set down to the comparative want of records in the new country, where observers and amateur collectors have until lately been scarce. This want is, however, being specdily supplied by the numerous students of ont-of- doors ornithology, who are everywhere springing up throughout the United States,

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Homo- geneity of its fauna.

Its limits generally definite,

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ward somewhere between lat. 30° and 35° N. tillit meets the Pacific Ocean, besides Japan and the Kurile Islands. 'he propriety of comprehending this euormous tract in one Zoological Region was first shown by Mr Sclater, in the paper to which reference has before been made,! and as regards the distribution of most classes of animals there have been few to doubt that it is an extremely natural one. Not indeed altogether so homogeneous as the Nearctic Region, it presents however even at its extreme points no very striking difference between the bulk of its Birds. Though Japan is far removed from Western Europe, and though a few generic fornis and still fewer families inhabit the one without also frequenting the other, yet there is a most astonishing similarity in a large portion of their respective Birds. In some cases the closest examination has failed to detect any distinction that may be called specific between the members of their avifauna; but in most it is possible to discover just sufficient difference to warrant a separation of the subjects. Nevertheless it is clear that in Japan we have as it were a repetition of some of our most familiar species—the Redbreast and the Hedge- Sparrow for example—slightly modified in plumage or otherwise so as to furnish instances of the most accurate representation.

The limits of the western portion of the Region are definite enough, for except in its African province it is girt by the sea, but even there we find a boundary hardly inferior to a coast-line in the precision with which it may

be recognized and in the influence it exerts. This is the Great Desert, commonly knowu as the Sahara, which, though yearly crossed by innumerable multitudes of many of the more migratory species, just as the sea itself is traversed by them, acts as a complete barrier to the less migratory and to the residents, cutting off the denizens of Morocco, Algeria, and Tunis from the rest of the continent to which they are geographically attached. Further to the eastward, however, the limits of the Region are if in any way marked at least but little known, though indications are not wanting to show that the avifauna of Tripoli is rather Ethiopian than Palzearctic in its character. When we reach Egypt we have a state of things which may be compared to that debatable land in Central America wherein the Neotropical and Nearctic avifaunas meet but hardly mingle. During winter the bird-population of the Nile-valley is formed almost exclusively of the hordes of European migrants of nearly all Orders and families which there seek refuge. When spring returns these begin to troop across the Mediterranean, and their place is taken by the indigenous Birds of Egypt which had been either reduced to coinparative insignificance by, or actually thrust out before, the northern invaders. The seaboard of Palestine, and even its interior, until the western limits of the Jordan-basin are touched, are on the contrary almost purely Palearctic, but the depressed valley of the Ghor, part of which is sunk about 1300 feet below the level of the Mediterranean, seems to be an outlier of the Ethiopian Region, and though the scanty avifauna of the Mountains of Moab may possess a northern phase, the desert, with its characteristic, and in the main Ethiopian, forms of animal- life almost immediately succeeds, and it is not until the fertile plains of Mesopotamia are approached or attained that we can feel assured we have again entered the Pale- arctic area, which may be considered to reach the head of the Persian Gulf. Coasting this inlet on its eastern side we havea fauna the character of which it is as yet impossible to declare, and this difficulty becomes greater still when we emerge into the Indian Ocean. It seems most probable

1 Journal of the Proceedings of the Linnean Society, Zoology. vol. ii. pp. 134-138, = is

that Beloochistan belongs to the Falzeartic Region, but if not then the line of demarcation must run inland and so continue between that land and Afghanistan till, ascend- ing the right bank of the valley of the Indus, it turns the shoulder of the Great Snowy Range and thence proceeds in the direction already traced parallel to the southern frontier of Thibet, and across the intervening portion of the Chinese Empire, ouce more to the ocean. Arrived here the remaining limits of the Region are as well marked by the coast-line as they were in Europe. They extend to Kamchatka, and rounding the furthest verge of Asia, within the Arctic Circle, they return by the north coast of Siberia till the confines of Europe are again reached.

To separate this vast area into subsidiary districts Subdivi- according to the zoological properties of each is perhaps a S!0Ds.

less easy task than is the same operation with regard to the Nearctic Region, and, as in that case, the mapping-out of the whole into Subregions is almost impossible except it be done arbitrarily. Nevertheless the attempt must be made, and, though in the Asiatic half considerable assist- auce is to be derived from a careful essay by Mr Elwes,? respecting the European moiety much doubt may be reasonably entertained.

The very fulness of the information which we possess as to the ornis of some countries of Europe makes the scarcity of it in respect to others all the more conspicuous, and renders any really comprehensive view of the whole all the more difficult. Grounds are not wanting at first sight in favour of a longitudinal or approximately longitudinal division of this quarter of the globe, in which case the line of demarcation might be taken to run up the Adriatic Sea, and starting from the neighbourhood of Trieste, to cross the Carnic Alps, descend the valley of the Inn till it falls into the Danube, and thence follow the angular mountain-froutier of Bohemia as far as the head-waters of the Niesse, along which it would proceed to their junction with the Oder,.and so to the Baltic a little to the westward of Stettin. Thence it might be continued northward be- tween CHiand and Gottland up the Gulf of Bothnia to the confines of Sweden and Finland, where cutting the Scandinavian peninsula to the westward of the Lower Tornea and its affluent the Muonio it would strike the shores of the Arctic Ocean perhaps

on the Lyngen Fjord. Though undoubtedly most species of Birds are common to both sides of this imaginary line, yet it would be found to divide the breeding-range of a few which are very character- istic of the east and west of Europe respectively. But on further consideration it would seem that though such a division as has just been suggested may be convenient if not natural for the couutries lying north of the Mediter- ranean basin, those, such as the three principal peninsulas which project into the great inland sea, together with the portion of North Africa which was at oue time known as Mauritania, form a group which have much iu common, and collectively differ more from the countries lying further to the north than the two (Eastern and Western) divisions of Central and Northern Europe, just suggested, do from one another. Accordingly it seems best to adopt primarily a latitudinal division of the Western part of the Palearctic Region.

Balkan, the Black Sea, and the Caucasus, and since it would thus comprehend by far the greater portion of this quarter of the globe, we may not inappropriately call it the " European" Subregion, further subdividing it if we think fit into a Western and an Eastern Province, accord- ing to the boundary above traced—the eastern boundary of the last being indeed very uncertain, though perhaps to

2 Proceedings of the Zoological Society, 1873, p. 615.

This done we should have as our first Limits of Subregion all Europe north of the Pyrenees, the Alps, the Subregions.

General character- istics,

Relations to other regions,

PALZARCTIC REGION. |

be limited by the Ural Mountains and the River of the saine name. Next we should have the Subregion to which we may most properly affix the name of " Mediterranean," comprehending the portion of North Africa already indi- cated, the Iberian and Italian peninsulas, as well as Turkey in Europe and the Peloponnesus, but we must extend it far to the eastward through Asia Minor and Persia until it touches the Indian Region. The lofty range of the

Caucasus would divide it from the European Subregion between the Black Sea and the Caspian; beyond the latter, however, we cannot do more than guess that the desert of the Tekko Turcomans and the mountains of Cabool would form its northern boundary. 'Then stretching from the eastern shores of the Caspian in a wide belt, but how wide is a matter of the greatest uncertainty, comes the third Sub- region, which we may call the '" Mongolian "'—marching with the Mediterranean Subregion till the Hindoo Koosh is reached, and thence coincident with the southern borders of the Region towards the Yellow Sea—possibly following the course of the Yangstzekiang. To this Subregion also would belong the greater part if not the whole of Japan. Northward again we have the great "Siberian" Subregion, but materials for any attempt to shew whether its southern boundary is capable of being laid down are absolutely want- ing. Even on the seaboard it is at present impossible to say whether it is in Manchuria that one Subregion passes into the other, or whether first the Stannovoi and further inland the Altai Mountains mark their respective limits. Having thus indicated the component parts of the whole area, it is time to say somewhat of its avifaunal characters. Like the Nearctic the Palearctic Region seems to produce but a single peculiar family of Birds—the Panuride, the type of which is the beautiful species known to Englishmen as the Bearded Titmouse (Panurus biarmicus)—and this is a family which has not been long or very generally recog- nized. Its members, however, are found stationed at intervals from the western to the eastern extremity, and every attempt to refer them to other groups of Birds has proved unsatisfactory—for the different genera (about the number of which there is much doubt) have often been widely scattered by systematists, one being placed at times with the Titmouse-family (Paride), at times with the Buntings (Lmberizide), another relegated to the Finches (Fringillide), and a third or even more to the so-called '¢ Babblers" (Zimelicde), The entire number of Palearctic families, computing them as we have already done those of other Regions, is about 67, not counting 1 other (Nectar tinted) of which a single species is peculiar to the valley of the Ghor, and that of the genera 323, about which there can be little doubt, or if any exist it may be that the number is understated. Of these as we have above men- tioned 128 are common to the Nearctic Region. Species of 51 more seem to occur as true natives both in the Ethiopian and Indian Regions, of which 4 genera belong to Sylviide, 1 each to Timelide, Ixidee, and Oriolide, 2 to Muscicapide, 1 to Laniide, 2 to

Motacillide, 1 to Diceeide, 2 to Fringillide, 1 to Emberizide, 3 to Alaudide, 1 to Cuculide, 2 to Coraciide, 1 to Meropide, Upupide, Caprimulgide, and Cypselide respectively, 4 to Vulturide, 6 to Falconide, 1 to each of Strigidew, Colum- bide, and Pterocleide, 3 to Tetraonide, 1 to Turnicile, 2 to Otidide and Charadriide, and 1 to each of Glare- olide, Cursoriide, Laride, and Anatide. Besides these 18 appear to be common to the Ethiopian without being found in the Indian Region, and no fewer than 71 to the Indian without being found in the Ethiopian. Of the former | is referable to T'urdide, 3 to Syluiide, 1 to each of Timeliide, Muscicapide, Laniide, and Motacillide, 3 to Fringillide, 1 to Emberizide and Sturnide respectively, 3 to Alaudide, and 1 to each of Gruide and Ciconiide.

Of the latter, 2 genera belong to Turdide, 17 to Sylvude, 4 to Timeliide, 1 to each of Troglodytide and Certhiide, 3 to Lrotrichide, 1 to Paride and Ixide respectively, 4 to Muscicapide, 1 to each of Motacillide and Hirundinide, 3 to Fringiilide, 4 to Sturnide, 3 to Corvde, 1 to Prttidee, 2to Picide, 1 toJyngide and Cuculidee respectively, 2 to Alcedinide, 1 to Vulturide, 3 to Strigide, 2 to each of Columbide and Tetraonide, 5 to Phasianide, 1 to Otidider, 3 to Scolopacide, and 1 to Anatide. To compare the Palearctic genera with those of the Australian and Neotropical Regions would be simply a waste of time, for the points of resemblance are extremely few, and such as they are they lead to nothing. It will therefore be seen from the above that next to the Nearctic Region, the Palearctic has a much greater affinity to the Indian than to any other, a fact which need not surprise us when we consider the great extent of their contact.

Having shewn this much we have next to deal with the peculiarities of the Region under our view. At the lowest computation 37 genera seem to be peculiar to it, though it is certain that species of several are regularly wont to wander beyond its limits in winter seeking a southern climate there to avoid the distress they would suffer in that of their birth. Of these genera 3 are to be apportioned to the Warblers, Sylviide ; probably 2 to the Babblers, Timeliide ; at least 3 or perhaps 4 to the Panuride ; 1 to each of Paride and IJxidew ; 2 to the Flycatchers, Muscicapide ; 6 to the Finches, Fringillide;

1 to the Buntings, Hmberizide, Starlings, Stwnide, Crows, Cor- vide, Woodpeckers, Picide@, aud the Sand-Grouse, Ptero- cleide, respectively ; 2 to each of the Grouse, Z"etraonida, and Pheasants, Phasicanidw ; 1 to the Ducks, Anatide, and Cranes, Gruide, respectively ; 2 to the Plovers, Chara- driide , and 5! to the Snipes, Scolopacide.

The European Subregion does not seem to possess a European single genus which can be accounted absolutely peculiar to Subregion.

it, but it has two genera, each containing but one species —Mergulus, one of the Alcide, and Pagophila, belonging to the Laride—which do not aypear to be elsewhere found in the Palearctic Region though both inhabit the most northern parts of the Nearctic. Jfuscicapa as now restricted? almost fulfils the conditions of peculiarity, but one species has been said to breed, though in small numbers, in Palestine.

The Mediterranean Subregion appears to have peculiar to it 4 genera of Sylvude, and 1 of Laride ; but sone 23 more belong to it and to no other part of the Region, though having a wider range outside of the latter. Of these there are 8 common to both the Ethiopian and Indian Regions, namely, 1 of Vulturide, 3 of Falconide, and 1 of Tetraonide, Anatide, Glareolide, and Cursoriide respec- tively. Confined to the same Subregion and the Ethiopian Region are 11, to wit, 1 of Turdide, 1 of Sylviide, 1 of Timeliide, 1 of Laniidee, 2 of Fringillide, 1 of Emberizde, 1 of Sturnide, 1 of Alaudide, 1 of Vulturide, and 1 of Charadriide ; while having the like relation to the Indian Region are 2—1 belonging to Cuculide and 1 to Otidide. Of the family last named another genus (Hupodotis), which only just makes its appearance in Morocco, ranges over Africa, India, and Australia; and a genus of Anatide (Lrismatura) is represented in America and Australia as well as in Africa.

The Atlantic Islands, which must be regarded as outliers

1 One of these last has for a wonder received no name from system- atists, but its generic separation seems on several grounds expedient. It is that which would have for its type the Zringa platyrhyncha of Temminck.

? That is excluding Butalis, Erythrosterna, and other kindred groups, as well as the purely Ethiopian forms which have been by some systematists attached to Afuscicapa proper.

Peculiari- of the Mediterranean Subregion, offer some peculiarities | example. In England the western limit of the range of Distribu- ties of too remarkable to be here left unnoticed. First we have | this incomparable songstcr seems to be formed by the tion of reas the Azores, the subject of an excellent monograph by Mr | valley of the Exe, which is only overstepped on rare ae slands. Frederick Godman,! in which is contained the result of his | occasions—Montagu having once heard it near Kingsbridge, oie own investigations in that group, as well as those of his | while it is said to have been observed at Teignmouth and predecessors. There is a general tendency among Azorean | Barnstaple. But even in the east of Devonshire it is local Birds to vary more or less from their continental repre- | and rare, as it also is in the north of Somersetshire, though sentatives, and this is especially shown by the former | plentiful in other parts of that county. Crossing the having always darker plumage and stronger bills and legs. | Bristol Channel it is said to be not uncommon at times In one instance the variation is so excessive that it fully | near Cowbridge in Glamorganshire ; but this seems to be justifies the establishment of a specific distinction. 'This is | an isolated spot, or at any rate there is no evidence of its the case of the Bullfinch of the more eastern of these islands | being found elsewhere in Wales, or between that place and (Pyrrhula murina), the male of which, instead of the ruddy | Tintern on the Wye, where it has been reported to be breast of its well-known congener (P. vulgaris), has that | plentiful. Thence there is more or less good testimony of part of a sober mouse-colour. A similar sombre hue dis- | its occurrence in Herefordshire, Shropshire, Staffordshire, tinguishes the peculiar Chaffinch of the Canary Islands | Derbyshire, and so on, to about 5 miles north of York, but (Fringilla teydea), but to these islands as well as the | not further. Along the line thus sketched out and imme- Azores and Madeiras there belongs in common another | diately to the east and south of it, the appearance of the Chaffinch

(F, tintillon), which, though very nearly allied to | nightingale, even if regular, which may be doubted, is rare, that of Mauritania (7. spodiogenia), is perfectly recogniz | and the bird exceedingly local; but in many parts of the able, and not found elsewhere. Madeira has also its | midland, eastern, and southern counties it is abundant, peculiar Golden-crested Wren (Regulus maderensis), and its | and the woods, coppices, and gardens ring with that thrill- peculiar Pigeon (Colwmba trocaz), while two allied forms of | ing song which has been the theme of writers in all ages. the latter (C. laurivora and C. bollit) are found only in the | There are many assertions of its occurrence in England Canaries. Further on this subject we must not go; we | further to the northward, but some of them rest on anony- can only state that Mr Godman has shown good reason for | mous authority only, and all must be regarded with the declaring that the avifauna of all these islands is the effect | greatest suspicion. Still more open to doubt are the state- of colonization extending over a long period of years, and | ments which have been made as to its visits to Scotland, going on now. while in Ireland there is no pretence even of its appearance. Mongolian The Mongolian has the largest number of peculiar genera | No reasonable mode of accounting for the partial distribu- Subregion. of any Palsearctic Subregion. In Sylviide there is 1, in | tion of the Nightingale has hitherto been propounded : Timeliide 2, in Panuride and Ixide 1 each, in Fringil- | there is no peculiar kind of soil which it especially affects, lide 3, in Sturnide and Pterocleide 1 respectively, in | or none, so far as we know, that it especially avoids ; and Phasianide 2, andin Anatide 1—or 18 inall; but, in com- | the same may be said of its relations to the flora of this mon with the Indian Region, and that only, there are 10 of | country. It is not so entirely adscriptus glebe that it will Sylviida, 4 of Timeliide, 1 of Troglodytide, 3 of Liotrichide, | not readily betake itself to new localities suited to its 1, rather doubtful in position, but possibly belonging to | wants, when these have been formed within its natural Panuride, 1 of Ixide, 4 of Muscicapide, 1 of Motacillide | limits, though they may be miles away from its ancient and Fringéllide respectively, 2 of Sturnide, 1 of Picide, | haunts. On the contrary, it is often one of the first birds 2 of Strigide and as many of Columbide, 1 of Tetraonide, | to establish itself when a heath has been broken up, and 4 of Phasianide, and 1 generally referred to Scolopacida* | plantations of trees thereon made have grown sufficiently —or 39 altogether. In common with the Ethiopian | to afford it the sheltering covert*

that it loves. This Region alone, the Mongolian Subregion has only 1 genus, | instance, taken from a bird whose habits have been so closely and that belongs to MMotacillidew; but in common with | studied both in captivity and at large, and one which is SO both Ethiopian and Indian, though with these only, there | familiar, and in many places so numerous, that abundant are 1 of Muscicapidee and 1 of Laniidw; while 2 genera— | opportunities are given for observing all that can be 1 of Fringillide and 1 of Scolopacide —belong equally to | observed about it, shews how futile would be the expecta- the Nearctic fauna: 2 genera, members respectively of | tion that in most cases we could at present, even if ever, the Dicwide and Pittide, are common as well to the | satisfactorily account for the existing causes which limit Ethiopian, Indian, and Australian Regions. the distribution of species. A vast majority of them, we Siberian The Siberian Subregion seems to have but 1 genus | know, have each its bounds, which virtually it cannot pass, Subregion. peculiar. This is Wwrynorhynchus, one of the Scolopacide; | and the case of the Nightingale in England, beyond the but as its breeding-quarters have never yet been discovered | fact that its distribution is extremely well marked, and the matter must remain in doubt. One genus of Laride | therefore has long attracted especial attention, has really and 6 of Alcide are also common to the Nearctic Region, | nothing out of the common way in it. In Europe, the but do not inhabit any other Palearctic Subregion. neighbourhood of Copenhagen is the most northern point Special It would extend the present article far beyond all | which our Nightingale is asserted to reach; but on the cases of reasonable bounds were we to dwell upon more than a few | continent its range is less extended, and though abundant ee of the curiosities of distribution which have been revealed | in Mecklenburg, it is not found in that part of Pomerania

by the continuous observations of European ornithologists. There is no need to travel out of our own island to meet with some of the most remarkable among them, and we may take that of the Nightingale (Daulias luscinia) as an

1 Natural History of the Azores or Western Islands, 8vo. London :

1870.

2 The genus of this family here meant is Syrrhaptes, the Three-toed Sand-Grouse, one species of which (S. paradoxus) overran Europe in astounding numbers in 1863, and effected a temporary settlement both in Denmark and Holland.

3 This is Ididorhynchus, which, until some details of its osteology are known, can hardly be placed without risk of error.

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4 When the history of the earth shall be really well and minutely understood, it seems quite possible that as much light will be shed on this and other particular cases of the same kind by a knowledge of the various changes and displacements which sea and land have undergone as has already been done by the same means in regard to many of the general facts of distribution. The results of the labour of the geologist are doubtless just as necessary to, and closely connected with, the work of the biologist, as those of the investigation of the historian are to and with the efficiency of the statesman ; while, in return, the researches of the biologist are, or ought to be, of the greatest service to the geologist. The history of the earth is for a long period of time that of its inhabitants. :

PALEARCTIC REGION. |

which lies to the north of the river Pcene, nor does it stretch so far to the eastward as Danzig. It occurs, how- ever, sparingly on the Polish frontier, near Thorn, and is observed in Austria, Upper Hungary, and Gallizia. In Russia its distribution cannot be laid down with any degree of accuracy, but it does not reach the Governments near the Ural, though it is said to be plentiful in that of Kharkov, and it is known to visit the Crimea Still further to the eastward it can be traced through Circassia, and as far as Kasbin in Persia. Southward of this imper- fectly-drawn line it may be found as a winter-visitant even in Arabia, Nubia, and Abyssinia, as well as in Algeria, where it is reported as breeding, and it would scem to migrate thence so far as the Gold Coast. It is abundant in Spain and Portugal ; but it is a stranger to Britanny, the westeru peniusula of France, just as it is to the westcrn peninsula of England."

One other example we may take, and this, though much less familiar, is equally instructive, as exhibiting some of the as yet unexplained peculiarities of distribution. It shall be from a Bird belonging to a very different Order from the last, having habits entirely dissimilar, and pre- senting in most ways a great contrast. The Kentish Plover (digialitis cantiana), first determined from specimens obtained on the coast of that English county whence it takes its specific name, has its breeding-place in Britain limited to the pebbly beach between Sandwich and Hast- ings, and in other parts of the British Islands only occurs as a chance straggler. Yet this bird has as wide a range elsewhere as almost any that could be named —breeding not only abundantly along the greater part of the coasts of the temperate and warmer portions of the Old World north of the Equator, but also occasionally in the interior, as at the base of the Caucasus and in the chotts of the North African plains; while during its migrations it wanders to the Malay Archipclago and South Africa, or even seems most likely to be specifically identical with a Plover which is found on the west coast of America, from California southward—though this last has been described as distinct under the name of 4. nivosa,

Islands must always be a matter of the greatest interest to the student of Geographical Distribution, and we have already mentioned some peculiarities of those groups which belong to the Mediterranean Subregion of Kurope. There are not many more here to be cited. Spitsbergen is supposed to have its peculiar species of Ptarmigan (Lag-

opus hemaleucurus), though it is confessedly very nearly | allied to the Rock-Ptarmigan (Z. rupestris) which inhabits the Arctic portion of the American continent and islands, Greenland, and Iceland, but, except in the last-named coun- try, does not occur in the Palearctic Region. Iceland is also remarkable for being the headquarters of the noble Faleon (Falco aslandus) which takes its name therefrom, though this bird also inhabits the southern districts of Greenland, to say nothing of other countries ; and in Ice- land alone of the western portion of the Region does the beautiful Harlequin-Duck (Mistrionecus torquatus) breed. It is, however, known to inhabit North Amcrica and the | eastern half of Siberia. Coming nearer home, we have a remarkable case of re- | stricted distribution in the Red Grouse (Lagopus scoticus), found (and in certain districts, as every one

knows, numcr- | ously), in each of the three kingdoms composing the British h

Distribu- tion of Kentish Plover.

European Islands.

Distribu- tion of Red Grouse.

Islands as well as in the principality of Wales. The de- tails of its local distribution, as of that of all other birds which breed in Great Britain, have been carefully and con- cisely given by Mr More,? and we do not propose to con-

i Of. Yarrell, British Birds, ed. 4, vol i. pp. 815-318, 2 Ibis, 1865, pp. 1-27, 119-142, 425-458.

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sider them here, but what is worthy of remark is that this particular species differs in no essential character save coloration from the Willow-Grouse (Z. albus), which is an abundant bird throughout the whole of the northern parts of the Palzearctic Region from Norway to Kamchatka, and again throughout the same or even lower latitudes of the Nearctic Region from Alaska to Newfoundland. Its re- mains, as has before been said (page 731), have also been found in the south of France, associated with those of the Reindeer and Snowy Owl. It is not for us now to enter into any hypothetical discussion, but it is hard to resist drawing an inference that at a time, geologically speaking, not very recent, both these species of Grouse had a common ancestor, and that the severe winters to which it has for a long period been exposed have caused the Willow-Grouse to don the snowy garb that is characteristic of it and other species of the genus, the more so since we fiud it in its first plumage possessed of the coloured quills, which are precisely similar to those of the Red Grouse at the same age.

Other instances there are in which British-born examples Other of species common to the continent are in a less degree Peculiari- distinguishable from those of neighbouring countries. The on Coal-Titmouse of England is to be recognized from that of Birds, continental Europe (Parus ater), and accordingly by some ornithologists it is regarded as a distinct species (P. britan- nicus), but the scanty remnants of the ancient pine-forests of Scotland are inhabited by birds between which and European examples no difference can be established. The home-bred Bottle-Titmouse of Britain, too, has, from its darker coloration, been accorded specific rank, but then we occasionally find continental birds of this species (Acre- dula caudata) varying in this respect, and the specific vali- dity of the British form (A. rosea) can hardly be with consistency maintained. Indeed, asa matter of fact, nearly all our smaller birds can be distinguished by an expert from their continental brethren, and this mainly through their duller or darker plumage. 'The difference is not so great by any means as obtains in the case of the birds of the Atlantic Islands above mentioned, but it most unques- tionably exists to a greater or less degree ; and it is curions that an analogous state of things is observable in regard to many of the birds of Japan, a country which is subject to many of the same climatic conditions as the British Islands. It will be for future investigators to ascertain the cause of this similarity, we here only record the fact ; but another remarkable instance of the forms of the western portion of the region being repeated in the far east, is found in the range of the two kindred species of the beautiful genus Cyanopica—the Blue Magpie of Portugal and Spain (C', cooki) being replaced in Amoorland and Japan by a species (C. cyanea) so closely allied that some authorities refuse to acknowledge their distinctness, and yet through- out 130° of longitude no representative of either is found.

V. Tue Eruiopian Recion, comprising the whole of the Erarortay African continent, except the Barbary States, besides the Reeron. Cape-Verd Islands and naturally those situated in the Gulf Bound- of Guinea, as well as Madagascar and the Mascarene group @ries. from Reunion (Bourbon) to the Seychelles, and the large island of Socotra, and crossing the Red Sea to Arabia, is sufficiently well marked out in a geographical point of view.

The Ghor, or valley of the Jordan and the depressed basin of the Dead Sca, has been before mentioned as an outlier of this Region, the north-eastern part of which melts into the Palearctic between Palestine and the Persian Gulf. There, and apparently there only, do its boundaries admit of no precise definition. Some zoogeographers secm in- clined to extend its limits further to the eastward, through Beloochistan and even beyond the Indus; but though the desert-forms of a large portion of that tract of country are

General character- istics.

Limits of Subregions,

undoubtedly closely allied to, if not identical with, the denizens of similar districts in Africa, yet it must be re- marked that such forms should be regarded in much the same light as those which frequent wide seas, and that the determination of a desert-tract must therefore depend rather on the fauna which inhabits its islands—as we may term the oases which, whether plentifully or rarely, stud its sur- face—rather than ou the fauna of the desolate space which surrounds these fertile and more favoured spots. Still, it is hardly to be denied that the influence of Ethiopian types is to be discovered in Sindh, Gujerat, and even further in the Indian peninsula. In the Ethiopian Region we again find a number of the sub-class /@atite in the very special- ized form Struthio—the Ostrich—and this ranges, or did range, from the immediate vicinity of the Cape of Good Hope to the confines of Algeria in the north-west, and to the banks of the Euphrates in the north-east.1 It is even possible that within historic times it penetrated much further to the eastward and reached Sindh at least, and if this be so, the fact would lend colour to the proposed in- clusion of that country within the Ethiopian Region.? But without concerning ourselves with speculations of this kind, there is enough and to spare which marks the Region as one of the chief zoological portions of the globe, despite the mystery which still hangs over its interior and at pre- sent completely defies any attempt to trace the boundaries of its Subregions or provinces beyond a comparatively little distance from the coast.

So large a portion of the Ethiopian Region lies between the tropics that no surprise need be expressed at the rich- ness of its fauna relatively to that of the last two Regions we have considered. Between 50 and 60 families of land- birds alone are found within its limits, and of them at least 8-— Buphagide, Kurycerotide, Musophagide, Frrisoride, Leptosomide, Colrideé, Serpentariide, and Struthionide— are peculiar ; but it is singular that of them only 2 belong to the Order Passeres, a proportion which is not maintained in any other tropical Region. The number of peculiar genera is too great for them to be named here; some of the most remarkable, however, especially of those peculiar to one of its Subregions, whose Bird-life has been differ- entiated to a degree that is very extraordinary, will pre- sently be mentioned.

The subdivision of the Ethiopian Region is perhaps accomplished with less difficulty than in the case of the more temperate tracts with which we have lately had to do. Bounded on the north by the Mediterranean Sub- region of the Palearctic Region, we have a Subregion ex- tending from the Cape-Verd Islands on the one side of the continent to Socotra on the other; and with this we must comprehend all the Asiatic territory, whatever be its limits, which is, for zoogeographical purposes, to be annexed to the Ethiopian Region. On the West Coast of Africa the southern frontier of this Subregion, which we may call the " Libyan,"® seems to lie a little to the northward of lat. 10° N.; but, owing to the unexplored state of the country, we quickly lose trace of its confines. We may perhaps

1 Xenophon, Anabasis, I. v. 2.

2 For all that can be said as to the supposed former extent of the 'Ostrich's range in Asia, and, indeed, for the best account of this Bird that has ever been published, see Finsch and Hartlaub, Végel Ost- Afrikas (pp. 597 -607), forming the fourth volume of Von der Decken's Reise in Ost-Afrika (Leipzig und Heidelberg: 1870). Fossil remains of Struthio have been indubitably recognized from the Sivalik hills in India.

3 In using this name the writer follows Blyth (Nature, iii. p. 428, March 30, 1871). Mr Sharpe, whose kind assistance in preparing this portion of the present treatise the author gratefully acknowledges, has proposed to call this Subregion the " Abyssinian," from its lead- ing characteristics being

most evident in that country, but that name 'would seem to be better applied to a province, and accordingly, here & moro general designation appears preferable.

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presume that they more or less follow that parallel to somewhere about long. 15° E., and then trend in a south- easterly dircction. On the East Coast the frontier of the Libyan Subregion extends from near Cape Guardafui in a south-westerly direction towards the system of the Great Lakes, all the waters flowing to which it may be held to include; and is then succeeded by the ' Mosambican" Subregion, which continues perhaps to Sofala. Beginning on the West Coast, where the Libyan Subregion stops, we have another Subregion, the "Guinean," comprising the seaboard from Sierra Leone to somewhere about Angola; but as to how far inland this penetrates we are absolutely without information. 'The rest of continental Africa forms what may be called the " Caffrarian" Subregion, while Madagascar, the Comoros, and the widely-scattered Mascarene Islands, constitute a fifth Subregion, the most distinct and remarkable of all, and for this we may most reasonably use the name " Madagascarian." .*

(1.) The Libyan Subregion, the first we have separated, may perhaps be broken up into four provinces—the Arabian, Egyptian, Abyssinian, and the Gambian ; but it must not be expected that all their respective boundaries

can be distinctly drawn—those of the first excepted, which, Arabian however, seems to be the one that has precisely the fewest province.

positive characteristics, and the propriety of its recognition, except on purely geographical grounds, is most question- able. We may doubt whether it has more than half-a- dozen peculiar species ; but then we know next to nothing of the zoology of any part of Arabia, save the Peninsula of Sinai and the desert of the Tih. As before mentioned the Ostrich occurs here, but its present northern or eastern limits are indeterminate ; we know, however, that within recent years it has been killed in the desert of Belka, just on the other side of the Dead Sea. The species which seem to be peculiar to the

Jordan basin are—Crateropus chalybeus, Nectarinia osea, Passer moabiticus, Amydrus tristrami and Caprimulgus tamaricis, the last but one of which in its name commemorates Canon Tristram, the naturalist to whom we owe most of our information as to the fauna of this singular district.

The Egyptian province, so far as regards the valley of Egyptian the Lower Nile, is remarkable for being, as already stated, province.

overrun by migrants from Europe during the winter, and since it is chiefly from the observations of travellers at this season that most of our knowledge is derived, it is perhaps not very wonderful that many zoogeographers are inclined to include this district within the Palearctic Region. The number of species which occur in Egypt and Nubia, as given by Captain Shelley,°® is 352, but many of them he says are of doubtful occurrence. Of these more than 230 are natives of the Palearctic Region ; but only between 50 and 60, or about one quarter of them, remain to breed in Egypt, and of this number a considerable proportion do not breed in Europe, but only in the Barbary States. The extra-Paleearctic character of the Egyptian ornis seems to be thus fully established.

Respecting the Abyssinian province very full particulars Abyssinian are included in the lately-completed work of Dr von province.

Heuglin ;° but for our purpose it is not easy thence to ascertain the precise features of its avifauna, since he has not discriminated between it and the Egyptian. North- east Africa, according to him, has about 950 species of Birds, of which he reckons about 325 as migrants from Europe or Western Asia—that is to say, from the Palearctic Region. Of these 113 breed in that Region, as well as in North-eastern Africa ; 294 have been observed in the Bar-

4 Again following Blyth (loc. cit.) 5 Handbook to the Birds of Egypt. ondon: 1872. 6 Ornithologie Nordost-Afrika's, Cassel: 1859-75

bary States; 438 are common to the West Coast, but whether to the Guinean Subregion, presently to be treated, or only to the Gambian province of the

Libyan, is not stated ; 318 are common to South Africa or the Caffrarian Subregion, and 253 only to the Mosambican; while 215 are peculiar to the district to which his work especially relates; the last statement being the most im- portant for our present use, since it cannot be doubted that nearly all these 215 species are peculiar to the Abyssinian province, which may be taken as extending from about the southern frontier of Dongola to the Victoria Nyanza, and from the Kosanga River (long. 27° E.) to Cape Guardafui. One of the most wonderful forms of birds peculiar to this province is the gigantic Whale-headed Stork, Baleniceps rex. Of Socotra we know far too little to determine its provincial affinity.

of Guinea, has been said to possess 1 peculiar genus, Cuphopterus (of perhaps uncertain affinity, though it has been referred to the Zimelizde), comprising a single species, (but this has since been sent from the Gaboon) and 6 other species—1 each of Dicwide and Hirundinide, and 2 of Ploceide and Columbide respectively. A curious assertion has been made with regard to this island, namely, that it is not inhabited by any Diurnal Bird-of-prey, all such being, it is said, driven off by the Grey Parrots (Psittacus erithacus) which there abound. The island of St Thomas, lying nearly or just under the equator, also has 6 peculiar species, belonging respectively to the Z'urdide, Diceide, Oriolide, Ploceide, Columbide, and Strigide ; while another species of the family last mentioned is common to this and Prince's Island, but seems to be found nowhere else. Of Annobon we know nothing.

Gambian Of the Gambian province we cannot say much, through (3.) The Cafrarian Subregion has its inland boundaries Caffrarian province. want of materials to convey any definite notion of its | as ill-defined as either of the preceding, yet its distinctive Subregion. character; and we are only able to confirm the general | features are much more marked—a fact which is doubtless belief that it has a good deal in common with the Abys- | to some extent explained by so great a portion of it lying sinian, next to be mentioned, for without lists carefully | without the tropic. Though this part of Africa has per- drawn up by those who have a special knowledge of the | haps received the closest attention from ornithologists, avifauna of a

country, or the power to compile such for | the several labours in various districts of the Subregion of oneself, which in this case the present writer does not | Levaillant and Jules Verreaux, Andersson and Andrew possess, any attempt at a critical examination of its details | Smith, Mr Layard and Mr Ayres, assisted at home by would be rather misleading than otherwise. The province | Sundevall and Mr Gurney, all require digesting before their probably lies between lat. 18° and lat. 10° N., but whether | bearings upon the subject of geographical distribution can it preserves those limits in the interior, whether it passes | be fully comprehended; and, as in the cases previously directly into the Abyssinian, or whether another province | mentioned, the careful collation and comparison of different intervenes, are questions that cannot be now decided, It | lists can only be usefully accomplished by one who has a would seem to have in common with the East Coast several | special knowledge of the objects treated of by those writers, very characteristic species, of which Buphaga africana, | and any attempt to attain this end by an inexpert would Vidua puradisea, Parus leucopterus, Corythornis cyano- | be dangerous. Only one island can be with certainty affili-

stigma, Coracias nevia, and Toccus nasutus, with 7', | ated to this Subregion, and that is St Helena, where the St Helena. erythrorhynchus, may be mentioned. indigenous Land-birds, if any there were, have probably Cape-Verl T'o the Gambian province belong the Cape-Verd Islands, | been extirpated with most of its original and peculiar flora. Islands. which, out of 17 or 18 Land-birds enumerated by Dr H. | Yet, curious as it may be, it seems to be a fact that this Dohrn (Journ. fiir Ornith. 1871, pp. 1-10), seem to have | isolated spot possesses a peculiar Water-bird, albeit it is of 2 peculiar species—a Sparrow (/ringillide) and an aquatic | a group which greatly affects dry places. This is a small Warbler (Sylviida). Ringed Plover (Aiyialitis sanctee-helene), and, though be- Guinean (2.) The Guinean Subregion is the next to be treated, | longing to a genus the members of which are remarkable Subregion. and occupies what is commonly spoken of as the " West | for very wide distribution, it is not known to have occurred

Coast" of Africa, extending from Sierra Leone to the south of Congo, while its breadth is a matter of the greatest un- certainty. Hitherto no catalogue even of its birds has been published, for the work of Dr Hartlaub!

comprehends also those of the Gambian province of the Libyan Sub- region, while, admirably executed as it was at the time of

off the island. 'Tristan da Cunha, commonly assigned to the Ethiopian Region, and therefore to this Subregion, seems, from reasons before stated, to have at least as much affinity to the Neotropical, and Ascension appears to have no indigenous Land-birds whatever, so that its appropriation inust remain in doubt.

(4.) The Mosambican Subregion next follows, and its Mosambi- relations to the Abyssinian the numbers already quoted can Sub- from Dr von Heuglin will have shewn, but these must be °6!"-

its appearance, so much has since been done by collectors In this part of Africa, and by those who in Europe have examined their collections (especially Professor Barboza du

Its islands.

Bocage and Mr Sharpe), that its results must be regarded as out of date. Yet no good, and much harm, would follow from any attempt to generalize on the facts thus recorded, at various times and in various publications, except it were made by one especially acquainted with African ornithology; and we must therefore, perforce, leave the continental portion of this Subregion without trying to exhibit its particular characteristics. Respecting the islands belonging to it, however, somewhat may be advanced with more confidence 'The chief of these are four in number—Fernando Po, Prince's Island, that of St Thomas, and Annobon, The first, lying in the Bight of Biafra, was once believed to possess a very peculiar avi- fauna ; but one by one, all, or nearly all, of the supposed peculiar species have been found on the mainland, until it seems likely to have none whatever. Prince's Island, situated outside the Bight, but still lying within the Gulf

1 System der Ornithologie West Africa's. Bremen: 1857.

taken with caution, since the limits of the Subregion are so indefinite. Whether we should comprehend in it the whole of the country drained by the Zambesi and its tribu- taries seems to be very uncertain; but, judging from the collections he has received, Mr Sharpe is now inclined to think that this part has more affinity to South Africa. The general uniformity of distribution which obtains aniong the Birds of all the tropical portion of the Region, especi- ally noticed by Dr Kirk in writing on those of Zambesia (Ibis, 1864, p. 307), requires much fuller geographical details than are at present available to entitle us to form any very decided opinion, though the in most respects ex cellent monograph of Drs Finsch and Hartlaub (see note at page 758) gives ample information as to the literature and descriptions of the 448 species which, according to those learned authors, constitute its avifauna, and no attempt can possibly be made to subdivide the Subregion into pro- vinces. Lying off its coast are three considerable islands, Pemba, Zanzibar, and Monfia, but as yet there is no reason

Madagas- carian Sub- region,

Malagash province.

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to expect that they have any very important bearing from a zoogeographical point of view. Zanzibar is the best known, and that seems to have a few species peculiar to it— for instance, Laniarius salime, L. orientalis, and Pranco- linus kirki,—but further investigation may prove that some of them also occur on the mainland.

(5.) The Madagascarian Subregion remains for considera- tion, and this from its insularity is obviously well defined, while a good deal of attention has been paid to its remark- able peculiarities. Indeed, except New Zealand, it may be safely deemed the most peculiar Subregion on the earth's surface, while from the richness and inultifariousness of its animal and especially of its ornithic population, New Zealand cannot for a moment be compared with it. Its principal subdivision, Madagascar itself, once possessed in the

extinct gigautic bird Apyornis a form of Ratite, uot less singular than the Ostrich or the Moa, and though some writers would fain see in the remains of this marvellous creature a realization of Oriental fables respecting the Roc, not a vestige has been recovered which cau be declared to belong to any period to which history or even legend can reach, and Arabian tales are not corroborated by the hypo- thesis of Professor Bianconi, while they are virtually con- tradicted by the researches at home of M. Alphonse Milne-Edwards, and Herr von Nathusius, and of M. Grandidier abroad. Three also of the satellite islands—Mauritius, Réunion (Bourbon), and Rodriguez —possessed brevipen- nate Birds totally dissimilar from but hardly less singular than the Zpyornis, and here the Dodo and its kindred, together with other Birds now extirpated, flourished peace- fully till they felt the power of man and his agencies. But brief particulars of these extinct forms have already been given (pp. 732, 733), and we must now restrict our- selves to the consideration of those which survive.

This Subregion is easily divided into two provinces— Madagascar and the Mascarene Islands; but then it be- comes a question whether the Comoros should not be con- sidered to form a third, and also how the Seychelles should be treated. Not without scruples we propose to refer the latter to the Mascarene province as an outlying group, and to regard the former in the same light in reference to the Malagash province or Madagascar proper.

Long studied as the Birds of Madagascar have been, hardly a year now passes without some new form being added to its list; and what is especially remarkable is that a very large proportion of the additions are not merely new species of genera previously known, but are the types of undeniably good and new genera, while it would seem also as if many of these had a very limited range in the island, for every fresh district visited by a collector is almost sure to produce something which neither he nor his predecessors have met with in other parts, though the actual distance between the localities may be inconsider- able. The number of genera of Land-birds amounts to nearly 100, and of them almost one-half are peculiar to the Subregion ; by far the greatest number of them be- longing to the Order Passeres, though the Picarie are also well represented by peculiar genera, and the Psittaci and Columb possess to a certain extent the same characteris- tics. Many of the genera belonging to the two Orders first

named can be but with difficulty referred to any family existing elsewhere, but for fear of exaggerating the singular character of the Subregion we prefer regarding two only of these families as absolutely peculiar. These are Lepto- somide and Eurycerotide, the single genus and species con- stituting each of which it seems impossible to place with any other family. Almost the same may be said of the genera Brachypteracias, Geobiastes, and Atelornis, which may per- haps be linked in one group, though to what family it should be attached seems very doubtful; and there is

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Philepitta so isolated that by one author it is referred to the Turdide, by another to the Paradiseide, and by a third to the Pittid@, the probability being that each assig- nation is wide of the mark. But the avifauna of Mada- gascar is not entirely composed of such singularities as these. We have homely genera, even among the Passeres, occurring there, such as Acrocephalus, Motacilla, Pratin- cola, and Alauda, while a C%sticola, which, though it has received a distinct trivial name, is undistinguishable from the well-known Fantail-Warbler (C. scheenicola) of southern Europe, Africa, and India, has long been known as an in- habitant of Madagascar. But there are also species, though not Passerine, which are absolutely identical with those of Britain—Aluco flammeus, Coturnix communis, Porzana pygmeea, and Podiceps minor—all of them common in the island. The number of species of Birds hitherto found in Madagascar cannot be safely put at less than 200, of which 120 are Land-birds, and of these latter fully 100 are peculiar. The Comoros, so far as they have been explored, have yielded more than 20 Land-birds, of which 12 at least are peculiar, the remainder being common to Madagascar ; but, no doubt, throughout every part of the Malagash province there is rooin for further discoveries.

The principal islands of the Mascarene province have Mascarene had their original fauna so largely destroyed by coloniza- province.

tion, as has just been stated, that we are hardly in a condition to judge its peculiarities accurately. Mauritius aud Réunion, lying within sight of each other, and possess- ing about the same number of existing species, seem not

to have more than 3incommon. ‘There is 1 genus (Oxynotus) belonging to the Campephagide which is peculiar to these

two islands, and represented in each by a distinct species.

Réunion also had within the memory of men yet living a peculiar genus of Sturnide—Wregilupus. Rodriguez is now known to possess only 4 species of Land-birds natural to it; and of these 3 arc peculiar, 1 being the Parrakeet before mentioned as on the verge of extinction, and another an aberrant form of Drymeca, pointing possibly to a common origin with certain Indian species! The Land- birds of the Seychelles which have not been introduced are 14 in number, and of these 12, according to Mr Edward Newton (Jbis, 1867, p. 359), are peculiar ; but there is no good genus which can be so termed, Finally, we may mention that the smull island of Aldabra has a Dove which has been described as a distinct species, and that of St Denis a Water-hen which probably merits the same remark. Taken as a whole, we cannot but be struck with the force of the evidence as to the land-connection which must once have existed—though not necessarily all at once—between the various units forming the whole Subregion. Even the scanty remnant that is left enables one to see how thie denizens of its most distant quarters represent one another, a clear token of their long-continued isolation and the working of a.differentiating power. But this is no place to pursue theories.

VI. Tres Inp1an Rucion? completes our survey of the

ee

1 This same leaning towards India is also indicated by the genus Hypsipetes, one of the Turdide, all the members of which, save 4, belong to the Indian region, and these four are peculiar respectively to Madagascar, Réunion, Mauritius, and the Seychelles, and it would be easy to cite similar cases of isolated Birds of either the Indian or Ethiopian Region which have their nearest relatives natives of the other.

2 Tt must be mentioned that objection has frequently, and not with- out show of reason, been taken to the name “ Indian ” applied to this Region ; and, except for the awkwardness of the title, we ust acmit that “Indo-

Malayan" would have most likely been found a more ex- pressive and suitable epithet, since what we commonly mean by "India" forms but a small and perhaps not the most characteristic portion. Mr Wallace proposes to use the name ' Oriental," against which it may be not unreasonably urged, that it errs on the side of vagueness, just as "Indian" does on the side of particularity. On the

INDIAN RuEGION.

Difficulty ofestablish- ing sub- ~ divisions.

Himalo- Chinese Subregion.

INDIAN REGION. | ,

globe ; and its boundaries, so far as they can be defined, have been already sketched out when treating of the adjoin- ing areas. Large as is its extent, and. greatly varied as are

its physical features, it would seem to have but 2 peculiar

families of Birds (Phyllornithide and Eurylemide) out of upwards of 70 which occur within its limits. There is peculiar difficulty in determining the zoological Subregions and provinces into which this Region should be separated. While the fauna of some districts, or even larger portions, has been studied so that we possess a knowledge of them almost as full as of any country in the world, Europe and the tracts of other Regions settled by Europeans alone excepted, the greater part is not much better known zoolo- gically than is the centre of Africa. Yet we cannot treat the Indian Region with the same audacity of ignorance that we did the Ethiopian, drawing our boundaries here aud there in a manner which the experience of a few more years will very likely prove to be exceedingly wide of the mark, for our acquaintance with the Region now under con- sideration is such as to convince us that throughout its whole extent there are districts, large or small, which have an unmistakable affinity to one another, and yet appear to be eut off from all communication with their neighbours. True it is that we may readily account for this on the ground that the similarity to be observed is due to corre- sponding elevation above the sea-level, and that

through- out the whole Region the hill-countries are, as a rule, dis-connected ; but such an explanation does not make our task the easier, and we are filled with the consciousness that we cannot map out the Indian Region according to the method we have hitherto followed. We find the character- istics of the Himalayan avifauna shewing themselves not only on the highlands of Southern India and Ceylon, but far away to the eastward also, as in Formosa, Hainan, and Cochin China, and again repeated in a lesser but still perceptible degree to the southward in the mountain ranges of Malacca and Sumatra. This then being the case, we think it better to follow in the main the scheme adopted by Mr Elwes, to whose essay on the geographical distribu- tion of Asiatic Birds we have before referred (page 754). Right or wrong in his results, he has the merit of having arrived at them, as he tells us, contrary to a certain bias which he had entertained at the beginning of his investiga- tions, and these are marked by uncommon care and a diligent study of all the means of information at that time available to him. Mr Elwes would establish three Sub- regions —the " Himalayan" "or Himalo-Chinese," the "Indian" (proper), and the " Malayan."

(1.) Lhe Himalo-Chinese Subregion, according to his view, includes all the middle slopes of the Himalayan range, from an elevation of about 3000 to 12,000 feet, and, beginning with Cashmere, extends through Nepal, Bhotan, the highlands of Assam, and thence, marching with the as yet undetermined frontier of the Palsearctic Region, to the sea-coast of China. To this Subregion belong the islands of Formosa and Hainan, and it not only includes a great part of China proper, but probably the whole of Cochin China and Siam, with the hill-country of Tennasserim and Burmah, merging into the Malayan Sub- region somewhere about lat. 12° N. In its western part, he observes, it is merely a narrow border-land, in which the members of two very different faunas meet, and, being inhabited during some part of the year by nearly all the principal Palearctic genera, and those of the proper Indian Subregion, probably includes some of the richest portions of the world. Besides this, as already remarked, its influ- ence is felt far to the southward, even in the islands of Ceylon and Sumatra.

whole, it seems as though " Indian," having been the distinguishing term first applied to this region, had better be retained.

From what has been said above as to the way in which some of the Subregions of the Indian Region are broken up, and this Subregion especially, it is useless to attempt any partitioning of them into true zoological provinces.

We can only follow Mr Elwes in taking the various coun- tries in succession, and stating what is known of them. Cashmere is the first. Here there seems to be 171 Land- Cashmere. birds, referable to 116 genera; of the latter, 34 have a wide range, 32 are characteristic of the Palearctic Region, 29 of the Indian, and 21 peculiar to or characteristic of the Himalo-Chinese Subregion. There is only 1 species peculiar to the country —a very normal Bullfinch (Pyrrhula) belonging to Fringillide. Cephalopyrus, an aberrant Tit- mouse (Paride), and once thought to be a peculiar genus, extends eastward so far as Simla, Of the species 70 seem to be peculiar to the Himalayan district, and 30 are common to the Palearctic Region.

Nepal is the next country of which we know enough to Nepal. give any satisfactory account ; and, indeed, thanks to Mr Hodgson's labours in years gone by, our knowledge of its zoology is very tolerably complete, though of late years little has been added to it. Its rich avifauna is said to consist of 553 species of Land-birds, belonging to 294 genera; of the latter, 62 are of wide range, 30 character- istic of the Palzearctic, and 122 of the Indian Region, while 80 are peculiar to, or characteristic of, the Himalaya. Of the species there are 330 peculiar to the Himalayan district, and 60 common to the Paleearctic Region.

The small state of Sikkim seems to be richer still, Ex- Sikkim. cluding the Accipitres there are here found 423 species of Land-birds, of which 270 do not occur out of the Himalaya, except as migrants or stragglers. Of these, 63 belong to genera of wide range, 60 more are of Palearctic distribution, and 154 are nearly peculiar to the Indian Region, while 146 are peculiar to, or characteristic of, the Himalo-Chinese Subregion. Passing to Assam, the hills to the north and east of which, however, are very little known, its

ornithic character seems greatly to resemble that of Sikkim ; but we have from its southern boundary a few genera which are not actually found in the Himalaya, such as Anthreptes, Turdinus, and Jhytoceros, belonging respectively to Vectar- iniide, Timelvide, and Bucerotide, while we are acquainted with only 16 species which are not found also in Sikkim, and of these one-half are Burmese.

Burmah must be taken next, though a district intervenes Burmah: of which we are quite ignorant, and this country, its high. and Ten- lands especially, requires much more exploration, but the ®#Sserm. valley of the Irrawadi, Aracan, and Pegu are very fairly known. Of 373 species of Land-birds, 97 are common to India, and the rest to the Malay peninsula. 193 more are found in India, and 27 in the peninsula alone, while 46 are peculiar to Burmah or to Burmah and Tennasserim. In Tennasserim, taking it to extend from Martaban to the isthmus of Krau, we have 313 species of Land-birds, 93 being common to India and the rest of the peninsula, 117 more being found in India, and 56 in the peninsula alone, while 47 are peculiar to Tennasserim or to Tennasserim and Burmah. 'This country is especially rich in species of the peculiarly Indian family urylemide, possessing a majority of the known forms.

Lying in the Bay of Bengal are two remarkable groups Andamans of islands —the Andamans and the Nicobars—which the and Nico- authority we are following would, from the similarity of >#"- their avifauna to that of Pegu, include in this Subregion.

Lord Walden, however, thinks (Jbzs, 1873, p, 297) the former have a greater affinity to the highlands of India south of the Himalaya and west of the Brahmapootra, and Mr Hume (Stray Feathers, ii. p. 136) considers both groups to form an outlying bit of the proper Indian Sub- region on which many foreign intruders have established

III. — 96

China. Tt is now necessary to retrace our steps northward and | of their observations. notice China ;? but this is a branch of the subject on which Beginning in the north-west with the Punjab, we have North-west it is as yet impossible to form an opinion. The chief | as yet no complete list of the

Birds of this most important of India, authority on Chinese ornithology is unquestionably Mr | district, and we can only infer that we shall here find the Swinhoe, who has for so long a time laboured in various | Malayan influence at its least, and the Palearctic at its parts of that country equally as a public servant and a | greatest; but descending the Indus to Sindh we have a naturalist ; but the results of his multitudinous contribu- | discursive account of its ornithology by Mr Hume,® from tions to our knowledge of its avifauna have never yet been | which Mr Elwes gives the following results: —of 150 tabulated, and probably their author is alone competent to | species observed, 41 are peculiarly desert-forms, and as perform this task without running into errors that would | such either very nearly allied to or identical with the like » be disastrous in their consequences. In his latest cata- | forms of the Palearctic and Ethiopian Regions; 40 are logue of the Birds of China,? he enumerates 675 species as | peculiar to the Indian Subregion, 8 are common to the found in that country and its islands; but valuable and | Malayan, 4 to the non-desert portions of the Ethiopian, carefully-drawn up as this list is, it is impossible to elimin- | and 12 to the similar parts of the Palzarctic Region, while ate therefrom the species not strictly belonging to that | 45 do not come under any of these heads. Omitting the part of the Celestial Empire which lies within our present | desert-forms as not leading to any just conclusion, it would bounds ; or even were this possible, an intimate acquaint- | appear that Sindh has less affinity to the Ethiopian Region A ance with its ornis would be required to separate the birds- | than to the Palearctic, that is to say, to its Mediterranean of-passage from the residents, and still more to classify | Subregion. The very remarkable district of Cutch yielded them according to their several Orders and families. Add | 115 Land-birds to Stoliczka,' and these were mostly mi- to this, that assiduously as Mr Swinhoe has himself worked | grants or common Indian specics of wide range. in the field, and diligently as he has availed himself of Of Rajpootana and Central India we know very little, such information as he could obtain from other trust- | but near Goona, about 200 miles to the south of Agra, worthy observers, only the outskirts of this great territory | Dr King some years since observed 116 species of Land- have, with few exceptions, been examined. Much is it to | birds; and more lately Mr Adam has noticed 171 species be hoped that he will be able in due time to bring forth | of Land-birds around the Sambhur Lake in its western the ripe fruit of his labours, but meanwhile the attempt

to | portion.® elucidate the peculiarities of the avifauna of China proper, We must next turn eastward to Oudh, wherein Col. Oudh that is, south at least of the Yangstzekiang and of Cochin | Irby (Z0is, 1861, p. 217) obtained 108 species of Land-birds, China, would be vain if not misleading. but of these 23 were found only on the hills of Kumaon. The two principal islands lying off the Chinese coast, | There seems to be a remarkable absence of many of the however, are in a different condition. One of them has | most widely-spread genera of the Region, and many forms been extremely and the other tolerably well ransacked by | generally common to Africa are also wanting; but no Formosa. Mr Swinhoe. In Formosa he has found 144 species, | doubt Mr Brooks, who has of late industriously investi- referable to 102 genera, of which 98 are found in the | gated this portion of the country, will be able to supply Himalayan Subregion, and 70 in the Malayan. 'The | some of these unaccountable deficiencies. species may be thus assorted :—74 belong to wide-ranging We may judge of what are politically known as the Central genera, 47 to genera common to the Himalayan and | "Central Provinces" of India, as well as of Bundelcund, provinces Malayan Subregions, 18 are peculiar to, or characteristic of, | Malwa, and Chota Nagpore, forming the " Gangetic" sub- ne the former Subregion, and 5 to China itself; 18 are not | province of Mr Blanford, from observations made by that found in the Malayan Subregion, and no less than 34 are | gentleman and Colonel M'Master,!? wherein 190 species of Hainan, peculiar to the island. For Hainan Mr Swinhoe has | Land-birds are enumerated, of which 38 have a very wide

themselves. It is certain that many genera, or even families, which are common in Burmah are wanting in the Andamans, such as the 7imelitde, Pittide, Hurylemde, and Bucerotide, though a peculiar form of the last occurs on Narcondam, an island between the Andamans and Burmah, and there is an extreme paucity of several other families. Still the Andamans possess an avifauna of some 155 species, 17 of which (all Land-birds) are peculiar. The precise number of species found in the Nicobars is not explicitly stated by Mr Hume, but he gives 10 as peculiar to that group, which is inhabited by two very noteworthy forms—Calenas, a very remarkable genus of Columbide, widely spread throughout the Malayan

archipelago, and a species of Megapodius, belonging to one of the most characteristic families of the Australian Region. The prc- sence of these two forms would almost incline one to remove the Nicobars from the Subregion to which they have generally been assigned, and refer them rather to the Malayan Subregion.

enumerated 130 species belonging to 96 genera, of which latter 86 are common to the Malayan Subregion, and 93 to the Himalayan. Of the species 54 belong to wide- ranging genera, 59 to genera characteristic of the Indian

- *Of China proper Mr Elwes says little, but he includes Eastern Thibet in this Subregion. The present writer, however, is disposed to refer that, or at any rate the scene of Pére David's discoveries, to the Palearctic Region.*

- *Proc. Zool. Soc. 1871, pp. 337-348.*

BIRDS

[DISTRIBUTION.

and 16 of the Palearctic Region, while 16 are believed to be peculiar to the island.

(2.) The Indian Subregion, still following Mr Elwes, is Indian the next to be considered. This consists of the remainder Subregion.

of the peninsula of India lying to the south and west of the last, as well as of the island of Ceylon. Its partition into provinces has been several times attempted, and doubt- less the method proposed by Mr Blanford, when treating of the geographical distribution of Indian Reptiles,' is one of the most reasonable, but even this may perhaps be pre- mature,' and here it seems preferable to abstain from doing more than consider, so far as materials are available, the avifauna of the various districts of which it is composed— the more so since the extraordinary impulse given to the study of ornithology in India by the publication of the late Dr Jerdon's work® will doubtless in a few years place the whole subject in a very different light, for

the number of Indian ornithologists is grown so considerable that that country has now a journal especially devoted to the record

range, 57 belong to widely-ranging genera but are almost

3 Journal of the Asiatic Society of Bengal, 1870, pp. 335-376.

4 Compare Dr Giinther's remarks, Zoological Record, vii. p. 67.

5 The Birds of India. Calcutta: 1862-64.

8 Stray Feathers, i. pp. 44-49, 91-289, 419-421.

7 Journal of the Asiatic Society of Bengal, 1872, pp. 211-258.

8 Op. cit. 1868, pp. 208-218.

9 Stray Feathers, i. pp. 361-404.

10 This, 1867, p. 461; Proc. As. Soc. Beng. 1869, p. 104 ; Journ, As. Soc. Beng. 1871, pp. 207-216.

Deccan.

Southern India.

Ceylon.

Malayan Subregion,

Malay Peninsula.

Philip- pines,

INDIAN REGION. |

confined to India, 37 to genera common to tropical Africa and India, 8 to genera of Ethiopian type, and 53 to purely Indian genera.

Pursuing our way southward we come to the Deccan or table-land of India, and our information respecting its ornis chiefly rests on the catalogue given by Sykes many years ago,' which only contains about 150 species of Land-birds, of which about 105 belong to genera common to the Himalayan and Malayan Subregions, 27 to Himalayan but not Malayan genera, 30 to genera having Ethiopian or Palearctic affinity, and the rest to widely-ranging genera or to genera peculiar to the Indian Subregion.

The avifauna of Southern India seems to be small rela- tively to the extent and variety of the country, and most of its peculiar species are said to have a considerable range of latitude, though some, which are restricted to the highest hills, are only found to the southward of lat. 12° N., where several mountain-ranges reach the height of 8000 feet. No single comprehensive list of the Birds of this part of India seems lately to have been put together, and Mr Elwes gives us no statistics as the result of his investigations whereby we may compare its ornithic products with those of other districts.

Ceylon has profited by the residence of several com- petent naturalists—especially Mr Layard and Mr Holds- worth, and taking also its isolation into account, we are in a position to speak of this island with greater certainty than of the preceding portions of the Subregion. The latter of these gentlemen gives a list? numbering 323 species, of which 224 are Land-birds, and an analysis shews that, though 37 species are peculiar, only 4 belong to genera

not found in Southern India, 22 belong to genera inhabit-

ing the Himalaya but not the Malayan Subregion, and only 6 to Malayan but not Himalayan genera, while 14 are members of genera only found in India.

(3.) The Malayan Subregion is the last of which we have to treat, and we have already hinted that it possibly has a connection with the Indian through the Nicobar Islands, but of course the most intimate communication between the two exists on the mainland. The birds of its con- tinental portion, the Malay Peninsula, have never formed the subject of a separate memoir, and to compile 4 com- plete list of them at present is a task which a more com- petent author has found impossible. Stoliczka has

given us a catalogue® of 95 species obtained in the Wellesley Province, lying opposite to Penang, and numerous species have been constantly described by various authors as coming from Malacca or Singapore, which in most cases probably means that the specimens have been purchased at one of those places. To enter into any details with respect to the Malay Peninsula, therefore, would here be impos- sible, but the case is different as regards the islands which form the greater part of the Subregion.

The Philippines, for more than a century, have supplied European ornithologists with materials of study, yet it is little more than ten years ago that any attempt to compile a complete list of their Birds was made, and that list, by Dr von Martens, was manifestly imperfect. It is only since the present article was begun that a satisfactory account of their avifauna has appeared. This is the work of Lord Walden,® and we here avail ourselves of the results which he has so ably set forth He enumerates 219 species, of which 150 are Land-birds ; but in consequence

1 Proc. Zool. Soc. 1832, pp. 77, 149

2 Op. cit., 1872, pp. 404-483.

3 Journ. As. Soc. Beng. 1870, pp. 277-334. This, however, must not be read without referring to Lord Walden's remarks on it (Zdis, 1871, pp. 158-177).

4 Journal fir Ornithologie, 1866, pp. 5-81

5 Transactions of the Zoological Society, ix. pp. 125-252.

of the caution he has exercised, it is most probable that this number is really too small. Of these, 106 species are peculiar to the archipelago—96 of them being Land-birds, There is no species, he remarks, which is common to the Philippines and the neighbouring island of Celebes which does not also possess a more extended range, and there is only one genus—Prioniturus, a very singular form of Psit- tact—common to both and yet found nowhere

else. The genera peculiar to the groupare 11 in number—Pseudolalage belonging to Campephagide, Zeocephus to Muscicapide, Lhabdornis to Certhiide, Sarcops to Sturnide, Penelopides to Bucerotide, Dasylophus and Lepidogrammus to Cucu- lide, Pseudoptynx to Strigide, Phabotreron and Ptilocolpa to Columbide, and Amaurornis to Rallide. There is also only 1 species common to one of the Philippines—the island of Negros—and to one other island. This is Xantholema rosea, which is also found in Java, and seems to be the representative of the widely-spread XY. hematocephala, which ranges over India, Malacca, and Sumatra, but is not found either in Java or Negros. It will thus be seen that the amount of peculiarity exhibited by the avifauna of the Philippines is very great, but it must be observed that hardly anything is as yet known of Palawan or the Sooloo cluster—islands which connect the Philippines with Borneo.

Borneo is the next island to which our attention should be Borneo,

directed, and this magnificent country, large enough as Mr Wallace has remarked for the whole of the United Kingdom to be set down in its midst and hidden, has lately had its avifauna carefully investigated by Dr Salvadori, the result of whose labours was published in 1874.6 The following may be given as a summary of them. There are 392 species, of which 325 are Land-birds, 27 belonging to the Order Accipitres, 4 to Psittaci, 99 to Picarie, 172 to Pas- seres, 14 to Columbe, and 9 to Gallinew. Yet there are

only 3 unquestionably peculiar genera'—Prtyriasis, a most

singular form, doubtfully referred to Lantidew, Schwaneria belonging to AMuscicapide, and Heterococcyx to Cuculide. There are 58 or 59 peculiar species, all but 1 Land-birds, and at least 25, or perhaps as many as 32, which have no representatives elsewhere. Of Land-birds Borneo has, in common with Malacca and Sumatra, 226 species ; in com- mon with Java, 149; with the Philippines, 25 ; with the Indian Subregion, 53; with China, 72; aud with Celebes, 28. Aspecies of Megapodius (M. cumingi) is found in Borneo and also in the Philippines,' and its presence in both, like that of a member of the same genus in the Nicobars already noticed, is a very remarkable fact.

The comparatively little-known island of Banca, lying Banca,

between Borneo and Sumatra, produces 2 peculiar species of Pittide, the one representing a species which inhabits the whole Subregion and extends to China and Siam, the other allied to two species, the first ranging from Nepal to Malacca, and the second inhabiting the Philippines, Borneo, and Sumatra.?

Sumatra must be considered next, or perhaps it ought Sumatra.

to have been taken after Malacca, from which it is divided by so narrow a channel. The greater part of this island, its northern half especially, is unknown, and not more than 240 species can be assigned to it, of which about 20 appear to be peculiar. Its avifauna is much allied to that

6 Annali del Museo Civico di Storia Naturale di Genova, v. pp.

1-430.

7 A reputed fourth, Anais, referred to Artamide, is suspected to be founded on a manufactured specimen! Lobiophasis, since established by Mr Sharpe (Ann. and Mag. Nat. Hist. Ser. 4, xiv. p. 373), and belonging to Phasianidaw, probably makes another.

8 Mr Sharpe, however, considers the species distinct (Proc. Zool. Soc. 1875, p. 111).

® But on this point compare Mr Hume's remark (Stray Feathers, ii, p. 475).

Java.

Bali.

Uniformity

and com:

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both of Malacca and of Borneo, but it seems to have much less peculiarity than the latter's.

We then have Java, the best-explored, the most thickly peopled, and, proportionately to its fauna, the most pecu liar, perhaps, of the Indo-Malay Islands. Here we find about 270 species of Land-birds, of which about 45 are peculiar—most of them being from the mountains in the western part of the island. The reappearance in Java of several Burmese species, as Crypsirhina varians, Picus analis, Pavo muticus, and others, which do not occur in the Malay Peninsula south of Penang, is very remark- able.

Of Bali, so interesting as the southern outpost of the Region, we only know from Mr Wallace that he saw there several Birds highly characteristic of Javan ornithology, and whether the island has any peculiar species nowhere appears. We are then brought to the brink of that re- markable strait through which runs " Wallace's Line," and crossing it find ourselves at once in the Australian Region, with which we began this protracted dissertation.

It is, of course, much to be regretted that at present our information does not allow of our treating all the Six Zoo-

pleteness of]ovical Regions of the globe on a uniform plan, or of deal-

treatment impossible.

Migrations apparently irregular may yet conform. to laws.

ing equally with their several component portions. That this will be possible in a few years, as materials are accu- mulated, none can doubt; but as yet we are far from the attainment of so desirable an end, and must be content to make the most of what we have. Want of space, also, has hindered the proper consideration here of many points that fully deserve notice, and especially the negative character- istics of the different Regions—often quite as important as those which are positive. Of the imperfections of the preceding sketch no one can be more painfully aware than its author, but its very imperfections may serve a useful purpose in drawing attention to the districts about which least is known. Yet it would be affectation for him not

to believe that it has some actual merit, but that merit is greatly if not chiefly due to the kindness of Mr Wallace, who, in the manner already stated, has allowed his forth- coming work to be laid under contribution, though in several respects its conclusions are not here adopted. That work, when published, will unquestionably form a foundation on which a noble superstructure will ultimately be erected, but it were vain to anticipate the ends which such a build- ing will one day serve, and it would be beyond our scope to enter into any theoretical disquisition on the deductions which follow from the facts here advanced. pus MIGRATION.

Most strangely and unaccountably confounded by many writers with the subject of Distribution is that of Migra- tion. True it is that owing to the vast powers of loco- motion possessed by nearly all Birds, we have individuals belonging in the main to certain groups, but by no means always confined to them, straying from their proper quar- ters and occurring in places far removed, not only from the land of their birth, but from the country whither they are ordinarily bound in their journeys, to reach which is the object wherefore such journeys are undertaken. It may be that in some measure this erraticism is governed by fixed laws, and indeed indication is not wanting that such laws exist, though as yet we know much too little to lay them down with any approach to confidence. But it is obvious on reflection that granting the existence of most rigorous laws of this kind—determining the flight of every winged vagabond—they must be very different from those which are obeyed by Birds commonly called " Migratory," and migrating year after year according to a more or less

sd BIRDS

[MIGRATION.

fixed rule from one locality to another with the seasons a3 they roll. The former laws would seem to be created or controlled by purely external circumstances, which if they possess any periodicity at all possess a periodicity of cycles, and are most likely dependent in the main on cycles of the weather, but on this point observation has not yet supplied us with the means of avoiding speculation. We may indeed say almost without much risk of error that so many individuals of a foreign species—whether North-American or Asiatic—will occur in Great Britain so many times in the

course of a term of years ; but, though we may safely predict that if they appear at all they will do so at a certain season, it is impossible to make a forecast as to the year in which an example will turn up, or whether in one year some half-dozen may or may not occur. The matter thus becomes a matter of averages, and like all such is open to the influence of many perturbants, not that such may not well be subject to some law of which we are ignorant. Besides this, the average is hard to strike, de- pending as it must on the existence of favourably-placed and watchful observers. Moreover if we consider that the number of competent observers, though possibly greater in England than anywhere else in the world, has been at all times small, it is not surprising that little has been effected towards the compassing of any definite notion on this head. At present we can but attribute the appearance of foreign stragglers on our shores, and no doubt the same may be said of other countries, to the influence of storms which have driven the wanderers from their course, and though other more remote causes may possibly be assigned, there seems to be none but this on which we can safely rely. Consequently until the periodicity of storms is brought within our knowledge we must be content to abide in our ignorance of the laws which govern the appearance of the strangers. Still confining our remarks to the British Islands, the effect of these laws is In some degree constant.

Singular as it may appear, the greatest number of North- Appear-

American Birds-—and especially of the Limicole, or Shore- birds, which are recorded as having occurred in this country

have been met with in the eastern part of England or Britain,

Scotland. There are two ways of accounting for this fact, the first of which is the unfortunate scarcity of observing naturalists in Ireland and on its western coast especially, and this is by no means to be overlooked; but it may be remarked that in no part of the United Kingdom is the profession of the gunner more enthusiastically followed than in the sister island, and the men who pursue that vocation are all alive to the mercantile value of any strange bird which may fallin their way. Of course they have no means of knowing what it is, yet as their spoils are sent for sale to the nearest market, it cannot but happen that if many examples of North-American species were

procured by them, some proportion of these would find their way to the notice of the amateur naturalist and by him be re- corded in the public prints! Now, as compared with Great Britain, this so rarely occurs in Ireland that it is by no means unfair to draw the inference that Transatlantic Birds are there far less frequently met with. The second mode of accounting for the fact above stated is that the majority of North-American Birds which occasionally visit Europe are of species which breed in somewhat high northern latitudes. On their way thence to their winter- quarters, some are driven out to sea by violent westerly gales—the strongest winds, be it remembered, that prevail

1 It seems also not unlikely that the very scarcity of rare birds in Treland is one reason why there are so few ornithologists in that country, for here it is not uncommon for a man to have his attention first called to zoology by meeting with some strange animal—be it beast, bird, beetle, or butterfly, and for such a man afterwards to become no mean field-naturalist,

Migration proper.

Exploded, fancy of hiberna- tion,

Chief facts of inigra- tion.

MIGRATION. |

in the North Atlantic, and thus strike the coast of Norway. In that country observers may be said to be practically absent, and fowlersasarule unknown. Such storm-beaten wanderers there consort with the allied species to be found at that season in abundance on its shores and in their com- pany pursue the same southerly course. With them they cross to the east of Great Britain, and once arrived here are speedily picked out and secured by the practised gunner. But should they even escape his notice, they with their comrades follow the shore-line, where they obtain the best supply of food, until passing round the south coast they find themselves at the western extremity of England—the district of the Land's End, in which, next to Norfolk and Suffolk, the greatest number of these Transatlantic stragglers have been obtained. This sugges- tion may serve to shew what

most likely goes on in other parts of the world, though the materials for establishing its general truth are not forthcoming.

But returning to the subject of Migration proper, dis- tinguished as it ought to be from that of the more or less accidental occurrence of stray visitors from afar, we have here more than enough to excite our wonder, and indeed are brought face to face with perhaps the greatest mystery which the whole animal kingdom presents—a mystery which attracted the attention of the earliest writers, and can in its chief point be no more explained by the modern man of science than by the simple-minded savage or the poet or prophet of antiquity. Some facts are almost universally known and have been the theme of comment in all ages and in all lands, The Hawk that stretches her wings toward the south is as familiar to the latest Nile-boat traveller or dweller on the Bosphorus as of old to the author of the book of Job. The autumnal thronging of myriads of Water- fowl by the rivers of Asia is witnessed by the modern sportsman as it was of old by Homer. Anacreon welcomed the returning Swallow, in numbers which his imitators of the colder north, to whom the associations connected with it are doubly strong, have tried in vain to excel. The Indian of the Fur-Countries in forming his rude calendar names the recurring moons after the Birds-of-passage whose arrival is coincident with their changes. But there is no need to multiply instances. The flow and ebb of the mighty feathered wave has been sung by poets and reasoned of by

philosophers, has given rise to proverbs and entered into

popular superstitions, and yet we must say of it still that our "ignorance is immense."

On one point and one only in connection with this subject can we boast ourselves to be clearly wiser than our ancestors. Some of them fully believed that the seasonal disappearance of the Swallow, the Nightingale, the Cuckow, and the Corncrake was due to hibernation, while others indeed doubted whether or not this was the true explana- tion of the fact. It is not so long since this belief and these doubts were in vogue, but now assuredly they have no hold upon the mind of any one capable of appreciating evidence, and this absurd fancy being exploded need not again trouble us,

In considering the phenomena of Migration it will be best first to take the facts, and then try to account for their cause or causes. That a very large number of Birds all over the world change their abode according to the season is well known, and we find that in almost all countries there are some species which arrive in spring, remain to breed, and depart in autumn; others which arrive in autumn, stop for the winter, and depart in spring; and others again—and these are strictly speaking the " Birds of Passage"—which shew themselves but twice a ee 9

? Prof. Baird's remarks on this subject are much to the point (Am. Journ. Sc., ser. 2, xli. pp. 344, 845).

year, passing through the country without staying long in it, and their transient visits take place about spring and autumn. People who have given but little thought to the subject are apt to suppose that these migrants, which may thus easily be classed in three categories, are acted upon by influences of different kinds, whereas very little reflec- tion will show that all are really affected by the same impulse, whatever that may be, and that the at first sight dissimilar nature of their movements is in truth almost uniform, The species which resort to this and to other tem- perate countries in winter are simply those which have their breeding-quarters much nearer the poles, and in returning to them on the approach of spring are but doing exactly as do those species which, having their winter-abode nearer the equator, come to us with the spring. The Birds-of- passage proper, like our winter-visitants have their breed- ing-quarters nearer the poles, but, like our summer-visitants, they seek their winter-abode nearer the equator, and thus perform a somewhat longer migration. So far there is no difficulty and no hypothesis—the bringing together of these three apparently different categories is the result of simple observation.

This however is not the only fact which is evident on Partial To take the birds of the migrants,

the most cursory examination. British Islands as an example (though exactly similar cascs are presented in other countries) we find that while there are some species, such as the Swallow or the Fieldfare, of which cvery individual disappears at one period of the year or another, there are other species, such as the Pied Wagtail or the Woodcock, of which only the majority of individuals vanish—a few being always present?—and these species form the so-called " Partial Migrants." If we extend our view and look to birds on the continent of Europe, we find that many species are there notoriously migrant which are not generally suspected to be so in this

country—such as the Song-Thrush and the Recdbreast, Song: both of which species closer observation has proved to be Thrush.

with us subject to the migratory impulse. In respect of the former it is known that towards the end of summer or in autuinn our native Song-Thrushes receive a considerable accession in numbers from the birds which arrive from the north, though the immigration is by no means so well marked as it is in Belgium, France, or Germany, where the arvival of the strangers sets all the fowlers to work, and the beginning of the Chasse aux Grives or Drosselzug is regarded in many places nearly as the Twelfth of August or the First of September is with us. In most localities in Britain the new comers depart after a short sojourn, and are accompanied by so many of the home-bred birds that in some parts of the island it may be safely declared that not a single Song-Thrush can be found from the end of November to the end of January, while in others examples can always be seen. Much the same may be said of the Redbreast. attentive scrutiny will reveal the fact that its numbers are subject to very considerable variation according to the season of the year. At no time do our Redbreasts collect in bands, but towards the end of summer they may be seen in the south of England successively passing onward, the travellers being mostly if not wholly young birds of the year; and so the great majority disappear, departing it may be safely presumed for more southern countries, since a few weeks later the markets of most towns first in France aud then in Italy are well supplied with this species. But the migratory influence affects, though in a less degree, many if not most of the Redbreasts that remain with us, Content during the autumn to occupy their usual haunts, ee ee

- *Whether these few be not migrants from another district is a point that would require further consideration,*

Undeniably resident as a species, Redbreast.

Migration almost universal.

Affection for old breeding- places.

Want of food the most ob- vious cause of migra- tion,

the first sharp frost has a decided effect upon their distri- bution, and a heavy fall of snow drives them towards the homesteads for the larger supply of food they find there, while should severe and long-continued hard weather follow even these birds vanish, leaving only the few which have become almost domesticated.

These two species have been here chosen as illustrative cases because they are at once plentiful and familiar, and want of space only forbids us from citing others, but we shall find on inquiry that there is scarcely a Bird of either the Palearctic or Nearctic Region, whose habits are at all well known, of which much the same may not be said, and hence we are led to the conclusion that every Bird of the northern hemisphere is to a greater or less degree migratory in some part or other of its range. Such a con- clusion brings us to a still more general inference—namely that Migration, instead of being the exceptional character- istic it used formerly to be thought, may really be almost universal, and though the lack of observations in other, and especially tropical, countries does not allow us to declare that such is the case, it seems very probable to be so. Before proceeding however to any further conclusions it is necessary to examine another class of facts which may possibly throw some light on the matter.

It must be within the experience of every one who has ever been a birds'- nesting boy that the most sedentary of Birds year after year occupy the same quarters in the breeding season. In some instances this may be ascribed, it is true, to the old haunt affording the sole or the most

convenient site for the nest in the neighbourhood, but in sO many instances such is not the case that we are led to believe in the existeuce of a real partiality, while there are quite enough exceptions to show that a choice is frequently exercised. The same may equally be said of the most migrant of Birds, and perhaps the strongest instance that has ever come to the knowledge of the writer refers to one of the latter. A pair of Stonc-Curlews (Wdicnemus crepitans)—a very migratory species, affecting almost exclusively the most open country—were in the habit of breeding for many years on the same spot though its character had undergone a complete change. It had been part of an extensive and barren rabbit-warren, and was become the centre of a large and flourishing plantation.

With these two sets of facts before us we may begin to try and account for the cause or causes of Migration. In some cases want of food would seem to be enough, as it is undoubtedly the most obvious cause that presents itself to our mind.? The need which all animals have of finding for themselves proper and sufficient sustenance is all- powerful, and the difficulties they have to encounter in

1 Two remarkable instances of this persistency may be noticed. The nest of a Falcon (Falco peregrinus) on Avasaxa—a hill in Finland somewhat celebrated as one of the most southern points whence the midnight sun may be seen—is mentioned by the French astronomer Maupertuis as having been observed by him in the year 1736. In 1799 it was rediscovered by Skjdldebrand and Acerbi. In 18538 Wolley found it tenanted, and from enquiries he made of the neigh- bours it was evident that such had yearly been the case so far as any one could remember, and so it was in 1855 as the writer can testify. In 1779 according to one account, in 1785 according to another, a pair of the Blue Titmouse (Parus coeruleus) built their nest in a large earthenware bottle placed in the branches of a tree in a garden at Oxbridge near Stockton-on-Tees. With two exceptions only, this bottle, or a second which has lately been placed close to it, has been tenanted by a pair of birds of this species from the year in which it was first occupied until 1873, when the writer saw it—See Yarrell's British Birds, 4th ed. i. pp. 58, 486.

° Far more so than variation of the temperature, though in popular belief that probably holds the first place. But Birds generally, as eompared with other Vertebrates, are but slightly affected by extremes of heat or eold, and indeed (so far as we can judge) by most climatie influences, provided only their supply of food is not affeeted thereby. 'Gf. Max Schmidt, Zoolog. Garten, 1865, pp. 330-340.)

obtaining it are so great that none can wonder that those which possess the power of removing themselves from a place of scarcity should avail themselves of it, while it is unquestionable that no Class of animals has this facility in

a greater degree than Birds. Even among many of those species which we commonly speak of as sedentary, it is only the adults which maintain their ground throughout*

the year. It has long been known that Birds-of-prey cus- Banish- toiarily drive away their offspring from their own haunts went of | so soon as the young are able to shift for themselves. The Y°"> reason generally, and no doubt truly, given for this be- haviour, which at first sight appears so unnatural, is the | impossibility of both parents and progeny getting a liveli- hood in the same vicinity. The practice, however, is not limited to the Birds- of-prey alone, but is much more uni- versal. We find it to obtain with the Redbreast, and if

we watch our feathered neighbours closely we shall per- ceive that most of them indulge in it. The period of expulsion, it is true, isin some Birds deferred from the

end of summer or the autumn, in which it is usually per- formed, until the following spring, when indeed from the maturity of the young it must be regarded as much in the light of a voluntary secession on their part as in that of

an act of parental compulsion, but the effect is ultimately

the same. These cases, however, which make certainly Excep- the exception rather than the rule, we can account for in tional another manner. It is to be

observed that they are con- fined to species having a peculiar mode of life, the indi- viduals associating in family-parties to form small bands.

The members of the Titmouse-family (Paride) offer a good instance of this peculiarity, but it requires no very abstruse reflection to perceive that the adoption of this habit is one eminently conducive to the easy attainment

of their food, which is collected, as it were, into particular spots often far apart, but where it does occur occurring plentifully. Thus a single Titmouse searching alone might hunt for a whole day without meeting with a sufficiency, while if a dozen are united by the same motive it is hardly possible for the place in which the food is lodged to escape their detection, and when discovered a few call-notes from

the lucky finder are enough to assemble the whole com- pany to share the feast. It is impossible to watch a band

of any species of Titmouse, even for a few minutes, with-

out arriving at this conclusion. One tree after another is visited by the active little rovers, and its branches examined :

if nothing be forthcoming away goes the explorer to the next that presents itself, merely giving utterance to the usual twitter that serves to keep the body together. But

*if the object of search be found, another kind of chirp is emitted, and the next moment the several members of the band are flitting in succession to the tree and eagerly en- gaged with the spoil.**

The mode in which the want of sustenance produces Outward Migration may best be illustrated by confining ourselves nl to the unquestionably migrant Birds of our own northern ee Le hemisphere. As food grows scarce towards the end of goo4, summer in the most northern limits of the range of a species, the individuals affected thereby seek it elsewhere.

Thus doing, they press upon the haunt of other individuals: these in like manner upon that of yet others, and so on,

3 The only animals which approach Birds in the extent and charaeter of their migrations are Fishes, of which there is no need here to say anything. j

4 The case is altogether different with those species which in winter form themselves into large flocks, as most of the Finehes (Fringtllide) and Buntings (Zmberizide). The discoverer of a favourite morsel perhaps by his actions betrays what he has obtained, and accordingly his fellows may repair to the place, but it is without invitation on his part, and the only particular bond of union not entirely selfish whieh keeps them together is the cry of alarm with which a stranger is greeted.

Homeward movement.

Mr Wallace

MIGRATION. |

until the movement which began in the far north is com- municated to the individuals occupying the extreme south- ern range of the species at that season; though, but for such an intrusion, these last might be content to stay some time longer in the enjoyment of their existing quarters. This seems satisfactorily to explain the southward move- ment of all migrating Birds in the northern hemisphere ; but when we consider the return movement which takes place some six months later, doubt may be entertained whether scarcity of food can be assigned as its sole or suf- ficient cause, and perhaps it would be safest not to come to any decision on this point. On one side it may be urged that the more equatorial regions which in winter are crowded with emigrants from the north, though well fitted for the resort of so great a population at that season are deficient in certain necessaries for the nursery. Nor does it seem too violent an assumption to suppose that even if such necessaries are not absolutely wanting, yet that the regions in question would not supply sufficient food for both parents and offspring—the latter being at the lowest computation, twice as numerous as the former—unless the numbers of both were diminished by the casualties of travel! But on the other hand we must remember what has above been advanced in regard to the pertinacity with which Birds return to their accustomed breeding-places, and the force of this passionate fondness for the old home cannot but be taken into account, even if we do not allow that in it lies the

whole stimulus to undertake the perilous voyage. Mr Wallace in some remarks on the subject (Vature,

on origin of x, p, 459) ingeniously suggests the manner in which the

migratory habits,

Earlier re- turnof male

migrants.

habit of Migration has come to be adopted :2—

"It appears to me probable that here, as in so many other cases, 'survival of the fittest' will be found to have had a powerful influ- ence. Let us suppose that in any species of migratory bird, breeding can as a rule be only safely accomplished in a given area; and further, that during a great part of the rest of the year sufficient food cannot be obtained in that area. It will follow that those birds which do not leave the breeding area at the proper season will suffer, and ultimately become extinct; which will also be the fate of those which do not leave the feeding area at the proper time. Now, if we suppose that the two areas were (for some remote ancestor of the existing species) coincident, but by geological and climatic changes gradually diverged from each other, we can easily under- stand how the habit of incipient and partial migration at the proper seasons would at last become hereditary, and so fixed as to be what we term an instinct. It will probably be found, that every grada- tion still exists in various parts of the world, from a complete coincidence to a complete separation of the breeding and the sub- sistence areas; and when the natural history of a sufficient number of species is thoroughly worked out, we may find every link between species which never leave a restricted area in which they breed and live the whole year round, to those other cases in which the two areas are absolutely separated."

A few more particulars respecting Migration are all that can here be given, and it is doubtful whether much can be built upon them, It has now been ascertained by re- peated observation that in the spring-movement of most species of the northern hemisphere the cock-birds are always in the van of

the advancing army, and that they appear some days, or perhaps weeks, before the hens. It is not difficult to imagine that, in the course of a journey

? If the relative proportion of land to water in the Southern Hemi- sphere were at all such as it is in the Northern, we should no doubt find the birds of southern continents beginning to press upon the tro- pical and equatorial regions of the globe at the season when they were thronged with the emigrants from the north, and in such a case it would be only reasonable that the latter should be acted upon by the force of the former, according to the explanation given of the south- ward movement of northern migrants. But, though we know almost nothing of the migration of birds of the other hemisphere, yet, when we regard the comparative deficiency of land in southern latitudes all round the world, it is obvious that the feathered population of such 48 now-a-days exists can exert but little influence, and its effects may be practically disregarded.

- *In principle Captain Hutton had already foreshadowed the same theory.—(Trans. New Zeal. Inst. 1872, p. 235.)*

prolonged throughout some 50° or 60° of latitude, the stronger individuals should outstrip the weaker by a very perceptible distance, and it can hardly be doubted that in most species the males are stouter, as they are bigger than the females. Some observers assert that the same thing takes place in the return-journey in autumn, but on this point others are not so sure, which is not surprising when we consider that the majority of observations have been made towards what is the northern limit of the range of the Passeres, to which the remark is especially applicable —in the British Islands, France, North Germany, and the Russian Empire—for it is plain that at the beginning of the journey any inequality in the speed of travelling will not have become so very manifest. There is also another matter to be noticed. It has been suspected that where there is any difference in the size of birds of the same species, particularly in the dimensions of their wings, the individuals that perform the most extensive journeys are naturally those with the longest and broadest »emiges, and in support of this view it

certainly appears that in some of the smaller migrants—such as the Wheatear (Samicola enanthe) and Willow-Wren (Phylloscopus trochilus)—the examples which reach the extreme north of Europe and there pass the summer possess greater mechanical powers of flight than those of the same species which stop short on the shores of the Mediterranean. It may perhaps be also inferred, though precise evidence is wanting, that these same individuals push further to the southward in winter than do those which are less favoured in this re- spect. It is pretty nearly certain that such is the case with some species, and it may well be so with individuals. Canon Tristram has remarked (bis, 1865, p. 77) that, in many genera of Birds, 'those species which have the most extended northerly have also the most extended southerly range; and that those which resort to the highest latitudes for nidification also pass further than others to the south- ward in winter," fortifying his opinion by examples adduced from the genera Turdus, Fringilla, Cypselus, and Lurtur. But supposing this to be true for many Birds, it may fairly be doubted whether it is so for all, and whether in some species certain individuals do not always occupy the most northern portion of the range and others always keep to the most southern, no matter what the season of the year may be, or over what countries the range may ex- tend, On this point therefore it will be advisable to await further investigation.

For many years past a large number of persons in dif- ferent countries have occupied and amused themselves by carefully registering the dates on which various migratory Birds first make their appearance, and certain publications abound with the records so compiled? Some of the observers have been men of high scientific repute, others of less note but of not inferior capabilities for this especial object. Still it does not seem that they have been able to determine what connection, if any, exists between the arrival of birds and the state of the weather. This is not very wonderful, for the movements of the migrants, if governed at all by meteorological forces, must be influenced by their action in the places whence the travellers have come, and therefore to establish any direct relation of cause and effect corresponding observations ought equally to be made in such places, which has seldom been done.

3 These are far too numerous to mention here. Perhaps the most remarkable series of them is that carried on from 1736 to 1810 and again from 1886 to 1874 by four generations of the Marsham family at Stratton-Strawless and Rippon near Norwich, of which an account is given by Mr Southwell (Trans. Norf. and Norw. Nat. Soc. ii. p. 31).

4 To a limited extent it must be admitted that the popular belief as to certain Birds being the harbingers of severe weather is justifiable. Cold comes from the north, and when it is accompanied, as is most gene-

Connec- tion of dis- tance with length of

wing.

Presumed effects of weather on migration,

Statistics of migration.

As a rule it would seem as though Birds were not de- | very exhaustive memoir by Herr Palmén,® but it would be

pendent on the weather to any great degree. Occasionally the return of the Swallow or the Nightingale may be somewhat delayed, but most Sea-fowls may be trusted, it is said, as the almanack itself. Were they satcllites revolving around this earth, their arrival could hardly be more surely calculated by an astronomer. or cold, the Puffins (Fratercula arctica) repair to some of their stations punctually on a given day as if their move- ments were regulated by clock-work. Whether they have come from far or from near we know not, but other Birds certainly come from a great distance, and yet make their appearance with scarcely less exactness. Nor is the regu- larity with which certain species disappear much inferior ; every observer knows how abundant the Swift (Cypselus apus) is up to the time of its

leaving its summer-home— in most parts of England, the first days of August—and how rarely it is seen after that time is past.

It must be allowed, however, that, with one exception, the mass of statistics above spoken of has never been worked up and digested so as to allow proper infcrences to be made from them, and therefore it would be premature to say that little would come of it, but the result of that one exception is not very encouraging. Some twenty years ago Dr von Middendorff carefully collated the records of the arrival of migratory Birds throughout the Russian Empire, but the insight into the question afforded by his published labours? is not very great. His chief object has been to trace what he has termed the csepipteses (txos = cequalis, érixrnots = advolatus) or the lines of simul- taneous arrival, and in the case of 7 species? these are laid down on the maps which accompany his treatise. The lines are found by taking the average datc of arrival of each species at each place in the Russian dominions where observations have been regularly made, and connecting those places where the dates are the same for each species by lincs on the map. The curves thus drawn indicate the inequality of progress made by the species in diffcrent longitudes, and assuming that the advance is directly across the isepiptesial lines, or rather the belts defined by each pair of them, the whole course of the migration is thus most accurately made known. In the case of his seven sample species the maps show their progressive advance at intervals of a few days, and the issue of the whole investigation, according to him (op. cit. p. 8) proves that in the middle of Siberia the general direction of the

Foul weather or fair, heat.

impossible within the limits of the present article to do more than mention his results concisely. He enters very fully into this part of the enquiry and lays down with much apparent probability the chief roads taken by the most inigratory Birds of the Palearctic Region in their return autuninal journey, further asserting that in the spaces be- tween these lines of flight such birds do not usually occur. These main routes are, he states, mene in number. The first (A—to use his notation), leaving the Siberian shores of the Polar Sea, Nova Zembla, and the North of Russia, passes down the west coast of Norway to the North Sea and the British Islands. The second (B),

proceeding from Spits- bergen and the adjoining islands, follows much the same course, but is prolonged past France, Spain, and Portugal to the west coast of Africa, The third © starts from Northern Russia, and, threading the White Sea, and the great Lakes of Onega and Ladoga, skirts the Gulf of Fin- land and the southern part of the Baltic to Holstein and so to Holland, where it divides—one branch uniting with the secoud main route (B), while the other, running up the valley of the Rhine and crossing to that of the Rhone, splits up on reaching the Mediterranean, where one path passes down the western coast of Italy and Sicily, a second takes the line by Corsica and Sardinia, and a third follows the south coast of France and eastern coast of Spain —all three paths ending in North Africa, The fourth (D), fifth (E), and sixth (F) main routes depart from the extreme north of Siberia. The fourth (D) ascending the river Ob, branches out near Tobolsk —one track, diverging to the Volga, descends that river and so passes to the Sea of Azov, the Black Sea, and thence, by the Bosphorus and Zigean, to Egypt; another track makes for the Caspian by way of the Ural River and so leads to the Persian Gulf, while two more are lost sight of on the steppes. The fifth (E) mounts the Jennesei to Lake Baikal and so passes into Mongolia. 'The sixth (F) ascends the Lena and striking the Upper Amoor reaches the Sea of Japan, where it coalesces with the seventh (G) and eighth (O) which run from the eastern portion of Siberia and Kamchatka. Be- sides these the ninth (X) starting from Greenland and Iceland passes by the Feroes to the British Islands and so joining the second (B) and third © runs down the French coast. These being the main routes it must be added that, in Herr Palmén's opinion and that of many others, nearly all river-courses form minor routes.'

But lay down the paths of migratory Birds, observe their The retum comings and goings, or strive to account for the impulse of birds to which urges them forward as we will, there still remains Oe ae for consideration the most marvellous thing of all—How geemingly do the birds find their way so unerringly from such im- inexplic-

mense distances? This seems to be by far the most in- able.

usual migrants is almost due north, in the east of Siberia from south-east to north-west, and in European Russia from south-west to north-east. Thus

nearly all the migrants of the Russian Empire tend to converge upon the most northern part of the continent, the Taimyr Peninsula, but it is almost needless to say that few of them reach any-

Routes of migrants.

thing like so far, since the country in those high latitudes is utterly unfit to support the majority. With the excep- tion of some details, which, though possessing a certain special interest, need not here be mentioned, this treatise fails to shew more; for the fact that there are places that notwithstanding their higher latitude are reached by Birds on their spring-migrations sooner than others in a lower latitude was already known.

The routes followed by migratory Birds, so far as our information at present extends, has been the subject of a

rally the case, by heavy falls of snow, such Birds are of course driven southward to seek their living. But as often as not the Birds arrive with the kind of weather they are commonly held to prognosticate, while sometimes this does not follow their appearance.

1 Die Isepiptesen Russlands. Grundlagen zur Erforschung der Zug- zeiten und Zugrichtungen der Vogel Russlands. St Petersburg: 1855.

2 Hirundo rustica, Motacilla alba, Alauda arvensis, Oriolus galbula, Cuculus canorus, Ciconia alba, and Grus communis.

explicable part of the matter. Year after year the mnigra- nr

3 Om Foglarnes flytiningsvigar (Helsingfors: 1874). In this and the work of Dr von Middendorff, already cited, reference is made to almost every important publication on the subject of Migration, which renders a notice of its very extensive literature needless here, and a pretty full bibliographical list is given in Prof. Giebel's Thesaurus Ornithologie (i. pp. 146-155). Yet mention may be made of Prof. Schlegel's Over het trekken des Vogel's (Harlem: 1828), Mr Hodgson's "On the Migration of the Vatatores and Grallatores as observed at Kath- mandu" in Asiatic Researches (xviii. pp. 122-128), and M. Marcel de Serres's Des causes des Migrations des

Animauax et particuliérement des Oiseauz et des Poissons (Harlem: 1842). This last though one of the largest publications on the subject is one of the least satisfactory. Prof. Baird's excellent treatise On the Distribution and Migrations of North American Birds has been before adverted to.

4 In giving this abstract the present writer wishes to state that he does not thereby express his agreement with all that it contains. Herr Palmén's views deserve the fullest attention from the truly scientific spirit in which they are put forward, but some of the details on which they are founded seem to require correction.

Explana- tions offered :— Magnetism,

lustinct.

MIGRATION. |

tory Wagtail will build her nest in the accustomed spot, and year after year the migratory Cuckow will deposit her eggs in that nest, and yet in each interval of time the former may have passed some months on the shores of the Mediterranean, and the latter, absent for a still longer period, may have wandered into the heart of Africa.) The writer cannot offer an approach to the solution of this mystery. There was a time when he had hopes that what is called the "homing" faculty in Pigeons might furnish a clue, but Mr Tegetmeier and all the best authorities on that subject declare that a knowledge of landmarks ob- tained by sight, and sight only, is the sense which directs these Birds, while sight alone can hardly be regarded as affording much aid to Birds—and there is reason to think that there are several such—which at one stretch transport themselves across the breadth of Europe, or even traverse nore than a thousand miles of open ocean, to say nothing of those—and of them there are certainly many—which perform their migrations by night. That particular form of Bluethroat which yearly repairs to breed upon the mosses of the Subalpine and Northern parts of Scandinavia (Cyane- cula swecica) is hardly ever seen in Europe south of the Baltic? Throughout Germany it may be said to be quite unknown, being replaced by a conspicuously different form (C. leucocyana), and as it is a Bird in which the collectors of that country, a numerous and well-instructed body, have long taken great interest, we are in a position to declare that it is

not known to stop in its transit from its winter haunts, which we know to be Egypt and the valley of the Upper Nile, to its breeding-quarters. Other instances, though none so crucial as this, could be cited from among European Birds were there room here for them. In New Zealand there are two Cuckows which are annual visitors : one, a species of Chrysococcyz, is supposed to come from Australia, the other, Zudynamis tattensis is widely spread throughout Polynesia, yet both these birds yearly make two voyages over the enormous waste of waters that sur- rounds the country to which they resort to breed. But space would utterly fail us were we to attempt to recount all the examples of these wonderful flights. Yet it seems impossible that the sense of sight should be the faculty whereby they are so guided to their destination, any more than in the case of those which travel in the dark.

Dr von Middendorff (op. cit. p. 9), from the conclusions he has drawn, as before mentioned, as to the spring-move- ment of all birds in the Russian Empire being towards the Taimyr Peninsula, the seat of one of the magnetic poles, has suggested that the migrating Bird is always aware (he does not sufficiently explain by what means) of the situa- tion of this point, and thus knows how to steer its course. Not only is this hypothesis unsupported by any considera- tions known to the writer, but it is not at all borne out by the observed facts of Migration in North America, where Birds as has been shewn by Professor Baird (op. cit. p. 347) do not migrate in the direction of the magnetic pole. .

Other authors there are who rely on what they call "instinct " as an explanation of this wonderful faculty. This with them is simply a way of evading the difficulty before us, if it does not indeed remove the question alto- gether from the domain of scientific inquiry. Rejecting such a mode of treatment, Herr Palmén meets it in a much

1 Absolute proof of the identity of the particular birds is of course wanting, but if that objection be raised the circumstance becomes still more puzzling, for then we have to account for some mode of com- municating precise information by one bird to another.

2 Tt has occurred indeed as a straggler in about a dozen instances in England, and it arrives twice a year in greater or less numbers in

Heligoland as reported by the ever-watchful observer on that island, Mr Gatke, to whom ornithologists are so deeply indebted for his long-continued and intelligent scrutiny of the extraordinary number of wandering birds which alight there.

fairer spirit. He asserts (op. cit. p. 195) that migrants are led by the older and stronger individuals among them, and, observing that most of those which stray from their right course are yearlings that have never before taken the journey, he ascribes the due performance of the flight to "experience." But, granting the undisputed truth of his observation, his assertion seems to be only partially proved. That the birds which lead the flock are the strongest is on all accounts most likely, but what is there to show that these are also the oldest of the concourse? Besides this, there are many Birds which cannot be said to migrate in flocks. While Swallows, to take a sufficiently evident example, conspicuously congregate in vast flocks and so leave our shores in large companies, the majority of our summer-visitors slip away almost unobserved, each appa- rently without concert with others. It is also pretty nearly certain that the same species of Bird does not migrate in the same manner at all times. When Skylarks arrive on our north-eastern coast in autumn they come flitting over in a constant, straggling stream, not in compact flocks ; yet a little later these same birds collect in enormous assemblages which prosecute their voyage in company. It is indeed possible that each bird of the stream intentionally follows that which goes before it, though in a long sea- passage it must be hard to keep the precursor in sight, and it nay perhaps be granted that the leader of the whole is a bird of experience. But then we must consider not these cases only, but also those of Birds which do not migrate in company, and we must also have regard to what is implied in the word "experience." Here it can only signify the result of knowledge acquired on former occasions, and obtained by sight. Now it was stated by Temminck? many years ago, and so far as would appear the statement has not been invalidated, that among migrants the young and the old always journey apart and most generally by different routes. The former can have no "experience," and yet the greater

number of them safely arrive at the haven where they would be. The sense of sight, essential to a knowledge of landmarks, as we have above attempted to demonstrate, is utterly insufficient to account for the success that attends Birds which travel by night, or in a single flight span oceans or continents. Yet without it the idea of "experience" cannot be substantiated. We may admit that inherited but unconscious experience, which is really all that can be meant by instinct, is a factor in the whole matter—certainly, as Mr Wallace seems to have proved, in originating the migratory impulse, but yet every aspect of the question is fraught with difficulty, and we must leave to time the discovery of this mystery of niysterics.

Experience.

There yet remain a few words to be said on what may Excep- be termed Exceptional Migration, that is when from some tional _ cause or other the ordinary practice is broken through. migration.

This differs from the chance occurrence of the waifs and strays with whicli this section of the article began in that the Birds subject to it keep in a great measure their cus- tomary habit of migrating, and yet are compelled to indulge it in an irregular, or perhaps an altogether novel, manner, though they are not entirely the sport of circumstances,

The erratic movements of the various species of Crossbill Crossbills,

(Zoxia) and some allied forms afford perhaps the best- known exaniples. In England no one can say in what part of the country or at what season of the year he may not fall in with a company of the Common Crossbill (Z. curvirostra), and the like may be said of many other lands, The food of these Birds consists mainly of the seeds of conifers, and as its supply in any one locality is inter- mittent or precarious, we may not unreasonably guess that

3 Manual d Ornithologie, iii. Introd. p. xliii. note.

Nutcracker,

Waxwing.

Pallas's Sand- Grouse.

Nocturnal concourse of migrants,

they shift from: place to place in its quest, and may thus find an easy way of accounting for their uncertain appear- ance. The great band of Nutcrackers (Vuetfraga caryo- catactes) which in the autumn of 1844 pervaded Western and Central Europe' may also have been actuated by the game motive, but we can hardly explain the roaming of all other Birds so plausibly. The inroads of the Waxwing (Ampelis garrulus) have been the subject of interest for more than 300 years, and by persons prone to superstitious auguries were regarded as the forerunners of dire calamity. Sometimes years have passed without its being seen at all in Central, Western, or Southern Europe, and then perhaps for two or three seasons in succession vast floeks have sud- denly appeared. later observation has shown that this species is as inconstant in the choice of its summer- as of its winter-quarters, and though the eause of the irregularity may possibly be of much the same kind as that just sug- gested in the case of the Crossbill, the truth awaits further investigation.2 One of the most extraordinary cvents known to ornithologists is the irruption into Europe in 1863 of Pallas's Sand-Grouse (Syrrhaptes paradoxus). Of this Bird, hitherto known only as an inhabitant of the 'Tartar steppes, a single specimen was obtained at Sarepta on the Volga in the winter of 1848. In May 1859 a pair is said to have been killed in the Government of Vilna on the western borders of the Russian Empire, and a few weeks later five examples were procured, and a few others seen, in Western Europe—one in Jutland, one in Holland, two in England, and one in Wales. In 1860 another was obtained at Sarepta ; but in May and June 1863 a horde computed to consist of at least 700 individuals overran Europe—reaching Sweden, Norway, the Feeroes, and Ireland in the north-west, and in the south extending to Sicily and almost to the frontiers of Spain. On the sandhills of Jutland and Holland some of these birds bred, but war was too successfully waged against the nomades to allow of their establishing themselves, and a few survivors only were left to fall to the gun in the course of the following winter and spring.' In the summer of 1872,

another visitation to Great Britain was reported, but if it really took place it must have been that of a very small number of birds, and it was not observed on the Continent. Speculation has amused itself by assigning causes to these movements but the real reason remains in doubt.

We cannot quit the subject of Migration, however, with- out referring to the wonderful assemblages of Birds which have in various places been time and again noticed by night. Towards the close of summer, in dark, cloudy, and sti weather, it not unfrequently happens that a vast and, to judge from their cries, heterogeneous concourse of Birds may be heard hovering over our large towns. The practical ornithologist will recognize the notes of Plover, Sandpiper, Tern, and Gull, now faint with distance and then apparently close overhead, while occasionally the stroke of a wing may eatch his car, but nothing is visible in the surrounding gloom. {Sometimes but a few fitful wails are heard, of which only an expert listener will know the meaning. At others the continuous Babel of sounds will ensure the attention of the most incurious. It is supposed that these noises proceed from migrating birds, which, having lost their way, are attracted by the glare of the street lamps, but far too little has been observed to remove the obscurity that in a double sense surrounds them and to enable us to come to any definite conclusion. It must be added also that such a concourse has been noticed where the fascina-

- *Bull. de l'Acad. de Bruxelles, xi. p. 298.*

° Cf. Yerrell, Brit. Birds, ed. 4, i. pp. 524-532.

® Jbis, 1864, pp. 185-222. A few additional particulars which have since become known to the writer are inserted above.

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tion of light did not exist, for Lord Lilford has recorded 4 how that once at Corfu he was startled by an uproar as if all the feathered inhabitants of the great Achernsian Marsh had met in conflict overhead, but he could form no coneep- tion of what birds produced the greater part of it.

SONG.

Leaving then the subject of Migration, the next impor- tant part of the economy of Birds to be considered is erhaps their Song—a word, however, in a treatise of this kind to be used in a general sense, and not limited to the vocal sounds uttered by not more than a moiety of the feathered races which charm us by the strains they pour from their vibrating throat,—strains indeed denied by the scientific musician to come under cognizance as appertain- ing to his art, but strains which in all countries and in all ages have conveyed a feeling of true pleasure to the human hearer, and strains of which by common consent the Night- ingale is the consummate master. It is neccssary in a philosophical spirit to regard every sound made by a Bird under the all-powerful infinence of love or lust asa "Song."

It seems impossible to draw any but an arbitrary line Variety of between the deep booming of the Emeu, the harsh cry of Song.

the Guillemot (which, when proceeding from a hundred or a thousand throats, strikes the distant ear in a confused murmur like the roar of a tumultuous crowd), the plain- tive wail of the Plover, the melodious whistle of the 'Widgeon, "' the Cock's shrill clarion," the sercain of the Eagle, the hoot of the Owl, the solemn chime of the Bell- bird, the whip-eracking of the Manakin, the Chaffineh's joyous burst, or the hoarse croak of the Raven, on the one hand, and the bleating of the Snipe® or the drumming of the Ruffed Grouse, on the other. Innumerable are the forms which such utterances take. In many birds the sounds are due to a combination of vocal and instrumental powers, or, as in the cases last mentioned, to the latter only. But, however produced—and of the machinery whereby they are accomplished there is not room here to speak— all have the same cause and the same effect. The former has been already indicated, and the latter is its consum- mation. Almost coinstantaneously with the hatching of the Nightingale's brood, the song of the sire is hushed, and the notes to which we have for weeks hearkened with rapt admiration are changed to a guttural croak, expressive of alarm and anxiety, inspiring a sentiment of the most opposite character. No greater contrast can be imagined, and no instance can be cited which more completely points

out the purpose which "Song" fulfils in the economy of Purpose of | the bird, for if the Nightingale's nest at this early time be 596:

destroyed or its contents removed, the cock speedily re- covers his voice, and his favourite haunts again resound to his bewitching strains. For them his mate is content again to undergo the wearisome round of nest-building and incubation. But should some days clapse before disaster befalls their callow care, his constitution undergoes a change and no second attempt to rear a family is made. It would seem as though a mild temperaturc, and the abundance of food by which it is generally accompanied, prompt the physiological alteration which inspires the males of most birds to indulge in the "Song" peculiar to them. Thus after the annual moult is accomplished, and this is believed to be the most critical epoch in the life of any bird, cock Thrushes, Skylarks, and others begin to sing, not indeed with the jubilant voice of spring but in an

4 Ibis, 1865, p. 176.

5 'he true cause of this sound has been much discussed, but Herr Meves's explanation (Proc. Zool. Soc. 1858, p. 302), based on experi- ment, seems to be correct, though it is far from being generally accepted.

Gestures akin to song.

Varieties of nests.

NIDIFICATION. |

uncertain cadence which is quickly silenced by the super- vention of cold weather. Yet some birds we have which, except during the season of moult, hard frost, and time of snow, sing almost all the year round. Of these the Red- breast and the Wren are familiar examples, and the Chiff- chaff repeats its two-noted cry, almost to weariness, during the whole period of its residence in this country.

Akin to the "Song" of Birds, and undoubtedly proceed- ing from the same cause, are the peculiar gestures which the males of many perform under the influence of the approaching season of pairing, but these again are far too

numerous here to describe with particularity. It must suffice to mention a few cases. The Ruff on his hillock in a marsh holds a war-dance. The Snipe and some of his allies mount aloft and wildly execute unlooked-for evolutions almost in the clouds, The Woodcock and many of the Goatsuckers beat evening after evening the same aerial path with its sudden and sharp turnings. The Ring-Dove rises above-the neighbouring trees and then with motion- less wings slides down to the leafy retreat they afford. The Capercally and Blackcock, perched on a commanding eminence, throw themselves into postures that defy the skill of the caricaturist—other species of the Grouse-tribe assume the strangest attitudes and run in circles till the turf is worn bare. The Peacock in pride spreads his train so as to shew how nearly akin are the majestic and the ludicrons. The Bower-bird, not content with his own splendour, builds an arcade, decked with bright feathers

and shining shells, through and around which he paces .

with his gay companions. The Larks and Pipits never deliver their song so well as when seeking the upper air. Rooks rise one after the other to a great height and, turn- ing on their back, wantonly precipitate themselves many yards towards the ground, while the solemn Raven docs not scorn a similar feat, and, with the tenderest of croaks, glides supinely alongside or in front of his mate.?

NIDIFICATION.

Following or coincident with the actions just named, and countless more besides, comes the real work of the breeding-season, to which they are but the prelude or the accompaniment. Nidification is with most birds the beginning of this business ; but with many it is a labour that is scamped if not shirked. Some of the Auk tribe place their single egg on a bare ledge of rock, where its peculiar conical shape is but a precarious safeguard when rocked by the wind or stirred by the thronging crowd of its parents' fellows, The Stone-Curlew and the Goatsucker deposit their eggs without the slightest preparation of the soil on which they rest ; yet this is not done at haphazard, for no birds can be more constant in selecting, almost to an inch, the very same spot which year after year they choose for their procreant cradle. In marked contrast to such artless care stand the wonderful structures which others, such as the Tailor-bird, the Bottle-

Titmouse, or the Fantail-Warbler build for the comfort or safety of their young. But every

1 A curious question, which has as yet attracted. but little attention, is whether the notes of the same species of Bird are in all countries alike. From his own observation the writer is inclined to think that it is not, and that there may exist " dialects,' so to speak, of the song. (Cf. Gloger, Jour. fiir Orn. 1859, p. 398.)

2 No comprehensive account of the Song of Birds seems ever to have been written. The following may be cited as the principal treatises on the subject :—Barrington, Phil. Trans. 1773, pp. 249-291 ; Ken- uedy, V. Abhandl. baier. Akad. (Phil. Abhandl.) 1797, p. 169; Black- wall, Mem. Lit. and Phil. Soc. Manch. 1824, pp. 289-328 ; Savart, (Froriep's) Notizen u. s. w., 1826, pp. 1-10, 20-25 ; Brehm and Hans- mann, Naumannia, 1855, pp. 54-59, 96-101, 181-195, and Journ. Sir Orn. 1855, pp. 348-351, 1856, pp. 250-255. The notcs of many of our common Birds are musically expressed by Mr Harting, Dirds ef Hf iddlesex (London: 1866).

variety of disposition may be found in the Class. The Apteryx seems to entrust its abnormally big egg to an ex- cavation among the roots of a tree-fern; while a band cf female Ostriches scrape holes in the desert-sand and therein promiscuously dropping their eggs cover them with earth and leave the task of incubation to the male, who discharges the duty thus imposed upon him by night only, and trusts by day to the sun's rays for keeping up the needful, fos- tering warmth. The Megapodes raise a huge hotbed of dead leaves wherein they deposit their eggs and the young are hatched without further care on the part of either parent. Some of the Grebes and Rails seem to avail them- selves in a less degree of the heat generated by vegetable decay, and dragging from the bottom or sides of the waters they frequent fragments of aquatic plants form of them a rude half-floating mass which is piled on some growing water-weed—but these birds do not spurn the duties of maternity. Many of the Gulls, Sandpipers, and Plovers lay their eggs in a shallow pit which they hollow out in

‘the soil, and then as incubation proceeds add thereto a low

breastwork of haulm. The Ringed Plover commonly places its eggs on shingle, which they so much resemble in colour, but when breeding on grassy uplands it paves the nest-hole with small stones. Pigeons mostly make an artless plat- form of sticks so loosely laid together that their pearly treasures may be perceived from beneath by the inquisi- tive observer. The Magpie, as though self-conscious that its own thieving habits may be imitatcd by its neighbours, surrounds its nest with a hedge of thorns. Very many birds of almost every group bore holes in some sandy cliff, and at the end of their tunnel deposit their eggs with or without bedding. Such bedding, too, is very various in char- acter ; thus, while the Sheldduck and the Sand-Martin sup- ply the softest of materials, the one of down from her own body, the other of feathers collected by dint of diligent search,—the Kingfisher forms a couch of the undigested spiny fish-bones which she ejects in pellets from her own stomach, Other birds, as the Woodpeckers, hew holes in living trees, even when the timber is of considerable hard- ness, and therein establish their nursery. Some of the Swifts secrete from their salivary glands a fluid which rapidly hardens as it dries on exposure to the air into a substance resembling isinglass, and thus furnish the ‘ edible birds’ nests” that are the delight of Chinese epicures. In the architecture of nearly all the Passerine birds, too, some salivary secretion seems to play an important part. By its aid they are enabled to moisten and bend the otherwisc refractory twigs and straws and glue them to their place. Spiders’ webs also are employed with great advantage for the purpose last mentioned, but perhaps cluefly to attach fragments of moss and lichen so as to render the whole structure less obvious to the eye of the spoiler. The Tailor-bird deliberately spins a thread of cotton and there- with stitches together the edges of a pair of leaves to make a receptacle for its nest. Beautiful too is the felt fabri- cated of fur or hairs by the various species of Titmouse, while many birds ingeniously weave into a compact mass both animal and vegetable fibres, forming an admirable non-conducting medinm which guards the eggs from the extremes of temperature outside. Such a structure may be open and cup-shaped, supported from below as that of the Chaffinch and Goldfinch, domed like that of the Wren and Bottle-Titmouse, slung hammock-wise as in the case of the Golden-crested Wren and the Orioles, or suspended by a single cord as with certain

Grosbeaks and Humming- birds. Under snch circumstances it is even sometimes needful to balance the nest lest the weight of the growing young should destroy the equipoise and, precipitating them on the ground, dash the hopes of the parents, and com- pensation in such cases is applied by loading the opposite

Occasional departure from habits.

Birds breeding in socie- ties

Parasitic Birds.

T72

side of the structure with lumps of earth. Certain Warblers (.ledon aud Thamnobia) for some unascertained reason in- variably lay a piece of snake's slough in their nests. —to repel, it has been suggested, marauding lizards who may thereby fear the neighbourhood of a deadly enemy. The clay-built edifices of the Swallow and Martin are known to everybody, and the Nuthatch plasters up the gaping mouth of its uest-hole till only a postern large enough for entrance and exit, but easy of defence, is left. In South America we have a family of birds (Purnarude) which construct on the branching roots of the mangrove globular ovens, so to speak, of mud, wherein the eggs are laid and the young hatched. The Flamingo erects in the marshes it frequents a mound of earth some two feet in height, with a cavity atop, on which the hen, having oviposited, sits astride with dangling legs, and in that remarkable atti- tude is said to perform the duty of incubation. The females of the Hornbills, and perhaps of the Hoopoes, submit to incarceration during this interesting period, the males immuring them by a barrier of mud, leaving only a small window to admit air and food, which latter is assidu- ously brought to the prisoners.

But though in a general way the dictates of hereditary instinct are rigidly observed by birds, in many species a remarkable degree of elasticity is exhibited or the rule of habit is rudely broken. Thus the noble Falcon, whose ordinary eyry is on the beetling cliff, will for the con- venience of procuring prey condescend to lay its eggs on the ground in a marsh, or appropriate the nest of some other bird in a tree. The Golden Eavle, too,

remarkably adapts itself to circumstances, now rearing its young on a precipitous ledge, now on the arm of an ancient monarch of the forest and again on a treeless plain, making a humble home amid grass and herbage. Herons also shew the same versatility and will breed according to circuin-stances in an open fen, on sea-banks or (as is most usual) on lofty trees. Such changes are easy to understand. The instinct of finding food for the family is predomin- ant, and where most food is there will the feeders be gathered together. This explains, in all likelihood, the associated bands of Ospreys or Fish-Hawks, which in North America breed (or used to breed) in large companies where sustenance is plentiful, though in the Old World the same species brooks not the society of aught but its mate. Birds there are of eminently social predilections, In Europe, excepting Sea-fowls—whose congregations are universal and known to all—we have perhaps but the Heron, the Fieldfare, and the Rook, which habitually flock during the breeding-season; but in other parts of the world many birds unite in company at that time, and in none possibly is this habit so strongly developed as in the Anis of the Neotropical Region, the Republican Swallow of North America, and the Sociable Grosbeak of South Africa, which last joins nest to nest until the tree is said to break down under the accumulated weight of the common edifice.?

In the strongest contrast to these amiable qualities is the parasitic nature of the Cuckows of the Old World and

the Cow-birds of the New, but this peculiarity of theirs is

so well known that to dwell upon it would be needless. Enough to say that the egg of the parasite is introduced

1 There are not many works on nidification, for " Caliology"' or the study of nests has hardly been deemed a distinct branch of the science. A good deal of instructive matter (not altogether free from error) will be found in Rennie's Architecture of Birds (London: 1831), and there is Mr Wallace's most interesting dissertation, " A Theory of Birds' Nests," originally published in the Journal of Travel and Natural History (1868, p. 73), and reprinted in his Contributions to the Theory of Natural Selection (London : 1870). Mr Andrew Murray's and the Duke of Argyll's remarks on this essay are contained in the same voluine of the Journal named (pp. 137 and 276).

BIRDS

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into the nest of the dupe, and after the necessary incuba- tion by the fond fool of a foster-mother the interloper suc- cessfully counterfeits the heirs, who perish miserably, victims of his superior strength. The whole process has been often watched, but the reflective naturalist will pause to ask how such a state of things came about, and there is not much to satisfy his enquiry. Certain it is that some birds whether by mistake or stupidity do not unfrequently lay their eggs in the nests of others, It is within the know- ledge of many that Pheasants' eggs and Partridges' eggs are often laid in the same nest, and it is within the knowledge of the writer that Gulls' eggs have been found in the nests of Eider-Ducks, and vice versa; that a Redstart and a Pied Flycatcher will lay their eggs in the same convenient hole —the forest being rather deficient in such accommodation ; that an Owl and a Duck will resort to the same nest-box, set up by a scheming woodsman for his own advantage ; aud that the Starling, which constantly dispossesses the Green Woodpecker, sometimes discovers that the rightful heir of the domicile has to be brought up by the intruding tenant. In all such cases it is not possible to say which species is so constituted as to obtain the mastery, but it is not diffi- cult to conceive that in the course of ages that which was driven from its home might thrive through the fostering of its young by the invader, and thus the abandonment of domestic habits and duties might become a direct gain to the evicted householder. This much granted, all the rest will follow easily enough, but it must be confessed that this is only a presumption, though a presumption which seems plausible if not likely.

EGGS.

The pains bestowed by such Birds (incomparably the most numerous of the Class), as build elaborate nests and the devices employed by those that, not doing so, display no little skill in providing for the preservation of their produce, invite some attention to the eggs which they lay. This attention will perhaps be more cheerfully given when we think how many naturalists, not merely ornithologists, have been first directed to the study of the animal kingdom by

the spoils they have won in their early days of birds' nesting. Birds' With some such men the fascination of this boyish pursuit sting.

has maintained its full force even in old age—a fact not so mucb to be wondered at when it is considered that hardly any branch of the practical study of Natural History brings the enquirer so closely in contact with many of its secrets. It is therefore eminently pardonable for the victims of this devotion to dignify their passion by the learned name of " Ooroey," and to bespeak for it the claims of a science. Yet the present writer—once an ardent follower of the practice of birds'-nesting, and still on occasion warming to its pleasures—must confess to a certain amount of disap- pointment as to the benefits it was expected to confer on

Systematic Ornithology, though he yields to none in his Its uses

high estimate of its utility in acquainting the learner with the most interesting details of bird-life—without a know- ledge of which nearly all systematic study is but work that may as well be done in a library, a museum, or a dis- secting-room, and is incapable of conveying information to the learner concerning the why and the wherefore of such or such modifications and adaptations of structure. To some—and especially to those who are only anatomists— this statement may seem preposterous, but it is in truth no such thing. What engineer can be said to understand his business if he knows not the purpose to which the machines he makes are to be applied and is unacquainted with their mode of working? We may investigate tho- roughly the organs of any animal, we may trace them from the earliest moment in which they become defined, and

Discoveries of oolo- gists.

EGGS. |

watch them as they develop to maturity, we may compre- hend the way in which every part of a complicated struc- ture is successively built up, but if we take not the trouble to kuow their effect on the economy of the creatnre we as naturalists have done but half our task and abandon our labour when the fulness of reward is coming upon us. The field-naturalist, properly instructed, crowns the work of the comparative anatomist and the

physiologist, though without the necessary education he is little more than an empiric, even should he possess the trained cunning of the savage on whose knowledge of the habits of wild animals depends his chance of procuring a meal.

Perhaps the greatest scientific triumph of oologists lies in their having fully appreciated the intimate alliance of the Limicole (the great group of Snipes and Plovers) with the Gave (the Gulls, Terns, and other birds more distantly connected with them) before it was recognized by any pro- fessed taxonomist,—L'Herminier, whose researches have been much overlooked, excepted; though to such an one was given the privilege of placing that affinity beyond cavil (Huxley, Proc. Zool. Soc. 1867, pp. 426, 456-458 ; cf. Ibis, 1868, p. 92). In like manner it is believed that oologists first saw the need of scparating from the true Passeres several groups of birds that had for many years been un- hesitatingly associated with that very uniform assemblage. Diffidence as to their own capacity for meddling with mat- ters of systematic arrangement may possibly have been the cause which deterred the men who were content to brood over birds' eggs from sooner asserting the validity of the views they held. Following the example furnished by the objects of their study, they seem to have chiefly sought to hide their offspring from the curious eye—and if such was their design it must be allowed to have been admirably successful. In enthusiastic zeal for the prosecution of their favourite researches, however, they have never yielded to, if they have not surpassed, any other class of naturalists. If a storm-swept island, only to be reached at the risk of life, held out the hope of some oological novelty there was the egg-collector (Faber, /s¢s, xx. pp. 633-688 ; Proctor, Naturalist, 1838, pp. 411, 412). Did another treasure demand his traversing a burning desert (Tristram, bis, 1859, p. 79) or sojourning for several winters within the wildest wastes of the Arctic Circle (Wolley, Zbis, 1859, pp. 69-76 ; 1861, pp. 92-106; Kennicott, Rep. Smithson. Inst. 1862, pp. 39, 40), he endured the necessary hard- ships to accomplish his end, and the possession to him of an empty shell of carbonate of lime,} staincd or not (as the case might be) by a secretion of the villous membrane of the parent's uterus, was to him a sufficient reward. 'T'axo- nomers, however, have probably been right in not attach- ing too great an importance to such systematic characters as can be deduced from the eggs of birds, but: it would have been better had they not insisted so

strongly as they have done on the infallibility of one or another set of characters, chosen by themselves. Oology taken alone proves to be a guide as misleading as any other arbitrary method of classification, but combined with the evidence afforded by due study of other particularities, whether superficial or deep-seated, it can scarcely fail in time to conduct us to an ornithological arrangement as nearly true to Nature as we may expect to achieve.

The first man of science who seems to have given any special thought to oology, was the celebrated Sir Thomas Browne, of Norwich, who already in 1681, when visited by John Evelyn (from whose diary we learn the fact), had assigned a place in his cabinet of rarities to a collection of birds' eggs. The next we hear of is that Count of Marsigli

1 A small proportion of carbonate of magnesia and phosphate of lime and magnesia also enters into its composition.

who early in the eighteenth century explored, chiefly for this kind of investigation, the valley of the Danube—a region at that time, it is almost unnecessary to remark, utterly unknown to naturalists. But there is no nced to catalogue the worthics of this study. As they approach our own day their number becomes far too great to tell, and if very recently it has seemed to dwindle the reason is probably at hand in the reflection that most of the greatest prizes have been won, while those that remain to reward the aspiring appear to be just now from one cause or another almost out of reach. Perbaps at the present time the Birds- of-Paradise and their allies form the only group of any recognized distinctiveness and extent of whose eggs we know absolutely nothing—though there are important iso- lated forms, such as Atrichia, Heterolocha, and others, con- cerning the eggs as well as the breeding habits of which our ignorance is absolute, and the species of many families that have hitherto defied the zeal of oologists are very numerous, These last, however, though including some common and some not very uncommon British birds, possess in a general way comparatively little interest, since, the eggs of their nearest allies being well

known, we cannot expect much to follow from the discovery of the recluses, and it is only to the impassioned collector that the obtain- ing of such desiderata will afford much satisfaction.

*The first thing which strikes the eye of one who be- Varied holds a large collection of egg-shells is the varied hues of hues of Hardly a shade known to the colourist is °8**

the specimens. not exhibited by one or more, and soine of these tints have their beauty enhanced by the glossy surface on which they are displayed, by their harmonious blending, or by the pleasing contrast of the pigments which form markings as often of the most irregular as of regular shape.

amount of observation will shew to have been deposited on the shell a short time before its exclusion, are primarily and normally circular, for hardly any egg that bears mark- ings at all does not exhibit some spots of that form, but that in the progress of the eggs through that part of the oviduct in which the colouring matter is laid on many of them become smeared, blotched, or protracted in some par- ticular direction. The circular spots thus betoken the deposition of the pigment while the egg is at rest, the blurred markings show its deposition while the egg is in motion, and this motion would seem often to be at once onward and rotatory, as indicated by the spiral markings not un- commonly observable in the eggs of some Birds-of-prey aud others—the larger end of the egg (when the ends differ in form) making way for the smaller.2, At the same time the eggs of a great number of birds bear, beside these last and superimposed markings, more deeply-seated stains, generally of a paler and often of an altogether different hue, and these are evidently due to some earlier dyeing process,

formation of the shell, would appear to be suffused soon after. The depth of colouring whether original or super- vening is obviously dependent in a great measure on the constitution or bodily condition of the parent. If a bird, bearing in its oviduct a fully-formed egg, be captured, that egg will speedily be laid under any circumstances of in- convenience to which its producer shall be subjected, but such an egg is usually deficient in coloration—fright and

- *That the larger end is protruded first was found on actual experi- ment hy Mr Bartlett, Superintcndent of the Gardens of the Zoological Society, to be the case commonly, but as an accident the position may be sometimes reversed, and this wil] most likely account for the occa- sional deposition of markings on the sinaller instead of the larger end as not unfrequently shown in eggs of the Sparrow-hawk (Accipiter nisus). The head of the chick is always formed at the larger end.*

But it Forms of would seem as though such markings, which a very smal] ™4rkings.

The peculiar tint of the ground-colour, though Ground- commonly superficial, if not actually congenital with the colour.

Teffect of age on colour.

Varieties

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captivity having arrested the natural secretions. In like manner over excitement or debility of the organs, the con- sequence of ill health, give rise to much and often very curions abnormality. It is commonly believed that the older a bird is the more intensely coloured will be its eggs, and to some extent this belief appears to be true. Certain Falconide, which ordinarily lay very brilliantly-tinted eggs, and are therefore good tests, seem when young unable to secrete so much: colouring-matter as they do when older, and season after season the dyes become deeper, but there is reason to think that when the bird has attained its full vigour improvement stops, and a few years later the inten- sity of hue begins to decline. It would be well if we had more evidence, however, in support of this opinion, which is chiefly based on a series of eggs of one species—the Golden Eagle (Aquila chrysaetus), in the writer's possession, among which are some belicved on good grounds to have been the produce in the course of about twelve years of one and the same female. The amount of colouring-matter secretcd and deposited seems notwithstanding to be gene- rally a pretty constant quantity—allowance being made for individual constitution ; but it often happens—especially

in the same jn birds that lay only two eggs—that nearly all the dye will

clutch.

Nature of pigment.

be deposited on one of tlicse, leaving the other colourless ; it seems, however, to be a matter of inconstancy which of the two is first developed. Thus of two pairs of Golden Eagles' eggs also in the possession of the writer, one speci- men of each pair is nearly white while the other is deeply coloured, and it is known that in one case the white egg was laid first and in the other the coloured one. When birds lay many mottled, and a fortiori plain, eggs, there is gene- rilly less difference in their colouring, and though no two can hardly ever be said to be really alike, yet the family resemblance betweeu them all is obvious to the practised eye. It would seem however to bea peculiarity with some species—-and the Tree-Sparrow (Passer montanus) which lays five or six eggs may be taken as a striking example—that one egg should always differ remarkably from the rest of the clutch. In addition to what has been said above as to the deposition of colour in circular spots indicating a pause in the progress of the egg through one part of the oviduct, it may be observed that the cessation of motion at that time is equally shewn by the clearly defined hair-lines or vermiculations seen in many eggs, and in none more commonly met with than in those of the Buntings (Zmber- wide). Such markings must not only have been deposited while the egg was at rest, but it must have remained mo- tionless until the pigment was completely set, or blurred instead of sharp edges would have been the result.

The composition of this pigment has long excited much curiosity, and it has been commonly and rather crudely ascribed to secretions of the blood or bile,? but very recently unexpected light has been shed upon the subject by the researches of Mr Sorby (Proc. Zool. Soc. 1875, p. 351), who, using the method of spectrum-analysis, has now ascer- tained the existence of seven well-marked substances in the colouring-matter of eggs, to the admixture of which in cer- tain proportions all their tints are due. These he names

1 The principal oological works with coloured figures are the follow- ing :—Thienemamn, Fortpflanzungsgeschichte der gesammten Vogel (Ato,

Leipzig: 1845); Lefevre, Atlas des wufs des oiseaux d' Europe (8vo, Paris: 1845); Hewitson, Coloured Illustrations of the Eggs of British Birds (8vo, Ed. 3, London: 1856); Brewer, North American Oology (4to, Washington: 1859); Taczanowski, Oologia Ptakéw Polskich (8vo, Warszawa: 1862); Badeker, Die Hier der Europiischen Vogel (fol. Leip-

zig: 1863); Wolley, Ootheca Wolleyana (8vo, London: 1864)—some of

which have never been completed ; but a great number of rare eggs

are also figured in various journals, as the Proceedings of the Zoologi-

cal Society, Nawmannia, the Journal fiir Ornithologie, and The Ibis.

2 Of. Wilke, Nawmannia, 1858, pp. 393-397, and C. Leconte, Revue

et Magasin de Zoologie, 1860, pp. 199-205.

BIRDS

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Oorhodeine, Oocyan, Banded Oocyan, Yellow Ooxanthine, Rufous Ooxanthine, a substance, giving narrow absorption- bands in the red, the true colour of which he has not yet been able to decide, and lastly Lichenoxanthine. It would be out of place here to particularize their chemical proper- ties, and it is enough to say that they are closely connected either with hemoglobin or bile-pigments, and in many respects resemble the latter more than do any other group of colouring-matters, but do not actually agree with them. The first is perhaps the most important of all the seven, because it occurs more or less in the shells of so great a number of eggs that its entire absence is exceptional, and it is of a very permanent character, its general colour being of a peculiar brown-red. The second and third seem when pure to be of a very fine blue, but the spectrum of the former shows no detached bands, while that of the latter has a well-marked detached absorbent-band near the red end, though the two are closely related since they yield the same product when oxidized. The fourth and fifth sub- stances supply a bright yellow or reddish-yellow hue, and the

former is particularly characteristic of eggs of the Emeus (Dromeus), giving rise when mixed with oocyan to the fine malachite-green which they possess, while the latter has only been met with in those of the Tinamous (Tinamidee), in which it should be mentioned that oorho- deine has not been found, or perhaps in those of a Casso- wary (Caswartus), and when mixed with oocyan produces a peculiar lead-colour. The sixth substance, as before stated, has not yet been sufficiently determined, but it would seem in combination with others to give them an abnormally browner tint ; and the seventh appears to be identical with one which occurs in greater or less amount in almost all classes of plants, but is more especially abundant in and characteristic of lichens and fungi. There isa possibility however of this last being in part if not wholly due to the growth of minute fungi, though Mr Sorby believes that some such substance really is a normal constituent of the shell of eggs having a peculiar brick-red colour. That gentleman is further inclined to think that oorhodeine is in some way or other closely related to cruentine, being probably derived from the red colouring-matter of the blood by some unknown process of secretion, and likewise that there is some chemical relation between the oocyans and the bile.

The grain of the egg-shell offers characters that deserve Grain of far more consideration than they have received until lately, the shell when the attention of Herr von Nathusius having been directed to the subject by some investigations carried on by Dr Landois® and Herr Rudolf Blasius, he has brought out a series of remarkable papers® in which he has arrived at the conclusion that a well-defined type of shell-structure belongs to certain families of birds, and is easily recognized under the microscope. In some cases, as in the eggs of certain Swans and Geese (Cygnus olor and C'. musicus, Anser cinereus and A. segetum) even specific differences are apparent. The bearing of these researches on classifica- tion generally is of considerable importance and must be taken into account by all future taxonomers. Here we cannot enter into details, it must suffice to remark that the grain of the shell is sometimes so fine that the surface is glossy, and this is the case with a large number of Pr- caric, where it is also quite colourless and the contents of their eggs seen through the semi-transparent shell give an*

3 Zeitschr. fir wissensch. Zoologie, xv. pp. 1-31,

- *Op. cit. xvii. pp. 480-524.*

5 Op. cit. xviii. pp. 19-21, pp. 225-270, xix. pp. 322-348, xx. pp. 106-130, xxi. pp. 830-385. A summary of these will be found in Journ. fir Ornith. 1871, pp. 241-260, and the subject has been con- tinued in the same periodical for 1872, pp. 821-332, and 1874, pp.

1-26.

Form of eggs.

EGGS. |

opalescence of great beauty; but among the Tinamous (Zinamide) colour is invariably present and their opaque eggs present the appearance of more or less globular balls of highly-burnished metal or glazed porcelain. Most birds lay eggs with a smooth shell, such as nearly all the Gavice, Lamicolw, and Passeres, and in some groups, as with the normal G'alline, this seems to be enamelled or much polished, but it is still very different from the brilliant surface of those just mentioned, and nothing like a definite line-can be drawn between their structure and that in which the substance is dull and uniform, as among the Alcidee and the Accipitres. In many of the Rutite the surface is granulated and pitted in an extraordinary man- ner,' and in a less degree the same feature is observable in the eggs of some other birds, as the Storks (Ciconiide). Many Water-fowls, and particularly the Ducks (Azatide), lay eggs with a greasy or oleaginous exterior, as the col- lector who wishes to inscribe his specimens with marks of their identity often finds to his inconvenience ; but there are other eggs, as those of the Anis (Crotophaga), the Grebes (Podicipedidee), and all of the Steganopodes, except Phaeton, which are more or less covered with a cretaceous film, often of considerable thickness and varied by cal- careous protuberances, :

In form eggs vary very much, and this is sometimes ob- servable in examples not only of the same species but even from the same mother, yet a certain amount of resemblance is usually to be traced according to the natural group to which the parents belong. Those of the Owls (Strigida) and of some of the Picarte—especially those which lay the glossy eggs above spoken of—are often apparently sphcri- cal, though it is probable that if

tested mathematically none would be found truly so—indeed it may be asserted that few eggs are strictly symmetrical, however nearly they nay seem so, one side bulging out, though very slightly, more than the other. The really oval form, with which we are most familiar, needs no remark, but this is capable of infinite variety caused by the relative position and pro- portion of the major and minor axes. In nearly all the Limicole and some of the Aleide the egg attenuates very rapidly towards the smaller end, sometimes in a slightly convex curve, sometimes without perceptible curvature, and occasionally in a sensibly concave curve. The eggs having this pyriform shape are mostly those of birds which invariably lay four in a nest, and therein they lie with their points almost meeting in the centre and thus occupying as little space as: possible and more easily covered by the brooding parent. Other eggs as those of the Sand-Grouse (Pterocleidw) are elongated and almost cylindrical for a considerable part of their length terminating at each end obtusely, while eges of the Grebes (Podicipedidw) which also have both ends nearly alike but pointed, are so wide in the middle as to present a biconical appearance.?

The size of eggs is generally but not at all constantly in proportion to that of the parent. The Guillemot (Alea trode) and the Raven (Corvus coraz) are themselves of about equal size; their eggs vary as ten to one. The Snipe (Scolopax gallinago) and the Blackbird (Turdus merula) differ but slightly in weight, their eggs remarkably. The eggs of the Guillemot are as big as those of an Eagle; and those of the Snipe equal in size the eggs of a Partridge

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(Perdix cinerea), Mr Hewitson, from whom these instances

It is curious that Ostriches' eggs from North Africa are to be readily distinguished from those from the Cape of Good Hope by their sinooth ivory-like surface, without any punctures, whereas southern specimens are rough as though pock-marked (Zbis, 1860, p. 74), yet no difference that can be deemed specific has as yet been established be- tween the birds of the north and of the south.

? A great deal of valuable information on this and other kindred subjects is given by Des Murs, Traité général d' Oologie ornithologique (8vo, Paris: 1860).

are taken, remarks :—" The reason of this great disparity is, however, obvious ; the eggs of all those birds which quit the nest soon after they are hatched, and which are conse- quently more fully developed at their birth, are very large." It must be added, though, that the number of eggs to be covered at one time seems also to have some relation to their size, and this offers a further explanation of the fact just mentioned with régard to the Snipe and the Partridge —the former being one of those birds which are constant in producing four, and the latter often laying as many as a dozen ~for the chicks of each run as soon as they release themselves from the shell.

Incubation is performed, as is well known, by the feiale Incubation.

of nearly all Birds, but with most of the Passeres and many others the male seems to share her tedions duties, and among the Ratite, apparently without exception, the cock takes that office wholly on himself. There are a few groups or perhaps species in which the same practice is suspected to obtain —certain of the Limicole for instance, the Godwits (Limosa), the Phalaropes (Phalaropus), and the Dotterel (Hudromias morinellus)—and in these it is to be remarked that the hen is larger and more brightly coloured than her mate. Owing to the unfortunate neglect of those who have the opportunity of making the necdful observations the period of Incubation has been ascertained in compara- tively few birds, and it is here possible to deal with that subject only in the most vague and general language. It may be asserted that most of the smaller Passeres of Kurope hatch their young in about thirteen days, but in a few species the term is believed to be shortened to ten or eleven days, while in the largest of that Order, the Raven, it is lengthened to some twenty-one days. This also is the period which the Barndoor-fowl ordinarily takes, but the Pheasant, though so very nearly allied, takes about twenty- eight. Most Water-birds, so far as is known, and

the smaller Birds-of-prey seem to require as long a tiie, but in the Swan incubation is protracted to six weeks. The temperature of the air is commonly credited with having something to do either in hastening or retarding exclusion from the egg, but to what extent, or even whether justly so or not, seems in the absence of precise experiments to be doubtful, Certain birds occasionally begin brooding as soon as the first egg is laid, and this plan unquestionably has its advantages, since the offspring being of different ages thereby become less of a burthen on the parents which have to minister to their wants, while the fostering warmth of the earlier chicks can hardly fail to aid the development of those which are unhatched, during the absence of father and mother in search of food; but most birds, and it need searcely be said, all those the young of which run from their birth, await the completion of the clutch before sitting is begun. The care bestowed, by almost every species, on the infant-brood, is proverbial, and there is hardly any extremity of danger which one at least of the anxious parents will not incur to ward off injury from their pro-*

geny. MOULT.

The more or less protracted business of reproduction being ended there forthwith follows in the case of nearly all Birds a process of the inost vital consequence to then. This is the Moult or shedding of their old and often wea- ther-beaten feathers to be replaced by an entirely new suit. It is probably the severest strain to which bird-life is ex- posed, and, to judge from its effects on our domesticated pets, produces a greater mortality than an occasional want

3 Hewitson, op. cit. Introd. p. x.

"This seems to be very often the case with the Owls, but if the writer's observation is not mistaken the habit is not constant evan with the same individual bird.

Annual Moult.

Necessity of moult.

of proper or even any food does. Important however as are its bearings on every individual of the whole Class, the subject is one which has been sadly neglected by ornitho- logical writers and, with one exccption,' we are not awarc of any connected series of observations on Moult within the whole range of their literature. The structure and mode of growth of feathers has been very well studied and de- scribed by several investigators, and must be especially treated in introducing the subject of Pterylography—or the disposition of the various plumed patches on the bird's body—which, having been found to be a most useful auxili- ary in Classification, is deferred until that comes to be discussed under the article " OrnirHoLoey." For the pre- sent we have briefly to consider the different phases which the process of Moulting offers.

As a general rule all Birds are subject to an annual Moult, and this as above stated, commonly begins immedi- ately on the close of the breeding-season, but, as will be explained further on, there are some which undergo in addition a second or even a third partial change of plum- age, and it is possible that there may be others still more exceptional, our information respecting these, however, is too meagre to make it worth while saying anything here about them. It must be acknowledged that with regard to the great majority of forms we can only judge by analogy, and though it may well be that some interesting deviations from the general rule exist of which we are altogether ignorant, yet when we consider that the Ratite, so far as observed, moult exactly in the same manner as other birds,? the uniformity of the annual change may be almost taken for granted.

It is not intended here to describe the way in which a feather dies and a new one succeeds it, nor need we conipare the process of moulting with the analogous shedding of the hair in Mammals or of the skin in Reptiles. Enough for our present purpose to see that such renovation is required in Birds, which nearly all have to depend upon their quills for the means of locomotion and hence of livelihood. It is easy to understand that durable as are the flight-feathers, they do not last for cver and are besides very subject to accidental breakage, the consequence of which would be the crippling of the bird. It is obviously to provide against what in most cases would be such a disaster as this last that we find the vemiges, or quill-feathers of the wings, to be always shed in pairs. They drop out not indeed abso- lutely at

the same moment, though this sometiines seems to happen, but within a few days of each other, and, equilibrium being thus prescrved, the power of flight is but slightly deteriorated by their temporary loss. The same may. be observed in a less degree, since there is less need of regularity, with the rest of the plumage, as a little attention to any tame bird will show, and the new feathers grow at an almost equal rate. In the young of most species the original quills are not shed during the first year, nor in the young of many does there seem to be an entire moult during that time, but in the typical G'adline, which are able to fly at a very early age, often before they are one-third grown, the original quilis, being proportioned to the duties required of them, are shed before the bird has attained its full size and are succeeded by others that serve it when it has reached maturity. In the Duck-tribe (Anatide), however, we have a very singular exception to what has been above stated. Most of these birds shed their quill- feathers all at once, and become absolutely incapable of

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1This is a valuable paper by Herr Meves, of Stockholm (G/vers. K. Vet. Akad. Forhandl. 1854, p. 258), of which a German transla- tion with some additions by the author may be found in Journ. fir Ornith. 1855, pp. 230-238.

2 For the knowledge of this fact the writer is indebted to the vast experience of Mr Bartlett.

flight for a season,' during which time they generally seek the shelter of thick, aquatic herbage, and it is further to be particularly remarked that the males of most of two sections of the family (Anatinw and Fuliguline) at the same period lose the brilliantly-coloured plumage which commonly distinguishes them and "go into eclipse," as Waterton happily said, putting on for several weeks a dingy garb much resembling that of the other sex, to resume their gay attire only when, their new quills being grown, it can be safely flaunted in the open air. Here Additional we have the first instances

of Additional Moult to be men- ™oult tioned. Another is not less interesting, though ornitholo- gists must confess with shame that they have not sufficiently investigated it, This is that of the Ptarmigan (Lagopus mutus), both sexes of which not only moult after the breed- ing-season is over into a grey suit, and then again as autumn passes away into their snowy winter-clothing, but, divesting themselves of this last in spring, then put on each a third and most distinctive dress—these changes, however, do not extend to the quills either of the wings or tail.4

The number of Birds which undergo a more or less entire Variation Double Moult is very considerable, and the peculiarity is of moult in not always characteristic of families or even, unless in a allied Diag restricted sense, of genera. Thus while the Garden-Warbler (Sylvia salicaria) is said to moult twice in the year the Blackcap (8. atrecapilla) does so but once. The same may be said of the Mmberizide, in which family both practices seem to obtain, but on the other hand the distinction in this respect between the Larks (Adaudide) and the Pipits (Anthine), belonging to the family Motacillide, appears, so far as our knowledge goes, to be invariable, though the habits and general appearance of both groups are so much alike —- the Alaudide moulting but once and the Anthine, conform- ing to the practice of the normal Motacillide (M otacilline), twice a year—the quills, be it understood, excepted. But it would be impossible here to give more than these few exainples, and indeed we scarcely know anything of the subject outside of groups belonging to the Northern hemisphere.®

In a large number of species the Additional Moult is very Partial partial, being often limited to certain portions of the plumage, moult. and it is yet an unsolved problem how far some of the changes to be observed are due to actual Moult and how far to the alteration of colour in the feathers themselves, as also the way by which this alteration of colour is produced, whether, as certainly happens in many instances, by the dropping off of the " barbicels"—the fine filaments that fringe the '"barbicels" which are arranged on the upper surface of each "barb" composing the web of the feather —or in some other manner. With either of these last considerations we need not now concern ourselves. It is unquestionable that there are innumerable species of birds, the males at least of which put forth in spring decorative plumes unknown at any other season, and it would appear that

in the majority of them the feathers which before clothed the parts whence the newly-donned ornaments grow are doffed to make room for these paraphernalia of marriage.

The subject of Additional Moult is thus intimately con- nected with the seasonal adornment of Birds, and as that

3 One species, Aficropterus cinereus, seems never to regain the power of flight thus lost. Gf. Cunningham, Proc. Zool. Soc. 1871, p. 262.

4 Macgillivray (Brit. Birds, i. p. 196, London: 1837; and Nat. Hist. of Deeside, p. 405, London: 1855) thought there were four moults in this species, but that seems to be one too many. Herr Meves (loc. cit.) and the Abbé Caire (tev, Zool. 1854, p. 494) independently made the discovery of the Triple Moult, and almost simultaneously announced it. Cf. Gloger, Journ. fiir Orn. 1856, p. 461.

5 The fullest list as yet published is that of Herr Meves (ut supra), but it is not entirely free from error.

Bak, Dd

properly belongs to a braueh of the great question of Natural Seleetion, its further consideration must here be put off until that is more fully treated, together with what are known as the "Laws of Plumage," the reader being meanwhile referred to those exeellent chapters in which Mr Darwiu! has treated the matter with his usual perspi- euity, though even he has far from exhausted its varied | points of interest.

It remains to be remarked that though the annual Moult

commonly takes place so soon as the breeding-season is over, there are plenty of cases where we find the change delayed to a later period of the year. This is so with the Swallow (Z/trundo rustica), which has long been known to moult in midwinter, and it is generally the way with all the Diurnal Birds-of-prey. But unquestionably most birds aeeomplish the

ehange much earlier, aud before they leave their breeding-quarters for their winter-hauuts, thereby starting on one of their great annual journeys with all the external machinery of flight renewed aud in the best con- ditiou for eseaping its attendant perils, (A. WN.)

1 The Descent of Man and Selection in Relation to Sex, chaps. xiii— xvi. London: 1871. INDEX TO THE GENERA AND LARGER Groups or Brrps NAMED.

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712. Porzana, 760. Pyrrhula, 752, 756, 761. Sceloglaux, 742. Pratincola, 760. Querquedula, 712. Schizognaths, 699, 711, Prioniturus, 763. Rallidw, 699, 711; 729, 712, 713. Prionoteles, 750, 741, 742, 747, 749, 751. Schizorhis, 715. Procellaria, 727. Rallus, 730, 740. Schwaneria, 763. Procellariide, 751. Rapaces, 711, 714, 725. Scolopacid, 745, 750, Progne, 747. Raptores, 712, 724. 751, 752, 755, 756. Prosthemadura, 742. Ratitse, 699, 700, 705. 706, | Scolopax, 730, 753, 775 Protornis, 730. 718, 720, 721, 72+, 725, | Scopus, 713. Psamathia, 741. 727; 738, 742, 745, 758, | Scotopelia, 720 Psephotis, 715. 760, 775, 776. Scythrops, 715. Pseudogryphus, 742. Recurvirostride, 750. Semioptera, 740. Pscudolalage, 763. Regulus, 756. Serpentariide, 758. Pseudoptynx, 763. Rhabdornis, 763. Serresius, 741. Pseudoscops, 750. Rhamphastide, 743, 746. | Sitta, 730. Psittaci, 737, 740, 74], | Rhamphastos, 715, 721. | Sittidse, 748, 750.

742, 760, 763. Rhamphoeinclus, 749. | Somateria, 735.

Talegalla, 712. Tanegrid, 743, 745, 746,

747, 748, 749, 750.

Trochilomorpha, 700. Zosterops, 739, 742

BIRDS OF PARADISE, a group of Passcrine Birds inhabiting New Guinea and the adjacent islands, so named by the Dutch voyagers in allusion to the brilliancy of their plumage, and to the current belief that, possessing neither wings nor feet, they passed their lives in the air, sustained on their ample plumes, resting only at long intervals suspended from the branches of lofty trees by the wire- like feathers of the tail, and drawing their food " from the

Standard Wing Bird of Paradise (Semioptera wallacet).

dews of heaven and the nectar of flowers." Such stories obtained credence from the fact that so late as the year 1760, when Linnzus named the principal species apoda, or "footless," no perfect specimen had been seen in Europe, the natives who sold the skins to coast traders invariably depriving them of feet aud wings. The birds now usually included under this name belong to two distinct families, the Paradiseide and the Lpimachide,

the former or true Birds of Paradise being closely allied to the Crows, the latter or Long-billed Paradise Birds being usually classed, from the form and size of their bills, with the Hoopoes. Both families occuny the same geographical area, and are alike distingushed by the enormous developmeut of certain parts of their plumage. Of the true birds of paradise, the largest is the Great Emerald Bird (Paradisea apoda), about the size ef the common jay. Its head and neck are covered

with short thick-sct feathers, resembling velvet pile, of a bright straw colour above, and a brilliant emerald green beneath. From under the shoulders on each side springs a dense tuft of golden-orange plumes, about 2 feet in length, which the bird can raise at pleasure, so as to enclose the greater part of its body. The two centre tail feathers attain 2. length of 34 inches, and, being destitute of webs, have a thin wire-like appearance. This splendid plumage, how- ever, belongs only to the adult males, the females being exceedingly plain birds of a nearly uniform dusky brown colour, and possessing neither plumes nor lengthened tail feathers. The young males at first resemble the females, and it is only after the fourth moulting, according to A. R. Wallace, who recently studied those birds in their native haunts, that they assume the perfect plumage of their sex, which, however, they retain permanently afterwards, and not during the breeding season only as was formerly supposed, At that season the males assemble, in numbers varying from twelve to twenty, on certain trees, and there disport theniselves so as to display their magnificent plumes in presence of the females. Wallace in his Malay Archipelago, vol. ii., thus describes the attitude of the male birds at one of those " sacaleli," or dancing parties, as the natives call them ; "their wings," he says, 'are raised vertically over the back, the head is bent down and stretched ont, and the long plumes are raised up and expanded till they form two magnificent golden fans striped with deep red at the base, and fading off into the pale brown tint of the finely-divided and softly-waving points; the whole bird is then overshadowed, by them, the crouching body, yellow head, and emerald green throat, forming but the foundation and setting to the golden glory which waves above." It is at this season that those birds are chiefly captured. The bird-catcher having found a tree thus selected for a "dancing party," builds a hut among the lower branches in which to conceal himself. As soon as the male birds have begun their graceful antics, he shoots them, one after the other, with blunt arrows,

for the purpose of stunning aud bringing them to the ground without drawing blood, which would injure their plumage; and so eager are those birds in their courtship that almost all the males are thus brought down before the danger is perceived. The natives in preparing the skins remove both feet and wings, so as to give more prominence to the com- mercially valuable tuft of plumes, They also remove the

skull, and the skin is then dried in a smoky hut. The Great Emerald Bird, so far as yet known, is only found in the Aru Islands. :The Lesser Bird of Paradise (Puradisea minor), though smaller in size and somewhat less brilliant in plumage, in other respects closely resembles the preceding species. It is also more comniou, and much more widely distributed, being found throughout New Guinea and the neighbouring islands. Its plumes are those mest generally used as ornaments for ladies' head-dresses. It has been brought alive to Europe, and has been known to live for two years in the gardens of the Zoological Socicty of London. Both species are omnivorous, feeding voraciously on fruits and insects. They are strong, active birds, and are believed to be polygamous. The King Bird of Paradise (Cicinnurus regius) is one of the smallest and most brilliant of the group, and is specially distinguished by its two middle tail feathers, the ends of which alone are webbed, and coiled into a beautiful spiral disc of a lovely emerald green. In the Red Bird of Paradise (Paradisea rubra) the same feathers are greatly elongated and destitute of webs, but differ from those in the other species, in being flattened out like ribbons. They are only found in the small island of Waigiou off the coast of New Guinea. Of the Long-billed Paradise Birds (Zpimachide) the most remarkable is that known as the "Twelve-wired" (Seleucides alba), its delicate yellow plumes, twelve of which are transformed into wire-like bristles nearly a foot long, affording a striking contrast to the dark metallic tints of the rest of its plumage. Like the Pava- diseide they feed on insects and fruits.

BIRKBECK, Getorce, an English physician and philanthropist, born at Settle in Yorkshire in 1776. He early evinced a strong predilection for scientific pursuits ; and in 1799, after graduating as doctor of niedicine, he was appointed to the chair of natural philosophy at the Andersonian

Institution of Glasgow. In the following year he delivered, for the benefit of the working-classes, 4 gratuitous course of scientific lecturcs, which were continued during the two following years and proved eminently successful, He removed to London in 1804, and there he endeavoured to prosecute his philanthropic schemes, at first without much encouragement, but ultimately with marked success. In 1827 he contributed to found the Mechanics' Institute, his coadjutors being Bentham, Wilkie, Cobbett, aud others. He was appointed director of the institute, which he had originally endowed with the sum of £3700, and held the office till his death in December 1841.

BIRKENHEAD, aseaport, market-town, extra-parochial district, township, and parliamentary borough, in the hun- dred of Wirral and west division of Cheshire, England. It is situated on the western bank of the Mersey, directly opposite Liverpool. It is of considerable antiquity, its history dating from 1150, when a priory was founded in honour of St Mary and St James by the third baron of Dunham Massey, and had considerable endowments. The priors sat in the parliaments of the earls of Chester, and enjoyed all the dignities and privileges of palatinate barons, A fine crypt and some interesting ruins of the priory still exist. From acomparatively obscure fishing village Birken- head has become a large and important town, with a rapidity truly marvellous. The inhabitants numbered only 200 in 1821; in 1831 they were 2569 ; the following table shows the increase since 1841 :—

Dwelling

iguscs Rateable Value.

Population.

§227 1466

4148 5239 7511 8000

£44,000

114,301 150,827 219,011 228,909

25,000 37,796 45,418

cestim.) 52,000

19

Birkenhead began to develop itsclf as a market-town in the year 1833, when an Act was obtained fur paving, light- ing, watching, cleansing, and improving the town, and for regulating the police and establishing a market. By this Act the Improvement Commissioners were originally con- stituted, and at that time included the mayor, bailiffs, and four aldermen of Liverpool. Immediately after the passing of this Act the town made rapid progress. The principal streets were laid out on a regular plan, intersect- ing each other at right angles. A line of tramway, the first laid in England, affords every facility of street com- munication. Hamilton Square, which occupies the summit of the rising ground near the river, forms the basis or starting point for all the parallel and rectangular lines of streets. The houses of the square are four stories in height, with stone fronts, the centres and ends of each terrace being relieved or ornamented with columns and porticos in the Tuscan order of architecture.

Birkenhead has (exclusive of the out townships) nine churches belonging to the Established Church. St Mary's, built in 1821 by Mr, F. R. Price, late lord of the manor, is in the Decorated Gothic style of architecture, with a well-proportioned tower and spire. The churchyard includes the burial ground and ruins of the ancient priory and chapel of St Mary. In addition to the Established churches there are twenty-four places of worship belonging to various Nonconforming denominations, viz., five Presby- terian, three Independeut or Congregational, 2 Baptist, four Wesleyan, oue Primitive Methodist, one Society of Friends, two Plymouth Brethren, three Roman Catholic, one Catholic and Apostolic, two Unitarian. Many of these buildings are fair examples of Gothic and classic architecture. St Aidan's Theological College, in connec- tion with the Established Church, occupies a fine and elevated sitc adjoining the western boundary of Claughton. It isa handsome building in the Tudor style of architcc- ture. There are seven public elementary schools in con- nection with the Established churches, and seven in con- nection with other religious bodies. There is also a first-class proprietary school, conducted on the model of the great public schools, besides several private academies.

There are several public buildings in Birkenhead worthy of notice. The market-hall is a large and commodious building, 430 feet long and 130 feet wide, with substantial and lofty vaults extending under its entire area. It was opened in 1845, and built at a cost of £35,000. The public slaughter-houses in Jackson Street, belonging to the Birkenhead Commissioners, form an extensive pile of build- ings ; they were erected in 1846 at a cost, exclusive of the site, of about £11,000, and were the first public slaughter-houses of any extent erected in England. The town water-works also belong to the Birkenhead Commis- sioners, and consist of two pumping stations, the wells of which yield an aggregate supply of about 2} million gallons in twenty-four hours. The town-hall in Hamilton Street is a one-story building, and formed when first erected the front of the old market-hall; it contains a police court, fire-engine station, and chief bridewell; there are, besides, two branch bridewells. Among other buildings are the post-office in Conway Street, the borough hospital, and the School of Art, also in Conway Street, both erected by the late Mr John Laird, M.P., and a free library in Hamilton Street. The large and commodious industrial schools in Corporation Road were built at the cost of Sir Wm. Jackson, Bart.,as a memorial to the late Prince Consort. The Music Hall and the Queen's Hall are situated in Claughton Road. There is also a neat and comniodions theatre and opera-house in Argyle Street.

Birkenhead Park, opened in 1847, occupies 1902 acres of ground, and was laid out at a cost (including the land) of

£140,000. Birkenhead Cemetery, on Flaybrick Hill, occupies 202 acres of ground, and cost about £40,000. Woodside Ferry may be regarded as the principal entrance to Birkenhead and Wirral from Liverpool ; and its exclusive right of ferryage dates back to 1832. In 1842 the Birkenhead Commissioners purchased this ferry, under an Act of Parliament, from Mr I'. R. Price, the lord of the manor. At the present time the annual receipts for passengers alone amount to £36,000, and the number of persons conveyed in the twelve months is upwards of nine millions, the single fare being one penny. A large landing- stage, 800 feet in length and 80 feet in width, is moored at this ferry, the passenger traffic being conducted to and

from the stage by means of a double gangway bridge, covered by two circular glass and iron roofs. The goods traffic is conveyed to and from the stage by a well-con- structed floating bridge, 670 feet in length and 30 feet in width, which enables the traffic to be carried on at any state of the tide. Handsome and commodious saloon steamers, built and designed upon an improved principle, and capable of carrying above 1700 passengers each, are now used upon this ferry. The late Mr William Laird, whose name is so well known in connection with iron shipbuilding, first conceived the idea of turning to advantage the capabilities of Wallasey Pool for the forma- tion of a dock. After a lapse of many years, the Com- missioners of Birkenhead, alive to the advantages which this project would confer upon the town, employed the late Mr Rendel as their engineer, and applied to Parlia- ment for powers to construct the necessary works. The foundation-stone of the new docks was laid in October 1844, and the first dock was opened by the late Lord Morpeth on 5th April 1847. Subsequently, the dock powers of the Commissioners were entrusted to a corporate body of trustees who afterwards transferred the property to the corporation of Liverpool ; and ultimately it was vested in the Mersey Docks and Harbour Board, a corporation created by the Act of 1857 for the management of the docks on both sides of the Mersey. At that time the area of the dock space open and in use in Birkenhead was about 7 acres. The docks bound the town on the north and north-east and partly on the east, extending from the landing-stage at Woodside Ferry to the Wallasey Bridge, a distance of over two miles, The Great Float has been constructed on the site of the Wallasey Pool, forming an immense dock of 150 acres, with a quay space of about five miles. The Great Float separates Birkenhead from Poulton-cum-Sea-combe, in the parish of Wallasey, and communicates on the east with a low water basin of about 14 acres (now being converted into a dock) and the Alfred Dock (about 8 acres, and quay space 460 lineal yards), and on the south-east with the Egerton, Morpeth, and Morpeth Branch Docks. The Morpeth Dock (about 11 acres, quay space 1299 lineal yards) is connected with the Morpeth Branch Dock (about 3} acres, quay space 600 lineal yards), both set apart for steamers. The total water area of these docks is about 170 acres, and the lineal quay space about 10 miles. The entrances to the Birkenhead Docks are capable of docking the largest class of steamers afloat. The massive iron bridges across the dock entrances are opened and closed by hydraulic power, which is likewise applied to the cranes, coal

hoists, warehouse lifts, and other appliances about the docks. At the extreme western end of the West Float are three large graving docks, two about 750 feet in length, and 130 feet and 80 feet in width respectively, and the largest, now in course of construction, measuring about 900 fect in length and 130 feet in width. Substantial and commodious sheds and warehouses have been erected at various places along the dock quays for the full development of the traffic.

BIR—BIR

The block of warehouses known by the name of the corn warehouses are immense piles of buildings, with a canal between to give access to the separate blocks of buildings, and with machinery for carrying the grain, &e., from floor to floor, and for despatching it by railway.

In 1847 the Birkenhead Dock Warehousing Company opened their first warehouses, capable of storing 80,000 tons of goods. Each block is detached, and the whole premises are surrounded by a wall 12 feet high. A rail- way branch, called the Dock Extension Railway, is carried. round the property. The company also built blocks of houses for their workmen, known as the Dock Cottages. This property is now in the hands of the Mersey Docks and Harbour Board.

The commerce of Birkenhead is in all respects a branch of that of Liverpool, and chicfly devoted to coal, guano, and grain,—the quantity of coal alone exported being over one willion tons per annum. Many manufactories have sprung up within the last few years on the margin of the Great Float and other parts of the town, such as iron foundries, boiler-works, oileake and seed mills, &c., some of the engineering works, shipbuilding yards, and forges being on a large scale. The Birkenhead Iron-works of Messrs Laird Brothers employfrom 3000 to 4000 men ; these works, in connection with their shipbuilding yards, have turned out some of the largest iron-clad ships; the engine-works, also belonging to the same firm, are.on a very extensive scale. The Canada Works, belonging to Messrs Thomas Brassey and Co., carry on an extensive business in marine engines, iron-bridge building, pontoon and general railway work. There are also the Britannia Works (Messrs James Taylor and Co.) for portable engines, marine engines, traction engines, steam cranes, &c.; Messrs Clay and Inman's Forge, for

heavy shafting, &c.; the Wirral Foundry, for large engine castings, &c.; and the Starbuck Car and Waggon Co.'s Works, for building tramway cars, &c. ; and Messrs Clover and Clayton's shipbuilding premises as well as other manufactories of less extent.

The affairs of the township of Birkenhead and Claughton- cum-Grange are managed by twenty-one Commissioners, chosen by the ratepayers. The town contains a head post- office, county court, police court, petty sessional court for the hundred of Wirral, and two banks. Two news- papers are published weekly. The principal market-day is Saturday, but a large hay, straw, and vegetable market is held on Tuesdays in the hay market, a large open space of ground, having an area of about 1} acres. The total area of the Commissioners' district is 1684 acres, including 365 acres of water space, viz., Birkenhead, 1248 acres, and Claughton-cum-Grange, 436. The parliamentary borough of Birkenhead was constituted in 1861, and returns one member to parliament. Its parliamentary limits include the extra-parochial chapelry of Birkenhead, the several "townships of Claughton, Tranmere, and Oxton, and so much of the township of Higher Bebington as lies to the eastward of the road leading from Higher Tranmere to Lower Bebington." The population of this district in 1861 was 51,649, and in 1871 it had increased to

64,671.

BIRMINGHAM, the fourth town in size and population in England, and the fifth in the United Kingdom, is situated at the extreme north-west of the county of Warwick, in 52° 59' N. lat. and 1° 18' W. long. It is 102 miles in a straight line N.W. of London, from which it is distant 112 miles by the North-Western Railway. The Roman Road, known as the Ikenield Street, runs through the town. On the north Birmingham touches Staffordshire, and on the south and west Worcestershire, the suburbs of the town extending largely into both these counties—Har- borne and Handsworth being in the former and Balsall,

Moseley, and Yardley in the latter, The borough itself, however—both parliamentary and municipal, the bound- aries being identical—is wholly in

the county of Warwick. It covers an arca of 8420 acres (of which 5900 are built upon), and includes the whole of the parishes of Birming- ham and Edgbaston, and about one-third of the parish of Aston. It is nearly 6 miles long, has an average breadth of 3 miles, is 21 miles in circumference, and has 190 miles of streets and roads. The population, at the census of 1871, was 343,000; and in June 1875 it was estimated by the registrar-general at 360,000, Birmingham was enfranchised by the Reform Act of 1832, when two repre- sentatives were assigned to it—and Mr Thomas Attwood and Mr Joshua Scholefield (leaders of the Political Union) were elected; by the Reform Act of 1867 this number was

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raised to three. A grant of incorporation was made to the town in 1838, when the first municipal council was elected. In 1870 a School Board of

fifteen members was elected, under the Elementary Education Act passed in that year. The town is built upon the New Red Sandstone, on a boldly undulated site, varying from 200 to 600 feet above the sea-level, steadily rising towards the north and west, so that when looked at from the heights on the south-east side it presents the appearance of a vast semicircle, picturesquely disposed, the masses of houses being broken by spires and lofty chimneys, and the south and west sides being thickly wooded on the slopes. The plan of the town is irregular, and the streets are mostly winding, and many of them somewhat narrow. In the centre, however, is a large open space, known as the Bull Ring and High

Sketch-Plan of Birmingham.

Street, at the foot of which stands the mother church of St Martin, and in which is situated the Market-Hall, one of the largest buildings of its kind in the kingdom. From this centre access is obtained to the principal streets, New Street and High Street ; the former, about a quarter of a mile in length, derives a most picturesque appearance from its slightly curved form, and from the effective manner in which the sky-line is broken by lofty buildings alternating with others of lower altitude. This street contains the Exchange, the Grammar School, the Theatre Royal, the rooms of the Royal Society of Artists, which have a fine Corin- thian portico stretching across the pavement. At the upper end of the street is the Town-Hall, and close to this are the corporate buildings and the Post-Office. The last quarter of a century has seen a great advancement in the style and accommodation of the public and commercial edifices ; streets have been widened and new roads opened,

and the place has altogether put on a livelier and wealthier look. Excepting in some of the older and poorer districts, the private houses have undergone a corresponding im- provement. The richer classes live chiefly in the parish of Edgbaston, which belongs almost entirely to Lord Calthorpe, and in which strict rules as to the description, position, and area of the houses are enforced. The streets inhabited by the working-classes are, of course, more crowded, and many of the houses are built in enclosed courts, access to which is gained from the street, either by openings between the houses, or by narrow entries, too commonly built over, and thus impeding the free

passage of air. Many of the courts, however, are wide enough to allow of small gardens in front of the houses, while in the suburbs almost every house is provided with a garden of some kind; and in a considerable number of cases the houses, through means of building societics, have become

the property of the workmen themselves. The habit exists among all classes of each family (with rare exceptions) occupying a separate house, a practice which greatly affects the area of the town. Thus, to a population of 360.000 there are about 76,000 inhabited houses, giving an average of five persons to a house. Birmingham is a town of rapid growth. In 1700 the population was about 15,000. A century later, at the ceusus of 1801, it had increased to 78,000 In the next thirty years the popu- lation doubled, being 147,000 in 1831. The same pro- cess was repeated in the following term of thirty years, the population in 1861 being 296,000. Between 1861 and 1871 the increase was 47,000, and the returns of the registrar-general show that the same rate of progress is still going on. It is, however, likely to be checked by the increasing value of land within the borough, by the absorp- tion of available sites for building, and by the consequent overflow of population into the suburbs, If these, inhabited solely by borough people, are takeu into account, thereal popu- lation at present is probably not far short of half a million.

Government.—The government of the town resided originally in the high and low bailiffs, both officers chosen at the court of the lord of the manor, and acting as his deputies The system was a loose one, but by degrees it became somewhat organized, and Crown writs were addressed to the bailiff, In 1832, when the town was enfranchised, they were made the returning officers. About the beginning of the century, however, a more regular system was instituted, by an Act creating a body of street Commissioners, who acted for the parish of Birmingham,—the hamlets outside its boundaries having similar boards of theirown. The annoyance and difficulty caused by these bodies—thirteen in number—led to a demand for the incorporation of Birmingham as a borough ; and a charter was accordingly granted by the Crown in 1838, vesting the general government in a mayor, sixteen

aldermen, and forty-seven councillors. The powers of this body were, however, unusually restricted, the other local governing bodies remaining in existence. It was not until 1851 that an Act of Parliament was obtained, abolishing all governing authorities excepting the Town Council, and transferring all powers to this body Under this Act, and another local Act obtained in 1862, the affairs of the town are now administered, the whole municipal government being in the hands of the Town Council. The importance of the duties discharged by the Council may be inferred from the fact that it has under its control nearly 200 miles of street and road, that it has a police force of nearly 500 men, and that its revenue, derived from tolls and rates, amounts to about £300,000 a year. These responsibilities have been increased by the purchase in 1875 of the gas and water-works (the latter with a daily supply of 17,000,000 gallons), the two purchases making a cost of more than £3,000,000. The growth of the revenue and expenditure of the town, its rateable value, and its ordinary debt, excluding the gas and water-works, will be seen from the following tabular statement :—

Amount of Total Amount

| Year. Ener seers of Lil in Income Expenditure, Mecraeg ad

| Rate

£ a. dy £ £ £

1854 645,349 8.6 120,237 131,723 366,095

1859 824,869 3.4 157, W21 136,987 467,002

1864 920,191 3 8 187,620 185,587 638,803

1869 |1,052,796 3.2 195,155 199,950 588,449 1874 |1,254,911 3 101 | 289,655 | 271,807 | 664,959 | wad

N.B.—The amount of property possessed by the Corporation on 31st December 1874, taken at its original cost, was £1,259,047.

1 Including rate for School Board, 3d. in the £.

BIRMINGHSA EH

The administration of the poor-law is vested in a Board of Guardians, of sixty members, for the parish Birmingham. The parish of Edgbaston (wholly within e 3

the borough) is in the poor-law union ss | of King's Norton, and that part of the ai f a=

parish of Aston included in the borough iy "|

workhouses—that for Birmingham pa- rish, situated at Birmingham Heath, is capable of receiving over 2000 inmates. In the week ending June 19, 1875, there were chargeable to the parish (including lunatics and persons receiving outdoor relief) 6949 paupers, a very small number in proportion to population.

Birmingham has a grant of quarter sessions, with a recorder, and petty sessions are held daily at the Sessions Court, in Moor Street, before a stipendiary magistrate, and a bench of borough justices. The justices for the borough and Aston division of Warwickshire also sit here occasionally. The borough justices have charge of the administration of the gaol. The town is the head of a county court district, and is the seat of the probate regis- try for Warwickshire.

Religious Denominations, Buildings, &c.—Until the year 1821 Birmingham was in the diocese of Lichfield and Coventry; it is now in the diocese of Worcester and archdeaconry of Coventry, and is a rural deanery. There was formerly a religious house, the priory of St Thomas the Apostle, and a Guild of the Holy Cross, an associa-

tion partly religious and partly charitable, having a chantry in the parish church. The possessions of the priory went to the Crown at

is in the Aston Union. There are three = : =| ae

Arms of Birmingnam.

-the dissolution, and the building was destroyed before the close of

the 16th century. The lands of the Guild of the Holy Cross were granted by Edward VI. to trustees for the support of a free gram- mar school; they are now of the value of nearly £15,000 a year. Until 1715 there was but one parish church, St Martin's, a rectory, having the tithes of the entire parish of Birmingham. St Martin's was erected about the middle of the 18th century; but in the course of ages was so disfigured, internally and externally, as to present no traces except in the tower and spire of its former character, In 1858 the tower was found to be in a dangerous condition, and together with the spire was rebuilt. In 1878 the remaining part of the old church was removed without disturbing the monnments, and a new and larger edifice was erected in its place, at a cost of nearly £30,000. The new church constitutes the chief ecclesiastical edifice in Birmingham, and indeed the handsomest structure in the town. St Philip's, a stately Italian structure, designed by Archer, a pupil of Wren, was the next church erected. It was consecrated in 1715. Then followed St Bartholomew's in 1749, St Mary's in 1774, St Paul's in 1779, St James's, Ashtcd, in 1791, and others, which need not be mentioned, followed in due course. At present the mother parish is divided into five rectorics, and there are within the borough, including those mentioned, 42 churches (each having an ecclesiastical district assigned to it) of the Church of England, most of these having schools and missions attached to them.

Under the Commonwealth Birmingham was a stronghold of Puri- tanism. Clarendon speaks of it and the neighbourhood as " the most eminently corrupted of any in England." Baxter, on the other hand, commending the garrison of Coventry, says it contained " the most religious men of the parts round about, especially from Birmingham." The traditional reputation for Nonconfermityis main- tained by the town, all varieties of dissenters being numerous and influential.

The Unitarians, the oldest body established here, have six chapels. One of these, the Old Meeting, is historically interesting, the congregation having been formed on the Presbyterian model by a number of ministers ejected under the Act of Uniformity. Another chapel, the New Meeting, in Moor

Street (now occupied by the Roman Catholics), is memorable as having been the place of Dr Priestley's ministerial labours. In 1862 the Unitarians removed from this place to a new Gothic edifice, called the Church of the Messiah, in Broad Street, where they still preserve a monument of Priestley, with a medallion portrait in profile, and an inscription written by Priestlcy's friend, Dr Parr. The Society of Friends, whose first meeting-house dates from about 1690, have now three places of meeting. The Jndependents have now eleven chapels, several of them large and flourishing. The Baptists first erected a chapel in Cannon Street in 1788. They have now 16; one of them, Wycliffe Chapel, Bristol Road, is a singularly handsome structure of 14th century Gothic. The Wesleyan Methodists were established in Birmingham by John Wesley himself in 1745, when he was roughly handled while preaching on Gosta Green. For some years they

worshipped in temporary premises. They have now i7 places of worship ; and the other divisions of the Methodist body have 24 in the aggregate. The Presbyterians possess 5 places of worship, and the Jews have a handsome synagogue. The Koman Catholies have paid special attention to Birmingham. From the Revolution of 1688 until 1789 they had no place of worship here. They now have a bishop (who assumes a title from the town), a cathedral, and 9 other churches or chapels, a cemetery, and other establish- ments in the suburbs, including several religious houses, including the Oratory, founded by Dr Newman. The principal edifice is the cathedral of St Chad, built from the designs of Mr Pugin, at a cost of more than £30,000.

The religious institutions and societics in Birmingham are very numerous, and with these are associated many cstablishments of a benevolent character, such as almshouses, asylums, refuges, societies for the aid of discharged prisoners, and for the promotion of religious education in Board schools, training institutions for nurses and servants, and others of various kinds, in the management of which persons of different religious opinions are commonly found working together in friendly association.

Charities. —These are numerous. The principal is the General Hospital, Summier Lane, opened in 1779; it was founded by Dr Ash, an eminent local

physician. 'The yearly average of in-patients is about 2300, of out-patients, 25,000. The Queen's Hospital, Bath Row, the other large hospital of the town, was founded in 1840 by Mr W. Sands Cox, F.R.S., an eminent local surgeon, who also founded the Queen's College as a medical school. This hospital receives annually about 1300 in-patients and 17,000 out-patients. The General Dispensary, the officers of which visit patients at their own homes, relieves about 8000 yearly. 'The Children's Hospital (free), established in 1864 by Dr Heslop, relieves about 15,000 out and 1000 in-patients. It has two establishments—for out-patients (a very handsome Gothic building) in Steelhouse Lane, and an in- patient department in Broad Street. There is also a Women's Hospital (free) for the special diseases of women; a lying-in charity; special hospitals for diseases of the eye, the ear, bodily deformi- ties, and the teeth; and a homeopathic hospital. 'he parish of Birmingham maintains a large infirmary at the workhouse (Birming- ham Heath), and a dispensary for out-patients in Paradise Street.

Nearly all these medical charities depend upon subscriptions, donations, legacies, and income from invested property ; and the sum raised in this way is probably nearly £30,000 a year. There are two public organizations for aiding the charities, both of which were begun in Birmingham. One is a simultaneous collection in October in churches and chapels, called the Hospital Sunday, estab- lished in 1859, and now yielding over £5000 a year ; the other is the Saturday Hospital collection, made by the work-people in March, which was established in 1873, and yields about £4000.

There is also a Sanatorium at Blackwell, near the Lickley Hills, about 10 miles distant, common to all the hospitals. Amongst the non-medical charities the principal are the Blind Institution and the Deaf aud Dumb Asylum, both at Edgbaston; and Sir Josiah Mason's Orphanage at Erdington, which receives 300 orphan children, and was built and endowed at the cost of about £250,000 solely by Sir Josiah Mason, a Birmingham penmaker. There are also in the town numerous almshouses for aged persons, the chief of which are Lench's Trust, the James Charities, the Licensed Victuallers' Asylum. Besides the general benefit societies, such as the Oddfellows', Foresters', &c., which are strongly supported in Birmingham, the work-people have numerous clubs of a charitable kind,

and there are several important local provident societies of a general character, with many thousand members.

Hducation.—The oldest and principal institution is the Grammar School of King Edward the Sixth, founded in 1552, out of the lands of the Guild of the Holy Cross, then of the annual value of £21, but now yielding about £15,000 a year, with a prospect of large increase. The principal or high school, in New Street, was erected in 1840, in the Perpendicular period of the Gothic style, from designs by Sir Charles Barry, at a cost, including land, of £71,000. This school is divided into two departments, classical and English, and educates about 600 boys; while connected with it there are four elementary schools for boys and girls, used chiefly by the lower middle class, the number of pupils being 1500. The classical school has ten exhibitions of £50 each, tenable at Oxford or Cambridge. The next most important foundation is that of the Midland Institute, which includes a general literary department (lectures, museums, and reading-rooms), and an industrial depart- ment, with classes in science, languages, mathematics, arithmetic, history, literature, and the laws of health. There are about 600 science students, and about 1600 in

the other departments. The Queen's College, originally a school of medicine, founded in 1828, obtained a royal charter in 1843 as a kind of university, with departments of literature, theology, law, science, and engineering. All these branches have now fallen into disuse, excepting medicine and theology ; in the latter the college educates candidates for the ministry of the Church of England. An important foundation is Sir Josiah Mason's Scientific College, for the endowment of which Sir Josiah has con- veyed to trustees property valued at nearly £100,000, and a capacious building, estimated to cost probably £40,000, is now in erection in Edmund Street, near the Town-Hall. Among the other educational foundations may be men- tioned Spring Hill College, Moseley, for the education of Congregational ministers ; four industrial schools ; a large reformatory for boys at Saltley, and one for girls at Smeth- wick. For general education there are many private schools, of a good class, for boys and girls. Elementary education is provided in the Church of England day schools,

Roman Catholic schools, and Board schools. A total pro- vision, in all the public elementary schools, is made for 41,791 children; there are (July 1875) 51,334 on the books, with an average attendance for the previous quarter of 37,894, The School Board, though it was elected only in 1870, has, by the provision of new schools, and the exercise of compulsory powers, more than doubled the school attendance. It has already built and opened 9 schools, with accommodation for‘8800 children, at a cost, for land and buildings, of about £86,000; and 8 other schools are now in progress, providing accommodation for 7400 children, at an estimated cost of about £103,000— making a total expenditure of nearly £200,000, and pro- vision for a total of about 16,000 children.

Libraries, &c.—The principal libraries of the town are the Birmingham Library (belonging to a body of proprietors), founded in 1798 by Dr Priestley, and containing about 40,000 volumes, and the Corporation Free Libraries, in Ratcliff Place, commenced in 1861. These consist of a central reference library and lending library (the former containing 36,000 volumes of carefully chosen books), to which is attached a central reading-room. ‘There are also four lending libraries and news-rooms in other parts of the town, and news-rooms are about to be opened by the Corporation in connection with the Board schools. ‘fhe total issue of books from the libraries for 1874 was 521,991. Included in the reference library are a special Shakespeare library, containing almost all known editions of the plays and of works illustrating them; a library cf nearly 1000 volumes, illustrating the works of Cervantes (presented by Mr W. Bragge of Sheffield) ; and a large and unique collection of Warwickshire books and anti- quities, known as the Staunton collection. An Art Gallery and Industrial Museum is attached to the Free Libraries ; and there is at Aston Hall another museum of natural history, &c., belonging to the Corporation. Art instruc- tion is provided by the Royal Society of Artists, which has classes and lectures for students, and which holds two general exhibitions annually ; and by the School of Art, which has 900 students, together with affiliated classes in schools, containing nearly 1700 students.

Miscellaneous Institutions, Parks, &e.—These include 8 banks, 4 principal clubs—the Union, the Midland, the Arts, and the Conservative—to which a Liberal Club is about to be added. There are 3 morning and 2 evening daily

papers—4 of them Liberal and 1 Conservative — and 2 weekly papers. There are 2 theatres, 2 large music-halls, and several smaller ones. Musical festivals for the benefit of the General Hospital are held triennially, and are usually marked by the production of new and important works, and by the engagement of most of the leading

vocalists and instrumental performers. There are 5 parks and pleasure grounds belonging to the Corporation— Aston Park and Hall, 45 acres; Calthorpe Park, about 30 acres; Cannon Hill Park, 65 acres; and Adderley and Highgate Parks, each about 12 acres. Beside these there are numerous pleasure-grounds—the Botanical Gardens, Edgbaston, open to subscribers, and the Lower Grounds, a beautiful series of gardens at Aston, in which important flower shows are periodically held. Sutton Park, about 8 miles distant, and including about 3000 acres, is also much used by the Birmingham people. The Corporation has several sets of baths and wash-houses in various parts of the town. There are several extensive cemeteries.

Public Buildings.—Of these the Town-Hall, a nobly-pro- portioned and impressive edifice, is the principal, It stands at the top of New Street, and on three sides is isolated from all other buildings by broad and handsome streets. The hall, completed in 1850 at a total cost of £52,000, is severely classic, modelled upon a Greck temple. The lower stage consists of a vast plinth or basement, 23 fect high, upon which is reared a facade of pcripteral character, with 8 Corinthian columns (36 feet high) at the two principal fronts, and 13 columns on each side. These columns (imitated from those of the temple of Jupiter Stator at Rome) support a bold and enriched cornice, finished at each end with a lofty pedt- ment and entablature. The exterior of the hall is built of Anglesea marble. The interior consists chiefly of a regularly-built room, designed specially for meetings and concerts, with an orchestra containing one of the finest organs in the kingdom. 'The seats are arranged for an audience of 2265 persons, but when cleared of benches, as is the case at great political meetings, 5000 persons may find standing room. On one side of the Town-Hall are the buildings of the Midland Institute and the Free Libraries (of Italian design), occupying the whole of Ratcliff Place, with fronts to

Paradise Street and Edmund Street. A new Art Gallery is in course of erection, front- ing the latter street. At the back of the Town-Hall is the site of the new building ot the Mason College (Gothic), and in front of the hall, in Paradise Strect, are Christ Church (classic), the Queen's College (Gothic), and the Post-Office. On the side of the hall in Ann Street, opposite to the Midland Institute, are the new Corporate Buildings (Italian), now being erected at a cost of nearly £200,000. These will give accommodation for the Town Council, law cuurts, public offices, and the mayor of the borough. Lower down New Street is the building of the Royal Society of Artists (classic), with a noble portico ; then comes the Exchange (Gothic) in Stephenson Place ; and at the bottom of the latter street is the Central Railway station, used by the North-Western, the Midland, and their branch railways, and fronted by the Queen's Hotel. The station is more than a quarter of a mile in length. The roof, a magnificent specimen of engineering, consists of a vast arch of glass and iron, carried on pillars on each side, and measuring 1100 fect in length, 80 feet in height, and 212 feet in width in a single span. The glass in the roof weighs 115 tons, and the iron-work 1400 tons. Below the station, in New Street, is the Grammar School ; and in High Street, close at hand, is the Market-Hall, a magni- ficent classic building, erected in 1833 at a cost of nearly £70,000, with an area of 4380 square yards, and affording room for 600 stalls. Amongst the other public buildings are the Borough Gaol at Winson Green, with 467 cells, arranged on the separate system; near this the Lunatic Asylum, with accommodation for 600 patients; and close at hand the workhouse, which receives about 2000 inmates. The General and Queen's Hospitals are also handsome buildings, the latter especially so, it being remarkable for a very noble out-patient hall. This and the out-patient

here. a centre of manufactures began towards the close of the

BIRMINGHAM

hall at the Children's Hospital 1n Steclhouse Lane (Gothic) are perhaps the finest rooms of their kind in the kingdom, Birmingham had till very recently only one public monu- ment, the statue of Nelson, by Westmacott, in High Street; but several others have been erected—namely, those of Joseph Sturge, at the Five Ways, and of Thomas Attwood, the founder of the

Political Union, in Stephenson Place, both of them by the late Mr Thomas; James Watt, a singularly beautiful work, in Ratcliff Place, by the late Mr Munro; Sir Robert Peel, in New Street, by Mr P. Hollins; the late Prince-Consort, in the Art Gallery, by Mr Foley; Sir Rowland Hill, in the hall of the Post-Office, by Mr Noble; and Dr Priestley, in New Street, by Mr F. J. Wil- liamson, Chantrey's famous statue of Jaines Watt is in a special chapel at Handsworth church, Manufactures—From an early period Birmingham has been a seat of manufactures in metal. Hutton, the his- torian of the town, claims for it Saxon or even British antiquity in this respect, but without the shadow of founda- tion. 'he first or direct wention of Birmingham trades is to be found in Leland's Jtinerary (1538). He writes : — "T came through a pretty street as ever I entered into Bermingham towne. 'This street, as I remember, is called Dirtey (Deritend). In it dwell smiths and cutlers. There be many smithes in the towne that use to make knives and all manner of cutlery tooles, and many lorimers that make bittes, and a great many naylors, so that a great part of the towne is maintained by smithes, who have their iron and sea-cole out of Staffordshire." The cutlers no longer exist, this trade having gone to Sheffield; but the smiths remain, and the heavier cutting tools are still largely made The well-ascertained importance of Birmingham as

17th century, one great source of it being the absolute

freedom of the town, there being no guilds, companies, or restrictions of any kind; besides which the easy access to

cheap coal and iron indirectly helped the development. It is remarkable that two important trades, now located elsewhere, were first established here. Steel was made in Birmingham until 1797, and was then disused for quite 70 years, when an experiment in steel-making (still carried on) was made by a single firm. Cotton-spinning was begun in Birmingham by John Wyatt, and Lewis Paul, and Thomas Warren as early as 1730; but the speculation was abandoned before the end of the century. The great staple of Birmingham is metal-working in all its various forms. The chief variety is the brass-working trade, which employs several hundred masters, and about 10,000 work-people, and consumes probably 50,000 tons of metal annually, which is worked up into an infiaity of articles of ornament and utility. Iron-working, though largely car- ried on, is a much less important trade, works of this kind being chiefly established in the Staffordshire district. Jewellery, gold, silver, and gilt come next to brass. Then follow small arms of all kinds, some of the larger establishments being capable of turning out 2000 stand per week. Buttons, hooks and eyes, pins, and other articles used for dress, constitute a large class of manufac- tures. Glass, especially table glass, is a renowned staple of the town. Screws, nails, &c., are made in enormous quantities; indeed, Birmingham has a monopoly of the English screw trade. Steel pens are also a specialty—as much as, probably, 15 tons or more of steel being the weekly consumption of these articles; the largest maker, Sir Josiah Mason, rolls 5 tons weekly for his own con- sumption, and has about 60 tons of pens constantly in manufacture in various stages. About 20,000,000 pens are made weekly in the town, and are sold at prices rang- ing from 14d. to 12s. per gross of 12 dozen. The fact that each gross requires 144 pieces of steel to go through

12 different processes, renders this cheapness of sale one of the greatest marvels of manufacturing skill and industry. Electro-plating, first established about 1848 by Messrs Elkington and Mason, is one of the

leading trades. Amongst other branches of manufacture are wire-drawing, bell founding, metal rolling, railway carriage building (a large and important industry), steel-toy making (including cut- ting implements and tools of all kinds), die-sinking, papier- maché making, and a variety of others, for which refcr- ence may be made to a volume entitled Birmingham and the Midland Hardware District, prepared on the visit of the British Association in 1865, and extending to more than 700 pages. It is impossible, indeed, in smaller com- pass to give an adequate idea of the variety and extent of Birmingham industry. To quote a modern writer :—

"'We cannot move without finding traces of the great hive of metal-makers —the veritable descendants of Tubal-cain. At home or abroad, sleeping or waking, walking or riding, in a carriage or upon a railway or steamboat, we cannot cscape reminiscences of Birmingham. She haunts us from the cradle to the grave. She supplies us with the spoon that first brings our infant lips into acquaintance with 'pap,' and she provides the dismal 'furniture' which is affixed to our coffins. In her turn Birmingham lays the whole world under contribution for her materials. For her smiths, and metal workers, and jewellers, wherever nature has deposited stores of useful or precious metals, or has hidden glittering gcms, there industrious miners are busily digging. Divers collect for her button makers millions of rare and costly shells. For her, adven- turous hunters rifle the buffalo of his wide-spreading horns, and the elephant of his ivory tusks. There is scarcely a product of any country or any climate that she does not gladly reccive, and in return stamps with a richer value."

These labours Birminghain performs with the aid of many thousands of willing hands, moved by busy and ingenious brains, and aided by her own great invention, the steam- engine; for by the genius of Watt and the intrepid courage of Boulton, Birmingham may claim the perfection of this discovery as her own. The inemory of the great Soho factory is one of the most precious heritages of the town, and the name remains, for though the old factory has long since disappeared, the firm of Boulton and Watt still con- tinue to make steam-engines in the immediate neighbour- hood ; and James Watt's own private workshop continues just as he left it, with no single article disturbed, carefully preserved in the garret of his house at Heathfield.

The mention of Watt and of Soho recalls the memorics of distinguished inventors and others who have been con- nected with Birmingham. Johnson was a frequent visitor here to his friend Hector, the surgeon, on whose house in the Old Square a tablet (erected by the Shakespeare Club) bears witness to the residence of the great moralist. Then Baskerville, the printer, carried on his work here. The famous Lunar Society, fully described by Mr Smiles in his Lives of the Engineers, brought together a brilliant com- pany —Watt, Boulton, Priestley, Josiah Wedgwood, Darwin, Parr, Withering, Edgeworth, Sir Joseph Banks, Herschel, Dr Solander, Fothergill, Roebuck, Galton, Keir, and many others. Murdoch, the inventor of gas, was a Soho man, and first used his invention to light the Soho factory at the peace of Amiens in 1802. Rickman, the reviver and historian of Gothic architecture, practised as an architect in Birmingham. Hutton, the antiquary and_ historian, carried on his bookselling business here. Many of the best engravers were Birmingham men, notably Willmore and Pye, the special translators of Turner's marvellous creations. In the ranks of landscape painters the name of David Cox will ever confer honour upon the town. Attwood, Joseph Parkes, and Bright speak for it in the region of politics and statesmanship. 'The series of inventors is continued to our own day by the names of Gillott, Elkington, Chance, Mason, and others.

In many respects Birmingham is a peculiar town, and in none more than the hold it has upon the affections of its

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people. A " Birmingham man" is usually a man of stroug individuality, independence of character, facility of resource, and with an enduring love for "the old town." These traits of character are the result of a variety of circum- stances, Birmingham is peculiar in opening a career even to the humblest who are gifted with ingenuity and industry. The great number of trades keeps work fairly constant, the skill required in them sustains wages of artizans at a high level, and the distribution of labour, and its dependence upon direct personal aptitude, afford chances of rising in the social scale which cannot be found in places where manufactures are mainly of one class and are conducted in factories demanding Jarge capital. It is easy in Birming- ham for a man to become a small master, and

gradually to push his trade until he is able to establish a factory. Many of the largest employers have either been workmen themselves or are the sons of workmen; while of the smaller manufacturers almost all take a direct part in the handicraft work carried on in their places of business.

Wealth is more evenly distributed than in most other places. There are no colossal fortunes in Birmingham, and coinparatively few large ones, and of these very few are made by speculative operations. To compensate for these distinctions there is an unusually large comfortable class— people of good though not excessive incomes derived from solid trade, or from savings made by hard personal and associated work. This class, touching the actually wealthy on one side, by easy and almost imperceptible stages touches the actual working-class on the other, and this latter class is constantly rising into the middle rank.

The Birmingham work-people, in their way, are courteous and helpful. This is probably owing to the free and open and common discussion of subjects of political and social interest engaged in without distinction of class, The same principle is adopted educationally—in the Mid- land Institute, for example—the Act of Parliament which established the Institute providing that the governing council shall always include artizan members. Another noticeable characteristic of the town is the development of means of self-instruction and of self-help. Birmingham was amongst the earliest places to establish a mechanics' institution, the place of which is now more efficiently sup- plied by the Midland Institute. Birmingham, again, was the birthplace of the freehold land and building societies, by which workmen are enabled, on easy terms, to acquire houses of their own; and in addition to these institutions, which are numerous and flourishing, it has a very large number of sick and friendly societies, savings-clubs, and other organizations of a provident kind,—more in proportion to population than, probably, any cther of the large towns in England. Amongst the social characteristics it should be mentioned that there are few serious disputes between masters and workmen, and that strikes are infrequent, and when they do occur are found capable of easy adjustment by friendly negotiation. One point more is worthy of record—the constancy of the town to those who serve it. Many of the leading manufacturers and other citizens are members of the local

governing bodies, and these and the parliamentary representatives are rarely changed by their constituents.

Listory.—Owing to its rapid cxpansion, and the consequent newness of most of the public and other buildings, Birmingham is often supposed to be a modern town. It is really one of the oldest in the country, and was in existence as a community in the Saxon period. Proof of this was given in 1309 by William de Bermingham, then lord of the manor, who showed in a law-suit that his ancestors had a market in the place, and levied tolls, before the Conquest. Some authors have endeavoured to identify the town with the sup- posed Roman station called Bremenium, but this claim has long since been abandoned as fabulous. The origin of the name is un-

traceable; the spelling of it is traceable in about 100 different forms. Dugdale, the historian of Warwickshire, adopts Brom-

wycham, and regards it as of Saxon derivation. Hutton, the historian of Birmingham, has the fanciful etymology of Brom (broom), wych (a descent), and ham (a home), making together, the home on the hill by the heath. As regards the history of the town, we must agree with Hutton that 'the way is long, dark, and slippery." In Domesday Book it is rated at four miles of land with half aimile of woods, the whole valued at £208. Two hundred years later the family of De Bermingham, the owners of the place, come into sight,—one of them, William, being killed at the battle of Evesham, in 1265, fighting with Simon de Montfort and the barons against Henry the Third. The son of this William after- wards took part in the French war, and was made prisoner ; his father's estates, forfeited by treason, were restored tohim. Thence- forward we find the family engaged in various loeal and other offices, but seemingly abstaining from politics. They held the place until 1527, when Edward de Berminghain was deprived of his property by means of John Dudley, duke of Northumberland, who trumped up a pretended charge of riot and robbery against him, and procured Birmingham for himself. On the attainder of Dudley the manor passed to the Crown, and was granted to Thomas Marrow, of Berks- well, fronl whom

by marriage and descent it went to Christopher Musgrave, and finally, as regards the only valuable part—the market tolls—by pureliase to the town itself. In the Wars of the Roses it does not seem that Birmingham took any part; but energy revived in the civil war under Charles I., when the town sided actively with the Parliamentarians. 1n 1642, when Charles was marching from Shrewsbury to relieve Banbury, the Birmingham people seized part of his baggage, including much plate, money, and wine, whicli they sent to the Parliamentary garrison at Warwick. Before the battle of Edgehill Charles rested for two nights at Aston Hall; near the town, as the guest of Sir Thomas Holte. The Birmingham people resented this by helping the Parliamen- tarians to canuonade the hall and to levy a fine upon Sir Thomas Holte. They also set to work, and supplied the Parliamentary army with 15,000 sword blades, refusing to make a siugle blade for the Royalists. These manifestations of hostility were avenged in April 1643, by Prinee Rupert, who, with 2000 men and several] pieces of artillery, attacked the town, planting his cannon on an eminence near Sparkbrook, still known as Camphill. The towns- people resisted, but were beaten, many persons being killed o1 wounded. Amongst the former was Lord Deubigh, one of the Royalist officers. Having captured the place, Prince Rupert allowed his troops to plunder it, to burn about eighty houses, and to set their prisoners to ransom, He also levied a fine of £30,000, equal to at least £100,000 of the present value of inoney, This bitter lesson kept Birmingham quiet during the rest of the eivil war, though the sympathies of the people with the Parliamentarians were unabated. 1n 1665 Birmingham suffered heavy losses by the plague, great numbers of dead being buried in the Pest Field, at Lady- wood, then a lonely place far outside the town, but long since thiekly covered with buildings. In 1688 the Revolution provoked a temporary outbreak of Protestant feeling. James I]. had given timber from the royal forest of Needwood, near Burton, to build a Catholic chapel aud eouvent in a place still called Mass-house Lane. 'This edifice the mob promptly destroyed when James gave place to William and Mary. Rather more than a century of quiet prosperity ensued, and then oecurred the serious and most lament- able outbreak of popular fury known as the Church and King riots of 1791. For some years there had been much political activity in Birmingham, the disseuters, partienlarly the Unitarians, being de- sirous of relief from the political and religious disabilities under which they laboured. The leader in these movements was the famous Dr

Priestley, who kept up an active controversy with the local clergy and others, and thus drew upon himself and his eo- religionists the hatred of the more violent members of the Chureh and Tory party. The smouldering fire broke out on the occasion of the Freneh Revolution. On the 14th of July a dinner of Bir- mingham Liberals was held at the Royal Hotel to celebrate the destruetion of the Bastille. This was the signal of a popular ont- break. A Church and King mob, encouraged and organized by leaders of better station, but who were too cowardly to show themselves, began an attack upon the Unitarians. Dr Priestley-was not present at the dinner, but his house at Fair Hill, Sparkbrook, was one of the first to be sacked and burnt —his library and laboratory, with all his manuscripts, the records of life-long scientific and philosophical inquiries, perishing in the flames. The house and library of Hutton, the historian and antiquary, were also destroyed. The Unitarian ehapel was burnt, and several houses belonging to members of the sect were sacked aud burnt. The riot continued until a strong body of troops was marched into the town, but before their arrival damage to the amount of more than £60,000 had been done. Soine of the rioters perished in the burning buildings, in the cellars of which they drank themselves into stupefaction. Others were tried and imprisoned, and four of the prisoners were hanged. The per- secuted Unitarians recovered a small part of their losses from the county ; but Dr Priestley himself, owing to the unworthy preju- dice against him, was in a great measure forced to remove to the

United States of America, where he spent the rest of his life. A late atonement was made by the town to his memory in 1873, by the erection of a statue in his honour in front of the Town-Hall, and the foundation of a Priestley scholarship at the Midland Institute. As if ashamed of the excesses of 1791, Birmingham thenceforth became a thoroughly Liberal and, with one or two exceptions, a peaceful town. In the dismal period from 1817 to 1819, when the manufacturing distriets were heavily distressed and were dis- turbed by riots, Birmingham remained quiet. Even when some of the inhabitants were tried and punished for demanding pazrlia- mentary representation, and for electing Sir Charles Wolseley as their delegate, there was no demonstration of violence—the wise counsels of the leaders

inducing orderly submission to the law. The game prudent course was observed when in the Reform agitation of 1831-32 the Political Union was formed, under the leadership of Thomas Attwood, to promote the passing of the Reform Bill. Al- most the whole town, and great part of the surrounding district, joined in this agitation ; vast meetings were held on N ewhall Hill; there was much talk of marching upon London 100,000 strong; but, owing to the firmness and statesmanship of Mr Attwood and his associates, there was no rioting or any sign of violence. Ultimately the Political Union succeeded in its object, and Bir- mingham helped to secure for the nation the enfranchisement of the middle elasses and other political reforms. One exception to the tranquillity of the town has to be recorded—the occurrence of riots in 1839, during the Chartist agitation. Chartism took a strong hold in Birmingham, and, under the influence of Mr Feargus O'Connor and some of his assoeiates, nightly meetings of a threatening char- acter were held in the Bull King. The magistrates resolved to put these down, and having obtained the help of a detachment of the metropolitan police—the town then having no local police force— a meeting was dispersed, and a riot ensued, which resulted in injury' to several persons, and required military force to suppress it. 'This happened on the 4th of July. On the 15th of the same month another meeting took place, and the mob, strongly armed and num- bering many thousands, set fire to several houses in the Bull Ring, some of whieh were burned to the ground, and others were greatly damaged. The military again interfered, and order was restored, several of the ringleaders being afterwards tried and imprisoned for their share in the disturbance. There was another riot in 1867, caused by the ferocious attaeks of a lecturer named Murphy upoa the Roman Catholies, which led to the sacking of a street chicfly inhabited by Irishmen ; but the incident was comparatively trivial, and further disorders were prevented by the prompt action of the authorities. (J. T. B.)

BIRON, ARMAND DE GoNnTAULT, a baron and marshal of France, and a celebrated general, who signalized him- self by his valour and conduct in several sieges and battles in the 16th century. He was made grand master of the artillery in 1569, and commanded at the siege of Rochelle, and in Guienne. He was one of the first who declared for Henry IV.; he brought a part of Normandy under his sub- jection, and dissuaded him from retiring to England or Rochelle. Biron was killed by a cannon-ball at the siege of

Epernay, July 26, 1592, He was a man of considerable literary attainments, and used to carry a pocket-book, in which he noted everything that appeared remarkable. This gave rise to a proverb at court, when a person happened to say anything uncommon, " You have found that in Biron's pocket-book."

BIRON, Caries DE Gonravutt, son of the above and born in 1562, created duke of Biron and admiral of France by Henry IV., was a man of great intrepidity, but fickle and treacherous. In 1601 he was sent as ambassador to the court of queen Elizabeth to announce his royal master's marriage with Mary of Medici; but being discovered in a treasonable correspondence with Spain, he was beheaded in the Bastille at Paris, July 31, 1602. The extent to which he had carried his treason was not great, and Henry by sparing his life would not have shown undue clemency.

BIRS NIMRUD. See BaByton, page 183.

BISACCTA, a city of Italy, in the Principato Ulteriore, 60 miles E. of Naples. It is a bishopric in conjunction with St Angelo, and contains 5342 inhabitants. Formerly it was the chief city in a principality belonging to the Pignatelli family, and it is believed to occupy the site of the ancient Romulea, a Samnite town of considerable size, which was captured by the Romans about 297 B.c.

BIS—BIS 187

BISCAY, or Vizcaya, one of the three Basque provinces of Spain, with the title of Seignory. It is bounded on the N. by the bay to which it gives its name, E. by Guipuzcoa, S. by Alava, and W. by Santander. Its area is 845 square miles, and its population in 1867 was 183,098. The coast- line, which extends from Ondarroa to a short distance to the east of Castro, is bold and rugged, and in some places is deeply indentcd. The only river of any size is the Nervion or Ibaizabal, on which Bilbao is situated ; the others, which are numerous, are merely large mountain streams. The surface of the country is for the most part very mountainous, but at the same time is diversified with numeroyis narrow valleys and small plains. Some of the mountains are almost entirely composed of naked calcareous rock, but most of them are covered to their summits with forests of oaks,

chestnuts, or pine trees. Holly and arbutus are also common, and furze and heath abound in the poorer parts. The province produces wheat, maize, barley, rye, flax,

‘grapes, peaches, apples, and other fruits. The farms are

generally small, and are for the most part tilled by manual labour. The wild boar, lynx, fox, and other wild animals, are found in the forests; and deer, rabbits, partridges, woodcocks, and other kinds of game are plentiful. Sheep and goats are the principal domestic animals. In minerals Biscay is very rich. Iron of the finest quality is found in almost every part, and forms a main article of export. The best mines are those of Somorostro, near the coast. The amount obtained in 1866 was about 80,000 tons. Lead, zinc, alum, aud sulphur, are also present in smaller quantities ; and marble, lime, and sandstone are abundant. The manufacture of the iron ore is the chief branch of industry; but porcelain, linens, copper and brass wares, ropes, and leather, are also produced. The fisheries are actively prosecuted along the coast by a hardy race of fishers, who were the first of their craft in Europe to pursue the whale, formerly abundant in the Bay of Biscay. Cod, bream, tunny, and anchovy are the principal fish taken. Bilbao is the capital of the province, with a population of 17,649; the other towns, Portugalete, Miravalles, Durango, and Orozco, are all very small. The principal ports, besides Portugalete, are Plencia, Bermeo, and Hea. After the fall of the Romans this Cantabrian province came successively into the hands of the Suevi, Franks, and Goths, and formed for some time an independent lordship. The legislative authority was exercised by the lord and a junto of popular representatives. The latter regularly assembled every two years, and on any emergency held an extra- ordinary meeting under an old tree at Guernica, Although incorporated with Spain, the Biscayans still maintain a republican form of administration, nominating their own governors and magistrates, regulating the amount of the taxes, and exercising various other privileges. They are a brave and active people, and their history is largely composed of exploits in defence of their liberties. For their linguistic and ethnographic affinities, see the article Basque Provinces. The name Biscay is not unfrequently employed as geographically equivalent to Basque, in that case including the three provinces of Biscay proper, Guipuzcoa, and Alava.

BISCAY, Bay or, in French the Golfe de Gascogne, and the Roman Sinus Aquitanicus, an extensive gulf or bay of the Atlantic, enclosed by the northern coast of Spain and the western coast of France. It extends from the island of Ushant, on the coast of Finistére, to Cape Ortegal on the north of Galicia. In the Spanish portion of the bay the water is about 200 fathoms deep, while in the French portion it is only 20 fathoms. Navigation is impeded by strong westerly winds, and by Rennel's Current, which sets in from the west and sweeps along the southern and eastern shores sometimes at a rate of 27 miles

a day. The Loire, Charente, Gironde, and Adour, besides numerous smaller streams from the Spanish mountains, fall into the bay.

BISCEGLIA, perhaps the ancient WVatiolwm, a fortified seaport of Italy, in the province of Terra di Bari, situated on a rocky promontory on the Adriatic, 21 miles W.N.W. of Bari. It is the seat of a bishopric, and has a cathedral, numerous churches and convents, and a theatre. Some ruins still exist of a hospital, founded by Bohemund for pilgrims to the Holy Land. Its harbour is only accessible to small vessels, and it has little trade. Being destitute of springs, it has numerous reservoirs for the collection of rain-water. Population, 21,371.

BISCHWEILER, a town of Alsace, 14 miles N. of Strasburg, on the railway from Hagenau. It has manu- factures of woollen and linen stuffs, oil, soap, earthen- ware, &c., and some trade in hops, hemp, leather, and tobacco. Population in 1871, 9220, including that of Hanhoffen, which numbered 689.

BISCUIT. See Baxine, page 252,

BISHOP, the title of an ecclesiastical dignitary set over the presbyters and deacons at a very early period in the Christian church. The word is derived from the Saxon bisceop, which is a corruption of the Greek word episcopos, which signifies an "overlooker" or "overseer," and the churches in which the order of bishops is recognized as distinct from and superior to the ordcr of presbyters are styled "Episcopal churches." The early history of the Episcopal order is obscure, but it would appear that the first bishops were established in the chief cities of Christendom, and each bishop had a

certain territorial district placed under his superintendence, whence the city was termed the see (sedes) of the bishop, and the district his parish (apouxia), and subsequently his diocese (Stocknows). In course of time the districts assigned to the first bishops became too populous, whercupon the clergy of each diocese, as the case might bc, appear to have assembled and to have subdivided the diocese, and to have selected a second bishop, and so bishops and dioceses were multiplied, according to the wants of the churches, until it was thought expedient to reserve the right of erecting new bishoprics to provincial councils, and this reservation was made a rule of the church by a decree of the Council of Sardica. Meanwhile the bishops of the new sees had grouped themselves round the bishops of the more ancient sees, who exercised over them a certain spiritual authority as primates, and presided in their councils; and as some of the great cities in which the sees of the first bishops had been established were distinguished by the title of " metropolis," or mother-city, and were in fact the chief cities of civil provinces of the Roman empire, the bishops of those sees came to be distinguished by the title of metropolitan bishops, and exercised a superior authority in the councils of the church in proportion to the greater importance of their respective sees. This superior dignity of the metropolitan bishops over the others was formally recognized at the Council of Niésa as being in accordance with custom. Upon the establishment of Christianity as the religion of the Roman empire a coercive jurisdiction was engrafted on the spiritual superiority of the metropoli- tan, and the district over which the metropolitan exercised this jurisdiction was termed his province, the earliest ecclesiastical provinces being for the most part conterminous with the civil provinces of the empire. From the cireum- stance that there was no metropolitan city in Western Africa, the term metropolitan was ucvcr adopted in the Carthaginian Church, the senior bishop of that church being termed the primate, and having precedence and authority as such over the other bishops.

In the Church of Rome the Pope claims of right the

appointment of all the bishops; but the exercise of this right is modified by concordats with the sovereigns of the respective states. In France, since the

concordat between Pope Leo X. and King Francis I., the sovereign has had the exclusive right of nominating the bishops, but the nomination is subject to the Pope's confirmation. In Austria (with the exception of four bishoprics), in Bavaria, in Spain, and in Portugal, the bishops are also nominated by the sovereign. In some countries the bishops are elected by the chapter of the cathedral church, as in Wiirtemberg, or by the bishops of the province, as in Ireland. In England, in the United States of America, and in Belgium, the Pope selects one out of a list of candidates submitted to him by the chapter. In all cases the bishop-nominate or the bishop-elect, as the case may be, has to obtain from the Holy See certain letters, entitled provisions, to authorize his consecration, and to recommend him to the protection of the sovereign and to the good offices of his metropolitan

In the Church of Russia, after its separation from that of Constantinople, the right to elect a bishop was for some centuries vested in a synod of bishops, but by a regulation of the Emperor Peter the Great, the Holy Synod was restricted to recommend two persons to the sovereign for him to select one of them to be bishop. This regulation, however, is not always observed, and the sovereign, if he thinks fit, sets aside the list submitted to him by the Synod, and nominates of his own choice a person whom the Synod is obliged to elect. In Russia a diocese sometimes contains two capital cities, and the bishop has his title from both.

In the Church of the Levant, properly called the Greek Church, which is governed by the four patriarchs of Constantinople, Antioch, Jerusalem, and Alexandria, each patriarch has the right of confirming the election of the bishops within his patriarchate ; but the firman or barat of the sultan is likewise necessary to give full authority to the bishops after their confirmation.

The bishops of the Church of England are twenty-eight in number, two of them being metropolitans, namely, Canterbury and York, who enjoy the more dignified title of archbishop, and have a special precedence assigned to them by law (see ARcHBISHOP). The twenty-six diocesan bishops, with the exception of the bishop of the Isle of Man, who is designated the bishop of Sodor and Man, are lords of parliament, and take precedence of the barons in the House of Lords; but the junior bishop for the time being is, by

statute, disentitled from being summoned to parliament. From this disqualification the bishops of London, Durham, and Winchester are exempt. These three bishops have precedence over one another in the order in which their names are above mentioned, and they precede all the other bishops, the latter taking precedence of one another according to the date of their appointment. The junior bishop who has a seat in parliament acts as chaplain to the House of Lords.

In the Church of England the bishops exercise certain spiritual functions which are held not to be within the competence of the presbyters. They alone can administer the rite of confirmation to baptized persons, and they alone can ordain candidates for the sacred ministry. These functions the bishops exercise in virtue of their order, but they are also empowered by law to exercise a certain jurisdiction over all consecrated places and over all ordained persons. This jurisdiction they exercise for the most part through their consistorial courts, or through commissioners appointed under 3 and 4 Vict. c. 86, called the Church Discipline Act. The bishops also exercise a certain jurisdiction over marriages, inasmuch as they have by the canons of the Church of England a power of dispensing

with the proclamation of banns before marriage. These dispensations are termed marriage licences, and their legal validity is recognized by the Marriage Act, 4 Geo. IV. ¢. 76. The bishops had formerly jurisdiction over all questions touching the validity of marriages and the status of married persons, but this jurisdiction has been transferred from the consistorial courts of the bishops to a court of the Crown by 20 and 21 Vict. c. 85. They have in a similar manner been relieved of their jurisdiction in testamentary matters, and in matters of defamation and of brawling in churches ; and the only jurisdiction which they continue to exercise over the general laity is with regard to their use of the churches and churchyards, The churchwardens, who are representative officers of the parishes, are also executive officers of the bishops in all matters touching the decency and order of the churches and of the churchyards, and they are responsible to the bishops for the due discharge of their duties ; but the abolition of church-rates has relieved the churchwardens of the most onerous part of their duties, which was connected with the stewardship of the church funds of their parishes.

The bishops are still authorized by law to dedicate and set apart buildings for the solemnization of divine service, and grounds for the performance of burials, according to the rites and ceremonies of the Church of England; and such buildings and grounds, after they have been duly con- secrated according to law, cannot be diverted to any secular purpose except under the authority of an Act of parlia- meut.

The bishops of England have also jurisdiction to examine clerks who may be presented to benefices within their respective dioceses, and they are bound in each case by the 95th canon of 1604 to inquire and inform themselves of the sufficiency of each clerk within twenty-eight days, after which time, if they have not rejected him as insuffi- ciently qualified, they are bound to institute him, or to license him, as the case may be, to the benefice, and thereupon to send their mandate to the archdeacon to induct him into the temporalities of the benefice. Where the bishop himself is patron of a benefice within his own diocese he is empowered to collate a clerk to it,—in other words, to confer it on the clerk without the latter being presented to him. Where the clerk himself is patron of the living, the bishop may institute him on his own petition. See BENEFICE.

The qualifications of a bishop of the Church of England are, that he should be a learned presbyter of at least thirty years of age, born in lawful matrimony, and of good life and behaviour. The mode of his appointment is regulated by 24 Henry VIII. c. 20. Upon the avoidance of a bishopric the Crown is authorized to issue to the dean and chapter of the cathedral church of the see a licence for them to proceed to the election of a bishop, accompanied by a letter missive containing the name of the person whom they are to elect. The dean and chapter are thereupon required, within twelve days, to elect the person so named by the Crown to be the bishop of the vacant see, failing which election the Crown is impowered to name, by letters patent under the Great Seal addressed to the archbishop and metropolitan of the province, such person to be bishop as the Crown shall think able and convenient. Upon the election being reported to the Crown, a mandate issues from the Crown to the archbishop and metropolitan, requesting him and commanding him to confirm the election, and to invest and consecrate the bishop-elect. Thereupon the archbishop issues a commission to his vicar-general to exainine formally the process of the

election of the bishop, and to supply by his authority all defects in matters of form, and to administer to the bishop-elect the oaths of allegiance, of supremacy, and of canonical obedience.

Bel ss HOP

After this formal coufirmation of the bishop's election has taken place, the archbishop, with the assistance of at least two bishops, proceeds to consecrate the bishop-elect. The most important part of the religions ecremony on this occasion consists in the imposition of hands, in other words, in the archbishop and the bishops placing their hands simultaneously upon the head of the bishop-elect kneeling before them, and in the name of the Holy Trinity com- mitting to him his office of bishop ; after which the arch- bishop delivers to him the Holy Bible and addresses to him a short admonition to preach faithfully the Word of God. The bishop is required afterwards, by statute, to do homage to the Crown, upon which he is put into possession of the temporalities of his see. In the case of the avoidance of the archbishopric of either province, the Crown sends a inandate to the archbishop of the other province to confirm and consecrate the archbishop-elect, and the practice is, for the most part, for the archbishop of the other province to send a commission to four or more bishops of the province of the archbishop-elect to confirm his election and to invest and consecrate him,

Doubts having been raised whether a bishop of the Church of England, being a lord of parliament,. could resign his seat in the Upper House of parliament, although several precedents to that effect are on record, a statute of the realm (19 and 20 Vict. c. 115), which is confined to the case of the bishops of London and Durham, was passed in 1856, declaring that on the resignation of their sees being accepted by their respective metropolitans, those bishops should cease to sit as lords of parliament, and their sees should be filled up in the manner provided by law in the case of the avoidance of a bishopric. By a subsequent statute (32 and 33 Vict. c. 111), provision has been made for the case of an archbishop or bishop being permanently incapacitated by age or mental infinnity. If the archbishop or bishop is capable of exccuting an act of resignation, a representation may be made to the Crown, which is im- powered to declare

the see to be vacant, but if the arch- bishop or bishop should be incapacitated from intimating his desire to resign his bishopric, the Crown may grant a licence to the dean and chapter of the cathedral church of the diocese to appoint a bishop-coadjutor. This Act was to be in force for two ycars; it has been continucd for three years more by 35 and 36 Vict. c. 40.

A pecular institution of the Church of England, established by 26 Henry VIII. c. 14, having been long allowed to remain dormant, has becn recently revived, under which every archbishop and bishop, being disposed to have a suffragan to assist him, may name two honest and discreet spiritual persons for the Crown to give to one of them the title, name, style, and dignity of a bishop of any one of twenty-six sees enumerated in the statute, as the Crown may think convenient. The Crown, having made choice of one of such persons, is impowered to present him by letters patent under the great seal to the metropolitan, requiring him to consecrate him to the same name, title, style, and dignity of a bishop; and the person so conse- crated is thereupon entitled to exercise, under a commission from the bishop who has nominated him, such authority and jurisdiction, within the diocese of such bishop, as shall be given to him by the commission, and no other.

The first: colonial bishopric of the Church of England was that of Nova Scotia, founded in 1787, since which time various colonial bishoprics have been established, some of which were constituted by letters patent of the Crown only, whilst others have been confirmed by acts of the imperial or colonial legislatures. With regard to those bishoprics which have been constituted by letters patent of the Crown only, where the bishopric has been established in a Crown colony, the bishop is legally entitled to exercise the jurisdiction conferred upon him by the letters patent ; but where the bishopric has been established in a colony possessing at the time an indepen-

dent legislature, the bishop is not entitled to exercise such: jurisdic- tion unless it has been confirmed to him by an imperial or colonial statute. The report of the judicial committee of the Privy Council in the case of the bishop of Natal (Moore's Privy Council Re- ports, N.S., iii. p. 115) is an exposition of the law on this subject. On the other hand, where bishoprics

have been constituted by letters patent of the Crown, in pursuance of imperial statutes, as was the case of the East Indian bishoprics, or where bishoprics consti- tuted by letters patent have subsequently been confirmed or recog- nized by colonial statutes, the bishop's jurisdiction is complete; otherwise his authority is only pastoral or spiritual. The practice adopted by the Crown, since the decision of the judicial committce in the case of the bishop of Natal has revealed the invalidity of the Ictters patent granted to many colonial bishops, has been to grant licences to the archbishop of Canterbury to consecrate bishops for the colonies without any definite diocese, and without any authority to exercise coercive jurisdiction. The Crown has also revoked the lettcrs patent erecting Gibraltar into a bishop's see, and the last appointed bishop has been consecrated under a licence from the Crown, and is a titular bishop, having only consensual authority in that colony. (ED) BISHOP, Sir Henry Row ey, musical composer, was born in London on the 18th November 1786. He received his artistic training from Francisco Bianchi, at whoseinstance, probably, he was employed to write his first work, the ballet of Tamerlan et Bajazet, produced at Covent Garden in 1806. This proved successful, and was followed within two years by several others, of which Caractacus, a pantomimic ballet, written for Drury Lane, may be named. Iu 1809 his first opera, The Circassian's Bride, was pro- duced at Drury Lane; but by a singular misfortune the theatre was burned down after one performance, and the score of the work perished in the flames. His next work of importance, the opera of The Maniac, written for the Lyceum in 1810, established his reputation, and probably secured for him the appointment of composer for Covent Garden theatre. The numerous works—operas, burlettas, cantatas, incidental music toShakespeare's plays, &c.— which he composed while in this position, are now in great part forgotten. The most successful were—The Virgin of the Sun (1812), The Miller and his Men (1813), Guy Man- nering and The Slave (1816), Maid Marian and Clart, introducing the air of "Hone, Sweet Home" (1822). His English adaptations, or rathcr mangled versions, of Mozart's Don Giovanni and Migaro, and Rossini's Jl Barbiere and Guillaume Zell, were certainly no true service to art. It seems almost incredible that a man of Bishops undoubted genius should have been so misguided as to suppress the incomparable Figaro overture of Mozart in favour of one of his own. In 1824 Bishop was induced by Elliston to transfer his services from Covent Garden to the rival house in Drury Lane, for

which he wrote with unusual care the opera of Aladdin, intended to compete with Weber's Oberon, commissioned by the other house. As was to be expected the result was a failure, and with Aladdin Bishop's career as an operatic composer may be said to close. On the formation of the Philharmonic Society (1813) Bishop was appointed one of the directors, and he took his turn as conductor of its concerts during the period when that office was held by different musicians in rotation. In 1841 he was appointed to the " Reid" chair of music m the University of Edinburgh, but he resigned the office in 1843. He was knighted by the queen in 1842, being the first musician who ever received that honour. In 1848 he succeeded Dr Crotch in the chair of music at Oxford. The music for the ode on the occasion of the installation of Lord Derby as chancellor of the university (1853) proved to be his last work. He died on the 30th April 1855 in impoverished cir- cumstances, though few composers ever made more by their labours. Bishop's name will live in connection with his numerous glees, songs, and smaller composi- tions, rather than with his larger works, which are now seldom or never performed in their entirety. His Shake-

speare songs and glees are familiar favourites with all vocalists, and genius is discernible in not a few of them. His melodies are clear, flowing, appropriate, and often charming ; and his harmony is always pure, simple, and sweet. He was a prominent example of boththe strength and the weakness of the native English school, in which the name of Purcell alone stands unquestionably higher than his. BISHOP-AUCKLAND, a market-town of England, in the county of Durham, 11 miles south-west of the city of Durham. It is beautifully situated on an eminence near the confluence of the Wear and the Gaunless; its streets are well paved and lighted, and there is a good supply of water. The parish church is 1 mile distant, at Auckland St Andrews, but there are several churches and chapels in the town. 'The town-house, which dates from 1863, is a handsome building, with a tower 100 feet in height; and the palace of the bishop of Durham, which stands at the north-east end of the town, is a spacious and splendid though irregular pile. The site of the palace was first chosen by Bishop Anthony Beck, in the

time of Edward 1. The present building covers about 5 acres, and is sur- rounded by a park of 800 acres. The principal industrial establishments are cotton-factories and engineering works ; and in the neighbourhood of the town are several coal- mines. Population of local board district in 1871, 8736. BISHOP-STORTFORD, a market-town of England, on the eastern border of Herts, 11 miles E.N.E. of Hertford, and 32 miles by railway from London. It is situated on both sides of the River Stort, a tributary of the Lea, and has thus direct water communication with the metropolis. The parish church of St Michael's, a fine building with a spire, dates from the reign of Henry VI, but was partly rebuilt in 1820. Atown-house, a corn exchange, a union workhouse, a high school, a collegiate school, and a diocesan training school, are among the chief buildings; and there are also public baths, libraries, and banks. The industrial establishments comprise a brewery, malt-houses, coach- works, lime-kilns, and a foundry; and the trade consists chiefly in grain and malt. Stortford was in existence before the Norman conquest; and its castle, known as Waytemore Castle, was presented by William the Con- queror to Maurice, bishop of London, and his successors. The building was, however, demolished by King John, and only a few ruins remain. Sir H. Chauncey, the historian of Hertfordshire, and Hoole, the translator of Tasso, were both natives of Stortford. Population of the parish in

1871, 6250.

BISHOP-WEARMOUTH, a township of Durham in England, now incorporated in the parliamentary borough of Sunderland. See SUNDERLAND. BISKARA, or BiskRra, a town of Algeria, in the pro- vince of Constantine, and the most important military post of the Sahara. It lies on the south side of the Aures Mountains, in a fertile district, watered by the Wadi Biskra. The streets of the town are broad, and its houses are for the mest part built of brick, one story high, and with terraced roofs. Among the principal buildings are the fort of St Germain, the caravanserai, the hospital, and the barracks. A large caravan trade between the Sahara and the Tell passes through the town; iron, limestone, and saltpetre are obtained in the neighbourhood, and the surrounding country yields abundance of valuable dates. The chief articles of manufacture are burnous and carpets. An acclimatization garden has been established at Beni- Morra by the

French, who first made themselves masters of Biskara in 1844. Population in 1872, 7367. BISMUTH. 'This metal appears to have been unknown to the older metallurgical writers, it having been first noticed by Agricola, who speaks of it as a form of lead, and describes the method of separating it from its associ-

ated minerals by liquation. Mathesius in his Bergpostilla, written between 1553-1562, describes it as white like

pyrites, and occasionally cubical like marcasite, easily over-

come by the fire when melted, and running together with

the tin, which thereby is rendered brittle and unsound,—

the last remark referring to its occurrence with tin ores in Saxony. It was considered by the miners as a hopeful indication of silver, and even in certain cases is said to have been transformed gradually into that metal, as por- tions of the ore which had lain for some time exposed were found afterwards to be partly or wholly changed into silver. This remark is interesting, as the same belief scems to have come up again in ourown time, The name Wismuth is a miner's term, whose origin is completely lost; but Mathesius assigns it a fanciful derivation from Wisse = Wiese, a meadow, because in the mine it is found covered with flowers or incrustations of various colours, resembling a meadow covered with brilliantly coloured flowers,—an obvious confusion with the minerals known as nickel and cobalt bloom, derived from the oxidation of arsenides of nickel and cobalt, with which native bismuth is commonly associated in Saxony. It is to this associa- tion with cobalt and arsenic that must be ascribed the statements that its principal use was to produce a blue colour, and that it gave off a very poisonous furnace smoke. The chief use of the metal at that time seems to have been by pewterers, who added it to their alloy in small proportions for the purpose of rendering their wares hard and sonorous when struck.

The principal minerals containing bismuth are:—-1. Ores

Native bismuth, essentially the pure metal, having all the properties described below. This, the most important ore, occurs in connection with nickel and cobalt ores at Schnee- berg, Saxony, at Wheal Sparnon in Cornwall, similarly associated, and with tin ores in the mines of the St Just district. It is also found in some quantity in Bolivia. 2. Tetradymite, or telluric bismuth, a compound in variable proportions with the isomorphous element tellurium. This contains from 60 to 80 per cent. of bismuth, 15 to 35 per cent. of tellurium, and from 3 to 5 per cent. of sulphur. Tt occurs usually in association with gold ores; the principal localities are Schemnitz and Retzbanya in Hungary, the gold mining district of Virginia and North Carolina, California, and other western states of America, It was also found at the Merionethshire gold mines as a rarity. 3. Bismuth silver, found at Schapbach in Baden, and near Copiapo in Chili. The mineral from the former locality contains 27 of bismuth to 15 of silver, with some lead and sulphur, and a little iron; and that from the latter 60 of silver to 10 of bismuth, the remainder being copper and arsenic. 4. Bismuthine, or bismuth glance, a sulphide of bismuth, of the composition Bi,S,, containing 81°6 per cent. bismuth and 18°4 per cent. sulphur, crystallizing in acicular rhombic prisms isomorphous with antimony glance. It occurs with tin ore at Botallack and other mines near St Just in Cornwall, and in the Saxon localities given above. 5. 'Bismuth ochre, an earthy oxide of bismuth, containing 90 per cent. bismuth and 10 per cent. oxygen, which is derived from the oxidation both of the native metal and of the sulphide. 6. Bismutite, a hydrated car- bonate of bismuth, containing 90 per cent. bismuth oxide, 6-56 per cent. carbonic acid, and 3°44 per cent. water, an- other product of atmospheric action upon native bismuth. It is found principally in Saxony and South Carolina. Besides the above there is also a silicate described, but this is an exceedingly rare mineral, as is also Hypochlorite, a hydrated silicate mixed with phosphate of alumina, Practi- cally the only ore is the native metal, and of late years, from the supply not keeping pace with the demand, the

| price has risen very considerably. The bismuth of com-

Physical properties.

Chemical properties,

Salts,

BLS Ww

merce usually contains both gold and silver, often in con- siderable quantity, which circumstance has probably given

rise to the story current about its transmutation into |

these metals.

Bismuth may be readily obtained in crystals by pouring it when melted into a heated iron ladle, and cooling it until a erust is formed on the surface, which must then be pierced by a red-hot iron rod, and the liquid metal poured off. The solidified portion adhering to tho ladle ig found to be covered with hopper-shaped crystals, which are usually beautifully irised, owing to the formation of a thin film of oxide on the surface, showing the colours of thin plates. This eolouring is only obtained when the metal is quite free from arsenic. It may be purified by melting with about 10 per cent. of nitre, and keeping it constantly stirred at a temperature not much above its melting point, whereby the more oxidizable metals are removed, and form a slag at the surface. Another method of purifying it from arsenic is by fusing it with from 3 to 5 per cent. of zinc, covering the surface with charcoal to prevent oxidation of the zine, which takes off the whole of the arsenic, and is subsequeutly removed by treatment with hydrochloric acid, the purified bismuth remaining insoluble. When prepared by any of these processes, Bismuth is a hard, brittle metal, and the fracture is hig!ily crystal- line and white, with a perceptible red tinge by reflected light. 'The crystalline form is rhombohedral, the angle of the primary rhom- bohedron being 87° 40', or very close toacube. The specific gravity is 9°83, but when subjected to great pressure the density is reduced to 96. The melting point is 264° C. (507° Fal.) (Rudberg), or 268°°3 (515°) (Riemsdijk), Like water it may be cooled 6° or 7° ©. below its freezing point; but when solidification sets in the tempera- ture rises to 480° Fahr., and continues until the mass is completely solidified. Like ice it expands about 4 of its volume in solidifi- cation, a property which is communicated to its alloys, rendering them valuable for taking casts of incised or relief surfaces for reproduction, as printing-blocks by electrotype or other processes. It may be distilled by

heating to a higher temperature in hydrogen. Despretz volatilized it by subjecting it to the current from 600 Bunsen elements. The spectrum of the vapour in the voltaie arc shows numerous brilliant green lines, one strong and one fainter line on the red, and a faint line on the orange field (Masson). The coefficient of expansion by heat is '601341, calorific conducti- bility 61, silver being 1000 (Calvert and Johnson), and specitic heat 0°0305 (Kopp). The electrie conductivity is 1:19 at 14°C., silver being 100 at 0° (Matthiesen). According to Matteuci the conductivity varies in the crystals according to the direction of the cleavages. It is the most strongly diamagnetie of all metals.

The atomic weight is 208 (Schneider) or 210 (Dumas). Like phosphorus and arsenic it is both triatomie and pentatomic, the latter state being represented only by a very unstable acid ; there are also several diatomie compounds, including BiBr,, BiCl,, and Bil,. The triatomic compounds are the most numerous and stable. Unlike the elements ehemically similar,—phosphorus, tellurium , arsenic, antinony, &c.,—it does not form a gaseous compound with hydrogen. Bismuth does not change in dry air, but in moist air it oxidizes superficially, and by long exposure may be converted into carbonate. When melted at a red heat it oxidizes, and the oxide (whose formula is Bi,O,), by a higher temperature, melts to a glassy substance, in which property it resembles lead, the oxide, 'like litharge, exerting a very corrosive action upon earthern crucibles, or substances containing silica, at a red heat. At a red-white heat it slowly decomposes water with the production of oxide. The higher oxide Li,O, corresponds to arsenic acid ; it isa very unstable compound, and of no practical 'value. An intermediate oxide is known which is generally regarded as a compound of the other two, Bi,O;, Bi,Os. Bismuth unites directly with chlorine, bromine, and iodine, and when fused with sulphur forms a sulphide of the form Bi,S,, corresponding to bismuth glance, and isomorphous with the corresponding sulphide of antimony. The same sulphide is produced when sulphuretted hydrogen is passed through a solution containing bismuth. :

Bismuth is but slightly acted upon by hydrochloric or sul- phuric acids in the cold; but the latter dissolves it more readily when heated. The best solvent is nitrie acid, which attacks it readily, producing a nitrate which crystallizes from the eoncentrated solution in colourless transparent

crystals belonging to the triatomic system, whose composition is Bi. 3NO,.5H,O. 'These crystals are soluble in nitric acid, but, like all neutral salts of the metal, are decomposed by water, with the formation of an insoluble basic nitrate and an acid liquor. These basic salts are very numerous and complex in constitution, the most important one being that represented by the formula Bi.NO3.H,O, which is known as pearl- white, blanc de fard. This, which is largely used as a medicine, is prepared by adding to a concentrated solution of bismuth dissolved in nitric acid from 40 to 50 times its weight of water, which precipi- tates a cousiderable proportion in the form of a white powder; the remainder, which is retained by the acid liquor, may be separated by neutralizing the excess of acid with ammonia, when a rather

more acid salt than the first precipitate is obtained. Under the name of pearl-white the sub-nitrate is used as a cosmetic, but

- has the disadvantage of being readily blackened by sulphuretted ydrogen.

Bismuth unites readily with other metals, the alloys being remark- able for their ready fusibility, and by their property of expanding ou solidification. An alloy with potassium is obtained by calcining 20 parts of bismuth with 16 parts of cream of tartar in a crucible, and heating the mixture to a very strong red heat. On cooling, a button of metal is found, of a silvery white colour and lamellar fracture, which fuses easily, and remains for a long time in a pasty condition before solidification ; it is brittle, can be easily powdered, and is readily decomposed by water. The alloy with sodinm is obtained in a similar manner, with a sodic tartrate. With silver, gold, and metals of the platinum group, bismuth forms brittle alloys. With mercury it forms a liquid amalgam; but when equal weights of the two metals are heated together, there is a separation on cooling of octahedral crystals, which may be a solid amalgam. The copper alloy is brittle, and of a pale red colour. The ternary alloys of lead, tin, and bismuth, are the most interesting of these compounds, from their low fusibility, which is much below that of any of the com- ponents taken separately. 'This property was known to Sir Isaac Newton ; the alloy named after him, Newton's fusible metal, melts at 94°5 ©. (202° Fahr.) ; it contains 8 parts of bismuth, 5 of

lead, and 3 of tin. Darcet's fusible inetal, containing 2 of bismuth, 1 of lead, and 1 of tin, melts at 98° (199°'4 Fahr.) Another, with 5 of bismuth, 2 of tin, and 3 of lead, melts at 91°°6 (197° Fahr.) Rose's fusible metal, containing 420 parts of bismuth, 236 of lead, and 207 of tin, a composition corresponding to the formula Bi,Sn,Pb, fuses below 100° (212°), and remains pasty for a con- siderable range of temperature below that point. The expansion of this alloy by heat proceeds regularly from 0° to 35°C., but by further heating it contracts up to 55°, from which point up to 80° the rate of expansion is more rapid than at the lower temperatures. Above 80° the normal rate is resumed. The fusibility of these alloys is increased by an addition of cadmium. Thus Wood's fusible metal, containing 1 to 2 parts of cadmium, 2 of tin, 2 of lead, and 7 to 8 of bismuth, melts between 66° and 71°C. Another, described by Lipowitz, containing 8 parts of lead, 15 of bismuth, 4 of tin, and 3 of cadmium, is silvery white, and has a specific gravity of 9°4. It softens at about 55°, and is completely liquid at a little above 60°,

Fusible alloys containing bismuth are used to some extent as safety plugs for steam boilers, as an accessory to the safety-valve,—a hole in the boiler being plugged by a disc of the metal, which in the event of the temperature of the water rising through excessive pressure is mclted, and the steain passes through the aperture in the same manner as through an opened safety-valve. It is found, however, that this method is not trustworthy, owing to the liqua- tion of the more fusible components of the mass, when subjected to continued heating near but below the melting port leaving a niore refractory alloy behind, The alloy known as Britannia metal, con- sisting chiefly of tin, antimony, and copper, often contains a little bismuth.

In analysis bismuth is usually separated from solution as car- bonate by precipitation with carbonate of ammonia, which is then converted into oxide by calcination at a gentle heat, in which form it is weighed and estimated. The oxide Bi,O, contains 89°74 per cent. of bismuth. It is readily precipitated as sulphide by passing sulphuretted hydrogen through an acid solution, but the precipitate eannot be weighed, as it usually contains an excess of sulphur, and eannot be completely freed from water below 200°, so that it must be redissolved in nitric acid and precipitated as carbonate as above described. It may be precipitated in the metallic state by zine,

cadmium, copper, iron, or tin. A plate of copper introduced into a boiling solution of a bisinuth salt, even when very weak, is readily covered with a coating of the reduced metal of a steel-gray colour.

Bismuth may be employed instead of lead' for the assay of gold and silver by cupellation, as the melted oxide is absorbed by bone ash in exactly the same manner as litharge.

The separation of bismuth from solutions in which it is associated with silver, copper, mercury, cadmium, and lead, may be effected by cyanide of potassium ; by digesting the solution with an excess of this reagent the cyanides of bismuth and lead remain in the in- soluble portion, while those of the other metals are contained in the filtrate. On redissolving, the lead may be precipitated as sul-. phate, or by hydrochlorie acid and alcohol, which renders the chloride of lead insoluble. The bismuth is finally precipitated from the filtrate by sulphuretted hydrogen. [rom copper it is readily separated by carbonate of ammonia, bismuth being precipitated, and copper re- maining in solution. Another method is by heating in a current of chlorine, when chloride of bismuth is volatilized.

The metallurgical processes for the extraction of bismuth are very simple, being mainly comprised in liquation out of contact with the air, and subsequent fusion of the liquated product of the first operation. At Schneeberg, in Saxony, the liquation is effected in cast-iron tubes placed transversely over a fire-grate which runs the whole length of the furnace. The tubes are inclined, the higher

Alloys.

Analysis and separa- tion.

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end being open for charging,~~and the lower stopped, with the excep~~ tion of a small hole for the passage of the separated metal, which +3 received in a cast-iron pot placed in front and heated with charcoal. The charge, about

half a cwt. of ore, broken into pieces about half inch cube, occupies about half of the length and rather more than half the area of each tube. When all the tubes are charged the upper ends are stopped by sheet-iron doors, and heat is applied by means of a wood fire upon the grate. The liquid metal soon commences to flow, and is received in the pots in front. If the flow ceases through any obstruction the passage is cleared by an iron rod introduced through the aperture at the lowerend. When the operation, which usually lasts about an hour, has terminated, the residues in the tubes are removed and thrown into a water trough placed behind the furnace ou the charging side, and a fresh supply of ore is introduced. The bismuth collected in the pots is ladled out and cast into ingots of from 25 to 50 tb weight. In a furnace containing 11 tubes about 20 cwts. of ore may be heated daily with a consumption of 63 cubic feet of wood. In Plattuer's modification the furnace is of the reverberatory form, the tubes being placed with their inclined axes in the direction of the flame, an arrangement which allows the use of a smaller fire-grate and a proportionate saving of fuel. At Joachimsthal, ores containing from 10 to 30 per cent. of bismuth are heated in a finely-ground state with scrap- iron, carbonate of soda, and a little lime and fluor-spar iu earthen crucibles, which are heated until the mixture is completely fused, when the contents are poured into iron moulds of a sugar-loaf form. The bismuth collects in the point of the mould, and is covered with a cake of speiss, containing all the nickel and cobalt of the ore with about 2 per cent. of bismuth, which is reserved for further treat- ment ; the slag filling the upper part of the mould is thrown away. Lf the bismuth is sufficiently rich in silver it is cupelled, and the oxide formed is subsequently reduced or revived by fusion with carbon, When argentiferous lead containing bismuth is subjected to cupellation the former metal is oxidized more rapidly than the latter, which accumulates to such an extent that it may often form a notable proportion of the litharge produced towards the end of the process, ulthough not existing in sutticient amount to be appreci- able by the ordinary processes of analysis in the original lead. This, property has recently been utilized to recover a sinall quantity of bismuth existing in the silver ores smelted at Freiberg. The last portion of the litharge, and the hearth or test bottom from the silver refining furnace, are heated in quantities of 80 or 100 Ib in earthen- ware pots with hydrochloric acid until complete solution of the bismuth oxide takes place, the proportion of acid and water being regulated to prevent the formation of insoluble

salts. When the liquid is clear it is siphoned off to the precipitating tubs, where it is thrown down as an insoluble oxychloride by the addition of a large quantity of water. By redissolving and reprecipitating, a purer material is obtained, which is then dried and reduced by fusion in iron crucibles with carbonate of soda and charcoal. The production of bismuth annually in Saxony is about 22 tons, and in Austria about 17 cwt.

The principal properties and reactions of bismuth and its com- pounds were described in 1739 by Pott, who gave a summary of the information contained in the earlier writers. Our more exact knowledge of the subject is due to Neumann, Hellot, Geoffrey (1753), John Davy (1812), Lagerhjelm (1815), Stromeyer, and, more recently, Schneider and Nickles. (H. B.)

BISON, a genus of Ruminant Mammals belonging to the family Bovide, and comprising two widely separated species—the European and American Bisons. They are distinguished from other bovine animals by the greater breadth and convexity of their foreheads, superior length of limb, and the longer spinal processes of the dorsal vertebra, which, with the powerful muscles attached for the support of the massive head, form a protuberance or hump on the shoulders. The bisons have also fourteen pairs of ribs, while the common ox has only thirteen. 'he forehead and neck of both species are covered with long, shaggy hair of a dark brown colour; and in winter the whole of the neck, shoulders, and hump are similarly- clothed, so as to form a "curly felted mane." 'This mane in the European species disappears in summer ; but in the American Bison it is to a considerable extent persistent. The European Bison (Bison bonassus), or Aurochs of the Germans, is the largest of existing European quadrupeds, measuring about 10 feet long, exclusive of the tail, and standing nearly 6 feet high. Formerly it was abundant throughout Europe, as is proved by its fossil remains found on the Continent and in England, associated with those of the extinct mammoth and rhinoceros. These

remains, while indicating larger proportions in the ancient aurochs than in those now living, do not, in Professor Owen's opinion, exhibit any satisfactory specific distinc- tion. Cesar mentions the aurochs as abounding, along with the now extinct Bos primigenius, in the forests of Germany and Belgium, where it appears to have been occasionally

captured, and afterwards exhibited alive in the Roman amphitheatres. At that period, and long after, it seems to have been common throughout Central Europe, the Caucasus, and the Carpathian Mountains. It is now only found in one of the forests of Lithuania, where it is saved from immediate extinction by the protection of the emperor of Russia, but notwithstanding this it is gradually dying out. Many years ago the Lithuanian bisons numbered over 1000, but by the year 1872 they had diminished to 528, and all attempts to domesticate them have failed. The aurochs feeds on grass and the bark of young trees. The American Bison (Bison americanus) has its home on the eastern slopes of the Rocky Mountains, being seldom found to the west of these, and rarely to the east of the Appalachian range. Northwards it extends to lat. 63°, and southward as far as New Mexico. 'Those bisons or buffaloes, as the settlers call them, roam in enormous herds over the western prairies in quest of fresh pastures, being specially fond of the tender grass that springs up after a prairie fire. The two sexes live in separate herds during the greater part of the year, although one or two aged bulls, it is said, always accompany the females. During the rutting season when the sexes come together, the bulls engage in fierce fights among themselves, and at such seasons it 1s highly danger- ous to approach them. At other times they are shy, and retreat before man; but when wounded they become furious, and then all the dexterity of the practised hunter is needed to make good his retreat. The Indians capture them in various ways; by bunting on horseback, and shooting them with bows and arrows, or with fire-anns ; by snaring them within immense enclosures of snow, which the bisons are unable to overleap; or by attracting the herd towards a precipice, and then setting it in motion from behind, so that those in front are pushed irresistibly forward and over. 'The American Bison, though still found in considerable numbers, is rapidly diminishing before the advance of the white settler; and should man in the mean- time not succeed in domesticating it, it will probably ere long share the fate which threatens its European congener. To the Indian the bison has hitherto been indispensable as an article of food, and for the many useful purposes to which its horns, skin, and hair are applied. Its hide forms an excellent fur wrapper; its great value in this respect was proved during the Crimean war.

BITHYNIA (BuOvvia), a province in the N.W. of Asia- Minor, adjoining the Propontis, the Thracian Bosphorus, and the Euxine. According to Strabo it was bounded on the east by the River Sangarius; but the more commonly received division extended it as far as the Parthenius, which separated it from Paphlagonia, thus comprising the district on the sea-coast between these two rivers, which was inhabited by the Mariandyni. Towards the west and south-west it was limited by the River Rhyndacus, which separated it from Mysia; and on the south it adjoined the portion of Phrygia called Phrygia Epictetus, and a part of Galatia. The territory thus defined is in great part occupied by mountains and forests, but has valleys and districts near the sea-coast of great fertility. The most important of the mountain ranges is that known as the Mysian Olympus—from its proximity to that province, though properly included within the limits of Bithynia— which rises to a height of about 6400 feet. It towers in a commanding manner above the city of Broussa, while it forms a conspicuous object as seen fram Constantinople, at

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a distance of 70 miles. Its summits are covered with snow for a great part of the year. Jastward of this the range now called Ala-Dagh extends for above 100 miles from the River Sangarius to the confines of Paphlagonia. It adjoins throughout its course the frontiers of Phrygia and Galatia, and rises to a height of from 6000 to 7000 feet. Both of these ranges belong to that border of mountains which bounds the great table-land of Asia Minor through a great part of its extent. The country between them and the sea-coast is for the most part occupied by subordinate mountain chains, which may be regarded as underfalls or offshoots of the more lofty mountain ranges of the interior. These constitute a very rugged and broken country, covered with extensive forests, and traversed by very few lines of route, so that it is still very imperfectly known. But the broad tract which projects towards the west as far as the shores of the Bosphorus, though hilly and covered with forests, so as to be termed by the Turks Aghatch Denizi, or "The Ocean of Trees," is not traversed by anything like a mountain chain,

The western coast of Bithynia, where it adjoins the Propontis or Sea of Marmora, is indented by two deep gulfs or inlets—the northernmost, now

called the Gulf of Ismid, anciently known as the Gulf of Astacus, penetrating to a distance of between 40 and 50 miles into the interior, as far as the town of Ismid, the ancient Nico- media, which is separated by an isthmus of only about 25 miles from the Black Sea. The next, known in ancient. times as the Gulf of Cius, now called the Gulf of Mou- dania or Gemlik, extends to about 25 miles. At its ex- tremity is situated the small town of Gemlik, on the site of the ancient Cius, at the mouth of a valley, through which it communicated with the inland lake of Isnik, on which was situated the flourishing city of Nicza.

According to the general testimony of ancient authors (Herodotus, Xenophon, Strabo, &c.), the Bithynians were a tribe of Thracian origin who had migrated into Asia by crossing the Bosphorus. The existence of a tribe called Thyni in Thrace is well attested, aud the two cognate tribes of the Thyni and Bithyni appear to have settled simultaneously in the adjoining parts of Asia, where they expelled or subdued the previously existing races of the Mysians, Caucones, and other petty tribes, the Mariandyni alone maintaining themselves in the north-eastern part of the country. Herodotus mentions the two tribes, the Thyni and Bithyni, as existing side by side; but ultimately the

latter people must have become the more important, so as.

to give name to the whole country. They were first subdued by Crcesus, and incorporated with the Lydian monarchy, together with which they soon after fell under the dominion of Persia (546 Bc.) During the Persian empire they were included in the satrapy of Phrygia, which comprised all the countries up to the Hellespont and Bosphorus. But even before the conquest by Alexander some obscure native chiefs appear to have asserted their independence in the mountains of Bithynia, and successfully maintained it under two native princes named Bas and Zipcetes, the last of whom transmitted his power to his son Nicomedes IJ., who was the first to assume the title of king. He became the founder of the city of Nico- media, which soon rose to great prosperity and opulence ; and. during his long reign (278-250 B.c.), as well as those of his successors, Prnsias I., Prusias II., and Nicomedes IT. (149-91 B.C..), the kingdoin of Bithynia held a considerable place among the minor monarchies of Asia. But the last king,

Nicomedes JII., was unable to maintain himself against the increasing power of his neighbour Mithridates, king of Pontus ; and although restored to his throne by the interposition of the Roman Senate, at his death, in 74 3.c., he bequeathed his kingdom by will to the

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Romans. Bithynia was now reduced into the form of a Roman province; but its limits were frequently varied, and it was commonly united for administrative purposes with the neighbouring province of Pontus, extending along the southern shore of the Black Sea as far as Trapezus or Trebizond. This was the state of things in the time of Trajan, when the younger Pliny was appointed governor of the combined provinces (103-105 a.p.), a circumstance to which we are indebted for much valuable information concerning the Roman provincial administration. Under the Byzantine empire Bithynia was again divided into two provinces, separated by the River Sangarius, to the western- most of which the name of Bithynia was restricted.

The most important cities of Bithynia in ancient times were Nicomedia and Nica, which disputed with one another the rank of its capital. Both of these were founded after the time of Alexander the Great; but at a much earlier period the Greeks had established en the coast the colonies of Cius (afterwards named Prusias), on the site of the modern Gemlik ; Chalcedon, at the entrance of the Bosphorus, nearly opposite Constantinople ; and Heraclea, surnamed Pontica, on the coast of the Euxine, about 120 miles east of the Bosphorus. All these rose to be flonrishing and important places of trade. Prusa, at the foot of Mount Olympus, which was founded by Prusias, was also a considerable town under the Roman empire, but did not attain in ancient times to anything like the importance enjoyed by the modern city of Broussa, which became the capital of the Ottoman Turks before the con- quest of Constantinople, and is still (after Smyrna) the second city of Asia Minor. The only other places of im- portance at the present day are Ismid (Nicomedia) and Scutari, which, from its position on the Bosphorus, may be considered as a mere suburb of Constantinople.

The natural resources of Bithynia are still very imper- fectly developed. Its mountains are covered with vast forests, which would furnish an almost inexhaustible supply of timber, if rendered accessible by roads. Coal also is known to exist in the neighbourhood of Erekli (Heraclea), but is not worked to any extent. The valleys which open towards the Black Sea abound in fruit trees of all kinds, while the valley of the Sangarius and the plains near Broussa and Isnik (Nicvea) are fertile and, well culti- vated. Extensive plantations of mulberry trees supply the silk for which Broussa has long been celebrated, and which is manufactured there on a large scale.

The principal rivers of Bithynia are the Sangarius, still called the Sakaria, which traverses the province from §. to N.; the Rhyndacus, which forms the boundary that separated it from Mysia; the Billeus (Filyas), which rises in the chain of the Ala-Dagh, about 150 miles from the sea, and after flowing by the town of Boli (the ancient Claudiopolis) falls into the Euxine, close to the ruins of the ancient Tium, about 40 miles N.E. of Heraclea. It has a course of more than 1U0 miles. The Parthenius (now called the Bartan), which forms the boundary of the province towards the E., is a much less considerable stream. (E. H, B.)

. BITONTO, a city and bishop's see, in the province of Bari, in South Italy, on the great road from Foggia to Bari, about 12 iniles from the latter town. Its cathedral, dedicated to St Valentine, is a fine building in the Italo-Gothic style; and it possesses a theological seminary, a large orphan asylum, and a hospital. The inhabitants maintain an active trade, and have extensive manufactures of olive oil. 'Their principal export is an excellent wine known as Zagarelle. Bitonto, or Butuntum, seems from its coins to have been a place of some importance at an early period, but it makes no appearance in ancient history. In the Middle Ages its Accademia deg! Infiammati obtained

considerable fame. In 1735 it was the scene of a severe battle, in which the Austrians were defeated by the Spaniards under Mortemar, in whose honour Philip: V. caused a pyramid to be erected on the spot. Population in 1871, 24,978.

BITSCH (French, Brrcwe), formerly KALTENHAUSEN, a town and fortress in German Lorraine, on the River Horn, at the foot of the northern slope of the Vosges, between Hagenau and Saargemund. It was originally a countship in the possession of the counts of Alsace and Flanders, but was bestowed by Frederick JIT. on the dukes of Lorraine, and at length passed with that duchy to France in 1738. After that date it rapidly increased, and its citadel, which had been constructed by Vauban on the site of the ducal palace, was restored and strengthened. The attack upon it by the Prussians in 1793 was repulsed, and although the Bavarians occupied the town in 1815 and 1818, they did not get possession of the fort. In the war of 1870 it was blockaded by the Germans in vain, and only surrendered in 1871, after the campaign was over. A large part of the fortification is excavated in the red-sandstone rock, and rendered bomb-proof; while a supply of water is secured to the garrison by the possession of a deep well in the interior. The inhabitants of the town, who in 1871 numbered 3047, manufacture watch-glasses and matches, and carry on a trade in grain, cattle, wood, and peats.

BITTERN, a genus of Wading Birds, belonging to the family Ardeide, comprising several species closely allied to the Herons, from which they differ chiefly in their shorter neck, the back of which is covered with down, and the front with long feathers, which can be raised at pleasure. They are solitary birds, frequenting countries possessing extensive swamps and marshy grounds, remaining at rest by day, concealed among the reeds and rushes of their haunts, and seeking their food, which consists of fish, reptiles, insects, and small quadrupeds, in the twilight. The Common Bittern (Botaurus stellaris) is nearly as large as the heron, and is widely distributed over the eastern hemisphere. Formerly it was common in Britain, but the extensive drainage of late years has greatly diminished its numbers, and it is now a permanent resident only in the fen districts of England. The bittern in the days of falconry was strictly preserved, and afforded excellent sport. It sits crouching on the ground during the day, with its bill pointing in the air, a position from which it is not easily roused, and even when it takes

wing, its flight is neither swift nor long sustained. When wounded it requires to be approached with caution, as it will then attack either man or dog with its long sharp bill and its acute claws. It builds a rude nest among the reeds and flags, out of the materials which surround it, and the female lays four or five eggs of a uniform dusky brown. During the breeding season it utters a booming noise, from which it probably derives its generic name, Botaurus, aud which has made it in many places an object of supersti- tious dread. Its plumage for the most part is of a pale buff colour, rayed and speckled with black and reddish brown. 'The American Bittern (Botaurus lentiginosus) is somewhat smaller than the European species, and is found throughout the central and southern portions of North America, where it forms an article of food. It also occurs in Britain as an occasional straggler.

BITTERS, an aromatized alcoholic beverage, so named originally in the United States, where it was first used on account of its flavour and tonic influence. The drink by itself, or as an addition to unflavoured spirits, is used with considerable frequency in Europe, and especially in France it has come to be be favourably regarded as a sub- stitute for the insidious and delcterious absinthe. In the

year 1867 the daily consumption of bitters in Paris aloue

had reached 4000 litres. The preparation of bitters in Europe was at first a spectalité of the Dutch, and Dutch bitters are the staple used in Great Britain. A consider- able variety of recipes are in use for the preparation of Dutch bitters, but generally gentian root is the leading bitter ingredient in the beverages. The following is given as the composition of brandy bitters :—Gentian root, 4 oz. ; orange peel, 5 oz.; cassia bark, 2 oz. ; cardamoms, sou; and proof spirits, 1 gallon, coloured with 4 0z. of cochineal. Bitters prepared in the great French cities—Bordeaux, Rouen, Havre, Paris, &c.—contain extracts of gentian root, bitter orange peel, aud orange flowers, with a proportion of sugar, and possess an alcoholic strength of about 40°.

BITUMEN. See AspHatt, vol. ii. p. 715.

BIZERTA, or BeNzERT, a scaport of North Africa, in Tunis, 38 miles from the capital, on a gulf or salt lake of the same name, which communicates with a shallow fresh water lake in the interior, formerly called Sisara, and

now the lake of Gebel Ishkel. It occupies the site of the ancient Tyrian colony Hippo Zaritus, the harbour of which, by means of a spacious pier, protecting it from the north- east wind, was reudered one of the safest and finest on this coast. This important work, however, having been neglected by the Turks, the port has been to a great extent choked up. It is still visited by small vessels, and a certain amount of trade is carried on. The exports in 1869 were valued at £19,759. The town is about a mile in circuit; it is defended by several forts. The principal employment of the inhabitants is fishing. The adjoining lake abounds in fish, particularly mullets, the roes of which, dried and formed into the substance called botargo, form a considerable article of Mediterranean com- merce. N. lat. 37°17', E. long. 9°50'. Population, 8000.

BLACK, Dr Josepu, a celebrated chemist, was born, in 1728, at Bordeaux, where his father—a native of Belfast, but of Scottish descent—was engaged in the wine trade. He was educated from his twelfth to his eighteenth year ata grammar school in Belfast, whence he removed, in 1746, to the university of Glasgow. There he chose medicine as his profession, and devoted himself earnestly to physical science, being encouraged and guided by Dr Cullen, who then lectured on chemistry in Glasgow, and whose liberal and original views were in unison with Black's own 'aspirations. From assisting in Cullen's chemical experiments he acquired the delicate manipula- tive skill essential to success in original scientific research.

In 1751 he went to complete his medical studies at Edinburgh, and after taking his medical degree there in 1754 revealed himself as a great scientific discoverer. At that time the causticity of the alkalies was attributed to their absorbing an imaginary fire-essence known as philo- giston, an hypothesis which Black overthrew by showing that their causticity depended on their combining with a ponderable gas, carbonic acid, which he named fixed av, meaning that it was found uot only as a separate fluid, but as fixed in solid bodies. This discovery, made by Black in his twenty-fourth year, was first sketched in a treatise, De Acido e Cubis orto, e de Magnesia, and afterwards embodied in his work, Experiments on Magnesia, Quicklime, and other Alkaline Substances, which Lord Brougham has declared to be "incontestibly the most beautiful example of strict inductive investigation since the Optics of Sir Isaac Newton."

These works revolutionized chemistry. Previous inves tigators imagined that atmospheric air was the sole perma- nently aeriform element, a belief to which even Hales, who had shown that solids contain elastic fluids, had adhered. But when Black proved that a gas not identical with atinospheric air was found in alkalies, it was made plain

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that various dissimilar gases might exist, and pneumatic chemistry was founded.

Although the full value of this discovery was not immediately visible, it added so greatly to Black's reputa- tion that in 1756 he was chosen to succeed Dr Cullen as lecturer on chemistry in Glasgow University. He was also appointed to the chair of anatomy, but, not finding its duties congenial, exchanged it for the professorship of medicine. For some time he was so assiduous in preparing his lectures as to neglect fresh investigations, and even left the examination of carbonic acid, or jized air, to be afterwards completed by Cavendish, He was highly esteemed as a professor by his students and colleagues, and became, through his attention and urbanity, a very popular physician in Glasgow. From 1759 to 1763 he prosecuted inquiries resulting in his theory of latent heat, which may be thus summarized—aA solid liquefies or a fluid vaporizes through heat uniting with the solid or fluid body, and a fluid solidifies or a gas liquefies through the loss of heat; but in no case is this increase or diminution of heat detected by the senses or the ther- mometer, Black therefore named that heat latent which alters the condition, not the temperature, of a body. He likewise proved that bodies of equal masses require different increments of heat to raise them to the same sensible temperature—a doctrine now known as the law of specajic heat.

His theory of latent heat he corroborated by numerous experiments, but he never published a detailed account of it, an omission which enabled others to lay claim to his great discovery. Thus M. Deluc, in 1788, declared himself its author. In 1766 Black was elected to succeed Cullen in the chair of chemistry at Edinburgh University. In this office he bestowed great care on his lectures, striv- ing to give a lucid exposition of ascertained facts rather than to effect new discoveries ; and suchan interest did he

communicate to his subject, that chemistry was for a time, it is said, regarded as a fashionable accomplishment in the Scottish capital.

He was intimate with the great men who adorned Edin- burgh society during the second half of the eighteenth century, counting among his friends Watt, Hume, Robert- son, Hutton, Adam Smith, and, at a later period, Robison, Playfair, and Dugald Stewart. His constitution had always been feeble, and he was ultimately reduced to the condition of a valetudiuarian, which may account for the indifference he manifested during his latter years to original research. He retired from his professorship in 1796, and on the 26th November 1799 passed away so quietly that a cup of water, which he had held in his hand, remained unspilled after he had breathed his last. At the instance of Lavoisier he had been elected a member of the Paris Academy of Sciences.

Black was singularly modest, gentle, and sincere; his philosophic tranquillity was seldom ruffled; and _ his sagacious diffidence was equally conspicuous in his scien- tific inquiries and in his social relations. He has been called the founder of modern chemistry. When he began his career that branch of knowledge had only recently been raised to the rank of a true science through the efforts of Hermann Boerhaave, and was in many quarters even regarded with suspicion as being akin to alchemy on the one hand, and to humble trades on the other. But after Black's discoveries its scope and capabilities were immensely extended, and no one could then question its claim to rank with the most important sciences. The only works of his which appeared in print during his life- time were Experiments on Magnesia, &c., Observations on the more ready Freezing of Water that has been boiled, and Analysis of the Waters of some Boiling Springs in Iceland.

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His lectures on chemistry were issued after his death. (Cf. Prof. Robison's Life of Black.)

BLACK FOREST (German, ScHWARZWALD), an exten- sive upland district on the right bank of the upper Rhine, stretching from that river to the Neckar and upper Danube. See BapEN and WURTEMBERG.

BLACK SEA, or Euxine, the Pontus Fuxinus of the ancients, is a large inland sea, bounded on the W. by the Turkish provinces of Rumilia, Bulgaria, and Moldavia; on the N. by South Russia, including Bessarabia, Kherson, and Taurida; on the E. by the Russian provinces of Circassia and Transcaucasia; and on the S. by the Turkish provinces of Asia Minor. It is entered from the Mediterranean through the channel of the Dardanelles or fHellespontus, the Sea of Marmora or Propontis, and the channel of Constantinople or Thracian Bosphorus ; and it is connected with the Sea of Azoff, or Palus Afcotis, by the strait between the Crimea and the isle of Taman, anciently the Ciummerian Bosphorus, and kuown by the various modern names of the Strait of Kertch, of Yenikale, and of Taman.

The first navigators of Greece who ventured into this sea having been repulsed or massacred by some of the fierce tribes inhabiting its coasts, their countrymen gave it the name of Pontus Axenos, or "sea unfriendly to strangers." But when the repeated visits of the Greeks had rendered these tribes more familiar with strangers, and commercial intercourse had softened down the original ferocity of their character, Grecian colonies were established at different points on the shores of this sea, and the epithet Azxenus was changed into Huwaxinus, which has the opposite import, and means "friendly to strangers." The modern name seems to have been given to it by the Turks, who, being accustomed to the navigation of the Aigean, the islands of which furnish numerous harbours of refuge, were appalled by the dangers of a far wider expanse of water without any shelter, subject to sudden and violent storms, and often covered with dense fogs.

The basin of the Black Sea is of an irregular ovate form, its long diameter lying nearly E. and W. Its greatest length, from the head of the Bay of Burghaz in Rumiha on the west to the boundary between Transcaucasia and Asiatic Turkey near Batum on the east, is about 720 miles. Its greatest breadth is in its western portion, between the estuary of the Dnieper on the north and the mouth of the Sakaria on the south, where it is 380 miles; its middle portion is narrowed, by the projection of the Crimean peninsula on the north and of the coast line of Aaatolia between Cape Kerempe and Sinope on the south, to 160 miles ; but further east it widens out again between the Strait of Kertch on the north and the mouth of the Kizil Irmak (the ancient Halys) on the south, to 260 miles. Its total area, including the

Sea of Azoff, is about 172,500 square miles. The western coast line of the Black Sea, for some distance northwards from the Bosphorus, is high and rocky, having ranges of hills at its back; and the water rapidly deepens to from 30 to 40 fathoms. Between their northern extremity and the range of the Balkans (the ancient Hemus), which extends east and west, terminating in Cape Emineh, there is a large bay, named after the town of Burghaz at the head of it, which affords a safe anchorage for large ships, the only one on this coast. Be- tween Cape Eimineh and Varna the coast line is again low and the shore shallow; and the same condition extends, with but little interruption, along the low-lying region called the Dobrudscha, which extends to the mouth of the Danube. This great river discharges itself by seven mouths, ainong swampy islands and shifting banks ; and the quan- tity of detritus brought down by it is so large as not only to form a very extensive bar, but also to require the con-

tinual use of artificial means for its removal from the bed of the navigable channels. 'lhe same low coast-line con- tinues along the southern boundary of the Russian steppes, to the shallow inlet which forms the estuary of the Dnies- ter, and of which the mouth is nearly closed by a bar; beyond which, towards Odessa, the coast-line is more lofty, and the waters deepen more rapidly, so that it has been possible to constrnet a harbour in which ships of consider- able tonnage can lie securely. Between Odessa and the mouth of the Dniester the shore again becomes low, and the water shallow ; and the outlet of that river, which also receives the River Bog or Bug, is a long shallow bay bor- dered by shifting sand-banks, which is called the Gulf of Leman or the Bay of Kherson. Only ships of light draught of water can navigate these rivers, of which the Bug is the deeper; and vessels of war, which are built and repaired at the arsenals of Kherson and Nicolaieff, are artificially floated up and down. The Crimean peninsula is separated from the mainland on the western side by the Gulf of Perekop, the northern boundary of which is formed by a narrow belt of sand that runs nearly straight for a distance of 80 miles, and was celebrated by ancient geographers as the Spdpos 'AyAAews. The inner portion of this gulf is so shallow that only vessels of very light draught can make their way to Perekop, which is situated on the narrow isthmus that divides it from the

Sea of Azoff. Along the western coast of the Crimea, however, the coast-line gradu- ally rises, and the shore deepens more rapidly ; and at Eupatoria there is a good harbour for ships of moderate size. South of Eupatoria, the coast is formed by cliffs, sometimes of considerable height; and the water is deep almost to their base. The harbour of Sebastopol some- what resembles that of Valetta in being a deep inlet, sub- dividing into several branches, in any one of which the largest vessels may find good anchorage, and lie within a cable's length of the shore. Between Sebastopol and Cape Chersonese are six other bays running inland parallel to each other; and on rounding this we arrive at the harbour of Balaclava, which is a remarkable inlet, having a very narrow eutrance, and almost entirely surrounded by lofty heights. Eastward from Balaclava there commences an almost continuous chain of lofty cliffs, with mountains be- hind them, whose height ranges from 4000 to 5800 feet ; the commencement of this chain is formed by Cape Aia or Tarchanskoi, probably the Partheniwm of Strabo, the most remarkable headland in the Crimea. Along the whole south-east coast of the Crimean peninsula the water is deep ; but there is no good harbour between Balaclava and the Bay of Kaffa, which furnishes an excellent and sheltered anchorage for large vessels, and was formerly much fre- quented when Kaffa or Z'heodosia (an ancient Greek colony) was a port of considerable importance. 'The peninsula of Kertch and the island of Taman, which separate the Sea of Azoff from the Black Sea, are for the most part low and sandy, the most elevated land in each being near the border of the Strait of Yenikale. On the western side of this strait the town of Kertch is situated, upon what was formerly known as the Hill of Mithridates.

The Sea of Azoff may be considered as the wide shallow estuary of the River Don, which discharges its waters into the north-eastern prolongation of the sca, sometimes distinguished as the Gulf of 'Taganrog ; its area is estimated at about 14,000 square miles; and its depth, which is nowhere more than 74 fathoms, diminishes near the shores to 44 fathoms, and is less than 2 fathoms opposite the town of Taganrog. These depths show a tendency to yet further diminution through the deposit of river detritws,—vessels which could formerly pass up the gulf as far as Taganrog being no longer able to do so, whilst during certain winds the bottom becomes dry enough to be crossed between Taganrog and Azoff. The western portion of this basin is separated from the rest by a long narrow strip of low sandy land, enclosing

what was named by the Greeks the Putrid Sea,—into which, when the wind is easterly, the water

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of the Sea of Azoif passes through a narrow opening at the northern extremity of the bar, but which at other times consists of a series of swamps and quagmires, equally impassable to men and aniinals, and giving forth noxious exhalations that render the adjacent country nearly uninhabitable. The water of the Sea of Azoff is always less salt than that of the Black Sea; and when the Don is at its fullest, the large quantity of fresh water which is mingled with the water of the sea renders the latter nearly drinkable, and tends to empty the basin of its salt. When, on the other hand, the river brings down but little water, and the wind is from the south, there is a considerable reflux of the more saline water out- side ; and thus the average salinity of the water of the Sea of Azolf is maintained,—just as is seen to be the case on a larger scale with the Baltic. Sce Bauric, p. 297.

The whole of the portion of South Russia that lies between the Dnieper and the Don is an almost unbroken steppe, but very little elevated above the sea-level; and there are abundant indications of its having been at no remote period covered by salt water. For not only are there numerous salt lakes and marshes at a long distance inland from the present coast-line, but extensive beds of sea-shells, which have become mineralized into strata of solid limestone, sometimes 30 or 40 feet in thickness. The like features prevail over the plain which lies between the Don and the Kuban, and which forms the eastern boundary of the Sea of Azofi; this plain, inhabited by nomade Kalmucks and Cossacks, extends eastward to the desert of Astrakhan; and, as salt marshes and beds of sea-shells are found there also, it is evident not only that both the Black Sea and the Caspian extended farther north than they do at present, but that they were then in continuity with each other over the plain of South Russia, though separated towards the south by the Caucasian Highlands. It is interesting to note that Pliny expressly stated that the Tauric Chersonese was not only surrounded by the sea, but that the sea covered all that northern por- tion of it which is now an alluvial level.

The island or peninsula of Taman, which forms the eastern border of the Strait of Yenikale, is for the most part an expanse of salt-marshes and lagoons, into which the River Kuban discharges itself,—-one portion of its water passing into the Sea of Azoff and the rest into the Black Sea. At Anapa, a little to the east, the Caucasian range comes down to the sea; and thence around the shore of Cireassta, the coast-line is high with a mountain- ous back-ground, and the water rapidly deepens. As the great mountain range trends inland, however, the coast becomes lower ; and the region now termed Mingrelta, the ancient Colchis, is a fertile plain, through which run the River Rion (the ancient Phasis) having the important port of Poti at its mouth, and the Khopi, at the mouth of which is Redout Kale. Through these channels the mer- chants of Tiflis export the produce of the interior, and import European goods. Passing the boundary between Russia and Turkey, the coast-lme begins to trend west- wards, to the outlet of the large river Chouruk (the ancient Batys), where the fortified town of Batoum is situate at the base of the northern mountain range of Asia Minor. This range extends, with occasional interruptions, along the whole southern coast of the Black Sea, sending down spurs that form headlands and promontories, some- times of considerable height. Owing to the steepness of the shores, there are few good anchorages here, except in the Bay of Samsoun, which receives the River Yeshil, and the Bay of Sinope, which receives the Kizil-Irmak,—at the mouths of which rivers there are plains formed by their alluvial deposit. From Cape Injeh westward to the Bos- phorus, the coast-line of Anatolia is continuously elevated, with high mountains in the back-ground, occasionally pro- jecting seawards as lofty promontories, of which Cape Kerempe is the most noteworthy; numerous rivulets come down from the mountains, and discharge themselves into

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little coves; but excepting the Sakaria (the ancient San- garius), there is no considerable river, aud thé water deepens very rapidly to 20 fathoms or more.

Although it is known that the depth of the central part of the basin of the Euxine reaches 1070 fathoms, the ex- tent of this deep depression is not known. The increase of depth off the low-lying western and north-western

shores is very gradual and regular, the lines of 20, 30, and 60 fathoms maintaining a general parallelism to the coast,—so that within this range the distance of a ship from land can be approximately ascertained by sounding. But out- side the 60 fathom line the bottom deepens more rapidly and less regularly, depths of from 600 to 700 fathoms

being met with in some parts within a few miles of it. .

The depth of the eastern portion of the basin has not been ascertained, but it is probably considerable.

The basin of the Euxine communicates with that of the Sea of Marmora by the Bosphorus, a strait about 20 miles long, from ? to 2} miles wide, and a depth of from 30 to 40 fathoms, resembling a broad river with high banks, which maintain a general parallelism, although the strait has seven distinct reaches. The region on either side presents distinct evidence of recent volcanic action.

The Sea of Marmora lies in the course of the channel that connects the Black Sea with the Augean. Its bottom is depressed to a depth far greater than that of the chan- nel of which it is an expansion. Its length from strait to strait is 110 geographical miles, and its greatest breadth is 43 miles. Round the shores, the depth gene- rally ranges from 10 to 30 fathoms ; but it rapidly increases in most parts; and depths of 100, 133, 266, and even 355 fathoms have been met with, chiefly near the line conuecting the two straits.

The channel which connects the Sea of Marmora with the Aigean is properly termed the Hellespont,—the name Dardanelles, by which it is commonly known, being really that of the fortifications erected on the two sides of the strait by which its passage is guarded. The Sea of Marmora narrows toa breadth of ten miles towards the north-eastern entrance of the chaunel; at Gallipoli, the distance between the two shores suddenly contracts to about two miles ; and between this and the Aigean end of the strait, that distance is further diminished at certain points to even less than a mile. The depth of the channel is considerable, being for the most part between 30 and 50 fathoms.

Climate.—The climate of the Black Sea is very peculiar, — the range of temperature between the summer and winter extremes being remarkably great. The swmmer isotherm of 70° runs a little way inland, nearly parallel to its north- western coast-line, whilst the summer isotherm of 80° passes along its southern coast-line, which is as warm as the southern coast-line of the Mediterranean, nearly 10° nearer the equator. Thus the whole area of the Black Sea lies, like that of the Mediterranean, bctween these two summer isotherms; and the evaporation from its surface during the warmer part of the year will consequently be enormous. During the winter months, on the other hand, the Black Sea is exposed to the chilling winds which come down to it from the Arctic regions, sweeping over the snow-covered plains of Russia, without any interruption from high mountain ranges; and nearly the whole of its area lies between the winter isotherms of 30° and 40°, the former passing round its northern coast, while the latter passes from the Bosphorus to Poti in Mingrelia. Thus it happens that, notwithstanding their high summer tempera- ture, the northern shores of the Black Sea are more or less blockaded with ice during the winter,—this being most the case where the water is shallowest, and has its salinity lowered by the entrance of rivers. Thus the Sea of Azoff

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and the Strait of Yenekale are always frozen over, as are also the northern ports between the Crimea and Odessa ; while, on the other hand, the harbours of Kaffa and Sebas- topol are never closed, and that of Odessa but seldom. It is recorded, however, that in 401 a.p. the surface of the Euxine was almost entirely frozen over, and that when the ice broke up enormous masses were seen floating in the Sea of Marmora for thirty days. In 762 a.p., again, the sea is said to have been frozen from the terminal cliffs of the Caucasus to the mouths of the Dniester, Dnieper, and Danube ; and contemporary writers assert that the quan- tity of snow which fell on the ice rose to the height of from 30 to 40 feet, completely hiding the contour of the shores, and that on the breaking up of the ice in the month of February, the masses of it carried by the current into the Sea of Marmora reunited in one immense sheet across the Hellespont between Sestos and Abydos. No similar occurrence has been subsequently recorded.

The winds of the Black Sea are variable, except during summer, when they generally blow from the north-east, while at other seasons southerly or south-westerly winds cften prevail. 'The area is very subject to fogs, which appear to proceed from the precipitation by a cold northerly current of the moisture which has been raised by evapora- tion from its surface, or has been brought thither by S. or S.W. winds. This sea is remarkable for the rapidity with which violent storms not unfrequently arise, often to sub- side again with like rapidity,

Drainage Arca,—The drainage area of the Black Sea is one of the largest in the world, being estimated at 939,000 square miles, of which 825,000 lie in Europe and 114,000 in Asia. The largest of its rivers is the Danube, which has a total length of 1560 miles, and drains the immense area of 306,000 square miles in the southern portion of Central Europe ; its western tributaries lie so near the southern tributaries of the Rhine and the Elbe, that a canal-com- munication has been established between them, by which small vessels can pass between the North Sea aud the Black Sca. The Dnieper has a total length of 1050 miles, and drains an area of 195,500 square miles, chiefly in Western Russia and Russian Poland; its northern tributaries approach the southern tributaries of the Niemen; and a canal-communication has thus been established between the Black Sea and the Baltic. The Don, with a leugth of 1000 miles, drains an area of 176,500 square miles in South-Kastern Russia, which is conterminous with the basin of the Volga, being separated from it by the Sarpa Hills. Between the Dneiper and Danube, the two smaller rivers, the Bug and the Dniester, traverse respectively 440 and 660 miles in their course, and drain an arca of more than 50,000 square miles (ten times greater than that of the Thames). Passing eastwards, we come to the Kuban, which drains the northern slopes of the Caucasus and the plains inhabited by the Black Sea Cossacks, and debouehes near the entrance to the Sea of Azotf. But there is no other important river on tlie eastern coast, most of the water flowing from the mountainous region that sepa- rates the Black Sea from the Caspian passing into the latter. The northern slopes of the Armenian mountains furnish tributaries of the River Chouruk, a stream of moderate size, which enters the Blaek Sea to the east of Trebizond. On the southern coast the principal river is the Kizil Irmak (the Halys of the ancients), which drains the large central area of the northern portion of Asia Minor,

while towards the western side the River Sakaria drains a large arca in the province of Anatolia, Along the whole western coast of the Black Sea, from the Bosphorus to the Danube, no large stream empties itself into the basin, —most of the drainage of Rumilia being carried off by the River Maritza into the Agean, whilst that of Bulgaria contributes to swell the Danube.

The greater part of the drainage area of the Black Sea, like that of the Baltic, is covered with snow during the winter months, and comparatively little water is then brought down by the rivers. With the return of spring, however, the melting of the snow increases the volume of fresh water poured into the sea, its rivers being at their highest in early summer. By far the larger part of this water is discharged at its north-western border; and the elevation of level thus produced establishes a current that sets along its western shore towards the outlet of the Bosphorus. But as the narrowness of this channel does

not allow it to give immediate passage to the overflow, a portion of the current continues to pass onwards along the southern shore, and, when more than usually strong, even completes the entire circuit of the sea. There are no per- ceptible tides in this basin.

As might be expected from the foregoing, the salimity of Black Sea water varies (like that of the Baltic) at dif- ferent periods of the year; but in consequence of the much greater total mass of water contained in the deeper part of this basin, the variation of its salinity is by no means so great as that of Baltic waters,—the usual range of its sp. gr. being from about 1-012 to 1-014, which corresponds to a little less or a little more than half the salinity of ordinary sca-water,

The most contradictory notions have prevailed as to the influence of the Euxine waters on those of the Mediter- ranean,——some writers having represented the rivers of the former as important contributors to the maintenance of the level of the Mediterranean, which the enormous evaporation from that area is always tending to reduce; whilst others assert that the Bosphorus and Dardanelles' currents are entirely due to the agency of wind. A valuable datum is afforded by the condition of the Caspian, in

the closed basin of which, contracted by a reduction of its level to 80 feet below that of the Black Sea, an equality is now established between the amount of water lost by evaporation and that which is restored by its rivers and by the rainfall on its own surface. 'The areas of the Caspian and of the Euxine are not very different; and though the axis of the former basin lies north and south, while that of the latter lies east and west,—so that the northern portion of the Caspian is colder, and the southern portion warmer, than the northern and southern portions of the Black Sea,—the annual average temperatures, and consequently the total evaporation, of the two areas cannot differ much. Now, the drainage area of the Volga is equal to that of the Danube, the Dnieper, and the Dniester taken together ; the Ural, with the two Transcaucasian rivers, Kur and Araxes, may be considered as equalling the Don; and thus the Bug and the rivers of the Caucasus and Asia Minor may be regarded as furnishing the excess of water discharged into the Black Sea above that which is received by the Caspian. Hence, as the whole of the river and rain water annually discharged into the basin of the Caspian is only sufficient to replace that which is lost by evaporation during the same period, it follows that we may in like manner regard the principal rivers of the Black Sea as only fulfilling the same function ; consequently, if the Bos- phorus were closed, the water which they pour into the Euxine basin would not produce any elevation of its level, being entirely dissipated by evaporation. Thus the water which the Black Sea has to spare for the Mediterranean only represents the excess of its river supply above the total river supply of the Caspian; and that this excess is small in amount appears from the fact that the salinity of the water of the Avgean is not sensibly reduced by it below that of the Mediterranean. But that there is some excess is evident from the consideration that if the evaporation of the Black Sea were merely neutralized by the return of fresh water, its water would have the salinity of that of the great basin with which it is in free communication, instead of containing only about half its proportion. It is further evident, on the other hand, that a continual efflux of the half-salt water of the Black Sea, to be replaced only by the fresh water discharged into its basin by rain and rivers, would in time completely drain that basin of its salt ; and as its proportion, though liable to seasonal variation, undergoes no sensible diminution from year to year, it is obvious that the salt which passes out must be replaced by a re-entry of Algean water. The mode in which this re-

placement is effected has been recently elucidated by a careful examination of the currents of the Black Sea straits, of which an account will be presently given.

It is during the winter months, when a large proportion of the drainage area of the Black Sea rivers is covered with snow, that the supply of water is at its minimum ; but it is then that the evaporation from its surface is also at its minimum; so that there is no reason to suppose that the level of the Black Sea ever falls below that of the Atgean. There can be no reasonable doubt that during the spring and early summer, when the melting of the snows causes the rivers to swell to their highest, the quantity of fresh water thus brought into the basin, being greater than that which is lost by evaporation (as is shown by the general reduction which then takes place in the salinity of its con- tents), would cause a considerable rise of level, if this were not kept down by the outflow through the straits.

Dardanelles and Bosphorus Currents.—-It has been known from very early times that a current, usually of considerable strength, sets outwards through the Black Sea straits during a large part of the year,—its rate being subject, however, to considerable variation in accordance with the breadth of the channel, and also with the force and direction of the wind. Thus, when the N.E. wind is of average strength, the rate of the current at Gallipoli is about 1 knot per hour; whilst in the "Narrows" at Chanak Kaleski it is about 3 knots, increasing with a strong wind to about 44 knots. In calm weather the out-current of the Dardanelles is usually slack; and if, as sometimes happens even during the general prevalence of N.E. winds, the wind should suddenly blow strongly from the 8.W., the surface outflow may be entirely checked. It requires a continuance of strong S.W. wind, however, to reverse its direction; and its rate, when thus reversed, never equals that of the out-current. The Bosphorus current has not been as carefully studied as that of the Dardanelles ; but its rate is greater, in accordance with the limitation of its channel, which is scarcely wider at any point than the "Narrows" of the Dardanelles. It con- tinues to run, though at a reduced rate, when there is no wind, and is not known to be ever reversed except in winter after a 8.W.

gale of long duration, Even then it appears that the reversal is confined to the superficial stratum ,—the direction of the sub-surface water-weeds proving that there is still an outflow from the Black Sea into the Aigean. Hence it cannot be reasonably maintained that it is by this occasional and superficial reversal that the immense mass of salt continually being carried outwards by the Bosphorus and Dardanelles currents is restored to the Black Sea basin.

The existence of an inward under-current (although controverted by an authority of weight) has been clearly demonstrated by the recent experimental researches of Captain Wharton, R.N., of H.M. surveying ship '" Shear- water." By the use of a "current-drag," so constructed and suspended as always to present a large vertical surface, it was found that when the outward surface-current was at its strongest there was an inward under-current sufli- ciently strong and rapid to carry inwards the suspending buoy.

The difference in specific gravity of water obtained from. different depths was found, in Captain Wharton's investi- gations (as in those previously made by Dr Carpenter, in conjunction with Captains Calver and Nares, in the Strait of Gibraltar), to afford, under ordinary circumstances, a very sure indication of the direction of the movement of each stratum,—the heavy water of the A'gean, as a rule, flowing inwards, and the lighter water of the Black Sea flowing outwards. And it was indicated alike by both modes of inquiry that the two strata move in opposite directions, one over the other, with very little intermixture

or retardation,—the transition between them being usually very abrupt. The anomalies occasionally met with seemed due to the prevalence of opposite winds at the two ends of the straits.

Putting aside for the time the influence of wind, the double current of the Black Sea straits may be accounted for as follows :—The excess of fresh water discharged into the basin of the Black Sea is always tending to raise its level ; and this produces an outward surface-current, which as regularly tends to keep it down. On the other hand, the reduced salinity of the Euxine

column gives to the Egean column an excess of lateral pressure, which causes its lower stratum to flow back into the Black Sea basin ; and as the equality in the amount of salt thus carried back by the under-current to that which escapes by the surface-current is indicated by the maintenance of the standard salinity of Black Sea water, it follows that, as the water which escapes contains about half as much salt in equal measures as the water that enters, the volume of the latter must be about half that of the former.

Now, when the rate of the surface-current is augmented by a N.E. wind, there will be not only a more rapid lower- ing of the Black Sea level, but a tendency to elevation at the Augean end of the strait ; and as this will augment the difference between the downward, and therefore the lateral, pressures of the two columns, the force and volume of the inward under-current will be augmented. When, on the other hand, the S.W. direction of the wind reverses the surface-current, it tends, by piling up the water at the N.E. end of the strait, to augment the weight of the Black Sea column,—the excess of which (notwithstanding its lower salinity) over that of the A°gean column, will then produce a reversal of the under-current also. When the 8.W. wind is moderate enough to check the surface outflow without reversing it, the inward under-current will likewise be brought to a stand; for a slight rise in the level of the Black Sea column will cause its greater height to compen- sate for the greater salinity of the AZgean column, so that their lateral pressures will be e:jualized.mWe have here a "pregnant instance" of the poteucy of slight differences in level and in salinity to produce even rapid movements of considerable bodies of water; and a strong confirmation is thus afforded by direct observation to the doctrine that differences in density produced by temperature are adequate to give rise to still larger, though slower, movements of the same kind in the great ocean basins.

Zoology.—The basin of the Black Sea is frequented by seals, dolphins, aud porpoises; and it is said that in the neighbourhood of the mouths of the Danube the porpoise is perfectly white, so that the Greek mariners, when they catch sight of it, know that they are in the current of that river, although in 30 fathoms water, and many leagues from land. The fish of the Black Sea appear to be for the most part the same as those of the Caspian and the Sea of Aral. Its northern rivers bring into it the sturgeon, sterlet,

and other fresh-water fish, which can live in and near their estuaries. Oa the other hand, its waters are elsewhere salt enough for the mackerel, whiting, roach, turbot, and sole. The pelamys spoken of by Strabo as issuing from the J/wotis (Sea of Azoff) in shoals, and as following the coast of Asia, is still abundant; though commonly spoken of as the herring, it seems to be a large sprat. The principal fish that enters this basin from the Mediterranean is the tunny, which comes into the Black Sea in large nunibers at the spawning seasou. The other inhabitants of the Black Sea have not been especially studied ; but it may be noted that a species of Teredo is very common and destructive both to ships and to wooden harbour-works, and that it is not con- fined to the salter waters of the basin, but frequents the estuaries where the water is almost fresh. (von)

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BLACKBIRD (urdus merula), belongs to the Zurdide or Thrushes, a family of Dentirostral Birds. The plum- age of the male is of a uniform black colour, that of the female various shades of brown, while the bill of the male, especially during the breeding season, is of a bright gamboge yellow. The blackbird is of a shy and restless disposition, courting concealment, and rarely seen in flocks, or otherwise than singly or in pairs, and taking flight when startled with a sharp shrill cry. It builds its nest in March, or early in April, in thick bushes or in ivy- clad trees, and usually rears two broods each season. The uest is a neat structure of coarse grass aud moss, mixed with earth, and plastered internally with mud, and here the female lays from four to six eggs of a blue colour speckled with black. The blackbird feeds chiefly on fruits, worms, the larve of insects, and snails, extracting the latter from their shells by dexterously chipping them on stones ; and though it is generally regarded as an enemy of the gardeu, it is probable that the amount of damage done by it to the fruit is amply compensated for by its undoubted services as a vermin-killer. The notes of the blackbird are rich and full, but monotonous as compared with those of the song-thrush. Like many other singing birds it is, in the wild state, a mocking-bird, having been heard to imitate the song of the nightingale, the crowing of a cock, and even the cackling of a hen. In confine- ment it can be taught to whistle a variety of tunes, and even to imitate the human voice. It is found throughout Europe, Palestine, and the northern parts of Africa;

and Darwin states that he observed it as far west as the Azores. Individuals reared in Britain, it is said, do not migrate ; but annually great flocks arrive on the eastern shores of England from more northern countries, remaining for a few days ouly, and then proceeding southward.

BLACKBURN, a large manufacturing town and muni- cipal borough of England, situated on a stream called, in Domesday Book, the Blackeburn, but now only known as "The Brook," in the north-eastern division of the county of Lancaster, 209 miles from London by railway, 15 E. of Preston, and 30 N.N.W. of Manchester. Besides its numerous churches and chapels, the public buildings of Blackburn comprise a large town-hall, finished in 1856, a market-house, au exchange, built in 1865, a county court (1863), public baths (1864), and, outside the town, an infirmary (1862). A public park of about 50 acres was opened in 1857. Since about 1865 a variety of extensive and important improvements have been effected in the general condition of the town, which is now well paved and lighted, has an elaborate system of drainage, and receives an abundant supply of water. Previous to that date the so-called streets were, over a large area, almost useless for purposes of traffic. The staple trade of Black- burn has long been the manufacture of cotton, for the development of which a great deal was done by some natives of the town, such as Peel and Hargreaves, in the last century. The subordinate branches include woollen factories, engineering works, iron foundries, and breweries. In 1871 there were employed in the cotton factories 14,220 men and 17,075 women, of twenty years of age and upwards; the engineering works gave employment to 356 men, and the iron manufacture to 794. Coal, and lime, and building stone are abundant in the neighbouring district, which is, however, very far from fertile. The Leeds and Liverpool Canal passes the town, which has also extensive railway communication. Blackburn is a place of some antiquity, and its parish church of St Mary's (for the most part taken down in 18138), dated from before the Norman Couquest. It was for a time the chief town of a district known as Blackburnshire, and as early as the reign of Elizabeth ranked as a flourishing market town. About

the middle of the 17th century it became famous for its " checks," which were afterwards superseded by a similar linen-and-cotton fabric known as " Blackburn greys." A charter of incorporation was obtained in 1851, when W. H. Hornby, one of the largest cotton manufacturers of the place, was elected first mayor. The population of the town, which was only about 5000 in 1790, had increased by 1501 to 11,980. In 1861 there were 11,306 inhabited houses in the municipal borough ; and by the census of 1871 the number had increased to 14,690. In the former year the population of the municipal borough was 63,126, and in 1371 it amounted to 76,339 (males 36,099, females 40,240), while the parliamentary burgh with its extended boundaries contained 82,928 inhabitants. Blackburn re- turns two members to parliament.

BLACKCOCK (Yetrao tetrix), a Gallinaceous Bird be- longing to the family Tetraonide or Grouse, the female of which is known as the Grey Hen and the young as Poults. In size and plumage the two sexes offer a striking contrast, the male weighing about 4 Ib, its plumage for the most part of a rich glossy black shot with blue and purple, the lateral tail feathers curved outwards so as to form, when raised, a fav-like crescent, and the eyebrows destitute of feathers and of a bright vermilion red. 'The female, on the other hand, weighs only 2 ib, its plumage is of a russet brown colour irregularly barred with black, and its tail feathers are of the ordinary form or but slightly forked. The males are polygamous, and during autuinn and winter associate together, feeding in flocks apart from the females ; but with the approach of spring they separate, each selecting a locality for itself, from which it drives off all intruders, and where morning and evening it seeks to attract the other sex by a display of its beautiful plumage, which at this season attains its greatest perfection, and by a peculiar cry, which Selby describes as "(a crowing uote, and another similar to the noise made by the whetting of a scythe." Its nest, composed of a few stalks of grass, is built on the ground, usually beneath the shadow of a low bush or a tuft of tall grass, and here the female lays from six to ten eggs of a dirty-yellow colour speckled with dark brown. The blackeock then rejoins his male associates, and the female is left to perform the labours of hatching and rear- ing her young brood. The plumage of both sexes is at first like that of the female, but after mioulting the young males gradually assume the more brilliant plumage of their sex. 'There are also many cases on record, and specimens

may be seen in the principal museums, of old female birds assuming, to a greater or less extent, the plumage of the male. The blackcock is very generally distributed over the highland districts of Northern and Central Europe, and in some parts of Asia. It is found on the principal heaths in the south of England, but is specially abundant in the Highlands of Scotland, where great numbers are. killed annually during the statutory shooting season, which com- mences on August 20 and extends to December 10. The bird does not occur in Ireland, and all attempts that have hitherto been made to naturalize it there have failed, al- though it now thrives and breeds in the south-west of Scotland within 21 miles of the Irish coast. During sum- mer, blackcock reside chiefly on the ground, feeding on seeds, the young shoots of heath, and insects; in autumn they regularly frequent the stubble fields ; but in winter they perch on trees, especially the birch and fir, the tender shoots of which then form their principal food.

BLACKLOCK, Tuomas, a Scottish poet and divine, was born of humble but respectable parents at Annan, in Dumfriesshire, in 1721. When not quite six months old he lost his sight by the smallpox. Under this misfortune, his father and friends endeavoured to amuse him as he grew up by reading to him various books,—among others,

the works of Milton, Spenser, Prior, Pope, and Addison. Shortly after the death of his father, which took place in 1740, some of Blacklock's poems began to be handed about among his acquaintances and friends, and a few specimens were brought under the notice of Dr Stevenson of Edin- burgh, who was struck by their merits, aud formed the design of giving the author a classical education. Black- lock, in consequence, was enrolled a student of divinity in the university of Edinburgh in 1741, and continued his studies under the patronage of Dr Stevenson till 1745, when he retired to Dumfries, and resided there until the close of the civil war. When peace had been restored, he returned to the university, and during this residence in Edinburgh he made the acquaintance of several literary men, in particular of Hume, who was extremely useful

to him in the publication by subscription of the 4to edition

of his poems in 1756. Two editions in 8vo had previ- ously been published at Edinburgh, in 1746 and in 1754. After applying closely for a considerable time to the study of theology, he was in 1762 ordained minister of the church of Kirkcudbright ; but owing to an opposition to the appoint- mient on the part of the parishioners, he resigned his right to the living, and accepted a moderate annuity in its stead. In 1767 the degree of doctor in divinity was conferred on him by Marischal College, Aberdeen. He died on the 7th of July 1791. His poems are pleasing but weak effusions, and there is nothing remarkable about them save that they were written by one who laboured under the misfortune of blindness.

BLACKMORE, Srr Ricwarp, a physician, and volu- minous writer of theological and poetical works, was born in Wiltshire about 1650. He was educated at Westmin- ster and Oxford, graduated in medicine at Padua, and settled in practice asa physician in London. Having early declared in favour of the Revolution, he was in 1697 chosen one of King William's physicians in ordinary, and received the honour of knighthood. On Queen Anne's accession, Sir Richard was also appointed one of her physicians, which office he held for some time. He died on the 9th October 1729. Blackmore had a passion for writing epics. No fewer than seven long poems were published by him between 1695 and 1723. The first was Prince Arthur, in 10 books ; then followed King Arthur, in 12 books; Eliza, in 10; Creation, in 7; Redemption, in 6; Nature of Man, in 3; and Alfred, in 12. Of these Creation, a philosophic poem directed against the atomic theories of Epicurus and Lucretius, and intended to refute the atheism of Vanini, Hobbes, and Spinosa, and to unfold the intellectual philosophy of Locke, has been the most favourably received. Addison and Johnson praised it highly, the latter anticipating that this poem would transmit the author to posterity 'among the first favourites of the English muse." It would be hard to find grounds for this expectation, which has certainly not been realized. The poem, like everything else that Blackmore wrote, is dull and tedious, and exhibits in every part the author's want of true poetic sensibility and taste.

BLACKPOOL, a seaside town of England, in Lancashire, situated on the coast to the north of the estuary of the Ribble, about 20 miles W. of Preston by rail. it is largely frequented as a bathing-place. A good sandy beach,

bracing air, and a fine view, are its chief attractions. In the end of last century it was a mere hamlet, but since then it has gradually increased. It has two churches, two market- halls, a court-house, and assembly rooms. The parade affords a fine promenade. A new pier was built in 1866. Population in 1871, 6100.

BLACKSTONE, Sim Witiiam, an eminent English jurist, was born at London, July 10, 1723. He was a posthumous child, and his mother died before he was twelve

years old. From his birth the care of his education was |

undertaken by his maternal uncle Thomas Bigg, an eminent surgeon in London. When about seven years old he was sent to the Charterhouse School, and in 1735 he was ad- mitted upon the foundation there by the nomination of Sir Robert Walpole. His progress was so rapid that at the age of fifteen he was at the head of the school, and qualitied to be removed to the university, and he was accordingly entered a commoner at Pembroke College, Oxford, on the 30th of November 1738. At the time of entering he held an exhibition from his school, and in February following he was elected by his college to one of Lady Holford's exhibitions for Charterhouse scholars, He was a diligent student, devoting himself specially though not exclusively to the Greek and Roman poets. At the early age of twenty he compiled a treatise, entitled Llements of Archatecture, intended for his own use only and not for publication, which was highly spoken of by those who were permitted to read it.

Having made choice of the profession of the law, he was entered in the Middle Temple, November 20,1741. In a copy of verses of considerable merit, afterwards published by Dedsley in the fourth volume of his Miscellanies, en- titled The Lawyer's Farewell to his Muse, he gave utterance

to the regret with which he abandoned the pleasing pur-

suits of his youth for severer studies. Besides this, several fugitive pieces were at times communicated by him to his friends ; and he left, but not with a view to publication, a small collection of juvenile pieces, consisting of both original poems and translations. Some notes which just before his death he communicated to Steevens, and which were inserted by the latter in his last edition of Shake- speare's works, show how well he understood the meaning and relished the beauties of his favourite English poet.

In November 1743 he was elected into the society of All Souls' College. In the November following he spoke the anniversary speech in commemoration of Archbishop Chichele, the founder, and the other benefactors to that house of learning, and was at the same time admitted actual fellow. From this period he divided his time between the university and the Temple, where he took chambers in order to attend the courts. In the former he pursued his academical studies, and on the 12th of June 1745 took the degree of bachelor of civil law; in the latter he applied himself closely to his profession, both in the hall and in his private studies ; and on the 28th of November 1746 he was called to the bar. Though but little known or distinguished in Westminster Hall, he was actively em- ployed, during his occasional residences at the university, in taking part in the internal management of his college. In May 1749, as a small reward for his services, and to give him further opportunities of advancing the interests of the college, Blackstone was appointed steward of its manors. In the same year, on the resignation of his uncle, Seymour Richmond, he was elected recorder of the borough of Wallingford in Berkshire. On the 26th of April 1750 he commenced doctor of civil law, and thereby became a member of the couvocation, which enabled him to extend his views beyond the narrow circle of his own socicty, to the benefit of the university at large. In the summer of 1753 he took the resolution of wholly retiring to his fel- lowship and an academical life, still continuing the practice of his profession as a provincial counsel.

His lectures on the laws of England appear to have been an early and favourite idea; for in the Michaelmas term immediately after he quitted Westminster Hall, he entered on the duty of reading them at Oxford ; and we are told by the author of his Zzfe, that even at their commence- ment, the

high expectations formed from the acknowledged abilities of the lecturer attracted to these lectures a very

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crowded class of young men of the first families, charac- ters, and hopes. Bentham, however, declares that he was a "formal, precise, and affected lecturer—Just what you would expect from the character of his writings—cold, reserved, and wary, exhibiting a frigid pride." Tt was not till the year 1758 that the lectures in the form they now bear were read in the university. Mr Viner having by his will left not only the copyright of his abridgment, but other property to a considerable amount, to the Uni- versity of Oxford, in order to found a professorship, fellow- ships, and scholarships of common law, Blackstone was on the 20th of October 1758 unanimously elected Vinerian professor ; and on the 25th of the same month he read his first introductory lecture, which he published at the request of the vice-chancellor and heads of houses, and afterwards prefixed to the first volume of his celebrated Commentarves. {t is doubtful whether the Commentaries were originally intended for the press; but many imperfect and incorrcct copies having got into circulation, and a pirated. edition of them being cither published or preparing for publication in Ireland, the author thought proper to print a correct edition himself, and in November 1765 published the first volume, under the title of Commentaries on the Laws of England. The remaining parts of the work were given to the world in the course of the four succeeding years, It ought to be remarked, that before this period the reputa- tion which his lectures had deservedly acquired for him had induced him to resume his practice in Westminster Hall; and, contrary to the general order of the profession, he who had quitted the bar for an academic life was sent back from the college to the bar with a considerable in- crease of business. He was likewise elected to parliament, first for Hindon, and afterwards for Westbury in Wilts ; but in neither of these departments did he equal the expec- tations which his writings had raised. The part he took in the Middlesex election drew upon him the attacks of some persons of ability in the senate, and likewise a Severe animadversion from the caustic pen of Junius. This cir- cumstance probably strengthened the aversion he

professed to parliamentary attendance, “where,” he said, “amidst the rage of contending parties, a man of moderation must expect to meet with no quarter from any side.” In 1770 he declined the place of solicitor-general ; but shortly after- wards, on the promotion of Sir Joseph Yates to a seat in the court of Common Pleas, hc accepted a seat on the bench, and on the death of Sir Joseph succeeded him there also. Blackstone died on the 14th February 1780, in the fifty-seventh year of his age.

The design of the Commentaries is exhibited in his first Vinerian lecture printed in the introduction to them. The author there dwells on the importance of noblemen, gentle- men, and educated persons generally being well acquainted with the laws of the country ; and his treatise, accordingly, is as far as possible a popular exposition of the laws of Eng- land. Falling into the common error of identifying the various meanings of the word law, he advances from the law of nature (being either the revealed or the inferred will of God) to municipal law, which he defines to be a rule of civil conduct prescribed by the supreme power 1u a state commanding what is right and prohibiting what is wrong. On this definition he founds the division observed in the Commentaries. The objects of law are rights and wrongs. Rights are either rights of persons or rights of things. Wrongs are either public or private. These four headings form respectively the subjects of the four books of the Commentaries.

Blackstone was by no means what would now be called a scientific jurist. He has only the vaguest possible grasp of the elementary conceptions of law. He evidently regards the law of gravitation, the law of nature, and the law of

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England, as different examples of the same principle—as rules of action or conduct imposed by a superior power on its subjects. He propounds in terms a fallacy which is perhaps not yet quite expelled from courts of law, viz., that municipal or positive laws derive their validity from their conformity to the so-called law of nature or law of God. ‘“‘No human laws,” he says, “are of any validity if contrary to this.” His distinction between rights of persons and rights of things, implying, as it would appear, that things as well as persons have rights, is attributable to a mis-understanding of the technical terms of the Roman law. In distinguishing between private and public wrongs (civil injuries and crimes) he fails to seize the true principle of the division. Austin, who accused him of following slavishly the method of Hale’s Analysis of the Law, declares that he “ blindly adopts the mistakes of his rude and com- pendious model; missing invariably, with a nice and sur- prising infelicity, the pregnant but obscure suggestions which it proffered to his attention, and which would have guided a discerning and inventive writer to an arrangement coinparatively just.” By the want of precise and closely- defined terins, aud his tendency to substitute loose literary phrases, he falls occasionally into irreconcilable con- tradictions. Even in discussing a subject of such immense importance as equity, he hardly takes pains to discriminate between the legal and popular senses of the word, and, from the small place which equity jurisprudence occupies in his arrangement, he would scarcely seem to have realized its true position in the law of England. Subject, however, to these strictures the completeness of the treatise, its service- able if not scientific order, and the power of lucid exposi- tion possessed by the author demand emphatic recognition. Blackstone’s defects as a jurist are more conspicuous in his treatment of the underlying principles and fundamental divisions of the law than in his account of its substantive principles,

Blackstone by no means confines himself to the work of a legal commentator. It is his business, especially when he touches on the framework of society, to find a basis in history aud reason for all our most characteristic institutions. There is not much either of philosophy or

fairness in this part of his work. Whether through the natural conserva- tism of a lawyer, or through his own timidity and sub- serviency as 4 man and a politician, he is always found to "be a specious defender of the existing order of things. Bentham accuses him of being the enemy of all reform, and the unscrupulous champion of every form of professional chicanery. Austin says that he truckled to the sinister interests and mischievous prejudices of power, and that he flattered the overweening conceit of the English in their own institutions. He displays much ingenuity in giving a plausible form to common prejudices and fallacies ; but it is by no means clear that he was not imposed upon himself. More undeniable than the political fairness of the treatise is its merit as a work of literature. It is written in a most graceful and attractive style, and although no opportunity of embellishment has been lost, the language is always simple and clear. Whether it is owing to its literary graces, or to its success in flattering the prejudices of the public to which it was addressed, the influence of the book in England has been extraordinary. Not lawyers only, and lawyers perhaps even less than others, accepted it as an authoritative revelation of the law. It performed for educated society in England much the same service as was rendered to the people of Rome by the publication of their previously unknown laws. It is more correct to regard it as a handbook of the law for laymen than as a legal treatise; and as the first and only book of the kind in Kugland it has been received with somewhat indis- criminating reverence. It is certain that a vast amount of

the constitutional sentiment of the country has been inspired by its pages. To this day Blackstone's criticisin of the English constitution would probably express the most profound political convictions of the majority of the Iinglish people. Long after it has ceased to be of much practical value as an authority in the courts, it remains the arbiter of all public discussions on the law or the constitu- tion. On such occasions the Commentaries are apt to be construed as strictly as if they werea code. It is amusing to observe how much importance is attached to the ¢psvs- stma verba of a writer who aimed more at presenting a pic- ture intelligible to laymen than at recording the principles of the law with technical accuracy of detail. (E. RB.)

BLAINVILLE, Henri-Mariz Docroray ps, a dis- tinguished naturalist, was born at Arques, near Dieppe, Sept. 12, 1777. About the year 1795 he entered the school of design at Rouen, but after a very short time he went to Paris, where he became a pupil of Vincent the painter. Attracted by the lectures of Cuvier and other eminent professors in the College of France, he commenced the study of anatomy, and in 1808 he took the degree of M.D. He now devoted himself to the study of natural history, particularly the department of myology, and he soon attracted the attention of Cuvier, who engaged him to draw some figures for one of his works, and to carry out some of the practical work of anatomy. He was also chosen by that illustrious professor to supply his place on occasions at the College of France and at the Atheneum, and in 1812 he obtained the vacant chair of anatomy and zoology in the Faculty of Sciences at Paris. His some- what irascible disposition was probably one cause of the subsequent estrangement between him and Cuvier, which ended in an open and irreconcilable enmity. In 1825 | Blainville was admitted a member of the Academy of Sciences; and in 1830 he was appointed to succeed Lamarck in the chair of natural history at the nruseum. This he resigned in 1832, being appointed on the death of Cuvier to the chair of comparative anatomy, which he continued to occupy for the space of eighteen years, and in the conduct of which he proved himself no unworthy successor to his great teacher. Blainville was found dead in a railway carriage while travelling between Rouen and Caen, May 1, 1850.

Besides a great variety of separate memoirs, he was the author of Prodrome @une Nouvelle Distribution Méthodique du Régne Animal, 1816 ; Ostéographie ow Description Iconographique Comparée du Squelette, &c. ; Faune Francaise, 1821-1830 ; Cours de Physiologie Générale et Comparée, 1833 ; Manuel de Malacologie et de Conchy- me" 1825-1827 ; Histoire des Sciences Naturelles au Moycn Age,

1845.

BLAIR, or Port-Buatr, the chief place in the convict settlement of the Andaman Islands in the Indian Ocean, is situated on the south-east shore of the South Andaman Island, in 11° 42'N. lat. and 93° E. long. In 1789 it was selected as a convict settlement, under orders of the Indian Government, by

Lieutenant Blair, R.N., whose name the port bears. It possesses one of the best harbours in Asia, while its central position in the Bay of Bengal gives it immense advantage as a place of naval rendezvous for military operations in this part of the world. For further particulars see ANDAMAN IsLANDs.

BLAIR, Dr Hveu, was born April, 7, 1718, at Edin- burgh, where his father was a merchant. He entered Edinburgh University in 1730 and won the favourable notice of Professor Stevenson by an essay on the Beauti- ful, written for the logic class in his sixteenth year. On taking the degree of M.A. in 1739, he printed a thesis De Fundamentis et Obligatione Legis Nature, which contains an outline of the moral principles afterwards unfolded in his sermons. He was licensed to preach in 1741, and in a few months the earl of Leven, hearing of his eloquence,

presented him to the parish of Collessie in Fife. In 1743 he was elected to the second charge of the Canongate Church, Edinburgh, where he performed the pastoral duties with great success, until removed to Lady Yester's, one of the city churches, in 1754. He married his cousin, Katherine Bannatyne, in 1748, and by her hada son, who died in infancy, and a daughter who lived to her twenty- first year. In 1757 the University of St Andrews con- ferred on him the degree of D.D., and in the following year he was promoted to the High Church, Edinburgh, the most important charge in Scotland. In 1759 he com- menced, under the patronage of Lord Kames, to deliver a course of lectures on composition, the success of which led to the foundation of a chair of rhetoric and belles lettres in the Edinburgh University. To this chair he was appointed in 1762, with a salary of £70 a year. Having long taken interest in the Celtic poetry of the Highlands, he published in 1763 a laudatory Dissertation on Mac- pherson's Ossian, of which he maintained the authen- ticity. This critique, after being greatly overrated at the time, has now fallen into neglect. In 1777 the first volume of his Sermons appeared. 1t was succeeded by other four volumes, all of which met with the greatest success. Dr Samuel Johnson praised them warmly. "1 love Blair's Sermons," Johnson said, "his doctrine is the best limited, the best expressed; thcre is the most warmth without fanaticism, the most rational transport." The Sermons were translated into almost every

language of Europe, and in 1780, to signify the royal approbation, George III. conferred upon. him a pension of £200 a year. In 1783 he retired from his professorship and published his Lectures on Ihetoric which he had carefully revised, and which have been frequently reprinted. He died, after a brief illness, on the 27th December 1801. In the church Blair belonged to the " moderate" or latitudinarian party, aud his Sermons have been objected to as deficicnt in doctrinal definiteness. His once brilliant reputation is now becom- ing forgotten. His works display little originality, but are written in a flowing and elaborate style ; and his Rhetorvc, although inferior to Campbell's, and wanting in research and depth of thought, is unworthy of the neglect it has met with.

BLAIR, Ropert, author of the well-known poem entitled The Grave, was the eldest son of the Rev. Robert Blair, of Edinburgh. He was probably born at Edinburgh about the year 1700, and at the university of that city he received the elements of a classical education. He after- wards spent some time on the Continent. Upon his return he took orders, and in 1731 was ordained minister of Athel- staneford, in East Lothian, where he spent the remainder of his life, He died of fever, February 4, 1746, and was succeeded in his living by John Home, the author of Douglas, His fourth son became lord-president of the Court of Ses- sion. Blair wrote several other pieces besides Zhe Grave; but that poem alone constitutes his title to rank as a poet. It consists of a succession of descriptions and reflections, which have no other connection except what they may derive from their relation to a common subject; but these are inter- spersed with striking allusions, picturesque imagery, touches of a rude though effective pathos, and a vein of sentiment at once natural and just. The rhythm is often harsh, and the versification frequently devoid of correctness, harmony, and grace ; but it has nevertheless a masculine vigour and freshness about it, which more than atone for the defects in the finishing ; while, in certain moods of the mind, the air of deep and almost inisanthropical melancholy diffused over the whole proves highly touching and impressive. Camp- bell, in the Pleasures of Hope, has borrowed, with a slight variation, a line from this poem—

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The vigorous, though occasionally rather forced, poetic conceptions of the author of Zhe Grave, were finely illus- trated in Cromek's edition, published in 1808, by the grandly wild designs of William Blake, engraved by the delicate burin of Schiavonetti. Zhe Grave was first printed at London in 1743.

BLAKE, Rozert, the famous English admiral of the Commonwealth, was born at Bridgwater in Somersetshire, in August 1598. His birth thus falls in the year before that of Cromwell; thcir lives ran parallel in the service of their country; their characters present many points of likeness ; and they died within a few months of each other. Blake was the eldest son of a well-to-do merchant, and reccived his early education at the grammar school of Bridgwater. At the age of sixteen he was sent to Oxford, entering at first St Alban's Hall, but removing afterwards to Wadham College, then recently founded by his father's friend, Nicholas Wadham. He remained at the university. till 1623, and though certainly not wanting in ability or in diligence, he missed, for some reason not clearly ascertained, such college preferment as he naturally aimed at. From Oxford, after taking his degree of M.A., he returned to his father's house, where, through the memor- able and troubled years which followed, he led a quiet and retired life. His thorough honesty, his public spirit and disinterestedness, his courageous utterance of what he thought of the court and the church, of shipmoney and the High Commission Court and the licence of the times, made him a man of mark among his neighbours. And when, after eleven years of kingship without parliaments, a parlia- ment was summoned to meet in April 1640, Blake was elected by the Presbytcrian party to represent his native borough. This parliament, named "the Short," was dis- solved in three weeks, and the career of Blake as a poli- tician was suspended. Two years later the inevitable con- flict began. Blake declared for the Parliament; and thinking, says Johnson, a bare declaration for right not all the duty of a good man, he raised a troop of horse in his county, and rendered such efficient service, that in 1643 he was entrusted with the command of one of the forts of Bristol. This he stoutly held during the sicge of the town by Prince Rupert, and was near being hung for continuing his resistance after the governor had capitulated. In the following year Colonel Blake took Taunton by surprise, and notwithstanding its imperfect defences and inadequate supplies, held the town for the Parliament against two sieges by the

Royalists, until July 1645, when it was relieved by Fairfax. Blake did not approve of the trial and execution of Charles I.; but he adhered to the Parliamentary party after the king's death, and within a month (February 1649) was appointed, with Colonels Dean and Popham, to the command of the fleet, under the title of General of the Sca. In April he was sent in pursuit of Prince Rupert, who with the Royalist fleet had entered the harbour of Kinsale in Ireland. There he blockaded the Prince for six months; and when the latter, in want of provisions, and hopeless of relief, succeeded in making his escape with the fleet and in reaching the Tagus, Blake followed him thither, and again blockaded him for some months. The king of Portugal refusing permission for Blake to attack his enemy, the latter made reprisals by falling on the Portuguese fleet, richly laden, returning from Brazil. He captured seventeen ships and burnt three, bringing his prizes home without molestation. After revictualling his fleet, he sailed again, captured a I'rench man-of-war, and then pursued Prince Rupert once more to the harbour of Carthagena. The Spanish governor would not allow him to violate the peace of a neutral port, and he therefore withdrew. In January 1651 he at last attacked the Royalist fleet in Malaga harbour, and destroyed the whole

with the exception of two ships. Jn consequence of the Portuguese protest against his proceedings, a formal investi- gation was instituted in England, which resulted in the approval of the home authorities. The thanks of Parliament were voted to Blake, aud he was appointed warden of the Cinque Ports. He was continued in his office of admiral and general of the sea; and in May following he took, in conjunction with Aysenc, the Scilly Islands. For this service the thanks of Parliament were again awarded him, and he was soon after made a member of the Council of State. In 1652 war broke out with the Dutch, who had made great preparations for the conflict. In March the command of the fleet was given to Blake for nine months; and in the middle of May the Dutch fleet of forty-five ships, led by their great admiral Van Tromp, appeared in the Downs. Blake, who had only twenty ships, sailed to meet them, and the battle took place off Dover on May 19. The Dutch were defeated in an engagement of four or five hours, lost two ships, and withdrew under cover of darkness. Attempts at accommodation

were made by the States, but they failed. Early in July war was formally declared, and in the same month Blake captured a large part of the Dutch fishery-fleet and the twelve men- of-war that formed their convoy. On September 28, Blake aud Penn again encountered the Dutch fleet, now com- manded by De Ruyter and De Witt, in the Downs, defeated it, and chased it for two days. The Dutch took refuge in Goree.

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neighbouring coasts, to intercept the Spanish shipping. One of his captains captured a part of the Plate fleet in September 1656. In April 1657 Blake, then in very ill health, suffering from dropsy and scurvy, and anxious to have assistance in his arduous duties, heard that the Plate fleet lay at anchor in the bay of Santa Cruz, in the island of Teneriffe. The position was a very strong one, defended by a castle and several forts with guns. Under the shelter of these lay a fleet of sixteen ships drawn up in crescent order. Captain Stayner was ordered to enter the bay and fall on the fleet. This he did. Blake followed him. Broadsides were pourcd into the castle and the forts at the same time; and soon nothing was left but ruined walls and charred fragments of burnt ships. The wind was blowing hard into the bay; but suddenly, and fortunately for the heroic Blake, it shifted, and carried him safely out tosea. 'The whole action," says Clarendon, 'was so incredible that all men who knew the place wondered that any sober man, with what courage soever endowed, would ever have undertaken it; and they could hardly persuade themselves to believe what they had done; while the Spaniards comforted themselves with the belief that they were devils and not men who had destroyed them in such a manner." The English lost one ship and 200 men killed and wounded. 'The thanks of Parliamant were voted to officers and men; and a very costly jewel (diamond ring) was presented to Blake, "as a testimony," says Cromwell in his letter of June 10th, 'of our own and the Parliament's good acceptance of your carriage in this action." "This was the last action of the brave Blake." After again cruising for a time off Cadiz, his health failing more and more, he was compelled to make homewards before the summer was over. He died at sea, but within sight of Plymouth, August 17, 1657. His body was brought to London and embalmed, and after lying in state at Greenwich House was interred with great pomp and solemnity in Westminster Abbey. In 1661

Charles IT. disgraced himself by ordering the exhumation of Blake's body, with those of the mother and daughter of Cromwell and several others. They were cast out of the abbey, and were reburied in the churchyard of St Margaret's. ' But that regard," says Johnson, 'which was denied his body has been paid to his better remains, his name and his memory. Nor has any writer dared to deny him the praise of intrepidity, honesty, contempt of wealth, and love of his country." Clarendon bears the following testimony to his excellence as a commander :—" He was the first man that declined the cld track, and made it apparent that the science might be attained in less time than was imagined. He was the first man that brought ships to contemn castles. on the shore, which had ever been thought very formidable, bnt were discovered by him to make a noise only, and to fright those who could be rarely hurt by them." A life of Blake is included in the work entitled Lives, Hnglish and Koreign. Dr Johnson wrote a short life of him, and in 1852 appeared Mr Hepworth Dixon's fuller narrative, Robert Blake, Admiral and General at Sea. (W.L. RB. ©.) BLAKE, Wit1i1aM, poet and painter, was born in London,. on 28th November 1757. His father, James Blake, kept a hosier's shop in Broad Street, Golden Square ; and from the scanty education which the young artist received, it may be judged that the circumstances of the family were not very prosperous. For the facts of William Blake's early life the world is indebted to a little book, called A Father's Memotrs on a Child, written by Dr Malkin, and published in 1806. Here we learn that young Blake quickly developed a taste for design, which his father appears to have had sufficient intelligence to recognize and assist by every means in his power. At the age of ten the boy was sent to a drawing school kept by Mr Pars

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in the Strand, and at the same time he was already cultivating his own taste by constant attendance at the different art sale rooms, where he was known as the " little connoisseur." Here he began to collect prints after Michel Angelo, and Raphael, Durer, and Hemskerk, while at the school in the Strand he had the opportunity of drawing from the antique. After four years of this preliminary instruction Blake entered upon another branch of art

study. In 1777 he was apprenticed to James Basire, an engraver of repute, and with him he remained seven years. His apprenticeship had an important bearing on Blake's artistic education, and marks the department of art in which he was made technically proficient. In 1778, at the end of his apprenticeship, he proceeded to the school of the Royal Academy, where he continued his early study from the antique, and had for the first time an opportunity of drawing from the living model.

This is in brief all that is known of Blake's artistic educa- tion. That he ever, at the academy or elsewhere, systema- tically studied painting we do not know; but that he had already begun the practice of water colour for himself is ascertained. So far, however, the course of his training in art schools, and under Basire, was calculated to render him proficient only as a draughtsman and an engraver. He had learned how to draw, and he had mastered besides the practical difficultics of engraving, and with these qualifications he entered upon his career. In 1780 he exhibited a picture in the Royal Academy Exhibition, con- jectured to have been executed in water colours, and he continued to contribute to the annual exhibitions up to the year 1808. In 1782 he married Catherine Boucher, the daughter of a market-gardener at Battersea, with whom he lived always on affectionate terms, and the young couple after their marriage established themselves in Green Street, Leicester Fields. Blake had already become acquainted -with some of the rising artists of his time, amongst them Stothard, Flaxman, and Fuseli, and he now began to see something of literary society. At the house of the Rev. Henry Mathew, in Rathbone Place, he used to recite and sometimes to sing poems of his own composition, and it was through the influence of this gentleman, combined with that of Flaxman, that Blake's first volume of poetry was printed aud published in 1783, From this time forward the artist came before the world in a double capacity. By education as well as native talent, he was pledged to the life of a painter, and these Poetical Sketches, though they are often no more than the utterances of a boy, are no less decisive in marking Blake as a future poet.

For a while the two gifts are exhibited in association. To the close of his life Blake continued to print and publish, after a manner of his own, the inventions of his verse illustrated by original designs, but there is a certain period in his career when the union of the two gifts is peculiarly close, and

when their service to one another is unquestionable. In 1784 Blake, moving from Green Street, set up in company with a fellow-pupil, Parker, as print-seller and engraver next to his father's house in Broad Street, Golden Square, but in 1787 this partner- ship was severed, and he established an independent business in Poland Street. It was from this house, and in 1787, that the Songs of Innocence were published, a work that must always be remarkable for beauty both of verse and of design, as well as for the singular method by which the two were combined and expressed by the artist. Blake became in fact his own printer and publisher. He engraved upon copper, by a process devised by himsclf, both the text of his poems and the surrounding decorative design, and to the pages printed from the copper plates an appropriate colouring was afterwards added by hand. The poetic genius already discernible in the first volume

of Poetical Sketches is here more decisively expressed, and some of the songs in this volume deserve to take rank with the best things of their kind in our literature. In an age of enfeebled poetic style, when Wordsworth, with more weighty apparatus, had as yet scarcely begun his reform of English versification, Blake, unaided by any contemporary influence, produced a work of fresh and living beauty; and if the Songs of Innocence established Blake's claim to the title of poet, the setting in which they were given to the world proved that he was also something more. For the full development of his artistic powers we have to wait till a later date, but here at least he exhibits a just and original understanding of the sources of decorative beauty. Each page of these poems is a study of design, full of invention, and often wrought with the utmost delicacy of workmanship. The artist retained to the end this feeling for decorative effect ; but as time went on, he considerably enlarged the imagina- tive scope of his work, and decoration then became the condition rather than the aim of his labour. Notwithstanding the distinct and precious qualities of this volume, it attracted but slight attention, a fact per- haps not very wonderful, when the system of publication is taken into account. Blake, however, proceeded with other work of the same kind. The same ycar he pub- lished Uke Book of Thel, more decidedly mystic in its poctry, but scarcely less beautiful as a piece of illumination; Zhe Marriage of Heaven and Hell followed in 1790;

and in 1793 there are added The Gates of Paradise, The Vision of the Daughters of Albion, and some other ‘ Prophetic Books,”, It becomes abundantly clear on reaching this point in his career, that Blake’s utterances cannot be judged by ordinary rules. The Songs of Hxperience, put forth in 1794 as a companion to the earlier Songs of Innocence, are for the most part intelligible and coherent, but in these intervening works of prophecy, as they were called by the author, we get the first public expression of that phase of his character and of his genius upon which a charge of insanity has been founded. The question whether Blake was or was not mad seems likely to remain in dispute, but there can be no doubt whatever that he was at different periods of his life under the influence of illu- sions for which there are no outward facts to account, and that much of what he wrote is so far wanting in the quality of sanity as to be without a logical coherence.. On the other hand, it is equally clear that no madness imputed to Blake could equal that which would be involved in the rejection of his work on this ground. The great- ness of Blake’s mind is even better established than its frailty, and in considering the work that he has left we must remember that it is by the sublimity of his genius, and not by any mental defect, that he is most clearly distinguished from his fellows. With the publication of the Songs of Experience Blake’s poetic career, so far at least as ordinary readers are concerned, may be said to close. A writer of prophecy he continued for many years, but the work by which he is best known in poetry are those earlier and simpler efforts, supplemented by a few pieces taken from various sources, some of which were of later production. The body of Blake’s intelligible verse is now made accessible to the public, in Mr W. Rossetti’s edition of his works, published in the Aldine series, and to this volume those readers may be referred who desire to know the foundation upon which the poet’s fame has been built. But although Blake the poet ceases in a general sense at this date, Blake the artist is only just entering upon his career. In the Songs of Innocence and Hapertence, and even in some of the earlier Books of Prophecy, the two gifts worked together in perfect balance and harmony; but at this point the supremacy of the artistic faculty

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asscrts itself, and for the remainder of his life Blake was pre-eminently a designer and engraver. The labour of poetical composition continues, but the product passes beyond the range of general comprehension; while, with apparent incousistency, the work of the artist gains steadily in strength and colierence, and never to the last loses its hold npon the understanding. It may almost be said without exaggeration that his earliest poetic work, The Songs of Innocence, and nearly his latest effort in design, the illustrations to the The Book of Job, take rank among the sanest and most admirable products of his genius. Nor is the fact, astonishing enough at first sight, quite beyond a possible explanation. As Blake advanced in his poetic career, he was gradually hindered and finally overpowered by a tendency that was most serviceable to him in design. His inclination to substitute a symbol for a conception, to make an image do duty for an idea, became an insuperable obstacle to literary success. He endeavoured constantly to treat the intellectual material of verse as if it could be moulded into sensuous form, with the inevitable result that as the ideas to be expressed advanced in complexity and depth of meaning, his poetic gifts became gradually more inadequate to the task of interpretation. The earlier poems dealing with simpler themes, and put forward at a time when the bent of the artist's mnind was not strictly determined, do not suffer from this difficulty ; the symbolism then only enriches an idea of no intellectual intricacy ; but when Blake began to concern himself with profounder problems the want of a more logical understanding of language made itself strikingly apparent. If his ways of thought and modes of workmanship had not been developed with an intensity almost morbid, he would probably have been able to distinguish and keep separate the double functions of art and literature. As it is, however, he remains as an extreme illustration of the ascendency of the artistic faculty. For this tendency to translate ideas into image, and to find for every thought, however simple or sublime, a precise and sensuous form, is of the essence of pure artistic inven- tion. If this be accepted as the dominant bent of Blake's genius, it is not so wonderful that his work in art should have strengthened in proportion as his poetic powers waned; but whether the explanation satisfies all the require- ments of the case or not, the fact remains, and cannot be overlooked by any student of Blake's career.

In 1796 Blake was actively employed in the work of illustration. Edwards, a bookseller of New Bond Street, projected a new cdition of Young's Night

Thoughts, and Blake was chosen to illustrate the work. It was to have been issued in parts; but for some reason not very clear the enterprise failed, and only a first part, including forty- three designs, was given to the world. These designs were engraved by Blake himself, and they are interesting not only for their own merit but for the peculiar system by which the illustration has been associated with the text. Quite recently it has been discovered that the artist had executed original designs in water colour for the whole series, and these drawings, 537 in number, form one of the most interesting records of Blake's genius. Mr Gilchrist, the painter's careful and sympathetic biographer, in commeuting upon the engraved plates, regrets the absence of colour, "the use of which Blake so well understood, to relieve his suuple design and give it significance," and an examination of the original water colour drawings fully supports the justice of his criticism. Soon after the publi- cation of this work Blake was introduced by Flaxman to the poet Hayley, and in the year 1801 he accepted the suggestion of the latter, that he should take up his re- sidence at Felpham in Sussex. The mild and amiable poet had planned to write a life of Cowper, and for the

illustration of this and other works he sought Blake's help and companionship. The residence at Felpham continued for three years, partly pleasant and partly irksome to Blake, but apparently not very profitable to the progress of his art. One of the annoyances of his stay was a malicious prosecution for treason set on foot by a common soldier whom Blake had summarily ejected from his garden; but a more serious drawback was the in- creasing irritation which the painter seems to have ex- perienced from association with Hayley. In 1804 Blake returned to London, to take up his residence in South Moulton Street, and as the fruit of his residence in Felp- ham, he published, in the manner already described, the prophetic books called the Jerusalem, The Emanation of the Giant Albion, and Milton. The first of these is a very notable performance in regard to artistic invention. Many of the designs stand out from the text in complete in- dependence, and are now and then of the very finest quality.

In the years 1804-1805 Blake executed a series of designs in illustration of Blair's Grave, of much beauty and grandeur, though showing stronger traces of imitation of Italian art than any earlier production. These designs were purchased from the artist by an adventurous and unscrupulous publisher, Cromck, for the paltry sum of £21, and afterwards published in a series of engravings by Schiavonetti. Despite the ill treatment Blake received in the matter, and the other evils, including a quarrel with his friend Stothard as to priority of invention of a design illustrating the Canterbury Pilgrims, which his association with Cromek involved, the book gained for him a larger amount of popularity than he at any other time secured. Stothard's picture of the Canterbury Pilgrims was exhibited in 1807, and in 1809 Blake, in emulation of his rival's success, having himself painted in water colour a picture of the same subject, opened an exhibition, and drew up a Descriptive Catalogue, curious and interesting, and containing a very valuable criticism of Chaucer.

The remainder of the artist's life is not outwardly eventful. In 1813 he formed, through the introduction of George Cumberland of Bristol, a valuable friendship with Mz John Linnell and other rising water colour painters. Amongst the group Blake seems to have found special sympathy in the society of Varley, who, himself addicted to astrology, encouraged Blake to cultivate his gift of inspired vision ; and it is probably to this influence that we are indebted for several curious drawings made from visions, especially the celebrated "ghost of a flea" and the very humorous portrait of the builder of the Pyramids. In 1821 Blake removed to Fountain Court, in the Strand, where he died 1827. The chief work of these last years was the splendid series of engraved designs in illustration of the book of Job. Here we find the highest imaginative qualities of Blake's art united to the technical means of expression which he best understood. Both the invention and the engraving are in all ways re- markable, and the series may fairly be cited in support of a very high estimate of lis genius. None of his works are without the trace of that peculiar artistic instinct and power which seizes the pictorial element of ideas, simple or sublime, and translates them into the appropriate language of sense; but here the double faculty finds the happiest exercise. The grandeur of the theme is duly reflected in the simple and sublime images of the artist's design, and in the pre- sence of these plates we are made to feel the power of the artist over the expressional

resources of human form, as well as his sympathy with the imaginative significance of his subject.

A life of Blake, with selections from his works by Alexander Gilchrist, was published in 1863; in 1868 Mr Swinburne published a critical.essay on his genius re-

markable for a full examination of the Prophetic Books, and still more recently Mr William Rossetti has published a memoir prefixed to an edition of the poems. (J. ¢. c.)

BLANC, Mont, the highest, and in other respects one of the most remarkable mountains in Europe, is situated in that division of the great Alpine system kuown as the Pennine Alps, in 45° 49’ 58” N. lat. and 6° 51’ 54” E. long. It rises alinost in the shape of a pyramid to the height of 15,780 feet, and is visible at a distance of 130 niles to the west. ‘The mass of the mountain is composed of granite, covered with strata of schists and limestones. To the N.E. lies the beautiful vale of Chamouni, and on the S.W. the Allée Blanche. Of the numerous glaciers that send their ice-streams down its sides the most remark- able is the Mer de Glace, which winds down its vorthern slope towards Chamouni, and gives birth to the River Arve. The ascent of Mont Blanc was first accomplished in 1786 by a guide named Jacques Balmat, who shortly afterwards led Dr Paccard, a local physician, to the summit, and thus gave him the honour of being the first person of scientific education to make known the possibility of the undertak- ing. De Saussure, the naturalist, ascended in the following year, and when the Italian naturalist Imperiale de Sant- Angelo made the ascent in 1840 he had been preceded by thirty-three known travellers. The whole journey to the top and back can now be accomplished in 50 or 60 hours ; but in general the view can hardly be said to be worth the fatigue, the extreme height of the position, even when the outlook is unclouded, rendering the prospect indistinct. For authorities and maps, see ALps, vol. i. pp. 635-6.

BLANE, Sir Gruzert, a distinguished physician, was born at Blanefield in Ayrshire, in 1749, and died in Lon- don in 1834, He was educated at Edinburgh University, and shortly after his removal to London became

private physician to Lord Rodney, whom he accompanied to the West Indies. Through his skill and exertions the health of the seamen on board the fleet remained comparatively unaffected by the climate; and on his return home he embodied the results of his experience in a treatise On the Diseases of Seamen, 1783. He rose rapidly to fame, ac- quired an extensive practice, and in 1812 was appointed physician in ordinary to the Prince of Wales, with the rank of baronet. When at the head of the Navy Board of Health, an office he held for some years, he introduced many useful measures for securing the health of seamen during long voyages. Of his numerous works the most important is the Hlements of Medical Logic, 1872.

BLANES, a city of the province of Gerona in Spain, at the mouth of the River Tordera, defended bya castle. The population, 5900 in number, are principally employed in the fisheries and navigation. Lace is manufactured by the women. Long. 2° 51' E., lat. 41° 42' N.

BLARNEY, a small village of Ireland, in the county of Cork, about 5 miles from that city, chiefly celebrated as giving name to a peculiar kind of eloquence, alleged to be characteristic of the. natives of Ireland. The " Blarney Stone," the kissing of which is said to confer this faculty, is pointed out within the castle.

BLASPHEMY means literally defamation or evil speak- ing, but is more peculiarly restricted to an indignity offered to the Deity by words or writing. The common law of England treats blasphemy as an indictable offence. All blasphemies against God, as denying his being, or pro- vidence, all contumelious reproaches of Jesus Christ, all profane scoffing at the Holy Scriptures, or exposing any part thereof to contempt or ridicule, are punishable by the temporal courts with fine, imprisonment, and also infamous corporal punishment. The Act 1 Edw. VI. c. 1 (repealed 1 Mary, c. 2, and revived 1 Eliz. c.1), enacts that persons re- viling the sacrament of the Lord's supper, by contemptuous

words or otherwise, shall suffer imprisonment. Persons denying the 'Trinity were deprived of the benefit of the Act of Toleration by 1 Will. III. c.18. The 9and 10 Will. III. c. 32, enacts that if any person, educated in or having

made profession of the Christian religion, should by writing, preaching, teaching, or advised speaking, deny any one of the persons of the Holy Trinity to be God, or should assert or maintain that there are more gods than one, or should deny the Christian religion to be true, or the Holy Scriptures to be of divine authority, he should, upon the first offence, be rendered incapable of holding any office or place of trust, and for the second incapable of bringing any action, of being guardian or executor, or of taking a legacy or deed of gift, and should suffer three years' imprisonment without bail. It has been held that a person offending under the statute is also indictable at common law (Rex v. Carlisle, where Mr Justice Best remarks, 'In the age of toleration, when that statute passed, neither churchmen nor sectarians wished to protect in their infidelity those who disbelieved the Holy Scriptures.") The 53 Geo. III. c. 160, excepts from these enactments 'persons denying as therein mentioned respecting the Holy Trinity," but otherwise the common and statute law on the subject remains as stated. In the case of Rex v. Woolston (2 Geo. IL) the court declared that they would not suffer it to be debated whether to write against Christianity in general was not an offence punishable in the temporal courts at common law, but they did not intend to include disputes between learned men on particular controverted points. The law against blasphemy has not recently been in active operation. In 1841, Moxon was found guilty of the publication of a blasphemous libel (Shelley's Qween Jfab), the prosecution having been instituted by Hetherington, who had pre- viously been condemned to four months' imprisonment for a similar offence, and wished to test the law under which he was punished. In the case of Cowan v. Milbourn, in 1867, the defendant had broken his contract to let a lecture-room to the plaintiff, on discovering that the intended lectures were to maintain that "the character of Christ is defective, and his teaching misleading, and that the Bible is no more inspired than any other book," and the Court of Exchequer held that the publication of such doctrine was blasphemy, and the contract therefore illegal. On that occasion the court reaffirmed the dictuin of C. J. Hale, that Christianity is part of the laws of England. The Commissioners on Criminal Law (sixth report) remark, that 'although the law forbids all denial of the being and providence of God or the Christian religion, it is only when irreligion assumes the form of an insult to God and man that the interference of the criminal law has taken place."

Profane cursing and swearing is made punishable by 19 Geo. II. c. 21, which directs the offender to be brought before a justice of the peace, and fined 5 shillings, 2 shil- lings, or 1 shilling, according as he is a gentleman, below the rank of gentleman, or a common labourer, soldier, &c..

By the law of Scotland, as it originally stood, the punishment of blasphemy was death. By an Act passed in the first parliament of Charles II., whoever, ‘ not being distracted in his wits,” should curse God or any person of the blessed Trinity was punishable with death; and by a statute of King William’s reign (1695, c. 11), any person reasoning against the being of God, or any person of the Trinity, or the authority of the Holy Scriptures, or the providence of God in the government of the world, was to be imprisoned for the first offence until he should give public satisfaction in sackcloth to the congregation, to be punished more severely for the second offence, and for the third doomed to death; but by 6 Geo. IV. c. 47, amended by 7 Will. IV. and 1 Vict. c. 5, blasphemy was made punishable by fine or imprisonment or both. (z. BR.)

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BLASTING is the process by which portions of rock, or other hard substances, are disintegrated by means of an explosive agent, such as gunpowder. Itis largely resorted +o in quarrying, tunnelling, and mining operations.

Of late years there has been rapid advance in the art, through the discovery of new explosives, through improve- ments in appliances for firing, &c.; so that the older method of blasting has, in many instances, given place to a more complex system, with which much better results are obtained. The simpler process may be described thus. When a blast is to be made, a hole to receive powder is first bored in the rock ; such holes vary in diameter from 4 inch to 2} inches, in depth from a few inches to many feet, and in direction from the vertical to the horizontal. The borer, or jumper, with which the hole is made is a steel pointed drill ; it is struck by a hammer, and is turned partly round after each blow, to make the hole cylindrical. One inan nay do all this alone, but generally, in the case of larger holes, a man, in sitting posture, directs the jumper, supplies the hole with water, and clears out the powdered stone at intervals with a scraper, while another

man, or two, or three, are engaged in striking. A small rope of straw or hemp is twisted round the jumper at the orifice of the hole to prevent squirting up of the water. In the case of soft rock a loaded drill is sometimes used, which acts merely by its own weight. On the other hand, in substances like pyrites, or compact magnetic iron ore, which cannot be penetrated with steel drills, holes for blasting may be made by the gradual action of an acid (commonly muriatic) admitted through a vertical glass tube. When a sufticient depth is reached, the hole is cleaned and dried, and a charge of powder put in. A small taper rod of copper, the needle or nail, is inserted so as to reach to the bottom of the charge; then the rest of the hole is filled up with some such material as dry sand or tough clay, which forms the " tamping" or wadding, and which is firmly rammed down in small quantities successively by means of the tamping bar, a copper-faced punch of such thickness that it nearly fills the hole, and having a groove in it to reccive the nail. This operation requires great care, because of the danger of eliciting sparks through collision. 'The hole being now fully charged, the nail is withdrawn, leaving a small vent hole, into which is then introduced an oaten straw filled with powder (or a series of such). 'To this is attached a slow match of paper steeped in saltpetre. The match is touched with fire; the alarm is given to retire to a safe distance ; and presently the explosion takes place, the rock opening with a sharp report, and fragments of stone being often shot into the air in all directions. An improvement on this method of firing consists in the employment of Bickford's patent fuse, which may be described as a perforated rope or hose containing an inflammable composition. A suitable length of fuse is placed in contact with the charge before tamping, and carried up to the mouth of the hole. On being lighted it burns at the rate of 2 to 3 feet per minute, giving the miners an opportunity to escape before explosion, A water-tight form of the fuse is often used in submarine blasting,—the shot or charge being then made up in cartridge form.

Blasting, however, is often done on a much larger scale than that just indicated. As an example of the large blasts, or "' mines," where great blocks of rock have to be removed at once, we might take some of the operations carried on at the Holyhead quarries a number of years ago for the harbour works. An entrance gallery, 5 feet 6 inches by 3 feet 6 inches

was first driven from the face of the rock (hard quartzose schist), an extent of 34 feet,

where ashaft, 3 feet 6 inches by 3 feet 6 inches, was sunk

to a depth of 14 feet. From this, level galleries were

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driven some distance right and left, with four short headings, at intervals, returning towards the face of the rock and terminating in chambers for the charges. The four charges, amounting in all to 12,000 ib of powder, were enclosed in canvas bags coated with tar. They were calculated at the rate of 1 tb of powder to 3 tons of rock. For tamping a stiff red clay was used ; it was well rammed up close to the bags of powder (leaving a small air space round these), and continued to the mouth of the gallery. The charges were fired simultaneously by means of platinum wire heated by a Grove's battery. The total quantity of rock removed was about 40,0C0 tons; it was separated into various sized blocks. Similarly, the Rounddown Cliff at Dover was overthrown in 1843 for railway purposes by 18,500 ib of powder, in three separate charges, fired simul- taneously from a Voltaic battery; a saving of £7000 was thus effected by the South-Kastern Raiiway Company.

In reviewing recent developments of the art of blasting, the application of machinery in the boring of rocks naturally claims some attention. A good rock-boring machine, at least where used in connection with simultaneous firing by electricity, ensures considerable economy in time and labour over the old method of hand-boring. Of such machines, in which the jumper is repeatedly driven against the rock by compressed air or steam, being also made to rotate slightly at each blow, there are several varieties ; the Burleigh rock drill is one of the best. It was used in the Hoosac tunnel in Massachusetts from 1869 ; and the last 5220 yards were completed with only eight of these machines. The rock was gneiss alternating with quartz. With hand-boring, the progress per minute was about 16 yards; with the Burleigh drill it was 48 yards, and the work was about one-third cheaper. According to Engineering, the cost of the Mont Cenis tunnel was £195 per linear yard ; that of the Hoosac tunnel, notwithstanding much harder rock, only £180. In the recent large blastings at Hellgate, New York, the Burleigh

machines also established their superiority, and came to be used exclusively. Among other boring-machines may be men- tioned the " Diamond" drill, and the systems of Law, Ingersoll, M'Kean, Bergstroem, Sachs, Doering.

The general properties of ordinary blasting-powder are well known ; it requires to be kept dry, and when dry, a spark of fire will cause it to explode, Various efforts have of late years been made towards the employment of more powerful explosive.agents for blasting purposes. The violent oxidizing power of chlorate of potash marked it out as available for explosive mixtures; and sundry preparations containing this substance have been made (some of them highly dangerous). Horsley's Blasting- Powder, consisting of powdered nut galls and chlorate, may be taken as a type of these mixtures, and as the safest of them. Itis both more violent and more rapid in explosion than ordinary blasting-powder, and does not give off any smoke or unpleasant smell when it explodes. It must be kept dry, and it is liable to explode through friction ; the expensiveness of its ingredients is also a drawback. Gun- cotton was discovered by Schénbein in 1846, but owing to disastrous accidents occurring in the three years which followed, it was abandoned in this country and in France for sixteen years. Through the researches, meanwhile, of an Austrian, Baron von Lenk, it again came into notice in 1864, and a Government committee investigated the merits of the gun-cotton twist or rope made according to the Austrian system. For blasting hard rock its general superiority in effect to powder was recognized ; and the absence of smoke, where the resistance opposed to the gun-cotton was sufficient to develop its full explosive force, was specially remarked upon. The want of rigidity of the material was objectionable ; and several accidents

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occurred, through violent friction of the twist, when miners had attempted to drive home a jammed charge. A con- siderable gain was secured by the invention of compressed gun-cotton by Professor Abel in 1868. In this form the explosive occupied less than half the space of the rope charges ; and the smooth, hard exterior of the cylindrical charges rendered the operation of

loading comparatively easy. The compressed charges, moreover, did not burn with the explosive violence of spun gun-cotton even when con- fined in the ordinary packing cases. Among further im- provements may be noted the cheapening of the material by use of cotton waste, instead of the long staple cotton of high quality that was used in the Austrian manufacture. In 1868 Mr E. O. Brown discovered that (like nitroglycerine)! compressed gun-cotton was susceptible of violent explosion through the agency of a detonation, as well as in the ordinary way. This was important, especially for submarine operations and works of demolition ; for the strong con- finement which was always necessary in the other case could be dispensed with ; indeed, with some waste of power, the substance might be exploded completely unconfined. Gun- cotton is not affected in its explosiveness by cold ; and it can be kept any length of time without deterioration in the damp and perfectly unignitable state. The formula that has been assigned for the most explosive gun-cotton is C.H,;N,0,;.

In 1864 Mr Nobel's researches called attention to the application of nitroglycerine (discovered by Sobrero in 1846) as an explosive agent. He first showed that the effect of gunpowder was considerably increased through impregna- tion with it ; and later, that the liquid itself, which burns slowly in the air on application of a flame with a common fuse, could be exploded by an initiative detonation,—con- finement by tamping being then unnecessary. In its pure state it was soon proved to be the most powerful explosive yet known ; its destructive force is about ten times that of gunpowder. Its liquid form, high specific gravity, and insolubility in water, are valuable properties in some cases, as in blasting under water or in wet holes. It freezes at a comparatively high temperature (40° Fahr.); but the opinion, formed from several grave accidents, that it was more susceptible of detonation in the frozen than in the liquid state, has been shown to be contrary to fact. When frozen it is more liable to recklessly rough usage. The liquid state of nitroglycerine, on the other hand, constitutes avery serious defect, owing to its tendency to leak from vessels in which it is carried, or from the blast-hole, through fissures in the rock,—resulting in unexpected explosions, it may be, through some slight concussion. Mr Nobel's ingenious device for rendering nitroglycerine temporarily inexplosive, by dissolving it, viz., in wood spirit, is only partially successful. Nitroglycerine has been extensively used in various mining districts,

especially in California. After some terrible accidents, which occurred in 1866-7, its use in England was placed under severe restrictions.

Impressed with the serious disadvantages of this explosive, Mr Nobel was led to the important observation that its readiness to explode by detonation is not diminished, but rather favoured, by mixture with solid substances, in themselves quite inert ; and the dilution did not materially detract from the great superiority of nitro- glycerine over gunpowder. In 1867 he brought before the public the substance appropriately called dynamite, which is one of the safest, most powerful, and most convenient explosives for industrial purposes. It consisted of seventy five parts of nitroglycerine held absorbed by twenty-five er

1 Tt was found, in the course of these inquiries, that all explosive compounds, even including gunpowder, are susceptible of explosion throngh a detonation, though the nature and force of the-detonation vary considerably with different explosive substances,

parts of a porous, infusorial, silicious earth, known in Germany as "Kieselguhr." Other absorbents have been employed (precipitated kaolin, tripoli, precipitated alumina, sugar, &c.), but none of them are equal to kieselguhr in power of retaining oil. Dynamite is furnished to the trade in the form of small cylindrical cartridges, in which the

'material, consolidated by pressure, is enclosed in a single

wrapping of parchment paper. It requires no tamping, and can be exploded by detonation under water. It is slow to catch fire, but burns rather fiercely when fired ; and if the quantities are large, or under confinement, an explosion may finally ensue. he trade in it has developed rapidly ; thus, while only 11 tons of it were sold in 1867, the quantity rose to 3120 tons in 1874.

In the preparation known as lithofracteur, which came into notice during the Franco-German War, nitroglycerine is used in considerably smaller proportions than in dynamite; and the kieselguhr of the latter is partly replaced by materials forming of themselves a feebly explosive mixture. Its properties are very similar to those of dynamite, but it is less powerful.

The less known ammonia powder, invented by Ohlson and Norbin, is much stronger than lithofracteur, and even surpasses dynamite. Its only drawback is the hygroscopic nature of its chief ingredient, which is nitrate of ammonium ; but otherwise it is a very superior blasting agent. Numerous other explosives have been tried in blasting, but those we have named are amongst the most important.

In a recent paper to the Society of Arts, Mr Nobel has discussed the relative power of several blasting agents. He finds that when their ballistic power is compared bulk for bulk, the substances experimented with rank as follows : — Nitroglycerine, 100; ammonia powder, 80; dynamite (No. 1), 74; lithofracteur, 53; gun-cotton, 45; Curtis and Harvey's blasting-powder (fired by detonator), 17°5. While these figures show the great superiority of nitroglycerine, there are practical circumstances which bring it and dynamite nearly on an equality. Thus, to get the full benefit of a blast there should be no air-space round the charge. Now, from the danger (as we have seen) of nitroglycerine leaking through imperceptible fissures in a rock, rigid cartridges are required for it, and these always involve a considerable air chamber, whereas dynamite, being highly plastic, can be easily compressed so as to exclude all empty space. The cartridges of compressed gun-cotton are also liable, of course, to the objection just noticed.

Where rapid destruction is to be accomplished there 1s a saving of labour, of tools, and of time by use of the new explosive agents (such as dynamite or gun-cotton). Their shattering and splitting effect in hard rock is much greater ; but in quarrying, the rock is generally not thrown out by them to the same extent. Where a moderate cleaving or splitting effect is desired, with as little local action as possible, gunpowder is best, as in raising large blocks of slate ; also where great displacing action is required. In submarine blasting of soft rocks the violent explosives disintegrate the rock into a plastic mass within a limited area, but do not shatter or rend it to any great distance.

As regards comparative safety, there is no doubt that inodern explosives offer a relative immunity from the danger arising from fire, to which gunpowder is subject. Neither dynamite nor guu-cotton can be fired by a spark, and if accidentally fired by a flame, they allow reasonable chances of

escape. On the other hand, accidents have often, happened in the thawing of nitroglycerine preparations when frozen,—a process that requires great care, and for which suitable warming-pans are provided. But miners are slow to understand that a cartridge which firing does not set off cannot be slowly heated with the same impunity ; hence they will roast the preparations near a

fire, or on hot cinders, or in other ways really dangerous. Gun-cotton and dynamite prove much safer than nitro- glycerine as regards exploding through concussion. There is not, however (Mr Nobel thinks), that amount of ditference between the sensitiveness of nitroglycerine and dynamite which the latter substance generally receives credit for. The main danger of nitroglycerine arose from the sensitiveness to concussion which it acquired through contact with a hard, metallic, strongly vibrating substance, such as the tin canisters in which it was contained. The main safety of dynamite is derived from the absence of any hard vibrating material in immediate contact with the nitroglycerine it contains.

As regards danger from concussion in manufacture and transit, gun-cotton ranks first ; but in the hands of miners, the case is reversed, through the rough usage of gun-cotton charges, where, ¢.g., they are found too large fora bore-hole, for gun-cotton is well known to explode with a blow. The danger most dreaded in modern explosives is from their supposed liability to chemical decomposition productive of heat, which sometimes leads to ignition and explosion. This decomposition is generally due to the presence of acid (chicfly nitric and hyponitric), which every nitrated com- pound has a strong tendency to retain. From the ease with which the acid can be washed out from nitroglycerine, both it and dynamite show much greater chemical stability than gun-cotton. Most cases of spontaneous conibustion of the latter have probably arisen either from imperfect washing, or from drying at too high a temperature (by which hyponitric acid is set free).

Complaints have often been made of the poisonous fumes given off by the new explosives. Where this occurs, it is probably due to an injudicious use

of the substance, resulting in imperfect explosion. Ifa dynamite cartridge partly burus instead of exploding, the temperature is much lower, and fumes of hyponitric acid are given off, which could not escape decomposition at the higher temperature of perfect explosion. securing carefully the detonator cap to the fuse, and especially the fuse to the cartridge.

Blasting by Hlectricity.—It is known that electricity has a thermal effect on wire through which it passes ; and the amount of heat produced in any part of the circuit is pro- portional to the resistance in that part. Thus a piece of wire of small section and conductivity may be made incan- descent by a current. On this principle platinum is some- times employed to fire blasting charges. In making a fuse of this sort, two insulated copper wires are twisted together for a length of about 6 inches, leaving the extre- mities free for about half an inch, and separated the same distance. A fine platinum (or iron) wire is stretched across this interval, metallic contact being established with the copper. The other ends of the fuse are connected with a battery. Platinum fuses are not much to be relied on for simultaneous blasting of several charges by one battery ; for some of the fuses may take a little more time to reach the ex- ploding temperature than others, and thus, as soon as one explodes, the connection between the others and the battery is broken. 'The batteries to be used with them are such as generate electricity of great quantity. The Bunsen and Leclanché batteries, in some of their varieties, are well suited for this. Twelve cells of Highton's battery will melt a piece of platinum wire over an inch long.

There is,{however, another class of fuses, offering cer- tain advantages over those just referred to, in which the spark produced by electricity of tension is the means used to effect the explosion. It might naturally be thought that an electric spark must inevitably cause explo- sion in a mass of powder or like substance through which it is made to pass; but this is not the case. The heating

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The general mistake consists in not:

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power of the spark is often insufficient:for explosion. The duration of an induction spark is about the millionth of a second ; whereas, to ignite powder, it is necessary that a spark should exist for at least the three hundredth part of a second, By interposing, however, a suitable priming con1- position in the interval which the spark is to cross, and in contact with the charge, explosion may be thus effected. In preparing such a composition, the properties of the ingredients as regards conductivity, inflammability, and explosiveness have to be nicely adjusted, according to the degree of tension of the electricity employed. The com- position selected by Professor Abel for his fuses is an inti- mate mixture of subsulphide of copper, subphosphide of copper, and chlorate of potassium. It is a mixture which conducts, but conducts with difficulty, and the fuses made with it are very effective. There are several other varieties, e.g., Ebner's fuse, where the priming consists of a mixture of sulphuret of antimony, chlorate of potash, and graphite.!

For generating electricity of tension with the Voltaic battery, Leclanché's battery is, again, one of the most suitable. The elements of this battery cousist of a rod of carbon placed in a porous cell and tightly packed round with a mixture of peroxide of manganese and coke; the porous cell is placed in a vessel containing a plate of zine, which forms the electro-positive element, and a solution of sal-ammoniac is uscd as the exciting liquid. There are some forms of battery for the same purpose so arranged that the contact of the elements with the liquid takes place only at the time of firing; such are those of Wollaston, Rulunkorff, and Trouvé.

Frictional electricity is the kind generally adopted by military authorities in firing charges,—the machines for generating it being easily made, simple, portable, and powerful. Bornhardt's frictional machine has found exten- sive use in Austria in ordinary blasting operations. It is coutained in a sniall metallic case, and consists of a dise of ebonite, which can be rotated between two cushions, charging a small Leyden jar placed near it. On pressing a little button from the outside, connection is made between the two coatings of the jar in such a way that the charge is sent through two wires by which the box is connected with the fuse, or fuses, at a distance. Some absorbent of mois- ture is kept within the box, and it is necessary to see that the machine be kept as warm and dry as possible.

Experiments were made by Messrs Wheatstone and Abel, a number of years ago, with Armstrong's hydroelectric machine, as a source of electricity for exploding charges of powder. 'They state that in very extensive mining opera- tions, where a great many charges have to be fired simul- taneously, and provided all the necessary appliances for success are at hand, the machine could be used very effec tively. It isa powerful source of electricity of high tension. There are serious objections, however, to its general use.

Electro-inagnetic induction currents (such as are deve- loped in Ruhmkorff's coil) were first applied, and success- fully, by Colonel Verdu, a Spanish officer, in 1853. The induction discharge, unlike that of a Leyden battery, is much enfeebled by successive solutions of continuity, so that not more than four mines in a single circuit could certainly be exploded on this system. But M. Savare made an improvement by interposing the fuses in branches of the principal circuit. The mine nearest the apparatus explodes first; and, owing to the abrupt separation of the wires, the current can no longer pass through this branch ; thus the electric action is augmented in the other branches, and in a similar manner the explosions necessarily take

a "a EEE eee 1 In one form of fuse employed with dynamite, there is connected

with the priming just mentioned some mercuric fulminate and loose gun-cotton.

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place in them, and that with a rapidity almost instantaneous. This is also a more efficient plan than that of employing a rheotome for changing the direction of the current, so as to bring wires connected with one or more charges successively into the circuit. The Ruhmkorff coil is, however, objec- tionable for its delicacy and the maintenance of batteries in connection with it. In experiments made by Messrs Wheatstone and Abzl, a powerful magneto-electric machine was found very limited in its power of igniting several charges arranged in succession in one circuit (it only

ignited three at most, with certainty) ; but on M. Savare's:

plan of arranging the charges in divided circuits, the simul- taneous ignition of twenty-five charges was repeatedly effected ; on several occasions as many as forty. By this plan each charge was connected with a separate branch attached to the main line, and their connection with earth established by means of uncovered copper wire wound round an iron stake driven in the ground. Another form of instrument, devised by Wheatstone, consists of six small magnets, to the poles of which are fixed soft iron bars surrounded by coils of insulated wire ; the coils of all the magnets are united together, so as to form, with the external conducting wire and the earth, a single circuit. An axis carries six soft iron armatures, in succession, before each of the coils. With this apparatus twenty-five charges were frequently fired in divided circuit, so rapidly that the effect on the ear was as of one explosion, only of slightly longer duration than when the large magnet was enployed. The Markus apparatus, largely used in Germany, is on the same principle.

Siemens's dynamo-electric machine, in which electro- magnets are employed, is a very useful machine for simultaneous firing. It is found that the residual

magnetism left in the coils of electro-magnets, after a current from even a single Voltaic cell has been once sent through them, is always sufficient to have the necessary inductive action on the armature. This inductive action, though very weak at first, generates slight alternating currents in the armature, which are by means of a com- mutator caused to flow always in one direction through the coils of the electro-magnet, thus increasing the magnetism in the core, which, in its turn, increases the inductive action, causing stronger and stronger currents to be generated in the armature. This action and reaction goes on till the limit of magnetic capacity of the core is reached, and if the coil of the armature be then suddenly connected with the line leading to a fuse, a very powerful current is transmitted. In Breguet's exploder (in which a bar of soft iron is suddenly separated from the armature of a magnet bearing two induction coils) a special arrangement gives rise to an extra-current, and considerably increases the intensity of the current. M. Breguet has lately utilized in this apparatus the

new and powerful laminated magnets constructed by M. Jamin. Gramme's machines are also effective in exploding charges, but their volume and high price are against a large use of them industrially.

For more detailed information on the recent develop- ments of blasting, reference may be made to Spon's Dictionary of Engineering, art. " Boring and Blasting ;" Professional Papers of the Corps of Royal Engineers, vols. vii, x., xxii.; Transactions of the Society of Hugineers, 1869 and 1871; Proceedings of South Wales Institute of Mining Engineers, vol. viii., No. 5, vol. ix., Nos. 1 and 2 ; Dingler's Polytechnisches Journal, Oct. 1, 1874; Annales de Chimie et de Physique, May 1875 ; Journal of the Society of Arts, May 28, 1875. (A. B. M.)

BLEACHING

LEACHING is the process of whitening or depriving objects of colour, an operation incessantly in activity in nature by the influence of light, air, and moisture. The art of bleaching, of which we have here to treat, consists in inducing the rapid operation of whitening agencies, and as an industry it is mostly directed to cotton, linen, silk, wool, and other textile fibres, but it is also applied to the whitening of paper-pulp, bees'-wax, and some oils and other substances. The term bleaching is derived from the Anglo- Saxon blecan, to bleach, or to fade, from which also comes the cognate German word bleichen, to whiten or render pale. Bleachers, down to the end of last century, were known in England as " whitsters," a name obviously derived from the nature of their calling.

The operation of bleaching must from its very nature be of the same antiquity as the work of washing textures of linen, cotton, or other vegetable fibres. Clothing repeatedly washed, and exposed in the open air to dry, gradually assumes a whiter and whiter hue, and our ancestors cannot have failed to notice and take advantage of this fact. Scarcely anything is known with certainty of the art of bleaching as practised by the nations of antiquity. Egypt in early ages was the great centre of textile manufactures, and her white and coloured linens were in high repute among contemporary nations. As a uniformly well bleached basis is necessary for the production of a satisfactory dye on cloth, it may be ~~assumed that the Egyptians were fairly proficient in bleaching, and that still more so were the Phœnicians~~

~~with their brilliant and famous purple dyes. We learn, from Pliny, that different plants, and likewise the ashes of plants, which no doubt contained alkali, were employed as detergents. He men~~ tions particularly the Struthiwm as much used for bleaching

in Greece, a plant which has been identified by some with Gypsophila Struthium. But as it does not appear from Sibthorp's Flora Greca, published by Sir James Smith, that this species is a native of Greece, Dr Sibthorp's conjec- ture that the Struthium of the ancients was the Saponarva offi- cinalis, a piant common in Greece, is certainly more probable.

In modern times, down to the middle of the 18th century, the Dutch possessed almost a monopoly of the bleaching trade, although we find mention of bleach-works at South- wark near London as early as the middle of the 17th century. It was customary to send all the brown linen, then largely manufactured in Scotland, to Holland to be bleached. It was sent away in the month of March, and not returned till the end of October, being thus out of the hands of the merchant more than half a year.

The Dutch mode of bleaching, which was mostly con- ducted in the neighbourhood of Haarlem, was to steep the linen first in a waste lye, and then for about a week in a potash lye poured over it boiling hot. The cloth being taken out of this lye, and washed, was next put into wooden vessels containing butter-milk, in which it lay under a pressure for five or sixdays. After this it was spread npon the grass, and kept wet for several months, exposed to the sunshine of summer.

In 1728 James Adair from Belfast proposed to the Scotch Board of Manufactures to establish a bleachfield in Galloway ; this proposal the board approved of, and in the same year resolved to devote £2000 as premiums for the establishment of bleachtields throughout the country. In 1732 a method of bleaching with kelp, introduced by R. Holden, also from Ireland, was submitted to the board ; and with their assistance Holden established.a bleachfield for prosecuting his process at Pitkerro. near Dundee,

The bleaching process, as at that time performed, was very tedious, occupying a complete summer. It consisted in steeping the cloth in alkaline lyes for several days, washing it clean, and spreading it upon the grass for some weeks. The steeping in alkaline lyes, called bucking, and the bleaching on the grass, called crofting, were repeated alternately for five or six times. The cloth was then steeped for sonie days in sour milk, washed clean, and crofted. These processes were repeated, diminishing every time the strength of the alkaline lye, till the linen had acquired the requisite whiteness.

For the first improvement in this tedious process, which was faithfully copied from the Dutch bleachfields, manu- facturers were indebted to Dr Francis Home of Edinburgh, to whom the Board of Trustees paid £100 for his experi- inents in bleaching. He proposed to substitute water acidulated with sulphuric acid for the sour milk previously employed, a suggestion made in consequence of the new mode of preparing sulphuric acid, contrived some time before by Dr Roebuck, which reduced the price of that acid to less than one-third of what it had formerly been. When this change was first adopted by the bleachers, there was the same outcry against its corrosive effects as arose when chlorine was substituted for crofting. A great advantage was found to result from the use of sulphuric acid, which was that a souring with sulphuric acid required at the longest only twenty-four hours, and often not more than twelve ; whereas, when sour milk was employed, six weeks, or even two months, were requisite, according to the state of the weather. In consequence of this improve- ment, the process of bleaching was shortened from eight mouths to four, which enabled the merchant to dispose of his goods so much the sooner, aud consequently to trade with less capital.

*No further modification of consequence was introduced in the art till the year 1787, when a most important change was initiated by the use of chlorine, an element which had been discovered by Scheele in Sweden about thirteen years before. Berthollet repeated the experiments of Scheele in 1785, and by the prosecution of further investigations he added considerably to the facts already known. * He showed that this substance (called by Scheele dephlogisti- cated muriatic acid) is a gas soluble in*

water, to which it gives a yellowish green colour, an astringent taste, and the peculiar smell by which the body is distinguished.

The property which this gas possesses of destroying vegetable colours, led Berthollet to suspect that it might be introduced with advantage into the art of bleaching, and that it would enable practical bleachers greatly to shorten their processes. Ina paper on dephlogisticated muriatic acid, read before the Academy of Sciences at Paris in April 1785, and published in the Journal de Physique for May of the same year (vol. xxvi. p. 325), he mentions that he had tried the effect of the gas in bleaching cloth, and found that it answered perfectly. This idea is still further de- veloped in a paper on the same substance, published in the Journal de Physique for 1786. In 1786 he exhibited the experiment to Mr James Watt, who, immediately upon his return to England, commenced a practical examination of the subject, and was accordingly the person who first intro- duced the new method of bleaching into Great Britain. We find from Mr Watt's own testimony that chlorine was practically employed in the bleachfield of his father-in-law, Mr Macgregor, in the neighbourhood of Glasgow in March 1787. Shortly thereafter the method was introduced at Aberdeen by Messrs Gordon, Barron, and Co., on informa- tion received from M. de Saussure through Professor Copland of Aberdeen. Mr Thomas Henry of Manchester was the first to bleach with chlorine in the Lancashire dis- trict, and to his independent investigations several of the

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early iniprovements iu the application of the material were due.

No very great amount of success, however, attended the efforts to utilize chlorine in bleaching operations till the subject was taken up by Mr Tennant of Glasgow. He, after a great deal of most laborious and acute investigation, hit upon a method of making a saturated liquid of chloride of lime, which was found to answer perfectly all the pur- poses of the bleacher. This was certainly a most important improvement, without which, the prodigious extent of business carried on by some bleachers could not possibly have been transacted. Such was the acceleration of pro- cesses

effected by the new method that, it is stated, a bleacher in Lancashire received 1400 pieces of gray muslin ona Tuesday, which on the Thursday immediately following were returned bleached to the manufacturers, at the dis- tance of sixteen miles, and were packed up and sent off on that very day to a foreign market.

In the year 1798 Mr Tennant took out a patent for his uew invention, and offered the use of it to practical bleachers, for a fair and reasonable portion of the savings made by its substitution for potash, then in general use. Many of the bleachers, however, used it without paying him, and a combination was formed to resist the right of the patentee. In December 1802, an action for damages was brought against Messrs Slater and Varley, nominally the defendants, but who, in fact, were backed and supported by a combination of almost all the bleachers in Lancashire. In consequence of this action, the patent right was set aside by the verdict of a jury and the decision of Lord Ellenborough, who used very strong language against the patentee. The grounds of this decision were, that the patent included a mode of bucking with quicklime and water, which was not a new invention. It was decided that, because one part of the patent was not new, therefore the whole must be set aside. Lime was indeed used pre- vious to the patent of Mr Tennant ; but it was employed in a quite different manner from his, and he would have allowed the bleachers to continue their peculiar method without any objection, because it would have been pro- ductive of no injury to his emolument.

In consequence of this decision the use of liquid chloride of lime in bleaching was thrown open to all, and speedily came to be universally employed by the bleachers in Britain. Mr Tennant, thus deprived of the fruits of several years of anxious and laborious investigation, advanced a step farther, to what may be considered as the completion of the new method. This consisted in impregnating quicklime in a dry state with chlorine, an idea originally suggested by Mr Charles M'Intosh of Cross Basket, then a partner with Messrs Tennant and Knox. A patent for this was taken out on the 13th of April 1799, and he began his manu- facture of solid chloride of lime at first upon a small scale, which has ever since been gradually extending, and the manufactory is now the largest of the kind in Great Britain.

The various processes for the preparation of the so- called chloride of lime, or bleaching-powder, as conducted at the present day, and its other applications in arts, will be found described under the head of CHLORINE,

BLEACHING OF CoTTON.

Of the two great staples, cotton and linen, to the whitening of which the art of the bleacher is directed, cotton is the more easily and expeditiously bleached. The basis of all vegetable fibres is cellulose or ligneous tissue, a pure white substance, and it is to obtain this body in a state of purity, free from the resinous matter naturally associated with it, as well as from adventitious impurities

COTTON. |

imparted in the process of spinning and weaving, that is the object of bleaching. The operations, although appa- rently complex and numerous, are essentially simple, though frequently repeated, and the greatest variety of detail is connected with the finishing of cloth, which is in reality a separate industry, frequently conducted in distinct estab- lishments under the name of calendering and finishing works. Bleaching proper resolves itself into washing with suitable detergents, and subjecting the washed material to the influence of chlorine, whereby the colouring matter either belonging to the fibre or imparted to it is oxidized and discharged.

The general arrangements of a bleach-house will be made plain from the ground-plan (fig. 1). The various pieces

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Fria. 1.—Ground-Plan of Bleach-House.

of apparatus, the positions of which are there indicated, will be described in connection with the sequence of opera- tions through which the cloth passes in the process of bleaching. In the best arranged works, it should be mentioned, where power is required to work any machine, it is generally supplied by a separate engine attached to the machine itself, instead of by gearing carried from one engine for all the machinery. For this plan, as well as for the greater portion of the illustrations which follow, we are indebted to Mr William Mather, of the eminent firm of Mather and Platt, Salford, to whom we are also under obligation for much valuable practical information. have also to express our indebtedness to Mr Alexander Crum of Thornliebank, for the fullest access to the impor- tant works of his firm, and for the cordial assistance afforded by the managers of its various departments.

The sequence of operations in the bleaching and finishing of calico has undergone no change in its general details since the bleaching-powder process was first introduced ; but the mechanical arrangements by which the operations. are conducted have been the subject of frequent improvements. The ingenuity of engineers and bleachers has been chiefly directed towards the decreasing of manual labour, economy of fuel and materials, and the rapid completion of the various processes. The application of factory legislation to bleach-works by the Bleaching and Dyeing Works Act of 1860, by imposing a necessity for regular and stated hours of work, still further stimulated the production of apparatus and arrangements for prompt and certain completion of the various operations. Consequently a great part of the old machinery and arrangements of a bleach-house have now disappeared, and the processes are carried on in a continuous series of operations by machinery and appliances to a large extent self-acting. Formerly each piece of goods was separately treated and carried by hand or on barrows from one stage to the next ; now the pieces are sewn end to end, as many as 1000 pieces, measuring perhaps 20 miles, being operated on in one stretch.

As various pieces of old machinery are yet in use for certain kinds of work, it has been cousidered desirable to

give descriptions and figures of some of them, and these, at the same time, will serve the further purpose of indicating the nature of the mechanical improvements which have been carried out, in recent years, in bleaching establishments. The important and frequently repeated operation of wash- ing was formerly conducted either at the wash-stocks or washing-mill or in the dash-wheel. The wash-stocks, which are yet in use in many large works, especially where linen is the bleacher's staple, consists of a trough or box for holding the goods to be washed, through which a constant stream of water is passing. A pair or more of heavy hammer-headed wooden beams, hung by long shafts, and playing into the trough, are alternately tilted against the cloth, causing the water by their momentum to work through and squirt out of the mass. This process of washing is rather tedious, occupying on an average about half an hour, and requiring besides a great amount of manual labour. The dash-wheel (fig. 2) is a cylindrical hox revolving on its axis. It has four divisions, as shown by the dot- ted lines, and an opening into each division. A num- ber of pieces are put into each, abundance of water is admitted behind, and the knocking of the _ eee pieces as they Fic. 2.—Section: of a Dash-Wheel. alternately dash from one side of the division to the other during the revolution of the wheel effects the washing. The process lasts from four to six minutes, The dash- whecl is used to the present day in the bleaching of curtain materials and fine muslins. In nothing have greater im- provements been effected than in the arrangement of the kiers or vessels in which the cloth is boiled or " bowked." An old form of kier is seen in fig. 3. It consisted of a cylindrical vessel AA, 9 feet wide, of wood or iron, having a false bot- tom BB, on which the goods were placed, about 6 inches from the realone. Asmall pipe E, in the cen- tre of a wider one CC, conveyed the steam from the steam – boiler. When the hquid boiled at the bottom, where the steam issued, the steam forced its way up the pipe CC, carrying with it a quan- tity of the lye, which was thrown back

by the small cover D, spreading itself over the surface of the goods, and filter- ing through them into the space below the false bottom, where it was again heated by the steam, reascended the pipe CC, and so on in constant succession, till the boil- ing was completed. FF is a wooden cover which prevented the cooling of the materials below a boiling heat.

The bleaching of common calico is divided into two branches~—lst, print bleaching, in the case of which the goods are bleached as a preliminary to the process of calico printing; and 2d, white bleaching, which applies to goods to be finished white or unprinted. The processes differ in some of their details, as in white bleaching it is only neces-

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Fra, 8.—Section of Kier (old form).

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sary to satisfy the eye, whereas in print-bleaching the material must be rendered chemically pure, otherwise the colours in the subsequent printing process would be dull and blotchy. The print bleaching must therefore be more thoroughly done than the other ; but as the processes are generally the same, it will be sufficient to indicate the points of difference in the various stages through which the material in both cases passes. A process preliminary to bleaching is

Singeing.—Gray calico as received from the looms is generally in lengths of 374.and 50 yards. A large number of these, sometimes as many as 1000, measuring more than 20 miles in length, are sewn into a continuous web. At the extremities of each owner's lengths, the name of the firm, or some distinguishing mark, is either stamped on in tar, or marked by means of coloured threads. These long lengths are then submitted to the operation of singe- ing, which has for its object the removal of the downy pile and short threads from the surface of the cloth, which would interfere with the appearance of finished white goods, and with the uniformity and sharpness of patterns in the case of prints. Several methods of accomplishing this have been employed, but that most commonly used is the system of plate singeing illustrated in fig. 4. A pair of

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singe-plates, a and 6, made of thick bent sheets of copper, are mounted over the flues of a fire sufficient to raise a white heat. The plate 6 is most highly heated, a being at the end of the flue furthest removed from the fire. The cloth enters over a rail a, and in passing over the plate a is thoroughly dried and prepared for the singeing it receives when it comes to the highly-heated plate 6. A block d, carrying two rails in the space between the plates, can be raised or lowered at pleasure so as to increase or lessen the pressure of the cloth against the plates, or, if necessary, to lift it quite free of contact with them. The system of plate singeing is found generally sufficient in practice, but the caking of paste and dirt on the plates from the cloth as it passes over them, and variations in the heat of the plates, often lead to irregularities in singeing. A combination of plate and gas singeing is frequently employed to over- come the deficiencies of plate singeing alone. In this case the cloth is passed first over an ordinary plate, and then on to another, along the ridge of which is a long narrow slit, which allows the issue of a gas flame produced from coke burning immediately under it. By this means long loose threads are more effectually burned off than in plate singeing, and a more uniform heat is applied to the gray cloth. Fig. 5 is a sectional view of a very efficient singe- ing apparatus introduced by Messrs Mather and Platt. The figure represeuts the first half of the machine, the second portion being precisely similar in arrangement. The singeing in this

case is accomplished by the burning of a mixture of coal-gas and atmospheric air admitted by a pipe

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a, and driven by a fan blast to the burners 4, 6, which are regulated by stop-cocks. The mixture burns with an

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Fria. 5.—Gas Singeing Apparatus.

intense heat and a blue smokeless flame. 'The cloth is carried by a series of rollers to the gas jets, and in passing over the rollers ¢, c, c, ¢ the one side of the cloth impinges laterally four times against the flame, which is never permitted to pass through the fabric, but only shaves its surface. The back is thus singed in the first portion of the apparatus, and being turned over on roller d it is carried forward to another pair of jets, where, being thoroughly dry, the face side of the cloth is completely singed by going over exactly the same course through which the back is carried in the first part. By an arrange- ment not shown in the illustration, the attendant of the machine can instantaneously lower the gas burners by a treadle movement in case of any stoppage or accident, and thus prevent the cloth from being burned. With a proper pressure of gas this machine singes at the rate of 60 yards per minute.

At this stage the cloth has now in addition to the brown coloured incrusting substance and the resinous material proper to the fibre, a dark-coloured carbonized surface, caused by the singeing process, the weaver's paste or dressing, tallow or other fat introduced in the pro- cess of weaving, and the accumulation of dirt which the handling of weavers and others may have produced. The object of the subsequent processes is to wash out the mechanical impurities and resinous substances from the cloth, to render soluble by chemical agencies such as are otherwise insoluble in water, and

to oxidize the colour- ing matter of the cotton by the chloride of lime as already explained.

Liming.—In some cases it is the practice immediately after singeing to steep the pieces in water and pile them up wet for a night, in order to loosen and partly ferment the weayer's paste, which is then in large part removed by washing in a machine to be subsequently described. The " sray-backs" which have been used in calico-printing have always to be thus steeped, and at one time it was the practice to leave the cloth so long in this steep that it acquired a most offensive odour. This preliminary steeping and washing facilitates the percolation of the liquor through the fabric in the process of boiling, but notwithstanding this advantage it is generally dispensed with, and the goods pass direct from the singeing to the liming process. The pieces are formed into a loose coil or rope by being passed through circular rings of glass or pottery called " pot-eyes," and worked up and down several times in a strong milk of lime, in order that the whole may be uniformly and thoroughly impregnated. The arrangement for liming will be understood from fig. 6, which is a sectional view of a 'squeezer," an apparatus used repeatedly in subsequent operations as well as in this of liming. The cloth passes up and down as indicated by the arrows, dipping several times into the solution, and before passing finally on to the kiers for boiling it is slightly "nipped" between the

"bowls" of the squeezer to extract superfluous moisture. These bowls are thick cylinders of wood, usually in this case made of beech. From the lime squeezer the cloth is carried over winches, and guided through pot-eyes into the kiers,

Fie. 6.—Seetion of Lime Squeezer.

Bowking— A. bowking kier is an apparatus in which the cloth is boiled. To one old form of kier allusion has already been made. Bowking is now mostly accomplished in closed kiers worked up to a considerable pressure of steam. In the boiling for white bleaching about 80 ib of lime are required for 2700 Ib of cloth, and the boiling is continued for ten hours at a pressure of about 30 tb. A form of kier very generally employed consists of a strong

vessel made of boiler plate, with a man-hole in the upper part, which can be screwed tightly down. The vessel is about 10 feet in depth, and 5 or 6 feet in diameter, and has a false bottom made of a gird of wood or iron, on which the lowest layer of cloth rests. Up the centre of the kier passes a pipe or tube which reaches higher than the cloth can be piled, and is surmounted by an umbrella-shaped plate. Steam is admitted at the lower part of the kier,

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and as the pressure accumulates it gradually forces the liquor upwards through the central pipe till, by-and-by, it is dashed with great violence against the umbrella-shaped

plate, and thrown over the upper surface of the cloth. It gradually percolates down through the cloth to the bottom, where it is again caught and forced up through the central pipe, and thus a constant circulation is maintained. A very efticient circulating kier, the invention of Mr Taylor of Berchvale, has recently been introduced, of which a sectional representation is given in fig. 7. This kier in outline is like the previous, but it has no central distribut- ing pipe. Instead, the liquor is carried by an external pipe to the top of the kier, where it enters and is forcibly thrown against the surface of the cloth. The kier A has a false bottom B as in the previous case, and when filled with cloth and liquor, the liquor percolates by a pipe C into the receiver D, where it finds its own level in the ascending

pipe E. Steam is admitted at the lower part of the receiver by the steam-pipe F, and forces the liquor upwards through the pipe E to the top of the kier. The vacuum created in the receiver is supplied from the lower part of the kier, and the flow is facilitated by the pressure of steam from above, and thus a constant steady circulation is maintained. This kier is very useful in cases where a comparatively low pressure is desirable, as in white bleaching, where the coloured headings of the cloth (Turkey red or other coloured threads introduced at the end of a web) have to be preserved.

The bowking apparatus generally used by printers is Barlow's high-pressure kiers, an arrangement in which the kiers are worked in pairs. A pair is shown in fig. 8, one

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Fic. 8.—Barlow's High-Pressure Keirs.

being seen in section; the dimensions of the vessels are inserted in the figure.

The novelty these kiers introduced when first brought out, was that in using steam of 40 Ib instead of 5 Tb, a greater economy of time and drugs would be effeeted. Their world-wide application has proved that the inventor's theory has found ample eonfirmation. The cloth is carried or rather drawn by winehes, and dropped into the wrought iron boilers or kiers AA', through the man-holes in the top, two pieees in all cases running side by side. As the pieces are deNvered continuously in the kiers, a lad in each spreads a pile of the eloth all round the kier, as equally as possible, so that, when full, the

kier shall be packed uniformly to the top.. This cloth rests on what is termed a false bottom, simply a grid or plate with holes in it, as shown at B. Upon the grid are generally placed a few smooth stones, through the spaces between which the liquor drains from the eloth.

Down the centre of the kier is a pipe C, perforated with holes, for the purpose of distributing the liquor freely into the mass of eloth. The kiers are connected by a pipe D, leading from the bot- tom of one to the top of the other, and vice versa. The steam is introduced through the valves EE', After the kiers are filled with cloth, each holding about 6000 Tb, the man-hole lids are screwed down and all made steam tight. A little steam is then turned on to discharge the air from the cloth, which escapes through the pipes FF'. This steam, moreover, gradually warms the goods. The alka- line liquor or lime water, having been mixed to the proper strength,

is then let into the kicr A, through the tap G, until the necessary quantity has been supplied, about 20 gallons of caustic soda at 70° Tw., and 400 tb lime for the full charge being used. The stcam ig then turned on slowly, and by its pressure the liquor in kier A is made to pass with great foree through the cloth, and then up the pipe D, through the 3-way valve, into the kier A'. When all the liquor has passed over, the steam valve EH' is reversed, steam is shut off from A, communication is opened to pipe D', and valve K' turned so as to admit steam to A', when the action of forcing the liquor through the cloth up the pipe E' into kier A is performed. This alternate passing of the liquor backwards and forwards, see-saw fashion, through the cloth, constitutes the operation of boiling. The steam also has great effect if left in contact with the cloth for a few minutes in one kier, after the liquor has gone over to the other kier. This process is continued for eight hours (nearly one-third the time formerly required in what are termed low-pressure kiers), with steam of from 30 to 50 tb, during which time the liquor passes about 16 times from one kier to the other ; then the valves HH' are opened, and all the liquor expelled by the steam from the cloth into a drain. The steam is then shut off, the man-hole lids removed, and the ends of the two chains of cloth taken out and passed through pot eyes, which guide the pieces to the washing-machine.'

Washing.—The cloth as it issues from the kiers is found to have assumed a very dirty brown aspect. Formerly, the apparatus used for washing was either the wash-stocks or the dash-wheel, to which allusion has already been made. The machine now generally employed is represented in section in fig. 9. It consists of a pair of wooden bowls

Fic. 9.—Section of Washing- Machine.

or cylinders a and 8, about 9 feet long, mounted in a strong framework, and arranged to press against each other in their revolution. Plane tree is the wood most suitable for making these bowls. Running underneath the whole length of the bowls isa box or trough ¢ filled with water, near the bottom of which a rectangular roller d is fixed. The water in the box is constantly renewed during washing operations by a current flowing in at the middle and escaping at each end. Two chains of cloth are washed in this machine at the same time, one being introduced at each extremity of the roller. The cloth passes down into the water under the roller d and up to the wooden bowls, between which it is caught and nipped, and down again

: For this description of the Barlow kiers we are indebted to Mr William Mather.

BLEACHING

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into the water, working its way in a spiral manner from the end to the centre of the machine, passing nine times through the water and between the bowls in its progress, Its course inwards is guided by a strong wooden rail, from which pegs project, arranged according to the number of turns to be given to the cloth, In the centre part of the upper bowl there is a lapping of cotton rope, which projects a little above the surface of the wood, and serves to give the cloth, as it finally issues from the machine, a much

stronger squeeze than it would obtain between the long even bowls, and thereby expels a large proportion of mois- ture. As the cloth travels inwards towards the centre of the trough, while the flow of water is outward to escape at each end, the cloth on each revolution is meeting water more

nearly pure, till just at the point where it issues from the trough for the last time, the clean water entering the trough is powerfully spurted upon it, thus giving it a thorough rinse before it is finally squeezed. It is usual to pass the cloth from the lime boil either through a pair of such washing-machines, or twice through the same, in order to expel the last trace of calcareous soap and uncombined lime from the texture.

In addition to this machine various other devices have from time to time been proposed and introduced to perform the important operations of washing. Among these the continuous washer of Mr Henry Bridson of Bolton-le- Moors, Lancashire, patented in 1852, is deserving of notice as a simple and efficient washing-machine. Mr Bridson's washer consists of an oblong tank or trough of cast-iron which, in use, is kept about half filled with water. Within this tank, just dipping into the water, two cross shafts are fixed, which are geared to revolve in the same direction by spur-gearing mounted outside the trough.

'Each shaft carries a pair of discs of large diameter, and

between the discs of the two shafts a pair of bars placed diametrically opposite each other are mounted. These bars form flat winces or revolving frames, by the revolu- tion of which the fabric is not only carried forward, but is in its progress caused to strike with great violence against the surface of the water. The intermittent flapping and shaking motion thus communicated to the material has a powerful effect in detaching adhering impurities from the cloth. Another form of washing-machine in use in Lancashire consists of a row of eight vats or troughs arranged in an ascending series, so that the overflow of water from the highest or last runs into the second highest, and so downwards till it escapes from the lowest or first. The cloth enters at the lowest trough, and is carried by guide-rollers up and down through the entire series, issuing at the top between a pair of squeezing rollers.

Gray Sour.—From the washing-machine the chain of cloth is passed through a pair of squeezers, by which a large proportion of moisture is expelled, The operation of souring, which comes next, is performed in an apparatus of the same construction as the washing-machine, the trough under which contains the souring liquor. For white bleaching a solution of hydrochloric acid of @ strength of 9° Twaddle (sp. gr. 1010) is used, and for print bleaching the solution is made up to 4° Tw. Through this the cloth is passed up and down twice by the revolution of the bowls, and piled up in the sour in stillages for some hours. The object of the souring is to dissolve any traces of free lime which may have been left in the washing, and to decompose the calcareous soap.

Second Boil.—After having lain in the sour for a sufficient length of time the cloth is passed through squeezers to expel as much as possible of the acid, and again washed in the machine. It is next passed into a kier or set of kiers, precisely as after liming, for the second boil, which in the

case of print bleaching is done with a solution of soda-ash and rosin. For a pair of Barlow kiers boiling 12,000 ib of cloth, the quantities used are 350 tb of soda-ash and 200 Ib of rosin dissolved with 30 gallons of caustic soda at 70° Tw. The boiling is carried on for ten hours, in a like manner and at

the same pressure as in the case of the lime boiling. The soda-ash and rosin form a soap, which dissolves out the free fatty acid in the cloth, and acts on the calcareous soap remaining by forming. carbonate of lime and a soluble soda soap. In the white bleaching of 2700 ib of cloth, the boiling solution is 8 gallons of caustic soda at 70° Tw., but by some bleachers soda-ash is employed in the proportion of 80 ib to 2700 Ib of cloth, From this boil the cloth is passed on to the washing-machine, and then squeezed, when it is ready for "chemicking" withthe bleaching- powder solution.

Chemicking.—When the previous processes have been efficiently carried out, the cloth will, at this point, have attained a considerable appearance of whiteness and purity. The "chemicking" or liquoring with bleaching-powder which it now undergoes is conducted in a similar manner to the souring already described. The chemick is used as weak as possible, the solution varying from ~° to }° Tw. (sp. gr. 1000625 to 1:00125) according to the weight and condition of the cloth under treatment. It is run through this liquor, gently squeezed, and piled up for four or six hours. It is then squeezed and washed ; and at this stage the bleacher has to judge whether the cloth requires to be chemicked a second time, which, in the case of heavy goods, is frequently necessary. If a repetition of the process is required, the cloth is again passed into the kiers, boiled with a solution of soda-ash, and the other processes repeated as before.

White Sour. After lying in the chemick the goods are again washed and squeezed, and afterwards soured in machine with sulphuric acid, used at a strength of about 4° Tw. (sp. gr. 1:020), and piled up for a period of at least three hours. Thereafter, in order thoroughly to expel all acid the goods are twice washed, and finally squeezed, which concludes the operation of bleaching proper. The calico should now present a snow-white aspect, and should be fit to take the most delicate shades of colour when it is to be used for printing purposes.

Opening.—In passing through the numerous processes detailed in the foregoing statement, the cloth has been always in the form of a coil er loose rope. In the drawing from one machine to another it has been also pulled some- what to the length at the expense of breadth, and in places it is likely to have become a little twisted. The pieces have therefore now to be opened

out to their full width, and, if necessary, evened. The opening out is effected by passing the pieces to a winch placed at a considerable height when the weight of the cloth itself in passing upwards unfolds it, and the selvedges are caught aud extended by a boy just before it passes on to the winch. When necessary it is caught beyond the winch by an opening-machine, such as that patented in 1871 by Mr Wm. Birch of Salford. It is a complex apparatus, working. by endless bands, on which are toothed projections, and these, travelling from the centre to the sides in opposite directions, open and spread out the cloth before it passes over the roller which is mounted on the machine. From the opener the cloth passes at once to the drying-machine (hereafter described), after passing over which cloth intended for printing is folded or batched on rollers, and its further treatment belongs to the art of calico-printing.

Finishing.—So far as regards bleaching proper the pro- cess is now at an end, and the further operations which white calicoes undergo have only for their object the improvement of their appearance for the market. But

although the finishing adds in no way to the quality of the material, it is regarded as of great value by the merchants, and the finish of a bleacher is of more import- ance than his bleaching. A great variety of finishing operations have to be employed, according to the different qualities of textiles, and the purposes to which they are devoted. Finishes are "beetled," "calendered" (either "stiff," "medium," or "soft," or "glazed,") and, fordress muslins, &c., "elastic." As the processes and appliances for these finishing operations are very numerous and varied, they cannot here be described in detail. In most cases they are the same as used in the finishing of calico prints, and more information will be found under that head. We shall here confine our remarks chiefly to the finishing of ordinary white beetled calicoes.

Water Mangle.—The cloth, when brought into the finish- ing-room, is passed over a stretching rail into a trough of boiling water and between a series of calender rollers, in which it is powerfully pressed. A common arrangeinent of the cylinders of the water mangle is to have a series of four, two of small diameter being made cf copper, and two larger of condensed

cotton ; but wooden bowls are also sometimes employed with only a single intermediate copper cylinder. By this mangling process the water is equalized throughout the whole piece, the threads are flattened, and the cloth stretched, smoothed, and wound upon a roller, and thus rendered fit for receiving the starch,

Starching.—It is in this stage that so much is done by some bleachers to give cloth a factitious appearance of weight and bulk by filling up the interstices between the fibres with compounds which have no other object than to please or deceive the eye, and some of which have a decidedly deleterious influence on the tissue they are intended to improve in appearance. A great variety of mixtures, both cheap and nasty, are used by some finishers in place of starch with a view to produce weight and appearance, but, naturally, as little information as pos- sible on this point is permitted to leak out to the public. What ought to be, and by reputable bleachers really is, used is pure starch, either of Indian corn or wheat, or both, made up into a stiff mucilage and blued with ultramarine or indigo. The cloth passes over a stretching rail into a trough of this starch, in which a roller is mounted. As it comes out of the starch it is caught between a pair of bowls, by which the superfluous starch is squeezed out and thrown back into the trough, the cloth passing on to the drying. machine. The starching mangle and drying-machine are seen together in fig. 10.

Drying.—The drying-machine (fig. 10), consists of a

Fic. 10.—Starching Mangle and Drying Cans.

number of cylinders made of tinned: iron or copper, and filled with steam of low pressure. The cloth passes alter. nately back and face over one and the other, and emerges to be placed down at the end perfectly dry. This system of drying was introduced among the first mechanical appli- ances used in calico-printing, and has not as yet been superseded by any other plan. Various improvements in detail, we learn from Mr William Mather, as to the con- struction of the cylinders and the mode of applying steam to them have been recently introduced, but the machine remains the same. One important defect has been recently Ill. — 103

removed by an alteration in the construction of the cylinders, to prevent collapse, in case a vacuum were formed by the rapid condensation of the steam. A spiral rib or stay is made to run from end to end of the body of the cylinder, giving support uniformly the whole length, and serving at the same time as a screw to drive the condensed water, as the cylinder revolves, to one end, where it is ejected through a nozzle. The steam enters at a nozzle, from the framing which is cast hollow, and serves aS a pipe to distribute the steam to all the cylin- ders in the machine, while tle framing on the other side serves in like manner to receive and discharge the water.

Damping.—From the drying cans the cloth is passed on to the damping-machine, where it is uniformly moistened by an exceedingly fine spray of water thrown upon it. The spray is thrown up by a circular brush, the tips of which are allowed to dip into water in a trough over which it revolves. Mather and Platt have introduced a manifest improvement on this plan by throwing the water in fine jets on the brush from a pipe which runs parallel with it. By this means the quantity of water and degree of moisture can be regulated with the utmost nicety. Fig. 11 shows the damping-machine in section as modified by

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Fig. 11 i- Sieg 'Machine.

Mather and Platt. a@ represents the circular brush revolv- ing in a trough, and 6 is the pipe from which the water is squirted on the brush. The spray from the brush is confined by two sloping boards ¢, c, which work on quadrants, and the lever d raises or depresses the brush at

j Se

Fic, 12.—Elevation of Belt-Stretching Machine.

pleasure. The course of the cloth over the machine is indicated by arrows, and after damping it is batched on

BLEACHING

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an iron or wooden beam e, when it is ready for the process of beetling. When goods are to be finished of any parti- cular width, they are at this stage breadthened by such an apparatus as the belt-stretching machine of Mather and Platt shown in elevation in fig. 12 and in plan in fig, 13. In

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Fia. 138.—Plan of Belt-Stretching Machine.

this machine the full width of the cloth is obtained by the selvedges being held firmly by a belt and pnlley on each side, the pulleys revolving at such an angle that the stretch on the cloth has to compensate for the ditference in distance between these pulleys at A and B.

Beetling.—The beetles ordinarily employed are a series of long heavy wooden piles arranged in a frame. These piles are alternately raised and allowed to fall with their full weight against the beamed cloth by the revolution of a roller having a spiral serics of notches, which catch a corresponding range of projections on the piles. The beam with the cloth is made to revolve gently by a ratchet motion as it is submitted to this hammering, which goes on for two er three hours. Recently Mr John Patterson of Belfast has patented and introdnced a form of beetling-machine (fig. 14), which from its highly effective action

Fic. 14.—Patterson's Patent Beetle. "i

is likely to come into very extensive use. The advantages claimed for his machine over the common beetle Mr Patterson thus states: " Heretofore, the beetling of textile fabrics has been done by means of beetles, or stampers, falling upon the fabric by the action of gravitation, each stamper or beetle falling 55 or 60 times per minute through a space of 13 to 15 inches. This rate of speed cannot be accelerated by gravitation, and the consequence has been that in order to increase the quantity of work done by the ordinary beetles, very bulky and massive machinery has been employed, requiring large and expensive buildings and driving gear. The new beetling-machine requires not one-tenth of the space, very much lighter gearing, and

instead of making 60 blows per minute, each beetle makes from 420 to 500 blows per minute. The blows are not by the action of gravitation, but are actuated by a series of cranks cut upon a solid steel shaft. There are connecting rods from the steel cranks to semicircular springs. The beetles are attached to, or suspended between, the points of the semicircular springs by means of leather straps. When the crank shaft is set in motion the beetles are snatched up in regular sequence by the upward motion of the cranks, and the springs are compressed by the weight of the beetles, as in fig. 15, and by the combined upward motion of the cranks and the springs the beetle is thrown upwards with great impetus. The upward motion is stopped as the cranks pass the top centres, and the beetles are thus met by the springs and thrown violently into them, causing them to be again compressed, as in fig. 16.

Fria. 16. Hammers of Patterson's Beetle.

Fia. 15.

When by the downward motion of the cranks the springs are allowed to throw the beetles on the cloth beam, a rapid forcible whipping blow is imparted to the cloth, which does not cut or injure it in the manner often done by the slow dropping blows of the ordinary beetles. The weight of the blows can be instantly varied by varying the speed of the crank shaft, from the slightest touch to the heaviest penetrating blow. It is found that twice or thrice the number of folds of cloth can be beetled effectively on the cloth beams more than can be done on ordinary beetles, that is, instead of 200 folds onthe beam, 400 or 600 folds can be equally well beetled on the new machine." Calendering.—When it is desired to finish cloth with a stiff or with a glazed finish, instead of being submitted to the operation of beetling, it is finished in the calender. The calender, as its name xvAwvdpos implies, is a series of cylinders mounted above each other in a strong frame- work, The number of cylinders and the material of which they are constructed vary. In some only three cylinders or bowls are employed, and in others they are four or five. One or two of the bowls are made of metal, and two or three are either of wood, of condensed cotton, or of paper, and they must always be turned with great accuracy and be free from all warping.

Cylinders of paper or con- densed cotton have a very smooth surface and a consider- able amount of elasticity. Between these cylinders the cloth as it comes from the damping-machine is passed, and twice, thrice, or four times, according to the construction of the calender, it is powerfully pressed. The pressure gives the cloth a very even surface, condensing the fibres, and producesa shining lustre. When the cloth is submitted to friction, as well as to pressure in a heated calender, a glazed finish is produced. The frictional effect is produced by the cylinders being geared to move at different rates of rapidity, so that in their revolution they rub over the sur- faces of each other in addition to communicating pressure. Fig. 17 shows a finishing or friction calender in section. The metal cylinder a is made hollow so that it may be heated by the introduction of steam or gas, 6 and d are of compressed cotton or paper of the same diameter as a, and c is a smaller metal cylinder. The pressure of the cylinders is regulated by means of the screw ¢, and the compound lever f, which is adjusted by the double screw on the con-

necting rod at g. The cloth enters over stretching rails and rollers, passes through the calender in the manner indicated by the arrows, and is batched on roller A.

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Fia. 17.—Section of Calender.

Elastic Finish.—This particular kind of finish is applied to muslins and similar thin fabrics, and has to be done in highly-heated apartments called stentering stoves. Formerly the work was entirely done by manual labour, and con- sisted in holding the fabric by the selvedges, and pulling it

forward and backward while it was drying in the heated air. In this way the threads were made to rub against each other, and the cloth was thus deprived of the hard, stiff board-like appearance it would have possessed if left motionless when drying. Mr Ridgway Bridson was the first who introduced a machine which successfully supplanted hand labour in producing the elastic finish in muslins. His stentering frame is thus described :—Two horizontal rails or frames extend side by side the whole length of the machine, carrying at each end a large wheel or pulley, with small pins fixed at equal distances in its periphery. These pins pass through corresponding holes in an endless band which passes round the pulleys. On the surface of the endless bands are fastened very fine needle or tenter points to hold the selvedges of the fabric as it passes through the machine. The horizontal rails can be moved away from each other laterally, so as to stretch the fabric breadthwise. The rails are of equal length with the fabric to be treated, which is fastened ky the selvedges at one end to the centre pins, and the pulleys being set in motion, the entire piece is carried on and stretched out over the machine, and the rails are then moved outwards to breadthen the fabric. The elastic finish is given by communicating alternate vibrating motions to the two rails, by which a diagonal stretching is given to the muslin while in the process of drying.

At the conclusion of any of these various finishing processes, the goods are folded either in a plaiting-machine or by girls hooking plaits of definite length by the selvedges on steel spikes. The end of each separate piece is then stamped with some device or motto intended to serve as a trade-mark. After the goods have been regularly folded, they are placed piece by piece, separated by sheets of

pasteboard, in a Bramah press, and after a certain interval an iron plate is substituted for the pasteboard, to prevent any inequality in the pile. Finally, the folded pieces are prepared for the market by fastening a band of gilt and ornamented paper around each end, which with the imprinted device is in some way regarded as a guarantee of good quality.

The whole operations of bleaching and finishing occupy on an average eight days, although goods can be hurried through much quicker if

occasion arises. The cost, which of course will vary with the price of fuel and other cireum- stances, is very small as compared with the value of the material, and does not on an average, for shirting calicoes and the like, exceed 14d. per Ib weight of cloth.

BLEACHING or THREAD.

We have been favoured by Messrs J. and P. Coats of Paisley with the following outline of the processes in the bleaching of thread :—

1. The various Nos. of thread are prepared before boiling.

2. The first boil. The kier uscd is a common vomiter, into which are put water and a solution of caustie lye,—the proportions being regulated by the number of pounds of thread to be treated.

3. The first bleach. The thread is placed in a box, and a sieve let down upon it. Underneath the box is a well which is filled with water and ehlorine. 'The liquor is drawn up by a pump, and thrown upon the sieve, through which it passes, and filters through the thread into the well.

4. The thread is next moved into a souring-box, also covered with a sieve, where it is washed to take out the ehlorine of the pre- vious process.

5. A souring-well under the souring-box is now filled with water and sulphuric acid, and this mixture, called the sowr, is pumped wp on the sieve over the souring-box, through which it runs back into the souring-well, in the same manner as described in process No 3.

6. Before removing the thread from the souring-box it is washed with water through the sieve.

7. It is next washed in a washing-maehine,

8. The scald, or second boil in kier. Various mixtures are used for it. Some prefer black soap and crystals of soda; others use caustic lye.

9-13. Repetition of Nos. 3, 4, 5, 6, and 7.

14. The thread is now extracted, ¢.c., dried in hydro-extractors.

15. Stocking. The stocks are boxes about 3 ft. long, by 2 ft. wide, and 2 ft. deep, with a large wooden mallet hung in each, similar to those used in bleaching linen. The thread hanks having been properly prepared, so that they will not get loose, are put into the stoeks with a mixture of hot soap and water, and beat there till of the proper colour. It is then taken out, and

16. Washed in washing-machine, and

17. Iixtracted.

18. The blueing process is done in a box filled with a solution of water and extract of indigo. As mueh thread is put in as the box will contain. It is let stand for a time, after which it is taken out and thrown on a barrow.

19. It is next taken to extractor and dried, and

20. Placed in the stove. After being a sufficient time there it is

21. Removed to cooling shed, where it is hung up to cool.

22. It is now taken to stretching-machine, where it is passed over hot rollers to take out the curl and moisture received in cool- ing shed.

23. Taken to warehouse, where Nos, are classed and made up in bundles.

BLEACHING oF LINEN.

The bleaching of linen is a much more tedious and difficult operation than the bleaching of cotton. The process of water-retting, or rotting, by which the fibre is separated from the woody portion of the stalk, lodges a large proportion of colouring matter in the fibre, with which it euters into very intimate combination. The amount of colouring matter which has thus to be dealt with in the bleaching of linen is very great, being as much as one-third of the entire weight of the fibre. In the early part of the century a great amount of public attention was given toa plan proposed by Mr James Lee for preparing flax fibre without the process of steeping or retting, by

| manner by the Irish Linen Board.

BLEACHING

which it was affirmed that, among other advantages, it would only be necessary simply to wash, in soap, linen fabrics made from fibre so prepared, to render them pure and white. Mr Lee obtained a special Act of parliament allowing the specification of his patent to remain sealed for seven years, and his plans were entered into in a most full and laborious After the expenditure of many thousands of pounds on his machines and experi- ments, the plan had to be entirely abandoned as a failure, More recently, Chevalier Claussen renewed the attempt to prepare flax without steeping, by breaking it by means of machinery, separating the refuse part of the stalk from it, and then by a chemical process splitting the hollow fibres, so as to reduce them to a soft cottony state fit for spinning by means of the cotton-spinning machinery. The fibre was proposed to he split by steeping the prepared flax in a solution of carbonate of soda, and then plunging it into dilute sulphuric acid. The sudden evolution of carbonic acid gas within the hollow tube of the flax was said to have the effect of splitting up the fibre and reducing it to fine flat threads possessing the felting properties of cotton. Sir Robert Kane, in his Report to the House of Com- mons, May 20, 1852, states that the whole process failed, The machinery for the beating and cleansing of the flax failed to separate it sufficiently from the refuse part of the stalk ; and the chemical process for the splitting of the hollow tube only broke up small portions of the exposed ends, leaving the greater portion untouched. Various other plans of preparing flax fibres without water or dew- retting have from time to time been proposed and patented, but hitherto none of them has stood the test of extended practical operation. Till towards the end of last century the bleaching of linen both in the north of Ireland and Scotland was accomplished by bowking in cow's dung and souring with sour milk. In the year 1764 Dr James Ferguson of Belfast received a premium of £300 from the Trish Linen Board for the application of lime in the bleaching of linen. Notwithstanding this reward the use of lime in the bleaching of linen was for a long time after- wards forbidden in Ireland under statutory penalties, and so late as 1815 " Mr James Barklie, a respectable linen-bleacher of Linen Vale, near Keady, was prosecuted for using lime in the whitening of

linens in his bleach- yard." The bleaching of linen to the present day is conducted much more in the primitive fashion of last cen- tury than is the practice with cotton-bleaching. Owing to the stiffness and inelasticity of flax fibres, a great part of the machinery used for cotton is not available for linen, and solutions of acid and bleaching-powder require to be used in a very dilute condition for linen fabrics, involving frequent repetitions of the various processes before a satisfactory white is produced. " Crofting," or exposure to the air on grass, is also very largely resorted to in the bleaching of linens, especially for plain shirting and sheeting, which necessitates the possession of very extensive grass parks in connection with works, and renders the pro- cess both tedious aud subject to the influences of the weather. A large proportion of linen cloth is half-bleached or improved in the yarn before being woven, and it con- sequently requires less bleaching than that which comes in its original "green" condition. The following isan outline of the two chief methods, with and without crofting, as pursued in the principal Scotch linen bleachfields at the present day :—

J, WirHovut Crorrine.

1. Limed. 4. Soured with hydrochloric 2. Boiled in open kier for about acid, and piled in sour for 6 hours. some hours. 3. Washed at washing-mill or | 5. Washed at stocks. stocks.

BLEACHING

6. Boiled in soda-ash for 8 or| 10. Boiled in alkali for 6 or 7 10 hours. hours. 7. Again boiled. 11. Liquored in chlorine solution. 8. Liquored in chlorine solution; 12. Washed. and piled up. 13. Soured with sulphuric aeid. 9. Washed. 14. Washed.

When necessary the processes from 10 to 14 are repeated. The whole processes occupy, ou an average, four weeks.

Il, Wiru CRrorrtine.

1. Boiled in lime. 10. Liquored. 2. Washed. 11. Washed. 3. Soured. ' 12. Soured with sulphuric acid. 4, Washed. 13. Washed. 5. Boiled in alkali and washed. | 14. Boiled in alkali. 6. Exposed on grass 3 or 4 | 15. Liquored.

days. 16. Washed. 7. Boiled in alkali. 17. Soured with sulphuric acid. 8, Washed. 18. Washed, and proeesses 14 to 9. Exposed on grass. 18 repeated if required.

With exposure on the grass the bleaching of plain linens usually occupies from 4 to 6 weeks. The finishing processes arc essentially the same as in the case of calicoes. The following are the stages in finishing linen damasks :—

. Nipped in squeezcrs. 7. Calendered.

. Blued in ultramarine in blue-| 8. Dried on steam eans. ing-water inangle. 9. Again calendered.

. Starched in starching-mangle.| 10. Viewed to deteet rust spots

. Dried on steam cans. and holes.

. Damped with fine spray. 11. Lapped.

. Beetled. 12. Pressed in hydraulic-press.

Charles Tennant of St Rollox made some experiments in 1831 to determine by which parts of the proeess the chief loss was sustained during bleaching. The result was that in 1000 parts by weight, linen yarn lost—

In the now abandoned fermenting alkaline steep 57 parts.

SOUR OO pre

In 4 boils with eaustic soda@.....0…...c0cs0seecse ee 0 3 In 4 steeps with chloride of lime….....0.. Mi o¢ PAA CCC MONIT, THEMSOUT .....ccccccecesenssne © sseees cae, HDRES] cr mceeusininesea telat 315 parts in 1000.

BLEACHING oF Parer-Maxina MATERIALS.

In addition to cotton and linen rags, esparto or Spanish grass (Macrochloa tenacissima) is now very largely used for the manufacture of the better classes of paper. Wood, especially the wood of the aspen (Populus tremula),

is also now applied as a paper-making material. Jute has been used for printing paper, and straw is very largely employed, but chiefly for brown and packing papers. These and the numerous other substances used for paper-making are all reduced to the condition of ‘ half-stuff” before they come to undergo the operation of bleaching, and the treatment they receive in this stage varies only in the amount of whitening required, and consequently in the proportions of bleaching solution used. It is therefore unnecessary to notice more than the process followed in the bleaching of the “ half-stuff,” which in Great Britain is very frequently prepared from a mixture of esparto fibre and rags. The bleaching solution of chloride of lime is either prepared in specially constructed cisterns, fitted with revolving agitators and stored in a reservoir for use, or prepared for immediate use in a wooden vessel. When the solution is made up to the requisite strength, and all insoluble sediment has sunk to the bottom of the vessel, it is ready for pouring into the engine. From 4 to 10 tb of ordinary bleaching-powder are used for every 100 ib of rag half-stuff, but a much larger proportion is required for esparto. Sulphuric acid in not more than a proportion of 1 fb to 4 tb of bleaching-powder is thereafter added in a highly dilute condition, and the whole, after mixing in the engine, is turned into the drainer, which is a large tank provided with a false bottom of per- forated wood covered with wire-netting or bagging. In some cases the bleaching-liquids are not added to the pulp material till it is deposited in the drainer; and the acid

solution may be poured in first, or both solutions may be alternately used in small quantities. The bleaching process is sometimes carried on in separate engines constructed of materials not affected by the corrosive action of acid sub- stances. Drained half-stuff may also be bleached in a suitable apparatus by the direct application of chlorine gas.

It is of the greatest importance to free the pulpy material from the last traces of chlorine before it is made into paper, as it would react upon the manufactured product and render it brittle. To eliminate the free chlorine and acid, &kc.,

the pulp is washed in the beater with pure water till it

ceases to redden litmus paper, or give other characteristic indications of the presence of such compounds. 'The pre- judicial effects of chlorine and its combinations are also overcome by the addition of ' antichlor," the hyposulphite of soda or of lime, which forms with them compounds that do not affect the colour of the paper, although it is desir- able, as far as possible, to reinove such compounds also by washing with water.

BLEACHING OF STRAW.

The fine wheat-straw used in Tuscany and elsewhere for straw-plaiting, after being cut, dried, and tied up in bundles, is stacked for a month. It is then spread out in a meadow, and exposed to the action of the sun and air, being frequently turned during that period, The lower joint of the straw is then separated, leaving only the upper joint with the ear attached,—this being the only part of the straw used. It is then steamed, and after that exposed to the action of sulphurons acid gas prepared by burning sulphur, which complete the bleaching. It is then tied up in bundles, in which state it is ready for the market. In the strawplait-making centres of Great Britain—Luton, Dunstable, &c., in Bedfordshire—straw is bleached, chiefly after plaiting, by the influence of sulphurous acid gas.

WHITENING AND CLEANING Prints, Mars, Books, AND OTHER ARTICLES OF PAPER.

Chlorine was first applied to this purpose by Chaptal, and his method was employed with the greatest success by Vialard and Heudier, who by Chaptal's process restored several of the most valuable books of the French National Library. Chaptal's modus operandi is thus described in his own words :—

"They begin by unsewing the book and separating it into leaves, which they place in cases formed in a leaden tub, with very thin slips of wood or glass, so that the leaves, when laid flat, are separ- ated from each other by intervals scarcely sensible. The acid is then poured in, making it fall on the sides of the tub, in order that the leaves may not be deranged by its motion. When the work- man judges, by the whiteness of the paper, that it has been suf- ficiently acted upon by the acid, it is drawn off by a cock at the bottom of the tub, and its place is supplied by elear fresh water, whieh weakens and

carries off the remains of the acid, as well as its strong smell. The leaves are then to be dried, and, after being pressed, may be again bound up.

‘«The leaves may be plaeed also vertically in the tub; and this position seems to possess some advantage, as they will then be less liable to be torn. With this view I constructed a wooden frame, which I adjusted to the proper height, according to the size of the leaves which I wished to whiten. This frame supported very thin slips of wood, leaving only the space of half a line between them. I plaeed two leaves in each of. these intervals, and kept them fixed in their place by two small wooden wedges, which I pushed in be- tween the slips. When the paper was whitened, I lifted up the frame with the leaves, and plunged them into cold water, to remove the remains of the acid, as well as the smell. This process I pre- fer to the other.

*‘*By this operation books are not only cleaned, but the paper acquires a degree of whiteness superior to what it possessed when first made. ‘The use of this acid is attended also with the valuable advantage of destroying ink spots. This liquor has no action upon spots of oil, or animal grcase ; but it has been long known that*

a weak solution of potash will effectually remove stains of that kind.

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“When I had to repair prints so torn that they exhibited only scraps pasted upon other paper, 1 was afraid of losing these frag- ments in the liquid, because the paste became dissolved. In such cases I enclosed the prints in a cylindrical glass vessel, which I in- verted on the water in which I had put the mixture proper for ex- tricating the oxygenated muriatic acid gas. This vapour, by filling the whole inside of the jar, acted upon the print, extracted the grease as well as ink spots, and the fragments remained pasted to the paper.”

A solution of peroxide of hydrogen (H,O,) has been used with great success in the restoration of valuable prints, as well as for cleaning and reviving oil painting darkened by the action of sulphurous vapours.

BLEACHING oF Woot.

The bleaching of wool and animal fibres generally is a much simpler and less important operation than is the whitening of vegetable fibres. Wool is covered with a peculiar varnish or greasy matter which impairs its qualities, and which it is the object of the bleacher to remove. 'To this varnish the name of " yolk," or "suint" is given. It is a fatty unctuous matter, chiefly derived from the cutaneous perspiration, but, no doubt, also secreted by the pores of the wool itself ; and it imparts that peculiar heavy odour to sheep with which all must be familiar. From the researches of Vauquelin it would appear that this unctuous varnish consists chiefly of a kind of soap, together with a small quantity of waxy matter, a peculiar odorous animal substance, a mixture of potash salts, and a little lime. This varnish, in consequence of its soapy nature, is soluble in water, so that washing in pure water would remove the greater portion of it; but it is found more advantageous to remove it by the process termed " scour- ing."

Scouring is performed by means of an ammoniacal lye, prepared of river or other soft water mixed with stale purified urine, which is found to contain a large quantity of ammonia, upon which its action probably depends. The mixture is heated by steam to a temperature at which the hand of the workman can be easily held in it for a considerable time. In this bath the wool is left for from half an hour to two hours, according to the quantity of greasy matter it contains. It is then to be taken out and drained into a basket, so that the drainings may drop into the vessel in which it was steeped, that nothing may be lost. It must now be completely rinsed by exposing it in baskets to a continuous stream of clear water, while a workman is perpetually employed in stirring it with a pole, till the water passes off perfectly clear. As a substitute for urine pig's dung is sometimes used, and various other substances have been proposed and introduced, such as ammoniacal salts, soda-ash, phosphate of soda, and soluble glass. Recently a machine, Petrie's wool-washer, has been introduced for scouring wools. It consists of a range of three or four long tanks, clean water entering at one end of the series and flowing through the whole. The wool is introduced at the end of the range where the water escapes, and where it is consequently most highly charged with the impurities of the washing process, and it is carried forward from one tank to another till it is lifted out at the point where the pure water enters.

It is known that the wool is properly scoured by its filaments being smooth, long, slender, white, and pertectly free from foreign substances, and not having lost their natural tenacity. If this scouring be properly done there is no need of further washings in soaps, or otherwise, till the wool is subjected to the process called '" sulphuring ;" and in point of fact it is very rarely passed through any other pro- cess. Some, however, recommend for the finer wools, where a very delicate white is wished, that they should be passed through one, two, or more baths of soft soap. No caustic

alkaline lyes can be employed, as they destroy the wool altogether, dissolving it, and forming with it a kind of soap.

The process of sulphuring is applied to yarns and woven goods only when they are intended to be finished white or light bright colours. Formerly, the method of sulphuring woollen goods was to expose them in a close apartment to the vapour of burning sulphur. The goods were hung on poles, and when the chamber was filled, a quantity of sulphur placed in very flat and broad dishes was allowed to burn away gradually in the chamber, while every aperture by which the vapour could escape was carefully closed. After exposure to the sulphurous acid vapours from six to twenty-four hours the bleaching process was complete, and the goods withdrawn from the chamber. The same process is now much more expeditiously performed by Thom's sulphuring process. The goods are passed on a long chain up and down over a series of rollers in a small chamber filled with sulphurous acid vapours, and a few minutes suffice for the operation. Sulphite of soda acidified with hydrochloric acid is also used in France for the bleaching of woollen fabrics.

Cloth which is to be finished white after the sulphuring process is run through a bath containing some indigo carmine, which increases the brilliancy of the white. When it is to be dyed it is treated with dilute sulphuric acid, thoroughly washed, and dried.

BLEACHING OF SILK.

Raw silk is covered with a kind of varnish, the nature of which was first thoroughly investigated by M. Roard. He showed that this varnish, instead of being a gum, as was usually believed, resembled a mixture of bees' wax and oil, with a resinous colouring matter, and in raw silk constituted 23 or 24 per cent. of the weight. The varnish is soluble in water, and affords a solution which forms a lather like soap. The yellow varnish is of a resinous nature, and is insoluble in water, but is soluble in alcohol. The waxy substance exists in all silks, but the whiter the silk the less wax does it contain.

The comparative composition of yellow and white raw silk is shown by M. Mulder's analysis :—

Yellow. White. PUDROMBES.... ise 'icdasecederssumnsondrvoes eee 53°37 54°04 (elAtIMGN…..csrccverecsemer cst ce eeen naman 20°66 19°08 PPC is. ws daw neta conte qucsne came 24°43 25°47 A/c eee Re Ben doncrEAnbedetasade oneaaadecon 1°39 WU Coloirmagmimiter s,s… scr. +. -10 sees 0°05 ie Fatty and resinous matter …..... ....4 0°10 0°30

This varnish, or " gum," as it is technically called, gives the silk a stiffness and elasticity which, for many of the purposes to which silk is applied, it is desirable to remove. This is called "ungumming" by the bleachers of silk. Though many different processes have been suggested for this purpose, none seems to answer so well as the old pro- cess of scouring in a weak solution of soap. If, however, the silk be kept in the soap too long after the varnish is removed, it begins to lose bedy, and has its qualities impaired, becoming dull, stiff, and discoloured, in conse- quence of being partly dissolved. White or yellow silks may be completely scoured in one hour in the soap bath, using about 15 fb of water for each pound of silk, and a suitable quantity of the finest soap. The soap and silk should be put into the water half an hour before it is brought to the boiling point, and then be boiled one hour. They are then removed, wrung out, washed in pure water, and either exposed to the vapour of sulphur or passed through a solution of sulphurous acid gas in water.

The following is the process usually followed by the scourer of silks. A quantity of water is put into a boiler over a fire, and for every 100 ib of silk to be scoured, 30 fb

of very fine soap are dissolved. The solution is generally boiled ; but before the silk is put into it, the heat must be lowered to about 90° Fahr., and at this temperature it must be kept during the process. The silks are to be hung in the liquor on rods or frames, and left till the gum is suffi- ciently destroyed,—care being taken to alter their position now and then, so that every part may be exposed to the action of the bath. When perfectly ungummed, they are flexible and of a dull whiteness ; in this state they are to be wrung out to clear them of the soapy water, then well shaken, and put into coarse linen bags, in parcels of from 20 to 30 1b each.

These bags are now to be steeped in a fresh bath, or, as the workmen say, are to be baked. The bath is prepared in a manner and proportion much as before, except that the quantity of soap may be somewhat diminished as the heat is to be increased ; for the silk is now to be boiled for an hour and a half, taking care to keep the bags from sticking to the bottom of the boiler, by frequently stirring them with a stick. Tor silk that is intended to be dyed, the former steeping in the lukewarm soap-batn is unneces- sary, and the boiling only is employed, using a greater quantity of soap in proportion to the fineness of the colour. After boiling the silk is wrung as before, and then washed, and if it is found to be not sufficiently or not uniformly scoured, it must be submitted to a fresh bath.

The white silk usually sold has a bluish shade given it by a bath impregnated with litmus or indigo. This is prepared by dissolving a pound and a half of fine soap in about 90 gallons of water, in which a small quantity of litmus or indigo has been diffused. This process gives to the silk the tints known by the names of " silver white," "azure white," and "thread white," according to the depth of shade which has been imparted. The " China white" tint is given by adding arnotto to the bath instead of indigo.

From these processes the silk acquires a tolerably clear white, but the highest degree is given to it by the action of sulphurous acid, the silk being either, as is usually the ease, subjected to the acid in the state of vapour, or im- mersed in a solution. At Lyons no soap is used in the tinting process ; but, after being boiled, the silk is washed, wrung dry, sulphured, aud then passed through water pro- perly blued.

BLEACHING OF BrxEs'-Wax, &o.

Bees'-wax in its raw conditicn, as it is first melted up from the comb, is a yellowish coloured substance somewhat greasy to the touch, and having a faint honey-like odour. It often contains mechanical impurities, besides traces of honey, and to remove these and discharge the colour the following process 1s adopted :—The wax is broken up into small pieces and melted in a copper boiler, with water sufficient to keep it from burning. When nielted it is run into a tub containing hot water, and while in the hot fluid condition the mechanical impurities it may have contained subside to the bottom. From this tub the melted wax flows

into a vessel, the bottom of which is perforated with small holes. Through these thin streams of wax are received on a cylinder kept revolving in water below ; and thus fine threads of solid wax are produced. These are exposed on moistened sheets to the air and light for some days, during which they are occasionally turued and watered. By this exposure the wax loses much of its colour. It is then melted up into solid blocks and left for some time, after which the operations of melting, forming into threads, and bleaching in the light are repeated till it has attained a pure white translucent lustre, is of very firm consistency, and is free from all odour. Yellow wax is also decolorized by treatment with nitric acid; but chlorine, although it bleaches most expeditiously, is not available, as it leaves traces incorporated with the wax, which on burning evolves irritating fumes of hydrochloric acid. Palm oil, used in the manufacture of soap and candles, is bleached by the action of bichromate of potash and acid.

For bleaching generally, but especially for the bleaching of animal fibres aud substances, the use of a considerable variety of processes, and of chemicals other than chlorine and sulphur compounds, have from time to time been proposed and to some extent put into operation. To some of these proposals incidental allusion has already been made, and generally their success has not been such as to warraut special notice. Among other substances which have been recommended for scouring wools and silk are feeble solutions of sulphides of sodium and of potassium, or aluminates of these alkalies, the cyanide of potassium, and a mixture of common salt and

oxalic acid. The alkaline permanganates have also been frequently regarded as hopeful bleaching chemicals; and a few years ago the permanganate of potash was introduced and used by MM. Tessié du Motay and Maréchal, who, in connection with the permanganate, used a solution of the peroxide of hydrogen. To this latter substance a peculiar bleaching application has recently been given. Under the name of golden hair water, or auricome, a liquid is sold by hair-dressers which is found to hold in solution a large percentage of peroxide of hydrogen. The use of this solution gives to the hair the brilliant golden yellow tinge which has come to be regarded as a highly fashionable colour. Other applications of this powerful oxidizing and re- ducing agent have been suggested by its toilet use, and it has been employed for the bleaching of ornamental feathers, hair, &e. Doubtless, if it could be prepared in stable solution at moderate price it would be found extensively useful in bleaching and other industrial applications. It has also long been hoped that a means of applying ozone as a direct bleaching agent might be devised, but hitherto little success has been attained in this direction. In Germany ivory is bleached by steeping it a week in light naphtha or other volatile oil, and exposing it thereafter to the air and sunlight, by which the atmo- spheric oxygen becomes ozonized in contact with the ivory and thus whitens it. (J. PA.)

BLEEK, Friepricn, one of the greatest Biblical scholars that Germany has produced in modern times, was born on the 4th July 1793, at Ahrensbok, in Holstein, a village near Liibeck. While attending the elementary school there, he gave evidence of such ability that his father sent him, after he had acquired some knowledge of Latin and Greek, in his sixteenth year, to the gymnasium at Liibeck, where he spent three years, and there imbibed so great a love for the languages of antiquity, that he abandoned the idea of a legal career, which he had once entertained, and resolved

to devote himself to the study of theology. After spending some time at the University of Kiel, he repaired to Berlin, and there, from 1814 to 1817, enjoyed the instructions of De Wette, Neander, and Schleiermacher. The teaching of these distinguished men, especially of the last named, exercised a decisive influence upon the whole of his after life. So highly were his merits appreciated by his pro- fessors—Schleiermacher was accustomed to

say of Bleek that he possessed a special charisma for the science of "Tutreduction "—that in 1818, after he had passed the

necessary examinations for entering the church, he was recalled to Berlin to occupy the position of Repetent or tutor in theology, a temporary post which the theological faculty had obtained for him, with a view of retaining his services in connection with that department of the university. In this position, besides discharging his duties in the theo- logical seminary, he published, in Schleiermacher's and Liicke's Journal (1819, 1820, 1822), two dissertations, one on the " Origin and Composition of the Sibylline Oracles," and another on the " Authorship and Design of the Book of Daniel." These articles attracted much attention, and were distinguished by those qualities of solid learning, thorough investigation, and candour of judgment, which characterized all the productions of his pen. Bleek's merits as a rising scholar were recognized by the minister of public instruction, who continued his stipend as Repetent for a third year, and promised further advancement in due time, But the attitude of the political authority underwent a change. The excitement caused in academic circles by the dismissal of De Wette from his professorship in 1819, in consequence of certain injudicious expressions in the letter of sympathy which he had written to the mother of Sands, the murderer of Kotzebue, had not died out, and the odium and punishment which fell upon De Wette were shared in a greater or less degree by his friends. Bleek, who had been a favourite pupil, of the banished professor, incurred the suspicion of the Government as one who was believed to hold extreme democratic opinions. Not only was his stipend as Mepetent discontinued, but his nomina- tion to the office of extraordinary professor, which had already been signed by the minister Altenstein, was with- held for two years. The mystery at last was cleared up. Bleek had been confounded with another individual of a similar name, one Baueleven Blech. Tardy justice was at length done, and in 1823 Bleek received the appoint- ment to which his merits so well entitled him.

During the six years that Bleek remained at Berlin he twice declined a call to the office of ordinary professor of theology, once to Greifswald and once to Kénigsberg. In 1829, however, he was induced, on the dcath of Liicke, to

accept his chair in the recently-founded university of Bonn, and entered upon his duties there in the summer of the same year. For the space of thirty years he laboured with ever increasing success, attracting students to his lectures, not by any attractions of manner nor by the enunciation of novel or bizarre opinions on theological subjects, but by the soundness and thoroughness of his investigations, the remarkable impartiality of his critical judgments, and the exceeding clearness of his method of presentation. In 1843 he was raised to the office of consistorial councillor, and was selected by the university to hold the office of rector, a distinction which has not since been conferred upon any theologian of the Reformed Church. After a long and honoured academic life he died suddenly of apoplexy on the 27th February 1859, having been able to lecture to his students as usual on the previous day.

Bleek's works belong entirely to the departments of Biblical criticism and exegesis. His great merits as a critic and exegete consist, as has been already observed, in the thoroughness of his investigations, and especially in the candour of his judgment. The latter quality, indeed, he possessed in so remarkable a degree, that, as a recent writer has remarked, it has become " proverbial." His views, indeed, on questions of Old Testament criticism would be regarded in this country as those of the "advanced " school; for on all the disputed points concerning the unity and authorship of the books of the Old Covenant he was led to form conclusions opposed to received opinions. But with respect to the Mew Testament, his position was highly conservative. His defence of the genuinencss and

authenticity of the gospel of St John is still regarded as the ablest that has yet appeared; and although, oa some minor points, his views did not altogether coincide with those of the traditional school, his critical labours.on the New Testament must nevertheless be regarded as among the most important contributions to the maintenance of orthodox opinions that the present century has produced, Bleek's works were published partly during his lifetime, and partly after his death. His greatest work, his commentary on the epistle to the Hebrews (Brief an die Hebriier erluutert durch Hinleitung, Uebersetzung, und fortlaufenden Commentar) appeared in three

parts, in 1828, 1836, and 1840 respectively. Of it De Wette said that "It was so distinguished for comprehensive learning and thorough untiring industry, for so pure and transparent a love of truth and so profound a theological feeling, that it was entitled to one of the foremost, if not the very foremost, place among the exegetical works of our time;" and Delitzsch adds that "every one acquainted with the subject will endorse the judgment." This work was abridged by Bleek for his college lectures, and was published in that condensed form after his death by Pfarrer Windrath in 1868, In 1846 he published his contributions to the criticism of the gospels (Bettrdge zur Evangelien Kritik, pt. i.), which contained his defence of St John's gospel, and which arose out of a review of Ebrard's JVissenschaftliche Kritik der Evangelischen Geschichte.

After his death were published—(1), his Introduetion to the Old Lestament (Einleitung in das Alte Testament), 3d edition, by his pupil Prof. Kamphausen, 1869, English translation, by Venables (from 2d edition), 1869; (2), his Introduetion to the New Testa- ment, 8d edition, Mangold, 1875, English translation, by Urwick, 1869, 1870; (8), his Exposition of the first three Gospels, by Holtz- mann, 1862; (4), his Leeéwres on the Apocalypse, English transla- tion, 1875. Besides these there has also appeared a small volume containing Leetures on Colossians, Philemon, and Ephesians, Berlin, 1865. Bleek also contributed many articles to the Studien und Kritiken. For further information as to Bleek's life and writings the reader is referred to Kamphausen's article in the Darmstadt Aligemeine Kirehen-zeitung, 1859, No. 20; to the same writer's article in Herzog's Real-Eneyklopedie, vol. xix.; and to Lichten- stein's [istotre des Idées Religicuses en Allemagne, vol. iii. ; and to Diestel's Gesehiehte des Alten Testamentes, 1869. (F.Co

BLEEK, WityHetm Hetnrich IMMANUEL, son of the preceding, distinguished by his researches in African philology, was born in 1827 at Berlin. He studied first at Bonn and afterwards at Berlin, where his attention was directed towards the philological peculiarities of the South African languages. In his doctor's dissertation (Bonn, 1851), De nominum generibus linguarum Africe Australis, he endeavoured to show that the Hottentot language was of North African descent. In 1854 his health prevented him accompanying Baikie in the expedition to the Niger ; but in

the following year he accompanied Bishop Colenso to Natal, and was enabled to prosecute his researches into the language and customs of the Kaffres. Towards the close of 1856 he settled at Cape Town, and in 1857 was appointed interpreter by Sir Gecrge Grey. In 1859 he was compelled by ill-health to visit Europe, and on his return in the following year he was made librarian of the valuable collection of books presented to the colony by Sir George Grey. In 1869 he visited England, where the value of his services was recognized by a pension from the Civil List.. He died at Cape Town on the 17th August 1875. His works, which are of the first importance for African and Australian philology, consist of the Vocabulary of the Mozambique Language, Lond., 1856 ; Handbook of African,

| Australian, and Polynesian Philology, Cape Town and Lond., 3 vols, 1858-63; Comparative Grammar of the South African Languages, vol. i., Lond., 1869 ; Reynard the Fox in South Africa, or Hottentot Fables and Tales, Lond., 1864; Origin of Language, Lond., 1869.

BLE—BLI

BLENHEIM (German, BuinpHEIM), a small village of Germany, in the kingdom of Bavaria, and circle of Swabia, situated on the left bank of the Danube, a few miles below Hochstiidt. It is only remarkable as the scene of the defeat of the French and Bavarians, on the 13th of August 1704, by the English and the Austrians under the duke of Marlborough and Prince Eugene. Population, 751.

BLENHEIM HOUSE, a princely mansion erected by Parliament for the duke of Marlborough at Woodstock, near Oxford, and, with the manor of Woodstock, settled on the duke and his heirs, in consideration of his military services, and especially his decisive victory at Blenheim. The large sum of £500,000 was voted for the purchase of the manor and the erection of the building, which, notwithstanding the strictures of Swift and the criticisms of Evans and Walpole, is a magnificent pile, built by Sir John Vanbrugh, in a massive Italo-Corinthian style. The front from wing to wing extends to 348 feet ; and the great hall is a lofty and noble apartment in good proportions. There are a considerable number of fine pictures in the Blenheim collection, the most noted being "The Young St Augustine and Pope Gregory," by Titian ; " Europa," " Esther," and "' The Massacre of

the Innocents," by P. Veronese ; "St Jerome," by Tintoretto ; " Magdalen," by C. Dolce; many historical subjects, by Rubens ; portraits by him and Vandyck ; and " The Woman taken in Adultery," and 'Isaac blessing Jacob," by Rem- brandt.

BLESSINGTON, Marcaret Power, CoUNTESS OF, novelist and miscellaneous writer, was born near Clonmel, Tipperary, Ireland, September 1, 1790. Her childhood was made unhappy by the bad temper, improvidence, and loose living of her father, and by the reduced circumstances of the family. Her early womanhood was made unhappier still by her compulsory marriage at fifteen to one Captain Farmer, whose drunkenness involved him in debt, and whose debts brought him to the King's Bench prison, where he was killed by a fall in one of his drunken fits, in October 1817. His wife had some time before left his house, and in February 1818 she was married a second time to the earl of Blessington. Celebrated for her wit, her literary accomplishments, her generosity, and her social attractions, she was no less distinguished by her passion for pleasure and her craving for show and a high style of living. In the gratification of these tastes debts were accumulated, and the estates of the earl soon became burdened with " incum- brances." In the autumn of 1822 they set out on a Con- tinental tour, and remained abroad till the death of the earl, which took place at Paris in May 1829. Some years earlier they had become acquainted with Count Alfred d'Orsay, a man of fashion and seeker of pleasure, who was then serving in the army, but quitted it for the sake of joining them. In 1827 he had connected himself with the family by his marriage with the only daughter of the earl by a former wife. After Lord Blessington's death Count d'Orsay, who had separated from his wife, came to England with the countess, and they lived together in London till her death. The home of the beautiful and brilliant coun- tess (first Seamore Place, and afterwards Gore House, Kensington) became a centre of attraction for whatever was distinguished in literature, learning, art, science, and fashion. Ambitious of the distinction of authorship, Lady Blessington had published in 1822 her first work entitled Sketches, in two volumes. Ten years later she made herself favourably known by a Journal of Conversations with Lord Byron, which appeared first in successive numbers of the New Monthly Magazine, and soon afterwards as a separate work. This was followed by a long series of works, most of them novels of high

life, several of which obtained con- siderable popularity. Her /dler an Italy and Idler un

France were rendcred temporarily attractive by personal gossip aud anccdote, descriptions of naturc, and senti- ment. Lady Blessington was for some years editor of Heath's Book of Beauty and the Keepsake, the popular annuals of the day, and also contributed largely to magazines and newspapers. Early in 1849, in consequence of failing resources, the splendours of Gore House were extinguished ; its furniture and decorations were sold to pay debts, and its presiding genius withdrew to Paris, whither her friend Count d'Orsay had previously gone. She died there, June 4, 1849. Her Juterary Life and Correspondence, 3 vols., edited by R. R. Madden, appeared in 1855,

BLICHER, SteEN StTEENSEN, Danish lyrical poet and novelist, was born at Vium in Viborg, Jutland, on the 11th October 1782. He was extremely delicate in constitution, and after having passed a year or two at the university, which he joined in 1799, was compelled to give up his studies on account of a consumptive complaint. He accepted a situation as tutor in a family at Falster, and by vigorous physical exercise and flute-playing succeeded in restoring himself to health. He afterwards returned to the university, and completcd his course in 1809. Several years were then spent at his father's parsonage, preparing for the ministry and managing the farm. In 1819 he was called to the church of Thorning, and in 1825 to a more remunerative charge at Spentrup. Here he died in 1848. Blicher was first known by his translations of Ossian, but his early poems did not attract much attention, He then contributed to a literary journal, the Nordlyset, in which appeared the first of his Jutland tales (Jydske Romanzer). The popularity of these romances was surpassed by that of the National Noveller, which give an admirable picture of country life in Jutland. His collected poems, soine of which had appeared as early as 1814, were published in 2 vols., 1835-36 ; the novels appeared in 5 vols., 1833-36. A short sketch of his own life and character was prefixed by him to the complete collection,—Old and New Novels (Gamle og nye Noveller) 7 vols., 1846-47, Blicher also translated Goldsmith's Vicar of Wakefield.

BLIDAH, the chief town of an arrondissement in the province of Algiers in Algeria, about 30 miles inland from the capital, on the railway from that city to Oran. It lies at the base of the Algerian Atlas, in the midst of the fertile plain of Metija, and is beautifully surrounded with orchards and gardens, which afford a pleasant contrast to its ramparts and towers. Ithas well-built modern strects with frequent arcades, and numbers among its buildings several mosques and churches, a Franco-Arabic and a Protestant school, extensive barracks, and a military hospital. Water is abundantly supplied by an aqueduct fed by the Oucd-el- Kebir. As the centre of a flourishing district and a post on one of the main routes in the country it enjoys an extensive traffic, and the inhabitants maintain a thriving trade in oranges, raisins, grain, cotton, and tobacco. The products of the neighbouring copper-mines and of the cork- tree and ¢edar-groves are also of importance. In the vicinity are the two villages of Joinville and Montpensier, which owe their origin to the military camps established by Marshal Valce in 1838; and on the road to Medeah are the tombs of the Marabut Mohammed-el-Kebir and his two sons. Blidah was a town of some impertance under the Turks, but in 1825 it was nearly destroyed by an earthquake. It was not till 1838 that it was finally held by the French, though they had been in possession for a short time eight years before. In 1867 it suffered from another earthquake which also nearly ruined the village of Chiffa. Population in 1872, 8113.

BLIGH, Wittiam, admiral, was born of a good family in the south of England in 1754. He accompanied Captain

Cook in his second expedition as sailing-master of the "Resolution," and in 1787 was despatched to the Pacific in command of H.M.S. " Bounty," for the purpose of introduc- ing into the West Indies the bread-fruit tree from the South Sea Islands. Bligh sailed, in 1787, from Otaheite, where he had remained about six months; but, when near the Friendly Islands,a mutiny broke out on board the "Bounty," headed by Fletcher Christian, the master's mate, and Bligh, with eighteen others, was set adrift in the launch. This mutiny, which forms the subject of Byron's Jsland, did not arise so

much from tyranny on the part of Bligh as from attachments contracted between the seamen and the women of Otaheite. After suffering severely froin hunger, thirst, and storms, Bligh and his companions landed at Timor in the East Indies, having performed a voyage of about 4000 miles in au open boat. Bligh returned to England in 1790, and he was soon afterwards appointed to the " Providence," in which he effected the purpose of his former appointment by introducing the bread-fruit tree into the West India Islands. He showed great courage at the mutiny of the Nore in 1797, aud in the same year took part in the battle of Camperdown, where Admiral Duncan defeated the Dutch under De Winter. In 1801 he commanded the "Glatton" at the battle of Copenhagen, and received the per- sonal commendations of Nelson. He was subsequently made governor of New South Wales, and vice-admiral of the blue. Hedied at London in 1817. He was an active, persevering, and courageous officer, although, perhaps, somewhat exacting in his manner.

BLIND. The blind, as a class, are limited to such narrow spheres of action that those unacquainted with the subject fail to realize how large a number of the human vace are deprived of sight. In the temperate regions of the globe about 1 in every 1000 of the population is blind, but in less favourable climates the percentage 1s much greater. When we consider what medical skill has already accomplished in Europe aud America, not only for the relief but the positive prevention of blindness, we may readily conclude that in warmer and less civilized countries the class is more numerous and their condition more de- plorable.

We rejoice that much can still be done by proper care and treatmeut to prevent blinduess ; for instance, ophthal- mia of infants is a very common cause, and ought not to terminate in loss of sight, which in most cases results from neglect and dirt. Glaucoma is also a fruitful source of blindness, invariably causing loss of sight if left to itself ; but, thanks to Professor Grife's brilhant discovery, these cases are generally curable if operated on early. Another very common cause of blindness is serious injury to one eye, which is thus lost, and if the injured organ be not at once removed, sympathetic inflammation and destruction of the other is very apt to follow, resulting in total blind- ness ; whereas, if the injured eye be at once removed the other is generally preserved.

Loss of sight from small-pox is now comparatively rare, owing to the general practice of vaccination, but much undoubtedly may still be done towards diminishing the frequency of blindness by further advances in the art of treating eye-disease, and especially by spreading among all classes a knowledge of what has already been done in this direction.

It often occurs that children become blind through the most trivial causes by parents consulting unskilful prac- titioners. The improvement and increase in the number of well-regulated hospitals now makes it possible for every parent, however poor, to have the best medical advice and attendance.

In all ages of the world the blind have been the objects of pity and commiseration, yet it has only been within the

past century that Christian civilization in its grand onward march lias taken them in its embrace, and shed the influ- ence of its light upon their midnight darkness. During recent years leading philanthropists have given much earnest thought to the best methods of ameliorating and improving the condition of the blind. Nearly all the European Governments and the States of the American Union have made liberal provision for their education and special training. In Great Britain the work has been left thus far to charitable enterprise. Much, however, has been done,—alniost every large town having its asylum, workshop, or home teaching society.

The following summary, from A Guide to Institutions and Charittes for the Blind, prepared by M. Turner and W. Harris in 1871, will show the state of these institutions at a recent date :—

'In the year 1800 there were only four institutions for the blind in the United Kingdom ; during the next thirty ycars six others were added to the list; in the sueceeding thirty years seventeen more were opened; while within the last ten years twenty new ones have been established, inaking a total now of fifty-three, with- out including societies for visiting the blind at their homes, and other charities, j

Scotland with five institutions sold, in the last year of which we have any report, goods of the value of £21,930, while England with forty institutions

only sold in the same period goods of the value of £38,598 ; and Ireland, only £454.

Scotland provides for, on an average, 76 blind in each institu- tion ; while England only provides for 48, and Ireland for 60.

The donations and subscriptious in Scotland for the same year amount to more than £20 per head of the number benefited ; while in England they amount to about £21, and in Ireland to about £16.

So far as returns have reached us, it appears that Mr Moon's system of reading for the blind is adopted by 38 institutions and home-teaching societies, while only 22 use the books of other sys- tems—Lucas's, 7; Roman, 4; Alston's, 4; Frere's, 3; Braille, 4. [Since 1871 the use of Braille has been introduced into many other institutions.]

Of the 30,000 blind in the United Kingdom, there are only about 2250 being instructed or assisted to work. The total amount re- ceived per annum for the benefit of the blind, according to the answers received, is about £66,000; besides, there are twelve societies from which no return has been made. Of institutions for the blind generally, we may remark that in each institution nearly the same difficulties appear to exist, the principal one being the difficulty of selling the goods manufactured at such prices as will seeure a ready sale and cover the cost of production, and consequeutly in most instances there is a large surplus stock. In cases where the stock is wholly disposed of, our observations lead us to think that sales have been secured by selling at a loss.

The principal trades practised by the blind in the United Kingdom are the making of baskets, brushes, brooms, mattresses, rugs, mats, caning of chairs, with knitting and sewing for women."

Within a few years a great impetus has been given im England to the higher education of the blind, by the for- mation of the British and Foreign Blind Association, the establishnient of the College for the Blind Sons of Gentle- men at Worcester, and the Royal Normal College and Academy of Music for the Blind, Upper Norwood.

The first-mentioned association "has been formed for British and the purpose of promoting the education and employment Blind Aso of the blind, by ascertaining what has been done in these gation, respects in this and other countries, by endeavouring to supply deficiencies where these are found to exist, and by attempting to bring about greater harmony of action be- tween the different existing schools and institutious.

'"'The founders of the association took as an axiom that in all questions which relate to obtaining impressions by touch the blind are the best judges; the council of the . association therefore consists entirely of gentlemen who are either blind, or so nearly so that they have to use the finger instead of the eye for the purpose of reading.

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"One main difficulty in the way of educating the young blind is the great cost of most of the appliances ; this the council have endeavoured to meet by the manufacture of cheaper and better apparatus than any hitherto in use.

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No one who has not made the attempt can have any idea of the extreme difficulty of combining great accuracy and durability with cheapness. This has been in a great mea- sure accomplished as regards the Braille writing frames, which are now within the reach of cvery blind person who wishes to avail himself of the advantages of writing. The fact that a large nuniber of these frames has been already sold speaks for itself, and, as the great majority of the purchasers are poor, the quick sale is evidence not only of the cheapness of the frames, but also of the widespread desire for self-education existing among the blind.

" Another obstacle to the diffusion of the knowledge of the Braille system has been the absence of printed books in English. With the view of meeting this want one of the council has perfected the process of stereotyping used in France, by which the cost of production of stereotype plates is greatly

reduced ; and as the blind can themselves produce these plates, a new and remunerative means of employment has been discovered. Some school books have already been issued by the association, and will shortly be followed by others. The work on the Hducation and Hm- ployment of the Blind, by the honorary secretary, has been published under the sanction and at the expense of the association."

The following extract from an address delivered by the honorary secretary before the Society of Arts on the vari- ous types for the blind, shows how thoroughly they are investigating the subject :—

"The happy idea of printing on paper letters recognizable by the touch is due to M. Haiiy of Paris, who printed his first book in 1784, and founded the Institut des Jeunes Aveugles, Paris. The type he adopted was the script, or Italic form of the Roman letter, his was introduced into England by the present Sir C. Lowther, who printed the gospel of St Matthew in 1832 with type obtained from Paris, and followed it with other portions of the Bible. In 1834, Gall, of Edinburgh, printed the gospel of St John in Roman eapitals, in which, however, all curves were replaced by angular lines, and the lines themselves were serrated, which changes, he believed, gave greater distinctness to the letter.

Alston, of Glasgow, adopted Fry's plan of using ordinary Roman capitals. Dr Howe, of Boston, U.S., makes use of the small Roman letters, giving them angularity according to Gall's idea.

The Philadelphia type does not differ much from Alston's. The combination of capitals with small letters has also been tried, and a society has recently been formed at Worcester with the in- tention of printing on a large seale in this type. In Germany vari- ous modifications of the Roman letter exist, the principal of which, the so-called Stachelschrift of Stuttgart, consists of Roman capitals formed by finely dotted lines. All these modifications are sugges- tive of the strong tendency among those who have attempted to benefit the blind to retain for them the form of letter to which the seeing are accustomed, while the constant change of form indicates a fact with which most blind persons are familiar from personal experience, viz., that none of these modifications are satisfactory as to the primary condition of being easily felt. A better form than any which has obtained currency was

suggested twenty years ago by Mr Welch, a blind man, who has been the pioneer of education amongst the blind of London, and this is almost identical with one independently worked out by Mr Littledale of Cheltenham.

The second great class is made up of alphabets deviating more or less widely from the Roman letter, and consists of a stenographic shorthand invented by Mr Lucas, a phonetic shorthand due to Mr Frere, and a full written system introduced by Mr Moon, in which the Roman letter is retained in a more or less modified form when- ever he considered this could be done compatibly with easy recog- nition, the simple line-signs employed by Mr Frere being used to replace the more complicated of the Roman letters. It will be necessary to examine these systems in detail, and it will facilitate this examination if we compare them with each other in the follow- ing particulars :—(a.) As respects the shape of the letter; (b.) As respects the advantage of conformity with the Roman letter ; (c.) As regards the reading from right to left and from left to right alter- nately ; (d.) Advantage of a shorthand as contrasted with a full written system.

(a.) As respects the shape of the letter. —Mr T.ucas and Mr Frere

brought out their systems about the year 1838, Lucas preceding

Frere by a few months. They employed at first almost identically the same characters, but unfortunately conld not agree to represent the same sound by the same symbol. Mr Frere had the advantage

of having his plan carried out bya very ingenious and sensible blind man, who soon discovered that the letters formed by lines and curves upon which dots were placed were too similar to those formed by the corresponding lines and curves without dots ; he, therefore, changed all his dotted characters, replacing the dotted curves by angles of 45°, and the dotted lines by lines in which a short line is substituted for the dot.

The result of this change is, that Frere's character is now far superior to Lucas's in the quality of easy recognition. Mr Moon's character, in the large size which is used by him, is quite as easily distinguishable as Frere's, but in the form in which he now: prints his characters, his right-angles are not

true right-angles, but are rounded. In the size which he uses, this defect is of very little importance, but it effectually prevents any considerable diminution, because, if this is attempted, the rounded right-angles cannot be distinguished from the hooked lines.

The importance of using a character as small as is compatible with easy recognition may be readily understood from the following statement :—'The largest type used by Mr Frere is that employed in the gospel of St John. The character _is 44-sixteenths of an inch long, and is about the same size as Moon's character. The pages occupied by the gospel of St John in Frere are 96. In his medium type, in which the length of the letter is 4-sixteenths of an inch, the same matter would go into 67 pages; and in his smallest type, in which the length of the letter is 34-sixteenths, it would occupy 46 and a third pages. It has been found, by an experience extending over 27 years, and embracing many hundreds of individuals of all ages and conditions, that all those who can read the largest type can read the medium, and almost all can read the smallest.

The medium type is very gencrally preferred, as being more

pleasant to the finger, and many with delicate touch prefer the

smallest for the same reason. Thus it will be seen that, by select- ing a well-devised character, not only can a very considerable saving be made in the size, and therefore in the cost of books, but by a

diminution of size, within certain limits, the character is rendered

absolutely more legible. The gospel of St John, in Moon's type,

occupies 140 pages.

(b.) As respects the advantage of conformity with the Roman letter.—Much has been said and written on this subject. A favourite argument with the advocate of the Roman letter is, that

by its use a blind man can be assisted in his reading by those

around him who are possessed of sight. This, no doubt, would be valid if no simpler character for the blind had been invented, but when we have to choose between a character in the reading of

which the blind can be assisted by the secing, and one which is so

simple that no assistance is required, there can hardly be a doubt as to which ought to be used.

Another plea for the use of the Roman letter is, that by its means the blind can write in a character understood by everybody. This writing is, as we shall presently sce, a very imperfect process ; but this argument is undoubtedly of some weight. 'hese remarks apply simply to the existing systems in which the Roman letter is employed. It is probable that a much more legible alphabet might be constructed, but, after our 96 years of experience and experi- ments with the Roman letter, another failure may well be feared. The small angularized Roman letter of Dr Howe, of Boston, which is used in most of the schools of the United States, is probably as good a form as any, and if printed in a larger size would not be difficult to feel ; in its present size, however, it is far too small, and has signally failed in America. The American schools are all State institutions, and have to furnish accounts to their respective State Legislatures of the work done by them.

Out of 664 pupils in seven schools, where the Roman character of Dr Howe is used, one-third learn to read fluently, one-third by spelling, while none fail ; and it must be borne in mind that those who learn to read by this system also acquire an admirable method of writing. Moon's system retains those Roman letters which can be casily distinguished, and thus makes a transition between the systems in which the Roman character is used and those which employ purely arbitrary signs. For this reason, and from its great simplicity of construction, it is more easily learned than any other, and therefore is well suited to the great mass of the poor, who from want of intclligence or of application cannot learn one of the short- hand systems. Its great bulk, however, involving costliness of production and comparative slowness of reading, is a scrious obstacle to its general use.

(c.) Reading from left to right, and from right to left, alternately. —In Frere's system the lines are read from left to right, and from right to left, alternately, an are of a circle taking the finger from the end of the upper to the beginning of the lower line. The plan may be illustrated by imagining the lettcrs to be fixed on the upper edge of a long string. Let it be supposed that this string is doubled backwards and forwards upon itself in such a way that the letters always occupy its upper edge. This will give a good idea of Frere's method of reversing the line ; not only is the line reversed, but every letter in it is also reversed, so that the finger, when

moving forwards, whether towards the right or towards the left, meets the eharacters in the saine position, and is, in faet, never moving backwards, in the sane manner that a person may walk to the end of a room, turn and walk back, yet is moving forwards in both directions, Moon, on the other hand, while borrowing the reversal of the line from Frere retains the letters in the returning line in the same position as the advancing, so that the finger in the returm linc meets the eharacters in the opposite dircetion from that in the advaneing line; and to those aecustomed to Frere's simpler method of reversal an unpleasant fecling is produced, exactly comparable to walking baekwards.

The following example of both modes of reversal, in which toman Capitals are used, will make this clear :—

Frere's Method.] WILL MAKE DARKNESS M3SHT 3AH0RS48 THOII

Moows Method.

1 WILL MAKE DARKNESS -MEHT EROFPEB THGIL

No doubt habit will accustom a reader to either plan, and probably there is not much difference in the diffieulty of either, but, as we shall see by-and-by, it is absolutely necessary for writing that the pupil should thoroughly understand that, whiehever way he goes, he is moving forwards ; it is, therefore, wise to accustom him in reading to a proeess which he will have to follow in writing. Opinions differ widely among the blind whether it is

best to read forwards in one direction and backwards in the other, or forward in both ; it seems, however, among those who have had experience of the return line, that there can be no doubt of its great value, as by its use no time is lost by the reading finger having to return from the end of the upper to the beginning of the lower line, and the setting free of the left hand enables it to follow the right in reading, to take its place, or to rest.

(d.) Shorthand.—By a shorthand system, reading is more rapid, and a nearer approach is made to the way in which the eye takes in a whole word at a glance, than in a full-written system. The books are also more manageable and less eostly, but the stereo- graphic method is distinctive of correet spelling, and in the pho- netic method this is not even attempted ; yet it is advisable, for many reasons, that the blind should be able to spell. The short- hand systems sccm therefore to be of the same use to the blind as to the seeing—not being of universal application, but extremely useful to those who have to read mueh.

In all the systems which we have hitherto considered, the letters, whether Roman or arbitrary, are formed by raised lines. The method cmployed for writing them is as follows :—Small cubes of wood are used with projeeting pin points, so placed as to assume the form of each letter. The paper to be written on being laid on a soft surface, the pin-point letters are pressed into it ; each point carries some of the paper before it, forming a little prominence on the reverse side, and as the pin points are very close together, the series of little prominences formed by them feel to the fingers like serrated lines, This plan ought rather to be called printing than writing. It requires great practice, and is at the best very slow and imperfect ; yet it has its uses, as by employing Roman capitals the blind can correspond with the seeing. The letters, however, are not sufficiently distinct, and communications from blind correspond- ents written in this manner, or with pencil, are less satisfactory, both to writer and reader, than if the letter had been written from dictation. Printing from the Roman letter (not embossed) can be effected by the blind, with considerable rapidity, by means of Hughes's typograph or Foucault's writing-machine; but the blind writer cannot read what he has written, and the apparatus is so costly that it is not proeurable by the poor.

[A new machine called ‘the type-writer,’ has lately been in- vented in America. It is largely manufactured, and is coming into general use for the seeing. It is equally well adapted to the use of the blind, is very simple, and can be manipulated very rapidly. A skilful operator can write at least twice as fast as an expert pen- man. It is not only a valuable invention, but one superior to all others of the kind.] 2

Various plans exist to enable the blind to keep their lines when writing with a peneil or with a stile on carbonized paper, but such writing can only be used for correspondence with the seeing, and eannot, of eourse, be read by touch.

We come now to the third class of systems, viz., those in which the letters are formed by a combination of dots. These are :—

1. The Braille system, universal in France, both for writing and printing, and very much used for both purposes in Switzerland, and employed as the written character in almost all countries, with the exception of the United Kingdom.

2. The Carton type, which was introduced into Belgium by the Abbé Carton.

3. Hughes’s system consists of large and small dots, and lines placed in different positions. It never obtained much currency, and

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seems never to have attracted the attention which its ingenuity merited.

4, A modification of the French method has been lately proposed in New York, and seems to have much to recommend it.

To begin with the French method. This was invented in 1834 by M. Braille, a blind pupil of the Jnstitut des jeunes Aveugles. It spread with great rapidity, and has, as we have before seen, become almost the universal written language of the blind. Its signs are purely arbitrary and consist of varying combinations of six dots placed in an oblong, of which the vertieal side contains three and the horizontal two dots. For writing, a frame is used

consisting of a grooved metal bed, containing ten grooves to the ineh ; over this is fitted a guide whose vertical diaineter is 38, inch, while the horizontal diameter is 725. This perforated guide is fixed into a light wooden frame, like the frame of a slate, which is attached to the grooved metal bed by hinges. The paper is introduced between the frame and the grooved bed. The instrument for writing is a blunt awl, which carries a little cap of paper before it into the grooves of the bed, thereby producing a series of little pits on the side next the writer. When taken out and turned over, little prominenees are felt, corresponding to the pits on the other side. The reading is performed from left to right, consequently the writing is from right to left ; but this reversal presents no practieal difficulty as soon as the pupil has caught the idca that in reading and writing alike he has to go forwards. The brass guide has a double row of openings, which enables the writer to write two lines; when these are written, he shifts his guide downwards until two little pins, which project from the under surface at its ends, drop into eorre- sponding holes of the frame, when the writer writes two more lines, and this operation is repeated until he arrives at the bottom of the

age.

The first ten letters, from 'a' to 'j,' are formed in the upper and middle grooves; the next ten, from 'k' to 't,' are formed by adding one lower dot behind to each letter of the first series; the third row, from 'u' to 'ui' is formed from the first by adding two lower dots to each letter; the fourth row, from '4' to ' w,' similarly, by adding one lower front dot.

The first ten letters, when preceded by the prefix for numbers, stand for the nine numbers and the cypher. The same signs, written in the lower and middle grooves, instead of the wpper and middle, serve for punctuation. The seven last letters of each series stand for the seven musical notes—the first series representing quavers, the seeond minims, the third semibreves, the fourth crotechets. Rests, accidentals, and every other sign used in music, ean be readily and clearly expressed, without having recourse to the staff of five lines which forms the basis of ordinary musical notation, and which, though it has been reproduced for the blind, can only be considered as serving to give them an idea of the method employed by the seeing, and

eannot, of course, be written. By means of this dotted system a blind man is able to keep memo- randa or accounts, write his own music, emboss his own books from dictation, and carry on correspondenee.

But this French system, though extremely useful, is not perfect. The letter is too small for ready recognition by the unskilful or hard-handed, and if this is sought to be remedied by inereasing the size, the reading finger does not eover the whole of the letter, and has to proceed up and down, feeling out each letter, instead of following the even gliding motion essential to good reading. The modification proposed in New York remedies this defect, though this does not appear to have been the intention of its promoters. lt proceeds on the principle that the letters occurring most frequently in the English language should be represented by the fewest number of dots, and that the letters should be so spaced that a letter composed of one dot should not, as is the case in the Freneh system, oceupy the same room as one with six dots. For this pur- pose the oblong, consisting of six dots, composing the root-form of the letter, is placed horizontally instead of vertically, the greatest vertical depth of any letter in two dots instead of three. From these two changes results a saving of about one-third in space ; this involves a saving of about one-third in the price of printed books; writing is rendered more rapid; and as the size can now be in- creased, owing to the diminution of the vertical length of the letter, it can be made sufficient for the dullest toueh. Ten-word and part-word signs have been introduced, which effect a further saving of nearly one-third, while they do not interfere in the least degree with correct spelling. These advantages make it well worth while to consider whether the modification of the Braille system ought not to be adopted as the written system of all English-speaking blind ; but before such a step is reeommended, the question should be carefully considered in all its bearings on musical notation as well as on ordinary writing."

*Regarding the Worcester College for Blind Sons of Worcester Gentlemen, founded in 1866 by the Rev. R. H. Blair, the Colles**

Report informs us that—

*'*1t was opened with the view of giving to families of the better class an opportunity of educating thcir children in a systematic*

manner, with a due regard to home comforts, and with surroundings befitting their position.

The course of edueation projected by Mr Blair was sueh as would convert the pupils into intelligent home companions, if no other object were desired. But a conviction, based on personal know- ledge, that the blind were capable of the highest competition with the seeing, lay at the root of this gentleman's endeavours. Self- helpfulness and usefulness in the ordinary affairs of life is therefore but one of the first results which reward the teaching of the blind ; and it appears that blind men can be made reproductive also, not only in the particular instance, but in the bulk, and that the arts of teaching and lecturing, acting as deputations, translating, presiding over blind or other institutions, the law, and in the most

favoured cases the church, are fully within the capacity of the

well-educated blind. A prejudice has hitherto existed against the employment of blind men, owing to their supposed incapacity, and certain other drawbacks resulting from neglect. Let this impres- sion be removed, and there will be an increase in the number of positions open to them.

For an entrance into these walks of life, the training must be such as to enable its recipients to compete for university distinc- tions. The objections to this course, if they are entertained, will be removed by a little reflection on the nature and uses of a univer- sity; and the difficulties whieh in the idea of inexperienced persons a blind man has to overcome, are greatly diminished by being met and grappled with in early years, and are aetually being materially lessened by the earnest efforts now made by blind instructors and investigators.

It is impossible to rule definitely at what age the school educa- tion of a child born blind should begin. Children vary as much in natural quickness as parents in the power of educating.

No claim to exclusiveness is asserted in the use of English types. There are useful works to be found in all; and when a pupil arrives who has been

educated in one or other form of type, he is never discouraged from its continued use. But as uniformity of class- books is desirable, and one system must be employed as a basis, the Roman form;in which are printed books suitable for higher eduea- tion, is adopted for elass purposes. Dr Moon's type is read by some for recreation or private study, and the American Bible, which is the most portable yet printed, and is beautifully executed, is read by those whose dexterity, acquired by long practice, enables them to master this somewhat difficult, because small, type. After sonie years of practice the desire for smaller type seems to become a passion for those possessed of a quick and nimble touch.

Dr Moon's type is large and easy, and comprises the Bible, Prayer Book, and a large number of religious and devotional works, together with numerous stories, biographies, and other works suit- able for the young and aged. Dr Moon has also several educational works of a very useful character; but his plan of action has not yet led him to enter largely into the production of higher literature."

The Royal Normal College and Academy of Music for the Blind has for its object the affording of a thorough gencral and musical education to the youthful blind of both sexes who possess the requisite talent, so as to qualify them for self-maintenance. The Report of the institution states that

' As without previous trial it would in many cases be diffieult to determine whether an applicant for admission has sufficient capacity for the kind of education given at the college, candidates will first be received as probationers for a term of three months, or less. I, at the end of that period, they are found to possess adequate ability, they may beeome permanent pupils. ;*

With a view to adapting the methods of instruction to pupils of different ages and capacities, the following classification has been adopted, viz.:—A. The elementary seetion, the instruction in whieh

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is designed especially for children from seven to nine years of age ; B. The intermediate, for pupils from nine to twelve years of age ; ©. The junior, for

pupils from twelve to fifteen years of age; D. The senior, for pupils from fifteen to twenty-one years of age. Exceptional cases over twenty-one years of age can only be ad- mitted by special vote of the committee.

The college embraces three distinct departments—1. General edu- cation ; 2. The seience and practice of music ; 8. Pianoforte tuning.

The department of general education embraces all the ordinary branches of a sound English education. Special care is bestowed on the intellectual training of the pupils ; for experience has shown that in order to qualify the blind for self-support, it is essential to afford them a thorough general as well as musical education.

In the musical department both vocal and instrumental in- struction is given, according to the improved methods which have been employed during late years with marked success in the leading institutions of France and America. This department embraces the culture of the voice, the study of the piano, organ, and other solo instruments, harmony, counterpoint, composition, the history of music, and the art of teaching.

In the department for training the pupils in the art of regulating and tuning pianos, pupils are instructed who have passed the age at whieh they might have beeome qualified for remunerative em- ployment in other departments. Though a superficial knowledge of the art of tuning may be readily aequired by those deprived of sight, a prolonged course of careful training is necessary in order to enable them to become thoroughly successful.

Experience has shown that the blind can seldom fully support themselves merely by manual labour, and the great majority of those who have been trained to industrial trades continue to require charitable assistance during their whole life.

It is well known that many of the blind possess musical talent, yet only a small number in the United Kingdom have ever been qualified to earn their living by the profession of musie.

Such was formerly the case in other countries, but during recent years great improvements in the general and musieal education of the blind have been

effected abroad, particularly in France and America, and large numbers of this class educated in the institu- tions of those countries have been enabled to maintain themsclves fully by various pursuits, especially as skilled organists, teachers, pianists, and pianoforte tuners.

In view of the practical results of the improved education of the blind in other countries, the Normal College and Academy of Musie was founded in order to afford similar advantages to the youthful blind of the United Kingdom.

The college was opened in March 1872, under the direction of a committee, including members of the governing bodies of various metropolitan societies and institutions for the blind, with an experienced prineipal, and a staff of highly-trained teachers.

Upwards of seventy pupils from Loudon and other large towns have been under instruction; a number have already left the college, aud are ow regularly employed as thoroughly competent pianoforte tuners."

As it will be impossible in this article to give any length- ened account of the institutions on the Continent and in America, we will briefly sketch the plan of working in a few of the most progressive.

The following extracts from addresses delivered at the first European Congress of Teachers of the Blind at Vicnna in 1873, will best give an insight into the schools of Saxony :—

Herr Reimer, superintendent of the Preparatory School for the Saxony.

Blind at Hubertusberg, pointed out that, '"'even among the families which are not very poor, blind children often grow up without learning to wash or feed themselves, with hands hanging soft and helpless at their sides, and thus become more incapable than the poorest, who are forced to exert themselves by the neces- sity of the case.

If they are not taught to help themselves at home, it is very difficult to teach them at school, and as the existing blind institu- tions cannot admit young children without injuring the education of the older ones, they ought to be

taught in preparatory schools or Kindergiirten separately, which should be established by the State.

In the preparatory school at Hubertusberg in Saxony, the first thing aimed at is the strengthening of the limbs, then to make the children use them properly, to make them help themselves instead of relying on others, to correct their bad habits and to improve their mental condition, arousing in their minds the love of God and of truth as well as conscience. All this must be done methodi- cally, and each lesson must be given separately and repeatedly as well as most patiently.

The change wrought thus is wonderful, if the teachers are ex- perienced. They must be eneouraged to move about as directed, and the '¥robel play and exercises' will be found useful. Plaiting

strips of leather, and other occupations which combine play with work, are carried on with advantage. A good manager of Kinder- giirten can do them great good, and gymnastics give them the power of controlling their limbs ; but every exercise must be first taught singly.

Object lessons must be given by means of models, stuffed animals, birds, fish, &c., to bring out the powers of memory and reason. Simple hymns and ballads are practised.

Very little technical work can be taught, except making rush baskets, &c., as the children are all under ten. This school has been carried on for eleven years, and the benefits of teaching blind children so early are plainly seen by all who watch the progress which they make when removed to the Blind Institution ; they are fit for independent work at an age three years less than the average of those who do not go through it.

As the children pass through the institution more rapidly, there is also more room for those who become blind as adults."

Of the National Blind Institution at Dresden, Dr Reinhard, the director, said —"It is organized so that the working school forms an essential part of it,

and when children enter it, consideration is at once given, not only to their physical, religious, and intellectual education, but also to their instruction in work. Whilst between the ages of six and eleven they remain in the preparatory school, and find inexhaustible occupation in Frobel's system of play and exercise.

'Playwork' is given them as they become fit for it; for the fecling that they can make something useful rejoices the little workers and excites their activity ; it is important that they should learn early to aim at real work. They learn to plait reed mats, which is an excellent means of strengthening the muscles of the arm and hand, and they also make little rush baskets.

The range of their work is extended when they are transferred to the higher class, which is usually during their eleventh year ; and from that time till their confirmation, which is generally at the end of their fourteenth year, they have at least three hours' work every day in the shops.

'The work of the girls is, unfortunately, much restricted, and it is doubtful whether their learning to make baskets and rope is without injury to their constitution. Besides, we must not lose sight of the evils arising from their working with male overseers and workmen.

Hence, girls learn in general only knitting, plaiting counterpanes, chair-caning, hair-working, and sewing—as much as is required for mending their linen.

Hair-work has already been adopted in another institution, and is the most profitable work for blind girls, as a clever one can earn 7 or 8 groschen (about 9d.) a day by it, whilst the quickest knitter can scarcely make 2 groschen a day.

The boys learn either basket-making or rope-making ; they learn in the rope factory various kinds of light work, and, when they have been confirmed, choose for themselves between these two trades, their muscles being strengthened by alternately being em- ployed at both.

It is important to consider the grounds of fitness for these trades, Rope-making requires strength and health of body, for much of the work must be

carried on in places exposed to the weather ; and besides this it requires a great deal of dexterity which is not indis- pensable in baskct-making. 1t is also of great importance that each should learn the trade in which he is most likely to succeed after leaving the institution ; for 'the great object is that pupils should be fitted for independent work eventually,

All those who understand the subject are now convinced that the blind cannot be really helped by building asylums. lf there were three times as many asylums as there are schools, there would not be room for all, and the inmates would never be satisfied with their condition. Even women prefer an independent life full of care to the sameness of an asylum, where one quarrelsome person often embitters the whole life of the institution.

If there is any possibility of establishing pupils of either sex without exposing them to the risk of losing their health, there can be no doubt that it is to be preferred to placing them in asylums.

«The Dresden Blind Institution is managed on the principle that the pupils, on commencing independent work, require much assistance before they can support themselves by it, and that the institution must give the necessary help. The director of the institution makes known to the manufacturers that a blind worker is coming to settle near them, and induces some of the families around to take an interest in him, and recommend him for employ- ment. He also inserts in the newspapers short notices describing his capacity for work, and his difficulty in finding customers, &c., and requesting people to employ him.

The outfit required for pupils on leaving the institution consists of tools and clothing, and materials must also be provided at first. The cost of these is partly defrayed by the fund established for the purpose, partly by the savings of the pupils, and partly, if necessary, by a grant from the parish.

It is indispensable that the blind worker should have some person near in whom he can fully confide, and from whom he can

get advice and help in any time of temporary difficulty, whilst the manager of the institution can rely on his taking an interest in the worker, and seeing that he obeys the rules.

he purchase of raw material causes the greatest difficulty; the blind man has not the means of buying much at a time, and must, consequently, pay highly for it; therefore the institution helps him by buying it at wholesale prices and letting him have it at the same price in small quantities. The number of his applications for materials shows the managers whether the man is industrious.

More than 200 blind support themselves in Saxony by means of the aid afforded by the fund and their own exertions. The fund amounted, in 1873, to 85,000 dollars, subscribed in all parts of the country."

Previous to the Franco-German War, Mr Liebreich, a Paris,

celebrated oculist aud practical friend of the blind, by order of the empress of the French, prepared a report in regard to the Institution Impériale des jeunes Aveugles of Paris, in which he says that the institution—

' Tg an establishment of the State, in which children of both sexes deprived of sight receive an intcllectual, musical, and industrial training. Children are received at the age of 13 years. They remain in the institution 8 years, and are made professors, musicians, tuners of pianos, workmen and workwomen.*

During the last ten years 110 male pupils have left the institution,

concerning whom we have received satisfactory information. The workwomen, on the contrary, earn but very little; among 166 blind, 108 have received a very good education, which ensures to them an easy and independent living ; 56 have received an elemen- tary training, and have not been put entirely beyond the charge of public charity. – The annual expense for 200 pupils is very nearly 240,000 franes (of which 146,000 francs are given by the State), making an average of 1200 fr. (£48) per pupil,—the workman costing a little less, the artist a little more. 'This sum is not excessive for the education of a tuner, a professor, or an organist, but

it certainly is for the educa- tion of a workman, who only receives an elementary training, and is not even qualified to earn his own living.

M, Gaudet, chief instructor of the institution, expresses dis- approval of the simultaneous education of artists and workmen. He says, ‘ Realizing from the first the great difference which exists between the future of an organist or a piano tuner on one side, and of a blind workman on the other, the apprentices regard themselves as sacrificed ; therefore they do all they can tofbecome tuners, and thus often lose much time in fruitless efforts before they resign themselves to become workmen, and even then toil reluctantly. On

uitting the establishment to follow their occupations, they are not habituated to assiduous toil ; returning to thcir indigent families they regret the comfortable life of the institution, and finally become discouraged.’

Tuners begin ordinarily to work with piano manufacturers, and earn easily 1500 franes per year. Ifa little later they succeed in obtaining a town connection, they have no difficulty in earning double that or more. Some have even succeeded in uniting manufacture with tuning. The organists, by obtaining places in churches and by giving music lessons, very soon earn a good liveliliood.

In short, the tuners, organists, and teachers have, in spite of their infirmity, become independent men, exercising honourable and lucrative professions ; some have married and reared families, others have come to the aid of their indigent relatives.

Very different is the lot of the blind workmen, who by toiling without relaxation many more hours than sighted workmen, barely succeed in gaining a part of what they need to support themselves. By perfecting as far as possible the industrial training of the in- stitution, a greater number of the male pupils might be enabled to earn 300 or 400 francs, but none far exceed this sum. The work- women seldom earn more than 100 or 150 franes per year.”

The institutions of America are not asylums, but in the America

truest sense of the word educational establishments, in which the blind, without regard to their future, receive a thorough education. The blind in the United States are socially far above those of any other country ; large num- bers of them become eminent scholars and musicians, and even their blind workmen enjoy a degree of comfort unknown in England or on the Continent.

The results achieved by the Perkins Institution at Boston, U.S., are particularly instructive, High-class musical training appears to have been commenced there about 13 years ago, previous to which time the results in this respect were far from being satisfactory. The report of 1867 states that music is now taught to all of both sexes whose natural abilities make it probable that, under proper

instruction, they will succeed as organists, teachers of music, or piano tuners, and goes on to say—" The teaching of music and playing is now the largest single field open to the blind as a means of support, and it seems to be growing larger. People are becoming more disposed to employ them ; and as they go forth from the school they have more and more ground of hope that they will find opportunities to earn their living in this way." The whole tone of mind among the musical pupils has been changed, for instead of looking forward to the future with fear and anxiety, they now feel a well-grounded confidence in them- selves, It seems that in Boston, and in America generally, the blind are able to earn more as teachers of music than as tuners, which is exactly the reverse of the state of things existing in Paris, and may arise either from differences in the condition of the two countries, or from the training for teachers being more thorough at Boston than at Paris ; but their experience is identical in one respect, which is, that the blind who have the requisite amount of talent are almost cer- tain to make a good income out of music ; but to attain this end they must aim high. It will not do to be equal to the average seeing teacher or tuner; they must be superior; and this involves a good musical notation with first-rate masters, instruments, and appliances, and above all, a determination onthe part of managers and teachers toovercome allobstacles.

A few paragraphs from American reports will sufficiently illustrate the enlightened views held in that country in re- gard to the education of the blind.

‘ A school for the higher education of the blind should be spe- cially adapted to the condition and wants of the persons to be trained. Init the course of study should be the same as in our best colleges. All instruction should be oral, and the apparatus and modes of illustration be addressed to the touch. It should be supplied with text-books, maps, diagrams, and the like, in raised characters. 1t should have large collections of models of various kinds, such as weights, measures, tools, machinery, and the like ; mannikins and models showing the anatomy of plants and animals, as well as their outward form. It should have collections of shells, crystals, minerals, and the like; models and sections showing geological strata ; philosophical apparatus adapted to the touch ; in short, everything that can be represented by tangible forms.*

It would amaze those who have not reflected upon it to know how much can be done in this way. Saunderson, the blind pro-

fessor of mathematics in Cambridge, not only knew ordinary money well, but he was an expert numismatist, and could detect counter- feits in a collection of antique coins better than ordinary persons could do by the sight.

Such an institute should have able professors and teachers, with special aptness for adapting their lessons to the condition of their scholars. It should furnish special facilities for the study of languages, ancient and modern, of mathematics, of pedagogy, and especially of music. It should also be well provided with every- thing necessary in a good conservatory of music, and have funds for the payment of competent teachers.

It is evident that there are a large number of persons to whom such an institute would be a source of great happiness, and a means of preparation for great usefulness.

A little reflection will show what a great advantage generous culture would be to a blind man, even if he were to be only a musician. Let him be ever so accomplished in his immediate art, he is under great disadvantages as compared with his competitors who can see. But if he has generous culture in other branches of knowledge, he will have advantages which few of them possess, and of course he will be more nearly on a level with them, and more capable of earning a living and enjoying it. Human effort will in such a case be successful in counteracting the principal evil which flows from the infirmity of blindness."

'©The careful observer will see a marked difference betiveen a hundred youths in a blind institution and the same number of boys in an ordinary school. This is cspecially true of the male scx. He will find among the blind a larger proportion of scrofulous, narrow-chested, angular, pallid, and feeble boys, who move slug- gishly and soon tire; and a smaller proportion of those full-chested, chubby, rosy, elastic creatures, whom nothing can keep still, and nothing tire out.

Now, if the blind, as a class, have a much smaller guantum of life than ordinary persons, it must be either on account of some flaw in the stock whence they sprung, or of some peculiarity in their mode of life, induced by their infirmity, such as bodily inactivity; but it probably results from both causes. At any rate, it is a matter worth considering.

The following tables have been calculated from data furnished by Vitality seven, American State Institutions for the Blind—namely, those of of the New York, Ohio, Pennsylvania, Illinois, Missouri, Tennessee, and Blind.

Massachusetts, and are the results of careful discussion of data, by far the most extensive and trustworthy, it is believed, yet pub- lished in any country.

In each of these tables the number of the blind actually sur- viving in 1859 are compared with the numbers that should then be surviving, according to two different Life Tables—first, the Massa- chusetts Life Table, prepared by Mr Elliott, from the State Census and Registration Returns for the ycar 1855; and secondly, the English Life Fable, prepared by Dr Farr of London, from the re- turns for the year 1841 :—

TABLE I.—Comparing the relative vitality (or ability to resist destructive influences) of the Blind, at divers ages of life, aceording to the combined experience of scven American State Institutions for the Blind, with that of the populations of Massachusetts and of England respectively. Calculated by Mr E. B. Elliott, Consulting Aetuary, Boston.

nee of Persons : ASE Miumiver acoeon | Admitted | Averge | Aveta? | NamPe | ho agesen, | Guown | Accom | clapsea | defore | Survsing 3 ae a to'middle | the end o n 1859). i tl of 1859, | 1869). f é ceased). 0-6 14 4°4 ATgyeal al 13 6-10 210 "uy 14:3 39 17a 10-14 287 Ts 13°2 52 235 14-18 209 15'5 13'3 38 il7/il 18-22 177 19°3 14°8 50 127 22-26 101 23°3 14°6 19 82 26-30 47 27°4 12°6 10 37 30 and over 38 87 °2 12°7 11 27 Age not 7 specified 19 12°4 4 15 All ages…) 1102 15°4 13°8 224 878

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a Survivors, rclative ra Survivors, relative ii6 id be} t° the Number that | .,ou14 pe | to the Number that careietie g should be Surviving. | gurvivin g should be Surviving. ee: Number. Per cent. stable Number. | Per ecnt. 12°0 —1"0? itt 12°0 -1:0? an 189°2 18°2 9°6 189°8 18°8 Pg) 2572 22°2 8'6 | 259°5 24°5 9°4 182°0 11:0 6°1 186°6 15°6 8°4 149°6 22°6 15:1 154°0 27°0 175 84°8 2°8 3°4 86°9 4°9 5°6 40°3 3°3 81 40°8 3°8 9°4 31°9 4°9 15'4 31°8 4°8 15°2 Ley 17 10°4 geal 2a 12°4 963°7 85°7 8°9 978°5 100°5 10°3

| 0) | Se ee ee ee ee eee ee " Note.—This table may be read thus :—Between the ages of 6 and 10 the number of persons admitted to the above-mentioned institutions, of whom it is known whether they were living in 1859 or had previously deceased, was 210; their average age on admissiqn

was 7‘7 years; the average period elapsed since admission, those who died before the end of the year according to the Massachusetts Life Table, is 189°2. the Massachusetts Table, soon to the English Life Table, is 189°8.

English

1859 was 39,—the number surviving in 1859 being 171. Hence the number of actual survivors was 182 Jess than the number demanded by

which deficiency is 9°6 per cent. of (189°2) Hence the number of actual survivors was 18°8 less than the number demanded by the

able, which deficiency is 9°9 per cent. of (189°8) the number so demanded.

and previous to the middle of the year 1859, was 14°3 years; the number of

The number that should be surviving,

the number so demanded. The number that should be surviving,

1 Calculated on the assumption that the average age on admission of the persons whose ages were not specified was the same as the average

age of those whose ages were specified, to wit, 15°4 years.

2 Excess,

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Taste I1.—Comparing the relative vitality (or ability to resist destruetive influences) of the Blind, at different periods after admission, according to the combined experience of seven American State Institutions for the Blind, with that of the population of Massachusetts and England respectively. Caleulated by Mr E. B. Elliott, Consulting Actuary, Boston.

*| Aeeording to Elliott’s Massachusetts Aecording to Farr’s English Life Table. Life Table. Number | Number Average * ‘ ; of Persons] 4 ceased Rie : Deficicney of Actual Survivors, Deficiency of Actual Survivors, Admitted (previous Number Average of Years | Number relative to the Number*

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Note.—This table may be read thus:—Of the 68 persons admitted to the before-mentioned institutions during the year 1844, 14 died previous to the middle of the year 1859, and 54 were surviving in that year. The average age on admission of the 68 persons was 13°9 years, and the average number of years clapsed between the time of admission and the middle of the year 1859 was about 15 years. ‘According to the Massachusetts Life Table, the number that should be surviving in 1859 was 58°6, showing the number of actual survivors to have been 4°6 less than the number demanded by such table. The deficiency (4°6+5°3+2°6=12‘5) of actual survivors relative to the number that should survive of those admitted during the three years 1844, 1845, and 1846, was, according to the Massachusetts Table, 8°9 per cent. of (58°6 +37°3+44°6=140‘5) the number demanded; and the deficiency of actual survivors relative to the

number that should survive of those admitted during the seven years 1839 to 1845 inclusive, was, according to the same life table, 8°7 per cent. of the number demanded. In like manner may be read the results derived from comparison with the English Life Table.

Taste I1I.—Summary of the results presented in the two preceding Tables, comparing the relative vitality (or ability to resist destruetive influences) of the Blind, at divers ages of life, and also at divers periods after admission, according to the eombined experience of seven American State Institutions for the Blind, with that of the population of Massachusetts and England respectively. Calewlated by Mr EH. B, Elliott, Consulting Actuary, Boston.

Deficieney in the number of the Blind that survived in 1859, relative to the number that should then be surviving.

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Note.—This table may be read thus :—Of the number of persons adinitted to the above-mentioned institutions, between the ages of 10 and 14, the number that was surviving in 1859 was 8°6 per cent. Jess aceording to the Massachusetts Life Table, and 9°4 per cent. less according to the English Life Table, than the number that should then be surviving. Of the number of persons admitted during the three years 1838-40, from which the average time elapsing to the middle of 1859 was 20°0 years, the number that survived in 1859 was 12°3 per cent. less according to the Massachusetts

Table, and 15°4 per eent. less according to the English Table, than the number that should then have been surviving. Of the number of persons admitted during the seven years 1839-45, from which the average time elapsing to the middle of 1859 was 16°6 years, the number that survived in 1859 was 8°7 per eent. less according to the Massachusetts Table, and 11°1 per cent. less according to the English Table, than the number that should then have been surviving.

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According to the first table, it appears that, of the cntire 1102 persons admitted whose after-history is known, 878 now survive, whereas the Life Table of Massachusetts calls for about 979 sur- vivors, thereby indicating that the power of the blind, represented by the returns of these institutions, to resist destructive influences is about 9 per cent. (10°3) ess than that of the population of all England, and that the number of deaths is from 60 to 80 per cent. greater, according to the tables employed for the comparison, than the number required by such tables.

If we could draw our statistics from the blind as a whole, and not from the favoured few who have been taught in schools, the average duration of life would be much less. We should probably find the average amount of vital force, or power to resist destructive agen- cies, to be nearly one-fifth less than that of ordinary persons.

lt is well known that the blind as a class arc happy, contented, and cheerful. There are exceptions, of coursc, and it is unfortunate that Milton should have been one of them, because his eminence as a poet and scholar makes his example conspicuous, and his words to be taken as the natural language of a class of unfortunates. There have been others more admirable in this respect, for they set forth in their lives and conversation the sublime moral height to which men may attain by grasping courageously the nettle misfor- tune, and 'plucking thence the flower' happiness." (F. J. C.)

BLOCH, Marx Extezer, a German naturalist, born at Ansbach, of very poor Jewish parents, about the year 1730. Having entered the employment of a surgeon at Hamburg, he was enabled by his own exertions to supply the want of early education, and made great progress in the study of anatomy, as well as in the other departments of medical science. After taking his degree as doctor at Frankfort-on-the-Oder he established himself as a physician at Berlin, and found means to collect there a valuable museum of objects from all the three kingdoms of nature, as well as an extensive library. His first work of import- ance was an essay on the different species of worms found in the bodies of other animals, which gained the prize offered by the Academy of Copenhagen. Many of his papers on different subjects of natural history, comparative anatomy, and physiology, were published in the collections of the various academies of Germany, Holland, and Russia, particularly in that of the Friendly Society of Naturalists at Berlin. But his greatest work was his

BLOCK MACHINERY. A block is a case with its con- tained pulley or pulleys, by mcans of which weighty objects are hoisted or lowered with facility. There is nothing in the appearance of a block which, to an unpractised eye, would seem to require any stretch of mental ingenuity or of manual dexterity to manufacture. It is a machine appar- ently so rude in its structure, and so simple in its con- trivance, that the name was probably given to it from its

general resemblance to a log of wood, as is obviously the case with a butcher's block, a barber's block, the block of the executioner, &c. Of the two constituent parts of a ship's block, the external shell and the internal sheave, every carpenter might make the one, and every turner the other; but still block-making is a separate branch of trade, and it is necessary that it should be, for the whole effici- ency of the block depends upon the proper proportions being observed between the various parts and the accuracy with which they are adjusted. ;

Mr Walter Taylor of Southampton took out a patent in the year 1781, to secure the benefit of some improvement he had made in the construction of the sheaves. He also shaped the shells, cut the timber, &c., by machinery

driven by water, and carried on so extensive a manufacture of blocks as to be able to contract for nearly the whole supply of blocks and blockmakers' wares required for the use of the Royal Navy. Mr Dunsterville of Plymouth had a similar set of machines wrought by horse-power. Both his blocks and Taylor's were said to be superior to those constructed by the hand, though still deficient in many respects.

It would appear that it was the enormous quantity of blocks consumed in the course of a long protracted war that first called the attention of the Admiralty or Navy Board to the possibility of some reduction being made in the expense of so important an article, and to the impru- dence of depending entirely on a single contractor. On these considerations, it seems to have been the intention of Government to introduce, among other improvements in Portsmouth Dockyard about 1801, a set of machines for making blocks there. About this time, too, Mr Brunel had completed a working model of certain machines for con- structing, by an improved method, the shells and sheaves of blocks. This model was submitted to the inspection of the lords commissioners of the Admiralty, and it was decided to adopt Mr Brunel's more ingenious machinery.

The advantages to be gained were those common to all cases in which machine work supersedes hand labour, and consisted in the fact that, after the proper sizes of each part had been determined by careful calculation and ex- perience, the machine could be made to observe these sizes with unerring accuracy, and so avoid all variations due to the carelessness or ignorance of the workman; these con- siderations are in blocks, perhaps more than in most things, of the utmost importance. Another advantage was, that the blocks could be made by Brunel's machinery about 30 per cent. cheaper than hand-made blocks had been previ- ously obtained by contract, and the importance of this to the Admiralty in those days, when all ships were so heavily rigged, having no steam to supplement their sail power, will be sufficiently seen when it is stated that the remunera- tion which Brunel was to receive for his invention was agreed to be the savings of one year, and that these savings were estimated at £16,621; in addition to this he received an allowance of a guinea a day for about six years while engaged on the work, and was paid £1000 for his working model—the total amount paid to Brunel for the invention amounting to about £20,000.

The process may be described as follows :—Pieces of wood are cut roughly to the size of the block, and the first operation is then performed by the boring-machine, which bores a hole for the pin, and one, two, or three holes, as the case may be, for single, double, or treble blocks, to receive the first stroke of the mortising chisel; the block is next taken to the mortising-machine, where the mortise or mortises for the sheaves are cut; after this, to a circular saw, conveniently arranged for cutting off the corners and so preparing the block for the shaping-machine, which con- sists principally of two equal and parallel circular wheels

moving on the same axis, to which one of them is firmly fixed, but on which the other is made to slide; so that these two wheels may be placed at any given distance from each other, aud blocks of any size admitted between their two rims or peripheries. For this purpose, both rims are divided into ten equal parts, for the reception of ten blocks, which are firmly fixed between the two wheels. When the double wheel with its ten attached blocks is put in motion, the outer surface of the blocks, or those which are farthest from the centre, strike against the edge of a chisel or gouge fixed in a movable frame, which, being made to slide in a curved direction in the line of the axis, cuts those outward faces of the blocks to their proper curvature. A contrivance is attached to the cutting tool which allows of the curvature being altered in any re- quired way. One side being shaped, the ten blocks are then, by a single operation, each turned one fourth part round, and another side is exposed to the cutting instru- ment moving in the same direction as before. A third . side is then turned outwards, and after that the fourth side, when the whole ten blocks are completely shaped.

The velocity with which the wheels revolve, and the great weight with which their peripheries are loaded, would make it dangerous to the workmen or bystanders, if, by the violence of the centrifugal force, any of the blocks should happen to be thrown off from the rim of the wheels; to prevent the possibility of such an accident, an iron cage or guard is placed between the workman and the machine.

The last operation is performed by the scoring-machine, which cuts a groove to receive the binding or strappiug of the block. The binding may be of iron or rope, and is very frequently of wire rope.

The Sheaves.—The machinery employed for making this part of the block consists of a circular saw, by which the log is cut into plates of the thickness required for the sheaves, according to their several diameters. These plates are next carried to a crown saw, which bores the central hole, and at the same time reduces them to a perfect circle of the assigned diameter. The sheave, thus shaped, is next brought to the coaking-machine, a piece of mechanism not inferior in ingenuity to the shaping machine for the shells. A sinall cutter, in traversing round the central hole of the sheave, forms a groove for the insertion of the coak or bush, the shape of which is that of three semicircles, not concentric with each other, nor with the sheave, but cach having a centre equally distant from that of the sheave. The manner in which the cutter traverses from the first to the second, and from this to the third semicircle, after finishing each of them, is exccedingly ingenious. So very exact and accurate is this groove cut for the reception of the metal coak, and so uniform in their shape and size are the latter cast, the casting being made not in sand but in iron moulds, that they are invariably found to fit each other so nicely that the tap of a hammer is sufficient to fix the coak in its place. The coaks are cast with small grooves or channels in the inside of their tubes, which serve to retain the oil or grease for the pins.

The sheave, with its coak thus fitted in, is now taken to the drilling-machine, which is kept in constant motion. In casting the coaks a mark is left in the centre of each of the three semicircles. This mark is applied by a boy to the point of the moving drill, which speedily goes through the two coaks and the intermediate wood of the sheave, Rivets are put in these holes and clenched by hand. The next operation is performed by the facing-machine, which has two cutters, so arranged as to finish the side and groove the edge siniultaneously ; then the hole for the pin is enlarged to its exact size by the broaching-machine. The pins, which form a very important part of the block, are

now made at Portsmouth, not of iron but of steel, carefully tempered by special appliances. They are turned by a self-acting lathe, and are then reduced to the exact required diameter, and polished in the pin-polishing machine. They are also, in this machine, subjected to a proof strain proportional to their sectional area, and thus the strength of the pin is guaranteed.

The blocks are invariably made of English elm, the grain of the wood running lengthways of the block ; but in Germany recently, blocks have been made with the grain of the wood running across the block, the reason being that they are less likely to be split by the pressure on the pin of the sheave. The sheaves are made of lignum vite.

Three machines of each description for each operation, up to and including the facing-machine, are required. The smallest sized machines will make blocks of from 4 inches to 7 inches in length, the second size from 8 inches to 11 inches, and the largest from 12 inches to 17 inches. Two sizes of the broaching-machine, and one pin-polishing machine, are sufficient. Blocks larger than 17 inches are made by hand, 26 inches being the largest used in the Royal Navy.

As will be seen from the foregoing account, all machine- made blocks are cut out of a solid piece of wood; whereas hand-made blocks, larger than about 8 inches, are usually made in pieces, filled in at the ends and riveted together. It is questionable whether a block so made is not stronger than one cut out of th» solid, as in the latter case the short-grained wood at the ends of the mortises is very liable to give way. In hand-made blocks the brass coak or tail of the sheave is not made of the peculiar shape described for machine-made blocks, but is usually of a circular shape.

The machinery for Portsmouth Dockyard, on Brunel's plans, was made by Maudslay, whose firn—now the very eminent firm of Maudslay Sons and Field—has since supplied block-making machinery to the Spanish, Turkish, and Russian Governments, and also to Chatham Dockyard ; the last mentioned, however, has never been used, as the machinery at Portsmouth is capable of supplying all the dockyards, the demand for blocks being much less for the steamships and ironclads than it was formerly for the old sailing ships. The first cost of this machinery is so great that no private firm

has yet ventured to set it up, and the whole of the blocks used in merchant skips are made by hand-labour, assisted by a lathe and two or three other simple mechanical contrivances. (T. M.)

BLOCKADE. It appears to have been the ancient practice of belligerents at the outset of a war to forbid by proclamation all trade on the part of neutrals with the enemy, and to treat as enemies all those who contravened the proclamation ; and neutrals acquiesced tacitly in this practice until the commencement of the 17th century. In the course of that century the ancient practice came into question, as imposing on the commerce of neutrals an in- convenience not justified by any adequate necessity on the part of belligerents, and it has since fallen into desuetude. Belligerents, however, have still maintained, without any question on the part of neutrals, the practice of intercepting supplies going over sea to an enemy under certain condi- tions, namely, when a belligerent has invested an enemy's port, with the intention of reducing the enemy to surrender from the failure of supplies, and for that object a stoppage of all supplies to such port has become a necessary opera- tion of the war. Any attempt, under such circumstances, on the part of a neutral merchant to introduce supplies into the invested port is a direct interference with the operations of the war, and is inconsistent with neutrality, aud it accordingly subjects the offending party to be treated

as an enemy by the belligerent. The question, What con- stitutes such a belligerent investment of an enemy's port as to create an obligation on the part of neutrals to abstain from attempting to enter it, has been much controverted since the "armed neutrality" of 1780; but all uncertainty as to the principle upon which the decision in each case must proceed, has been put an end to by the declaration of the powers assembled in congress at Paris in 1856, that '"' Blockades, in order to be binding, must be effective, that is to say, must be maintained by a force sufficient really to prevent access to the enemy's coast." The question of fact will still be a subject for judicial inquiry in each case of capture, whether the conditions under which a blockade has been maintained satisfy the above declaration. If an asserted blockade is maintained in a manner which satisfies the above

declaration, there is no limit to the extent of an enemy's coast which may be placed under blockade. There is also a general consent amongst nations that a neutral merchant must have knowledge of a blockade in order to be liable to be treated as an enemy for attempting to break it; but there is not any uniform practice amongst nations on this subject further than that when a blockade has become notorious, the knowledge of it will be presumed against every neutral vessel which attempts to enter the blockaded port. On the other hand, where a blockade is not notorious, it is in accordance with the practice of nations to give some notice of it to neutrals; and this notice may be communicated to them either by actual warning given to each neutral vessel which seeks to cross the line of blockade, or by a constructive warning to all neutrals resulting from an official notification of the blockade on the part of the blockading power to all powers inamity with it. It is a growing practice, if not altogether an established practice, amongst nations which accredit to one another resident envoys, for belligerents to notify diplomatically to the neutral powers the fact that they have placed an enemy's port under blockade ; and it is the rule of the prize courts of Great Britain and of the United States of America to hold that, where such an official notification has been made, all the subjects of the neutral powers may be presumed to have knowledge of the blockade. Other powers, amongst which France may be mentioned, have been accustomed to direct their blockading cruisers to give warning of the blockade to each vessel that attempts to cross the line of blockade, and not to capture any vessel unless she attempts to break the blockade after such warning ; but the practice of France agrees with the practice of other powers in not giving such warning after a blockade has become notorious. There is, further, a general practice amongst nations to treat the act of sailing with an intention to enter a blockaded port as an unneutral act, which will warrant the capture of a neutral merchant vessel by a belligerent cruiser on any part of the high seas, unless clear evidence is forthcoming from the captured vessel that the intention has been abandoned, or that its execution was contingent on the blockade being raised. After a port has been placed under blockade, egress is prohibited to all neutral vessels, except to such as have entered the port before the blockade was established, if they come out either in ballast or with cargoes taken on board before the com- mencemeut of the blockade. No warning is required to affect such vessel with a knowledge of the blockade, and if any such vessel should succeed in passing through the

blockading squadron it becomes liable to capture as good prize by a belligerent cruiser on any part of the high seas, until it has reached its port of destination, when the offence is considered to be purged. Under the ancient practice both ship and cargo were confiscable for the breach of a blockade, and even the captain and crew were liable to be treated as enemies. A milder practice is now generally

observed as regards the captain and crew, and a certain equity is administered in the British and American prize courts towards the owners of cargo, where the ship and the cargo do not belong to the same parties, and the owners of the cargo have not any knowledge of the blockade, or have been unable to countermand the shipment of the cargo since the blockade has become known to them. In such cases the cargo is released, although the ship may be rightfully condemned to the captors. Ga)

BLOIS, the chief town of the department of Loir-et-Cher in Frauce, is situated in the form of an amphitheatre on the steep slope of a hill on the right bank of the Loire, 35 miles 8.W. of Orleans, in 47° 35' N. lat. and 1° 29' E. long. It is united by a bridge of the 17th century with the suburb of Vienne on the other side of the river. The houses of the older part of the town are frequently: of antiquarian interest, and the streets, which are in many cases rather stairways than streets, have often a picturesque appearance. The castle is an immense structure built at different periods, part as early as the 13th century. It was the birth-place of Louis XII., and is noted as the scene of the assassination of the duke of Guise and his brother the cardinal by command of Henry III, Among the other remarkable buildings in the town are the Hétel de Ville, the episcopal palace, now occupied by the prefecture, the cathedral of St Louis (a modern structure), and the churches of St Vincent and St Nicholas, An ancient aqueduct, cut in the solid rock by the Romans, conveys the water of several springs to a reservoir, whence it is distributed to different parts of the town. Blois is the seat of a bishopric founded by Louis XIV., and has a communal college, a normal school, and two diocesan seminaries ; an exchange, a hospital, a theatre, a botanical garden, a public library, and an agricultural society. It manufactures gloves, hosiery, hardware, and pottery, and has a

considerable trade in wine, brandy, and timber. Population in 1872, 17,475. Though possibly existing under the Roman empire, Blois is first distinctly mentioned by Gregory of Tours in the 6th century, and does not become of much importance till the 9th or 10th, when it forms the chief town of a countship. From that date it appears very frequently in French history. In 1577 and 1588 the States-General were held in the city.

BLOMFIELD, Cnartes James, bishop of London, was born on the 29th May 1786, at Bury-St-Edmund's. He received his first education at his father's school in that town, and was then transferred to the grammar school, where, under the able instruction of the Rev. M. T. Becher, he laid the foundations of an unusually sound and thorough classical scholarship. His career at Trinity College, Camw- bridge, which he entered in 1804, was brilliant. He gained the Browne medals for Latin and Greek odes, and carried off the Craven scholarship. In 1808 he graduated as third wrangler and first medallist, and in the following year was elected to a fellowship at Trinity College. The first-fruits of his scholarship was an edition of the Prome- theus of AEschylus, in 1810; this was followed by editions of the Septem contra Thebas, Perse, Choephore, and Agamemnon, of Callimachus, and of the fragments of Sappho, Sophron, and Alczus. Blomfield, however, soon ceased to devote himself to mere scholarship. He had been ordained in 1810, and held for a short time the curacy of Chesterford. He was then presented to the rectory of Quarrington, and shortly afterwards to that of Dunton, in Buckinghamshire, where he remained for about five years. In 1817 he was moved to the benefices of Great and Little Chesterford and Tuddenham, and he was in the same year appointed private chaplain to Howley, bishop of London. In 1819 he was nominated by Lord Liverpool to the rich living of St Botolph's, Bishopsgate, and in 1822

he becaine archdeacon of Colchester. Two years later he was raised to the bishopric of Chester, and in that position began his career of incessant labour for the advancement of the church. Many reforms were needed in the diocese, and the new bishop's energy and ardour succeeded in effecting much, though not without stirring up enemies. In 1828 he was transferred to

a wider sphere of activity, being raised to the bishopric of London. This important office he held for eight-and-twenty years, labouring inces- santly in a field where unremitting exertion was absolutely necessary. He gave his whole heart to the endeavour to extend the influence and efficiency of the church, and his strenuous activity was not without result. In all political or social movements which concerned the church the bishop took a prominent part. He was noted as being one of the best debaters on the episcopal bench in the House of Lords ; he took a leading position in the action for church reform, which culminated in the Ecclesiastical Commission ; and he did much for the extension of the colonial episcopate. His health gave way under his unceasing labours, and in 1856 he was permitted to resign his bishopric, retaining Fulham palace as his residence, along with a pension of £6000 per annum. He died at Fulham on the 5th August 1857. In private life Blomfield was warm-hearted, genial, and kindly ; he was foud of travelling and of intellectual society, in which he was well qualified to shine. His published works, exclusive of those above mentioned, con- sist of charges, sermons, lectures, and pamphlets, and of a Manual of Private and Fanuly Prayers. He was a frequent contributor to the quarterly reviews, chiefly on classical subjects. An admirable memoir has been published by the bishop's son, Jfemoirs of Charles James Blomfield, D.D., Bishop of London, with Selections from his Correspondence, edited by his son, Alfred Blomfield, M.A., &c., 1863. See also Biber, Bishop Blomfield and his Times, 1857.

BLONDEL, Davin, a Protestant clergyman, distin- guished by his proficiency in ecclesiastical and civil history, was born at Chalons-sur-Marne in 1591, and died in 1665. In 1650 he succeeded G. J. Vossius in the professorship of history at Amsterdam. His works were very numerous, and were remarkable even at that period for obscurity of style. The most celebrated of them was the dissertation on Pope Joan, in which he came to the conclusion that the whole story was a mere myth. Considerable Protestant indignation was excited against him on account of this book.

BLOOD. See Anatomy and PyysroLoey.

BLOOD, Tuomas, generally known by the appellation of Colonel Blood, was a disbanded officer of the Parliamentary army. Bearing a grudge

against the duke of Ormond, who had defeated a conspiracy he engaged in to surprise the castle of Dublin, Blood seized the duke one night in his coach in St James's Street, and carried him off a considerable distance, resolving to hang him at Tyburn ; but Ormond struggled for his liberty and was rescued by his servants. Soon after, in 1671, Blood formed the design of carrying off the crown and regalia from the Tower,—an attempt which very nearly proved successful. He had bound and wounded Edwards, the keeper of the jewel-office, and had escaped out of the Tower with his prey; but he was overtaken and seized, together with some of his associates. One of these was known to have been concerned in the attempt upon Ormond, and Blood was immediately concluded to be the ringleader. 4, When questioned, he frankly avowed the enterprise, but refused to discover his accomplices. All these extraordinary circumstances induced Charles II. to seek an interview with him, which not only led to his pardon, but to the king's granting him an estate of £500 a year in Ireland, encouraging his attendance about his person,

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and showing him great favour. He died August 24,

1680,

BLOOMFIELD, Rosert, was born of very humble parents at the village of Honington in Suffolk, in 1766. Losing his father at the age of eleven, he was apprenticed to a farmer, and could only cultivate his literary tastes by perusing such books as he could borrow. Thomson seems to have been his favourite author, and Z'he Seasons inspired him with the ambition of being a poet. He came to London, and composed Zhe Farmer's Boy in a garret in Bell Alley. The manuscript fell into the hands of Capel Lofft, who encouraged him to print it, and it suc- ceeded so well, that above 26,000 copies of it were sold. His reputation was increased by the appearance of his Rural Tales, Songs and Ballads, News from the Farm, Wild Flowers, and The Banks of the Wye. These are of unequal merit; but all breathe a spirit of purity and enthusiasm for the beauties of nature, that place the name of Bloomfield among the most natural and amiable of our pastoral poets. Theextensive sale of Zhe Farmer's Boy and Wad Flowers seems to have done little for the benefit of the poet, who died in poverty at Shefford

in Bedford- shire in 1823, His Remains in Poetry and Verse, 2 vols., appeared in 1824, and another edition of his poems in 1866. A selection from his correspondence, edited by Hart, appeared in 1871.

BLOUNT, CrHarues, younger son of Sir Henry Blount, was born at Upper Holloway, April 27, 1654, and died 1693. He gained considerable reputation as a politician and man of letters, but his abilities were not great, and his strength lay in scoffing infidelity. His Anima Mundi, or an Historical Narration of the Opinions of the Ancients con- cerning Man's Sou after this Life, according to Unen- lightened Nature, gave great offence; and his translation of Philostratus's Life of Apollonius Tyanwus was sup- pressed for the flippancy and impertinence of its attacks on revealed religion. A similar work of his, called Great is Diana of the Ephesians, under colour of exposing super- stition, struck at revelation. In 1684 he printed a kind of introduction to polite literature, under the title of Janua Scientiarum. His Just Vindication of Learning and of the Liberty of the Press(1693) is a shameless plagiarism from the Areopagitica, The pamphlet which he sent anonymously to Bohun, the censor, entitled King William and Queen Mary Conquerors, set all London in a flame, and completely attained its object, the ruin of Bohun. Indirectly it had a good result in directing attention to the folly of the cen- sorship. After the death of his wife, he proposed to marry her sister, and wrote a letter on that subject with great learning aud address; but the archbishop of Canterbury and other divines decided against him, and the lady having therefore refused him, he is said to have shot himself, or, according to Pope's account, to have given himself a mortal wound in the arm. A collected edition of his works was published in 1695 by Gildon, with a life by the editor. See Macaulay, JZistory, iv. 352, sqg.; Lechler, Ges. d. Englisch. Deismus, 114-127.

BLOW, Joun, an English musical composer, was born in 1648 at North Collingham in Nottinghamshire. He was educated at the chapel royal, and distinguished him- self by his proficieucy in music, having composed several anthems at an unusually early age. In 1673 he was made a gentleman of the chapel royal, and in 1685 was named one of the private musicians of James TI. In 1687 he became master of the choir of St Paul's Church; in 1695 he was elected organist of St Margaret's, Westminster, and

in 1699 composer to the chapel royal. In 1700 he published his Amphion Anglicus, a collection of pieces of music for one, two, three, and four voices, with a figured-bass accom- paniment. Doctor Burney says that in the Amphion

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Anglicus "the union of Scottish melody with the English is first conspicuous." Blow died in 1708, and was buried in the north aisle of Westminster Abbey. None of his compositions, most of which are anthems, attain the highest order of merit.

BLOWPIPE, a tube for directing a jet of air into a fire or into the flame of a lamp or gas jet, for the purpose of producing a high temperature by complete and rapid com- bustion. The blowpipe has been in common use from the earliest times for soldering metals and working glass; and since 1733, when Anton Swab first applied it to analysis of mineral substances, it has become a valnable auxiliary to the mineralogist and chemist, in the chemical examina- tion and analysis of niinerals. Its application has been variously improved at the hands of Cronstedt, Bergmann, Gahn, Berzelius, Plattner, and others, but more especially by the two last-named chemists.

The simplest and oldest form of blowpipe (still used by gasfitters, jewellers, d&c.), is a conical brass tube, about 7 inches in length, curved at the small end into a right angle, and terminating in a small round orifice, which is applied to the flame, while the larger end is applied to the mouth. Where the blast has to be kept up for only a few seconds, this instrument is quite serviceable ; but in longer chemical operations inconvenience arises from the condensation of moisture exhaled by the lungs in the tube. Hence many blowpipes are made with a cavity for retaining the moisture. Cronstedt placed a bulb in the centre of his blowpipe. Dr Black's convenient instrument consists of a conical tube of tin plate, with a small brass tube, support- ing the nozzle, inserted near the wider end, and a mouth- piece at the narrow end. One of the most suitable forms of blowpipe is that shown in fig. 1. It is Gahn's instru-

Fia. 1.—Extremities of Gahn's Blowpipe,—ordinary size.

ment as improved by Plattner. The tube A is ground to fit accurately into a socket at the top of the water-trap B, as is also the jet-pipe C. The nozzle D, of platinum, is fitted in the same manner, so that it can be easily removed and replaced while hot; ¢.g. when it is desired to remove the crust of soot which deposits upon the point when an oil lamp or candle is used. The sizes of orifice recom- mended by Plattner are 0'4 and 0°5 millim. The trumpet mouthpiece, from the support it gives to the cheeks when inflated, conduces to a more steady and long-continued blast being kept up without fatigue than when the mouthpiece is inserted between the lips. Mr David Forbes has sug- gested the use of a double jet-pipe in connection with this instrument, so that a large or small orifice may be obtained without stopping the point ; but it is doubtful whether the advantage gained is counterbalanced by the extra cost and complication. For the majority of blowpipe workers, there is probably no better instrument than Dr Black's, if pro- vided with a properly-shaped nozzle, if possible of platinum ; but where it is much used, the large-sized trumpet-mouthed instrument of Plattner is to be pre- ferred. The instrument should be held with the first and fourth fingers passed round it, and the thumb laid along the side of the tube, the hold being steadied by resting

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the elbow on the table. The mode of blowing is peculiar,

and requires some practice ; an uninterrupted blast is kept

up by the muscular action of the cheeks, while the ordinary respiration goes on through the nostrils.

If the flame of a candle or lamp be closely examined, it will be seen to consist of four parts—(a) a deep blue ring at the base, (6) a dark cone in the centre, (c) a luminous portion round this, and (d) an exterior pale blue envelope. The blue ring is formed chiefly by combustion of carbonic oxide. In the central cone the combustible vapours from the wick, though heated, are not burned, atmospheric oxygen not reaching it. In the luminous portion the supply of oxygen is not sufficient for complete combustion ; the hydrogen takes up all or most of it, and carbon is pre- cipitated in solid particles and ignited. In the exterior envelope, lastly, the temperature is highest, and combustion most complete,—suflicient oxygen being supplied to con- vert the carbon and hydrogen into water and carbonic acid.

In blowpipe work only two of these' four parts are made use of, viz., the pale envelope, for oxdation, and the luminous portion, for reduction. To obtain a good oxidizing flame, the blowpipe is held with its nozzle inserted in the edge of the flame close over the level of the wick, and blown into gently and evenly. A conical jet is thus produced, consisting of an inner cone, with an outer one com- mencing near its apex:—the former, corresponding to (a) in the free flame, blue and well defined ; the latter, corre- sponding to (d), pale blue and vague. The heat is greatest just beyond the point of the inner cone, combustion being there most complete. Oxidation is better effected (if a very high temperature be not reqnired) the farther the substance is from the apex of the inner cone, so far as the heat proves sufficient, for the air has thus freer access.

To obtain a good reducing flame (in which the com- bustible niatter, very hot, but not yet burned, is disposed to take oxygen from any compound containing it), the nozzle, with smaller orifice, should just touch the flame at a point higher above the wick, and a somewhat weaker current of air should be blown. The flame then appears as a long, narrow, luminous cone,—the end being enveloped by a dimly visible portion of flame corresponding to that which surrounds the free flame, while there is also a dark nucleus about the wick. The substance to be reduced is brought into the luminous portion, where the reducing power is strongest.

The flame of an oil-lamp is the best for blowpipe opera- tions where gas is wanting; candle flame may be used when great heat is not required. The blowpipe lamp of Berzelius, supplied with colza oil, is probably the most suitable. The wick, when in use, should be carefully trimmed and clean, so as to avoid a smoking flame. The general introduction of gas has quite driven out the use of oil-lamps for blowpipe purposes in laboratories.

Various materials are used as supports for snbstances in the blowpipe flame ; the principal are charcoal, platinum, and glass. Charcoal is valuable for its infusibility and low eonductivity for heat (allowing substances to be strongly heated upon it), and for its powerful reducing agency by the production of carbonic oxide when ignited ; so that it is chiefly employed in trying the fusibility of minerals, and in reduction. 'The best kind of charcoal is that of close-grained pine or alder; it is cut in short prisms, having a flat smooth surface at right angles to the rings of growth. In this a shallow hole is made with a knife or borer, for receiving the substance to be held in the flame. Platinum is employed in oxidizing processes, and in fusion of substances with fluxes with a view to try their solubility in them, and note the phenomena of the bead ; also in observing the colouring effect of substances on the blowpipe flame (which effect is apt to be somewhat masked

by charcoal). Most commonly it is used in the form of wire, with a small bend or loop at the end. In flux experiments this loop is dipped when ignited in the powdcred flux (e.g., borax), then held in a lamp flame till the powder is fused ; and the process is repeated, if neces- sary, till the loop is quite

filled with a bead of the flux ; to this is now added a little of the substance to be examined. Platinum is also uscd in the form of foil and of spoons, and for the points of forceps. Metals and casily reducible oxides, sulphides, or chlorides should not be treated upon

platinum, as these substances may combine with and

damage it. Tubes of hard German glass, 5 to 6 inches long, about 1th inch diameter, and open at both ends, are useful in the exainination of substances containing sulphur, selenium, arsenic, antimony, and tellurium ; these, when heated with access of air, evolve characteristic fumes. They are put in the tube near one end (which is held slightly depressed), and subjected to the blowpipe flame. The sublimates often condense on the cooler parts of the tube. Small tubes, closed at one end, are used, where it is required to detect the presence of water, mercury, or other bodies which are volatilized by heat without access of air.

The most important fluxes used in blowpipe analysis are carbonate of sodium, borax, and microcosmic salt. The first (which must be anhydrous and quite free from sulphates) serves chiefly in reducing metallic oxides and sulphides on charcoal, decomposing silicates, determining the presence of sulphur, and discriminating between lime and other earthy bases in minerals. Pure borax, or acid borate of sodium deprived of its water of crystallization by heating, is used for the purpose of dissolving up metallic oxides, when in a state of fusion at a red heat, such fused masses usually having characteristic colours when cold. In some cases the colour and transparency change on cooling. Jficrocosmic salts, or ammonio-phosphate of sodium, is used on platinum wire in the same way as borax ;! on heating, water and ammonia are given off. The following are some other reagents for certain cases—nitrate of potash, bisulphate of potash, nitrate of cobalt, silica, fluoride of calcium, oxide or oxalate of nickel, protoxide of copper, tinfoil, fine silver, dry chloride of silver, bone ash, and litmus and Brazil-wood paper.

lt may be useful here to pass briefly under review a few of the effects obtained in qualitative examinations with the blowpipe. Beginning with the closed tube, organic sub- stances may be revealed by the empyreumatic odour given off, and by charring. Mercury condenses on the tube in minute

globules. Selenium gives a reddish-brown, tellurium a grey, arsenic a black sublimate. Oxygen is sometimes given off, and will inflame an incandescent splinter of wood when introduced; while ammonia may be detected by red litmus paper, as also the acid or alkaline reaction of any liquid product. In the open tube, sulphur and sulphides give off pungent-smelling sulphurous acid gas. Selenium gives a steel-grey deposit, and an odour resembling that of horse radish. Arsenic, antimony, tellurium, yield their respective acids, forming white sublimates. The deposit from arsenic is crystalline, that from the others amorphous. In examination on charcoal, it is useful, in practice, to commence with pure materials and familiarize one's self with their phenomena. Most of the metals fuse in the heat of the blowpipe flame ; and in the outer flame they oxidize. The noble metals do not oxidize, but they fuse. 'The metals platinum, iridium, rhodium, and palladium do not fuse. The incrustations (when such occur) are in each case characteristic, both in aspect and in the effects they give before the blowpipe flame. Among the most com- mon oxides capable of reduction on charcoal alone, in the

1 Tn a paper to the Royal Society, Captain Ross points out that it is

better to use boric acid and phosphoric acid, instead of borax and microcosmic salts, for various analyses.

inner flame, are those of zinc, silver, lead, copper, bismuth, and antiniony. The principal minerals that cannot be so reduced are those containing alkalies and alkaline earths, and the oxides of iron, manganese, and chromium. Many substances give a characteristic colour, when held by platinum forceps in the oxidizing flame. For example, arsenic, antimony, lead, colour the flame blue; copper, baryta, zinc, green; lime, lithia, strontia, red; potash, violet. Heated with borax, some bodies give a clear bead, both while hot and cold, except when heated by the inter- mittent oxidizing flame, or the flame of reduction, when the bead becomes opalescent, opaque, or milky white. The alkaline earths, tantalic and titanic acids, yttria and zir- conia are exainples of this. The oxides of most of the heavy metals give coloured glasses with borax, similar to those obtained by their use in glass or enamel painting. Thus oxide of cobalt gives a showy blue, and oxide of nickel a reddish-brownish colour, both being very

characteristic and delicate tests of the presence of these metals. Ferric oxide gives a feeble yellow colour, which is darker while hot; but when the bead so coloured is treated in the reduc- ing flame the iron passes into the state of ferrous oxide, giving an intensely green or nearly black colour. This reaction may be more certainly brought about by touching the bead while melted with a fragment of tin, when the ferric oxide is probably reduced at the expense of the metal. With manganese the reverse eflect is produced. A bead containing a considerable quantity of manganous oxide, such as is produced by a clean reducing flame, is colourless, but when treated in the oxidizing flame the showy violet colour of the higher oxide is brought out. This reaction is a very delicate one, and is to be recommended to begin- ners as a test exercise in blowing a clean flame, the bead being rendered alternately coloured and colourless accord- ing as the oxidizing or reducing fame is used. Molybdic acid, which gives a black bead in the reducing, and a clear – bead in the oxidizing flame, but requires more careful management, was usually recommended by Plattner to his students for this kind of exercise. Copper salts give a grecn bead in the oxidizing and a deep sealing-wax red in the reducing flame. 'This latter indication is of value in detecting a trace of copper in the presence of iron, which is done by reducing with tin as already described for iron. The effects obtained with beads of microcosmic salt, or as it is more generally called salt of phosphorus, are generally similar to those described for borax, but in certain' cases it is to be preferred, especially in the detection of silica, which remains undissolved, and titanic acid, which can be made to assume the form of crystals similar to the natural mineral anatase by particular treatment and microscopic examination. Several new phenomena, due to the crystallization of titanic acid and similar bodies, have been described by Gustav Rose. With carbonate of sodium as flux (a paste of which and the substance to be examined is made with water, and held on charcoal to the flame), three reactions may occur. The substance may fuse with effervescence, or it may be re- duced, or the soda may sink into the charcoal, leaving the substance intact on the surface. The first takes place with silica, and with titanic and tungstic acids. The oxides of tungsten, antimony, arsenic, copper, mercury, bismuth, tin, lead, zinc, iron, nickel, and cobalt are reduced. Lead, zine, antimony, bismuth, cadmium, and tellurium are volatilized partiatly, and form sublimates on the charcoal. Mercury and arsenic are dissipated as soon as reduced. Silica and titanic

acid are the only two substances that produce a clear bead. The bead in which silica is fused is sometimes rendered yellow by the presence of sulphur. Carbonate of soda, with addition of a little nitrate of potassa, is very useful for detecting minute quantities of manganese. The fused mass, when clear, has, from the production of man-

ganate of sodium, a fine green colour. (For particulars of the behaviour of different minerals before the blowpipe, see the detailed description in the article MinERALOGY.) Of late years the spectroscope has been successfully used in connection with blowpipe operations, in the detection of certain of the rarer metallic elements,

The blowpipe was first applied in the quantitative deter- mination of metals by Harkort in 1827, and was brought to a high degree of perfection by Plattner. The methods are substantially those adopted in the assay of ores on the large scale in the wind furnace or muffle, thin cap- sules of clay or cavities in charcoal blocks being substituted for crucibles, and steel basins faced with bone ash, for cupels, in silver and gold assaying. From the small size of the beads obtained, especially when the ores of the pre- cious metals are operated upon, the results are often such as cannot be weighed, and they are then measured by a tangent scale, and the weight computed from the observed diameter. This method, devised by Harkort, gives very accurate results when carefully used, but owing to the difficulty of sampling the minute quantities operated upon so as to represent the bulk of the mineral fairly, the quantitative blowpipe assay has not made much progress. Perhaps the most useful quantitative application is in the determination of nickel and cobalt. This depends upon the fact that when the compounds of these nietals, as well as those of copper and iron, with arsenic, are melted in contact with an oxidizing flux, such as borax or salt of phosphorus, iron is first taken up, then cobalt, and next nickel, and finally copper; and as the oxides of these metals give very different colours to the flux, we are enabled by examining the slag to detect the exact moment at which each is removed. For the details of the process the reader is referred to Plattner's work.

Among the various arrangements which have been con- trived for supplying air to the blowpipe otherwise than with the mouth, we may select that

represented in the annexed figure (2) as one which is generally sufficient for

Fic, 2.—Blowpipe with Bellows.

practical purposes, It will be seen that the jet ¢ is sup- ported on a slide which can be fixed by screwing in any direction and at any height on the rod s, which is jointed on the board &. The blast can thus be adjusted variously, according to the position given to the blowpipe lamp a, which is of the form devised by Berzelius. The bellows B, the tube &, and the reservoir R, are of vulcanized india-rubber, v and v' are valves, The bellows being alternately compressed (with hand or foot) and allowed to expand, air is driven into the reservoir, and a fresh supply admitted into the bellows through v. After a few trials a constant blast may thus be maintained through the nozale.

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For glass-blowing ordinary coal gas is the best com- bustible, as the flame can be well controlled by a stop- cock, and requires no trimming. The nature of the apparatus will be understood from fig. 3, which shows the burner in horizontal section. The tube ab is screwed into another tube which is con- nected with the gas pipe ef. mn and op are two annular disks which support the pipe ab ; they have a series of open- ings round their edges, to admit a uniform flow of gas to the narrow annular mouth between the two tubes where it joins the blast. The stop- cock f regulates the supply of gas. The wind, supplied by double bellows fixed under the table, is sent through a lead pipe on which brass nozzles of various width can be screwed, opening into ab; the finer nozzles being pushed up nearly to the end of this. Elastic tubing may sometimes be used with advantage for the connections. A modified form of the apparatus is suit- able for ordinary blowpipe researches of the mineralogist or chemist (see Plattner's work, 4th edition), and the appara- tus used in hand-soldering of metals and other operations of the workshop is on the same principle. With suit- able trunnions the blowpipe may be nade to point in any direction as re- quired,

The soldering lamp of tinners is an example of the eolipile, an instru- nient which deserves some notice here. The spirit lamp a (fig. 4) is inserted at the bottom of a sheet-iron cylinder MN, which is open on one side, as shown.

‘The upper part of the cylinder supports a strong cup of hammered metal, with an opening for spirits at the top (closed by a screw or cock), and a bent tube coming down from its upper part, through a slit in the cylinder to the back of the flame. The weak spirits which are put in the cup are caused to boil by the heat of the lamp, and the vapour, escaping through the bent tube, pro- duces a jet of very hot flame. (The F’G. 5.—Cup of fig. 4. cup is shown separately in fig. 5). Similar advantage is gained by causing air to pass through a quantity of some soluble hydrocarbon before it goes to the nozzle of a blow- pipe.

Whee are several forms of apparatus in which water- pressure is utilized for supplying a steady blast to the blowpipe. One of these consists of a tin case, with an oblique partition reaching nearly to the bottom. The case is filled nearly three-fourths with water. Air is blown into the compartment which narrows upwards (and with which the nozzle is connected above) by a pipe reaching nearly to the bottom. This air rises through the water and accumulates above it, forcing the water up into the other compartment, which communicates freely with the outer air. The difference of water-level in the two cham-

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Fig. 3.—Section of Blowpipe for Glassblowing.

Fic. 4. —Soldering Lamp.

bers thus sustains a continuous blast through the nozzle. Blowpipes have also been made on the principle of the blowing-machine known as the trompe. Again, the blast is sometimes supplied from a chamber in which air is con- densed by means of a syringe.

The absorption of heat when an ordinary blast of cold air (with its large proportion of nitrogen) is sent into a flame is considerable; and this has suggested the employment of a hot blast for blowpipe work. Mr T. Fletcher has constructed an apparatus on this principle, which yields a very intense flame, sufficient to fuse plati- num wire. The arrange- ment is represented in

fig. 6. It will be ob- served that the pipe con- veying the blast iscoiled several times round the gas pipe (for ordinary S coal-gas), and that both sz coil and core are heated by a row of burners placed below. The blast is furnished either with the mouth or with india-rubber bellows.

The power of the blowpipe flame may be greatly in- creased by supplying oxygen in the place of atmospheric air; and a still greater heat is obtained by the combina- tion of pure oxygen and hydrogen. In the latter arrange- ment, which constitutes the oxyhydrogen blowpipe, it is important that the oxygen and hydrogen be kept in sepa- rate reservoirs, and be only allowed to mix at the jet, otherwise explosion may occur through the flame running back through the jet to the reservoir of mixed gases. There are various methods of effecting this, which we do not stop to describe. The blue flame produced gives the most intense heat that is obtainable by artificial means, except by the electric current. Thick platinum wires are melted before it like wax in a candle flame; and earths, such as lime, magnesia, or zirconia, are raised to intense incandescence. For the application of the oxyhydrogen blowpipe to the fusion of the more refractory metals, see PLATINUM.

The literature of the blowpipe is very extensive. The earlier notices of the subject will be found in Berzelius's original work, of which there are English translations by Children, published in 1822, and by J. D. Whitney (of a later edition), published in Boston in 1845. The most complete work, however, is Plattner's Probirkunst mit dem Lithrohre, of which there are several editions; the fourth or latest, published since the author's death, has been edited by his pupil and successor, Professor Richter of Freiberg. An English translation, by Professor H. B. Cornwall, has been published in New York. For the use of the blowpipe in determining minerals, the best works are Scheerer's Loth- rohrbuch, translated by Professor H. B. Blanford, and a Manual of Determinative Mineralogy, with an Introduction to Blowpipe Analysis, by Professor G. J. Brush of Yates College. In addition to these works, notices, more or less extensive, will be found in most mineralogical handbooks and works on chemical analysis. (A. B. M.)

BLUCHER, Gesuarp Lesprerecut von, field-marshal of the Prussian armics, prince of Wahlstadt in Silesia, was born at Rostock in 1742. In his fourteenth year he eutered into the service of Sweden; and in the war

between that power and Prussia he was taken prisoner. He after- wards entered into the service of Prussia, in which he became distinguished by his activity; but conceiving him- sclf neglected by the great Frederick, he became a farmer

Fria, 6.—Hot-Blast Blowpipe.

in Silesia, and by his enterprise and perseverance in fifteen years he acquired an honourable independence. On the accession of Frederick-William IJ. he was recalled to mili- tary service, and replaced as major in his old regiment, the Black Hussars, where he distinguished himself in six general actions against the French, rose to the rank of colonel and major-general in 1793—4, and gained a high reputation by his energy, promptitude, and foresight. He was in a subordinate command in the disastrous battle of Jena in 1802; but he made a masterly retreat with his column to Liibeck, and extorted the praises of his adversaries, who testified on his capitulation that it was caused by " want of provisions and ammunition." He was soon exchanged for General Victor, and was actively employed in Pomerania, at Berlin, and at Kénigsberg, until the conclusion of the war. When Prussia shook off the French yoke in 1813, he first obtained a separate command. At the head of 60,000 troops, chiefly composed of raw militia, he defeated four French marshals at Katsbach, and rapidly crossing the Elbe, materially contributed to the signal victory of Leipsic. In several severe actions he fought his way to Paris, which he entered on 31st March 1814; and there, it has been stated, but for the interven- tion of the other allied commanders, he was disposed to make a severe retaliation for the calamities that Prussia had suffered from the armies of France. Blowing up the bridge of Jena across the Seine was said to be one of his contemplated acts. When war again broke out in 1815, the veteran was at the head of the Prussian armies in Belgium, and exhibited his wonted enterprise and activity. But partly owing to his own confidence and tenierity, partly to the skilful strategy of his celebrated opponent, he was defeated in the severe battle of Ligny on 16th of June; yet, with his characteristic spirit and energy, Bliicher rallied his defeated forces, and appeared on the field of Waterloo on the 18th, just as Wellington had

repulsed the last attack of Napoleon on the British position. At that critical moment Bliicher was seen emerging from the wood of Frichemont on the French right; and the simultaneous irresistible charge of the British forces converted the retreat of the French into a tumultuous flight. The allied commanders met on the Genappes road, near the farm called Maison du Roi, where the British forces were halted. The pursuit was continued through the night by sixteen fresh Prussian regiments with terrible carnage. The allies soon again entered Paris, where Bliicher remained for several months; but the health of the aged commander having declined, he retired to his Silesian residence at Kirblowitz, where he died on the 12th September 1819, aged seventy-seven. The life of Bliicher has been written by Varnhagen von Ense (1827), Rauschnick (1836), Bieske (1862), and Scherr (1862).

BLUMENBACH, Jouann Friepricn, a distinguished physiologist, was born at Gotha on the 11th of May 1752. He studied medicine at Jena, and afterwards at Gdt- tingen, where he took the degree of doctor in 1775. His thesis on that occasion De Generis Humani Varvetate Nativa, published in quarto, was the germ of those cranio- logical researches to which so many of his subsequent inquiries were directed ; and such was the opinion enter- tained of his acquirements, that he was appointed an adjunct or extraordinary professor of medicine in the following year, and ordinary professor in 1778; soon after which period he began to enrich the pages of the Medwcin- ische Bibliothek, of which he was editor from 1780 to 1794, with various contributions on medicine, physiology, and anatomy. In physiology he was of the school of Haller, and was in the habit of illustrating his theory by a careful comparison of the animal functions of man with those of the lower animals. His reputation was much extended by

the publication of his excellent Institutiones Physiologica, a coudensed, well-arranged view of the animal functions, expounded without discussion of minute anatomical details. This work appeared in 1787, and between its first publi- cation and 1821 went through many editions in Germany, where it was the general text-book of the science. It was translated into English in America by Caldwell in 1798, and in London by Elliotson in 1807.

Blumenbacli was perhaps still more extensively known by his admirable Handbuch of comparative anatomy, of which the German editions were numerous, from its appearance in 1805 to 1824. It was translated into English in 1809 by the eminent surgeon Lawrence, and again, with the latest improvements and editions, by Coul- sonin 1827. This manual of Blumenbach's, though slighter than the subsequent works of Cuvier, Carus, and others, and not to be compared with such recent expositions as that of Gegenbaur, will always be esteemed for the accuracy of the author's own observations, and his just appreciation of the labours of his predecessors.

One of the most extensive cf Blumenbach's works was the Decas Collectionis sue Cramorum Diversarum Gentium illustrata, in which accurate though slight delineatious of the skulls in his noble collection are given, with brief descriptions of each. It appeared in fasciculd, until sixty crania were represented,—exhibiting in a striking manner the peculiarities in form of the skulls of different nations, and justifying the division of the human race into several great varieties or families, of which he enumerated five— the Caucasian or white race, the Mongolian or Tatar, the Malayan or brown race, the Negro or black race, and the American or red race, The classification he thus proposed has been very generally received, and most later schemes have been modifications of it. For these see the article ANTHROPOLOGY, vol. ii. p. 113.

Although the greatest part of Blumenbach's long life was passed at Gottingen, in 1789 he found leisure to visit Switzerland, and gave a curious medical topography of that country in his vbliothek. He was in England in 1788 and 1792. The Prince Regent conferred on him the office of physician to the royal family in Hanover in 1816, and made him knight companion of the Guelphic order in 1821. The Royal Academy of Paris elected him a member in 1831. He died at Gottingen on the 22d of January 1840.

BOA, a name formerly applied to all large Serpents, which, devoid of poison fangs, killed their prey by con- striction; but now confined to that section of them occur- ring in America, the Old World forms being known as Pythons. The true boas are widely distributed throughout tropical America, occurring most abundantly in Guiana and Brazil, where they are found in dry sandy localities, amid forests, on the banks of rivers and lakes,

and in the water itself, according to the habits of the various species. They feed chiefly on the smaller quadrupeds, in search of which they often ascend trees, suspending themselves from the branches by the tail, and thus awaiting motionless the approach of their victim. While so hanging they are partly supported by two spine-like hooks, situated one on cach side of the vent, which are connected with several small bones concealed beneath the skin and attached to the main skeleton. These bones, terminating thus in an external claw, are characteristic of the family Boidce, and are recognized by anatomists as the rudiments of those which form the hiud limbs in all quadrupeds. The size of the boa's prey often seems enormously beyond its apparent capacity for swallowing, a difficulty which disappears on acquaintance with the peculiar structure of the creature's jaws. The bones composing these are not knit together as in Mammals, but are merely connected by ligaments, which

can be distended at pleasure. The mouth of the boa can thus be made to open transversely as well as vertically ; and in addition to this the two jaws are not connected directly as in other animals, but by the intervention of a distinct bone, which adds greatly to the extent of its gape. It has also the power of moving one half of the jaw in- dependently of the other, and can thus keep a firm hold of its victim while gradually swallowing it. 'The boa pos- sesses a double row of solid sharp teeth in the upper jaw, and a single row beneath, all pointing inwards, so that, its prey once caught, it would be well-nigh impossible even for the boa itself to release it. After feeding, boas, like all other reptiles, become inactive, and remain so while the process of digestion is going on, which, in the case of a full meal, may extend over a few weeks, and during this period they are readily killed. All the species are ovo- viviparous. The Jiboya or Bou constrictor—the latter name having been loosely given to all the species—is an in- habitant of the dry and sandy districts of tropical America, and rarely exceeds 20 feet in length. Its food consists chiefly of the agoutis, capybaras, and ant-bears, which abound in those districts. It seeks to avoid man, and is not feared by the inhabitants, who kill it readily with a sharp blow from a stick. The Water-Boa or Anaconda (Hunectens murinus) is a much more formidable creature, attaining, it is said, a length of 40 feet, and being thus probably the largest

of living serpents. It inhabits the lakes, rivers, and marshes of Brazil and Guiana, and passes a considerable portion of its existence in the water. It is exceedingly voracious, feeding on fishes and on such animals as may come to the banks of the stream to drink, for which it lies in wait with only a small part of its head above the surface of the water. It also occasionally visits the farmyards, carrying off poultry and young cattle, and it has been known to attack man.

BOADICEA, a British queen in the time of the Em- peror Nero. She was wife of Prasutagus, king of the Iceni, a people inhabiting the eastern coast of Britain. On his deathbed, 60 a.D., Prasutagus named the emperor heir to his accumulated treasures conjointly with his own two daughters, in expectation of securing thereby Nero's pro- tection for his family and people ; but. he was no soouer dead than the cmperor's officers seized all. Boadicea's opposition to these unjust proceedings was resented with such cruelty, that orders were given that she should be publicly whipped, and her daughters exposed to the brutality of the soldiers. The Britons took up arms, with Boadicea at their head, to shake off the Roman yoke ; the colony of Camalodunum or Colchester was taken, and the Romans were massacred wherever they could be found. The whole province of Britain would have been lost to Rome, if Suetonius Paulinus had not hastened from the Isle of Mona, and at the head of 10,000 men engaged the Britons, who are said to have amounted to 230,000. A great battle was fought, which resulted in the complete defeat of the Britons (62 a.p.) Boadicea, who had dis- played extraordinary valour, soon after despatched herself by poison. (Tac. Ann. xiv. Agric., 15-16; Dion Cass. Ixii.)

BOAR, Wiip (Sus scrofa), an important species of Suidee, a family of Pachydermatous Mammals, and gene- rally regarded as the original stock of our domestic breeds of swine. In size it is equal to the largest of the domestic kinds, while exceeding them all in strength of body and in ferocity of disposition. It is of a greyish- black colour, covered with short woolly hair, thickly inter- spersed with coarse stiff bristles, which assume the form of a mane along the spine. The canine teeth are largely developed, forming two pairs of prism-shaped tusks, which thus become formidable weapons. In old age those tusks in the lower jew gradually curve inwards and upwards over

the snout until they are rendered useless for purposes of attack, when, according to Darwin, they become serviceable for defence in the frequent fights which take place during the rutting season. At the same time, the canines of the upper jaw begin to develop outwards and upwards, and these take the place of the lower ones as offensive weapons. The wild boar is a native of the temperate regions of Europe and Asia, where it inhabits the deepest recesses of forests and marshy grounds. Vambery, in his recent journey through Central Asia, found them in enormous numbers in the extensive swamps of Turkestan. They appear to have been denizens of British forests at least till the reign of Henry II., after which they are not heard of till the time of Charles I., when an attempt to restock the New Forest with them failed. In the reign of William the Conqueror any one killing a wild boar was liable to have his eyes put out. After reaching maturity the boar becomes a solitary animal, unless during the breeding season, when it seeks the female, and at this time they engage in fierce contests with each other, although these, it is said, seldom lead to fatal results, as they contrive to receive the blows on their tusks, or on the specially tough skin which covers their shoulders. The Indian Wild Boar (Sus indicus) is undoubtedly polygamous, and there are several facts which point to a similar habit in the European boar. Both species are nocturnal, issuing from their coverts at twilight in quest of food. This is chiefly of a vegetable nature, consisting of roots which it ploughs up by means of its broad muscular snout and of grain; although they are also known to devour the smaller mam- nals, birds, and eggs. The female is ordinarily a timid creature, but shows great courage and fierceness in defence of its young. It associates with other females for mutual protection against wolves. The wild boar was for many centuries a favourite beast of chase with the nobility of Europe. It was hunted on foot with the spear,—its great strength, and its ferocity when at bay, rendering the sport alike exciting and dangerous. The gun has now super- seded the spear in European boar-hunting, but owing to the comparative scarcity of the boars it is now little practised. In India, however, where these animals abound in the jungles, it is still a favourite sport, the boar being pursued on horseback and speared.

The bristles of the boar are much used in the manufacture of brushes. BOAT-BUILDING. See Suip-sBuiLpINe. BOBRUISK, a town of Russia, in the government of Minsk, 110 miles S.E. of that city, in 53° 15’ N. lat. and 28° 52’ KE. long., on the right bank of the Berezina, near the confluence of the Bobruiska, on the high road from Mogileff to Brest-Litovsk. Bobruisk was an unimportant place in 1508, when the Moscovite army, sent by the Em- peror Basil against the Polish king Sigismund, advanced towards it. In the 17th century there existed a castle, which was burned down in 1649. When the Minsk government was incorporated with Russia, Bobruisk was a small borough ; but in 1795 it was raised to the rank of chief town of a departnient in the Minsk government. In the beginning of the reign of Alexander I. there was erected at Bobruisk, by the advice of General Osterman, a fort, which obtained great importance in 1812, and was made equal to the best in Europe by the Emperor Paul I. The fort proper is built on a height exactly at the conflu- ence of the Bobruiska with the Berezina, nearly a mile from the town. On the right bank of the former river is another small fort, called Fort Frederick William, well sup- ported by a line of defences. In 1860 the population of Bobruisk was 23,761, of whom 11,394 were Jews. It has 2 Greek churches, 17 synagogues, a military hospital, and a de- partmental college. The only industrial establishments are two potteries. On the river near the town there is a har-

bour, by which grain and salt are imported from the southern governments.

BOCCACCIO, Giovanni. Comparatively little is known of Boccaccio’s life, particularly of the earlier portion of it. He was born in 1313, as we know from a letter of Petrarch, in which that poet, who was born in 1304, calls himself the senior of his friend by nine years. The place of his birth is somewhat doubtful,—Florence, Paris, and Certaldo being all mentioned by various writers as his native city. Boccaccio undoubtedly calls himself a Florentine, but this may refer merely to the Florentine citizenship acquired by his grandfather. The claim of Paris has been supported by Baldelli and Tiraboschi, mainly on the ground that his mother was a lady of good family in that city, where she met Boccaccio’s father. The balance of evidence is de- cidedly in favour of Certaldo, a small town or castle in the valley of the

Elsa, 20 miles from Florence, where the family had some property, and where the poet spent much of the latter part of his life. He always signed his name Boc- caccio da Certaldo, and named that town as his birthplace in his own epitaph. Petrarch calls his friend Certaldese ; and Filippo Villani, a contemporary, distinctly says that Boccaccio was born in Certaldo.

Boccaccio, an illegitimate son, as is put beyond dispute by the fact that a special licence had to be obtained when he desired to become a priest, was brought up with tender care by his father, who seems to have been a merchant of respectable rank. His elementary education he received from Giovanni da Strada, an esteemed teacher of grammar in Florence. But at an early age he was apprenticed to an eminent merchant, with whom he remained for six years, a time entirely lost to him, if we may believe his own statement. For from his tenderest years his soul was attached to that " alma poesis," which, on his tombstone, he names as the task and study of his life. In one of his works he relates that, in his seventh year, before he had ever seen a book of poetry or learned the rules of metrical composition, he began to write verse in his childish fashion, and earned for himself amongst his friends the name of "the poet." It is uncertain where Boccaccio passed these six years of bondage; most likely he followed his master to various centres of commerce in Italy and France. We know at least that he was in Naples and Paris for some time, and the youthful impressions received in the latter city, as well as the knowledge of the French language acquired there, were of cousiderable influence on his later career. Yielding at last to his son's immutable aversion to commerce, the elder Boccaccio permitted him to adopt a course of study somewhat more congenial to the literary tastes of the young man. He was sent to a celebrated professor of canon law, at that time an important field of action both to the student and the practical jurist. Accord- ing to some accounts—far from authentic, it is true —this professor was Cino da Pistoia, the friend of Dante, and himself a celebrated poet and scholar. But, whoever he may have been, Boccaccio's master was unable to inspire his pupil with scientific ardour. " Again," Boccaccio says, "T lost nearly six years. And so nauseous was this study to my mind, that neither the teaching of my master, nor the authority and command of my father, nor yet the exertions and reproof of my friends, could make me take to it, for my love of poetry was invincible."

About 1333 Boccaccio settled for some years at Naples, apparently sent there by his father to resume his mercan- tile pursuits, the canon law being finally abandoned. The place, it must be confessed, was little adapted to lead to a practical view of life one in whose heart the love of poetry was firmly rooted. The court of King Robert of Anjou at Naples was frequented by many Italian and French men of letters, the great Petrarch amongst the

number. At the latter's public examination in the noble science of poetry by the king, previous to his receiving the laurel crown at Rome, Boccaccio was present,—without, however, making his personal acquaintance at this period. In the atmosphere of, this gay court, enlivened and adorned by the wit of men and the beauty of women, Boccaccio lived for several years. We can imagine how the tedious duties of the market and the counting-house became more and more distasteful to his aspiring nature. We are told that finding himself by chance on the supposed grave of Virgil, near Naples, Boccaccio on that sacred spot took the firm resolution of devoting himself for ever to poetry. But perhaps another event, which happened some time after, led quite as much as the first mentioned occurrence to this decisive turning point in his life. On Easter-eve, 1341, in the church of San Lorenzo, Boccaccio saw for the first time the natural daughter of King Robert, Maria, whom he immortalized as Fiammetta in the noblest ereations of his muse. Boccaccio's passion on seeing her was instantaneous, and (if we may accept as genuine the con- fessions contained in one of her lover's works) was returned with equal ardour on the part of the lady. But not till after much delay did she yield to the amorous demands of the poet, in spite of her honour and her duty as the wife of another. All the information we have with regard to Maria or Fiammetta is derived from the works of Boc- caccio himself, and owing to several apparently contradic- tory statements occurring in these works, the very existence of the lady has been doubted by commentators, who seem to forget that, surrounded by the chattering tongues of a court, and watched perhaps by a jealous husband, Boc- caccio had all possible reason to give the appearance of fictitious incongruity to the effusions of his real passion. But there seems no more reason to call into question the main features of the story, or even the identity of the person, than there would be in the case of Petrarch's Laura or of Dante's Beatrice.

It has been ingeniously pointed out by Baldelli, that the fact of her descent from King Robert being known only to Maria herself, and through her to Boccaccio, the latter was the more at liberty to refer to this circumstance,—the bold expression of the truth serving in this case to increase the mystery with which the poets of the Middle Ages loved, or were obliged, to surround the objects of their praise. From Boccaccio's Ameto we learn that Maria's mother was, like his own, a French lady, whose husband, according to Baldelli's ingenious conjecture, was of the noble house of Aquino, and therefore of the same family with the celebrated Thomas Aquinas. Maria died, according to his account, long before her lover, who cherished her memory to the end of his life, as we see from a sonnet written shortly before his death.

The first work of Boccaccio, composed by him at Fiam- metta's command, was the prose tale, /vocopo, describing the romantic love and adventures of Florio and Bianca- fiore, a favourite subject with the knightly minstrels of France, Italy, and Germany. The treatment of the story by Boccaccio is not remarkable for originality or beauty, and the narrative is encumbered by classical allusions and allegorical conceits. The style also cannot be held worthy of the future great master of Italian prose. Considering, however, that this prose was in its infancy, and that this was Boccaccio's first attempt at remoulding the unwieldy material at his disposal, it would be unjust to deny that Filocopo is a highly interesting work, full of promise and all but articulate power.

Another work, written about the same time by Fiam- metta's desire and dedicated to her, is the Jeseide, an epic poem, and indeed the first heroic epic in the Italian lan- guage. The name is chosen somewhat inappropriately, as King Theseus plays a secondary part, and the interest of

the story centres in the two noble knights, Palemone and Arcito, and their wooing of the beautiful Emelia. The Teseide is of particular interest to the student of poetry, because it exhibits the first exainple of the ottava ruma, a metre which has been adopted by Tasso and Ariosto, and in our own language by Byron in his Don Juan. Another link between Boccaccio's epic

and our literature is formed by the fact of Chaucer having in the Anight's Tale adopted its main features.

Boccaccio's poetry has been severely criticized by his countrymen, and most severely by the author himself. On reading Petrarch's sonnets, Boccaccio resolved in a fit of despair to burn his own attempts, and only the kindly encouragement of his great friend prevented the holocaust. Posterity has justly differed from the author's sweeping self-criticism. It is true, that compared with Dante's grandeur and passion, and with Petrarch's absolute master- ship of metre and language, Boccaccio's poetry seems to be somewhat thrown into shade. His verse is occasionally slip-shod, and particularly his epic poetry lacks what in modern parlance is called poetic diction,—the quality, that is, which distinguishes the elevated pathos of the recorder of heroic deeds from the easy grace of the mere conteur. This latter feature, so charmingly displayed in Boccaccio's prose, has to some extent proved fatal to his verse. At the same time, his narrative is always fluent and interesting, and his lyrical pieces, particularly the poetic interludes in the Decameron, abound with eharming gallantry, and frequently rise to lyrical pathos.

About the year 1341 Boccaccio returned to Florence by command of his father, who in his old age desired the assistance and company of his son. Florence, at that time disturbed by civil feuds, and the silent gloom of his father's house could not but appear in an unfavourable light to one accustomed to the gay life of the Neapolitan court. But more than all this, Boccaccio regretted the separation from his beloved Fiammetta. The thought of her at once embittered and consoled his loneliness. Three of his works owe their existence to this period. With all of them Fiammetta is connected ; of one of them she alone is the subject.

The first work, called Ameto, describes the civilizing influence of love, which subdues the ferocious manners of the savage with its gentle power. Fiammetta, although not the heroine of the story, is amongst the nymphs who with their tales of true love soften the mind of the hunts- man.

Ameto is written in prose alternating with verse, speci- mens of which form occur in old and middle-Latin writings. It is more probable, however, that Boccaccio adopted it from that sweetest and purest blossom of medieval

French literature, Azcassin et Nicolette, which dates from the 13th century, and was undoubtedly known to him. So pleased was Boccaccio with the idea em- bodied in the character of Ameto that he repeated its essential features in the Cimone of his Decameron (Day 5th, tale i.)

The second work referred to is a poem in fifty chapters, called L'amorosa Visione. It describes a dream in which the poet, guided by a lady, sees the heroes and lovers of ancient and medimval times. Boccaccio evidently has tried to imitate the celebrated Zrionfi of Petrarch, but without much success. There is little organic development in the poem, which reads like the catalogue ravsonné of a picture gallery ; but it is remarkable from another point of view. Itis perhaps the most astounding instance in literature of ingenuity wasted on trifles ; even Edgar Poe, had he known Boccaccio's puzzle, must have confessed him- self surpassed. For the whole of the Amorosa Visione is nothing but an acrostic on a gigantic scale. The poem

is written, like the Divina Commedia, in terza rima, and the initial letters of all the triplets throughout the work compose three poems of considerable length, in the first of which the whole is dedicated to Boccaccio's lady-love, this time under her real name of Maria. In addition to this, the initial letters of the first, third, fifth, seventh, and ninth lines of the dedicatory poem form the name of Maria ; so that here we have the acrostic in the second degree. No wonder that thus entrammelled the poet's thought begins to flag and his language to halt.

The third important work written by Boccaccio during his stay at Florence, or soon after his return to Naples, is called L'amorosa Fiammetta ; and although written in prose, it coutains more real poetry than the elaborate production just referred to. It purports to be Fiammetta's con- plaint after her lover, following the call of filial duty, had deserted her. Bitterly she deplores her fate, and upbraids her lover with coldness and want of devotion. Jealous fears add to her torture, not altogether unfounded, if we believe the commentators' assertion that the heroine of Ameto is in reality the beautiful Lucia, a Florentine lady loved by Boccaccio. Sadly Fiammetta recalls the moments of former bliss, the first meeting, the stolen embrace.

Her narrative is indeed our chief source of information for the incidents of this strange love-story. It has been thought unlikely, and indeed impossible, that Boccaccio should thus have become the inouthpiece of a real lady's real passion for himself ; but there seems nothing incongruous in the supposition that after a happy reunion the poet should have heard with satisfaction, and surrounded with the halo of ideal art, the story of his lady's sufferings. Moreover, the langnage is too full of individual intensity to make the conjecture of an eutirely fictitious love affair intrinsically probable. L'amorosa Fiammetta is a monody of passion sustained even to the verge of dulness, but strikingly real, and therefore artistically valuable.

By the intercession of an influential friend, Boccaccio at last obtained (in 1344) his father's permission to return to Naples, where in the meantime Giovanna, grand-daughter of KXing Robert, had succeeded to the crown. Being young aud beautiful, fond of poetry and of the praise of poets, she received Boccaccio with all the distinction due to his literary fame. For many years she remained his faithful friend, and the poet returned her favour with grateful devotion. Even when the charge of having instigated, or at least connived at, the murder of her husband was but too clearly proved against her, Boccaccio was amongst the few who stood by her, and undertook the hopeless task of clearing her name from the dreadful stain. It was by her desire, no less than by that of Fiammetta, that he composed (between 1344 and 1350) most of the stories of his Decameron, which afterwards were collected and placed in the mouths of the Florentine ladies and gentlemen. During this time he also composed the /rlostrato, a narrative poem, the chief interest of which, for the English reader, lies in its connection with Chaucer. With a boldness pardonable only in men of genius, the great English poet has adopted the main features of the plot, and has literally translated parts of Boccaccio's work, without so much as mentioning the name of his Italian source.!

In 1350 Boccaccio returned to Florence, owing to the death of his father, who had made him guardian to his younger brother Jacopo. He was received with great dis-

1 Among the publications of the Chaucer Society for 1873 the reader will find a careful analysis of Filostrato, together with an English trans- lation

of the lines partly or entirely embodied in Chaucer's poem, by Mr W. M. Rossetti. The parallel between the treatment of the same story by two poets, both great in their individual spheres, and both In a manner representative of their national types of literature, is of engrossing interest.

BOC CHA CCese

tinction, and entered the service of the Republic, being at various times sent on important missions to the margrave of Brandenburg, and to the courts of several popes, both in Avignon and Rome. Boccaccio boasts of the friendly terms on which he had been with the great potentates of Europe, the emperor and pope amongst the number. But he was never a politician in the sense that Dante and Petrarch were. Asa man of the world he enjoyed the society of the great, but his interest in the internal com- motions of the Florentine state seems to have been very slight. Besides, he never liked Florence, and the expressions used by him regarding his fellow-citizens betray anything but patriotic prejudice. In a Latin eclogue he applies tu them the term " Batrachos" (frog), by which, he adds parer- thetically— Lgo intelligo Florentinorum morem ; loquacis- simi enum sumus, verum in rebus bellicis nihil valemus. The only important result of Boccaccio's diplomatic career was his intimacy with Petrarch. The first acquaintance of these two great men dates from the year 1350, when Boccaccio, then just returned to Florence, did all in his power to make the great poet's short stay in that city agreeable. When in the following year the Florentines were anxious to draw men of great reputation to their newly- founded aniversity, it was again Boccaccio who insisted on the claims of Petrarch to the most distinguished posi- tion. He himself accepted the mission of inviting his friend to Florence, and of announcing to Petrarch at the same time that the forfeited estates of his family had been restored to him. In this manner an intimate friend- ship grew up between them to be parted only by death. Common interests and common literary pursuits were the natural basis of their friendship, and both occupy prominent positions in the early history of that great intellectual revival commonly called Renaissance.

During the 14th century the study of ancient literature was at a low ebb in Italy. The interest of the lay world was engrossed by political struggles, and the treasures of classical history and poetry were at the mercy of monks, too

lazy or too ignorant to use, or even to preserve them. Boccaccio himself told that, on asking to see the library of the celebrated monastery of Monte Casino, he was shown into a dusty room without adoortoit. Many of the valuable manuscripts were mutilated ; and his guide told him that the monks were in the habit of tearing leaves from the codices to turn them into psalters for children, or amulets for women at the price of four or five soldi a piece. Boccaccio did all in his power to remove by word and example this barbarous indifference. He bought or copied with his own hand numerous valuable manuscripts, and an old writer remarks that if Boccaccio had been a professional copyist, the amount of lis work might astonish us. His zealous endeavours for the revival of the all but forgotten Greek language in western Hurope are well known. The most celebrated Italian scholars about the beginning of the 15th century were unable to read the Greek characters. Boc- caccio deplored the ignorance of his age. He took lessons from Leone Pilato, a learned adventurer of the period, who had lived a long time in Thessaly and, although born in Calabria, pretended to be a Greek. By Boccaccio's advice Leone Pilato was appointed professor of Greek language and literature in the university of Florence, a position which he held for several years, not without great and last- ing benefit for the revival of classical learning. Boccaccio was justly proud of having been intimately connected with the foundation of the first chair of Greek in Italy. But he did not forget, in his admiration of classic literature, the great poets of hisown country. He never tires in his praise of the sublime Dante, whose works he copied with his own hand. He conjures his friend Petrarch to study the great Florentine, and to defend himself against

the charges of wilful ignorance and envy brought against him. A life of Dante, and the commentarics on the first 16 cantos of the Inferno, bear witness to Boccaccio's learn- ing and enthusiasm.

In the chronological enumeration of our author's writ: ings we now come to his most important work, the De- cameron, a collection of one hundred stories, published in their combined form in 1353, although mostly written at an earlier date. This work marks in a certain sense the rise of Italian prose. It is true that Dante's Vita Nuova was written before, but its involved

sentences, founded essentially on Latin constructions, cannot be compared with the infinite suppleness and precision of Boccaccio's prose. The Cento Novelle Antiche, on the other hand, which also precedes the Decameron in date, can hardly be said to be written in artistic language according to definite rules of grammar and style. Boccaccio for the first time speaks a new idiom, flexible and tender, like the character of the nation, and capable of rendering all the shades of feeling, from the coarse laugh of cynicism to the sigh of hopeless love. It is by the name of "Father of Italian Prose" that Boccaccio ought to be chiefly remembered.

Like most progressive movements in art and literature, Boccaccio's remoulding of Italian prose may be described asa "return to nature." It is indeed the nature of the Italian people itself which has become articulate in the Decameron ; here we find southern grace and elegance, together with that unveiled nazveté of impulse which is so striking and so amiable a quality of the Italian character. The undesirable complement of the last-mentioned feature, a coarseness and indecency of conception and expression hardly comprehensible to the northern mind, also appears in the Decameron, particularly where the life and conver- sation of the lower classes are the subject of the story. At the same time, these descriptions of low life are so admir- able, and the character of popular parlance rendered with such humour, as often to make the frown of moral disgust give way to a smile.

It is not surprising that a style so concise and yet so pliable, so typical and yet so individual, as that of Boc- caccio was of enormous influence on the further progress of a prose in a manner created by it. his influence has indeed prevailed down to the present time, to an extent beneficial upon the whole, although frequently fatal to the development of individual writers. Novelists like Giovanni Fiorentino or Franco Sacchetti are completely under the sway of their great model ; and Boccaccio's influence may be discerned equally in the plastic fulness of Machiavelli and in the pointed satire of Aretino. Withont touching upon the individual merits of Lasca, Bandello, and other novelists of the cinguecento, it may be asserted that none of them created a style independent of their great predecessor. One cannot indeed but acquiesce in the authoritative utterance of the Accademia della Crusca, which holds up the Decameron as the standard and model of

Italian prose. Even the Della Cruscan writers themselves have been unable to deprive the language wholly of the fresh spontaneity of Boccaccio's manner, which in modern litera- ture we again admire in Manzoni's Promess? sposi.

A detailed analysis of a work so well known as the Deca- meron would be unnecessary. The description of the plague of Florence preceding the stories is universally acknowledged to be a masterpiece of epic grandeur and vividness. It ranks with the paintings of similar calami- ties by Thucydides, Defoe, and Manzoni. Like Defoe, Boceaccio had to draw largely on hearsay and his own imagination, it being almost certain that in 1348 he was at Naples, and therefore no eye-witness of the scenes he describes. The stories themselves, a hundred in number, range from the highest pathos to the coarsest licentiousness.

A creation like the patient Griselda, which international literature owes to Boccaccio, ought to atone for much that — is morally and artistically objectionable in the Decameron. It may be said on this head, that his age and his country were not only deeply immoral, but in addition exceedingly outspoken. Moreover, his sources were anything but pure. Most of his improper stories are either anecdotes from real life, or they are taken from the fabliaux of medieval French poets. On comparing the latter class of stories (about one-fifth of the whole Decameron) with their French originals, one finds that Boccaccio has never added to, but has sometimes toned down the revolting ingredients. Not- withstanding this, it cannot be denied that the artistic valne of the Decameron is greatly impaired by descriptions and expressions, the intentional licentiousness of which is but imperfectly veiled by an attempt at humour.

Boccaccio has been accused of plagiarism, particularly by French critics, who correctly state that the subjects of many stories in the Decameron are borrowed from their literature. A similar objection might be raised against Chaucer, Shakespeare, Goethe (in Faust), and indeed most of the inaster minds of all nations. Power of invention is not the only nor even the chief criterion of a great poet. He takes his subjects indiscriminately from his own fancy, or from the consciousness of his and other nations. Stories float

about in the air, known to all yet realized by few; the poet gathers their disjecta membra into an organic whole, and this he inspires and calls into life with the breath of his genius. It is in this sense that Boccaccio is the creator of those innumerable beautiful types and stories, which have since become household words amongst civilized nations. No author can equal him in these con- tributions to the store of international literature. There are indeed few great poets who have not in some way become indebted to the inexhaustible treasure of Boccaccio's creativeness, One of the greatest masterpieces of Ger- man literature, Lessing's Vathan the Wise, contains a story from Boccaccio (Decameron, Day Ist, tale iii.), and the list of English poets who have drawn from the same source comprises amongst many others the names of Chaucer, Lydgate, Dryden, Keats, and Tennyson.

For ten years Boccaccio continued to reside in Florence, leaving the city only occasionally on diplomatic missions or on visits to his friends. His fame in the meantime began to spread far and wide, and his Decameron, in par- ticular, was devoured by the fashionable ladies and gentle- men of the age. About 1360 he seems to have retired from the turbulent scenes of Florence to his native Certaldo, the secluded charms of which he describes with rapture. In the following year took place that strange turning- point in Boccaccio's career, which is generally described as his conversion. It seems that a Carthnsian monk came to him while at Certaldo charged with a posthumous message from another monk of the same order, to the effect that if Boccaccio did not at once abandon his godless ways in life and literature his death would ensue after a short time. It is also mentioned that the revelation to the friar on his deathbed of a secret known only to Boccaccio gave additional import to this alarming information. Boccaccio's impressionable nature was deeply moved. His life had been far from virtuous ; in his writings he had frequently sinned against the rules of morality, and worse still, he had attacked with bitter satire the institutions and servants of holy mother church. Terrified by the approach of inmediate death, he resolved to sell his library, aban- don literature, and devote the remainder of his life to penance and religious exercise. To this effect he wrote to Petrarch. We possess the poet's answer; it isa masterpiece of writing, and what is more, a proof of tenderest friendship. The message of the monk Petrarch is evidently inclined

to treat simply as pious fraud, without however actually committing himself to that opinion. ‘ No monk is required to tell thee of the shortness and precariousness of human life. Of the advice received accept what is good ; aban- don worldly cares, conquer thy passions, and reform thy soul and life of degraded habits. But do not give up the studies which are the true food of a healthy mind.” Boccaccio seems to have acted on this valuable advice. His later works, although written in Latin and scientific in character, are by no means of a religious kind. It seems, however, that his entering the church in 1362 is connected with the events just related.

In 1363 Boccaccio went on a visit to Naples to the seneschal Acciajuoli (the same Florentine who had in 1344 persuaded the elder Boccaccio to permit his son’s return to Naples), who commissioned him to write the story of his deeds of valour. On his arrival, however, the poet was treated with shameful neglect, and revenged himself by denying the possibility of relating any valorous deeds for want of their existence. This declaration, it must be con- fessed, came somewhat late, bnt it was provoked by a silly attack on the poet himself by one of the seneschal’s indis- creet friends.

During the next ten years Boccaccio led an unsettled life, residing chiefly at Florence or Certaldo, but frequently leaving his home on visits to Petrarch and other friends, and on various diplomatic errands in the service of the Republic. He seems to have been poor, having spent large sums in the purchase of books, but his independent spirit rejected the numerous splendid offers of hospitality made to him by friends and admirers. During this period he wrote four important Latin works—De Genealogia Deorum libri X V.,acompendium of mythological knowledge full of deep learning; De Montiwm, Silvarum, Lacuum, et Marium nominibus liber, a treatise on ancient geography; and two historical books—De Casibus Virorum et Pemin- arum Illustrium libri IX., interesting to the English reader as the original of John Lydgate’s all of Princes ; and De Claris Mulieribus. To the list of his works ought to be added Il Minfale Fiesolano, a beautiful love- story in verse, and J! Corbaccio ossia Il Laberinto d’ Amore, a coarse satire on a Florentine widow who had jilted the poet, written about 1355,

not to mention many eclogues in Latin and miscellaneous me in Italian (the latter collected by his biographer Count Baldelli in 1802).

In 1373 we find Boccaccio again settled at Certaldo. Here he was attacked by a terrible disease which brought him to the verge of death, and from the consequences of which he never quite recovered. But sickness could not subdue his intellectual vigour. When the Florentines established a chair for the explanation of the Daina Commedia in their university, and offered it to Boccaccio, the senescent poet at once undertook the arduous duty. He delivered his first lecture on the 23d of October 1373. The commentary on part of the Inferno, already alluded to, bears witness of his unabated power of intellect. In 1374 the news of the loss of his dearest friend Petrarch reached Boccaccio, and from this blow he may be said to have never recovered. Almost his dying efforts were devoted to the memory of his friend ; urgently he entreated Petrarch's son-in-law to arrange the publication of the deceased poct's Latin epic Africa, a work of which the author had been far more proud than of his immortal sonnets to Laura.

In his last will Boccaccio left his library to his father confessor, and after his decease to the convent of Santo Spirito in Florence. His small property he bequeathed to his brother Jacopo. His own natural children had died before him. He himself died on the 21st of December 1375 at Certaldo, and was buried in the church of SS.

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Jacopo e Filippo of that town. On his tombstone was engraved the epitaph composed by himself shortly before his death. It is calm and dignified, worthy indeed of a great life with a great purpose. These are the lines :—

" Hac sub mole jacent cineres ac ossa Joannis ; Mens sedct ante Deum, meritis ornata laborum Mortalis vitee. Genitor Boccaccius illi ; Patria Certaldum ; studium fuit alma poesis."*

A complete edition of Boccaccio's Italian writings, in 17 vols, has been published by Moutier (Florenee, 1834), The life of Boecaccio has been written by Tiraboschi, Mazzuchelli, Count Bal- delli (Vita di Boeeaeeto, Florence, 1806), and others. The first printed edition of the Decameron is

without date, place, or printer's name; but it is believed to belong to the year 1469 or 1470, and to have been printed at Florence. Besides this, Baldelli mentions eleven editions during the 15th century. The entire number of editions by far exceeds a hundred. A curious expurgated edition, authorized by the Pope, appcared at Florence, 1573. Here, how- ever, the grossest indecencies remain, the chief alteration being the change of the improper personages from priests and monks into laymen. The best old edition is that of Florence, 1527. Of modern reprints, that by Forfoni (Florenee, 1857) deserves mention. Manni has written a Storia del Deecamerone (1742), and a German scholar, M. Landau, has published (Vienna, 1869) a valuable investi- gation of the sources of the Decameron. An interesting English translation of the work appeared in 1624, under the title The Model of Mirth, Wit, Eloquence, and Conversation. (F. H.)

BOCCALINI, Trasano, an Italian satirist, was born at Loretto in 1556. The son of an architect, he himself adopted that profession, and it appears that he commenced late in life to apply to literary pursuits. Pursuing his studies at Rome, he had the honour of teaching Bentivoglio, and acquired the friendship of the cardinals Gaetano and Borghesi, as well as of other distinguished personages. By their influence he obtained various posts, and was even appointed by Gregory XIII. governor of Benevento in the states of the church. Here, however, he seems tu have acted imprudently, and he was soon recalled to Rome, where he shortly afterwards composed his most important work, the Ragguagli di Parnaso, in which Apollo is repre- sented as receiving the complaints of all who present themselves, and distributing justice according to the merits of each particular case. The book is full of light and fantastic satire on the actions and writings of his eminent contemporaries, and some of its happier hits are among the hackneyed felicities of literature. To escape, it is said, from the hostility of those whom his shafts had wounded, he returned to Venice, and there, according to the register in the parochial church of Sta Maria Formosa, died of colic, accompanied with fever, on the 16th of November 1613. It was asserted, indeed, by contemporary writers that he had been beaten to death with sand-bags by a band of Spanish bravadoes, but the story seems without foundation. At the sume time, it is evident from the Pietra del Paragone, which appeared after his death in 1615, that whatever the feelings of the Spaniards towards him, he cherished against them feelings of the bitterest

hostility. The only Government, indeed, which is exempt from his attacks is that of Venice, a city for which he seems to have had a special affection. The Ragguagli, which was first printed in 1612, has frequently been re-published ; but its popularity seems exceeded by that of the Pietra, which has been translated into French, German, English, and Latin. The English translator was Henry earl of Monmouth, and the title of his version, Zhe Politicke Touchstone, London, 1674, Another posthu- mous publication of Boccalini was his Commentarw sopra Cornelio Tacito, Geneva, 1669, which ought rather to be called observations than commentaries, and has not done much for his fame. Many of his manuscripts are pre- served still unprinted in various Italian libraries. (See Mazzuchelli's Scrittort d'Italia.)

BOC—BOD

BOCHART, Samvet, a learned writer of the 17th ceutury, specially distinguished as an Oriental scholar, was born at Rouen in Normandy, May 30, 1599. He was many years pastor of a Protestant church at Caen, and became tutor to Wentworth Dillon, earl of Roscommon, author of the Lssay on Translated Verse. While at Caen he particularly distinguished himself by his public disputa- tions with Father Veron, a Jesuit, and celebrated as a polemic. The dispute was held in the castle of Caen, in the presence of a great number of Catholics and Protestants, the duke of Longueville being among the former. In 1646 Bochart published his Phaleg and Chanaan, which are the titles of the two parts of his Geographia Sacra. His erozoicon, which treats of the sacred animals of Scripture, was printed at London in 1675, In 1652, Christina, queen of Sweden, invited him to Stockholm, whither he repaired, accompanied by Huet. On his return to Caen he resumed his duties as a minister of the gospel, married, and was received into the academy of that city. Bochart was a man of profound erudition ; he possessed a thorough knowledge of the principal Oriental languages, including Hebrew, Syriac, Chaldaic, and Arabic; and such was his zeal for extending his acquirements, that at an advanced age he wished to learn Ethiopic. He was remarkable for modesty and candour ; but so absorbed was he in his favourite study, that he saw Phoenician, and nothing but Pheenician, in everything, even in the words of the Celtic, and hence the prodigious number of chim- erical etymologies which swarm in his works. He died at Caen, May 16, 1667. A complete edition of his works was

published at Leyden, under the title of Sam. Bochart Opera Omnia: hoc est ; Phaleg, Chanaan, seu Geographia Sacra, et Hierozoicon, sew de Animalibus sacris Sacre Scripture, et Dissertationes Varie, 1675, 2 vols. folio; 1692, 1712, 3 vols. folio.

BOCHNIA, the chief town of a district in Austrian Galicia, on the River Raba or Uswica, a tributary of the Vistula. It is built principally of wood, and has a gym- nasium, a hospital, and various public offices. Its im- portance is mainly due to its extensive salt mines, entrance to which is obtained by a shaft in the very heart of the town. The excavations, carried on at different levels, have completely undermined the whole area of the place, which was greatly damaged by a subsidence of the ground in 1843, occasioned by heavy floods. About 290,000 cwts. of salt are obtained annually. Population in 1869,

7480.

BOCHUM, the chief town of a circle in the Prussian province of Westphalia and government of Arnsberg, on the railway between Duisburg and Dortmund. It is a busy industrial town, with manufactures of cassimeres, woollen cloth, carpets, and hardware of various descrip- tions. About 27,000 hand coffee-mills are turned out annually. There is an extensive steel factory in the hands of a company ; coal-mines are worked, and coke is manufactured ; and a considerable trade is carried on in grain. Population in 1871, 21,192.

BODE, Jonann Evert, acelebrated German astronomer, born January 19, 1747, at Hamburg, where his father kept a commercial academy. From his earliest years he was devoted to the mathematical sciences, especially astro- nomy. In the garret of his father's house, with the aid of a telescope constructed by himself, he eagerly made observa- tions of the heavens ; and at eighteen years of age he had acquired so great a knowledge of astronomy, that when Dr Reimarus visited his father, young Bode was found occu- pied in calculating an eclipse of the sun. This incident was the means of introducing him to the notice of Professor Biisch, who at once afforded him every facility for prosecut- ing his labours with success. Shortly afterwards Bode

gave the first public proof of his knowledge by a short work on the solar eclipse of August 5, 1766; and this was followed by his Anleitung zur Kenntniss des gestirnten Fhimmels, an elementary treatise on astronomy, which was eminently successful, and has since gone through numerous editions. In 1772, being called to Berlin by Frederic IL., he was made astronomer to the Academy of Sciences, and afterwards a member of that institution. The well-known periodical work entitled Astronomische Jahrbticher, which is continued to the present day, was commenced by Bode in 1774; but that on which his fame chiefly rests is the Uranographia, published in 1801, in which the industrious author has given observations of 17,240 stars, or 12,000 more than are to be found in any older charts. This veteran observer, who may justly be said to have been the first to diffuse a general taste for astronomy in Germany, died at Berlin, Nov. 23, 1826. For the curious empirical law which bears Bode's name, see AstTRoNomy, vol. ii. p.

806.

BODIN, Jean, one of the ablest political thinkers in France during the 16th century, was born at Angers in 1530. He studied law at Toulouse, and, after taking his degree, lectured there for some time on jurisprudence. Thence he proceeded to Paris, and began to practise at the bar. His want of success is said to have been the reason of his applying himself to literature; but this we may reasonably doubt, as he was only twenty-five years of age when he published his first work, a translation of Oppian's Cynegeticon into Latin verse, with a commentary. Almost immediately on its publication the celebrated scholar, Turnebus, complained that some of his emendations had been appropriated without acknowledgment. A discourse ou public instruction, Oratio de Lnstituenda in Republica Juventute, which Bodin had delivered at Toulouse, was printed in 1559, and his Methodus ad Facilem Historiarum Cognitionem appeared in 1566, The latter is a work of considerable interest and value. It has, indeed, no title to the high honour which M. Baudrillart assigns to it of having laid the foundation of the philosophy of history ; but it contains several thoughts of essential importance tu that philosophy, as, for example, those relative to the nature

of history, to progress and law in history, and to historical causation. Two years later Bodin published a work in refutation of the views of M. de Malestroict, who maintained that there had been no rise of prices in France during the three preceding centuries. The Mesponsio ad Paradoxa Malestretti not only completely established the contrary, but for the first time explained in a nearly satis- factory manner the revolution of prices which took place in the 16th century, pointing out not only its primary but most of its secondary causes with remarkable perspicacity. This tract, the Discours sur les causes de Veatreéme cherté qui est aujourdhuy en France (1574), and the disquisition on public revenues in the sixth book of the Republic, undoubtedly entitle Bodin to a distinguished position among the earlier cultivators of political economy. His learning, genial disposition, and conversational powers recommended him to the favour of Henry ILI. and of his brother, the duke of Alencon. The former appointed him to the office of king's attorney at Laon in 1576. This was the most eventful year of his life, being that in which he married, performed his most brilliant service to his country, and completed his greatest literary work. Elected by the Tiers Etat of Vermandois to represent it in the states- general of Blois, he contended with great skill and boldness in extremely difficult circumstances for freedom of con- science, justice, and peace. The nobility and clergy favoured the League, and urged the king to force his subjects to abjure Protestantism and profess the Catholic religion, When Bodin found he could not prevent this

resolution being carried, he contrived to get inserted in the petition drawn up by the statcs the clause " without war," which practically rendered all its other clauses nugatory. While he thus resisted the clergy and nobility and their dependents, he opposed the demand of the king to be allowed to alienate the public lands and royal deimesnes, and had influence sufficient to get it refused, although the chief deputies had been won over to assent to it. This lost him the favour of the king, who wanted money on any terms. His magnum opus—Les six livres de la République (Paris, 1576)—passed through various editions in its author's lifetime, that of 1583 having as an appendix Lapologie de René Herpin (Bodin himself). In 1586 he issued a Latin version, for the use chiefly of English students of law and politics. It is

the first elaborate attempt in modern times to construct a system of political science. “ From the time,” says Sir William Hamilton, “‘when Aristotle wrote his eight books of Polvtics, until the time when Montesquieu wrote his thirty-one books on The Spirit of Laws, the six books of the Republic of Bodinus is the ablest and most remarkable treatise extant on the philosophy of government and lcgislation ; aud even until the present day these three authors stand out as the great political triumvirate.” Bodin was, of course, greatly indebted to Aristotle for his knowledge of the working of political causes, but he made use of what his illustrious predecessor taught him in no servile way, and added much from his own reflections, his large acquaintance with history, and his vivid personal experience. The Republic is a work of which it is quite impossible to give a brief account, and as there have been many lengthened sum- maries of it, it may suffice to say that those to be found in Hallam’s Lit. of Hurope (vol. ii. 1st ed.), Heron’s History of Jurisprudence, Lerminier’s Introduction a ? Histoire du Droit, and Bluntschli’s Geschichte des Staatsrechts, give a good general view of its character, while that in Professor Baudrillart’s J. Bodin et son Temps is so exceedingly care- ful and excellent that scarcely a thought of any value in the original has escaped being indicated. With all his breadth and liberality of mind Bodin was an exceedingly credulous believer in witchcraft, the virtues of numbers, and the power of the stars, and in 1580 he published the Demonomanie des Sorciers, a work which is a most humbling evidence that even the greatest men may not be exempt from the most irrational prejudices of theirage. Although he was himself regarded by most of his contemporaries as a sceptic, and by some as an atheist, he denounced all who dared to doubt of sorcery, and zealously urged the burning of witches and wizards, It might, perhaps, have gone hard with himself if his counsel had been strictly followed, as he confessed to have had from his thirty-seventh year a friendly demon who, if properly invoked, touched his right ear when he purposed doing what was wrong, and his left when he meditated doing good. To the duke of Alencon Bodin owed several important preferments. In 1581 he accompanied his patrou as secretary when that prince came over to England to seek the hand of Queen Elizabeth. Here he had the pleasure of finding that the Republic was studied at London and Cambridge, although in a barbarous Latin translation. This was what determined him to translate his work into Latin himself. The latter part of Bodin’s life was spent at Laon, the inhabitants of which he is said to

have persuaded to declare for the League in 1589, and for Henry IV. five years afterwards. He died of the plague in that city in 1596, and was buried in the church of the Carmelites. In the year during which he died there appeared his Universale Nature Theatrum, which was translated into French by Fongerolles in the following year. He left behind him a very famous MS., the Colloguiwm

Heptaplomeres de abditis rerum sublimium arcants, which

was published for the first time in a complete form by Noack in 1857, although it had been previously studied by others, ¢e.g., Grotius, Huet, Ménage, Diecmann, &c. It is composed in the form of a conversation between seven learned men—a Jew,a Mahometan,a Lutheran, a Zwinglian, a Roman Catholic, an Epicurean, and a Theist. The con- clusion to which they are represented as coming is that they will live together in charity and toleration, and cease from further disputation as to religion.

Authorities.—The works of Bodin above mentioned ; H. Baud- tillart, J. Bodin et son Temps (Paris, 1853); N. Planchenault, Litudes sur Jean Bodin (Angers, 1858) ; and Thierry, History of the Ticrs Htat (Kingl. Transl.) As to the political philosophy of Bodin, sec the works of Hallam, Heron, Lerminier, and Bluntschli, already indicated ; as to his political economy, Kautz, Geschichte der National-Ockonomik, ii. 269-271; as to his ethical teaching, A. Desjardins, Les Moralistes Francais du Seiziéme Siecle, ch. v.; and as to his historical views, Flint's Philosophy of History in Europe, i. 69-76. (R. F.)

BODLEY, Srr Tuomas, founder of the Bodleian library at Oxford, was born at Exeter in 1544. When he was about twelve years of age, his father, John Bodley, being obliged to leave the kingdom on account of his Protestant principles, settled with his family at Geneva, and continued there till the death of Queen Mary. In that university, then in its infancy, young Bodley studied under several eminent professors. On the accession of Queen Elizabeth he returned with his father to England, and was soon after entered of Magdalen College, Oxford. In 1563 he took the degree of bachelor of arts, and the year following was adinitted a fellow of Merton

College. In 1565 he read a Greek lecture in the hall of that college, took the degree of master of arts the year after, and read natural philosophy in the public schools. In 1569 he was one of the proctors of the university, and for some time after officiated as public orator. Quitting Oxford in 1576, he made the tour of Kurope; and on returning to his college after four years absence he applied himself to historical and_ political studies. He became geutleman-usher to Queen Elizabeth ; and in 1585 he married Anne Ball, a widow lady of con- siderable fortune, whose father, named Carew, was of Bristol. He was soon after sent as ambassador to the king of Denmark, and to several German princes, He was next despatched on a secret mission to France ; and in 1588 he went as ambassador to the United Provinces. On his return to England in 1597, finding his preferment obstructed by the jarring interests of Burleigh and Essex, he retired from court, aud could never afterwards be prevailed on to accept of any public employment. He now began the foundation of the Bodleian library; and soon after the accession of King James I. he received the honour of knighthood. He died at his house in London, Jannary 28, 1612, and was buried in the choir of Merton College chapel, where a monument of black and white marble was erected to him, on which stands his effigy in a scholar's gown, surrounded with books. Sir Thomas wrote his own life to the year 1609, which, with the first draught of the Statutes and his Letters, has been published from the originals in the Bodleian library, by Hearn, under the title of Religuice Bodleianw, or Authentic Remains of Sir Thomas Bodley, London, 1798, 8vo. For a particular account of the Bodleian library, see LiBRARIES.

BODMIN, a parliamentary aud municipal borough and market-town of England, in the county of Cornwall, 235 miles from London, and 30 from Plymouth by rail. It is situated between two hills, and consists of one narrow but well-paved street, about a mile in length. The church of St Petrock, which formerly belonged to the monastery of that name, is a spacious building dating from 1472; and the town-hall consists partly of remains of the convent of the Grey Friars. A lunatic asylum, erected in 1866, the

county jail, rebuilt in 1859, and a market-house of recent date, are among the chief buildings. The principal manu- facture is shoes. Four annual fairs for cattle and horses are held in the town, and at St Lawrence, one mile to the S.W., there is a fair in October for cattle and sheep. Bodmin returned two mem- bers to Parliament from the time of Edward I. till 1868, when its representation was reduced to one member. The assizes and quarter-sessions are held in the town, and it is one of the polling-places for the east division of the county. Bodmin or, as the name appears in charters, Bosmana or Bod-minian, grew up in the neighbourhood of a monastic building, which is said to have been founded as early as 926. At the time of the Conquest it was a flourishing town, but fell into decay at ' the Reformation, and only recovered its prosperity in the course of last century. In 1498 the Cornish insurrection was originated by the people of Bodmin, who again, in the reign of Edward VI., expressed their discontent at the change of religion by resorting to arms. Population of municipal borough in 1871, 4672, and of parliamentary borough, 6758.

BODONI, Grampattista, superintendent of the royal press at Parma, chief printer to his Catholic Majesty, member of various academies in Italy, and knight of several orders, was born in 1740, at Saluzzo in Piedmont, where his father owned a printing establishment. While yet a boy he began to engrave on wood. He at length went to Rome, and there became a compositor for the press of the Propaganda. He made himself acquainted with the Oriental languages, and thus was enabled to render essential service to the Propaganda press, by restoring and accurately dis- tributing the types of several Oriental alphabets which bad fallen into disorder. The Infante Don Ferdinand having established at Parma, about 1760, a printing-house on the model of those in Paris, Madrid, and Turin, Bodoni was placed at the head of this establishment, which he soon rendered the first of the kind in Europe. The beauty of his typography, &c., leaves nothing further to be desired ; but the intrinsic value of his editions is seldom equal to their outward splendour. His Homer, however, is a truly magnificent work ; and, indeed, his Greek letters are fault- less imitations of the best Greek manuscript. His editions of the Greek, Latin, Italian, and French classics are all highly prized for their typographical elegance, and some of them are not less remarkable for their accuracy. Bodoni died at Padua in 1813, aged 73. In 1818 a magnificent work appeared in two

volumes quarto, entitled Manuale Tipografico, containing specimens of the vast collection of types which had belonged to this celebrated typographer. See De Lama, Vita del Cavaliere Giambattista Bodoni, 1816, 2 vols.

BOECE, or Boycr, Huctor, a distinguished Scottish historian, was born at Dundee, about the year 1465, being descended of a family which for several generations had possessed the barony of Panbride or Balbride. The orthography of his surname is extremely fluctuating ; it is to be found under the various modifications of Boece, Boeth, Boeis, Boys, Boyse, Boyes, Boyis, Boiss, and Boyce. He received his early education at Dundee, and completed his course of study in the university of Paris, where he took the degree of B.D. He was appointed a professor of philosophy in the college of Montaigu; and in this seminary he became intimately acquainted with Erasmus,

Arms of Bodmin,

who in two epistles has testified his esteem for Boece's character (Hrasmi Opera, tom. i. tom. iii. col. 1784, edit: Clerici). In his academical station he had already distin- guished himself when King's College was founded at Aberdeen by the munificence of William Elphinstone, bishop of the diocese. The Papal bull for the erection of a university had been obtained in the year 1494, but the buildings were not sufficiently advanced, nor did the lectures commence, till about the year 1500. It was not without. some degree of hesitation that he consented to quit the lettered society of Paris, and to become principal of this new college ; but having at length accepted the con- ditions, he proceeded to Aberdeen, and experienced a kind reception from the canons of the cathedral, several of whom he has commemorated as men of learning, It was a part of his duty as principal to read lectures on divinity. The common branches of science and literature were taught with zeal and success ; and the prosperity of the institution was greatly promoted by the influence of Boece.

The emoluments of his office were not such as appear very dazzling to modern eyes. " Boethius, as president of the university," says Dr Johnson, "' enjoyed a revenue of forty Scottish marks, about two pounds four

shillings and sixpence of sterling money. In the present age of trade and taxes, it is difficult even for the imagination so to raise the value of money, or so to diminish the demands of life, as to suppose four and forty shillings a year an honourable stipend ; yet it was probably equal not only to the needs but to the rank of Boethius. The wealth of England was undoubtedly to that of Scotland more than five to one, and it is known that Henry the Eighth, among whose faults avarice was never reckoned, granted to Roger Ascham, as a reward of his learning, a pension of ten pounds a year." But it is necessary to recollect that this was not the only preferment which Boece enjoyed: he was not only principal of King's College, but was likewise a canon of Aberdeen, and rector of Tyrie in the same county. Under the date of July 14, 1527, we find a " grant to Maister Hector " of an annual pension of £50, to be paid by the sheriff of Aberdeen out of the king's casualties ; and on the 26th of July 1529 was issued a " precept for a lettre to Mr Hector Boys, professor of theology, of a pension of £50 Scots yearly, until the king promote him to a benefice of 100 marks Scots of yearly value; the said pension to be paid him by the customers of Aberdeen." In 1533 and 1534, one-half of his pension was, however, paid by the king's treasurer, and the other half by the comptroller; and as no payment subsequent to that of Whitsuntide 1534 has been traced in the treasurer's accounts, he is supposed to have obtained his benefice soon after that period.

His earliest publication, the lives of the bishops of Aberdeen, appeared under the following title—Lpiscoporum Murthlacensium e Aberdonensium per Hectorem Boetium Vite. Impressa sunt hec prelo Ascensiane ad Idus Matias anno Salutis, M.D.X XII, 4to. This little volume, which is of great rarity, was reprinted for the members of the Bannatyne .Club—Hectoris Boetui Murthlacensium et Aberdonensium Episcoporum Vite iterum in lucem edite, Edin., 1825, 4to. Of this diocese the seat was originally at Murthlack, or Mortlach, in the county of Banff, but it was afterwards transferred to Aberdeen. His notices of the early prelates are necessarily brief and unsatisfactory, and the most interesting portion of the book is that which relates to his liberal patron Bishop Elphinstone, of whose private history and public services he has given a circum- stantial detail, which occupies nearly one-third of the volume. Here we likewise find an account of the founda- tion and constitution of the college, together with some

notices of its earliest members. His more famous work, the History of Scotland, was published after an interval of

five years :—Scotorum Llistorie a prima gentis origine cum aliarum et rerum et gentium illustratione non vulgari: premissa epistola nuncupatoria, tubellisque amplissimis, et non panitenda Isagoge, que ab hujus tergo explicabitur diffustus. Quce omnia impressa quidem sunt Iodoct Badii Ascensit typis et opera; impensis autem nobilis et proedocti virt Hectorts Boethit Deidonani, a quo sunt et condita et edita, fol. The title and colophon have no date, but the commendatory epistle by Alexander Lyon, precentor of the cathedral of Elgin, bears the 15th of March 1527. This edition coutains seventeen books, Another edition, con- taining the eighteenth book and a fragment of the nincteenth, was published by Ferrerius, who has added an appendix of thirty-five pages; Paris, 1574, fol. Though published at Faris, the latter edition appears from the colophon to have been printed at Lausanne.

The composition of Boece's history displays much ability ; and if the style does not always reach the standard of aucient purity, it displays a certain vein of elegance which geuerally renders it attractive. The authior's love of his native country, and his auxiety to emblazon the heroic deeds of his countrymen, are conspicuous in every part of the work ; nor must we leave unnoticed those aspirations after political freedom, by which he was honourably distin- guished ata period when the human inind was so generally chained to the earth by the most slavish maxims of sub- mission. It may be recorded as commendation instead of reproach, that his principles of polity have been represented as no better than those of Buchanan. Boece's imagination was, however, stronger than his judgment: of the extent of the historian's credulity, his narrative exhibits many unequivocal proofs; and if this circumstance admits of a sufficient excuse from the common propensity of the age in which he lived, his work presents strong indications of another fault, for which it is not so easy to find an apology. According to Bishop Lloyd, he put Fordun's tales " into the form of an history, and pieced them out with a very good invention, that part in which he chiefly

excelled." (Lloyd's Historical Account of Church Government in Great Britain and Ireland, pref.) He professes to have obtained from the monastery of Icolmkill, through the good offices of the earl of Argyll, and his brother the treasurer, certain original historians of Scotland, and among the rest Veremundus and Campbell, of whose writings not a single vestige is now to be found. In his dedication to the king, he is pleased to state that Veremundus, a Spaniard by birth, was archdeacon of St Andrews, and that he wrote in Latin a history of Scotland from the origin of the nation to the reign of Malcolm IIT., to whom he inscribed his work, According to Bishop Stillingfleet, whose opinion has been adopted by many other writers, these historians never existed except in Boece's fertile imagination. His propensity to the marvellous was at an early period exposed in the following tetrastich of Leland :—

' Hectoris historici tot quot mendacia scripsit, Si vis ut numerem, lector amice, tibi,*

Me jubeas etiam fluctus numerare marinos, Et liquidi stellas connumerare poli."

Lhuyd, who attacked him in different works, spoke of his fabrications with unsparing severity, nor did he ex- perience much better treatment from Stanihurst, an Irish writer of considerable reputation. Of his merits as an historian a very unfavourable estimate was formed by Lord Hailes and Mr Pinkerton. But in the opinion of Wallace, a learned lawyer, his "elegant style and correct com- position, not to add beautiful genius and fine fancy, are conclusive proofs that his understanding could not be in- accurate." And, as Maitland, the editor of Bellenden's trans- lation of Boece's history, has remarked, "in forming a final estimate of the literary character of Boece, we must bear

in mind that, when scholar-craft in this country at least was rare, he was a scholar, and contributed, by reviving ancient learning, to dispel the gloom of the Middle Ages; and that, while the history of his country existed ouly in the rude page of the chroniclers who preceded him, or in the fading records

of oral tradition, he embodied it in narrative so interesting and language so beautiful, as to be worthy of a more refined age."

Boece's History of Scotland was translated into the Scottish language by John Bellenden, archdeacon of Moray and canon of Ross. While the learned archdeacon was engaged in translating the work into prose, another indi- vidual was engaged in the more formidable task of trans- lating it into verse. A copy of this metrical version, containing about 70,000 lines, is preserved in the library of the University of Cambridge; a leaf seems to be wanting at the beginning, and the manuscript has suffered some other mutilations. The name of the versifier does not appear, nor has it heen ascertained from any other docu. ment; but we learn from the prologue that his labours, like those of Bellenden, were intended for the benefit of the young monarch. From the concluding lines, it is ascer- tained that he began his task in April 1531, and concluded it in September 1535. His verses are not distinguished by any considerable degree of energy or elegance, and the writer is chiefly to be commended for his perseverance.

In 1528, soon after the publication of his history, Boece took the degree of D.D. at Aberdeen ; and on this occasion the magistrates voted him a present of a tun of wine when the new wines should arrive, or, according to his option, the sum of £20 to purchase a new bonnet. He appears to have survived till the year 1536; for on the 22d of November in that year, the king presented John

Garden to the rectory of Tyrie, vacant by the death of

"Mr Hector Boiss." He died at Aberdeen, and, according to the most probable conjecture, he had then attained, or at least approached, the age of seventy.

BOECKH, Avcust, one of the greatest scholars that Germany has produced in modern times, was born in Karlsruhe, November 24, 1785. He was sent to the gymnasium of his native city, and remained there until he left for the University of Halle. There he devoted himself to the study of theology, as his intention was to enter the church. He had the privilege of listening to the lectures of Schleiermacher and other eminent theologians ; but at this time in Halle . Wolf was exercising a spell over the young men and creating an

enthusiasm for classical studies. August Boeckh felt the spell, passed from theology to philology, and became the greatest of all Wolf's scholars. At Easter of 1806 he went to Berlin to study in the seminary for secondary teachers, conducted by Gedike ; but the disturbances which then agitated the country sent himhome. In the summer of 1807 he came out as privat-docent in the University of Heidelberg, and in the autumn of the same year he was appointed a professor extraordin- arius. Two years after (1809) he was nominated ordinary professor. In 1811 he removed to Berlin, having been appointed professor of eloquence and ancient literature in the university newly established there. Here he remained till his death, which took place August 3, 1867. He was elected a member of the Academy of Sciences of Berlin in 1814, and for a long time acted as its secretary. Many of the speeches contained in his Kleine Schriften were delivered in this latter capacity.

Boeckh worked out the ideas of Wolf in regard to philology, and illustrated them by his practice. Discarding the old notion that philology lay in a minute acquaintance with words and the exercise of the critical art, he believed it to be the entire knowledge of antiquity, historical and philosophical (esse cam universe antiquitatis cognitionem

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historicam et philosopham). He divides philology into five parts: first, an inquiry into public acts, with a knowledge of times and places, into civil institutions, and also into law ; second, an inquiry into private affairs; third, an exhibition of the religions and arts of the ancient nations ; fourth, a history of all their moral and physical speculations and beliefs, and of their literatures ; and fifth, a complete explanation of the language. These ideas in regard to philology Boeckh gave out in a Latin oration delivered in 1822 (Gesammelte Kleine Schriften, vol, i. p. 104). He repeats themiin somewhat. different language in the speech which he delivered at the opening of the congress of German philologists in 1850. He there defines philology to be the historical construction of the entire life,—there- fore, of all forms of culture and all the productions of a people in its practical and spiritual tendencies. He allows that such a work is too great for any one man; but the very infinity of subjects is the stimulus to the pursuit of truth,

and men strive because they have not attained (vol. ii, p. 189). Even before Boeckh had published anything on this subject, his oral expositions had become widely spread, and were much discussed. (Liibker, " De Partitione Philologiz," Gesammelte Schriften zur Philologie und Pado- gogik, vol. i. p. 8.) Freund gives the following account of Boeckh's division of philology : —

"Boeckh distinguishes two chief parts of philological discipline—a formal and a material part. To the formal part belong only interpretation and criticism; to the material all the other disciplines, even grammar. More particularly the material part embraces—I. the practical life ; IIL. the theoretical life of the ancients. J. The practical, again, falls into the two divisions of—1. Public life, including (1) political history, (2) political antiquities, (3) chronology, and (4) geography; 2. Private life, which is considered as (1) external life, in agriculture, commerce, trades, domestic economy, and metrology ; (2) internal life, including marriage, education, slaves, &c. II. Theoretical life is divided into two parts—l. The life in which the thought of man is presented externally through a symbol—-worship, plastic art, music, Orchestik ; 2. Life in which the thought remains pure within the mind—science. In the case of the last (1) the contents, and (2) the form of acquisition are distinguished. The contents lie originally in mythology, out of which philosophy developed itself, and out of philosophy came the other sciences, which are partly physical, including mathematics, and partly ethical, The form of knowledge is language, and it must be considered first in itself, in its inner structure through grammar, and then in its formation and application to the various artistic forms which the history of literature has to exhibit" (Wie studirt man Philologie, p. 29).

From 1806 till the time of his death, Boeckh's literary activity was unceasing, His principal works were—(1.) An edition of Pindar, the first volume of which (1811) contains the text of the Epinician odes; a treatise De Metris Pindari, in three books; and Notw Critice: the second (1819) contains the Scholia ; and part 11. of volume ii, (1821) contains a Latin translation, a commentary, the fragments, and indices. It is the most complete edition of Pindar that we have. But it was especially the treatise De Metris Pindari in the first volume which placed Boeckh in the first rank of scholars. This treatise forms an epoch in the treatment of Greek metres.

In it the author threw aside all attempts to determine the Greek metres by mere subjective standards, pointing out at the same time the close connection between the music and the poetry of the Greeks. He investigated minutely the nature of Greek music as far as it can be ascertained, as well as all the details regarding Greek musical instruments ; and he explained the statements of the ancient Greek writers on

rhythm. In this manner he laid the foundation for a new treatment of Greek metres. (2.) Die Staatsaushaltung der Athener, 2 vols., Berlin, 1817 (2d improved edition, Berlin, 1851), translated into English by Sir George Cornewall Lewis, 2 vols. Lond., 1828. Boeckh shows in this work an imperfect acquaintance with the principles of the modern science of political economy. The book might have been written by an ancient Greek. But this imperfection does not much impair its great value and extraordinary merits. Boeckh has in it investigated a subject of peculiar difficulty with profound learning. He has amassed information from the whole range of Greek literature, he has carefully apprized the value of the information given, and he shows through- out every portion of it rare critical ability and insight. Similar and supplementary to his work on tbe political economy of Athens, was his Urkunden 'tiber das Seewesen des Attischen Staats, Berlin, 1840. Allied to it also was his work Afetrologische Untersuchungen wiber Gewichte, Miinzfusse, und Maasse des Alterthums, Berlin, 1838. (3.) His third great work arose out of his second. In regard to the taxes and revenue of the Athenian state he derived a great deal of his most trustworthy information from inscriptions, and many of these inscriptions are given in his book. It was natural, therefore, that when the Berlin Academy of Sciences projected the plan of a Corpus Inseriptionum Greecarum, Bocckh should be chosen as the principal editor. . This great work (1825-1859) is in four volumes, the last being incomplete. Boeckh's resources as a scholar have full scope in the treatment of these inscriptions, and though a new edition is now necessary and has been begun, Boeckh's explanations of them will form the basis of all subsequent commentaries.

These were Boeckh's great works; but his activity was continually digressing into widely different fields. He has gained for himself a foremost

position amongst investigators into ancient chronology, and his name will occupy a parallel place with those of Ideler and Mommsen. His principal work on this subject was called Zur Geschichte der Mondcyclen der Hellenen, Leipsic, 1855; but another, Epigraphisch-chronologische Studien, 1856, and_ several papers which he published in the Zransactions of the Berlin Academy, throw light on the subject. Boeckh also occupied himself with philosophy. One of his earliest papers was on the Platonic doctrine of the world (De Platonica corporis mundani fabrica, 1809), and De Plat. System. coclestium globorum et de versa indole astronomiw Philolare, 1810. In opposition to Gruppe he denied that Plato affirmed the diurnal rotation of the earth, Untersuchunger tiber das kosmische System des Platon, Berlin, 1852, and when in opposition to him Grote published his opinions on the sub- jects (Plato and the Rotation of the Earth) Boeckh was ready with his reply. Another of his earlier papers, and one frequently referred to, was Clommentatio Academica de simultate que Platoni cum Xenophonte intercessisse fertur

1817).

\ ea did not do much in the way of editing the classics. We have already noticed his cdition of Pindar. He also published an edition of the Antigone of Sophocles, with a poetical translation. (Antigone, Griechisch und Deutsch: Nebst Abhandlungen tiber diese Tragédve in Ganzen und tiber Einzelne Stellen derselben, Berlin, 1843). He also collected and arranged the fragments ascribed to Philolaus (Berlin, 1819), and endeavoured to show that they were genuine, The force of his arguments in this direction has, however, been recently weakened by Schaarschmidt, and the genuineness of the fragments is open to grave doubt.

The smaller writings of Boeckh began to be collected in his lifetime. Three of the volumes were published before his death, and four after (Gesammelte kleine Schriften, 7 vols, 1859-1873). The first two consist of orations

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delivered in the university or academy of Berlin, or on public occasions. The third, fourth, fifth, and sixth contain his contributions to the Transactions of the Berlin Academy, and the seventh contains his critiques.

The first two are valuable among other excellences from an educational point of view, and contain an exposition of many sound educa- tional principles. In them Boeckh shows himself a man of wide heart, interested in the most diverse forms of investigation, an ardent patriot, and a lover of justice and truth. (aap,

BOEHME, Jaxon (1575-1624), a mystical writer, whose surname (of which Fechner gives eight German varieties) appears in English literature as Beem, Behmont, &c., and notably in the form BenMmeEN, was born at Alt-Seidenberg, in Upper Lusatia, a straggling hamlet among the hills, some ten miles 8.E. of Gorlitz. He came of a well-to-do family, but his first employment was that of herd boy on the Landskrone, a hill in the neighbour- hood of Gérlitz, and the only education he received was at the town-school of Seidenberg, a mile from his home. Seidenberg, to this day, is filled with shoemakers, and to a shoemaker Jakob was apprenticed in his fourteenth year (1589), being judged not robust enough for hus- bandry. Ten years later (1599) we find him settled at xorlitz as master-shoemaker, and married to Katharina, daughter of Hans Kuntzschmann, a thriving butcher in the town. After industriously pursuing his vocation for ten years, he bought (1610) the substantial house, which still preserves his name, close by the bridge, in the Neiss- Vorstadt. Two or three years later he gave up business, and did not resume it as a shoemaker; but for some years before his death he made and sold woollen gloves, regularly visiting Prague fair for this purpose.

Boehme's authorship began in his 37th year (1612) with a treatise, Morgen Rothe im Auffyang, which though un- finished was surreptitiously copied, and eagerly circulated in MS. by Karl von Ender. This raised him at once out of his homely sphere, and made him the centre of a local circle of liberal thinkers, considerably above him in station and culture. The charge of heresy was, however, soon directed against him by Gregorius Richter, then pastor primarius of Gérlitz. Feeling ran so high after Richter's pulpit denunciations, that, in July 1613, the municipal council, fearing a disturbance of the peace, made a show of examining Boehme, took possession of his fragmentary quarto, and disinissed the writer with an admonition to meddle no more with such matters, Tor five years he obeyed this injunction. Butin 1618 began a second period of authorship ; he poured

forth, but did not publish, treatise after treatise, expository and polemical, in the next and the two following years. In 1622 he composed 'nothing but a few short pieces on true repentance, resiguation, &c., which, however, devotionally speaking, are the most precious of all his writings. They were the only pieccs offered to the public in his lifetime and with his permission, a fact which is evidence of the essentially religious and practical character of his mind, Their publication at Gérlitz, on New Year's Day 1624, under the title of Der Weg zu Christo, was the signal for renewed clerical hostility. Boehme had by this tine entered on the third and most prolific though the shortest period (1623-4) of his speculation. His labours at the desk were interrupted in May 1624 by a simmons to Dresden, where his famous " colloquy" with the Upper Consistorial Court was madc the occasion of a flattering but transient ovation on the part of a new circle of admirers. Richter died in August 1624, and Boehme did not long survive his pertinacious foe. Seized with a fever when away from home, he was with difficulty con- veyed to Gorlitz. His wife was at Dresden on business ; and during the first week of his malady he was nursed by

a literary friend. He died, after receiving the rites of the church, grudgingly administered by the authorities, on Sun- day, 17th November. Clerical ill-will followed him to the grave, and the malice of the vulgar defaced his monument,

Boehme always professed that a direct inward opening or illumination was the only source of his speculative power. He pretended to no other revelation. LEestatic raptures we should not expect, for he was essentially a Protestant mystic. No "thus saith the Lord" was claimed as his warrant, after the manner of Antoinette Bourignon, or Ludowick Muggleton; no spirits or angels held con- verse with him as with Swedenborg. It is needless to dwell, in the way either of acceptance or rejection, on the very few occasions in which his outward life seemed to hin to come into contact with the invisible world, The appari- tion of the pail of gold to the herd boy on the Landskrone, the visit of the mysterious stranger to the young apprentice, the fascination of the luminous sheen, reflected from a common pewter dish, which first, in 1600, gave an intuitive turn to his meditations, the heavenly

music which filled his ears as he lay dying—none of these matters are con- nected organically with the secret of his special power. The mysterics of which he discoursed were not reported to him: he "beheld" them. He saw the root of all mysteries, the Ungrund or Urgrund, whence issue all contrasts and discordant principles, hardness and softness, severity and mildness, sweet and bitter, love and sorrow, heaven and hell. These he "saw" in their origin ; these he attempted to describe in their issue, and to reconcile in their eternal result. He saw into the being of God; whence the birth or going forth of the divine manifestation. Nature lay unveiled to him, he was at home in the heart of things. '" His own book, which he himself was," the microcosm of man, with his threefold life, was patent to his vision. Such was his own account of his qualification. If he failed it was in expression ; he confessed himself a poor mouthpiece, though he saw with a sure spiritual eye.*

It must not be supposed that the form in which Boehme's pneumatic realism worked itself out in detail was shaped entirely from within. In his writings we trace the influence of Theophr. Bombast von Hohenheim, known as Paracelsus (1493-1541), of Kaspar Schwenkfeld (1490- 1561), the first Protestant mystic, and of Valentin Weigel (1533-1588). From the school of Paracelsus came much of his puzzling phraseology,—his Turba and Tinctur and so forth,— a phraseology embarrassing to himself as well as to lis readers. His friends plied him with foreign terms, which he was delighted to receive, interpreting them by an instinct, and using them often in a corrupted form and always in a sense of his own. Thus the word /dea called up before him the image of "a very fair, heavenly, and chaste virgin." The title Awrora, by which his earliest treatise is best known, was furnished by Dr Balthasar Walther. These, however, were false helps, which only serve to obscure a difficult study, like the Flagrat and Lubet, with which his English translator veiled Boehme's own honest Schreck and Lust. There is danger lest his crude science and his crude philosophical vocabulary con- ceal the fertility of Boehme's ideas and the transcendent greatness of his religious insight. Few will take the pains to follow him through the interminable account of his seven Quellgeister, which remind us of Gnosticism ; or even of his three first properties of eternal nature, in which his disciples find Newton's formule anticipated, and which certainly bear a marvellous resemblance to the three épxat of Schelling's Theogonische Natur. Boehme

is always greatest when he breaks away from his fancies and his trammels, and allows speech to the voice of his heart. Then he is artless, clear, and strong; and no man can help listening to him, whether he dive deep down with the

conviction "ohne Gift und Grimm kein Leben," or rise with the belief that "the being of all beings is a wrestling power," or soar with the persuasion that Love 'in its height is as high as God." The mystical poet of Silesia, Joh. Angelus, discerned where Boehme's truest power lay when he sang— "Im Wasser lebt der Fisch, die Pflanze in der Erden, Der Vogel in der Luft, die Sonn' ain Firmament,

Der Salamander muss im leu'r erhalten werden, Und Gottes Herz ist Jakob Béhme's Klement."

The three periods of Boehme's authorship constitute three distinct stages in the development of his philosophy. He himself marks a threefold division of his subject matter :—1. PHILOSOPHIA, 2.¢., the pursuit of the divine Sophca, a study of God in himself; this was attempted in the Aurora. 2, ASTROLOGIA, 2.¢., in the largest sense, cosmology, the manifestation of the divine in the structure of the world and of man; hereto belong, with others, Die drei Prin- cipien gittlichen Wesens; Vom dreifuchen Leben der Menschen ; Von der Menschwerdung Christi; Von der Geburt und Bezcichnung aller Wesen (known as Signatura Rerum). 3. THEoLoGIA, #. ¢., in Scougall's phrase, " the life of God in the soul of man." Of the speculative writings under this head the most important are Von der Gnadenwahl ; Mysterium Magnum (a spiritual commentary on Genesis); Von Christi Testamenten (the Sacraments).

Although Boehme's philosophy is essentially theological, and his theology essentially philosophical, one would hardly describe him as a philosophical theologian ; and, indeed, his position is not one in which either the philosopher or the theologian finds it easy to make himself completely at home. The philosopher finds no trace in Boehme of a conception of God which rests its own validity on an accord with the highest canons of reason or of morals ; it is in the actual not in the ideal that Boehme seeks God,

whom he discovers as the spring of natural powers and forces, rather than as the goal of advancing thought. The theo- logian is staggered by a language which breaks the fixed association of theological phrases, and strangely reversing the usual point of view, characteristically pictures God as underneath rather than above. Nature rises out of Him ; we sink into Him, The Ungrund of the unmanifested Godhead is boldly represented in the English translations of Boehme by the word Abyss, in a sense altogether un- explained by its Biblical use. In the Theologia Germanica this tendency to regard God as the substantia, the underly- ing ground of all things, is accepted as a foundation for piety ; the same view, when offered in the colder logic of Spinoza, is sometimes set aside as atheistical, The proces- sion of spiritual forces and natural phenomena out of the Ungrund is described by Boehme in terms of a threefold manifestation, commended no doubt by the constitution of the Christian Trinity, but exhibited in a form derived from the school of Paracelsus. From Weigel he learned a purely idealistic explanation of the universe, according to which it is not the resultant of material forces, but the expression of spiritual principles. 'These two explanations were fused in his mind till they issued forth as equivalent forms of one and the same thought. Further, Schwenkfeld supplied him with the germs of a transcendental exegesis, whereby the Christian Scriptures and the dogmata of Lutheran orthodoxy were opened up in harmony with his new-found views. Thus equipped, Boehme's own genius did the rest. A primary effort of Boehme's philosophy is to show how material powers are substantially one with moral forces. This is the object with which he draws out the dogmatic scheme which dictates the arrangement of his seven Quellgeister. Translating Boehme's thought out of the uncouth dialect of material symbols (as to which one doubts sometimes whether he means them as concrete

instances, or as pictorial illustrations, or as a mere memoria technica) we find that Boehme conceives of the correlation of two triads of forces. Each triad consists of a thesis, an antithesis, and a synthesis; and the two are counected by an important link, In the hidden life of the Godhead, which is at once Wichts and Alles, exists the original triad, viz., Attraction, Diffusion, and their resultant, the Agony of the unmanifested Godhead. The

transition is made; by an act of will the divine Spirit comes to Light; and imme- diately the manifested life appears in the triad of Love, Expression, and their resultaut, Visible Variety. As the action of contraries and their resultant arc explained the relations of soul, body, and spirit; of good, evil, and free will; of the spheres of the angels, of Lucifer, and of this world. It is a more difficult problem to account on this philosophy for the introduction of evil. Boehme does not resort to dualism, nor has he the smallest sympathy with a pantheistic repudiation of the fact of sin. That the difficulty presses him is clear from the progressive changes in his attempted solution of the problem. In the Aurora nothing save good proceeds from the Ungrund, though there is good that abides and good that falls—Christ and Lucifer. Jn the second stage of his writing the antithesis is directly generated as such; good and its contrary are coincidently given from the one creative source, as factors of life and movement ; while in the third period evil is a dircct outcome of the primary principle of divine manifes- tation —it is the wrath side of God. Corresponding to this change we trace a significant variation in the moral end contemplated by Boehme as the object of this world's life and history. In the first stage the world is created in remedy of a decline; in the second, for the adjustment of a balance of forces; in the third, to exhibit the eternal victory of good over evil, of love over wrath.

Boehme's influenee has lain chiefly with the learned. Trans- lations of sundry treatises have been made into Latin (by J. A. Werdenhagen, 1632), Dutch (eomplete, by W. v. Bayerland, 1634- 41), and Freneh (by Jean Maele, céivc. 1640, and L. C. de Saint- Martin, 1800-9). For the nearest approach to popularity whieh his writings have enjoyed we must search the annals of the English Commonwealth. Between 1644 and 1662, all Boehme's works were translated by John Ellistone (d. 1652) and John Sparrow, assisted by Durand Hotham and Humphrey Blunden, who paid for the undertaking. At that time regular soeicties of Behmenists, em- bracing not only the cultivated but the vulgar, existed in England and in Holland. They merged into the Quakcr movement, holding already in eommon with Friends that salvation is nothing short of the very presenee and life of Christ in the believer, and only kept apart by an objcetive doctrine of the sacraments which exposed them to the polemie of Quakers (¢.g., J. Anderdon), Muggleton led an anthropomorphie reaction against them, and

between the two currents they were swept away. The Philadelphian Society at the beginning of the 18th century consisted of eultured mysties, Jane Lead, Pordage, Francis Lee, Bromley, &e., who fed upon Boehme. William Law (1686-1761) somewhat later reeurred to the same spring, with the result, however, in those dry times of bring- ing his own good sense into question rather than of reviving the eredit of his author. After Law's death the old English translation was in great part re-edited (4 vols. 1762-84) as a tribute to his memory, by George Ward and Thomas Langeake, with plates from the designs of D. A. Freher (Brit. Mus. ddd. MISS. 5767-94). This forms what is commonly called Law's translation ; to com- plete it a 5th vol. (12mo, Dublin, 1820) is needed. Germany has also in this century turned to Boehme with eyes directly philosophi- cal. ''Heis known," says Hegel, "as the Philosophus Teutonieus ; and in reality through him for the first time did philosophy in Germany come forward with a characteristic stamp. 'The kernel of his philosophizing is purely German" (Gesch. Ph., iii. 1836, p. 300). Franz Baader is the most remarkable of his reeent philo- sophieal exponents. See also Hamberger, Die Lchre des deutschen Philosophen J. Bochmes, 1844; Alb. Peip, J. Boehme der deutsche Philosoph, 1860; von Harless, J. Bochme und die Alchymisten, 1870. For Boehme's life, consult the A/cmoirs, by Abm. von Frankenberg and others, trans. by Fras. Okely, 1870 ; La Motte Fouqué's J. Boehm, ein biographischer Denkstcin, 1831; and, above all, H. A. Feehner's J. Lihme, sein Leben und seinc Schriften, 1857. A com- prehensive study of Boehme in English is a desideratum. See Memorial of IV. Law (by Chr. Walton, 1856); Sat. Rev., xxxvi.*

(1873) p. 52; Unitar. Rev. (Amer.), ii. (1874) pp. 248, 447, art. by Prof. R. E. Thomson. Boehme's MSS. went to Holland. His works, having been separately printed at Amsterdam, 1631-82, by Hen. Beets and others, were first uniformly edited by J. G. Gichtel, Amst. 1682-3, in 24 pts. 8vo, bound in 6, 7, or 9 vols. ; reprinted Amst. 1715, 2 vols. 4to; again, Amst. 1730-1, in 21 pts. 8vo, bound in 6 vols. They were re-edited by K. W. Schiebler, Leips. 1831-47, in 7 vols. 8vo; reprinted 1861, 7.

RALOTIA (Bowréa) a country of Ceutral Greece, bounded on the 8. by the Gulf of Corinth, Megaris, and Attica; on the E. by Attica and the Euripus,

which separates it from Eubcea; on the N. by the territory of the Locri Opuntii ; and on the W. by Phocis. Its surface is estimated at 1119 English square miles. Surrounded nearly on all sides by mountains, it divides itself naturally into three parts, the low country about Lake Copais, or, as it is now called, the Lake of Topolias, the valley of the River Asopus (now Oropo), and the coast district between Mount Helicon and the Corinthian Gulf. The country about the lake is a large valley, so completely surrounded by hills that it is con- nected with the Eubcean Sea by subterranean passages only. The natural passages, or katavothra, not being sufficient to carry off the great masses of water accumulating in the valley, which is traversed by the Cephisus, the principal river in the country, the early inhabitants often suffercd severcly from inundations; and at a very remote period large artificial drains were constructed, probably by the Minyans of Orchomenos, to supplement the natural outlets. Remains of these works, as stupendous as any that were executed in antiquity, still excite the admiration of the traveller. They formerly rendered that part of Boeotia one of the most fertile districts of Greece, but being neglected for centuries, the shores of the lake became an exten- sive marsh. A large stretch of country is still often under water during the winter, but it begins to dry up in spring, and in summer forms fine wheat-ficlds and meadows. Between this valley of the Copais and the basin of the Asopus is situated the Theban plain, which is still distin- guished for its fertility, especially in grain. The lowlands and valleys of Boeotia were notorious in antiquity for their nioist and thick atmosphere, which was believed to render the inhabitants dull and stupid. For these characteristics the Boeotians are frequently satirized by the Attic writers ; and it is certain that comparatively few namcs were added to the long roll of Greek litcrature from this portion of the Greek soil. One writer alone, perhaps, the poet Pindar, stands out in striking contrast to the national character ; the two others who alone of his fellow-countrymen can claim to be also his intellectual kinsmen, Hesiod and Plutarch, bear no small trace of a Boeotian origin. The dialect spoken by the Bceotians was a broad Atolic. In the carliest times of history Boeotia was inhabited by various tribes, such as the Aonians, Temmicians, Thracians, Leleges, Phlegyans, and the Minyans of Orchomenos. Of these we know almost nothing, but the last-mentioned appear to have formed a great centre of civilization at a very remote period. All these tribes were gradually expelled or absorbed by the Beeotian folians, who immi- grated from Thessaly about

sixty years after the destruction of Troy, according to the ordinary chronology. The country, which had previously possessed no common name, henceforth is always spoken of as Boeotia, and the several cities and 'towns, with Thebes at their head, formed a sort of confederation, in which, however, the Thebans and the other Bceotians frequently came into hostile collision, Thebes claiming the supremacy of the whole country, and the other cities insisting on their independence. The confederation was administered by a number of officers called Bceotarchs, of whom two were chosen by Thebes aud one by each of the remaining confederate communities. The federal temple was that of Athene Itonica

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at Coronea, and there a religious festival was held, The political history of the country is inscparable from that of ORcHoMENOS, THEBES, PLAT##, and THESPIA, to which the reader must be referred for details. The confederacy continued its nominal existence even under the Roman emperors, although the country was so reduced that, about the time of Augustus, Tanagra and Thespie alone could be considcred towns, the other cities having either been entircly destroyed, or existing only as villages. The more important of the towns which had formerly existed, be- sides those already mentioned, were Tegyra, Arne, Haliartus, Alalcomenz, and Lebadea in the Copaic valley ; Anthedon, Mycalessus, and Oropus along the Euripus; Thisbe and Creusis on the Corinthian Gulf; Ascra and Leuctra further inland ; and Side, Tanagra, and Pherze in the valley of the Asopus. During the Middle Ages and under the Turkish domination, Livadia, the ancient Lebadea, was the capital of the country, which indeed was frequently called after that city. The district is now united in one Vomos with Attica (Attikoviotia), and is divided into two eparchies that take their names from Thebes and Livadia. The population in the eastern part is largely Albanian, and is engaged in the growing of grain and culture of the vine. See the Travels of Clarke, Wheler, Dodwell, Sir W. Gell, Hobhouse, Holland, Leake, and Mure; Thiersch, Etat actwel de la Gréce, 1833; Forchhammer, J/ellencka, 1837; Kruse, Hellas, 1825—28 ; Kliitz, De feedere Bootico, 1821 ; Ten Breujel, De foedere Beotico, 1834; Francke, Der Béotische Bund, 1843; and Bursian's Geographie von C'riechenland,

1863.

BOERHAAVE, Hermann, one of the most celebrated physicians of modern times, was born at Voorhout near Leyden, December 31, 1668. Destined for the clerical profession, to which his father belonged, he received a liberal education, and early displayed unusual abilities. At the age of sixteen he entered the University of Leyden, where he studied under Gronovius, Ryckius, Trigland, and other distinguished men, and obtained the highest academical honours. In 1690 he took his degree in philosophy; on which occasion he delivered an inaugural dissertation De distinctione mentis a corpore, wherein he attacked the doctrines of Epicurus, Hobbes, and Spinoza. Being left, on the death of his father, without any provision, he was compelled to support himself by teaching mathematics. By the advice of Vandenberg, the burgomaster of Leyden, Boerhaave now applied himself with ardour to the study of medicine, to which indeed he had early manifested a decided inclination. The works of Hippocrates among the ancients, and those of Sydenham among the moderns, were the especial objects of his study; but his reading was by no means confined to these authors. In 1693 he took his degree of M.D. at Harderwyck in Guelderland, and imme- diately entered on the studies of his profession. His merits were soon recognized, and in 1701 he was appoint- ed by the University of Leyden to supply the place of Drelincourt as lecturer on the institutes of medicine. His inaugural discourse on this occasion was entitled De com- mendando Hippocratis studio, in which he recommended to his pupils that great physician as their model. In 1709, the university appointed him successor to Hotton in the chair of botany and medicine, in which capacity he did good service, not only to his own university, but also to botanical science, by his improvements and additions to the botanic garden of Leyden, and by the publication of numerous works descriptive of new species of plants. He was appointed in 1714 rector of the university. In the same year he succeeded Bidloo in the chair of practical medicine, and in this capacity he had the merit of introducing into modern practice the system of clinical instruction. Four years later he was appointed to the

chair of ehemistry, and delivered an inaugural discourse, which eontains the germs of his celebrated Elements of Chemistry. In 1728 he was elected into the Royal Academy of Sciences of Paris, and two years later into the Royal Society of Loudon; to both of which he eommunicated his ehemical researches. In 1729 declining health obliged him to resign the chairs of ehemistry and botany ; and in 1731 he resigned the rectorship of the university, to which oftice he had been re-elected. On this occasion he delivered a discourse De Honore Medici Servitute. This great and good man died, after a lingering aud painful illness, on the morning of the 23d September 1738,

From the time of Hippocrates, no physician had more justly merited the esteem of his contemporaries and the adiniration of posterity than Boerhaave. To uncommon intellectual abilities he united those amiable qualities of the heart which give them so great a value to society. His personal appearance was simple and venerable. He taught very methodically, and with great precision ; his style was eloquent, and his delivery dignified and graceful. He sometimes also gave his lectures a lively turn; but his raillery was never coarse or satirical. He possessed remarkable powers of memory, and was an accomplished linguist. A declared foe to all excess, he considered decent mirth as the salt of life. He was foud of music, with which he had a scientifie acquaintance ; and during winter he had a weekly concert in his house. It was his daily practice throughout life, as soon as he rose in the morning, which was generally very early, to retire for an hour to private prayer and meditation on some part of the Scriptures. He often told his friends, when they asked him how it was possible for him to go through so much fatigue, that it was this practice which gave him spirit and vigour in the business of the day.

Of his sagacity, and the wonderful penetration with which he often discovered and described, at first sight, such distempers as betray themselves by no symptoms to common eyes, very surprising accounts have been transmitted to us. Yet so far was he from having presumptuous confidence in his own abilities, or from being puffed up by prosperity, that he was condescending to all, and remarkably diligent in his profession. His great skill and celebrity as a physician brought him a large fortune. He left his only surviving daughter two millions of florins.

The genius of Boerhaave raised the fame of the University of Leyden, especially as a school of medicine, so as to make it a resort of strangers from every part of Europe. All the princes of Europe sent him disciples, who found in this skilful professor not only an indefatigable teacher, but an affectionate guardian. When Peter the Great went to Holland in 1715, to instruet himself in maritime affairs, he also took lessons from Boerhaave. The reputation of this eminent man was not eonfined to Europe; a Chinese mandarin wrote him a letter directed "To the illustrious Boerhaave, physician in Europe," and it reached him in due course. The city of Leyden raised a splendid monu- ment to his memory in the church of St Peter, inscribed "To the health-giving genius of Boerhaave," SALUTIFERO BoERHAAVII GENIO SACRUM.

The principal works of Boerhaave are—(1.) Jnstitutiones Medice, Leyden, 1708 ; (2.) Aphorismi de cognoscendis et curandis Morbis, Leyden, 1709,—on this work, which was the text-book of Boerhaave's lectures, Van Swieten pub- lished a commentary in 5 vols. 4to; (3.) Lvbellus de Materia Medica et Remediorum Formulis, Leyden, 1719 ; (4.) Institutiones et Experimenta Chemie, Paris, 1724.

BOETIUS, Anicrus Manurus SrveRINvs, is described by Gibbon "as the last of the Romans whom Cato or Tully could have acknowledged for their countryman." The events of his life are involved in uncertainty. The

historians of the day give us but imperfect records or make unsatisfactory allusions. Later chroniclers indulged in the fictitious and the marvellous, and it is almost exclusively from his own books that trustworthy information can be obtained.

There is considerable diversity among authorities as to the name of Boetius. One editor of his De Consolatione, Bertius, thinks that he bore the preenomen of Flavius, but there is no authority for this supposition, His father bore the name of Flavius, and it is probable that the Flavius Boetius who was pretorian prefect, and who was put to death in 455 a.p., by order of Valentinian ILI., was the grandfather of the subject of our notice ; but these cirenm- stances form no good reason for supposing that he also had

the prenomen of Flavius. Many of the earlier editions, inserted the name of Torquatus, but it is not found in any of the best manuscripts. The last name is generally written Boethius, from the idea that it is connected with the Greek BonOés; but here, again, the best manuscripts agree in reading Boetius, and the latest editors have adopted this form.

The date of his birth is unknown ; but it is conjectured on good grounds that he was born at Rome somewhere about the year 475 a.p. He was, therefore, too young to sec the last of the Roman emperors (476), and his boyhood was spent in Rome while Odoacer, king of the Heruli, was monarch of that city. We know nothing of his early years. A passage in a treatise falsely ascribed to him (De Disctplina Scholarium) and a misinterpretation of a passage in Cassiodorus, led early scholars to suppose that he spent a long time in Athens pursuing his studies there; but later biographers have seen that there is no foundation for this opinion. His father, Flavius Manlius Boetius was eonsul in the. year 487. It is probable that he died soon after; for Boetius states that, when he was bereaved of his parent, men of the highest rank took him under their charge (De Cow., lib. ii. e. 3). He soon became well known for his energy and ability, and his high rank gave him access to the noblest families. He married Rusticiana, the daughter of the senator Symmachus. By her he had two sons, Anicius Manlius Severinus Boetius and q. Aurelius Memmius Symmachus. When Theodoric, the king of the Ostrogoths, displaced Odoacer no change of for- tune for the worse seems to have befallen Boetius. On the eontrary he became a favourite with that monareh, and was one of hisintimate friends. Boetius attained to the eonsul- ship in 510, and his sons, while still young, held the same honour together (522). Boetius regarded it as the height of his good fortune when he witnessed his two sons, consuls at the same time, convoyed from their home to the senate- house by a crowd of senators amidst the enthusiasm of the masses. On that day, he tells us, while his sons occupied the curule chairs in the senate-house, he himself had the honour of pronouncing a panegyric on the monarch, and placed between his two sons he distributed largesses among the people in the circus. But his good fortune did not last, and he attributes the ealamities that came upon him to the ill-will which his bold maintenance of justice had caused, and to his opposition to every oppressive measure. 'How often," he says, " have I opposed the attacks of Conigastus on the property of the weak ? how often have I kept Trigguilla,

the chamberlain of the palace, from perpetrating acts of injustice? how often have I protected, by influence exercised at my own peril, the miserable whom the licensed avarice of the barbarians always harassed with endless insults?" And then he mentions several particular eases, A famine had begun to rage. The prefeet of the praetorium was deter- mined to satisfy the soldiers, regardless altogether of the feelings of the provincials. He accordingly issued an ediet for a coemptro, that is, an order compelling the provincials

to sell their corn to the Government, whetlicr they would or not. This edict would have utterly ruined Campania. Boetius interfered. The case was brought before the king, and Boetius succeeded m averting the coemptio from the Campauians. He also rescued Paulinus, a man of consular rank, from the jaws of those whom he calls palatine canes (dogs of the palace),and who, he says, had almost devoured his riches. in that he exposed himself to the hatred of the informer Cyprianus by preventing the punishment of Albinus, a mau of consular rank, He mentions in another place that when at Verona the king was anxious to transfer the accusation of treason brought against Albinus to the whole senate, he defended the senate at great risk. In consequence of the ill-will that Boetius had thus roused, he was ac- cused of treason towards the end of the reign of Theo- doric. 'Three accusers appeared against him. The first, Basilius, had been expelled from the monarch's service, and in consequence of debt he had become an informer and now appeared against Boetius. The other two were Opilio and Gaudentius, on whom sentence of banishment had been pronounced on account of innumerable frauds. They first took refuge in a church, but when this fact became known, a decree was issued that if they did not leave Ravenna before a prescribed day, they were to be driven out with a brand upon their forehead. On the very last day allowed them they gave information against Boetius, and their information was received. The accusation which these villains brought against him was that he had conspired against the king, that he was anxious to maintain the integrity of the senate, and to restore Rome to liberty, and that for this purpose he had written to the Emperor Justin. Justin had, no doubt, special reasons for wishing to see an end to the reign of Theodoric. Justin was orthodox.

Theodoric was an Arian. The orthodox subjects of Theodoric were suspicious of their ruler; and many would gladly have joined in a plot to displace him. The know- ledge of this fact may have rendered Theodoric suspicious. But Boetius denied the accusation in unequivocal terms. He did indeed wish the integrity of the senate. He would fain have desired liberty, but all hope of it was gone. The letters addressed by him to Justin were forgeries, and he had not been guilty of any conspiracy. Notwithstand- ing his innocence he was condemned and sent to Ticinum (Pavia) where he was thrown into prison, It was during his confinement in this prison that he wrote his famous work De Consolatione Philosophie. His goods were con- fiscated, and after an imprisonment of considerable dura- tion he was put to death in 525. Procopius relates that Theodoric soon repented of his cruel deed, and that his death, which took place soon after, was hastened by re- morse for the crime he had committed against his great counsellor.

Two or three centuries after the death of Boetius writers began to view his death as amartyrdom. Several Christian books were in circulation which were ascribed to him, and there was one especially on the Trinity which they regarded as proof that he had taken an active part against the heresy of Theodoric. It was therefore for his orthodoxy that Boetius was put to death. And these writers delight to paint with minuteness the horrible tortures to which he was exposed and the marvellous actions which the saint performed at his death. He was canonized as Saint Severinus. The brick tower in Pavia in which he was confined was a hallowed building. And finally, in the year 996, Otho III. ordered the bones of Boetius to be taken out of the place in which they had lain hid, and to be placed in the church of St Augustine within a splendid marble tomb, for which Gerbert, who afterwards became Pope under the name of Silvester II., wrote an inscription.

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And he gives as a third and crownilg instance.

BOETIUS

It should be mentioned also that some have given him a decidedly Christian wife, of the name of Elpis, who wrote hymns, two of which are still extant

(Daniel, Zhes. Hyma., 1, p. 156). This is a pure supposition inconsistent with chronology, unauthenticated by authority, and based only on a misinterpretation of a passage in the De Consolatione.

The contemporaries of Boetius regarded him as a man of profound learning. Priscian the grammarian speaks of him as having attained the summit of honesty and of all sciences. Cassiodorus, the chancellor of Theodoric and the intimate acquaintance of the philosopher, employs language equally strong. And Ennodius, the bishop of Pavia, knows no bounds for his admiration. 'You surpass," he says to

| Boetius, "the eloquence of the ancients in imitating it."

The king Theodoric had a profound idea of his great scientific abilities. He employed him in setting right the coinage. When he visited Rome with Gunibald king of the Burgundians, he took him to Boetius, who showed them, amongst other niechanical contrivances, a sun-dial and a water-clock. The foreign monarch was astonished, and, at the request of Theodoric, Boetius had to prepare others of a similar nature, which were sent as presents to Gunibald. It was Boetius also whom Theodoric consulted when Clovis, king of the Franks, wished a musician who

could sing to the accompaniment of the lyre, and Boetius

was charged with the duty of selecting him.

The fame of Boetius increased after his death, and his influence during the Middle Ages was exceedingly powerful. His circumstances peculiarly favoured this influence. He appeared at a time when contempt for intellectual pursuits had begun to pervade society. In his early years he was seized with a passionate enthusiasm for Greek literature, and this continued through life. Even amidst the cares of the consulship he found time for commenting on the Categories of Aristotle. The idea laid hold of him of reviving the spirit of his countrymen by imbuing them with the thoughts of the great Greek writers. He formed the resolution to translate all the works of Aristotle and all the dialogues of Plato, and to reconcile the philosophy of Plato with that of the Stagirite. He did not succeed in all that he designed; but he did a great part of his work. 'Through your translations,"

says Cassiodorus to him, "the music of Pythagoras and the astronomy of Ptolemzus are read by the Italians; the arithmetic of Nicomachus and the geometry of Kuclid are heard by the Westerns; the theology of Plato and the logic of Aristotle dispute in the language of Quirinus; the mechanical Archimedes also you have restored in a Latin dress to the Sicilians ; and whatever discipline or arts fertile Greece has produced through the efforts of individual men, Rome has received in her own language through your single instru- mentality." Boetius translated into Latin Aristotle's Analytica Priora et Postertora, the Topica, and Llencha Sophistica ; and he wrote commentaries on Aristotle's Categories, on his book wept éppyveias, also a commentary on the Zsagoge of Porphyrius. These works formed to a large extent the source from which the Middle Ages derived their knowledge of Aristotle. (See Stahr, Arestoteles ber den Ldémern, pp. 196-234.)

But Boetius did not confine himself to Aristotle. He wrote a commentary on the Topica of Cicero; and he was also the author of independent works on logic :— Introductio ad Categoricos Syllogismos, in one book ; De Syllogismo Categorico, in two books'; De Syllogusmas Hypotheticits, in two books; De Divisione, in one book : De Definitione, in one book; De Diferentiis Toprers, in four books.

We have also seen from the statement of Cassiodorus that he furnished manuals for the quadrivium of the schools of the Middle Ages (the " quattwor matheseos discipline,"

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as Boetius calls them) on arithmetic, music, geometry, and astronomy. The statement of Cassiodorus that he trans- lated Nicomachus is rhetorical. Boetius himself tells us in his preface addressed to his father-in-law Symmachus that he had taken liberties with the text of Nicomachus, that he had abridged the work when necessary, and that he had introduced formule and diagrams of his own where he thought them useful for bringing out the meaning. His work on music also is not a translation from Pythagoras, who left no writing behind him. But Boetius belonged to the school of musical writers who based their science on the method of Pythagoras. They thought that it was not

sufficient to trust to the ear alone, to determine the prin-

ciples of music, as did practical musicians like Aristoxenus, but that along with the ear, physical experiments should be employed. The work of Boetius is in five books, and is a very complete exposition of the subject. It remained a text-book of music in the Universities of Oxford and Cambridge till within comparatively recent times. It is still very valuable as a help in ascertaining the principles of ancient music, and gives us the opinions of some of the best ancient writers on the art. The manuscripts of the geometry of Boetius differ widely from each other. The latest editor, Godofredus Friedlein, thinks that there are only two manuscripts which can at all lay claim to con- tain the work of Boetius. He has published the Ars Geometric, in two books, as given in these manuscripts ; but critics are generally inclined to doubt the genuineness even of these.

By far the most important and most famous of the works of Boetius is his book De Consolatione Philosophie. Gib- bon justly describes it as ‘“‘a golden volume, not unworthy of the leisure of Plato or Tully, but which claims incom- parable merit from the barbarism of the times and the situation of the author.” It was a favourite book of the Middle Ages, and deserves to be a favourite still. The high reputation it had in medieval times is attested by the numerous translations, commentaries, and imitations of it which then appeared. Among others Asser, the instructor of Alfred the Great, and Robert Grosseteste, bishop of Lincoln, commented on it. Alfred translated it into Anglo- Saxon. Versions of it appeared in German, French, Italian, Spanish, and Greek before the end of the 15th century. Chaucer translated it into English prose before the year 1382; and this translation was published by Caxton at Westminster, 1480. Lydgate followed in the wake of Chaucer. It is said that, after the invention of printing, amongst others Queen Elizabeth translated it, and that the work was well known to Shakespeare.

This famous work consists of five books. Its form is peculiar, and is an imitation of a similar work by Marcianus Capella, De Nuptiis Philologic et Mercurii. It is alternately in prose and verse. The verse shows great facility of metrical composition, but a con- siderable portion of it is transferred from the tragedies of Seneca. The first book opens with a few verses, in

which Boetius describes how his sorrows had turned his hair grey, and had brought him toa premgiure old age. As he is thus lamenting, a woman appears to

im of dignified mien, whom for a time he cannot distinguish in con- sequence of his tears, but at last he recognizes her as his guardian, Philosophy. She, resolving to apply the remedy for his grief, puts some questions to him for that purpose. She finds that he believes that God rules the world, but does not know what he himself is ; and this absence of self- knowledge is the cause of his weakness. In the second book Philosophy presents to Boetius Fortune, who is made to state to him the blessings he has enjoyed, and after that proceeds to discuss with him the kind of blessings that fortune can bestow, which are shown to be unsatisfactory and uncertain. In the third book Philosophy promises to lead him to true happiness, which is to be found in God alone, for since God is the highest good, and the highest good is true happiness, God is true happiness. Nor can real evil exist, for since God is all-powerful, and since he does not wish evil, evil must be non-existent. In the fourth book Boetius raises the question, Why, if the governor of the universe is good, do evils exist, and why is virtue often punished and vice rewarded? Philo-

"person of Christ.

sophy proceeds to show that this takes place only in appearance ; that vice is never unpunished nor virtue unrewarded. From this Philo- sophy passes into a discussion in regard to the nature of providence and fate, and shows that every fortune is good. The fifth and last book takes up the question of man's free will and God's foreknow- ledge, and, by an exposition of the nature of God, attempts to show that these doctrines are not subversive of each other ; and the con- clusion is drawn that God remains a foreknowing spectator of all events, and the ever-present eternity of his vision agrees with the future quality of our actions, dispensing rewards to the good and punishments to the wicked.

Several theological works have been ascribed to Boetius, as 'has been already mentioned. The Consolatio affords conclusive proof that the author

was not a practical believer in Christianity. The book contains several expressions, such as daemones, angelica virtus, and purgatoria clementia, which have been thought to be derived from the Christian faith; but they are used in a heathen sense, and are explained sufficiently by the circumstance that Boetius was on intimate terms with Christians, and could not help being influenced to some extent by their language. The writer nowhere finds con- solation in any Christian belief, and Christ is never named in the work. It is not impossible, however, that Boetius may have been brought up a Christian, and that in his early years he may have written some Christian books. This is the conjecture to which the latest editor of his Christian treatises has had recourse. Peiper thinks that the first three treatises are the productions of the early years of Boetius. 'The first, De Sancta T'rinitate, is addressed to Symmachus (Domino Patri Symmacho), and the result of the short discussion, which is of an abstract nature, and deals partly with the ten categories, is that unity is predicated absolutely, or, inregard to the substance of the Deity, trinity is predicated relatively. The second treatise is addressed to John the deacon ("Ad Joannem Diaconum"'), and its subject is " Utrum Pater et Filius et Spiritus Sanctus de divinitate substantialiter predicentur." The treatise is shorter than the former, occupying only two or three pages, and the conclusion of the argument is the same. The third treatise bears the title, Quomodo substantice in co quod sint bone stint cum non sint substantialia bona. It contains nothing distinctly Christian, and it contains nothing of great value; thcrefore its authorship is a matter of little consequence. Peiper thinks that, as the best MSS. uniformly assign these treatises to Boetius, they areito be regarded as his; that it is probable that Symmachus and John (who afterwards became Pope) were the men of highest distinction who took charge of him when he lost his father; and that these treatises are the first-fruits of his studies, which he dedicates to his guardians and benefactors. He thinks that the variations in the inscriptions of the fifth treatise, which is not found in the best manuscript, are so great that the name of Boetius could not have originally been in the title. The fourth book is also not found in the best manuscript, and two manuscripts have no inscription. He infers, from these facts, that there is no sure evidence for the authorship of the fourth and fifth treatises. The fifth treatise is Contra Eutychen et Nestorium. Both Eutyches and Nestorius are spoken of as living. A council is mentioned, in which a letter was read, expounding the opinion of the Eutychians for the first time. The novelty of the opinion is

also alluded to. All these circumstances point to the Council of Chalcedon (451). The treatise was therefore written before the birth of Boetius, if it be not a forgery; but there is no reason to suppose that the treatise was not a genuine production of the time to which it professes to belong. The fourth treatise, De Fide Catholica, does not contain any distinct chronological data; but the tone and opinions of the treatise produce the impres- sion that it probably belonged to the same period as the treatise against Eutyches and Nestorius. Several inscriptions ascribe both these treatises to Boetius. It will be seen from this statement that Peiper bases his conclusions on grounds far too narrow; and on the whole it is far more probable that Boetius wrote none of the four Christian treatises, particularly as they are not ascribed to him by any of his contemporaries. Three of them express in the strongest language the orthodox faith of the church in opposition to the Arian heresy, and these three put in unmistakable language the procession of the Holy Spirit from both Father and Son. The fourth argues for the orthodox belief of the two natures and one When the desire arose that it should be believed that Boetius perished from his opposition to the heresy of Theodoric, it was natural to ascribe to him works which were in harmony with this supposed fact. The works may really have been written by one Boethus, a bishop of Africa, as Jordan supposes, or by some Saint Severinus, as Nitzsch conjectures, and the similarity of name may have aided the transference of them to the heathen or neutral Boetius.

The best editions of the entire works of Boetius are the Basel edition of 1570, and Migne's in his Patrologie Cursus Completus, Series Latina, vols. lxiii., lxiv. There are many editions of the De Consolatione. The most recent are—(1.) In Valpy's Delphin Classics, Nos. 54 and 55. This contains the lives of Boetius by Bertius and

by Rota, and a list of the various editions of Boetius. It has also numerous notes. (2.) An edition by Theodorus Obbarius, Jene, 1843. This contains prolegomena on the life and writings of Boetius, on his religion and philosophy, and on the manuscripts and editions, a critical apparatus, and notes. (3.) An edition by Rudolfus Peiper, Lipsie, 1871. This edition has the

fullest collation of manu- scripts, though a considerable number of manuseripts still remain to be collated. In addition to an account of the MSS. used, it gives the Book of Lupus " De Metris Boetii," the " Vita Boetii" con- tained in some MSS., " Elogia Boetii," and a short list of the com- mentators, translators, and imitators of the Consolation. It con- tains also an account of the metres used by Boetius in the Con- solatio, and a list of the passages which he has borrowed from the tragedies of Seneca. The work also includes the five treatises, four of them Christian, of which mention has been made above. In 1867 appeared a very satisfactory edition of Boetius's works, De Institutione Arithmetica Libri Duo, De Institutione Musica Libri Quingue, Accedit Geometria que fertur Boetti.: e libris manu scriptis edidit Godofredus Friedlein, Lipsiz. (J. D.)

BOGHAZ-KEUY, or Bocuas-Koet (7.¢., the Village of the Gorge), a small hamlet in Asia Minor, remarkable for its ruins, which are identified with the ancient Pterium or Pteria. It stands 3515 feet above the sea-level, about half-way between Angora and Amassia, almost in the 40th parallel of N. lat., on the banks of a small tributary of the Kizil Irmak. The present village contains about 150 houses, but the remains give evidence of its former import- ance. Almost all the heights they occupy bear traces of fortification ; extensive chambers have been excavated in the rocks; many portions of escarpment are elaborately sculptured ; and the massive foundations of a vast temple or palace can still be traced. The date and origin of these ruins have given rise to much discussion. Dr Barth thinks the city was probably founded by Cyaxares, the Mede, and explains the groups of sculpture as commemorating the peace between Cyaxares and Alyattes, which is described by Herodotus in the 74th chapter of his lst book. M. Texier's hypothesis, on the other hand, is that the carvings represent the introduction of the worship of Astarte into Phrygia ; and this interpretation has been provisionally accepted by Van Lennep, in whose Z'ravels in Asia Minor, 1870, carefully-drawn copies of the sculptures will be found. (See also Barth, Reese von Trapezunt nach Scutari, 1860, and in Monatsbericht der Berl. Akad. der Wissensch., Febr., 1859.)

BOGODUKHOFF, a town of Russia, in the government of Kharkoff, about 43 miles N.W. of that city, in 50° 10' N. lat. and 36° 32' KE. long., on the sandstone heights along the River Merl. There seems to have been a settle-

ment on this site as early as 1571, and in 1681 it is spoken of asatown. In 1709, at the time of the Swedish war, Bogodukhoff was taken by Menschikoff and the Emperor Alexis Petrovitch. There are still remains of the ramparts and ditches with which it was formerly surrounded. The town contains four churches and a cathedral (of the Assumption, built in 1793), a hospital, and an almshouse. The inhabitants are chiefly engaged in agriculture and gardening, and in the manufacture of boots, caps, and turred gowns. Tanning also is carried on to some extent. The trade is principally in grain, cattle, and fish. There are two weekly markets and six annual fairs. Population in 1860, 10,522.

BOGOMILIT, a heretical sect of the Greek Church, who came into notice during the 12th century. In origin they are probably Bulgarian, and their name appears to be a compound of the Slavonic words Bog, God, and milui, have mercy. In doctrine they are closely assimilated to the Euchites of the preceding century, and they may be looked on as an offshoot of that older sect. The peculiarity of their systein of belief is the place assigned to Satan, who, under his original name Satanael, is held by them to be the first-born sou of God. But Satanael, though seated at the right hand of his father and endowed with universal sway, was discontented and desired to become independent. He

led away a section of the angels from their allegiance, and with their aid formed out of chaos a new world—the earth, and a new race—man. But he was unable to give to man a portion of his own living spirit, and therefore besought God to bestow life on this new creation, promising that the vacant places of the seceded angels should be filled up by the spirits of men. Repenting of this promise, however, he resolved to bring forth an evil race which should over- whelm the good among mankind. He accordingly seduced Eve, who gave birth to Cain, the first of the descendants of the evil principle. His power also enabled him to deceive the greater part of mankind, particularly the Jews, to whom he represented himself as Jehovah. At last God sent out from himself the Logos, or angel Michael, who came upon earth in an ethereal form which was in appear- ance only an earthly body. Christ overcame Satanael, and deprived him of his creative power, /,

from which time he is called Satan. Christ then ascended and took his place beside the Father, who again sent forth an emanation, the Holy Ghost, for the comfort and edification of believers. In church observances the Bogomili were equally heterodox. They rejected baptism by water only, and made the cere mony consist of prayer, and of laying on the head of the convert the gospel (probably apocryphal) of St John, and the hands of the congregation. As they rejected the symbol of water in baptism so they refused to admit such symbolic rites as the Lord's supper, which they looked upon as an offering to evil spirits. They were averse to all images, even to the cross. The Bogomili suffered – persecution from Alexius Comnenus, who put to death their leader Basilius, and they were condemned by a synod of Constantinople in 1140. They lingered on, however, in and about Philippopolis, and opinions nearly identical with theirs are to be met with among the later Catharists. (See the Church Histories of Neander and Gieseler.) BOGOTA, or Santa Fs pe Bocora, the capital of the United States of Colombia, in South America, is situated in the state of Cundinamarca, in 4° 6' N. lat. and 78° 30° W. long. It occupies a fine position at the base of the mountains La Guadalupe and Montserrato, on a table-land that forms part of the eastern ridge of the Andes, between the extensive valley of the Magdalena and the plains that are watered by partof the Orinoco system. The surround- ing country is exceedingly fertile, and produces abundant crops of wheat and barley and the leguminous plants cultivated in Europe. The city of Bogota is the finest in the republic; its streets are well built, and run at right angles to each other; and within recent years most of them have been supplied with side pavements. The private houses are built of sun-dried bricks, and white- washed ; and owing to the prevalence of earthquakes they are mostly of one story in height. Of the streets tne largest and finest is the Calle-Real or Calle de la Republica, which ends in a large square or plaza containing some of the chief buildings in the city. The cathedral, rebuilt in 1814, possesses very little external beauty ; but its interior is fitted up with considerable elegance, its ornaments are rich and valuable, and the image of the Virgin, the patron saint, is covered with a profusion of precious stones. There are about thirty other churches in the city, but many of them are in a state of decay, while several of the monastic buildings are appropriated to secular uses,—the religious conmmunities having been dissolved by Mosquera, and their revenues devoted in great measure to educational purposes. The convent of San Francisco is of great

extent, and contains some of the productions of Vasquez, a native artist of merit. A large and elegant building—a capitol, for the reception of Congress and for the various offices of state—is now (1875) in course of erection. Besides the university there are three endowed colleges, a school of

chemistry and mineralogy, a national academy, a public library, a botanic garden, and a military school, which is supported out of the public funds, and has produced Some good engineers, The mint, one of the three in the republic, is a large and handsome building, and is well suppled with the necessary machinery. There are manu- factures of soap, cloth, leather, and the precious metals ; an active trade is carried on; and the neighbourhood is rich in minerals of various kinds. The population in 1800

amounted to 21,464, exclusive of strangers and temporary

residents ; in 1821 it was estimated at 30,000, and in 1870 at about 52,000. Santa Fé de Bogota was founded in 1538 by Gonzalez Ximenes de Quesada, and received its

name from his birthplace Santa Fé, with the addition of

Bogota, in honour, it is said, of a native prince of that time. It soon increased in size and importance, and became the capital of the Spanish vice-royalty of New Granada. In 1811 the citizens threw off the Spanish yoke and a republic was proclaimed ; the city, however, in 1816, fell into the hands of Murillo the Spanish general. Delivered by Bolivar in 1819 it was made capital of the republic of Colombia; on the separation of the three states it remained the chief city of New Granada, and it is now the capital of the United States of Colombia, forming itself an inde- pendent federal territory. It is the seat of the supreme court and the other offices of the Federal Government, and the residence of the foreign diplomatic representatives. BOGRA, correctly Bacurd, a district in the Rajshaht division, within the Lieutenant-Governorship of Bengal, situated between 25° 20’ and 24° 20’ 28” N. lat., and 88° 55’ 30” and 89° 49’ 25” E. long. It is bounded on the N. by the districts of Dindjpur and Rangpur, on the E.

by the districts of Rangpur and Maimansinh, on the S. by the district of Pabna, and on the W. by the districts of Rajshahi and Dindjpur. The revenue area of the district in 1870 was 2000 square miles, of which 1750 were returned as under cultivation, 125 as cultivable but not actually cultivated, and 125 as uncultivable waste. The census of 1872 returned the police area of the district at 1500 square miles, and disclosed a population of 689,467 souls, of whom 556,620, or 80 per cent., were Mahometans ; 130,644, or 19 per cent., Hindus; 22 Christians; and 2181 were classified as "others." Density of population in the census area, 59 per square mile. The district stretches out in a level plain, intersected by numerous streams and dotted with patches of jungle. The Karatoya River flows from north to south, dividing the district into two portions, possessing very distinct characteristics. The eastern tract consists of rich alluvial soil, well watered, and subject to fertilizing inundations, yielding heavy crops of coarse rice, oilseeds, and jute. The western portion of the district is high-lying and produces the finer qualities of rice. The principal rivers are formed by the different channels of the Brahmaputra, which river here bears the local names of the Kondi, the Déokobé, and the Jamuna, the last forming a portion of the eastern boundary of the district. Its bed is studded with alluvial islands. The Brahmaputra and its channels, together with three minor streams, the Bangali, Karatoyd, and Alai, afford admirable facilities for commerce, and render every part of the district accessible to native cargo boats of large burden. The rivers swarm with fish,—the value of the fisheries being estimated at £45,000 a year. The principal pro- ducts of the district are rice, pease, pulses, oilseeds, jute, sugar-cane, mulberry, red pepper, and hemp for smoking (Cannabis indica). These products, together with clarified butter and a little silk, form the chief articles of export. The imports consist of salt, cloth, tobacco, areca-nuts, copper and brass utensils, spices, iron and piece goods. The chief trading markets are. Bogra, Lakhmigan), Buriganj,

Dhupchachid, &c. A silk factory has been established at Naodapara, and is conducted with European capital, with an annual outlay of about £4500. The revenue and expendi- ture of the district have steadily increased of late years. In 1853 the total revenue of the district amounted to £48,431, and the

civil expenditure to £7282; in 1860, revenue £57,744, and civil expenditure £11,013 ; in 1870— 71 the revenue had risen to £59,979. In 1870-71 the district contained 1064 separate estates held by 2497 pro- prietors, paying a total Government land revenue of £44,347. The machinery for protecting person and property consists of six magisterial and six civil courts, with (1) a regular police force, numbering 54 officers and 252 men, and cost- ing Government £5975; (2), a rural constabulary or village watch, numbering 2552 men, and costing £6635, paid by the landholders and villagers ; and (3), municipal police, numbering 36 men, and costing £251. In 1871-72 there were 41 Government and aided schools in the district, attended by 1492 pupils, and maintained at a total cost of £1398, of which £692 was contributed by the state. The total number of aided and unaided schools in the district is returned in the census of 1872 at 169, attended by 1685 pupils. The only town containing upwards of 5000 inhabitants in the district is Bogr4, the administrative headquarters, situated on the Karatoya River ; population in 1872, 5872; municipal income, £282; expenditure, £208 ; rate of taxation per head, 114d. There is one other municipality, Sherpur, formerly a place of importance when the East India Company had silk filatures in its neighbourhood. A great part of this town is now over- grown with jungle; the municipal income in 1869 was £246, the expenditure £174. 'The climate of Bogrd is mild during the winter, but sultry and oppressive at other seasons. The average annual rainfall for the five years ending 1869 was 82 inches, and the average annual tem- perature 77° Fahr.

BOHADDIN, or, more properly, Bona-Eppyn, an emi- nent Arabian writer and statesman, better known in the East under the appellation of Isn-Sseppap. He was born at Mosul 1145 a.p, (539 a.H.), and early became eminent in the study of the Koran, as well as in jurisprudence. At the age of twenty-seven he obtained the place of lecturer at Baghdad, and, soon after, a professor's chair at Mosul. In 1187 he made the pilgrimage to Mecca, and then proceeded to visit Jerusalem and Hebron. In passing through Damascus he was sent for by Saladin, who was then employed in the siege of Kancab. Bohaddin observed, as he himself mentions (Vita Saladina, c. v.), that the whole soul of the monarch was engrossed by the war which he was then waging against the enemies of the faith, and saw that the only mode of acquiring his favour was by urging him to its vigorous prosecution. With this view he com- posed a treatise on the Laws and Discipline of

Sacred War ; and this work, on his return, he presented to Saladin, who received it with peculiar favour. Bohaddin, from this time, remained constantly attached to the person of the sultan, and was employed in various important embassies and departments of civil government. He was also appointed judge of the army, and judge of Jerusalem, After Saladin's death Bohaddin was active in securing the throne to his son, Melik-al-Dhaker, and was by that prince created cadi of Aleppo. He then founded a college in that city of which he himself was the principal professor. When Melik-al- Dhaker died, his son Melik-al-Aziz was a minor, and Bohaddin obtained the principal sway in the regency. This gave him an opportunity of introducing learned men at court, and loading them with honours. As the prince, however, approached to manhood, Bohaddin, though he still retained his offices, found it expedient to retire from court, Even after he was unable to go to college, he continued to

give lectures in his own house; and he persevered in these learned labours till the age of nincty, when he died 1235 A.D. (633 4.H.) Bohaddin wrote on jurisprudence and Muslim divinity ; but his principal work is his Life of Saladin, which, with several other pieces connectcd with the same subject, was published by Schultens, at Leyden, in 1732, accompanied by a Latin translation, with notes and a geographical index. This work affords a favourable specimen of the historical compositions of the Arabs. It is written with some spirit, and yet is free from that inflation which so frequently disfigures Oriental composition. What- ever relates to Saladin breathes the highest tone of panegyric; yet the enthusiasm with which everything concerning him is narrated, and the anecdotes which the author, from his personal knowledge, is able to communicate respecting that extraordinary character, give his work a great degree of interest.

BOHEMIA (German Boumen or Boxer), a king- dom of the Austrian empire, situated between 48° 33' and 51° 4' N. lat., and 12° 5' and 16° 25' W. long., and bounded on the N. by Saxony and Prussian Silesia, E. by Moravia, 8S. by Upper and Lower Austria, and W. by Bavaria. Its area is estimated at 19,983 square miles. It belongs almost entirely to the basin of the Elbe, which rises within the territory, and is joined by the Adler, the Iser,

the Moldau, and the Eger before it passes the frontier. The boundaries are pretty clearly marked by mountain ranges on all sides,—the Béhmerwald dividing the country from Bavaria, the Erzgebirge and Riesengebirge from Saxony and Silesia,land the Moravian Hills from the basin of the Danube. The climate is healthy, but varies considerably in different districts; the soil in many parts is highly fertile, and grain of various kinds, potatoes, hops, flax, hemp, vines, and fruits are extensively cultivated. In 1870 there were 6,205,161 acres of ploughed land, 2656 in vineyards, 1,560,321 in gardens and meadows, 995,340 in pasture, and 3,749,411 in woodland. At the same date the number of horses in the country was 189,337, cattle 1,602,015, sheep 1,106,290, goats 194,273, swine 228,180, and bee-hives 140,892. The mineral productions comprise gold, silver, lead, tin, copper, iron, cobalt, bismuth, arsenic, sulphur, coal, alum, vitriol, and different sorts of stone. In 1870 there were obtained 156 ewt. of gold-ore, 1245 of silver-ore, 225,536 tons of iron, 999 tons of lead, 2274 of tin, 61 tons of anti- mony, and 111 of arsenic-ore. The quantity of coal and lignite amounted to 4,099,909 tons. The mineral springs of Bohemia—Carlsbad, Teplitz, Marienbad, and Franzens- brunn, &c.—are justly famous. The industry of the kingdom is highly developed in various directions. Most important of all is the manufacture of woollen goods, prin- cipally carried on at Reichenberg and in the neighbour- hood. The cotton manufacture is also extensively pro- secuted in the same district ; and at Rumburg and other places linen stuffs are largely produced. Bohemian glass has been celebrated for centuries, and is still exported to all parts of Europe. Porcelain and earthenware of different sorts, iron and steel wares, copper, tin, and pewter articles, wooden wares, chemical stuffs, and paper are all the objects of a considerable industry. Beetroot sugar is pretty largely manufactured, the refineries numbering 126 in 1870. At the same date there were 968 breweries in the country, and 324 brandy distilleries. The chief commercial city is the capital, Prague; but Reichenberg, Pilsen, Haida, Rumburg, Leitmeritz, and Budweis are all important centres. Bohemia is divided into twelve circles—Prague, Budweis, Pisek, Pilsen, Eger, Saaz, Leitmeritz, Bunzlau, Jiczin, Kéniggratz, Chrudim, Czaslau, and Tabor, and these are subdivided into 91 departments. In 1869 there were 372 towns, 226 smaller market-towns, and 12,551 villages. The number of inhabited houses in the whole country amounted to

632,404 ; and the total population was 5,106,069, of whom 2,433,629 were males, and 2,672,440 females. The census of 1869 took no count of nationality, but according to Ficker in his Die Volkerstémme der O6esterreichisch- Ungarischen Monarchie, there are 20 of German race for 32 of Slavonic. By far the greater part of the popula- tion (4,940,898) belongs to the Roman Catholic Church ; while only 3438 are members of the Greek Church, 106,115 Protestants, and 89,933 Jews. The country con- stitutes an archbishopric, and is divided into three bishoprics. In 1870 there were 140 ecclesiastical founda- tions, with endowments amounting to £65,726. At the head of the educational establishments is the University of Prague, with four faculties, and attended in 1871 by 1516 students. There are upwards of 4000 ordinary schools in rather more than the half of which Czech is spoken, 26 gymnasiums, 4 theological seminaries, and several institu- tions for special departments of the arts and sciences.

Bohemia derives its name from the Boli, a Celtic race History.

expelled from the country by the Marcomanni, who, after establishing a considerable kingdom under Marbod and being converted to Christianity, were in their turn supplanted by the Slavonic race, which is still predominant. The new comers were in danger of expulsion or conquest by the Avars, but were defended and established, according to their own possibly mythical account, by the heroic Samo ; and somewhat later, as the story goes, his place was filled by the good knight Krok, whose daughter Libussa, marry- ing Premysl, became the founder of a regular dynasty. Bohemia was for a time absorbed in the great Carlovingian monarchy, but soon reasserted its independence. In the course of the 9th century Christianity was introduced. Under Boleslas I. the bounds of Bohemia were extended . and its unity secured ; but after a vigorous defence he had to recognize the overlordship of Otto I. of Germany. Under his grandchildren his kingdom fell to pieces; a Polish conquest followed, and the restoration of the native dynasty was only effected by the help of Henry II. of Germany. In 1086 Wratislas II. received the title of king from the emperor for himself; and Premysl Ottocar I. (1197-1230) became the founder of a hereditary series of _ kings. He was a bold defender of his independence, and at the

same time gave great encouragement to German immigration. By the introduction of the right of primogeni- ture in the succession to the throne, he put an end to the disputes and contests which so often followed the death of a king. In 1241 his son and successor was the successful defender of Europe against a Mongolian invasion ; but he was eclipsed by Ottocar IT. (1253-1278), who added greatly by conquest to the extent of his dominions, and made himself a formidable rival to the emperor himself. The Premysl dynasty was at last extinguished in 1306; and after a few years of uncertainty and dissatisfaction the Bo- hemian crown was bestowed on John of Luxembourg (son of the Emperor Henry VII.), who thus became the founder of a dynasty which lasted till 1437. This warlike and prosperous monarch was succeeded by his son Charles L., who obtained the imperial dignity as Charles IV., and left Bohemia in a flourishing and influential position at his death in 1378. Under his successors, who fell far below the character of their ancestor, the country was thrown into confusion by the Hussite reformation, which resulted in a protracted war (1419-1434). The success of the reforming party led to an elective monarchy, and after various vicissitudes, George of Podiebrad mounted the throne in 1458; and in spite of Papal bull and Hungarian arms maintained his position till his death in 1471. His successor, the Polish prince Ladislas, ultimately obtained also the crown of Hungary ; but under him and his son Louis (1517-1526) the nobility made themselves more and

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more independent of the king, and the common people were crushed deeper into serfdom. On the death of Louis, in a battle against the Turks at Mohacz, Bohemia passed into the hands of Ferdinand of Austria, who treated the kingdom in the most despotic manner, and in 1547 declared it a hereditary possession. He was followed in succession by his son Maximilian II. and his grandson Rudolph IT., who left the country as distracted as they found it. The son of Matthias, the next king, was rejected by the Protestant party, which chose in his stead Frederick V. of the Palatinate ; but the victory at the White Mountain in 1620 left Bohemia at the mercy of the emperor, who inflicted a terrible vengeance on his enemies, and in 1627

declared the country a purely Catholic and hereditary kingdom of the empire. Owing to this no fewer than 30,000 families are said to have gone into exile and the population of the country was reduced to 800,000. On the death of Charles VI. Charles Albert of Bavaria laid claim to the crown, which continued to be an object of dispute though the Silesian campaigns and the Seven Years' War, but was successfully defended by Maria Theresa and her son Joseph II. The country was greatly benefited in many ways by the government of that monarch; but he

destroyed the independence of the royal towns, and treated'

the whole land as a mere province of the empire. Its religious condition was considerably improved, however, by an edict of toleration published in 1781. Under the succeeding reigns the circumstances of Bohemia underwent but little alteration, and it was hardly affected by the first French Revolution. In 1848, however, a determined "national" movement agitated the country. The demands of the Liberal party gradually increased, and nothing short of a full share in the constitutional government of their country would suffice. The movement was not confined to Bohemia, but spread through the whole Austrian empire, to the article on which (p. 137 of the preseut volume) the reader is referred. (See Freher, Rerum Bohemicarum Antigui Scriptores, 1602; Dobner, Monumenta Historica, 1764-68 ; Pelzel, Geschichte der Béhmen, 1817; Palacky, Geschichte von Bohmen, 1839; Jordan, Geschichte des bohm. Volks und Landes, 1845-47.)

The Bohemians or Czechs speak a Slavonic language, which has been subjected to literary culture from about (if not before) the 9th century. A few fragments of a pre-Christian literature have been preserved in a manu-script discovered by Hanka in 1817 in the church-steeple of K6niginhof ; but the first productions of any extent are due to the activity of the early German Christians, and are composed for the most part in the Latin language. Against this powerful exotic speech the vernacular had a long and dubious struggle, especially in the ecclesiasti- cal domain, and it was still striving against its encroach- ments when the political circumstances of the nation exposed it to the more dangerous, because more popular and less artificial, rivalry of German. From the court and the capital outward over the nobility and the country there spread a Germanizing energy that at first

seemed likely to destroy everything that was distinctively Bohemian ; but here and there the national language and customs were fostered and preserved by a few patriotic spirits, among whom the monks of the Slavonic monastery of Sazawa were especially conspicuous. At length the native language obtained the imperial patronage (under Charles IV.) Dalimil wrote his Rhyming Chronicle of Bohemia (1314) ; and translations began to be made from Latin and other languages. Among these were Mandeville's Travels ; and about the end of the 14th century a complete version of the Scriptures, the manuscript of which is preserved at Nikolsburg in Moravia. Thomas Stitny the domestic moralist, Duba the jurist, and Flaska the didactic poet,

deserve to be mentioned as original writers. The next generation saw the attempts at once at religious and at linguistic reform that came to so sad anend in the burn- ing of John Huss and the persecutions that followed. The Bohemian language was, indeed, brought into general use and served the disputants of both sides ; but little was consigned to its keeping except the ephemeral pro- ductions of ecclesiastical and political strife. A large collection of these works, saved from destruction by the invading Swedes, is still preserved in the library of Stockholm. Of more permanent interest may be mentioned Paul Zidek's History of the World, written for George of Podiebrad ; the interesting travels of Leo of Rosmital and his companions through various countries of Europe ; and those of Kabatnik in Egypt and Asia Minor, and of John of Lobkowitz in Palestine. The 16th century saw a remarkable development of Bohemian prose in various departments of literature. Weleslawin, Paprocky, and Hayck of Liboczun wrote popular histories; Wratislas of Mitrovic and Prefat of Wlkanow gave accounts of their travels; and Nicolas Konec, Dobrensky, and Lomnicky produced didactic works of different kinds. A valuable translation of the Bible was published at Kralitz in Moravia by eight learned Bohemian Brethren at the instigation of John of Zerotin; and various versions of the classics appeared from time to time. A long period of literary decadence followed the battle of the White Mountain in 1620. The best blood of the nation went into exile, and what Bohemian literature was produced appeared for the most part in foreign cities. In 1774 a severe blow was struck at the native language by

Maria Theresa's imperial decree which enforced the use of German in the higher and middle schools of the country. Before long, however, the defence of the mother tongue was taken up by Count Kinsky, Hanka of Hankenstein, the historian Pelzel, and the Jesuit Balbin,—by the last mentioned in a Dissertatio apologetica pro lingua Bohemica. The language became the object of the scientific investigations of Do- browsky, and the remains of the early periods were edited by Dobner, Prochazka, and other philologists. A chair of the Bohemian language was founded in the University of Prague, and in 1818 a Bohemian museum was established in connection with a society that devoted itself to the study of national antiquities, and published a valuable journal. Puchmayer (1795-1820) gave an impulse to national poetry, aud has been succeeded by Langer, Roko, Wocel, Schneider, Czelakowsky, and Kollar, and a great number of other writers. In the department of science Presl, Sadek. Amerling, Smetana, Petcina, Sloboda, and Opiz have attained distinction. Grammars of the Czech language have been produced by Burian, Hanka, Maly, Sembera, and Tomicek; Sumawsky published a great German- Bohemian dictionary ; Spatny, a Bohemian-German and German-Bohemian technological dictionary ; and Jungmann a large Bohemian-German lexicon. The names of even the prominent writers in philosophy, theology, and politics are too numerous to be mentioned. (See Schafarik's Slavisch Alterthiimer, 1842, and Geschichte der Slav. Sprache, 1826; Jungmann's Geschichte der Bohm. Sprache und Literatur, 1825.)

BOHEMOND, Maro, one of the leaders of the Crusades, born about 1056, was the eldest son of Robert Guiscard, a Norman, who had obtained by conquest the dukedom of Apulia and Calabria. From 1081 to 1085 he served under his father in a war against the Byzantine emperor Alex- ander Comnenus, whom he twice defeated, though he had to return to Italy without reaping any substantial fruits of his success. In 1085 his father died, leaving Apulia and Calabria to a younger son, while Bohemond obtained only the small principality of Tarentum. A war between the

brothers followed, from which, however, Bohemond was speedily diverted by the Crusades, which opened up a wider field for his ambition. Accompanied by his cousin Tancred, he led an army of 10,000 cavalry and

20,000 infantry, with which he would have besieged Constantinople had he been able to persuade Godfrey of Bouillon to join him. He took a leading part in the battle of Doryleum (1097), and the other engagements of the campaign in Asia Minor.

BOIARDO, Counr Marreo Marta, of a noble and illustrious house established at Ferrara, but originally from teggio, was born at Scandiano, one of the seignoral estates of his family, near Reggio di Modena, about the year 1434, according to Tiraboschi, or 1420 according to Mazzuchelli. At an early age he entered the University of Ferrara, where he acquired a good knowledge of Greek and Latin, and even of the Oriental languages, and was in due time admitted doctor in philosophy and in law. At the court of Ferrara, where he enjoyed the favour of Duke Borso d'Este and his successor Hercules,he was entrusted with several honourable employments, and in particular was named governor of Reg- gio, an appointment which he held in the year 1478. Three years afterwards he was elected captain of Modena, and reappointed governor of the town and citadel of Reggio, where he died in the year 1494, though in what month is uncertain, Almost all his works, and especially his great poem of the Orlando Inamorato, were composed for the amusement of Duke Hercules and his court, though not written within its precincts. His practice, it is said, was to retire to Scandiano or some other of his estates, and there to devote himself to composition; and Castelvetro, Vallisnieri, Mazzuchelli, and Tiraboschi, all unite in stating that he took care to insert in the descriptions of his poem those of the agreeable environs of his chateau, and that the greater part of the names of his heroes, as Mandricardo, Gradasse, Sacripant, Agramant, and others, were merely the names of some of his peasants, which, from their uncouth- ness, appeared to him proper to be given to Saracen warriors. Be this as it may, the Orlando Inamorato deserves to be considered as one of the most important poems in Italian literature, since it forms the first example of the romantic epic worthy to serve as a model, and, as such, undoubtedly produced the Orlando Furioso. Gravina and Mazzuchelli have said, and succeeding writers have repeated on their authority, that Boiardo proposed to himself as his model the Ziad of Homer; that Paris is besieged like the city of Troy; that Angelica holds the place of Helen; and that, in short, the one poem is a sort of reflex image of the other. In point of fact, however, the subject-matter of the poem is derived from the

Fabulous Chronicle of the pseudo-Turpin; though, with the exception of the names of Charlemagne, Roland, Oliver, and some other principal warriors, who necessarily figure as important characters in the various scenes, there is little resemblance between the detailed plot of the one and that of the other. The poem, which Boiardo did not live to finish, was printed at Scandiano the year after his death, under the superintend- ence of his son Count Camillo. 'The title of the book is without date; but a Latin letter from Antonia Caraffa di

Reggio, prefixed to the poem, is dated the kalends of June 1495.

tinuation of Agostini, wretched as it unquestionably is,

Boiardo's poem suffers from the incurable defect of a laboured and heavy style. His story is skilfully con- structed, the characters are well drawn and sustained throughout ; many of the incidents show a power and fertility of imagination not inferior to that of Ariosto, but the perfect workmanship indispensable for a great work of art is wanting. The poem in its original shape was not popular, and has been completely superseded by the ifacimento of Francesco Berni. See BERNI.

The other works of Boiardo are—1. Z/ Timone, a comedy, Scandiano, 1500, 4to ; 2. Sonnetti e Canzoni, Reggio, 1499, 4to; 3. Carmen Bucolicon, Reggio, 1500, 4to; 4. Cinque Capitola in terza rima, Venice, 1523 or 1533; 5. Apulejo dell' Asino d'Oro, Venice, 1516, 1518; 6. Asino d'Oro de Luciano tradotto in volgare, Venice, 1523, 8vo; 7. Erodoto Alicarnasseo istorico, tradotto di Greco in Lingua Italiana, Venice, 1583 and 1538, 8vo; 8. Rerum Ttalicarum Scriptores. (See Panizzi's Booardo, 1830-31.)

BOITELDIEU, Francors-ApRIgEy, is the chief representa- tive of the national school of comic opera in France, a branch of art in which everything that is most lovable and at the same time most national in the French character has found its full expression. He was born at Rouen in 1775, and received his first musical education from M. Broche, the organist of the cathedral of that city. It is said that, when quite a youth, in order to escape the punishment of a severe master for a slight offence, he went off to

Paris on foot, but was discovered and brought back by his parents. He began composing songs and chamber music at a very early age,—his first opera, La Famille Suisse, being produced on the stage of Rouen in 1795, where it met with an enthu- siastic reception. Not satisfied with his local success he turned his eyes to that loadstar of youthful ambition, Paris. He went to the capital in 1795, full of hope and expectation. The score of his opera was submitted to the leading musicians of the day, such as Cherubini, Méhul, and others, but met with little approbation. Altogether the time was not favourable for the comic muse. The heroic passions roused by the revolutionary events of the preceding years required commensurate efforts of musical art; the grand opera was the order of the day. Boieldieu had to fall back on his talent as a pianoforte-player for a livelihood, and to wait for a chance of higher success in the meantime. This success came at last from a source whence it was little expected, and, perhaps, less desired. Garat, a fashionable singer of the period, admired Boieldieu's touch on the piano, and made him his accompanyist. He also sung in the drawing-rooms of the Directoire the charming songs and ballads with which the young composer supplied him but too willingly. In this manner Boieldieu's reputa- tion gradually extended to wider circles. In 1797 his above- mentioned opera appeared for the first time on a Paris stage, and was well received. Several others followed in rapid succession, of which only the last, Le Calife de Bagdad (1799), has escaped oblivion. It tends to show Boieldieu's true artistic vocation, that, after the enormous success of

this work, he felt the want of a thorough musical train- ing, and voluntarily descended from the position of a successful maestro to that of a humble pupil. He took lessons from Cherubini, and the influence of that great master is distinctly discernible in the higher artistic finish of Boieldieu's later compositions. In 1802 Boieldieu, for the second time in his life, took to sudden flight, on this occasion in order to escape the domestic troubles caused by his marriage with a celebrated ballet-dancer of the Paris Opera. The frightened husband went to Russia, where he was received with open arms by the Emperor Alexander. During his prolonged stay at St Petersburg he composed a number of operas which it is unnecessary to name. He algo set to music the choruses of Racine's Athalie, one of his few attempts at the

tragic style of dramatic writing. In 1811 he returned to his own country, where the following year witnessed the production of one of his finest works, Jean de Paris. The charming coquetry of the queen of Navarre, the chivalrous verve of the king, the officious pedantry of the seneschal, and the amorous tenderness of the page—all this rendered in the finest touches that music, and only French music, is capable of, will not soon be forgotten. We pass over a number of other operas of lesser value, partly written in collaboration with other com- posers, and turn at once to the second and greatest master- piece of Boieldieu's genius, his Dame Blanche (1825). The libretto, written by Scribe, was partly suggested by Walter Scott's Monastery, and several original Scotch tunes cleverly introduced by the composer add not a little to the melodious charm and local colour of the work. La Dame Blanche marks the highest development of the French school of comic opera. Grétry stood at the head of this school ; Cherubini with his Deux Journées followed in his wake ; Boieldieu, greater than both (in this particular branch of art), reached a perfection which was to some extent sustained by the works of Auber. Boieldieu's pupil, Adam, has in his Derniers Souvenirs dun Musicien left a charming sketch of the genesis of Boieldiew's masterpiece. The chief characteristics of his style are an easy flow of graceful melodies, a refined though occasionally somewhat meagre instrumentation, admirable phrasing, and a most distinct enunciation of the words. The outer events of Boieldieu's career may be summed up in few words. For a long time he occupied the position of professor of composition and pianoforte at the Conservatoire; in 1817 he was made a member of the Institute. The Dame Blanche was his last opera but one. Soon after its production he was seized with a violent attack of pulmonary disease. To stop the rapid progress of the illness he travelled in Italy and the South of France, but fell a victim to it on October

8, 1834.

BOI, a Celtic people, who at an early date crossed the Alps and established themselves between the Po and the Apennines to the south of the Insubres and Cenomani. On the defeat of their neighbours the Senones by the Romans they joined the Etruscans against the conquerors, and were involved in the disastrous results of the battle at the Vadimonian Lake in 283 B.c. Equally unsuccessful in the following year, they formed a treaty of

peace with the Romans, which they kept for a considerable time, till the encroachments of their conquerors led them to engage in the Great Gallic war of 225 p.c. From that period they continued to indulge their hostility on all occasions, and on the outbreak of the Punic wars gave valuable aid to the Carthaginians from time to time. At length their strength was broken by Scipio Nasica in 191 B.c. ; a large proportion of their territory was appropriated and secured by the colonies of Bononia, Parma, and Mutina; and before long the whole race seems to have been constrained to recross the Alps. They betook themselves to that

district of country which is still called in consequence Bohemia ; but before many centuries they were expelled by other hostile tribes and their separate existence as a people was lost.

BOILEAU-DESPREAUX, Nicotas, was born at Paris on the lst November 1636. Crone, not far from the capital, has been frequently stated to be his birthplace, but the matter seems to be pretty nearly settled by the researches of M. Labat (Recherches historiques sur I' Hétel de la Préfecture de Police), who has discovered the very house in the Rue de Jérusalem where the poet was boru. He was educated at the College of Beauvais, and was at first destined for the legal profession. From this, however, after a short trial, he recoiled in disgust, complaining bitterly of the amount of chicanery which passed under the name of law and justice. To escape such a course of life he began to study for the church, and actually received a priory of a small annual value, but his wishes soon turned in another direction. He gave up his clerical profession, and, his father having left him a small provision suffi- cient for his wants, thenceforward devoted himself to letters. Such of his early poems as have been pre- served hardly contain the promise of what he ultimately became. The first piece in which his peculiar powers were displayed was a satirical poem, Adieus of a Poet to the (ity of Paris, published in 1660. This was quickly followed by eight others, and the number was at a later period increased to twelve. A twofold in- terest attaches to the satires. In the first place the author skilfully parodies and attacks writers who at the time were placed in the very first rank, such as Chapelain, Cotin, Quinault, and Scudéri; he openly raised the stand- ard of revolt against the older poets. But in the second place he showed, both by precept and practice, what were the poetical capabilities of the French

language. Prose, in the hands of such writers as Descartes and Pascal, had proved itself a flexible and powerful instrument of expres- sion, with a distinct mechanism and form. But except with Malherbe, there had been no attempt to fashion French versification according to rule or method. In Boileau for the first time appeared terseness and vigour of expression, with perfect regularity of verse structure. His fame was quickly established; he received a pension, and was made historiographer along with his friend Racine. In 1664 he composed his prose Dialogue des heros de roman, which is a refined satire on the elaborate romances of the time. It may be said to have once for all abolished them. From 1669 onwards appeared the Lpistles, graver in tone than the satires, maturer in thought, more exquisite and polished in style. In 1674 his two master-pieces, LP Art Poetique and Le Lutrin, were published. The first, in imitation of the Avs Poetica of Horace, lays down the code for all future French verse, and may be said to fill in French literature a parallel place to that held by its proto- type in Latin. On our own literature the maxims of Boileau, through the translation revised by Dryden, and through the magnificent imitation of them in Pope's Art of Criticism, have exercised no slight influence. Boileau does not merely lay down rules for the language of poetry, but analyses carefully the various kinds of verse composition, and enunciates the principles peculiar to each. Of the four books of the Art Poetique, the first and last consist of general precepts, inculcating mainly the great rule of bon sens; the second treats of the pastoral, the elegy, the ode, the epigram, and satire; and the third of tragic and epic poetry. Though the rules laid down are of value, their tendency is rather to hamper and render too mechanical the efforts of poetry. Boileau himself, though a great critic in verse, cannot be considered a great poet. The Lutrin, a mock heroic poem, of which four cantos appeared in 1674,

is by French critics considered the best of Boileau's works. It has furnished the model for the Rape of the Lock, but the English poem is superior in richness of imagination and subtilty of invention.. The fifth and sixth cantos, after- wards added by Boileau, rather detract from the beauty of the poem; the last canto in particular is quite unworthy of his genius, Inthesame year which saw the Art Poetique and the Lutriz was published his translation of

Longinus On the Sublime, to which were afterwards added certain critical reflections. His later publications were chiefly occasional poems, in which his better powers did not shine. He died 13th March 1711. Boileau was extremely delicate in youth, and his constitution seems never to have been very strong. He was a man of warm and kindly feelings, honest, outspoken, and benevolent. Many anecdotes are told of his frankness of speech at court, and of his generous actions, He holds a well-defined place in French literature, as the first who reduced its versification to rule and who taught the value of workmanship for its own sake. His

influence on English literature, through Pope and his –

contemporaries, was not less strong, though less durable. Editions of Boileau's works are very numerous. Perhaps the best is that published by Garnier in 1860, Qwures complétes, with copious notes, an essay by Sainte-Beuve, and Boleuna.

BOILER. See STEAM ENGINE.

BOIS-LE-DUC, 's HerToGENnBoscu, or 's Boscu, a city of Holland, capital of the province of North Brabant, 28 iiles §.S.E. of Utrecht. It stands at the confluence of the Dommel and the Aa, and is strongly fortified, being defended by a citadel and two forts. The city is handsome and well built, and is intersected by several canals. It contains seven churches, among which is that of St John, founded in the beginning of the 14th century, and one of the finest ecclesiastical edifices in Holland. It has also a handsome towu-hall, surmounted by a tower containing a fine set of chimes, a court-house, Government buildings (formerly a Jesuit monastery), an episcopal palace, an orphan asylum, a grammar school (once attended by Erasmus), a prison, two hospitals, an arsenal, and barracks. The trade of Bois-le-Duc is very considerable; it has several dis- tilleries, breweries, and glass-works, and manufactures linen, needles, cutlery, &c. It is the seat of a vicar-general, and has tribunals of primary instance and commerce. Originally a hunting-lodge of the Brabant dukes, 's Her- togenbosch, or ' Duke's Wood," gradually increased, and in 1184 was raised to the rank of a town and surrounded with walls. In 1453 it was greatly enlarged. Successive attempts made by the Netherlands in 1585, 1594, 1601, and 1603 to get possession of the town were futile; but at length, in 1629, it was captured after a five

months' siege. In 1794 it was taken by the French, and in 1814 by the Prussians. Population in 1869, 24,395. .

BOI—BOTI

BOISSARD, Jean Jacquus, a classical antiquary and Latin poet, was born at Besangon in 1528. He studied at Louvain ; but, disgusted by the severity of his master, he secretly left that seminary, and after traversing a great part of Germany reached Italy, where he remained several years, and was often reduced to great straits. His residence in Italy developed in his mind a taste for antiquities, and he soon formed a collection of the most curious monuments of Rome and its vicinity. He then visited the islands of the Archipelago, with the intention of travelling through Greece, but a severe illness obliged him to return to Rome. Here he resumed his favourite pursuits with great ardour, and having completed his collection, returned to his native country ; but not being permitted to profess publicly the Protestant religion, which he had embraced some time before, he withdrew to Metz, where he died, October 30, 1602. His works are—

1. Pocmata, Epigrammatum libri tres, Elegtce libri tres, Epistola- rum libri tres, Basel, 1574; 2. Emblemata, Metz, 1584; 3. Icones Virorwm Illustrium, 1597, sqq.; 4. Vite et Icones Sultanorum Tur- cicorum, &c., Frankfort, 1596; 5. Theatrum Vite Humane, Metz, 1596 ; 6. Romane Urbis Topographic et Antiquitatum, quibus suc- cincte et breviter describuntur omnia que tum publice quum privatim videntur animadversione digna, partes VI., Frankfort, 1597-1602, folio, six volumes in three, with plates, and now very rare; 7. Icones et Vite Virorum Illustrium, Frankfort, 1592 to 1599; 8. Parnassus Biccps, Frankfort, 1601; 9. De Divinatione et Magicis Prestigiis, Oppenheim and Hanau, rare and curious; 10. Habitus Variarum Gentium, Metz, 1581, ornamented with seventy illum- inated figures.

BOISSONADE, Jean Francois, French classical scholar, was born at Paris, 12th August 1774. In 1792 he entered the public service during the administration of General Dumouriez. Driven from it in 1795, he was restored by Lucien Bonaparte, during whose time of office he served as secretary to the prefecture of the Upper Marne. Hethen definitivelyresigned public employment and devoted himself to the study of Greek, for which he had always a strong inclination. In 1809 he was named professor of Greek

at the faculty of letters at Paris, though he did not assume the title till the death of Larcher, who held the chair, in 1812. In 1828 he succeeded Gail in the chair of Greek at the Collége de France. Healso held the offices of librarian of the Bibliothéque du Roi, and perpetual secretary of the Academy of Inscriptions. He died 12th September 1857. Boissonade's works consist mainly of editions of several less known classical writers, such as Philostratus, Marinus, Eunapius, Aristeenetus. Perhaps his most widely known editions are those of Babrius (1844), and of Tzetzes (1851). The Anecdota Greca, 5 vols. (1829-33), and Anecdota Nova (1844) contain many interesting and comparatively unknown writings. Boissonade was a contributor to the Journal des Débats and other critical journals, and a selection of his papers has been published by M. Colincamp, Oritique littéraire sous le premier Empire, 2 vols., 1863.

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BOKHARA

OKHARA, Buxwara, or BUKHARIA, a country and khanate of Central Asia, in Turkistan or Indepen- dent Tartary, lying between lat. 37° and 41° N., and long. 62° and 69° E. Its extent has been greatly duninished during recent years both on the N. and S.,—in the former direction by the conquests of Russia, and in the latter by the encroachments of Afghanistan. A considerable stretch of country, including the important towns of Balkh, Andkhoi, and Meimene, was at various times regarded as an integral part of the khanate; but at present the River Oxus forms for the most part its southern boundary. To the W. it is conterminous with the khanate of Khiva and the desert of Kharezm, which now form part of the Russian empire ; and on the E. it stretches to the khanates of Kunduz and Khokand. Its area is estimated at 100,000 square miles. A large part of the western half of the land consists of a desolate steppe of argillaceous clay, broken by hills of slate and bare granite rocks ; the eastern parts are occupied by offshoots of the Hindu-Koh and Tien-shan ranges, and the Pamir steppe. The cultivated land is confined almost entirely to the immediate neighbourhood of the rivers, of which the most important are the Amu or Oxus, the Zer- Affshan, and the Karshee. The Amu (Sogd or Kohik), which only belongs to the khanate in the middle part of its course, flows from S.E. to N.W., and varies in width from 300 to upwards of 800 yards. The Zer-Affshan, inferior to the Amu in the volume of its waters, and superior to it in the populousness and cultivation of its banks, rises in the high lands east of Samarkand, and, passing north of that city and of Bokhara, forms a lake in the province of Karakul about 25 miles in length. Its whole course is about 340 miles. The Karshee rises in the same high lands as the Zer-Affshan, and passes through Shehr-Sebz and Karshee, below which it is lost in the desert.

There are no gold mines in Bokhara, but that metal is found among the sands of the Oxus in greater abundance, perhaps, than in any of the other rivers which flow from the Hindu-Koh. The climate of Bokhara is exposed to great variations. In summer the heat is often very great, and in winter the cold is proportionally severe. The frosts commence about the end of November, and continue till towards the end of April. The Amu is generally frozen over for some weeks in winter so as to be passable for

caravans. In the desert the heat in sumimer exceeds 100° Fahr. Thunder-storms and earthquakes are not unfrequent, especially in the spring; and there are sometimes violent tornadoes, generally blowing from the N.W.

The population of Bokhara, composed of Tadjiks, mhabi- Arabs, Uzbeks, Turkomans, Persians, Mervi, and Jews, may tants.

be estimated at between 1,000,000 and 2,000,000. Me- yendorff estimates it at 2,478,000, Khanikoff at from 2,000,000 to 2,500,000, Burnes at less than 1,000,000, and Wolff at 1,200,000. The Tadjiks are the aborigines of the country, and are said to have come from the west, and settled on the banks of the Zer-Affshan at a time when the country was uninhabited, and a jungle of reeds covered the place where the town of Bokhara now stands. Except in the town of Bokhara, where they constitute the majority of the population, there are few Tadjiks now in the khanate. They are mostly engaged in commerce, are peaceful or even cowardly in their disposition, and are characterized by avar- ice, faithlessness, and deceit. They are usually tall, with handsome and regular features, fair complexion, and black eyes and hair. The number of Arabs, though not consider- able, exceeds that of the Tadjiks. They are the descendants of the followers of Kutribe, who conquered the country about the beginning of the 8th century, and compelled the in- habitants to adopt the Mahometan faith. Their numbers are stated at 60,000, and they inhabit the northern part of the khanate, especially the neighbourhood of Vardanzi and Vafkend. Like their ancestors they still continue to lead a wandering life, their chief occupation being the tending of their flocks. Their moral qualities seem to be of a higher character than those of the Tadjiks. The Uzbeks, the last people that conquered this country, are the most numerous, and are at present the dominant race. They are divided into a number of tribes, of which the

principal is that of Manghit. To it the reigning dynasty belongs, Some of the Uzbeks are nomadic in their habits, others are engaged in agriculture or live intowns. They are more bold and straightforward in their manners than the Tadjiks, but have unfortunately degenerated from contact with that race. There are a considerable number of Persians in Bokhara, most of whom have been brought as slaves from their native country. They are readily distinguished by the regularity of their features, and their bushy black IV. — 1.

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hair. Large numbers of them rise by their intelligence and faithfulness to occupy important situations. Although outwardly conforming to the faith and manners of the country, they cordially hate the native races, and are ready to hail with joy any political revolution which might shake the power of the Uzbeks The Jews, though long estab- lished in the country, form but a very inconsiderable part of its inhabitants. They are chiefly to be found in Bokhara and some of the larger towns, where they have separate quarters assigned to them. Their privileges are very restricted. The Mervi, who number about 40,000, are the people who were transplanted from the city of, Merv on its destruction about 1810 by Emir Said Khan. The Turko- man or Kirghiz part of the population is wholly nomadic, and is chiefly to be found in the regions south of the Oxus.

The orchards in the neighbourhecd of the larger towns are numerous and highly cultivated. They produce grapes, figs, peaches, pomegranates, apricots, plums, apples, pears, and quinces. The cultivation of cotton, tobacco, and lucerne is extensively carried on, as is also that of the mulberry, beet, cabbage, carrots, radishes, onions, cucum- bers, pease, beans, lentils, melons, and pumpkins. The soil being of a saline nature requires to be cultivated with some care, so that it is found to be much more profitably laid out in gardens than in fields ; indeed, the returns from the

former exceed by sevenfold the returns from the same quantity of the latter. Wheat, rice, barley, millet, and joar (Sorghum vulgare) are the principal kinds of grain grown, The last-named is one of the most useful pro- ductions of the khanate, and as it is cheap and nutritious, it forms the chief subsistence of the poor.

The horses of Bokhara are numerous, but are more remarkable for strength than for beauty. Asses are also very plentiful, and are large and sturdy. The camels, by means of which the entire traffic of Bokhara is carried on, are reared chiefly by the wandering tribes, particularly the Turkomans. They have a sleek coat as fine as that of a horse, and shed their hair in summer; from the hair a fine waterproof cloth of close and rather heavy texture is manu- factured. The goats are about the common size, of a dark colour, and yield a shawl-wool inferior only to that of Kashmir The bulls and cows are miserably small, and in very wretched condition. The rearing of sheep is much attended to, particularly by the Arabs. There is a peculiar breed, said to thrive only in the district of Karakul, which produces a jet-black curly fleece that is much valued. The wild animals are few. Tigers of a diminutive species are found in the valley of the Oxus; wild hogs, herds of deer, antelopes, and the wild ass roam on the plains ; and foxes, wolves, jackals, and ounces are found in some parts. All kinds of game are scarce. The scorpion is common. The most valuable insect is the silk- worm, which is reared in all parte of the khanate where there is water—every rivulet being lined with the mulberry.

Bokhara owes its importance to its central position. Lying on the route between Europe and the richest part of Asia, it is the seat of a considerable transit trade. The Government has established custom-houses, built caravanserais, and constructed cisterns along such caravan roads as are insufficiently supplied with water, but otherwise does nothing to encourage traffic; and the roads are generally in a wretched condition. Religious fanaticism formerly rendered it impossible for any except Mahometan merchants to trade with safety in the country ; but since 1868 all at least who are in any way under the protection of Russia have full freedom to import or transport their wares throughout the country. Bokhara carries on an extensive trade with Russia by means of caravans, which travel by the

following routes, viz.,—by the route of Khiva to the shores of and across the Caspian from and to

Astrakhan ; by the route to and from Orenburg by land in sixty days, through Orghenj in Khiva; to and from Troidska in Tobolsk, by the route east of the Sea of Aral, in forty-nine days; and to and from Petropavlosk (Kizil Djar) in ninety days. From 5000 to 6000 camels are annually employed in this trade. Bokhara exports to Russia, besides cotton, which is the principal item, dried fruits, rice, raw and dyed silks, indigo, silk sashes, turquoises, shawls, and furs. It imports muslins, calicoes, chintzes, some silk stuffs, broad-cloth, brocades, hides, iron, and other metals. The trade with Khiva employs only from 1000 to 1500 camels, and consists chiefly in exporting to Bokhara Russian goods, of which there is always an available surplus in the markets of Khiva. Three, and occasionally four, caravans arrive annually from Meshid in Persia, bringing cotton and silk stuffs, calicoes, chintzes, muslins, carpets, shawls, turquoises and opium, and receiving in return lamb-skins, cotton, rice, &c. From Herat and Kashmir is imported a considerable quantity of shawls and Indian produce and English manufactures from Kabul. A brisk traffic is also carried on with Khokand, Tashkand, Kashgar, and Yarkand. The central points of commerce are Bokhara and Karshee; and trade is principally conducted at the marts and fairs that are held in various parts of the country. Almost the only manufactures carried on in Bokhara are those of cotton goods, silks, carpets, leather, hardware, and jewellery. There is one manufactory of cast-iron articles, Swords and knives are fabricated at Hissar and Karshee, and excellent paper of raw silk at Bokhara.

Bokhara has for ages been reckoned the centre of Educatidf:

Mussulman erudition ; and if we look at the number of its schools and the state of education among its people, we cannot but admit that, in that respect, it ranks first among the states of Central Asia. About one-fourth of the population is said to be able to read and write. The primary schools are numerous in the capital, as well as in the other cities, and even in villages. The course in these schools extends over about seven years. Those wishing to continue their studies then enter the medresses, or seminaries, in which they pursue a higher course of studies, chiefly theological, under one or two

professors who have acquired the right to give lectures. Each establishment has a fixed number of students, according to the extent of the building. Fifteen or even twenty years are reckoned insufficient to go through a complete course in these institutions. The people are, however, very superstitious, believing in witchcraft, omens, spirits, and the evil eye.

The Government is a hereditary despotism, the khan eee. The ment.

having the power of life and death over his subjects. civil administration is in the hands of the clergy, and is founded on the Koran and the commentaries upon it. The military and civil dignitaries are divided into three grades. The troops of the khan are estimated at about 40,000 men, but of these not more than one-third are completely armed. The languages in use are the Persian and Turkoman ; the latter is spoken by the Uzbeks, and the wandering tribes south of the Oxus.

Bokhara was known to the ancients under the name of Sogdiana. It was too far removed to the east ever to be brought under the dominion of Rome, but it has shared deeply in all the various and bloody revolutions of Asia. It is mentioned by the earliest historical writers of Persia ; and the foundation of the capital is ascribed to Efrasiab, the great Persian hero. About the year 856, Yacub- bin-Leis is said to have been invested with the govern- ment of that province by the caliph. About twenty years later it was conquered by Ismael, the first sovereign of the Sassanean dynasty, whose successors held it until the renowned Malek Shah, third of the Seljuk dynasty

of Persia, passed the Oxus about the end of the 11th century, and subdued the whole country watered by that river and the Jaxartes. In 1216 Bokhara was again sub- duced by the celebrated Mahomet Shah Kharezm, who enjoyed his conquest but a short time ere it was wrested from him by Genghis Khan in 1220. The country was wasted by the fury of this savage conqueror, but recovered something of its former prosperity under Octai Khan, his son, whose disposition was humane and benevolent. His posterity kept possession till about 1400, when Timur bore down everything before him. His descendants ruled in the country until about 1500, when it was overrun by the Usbek Tatars, under Ebulkhier Khan, the founder of the

Sheibani dynasty, with which the history of Bokhara properly commences. The most remarkable representative of this family was Abdullah Khan, who greatly extended the limits of his kingdom by the conquest of Badakhshan, Herat, and Meshed, and greatly increased its prosperity by the public works which he authorized. Before the close of the century, however, the dynasty was extinct, and Bokhara was at once desolated by a Kirghiz invasion and distracted by a disputed suc- cession. At length, in 1598, Baki Mehemet Khan, of the Astrakhan branch of the Timur family, mounted the throne, and thus introduced the dynasty of the Ashtar- khanides. The principal event of his reign was the defeat he inflicted on Shah Abbas of Persia in the neighbourhood of Balkh. His brother Veli Mehemet, who succeeded Baki in 1605, soon alienated his subjects, and was supplanted by his nephew Imamkuli. After a highly prosperous reign this prince resigned in favour of his brother, Nezr Mehemet, under whom the country was greatly troubled by the rebellion of his sons, who continued to quarrel with each other after their father's death. Mean- while the district of Khiva, previously subject to Bokhara, was made an independent khanate by Abdulgazi Bahadur Khan ; and in the reign of Subhankuli, who ascended the throne in 1680, the political power of Bokhara was still further lessened, though it continued to enjoy the un- bounded respect of the Sunnite Mahometans. Subhankuli died in 1702 at the age of 80, and a war of succession broke out between his two sons, who were supported by the rivalry of two Usbek tribes. After five years the contest terminated in favour of Obeidullah, who was little better than a puppet in the hands of Rehim Bi Atalik, his vizier. The invasion of Nadir Shah came to complete the degradation of the land; and in 1740 the feeble king Ebulfeiz paid homage to the conqueror, and was soon after murdered and supplanted by his vizier. The time of the Ashtarkhanides had been for the most part a time of dis- solution and decay ; fanaticism and imbecility went hand in hand. Onits fall the throne was seized by the Manghit family in the person of Mir Maasum, who pretended to the most extravagant sanctity, and proved by his military career that he had no smal] amount of ability. He turned his attention to the encroachments of the Afghans, and in 1781 reconquered the greater part of*what had been lost to the south of the Oxus. Dying in 1802 he was succeeded by Said, who in bigotry and fanaticism was a true son of his father. In 1826 Nasrullah Bahuder mounted the throne, and began with the murder of his brother a reign of continued oppression and cruelty. Meanwhile Bokhara became an

object of rivalry to Russia and England, and envoys were sent by both nations to cultivate the favour of the emir, who treated the Russians with arrogance and the English with contempt. The Russian armies were gradually advancing, and at last they appeared in Khokand 3 but the new emir, Mozaffer-eddin, instead of attempting to explate the insults of his predecessor, sent a letter to General Chernayeff summoning him to evacuate the country,

and threatening to raise all the faithful against him. In 1866 the Russians invaded the territory of Bokhara proper, and a decisive battle was fought on 20th May at Irdjar on the left bank of the Jaxartes. The Bokharians were defeated ; but after a period of reluctant peace they forced the emir to renew the war. In 1868 the Russians entered Samarkand (May 14) and the emir was constrained to submit to the terms of the conqueror. Bokhara, though still nominally independent, is in reality subject to Russia, which must ere long absorb it completely.

Hitherto European intercourse with Bokhara has been very slight, and few travellers have personally visited it. The Brothers Polo were there in the time'of Borak Khan (1264-1274) and Anthony Jenkinson in 1558-9, Cladisheff in 1740, Meyendorff and Nagri in 1820, Burnes in 1832, Wood in 1838, Khanikoff and Lehmann in 1841-2, Stoddart and Conolly in 1842, Danilevsky in 1842-3, and Vainbery in 1863.

See Khanikoff's Bokhara, translated by De Bode (1845); Vambery, Travels in Central Asia (1864), Sketches of Central Asia (1868), and History of Bokhara (1878); Fedchenko's " Sketch of the Zarafshan Valley" in Journ. R. Geogr. Soc. for 1870; Hellwald, Die Russen in Central Asien (1878).

BoxuaRA, or BukwaRA, the capital of the above khanate, is situated six or seven miles from the left bank of the Zer- Affshan, in 39° 48' N. lat. and 64° 26' E. long. It is about eight miles in circumference, has a triangular shape, and is surrounded by an earthen wall about 20 feet high, which is pierced by eleven gates. It is divided into two main por- tions known as the Deruni Shehr and Beruni Shehr, or the inner and outer city, and these are subdivided into several districts. Of the former splendours of '" Bokhara the Noble" the remains are comparatively few, and the general appearance of the city is very disappointing. Vambery describes it as one of the dirtiest

and most unhealthy places in all Asia. The streets are extremely narrow, and the houses, flat-roofed and built of sun-dried bricks on frameworks of wood, are small and only one story in height. The bazaars are very numerous, and each trade has its own. There are about thirty small caravanserais throughout the city, which serve partly as store-rooms and partly as inns. The largest building in Bokhara is the Mosque of Kelan, which was originally built by Timur, and was restored by Abdullah Khan. It occupies a square of 300 feet, and is surmounted by a dome 100 feet high. There the khan comes to pay his devotions on Fridays in the midst of his subjects. Among the other mosques, which are fabulously said by the inhabitants to number 365, the most important are the Mesdjidi Mogak, a subterranean building of uncer- tain origin, and the Divanbeghi, which dates from 1629. In the neighbourhood of the latter is an open square, with a reservoir in the middle, which forms one of the favourite lounges of the people of Bokhara. On the opposite side rises the ark or palace of the khan, a gloomy building on an elevated site. Bokhara has long been regarded as the intellectual centre of Central Asia, and possesses a large number of educational establishments. There is hardly a street without its school, and the number of colleges or medresses, set down too at 865 by the inhabitants, is really about 80. Of these the handsomest is Abdullah's, which was built in 1372, and contains about 100 cells. Others date from 1426, 1529, and 1582; and one was founded by the Empress Catherine of Russia. The water supply of Bokhara is very defective, and the canals that convey it from the river are left in such an extreme state of filthiness, as readily to account for the prevalence of many forms of disease. 'The population was estimated by Meyendorff at about 70,000, and in this he was sup- ported by Moorcroft and Khanikoff. Burnes raised the number to 150,000, and Wolff to 180,000; but it is now stated by Vambery at no more than 30,000.

BOLBEC, a town of France, capital of a canton in the department of Lower Seine, 18 miles E.N.E. from Havre on the railway to Paris, which here passes over high embankments and a viaduct. It was burned almost to the ground in 1765, but is nowa flourishing brick-built manu- facturing town, well supplied with water-power by the Bolbec stream. The principal

manufactures are cotton goods, woollen cloth, and leather; there are also linen factories and dye-works. Population in 1872, 9019.

BOLEYN, ANNE, or, as the name is variously spelled, Bullen, Bouleyn, Boullan, or Boulain, queen of England, and second wife of Henry VIII., was the daughter of Sir Thomas Boleyn, a distinguished politician, and Lady Elizabeth Howard, daughter of the earl of Surrey, after- wards duke of Norfolk. Considerable obscurity rests over the date of her birth, which has been variously stated as 1501 and 1507; perhaps the earlier date is the more probable. She received a very careful education, and in 1514 became maid-in-waiting to Mary Tudor, then the affianced bride of Louis XII. of France. She crossed to France in Mary's train, but did not return with her, hav- ing entered the service of Queen Claude, where she was celebrated for her beauty, talents, and accomplishments. The period of her return to England has been matter of dispute ; some, following Herbert and others, would make the date about 1522, others 1527. It may be assumed with some confidence that she returned about the earlier date. About this time occurred her love affair with Percy, afterwards earl of Northumberland, which was broken off by Wolsey, acting apparently under the directions of the jealous king. Henry seems already to have begun to direct his affections towards the fair Boleyn, who was then one of the maids of honour attached to his consort, Katherine of Aragon. He advanced her family, but is said to have been repulsed by her when he made an offer of his love. In 1527, after some absence from the court, she seems to have returned, and Henry's attentions to her became more marked than before. His passion soon opened his eyes more clearly to the sin of his marriage with his deceased brother's wife, and the subject of the divorce began to be seriously discussed. Towards 1520 Anne Boleyn was accustomed to keep state almost as queen ; in 1532 she was raised to the peerage with the title of marchioness of Pembroke, and accompanied Henry in his visit to France. On January 25, 1533, according to a contemporary report, her ambition was crowned by a private marriage with Henry. On the 12th of April she was openly proclaimed queen, and the marriage was again solemnized ; and on the 8th of May the king's previous marriage was declared to have been null and void. The coronation took place on the 19th of May, and on the 7th September, a princess, the famous Elizabeth, was born.

Little is known of the new queen's married life. She to some extent favoured the Reformers, and countenanced the translation of the Bible. In January 1536 she gave birth to a prince, still-born. It is said that this mishap was occasioned by her suddenly becoming aware of Henry's attentions to Lady Jane Seymour. However this may be, Henry's superstitious fears seem to have been roused by the want of a male heir, and his fancy for Anne Boleyn had been replaced by a new passion. In April 1536 a com- mittee sat privately to inquire into certain accusations of adultery against the queen. A special commission was called on the 24th April, and orders were issued for the arrest of the Viscount Rochford, the queen's brother, Sir Henry Norris, Sir Wm. Brereton, Sir Francis Weston, and Mark Smeton, all her alleged paramours. At the same time writs were issued for a new parliament. On the 2d May the queen was arrested and summoned before the privy council.

Snieton, Norris, and Weston were afterwards examined, and of these Smeton confessed, though it was said under torture. Norris is thought to have made some admission, which, however, he afterwards withdrew. All three were committed to the Tower, to an apartment in which the queen was also consigned. Henry wrote to her, holding out hopes of pardon if she would he open and honest. Her reply, however, strongly affirms her innocence, and its general tone goes far in her favour. (The authenticity of the queen's letter has been doubted, though on slight grounds, by Mr Froude.) The juries of Middlesex and Kent, before whom proceedings opened, found true writs charging the queen with adultery, committed with the above-named Rochford, Brereton, Weston, Norris, and Smeton, and all with conspiring against the king's life. On the 12th May, Brereton, Norris, Weston, and Smeton were tried at West- minster, found guilty, and condemned. On the 15th Anne Boleyn and her brother were tried before twenty-seven peers, found guilty, and sentenced. On the 17th Smeton was hanged, the others beheaded. Their remarks on the scaffold were general, and can be interpreted fairly in neither way. Before the queen's execution she is said to have confessed to Cranmer some previous impediment which rendered her marriage with the king null and void, but what the confession was is absolutely unknown. On the 19th May she suffered death on Tower Green. On the next day Henry was married to Jane Seymour. Over the whole episode of Anne Boleyn's trial and execution the deepest obscurity rests. All traces of the evidence have vanished, and the conflicting

judgments of historians, it must be confessed, seem generally to be determined by the bias of the individual writer.

See State Trials, where Burnet and the older writers are quoted ; Strickland, Lives of the Queens of England ; Miss Binger, Life of A. Boleyn; and the histories of Lingard and Froude.

BOLI, a town of Asiatic Turkey, in Anatolia, situated about 85 miles N.W. of Angora, on the Philios Chai, to the south of the Boli Dagh, in 31° 40’ E. long. and 40° 45’ N. lat. It is the capital of a sandjak and the seat of a governor, and contains a ruined castle and numerous mosques and baths, nowise remarkable in their structure. Cotton and leather are manufactured ; the country around is fertile, and in the neighbourhood is a forest, from which Constantinople is largely supplied with wood. There are warm springs in the vicinity. Boli is built not far from what is regarded by Leake as the ruins of Hadrian- opolis, where many marble fragments with Greek inscrip- tions are stillfound. The population is conjecturally stated at 10,000.

BOLINGBROKE, Henry St Jonn, Viscount, was born in October 1678. His father, Sir Henry St John, the descendant of an old and noble family, was a noted rake of the Restoration period, who continued to live his life of pleasure and indolence for upwards of ninety years. Of his mother little is known, save that she was a daughter of the earl of Warwick. The education of her son was entrusted to the care of his grandmother, Lady St John, who was a professed Puritan and of a pious disposition. His tutor was a Dr Burgess, then renowned for his wit not less than for his piety, whose instructions in divinity seem to have been somewhat distasteful, if we are to accept the pupil’s account of the dreary studies he was compelled to engage in. At an early age he was sent to Eton, where he appears to have been a school-fellow, though hardly a rival, of Walpole, and then proceeded to Christ Church, Oxford. The life he led at the university was typical of his later career. His brilliant talents and unusually retentive memory enabled him to amass an immense amount of information—more, indeed, than he was given credit for: while at the same time he began to

acquire an equally high reputation for dissipation and licentiousness. He was the Rochester of the period, with more than Rochester's abilities. He sought and gained the fame of a modern Alcibiades or Petronius. Amidst all his excesses. however, he maintained a real interest in literature. He was intimate with Dryden, and prefixed a laudatory poem to the first edition of the translation of Virgil The verses did not hold out high promise of poetic power; and his later efforts in the same direction did little for his literary reputation His most considerable production, Almahade, an Ode, is a miserable tawdry affair; the light ode to the equally light Clara is very much better, aud has some vivacity and sparkle. He seems to have been conscious of his want of poetic genius, for his verse remains are not numerous,

For two years, from 1698 to 1700, he zesided on the Con- tinent, and during that time acquired the thorough mastery of the French language which was afterwards of so much service to him. On his return his friends, in the hope of withdrawing him to some extent from his loose mode of life, negotiated a marriage with the wealthy daughter of Sir Henry Winchescomb, a baronet of Berkshire Marriage, however, effected little or no change in St John, and, though his wife never formally separated from him, aud always retained a true affection for her husband, their married life was unhappy and divided. In February of the year following he entered Parliament as member for Wootton-Basset,

The Tory party, from a combination of circumstances, were then all-powerful in the House of Commons. The Partition Treaty, a measure for which, indeed, little can be said, had not met with popular favour, while William's large grants to foreigners, together with the general cold- ness and repulsiveness of his manners, had rendered him most unpopular. A perfect storm of discontent had arisen, and the Tories were nearly bewildered with the power which had been suddenly placed in their hands. Harley, perhaps, at that time, from his moderation, the most influential man of the party, led the House as speaker. St John enrolled himself among the Tories with the utmost enthusiasm, and from the first displayed such brilliant powers as placed him at once in the front rank, and gave him an almost unique position. His youth and high birth, his handsome and commanding presence, and his agreeable address, no doubt contributed largely to his rapid elevation ; but what above all secured for him an

unequalled success was his wonderful eloquence. The powers he unexpectedly evinced as an orator and debater were unrivalled then, and, if we are to take contemporary reports as our authority, had never been equalled, and have seldom, if ever, been surpassed. Not a fragment of his many speeches has come down to us; but from the criticisms of those who heard him speak, and from his published writings, some idea of their general quality may be gathered. The most pro- minent characteristics seem to have been copiousness and readiness, extreme fluency, and spontaneity, combined with a brilliant felicity of phrase, the right expression seeming to spring up naturally along with the thought to be expressed. His sentences are mostly massive and balanced, yet never heavy ; flowing, but rarely redundant. He is, perhaps, the first British statesman whose parlia- mentary oratory has been really a power ; and with such splendid qualifications it was little wonder that he readily became the protagonist of the Tory party. He was their mouthpiece ; he gave expression to their half-articulate wishes, hounded them on in their insane attacks on the great Whig leaders, and barbed their invectives with his own trenchant wit. But, as he has himself admitted, it

_ would be difficult to discover what object the Tories really had in view. Their only desire seems to have been to

revenge themselves upon their political opponencs and indirectly to assail the king. A definite policy they had not either at that time or throughout the succeeding reign. The Whigs had so far a basis of operations ; they held by the Protestant succession, and were in favour of a war with France. The Tories, who, if thoroughgoing, were really Jacobites, were averse to the French war, because it indirectly weakened their party, and they did not favour the succession. But consistent adherence to principle is a thing one looks for in vain among the majority of statesmen in the reign of Anne. There never was a time in British history when the movements of politicians were regulated by such petty causes, and when great talents had to be turned to such paltry purposes. Politics became but a grand game, in which success meant office, power, wealth, and dignity ; and to secure such success few hesitated at the most dishonourable means, Treason was a thing of common occurrence, and many names among the highest in English history are tarnished by acts of grossest treachery. Bolingbroke participates

to the full in the spirit of his time. Never throughout his whole career can one observe the operation of a consistent policy, or trace the action of any motive higher than personal ambition. Mentally and morally he was well qualified to take a pro- minent place in the political struggle of the time.

The rush of popular favour to the Tory party was checked by Louis's acknowledgment of the Pretender as legitimate king of England. 'There was no opposition made to the proposed war, which was not interrupted by the death of William and the accession of Anne. Godolphin and Marlborough, both moderate Tories, were strongly in favour of the war, and consequently found themselves gradually drawn into harmony with the Whigs rather than with the extreme members of their own party. Several of the latter were removed from the cabinet, and among the new officials were Harley, and, curiously enough, St John, the former being made Secretary of State, the latter Secre- tary at War. It has been doubted to what influence St John owed this singular promotion. Harley's power was hardly great enough to effect it, and it is more than probable that it was in great part, if not entirely, the work of Marlborough, who had a very considerable affection and respect for.St John, and who doubtless desired a friend of his to fill the office with which he had so many transac- tious. As secretary St John discharged his duties with great efficiency, and manifested the most enthusiastic admiration for Marlborough's military genius and success. Meantime Harley had been tampering with the secret springs which moved so much of the political machinery. His relative Mrs Masham was supplanting the imperious duchess of Marlborough, and through her influence the queen was becoming convinced that the interests of the nation should be confided to Harley and the Tories. She was ready to dismiss Godolphin at the first opportunity, but the Whigs were as yet too strong, and Harley's schenies having been discovered, he was in 1708 compelled to resign. St John, who can hardly be thought to have had no cognizance of what was afoot, resigned along with him, and spent two years in philosophical retirement, studying diligently and living loosely as before. During these years a gradual uudercurrent of feeling swelled up against the Whig party. The war was distasteful, and its prolongation was looked upon as altogether the work of Marlborough. Above all, the queen was thoroughly alienated from her old friend and under the influence of Mrs Masham. Yet the strength of the Whig party might have enabled them to

carry through their policy successfully had not an act of suicidal imprudence completely ruined them. The prosecution of Sacheverell was the signal for a perfect storm of insanely loyal feeling throughout the country. A Tory ministry

would evidently meet with popular approval, and Anne had therefore no hesitation in dismissing Godolphin and the Whigs. Harley became Chancellor of the Exchequer and virtually premier, St John was made Secretary of State.

The political problem, how, under all contingencies, to retain power, was somewhat complicated. The queen's health made the succession the main question. Now, the accession of the Elector meant the restoration of the Whigs to power It was hardly possible for the Tory leaders to oust the Whig party from the graces of the House of Hanover, with whom their policy was so knit up. Prudence, therefore, as well as principle, made them lean towards the exiled House of Stuart, and for a time extreme Tory was synonymous with Jacobite. But the hopes of James to a great extent depended on the assistance of France, and consequently peace with France became their primary object, To attain it they were urged also by the loudly expressed wishes of a large section of the people, and by their hatred of the Whigs, with whom the war was identified. Active steps in the matter were taken mainly by St John, and in the beginning of 1712 he had at last brought affairs to such a pass that the duke of Ormond, who had superseded Marlborough, received secret orders not to attack the French, while private intimation of this order was sent to the French Government. Arraugements were then made with the French minister De Torcy, whereby the fundamental articles of the league with the allies were broken, Britain engaging to enter into a separate peace with France, receiving certain special advantages, and quietly abandoning some of the allies, as the Catalans. Nothing can possibly extenuate the baseness of these proceedings, and our judgment of them cannot be altered by our opinion as to the advisability of the peace. The Whig party were wholly unable to throw any obstacles in the way; their majority in the House of Lords had been swamped by the creation of twelve new peers; and Walpole had been

impeached on a petty charge and committed to the Tower. Finally, St John, now Viscount Bolingbroke, visited Paris to push on negotiations so that peace might be announced to next Parliament. It has been said, though he himself denied it, that during this visit he had interviews with the Pretender In April 1713 the famous treaty of Utrecht was signed, and the Parliament of that year had the articles read to them. This, however, had not the effect anticipated by Bolingbroke. There was a lurking feeling of discontent with regard to it, and the commercial articles, bearing on trade with France, excited great indigna- tion among the mercantile classes.

Bolingbroke and the Tories seemed, however, to be at the zenith of their power: but the foundations of that power were unstable, and there was dissension among the leaders. Harley had become earl of Oxford, and Bolingbroke was indignant at receiving only the rank of viscount His anger was increased on failing to receive the garter vacant by the death of Godolphin. The disputes between the former allies became oper and violent. By unscrupulous bribery Bolingbroke managed to secure the interest of Mrs Masham, and through her wrought upon the queen. In the Parliament of 1714 he dealt the death- blow to Oxford's power, by compelling him to vote upon the Schism Bill; and finally, on the 27th July, after a stormy discussion, which greatly excited the queen, Oxford was dismissed. Bolingbroke, however, had but a brief taste of power, for on the 30th the queen was seized with apoplexy. At the council held upon the emergency the dukes of Argyle and Somerset boldly presented themselves, and proposed and carried a resolution that the duke of Shrewsbury should be recommended as Lord Treasurer. Bolingbroke was obliged to yield. Anne was able to give

assent; the Whig party had already made all their arrange- ments, and immediately on the queen's death (August 1) the Elector was proclaimed king, and special messengers were despatched to bring him over. Bolingbroke and his friends seemed bewildered ; they were, indeed, thoroughly taken by surprise, and their half-formed schemes discon- certed. Atterbury alone urged Bolingbroke boldly to proclaim James, but either the courage of the latter failed, or, as is more probable, his intentions were not sufficiently definite. It is not an unreasonable supposition that, had a fair time been granted to him, he would have endeavoured to make favour with

the House of Hanover. Any such hope was then out of the question ; the duties of his office were transferred temporarily to Addison, and within the month in which the queen died he was formally dismissed. Jt was soon known that the new Parliament, who were mainly Whigs, intended to impeach Oxford and Bolingbroke for their share in the recent peace. From what we now know of the actual accusation, it is plain that it did not amount to high treason. Had there been nothing further it would have been the best plan to have stayed and faced the trial. This, accordingly, was done by Oxford; but Bolingbroke, after showing himself ostentatiously in public, fled over to France in disguise, even before the impeachment had been made in the House. In the letter he left behind him for Lord Lansdowne he gives as his excuse that he had certain and repeated informations from some who were in the secret of affairs that a resolution was taken to pursue him to the scaffold. In the famous letter to Sir Wm. Windham he takes somewhat different ground, and accounts for his flight from his intense dislike of Oxford, and his resolution not to be associated with him in any way. It was not till the 10th June that he was formally impeached ; on 6th August he was attainted and summoned to appear before the 10th September. On the 16th September, he not having made his appearance, his name was struck off the list of peers, and sentence of banishment was passed. Long before this, however, Bolingbroke had thrown in his lot with the Pretender. He had secret interviews with the duke of Berwick immediately after his arrival in Paris, while professing the most loyal sentiments to Lord Stair, the British ambassador, aud in the month of July he was formally installed as Secretary of State to the prince. Whatever plans he might have hoped to carry through in this capacity were thoroughly thwarted by the numberless irregular agents and advisers who swarmed about the petty court, and by the impracticable disposition of the prince himself. The expedition to Scotland, undertaken against Bolingbroke’s advice, proved a complete failure; and in February 1716 he was dismissed with scant ceremony from the prince’s service, while a formal impeachment was drawn up, accusing him of dilatoriness and want of energy. Rumour was busy with his name, and every species of treachery was imputed to him. The celebrated letter to Sir Wm. Windham, in many respects the best of his writings, was drawn up in the following year, and contains an elaborate sketch of the events of his political career and a justification of his proceedings. The letter may have been circulated to a slight extent in print

or in manuscript, but it was undoubtedly not made public till 1753, two years after Bolingbroke's death. It isa skilful piece of work, written with great apparent candour, but inconsistent with known facts, and throwing no satisfactory light on the com- plicated transactions in which the writer had been involved.

His efforts to ingratiate himself with the new dynasty in England were unavailing, and from this time onwards to his death he led a life of enforced inactivity. He was for ever debarred from the arena of political strife, and though he incessantly hovered round the outskirts, he was unable to effect an entrance. He plunged deeply into philosophical

studies, and would fain have had his friends believe that he had thoroughly and voluntarily resigned himself to a life of studious retirement. He took up his abode at La Source, and in 1720, two years after the death of his first wife, married the Marquise de Villette, for whom he seems to have had a sineere affection. In 1723, by bribing the duchess of Kendal, a removal of part of his sentence was attained ; he was permitted to return to England, and, by a special bill, passed two years later, was allowed to enjoy his first wife's property. He bought a magnificent estate at Dawley ; and, while keeping up the appearance of single- minded devotion to study, plunged eagerly into as much of political intrigue as was open to him. He had tried in vain to conciliate Walpole, and seems to have seen that during that minister's tenure of power he could never recover his position. He accordingly united himself to the dissatisfied section of the Whigs led by Pulteney, and tried to organize out of them and the remnant of the Tories an opposition to Walpole. His aid was lent not only in preparing speeches for Windham, Pulteney, and others, who for a time were little more than his mouthpieces, but in written attacks upon the minister. His papers in the Craftsman, which gave that journal a circulation exceeding even that of the Spectator, are masterpieces of vigorous English. In their collected form as the Dissertation on Parties and Oldcastle's Remarks on History, they are valuable contributions to our knowledge of the political movements of the period. At one time, indeed, it seemed that the opposition would succeed in driving Walpole from the field. The outcry against his Excise Bill was

strong, and his majority in the House was seriously diminished, but he was too firmly rooted to be easily moved; and in 1735 he retaliated on Bolingbroke by a significant and threatening speech. So evident was it that he had obtained an insight into intrigues which could not stand investigation, that Bolingbroke took alarm and a second time fled to Franés. Other motives, such as pecuniary embarrassments, may have contributed to force him to this step, and there can be little doubt that his reputation was of a nature seriously to damage any party with whom he united. He found that Pulteney was anxious to get rid of him, and felt with some bitterness that, like an old actor, he must retire from the political stage before being hissed off. After this second retreat he settled at Chanteloup, in Touraine, whence he paid two or three visits to England. Finally, in 1743, after the death of his father, he took up his residence at Battersea, and, finding the new statesmen little disposed to hearken even to his counsels, endeavoured to devote himself entirely to philosophy. He died at Battersea on the 12th December 1751.

Of Bolingbroke as an author but little can besaid. The question asked a very few years after his death, ““ Who now reads Bolingbroke?” may be put with tenfold significance how. The influence of his writings on English literature has been quite inappreciable, and probably the works of few men of such ability have been so little read. Yet this neglect is in some respects undeserved. His writings may be regarded in two aspects,—as specimens of English prose, and as positive contributions to history, politics, and philosophy. In the latter aspect their worth is indeed small. His historical treatises, while containing much that 1s of interest and importance, are over-weighted by the constant reference to the peace of Utrecht, the defence of which is almost their sole object. It would be difficult to extract from the Dissertation on Parties, the Idea of a Putriot King, or the Letters on Patriotism anything like @ consistent philosophy of government. No one has expounded better than Bolingbroke the fundamental principles of Whig policy, and yet his ideal of a king is a sovereign who, from various qualities, is able to retain

nearly absolute power, and to govern without the interven- tion of party spirit. In philosophy he occupies but a subordinate place in the long line of English writers who drew their inspiration from Locke, and who gave the

key-note to the religious enlightenment of the 18th century. He is a deist, and from the basis of the sensational theory of knowledge attacks revealed religion with force quite inferior to Toland or Tindal. Bolingbroke's philosophical works are indeed insufferably wearisome, and it is only in them that his style ever flags and grows cumbersome, for his other writings are in many respects the perfection of English prose style, and can stand comparison even with the finished compositions of Addison. For ease, grace, and oratorical vehemence and energy, the Letter to Sir Wm. Wendham and the dedication of the Dissertation on Parties are nearly unsurpassed. Bolingbroke clearly was at his best when roused by strong feeling, and his most vigorous passages are those which would naturally have been spoken. That none of his parliamentary orations have come down to us is matter of deepest regret, even though our estimate of them be lower than Pitt's.

Bolingbroke's works were published in 5 vols. 4to, by David Mallet, 1753-54. Later editions have generally prefixed to them the Life by Goldsmith, a compilation of little value. Two volumes of Correspondence were published by Parke in 1798. Materials for Bolingbroke's life are to be found in the Stuart papers, Marchmont papers, Coxe's Life of Marlborough, Swift's Journal and History of the last Four Years of Queen Anne, Somerville's Queen Anne, and Stanhope's Reign of Queen Anne and History of England, particularly vols. i. and ii. Some special information will be found in De Torcy's Afémoires, and Mignet's Negociacions relatifs & la Succes- sion d'Espagne. See also G. W. Cooke, Memoirs of Bolingbroke, 2 vols., 1835; Rémusat, Angleterre au XVIII Sidcle, vol. i. : Macknight, Life of Bolingbroke, 1863. (R. AD.)

BOLIVAR, Simon, the hero of South American inde- pendence, was born in the city of Caracas, Venezuela, on the 24th July 1783. His father was Juan Vicente Bolivar y Ponte, and his mother Maria Concepcion Palacios y Sojo, both descended of noble families in Venezuela. After acquiring the elements of a liberal education at home, Bolivar was sent to Europe to prosecute his studies, and with this view repaired to Madrid, where he appears to have resided for several years. Having completed his education, he spent some time in travelling, chiefly in the south of Europe, and visited the French capital, where he was an eye-witness of some of the last scenes of the

Revolu- tion. Returning to Madrid, he married, in 1801, the daughter of Don N. Toro, uncle of the marquis of Toro in Caracas, and embarked with her for America, intending, it is said, to devote himself to the improvement of his large estate. But this plan was frustrated by the premature death of his young wife, who fell a victim to yellow fever ; and Bolivar again visited Europe, in order, by change of scene, to alleviate the sorrow occasioned by this bereavement.

On his return home in 1809 he passed through the United States, where, for the first time, he had an opportunity of observing the working of free institutions ; and soon after his arrival in Venezuela he appears to have identified himself with the cause of independence which had already agitated the Spanish colonies for some years. Being one of the promoters of the movement at Caracas in April 1810, he received a colonel's commission from the revolutionary junta, and was associated with Luis Lopez Mendez in a mission to the court of Great Britain. Venezuela declared its independence of the mother country on July 5, 1811, and in the following year the war commenced in earnest by the advance of Monteverde with the Spanish troops. Bolivar was intrusted with the command of the important post of Puerto Cabello, but not being supported he had to evacuate the place; and owing to the inaction of Miranda the Spaniards recovered their hold over the country.

Like others of the revolutionists Bolivar took to flight,

and succeeded in reaching Curagao in safety. He did not, however, remain long in retirement, but in September 1812, hearing of important movements in New Granada, repaired to Carthagena, where he received a commission to operate against the Spanish troops on the Magdalena River. In this expedition he proved eminently successful, driving the Spaniards from post to post, until arriving at the confines of Venezuela he boldly determined to enter that province and try conclusions with Gcneral Monteverde himself. His troops did not nuntber more than 500 men; but, in spite of many discouragements, he forced his way to Merida and Truxillo, towns of some importance in the west of Venezuela, and succeeded in raising the population to his support. Forming his increased forces into two divisions,

he committed the charge of one to his colleague Rivas, and pushing on for Caracas the capital, issued his decree of “war to the death.” A decisive battle ensued at Lastoguanes, where the Spanish troops under Monteverde sustained a crushing defeat. Caracas was entered in triumph on the 4th of August 1813, and Monteverde took refuge in Puerto Cabello. General Marifio effected the liberation of the eastern district of Venezuela, and the patriots obtained entire possession of the country in January 1814. This success was, however, of very brief duration. The royalists, effectually roused by the reverses they had sustained, concentrated all their means, and a number of sanguinary encounters ensued. Bolivar was eventually defeated by Boves near Cura, in the plains of La Puerta, and compelled to embark for Cumana with the shattered remains of his forces. Caracas was retaken by the Spaniards in July ; and before the end of the year 1814 the royalists were again the undisputed masters of Venezuela, From Cumana Bolivar repaired to Carthagena, and thence to Tunja, where the revolutionary congress of New Grenada was sitting. Here, notwithstanding his inisfortunes and the efforts of his personal enemies, he was received and treated with great consideration. The con- gress appointed him to conduct an expedition against Santa Fé de Bogota, where Don Cundinamarca had refused_to acknowledge the new coalition of the provinces. In De- cember 1814 he appeared before Bogota with a force of 2000 men, and obliged the recalcitrant leaders to capitulate,—a service for which he received the thanks of congress. In the meanwhile Santa Martha had unfortunately fallen into the hands of the royalists, and Bolivar was ordered to the relief of the place. In this, however, he was not successful, General Morillo having landed an overwhelming Spanish force. Hopeless of the attempt, he resigned his commission and embarked for Kingston, Jamaica, in May 1814. While residing there an attempt was made upon his life by a hired assassin, who, in mistake, murdered his secretary.

From Kingston Bolivar repaired to Aux Cayes in Hayti, where he was furnished with a small force by President Petion. An expedition was organized, and landed on the mainland in May 1816, but proved a failure. Nothing daunted, however, he obtained reinforcements at Aux Cayes, and in December landed first in Margarita, and then at Barcelona. Here a provisional government was formed, and troops were assembled to resist Morillo, who was then advancing at the head of a strong division. The

hostile forces encountered each other on the 16th of February 1817, when a desperate conflict ensued, which lasted during that and the two following days, and ended in the defeat of the royalists. Morillo retired in disorder, and being met on his retreat by Paez with his Ulaneros, suffered an additional and more complete overthrow. Being now recog- nized as commander-in-chief, Bolivar proceeded in his career of victory, and before the close of the year had fixed his headquarters at Angostura on the Orinoco. At the opening of the congress which assembled in that city on

be spared. disappointed. Morillo was recalled, and General Torre assumed the command. ‘The armistice was allowed to

the 15th February 1819 he submitted an elaborate exposi- tion of his views on government, and concluded by sur- rendering his authority into the hands of congress. Being, however, required to resume his power, and retain it until the independence of the country had been completely established, he reorganized his troops, and set out from Angostura, in order to cross the Cordilleras, effect a junction with General Santander, who commanded the republican force in New Grenada, and bring their united forces into action against the common enemy. This bold and original design was crowned with complete success. In July 1819 he entered Tunja, after a sharp action on the adjoining heights ; and on the 7th of August he gained the victory of Bojaca, which gave him immediate possession of Bogota and all New Grenada. uae

This campaign is unquestionably Bolivar’s most brilliant achievement, and deserves much of the praise which has been lavished on it. His return to Angostura was a sort of national festival. He was hailed as the deliverer and father of his country, and all manner of distinctions and congratulations were heaped upon him. Availing himself of the favourable moment, he obtained the enactment of the fundamental law of 17th December 1819, by which the republics of Venezuela and New Grenada were henceforth to be united in a single state, under his presidency, by the title of the Republic of Colombia. The seat of government was also transferred provisionally to Rosario de Cucuta, on the frontier of the two provinces, and Bolivar again took the field. Being now at the head of the most numerous and best appointed army the republicans had yet assembled, he gained important

advantages over the Spaniards under Morillo, and on the 25th November 1820 concluded at Truxillo an armistice of six months, probably in the hope that the Spaniards would come to terms, and that the further effusion of blood might Tf such were his views, however, they were

expire, and a renewal of the contest became inevitable. Bolivar therefore resolved, if possible, to strike a decisive

blow ; and this accordingly he did at Carabolo, where,

encountering Torre, he so completely routed the Spaniards, that the shattered remains of their army were forced to take refuge in Puerto Cabello, where two years after they surrendered to Paez. ‘The battle of Carabolo may be con- sidered as having put an end to the war in Venezuela. On the 29th June 1820 Bolivar entered Caracas, and by the close of the year the Spaniards were driven from every part of the province except Puerto Cabello. The next step was to secure, by permanent political institutions, the independence which had been so dearly purchased ; and, accordingly, on the 30th of August 1821, the constitution of Colombia was adopted with general approbation, Bolivar himself being president, and Santander vice-president. There was, however, more work for him to do. ‘The Spaniards, though expelled from Colombia, still held possession of the neighbouring provinces of Ecuador and Peru; and Bolivar determined to complete the liberation of the whole country. Placing himself at the head of the army, he marched on Quito in Ecuador. A severe battle was fought at Pichincha, where, by the prowess of his colleague Sucre, the Spaniards were routed, and Quito was entered by the republicans in June 1822. Bolivar then marched upon Lima, which the royalists evacuated at his approach ; and entering the capital in triumph, he was invested with absolute power as dictator, and authorized to call into action all the resources of the country. Owing, however, to the intrigues of the republican factions in Peru he was forced to withdraw to Truxillo, leaving the capital to the mercy of the Spaniards under Canterac, by

whom it was immediately occupied. But this misfortune proved only temporary. By June 1824 the liberating army was completely organized ;

and taking the field soon after, it routed the vanguard of the enemy. Improving his advantage, Bolivar pressed forward, and on the 6th of August defeated Canterac on the plains of Junin, after which he returned to Lima, leaving Sucre to follow the royalists in their retreat to Upper Peru,—an exploit which the latter executed with equal ability and success, gaining a decisive victory at Ayacucho, and thus completing the dispersion of the Spanish force. The possessions of the Spaniards in Peru were now confined to the castles of Callao, which Rodil maintained for upwards of a year, in spite of all the means that could be employed for their reduction. In June 1825 Bolivar visited Upper Peru, which having detached itself from the government of Buenos Ayres, was formed into a separate state, called Bolivia, in honour of the liberator. The first congress of the new republic assembled in August 1825, when Bolivar was declared perpetual protector, and requested to prepare for it a constitution of government.

We now come to that period in the liberator's career when his care was directed to the administration of the affairs of the freed provinces. He had been suc- cessful in raising those districts to the position of in- dependent states, and now devoted himself to the framing of such laws as seemed to him most suitable to the inhabitants. His endeavours to satisfy his countrymen in this respect did not always meet with encouragement, and sometimes exposed him to slander. In December 1824 Bolivar convoked a constituent congress for the February following; but this body, taking into consideration the unsettled state of the country, thought it proper to invest him with dictatorial power for another year. A grant of a million dollars was offered him but declined, and the congress adjourned, leaving the dictator absolute governor of Peru, His project of a constitution for Bolivia was presented to the congress of that state on the 25th May 1826, accompanied with an address, in which he embodicd his opinions respecting the form of government which he conceived most expedient for the newly estab- lished republics. This code, however, did not give satis- faction. Its most extraordinary feature consisted in the provision for lodging the exccutive authority in the hands of a president for life, without responsibility and with power to nominate his successor, a proposal which alarmed the friends of liberty, and excited lively apprchensions amongst the republicans of Buenos Ayres and Chili; whilst in Peru, Bolivar was accused of a design to unite

into one state Colombia, Peru, and Bolivia, and to render himself perpetual dictator of the confederacy.

In the meanwhile the affairs of Colombia had taken a turn which demanded the presence of Bolivar in his own country. During his absence Santander had administered the government of the state ably and uprightly, and its independence had been recognized by other countrics. But Paez, who commanded in Venezuela, having becn accused of arbitrary conduct in the enrolment of the citizens of Caracas in the militia, refused obedience to the summons of the senate, and placed himself in a state of open rebellion against the Government, being encouraged by a disaffected party in the northern departments who desired separation from the rest of the republic.

Accordingly, having intrusted the government to a council nominated by himself, with Santa-Cruz at its head, Bolivar set out from Lima in September 1826, and hastening to Bogota, arrived there on the 14th November. He imme- diately assumed the extraordinary powers which by the constitution the president was authorized to exercise in case of rebellion. After a short stay in the capital he

pressed forward to stop the effusion of blood in Venezuela, where matters had gone much farther than he could have contemplated. On the 31st December he reached Puerto Cabello, and the following day he issued a decree offering a general amnesty. He had then a friendly meeting with Paez and soon after entered Caracas, where he fixed his headquarters, in order to check the northern departments, which had been the principal theatre of the disturbances. In the meanwhile Bolivar and Santander were re-elected to the respective offices of president and vice-president, and by law they should have qualified as such in January 1827. In February, however, Bolivar formally resigned the pre- sidency of the republic, at the same time expressing a determination to refute the imputations of ambition which had been so freely cast upon him, by retiring into private life, and spending the remainder of his days on his patri- monial estate. Santander combated this proposal, urging him to resume his station as constitutional president, and declaring his own conviction that the troubles and agita- tions of the country could only be appeased by the authority and personal influence of the liberator himself. This view being confirmed by a

resolution of congress, although it was not a unanimous one, Bolivar decided to resume his functions, and he repaired to. Bogota to take the oaths. Before his arrival, however, he issued simultaneously three separate decrees,—one granting a general amnesty, another convoking a national convention at Ocaiia, and a third for establishing constitutional order throughout Colombia. His arrival was accelerated by the occurrence of events in Peru and the southern departments, which struck at the very foundation of his power. Not long after his departure from Lima, the Bolivian code had been adopted as the constitution of Peru, and Bolivar had been declared president for life on the 9th December 1826, the anniversary of the battle of Ayacucho. At this time the Colombian auxiliary army was cantoned in Peru, and the third division, stationed at Lima, consisting of veteran troops under Lara and Sands, became distrustful of Botivar's designs on the freedom of the republic. Accord. ingly, in about six weeks after the adoption of Bolivar's new constitution, a counter-revolution in the government of Peru was effected by this body of dissatisfied veterans, and the Peruvians, availing themselves of the opportunity, abjured the Bolivian code, deposed the council appomted by the liberator, and proceeded to organize a provisional government for themselves. After this bloodless revolution the third division embarked at Callao on the 17th March 1827, and landed in the southern department of Colombia in the following month. Intelligence of these. events reached Bolivar while in the north of Colombia, and he lost no time in preparing to march against the refractory troops, who formerly had placed such implicit confidence in him. But he was spared the necessity of coming to blows, for the leaders, finding the government in the hands of the national executive, had peaceably submitted to General Ovando. In the meanwhile Bolivar had accepted the presidency, and resumed the functions belonging to his official position. But although Colombia was, to all external appearance, restored to tranquillity, the nation was divided into two parties. Bolivar had, no doubt, regained the personal confidence of the officers and soldiers of the third division ; but the republican party, with Santander at their head, continued to regard with undisguised appre- hension his ascendency over the army, suspecting him of a desire to imitate the career of Napoleon. In the mean- while all parties looked anxiously to the convention of Ocaiia, which was to assemble in March 1828, for a decided expression of the national will. The republicans

hoped that the issue of its deliberations would be favour- able to their views ; whilst the military, on the other hand, IV. — 2

Plate XVII.

Bound- aries and divisions.

10

did not conceal their conviction that a stronger and more permanent form of government was essential to the public welfare. The latter view scems to have prevailed. In virtue of a decree, dated Bogota, the 27th August 1828, Bolivar assumed the supreme power in Colombia, and con- tinued to exercise it until his death, which took place at San Pedro, near Santa Martha, on the 17th December 1830.

In the career of this remarkable man, which was often embittered and was perhaps shortened by the suspicions and slanders of his colleagues in the work of liberation, certain circumstances, apparently well established, stand out, which deserve particular mention. He expended uine-tenths of a splendid patrimony in the service of his

country ; and although he had for a considerable period !

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unlimited control over the revenues of three countries,— Colombia, Peru, and Bolivia,—he died without a shilling of the public money in his possession. He conquered the independence of three states, and called forth a spirit in the southern portion of the New World which can never be extinguished. He purified the administra. tion of justice; he encouraged the arts and sciences ; he fostered national interests; and he induced other coun- tries to recognize that independence which was in a great measure the fruit of his own exertions. JBolivar’s remains were removed in 1842 to Caracas, where a monument was erected to his memory; and in 1858 the Peruvians

followed the example by erecting an equestrian statue of the liber- ator in Lima.

BOLIVIA

HIS name was given in honour of Bolivar (see last T article) to a state in South America, formed in 1825 from the provinces of Upper Peru which formerly con- stituted part of the vice-royalty of Buenos Ayres. The bulk of the country extends from 10° to 23°S. lat., and from 58° to 71° W. long., and it is bounded on the N. by Peru and Brazil, on the E. by Brazil and Paraguay, on the S. by the Argentine Republic and Chili, and ‘on the W. by the Pacific Ocean and Peru. The greater part of Bolivia is a mountainous and clevated country, more particularly at its western and central parts ; but towards the east it becomes much less so, and at length terminates in extensive plains, which are bounded on the east by Brazil. From the Pacific coast the southern boundary of Bolivia runs along the 24th parallel of latitude (the limit decided by treaty with Chili in August 1866), to as far as the crest of the Andes; turning S. it follows the line of the mountains to 26°S. lat., in which parallel it crosses the plateau to the inner Cordillera, along which it lies N.N.E. to the 22d parallel. This line of latitude forms the boundary of territory which is certainly Bolivian, as far as the River Paraguay; but Bolivia, in common with the Argentine Republic and Paraguay, has claims on the unexplored territory of the Gran Chaco, which lies south of this line, and between the rivers Pilcomayo and Paraguay. From 22° on the River Paraguay, the frontier with Brazil was decided, by treaty of March 1867, to be a line following that river northward to the Bahia Negra in 20° 11’, along the Negra to its termination, and thence through the midst of the lagoons of Caceres, Mandioré, Gaiba,and Uberaba (lying immediately west of the Paraguay River), to Corixa Grande ; thence in a straight line to Boa Vista and the source of the Verde ; down that river to the Guapore, and along the latter to where the Beni joins it in 10° 20’S. ; thence in a straight line towards the source vf the River Javary (in 7°.) The present Government of Bolivia appears inclined, however, to repudiate this treaty, and to return to the older frontier, which included the tributaries of the Amazons as far as 6° 28’ 8. On the Peruvian or western frontier the boundary follows a more or less northerly direction from the mouth of the

River Loa in Atacama, along the Cordillera, crossing Lake Titicaca, and passing north thence to the line running from the Beni to the Javary.

Before the formation of the republic, Bolivia, or the former province of Charcas, consisted of four great districts or “intendencias,” which were under the rule of the viceroy of Rio de la Plata. These were—

1. Santa Cruz, formed of the districts of its bishopric— Mojos, Chiquitos, Santa Cruz, Valle Grande, Misque, and the special jurisdiction of its capital Cochabamba ;

2. La Paz, consisting of the dioceses of its bishopric ;

3. Potosi, comprising Tarija, Chichas, Lipez, Atacama, Porco, and Chayanta ;

4, The province of La Plata, which embraced all remain- ing portions of the archbishopric.

At the present time the republic is divided politically into departments, provinces, and cantons. The departments, which are named La Paz de Ayacucho, Cochabamba, Potos{, Chuquisaca, Oruro, Santa Cruz de la Sierra, Tarija, Beni, and Atacama, have each one or two capital towns ; the provinces and cantons have also each its chief place. Each department has a governor, who stands in direct communication with the Government; the subdivisions have their corregidors and alcaldes, who are subject to the governor.

The westcrly departments of La Paz, Oruro, and Potosi are situated in the highest regions of the plateau of Bolivia, and are more valuable on account of their mineral riches than for their vegetable products, of which a coarse grass is characteristic. The first consists of a series of high ranges and deep valleys, in which the climate and produc- tion vary with the elevation; the second lies also in the high table-land or Puna region ; both are rich in veins of gold, silver, and tin, but the mining of thesc has not yet been fully developed. The third, Potosi, belongs entirely to the highest regions of Bolivia, and is bare and dry, with a cold and rude but healthy climate; this is the greatest mining region of the country.

The central departments of Cochabamba, Chuquisaca, and. Tarija lie partly on the high plateau, partly on the lower slopes and plains eastward, and pass thus through the whole series of changing climates and zones of production, from the bare high land to the tropical regions of the low lands. The first is eminently the granary of Bolivia and southern Peru, excelling in the cultivation of wheat ; the industries of woollen and cotton manufactures are also most highly developed in the department, but its mines are not worked. Chuquisaca, of which only a third part lies in the high land, is also a vegetable growing region, in which wheat, barley, rice, peas, vines, and all sorts of vegetables are cultivated ; cattle and horses are also numerous. The forests of this department and of Tarija, which slope down to the wooded and pastoral plains of the tributaries of the Paraguay, afford many species of valuable timber.

The departments of Beni (or Veni) and Santa Cruz de la Sierra lie altogether in the low lands of the east, stretching to the Rio Maderia and the Paraguay. The former is as yet little explored, but is a land of tropical forests, rivers, and swamps, with an unhealthy climate. Santa Cruz is also characterized by a hot, damp atmosphere, but produces garden and field fruits in astonishing richness,—coffee, cocoa, vanilla, sugar-cane, maize, and cotton. The forests of both of these departments afford an infinity of valuable

Mountains,

Lakes,

BOLIVIA

timber trees, and in the latter there is much pasture land well fitted for cattle breeding

Thedepartment of Atacama, which belongs geographically either toPeru or Chili, forms the only part of Bolivia which comes into contact with the ocean, and is situated between the Andes and the Pacific coast. It is almost entirely desert and sterile, has many volcanoes, and is characterized by rapid changes of temperature; it is almost destitute of population, and is only inhabited in those parts of the coast in which valuable guano deposits are found, or where the nitrate deposits and silver mines in the interior are

worked. Near its northern limit is situated the small port of Cobija, the only avenue by which foreign articles of commerce can enter the Bolivian Republic without the payment of transit dutics It has obtained peculiar and valuable privileges as an encouragement to the introduction of merchandise by this route, in preference to the more convenient routes by the Puertos Intermedios, belonging to the Republic of Peru. But the arid nature of the surrounding country, and the great scarcity of water, must greatly retard its advancement, since not only are the inhabitants scantily supplied with this necessary of life, but the mules employed in transporting goods into the interior are exposed to great hardships.

Western Bolivia is the highest and most mountainous country of the two Americas. Five separate systems of inountains, curving from Peru in the north-west and passing south into Chili, may be distinguished as forming its high land. Nearest the Pacific is the range of the outlying coast mountains, which does not exceed 5000 fect in altitude. The range of the true Andes rises farther inland, forming part of the vast chain which extends along the whole of Amcrica ; in Bolivia it attains an average height of 15,000 feet, and has a general width of 20 miles, having its highest known point here in the voleano of Sahama, 23,000 feet in clevation. Next follows the central system of the Cordil- lera Real, also named the eastern Cordillera, presenting a succession of sharp, rugged peaks, reaching up into the region of cternal ice and snow, higher generally than the Andes, but less massive: the peaks of Illimani (21,300 feet) and Sorata (24,800 feet) are its culminating points. Between the Andes and the Cordillera Real there are various Serrania or isolated groups of mountains, and single cerros of less altitude, rising from the enclosed plateau to 17,000 feet in some instances. The last system is that of the numerous minor Cordilleras, which run south-eastward from the Cordillera Real into the lowlands of eastern Bolivia, of which the most important is that of Cochabamba, stretching out to 62° 40’ E. long. ‘The elevation of the snow line in the highlands of Bolivia appears to vary between 16,000 and 18,000 feet, modified in many cases by the aspect of the mountains and the nature of the country surrounding them, being raised where heat is powerfully reflected from the surfacc of the bare high plains, or lowered where the mountains are exposed to cold southerly winds. Volcanoes are frequent in the Andes and coast ranges; those of

Sahama and Isluga, with Tua, Olca, and Ollagua farther south, are constantly smoking.

These mountain systems divide Bolivia into a high region, containing many very elevated plains stretching between the enclosing heights of the west, and a low land forming the eastern side of the country, beneath the mountains, and at a comparatively small elevation above the sea. The high plains or basins of the plateau enclose a conti- nental water system, from which there is no outlet to the occan, the rivers terminating in lakes, of which Lake Titicaca is the chief, or in swamps, or in vast dried up salt fields,—rapid evaporation disposing of and balancing the supply of water flowing to these by the mountain streams.

The valley or plateau which is occupied by the Lake of Titicaca and the Rio Desaguadero forms the most ele-

vated table-land in the globe, with the exception of that of Thibet, which presents only mountain pastures, covered with sheep ; while this table-land of the New World pre- sents towns and populous cities, affords support to nume- rous herds of cattle, lamas, guanacos, and sheep, and is covered with harvests of maize, rye, barley, and wheat, at an elevation which has nothing to equal it in any other part of the world. The Lake of Titicaca or Chuquito, which occupies its northern extremity, is 12,600 feet above the level of the sea, and its extent is equal to fourteen times that of the Lake of Geneva, or 3220 square miles, the greatest depth being upwards of 700 feet. It is sur- rounded by numerous towns and villages, and a rich and fertile country, and contains several islands, the largest of which is called Titicaca, and was long held in great venera- tion by the Peruvian Indians, in conscquence of its hav- ing been the place whence Manco Capac and his consort Manco Oello Huaco, the great founders of the empire of the Incas, issued, to spread civilization, industry, and good government among the surrounding nations. The Lake of Titicaca is very irregular in its form. It admits of exten- sive navigation for small vessels, though not unattended with danger, as it is subject to sudden storms and violent gusts of wind from the neighbouring mountains, This lake communicates with the smaller Lake of Pansa, or of the “ Pampa Aullagas,” situated at the southern extremity of the valley, by

means of the Rio Desaguadero, which flows out of the Lake of Titicaca, and has a breadth of from 80 to 100 yards. This river and lake form part of the western boundaries between the Republics of Bolivia and Peru. Over the river was formed, in the time of the Incas, a suspension bridge, composed of cables and cords made of the grass and rushes which grow on its borders ; and the work was constantly. renewed from time to time, to obviate the effects of decay, as it constituted the only line of communication between the opposite sides of the valley. These lakes, with the Desaguadero, form the only receptacles for the water of those rivers and streams which descend from the surrounding mountains and enter this extensive plain, which has no visible outlet whereby its contents can escape otherwise than by evaporation.

Those rivers which take their rise from the western Rivers.

declivity of the Andes, and flow into the Pacific, are so inconsiderable in magnitude, and so short in their course, as scarcely to merit observation, and are only useful in supplying the means of a partial irrigation to the arid plains which separate these mountains from the Pacific. But those numerous rivers taking thcir origin on the eastern declivity of the Cordillera Real, which is the main water- parting of Bolivia, present a very different aspect, and are of much greater importance, since they communicate with large navigable rivers, which terminate in the Atlantic Ocean.

The River Paro or Beni, which takes its origin in the neighbourhood of the city of La Paz, and the Guapey, which rises near Cochabamba, and, sweeping round the southern and eastern bases of the Cordillera of Cochabamba, unites itself to the Mamore, flow to the north-east to mingle with the waters of the Madeira and the mighty Marafion or Amazons; while the Pileomayo, which rises near Potosi and Chuquisaca, and the Vermejo, from the valley of Tarija, bend their courses, at aconsiderable dis- tance from each other, to the south-east, until they join the Paraguay, which terminates in the Rio de la Plata. Possess- ing only a small extent of sea-board, and that in a perfect desert difficult of passage, and behind which the lofty range of the Andes forms a huge barrier, the whole of the rich provinces of eastern Bolivia are land-locked and almost isolated from

communication with the outer world. The most natural outlets of the country appear to be in the

Climate and vegeta- tion.

rivers flowing to the great mediterranean navigation sys- tem of the Amazons in the north, or to the Rio de la Plata. More than forty years ago the importance of opening up ariver highway from eastern Bolivia to the Rio Paraguay had impressed itself strongly on the Government, and large grants and privileges were offered in encouragement of this object, the rivers Otuquis, Tucabaca, and Latirequiqui, flowing to the Paraguay about the 20th parallel, being looked to as probably affording the desired navigable way. As yet, however, though this plan has been frequently revived, no definite progress has been made in this direction. An expedition sent down the Rio Pilcomayo in 1844 reported it innavigable. On the side of the Amazons, the rapids of the River Madeira, 18 in number, and extending over a distance of 230 miles, form a great natural barrier ; to overcome this and to connect the navigable upper tributaries in Bolivia with the navigation of the lower Madeira, a company was recently formed for the construc- tion of a railroad along the interrupted portion of the course of the Madeira: this scheme also is for the present in abeyance. It seems probable, however, that the recent opening of regular navigation on the Rio Vermejo from the Paraguay to the upper Argentine province of J ujuy on the southern frontier of Bolivia may to some extent afford an outlet, and tend to develop the resources of that part of the country.

Bolivia lies, as has been noticed, for the most part within the tropical zone; but from its peculiar formation, its climate and productions are dependent rather upon the elevation of different parts of the land than upon its geographical situation. In descending from the highest region of snow and ice to the low plains of rich tropical vegetation several zones or stages are distinguished. The name Puna brava is given to the uppermost mountain regions which rise above 12,500 feet to the snow limit: these are scarcely inhabited by man, and are characterized by mosses and hardier grasses,—the animal kingdom being represented by the vicuifia, guanaco, llama, alpaca, viscacha, chinchilla, besides the condor and other birds of prey. The

region be- tween an elevation of 11,000 feet and the lower Puna brava is termed the Puna ; less cold than the former, it is suited for the growth of potatoes, barley, and rush-like grasses, upon which sheep, llamas, vicufias, &c., may feed. This division embraces the whole of the high plains of Bolivia, which are but scantily peopled or cultivated. Several species of cactus are found in these elevated regions, and especially the Cactus peruvianus, which sometimes grows to a height of from 20 to 30 or even 40 feet, and is serviceable for many purposes. Under the general name Cabezera de Valle are grouped the heads of the valleys descending to the lower lands, between 9500 and 11,000 feet in elevation, where the climate is temperate. These cultivable districts produce wheat, maize, and the ordinary vegetables, The Valle or Medio Yungais the general name of the deeper portions of the valleys, between 9500 and 5000 feet, with warm climate, affording field and garden fruits in abundance. The Yunga, lastly, is the low tropical region, comprising all beneath 5000 feet, and producing all kinds of tropical fruits and vegetation.

In the punas the air is always dry and perceptibly cold, though the temperature may rise high in the sun, and cold, cutting blasts of air from the mountains are of frequent occurrence. In the Valle and upper Yunga a perpetual spring seems to reign, and night frosts are rare. The western side of the Andes is completely rainless, all moisture-bearing clouds rolling up from the ocean being quickly evaporated, or condensed in the higher mountain regions in snow or hail; but the whole of the remaining eastern region of Bolivia has a rainfall. In the lowlands this is irregular in season; but in the upper regions of the

storms, with hail and snow in the higher regions.

BOLDIV ie

Puna and the Cabezera de Valle, a rainy season generally begins in the middle of November and concludes in the beginning of March, often accompanied by furious thunder- The climate of Potosi, at an elevation of 13,300 to 13,600 feet, is so various that in one day it frequently exhibits the vicissitudes of the four seasons of the year. Thus, during the night and the early part of the morning it is piercingly cold; in the forenoon it resembles our fine weather in March ; in the afternoon the rays of the sun in so pure

and attenuated an atmosphere are very powerful and scorchingly hot ; while towards evening the air usually becomes mild and serene. Strangers on first arriving in these higher plains are usually affected with difficulty of breathing, owing to the extreme rarity of the atmosphere ; they are likewise sufferers from dysentery, which, however, for the most part soon disappears, and in general the highlands are by no means unhealthy. ‘Travellers in the higher regions are exposed to great danger and hardships owing to the storms which occasionally prevail, especially snow storms, which frequently produce the swrwmpi, or snow blindness, an affection which has proved fatal to some travellers. An infectious fever called “ fiebre amarilla” sometimes breaks out in the Indian villages of the Puna, causing great loss of life; coughs and lung diseases are prevalent among the children in the punas, and do much injury among grown people in the Valle and Yungas, In descending through the eastern provinces towards the plains of Mojos and Chiquitos, all the gradations of climate are experienced down to that which characterizes the equinoctial regions of America, where intermittent “terciana” or cold fevers, dysenteries, and other diseases peculiar to warm climates prevail.

of Bolivia are the guanaco, the llama, the alpaca (the first supposed to be the original from which the second and third varieties have been domesticated), and the vcwra. These animals, in their structure and habits, are all closely allied to the camel of Africa. Thus, an examination of the structure of the stomach shows that they are capable of existing during a considerable time without any supply of water, and in fact they are seldom seen to drink from the streams of their native mountains. The camel seems peculiarly well calculated to live in the arid and burning deserts of the Old World, and the form of its feet is singularly adapted for traversing rapidly these extensive plains ; whilst, on the other hand, the guanaco and the llama have their feet so constructed as to enable them with facility to ascend and descend the abrupt declivities, and to traverse the rugged and uneven passes which abound in these mountains. They seem likewise to frequent particularly those parts of the Cordillera of the Andes which are the most dry and arid, and which are least clothed with forests and shrubbery. Thus, in the Cordil- lera which separates the Argentine Republic from Chili, the guanacos are found in great numbers on the summits and eastern declivities, which are exceedingly arid and bare when compared with the western or

Chili side, where the Andes in their whole extent are clothed to a certain elevation with a broad belt of forest trees and evergreens, and where, at certain seasous of the year, there are heavy and continued rains. On this side guanacos are of comparatively rare occurrence. Their flesh is savoury when young, but not very palatable when full grown ; their wool, however, is very valuable to the Indians, who manu- facture it into hats and various kinds of woollen stuffs ; and their skins, when tanned, are useful in making shoes and harness. The number of these animals in the country is estimated at not less than three millions ; about a third part of them, the full-grown males, are employed as

The animals which distinguish the more elevated parts Animals. |

hals,

Geology.

Minerals,

Gold,

the lake of Illimani, situated at its base.

BOLIVIA

beasts of burden, all the traffic of Bolivia being carried on by means of them.

The vicufia (Camelus vicugna) is a smaller animal than the guanaco or the llama, and only useful for its fleece. The wool is long and fine, and forms a valuable article of commerce ; itis of a brownish colour, somewhat resembling that of a dried rose leaf; it has a soft, silky, and close texture, and is well adapted for the manufacture of hats and warm clothing. The vicufia very much resembles the llama and guanaco in its habits and dispositions, but cannot be usefully employed as a beast of burden. It usually fre- quents the highest parts of the mountains, is extremely timid, is gregarious, and runs very swiftly. The chinchilla (Chinchilla lanigera) is also an inhabitant of the moun- tainous parts of Bolivia. The skins,

however, are of an inferior quality, although larger than those obtained from the northern parts of Chili; but still they form a very valuable article of commerce, on account of the great fineness and delicacy of their furs.

The sheep pasturing in the highlands of Bolivia are supposed to number about seven millions, and in the lower regions of the east horned cattle are very numerous. The eastern or more thickly-wooded parts of Bolivia are inhabited by a variety of wild animals, such as the jaguar and the tapir, which are more or less common in Brazil and the other parts of intertropical America of incon- siderable elevation.

The geological structure of the colossal mountains situated in Bolivia has hitherto been very imperfectly examined. We learn from Humboldt, however, that the metalliferous mountains near Potosi are principally composed of trachytic porphyries; and Mr Yentland discovered trachyte also in the mountain of Pichu, one of the most elevated of the western Cordillera. In the same chain there likewise exist various voleanic mountains, some of which are in an active state. There is perhaps no part of the world which affords a more interesting field for the investigations of the geologist than Bolivia, not only.on account of the great elevation which it attains, but also from the exhibitions of internal structure presented by volcanic agency and otherwise,— not to mention the aid afforded by such inquiries in the prosecution of mining enterprises.

The great variety, extent, and value of the mincral productions of the mountainous districts of Bolivia have given to this part of America an importance and celebrity which it would not otherwise have obtained, and have caused large and populous cities and towns to be built at elevations where the rigours of the climate and the deficient vegetation would otherwise have afforded very few inducements for fixing the abodes of industry. Mining is, however, at the present time in a ruinous state.

Gold is found in considerable quantities in the moun- tainous parts of Bolivia; but, owing to the expense of extracting the metal from the ore, the mines which produce it have not been worked to the extent of which they are capable. In these it is usually found in the form of grains or nodules, or intermixed with antimony, silver, and other substances, and is separated by reducing the whole to a fine powder, and by amalgamation with quicksilver.

The mountain of Illimani is believed to contain great quantities of gold, in consequence of that metal having been found in a native state in considerable quantities in In the 17th century, likewise, an Indian found here, at a short distance from the city of La Paz, a mass of native gold, which was said to have been detached from the mountain by the agency of lightning, and which, having been purchased for the sum of 11,269 dollars, was afterwards deposited in the cabinet of natural history at Madrid. But by far the greater part of the gold procured in Bolivia is obtained by means

of the /avaderos or gold-washings, in the beds of rivulets, where itis foundin the form of grains. The most produc- tive of these are the celebrated lavaderos of Tipuani, consisting of streams descending from the snow-capped summits of the Cordillera of Ancuma, situated about sixty leagues to the north-east of the city of La Paz, in the province of Larecaja. ‘The gold is found in the form of grains or pepitas, at the depth of 10 or 12 yards below the surface, embedded in a stratum of clay of several feet in thickness. The gold-washings at Tipuani were worked in the time of the Peruvian Incas, as is evinced by their tools, which are occasionally found embcdded in the alluvial soil, and almost invariably in such situations as prove the most productive. The gold-washings and quartz veins of Cho-quecamata, in the province of Ayopaya in Cochabamba, are also famous, and their yield up to 1847 was valued at £8,000,000. Several districts of the departments of Potosi, Chuquisaca, Santa Cruz, and Tarija, are also rich in gold, but the greater part of the mines formerly worked have now been abandoned, or the known veins have not been explored. .

Silver, however, has hitherto been the staple metallic silver.

production of Bolivia, and has given to it that cclebrity which it has long possessed. In the rich mountains of Potosi alone, according to the records kept at Potosi of the quintas or royal duties from the year 1545 to the year 1800, no less than 823,950,509 dollars were coined dur- ing that period; and if the other produce of the mines be taken into account, it is estimated that not less than 1,647,901,018 dollars must have been obtained from this source alone during those 255 years.

The Cerro de Potosi, or argentiferous mountain of Potosi, lias a somewhat conical form, resembling a colossal sugar- loaf; its base being about three leagues in circumfer- ence, and its summit 15,977 feet above the level of the sea, and 2697 above the level of the great square or plaza of the city of Potosi, which is situated at its base. At the foot of the Ccrro is a smaller mountain called Huayna Potosi, or the Younger Potosi, likewise containing silver, but in less abundance than the other, and less accessible, from the numerous springs which there impede the opcra- tions of mining. ‘The principal mountain has been worked as high up as within 125 feet of its summit. The labours of the miners have been principally confined to the upper half of the mountain, which has been perforated by nume- rous excavations, with at least 5000 openings of mines, the greater number of which are however abandoned. The upper part of the mountain is exhausted to a considerable extent of its valuable contents ; but the lower part is still in a great measure untouched, as the springs are there more numerous, and the water accumulates in such quantities as materially to interrupt the further progress of the miners. The mines of Potosi, according to Humboldt, rank next in importance to those of Guanaxuato in Mexico. The exist- ence of silver in this place was first accidentally discovered by an Indian in the year 1545, and ever since that time its mines have been worked. In 1858, twenty-two companics were working 46 silver mines and 4 tin shafts in the pro- vince of Potosi, and the yield in 1856 amounted to a value of nearly a million dollars,

The silver mines of Portugalete, in the province of Chichas, have acquired considerable celebrity on account of the richness as well as quantity of their ores, which yield from 60 to 80 merks of silver to the caxon, while those of Potosi only afford about 10 merks from the same quantity of ore. Besides these there are various other silver mines in the province of Chichas, but their value is much dimi- nished by the scarcity of water, and by their being situated in an almost desert and unproductive country. The mines of Laurani, in the province of Sicasica in La Paz, once famous,

BOMLY Isa

The productions furnished by Bolivia as articles of Products commerce are chiefly the precious metals, vicufia and alpaca and trade.

are now abandoned ; and those of the province of Arque in Cochabamba are not now regularly worked. The rich

silver mines of Lipez also lie fallow, as do those of the department of Oruro. In 1870 great silver deposits were discovered at Caracoles, about 120 miles inland, in the desert province of Atacama, drawing thither a rush of miners from all parts of Chili and Peru.

wool, guano, nitrate of soda, leather, coffee, cacao, and chinchona bark; but from the fact that no direct com- mercial intercourse has ever existed with the outer world, these products are frequently ascribed to the countries through which they must pass. Thus the metals and

Other Among the other mineral riches of Bolivia copper takes | wools of Bolivia are looked upon as Peruvian, and the

minerals. the next rank, and is also widely distributed The province | cinchona bark and gums passing out eastward are credited

of Ingavi in La Paz possesses mines from which 15,000 | to Brazil or the Argentine Republic. The rude and simple

to 20.000 ewts. of copper are annually taken. The | fabrics manufactured by the Peruvian Indians are usually

departments of Potosi, Chuquisaca, Oruro, and Atacama | appropriated to their own domestic uses ; while the valu-

are also rich in copper. Tin is mined to some extent in | able vegetable productions, and the herds of cattle and

Potosi and Oruro, where it is found along with the silver. | mules which are reared in the eastern parts of the republic,

Lead is also frequently found in the neighbourhood of | have hitherto scarcely been sufficient for the supply of

silver, as well as quicksilver. The methods hitherto | the inhabitants of those populous mining districts that are employed for the reduction of the ores of this country | principally dependent on them for subsistence.

are excecdingly imperfect and inefficient. More skill and Before the war of independence a very extensive traffic

capital are requisite to render them productive and remune- | was maintained between the upper provinces of Peru (or

rating Coal and iron have been found in the departments | Bolivia) and the provinces of the Rio de la Plata for supplies

of Chuquisaca, Oruro, and Beni, though the extent or | of cattle and mules. These were reared in great numbers

value of these products is yet unknown, Precious stones, | in all the interior Argentine provinces expressly for the use

chiefly the hyacinth and opal, have been found in the | of those countries, and were first sent by easy journeys to

department of Santa Cruz, and diamonds in Beni. the luxuriant pastures of Salta and Jujuy, where they were

Very valuable beds of guano extend along the Pacific | carefully fed and tended during the winter, previous to

coast between 23° and 25° S., those of Mexillones being | their being conveyed to their final destination in Bolivia

specially famous. Nitrate of soda also exists in great | and Peru. Some idea may be formed of the extent of this

quantity in the deserts of Atacama, and is profitably worked. | traffic from the statement that, besides all those furnished by

Roads The roads which form the means of communication | the other Argentine provinces, the province of Salta alone

between Bolivia and the surrounding countries, and between the various provinces of the republic, are in no respect sufficient for the important purposes which they are destined to serve. By inattention to the formation and preservation of roads, the Spaniards and their descendants have fallen greatly behind the ancient Peruvians, whose industry and civilization they affected to despise, and laboured hard to depreciate. The present route, for it can scarcely be designated by the name of road, from Potosi to Jujuy, the first city belonging to the Argentine Republic, is about 310 miles in length ; and this place forms the point where a road commences for carriages and waggons as far as Buenos Ayres, an additional extent of land carriage of about 1617 geographical miles. The various routes from Bolivia to the coast of the Pacific, by the way of Cobija, by Tarapaca, and by Oruro to Tacna, can only be passed on mules or horscback ; and travellers are sometimes exposed to great perils and hardships from exposure to the storms which occasionally prevail at such great elevations. The President Ballivian, however, while in office, did much to obviate these difficulties, and initiated a new era of things by the construction of a splendid highway, which leads from Sucre, and passing Santa Cruz, connects Mojos and Chiquitos and the fertile plains of the Beni and Madeira. Although railroads are as yet unknown in the greater part of Bolivia, and though the country presents the most formidable natural difficulties in the way of engineering, a beginning has been made in this direction. The only line at present constructed in Bolivian territory is a short one from the bay of Autofagasta, south of that of Mexillones on the Pacific coast, in Atacamia, to the nitrate of soda works of Salar el Carmer ; it is intended to extend this line inland to the nitrate fields and to the silver mines of Caracoles. It is also proposed to extend one of the southern Peruvian coast lines, starting from near the point of Iquique to Oruro in Polivia. At present one of the main outlets of western Bolivia is by the Peruvian railroad from the port of Mollendo and Arequipa to Puno, on Lake Titicaca, completed in 1870. Puno, its inland terminus, is connected with Bolivia by steam navigation across Lake Titicaca.

supplied annually to Upper and Lower Peru from 60,000 to 80,000 mules, on all of which they realized considerable profits, the prices being proportioned to the distance to which they were conveyed. ‘The customs derived from the import of cattle from the Argentine Republic still form an important source of revenue. The trade is now in a great degree diverted

from the Argentine provinces to the ports of the Pacific called the Puertos Intermedios, Tacna and Arequipa, with their respective ports, have now become the principal channels through which Bolivia receives the produce and manufactures of other countries, the Bolivian port of Cobija being of little value, owing to the difficulties of transport from it by mules and llamas across the desert track and the mountains. There are no certain returns of the value of the trade of Bolivia ; the importation by Tacna and Arica is valued at 5 or 6 millions of dollars, that of Cobija at 14 to 2 millions. A new and very important channel of communication for commerce will be opened between Bolivia and the Atlantic, whenever commercial enterprise and increasing civilization shall have established steam navigation on the Rio de la Plata and its tributary streams, or frora the mouth of the Amazons to its distant tributaries the Beni and the Mamore.

The population of Bolivia consists of a mixture of Population. |

various races, chiefly of the Spaniards with the Indian natives, A third of their number live in towns or “ villas,” the rest in smaller villages, or in the open camp. Besides the native Indians there are in the country some descendants of African negro slaves, and not a few Guaranis, who came over from the regions east of the Paraguay, and settling in the plains, have increased in numbers. The Indian population may be considered as the civilized, the half civilized, and the wild. To the first class belong the Quichua and Aymara, or the Inca Indians, who are by far the most numerous, who have come most closely into contact with the Spanish invaders, and who occupy chiefly the highlands of the west. The Indians of Mojos and Chiquitos may be considered as representing the half-civilized class,—retaining part of the civilization introduced among them in the 17th century by the Jesuits. The nomadic or wild Indians of the eastern lowlands in

Bolivia belong to the following tribes :—The Sirionos, who inhabit the banks of the Rio Grande or Guapay, and of the Rio Pirai; the Hichilos, who occupy the pampas north of San Carlos in the department of Beni ; the Penogwgquias, living in the upper or southern districts of the River Itonama or San Miguel; the Guaraiocas, inhabiting the western portion of the space

between the rivers Tucabaca and Latiriquique ; the Potororos in the north-west of the same district ; and the Chiriguanos, occupying the country along the north of the upper Pilcomayo below the con- fluence of the Pilaya. To these may be added the Todas, who though they generally occupy the lower basin of the Rio Vermejo in the Argentine portion of the Chaco, occasionally make raids into the departments of Tarija and Chuquisaca, plundering and destroying the villages, and carrying off women and cattle. The Quichuaand Aymara have no relations or sympathies with the [ndians of the plains, who in their turn hold the civilized Indians in great contempt. These descendants of the Peruvians under the empire of the Incas are still numerous, notwithstanding the many causes which have tended to diminish their numbers, and form a distinct race, preserving the language and manners of their ancestors, their habits having been only somewhat modified by the circumstances in which they have been placed since they came under the dominion of the Spaniards. The Quichuas are mild in character, apparently subdued and apathetic,—qualities which are but the natural result of the state of subjection and debase- ment in which they were long held by their conquerors ; they are, However, robust and. muscular, and capable of great endurance, though little inclined to labour; their customs are rude and simple, their mode of living poor in the extreme. The Aymara are perhaps more mobile in char- acter, but in other respects similar. Both are cultivators of the land according to their rude notions of husbandry ; vegetables, especially maize and potatoes, form the staple of their food, and they indulge freely in their favourite chicha, an intoxicating liquor prepared from maize; many are employed as drivers of llama trains, or are breeders of the llama, sheep, or goats, which they possess in great numbers, Among the half-bred population of Bolivia, who stand in relation of numbers to the Inca Indians as about one to two, there are distinguished the zwmbo, or half-negro half- Indian, powerful in frame and intelligent, but unfaithful and cuuning ; the mulatto, or offspring of the Spaniard and negro; and the cholo, the descendant of the alliances of the Spaniards with the Inca Indians. The last generally resemble their fathers in character, and occupy themselves chiefly in mining. It is to the Cholos that Bolivia owes its political independence,

The population of Bolivia has greatly increased since the year of independence, 1825, when the whole number did not exceed 979,000; in

1831 it exceeded 1,000,000 ; at the census of 1846 it had risen to 1,380,000. The follow- ing table shows the population of each department, as given by Ondarza in 1858, Thisis the most recent detailed statement of the population of Bolivia, but an estimate of the population of the ecclesiastical divisions of the country for 1874 is appended to it ; the provinces into which each department is divided are also named, on the authority of Herr Reck :—

Departments, Provinces Popwation, 1858. Omasuyos Ingavi

Sicasica Be: » Mugiecas | 475,322

E Paz

Yungas Larecaja (Inquisivi J

Carry forward, 475,822

15

Population, 1858,

475,322

Provinces. Brought forward,

(Cochabamba [| Cliza COCHABAMBA { Monae

(aes

Ayopaya

(Potosi

| Porco ROGOSI.. 6… 4 Chayanta

| Chichas

\ Lipez Yamparaes Tomina-azero Cinti Santa Cruz Valle Grande Chiquitos Cordillera } Oruro

Departments.

349, 892

281,229

CHUQUISACA 223,668

SanrTa Cruz

153,164

Paria or Podpo Carangas } Tarija

110,931

Salinas Concepcion

Mojos

88,900

Caupolican or Apolobamba Juracarés ... Upper and Lower Deserts …...

58,973

a

ATACUMA 5) 27S)

1,742,352 245,000

JOD apaoacaranopst 1,987,352

The Archbishopric of La Plata, including the departments of Potos{, Chuquisaca, Oruro, Tarija, and Atacama, con- tained in 1874 706,989

inhabitants ; the Bishopric of La Paz, the department of La Paz, 519,465 ; the Bishopric of Santa Cruz, the department of Santa Cruz, 205,131; and the Bishopric of Cochabamba, the department of Cocha- bamba, 379,783,—total, 1,811,368. Decrees of 1866 and 1867 ordered the formation of two new departments, viz., Melgarejo, to be formed of part of the existing department of Cochabamba, and including the town of Tarata, and Mexillones, on the coast.

The populations of the chief towns, in 1858, were as follows :—La Paz, 76,372; Cochabamba, 40,678 ; Chu- quisica or Sucre, 23,979; Potosi, 22,580; Santa Cruz, 9780 ; Oruro (the seat of Government since 1869), 7980; Tarija, 5680; Trinidad, 4170; Cobija, 2380. Among the small number of foreigners in the country, Italians, Spaniards, and French are in a majority.

The area of Bolivia, hitherto very uncertain, on account Ayea,

of the indefinite state of the frontier on the east and south, has been calculated at Gotha, on the basis of the recent determination of the boundary with Brazil, at 536,200 English square miles, or about ten times the cxtent of England.

The religion of the people is Roman Catholic.

siderable part of the revenues of the minor convents and monastic establishments in Bolivia has been diverted from their original purposes to form a fund for the establish- ment and support of seminaries of education. Colleges on improved modern principles are formed in each of the departments. A university having long existed at Chu- quisaca for the education of the youth of Upper Peru, the utility of the establishment was greatly augmented, during the administration of General Sucre, by an im- provement in the modes of instruction, and an increase in the number of the departments of education. In Potosi, likewise, efficient means were adopted by General Miller, while prefect of that department, to establish there a college for the study of mineralogy,—a branch of education of great importance in a place wholly dependent on mining,

: Since Religion. the commencement of the republican government a con-
Education.

Govern- ment,

Revenue.

16

The constitution given to the country by Bolivar, which, in the frequent revolutions of later times has often been modified and altered, and sometimes set aside altogether, is founded on the strictest principles of justice, in as far as regards the civil rights and privileges of the community; but in other respects, and particularly in reference to the supreme executive authority, its provisions savour strongly of a mon- archical spirit. ‘The supreme authority is vested in a prest- dente vitalicio, or president for life, with the power of naming his successor. It guarantees to the Bolivians civil liberty, security of persons and property, and equality of rights ; the free exercise and communication of thoughts and opinions, either by the press or otherwise ; liberty to remain or leave the territory of the republic with their property, at their pleasure, but without prejudice to others ; equality in the imposition of taxes and contributions, from the payment of which none can be exempted; and the abolition of all hereditary employments, privileges, and entails. No pro fession, trade, or employment cau be prohibited, unless repugnant to public feeling, or injurious to the health and security of the community ; and every inventor is secured in the benefits of his discovery. No one can be arrested without previous information of the alleged fact of delin- quency, unless when taken flagrantt delicto, All trials aud judgments are public; and in criminal cases none can be imprisoned more than forty-eight hours without having presented to him the charges preferred against him, and being delivered over to the proper tribunal or judge.

By this constitution all legitimate power enlanates directly from the people, and is in the first instance exercised by all who can justly claim the privilege of citizens. Of these every ten nominate an elector, who exercises his delegated authority for a period of four years. At the commencement of each year all the electors assemble in the capitals of their respective provinces, and regulate their proceedings and the exercise of their various

functions by a plurality of votes. They elect the members of the three legislative chambers, the number of each amounting to thirty ; those for the chamber of tribunes being nominated for four years, and renewed by moieties every two years ; those for the senate for eight years, and renewed by inoieties every four. years ; and those for the chamber of censors being nominated for life.

The executive government consists of a president, vice- president, and three secretaries of state. The president of the republic is named for the first time by a majority of the collective legislature, and retains the dignity during life, with the power of naming his successor. He is the chief of the administration of the state, and is not respon- sible for the acts of his administration, The constitutional privileges of the president are the most limited that have been intrusted to the supreme chief of any nation. They extend only to the nomination of the officers of the revenue, of peace, and of war, and the command of the army. The administration belongs wholly to the ministry, which is responsible to the senate, and is subject to the jealous vigilance of the legislators, magistrates, judges, and citizeus. The judicial department enjoys the most perfect indc- pendence, the members composing it being proposed by the people, and chosen by the legislature. Slavery in every form has long been abolished, and the exercise of religion is free from all restraints. The armed force is composed of the regular army, amounting to abont 3000 officers and men, to garrison and defend the frontiers ; of the national militia to preserve internal order; of the preventive service to protect the revenue; and of a navy when circumstances may require its formation.

The financial budget of Bolivia for 1873-74 was as | follows, the amount being given in Bolivian dollars of the ‘

value of about 3s, 3d. sterling :—

SOT Vis

RECEIPTS— JATHOR) coomoosconcdenonninassobaonanouce 405,000 Customs } Cobija cscs sccssccesseeseecscee eens 250,000 Export of Silver…….....::s:cessseeeeesee eee ereens 193,676 SiIGy (ett CHUETID\O Ran oannaosndasaboo occ coopnenonancHunidE 300,000 Stampa. .... <0s00. ccressenecesaeeew en tsusereos ers 27,628 Cattle Customs (Argentine Republic)..... 20,880 English Loan ….....:csecsecseseeeseeeeenenentee ens 650,000 Indian iribute…. ccm er neeree tee eter 686,307 Departments …... 2. .eeeseseeeeecntees tee teesen ees 396,423

2,929,914

EXPENDITURE. «...000:csecreces ences cer taeerevs conn ems 4,505,504

Public debt 1873 = 16,428,329 bolivianos, including £1,700,000

sterling of the loan for railways.

The early history of that part of the empire of the Incas

which now forms the Republic of Bolivia is so intimately connected with that of Peru, that the consideration of it may with propriety be deferred until we come to treat of that country, in which Cuzco, the capital of the Incas, is situated. Attention will therefore at present be directed chiefly to that period of its history which is more recent, and which has so materially influenced its present condition.

The Peruvians, ever since the conquest of their country

by the Spaniards in the 16th century, have been sub- jected to a system of tyranny and oppression which has few parallels in the history of the universe. little better than beasts of burden. and silver were obtained from the mines, the lands were cultivated, the flocks and herds were attended to, and all the domestic and menial offices performed. Yet the fruits of their labour, especially that of mining, which was attended with numerous privations, and often with great loss of life, were altogether devoted to enriching their oppressors.

They were treated By their toil the gold

One of their principal grievances was: the mita, & com-

pulsory kind of personal labour, either in the working of

the mines or in the cultivation of the fields, exacted from the Indians generally for the space of one year. proprietors of mines and

The land to be worked or cultivated were privileged to claim as their undoubted right the

persoual services of the Indian population of the district surrounding that in which their property was situated.

By the regulations of the meta a proportional number of

the Indians of the district were annually chosen by lot for the purposes required ; the effects of such a regulation from the fact that 1400 mines

and some idea may be formed of

were registcred in Peru alone, and that every mine which remained unworked a year and a day became the property of the first claimant. So much was the labour of the mines dreaded by those persons on whom the lot fell, that they considered it as equivalent to a sentence of death, and made all their arrangements accordingly, carrying with them their wives and families to their new and dreaded place of abode. An estimate may be formed of the extent of this evil from 12,000 Indians having been annually required by the mita of Potosi alone ; and it is calculated that, in the mines of Peru, no less than 8,285,000 Indians have perished im this manner. Besides the mita for the service of the mines, the Indians were also compelled to labour for their superiors on their cultivated estates, their estancias or grazing farms, and also in their obrages or manufactories.

The tribtite exacted by’the Government from every Indian between the age of eighteen and fifty-five was a capitation tax of 8 dollars. This was levied with the greatest rigour, and the official persons charged with its collection frequently committed great injustice in doing so,—obliging the Indians to commence these payments at fifteen, and continue them until seventy years of age, and putting the amount of tribute for the years before and after the legal period into their own pockets. In proof of

- t mal

the extent to which this evil was carried, and of the rapacity of the Spanish Government, it may be stated that a law was enacted for the express purpose of augmenting the number of the people liable to pay tribute. By it

the Indians were obliged to raarry, the men at the age of fifteen, the women at thirteen. The governor of each province was responsible to the Government for the amount of the tribute, which was regulated by a census of the tributary Indians, taken every seven years; and in this many frauds were practised, the actual number being often underrated.

Besides all these, the Peruvian Indians were long sub- jected to another system of extortion no less grievous and unjust,—the law of repartamiento. This was originally established with the best intentions,—the governors or corregidors of the districts being intrusted with the charge of supplying the inhabitants under their care with such articles as they might require at a fair and equitable price. But the law, which had so plausible an origin, was shame- fully abused ; and it was made compulsory on the Indian population to purchase worthless articles at an extrava- gant price.

The constant and extensive operation of these demoraliz- ing practices, although more immediately affecting the aboriginal population, could not fail to produce the most pernicious effects on the Creoles or descendants of the Spaniards ; but, in addition to these causes of dcbasement, the latter were subjected to numerous unjust and oppres- sive laws, all tending to paralyze their advancement.

The raising of those vegetable products which form the principal objects of culture in Spain, as articles of com- merce, was strictly prohibited to the South Americans, however favourable the soil and climate of their native country might be for the production of them. No kind of manufacture of cloth or articles of clothing was permitted which could interfere with the commerce of Old Spain, excepting only the coarse fabrics manufactured and worn by the Indians. Even the valuable mines of mercury and iron found in South America were, in a great measure, hermetically sealed by prohibitory decrees, lest they might interfere with the traffic carried on by Spain in these articles. And, not only was the commerce of South America confined entirely to Spain and prohibited with other nations, under the severest penalties, but the colonies were not per- mitted to have any commerce with each other.

The grievances under which they suffered at length ex- ceeded even the powers of endurance possessed by the pacific Indians, and gave risc to the

insurrection of 1780-81, led by the Inca Tupac Amaru, who spread fire and sword against everything Spanish from Cuzco to Jujuy; twice the city of La Paz was besieged by a force of 20,000 Indians ; and in the battle before that town Tupac Amaru was made prisoner and put to death in the most barbarous manner by the Spaniards. The insurrection was finally put down in 1782, and with it ended the last power of the Incas. The aboriginal population, having failed in their arduous under- taking, after the destruction of great numbers of their nation, and finding their chains now rivetted with double force, never again recovered their wonted energies. This accounts for the comparative indifference with which they viewed the rise and progress of the war of independence.

From the causes already stated, the war of independence was principally carried on, as regards Bolivia, by the resources of, and in concert with, the neighbouring pro- vinces of the Rio de la Plata and Peru, all of which had equal cause to avenge themselves on their oppressors, but were placed in circumstances somewhat more fortunate for accomplishing their purpose. When the patriots of Buenos Ayres had succeeded in liberating from the dominion of Spain the interior provinces of the Rio de la Plata, they turned their arnis against their enemies who held Upper

Peru. An almost uninterrupted warfare followed, from July 1809 till August 1825, with alternate successes on the side of the Spanish or royalist and the South American or patriot forces,—the scene of action lying chiefly between the Argentine provinces of Salta and Jujuy and the shores of Lake Titicaca. The first movement of the war was the successful invasion of Upper Peru by the army of Buenos Ayres, under General Balcarce, which, after twice defeating the Spanish troops, was able to celebrate the first anniver- sary of independence near Lake Titicaca, in May 1811. Soon, however, the patriot army, owing to the dissolute conduct and negligence of its leaders, became disorganized, and was attacked and defeated, in June 1811, by the Spanish army under General Goyeneche, and driven back into Jujuy. Four years of warfare, in which victory was alternately with the Spaniards and the patriots, was ter- minated in 1815 by the total rout of the latter in a battle which took place between Potosi and Oruro, To this suc- ceeded a revolt of the Indians of the southern provinces of Peru, and the object being the independence of the whole country, it was joined by

numerous Creoles. This insur- rection was, however, speedily put down by the royalists. In 1816 the Spanish general Laserna, having been appointed commander-in-chief of Upper Peru, made an attempt to invade the Argentine provinces, intending to march on Buenos Ayres, but he was completely foiled in this by the activity of the irregular gaucho troops of Salta and Jujuy, and was forced to retire. During this time and in the six succeeding years a guerilla warfare was maintained by the patriots of Upper Peru, who had taken refuge in the moun- tains, chiefly of the province of Yungas, and who frequently harassed the royalist troops. In June 1823 the expedition of General Santa Cruz, prepared with great zeal and activity at Lima, marched in two divisions upon Upper Peru, and in the following months of July and August the whole country between La Paz and Oruro was occupied by his forces; but later, the indecision and want of judgment displayed by Santa Cruz allowed a retreat to be made before a smaller royalist army, and a severe storm converted their retreat into a precipitate flight, only a remnant of the expedition again reaching Lima. In 1824, after the great battle of Ayacucho in Lower Peru, General Sucre, whose valour had contributed so much to the patriot success of that day, marched with a part of the victorious army into Upper Peru. On the news of the victory a universal rising of the patriots took place, and before Sucre had reached Oruro and Puno, in February 1825, La Paz was already in their possession, and the royalist garrisons of several towns had gone over to their side. The Spanish general Olaiieta, with a diminished army of 2000 men, was confined to the province of Potosi, where he held out till March 1825, when he was mortally wounded in an action with some of his own revolted troops.

General Sucre was now invested with the supreme com- mand in Upper Peru, until the requisite measures could be taken to establish in that country a regular and constitu- tional government. Deputies from the various provinces to the number of fifty-four were assembled at Chuquisaca, the capital, to decide upon the question proposcd to them on the part of the Government of the Argentine provinces, whether they would or would not remain separate from that country. In August 1825 they decided this question, declar- ing it to be the national will that Upper Peru should in future constitute a distinct and independent nation. This assembly continued their session, although the primary object of their meeting had thus been

accomplished, and afterwards gave the name of Bolivia to the country,—issuing at the same time a formal declaration of independence.

The first general assembly of deputies of Bolivia dissolved itself on the 6th of October 1825, and a new congress

was summoned and formally installed at Chuquisaca on | promote agriculture, industry, and trade. Gencral Jorge the 25th May 1826, to take into consideration the consti- | Cordova succeeded him, but had not been long in office tution prepared by Bolivar for the new republic. A | when a new revolt in September 1857, originating with favourable report was made to that body by a committee | the garrison of Oruro, spread over the land, and compelled appointed to examine it, on which it was approved by the | him to quit the country. His place was taken by Dr José congress, and declared to be the constitution of the republic ; | Maria Linares, the originator of the revolution, who taking and as such, it was sworn to by the people. General | into his own hands all the powers of Government, and act- Sucre was chosen president for life, according to the con- | ing with the greatest severity, caused himself to be pro- stitution, but only accepted the appointment for the space | claimed dictator in March 1858. Fresh disturbances led of two years, and on the express condition that 2000 | to the deposition of Linares in 1861, when Dr Maria de Colombian troops should be permitted to remain with him. | Acha was chosen president. In 1862 a treaty of peace

The independence of the country, so dearly bought, did | and commerce with the United States of North America not, however, secure for it a peaceful future. Repeated | was ratified, and in the following year a similar treaty was risings occurred, till in the end of 1827 General Sucre and | concluded with Belgium ; but new causes of disagreement his Colombian troops were driven from La Paz. A new | with Chili had arisen in the discovery of rich beds of congress was formed at Chuquisaca in April 1828, which | guano on the eastern coast-land of the desert of Atacama, modified the constitution given by Bolivar, and chose | which threatened warfare, and

were only set at rest by Marshal Santa Cruz for president ; but only a year later a | the treaty of August 1866, in which the 24th parallel of revolution, led by General Blanco, threw the country into ; latitude was adopted as the boundary between the two disorder and for a time overturned the Government. Quiet | republics. A new military revolution, led by Maria Mel- being again restored in 1831, Santa Cruz promulgated the | garejo, broke out in 1865, and in February of that year code of laws which bore his name, and brought the finan- | the troops of President Acha were defeated in a battle near cial affairs of the country into some order; he also con- | Potosi, when Melgarejo took the dominion of the country. cluded a treaty of commerce with Peru, and for several | After defeating two revolutions, in 1865 and 1866, the years Bolivia remained in peace. In 1835, when a struggle | new president declared a political amnesty, and in 1869, for the chief power had made two factions in the neigh- | after imposing a revised constitution on the country, he bouring republic of Peru, Santa Cruz was induced to take | became its dictator till 1871.

a part in the contcst ; he marched into that country, and Such, in brief, are the rapidly succeeding political changes after defeating General Gamarra, the leader of one of the | and internal conflicts which have kept Bolivia far behind opposing parties, completed the pacification of Peru in the | its neighbouring republics, and_have prevented the de- spring of 1836, named himself its protector, and had in | velopment of its natural wealth. Notwithstanding these wars view a confederation of the two countries. At this juncture } and revolutions which rent the country, Bolivia had main- the Government of Chili interfered actively, and espousing | tained itself without foreign credit until the presidency of the cause of Gamarra, sent troops into Peru. Three years | Melgarejo, when it was drawn into disastrous speculations of fighting ensued, till in a battle at Jungay in June 1839 | aud contracts which have compromised its credit and loaded Santa Cruz was defeated and exiled, Gamarra became pre- | the country with a heavy foreign debt.

sident of Peru, and General Velasco provisional chief in President Morales was elected in 1871, since that time Bolivia. The Santa Cruz party, however, remained strong | a civilian Government has succeeded to the military sys- in Bolivia, and soon revolted successfully against the new |

tem, and attempts are being made to reform the disordered head of the Government, ultimately installing General | affairs of the republic.

Lolvape – uke elief as Taking advantage of the A. Dessalines d'Orbigny, Voyages dams l'Amerique méridionale, disturbed condition of Bolivia, Gamarra made an attempt | 1896-1833, Paris, 1835, and Deseripeton geografica, historica, y to annex the rich province of La Paz, invading it in August | estadistica de Bolivia, Paris, 1845; Dalence, Statistical Account of 1841 and besieging the capital; but in a battle with Bal- | Bolivia, 1846; H. A. Weddell, Voyage dans le nord de la Bolivie, lvian his army was totally routed, and Gamarra himself | Far 2858; Manoel Joe Conti, Znee san, ogden ts was killed. The Bolivian general was now in turn to n- | America, London, 1861; Hugo Reck, ''Geographie und Statistik vade Peru, when Chili again interfered to prevent him. | der Republik Bolivia," in Geogr. Mittheilungen, Gotha, 1865, 1866, Ballivian remained in the presidency till 1848, when he | 1867; Avelino Aramayo, Projecto de una nueva via de communt- retired to Valparaiso, and in the end of that year General | Enns entre Bolivia y el ocenno Pacifico, Loudon, 1863,—also PRélsu. Ser ledtic & 2 fir] eee as $S0k | olivia (extracts from the last work, translated, with additions

; g a successful military revolution, too |

: : ; : to 1874), London, 1874; José Domingo Cortés, Bolivia, Paris the chief power, and during his presidency endeavoured to | 1875. " , (K. J.)

BOLLANDIST FATHERS, Tue, the authors of the | original plan of the work was soon widened. The ground- famous Acta Sanctorum. During the Roman Catholic | plan of the undertaking was to form a huge calendar, giving revival in the end of the 16th and beginning of the 17th | the life and deeds of cach saint under the heading of the centuries a great number of martyrologies were published, | day set apart by the church for his honour. In 1643 the and it occurred to a Jesuit father, Heribert Rosweyd, to | first two volumes were published, containing the saints' collect all the various legends about the martyrs and saints | days in January. Bolland died soon after the beginning of the church into one great standard martyrology, which | of his labour, but not until he had seen the work fairly he proposed should fill 18 vols. folio. Rosweyd died in 1629 | started ; other deaths

followed, but the work was prosecuted without having been able to carry out his plan. His idea, | in accordance with the original plan, and went on pros- however, was taken up by John Bolland, a Jesuit father | perously until 1773, when the troubles which then overtook of the Low Countries, who had settled in Antwerp. He | the Jesuits affected the Bollandists also. The little com- began an extensive correspondence, writing to every one | pany struggled on, however, amid many difficulties until throughout Europe who he supposed was able to help him. | 1794, when they were dispersed ; and the whole of the The public libraries and the libraries of convents and | MS. collections were destroyed during the French invasion churches were thoroughly examined for MSS. about saints | of the Netherlands. At this time 54 vols. had been pub- and martyrs, and so much material was found that the | lished, bringing the work down to the 15th of October.

In 1837 three Jesuit fathers made proposals to continue the Acta according to the original plan, and in 1838 pub- lished a programme under the title De prosecutione operis Bollandiani. They made some progress with the under- taking, but their work is much inferior to the earlier Acta. The 54 vols. of the older Bollandists, along with 6 vols. of the continuation, were published at Paris and Rome in

1863-7.

BOLOGNA, a province of northern Italy, having an area of 1385 square miles. It consists in the north of a fertile plain, well watered by several tributaries of the Po, while the southern portion is occupied by the Apennines, which separate it from Tuscany. It is in a highly flourishing condition. The soil produces abundant crops of rice, barley, wheat, and pulse, besides hemp, flax, olives, grapes, figs, almonds, chestnuts, and other fruits. The culture of silk is largely prosecuted ; and considerable numbers of cattle and swine are reared in the province.

BotoeNa, the chief city of the above. province and the see of an archbishop, is situated between the rivers Reno (Rhenus) and Savena, at the foot of the lower slopes of the Apennines, 399 feet above the level of the Adriatic, and 23 miles §.E. of Modena, on the main line of railway that runs across the

north of Italy, in 44° 30’ N. lat. and 11° 21’ E. long The city is about 2 miles in length and 1} in breadth, and is surrounded by a high brick wall with

Ground-Plan of Bologna.

twelve gates. The streets are clean and well paved, but are generally narrow and crooked ; the houses are mostly three stories high with projecting roofs, and are very often surrounded with arcades. All the public as well as private buildings are constructed of brick. The Piazza Vittorio Emmanuele, formerly called Piazza Maggiore or del Gigante, is the principal square and has many fine edifices. In the centre is a fountain adorned with a colossal statue of Neptune by Giovanni da Bologna. The city contains no fewer than 130 churches, twenty convents, and six hospitals. Of the churches the largest is San Petronio, an unfinished but splendid structure dating from 1390, and dedicated to the patron saint of the city. The cathedral or 8. Pietro, begun in 1605, is surpassed not only by it but by 8. Dominico, 8. Giacomo Maggiore, and various others. San Stefano is a curious collection of seven churches, with a good deal of antiquarian interest. (Vide Street’s Brick and Marble in the Middle Ages, 1874.) Of the secular buildings the most important are the Palazzo Pubblico, founded in 1290, the Palazzo del Podesta, of slightly earlier date, the Palazzo della Mercanzia, or Chamber of Commerce, and a few of the residences of the

great medizeval families. At the head of the educational institutions stands the university, which was once the most celebrated in Italy, but is now attended by only 400 or 500 students. The university library, which was at one time in the keeping of Cardinal Mezzofanti, numbers upwards of 140,000 volumes and 9000 MSS. The Accademia delle Belle Arte, situated in what was formerly the Jesuit’s College, has a rich gallery of paintings, chiefly by native artists. There isa museum of antiquities in con- nection with the university, as well as a botanical garden, and an observatory ; and the city possesses besides a scientific institute, a philharmonic lyceum, and various intellectual institutions, many of which are due to the liberality of Count Ferdinand Marsigli, in the 17th century. There are five theatres (the Teatro del Commune, erected in 1756 by Bibiena, on the site of the Palazzo Benti- voglio, being one of the largest in Italy), a casino, and a hall for

playing the favourite game of ball. The lean- ing towers of Asinelli and Garisende are worthy of men- tion. They are situated quite near each other ; the former, which is 272 feet in height, deviates 5 feet from the per- pendicular, while the latter has a height of 138 feet and a divergence of 9. Bologna has long been famous for its Mortadelle sausages, its soap, and a kind of confection called terra caté ; its manufactures also include crape, silk, glass, wax candles, paper, and musical instruments. The people have a very peculiar dialect. The city is the birth- place of Domenichino, Guido Reni, the Carraccis, Righini, Benedict XIV., and other famous men, and gave rise and name to the Bolognese school of painting. Population in

1871, 115,957.

Bologna is said to have been founded by an Etruscan king, and was originally called Felsina after his name. It was held for some time by the Boian Gauls, and on their expulsion became, in 189 z.c., a Roman colony under the name of Bononia. Its importance rapidly increased, but it does not appear much in history till the time of the civil wars. The terms of the second triumvirate were settled in 43 B.C. in an interview held between Octavius Antony and Lepidus on a neighbouring island. During the later empire the city was frequently an imperial residence, and in 410 A.D. it was still strong enough to resist the forces of Alaric. It afterwards passed under the power of the Lombards, and on their subjugation by Charlemagne it was united to his empire and made a free imperial city. In 962 it became an independent republic, which soon acquired an extensive commerce and a powerful military force. The Middle Ages form the period of its greatest celebrity and importance. In the Crusades the Bolognese took an active share; and after a long neutrality in the contest between the Ghibellines and the Guelfs, they sided with the latter and became deeply involved in struggles both foreign and intestine. In 1240 they defended themselves successfully against Frederick JJ., and-in 1247 expelled from their city the Lampertazzi and Geremei with 1500 adherents. During the rest of the 13th century and the whole of the 14th and 15th they passed from the domination of one powerful family to another—from the Pepoli to the Bentivogli, from the Bentivogli:to the Visconti, and back again to the Bentivogli—till at last, in 1512, they were incorporated by Julius IJ. with the Papal States. The French Revolution made Bologna part of the Cisalpine Republic, but on the

fall of Napoleon it reverted to the popes. In 1821] it was the centre of the republican imsurrection, but had to yield in the following year before the Austrian arms. The revolution of 1831 was equally short-lived ; and in 1849 the city was forced, after repeated bombardment, to receive an Austrian garrison, which continued in possession till the formation of the Italian kingdom in 1859.

BOLOGNE, Jzan (or Giovanni Botoena, as he was

styled in Italy), a celebrated sculptor, was born at Douay in 1524, and died at Florence in 1608. He went early to Italy, and studied at Florence, where his best works still remain. His two most celebrated productions are the single bronze figure of Mercury, poised on one foot, resting on the head of a zephyr, as if in the act of springing into the air (in the Florentine gallery), and the famous marble group of the Rape of the Sabines, which received this name, Lanzi informs us, after it was finished. de Lanzi of the ducal piazza. Giovanni was also employed at Genoa, where he executed various excellent works, chiefly in bronze. All his pieces are characterized by great spirit and elegance.

BOLSENA, a town of Italy, in the province of Rome, and the district of Viterbo, 10 miles 8. by E. of Orvieto. it is situated on the north shore of the lake of the same name (Lago di Bolsena), and probably occupies the site of the Roman city of Volsinii. The principal remains are the ruins of an amphitheatre and those of a temple, which is popularly called a Tempio di Norzia after the Etruscan goddess Norsia, and there are numerous other relics scattered throughout the city or built into the walls of its modern buildings. Volsinii was originally one of the most powerful of the Etruscan cities, and occupied a position among the hills ; but after a series of struggles with the Romans, the Volsinians were finally subdued about 280 B.c., their city was razed to the ground, and themselves obliged to settle in a less defensible site in the plain. The only event of interest in the history of the new town was its being the birthplace of Sejanus, the favourite of Tiberius. Its present population is only 2690. The Lake of Bolsena is about 10 miles in length by 8 in breadth, and is surrounded by well-wooded hills. It contains two small islands, Bisentina and Martana, in the latter of which

Amalasontha, the wife of Theodatus, king of the Goths, was put to death by his orders.

BOLTON, or Botton te Moors, a municipal and parlia- mentary borough of England, in the county of Lancashire, 11 miles N.W. of Manchester, in 53° 35’ N. lat. and 2° 37’ W. long. It is divided by the Croal, a small tributary of the Jewell, into Great and Little Bolton, the former of which is situated on the south side of the stream. The town is on the whole well arranged and well built, and great improvements and extensions have been effected since 1860. An abundant supply of water is obtained from the neighbouring hills and stored in reservoirs at Belmont, Sharples, and Heaton. The water-works, formerly in the hands of a com- pany founded in 1824, have been the property of the corporation since 1847. The water rises by natural pressure to a height of 80 feet. Bolton possesses a large number of churches, but few are remarkable for either antiquity or architecture. The parish church of St Peter’s, a building of somewhat early date, was restored in an elaborate style about 1868. Among the educational establishments may be mentioned Lever’s Grammar School, founded in 1641, where Dr Ainsworth, the Latin lexicographer, and Lempriére, of the Classical Dic- toonary, were formerly masters. A new town-hall, two cloth- halls, a fish-market, an exchange, a theatre, and assembly rooms, are among the chief buildings. There are several public hbraries and a mechanics’ institute ; and in 1855 a large Church of England institute was erected. During the great cotton famine the unemployed operatives were set to work on a large public park, which was opened in 1866. The cotton manufacture in various departments is still the most important in the town; in 1871 it gave employment to 8708 men and 11,353 women of twenty years of age and

Arms of Bolton.

It is now in the Loggia:

upwards, Various other industries, however, are extensively carried on. In 1871, 1030 adult workmen were employed in the manufacture of machinery, and 2524 in the iron manufacture ; while silk-weaving was the occupation of 881, linen-weaving of 289, and paper-making of 306.

Bleaching is also extensively carried on, and there are chemical works, dye-works, and calico-printing establishments. The coal mines in the neighbourhood give employment to nearly 4000 miners. Bolton is a place of some antiquity, but had little importance till the introduction of the woollen manufacture by Flemish immigrants about 1337. Several centuries afterwards its industries received a further development from a body of French refugees, driven from their own country by the Edict of Nantes. During the civil war of the 17th century the inhabitants espoused the popular side, and their town was taken by storm in 1644 by the royalists under Prince Rupert and the earl of Derby. The 18th century saw a great stimulus given not only to Bolton but to all England by the inventions of Arkwright and Crompton, who were both natives of the parish. It was here that cotton velvets were made for the first time (in 1756) and muslins (1782) by means of machinery. In 1791 a canal was constructed from Manchester to Bolton, and in the following year an Act of Parliament was passed for enclosing Bolton Moor. This measure was soon succeeded by a large extension of the town, which has since continued to increase from year to year. The municipal borough, with an area of 1748 acres, contained in 1851 10,394 inhabited. houses for a population of 61,171; and in 1861, 13,129 houses for a population of 70,395. In 1871 the borough, with an increased area of 1822 acres, included 16,286 houses, and the population was 82,853. The parliamentary borough, which owes its existence to the Reform Bill of 1832, returns two members to parliament. BOLZANO, Brernuarp, Catholic theologian and philo- sopher, was born at Prague on the 5th October 1781. He distinguished himself by his proficiency in mathematics, a study for which he always retained a predilection, and in philosophy. At the age of twenty-four he took orders, and was appointed professor of the philosophy of religion at the philosophical faculty in Prague, His lectures, in which he endeavoured so to present the system of Catholic theology as to show its complete harmony with reason, were received with eager interest by the younger generation of thinkers. But his views met with much opposition ; and it was only through the powerful protection of the Prince Archbishop Salm-Salm that he was enabled to retain his chair. At last, in 1820, he was accused of being connected with some of the students’ societies, and was compelled to resign his professorship. Several doctrines extracted from his works were condemned at Rome, and he was suspended from his priestly functions. The remainder

of his life was devoted to literary work. He died at Prague in 1848. Bolzano's works are very numerous, filling, according to Erdmann, twenty-five volumes. The most important are the Wissenschaftslehre (4 vols., Sulzbach, 1837), containing some admirable discussions on logic, and the Lehrbuch der Religions-wissenschaft (4 vols., Sulzbach, 1834), which contains a philosophic representation of all the dogmas of the Catholic theology. In some respects it resembles the earlier work of Georg Hermes, for whom Bolzano had a great veneration. Some of the best of his minor works are on the philosophy of mathematics ; such are—Betrachtung- en uber LElementargeometrie, Beitrdge zr begriindeteren Darstellung der Mathematik, Begriindung der Lehre von der drei Dimensionen des Raums. (See Lebensbeschreibung des Dr Bolzano (an autobiography), 1836; Wisshaupt, Skizeen aus dem Leben Dr Bolzanos, 1850. A good account of Bolzano's philosophical position will be found in Erdmann, Grundriss der Ges. d. Phil., ii. p. 385, sqq.)

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BOMBAY

OMBAY, a Presidency aud Governorship of British B India, consisting partly of British districts, and partly of native states under the protection of Her Majesty's Indian Government. 'This territory extends from 28° 32' to 13° 65' N. lat., and from 66° 43' to 76° 20' E. long. ; and is bounded on the N. by Beluchistan, the Panjab, and the native states of Rajputand; on the E. by the native state of Indor, the Central Provinces, West Berar, and the Nizdm's dominions ; on the S. by Madras and Mysor ; and on the W. by the Arabian Sea. Area, including Sindh, 188,195 square miles, viz., 124,943 British, and 63,252 under Native rule. Population, 25,624,696 souls, viz., British districts, 16,352,623; Native states, 9,272,073. Bombay Presidency comprises three British divisions or commissionerships, the northern, the southern, and the Sindh divisions, with the following 24 districts :—Bombay, Ahmadabad, Kaira, Pinch Mahals, Broach, Surat, Tanna, Kolaba, Khandesh, Nasik, Ahmadnagar, Belgam, Kanara, Dharwar, Kaladgi, Pind, Ratndgiri, Satérd, Sholdpur, Upper Sindh Frontier, Karachi, Haidardbad, Shikarpur, and 'har Parkar. 'The Native states are under the super- vision of British political officers, and are divided into 16 agencies, viz., Baroda,

Kachh, Kathidwar, Kair4, Surat, Sholpur, Satara, Kolh4pur, South Marhatté Country, Rewdkanta, Mahikanta, PAhlanpur, Sawantwari, Tanné, Koléba, and Dharwar. The Presidency also includes the Portuguese possessions of Daman, Diu, and Goa.

Puysicat Aspects.—The Bombay Presidency consists of along strip of land along the Indian Ocean from the south of the Panjab to the north of Mysor, from 25° to 14° 3'N. lat. The coast is rock-bound and difficult of access ; and though it contains several bays forming fair-weather ports for vessels engaged in the coasting trade, Bombay, Karachi in Sindh, and Karwar alone have harbours sufficiently land- locked to protect shipping during the prevalence of the south-west monsoon. The coast-line is regular and little broken, save by the Gulfs of Kambay and Kachh, between which lies the peninsula of Kathiawar.

Mountains.—Speaking generally, a range of hills, known as the Western Ghats (ghauts), runs down the coast, at places rising in splendid bluffs and precipices from the water's edge, at others retreating inland, and leaving a flat fertile strip of 5 to 50 miles between their base and the sea. In the north of the Presidency on the right bank of the Indus, the Hal4 mountains, a continuation of the great Sulaiman range, separate British India from the dominions of the Khan of Kheldt. Leaving Sindh, and passing by the ridges of low sand hills,—the leading feature of the desert east of the Indus,—and the isolated hills of Kachh and Kathidwar, which form geologically the western extre- ulity of the Aravali range, the first extensive mountain rauge is that separating Gujardt from the states of Central India. The rugged and mountainous country south of the Tapti forms the northern extremity of the Sahyadri or Western Ghats. This great range of hills, sometimes over-hanging the ocean, and generally running parallel to it at a distance nowhere excecding 50 miles, with an average elevation of about 1800 feet, contains individual peaks rising to more than double that height. They stretch southwards for upwards of 500 miles, with a breadth of 10 to 20 miles. The western declivity is abrupt, the land at the base of the hills being but slightly raised above the level of the sea. As is usually the case with the trap formation, they descend to the plains in terraces with abrupt fronts. The landward slope is in many places very geutle, the crest of the range being sometimes but slightly

raised above the level of the plateau of the Dakhin. Their best-known elevation is Mahdbaleshwar, 4800 feet high, a fine plateau, 37 miles from Puna, covered with rich vegetation, and used by the Bombay Government as its summer retreat and sanitarium. In the neighbourhood of the Sdahyddri hills, particularly towards the northern extremity of the range, the country is rugged and broken, containing isolated peaks, masses of rock, and spurs, which, running eastward, form watersheds for the great rivers of the Dakhin. The Satpurd hills separate the valley of the Tapti from the valley of the Narbada, and the district of Khandesh from the territories of Indor. The Satmala or Ajanta hills, which are rather the northern slope of the plateau than a distinct range of hills, separate Khandesh from the Niz4m's dominions.

Plains.—The more level parts of Bombay consist of five well-demarcated tracts—Sindh, Gujarat, the Konkan, the Dakhin or Deccan, aud the Karnatic. Sindh, or the lower valley of the Indus, is very flat, with but scanty vegetation, and depending for productiveness entirely on irrigation. Gujarét, except on its northern parts, consists of rich, highly cultivated alluvial plains, watered by the Tapti and Narbadé, but not much subject to inundation. The Kon- kan lies between the Western Ghats and the sea. It isa rugged and difficult country, intersected by crecks, and abounding in isolated peaks and detached ranges of hills. The plains of the Dakhin and Khandesh are watered by large rivers, but as the rainfall is uncertain, they are gene- rally, during the greater part of the year, bleak and devoid of vegetation. The Karnatic plain, or the country south of the River Krishud, consists of extensive tracts of black or cotton soil in a high state of cultivation.

Rivers.—The chief river of Western India is the Indus, which enters the Presidency from the north of Sindh, and flowing south in a tortuous course, falls into the Arabian Sea by several mouths, such as the Ghizri creek, Khudi creek, Pitiani creek, Sisi creek, Hajamri creek, Vatho creek, Mall creek, Wari creck, Bhitidra creek, Sir creek, and Khori creek. In the dry season the bed varies at different places from 480 to 1600 yards. The flood season begins in March and continues till September, the average depth of the river rising from 9 to 24 feet, and the velocity of the current increasing from 3 to 7 miles an hour. Next to the Indus comes the Narbaddé. Rising in

the Central Provinces, and traversing the dominions of Holkar, the Narbada enters the Presidency at the north-western extre- mity of the Khandesh district, flows eastward, and after a course of 700 miles from its source, falls into the Gulf of Kambay, forming near its mouth the alluvial plain of Broach, one of the richest districts of Bombay. For about 100 miles from the sea the Narbada is at all seasons navi- gable by small boats, and during the rains by vessels of from 30 to 10 tons burden. The Tapti enters the Presi- dency a few miles south of the town of Burhanpur, a station ou the Great Indian Peninsula Railway, flows castward through the district of Khandesh, tle native state of Rewakanta, and the district of Surat, and falls into the Gulf of Kambay, a few miles west of the town of Surat. The Tapti drains about 250 miles of country, and is, in a commercial point of view, the most useful of the Gujarat rivers. Besides these there are many niinor streams. ‘The Bands and the Saraswati take their rise in the Aravali hills, and flowing eastward through the native state of Pahlanpur, fall into the Rann of Kachh. The Sabarmati and tke Mahi rise in the Méhikanta hills, and flowing southwards, drain the districts of Northern Gujarat, and fall into the

sea near the head of the Gulf of Kambay. The streams which, rising in the Sdéhyadri range, or Western Ghats, flow westward into the Arabian Sea, are of little importance. During the rains they are formidable torrents, but with the return of the fair weather they dwindle away, and during the hot season, with a few exceptions, they almost dry up. Clear and rapid as they descend the hills, on reaching the lowlands of the Konkan they become muddy and brackish erceks. The Kanarcse rivers have a larger body of water and a more regular flow than the streams of the Konkan. One of them, the Sherdwati, forcing its way through the western ridge of the Ghats, plunges from the high to the low country by a succession of falls, the principal of which is 890 feet in height. The Sahyddri, or Western Ghats, also throw off to the eastward the two principal rivers of the Madras Presidency, the Godavari and the Krishna, These rivers collect countless tributary streams, some of them of considerable size, and drain the entire plain of the Dakhin as they pass eastward towards the Bay of Bengal,

Lakes.—The Manchar Lake is situated on the right bank of the Indus. During inundations it attains a length of 20 miles, and a breadth of 10, covering a total area estimated at 180 square miles. But the most peculiar lacustrine feature of the Presidency is the Rann or Lake of Kachh (Cutch), which, according to the season of the year, is a salt marsh, an inland lake, or an arm of the sea. Its area is esti- mated at 8000 square miles. It forms the western bound- ary of the province of Gujarat, and when flooded during the rains, unites the Gulfs of Kachh (Cutch) and Kambay, and converts the territory of Kachh into an island. Inthe dry season the soil is impregnated with salt, the surface in some places being moist and muddy, and in others, like a dry river bed or sea-beach, strewn with gravel or shingle. The Rann is now used as the great source of salt supply for the whole Presidency. Its present condition is pro- bably the result of some natural convulsion. But whether the Rann is an arm of the sea from which the waters have receded, or an inland lake whose seaward barrier has been swept away, still remains a matter of discussion.

Climate.—Great varieties of climate are met with in the Presidency. In its extreme dryness and heat, combined with the aridity of a sandy soil, Upper Sindh resembles the sultry deserts of Africa, ‘The mean maximum tempera- ture at Haidardbad, in Lower Sindh, during the six hottest months of the year, is 98° 5’in the shade, and the water of the Indus reaches blood heat ; in Upper Sindh it is even hotter, and the thermometer has been known to register 130° in the shade. In Kachh and in Gujarat the heat, though less, is still very great. The Konkan is hot and moist, the fall of rain during the monsoon sometimes approaching 300 inches. The table-land of the Dakhin above the Ghats, on the contrary, has an agreeable climate except in the hot months, as has also the southern Mar- hatta country; and in the hills of Mahabaleshwar, Singarh, and other detached heights, Europeans may go out at all hours with impunity. Bombay Island itself, though in general cooled by the sea breeze, is oppressively hot during May and October. The south-west monsoon generally sets in about the first week in June, and pours down volumes of rain along the coast. From June to October travelling is difficult and unpleasant, except in Sindh, where the monsoon rains exert little influence.

Forests. —Bombay Presidency possesses two great classes of forests-— those of the hills and those of the alluvial plains. The hill forests are scattered over a wide area, extending from 23° to 14° N. lat. Most of them lie among the Sahyadri hills or Western Ghats. The alluvial forests lie in Sindh, on or close to the banks of the Indus, and extend over an arca of 550 square miles. The principal timber

trees in the forests are—teak ; blackwood of two varieties (Dalbergia Sisu and Dalbergia latifolia), Dalbergia ujain- ensis, Pterocarpus Marsupium, Terminalia glabra, Acacia arabica, Acacia Catechu, Nauclea cordifolia, Nauelea parvi- folia, Bidelia spinosa, Hardwickia binata, Juga xylocarpa, Populus euphratica, and Tamariz indica. The forests contain many trees which, on account of their fruits, nuts, or berrics, are valuable, irrespective of the quality of their timber. Among these are the mango (Mangzfera indica) ; the jack (Artocarpus integrifohia), Zizyphus Jujuba, digle Marmelos, Terminalia Chebula, Calophyllum Inophyllum, Bassia latifolia, and Pongamia glabra. The jungle tribes collect gum from several varieties of trees, and in Sindh the Forest Department derives a small revenue from lac. The palms of the Presidency consist of cocoa-nut, date, palinyra, and areca catechu.

Geology.—_Geologically the Bombay Presidency is divided into two tracts: the north-western part, consisting of Sindh, Kachh (Cutch), and Gujarat; and the south-western, comprising the Marhatté country. Undulating sandy plains, with scattered craggy hills, are found in Gujarat; the im- mense alluvial flats to the north being, for the most part, deserts of blown sand, and the fertile country consisting of a belt along the borders of the sea. In Sindh, the country, except on the banks of the Indus, or where reclaimed by irrigation, is an arid tract of gravel and sand, from which rise steep scarps of limestone ranges. The rocks of Guja- rat, Kachh, and Sindh, are only partially represented in the more southern peninsula, and are continuous with the formations found in Persia and Arabia. In the Marhatta country the greater portion of the surface is composed of nearly horizontal strata of basalt and similar rocks.

PopuLaTion.—The census of 1872 returns the total area of the Presidency, including Sindh, at 188,195 square miles, and the total population at 25,624,696 souls. Details, however, are only available for the British part of the Presidency, which contains an area of 124,943 square miles, and a total population of 16,352,623 souls. The average density of population in the British districts is 131 persons per square mile, but it varies from a maxi- imum of 29,291:13 in Bombay city to 14°20 in Thar and Parkar. ‘Total number of houses in the British districts, 2,164,338 ; and average number of persons per house, 4°99, Of the total population of the British portion, 12,440,659, or 76°08 per cent., are Hindus; 2,847,756, or 17:4 per cent., Muhaminadans; 192,245, or 1:17 per cent., Budd- hists; 106,133, or 0°65 per cent., Christians; 67,115, or 0-41 per cent., Parsis ; 603,836, or 3°69 per cent., abori- gines; and 94,879, or 0°58 per cent., of unspecified religion or nationality. ‘The males number 8,547,100, or 52 per cent, of the population; the females, 7,805,523, or 48 per cent. The percentage of the total number of children under twelve years of age is 31°65. The Hindus are most numerous in Satara, and fewest in the Upper Sindh Frontier district. ‘The Muhammadans form nearly the whole population of Sindh, and are least numerous in the Panch Mahals. Except in Sindh, the Buddhists are widely scattered throughout the whole Presidency. The Christians are chiefly confined to Bombay city, Tanna, the Indo-Portuguese possessions, and the larger cantonments, such as Puna. The British districts of the Presidency contain upwards of 26,800 villages, and 175 towns of upwards of 5000 inhabitants. Besides Bombay city, there are 213 municipalities cstablished under Act 26 of 1850. Of these, 4 have an income of over £10,000; 27 of over £1000; 22 of over £500; 94 of over £100; and 66 of under £100. Exclusive of the town of Bombay, the total muni- cipal revenue realised in 1872-73 amounted to £198,857. Average rate of municipal taxation, 2s. 14d. per head of the town population. ‘he principal sources of municipal

revenue are the octro duties, house tax, and wheel tax.

AGRICULTURAL Propucts.—The staple crops are as fol- lows :—Joar (Sorghum vulgare) and bajra (Holeus spicatus) are the staple food grains in the Dakhin and Khandesh. Rice is the chief product of the Konkan, Wheat,

generally grown in the northern part of the Presidency, but specially in Sindh and Gujarat, is exported to Europe in large quanti- ties from Karachi, and on a smaller scale from Bombay. Barley is principally grown in the northern parts of the Presidency. Nachani (Zleusine coracana) and Kodra (Pas- palum scrobieulatum), inferior grains grown on the hill sides, furnish food to the Kulfs, Bhils, Waralis, and other abori- ginal tribes. Of the pulses the most important are gram (Cicer arietinum), tir (Cajanus indicus), kulti (Dolichos biflorus), and mug (Phaseolus Mungo). Principal oil-seeds: til (Sesamum orientale), mustard, castor-oil, safflower, and linseed. Of fibres the most important are cotton, Dakhini hemp (L/abiscus cannabinus), and san or tag (Crotolaria juncea). Much has been done of late years to improve the cotton of the Presidency. American varieties have been introduced with much advantage in the Dharwar collec- torate and other parts of the southern Marhatté country. In Khandesh the indigenous plant from which one of the lowest classes of cotton in the Bombay market takes its name, has been almost entirely superseded by the superior Hinganghat variety. Miscellaneous crops :—Sugar-cane, requiring a rich soil and a perennial water supply, and only grown in favoured localities, red pepper, potatoes, turmeric, and tobacco. In 1871-72, 3,379,937 acres were under cotton cultivation; in 1872-73 the area increased to 8,715,945 acres. The total out- turn was 260,444 candies (560 Ib) in 1872-73, against 221,144 in 1871-72. A legislative enactment has been passed to prevent adultera- tion of cotton, and in 1872-73, 24 persons were convicted under it, In 1872-73, 2281 steam cotton gins were at work with 158 steam presses. Two model farms have been established in the Presidency—one at Hala, near Haidarabad, in Sindh, and the other in Khandesh. Ex- periments have been instituted in the cultivation of fibres and tobacco. Large quantities of Carolina rice seed were distributed over the country, but the results hitherto cannot be deemed to have been successful. The same may be said of the endeavours which have been made to pro- pagate the cinchona tree near Mahdbaleshwar. Acreage under principal crops—Jodr, 6,552,385 acres; bajra, 4,560,271; rice, 2,009,115; wheat, 1,322,835; and pulses, 1,167,809 acres. The land system of the Presidency is complicated, each province having a variety of tenures of its own. But the most important, and by far the most universal, is the survey tenure created by the British administration, which gives a right of occupancy to the holder on condition of his paying the Government demand.

Pustic Works AND Rarnways.—In 1872-73 the sum of £1,180,000 was expended on account of Public Works in the Bombay Presidency ; and the allotment under this head tends annually to increase. In the same year there were five railways open—l. The Great Indian Peninsula Railway: total miles open, 1278; total capital invested, £25,569,568 ; total receipts during the year, £1,872,826 ; working expenses, £1,203,200; net profit, £669,626. 2. The Bombay, Baroda, and Central India Railway : miles open, 389 ; capital invested, £58,418,202; receipts, £564,931; working expenses, £338,786; net profit, £226,145. 3, The Khamgdon State Railway: miles open, 8; capital invested, £48,530; receipts, £1241; working expenses, £562; net profit, £679. 4. The Amrdoti Rail- way : miles open, 54; capital invested, £43,730; receipts, £2302; working expenses, £1241; net profit, £1061. 5. The Sindh section of the Sindh Panjab and Dehli Railway :

miles open, 106; capital invested, £2,646,106; receipts, £157,100; working expenses, £118,934; net profit, £38,166. Total miles open of the above five railways, 17864; total capital invested, £36,726,136; total receipts in 1872, £2,598,400 ; total working expenses, £1,662,723 ; total net profit, £980,667. Besides these, the following railways are either in progress or about to be undertaken : —(1), State line, Southern Marhatta country ; (2), Native State line, Virdwal, Jundgarh, and Dhordji; (3), Patri Branch (State line, light rail) ; (4), Anand and Dakor Branch; (5), Mig&ngdon and Dhaboi Railway; (6), Wardha to Hinganghét and Warord: (7), Wadi to Haidardbad; (8), Khandwé to Indor. In 1872-73 the Bombay Tele- graph Department had 4406 miles of wire in operation.

Post-Orrices.—In 1872-73, 447 post-offices were distributed over the Presidency; total mileage of postal lines, 10,208 miles; total number of letters, parcels, &c., despatched and received, 17,601,982.

MINES AND Quarrizs.—Ihe Presidency of Bombay though deficient in mineral wealth, is abundantly supplied with stores of stone fitted for building and road-making purposes. At Teagar, in the Dharwar district, iron-ore is mined and smelted, but the scarcity of fuel prevents opera- tions being conducted on an extensive scale. There are also large slate quarries in Dharwar. Mandargé hill is quarried extensively for stone, the right of

working it being annually sold by public auction. In Belgdm district are quarries, from which building stones, stone bricks, or oblong quad- rangular blocks of soft rock are obtained in abundance. Limestone is also found in the river beds of this district. There are a few trap and laterite quarries in the Ratnagiri district. The trap stone is used for tank and well building, and for the plinths of houses; the laterite is used for house- building. Near Kardchi are five quarries containing a species of limestone, largely used in buildings in that town.

MANUFACTURES.—Thec indigenous manufactures of the country have rapidly declined since the influx of Manchester goods. But cotton weaving is still carried on upon a small scale in every village of any importance. Dyeing is prac- tised in most places where fresh water is procurable. Printed cotton goods are manufactured in all the large towns of Gujarat, and the further the locality is removed from the direct influence of railways the better the work is. This is owing to the competition of European cotton goods, which are sold much cheaper, and are more brilliant in colour, although less strong and durable, than the native manufactures. Most of the lower classes still wear home- spun and woven goods; but the cotton-mills crected in Bombay, Broach, and in other parts of the Presidency, have introduced threads and cloths, which are readily bought up, and upon which the native workmen display their taste and skill. The cloths manufactured for the Marhatta castes are of various kinds. Some are all cotton, or cotton and silk, some cotton silk with metallic threads, some silk with gold or silver thread. Ahmadabad, Yeolé, Ahmad- nagar, Maligdon, Nasik, Pind, and Dharwar, are all celebrated for their cotton goods. Carpets, rugs, horse-cloths, towels, napkins, &c., made of cotton, are manu- factured throughout the Presidency. Ahmadnagar has an ancient reputation for the strength and durability of its carpets; Khandesh and Dharwar for druggets, rugs, and bullock cloths. A new future has lately been opened to manufacturing energy by the introduction of machinery from England. The ancient products of the Presidency, above named, are chiefly household industries. But large steam mills are now rapidly springing up in Bombay city, Broach, Surat, and other stations on the railway lines, especially in the cotton districts. Several of these employ over 1500 hands; one is reported to have nearly double

that number; and the low rates of wage, with the natural

aptitude of the native for textile work, enables the Bombay |

mill-owners to compete with the Lancashire manufacturers, notwithstanding the heavy cost of importing machinery and of European supervision, Several of the mills have a capital of some hundreds of thousands sterling invested in them; and their superior reputation for turning out unglazed and genuine goods has almost driven the lower qualities of Manchester fabrics from the market. In 1873 fifteen mills were at work in the town and island of Bom- bay, and five in other parts of the Presidency. Most of them have both spindles and looms, and their yarn and piece goods find a ready market. In Ahmadabad, Surat, Yeola, Nasik, and Bombay, considerable quantities of silk goods are made, the silk being imported from China either in the cocoon or in skeins. Gold and silver thread enter largely into the manufacture of silk and cotton fabrics. The kinkhdb (kincob), the richest kind produced, is either gold thread and silk, or silver, gold, and silk. Embroidery in silk cloth and cotton, and in gold, silver, and silk thread, is carried on to some extent in Haidardbad, in Sindh, principally for European markets. Fibres are used for the manufacture of paper in Ahmadabad, Baroda, Surat, Nasik, Bombay, and Kolhapur. Mats, beds, &c., are manufactured from cocoa-nut fibre. Leather is worked into a variety of articles throughout the Presidency. The manufactures of minor importance consist of pottery, brass, and copper utensils, cutlery, and agricultural implements, gold and silver ornaments, carved wood, ivory work, é&c.

TRADE.—The total value of the external trade of the Presidency for 1872-73 was as follows:—Bombay Port —imports, £17,388,953; exports, £19,117,081; re-ex- ports, £5,140,924; total, £41,646,958. Minor ports—im- ports, £395,238 ; exports, £729,028; re-exports, £13,368 ; total, £1,137,634. Sindh ports—imports, £1,677,399 ; exports, £1,991,556; total, £3,668,955. Aden—imports, £1,407,102; exports, £834,087 ; total, £2,241,189. Total of the Presidency — imports, £20,868,692; exports, £22,671,752 ; re-exports, £5,154,292; total, £48, 694,736. In the same year 5314 ships, having a tonnage of 902,157 tons, cleared from Bombay

harbour, and 5208 ships, of 161,907 tons, from the minor ports. Principal articles of commerce—cotton, cotton piece-goods, wool and woollen piece goods, machines and machinery, oils, tea, wines and spirits, metals, coal, candles, jute and gunny cloths, apparel, sugar and sugar-candy, twist, hides and skins, grain and pulse, bullion, &c. In 1872-73 upwards of 55,300 tons of cotton were imported into Bombay in the shape of Manchester goods, and 143,017 tons of raw cotton exported from it.

REVENUE AND ExpENDITURE.—The total revenue of the Presidency for the year 1872-73 amounted to £9,980,043, and the expenditure to £8,027,040. The principal heads of revenue are as follows:—Land revenue, £3,751,050; tributes and contributions from native states, £92,337; forests, £114,640, excise, £418,746; assessed taxes, £110,098; customs, £667,825; salt, £885,013; opium, £2,614,897 ; stamps, £527,382; law and justice, £29,677; marine, £64,475; interest, £103,209. The settlement of the land revenue is usually made for thirty years.

STATISTICS OF PRorEcTIon.—The military strength of the Bombay Presidency consists of 1250 European commis- sioned officers, 11,067 European non-commissioned officers and rank and file, 27,002 Native commissioned and non- commissioned officers and rank and file; total, 39,319. The whole are under the control of a separate commander- in-chief for Bombay. ‘Ten ships constitute the strength of the Bombay marine. The regular police of Bombay con-

‘chancellor, and fellows.

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sisted in 1872-73 of 18,166 officers and men, maintained at a total cost of £305,810; the average being 1 man to every 6°8 square miles of the area, and to 900 of the population.

Epucation.—The University of Bombay, established in 1857, is a body corporate, consisting of a chancellor, vice-— The Governor of Bombay is ea- officio chancellor. The Educational Department is under a director of public instruction, who is responsible for the administration of the department in accordance with the general educational policy of the state.

In 1872-73 the number of schools and colleges aided by the state or under its inspection was as follows :—7 colleges, attended by 544 pupils; 4 professional schools, with 275 pupils; 41 high schools, 7167 pupils; 176 middle class schools, 16,612 pupils; 3595 lower class schools for boys, 182,147 pupils; 253 lower class schools for girls, 10,885 pupils; 12 normal schools, 602 pupils; total, 4088 schools, 218,466 pupils. The total cost for the schools was £285,650, of which the state contributed £99,600; the balance being obtained from school fees, local contributions, private endowments, &c.

History.—The territories now comprising the Presidency of Bombay formed in ancient times several separate Hindu kingdoms, among which Mahardshthra, Gujardshthra, Sindhu, were the most important. As in other parts of India, the great majority of the people are Hindus, with more recent accretions of Muhammadans, and a sprinkling of hill-tribes practising non-Hindu rites, and representing the pre-Aryan races. The first Muham- madan invasion of which we have authentic accounts is that of Mahmud of Ghazni, who, in 1024 «.D., in- vaded Gujarit with a large army, destroyed the national Hindu idol of Somnath, and carried away an immense booty. Muhammad Ghori also invaded Gujarat, and left a garrison in its capital. But it was not till after the Musalmadn power was firmly established in Northern India that the Muhammadan sovereigns of Dehli attempted the conquest of the south. In 1294 the Emperor Al4-ud-din first invaded the Dakhin (Deccan), and in 1297 he con- quered Gujarét. In 1312 the Muhammadan arms were triumphant through the Marhatta country ; and seven years later the whole of Malabar fell a prey to the invaders. In the middle of the 14th century the weakness of the Dehli sovereigns tempted the governors of provinces to revolt against their distant master, and to form independent king- doms. In this way the B&hmini kingdom was established in the Dakhin, and embraced a part of the Bombay Pre- sidency. Ahmadnagar and Gujarat also became the seats of a new kingdom. In 1573 Akbar conquered Gujarat and reannexed it to the empire, and in 1601 he effected the reconquest of Ahmadnagar and Khandesh. From this time the country was never tranquil, and Ahmadnagar be- came the focus of constant rebellions. During the latter part of the 17th century the Marhattds rose into power, and almost every part of the country now comprising the Presidency of Bombay fell under their sway.

As early as 1532 a.p. the island of Bombay was occupied by the Portuguese. The Dutch and English made an unsuccessful attempt to gain possession of the island in 1627, and in 1653 proposals were suggested for its purchase from the Portuguese. In 1661 it was ceded tothe English Crown, as part of the dower of the Infanta Catherina on her marriage with Charles II. So lightly was the acquisi- tion esteemed in England, and so unsuccessful was the administration of the Crown officers, that in 1668 Bombay was transferred to the East India Company for an annual payment of £10. The population at that time did not exceed 10,000 souls, and so unhealthy was the climate, that three years were regarded as the average duration of the life of its European inhabitants. At the time of the

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transfer, powers for its defence and for the administration of justice were also conferred ; a European regiment was enrolled; and the fortifications erected proved sufficient to deter the Dutch from their intended attack in 1673. In 1687 Bombay was placed at the head of all the Company's possessions in India ; but in 1753 the Government of Bom- bay became subordinate to that of Calcutta. The first English settlement in the Bombay Presidency was in 1618, when the East India Company established a factory at Surat, protected by a charter obtained from the Emperor Jahangir. After the termination of the second Marhatta war in 1803, the East India Company obtained the districts of Surat, Broach, Kair4, &c.; and on the overthrow of the Peshw4 in 1813, they annexed Pind, Ahmadnagar, Nasik, SholApur, Belgam, Kaladgi, Dharwar, &c. Sindh was con- quered in 1843, and became a part of the British empire. The native states under the supervision of the Government of Bombay are divided, historically and geographically, into two main groups. The northern or Gujarat group includes the territories of the Gaikwar, with the smaller states which form the administrative divisions of Kachh, Péhlanpur, Rew& Kanta, and Mahi Kanta. These terri- tories, with the exception of Kachh (Cutch), have an histori- cal connection, as being the allies or tributaries of the Gaik- wAr in 1805, when final engagements were concluded be- tween that prince and the British Government. The southern or Marhatt4 group includes

Kolhapur, Akalkot, Sawantwari, and the Sétar4 and southern Marhatta Jagirs, and has an historical bond of union in the friendship they showed to the British in their final struggle with the power of the Peshwiin 1818. The remaining territories may con- veniently be divided into a small cluster of independent zamindéris, situated in the wild and hilly tracts at the northern extremity of the Sdhyddri range, and certain

principalities which, from their history or geographical.

position, are to some extent isolated from the rest of the Presidency.

ADMINISTRATION.—The Government of Bombay is ad- ministered by a Governor in Council, the latter consisting of the Governor as president, two ordinary civil members, and, as a rule, the commander-in-chief of the Bombay army. These are the executive members of Government. For making laws there is a legislative council, consisting of the Governor and his Executive Council, with certain other persons, not fewer than four or more than eight in number, nominated by the Governor to be members of council for legislative purposes only, and intended to represent the non-official European and Native communities. Each of the members of the Executive Council ‘has in his charge one or two departments of the Government ; and each department has a secretary, an under-secretary, and an assistant secretary, with a numerous staff of clerks. The political administration of the native states is under the superintendence of British agents placed at the principal native courts; their position varies in different states according to the relations in which the principalities stand with the paramount power. The administration of justice throughout the regulation districts of the Presidency is conducted by a High Court at Bombay, consisting of a Chief Justice and seven Puisne judges, along with district and assistant judges throughout the districts of the Presi- dency. The revenue administration of the regulation dis- tricts is carried on by two revenue commissioners, seven- teen collectors, twenty assistant collectors, and a varying number of supernumerary assistants. (w. Ww. H.)

Bompay City AND ISLAND.

The Island of Bombay, with an area slightly in excess of 22 square miles, is situated in 18° 53’ 54” N. lat., and

72° 52’ E. long. It consists of a plain about 11 miles long by 3 broad, flanked by two parallel lines of low hills. A neck of land stretching towards the south-west forms the harbour on its eastern side, sheltering it from the force of the open sea, and enclosing an expanse of water from 5 to 7 miles wide. At the south-west of the island, Back Bay, a shallow basin rather more than 2 miles in breadth, runs inland for about 3 miles between the extreme points of the two ranges of hills. On a slightly raised strip of land between the head of Back Bay and the harbour is situated the fort, the nucleus of the city of Bombay. From this point the land slopes westward towards the central plain, a low lying tract, which before the construction of the embankment known as the Hornby Velard, used at high tide to be submerged by the sea. To the north and east, although causeways and railway embankments have now shut out the sea, a large area of salt-marsh land still remains subject to inundation.

In the foregoing article on the Bombay Presidency it is explained that Bombay Island passed to the English Crown as part of the dower of the Infanta Catherina, on her marriage with Charles II., and that although the new acquisition was at first despised, it rose in 1687 to the chief importance in the East India Company’s possessions. In the next century it declined before the growth of Calcutta, and sank into a subordinate settlement. The present cen- tury has again witnessed a revolution in its fortunes. Its splendid harbour and comparative nearness to the Suez Canal, with the system of railways which now connect Bombay with the other Presidencies, have marked out for it a career scarcely second, if at all second in commercial importance, to that of Calcutta itself. The sudden demand for Indian cotton, which resulted from the American war, gave an unprecedented rapidity to its development. The cotton of Gujar4t, Dharwar, and other parts of Bombay, is much superior to the Bengal fibre. Several years of brilliant prosperity culminated in 1866-67 in a financial crisis, that left the commerce of Bombay in a shattered state. Depending as it does chiefly on the one article of cotton, along with some export of grain and the Government opium, the trade of Bombay rests on a narrower basis than that of Calcutta, which in years of misfortune has a large variety of staples to fall back upon, such as tea, indigo, jute, rice, hides, oil-seeds, &c. Moreover, Bombay has only the costly railway communication with the interior parts of India, while Calcutta commands the confluence of two of

the greatest river systems in the world, the Brahmaputra and the Ganges. Nevertheless, Bombay is pressing close upon Calcutta as the commercial capital of India. Its imports are about as great, and its exports not very far short. In 1871-72 its total trade was £50,384,929 against a total of £54,136,829 in Calcutta. In that year the Bombay imports were 22} millions sterling ; the exports, 23} mil- lions, and the re-exports, 44 millions: total, 504 millions sterling.

In natural scenery and in the sanitary advantages of its position Bombay ranks first among the cities of India. The Bombay Island, or, as it ought to be more correctly called, the Bombay Peninsula, is now connected with the mainland by the railway causeways. It stands out from a coast ennobled by lofty mountains, and its harbour is studded by rocky islands and precipices, whose peaks rise to a great height. The approach from the sea discloses one of the finest panoramas in the world,—the only European analogy being the Bay of Naples. The town itself consists of well-built and unusually handsome native bazars, and of spacious streets devoted to European commerce. In the native bdz4r the houses rise three or four stories in height, with elaborately carved pillars and

front work. Some of the Europeau hotels and commercial Nee

buildings are on the American scale, and have no rival in any other city of India. The private houses of the European residents lie apart alike from the native and from the mercantile quarters of the town. As a rule, each is built in a large garden or compound ; and although the style of architecture is less imposing than that of the stately residences in Calcutta, it is well suited to the climate, and has a beauty and comfort of its own. The favourite suburb is Malabar hill, a high ridge running out into the sea, and terraced to the top by handsome houses, which command one of the finest views in the world. To the right of this ridge, looking towards the sea, runs another suburb known as Breach Candy, built close upon the beach and within the refreshing sound of the waves. To the left of Malabar hill the island forms a spacious bay, with a

SCALE of FEET

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Ground-Plan of Bombay.

promontory at the other side, which marks the site of the old Bombay Fort. The fort is now a mere garrison, with small pretensions to defensive capabilities. Its walls are demolished, and its area is chiefly devoted to mercantile buildings. Further round the island, beyond the fort, is Mazagon Bay, commanding the harbour, and the centre of maritime activity. The defences of the port consist chiefly in ironclad “Monitors” anchored off the town, with one or two fortified islands, and the guns which still line a por- tion of the old fort walls that have been left standing towards the sea. The census of 1872 disclosed a popula- tion of 644,405 souls; of whom 408,680, or 63°42 per cent., are Hindus; 138,815, or 21-54 per cent., Muhammadans; 44,091, or 6-84 per cent., Parsis; 15,121, Buddhists and Jains; 34,705, or 5°39 per cent., European, African,

BAY

Eurasian, and Native Christians, with 2993 classified under the head of “others.” Dycing, tanning, and working in metals may be noticed as specially active trades, but the most progressive and important industry is the manufacture of yarn and cotton cloth. In 1873 there were 5 steam spinning and weaving mills in Bombay, giving employment to about 11,000 hands. In these factories 380,000 spindles and 5000 looms were at work. A considerable section of the population is supported by the cultivation of cocoa-nut trees and the preparation of intoxicating drinks from the juice of the different species of palm. Rice is the chief agricultural product, but many varieties of garden vege- tables are profitably cultivated. Of these the most com- mon are onions, “ bhendis” (Abelmoschus esculentus), and gourds of different sorts. The imperial revenue from the town and island of Bombay is derived from two sources, —the one supervised by the collector of Bombay, the other by the commissioner of customs. The total receipts for the past year, under the first head, amounted to £148,287, of which £23,131 was derived from land, £17,250 from excise, and £107,906 from stamps. The total amount collected by the commissioner of customs was £3,252,714, of which the customs yielded £609,630, and the export duty on opium £2,643,084. Owing to the difficulty of procuring colonists in the

early days of the settlement, the land is generally held on easy terms,—the payment to Government being in most cases of the nature of a quit rent, free from enhancement or resettlement as long as the land is used for cultivation only. Of the whole area, 13 miles are returned as cultivated, and 9 as unculturable. During the year 1872 there were 101 schools in Bombay, attended by 11,351 scholars, or 1 to every 56 of the entire population. The total strength of the local police foree in 1872 was 1402, or 1 policeman to every 459 inhabitants. Of the entire number, 1124 are muni- cipal, and 278 Government police. Of the former, 35 are European, and 13 are mounted Native police. The Government police are employed on harbour duty and as guards for Government offices. Hight of them are Huro- peans.

MunicieaL Stratistics.—The limits of the Bombay municipality exteud over the whole of the island of Bom- bay, including, as stated above, a population of 644,405 souls. The total municipal revenue for the year 1873 amounted to £314,645, of which £223,041 was raised by taxation, £59,958 on account of services rendered, and £31,646 from municipal property and miscellaneous receipts. The following are the main items under the head of taxation proper:—House rate, £73,587 ; police rate, £24,189; lighting rate, £21,179; wheel taxes, £23,197; tobacco and liquor duty and licenses, £28,690 ; town duties, £45,200; and additional rates from Port Trust, £4000. Under the head, Service rendered, are included the Halalkar cess and the water rate, yielding respectively £20,392 and £39,566. The returns under the third head are chiefly receipts from the Crawford markets. The total expenditure was £312,208. Of this amount £25,325 was spent on general supervision, £36,041 in supporting the police and fire bngade. Under the head of public health, £87,574 was spent, and £84,835 on public works. The interest and sinking fund on the police debt consumed £74,496. The incidence of municipal taxation per head of the population is 6s. 9d. It is estimated that the gross annual income of the city is about 855 lakhs of rupees, or upwards of 84 millions sterling, on which sum the municipal taxation proper amounts to about 2°57 per cent., and the total municipal income and expenditure to about 3°64 per cent. The municipal debt at present amounts to about £790,000, or

| nearly 24 years’ income. (w. W. H.)

BONALD, Louis Gasriez AmsBROISE, VICOMTE DE, philosopher and politician, was born at Monna, near Milhaud, in Rouergue, France, on the 2d October 1754. He served for some years in the king's musketeers, and after his marriage was made mayor of his native place. Dissatisfied with the revolutionary principles then being acted upon, he emigrated in 1791, and joined the army of the Prince of Condé. Soon afterwards he settled, with his family, at Heidelberg, where he wrote his first important work, Z/éorve du pouvoir politique et réligiewa dans la Société cwile, 3 vols., 1796, in which his conservatism and reactionary views are fully expounded and illustrated. In this work, too, he predicted the certain return of the Bourbons to France. The book was condemned by the Directory, and in France very few copies escaped detection. Naturally, on his return to his native country, M. de Bonald found himself an object of suspicion, and was obliged to live in retirement. He still continued to publish works of the same tendencies,—his Hssai analytique sur les Lois naturelles de Pordre social appearing in 1800, the Législation primitive in 1802, and the treatise Du Divorce considéré au XIX™ Siacle shortly after. In 1806 he was associated with Chateaubriand and Fiévée in the conduct of the Mercure de France; and two years later, after great persuasion, he allowed himself to be appointed councillor of the Imperial University, which he had often attacked. After the Restoration he was made member of the Council of Public Instruction, and from 1815 to 1822 he sat in the chamber as deputy. His speeches and votes were invariably on the extreme Conservative side ; he even advocated a literary censorship. In 1822 he was made minister of state, and presided over the commission in whose hands the censorship rested. Inthe following year he was raised to the rank of peer, a dignity which he lost through refusing to take the oath in 1830. From 1816 onwards he had been a member of the Academy. He took no part in public affairs after 1830, but retired to his country-seat at Monna, where he died on the 23d November 1840.

Bonald was one of the most able and vigorous writers of the theocratic or reactionary school, which comprehended among its numbers such men as De Maistre, De Lamennais, Ballanche, and D'Eckstein. The great bulk of his writings belong to the department of social or political philosophy ; but

all the results at which he arrives are deductions from a few principles. The one truth which to him seemed, in fact, all-comprehensive was the divine origin of language. In his own somewhat enigmatic expression, L'homme pense sa parole avant de parler sa pensée, words and thoughts are inextricably linked together; the first language con- tained the essence of all truth. From this premise he draws his proof for the existence of God, and for the divine origin and consequent supreme authority of the Holy Seriptures. The infallibility of the church as the exponent of spiritual truth readily follows. While this thought lies at the root of all his speculations there is a formula of constant and significant application. All relations are by him reduced to the triad of cause, means, and effect, which he sees constantly repeated throughout all nature. Thus, in the universe there are the first cause as mover, movement as the means, and bodies as the result; in the state we have power as the cause, ministers as the means, and subjects as the effects; in the family we have the same relation exemplified by father, mother, and children. It is also to be remarked that these three terms bear specific relations to one another, the first is to the second as the second is to the third. Thus, in the great triad of the religious world,—God, the Mediator, and Man,—God is to the God- Man as the God-Man is to Man. It will be readily apparent how Bonald was able from these principles to construct a complete system of political absolutism, for the

sufficiency of which only two things were wanted,—well- grounded premises instead of baseless hypotheses, and the harmony of the scheme with the wills of those who were to be subjected to it. Bonald's style is remarkably fine ; ornate, but pure and vigorous. Many fruitful thoughts are scattered among his works, which have been popular with a certain party ; but his system scarcely deserves the name of a philosophy.

Besides the above-mentioned works, Bonald published Recherches Philosophiques sur les premiers objets de Connaissances Morales, 2 vols., 1818 ; Mélanges littéraircs et politiques, Démonstration phito- sophique du principe constitutif de la Société, 1830. The first col- lected edition appeared in 12 vols., 1817-19; the latest is that in 8 vols., with introductory notice by the Abbé Migne. See Notice sur M. le Vicomte de Bonald, 1841 (by his son), and Damiron, Phil. en France au XLXme Siecle.

BONAPARTE, or, as it was originally spelled, BUOoNAPARTE, the name of the Italian family from whom the great Napoleon was descended. ‘The father of the first emperor, Carlo Maria Bonaparte, was born at Ajaccio in 1746. He was a lawyer by profession, and took a vigorous part in Paoli’s insurrection. In 1781 he was one of the members of the council of Corsican nobility; he also held the post of assessor of Ajaccio. In 1785 he died of cancer in the stomach at Montpellier, whither he had removed for his health. His wife, Letizia Ramolino, born in 1750, was celebrated for her majestic beauty and resolute courage. She accompanied her husband through the campaigns with Paoli, and in 1793 emigrated with her family to Marseilles, where for a time she lived in great penury. After her son was made first consul she removed to Paris ; and, on the establishment of the empire, received the title of Madame Mére. She cared little for display ; and her frugal style of living frequently displeased Napoleon. After the battle of Waterloo she took up her abode in Rome, where she continued to reside till her death in 1836. Of her large family of thirteen, eight survived their father and have become known in history. These in order of age are—

I. Joszpn, the eldest son, born on the 7th January 1768. He was placed, along with his younger brother Napoleon, at the school of Autun, from which the latter was soon afterwards withdrawn. Oncompleting his education he contemplated a military career, but, on the death of his father, devoted himself to the care of his family. He studied law at the University of Pisa, and was received as an advocate in Corsica. He and his brother eagerly embraced the revolutionary side ; and in 1793 the whole family were compelled to emigrate to Marseilles. In the following year he married Mlle, Clary, daughter of a rich merchant, whose younger sister afterwards became the wife of Bernadotte. Two years later, when Napoleon was made general of the army of Italy, Joseph accompanied him as commissary-general. In 1797 he was elected to the Council of Five Hundred, and sent as ambassador to the Pope. On the establishment of the consulate he was made councillor of state, and by his suave and courteous manners rendered good diplomatic service. He conducted the negotiations with the United States in 1800, concluded the Treaty of Luneville in 1801, and was similarly engaged at the Treaty of Amiens in 1802. In 1805, after refusing various posts offered by his brother, he was left in charge of the Government during the war in Germany. In the following year, however, he was compelled to take

command of the army of Naples, and soon after he set out it was announced to him that he must assume the throne of that kingdom. With considerable reluctance he accepted the

ost, and soon found that, though nominally king, he was really but the viceroy of his brother. He introduced many reforms, most of which were well conceived, but which did not at all meet the wishes of Napoleon, who looked upon Naples merely as a province of France, and thought it

useful only in so far as it contributed to the support of his own power. The Neapolitans soon discovered that their king was but a mouth-piece, and learned to despise him ; and his rule was disturbed by constant insurrections. In the beginning of 1808 Napoleon began to communicate with his brother regarding the affairs of Spain ; and finally, on the 10th May, wrote to him that the Spanish throne was vacant, and that he had destined it for him. Joseph, with many forebodings, was obliged to accept; and for a short time matters seemed sufficiently smooth. But the smouldering discontent soon broke out into open flame over the land, and the Spaniards, assisted by the British and Portuguese, made a struggle for freedom. Joseph's influence in the kingdom was a nullity; the people had never accepted him, and Napoleon, by giving absolute command to his various marshals, robbed his brother of all real power. Thrice the new king was compelled to fly from Madrid, and it was with difficulty that he escaped after the final battle of Vittoria. During the great struggle of 1814 Joseph acted as lieutenant-general of the empire, and as adviser-in-chief to the empress-regent. Under his brother's orders he sent off Maria Louisa and her son to Blois when the allied army approached Paris ; and it was on his authority that Marmont treated for the capitulation of the city. For these acts he has sometimes been blamed, but with scant justice. While Napoleon was in Elba Joseph took up his residence in Switzerland ; but he rejoined his brother in Paris during the Hundred Days. After the abdication he had an interview with the fallen emperor at the Isle of Aix, and generously offered to give up to him his cwn means of escape. 'The proposal not being accepted, he sailed for America and settled near Philadelphia, at Point-Breeze, on the banks of the Dela- ware. Here he lived for some years under

the title of Comte de Survilliers, endeared to the inhabitants by his liberality and gracious manners. After the July revolution of 1830 he wrote a long and eloquent letter, advocating the claims of his nephew, the duke of Reichstadt, to the French throne. Two years later he visited England, where he resided for some years, and to which he paid a second visit in 1839 In 1841 he was permitted to enter Genoa and Florence where his wife resided. In the latter city he died on the 28th July 1844. Joseph Bonaparte was of a handsome figure and commanding presence; his manners were peculiarly suave and courteous. Of all the brothers he seems to have been the only one personally loved by Napoleon. His wife, the daughter of a Marseilles merchant, died on the 7th April 1845. The elder of his two daughters, Zenaide Charlotte Julie (born 1801, died 1854), was married to her cousin Charles Bonaparte, son of Lucien; the younger, Charlotte (born 1802, died 1839), was married to Napoleon Louis, second son of Louis Bonaparte.

II. Napotzon, born 1769. See Napoxeon I.

III. Lucten, Prince of Canino, was born at Ajaccio, 21st March 1775. He was educated at Autun, Brienne, and Aix, and rejoined his family in Corsica in 1792. Already imbued with the principles of the Revolution he turned against Paoli when the latter declared against France, and was spokesman of the deputation sent to Marseilles to solicit aid from the republic. He did not return to Corsica, as the whole Bonaparte family soon afterwards emigrated to France, and he obtained employ- ment in the commissariat at Saint Maximin. Here he married Mlle. Christine Boyer, of poor but good family, and began to take the leading part in the popular meetings of the place. He was elected president of the Republican committee of the town, and, by his moderation and firm- ness, prevented excesses such as occurred in other parts of the country. After the fall of Robespierre he was in

danger of being taken for one of his partisans, but resolutely maintained his ground, and declined to take refuge in flight. In 1795 he left Saint Maximin for Saint Chamans, where he had been appointed inspector of military stores, and where he was arrested and confined for six months. His release was obtained through his brother’s influence with Barras, and he retired for a time to Marseilles. In 1795 he was made commissary to the army of the north, and spent some time at Brussels and in Holland; but his heart was in

the political warfare of Paris, and in 1796 he obtained permission to resign. He had a short interview with Napoleon in Italy, and spent the two succeeding years in Corsica. In 1798 he was elected deputy to the Council of Five Hundred, and at once set off for Paris, He was an ardent adherent of the constitution of 1795 (the year III.), and sympathized rather with the Abbé Sieyés than with the extreme party. His abilities were soon recognized: he was an able and powerful speaker, with a calm courage that defied all popular tumult. His house, also, was the resort of the best literary society of Paris. It gradually became clear to him that the power of the Directory was divided and broken, and that a coup d'état was required to prevent another sanguinary revolu- tion. There was but one man ina position to effect this change—his brother Napoleon, whose unexpected arrival on the 10th October 1799 was received with the utmost joy. A week after, Lucien was elected president of the Council of Five Hundred. Careful preparations were made, and on the 19th Brumaire the principles of the Revolution ceased to have a living power. On that day the coolness, promptitude, and courage of Lucien alone pre- served Napoleon from destruction. He took part in pre- paring the new scheme of government, and was appointed to succeed La Place as minister of the interior. His com- petency for the post was undoubted, but differences with his brother had already begun, and these were fomented by the treacherous Fouché ; so that, in little more than a year, he gave up office, and was sent as ambassador to Spain. He succeeded in his negotiations, though not entirely to Napo- leon's satisfaction, and after his return to Paris took an active part in the arrangement of the Concordat and the establishment of a legion of honour. After the consulate had been settled on Napoleon for life Lucien was made a senator, and received the estate of Seppelsdorf. But his marriage in 1803 with the beautiful Mme. Jouberthon was displeasing to the First Consul, who already contemplated royal alliances for his brothers. Lucien, who did not approve the project of making the consulate hereditary, thought it advisable to leave France, and settled first at Milan, but finally at Rome. He lived in great magnifi- cence, indulging his literary tastes, and apparently indifferent to the growth of the imperial power. After the peace of Tilsit Napoleon had an interview with him, and offered him a kingdom provided he would look upon it as in all respects a province of the empire. Lucien refused, and his brother then gave him to understand that he must quit the Con- tinent. He withdrew from Rome, and settled on the estate of

Canino, whence he took his title of prince, but soon came to the resolution of sailing for America. He embarked on the Ist August 1810, was captured by an English cruiser, and was carried to England, where for some time he was kept under surveillance in Ludlow Castle. He after- wards purchased a house near London, in which he resided till 1814, when he returned to Rome. In two letters to Elba he offered assistance to his brother; and during the Hundred Days he sat in the Chamber of Peers as a French prince. After Waterloo he advised Napoleon to dissolve the assemblies and proclaim himself dictator, and it was on his recommendation that the second abdication was made in favour of Napoleon's son. All his efforts to obtain a

regency were unavailing, and soon after parting from his brother on the 29th June, he left France. Arrested at Turin he was kept for three months in confinement before he was suffered to settle again at Rome. He passed the remainder of his life in Italy, surrounded by his family and busily engaged in literary and antiquarian labours. The grounds around Canino proved unusually rich in gems and Etruscan curiosities, of which a valuable cabinet was formed. He died at Viterbo, 29th June 1840 Lucien was a man of high abilities, resolute to his purpose, and of great cour- age and presence of mind He was throughout his whole life a moderate or constitutional republican. As a literary man he enjoys considerable distinction, though his great epic, Charlemagne (2 vols. 4to, London, 1814), was a failure. His Mémoires, unfortunately, have not been com- pleted He was twice married. By his first wife he had two daughters; by his second, four daughters and four sons, Of the sons the eldest, Charles Lucien Jules Laurent (born 1803, died 1857), prince of Canino, is distinguished as a naturalist, and takes rank along with Wilson and Audubon. In 1822 he married his cousin, Zenaide, daughter of Joseph Bonaparte, whom he joined in America. He remained there till 1828, and gained high reputation by his works on American ornithology. After his return to Italy he began the publication of a magnificent work, Iconograjia della Fauna Italwa, 3 vols., 1833-41. On his father's death in 1840 he succeeded to the title, and in 1847 began to interest himsclf in politics. He was ordered to leave the Austrian territories for having introduced political matter into a scientific congress, and in 1848-49 he took part on the Radical side in the disturbances at Rome.

Driven from that city by the arrival of French troops he landed at Marseilles, but received an order to quit French territory. Not having paid any attention to this he was seized and conducted under escort to Havre, whence he was compelled to take ship for England. He returned once more to Paris, but did not again interfere in politics. Of the other sons of Lucien, Louis Lucien (born in 1813) has distinguished himself as a philologist, and is known by his writings on the Basque language as well as on the dialects of Italy and England; and Pierre Napoleon, commonly called Prince Pierre (born 1815), has lived a troubled life of adventure in Itaiy, America, and France. In January 1870 he shot and mortally wounded the journalist Victor Noir, who had called upon him to arrange preliminaries for a duel with M. Paschal Grousset. ‘This unfortunate affair did inconceivable harm to the Napoleonic cause. The prince was found not guilty, but was ordered to indemnify the family of Noir. From that time he took up his residence in London,

IV Marr Anne Etisa, born at Ajaccio on the 3d January 1777. She married in 1797 Felix Bacciochi, captain of infantry, who was poor but of good family. In 1805 Lucca and Piombino were erected into a principality for her, and she gave such proofs of administrative ability as to be named the Semiramis of Lucca. After the fall of Napoleon she lived for some time at Brunn, and latterly at Santo Andrea near Trieste, where she died in 1820.

~~Y. Lovis, the father of Napoleon IIL, was born at Ajaccio in 1778. He received the greater part of his military education at the school of Chalons, and accom~~ panied his brother throughout the famous Italian cam- paigns. He distinguished himself in various engagements, particularly at the battle of Arcola, but manifested little enthusiasm for a military career. He took part in the Egyptian expedition, and was sent back from Cairo to report the state of affairs and solicit reinforcements. In 1802, with the greatest reluctance, for he was enamoured of another, he was prevailed on to marry Hortense Beau- harnais, Josephine’s daughter. The forced marriage proved

exceedingly unhappy. After the consulate he became general, and in 1804 was raised to the dignity of prince. He was commissioned to organize the army of the north in 1805, and performed his task to the complete

satisfaction of Napoleon. Soon afterwards the States-general of Holland sent a deputation to the emperor praying that one of his brothers might be made their king. Louis, who was selected for this dignity, consented with considerable reluctance, and was proclaimed on the 6th June 1806. But when he had assumed the reins of government he manifested the warmest interest in his new subjects. He procured the withdrawal of the French troops from Holland, and formed a cabinet consisting almost entirely of Dutch notables. The decree blockading the British Isles was extremely offensive to him in his new position, and he evaded it so far as possible. In 1807 the death of his eldest son caused him to withdraw for a timc to the south of France, and on his return Hortense did not accompany him. The relations of the king with Napoleon were anything but satisfactory. The emperor complained of not receiving due assistance from Holland, and in 1809 sent Bernadotte to take com- mand of the army in that country. At the meeting of the two brothers in December 1809 there was a bitter quarrel; and Louis, who felt that his country was looked on as merely a province of the empire, was detained as a prisoner, while Holland was overrun with French troops. Before obtaining his release he was compelled to sign a new treaty with the emperor, which greatly curtailed his power. Mat- ters were not improved after his return to Amsterdam, and onthe 1st July 1810 he abdicated at Haarlem in favour of his elder son Napoleon Louis, He then set out for Téplitz, where he resided with the assumed title of Comte de St Leu. His kingdom was soon united to the empire, and no attention was paid to the arrangement he had made. After the Russian campaign he offered his services to his brother, and tried again, but in vain, to resume his power in Holland. In 1815 he instituted pro- ceedings against his wife to obtain from her the custody of his elder son, and gained his cause. He refused to take any part in the Hundred Days, and settled in Rome, where he passed most of the remainder of his life. His wife was reunited to him, but the death of his elder son, in 1831, was a blow from which he never recovered. The unfortunate attempts of Louis Napoleon at Strasburg and Boulogne also affected him deeply; and he in vain attempted to procure his son’s liberation from the prison of Ham. After the escape of the prince his father earnestly desired to see him, but passports for Italy could not be granted. The disappointment was too much for Louis, who was seized with apoplexy, and died on the 25th July 1846. His remains were conveyed to Saint Leu in 1847. Louis was of a somewhat retiring and philosophic disposition,

inclined to rule well had he been permitted, and of decided literary tastes. He published several works—Aarve, ow les Hol- landaises, a novel; Odes; Mémoire sur la versification ; Histoire du Parlement Anglais; Documents historiques et réflevions sur la Gouvernement de la Hollande ; Réponse a Sir Walter Scott; Nouveaw recueil des poésies. He had three sons—Napoleon Charles, born 1802, died 1807 ; Napoleon Louis, born 1804, died 1831; Charles Louis Napolcon (NapoEon IIL, g.v.), born 1808, died 1873. VI. Marie Paving, born at Ajaccio 1780. In 1801 she was married to General Leclerc, whom she accompanied in the same year toSt Domingo. Her liusband died there of yellow fever in 1802, and she returned to France. On the 28th August 1803 she was married, through her brother's influence, to Camillo, Prince Borghese, a wealthy Italian nobleman. It was not long before they separated ; and Pauline, with the rank of duchess of Guastalla, lived in a style of easy magnificence. She was good tempered,

fond of art, and liberal. In 1810 Napoleon, although he had a great affection for her, banished her from court for her insulting behaviour to Maria Louisa. Yet she joined him in the Isle of Elba in 1814, and would fain have accompanied him in his exile at St Helena. She was reconciled to her husband shortly before her death on 9th June 1825 Pauline was Napoleon's favourite sister. She was extremely beautiful, and her statue as Venus Victrix, by Canova, is a well-known work of art.

VII. Martz AWNNONCIADE CAROLINE, born at Ajaccio 1782. In 1800 she was married to Murat; in 1806 she became grand-duchess of Berg and of Cleves, and in 1808 queen of Naples. In 1815, after the flight of her husband, she was compelled to leave the capital, and surrendered to the Austrians. She was for a short time imprisoned at Trieste, and was then permitted to reside at Haimburg near Vienna. She afterwards obtained leave to take up her abode at Trieste with her sister Elisa. In 1838 she obtained a pension from the French Government, but did not enjoy it long. Shc died on 18th May 1839.

VIII. Jéréme, the youngest brother of Napoleon, was born at Ajaccio in 1784. In 1800 he centered the navy, and served in the Mediterranean, and under Villaret Joycuse in the West Indies. In 1802-3 he was recalled ; but

tne port in which his vessel lay being blockaded by the English cruisers, he made his way to Boston, whence he intended to take a passage to France. He was well received in the United States, and fell violently in love with a beaunti- ful young American, Miss Elizabeth Paterson, daughter of a Baltimore merchant, whom hemarried on the 24th December 1803. He remained in America till 1805. Meanwhile Napoleon, excessively displeased, had passed a decree annulling the marriage, and declined to allow the lady to enter France Jérdme's submission was rewarded by high command in the navy, in which he showed himself a competent officer. In 1806 he was made brigadier-general in the army, and distinguished himself in Silesia. On the 8th July of the following year he was made king of West-phalia; and, on the 22d August, he married the daughter of Frederick king of Wtirtemberg. He accompanied Napoleon on the Russian campaign, but was disgraced for apparent want of success in some engagement, and retired to his kingdom. After the first abdication he lived for some time at Trieste, but at once rejoined the emperor in 1815, and took a conspicuous part in the hurried events of the Hundred Days. After Waterloo and the second abdication, Jéréme retired to the kingdom of his father-in- law, where he lived in a species of imprisonment. He moved afterwards to Trieste, Rome, Florence, and Lausanne, and in 1847 was permitted to visit Paris. In the follow- ing year he was made governor of the Invalides, and in 1850 marshal of France. In 1852 he was president of the senate, but after that time he took no active part in politics He died on the 24th June 1860. Of his children the only one famous is Joseph Charles Paul, com- monly known as Prince Napoleon, born in 1822.

Besides the vast mass of mémotres and treatises relating to the Bonaparte family, the following special works may be noted :—A. du Casse, Afémotres ct correspondance politique ct militaire du Rot Joseph, 10 vols., 1854; Miot de Melito, Mémoires, 3 vols., 1858; Mémoires de Lucien Bonaparte, 1836, 1845; Documents historiques et réflexions sur le Gouvernement de la Hollande (by Louis), 3 vols. 1820 ; Du Casse, Mémovres du roi Jeréme ; Wouter's Les Ronapartes depuis 1815 jusqu'a nos jours; Jerrold, Life of Napoleon LIT, vol. i.

BONAVENTURA. Joun or Finanza, or Fipenza, more commonly known as St Bonaventura, was born at Bagnarea in the Papal States, in the year 1221.

He was at an early age destined by his mother for the church, and is said to have received his cognomen of Bonaventura from St Francis of Assisi, who performed on him a miraculous cure. He entered the Franciscan order in his twenty-second

year, and is said to have studied at Paris under Alexander of Hales. This does not seem very probable, but he certainly studied under Alexander's successor, John of Rochelle, to whose chair he succeeded in 1253. Three years before that period his fame had gained for him permission to read upon the Sentences, and in 1255 he received the degree of doctor. So high was his reputation both for brilliancy of intellect and purity of mind that, in the following ycar, he was elected general of his order. He at once set himself to work to introduce better discipline, and by his mild regulations succeeded in effecting much good. He was an advocate of asceticism, and looked upon the monastic life as the surest means of grace. It is worthy of notice that by his orders Roger Bacon was interdicted from lecturing at Oxford, and compelled to put himself under the surveillance of the order at Paris. Bonaventura was instrumental in procuring the election of Gregory X., who rewarded him with the titles of cardinal and bishop of Albano, and insisted on his presence at the great Council of Lyons in the year 1274. At this meeting he died. Bonaventura's character seems not unworthy of the eulogistic title, " Doctor Seraphicus," bestowed on him by his contemporaries, nor of the place assigned to him by Dante in his Paradiso. He was formally canonized in 1482 by Sixtus IV.

His works, as arranged in the Lyons editon (7 vols., folio), consist of expositions and sermons, filling the first three volumes ; of a commentary on the Sentences of Lombardus, in two volumes, celebrated among mcdizval theologians as incomparably the best exposition of the third part ; and of minor treatises filling the remaining two volumes, and including a life of St Francis. The smaller works are the most important, and of them the best are the famous L[tinerarium Mentis ad Deum, Breviloquium, De Reduc- tione Artium ad Theologiam, Soliloquium, and De septem itineribus ceternitatis, in which most of what is individual in his teaching is contained.

In philosophy Bonaventura presents a marked contrast to his great contemporaries, Thomas Aquinas and Roger Bacon. While these may be taken as representing respectively physical science yet in its infancy, and Aristotelian scholasticism in its most perfect form, he brings before us the mystical and Flatonizing mode of speculation which had already to some extent found expression in Hugo and Richard of St Victor, and in Bernard of Clairvaux. To him the purely intellectual element, though never absent, is of inferior interest when compared with the living power of the affections or the heart. He rejects the authority of Aristotle, to whose influence he ascribes much of the heretical tendency of the age, and some of whose cardinal doctrines—such as the eternity of the world—he combats vigorously. But the Platonism he received was Plato as understood by St Augustine, and as he had been handed down by the Alexandrian school and the authors of the mystical works passing under the name of Dionysius the Areopagite. Bonaventura accepts as Platonic the theory that ideas do not exist im rerum natura, but as thoughts of the divine mind, according to which actual things were formed ; and this conception has no slight influence upon his philosophy. Like all the great scholastic doctors he starts with the discussion of the rela- tions between reason and faith. All the sciences are but the handmaids of theology ; reason can discover some of the moral truths which form the groundwork of the Christian system, but others it can only receive and apprehend through divine illumination. In order to obtain this illumination the soul must employ the proper means, which are prayer, the exercise of the virtues, whereby it is rendered fit to accept the divine light, and meditation which may rise even to ecstatic union with God. The supreme eud of life is such union, union in contcmplation or intellect

and in intense absorbing love; but it cannot be entirely reached in this life, and remains as a hope for futurity. The mind in contemplating God has three distinct aspects, stages, or grades,—-the senses, giving empirical knowledge of what is without and discerning the traces (vestigia) of the divine in the world; the reason, which examines the soul itself, the image of the divine Being; and lastly, pure intellect (intelligentia) which, in a transccndent act, grasps the Being of the divine cause. To these three

correspond the three kinds of theology,—theologia symbolica, theologia propria, and theologia mystica. Each stage is subdivided, for in contemplating the outer world we may use the senses or the imagination; we may rise to a knowledge of God per vestigia or in vestigus. In the first case the three great properties of physical bodies—weight, number, measure,— in the second the division of created things into the classes of those that have merely physical existence, those that have life, and those that have thought, irresistibly lead us to conclude the power, wisdom, and goodness of the Triune God. So in the second stage, we may ascend to the knowledge of God, per imaginem, by reason, or in tmagine, by the pure understanding (¢ntellectus) ; in the one case the triple division—memory, understanding, and will,—in the other the Christian virtues—faith, hope, and charity— leading again to the conception of a Trinity of divine qualities —eternity, truth, and goodness. In the last stage we have first stelligentia, pure intellect, contemplating the essential being of God, and finding itself compelled by necessity of thought to hold absolute being as the first notion, for non-being cannot be conceived apart from being, of which it is but the privation. To this notion of absolute being, which is perfect and the greatest of all, objective existence must be ascribed. In its last and highest form of activity the mind rests in the contemplation of the infinite goodness of God, which is apprehended by means of the highest faculty, the apex mentis, or synderesis. This spark of the divine illumination is common to all forms of mysticism, but Bonaventura adds to it peculiarly Christian elements. The complete yielding up of mind and heart to God is unattainable without divine grace, and nothing renders us so fit to receive this gift as the meditative and ascetic life of the cloister. The monastic life is the best means of grace.

Bonaventura, however, is not merely a meditative thinker, whose works may form good manuals of devotion ; he is a dogmatic theologian of high rank, and on all the disputed questions of scholastic thought, such as universals, matter, the principle of individualism, or the intellectus agens, he gives weighty and well-reasoned decisions, He agrees with Albert in regarding theology as a practical science ; its truths, according to his view, are peculiarly adapted to influence the affections. He discusses very carefully the

nature and meaning of the divine attributes ; considers _

universals to be the ideal forms pre-existing in the divine mind according to which things were shaped ; holds Inatter to be pure potentiality which receives individual being and determinateness from the formative power of God, acting according to the ideas; and finally maintains that the intellectus agens has no separate existence. On these and on many other points of scholastic philosophy the Seraphic Doctor exhibits a combination of subtilty and moderation which makes his works peculiarly valuable. Editions of Bonaventura's works are numerous. The most com- ag early edition was that in 7 vols. fo., Rome, 1588-96. They have also been published at Lyons, 7 vols., 1668, and at Venice, 14 vols., 1751, sgg. The best edition is that by A. C. Peltier, begun in 1863. Of detached works the editions and translations are very numerous. The following are perhaps the most important :— Breviloguium et Itinerarium Mentis ad Deum, ed. Hefele, 3d ed., 1862 ; _Théologie Séraphique, extraite et tradwite des euvres de St B., hy Alix, 2 vols., 1853-56. For Bonaventura's philosophy, see Erdmann, Hauréau, Stock]; the works on the history of mysticism by

Schmid, Gérres, Helfferich, Noack, and Preger; and Ozanam, Dante et la Philosophie Catholique au XI1Ime Siecle. There are two mono- graphs on him,—Margerie (A. de), Hssai sur la philosophie de St Lonaventure, 1855, and Hollenberg, Studien zu Bonaventura, 1862. Notices of his life are given in the Venice edition, and in that of Peltier ; also in the Histoire Litt. de la France, vol. xix. (R. AD.)

BONDU, a kingdom of Western Africa lying to the W. of Bambouk, from which it is separated by the River Faleme, between 14° and 15° N. lat., and 12° and 13° W. loug. The country is an elevated plateau, with hills in the southern and central parts. These are generally unproduc tive, and covered with stunted wood; but the lower country is fertile, and finely clothed with the baobab, the tamarind, and various valuable fruit-trees. It is traversed by beds of torrents, which flow rapidly during the rains, but are empty in the dry season. Cultivation, though it extends over only a comparatively small proportion of the whole surface, is carried on with a measure of activity. The products consist of grain (four species), rice, cotton, indigo, water-

melons, cucumbers, tobacco, and fruits. The workmen in the different parts display considerable dexterity, though they employ very rude and defective tools. The people consist chiefly of Foulahs, though the country is much frequented by Mandingoes and Serawoollies for purposes of trade. The exports consist of provisions and cotton cloth manufactured in the country, and slaves and salt are imported. The caravans, bringing the former from the interior to the coast, pass usually through Bondu. The religion and laws of this country are Mahometan, though the precepts of that faith are not very rigorously observed. There are schools, however, in every town, where the Koran and the reading and writing of Arabic are taught; but the scholar is treated as the menial servant of the teacher. The king is nearly absolute, and commands a considerable body of troops, who are much employed in predatory expeditions, chiefly for the purpose of collecting slaves. His revenues are derived from a tenth part of the produce of the land, and of the salt imported, as also from duties on goods passing through his territories, with numerous presents expected or extorted. Park, who was the first European traveller to visit the country, experienced to his cost the rapacity of the reigning prince, being obliged to give up even the coat which he wore. The royal residence was then at Fatteconda ; bnt when Major Gray visited Bondu it had been removed to Bulibani, a small town, with about 3000 of a population, surrounded by a strong clay wall. The population of the whole country is estimated at 1,500,000.

BONE, Bona, Bounan, BELEep-EL-A’NEB (the town of jujubes), or ANNABA, a fortified town and seaport of Algeria, in the province of Constantine, 85 miles N.E. of the city of that name, on a bay of the same name at the mouth of the Seybouse, in lat. 36° 54’ N. and long. 7° 47’ E. The town is surrounded with a modern rampart erected outside of the old Arab wall, the compass of which was found too small for its growth. In other respects also it has been greatly Europeanized ; much of the old town has been demolished, and the ground occupied by new buildings. The streets are wide and well laid out, but in some instances are very steep, owing to the formation of the ground. All the ordinary conveniences of a flourishing French city are met with,—bazaars, markets, coffee-houses, hotels, reading- rooms, a bank, a theatre, barracks, hospitals, an orphan asylum, and schools of various kinds. There is also a cathedral dedicated to St Augustine, as well as other Roman Catholic churches, a nunnery for

sisters of mercy, handsome mosques, a synagogue, and a Protestant church. Béne is an important seat of the coral fishery, and carries on a considerable trade, the exports consisting chiefly of iron and lead ore, corn, coral, cattle and sheep, olive oil, salt fish, and tobacco. The manufactures comprise native garments,

tapestry, leather, and saddles, and of late its soap has come into repute. In 1872 there entered the port 461 French vessels, with a tonnage of 187,415 tons, and 506 foreign ships with a tonnage of 40,822. The anchorage was long insecure ; but about 1870 a harbour, with an area of 195 acres, was constructed by means of two breakwaters, and an inner basin, surrounded with masonry quays, and having an extent of nearly 25 acres. The marshes at the mouth of the river have also been drained by a system of canals, to the great improvement of the sanitary condition of the town, which has the further advantage of an abundant supply of water obtained from the neighbouring hills. There are cork-woods and marble-quarries in the vicinity, and various other resources of the surrounding country are being rapidly developed. The woods, however, suffered severely from a conflagration in 1873; and it will be many years before the production of cork can become as extensive as before. The port will be rendered still more important by the railway in course of construction to various inland towns. Bone is identified with the ancient Aphrodisium, the seaport of Hippo Regius or Ubbo, but it derives its name from the latter city, the ruins of which, consist- ing principally of large cisterns, and part of the Roman walls, are still to be found about a mile to the south of the town. Hippo, the bishopric of Augustine, was burnt by the Vandals in 430, partially restored by Belisarius, and again sacked by the Arabs in the 7th century. The latter conquerors built the city of Bona, or Annaba, which has since passed through many vicissitudes. From the beginning of the 14th to the middle of the 15th century it was frequented by Italians and Spaniards, and in the 16th it was held for some time by Charles V., who strengthened its Casbah or citadel, originally built in 1300. From the time of Louis XIV. to the Revolution the French Compagnie d’Afrique maintained a very active trade with the port. The town was finally captured by the French in 1832, and its citadel was defended by a small body of marines for some months against

the Turks. Population in 1872, 16,196, about half of whom are European; in 1832 it was only 3000 or 4000.

~ BONE, Henry, R.A., the most eminent enamel painter of his time in Great Britain, was born at Truro in 1755. He was much employed by London jewellers for small designs in enamel, before his merits as an artist were well known to the public. In 1800 the beauty of his pieces attracted the notice of the Royal Academy, of which he was then admitted as an associate; in 1811 he was made an academician. From the beginning of the century to 1831, he executed many beautiful pieces of much larger size than had been attempted before in England; among these his eighty-five portraits of the time of Queen Elizabeth, of different sizes, from 5 by 4 to 13 by 8 inches, are most admired. They were disposed of by public sale after his death, which took place in 1834. His Bacchus and Ariadne, after Titian, painted on a plate, brought the great price of 2200 guineas.

. BONFIGLI, Beneperto, an Italian painter, whose reputation is not equal to his importance. One of the most remarkable circumstances in the history of art in the peninsula is the sudden advance made by the school of the Umbrian province, which, until near the middle of the 15th century, was far behind those of Florence and the North, but which, in the person of Perugino and some of his followers, came into the very first rank. Criticism had been used to overlook the precursors and senior com- panions of Perugino, whose improvements prepared the way for his signal excellences. But among these none holds a more distinguished place than Benedetto Bonfigli. The most important of his extant works are a series, in fresco, of the life of St Louis of Toulouse, in the communal palace

of his native city of Perugia. All his life (the dates of which are not quite certain) was spent in honourable employment by the civic and religious bodies of Perugia and neighbouring towns.

BONGO, a people of Central Africa, who inhabit the country lying between 6° and 8° N. lat., and 27° and 29° E. long., which is watered by five important tributaries of the Bahr-el-Ghazel. The Bongo are a brachycephalous race of medium height, with a red-brown complexion and black hair. The grain most largely cultivated by them is sorghum ; but they obtain a considerable part of their food from the fruits, tubers, and fungi

with which the country naturally abounds. They also eat every living creature—bird, beast, and reptile—except the dog. Tobacco is universally cultivated and smoked. They have no cotton or flax, and go for the most part with no more clothing than an ornamental girdle about the loins. The domestic animals are goats, dogs, and poultry ; sheep and cattle are rare. Iron is abundant, and the people smelt and work it with great skill; it forms the only currency of the country, and is extensively employed for all kinds of useful and ornamental purposes. Their spears, knives, rings, and other articles are frequently fashioned with great artistic elaboration. They havea variety of musical instruments,— drums, stringed instruments, and horns,— in the practice of which they take great delight ; and they indulge in a vocal recitative which seems intended to imitate a succession of natural sounds. Marriage is generally by purchase ; and a man is allowed to acquire three wives, but not more. After marriage the women extend the under lip by the insertion of a peg of wood or bone, which is gradually increased. ‘Tattooing is partially practised. Their method of sepulture resembles that of the Peruvians, the corpse being bound in a crouching position with the knees drawn up to the chin ; and their tombs are frequently ornamented with rough wooden figures intended to represent the deceased. Of the immortality of the soul they have no notion ; and their only approach to a knowledge of a deity consists in a vague idea of luck. On the other hand they have a most intense belief in a great variety of petty goblins and witches, which are identified with bats, owls, and other ominous animals. Their language is musical, aud abounds in the vowelso anda ; its vocabulary of concrete terms is very rich, but the same word has often great variety of meanings. The gramnuatical structure is simple. The Bongo are now subject to the people of Khartoom, who have treated them with great injustice, and greatly reduced the numbers of the population, which now hardly exceeds 100,000.

BONI, a kingdom or confederation in the island of Celebes, stretching along a part of the western shores of a great bay of the same name, which indents the south side of the island to the depth of nearly 180 miles, It has an area of 450 square miles at most, and its present popula- tion is estimated about 200,000. It was at one time the most powerful state of Celebes, all the other princes being regarded as vassals of its king, but has latterly been practi- cally reduced to a Dutch dependency, though this has not been

brought about without trouble. An expedition in 1825, under General van Geen, was not very successful; but the war of 1859 was brought to a more satisfactory termination for the invaders. The inhabitants, called Bugis, are one of the most remarkable of the peoples of the Eastern Archipelago. They speak a language allied to that of the Macassars, aud write it with similar characters. It has been studied and its letters reproduced in type by Dr B. F. Matthes of the Netherlands Bible Society. The Bugis are industrious and ingenious ; they practise agricul- ture more extensively than the neighbouring tribes, and manufacture cotton cloth not only for their own use, but also

for export. in the mineral and vegetable productions of their country, such as gold dust, tortoise-shell, pearls, nutmegs, camphor, and various medicinal preparations.

regularly built, and they have schools of their own. The

king is elected generally for life, and always from their

own number, by the chiefs of the eight petty states that compose the confederation, and he cannot decide upon any public measure without their consent. In some of the states the office of chief is hereditary; in others any member of the privileged classes may aspire to the dignity, and it not unfrequently happens that the state comes to be governed by a woman. The capital, also called Boni, is situated on the coast in 4° 37’ §. lat. and 120° 30’ E. long., and is the residence of the king. Various Dutch settlements have been formed round the bay. Of the history of Boni not much is known. According to Temminck, it first acjuired importance in the year 1666, when the rajah Palakkah, whose father and grandfather had been murdered by the family of Hassan, the tyrant of Sumatra, made common cause with the Dutch against that despot. . From that date till the beginning of the present century the Dutch influence in the kingdom remained undisputed. In 1814, however, Boni fell into the hands of the British, who retained it for two years ; but by the European treaties concluded on the downfall of Napoleon it reverted to its original colonizers. See CELEBES.

BONIFACKH, St, the Apostle of Germany, whose real name was Winfrid, was born at Crediton in Devonshire, in 680. He was of good family, and it was somewhat against his father's wishes that he devoted himself at an early age to the monastic life. He received his theological train- ing in the convents of Exeter and Nutcell, and at the age of thirty became a priest. In 715 he set out on a missionary expedition to Friesland, but his efforts were frustrated by the war then being carried on between Charles Martel and Radbod, king of the Frisians. Despite the wishes of his brethren, who desired to make him their abbot, he again set out in 718, visited Rome, and was commissioned by Gregory IT. to preach to the pagans of Germany. For five years he laboured in Thuringia, Hessia, and Friesland, and then returned to Rome to report his success. He again set out for Germany, and, armed with full powers from the Pope, baptized thousands of the heathen, and brought back to the Church of Rome many Christians who had in a measure separated themselves from the fold. After another visit to Rome in 738 he proceeded to Bavaria, and founded there the bishoprics of Salzburg, Regensburg (Ratisbon), Freisingen, and Passau. He then resumed his labours in Germany, where he erected the districts of Wiirzburg, Erfurt, and Burburg into bishoprics. He also organized provincial synods in the Frankish Church, and obtained great influence over the king, Pepin, whom he crowned at Soissons. Boniface had been created a bishop by Gregory IL, and after the deposition of the bishop of Mainz in 745, that bishopric was converted into a metropolis and conferred upon him, much against his own inclinations. He had never relinquished his hope of couverting the Frisians, and in 755 he set out with a small retinue for Friesland, He baptized a great number, and summoncd a general meeting for confirmation at a place not far from Dokkum, between Franeker and Groningen. Instead of his converts, however, there appeared a mob of armed pagans, who fell upon the aged archbishop and slew him. His remains were finally deposited in the famous abbey of Fulda, founded by himself.

The epistles of Boniface have been published by Serrarius, 1605, and by Wiirdtwein, 1790; his works by Giles, 2 vols., 1842. On his life and labours see Lé filer, Bonifacius, 1812; Seiter, Bonifacius, 1845; Rettberg, Kirchengeschichte Deutschlands, i.- Neander, Church History, Bohn's transl., vol. v.

They likewise carry on a considerable traffic

Their towns are

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BONIFACE, the name of nine popes.

BontFacx I., bishop of Rome from 418 to 422, was a contemporary of St Augustine, who dedicated to him some of his works.

Bontrace II., 530-532, was by birth a Goth, and owed his election to the influence of the Gothic king. He had for some time an anti-pope, Dioscurus.

Bonirack III., 15th February to 12th November 606, obtained from Phocas recognition of the headship of the Church at Rome.

Bontrace IV., 608-615, received from Phocas the Pantheon at Rome, which was converted into a Christian church.

BontFace V., 619-625, did much for the Christianizing of England.

BoniFacr VI. was elected in April 897, and died fifteen days afterwards.

Bontrace VII, who attained the Papal chair in 974, is sometimes styled an anti-pope. He is supposed to have put his predecessor, Benedict VI., to death. A popular tumult compelled him to flee to Constantinople; but he carried with him vast treasure, and in 984 he returned and removed, by murder, John XIV., who had been elected in his room. He died in 985 or 986.

Bontracr VIII., Benedict Cajetan, a man of great ability, was elected in 1294, Celestine V. having been per- suaded to resign. He meddled incessantly in foreign affairs, and put forward the strongest claims to temporal as well as spiritual supremacy. His bitterest quarrels were with the emperor, with the powerful family of the Colonnas, and with Philip the Fair of France, whom he excommunicated in 1303. He was about to lay all France under an interdict when he was seized at Agnani by a party of horsemen under Nogaret, an agent of Philip, and Sciarra Colonna. After

three days’ captivity he was rescued by the town’s people, but the agitation he had undergone caused his death soon after, on the 11th October 1303. In 1300 Boniface instituted the jubilees, which afterwards became such a source of profit and of scandal to the church.

Bonirace IX. was elected in 1390 and died in 1404. During his time the so-called Clement V. continued to hold state as pope in Avignon.

BONIFACIO, a town at the southern extremity of Corsica, in the arrondissement of Sartene, near the strait to which it gives its name. It is one of the most pictur- esque and interesting places in the island, its white houses being built on the top of a white calcareous rock that can only be reached on foot or on horseback. It is well fortified, has a secure harbour, carries on some trade, and has coral fisheries. The rock is hollowed out into vast caves that stretch below the town. Bonifacio was founded in 833 by the Tuscan Marquis whose name it bears, as a defence against the Saracen pirates. At the end of the 11th century it became subject to Pisa, and m1 1195 was taken by the Genoese, whose influence continues to affect the character of the population to this day. In 1421 it heroically withstood a protracted siege by Alphonso of Aragon ; but in 1553 it fell into the hands of the Franco- Turkish army. Population in 1872, 3402. (See Gre-gorovius’s Corsica, vol. ii.; Lear, Journ. in Corsica, Dy 02.)

BONN, the chief town of a circle of Rhenish Prussia, situated on the left bank of the Rhine, about 16 miles by rail 8.S.E. of Cologne. The central part is mostly com- posed of very narrow streets, but the outskirts contain numerous fine buildings, and the general appearance from the river is rather attractive. There are five Roman Catholic and two Protestant churches, the most important of which is the Minster or St Cassius, an old building in ive, 5

the Transition style, surmounted by five towers. The town also possesses a “ Rathhaus,” of modern erection, a court- house, a hospital, a gymnasium, and a theatre. By the far the finest of its buildings, however, is its famous university, which occupies the larger part of the southern frontage of the town. ‘The present establishment only dates from 1818, and owes its

existence to the king of Prussia ; but as early as 1786 the academy which had been founded about nine years before was raised by Archbishop Maximilian Frederick of Cologne to the rank of a uni versity, and continued to exercise its functions till 1794, when it was dissolved by the last elector. The building now occupied was originally the electoral palace, con- structed about 1717 out of the materials of the old fortifications. It was remodelled after the town came into Prussian possession. There are five faculties in the university—a legal, a medical, and a philosophic, and one of Catholic and another of Protestant theology ; in 1873 it was attended by 752 students, ranking as eighth among the German universities. The library num- bers upwards of 200,000 volumes ; and the antiquarian museum contains a valuable collection of Roman relics discovered in the neighbourhood. A separate building for anatomical operations is situated in the extensive garden to the south of the university; and an academy of agriculture, with a natural history museum and botanic garden attached, is established in the palace of Clemensruhe at Poppelsdorf, which is reached by a fine avenue about a mile long, bordered on both sides by a double row of chest- nut trees. A splendid observatory, long under the charge of Argelander, stands on the south side of the road. Among the numerous men of learning who have taught or teach in Bonn are the theologians Bleek and Lange, Hermes and Achterfeldt ; the jurists Walter and Bécking ; Harless, Mayer, and Rindfleisch in the medical faculty ; and Niebuhr, Welcker, Ritschl, Brandis, Lassen, Simrock, Diez, and Sybel, in various branches of literature and history. Beethoven was born in the town, and a statue was erected to himin the Miinsterplatz in 1845. Niebuhr is buried in the cemetery outside of the Sternthor, where a monument was placed to his memory by Frederick William IV. But for its university Bonn would be a place of comparatively little importance, its industry and com- merce being of moderate dimensions. Its principal manufactures are cotton and silk, earthenware, soap, vitriol, and tobacco ; and its trade, chiefly carried on by the Rhine, consists largely of corn and wine. Population in 1871, 26,030. Bonn (Bonna or Castra Bonnensia), originally a town of the Ubii, became at an early period the site of a Roman military settlement, and as such is frequently mentioned by Tacitus. It was the scene, in 70 a.v., of a battle, in which the Romans were defeated by Claudius Civilis, the valiant leader of the Batavians. Greatly reduced by successive barbarian inroads it was restored about 359 by the Emperor Julian, but its import- ance only dates

from 1268, when it became the residence of the electors of Cologne. During the various wars that devastated Germany in the 16th, 17th, and 18th centuries, the town was frequently besieged and occupied by the several belligerents, but continued to belong to the electors till 1794, when the French took possession of it. At the peace of Lunéville they were formally recognized in their occupation ; but by the Vienna Congress of 1814 the town was made over to Prussia. The fortifications had been dismantled in 1717.

BONNER, or Boner, Epmunp, an English prelate, notorious for his persecutions of the Protestants during the reign of Queen Mary, was born at Hanley in Worcester- shire, about the end of the 15th century, and generally passed for the natural son of George Savage, a priest who

was the natural son of Sir John Savage of Clifton in the same county. Strype in his Memorials of Cranmer, how- ever, says he was positively assured that legitimate offspring of a poor man, who lived in a cottage long afterwards known as Boner’s place. entered as a student of Broadgate Hall (now Pembroke College), Oxford; and in 1519 he was admitted as bachelor of the canon and of the civil law. Having been admitted into orders, he obtained some preferment in the diocese of Worcester. attracted the notice and patronage of Wolsey. Bonner

Bonner was the

About 1512 he

In 1525 he took his degree as doctor, and

was with the cardinal at Cawood when he was arrested on charge of high treason. After the death of Wolsey he adopted Lutheran sentiments, and insinuated himself into the favour of Henry VIII., who made him one of his chaplains, and employed him in several embassies abroad. In 1532 he was sent to Rome with Sir Edward Carne, to answer for the king, who had been cited to appear in person or by proxy in regard to the divorce of Queen Catharine. In 1533, being again despatched to Pope Clement VII., then at

Marseilles, to intimate Henry's appeal to a future general council from the sentence pro- nounced against his divorce, he threatened the Pope with 50 much resolution, that his holiness talked of having him burned alive or thrown into a cauldron of melted lead. Clement did not foresee that the man whom he had thus menaced with the flames was destined to burn heretics in England in support of the very faith which, under Henry, he had lent his aid to overthrow. In 1538, being then ambassador at the court of France, he was nominated bishop of Hereford; but before consecration, he was translated to the see of London, and was enthroned in April 1540. When Henry VIII. died in 1547, Bonner was ambassador at the court of the Emperor Charles V. During Henry's reign he was constantly zealous in his opposi- tion to the Pope, and favoured the Reformation in obedience to the king, who exacted rigid compliance with all his caprices. On the accession of Edward, however, Bonner refused to take the oath of supremacy, and was com- mitted to the Fleet, where he remained until he pro- mised obedience to the laws. After his release he assented to the Reformation, but with such manifest reluctance, that he was twice reprimanded by the Privy Council, and in 1549 was, after a long trial, committed to the Marshalsea, and deprived of his bishopric, to which, however, he was restored on the accession of Mary ; and soon afterwards he was appointed, in place of Cranmer, vicegerent and president of the Convocation. From this time he became the chief instrument of persecution, and is said to have condemned no less than 200 Protestants to the flames in the space of three years. On the accession of Elizabeth he appeared with the rest of the bishops at Highgate, to congratulate her; but the queen refused to permit him to kiss her hand. Having, in the second year of her reign, refused to take the oath of supremacy, he was again committed to the Marshalsea, where he died, September 5, 1569, aftera confinement of ten years. The character of Bonner was remarkable for obstinacy and inflexibility in everything save principle ; yet even in this respect it exhibits some striking contrasts. In his early career he accommodated his principles to his convenience and ambition ; after his return to Catholicism, he remained steadfast to the church, and, when disgraced, bore his deprivation and imprisonment with apparent resignation. The charge of atheism brought against one so defiled with blood was superfluous. He was constitutionally merci- less and austere, fitted by nature for a persecutor, and equally capable of employing the same ardent zeal either against or in favour of any cause that he

espoused, Among his works are, Responsum et Exhortatio in LaudemSacerdoti,

a preface in Gardener’s treatise De Vera Obedientia, and several homilies.

BONNET, CuaR.es, an eminent naturalist and philo- sophical writer, was born at Geneva on the 13th March 1720, The Bonnets, a French family whom the religious persecution in the 16th century had driven into Switzer- land, were accustomed to fill important posts in the Genevese Government; and young Charles Bonnet was expected to qualify himself to make use of the family influence by becoming a lawyer. But dry legal technical- ities proved to be anything but attractive to his rich and imaginative mind, all the more that he found in the study of nature an employment which was not also a task. He made law his profession, but he never seems to have per- mitted it to interfere seriously with his favourite pursuits. The account of the ant-lion in Pluche’s Spectacle de la Nature, which he chanced to read in his sixteenth year, turned his attention in particular to the wonders of insect life. He procured Réaumur’s work on insects, and with the help of live specimens succeeded, after minute and patient investigation, in adding many observations to those of Reaumur and Pluche ‘The result of two years’ labour he made known to Réaumur, who was naturally not a little surprised to find so much sagacity and power of research in a youth of eighteen In 1740 Bonnet communicated to the Academy of Sciences a paper containing a series of experiments establishing what is now termed partheno- genesis in aphides or tree-lice, which obtained for him the honour of being admitted a corresponding member of the academy. In 1741 he instituted a set of experiments respecting the reproduction of worms by fission; and in the following year he discovered that the respiration of caterpillars and butterflies is performed by pores, to which the name of stigmata has since been given. In 1743 he was admitted a fellow of the Royal Society; and in the same year he became a doctor of laws,—his last act in connection with a profession which had ever been distasteful to him. His first published work appeared in 1745, entitled Traité d’Insectologie, in which were collected his various discoveries regarding insects, along with a preface on the development of germs and the scale of organized beings.

Botany, particularly the leaves of plants, next attracted the attention of Bonnet ; and after several years of diligent study, rendered irksome by the increasing weakness of his eyesight, he published, in 1754 one of the most original and interesting of his works, 7'raité de ''usage des feuilles ; in which among other things he advances many considera- tions tending to show that plants are endowed with powers of sensation and discernment. But Bonnet's eyesight, which threatened to fail altogether, now caused him to turn his thoughts from investigation to speculation In 1754 his Hssaa de Psychologie was published anonymously in London. This was followed in 1760 by the Zssai analytique sur les Jucultés de Pame, in which he develops his views regarding the physiological conditions of mental activity. He returned to physical science, but to the speculative side of it, in his Considérations sur les corps organisés, Amsterdam, 1762. The principal objects of this work were to give, IN an abridged form, all the most interesting and well-ascertained facts respecting the origin, development, and reproduction of organized bodies, to refute the theory of epigenesis, aud to explain and defend the doctrine of pre-existent germs. Iu his Contemplation de la Nature, which next appeared (1764-5), one of his most popular and delightful works, he sets forth, in eloquent language, the theory that all the beings in nature form a gradual scale rising from lowest to highest, without any break in its continuity. His last important work is entitled Palingénésie Philosophique, (Geneva, 1769); in it he treats of the past and future of living beings, and supports the idea of the survival of all

animals, and the perfecting of their faculties in a future state. Bonnet's life was singularly uneventful. He seems never to have passed beyond the limits of his native country; nor does he appear to have taken any part in public affairs except for the comparatively short period between 1752 to 1768, during which he was a member of the council of the republic. 'The last twenty-five years of his life he spent in the country, simple and regular in his mode of life, easy in his circumstances, and happy in a small circle of friends. His wife, whom he married in 1756, was a lady of the family of De la Rive. They had no children, but Madame Bonnet's nephew, the celebrated De Saussure, was brought up as their son. Bonnet died, after a long and painful illness, on the 20th May 1793. The outlines of Bonnet's

philosophical system may be set forth in a few sentences. Man, according to him, is a mixed being, composed of two distinct substances,— mind and body,—the one immaterial and the other mate- rial. In what manner the two are connected we do not know, but of this at least we are certain, that bodily activity is a necessary condition of thought. All knowledge originates in sensations ; sensations themselves follow (but whether as physical effects or merely as sequents Bonnet will not say) vibrations in the various nerves appropriate to each; and lastly, the nerves are made to vibrate by the action of outward objects upon them. A nerve once set in motion by a particular object contracts a certain tendency to reproduce that motion; so that when it a second time receives an impression from the same object it vibrates with less resistance. It is the sensation accompanying this increased flexibility in the nerve that is, according to Bonnet, the condition of memory. When reflection—that is, the active as distinguished from the merely passive element in mind—is applied to the acquisition and combination of sensations, those abstract ideas are formed which are usually placed in opposition to sensations, but which are thus, no matter how refined they may appear, sensations in combina- tion only. That which puts the mind into activity is pleasure or pain ; happiness is the end of human existence. Bonnet's metaphysical theory is based on two principles borrowed from Leibnitz,—first, that there are not successive acts of creation, but that the universe is completed by the original act of the divine will, and thereafter moves on by its own inherent force ; and, secondly, that there is no gap in the continuity of existence. 'The divine Being, according to Bonnet, origi- nally created a multitude of germs in a graduated scale, each with an inherent power of self-development. At every successive step in the progress of the globe, these germs, or what has been developed in their place, advance nearer to perfection ; if some advanced and others did not there would be a gap in the continuity of the chain. Thus not man only but all other forms of existence are immortal. Nor is it man's mind merely ; his body also will pass into the higher stage, not, indeed, the body he now possesses, but a finer one of which the germ at present exists within him. This is equally true of the other animals, who also possess a germ that will develop itself in the next stage; and every individual begins each successive stage with that amount of perfection and of knowledge which he had when he left the previous stage. It is impossible, however, to reach absolute perfection, because the distance is infinite. It is difficult to reconcile this last

proposition with the law of continuity, if that law is to be accepted, as Bonnet seems to accept it, as an absolute principle of the universe, embracing all exist- ence divine and created, for surely the interval between the divine Being and the highest created being, constantly lessening though it be, is a break in the continuity of the chain. It is also difficult to understand whether the con- stant advance to perfection is performed by every individual on his own account. or only by each race of beings asa

whole. Is aman when he dies at once translated to the next stage, or must he wait until the time comes when the advancement of the whole human race takes place, before he, at any rate consciously, realizes the new state? There seem, in fact, to be two distinct but somewhat analogous doctrines,—that of the constantly increasing advancement of the individual in future stages of existence, and that of the constantly increasing advancement of the race as a whole according to the successive cvolutions of the globe. Bonnet's complete works appeared at Neufchatel in 1779-1785, partly revised by himself. An English trans- lation of certain portions of the Palingénésie Philosophique was published in 1787, under the title, Philosophical and Critical Inquiries concerning Christianity. (See A. Lemoine, Charles Bonnet, Paris, 1850; and the Duc de Caraman's Charles Bonnet, philosophe et naturaliste, Paris, 1859.) BONNEVAL, CuaupE ALEXANDRE, CoMTE DE, a cele- brated French adventurer, known also as Achmet Pasha, was the descendant of an old family of Limousin. He was born on the 14th July 1675 at Coussac, and at the age of thirteen joined the Royal Marine Corps. After three years he entered the Guards, whence he was transferred to the infantry regiment of Latour He served in the Italian campaigns under Catinat, Villeroi, and Vendéme, and in the Netherlands under Luxembourg, giving proofs of indomitable courage and great military ability. His inso- lent bearing towards Chamillard, minister of war, was made matter for a court-martial. He was condemned to death, but having foreseen this sentence, he saved himself by flight to Germany, Through the influence of Prince Eugene he obtained a command in the Austrian army, and fought with great bravery and distinction against France, and afterwards against Turkey. He was severely wounded at Peterwardein, and after his recovery paid a visit to Paris. The proceedings against him in France had been

allowed to drop, and he married a daughter of Marshal de Biron, whom, however, he deserted after a week or two. He returned again to the Austrian army, and fought with distinction at Belgrade. He might now have risen to the highest rank, had he not made himself disagreeable to Prince Eugene, who sent him as master of the ordnance to the Low Countries There his ungovernable temper led him into a quarrel with the Marquis de Prié, governor of the Netherlands, who answered his challenge by placing him in confinement. A court-martial was again held upon him, and he was condemned to death; but the emperor commuted the sentence to one years imprisonment and banishment from the imperial domains. Bonueval, soon after his release, offered his services to the Turkish Government, professed the Mahometan faith, and took the name of Achmet. He was made a pasha of three tails, and appointed to the command of the artillery. He rendered valuable sevices to the sultan in his war with Russia, and with the famous Kouli Khan, As a reward he received the governorship of Chios, but soon fell under the suspicion of the Porte, and was banished for a time to the shores of the Black Sea. He was meditating a return to Europe and Christianity when he died at Constantinople, 27th March 1747. The demoirs published under his name are spurious. eter de Ligne, Mémoire sur la Comte de Bonneval, BONNIVARD, Frangots bz, the “ prisoner of Chillon,” was born at Seyssel in 1496. Educated at Turin, he suc- ceeded, in 1510, to the priory of St Victor, just outside the walls of Geneva, his uncle having resigned in his favour. Of ardent republican principles he espoused the cause of the Genevese against the duke of Savoy, who was seeking to assert the seignorial rights that had just been ceded to him by the prince bishop. In 1519, on the entrance of the duke into Geneva, Bonnivard was arrested and im-

prisoned for two years at Grolée. On his liberation he returned to his priory. In 1530, when travelling in the service of the republic, he was unfortunate enough to fall into the hands of robbers, who delivered him over once more to the duke of Savoy. His imprisonment in the castle of Chillon, which has been celebrated in Byron’s poem, lasted till 1536, when he was liberated by the com- bined force of the Bernese and Genevese. On his return to Geneva, which had now completely emancipated itself, he received the honours and

rewards that were due to his patriotism, being made a member of the Council of Two Hundred, and endowed with a pension. He died about 1570, the precise date being uncertain, Bonnivard was the author of a history of Geneva, and left his books and manuscripts to the town.

BONPLAND, Aim, French traveller and_ botanist, was born at Rochelle, August 22,1773. After serving as a surgeon in the French navy and studying under Corvisart at Paris, he accompanied Humboldt during five years of travel in Mexico, Colombia, and the districts bordering on the Orinocoand Amazon. In these explorations Bonpland collected and classified about 6000 plants till then mostly unknown in Europe, which he afterwards described in Plantes Equinowiales, &c. (Paris, 1808-1816). On return- ing to Paris he received a pension and the superintend- ence of the gardens at Malmaison, became acquainted with Gay-Lussac, Arago, and other eminent scientists, and published Monographie des Mélastomées (1806), and De- scription des plantes rares de Navarre. After vainly en- deavouring to persuade Napoleon to retire to America, he set out, in 1816, with various European plants for Buenos Ayres, where he was elected professor of natural history, an office which he soon quitted in order to explore Central South America. While journeying to Bolivia he was arrested as a spy, in 1821, by command ot Dr Francia, who detained him a prisoner at Santa Marta until 1831, during which time he acted with great disinterestedness as 4 physician to the neighbouring poor. On regaining liberty he resided at San Borje in the province of Corrientes, until his removal in 1853 to Santa Anna, where he occupied himself in scientific research, and in cultivating the orange trees which he had introduced. He was widely respected, and was presented with an estate worth 10,000 piastres by the Government of Corrientes. His intention of revisiting Paris was frustrated by his death at Santa Anna in 1858, (See Humboldt’s Z7avels.)

BONSTETTEN, Cartes VicroR DE, was born at Bern in 1745, of a noble and ancient family. He re- ceived the elements of his education in his native town, and at fourteen was sent to Yverdun, and soon after to Geneva. There he imbibed many revolutionary doctrines both in religion and politics, which ill fitted him for a career as a Bernese senator of the traditional type ; and his father, alarmed at the tone of his son’s letters, peremp- torily ordered him to return home—a command which the young man, albeit he

would acknowledge no authority but reason, was obliged to obey. The change, however, was worse than useless ; for the dulness of Bern so preyed upon his mind that he made au attempt on his life, which was frustrated by the somewhat curious accident of a ray of the moon attracting his attention when about to discharge the pistol. His father seeing his condition, sent him to Leyden to finish his studies; but as the climate of the place disagreed with him, he was allowed to exchange it for England, which he reached in 1769. ‘The facility with which he gathered friends around him, which distinguished him, perhaps, as much as anything elsc, made his stay in England not the least happy period of his life. He went home by way of Paris, where he was introduced to much of the best literary society in France, but on his return

he found that the mournful duty awaited him of nursing his father in his last illness. Immediately after his father’s death he again left home, and spent a considerable time in Italy, travelling as far south as Naples. Time and ex- perience had done much to alter the character of Bon- stetten since the days of his wild theorizings at Geneva. No longer a Republican, but still a Liberal, he was daily recognizing with greater clearness that the watchwords of revolution meaut anything but law and order. On re- turning to Bern he became a member of the avoyer’s council, and soon after was appointed magistrate at Ges- senay Thence he was removed in 1787 to Nyon in the Pays de Vaud, a place attractive to him from its proximity to the intellectual life and society of Geneva and Lausanne, but in other respects unsuitable ; for the Pays de Vaud, as well from its nearness to France and to Geneva, as from the weight of the Bernese yoke, was nearly ripe for revolt, and Bonstetten was, as a magistrate, trusted neither by his revolutionary friends and former allies, nor by his fellow- rulers in the government of Bern. He firmly declared that he should stand by his order, a declaration that was not without good effects; but in 1792, when Geneva was threatened by the army of the Convention, he took certain steps to avert the danger, which, as he had not received a military training, were not very judicious. This increased the suspicion which the Bernese Government felt towards him ; and, in consequence, he was permitted to exchange his office for one on the Ticino, where he re- mained until 1797, when political

troubles and the French armies compelled him to leave his native country. At the solicitation of Madame Briin he at first repaired to Copen- hagen, but he finally determined to settle at Geneva, which proved to be his home for the rest of his life. There, as of old, he enjoyed the society of many distinguished persons; but if this last half of his life is the most bril- liant, it is also the least eventful. He died in February

1832.

As a writer Boustetten cannot be said to occupy a very high place. His works, indeed, show a great power of observation, and an extensive insight into human character ; but as a psychologist he is deficient in method, exactness, and depth ; and his style, like his thought, wants point and clearness. In psychology he occupies an eclectic position, and urges the necessity of making use of internal observa- tion in the study of mind. It is, however, in his social character, as a conversationalist, and as the friend, often the intimate companion, of many of the leaders of thought and action during his long life, that Bonstetten will be best remembered. The following are the titles of his chief works :—Jecherches sur lanature et les lors de Vimagina- tion, 1807 ; Ltudes d'homme, ou Recherches sur les facultés de sentir et de penser, 1821; Sur Véducation nationale, 1802; Pensées sur divers objets de bien public, 1815; L' Homme du Midi et V Homme du Nord, 1814.

BONVICINO, AtessanpRro. See Morerto.

BOOK, the common name for any literary production of bulk, now applied particularly to a printed composition forming a volume. The name is also used for the literary divisions of a work.

Wachter, with some other writers, derives the word from the same root as the German biegen, to bend, as the Latin volumen comes from volvere. niology makes the tree the parent of the book, and refers the origin of the latter (Angl. Sax., boc; Germ., Buch ; Dutch, bock) to writing on the bark of the beech tree (Augl. Sax., boc ; Germ., Buche ; Icel., beyke ; Dutch, beuke), or perhaps on beach boards. Analogy supports this deriva- tion, The byblos of the Greeks—whence their name for a book—refers to the

Egyptian papyrus itself, and the Latin liber to the pellicle which enclosed its stalk. The codex of

But the more common ety-.

the Romans meant at first the trunk of a tree ; and the leaves of a book indicate a similar origin.

The earliest writings were purely monumental, and accordingly those materials were chosen which were sup- posed to last the longest. The same idea of” perpetuity which in architecture found its most striking exposition in the pyramids was repeated, in the case of literary records, in the two columns mentioned by Josephus, the one of stone aud the other of brick, on which the children of Seth wrote their inventions and astronomical discoveries; in the pillars in Crete on which, according to Porphyry, the ceremonies of the Corybantes were inscribed ; in the leaden tablets containing the works of Hesiod, deposited in the temple of the Muses, in Beeotia; in the ten command- ments on stone delivered to Moses; and in the laws of Solon, inscribed on planks of wood. The notion of a literary production surviving the destruction of the materials on which it was first written—the “‘monuinentum ere perennius ” of Horace’s ambition—was unknown before the discovery of substances for systematic transcription.

Tablets (¢abule) of ivory or metal were in common use Tablets.

among the Greeks and Romans. When made of wood— sometimes of citron, but usually of beech or fir—their inner sides were coated with wax, on which the letters were traced with a pointed pen or stiletto (stylus), one end of which was used for erasure. It was with his stylus that Cxsar stabbed Casca in the arm when attacked by his murderers. Two such tablets, joined together, were called diptycha,! the earliest specimens of bookbinding. They were fastened together at the back by wires, which acted as hinges; the pages were called cerw, from their waxen coating, and a raised margin was left round each to prevent obliteration by friction. Wax tablets of this kind continued in partial use in Europe during the Middle Ages; the oldest extant specimen, now in the museum at Florence, belongs to the year 1301.

The leaves of the palm tree were after- wards used in their stead, as also the inner bark of the lime, the ash, the maple, and the elm. But the earliest, though long obsolete, flexible material of importance was made from the concentric coats which wrapped the stalk of the Egyptian papyrus, from which is derived our word paper. The time of its introduction has been much disputed ; but it was certainly known long before Herodotus. The length of the Greek papyri is said to vary from eight to twelve inches; the Latin often reach sixteen. Some rolls, however, have been found as long as thirty feet. They were written on with reeds dipped in gum-water coloured with charcoal or soot of resin, the writing being readily obliterated with a sponge ; and it is conjectured that the surface was some- times prepared for that purpose with a wash or varnish. Pliny mentions also the ink of the cuttle fish as having been used for writing, as well as a decoction of the lees of wine.” Red ink consisted of a preparation from cinnabar. The next material commonly employed after papyrus was

parchment, made from the skins of animals, usually of Parchment

sheep or lambs. Vellum is a finer substance, consisting of prepared calf-skin. Parchment is commouly ascribed to Eumenes, king of Pergamus, in Asia Minor; but he was, in all probability, not the inventor but the improver, Writing on skins is mentioned by Herodotus as common in his day ; and Diodorus and Ctesias speak of ancient Persian records on leather. The word itself (pergamena) first occurs, according to Mabillon, in the writings of Tatto, a monk of the 4th century. It appears to have superseded papyrus about the 7th century ; but its quality afterwards

1 See Montfaucon, Pal. Grec. p. 84. in the British Museum.

2 For more on this subject see Caneparius, De Atramentis cujus- cumque generis, London, 1660; Beckmann’s History of Inventions s and Becker’s Charicles and Gallus.

There are several specimens

Paper.

Rolls.

Form now used.

deteriorated. At first only one side was written on, the back being frequently stained. Parchments written on both sides are called by Pliny opisthographt. The term boc-fell is found, in early English, to designate this material. Its dearness in classical times led to the practice of erasing the original writing for the purpose of substituting new. Parchments so obliterated are known as palimpsests, from a Greek word signifying twice rubbed, or prepared for writing ; and they are alluded to under that name by Cicero (ad Dw. vii, 18). Paper made from cotton (charta bombycina) came into use, according to Montfaucon, towards the end of the 9th or the beginning of the 10th century; and the in- vention was opportune, as it checked the further use of palimpsests, which, from the scarcity of parchment and the demand for books of devotion, had imperilled the preserva- tion of much classical literature. Cicero's De Republica was discovered by Angelo Mai in the Vatican library written under a commentary of St Augustine on the Psalms; and the Institutions of Gaius, in the library of the chapter at Verona, were deciphered in like manner under the works of St Jerome. But the invention of linen paper gave the first real impulse to book production. The precise date of this invention is disputed ; Mabillon refers it to the 12th century. Montfaucon, however, found no specimens earlier than 1270, and Maffei none before 1300; the most numerous of them belong to the 14th century. Scaliger ascribes the invention to the Germans, Maffei to the Italians, and others to certain Greek refugees at Basel; while Duhalde refers it to the Chinese, and Prideaux to the Saracens in Spain. For further particulars respecting the various substances of early books, the reader may consult the first volume of the Nouveau traité de diplomatique, by the Benedictines of St Maur, and the Hssai sur histoire dw Parchemin et du Vélin, by Peignot, who has given a list of authorities on this subject.

The form of ancient books differed with the materials of which they were composed. When flexible matter came into use, it was found convenient to

make books in the form of rolls, and the two names are synonymous in legal phraseology to this day. The papyrus, and after- wards the parchment, was joined together to form one sheet, and then rolled upon a staff into a volume (volwmen). When an author divided his work into portions or “ books,” in the literary sense of the word, each division was usually a volumen by itself,—thus Ovid speaks of his fifteen books of the Metamorphoses as so many volumina ; and the same was done when an entire work was too bulky to be rolled ou one stick. ‘The staff in the Herculaneum rolls is con- cealed by the papyrus, but it usually projected, the ends being ornamented with bosses (wmb¢lcz) of wood and ivory. The title (tituwlus index) was either suspended like a ticket to the roll, or pasted on the outside. These rolls were frequently protected by a parchment cover; they were deposited in a cylindrical box (capsa or scrim), or were arranged horizontally in cases round the walls of a library, asat Herculaneum. Many books could probably be stowed away in small compass by this means; and the smallness of the rooms devoted in ancient times to such collections is readily explained in this manner. The volwmen, however, in most cases, was far from containing as much as our ordinary books, even in an octavo form. The square form, originally applied to the codices or wax tablets joined together in the way described above, was resorted to afterwards for separate leaves, the same name being re- tained with altered materials. Martial speaks of this later kind of codex as a novelty in his day. It was com- mon, however, in Greek MSS., among the earliest of which Montfaucon discovered few specimens of rolls. The term liber in the 4th century is found applied to both rolls and squared leaves, but the former were discontinued in the

Middle Ages, and covers of boards were gradually intro- duced, the leaves being stitched together as well as folded. The internal arrangement of books has undergone Internal many modifications, which belong, however, chiefly to the ®™nge- subject of early writing. At first the letters were divided ™™™ only into lines, then into separate words, and these by degrees were noted with accents, and distributed by points and stops, into periods, paragraphs, chapters, and other divisions. In some countries, as among the Orientals, the direction of the characters was from right to left, in others, as

among the Northern and Western nations, from left to right. The early Greeks followed the two directions alter- nately,—a method which was called boustrophedon, from its analogy to the path of oxen when ploughing. In most countries the lines run from side to side, but in some, parti- cularly among the Chinese, their direction is vertical.

The diffusion of early books concerns especially the

literary historian. Their scarcity before printing is illus- trated by the conditions attached to purchase or loan ; but it must be remembered that a particular book might easily bear a monopoly price, and that this is no test of the cost of those which might be multiplied by transcription. When, however, the small number of copyists in the Dark Ages and even later is considered, the high prices recorded in many instances do not appear surprising. A curious collection of scattered notices of this kind is given in the first volume of Warton's LHistory of English Poetry. A catalogue of the books in the Sorbonne in 1292, consisting of upwards of 1000 volumes, is mentioned by Chevillier? as having been valued at 3812 livres, equiva- lent, according to an English writer, to as many pounds sterling of the present day. In 1425, when the English became masters of Paris, the duke of Bedford, regent of France, sent the whole of the royal library into England ; and the collection, which amounted to only 853 volumes, was valued at 2223 livres.

The characteristics of early printed books are noticed Printed under the head of BrstiocraPHy (g. v.) The folio and books. quarto sizes, originally adopted from the largeness of the types in the infancy of printing, are now generally restricted to works of bulk, as dictionaries and other books of reference. The size of a printed book is named from the dimensions of the paper and the number of leaves into which it is folded. The ordinary sizes for a long time were royal, demy, and crown; and the demy 8vo is now the commonest size inuse. Post and foolscap are frequently but inaccurately described in catalogues as duodecimo. "Paper-moulds," says Mr W. Blades,? a competent authority on this subject, "have fixed conventional sizes ; but since the introduction of machines for making paper, and the consequent disuse of moulds, makers work more by a given number of inches than by names of sizes. Consequently, the correct description of book sizes has

become impossible, and the trade describe the new by the names of the old size they most resemble. ‘To determine the real size of a bound book,” he adds, “find the signature (a letter or figure at the bottom of the page), and count the leaves (not pages) to the next. A further test is the binder’s thread in the middle of the sheet; the number of leaves from each thread to the next will give the same result. But these rules do not apply to old black-letter books and those of the 15th and 16th centuries, in which the most satis- factory test is the water-mark. The rule is:—a folio volume will have all the water-marks in the middle of the page;

a quarto has the water-mark folded in half in the back of the book, still midway between the top and bottom ; in an octavo it is at the back, but at the top, and often

A

1 Origines de UVimprimerie de Paris, p. 370, 2 Notes and Queries, 3d series, ix. 83.

BOOK

considerably cropped by the binder’s plough ; and a 12mo and 16mo have the water-mark on the fore-edge.” For furthcr information regarding MS. books see Pauzo-

GRAPHY, and for printed books Bistiocrapuy. (£. F. ‘.) Bookselling. The trade in books is of a very ancient date. The early

poets and orators recited their effusions in public to induce their hearers to possess written copies of their poems or orations, Frequently they were taken down viva voce, and transcripts sold to such as were wealthy enough to pur- chase. In the book of Jeremiah the prophet is repre- sented as dictating to Baruch the scribe, who, when ques- tioned, described the mode in which his book was written. These scribes were, in fact, the earliest booksellers, and supplied copies as they were demanded, Aristotle, we are told, possessed a somewhat extensive library ; and Plato is recorded to have paid the large sum of one hundred minz for three small treatises of Philolaus the Pythagorean. When the Alexandrian library was founded

about 300 B.C., various expedients were resorted to for the purpose of procuring books, and this appears to have stimulated the energies of the Athenian booksellers, who were termed BiBrlwv xdarnro. In Rome, towards the erid of the Republic, it became the fashion to have a library as part of the household furniture; and the booksellers, librardi (Cic., De Leg., iii. 20) or bebleopolee (Martial, iv. 71, xiii. 3), carried on a flourishing trade. Their shops (taberna librarw, Cicero, Phil., ii, 9) were chiefly in the Argiletum, and in the Vicus Sandalarius. On the door, or on the side posts, was a list of the books on sale ; and Martial (i. 118), who mentions this also, says that a copy of his First Book of Epigrams might be purchased for five denarii. In the time of Augustus the great booksellers were the Sosii. According to Justinian (ii. 1, 33), a law was passed securing to the scribes the property in the materials used; and in this may, perhaps, be traced the first germ of the modern law of copyright.

The spread of Christianity naturally created a great demand for copies of the Gospels and other sacred books, and later on for Missals and other devotional volumes for church and private use. Benedict Biscop, the founder of the abbey at Wearmouth in England, brought home with him from France (671) a whole cargo of books, part of which he had “ bought,” but from whom is not mentioned. Passing by the intermediate ages we find that, previous to the Reformation, the text writers or stationers (stacyoneres), who sold copies of the books then in use,—the A B C, the Paternoster, Creed, Ave Maria, and other MS. copies of prayers, in the neighbourhood of St Paul’s, London,—were, in 1403, formed into a guild. Some of these “ stacyoneres ” had stalls or stations built against the very walls of the cathedral itself, in the same manner as they are still to be found in some of the older Continental cities. In Mr Anstey’s Munimenta Academica, published under the direc- tion of the Master of the Rolls, we catch a glimpse of the “sworn” university bookseller or stationer, John More of Oxford, who apparently first supplied pupils with their books, and then acted the part of a pawnbroker. Mr Anstey says (p. 77), “The fact is that they (the students) mostly could not afford to buy books, and had they been able, would not have found the advantage so considerable as might be supposed, the instruction given being almost wholly oral. The chief source of supplying books was by purchase from the university sworn stationers, who had toa great extent a monopoly Of such books there were plainly very

large numbers constantly changing hands.” Besides the Sworn stationers there were many booksellers in Oxford who were not sworn ; for one of the statutes, passed in the year 1373, expressly recites that, in consequence of their pres-

ence, “ books of great value are sold and carried away from Oxford, the owners of them are cheated, and the sworn stationers are deprived of their lawful business.” Tt was therefore enacted that no bookseller except two sworn stationers, or their deputies, should sell any book being either his own property or that of another, exceeding half a mark in value, under pain of imprisonment, or, if the offence was repeated, of abjuring his trade within the university.

“The trade in bookselling seems,” says Hallam, “to have been established at Paris and Bologna in the 12th century; the lawyers and universities called it into life. It is very improbable that it existed in what we properly call the Dark Ages. Peter of Blois mentions a book which he had bought of a public dealer (a guodam publico nuangone hibrorum) ; but we do not find many distinct accounts of them till the next age. These dealers were denominated stationarw, perhaps from the open stalls at which they carried on their business, though statio is a general word for a shop in low Latin. They appear, by the old statutes of the University of Paris, and by those of Bologna, to have sold books upon commission, and are sometimes, though not uniformly, distinguished from the lbrarii, a word which, having originally been contined to the copyists of books, was afterwards applied to those who traded inthem. They sold parchment and other materials of writing, which have retained the name of stationery, and they naturally exer- cised the kindred occupations of binding and decorating. They probably employed transcribers ; we find at least that there was a profession of copyists in the universities and in large cities.”

The modern system of bookselling dates from soon after the introduction of printing. ‘The earliest printers were also editors and booksellers ; but being unable to sell every copy of the works they printed, they had agents at most of the seats of learning. Antony Koburger, who introduced the art of printing into Nuremberg in 1470, although a printer, was more of a

bookseller; for, besides his own sixteen shops, we are informed by his biographers that he had agents for the sale of his books in every city of Chris- tendom. Wynkin de Worde, who succeeded to Caxton's press in Westminster, had a shop in Fleet Street.

The religious dissensions of the Continent, and the Reformation in England under Henry VIII. and Edward VI, created a great demand for books; but in England neither Tudor nor Stuart could tolerate a free press, and various efforts were made to curb it. The first patent for the office of king's printer was granted to Thomas Berthelet by Henry VIII. in 1529, but only such books as were first licensed were to.be printed. At that time even the pur- chase or possession of an unlicensed book was a punishable offence. In 1556 (3 and 4 Philip and Mary) the London Company of Stationers was incorporated, and very extensive powers were granted in order that.obnoxious books might be repressed. In the following reigns the Star Chamber exercised a pretty effectual censorship ; but in spite of all precaution, such was the demand for books of a polemical nature, that many were printed abroad and surreptitiously introduced into England. Queen Elizabeth interfered but little with books except when they emanated from 'Roman Catholics, or touched upon her royal prerogatives; and towards the end of her reign, and during that of her pedantic successor, James, bookselling flourished. Arch- bishop Laud, who was no friend to booksellers, introduced many arbitrary restrictions; but they were all, or nearly all, removed during the time of the Commonwealth. So much had bookselling increased during the Protectorate that, in 1658, was published A Catalogue of the most Vendible Books in England, digested under the heads of Divinty, History, Physic, é&c., with School Books, Hebrew, Greek, and Latin, and an Introduction, for the use of

Schools, by W. London.

of the Press, which continued till 1694.

In the first Copyright Act (8 Anne, c. 19), which speci- ally relates to booksellers, it is enacted that, if any per- son shall think the published price of a book unreason-

ably high, he may thereupon make complaint to the arch- bishop of Canterbury, and to certain other persons named, who shall thereupon examine into his complaint, and if well founded reduce the price ; and any bookseller charging more than the price: so fixed shall be fined £5 for every copy sold. Apparently this enactment remained a dead letter.

The modern bookselling trade divides itself into the seve- ral branches of publishing and wholesale bookselling, and the retail, the old or second-hand, and the periodical trades. Publishing is confined to a few of the larger cities, London naturally taking the lead, followed by Edinburgh, Glasgow, Oxford, Manchester, Liverpool, Cambridge, Dublin, and a few other places; while purely wholesale dealers are to be found in the large towns only. In Great Britain, and especially in Scotland, booksellers are located in every small town; but in Ireland there are very few, except in the chief cities. pected to demand the full retail price of a book, and make

no greater reduction than discount for ready money ; but

this restriction has been discontinued as contrary to the spirit of free trade.

of business, requiring a knowledge of bibliography, while the transactions are with individual books rather than with numbers of copies.

books, which, having ceased from one cause or another to sell with the publisher, they offer to the public as bargains. The periodical trade is entirely the growth of the present century, and was in its infancy when the Penny Magazine, Chambers’s Journal, aud similar publications first appeared. The growth of this important part of the business has been greatly promoted by the abolition of the newspaper stamp and of the duty upon paper, the introduction of attractive illustrations, and the facilities offered for purchasing books by instalments.

The history of bookselling in the New World has yet to be written. The Spanish settlements in America drew away from the old country much of its enterprise and best talent, and the presses of Mexico and other cities teemed with publications mostly of a religious character, but many others, especially linguistic and_ historical, were also published. Bookselling in the United States was of a somewhat later growth, although printing was

introduced into New York as early as 1673, Boston in 1674, and Philadelphia in 1683. Franklin had served to make the trade illustrious, yet few persons were engaged in it at the commencement of the present century. Books chiefly for scholars and libraries were imported from Europe ; but after the second war printing-presses multiplied rapidly, and with the spread of newspapers and education there also arose a demand for books, and publishers set to work to secure the advantages offered by the wide field of English literature, the whole of which they had the liberty of reaping free of all cost beyond that of production. The works of Scott, Byron, Moore, Southey, Wordsworth, and indeed of every author of note, were reprinted without the smallest payment to author or proprietor. Half the names of the authors in the so called “American” catalogue of books printed between 1820 and 1852 are British, By this means the works of the best authors have been brought to the doors of all classes in the cheapest variety of forms. In consequence of the war with the Southern States, the

A bad time immediately fol- lowed. The Restoration also restored the office of Licenser

Formerly the retail booksellers were ex- .

The trade in old or (they are some- times called) second-hand books is in a sense a higher class

Occasionally dealers in this class of books replenish their stocks by purchasing remainders of

high price of labour, and the restrictive duties laid on in order to protect native industry, coupled with the frequent intercourse between the two countries, a great change has taken place during the last few years. Books printed and bound in Britain are greatly appreciated, and American publishers, in the absence of an international copyright, make liberal offers for early sheets of new publications. Boston, New York, and Philadelphia still retain their old supremacy as bookselling centres.

In Australia the sale of books is not large at present ; there are, however, indications of a great increase. The booksellers there as in Canada, although supposed to be bound by the copyright law restricting the sale of any but

genuine editions, avail themselves of American and other reprints, in which the authors have little or no interest.

After the revocation of the Edict of Nantes the Low Countries for a time became the chief centre of the bookselling world, and many of the finest folios and quartos in our libraries bear the names of Jansen, Blauw, or Plantin, with the imprint of Amsterdam, Utrecht, Leyden, or Antwerp, while the Elzevirs besides other works produced their charming little pocket classics. The southern towns of Douai and St Omer at the same time furnished polemical works in English.

Germany, the birthplace of the art of printing, is still the first bookselling country in the world. There, dis- tributed over 786 towns, are 3473 publishers and book- sellers, Leipsic being the centre to which they all look, all of any consequence having an agency there, where their books are collected, and their own publications distributed. In Leipsic there are 105 commission-agents for 4202 booksellers, of whom 1143 carry on business in Austria, France, Russia, Holland, America, and England. The book exchange has 115 members who transact business there. The other centres of the German book trade are Stutt- gart, with 16 agents for 542 booksellers ; Vienna, with 31 agents for 475; Berlin, with 29 agents for 305; and Prague, with 18 agents for 98. The great book fair at Leipsic is held every year immediately after Easter, and is attended by booksellers from every part of the world.

In France the press is still shackled, and every book and pamphlet must be registered before publication ; but not- withstanding this booksellers flourish, especially in all the large towns, and some of the finest illustrated works of the day are issued from the French press. In Italy book- sellers are few, and in Spain they can hardly be said to have any existence at all.

From the English Catalogue of Books for 1874 it appears that there were about 4500 books published in Great Britain and Ireland during that. year. This number in- cludes new editions of works previously issued, as well as the principal books published in the United States.

The values of books exported and imported during 1874 are given in the official returns as follows :—

Exports. i Imports. To United States…..... £274,378 | From France….....-. £57,680 » Australia …... 2 …:..267,658 » (Gerlmamye….2…..: 36,494 ,, British India and yn OR aa 3.0.03, 31,837 (Rica leh aepernccceeers ce 83,259 5, United States….. 17,807 ,», British N. America.. 69,127 Fy esos hhi ni Aeperemery se 254 ao, SRWIICON cn Tautacet es 41,622 Sy RMIT ope cee dennces 4,177 j) OWE AMAL Seek «iene 35,986 Wy Se MRSULI or aclewss otapernien's 1,328 4) Holland.' .< tance oe ,, Other countries… 13,359 op: CROTUMAMIY,. isis 6 ashe travers 19,894 73 DOU. 0s ssa epee 16,953 ,, British West Indies and Guiana…..... 14, 469 », Other countries …... 59,539 SF Total. ... ...£904,792 Lobel csesvee £178,956

Much interesting information on the book trade will be found in Charles Knight's Biography of William Caxton,

and in the same author's Shadows of the Old Booksellers, 1865. See also History of Booksellers, by Henry Curwen, 1873, and Bilder-Hefte zur Geschichte des Biicherhandels, by Heinrich Lempertz, Cologne, 1854.

BOOKBINDING is the art of fastening together the sheets of paper composing a book, and enclosing them in eases of pasteboard covered with leather, cloth, or other materials,—the object being the preservation of the book, and its protection from injury while in use.

At the time when books were rarities, being either manu- scripts produced by patient secluded labour or the pro- ductions of the printing-press during the infancy of typo- graphy, they were naturally very highly prized; and as much labour and expense were bestowed upon the pro- tection and embellishment of a cherished folio as would suftice at the present day for the building of a house. The wooden cover of a book, with its metal hinges, bosses, guards, and clasps, seems, in all but dimensions, fit for a church door; but the great improvement in all the mechanical arts, together with the extension of education to all classes, and the consequent diffusion of knowledge, has led to the multiplication of books, and the gradual but radical changes witnessed during the present century in the art of bookbinding,

For a period of one thousand years—from the end of the 5th to the 15th century—books were excessively rare and costly, and comparatively few bindings illustrative of the art during the Dark Ages have been preserved to the present day. From being the task of slaves during the Roman empire, the transcribing of books came to be the duty of monks, who copied and bound the works whieh were among the chief treasures of religious establishments. Numerous documents exist indicating the attention which was given by all grades of the priestly order to the bind- ing and preservation of their literary treasures. The general aspect of monastic bindings was thick, heavy, and solid, and according to modern ideas somewhat clumsy. Books for common use were enclosed in boards of hard wood eovered with leather, with the binding protected by metallic bosses, corner plates, and clasps. The literary treasures, on the other hand, of kings and ecclesiastical dignitaries, and the sacred volumes of churches and monas- teries, were encased in ivory sides, with appropriate subjects artistically carved on them, in silver and sometimes even gold plaques, or in the enamels of Limoges, &e.; and these bindings were frequently enriched besides with gems and jewels. Often these precious volumes were, in keeping with ancient customs, further preserved in boxes or cases no less rich and costly than the bindings they were meant to preserve. As the period of the Renaissance approached, silk and velvet came into use for ornamental bindings.

The most ancient binding in the British Museum is the St Cuthbert gospels and manuscript, written about the beginning of the 8th century, bound in velvet intermixed with silver, with a broad silver border, enriched with inlaid gems. One of the most ancient and remarkable of bindings, a Lectioncrium, which was formerly in the eollection of M. Libri, that eminent bibliophile thus deserives in his Monuments inédits: “ Manuscript upon vellum of the 11th or 12th century in an ornamented cover (forming a diptych), both sides being gilt and silvered metal, with ivory carvings, figures in alto rilievo, and enamels en taille d’épargne. The borders contain thirty-two large Wory medallions (sixteen on each side), representing the old prophets and saints, with their symbols, and having inscriptions in ancient uncial letters, the whole surrounded with a foliage of ivory work in the Greek style, and with baguettes carved in compartments. The ivory niedallions are very early, probably as old as the 6th century, whilst the enamels and metal ornamentation are specimens of the

handiwork of a rather later period. . . . This Lectionarium has evidently been inserted in the present cover at a later period, the original one having most probably been damaged or destroyed by use." Referring to this work, M. Libri, in the introduction to the volume above quoted, says: "Whether the enamels contained in this binding are Byzantine and contemporary with the ivory sculptures, or were introduced later (as we have shown was frequently the case) into an older covering, the medallions and other workmanship in ivory, adorning the sides of this coating, appear, from the character of the heads, from the inscriptions, and from the workmanship itself, to date back to the earliest period of the Byzantine school."

With the invention of printing, and the consequent multiplication of books in a portable shape, came the modern style of bookbinding. The old inassive boards, with their bosses, corner plates, and heavy clasps disap- peared, and thin sides covered with leather, parchment, and vellum came into use. Bindings in which enamels, precious metals, or gems were employed almost entirely disappeared, and were followed by bindings in richly-coloured leather or vellum, with elaborate designs, blind- tooled or worked in gold and colour, and gilt gauttré edges. By the wealthy and powerful families of Italy this style of binding and ornamentation was first encouraged towards the end of the 15th century, and skilful artists were employed to design appropriate decorations to be worked out by the bookbinders. Among the most famous early patrons of the bibliopegic art in Italy were Michael and Thomas Maioli, the books of the latter being the models on which were fashioned the bindings of later collectors and of other countries. More rare and artistically valuable still are the works of another Italian collector of the 16th century, Demetrio Canevari, commonly called Mecenate, physician to Pope Urban. They are distinguished by a medallion executed in gold, silver, and colour, with the device of a charioteer driving towards Pegasus on an elevation, and the motto, OPOQS. KAI. MH AOZIOS. These elegantly gilt bindings have, in the opinion of M. Libri, never been surpassed,

Artistic bindings of Italy and Italian binders were brought to France by Charles VIII. and Louis XII.; but it was not till the time of Francis I.—

himself a lover of books and bindings—that Grolier, his military treasurer and the governor of Milan, brought the French school of binding suddenly to the front, and placed it, where it long remained, at the head of the art in Europe. The bindings executed for Grolier usually contain on their obverse the inscription, 10. GROLIERII ET AMICORUM, and on the reverse his usual motto was PORTIO MEA DOMINE SIT IN TERRA VIVENTIUM. Of Grolier's bindings the learned De Thou, a later and little less famous French bibliophile, remarked " that his books partook of the elegance and polish of their owner." The Grolier style is yet recognized as the most chaste, elegant, and appropriate method of book ornameutation, and it immediately attained an enormous reputation in France. '"The very tools used by his binders," remarks M. Libri, ""were employed for contemporary collectors, and his admirable patterns have been imitated and copied by other French bibliophiles. The gradual change in those patterns is very perceptible. At first they were formed by a simple and chaste combination of various links only; but after- wards Grolier successively introduced into the designs more rieh ornaments, such as small flowers, wreaths, é&c." Some of his later covers were resplendent with gold and coloured ornament, most elaborately tooled.

After the period of Grolier the taste for magnificent bindings in France grew into a passion, and the sumptuous bindings in which the famous Diana of Poitiers indulged

are almost without parallel. The designs for many of her bindings are said to have been prepared by order of her royal lover Henry II., under the superintendence of the celebrated artist Le Petit Bernard. Her books are marked with her favourite symbols, the lunar crescent and the bow, and the monogram D q, sometimes (probably in the case of love-gifts) with the H of Henry interlaced, and surmounted by the crown. It would be a useless and almost endless task to name the patrons of artistic bind- ings up to near the period of the revolutionary outbreak, during which long time French binders stood at the head of their craft. Such outstanding names among many bibliophiles as those of the historian De Thou (Jacobus Augustus

Thuanus) and Colbert, the minister of Louis XIV., cannot be passed over. Such was Colbert's care for artistic bookbinding that, in a treaty with Marocco, he inserted a stipulation for a certain number of skins annually to be used for bindings in the Bzbliotheque Royale. Much less is known concerning the bookbinders themselves than of their patrons and the works they executed; but prominent among the bibliopegic artists of all times stand the chief French reléewrs of the 17th and 18th centuries—Le Gascon, Abbé Dusseuil, Padeloup, and Derome. Bindings by these artists are among the esteemed prizes of modern collectors.

Although during the 16th and 17th centuries bindings were produced in England which suffer no disgrace by com- parison with contemporary masterpieces of French, Italian, and German bibliopegy, it was not till well into the 18th century that England took the leading place in the work- manlike forwarding and artistic finishing of books. Silk and velvet long remained the favourite coverings for the more costly bound books in the royal library, and down to the time of James I. we find very elaborately worked bindings in these substances. But, at the same time, there are not wanting magnificent examples of work in calf, morocco, and vellum, with blind and gold toolings, and gilt gauffré edges. The bindings of John Reynes, bookbinder to Henry VIII., had embossed on them the curious heraldic conceit of a shield, supported by a pair of unicorns, charged with the emblems of the passion, and

along with his monogram the inscription Medemptorcs |

mundi arma. Before James VI. of Scotland came as James I, to the English throne, he was, as became his literary character, a collector of books and a lover of bind- ings. John Gibson of Edinburgh held, under James, the office of royal binder, with an annual salary of £20 Scots. A detailed list of bindings, with the prices charged by Gibson, is printed by the Bannatyne Club in Zhe Library of Mary Queen of Scots and James VI. Mr J. T. Gibson- Craig of Edinburgh has in his excellent collection an original Scotch binding from the library of Queen Mary, the Cronique de Savoye, a small folio in brown calf, richly tooled in silver, with the Scottish arms, and the initial M. The same collector also possesses a Scotch binding in brown calf, with blind and gold panelling, gilt and gautfrée edges, with the name

and arms of the Earl of Bothwell, the third husband of Queen Mary. De Quincey, in a paper on ‘Secret Societies,” ranks a Bible bound by Mr Farrer in 1635 above the chefs d’auvre of British and Continental artists,

_ The acknowiedged supremacy attained by English book- binding in the latter half of last century is due in large measure to the work of Roger Payne, a man gifted with extraordinary skill, dexterity, and taste, but unfortunately also of the most erratic and dissolute habits. Payne’s work was, as he himself expressed it, “very carefully and honestly done ;” his tooling especially was very beautiful, and his ornaments, many of which he fashioned with his own hands, were at once highly appropriate and artistic.

In his bills he was in the habit of taking his patrons into his confidence in an unusual manner, and one of these may be worth copying.

“ Aeschylus Glasywe MDCCXOV Flaxman illustravit. Bound

in the very best manner, sew’d with strong Silk, every Sheet round every Band, not false bands: the Back lined with Russia Leather, Cut Exceeding large ; Finished in the most magnificent manner. | Embordered with Ermine expressive of The High Rank of the

Noble Patroness of The Designs, ‘he other Parts Finished in the

most Elegant Taste with small Tool Gold Borders Studded with

Gold ; and small Tool Panes of the most exaet Work. Measured with the Compasses. It takes a great deal of Time making out the

different measurements, preparing the Tools, and making out new

Patterns. The Back Finished in Compartments with parts of Gold studded work and open Work to relieve the Rich elose studded

work, Al the Tools exeept studded points are obliged to be

worked off plain first, and afterwards the Gold laid on and Worked off again. And this Gold Work requires double Gold being on Rough Grained

Moroeeo. The impressions of the Tools must be fitted and cover'd at the bottom with Gold to prevent flaws and eracks."

Payne, in poverty aud distress, came prematurely to a drunkard's grave in 1797. His style of binding has still many admirers, and the Roger Payne style is one of the established methods of finishing in bookbinders' establish- ments at the present day. After Payne, Charles Lewis was the next famous English binder flourishing in London in the early part of the present century, and his bindings come down to and connect with the work of bibliopegistic artists who still exercise their calling.

The operations of bookbinding are now carried on upon a scale which could not have been dreamt of even at the beginning of the present century, and the millions of volumes which annually issue from the press could not possibly be put into the hands of the reading public in the form and at the price at which they are sold without the aid of machinery. In Great Britain nearly all books are first issued in cloth cases, and while the greatest variety of grain and colouring has been reached in the preparation of the cloth for such cases, their gilding, embossing, and lettering, all accomplished by machinery, leave almost no improvement to be desired, and the most handsome and fairly durable bindings can thus be supplied at an in- credibly small cost. At the same time, it is practicable to prepare, emboss, and gild cheap leather covers by the same processes and machinery adopted for cloth cases, and the bindings of cheap family and pocket Bibles are thus pro- duced, But although the old solid and substantial handi- work of the craft is thus fairly eclipsed, there is still employment—and more employment than ever—for binders in leather, who chiefly rely on manual dexterity for the forwarding of their work, and individual taste and skill for its artistic finishing.

Modern bookbinding thus divides itself into two principal branches—lst, Leather work, and all kinds in whieh manual labour and skill are chiefly employed ; and 2d, Cloth-easing, or such work as is largely exeeuted by the aid of machinery.

It may be convenient first to notice the various operations through which a book passes in ordinary or leather binding. These operations are grouped under two main divisions—"" forwarding" and "finishing." Under the first

is comprehended everything necessary to the preservation of a book ; the seeond concerns merely the embellishment.

Forwarding.—In the first place, the sheets of a book are folded in such a manner that the pages follow each other in consecutive order. In this operation the binder is guided by the "‘ signatures," which indicate the part of a sheet to be superimposed upon another. This labour is performed by women and girls, who aequire in- eredible dexterity by continued practice. ‘The sheets, after being folded, are loose and bulky. The next operation has for its object the bringing them into a more eompaet form, which was formerly accomplished by beating them with a broad-faced hammer upon a smooth flat stone. The condensing or compacting is now generally aecomplished by passing the sheets between the cylinders of a roll- ing-machine. ‘A quantity of sheets, ealleda ‘‘ section," is gathered

and arranged between two pieces of tin plate and passed through

——

between the powerful cast-iron rollers of the machine. After roll- ing, the sections composing a volume, supposing it to have been necessary to press it in more than one division, are brought together and carefully collated. The whole of the sheets to compose the volume being found in their proper place and order, they are taken in sections to the standing-press, in which a number of them are piled up between boards. The form of standing-press generally used is what is termed the Atholl or Isle of Man press, on account of the three arms, or rather legs, by which the compound screw of the press is worked.

The volumes arc then adjustcd and clamped up in the laying or cutting-press for the operation of sawing the back. ‘Two or three grooves are, in this operation, sawn straight across the back of the volume, according to the number of bands on which the book is to be sewed. In these grooves the bands are lodged, so that when the sewing of the book is complete, the bands are ‘‘ flush" with the rest of the back, instead of projecting out as they did in old times. A slight cut is made near each end for holding the ‘‘kettle

stitch,” or stitch by which the sewer fastens her thread each time she passes up and down. The sewing is done at an apparatus called the sew- ing-press or frame, upon which the number of cords to be employed are fastened at proper distances, in accordance with the saw-marks in the back of the volume. The method of sewing varies according as the sewer is working one or two ‘‘sheets on;”’ and the number of bands employcd may be from two to six, according to the size of sheet, weight of the book, &. When taken out of the sewing- frame the fly-leaves are pasted on, and the volume being neatly squared, the back is covered with a coating of thin glue ; it is then Jaid on a board and allowed gradually to dry. When the glue is quite dry the back is rounded by beating with a hammer, and sub- sequently the volume is placed between two feather-edged boards, above which the back slightly projects. These are then placcd together in a lying-press, for the backing process, that is, the back of the book is well beaten until it projects a little over each side of the bevelled board, so as to form a groove or place for the millboard covers to lie in. The book is now ready for the boarding. The boards were formerly, as the name indicates, really of wood, but now of millboard of various thicknesses, according to the size of the book. They are cut a little larger than the book itself, and are attached by the ends of the bands, left for that purpose, being passed through holes in the sides of the boards. The ends of the slips or bands are then frayed out, pasted down, and hammered flat and smooth. The volume is next placed between pressing boards, and put with others into the standing-press, where it is submitted to a powerful

ressure for several hours. ‘Thereafter it is again fastened into a ying-press for cutting or ploughing the edges with a knife-edged instrument called the plough. The object of the binder in this operation is to make every page of uniform size, presenting a smooth and equal “‘head,” ‘‘tail,” and ‘‘fore-edge.” The binder is careful to leave as broad a margin as practicable; but the size of the smallest sheet is the real gauge of the whole book. The head is first cut, next the tail, and before the face is cut it is necessary to have the back flattened by passing ‘‘ trindles” through between the cords and the boards. After the face has been ploughed the back springs back into its rounded form, and thus the face presents the appearance of having been cut in the round. he book is now ready to have its edges either sprinkled, coloured, marbled, or gilt. Sprinkling is accomplished by merely mixing the

colour or colours with paste or size, and throwing the mixture from a brush violently on the edges. The uniform colouring of the edges is done by screwing the volume up in the lying-press and applying the colour with a sponge. Marbling is usually carried on as a separate trade, and requires considerable adroitness, The colours to be used are thrown into a square shallow trough contain- ing prepared gum water, and as they float on the top they are dexterously mixed and combed through each other so as to pro- duce the kind of marble pattern desired. In this the edges to be marbled are dipped, and when they are withdrawn it is found that the marbled colours have adhered to them. In the gilding the fore- edge or face is first operated on; and to level it the back must again be flattened, as in ploughing. The book is then firmly fixed in the lying-press, and the edges are scraped and smoothed with a steel scraper. The edges are next coloured, the gold size, consist- Ing of white of egg mixed with water, called glaire, is laid on with a camel's-hair brush, and immediately covered with gold leaf. When dry, it is burnished by rubbing with an agate burnisher, and the head and tail are put through the same processes. Gilt edges in early bound books were usually gau/ffré, i.c., had designs impressed on them ; but scarcely any such work is now done.

The head-bands, which are next attached to the back head and tail, are ornamental appendages, which partly conceal the folded-in edges of the leather, and give a finished aspect to the book. They consist of strips of vellum or parchment worked over with coloured silk or cotton, and are partly glued to the backs and partly fastened by threads passing through the kettle stitches. The back is then lined with strong paper glued on it, two or three thicknesscs being used according to the weight of the book. Nearly all books are

now bound with open or elastic backs, that is, with the leather of the cover not attached to the back of the sheets. The elastic back is composed of a strip of thin cardboard as long as the volume and a little broader than the back, so that it covers the whole back, and is glued in the joint at the edge of the millboards. Across this elastic back false bands are glued to imitate

the projections produced by the cords of ancient bindings; and when these are dry, the book is ready for covering.

The materials used for covering are very various; but for the greater part of modern books calf-skin dyed of various colours is employed ; while kid-skin, and its imitation in sheep-skin or roan, and sheep-skin acknowledged as such, in which school-books and many law-books are bound, are also used in great quantities. The piece of leather, cut to a proper size, is moistened with water, next covered on the inner side with paste or glue, and then applied evenly to the millboard sides. The superfluous edge of the leather, first pared to reduce its thickness, is turned over on the inside, and concealed from view by the end papers attached to the sheets form- ing the book, which are subsequently pasted down upon the mill- boards, As a last operation in forwarding, but one now frequently omitted, the book is "corded," that is, firmly tied between two boards until it is dry, so as to insure perfect smoothness in the cover. A book is half-bownd when only the back and corners are protected with leather, the rest of the boards being covered with prepared paper or cloth.

Hinishing.—Finishing processes are so varied and numerous, ac- cording to the material under treatment and the effect to be produced, that a lengthy treatise would be required to detail the operations. It will suffice here to notice the operations in finishing an ordinary white-calf binding. The whole of the leather is first washed over with a thin paste of the consistency of cream and allowed to dry. The colouring is then done by brushing over it a solution of " salts of tartar" (tartrate of potash), which produces the brown tint of ordinary bindings. If the sides are to be further ornamented, as, for example, by forming ''tree-calf," they are washed over with glaire Gaile of egg). Hach board when dry is separately bent convex, and water is sprinkled on till it runs downwards from the central ridge in a great number of separate branching runlets. As the water is so running, a solution of copperas is sprinkled on and carried along and out by every tricklet, and thus the dark-coloured branched pepe are produced. The appearance of 'French calf" is produced by dabbing copperas from a sponge on the brown covers. The back is next pieced for title, by pasting a piece of coloured morocco into the space between the first and second bands. The points at which lines either blind or in gold are to cross the tibet are then marked, the

whole back is washed with thin paste, and two coatings of glaire are applied to it. When dry the gold leaf is laid on, the lines and ornaments are tooled, and the title lettered with tools and letters which have been heated at a gas stove. The superfluous gold is cleaned off, and after polishing the whole with a hot iron tool the back is finished. The same processes are followed with the sides and the ‘‘ squares” when any ornamentation is tooled upon them. In the case of finishing of a high class, in morocco, &c., the ornaments are first tooled blind, glaire is pencilled into the lines, and allowed to dry, and gold leaf is then laid on and tooled in. A book is said to be bound eatra

| when well forwarded, lined with superior paper, and gilt round the

sides and inside the squares.

Casing.—Previous to the year 1825, new books were generally issued in boards, that is, in millboards covered with drab paper, upon which the title, eee on a white label, was pasted. Although this was greatly superior to the Continental mode of covering new books with thin paper, something more elegant and durable was needed, and Mr Archibald Leighton of London endea- voured to meet this want by introducing coloured cloth (glazed calico). One of the first books of importance bound in this material was the edition of Lord Byron’s works in seventeen volumes. The covering of books in cloth cases can be done profitably only in a factory where there is much division of labour and many labour- saving machines. In cloth binding the preparation and ornamenta- tion of the cases are throughout distinct from the preparation of the sheets, and it is only in the very last stage that the volume and its case are brought together. The first process in the preparation of the cloth cases is cutting the millboard. This is now effected by a rotary cutting-machine or ‘‘ripper,” an invention introduced from America, whence indeed comes most of the machinery used in this species of binding. The machine consists essentially of a pair of strong spindles placed above each other, on which are mounted circular scissor-edged discs, which cut in pairs like the blades of a pair of scissors. The cutting discs can be arranged on the spindles to cut any desired size of board, and the gauge-frame on the feeding table pushes the pieces of millboard into the machine by a motion com- municated by a cam-wheel.

Such a machine will cut 50,000 pairs of boards in the working hours of a week. When the boards are to be bevelled this is done in a kind of planing-machine. The cloth for the covers being cut to the required size and covered with glue, a pair of boards are laid on with the help of a brass gauge,

which keeps them parallel, and regulates the width of the space to be left for the back. A strip of paper is pasted into the back, the edges of the cloth are laid in, and the boards are passed between a pair of india-rubber rollers, by the pressure of which any air-spaces between the cloth and the millboards are squeezed out. ‘They are then hung up to dry previous to receiving title and ornamentation. The ornamentation on book cases consists of embossing or blind tooling, black or colour printing, and gilding; and the machines in which the work is done are the same in principle. They are powerful presses, worked either by long lever handles or by power with heavy fly-wheels. Blind patterns, or gilded work and titling, are done at one operation, the dies containing the pattern being heated either with steam or gas. In the case of ornaments to be printed in ink, the pattern is first blocked in the blind with a heated die, and subsequently ink-printed in the same press with the die cold.

The gathering, collating, and stitching of the sheets differ in no way from the same processes already described for leather work. Machinery has been adapted for folding, but, for the working of folding-machines, guide points require to be printed on the sheets, as books must be folded by the type and not by the edge of the sheet. A machine of American origin, besides folding 8vo sheets, will cut, fold, and insert the half sheet of a12mo. This machine, attended by a single girl, is sufficient to fold from 1200 to 1500 sheets in an hour. The folded sheets are sometimes condensed in another American machine called ‘‘ The Smasher,” which is similar in its action to the embossing press. After stitching, books which are to be cased up with uncut edges have their face and tail cut square by means of a trimming-machine. The principle of this machine consists in a revolving circular knife driven with a treadle or handle; a table (containing the gauge, press bar, and rest), upon which the books are placed, glides across the axis of the knife, and the parts requiring cutting off, coming in contact with the revoly- ing knife, are

cut away. When the edges are to be gilt they are eut in some of the numerous forms of guillotine cutting-machines. The commonest form of guillotine is a heavy knife fixed in a strong framework, and having a diagonal motion in its descent by which it cuts with a kind of shearing action. In another machine the knife acts with a punching motion, and cuts the three edges in one descent; and there is in use a most ingenious American machine, with a revolving table, in which each edge of the book is in succes- sion drawn in a slanting direction up against a fixed cutter. The edges are gilt as in ordinary binding, but instead of each volume being operated on singly, a number are placed evenly in a lying press and gilt simultaneously.

After trimming or gilding, as the case may be, the backs are glued up, and when dry they are rounded, generally with the hammer. Several machines have been devised to perform this operation, and one patented in 1865 by Messrs Cope and Bradbrook has come into extensive use. In this machine the book is clamped up between a pair of horizontal cheeks on a table which moves backwards and forwards under a heavy roller adjusted in a frame over the table. ‘The pressure of the roller against the back gives the required ‘‘round,” which can be varied by raising or lowering the pitch of the roller. From the rounding process the volume goes to the backing-machine, by which the joint or groove along the back in which the boards lie is formed. The backing-machine is worked by the hand, and its action is somewhat similar to that of the rounding-machine. The book is seized between a pair of jaws, which only leave about a quarter of an inch projecting above them. ‘The workman brings down a roller on this projecting part of the volume, and its pressure forces the free portion of end sheets over the sides of the jaws, thus forming the joint to receive the boards. With the backing the part of the work done by machinery ends. The backs are next coated with glue, pieces of calico for pasting down are laid on, and the entire back is covered with paper. When dry, the volume is fitted into its cases and ‘‘ pasted up,” and the operations are finished by piling the cased books in a hydraulic press between boards, go as to leave only the backs pro- jecting.

A kind of binding in which the process of sewing is dispensed with, and the backs coated with a rapidly-drying solution of india- rubber, was patented

by Mr William Hancock in 1836, and is still used to some extent. The shcets in this binding must either be cut into single leaves or folded as folios, as they all require to be agglutinated by repeated coatings of the india-rubber solution. The india-rubber backing is convenient for volumes of plates, music books, and any volumes made up of large separate sheets.

_ Although cloth casing is found sufficient for the greater propor- tion of the literature which now circulates so extensively, books of reference and works in public libraries require the more secure and workmanlike binding accomplished by hand. At the same time, while ornaments stamped from dies may be very pretty and effective, they have no claim to rank as works of art, and for the collections of bibliophiles the hand-tooling of bibliopegic artists is in as great demand and as handsomely remunerated as was the art of the most accomplished binders of the 16th century. (J. PA.)

BOOK-KEEPING.—The object of book-keeping is to exhibit a distinct and correct state of one's affairs, and to enable companies, firms, and individuals in trade, or other- wise occupied, to ascertain at any time the nature and extent of their business, the amount of their profits or available income, or, as the case may be, the extent of their iosses.

To those engaged in trade or commercial pursuits book- keeping is absolutely necessary, as by it all transactions should be regulated, and their results exhibited. The more simple the system the better; but care must be taken that the plan adopted is sufficiently comprehensive and explanatory, to satisfy not only the person keeping the books, but those who may have occasion to refer to them ; for, however satisfactory it may be to a trader to follow a system which is intelligible to himself alone, circum- stances might arise to render the inspection of others necessary, and from their inability to follow out transac- tions in the books, suspicions would probably be engendered for which there was no real foundation. Hence the necessity for the adoption of certain recognized and approved systems, which, being plain and easily understood. must prove satisfactory to all concerned.

Book-keeping, when conducted upon sound principles, is invaluable ; it not only shows the general result of a commercial career, but admits of analysis, by which the success or failure, the value or utter worthlessness of

its component parts, or each particular transaction, can be easily ascertained. In a word, on the one hand 1t pro- motes order, regularity, fair dealing, and honourable enterprise; on the other, it defeats dishonesty, and pre- serves the integrity of man when dealing with his fellows.

It would be difficult, and perhaps of little importance, to trace the origin of book-keeping. It was certainly known to the ancients (see Pliny, lib. ii, cap. 7); and Cicero seems to have had bill transactions between Rome and Athens when he arranged for his son's education with- out the necessity of having to remit money (see Lpis. ad Att. xii. 24; xv. 25), which infers some kind of book- keeping. Kelly, however, who wrote on the subject in 1805, asserts, and itis not disputed, that a friar, named Lucas di Borgo, whose work on algebra was the first to appear in print, was the first to write a treatise upon book-keeping, and this was published at Venice in 1495.

This work was followed by many others, possessing con- siderable merit, but so complex as to make them useless. After a time the mercantile community became alive to the fact that a practical systeni would be preferable to the theoretical suggestions of writers who were utterly ignorant of commercial matters ; and men, more or less connected with trade, began to write on the subject. The incubus of prolixity, however, still clung to them, conciseness of style seenling an impossibility, and the great fundamental principles of the art were so smothered by rules and explanations—the volumes sometimes containing 500 or 600 pages—that the difficulty was how to apply them ; hence the need of still greater siniplicity and improvement.

In 1796 Mr EK. T. Jones of Bristol devised a plan "for keeping books correctly," breaking the ice with a treatise which is still held in very high estimation. After that a great improvement is visible in the writings of authors on this important subject, as in those of Benjamin Booth (1789), Hamilton (1820), Jones (2d treatise, 1821, 3d treatise, 1831), C. Morrison (1823), W. and R.. Chambers, Edinburgh,—the most of them, those of Jones excepted, being elementary works, more particularly adapted to schools, and illustrating the principles of the science by the exainple of one set of books adapted to foreign trade. In F. H. Carter's Practical Book-

keeping, adapted to Com- mercial and Judicial Accounting (3d ed. 1875), which gives a great variety of forms and sets of books, the recognized

systems of book-kceping are practically applied, so as to enable any one, without difficulty, to acquire a thorough knowledge of the science.

The questions to which a satisfactory system of book- keeping gives the trader ready and conclusive answers are such as relate—1. To the extent to which his capital and credit will entitle him to transact business; 2. To the assurance he has that all his obligations are honestly ful- filled ; 3. To the ascertainment of the success or failure of his commercial dealings, and the position of his affairs from time to time.

There are three recognized systems of book-keeping, namely, by “ single entry,” “ double entry,” and the “ mixed method.”

I, Sinctze Entry.—This system is denoted by its name, transactions being posted singly, or only once, in the ledger. ‘Three books are generally kept—the cash book, day book, and ledger, although the first-named is not essential, the cash entries being passed through the day book. Its only use is to check the balance of cash in hand. In the day book are entered daily all the purchases and sales, whether for cash or credit; and all the credit

entries are then transferred to accounts opened in the ledger, that is, all goods sold on credit are charged against the customers, and what are purchased are carried to the credit of parties supplying them. In the same way, when cash is received from a customer for goods sold on credit, it is posted to his account, and the reverse entry is made when a trader pays for the goods he has bought. Thus it will be seen that only personal accounts are entered in the ledger.

To frame a balance shcet, or state of affairs, on this system, the book-keeper brings down the balances due by customers to him, also his stock of goods as valued, and the cash he may have in hand, on the left-hand side of the

sheet ; whilst on the right-hand side he enters the balances still due by him for goods supplied, or money lent to him, and the capital, if any, with which he commenced busi- ness. The difference between the amounts of the two columns is either profit or loss; if profit, the merchant’s capital is increased to that extent, and if loss, then he is so much the poorer.

The following skeleton balance sheet will give a better idea of the working and ultimate results of the system :—

Balance Sheet by Single Entry.

Assets, eS Ge ah To Sundry Customers for Goods sold, per List…... 216 10 0 », Goods in Stock, per Inventory and Valuation..| 314 9 6 PSHM ee anuisiike + «sais svagnses osbeenstensen SM 38 4 9

Liabilities, oS

By sundry Tradesmen for Goods supplied, per List.) 184 7 8 », Capital put into the Business,.....:.cc0sc0e0 300 0 0

8

7

np Mikelilig Gn JBI ACES) (10) GIES popnanesgencse Gopodd snbdor

It will be observed that as the assets exceed the liabili- ties (including capital) by £49, 16s. 7d., that sum, being profit, must be added to capital; if, in the next or following years, any loss should emerge, as a matter of course such deficiency must be deducted from the trader’s capital. The advantages of single entry are simplicity and easy adaptation to small retail trades, as the ledger contains only outstanding debts due to or by the trader. The disadvantage is in the difficulty of ascertaining the profits or losses on various goods, or on the several depart- ments of a business.

II. Dovsrz Entry.—It is now universally admitted that this system is the best adapted for heavy, responsible, or speculative trades, for forcign trade especially, and for extensive mercantile concerns. As its name implies, it so

far differs from the system already described, that every transaction must be recorded doubly in the ledger, that is

to say, accounts must be opened in that book, to which all entries in the subsidiary books, after being journalized, are twice carried, to the debit of one account and the credit of another. To illustrate this, let us assume that a merchant speculates in cotton, and purchases so many bales from John Bevan and Co. upon credit; he debits “ Cotton account,” and credits “John Bevan and Co.” He does not pay for it in cash, but gives his bill at three months for the amount; John Bevan and Oo. are debited with the bill, and ‘“ Bills Payable” are credited. He then sells the whole lot of cotton for cash to Cairns, Brown, and Co., debiting “ Cash” and crediting ‘‘ Cotton account.” Lastly, he retires or pays the bill granted to John Bevan and Oo., debits ‘“ Bills Payable,” and credits “Cash.” We will now

put all these transactions into a “journal,” posting there- from to a “ledger,” and so illustrate book-keeping by double entry.

JOURNAL. Dr. Cr ££ Sad. Bs SRE eis 558 SS cid) | Sheen sede a aedaweaave vce adgncua vous adadionndies 2349 0 0 Momommmebevanennd Cons CharleStOn,... icc. ccse0ccesccocewsesveeveusees a0 sancecsavsnuactavecueserves ee 2349 0 For Bales, , ew “* Mary Jane.” Oa Ry crilins vs scencsibiacavedineee sevaedunaesavarseceenes 2349 0 0 | ey. MR onan oacaslainse dan eelesiie eddie sasaedieasscossseseeries a 2349 For our acceptance, No. 136, 3m/., due 6/9 Sept., at County Bank. { MTG OUT ..cccecesseteessesevsse csr etseustessas ssnttersassveescovensovrsasoveccevsseerseecced 8200 0 0 | ” OM ree eke Cs bédsnecesdoondinve 4 lonauaeacensaveccenens | 3200 For Bales, @ , sold to Cairns, Brown, and Co., Manchester. | PEW PRINS PAVABIEL.....ccssscssscescsccsessssssvsresstscscsseave en eon ca meee 2349 0 0 ” ‘No (CES) loo punted Cee eee eee eee PEC PERI a ese cease cas sie cin) Gqige rene vieteies oncejenronmlanainaetene i 2349 For Bill, No. 186, retired at County Bank. Sept. 30 | Cotton Aeugut, , = N Ra chat eRA eatin Aavieiooor | 851 0 0 ” EN ru een Cm SSAC COMMU omtO NER ot iiss. sso sciccs tes ccescsvvaceevssansuseenenel emeeniel oem | hae 851 For Profit on Cotton, ex ‘‘Mary Jane.” – 13,098 0 O | 11,098

e « LEDGER Accounts.

Corron ACCOUNT.

1875. esd: ae | ae : on, aes BG ss Te June 4 | To J. Bevan and Co., for Bales, cx June 1 y Cash for 3ales, sold to Cairns, OS IM [chew diciovel” saampacanocnoee oon sec 2349 0 0 Browih, MAW Oy sgssicnes acnaucnas.cne oo Tt Sept. 30 | ,, Profit and Loss, for gain……. 851 0 0 3200 0 0 | . atl Ne Ee Dr Joun BEVAN AND Co., Charleston. ee ee ee ee 1875. ; l ¢ «6 d.| 1875. £ 3d. June 6 | To Bills payable, No. 136, due 6/9 June 4 | By Cotton, per ‘‘ Mary Jane,” Sept, County Bamlk…...0%.-.00 aa 8 Balog Or coer te canaye ae Dr, Bits PAYABLE. Cr. 1875. | £ « 1875. £ wie Sept. 9 | To Cash, No. 1386, retived.....++0 2349 0 0 June 6 By John Bevan and Co., No. 136, due 2349 0 0 6/9 Sept., County Bank..... | Dr, CAsH ACCOUNT. Cr. 1875. | 2) small “deme: | eC we June 17 | To Cotton Account, Cairns, Brown Sept. 9 | By Bills payable, No. 186, retired at Enevel {Oly coonoe eas oe a County Bank…..... peers. ‘ ae OG » 30) BRsT EOL hatin gs oA Samet enn rem nerieeane 851 0 0

3200 0 0

Dr. . PROFIT AND Loss. Cr. 1875. eG 0h Sept. 80 | By Gain on Cotton, ex ‘‘Mary Jane”..| 851 0 0 Dr BALANCE SHEET, 380th September, 1875. Cr.

It may be alleged that there are many unnecessary entries, involving too much trouble and waste of time, in bringing out the above results ; but upon examination of the several accounts the great simplicity and utility of

double entry is evident. For instance, “ Cotton” account shows the actual result of the speculation per “‘ Mary Jane ;” “ John Bevan and Co.’s ” account exhibits the whole transac- tion with them, and how it was settled; ‘ Bills Payable” account at once shows that the cotton bill is retired or paid; and ‘‘ Cash” account declares a balance of £851 in cashier’s hands, being the actual profit on the cotton, as further shown in “ Profit and Loss” account.

An infinity of examples might be given, but the above will be a sufficient illustration. A brief outline, however, of the principal books required in this system may be introduced.

1. The Casi Boox.—In this most important book every cash transaction must be entered of its proper date, and under its dis- tinctive ledger heading, so as to give facility in journalizing ; any balance thereon must be cash in hand, and should agree with the balance on ‘‘Cash account” in the ledger.

2. The Day or Wasrr Boox.—This book records the daily trans- actions of every description in the rough, which, when properly arranged and classified, are written into the journal, and posted from thence to the ledgers.

3. The JourNAL.—This may be called the mainspring of the system, and is sometimes called the ‘“‘ posting mediwm,” as in it every transaction of the business is properly recorded before being again distributed into the ledger. There are several forms of journal, but the simplest and best is that of which a specimen has been given, with the addition of a column for the insertion of ledger folios when posted. It will be observed that the debit entries are in one column and the credit entries in another ; if, therefore, the summations of these agree, and the entries therein embraced are correctly posted to the debit and credit of accounts in the ledger, the double entry is correct, and the books of the concern, no a how multitudinous the entries may be, must come to a true

alance.

final recipients of every transaction of the concern, branched out or distributed into certain heads or accounts which tell their own his- tory ; arid if unbalanced, must exhibit a difference either in favour

of the business as an ‘‘ Asset,” or against it as a ‘‘ Liability.” ‘The ©

usual plan is to have only one ledger, embracing every account, but in large concerns there are debit and credit ledgers, and gene- rally a private ledger, which is accessible to partners only.

The advantages of double entry are many—(1.) Un- less the debit balances exactly correspond with the credits the books are wrong, and the error must be discovered by comparison ; (2.) The discovery of such errors is more easily accomplished than in any other system ; (3.) Accounts can be readily analyzed ; and (4.) The profit or loss on distinct transactions can be ascertained without difficulty. The disadvantages are—(1.) More manual labour required in transcribing the journal and posting therefrom than im other systems ; and (2.) There is not the same privacy, as profits and losses can be seen at a glance by any one having access to the ledger. Nevertheless, no other system as yet devised can at all compare with that by double entry.

III. Mrxep MerHop.—This system is now extensively adopted by such companies and firms as begrudge the time expended in journalizing, and are of opinion that double entry is too elaborate, when the same results can be arrived at by a more direct and less laborious plan. ‘There is this identity, however, between the systems, that every trans- action must be recorded somewhere, and eventually twice posted, as in double entry, but without the medium of a journal ; moreover, the entries are fewer, summations and not specific items being posted, and what would be the daily labour under one system is reserved under this for a monthly or perhaps longer period. There are only three books required for this systein to which we need draw attention, and in doing so we will point out in what respect

4, The LupcEers.—These are important books, as they are the | they differ from those kept in single and double entries.

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BOO—BOO

1. Cash Boox.—Every entry is posted from this book, but not all to the ledger as in double entry—‘‘ Charges” being posted to the day book. It is not journalized, and is in itself a ledger, as it eontains the bank account, and reports its own cash balance. On the other hand, it is unlike the ‘‘Cash” of single entry, be- eause every entry is posted somewhere, whereas by the latter system only personal accounts are carried to the ledger.

2. Day Boox.—This book also exhibits a marked difference be- tween the journal of double entry and the day book of single entry. The journal is simply a posting medium, and when its use is served is almost valueless. The single entry day book, on the other hand, is only a posting medium to a certain extent, as it does not embrace all transactions; but in this system the day book unites the characteristics of journal and ledger, and also becomes in itself a profit and loss aeeount, as by deducting the amount of charges from the amount of the business fees (say for solicitors' books) the profit on said business is shown.

3. The Lepcurs.—These books also lose their completeness under the mixed method. It has already been shown that in double entry every amount must appear in the ledger, and in single entry that only personal accounts are posted init. By this system not only are all personal accounts included, but those applicable to "Capital," to '' Banks," '' Bills," &c.; whilst, on the other hand, such accounts as '' Profit and Loss," '* Charges," and ''Cash" are excluded.

It would be out of place here to dwell on the many intricacies of this subject, or on the difficulties which are constantly presenting themselves even to the most prac- tical men. With a thorough knowledge of the art, how- ever, and that patience and perseverance so essential to the calling of a book-keeper, the gravest impediments are overcome, and everything becomes simple and plain. Our sole object having been to show the utility of book-keeping as a science, and the peculiar features of existing systems with their advantages and disadvantages, it is unuecessary to enter more minutely into details by describing subsidiary books or forms of accounts, as these are only so many inaterials out of which the fabric of book-keeping is erected, and can be seen in any counting-house or mercantile esta- blishment where regular systems are adopted. (F. H.C.)

BOOLE, Guoresx, one of the most original logicians and mathematicians whom England has produced, was born in Lincoln on the 2d of November 1815. His father was a tradesman of limited means, but of studious char- acter and active mind. Being especially interested in mathematical science the father gave his son early instruc- tion in the rudiments of the science he was so greatly to advance; but it is remarkable that the extraordinary

mathematical powers of George Boole did not manifest them- selves in early life. The classical languages formed at first the favourite subject of his studies. Not until the age of seventeen years did he attack the higher mathematics, and his progress was much retarded by the want of efficient help.

When about sixteen years of age he became assistant- Inaster in a private school at Doncaster, and he maintained himself to the end of his life in one grade or other of the scholastic profession. Few distinguished men, indeed, have had a less eventful life. Almost the only changes which can be called events are his successful establishment of a school at Lincoln, its removal to Waddington, his appoint- ment in 1849 as professor of mathematics in the Queen's College at Cork, and his marriage in 1855 to Miss Mary Everest.

To the public Boole was known only as the author of nunierous abstruse papers on mathematical topics, and of three or four distinct publications which have become standard works, His earliest published paper was one upon the "Theory of Analytical Transformations," printed in the Cambridge Mathematical Journal for 1839, and it led to a friendship between Boole and D. F. Gregory, the editor of the journal, which lasted until the premature death of the latter in 1844. A long list of Boole's memoirs and detached papers, both on logical and mathematical topics, will be found in the Catalogue of Scientific Memoirs published by

the Royal Society, and in the supplementary volume on Differential Equations, edited by Mr Todhunter. To the Cambridge Mathematical Journal and its successor, the Cambridge and Dublin Mathematical Journal, Boole con- tributed in all twenty-two articles. In the third and fourth series of the Philosophical Magazine will be found sixteen papers. The Royal Society printed six important memoirs in the Philosophical Transactions, and a few other memoirs are to be found in the Transactions of the Royal Society of Ldinburgh and of the Royal Irish Academy, in the Bulletin de Académie de St Pétersbourg for 1862 (under the name G. Boldt, vol. iv. pp. 198-215), and in Crelle's Journal. To these lists should be added a paper on the mathematical basis of logic, published in the Mechanic's Magazine for

1848, The works of Boole are thus contained in about fifty scattered articles and a few separate publications.

Only two systematic treatises on mathematical subjects were completed by Boole during his lifetime. The well- known Z'reatise on Differential Equations appeared in 1859, and was followed, the next year, by a Treatise on the Calculus of Finite Differences, designed to serve as a sequel to the former work. These treatises have become the standard text-books on the important branches of mathe- matics in question, and Boole, in composing them, seems to have combined elementary exposition with the profound investigation of the philosophy of the subject in a manner hardly admitting of improvement. To a certain extent these works embody the more important discoveries of their author. In the 16th and 17th chapters of the Differential Equations we find, for instance, a lucid account of the general symbolic method, the bold and skilful employment of which led to Boole's chief discoveries, and of a general method in analysis, originally described in his famous memoir printed in the Philosophical Transactions for 1844. Boole was one of the most eminent of those who perceived that the symbols of operation could be separated from those of quantity and treated as distinct objects of calculation. His principal characteristic was perfect confidence in any result obtained by the treatment of symbols in accordance with their primary laws and conditions, and an almost unrivalled skill and power in tracing out these results.

During the last few years of his life Boole was constantly engaged in extending his researches with the object of pro- ducing a second edition of his Differential Hquations mucli more complete than the first edition ; and part of his last vacation was spent in arduous study in the libraries of the Royal Society and the British Museum for the purpose of acquiring a complete knowledge of the less accessible original memoirs on the subject. Jt must be always a matter of regret that this new edition was never completed. Even the manuscripts left at his death were so incomplete that Mr Todhunter, into whose hands they were put, found it impossible to use them in the publication of a second edition of the original treatise, and wisely printed them, in 1865, in a supplementary volume.

Profound and important as were Boole's discoveries in pure mathematics, his writings on logic may be considered as still more original, With the exception of De Morgan, he was probably the first English mathematician since the time of Wallis who had also written upon logic; and his wholly novel views of logical method were due to the same profound confidence in symbolic reasoning to which he had successfully trusted in mathematical investigation. From the preface to his Mathematical Analysis of Logic, printed as a separate tract in 1847, we learn that speculations con- cerning a calculus of reasoning had at different times occupied Boole's thoughts, but it was not till the spring of 1847 that a memorable logical controversy led him to put his ideas into a definite form. Boole afterwards regarded this pamphlet as a hasty and imperfect exposition of his

logical system, and he desired that his much larger work, An Investigation of the Laws of Thought, on which are founded the Mathematical Theorves of Logic and Probabilities, published in 1854, should alone be considered as containing a mature statement of his views. Nevertheless, there is a charm of originality about his earlier logical work which no competent reader can fail to appreciate, and the intro- duction gives striking evidence of his profound views and wide reading.

It is not easy to give in a few words a correct notion of Boole's logical system, and only those who are conversant with the principles of symbolical reasoning can exactly apprehend his position. He did not regard logic as a branch of mathematics, as the title of his earlier pamphlet might be taken to imply, but he pointed out such a deep analogy between the symbols of algebra and those which can be made, in his opinion, to represent logical forms and syllogisms, that we can hardly help saying that logic is mathematics restricted to the two quantities, 0 and 1. By unity Boole denoted the universe of thinkable objects ; literal symbols, such as 2, y, 2, v, u, duc., were used with the elective meaning attaching to common adjectives and sub- stantives. Thus, if « = horned, and y = sheep, then the successive acts of election represented by x and y, if per- formed on unity, give the whole of the class horned sheep. Boole showed that elective symbols of this kind obey the same primary laws of combination as

algebraical symbols, whence it followed that they could be added, subtracted, multiplied, and even divided, almost exactly in the same manner as numbers. Thus, 1 — # would represent the operation of selecting all things in the world except horned things, that is, all not horned things, and (1 —«) (1 —y) would give us all things neither horned nor sheep. By the use of such symbols propositions could be reduced to the form of equations, and the syllogistic conclusion from two premises was obtained by eliminating the middle term according to ordinary algebraic rules.

Still more original and remarkable, however, was that part of his system, fully stated in his Laws of Thought, which formed a general symbolic method of logical infer- ence. Given any propositions involving any number of terms, Boole showed how, by the purely symbolic treat- ment of the premises, to draw auy conclusion logically contained in those premises. The second part of the Laws of Thought contained a corresponding attempt to discover a general method in probabilities, which should enable us from the given probabilities of any system of events to determine the consequent probability of any other event logically connected with the given events. Soon after its publication this method was the subject of a con- troversy in the Philosophical Magazine ; but it cannot be said that the exact value of this part of his works has ever been clearly ascertained.

It is often supposed that mathematicians are deficient in judgment and knowledge of other matters. In Boole this was not the case; for though he published little except the mathematical and logical works already mentioned, his acquaintance with general literature was wide and deep. Dante was his favourite poet, and he preferred the Paradiso to the Inferno. The metaphysics of Aristotle, the ethics of Spinoza, the philosophical works of Cicero, and many less celebrated works of a kindred character, were also frequent subjects of study. His reflections upon scientific, philosophical, and religious questions are to be mainly gathered from four addresses upon The Genius of Str Isaac Newton, The Right Use of Leisure, The Claims of Science, and The Social Aspect of Intellectual Culture, which he delivered and printed at different times.

The personal character of Boole inspired all his friends with the deepest esteem. He was marked by the modesty

of true genius, and his life was given to the single-minded pursuit of truth. Though he received a royal medal for his memoir of 1844, and the honorary degree of LL.D. from the University of Dublin, it may be said that he neither sought nor received the ordinary rewards to which his discoveries would entitle him.

On the 8th of December 1864, in the full vigour of his intellectual powers, Boole died of an attack of fever, ending in suffusion on the lungs. An excellent sketch of his life and works, by the Rev. R. Harley, F.R.S., to which the present writer is indebted for many particulars, is to be found in the British Quarterly Review for July 1866, No. One . (w. 8. J.)

BOOM, a town of Belgium, in the province of Antwerp, and 12 miles S. of that city, at the junction of the Brussels Canal with the Hiver Rupel. It is an active industrial town, possessing tanueries, salt-works, starch-factories, breweries, and brick and tile works, and carries on a con- siderable trade. Population of the commune, 10,064.

BOOMERANG, a missile instrument of the Australian aborigines, in the use of which they are very dexterous. It consists of a piece of hard wood, with the curve of a parabola, and is about 2 feet long, 24 inches broad, $ inch thick, and rounded at the extremities. One side is flat, the other is rounded, and it is brought tu a bluntish edge. It is discharged with the hand by one end, the convex edge being forward and the flat side upwards. After advancing some distance, and ascending slowly in the air witha quick rotatory motion, it begins to retrograde, and finally falls to the ground behind the thrower. A weapon of similar form, but wanting the return flight, has been found in use among savage tribes both in India and Africa. A very full comparative account of the boomerang is contained in Colonel A. H. Lane Fox’s lecture on ‘Primitive Warfare” (Jour. of the Royal United Service Institution, vol. xii. No. 51).

BOOTH, Barron, an English tragedian, descended from an ancient family in Lancashire, was born in 1681. He was educated at Westminster school under the celebrated Dr Busby, and his success in the Latin plays, customarily per- formed there by the scholars, gave him an inclination for

the stage. He was intended for the church ; but at seventeen years of age he ran away from school, and after some vicissitudes obtained employment in a theatrical company in Dublin. His first appearance was hailed with applause ; and he continued to improve daily. After two successful cainpaigns in Ireland he returned to his native country, having first reconciled himself to his friends. Betterton, to whom he had an introduction, received him with great cordiality, and gave him all the assistance in his power. His success at London was complete, and he established his reputation as only second to his great instructor. He was indebted to a happy coincidence of merit and chance for the celebrity which he at length attained in the character of Cato. The Whigs, in favour of whose principles Addison's tragedy had been written, thought it their duty to support it strongly ; while the Tories, at every passage susceptible of a }opular turn, were no less vehement in their approbation, and at the close the actor was presented by Lord Bolingbroke with a purse of fifty guineas, ‘‘as a slight acknowledgment of his honest opposition to a perpetual dictator, and his dying so bravely in the cause of duty.” Booth was twice married,—first to a daughter of Sir William Barkham, Bart., and afterwards to Miss Hester Santlow, an actress of great merit. During the twenty years of his management the theatre was in the greatest credit; and his death, which happened on the 10th of May 1733, contributed not a little to its decline. Booth was a mau of excellent character, and greatly esteemed for his amiability and goodness of heart.

(See Memoirs of the Life of Barton Booth, 1733; Cibber, Lives and Characters of the most Eminent Actors, &c., pt. i, 1753.)

BOOTHIA FELIX, a peninsula of British North America, between lat. 69° and 72° N., and long. 92° and 97° W. It was discovered by Captain (afterwards Sir James) Ross, in 1830, and was named after Sir Felix Booth, who had fitted out the expedition. It forms the western side of the gulf of the same name into which Prince Regent's Inlet leads from Baffin's Bay. From the American shore it is almost separated by lakes and inlets; and a narrow channel known as Bellot Strait intervenes between it and North Somerset Island, which was discovered by Sir E. Parry in 1819. The

peninsula is not only interesting for its connection with the Franklin expedition and the Franklin search, but is of scientific importance from the north mag- netic pole having been first distinctly localized there by Ross.

BOPP, Francis, glottologist, was born at Mainz on the Rhine, September 14, 1791. In consequence of the political troubles of that time, his parents removed to Aschaffenburg, in Bavaria, where Francis received a liberal education at the Lyceum. It was here that his attention was drawn to the languages and literature of the East by the eloquent lectures of Carl J. Windischmann, who, with Creuzer, Gorres, and the brothers Schlegel, was full of enthusiasm for Indian wisdom and philosophy. And further, Fr. Schlegel's book, Veber die Sprache und Weisheit der Inder (Heidelberg, 1808), which was just then exerting a powerful influence on the minds of German philosophers aud historians, could not fail to stimulate also Bopp's interest in the sacred language of the Hindus. He was, however, too strictly trained in grammatical and philological studies, and too eager for the scientific analysis of language, to allow the clearness of his judgment to be warped by the romantic and speculative predilections of Windischmann and Fr. Schlegel. In 1812 he went to Paris at the expense of the Bavarian Government, with a view to devote himself vigorously to the study of Sanskrit. There he enjoycd the society of such eminent men as Chézy, 8. de Sacy, Langlés, and, above all, Al, Hamilton, who had acquired, when in India, a respectable acquaintance with Sanskrit, and had brought out, conjointly with Langlés, a descriptive catalogue of the Sanskrit manuscripts of the Imperial library. At that library Bopp had access not only to the rich collection of Sanskrit manuscripts, most of which had been brought from India by Father Pons early in the 18th century, but also to the Sanskrit books which had up to that time issued from the Calcutta and Seranipore presses.

The first fruit of his four ycars' study in Paris appeared at Frankfort-on-the-Main in 1816, under the title Ueber das Conjugationssystem der Sanskritsprache in Vergleichung mit jenem der Griechischen, Lateinischen, Persischen, und Germanischen Sprache, and it was accompanied with a preface from the pen of Windischmann, bearing datc 16th May of that year. In this first book, Bopp entered at oncc on the path on which the philological researches of his whole subscquent life were concentrated. It

was not that he wished to prove the common parentage of Sanskrit with Persian, Greek, Latin, and German, for that had long been established ; but his object was to trace the common origin of their grammatical forms, of their inflexions from composition,n—a task which had never been attempted. By a historical analysis of those forms, as applied to the verb, he furnished the first trustworthy materials for a history of the languages compared.

After a brief sojourn in Germany, Bopp came to London, where he made the acquaintance of Wilkins and Colebrooke, and became the friend of Wilhelm von Humboldt, then Prussian ambassador at the court of St J ames's, to whom he gave instruction in Sanskrit. He brought ont, in the

Annals of Oriental Literature (London, 1820, pp. 1-65), an essay entitled ' Analytical Comparison of the Sanskrit, Greek, Latin, and Teutonic Languages," in which he ex- tended to all parts of the grammar what he had done in his first book for the verb alone. He had previously pub- lished a critical edition, with a Latin translation and notes, of the story of Wala and Damayanti (London, 1819), the most beautiful episode of the Mahabharata, which he had with genial tact culled from the tangled labyrinth of that gigantic epic. Other episodes of the Mahabharata—ZJndra- lokdgamanam, and three others, Berlin, 1824; Déilavium, and three others, Berlin, 1829; and a new edition of Nala, Berlin, 1832—followed in due course, all of which, with A. W. Schlegel's edition of the Bhagavadgittd, 1823, proved excellent aids in initiating the early student into the reading of Sanskrit texts. On the publication, in Calcutta, of the whole Mahabharata, Bopp discontinued editing Sanskrit texts, and confined himself thenceforth exclusively to grammatical investigations.

After a short residence at Géttingen, Bopp was, on the recommendation of W. von Humboldt, appointed to the chair of Sanskrit and comparative grammar at Berlin in 1821, and was elected member of the Royal Prussian Academy in the following year, both which posts he held up to his death, Oct. 28, 1867. In his quality as Sanskrit pro- fessor he brought out, in 1827, his Ausfiihrliches Lehrge- bdude der Sanskrita-Sprache, on which he had been engaged since 1821. A new edition, in Latin, was commenced in the

following year, and completed in 1832. A. shorter grammar (Kritische Grammatik der Sanskrita-Sprache in kuirzerer Fassung) has run through three editions (Berlin, 1834, 1845, 1863). At the same time he compiled a Sanskrit and Latin glossary (1830) in which, more espe- cially in the second and third editions (1847 and 1867), account has also been taken of the cognate languages. His chief activity, however, centred on the elaboration of his Comparative Grammar, which appeared in six parts at con- siderable intervals (Berlin, 1833, 1835, 1842, 1847, 1849, 1852 ; 1511 pages in small 4to), under the title Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, Intthauischen, Altslavischen, Glothischen, und Deutschen. How carefully this work was matured may be gathered from the series of monographs printed in the Zi ansactions of the Berlin Academy (1824 to 1831), by which it was preceded. They bear the general title, Vergleachende Zergliederung des Sanskrits und der mit thm verwandten Sprachen. Two other essays (on the “ Numerals,” 1835) followed the publication of the first part of the Comparative Grammar. The Old-Slavonian began to take its stand among the languages compared from the second part onwards. At the instance of the earl of Ellesmere (then Lord Francis Egerton) the work was translated into English by Mr E. B. Eastwick (3 vols., 1845; second edition, 1854). A second German edition, thoroughly revised (3 vols., 1856-1861), comprised also the Old- Armenian. From this edition an excellent French trans- lation was made by Professor Michel Bréal, which came out in 5 vols. in 1866, 7. A third German edition has been published since the author’s death, in 1871, 7.

The task which Bopp endeavoured to carry out in his Comparative Grammar was threefold,—to give a description of the original grammatical structure of the languages as deduced from their intercomparison, to trace their phonetic laws, and to investigate the origin of their grammatical forms. ‘The first and sccond points were subservient to the third. As Bopp’s researches were based on the best avail- able sources, and incorporated every new item of information that came to light, so they coutinued to widen and deepen in their progress. Witness his monographs on the vowel system in the Teutonic languages (1836), on the Celtic

languages (1839), on the Old-Prussian (1853) and Albanian languages (1854), on the accent in Sanskrit and Greek (1854), on the relationship of the Malayo-Polynesian with the Indo-European languages (1840), and on the Caucasian languages (1846). In the two last-mentioned the impetus of his genius had led him on a wrong track. They show the rocks against which the student of comparative philo- logy has to guard.

As for the charge that has been made against Bopp of neglecting the study of the native Sanskrit grammars, every excuse ought to be made in his favour. In those early days of Sanskrit studies the requisite materials were not accessible in the great libraries of Kurope ; and if they had been, they would have absorbed his exclusive attention for years, while the grammars of Forster, Wilkins, and Colebrooke, from which his grammatical knowledge was derived, were all based on native grammars. The further charge that Bopp, in his Comparatwe Grammar, gave undue prominence to Sanskrit may be disproved by his own words ; for, as early as the year 1820, he gave it as his opinion that frequently the cognate languages serve to elucidate grammatical forms lost in Sanskrit (Annals of Or. Lit., i. 3),—an opinion which he has further developed in all his subsequent writings. In his translations from the Sanskrit Bopp was not successful. He seems to have felt this himself ; for, after the publication, in 1838, of his metrical translation of the Story of Nala, he resigned that task to more skilful hands.

The method of tracing the life and growth of language, so successfully applied by Bopp in the case of the Indo- European languages, has become the corner stone on which all modern linguistic science rests. His researches, carried with wonderful penetration into the most minute and almost microscopical details of linguistic phenomena, have led to the opening up of a wide and distant view into the original seats, the closer or more distant affinity, and the tenets, practices, and domestic usages of the ancient Indo-European nations, and form the only safe basis on which further investigations in each direction are possible. The outlines of his great work had been distinctly traced by him in his very first publication, from which the science of comparative grammar may truly be said to date,

In grateful recognition of that fact, on the fiftieth anniversary of the date of Windischmann's preface to that work, a fund called Die Bopp-Styftung, for the promotion of the study of Sanskrit and comparative grammar, was established at Berlin, to which liberal contributions were made by his numerous pupils and admirers in all parts of the globe.

Bopp was specially favoured by fortune in living to see the results of his labours everywhere accepted, and his name justly celebrated. But the sun that gilds the writer's pen did not shine upon him, and he died a poor man, —by his genuine kindliness and unselfishness, his devotion to his family and friends, and his rare modesty, endeared to all who knew him. (Bréal's Translation of Bopp's Comp. Gr., vol. i, introduction; Th. Benfey, Geschichte der Sprachwissenschaft, 1869 ; A. Kuhn in Unsere Zeit, Neue Folge, iv. 1, 1868.)

BORAX, the biborate of sodium (Na,B,O;), a substance found in commerce under the two different forms of ordinary or prismatic borax, which contains ten equivalents of water of crystallization, and octahedral or jeweller's borax, which has only five molecules of water in its composition. The former, which is the variety commonly met with, occurs as a natural product in various parts of the world. In former times crude borax was procured chiefly from Thibet, whence it came by way of India under the name of tincal. It also is found in other parts of Central Asia, at Halberstadt in Transylvania, in Canada, and in Peru; and in recent years an important source of

the mineral has been discovered near the Clear Lake in California, in a body of water now called the Borax Lake. In very dry seasons the water almost entirely disappears from the basin of the Borax Lake, which is situated in a region containing hot springs and the remains of volcanic action. In 1863, when the lake measured 4000 feet long, 1800 feet across at its widest part, and about 3 feet deep, the water was found to contain 2401°56 grains of solid matter per gallon, of which 535-08 grains represented crystallized borax. The bed of the lake is occupied with a deposit of borax crystals, which are obtained by sinking caissons, pumping out the water, and digging up the deposit. Californian crude borax is fit for use by assayers and others without undergoing any purification ; but that obtained from Thibet

contains a greenish encrusting matter of a soapy consistence which has to be separated before the material is fit for use under the name of refined borax.

The supply of borax is, however, more largely derived by artificial means from boracic or boric acid, or from salts in which that acid occurs, than from these natural sources, Boracic acid is found among the ejecta around the craters of some volcanoes, and it is found in jets of vapour which stream forth from fissures in the earth in regions of volcanic disturbance. The chief source of boracic acid at the present day is found in the Maremma of Tuscany, an extensive and desolate track of country embracing an area of about forty miles, over which jets of vapour and heated gases (soffiont) and springs of boiling water spurt out from numerous chasms and fissures. The Maremmais dis- turbed by frequent volcanic shocks ; at some points the mouths of the fissures open direct into the air, at others they are covered by small muddy lakes (/agont). In addition to a small impregnation of boracic acid the soffioni contain ammoniacal vapour, to fix and obtain which the gases at some works are led through sulphuric acid. For obtaining the boracic acid a series of basins or artificial lagoni are formed over the soffioni, so arranged that water to becharged with the acid is conveyed by gravitation from the first to the last of the series. Water is led into the highest and by the action of the heated gases it is soon in a state of ebullition. After being so left for about a day it is drawn off into the second, where it remains under like circumstances for the same period, and so to the end of the series, when the water should contain nearly 2 per cent. of boracic acid. The mechanical impurities being allowed to subside, the liquor is then run into evaporating pans, shallow lead-lined vessels, heated by the gases from the soffioni themselves. The evaporating pans are worked on a con- tinuous system, similar to the lagoons ; the liquor placed in the upper being concentrated down to half its original bulk is run into the second, and so oun till it reaches a degree of concentration fit for crystallizing out the acid. In recent years artificial soffioni have been formed by boring through the rock till some of the numerous chasms or chambers, with which the interior is honey-combed, are reached, when immediately all the phenomena of a boracic soffione are established. From some of these artificial soffioni issues water of sufficient richness in acid to be led there direct to the evaporating pans. Similar emanations of volcanic

vapours and boracic acid have been discovered in Nevada, United States. Boracic acid is also obtained from boronatrocalcite (Ulexite or Hayesine), a double salt of sodium and calcium, of which extensive deposits exist in the neighbourhood of the nitrate of soda beds of Chili and Peru. It is very variable in constitution and condition of purity. Similar deposits are found in Cali- fornia, Nevada, and Nova Scotia, and from the West Coast of Africa is received a borate of lime bearing the name of rhodizite. The boronatrocalcite, or borate of lime, as it is called in commerce, is applied in its unrefined condition

to many uses for which borax isemployed. In 1855 Dr T. Richardson patented a process for using the picked and washed boronatrocalcite as a substitute for borax. in the glass manufacture and preparation of pottery glazes. It is, however, chiefly employed as a source of boracic acid, and there are also several methods of obtaining borax direct from the compound salt.

Commercial boracic acid usually contains a considerable

percentage of sulphates of ammonium, magnesium, and calcium besides other impurities. To prepare borax from this acid, from 110 to 120 parts of crystallized sodium carbonate are required for 100 parts of boracic acid. The soda is dissolved in a lead-lined vessel heated with steam, to which the boracie acid is added in repeated charges. ‘The vessel is covered and the carbonate of ammonia given off is led into a solution of sulphuric acid and fixed. For the production of ordinary or prismatic borax the solution is brought to a strength of 20° to 92° Baumé (1:161 to 1°180 sp. gr.) and allowed to cool down as slowly as possible, so that the crystals may assume the large size demanded in commerce. Octahedral borax is deposited when a solution indicating 30° Baume (sp. gr. 1:264) is slowly cooling down from 72° to O6° C. Below this point the formation of ordinary borax takes place. Under the blowpipe borax parts with its water, and melts into a clear glass which has the peculiar property of dissolving many metallic oxides, and thereby exhibiting characteristic colours, on which account it is of great value in blowpipe analysis. The same property also renders it a valuable material for pottery glazes and enamels, and as it adheres closely to clean

surfaces of metal and prevents their oxidation under high heat, it is indispensable for use in hard soldering, and is largely employed in brass manu- factures. It is also one of the ingredients employed in glass-making. Borax forms with oils and fats a soap which has been proposed as a detergent ; but experiments con- ducted by the late Professor Thomas Anderson of Glasgow show that it has a more corrosive influence on fibres than common soap. In Belgium powdered borax is used in domestic washing, with the object of economizing soap. Borax is used in medicine as an external application in skin diseases, and the preparation known as mel boracis isa useful gargle in ulceration of the mouth and throat. In Sweden boracic acid is extensively employed for the preservation of meat and milk; and while it forms an efficient antiseptic, food prepared with it is said to be perfectly fit for use. A very beautiful pigment, now much used in calico-printing, under the name of Guignet's green, is a borate of chromium.

BORDA, Jean Caries, mathematician and nautical astronomer, was born at Dax on the 4th May 1733. He studied at La Fléche, and at an early age obtained a com- mission in the cavalry. In 1756 he presented a valuable paper to the Academy of Sciences, who elected him a mem- ber. He was present at the battle of Hastembeck, and soon afterwards joined the naval service. He visited the Azores and the Canary Islands, of which he constructed an admir- able map. In 1782 his frigate was taken by a British squadron; he himself was carried to England, but was almost immediately released on parole, and returned to France. He died on the 20th February 1799. Borda was an admirable mathematician, and contributed a long series of valuable memoirs to the Academy of Sciences. His researches in hydrodynamics were highly useful for marine engineering, while the reflecting and repeating circles, as improved by him, were of great service in nautical astronomy. He was associated with Delambre and Mé- chain in the attempt to determine an arc of the meridian, and the greater number of the instruments employed in

the task were invented by him. (Sce Biot, " Notice sur Borda" in the Mém. de ? Acad. des Sciences, iv.) BORDEAUX, one of the finest and wealthiest commer- cial cities of France, formerly the capital of Guienne and

Bordelais, and now the chief town of the department of Gironde. It is situated 370 miles §.E. of Paris, in 44° 50’ N. lat. and 0° 25’ W. long., on the left bank of the Garonne, about 60 or 70 miles from its mouth, and in the midst of an extensive plain which comprises the district of Médoc, well-known for its red wines. Opposite the town the river makes a semicircular curve, and widens out into an extensive basin, which serves as a harbour, and is lined with: quays on both sides for a distance of three miles, Vessels of 800 tons can come up to the town, and ships of the greatest ordinary tonnage have depth enough as far as Pauillac, about 35 miles from the mouth of the river. The basin is crossed by a magnificent stone bridge of 17 arches, 1534 feet long, which was built in 1821, and remained in the hands of a company till 1861 when it was declared free. A short distance further up the river is spanned by a railway bridge. Few cities in Europe can show such a striking water-front as Bordeaux; and though the streets of the older part are narrow and mean, those of the newer portions are wide and well paved, and contain handsome houses and public buildings. The principal square is the Place des Quinconces, which is adorned with statues of Montaigne and Montesquieu. Among the ecclesiastical buildings the most important are the cathedral of Saint André, a fine Gothic structure with two spires 160 feet high; the church of Saint Michel, founded in 1160, and formerly remarkable for a spire 319 feet in height, destroyed by a storm in 1768; Saint Croix, pro- bably in existence before the 7th century, restored in 1864-5 ; Saint Paul, built by the Jesuits in 1676; and the church of the Collége Royal, in which is the tomb of Montaigne. ‘The great intellectual activity of the city may be seen from the fact that it possesses an academy (with faculties of theology, law, science, and literature), a medico-pbarmaceutical school, a lyceum, a school for deaf- mutes, a normal school, and a school of navigation ; numbers among its societies an academy of sciences, arts, and belles lettres, a medical society (founded in 1798), an agricultural society, a philomathic, a Linnean, a horti- cultural, and an archeological society ; and maintains nine daily papers, about as many weeklies, and two or three monthly periodicals, besides the official publications of several of the above-mentioned societies. Its communal library, which dates from 1566, contains about 200,000 volumes; and it has also an antiquarian museum, a museum of natural history, and a picture gallery. Among its benevolent institutions are the hospital of Saint André, founded in 1825 to replace an older building of the same name, which dated

from 1390, a children’s hospital, originated in 1619, a hospital for incurables, a maternity and a military hospital, the lock hospital of Saint Jean, and a magnificent deaf and dumb asylum. Of theatres there are five,—the Grand Théatre, finished in 1780 and seated for 1300; the Théatre Louit, opened in 1868, for 2500; the Thédtre Francais, dating from 1857, for 1300 ; the Théatre National, opened in 1866, for 1000; and the ThéAtre des Folies Bordelaises built in 1872. A few buildings are of merely antiquarian interest, the most im- portant being the Palais Gallien, which is really an old Roman amphitheatre of the 3d century, and the tower of Pey Berland. Bordeaux is the seat of an archbishop, and has a court of appeal, a court of assize, and tribunals of primary instance and commerce. It has also a mint, the coinage of which is marked by the letter K. Its commercial institutions are necessarily numerous and varied ; comprising an exchange, banks, insurance-offices, custom-

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houses, public warehouses, and consulships of some forty different countries. The trade is very extensive, particu-

larly in wines, and has undergone a remarkable develop- ment since the introduction of railways and steamships. For a long time Bordeaux was greatly indebted to the Languedoc canal, but this means of communication is now

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BORDEAUX

of minor importance. The total value of the export and import trade is annually about £16,500,000, about a third belonging to Britain. In 1872 the value of Bordeaux wines exported from France was upwards of £5,600,000, and the brandy and liqueurs from Bordeaux itself annu- ally produce about £1,000,000. The other articles exported

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Ground-Plan of Bordeaux.

48. Arehbishop’s Palace,

1. Hospital for Old Men. 14. Chureh of St Nieholas. 25. Hétel de Vile. 37, Mint. 49, Hotel de la Marine. 2. Chureh of St Michel. 15. St John’s Hospital. 26. Prison Départemental. 38. Place de Tourny. 50. Chureh of the Carmelites. 3. Place du Marehé Neuf 16. Hospital for Ineurables, 27. Palais de Justiee, 39, Théfitre des Varictés, 51. Baths, 4. Grand Séminaire. 17. Synagogue. 28. Place d’Armes. 40. Place des Grands Hommes.| 42. English Protestant 5 Petit Séminaire. 18, St James’s Chapel. 29. St Andrew’s Hospital. 41, Church of Notre Dame. Church, 6. Asylum for the Insane. 19. Barracks, 30. St Raphael’s Barracks. 42. Hotel de ! Académie. 53. Protestant Church, 7. Place des Capucins. 20. Old Palais de Justiee and | 31. Church of St Eulalie. 43. Place de la Comédie. 54, Entrepét réel. 8. Place Bourgogne St Paul’s Church. 82. Tobacco Manufactory. 44. Grand Théatre. 55. Chureh of St Louis and 9. Custom House 21. Lyeée Impérial. 33. Place Rodesse. 45. Hétel de la Préfecture. Archives du Départ- 10, Exchange. 22 Old Chapelle des Irlan- 34, Church of St Bruno. 46. Old Church of St Rémi. ment. 1L. Place de la Bourse. dais. 35. Chureh of St Seurin. 47. Chapelle de Notre Dame 56, Collége de Tivoli. 12. Place d’ Aquitaine 23. St Andrew’s (Cathedral), 36. Deaf and Dumb Institu- de Bon Secours, 57. Church of St Eloi, 13. Military Hospital. 24, Municipal Barracks, tion,

comprise corn, fruits, sugar, wood, resin, rags, madder, tartar, gums, indigo, and native manufactures. Shipbuild- ing is a leading industry, the number of firms in that department being about twenty in 1875. In the same year 220 vessels belonged to the port, with a total tonnage of upwards of 92,000 English tons.

Bordeaux, or Burdigala, was originally the chief town of the Bituriges Vivisci. Under the Roman empire it be- came a flourishing commercial city, and in the 3d century it was made the capital of Aquitania Secunda. Ausonius, a writer of the 4th century, who was a native of the place, describes it as four-square and surrounded with walls and lofty towers, and celebrates its importance as one of the greatest educational centres of Gaul. In the evils that resulted from the disintegration of the empire Bordeaux had its full share, and did not recover its prosperity till the beginning of the 10th century. Along with Guienne it belonged to the English kings for nearly

three hundred years (1154-1452), and was for a time the seat of the brilliant court of the Black Prince, whose son Richard was

58, Plaee Fégere.

born in the city. An extensive commerce was gradually developed between the Bordeaux merchants and their fellow- subjects in England,—London, Hull, Exeter, Dartmouth, Bristol, and Chester being the principal ports with which they traded. For full details regarding the character of the traffic and its influence on the destinies of the city the reader may consult Francisque Michel's Histoire du Com- merce et de la Navigation de Bordeaux, 1867. In 1548 the inhabitants resisted the imposition of the salt-tax by force of arms, a pardonable rebellion for which they were punished by Montmorency with merciless severity. Ata later period they held out for the Frondeurs against the royal army under Louis XIV. and Richelieu, with an obstinacy that brought the monarch and his minister to a humbler mood. During the Reign of Terror the city suffered almost as severely as Lyons and Marseilles, and its comlmerce was greatly reduced under the despotism of the first Napoleon. In 1814 it declared for the House of Bourbon, and Louis XVIII. gave the title of duke of Bordeaux to his son, better known as the Count de

Chambord. In 1870 the French Government was transferred to Bordeaux from Tours on the approach of the Germans to the latter city.

Dupré de Saint Maur, Hist. Curteuse de Bordeaux, 1760; Devienne, Hist. de la ville de Bordeaux, 1771 and 1862; Bernadan, Hist. de Bordeaux, 1838-40 ; O'Reilly, Hist. complete de Bordeaux, 1853-60.

BOREAS, in Greek Mythology, was a personification of the north wind, and to be like it he was represented as rough, powerful, and accustomed to gain his ends by irresistible force. A favourite instance of this was the story of his carrying off the beautiful Oreithyia, a daughter of Erechtheus, king of Athens, when he found her gather- ing flowers by the banks of the Iissus, or at the sources of the Cephisus,—others said the Areopagus, and others, again, the Citadel. He had sought before to woo her in vain, and now carried her to Mount Hemus in Thrace, where they lived as king and queen

of the winds, and had two sons, Zetes and Calais, and two daughters, Cleopatra and Chione. For the loss of Oreithyia the Athenians in after times counted on Boreas's friendliness, and were assured of it when he sent storms which wrecked the Persian fleet at Athos and at Sepias. For this they erected to him a sanctuary, or, as others said, an altar near the Ilissus, and held a festival in his honour. Thurii also, which was a colony of Athens, offered a sacrifice to him every year, because he had destroyed the hostile fleet of Dionysius the élder, Boreas was described as a son of Astreeus and Aurora. In works of art he was represented as bearded, powerful, draped against cold, and winged. On the Tower of the Winds at Athens he is figured holding a shell, such asis blown by Tritons. Boreas carrying off Oreithyia is the subject of a beautiful bronze relief in the British Museum, found in the island of Calymna. The same subject occurs frequently on the painted Greek vases.

BORELLI, Giovanni Atronso, the head of what has been called the iatro-mathematical sect, or that which, misled by the great progress which the application of mathematics had produced in the physical sciences, attempted to secure the same advantage for medicine, by subjecting to calculation the phenomena of the living economy. He was born at Naples, January 28, 1608, taught mathematics for some time at Pisa, and seems after- wards to have held the professorship of medicine at Flo- rence. He was greatly favoured by the princes of the house of Medici; but having been engaged in the revolt of Messina, he was obliged to retire to Rome, where he spent the remainder of his life under the protection of Christina, queen of Sweden, who honoured him with her friendship, and by her liberality softened the rigour of his fortune. He died of pleurisy on the 31st December 1679. Borelli, more judicious than Bellini, restricted the applica- tion of his system chiefly to muscular motions, or to those phenomena of the animal economy which are in certain points subject to the laws of mechanics, and was led to the discovery of some principles new in themselves, and directly opposed to the received beliefs of his time. His followers, less cautious, wishing to generalize the applica- tion he had made, by hypotheses, to which the return to a sound medical philosophy has done justice, greatly retarded the restoration of the science.

The works of Borelli are,—1. Della Causa delle Febri maligni, Pisa, 1658, 4to; 2. De Renum usu Judicium, Strasburg, 1664, 8vo; 3. Huclides Restitutus, 1628, 4to; 4. Apollonti Pergei Conicorum libri v. vi. et vii., Florence, 1661; 5. Theorie Medtceorum Planet- arum ex Causis Physicis deduct, Florence, 1666, 4to; 6. Tractatus de Vi Pereussionis, Bologna, 1667, 4to; 7. Historia et Meteorologia tneendit Aithnei, Reggio, 1669, 4to; 8. De Motionibus naturalibus

a gravitate pendentibus, Bologna, 1670, 4to; and 9. De Motu Ani- maivum, opus posthumum, Rome, 1680, 1681, 4to.

BORGA, or Borgo, a seaport town of the Russian Grand Duchy of Finland, situated in the province of Nyland, at

the entrance of the River Borga into the Gulf of Finland, about 25 miles N.W. of Helsingfors, in 60° 22’ N. lat. and 25° 45’ E. long. It was at one time a wealthy and hand- some city, but has greatly decayed. It is still the seat of a Lutheran bishopric which extends over a large part of Finland; and it possesses a beautiful cathedral, a gymnasium (where the well-known Swedish poet Runeberg lectured for many years), and a theatre. The weaving of sail-cloth and the manufacture of tobacco are the principal industries, and the chief articles of trade are wood, butter, and meal, In 1873 the value of the imports, mainly from Germany, England, and Russia, was upwards of £141,000, while that of the exports was rather under £50,000. Borga was the seat of the Finnish diet in 1809. Population, which is mostly Swedish, in 1867, 3420.

BORGERHOUT, a flourishing township of Belgium, in the arrondissement of Antwerp, and on the road from that city to Turnhout. It has bleachfields, dye-works, woollen factories, and corn-mills, Population, 10,787.

BORGHESE, a noble Sienese family, one of whom, on being elected pope in 1605, assumed the name of Paul V., after which the family became among the most powerful of the Roman nobility by their union with the Aldobrandini. Camillo Filippo Ludovico, Prince Borghese (born 1775), married in 1803 Pauline, sister of the Emperor Napoleon, and widow of

General Leclerc. In 1806 he was made duke of Guastalla, and for some years acted as governor of the Piedmontese and Genoese provinces. After the fall of Napoleon he fixed his residence at Florence, where he died in 1832. The Borghese palace at Rome is one of the most magnificent buildings in the city, and contains a splendid gallery of pictures.

BORGIA, Casarand Lucretia. The history of Cesar

and Lucretia Borgia up to the death of their father has

been related under ALEXANDER VI. (vol. i. p. 487). Alex- ander's sudden decease at an unfavourable conjuncture proved the ruin of Cesar, who, as he subsequently told Machiavelli, had provided for every contingency except that of his father and himself being disabled at the same time. Though suffering from a dangerous illness, popularly be- lieved to be the effect of poison, he possessed himself of his father's treasures, and exerted sufficient influence in the conclave to procure the election of a friendly pope. The pontificate of Pius III., however, only endured for a few weeks, and his successor, Julius I., the hereditary enemy of the Borgias, threw Cesar into the prison of St Angelo, where he was detained until he had consented to deliver up all his fortresses. He was then sent to Naples, where the Spanish viceroy, Gonsalvo de Cordova, in violation of his pledge, caused him to be arrested and sent to Spain. After two years' confinement.in the castle of Medina del Campo, he escaped and took refuge with his brother-in-law, the king of Navarre, in whose service he was slain before Viana, March 12, 1507. Czesar possessed considerable abilities, but these are in general much overrated by historians, especially by Lord Macaulay in his essay on Machiavelli. His extraordinary succcss was not so much owing to the superiority of his qualities as to his utter emancipation from every restraint of conscience and honour. As a ruler he was intelligent and sagacious ; his subjects regretted him, and his mercenaries served him with remarkable fidelity. Lucretia Borgia's life, after her marriage to the duke of Ferrara's son, was prosperous and uneventful, or at most only troubled by the not very well attested homage of Cardinal Bembo. She obtained uni- versal respect by her piety and prudence, and her patron- age of men of letters, and died in 1520. In fact, although intelligent and highly educated she was

essentially a common-place woman, incapable from every point of view of the atrocities imputed to her by libellers in her own

day, and by poets and romancers ever since. She has suffered vicariously for her father and brother. See espe- cially her latest historian, Gregorovius (Zucrezta Borgia, 1874), whose volumes contain a mass of most interest- ing information, especially relating to Lucretia's early years, but whose vindication of his heroine might have been much more decided. The English biography by Gilbert is well intended, but devoid of literary or historical value. (R. G.)

BORGO SAN DONNINO, a walled town of Italy, in the province of Parma, and capital of a circondario, is situated on the Stirone, a sub-tributary of the Po, about 15 miles W. of Parma on the railway to Milan. Besides its cathedral, a building of the 13th century, in the Lombard style, adorned with rude sculptures, it possesses a castle and fort, a theological seminary, a college, a music school, and a remarkable institution for mendicants. The spinning of hemp and silk and the manufacture of glass are its principal industries. Borgo is identified with Fidentia, memorable in ancient history for the siege sus- tained by M. Lucullus, one of Sulla's generals, against the forces of Carbo. It is mentioned asa municipium by Pliny, but seems afterwards to have sunk to a mere village. In 304 it was the scene of the martyrdom of Saint Domninus, from whom it has derived the distinctive part of its modern name, During the Hohenstauffen dynasty it was an imperial possession, and in 1501 it became the seat of a bishop. Population, 10,855.

BORGOGNONE, Amprocio. See Fossano.

BORGU, or Bara, a large district in the interior of Africa, bounded on the E. by the Niger, on the 8. by Yoruba, on the W. by Dahomey, and on the N. by Gurma. It is about thirty days' journey in length and eleven in breadth. It has generally a level surface, though crossed by a considerable range of mountains. 'The soil is mostly fertile, and tolerably cultivated, producing in abund- ance corn, yams, plantains, and limes. 'The cattle are numerous and of excellent breed, and there is a copious supply of all the species of game that prevail in Africa. A considerable inland trade between Haussa and the coast passes through this territory. When Clapperton entered it from Eyeo, he was warned to be on his guard, as the people were the greatest robbers and plunderers in all Africa, but he found this bad report altogether unjust. The people were honest, cheerful, obliging, good-humoured, and communicative. The district of Borgu is divided into a number of states, of which the smaller, such as Boussa, Wawa, Kiama, and Lugu, are dependent on the Fellatah kingdom of Gondo, while Kiti is ruled by a powerful and independent chief, who is frequently spoken of as sultan of Borgu. Wawa and Kiama are important commercial cities. Boussa was the scene of the dis- astrous fate of Mungo Park in 1805.

BORING. The methods and apparatus of boring will be found noticed under the different industries in which it is employed. See ArresIAN WELLS, BuastInc, Coat, Guns, &c.

BORISSOGLIEBSK, a town of Russia, in the govern- ment of Tamboff, 114 miles S.E. of that city, in 51° 22' N. lat. and 41° 4' E. long., on the left bank of the River Vorona. It was founded in 1646 to defend the southern frontiers from the incursions of the Crim Tatars, and in 1696 was surrounded by wooden fortifications by command of Peter I. The public buildings include four churches, a hospital, and two schools; the principal industries are the preparation of wool, the manufacture of cast-iron, soap-boiling, tallow-melting, and brick-making; and the trade, which is decidedly important, consists in grain, wool, cattle, and leather. There are two annual fairs, and markets twice a week. Population in 1867, 12,254.

BORKU, or Boreu, a country in the interior of Africa, situated between the 17th and 20th parallels of N. lat., and between 18° and 21° E. long., and forming part of the great Soudan region. It is bounded northwards by the Tibesti Mountains, and is in great measure occupied by lesser elevations belonging to the same system ; to the south or rather south-west lies the Bodele basin, from which it is separated by a narrow stretch of higher ground. The climate is much better than that of the neighbouring countries to the south and east ; but the eastern trade-winds blow persistently with great violence, being strongest from early morning till about three p.m. The light sand that covers a large part of the country is drifted by it into countless heaps, that change their shape and position from day to day. It is plain, from the fish-skeletons still strewing the ground, that a considerable portion of the south of Borku has at no very distant day been like Bodele and other districts under water. At present the irrigated and fertile portions consist mainly of a number of valleys separated from each other by low and irregular limestone rocks. Of these the most important are Jin, Nguro, Elleboé, and Kirdi in the south, and Bodo, Tiggi, and Jarda in the north. They furnish excellent dates, of about twelve different sorts. The northern valleys and Jin are inhabited by a settled population of about 5000 people, known as the Donosa or Dosa; the others are mainly visited by nomadic tribes. The Uelad Sliman, a powerful Arab tribe, claim the lordship of the land, but have to share their authority with another tribe known as Mgharba which immigrated from Barca about 1860. They do not inhabit the country of Borku, but give proof of their claim to possession by plundering the valleys every three or four years. In the end of 1851 Dr Barth and Dr Oberweg joined an army despatched by the sultan of Bornu for the conquest of the region east of Lake Chad; but the army was defeated and put to flight, and the travellers were disappointed in their expectation of reaching Borku. Dr Nachtigal spent some time in the country in the year 1871, and gives an account of his sojourn in the Zeitschrift der Gesellschaft fiir Erdkunde zu Berlin, 1873.

BORLASE, W1t11AM, a learned antiquary and naturalist, was born at Pendeen in Cornwall, of an ancient family, February 2, 1696. He was educated at Exeter College, Oxford, where he took his degree as master of arts. In 1720 he was ordained as priest; he was instituted in 1722 to the rectory of Ludgvan, and in 1732 was presented to the vicarage of St Just,

his native parish. In the parish of Ludgvan are rich copper works, abounding with mineral and metallic fossils, of which he made a collection, and thus was led to study somewhat minutely the natural history of the county. In 1750 he was admitted a fellow of the Royal Society ; and in 1753 he published, in folio, at Oxford, his Antiquities of Cornwall, a second edition of which was published at London, 1769, with the title of Antiquities, Historical and Monumental, of the County of Cornwall ; consisting of several Essays on the Ancient Inhabitants, Druid Superstition, Customs, and Remarns of the most remote Antiquity in Britain and the British Isles, exemplified and proved by Monuments now extant m Cornwall and the Scilly Islands ; with a Vocabulary of the Cornu-British Language. His next publication was Observations on the Ancient and Present State of the Islands of Scilly, and their importance to the trade of Great Britain, Oxford, 1756, 4to, which had previously been printed in the Phil. Lrans. In 1758 appeared his Natural History of Cornwall, Oxford, folio. He presented to the Ashmolean Museum a variety of fossils and antiquities, which he had described in his works, and for his benefactions received the thanks of the university, and the degree of LL.D. He died August 31, 1772. Borlase was well acquainted with

most of the leading literary men of the time, more particularly with Pope, with whom he kept up a long correspondence, and for whose grotto at Twickenham he furnished the greater proportion of the fossils and minerals. His letters to Pope, St Aubyn, and others, with answers, fill several volumes of MS. There are also MS. notes on Cornwall, and a complete unpublished treatise Concerning the Creation and Deluge. Some account of these MSS., with extracts from them, will be found in the Quarterly Review, October, 1875. Borlase’s memoirs of his own hfe were published in Nichol’s Leterary Anecdotes, vol. v. BORN, Ianatius, BARON VON, an eminent mineral-

ogist and metallurgist, was born of a noble family, at.

Karlsburg in Transylvania, in 1742 He was educated in a Jesuit college at Vienna, and entered that order, which, however, after sixteen months, he quitted. After studying law at Prague he travelled into Germany, Holland,

and France. On his return to Prague he engaged in the study of mineralogy. Austria produces various metals in considerable abundance, and the administration of the revenue arising to Government from this source is con- ducted by local boards, under the control of the chamber of minesat Vienna. This administration offers a field of some preferment; and Von Born was received into the department of the mines and mint at Prague in 1770. About this time he met with an accident which nearly proved fatal, in the course of a journey through Transyl- vania. Having entered a mine at Felso-Banya, whilst the air was charged with arsenical vapour, he was stupified for fifteen hours, and long afterwards suffered from a cough and general pain. Some time after this accident he was affected with violent colics, and in the latter part of his life was deprived of the use of both legs, These calamities, however, did not repress the activity of his mind. He had to give up his assessorship of the mining council, but con- tinued to produce works on mineralogy which won him a European reputation. He met with much opposition in attempting tointroduce amalgamation in Hungary, in place of smelting and cupellation, for extracting silver from the ores, His opponents endeavoured to prove his process inferior to that already in use; and, after it had been tried successfully, pronounced it to be merely the old Spanish process of amalgamation. The emperor, however, ordered that his method should be employed in mines belonging to Government, and that he should receive a third part of the savings arising from the improvement during the first ten years, and 4 per cent. of this third part for the next twenty years. In 1766 he was appointed by Maria Theresa to arrange the imperial museum at Vienna, where he was made councillor of state, and continued to reside until his death. Von Born attempted satire with no great success. The Staats Perucke, a tale published without his know- ledge in 1772, and an attack on Father Hell, the Jesuit, and king’s astronomer at Vienna, are two of his satirical works. Part of a satire, entitled Monachologia, in which the monks are described in the technical language of natural history, is also ascribed to him. Von Born was well acquainted with Latin and the principal modern languages of Europe, and with many branches of science not imme- diately connected with metallurgy and mineralogy. He took an active part in the political changes in Hungary. After the death of Joseph, the diet of the states of Hungary rescinded many innovations of that scheming ruler, and conferred the rights of denizen on several persons who had been favourable to the cause of the Hungarians,

and, amongst others,on Von Born. At the time of his death in 1791, he was employed in writing a work entitled Fasti Leopoldini, probably relating to the prudent conduct of

Leopold II, the successor of Joseph, towards the Hua- garians, .

BORNE, Lupwie, German political writer and satirist, of Jewish family, was born 18th May 1786, at Frankfurt- on-the-Main, where his father, Jakob Baruch, carried on the business of abanker. He studied first at Berlin, where he became acquainted with Schleiermacher and the famous Henrietta Herz, and afterwards at Halle, intending to enter the medical profession. His inclinations for pure literature proved too powerful to allow him to carry out this design, and in 1806 he removed to Heidelberg in order to study financial and political economy. Two years later he took his degree at Giessen, and in 1811 he received an appoint- ment in the bureau of police in his native town. The reconstitution of Frankfurt as a free city after the fall of Napoleon's power in Germany soon deprived him of a situation which was but little suited to his tastes or abilities. He then devoted himself to literature, and for a time edited a newspaper entitled Staats-Ristretto, which was quickly suppressed by the Government on account of its liberal tone and the boldness of its criticisms. The same fate attended his next venture, Die Zeitschwingen, which ap- peared for only four months. In 1817 he renounced his Jewish faith and took the name of Borne, by which he is always known. From 1818 to 1821 he edited Die Wage, a paper particularly distinguished by its lively political articles, and by its powerful but sarcastic theatrical criti- cisms. or some years after the suppression of his paper, Borne resided principally in Paris, Hamburg, and Frank- furt. After the July revolution (1830) he hurried to Paris, expecting to find the newly constituted state of society somewhat in accordance with his own philosophic views ; but in this hope he was completely disappointed, and the bitterness of his anger lent additional force to the satirical letters he began to publish in his last literary venture, La Balance. While advocating his favourite scheme of a closer union between France and Germany, he assailed with unsparing sarcasm and polished wit the German dynasties, whom he looked upon as the great opponents of liberalism. He died at Paris in 1837. Borne's works are remarkable for brilliancy of style and for a thoroughly French vein of satire. His most elevated piece of criticisin is the

Denkrede auf Jean Paul, in which he shows him- self fully able to appreciate the great German humourist. The Menzel der Tranzosenfresser may be taken as a speci- men of his unrivalled powers of sarcasm, There have been several complete editions of his writings, the latest being that of 1862, 12 vols., Leipsic ; his life has been written by Gutzkow, 1840.

BORNEO, one of the largest islands of the world, is situated about the middle of the East Indian Archipelago, between 7° N. and 4° 20’S. lat., and between 109° and 118° E. long. It forms a kind of irregular hexagon divided into two almost equal parts by the equator ; and its whole area is estimated by Melvill von Carnbee at 12,745 square miles. Its coast-line is much less broken than that of most of the neighbouring islands; and though there are some extensive bays, such as Maludu in the north and Sarawak in the west, none of thei are so deep as greatly to interfere with the regularity of its contour. A large proportion of the seaboard is of alluvial formation ; and in various districts the deposition of new land is very per- ceptibly going on. The whole of the ground, for example, to the west of the Kandang Mountains in the kingdom of Landak has been gained from the sea during the last four centuries, and it is evident that many smaller islands which fringed the coast in former times have been incor- porated with the mainland. This process of extension goes on all the more rapidly, because the neighbouring sea is very shallow, except on the eastern side.

Of the interior of the island a considerable part has been only partially explored, so that the physical features can

Mountains

Rivers.

hardly be given with sufficient precision and detail. The general character of the country is mountainous, though none of the ranges and few of the individual peaks attain to any great elevation The centre of the island seems to be occupied by a kind of table-land, with which the principal chains connect themselves more or less directly. Of these the most extensive may

be traced from Cape Dati, on the west coast, in 2° 5’ 24” N, lat., northwards through the length of the island, which it divides as water-

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Le amelie “4 Sketch-Map of Borneo.

shed into two portions, a north-western of comparatively narrow dimensions, and a south-eastern comprising the rest of the island. The different parts of the chain are known by various local names, as the Krimbang or Bayang-Miut, the Batang-Lupar, the Madi, and the Anga-Anga Mountains. In the north-west corner of the island it attains its highest elevation in Kini-balu, or St Pietersberg, which is gene- rally supposed to be the highest peak in the whole island. According to the trigonometrical measurement of Capt. Belcher the summit is 13,698 feet above the level of the sea, but this was in 1851 reduced to 9500 by Messrs Low and St John, who were the first to ascend the mountain. A second great chain, known as the Kaminting Mountains, stretches south-west from: the Anga-Anga, and fills the south-west corner of the island with numerous offshoots and underfalls ; and a third starting from the same quarter strikes first south-east and then south along the southern part of the eastern coast, and is known as the Meratu Mountains. A fourth chain, of which the most important part bears the name of Sakuru, runs almost due east to Cape Kamiungun.

Unlike the most of the larger islands of the archipelago, and in remarkable contrast with Java, Borneo seems to possess no active volcanoes. Many of the peaks, however, bear distinct evidence of former activity in regular craters, now in some cases forming lakcs of salt water. The prevailing rocks are limestone, slate, sandstones, con- glomerates, and on the mountain tops

syenitic granite. The limestone hills are remarkable for the number of their caves, many of which, such as those of Rumbary, are a source of wealth to the natives, as they afford shelter to swallows that build edible nests.

The island, which is abundantly supplied with rivers and streams, may be hydrographically divided into five princi- pal versants Of these the shortest lies along the north-

western slope of the Krimbang and Kini-balu range, and discharges its waters into the Chinese Sea. The most im- portant of its rivers are the Sarawak, the Batang-Lupar, the Seribas, the Rejang (which is navigable for 140 miles), the Baram (about half a mile wide at its mouth), the Limbang or Bruni River, the Tewaran, the Bintulu, and the Tampasuk, the last two having their sources in Mount Kini-balu itself. In the south-western versant the largest river is the Kapuas, which, rising towards the centre of the island, in about 114° E. long., falls, after a long and winding course, into the sea between Mempawa and Sukkadana. It has eight navigable mouths, and at Sintang, where it receives the Melawi, its principal tributary, it hasa breadth of 1072 feet and a varying depth of 6 to 11 fathoms, The Banjermassin or Barito, which is the master stream of the southern versant, rises in the Kuti-Lama Lake, and reaches the Sea of Java in 114° 30’ E. long. Its upper channel is greatly interrupted by rocks and waterfalls, but the lower part of its course is wide and navigable, and traverses a rich alluvial district. Cross branches unite it with two rivers of considerable size towards the west, the Little Dayak or Murung and the Great Dayak or Kahayan, and still further west are the independent rivers Mendawi, Sampit, Pembuang or Surian, and Kota-Waringin. Passing over the south-east corner of the island, which is watered by a large number of short mountain streams, we reach the one great river of the eastern versant, the Kuti(Coti) or Mahakkan, which, rising in Mount Lassan-Tula, flows east, with a rapid and sinuous course, and falls by numerous mouths into the Strait of Macassar. Most of the rivers of the northern versant are comparatively small, as the island narrows into a kind of promontory. Besides the Sebuku, which rises in Mount Pentyieangan and falls into the sea at Temelingan, the Berou, the Gunong-Tebur, and the Bulungan are all worthy of mention.

Among the lakes of Borneo that of Kini-balu, near the Takes. mountain of the same name, is regarded as the largest, but many others are of considerable size. The Danau Sriang, for example, on the Kapuas River, is, according to Dr E. van Martei.x, larger than the Lake of Constance. Tn the valley of the banjermassin are the Babi and the Pamingir (or Telaga) Jakes, the latter of which supplies nearly all the inhabitants of the kingdom with fish; and in the district of Sintang there is an extensive sheet of water, on the Kapuas-Tawang, which was discovered in 1825, and is known by the various names of the Luar, Sumbah, Malayu, or van Capellan Lake.

In spite of the equatorial position of the island its Climate climate is nowhere oppressive, and in many places might almost be called temperate. At Pontianak, for example, which is almost under the equator, the mean reading of the thermometer is 82°, while it varies from 76° to 79° at sunrise, and hardly ever, even at noon, exceeds 92°. The difference between the rainy season and the dry is not rigidly marked ; the atmosphere is moist all the year round, and while, on the one hand, there is hardly a day of continuous downpour, there is hardly, on the other hand, a day without a shower. During the rainy season, which extends from November to May inclusive, the torrents, while they last, are tremendous, and the wind is frequently violent. Over such an extensive area there is, of course, great variety in the climatic character of different districts, especially when viewed in relation to health. Some places, as Bidi, Health. for example, are notoriously unhealthy; but from the statistics of the Dutch Government it appears that the European has in general no more to fear in Borneo than in the island of Java. Among the native races the prevailing diseases are principally those that arise from bad food or want of cleanliness. ‘Scrofula is common throughout the

Js.

BORNEO

country, and elephantiasis is frequently met with on the coast. Small-pox, dysentery, and fevers are the usual epidemics ; and ophthalmia sometimes attacks whole tribes.

About a sixth of the native population in some quarters

suffer from a kind of ringworm, called kurab, which is identified with herpes farwmosus. Consumption is not unconmon.

The mineral wealth of Borneo is great and varied, including diamonds, gold, platina, quicksilver, cinnabar, copper, iron, tin, antimony, petroleum, sulphur, rock-salt, marble, and coal, Landak and Pontianak are the best diamond districts, and Sambas, Landak, Montrado, and Borneo Proper furnish the greatest quantity of gold. The annual amount of gold collected in the island cannot be ascertained ; but the amount exported from Bruni in 1870 was 5789 dollars. Coal of excellent quality is found in the valleys of the Banjermassin, the Kuti, the Gunong-Tebur, and the Melawi, as well asin Sarawak, and in the island of Labuan. The Kuti deposit was discovered in 1845 or 1846 above Samarinda, and has since been struck in a number of places along the main river and several of the tributaries. A mine was opened at Pelarang, but does not seem to be at present worked. Another, however, at Pengaron, on the Riam Kiva, yields aunually about 9000 or 10,000 tons. The coal-fields in Borneo Proper

were conceded to Sir James Brooke in 1846, and since.

1868 have been in the hands of the Oriental Coal Com- pany, which has as yet taken no advantage of its rights. Antimony was discovered to be a Bornean product by Mr J. Craufurd, the well-known geographer, who, in 1825, learned that a quantity had been brought to Singapore by a native trader as ballast. The supply is practically unlimited, and the chief mine is at Bidi in Sarawak.

The fauna of Borneo comprises a large variety of species, many of which are numerically of great importance. Among the Quadrumana, which are very well represented, the most remarkable is the orang-outan (or mas, as it 1s called by the natives), au animal only to be found elsewhere in the Island of Sumatra. It frequents the low-lying districts, especially in the neighbourhood of the Dyak plantations. The wawah, a kind of gibbon, several Semmopithect (as the longnosed ape and the golden-black or chrysomelas), and the large-eyed Stenops tardigradus are also worthy of mention. The larger beasts of prey seem to be altogether wanting, so that little check is put on the natural fecundity of the graminivorous species. A small panther and the Lelis macrocelis are the largest animals of the cat-

kind known ; for though the tiger has sometimes been reported to occur in the mountains, its presence has never been verified. The Malay or honey bear is very common. The rhinoceros is found on the north-west coast, and the elephant, introduced by the Chinese or Portuguese, in the neighbourhood of Cape Unsang. Wild oxen of the Sunda race are not uncommon ; and the whole island swarms with droves of wild pigs, which are distinguished by a curious protuberance of hair on each side of the head. These furnish food uot only to the Dyaks, who are very fond of the flesh, but also to the crocodiles that abound in the principal rivers. Three or four specics of deer are euumerated, one of which, the pelandok of the Malays, is remarkable for its smallness and beauty. Squirrels, porcupines, civet-cats, rats, bats, and lizards are well represented, and snakes of various kinds, from the boa constrictor downwards, are abundant, while the marshy districts swarm with frogs and leeches. The latter attach themselves in a most troublesome manner to the passing traveller, A remarkable flying-frog was discovercd by Mr Wallace. Birds are comparatively rare in many quarters ; the most important being eagles, vultures, falcons, owls,

horn-bills, cranes, pheasants,—notably the Argus-pheasaut, —partridges, ravens, crows, parrots, woodpeckers, doves, and swallows. The Cypselus esculentus, or edible-nest swallow, is very common. Mosquitoes and sandflies are the chief insect ‘pests, and in some districts are very troublesome. There is also a kind of ant called the swmpit-api or fire-ant, the sting of which is very painful. The lepidopterous insects are remarkable for their number, variety, beauty, and size. In one favourable situation Mr Wallace caught 120 different species of moths in one night. The Coleoptera are no less numerously represented, as, indeed, might be expected in so richly-wooded a region. The lakes and rivers, as well. as the surrounding sea, abound with fish. Dr Bleeker in his “ Bijdragen tot de Kennis der Ichthyologische Fauna van Borneo,” in the Natuurkundig Tijdschrift van Nederl. Ind., describes 176 species which he obtained during his residence in the island.

The domestic animals of Borneo are few both in number of species and for the most part in number of individuals. The character of the country has

prevented the development of pastoral modes of life. In some districts, as in the neighbourhood of Ambong, there are bullocks of the Brahmin breed, about thirteen hands high ; the buffalo is sometimes employed in agriculture; and sheep and goats occur. The cat and dog are both domesticated. A few horses, introduced by Europeans, and only possessed by the wealthier classes, are found in Banjermassin and Sarawak.

The flora of Borneo is very rich, the whole surface of Plants,

the island being clothed in luxuriant vegetation. The king of the forest is the tappan, which, rising to a great height with a single branchless stem, is crowned with a splendid dome of foliage. From the wood of this tree the chiefs construct their official seats. The iron-wood, so reinarkable for the durability of its timber, is abundant; it is used by the natives for the pillars of their houses, and forms an article of export to China. It is almost rivalled by the kayu temesuin hardness. In all about sixty kinds of timber are furnished in more or less profusion. Palm-trees are abundant in great variety, including the xipa, cabbage, fan, cocoa-nut, and sago palms ; the two last afford large supplies of food to the natives. Gutta-percha, camphor, cinnamon, cloves, nutmegs, gambir, and betel-nuts are all produced in the island ; most of the tropical fruits flourish, such as the mangosteen, the lansat, rambutan, jack, jainbon, and blimbang; nor must the wonderful durian be forgotten, of which Mr Wallace enthusiastically declares that it is worth a voyage from Europe to taste it. It is a large fruit with an exceedingly strong spiked outer covering, and not unfrequeutly inflicts severe wounds by falling on the passers by. Yams, potatoes (an indigenous sort), melons, pumpkins, cucumbers, pine-apples, and bananas, sugar, pepper, cotton, and tobacco are cultivated, though not as yet ona very extensive scale. In the south-castern division of the Dutch territory the export of cotton was in 1854 1795 picols. The product of the wild plant is very good, and is exported from Borneo Proper. Among the more beautiful of the flowering plants are rhododendrons, orchids, and pitcher-plauts,—the last reaching a most extraordinary devclopment, especially in the northern districts about Kini- balu. Epiphytous plants are very common, many that are usually independent assuming here the parasitic character. The Vanda Low, for example, ‘grows on the lower branches of trees, and its strange pendent flower-stalks often hang down soas almost to reach the ground.”

Ferns are abundant, but are not so varied as in Java; Mr Wallace collected fifty species.

The population of Borneo consists of a considerable Inhabi- variety of races, of very different: origin, and of different tants.

degrees of civilization. The most important numerically are the Dyaks, the Malays, the Chinese, and the Buginese ; IV. — 8

Dyaks.

and, from their political influence, the Arabs and the Dutch.

The Dyaks, Dayaks, or Dayakkers are generally regarded as the most aboriginal. For themselves they have no general designation ; but, broken as they are into numerous tribes, they are distinguished by separate tribal names, many of which seem to be merely the names of the rivers on which their settlements are situated. Though regarded by the Malays as aliens, and looked down upon as almost beneath humanity, they belong to the same race. Separation, how- ever, must have taken place at a very early date. Kessel, who has attempted to form a classification of the Dyaks according to their ethnographical affinity, divides them into five principal branches. The first of these, which he calls the north-western, includes the natives of Sadong, Sarawak, Sambas, Landak, Tayan, Melionow, and Sangow. They all speak the same language, and are remarkable for their dependence on the Malay princes. The second branch, which is called emphatically the Malayan from its greater retention of Malay characteristics, occupies the north coast in Banting, Batang-Lupar, Rejang, and part of the valley of the Kapuas. To the third or Parian branch belong the Dyaks of the rivers Kuti and Passir, who are said to speak a language like that of Macassar. The fourth consists of the Beyadjoes, who are settled in the valley of the Banjermassin ; and the fifth and lowest comprises the Manketans and Punans, who are still nomadic and ignorant of agriculture. In stature the Dyak is rather above the Malay, while still considerably shorter than the average European. He is rather slightly built, but is active and capable of enduring great fatigue. His features are dis- tinctly marked and often well-

formed, though the cheek- bones are higher and the nose more retroussé than agrees with the European standard. The forehead is generally high, and the eyes are dark; the hair is black, and the colour of the skin a pure reddish brown, that frequently, in the female, approaches to a Chinese complexion. In general neither beard nor whiskers are present, but this does not hold of all the tribes. In dress there is con- siderable variety, great alterations having resulted from foreign influence. The original and still prevailing style is very simple, consisting of a mere chawat or waistcloth, generally of blue cotton, for the men, and a tight-fitting petticoat for the women, who acquire a peculiar mincing gait from its interference with their walking. The favourite ornaments of both sexes are brass rings for the legs and arms, hoops of rattan decorated in various ways, necklaces of white and black beads, and crescent-shaped ear-rings of a large size. Tattooing is commonly practised by most of the tribes. The men usually go bare-headed, or wear a bright-coloured kerchief. The custom of betel-chewing being almost universal, the betel-pouch worn at the side is a necessary part of the equipment. The weapons in use are a klewary or curved sword and a long spear. The bow is unknown, but its place among some tribes is partly sup- plied by the swmpztan, or blowpipe, in the boring of which they show great skill. When going to war the Dyak invests himself with a strong padded jacket, which proves no bad defence. Not only is it a custom with many tribes to preserve the skulls of their slaughtered enemies as trophies of their success in war; but, as the possession of a certain number of human heads is necessary before a man can be admitted to some of the most important of his social privileges, it is usual for the young men to go out on private head- hunting excursions. The custom, however, is dying out before the influence of civilization.

The Dyak is decidedly intelligent ; his memory is tena- cious, and his powers of observation good, Unacquainted in his natural state with both reading and writing, his aptitude for acquiring these arts is greatly praised by

missionaries. In moral character he is far superior to the civilized Malay, being unsuspicious and hospitable, and honest and truthful in a striking degree. The various tribes differ greatly in religious ceremonies and beliefs, and it is i hard to give a satisfactory idea of them. They have no temples,

priests, or regular recurrence of worship ; but the father of each family performs such rites as the exigencies of each day demand. A supreme god seems generally acknowledged, but subordinate deities are supposed to watch over special departments of the world and human affairs. Sacrifices both of animals and fruits—and in some cases even of human beings—are offered to appease or invoke the gods; divination of various kinds is resorted to for the purpose of deciding the course to be pursued in any emergency ; and criminals are subjected to the ordeal by poison or otherwise. There is a very strong belief in the existence of evil spirits, and all kinds of calamities and diseases are ascribed to their malignity. Thus almost the whole medical system of the Dyaks consists in the applica- tion of appropriate charms or the offering of conciliatory ‘ sacrifices. Many of those natives who have had much intercourse with the Malays have adopted a kind of mongrel Mahometanism, with a mixture of Hindu elements. The transmigration of souls seems to be believed in by some tribes; and some have a system of successive heavens rising one above the other very much in the style of the Hindu cos- mogony. In the treatment of their dead the same variety prevails as in other things—they are sometimes buried, |

sometimes burned, and sometimes elevated on lofty frame- work. The Dyaks have no exact calculation of the year, and simply name the months first month, second month, and so on. They calculate the time of day by the height of the sun, and if asked how far distant a place is can only reply by showing how high the sun would be when you reached | it if youset out inthe morning. In agriculture, navigation, | and manufactures they have made some progress. Ina few districts a slight sort of plough is used, but the usual instrument of tillage is a kind of cleaver. Two crops, one of rice and the other of maize or vegetables, are taken, and then the ground is allowed to fallow for eight or ten years, They spin and weave their own cotton, and dye the cloth with indigo of their own growing. Their iron and steel instruments are excellent, the latter far surpassing European wares in strength and fineness of edge. ‘Their houses are neatly built of bamboos, and raised on piles a considerable height from the ground; but perhaps their most remarkable constructive effort is the erection of sus- pension bridges and paths over rivers and along the front of precipices, in which they display a boldness and in- genuity that surprise the European traveller.

The Dyaks speak a variety of dialects, most of which are still very slightly known. The tribes on the coast have adopted a great number of pure Malay words into common use, and it is often hard to ascertain their own proper synonyms. The American missionaries have investigated the dialects of the west coast (Landak, &c.), and their Rheuish brethren have devoted their attention to those of the south, into one of which (that of Pulu Petak) a complete translation of the Bible has been made. Mr Hardeland, the translator, has also published a Dyak-German dictionary. (See Vocabularies in St John's Life an the Forests.) On the authority of the sultan of Bruni, who in 1824 visited Singapore, Crawfurd asserts that of the forty wild tribes that inhabit Bruni, eight had completely, and five partially, adopted the Malay speech. The dialect of the Kayans seems to be one of the purest, — nine-tenths of its words hay- ing no cognates in the other languages of the archipelago.

For an account of the Malays the reader must be Chinee referred to a separate article, but the Chinese require inhab more particular notice. They seem to have been the —

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first civilized people who had dealings with Borneo: their own annals speak of tribute paid to the empire by Pha-la on the north-east coast of the island as early as the 7th century, and later documents mention a Chinese coloniza- tion in the 15th. The traditions of the Malays and Dyaks support these statements,—the people of Bruni regarding themselves as partly of Chinese descent, and the annals of Sulu recording an extensive Chinese immigration about 1575. Be this as it may, the flourishing condition of Borneo in the 16th and 17th centuries was largely due to trade with China, The Chinese founded in the 18th century an important colony in Bruni; but their numbers were lessened by the bad treatment of the princes. The Malay chiefs of other districts invited them to come and develop the mineral

wealth of the country, and before long they were to be found in considcrable numbers in Sambas, Montrado, Pontianak, and elsewhere. They were at first forbidden to engage in commerce or agriculture, and pre- vented from wearing fire-arms or possessing gunpowder. About 1779 the Dutch acquired immediate authority over all strangers, and thus had the means of controlling the new colonists, who soon proved themselves rather trouble- some. Their numbers continually increased, and they pushed inland to new mineral districts, forming friend- ships and contracting marriages with the Dyaks, For the better management of their affairs they entered into ex- tensive associations, which gradually assumed more and more of a political character until they were almost regular confederacies. This rendered them at once more disposed and more able to assert their claims to independence ; and it cost both the Dutch Government and the Rajah of Sarawak several severe contests to bring them to terms, They form at the same time one of the most valuable elements in Bornean civilization, and are an industrious, intelligent, and well-educated race, It would be hard to find a man among them who cannot read and write; and their first care in a new settlement is to found a school. The greater part of those on the west coast are emigrants, originally from the northern boundaries of Quang-tung and Quang-si. They are rough, stern, and quarrelsome, A more polished class come from the coast district of Amoy, and look down on their ruder fellow-countrymen, from whom they keep themselves markedly distinct. The former class are called Kehs by the Borneans, and the latter Ollohs.

In regard to the number of the population of Borneo it is difficult to arrive at anything like a satisfactory estimate. The inland districts seem to be very thinly inhabited ; and the Dyaks increase in numbers at a very slow rate, in spite of their being both a healthy and moral people. This is attributed by Mr Wallace mainly to infecundity on the part of the women brought on by the excessive labour to which they are subjected from early girlhood. The popula- tion of the Dutch territory was stated in 1871 at 335,677 natives and 131 Europeans in the western division, and at 847,846 natives and 320 Europeans in the south-eastern, making a total of 700,386; but the statements rest on little better than conjecture. If they approximate to the truth, the population of the whole island may be set down at between 1,000,000 and 2,000,000. Earlier estimates carried the total as high as 3,000,000.

_ Borneo is politically divided into Borneo Proper or Bruni (inclusive of Sarawak), the territory of the sultan of Sulu, and the Dutch possessions and protectorate. Bruni is an independent country, governed by a sultan, who is nom- inally absolute; but the real power is distributed among the subordinate chiefs, who act each as much as possible as his own master. The inhabitants are all serfs of the sultan or the chiefs, who may dispose of their property, their wives, or their children in the most

arbitrary manner. Mahometanism is the state religion. The capital, also called Bruni, is a large and flourishing city. The estimates of its population have all along greatly varied. Among the most recent is one which makes it 30,000 or 40,000, while the population of the whole king- dom is given at 225,000. A considerable traffic is carried on with Malacca, Singapore, China, Rio, Sambas, Ponti- anak, and other places in the Dutch possessions. There is an extensive fishing in the river, the produce of which furnishes the people with a large proportion of their food. The fishermen form a distinct caste, and the same is the case with the workers in brass, the blacksmiths, the gold- smiths, the matmakers, &c. The manufacture of goldlace and silk embroidery is carried to great perfection. For accounts of Sarawak and the Sulu territory the reader is referred to separate articles.

The Dutch territory forms two great divisions, the Dutch The western, governed territory.

western and the south-eastern. by a resident, is subdivided into two parts, Pontianak and Sambas, the former administered by the resident him- self and the latter by an assistant-resident and the sultan of Sambas. Pontianak includes Landak, Tajan, Mampawa, Sintang, Selimbou, Upper-Kapuas, and Montrado, while to Sambas belong the districts of Pamangkut and Seminis. The south-eastern division is subdivided into an eastern and a southern part. Under the southern are Kota-Waringin, Pembuang, Sampitite, Great and Little Dyak, Bekompai, Duson, Banjermassin, and Tanah-Laut; and under the eastern are Tanah-Bumbu, Kusan, Passir, Kuti, Sambi- lung, Gunong-Tebur, Bulungan (the three last being also known as Berou), and the Tidung lands. The east coast, from Sebamban in Tanah Bumbu to Kaniungan in 1° 3’ N. lat., belongs immediately to the Dutch Government. In the western

division several important military roads have been constructed, and the resources of the country are being opened up.

Borneo has never, as far as we have information, formed a History.

political unity ; and even its physical unity as an island is so little known or considered by its native inhabitants that it possesses in their languages no general designation. As a natural consequence Borneo has no proper history. The island was first discovered by European navigators in the beginning of the 16th century, according to one account by Lorenzo de Gomez, a Portuguese, in 1518, and according to another by Don Jorge de Menezes in 1526. Before long commercial relations were formed with the natives by the Portuguese traders, at first in the city of Bruni itself, and then in various other maritime states. In 1573 their Spanish rivals tried to open a connection with Bruni, but their attempts were without success till the sultan being dethroned appealed to them for assistance, and was restored in 1580. From that time they kept up intercourse with the country, but it was not unfrequently interrupted by war. In 1645 an expedition was sent to punish the in- habitants of the capital for their piratical excursions. The real influence exerted by the Portuguese and Spaniards on the condition of the country was very slight ; and the only effort at proselytizing of which we have record came to an untimely end in the death of the Theatine monk, Antonio Ventimiglia, who had been its originator. Meanwhile the

| Dutch and English had been gaining a footing in the island.

In 1604 Waerwijck began to trade on the west coast, and in 1608 Samuel Blommaert was appointed Dutch resident in Landak and Sukkedana. The English appeared for the first time about 1609, and by 1698 had an important settlement at Banjermassin, from which, however, they were expelled by the influence of the Dutch, who about 1733 obtained from the sultan a monopoly of the trade. The Dutch, in fact, became paramount all round the west and south coasts, and the king of Bantam ceded his rights

of suzerainty tothe company. Theattention of the English was meantime turned to the north of the island, which was subject to the sultan of Sulu,

from whom, in 1756, Alexander Dalrymple obtained possession of the island of Balambangan, and all the north-eastern promontory. A military post was established, but in 1775 it was sur- prised and destroyed by the natives under the dutus or subordinate chiefs, who were dissatisfied with the ccssion of their territory. This disaster rendered a treaty, which had just been concluded (in 1774) with the sultan of Bruni, in great measure a dead lettcr, and before the end of the century English influence in Borneo was practically at an end. The Dutch, too, were overtaken, in spite of apparemt success, with a succession of misfortunes, through their own mismanagement ; and in 1809 their settlements were all abandoned by order of Marshal Daendels. The natives along the coast, assisted and stimulated by immi- grants from the neighbouring islands to the north, gave themselves more and more to piracy, and rendered the trade of civilized nations almost an impossibility.

In 1811, however, an embassy was sent to the British Government in Java by the sultan of Banjermassin to crave their assistance, and in reply Alexander Hare was despatched as commissioner and resident. He not only formed an advantageous treaty with the sultan, but got for himself a grant of a district of country which he proceeded to colonize and cultivate. An expedition was also sent against Sambas, and a post established at Pontianak. On the restoration of the Dutch possessions in 1818 all these arrangements were cancelled, and a free field was left to the enterprise of the Dutch Government. A succession of active commissioners—Boekholtz, Tobias, Halewijn, &c.~~— soon laid the foundations of an extensive supremacy. About half of the kingdom of Banjermassin was surrendered by the sultan in 1823, and further concessions were granted by his son in 1825. Meanwhile, George Mullcr was exploring the east coast, and obtained from the sultan of Kuti an acknowledgment of the Dutch authority—a con~~ cession which seems to have been immediately regretted, as the enterprising traveller was shortly afterwards killed. The outbreak of a war in Java turned the attention of the Dutch in some measure from Borneo, and nothing was done by them to check the piracy which was growing more and more unendurable. On the rise of Singapore direct trade had been opened with Sarawak and Bruni, and it was a matter of moment to the English merchants that their traffic should be safe. In 1838 Sir James Brooke, an Englishman, whose attention had been turned to the state of affairs in the Eastern

Archipelago, set out for Borneo, determined, if possible, to remedy the evil. By 1841 he had obtained from the sultan of Bruni the highest authority in Sarawak, and before many years were over he succecded in restoring order and peace to the dis- trict, and, with the assistance of the English Government, in repressing piracy. (See Brooxn and Sarawak.) In 1847 the sultan of Bruni agreed to make no cession of territory to any nation or individual without the consent of Her British Majesty. The Dutch hopes of gradually incorporating the whole island were thus frustrated, but this served only to increase their activity in other direc- tions. In 1844 the sultan of Kuti had acknowledged their protectorate, and about the same time a treaty of similar character was formed with Passir. Since 1834, when Gunong-Tebur, Tanjong, and Bulungan are said to have made a nominal submission, the boundaries of their authority have undergone no change to the north; and in general their political power has been rather rising in level, so to speak, over the southern part of the island than seek- ing to spread over a wider area,

Of the works on Borneo, which are very numerous, the following

may be named:— Blommaert's Diseowrs ende ghelegentheyt van het eylandt Borneo int Jear 1609; Haehelyke reystugt van Jacob Jansz. de Roy na Borneo en Atchin in het jaar 1691 ; Beeekman, Visit to Borneo, 1718; Valentijn's description in his great work, 1726; Berigt van een reiziger over Borneo Propre in P. P. Roorda van Kysinga's Versehill. reizen en lotgevallen, vol. iv.; G. W. Earl, Eastern Seas, 1887; W. L. Ritter, Indisehe Herinneringen, &c., 1843; S. Muller, Retzen in den Ind. Archip.; Keppel, Expedition of the Dido, 1846; Mundy, Narrative of events in Borneo and Celebes, 1848; Belcher, Voy. of the Samarang, 1840; H. Low, Sarawak, 1848; F. 8S. Marryat, Borneo, &e., 1848; Keppel, Visit to Ind. Arehipel. by the Meander, 1858; J. C. Temple, Private Letters of Sir J. Brooke, 1853; H. St John, The Indian Arehip., 1853; C. A. L. M. Schwaner, Borneo, Besehr. van het stromgebied van den Barito, ete., in den jaaren 1848-47, 1853-4 ; P. J. Veth, Borneo's Westerafdeeling, 1854, 1856 (a work which has been largely used in the preparation of the present article); EK. Francis, Lerinneringen nit het leven van een Indiseh. ambtenaar, 1856; J. J. Rochussen, Toeliehting, ete. van cenige daden van mijn bestuur, 1858; W. A. van Rees, Montrado, &e., 1858; C. J. Temminck, Coup dail sur les poss.

Neérland. dans I’ Inde Arehipel., 1846-50 ; Ida Pfeiffer, Zweite Weltreise, 1856; MacDougall, Letters from Sarawak, ad- dressed to a Child, 1854; Crawfurd, Deseriptive Dictionary, art. Borneo; W. E. Kroesen and F. H. van Vlissingen, Cultwur- en Industrie-ondernemingen van Borneo, 1859; J. Hasselman and F. H. van Vlissingen, Besehowwingen over de exploitatie van Borneo, 1859; I’raey, History of the American Board of Commissioners for Foreign Missions, 1842 ; Spenser St John, Life in the Forests of the Far East, 1862; F. Boyle, Adventures among the Dyaks of Borneo, 1865; A. R. Wallace, The Malay Archipel., 1869; P. J. Veth, Woordenboek van Nederl. Indie, 1869 ; (in this work the reader will find a long list of articles on Borneo that have appeared in Duteh and other periodicals) ; ‘‘ Contribuzioni geografiche italiane a Bornco” in the Cosmos of Guido Cora, 1874. (H. A. W.)

BORNHOLM, an island in the Baltic, belonging to Denmark, in the “ Stift” of Seeland, between 54° 59’ and 55° 18’ N. lat., and between 14° 42’ and 15° 8’ E. long. It is about 20 miles in length by 14 in breadth, with a generally mountainous surface and steep and rocky shores. Besides a good freestone, which is largely exported for building, it furnishes limestone, blue marble, coal, and clay. Oats, flax, and hemp are cultivated. The popula- tion amounts to about 33,000, and is chiefly employed in agriculture, fishing, brewing, distillation, and the manu- facture of earthenware. Weaving and clock-making are also carried onto some extent. The capital is Ronne, and there are six other small towns on the island,—Svanike, NexGe, Hasle, Allinge, and Sandvig,—the total town population amounting to 11,100. On the north-west coast are the ruins of the castle of Hammershuus, which was built in 1158, and long served as a_state-prison ; while another old castle, erected by Christian V. in 1684, and important as commanding the entrance to the Baltic, is situated on Christiansée, one of a small group of islands about 11 miles to the north-east. The island of Bornholm has had a very eventful history. For a sbort time, in the 9th century, it formed a separate principality or kingdom, which was afterwards united to Denmark, In 1510 it was captured by the Hanseatic League, and in 1522 it became directly subject to the city of Ltibeck. In 1645 the Swedes took it by storm, and their possession of it was confirmed by the peace of Roeskild in 1658; but the sympathies of the people were with Denmark, and a pop- war insurrection succceded in expelling the Swedish forces.

BORNU, or Bornov, a kingdom of Central Africa, situated to the south-west of Lake Chad, and separated from the Niger ly the kingdom of Haussa. Its area is estimated at 51,250 square miles, and its population at 5,000,000. The country is for the most part a flat alluvial plain, subject in its north-eastern portions to inundation from the lake and its tributary rivers—the Shari and the Yo. The former of these, which is by far the larger, serves as a boundary towards Baghcimi on the east ; the latter, rising in Haussa, flows north-east through the whole country. The soil is in general fertile and well watered, yielding large crops even under very imperfect cultivation.

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One of the finest districts in the country is that of Uje, which is inhabited by the Ghamergu tribe. The labour is chiefly performed by female slaves, who, besides their other labours are obliged to perform the perilous task of guarding the growing crops against animal depredators. ‘The rice and wheat are excellent, but are grown in small quantity. The grain which forms the staple food of the people, is a species of millet called gusswb, which they form, not into bread (an article here cntirely unknown), but into a species of paste, which, by the addition of butter and honey, forms the highest boast of Bornu cookery. Cotton and indigo grow wild, and afford the materials for the cloths finely dyed with blue stripes, which form the staple fabric of the country. Onions and water-melons are almost the only vegetables, and besides tomatoes the only fruits are a few limes and figs. The prevailing bush is the Asclepias gigantea, and the woods consist largely of acacias and tamarinds. ‘The caoutchouc tree is very common, but its juice has not as yet been utilized by the inhabitants. All the doniestic animals are reared, and there are very numerous herds of oxen, possessed chiefly by the Shuwa tribe. Animal food is thus very cheap, and forms a large proportion of the ordinary diet.

Wild animals, in great numbers, find both food and cover in the extensive districts of wood and marsh. Lions, giraffes, elephants, hyenas, crocodiles, and hippopotami are common; and antelopes, gazelles, ostriches, and various other animals are pursued as game. The country abounds with bees; and the honey, though only partially collected, forms one of the chief Bornuese delicacies. The climate, especially from March to the end of June

is oppressively hot, rising sometimes to 105° and 107°, and even during most of the night not falling much below 100°. In May the wet season commences, with violent storms of thunder and lightning. In the end of June the rivers and lakes begin to overflow, and for several months the rains, ac- companied with sultry weather, are almost incessant. The inhabitants at this season are severely afflicted with fever and ague, which carry off great numbers. In October the rains abate ; cool, fresh winds blow from the west and north- west ; and for several months the climate is both healthful and agreeable.

The leading people of the country, called Bornuese or Kanuri, present a perfect specimen of the negro form and features, having large mouths, thick lips, and broad noses, but good teeth and high foreheads. The females add to their want of beauty by extensive tattooing ; they also stain their faces with indigo, and dye their front teeth black and their canine teeth red. The law allows polygamy, but even the richest have seldom more than two or three wives. The marriage ceremonies last for a whole week, the first three days being spent in feasting on the favourite national dishes, and the others appropriated to certain symbolical rites. The favourite amusement is to watch the wrestling of slaves taken in war from the neighbouring nations, Another amusement is a rude game bearing some resemblance to chess, played with beans and holes in the sand. The Mahometan religion is universally professed in Bornu, and with bigotry and violence. The prevailing language of the people is known as the Kanuri. It has no affinity, according to Dr Barth, with the great Berber family, A grammar was published in 1854 by 8. W. Koelle, as well as a volume of tales and fables, with a translation and vocabulary.

The pastoral districts of the country are occupied by the Shuwas, who are undoubtedly of Arabian race, and speak a well-preserved dialect of that language. Of the date of their immigration from the East we have no knowledge; but they were in the country as early as the middle of the 17th century. Their total number is from

200,000 to 250,000, and they are divided into numerous distinct clans. Their villages in general consist of rudely- constructed huts, of an

exaggerated conical form. Another tribe, called the La Salas, inhabit a number of low fertile islands in Lake Chad, separated from the continent by channels which those who know the tracts can ford on

horseback.

The military force of Bornu consists almost entirely in cavalry, amounting to about 30,000, who are mounted on heavy steeds, which, as well as their riders, are frequently cased in light iron mail. The Shuwas, however, are clad only in a light shirt, and mounted on small unseemly nags, and the Kanembu spearmen are almost naked, and fight with shield and spear. Camels and oxen are used for conveying the baggage. The sheikh of Bornu is surrounded by a mounted body-guard, who likewise compose his principal nobles and chiefs. It is indispensable to the chief of rank that he should possess a huge belly, and when high feeding cannot produce this, padding gives the appear- ance of it. Notwithstanding the heat of the climate, the

body is enveloped in successive robes, the number indicat-

ing the rank of the wearer. The head likewise is enclosed in numerous turbans.

The towns are of considerable size. They are surrounded with walls 35 or 40 feet in height, and 20 feet in thickness, having at each of the four corners a triple gate, composed of strong planks of wood, with bars of iron. The abodes of the principal inhabitants form an enclosed square, in which are separate houses for each of the wives ; the chief's palace consists of turrets connected together by terraces. These are well built of a reddish clay, highly polished, so as to reseinble stucco; the interior roof, though composed only of branches, is tastefully constructed. Kuka (or Kukawa, as it is called from its consisting of two distinct parts) is situated near the western shore of the lake, and has a population of 60,000. Still more populous is Ngornu, Angornou, or Gornu (the town of the " Blessing"), which lies about 18 miles to the south-east. It carries on a large trade, and contains about 50,000 inhabitants. On the Waube or Yo are still to be seen extensive remains of Old Bornu or Birni and Gambarou or Ghambaru, which were destroyed by the Fulbe about 1809. Among the other towns of more or less importance

are Alaw, where Edris Alawoma, the famous king of Bornu, is bnried, Alamay, Allauna, or Kabshari, Borzani, Lamiso, Mashena, Uje Maidugari, Uje Maibani, Wushek, and Yo.

The history of Bornu goes back only to the 9th century of our era, and its early portions are very fragmentary and dubious. The first dynasty known is that of the Séfuwa or descendants of Sef, which came to the throne in the person of Dugu or Duku, and has its capital at Njimiye in Kanem. Mahometanism was adopted about 1086 by the ruling monarch, Dinama Ben Humé, and has since continued the religion of the country. From 1194-1220 reigned Selma or Abd-el Jelil, under whom the power of the kingdom was greatly extended ; and Dunama, his successor, was also a powerful and warlike prince. In the following reigns the prosperity of the country began to diminish, and in 1386 the dynasty was expelled from Njimiye, and forced to seek refuge in the western part of its territory by the invasion of the Bulala. Mai Ali Ghajideni, who founded the city of Birni or Ghasrggomo, on the River Wau, rendered his country once more redoubtable and strong. His successor, Edris, completely vanquished the Bulala and subjugated Kanem ; and under Mahomet, the next monarch, Bornu reached its highest pitch of greatness. A series of for the most part peaceful reigns succeeded till about the middle of the 18th century, when Ali Omarmi entered upon a violent struggle with the Tuaricks or Imoshagh. Under his son Ahmed (about 1808) the kingdom began to be harassed by the

Fulbe or Fellatah, who had already conquered the Haussa country. Expelled from his capital by the invaders, Ahmed was only restored by the assistance of the fakir Mahomet el-Amin el-Kanemi, a mere private individual, who, pre- tending to a celestial mission, hoisted the green flag of the prophet, and undertook the deliverance of his country. The Fellatahs appear to have been taken by surprise, and were in ten months driven completely out of Bornu. The conqueror, having the army wholly devoted to him, might probably have, with little difficulty, assumed the sovereign power, More moderate, and perhaps more prudent, he invested the nearest heir of the ancient kings with all the appearance and pomp of sovereignty,—only reserving for himself, under the title of sheikh, all its reality. The court of the king or

sultan was established at New Bornu, or Birni, which was made the capital, the old city having been entirely destroyed during the Fellatah invasion; while the sheikh, in military state, took up his residence at the new city of Kuka. Fairly established he ruled the country with a rod of iron, and at the same time inspired his subjects with a superstitious notion of his sanctity His zeal was peculiarly directed against moral or religious offences. The most frivolous faults of females, as talking too loud, and walking in the street unveiled, rendered the offender liable to public indictment, while graver errors were visited with the most ignominious pun- ishments, and often with death itself. Kanemi died in 1835, and was succeeded by his son, Sheikh Omar, who alto- gether abolished the nominal kingship of the Sefuwa. The intercourse of Europeans with Bornu has, during his reign, been for the most part satisfactory as well as frequent. The expectations entertained at various times of opening up a valuable commerce with the people have not been as yet realized, and it seems likely, from the latest reports, that before long the traveller in Central Africa will have little to hope or fear from the sheikh of Bornu. Dr Barth, who was at Kuka in 1851, foreboded this decay; and Dr Nachtigal, who in 1870 conveyed the friendly presents sent by King William of Prussia, in acknowledgment of the sheikh's kindness to so many German explorers, writes thus in December 1872 :—

‘‘The rapid declension of Bornu is an undeniable and lamentable fact. It is taking plaee with increasing rapidity, and the boundless weakness of Sheikh Omar—otherwise so worthy and brave a man— must bear almost all the blame. His sons and ministers plunder the provinces in an almost unheard of manner; trade and inter- eourse are almost at a standstill ; good faith and confidence exist no more, ‘The indolence of the court avoids military expeditions, and anarchy and a lack of security on the routes are the conse- quences. As two years ago the prince of Zinder could kill the Munioma or prince of Munio, a faithful vassal of the sheikh, and escape unpunished, the people of Khudadza have now slain the prince of Gummel, The sheikh will probably take their presents as indemnification, as he pardoned the sultan of Zinder for the mur- der of ‘the faithful Munioma for the sake of a few camel-loads. Most of the small princes of the western provinces of Bornu now pay an indeterminate tribute to the prince of Zinder, who on his part has no less ambition than to beeome master of Bornu. Thus the sheikh and

the land grow poorer and poorer, and public morality sinks lower and lower.”

See Denham and Clapperton’s Travels, 1828; Barth’s Travels in Central Africa, vol. i:., 1857 ; Rohlfs’s Land wnd Volk in A frica, 1873; Petermann’s AMitthedl., 1871, pp 67 and 827,

BOROUGH. Although the idea of self-government by a town is exemplified in the colonic and municipia of Rome, and in their duumviri, decuriones, and lesser senate, com- posed of the curial orders, which along with the defensor cwitates appear to have existed in vigour until the reign of Leo the Philosopher (Const., 46, 47), yet as the local power was gradually subordinated to the imperial, and as both in France and Italy it seems almost universally to have dis- appeared when the territorial jurisdictions, as well as the feudal fiefs, became hereditary, it is impossible to trace an historical connection between these institutions and the

modern borough. In Spain and Languedoc, perhaps, the forms of ancient independence may have been continuously preserved, but the system of government by comes and scabint (or assessors), which was pursued in both France and Italy by the successors of Charlemagne, was obviously opposed to the freedom of towns. It is during the 11th and 12th centuries that we begin to read in charters of the citizens of Narbonne, the burgesses of Carcassonne, the consuls of Beziers, the magistrates of Rouergues, the capitols of Toulouse. It is during the reigns of Louis the Fat, Louis the Lion, and Philip Augustus that charters of com- mune become frequent. These charters, which sometimes bear to be granted on account of the poverty of the towns- folk, the enormities of the clergy, or the attacks of the local Seagneurs, were probably dictated by the pecuniary needs of the Crown ; but they attest the growing power—the de facto rights of the industrial population. They distinguish between Bourgeoisies and Communes proper: the former obtained a confirmation of ancient customs, of exemption from feudal jurisdiction, of personal liberty, but they did not obtain an elective municipal government. In Italy the revival of civic autonomy was much more rapid. Although Frederic Barbarossa reserved to himself in the peace of Constance the right of nominating consuls in the Italian towns, Bishop

Otho of Frisingen tells us that the imperial influence did not count for much; and in 1288, at least, we have in the Potestas (Podesta), the Concilium Generale, and Concilium Novem Dominorum of Siena, a type of the independent republican city.

The Saxon byrig or burh is properly the fortified house of the powerful man. Related forms are burgus (Latin of 4th century) ; burg (High German) ; baurgs (Gothic) ; borg (Gaelic) ; wépyos (Greek) ; bor, bore, and bowrg (French) ; and broch, a pledge. The burgensis, or inhabitant of a walled town, was opposed to villanus, or inhabitant of the villa, or open town. The Gemot, or assembly of the original township, had the power of making by-laws (the Danish prefix means “ town”), and of electing the Gerefa (Reeve), the Bydel, and the Tithing-man or constable, the first of whom represented the assembly in the courts of the hundred and the shire. The Gemot also saw to the collection of taxes imposed by the higher courts, the pursuit of criminals, and the search for stolen goods. In mercantile places, such as London and Bath, the chief officer was called Port-Gerefa from the gates in which the market was held.

The freeholder of this period had undoubtedly political as well as personal liberty. Generally speaking, how- ever, although common property may have been held by a guild or corporation, and special privileges of trade or inheritance may have been enjoyed, there is before the Conquest little trace of municipal organization. The Lagemanni of Lincoln and the Justices of Chester were apparently among the most ancient resident magistrates, but the manner of their election is unknown. The Conquest divided the boroughs into those which formed part of the royal demesne and those which held of the barons and dignified churchmen,—the interest of the Crown and its grantees in the property and in the profits of fairs and markets, &c., being, at first absolute, but latterly con- verted into a firma burg? or perpetual rent from the whole borough in lieu of tribute from individual burgesses. The non-elective bailiff succeeded to the reeve, and proved a useful agent in carrying out the oppressive and arbitrary tallagia, which were often the price of new or confirmed privileges. The bailiwicks were sometimes farmed out, and this led to still more severe exaction. To the bailiff succeeded the mayor (major), who accounted to Exchequer for

the annual rents of the borough. Grants of jurisdic- tion, of socan and sacan, of outfangenthef and infangenthef,

and grants of the right of appointing prepositi (provosts), ballivi (from Greek BdédXew or Latin bajulus), and justiciarvi increase in number towards the reign of John, and are pro- bably included along with the various exemptions from tolls, d&c., granted by Henry IL in the “liberties and free customs” guaranteed by the Great Charter. The terms alderman, capital citizen, capital burgess, and jurat were of fluctuating signification ; but the last three were finally applied to members of the Common Council which gradually took the place of the assembly of incorporated burgesses. The rights of a free burgess might be acquired by birth, apprenticeship, marriage, or purchase ; and as prior to Edward IIL.’s Laws of the Staple these rights included exclusive privileges of trade, they were properly connected with the payment of local taxation and the performance of local duties, from which non-freemen (strangers and temporary resi- dents) were exempt. In many cases it is probable that the ‘“civitas,” or community of freemen, was identical with the conwwiwm conjuratum, or Secular Frith Guild of traders and craftsmen, possessing portions of town land, Such voluntary associations for protection of trade, the administration of common property, or for religious and charitable purposes, were more highly developed in England than in any other part of Europe. The members of the leading industry naturally assumed the direction of municipal affairs, and when their guild was recognized by the Crown their bye-laws acquired a binding force. For instance, in deeds of the 12th century relating to the magistrates of Paris the terms burgenses and mercatores per aquam are used as synonymous. (Brentano on Gilds.) Such guilds gave compensation to brethren who had incurred losses by shipwreck or undeserved misfortune, and made gratuitous loans to poorer brethren for carrying on their trade. In was their special endeavour to obtain staple right, the right of coinage, immunity from tolls, &c. Gradually, however, the distinction arose between the merchants proper who formed the gilde mercatorie, and the craftsmen, who had at first traded in the raw materials they worked with, but who were now oppressed and deprived of civic rights by their wealthier brethren. The man “with dirty hands” or “blue nails,” the man “without hearth or honour,

who lives by his labour," or "hawks his wares in the streets," was threatened with a serfdom like that which the barons and bishops had imposed. But at this juncture the great craft guilds arose to assert the rights of manufacture. In the time of Henry VI. their victory in England was complete, and the Crown, which had previously recognized the constitution and liberties of a town by confirming the guild, now used in its charters the words of express incorporation (commuunitas perpetua et corporata). A glance at the names and forms of the most modern municipality will show how closely trade organization and burghal government have been intertwined,

Th Treland the earliest traces of burghal life are connected with the maritime settlements on the southern and eastern coast. 'The invasion of Henry II. colonized these Ostman ports with Anglo-Norman communities, who brought with them, or afterwards obtained, municipal charters of a favour- able kind. The English settlement obviously depended on the advantages which the burgesses possessed over the native population outside. Quite different from these were the new close boroughs which during the plantation of Ulster James I. introduced from England, The conquest was by this time completed, and by a rigorous enforcement of the Supremacy and Uniformity Acts the existing liberties of the older boroughs were almost entirely withdrawn. By the new rules published (in terms of the Acts of Settlement and Explanation) in 1672 resident traders were permitted to become freemen, but neither this regulation nor the ordi-

nary admissions through birth, marriage, and apprentice- ship succeeded in giving to Ireland free and vigorous muni- cipalities. The corrupt admission of non-resident freemen, in order to outvote the ancient freeholders in parliamentary elections, and the systematic exclusion of Roman Catholics, soon divorced the " commonalty" from true local interests, and made the corporations, which elected themselves or selected the constituency, dangerously unpopular.

In Scotland burghs or burrows are divided into Royal Burghs, Burghs of Regality, and Burghs of Barony. The first were erected by Royal Charter, and every burgess held direct of the Crown. It was, therefore, impossible to subfeu the burgh lands,—a distinction still traceable in modern

conveyancing. Where perhaps no charter ever existed, the law or proof of immemorial possession of the privileges of a Royal Burgh has presumed that a charter of erection once existed, The charter gave power to elect provost, bailies (French terms which superseded the ancient mayor and aldermen), and council, a power long exercised under the Act 1469, which directs the new council to be chosen annually by the retiring council, and the magistrates by both councils. The jurisdiction of these magistrates, which was specially reserved in the Act of 1747 abolishing heritable jurisdictions, was originally cumulative with, and as large as, that of the sheriff. It is now confined to police offences, summary ejections, orders for dxterim aliment (for prisoners), payment of burgh dues, and delivery of title deeds. Three head courts were held in the year, at which all burgesses were obliged to attend, and at which public business was done and private transactions were ratified. There were three classes of burgesses—burgesses in sua arte, members of one or other of the corporations ; burgesses who are guild brothers ; and simple burgesses. The Leges Burgorum apparently contemplate that all respectable inhabitants should have the franchise, but a ceremony of admission was required, at which the applicant swore fealty and promised to watch and ward for the community, and to pay his “maill” to the king. These borough maills, or rents, and the great and small customs of burghs, formed a large part of the royal revenue, and, although frequently leased or feued out for a fixed duty, were on the accession of James I. annexed to the Crown as an alimentary fund. Burgh customs still stand in the peculiar position of being neither adjudgeable nor arrestable ; they are therefore bad security. The early charters contain the usual privileges of holding a market, of exemption from toll or tribute, and that distraint will be allowed only for the burgess’s own debts. There was also the usual strife between the guildry and the craftsmen, who were generally prohibited from trading, and of whom dyers, fleshers, and shoemakers were forbidden to enter the guildry. Deacons, wardens, and visitors were appointed by the crafts, and the rate of wages was fixed by the magistrates. The crafts in Scotland were frequently incorporated, not by Royal Charter, but, as in the case of the cordiners of Edinburgh, by seals of cause from the corporation. The trade history of the free burghs is very important. Thus in 1466 the privilege of importing and exporting merchandize was confined to freemen, burgesses, and their factors. Ships are directed to trade to the king’s free burghs, there to pay the customs, and to receive their cocguets or custom-

house seals; and in 1503 persons dwelling outside burghs are forbidden to "'use any merchandize," or to sell wine or staple goods. An Act of 1633, erroneously called a Rati-

fication of the Privileges of Burghs, extended these privi-

leges of buying and selling to retail as well as wholesale trade, but restricted their enjoyment to Royal Burghs. Accordingly, in 1672, a general declaratory Act was passed confirming to the freemen in Royal Burghs the wholesale trade in wine, wax, silk, dyeing materials, &c., permitting

generally to all persons the export of native raw material, specially permitting the burgesses of Barony and Regality to export their own manufactures, and such goods as they may buy in " markets," and to import against these consign- ments certain materials for tillage, building, or for use in their own manufactures, with a general permission to retail all commodities. This extraordinary system was again changed in 1690 by an Act which declared that freemen of Royal Burghs should have the sole right of importing everything by sea or land except bestial, and also of exporting by sea everything which was not native raw material, which might be freely exported by land. The gentry were always allowed to import for their personal consumption and to export an equal quantity of commo- dities. The Act mentions that the Royal Burghs as an estate of the kingdom contributed one-sixth part of all public impositions, and were obliged to build and maintain prison-houses. Some of these trade privileges were not abolished till the Act 9 and 10 Vict. c. 17.

In the north of Scotland there was an association of Free Burghs called the Hanse or Ansus; and the Lord Cham- berlain, by his Zter, or circuit of visitation, maintained a common standard of right and duties in all burghs, and examined the state of the "common good," the accounts of which in 1535 were appointed to be laid before the auditors in Exchequer. The Chamberlain latterly presided in the Curia Quatuor Burgorum (Edinburgh, Berwick, Stirling, Roxburgh), which not only made regulations in trade, but decided questions of private right (e.g., succession), accord – ing to the varying customs of burghs, This court frequently met at Haddington ; in

1454 it was fixed at Edinburgh. The more modern Convention of Royal Burghs (which appeared as a judicial persona in the Court of Session so late as 1839) probably dates from the Act of James III. (1487, c. 111), which appointed the Commissioners of Burghs, both north and south, to meet yearly at Inver- keithing " to treat of the welfare of merchandize, the good rule and statutes for the common profit of burghs, and to provide for remeid upon the skaith and injuries sustained within the burghs." Among the more important functions of this body (on whose decrees at one time summary diligence proceeded) were the prohibition of undue exactions within burghs, the revisal of the " set" or mode of muni- cipal election, and the pro rata division among the burghs of the parliamentary subsidy required from the Third Estate. The Convention still meets, but the reform of the municipalities, and the complete representation of the mercantile interests in the United Parliament, have deprived it of importance. In its great days it negotiated a treaty with Campvere, and one of its judgments was given cffect to by Edward I. in the Parliament of Newcastle, 1292.

Burghs of Regality and of Barony held in vassalage of some great lordship, lay or ccclesiastical, but were always in theory or in practice created by Crown grant. They received jurisdiction in civil and criminal matters, generally cumulative with that of the Baron or the Lord of Regality, who in some cases obtained the right of nominating magistrates. Powers to hold markets and to levy customs werc likewise given to these Burghs.

Tke Scotch burgks emerged slowly into political importance. In 1295 the procurators of six burghs ratified the agrcement for the marriage of Edward Balliol; and in 1326 they were recognized as a Third Estate, granting a tenth penny on all rents for the king's life, if he should apply it for the public good. The Commissioners of Burghs received from the Exchequer their costages or expenses of attending Parliament. The burglis were re- presented in the Judicial Committee, and in the Committee on Articles appointed during the reign of James V. After the Reformation, in spite of the annexation of kirk lands to

the Crown, and the increased burdens laid on temporal lands, the proportion of general taxation borne by the burghs (viz., 1s. 6d.) was expressly

preserved by Act 1587, c. 112. The number of commissioners, of course, fluctuated from time totime. Cromwell assigned ten members to the Scotch burghs in the second Parliament of Three Nations (1654). The general practice until 1619 had _becn, apparently, that each burgh should send twomembers. In that ycar (by an arrangement with the Convention of Burghs) certain groups of burghs returned one member, Edinburgh returning two. Under Art. 22 of the Treaty cf Union the number of members for Royal Burghs was fixed at fifteen, who were elected in Edinburgh by the Magistrates and Town Council, and in the groups of burghs by delegates chosen ad hoc. See PARLIAMENT. (See Connel, History of the Constitution of Towns ; Stubbs' Constitutional History of England, vol. i.) (w. ay

BOROUGH-ENGLISH, a custom prevailing in certain ancient boroughs, and in districts attached to them (where the lands are held in socage), and also in certain copyhold manors (chiefly in Surrey and Middlesex), by which in general lands descend to the youngest son, to the exclusion of all the other children, of the person dying seized and intestate. Descent to the youngest brother to the exclusion of all other collaterals, where there is no issue, is sometimes included in the general definition, but this is really a special custom to be proved from the Court-Rolls of the manor and from local reputation,—a custom which is sometimes extended to the youngest sister, uncle, aunt, Generally, however, Borough-English, apart from specialties, may be said to differ from gavel-kind in not including collaterals. It is often found in connection with the distinct custom that the widow shall take as dower the whole and not mercly one-third of her husband's lands, (See Third Report of Real Property Commission, and case of Muggleton v. Barnett, 2 Hurls. and Nor. Rep.)

BOROVICHI, a town of Russia, in the government of Novgorod, situated in 58° 23' N, lat. and 23° 54' EH. long., on both banks of the River Msta. On the site of the present town there existed, from an early date, a settlement famous for the skill of its pilots; and for their encourage- ment in that occupation the inhabitants were freed from taxation by Peter I. In 1770 the village was raised to the rank of a town, and in 1776 was made the head of a department in the Novgorod government. It contains seven or eight churches and a monastery, an almshouse, and a hospital. Flour, malt, beer,

tallow, earthenware, and bricks are all manufactured, but none of them to any great extent. The principal articles of trade are linen, leathcr, and wood. ‘There are two annual fairs, and a weekly market. Population in 1867, 9108.

BOROVSK, a town of Russia, in the government of Kaluga, 54 miles from that city on the old post road to Moscow, is situated on both banks of the Protva at the con- fluence of the Tikizh, in 55° 13’ N. lat. and 36° 9’ E. long. The town was in existence in the 13th century, and derived its name from the Borh, or pine forest, which still lics to the N.W. Its principal industries are tanning, soap- Loiling, and the manufacture of wax, linseed-oil, and pottery, and it has a trade of considerable importance in grain, hemp, and cloth. There are four annual fairs, two of which are held in the town and two about two miles off, at the monastery of Paphnutius, which was founded in 1444. The population, mainly belonging to the Greek Church, was in 1860, 8150.

BORROMEAN ISLANDS, a group of four small islands on the western side of Lago Maggiore, in Northern Italy, beautifully surrounded by lake and mountain. Naturally mere barren rocks, they were in 1671 con- verted by Vitaliano Borromeo into pleasure gardens of great

beauty, the soil being transported from the neighbouring shores of the lake. ‘The two most celebrated are the Isola Bella and the Isola Madre. The former rises 130 feet above the level of the water, in ten successive terraces, the highest of which is vaved and surrounded by a balustrade, while all are environed by gigantic marble statues of various figures, and the walls are clothed with the finest fruit-trees and evergreens. There is, besides, towards the western end of the island, and close to the lake, a magnificent palace, built on arches, which are formed into grottos, with floors of mosaic and decorations of shell-work and marble. Isola Madre, which is the largest of the group, lies betwecn onc and two milcs from Isola Bella, and con- sists of a superstructure of seven terraces, not less beautiful than the other. Here also there is a palace, now dilapi- dated, with similar decorations. A richly-coloured descrip- tiou of the place is giveu in his “Titan,” by Jean Paul Richter.

BORROMEO, Canto, saint and cardinal of the Roman Catholic Church, was the son of Ghiberto Borromeo, count of Arona, and of Mary of Medici, and was born at the Castle of Arona, upon the Lago Maggiore, in the Milanese, October 2, 1538. When he was about twelve years old, Julius Cesar Borromeo resigned to him au abbacy, the revenue of which he applied wholly in charity to the poor. He studied the civil and canon law at Pavia under the learned Francis Alciat. In 1554 his father died ; and, although he had an elder brother, Count Frederick, he was requested by the family to take the management of their domestic affairs. After a time, however, he resumed his studies, and in 1559 he took his doctor's degree. In the following year his uncle Cardinal de' Medici was raised to the pontificate, by the name of Pius IV. ; and Borromeo was made prothonotary, entrusted with both the public and privy seal of the ecclesiastical state, created cardinal deacon, and soon after raised to the archbishopric of Milan. In compliance with the pope's desire, he lived in great splendour; yet his own temperance and humility were never brought into question. He established an academy of learned persons, and published theiv memoirs as the Noctes Vaticane. About the same time he also founded and endowed a college at Pavia, which he dedicated to Justina, virgin and martyr. Upon the death of his elder brother Frederick, his friends adviscd him to quit the church aud marry, that his family might not become extinct. Contrary to expectation, however, he declined the proposal; and from that time became more fervent than ever in exercises of piety, and more zealous for the welfare of the church.

On the death of Pius IV., January 7, 1566, the skill and diligence of Borromeo materially contributed to stifle the cabals of the couclave. As soon as tranquillity had been re-established he devoted himself wholly to the reformation of his large and important diocese, where the most flagitious irregularities were openly practised. He began by raaking pastoral visits in his metropolis; and by a variety of wise and necessary regulations, he soon restored proper decency and dignity to divine service. In conformity to the decrees of the Council of Trent, he cleared the cathedral of its gorgeous tombs, rich ornaments, banners, arms, not even sparing the monuments of his own relations. He also divided the nave of the church into two compartments for the separation of the sexes. He proceeded next to the collegiate churches, and even to the fraternities of penitents, particularly

that of St John the Baptist. The reformation of the monasteries followed that of the churches ; and the vigilance of the archbishop soon extended itself from the city to the country round it. The great abuses which had overrun the church at this time arose principally from the ignorance of the clergy. In order, therefore, to

attack the evil at its root, Borromeo established seminaries, colleges, and communities, for the education of young persons intended for holy orders. He met with much opposition in his endeavours to bring about his reforms, but succeeded, nevertheless, in rendering the most important services to the cause of morals as well as religion. The governor of the province, and many of the senators, appre- hensive that the cardinal's ordinances and_ proceedings would encroach upon the civil jurisdiction, addressed many remonstrances and complaints to the courts of Rome and Madrid. But Borromeo had more formidable difficulties to struggle with, in the inveterate opposition of several religious orders, particularly that of the Brothers of Humi- lity. Some members of that society formed a conspiracy against his life, and a shot was one evening fired at him in the archicpiscopal chapel under circumstances which led to the belief that his escape was miraculous.

In the year 1576 the city and diocese of Milan were visited by the plague, which swept away great numbers. On this occasion he went about giving directions for ac- commodating the sick and burying the dead, avoiding no danger, and sparing no expense. He also visited all the neighbouring parishes where the contagion raged, distributing money, providing accommodation for the sick, and punishing those, especially the clergy, who were remiss in discharging the duties of their calling.

But continual labours and austerities appear to have shortened his life. He was seized with an intermittent fever, and died at Milan, November 4, 1584. He was im- mediately enrolled among the saints, but was uot canonized til11610. Besides the Voctes Vaticane, to which he appears to have contributed, the only literary relics of this intrepid and zealous reformer are some homilies, discourses, and sermons, with a collection of letters. Several

lives of him have been published,—by Godeau; by Touron, a Dominican ; by Ribadeneira, a Spanish Jesuit ; by Bimeus, and by others.

BORROMINI, Francesco, an Italian architect, born at Bissone in 1599, He was much employed in the middle of the 17th century at Rome. In his style he affected originality and richness, which corrupted the noble simpli- city of the older schools, though his compositions are occasionally imposing. His principal works are the church of St Agnese in Piazza Navona, the church of La Sapienza in Rome, the church of San Carlino alle Fontane, the church of the Collegio di Propaganda, and the restoration of San Giovanni in Laterano. He died by his own hand at Rome in 1667. Engravings of his chief compositions are to be found in the posthumous work Jranciscr Borromini opus Architectonicum, 1727.

BORROWSTOUNNESS (usually abbreviated to Bo'ngss), one of the oldest seaports of Scotland, is situated on the Firth of Forth, in Linlithgowshire, about four miles from the county town, in 56° 2' N. lat. and 3° 35' W. long. The town is very irregularly built, contrasting unfavourably with the beauty of its situation. It was formerly a place of considerable traffic, ranking in the 18th century immediately after Leith; but it has been for a long time left far behind by the neighbouring seaport of Grangemouth. Its harbour, with an area of 24 acres, being too small for the trade of tlie port, a bill has been passed in Parliament for a large extension. The commerce is now for the most part confined to the Baltic, and the principal import con- sists of wooden props for use in mines. The value of the total imports in 1873 was £150,059, and of the total exports in the same year £223,539. There are extensive manufactories of salt, distilleries, a pottery, ropeworks, and vitriol and soap-works; but the collieries and iron-stone pits in the immediate neighbourhood are much more important. Some of the former have been worked for IV. — 9

centuries, and extend under the firth to the distance of a mile. The smelting of the iron-ore is carried on in two or three blast-furnaces in the neighbourhood of Kinniel House, which was for many years the residence of Dugald Stewart. A part of Graham's Dyke, the Roman wall of Antoninus, runs through the parish. Population in 1871, 4256

BORY DE SAINT-VINCENT, Juan BapvtisTE Grorce-Mariz, a learned and industrious French naturalist, was born at Agen in 1780, While a mere boy he displayed the scientific bent of his genius and attracted attention by two memoirs addressed to the Society of Natural History at Bordeaux. Having been sent as naturalist of Baudin's expedition to Australia in 1798, he left the vessel at the Mauritius, and spent two years in exploring Bourbon and the other islands of East Africa. Joining the army on his return, he was present at the battles of Ulm and Austerlitz, aud in 1808 went to Spain with Marshal Soult. His%attachment to the Napoleonic dynasty and dislike to the Bourbons were shown in various ways during 1815, and his name was consequently placed on the list of the proscribed ; but after wandering in disguise from one city to another he was allowed quietly to return to Paris in 1820. In 1829 he was placed at the head of a scientific expedition to the Morea, and in 1839 he had charge of the exploration of Algeria. Through all the vicissitudes of his life his literary activity was great, and he did a great deal for the popularization of his favourite science. He was editor of the Dictionnaire classique d'histoire naturelle, and one of the principal authors of the Annales des sciences physiques ; the official work on the Morea was produced under his care, and he contributed frequently to periodical publications The most important of his separate produc- tions are—Lssais sur les tles Fortunées, 1803; Voyage dans les étles d' Afrique, 1804; Justification de la conduite et des opinions politiques de J. B. Bory de Saint- Vincent, 1816; Voyage Souterrain, being an account of the quarries in the neighbourhood of Maestricht, 1823; LZ' Homme, essar zoologique sur le genre humain, 1827; Résumé de la géographie de la Péninsule, 1838,

BOSA, a city on the western coast of the island of Sardinia, in the province of Cagliari and district of Oristano, in a fine valley on the northern bank of the Terno, in 40° 16' £0" N. lat. and 8° 25' 31" E. long. It is the see of a bishop, and has a cathedral and a diocesan seminary. The harbour is safe, being sheltered by an islet. Coral fishery is carried on, and there is trade in cheese, grain, and wine. Population, 6706.

BOSC, Louis AucustInE GUILLAUME, French naturalist, was born at Paris on the 29th January 1759. He was educated at the college of Dijon, and attended the lectures of Durande on botany, which inspired him with a

passion for natural history. He followed up his studies at Paris, and was a constant auditor at the Jardin des Plantes. Even when closely occupied in official work, he managed to find time for his favourite researches and contributed many valuable papers to various scientific transactions and reviews. At the age of eighteen he had obtained an appointment under Government, and he rose to be one of the chief officials in the postal department. Under the nunistry of Roland he also held the post of superintendent of prisons, but the violent outbreaks of 1793 drove him from office, and compelled him to take refuge in flight. For some months he lay concealed in the forest of Montmorency, barely subsisting on roots and vegetables. He was enabled to return to Paris on the fall of Robespierre, and soon after set out for America, resolving to explore the natural riches of that country. The immense materials he gathered were never published in a complete form, but much went to enrich the works of Lacépéde, Latreille, and others. After his return, on the establishment of the

Directory, he was reinstated in his old office. Of this he was again deprived by the coup d'état of 1799, and for a time he was in great destitution. He set resolutely to work, however, and by his copious contributions to scientific literature, contrived to support himself and to lay the foundations of a solid reputation. He was engaged on the Supplement to Rozier's Dictionary, on the new Dictionnaire histoire naturelle, and on the Encyclopédie Méthodique. He edited the Dzctionnaire raisonné et universal d'agriculture, and was one of the editors of the Annales de Vagriculture Francaise. His increasing fame brought him manifold employments. He was made inspector of the gardens at Versailles, and of the public nurseries belonging to ministry of the Interior, The last years of his life were devoted to an elaborate work on the vine, for which he had amassed an immense quantity of materials, His death, on the 10th July 1828, prevented the prosecution of this work ; and his notes which still exist are said to be so unsystematic as to be unfit for publication.

BOSCAN, Juan, a Spanish poet, celebrated as the introducer of Italian measures into Spanish literature, was born about the close of the 15th century. The exact date is unknown, but it was probably a few years before

1500, He was of patrician birth and appears to have passed some years in military service. He died in 1540 at Perpignan, where he was residing with the duke of Alva. His poems were published in 1543 at Barcelona by his widow. ‘They are divided into four books which mark out distinctly the stages of Boscan’s poetical history. The first book contains light poems in the Old Castilian metres, resembling the Cancioneros. ‘These were written in his youth, before 1526, in which year he became acquainted with Audrea Navagiero, ambassador from Venice. Navagiero urged him to adopt some of the Italian measures, and his advice gave a new turn to Boscan’s activity. The second and third books contain a number of pieces in Italian metres, sonnets, canzones, and poems in blank verse, terza rima, and octaves. The longest of these poems is the Hero and Leander, in blank verse. The fourth book contains his best effort, the Allegory, written in the maturity of his powers, and exhibiting great delicacy of imagination and skilful verse composition, He also published, in 1534, a translation of Balthasar Castiglione’s Italian poem Zhe Courtier. Boscan’s greatest follower in the endeavour to mould Spanish poetry after Italian models was Garcilassa de la Vega, who is more celebrated than his master.

See Bouterwek, Spanish Literature, vol. i.; Ticknor, History of Spanish Literature, vol. i.

BOSCAWEN, Epwarp, British admiral, was born August 19,1711. He was the third son of Hugh, Lord Viscount Falmouth. He early entered the navy, and in 1740 distinguished himself at the taking of Porto Bello. At the siege of Carthagena, in March 1741, at the head of a party of seamen, he took a battery of fifteen 24-pounders, while exposed to the fire of another fort. On his return to England in the following year he married, and entered parliamentas member for Truro. In 1744 he captured the “ Medea,” a French man-of-war, commanded by M. de Hocquart, the first ship taken in the war. In May 1747 he signalized himself in the engagement off Cape Finisterre, and was wounded in the shoulder with a musket-ball. Hocquart again became his prisoner, and the French ships, ten in number, were taken. On the 15th July, he was made rear-admiral and commander-in-chief of the expedition to the East Indies. On the 29th July 1748 he arrived off Fort St David’s, and soon after laid siege to Pondicherry ; but the sickness of his men and the approach of the monsoons led to the raising of the siege. Soon

afterwards he received news of the peace, and Madras was delivered up to him by the French. In April 1750

he arrived in England, and was the next year made one of the lords of the Admiralty, and chosen an elder brother of the Trinity House. In February 1755 he was appointed vice-admiral, and in April he intercepted the French squadron bound to North America, and took the “Alcide” and “ Lys” of sixty-four guns each. Hocquart became his prisoner for the third time, and Boscawen returned to Spithead with his prizes and 1500 prisoners. For this exploit he received the thanks of Parliament. In 1758 he was appointed admiral of the blue and commander-in-chief of the expedition to Cape Breton, when, in conjunction with General Amherst, he took the fortress of Louisbourg, and the island of Cape Breton,—services for which he again received the thanks of the House of Commons. In 1759, being appointed to command in the Mediterranean, he pursued the French fleet, and after a sharp engagement in Lagos Bay, took three large ships and burnt two, return- ing to Spithead with his prizes and 2000 prisoners. In December 1760 he was appointed general of the marines, with a salary of £3000 per annum, and was also sworn a member of the privy council. He died at his seat near Guildford, January 10, 1761, in the 50th year of his age.

ROSCOVICH, RocEr JosEpPH, a distinguished Italian mathematician and natural philosopher, and one of the earliest of foreign savants to adopt the theory of Newton, was born at Ragusa in Dalmatia, May 18, 1711, according to the usual account, but ten years earlier according to Lalande (loge, 1792). In his fifteenth year, after passing through the usual elementary studies, he entered the society of Jesus. On completing his noviciate, which was spent at Rome, he studied mathematics and physics at the Collegium Romanum ; and so brilliant was his progress in these sciences that in 1740 he obtained the appoint- ment of professor of mathematics in the college. For this post he was especially fitted by his large acquaintance with modern advances in science and by his skill in a classical severity of demonstration, acquired by a thorough study of the works of the Greek geometricians. Several years before this appointment he had made himself a name by an elegant solution of the problem to find the

sun’s equator and determine the period of his rotation by observation of the spots on his surface. Notwithstanding the arduous duties of his professorship he found tiie for investigation in all the fields of physical science; and he published a very large number of dissertations, some of them of considerable length, on a wide variety of subjects. Among these subjects were the transit of Mercury, the Aurora Borealis, the figure of the earth, the observation of the fixed stars, the inequalities in terrestrial gravitation, the application of mathematics to the theory of the telescope, the limits of certainty in astronomical observations, the solid of greatest attraction, the cycloid, the logistic curve lines, the theory of comets, the tides, the law of continuity, the double refraction micrometer, various problems of spherical trigonometry, dc. In 1742 he was consulted, with other men of science, by the pope, Benedict XIV., as to the best means of securing the stability of the dome of St Peter’s, in which a crack had been discovered. His suggestion was adopted. Shortly after he engaged to take part in the Portuguese expedition for the survey of Brazil and the measurement of a degree of the meridian; but he yielded to the urgent request of the pope that he would remain in Italy and undertake a similar task there. Ac- cordingly, in conjunction with Christopher Maire, an English Jesuit, he measured an are of two degrees between Rome and Rimini. The operations were begun towards the close of 1750, and were completed in about two years. An account of them was published in 1755, entitled De datteraria expeditione per pontyficam ditionem ad dime-

tiendos duos meridian: gradus a P. P. Mare et Boscovich. The value of this work was increased by a carefully prepared map of the States of the Church. 4 French translation appeared in 1770, A dispute having arisen between the Grand Duke of Tuscany and the republic of Lucca with respect to the drainage of a lake, Boscovich was sent, in 1757, as agent of Lucca to Vienna, and succeeded in bringing about a satisfactory arrangement of the matter. In the following year he published at Vienna his famous work on the molecular theory of matter, entitled Theoria philosophie naturalis redacta ad unicam legem virium wm natura existentium. Another occasion for the exercise of his diplomatic ability soon after presented itself. A suspi- cion having arisen on the part of the British Government that ships of war had

been fitted out in the port of Ragusa for the service of France, and that the neutrality of Ragusa had thus been violated, Boscovich was selected to undertake an embassy to London (1760), to vindicate the character of his native place and satisfy the Government. This mission he discharged successfully, with credit to himself and satis- faction to his countrymen. During his stay in England he was elected a fellow of the Royal Society, which received him with marks of the highest respect. He soon after paid this society the compliment of dedicating to it his Latin poem, entitled, De Solis et Lune Defectibus. This prolix composition, one of a class which at that time was much in vogue—metrical epitomes of the facts of science—contains in about five thousand lines, illustrated by voluminous notes, a compendium of astronomy. It was for the most part written on horseback, during the author's rides in the country while engaged in his meridian measurements. The book is characterized by Delambre as " uninstructive to an astronomer and unintelligible to any one else."

On leaving England Boscovich travelled in Turkey, but ill health compelled him soon to return to Italy. In 1764 he was called to the chair of mathematics at the University of Pavia, and this post he held, together with the directorship of the observatory of Brera, for six years. He was invited by the Royal Society of London to under- take an expedition to California to observe the transit of Venus in 1769; but this was prevented by the recent decree of the Spanish Government for the expulsion of the Jesuits from its dominions. The vanity, egotism, and petulance of Boscovich provoked his rivals and made him many enemies, so that in hope of peace he was driven to frequent change of residence. About 1770 he removed to Milan, where he continued to teach and to hold the directorship of the observatory of Brera; but being de- prived of his post by the intrigues of his associates he was about to retire to his native place, when the news reached him (1773) of the suppression of his order in Italy. Uncer- tainty as to his future lot led him to accept an invitation from the king of France to Paris, where he was naturalized and was appointed director of optics for the marine, an office instituted for him, with a pension of 8000 livres. He remained there ten years, but his position became irksome, and at length intolerable. He continued however to devote himself diligently to the pursuits of science, aud published many remarkable memoirs. Among them were an elegant solution of the problem to determine the orbit of a comet from three

observations, and memoirs on the micrometer and achromatic telescopes. In 1783 he returned to Italy, and spent two years at Bassano, where he occupied himself with the publication of his Opera pertinentia ad opticam et astronomiam, &c., which appeared in 1785 in five volumes quarto. After a visit of some months to the con- vent of Vallombrosa, he went to Milan and resumed his literary labours. But his health was failing, his reputation was on the wane, his works did not sell, and he gradually sank a prey to illness and disappointment. He fell into

melancholy, imbecility, and at last madness, with lucid intervals, and died at Milan on the 13th of February 1787. In addition to the works already mentioned Boscovich published Hlementa universe matheseos (1754), the sub- stance of the course of study prepared for his pupils ; and a narrative of his travels, entitled Giornale di un viaggio da Constantinopoli in Polonia, of which several editions and a French translation appeared, His latest labour was the editing of the Latin poems of his friend Benedict Stay on the philosophy of Descartes, with scientific annotations and supplements. (We lame C)

BOSNA SERAIT, Seraievo, or in Italian SeRacuio, a city of European Turkey, and capital of the province of Bosnia, is situated on the Migliazza near its Junction with the Bosna, 246 miles south of Buda in 43° 54’ N. lat. and 18° 24’E. long. It occupies the declivities of several small hills, and its numerous turrets give it a rather imposing aspect. It is defended by a strong citadel, and retains portions of its ancient walls. The houses are in general rather meagre, but of late there has been an improvement in the style of architecture, owing to the employment of Austrian and Italian workmen. The old Government buildings have been replaced by a handsome and spacious structure. There are upwards of 100 mosques, several Greek churches, and a few Roman Catholic convents. Educational establishments owe any merit they possess to foreign influence, and notably to the stimulus given by Miss Irby and Miss Mackenzie (afterwards Lady Sebright). Bosna Serai is one of the chief industrial and commercial cities in European Turkey. It manufactures tin, iron, and copper wares, fire-arms, cotton and woollen cloths, and leather, and is the centre of the Bosnian trade. In the

neighbourhood are iron mines, and works of considerable extent. The city is the centre of a telegraphic system of some importance, and is well situated for railway communi- cation with both north and south. Bosna Serai, originally called Bosuavar, was founded in 1263 by the Hungarian general Cotroman, and derives its present name from the Serai or palace built by Mahomet II. The population is very variously stated; the Prussian consul gives it as about 50,000 in 1865, and in 1867 as not more than 35,000, while Salaheddin Bey, in La Turquie a& Vexposition uni- versale de 1867, states it as high as 70,000.

BOSNIA, the most north-westerly province of Turkey in Europe, comprisiag Bosnia Proper, a part of Turkish- Croatia, or Craina, the district of Herzegovina, and the ancient Rascia. It extends from 42° 3)’ to 45°15’ N. lat., and from 15° 40’ to 21° 2’ E. long; is bounded on the N. and W. by the Austrian dominions, 8. by Montenegro and Albania, and E. by Servia; and has an area of about 21,024 square miles. The whole province, with the excep- tion of the valley of the Save, is more or less mountainous, many of the summits reaching the height of 6000 feet. A large proportion of the surface is valuable forest-land, which furnishes almost inexhaustible stores of timber and fuel. Plums are largely grown in the northern portion and ex ported as prunes,—Beska on the Save being one of the chief centres of the trade. In Herzegovina the vine, olive, fig, and pomegranate flourish. Maize and wheat are the principal grains in cultivation, but barley, oats, hemp, and even rice are also grown. Abundance of pasture land occurs throughout the province, and cattle, sheep, and goats are reared; the number of the cattle was, however, greatly diminished by the plague in the decade ending with 1870. Large droves of swine are fed in the oak-forests. In mineral deposits the country is especially rich. The whole valley of the Bosnia is said to be one enormous coal-bed ; copper is worked in several places, and at Inatch is a very valuable cinnabar mine. There are also some quarries of good marble, and at Tuzla is a copious spring of salt water,

from which culinary salt is manufactured, though the de- mand for this article has still to be met by a foreign supply. The manufactures of the province are on a small scale; they include leather, cloth, and iron wares.

The principal exports are fruit, timber, cattle, wool, raw lamb-skins, furs of wild animals, wax, and honey. The foreign trade ig almost solely confined to the Austrian dominions,—the lack of a port on the Adriatic greatly impeding the intercourse by sea, Within the last ten years there have been constructed several carriage roads, the most important of which are from the capital to Brood, Gradishka, Mostar, and Yenibazar respectively. A railway has been constructed from Rasnice in Austria to Banyaluka, forming part of a great connecting line between Constantinople and Western Europe. The province is divided into the seven sandjaks of Banyaluka, Bihac, Herzegovina, Yenibazar, Seraievo, Travnik, and Zvoruik. Ethnologically it is Servian, not even the aris- tocracy being Turks, though they are principally Maho metans. A small part of the south has an Albanian population. Mahometanism is not only predominant, but is sometimes enforced by persecution. Education is said to be greatly neglected, though from the native statistics a different judgment might be formed, no fewer than 1079 schools being registered; but of these a large pro- portion are attached to the mosques, and have a merely nominal existence. The total revenue of the province was, in 1871, 50,589,970 piastres (£456,715), and the expenditure, 19,724,745 (£178,070). The population in- creases very slowly, chiefly owing to mortality among the children occasioned by improper treatment. The climate is by no means unhealthy. The number of the inhabitants has remained almost stationary, being estimated at 1,100,000 in 1844, and at 1,279,296 in 1873. The largest cities after Bosna Seria, the capital, are Banyaluka (15,000), Fotcha, Mostar, Zvornik, and Travnik (about 12,000 each), and Yenibazar (from 9000 to 15,000). Bosnia was at first depen- dent on the Servian and Croatian kings, but was raised fora time toa separate principality, which reverted about 1339 to the Servian king Stephen. After his death it was again independent, aud continued to have its own rulers till the latter half of the 15th century, in spite of the encroach ments of the Turks, who at last succeeded in incorporat- ing it in 1503. The Hungarians long disputed this appropriation, but the country was definitely ceded to Turkey at the peace of Carlovitz in 1699, which was con- firmed by the treaty of Sistovar in 1791. It is at present (1875) the scene of a formidable insurrection.

See Chaumette Desfosse’s Voy. en Bosnic, 1822; Pertusier, La Bosnie, 1822 ; Hilferding, Bosnia, Hercegovina, ¢ staraya Serbia (in Russian) 1859; Sax,

Skizzen diber die Bewohner Bosniens, 1864; Roskieviez, Bosnia und Herzegovina, 1867 ; Blau in Zeitschrift fir Frdk., Berlin, 1868 ; Rousseau in Bulletin de la Soc. de Géog., 1868 ; Maurer, Reise d. Bosnien, 1870; Geiger and Lebret, Studien dber Bosnien, etc., 1873; and a very full report by the English consul Holmes for 1872.

BOSPHORUS (or, more correctly, Bosporus, from the Greek Boéozopos, Ox-ford), originally used for a strait, was especially applied to the Bosporus Cimmerius, or Strait of Yenikale, and the Bosporus Thracius, or Strait of Con- stantinople. In modern times it has almost become the exclusive designation of the latter strait, which unites the Black Sea with the Sea of Marmora and forms the bound- ary between Europe and Asia. The channel is about 16 English miles in length, and has a maximum breadth of nearly 2 miles, a minimum breadth of 550 yards, and along the middle a varying depth of 148 to 388 feet. In the centre there is a rapid current from the Black Sea to the Sea of Marmora, and a counter-current sets in aloug each shore. At the narrows the three currents produce a most violent commotion. The average temperature of the water hardly differs from that of the air, but it almost never

reaches the atmospheric maxima and minima. The surface ig very rarely frozen over, not more than five or six instances being recorded since the 8th century a.p. The Golden Horn was partially frozen over in 1849 and 1862. The shores of the Bosphorus are composed in the northern portion of different volcanic rocks, such as dolerite, granite, and trachyte; but along the remaining course of the channel the prevailing formations are Devonian, consisting of sandstones, marls, quartzose conglomerates, and calcare- ous deposits of various kinds. The scenery on both sides is of the most varied and beautiful description. 2 BE 7a, € Grn A

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See Miss Pardoe’s The Bosphorus and the Danube, 1889 ; Ham- mer, Constantinopolis und der Bosporos, 1822 ; Reisewitz, Bosporos und Attika,

1861; Tchihatchef, La Bosphore et Constantinople, 1864, and Asie Minewre (Géographie physique comparée), 1852 ; Dethier, Der Bosphor wnd Constantinopel, 1873.

BOSSI, Gruszprs, an Italian painter and writer on art, was born at the village of Busto Arsizio in the Milanese,

in 1776 or 1777. He was educated at the college of Monza ; and his earty fondness for drawing was fostered by the director of the college, who supplied him with prints after the works of Agostino Carracci for copies. Passing next to the academy of Brera at Milan, he there pursued his special artistic studies, and about 1795 went to Rome. Here he studied for five or six years, associating with many artists of the Italian school, and especially forming an timate friendship with Canova. On his return to Milan he was named assistant secretary of the Academy of Fine Arts, and on the death of Bianconi succeeded him in the Office of secretary. He rendered important service in the organization of this new institution. In 1804, in conjunc- tion with Oriani, he drew up the rules of the three academies of art of Bologna, Venice, and Milan, and soon after was rewarded with the decoration of the Iron Crown. On the occasion of the visit of Napoleon I. to Milan in 1805, Bossi exhibited a drawing of the Last Judgment of Michael Angelo, and pictures representing Aurora and

Night, Cidipus and Creon, and the Italian Parnassus, By command of Prince Eugene, viceroy of Italy, Bossi under- took to make a copy of the Last Supper of Leonardo, then almost obliterated, for the purpose of getting it rendered in mosaic. The drawing was made from the remains of the original with the aid of copies and the best prints. The mosaic was executed by Raffaelli, and was placed in the Imperial Gallery of Vienna. Bossi made another copy in oil, which was placed in the museum of Brera. This museum owed to him a fine collection of casts of great works of sculpture acquired at Paris, Rome, and Florence. Bossi devoted a large part of his life to the study of the works of Leonardo; and his last work was a series of drawings in monochrome representing incidents in the life of that great master. He left unfinished a large cartoon in black chalk of the Dead Christ in the bosom of Mary, with John and the Magdalene. In 1810 he published a

special work in large quarto, entitled Del Cenacolo di Leonardo da Vinci, which had the merit of greatly interesting Goethe. His other works are Delle Opinion dev Leonardo intorno alla simmetria dé corpi umant (1811), and Del Tipo dell' arte della pittura (1816). Bossi died at Milan, December 15, 1816. A monument by Canova was erected to his memory in the Ambrosian library, and a bust was placed in the Brera,

BOSSI, GiusEpré Carrio AURELIO, BARON DE, an Italian poet and diplomatist, was born at Turin, November 15, 1758. He made his first appearance as poet at the age of eighteen by the publication of two tragedies, Rea Stdua and J Circassc ; and four years later he touvk the degree of doctor of laws. In 1781, in consequence of his ode in praise of the edict of toleration promulgated by the Emperor Joseph I1., he was banished the kingdom; but having rendered during his exile an important service to his countrymen he was recalled and appointed under- secretary of state for foreign affairs. In 1792, on occasion of the French invasion, he was sent to the court of Prussia to negotiate an alliance, and thence went as ambassador to St Petersburg. Dismissed by the emperor in consequence of the treaty of alliance between Sardinia and France (1797), he was named ambassador to Venice, which he reached only in time to witness the fall of the republic. He was next appointed envoy to General Bonaparte in Italy. After the conquest of SarJinia Bossi was a member of the Provisional Government, and one of the three deputies sent to Paris to petition for annexation to France. Tbe Russian invasion of 1799 drove him to take refuge in the Vaudois valleys. He was afterwards a member of the Provisional Government, but retired in 1802. Three years later he was made prefect of the Ain; he was created baron by Napoleon I. in 1810, and was afterwards transferred to the prefecture of La Manche. Deprived on the second return of the Bourbons, he came to England, but returned to France the following year. He spent his remaining years in retirement. Besides the works above mentioned Bossi was author of a long poem entitled Oromasia, on the cvents of the French revolution ; AJ/onaca, a poem on the secularization of convents (1787); and various lyrical pieces, among which are Zndependenza Americana (1785), Olanda Pacificata (1788), Vision (1799), &c. He died at Paris, January 20, 1823.

BOSSU, Renf Le, an eminent French critic, born at Paris, March 16, 1631. He studied at Nanterre, and in 1649 entered among the regular canons of Sainte-Geneviéve. After having acted as professor in different religious houses for twelve years, he withdrew into retirement. His first publication was Parallele des Principes de la Physique d'Aristote et de celle de René Descartes, which appeared in 1674, but met with little success. His next

_ work, entitled Traité du Poéme Epique, was published in

1675, and often reprinted afterwards. Its leading doctrine is that the subject should be chosen before the characters, and that the action should be arranged without reference to the personages who are to figure in the scene. Boileau, in his Third Reflexion on Longinus, pronounced this work "un des meilleurs livres de poétique qui, du consentement de tous les habiles gens, aient été faits en ndtre langue." It may be mentioned, however, that Bossu is said to have defended Boileau against Saint-Sorlin, and to have received his thanks for that service; and a sense of obligation may perhaps have dictated the commendation which Boileau bestowed on the work. Bossu died March 14, 1680. BOSSUET, Jacqurs Biniens, the celebrated orator and prelate, was born at Dijon, within a short distance of the cathedral, on the 27th September 1627. He was the fifth son of Bénigne Bossuet and Madeleine Mochette. The family of which he came, though of bourgeois rank, had long taken an honourable part in the public and official life of Burgundy. He was destined from infancy for the church, and grew up amid influences eminently favourable to the unfolding of his powers, for, although at six years of age, on his father's appointment to be president in the parliament of Metz, he was left at Dijon, yet his education had been wisely confided to an uncle, Claude Bossuet, a large-hearted man, ardently devoted to literature, whose delight it was to foster his nephew's intellectual gifts. These soon gave token of exceptional brilliancy, and in the Jesuits' College, where he went to school, he distanced all competitors in the facility with which he mastered the Greek and Latin classics, Virgil and Homer being his especial favourites, for whose writings he contracted an unalterable attachment, just as Horace became the life-long companion of his rival Fénélon. It was from a higher source, however, that Bossuet's genius, which was essentially of

the Hebrew type, caught its finest inspiration; and one day reading a Bible left open by accident at the prophecies of Isaiah, he was so thrilled by their poetry that thenceforth he became virtually “a man of one book,” and in Holy Scripture, read and re-read until learned ultimately almost by heart, he found the field in which his mind could best expatiate and gather light and power. In Bossuet, says Lamartine, the Bible was transfused into a man. With that keen-sighted appreciation of talent which they uniformly display, the Jesuits sought to enlist him in their order, but family influence being against the proposal, in 1642 he was sent to Paris; nor could the circumstances of his arrival there fail profoundly to impress the fervid imagination of the boy, for it chanced to be on the very day on which Richelieu, then near his end, was borne into the city in a splendid movable chamber, at the close of the vengeance-taking campaign, which terminated in the execu- tion of De Thou. Bossuet entered the college of N avarre, the oldest in the University, where, under Nicholas Cornet, the presiding genius of the place, and in midst of the intellectual quickening imparted to it in common with the whole of learned Europe by the new philosophy of Descartes, he achieved distinction in every department except mathe- matics, for which he seems to have possessed neither the taste nor the faculty. At sixteen his attainments were the talk of the town. He became the pet of the lettered aristocracy of Paris, and it argues his strength of character that he was unspoiled by their caresses. The applause which greeted the delivery of his thesis for the bachelor’s degree encouraged him to perfect his superb oratorical gifts, nor did he count it unlawful then to be a frequent spectator when the che/s-d’ceuvres of Corneille were played, although, later, he was not sparing in his criticism of the stage. At twenty-four he was appointed archdeacon of Metz. In Lent 1652, after a season of retreat at St Lazare, he received priest’s orders, and immediately quitted the gay

capital, and the career already opening to him there, to fulfil the duties awaiting hiin in the comparative obscurity of the provinces. Six years were spent in unwearied pastoral activity, as well as in exhaustive private study of Scripture and of the Fathers, notably St Augustine, although even in the less read Patristic writings he was at home, and quickly put his knowledge to use in a work of controversy, entitled Jtefutation du Catechisme de Paul

Ferry, a Protestant minister of Metz. It is of interest principally because it outlines even at that early date the doctrine afterwards vigorously defended by Bossuet of the limited authority of the popes in matters of faith. The echo of his pulpit eloquence had already begun to reach beyond Lorraine; during a short residence at Metz it fascinated Anne of Austria, the Queen Mother, and for the next ten years (1659-69) he was in perpetual request in the metropolis. Wherever he appeared court and city flocked to listen; the queens went from the palace and the nuns of Port Royal from their seclusion ; Condé, Turenne, Madame de Sevigné, and other famous contemporaries mingled with the crowd; while, in 1662, the preacher's triumph reached a climax, when after hearing him for the first time at the Louvre, Louis XIV., in a moment of rarely awakened enthusiasm, despatched a royal message to Bossuet's father—" pour le feliciter d'avoir un tel fils."

According to Lachet, these matchless discourses may be classified as belonging to three periods:—that of Metz, showing a considerable measure of crudeness both of thought and expression; that of Paris, distinguished by strength aud splendour (for, as Sainte-Beuve observes, every trace of immaturity or questionable taste disappears from the moment when Bossuet enters the circle of the king's influence); and that of Meaux, in which faultless grace of composition is purchased at the expense of vigour. On ordinary occasions, and for an audience that loved the practical truths of religion marshalled with logical force and distinctness, Bourdaloue was, perhaps, equally attractive as a preacher—there is even more contemporary talk about him ; but in the Oraisons Funébres Bossuet is unapproach- able. In this species of oratory Mascaron and Flechier had preceded him, but he is the veritable creator of it, and nowhere does his genius take such wing as at the grave's mouth, when, recounting the virtues of the illustrious dead, he pictures, with wonderful sweep of imagination and mastery of detail, the historical events and personages of the epoch in which they lived, the more impressively to demonstrate that all earthly pomp and renown "are shadows, not substantial things." Not that he altogether escapes the vice of the French pulpit of that age, for occasionally he does elevate into types of excellence those who fell far short of it; but, as compared with other offenders, the adulation which he offers is, even in the hearing of royalty, measured and temperate. His funeral orations at the death of Henrietta of

England, of her daughter, the duchess of Orleans, and of the great Condé, are commonly deemed his finest efforts of the kind.

In 1669 Bossuet was appointed to the diocese of Condom, and in the year following he became preceptor to the Dauphin; but being unable, in conscience, to retain both offices he resigned the former, and, in consideration of the pecuniary sacrifice involved, obtained the revenues of the Abbey of St Lucien at Beauvais. Convinced that on the culture of the Dauphin might depend the future welfare of the French people, he threw himself with incredible energy into the novel duties of the preceptor- ship, and resumed his own education the better to educate his august but indolent pupil. He lacked that sweetness of nature, however, which afterwards gave to Fénélon such sway over the Dauphin's son. For the edification of his royal charge Bossuet wrote several able works, such as

L'Mstoire abregée de la France; La Politique sacrée ; Traite de la connaissance de Dieu et de soiméme ; and most celebrated of all, Le Discours sur Vhistoire wniverselle. This work, originally meant to be a mere abridgment for use in the royal schoolroom, grew as he wrote into a mag- nificent historical narrative. It consists of three parts :— (1), asketch of history from Genesis to the birth of the modern world undcr Charlemagne; (2), an account of the Mosaic and Christian economies ; (3), a series of reflections on the vicissitudes of human government,—the whole being characterized by splendour of colouring and vast range of plan, although this latter feature is less striking in late editions than in the earliest, which was not broken up into chapters. In the composition of it Leibnitz greatly helped him, by forwarding from Germany every book bear- ing on the subject on which he could lay hands, Its central thought is that of all changes in history being overruled with sole reference to the progress and universality of true religion ; but Bossuet's treatment of this theme, notwith- standing a host of striking and unchallengeable observations, is vitiated by his identification of the Christian faith exclu- sively with the Papal form of it, and by the way in which he ignores the place and value of pagan antiquity in the world's development, so as to invite, if not to justify, the sneer of Voltaire: '"'I] parait avoir écrit uniquement pour

insinuer que tout a ét¢ fait dans le monde pour la nation |

juive.”

It was not until the close of 1679 that Bossuct’s official duties as preceptor came to an end, but in the interval his industry othcrwise did not slacken. He was elected a member of the Academy of France in 1671. About this time, too, he gave to the world the most frequently revised, most bitterly attacked, and most widely translated of all his books, LZ’ Hxposition de la doctrine catholique. Com- posed in 1669, and originally circulated in manuscript, it had been credited with effecting in this shape not a few conversions, among others that of Turenne. But Jean Daillé and other Reformers having charged it with toning down the harshness of Roman dogma with the purpose of ensnaring their flocks, Bossuet resolved to publish it. The book created a wide-spread flutter of excitement, as may be inferred from the terms employed in speaking of it by Jurieu, perhaps the ablest of Bossuet’s opponents, —“ Every- body is gone mad over the Lxposition ; everywhere one hears of the most disgraceful perversions.” It twice received the imprimatur of the Pope in despite of the author’s undisguised opinions with respect to infallibility. Curiously enough, it was this treatise that brought about in 1678 the conference between Bossuet and Claude, the learned pastor of Charenton. Floquet informs us that Wherever he could obtain a face to face encounter, Bossuet preferred it to controversial writing. On the present occasion the discussion lasted five hours, turning on the authority of the church, with what result is, perhaps, not unfairly described by Bayle in the pithy remark—“ That as at the battle of Seneft, both sides claimed the victory.”

During the latter years of the preceptorship Bossuet, with a few genial associates, busied himself with Motes and Annotations of the Books of Scripture. Many pleasant hours were spent in these round-table studies, and it is proof of his inexhaustible energy that he did not hesitate, even so late in life, to acquire a knowledge of Hebrew, though there may be a touch of exaggeration in what was said of him by an admirer,—‘“ that he was not less familiar with the language of Moses than with that of Homer.” His life at court was not without its shadows. His very position involved him unwillingly in the miserable transac- tions ‘Springing out of the unhallowed

relation in which the king stood to his successive favourites. But Bossuet never forgot the bishop in the courtier. He remonstrated

often and seriously with the profligate Louis. As spiritual adviser of the beautiful but unhappy La Valliére, his Christian gentleness and wisdom shine out conspicuously in the interviews and correspondence which issued in her retirement to the convent of the Carmelites. If, in the case of Madame de Montespan, his actions are more open to misconstruction, yet further investigation tends towards his acquittal of the charges advanced by various historians.

Appointed in 1681 to the bishopric of Meaux, Bossuet had scarcely been installed when he was summoned to take part in the memorable assembly of the French clergy with which his name will always be associated. This council was convoked by royal edict, at the instance of the clergy themselves, for the purpose of finding a way out of the conflict, yearly growing fiercer, between Louis and Rome. The strife arose about the regalia, or claim of the Crown to administer the affairs of a vacant see until such time as its new occupant should take the oath of fidelity. But in the course of its discussions the council was agitated by questions far wider than that in which it took its rise, and embracing cventually the whole subject of the extent and limits of Papal authority. Bossuet preached the opening sermon. He gave fearless utterance to his cherished opinions. Referring to the aggressive dispo- sition of the Papacy he declared—“ Ocean itself, immense though it is, has its limits, and to break through at its own caprice would be to lay desolate the world.” At the same time, seeing the heated state of the public mind, he counselled moderation, occupying a middle place between Ultramontanists and ultra-Gallicans, and was even opposed to any formal declaration of the Gallican position. Being overruled in this chiefly through the influence of Harlay, archbishop of Paris, he next directed his efforts towards issuing the assembly’s decision in the most temperate and conciliatory form. He was himself appointed to draw it up, and there resuited the famous four articles which were in substance these:— I. The civil authority is not subject to the ecclesiastical in temporal things; II. As decreed by the Council of Constance, a general council is superior to

the Pope; III. The exercise of the apostolic power ought to be tempered by the usage of particular churches; IV. Except with the consent of the church the judgment of the Pope is not unalterable in matters of faith. Being virulently attacked, these pro- positions were defended by Bossuet in his great Defense de la doctrine du clergé de France, which, however, was not printed until 1735.

Bossuet applauded the shameful revocation of the Edict of Nantes (1685), but his English biographer reminds us that, stern as was his character, he did his utmost to secure to Protestants as much liberty as was possible under the existing law; and, further, that no military execution took place during his episcopate at Meaux.

_In 1688 there appeared L'Histovre des Variations des Lglises Protestantes, a review ind analysis, in fifteen books, of the confessions of faith emitted by Protestant churches during the epoch of the Reformation, in which Bossuet aims at demonstrating their incoherency and self-contra- diction, even on cardinal points, as contrasted with the doctrinal stability of Rome. Forcible and learned as it undoubtedly is, this work is grievously lacking in candour, and in the paramount love of truth, the treatment of Luther and his writings being especially unscrupulous and vindictive. Indeed, from first to last, it is executed in the spirit less of an upright judge than of an unprincipled partisan. These less attractive features of Bossuet's char- acter, over which one would gladly throw the veil, became still more prominent when in 1689 there broke out the bitter quarrel on the subject of " Quietism," the melancholy and fluctuating history of which may be best embraced

under that of Fénélon. Bossuet, by his attitude, alike unjust and ungenerous, has left an indelible stain upon his otherwise brilliant reputation, while the man for whose condemnation he resorted to violence and intrigue con- ducted himself with the meekness and charity of a saint. Attacked by a painful disorder, of which the premonitory symptoms appeared in 1696, the venerable prelate lingered on until the 12th of April 1704, when he died at Paris in his 77th year, amid the tokens of universal regret.

Of unrivalled eloquence and consummate learning, an intrepid controversialist and defender of the faith, as well as the most conscientious and diligent of bishops, he will probably be remembered longest as the champion of the ancient rights and libertics of the Gallican Church, and the representative of a phase of catholicism which the Vatican council has for ever banished from within the Roman pale.

The best edition of Bossuet's works is that of Lachat in thirty- one vols., Paris (Vives). Sec also Life of Bosswet, by Cardinal de Bossuet ; Studies of his Life, by Floquet; and the Memoirs of the Abbé le Dieu. There is a fulland admirable English Life of Bosswet, by the author of the Life of St Francis dz Sales, 1874. For Brougham's estimate of Bossuet as an orator, which is very depre- ciatory, see his Works, iii. 262-269. For a criticism of L' Histoire Universelle see Flint's Philosophy of History. (A. B. C.)

BOSTON, a parliamentary and municipal borough and seaport town of England, in the county of Lincoln and wapentake of Skirbeck. It is situated in a rich agri- cultural district on the Witham, six miles from the sea, and thirty miles §.E. of Lincoln on the Great Northern Railway, in 52° 59' N. lat. and 0° 2' E. long.

Boston is by some supposed to have been a Roman station in the province of Flavia Cesartensis, but of this sufficient evidence does not szemtoexist. According to the Saxon Chronicle, St Botolph, the patron of sailors, founded a monastery at Icanhoe in 654, which was destroyed by the Danes in 870. From this Bos- ton is said to have taken its name (Botolph's town). It be- came a place of considerable commercial importance after t'13 Norman Conquest, and, in 1204, when the quinziéme tax was imposed on the ports of England, that of Boston amounted to £780, and was exceeded only by that of Loudon, which was £836. A great annual fair was held in the town at this period. By 27th Edward IIL. it was made a staple for wool, woolfells, leather, and lewd. Its prosperity about this time induced merchants from the Hanseatic and other Continental commercial cities to settle here ; a century later, however, these foreigners were obliged to leave, in consequence of a quarrel with the townsmen. From this time it rapidly declined. The dissolution of the monasteries by Henry VIII. injured the town, though compensation was in some degree made by granting it a

charter of incorporation ; and Philip and Mary endowed it with upwards of 590 acres of land. It afterwards suffered from the plague aud from inundations, to which its low situation rendered it particularly liable. It was for some time the headquarters of Cromwell's army.

Boston is well built, paved, and lighted. It is divided into two nearly equal parts by the Witham, here crossed by au elegant iron bridge of one arch, 86 feet in span. At one time the supply of water was very deficient ; but, in virtue of an Act passed in 1847, there is now a plentiful supply conveyed by pipes from a distance of twelve miles. The principal building is the parish church of St Botolph, founded in 1309, and partly restored in 1857 at the

Arms of Boston.

expense of the inhabitants of Boston in America, in memcry of their conucction with the Euglish city. It is one of the largest churches without aisles in the kingdom, being 290 feet by 98 within the walls. The tower, 290 feet in height, resembles that of Antwerp cathedral, aud is crowned by a beautiful octagonal lantern, forming a landmark seen forty miles off. A chapel of ease was erected in 1822, There is a free grammar school, founded in 1554, a charity school for the sons of poor freemen, a blue-coat, national, and other schools. 'There is also a dispensary, a town-hall, a market-house, a custom-house, assembly rooms, a theatre, a borough gaol, a house of correction, a union poor-house, Vauxhall gardens, a mechanics' institution, public baths, subscription libraries, an athenzum, and a freemason's hall, built in imitation of Egyptian architecture. The manufactures consist chiefly of sail-cloth, canvas, sacking, ropes, beer, leather, hats, and bricks. There are also iron and brass foundries, and ship-yards, with patent slips, where vessels of 200 tons are built.

From neglect to clear the river, it became so obstructed that in 1750 a sloop of 40 or 50 tons could with difficulty come up to the town at spring tides. Since that period great improvements have been made, and vessels of 300 tons are enabled to unload in the town. The imports are chiefly timber, pitch, tar, and hemp from the Baltic, and coal and manufactures coastwise ; the exports, wool, wood, corn, and other agricultural produce. The total

value of the former was in 1873, £200,825, and of the latter £86,571. By means of the river and the canals con- nected therewith, Boston has navigable communication with Lincoln, Gainsborough, Nottingham, and Derby. The East Lincolnshire Railway connects it with Louth, Grimsby, and other towns in the north, and the Great Northern with Peterborough and the south; another line extends to Lincoln. It has returned two members to parliament since the reign of Edward IV. The title of Baron of Boston is borne by the Irby family. In 1871 the popu-

lation within the parliameutary boundaries was 18,279; —

within the municipality, 14,526.

BOSTON, the capital of the State of Massachusetts, in Suffolk County, and the second city in commerce, wealth, banking capital, and valuation in the United States of North America. It lies at the bottom of Massachusetts Bay, and is one of many pear-shaped peninsulas formerly attached to the mainland only by narrow marshy necks, which fringed the shores of the bay. The Charles River, once more than double its present width, divides it from the similar promontory of Charlestown (the site of the battle of Bunker Hill), on the other side of which the Mystic River, uniting with the Charles, flows into the harbour. The latest deterniination gives the latitude of Boston 42° 21’ 27°6” N., and the longitude 5° 59’ 18”E. from Washington and 71° 3’ 30” W. from Greenwich. When it is noon in Boston it is 4 o’clock 44 minutes and 14 seconds at Greenwich, and 36 minutes past 11 at Washing- ton, which is distant by railroad 450 miles,

The Indian name of the peninsula was “ Shawmut,” meaning “ living fountains.” When Governor John Win- throp, with his company, came over from England with the king’s charter, to establish a government under it in the bay, they reached Charlestown, as a temporary settle- ment, on June 17, 1630. Looking across the Charles, the Indian Shawmut presented to the eye an elevation nearly in its centre, with three distinct summit peaks, the remnants of the ouly one of which now remaining constitute the present Beacon Hill, so called from its ancient use as a signal warning station. These triple summits led to the substitution of the name “ Trimountaine,” or “ Tremont,” as the English designation of the whole peninsula—a

favourite title perpetuated in the name of a central street, —

a hotel, a theatre, a bank, a lecture-hall, &c. A single | was commemorated by public civic services, an oration by lonely white man, the Rev. William Blaxton, a clergyman | Josiah Quincy, a former mayor, then president of Harvard of the English Church, was then living, with house, | University, and a poem by the banker-poet, Charles orchard, and garden on the slope of the central hill, sup- | Sprague. It is not probable that the peninsula was posed to have come over in 1623, one of several isolated | occupied till a month later. Blaxton, not finding the settlers on the promontories and islands of the bay, called | new-comers congenial associates, sold out his rights to “the old planters.” He invited Winthrop’s company to | them in 1634, and moved elsewhere. It has often been cross the river and build their cabins on his side, because | said, and has been widely accepted, that Boston received its of the purer and more abundant water-springs. On the | name in compliment to the second minister of its first records of the company we read, that at a court held in | church, the Rev. John Cotton, formerly vicar of St Charlestown, September 17 (n.s.), 1630, “It is ordered | Botolph’s, borough of Boston, Lincolnshire, England. . that Trimountaine shall be called Boston.” This has con- | This was not the case. The Rev. John Wilson, of King’s ” sequently been the date assumed for the foundation of what | College, Cambridge, and of Sudbury, in Suffolk, England, is now the present city, and the second centennial of which ; came in Winthrop’s company, and was first pastor of the

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1, Massachusetts Hospital. «2. State House. 38. Atheneum. 4. Court-House. 5. Faneuil Hall. 6. City Hall. 7. Exchange. 8. Custom House. 9. Bunker’s

Hill peveinont. 10. Insane Hospital. 11. House of Correction. 12, Telegraph Hill (Dorchester Heights). .....0.6… Low Water mark, ------ 5 Fathom ne,

A

three years after the name Boston had been adopted. | of the colonists as a place of settlement, because of its Undoubtedly the name was chosen in compliment to the | facilities for commerce and for defence. Its aboriginal much honoured Mr Isaac Johnson, one of the foremost in | occupants had previously been devasted by a plague, the enterprise, who with his wife, the Lady Arbella, | leaving it vacant. Some fifty years afterwards the settlers daughter of the Earl of Lincoln, came with Winthrop in | satisfied the claims of an Indian sachem, representing that a vessel bearing her name. Johnson was from the English | his grandfather had been its proprietor. Had these Boston, as were also his associates, Athcrton Hough, who | settlers contemplated the enormous outlay of labour, skill, had been mayor of the borough, and Thomas Leverett, | and money, which their posterity would have to expend “ruling elder” of the church, who had been an alderman. | upon the original site to make it habitable and commodious,

Some graceful courtesies have been exchanged in recent | they might have planted themselves elsewhere. There was years between the two cities. The English Boston sent | neither wood nor meadow on the peninsula ; but it might Over a copy of her charter, framed in wood from St | be defended from the Indians and wolves, and as one Botolph’s church, and this now hangs in the city hall of | early visitor vainly imagined, from “moskitoes.” The the Massachusetts capital ; and some descendants of John | surface was very abrupt, irregular, hilly, and undulating, Cotton, with members of his American Church, through | deeply indented by coves, and surrounded by salt-marshes one of their number, Edward Everett, then American | left oozy by the ebbing tides, and separating the shores minister at the Court of St James’s, united in a generous | from the river channels. ‘The peninsula contained less subscription to restore a chapel in St Botolph’s, and to | than 1000 acres, and the narrow neck, which joined it erect 4 monumental tablet in it to the revered teacher. to the main, was often swept by spray and water. The

church, Cotton did not arrive till September 4, 1633, The sea-girt peninsula seems to have attracted the choice I |

widening of Charles River near its mouth gored deeply into the northern side of the peninsula, almost dividing it, and the waters were soon turned to account for a mill-pond. This was filled up by earth from the hills in 1807, adding more than 50 acres to the territory. Another broad cove on the southern side was filled in 1837, adding 77 acres more. The Back Bay, so called, and all the flats on both sides of the original neck, have since been reclaimed for the various uses of a public garden, and squares, streets, dwellings, churches, schools, hotels, manufactories, &c., con- stituting, in fact, a new city with many costly and elegant structures, on what was originally the narrowest and most disagreeable, but is now the fairest and widest, portion of the primitive site. But whole forests from the State of Maine, and vast quarries of granite, and hills of country gravel, have been put to service in fringing water margins, constructing the wharves, piers, and causeways, redeeming the flats, and furnishing piling and solid foundations for the stately edifices, private houses, halls, churches, and rail-road stations, principally between Charles River and the old Dorchester flats. From the first settlement, however, the ownership and occupancy of land by the citizens were not confined to the svil of the peninsula. The land needed for grazing, farming, and wood, on neighbouring pro- montories and islands was soon placed under the jurisdic- tion of Boston, for its “inlargement.” Portions of territory, thus added, were from time to time severed, and have since been re-annexed. Noddle’s Island, now East Boston, was “layd to Boston” in 1637. It then contained 660 acres, with several hundreds more of flats and marsh, since reclaimed. It has a wharf, 1000 feet in length, for the English and Canadian steamers. Dorchester Neck and Point, containing 560 acres, were annexed as South Boston in 1804, and the neighbouring Washington Village in 1855. The city of Roxbury was annexed in 1868; the town of Dorchester in 1870; the city of Charlestown, and the towns of Brighton and West Roxbury, in 1874. The 900 acres of the original peninsula have been doubled on its own area; while the present area of the city’s jurisdic- tion covers 22,472 acres. The whole length of the original peninsula, from Roxbury line to Winnisimmet

Ferry, was two miles anda little more than three quarters ; its greatest breadth was 1 mile and 139 yards. The reclaimed territory is raised to a uniform level, sufficiently high to secure it against freshets, and is well drained. While the original site still preserves to a large extent its irregularity of sur- face, and its undulations, some of its former steep eminences have been reduced or wholly removed. The highest eminence in the old territory is about 110 feet above the sea-level. This work of levelling, grading, and reclaiming has been done at vast expense. But greater has been the expense of widening and straightening the narrow and crooked highways, streets, thoroughfares, and lanes of the first settlers, which are traditionally said to have been made by the cattle on their way to and from their pastures. This, next to the water-works, has been the occasion of the most considerable increase of the debt incurred by the city, somewhat relieved by assessments for betterment on abut- ting proprietors. It is believed that there has been a larger outlay of labour, material, and money, in reducing, level- ling, and reclaiming territory, and in straightening and widening thoroughfares in Boston, than has been expended for the same purposes in all the other chief cities of the United States together. The broad watercourses around Boston are now spanned by causeways and bridges,—East Boston only, that the harbour may be opened to the navy- yard, being reached by a ferry. The first bridge over Charles River, that to Charlestown, was opened in 1786 ; the West Boston bridge, to Cambridge, in 1793; the Western Avenue, a solid causeway to Brookline, 7000 feet

long, in 1821. Boston has now to maintain sixteen bridges. Most of the railroads also have their bridges,

Six of the islands in Boston harbour are the property of

the city, and three more of them have been ceded to the United States for fortifications, The harbour islands, including rocks and shoals, are very numerous, rendering the navigation through the two channels very difficult and easily guarded. But the harbour, when reached, is very secure. It is nearly 14 miles long, and 8 miles wide, giving nearly 60 square miles of anchorage. These islands were for the most part heavily wooded when first

occupied, and some of them were profitably used for grazing and pasturage. Since they have been stripped of their primitive growth for fuel and building material, it has been found impracticable to reclothe them with trees, on account of the roughness of the sea-air. The washing of the soil from the bluffs of many of them, to the great injury of the harbour, has involved large expense in the erection of sea- walls, The first settlers constructed rude defences, fre- quently repaired and extended, on Castle Island, 24 miles from Boston. More formidable works were raised here by an English engineer in 1701-3. The United States Government has constructed elaborate fortifications on this site, now called Fort Independence, which, with Forts Winthrop and Warren, on neighbouring islands, offer formidable harbour defences. The first lighthouse was erected in the harbour, on Beacon Island, 84 miles from the town, near the Great Brewster, in 1716. This was destroyed during the Revolutionary War, re-erected in

| 1783, ceded to the United States in 1790, refitted in 1856

and 1860, with a tower 98 feet high, fog-horn, bell, &c., and is now called the Outer Light. An inner lighthouse

| was established on Long Island Head in 1819, refitted

in 1855. On the long spit, at the western extremity of the Little Brewster, stands the Bug or Spit Light, erected in 1856.

It is remarkable, considering the leading and conspicuous character which has always attached to Boston from the first English settlement of the country, that it should have remained for nearly two centuries under the simple form and administration of a town government, the same as that of the smallest interior hamlets. Such a government, by all the citizens assembled in ‘town meeting” to dispose all their affairs, was, however, found favourable to the development and prosperity of the community. Here was trained a homogeneous population under peculiar institutions, Wealth slowly but steadily increased, through the whale and cod fisheries, the fur-trade, the sale of lumber and pitch, and a commerce. largely with the West Indies and elsewhere,—though much impeded by the restrictions of the English navigation laws. Heavy exactions and drawbacks were found in the

Indian and in the French colonial wars. Here began opposition to the measures of the British ministry, for oppressing and taxing the colonies. The Stamp Act, passed in 1765, was repealed in 1766. The Tea Act, passed in 1773, was defied by the emptying of three cargoes of tea into the harbour, December 16 of the same year, by a party in the guise of ‘Mohawk Indians.” The port was closed by a British fleet, June 1,1774. The British army evacuated Boston March 17, 1776, after having been beleaguered in it nearly a year. The constitution of the State was adopted here in 1780, midway in the war.

Boston received a city charter in 1822. Its Govern- ment is composed of a mayor, twelve aldermen, and 4 common council of seventy-two members, three from each of its twenty-four wards, annually elected by the citizens. There are commissioners for fire, water, health, and various other departments. There is a board of twelve overseers of the poor, with a commodious central building, connected

with twelve charitable organizations, with which the board acts in concert. The board holds charity trust funds amounting to $312,183, it expended in 1874 $101,591, and relieved 304 beneficiaries on its trust funds, and 9762 other persons.

Population, Valuation, dc.—The population of Boston, in 1708, was about 12,000; in 1719, about 18,000; in 1780, about 23,000 ; in 1800, 25,000; in 1850, 139,000 ; and, with Roxbury and Dorchester, in 1873, was 308,875. Charlestown brought with it 32,040; West Roxbury, 10,361; .and Brighton, 5978. The total, in 1875, must be nearly 360,000. The valuation of the city in May 1875 was $554,200,150 of real estate, and $244,554,900 of personal property,—total, $798,755,050. The value of the corporate public property is $30,787,292. The uet city debt is $27,294,208. The number of public paupers, including insane, is 689; of criminals, 1495. There are fifty-eight banks of deposit and discount in the city, the capital of which is $52,900,000, and the circulation $27,074,396. The number of savings-banks is twenty-one, with deposits of $73,322,368°56. Of fire and marine insurance companies, stock and mutual, there are thirty, with four new ones in formation, besides life insurance companies and those against accidents

and for specific forms of property. The annual sale of merchandise in the city is estimated at $1,000,000,000,

Commerce.—Boston has commercial relations with every part of the globe. In 1874 the gold value of its foreign imports was $49,522,547 ; of its exports of foreign mer- chandise, $2,084,257 ; and of its domestic merchandise, in currency, $27,035,169. There arrived 167 American vessels from foreign ports, with a tonnage of 234,587 and 6324 men; of foreign vessels from foreign ports 1849, with a tonnage 484,448 and 18,486 men. There cleared for foreign ports, 598 American vessels, with 254,347 tons and 6606 men; and 1882 foreign vessels, with 472,941 tons and 17,995 men, The total tonnage of Boston, registered and enrolled, on December 31, 1874, was

331,266. Its commerce is slowly recovering from the

effects of the war of secession.

Great Fires,—The buildings of Boston having from the first been largely of wood,—the use of which material for that purpose is now under severe restrictions,—and closely compacted, the old town suffered from frequent and disas- trous conflagrations, several of which were successively described as "' The Great Fire." There had been ten of these disasters, severe under the then existing circumstances, before the year 1698. In 1711, the town-house and a meeting-house, both of brick, and a hundred dwellings were destroyed. In 1760 a conflagration consumed 349 dwell- ings, stores, and shops, and rendered more than 1000 people homeless, But these and all subsequent ones were eclipsed in their devastation by the disaster of November 9-10, 1872, in which hundreds of costly warehouses filled with goods, with banks, offices, churches, &c., were destroyed, though all of brick or granite, involving a loss of over $80,000,000. Itis an evidence of the energy and resources of the citizens, that in a little more than two years after the catastrophe, the whole "burnt district," with widened and improved thoroughfares, was covered with solid, sub- stantial, and palatial edifices combining all the safeguards, improvements, and conveniences of modern skill. At least as large anamount has been expended on this restoration as was lost in the ruin. The fire department has been made more efficient under the control of three commis- Sioners. There

are now in the city twenty-nine steam fire-engines and a fire-boat in the harbour, eleven hook and ladder companies, sixteen horse-hose companies, a protective department, an insurance brigade, with wagons, &., an alarm telegraph, and a system of signal boxes.

(6s)

Water Supply.—Though the first white settlers were drawn to Boston by its pure and abundant springs, the want of water resources was long felt till efficient measures were taken for a supply. The southern portion of the town was supplied at the beginning of this century by an aqueduct from Jamaica Pond in Roxbury. The works already constructed and still in progress fully meet the present and prospective demands, The waters from Cochi- tuate Lake and its tributaries, from twenty to thirty miles from the city, flowed into it by gravitation, October 25, 1848, The storage reservoirs and the works have cost up to May 1875, $10,786,739. The length of the conduit of brick is 14% miles, and of supply pipes of iron 2624 miles. The annexation of Charlestown brought with it the waters of Mystic Lake, the works for which had cost $1,147,902, with 14 miles of brick conduit, and 127 miles of pipe, pumping engines, and reservoir.

The public schools of the city are organized and super- vised under the statutes of the State which make provision for free education by some compulsory enactments, subject to such special regulations as may be enjoined by the Legislature. The Legislature of 1875, by an Act (chapter 241), introduced a change in the composition and functions of the school committee. Henceforward this board is to consist of twenty-four members, chosen by the citizens on general ticket, to be disposed in three sections of eight members each. After the close of the first year from the first election, eight members are to retire, and eight new members are to be elected, to serve for three years, all without compensation. The board is to elect and fix the compensation of a secretary, an auditing clerk, and other necessary subordinate officers, and also of a superintendent of schools, and a board of not more than six supervisors. The mayor is to be, ew officio, chairman of the general board, to which no other member of the city government can belong, and which shall have the whole management of the schools, choosing and fixing the compensation of all teachers, janitors, &c., but

needing the authority of the city council before incurring an expense exceeding $1000 for the purchase of land, or the erection or alteration of a building. Boston has now 9 high schools, 49 grammar- schools, 416 primary schools, 25 evening schools and industrial, licensed minors', deaf-mute, and kindergarten schools,—total, 499. The number of teachers employed is 1289; of scholars, 53,391. Cost of maintenance for the year ending May 1, 1875, $1,724,373°61. In the old city there is a Latin, English high, girls' high, and normal school ; and in each of the municipalities that have been annexed there is a high school, where classical education is furnished.

The public buildings of Boston are very numerous, embracing those of the United States Government, the State, the county, and the city. Most of them have been built within a few years, and are substantial and com- modious, but, owing to the constant expansion and growth of the city, each of them in turn becomes contracted, and needs enlargement or a substitute. The buildings con- nected with each of the railroad stations have been recon-structed for extension three or four times. The largest group of edifices and works is that of the United States navy-yard, with docks, manufactories, foundries, machine shops, ordnance stores, rope-walks, furnaces, casting pits, timber sheds, ordnance parks, ship-houses, &c. The half of a very elaborate and costly edifice, the corner-stone of which was laid by President Grant, is now (1875) com- pleted and in use for the United States post-office and sub-treasury. The other half, now in progress, will accommodate the United States courts. There is also a custom-house, with bonded warehouses, and the United States court-house,

The State House, for the business of the Legislature of the commonwealth, was built in i798, and has been recently greatly extended. It stands on the highest land in the city,—what remains of the old Trimountaine sum- mits, —and has a gilded dome, fountains, and statues on Its lawn, with statues, busts, paintings, and trophies within. The edifice looks nobly down upon the ‘ Common,” so dear to the citizens of Boston. This park came with the original purchase from Mr Blaxton, and encloses 48 acres, with malls all round it, a pond, a fountain, a soldiers’ monu- ment, a deer park, and about 1300 trecs. An Act of the Legislature of 1875 protects it from being encroached upon in any way by the municipal authorities without a vote of the majority of the citizens. To the State also belong a court-house and some of the newly reclaimed territory on the South Bay. To the county of Suffolk belong a jail, and court-houses, municipal and probate. The State prison is in Charlestown district.

To the city, besides the school-houses,—which bear the names of honoured citizens for many generations, and of ex-mayors,—belong a large number of structures and appliances :—the Old State House, so called, built for the British authorities in 1712,—the oldest public building now standing in the city, Christ Church, dedicated in 1723, coming next to it; Faneuil Hall, famous for its patriotic oratory, originally the gift of Peter Faneuil in 1743, used for “town meetings,” and enlarged in 1806; extensive market-houses ; the City Hall; the Public Library ; bath- houses ; engine-houses and armories; the Public Garden on the new territory, highly ornamented, enclosing more than 24 acres, with a pond ; city stables, &c.

Statues in public places :—in bronze, a fine equestrian statue of Washington, and those of Dr Franklin,—born in Boston, January 17, 1706, —of Daniel Webster, Horace Mann, and Edward Everett; of marble or granite, Wash- ington, Alexander Hamilton, Governor Andrew, Columbus, Aristides, soldiers in the war of secession, and the monu- ment commemorating the introduction of the use of ether as an anesthetic, first applied in the Massachusetts General Hospital, Boston.

Boston is fringed with substantial wharves on all its water margins, for the most part covered with massive warehouses. Horse railroads, or tramways, make easy connections within its own limits, and with the suburbs. Steam

roads open communication with the whole continent, in every landward direction. Successive experiments have been tried with the various materials and methods for pav- ing the streets, and constructing side-walks. *‘The streets of the town were first named in 1708. The first map of the town, that of Bonner, was made in 1722. Overseers of the poor were first chosen in 1691. The superintendent of lamps has charge of 7664 gas, and 976 fluid, burners. The cost of gas to the city, for 1874, was $275,064°35. There are seventeen police-station houses and lock-ups ; the expense of that department was $683,892°78 ; of the health department, $446,877°08; of the fire department, $671,511°13: of the City Hospital, $111,198°31; of penal and pauper institutions, $405,903-40. The cost of street widenings and extensions from 1822 to 1874 was $21,739,983°13; and in 1873-74, $6,403,413°76, re- duced by “ betterments,” $283,697‘50 ; tax assessed in 1874, $9,022,187:17 The revenue of the city was $23,633,874°06. Tnere had been in the town and original city eleven burial-places. Mount Auburn Cemetery in Cambridge, five miles distant, enclosing 125 acres, was put to use in 1831. There have been more than 19,000 inter- ments in it. Five other suburban cemeteries are now provided, and interments in the city are prohibited.

The Public Library, as an institution of the city, was fostered by an enterprise initiated- by M. Vattemare, in

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securing a gift of books from the city of Paris, in 1843, Acts of the Legislature, renewed and extended from 1848 to 1857, aided by the efforts of individual citizens and meet- ings of committees, with free and conditional gifts of money and of books, kept the object steadily in view. In 1852 Mr Joshua Bates, born in Massachusetts, then of the firm of the Messrs Baring, of London, made a gift to the city for the purpose of a library, of $50,000, subse quently adding various donations of books. The main hall of the library building bears his name, in commemoration of his munificence. The present spacious and solid struc- ture, which, however, already needs a second enlargement, was inaugurated for its uses, on January 1, 1858, with an address by Edward Everett. It cost, with the land, $365,000. Large donations of money and of private libraries have since

accrued from living benefactors, and by bequests. ‘The names of Ex-Mayor Bigelow, of Abbot Lawrence, and Jonathan Phillips deserve mention for their pecuniary gifts; while the libraries of Theodore Parker, Edward Everett, and George Ticknor have furnished most valuable acquisitions. Here is deposited the Prince Library, belonging to the Old South Religious Society. The unique and rich coilection, known as the Barton Library, of 12,000 volumes, including the magnificeut Shakspearian treasures, was obtained in 1873. The edifice has been once enlarged, with efforts to render it fire- proof, and additional ground has been purchased at a cost of $70,000. The expense of its maintenance and care, in 1874, was $135,000. There are employed in it 103 persons. The number of volumes is about 280,000, besides pamphlets, MSS., and valuable collections of en- gravings, including the Tosti, so called. Branch libraries are established for the convenience of the citizens, in South and East Boston, Dorchester, Roxbury, Brighton, and Charlestown ; and a system of other local deliveries has been initiated,

Of churches and places of worship in Boston, there are 163 for Protestants, 26 for Roman Catholics, and 3 Jewish synagogues, The Roman Catholics have a cathedral which will seat more than 4000. The Unitarians have the largest number of Protestant churches. There are 112 public halls, which serve very miscellaneous uses of worship, debate, lecturing, society meetings, and amusement.

Literary, learned, scientific, benevolent, and secret so- cieties, represented by their own edifices, halls, libraries, and collections, are very numerous, and well sustained. Among these may be mentioned the American Academy of Arts and Sciences ; the Massachusetts Historical Society ; the Boston Atheneum, with a very extensive library, paintings, and statuary; the New England Historic Genealogical Society; the Masonic Temple; the Odd Fellows’ Hall ; the Mechanics’ Association ; the Mercantile Library Association ; the Massachusetts Institute of Tech- nology ; the Boston College (Roman Catholic) ; the Boston University (Methodist) ; Young Men’s Christian Union ; Young Men’s Christian Association, with a sectarian condition ; Young Women’s Christian Association ; the Natural History Society ; the Horticultural Society ; the Marine Society ; the Boston Library Society; the Music Hall, with its great organ ; the Harvard Medical

School, and Warren Muscum; the State Library; the Law Library; the General Theological Library; the Art Museum, &c. There are four theatres in the city,—the Boston, the Globe, the Howard, and the Museum.

Hospitals, asylums, and refuges, chiefly founded and sustained by private benevolence, and generously admin- istered, provide, for the most part gratuitously, for the various ills and maladies of humanity. Of these, besides the City Hospital, may be mentioned the Massachusetts General Hospital, with its branch for the insane, the

M‘Lean Asylum, in a suburb; the Orphan Asylum; the Perkins Institution for the Blind; the Eye and Ear Infirmary ; the Consumptives’ Home; the Carney Hos- pital ; the Homeeopathic Hospital; the School for Idiotic and Feeble-minded ; the Lying-in Hospital; the Tem- porary, Washingtonian, and Appleton Homes; Hospitals for Women, Children, and Infants; Homes for Aged Men, for Aged Women and for Coloured Women, for Little Wanderers ; a Children’s Mission ; House of the Angel Guardian ; Commissioners of Foreign Missions, &c. The city institutions for paupers, the insane, and criminals, are in South Boston and on Deer Island.

Ninety years after the settlement of the town of Boston, Daniel Neal, of London, wrote a description of it, return- ing from his visit. In this he says: “ The conversation in this town is as polite as in most of the cities and towns in England, many of their merchants having travelled into Europe, and those that stay at home having the advan: tage of a free conversation with travellers; so that a gentleman from London would almost think himself at home at Boston, when he observes the numbers of people, their houses, their furniture, their tables, their dress, and conversation, which perhaps is as splendid and showy as that of the most considerable tradesmen in London.” Though in the succession of visitors from abroad, par- ticularly from England, who have followed Mr Neal, there have been a few who have found matter for satire and depreciatory criticism in their accounts of Boston, of its citizens, their habits, &c., the great majority of its foreign guests, especially if their own manners and errands have recommended them, have written in a similar strain. ‘They have found there much to learn and enjoy, and to remember with pleasure. Cultivated

Englishmen, particu- larly those who have visited Boston in recent years to obtain or to impart information, have found themselves at home there. ‘The supposed conceit of its citizens over their own distinctive qualities or advantages has led to some pleasant banter from at home and abroad in characterizing the city as the “‘ Athens of America” or “ The Hub of the Universe.”

The development, growth, and increased population of the city, under the liberal social influences, and the changes of opinion and habit, which in no part of the world are more marked and active than here, have, of course, wholly displaced the original homogeneousness of its people, and the peculiarly Puritan character of the tone and customs of life, Its large foreign population make, in traditions, habits, social relations, and religion, a uation within a nation. The unfamiliar names which appear cn the signs of shops and dwellings, the relaxed usages as regards the observance of Sunday, and the indulgence in amusements, large personal freedom, &c., have made Boston, substantially, a cosmopolitan city. Those now living remember when a persou who ventured to smoke a cigar or a pipe in the street would have fallen into the hands of a constable. When the traffic in the streets is annually obstructed by an elaborate procession, mounted and on foot, ou “ St Patrick’s Day,” and when a cardinal, with other officials from the court of Rome, comes hither to consecrate an archbishop in a cathedral, it is difficult to recall the virgin promontory and the English exiles with which this notice began. (G. E. E.)

BOSTON, Tuomas, a popular and learned Scottish divine, born at Dunse, May 17, 1676. He was educated at Edinburgh, and in 1699 became minister of the parish of Simprin, from which he was translated in 1707 to Kttrick. It was by his recommendation that Hog of Carnock reprinted in 1718 the famous Marrow of Modern Dwinity, which excited such a fierce controversy in the Scottish church. He also distinguished himself by being

the only member of Assembly who entered a protest against the sentence passed on Professor Simson as being too slight a censure. He died May 20, 1732. His writings were numerous; but he is best known by his Fourfold State, the Crook wm the Let, and his Body of Divinity, works much

esteemed by Presbyteiians, and which long exercised a powerful influence over the minds of the Scottish peasantry. He left Memoirs cf his own Life and Times, published in 1776. An edition of his works in 12 volumes appeared in 1849, 7.

BOSWELL, Jamzs, the biographer of Johuscn, was born at Edinburgh on the 29th October 1740. His father was one of the lords of Session, or judges of the supreme court in Scotland, and took his title, Lord Auchinleck, from the name of his property in Ayrshire. The family was of old and honourable descent, a fact of which both father and son were not only proud but vain. James, the eldest son, was educated at Edinburgh and Glasgow Universities, and during his student days contracted a close and life-long friendship with William Johnson Temple, afterwards vicar of St Gluvias and rector of Mamhead. His unrestrained correspondence with Temple, extending with occasional breaks from 1758 to the last year of his life, affords us the best materials for a knowledge of his career and an estimate of his character. At the age of eighteen he was busily engaged in the study of the law at Edinburgh, not entirely in accordance with his own inclina- tion, butin obedience to the desire of his father. Already, however, he had begun to take a pride in being associated with men of distinction, and tells his friend, with some exultation, that he had accompanied Sir David Dalrymple (afterward Lord Hailes) on the Northern Circuit, and had kept a journal of what was said by the great man on the way. Some other peculiarities of his character also became manifest even at this early period of his life. He was evidently unsettled and unstable, “ constitutionally unfit,” as he afterwards said, “for any employment ;” he disliked the Scottish style of life, and longed for the elegance, refinement, and liberality of London society. In 1760 this wish was so far gratified; he tasted some of the delights of the capital, and indulged in magnificent dreams of entering the Guards and spending his time about the court. Such a fancy, however, came to nothing, for as he has narrated with some pride, the duke of Argyll told his father that “this boy must not be shot at for three and sixpence a day.” A military life, indeed, would hardly have suited him, for, as he frankly confesses, his personal courage was but small.

Boswell’s tastes were always literary ; he had contributed some slight things to the current magazines; and in 1762 he published a rather humorous little

poem, Z'ke Cub at Newmarket. In the following year appeared a collection of Letters between the Hon. Andrew Erskine and James Boswell, Esq., which the vanity of the youthful authors induced them to think would be received with pleasure and profit by the world. The only prominent characteristic of these cpistles is an overstrained attempt at liveliness and wit.

On Monday, 16th May 1763, Boswell, then on a second visit to London, had the supreme happiness to make the acquaintance of the object of his almost idolatrous adimira- tion,—Dr Johnson. 'Their first interview in the back parlour of Mr Davies's shop in Russell Street was charac- teristic of both ; the calm strength and ponderous wit of the one, the fluttering folly and childish servility of the other, are portrayed to the life in Boswell's own narrative. Few things are more singular than the intimacy which sprang up between two men so differently constituted. Boswell might indeed congratulate himself that he had something about him that interested most people at first sight in his favour. He was then about to proceed to Utrecht in order

to prosecute his studies ; and the great Dr Johnson actually accompanied him to Harwich and saw him off, with many protestations of affection.

At Utrecht Boswell was as unsettled and dissipated as before. He had a fair allowanee from his father—£240 a year; but he was determined " not to be straitened nor to encourage the least narrowness of disposition as to saving money." To what extent this virtuous resolution was carried out is unknown; but after leaving the university, he determined, sorely against his father's inclination, to prolong his residence abroad. He travelled through various parts of the Continent, visited Voltaire and Rousseau, and was finally attracted to Corsica, where he speedily attached himself to and became the intimate friend of the patriot Paoli. He did not return to England till 1766, but he had not neglected his note-book, and in 1768 published his Account of Corsica, Journal of a Tour to that Island, and Memoirs of Pascal Paoli. The book had a very con- siderable success, not on account of the merits of its historical or descriptive passages, but from the liveliness and truth of the journal, and from the numerous anecdotes and sayings, which brought the

Corsican patriot vividly before the English imagination. Johnson's estimate of the work was discriminating and just; and other good judges, though they could not avoid noticing and ridiculing Boswell's extravagances and follies, appreciated at its true value his unrivalled power of biographical narration. The book did much for Paoli, and secured for him sympathy and assistance in England when he was compelled to fly from his native island. The author was for a time intoxicated with his success ; he pestered every one with Corsica, introduced himself to Pitt in Corsican dress, and not only appeared at the Shakespeare Jubilee arrayed in the costume of an armed Corsican chief, with " Viva la Liberta" inscribed on his hat, but wrote a full description of his appearance to the London Magazine. He certainly gained notoriety, if not fame.

His restless spirit next found occupation in the great Douglas peerage case. He took an intense interest in this affair, acted as an unattached counsel, and published on it a novel and a pamphlet. The often repeated story, that he resented the judgment given by his father in the case to such an extent that he headed the rioters who broke the old judge's windows, is not inconsistent with his character, but as the father's judgment virtually coincided with the son's opinion, it really has no foundation in fact.

In 1769, after numerous love affairs, which are told to his friend Temple with more freedom than decency, he married Miss Montgomerie. Not much is known of this lady, except that she was a relation of the earl of Eglinton, as Boswell took care to inform the people of Scotland in his Letter to them in 1785. Johnson's opinion of her qualities was very low; but she probably concurred with old Lord Auchinleck in thinking the great lexico- grapher "a brute." She seems also to have had rather a contempt for some aspects of Mr Boswell's character, what- ever that might '" comprehend in his own imagination, and in that of a wonderful number of mankind."

In 1778, though against his father's will, Boswell came to London. He was admitted a member of the Literary _ Club, and soon after set out with his great friend on the

immortal tour to the Hebrides. It was not till many years afterwards that the famous Journal was given to the world,—not till after the death of Johnson. Some years after the death of his father in 1782 he had joined the English

bar, but he never succeeded in gaining any practice. In 1785 the Journal of a Tour to the Hebrides was published, and preparations set on foot for an extended Life of Johnson. The collection of materials and careful revision occupied several years, and though Boswell sometimes was de-

spondent, yet on the whole he looked with well-grounded confidence for suecess. He was absolutely certain that his “mode of biography, which gives not only a history of Johnson’s visible progress through the world, and of his publications, but a view of his mind in his letters and con- versations, is the most perfect that can be conceived, and will be more of a life than any work that has ever yet appeared.” His expectations were not deceived. The book, which appeared in 1791, was received with the greatest eagerness and delight; and in 1793 a second edition was published. The author’s triumph and self- satisfaction were complete; but meantime the evil habits he had contracted during a dissipated life were ruining his health, both of mind and body. He was in his later years an habitual drunkard, and the hypochondria, from which he had always suffered at intervals, terribly increased, He died after a short illness on the 19th May 1795, at the age of 5D.

Boswell’s character is curious and somewhat con- tradictory. He was vain of his birth, and of his own talents, sensual and self-indulgent, inquisitive and un- dignified ; and all these faults he parades with a per- fectly childish naiveté ;—not certainly without conscious- ness that they were faults, for he is constantly repenting of his sins and framing the best of resolutions, swearing “like an ancient Pythagorean to observe silence, to be grave and reserved though cheerful and communicative.” “ One great fault of mine,” he says, “‘is talking at random. I will guard against it.” But he was, as he has himself admitted, “utterly wanting in solidity and force of mind.” His egotism and vanity were excessive, and he exposes these qualities with the greatest frankness to his friend Temple. “I, James Boswell, Esq.,” he writes on one occasion,—‘“‘ you know what vanity that name includes,” And again with reference to one of his rivals in Johngonian literature, he writes; “ Hawkins is, no doubt, very malevolent ; observe how he talks of me as quite unknown.” The peculiar weakness of his intellect and exuberance of his spirits hurried him into absurdities and follies, and made him the butt of the society in which he moved. Yet he was far from having no redeeming qualities. He was genial and friendly, of cultured literary taste, and of no

inean powers of mind. It was not a mere frivolous, foolish, prating sot who could appreciate the great qualities of Johnson, and devote himself to a friendship from which he derived no profit and little praise. And assuredly it was not by his unrivalled powers as a fool that Boswell has produced the best biography the world has yet seen. He was not only, as Macaulay admits, a man of quick observa- tion and retentive memory, hut he had also grasped with complete consciousness the true idea of biography, which he had learned from his great teacher. Johnson valued biography, because it gives us what comes home to ourselves;

he thought that no one could write a real life unless he had

lived in social intercourse with the man of whom he wrote, and laid it down as the duty of a biographer to give a full account of the person whose life he is writing, and to discriminate him from all other persons, by any peculiarities of character or sentiment he may happen to have. All these hints were taken hold of and assimilated by Boswell, and the result was a biography which has no equal in our own or in any other literature, which, so far from losing its popularity, is as much esteemed now as when first given to the world, and on which it seems superfluous even to bestow laudation. Johnson was undoubtedly 4 great man, but he would never have been to us more than a mere name had it not been for Boswell's life. Through that life he is known to us as no other English writer is ; his faults and weaknesses, his grand powers of mind and rugged moral strength,—his whole personality is revived for

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us. We know him as he actually lived and moved among his fcllow-men. 'The very lights and shades thrown on his character by the narrative give it additional force, for they convince us of its intense truth and reality. Nor is it only as a life of Johnson that Boswell's book has value for us ; itis the most important contribution yet made to a knowledge of actual living and thinking in the 18th century. "It is not speaking with exaggeration," says Carlyle, "but with strict measured sobriety, to say that this book of Boswell's will give us more real insight into the history of England, during those days, than twenty other books, falsely entitled ' Histories,' which take to theniselves that special aim."

A short memoir of Boswell was written by Malone and

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HEscience of Botany includes everything relating to the Vegetable Kingdom, whether in a living or in a fossil state. Its object is not, as some have supposed, merely to name and arrange the vegetable productions of the globe. It embraces a consideration of the external forms of plants —of their anatomical structure, however minute—-of the functions which they perform—of their arrangement and classification—of their distribution over the globe at the present and at former epochs—and of the uses to which they are subservient. It examines the plant in its earliest state of development, when it appears as a simple cell, and follows it through all its stages of progress until it attains inaturity. It takes a comprehensive view of all the plants which cover the earth, from the minutest lichen or moss, only visible by the aid of the microscope, to the most. gigantic productions of the tropics. It marks the relations which subsist between all members of the vegetable world, and traces the mode in which the most despised weeds contribute to the growth of the mighty denizens of the forest. The plants which adorn the globe more or less in all

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will be found in Nichol’s Literary Anecdotes. It is also reprinted, with some extracts from Boswell’s letters to Malone, in the edition of the Life published by Bohn, 1859. The Letters to W. J. Temple and Andrew Erskine were printed in 1857; in the introduction will be found a pretty complete notice of Boswell’s minor writings. Dos- welliana have been published in the second volume of the Philobiblon Society Miscellanies, 1855-6, and by Dr Charles Rogers, 1874. Editions of Boswell’s great work are very numerous; perhaps the amended form of Croker’s first edition, by Wright (Bohn, 10 vols., 1859), is the most The famous essays on Boswell by Macaulay and Carlyle may be taken as mutually corrective and supple-mentary.

ANY

He is called by Linnzeus primus verus systematicus. In his work De Plantis, published at Florence in 1583, he dis- tributed the 1520 plants then known into fifteen classes— the distinguishing characters being taken from the fruit.

John Ray, a native of Essex, did much to advance the science of botany. He was born in 1628, and died in 1705. He promulgated a system which may be considered as the dawn of the “natural system” of the present day (Ray, Methodus Plantarum, 1682). He separated flower- ing from flowerless plants, and divided the former into Dicotyledons and Monocotyledons. His orders were founded on a correct idea of the affinities of plants, and he far outstripped his contemporaries in his enlightened views of arrangement.

About the year 1670 Dr Robert Morison! of Aberdeen published a systematic arrangement of plants. He divided them into eighteen classes, distinguishing plants according as they were woody or herbaceous, and taking into account the nature of the flowers and fruit. In 1690 Rivinus? pro- mulgated a classification founded chiefly on the forms of the flowers. Tournefort®? about the same time took up

countries must necessarily have attractcd the attention of | the subject of vegetable taxonomy. He was a contemporary mankind from the earliest times. The science that treats | of Ray, and was professor of botany at Paris in 1683. of them dates back to the days of Solomon, for that | He was long at the head of the French school of botany, wise monarch “spake of trees,” from the cedar of | and published a systematic arrangement in 1694-1700. Lebanon to the hyssop on the wall. The Chaldeans, | He described about 8000 species of plants, and distributcd Rgyptians, and Greeks werc the early cultivators of | them into twenty-two classes, chiefly according to the form science, and Botany was not neglected, although the study | of the corolla, distinguishing herbs and under-shrubs on the of it was mixed up with crude speculations as to vegetable | one hand from trees and shrubs on the other. The system

life, and as to the change of plants into animals. Alscu- Japius and his priests, the Asclepiades, who studied the art of medicine, had their attention directed to plants in a pharmaceutical point of view. About 300 years before Christ Theophrastus wrote a History of Plants, and described about 500

species used for the treatment of diseases. Dioscorides, a Greek writer, who appears to have flourished about the time of Nero, issued a work on Materia Medica. The elder Pliny described about a thousand plants, many of them famous for their medicinal virtues. Asiatic and Arabian writers also took up this subject. Little, however, was done in the science of botany, properly so called, until the 16th century of the Christian era, when the revival of learning dispelled the darkness which had long hung over Europe. Brunfels, a physician of Bern, has been looked upon as the restorer of the science in Europe. He published a History of Plants, iMustrated by figures, about the beginning of the 16th century.

One of the earliest attempts at a methodical arrangement of plants was made in Florence by Andreas Cesalpinus, a native of Arezzo, some time professor of botany at Padua, and afterwards physician to Pope Clement VIII.

of Tournefort was fora long time adopted on the Continent, but was ultimately displaced by that of Linnzus.

Carl von Linné, or, as he is commonly called, Linnzus,* was born on the 23d of May 1707, at the village of Roos- hoolt (Rashult),in Smaland, a province of Sweden, where his father, Nicholas Linnzeus, was clergyman. He entered as a pupil at the University of Lund, and about the years 1727-28 was received into the house of Stobzus, a physician in that city, where he had abundant opportunities of prosecuting natural history. He afterwards proceeded to Upsal, and had to struggle with great difficulties during his studies there. He aided Celsiusin his [erobotanicon, or account of the plants of Scripture, and he became assist- ant to Rudbeck, professor of botany. He afterwards travelled in Lapland, took his degree in Holland, visited

1 Morison, Preludia Botanica, 1672; Plantarum Historia Univer- salis, 1680.

2 Rivinus (Augustus Quirinus) paterno nomine Bachmann, Jntro- ductio generalis in Rem Herbariam, Lipsie, 1690.

8 Tournefort, Hlémens de Botanique, 1694; Institutiones Ret Herbarice, 1700.

4 Linneus, Systema Nature, 1735; Genera Plantarwm, 1787 3 Philosophia Botanica, 1751 ; Species Plantarum, 1758.

England, and commenced practice in Stockholm, where he lectured on botany aud mineralogy. He finally became professor of botany at Upsal, and was one of the most popular lecturers of the day. He died on the 8th of January 1778, in the 71st year of hisage. His herbarium is now in the possession of the Linnean Society.

One of his biographers, in summing up his merits, says, —‘ Educated in the severe school of adversity, accustomed from his earliest youth to put a high value on verbal accu- racy and logical precision, endowed with a powerful understanding, and capable of undergoing immense fatigue, both of body and mind, Linneus produced a most impor- tant revolution in botanical science. He improved the distinctions of genera and species, introduced a_ better nomenclature on the binomial method, and invented a new and comprehensive system founded on the stamens and pistils. His verbal accuracy and the remarkable terseness of his technical language reduced the crude matter that was stored up in the folios of his predecessors into a form which was accessible to all men. He separated with singu- lar skill the important from the unimportant in their descriptions. He arranged their endless synonyms with a patience and a lucid order that were quite inimitable. By requiring all species to be capable of a rigorous defini- tion, not exceeding twelve words, he purified botany from the endless varieties of the gardeners and herbalists; and by applying the same strict principles to genera, and reducing every character to its differential terms, he got rid of the cumbrous descriptions of the old writers. It is said of Linneus, that, although no man of science ever exercised a greater sway, or had more enthusiastic admirers, yet his merit was not so much that of a discoverer as of a judicious and strenuous reformer. The knowledge which he displayed, and the value and simplicity of the improve- ments which he proposed, secured the universal adoption of his suggestions, and crowned him with a success alto- gether unparalleled in the annals of science.”

‘The system of Linnzeus is founded on the sexes of plants, and hence it is often denominated the sexual system. It is called an artificial method,

because it takes into account only a few marked characters in plants, and does not pro- pose to unite them by natural affinities. It is an index to a department of the book of nature, and as such is useful to the student. It does not aspire to any higher character, and although it cannot be looked upon as a scientific and uatural arrangement, still it has a certain facility of appli- cation which commends it to the tyro. In using it, how- ever, let it ever be remembered, that it will not of itself give the student any view of the true relations of plants as regards structure and properties, and that by leading to the discovery of the name of a plant, it is only a stepping- stone to the natural system. Linnzus himself claimed nothing higher for it. He says—‘ Methodi Naturalis frag- menta studiose inquirenda sunt. Primum et ultimum hoc in botanicis desideratum est. Natura non facit saltus. Plantz omnes utrinque affinitatem monstrant, uti terri- torium in mappa geographica.” Accordingly, besides his artificial index, he also promulgated fragments of a natural method of arrangement.

The Linnean system was strongly supported by Sir James Edward Smith, who adopted it in his Hnglish Flora, and who also became possessor of the Linnean collec- tion. The system was for a long time the only one taught in the schools of Britain, even after it had been discarded by those in France and in other Continental countries.

The foundation of Botanic Gardens during the 16th and 17th centuries did much in the way of advancing botany. They were at first appropriated chiefly to the cultivation of medicinal plants. This was especially the case ut universities, where medical schools existed. The

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first Botanic Garden was established at Padua in 1545, and was followed by that of Pisa. ‘The garden at Leyden dates from 1577, that at Leipsic from 1579. Gardens also early existed at Florence and Bologna. The Mont- pellier Garden was founded in 1592, that of Giessen in 1605, of Strasburg in 1620, of Altorf in 1625, and of Jena in 1629. The Jardin des Plantes at Paris was established in 1626, and the Upsal Garden in 1627. The Botanic Garden at Oxford was founded in 1632. The garden at Edinburgh was

founded by Sir Andrew Balfour and Sir Robert Sibbald in 1670, and, under the name of the Physic Garden, was placed under the superintendence of James Sutherland, afterwards professor of botany in the university. The park and garden at Kew date from about 1730. ‘The garden of the Royal Dublin Society at Glas. nevin was opened about 1796; that of Trinity College, Dublin, in 1807; and that of Glasgow in 1818. The Madrid Garden dates from 1763, and that of Coimbra from 1773. Gesner states that at the end of the 18th century there were 1600 Botanic Gardens in Europe.

A new era dawned on botanical classification when Antoine Laurent de Jussieu appeared. He was born at Lyons in 1748, and was educated at Paris under the care of his uncle, Bernard de Jussieu. At an early age he became botanical demonstrator in the Jardin des Plantes, and was thus led to devote his time to the science of botany. Being called upon to arrange the plants in the garden, he necessarily had to consider the best method of doing so, and adopted a system founded in a certain degree on that of Ray, in which he embraced all the discoveries in organography, adopted the simplicity of the Linnean definitions, and displayed the natural affinities of plants, His Genera Plantarum, begun in 1778, and finally pub- lished in 1789, indicated an important advance in the principle of classification. Jussieu subsequently became professor of rural botany; he died in 1836 at the age of 88.

The system of Jussieu made its way slowly in Great Britain, and it was not until Robert Brown brought it under notice that it was adopted.’ It is now the basis of all natural classifications. One of the early supporters of this natural method was Augustin Pyrame De Candolle, who was born in 1778, and who, after attending the lectures of Vaucher at Geneva, devoted himself to botanical pursuits. He subsequently prosecuted his studies at Paris, and lectured on botany at the College of France. He commenced his publications in 1802, and in 1804 he pro- mulgated his Elementary Principles of Botany. In 1807 he became professor of botany at Montpellier, and in 1816 he was appointed to the chair of natural history at Geneva, with the charge of the Botanic Garden. In that city he carried on his future botanical labours, and began his Prodromus Systematis Naturalis Regni Vegetabils,

which was intended to embrace an arrangement and

description of all known plants. He was enabled to complete eight volumes of the work before his death, and it has since been carried on by his son Alphonse De Candolle, with the aid of other eminent botanists. It now embraces descriptions of the genera and species of Dicotyledonous plants. The system followed by De Candolle is a modification of that of Jussieu, and it is adopted more or less at the present day. De Can- dolle's own herbarium was extremely rich. He had visited and carefully examined many of the most exten- sive collections, especially those of Paris; and many entire collections, as well as separate families, on which he was specially engaged, were from time to time submit- ted to his examination by their possessors, He had thus

1 Brown, Prodromus Flore Nove Hollandia, 1810.

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opportunities of comparison greatly beyond what in ordinary circumstances fall to the lot of an individual. His library, too, was stored with almost every important publication that could be required for his undertaking. With such ample materials, aided by his untiring zeal and the persevering energy of his character, he steadily pursued his allotted task, and only ceased to labour at it when he ceased to live. For some years his health declined, and it is to be feared that the severe and incessant attention which he paid to the elaboration of the great family of Compositz had made a deep inroad upon it. Asa relaxa- tion from his labours he undertook in the last years of his life a long journey, and attended the scientific meeting held at Turin; but he did not derive from this the antici- pated improvement in his health, which gradually failed until his death on the 9th September 1841. Since De Candolle's time various modifications of his system have been introduced by Endlicher, Lindley, Hooker, and Bentham.

In arranging plants according to a natural method, we require to have a thorough knowledge of structural and morphological botany, and hence we find that the advances made in these departments have materially aided the efforts of systematic botanists.

Robert Brown, a Scottish botanist, was the first in this country to support and advocate the natural system of classification. The publication of his Prodromus Flore Nove Hollandie, according to the natural method, led the

way to the adoption of that method in the universities:

and schools of Britain. Sir William (then Dr) Hooker, in his prelections in the University of Glasgow, and in his numerous writings, ably supported Brown. John Lindley also came into the field, and in 1830 published the first edition of his Introduction to the Matural System, Dr Robert Kaye Greville and Dr Walker Arnott were able coadjutors, more especially in the department of Crypto- gamic Botany. From the year 1832 up to 1859 great advances were made in systematic botany, both in Britain and on the continent of Europe. Endlicher's Enchiridion and Genera Plantarum, De Candolle's Prodromus, and Lindley's Vegetable Kingdom became the guides in syste- matic botany, according to the natural system.

The following remarks embrace the views of Mr Bentham on the change from the Linnean to the natural system of classification :—" The change from the technical to the scientific study of plants was now complete. The Linnean platform, established on the relation of genera and species, had now been so long and so universally adopted as the basis or starting point, that the credit due to its founder was almost forgotten, and it was superseded by the Jussiean method, although it was chiefly by the consistent following out the principles laid down by Linneus himself that the change had been effected. Plants were now grouped upon a philosophical study of their affinities, whether morphological, structural, or physiological."

In all classification it is necessary to define what is meant by species. The usual definition of the term has been that a species (as regards the present epoch of the earth's history) is an assemblage of individuals having characters in common, and coming from an original stock or protoplast, and their seeds producing similar individuals. It was also supposed that variation in species was restrained Within certain limits, and that varieties had a tendency to revert to the parent form. 'The view, however, adopted by many now-a-days is, that the tendency to variation is continuous, and that, after a lapse of long periods of time, and under the influence of varying

external conditions, the descendavts from a common stock may exhibit the differences which characterize distinct

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species. These are the views which are advanced by Darwin, and which imply a complete revolution in our idea of species. his theory is thus stated by Bentham :—

1. That although the whole of the numerous offspring of an individual plant resemble their parent in all main points, there are slight individual differences.

2. That among the few who survive for further propagation, the great majority, under ordinary circumstances, are those which most resemble their parent, and thus the Species is continued with- out material variation.

3. That there are, however, occasions when certain individuals, with slightly diverging characters, may survive and reproduce races, in which these divergencies are continued even with increased intensity, thus producing Varieties.

4. That in the course of an indefinite number of generations cir- cumstances may induce such an increase in this divergency, that some of these new races will no longer readily propagate with each other, and the varieties become New Species, more and more marked as the unaltered or less altered races, descendants of the common parent, have become extinct.

5. That these species have in their turn become the parents of groups of species, that is Genera, Orders, &c., of a higher and higher grade, according to the remoteness of the common parent, and more or less marked, according to the extinction or preservation of unaltered primary, or less altered intermediate, forms.

As there is thus no difference but in degree between a variety and a species, between a species and a genus, between a genus and order, all disputes as to

the precise grade to which a group really belongs are vain. It is left in a great measure to the judgment of the systematist, with reference as much to the use to be made of his method as to the actual state of things, how far he should go in dividing and subdividing, and to which of the grades of division and subdivision he shall give the names of Orders, Sub-orders, Tribes, Genera, Subgenera, Sections, Species, Sub-species, Varieties, dc. with the consequent nomen- clature.

Such a systematic arrangement is founded on a hypo- thesis which, so far as the present flora of the globe is con- cerned, cannot be demonstrated. Conjecture is hazarded as to the present epoch of the earth's history, by extending back to unlimited ages. If the theory is consistent with what we see around us, and is founded on plausible grounds, then we must think that we have ascertained the plan followed by the great Creator, Designer, and Upholder of all things, that we have been able to ascertain and follow His work- ings, and the mode in which He has created the diverse plants which have covered our globe in time and space. This new phase of systematic botany, however, requires more definite data to lead to its adoption as an explana- tion of the plan of creation.

The Physiology of plants did not keep pace with the advance in Classification. Grew and Malpighi were the earliest discoverers in this department of botany. Hales also contributed to it by his observations on the motion of fluids in plants. The subject of fertilization was one which early excited attention.

The idea of the existence of separate sexes in plants was entertained in early times, long before separate male and female organs had been demonstrated. The produc- tion of Dates in Egypt, by bringing two kinds of flowers into contact, proves that in very remote periods some notions were entertained on the subject. Female Date Falms only were cultivated, and wild ones were brought from the desert in order to fertilize them. Herodotus informs us that the Babylonians knew of old that there were 'male and female Date-trees, and that the female required the concurrence of the male to become fertile. This fact was also known to the Egyptians, the Phoenicians, and other nations of Asia and Africa. The Babylonians suspended male clusters from

wild Dates over the females ; but they seem to have supposed that the fertility thus produced depended on the presence of — flies among

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the wild flowers, which, by entering the female flowers, caused them to set and ripen. The process was called palmification. Theophrastus, who succeeded Aristotle in his school in the 114th Olympiad, frequently mentions the sexes of plants, but he does not appear to have determined the organs of reproduction. Pliny, who flourished under Vespasian, speaks particularly of a male and female Palm, but his statements were not founded on any real knowledge of the organs. From Theophrastus down to Cesalpinus, who died at Rome in 1603, there does not appear to have been any attention paid to the reproductive organs of plants. Casalpinus had his attention directed to the subject, and he speaks of a halitus or emanation from the male plants causing fertility in the female.

Grew seems to have been the first to describe, in a paper on the Anatomy of Plants, read before the Royal Society in November 1676, the functions of the stamens and pistils. Up to this period all was vague conjecture. Grew speaks of the aétire, or the stamens, as being the male parts, and refers to conversations with Sir Thomas Millington, Savilian professor at Oxford, to whom the credit of the sexual theory seems really to belong. Grew says that, ‘when the attire or apices break or open, the globules or dust falls down on the seedcase or uterus, and touches it with a prolific virtue.” Ray adopted Grew’s views, and states various arguments to prove their correctness in the preface to his work on European plants, published in 1694. In 1694 Camerarius, professor of botany and medicine at Tiibingen, published a letter on the sexes of plants, in which he refers to the stamens and pistils as the organs of repro- duction, and states the difficulties he had encountered in determining the organs of Cryptogamic plants. In 1703 Samuel Morland, in a paper read before the Royal Society, stated that the farina (pollen)is a congeries of seminal plants, one of which must be conveyed into every ovum or seed before it can become prolific. In this remarkable state- ment he seems to anticipate in part the discoveries after- wards made as to pollen tubes, and more particularly the peculiar views

promulgated by Schleideu. In 1711 Geoffroy, in a memoir presented to the Royal Academy at Paris, sup- ported the views of Grew and others as to the sexes of plants. He states that the germ is never to be seen in the seed till the apices (anthers) shed their dust; and that if the stamina be cut out before the apices open, the seed will either-not ripen, or be barren if it ripens. He mentions two experiments made by him to prove this—one by cut- ting off the staminal flowers in Maize, and the other by rearing the female plant of Mercurialis apart from the male. In these instances most of the flowers were abortive, but a few were fertile, which he attributes to the dust of the apices having been wafted by the wind from other plants.

Linneus was the next botanical author who took up the subject, and by his sexual system he may be said to have opened a new era in’‘the history of botany. He first published his views in 1736, and he thus writes—“Antheras et stigmata constituere sexum plantarum, a palmicolis, Mill- ingtono, Grewio, Rayo, Camerario, Godofredo, Morlando, Vaillantio, Blairio, Jussievio, Bradleyo, .Royeno, Logano, &c., detectum, descriptum, et pro infallibili assumptum ; nec ullum, apertis oculis considerantem cujuscunque plant flores, latere potest.” He divided plants into sexual and asexual, the former being Phanerogamous or flowering, and the latter Cryptogamous or flowerless. In the latter divi- sion of plants he could not detect stamens and pistils, and he did not investigate the mode in which their germs were produced. He was no physiologist, and did not promulgate any views as to the embryogenic process. His followers were chiefly engaged in the arrangement and classification of plants, and while descriptive botany made great advances,

the physiological department of the science was neglected, His views were not, however, adopted at once by all, for we find Alston stating arguments against them in his Désser- tation on the Sexes of Plants. Alston’s observations were founded on what occurred in certain unisexual plants, such as Mercurialis, Spinach, Hemp, Hop, and Bryony. The conclusions at which he arrives are those of Pontedera, that the pollen is not in all flowering plants necessary for impregnation, for that fertile seeds can be

produced with- out its influence. He supports parthenogenesis in some plants. Soon after the promulgation of Linnzus's method of classification, the attention of botanists was directed to the study of Cryptogamic plants, and the valuable work of Hedwig on the reproductive organs of Mosses made its appearance in 1782. He was one of the first to point out the existence of certain cellular bodies in these plants which appeared to perform the functions of reproductive organs, and to them the name of antheridia and pistillidia were given, This opened up a new field of research, and led the way in the study of Cryptogamic reproduction, which has since been much advanced by the labours of numerous botanical inquirers. The interesting observa- tions of Morland, already quoted, seem to have been neglected, and no one attempted to follow in the path which he had pointed out. Botanists were for a long time content to know that the scattering of the pollen from the anther, and its application to the stigma, were necessary for the production of perfect seed, but the stages of the process of fertilization remained unexplored. The matter seemed involved in mystery, and no one attempted to raise the veil which hung over the subject of embryogeny. The general view was, that the embryo originated in the ovule, which was in some obscure mauner fertilized by the pollen.

In 1815 Treviranus roused the attention of botanists to the development of the embryo, but although he made valuable researches, he did not add much in the way of new information. In 1823 Amici discovered the exist- ence of pollen tubes, and he was followed by Brongniart and Brown. 'The latter traced the tubes as far as the nucleus of the ovule. These important discoveries mark a new epoch in embryology, and may be said to be the foundation of the views now entertained by physiologists, which have been materially aided by the subsequent eluci- dation of the process of cytogenesis, or cell-development, by Schleiden, Schwann, Mohl, and others, The whole subject has been investigated recently with great assiduity and zeal by physiologists, as regards both Cryptogamous and Phanerogamous plants. The formation of germinal vesicles in the ovule, and the development of the embryo in flowering plants, have been fully considered by Griffith, Schleiden, Mirbel, Spach, Meyen, Schacht, Mohl, Unger, Naudin, Radlkofer, and others; the embryogenic process in Coniferous plants and in the higher Cryptogams by Hof- meister, Henfrey, Suminski, Mettenius, Strasburger, Hichler, Baillon, Cohn, Pringsheim,

Millardet ; and that of the lower Cryptogams by Thuret, Bornet, Decaisne, and Tulasne. The observations of Darwin as to the fertilization of Orchids, Primula, Linum, and Lythrum, and the part which in- sects take in this function, have opened up a new era in Physiological Botany. He has been followed by Hermann Miller. Darwin's experiments in reference to the move- ments of climbing and twining plants, and of leaves in insectivorous plants, have opened up a wide field of inquiry which he has cultivated with eminent success and with most important results. Among other authors who have contributed to the advance of Vegetable Physiology may be named Hoffmann, Sachs, Van Tieghem, Prillieux, Dehe- rain, and Famintzen. We have thus been enabled to come to certain general conclusions on this obscure subject, and

future observers have been directed in the proper path of investigation.

In the Physiological department of botany the most important researches have been made by French and German botanists. The laboratories in connection with schools in Germany offer facilities for study which do not exist to the same extent in Britain. Physiological researches demand not only a Botanic Garden with its appendages, but apparatus of various kinds, means of pro- secuting histological and chemical investigations, physical experiments, and observations by the spectroscope. Our schools require then not only lecture-rooms, but labora- tories well fitted up with all needful appliances, and salaried assistants to aid the teachers in their demonstra- tions and the pupils in their practical work.

The department of Geographical Botany has made rapid advance by means of the various scientific expeditions which have been sent to all quarters of the globe; and the question of the mode in which the floras of islands and of continents have been formed has given rise to important speculations by such eminent botanical tra- vellers as Darwin and Hooker. The latter has published a valuable paper on insular floras. Under this depart- ment the connection between climate and vegetation has been carefully studied both by botanists and by meteorolo- gists, Among the contributors to this department of botany the following authors may be noticed—Humboldt, Schouw, Meyen, Berghaus, Martius, Harvey, Hooker.

The subject of Paleontological Botany has been much advanced of late by the researches of botanists and geo- logists. The use of the microscope in the examination of tissues has aided much in the determination of fossil plants. The more accurate study of Organography has also been the means of correcting errors in diagnosis. The nature of the climate at different epochs of the earth's history has also been determined from the character of the flora. The works of Brongniart, Goeppert, and Schimper have advanced this department of science. Among others who have contributed valuable papers on the subject may be noticed Heer, who has made observa- tions on the Miocene flora, especially in Arctic regions ; Saporta, who has examined the Tertiary flora ; Dawson and Lesquereux, who have reported on the Canadian and American fossil plants ; and Williamson, who has made a careful examination of many of the coal fossils, and whose excellent drawings of structure have opened a new light on the character of many of the genera. Delineations of fossils by Witham, Lindley and Hutton, and Carruthers, have tended much to advance our knowledge of the fossil flora of Britain.

Botany may be divided into the following departments :— 1. Structural Botany, having reference to the anatomical structure of the various parts of plants, including Vegetable Histology, or the microscopic examination of tissues; 2. Morphological Botany, the study of the form of plants and their organs—(these two departments are often included under the general term of Organography) ; 3. Physiological Botany, by some termed Organology, the study of the life of the entire plant and its organs, or the consideration of the functions of the living plant; 4. Systematic Botany, the arrangement and classification of plants; 5. Geographical Botany, the consideration of the mode in which plants are distributed over the different regions of the globe; 6. Paleontological Botany, the study of the forms and structures of the plants found in a fossil state in the various strata of which the earth is composed.

In the present article we shall confine our attention to the Structure and Morphology of Plants. The limits and classi- fication of the Vegetable Kingdom have been partly con-

sidered under BioLocy (vol. iii. pp. 690-696). The Classi- fication of Plants will be taken up in extenso under the head- ing VEGETABLE Kinepom, and the Distribution of Plants in space and time will be treated of in separate articles,

STRUCTURAL ELEMENTS OF PLANTS.

The elementary structure which is the foundation of The cell.

all vegetable tissue is the cell. In the young succulent bud of a growing stem each cell consists of an outer firm, elastic membrane of cellulose constituting a cell-wall ; within this, a gelatinous soft mass of protoplasm, of which there may be a portion distinctly marked off as a nucleus ; and, enclosed by the protoplasm, a cell-cavity containing a more or less watery fluid, the cell-sap (fig. 1). Such may be taken as the structure of a typical vegetable cell, which is thus a closed vesicle or sac with fluid or semi-fluid contents. Of these elements of the cell the protoplasm is that which is essential for its growth and development. In it are con- tained all the substances requisite for the formation of the cell-wall and the cell-sap; and the nucleus is merely a differentiated portion of it. From it then all the other parts of ‘ Fig. 1. See the cell are formed, and it is essen- Young cells from root of Frt- tial to the growth of the cell. Hence a ge, il he het it has received the appellation of ‘us nucleolus. (Sache primordial cell; and, indeed, amongst many Alge it exists for some time as a separate cell without any cell- wall or other part. This must be borne in mind when defining the cell as a sac or vesicle. The growth of the cell is usually, at first, uniform throughout, and it has therefore a more or less rounded form ; but, according to the function which it is destined eventually to perform, one or other, or it may be all, of the parts of the cell become modified or specially developed. The cell-wall may be greatly thickened ; or it may grow more in one direction than another, so as to be elongated and form protuberances ; or perforations may occur ; or several similar cells arranged in a longitudinal series may, by obliteration of the interposed septa, unite to form along tube which is then called a vessel. The protoplasm in the process of growth may be completely absorbed ; and when this occurs growth ceases and the cell-walls form merely aframework. It may, how-

ever, remain a long time, assuming various shapes and often uniting with colouring matters. The cell-sap also may disappear or may remain, containing in solution, or as definite forms in its mass, various assimilative substances, as fat granules, oil globules, starch, mineral crystals, dc. In some plants, as amongst Algz (Protococcus), one cell alone performs all the functions necessary for the exist- ence of the plant. We have thus in this cell an epitome of vegetable life, and this is the most perfect form of cell.

_As we pass to the higher forms of plants, where many cells

are united, we find a physiological specialization taking place, by which certain cells are set apart for assimilation, some being embryonal, some supporting, and others pro- tective, &c. Amongst such plants as Ferns and ordinary Flowering Plants a further differentiation takes place, and some of these cells unite to form true vessels, We thus have a means of arranging all plants in two groups, viz., those whose tissues consist entirely of cells, cellular plants (including Fungi, Algse, Mosses, &c.); and those in which vessels are present, vascular plants (including Ferns, Lycopods, and ordinary Flowering Plants),

1. Cells and Vessels—Cellular and Vascular Tissues. Cells united together constitute cellular tissue (fig. 2).

Cells and vessels,

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It exists in all plants and abounds in fleshy roots, stems, leaves, and in succulent fruits, It constitutes the pith and outer bark of trees, and is very abundant in the centre of the stem of the Aralia (Fatsia) papyrifera, whence Chinese rice-paper is derived by cutting it into thin sheets. By cultiva- tion the Turnip, Carrot, Cabbage, and other esculent vegetables acquire much cellular tissue, and become tender and succulent. The cells of the tissue vary much in size. In acubic inch of a leaf of the Carnation there are said to

be upwards of three millions of cells. They are frequentlyseen yo/5pth, sd oth, and +4 ,th of an inch in diameter. Insome of the Cucum- ber tribe, and in the pith of aquatic plants, cells = th aud jth of an inch in diameter occur.

In young cells the cell-wall is a thin membrane consist- ing of cellulose, with some water and a certain amount of incombustible material. It is permeable by water, is slightly extensible and elastic, and is colourless. It dissolves in_sulphuric acid, and upon addition of iodine and sulphuric acid assumes a deep blue colour. By intus- susception of nutrient material, 2.¢., the interposition of new molecules between those pre-existing, the cell-wall increases both in surface-extent and in thickness. The resulting cell- wall is not, however, uniform in its structure, but is composed of lamellee of different refractive power, in which the cellulose is combined alternately with much and with little water. These alternating dense and watery layers, —of which one set is concentric with the cell-wall, whilst two other series are vertical or oblique to the surface of the cell- wall, and cut the concentric ones throughout the whole thickness of the wall,—-under a high power of the micro- scope present a series of mutually intersecting lines, and constitute respectively what are termed the stratisication and striation of the cell-wall.

Independently of these changes in the structure of the cell-wall, consequent on its increase in surface-extent and thickness, which will be presently noticed, there are other changes of a chemical nature which take place during the growth of the cell, and which so affect its wall as to break it into distinct “ shells,” which differ both chemically and physically from the original cell-wall. Thus, in the epidermis or outer cellular covering of plants, the outer- most portion of the outer wall of the cells becomes converted into an elastic substance, quite impervious to water, which acts as a protective covering. This substance is known as cork or cuticular matter.. Another alteration is the conversion of the layers of the cell-wall into woody matter, by a process of lignification, or formation of wood. Or, again, layers of the cell-wall may be converted into mu- cilaginous substance, i.e., absorbing water, and becom- ing gelatinous, as in the cells of pith of Astragalus Tra- gacantha,—which furnishes gum tragacanth,— and the outer cells of the seed of the Common Flax. Lastly, mineral matters may be deposited in the cell-wall, such as lime, silica, &c., so abundantly in

some instances as to constitute, after burning, a perfect skeleton of the cell-wall. In all these cases, however, of alteration of layers of the cell-wall, an innermost layer, giving all the reactions of pure cellulose, may be observed. If growth in surface- extent proceeded uniformly over the whole of a cell-wall the resulting structure would be a more or less rounded vesicle ; but at different points portions grow more rapidly than at others, and thus cells, originally oval or spherical, may become cylindrical, conical, &. The changes con- sequent on unequal growth in thickness are, however, much more 1mportant, giving rise to altered appearances both on the outside and inside of the cell-wall. The external thick-

Fig. 2. Hexagonal complete cel- lular tissue from the pith of the Elder,

enings are most usually projections in the form of spines, knobs, &c., as in some pollen-grains, and in cilia connected with the reproductive cells of many Alge (fig. 3), or club- shaped hygrometric filaments as in Equisetum (figs. 4, 5) , whilst the internal ones are more usually ridges—annular, spiral, or reticulate (figs. 11 and 12)—which may proceed so far as almost to obliterate the cavity of the cell-wall,

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Figs. 8 and 4.—Spore or reproductive cell of Equisetum, Horsetail, with two cla- vate hygrometric filaments. In fig.3 the filaments are expanded ina dry state; in 4 they are eurled round the spore on the application of moisture.

Fig. 5.—-Cell v, with vibratile filaments or cilia ¢, from Cheetophora.

Fig. 6.—Older cells than those repxesented in fig. 1. A, cell-wall; p, protopiasm with nucleus and nueleolus; s, vacuoles in the protoplasm filled with fluid cell-

The protoplasm, which lines the interior of the cell-wall, and which is the essential living portion of the cell, consists of albuminous substance mixed with water and some in- combustible materials, and it also contains some organic compounds. Itis a homogeneous, soft, gelatinous substance. As we usually find it in cells it has a granular and turbid appearance. This arises from an admixture of formative matters, to which the name metaplasm has been applied. It is coagulated by heat, and is soluble in a dilute solution of caustic potash ; iodine solution colours it yellow or brown, whilst strong sulphuric acid at first colours it rose-red, subsequently dissolving it. Usually, at points in the interior, drops of fluid become differen- tiated as vacwoli (fig. 6), which may subsequently coalesce, and thus the protoplasm may be- Ho, come @ sac containing cell-sap ; Yi \ and if growth of the cell-wall con- ast J

ay.

tinues the protoplasm eventually forms a mere lining of the cell- wall constituting the primordial utricle of Von Mohl. The proto- plasm in some cells exhibits pheno- mena of movement within the cell- wall of a definite character. Thus in the internodal cells of Characeze (fig. 7) a movement of protoplasm round the longest diameter of the cell is seen, and in the hairs of Trades- cantia (Virginian Spiderwort) a cir- culation of protoplasm occurs. These constitute the phenomena of rotation and cerculation.

The nucleus (fig. 1, £) is present in the cells of all the higher plants. It is a small rounded differentiated por- tion of the protoplasm, and frequently contains vacuoles, which are termed nucleoli (fig. 1, kk). It may be in the centre of the cell or close to the sides, but it may change its position. Portions of the protoplasm are also differentiated as grains

Fig. 7.

A small portion of a Chara magnified to show the intra- eellular circulation. The arrows mark the direction of the eourse of the proto- plasm in the cells. The clear spaees are parts where there is no movement.

or granules, to which colouring matters are attached ; but

The pro toplasn,

these will be noticed hereafter. The protoplasm in old Under the term plewrenchyma (fig. 8) is included tissue Pleuren- cells may disappear, and then all growth ceases, andthe cells | composed of such elongated prosenchymatous, flexible, chyma. consist of a mere framework; or it may remain, and then | thickened cells, as are found in the bast or phloém growth of the cell continues. And itis by are-arrangement | layers of ordinary trees. They also occur in the wood

of the molecules of this protoplasm that the formation of | portion. Their walls are thickencd regularly, and they con-

new cells begins,—the nucleus entering also into the pro- | stitute when united what is commonly known as the woody

cess. or bast fibre. The diameter of the woody fibres varies from

By the term cell-sap is meant the fluid contained in | soiggth to g}oth of an inch. The materials used for ropes the vacuoli. It consists in great part of water, in which | and cordage, linen, certain Indian muslins, mummy-cloths, are dissolved various salts, derived from without, and | and mats consist of the woody fibre of plants from which compounds formed by assimilation in the plant itself. | the more delicate tissues have been removed by maceration Amongst the latter we may mention inulin, a substance | in water. Flax or lint is thus procured from the bark of closely allied to starch and sugar, found in Composite | Linum usitatissimum, hemp from Cannabis sativa, New plants. Zealand flax from Phormium tenax, Pita flax from Agave

The term parenchyma (areolar, utricular, or vesicular | americana, Sun-hemp from Hibiscus cannabinus, and bass

tissue) is a general name for any form of cellular tissue, in | or bast from the common Lime or Linden-tree. Fibres which thin-walled cells of a diameter nearly equal in every | are also procured for manufacture from the Pine-apple direction are united to one another by broad surfaces (fig. | plant

(Ananassa sativa), from Yucca gloriosa, from Boh- 2). If the cells are pointed at both ends and have a length | meria nivea, which yields the Indian Rheea fibre, from greatly exceeding their breadth, there is formed prosen- | most of the plants belonging to the Mallow and Nettle chyma (fig. 8). Both tissues. may be complete (figs. 2 and | tribes, and from some Leguminous plants, such as Crota- | 8) or tncomplete (figs. 9 and 10), ze. the component cells | laria juncea, which supplies a kind of Bengal hemp. If may touch each other on every side and leave no inter- | the maceration of the fibre is carried to a great extent, a cellular spaces, or intercellular spaces may exist between | pulp is formed from which paper is manufactured. Pleu- the cells. According to the amount of surface-growth and | renchyma does not occur in cellular plants, such as Lichens, thickening of the cell-wall various forms of parenchy- | Sea-weeds, and Mushrooms. The tissues of these plants matous and prosenchymatous tissue result. Thus, in the | speedily disappear under the action of water, and hence, ‘ Rush and Bean we have a stellate parenchyma, with large | perhaps, the reason of their rarity in a fossil state. In the intercellular spaces (fig. 10), in the Elder pith a complete | very young state woody cells are delicate, and it is only in angular parenchyma (fig 2), and in the succulent stem of | proportion as they attain maturity that their walls acquire | the Cactus a spherical incomplete parenchyma (fig. 9). | a thick consistence. In the sap-wood of ordinary trees the Those forms of tissue in which the individual cells have | woody cells are thickened in their walls, but are pervious ; | been altered by thickening of the cell-wall are the most | while in the heart-wood they are rendered solid by the thickening matter, which is often variously coloured.

If the thickening of the cell-wall takes place so that a Spiral network, ring, or spiral of thickening matter is formed, then tissue. the cells are reticulated, annular (fig. 11), or spiral (fig.

12), as in the leaves of Sphagnum, hairs of Cactacez, and seed-coat of Casuarina. In these cells the spiral thickening fre- quently becomes loosened from the cell-wall as a spiral fibre, and can be unrolled. Such forms oc- cur in the outer covering of the seed of Collomia linearis and of the fruit of Salvia Verbenaca. In these, when placed in water, the *%,1tj>Anaular cell from the es spirals rupture the softened mem- Fic. 12. —Spiral eell from an Or eK brane of the cells, and spread out- — wards.

The spongy elastic character of the outer cellular covering of the roots of tropical Orchids and Aracee, of Plate XVI. the sepals of Illecebrum verticillatum, of the pericarp of fig. 2. Cachrys Morisoni and C. odontalgica, and of the ribs of

Fig. 11.

Fig. 10. the fruit of Aithusa Cynapium, is due to the presence of 4 Fig. 8. spiral cells. In the reproductive cells of Hepatice spiral fis & — Prosenchymatouncells Fie. 9,—Incomplete parenchyma, | fibres called elaters are found in connection with the spores.

re. ages or star-like cellular tissue of the Bean, with intercellular spaces | Reticulated or netted cells, produced by fibres forming a ; ; ; sort of mesh or network, occur in the wing of the seed of important ; and the alterations in the cell-wall consequent | Swietenia, in the pericarp of Picridium tingitanum and P. on growth in thickness may be such as to produce oblitera- | vulgare, in the seed-coat of Cucurbita Pepo, in the paren- tion of the septum between superposed cells, and their | chyma of the leaf of Sanseviera guineensis, and in isolated cavities, freely communicating, then give rise to a tube or | cells of the pith of Rubus odoratus and of Erythrina Vessel, a combination of which constitutes the vascular | Corallodendron. tessue of authors. Whilst this is the nature of a true vessel, If spiral, annular, or reticulated cells are arranged considerable confusion has arisen from the term being | in a longitudinal series, and the septum between adjoin- applied to any cell-like structure in which the longitudinal | ing cells gives way, then we have a spiral, annular, or reti- diameter exceeds the transverse ; and thus the difference | culated vessel (figs. 13, 15, 16) formed, and to this tissue | between a cell and a vessel became one of length only. | authors have given the name trachenchyma, on account ‘| The term vessel ought to be restricted to such as are formed | of its resemblance to the trachez or air-tubes of animals. by coalescence of cells. These vessels vary from gogqth to sAgth of an inch in

Bordered pits.

diameter, The spiral thickened portion of the wall of the vessel may become loosened from the membrane of the wall and form a spiral fibre in the interior. These fibres are elastic, usually rounded and simple; but sometimes two or more are combined so as to form a flat band. These flat ribands, consisting of fibres which vary in number from two to twenty-five, or more, are met with abundantly in the stems of Bananas and Plantains, and in the shoots of Asparagus. The spiral in such cases is called compound, and the vessels plevotrachee. The spiral fibres have such tenacity that when the vessels are ruptured they can be pulled out. This capability of being unrolled characterizes true spiral vessels (fig. 13). When the spiral is not loosened from the cell-wall and cannot. therefore be unrolled, it is said to be closed. On breaking the young shoots or leaf-stalks of the Geranium, Strawberry, and Rose, or the leaves of the Hyacinth, Amaryllis, and Banana, and pulling the parts gently asunder, the fibres can be easily seen in the form of. a fine cobweb. When the aerial stems of the Banana and Plantain are cut across, the spiral fibres may be pulled out in large quantity so as to be used for tinder. Generally, the coils or volu- tions of the fibre are said to be left-handed, that is, turning to the left of a person supposed to be in the axis. In the

Fig. 13. Fia. 13.—Spiral vessels of the Melon, showing the clastic fibres uncoiled, and the vessels overlapping at their pointed extremities a. Fie. 14. —Branching fibre, from spiral vessels of Gourd (Cucurbita Pepo). Fig. 15. —An annular vessel taken from the Melon plant. Fria, 16.—Reticulated vessel taken from the Melon plant.

garden Lettuce vessels are met with, some having the fibre turning to the left, others to the right. In the Scarlet Bean the coils of the fibres are left-handed, while the plant itself turns to the right in twining. Spiral vessels are abundant in young plants and shoots, while in the hard stems of trees and shrubs they chiefly surround the pith. Spiral vessels occasionally exhibit a branched appearance. This may arise from the union of separate vessels, or it may depend on a regular division of the fibres, as is seen in the Mistleto, House-leek, and Gourd (fig. 14). Annular vessels are those in which the thickening (or, if it be loosened from the wall of the vessel, the fibre) is in the form of rings (fig. 15). These rings in Mammillaria quadrispina, and in some other plants of the Cactus tribe, are very thick, and leave only a small

canal in the centre of the vessel. Annular vessels are from ,igth to zt5th of an inch in diameter. In reticulated vessels (fig. 16) the thickenings take the form of a network, All vessels of this type lose very early their protoplasmic contents, and serve to convey air,

In the process of thickening of the cell-wall, if large spaces of the cell-wall remain thin, and the thickening mass growing in a circular manner projects into the interior of the cell and gradually arches over the thin

ANY

portion of cell-wall, a dome-shaped cavity is enclosed

[STRUCTURAL

betwixt the thin cell-wall and the thickening mass. The

growing thickening mass gradually contracts the opening into this cavity, but never completely closes it. On front view this presents the appearance of two concentric circles, an outer marking the edge of the original thin portion of the cell-wall, and an inner indicating the under edge of the gradually contracting ring of thickening matter (fig. 17), When this process takes place on opposite sides of the parti- tion wall between two cells, there are then two similar cavyi- ties separated by the thin partition wall of the cells, each communicating freely by a small circular aperture with the cell in which it has been formed (figs. 17 and 18). In process

Fig. 17. Fig. 18. Fig. 19.

Fre. 17.—Radial longitudinal section of wood of Pinus sylvestris. a, cambium; b, ¢, d, e, J, wood cells; ¢, bordered pitsin an carly stage of formation, before the thickening ring has arched over the thin portion of cell-wall; ¢/, bordered pit

_ after the thickening mass has arched over the thin cell-wall; st, very large pits where in contact with medullary rays.

Fria. 18.—Diagram to show thickening dome on both sides of the partition wall.

Fra. 19,—Partition wall has given way and a single cavity is formed, communicating on both sides with adjacent cells. (These figures after Sachs.)

of growth the partition wall is absorbed, and then a lenticular cavity is formed, connected by a circular aperture on each side with adjacent cells (fig. 19), When viewed by trans- mitted light these present the appearance seen in fig. 17 ¢; such structures are termed bordered pits, and a collec- tion of such cells constitutes the disk-bearing or punctated tessue of authors. It is well seen in Firs and other cone bearing plants. It has been called glandular tissue. In the case of some fossil woods, pieces of silica, like double convex lenses, have been found in the cavities. When a vertical radial section is made of the stem of Fir, bordered pits, arranged in two rows, with individual pits on the same level, are seen. In Araucaria double and triple alter- nating rows are seen ; whilst in the Yewa prominent striation line winding spirally amongst the pits is noticeable. When the thickening begins by the formation of transverse ridges extending right across the wall of the cell, and the inwardly projected ridges gradually arch over the thin membranous portion of the wall, a narrow fissure only is left leading into the cavity enclosed by the thickening masses and the thin por- tion of the partition wall, on the opposite side of which a similar process has pro- ceeded. By the absorption of the parti- tion wall asingle cavity between two cells is thus produced, communicating with both, just as in the last case. Viewed by transmitted light these present an appear- ance like rungs of a ladder, and hence the name scalariform applied to the cells in which they occur (fig. 20), They are specially seen in Ferns, where they give rise to long prismatic vessels,

Fig. 20. When the thickening takes place over scalariform or ladder. Pittet

nearly the whole of the cell-wall, thin portions may be left here and there, which appear as pits when viewed by transmitted light,

of a Tree Fern.

. q q like prismatic vessels tissues — |

or as small canals when the cell-wall is very thick. Such cells are termed porous or pitted or dotted cells (fig. 21). In old cells, after the protoplasm has disappeared, the portion of the cell-wall which remained thin is often absorbed, and thus there is a true perforation of the cell-wall. These perforations often occur in groups both upon the cell-wall and upon the septum between superposed cells, and give rise to a remarkable sieve-like structure, in which case they are termed steve-cells. The latticed cells of some authors are of a similar nature. When superposed porous or sieve-cells coalesce by complete obliteration of the septum, then a pitted vessel, sieve tube, or duct is formed (fig. 22). These ducts are usually of a larger size than other ves-

Fig, 22, Fria. 21.—Porous or pitted cell from the Mlstleto. Fra, 22.—Moniliform dotted or pitted vessel from the Melon.

F¥ia. 23.—Section of a Bamboo, showing an angular network of cells, and the round apertures of pitted vessels,

sels ; they are well seen in the inner phloém layers and in the wood of trees, and they constitute the large rounded openings which are seen in the transverse section of the stems of the Oak, Poplar, Willow, &c. They also abound in the Bamboo (fig. 23), and in other plants of rapid growth. The names of bothrenchyma and taphrenchyma have been given to a tissue composed of such cells, Not unfrequently contractions are visible on the outside of the vessel (fig. 22), indicating its formation by coalescence of superposed cells. To vessels exhibiting contractions of this kind, whether spiral or pitted, the terms moniliform and vermiform have been applied ; and the tissue composed of these moniliform vessels has been denominated phleboidal. In the ducts of many plants a remarkable appearance is produced by the protrusion, through the perforations into the cavity of the vessel, of portions of the adjoining cells, or, before its absorption, of the portion of partition-wall closing the pit.

vessel, and are described under the name of tylosis (fig. 24). It is well seen in the Walnut, Chestnut, Oak, &c.

tubes or passages, having a diameter of about ~,,oth of au inch, forming, by their union, an anastomosis or network, like the veins of animals. They are the milk vessels and the proper vessels of old authors. They receive their name from containing an emulsion called latex, of a granular nature, often milky or coloured. They are seen in the India- rubber and Gutta-percha plants, the Mudar plant, the Cow-tree, Spurges, Dandelion, Lettuce, Chicory, and Celan- dine, frequently containing a large quantity of caoutchouc. Usually these vessels are thin-walled, but sometimes slightly thickened. They are found most abundantly in the phloéin layers—rarely in the xylem or wood layers (Papayacesz). They are the result of the coalescence of anastomosing or rectilinear rows of cells, and sometimes they seem to have resulted from the conversion of other vessels. In somé Aracez they seem to represent spiral vessels. In Asclepia- daceve they are evidently bast-fibres. Some consider them as merely intercellular canals. The milky sap of Euphorbia phosphorea is said to be luminous, The latex exhibits movements which have given origin to the name cinen- chyma applied to laticiferous tissue by some authors. Those movements, classed under the name cyclosis, must not be confounded with the motion of protoplasm in cells which is designated rotation.

We have seen that the cellular tissue is sometimes in- complete, that is, the cells do not touch on every side (fig. 9).

The intervening spaces are called intercellular spaces, and Intercellu-

these may be either circumscribed cavities called lacune, or they may extend for some length through the tissue as intercellular canals ; but these two structures pass into one another. In the earliest stage of development the tissue is always complete, and these spaces are formed subse- quently by a splitting of the partition or common wall of the cells, and they may subsequently be increased in size by an absorption of the investing cells.

These lacunz and canals may contain air, especially in aquatic plants, to give them buoyancy, as in Potamogeton (fig. 26), or they may be recep-

Fig. 26.

Vertical section of the leaf of Potamogeton or Pondweed, showing air cavities or lacuns /, and parenchymatous cells p, with granules.

tacles for various secretions, and when they exist as canals they usually aid in conducting sap. The intercellular canals are exceedingly well seen in coniferous plants, where they constitute resin passages, forming a continuous system throughout the plant, and arranged at intervals in concentric circles in the xylem or wood portion of the stem.

These portions appear as cells filling the interior of the

Chlorophyll is the green colouring-matter of plants, It Substances occurs in the cells of the superficial parts of plants united found in with small portions of the protoplasm (chlorophyll bodies), > which are combined into grains of various forms, Starch- grains are usually abundant in the chlorophyll bodies. Chlorophyll is soluble in alcohol and ether. It consists of four substances, two yellow and two green, which possess distinct optical properties. It gives a black band in the red of the spectrum. Physiologically it is very important.

It is developed under the action of light, and undergoes changes according to its state of oxygenation. Hence the varied tints of leaves in autumn. Numerous colouring matters occur in plants, especially in flowers, and all such when not green are included under the general term chromule. Starchy and oily matters and albuminoids occur very abundantly in the cells of plants, where they are stored

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Fig. 25. Fia. 24.—Longitudinal section of the stem of a specles of Walnut (Juglans cinerea), – showing tylosis in pitted vessels, a.

1¢. 25.—Branching and anastomosing laticifcrous vessels. The arrows mark the direction of the current

als. Latiferous vessels (fig 25) consist of long branching

Starch

ugar.

Gum.

for the purposes of nutrition. Starch, composed chemically of carbon and the elements of water (hydrogen and oxygen), its formula being C,H,,O,, occurs in the form of fine grains, more or less oval or rounded, which vary in diameter from the zps5th to the y}5th of an inch. Each grain contains starch in two forms,—one, receiving the name granulose, is easily soluble, and gives a deep blue colour on the addition of iodine; the other form, starch cellulose, is less soluble, and gives a yellow or brown colour with iodine; but the former is most abundant in the grain. The individual grains either lie distinct from each other in the cells, as in the Potato, Wheat, and Pea, or they are aggregated so as to form compound grains, as in West Indian Arrowroot, obtained from Maranta arundinacea, and Portland Sago, procured from Arum maculatum. Grains of starch pre- sent a very characteristic concentrically striated appear- ance (fig. 27). This is the result of their mode of for- mation. The point round which the strie are arranged is called the hilum. Starch is accumulated in the internal, and often in the subterranean parts of plants. It occurs abundantly in fleshy roots, and in stems, as well as in seeds and fruits, and is easily separated by washing. The ordinary cultivated grains yield starch in considerable quan- tity; so also do the Potato, Arrowroot, and Cassava plants, the Sago-palms, and a, Starch cells of the Banana fruit. That procured from the showing grains of

: starch in the interior. Arrowroot plant consists of dull white , Separate starch

grains ; while that from the Potato, and fitum, eee sie from various species of Canna supply

ing tous-les-mois, is in the form of large shining par- ticles Sago and Tapioca are granulated forms of starch, the former being procured from the cells of various spe- cies of Sagus and Metroxylon, the latter from the Cas- sava plant, The existence of starch in the bark and young wood of trees, such as the Birch and Pine, renders them useful as articles of food in cold countries. Lichenin is a form of starch existing in the cells of Iceland moss and other lichens; while inulin, which occurs dissolved in the cell-sap, is the starchy matter supplied by the roots of the Dahha, Dandelion, and Elecampane. By the action of prolonged heat, as well as by the addition of dilute sulphuric acid, or of malt, starch is converted into a soluble gummy substance called dextrin. The same change occurs during germination or the sprouting of the seed. Oily matters occur as drops in the interior of cells, usually associated with starchy substances or with albuminoids. These latter exist as small granules or large rounded masses with definite chemical and optical properties, and are termed aleurone grains. They are frequently associated with a crystalline arrangement of portions of the protoplasm of the cell known as crystalloids. Sugar occurs abundantly in the sap of plants. When pure and in a solid state this substance is crystalline and soluble in water; but it also occurs in an uncrystallized form. There are two marked varieties of it. Cane-sugar, C,,H.,,0,,, procured from the Sugar-cane, Sugar- maple, Beet, Carrot, &c.; and grape- sugar, occurring in numerous fruits, as Grapes, Gooseberries, Currants, Peaches, and Apricots The formula for grape- sugar is C,H,,O, During the sprouting of the seed, starch is converted into grape-sugar, and a similar change is in- duced by the action of malt, or of any ferment. A sweet substance (not a true sugar), called Mannite, is pro- cured from the Manna-ash (Ornus europea) as well as from various sea- weeds, from species of Eucalyptus, and from the Dandelion. Gum or mucilage’is another substance found in vegetable tissues, When pure it is clear, soluble in water and also in dilute acids, but not soluble in alcohol

BOTANY

[STRUCTURAL ELEMENTS,

or ether. It is one of the forms through which vegetable matter passes in being applied to the purposes of plant life, It exists largely in the vegetable juices. From the bark of many trees it is procured in the form of an exudation, Two well-marked kinds of gum are met with,—arabin, soluble in cold water, constituting the chief ingredient of gum-arabic, procured from various species of Acacia; and cerasin, insoluble in cold water, but readily soluble in boiling water, constituting the gummy secretion obtained from the Cherry and Plum. A substance called bassorin, or vegetable jelly, is found in Tragacanth, the roots of some Orchids, as well as in Carrageen (Chondrus crispus), and other sea-weeds. It is allied to gum, but differs in swelling up and becoming gelatinous when mixed with water. Another gum-like substance called pectin exists in the juice of the Apple, Pear, and other pulpy fruits. It is changed by the action of alkalies into pectic acid, which is found in many fruits and such succulent roots as Carrot, Turnip, Beet, &c.

of assimilation. The oils are either fixed or volatile,—the former being divided into drying, fatty, and solid, while the latter are distinguished according as they consist of carbon and hydrogen alone, or of these elements combined with oxygen or with sulphur. Resinous matter occurs in the form either of fluid balsams, or of the various kinds of solid resin and pitch. In the rind of the Orange and Lemon glands of oil occur (fig. 28). Turpentine canals are met with inthe wood of Pines ; and Vitte, or oil-canals, in the fruit of Umbelliferous plants, such as the Coriander, In the fleshy covering of the fruit of the Olive there are numerous oil-cells. The fruit of the Guinea-palm yields a solid oil, called palm-oil. The dotted appearance of the leaves of the Orange, Myrtle, Eucalyptus, and St John’s Wort, depends on the presence of numerous cells or cavities containing essential oil.

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Fig. 29. Fig. 31.

Fig. 28.—Vertical section of part of the rind of the Orange, showing glands con- taining volatile oil, R, R, R, surrounded by cells.

Fig. 29.—Cells of Rumex c, containing raphides r.

Fig. 30.

: The cells are called Raphi- dian. The raphides are acicular or needle-like crystals forming bundles.

Fic. 30.—Cells of Beet-root, containing conglomerate crystals,

Fie. 31.—Cellular tissue from leaf of Urostigma (Ficus) elasticum. c, a large cell; r, cystolith, an agglomeration of crystals situated at the extremity of an inward prolongation of the cell-wall, ¢; w, cells filled with chlorophyll granules.

As allied to these secretions, we may notice caoutchoue, which is found in the milky juice of plants, especially those belonging to the Fig, Spurge, and Dogbane orders. The trees most prolific in this substance are Siphonia elastica, Urceola elastica, and Urostigma elasticum. Gutta- percha is the concrete milky juice of the Taban plant (Isonandra Gutta). Wax is also found in the tissues of plants, and it frequently occurs as a secretion on the stems, as in the Wax Palm, and on the surface of fruits, as in the bloom or glaucous secretion of the Plum and the Candleberry Myrtle. Crystals of lime salts occur in the interior of cells, and also in the cell-walls of plants. They

Oils, Fats, and Resins occur in Oils mi cells of plants, or in special canals or glands as products resin

INTEGUMENTARY SYSTEM.]

consist of lime in combination with carbonic or oxalic acids, and are in many plants very abundant. In Mono- cotyledons they usually assume the form of needle-like crystals, and are termed raphides; they consist of oxa- late of lime (fig. 29). They are remarkably well seen in the Bauana. The Squill bulb and the bulb of the Onion exhibit raphidian cells, which are easily separated during the decay of the plants. The crystals are also arranged in a conglomerate form (fig. 30), as may be seen in the root of Turkey Rhubarb, to which they impart grittiness ; and in Old-Man-Cactus they constitute 60 to 80 per cent. of the dried tissue. In a single cell of the Poke (Phytolacca decandra) twenty to thirty crystals may be seen. In the epidermal cells of species of Ficus, and other allied plants, prolongations inward of the cell-wall occur, at the extremity of which small crystals of carbonate of lime are deposited (fig. 81); to these the name cystoliths has been applied. Siliceous matter occurs in the walls of cells, as in Grasses and Horsetails, and especially in Diatomacez,

2. Integumentary System.

A more or less marked division of the tissues into an outer layer bounding au inner mass is visible in all plants. Amongst the lower cellular plants this division is not very distinct ; the circumferential cells are perhaps only a little smaller and more compacted than those near the centre. The higher cellular plants, however, exhibit great diversity.

. In them the cells of the circumference may be arranged in

layers so as to constitute a true epidermis, the component cells having a definite relation to one another and to the exterior in the respective families. In all vascular plants an epidermis is found. In many cases, however, it is diffi- cult to recognize it, as in the stems of submerged plants and in most roots. It usually consists of a single thin layer of cells closely compacted, and leaving no interspaces except at definite points (stomata), where openings lead into inter- cellular cavities. The cells composing this layer have their outer wall much thickened, the inner wall remaining thin,

_ and they contain no starch or granular matter, and usually

are colourless,

In many aquatic plants, however, and in Ferns, chlorophyll is present. The apparent colour of the

| epidermis depends on that of the parenchymatous cells

below, from which it can be separated as a colourless layer. Sometimes the cell-sap of the epidermal cells has a red tinge. The outer lamella of the outermost cell-wall of the epi- dermal cells usually becomes cuticular or corky, and thus is formed an external separable layer or cuticle upon the surface of the epidermis proper. This layer has different chemical properties from the epidermis, being insoluble in sulphuric acid. Upon this cuticle wax is frequently de- posited in various forms, serving as a protective from mois- ture ; of this nature is the bloom of the Plum. The cuticle in aquatic plants is very thin; in aerial plants it is much thicker, The single layer of cells forming the epidermis is not unfrequently strengthened by the addition to the inside of other layers of cells, In the leaves of Begonia, Ficus, and the outer covering (velamen) of the aerial roots of Orchids, this constitutes the hypoderma, the cells being of various forms. It is well seen also in vascular Cryptogams, many Bromeliaces, Ilex, &c. On those parts of the plant which live long and have vigorous growth in thickness the efficacy of the epidermis as a protective covering is in- creased by a large formation of cork. Each epidermal cell divides into an outer and an inner cell, The former at once becomes a cork cell, losing all its succulent matter ; the latter remains capable of division. When a layer of these merismatic cells occurs we have a cork cambium or phellogen. If several layers of cork cells be formed a cork tissue or periderm is the result, which supersedes the epi- dermis, and which from variations in the several layers may

be stratified. Not unfrequently the phellogen cells, in addi- tion to giving off cork cells outwardly, give rise on the inner face to cells containing chlorophyll ; and if a layer of such is formed it is termed a phelloderm. In such cases the phellogen lies between the phelloderm and the periderm. If phellogen lamelle are formed deeper in the tissues of the plant, the internal layers of tissue become dry and con-

stitute the bark. Periderm is thus replaced by bark. One Stomata.

important character of the epidermis is the presence of stomata or breathing-pores. These exist abundantly upon the stems and leaves of plants ; they also occur on the parts of the flowers ; but they are absent from all root structures, though present on underground axial structures, Each consists of a ceutral pore bounded by two or more cells (guard-cells), which contain chlorophyll, starch, and matters distinct from the surrounding epidermal cells. The pore has various forms, and opens into an intercellular cavity (fig. 32). It may be round ff

(Primrose), oval (Liliacez), quadrangular (Yucca). The arrangement of the stomata on the plant varies much. They may be in lines as in Equisetum, or they may be scattered irregularly as in Balsam (fig. 33), orin definite clusters as in Crassula and Saxifraga (fig. 34). Inu

Fig. 32.

Vertical section of epidermis, from the lower surface of the leaf of Madder, showing the intimate union of the epi- dermal cells e, e, the loose subjacent par- enchyma p, with intercellular canals m, and lacuna 7; s, stoma.

Equisetum the stomata, which are about ,4oth of an inch

in their greatest diameter, consist of four guard-cells; two st

ag t} ay,

Fig. 33. Fig. 34,

Fig. 38.—Epidermis of the garden Balsam (Balsamina hortensis), showing stomata st, of an elliptical form.

Fig. 34.—Epidermis of leaf of Sarifraga sarmentosa, showing clusters of stomata s,s, surrounded by large epidermal cells e,e. The cells among which the stomata occur aye very small.

of which are arched and thick at their outer convex margin,

Fig. 35. Fig. 36. Fia. 35.—Formation of stomata from leaf of Hyacinth, seen from the surface. e, epidermis cells; s’, mother-cell of stomatic guard-cells; s, bipartition of

mother-cell into two guard-cells. (Sachs.) Fie. 36.—Splitting of partition wall between guard-cells to form the stoma. (Sachs.)

becoming thin at their inner concave edge, where two other

av. == 24

Trichomes.

smaller cells overlie them, with their upper walls raised as ridges running at right angles to the stoma. This gives the stoma a fringed appearance, hence called pectinate, The mode of formation of a stoma is an interesting process, result- ing from the division of a single epidermal cell. Preparatory to the complete formation of the mother-cell of the stomatic guard-cells, divisions may take place in the epidermal cells by which numerous or few cells are formed surrounding this mother-cell.. In the mother-cell a partition wall is developed (fig. 35, s). A thickening of the partition wall occurs, and eventually in the central portion a fissure makes its appearance, which gradually increases in size (fig. 36). It does not, however, pass throughout the whole extent of the partition wall. An opening or stoma is thus formed, bounded on each side by a single guard-cell, leading into an intercellular space in the parenchyma beneath. If we suppose the mother-cell to be divided by numerous vertical septa we should have a stoma surrounded by many guard- cells, as occurs in some Hepatice ; and in this family, after the formation of the fissure a series of horizontal septa appear in the guard-cell, and thus the stomatic opening becomes a canal. In Ceratopteris thalictroides the stoma is bounded by three cells,—two of which, in their open condi- tion, are crescentic and concave inwardly, while the third sur- rounds them, except for a small space at the end of the long axis of the stoma, and has on this account been called peristomatic. In Urostigma elasticum four cells form the stoma. Subsequent changes in the surrounding epider- mal cells

may cause alterations in their relations to the stomata. Thus, in the Oleander (fig. 37) the epidermis

Fig. 387, Fig. 37.—Vertical section of lower epidermis of the leaf of Neriwm Oleander. e, epidermis composed of several layers of cclls; p, parenchyma of thc leaf; s, cavity filled with hairs, at the bottom of which is a stoma. Fig. 88.—Unicellular hair of the Common Cabbage.

develops so as to sink the stoma within a ciliated cavity; in

other cases the stomata are raised on pillars. The guard- cells have a power of opening or closing the orifice of the stoma; when moistened they swell and curve outward, and leave afree opening ; when dry they collapse and their edges are straightened, and they close the orifice. Stomata are most abundant on the under surface of leaves. Their number varies from 200 to 160,000 or more in a square inch of surface. In the leaves of the White Lily there are 60,000 in a square inch on the under surface, and about 3000 on the upper; on the leaves of the Cherry-Laurel there are 90,000 on the lower surface, and none on the upper. Upon the epidermis and as outgrowths from it are found certain appendages. These are hairs, scales, prickles, &c., and all have been embraced under the general name trichome. Hairs (pili or vill) are productions each of an epidermal cell, having typically an elongated or conical form, and covered by the cuticle. They are erect or oblique, or they lie parallel to the surface, and are appressed. Sometimes they are formed of a single cell, which is simple and undivided (fig. 38), or forked (fig. 39), or branched ; at other times they are composed of many cells, either placed end to end, as in moniliform or necklace-like hairs (fig. 40), or united together laterally, and gradually form- ing a cone, as in compound or branched hairs. When the branches of a hair proceed from a common centre, it is stellate or radiated (fig. 41, a, 6), as in hairs of the Mallow tribe, in those of Deutzia scabra, and those on the stem of

the Rice-paper plant (Fatsia papyrifera). When stellate hairs are flattened out, so as to form a sort of membranous expansion (fig. 44), a scale or scurf

is produced, In Bromeliacese the scurfiness of the leaves is a marked character. To such expansions of the epidermis the name lepis is applied, and the surface is said to be Jepidote, These scales have sometimes a beautiful silvery appearance, as in Eleeagnus and Sea-buckthorn (fig. 44). Surrounding the base of the leaves of Ferns a brown chaffy substance occurs, consisting of elongated cells, to which the name of ramentaceous hawrs, or ramenta, has been given. In Palms also a similar substance but of a fibrous texture occurs, called reticulum or mattulla, Sete are bristles or stiff hairs, and the surfaces on which they occur are said to be setose or setaceous. Some hairs, as those of Drosera

Fig. 39.

Fra. 89.—-Forked or bifurcated unicellular hair of Draba or Whitlow-grass.

Fic. 40.—Moniliform or necklace-like hair of Virginian Spiderwort (Zradescantia virginica).

Fic. 41.—Unicellular hair a, of Alyssum, dividing into rays at the apex. The stellate or star-like arrangement is represented in the lower figure }.

Fic. 42.—Glandular, multicellular or many-celled hair of Frogsmouth (Antirrhi-

Fig. 40.

Fig. 41.

Fig. 42. Fig, 43,

num majus). It is a partitioned capitate hair,

Fig. 48.—Sting (stimulus) of Nettle (Urtica dioica); its base is formed by nu- merous cells containing irritating fiuid; from these arises a simple unicellular conical hair, which serves as a duct for conveying the fluid.

(Sundew), have one or more spiral fibres in their interior, When the cells of hairs are hardened by thickening of the cell-wall, as in the Rose and Bramble, they are called Prickles (aculet). By some these are not considered

as hairs, but are termed emergencies, inasmuch as they arise from a collection of cells, not from one epidermal cell. Various names have been given to the different forms of hairs. They are clavate, or club-shaped, gradually expanding from the base to their apex ; capitate (fig. 42), having a distinct rounded head; rough or scabrous, with slight projections on their surface ; hooked or uncinate, with a hook at their apex pointing downwards and to one side; barbed or glochidiate, with two or more hooks around the apex; shield-like or peltate, when attached by their middle, and projecting horizontally on either side, as in Malpighia urens (fig. 45), and in many Cruciferous plants ; cilia, when surrounding the margin of leaves. On the pod of the Cowitch (Mucuna pruriens) hairs are produced with projections on their surface, which cause irritation of the skin. In Venus's Fly-trap (Dionza muscipula) stiff hairs exist on the blades of the leaf (fig. 46), which, when touched, induce their closure.

Hairs occur on various parts of plants,—on the stem, leaves, flowers, seed-vessels, and seeds, and even in the interior of vessels. In the interior of the spathe of some Palms numerous ovate cells, analogous with hairs, occur in clusters, and can, when the spathe is dried, be shaken out in the form of powder. Cotton consists of the hairs surrounding the seeds of Gossypium herbaceum and other species of the genus. These when fresh are elongated tubular cells; when dried their walls collapse and they appear twisted. Hairs are occasionally developed to 4 great extent on plants exposed to elevated temperatures, as well as on those growing at high altitudes. When they occur on the organs of reproduction they are connected with fertilization, ag the hairs on the style of Goldfussia, and the retractile hairs on the style of Campanula.

BOT

Different organs of plants are transformed into hairs,—as may be seen in the flowering stalks of the Wig-tree (Rhus Cotinus), and in the calyx of Compositz.

Names are given to the surfaces of plants according to the presence or absence of hairs, as well as the nature of the hairs which cover them, The following are the more important terms -—Gabrous, smooth, having no hairs ; hairy or pilose, furnished with hairs ; pubescent, covered with soft,

short, downy hairs. willows, having long, weak, often oblique hairs ; sericeous, covered with long, closely appressed hairs, having a silky lustre ; Aispid, covered with long harsh or stiff hairs not appressed , Aersute, having long tolerably distinct hairs, not harsh nor appressed ; velvety or velutinous, with a dense covering of short down, like velvet ; tomentose, covered with crisp, rather rigid, entangled hairs like cotton, which form a sort of felt (tomentum) ; woolly, with long curled and matted hairs like wool ; bearded or stupose, when hairs occur in small tufts. The hairs which are most frequently met with in plants are called tymphatic, from their not being connected with any peculiar secretion. Those, on the other hand, which have secreting cells at their base (fig. 43) or apex, are denominated. glandular, and are not to be distinguished from glands. On young roots cellular projections occur, which may be called radical hairs. Young leaves and buds are frequently covered with protecting hairs. On the parts of the flower, as in the Iris, coloured hairs occur which have been called corolline

In connection with the epidermal appendages we may notice glands, although they may occur in any tissue. A gland consists of a single cell or a collection of cells secreting substances different from those contained in the surrounding cells In the former case the gland is simple, in the latter it is compound. In compound glands it frequently happens that the walls of the inner cells are absorbed, and thus the gland has only a single cavity, as in the glands of the Orange rind (fig. 28); these are termed vesicular. The secretion of the glands may be stored in their interior, as in Orange rind, and in the leaves of Laurus Camphora, or it may be exuded as in Lychnis viscaria, and inthe nectaries of Fritillaria imperialis (fig. 50). Hairs serve as ducts through which the secretion of glands is dis- charged. Such hairs are seen in the Nettle (fig. 43), in Loasa or Chili Nettle, and in Malpighia (fig. 45), and are

GLANDS. |

Fig. 46.

Fie. 44.—Radiating hair or seale from Eleagnus (Oleasier). P Fig, 45,—Peltate hair pp of Malpighiaurens rising from e, epidermis, g,gland, Fig. 46. —Trritablo leaves of Venus’s Fly-trap (Dionwa)

commonty called stings (stimuli). In the Nettle they are formed of a single conical cell, dilated at its base, and closed at first at the apex by a small globular disk placed

obliquely. This disk breaks off on the slightest. touch when the sharp extremity of the hair enters the skin, and pours into the wound the irritating fluid which has been pressed out from the elastic epidermal cells at the base. When a nettle is grasped with violence, the sting is crushed, and hence no injury is done to the skin. The glandular en- larged apex of hairs sometimes exudes a viscid secretion, as in the Chinese Primrose and in theSundew. The hairs of the latter plant, by this secretion, detain insects which happen to alight on them. The hairs gradually close on the insects, electrical phenomena taking place during the movement, and then the secretion from the glands becoming acid, an action takes place upon the organic matter analogous to that of the pepsin of the gastric juice, by which it is rendered soluble, and is eventually absorbed by the plant. A similar property is possessed by the secretion from the glands upon the surface of the leaf of Venus's Fly-trap (Dionzea muscipula, fig. 46). The acid in both instances belongs to the formic acid series. Glands may be either internal or external, and they may be situated at the extremity of a hair (when they are stalked), or they may be immersed in the substance of the plant (sessile). Inthe Dittany (Dictamnus albus, fig. 47) a form of gland is seen intermed- iate between the sessile and stalked form. The glands in this plant secrete a green oily matter, so also do the stalked glands in the Rose. In the Ice-plant the glands appear as elevations of the epidermis, containing a transparent fluid like ice, which is said to have an alkaline reaction ; in the Chick-pea similar superficial cells contain an acid fluid. Clear glands are also seen on the under surface of the leaf of Passiflora lunata. Resinous glands are seen in the Hop (fig. 48) and Hemp plants. At the base of the petals of the Crown-imperial (fig. 50), cavities occur containing a honey- like fluid, secreted by what are called nectariferous glands.

Gland of Dittany eut vertically.

Fig. 50.

Fig. 49.

Fig. 48.-—Superficial glands of the Hop, containing a resinous seeretion called

ne. – enor na of ovate-oblong glands from the base of the stipule of the Ipecacuan plant (Cephaelis Ipecacuanha). , ;

Fig. 50,—One of the petals of Fritillaria imperialis, Crown Imperial, showing a pit or depression g at the base containing a honey-like seeretion. This gland is sometimes called a nectary.

Cavities containing saccharine matter, surrounded by small

thin-walled cells, are met with in the leaves of Acacia

longifolia, also in Viburnum Tinus, and Clerodendron fragrans. The cavities communicate with the surface of the leaves by means of canals. Peculiar sessile glands secreting a gummy substance are found at the inner side of the base of the petioles of Cinchona and Ipecacuan plants

(fig. 49). On the buds of various trees peculiar glandular

hairs termed colleters exist, secreting a gummy mucilaginous

matter, the 6blastocolla, which covers the bud. These, however, disappear on the bursting of the bud. They

seem to have a protective function. The secretions of

glands are very various, oily, waxy, resinous, gummy, saccharine, acid, &c.

ORGANS OF PLANTS.

Having now considered the elementary structures and tissues found in the Vegetable Kingdom, we proceed to view them in combination to form the plant. The simplest plant is found amongst Algee, where, as in the Red-

snow plant (Protococcus nivalis, fig. 51) the whcle organism con- sists of a single isolated cell. Other Alge and all Fungi and Musci are composed of a number of cells united in various ways; whilst in Ferns and their allies and all “ flowering plants vessels are formed a in addition to the cells. The plants in which the tissues are entirely cellu- lar are termed cellular plants ; those in which vessels are also found are vascular plants.

That the portions of a plant may be properly maintained two functions have to be performed, namely, nutri- tion, on the proper performance of which the life of the individual plant depends, and reproduction, by which the perpetuation of the type is provided for. In such a simple form as the Red-snow plant (fig. 51) those functions are performed by the single cell. In the plants composed of numerous cells a differentiation takes place by which special cells are set apart for particular functions, and thus certain organs are formed in the plant. In the higher plants those organs become more complicated from the introduction of the vascular element.

The nutritive organs of plants are generally known as the root, the stem, and the leaves. In all vascular plants aud the higher cellular plants an axis or stem having roots and bearing leaves is distinguishable, and such plants have been designated Cormophytes or Phyllophytes. In the lower class of cellular plants, as Fungi and Alge, no such distinction is possible, and there is merely a flattened leafy expansion with dependent filiform processes ; this structure has been termed a thallus, and such plants are Zhallogens or Thallophytes.

Amongst the higher plants the reproductive organs are,

Fig. 51.

Cells of the Red-snow plant (Protococcus nivalis), in different stages of growth and development. a, cell in the young state; 6, cell fully formed, with cellules in its interior ready to be discharged, and to form independent plants; c, cell after its contents have been dis- eharged.

Fig. 52,

Fie. 52.—Haricot or French Bean, a Dicotyledonous plant, germinating. 1, the roots coming off from the radicular end of the axis; t, the hypocotyledonary portion of the axis bearing the cotyledons ¢, c; the young stem and leaves, g, g. Fig. 53.—Grain of Maize or Indian Corn, a Monocotyledonous plant, germinating.

Roots come off from lower end of ¢, the axis; c, the single cotyledon; g, the young stalk and leaves.

in ordinary language, comprehended under the term flower ; and, as they are conspicuous, such plants have been denominated Flowering, Phanerogamous, or Pheenogamous. Amongst all cellular plants and in some vascular plants, as

Ferns and Equisetum, there are no flowers, and the repro. ductive organs are inconspicuous, hence they have been termed Flowerless or Cryptogamous. In all cases the young plant, or embryo, is completely cellular. But as growth proceeds, that differentiation takes place which dis. tinguishes the several classes of plants one from the other, In Phanerogams the first leaves produced upon the embryo plant are termed primary, seed-lobes, or cotyledons, Jn some cases these are two in number, and are opposite one another. Plants in which this occurs are Ducotyledonous (fig. 52), as our ordinary forest trees. In other plants the lobes alternate and only one cotyledon is formed; such are Monocotyledonous (fig. 53), as Grasses, Lilies. In Crypto- ganis, on the other hand, no such seed-lobes or cotyledons are produced, and they are Acotyledon- ous (fig. 54).

In all plants the original cell tissue which gives origin to its parts is of a uniform nature, and is termed the primary tissue. When all the cells of this tissue are capable of multipli- cation and division the tissue is a meristem or generating tissue. If the , cells are not so capable, then it is a Fig. 54. permanent tissue, The primary tissue Ofminane res Oe at the growing point of any shoot or cwlaris). a, spore giving root is essentially a meristem, and it a NT the otherren has been designated the primary tremity, a oan i‘

meristem to distinguish it from the se- a cellular frond; ’ 4, the condary meristem, which is applied {77° Pte dividing, to a tissue in the older parts of a No cotyledons are pro- stem or root which remains or be °”* comes capable of division. The growing point of the apex has been termed the punctum vegetationis, and it not unfrequently forms a conical projection, and is then the vegetative cone. By growth at this punctum vegetationis the shoot or root increases in length, and the mode of addition is in many cases of a definite character. Two chief types of growth are recognized. In one of thesea single large cell is always preseut at the apex, termed the apical cell, which may be regarded as the mother-cell, whence by bipartition in a definite manner the whole meristem below it has arisen, as is well seen in vascular Cryptogams and cellular plants. The other type is seen in Phanerogams, and here no such apical cell is visible, but a number of cells are found at the apex by whose multiplica- tion the subsequent tissues are formed. But in whatever way formed, a primary meristem is the result of all the processes of growth, and by differentiation of its cells the various parts of the shoot or root are formed. The outer layer of the primary meristem, which extends completely over the punctum vegetationis, is termed the dermatogen; it is the primordial epidermis, being continuous with the epidermis of the shoot and afterwards becoming epidermis. Underneath the dermatogen several layers of cells are distinguished, continuous with the cortical portion of the shoot or root; this is the primordial cortex, and constitutes the periblem. Enclosed by this is a central cellular mass, out of which the fibro-vascular bundles and the structures of the central part of the shoot or root are formed; this has been termed the plerome. If the growing axis be a young root there is in addition developed, usually from the dermatogen, a mass of cells at the extremity, constituting a-root-cap, or protective covering, to the delicate meris- matic cells beneath ; no such structure is formed in a stem. Thus a stem is structurally distinct from a root in having no root-cap.

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In the plerome the fibro-vascular bundles are formed. Hib Certain cells become elongated and prosenchymatous oie

and united in bundles leaving no intercellular spaces;

this mass is termed the procambium of the fibro-vas- cular bundle. As growth proceeds changes take place in the cells by thickening, and, their contents disappear- ing, various kinds of cells and vessels are formed. In this way the whole mass of the procambium may be con- verted into permanent tissue, and then growth ceases; or an inner portion of the bundle remains merismatic, which is called the cambiwm, and then growth proceeds, the shoot or root increasing in thickness by the cambium forming new cells on both sides. In the former case the bundle is closed, a8 in Cryptogams and Monocotyledons and some Dicotyledons ; in the latter it is open, as in most Dicotyle- dons and Conifers. In every fibro-vascular bundle a separation into two groups of structures may be distin- guished—the wood or xylem layers, and the bast or phloém layers. As long as the bundle is open and cambium present, these layers are separated by the cambium (fig. 55). Their

Fig. 55.

Transverse section of an open fibro-vascular bundle. ¢, cambium; cb, continua tion of cambium between the fibro-vascular bundles; g, large pitted vessels; ¢ smaller pitted vessels and spiral vessels intermixed with wood-cells ; y, inner phloém layers; b, bast fibres; m is the parenchyma of the pith; r is the cortical parenchyma, Immediately external to the bark lies the bundle sheath

of cells filled with starch. (Sachs.)

relative position as regards the axis of the stem or root

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Fig. 56.

Longitudinal section of an open fibro-vascular bundle. c¢, cambium; s, s’, spiral vessels with fibres which can be unrolled; /, scalariform reticulated vessel; h,h’,h’’, h’’’, wood-cells; t, bordered pitted vessel ; ¢’, young pitted vessel; p, inner phloém layer; b, bast layer; gs, bundle-sheath; r, cortical parenchyma; m, pith parenchyma. The elements are devcloped from sto ¢’ in the xylem portion. (Sachs.)

varies. In some cases the phloém is nearer the cireum-

ference, in other instances the xylem is peripheral, and in rare cases amongst Dicotyledons there are phloém layers both on the outer and inner sides of the fibro-vascular bundles. In vascular Cryptogams the phloém layers always surround the xylem portion of the bundle.

In the xylem or wood portion of a fibro-vascular bundle the cells all tend to thicken their walls, and, consequently, numerous kinds of cells and vessels are found, which are usually arranged in a definite manner. On the side furthest removed from the phloém we find spiral vessels interspersed with wood-cells (figs. 55 and 56), outside are reticulated and scalariform vessels, and then interspersed with wood cells are large pitted vessels. In the phloém or bast layers the cells have not such a tendency to thicken, but usually remain thin-walled, forming ordinary parenchy- matous cells, or becoming perforated and forming sieve cells. In certain layers, how- ever, the cell-walls are thick- , ened so as to become flexible, 4; constituting the bast fibres. Around every fibro-vascular bundle a single layer of cells : of the fundamental cellular @ tissue of the stem is marked off from its surroundings, the cells get filled with starch. grains, and this constitutes what has been termed the bundle sheath or starch-bear- ing layer (fig. 57). In fig. 57 is seen a transverse sec- tion of the closed fibro-vascu- lar bundle from the Maize, 7: and it will be observed that it { is essentially the same as that of the open bundle (fig. 55), 2 only that all the cambiuw cells have passed into per manent tissue.

In all plants a provision is made for branching of the various organs, and two prin- cipal forms of it may be recognized. In one of these the generating axis elongates at the apex, producing in suc- cession lateral structures. To this form the term monopo- diwm has been applied. In the second form there is a cessation of growth at the apex in the direction of previous elongation of the axis, and a con- tinuance in two diverging directions. This is dichotomous branching. In their rudimentary state all brauchings may be easily referred to one or other of those types ; but in the mature system it is frequently difficult to recognize the type, owing to irregular development of the successive branching. Thus in a dichotomous branching only one of the secondary axes may develop strongly, the weaker branch appearing asa small lateral shoot from its base; and an apparent primary shoot is thus produced which in reality consists of the bases of single branches of consecutive forkings. Such an axis is termed a pseudasxis or sympodium. And, again, in monopodial branchings the primary axis may continue to develop more strongly than its lateral axes, which in their turn develop similarly, and a racemose form arises ; or the primary axis may be arrested in growth, and the secondary axes develop more strongly and overlap it,

when a cymose branching results. More will be said on this subject when considering the inflorescence of Phanerogams, in which the various forms of branching are well seen.

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Fig. 57.

Transverse section of a closed fibro-vas- cular bundle. r, annular vessel; s, spiral vessel; 7, inter-cellular canal; gy, pitted vessel, v,v, cambiform tissue which has become permanent. Between v and s are reticulated vessels. p, sur- rounding parenchym®. Outer cells a of the bundle are parenchymatous, t marks the inner side of the bundle. (Sachs.)

Root.

We now proceed to consider the form and internal structure of the various organs of plants.

I. ORGANS OF NUTRITION. 1. Root or Descending Axis.

Speaking generally, the root is that portion of the plant which descends into the soil. In all plants the root is at first entirely cellular. It may remain permanently so, or vessels may be formed in it. The Radicle, or young root (fig. 58, r), is the first portion of the embryo protruded from the seed or spore (fig. ; f 54) when germination com- fey a, mences, and resembles very h fon ie much in structure the young or) is ‘ stein. Both are entirely cel- , fi lular, consisting of a central f nucleus of cellular tissue covered by

two or more layers of cells, But at the apex of e r c the root a mass of cells is Fic, 58

; ; £. 58. developed, which constitutes ,. | ss otvtea aia, i Gala what is known as the root- Taaid pes hag rz 2 the two temas cotyle- cap or pileorhiza, ‘These $0ns,0 seed lobes, yhich remain un- cells extend for some distance the radicular extremity of the axis along the sides of the root, Hearing the young stalk and leaves g forming a sheath, and in — lie in a depression of the coty edons f.

some cases, as Lemna, the

cap becomes loosened from the root, remaining attached by a few cells at the apex only, and then it is known as the ampulla. This root-cap distinguishes structurally the root from the stem, and it serves as a protection to the apical growing-point of the root. Theroots of Thallophytes, con- sisting entirely of cells, do not develop a root-cap.

The root is merely a prolongation downwards of the stem, and the part where they unite is the collum or neck. After- wards the root is distinguished from the stem by the absence of a provision for the development of leaf-buds. It is not always easy to distinguish between a stem and a root. Many so-called roots bear at their upper part a portion called their crown, whence leaf-buds arise. Underground stems and roots are often confounded. Some plants, as the Moutan Peony, the Plum-tree, Pyrus japonica, and especially Anemone japonica, have a power of forming buds on what are commonly called their roots. The last- mentioned plant develops these buds on every part of its extensively ramifying root-like prolongations, which may be chopped into numerous pieces, each capable of giving rise to a new plant. Such is also the case with the annulated root of Ipecacuan. Roots are usually subter- ranean and colourless. Externally, they have a cellular epidermal covering of a delicate texture, sometimes called epiblema, in which no stomata exist. In woody plants fibro-vascular bundles are found in the roots, and there is an internal arrangement of tissues similar to that seen in the stem itself, but spiral vessels are rare in the root. The axis of the root gives off branches which divide into radicles or fibrils, the extremities of which, composed of delicate cellular tissue constituting the punctum vegetations, have been erroneously called

spongioles or spongelets ; they are not distinct organs. Hairs are often seen on roots, but no true leaves. These hairs consist of simple elongated cells, which occur singly, and appear to serve the purpose of absorption. Roots increase principally by additions to their extremities, which are constantly renewed, so that the minute fibrils serve only a temporary purpose, and represent deciduous leaves; but in large trees which form thick roots an increase in diameter occurs in the root similar to what is scen in the stem itself. In some plants no roots are formed at all; thus in the Orchidaceous plants

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[NUTRITIVE ORGANS,

Epipogium Gmelini, Corallorhiza innata, and also in Lemna arrhiza, no roots occur. Roots may be given off from any portion of astem, originating as cellular prolonga- tions from the inner portion of the stem, and coming off at any point of the stem, or at small lenticular points to which the name of lenticels has been given by some. When the stem is more or less horizontal the roots given off from it pass directly into the soil; but if the stem be erect they pass for a certain distance downwards through the air, and are called aerial. The latter are well seen in the Screw- pine (Pandanus), the Banyan (Ficus indica, fig. 59), and

Ficus indica, the Banyan tree, sending out numerous aerial roots, which reach

ihe soil, and prop the branches. many other species of Ficus, where they assist in support- ing the stem and branches. In the Mangrove they often form the entire support of the stem, which has decayed at its lower part. In Treeferns they forma dense coating around, and completely concealing, the stem ; such is also the case in some Draceenas and Palms. In Lpiphytes, or plants growing in the air, attached to the trunks of trees, such as Orchids of warm climates, the aerial roots produced do not reach the soil; they continue always aerial and greenish, and they possess stomata. Delicate hairs are often seen on these epiphytal roots, as well as a peculiar investment formed by the cells of the epidermis which have lost their succulent contents and are now filled with air. This layer is called velamen

radicum, or covering of the roots. The aerial roots of the Ivy are not the nutritive roots of the plant, but are only intended for mechanical support.

Parasitic plants, as the Mistleto (Viscum), Broom-rape ?

(Orobanche), and Rafilesia, send root-like processes into the substance of the plants whence they derive nourishment.

In the Dodder (Cuscuta), the tissue around the roots swells Plate

into a kind of sucker (hawstoriwm), which is applied flat upon the other plant, and ultimately becomes concave, 80 as to attach the plant by a vacuum. From the bottom of the sucker the root protrudes, which penetrates the support ing body. In the case of parasitic Fungi, such as Mould, there are cellular filaments which spread among the tissues of plants, and which may be looked upon as equivalent to roots and stems united. They form the spawn or myceliwm of these plants, and in some cases cause rapid destruction of the tissues of plants, as in the disease called Dry-rot. The forms of roots depend upon the mode in which the axis descends and branches. The mode of branching of roots is almost universally monopodial, only in Lycopodiacex is it dichotomous. When the central axis goes deep into the ground in a tapering manner, without dividing, a tap root is produced. This kind of root is sometimes shortened, and becomes succulent, forming the conical root of Carrot, or the fusiform or spindle-shaped root of Radish, or the napiform root of Turnip. In ordinary forest trees the first roct protruded continues to elongate and forms a long

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ROOT. |

primary root-axis, whence secondary axes come off. In other plants, especially Monocotyledons, the primary axis goon dies and the secondary axes take its place. When the descending axis is very short, and at once

divides into thin, nearly equal, fibrils, the root is called. fibrous, as in many Grasses (fig. 60); when the fibrils are thick and suc- culent the root is fascicwlated, as in Ranunculus Ficaria,

. Asphodelus luteus, and Cinanthe crocata; when some

of the fibrils are developed in the form of tubercules,

Hit ys Fig. 60.

Fig. 61.

Fra. 60 — Fibrous root of a Grass. Numerous fibrils coming off from one point.

Fig. 62,

Fig. 61,—Orchis, showing tubercules or tubcrous roots, matter called bassorin. Fig. 62.—An epiphytic Orchid with pseudo-bulbs,

which contain a gummy

the root is twbercwar, as in Orchis (fig. 61); when the fibrils enlarge in certain parts only, the root is nodudose, as in Spireea Filipendula, or moniliform, as in Pelargonium triste, or annulated, as in Ipecacuan. Some of these so-called roots are formed of a stem and root combined, and when cut in pieces they give rise to buds and new plants. In some cultivated plants, as Turnip, the central root is some- times injured, so as to end abruptly, and it then divides into numerous branches, resembling a fasciculated root. This gives rise to the disease called Fingers and Toes, which is very injurious to the crop. Anbury is a disease where a clubbing of the root takes place. “The mode in which the fibres of roots are produced and developed gives origin to different forms of rhizotaxis, or root-arrangement.

Roots either fix the plant in the soil or attach it to other bodies, They absorb nourishment by a process of imbibition or endosmose through their cellular extremities. The elongation of the roots by their extremities cnables them to accommodate themselves to the soil, and allows the ex- tremities of the

rootlets to extend deeply without being injured. Roots, in their lateral extension, bear usually a relation to the horizontal spreading of the branches, so as to fix the plant firmly, and to allow fluid nutritive sub- stances to reach the absorbing extremities. As has been already stated, the structure of perennial roots is identical with that of the stem, Thus in Dicotyledons we find a pith, medullary rays, zones of wood, cambium layers, and bark, although no medullary sheath is present. In Mono- cotyledons we have fibro-vascular bundles distributed in a matrix of cellular tissue. The young primary root in Monocotyledons differs from that in Dicotyledons in that it rises deeply within the embryonal tissue, and on germina- tion this tissue is ruptured and forms a sheath, around the base of the roots, called coleorhiza. Amongst Monocotyledons the primary roots usually soon die, and secondary roots are formed in abundance. “In vascular Dicotyledonous plants the structure of the root is similar to that of the stem. In Thallogens the roots consist merely of simple or branching filamentous hair-like structures. In some large tropical Sea- weeds the root-like bodies develop to a large extent, but

serve only as fixing organs, and take no share in nourishing the plant.

2. Stem or Ascending Axis.

A stem may be defined as an axis bearing leaves, Stem.

Structurally it differs from a root in having no develop- ment of cells forming a cap over the growing point. Under the term caulome (stem structure) are included all those parts of a plant morphologically equivalent in bearing leaves. The stem generally ascends, seeking air and light, and has therefore been termed the ascending axis. Stems have usually considerable firmness and solidity, but some- times they are weak, and either lie prostrate on the ground, thus becoming procumbent, or climb on plants and rocks by means of rootlets, like the Ivy, being then called scandent, or twist round other plants in a spiral manner like Wood- bine, when they are volubile.

Twining plants turn either from right to left, as the French Bean, Convolvulus, Passion-

flower, Dodder, Periploca, and Gourd ; or from left to right Plate X.

as Honeysuckle, Twining Polygonum, Hop, and Tamus. Bryony tendrils twine from right to left, and left to right, alternately. In warm climates twining plants (Jianas) often form thick woody stems; while in temperate regions they are generally herbaceous. Exceptions, however, occur in the case of the Clematis, Honeysuckle, and Vine ; the twining stem of the vine has been called sarmentum. Some stems are developed more in diameter than in height, and present a peculiar shortened and thickened aspect, as Testudinaria or Tortoise-plant, Cyclamen, Melocactus, Echinocactus, and other Cactaceze ; while in many Orchids (fig. 62) the stem assumes an Oval or rounded form, and is called a pseudo-bulb.

Names are given to plants, according to the nature and duration of their stems. Herbs, or herbaceous plants, have stems which die down annually. In some of them the whole plant perishes after flowering; in others, the lower part of the stem forming the crown of the root remains, bearing buds from which the stem arises next season. In what are called biennial herbs, the whole plant perishes after two years, while in perennial herbs the crown is capable of producing stems for many years, or new annual products are repeatedly added many times, if not indefinitely, to the old stems. The short permanent stem of herbaceous plants is covered partially or completely by the soil, so as to protect the buds. Plants producing permanent woody stems are called trees and shrubs. The latter are less than five times the height of a man, and produce branches from or near the ground; while the former have conspicuous trunks, which attain at least five times the height of aman. Shrubby plants of small stature are called wnder-shrubs or bushes. The limits between these different kinds of stem are not always well defined ; and there are some plants occupying an intermediate posi- tion between shrubs and trees, to which the name of arborescent shrubs is occasionally given. The stem receives the name of cazl7s in ordinary herbaceous plants which do not form a woody stem, culm in grasses, truncus in trees, caudex or stock in Palms and in some Cacti, and stipe in Ferns. The term Aaulm is probably a corruption of culm ; it is used by farmers to designate the stem

of grasses and the herbaceous stems of plants. The stem is not always conspicuous. Plants with a distinct stem are called caulescent ; those in which it is inconspicuous are acaulescent, as the Primrose, Cowslip, Gentian, and Dandelion. A similar term is given in ordinary language to plants whose stems are buried in the soil, such as Cyclamen or Sowbread. Some plants are truly stemless, and consist only of expansions of cellular tissue representing stem and leaf called a thallus, and hence are denominated Thallogens, o Thallophytes.

Stems have a provision for a symmetrical arrangement Leaf-buds.

of leaves and branches,—nodes, or points whence leaf-buds are produced, being placed at regular intervals. No such provision occurs in roots. The intervals between nodes are called internodes. The stem, although it has a tendency to rise upwards when first developed, in many instances becomes prostrate, and either lies along the ground partially covered by the soil, or runs completely underneath its surface, giving off roots from one side and buds from the other. Some stems are therefore subterranean, and are distinguished from roots by the provision made for regular leaf-buds. The first rudiment of the young stem in the embryo appears outside the seed or spore after the radicle has been protruded. It is termed the plumule (fig. 58), and differs from the radicle in the absence of a root-cap and in its tendency to ascend. The apical growing portion of the young stem constitutes the terminal bud of the plant, and by its development the stem increases in height ; but in addition there is a provision for the production of lateral buds, which develop into lateral shoots more or less resembling the parent stem, and by these the branching of the plant is determined. These buds are found in the ax of previously-formed leaves; or, in other words, in the angle formed between the stem and leaf. They are hence called axillary. They are produced always from the outer portion of the stem except in the case of Equisetaceze (Horsetails), where they have a deep-seated origin. At first they consist entirely of cellular tissue, but in the progress of growth vascular bundles are formed in them continuous with those of the stem, and ultimately branches are produced, which in every respect resemble the axis whence the buds first sprang. As the axis of the bud increases in length,

cellular projections appear at regular intervals upon the primary meristem, which are the rudimentary leaves.

Buds, as has been stated, are either terminal or lateral. By the production of the former, stems increase in length, while the latter give rise to branches (rami), from which others, called branchlets or twigs (ramulz), arise, and add to the diameter of the stem. The terminal bud, after producing leaves, sometimes dies at the end of. one season, and the whole plant, as in annuals, perishes; or part of the axis is persistent, and remains for two or more years, each of the leaves before its decay producing a bud in its axil, This bud continues the growth in spring. In ordinary trees, in which there is provision made for the formation of numerous lateral buds, any injury done to a few branches is easily repaired ; but in Palms, which only form terminal buds, and have no provision for a lateral formation of them, an injury inflicted on the terminal bud is more likely to have a prejudicial effect on the future life of the plant. In the trees of temperate and cold climates the buds which are developed during one season lie dormant during ‘he winter, ready to burst out under the genial warmth of spring. They are generally protected by external modihed leaves in the form of scales (tegmenta or perule), which frequently exhibit a firmer and coarser texture than the leaves themselves. They serve a temporary purpose, and usually fall off sooner or later, after the leaves are expanded. The bud is often protected by a coating of resinous matter, as in the Horse-chestnut and Balsam Poplar, or by a thick downy covering, as in the Willow. Linnzeus called leaf-buds hibernacula, or the winter quarters of the young branch. In some plants, as in Platanus, the buds destined to live through the winter are so completely surrounded by the base of the petiole as not to be visible until the leaf has fallen off. These are said to be untrapetiolar.

In the bud of a common tree, as the Sycamore (fig. 63), there is seen the cicatrix left by the leaf of the previous year ¢, with the pulvinus or swelling p, then the scales ¢, é, arranged alternately in a spiral, and overlying each

other in what is called an imbricated manner, On making a transverse section of the bud (fig. 64), the

ray

Fig. 64.

Fra, 63,—Leaf-bud of Syeamore (Acer Pseudo-platanus) covered with scales Fig. 64.—Transverse section of the same leaf-bud.

Fig. 63.

overlying scales ¢, ¢, ¢, ¢, are distinctly seen surrounding the leaves f, which are plaited or folded round the axis or growing-point. In plants of warm climates the buds are often formed by the ordinary leaves without any protecting appendages ; such buds are called naked. A bud may be removed in a young state from one plant and grafted upon another by the process of budding, so as to continue to form its different parts; and it may even be made to grow in the soil, in some instances, immediately after

removal. In some trees of warm climates, as Crycas, Plats!) | Papaw-tree, Palms, and Tree-ferns, growth by terminal ani Vi

buds is well seen. In these plants the elongation of the stem is generally regular and uniform, so that the age of the plant may be estimated by its height ; owing to this ‘mode of growth they do nof attain a great diameter. Although provision is made for the regular formation of buds, there are often great irregularities in consequence of many being abortive, or remaining in a dormant state. Such buds are called latent, and are capable of being developed in cases where the terminal bud, or any of the branches, have been injured or destroyed. In some instances, as in Firs, the latent buds follow a regular system of alternation; and in plants with opposite leaves, it frequently happens that the bud in the axil of one of the leaves only is developed, and the different buds so produced are situated alternately on opposite sides of the stem. Occasionally, after a partial development as branches, buds are arrested and form knots or nodules. The embryo-buds or nodules of the Beech, Cedar, and Olive are apparently of this nature.

When the terminal bud is injured or arrested in its growth the elongation of the main axis stops, and the lateral branches often acquire increased activity. By con- tinually cutting off the terminal buds, a woody plant is

made to assume a bushy appearance, and thus pollard trees are produced. Pruning has the effect of checking the growth of terminal buds, and of causing lateral ones to push forth. The peculiar bird-nest appearance, often presented by the branches of the common Birch, depends on an arrestment in the terminal buds, a shortening of the internodes, and a consequent clustering or fasciculation of the twigs. In some plants there is a natural arrestment of the main axis after a certain time, giving rise to peculiar shortened stems. Thus the crown of the root is a stem of this nature, forming buds and roots. Such is also the case in the stem of Cyclamen, Testudinaria Elephantipes, and in the tuber of the Potato. The production of lateral in place of terminal buds sometimes gives the stem a remark- able zigzag aspect. Branches are sometimes arrested In their progress at an early stage of their development, and. do not appear beyond the surface of the stem ; at other times, after having grown to a considerable size, they undergo decay. In both instances the lower part of the

branch becomes embedded and hardened among the woody layers of the stem.)

The mode in which branches come off from the stems gives rise to various forms of trees, as pyramidal, spread- ing, or weeping,—the angles being more or less acute or obtuse. In the Italian Poplar and Cypress the branches are erect, forming acute angles with the upper part of the stem ; in the Oak and Cedar they are spreading or patent, forming nearly a right angle; in the Weeping Ash and Elm they come off at an obtuse angle; while in the Weeping Wil- low and Birch they are pendulous from their flexibility. The comparative length of the upper and under branches also gives rise to differences in the contour of trees, as seen in the conical form of Spruce, and the umbrella-like form of the Italian Pine (Pinus Pinea). The branching of some trees is peculiar. In the Amazon district many Myris- ticaceze and Monimiaceze have verticillate branches coming off in fives. This is also seen in the Chili Pine. Sone Amazon trees taper downwards, so as to have a form like an inverted cone or pyramid, as in the Mulatto tree (Euky- lista Spruceana), one of the Cinchonacee.

Branches are sometimes long and slender, and run along the ground, producing buds with roots and leaves at their extremity or apex. This is seen in the runner (flagellum) of the Strawberry. In the Houseleek (Sempervivum) there is a similar prostrate branch of a shorter and thicker nature, producing a bnd at its extremity capable of independent existence. It receives the name of offset (propagulum). In many instances the branch decays, and the young plant assumes a separate existence. Gardeners propagate plants by the process of layering, which consists in bending a twig, fixing the central part of it into the ground, and, after the production of roots, cutting off its connection with the parent. A stolon differs from these in being a branch which curves towards the ground, and, on reaching a moist spot, takes root and forms an upright stem, and ultimately a separate plant. This is a sort of natural layering, and the plant producing such branches is called stoloniferous. In the Rose and Mint a subterranean branch arises from the stem, which runs horizontally to a certain extent, and ultimately sends up an aerial stem, which becomes an independent plant. Such branches are denominated suckers, and the plants are surculose. The gardener divides the connection between the sucker and the parent stem, in order to propagate these plants. In the case of Asparagus and other plants which have a perennial stem below ground, subterranean buds are annually produced, which appear above ground as shoots or branches covered with scales at first, and ultimately with true leaves. The young shoot is called a turio. These branches are herbaceous and perish annually, while the true stem remains below ground ready to send up fresh shoots next season. In Bananas and Plantains the apparent aerial stem is a shoot or leaf-bud sent up by an under- ground stem, and perishes after ripening fruit. Branches are sometimes arrested in their development, and, in place of forming leaves, become transformed into spines or thorns, as in the Hawthorn. Plants which have spines in a wild state, as the Apple and Pear, often lose them when cultivated, in consequence of their being changed into branches ; in some cases, as in the Sloe (Prunus spinosa), (fig. 65), a branch bears leaves at its lower portion, and terminates in a spine. Plants bearing thorns (modifications of branches or leaves) are denominated spiny, spinose, or spinescent. A bud is sometimes developed as a slender spiral or twisted branch, called a tendril or cirrus. In the Passion-flower the lateral buds are thus altered, with the view of enabling the plant to climb. In the Vine the

tendrils are looked upon as the terminations of separate axes, or as transformed terminal buds, and are sometimes

called sarmenta. In the Vine there are no young buds seen in the angle between the stem and leaves, nor between the stem and tendrils; and the latter are not axillary.

Fig. 65.

Fig. 65.—Branch of the Sloe (Prunus spinosa) producing spines or thorns which are abortive branches, as shown by their bearing leaves,

Fic. 66.—Portion of a branch of the Vine (Vitis vinifera), on which the terminal buds are converted into tendrils.

Fig. 66 represents the branch of a Vine, in which a’ is the primary or first formed axis, ending in v’,a tendril or altered terminal bud, and having a leaf f’ on one side. Between this leaf and the tendril, which represents the axis, a leaf-bud was formed at an early date, producing the secondary axis, or branch a”, ending in a tendril v”, with a lateral leaf f”, from which a tertiary axis or branch a” was developed, ending in a tendril v”’, and soon. The tendrils of Ampelopsis Veitchii are terminated by disks which secrete a sticky matter, by means of which they adhere to walls, &c. The tendrils, like those of the Vine, are modifications of the axis. Tendrils twist in a spiral manner, and enable the plants to rise into the air by twining round other plants. The direction of the spiral frequently differs from that of the climbing stem which produces the tendril. In the Vine the lower part of the stem is strong, and needs no additional support; the tendrils therefore occur only in the upper part, where the branches are soft, and require aid to enable them to sup- port the clusters of fruit. In the Bryony the tendril in the first part of its course twines from right to left, and in the last from left to right.

In some instances lateral buds are found without being in the axil of leaves. In this case they are extra-axillary. Such buds are produced after the stem and leaves have been formed, and in certain circumstances they are developed like

normal buds, What have been called embryo-buds are woody

nodules seen in the bark of the Beech, Elm, and other trees. They are partially developed adventitious or abnormal buds, in which the woody matter is pressed upon by the surround- ing tissue, and thus acquires a very hard and firm texture. When a section is made, they present woody circles arranged around a central pith, and traversed by medullary rays. The nodules sometimes form knots on the surface of the stem, at other times they appear as large excrescences, and in some cases twigs and leaves are produced by them. Buds sometimes become extra-axillary in consequente of the non-appearance or abortion of one or more leaves, or on account of the adhesion of the young branch to the parent stem. In place of one bud there are occasionally several accessory ones produced in the axil, giving origin to numerous branches. Such an occurrence is traced to the presence of latent or adventitious buds) By the union of several such buds, branches are produced, having IV. — 13

Modifica- tion of stem.

a thickened or flattened appearance, as is seen in the Fir, Ash, and other trees. These fasciated branches, in some cases, however, are owing to the abnormal development of asingle bud, Occasionally adventitious buds are produced on the edges of leaves, as in Bryophyllum calycinum (fig. 67), Malaxis paludosa,and various species of Asplenium, and on the surface of leaves, ag in Or— nithogalum thyr- soideum. These are capable of forming indepen- dent plants. Simi- lar buds are also made to appear on the leaves of Ges- nera, Gloxinia, and Achimenes, by wounding various parts of them, and placing them in moist soil ; this is the method often pursued by gardeners in their propagation. The Ipecacuan plant has been propagated by means of leaves inserted in the soil. In this case the lower end of the leaf becomes thickened like a corm, and from it roots are produced, and

ultimately a bud and young plant. Leaves bearing buds on their margin are called prolzferous.

The typical form of stems is rounded. They are some- times compressed or flattened laterally, while at other times they are angular: ‘being triangular, with three angles and three flat sides ; tregonous, with three convex faces ; triguet- rous, with three concave sides; quadrangular or square ; quinguangular or five-angled ; octangular or eight-angled, &c. Various terms are applied to the forms of stems, as cylindrical or terete, jointed or articulated, &c. The fol- lowing are some of the more important modifications of stems :—The crown of the root is a shortened stem, often partially under ground, which remains in some plants after the leaves, branches, and flower-stalks have withered. In this case the internodes are very short, and the, nodes are crowded together, so that the plant appears to be stemless. It is seen in perennial plants, the leaves of which die down to the ground annually. A rhizome or root-stock (fig. 68) is a stem which runs along the surface of the gyround,. being partially covered by the soil, sending out roots from its lower side and leaf-buds from its upper. It occurs in Ferns, Iris, Hedychium, Acorus or Sweet Flag, Gin- Rhizome + of Polygonatum multifiorum (Solomon’s

Leaf of Bryophyllum calycinum, producing buds along the margin, at the extremities of the primary veins.

: Seal), forming bnds and adventitions roots, a. ser, Water-lily ? many young bud; 6, bud developed as a branch; e¢, ‘ species of Carex, cicatrices or scars of old branches.

Rushes, Anemone, Lathrea, &c. By many the term rhizome is applied to stems creeping horizontally, whether they are altogether or only partially subterranean. In rhizomes called definite, the terminal bud gives off flowers, and the lateral buds form the stem ; while in indefinite rhi- zomes the terminal leaf-bud is formed annually. A rhizome such as occurs in Solomon’s Seal (fig. 68) is not a single stem, t.¢., the product of a single bud, but is composed of por- tions of successive axes, the leaves of which have died off and remain as scars (fig. 68, c, c); itis thus an indefinite rhizome. Rhizomes are well seen in British Ferns. A rhizome sometimes assumes an erect form as in Scabiosa succisa, in which the so-called

premorse root is in reality a rhizome, with the lower end decaying. The erect rhizome of Cicuta virosa shows hollow internodes, separated by partitions.

BOTANY

[NUTRITIVE ORGANS,

A pseudo-bulb (fig 62) is an enlarged bulbous-like aerial stem, common in Orchidaceous plants. It is succulent, often contains numerous spiral cells and vessels, and is covered with a thick epidermis. A soboles is a creeping underground stem, sending roots from one part and leaf- buds from another, as in Couch-grass, Carex arenaria, and Scirpus lacustris. Itis often called a creeping root, but is really a rhizome with narrow elongated internodes, A tuber ig a thickened stem or branch produced by the approximation of the nodes and the swelling of the inter- nodes, as in the Potato. The eyes of the Potato are leaf- buds. Tubers are sometimes aerial, occupying the place of branches. The ordinary herbaceous stern of the Potato, when cut into slips and planted, sends off branches from its base, which assume the form of tubers. Tubers frequently store up a quantity of starch as in Maranta arundinacea, whence arrowroot is derived. Another form of thickened underground stem is the corm, as seen in the Autumn Crocus (Colchicum, fig. 69), Gladiolus, &c. Structurally it is composed of a solid more or less rounded axis covered by a layer of thin membranous scales (fig. 70, 4, h). A

4 ob

‘wl || | Fig. 70.

Fa. 69.—Corm of Meadow Saffron (Colchicum autumnaie). ling; 6, young corm produced laterally from the old one.

Fra. 70.—Corms of Colchicum autumnale in autumn when the plant is in flower. k, oldest corm; h, h, brown scales covering it; t, its roots; st, its withered flower- ing stem; k’, younger corm produced from &; wh, roots from k’, which grows at expense of &; 8, s’, 8”, sheathing leaves; 7,2”, foliage lcaves; b, b, flowers; &”, young corm produced from # in autumn, and which in succeeding autumn will produce flowers. (Sachs.)

corm is only of one year’s duration, giving off buds annually in the form of young corms. In autumn the young corm gives origin to leaves, the lower of which (s, s’, s”) form sheaths round the corm and flower-stalk, the upper (1, 1”) re- maining very small ; and in the axil of the uppermost leaves the flowering-stem develops and bears the flowers (6, 0). Meanwhile in the axil of the middle leaves on the corm, @ bud—the rudiment of a new corm—appears (k’). The flowering-stem dies down, and the corm from which it arose enlarges greatly during the winter at the expense of its parent corm (k), which thus becomes shriveled. In spring the leaves produced on it (‘, 1”), which were merely rudiments in autumn, appear above ground as conspicuous

a, old corm shrivel-

i} | / y |

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| scales enclosing a growing-point. Ihese

| Bulbils are therefore transformed leaf- | buds, which are easily detached, and _ are capable of producing young plants

| stances. The scales in bulbs vary in

large leaves. At the end of spring these leaves die down, the bases of the lower ones alone remaining, and constituting thin brown scales around the corm (as at h), Meanwhile, the young bud corm (#”) in the axil of the middle leaves grows rapidly at the expense of its parent corm (k’), but it does not attain a great size. In autumn it produces new leaves, which remain small, but from the axil of the two upper the flowering stem rises up and bears flowers ; whilst in the axil of its middle leaves a new bud-corm appears, which will the following autumn produce young leaves, flowering stem, and a new bud-corm, and thus the cycle goes on. The buds or new corms formed from the old corms may be produced either laterally, as in Colchicum autumnale, or terminally, as in Crocus and Gladiolus. The bulb

is another form of underground stem or bud. The axis in this case is much shortened, and the internodes are hardly developed. The bases of the leaves rising from the stem are quite close together, and become succulent and enclose the axis, In the Lily the thick and narrow scales are arranged separately in rows, and the bulb is called scaly ; while in the Leek, Onion, Squill, and Tulip the scales are broad, and enclose each other in a concentric manner, the outer ones being thin and membranous, and the bulb is tunicated. In the axils of these fleshy scales new lateral

shoots arise, forming new bulbs. The lateral buds or cloves'

sometimes remain attached to the axis, and produce flowering stems, so that apparently the same bulb continues to flower for many years, as in the Hyacinth and Tulip; at other times the young bulbs are detached, and form separate plants. In the axil of the leaves of Lilium bulbiferum, Dentaria bulbifera, and some other plants, small conical or rounded bodies are produced, called bulhils or bulblets (fig. 71,). They resemble bulbs in their aspect, and con- sist of a small number of thickened

scales are frequently united closely to- gether, so as to form a solid mass.

when placed in favourable circum-

number. In Gagea there is only one scale; in the Tulip and Fritillaria im-

Big: (71: soa , Stem of Bulbifcrous Lily perialis they vary from two to five; "(tun bulbiferum),

while in Lilies and Hyacinthsthere are showing bulbils or | Z bulblets 6, produced a great number of scales, Inthe Tulip in the axils of the

a bud is formed in the axil of an outer 've.

scale, and this gives rise to a new flowering axis, and a new bulb, at the side of which the former bulb is attached in a withered state.

The forms of the stem having been considered, we now

| proceed to examine its anatomical structure, This structure , consists of the elementary tissues combined and arranged in

various ways. The arrangement of the fibro-vascular bundles in the mature stem or root is not the same in all plants, But we find that in most plants which have two

_ Seed-lobes in the embryo, ie., Dicotyledons, a characteristic

structure is apparent, quite distinct from what is found in the majority of plants in which only one seed-lobe is present in the embryo, 7.¢., in Monocotyledons; and these, again, have a different structure from that found in Acotyledons, or plants with no seed-lobe in their embryo. The three forms of stem here referred to have been usually distin- guished as follows :—(1.) Leogenous stem, in which the fibro-vascular bundles are produced indefinitely in an out- ward direction, and the stem increases in diameter by the annual formation of a new layer of woody matter on the outside of the preceding layers. This is the form found in most Dicotyledons, and they have hence been called

Eazogens, or Outward-growers, Ordinary trees, such as the Oak and Ash, furnish instances. (2.) Endogenous stem, in which the fibro-vascular bundles are definite, and are formed towards the centre, which becomes filled up with them in the progress of growth, so that the diameter of the stem increases in a great measure by the new matter pushing out that previously formed, This stem characterizes many Monocotyledons, which have thus been called Hndogens, or Inward-growers. Palmssupply examples. (3.) Acrogenous stem, in which the bundles of vessels are simultaneously developed, and the additions to the stem take place at the summit by the union of the bases of the leaves. Plants having this kind of stem are called Acrogens, or Summit- growers, and are Acotyledons. Tree-ferns furnish an example. Recent research, however, has shown that these terms cannot always be used as synonymous with Dicotyle- don, Monocotyledon, and Acotyledon, as we find amongst Dicotyledons stems where the formation of new fibro-vascu- lar bundles is distinctly endogenous, and again amongst Monocotyledons stems with a provision for exogenous growth, and also amongst Acotyledons examples are not wanting in which a continuous increase in diameter is pro- vided for,

We shall consider the structure of the stem in Dicotyle- dons, Monocotyledons, and Acotyledons successively.

In the young stem of a Dicotyledon the fibro-vascular stem in bundles first appear asa circle of wedge-shaped masses, Dicotyle- by which the stem is divided into a central cellular 2™* portion, the pith, and a peripheral cortex,—the space between the bundles being occupied by cellular tissue con- stituting the medullary rays, and uniting the pith and cortex. Each fibro-vascular bundle increases by division of its own cambium cells. Jf eventually all the cambium cells become permanent tissue Te then the bundle becomes closed, ra ts and all further growth ceases, This is the complete structure of an annual nerhaceous dicotyle- donous stem, which thus consists of a central cellular pith, a circle of fibro-vascular bundles, a cel- lular cortex united with the pith by medullary rays, and outside all an epidermis (fig. 72). In trees and shrubs with permanent woody a stems, the young shoots given out Fig. 72. annually have a structure similar Young Dicotylcdonous stem. m, to that of annual herbaceous Pee itier Weunless eet stems ; but as the shoot grows, aes a eg all is further changes occur by which / the diameter is increased, and the stem becomes more densc. After the first year’s growth, the cells of the medullary rays, stretching between the fibro-vascular bundles and con- tinuous with their cambium cells, be- come converted into secondary mert- stem, and then an interfascicular cam- bium is formed, which eventually coalesces with the cambium cells of the fibro-vascular

Fig, 73.

Young Dicotyledonous stem; m, pith; jv, fibro-vas- bun dles, and thus cular bundles; cb, connecting band of meristem, by

_ complet e cam- which a cambium ring is formed; r, cortex. (Suchs.)

bium ring is formed (fig. 73). From this cambium ring new xylem or wood is formed on the inside, whilst new cortex

 is formed on the outside; and in this way the stem increases in thickness. This growth in thickness, however, ceases periodically, and is renewed with each new period of vege- tation, and thus the wood is formed in concentric layers, sharply marked off from succeeding layers, each being an

coloured, dry, and full of air. These changes take place first in the central cells. Sometimes the pith is broken u

into cavities, which have a regular arrangement, as in the Walnut, Jessamine, and Cecropia peltata ; it is then called discoid or disciform. At other times, by the rapid growth : of the outer part of the stem, the pith is ruptured irregu. |

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The pith.

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annual ring of wood, and the same is seen in the cortex (fig. 74). The rings of wood are thus formed successively outside those pre-existing, while in the cortex the new layers are produced inside those already formed.

The inner vessels of the primary fibro-vascular bundles immediately surround the pith and often project into it, and form what is termed the medullary sheath, which consists of spiral vessels, and through this sheath the primary medullary rays pass. These medullary rays extend from the pith to the cortex, but as new zones of wood and cortex are produced, new rays

are formed in them, which increase by additions from the cambium layer. The secondary cortex, formed from the cambium ring, constitutes what is commonly known as the inner bark or endophleum ; the primary cortex, which forms the outer bark, consists of two layers of cells, which have been respectively termed the mesophlccum and the epiphiceum. Outside all is the epidermis. This, however, does not remain as thin-walled cells, but is usually converted into periderm, and this may in turn be completely supplanted by the bark. Thus, if a transverse and a longitudinal section of a Dicotyledonous stem be made, the following structures will be seen as repre- sented in fig. 74. In the centre is the cellular pith a, a,

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Fig. 74.

Diagram of the structure of an Exogenous or Dicotyledonous stem of three years' growth, A being a transverse section, and B a vertical section. The figures 1, 2, 8, mark the years of growth, and the letters refer to the same parts in both figures. a, a, medulla or pith, consisting of hexagonal parenchyma; b, 6, b, pitted or dotted vessels, and c, c,c, wood-cells, of successive annual layers ; d, spiral vessels of the medullary sheath; ¢, layer of cambium cells between wood and bark; 7, inner bast layer of bark 'Liber, Endophlceum); g, cellular envelope, forming middle laycr of bark (Mesophlcum) ; h, outer corky layer of bark (Epiphloeum) ; 4, ¢, medullary ray which, in the transverse section, is seen running continuously from the pith to the bark. (Ajter Carpenter.)

immediately surrounding it comes the medullary sheath d,

then the secondary layers of wood 8, c, of successive years'

growth, outside this the cambium ring e, separating the wood- layers from the cortical layers. Of these last, the inner, /, is the bast layer or endophleum, g is the middle cellular layer or mesophleeum, and d is the outer epiphleum. The latter two constitute the outer bark. Connecting the

meso- phloeum with the pith is seen a medullary ray 7, Outside all are the epidermal tissues.

Let us now examine the different parts of an Exogenous stem proceeding from the centre to the circumference :-—

_ The Pith, or the central part of a Dicotyledonous stem,

is composed of cellular tissue. In the young stem it is

succulent, the cells being full of fluid and frequently of a

greenish hue; but in process of time it becomes pale-

larly, and forms large cavities, as in the fistular stem of Plate} Umbelliferous plants. In some cases fibro-vascular bundles are found in the pith, as in Elder, Pitcher-plant, and Ferula, and occasionally its cells are marked by pores indicating a thickening of the cell-wall. The extent of pith varies in different plants and in different parts of the same plant. In Ebony it is small, while in the Elder it is large. In /schynomene aspera (Shola plant, the Rice paper plant of India), the interior of the stem is almost entirely composed of cellular tissue or pith ; from this a kind of paper is made, and light hats. The same kind of tissue occurs in the Papyrus of the Nile. Large pith is also seen in Fatsia (Aralia) papyrifera (Tung-tsaou or Chinese rice-paper plant), and in Scevola Taccada of the — Malay archipelago. When the woody circle of the first year is completed, the pith usually remains stationary as regards its size, retaining more or less its dimensions, even in old trunks, and never becoming obliterated.

‘ The Medullary Sheath is the fibro-vascular layer Medilly immediately surrounding the pith. It is the inner layer shea of the fibro-vascular bundle of the first year (fig. 74,d),and consists chiefly of true spiral vessels, with annular and reticulated vessels, intermixed with long woody fibres, which continue to exercise their functions during the life of the plant, and which extend into the leaves, Between the ves- sels of the sheath the medullary rays from the pith pass.

The Wood.—The layers of wood (fig. 74, }, c) are formed Tem outside the medullary sheath in concentric rings in the | manner already described. On account of this mode of formation of wood-layers successively outside pre-existing layers the stem increases indefinitely. ‘There are no annular or spiral vessels present; these have been replaced by pitted and punctated vessels along with wood-cells. The stems have been called exogenous and also indefinite, and Dicotyledonous plants have sometimes received the name of Cyclogens, in consequence of exhibiting concentric circles in their stems. On a transverse section each zone of circle is usually seen to be separated from that next to it by a well-marked line of demarcation. This line, as in the Oak and in the Ash, is indicated by holes which are the openings of large pitted vessels,—the remainder of the tissue in the circle being formed by pleurenchymatous tubes with thickened walls and of smaller calibre. In sone trees, a8 the Lime, Hornbeam, and Maple, the line is by no means so well marked, as the openings are smaller and more generally diffused ; but there is usually a deficiency of pitted vessels towards the outer part of the circle. In cone-bear ing plants, as the Fir, in which the woody layers consist entirely of punctated tissue, without any large pitted vessels, the line of separation is marked by the tissue becoming dense and often coloured. In some kinds of wood, a8 Sumach, the zones are separated by a marked development of cellular tissue. The separation between the zones 13 owing to the interruption in the growth of the tree during autumn and winter, and hence it is well defined in trees of temperate and cold climates. But even in tropical trees, the lines, although often inconspicuous, are still visible,— the dry season, during which many of them lose their leaves, being their season of repose.

The woody layers vary in their texture at different periods. At first all the tissues are pervious and full of fluid; but by degrees they become thickened, and the channels of the vessels get filled up and obliterated. ‘The first-formed layers are those which soonest become thus

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altered. In old trees there is a marked division between the central heart-wood or duramen, and the external sap- wood or alburnum,—the former being hard and dense, and often coloured, with its tubes dry and thickened, while the latter is less dense, is of a pale colour, and has its tubes permeable by fluids. The difference of colour between these two kinds of woods is often very marked. In the Ebony tree the duramen or perfect-wood is black, and is the part used for furniture, while the alburnum is pale ; in the Beech, the heart-wood is light-brown ; in the Oak, deep-brown; in Judas tree, yellow ; in Guaiacum, greenish. The alteration in colour is frequent in tropical trees. In trees of temperate climates, called whate-wood, as the Willow and Poplar, no change in colour takes place ; this is also the case in the Chestnut and Bombax. ‘The relative proportion of alburnum and duramen varies in different trees. The heart-wood is more useful than the sap-wood, and is less liable to decay.

From the mode in which the woody layers are formed, it is obvious that each vascular zone is moulded upon that which precedes it; and as, in ordinary cases, each woody circle is completed in the course of one year, it follows that, by counting the concentric circles, the age of a tree may be ascertained. Thus fig. 75 represents an oak eight years old, having eight woody layers 6. This computation can only be made in trees having marked separations There are, however, many sources of § In some instances, by interruption to growth,

in one year, and thus lead to an erroneous estimate. Care must be taken to have a complete section from the bark to the pith, for the circles

Fig. 75.

Horizontal section of the stem of an oak eight years old. 0, wood, show- ing concentric circles or zones, separ- ated by points which correspond to the opening of the large pitted vessels; é, bark, showing also eight concentric

circles, thinner and less distinct, The wood and bark are traversed by medullary rays, some of which are the primary rays extending from the bark to the pith, while others (the secondary rays) reach only a certain way inwards.

different parts of their course, anda great error might occur from taking only a few rings,

ing for the whole diameter of the tree. When by the ac- tion of severe frost, or other

causes, injury has been done to the tender cells from which

the young wood is developed, while, at the same time, the tree continues to live, so as to form perfect woody layers in subsequent years, the date of the injury may be ascertained by counting the number of layers which intervene between the imperfectly formed circle and the bark. Inscriptions made in the wood become covered, and may be detected in

after years when a tree is cut down ; so also wires or nails _ driven into the wood. As the same development of woody _ layers takes place in the branches as in the stem of an

exogenous tree, the time when a branch was first given off may be computed by counting the circles on the stem and branch respectively. If there are fifty circles, for instance, in the trunk, thirty in one branch and ten in another, then the tree must have been twenty years old when it produced the first, and forty when it formed the other.

In exogenous stems the pith is not always in the centre. The layers of wood on one side of a tree may be larger than those on the other, in consequence of their fuller exposure to light and air, or the nature of the nourishment conveyed, and thus the pith may become excentric. Zones vary in size in different kinds of trees, and at different periods of a plant’s life. Soft wooded trees have usually broad zones, and old trees form smaller zones than young

ones. There are certain periods of a plant’s life when it seems to grow most vigorously, and to form the largest zones, ‘This is said to occur in the Oak between twenty and thirty years of age.

Cambium.—External to the layers of wood, and between Cambium.

them and the bark, there is a layer of thin-walled cells in which the protoplasm and cell-sap remain, and consequently they are capable of division and growth. To this layer the name of cambium has been given. This cambium layer marks the separation between the wood and the bark, and may be regarded as constituting the active formative tissue of Dicotyledonous stems. It constitutes the thicken- ing zone, by means of which the stem is enlarged,—the cambium cells situated most internally being subservient to the purposes of the wood formation, while the external ones give origin to the new bark. When these cells are carry- ing on the process of growth with activity, during the flow of the sap in spring, the bark can be easily separated from the wood.

The Bark or Cortical System lies external to the wood, and, like it, consists of several layers. In the early state it is entirely cellular, and is in every respect similar to the pith; but as the fibro-vascular bundles are developed, the bark and pith are separated, and the former gradually becomes altered by the formation of secondary deposits. We find in the cortex, as in the wood portion of the stem, fibro-vascular along with cellular tissue. But the position and relative proportion of these two systems is reversed. In the bark the cellular system is external, and is much developed, while the fibro-vascular is internal, and occupies comparatively a small space. The cellular portion of the bark consists of an external layer, or epiphiceum, and the cellular envelope, or mesophleum, while the vascular system forms the internal portion called liber, or endophleeum.

The endophlceum, liber, or inner bark, is formed from the secondary cortex of the young stem. It consists mainly of thick or thin walled woody fibres, commonly known as bast-fibres, mixed with elongated cellular tissue and frequently with laticiferous vessels. It is separated from the wood by the cambium layer. The pleurenchymatous tubes are thickened so as to be

flexible, but are not ligni- fied, and are thus very tenacious. The endophlcum of the Lime-tree and of Antiaris saccidora (the Sack tree of Coorg) is used to form mats, cordage, and bags; and the tough- ness of the fibres of the inner bark of flax, hemp, and of many of the Nettle and Mallow tribes, render them fit for various manufacturing purposes. The endophloeum is sometimes, from its uses, called the bast-layer. Occasionally it is continuous and uninterrupted, as in the Vine and Horse-chestnut ; at other times, as in the Oak, Ash, and Lime, the fibres are separated during the progress of growth, and form a sort of network, in the interstices of which the medullary rays are seen, The fibres of the Lace-bark tree (Lagetta lintearia) are similar. In fig. 76 is represented the bark of Daphne We Laureola,—f indicating the woody fi]

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M3 fibres of liber, and r the medullary | MT rays. The endophlcum increases by / |j}j/|/f layers on its inside, which are thin, My and may be separated like the leaves Vpn c of a book. The outer layer of bast- f fibres betwixt the endophloeum and the outer bark has been termed the cortical sheath, corresponding to the medullary sheath on the inside of the stem.

The outer bark is formed from the primary cortex; it is always cellular, and is divided into two layers, the epi-

Network formed by liber of Daphne Laureola. fi J, fibrous bundles; 7, % medullary rays.

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phleum with the mesophleum underneath. The cellular envelope, or mesophleum, lies immediately on the outside of the liber. It consists of polyhedral, often prismatical cells, elongated vertically to the surface, usually having chlorophyll, or green colouring matter, in their interior, but sometimes being colourless, and containing raphides. They are distinguished from those of the epiphlcum by their form and direction, by their thicker walls, their green colour, and the intercellular spaces which occur among them. This cover- ing is usually less developed than the outer suberous layer, but sometimes, as in the Larch and common Fi, it be- comes very thick, and separates like the epiphleum. In the cellular envelope laticiferous vessels occur. The epzt- phleum is the outer covering of the bark, consisting of cells which usually assume a cubical or flattened tabular form. The cells have no chlorophyll in their interior, are placed close together, and are elongated in a hori- zontal direction; and thus they are distinguished from the cells of mesophleeum. In the progress of growth they become often of a brown colour. composed of a single layer of tabular cells; but in some trees it consists of numerous layers, forming the substance called cork, which is well seen in Quercus Suber, the Cork- oak ; hence the name swberous, or corky layer, which is given to it, The form of its cells varies in sume instances, being cubical at one part, and more compressed or tabular at another, thus giving rise to the appearance of separate layers. On the exterior of the epiphloeum is situated the epidermis, which has already been described. Itis formed of a layer of cells, which in woody stems serve only a temporary purpose, becoming ultimately transformed in various ways.

The bark, in its increase, follows an order exactly the reverse of that which occurs in the woody layers. The layers of liber owe their increase to the cambium cells, which, by their constant reproduction, mark the separation between the xylem and phloém portions of the stem. These layers are often so compressed and united together as to be counted with difficulty, while at other times they are separated by rings of cellular tissue, and thus remain con- spicuous. As the additions are made to the woody layers on the

outside, and to the bark on the inside, there is a constant distension going on, by. which the bark becomes compressed, its layers of liber are condensed, the fibres are often separated (fig. 76) so as to form meshes, its epider- mis is thrown off, and the epiphlceum is either detached along with it, or, when thick, is ruptured in various ways, so as to give rise to the rugged appearance presented by such trees as Elm and Cork-oak. In some instances the bark is very distensible, and its outer cellular covering is not much developed, so that the surface remains smooth, as in the Beech. The outer suberous layer sometimes separates with the epidermis, in thin plates or scales; in the Birch these have a white and silvery aspect. There is thus a continual destruction and separation of different portions of the bark. The cellular envelope and liber may remain while the epiphloeum separates, or they also may be gradually pushed off—the parts which were at first internal becoming external. In the case of some Australian trees both the cellular and fibrous portions are detached in the form of thin flakes, and occasionally each annual layer of liber pushes off that which preceded it. The epidermis separates early, and no renewal of it takes place. It is, however, replaced by the cork layer, which then covers the outer part of the stem. To this covering the name periderm is given.

From the mode in which the outer layers of bark separate, it follows that inscriptions made on them, and not extend- ing to the wood, gradually fall off and disappear.

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of the continued distension of an exogenous stem, it ig found that woody twining plants cause injury, by interrupt ing the passage of the fiuids, Thus a spiral groove may be formed on the surface of the stem by the compression exercised by a twining plant, such as Bush-rope (Bauhinia, fig. 77) or Honeysuckle. From what has been stated relative to the changes which take place in the aus bark, it will be understood that it is often aD difficult to count its annual layers, so as to estimate the age of the tree by means of them. This may, however, be done in some cases, as shown at fig.

75, where there are eight layers of bark e, and eight woody layers 0.
Medullary Rays or Plates.—While the bark and pith become gradually separated by the intervention of vascular bundles, the con- nection between them is kept up by means of processes called medullary rays (figs. 78 and 79). These form the silver grain in wood, so conspicuous in the maple; they communicate with the pith and tbe cellular envelope of the bark, and they consist of cellular tissue, which becomes compressed and flattened so Miss? % as to assume a muriform appearance. At gnnaa inal first they occupy a large space (fig. 72, st); furroonda but as the vascular bundles increase they tercalledBush- become more and more narrow, forming thin laminee or plates, which separate the woody bundles, On making a transverse or horizontal section of a woody stem, the medullary rays present the aspect of narrow lines running from the centre to the circumference (fig. 74); and on making a vertical section of a similar stem through one of the rays, the appearance represented in fig. 78 will be observed, where a medullary ray mr, composed of flattened muriform cells, passes from the pith p to the cellular

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Fig. 78. Fig. 79. Fig. 78.—Vertical section of a young Dicotyledonous stem, parallel to the medul- Fie 49. Vertical section of the same, tangential to the medullary rays. envelope ce, crossing the trachess of the medullary sheath t, the ligneous tissue /, the pitted vessels of the wood }, and the fibres of the liber ¢& The lamine do not by any means preserve an uninterrupted course from the apex to the base of the tree. They are broken up by the interven- tion of woody fibres, as seen in a vertical section of a woody stem (fig. 79), tangentially to the medullary rays mr, mr, mr, which are separated by interlacing fibres J. The primary medullary rays extend completely from the pith to the bark; but in the secondary wood and secondary cortex new rays are formed which, therefore, extend only through a portion of the stem. These are secondary medul- lary rays, All may increase by division of the merismatic cells of the cambium. Medullary rays are conspicuous it the Cork-Oak, Hazel, Beech, Ivy, Clematis, Vine. They

are not so well marked in the Lime, Chestnut, Birch, Yew. —

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8THM IN DICOTYLEDONS.

The medullary rays are in some cases, as in Clematis and Aristolochia, large and broad, while the woody wedges are comparatively small.

The stems of Dicotyledonous plants occasionally present anomalous appearances in the structure and arrangement of their wood, bark, and medullary rays. In place of con- centric circles there are sometimes only a few rows of wedge-shaped vascular bundles produced during the life of the

plant, additions being made by the annual interposi- tion of bundles of a similar kind, resembling in this respect the formation of woody bundles in the early growth of herbaceous plants. In Piperacee, Aristolochiacee, and Menispermacez, these anomalous stems occur. In Gnetum (fig. 80), the vascular bundles, 8, 6, 6, b, 6, form zones, which

Fig. 80. Fig. 81.

Fia. 80.—Horizontal section of stem of Gnetum. m, pith; em, medullary sheath ; 0, b, bb, 6, woody bundles forming seven concentric zones, each of which is the produce of several yeurs; 1,1, 1,1, 7,1, fibres of liber, forming interposed circles equal in number to the woody zones.

Fig. 81.—Peculiar stem of a Malpighiaceous plant of South America, The plant

‘ is Dicotyledonous.

are each the produce of several years’ growth, and are separated by layers, /, 7, 7, 1, 1, 4, which may be considered as representing different bast-layers. In some of the Menispermacez the separating layers are of a cellular and not of a fibrous nature. Many of the Malpighiacex, Sapindaces, and Bignoniaceew of Brazil exhibit stems in which the woody layers are arranged in a very irregular manner. Insome of them (fig. 81) there isa central woody inass with from three to ten small secondary ones round it. Each of the masses contains true pith, derived either from the cortical cellular tissue, or from the original medullary centre, Around these separate collections of pith there is a medullary sheath and spiral vessels) No annual rings have been detected in the secondary masses, but medullary rays exist usually in their outer portion. In some anomalous Sapindaces, the central and lateral woody masses are enclosed in a common bark, with a continuous layer of liber. Some have supposed that the lateral masses are undeveloped branches united together under the bark.

In some Bignoniacee: (fig. 82) the layers of wood are divided

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Fig. 83. Fie, 82.—Horizontal section of the stem of Bignonia capreolata, showing the crucial division of the woody layers. Fig. 83.—Fragment of a stem of a climbing species of Banisteria (B. scandens), showing the effocts of compression,

in a crucial manner into four wedge-shaped portions by the intervention of plates differing in texture from the ordinary |

wood of the plant, and probably formed by the introversion, or growing inwards, of the liber. In Aspidosperma excelsum (Paddle-wood) of Guiana, and in Heteropterys anomala, the stem assumes a peculiar lobed and sinuous aspect ; and in some woody climbing plants pressure causes the stems to become flattened on the side next the tree on which they are supported, while from being twisted alternately in different directions, they present a remarkable zigzag form, having the woody layers developed only on one side (fig. 83). In Firs the wood is occasionally produced in an oblique in place of a perpendicular manner, thus injuring the timber and causing it to split in an unusual way. The young plants produced from the seed of such twisted-wooded firs are said to inherit the peculiarity of their parents. Occasionally the Dicotyledonous stem becomes swollen at certain places, especially near the root, and thus exhibits a tuberous appearance. This peculiarity is said to be liable to occur in Coniferous plants grown from cuttings. In some of the lower class of plants a cellular stalk is produced, which on a transverse section presents an appear- ance like that of a Dicotyledonous stem. Thus Lessonia fuscescens, a species of sea-weed, has stems which are often 5 to 10 feet long, and as thick as the human thigh, and which show concentric elliptic cellular rings. Such is also the case with Usnea melaxantha, a tree-like lichen. In these plants, however, the structure is entirely cellular, and quite distinct from that of Dicotyledonous plants.

In the young stem of a Monocotyledonous plant the fibro- vascular bundles appear scattered in an irregular manner through the fundamental parenchyma, becoming more numerous towards the periphery. There is thus no primary separation in the stem into pith, cortex, and medullary rays,

although the central cellular mass may be considered as representing the pith. Thus, if a section be made across a young Monocotyledonous stem, an appearance is observed such as is represented in fig. 84, where the vessels are seen

Fig. 85.

Fig. 84. Fig. 84.—Transverse section of the stem of a Palm, which is Monocotyledonous. m, the central loose cellular portion; 7, the outer fibrous portion, showing numer- ous vascular bundles. The whole being covered by a false bark or rind. Fig. 85.—Transverse section of the stem of a Palm, more advanced. as points scattered through a cellular matrix, the circum- ference not having any marked cortex, and the whole covered by an epidermis. A similar section of a further advanced stem, as of a Palm (fig. 85), shows numerous bundles of vessels dispersed irregularly in cellular tissue ; those near the centre, m, being scattered at a distance from each other, while those towards the outside are densely aggregated, forming a darkish zone 6, and are succeeded at the circumference by a paler circle of less compact vessels 7, with some compressed cells, covered by an epidermis é The central cellular mass has no medullary sheath. In some cases its cells are ruptured, and disappear during the progress of growth, leaving a hollow cavity ; but in general it remains permanent, and is gradually encroached upon by the development of the vascular systenu. The peripheral portion “differs from true bark in not being separable from the rest of the tissue. It has received the name of false bark, and consists of the epidermal cells e, and what has been called the cortical integument, 7. This

Stem in Monocoty- ledons,

of their course. The true distinction between exogenous and endogenous stems is, that in the former the fibro- vascular bundles remain open, a cambium ring being eventually formed from which the stem increases indefinitely in diameter. In the latter the fibro-vascular bundles soon become closed, and being scattered irregularly through the cellular tissue, and not in a circle, no cambium ring can be formed, and thus growth in a transverse direction is soon arrested, and the stem is of a comparatively

uniform diameter throughout. The investing bark of the former permits an unlimited extension of woody growth beneath it; the fibrous cortical layer of the latter, by maintaining an intimate union with the subjacent tissue, prevents unlimited increase in diameter. Hence we find that the stem does not attain the enormous diameter exhibited by some Dicotyledonous trees, such as Sequoia (Wellingtonia) gigantea and the Baobab,—the former of which has been measured 116 feet in circumference. In consequence of this mode of formation, the outer part of a Palm-stem is the hardest and densest, and after acquiring a certain degree of firmness it resists all further distension, and frequently becomes so hard as to withstand the blow of a hatchet, and therefore a woody twining plant does less injury to it than to trees of exogenous growth (fig. 88). The growth

 portion of the stem is often very inconspicuous, but some- times it is much developed, as in Testudinaria Elephantipes, in which it is rugged, and is formed of a substance resembling cork in many respects. The fibro-vascular bundles of the stem very soon become closed, and thus all growth in them ceases, the cambium cells being converted completely into permanent tissue. Fig. 57 represents a transverse section of a closed fibro-vascular bundle from the stem of the maize (Zea Mays). In it the several elements seen in the section of the fibro-vascular bundle

the bundle, and hence the limited diameter characteristic of the stems of Monocotyledons.

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Fig. 86.

Diagram of a Monocotyledonous stem. A, transverse section; B, longitudinal section; a, a, cellular tissue (Parenchyma); 6, 0, dotted vessels (Bothrenchyma), c, ¢, woody fibres (Pleurenchyma); d, d, spiral vessels (Trachenchyma). (After Carpenter.)

represents a transverse and longitudinal section of a Monocotyledonous stem.

All the fibro-vascular bundles of the stem are common bundles, that is, they pass out into the leaf, and in these stems each bundle has a definite arrangement. At the point where the bundle curves out into the leaf it has its greatest thickness, gradually becoming attenuated as it passes upwards into the leaf and downwards into the stem. In some instances, however, the bundles as they descend increase at different parts of their course, probably by interstitial growth, and give rise to irregular swellings of the stem, as in Ceroxylon Andicola. The distension takes place occasionally at the base of the stem, as in Kuterpe montana. This downward prolonged portion does not, however, run a straight course, but first passing inwards towards the centre of the stem, it then gradually arches outwards towards the periphery. This passing inwards at first of the fibro-vascular bundle gave origin to the idea that the first formed fibres were gradually pushed towards the circumference by those which succeeded them, and that the wood portion of these stems was increased by additions to the centre ; hence the term endogenous applied to them, meaning internal growth. But, as has been shown, the fibro- vascular bundles really become external at the base, although internal above. On making a vertical section of the endogenous stem, as of a Palm (fig. 87), there is observed an interlacing of fibres, the fibro-vascular bundles are first directed towards the centre, and then curve outwards towards the circumference, so that those last formed ultimately become external. The term endogenous will, therefore, only apply strictly to the fibres at the early part

Fie. 87.—Vertical section of a Palm-stem, showing the vascular bundles, JY, curving downwards and interlacing.

Fig. 88.—-Monocotyledonous stem, surrounded by a twining woody plant, and remaining uninjured.

of endogenous stems may be said to resemble an upward growth of an exogen by the terminal bud only, for there is no cambium layer, and no peripherical increase. The terminal central bud is called a phyllophor or phyllogen. As growth only proceeds in this manner, no annual rings of wood are formed. From the absence of concentric circles the age of a Palm cannot be estimated in the same way @ that of an exogenous tree. The elongation, however, of each species of Palm is pretty regular, and by this some idea may be formed of its age. There are many herbaceous plants in Britain, as Lilies, Grasses, &c., having Mono- cotyledonous stems, but there are no British Monocotyle donous plants with permanent aerial woody stems.

the British trees are Dicotyledonous. Illustrations of Monocotyledonous stems must be taken from trees of other countries, and of these Palms furnish the best examples. Although this limited growth in a transverse direc- tion is characteristic of most Monocotyledons, we find i stances where a true thickening ring is formed and am indefinite increase in diameter takes place, as in Dracend Yucca, &c. This thickening ring, however, originates m a manner different from that in Dicotyledonous plants. layer of the fundamental cellular tissue parallel to the surface of the stem becomes merismatic, and produces neW closed fibro-vascular bundles and new cellular tissue

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between them. The new woody tissue so formed thus corresponds to the secondary wood in Dicotyledonous stems, ~ and the new fibro-vascular bundles are all cauline, that is,

do not pass out into the leaves. By this means an enormous – inerease in diameter of the stem may take place. And not

STEM IN MONOCOTYLEDONS. |

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central cellular mass or pith, and thus resembling in struc- ture a Dicotyledonous stem. This structure has been remarked in the Smilax or

Sarsaparilla family. Lindley calls these plants Dictyogens, from their netted leaves, by which they differ from most Monocotyledons.

: unfrequently the primary central portion of the stem gives way, and thus a hollow cylinder formed by this secondary wood remains. ‘This was well seen in the famous Draceena

Amongst Acotyledonous plants there are some which Stem in possess stems consisting entirely of cellular tissue, whilst Acotyle- in others the stems have a well-developed vascular system, 4°”*

Draco, or Dragon tree of Orotava, in the Canary Islands, which had a hollow stem capable of holding several men. The composition of the vascular bundles in different parts of their course varies. Thus, at the upper part, tracing them from the leaves towards the centre, they contain spiral vessels, pitted vessels with some cellular tissue, a few laticiferous vessels, and woody fibres resem- bling those of liber. As we descend to the older por- tions of the bundle, where the tissues have become per- manent throughout, the spiral vessels disappear, then the pitted vessels, and at the periphery nothing but pleurenchy- matous tissue remains, forming a complicated anastomosis or network. Not unfrequently at the nodes of the stem a network of horizontal vessels occurs. They are well seen in many Grasses, where the central portion of the stem has given way, and there they serve to strengthen the stem. The branching of Monocotyledonous stems is originally the same as in Dicotyledons, namely, a monopodial form; fre- quently however, the axillary buds do not unfold, and the form becomes much varied. In Palms this is well seen, and usually no lateral shoots are formed. In some Palms, however, as the Doum Palm of Egypt (Hyphcene thebaica), the lateral shoots are developed in such a way that the stem appears to fork. Other examples of the development of branches are seen in the case of the Screw-pine (Pandanus), in Grasses, as the Bamboo, in Asparagus, Cordyline, _ Draceena, &c. In some instances the axillary shoots detach themselves from the parent stem and form an independent plant, as in Lilium bulbiferum (fig. 71). The bases of the leaves produced from the stem remain attached to the stem in many Palms, being surrounded by a fibrous sub-

stance, the mattulla or reticulwm.

When the internodes of the caudex of a Palm are not much elongated, the scars of the leaves are seen forming spirals on the stem, as in the Coco-nut and Date. In Xanthorrheea Hastile the same arrangement is observed. In this plant also a curious internal structure of the stem _ occurs. On making a vertical section the structure appears to be that of a Dicotyledon. The woody part is formed of vertical loose fibres as in Palms, and there are other fibres, radiating from the centre, and cutting the preceding at right angles. These horizontal fibres resemble the medullary rays, but differ in their structure. They probably serve for the origin of leaves, which are numerous, and are dis- | posed throughout the whole length of the stem. In Palms, such as species of Chamzdorea, the internodes are much ! lengthened, and rings are seen on the stem at distant

intervals, showing thickened node-like joints. Some Palm _ Stems, as those of Calamus Rudentum, the common Cane, | are very thin and slender. In many Monocotyledonous _ Plants the stem remains below ground, developing shoots

which are simple, as in Banana and Plantain, or branched, | asin Asparagus. In the former the stem above ground is _ an herbaceous shoot, composed of the sheaths of the leaves, _ It dies after fruiting, and is succeeded by other shoots from ‘ the subterranean stem. The shoots or buds from such _ Stems occasionally remain in part below ground in the | form of bulbs, as in Lilies, Tulips, and Hyacinths; or as

- corms, as in Colchicum, Crocus, Gladiolus, and Arum. In

| Some instances the aerial stem has the usual Monocoty- _ ledonous structure, while in the underground stem the fibro- | Vascular bundles are arranged in a circle, enclosing a

Of the former we have examples in Mosses, Hepaticee, and Characee ; the latter we find represented in Ferns, Equisetacez, and Lycopodiace. The term Acrogenous has been used as descriptive of the stems of Acotyledonous plants, as they were supposed to be formed by additions to the summit, and by the elongation of vessels already formed. They are also sometimes called Acrobrya. But as in the case of the terms exogenous and endogenous applied to the stems of Dicotyledons and Monocotyledons respectively,

recent research has shown that the term acrogenous cannot have the significance formerly attached to it; for in some Acotyledonous plants a true cambium ring is formed by which layers of tissue are successively added, and the stem increases in diameter, and also in many instances the fibro-vascular bundles develop from above downwards. ‘The characters of the stem, however, enable us easily to distinguish it from that in Dicotyledons or Monocotyledons. With merely a slight exception there is no provision for lateral growth of the stem, and all increase in size takes place by an elongation of the terminal growing-point. No cambium ring is as a rule formed ; where it does exist, it is not produced in the same way as in Dicotyledons, but rather resembles the formation of the cambium ring in Draceena amongst Monocotyledons. When a permanent woody stem occurs amongst Acotyledonous plants it resembles in general aspect the stem of a Mono- cotyledonous plant, having nearly a uniform height, and being usually unbranched and producing a tuft of leaves (fronds) at the summit. Tree-ferns furnish the best example of this kind of stem. Jn them it is denominated a stipe, and it often attains the height of 120 feet. The stem in Acotyledonous plants is distinguished from that in Dicotyledons by the absence of annual rings of wood, of (with only slight exception) a cambium ring, of a separable bark, and by the fact that the fibro-vascular bundles are all closed; in this latter character they agree with Monocotyledons, but are distinguished from them by the arrangement of the vascular bundles.

In Acotyledonous stems growth takes place by division of a single apical cell, situated at the extreme end of the punctum vegetationis. By divisions of this cell two portions of tissue are marked out in the stem,—an inner portion, from which arise the fibro-vascular tissues when they exist, and an outer or cortical portion. The primary fibro-vascular bundles originate from the cellular tissue of the stem in a manner analogous to what occurs in Dicotyledons and Monocotyledons,—a procambial bundle being first formed, which differentiates subsequently into xylem and phloém layers, but the bundles always become closed. The character of the stem varies very much in the several families of Acotyledonous plants.

In Characez the stem consists of a series of joints Characen.

(internodes), each composed of a single much elongated cell. Interposed between successive internodes are the nodes, each composed of a whorl of small cells, from which the leaves are developed, one leaf from every cell of the node. In the genus Chara a cortex is found completely investing the internodal cell. It is formed by the develop- ment, from every cell, of the nodes of an ascending and descending lobe. The ascending lobes of one node and the descending lobes of the next higher node meet in the middle of the intervening internode, and there interlock in IV. — 14

Muscinee.

Ferns.

a prosenchymatous manner. Subsequently by cell-division a complicated structure is developed in this investing mass. No fibro-vascular bundles are found in Characez.

In Mosses and many Hepatice we find no fibro-vascular system, but a slender leafy cellular stem. In it there is sometimes a diffcrentiation into an inner and a peripheral mass of tissue. In the former the cells have usually thin walls, and are not coloured, though in some cases a thickening of the walls of the central cells is observed, and a sort of rudimentary bundle is formed. The circum- ferential cells have usually thickened walls, and are not unfrequently coloured.

In Ferns we have a familiar example of an Acoty- ledonous stem. Ordinary ferns of Britain seldom attain any height, but usually creep along the ground, form- ing rhizomes. But in the Tree-ferns of warm climates the caudex frequently attains a great height. A transverse section of the stem of a fern (fig. 89) exhibits an irregular circle of fibro-vascular bundles, composed of masses /, v, of various forms and sizes, situated near the circumference,— the centre m being formed of cellular tissue, frequently with solitary fibro-vascular bundles scattered through it, and often becoming hollow. On the outside of the vascular circle cells exist, p, covered by an epidermal layer or cellular integument e, often of hard and dense consistence, and marked with the scars of the fronds.

The vascular system is of greater density than the rest of the tissue, and is distinguished by the dark colour of

the outer portion (fig. 89, /), which surrounds the paler

Fig. 89.

Fig. 89.—Transverse section of the stem of a Tree-fern (Cyathea). Cellular tissue in the centre, m; that of the cireumference, p; vascular bundles, /, v, consisting of dark-coloured woody fibres 7, and paler vessels, chiefly sealariform and dotted, v; the outer cortical portion formed by the bases of the leaves, é.

Fia. 90.—Fibro-vaseular network from stem of Aspidium Filix-mas. (Sachs.)

Fig. 90.

vessels in the centre. In a very young stem only a single fibro-vascular bundle is found in the axis of the stem, surrounded by a mass of cellular tissue; but as growth |proceeds a network of anastomosing bundles is formed in place of the central bundle, constituting a wide meshed hollow cylinder (fig. 90), and separating the fundamental cellular tissue of the stem into an outer cortical and an inner medullary portion. In addition, however, scattered through the pith, other bundles occur, as in Pteris aquilina, where two large cauline bundles are found; and in Tree- ferns numerous small bundles are found which pass out through the meshes of the cylinder into the leaves. The primary bundles are ribbon-shaped and broad, and curve outwards at their margins, from which the bundles for the leaves pass off—a leaf arising always from an opening of the network. The xylem portion of the fibro-vascular bundles is characterized by the great abundance of scalariform _vessels, spiral vessels also being present and intermixed with them thin-walled prosenchymatous | cells, containing in winter a large amount of starch. This

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| constitutes the inner, lighter-coloured portion of the

bundles. The phloém portion, which completely surrounds the bundle, has also starch-cells, and, in addition, sieve. tubes and elongated bast-like thick-walled fibres are found at the periphery of the bundle. The whole bundle igs usually enclosed by a distinct sheath of elongated cells; these cells are frequently much thickened and of a dark brown colour, hence the appearance presented on transverse section of a dark layer enclosing a lighter-coloured part, The central cellular portion of the stem frequently becomes ruptured and absorbed in old stems, which are thus hollow, The bases of the leaves remain long attached, but ultimately fall off, leaving marked scars (fig. 91, c), which are at first

Fig. 91.

Fig. 91.—-Rhizome of Male Fern, Lastrea (Aspidium) Filix-mas, showing the scars (cicatrices) of the leaves (fronds), with the markings of the vascular bundles, ¢, Fie. 92.—Longitudinal section of rhizome of Equisetum, showing septum, &, between cavities h, h; g, g, fibro-vascular bundles; 7, vallecular canal; s, leaf- (Sachs.)

sheath. close together, but often separate afterwards by interstitial growth. On these scars or cicatrices the markings of the vessels are easily seen, arranged in the same manner as

those of the stem. From all points of the woody cylinder —

stem-roots may be given off, and frequently they are formed so abundantly as completely to invest the stem and conceal it.

In Equisetaceze or Horsetails we have another example In Py } | of an Acotyledonous stem. The true stem in those plants 4

is a rhizome underground, from which aerial shoots are sent

up annually. Every aerial stem consists of a series of —

joints (internodes), which are usually hollow and closed at their base by a thin septum (fig. 92). Each internode passes up into a leaf-sheath embracing the next internode, and this sheath is usually split into teeth at its upper margin. In transverse section a circle of fibro-vascular bundles is seen (fig.93) marking off an inner medullary from an outer cortical portion, and separated one from the other by @ mass of parenchyma. These bundles are all common bundles. From each tooth of the leaf-sheath the bundle may be traced, passing vertically down into the internodes

Fig. 93.

Fic. 93.—Transverse section of a rhizome of Equisetuin.

Fig. 94.

9, fibro-vasculat bundle; /, vallecular canal; h, central cavity. (Sachs.)

Fic. 94.—To show union of the fibro-vascular bundle of an upper with a lowe? internode ; ¢,¢, internode; &, node. (Sachs.)

as far as the node beneath, and at the lower end dividing into two, uniting by each branch with a bundle of the next lowest internode (fig. 94). In transverse section the bundle

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resembles much that of a Monocotyledon. One peculiarity, however, must be noticed. The spiral, annular, and reti- culated vessels at the inner side of the bundle soon dis- appear, and an air-canal is formed in the bundle. This

canal must be distinguished from the vallecular canals found in the cortex, with which they alternate. Round the bundles a single layer of usually thickened and coloured cells forms a sheath, and this may either run continu- ously round the stem, and thus shut off completely the medullary from the cortical portion of the stem, or may invest separately each bundle, in which case the medullary and cortical portions of the stem are continuous. In some cases a layer of thickened cells is found within the vascular bundles. ‘The cortical portion is divisible into two layers, an inner layer of parenchymatous cells with air canals, the vallecular canals, and an outer layer of thickened cells immediately underlying the epidermis. The structure of the rhizome resembles that of the aerial stem, differing only in the fact that the thickened cells of the outer cortical layer are dark coloured, and that the central canal of the internodes is often absent. In Calamites, a fossil plant which flourished abundantly during the Carboniferous Period, we have a plant which in all particulars is closely allied to Equisetum of the present day. But whilst the young stem of Calamites presented a zone of vascular bundles separating it into a medullary and cortical portion (just as in an Equisetum), new vessels were added to the exterior of the pre-existing bundles as the plant grew, so

that a series of woody wedges were formed, increasing in growth to an enormous extent.

In Lycopodiacess, or Club Mosses, the stem presents differences from that in Ferns and Equisetaces. In most members of the family there is an axial cylinder formed of either one or more fibro-vascular bundles. In some cases (Selaginella) the fibro-vascular bundles remain separate and do not form a cylinder. They are surrounded by a mass of prosenchymatous cellular tissue, the cells of which may be thin-walled, leaving no intercellular spaces, or the cell-

_ walls may be much thickened. Immediately surrounding

| cambium cells of the fibro-vascular bundles. more the thickening ring formed in Draceena, Yucca, and] other Monocotyledons.

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| termed endogenous buds. | the normal monopodial type.

the central axial bundle in Selaginella are large air lacuna, which are wanting in Lycopodium. The fibro-vascular

_ bundles consist of tissues very similar to what occurs in | Ferns, and the bundles are all cauline.

In the leaves, bundles arise which pass into the stem and coalesce with the cauline bundles. In Isoetes we find a most anomalous structure. Here there are no internodes in the stem ;

| consequently, it is much shortened. The central axial | fibro-vascular bundle is very poorly developed, and round | 1t a meristem is formed, which, by adding new parenchyma

outside, increases the diameter of the stem. Thus we have here a thickening ring, but it differs from that structure in Dicotyledons, inasmuch as it is not formed by a union of It resembles

(In Rhizocarpez the structure of the stem is very simple, consisting of an axial fibro-vascular bundle surrounded by parenchyma full of air-cavities.

In plants with Acotyledonous stems the mode of branch- Ing 1s various. In Lycopodiacez we have an example of a

_ dichotomous branching, and the same is also seen in Ferns.

In the Equisetaceze a mode of branching occurs seen nowhere else in the Vegetable Kingdom. The branches arise from deeply-seated lateral buds,

which, upon developing, break through the superincumbent tissue; thesc have been In Characee the branching is of

Amongst Thallogens, as a rule, there is no’ evident distinction between stem and leaf. The vegetative organs

| Consist of a number of cells separate or combined into a

more or less flattened expansion termed the thallus. In this group are included all the Algw, Fungi, and Lichens, and many Hepatice. The vegetative structures vary much in each of these groups. In many Hepatice, as Mar- chantia, the vegetative structure is of a thalloid nature, and appears as a flattened, broad, dichotomously-branched plate, composed of several layers of cells. The upper and lower layers consist of colourless cells, and form a sort of epidermis. The upper epidermal layer has stomata, while the lower gives off root-like filaments, which attach it to the stratum on which it grows. The stomata are, by repeated division of the guard-cells, converted into canals. The central layer of cells contains green matter, and between the cellules there are large intercellular spaces, which com- municate with the stomata on the upper surface. In what are usually termed the foliose Hepatice, such as Junger- manniz, a distinct stem is visible bearing leaves. All are cellular, no differentiation occurring beyond a compacting of the peripheral layers of cells. The mode of branching is usually dichotomous.

In Fungi the vegetative organs consist of a mass of Fungi.

cellular filaments, anastomosing and branching in various ways, constituting the mycelium or spawn (fig. 95, m), from which diversely-shaped portions of cellular tissue are developed, forming receptacles for the support of the reproductive organs. The mycelium creeps along in or upon the stratum whence it is nourished, sending up here and there a receptacle. The struc- tural elements which form these are colour- less cellular filaments, or hyphae, divided usually by many transverse septa. These sometimes combine to form a dense mass of parenchyma. of the mycelium

are densely interwoven, and form masses of definite shape, the outer layer of which (pseudo-parenchyma- tous) forms a hard shell or skin; such a mass is termed a sclerotium. The repro- ductive receptacle formed from the myce- lium is also composed of hyphw. When there is only a single hypha the reproductive bodies are borne on the ends of its branches; but more usually the branches of the hyphz bearing the reproductive bodies unite to form a flattened expansion, the hymenvum. As they contain no chlorophyll, Fungi take up assimilated matter from other organisms, and therefore are frequently parasites.

Fig. 95. In some cases the hyphe 4 species of Mould-

fungus (Botrytis), consisting of a mycclium m,bear- ing a_ septate cellular stalk s, which branches at the apex, each division bearing a rounded spore c,

In Algs the simplest forms present nothing but a cell- Alga.

wall, containing a coloured protoplasmic substance, as in some Nostocacess, In some cases firmness is attained by deposition of silica as in Diatoms, or by lime carbonate as in Acetabularia. Lignification never occurs. More usually, however, the cells are combined into a tissue, but the forms which this may assume and the modes of combination are more various than in any other class of plants,—linear masses, strings, globes, laminz, &c., being formed. There may be in some cases a slight differentiation into distinct organs. Thus, in some of the higher forms, as Fucacex, a distinct stem is formed, from which flattened thalli resembling leaf structures arise, and at the base root-like structures (rhizoids) are formed. These parts, however, have none of the internal structures which characterize higher plants, but consist entirely of cellular tissue. At most there is a condensation of cellular tissue at the periphery, forming an epidermis, and a similar condensation in the axis. The mode of branching amongst Algz is either monopodial or dichotomous.

In Lichens the thallus (fig. 96) consists of a hyphal Lichens.

element of anastomosing and interlacing filaments, amongst which are distributed rounded unicellular coloured bodies, the gonidia (fig. 97, 7). These gonidia are either arranged

in one layer in the thallus, which is then said to be

heteromerous (the hypha layer being divided into a cortical and deeper part), or they are scattered equally throughout its

Fig. 96.

Fic. 96.—A Lichen (Parmelia), with its cellular expansion (thallus), and its

rounded apothecia, or spots of fructification.

Fic. 97.—Vertical section of an apothecium and thallus of a Lichen, Rounded free cells g, of a green colour, and called gonidia, are scen in the centre of the thallus. The apothecium a@ consists of thecee and paraphyses. 1ts upper sur- face is often coloured and covered by a perithecium.

substance and are homewomerous. The gonidia are separ- able, and may form independent plants. When they are being detached, the separation begins at the centre of the thallus, so that the middle of the Lichen becomes pulverulent, while its circumference may remain foliaceous or crustaceous. By the continuation of this process it sometimes happens that the whole Lichen becomes a mass of greenish or yellowish powder. ‘The thallus may be crustaceous, in the form of an incrustation upon rocks, trees, &c., with which it becomes closely connected, as in Graphis; or it may be foliaceous, forming a flattened expansion easily detachable from the substratum to which it is counected by small root- like bodies or rhizines, as in Peltigera; or the lichen may be what is termed fruticose, z.e., composed of a much-branched thallus rising from a single point of attachment, as in Usnea. Recent observations upon Lichens tend to show that they are in reality composed of two distinct organisms,—one, a Fungus, being the hyphal part, and the other, an Alga, the gonidial portion, and that the Fungus is parasitic upon the gonidia.

3. Leaves and ther Modifications.

In popular language all the green expanded organs borne upon an axis are designated leaves. Investigation, however, has shown that many other parts of a plant which externally appear very different from ordinary leaves are, in their essential particulars, very similar to them, and are in fact their morphological equivalents. Thus the scales on the bulb of the Onion, the various parts of the flower, &c., are all leaves. Assuming, then, that the struc- ture ordinarily termed a leaf is the typical form, these latter are designated changed or metamorphosed leaves ; and all structures morphologically equivalent with the leaf are included under the general term phyllome (leaf-structure). Leaves are produced as lateral outgrowths of the stem. This character, common to all leaves, distinguishes them from other organs. In the higher plants we can easily recognize the distinction between stem and leaf. Amongst the lower plants, however, it is found that a demarca- tion into stem and leaf is impossible, but that there 18 a structure which partakes of the characters of both,— such is a thallome. The leaves always arise from the outer portion of the primary meristem of the plant, and the tissues of the leaf are continuous with those of the stem. Every feaf originates as a simple cellular papilla, which cousists of a development from the cortical layers covered by epidermis; and as growth proceeds, the fibro-vascular bundles of the stem are continued outwards, and finally expand and terminate in the leaf. The increase in length

of the leaf by growth at the apex is usually of a limited nature. In some Ferns, however, there seems to be a provision for indefinite terminal growth, while in others this growth is periodically interrupted. It not unfrequently happens, especially amongst Monocotyledons, that after growth at the apex has ceased, it is continued at the base of the leaf, and in this way the length may be much increased. Amongst Dicotyledons this is very rare. In all cases the dimensions of the leaf are enlarged by interstitial growth of its parts.

The simplest leaf is found in some Mosses, where it Sinn q Usually it consists of of lav |

consists of a single layer of cells. several layers, and amongst vascular plants is distinguish- able into an epidermis and a central parenchyma with fibro-vascular bundles distributed through it.

The epidermis (fig. 98, es, ev), composed of cells more or less compressed, has usually a different structure and

Fig. 98.

Section of a Melon-leaf, perpendicular to the surface es, upper epidermis; @i, lower epidermis; p, hairs; st, stomata; ps, upper layers of parenchymatous cells; pt, lower layers of parenchymatous cells; m, meatus, or canals connected

with stomata; they are sometimes called hypostomatic spaces; /, lacune, or —

cavities between the loose cells inthe cavernous lower parenchyma; Jv, bundles

of fibro-vascular tissue, consisting of woody, dotted, spiral, and other vessels, aspect on the two surfaces of the leaf. It is chiefly on the epidermis of the lower surface (fig. 98, e) that stomata, st, are produced, occupying spaces between the veins, and it is there also that hairs, p, usually occur. The lower epidermis is often of a dull or pale-green colour, soft, and easily detached. The upper epidermis is frequently smooth and shining, and sometimes becomes very hard and dense. Many tropical plants present on the upper surface of their leaves several layers of compressed epidermal cells. These appear to be essential for the preservation of moisture in the leaf. In leaves which float upon the surface of water, as those of the Water-lily, the upper epidermis alone possesses stomata.

The parenchyma of the leaf is the cellular tissue surrounding the vessels, and enclosed within the epidermis (fig. 98, ps, pr). of diachyma, mesophyllum, and duploé. two distinct series of cells, each containing chlorophyll or green-coloured granules, but differing in form and arrange ment. Below the epidermis of the upper side of the leaf there are one or two layers of oblong blunt cells, placed perpendicularly to the surface (fig. 98,

ys), and applied so closely to each other as to leave only small intercellular spaces (fig. 98, m), except where stomata happen to be present. On the under side of the leaf the cells are irregular, often branched, and are arranged more or Jess horizontally (fig. 98, pt), leaving cavities between them, l, which often communicate with stomata. On this account the tissue has received the name of cavernous. In leaves having a very firm texture, as those of Conifere and Cycadacez, the cells of the parenchyma immediately beneath the epidermis are very much thickened and

It has sometimes received the names” It is formed of

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BO T elongated in a direction parallel to the surface of the leaf, so as to be fibre-like. “These constitute a hypodermal layer, beneath which the chlorophyll cells of the parenchyma are densely packed together, and are elongated in a direction vertical to the surface of the leaf; this has been termed palisade tissue. The form and arrangement of the cells, however, depend much on the nature of the plant, and its exposure to light and air. Sometimes the arrangement of the cells on both sides of the leaf is similar, as occurs in leaves which have their edges presented to the sky. In very succulent plants the cells form a compact mass, and those in the centre are often colourless, In some cases the cellular tissue is deficient at certain points, giving rise to distinct holes in the leaf, as in Monstera Adansonii ; such a leaf has been called pertuse. In Victoria regia perfora- tions in the leaf seem to be subservient to the purposes of nutrition, by permitting the gases collected beneath the large expanded leaf to escape, and thus allowing its under surface to be brought into immediate contact with the water. The fibro-vascular system in the leaf constitutes the venation. The fibro-vascular bundles from the stem bend out into the leaf, and are there arranged in a definite manner. They usually form two layers, which may be separated by maceration. In skeleton leaves, or leaves in which the parenchyma is removed, these layers are well seen. In some leaves, as in the Barberry, the vessels forming the veins are hardened, producing spines without any parenchyma. The hardening of the extre-

tities of the vascular tissue is the cause of the spiny margin of many leaves, such as the Holly, of the sharp- pointed leaves of Madder, and of mucronate

leaves, or those having a blunt end with a hard projection in the centre.

Submerged leaves, or leaves which are developed under water, differ in structure from aerial leaves. They have usually no fibro-vascular system, but consist of a congeries of cells, which sometimes become elongated and compressed so as to resenible veins. They have a layer of compact cells on their surface, but no true epidermis, and no stomata. Their internal structure consists of cells, disposed irregularly, and sometimes leaving spaces which are filled

Liaves.]

_ with air for the purpose of floating the leaf. When exposed

to the air these leaves easily part with their moisture, and become shrivelled and dry. In some instances there is only a network of filamentous-like cells formed, the spaces between which are not filled with parenchyma, giving a peculiar skeleton appearance to the leaf, as in Ouvirandra fenestralis (Lattice plant). Such a leaf has been called fenestrate. A leaf, whether aerial ,or submerged, generally

| consists of a flat expanded portion (fig. 99, J), called the

blade, Vimb, or lamina, of a narrower portion called the petiole or stalk (fig. 99, p), and sometimes of a portion at the base of the petiole, which forms a sheath or vagina

| (fig. 99, 9), or is developed in the form of leaflets, called

| stipules (fig. 123, s), The sheathing portion is some- times incorporated with the | stem, and is then called | tgellary. These portions

are not always present. The sheathing or stipulary por- tion is frequently wanting, and occasionally only one of | the other two is developed. | When a leaf has a distinct | Stalk it is called petiolate ; | when it has none,

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Fig. 99. it 18 Leaf of Polygonum, with part of stem. sessile, and if in this case it embraces the stem it is said

to be amplewicaul.

The part of the leaf next the petiole or the axis is the base, while the opposite extremity | 18 the apex. The surfaces of the leaf are called the pagine,

AN Y 109 and its edges or margins form the circumscription of the leaf. The leaf is usually flattened and expanded horizon- tally, te, at right angles to the longitudinal axis of the shoot, so that the upper pagina is directed towards the heavens, and the lower pagina towards the earth. In some cases leaves, as in Iris, or leaf-like petioles, as in Australian Acacias and Eucalypti, have their plane of expansion parallet to the axis of the shoot; or the leaf may have a cylin- drical or polyhedral form, as in Mesembryanthemum. In other instances, as in Alstrémeria, the leaf becomes twisted in its course, so that what is superior at one part becomes inferior at another. The upper angle formed between the leaf and the stem is called its awil, and everything arising at that point is called axillary. It is there that leaf-buds are usually developed. The leaf is sometimes articulated with the stem, and, when it falls off, a scar or cwatricula remains ; at other times it is continuous with it, and then decays, while still attached to the axis. In their early state all leaves are continuous with the stem, and it is only in their after growth that articulations are formed. When leaves fall off annually they are called deciduous ; when they remain for two or more years they are persistent, and the plant is called evergreen. The laminar portion of a leaf is occasionally articulated with the petiole, as in the Orange, and a joint at times exists between the vaginal or stipulary portion and the petiole.

The arrangement of the fibro-vascular system in the venation

lamina constitutes the venation or nervation. In an ordinary leaf, as that of the Elm, there is observed a large central vein running from the base to the apex of the leaf, this is the midrib (fig. 100) ; it gives off veins laterally (pri-

Fig. 101.

Fie, 100.—Leaf of Ulmus effusa. Reticulated venation; primary veins going to

Fig. 100

the margin, which is serrated. Leaf unequal at the base.

Fre. 101.—Multicostate divergent leaf of Castor-oil plant (Ricinus communts). It is palmately-cleft, and exhibits seven lobes at the margin. The petiole is in- serted a little above the base, and hence the leaf is called peltate or shield-like,

mary veins), which either end in a curvature within the

margin (curve-veined), as in Lilac and Belladonna, or go directly to the edge of the leaf (/eather-veined), as in Elm

(fig. 100) and Chestnut. If they are curved, then external

veins and marginal veinlets are interspersed through the

parenchyma external to the curvature. There are also other veins of less extent (costal veins) given off by the midrib,

and these give origin to small veinlets. A leaf with only a

single midrib is said to be wnzcostate (fig. 100). In some

cases, as Sycamore and Cinnamon, in place of there being only a single midrib there are several large veins (ribs) of nearly equal size, which diverge from the point where the blade joins the petiole or stem, giving off lateral veins.

The leaf in this case is multicostate (fig. 101). When there

are three prominent ribs, as in Ciunamon and Cassia, the

leaf is tricostate; when five, quinguecostate. When the midrib gives off two ribs a little above the base, the leaf becomes triplicostate ; when it gives off

five, guintuplicostate.

110 BOT In a leaf having many ribs they may converge towards the apex, as in Cinnamon, or they may diverge, as in Sycamore and the Castor-oil plant (fig. 101). Thus the primary veins give off secondary veins, and these in their turn give off ter- tiary veins, and so on until a complete network of vessels is produced, and those veins usually project on the under surface of the leaf. To a distribution of veins such as this the name of reticulated or netted venation has been applied. In the leaves of some plants there exists a midrib with large veins running nearly parallel to it from the base to the apex of the lamina, as in Grasses (fig. 102); or with veins diverging from the base of the lamina in more or less

Fig. 102.

Fig. 102.—Stem of a Grass (Poa) with leaf. The sheathing petiole gv ending in a process gl, called a ligule; the blade of the leaf, 7.

Fic. 103.—Leaf of Fan Palm (Chamcerops), showing the veins running from the base.to the margin, and not forming an angular net-work.

parallel lines, as in Fan Palms (fig. 103), or with veins coming off from it throughout its whole course, and running parallel to each other in a straight or curved direction towards the margin of the leaf, as in Plantain and Banana. In these cases the veins are often united by cross veinlcts, which do not, however, form an angular network. Such leaves are said to be parallel-veined. The leaves of Monocotyledons have generally this kind of venation, while reticulated venation most usually occurs amongst Dicotyle- dons. Some plants, which in most points of their structure are Monocotyledonous, yet have reticulated venation. Such have been called Dictyogens. In vascular Acotyledonous plants there is frequently a tendency to fork exhibited by the fibro-vascular bundles in the leaf ; and when this is the case we have fork-veined leaves. This is well seen in many Ferns. The distribution of the system of vessels in the leaf is usually easily traced, but in the case of succulent plants, as Hoya, Agave, Stonecrop,and Mesembryanthemum, the veins are obscure, and the leaves are said to be hidden-veined. In the cellular leaves of Mosses a median vein of several layers of cells is often visible, but as there are no fibro-vascnlar bundles

present this is considered a false venation, and they are styled veinless (Avenia).

TABULAR ARRANGEMENT OF VENATION. A.—Reticulated Venation. I. Unéicostate. A single rib or costa in the middle (midrib). 1. Primary veins coming off at different points of the midrib. a, Veins ending in curvatures within the margin, and forming what have been called true netted leaves (Lilac). b. Veins going directly to the margin and forming Seather-veined leaves (Oak and Chestnut).

2. Primary veins coming off along with the midrib from the base of the leaf.

II, Mvulticostate. More than one rib. Authors usually give to these leaves the general name of costate or ribbed.

ANY 1. Convergent. Ribs converging, running from base to apex in a curved manner, as in Cinnamon and Melastoma, There is occasionally an obscure rib running close to the edge of the leaf, and called intra-marginal, asin the Myrtle.

2. Divergent. Ribs diverging or proceeding in a radiatin manner, a8 in Sycamore, Vine, Geranium, Castor-oj slant.

B.—Parallel Venation.—The term parallel is not strictly applic. able, for the veins often proceed in a radiating manner, ° but it is difficult to find a comprehensive term. This venation may be characterised as not reticulated,

I. Veins proceeding transversely from midrib to margin, usually with convexity towards the midrib, as in Musa and Canna.

II. Veins proceeding longitudinally from base to apex.

1. Veins more or less convergent, as in Iris, Lilies, Grasses,

2. Veins more or less divergent, as in J’an Palms.

C.—Furcate Venation. Veins dividing in a forked manner, as in the case of many Ferns.

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In all plants, except Thallophytes, leaves are present fom at some period of their existence. In Cuscuta (Dodder), lear _ however, we have an exception. The forms assumed Plate by leaves vary much, not only in different plants but — in the same plant. It is only amongst the lower classes — of plants,— Mosses, Characeze, &c.,—that all the leaves on a plant are similar. As we pass up the scale of vegetable life we find them becoming more and more variable. The structures in ordinary language designated as leaves ard considered so par excellence, and they are frequently spoken! of as foliage leaves. In relation to their production on the stem we may observe that when they are small they are always produced in great number, and as they increase in size their number and rapidity of growth diminish correspondingly. The cellular process from the axis which develops into a leaf is simple and undivided; it rarely remains so, but in progress of growth becomes segmented in various ways, either longitudinally or laterally, or in both ways. by longitudinal segmentation we have a leaf formed consisting of vagina, petiole, and lamina; or one or other of these may be absent, and thus stalked, sessile, sheathing, &c., leaves are produced. Lateral segmentation affects the lamina, producing indentations, lobings, or fissuring of its margins, In this way two marked forms of leaf are produced —(1.) Simple form, in which the segmenta- tion, however deeply it extends into the lamina, does not separate portions of the lamina which become articulated with the midrib or petiole ; and (2.) Compound form, where portions of the lamina are separated as detached leaflets (foliola), which become articulated with the midrib or petiole. In simple leaves, then, there is never more than one articulation, which is at the point of their insertion on the stem. In compound leaves there are one or more articw lations beyond the point of insertion on the stem. In both simple and compound leaves, according to the amount of segmentation and the mode of development of the parenchyma and direction of the fibro-vascular bundles, many forms are produced.

Sunple Leaves.—When the parenchyma is developed Sim symmetrically on each side of the midrib or stalk, the | ; is equal; if otherwise, the leaf is

unequal or oblique (fig. 100). If the margins are even and present no divisi0 the leaf is entdre (fig. 104); if there are slight projecti of cellular or vascular tissue beyond the margin the leaf is not entire ; when the projections are irregular and more Of less pointed, the leaf is dentate or toothed ; when they he regularly over each other, like the teeth of a saw, the leat is serrate (fig. 100); when they are rounded the leaf 18 crenate. If the divisions extend more deeply into the lamina than the margin, the leaf receives different names according to the nature of the segments; thus, when the divisions extend about half-way down (fig. 105), it is cleft (fissus), and its lines of separation are called fissures ; when

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the divisions extend nearly to the base or to the midrib the leaf is partite, and its lines of separation are called partitions,

SIMPLE LEAVES. |

Fig. 104.

Fig. 106,

Fig. 105.

Fie. 104.—Ovate acute leaf of Coriara myrtifolia, one of the adultcrations of

senna, Besides the midrib there are two intra-marginal ribs which converge to the apex. The leaf is therefore tricostate.

Fia. 105.—Runcinate leaf of Dandelion (Leontodon Taraxacum). It is a pinnatifid leaf, with the divisions pointing towards the petiole.

Fra. 106.—Pinnatitid leaf of Valeriana dioica,

If these divisions take place in a simple feather-veined leaf it becomes either pinnatifid (fig. 106), when the segments extend to about the middle and are broad; or pectinate, when they are narrow; or pinnatipartite, when – the divisions extend nearly to the midrib. These primary divisions may be

again subdivided in a similar manner, and thus a feather-veined leaf will become bipinnatifid or bipinnatipartite ; and still further subdivisions give origin to tripmnatifid and laciniated leaves, If the divisions of a pinnatifid leaf are more or less triangular, and point downwards towards the base, the extremity of the leaf being undivided and triangular, the leaf is runcinate (fig. 105), as in the Dandelion. When the apex consists of a large rounded lobe, and the divisions, which are also more or less rounded, become gradually smaller towards the base, as in Barbarea, the leaf is called Jyrate, from its resemblance to an ancient lyre. When there is a concavity on each side of a leaf, so as to make it resemble a violin, as in Rumex pulcher, it is called panduriform. The same kinds of divisions taking place ina simple leaf with radiat- ing venation, give origin to lobed, cleft, and partite forms. When the divisions extend about half-way through the leaves, they may be three-lobed, five-lobed, seven-lobed, many-lobed, or trifid, quinquefid, septemfid, multifid, ac- cording to the number of the divisions. The name pal- mate, or palmatifid (fig. 101), is the general term applied to leaves with radiating venation, in which there are several lobes united by a broad expansion of parenchyma, like the palm of the hand, as in the Castor oil plant, Rheum palma- tum, and Papaw. The divisions of leaves with radiating ven- ation may extend to near the base of the leaf, and the names bipartite, tripartite, quinquepartite (fig. 107), septempartite, digitipartite (Plate II. fig. 1), are given according as the partitions are two, three, five, seven, or more. In Drosera dichotoma bipartite and tripartite leaves are seen. The term dissected is applied to leaves with radiating venation, having

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When in a radiating leaf there are three primary partitions, and the two lateral lobes are again cleft, as in Helleborus

Fig. 107. Fig. 108.

Fic. 107.—Five-partite leaf of Aconite. Such a leaf is sometimes called palmt- partite, palmately-partite, or dissected. The venation is radiating, and the segments of the leaf are cuneate, and each of them is cleft and toothed at tho

apex

Fre. 108.—Pedate leaf of Stinking Hellebore (Helleborus foctidus). The venation is radiating. It is a palmately-partite leaf, in which the lateral lobes are deeply divided. When the leaf hangs down it resembles the foot of a bird, and hence the name.

(fig. 108), the leaf is called pedate or pedatifid, from a fancied resemblance to the claw of a bird. In all the instances already alluded tothe leaves have been considered as flat expansions, in which the ribs or veins spread out on the same plane with the stalk. In some cases, however, the veins spread at right angles to the stalk. If they do so equally on all sides, and are united by parenchyma, so that the stalk occupies the centre, the leaf becomes orbicular, as in Hydrocotyle ; if unequally,-so that the stalk is not in the centre, the leaf is peltate, as in Indian Cress (fig, 109). The edges or margins of orbicular and peltate leaves are often variously divided.

Fig. 109.

Fre, 109.—Peltate leaves of Indian Cress (Zropeo”um majyus). Fig. 110.—Lanceolate leaf of a species of Senna.

Without attempting to notice all the forms of leaves, the following are enumerated as the most important. When the veins do not spread out, but run from the base to the apex with a narrow strip of parenchyma, the leaf is

Fig. 110.

linear or acicular, a8 in Pines and Firs. These trees are hence called in Germany Wadel-hélzer, or needle trees. When the veins diverge, those in the middle being longest, and the leaf tapering at each end (fig. 110), it becomes lanceolate. If the middle veins exceed the others slightly, and the ends are convex, the leaf is either rounded, elliptical, oval, or oblong (fig. 111). Ifthe veins at the base are longest, and the leaf narrows to the top, it is ovate or egg-shaped (fig. 104), as in Chickweed ; if the apex is broadest, the leaf is obovate, or inversely egg-shaped (fig. 112). Leaves are cuneate or wedge-shaped, in Saxifraga; spathulate, or

numerous narrow divisions, as in Geranium dissectum. | spatula-like, having a broad rounded apex, and tapering

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Plate [V.

Compound leaves.

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down to the stalk, as in the Daisy ; swbwlate, narrow and tapering like an awl ; acwminate, or drawn out into a long point,as in Ficus religiosa; mucronate, with a hard stiff point or mucro at the apex. When the parenchyma is deficient at the apex so as to form two rounded lobes, the leaf is obcordate or inversely heart-shaped ; when the deficiency 1s very slight the leaf is called emarginate (fig. 112), as having a portion taken out of the margin ; when the apex 1s merely flattened or slightly depressed the leaf is retuse ; and when the apex ends abruptly in a straight margin, as 11 the Tulip-tree, the leaf is truncate. When the veins at the base of the lamina are prolonged downwards at an obtuse angle with the midrib, and rounded lobes are formed, as in

Fig. 112. Fig.

Fig. 114.

Fra. 111.~-Oblong leaf of a species of Senna. Fig. 112.~~Emarginate leaf of a species of Senna. The leaf in its contour is some~~ what obovate, or inversely egg-shaped, and its base is oblique.

Fria. 113.—Reniform leaf of Nepete Glechoma, margin erenate. Fig. 114.—Sagittate leaf of Convolvulus, Dog-violet, the leaf is cordate or heart-shaped ; it is kidney- shaped or reniform (fig. 113), when the apex is rounded as in Asarum. When the lobes are prolonged down- wards and are acute, the leaf is sagittate (fig. 114); when they proceed at right angles, as in Rumex Aceto- sella, the leaf is hastate or halbert-shaped. When a simple leaf is divided at the base into two leaf-like appendages, it is called

auriculate. When the veins spread out in various planes, and there is a large development of cel- lular tissue, so as to produce a succulent leaf, such forms occur as contcal, prismatical, ensiform or sword-like, acmaciform or scimitar-shaped, and dolabriform or axe- shaped. When the development of parenchyma is such that it more than fills up the spaces between the veins, the margins become wavy, crisp, or undulated, as in Rumex crispus and Rheum undulatum. By cultivation the cellular tissue is often much in- creased, giving rise to the curled leaves of Greens, Savoys, Cresses, Lettuce, &c. In Rushes the shoots which act as leaves are often terete. They are either barren or bear flowers. Their cellular tissue is often stellate, and the shoots sometimes exhibit a pe- culiar spiral twisting. Amongst parallel veined leaves the margins are usually entire, espe- cially when the veins converge.

Compound leaves are

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. (Fig. 115. those in which the divi- septenate leaf of the Horse-chestnut (Ziscu- lus Hippocastanum). Such leaves, espc-

sions extend to the mid. ™ i cially when there are five leaflets, are called rib or petiole, and the digifate.

separated portions become each articulated with it, and

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[NUTRITIVE ORGANS,

receive the uame of foliola or leaflets. The midrib, or petiole, has thus the appearance of a branch with separate leaves attached to it, but it is considered properly as one leaf, because in its earliest state it arises from the axis ag a single piece, and its subsequent divisions in the form of

leaflets are all in one plane. The leaflets are either sessile (fig. 115), or have stalks, called petzolules (fig. 116), accord- ing as the vascular bundles of the veins spread out or divari- cate at once, or re- main united for a ‘ certainlength. Com- yi pound leaves have _ been classified ac- cording to the ma- ture of the venation : VE and the development f * of parenchyma, If {—~ we suppose that in a simple feather- veined _—_unicostate leaf the divisions extend to the mid- rib, and each of the primary veins spreads ‘out or \ branches, and be- \ i . \

comes surrounded with parenchyma, and the leaflets thus formed become ar- ticulated to the pe- tiole or midrib (fig, 116), the leaf becomes compound and pinnate. with parenchyma, while the secondary (or those coming off in a feather-like manner from the primary veins) are, and separate leaflets are thus formed which are articulated with the veins, the leaf is bipennate. In this case the secondary veins form as it were partial petioles. A farther subdivision, in which the tertiary veins only are covered with parenchyma and have separate leaflets, gives tripinnate or decompound forms, in which case the tertiary veins form the partial petioles. A leaf divided still more is called supradecom-— pound. When a pinnate leaf has one pair of leaflets it 1s unijugate; with two pairs, it is bijugate; with many pairs, multijugate (fig. 116). When a pinnate leaf ends m a pair of pinne it is equally or abruptly pinnate (pari pinnate) ; when there is a single terminal leaflet (fig. 116), the leaf is wnequally pinnate (impari-pinnate) ; when the leaflets or pinne are placed alternately on either side of the midrib, and not directly opposite to each other, the leaf 1s alternately pinnate; and when the pinne are of different sizes, the leaf is interruptedly pinnate. In the case of a simple multicostate leaf with radiating venation, if we suppose the ribs to be covered with parenchyma, so as 0 form separate leaflets, each of which is articulated to the

Fig. 116,

Impari-pinnate (unequally pinnate) leaf of Robinia, There are nine pairs of shortly-stalked leaflets (foliola, pinnse), and an odd one at the extremity, At the base of the leaf stipules s are seen,

petiole, the digitate form of compound leaf is produced j Af |

if there are three leaflets the form is ¢ernate or trifoliate ; if four, quaternate ; if five, guinate; if seven, septenate; and so on. If the three ribs of a ternate leaf subdivide each into three primary veins, which become covered with parenchyma so as to be separate articulated leaflets, the leaf is biternate ; and if another threefold division takes place, it is treternate. a. |i The petiole or leaf-stalk is the part which unites the limb Pets | or blade of the leaf to the stem (fig. 99, p). It is absenb | in sessile leaves, and this is also frequently the case when the vagina is present, asin Grasses. It consists of a mass of fibro-vascular bundles with a varying amount of cellular

If the midrib and primary veins are not covered Plate! |

ee

| it has an undivided lamina (fig. 119, 2), | leaves, the pulvinus may be attached either to the petiole or

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tissue. The vessels are enclosed in an epidermal cover- ing, with few stomata, and are more or less compressed. When the vascular bundles reach the base of the lamina they separate and spread out in various ways, as already described under venation. At the place where the petiole joins the stem there is frequently an articulation, or a con- striction with a tendency to disunion, and at the same time there exists a swelling (fig. 117, p), called pulvinus, formed of cellular tissue, the cells of which exhibit the phenomenon

COMPOUND LEAVES. |

Fig. 117.

Fig. 118.

Fr, 117,—Branch and leaves of the Sensitive plant (Afimosa pudica), showing the petiole in its ereet state, a, and in its depressed state, 6; also the leaflets closed, ¢, and the leaflets expanded, d. Irritability resides in the pulvinus p, andin the struma.

Fig. 118.—A portion of the braneh and leaf of the Moving plant of India (//edy- sarum or Desmodium gyrans). The leaf is impari-pinnate, and often pinnately- trifoliate, The large leafiet or pinna, a; the smaller leaflets, 6, of which there are either one or two pairs. The leaflets are in constant motion.

of irritability (figs. 117, 118). At the point where the petiole passes into the lamina, or where the midrib joins the leaflets of a compound leaf, there is occasionally a cellu- lar dilatation called s¢rwma, and an articulation. In Mimosa pudica a sensitiveness is located in the pulvinus (fig. 117, P), which upon irritation induces a depression of the whole bipinnate leaf; a similar property exists in the struma at the base of the leaflets which fold upwards. In Desmodium

_ gyrans (fig. 118) the pulvinus and struma have a similar | power of causing movements of the large terminal leaflet

and the two smaller lateral ones. In other cases the petiole is not articulated, but is continuous either with the stem, or with the sheath (vagina). The articulation or joint is by many considered as indicating a compound leaf, and hence the leaf of the Orange is considered as such, although

In articulated

to the axis, and may fall with the leaf, or remain attached

| tothe stem. When articulated leaves drop, their place is

marked by a cicatrix or scar, seen below the bud in fig. 63. In this scar the remains of the vascular bundles ¢ are seen ; and its form furnishes characters by which particular kinds of trees may be known when not in leaf. In the case of

| many Paims and Tree-ferns the scars or cicatrices of the

leaves are very conspicuous. In fossil plants important characters are founded on them.

When there is no articulation between the petiole and

| the stem, as is the case with many Monocotyledons, the

leaf is continuous with the axis, and is not deciduous, but

| witbers ou the stalk, In many Liliaceous plants the

leaves during their decay continue attached to the plants. (The petiole varies in length, being usually shorter than the lamina, but sometimes much longer. In some Palms it is 15 or 20 feet long, and is so firm as to be used for poles or walking-sticks. In general, the petiole is more or less rounded in its form, the upper surface being flattened or grooved. Sometimes it is compressed laterally, as in the

| Aspen, and to this peculiarity the trembling of the leaves of this tree is attributed. In aquatic plants the leaf-stalk 18 Sometimes distended with air, as in Pontederia and

aN Y 113

Trapa, so as to float the leaf. At other times it is winged, and is either leafy, as in the Orange (fig. 119, »), Lemon, and Dioneea (fig. 46, p), or pitcher-like, as in the Pitcher-plant

Fig. 119. Fig. 120. Wigs 120,

Fig, 119.—Leaf of Orange (Citrus Aurantium), showing a winged Icafy petiole p, which is articulated to the lamina 7. It is considered a eompound leaf, having only one leaflet.

Fig. 120.—Pitcher of a species of Piteher-plant (Wepenthes distillatoria). It is supposed to be formed by a folded petiole p, the edges of which are united. The lid 7 at the top is supposed to represent the lamina, united by articulation to the pitcher,

Fie. 121.—Piteher (ascidium) of a species of Side-saddle plant (Sarracenia pur- purea), The piteher is supposed to be formed by the folded petiole, which is prolonged.

(fig. 120, ») and Sarracenia (fig. 121). Leafy petioles are occasionally united to the axis for some extent, and thus become decurrent. In some Australian Acacias, and in some species of Oxalis and Bupleurum, the petiole is flattened in a vertical direction, the vascular bundles separating immediately after quitting the stem, and run- ning nearly parallel from base to apex. This kind of petiole (fig. 122, ») has been called phyllodium. In these plants the laminz or blades of the leaves are pinnate, bipinnate, or ternate, and are produced at the extremities of the phyllodia in a horizontal direction ; but in many instances they are not developed, and the phyllodium serves the pur- pose of a leaf. Hence some Acacias are called leafless. These phyllodia, by their vertical position and their peculiar

Fig. 122. Fic. 122.—Leaf of an Acacia (Acacta heterophylla), showing a flattened leaf-like-

petiole p, called a phyllodium, with straight venation, lamina J. Fre. 123.—Leaf of Pansy, J, separated from the stem; the lyrate-pinnatifid stipules s are distinctly visible, and their lateral position is seen. On the

form, give a remarkable aspect to vegetation. same Acacia there occur leaves with the petiole and lamina IV. — 15

and a bipinnate

Plate VII.

Stipules.

perfect ; others having the petiole slightly expanded or winged, and the lamina imperfectly developed ; and others in which there is no lamina, and the petiole becomes large and broad. Some petioles, in place of ending in a lamina become changed into a delicate filiform body, a tendriu or cirrus, so as to enable the plant to climb. In many leaves interposed betwixt the petiole and the stem, or, in sessile leaves, betwixt the Jamina and the stem, an expan- sion of the foliar tissue takes place, so that a sheath (vagina) is formed, which embraces the whole or part of the circumference of the stem

(fig. 102, gv). This sheath is comparatively rare in Dicotyledons, but is seen in Umbelliferous plants, where it constitutes the pericladium, and in the Rhubarb order, where it is large and membranous, and has received the name of ochrea or boot. It is much more common amongst Monocotyledons. In Palms it forms a kind of network, to which the name of reticulum has been given. In Sedges the sheath forms a complete investment of the stem, whilst in Grasses (fig. 102) it is split on one side. In the latter plants there is also a membranous outgrowth at right angles to the median plane of the leaf from the point where the sheath passes into the lamina (there being no petiole). To this structure the name of ligule (fig. 102, gl) has been given. It is of various dimensions, and thus gives a character to the plants.

In leaves in which no sheath is produced we not unfre- quently find small foliar organs at the base of the petiole. These have been denominated stipules (fig. 128, s). The stipules are often twoin number, and they are important as supplying characters in certain natural orders. Thus they occur in the Pea and Bean family, in Rosaceous plants, and the Cinchona bark family. They are not common in Dicotyledons with opposite leaves. Plants having sti- pules are called stipulate ; those having none are exstiypu- late. Stipules are formed by some of the vascular bundles diverging as they leave the stem, and becoming covered with parenchyma, so as to resemble true leaves. Like leaves they are large or small, entire or divided, decid- uous or persistent, articulated or non-articulated. They are not usually of the same form as the ordinary foli- age leaves of the plant, from which they are distinguished by their lateral position at the base of the petiole. In the Pansy (fig. 123) the true leaves / are stalked and cre- nate, while the stipules s are large, sessile, and pinnatifid. In Lathyrus Aphaca, and some other plants, the true pinnate leaves are abortive, the petiole forms a tendril, and the stipules alone are developed, performing the office of leaves. When stipules are attached separately to the stem at the base of the leaf, they are called caulinary, as in Salix aurita. When stipulate leaves are opposite to each other, at the same height on the stem, it occasionally happens that the stipules on the two sides unite wholly or partially, so as to form an ¢interpetiolary or interfoliar stipule, as in Cinchona and in Ipecacuan. In the case of alternate leaves, the stipules at the base of each leaf are sometimes united to the petiole and to each other, so as to form an adnate, adherent, or

petiolary stipule, as in the Rose, or an axillary stipule, as in Houttuynia cordata. In other instances the stipules unite together on the side of the stem opposite the leaf, and become synochreate, as in Astragalus, This so-called union or adhesion of stipules is not an accidental adhesion taking place after they have been developed. In these cases the parts never were separate ; from the first they are developed as one por- tion. In the development of the leaf the stipules fre- quently play a most important part. They begin to be formed after the origin of the leaves, but grow much more rapidly than the leaves, and in this way they arch over the young leaves and form protective chambers wherein the parts of the leaf may develop. In Ficus, Magnolia, and

Potamogeton they are very large and completely envelop —~ the young leaf-bud. The stipules are sometimes so minute as to be scarcely distinguishable without the aid of a lens, — and so fugacious as to be visible only in the very young state of the leaf, They may assume a hard and spiny character, as in Robinia Pseudacacia, or may be cirrose, as in Smilax, where each stipule is represented by a tendril; while in Cucurbitaceze there is only one cirrose stipule. At the base of the leaflets or foliola of a compound leaf, small stipules are occasionally produced, to which some have given the name of stipels.

Variations in the structure and forms of leaves and leaf- aj… stalks are produced by the increased development of cellular maliti tissue, by the abortion or degeneration of parts, by the multiplication or repetition of parts, and by adhesion, When cellular tissue is developed to a great extent, leaves become succulent and occasionally assume a crisp or curled appearance. Such changes take place naturally, but they are often increased by the art of the gardener, and the object of many horticultural operations is to increase the bulk and succulence of leaves. It is in this way that Cabbages and Savoys are rendered more delicate and nutritious. Bya deficiency in development of parenchyma and an increase in the fibro-vascular tissue, leaves are liable to become hardened and spinescent. The leaves of Bar- berry and of some species of Astragalus, and the stipules of the False Acacia (Robinia) are spiny. To the same cause is attributed the spiny margin of the Holly-leaf. In the Gooseberry, the swelling (pulvinus) at the base of the petiole, and below the leaf, assumes a spinose character. Changes in the

appearances of leaves are produced by adhesions and foldings of various kinds. When two lobes at the base of a leaf are prolonged beyond the stem and unite (fig. 124), the leaf is perfoliate, the stem appearing to pass through it, as in Bupleurum perfoliatum and Chlora perfoliata; when two leaves unite by their bases they become connate (fig. 125), as in Lonicera Caprifolium ;

Fig. 124. Fig. 125.

Fic. 124.—Perfoliate leaf of a speeies of Hare’s-ear (Bupleurum rotundifolium), The two lobes at the base of the leaf are united, so that the stalk appears to

come through the leaf. } Fre. 125.—Connate leaves of a speeies of Honeysuckle (Lonicera Caprifolium). Two leaves are united by their bases. oe

and when leaves adhere to the stem, forming a sort of winged or leafy appendage, they are decuwrrent, as in Thistles. ‘I’he formation of peltate and orbicular leaves — has been traced to the union of the lobes of a cleft leat. In the leaf of the Victoria regia the transformation may be traced during germination. The first leaves produced by the young plant are linear, the second-are sagittate and hastate, the third are rounded-cordate, and the next are orbicular. The cleft indicating the union of the lobes” remains in the large leaves. The parts of the leaf are fre “® quently transformed into tendrils (cirri), with the view of | enabling the plants to twine round others for support. In Leguminous plants (the Pea tribe) the pinne are frequently cirrose. When tendrils occupy the place of leaves, all

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eaves. |

| appear as a continuation of the leaf-stalk, they are called petiolary, as in Lathyrus Aphaca, in which the stipules perform the function of true leaves. In Flagellaria Indica, Gloriosa superba, Anthericum cirrhatum, and Albuca

cir- rhata, the midrib of the leaf ends in a tendril. In Smilax there are two stipulary tendrils, while in the Cucumber tribe there is a single one at the base of each leaf. In the Passion-flower the lateral leaf-buds, and in the Vine the terminal ones, become tendrils. In the Vanille plant (Vanilla aromatica) the tendrils are produced opposite the leaves, until the plant gains the top of the trees by which it is supported,—the upper tendrils being then developed as leaves. ‘Ihe midrib is sometimes prolonged in a cup-like or funnel-shaped form ; this is occasionally seen in the common Cabbage, and seems to depend on the vascular bundles of the midrib spreading out at their extremity in a radiating manner, and becoming covered with parenchyma in such a way as to form a hollow cavity in the centre.

The vascular bundles and cellular tissue are sometimes developed in such a way as to form a circle, with a hollow in the centre, and thus give rise to what are called jistular or hollow leaves, as in the Onion, and to ascidia or pitchers, iets) Pitchers are formed either by petioles or by laminew, and

(fig. 121) and Heliamphora, the pitcher is composed apparently of the petiole of the leaf. In Nepenthes (fig. 120) and perhaps in Cephalotus, while the folding of a winged petiole p forms the pitcher, the lid 2, which is | united by an articulation, corresponds to the lamina. This _ kind of ascidium is called calyptrimorphous, aud may be _ considered as formed by a leaf, such as that of the Orange | (fig. 119); the lamina’ / being articulated to the petiole p, which, when folded, forms the pitcher. In Dischidia Rafilesiana, a climbing plant of India, the pitchers are | formed by the lamina of the leaf, and have an open orifice into which the rootlets at the upper part of the plant enter. These pitchers would seem, therefore, to coutain a supply of fluid for the nourishment of the upper branches of the plant. In Utricularia the leaves form sacs called ampulle. Some suppose that pitchers are not due to folding and adhesion, but that they are produced by a hollowing out of the extremity of the stalk. In some cases the leaves are reduced to mere scales; they are then frequently called cataphyllary leaves. They are produced abundantly upon underground shoots. In parasites (Lathrza, Orobanche), and in plants growing on decaying vegetable matter (Sapro- | phytes), in which no chlorophy]l is formed, these scales are the only leaves produced. In Pinus the only leaves pro- duced on the main stem and the lateral shoots are scales, the acicular leaves of the tree growing

from axillary shoots. In Cycas whorls of scales alternate with large pinnate leaves. In mauy plants, as already noticed, phyl- lodia or stipules perform the function of leaves. The production of leaf-buds from leaves has already been noticed. Such leaves are termed proliferous. In Bryophyllum ‘ (fig. 67) this is a common oceurrence, and it is met with E Many plants of the order Gesneracew. The leaf of , Venus’s Fly-trap (Dionza muscipula, fig. 46), when cut a and placed in damp moss, with a pan of water under-

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neath and a bell-glass for a cover, has produced buds from which young plants were obtained. Some species of ‘Saxifrage and of Ferns also produce buds on their leaves and fronds. In Nymphea micrantha buds appear at the Upper part of the petiole.

Amongst Dicotyledons we have leaves which present the greatest amount of variation in structure and form. The venation is reticulated. They are frequently articulated, jexhibit divisions at their margin, and become truly com- pound. There are, no doubt, instances in which the veins Proceed in a parallel manner, but this will be found to

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they are composed of one or more leaves. In Sarracenia :

Jioral leaves.

occur chiefly in cases where the petiole may be considered as occupying the place of the leaf. Examples of this kind are seen in Acacias (fig. 122). Dicotyledous rarely have a sheath developed, but stipules are very commonly present.

In Monocotyledons the leaves do not present an angular Leaves in network of vessels, nor do they, asa rule, exhibit divisions on Monocoty-

their margin. Exceptions to this occur in some plants, as Tamus and Dioscorea, which have been called Dictyo- gens by Lindley, on account of their somewhat netted venation ; and in Palms, in which, although the leaves are entire at first, they afterwards become split into various lobes. They are rarely stipulate, and very frequently have a sheath at their base. The petiole is often absent, and a sheathing ligule takes its place. The leaves are often continuous with the stem. In some aquatic Monocoty- ledons the submerged and floating leaves are narrow, like petioles, while those growing erect above the water expand. This is seen in Sagittaria sagittifolia, in which the erect leaves assume an arrow-like shape.

In Acotyledons the leaves vary much, being entire or Leaves in divided, stalked or sessile, often feather-veined, occasionally Acotyle- with radiating venation, the extremities of the veins being 1°”*

forked. In Ferns the leaf (frond) is usually stalked, with frequently a much-divided lamina, remarkable for the prolonged growth at the apex, and in the young state usually covered with curious flattened hairs (palew). In Kquisetacexe the leaves are sheathing cylinders embracing successive internodes of the stem, and subsequently splitting at the top into few or many teeth. In Lycopodiacex the leaves vary from mere rudimentary scales, as in Psilotum, to the flattened acuminate leaf of Selaginella, with only a single fibro-vascular bundle, and then to the more com- plicated form in Isoetes, in which the longest leaves in the order occur, and these have a sheathing basal part and an upper lamina. On the face of the sheathing part is a depression or fovea, in which rests the sporangium, the margin of it rising as a thin membranous outgrowth, the velum. Above the fovea, and separated from it by a saddle- like ridge, lies a smaller depression the foveola, the lower margin of which forms a lip, the labiwm, and from its bottom is prolonged beyond the foveola an apiculate mem- branous structure, which is termed the ligule. In Mosses we have the simplest form of leaf, composed of one or more layers of cells, sometimes the central ones being more or less compacted and forming a median vein.

Leaves occupy various positions on the stem and Phylto- branches, and have received different names according to taxis.

their situation. Thus leaves arising from the crown of the root, as in the Primrose, are called radical ; those on the stem are cauline ; on the branches, ramal ; on flower-stalks, The first leaves developed are denominated seminal leaves or cotyledons, and those which succeed are primordial. The arrangement of the leaves on the axis and its appendages is called phyllotaxis. In their arrange- ment leaves follow a definite order. It has been stated already that there are regular nodes or points on the stem at which leaves appear, and that the part of the stem between the nodes is the ¢nternode. Each node is capable of giving origin to a leaf. Occasionally several nodes are approximated so as to form as it were one, and then several leaves may be produced at the same height on the stem. When two leaves are thus produced, one on each side of the stem or axis, and at the same level, they are called opposite (fig. 126); when more than two are produced (fig. 127), they are vertzcrllate, and the circle of leaves is then called a vertzcil or whorl. When the zone of the axis which produces the circle of leaves is transverse from its origin, the whorl is a trwe one; but when the zone is the result of unequal development or of displacement the whorl is spurious. Again, in each whorl the leaves may be all

formed together, and a simultaneous whorl results ; or they may be formed one after the other, as in Characez, when a successive whorl is formed. When leaves are opposite, each successive pair may be placed at right angles to the They are then said to decus- The same occurs

pair immediately preceding. sate, following thus a law of alternation.

Fig. 127.

Fig. 128,

Fre. 126.—A stem with opposite leaves. The pairs are placed at right angles alter- nately, or in what is called a decussate manner. In the lowest pair one

leaf is in front, and the other at the back; in the second pair the leaves are placed

laterally, and so on. Fiq. 127.—Verticillate or whorled leaves of a species of Madder. There are five

leaves in the verticil or whorl.

Fig. 128,—A stem with alternate leaves, arranged in a pentastichous or quineun- clal manner. The sixth leaf is direetly above the first, and commences the second cycle. The fraction of the circumference of the stem expressing the divergence of the leaves is two-fifths.

in the verticillate arrangement, the leaves of each whorl rarely being superposed on those of the whorl next it, as on the branches of Chara, but usually alternating so that each leaf in a whorl occupies the space between two leaves of the whorl next to it. ‘There are considerable irregularities, however, in this respect, and the number of leaves in different whorls is not always uniform, as may be seen in Lysimachia vulgaris. When a single leaf is produced at a uode, and the nodes are separated so that each leaf is placed at a different height on the stem, the leaves are alternate (fig. 128). A plane passing through the point of insertion of the leaf in the node, dividing the leaf into two similar halves, is the median plane of the leaf ; and when the leaves are arranged alternately on an axis so that their median planes coincide they form a straight row or orthostichy. On every axis there are usually two or more orthostichies. The leaves in such a case are said to be rectiserial. In fig. 129, leaf 1 arises from a node x; leaf 2 is separated by

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Fig. 126.

Fig. 129,

Portion of a branch of a Lime tree, wlth four -eaves arranged in a distichous

manner, or in two rows. a, the branch with the leaves numbered in their Rath Sone the node, and m the Internode or merithal; 6 is a magnified ‘p

atlon of the branch, showing the cicatrices of the leaves and thelr

spiral arrangement, whleh is ex: i splral for two internodes. pressed by the fraetion 4, or one turn ef the

an internode m, and is placed to the right or left ; while leaf 3 is situated directly above leaf 1. In this case, then,

AN Y there are two orthostichies, and the arrangement is said to be distichous. When the fourth leaf is directly above the first, the arrangement is trzstichous. The same arrangement continues throughout the branch, so that in the lat- ter case the 7th leaf is above the 4th, the 10th above the 7th; also the 5th above the 2d, the 6th above the 3d, and so on. The size of the angle between the median planes of two consecutive leaves in an alternate arrange- ~ ment is their divergence ; and it is expressed in frac- tions of the circumference of the axis which is sup- posed to bea circle. Ina regularly-formed straight branch covered with leaves, if a thread is passed from one to the other, turning Part of a branch of a Cherry with six leaves, : the sixth being placed vertically over the always in the same direc- first, after two turns of the spiral, Thisis_ tion, a spiral is described, Sxvted by tre-ine oy he quan and a certain number of inorder; 6, a magnified representation of leaves and of complete eaves or their points of insertion, and tel turns occur before reach- *P!ral arrangement. ing the leaf directly above that from which the enumeration commenced. If this arrangement is expressed by a fraction, the numerator of which indicates the number of turns, and the denominator the number of internodes in the spiral cycle, the fraction will be found to represent the angle of diverg- ence of the consecutive leaves on the axis, Thus, in fig. 130, a, 6, the cycle consists of five leaves, the 6th leaf being placed vertically over the Ist, the 7th over the 2d, and so on; while the number of turns between the Ist and 6th leaf is two; hence this arrangement is indicated by the fraction 2. In other words, the distance or divergence between the first and second leaf, expressed in parts of a circle, is 2 of a circle, or 360°+2=144°. In fig. 129, a, 6, the spiral is 3, ze, one turn and two leaves; the third leaf being placed vertically over the first, and the diver gence between the first and second leaf being one-half the circumference of a circle, 360°+3=180°. Again, in a tristichous arrangement the number is 3, or one turn and three leaves, the angular divergence being 120°. By this

means we have a convenient mode of expressing on paper the exact position of the leaves upon an axis. Andy in many cases such a mode of expression is of excellent ser- vice in enabling us readily tounderstand the relations of the leaves. The diver- gences may also be represented dia- grammatically on a

horizontal projection Fig. 131. : of the vertical axis, Diagram of a phyllotaxis represented py the fraction 2-5ths. (Sachs.)

asin fig. 131. Here ¢ the outermost circle represents a section of that portion of the axis bearing the lowest leaf, the innermost represents tht highest. The broad dark lines represent the leaves, and they are numbered according to their age and position, Jt wi

scales 1, 9, 17, &c.; the second through 6, 14, 22, 30, &e.; the third through 3, 11, 19, 27, 35, 43,and soon. Thus it is that, by counting the secondary spirals, all the scales may be numbered, and by this means the generating spiral may be discovered. From the number of secondary spirals the angle of divergence may be easily calculated, the sum of

be seen at once that the leaves are arranged in orthostichies marked I.—V., and that these divide the circumference into five equal portions. But the divergence between leaf 1 and leaf 2 is equal to 2tka of the circumference, and the same is the case between 2 and 3, 3 and 4, &e. The

divergence, then, is 3, and from this we learn that, start-

ing from any leaf on the axis, we must pass twice round | the stem in a spiral through five leaves before reaching one directly over that with which we started. When the

leaves or scales are alternate, and run in a single series,

they are unijugate ; when the leaves are opposite, and there are twoseries, thearrangement is bijugate ; while in the case of whorled leaves the arrangement may be ¢rijugate or The line which, winding round an axis

quadrijugate. either to the right or to the left, passes through the points of insertion of all the leaves on the axis is termed the

genette or generating spiral ; and that margin of each leaf

which is towards the direction from which the spiral proceeds is the kathodic side, the other margin facing the point whither the spiral passes being the anodic side.

In cases where the internodes are very short, and the leaves are closely applied to each other, as in the House-leck, it is difficult to trace the generating spiral. Thus, in fig. 132 there are thirteen leaves which are numbered in their order, and five turns of the spiral marked by circles iu the centre

Fig. 132,

Fia, 182.—Cycle of thirteen leaves placed closely together so as to forma rosette? asin Sempervivum. A is the very short axis to which the leaves are attached,

The leaves are numbered in their order, from below upwards. The eireles in the eentre indicate the five turns of the spiral, and show the insertion of each of the leaves. The divergenee is expressed by the fraetion 5-13ths.

| Fia. 133.—Cone of Abies alba with the scales or modified leaves numbered in the order of their arrangement on the axis of the eone, The lines indicate a ree- | tilinear series of seales, and two lateral Secondary spirals, one turning from

left to right, the other from right to left.

(¥5 indicating the arrangement); but this could not be detected at once. So also in Fir cones (fig. 133), which are composed of scales or modified

leaves, the generating spiral cannot be determined easily. But in such cases a ‘series of secondary spirals or parastichies are seen running parallel with each other both right and left, which to a ‘certain extent conceal the genetic spiral, Thus, in fig. 133, jit will be found that there are five secondary spirals run- hing towards the right and parallel to each other, the first /passing through the scales 1, 6, 11, 16, &¢.; the second through 9, 14, 19, 24, &c.; the third through 17, 22, 27, sit 37, &e; the fourth through 30, 35, 40, 45, &.; the fifth through 43, 48, 53, &c. The number of these ‘secondary spirals indicates the number of scales interven- Ing between every two scales in each of these spirals, the ommon difference being five. Again, it will be found on »xami nation that there are secondary spirals running to the fet, In which the common difference between every two Beales is eight, and that this corresponds to the number of secondary spirals, the first of

which passes through the

those which wind in both directions giving the denominator of the fraction, while the smaller 15 of the two numbers representing A those winding in each direction is > 13 the numerator. Thus in the in- stance last mentioned the angular divergence is 35,. In the cone of the American larch (fig. 134) there is a quincuncial arrangement of scales marked by the fraction 2. There are five vertical ranks, as oF an marked in the tabular numerical Fig. 134. : 3 : : : view at the side of the cone, which Tye ay ea ae represents the unwound surface of the coue, viz., 2, 7, 12; 4, 9, 14; Cone of a species of Larch 1/6, 415)3,5.185 hie diiewths Bowie re common difference in each row be- [0Pe unwound and the seales ing 5. On looking at the cone we The arrangement is 2-5ths, find also parallel oblique ranks, two ‘ *h¢ Ave- ranked serfes. of which, ascending to the left, are marked by the numbers 1, 3, 5, which, if the diagram is coiled round a cylinder, continue in the numbers 7, 9,11, 13, 15; and 2, 4, 6, 8, 10, continued into 12, 14. There are thus two left- handed spirals, with 2 as the common difference in the numbering of the scales. Again, three oblique parallel spirals ascend to the right, marked by the numbers 1, 4, 7, running into 10, 13; 3, 6, 9, 12, going on to 15; and 5, 8, 11, 14; here the common difference in the number- ing of the scales is 3, corresponding with the oblique right- handed spirals, .

All the constant divergences found in phyllotaxis may be represented as successive convergents of the continued fraction

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oeEe TE 1 + 1, &e.,

where a may have the values 1, 2, 8, 4, dc. The actual fractions thus resulting are—

when a = 1,...4, % 3, § &, &c. = 2,...5, 9 % 3 ae, de. a = 3,...4, t tH to vs, We. a= 4,...4, $ & fo op ke

The spiral is not always constant throughout the whole length of an axis. The angle of divergence may alter either abruptly or gradually, and the phyllotaxis thus becomes very complicated. This change may be brought about by arrest of development, by increased development of parts, or by a torsion of the axis. The former are exemplified in many Crassulaceze and Aloes. The latter is seen well in the Screw pine (Pandanus). In the bud of the screw pine the leaves are arranged in three orthostichies with the phyllotaxis 4, but by torsion the developed leaves become arranged in three strong spiral rows running round the stem. These causes of change in phyllotaxis are also well exemplified in the alteration of an opposite or verti- cillate arrangement to an alternate, and wice versa; thus the effect of interruption of growth, in causing alternate leaves to become opposite and verticillate, can be distinctly shown in Rhododendron ponticum. Again, parts which are usually opposite or verticillate become alternate by the vigorous development of the axis, as in Hippuris, and also in Lysimachia vulgaris, where on different parts of the same stem there may be seen alternate, opposite, and

verticillate leaves. When the interruption to development takes place at the end of a branch, the leaves become fasct- culate or clustered, as in the Larch. The primitive or generating spiral may pass either from right to left or from left to right. It sometimes follows a different direc- tion in the branches from that pursued inthe stem. When it follows the same course in the stem and branches, they are homodromous ; when the direction differs, they are heterodromous. In different species of the same genus the phyllotaxis frequently varies.

All modifications of leaves follow the same laws of arrange- ment as true leaves—a fact which is of importance in a mor- phological point of view. In Dicotyledonous plants the first leaves produced (the cotyledons) are opposite, in some cases verticillate. This arrangement often continues during the life of the plant, but at other times it changes, passing into distichous and spiralforms. Some tribes of plants are dis- tinguished by their opposite or verticillate, others by their alternate, leaves. Labiate plants have decussate leaves, while Boraginacess have alternate leaves, and Tiliacee usually have distichous leaves ; Cinchonacez have opposite leaves ; Galiacez, verticillate. Such arrangements as 3, 3, 3°5, and ; are common in Dicotyledons. The first of these, called a quincunx, is met with in the Apple, Pear, aud Cherry (fig. 130) ; the second, in the Bay, Holly, Plantago media ; the third, in the cones of Pinus (Abies) alba (fig. 133); and the fourth in those of the Pinus (Abies) Picea. In Mono- cotyledonous plants there is only one seed-leaf or cotyledon produced, and hence the arrangement is at first alternate ; and it generally continues so more or less, rarely being ver- ticillate. Such arrangements as 4, 4, and $ are common in Monocotyledons, as in Grasses, Sedges, and Lilies. In Aco-

tyledons the leaves assume all kinds of arrangement, being |

opposite, alternate, and verticillate. It has been found in general that, while the number 5 occurs in the phyllotaxis of Dicotyledons, 3 is common in that of Monocotyledons. In the axil of previously formed leaves leaf-buds arise.

These leaf-buds contain the rudiments of a shoot, and consist of leaves covering a growing point. The buds of trees of temperate climates, which le dormant during the winter, are protected by cataphyllary leaves constituting the tegmenta or perule. These scales or protective append- ages of the bud consist either of the altered laminz, or of the enlarged petiolary sheath, or of stipules, as in the Fig and Magnolia, or of one or two of these parts combined. ‘These are often of a coarse nature, serving a temporary purpose, and then falling off when the leaf is expanded. They are frequently covered with a resinous matter, as in Balsam- poplar and Horse-chestnut, or by a thick downy covering as in the Willow. Inplants of warm climates the buds have often no protective appendages, and are then said to be naked. The arrangement of the leaves in the bud has been denominated vernation, prefoliation, and gemmation. In considering vernation we must take into account both the manner in which each individual leaf is folded and also the arrangement of the leaves in relation to each other. These vary in different plants, but in each species they follow a regular law. The leaves in the bud are either placed simply in apposition, as in the Mistleto, or they are folded or rolled up longitudinally or laterally, giving rise to different kinds of vernation, as delineated in figs. 135 to 144, where the folded or curved lines represent the leaves, the thickened part being the midrib. The leaf taken individually is either folded longitudinally from apex to base, as in the Tulip-tree, and called reclinate or replicate ; or rolled up in a circular manner from apex to base, as in Ferns (fig. 135), and called circinate ; or folded laterally, conduplicate (fig. 136), as in Oak ; or it has several folds like a fan, plicate or plated (fig. 137), as in Vine and Sycamore, and in Jeaves with radiating vernation, where the ribs mark the

foldings ; or it is rolled upon itself, convolute (fig. 138), as in Banana and Apricot; or its edges are rolled inwards, involute (fig. 139), as in Violet; or outwards, revolute (fig, — 140), as in Rosemary. ‘The different divisions of a cut

Fig. 138.

Fia. 133.—Circinate vernation.

Fig. 136.—Transverse section of a conduplicate leaf. Fig. 187.—Transverse section of a plicate or plaited leaf. Fre. 188.—Transverse section of a convolute leaf.

Fra. 139.—Transverse section of an involute leaf.

Fra. 140.—Transverse section of a revolute leaf.

Fig. 139.

Fig. 140.

leaf may be folded or rolled up separately, as in Ferns, while the entire leaf may have either the same or a different kind of vernation. The leaves have a definite relation to each other in the bud, being either opposite, alternate, or verticillate ; and thus different kinds of vernation are pro- duced. Sometimes they are nearly in a circle at the same level, remaining flat, or only slightly convex externally, and placed so as to touch each other by their edges, thus giving rise to valvate vernation. At other times they are at different levels, and are applied over each other, so as to be imbricated, as in Lilac, and in the outer scales of Sycamore (fig. 63); and occasionally the margin of one leat overlaps that of another, while it in its turn is overlapped by a third, so as to be twisted, spiral, or contortive, When — leaves are applied to each other face to face, without being folded or rolled together, they are appressed. When the leaves are more completely folded they either touch at their extremities and are accumbent or opposite (fig. 141), or are folded inwards by their margin, and become induplicate ; or a conduplicate leaf covers another similarly folded, which in turn covers a third, and thus the vernation is equitant (fig. 142), as in Privet; or conduplicate lea are placed so that the half of the one covers the half

Fig. 142. Fig. 143. Fic. 141.—Transverse section of a bud, in which the leaves are arranged in an

Fig. 141. Fig. 144.

accumbent manner. 4 Fic. 142,—Transverse section of a bud, in which the leaves are arranged in an

equitant manner. : Fie. 143.—Transverse section of a bud, showing two leaves folded in an obyolate

manner, Each is conduplicate, and one embraces the edge of the other, Fig. 144.—Transverse section of a bud, showing two leaves arranged in a super’

volute manner. of another, and thus they become half-equitant or 0000 lute (fig. 143), as in Sage. When in the case of con volute leaves one leaf is rolled up within the other, 1b 8 supervolute (fig. 144). The scales of a bud sometimes exhibit one kind of vernation, and the leaves another. The same modes of arrangement occur in the tlower-buds, as will be afterwards shown.

Leaves expose the fluids of plants to the influence of ai

Hnetions

LEAVES. |

and light. The fluids so exposed are elaborated. and thus fitted for the formation of the various vegetable tissues and secretions. For the proper performance of this func- tion the structure of the leaves, and their arrangement on the stem and branches, render them well adapted. The cells in the lower side of a leaf where stomata exist are chiefly concerned in the aeration of the sap, whilst other assimilative processes go on in the upper cells. The ela- boration of fluids in the leaves necessarily implies inter- change of their constituents with those of the surrounding atmosphere ; hence two processes are inevitable—a passing inwards into the leaf of the atmospheric elements by a process of absorption, and an outward current of the com- ponents of the plant-juices by a process of exhalation. The absorption of carbonic acid, water, and other fluids is carried on by the leaves, chiefly through their stomata, and most rapidly by the under surface of ordinary leaves in which the cuticle is thinnest, the cellular tissue least con- densed, and stomata most abundant ; the upper surface of the leaf, which usually presents a polished and dense epidermis with few stomata,

taking little part in such a process. An exhalation of both liquids and gases also takes place from the leaves, regulated by the number and the size of stomata as well as by the nature of the epidermis. The process of transpiration of fluids imparts moisture to the atmosphere, and hence the difference between the air of a wooded country and that of a country deprived of forests. Thus leaves have an important influence upon the climate of a country. In darkness little or no trans- piration takes place, and in diffuse daylight it is less than in the sun's rays. The exhalation of gases constitutes the process of respiration. The nature and amount of the gases respired depends both on the circumstances in which the leaves are placed and on the condition of the plant. But normally at all times there seems to be a respiration of carbonic acid, which, under the influence of light, is at once decomposed by the green parts of the plant, the carbon being fixed and the oxygen set free; consequently, in darkness no oxygen is eliminated. Leaves, after per- forming their functions for a certain time, wither and die. In doing so they frequently change colour, and hence arise the beautiful and varied tints of the autumnal foliage. This change of colour is chiefly occasioned by the diminished circulation in the leaves, and the higher degree of oxida- tion to which their chlorophyll has been submitted. Leaves which are articulated with the stem, as in the Walnut and Horse-chestnut, fall and leave a scar, while those which are continuous with it remain attached for some time after they have lost their vitality, as in the Beech. Most of the trees of Great Britain have decidu- ous leaves, their duration not extending over more than a few months, while in trees of warm climates the leaves often remain for two or more years. In tropical countries, however, many trees lose their leaves in the dry season. The period of defoliation varies in different countries according to the nature of their climate. Trees which are called evergreen, as Pines and Evergreen-oak, are always deprived of a certain number of leaves at inter- vals, sufficient being left, however, to preserve their green appearance. The cause of the fall of the leaf in cold climates seems to be deficiency of light and heat in winter, which causes a cessation in the functions of the cells of the leaf; its fluids disappear by evaporation; its cells and vessels become contracted and diminished in their calibre ; various inorganic matters accumulate in the textures; the whole leaf becomes dry ; its parts lose their adherence ; a process of disjunction takes place by a folding inwards of the tissue at the point where the leaf joins the stem or branch which gradually extends until

complete separation takes place, and the leaf either falls by its own weight or is

detached by the wind. In warm climates the dry seasou gives rise to similar phenomena.

II. ORGANS OF REPRODUCTION.

We now proceed to pass in review the reproductive

organs of plants. In Phanerogamous plants, as already mentioned, these organs are conspicuous, and constitute what is known as the flower ; in Cryptogamous plants they are inconspicuous. All Dicotyledonous and Monocoty- ledonous plants are included in the former ; Acotyledonous and Thallogenous plants compose the latter. The structures which go to form these organs are not, however, formations of a new type, but are merely modifications of those struc- tures which we have already considered under the nutritive organs. For example, the various parts of the flower in Phanerogams are really phyllomes, the supporting structures of the flower are caulomes, the spore-bearing sac of many Cryptogams is a trichome ; and in this way a morphological equivalency may be traced betwixt the two series of organs. Further, the difference betwixt the reproductive organs of Phanerogams and those of Cryptogams is one more of degree of differentiation than of actual morphological difference. In Phanerogams the flowers or floral axes are produced from flower-buds, just as leaf-shoots arise from leaf-buds. These two kinds of buds have a resemblance to each other as regards the arrangement and the development of their parts ; and it sometimes happens, from injury and other causes, that the part of the axis which, in ordinary cases, would produce a leaf-bud, gives origin to a flower- bud. A flower-bud has not in ordinary circumstances any power of extension by the development of its central cel- lular portion. In this respect it differs from a leaf-bud. In some cases, however, of monstrosity, especially seen in the Rose (fig. 145) and Geum, the central part is

prolonged, and bears leaves or flowers. , In such cases the flowers, so far as their functional capa- bilities are concerned, are usually abortive.

Flower-buds, like leaf- buds, are produced in the axil of leaves, which are called floral lcaves, bracts, or hypsophyllary leaves.

The term bract is pro- perly applied to the leaf from which the primary floral axis, whether simple or branched, arises, while the leaves which arise on the axis between the bract and the outer en- velope of the flower are bracteoles or bractlets. Bracts sometimes do not: differ from the ordinary leaves, and are then called leafy, as in Veronica: hederi- folia, Vinca, Anagallis, and Ajuga. Like leaves they are entire or divided. In general as regards their form

Proliferous or monstrous Rose, showing the prolongation of the axis beyond the flower. C, calyx transformed into leaves; P, petals multiplied at the ex- pense of the stamens, which are redueed in number; F, coloured leaves repre-

and appearance, they differ from ordinary leaves, the difference being greater in

senting abortive carpels; A, axis pro- longed, bearing an imperfect flower at its apex.

the upper than in the lower branches of an inflorescence. They are distinguished by their position at the base of the flower or flower-stalk. Their phyllotaxis is similar to that of the leaf. When the flower is sessile the bracts are often

’ Bracts.

Plate VII.

Plate IX.

applied closely to the calyx, and may thus be confounded with it, as in Malvacee and species of Dianthus and Eranthis, where they have received the name of epicalyx or calyculus. In some Rosaceous plants an epicalyx is present, due to the formation of stipulary structures by the sepals. In many cases bracts seem to perform the function of protective orgaus, within or beneath which the young flowers are concealed in their earliest stage of growth.

When bracts become coloured, as in Amherstia nobilis, Euphorbia splendens, Erica elegans, and Salvia splendens, they may be mistaken for parts of the corolla. They are sometimes mere scales or threads, and at other times they are abortive, and remain undeveloped, giving rise to the ebracteated inflorescence of Cruciferze and some Boraginacez. Sometimes no flower-buds are produced in their axil, and then they are empty. A series of empty coloured bracts terminates the inflorescence of Salvia Horminum. The smaller bracts or bracteoles, which occur among the sub- divisions of a branching inflorescence, often produce no flower-buds, and thus anomalies occur in the floral arrange- ments. Bracts are occasionally persistent, remaining long attached to the base of the peduncles, but more usually they are deciduous, falling off early by an articulation. In some instances they form part of the fruit, becoming incorporated with other organs. Thus, the cones of Firs and the strobili of the Hop are composed of a series of bracts arranged in a spiral manner, and covering fertile flowers; and the scales on the fruit of the Pine-apple are of the same nature. In amenta or catkins the bracts are

called sguamee or scales. At the base of the general umbel

in Unibelliferous plants, a whorl of bracts often exists, called a general involucre, and at the base of the smaller umbels or umbellules there is a similar leafy whorl called involucel or partial involucre. In some instances, as in Fool’s-parsley, there is no general involucre, but simply an involucel; while, in other cases, as in Fennel, neither involucre nor involucel is developed. In Composite the name involucre is applied to the leaves, scales, or phyllarves, surrounding the head of flowers (fig. 146, 2), as in Dandelion, Daisy, Artichoke. This involucre is frequently composed of

several rows of leaflets, which are either of the same or of different forms and lengths, and often lie over

Fig. 147.

Fig. 146.

Fia. 146.—Head (capitulum) of Marigold (Calendula), showing a congeries of

flowers, enclosed by rows of bracts or phyliaries, 7, at the base, which are col- iectively called an involucre.

Fig, 147.—Fruit of the Oak (Quercus pedunculata), showing a collection of bracts, a, forming the cup (cupula) of the acorn 0.

each other in an imbricatcd manner. When the bracts are arranged in two rows, aud the outer row is perceptibly smaller than the inner, the involucre is sometimes said to be caliculate, as in Senecio. The leaves of the involucre are spiny in Thistles and in Dipsacus, and hooked in Burdock. Such whorled or verticillate bracts may either

remain separate (polyphyllous), or may be united by cohesion (gamophyllous), as in many species of Bupleurum, and in Lavatera. In Compositee besides the general envelope called the involucre, there are frequently chaffy and setose bracts at the base of each flower, and in Dipsacacesze a membranous tube surrounds each flower. These structures are of the nature of an epicalyx. In the acorn the cupula or cup (fig. 147, a) is formed by a growing upwards of the flower. stalk immediately beneath the flower, upon which scaly or spiny protuberances appear. It is of the nature of bracts, Bracts also compose the husky covering of the Hazel-nut, In the Yew the succulent covering of the seed is by some considered to be formed by the bracts.

When bracts become united together, and overlie each other in several rows, it often happens that the outer ones do not produce flowers, that is, are empty or sterile. In the Artichoke the outer imbricated scales or bracts are in this condition, and it is from the membranous white scales or bracts (palew) forming the choke attached to the edible receptacle that the flowers are produced. The sterile bracts of the Daisy occasionally produce capitula, and give rise to the Hen-and-Chickens Daisy. In place of developing flower-buds, bracts may, in certain circumstances, as in proliferous or viviparous plants, produce leaf-buds, and the flower-buds, like the leaf-buds, may be terminal or they may be Jateral.

A sheathing bract en- closing one or several flowers is called a spatha or spathe. It is common among Monocotyledons, as Narcissus (figure 148), Snow – flake, Arum, and Palms. In some Palms it is 20 feet long, and en- ‘ closes 200,000 flowers. It is often associated with that form of inflorescence termed the spadix, and may be coloured, as in Richardia sthiopica, some-times called the Aithiopian or Trumpet Lily. When the spadix is compound or branching, as in Palms, there are smaller spathes,

Fig. 148. surrounding separate parts Mowers of Polyanthus Narcissus (Narcissus

of the inflorescence, to Tazetta) bursting from a sheathing bract

which the name spathelle

has sometimes been given, The spathe protects the flowersin their young state, and often falls off after they are developed, or hangs down in a withered form, as in some Palms, Typha, and Pothos. In Grasses the outer scales of the spikelets have been considered as sterile bracts, and have received the name of glumes (fig. 149, gl); and im Cyperaceze bracts enclose the organs of reproduction. Bracts are frequently changed into complete leaves. This change is called phyllody of bracts. It is seen in species of Plantago, especially in the variety of Plantago media, called the Rose-plantain in gardens. In this plant the bracts become leafy, and form a rosette round the flowering axis. Similar changes occur in Plantago major, P. lanceolata, Ajuga reptans, the Dandelion, the Daisy, the Dahlia, and in Umbelliferous plants. The conversion of bracts into stamens has been

observed in the case of Abies excelsa. This has been called staminody of bracts. A lengthening of the axis of the female strobilus of Conifers is not of infrequent occurrence in Cryptomeria japonica, Lanx europa, &c., and this is usually associated with a leaf-like condition of the bracts, and sometimes even with the development of leaf-bearing shoots in place of the scales.

PEDUNCLE. |

The arrangement of the flowers on the axis, or the ramification of the floral axis, is called inflorescence or anthotaxis. ‘The primary axis of inflorescence is some- times called rachis, its branches, whether terminal or lateral, which form the stalks supporting flowers or clusters of flowers, are peduncles, and if small branches are given off by it, they are called pedicels. A flower having a stalk is called pedunculate or pedicellate; one having no stalk is sessile. In describing a branching inflorescence, it is common to speak of the rachis as the primary floral axis, its branches as the secondary floral axes, their divisions as the ¢ertiary floral axes, and so on; thus avoiding any confusion that might arise from the use of the terms rachis, peduncle, and pedicel.

Fig. 149.

Fic, 149.— Spikelet of Oat (Avena sativa) laid open, showing the bracts g/, gl, which are denominated empty glumes; pe, the outer pale or glumellule (floral glume), with a dorsal awn a; p?, the inner pale; 7s, an abortive flower.

Fig. 150.—Peduncele, a, of Fig (Ficus Carica), ending in a hollow receptacie 2, enclosing numcrous male and female flowers.

The peduncle may be cylindrical, compressed, or grooved ; simple, bearing a single flower, asin l’rimrose ; or branched, as in London-pride. It is sometimes succulent, as in the Cashew, in which it forms the large coloured expansion supporting the nut; spiral, as in Cyclamen and Vallisneria ; or spiny, as in Alyssum spinosum. In some Rushes there is a green terete, and sometimes spiral, floral axis. Some- times the peduncle proceeds from radical leaves, that is, from an axis which is so shortened as to bring the leaves close together in the form of a cluster, as in the Primrose, Auricula,

Hyacinth, &c. In such cases it is termed a scape. The floral axis may be shortened, assuming a flattened, convex, or concave form, and bearing numerous flowers, as in the Artichoke, Daisy, and Fig (fig. 150). In these cases it is called a receptacle or phoranthium or clinanthium. The floral axis sometimes assumes a leaf-like or phylloid appearance, bearing numerous flowers at its margin, as in Xylophylla longifolia and in Ruscus; or it appears as if formed by several peduncles united together, constituting a fasciated axis, as in the Cockscomb, in which the flowers form a peculiar crest at the apex of the flattened peduncles. Adhesions occasionally take place between the peduncle and the bracts or leaves of the plant, as in the Lime-tree (fig. 151), Helwingia, Chailletia, several species of Hibiscus, and Zostera. The adhesion of the peduncles to the stem accounts for the extra-axillary position of flowers, as in many Solanacez. When this union extends for a consider- able length along the stem, several leaves may be interposed between the part where the peduncle becomes free and the leaf whence it originated, and it may be difficult to trace the connection. The peduncle occasionally becomes abortive, and in place of bearing a flower, is transformed into a tendril ; at other times it is hollowed at the apex, so

as apparently to form the lower part of the outer whorl of floral leaves as in Eschscholtzia. The termination of the

Fig. 151.

Iie. 151.—Leaf and flowering branch of the Lime-tree (Zilia). The bract 6 is adhcrent to the peduncle or flower-stalk. The flowers are arranged in a coryni- bose cyme.

Fig. 152.—The calyx and beak-like process of Geranium, with the parts of the pistil (the carpels) curled upwards, so as to scatter the seed. a, the extremity of the

rostrum or beak, whence the name crane’s bill is derived; 0, the carpels curled up by means of the styles which are attached to the beak; c, the calyx.

peduncle, or the part on which the whorls of the flower are arranged, is called the thalamus or torus.

receptacle is also sometimes ap- plied to this, whether expanded and bearing several flowers, or narrowed so as to bear one. It may be considered as the growing point of the axis, which usually is arrested by the production of the flowers, but which sometimes becomes enlarged and expanded. Thus, in the Geranium (fig. 152) it is prolonged beyond the flower in the form of a beak (vostrate) ; in the Arum (fig. 153) it is a club- shaped fleshy column; in the Strawberry (fig.]54) it becomes a conical succulent mass, on which the seed-vessels are placed; while in Nelumbium it forms a trun- cated tabular top-like expansion (turbinate), enveloping the seed- vessels. The margins of the re- ceptacle may grow up whilst the centre remains depressed, and thus a concave torus is formed, as in the Rose (fig. 155). In some mon- strous flowers of the Rose and Geum it is prolonged as a branch bearing leaves. Peduncles and pedicels sometimes become re- markably elongated, and this elongation of the flower-stalks sometimes alters the general char- acter of the inflorescence. We occasionally observe the heads of flowers of the common White Clover becoming racemose by the lengthening of the flower-stalks. Before proceeding to an ex- amination of the parts of the

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Fig. 155. Fig. 153.—Spadix of Cuckow-pint (Arum maculatum), consisting

Fig. 153.

of iuumerous male flowers 8, female a, and abortive flowers c, sessile on a succulent rachis, and enclosed in a spathe. which in the figure has been removed. The rachis cnds in a succulent club-shaped mass of cellular tis- sue, a. 16. 154.—Fruit of the Strawberry (Fragaria vesca), consisting of an

enlarged succulent prolonga- tion of the receptacle; bearing on its surface numerous carpels, which are often erroneously called seeds. The calyx is seen at the lower part.

Fig. 155.—The fruit of the Rose cut vertically. The receptacle re lines the interior of the calyx ca, and the carpels with their ovaries ov and styles sty are attached to it. Thestamens and petals are seen at the upper part, attached to the calyx.

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flower-bud, we will consider the various modes of arrange- ment of the flowers upon the axis, or the inflorescence. IV. — 16

Plate II,

Plate XVI.

Inflores- cence.

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We may recognize two distinct types of inflorescence—one in which the flowers always arise as lateral shoots from a primary axis, which goes on elongating, and the lateral shoots never exceed in their development the length of the primary axis beyond their point of origin. The flowers are thus always aadlary. Exceptions, such as 1n Cruciferous plants, are due to the non-appearance of the bracts. In the other type the primary axis terminates In a single flower, but lateral axes are given off from the axil of bracts, which again repeat the primary axis, and the development of each lateral axis is stronger than the primary axis beyond its point of origin. The flowers produced in this inflorescence are thus terminal. The first kind of inflorescence is indeterminate, indefinite, or awdlary. Here the axis is either elongated, producing flower-buds as it grows, the lower expanding first ; or it is shortened and depressed, and the outer flowers expand first. The expansion of the flowers is thus centripetal, that 1s, from base to apex, or from circumference to centre. This kind of inflorescence is shown in fig. 156, where the leaf from which the cluster of flowers is produced, f,

represents the bract or floral leaf. The rachis, or primary axis of the flower is a’; this produces small leaflets 6, which bear smaller flower-leaves or bractlets, from which peduncles or secondary axes spring, each bearing single flowers. In fig. 157 the same kind of inflorescence is shown on a shortened axis, the outer flowers expanding first, and those in the centre last.

Fre. 156.—Raceme of Barberry (Berberts vulgaris) produced in the axil of a leaf or bract f, which has been transformed into a spine, with two stipules s at its base; a’, primary floral.axis, bearing small alternate bracts 6, in the axil of which the secondary axes a”’,a” are produced, each terminated by a flower. The expansion of the flowers is centripetal, or from base to apex; the lower flowers have passed into the state of fruit, the middle are fully expanded, and those at the top are stillin bud. Indeterminate simple inflorescence.

Fic. 157.—Head of flowers (capitulum) of Scabiosa atro-purpurea. The in-florescence is simple and indeterminate, and the expansion of the flowers centripetal, those at the cireumference opening first,

The second kind of inflorescence is determinate, de- jinite, or terminal. In this the axis is either elongated and ends in a solitary flower, which thus terminates the axis, and if other flowers are produced, they belong to secondary axes farther from the centre; or the axis is shortened and flattened, producing a number of separate floral axes, the central one expanding first, while the others are developed in succession farther from the centre. The expansion of the flowers is in this case centrifugal, that is, from apex to base, or from centre to circumference. It is illustrated in fig. 158, where a representation is given of a plant of Ranunculus bulbosus ; a’ is the primary axis swollen at the base in a bulb-like manner 6, and with roots proceeding from it. From the leaves which are radical proceeds the axis ending in a solitary terminal flower /’. About the middle of this axis there is a leaf or bract, from which a secondary floral axis a” is produced, ending in a single flower J”, less advanced than the flower ie Ibis secondary axis bears a leaf also, from which a tertiary floral axis a’’ is produced, bearing an unexpanded, solitary

flower f’”. From this tertiary axis a fourth is in progress of formation. Here /’ is the termination of the primary axis, and this flower expands first, while the other flowers are developed centrifugally on separate axes.

A third series of inflores-

: fT cences, termed mixed, may * US be recognized. In them the py primary axis has an arrange- / P ment belonging to the oppo- / m site type from that on the / Ve branches, or vice versa. Ac- (\) 7’

cording to: the mode and degree of development of the lateral shoots and also of the bracts, various forms of e both inflorescences result. ION 4 Ae 7 Amongst indefinite forms ONS 4 ye the simplest occurs when a lateral shoot produced in the Ay, axil of a large single foliage END 2 v, leaf of the plant ends in a SIWES single flower, the axis of the SAR \ L Fs SS

plant elongating beyond, as in “CoM Veronica hederifolia, Vinca SF FRO “ay minor, and Lysimachia ne- © BAS morum. The flower in this Fig. 158.

case is solitary, and the In- piant of Ranunculus bulbosus, showing florescence has been desig- determinate inflorescence.

nated solitary axillary. The ordinary leaves in this case become floral leaves or bracts, by producing flower-buds in place of leaf-buds. The flowers, being all offshoots of the same axis, are said to be of the same generation or degree, and their number, like that of the leaves of this main axis, is indefinite, varying with the vigour of the plant. Usually, however, the floral axis, arising from a more or less altered leaf or bract, instead of ending in a solitary flower, is pro- longed, and bears numerous leaflets, called bracteoles or bractlets, from which smaller peduncles are produced, and those again in their turn may be branched in a similar way. ‘Thus the flowers are arranged in groups, and frequently very complicated forms of inflorescence result, When the primary peduncle or floral axis, as in fig. 156, a’, is elongated, and gives off pedicels a”, of nearly equal length ending in single flowers, a raceme or cluster is pr0- duced, as in Currant, Hyacinth, and Barberry. If the secondary floral axes give rise to tertiary

ones, the raceme is branching, and forms what is by some called a pamele, as in Yucca gloriosa; but it is better to restrict this term to the lax inflorescence of some Grasses and Rushes, If in a raceme the lower flower-stalks are developed moré strongly than the upper, and thus all the flowers aré nearly on a level, a corymb is formed, which may be simple, as in fig. 159, where the primary axis a’ divides into secondary axes a”, a’, which end in single flowers; or branching, where the secondary axes again subdivide. If the peduncles or secondary axes are very short oF awanting, so that the flowers are sessile, a spike is pro duced, as in Plantago and Verbena officinalis (fig. 160). The spike sometimes bears unisexual flowers, usually staminiferous, the whole falling off by an articulation, as in Willow or Hazel (fig. 161), and then it is called an amentum or catkin, hence such trees are called amentr ferous; at other times it becomes succulent, bearing numer ous flowers, surrounded by a sheathing bract or spathe, and then it constitutes a spadix, which may be simple, a8

in Arum macilatum (fig. 153), or branching, as in Palms. Pilate

A spike bearing female flowers only, and covered with scales, is either a strobilus, as in the Hop; or a cone, as mM the Fir (fig. 133). It may be mentioned here that many do not consider the cone of Firs an axis of inflorescence

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: but regard it as a single flower with the floral leaves placed | at different heights. In Grasscs there are usually numerous sessile flowers arranged in small spikes, called locuste or

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posite plants, as Sunflower, Dandelion, Thistle, Centaury, and Marigold, they are somewhat hemispherical, with a

FORMS OF INFLORESCENCE. |

Fig. 159. Fig. 160. Fig. 161.

Fia, 1592.—Corymb of Cerasus Mahaleb, produced in the axil of a leaf which has fallen, and terminating an abortive branch, at the base of which are modified zeaves in the form of scales, e.

Fie. 160,—Spike of Verbena officinalis, showing sessile flowers on a common rachis, The flowers at the lower part of the spike have passed into fruit, bo towards the middle are in full bloom, and those at the top are only in bud.

Fig. 161—Amentum or catkin of Hazel (Corylus Avellana), consisting of an axis or rachis covered with bracts in the form of scales (squamee), each of which covers amale flower, the stamens of which are seen proj ecting beyond the scale,

_ The catkin falls off in a mass, separating from the branch by an articulation. sptkelets, which are either set closely along a central axis, or produced on secondary axes formed by the branching of the central one ; to the latter form the term panicle is applied.

If the primary axis, in place of being elongated, is contracted, it gives rise to other forms of indefinite inflorescence. When the axis is so shortened that the secondary axes arise from a common point, and spread out as radw of nearly equal length, each ending in a single flower, or dividing again in a similar radiating manner, an _umbel is produced, as in fig. 162, From the primary floral

Fig. 162.

= umbel of Common Dill (Anethum graveolens), having a primary umbel a, and secondary umbels 2, without either involucre or involucel. The petiole Pp of the leaf is sheathing, and has been denominated pericladium.

pxis a the secondary axes come off in a radiating or umbrella-like manner, and end in small umbels b, which ‘are called partial umbels or umbellules, to distinguish them from the general wmbel formed by the branching of the primary axis. This inflorescence is seen in Hemlock, and other allied plants,

which are hence called Umbelliferous. f there are numerous flowers on a flattened, convex, or slightly concave receptacle, having either very short pedicels pF none, a capitulum (head), anthodium, or calathium, is ormed, as in Dandelion, Daisy, and other Composite plants fig. 146), also in Scabiosa (fig. 157) and Dipsacus, In the

erican Button-bush the heads are globular, in some ppecies of Teazel, elliptical, while in Scabious, and in Com-

flattened, slightly hollowed, or convex disk. If the margins of such a receptacle be developed upwards, the centre not developing, a concave receptacle is formed, which may partially or completely enclose a number of flowers that are generally unisexual. This gives rise to the peculiar in- florescence of Dorstenia (fig. 163), or to that of the Fig (fig. 150), where the flowers are placed on the inner surface of the hollow re- ceptacle, and are provided with bracteoles, This in- florescence has been called hypanthodium.

Lastly, we have what

are called compound inde- Jjinite inflorescences. In these forms the lateral shoots, developed centri- petally upon the primary axis, bear numerous brac- teoles, from which floral shoots arise which may have a centripetal arrange- ment similar to that on the mother shoot, or it i may be different. Thus Fig, 163. we may have a group Peduncle @ of Dorstenia, with concave of racemes, arranged in a receptacle b, racemose manner on a common axis, forming a raceme of racemes or compound raceme, as in Astilbe. In the same way we may have compound umbels, as in Hemlock and most Umbelliferz (fig. 162), a compound spike, as in Rye-grass, a compound spadix, as in some Palms, and a compound capitulum, as in the Hen-and-Chickens Daisy. Again, there may be a raceme of capitula, that is, a group of capitula disposed in a racemose manner, as in Petasites, a raceme of umbels, as in Ivy, and so on, all the forms of inflorescence being indefinite in disposition.

The elongation of secondary flower-stalks sometimes alters the general character of the inflorescence, changing a spike into a raceme, a raceme into a corymb, a capitulum into an umbel, and so forth. The capitulum of

flowers in some Composite, such as Hypocheris radicata and Senecio vulgaris, by a similar change in the pedicels assumes the form of an umbel. Among Umbelliferee the umbels are sometimes supported on very long stalks, while the pedicels of the individual flowers are not lengthened.

In Eryngium the shortening of the pedicels changes an umbel into a capitulum. The umbellate inflorescence of Pelargonium has been seen changed into a raceme.

The simplest form of the definite type of inflorescence is Definite in- seen in Anemone nemorosa and in Gentianella (Gentiana florescence. acaulis, fig. 164), where the axis terminates in a single flower, no other flowers being produced upon the plant. This is solitary terminal inflorescence. If other flowers were produced, they would arise as lateral shoots from the bracts below the first-formed flower. The general name of cyme is applied to the arrangement of a group of flowers in a definite inflorescence. A cymose inflorescence is an inflorescence where the primary floral axis before ter- minating in a flower gives off one or more lateral unifloral axes which repeat the process,—the development being only limited by the vigour of the plant. The floral axes are thus centrifugally developed. The cyme, according to its development, has been characterized as biparous or umparous. In fig. 165 the biparous cyme is represented in the flowering branch of Erythrea Centaurium. Here the primary axis a’ ends in a flower /’, which has passed

into the state of fruit, At its base two leaves are produced, each of which is capable of developing buds. These are flower-buds, and constitute secondary axes a” a”, ending in single flowers f” f’, which are thus terminal and solitary ; and at the base of these axes a pair of opposite leaves 1s

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Fig. 164.

Fig. 165. Gentianella (Gentiana acaulis). a, axis; Flowering branch of Erythrwa 6, flower; c, bract. Centaurium.

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produced, giving rise to tertiary axes a” a” a’, ending in single flowers f’” f’” 7’”,and so on. The term dichotomous has also been applied to this form of cyme. But these terms are not strictly correct, for here there is no dichotomous branching, although, when the terminal flower f of the generating axis has withered, an apparent dichotomy occurs ; but the lateral axes on the several shoots are produced monopodially, and therefore the term is apt to lead to con- fusion regarding the development of the shoots. The name dichasium has, therefore, been substituted for the old term. In the natural order Caryophyllacezee (Pink family) the dichasial cymose form of inflorescence is very general. In some members of the tribe, as Dianthus barbatus, D. Carthusianorum, é&c., in which the peduncles are short, and the flowers closely approximated, with a centrifugal expansion, the inflorescence has the form of a contracted dichasium, and receives the name of fascicle (fig. 166). A

Fig. 166.

Fascicle of Mallew (Malva sylvestris).

similar inflorescence is seen in Xylophylla longifolia. When the axes become very much shortened, the arrangement is more complicated in appearance, and the nature of the in- florescence can only be recognized by the order of opening of theflowers. In Labiate plants, as the Dead-nettle (Lamium), the flowers are produced in the axil of each of the foliage leaves of the plant, and they appear as if arranged ina simple whorl of flowers. But on examination it is found that there is a central flower expanding first, and from its

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[REPRODUCTIVE ORGANS,

axis two secondary axes spring bearing solitary flowers; the expansion is thus centrifugal. The inflorescence is there. fore a contracted dichasium, the flowers being sessile, or

Flowering stalk of the White’ Dead-nettle, (Lamium album). The bracts }, > are like the ordinary leaves of the plant, and produce clusters of flowers in their axil. The clusters are called verticillasters, and consist of flowers which are produced in acentrifugal manner.

Sometimes, especially towards the summit of a dichasium, owing to the exhaustion of the growing power of the plant, only one of the bracts gives origin to a new axis, the other remaining empty ; thus the inflorescence becomes unilateral, – and further development is arrested. In addition to the dichasial form there are others where more than two lateral axes are produced from the primary floral axis, each of which in turn produces numerous axes. To this form the terms trichotomous and polytomous cyme have been applied ; but these are now usually designated cymose umbels. They are well seen in some species of Euphorbia. Another term, anthela, has been used to distinguish such forms as occur in several species of Luzula and Juncus, where numerous lateral axes arising from the primary axis grow very strongly, and develop in an irregular manner.

In the uniparous cyme a number of floral axes are successively developed one from the other, but the axis of zach successive generation, instead of producing a pair of bracts, produces only a single one. The basal portion of the consecutive axes may become much thickened and arranged more or less in a straight line, and thus collectively form an apparent or false axis or sympodium, and the inflorescence thus simulates a raceme. In the true raceme, however, we find only a single axis, producing in succession a series of bracts, from which the floral peduncles arise as lateral shoots, and thus each flower is on the same side of the floral axis as the bract in the axil of which it is de veloped ; but in the uniparous cyme the flower of each of these axes, the basal portions of which unite to form the false axis, is situated on the opposite side of the axis to the bract from which it apparently arises (fig, 168). This

| bract is not, however, the one from which the axis termil-

ating in the flower arises, but is a bract produced upon it, and gives origin in its axil to a new axis, the basal por- tion of which, constituting the next part of the false aus, occupies the angle between this bract and its parent axis, — the bract from which the axis really does arise being situated lower down upon the same side of the axis with itself. The uniparous cyme presents two forms, the s¢or proid or cteinal and the helicoid or bostrychoid.

In the scorpioid cyme the flowers are arranged alter nately in a double row along one side of the false axis (lg. 169), the bracts when developed forming a second double

row on the opposite side, as seen in the Henbane ; the whole inflorescence usually curves on itself like a scorpion’s tail, hence its name, In fig. 170 is shown a diagrammatic sketch of this arrangement. The false axis, abcd, is formed by

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Fig. 170.

Fig. 169.

Fig. 168.—False raceme or helicoid cyme of a species of Alstrémeria. a! a” al”! all” are separate axes successively developed, which appear to form a simple continu- ous raceme, of which the axes form the internodes. It is a definite uniparous inflorescence, however, with centrifugal evolution. Each of the axcs is pro- duced in the axil of a leaf, and is terminated by a flower /? J” f”” 7”, opposite to that leaf, and the axes have a spiral arrangement.

Fra. 169.—Scorpioidal or cicinal cyme of Forget-me-not (Afyosotis pa’ustris).

Fig. 170.—Diagram of definite floral axes a, 0, c, a, e

Fig. 171.—Flowering stalk of a kind of Ragwort (Senecio). The flowers arc in heads (capitula), and open from the circumference inwards in an indefinite centripetal manner. The heads of flowers, on the other hand, taken collce- tively, expand centrifugally—the central one a first. Each head of flowers terminates a separate axis. They form together a corymb of capitula. The inflorescence is called mixed.

successive generations of unifloral axes, the flowers being arranged along one side alternately and in a double row ; had the bracts been developed they would have formed a similar double row on the opposite side of the false axis ; the whole inflorescence is represented as curved on itself. In fig. 169 the same scorpioid form of uniparons cyme is seen in the Forget-me-not, with the double row of flowers on one side of the false axis, but in this case the bracts, which

should appear on the opposite side, are not developed, and

hence the cyme is not complete. The inflorescences in the family Boraginacez are usually regarded as true scorpioid cymes. But it has been recently shown that in Myosotis (Forget-me-not) the axis is not a sympodium, but the branch- ing takes place monopodially, therefore it should more cor- rectly be regarded as a raceme with flowers only on one side and curving on itself. In Hyoscyamus (Henbane) and other Atropacez the branching is dichotomous, so that the inflorescence in this case also ought not to be regarded as a scorpioid cyme.

In the helicoid cyme there is also a false axis formed by the basal portion of the separate axes, but the flowers are not placed in a double row, but ina single row, and form a spiral or helix round the false axis. In Alstromeria, as represented in fig. 168, the axis a’ ends in a flower (cut

off in the figure) and bears a leaf. From the axil of this leaf, that is, between it and the primary axis a’ arises a secondary axis a”, ending in a flower /”, and producing a leaf about the middle. From the axil of this leaf a ter- tiary floral axis a”’, ending in a flower /”, takes origin. In this case the axes are

not arranged in two rows along one side of the false axis, but are placed at regular inter- vals, so as to form an elongated spiral round it.

Compound definite inflorescences are by no means com- mon, but in Streptocarpus polyanthus, and in several Calceolarias, we probably have examples. Here there are scorpioid cymes of pairs of flowers, each pair consisting of an older and a younger flower.

Forms of inflorescence occur, in which both the definite

and indefinite types are represented ; these, then, are med Mixed in- Thus in Composite plants, such as Hawk. Slorescence,

inflorescences. weeds (Hieracia) and Ragworts (Senecio, fig. 171), the heads of flowers, taken as a whole, are developed centri- fugally, the terminal head first, while the florets, or small flowers on the receptacle, open centripetally, those at the circumference first. So also in Labiate, such as Dead- nettle (Lamium), the different whorls of inflorescence are developed centripetally, while the florets of the verti- cillaster are centrifugal. This mixed character presents dif- ficulties in such cases as Labiate, where the leaves, in place of retaining their ordinary form, become bracts, and thus might lead to the supposition of the whole series of flowers being one inflorescence. In such cases the cymes are described as spiked, racemose, or panicled, according to circumstances. In Saxifraga umbrosa (London-pride) and in the Horse-chestnut we meet with a raceme of scor- pioid cymes; in Sea-pink, a capitulum of contracted scorpioid cymes (often called a glomerulus) ; in Laurustinus, a compound umbel of dichasial cymes; a scorpioid cyme of capitula in Vernonia centriflora. In the catkins of the Birch we have, in reality, spikes of contracted dichasial cymes. In the Bell-flower (Campanula), there is a racemose uniparous cyme. In the Privet (Ligustrum vulgare) there are numerous racemes of dichasia arranged in a racemose manner along an axis ; the whole inflorescence thus has an appearance not unlike a bunch of grapes, and has been called a thyrsus. TABULAR VIEW OF INFLORESCENCE. A. Indefinite Centripetal Inflorescence. I. Flowers solitary, axillary. Vinca, Veronica hederifolia, II. Flowers in groups, pedicellate. 1. Elongated form (Raceme), Hyacinth, Laburnum, Currant. (Corymb), Ornithogalwm. 2, Contracted or shortened form(Umbel), Cowslip, Astrantia. 111. Flowers in groups, sessile. 1.

Elongated form (Spike), Plantago. (Spikelet), Grasses. (Amentum, Catkin), Willow, Hazel. (Spadix) Arwm, some Palms. (Cone), Fir, Sprace. (Strobilus), Hop. 2, Contracted or shortened form (Capitulum), Daisy, Dande- lion, Scabious. IV. Compound Indefinite Inflorescence. a. Compound Spike, Rye-grass. b. Compound Spadix, Palms. c. Compound Raceme, Astilbe. d. Compound Umbel, Hemlock and most Umbellifercee. e. Raceme of Capitula, Petasttes. f. Raceme of Umbels, Jvy. B. Definite Centrifugal Inflorescence. I. Flowers solitary, terminal. Gentianella, Powony. 11. Flowers in Cymes. 1. Uniparous Cyme. a. Helicoid Cyme (axes forming a spiral,. * Elongated form, Alstrémeria. ** Contracted form, Witsenia corymbosa. b. Scorpioid Cyme (axes unilateral, two rows). * Elongated form, Forget-me-not, Symphytum, Henbane. ** Contracted form, Hrodiwm, Alchemilla arvensis.

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2. Biparous Cyme (Dichotomous), including 8-5-chotomous Cymes (Dichasium, Cymose Umbel, Anthela). a. Elongated form, Cerastiwmn, Stellaria. b. Contracted form (Verticillaster), Dead-nettle, Pelargo-

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nium.

3. Compound Definite Inflorescence. Streptocarpus polyan- thus, many Calceolarias.

©. Mixed Inflorescence.

1. Raceme of Scorpioid Cymes, Horse-chesinut. _

2. Scorpioid Cyme of Capitula, Vernonia centriflora. _

3. Compound Umbel of Dichotomous Cymes, Lawrustinus.

4, Capitulum of contracted Scorpicid Cymes (Glomerulus), Sea-pink.

The flower is the towt ensemble of those organs which are |

concerned in reproduction. It is constituted by a portion of the floral axis bearing the sexual organs, usually with certain protective envelopes. The parts borne on the floral axis and composing the flower are all metamorphosed leaves, and, though usually very different in appearance from foliage leaves, their morphological resemblance is frequently shown by their developing as foliage leaves. The axis bearing the parts of the flower is usually very much contracted, no internodes being developed, and it frequently expands into a flattened or hollowed expansion termed the thalamus or torus; at other times, though rarely, the internodes are developed and it is elongated. Upon this torus the parts of the flower are arranged in a crowded manner, usually forming a series of verticils, the parts of which alternate; but they are sometimes arranged in a spiral manner, especially if the floral axis be elongated. In a typical flower, as in fig. 172, we recoguize four distinct whorls of leaves :—an outer whorl of five parts, the calyx; within it, another whorl of five parts alternating with those of the outer whorl, the corolla ; next comes a whorl of parts alternating with the parts of the corolla, the androzctum ; and in the centre is the gynwcium. Fig 173 is a diagrammatic representation of’the arrangement of the parts of such a flower. The flower is supposed to be cut transversely, and the parts of each whorl are distinguished by a different symbol. Of these whorls the two internal, forming the male and female sexual organs, constitute the essential organs of reproduction ; the two. outer whorls are the protective coverings or floral envelopes. The calyx or outer covering (fig. 172, c) is formed of leaves, called sepals, which are generally of a greenish colour. The corolla p, the next covering, is composed of leaves, called petals, which are often showy, and normally alternate with the sepals. Sometimes, as in many Monocotyledons, the calyx and corolla both display rich colouring, and are apt to be con- founded. In such cases the term perianth, or perigone, has been applied to avoid ambiguity. Thus, in the Tulip, Crocus, Lily, Hyacinth, authors speak of the parts of the perianth, in place of calyx and corolla, although in these plants an outer whorl (calyx) may be detected, of three parts, and an inner (corolla), of a similar number, alternat- ing with them. When the parts of the calyx are in appear- ance like petals they are said to be petaloid, as in Liliacez. Tn some cases the petals have the appearance of sepals, then they are sepaloid, as in Juncacee. The term perianth is usually confined to the flowers of Monocoty- ledons, whatever colour they present, whether green,

as in Asparagus, or coloured, as in Tulip. Some use the term perianth as a general one, and restrict the use of perigone to cases where a pistil only is present. In plants, as Nymphea alba, where a spiral arrangement of the floral leaves occur, it 1s not easy to say where tha calyx ends and the corolla begins, as these two whorls pass insensibly into each other, When both calyx and corolla are present, the plants are dichlamydeous ; occasionally one becomes abortive, and then the flower is monochlamydeous (fig. 174), having a calyx only, or apetalous, having no petals. At

‘ mydeous, or naked. It is important to remember that

ANY

times both are abortive, aud then the flower is achla.

[REPRODUCTIVE ORGANS,

if only one perianth-whorl is present it is the calyx, The outermost whorl of the essential organs, collectively termed the andreciwm, is composed of a series of leaves

Fig. 176. Fic, 172.—Flower of Crassula rubens. ¢, ¢, sepals; p, p, petals: é, @ stamens;

‘ 0, carpels, each of them having a small seale-like appendage a at the

ase,

Fie. 178.—Diagram of a completely symmetrical flower, eonsisting of four whorls, each consisting of five parts. The outer row is the calyx formed of five sepals; the second is the corolla of five petals, alternating with the sepals; the third is the andreecium, consisting of five stamens, alternating with the petals; the een whorl is the gynceium, consisting of five earpels, alternating with the stamens.

Fig. 174.—Monoehlamydeous (apetalous) flower of Goosefoot (Chenopodium), eon- sisting of a single perianth (calyx) of five parts,

enclosing five stamens, which are opposite the divisions of the perianth, owing to the absenee of the petals.

Fie. 175.—Stamen, consisting of a filament (stalk) f and an anther a, containing powdery matter p, denominated pollen, which is discharged through slits in the two lobes of the anther.

Fig. 176.—The pistil of Tobacco (Wicotiana Tabacum), consisting of the ovary } eontaining ovules, the style s, and the eapitate stigma g, The pistil is placed on the receptaele 1, at the extremity of the pedunele,

distinguished as the staminal leaves or stamens. These are the male sexual organs. In their most differentiated form each consists of a stalk, either filiform or foliaceous, thé filament (fig. 175, f) supporting at its summit a lobed saccate mass, the anther (fig. 175, a), which contains a powdery matter, the pollen (fig. 175, »), which is discharged therefrom. In many cases, however, the staminal leaf resembles more nearly a cataphyllary leaf, bearing the pollen-

sacs scattered over its surface, as in Cycadacen. The lates! gynecium or pistil is the central portion of the flower, and is the female sexual organ. It consists of one or more folded leaves, called carpels, either separate (fig. 172, ¢) or combined (fig. 174.) The parts distinguished in the pistil are the ovary (fig. 176, 0), which is the lower portion en- closing the ovules destined to become seeds, and the stigma (fig. 176, 9), a portion of loose cellular tissue uncovered by epidermis, which is either sessile on the apex of the ovary, as in the Poppy, or is separated from it by a prolonged portion called the style (fig. 176, s). The andreecium and gynoecium are not present in all flowers. When both are present the flower is hermaphrodite ; and in descriptive botany such a flower is indicated by the symbol §. When

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SYMMETRY OF THE FLOWER. |

only one of those organs is present the flower is wniseaual or diclinous, and is either male (staminate), &, or female (pistillate), 9. A flower then normally consists of the four whorls of leaves,—calyx, corolla, andrcecium, and gynee- cium,—and when these are all present the flower is com- plete. ‘These several whorls of the flower are usually densely crowded upon the thalamus, but in some instances, after apical growth has ceased in the axis, an elongation of portions of the receptacle by intercalary growth occurs, by which changes in the position of the parts may be brought about. Thus in Lychnis an elongation of the axis betwixt the calyx and the corolla takes place, and in this way they are separated by an interval. Again, in Passiflora the stamens are separated cm from the corolla by an elongated por- tion of the axis, which has consequently been termed the androphore; and in Passiflora, Fraxinella (fig. 177), Cap- paridacese, and some other plants, the ovary is raised upon a distinct stalk : termed the gynophore ; it is thus sepa- .. * rated from the stamens, and is said \° to be stipitate.. The apical growth of the floral axis in the flower soon ceases, and therefore the parts are arranged in whorls ; but at times, as in the Ranun- culacex, Magnoliacer, &c., the growth is of sufficient duration to permit a spiral arrangement of parts. Usually the successive whorls of the flower dis- posed from below upwards or from without inwards upon the floral axis are of the same number of parts, or are a multiple of the same number of parts, those of one whorl alternating with those of the whorls next it.

When a flower consists of parts arranged in whorls it is

Calyx and pistil of Frax- inella (Dictamnus Frax- inella). The pistil con- sists of several carpels, which are elevated ona stalk prolonged from the receptacle. The stalk is called gyno- phore or theeaphore.

said to be cyclic, and if all the whorls have an equal |

number of parts and are alternate it is encyclic. In con- trast to the cyclic flowers are those, as in Magnoliacez, where the parts are in spirals. When in such a flower the transition from one foliar structure to another, z.¢., from calyx to corolla, from corolla to stamens, &c., does not coincide with a definite number of turns of the spiral it is said to be acyclic ; if it does so correspond it is termed hemicyclic ; the latter term also includes flowers which are cyclic at one portion and spiral at another, as in many

Ranunculacez. In spiral flowers the distinction into whorls is by no means easy, and usually there is a gradual passage from sepaloid through petaloid to staminal parts, as in Nympheacee (figs. 178, 179), although in some plants

Fig. 178. Fig. 179.

Fie. 178.—Flower of Vympheea alba, White Water-lily. c¢, ¢.¢,¢, the four foliola of the calyx or sepals; p, p, p, p, petals; e, stamens; s, pistil.

Fig. 179.—Parts of the flower separated to show the transition from the green sepals of the calyx c, and the white petals of the corolla p, to the stamens e. The latter présent changes from their perfect state, 5, through intermediate forms, 4, 3, 2, and 1, which gradually resemble the petals,

there is no such distinction, the parts being all petaloid, as in Trollius. We may again note here that some regard

the cone in Conifer and Cycadacez as a single flower, and in that case the whorls are much separated and arranged spirally along the floral axis. Normally, the parts of suc- cessive whorls alternate; but in some cases we find the parts of one whorl opposite or superposed to those of the next whorl. In some cases, as in the Ampelidez, this seems to be the ordinary mode of development, but in Caryophyllacez the superposition of the stamens on the sepals in many plants seems to be due to the suppression or abortion of the whorl of petals, and this idea is borne out by the development, in some plants of the order, of the suppressed whorl. In Primulacez, again, where there is a superposition of stamens and petals the abnormality is due apparently to another cause. The petals are developed after the stamens, and are to be regarded as appendages from them, of the same nature as the appendages to the stamens in Asclepiadacex, so that morphologically in Pri- mulacez, according to this view, there are no petals. As a rule, whenever we find the parts of one whorl superposed to those of another we may suspect some abnormality. Frequently, when parts are

superposed they become adherent to one another; thus the stamens become adherent to the petals or are epipetalous, or to the sepals and are erisepalous.

A flower is said to be symmetrical when each of its whorls consists of an equal number of parts, or when the parts of any one whorl are multiples of that preceding it. Thus, a symmetrical flower may have five sepals, five petals, five stamens, and five carpels, or the number of any of these parts may be ten, twenty, or some multiple of five. Fig. 173 is a diagram of a symmetrical flower, with five parts in each whorl, alternating with each other. In fig. 180 there is a section of a symmetrical flower of Stone-crop, with five sepals, five alternating petals, ten stamens, and five carpels. Here the number of parts in the staminal whorl is double that in the others, and in such a case the additional five parts form a second row alternating with the others. In the staminal whorl especially it is com- mon to find additional rows. In fig. 181 there is a

Fig. 181.

Fig. 180.—Diagrammatic section of a symmetrical pentamerous flower of Stone- crop (Sedum), consisting of five sepals externally, five petals alternating with the sepals, ten stamens in two rows, and five carpels containing seeds. The dark lines on the outside of the Sg sn are glands.

Fre. 181.—Diagram of the flower of Flax (Linum,, consisting of five sepals, five petals, five stamens, and five carpels, each of which is partially divided into two. It is pentamcrous, complete, symmetrical, and regular.

symmetrical flower, with five parts in the three outer rows,

and ten divisions in the inner. In this case it is the

gyneecium which has an additional number of parts. Fig.

182 shows a flower of Heath, with four divisions of the

calyx and corolla, eight stamens in two rows, and four

divisions of the pistil. In fig. 183 there are threc parts

in each whorl; and in figs, 184 there are three divi-

sions of the calyx, corolla, and pistil, and six stamens

in two rows. In all these cases the flower is symmetrical.

Where, as in the Stone-crop, an extra row of parts is deve-

loped in any whorl they may be either formed in regular

succession within the first row, or they may be weterposed to them, z.e., formed between them, or even external to and beneath them. We have cxamples of the former in many

Caryophyllaccous plants, the latter being well seen in

Crassulaceze, Geraniacee, &c. In Monocotyledons it is

usual for the staminal whorl to be double, it rarely having more than two rows, whilst amongst Dicotyledons there are often very numerous rows of stamens. The floral envelopes are rarely multiplied Flowers in which the number of parts

Fig. 184. Fig. 185.

¥icg. 182.—Diagram of the flower of Heath (Zrica), having four sepals, four divisions of the corolla, eight stamens in two rows, and four divisions of the pistil. The flower is tetramerous, complete, symmetrical, and regular,

Fic. 183.—Diagram of the trimerous symmetrical flower of Iris. There are three alternating divisions of each whorl. Below is a single bract.

Fic. 184.—Diagram of the symmetrical trimerous flower of Fritillary, having three divisions of the two outer whorls, and of the pistil in the centre, and six stamens in two rows.

Fic. 185,—Diagram of the flower of Saxifrage (Saxifraga tridactylites). calyx and corolla consist of five parts, the stamens are ten in two rows, while the pistil has only two parts developed. The flower is, nevertheless, called symmetrical, although the outer whorls are pentamerous, and the central one dimerous.

The

in each whorl is the same, are somerous (of equal number) ; when the number in some of the whorls is different, the flower is anisomerous (of unequal number). The pistilline whorl is very liable to changes. It frequently happens that when it is fully formed, the number of its parts is not in conformity with that of the other whorls. In such cir- cumstances, however, a flower has been called symmetrical, provided the parts of the other whorls are normal, —the permanent state of the pistil not being taken into account in determining symmetry. Thus, fig. 185 shows a pentamerous symmetrical flower, with dimerous pistils. Symmetry, then, in botanical language, has refer- ence to a certain definite numerical relation of parts. A flower in which the parts are arranged in twos, is called dimerous, the symmetry being binary and the arrangement marked thus 2/. This may be considered either as ana- logous to opposite decussating leaves, or as composed of distichous alternate leaves belonging to the one-half series. When the parts of the floral whorls are three, the flower is trimerous, and the symmetry being ternary or trigonal is marked ¥/. This may be looked upon as composed of verticillate leaves, or of tristichous alternate leaves with the angular divergence 4. When floral whorls have parts in a series of four, the flower is ¢etramerous, its symmetry being quaternary, and marked

sepal is next the axis, and is called superior or posterior; another is next the bract, and is inferior or anterior, and the other two are lJateral ; and certain terms are used to indicate that position. A plane passing through the anterior

and posterior sepal and through the floral axis is termed ,|

the median plane of the flower ; a plane cutting it at right angles, and passing through the lateral sepals, is the lateral plane; whilst the planes which bisect the angles formed by the lateral and median planes are the deagonal planes, and in these flowers the petals which alternate with the sepals are cut by the diagonal planes.

In a pentamerous flower one sepal may be superior, as in the calyx of Rosacez and Labiats ; or it may be inferior, as in the calyx of Leguminose (fig. 186),—the reverse, by the law of alternation, being the case with the petals. Thus, in the blossom of the Pea (fg. 187), the odd petal (vexil-

Fig. 186. ‘ Fig. 187.

Fig. 186.—Diagram of flower of Sweet-pea (Lathyrus), showing five parts of the calyx, of which two are superior, one inferior, and two lateral; five parts of the corolla, of which onc is superior, two inferior, and two lateral; ten stamens in two rows; one carpel, in consequence of four being undcveloped.

Fig. 187.—Flower of Pea (Pisum sativum), showing a papilionaceous corolla, with one petal superior, st, called the standard (vexillum), two inferior, car, called the keel (carina), and two lateral, a, called wings (alee). The calyx is marked¢,

lum) st is superior, while the odd sepal is inferior, In — the Figwort order one of the two carpels is posterior and the other anterior, whilst in Convolvulacez the carpels are arranged laterally. Sometimes the twisting of a part makes a change in the position of other parts, as in Orchids, where the twisting of the ovary changes the position of the labellum. When the different members of each whorl are like in size and shape, the flower is said to be regular; while differences in the size and shape of the parts of a whorl make the flower irregular, as in the Papilionaceous flower, represented in fig. 187. When a flower can be divided by a single median plane into two exactly similar parts, then it is said to be zygomorphic. Such flowers as Papilionacez, Labiate, are examples. In contrast with this are polysymmetrical flowers, which can be divided by several planes into several exactly similar portions ; such are all regular, symmetrical flowers. When the parts of any whorl are not equal to or some multiple of the others,

then the flower is unsymmetrical. This want of symmetry may be brought about in various ways. A consideration of the various unsymmetrical, irregular, and incomplete forms of the flower, and the processes by which they have been brought about, constitutes Teratology. Alteration in the symmetrical arrangement as well as in the completeness and regularity of flowers has been traced to suppression oF the non-development of parts, degeneration or impertect formation, cohesion or union of parts of the same whorl, adhesion or union of the parts of different whorls, multiply cation of parts, and deduplication (sometimes called chorisis) or splitting of parts.

By suppression or non-appearance of a part at the place where it ought to appear if the structure was normal, the symmetry or completeness of the flower is disturbed. This suppression when confined to the parts of certain verticils makes the flower unsymmetrical. Thus, in the flowers 0 Staphylea there are five parts of the calyx, five petals, five stamens, and only two carpels; in many Caryophyllace#, as Polycarpon and Holosteum, while the calyx and corolla are pentamerous, there are only three or four stamens aM three carpels; in Impatiens noli-me-tangere the calyx ®

composed of three parts, while the other verticils have five ; in Labiate flowers there are five parts of the calyx and corolla, and only four stamens; and in Tropxolum pentaphyllum there are five sepals, two petals, eight | stamens, and three carpels. In all these cases the want of symmetry is, traced to the suppression of certain parts. In the last-mentioned plant the normal number is five, hence it is said that there are three petals suppressed, as shown by the position of the two remaining ones; there are two rows of stamens, in each of which one is wanting, and there are two carpels suppressed. In many instances the parts which are afterwards suppressed can be seen in the early stages of growth, and occasionally some vestiges of them remain in the fully developed flower. By the suppression of the verticil of the stamens, or of the carpels, flowers become wnisexual, or diclinous, and by the suppression of one or both of the floral envelopes, monochlamydeous and achlamydeous flowers are produced. The suppression of parts of the flower may be carried so far that at last a flower consists of only one part of one whorl. In the Kuphorbiaceze we have an

excellent example of the gradual suppression of parts, where from an apetalous trimerons staminal flower we pass to one where one of the stamens is suppressed, and then to forms where two of thein are wanting. We next have flowers in which the calyx is sup- pressed, and its place occupied by one, two, or three bracts (so that the flower is, properly speaking, achlamydeous), and only one or two stamens are produced. And finall ; we find sterile flowers consisting of a single stamen with a bract, and fertile flowers consisting of a single carpel with ta bract. There is thus traced a degradation, as it is called, from a flower with three stamens and ‘three divisions of the calyx, to one with a single bract and a single stamen or carpel, Degeneration, or the transformation of parts, often gives rise either to an apparent want of symmetry or to irregularity in form. In unisexual flowers it is not uncommon to find vestiges of the undeveloped stamens in the form of filiform bodies or scales. To many of these Staminal degenerations Linnzeus gave the name of nectaries, In double flowers transformations of the stamens and | pistils take place, so that they appear as petals. In Canna, _ what are called petals are in reality metamorphosed stamens. In the capitula of Composite we sometimes find the florets converted into green leaves. The limb of the calyx may appear as a rim, as in some Umbbellifers ; or as pappus, in Composites and Valeriana. In Scrophularia the fifth stamen appears as a scale-like body, called staminodium Ft other Scrophulariaceze, as in Pentstemon, it assumes the form of a filament, with hairs at its apex in place of an anther. Cohesion, or the union of parts of the same whorl, and adhesion, or the growing together of parts of differcnt \whorls, are very common causes of change both as regards form and symmetry. Thus in Cucurbita the stamens are originally five in number, but subsequently some cohere, so that. three stamens ‘only are seen in the mature flower. \Again, amongst Malvaceze the stamens cohere by their Margins. Cases of what are called gamopetalous corollas, ‘Sanosepalous calyces, &c., must be distinguished carefully from such a process as this; for in these cases the parts Were never frec from one another, but developed from the ery first as one mass; and the same caution is necessary in Many instances of so-called union of stamens, which are really cases of branching. Adhesion is well seen in the gyno- stemvwm of Orchids, where the stamens and ovary adhere; and in flowers where the staniens are perigynous, t.e., are ad- herent to the calyx. In Capparidacez the calyx and petals ceupy their usual position, but the axis is prolonged in fhe

form of a gynophore, to which the stamens are united. Vohtesion and adhesion are rare amongst Monocotyledons, Multiplication, or an increase of the number of parts,

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gives rise to changes in plants. We have already alluded to the interposition of new members in a whorl. This takes place chiefly in the staminal whorl, but usually the additional parts produced form a symmetrical whorl with the others. In some instances, however, this is not the case. ‘Thus in the Horse-chestnut there is an interposition of two stamens betwixt the other whorl, and thus seven stamens are formed in the flower, which is unsymmetrical.

Parts of the flower are often increased by a process of deduplication, unlining, dilamination, or chorwzation, 1.¢., the splitting of a part so that two or more parts are formed out of what was originally one. This is believed by some to take place in a remarkable degree in the case of append- ages to petals. Thus, in Ranunculus, the petal has a scalo at its base, which is looked upon as a mere fold of it, This fold may in some cases be more highly developed, as in Caryophyllacez, and in Crassula rubens (fig. 172, a). Others refer such cases to the formation of outgrowths similar in nature to the ligule in Grasses. In Cruciferous plants a case of chorisis is said to occur. There the staminal whorl consists of four long stamens and two short ones (tetradynamous), The symmetry in the flower is evidently dimerous, and the abnormality in the androecium, where the four long stamens are opposite the posterior sepals, is said tu take place by a splitting of the filaments of two stamens into four; and thus the two long stamens on each side are, by gemination, normally one. This view is supported by cases in which the filaments of the long stamens are more or less united ; also by cases in which the shorter filaments exhibit tooth-like processes on both sides, while the longer ones have them only on the outer side. In such cases the two long filaments, if united, would present the same appearance as the shorter ones, and occupy their usual position of alternation with the petals. In some instances, by pelorization, it is found that tetradynamous plants

become tetrandrous, with stamens of equal length alternating with the petals. Many cases of what was con- sidered chorisis are in reality due to the development of stipules from the staminal leaf. Thus in Dicentra and Corydalis there are six stamens in two bundles ; the central one of each bundle alone is perfect, the lateral ones have each only half an anther, and they are really stipules formed from the staminal leaf. Branching of stamens also produces apparent want of symmetry; thus, in the so-called poly-adelphous stamens of Hypericacez there are really only five stamens which give off numerous branches, but the basal portion remaining short, the branches have the appearance of separate stamens, and the flower thus seems unsymmetrical.

Cultwation has a great effect in causing changes in the various parts of plants. Many alterations in form. size, number, and adhesion of parts are due to the art of the horticulturist. The changes in the colour and forms of flowers thus produced are endless. In the Dahlia the florets are rendered quilled, and are made to assume many glowing colours. In Pelargonium the flowers have been rendered larger and more showy ; and such is also the casc with the Ranunculus, the Auricula, and the Carnation. Some flowers, with spurred petals in their usual state, as Columbine, are changed so that the spurs disappear ; and others, as Linaria, in which one petal only is usually spurred, are altered so as to have all the petals spurred, and to present what are called pelorian varieties.

As a convenient method of expressing the arrangement Floral of the parts of the flower, floral formulse have been devised, formula. Several modes of expression are employed. The following is a very simple mode which has been proposed :—The several whorls are represented by the letters S sepals, P petals, St stamens, C carpels, and a figure marked after each indicates the number of parts in that whorl. Thus the formula 8,P,St,C, means that the flower is perfect, and has

Flower- bud,

pentamerous symmetry, the whorls being isomerous. Such a flower as that of Sedum (fig. 180) would be represented by the formula S,P,St,5C;, where Sts+5 indicates that the staminal whorl consists of two rows of five parts each. A flower such as the male flower of the Nettle (fig. 188) would be expressed 8,P,St,C,. It is also possible to indi- cate, in cases where members of a whorl are absent, which of them are wanting; thus, in the flower of an Orchis we have S,P,St,40C, Here Sti. indicates that the anterior stamen of the outer row is present, the other two stamens of the row, marked as dots, are wanting, as also all the stamens of the inner row. In Cypripedium, on the other hand, the formula is 8,P,Sto42C,, for here all the stamens of the outer row and the antcrior one of the inner row are absent, When no other mark is appended the whorls are supposed to be alternate; but if it is desired to mark the position of the whorls special symbols are employed. ‘Thus, to express the superposition of one whorl upon another, a line is drawn between them, e.g., the symbol 8,P, | St,C; is the formula of the flower of Primulaceee. To indicate the interposition of a row of parts in a whorl a dot is placed between the coefficients, thus §,P,St,.,C, indicates that an extra row of five stamens has been interposed between those already in existence. To represent adhesions and cohesions leads to complicated formule, but in many cases cohesion

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can be easily indicated. Thus in the formula 8,P,St,C., we have the arrangement of the parts of the flower in Veronica indicated, the sepals and the petals being united and the two carpels also being united into one pistil. The papilionaceous flower, of which fig. 186 is a diagram, may be formulated

S.PSt41 CG, We thus learn that there are five sepals united, five free petals, ten stamens in two rows, of which nine are united and one is free, and there is one carpel. When the parts of the flower are arranged spirally on the floral axis, as in Magnoliacee and other flowers, the formula is prefixed by a curved line thus C—>, and then the angle of divergence of the members may be marked in addition to their number. Many othcr points in the arrangement of the flower may be attached to the formula by different symbols, according to the object which one has in view.

Fig. 188. Fig. 189, Fig. 190.

Fig. 188.—Tetramerous male (uniscxual) flower of the Nettle (Urtica). It is in- complete, as it wants petals and pistil; and it is said to be monochlamydeous. One sepal is next the axis, and is called posterior or supcrior, another is next the bract, called anterior or inferior, and two are lateral, that is, to the right and left of the axis.

Fia. 189.—Diagram to illustrate valvular or valvate sstivation, in which the parts are placed in a circle, without overlapping or folding.

Fic. 190.—Diagram to illustrate induplicative or induplicate sstivation, in which the parts of the verticil arc slightly turned inwards at the edges.

_To the flower-bud the name alabastrus is sometimes given, and its period of opening has been called anthesis, whilst the manner in which the parts are arranged with respect to each other before opening is the estzvation or preefloration. The latter terms are applied to the flower- bud in the same way as vernation is to the leaf-bud, and distinctive names have been given to the different arrange- ments exhibited, both by the leaves individually and in their relations: to each other. As regards each leaf of the flower, it is either spread out, as the sepals in the bud of the Lime-tree, or folded upon itself (conduplicate), as in the petals of some species of Lysimachia, or slightly folded inwards or outwards at the edges, as in the calyx

of some species of Clematis, and of some herbaceous plants, or rolled up at the edges (involute or revolute), or folded transversely, becoming crumpled or corrugated,

as in the Poppy. When the parts of a whorl are placed Phi;

in an exact circle, and are applied to each other by their edges only, without overlapping or being folded, thus te. sembling the valves of a seed-vessel, the sestivation is valvate, as in the calyx of Guazuma ulmifolia (fig. 189),

The edges of each of the parts may be turned either inwards or outwards; in the former case, the estivation ig induplicate, as in the corolla of Guazuma ulmifolia (fig. 190), in the latter case, reduplicate, as in the calyx of Althea rosea (fig. 191). When the parts of a single whorl are placed in a circle, each of them exhibiting a torsion of its axis, so that by one of its sides it overlaps its neighbour, whilst its side is overlapped in like manner by: that standing next to it, the estivation 1s twisted -or contortive, as in the corolla of Althaa rosea (fig. 192), This arrangement is characteristic of the flower-buds of

Fig. 191. Fig. 192,

Fig. 191.—Diagram to illustrate reduplicative or reduplicate stivation, in which

the parts of the whorl are slightly turned outwards at the edges. Fie. 192.—Diagram to illustrate contortive or twisted sestivation, in which

the parts of the whorl are overlapped by cach other in turn, and are twisted on

their axis. Fig. 193.—Diagram to illustrate the quincuncial estivation, in which the parts

of the flower are arranged in a spiral cycle, so that 1 and 2 are wholly ex-

ternal, 4 and 5 are internal, and 38 is partly external and partly overlapped

by 1. Malvacee and Apocynacee, and it is also seen in Con- volvulacez and Caryophyllaces. When the flower expands, the traces of twisting often disappear, but sometimes, as in Apocynaces, they remain. Those forms of estivation are such as occur in cyclic flowers, and they are included under circular eestivation. But in spiral flowers we have a different arrangement, the leaves of the calyx of Camellia japonica cover each other partially like tiles on a house. This estivation is ¢mbricate. At other times, as in the petals of Camellia, the parts envelope each other completely, so as to become convolute, This is also seen in a transverse section of the calyx of Magnolia

grandiflora, where each of the three leaves embraces that within it. When the parts

of a whorl are five, as occurs in many Dicotyledons, and

Fig 194.

Fra. 194.—Diagram to illustrate imbricative or imbiicated sstivation, in which the parts are arranged in a spiral cycle, following the order indicated by the figures 1, 2, 3, 4, 5. ‘

Fic. 195.—Diagram of a papilionaccous flower, showing vexillary eestivation. 1 and 2, the alee or wings; 3, a part of the carina or keel; 4, the vexillum or stan- dard, which, in place of being internal, as marked by the dotted line, becomes

Fig 195.

external; 5, the remaining part of the keel. The order of the cycle is indi-

cated by the figures.

the imbrication is such that there are two parts external, two internal, and a fifth which partially covers one of the internal parts by its margin, and is in its turn partially covered by one of the external parts, the eestivation 8 quincuncial (fig. 193), This quincunx is common in the corolla of Rosacez. In fig. 194 a section is given of the

CALYX. |

bud of Antirrhinum majus, showing the imbricate spiral arrangement. In this case it will be seen that the part marked 5 has, by a slight change in position, become overlapped by 1. This variety of imbricate xestivation has been termed cochlear. In flowers, such as those of the Pea (fig. 187), one of the parts, the vexillum, is often large and folded over the others, giving rise to vexillary sestiva- tion (fig. 195), or the carina may perform a similar office, and then the estivation is carina/, as in the Judas-tree (Cercis Siliquastrum). The parts of the several verticils often differ in their mode of

estivation. Thus, in Malvaceze the corolla is contortive and the calyx valvate, or reduplicate ; in St John’s-wort the calyx is imbricate, and the corolla contortive. In Convolvulacez, while the corolla is twisted, and has its parts arranged in a circle, the calyx is imbricate, and exhibits a spiral arrangement. In Guazuma the calyx is valvate, and the corolla indupli- cate. The circular estivation is generally associated with a regular calyx and corolla, while the spiral estivations are connected with irregular as well as with regular forms.

J. PRotTecTIve ORGANS.

1. Calyx.

The calyx is the external envelope of the flower, and consists of verticillate leaves, called sepals, foliola, or phylla. These calycine leaves are sometimes separate from each other, at other times they are united to a greater or less

extent; in the former case, the calyx is dialysepalous or ~~eleutherosepalous, polysepalous or polyphyllous, or apo~~ sepulous ; in the latter, gamosepalous or gamophyllous, mono- | sepalous or monophyllous, or synsepalous. The divisions of the calyx present usually all the characters of leaves, and in some cases of monstrosity they are converted into the ordinary leaves of the plant. Their structure consists of cellular tissue or parenchyma, traversed by vascular bundles, in the forim of ribs and veins, containing spiral) vessels, which can be unrolled, delicate woody fibres, and other vessels, the whole being enclosed in an epidermal covering, having stomata and often hairs on its outer surface, which corresponds to the under side of the leaf, In the great divisions of the vegetable kingdom the vena- tion of the calyx is similar to that of the leaves,—parallel in Monocotyledons, reticulated in Dicotyledons. The leaves of the calyx are usually entire, but occasionally they are cut in various ways, as in the Rose, and they are some- jtimes hooked at the margin, as in Rumex uncatus. It is rare to find the leaves of the calyx stalked. They are usually sessile leaves, in which the vaginal portion is only slightly developed, and frequently the laminar part is alone present. Sepals are generally of a more or less oval, elliptical, or oblong form, with their apices either blunt or acute. In their direction they are erect or reflexed (with their apices downwards), spreading outwards (divergent or patulous), or arched inwards (connivent), They are usually (of a greenish

colour, and are called folvaceous or herbaceous ; but sometimes they are coloured, as in the Fuchsia, Tropaolum, Globe-flower, and Pomegranate, and are then called petaloid. Whatever be its colour, the external ‘envelope of the flower must be considered as the calyx. |The nature of the hairs on the calyx gives rise to terms similar to those already mentioned as applied to the surfaces i, other parts of plants. The vascular bundles sometimes ‘form a prominent rib, which indicates the middle of the ‘Sepal ; at other times they form several ribs. The venation 1s useful as pointing out the number of leaves which con- stitute a gamosepalous calyx. In a polysepalous calyx the number of the parts is marked by Greek numerals prefixed. ! hus, a calyx which has three sepals is ¢risepalous ; one with jBve sepals is pentasepalous or pentaphyllous. The sepals

occasionally are of different forms and sizes. In Aconite one of then is shaped like a helmet, and has been called galeate. Ina gamosepalous calyx the sepals are united in various ways, sometimes very slightly, and their number is marked by the divisions at the apex. These divisions either are simple projections in the form of acute or obtuse teeth ; or they extend down the calyx as fissures about half- way, the calyx being ¢trijid (three-cleft), quinquefid (five- cleft), (fig. 196), &c., according to their number ; or they reach to near the base in the form of partitions, the calyx being tripartite, quaarwartite, quinquepartite, &e. The union of the parts may be complete, and the calyx may be quite entire or truncate, as in some Correas, the venation being the chief indication of the different parts, The cohesion is sometimes irregular, some parts uniting to a greater extent than others; thus a two-lipped or dabiate calyx is formed, which, when the upper or posterior lip is arched, becomes rzngent. The upper lip is often composed of three parts, which are thus posterior or next the axis, while the lower has two, which are anterior, The part formed by the union of the sepals is called the tube of the

| calyx ; the portion where the sepals are free is the limb,

Occasionally, certain parts of the sepals undergo marked enlargement. In the Violet the calycine segments (/acinice) are prolonged downwards beyond their insertions, and in the Indian Cress (Tropzolum) this prolongation is in the form of a spur (calcar), formed by three sepals; in Delphinium it is formed by one. When one or more sepals are thus enlarged, the calyx is calcarate or spurred. In Pelargonium the spur from one of the sepals is adherent to the flower-stalk. When an epicalyx is present, as in the

Mallow order, the flower appears to be provided with a Plate III,

double calyx, and has been denominated caliculate, De- generations take place in the calyx, so that it becomes dry, scaly, and glumaceous (like the glumes of grasses), as in the

Rush tribe ; hairy, as in Composite ; or a mere rim, as in Plate IX. some Umbelliferee and Acanthacex, and in Madder (Rubia Plate VIL

tinctorum, fig. 198), when it is called obsolete or margrnate. In Diplolena it is reduced to five scales. In Composite,

Fig. 196. Fig. 198.

Fig. 200.

Fig. 199.

Big. 107. Fic. 196.—Gamosepalous five-toothed (quinque-dentate) calyx of Campion

Seria ee pappus attached to the fruit of Salsafy (7Jragopogon porrt

i alyx adhcres to the fruit, and its limb is pappose. Bice BR a Madder (Rubia), adherent to the pistil, its limb appearing in the form of arim. The calyx is called obsolcte. Fig. 199.—Caducous calyx of FODPY \ apace It is composed of two sepas, i ff before the petals expand. ie Sob pindder like cea of the Winter Cherry (Physalis Alkekengi), said open to show the mode

in which it surrounds the fruit without adhering to it. The calyx is persistent, but not adherent. It enlarges after the flower withers, and

is called accrescent. Dipsacacez, and Valerianacew, the calyx is attached to the pistil, and its limb is developed in the form of hairs called pappus (fig.197). This pappus is either simple (pilose) or

Plate VIII feathery (plwmose).

Plate I.

Plate XT.

Plate IT.

Corolla.

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In Valeriana the superior calyx is at first an obsolete rim, but as the fruit ripens it is shown to consist of hairs rolled inwards, which expand so as to waft the fruit. The calyx sometimes falls off before the flower expands, as in Poppies, and is caducous (fig. 199) ; or along with the corolla, as in Ranunculus, and is deciduous ; or 1t remains after flowering, as in Labiatew, Scrophulariacez, and Boraginacee ; or its base only is persistent, as in Datura Stramonium. In Eschscholtzia and Eucalyptus the sepals remain united at the upper part, and become disarticulated at the base or middle, so as to come off in the form of a lid or funnel. Such a calyx is operculate or calyptrate. The existence or non-existence of an articulation determines the deciduous or persistent nature of the calyx. In the case of Eschscholtzia the axis seems to be prolonged so as to forma sort of tube, from which the calyx separates. In Eucalyptus the calyx consists of leaves, the laminz or petioles of which are articulated like those of the Orange, and the separation between the parts occurs at this articu- lation. The receptacle bearing the calyx is sometimes united to the pistil, and enlarges so as to form a part of the fruit, as in the Apple, Pear, Pomegranate, Gooseberry, &c, In these fruits the withered calyx is seen at the apex. Sometimes a persistent calyx increases much after flowering, and encloses the fruit without being

incorporated with it, becoming accrescent, as in various species of Physalis (fig. 200); at other times it remains in a withered or marcescent form, as in Erica; sometimes it becomes inflated or vesicular, as in Sea Campion (Silene maritima).

2. Corolla.

The corolla is the more or less coloured inner floral envelope, forming the whorl of leaves between the calyx and the stamens. It is generally the most conspicuous whorl. The gay colours and fragrant odours of flowers are resident in it. It is present in the greater number of Dicotyledons. Petals differ more from leaves than sepals do, and are much more nearly allied to the staminal whorl. In some cases, however, they are transformed into leaves, like the calyx, and occasionally leaf-buds are developed in their axil. They are seldom green, although occasionally that colour is met with, as in some Cobseas, Hoya viridiflora, Gonolobus viridiflorus, and Pentatropis spiralis. As a rule they are highly coloured, the colouring matter being contained in cells, and differing in its nature from the chlorophyll of the leaves. As regards their structure petals consist of cellular tissue, traversed by true spiral vessels and thin-walled tubes. In delicate flowers, as Convolvulus and Anagallis, these vessels are easily seen under the microscope. Petals do not usually present numerous layers of cells like the leaves, neither is the epidermis always distinct, although in some instances it may be detached, especially from the surface next the calyx. The cuticle of the petal of a Pelargonium, when viewed with a } or }-inch object glass, shows beautiful hexagons, the boundaries of which are ornamented with several inflected loops in the sides of the cells

On the outer surface of petals, corresponding to the lower side of leaves, stomata are sometimes found, Petals are generally glabrous or smooth ; but, in some instances, hairs are produced on their surface. Petaline hairs, though sparse and scattered, present occasionally the same arrange- ment as those which occur on the leaves ; thus, in Bombacese they are stellate. Coloured hairs are seen on the petals of Menyanthes, and on the segments of the perianth of the {ris. Although petals are usually very thin and delicate in their texture, they occasionally become thick and fleshy, as in Stapelia and Rafflesia ; or dry, as in Heaths ; or hard and stiff, as in Xylopia. A petal

often consists of two portions—the lower narrow, resembling the petiole of a leaf,

and called the wnguis or claw ; the upper broader, like the blade of a leaf, and called the /amina or limb. These parts are seen in the petals of the Wallflower (fig. 201), where ¢ is the claw and /the limb. The claw is often wanting, as in the Crowfoot (fig. 202) and the Poppy, and the petals are Phi} then sessile. Petals having a claware wnguiculate. Accord. _ ing to the development of veins and the growth of cellular tissue, petals present varieties similar to those already noticed in the case of leaves. Thus the margin is either entire or divided into lobes or teeth. These teeth sometimes form a regular fringe round the margin, and the petal becomes fimbriated, as in the Pink ; or laciniated, asin Lychuis Flos-cuculi ; or crested, asin Polygala. Sometimes the petal becomes pinnatifid, as in Schizopetalum. The median vein is occasionally prolonged beyond the summit

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Fig. 203. Fig. 204. Fig. 205.

Fie, 201.—Unguiculate or stalked petal of Wallflower (Chetranthus Cheiri). ¢, the claw or unguis; 7, the blade or lamina.

Fie, 202.—Petal of Crowfoot (Ranunculus), without a claw, and thus resembling a sessile leaf. At the base of the petal a nectariferous scale is seen.

Fie. 208.—Tubular petal of Hellebore (Helleborus), formed by folding and adhesion, in the same manner as pitchers.

Fic. 204.—Horn-like hollow petal of Columbine (Aqutlegia vulgaris), formed by folding and adhesion of the edges.

Fic, 205.—Part of the flower of Aconite (Aconitum Napellus), showing two Irre- gular horn-like petals p, supported on grooved stalks 0, These used to be ealled nectaries. s, the whorl of stamens inserted on the thalamus, and sur- rounding the pistil.

of the petals in the form of a long process, as im

Strophanthus hispidus, where it extends for 7 inches ; and

at other times it ends in a free point or cuspis, and the petal

becomes cusprdate ; or the prolonged extremity is folded downwards or inflexed, as in Umbelliferz, so that the apex approaches the base. The limb of the petal may be flat or concave, or hollowed like a boat. In Hellebore the petals become folded in a tubular form, resembling a horn

(fig. 203) ; in Aconite (fig. 205) some of the petals resemble

a hollow-curved horn, supported on a grooved stalk ; while in

Columbine (fig. 204), Violet, Snapdragon, and Centranthus,

one or all of them are prolonged in the form of a spur, and

are calcarate. In Valeriana, Antirrhinum, and Corydalis, Plate the spur is very short, and the corolla or petal is said to be gibbous, or saccate, at the base.

A corolla rarely consists of one petal, and when this occurs, as in Amorpha, it depends on the abortion or non- development of others. Such a corolla is wnipetalous, 4 term quite distinct from monopetalous. A corolla 1s dipetalous, tripetalous, tetrapetalous, or pentapetalous, according as it has two, three, four, or five separate petals. The general name of potypetalous, dialypetalous, eleuthero- petalous, or apopetalous, is given to corollas having separate petals, while monopetalous, gamopetalous, or sympetalous 18 applied to those in which the petals are united. This union generally takes place at the base, and extends more or less towards the apex; in

Phyteuma the petals are united at their apices also. In some polypetalous corollas, as that of the Vine, the petals are separate at the base, and

adhere by the apices. When the petals are equal as regards their development and size, the corolla is regular; when unequal, it is wrregular. When a corolla is gamopetalous, it usually happens that the claws are united into a tube, while the upper parts are either free or partially united, so as to form a common limb, the point of union of the two portions being the faux or throat, which often exhibits a distinct constriction or dilatation. The number of parts forming such a corolla can be determined by the divisions, whether existing as teeth, crenations, fissures, or partitions, or if, as rarely happens, the corolla is entire, by the vena- tion ‘The union may be equal among the parts, or some may unite more than others.

Amongst regular polypetalons corollas may be noticed the rosaceous corolla (fig. 206), in which there are five spreading petals, having no claws, and arranged as in the single Rose and Potentilla ; the caryophyllaceous corolla, in which there are five petals with long narrow tapering claws, as in many of the Pink tribe; the alsinaceous, where the claw is less narrow, and there are distinct spaces between the petals, as in some species of Chickweed ; the cruciform, having four petals, often unguiculate, placed opposite in the form of a cross, as seen in Wallflower, and in other plants called cruciferous. Of irregular polypetalous corollas the most marked is the papilionaceous (fig. 187), in which there are five petals :—one superior (posterior), st, placed next to the axis, usually larger than the rest, called the vewillum or standard ; two lateral, a, the ale or wings; two inferior (anterior), partially or completely covered by the ale, and often united slightly by their lower margins, so as to form a single keel-like piece, car, called carina or keel, which em- braces the essential organs. This form of corolla is charac- teristic of British Leguminous plants. Among the irregular polypetalous corollas might be included the orchideous (fig. 207), although it is really the perianth of a Mono- cotyledon. This perianth consists of three outer portions equivalent to the calyx, and three inner parts alternating with them, constituting the petals. The latter are often very irregular, some being spurred, others hooded, &c.; and there is always one, called the labellum or

lip J, which presents a remarkable development, and gives rise to many of the anomalous forms exhibited by these flowers.

COROLLA. |

Fig. 208. Fig. 207.

Fig. 206.—Rosaeeous corolla of the Strawoerry (Fragaria vesea), composed of five petals without elaws

Fig. 207.—Flower of Twayblade (Listera ovata,, scen in front, showing a large bifid labellum /, which is different from the other five divisions of the perianth. The divisions of the perianth are in two rows of three each. The essential organs of reproduetion are plaeed on a column opposite the labellum. The perianth is irregular polyphyllous, and is denominated orehideous. :

Fre, 208.—Regular gamopctalous bell-shaped (campanulate) corolla of Harebell (Campanula rotundifolia). It is eomposed of five petals united. The ovary is inferior, and is united to the ealyx c.

Regular gamopetalous corollas are sometimes campanulate ov bell-shaped, as in Campanula rotundifolia (fig. 208) ; infundibuliform or funnel-shaped, when the tube is like an

inverted cone, and the limb becomes more expanded at the apex, as in Tobacco; hypocrateriform or salver-shaped, when there is a straight tube surmounted by a flat spreading limb, as in Primula (fig. 209); tubular, having a long cylindrical tube, appearing continuous with the limb, as in Spigelia and Comfrey; rotate or wheel-shaped, when the tube is very short, and the limb flat and spreading, as in Myosotis (when the divisions of the rotate corolla are very acute, as in Galium, it is sometimes called stellate or star- like) ; urceolate or urn-shaped, when there is scarcely any limb, and the tube is narrow at both ends, and expanded in the middle, as in Bell-heath (Erica cinerea). Some of these forms may become irregular in consequence of certain parts being more developed than others, Thus, in

Ve- ronica, the rotate corolla has one division much smaller than the rest, and in Digitalis there is a slightly irregular

campanulate corolla which some have called digitaliform. Plate XI.

Of irregular gamopetalous corollas there may be mentioned the labiate or lipped (fig. 210), having two divisions of the limb in the form of what are called labia or lips (the upper one, wv, composed usually of two united petals, and the lower, /, of three), separated by a hiatus or gap. In such cases the tube varies in length, and the parts in their union follow the reverse order of what occurs in the calyx, where two sepals are united in the lower lip, and three in the upper. When the upper lip of a labiate corolla is much arched, and the lips separated by a distinct gap, it is called ringent (fig. 210). The labiate corolla characterizes the

Fig. 210,

Fig. 211.

Fra. 209.—Regular gamopetalous sympetalous hypocrateriform eorolla of Oxlip

Primula elatior). ¢, calyx; eorolla; ¢, tube of corolla; /, limb; a@, anthers.

Fre. page ea manatees labiate eorolla of the Dead-nettle (Lamium album). The upper lip w is composed of two petals united, the lower lip /, of three. Between the two lips (labia) there is a gap (hiatus). The throat is the part where the tube and the labiate limb join. From the arehing of the upper lip this corolla is ealled ringent.

Fic. 211.—Irregular gamopetalous ligulate flower of Ragwort (Senecic). It is a tubular floret, split down on one side, with the united petals forming a strap- like projection /. The lines on the flat portion indicate the divisions of the five petals. From the tubular portion below, the bifid style projects slightly. The tercte fruit (aechzenium) @ is surmounted by pilose pappus, whieh is the metamorphosed calycine limb The flower is female, having no stamens.

natural order Labiate. When the lower lip is pressed

against the upper, so as to leave only a chink or rictus between them, the corolla is said to be personate or mask- like, as in Frogsmouth, Snapdragon, and some other

Scrophulariacee, and the projecting portion of the

lower lip is called the palate. In some corollas the two

lips become hollowed out in a remarkable manner, as in

Calceolaria, assuming a slipper-like appearance, similar to

what occurs in the labellum of some Orchids, as Cypri-

pedium. The calceolate corolla of Calceolaria may be con-

sidered as consisting of two slipper-like lips. When a

tubular corolla is split in such a way as to form a strap-like

process on one side with several tooth-like projections at

its apex, it becomes ligulate, or strap-shaped (fig. 211).

Plate IX.

This corolla occurs in many Composite plants, as in the florets of Dandelion, Daisy, and Chicory. The number of divisions at the apex indicates the number of united petals, some of which, however, may be abortive. Occasionally some of the petals become more united than others, and then the corolla assumes a bzlabiate, or two-lipped form, as seen in the division of Composite called Labiatiflore. In Grasses and Sedges, in place of verticillate leaves forming the flower, there are alternate scales or glumes. The flowers of Grasses usually occur in spikelets (fig. 212), which consist of one or two glumes a, covering several flowers 0. The spikelets

are associated in spikes or panicles. In Wheat these spikelets are arranged alternately along a common rachis. Each spikelet consists of two empty glumes a, a, having the form represented in fig. 212, and enclosing flowers composed of scales (palec

Fig. 212.

Fig. 213. Fig. 214,

Fic. 212.—A spikelet of Wheat (Zriticum), consisting of two glumes a, a, enclosing several flowers 6,6, which are composed of two pales (palex) covering the essential organs of reproduction. The stamens s hang out by long, slender, thread-like filaments. The individual glumes and palew are placed alternately on the floral axis.

Fic. 218.—Flowcr of Oat (Avena sativa), with the two glumes, and the outer glumella or palea removed. The inner glumella, flowering glume, or palea pi, is seen, of a lanceolate form, and bidentate at the apex. By removing the outer glumella there are seen two scales (lodicule, squame) sq, with the three stamens and two feathery styles.

Fig. 214.—Pistilliferous or pistillate flower of a Sedge (Carex) with a single glume or seale s. The pistil is covered by an ureeolate glumaceous bag wu, called perigynium. There is one style st, with three stigmas at its summit.

or glumelle), which are placed at different heights in an

alternate manner. In the flower of the Oat (fig. 213),

after removing the outer pale or glwmedle, the inner one

pvis seen with two scales (lodicule or syuamc) sq, at the base, enclosing the cssential organs of reproduction. The paleze of grasses are called by some flowering glumes, while hypogynous scales (lodicule) within them are considered as the rudimentary perianth. In Wheat (Triticum) there are two empty glumes and two flowering glumes, or, as some say, one flowering glume and one pale. In the

Oat (Avena) there are two empty glumes, usually three

flowering glumes with awns, and two lodicules representing

the perianth, In Sedges (Carices) the male flowers are

borne on scales, aud so are the female, as shown in fig. 214,

in which the scale sis placed on one side. Within the

scale the female flower is situated, having a peculiar bag- like covering w, termed perigynium.

_ The parts of the corolla frequently adhere to those of the calyx, and any change in the latter causes also an alteration in the former, Petals are sometimes suppressed, and sometimes the whole corolla is absent, In Amorpha and Afzelia the corolla is reduced to a single petal, and in some other Leguminous plants it is entirely wanting. In the natural order Ranunculaceze, some genera, such as

Ranunculus, Globe-flower, and Psony, have both calyx and

corolla, while others, such as Clematis, Anemone, and

Caltha, have only a coloured calyx. Flowers become

double by the multiplication of the parts of the corolline

whorl. This arises in general from a metamorphosis of the

stamens. Union of separate flowers (synanthos) occasion- ally occurs, and the adhesion which thus takes place causes various changes in the whorls. Flowers may be united by their peduncles, as seen in some anomaloug specimens of Dandelion, Hyacinth, and Centaury ; or by their outer parts, such as the calyx. At other times there is a complete fusion, as it were, of all

the parts of the flowers, some continuing normal. others being suppressed or abortive. Certain abnormal appearances occur 1n the petals of some} flowers, which received in former days the name of nectarteg, The term nectary was very vaguely applied by Linnzus to any part of the flower which presented an unusual aspect, as the crown (corona) of Narcissus, the fringes of the Passion-flower, &c. If the name is retained rt ought pro- perly to include only those parts which secrete a honey-like matter, as the glandular depression at the base of th perianth of the Fritillary, or on the petal of Ranunculus, or on the stamens of Rutacese. The honey secreted by flowers attracts insects, which, by conveying the pollen to the stigma, effect fertilization. What have usually, how. ever, been called nectaries, are mere modifications of some __ part of the flower, especially of the corolla and stamens, produced either by degeneration or outgrowth, or by dila mination, chorisis, or deduplication, Of this nature are the scales on the petals in Lychnis, Silene, Cynoglossum, and Ranunculus (fig. 202). Others consider these outgrowths of the petal to be formed in the same way as the ligules of Grasses, Corollas having these scaly appendages are some times denominated appendiculate. In Cuscuta and Samolus Phi the scales are alternate with the petals, and may represent altered stamens. The parts formerly called nectaries are mere modifications of the corolla or stamens, ‘Thus these called horn-like nectaries under the galeate sepal of Aconite (fig. 205) are modified petals, so also are the tubular nectaries of Hellebore (fig. 203). The nectaries of Menyanthes and of Iris consist of hairs developed on the petals. Those of Parnassia and the Passion-flower, Stapelia, Asclepias, and Canna, are fringes, rays, and processes, which are proba modifications of stamens ; and some consider the crown Narcissus as consisting of a membrane similar to which unites the stamens in Pancratium. Jt 1s someti difficult to say whether these nectaries are to be referred to the corolline or to the staminal row. The paraphyses of the Passion-flower, the crown of Narcissus, and the coronet of Stapelia are referred sometimes to the one and sometimes to the other. In general, they may be said to belong to that series with which they are immediately connected Some have given names indicating the parts of which they are modifications, by prefixing the term para, using sucl terms as paracorolla and parastemones. t Petals are attached to the axis usually by a narrow base, but occasionally the base is larger than the limb, as in the Orange flower. When this attachment takes place by am articulation, the petals fall off

either immediately after expansion (caducous), or after fertilization (deciduous). A corolla which is continuous with the axis and not article lated to it, as in Campanula and Heaths, may be persistent, and remain in a withered or marcescent state while the | j |

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fruit is ripening. A gamopetalous corolla falls off in ome piece ; but sometimes the base of the corolla remains pa — sistent, as in Rhinanthus and Orobanche.

II, Essentiat ORGANS.

These organs are the stamens and the pustil, the la containing the seeds or germs of young plants, and cot! sponding to the female, while the former produces @ powder necessary for fecundation, and is looked upon as pei the part of the male. The presence of both is required !

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i “Male organs, Phanero- gams,

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Stamens,

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SLAMENS. |

order that perfect seed may be produced. A flower may have a calyx and corolla, but it will be imperfect if the essen- tial organs are not present. The name of hermaphrodite or bisexual is given to flowers in which both these

organs are found; that of unisexual or diclinous to those in which only one of these organs appears,—those bearing stamens only, being staminiferous or male ; those having the pistil only, pistilliferous or female. But even in plants with hermaphrodite flowers it is rare that self-fertilization takes place, and this is provided against by the structure of the parts or by the period of ripening of the organs. For instance, in Primula and Linum some flowers have long stamens and a pistil with a short style, the others having short stamens and a pistil with a long style. The former occur in what are called thrum-eyed Primroses, the latter in those called pin-eyed. Such plants are called dimorphic. Other plants are trimorphic, as species of Lythrum, and proper fertilization is only effected by com- bination of parts of equal length. In some plants the stamens are perfected before the pistil; they are called proterandrous, as in Ranunculus repens, Silene maritima, Yea Mays. In other plants the pistil is perfected before the stamens, as in Potentilla argentea, Plantago major, Coix Lachryma, and they are proterogynous plants. Plants in which proterandry or proterogyny occurs are called dicho-gamous, When in the same plant there are unisexual flowers, both male and female, the plant is said to be monecious or monoicous, as in the Hazel and Castor-oil plant, This is indicated by the symbol 6-9. When the male and female flowers of a species are found on separate plants, the term diwcious or dioicous is applied, as in Mercurialis and Hemp, and the symbol &:@ is used; and when a species has male, female, and hermaphrodite flowers on the same or different plants, as in Parietaria, it is polygamous, for which & 9 9 is the symbol.

1. Male Organs iv Phanerogams.

The stamens (stamina) arise from the thalamus or torus within the petals, with which they alternate, forming one or more verticils or whorls, which collectively constitute the andrecium, or the male organs of the plant. Their normal position is below the inner whorl or the pistil, and when they are so placed (fig. 215, e) upon the thalamus they are hypogynous. Sometimes they become adherent to the petals, or are epipetalous, and the insertion of both is looked upon as similar, so that they are still hypogynous provided they are independent of the calyx and the pistil. Frequently the margins of the thalamus bearing the floral envelopes and stamens elongates, and the gynoecium remains in the centre of the concave receptacle; thus the

stamens ax it were rise from the calyx, and they surround the ovary, and are perigynous ; but when the ovary becomes eompletely inferior by the growing upwards and inwards of the receptacle, the parts of the flower rising from its sumuit, the stamens are epigynous (fig. 216), Numerous inter- mediate forms occur, especially amongst Saxifragaceze, where the parts are half superior or half inferior, In the Orchis tribe, where the stamens become adherent to the pistil so as to form a column, the flowers are said to be gynandrous. The same is the case in Aristolochia (fig. 217). These arrangements of parts are of great importance in classifica- tion. The stamens vary in number, from one to many hun- dreds. Like the other parts of the flower they are modified leaves, resembling leaves in their structure, development, and atrangement. They consist of cellular and vascular tissues. They appear at first in the form of cellular projections, and are arranged in a more or less spiral form. In their general aspect they have a greater resemblance to petals than to the leaves, and there is often seen a gradual transi- tion from petals to stamens, especially in spiral flowers, as

Nymphea alba. When flowers become double by cultiva- tion, the stamens are converted into petals, asin the Peony, Camellia, Rose, &c. When there is only one whorl the

Fig. 216

Fig. 215. Fig. 217.

Fig. 215.—Seetion of a flower of Geranium Robertianum, c,c,calyx; p, petals; é, stamens. The pistil is composed of ovary 0, and style and stigmata s. tis the torus or thalamus. ‘The petals and stamens are hypogynous, and the latter are monadelphous.

Fr¢. 216.—Seetion of the flower of Aralia spinosa. Letters as in last figure. The petals and stamens are epigynous, attached to the torus d, which covers the summit of the ovary. The ovary is adherent to the torus, and has been laid open to show its loculaments and pendulous ovules,

Fig. 217.—Essential organs of Birthwort (Aristolochia). Above the ovary 6, are the stamens united in acolumn with the style at a, so as to be gynandrous. On the summit is the stigma above the stamens.

stamens are usually equal in number to the sepals or

petals, and are arranged opposite to the former, and alternate

with the latter. The flower is then

Greek numerals prefixed to the term androus; thus a

flower with

1 stamen is Monandrous (Hippuris, Centranthus) ;

2 stamens is Diandrous (Veronica, Calceolaria, Circa) ;

3 stamens is Triandrous (Grasses, Iris, Valeriana) :

4 stamens is Tetrandrous (Alchemilla, Galium, Plantago) ;

5 stamens is Pentandrous (Primula, Umbellifere, Campanula) ;

6 stamens is Hexandrous (Tulip, Lilium, Juncus) ;

7 stamens is Heptandrous (Trientalis, Horse-chestnut) °

8 stamens is Octandrous (Heath, Fuchsia, Epilobium) ;

9 stamens is Enneandrous (Butomus, some Lauracee) 5 10 stamens is Decandrous (Saxifraga, Dianthus, Oxalis) ; 12 stamens is Dodecandrous (Asarum, Agrimonia, Reseda) ; 20 stamens is Icosandrous (Strawberry, Potentilla, Crateegus) ; Numerous and indefinite stamens is Polyandrous o (Poppy).

The simplest form of stamens is seen in Cycadaceous

plants, where cataphyllary leaves (the scales of the cone) Plate XV.

are the staminal leaves, bearing the pollen-sacs scattered over their under surface. The stamen usually consists of two parts, a contracted portion, often thread-like, termed the

The fila- ment.

filament (fig. 175, f), and a broader portion, usually of two lobes, termed the anther (fig. 175, a), containing a powdery matter, called pollen (p), and supported upon the end of the filament, That portion of the filament in contact with the anther lobes is termed the connective. ‘The exact morphological relations of these parts is not definitely settled. Some consider the filament as representing the petiole, and the anther as being the folded lamina ;_ others again regard the connective as representing the lamina, the rest of the filament being the petiole, and the anther lobes as mere appendages of thelamina. The filament is no more essential to the stamen than the petiole is to the leaf, or the claw to the petal. If the anther is absent the stamen is abortive, and cannot perform its functions. The anther is developed before the filament, and when the latter is not produced, the anther is sessile, or has no stalk, as in the Mistleto.

The filament, when structurally considered, is found to consist of a thin epidermis, on which occasionally stomata and hairs occur, and a layer of cellular tissue enclosing a bundle of spiral vessels, which traverses its whole length, and terminates at the junction between the filament and the anther, The filaments of Callitriche verna are said to have no vessels. The filament is usually, as its name imports, filiform or thread-like, cylindrical, or slightly tapering towards its summit. It is often, however, thickened, compressed, and flattened in varlous ways, becoming petaloid in Canna, Maranta, Nymphea alba (fig. 179); swbulate or slightly broadened at the base, and drawn out into a point like an awl, as in Butomus umbellatus; clavate, that is, narrow below and broad above, as in Thalictrum, In some instances, as in Tamarix gallica, Peganum Harmala, and Campanula, the base of the filament is much dilated, and ends suddenly in a narrow thread-like portion. In these cases the base may represent the sheath or vagina of the leaf, and may give off stipulary processes in a lateral direction, as in Allium and Alyssum calycinum. The filameut varies much in length and in

firmness. The length sometimes bears a relation to that of the pistil, and to the position of the flower, whether erect or drooping. ‘The filament is usually of sufficient solidity to support the anther in an erect position ; but sometimes, as in Grasses, it is very delicate and capillary, or hair-like, so that the anther is pendulous (fig. 212, s). The filament is generally continuous from one end to the other, but in some cases it is bent or jointed, becoming geniculate ; at other times, as in the Pellitory, it is spiral. It is frequently colourless; but, in many instances, it exhibits different colours. In Fuchsia and Poinciana, it is red; in Adamia and Tradescantia virginica, blue; im (Enothera and Ranunculus acris, yellow.

Hairs, scales, tecth, or processes of different kinds are sometimes developed on the filament. In Tradescantia virginica, or Spiderwort, the hairs are beautifully coloured, moniliform or necklace-like, and rotation is seen in them (p. 84). Such a filament is bearded or s¢upose. At the base of the filament glandular or scaly appendages are occasion- ally produced, either on its internal or its external surface. These may be either parts of a whorl, to be afterwards noticed under the name of the disk, or separate prolonga- tions from the filament itself, which is hence called appendiculate, or sometimes strumose. Filaments are usually articulated to the thalamus or torus, and the stamens fall off after fertilization ; but in Campanula and some other plants they are continuous with the torus, and the stamens remain persistent, although in a withered state. Changes are produced in the whorl of stamens by cohesion of the filaments to a greater or less extent, while the anthers remain free ; thus, all the filaments of the andreeclum may unite, forming a tube round the pistil, or a central bundle

in their interior. This internal lining varies in thickness,

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when the pistil is abortive, the stamens becoming mon- — adelphous, a8 occurs in plants of the Mallow tribe; or Pijy they may be arranged in two bundles, the stamens being diadelphous, as in Polygala, Fumaria, and Pea; in this case the bundles may be equal or uneqnal. It frequently happens, especially in Papilionaceous flowers, that out of ten stamens nine are united by their filaments, while one (the posterior one) is free (fig. 218). When there are three or more bundles the stamens are triadelphous, as in

Hypericum egyptiacum, or polyadelphous, as in Luhea paniculata and Ricinus communis. In some cases, especially in the Mallow tribe, the stamens cohere, having been originally separate, but in most other cases each bundle is produced by the branching of a single stamen. When there are three stamens in a bundle we may conceive the lateral ones as of a stipulary nature. In Lauracee there are perfect stamens, each having at the base of the filament two abortive stamens or staminodes, which may be analogous to stipules. Filaments sometimes are adherent to the pistil, forming a columna or column, as in Stylidium, Asclepiadaces, Rafflesia, Orchidace, and Aristolochiacer (fig. 217). The column is called gynostemium, and the flowers are denominated gynandrous. | The anther consists of lobes containing minute powdery Thjathe, matter, called pollen, which, when mature, is discharged by | a fissure or opening of some sort. The anther-lobes are considered by some as formed by the two halves of the lamina, their back corresponding to the under surface, and their face to the upper surface, united by the midrib, the pollen being tbe cellular tissue, and the fissure of the anther taking place at the margin, which, however, is often turned towards the face. In this view, the two cavities which are found to exist in each lobe may correspond with the upper | and under layer of cells, separated by a septum equivalent to the fibro-vascular layer of the leaf. Others view the anther as formed by each half of the lamina being folded upon itself, so that the outer surface of both face and back corresponds to the lower side of the leaf, and the septum dividing each cavity into two is formed by the united upper surfaces of the folded half. Again, others hold that the connective represents the lamina of the leaf to which the anther lobes are mere appendages. ‘There is a double covering of the anther—the outer, or exotheciwm, resembles the epidermis, and often presents stomata and projections of different kinds (fig. 219); the inner, or endothecium, 18

[REPRODUCTIVE ORGANS,

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Ty CST TONS Fig. 219. Fig. 220.

Fra. 218.—Stamens and pistil of Sweet Pea (Zathyrus). The stamens are dia-} delphous, nine of them being united by their filaments 7, while one of them, é, is free; the upper part of the pistil is marked si, the ealyx, c.

Fig. 219-—-Broken-down fibrous cells ¢f of the endothecium of the anther of the Melon. The walls of the eells are absorbed, and the fibres are set free. The exotheeium or outer epidermis is marked ce. |

Fic. 220.—Quadriloeular or tetrathecal anther of the flowering Rush (Butomus) umbellatus). The anther entire, a, with its filament; seetion of anther, b, showing the four loculi.

formed by a layer or layers of cellular tissue (fig. 219, cf); the cells of which have a spiral, annular, or reticulated fibre |

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generally becoming thinner towards the part where the anther opens, and there disappears entirely. The walls of the cells are frequently absorbed, so that when the anther attains maturity the fibres are alone left, and these by their elasticity assist in discharging the pollen. ‘The anther is developed before the filaménт, and is always sessile in the first instance, and sometimes continues so. It appears at first as a simple cellular papilla of meristem, upon which an in- dication of two lobes soon appears. Upon these projections the rudiments of the pollen-sacs are then seen, usually four in number, two on each lobe. In each a differentiation takes place in the layers beneath the epidermis, by which an outer layer of small-celled tissue surrounds an inner portion of large cells. Those central cells are the mother-cells of the pollen, whilst the small-celled layer of tissue external to them becomes the endothecium, the exothecium being formed from the epidermal layer.

In the young state there are usually four pollen-sacs or cavities produced, two for each anther-lobe, and when these remain permanently complete, it

is a quadrilocular or tetrathecal anther (fig. 220). The four cavities are some- times placed in apposition, asin Poranthera, and Tetratheca juncea, and at other times two are placed above and two below, as in Persea gratissima. Sometimes, however, only two cavities remain in the anther, by union of the sacs in each lobe, in which case the anther is said to be bilocular or dithecal. Sometimes the anther has a single cavity, and becomes wnilocular, or monothecal, or dimidiate, either by the disappearance of the partition between the two lobes, or by the abortion of one of its lobes, as in Styphelia leta and Althea officinalis, Occasionally there are numerous cavities in the anther, as in Viscum and Rafflesia. The form of the anther-lobes varies. They are generally of a more or less oval or elliptical form, or they may be globular, as in Mercurialis annua; at other times linear or clavate, curved, flexuose, or sinuose or anfractuose, as in Bryony and Gourd. According to the amount of union of the lobes and the unequal development of different parts of their surface an infinite variety of forms are pro- duced. That part of the anther to which the filament is attached, and which is generally towards the petals, is the back, the opposite being the face. The division between the lobes is marked on the face of the anther by a groove or furrow, and there is usually on the face a suture, indi- cating the line where the membranous coverings open to discharge the pollen. The suture is often towards one side in consequence of the valves being unequal. The stamens may cohere by their anthers, and become syngene- sous or synantherous, as in Composite flowers, and in Lobelia, Jasione, Viola, &c.

The anther-lobes are united to the connective, which may be either continuous with the filament or articulated with it, It consists of parenchyma, in which the spiral vessels of the filament terminate. From the connective a parti- tion or septum extends across each antherine loculus, dividing it either partially or completely. The septum Sometimes reaches the suture When the filament is continuous with the connective, and is prolonged so that the anther-lobes appear to be united to it throughout their whole length, and lie in apposition to it and on both sides of it, the anther is said to be adnate or adherent ; when be filament ends at the base of the anther, then the

atter is innate or erect. In these cases the anther is to a greater or less degree fixed, When, however, the attach- Ment 1s very narrow, and an articulation exists, the anthers eg and are easily turned by the wind. This is — Fe what are called versatile anthers, as in Tritonia, és ae a (fig. 212), where the filament is attached only peg ie e of the connective ; and it may occur also in

ere it 1s attached to the apex, as in pendulous

anthers. The connective may unite the anther-lobes com- pletely, or only partially. It is sometimes very short, and is reduced to a mere point, so that the lobes are separate or free. At other times it is prolonged upwards beyond the lobes, assuming various forms, as in Acalypha, and Nerium Oleander; or it is extended backwards and downwards, as in Violet (fig. 221), and Ticorea febrifuga. In Salvia officinalis the connective is attached to the filament in a horizontal manner, so as to separate the two anther-lobes, and then it is called distractile (fig, 222) ; one of the lobes only being perfect or fertile, containing pollen, the other imperfectly developed and sterile. In Stachys the connective is expanded laterally, so as to unite the bases of the antherine lobes, and bring them into a horizontal line.

The opening of the anthers to discharge their contents Antherine This takes place either by dehiscence

is denominated dehescence. clefts, by hinges, or by pores. When the anther-lobes are erect, the cleft takes place lengthwise along the line of the suture, constituting longitudinal dehiscence (fig. 175). At other times the slit takes place in a horizontal manner, from the connective to the side, as in Alchemilla arvensis (fig. 223) and in Lemna ; the dehiscence is then transverse. When the anther-lobes are rendered horizontal by the enlargement of the connective, then what is really longi- tudinal dehiscence may appear to be transverse. In other cases, when the lobes are united at the base, the fissure in each of them may be continuous, and the two lobes may

appear as one. The cleft does not always proceed the whole length of the anther-lobe at once, but often for a time it extends only partially. In other instances the opening is confined to the base or apex, each loculament opening by a single pore, asin Pyrola, Tetratheca juncea, Rhododen- dron, Vaccinium, and Solanum (fig. 224), where there are

Fig. 224.

Fig. 222. Fig. 225.

Fic. 221,—Two stamens of Pansy (Viola tricolor), with their two anther lobes anu the process p extending beyond them. One of the stamens has been deprived of its spur, the other shows its spur, c.

Fic, 222.—Anther of Salvia officinalis. Y/, fertile lobe full of pollen; Js, barren lobe without pollen; c, distractile eonnective; J, filament.

Fig. 223.—Stamen of Lady’s Mantle (Alchemiilia), with the anther opening transversely.

Fig. 224.Stamen of a species of Nightshade (Solanum), showing the divergenee of the anther-lobes at the base, and the dehiscenee by pores at the apex a.

Fig. 225.—The stamen of the Barberry (Berberts vulgaris), showing onc of the valves of the anther v, eurved upwards, bearing the pollen on its inner surfaec.

two, and Poranthera, where there are four ; whilst in the

Mistleto the anther has numerous pores for the discharge

of the pollen. Another mode of dehiscence is called IV 18

Plate XI,

hinged. In the Barberry (fig. 225) each lobe opens by a valve on the outer side of the suture, separately rolling up from base to apex; in some of the Laurel tribe there are two such valves for each lobe, or four in all. This may be called a combination of transverse and hinged dehiscence. In some Guttifere, as Hebradendron cambogioides (the Ceylon Gamboge plant), the anther opens by a lid separat- ing from the apex; this is called circumscissile dehiscence.

The anthers dehisce at different periods during the pro- cess of flowering; sometimes in the bud, but more com- monly when the pistil is fully developed, and the flower is expanded. ‘They either dehisce simultaneously or in succession. In the latter case individual stamens may move in succession towards the pistil and discharge their contents, as in Parnassia palustris, or the outer or the inner stamens may first dehisce, following thus a centri- petal or centrifugal order. The anthers are called cntrorse or antic, when they dehisce by the surface next to the centre of the flower ; they are extrorse, or postice, when they dehisce by the outer surface ; when they dehisce by the sides, as in. Iris and some grasses, they are laterally dehiscent. Sometimes, from their versatile nature, anthers originally introrse become extrorse, as in the Passion- flower and Oxalis.

The usual colour of anthers is yellow, but they present a great variety in this respect. They are red in the Peach, dark purple in the Poppy and Tulip, orange in Esch- scholtzia, &c. The colour and appearance of the anthers often change after they have discharged their functions.

Stamens occasionally become sterile by the degeneration or non-development of the anthers. Such stamens receive the name of staminodia, or rudimentary stamens. In Scrophularia the fifth stamen appears in the form of a scale; and in many Pentstemons it is reduced to a filament with hairs or a shrivelled membrane at the apex. In other cases, as in double flowers, the stamens are con- verted into petals ; this is also probably the case with such plants as Mesembryanthemum, where there is a multiplica- tion of petals in several rows. Sometimes, as in Canna, one of the anther-lobes becomes abortive, and a petaloid appendage is produced. Stamens vary in length as regards the corolla. Some are enclosed within the tube of the flower, as in Cinchona, and are called included, others are exserted, or

extend beyond the flower, as in Littorella, Plantago, and Exostemma. Sometimes the stamens in the early state of the flower project beyond the petals, and in the progress of growth become included, as in Geranium striatum. Stamens also vary in their relative lengths as respects each other. When there is more than one row or whorl in a flower, those on the outside are sometimes longest, as in many Rosacez ; at other times those in the interior are longest, a3 in Luhea, Whenthe stamens are in two rows, those opposite the petals are usually shorter than those which alternate with the petals. It sometimes happens that a single stamen is longer than all the rest. A definite relation, as regards number, sometimes exists between the long and the short stamens. Thus, in some flowers the stamens are didynamous, having only four out of five stamens developed, and the two corresponding to the upper part of the flower longer than the two lateral ones. ‘This occurs in Labiate and Scrophulariacee (fig. 226). Again, in other cases, there are six stamens, whereof four long ones are arranged in pairs opposite to each other, and alternate with two isolated short ones (fig. 227), giving rise to tetradynamous flowers, as in Cruciferee, Stamens, as regards their direction, may be erect, turned inwards, outwards, or to one side. In the last-mentioned case they are called declinate, as in Amaryllis, Horse-chestnut, and Fraxinella.

The pollen or powdery matter contained in the anther

consists of small cells developed in the interior of other Pollen cells. These are produced in the large thick-walled mother.

Fig. 226.

Fig. 227. Fra. 226.—-Corolla of Digitalis purpurea, cut in order to show the didynamous

stamens (two long and two short) which are attached to it. ¢, tube; J, filaments which are united to the corolla at 7, and run along its inner

surface, having formed’a marked adhesion; ag, anthers of the long stamens; ag, anthers of the short stamens,

Fie, 227.—Tetradynamous stamens (four long and two short) of Cheiranthus Cheirt, p,topof the peduncle ; c, cicatrices left by the sepals of calyx which have been removed; eg, two pairs of long stamens; ep, the short stamens ; f, torus or thalamus to which the stamens are attached.

cells or pollen utricles, formed in the interior of the pollen-

sacs of the young anther. These mother-cells are either

separated from one another and float in the granular fluid which fills up the cavity of the pollen-sac, or are not so isolated. A division takes place, by which four cells are formed in each, the exact mode of division differing in Dicotyledons and Monocotyledons. These cells are the pollen-cells or grains. They increase in size and acquire a cell-wall, which becomes differentiated into an outer cuticular layer, or extime, and an inner layer, or intine. Then the walls of the mother-cells are absorbed, and the pollen-grains float freely in the fluid of the pollen- sacs, which gradually disappears, and the mature grains form

a powdery mass within the anther. They then eitherremain

united in fours, or multiples of four, as in some Acacias,

Periploca greca, and Inga anomala, or separate into

individual grains, which by degrees become mature pollen.

Occasionally the membrane of the pollen-cell is not com-

pletely absorbed, and traces of it are detected in a viscous

matter surrounding the pollen-grains, as in Onagracem,

In Orchidaceous plants the pollen-grains are united into

masses, or pollinia (fig. 228), by means of viscid matter.

Fig. 228,

Fig. 229. Fig, 280,

Fie. 228.—Pollinia, or pollen-masses, separated from the point above the stigma, with their retinacula or viscid matter attaching them at the base. The pollen masses p are supported on stalks or caudicles¢. These masses are easily detached by the agency of insects.

Fig. 229.—Pistil of Asclepias, a, with pollen-masses, p adhering to the stigma 4. b, pollen-masses, removed from the stigma, united by a gland-like body.

Fig, 230.—Stamen of Asclepias, showing filament 7, anther a, and appendages Dp.

In Orchids each of the pollen-masses has a prolongation or stalk, called a caudicle, which adheres to a prolongation at the base of the anther, called rostellum, by means of @ viscous gland, called retinaculum. The gland is either naked or covered. The term clinandrium is sometimes applied to the part of the column in Orchids where the

stamens ate situated. In some Orchids, as Cypripedium, the pollen has its ordinary character of separate grains. The number of pollinia varies ; thus, in Orchis there are usually two, in Cattleya four, and in Lelia eight. The two pollinia in Orchis Morio contain each about 200 secondary smaller masses. These small masses, when bruised, divide into grains which are united in fours. In Asclepiadaceee the pollinia are usually united in pairs (fig. 229), belonging to two contiguous antherine cavities,— each pollen-mass having a caudicular appendage, ending in a common gland, by means of which they are attached to a process of the stigma. The pollinia are also provided with an appendicular staminal covering (fig. 230). J When mature, the pollen-grain is a cellular body having an external covering, extine, and an internal, tnétune. Fritzsche states that he has detected, in some cases, other two coverings, which he calls nteatone and exintine. They oceur between the extine and intine, and are probably formed by foldings of these

membranes. In some aquatics, as Zostera marina, Zannichellia pedunculata, Naias minor, &c., only one covering exists, and that is said to be the intine. The extine is a firm membrane, which defines the figure of the pollen-grain, and gives colour to it. It is either smooth, or covered with numerous projections (fig. 231), granules, points, minute hairs, or crested reticulations. The colour is generally yellow, and the surface is often covered with a viscid or oily matter. The intine is uniform in different kinds of pollen, thin and transparent, and possesses great power of extension. Pollen-grains vary from 3$5 t0 7} of an inch or less in diameter. Their forms are various. The most common form of grain is ellipsoidal, more or less narrow at the extremities, which are called its poles, in contradistinction to a line equidistant from the extremities, and which is its equator. Pollen-grains are also spherical ; cylindrical and curved, as in Tradescantia virginica; polyhedral in Dipsacacess and Composite ; nearly triangular in Proteacex and Onagraces (fig. 232). The surface of the pollen-grain is either uniform and homogeneous, or it is marked by

Fig. 232 Fig. 234. Fia. 23].—Ripe round pollen of Hollyhock (Althea), with its extine covered with prominent points,

F r 232.—Triangular pollen of Evening Primrose (Znothera), with one pollen ube, t, protruded. This tube is formed by the intine, which ts also seen Projecting at the other angles.

Fig. 283.—Ripe rounded pollen of Cherry (Cerasws), discharging its fovilla through

a tubular opening formed by the intine. There are other two points at which Fe the intine is seen protruding. pe bf flower of Pellitory (Partetarta offcinalts), having four stamens = incurved elastic filaments, and an abortive pistil in the centre. When the perlanth expands, the filaments are thrown out with force, so as to scatter the pollen on the female flowers in the vicinity.

folds dipping in towards the centre, and formed by thin- ntugs of the membrane. In Monocotyledonous plants there

is usually a single fold; in Dicotyledons, often three. Two, four, six, and even twelve folds are also met with. There are also rounded portions of the membrane or points of perforation or pores visible in the pollen-grain. These vary in number from one to fifty. In Monocotyledons, as in Grasses, there is. often only one, while in Dicotyledons they number from three upwards. When numerous, these points are either scattered irregularly, or in a regular order, frequently forming a circle round the equatorial sur- face. Sometimes at the place where they exist, the outer membrane, in place of being thin and transparent, is separated in the form of a lid, thus becoming operculate, as in the Passion-flower and Gourd. Grains of pollen have sometimes both folds and pores. Within the pollen- grain a granular semifluid matter called fovi/a is contained, along with some oily particles, and occasionally starch. The fovilla contains small spherical granules, sometimes the sydno Of an inch in diameter, and large ellipsoidal or elongated corpuscles, which exhibit molecular movements under the microscope. The application of moisture affects

_very markedly the pollen-grain, causing it to swell up by

endosmose. If the moisture be long applied the distension becomes so great as to rupture the extine irregularly if it is homogeneous, or to cause projections and final rupture at the folds or pores when they exist. The intine, from its dis- tensibility, is not so liable to rupture; it is often forced through the ruptured extine, or through the pores, in the form of small sac-like projections. The internal membrane ulti- mately gives way, and allows the granular fovilla to escape (fig. 233). If the fluid is applied only to one side of the pollen-grain, as when the pollen is applied to the pistil, the distension goes on more slowly, and the intine is prolonged outwards like a hernia, and forms an elongated tube called a pollen-tube (fig. 232). This tube, at its base, is often covered by the ruptured extine, and it contains in its interior fovilla-granules. The number of pollen-tubes which may be produced depends on the number of pores. In some pollinia the number of tubes which are formed is enormous. Thus, it has been calculated that two pollen- masses of Orchis Morio may give out 120,000 tubes.

When the pollen-grains are ripe, the anther dehisces Pollination.

(figs. 175, 223),and the pollen isshed. In order that fertiliza- tion may be effected the pollen must be conveyed to the female organ of reproduction. This process, termed pollina- tion, is promoted in various ways,—the whole form and structure of the flower having relation to the process. In some plants, as Kalmia and Pellitory (fig. 234), the mere elasticity of the filaments is sufficient to effect this ; in other plants pollination is effected by the wind, as in Conifere, and in such cases enormous quantities of pollen are produced. These plants are anemophilous. But the com- mon agents for pollination are insects. To allure and attract them to visit the flower the odoriferous secretions and gay colours are developed, and the position and complicated structure of the parts of the flower are adapted to the perfect performance of the process. Itis rare in hermaphrodite flowers for self-fertilization to occur, and the various forms of dichogamy, dimorphism, and trimorphism are fitted to prevent this.

Under the term disk is included every structure inter- Disk.

vening between the stamens and the pistil. It was to such structures that the name of nectary was applied by old authors. It presents great varieties of form, such as a ring, scales, glands, hairs, petaloid appendages, &c., and in the progress of growth it often contains sac- charine matter, thus becoming truly nectariferous. The disk is frequently formed by degeneration or transformation of the staminal row. It may consist of processes rising from the torus, alternating with the stamens, and thus representing an abortive whorl; or its parts may be oppo-

Plate VII.

Male organs, Crypto- gama.

site to the stamens, as in Crassula rubens (fig. 172).

In

some flowers, as Jatropha Curcas, in which the stamens are

not developed, their place is oc- cupied by glandular bodies form- ing the disk. In Gesneraceze and Cruciferz the disk consists of tooth-like scales at the base of the stamens (fig. 227). The parts composing the disk some- times unite and form a glandu- lar ring, as in the Orange; or they form a dark-red lamina covering the pistil, as in Peeonia Moutan (fig. 235); ‘or a waxy lining of the calyx tube or hol- low receptacle, as in the Rose ; or a swelling at the top of the ovary, as in Umbelliferse, in which the disk is said to be

Flower of Tree Paony (Paonia Moutan), deprived of its corolla, and showing the disk in the form of a fleshy expansion

: eovering the ovary. epigynous, The enlarged torus ‘ xf

covering the ovary in Nymphea and Nelumbium may be regarded as a form of disk.

2. Male Organs in Cryptogams.

Sexual organs have not as yet been demonstrated in all Cryptogamic plants ; but in most of them certain structures representing the male organs have been found. These are termed Antheridia or Pollinodia (figs. 236, 250). They are closed sacs of various forms,—rounded, ovate, oblong, clavate, flask-like, &c.,—developed from various parts of the plants, and composed either of one or of many cells enclosing a single central cell. In theinterior of this organ small cells (fig. 236, c) are formed of varying shape, con- taining in their interior peculiar bodies, termed antherozoids, spermatozords, or phytozoa (fig, 237). These are in most cases filamentous spirally coiled cells, frequently with cilza

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Fig. 238.

Fig. 239.

Fig. 236.—Antheridium a of the Hair-moss (Polytrichum), consisting of cellules

Fig. 241.

e, containing phytozoa coiled up in their interior. The phytozoa have a thickened extremity, whence proceeds a tapering tail-like process. Along with the antheridium are two separate filaments or paraphyses p, which are probably abortive antheridia, :

Fia. 237.—A spermatozoid with cilia, discharged from a cellule in the antheridium of the Forked Spleenwort (Asplenium septentrionale).

Fia. 238.—Antheridium a, or zootheca, of a Sea-weed (Fucus serratus), containing phytozoa. With the antheridium there are paraphyses united in the same conceptacle.

Fie. 239.—Antheridium of a Sea-weed (Fucus serratus), still containing two — in the sac. To the broad part of the phytozoa two vibratile cilia are

Fia. 240—Axis of Chara, with branches from the axil of which arises the nucule n; below them is the globule g.

Fig. 241.—Globule of Chara, being a rounded body with eight radiating valves externally, and filaments containing phytozoary cells internally.

attached, by means of which they move rapidly through the water. In some cases there are no cilia, as in the Algal group of Florides ; and the antherozoids of all Alge differ

[REPRODUCTIVE ORGANS,

from those of other Cryptogams in never being filamentoyg but short and more or less rounded. The amount of twist, ing of the antherozoid varies ; in some Rhizocarps there are as many as a dozen coils. Antheridia of this kind

haye been demonstrated in all vascular Cryptogams, but only in some Thallogens have such structures been seen.

In Characez, however, the antheridium, which ig here termed globule (fig. 240), has a peculiar structure, differing from all other Cryptogams. It is a globular case, formed by eight flat cells, of which four are quadrangular and four are triangular ; and these are folded at the margins so that the edges of contiguous plates dovetail (fig. 241), These are termed shzelds. Into the cavity of the globule the terminal cell of the stalk supporting it projects. From the centre of each shield projects on the inner surface ag – large oblong cell or man- ubrium, which in turn bears at its apex a round- ish cell termed the head. From each head-cell six secondary head-cells pro- ject, from each of which pass off fourslender separ- ate filaments (fig. 242) containing antherozoids. When mature the antheridium is ruptured, and the mother-cells of the antherozoid escape and discharge the antherozoids into the surrounding medium which is always water—fertilization only being effected in water, by which the antherozoids are carried to the female organ, In some cases, however, among Thallogens the antheridium actually penetrates into the female organ.

Antheridia are pro- duced on various parts of plants. Where they have been found amongst Thallogens, they arise from defi- nite portions of the cellular thallus. In thalloid Hepatic they may be sunk in the substance of the thal- lus, or they may be im- bedded in the upper surface of a_ peltate stalked disk rising from the thallus, as in Mar- chantia (figs. 243, 244). In Mosses they may be seated within the same whorl of leaves or peri- cheetiuni as the female organs, or they may be separate and surround- ed by a perzgone ; but they are always formed upon the leaf-bearing axis, either terminal or lateral. In Ferns and Equisetum they are produced on the surface—usually the lower surface—of 4 cellular flattened expansion, termed a prothailus (figs. 245, 250), in close proximity to the female organs. In Characex they always arise from the termination of one of the whorled leaflets.

In some Lycopodiacee no antheridia have as yet been found; but in Selaginella, Isoetes, and in the Rhizo- carpex, hollow sacs, termed microsporangia (figs. 246, 248), are produced in the axil of certain leaves of the

Fig. 242.

Partitioned filament of Chara, consisting of a series of cellules containing phytozoa, one of which is scen escaping in the form of a spiral thread.

Sf a

Fig. 243.

A species of Liverwort (Marchantia polymorpha) with its green thallus ¢, bearing a eup-like body g,in which minute cells or free buds aré seen, and a stalked receptacle s,r. In the substance of the disk-like receptacle r cells are produced containing phytozoa. These are considered anthcridia.

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plant, in which small cells, mcrospores (fig. 249), are found, each consisting of an outer covering or exospore, and an inner or endospore. Within those microspores (the manner varying in different genera) smaller cells are formed, which are the mother-cells of the antherozoids. In this

PISTIL. |

tag * Beso,

Fig. 244,

Vertical section of the disk-like receptacle of Liverwort (Marchantia), showing antheridia a,@ in its substance. These antheridia are flusk-shaped sacs con- taining phytozoary cells. They communicate with the upper surface, and their contents are discharged through it. Between the antheridia there are air cavities c, c, connected with stomata 8, 8.

development of Lycopodiacess we have parts which are analogous to those of the stamens in Phanerogams, The microsporangium evidently

corresponds to the pollen-sac, and the microspores are the equivalents of the pollen- grains,—the forms seen in such Gymnosperms as Cycad- aces being the link connecting them with the highest forms.

Fig. 245.

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Fig. 249, Fig. 250.

Fig. 245.—Spore s, of a Fern (Pieris longifolia) sprouting, giving off a root-like process, r, and a flat cellular expansion, p, called the prothallus or prothallium. On this expansion antheridia and pistillidia are said to occur.

Fig. 246.—Fructification of Club-Moss (Lycopodium), situated in the axil of a teaf,/, It consists of a case containirg minute cellular bodies, which are dis- charged in the form of powder.

Fig. 247.—Fructification of a Club-Moss (Lycopodium clavatum). The branch is covered with minute pointed leaves,7; from it proceeds a stalk bearing at its

. extremity two spikes, 7, consisting of modified leaves, with fructification. 1G. 248.—One of the cases separated from the axil of the Club-Moss leaf, opening

: by two valves, and discharging the minute Lycopod powder (microspores). 1G, 249.—The small spore of a Rhizocarp (Pilularia globulifera, Pillwort). The inner coat is protruded, and the outer coat has burst so as to discharge cellules containing spermatozoids. Some of the spermatozoids are separate, and are seen cofled up in a spiral form.

Fig. 250.—Antheridia from the prothallus of the Common Brake (Pteris aqui/ina). en unopened antheridium; 6, antheridium bursting at the apex, and dis- charging free cellules, each containing a spermatozoid; c, antheridium after the discharge of the ccllules.

3. Female Organs in Phanerogams. The pistil or gynoecium occupies the centre or axis of the

AN Y 141 flower, and is surrounded by the stamens and floral enve- lopes when these are present. It constitutes the innermost

flowering is changed into the fruit, and contains the seeds, It consists essentially of two parts, a basal portion forming a chamber, the ovary or germen, containing ovules or young seeds attached to a part called the placenta, and an upper portion, the stigma, a cellular secreting body, which is either seated on the ovary, and is then called sessile, as in the Tulip and Poppy, or is elevated on a stalk called the style, interposed between the ovary and stigma. The style

Fig. 251. °

Fig. 251.—Folded carpellary leaf of the fruit the plant produces leaves.

Fie, 252.—Vertical section of the flower of Meadow-sweet (Spirea). The pistil is apocarpous, consisting of several distinct carpels c, each with ovary, style, and stigma. The stamens are indefinite, and are inserted into the calyx.

Fig. 253.—Pistil of Broom, consisting of ovary o, style 8, and stigma ¢. It is formed by a single carpel. The terms pistil and carpel are here synonymous.

3 not necessary for the perfection of the pistil. Like the other organs, the pistil consists of one or more modified leaves, which in this instance are called carpels. When a pistil consists of a single carpel it is simple or mono-carpellary (fig. 253), a state usually depending on the non- development of other carpels. When it is composed of several carpels, more or less united, it is compound or polycarpellary. In the first-mentioned case the terms carpel and pistil are synonymous. Each carpel has its own ovary, style (when present), and stigma, and is formed by a folded leaf, the upper surface of which is turned inwards towards the axis, and the lower outwards, while from its margins are developed one or more buds called ovules. That this is the true nature of the pistil may be seen by examining the flower of the double- flowering Cherry. In it no fruit is produced, and the pistil consists

of sessile leaves (fig. 251), the limb of each being green and folded, with a narrow prolongation upwards, as if from the midrib, and ending in a thickened portion. The ovary then represents the limb or lamina of the leaf, and is composed of cellular tissue with fibro- vascular bundles, and an epidermal covering. The cellular tissue, or parenchyma, often becomes much developed, as will be seen particularly when fleshy fruits are considered. The outer epidermis corresponds to the lower side of the leaf, exhibiting stomata, and sometimes hairs; the inner surface represents the upper side of the leaf, being usually very delicate and pale, and forming a layer called sometimes epithelium, which does not exhibit stomata. The vascular bundles correspond with the veins of the leaf, and consist of spiral, annular, and other vessels. In Cycas the carpels are ordinary leaves, with ovules upon their margin.

A pistil is usually formed by more than one carpel. The carpels may be arranged like leaves, either at the same or nearly the same height in a verticil, or at different heights in a spiral cycle. When they remain separate and distinct, thus showing at once the composition of the pistil, as in Caltha, Ranunculus, Hellebore, and Spirzea (fig. 252), the term apocarpous is applied. Thus, in Crassula rubens (fig. 172) the pistil consists of five verticillate carpels 0, alter- nating with the stamens e. culus (fig. 254) the separate carpels are numerous and are arranged in a spiral cycle upon an elongated axis or recep- In the Raspberry the carpels are on a conical

Fig. 252.

Fig. 253. double-flowermg Cherry. In place of

tacle.

whorl, and is the female organ of the plant, which after The pistil.

Plate I.

Plate V.

Plate XV,

In the Tulip-tree and Ranun- ’

Plate ITT.

Fig. 255.—Syncarpous pisti] of Flax (Linum).

Fig. 256.—Pistil of the Pea

receptacle ; in the Strawberry, on a swollen succulent one (fig. 154); and in the Rose (fig. 155), on a hollow one. When the fruit consists of several rows of carpels, the in- nermost have their margins directed to the centre, while the margins of the outer rows are arranged on the back of the inner ones. When the carpels are united, as in the Pear, Arbutus, and Chickweed, the pistil becomes syncar- gous. The number of carpels in an apocarpous pistil, or the number of separate styles in a syncarpous one, is in- dicated in the following way :— A flower with a simple pistil or 1 style 2 separate carpels or 2 separate styles 3 carpels or 3 separate styles 4 carpels or 4 separate styles 5 carpels or 5 separate styles 6 carpels or 6 separate styles 7 carpels or 7 separate styles 8 carpels or 8 separate styles 9 carpels or 9 separate styles 10 carpels or 10 separate styles is Decagynous. 12 carpels or 12 separate styles is Dodecagynous. a greater number of carpels or styles is Polygynous. The union ina syncarpous pistil is not always complete; it may take place by the ovaries alone, while the styles and stigmata remain free, the pistil being then gamogastrous (fig. 255), and in this case, when the ovaries form apparently-a single body, the organ receives the name of compound ovary; or the union may take place by the ovaries and styles, while the stigmata are disunited ; or by the stigmata and the summit of the style only. Various intermediate states exist, such as partial union of the ovaries, a3 in the Rue, where they coalesce at their base ; and partial union of the styles, as in Malvacee. The union is usually most complete at the base; but in Labiate the styles are united throughout their length, and in Apocynacese and Asclepiadacez the stigmata only. When the union is incomplete, the number of the parts of a compound pistil may be determined by the number of styles and stigmata ; when complete, the external venation, the grooves on the surface, and the internal divisions of the ovary, indicate the number. The changes which take place in the pistil

by adhesion, degeneration, and abortion, are frequently so great as to obscure its composition, and to lead to anomalies.

is Monogynous. is Digynous.

is Trigynous.

is Tetragynous. is Pentagynous. is Hexagynous. is Heptagynous. is Octogynous. is Enneagynous.

Fig, 255.

Fig. 256.

Fig. 254,-Apocarpous compound pistil of Crowfoot (Ranunculus), consisting of

numerous separate uni-ovular carpels, arranged in spirals. The flower is polygynous. Each carpel consists of ovary, style, and stigma. Two of the stamens are left to show their insertion below the pistil in the thalamus (hypogynous).

: , : i It consists of five carpels, united by their ovaries, while their styles and stigmas are separate. Hence the flower is pentagynous.

Ei) (Pisum sativum) laid open. It consists of a single carpel containing numerous ovules ov, which are atari to the placenta pil, or soph giod suture, in two rows, by means of umbilical cords (funiculi) f The hes of the carpel consists of three layers; the outer, ep, corresponding to the Hh ee of the leaf, the inner, en, correspondin g to the upper epidermis of theleaf. Between these two layers there is a small amount of cellular tissue

like the parenchyma of the leaf T i i wins nto tdavked ho calyx ¢ is persistent. The style and

The pistil is more liable to changes of this kind than any other part of the flower.

The carpels are usually

sessile leaves, but sometimes they are petiolate, and then

are elevated above the external whorls. This elevation of the pistil may in general, however, be traced to an elongation of the axis itself, in such a way that the carpels, in place of being dispersed over it, arise only from its summit, and the pistil becomes stzpitate, or supported on a stalk called a gynophore or thecaphore, as in the Passion-flower and Dictamnus (fig. 177). Sometimes the axis is produced beyond the ovaries, and the styles become united to it, as in Geraniacez (fig. 152) and Umbellifera, In this case the prolongation is called a carpophore, monstrosity often occurs in the Rose (fig. 145) by which the axis is prolonged, and bears the carpels f in the form of alternate leaves.

The ovary contains the ovules. the placenta,

vessels pass to the ovule. The placenta is usually formed on the edges of the carpellary leaf (fig. 256), and is then said to be of the marginal type. In many cases, however, the placentas are formations from the axis, and are not con- nected with the carpellary leaves ; they are then said to be axile. Some restrict the term placenta to the point of attachment of a single ovule, and call the union of placentas, bearing several ovules, placentaries or pistilary cords, In marginal placentation the part of the carpel bearing the placenta is the zuner or ventral suture, corresponding to the margin of the folded carpellary leaf, while the outer or dorsal suture corresponds to the midrib of the carpellary leaf. As the placenta is formed on each margin of the carpel it is essentially double. This is seen in cases where the margins of the carpel do not unite, but remain separate, and consequently two placentas are formed in place of one, When the pistil is formed by one carpel the inner margins unite in the axis, and form usually a common marginal placenta. This placenta may extend along the whole margin of the ovary as far as the base of the style (fig. 256), or it may be confined to the base or apex only. When the pistil is composed of several separate carpels, or, in other words, is apocarpous, there are generally separate placentas at each of their margins. In a syncarpous pistil, on the other hand, the carpels are so united that the edges of each of the contiguous ones, by their union, form 4 septum, or dissepiment, and the number of these septa con- sequently

indicates the number of carpels in the compound It is obvious then that each dissepiment

Fig. 207. Fig. 258. Fig. 259.

Fig, 257.—Ovary or lower part of the pistil of the Lily (Lilium), cut transversely. There are three loculaments, indicating the union of three carpels, and the ovary is said to be trilocular. The divisions in the ovary, called septa or dissepi- ments, are formed by the sides of the carpellary leaves. Each septum is double, and the number of septa corresponds with the number of the carpels. The ovules are placed collaterally, in pairs, in each loculament, and are attached to a central placenta, formed by the union of the three ventral sutures.

Fig. 258.~~—Diagrammatic section of a quinquelocular or pentathecal ovary, com~~ posed of five carpels, the edges of which are folded inwards, and meet in the centre. The ovules 0 are attached to a central placenta, formed by the union the five ventral sutures, The five partitions, scpta, or dissepiments, s, are com> posed of the two sides of contiguous carpels. Dorsal suture, J.

Fra. 259.—Diagrammatic section of a quinquelocular ovary, in which the edges of the carpels, bearing the placentas and ovules 9, are not folded inwards. The placentas are parietal, and the ovules appear sessile on the walls of the ovary. The compound ovary is unilocular, and the edges of its carpels are applied be each other in a valvular manner,

is formed by a double wall or two lamin ; that the presence

of a septum implies the presence of more than one carpel; and that, when carpels are placed side by side, true dissepr ments must be vertical, and not horizontal. When the dissepiments extend to the centre or axis, the ovary 18

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These are attached to The This, sometimes called the trophosperm, placat consists of a mass of cellular tissue, through which the

A Plate y)

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“divided into cavities, cells, or loculaments, and it may be – pilocular, trilocular (fig. 257), quadrlocular, quinquelocular, or multilocular, according as it is formed by two, three, four, five, or many carpels, each carpel corresponding to a single cell or loculament. In these cases the marginal lacentas meet in the axis, and unite so as to form a single central one (figs. 257, 258), and the ovules appear in the central angle of the loculi, as in Canna, Lily (fig. 257). The number of loculaments 1s equal to that of the dissepi- ments, When the carpels in a syncarpous pistil do not fold inwards completely so as to meet in the centre, but only partially, so that the dissepiments appear as projections on the walls of the ovary, then the ovary is unilocular (fig. 260), and the placentas are parietal, as in Viola (fig. 261). In

-pracuna. |

Fig. 260, Fig. 261.

Fig. 260.—Diagrammatic section of a quinquelocular ovary, in which the septa s proceed inwards for a certain length, bearing the placentas and ovules 0. In this case the ovary is unilocular, and the placentas are parietal. Dorsum, J.

Fig. 261.-—Pistil of Viola tricolor, or Pansy. 1. Vertical section to show the ovules 0, attached to the parietes, Two rows of ovules are seen, one in front, and the other in profile; p, a thickened line on the walls forming the placenta; ¢, calyx; d, ovary; s, hooded stigma terminating the short style. 2. Horizontal section of the same; p, placenta; 0, ovules; s, suture.

these instances the placentas may be formed at the margin of the united contiguous leaves, so as to appear single; or the margins may not be united, each developing a placenta. _ Frequently the margins of the carpels, which fold in to the centre, split there into two lamellae, each of which is curved

outwards and projects into the loculament, dilating at the end into a placenta. This is well seen in Cucur- bitaceee (fig. 262), Pyrola, &c. From this it will be seen that dissepiments are opposite to placentas formed by the _ union of the margins of two contiguous carpels, but _ alternate with those formed by the margins of the same carpel. ‘The carpellary leaves may fold inwards very slightly, or they may be applied in a valvate manner, merely touching at their margins, the placentas then being | parietal (fig. 259), and appearing as lines or thickenings

Fig. 268,

Fig. 262.

Fig. 262.—Transverse section of the fruit of th @ Melon (Cucumis Melo), showin bs = aa pl, with the seeds attached to them, rs three oar folmlue rena are separated by partitions ci, From the centre, processes s, go to rea ae t, ending in curved placentaries bearing the ovules. axa <1 eaageey section of a compound unilocular ovary, in which there pip cations of partitions. The ovules o are attached to a free central ta, which has no connection with the walls of the ovary.

along the walls. Cases occur, however, in which the P rs are not connected with the walls of the ovary, and form what is called a Sree central placenta (fig. 263).

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This is seen in many of the Caryophyllacez and Primulacesa (figs. 264, 265). In Caryophyllaceze, however, while the placenta is free in the centre, there are often traces found at the base of the ovary of the remains of septa, as if rupture had taken place, and, in rare instances, ovules are found on the margins of the carpels. But in Primulacee, Myrsinaceze, and Santalacez, no vestiges of septa or marginal ovules can be perceived at any period of growth; the placenta is always free, and rises in the centre of the ovary, and the part uncovered by ovules gra- dually extends into the style. Free central pla- centation, therefore, has been accounted for in two ways ; either by suppos- ing that the placentas in the early state were formed on the margins of carpellary leaves, and Fig. 265.

that in the progress of Fig. 264.—Pistil of Cerastium hirsutum cut

development these leaves vertically. 0, unilocular or monothecal ovary; p, free central placenta; g, ovulcs;

Fig, 264.

separated from them, 5 styles,

leaving the placentas and Fg, 20 the supe cut hongonaly nd he ovules free in the centre > of the cavity of the ovary o, with the free or by supposing that the central placenta p, covered with ovules g. placentas are not marginal but awxile formations, produced by an elongation of the axis, the ovules being lateral buds, and the carpels verticillate leaves, united together around the axis. The first of these views would apply well to Caryo- phyllaceze, the second to Primulacee. The latter case has also been explained, on the marginal hypothesis, by con- sidering the placentas as formed from the carpels by a pro- cess of chorisis, and united together in the centre.

Some consider the axile view of placentation as applic- able to all cases, the axis in some’ instances remaining free and independent, at other times sending prolongations along the margins of the car ellary leaves, and thus forming the marginal placentas. Occasionally, divisions take place in ovaries which are not formed by the edges of contiguous carpels. These are called spurious dissepiments. They are often horizontal, and are then called phragmata, as in Cathartocarpus Fistula, where they consist of transverse cellular prolongations from the walls of the ovary, only developed after fertilization, and therefore more properly noticed under fruit. At other times they are vertical, as in Datura, where the ovary, in place of being two-celled, be- comes four-celled ; in Cruciferse, where the prolongation of the placentas forms a replum or partition ; in Astragalus and Thespesia, where the dorsal suture is folded inwards ; in Oxytropis, where the ventral suture is folded inwards ; and in Diplophractum, where the inner margin of the carpels is inflexed. In Cucurbitacez divisions are formed in the ovary apparently by peculiar projections inwards from curved parietal placentas. In some cases horizontal dissepiments are supposed to be formed by the union of carpels situated at different heights, so that the base of one becomes united to the apex of another. In such cases the divisions are true

dissepiments formed by carpellary leaves, The anomalous divisions in the ovary of the Pomegranate have been thus explained.

The ovary is usually of a more or less spherical or curved form, sometimes smooth and uniform on its surface, at other times hairy and grooved, The grooves usually indicate the divisions between the carpels, and correspond to the dissepi- ments. The dorsal suture may be marked by a slight pro- jection, or bya superficial groove. When the ovary is situated on the centre of the receptacle, free from the other whorls, so that its base is above the insertion of the stamens, it is

The style.

termed superior, as in Lychnis, Primula, and Geranium (fig. 215). When the margin of the receptacle is prolonged upwards, carrying with it the floral envelopes and staminal leaves, the basal portion of the ovary being formed by the receptacle, and the carpellary leaves alone closing in the apex, the ovary is inferior, as in Pomegranate, Apple, Pear, Gooseberry, and Fuchsia. In some plants, as many Saxifragacez, there are intermediate forms, in which the term half-inferior is applied to the ovary, whilst the floral whorls are Aalf-superior.

The style proceeds from the summit of the carpel, and may be looked upon as a prolongation of it in an upward direction (fig. 267). Itis hence called apicilar. It consists not merely of the midrib but of the vascular and cellular tissue of the carpel, and when carefully examined is found to be traversed by a narrow canal, in which there are some loose projecting cells, a continuation of the placenta, con- stituting what is called conducting tissue, which ends in the stigma, This is particularly abundant when the pistil is ready for fertilization. In some cases, owing to more rapid growth of the dorsal side of the ovary, the style becomes lateral (fig. 266); this may so increase that the style appears to arise from near the base, as in the Straw- berry, or from the base, as in Chrysobalanus Icaco, when it is called basilaz. In all these cases the style still indi- cates the organic apex of the ovary, although it may not be the apparent apex. When in a compound pistil the style of each carpel is thus displaced, it appears as if the ovary were

depressed in the centre, and the style rising from the depression in the midst of the carpels seems to come from the torus. Such astyle is gynobasic, and is well seen in Boraginaceee and Ochnacez. The form of the style is usually cylindrical, more or less filiform and simple ; some- times it is grooved on one side, at other times it is flat, thick, angular, compressed, and even petaloid, as in Iris and Canna. In Goodeniacee it ends in a cup-like expan- sion, enclosing the stigma. It may be smooth and covered with glands and hairs. These hairs occasionally aid in the application of the pollen to the stigma; and are called collecting hairs, as in Goldfussia, in Campanula, where they appear double and retractile, and also in Aster and other Composite. These hairs, during the upward develop- ment of the style, come into contact with the already

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Fig. 266 Fig. 267.

Fig. 269.

Fig. 268.

Fie, 266.—Unti-ovular carpel of Lady’s-mantle (Alchemilla) with the style s aris- ing laterally near the apparent base. It is called a latcral or semi-basilar style, although it arises from the organic apex, which is here turned round. The

_ Stigma at the summit of the style is capitate.

F PN re dee syncarpous pistil of primrose (Primula). The five carpels of we ich it is composed are completely consolidated so as to appear one. The ovaries 0, the styles ¢, and stigmata s, are united. The flower is called mono-

an Gee although in reality there are five parts of the pistil. eA tg aren of the Flower-de-Luce (Jris), consisting of an ovary o ad- feet pad “ie perianth, and a style sty, which divides into three petaloid seg-

S bearing stigmas stiy. The ovary is inferior, the perianth superior.

5 —a of Poppy, opening by pores p, under the radiating peltate

ripened pollen, and carry it up along with them, ready to be applied by insects to the mature stigma of other flowers.

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In Vicia and Lobelia the hairs frequently form a tuft below the stigma. The styles of a syncarpous pistil may be either separate or united ; when separate, they alternate with the septa. When united completely, it is usual to call the style simple (fig. 267); when the union is partial, then the style is said to be bifid, trofid, multifid, according as it is two. cleft, three-cleft, many-cleft; or, to speak more correctly, according to the mode and extent of the union of two, three, or many styles, The style is said to be bipartite tripartite, or multipartite, when the union of two, three, or many styles only extends a short way above the apex of the ovary. The style of a single carpel, or of each carpel of a compound pistil, may also be divided. Each division of the tricarpellary ovary of Jatropha Curcas has a bifurcate or forked style, and the ovary of Emblica officinalis hag three styles, each of which is divided twice in a bifureate manner, exhibiting thus a dichotomous division, The length of the style is determined by the relation which ought to subsist between the position of the stigma and that of the anthers, so as to allow the proper application of the pollen. In some cases the ovary passes insensibly into | the style, as in Digitalis, in other instances there is a Play| marked transition from one to the other. The style may | remain persistent, or it may fall off after fertilization ig | | accomplished, and thus be deceduous, , The stigma is the termination of the conducting tissue The) of the style, and is usually in direct communication with the placenta. It may, therefore, in most instances, be considered as the placental portion of the carpel, prolonged upwards. In Armeria, and some other plants, this connection with the placenta cannot be traced. The stigma consists of loose cellular tissue, and secretes a viscid matter which detains the pollen and causes it to protrude tubes. This secreting portion is, strictly speaking, the true stigma, but the name is generally applied to all the divisions of the style on which the stigmatic apparatus is situated. The stigma alternates with the dissepiments of a syncarpous pistil, or, in other words, corresponds with the

back of the loculaments ; but in some cases it would appear that half the stigma of one carpel unites with half that of the con | tiguous carpel, and thus the stigma is opposite the dissepi- | ments, that is, alternates with the loculaments, as in the Poppy. If the stigma is viewed as essentially a prolonga- tion of the placenta, then there is no necessary alternation between it and the placenta, both being formed by the } margins of carpellary leaves, which in the one case are ovuliferous, in the other stigmatiferous, There is often notch on one side of a stigma (as in some Rosacex), indicating apparently that it is a double organ like the placenta. To the division of a compound stigma the terms bifid, as in Labiate, Composite, trifid, as in Polemonium, &c., are applied, according to the number of the divisions. When the divisions are large, they are called Jobes, and when flattened like bands, lamelle ; so that stigmas may be bilobate, trilobate, bilamellar, trilamellar, &e. It has already been stated that the divisions of the stigma mark the number of carpels which are united together. A quinquefid or five-cleft stigma indicates five carpels, as in Campanula, although the other parts are united. In Bignoniacee, as well as i: Scrophulariaces — and Acanthacee, the two-lobed or bilamellar stigms indicates a bilocular ovary. Sometimes, however, a8 1 the case of the styles, the stigma of a single carpel may — divide. It is probable that in many instances what 18 called bifurcation of the style is only the division of the stigma. In Graminez and Composite there is a bifid stigma, and only one cavity in the ovary. This, however, may be probably traced to subsequent abortion in the ovary of one of the carpels. Its position may ™ terminal or lateral; either on one side of the style, wm |

. covering In Cycas the altered leaf, upon the margin of

lateral, as in Asimina, or on both sides, bilateral, as in Plantago. Occasionally, as in Tasmannia, it is prolonged along the inner surface of the style. In Iris it is situated on a cleft on the back of the petaloid divisions of the style (fig. 268). Some stigmata, as those of the Mimulus, present sensitive flattened laminz, which close when touched. The stigma presents various forms. It may be globular, as in Mirabilis Jalapa ; orbicular, as in Arbutus Andrachne ; umbrella-like, as in Sarracenia, where, how- ever, the

proper stigmatic surface is beneath the angles of the large expansion of the apex of the style; ovoid, asin Fuchsia ; hemispherical ; polyhedral ; radiating, as in the Poppy (fig. 269), where the true stigmatic rays are attached to a sort of peltate or shield-like body, which may represent depressed or flattened styles ; cucullate, i.e, covered by a hood, in Calabar Bean, where it is situ- ated on the apex of a declinate style, bearded (hairy) on its concave surface The lobes of a stigma may be flat and pointed, as in Mimulus and Bignonia, fleshy and blunt, smooth or granular, or they may be feathery, as in many Grasses (fig. 213). In Orchidacew the stigma is situated on the anterior surface of the column formed by the union of the styles and filaments,—the point where it occurs being called gynizus. In Asclepiadaces the stigmas are united to the face of the anthers, and along with them form a solid mass (fig. 229).

Transformations of the pistil are of frequent occur- rence, and depend generally on abortion of a certain number of carpels, and on adhesions of various kinds. In the apocarpous pistils of Aconite, Nigella, Larkspur, and Peony, we find on the same plant pistils composed of two, three, four, five, and six carpels. In some of the Brambles, all the carpels except one have been observed to disappear, thus making the fruit resemble that of the Plum. In the case of Leguminous plants there is usually only a single carpel, although the flower is pentamerous; this state has been traced to abortion of car- pels, and the view is confirmed by finding plants in the same natural order with more than one carpel. _Pistils of a succu- lent nature, such as those of the Sloe and Bird-cherry, some- times assume the form of a pod, like that of the Pea. Occa-. sionally stamens are changed into carpels, and at other times the carpels are transformed into stamens, and bear pollen. The ovule is the body attached to the placenta, and destined to become the seed. Ovules are most usually produced on the margins of the carpellary leaves, but are also formed over the whole surface of the leaf, ag in Cupressus. In other instances they rise from the floral axis itself, either as terminal buds, as in Polygonacee and Piperacee, or as lateral buds, as in Primulacee and Composite. The ovule is usually contained in an ovary, and all plants in which the ovule is so enclosed are termed angiospermous; but in Coniferee and Cycadacez it is generally considered as having no proper ovarian covering, and is called naked, these orders being denominated gymno-

spermous ‘The gymnospermal view is not adopted by all botanists, some maintaining that there is a true ovarian

united in such a way as to leave an opening at the apex of the pistil, so that the ovules are exposed or seminude, as in Mignonette. In Leontice thalictroides (Blue Cohosh), species of Ophiopogon, Peliosanthes, and Stateria, the ovary ruptures immediately after flowering, and the ovules are exposed; and in species of Cuphea the placenta ultimately bursts through the ovary and corolla, and becomes erect, bearing the exposed ovules. The ovule is attached to the placenta either directly, when it is called sessdle, or by means of a prolongation called a funiculus, umbilical cord, or podosperm (fig. 270a, f). This cord sometimes becomes much elongated after fertilization. The part by which the ovule is attached to the placenta or cord is its base or hilum, the opposite extremity being its apex. The latter is frequently turned round in such a way as to approach the base. The ovule is sometimes embedded in the placenta, as in Hydnora.

Fig. 270. Fig. 2700. Fig. 271. Fig. 272.

Fig. 270.—Young ovule of Celandine (Chelidonium majus) before its coverings are developed. It consists of the nucleus. which at this stage of growth is naked. The base of the nucleus, where the nourishing vessels enter, is marked ch. This point is called the chalaza.

Fie. 270a.—The ovule of Polygonum, with its nucleus n, covered by the inner coat s, or the secundine, and the outer coat p, or the primine. The opening in the secundine, end, is called the endostome, that in the primine, ez, is the exo- stome. The point of the nucleus is seen projecting at the foramen, The end by which the ovule is attached to the placenta is marked /.

Fig. 271.—Orthotropous or orthotropal ovule of Polygonum, showing the embryo- sac s, in the nucleus », the different ovular coverings, the base of the nucleus or chalaza ch, and the apex of the ovule with its foramen m.

Fig. 272,—Vertical section of the ovule of the Austrian Pine (Pinus austriaca), showing the nucleus a, consisting of delicate cellular tissue containing deep in its substance an embryo-sac 6, formed before impregnation by the coales- cence of a vertical series of a few cells. The

micropyle m is very wide, and through it the pollen-grains come into contact with the summit of the nucleus, into the substance of which they send their tubes.

The ovule appears at first as a small cellular projection from the placenta. The cells multiply until they assume a more or less enlarged ovate form, constituting what has been called the nucleus (fig. 270, »), or central cellular mass of the ovule. The nucleus may remain naked, and alone form the ovule, as in Balanophoracez, Santalacee, &c.; but in most plants it becomes surrounded by certain coverings or integuments during its development. These appear first in the form of cellular rings at the base of the nucleus, which gradually spread over its surface. In some cases only one covering is formed, especially amongst gamopetalous Dicotyledons, as in Composite, Campanu- laceze, also in Walnut, &. But usually besides the single covering (fig. 270a, s) another is developed subsequently (fig. 270a, p), which gradually extends over that first formed, and ultimately covers it completely, except at the apex. There are thus two integuments to the nucleus, an outer and an inner, called respectively primine, p, and secundine, s,—the terms having reference to their position as regards the nucleus and not indicating the order of development. The name ¢ercine has been given to the outer layer of cells of the nucleus. The integuments do not completely invest the apex of the nucleus, but an opening termed the foramen or micropyle is left. This foramen in most ovules extends through both coats, the opening in the primine (fig. 270a, ex) being the exostome ; that in the secundine (fig. 270a, end) being the endostome. But in many Monocotyledons the exostome has no share in the formation of the micropyle. The micropyle indicates the organic apex of the ovule, The term micropyle is sometimes restricted to the foramen in the perfect seed. The size

which the ovule is produced, and the peltate scales, from which they are pendulous in Zamia, are regarded by all botanists as carpellary leaves. But in the Conifer great discussion has arisen regarding the morphology of parts in many genera ; some considering the scales at the base of the scaly bracts of the cone as a placental process growing from the bract, which is thus a

carpellary leaf opened out and bearing a sessile ovule, the whole cone representing a Single flower ; while others, again, regard the scale as an ovular integument, and the ovule as being destitute of ovary, the outer scales being bracts, and the cone therefore being an inflorescence. The carpellary leaves are sometimes

of the micropyle depends on the development of the nucleus, as well as on the thickness of the integuments. Where the integument is very thick and the nucleus small, the micropyle is a long canal, as in Hippuris ; but more usually the nucleus is large, and the integuments reduced to a few layers of cells, and in this case the micropyle is correspondingly reduced. The nucleus alters in the progress of growth so as to be prepared for the development of the embryo in its interior. A single cell of the nucleus near its centre enlarges greatly until it forms a hollow cavity surrounded by the smaller cells of the nucleus. This cavity is the embryo-sac (fig. 274, s), and the protoplasmic contents have been termed the amnios. This embryo-sac increases in size, gradually supplanting the surrounding cellular tissue of the nucleus until it remains surrounded only by a thin layer of it; or it may actually extend at the apex beyond it, as in Phaseolus and Alsine media ; or it may pass into the micropyle, as in Santalum. In Gymnosperms it usually remains deep in the nucleus and surrounded by a thick mass of cellular tissue (fig. 272). In Veronica, Euphrasia, and many Labiate, the neck of the embryo-sac becomes elongated and swollen, and from it are developed certain vermiform or filamentous append- ages, which are probably connected with the nutrition of the embryo. In some cases more than one embryo-sac is formed. This occurs in some gymnospermous plants, as the Yew, and it is also seen in Crucifere. In the Mistleto several sacs are formed, but it is doubtful whether in this case several ovules have not coalesced. Usually only one becomes fully developed. When the embryo-sac has reached a certain stage of growth, a development of cellular tissue takes place within it by free cell formation. This occurs in all gymnospermous plants, and constitutes what is known as the endosperm (fig. 280, 6). In angiospermous plants the endosperm is not formed until after fertilization, and it is rare to find any special development of cellular tissue within the embryo-sac before fertilization. But in some cases at the

base of the embryo-sac a few cells are formed, which have been termed antipodal cells, and are frequently afterwards absorbed, or may be incorporated in the true endosperm when it is formed. The further processes of growth in gymnospermous ovules on the one hand, and angiospermous ovules on the other, differ so much that they must be noted separately.

At the apex of the embryo-sac in gymnosperms, two or more cells of the endosperm enlarge so as to form what have been termed corpuscles (fig. 273). Each of these divides so as to form a large lower terminal or central cell, and an

¢ Benes A Mitta

Fig. 274.

Fig. 273. Fig. 275.

Fia. 273.—Vertical section of the embryo-saé 6, and of part of the nucleus a, of

the ovule of the Weymouth Pine (Pinus Strobus). At the micropylar end of the embryo-sac two cells, called corpuscles, d, have made their appearance. Each of these Is at first separated from the inner surface of the micropylar end of the sac by a single cell, which afterwards divides into four, leaving a pas- sage from the surface of the sac down to the corpuscle. The pollen-grain ¢, on the summit of the nucleus, then sends down a tube which perforates the embryo-sac, and reaches the corpuscle through the intercellular canal.

Fie. 274.—Diagram of ovule of Polygonum, showing the nucleus n, and the embryo-sac s, containing a vesicle or germinal cell ¢, formed before impreg- nation. This cell, after fertilization, develops the first cell e of the embryo. The dark shading at the base marks the chalaza. and the outer lines are the integument, the micropyle being opposite the chalaza.

Fig. 275.—Campylotropous or campylotropal-ovule of Wallflower (Cheiranthus), showlng the funiculus J, which attaches the ovule to the

placenta; p, the primine, s, the secundine, n, the nucleus, ch, the chalaza, The ovule is curved upon itself, so that the foramen is near the funiculus,

upper neck of smaller cells (stigmatic cells), appearing as four when viewed from above, enclosing a canal. From

the upper part of the central cell at the bottom of the neck, a small portion is separated—the canal cell. It is froma portion of the central cell that, after fertilization, the embryo is formed. Those parts all have great physiological importance in connection with fertilization. In angiosperms from the protoplasmic mass at the apex of the embryo-sac by free cell formation two (rarely one) elongated ovoid cells are produced. These are the germinal vesicles (fig, 274), In some angiosperms as Crocus, Maize, &c., the vesicles placed side by side are both equally elongated ; toa con siderable extent their lower ends are rounded, and there it is that the nucleus is found. The upper end projects into the micropyle, and is marked by distinct striz lonpi-tudinally. This porfion has been distinguished as ibs filiform apparatus. From the germinal vesicles after impregnation the embryo is formed, only one vesicle developing. This filiform apparatus is considered as ¢or-responding to the canal cell formed from the corpuscula in gymnosperms, and it seems to serve for conducting the impregnating influence to the lower part of the central cell, In most angiosperms the germinal vesicles are placed obliquely over each other—one attached to the apex of the sac, the other lower down, and there is no filiform apparatus, Of these two vesicles the lower one alone forms an embryo, the upper one performing the same function as the filiform apparatus of other angiosperms, and the canal cell of gymnosperms. The point where the integuments are united to the base of the nucleus is called the chalaza (fig. 278, ch). This is often coloured, is of a denser texture than the surrounding tissue, and is traversed by fibro-vasculat bundles, which pass from the placenta to nourish the ovule,

When the ovule is so developed that the point of union between the integuments and nucleus (the chalaza) is at the hilum (next the placenta), and the micropyle is at the opposite extremity, there being a short funiculus,

the ovule is orthotropal, orthotropous, or atropous. This form is well seen in Polygonaceze (fig. 271), Cistaceze, and most gymno- sperms. In such an ovule a straight line drawn from the hilum to the micropyle passes along the axis of the ovule, Where, by more rapid growth on one side than on the other, the nucleus, together with the integuments, is curved upon itself, so that the micropyle approaches the hilum, and ultimately is placed close to it, while the chalaza is at the hilum, the ovule is campylotropal or campylotropous (fig. 275) when the portions onthe two sides of the line bisect- ing the angle of curvature are unequal, or camptotropal when they are equal. Curved ovules are found in Leguminose, Cruciferze, and Caryophyllaces. Usually the opposite faces of the concavity of curvature of such ovules coalesce, and outwardly no indication of curvature is visible ; but in some cases there is no coalition, and the ovule is Jecotropal, or

Fig. 276. Figs, 276, 277.—Ovule of Chelidontum majus (cut longitudinally in fig. 277 to

Fig. 277.

Fig. 278.

show the relation of its different parts). A, hilum or umbilicus; ¢, chalaza ; J, funlculus or umbilical cord; #, raphe; n, nucleus; #, secundine; #e, primine; ed, endostome; e2, exostome,

Fig. 278.—Anatropous or anatropal ovule of Dandelion (Leontodon Taraxacum), showing the coats of the ovule surrounding the nucleus 7, which is inverted, so that its base ch, where the chalaza exists, is removed from the base or hilum of the ovule h, while the foramen / is near the base. The connection between the base of the ovule and the base of the nucleus at sis kept up by means of the raphe fr

horse-shoe shaped. ‘The inverted, anatropal, or anatropous ovule (figs. 276, 277, 278) is the commonest form amongst

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angiosperms. In this ovule the apex with the micropyle is turned towards the point of attachment of the funiculus to the placenta, the chalaza being situated at the opposite ex- tremity; and the funiculus, which runs along the side usually next the placenta, coalesces with the ovule and constitutes the raphe ®, which often forms a ridge. The anatropal ovule arises from the placenta as a straight or only slightly curved cellular process, and as it grows, gradually becomes inverted, curving from the point of origin of the integuments, As the first integument (secundine) grows round it, the amount of inversion increases, and the funiculus becomes adherent to the side of the nucleus. Then if a primine be formed it covers all the free part of the ovule, but does not form on the side to which the raphe is adherent. Some anatropal ovules, however, seem to be formed in a different manner, the nucleus arising as a lateral bud from the apex of the funiculus, as in some Composite. These may be taken as the three types of ovule in the vegetable kingdom ; but there are various intermediate forms, such as semt-anatropal, amphitropal, and heterotropal (transverse) ovules, where the funiculus is only, as it were, partially attached along one side, becoming free in the middle.

The position of the ovule relative to the ovary varies. When there is a single ovule, with its axis vertical, it may be attached to the placenta at the base of the ovary (basal placenta), and it is then erect, as in Polygonacez and Composite ; or it may be inserted a little above the base, on a parietal placenta, with its apex upwards, and then is ascending, a8 in Parietaria. It may hang from an apicilar placenta at the summit of the ovary, its apex being directed downwards, and is inverted or pendulous, as in Hippuris vulgaris; or from a parietal placenta near the summit, and then is suspended, as in Daphne Mezereum, Polygalaceze, and Euphorbiacee. Sometimes a long funi- culus arises from a basal placenta, reaches the summit of the ovary, and there bending over suspends the ovule, as in Armeria (Sea-pink) ; at other times the hilum appears to be in the middle, and the ovule becomes horizontal, peltate, or peritropous, When there are two ovules in the same cell, they may be either collateral, that is, placed side by side (fig. 257), or the one may be erect and the other inverted, as in some species of Spireea and Alsculus ; or they may be placed one above another, each directed similarly, as is the case in ovaries containing a moderate or definite number of ovules. Thus, in the ovary of Leguminous plants (fig. 256), the

ovules o, are attached to the extended marginal placenta, one above the other, forming usually two parallel rows corresponding to each margin of the carpel. When the ovules are definite (7.c., are uniform, and can be counted), it is usual to find their attachment so constant as to afford good characters for classification. When the ovules are very numerous (indefinite), while at the same time the placenta is not much developed, their position exhibits great variation, some being directed upwards, others downwards, others transversely ; and their form is altered by pressure into various polyhedral shapes. In such cases it frequently happens that some of the ovules are arrested in their development and become abortive.

‘The homology of the ovule is by no means the same in all plants. In such cases as Polygonum and Piperaceze, it represents the termination of the floral axis, and therefore is of the nature of a caulome. Again, in such plants as Primulacess and Composite, it is produced laterally upon the axis, and therefore represents a leaf, the integuments representing the lamina, and the funiculus the petiole,—the nucleus being an outgrowth from them. Insome instances of malformation a transformation into these parts actually

€s place. In cases where they are produced on the margin of the carpellary leaves (the usual mode), the ovules represent lobes of a leaf, and in some cases of monstrosity,

FERTILIZATION. |

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as in Delphinium elatum, they appear as lobes of the carpellary leaf, whilst in Cupressus they are evidently outgrowths of the leaf. Further, the ovules in Orchidacess must be considered as mere trichomes, as they have no fibro-vascular bundles, and are developed from superficial cells of the placenta,

When the pistil has reached a certain stage in growth it Fertiliza- Pollination having been tion.

becomes ready for fertilization. effected, and the pollen-grain having reached the stigma in angiosperms, the summit of the nucleus in

gymnosperms, it is detained there, and the viscid secretion from the glands of the stigma in the former case, and the moisture from the ovule in the latter, induce the protrusion of the intine as a pollen-tube through the pores or points of perforation of the grain, many or few tubes being formed according to the number of pores. The pollen-tube or tubes pass down the canal (fig. 279), through the conducting tissue of the style when present, and reach the interior of the ovary in angiosperms, and then pass to the micropyle of the ovule, one pollen-tube going to each ovule, Sometimes the micropyle lies close to the base of the style, and then the pollen-tube enters it at once, but frequently it has to pass

pstig

Fig, 279.

Fig. 279.—Pistil and pollen of Polygonum 1 Stigma, stig, with pollen-grains p adherent to it, sending tubes tp down the conducting tissue of the style stl; the ovary o containing the ovule with its covering and central cellular mass or nucleus n, containing a rudimentary embryo-sac ve, in which ultimately the embryo is developed, The base of the ovule attached to the placenta is marked by the chalaza ch. 2. Pollen-grain , separated, with pollen-tube tp.

Fie. 280.—Vertical section of the ovule of the Scotch Fir (Pinus sylvestris) in May of the second year, showing the enlarged embryo-sac 8, full of endospermal cells, and pollen-tubes c, penetrating the summit of the nucleus after the pollen has entered the large micropyle of the oyule,

some distance into the ovary, being guided in its direc- tion by various contrivances, as hairs, grooves, &e. In gymnosperms the pollen-grain resting on the apex of the nucleus sends out its pollen-tubes, which at once penetrate the nucleus of the ovule (fig. 280). In angiosperms when the pollen-tube reaches the micropyle it passes down into the canal, and this portion of it increases considerably in size. Where, as in Santalum album, Crocus, é&c., there is a filiform apparatus, the pollen-tube comes in contact with it. In most cases, however, it reaches the apex of the embryo-sac, sometimes slightly indenting it, asin Narcissus poeticus and Digitalis purpurea, or even perforating it, as in Canna. The granular protoplasmic

matter in the pollen (fovilla) is then transmitted to the embryonal vesicle and fertilization is effected. Consequent upon this, after a longer or shorter period, those changes commence in the embryonal vesicle which result in the formation of the embryo plant, the ovule also undergoing changes which convert it into the seed, and fit it for a protective covering, and a store of nutri- ment for the embryo. Nor are the effects of fertilization confined to the ovule ; they extend to other parts of the plant. The ovary enlarges, and, with the seeds enclosed, constitutes

Fruit.

the fruit, frequently incorporated with which are other parts of the flower, as receptacle, calyx, &c. In gymnosperms the pollen-tubes, having penetrated a certain distance down the tissue of the nucleus, are usually arrested in growth for a longer or shorter period, sometimes nearly a year. Subsequently growth recommences ; the tube advances to the apex of the embryo-sac, which it pierces, and reaches the mouth of the canal of the corpuscle. It either descends the canal or remains attached at the mouth. The fovilla is transmitted to the central cell, and fertilization is complete, the central cell giving rise to the embryo. In angio- sperms usually only one embryonal vesicle is fertilized, and one embryo is produced—monoembryony ; but in some plants where many embryonal vesicles are formed, as in Citrus and Scabiosa, several of them may be fertilized, and thus many embryos produced—polyembryony. Usually, however, only one develops, so as to be capable of ger- mination or growth. In gymnosperms it is very com- mon to have polyembryony, although produced in a dif- erent way, for each central cell of a corpuscle may produce four embryos, and as the central cell of more than one corpuscle may be fertilized a great many embryos may be formed. They do not, however, all come to maturity.

4, Female Organs of Phanerogams after Fertilization.

a.—The Fruit.

After fertilization various changes take place in the parts of the flower. Those more immediately concerned in the process, the anther and stigma,

rapidly wither and decay, while the filaments and style often remain for some time ; the floral envelopes become dry, the petals fall, and the sepals are either deciduous, or remain persistent in an altered form; the ovary becomes enlarged, forming the pericarp ; and the ovules are developed as the seeds, con- taining the embryo-plant. The term fruit is strictly applied to the mature pistil or ovary, with the seeds in its interior. But it often includes other parts of the flower, such as the bracts and floral envelopes. Thus the fruit of the Hazel and Oak consists of the ovary and bracts and calyx combined ; that of the Apple, Pear, and Gooseberry, of the ovary and calyx; and that of the Pine-apple, of the ovaries and floral envelopes of several flowers combined. Such fruits are by some distinguished as psewdocarps. In popular language, the fruit includes all those parts which exhibit a striking change as the result of fertilization. In general, the fruit is not ripened unless fertilization has been effected; but cases occur in which the fruit swells, and becomes to all appearance perfect, while no seeds are produced. ‘Thus, there are seedless Oranges, Grapes, and Pine-Apples. When the ovules are unfertilized, it is common to find that the ovary withers and does not come to maturity ; but in the case of Bananas, Plantains, and Bread- fruit, the non-development of seeds seems to lead to a larger growth, and a greater succulence of fruit.

The fruit, like the ovary, may be formed of a single carpel, or of several. It may have one cell or cavity, being unilocular; or many, multilocular, &c. The num- ber and nature of the divisions depend on the number of carpels, and the extent to which their edges are folded inwards. The appearances presented by the ovary do not always remain permanent in the fruit. Great changes are observed to take place, not merely as regards the increased size of the ovary, its softening and harden- ing, but also in its internal structure, owing to the sup- pression, additional formation, or enlargement of parts. Thus, in the Ash (fig. 281) an ovary with two cells, each containing an ovule attached to a central placenta, is changed into a unilocular fruit with one seed; one ovule, ?, becoming abortive, while the other, g, gradually enlarging until the septum is pushed to one side, unites

with the walls of the cell, and the placeuta appears to be parietal. In the Oak and Hazel, an ovary with three cells, and two ovules in each, changes into a one-celled fruit with one seed. In the Coco-nut, a trilocular and triovular

ovary is changed into a one-celled, one-seeded fruit. This abortion may depend on the pressure caused by the development of certain ovules, or it may proceed from non fertilization of all the ovules and consequent non-enlarge ment of the carpels. Again, by the growth of the placenta, or the folding inwards of parts of the carpels, divisions occur in the fruit which did not exist in the ovary. Th Pretrea zanzibarica, a one-celled ovary is changed into a four-celled fruit by the extension of the placenta. In Cathartocarpus Fistula a one-celled ovary is changed into a fruit, having each of its seeds in a separate cell, in consequence of spurious dissepiments (phragmata) being produced in a horizontal manner, from the inner wall of the ovary. In Linum, by the folding inwards of the

Fig. 281.

Fria. 281.—Samara or Samaroid fruit of Frexinus oxyphylla, 1 Entire, with its wing a. 2. Lower portion cut transversely, to show that it consists of two loculaments; one of which, /, is abortive, and is reduced to a very small cavity, while the other is much enlarged, and filled with a seed g,

Fic. 282.—Drupe of the Cherry (Cerasus), cut vertically, showing the skin, or epicarp ep, the flesh or mesocarp me, and the stone, putamen, or endovarp én, enclosing the seed g, with the embryo.

back of the carpels a five-celled ovary becomes a ten-

celled fruit. In Astragalus, the folding inwards of the

dorsal suture converts a one-celled ovary into a two- celled fruit ; and in Oxytropis the folding of the ventral suture gives rise to a similar change in the fruit. The development of cellular or pulpy matter, and the en largement of parts not forming whorls of the flower, frequently alter the appearance of the fruit, and render it difficult to discover its formation. In the Gooseberry,

Grape, Guava, Tomato, and Pomegranate, the seeds nestle

in pulp, formed apparently by the placentas. In the

Orange, the pulpy matter surrounding the seeds is formed

by succulent cells, which are produced from the inner

partitioned lining of the pericarp. In the Strawberry the receptacle becomes succulent, and bears the carpels on its convex surface (fig. 154); in the Rose there isa fleshy hollow torus or disk, which bears the carpels on its concave surface

(fig. 155). In the Juniper the scaly bracts grow up round

the seeds and become succulent, and in the Fig (fig. 150) the

receptacle becomes succulent and encloses an inflorescence.

The pistil, in its simplest state, consists of a carpel or

folded leaf, with ovules at its margin ; and the same struc ture will be found in the fruit, where the pericarp represents the carpellary leaf, and the seeds correspond to the ovules. The pericarp consists usually of three layers, the external, or epicarp (fig. 282, ep), corresponding to the lower ep dermis of the leaf ; the middle, or mesocarp, me, representing the parenchyma of the leaf ; and the internal, or endocarp, en, equivalent to the upper epidermis of the leaf, or the epithelium of the ovary. These layers are well seen in suc

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a fruit as the Peach or Plum, where they are separable one from the other; in them the epicarp forms what is commonly called the skin; the mesocarp, much developed, forms the flesh or pulp, and hence has sometimes been called sarcocarp; while the endocarp, hardened by the production of woody cells, forms the stone or putamen, immediately covering the kernel of the seed. The pulpy matter found in the interior of fruits, such as the Gooseberry, Grape, and Cathartocarpus Fistula, is formed from the placentas, and must not be con- founded with the sarcocarp. In some fruits,

as in the Nut, the three layers become blended together, and are indistinguishable. In Bladder Senna (Colutea arborescens) the pericarp retains its leaf-like appearance, but in most cascs it becomes altered both in consistence and in colour. Thus in the Date the epicarp is the outer brownish skin, the pulpy niatter is the mesocarp or sarcocarp, and the thin papery-like lining is the endocarp covering the hard seed. Tn the Medlar the endocarp becomes of a stony hardness. Inthe Melon the epicarp and endocarp are very thin, while the mesocarp forms the bulk of the fruit, differing in texture and taste in its external and internal parts. The rind of the Orange consists of epicarp and mesocarp, while the endocarp forms partitions in the interior, filled with pulpy cells. The part of the pericarp attached to the peduncle is called its base, and the point where the style or stigma existed isthe apex. This latter is not always the apparent apex, as in the case of the ovary ; it may be lateral or even basilar, The style sometimes remains in a hardened form, rendering the fruit apiculate ; at other times it falls off, leaving only traces of its existence. The presence of the style or stigma serves to distinguish certain single- seeded pericarps from seeds.

When the fruit is mature and the contained seeds ripe, the carpels usually give way either at the ventral or dorsal suture or at both, and so allow the seeds to escape. The fruit in this case is dehiscent. But some fruits are indehiscent, falling to the ground entire, and the seeds eventually reaching the soil bytheir decay. Bydehascence the pericarp becomes divided into different pieces, or valves, the fruit being wnivalvular, bivalvular, or multivalvular, &c., according as there are one, two, or many valves. The splitting may extend the whole length of the fruit, or it may be only partial, the valves forming teeth at the apex of the fruit, and the dehiscence being aprcilar, as in Caryophyllacee (fig. 283). Sometimes the valves are detached only at certain points, and thus dehiscence takes

. place by pores at the apex, as in Poppy (fig. 269), or at

the base, as in Campanula. Indehiscent fruits are either dry, as the Nut, or fleshy, as the Cherry and Apple. They may be formed of one or several carpels. In the former case they usually contain only a single seed, which may become so incorporated with the pericarp as to appear to be naked. Such fruits are called pseudospermous or false- seeded, and are exemplified

in the grain of Wheat. In such cases the presence of the style or stigma determines their true nature.

Dehiscent fruits, when composed of single carpels, may open by the ventral suture ouly, as in the Peony, Hellebore, Aquilegia (fig. 300), and Caltha; by the dorsal suture only, as in Magnolias and some Proteacez, or by both together, as in the Pea (fig. 256) and Bean ; in these cases the dehiscence is called sutwral. When composed of several united carpels, two types of dehiscence may be recognized —a Jongitudinal type and a transverse type. In the longitudinal type the separation may take place by the dissepiments throughout their length, so that the fruit is resolved into its original carpels, and each valve will be a carpel, as in Rhododendron, Colchicum, &ec. This dehiscence, in consequence of taking place through the lamellae of the septum, is called septiccdal (figs. 284, 285).

The valves may separate from their commissure, or central line of union, carrying the placentas with them, or they may leave the latter in the centre, so as to form with the

Fig. 285. Fig. 287. Fig. 288.

Fie. 283.—Seed-vessel or capsule of Campion (Lychnis), opening by ten teeth at the apex. The placenta is free central. The calyx is seen surrounding the secd-vessel, but not adherent.

Fig, 284.—Fruit or capsule of Meadow Saffron (Colchicum autumnale), dehiscing by three valves in a septicidal manner. The fruit is thus resolved into its three component carpels, with their styles and stigmas.

Fig. 285.—Diagram to illustrate the septicidal dehiscence in a pentalocular capsule. The loculaments J correspond to the number of the carpels, which separate by splitting through the septa s.

Fic. 286.—The seed vessel (capsule) of the Flower-de-Luce (Jris), opening ina loculicidal manner. The three valves bear the septa in the centre, and the opening takes place through the back of the loculaments. Each valve is formed by the halves of contiguous carpels.

Fic. 287.—Diagram to illustrate loculicidal dehiscence. The loculaments J, split at the back, and the valves separate, bearing the septa s on their centres.

Frq. 288.—Diagram to illustrate septifragal dehiscence, in which the dehiscence takes place through the back of the loculamerits 7, and the valves separate from the septa s, which are left attached to the placentas in the centre.

axis a column of a cylindrical, conical, or prismatic shape, which is termed the colwmella. The union between the edges of the carpels may be persistent, and they may dehisce by the dorsal suture, or through the back of the loculaments, as in the Lily and Iris (figs. 286, 287). In these cases each valve consists of a half of each of two contiguous carpels. The placentas either remain united to the axis, or they separate from it, being attached to the septa on the valves, This dehiscence is loculicidal. When the outer walls of the carpels break off from the septa, leaving them attached to the columella, the dehiscence is said to be septifragal (fig. 288), and where, as in Linum catharticum and Calluna, the splitting takes place first of all in a septicidal manner, the fruit is described as septicidally septifragal ; while in other cases, as in Thorn Apple (Datura Stramonium), where the splitting is at first loculicidal, the dehiscence is loculicidally septifragal. In all those forms the separation of the valves takes place either from above downwards or from below upwards. But when the splitting only extends for a short distance, then dehiscence takes place by pores, which are situated either at the apex, base, or side, depending on the position of the valves. In the

Poppy (fig. 269) the opening takes place by numerous plate I.

pores under the peltate processes bearing the stigmas. In Campanula there are irregular openings towards the middle or base of the pericarp. In Frogsmouth or Snapdragon the pericarp gives way at certain fixed points, forming two or three orifices, one of which corresponds to the upper carpel,

and the other to the lower. These orifices have a ragged appearance at the margins, which has given rise to the term rupturing, sometimes applied to this mode of

Plate III. fig. 6.

dehiscence. In Saxifraga a splitting for a short distance of the ventral sutures of the carpels takes place, so that a single large apical pore is formed. In Caryophyllacez (fig. 283) numerous small valvular splittings occur, forming teeth at the apex, and a single apical orifice is formed. In the fruit of Crucifere, as Wallflower, there is a form of longitudinal dehiscence (fig. 289) in which the valves separate from the base of the fruit, leaving a central replum, or frame, which is a phragma formed by a prolongation from the parietal placentas on opposite sides of the fruit, extending between the ventral sutures of the carpels. In Orchidacez (fig. 290) the pericarp, when ripe, separates into three valves, in a loculicidal manner, but the midribs of the carpels, to which the placentas are attached, remain adherent to the axis both at the apex and base, and form three arches, bearing the seeds, after the valves have fallen. In fruits with a free central placenta it is sometimes difficult to tell whether the dehiscence is septicidal or loculicidal, inasmuch as there are no dissepiments, and the placentas and seeds form a column in the axis. Their number, as well as alternation or opposition, as compared with the sepals, will aid in determining whether the valves are the entire carpellary leaves, as in septicidal dehiscence, or only half carpels united, as in loculicidal dehiscence. The other type of dehiscence is transverse, the dehiscence in this case being called circumscissile. In this dehiscence the upper part of the united carpels falls off in the form of a lid or operculum, as in Anagallis and in Henbane (Hyoscyamus) (fig. 291), and hence the fruit is often denominated operculate. In such instances we may either suppose that the fruit or seed-vessel is formed by a number of articulated leaves like those of the Orange, the division taking place where the lamine join the petioles, or that the receptacle is prolonged in the form of a hollow cup, and the lid represents leaves united to it by articulation.

Fig, 292.

kira. 289.—Siliqua or seed-vessel of Wallflower (Cheiranthus Chetri), opening by two valves, which separate from the base upwards, leaving the seeds attached to the placentas in the middle, with a replum between.

Fria. 290.—-Seed-vessel of an Orchid (Orchis), opening by three valves v v v, which

bear the placentas and seeds in their middle. The midribs of the carpels remain united at the base and apex, and the withered floral envelopes e are seen attached at the apex.

Fia. 291.—Seed-vessel of Henbane (Hyoscyamus niger), opening b scissile dehiscence. The upper part of the seed-vessel comes off in the form of & lid, and the capsule haa been on this account called pyxis or pyxidium.

Fie. 292.—-The fruit of the Fennel (Feniculum vulgare), arrived at maturity. It

separates into two cocci or achenia, each of which is marked with obtuse' prominent ridges on the surface, and is suspended from the summit of a process

of the axis (columella), called a carpophore.

Fie. 293.—Lomentum or lomentaceous legume of a species of Sainfoin (edysarum). Each seed is contained in a separate cavity by the folding inwards of the walls of the legume at equal intervals; and the legume, when

ripe, separates transyerely into single-seeded portions or mericarps.

Sometimes the axis is prolonged beyond the base of the carpels, as in the Mallow and Castor-oil plant, the carpels

being united to it throughout their length by their and separating from it without opening. In the

faces,

Umbelliferee the two carpels separate from the lower part of the axis, and remain attached by their apices to a

circum-

prolongation of it, called a carpophore or podocarp, which splits into two (fig. 292) and suspends them ; hence the name cremocarp is applied to this fruit, which divides into two suspended mericarps. The general term schizocarp ig applied to all dry fruits, which break up into two or more one-seeded indehiscent mericarps, as in Hedysarum (fig, 293). In Geraniaces the axis is prolonged beyond the carpels, forming a carpophore,’ to which the styles are attached, and the pericarps separate from below upwards, before dehiscing by their ventral suture (fig. 152), Carpels which separate one from another in this manner are called cocct.

They are well seen in Euphorbiaceee, where there are Pla

usually three such carpels, and the fruit is designated {s.7

tricoccous. In many of them, as Hura crepitans, the coca separate with great force and elasticity, the cells being called dissilient. In many Leguminous plants, such as Ornitho Hedysarum (fig. 293), Entada, Coronilla, andthe Gum-arabic plant (Acacia arabica), the fruit becomes a schizocarp by the formation of transverse partitions from the folding in of the sides of the pericarp, and distinct separations taking place at these partitions by what has been’ termed solubility, In Cathartocarpus Fistula the schizocarp exhibits no evident depressions externally. Some look upon these pods as formed by pinnate leaves folded, and the divisions as indicating the points where the differént pairs of pinne are united.

Fruits may be formed by one flower, or they may be the product of several flowers combined. In the former case they are either apocarpous, of one mature carpel or of several separate free carpels; or syncarpous, of several earpels, more or less completely united. These different kinds of fruits may

be indehiscent or dehiscent. When the fruit is composed of the ovaries of several flowers united, itis usual to find the bracts and floral envelopes also joined with them, so as to form one mass; hence such fruits are called multiple, confluent, or anthocarpous. The term simple is perhaps properly applied to fruits which are formed by the ovary of a single flower, whether they are composed of one or several carpels, and whether these carpels are separate or

Fig. 295.

Fig. 296,

Fig. 294.—Fruit of a specics of Dock (Rumex), cut vertically. It is a mono-spermous indehiscent dry fruit, called an achene, or achenium. The outer part, ov, is the pericarp or seed-vessel containing the seed, with its coverings The seed contains nourishing matter, called albumen or perisperm ald, and the embryo plant pl, with its cotyledons pointing downwards, and its radicle

upwards. The seed is orthotropal, and the embryo is inverted, At the upper part of the pericarp two of the styles and stigmas are seen curving downwards. At the base part of the perianth is represented. 1

Fi@, 295—Achsenium of Crowfoot (Ranunculus), A single-secded seed-vessel, with the pericarp applied closely to the secd. Such fruits resemble seed in appearance; the style and stigma s aid in distinguishing them, .

Fic. 296.—Seed-vessel of Acer Pseudo-platanus (Sycamore, called Plane in Sco land), composed of two samaras or winged monospermous carpels united; 4, upper part forming a dorsal wing; J, lower portion corresponding to the loculaments,

combined. Simple fruits are hence sometimes denominated monogynecial, as being formed by one gyncecium; while multiple fruits are called poiygynecial, as being forn by many gyncecia.

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FORMS OF FRUIT. |

Simple fruits are either dry or succulent,—the pericarp, in the former instance, remaining more or less foliaceous in its structure, and sometimes being incorporated with the seed, while it is in the latter thick and fleshy or pulpy.

of The acheentwm is a dry unilocular monospermous inde- “hiscent fruit, the pericarp of which is closely applied to the seed, but separable from it. It may be solitary, forming a single fruit, as in the Dock (fig. 294), and in the

y) Cashew, where it is supported on a fleshy peduncle; or aggregate, a8 in Rununculus (figs. 254, 295), where several achenia are placed on a common elevated receptacle. In ‘the Strawberry the achenia (fig. 154) are aggregated on @ convex succulent receptacle. In the Rose they are supported on a concave receptacle (fig. 155), and in the Fig the succulent receptacle completely encloses the achenes (fig. 150). In Dorstenia (fig. 163) the achenes are situated

on a flat or slightly concave receptacle. In the Rose the aggregate achzenia with their covering are sometimes col- lectively called cynarrhodum. It will thus be remarked

_ that what in common language are called the seeds of the Strawberry, Rose, and Fig, are in reality carpels, which are distinguished from seeds by the presence of styles and stigmas, The styles occasionally remain attached to the achenia, in the form of feathery appendages, as in Clematis, and they are called caudate. In Composite, the fruit, 1x’ which is sometimes called cypsela, is an acheenium (fig. 197), to which the pappose or obsolete calyx remains ad- herent. Such is also the nature of the fruit in Dipsacacez. When

the pericarp is thin, and appears like a bladder surrounding the seed, the achzenium is termed a utricle, _as in Amarantacee. When the pericarp is extended in the form of a winged appendage, a samara or samaroid achenium is produced, as in the Ash (fig. 281), Common Sycamore (fig. 296), and Hireea. In these cases there are

_ usually two achzenia united, one of which, however, as in

_ Fraxinus oxyphylla (fig. 281), may be abortive. The wing _is either dorsal, that is, it is a prolongation from the median vein (fig. 296, a) or it is marginal, that is, formed by the lateral veins, It surrounds the fruit longitudinally in the Elm. When the pericarp becomes so incorporated with the seed as to be inseparable from it, as in grains of Wheat, Maize, Oats (fig. 297), and other Grasses, then the name

| Fig, 297, . Fra, 297,

Fig. 299. : —Caryopsls or single-seeded prain of Oats (Avena). The fruit and seed the es pg The pericarp o bears the styles and stigmas, and encloses cad $, with its albumen, or perisperm, a, and its embryo, consisting of the fia be ¢, the gemmule g, and the root r. &. 298.—Calyx and fruit of Comfrey (Symphytum), cut vertically. The fruit is

Fig, 298,

pet by the folding of the ovary into four single-secded portions or acheenia, which are seen in the figure, and the style appears to arise from the base

. “re turned inwards. The calyx tube is adherent to the fruit, and the imb of the calyx is often obsolete. ¥

ie 18 given, There are some fruits which consist of || “Wo or more achzenia, although originally the carpels were ite Into a syncarpous pistil, as in Labiate and m5 ee (fig. 298). To this form of schizocarpic fruit,

|°S Well as to that of Tropwolum and Mallow, the name

BOTANY

carcerulus is given. The cremocarp, or the fruit of °

Umbelliferee (figs. 292 and 299), is composed of two acheenia Plate VIT.

united by a commissure to a carpophore, from which they are suspended at maturity. It is sometimes denominated diachenium, from the union of two achenia, which in this instance receive the name of mericarps or hemicarps.

The nut or glans is a dry one-celled indehiscent fruit with a hardened pericarp, surrounded by bracts at the base, and, when mature, containing only oneseed. In the young state the ovary contains two or more ovules, but only one comes to maturity. It is illustrated by the fruits of the Hazel and Chestnut, which are covered by leafy bracts, in the form of a husk, and by the Acorn, in which the bracts and receptacle form a cupula or cup (fig. 147). The parts of the pericarp of the nut are united so as to appear one. In common language the term nut is very vaguely applied both to fruit and seeds.

The drupe is a succulent usually monospermal and unilocular indehiscent fruit, with a pericarp easily distin- guishable into epicarp, mesocarp, and endocarp. This term

is applied to such fruits as the Cherry (fig. 282), Peach, Plate XII.

Plum, Apricot, Mango, Walnut, Nutmeg, and Date. The endocarp is usually hard, forming the stone (putamen) of the fruit, which encloses the kernel or seed. The mesocarp is generally pulpy and succulent, so as to be truly a sarco- carp, as in the Peach, but it is sometimes of a tough tex- ture, as in the Almond, and at other times is more or less fibrous, as in the Coco-nut. Inthe Almond there are often two ovules formed, only one of which comes to perfection. In the Walnut, prolongations from the endocarp, which is of two layers, extend into the substance of the seed, and give rise to its characteristic convoluted lobate appearance. This fruit has been sometimes called tryma. In the Rasp- berry and Bramble several drupes or drupels are aggregated so as to constitute an eterio.

The follicle is a dry monocarpellary unilocular polyspermal (many-seeded) fruit, dehiscing by the ventral suture. It is rare to meet with a solitary follicle forming the fruit. There are usually several aggregated together, either in a circular manner on a shortened receptacle, as in Hellebore, Aconite, Delphinium, Aquilegia (figs. 300, 301) Crassulacese (fig. 172), Butomus, and Asclepiadacese; or in a spiral manner on an elongated receptacle, as in' Magnolia, Banksia, and Liriodendron. Occasionally, follicles dehisce by the dorsal suture, as in Magnolia grandiflora and Banksia.

The legume or pod is a dry monocarpellary unilocular poly-

spermal fruit, dehiscing both by the ventral and the dorsal Plate V., . It characterises Leguminous plants, as the Bean 98 ?-

suture. and Pea (fig. 256). In the Bladder-senna it retains its leaf-like appearance, and forms an inflated legume. In some Leguminosx, as Arachis, Cathartocarpus Fistula, and the Tamarind, the fruit must be considered a legume, although it does not dehisce. The first of these plants pro- duces its fruit underground, and is called earth-nut; the second has a partitioned legume and is schizocarpic; and both the second and third have pulpy matter surrounding the seeds. Some legumes are schizocarpic by the formation of constrictions externally. Such a form is the lomentum or lomentaceous legume of Hedysarum coronarium (fig. 298), Coronilla, Ornithopus, Entada, and of some Acacias. In Medicago the legume is twisted like a snail, and in Cesal- pinia coriaria, or Divi-divi, it is vermiform or curved like a worm; in Carmichaelia the valves give way close to the suture, and separate from it, leaving a division. Sometimes the number of seeds is reduced, as in Erythrina monosperma and Geoffroya superba, which are one-seeded, and in Ptero- carpus and Dalbergia, which are two-seeded,

The berry (bacca) is a succulent syncarpous polyspermal unilocular indehiscent fruit, with seeds immersed in a pulpy

Plate VI.

mass, formed by the placentas. The name is usually given to such fruits as the Gooscberry (fig. 302) and Currant, 1n which the ovary is inferior, and the placentas are parietal,

the seeds being ultimately detached from the placenta, and

Fig. 301.

Fra. 300.—Follicle of Columbine (4 quilegia vulgaris), consisting of a polyspermal carpel, opening by the ventral suture. at) c £4

Fre. 301.—Apocarpous fruit of Columbine (Agutlegia vulgaris), consisting of five separate mature carpels, with styles and stigmas. ,

Fre. 302,.—Fruit of the Gooseberry (Zibes Grossularia), cut vertically, showing the seeds attached to parietal placentas, and immersed in pulpy matter, which is formed partly from the endocarp and partly from the testa of the seed. The fruit is called a bacca.

Fre. 303.—Section of the fruit of the Apple (Pyrus Malus), consisting of a fleshy covering partly formed by the calyx and disk, and five cavities in the centre with sceds. The fruit is called a pome.

lying loose in the pulp. Others have applied it also to those in which the ovary is superior, as in the Grape, Potato, and Ardisia, and the placentas are central or free central. The latter are frequently separated under the name wa (grape). In general, the name of baccate or berried is applied to all pulpy fruits. In the Pomegranate there isa peculiar baccate many-celled inferior fruit, having a tough rind, enclosing two rows of carpels placed one above the other. The seeds are immersed in pulp, and are attached irregularly to the parietes, base, and centre of the loculi. The fruit has been called balausta, and the tough rind is called malicorium. In the Baobab there is a multilocular syncarpous fruit, in which the seeds are immersed in pulp, to which the name amphisarca 1s given.

The pepo or peponida, another indehiscent syncarpous fruit, is illustrated by the fruit of the Gourd, Melon (fig. 262), and other Cucurbitacex. It is formed of three carpels, to which the calyx is superior ; the rind is thick and

fleshy, partly formed by the calyx; and there are three or more seed-bearing parietal placentas, either surrounding a central cavity, or prolonged inwards into it. The fruit of the Papaw resembles the pepo, but the calyx is not superior.

The hesperidium is the name given to such indehiscent syncarpous fruits as the Orange, Lemon, and Shaddock, in which the epicarp and mesocarp form a separable rind, and the endocarp sends prolongations inwards, forming triangular divisions, to the inner angle of which the seeds are attached, pulpy cells being developed around them. Both pepo and hesperidium may be considered as modifica- tions of the berry.

The pome, scen in the Apple, Pear, Quince, Medlar, and Hawthorn, is a fleshy indehiscent syncarpous fruit with the calyx attached, and has an outer skin or epicarp, a fleshy mesocarp, and a scaly or horny endocarp (the core) enclosing the seeds (fig. 303). Some look upon the so-called epicarp and mesocarp as formed by the prolonged receptacle on the inner surface of which a fleshy lining is developed, while the endocarp represents the true carpels. In this view the endocarp might be regarded as consisting of a number of

indehiscent follicles (usually five) surrounded by a succulent receptacle.

In the Medlar the endocarp (or what may be |

called the true pericarp) is of a stony hardness, while the outer succulent covering is open at the summit. The stones of the Medlar are called pyrene ; some apply the term nuculanium to the Medlar. Taking this view of the pome it may be said to resemble in a manner the fruit of the Rose, the cynarrhodum producing achenes, and the pome closed follicles.

The name capsule is applied generally to all dry syn- Pi carpous fruits, which dehisce by valves of whatever kind, fi It may thus be unilocular or multilocular, monospermous r or polyspermous. The true valvular capsule

is observed in Colchicum (fig. 284), Lily, and Iris (fig. 286). The porose capsule is seenin the Poppy (fig. 269}, Antirrhinum majus, P and Campanula persicifolia. In Campanula the pores | occur at the base of the capsule, and it has been designated — a diplotegia. When the capsule opens by a lid, or by | circumscissile dehiscence, it is called a py«idiwm, as in Anagallis arvensis, Henbane (fig. 291), and Monkey pot | (Lecythis). The capsule assumes a screw-like form in Helicteres, and a star-like or stellate form in Tlicium © anisatum. In certain instances the cells of the capsule separate from each other, and open with elasticity to scatter the seeds. This kind of capsule is met with in the Sandbox tree (Hura crepitans), and other Euphorbiacea, 1 where the cocci, containing each a single seed, burst asunder '| with force; and in Geraniaceze, where the cocci, each con- | taining, when mature, usually one seed, separate from the — carpophore, become curved upwards by their adherent styles, and open by the ventral suture (fig. 152). In the former case the fruit collectively has been called regma.,

Fig. 807.

Fig. 304. Fig. 304.—Compound ovary (siliqua) of Wallflower (Chetranthus), consisting of at least two carpels united. One valve has been removed to show the partition

Fig. 306.

or replum cl, formed of a double layer from the placente cn on either side, tc which the ovules ov are attached by means of funiculi. The style and stigm: s are at the upper part of the ovary.

Fic. 305.—Silicula of Whitlow-grass (Draba), opening by two flat valves 0 from below upwards, leaving the parietal placentas pi in the centre, united by ¢ membrane or replum. The partition of the seed-vessel is broad, and henect the name latisepte.

Fig. 306,—Silicula or pouch of Shepherd's purse (Capsella), opening by two folde: valves, which separate from below upwards. The phragma is narrow, and hene' the name angustisepte.

Fic. 307—Fruit of the Pine-apple (Ananassa sativa), consisting of numerou flowers and bracts united together so as to form a collective or anthocarpou fruit. The crown of the Pine-apple, ¢, consists of a series of empty bract prolonged beyond the fruit.

The siligua is a dry syncarpous bicarpellary bilocula polyspermal fruit with a replum, dehiscing by two valve from below upwards, the valves separating from th placentas and leaving them united by the replum. Th seeds are attached on both sides of the replum, either! one row or in two. When the fruit is long and narrow}

}> XIV.

I ae al

+5 called siliqua (fig. 304); when broad and short, it is called silicula (figs. 305, 306). It occurs in Cruciferous plants, as Wallflower, Cabbage, and Cress. In Glaucium and Eschscholtzia (Papaveraceous plants) the fruit is silique- form, the dissepiment or replum being of a spongy nature, and it has been termed a ceratiwm. In its normal state a siliqua is supposed to consist of four carpels, but two of these are abortive. There are four bundles of vessels in it, one corresponding to each valve which may be called valvular or pericarpial, and others running along the edge called placental. The replum consists of two lamellz. It some- times exhibits perforations, becoming fenestrate. Rarely its central portion is absorbed, so that the fruit becomes onecelled. It may become lJomentaceous, as in Raphanus and Sea-kale, and it may be reduced, as in Woad (Isatis), to a monospermal condition.

It sometimes happens that the ovaries of two flowers unite so as to form a double fruit. This may be seen in many species of Honeysuckle. But the fruits which are now to be considered consist usually of the floral envelopes, as well as the ovaries of several flowers united into one, and are called multiple, confluent, or polygynecial. The term anthocarpous has also been applied as indicating that the floral envelopes as well as the carpels are concerned in the formation of the fruit.

The sorosis is a succulent multiple fruit formed by the confluence of a spike of flowers, as in the fruit of the Pineapple (fig. 307), the Bread-fruit, and Jack-fruit. Sometimes a fruit of this kind resembles that formed by a single flower, and a superficial observer might have some difficulty in marking the difference.

The syconus is an anthocarpous fruit, in which the recep- tacle completely encloses numerous flowers and becomes suc- culent. The Fig (fig. 150) is of this nature, and what are called its seeds are the acheenia of the numerous flowers scattered over the succulent hollowed receptacle. In Dorstenia (fig. 163) the axis is less deeply hollowed, and of a harder texture, the fruit exhibiting often very anomalous forms.

The strobilus, or cone, is a fruit-bearing spike, more or less elongated, covered with scales (fig. 134), each of which represents a separate flower, and has often two seeds at its base, the scales being considered as bracts and the seeds naked, and no true ovary present with its style or stigma. This fruit is seen in the cones of Firs, Spruces, Larches, and Cedars, which have received the name of Conifer, or cone-bearers, on this account. Cone-like fruit is also seen in some Cycadacese. The scales of the strobilus are some- times thick and closely united, so as to form a more or less angular and rounded mass, as in the Cypress ; while in the Juniper they become fleshy, and are so incorporated as to form a globular fruit like a berry. The dry fruit of the Cypress, and the succulent fruit of the Juniper, have received the name of galbulus. The fruit of the Yew (Taxus baccata) is regarded as a cone reduced to a single uaked seed, covered by succulent scales, which unite to form a scarlet fleshy envelope. In the Hop the fruit is called also a strobilus, but in it the scales are thin and membranous, and the seeds are not naked but are contained in pericarps,

The same causes which produce alterations in the other parts of the flower give rise to anomalous appearances in a fruit. The carpels, in place of bearing seeds, are some-

Imes changed into leaves, with lobes at their margins. re ae sometimes produced from the upper part of the Sic ae then called frondiparous. In the genus aa which the Orange and Lemon belong, it is very i = he with a

separation of the carpels, so as to an What are called horned oranges and fingered

ns. Jn this case a syncarpous fruit has a tendency to

rete ene rN AL * I , —— >

Aw ¥ 153

become apocarpous. In the Orange we occasionally find

a supernumerary row of carpels produced, giving rise to the

appearance of small and imperfect oranges enclosed within

the original one. The Navel Orange of Pernambuco is of this nature. It sometimes happens that, by the union of flowers, double fruits are produced. Occasionally a double fruit is produced, not by the incorporation of two flowers, but by the abnormal development of a second carpel in the flower.

ARRANGEMENT OF FRUITS.

I. Monogynecial fruits, formed by the gyncecium of one flower.

1. Capsulary fruits.—Dry, dehiscent, formed by one or more carpels ; when by more than one, coherent.

a. Monocarpellary.—Legume ; Follicle.

b. Polycarpellary.—Capsule ; Pyxidium ; Siliqua; Silicula ;

Ceratium ; Diplotegia ; Regma. . Aggregate fruits.—Polycarpellary ; carpels always distinct.

a. Indehiscent.—Etezrio ; Strawberry ; Cynarrhodum.

b. Dehiscent.—Follicles (Columbine).

. Schizocarpic fruits. —Dry, breaking up into one-celled inde- hiscent portions.

a. Monocarpellary.—Lomentum. b. Polycarpellary.—Cremocarp; Carcerulus; Samara (Acer).

. Achenial fruits.— Dry, indehiscent, one or few-seeded, not breaking up. Achenium ; Caryopsis; Utricle ; Samara (Elm) ; Cypsela; Glans.

. Baccate fruits.—Indehiscent ; seeds in pulp. Bacca; Uva; Hesperidium ; Pepo; Amphisarca ; Balausta.

. Drupaceous fruits.—Indehiscent, succulent, endocarp in- durated, usually stony. Drupe; Tryma; Pome; Nucu- lanium.

Polygynecial fruits,

flowers.

1. Succulent.—Sorosis ; Syconus; Galbulus.

2. Dry.—Strobilus ; Cone.

b.—The Seed.

When the ovule arrives at maturity it constitutes the seed, whichis contained in a seed-vessel in the plants called angio- spermous ; while in gymnospermous plants, such as Conifers and Cycadacee, it is naked, or,in other words, has no true pericarp. It sometimes happens in angiosperms, that the seed-vessel is ruptured at an early period of growth, so that the seeds become more or less exposed during their de- velopment ; this occurs in Mignonette, where the capsule opens at the apex, and in Cuphea platycentra, where the placenta bursts through the ovary and floral envelopes, and appears as an erect process bearing the young seeds. After impregnation the ovule is greatly changed, in con- nection with the formation of the embryo. In the embryo- sac of most angiosperms there is a development of cellular tissue, enveloping, when not previously absorbed,

the antv- podal cells, and more or less filling the embryo sac. In gymnosperms, as already mentioned, the endosperm is formed preparatory to fertilization. The germinal vesicle in angiosperms, the central cell of the corpuscle in crypto- gama, enlarges and divides, forming the embryo. The em- bryo-sac enlarges greatly, displacing gradually the nucleus, which may eventually form merely a thin layer around the sac, or it may completely disappear. The integuments also become much altered, and frequently appendages are developed from them.

The general integumentary covering of the seed is called spermoderm. In it are recognized two parts, an external membrane, called the episperm or testa (fig. 308, te), and an internal membrane, called endopleura or tegmen, e, which however is often incorporated with the testa, and hardly separable from it. The testa may consist of a union of the primine and secundine, or of the primine only, when, as occasionally happens, the secundine is absorbed ; the endopleura, of a combination between the outer layer of the nucleus (sometimes termed the tercine), and the embryo- sac, or of one of these parts alone. Sometimes the secundine remains distinct in the seed, forming what has been called a mesosperm ; and when it assumes a fleshy

10 formed by the gynecia of several

Plate VIII, fig. 3.

Plate XT. fic. 6.

character, it has received the name of sarcosperm or sarcoderm. ‘The nature of the testa depends upon that of the pericarp. When the pericarp is dehiscent then the seed-covering is of a strong and tough character ; but when

ri Pi : i ch rap f pl Fig. 308.

Fig. 309.

Fra. 808.—The seed of the Pea (Pisum), deprived of one-half of its integument or spermoderm. The outer covering, called either episperm, exosperm, or testa,

is marked ¢e, the inner, called endopleura, e. Within these integuments is the nucleus, consisting of cotyledons or seed-lobes c containing nourishing matter, the gemmule or young leaf-bud g, the radicle or young root 7, the tigelle or stalk between root and bud¢. The sced is attached to the placenta p/ by a eord or funiculus 7, The nourishing vessels rap enter the nucleus at the chalaza ch, and the root of the embryo points to the micropyle or foramen m. Fra. 309.—Sced of Asclepias, with a cluster of hairs arising from the edges of the micropyle, and by some considered as a hairy aril. These hairs are for the purpose of scattering the secd. the pericarp is indehiscent and encloses the seed for a long period, its outer covering has a proportional softness. The cells of the testa are often coloured, and have projections and appendages of various kinds. Thus in Abrus precatorius and Adenanthera pavonina it is of a bright red colour; in French beans it is beautifully mottled ; in the Almond it is veined; in the Tulip and Primrose it is rough ; in the Snapdragon it is marked with depressions ; in Cotton and Asclepias (fig. 309) it has hairs attached to it; and in Mahogany, Bignonia, and Firs it is expanded in the form of wing-like appendages (fig. 310). In Collomia, Acantho- dium, and other seeds, it contains spiral cells, from which, when moistened with water, the fibres uncoil in a beautiful manner ; so also in Cobza scandens and Calempelis scaber. In the testa of the seed of Ulmus campestris the cells are compressed, and their sinuous boundaries are traced out by minute rectangular crystals adhering to their walls; and in such plants as the Flax (Linum) the cells are converted into mucilage. These structural peculiarities of the testa in different plants have relation to the scattering of the seed and its germination upon a suitable nidus. But in some plants the pericarps assume structures which subserve the same purpose; this especially occurs in small pericarps enclosing single seeds, as achenes, caryopsides, &c. in Composite (fig. 197) and Valerian, the pappose limb of the calyx forms a parachute to the pericarp ; in Labiatz and some Composit spiral cells are formed in the epicarp; and the epicarp is prolonged as a wing in Fraxinus (fig. 281) and Acer (fig. 296).

The endopleura (fig. 308, ¢) is usually athin and transparent layer of cells underneath the testa, frequently incorporated with it. It represents the outer layer of the cells of the nucleus, constituting the tercine of the ovule, though frequently the embryo-sac is incorporated with it. Some- times there is an additional covering to the seed, formed after fertilization, to which the name arillus has been given (fig. 311). This is seen in the Passion-flower, where the covering arises from the placenta or extremity of the funiculus at the base of the ovule and passes upwards towards the apex, leaving the micropyle uncovered. In the Nutmeg and Spindle-tree this additional coat com- mences at the side of the exostome, and is formed from above downwards, constituting in the former case a laciniated scarlet covering called mace. In such instances it has been called by some an arillode (fig. 312). This arillode, after growing downwards, may be reflected upwards so as to cover the foramen.. The fleshy scarlet

reddish-brown colour, and is easily recognized at one end |

Thus .

[REPRODUCTIVE oRGANs, | covering formed around the naked seed in the Yew igs by some considered of the nature of an aril. On the testa, at various points, there are produced at times cellular bodies, which are not dependent on fertilization, to which the name of strophioles, or caruncules, has been given, the Th seeds being strophiolate or carunculate. These tumours f[5, may occur near the base of the seed, as in Polygala, or at the apex, as in Ricinus, where they are swellings of the exostome ; or they may occur in the course of the raphe, as in Blood-root and Asarabacca, The funiculi of the ovules frequently attain a great length in the seed, and in | some Magnolias, when the fruit dehisces, they appear as _ long scarlet cords suspending the seeds outside. The | hilum or umbilicus of the seed is usually well marked, as

a scar of varying size, in the Calabar bean and in some | species of Macuna and Dolichos, extending along a large portion of the edge of the seed ; and it frequently exhibits marked colours, being black in the Bean, white in man

species of Phaseolus, &c. The micropyle (fig. 308, m) of | the seed, with its exostome and endostome, may be recog. | nizable by the naked eye, as in the Pea and Bean tribe, Tris, &c., or it may be very minute or microscopic, It indicates the true apex of the seed, and is important as marking the point to which the root of the embryo is directed. At the micropyle in the Bean is observed a small process of integument, which, when the young plant sprouts, is pushed up like a lid, and is called embryotega, The chalaza (fig, 311, ch) is often of a different colour from | the rest of the seed. In the Orange (fig. 313) it is of a

of the seed when the integuments are carefully removed, | — In-anatropal seeds the raphe forms a distinct ridge along | __ one side of the seed (fig. 314).

Fig. 310.

Fig. 310.—Seed of Fir (Pinus), with a membranous appendage ew to the testa, called a wing. The secd is said to be winged.

Fig. 811—Young anatropal seed of the White Watcr-lily (Vymphea alba), cut vertically. It is attached to the placenta by the funiculus or umbilical cord J, cellular prolongations from which form an aril a. The vessels of the cord are prolonged to the base of the nucleus n by means of the raphe r, composed of

Fig. 311. Fig, 313,

cells and spiral vessels. The base of the nucicus is indicated by the chalaza ch, while the apex is at the micropyle m. The covering of the seed is marked i. nis the nucleus or perisperm, surrounded by its covering, and enclosing the embryo-sac es, in which the endosperm is formed. The embryo e, with its suspensor, is contained in the sac, the radicle pointing to the micropyle m.

Fic, 312.—Arillode a, or false aril, of the Spindle-tree (Zwonymus), arising from the micropyle /f.

Fie. 313.—Anatropal seed of the Orange (Citrus Aurantium) opened to show the chalaza c, which forms a brown spot at one end.

The position of the seed as regards the pericarp' resembles that of the ovule in the ovary, and the same terms are applied—erect, ascending, pendulous, suspended, | curved, &c. These terms have no reference to the mode in| which the fruit is attached to the axis. Thus the seed may be erect while the fruit itself is pendent, in the ordinary meaning of that term. The part of the seed next) the axis or the ventral suture is its face, the opposite side being the back. Seeds exhibit great varieties of form. They may be flattened laterally (comvressed), or from above |

downwards (depressed). They may be round, oval, triangu- lar, polygonal, rolled up like a snail, as in Physostemon, or coiled up like a snake, as in Ophiocaryon paradoxum. The endosperm formed in the embryo-sac of angiosperms after fertilization, and found previous to it in gymnosperms, consists of cells containing protoplasmic substance and starchy or fatty matter, or both, destined for the nutriment of the embryo. It arises by free-cell division from the protoplasm of the embryo-sac,—and may occupy the whole cavity of the embryo-sac, or may be formed only at certain portions of it, at the apex, as in Rhinanthus, at the base, as in Vaccinium, or in the middle, as in Veronica, As the endosperm increases in size along with the embryo-sac and the embryo, the substance of the original nucleus of the ovule is gradually absorbed, and usually at last disappears except the layer constituting the endopleura, and in some cases this goes also. Sometimes, however, as in Mus- acee, Cannacez, Zingiberaceze, no endosperm is formed ; the cells of the original nucleus, becoming filled with food-materials for the embryo, are not absorbed, but remain surrounding the embryo-sac with the embryo, and constitute the perisperm. Again, in other plants, as Nympheacez (fig. 311) and Piperacez, both endosperm and perisperm are present. It was from observations on cases such as these that old authors, imagining a resemblance betwixt the plant-ovule and the animal ovum, applied the name albumen to the outer nutrient mass or perisperm, and designated the endosperm as vitellus. The term albumen is very generally used as including all the nutrient matter stored up as a

separate mass in the ovule, but it would be advisable to discard the name as implying a definite chemical substance. There is a large class of plants in which although at first after fertilization a mass of endosperm is formed, yet, as the embryo increases in size, the nutrient matter from the endospermic cells passes out from them, and is absorbed by the cells of the embryo plant. In the mature seed, in such cases, there is no separate mass of tissue containing nutrient food-material apart from the embryo itself. Such a seed is said to be exalbuminous, as in Composites, Cruciferee, and most Legu-

minose. When either endosperm or perisperm or both are

present the seed is said to be albuminous.

The albumen varies much in its nature and consistence, and furnishes important characters. It may be farinaeeous or mealy, consisting chiefly of cells filled with starch, as in cercal grains, where it is abundant; jleshy or cartilaginous, consisting of thicker cells which are still soft, as in the Coco-nut, and which sometimes contain oil, as in the oily albumen of Croton, Ricinus, and Poppy ; horny, when the cell-walls are slightly thickened and capable of distension, as in Date and Coffee; and they sometimes become greatly thickened, filling up the testa as a hard mass, as in Vegetable Ivory. The albumen may be uniform throughout, or it may present a mottled appearance, as in the Nutmeg, the seeds of Anonacez, and some Palms, where it is called rummated. This mottled appearance is due to a protrusion of a dark lamella of the endopleura between folded pro- tuberances of albumen. The endosperm within the embryo- sac is developed from the protoplasm of that sac, but in Many cases as it grows inward the whole protoplasm is not converted into a solid mass, but a cavity is left in the centre which is usually filled with fluid, as in the Coco-nut. In the thickened albumen of this Palm, as well as in that of the Attalea funifera, the Date, and the Doum Palm, the small cavity in the centre and radiating spaces are well seen under the microscope. The albumen-is a store of matter laid up for the nourishment of the embryo. The relative size of the embryo and of the endosperm varies much. In Mono- votyledons the embryo is usually small, and the endosperm large, and the same is true in the case of Coffee and many

other plants amougst Dicotyledons. The opposite is the case in other plants, as in the Labiate, Plumbaginacee, dre,

In angiosperms after fertilization the embryonal vesicle The em- undergoes changes by which the embryo plant is eventually bryo.

formed. The portion of the vesicle nearest the apex of the embryo-sac coalesces with it. The lower portion enlarges and lengthens greatly, and divides by transverse partition until a large terminal cell is formed at the

extremity of a suspensor or proembryo (figs. 316, 317), formed of smaller cells. It is this terminal cell which immediately forms the

Fig. 316.

Fig. 815.

Fig. 314.—Entire anatropal seed of the Orange (Citrus Aurantium), with its rugose or wrinkled testa, and the raphe r ramifying in the thiekness of the testa on one side.

Fia. 315.—Seed of Wallflower (Cheiranthus) cut vertically. The seed is exalbu- mninous or aperispermie—all the nourishing matter being incorporated with the eotyledons c. On removing the integument which is marked by the dark

lines, the embryo alone is found in the intcrior. the edges of the eotyledons, which are aceumbent. division of Crucifere, ealled Pleurorhizex.

Fie. 316.—Section of the ovule of nothera, showing the pollen-tube ¢, with its enlarged extremity applied to the end of the embryo-sac, and introverting it slightly; the germinal vesicle in the sae has been impregnated, and has divided’ into two parts, the upper part forming a eonfervoid septate suspensor s, and! the lower dividing into four parts, which form a globular mass—the rudimentary’ embryo, surrounded by endospermal cells e.

Fie. 317.—A Dieotyledonous embryo, in different stages of development, within, the seed. At 1 it appears as a globular cellular mass at the extremity of a’ eellular eord or suspensor; at 2 it becomes more ovoid; it enlarges still more’ at 3; and at 4 it presents two distinct portions,—a, the radicle attaehed to. the suspensor, and 6, the two eotyledons.

embryo. By longitudinal growth the terminal cell becomes pushed into the endosperm (when present) of the sac, and becomes completely surrounded by it. In the lower parti of the central cell of gymnosperms a cell is produced: which divides until a proembryo is formed, which elongates and bursts through the central cell. The divisions in this proembryo take place so that several suspensors are formed, penetrating the endosperm. Usually,

each of these elongates and bears a large cell at its extremity, which becomes an embryo ; thus polyembryony occurs. The terminal cell of the proembryo in both angiosperms and gymnosperms in- creases in size, and divides repeatedly, until a cellular axis is formed. ‘This is the rudiment of the embryo. Upon this axial mass, one, two, or more rounded cellular protuberances appear, the indications of the first leaves or cotyledons ; and at the point where the embryo joins the proembryo is intercalated a mass of cellular tissue forming the hypophysis, from which subsequently the young root or radicle is formed. The axial mass continues to grow, and soon a differentiation is observable into an outer peripheral layer, the dermatogen or primordial epidermis, covering over the central mass, which soon is distinguishable into a plerome or axial mass, from which the fibro-vascular bundles develop, and a portion between it and the dermatogen,—the periblem or primordial cortex. After this has been formed a differ— entiation takes place in the hypophysis, by which an upper and a lower layer of cells is formed. The upper divides into two layers, the lower of which forms a con- tinuation of the dermatogen of the axial mass, the upper being continuous with the central portion of the axis, The lowermost cells of the hypophysis form the first layer of the root-cap. Lateral roots are frequently given off from

The radicle r is folded on’ The plant belongs to the!

the embryo, especially in Monocotyledons, and these arise as cellular processes from the outer or pericambial layer of the plerome in the hypocotyledonary portion of the axis. The primary root of the embryo is, by reason of its forma- tion, always directed to the micropyle In Monocotyledons and some Dicotyledons the young root rises deep in the tissues of the embryo, which, when it sprouts, form a sheath or coleorhiza around it. The lateral roots have also sheaths.

The embryo then consists of cotyledons (figs. 52, 53, 58, c), or the first leaves of the plant produced upon a cellular axial mass. ‘To that part of this axis immediately beneath the cotyledons the terms hypocotyledonary portion, caulrcle, or tigellus (t) have been applied, and continuous backwards with it is the young root or radicle ®, the descending axis, their

point of union being the collum, collar, or neck. The terminal growing bud of the axis is called the plumule or gemmule (g), and represents the ascending axis. That extremity of the embryo which produces the first leaves or cotyledons is called the cotyledonary extremity of the embryo, while the opposite is the radicular extremity. The radicular extremity being continuous with the suspensor points towards the micropyle (fig. 318), or the summit of the nucleus, an important fact in practical botany ; while the cotyledonary extremity is pointed towards the base of the nucleus or the chalaza. Hence, by ascertaining the position of the micropyle and chalaza, the two extremities of the embryo can in general be discovered. In some rare instances, in consequence of a thickening in the coats of the seed, as in Rieinus and some other Euphorbiacez, there is an alteration in the micropyle, so that the radicle does not point directly to it. It is in many cases difficult to recognize the parts in an embryo; thus in Cuscuta, the embryo appears as an elongated axis without divisions; and in Caryocar butyro- sum, the mass of the embryo is made up by the radicular extremity and tigelle, in a groove of which the cotyledonary extremity lies embedded. In some Monocotyledonous embryos, as in Orchidacex, the parts of the embryo of the ripe seed are not differentiated, and only become so after germination. In parasitic plants which form no chloro- phyll, as Orobanche, Monotropa, &c., the embryo remains without differentiation, consisting merely of a mass of cells until the ripening of the seed. When the embryo is surrounded by the endosperm on all sides except its radicular extremity it becomes internal or intrarius ; when lying outside the endosperm, and only coming into contact with it at certain points, it is external or extrarwus. When the embryo follows the direction of the axis of the seed, it is axle or axial (fig. 318), and it may be either external, so as to come into contact with the endosperm only by its cotyledonary apex, or internal. In the latter case the radicular extremity may, as in some Conifer, become incorporated with the endosperm apparently by means of athickened suspensor. When the embryo is not in the direction of the axis, it becomes abamxile or abaxial ; and in this case it may be either straight or curved, internal or external. In campylotropal seeds the embryo is curved, and in place of being embedded in endosperm, is frequently external to it, following the concavity of the seed (fig. 319),

and becoming pertpherical, with the chalaza situated in the |

curvature of the embryo, as in Caryophyllacee

It has been already stated that the radicle of the embryo is directed to the micropyle, and the cotyledons to the chalaza. In some cases, by the growth of the integuments, the former is turned round so as not to correspond with the apex of the nucleus,‘and then the embryo has the radicle directed to one side, and is called excentric, as is seen in Primulacez, Plantaginacee, and many Palms, especially the Date. The position of the embryo in different kinds of seeds varies. In an orthotropal seed the embryo is inverted or antitropal, the radicle pointing to

the apex of the seed, or to the part opposite the hilum, Again, in an anatropal seed the embryo is erect or homo. tropal (fig. 318), the radicle being directed to the base of the seed. In some anatropal seeds, as in Castor oil, the exostome is thickened or carunculate, and the endostome does not correspond exactly to it, so that the radicle of the embryo is directed to a point a little removed from the exostome. In curved or campylotropal seeds the embryo is folded so that its radicular and cotyledonary extremities are approximated, and it becomes amphatropal. In this instance the seed may be exalbuminous, and the embryo may be folded on itself; or albuminous, the embryo surrounding more or less completely the endosperm, ang being peripherical. According to the mode in which the seed is attached to the pericarp, the radicle may be directed upwards or downwards, or laterally, as regards the ovary, In an orthotropal seed attached to the base of the pericarp it is superior, as also in a suspended anatropal seed. In other anatropal seeds the radical is inferior When the seed is horizontal as regards the pericarp, the radicle is either centrifugal, when it points to the outer wall of the ovary; or centripetal, when it points to the axis or inner wall of the ovary.

Fig. 319. Fig. 320.

Fig. 318.—The seed of the Pansy (Viola tricolor) cut vertically. The embryo pl

Fig. 322.

is axial, in the midst of fleshy albumen al. The seed is anatropal, and the embryo is homotropal; the cotyledons co point to the base of the nucleus or chalaza ch, while the radicle, or the other extremity of the embryo, points to the foramen, close to the hilum'. The hilum or base of the seed, and the chalaza or base of the nucleus are united by means of the raphe r,

Fig. 319.—Seed of the Red Campion (Zychnis), cut vertically, showing the peripherical embryo, with its two cotyledons and its radicle. The embryo is curved round the albumen, so that its cotyledons and radicle both come near the hilum. The embryo is sometimes called amphitropal.

Fig. 320.—Mature Dicotyledonous embryo of the common Almond, with one of the cotyledons removed; fr, radicle; ?¢, tigelle or caulicule; ¢, one of the cotyledons left; te, cicatrix left at the place where the other cotyledon was attached; g, gemmule composed of several small leaves,

Fig. 321.—Transverse section of the seed of the Wallflower (Chetranthus). The radicle r is folded on the edges of the cotyledons c, which are said to be accumbent, f

Fre. 322.—Transverse section of the seed of the Dame's Violet (Hesperis). The radicle 1 is folded on the back of the cotyledons e, which are said to be incum- bent.

Plants in which there are two cotyledons produced in the embryo are Dicotyledonous. The form of this embryo varies much; and although sometimes resembling in its general aspect that of Monocotyledons, yet it is always distinguished by a division taking place at the cotyledonary extremity (fig. 317), by which two, more or less evident, lobes are formed. The two cotyledons thus formed are opposite to each other (figs. 58 and 320). The cotyledons are not always, however, of the same size. Thus, m4 species of Hirsea, one of them is smaller than the other; and in Carapa guianensis there appears to be only one, m consequence of the intimate union which takes place between the two. The union between the cotyledonary leaves may continue after the young plant begins W germinate. Such embryos have been called psewdo- monocotyledonous.

The texture of the cotyledons vanes. They may be thick, as in the Pea (fig. 58), exhibiting only slight traces of venation, with their flat item surfaces in contact, and their backs more or less convex;

or they may be in the form of thin and delicate lamin,

foliaceous, or seminal leaves,

bOT

flattened on both sides, and having distinct venation, as in Ricinus, Jatropha, Euonymus, &c. In the former case they are called fleshy, or seminal lobes; in the latter, The cotyledons usually form the greater part of the mature embryo, and this is remarkably well seen in such exalbuminous seeds as the Bean and Pea.

Cotyledons are usually entire and sessile. But they occasionally become lobed, as in the Walnut and the Lime, where there are five lobes; or petiolate, as in Geranium molle ; or auriculate, as in the Ash. Like leaves in the bud, cotyledons may be either applied directly to each other, or may be folded in various ways. In Geranium the cotyledons are twisted and doubled; in Convolvulus they are corrugated; and in the Potato and in Bunias, they are spiral,—the same terms being applied as to the foliage leaves. The radicle and cotyledons may be either straight or curved in various ways. Thus, in some Cruciferous plants, as the Wallflower, the cotyledons are applied by their faces, and the radicle (fig. 321) is folded on their edges, so as to be lateral ; the cotyledons are here accumbent. In others, as the Hesperis, the cotyledons (fig. 322) are applied to each other by their faces, and the yadicle, 7, is folded on their back, so as to be dorsal, and the cotyledons are incumbent. Again, the cotyledons are conduplicate when the radicle is dorsal, and enclosed between their folds. In other divisions the radicle is folded in a spiral manner, and the cotyledons follow the same course.

In many gymnosperms more than two cotyledons are present, and they are arranged in a whorl. This occurs in Coniferze, especially in the Fir (fig. 323), Spruce, and Larch, in which six, nine, twelve, and even fifteen have been observed. They are linear, and resemble in their form and mode of

development the clustered or fasciculated leaves oi the Larch. Plants having numerous cotyledons are occasion- ally denominated polycotyledonous. Inthe gymnospermous genus Welwitschia, there are two cotyledons which last throughout its life (more than a century), and in the course of time they grow to an enormous size, being sometimes six feet long and two or three feet in breadth. They con- stitute the only leaves of the plant. In species of Strepto-

ture is well seen, and in these cases its homology, as an expansion of the radicular extremity of the embryo, is clearly discernible; and this is further borne out by such cases as that of Caryocar butyrosum among Dicotyledons, where the radicular swelling or.upies most of the embryo (fiz. 326). In some Grasses, as Oats and Rice, a projection

Fig. 3238. Fig. 324.

Fig. 525, Fre. 323.—Polycotyledonous embryo of the Pine (Pinus) beginning tn sprout:

Fig. 826.

The axis ¢ shows its radicular portion and cotyledonary portion c, The cotyledons ¢ are numerous. Within the cotyledons the primordial Icaves are seen, constituting the plumule or first bud of the plant. |

Fia. 824.—Embryo of a species of Arrow-grass (7riglochin Barreliert), showing a uniform conical mass, with a slits near the lower part. The cotyledon c envelops the young bud, which protrudes at the slit during germination. The radicle is developed from the lower part of the axis r.

Fia. 325.—Grain of Wheat (Zriticum) germinating. The embryo lies at one side of the grain g. The radicular portion of the embryo gives off rootlets rr rrr, covered with cellular hairs. The principal root is the central one; the

others being developed subsequently in succession. The roots pass through sheaths ccc. The ascending axis ¢, sheathed in the cotyledon, rises upwards.

Fia. 326.—Embryo of Caryocar butyrosum. t, thick tigelle or caulicule, forming nearly the whole mass, becoming narrowed and curved at its extremity, and applied to the groove s. In the figure this narrowed portio: is slightly separated from the groove; c, two rudimentary cotyledons. :

of cellular tissue is seen upon the side of the embryo oppo- site to the scutellum, that is, on the anterior side. This has been termed the epiblast. It is very large in Rice. This by some was cousidered the rudimentary second cotyledon ; but this is impossible, as it arises outside, and after the first cotyledon. It is merely an outgrowth of the radicular extremity like the scutellum. The radicular portion of the axis is usually shorter than the cotyledon, and more dense in structure; but in some instances it becomes much larger, giving rise to what has been called a macropodous embryo.

5. Female Organs and Reproduction in Cryptogams.

The female organs of reproduction, like the male organs, Female

have not been demonstrated in all Cryptogams. In all organs in vascular Cryptogams, and in Mosses and Hepatice, certain higher yp s ’ p b) Crypto-

usually flask-shaped bodies, which have been termed gams.

carpus the cotyledons are also permanent, and act the part of leaves. One of them is frequently largely developed, while the other is small or abortive.

In those plants in which there is only a single cotyledon (fig. 53) in the embryo, hence called Monocotyledonous, the embryo usually has a cylindrical form more or less rounded at the extremities, or elongated and fusiform, often oblique. The axis is usually very short compared with the cotyledon, which in general encloses the plumule by its lower portion, and exhibits on one side a small slit which indicates the union of the edges of the vaginal or sheathing portion of the leaf (fig. 324). In Grasses, by the enlargement of the embryo in a particular direction, the endosperm is pushed on one side, and thus the embryo comes to lie outside at the base of

the endosperm. The lamina of the cotyledon is not developed. Upon the side of the embryo next the endosperm and enveloping it is a large shield-shaped body, termed the scwtellum. This is by some authors considered to be an outgrowth from the hypocotyle- donary portion of the axis or expansion of the radicular extremity, enveloping more or less the cotyledon and plumule, in some cases, as in Maize, completely investing it; in other cases, as in Rice, merely sending small prolon- gations over its anterior face at the apex. By others this scutellum is considered as the true cotyledon, and the sheathing structure covering the plumule is regarded as a ligule or axillary stipule. In several other Monocotyle- donous plants, as Ruppia and Zostera, this scutellar struc-

archegonia or pistillidia (fig. 327), represent the female organs producing cells or spores, which germinate and form new plants (fig. 54). These archegonia have the general structure of a large cell, the central cell or oosphere (c) surrounded by a layer of smaller cells. From the apex of this oosphere leads a canal, which is bounded by four rows of small cells and constitutes the neck, and in it is a large cell full of soft mucilaginous matter, which has been formed from the central cell, and is the canal cell. Upon the wall of the oosphere, turned towards the neck, a small portion different from the surrounding part is the receptive spot, Fertilization is effected by the antherozoids freed from the antheridium, penetrating the neck of the archegonium, and eventually reaching the receptive spot of the central cell or oosphere; they then enter the oosphere and coalesce with it. The fertilized oosphere is termed an oospore, and it then may escape from the archegonium, and sooner or later germinates ; or it germinates within the archegonial cells, These archegonia are, in vascular Crypto- gams, produced upon a cellular expansion formed asexually from a spore, and termed the prothallus (fig. 245), which is of varying size and form. Both archegonia and antheridia may be formed on one prothallus, or only one form of organ may be produced, thus indicating a tendency to diclinism.

In Characes the female organ has a peculiar structure,

In Cha- racem.

In Mosses and Hepa- tice.

In Thallo- gens.

and is termed a nucule (fig. 240, x). This consists of a large central cell, of which the contents at the apex are clear and hyaline, while the lower part contains much starch and fat. Rising from its base and twisting round it are five long tubes (fig. 328), at the extremity of each of which

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Fig. 327. Fig. 329.

Fig. 327.—Archegonium of the Forked Spleenwort (Asplenium septentrionale) Immediately after fertilization. a, canal leading to the large cell (oosphere) c at the base of the archegonium ; e, nucleated embryonic cell, whence the sporan- giferous frond proceeds,

Fiq. 328.—Nucule of Chara entire, with five cells, wound round a large central cell in a spiral manner; a, crown or eoronula of five smaller cells. .

Fig. 329.—Pistillidium of Liverwort (Afarchantia). It is a cellular body surrounded by an involucre (perigone or calyx) 6, and septate filaments (paraphyses) ¢, and it is provided with a styloid calyptra a.

above the apex of the central cell is a single short cell in

Chara, while in Nitella it is divided transversely into two.

These five or ten short cells form the crown. They unite

together so that their apices project as small teeth.

Between the crown and the apex of the central cell, which

is termed the apical papilla, a cavity is included, bounded

at the sides by the five enveloping tubes, which at this point form the neck of the nucule. The cavity of the neck is coustricted in the middle by the projection inwards of the tubes to forma sort of diaphragm, so that the enclosed cavity has a rude hour-glass-like shape, the upper cavity closed above by the crown being connected by a narrow canal with a lower cavity bounded beneath by the apical papilla of the central cell. When fertilization takes place slits are formed betwixt the five tubes of the neck, beneath the crown and above the diaphragm. The antherozoids from the globule enter by them into the upper cavity, pass through the canal into the lower one, and fuse with the apical papilla of the central cell or oosphere. The oospore thus formed becomes detached from the plant, being covered by the thickened inner wall of the tube which invested it. The nucule rises from the base of one of the whorl leaves in

Chara, and is therefore above the globule ; in Nitella it is

produced upon the leafy axis beneath the globule.

In Mosses the archegonia are frequently situated along with the antheridia and paraphyses. They are surrounded by the same whorl of leaves, or pericheettum, when the moss is said to be hermaphrodite, or they occur separately on the same or on different plants, the moss being then monecious or dicecious. The term perigone is applied to the whorl of leaves around the antheridia. ‘The basal portion of the archegonia which surrounds the oosphcre is termed the epigone. In Hepatice the archegonia (fig. 329) are situ- ated in the substance of the thallus itself, or they may be in various situations, as in Jungermanuia (fig. 330); in

Marchantia they are produced upon the under surface of a

stalked stellate disk (fig. 331).

In many Thallogens no structure analogous to a female organ has been as yet discovered ; in some, however, such structures have been met with.

Thus amongst Alge large cells, termed oogonia, are found, in which usually one, sometimes many (Fucacez), oospheres are produced (fig. 332). The antherozoids from the antheridium fertilize these, penetrating the oogonia at a definite point thinner

ANY

than the surrounding portion ; and oospores are formed In the Floridex, a group of Alge, the organs are differen, in character. Here the antherozoids are not motile

having no cilia. On discharge from the antheridium, these are washed into a long filiform hollow body, termed the trichogyntwm. This is supported usually upon a cellular stulk—the trichophore—at the side of the base of which js a small cellular mass. The antherozoids having entepeq the trichogynium, fertilization is effected, and results jp the formation, from the cellular mass at the base of the

[REPRODUCTIVE ORGaNs

Fig. 330. Fig. 331.

Fig. 330.—Archegonia of Jungermannia bicuspidata. a, archegonium, with a tube leading fo a cavity near the base of which is a ecll; 6, arehegonium afterfertil- ization, with the eell ¢ divided into two nucleated portions. This double nu- cleated body is the rudiment of the fruit-bearing stalk. At the apex of the eanal leading to the cell are seen spermatozoids s s.

Fig, 331.—Thallus of Liverwort (dfarchantia polymorpha), bearing a stalked fruit s, which is the product of the impregnated cell of the arehegonlum. The receptacle at tbe apex of the stalk bears on its under surface sporangia con- taining spores and elaters. The spores, when germlnating, produee a thallus, on which antheridia and archegonia are formed.

trichophore, of a large cell, the cystocarp, in which spores are formed. In the Saprolegniez the antheridia actually penetrate into the oogonium and discharge their anthero- zoids. Amongst Fungi it is rare to find sexual

organs, In some thecasporous fungi, as Eurotium, a sexual pro- cess has been observed. The female organ, here termed ascogonium or carpogonium, is of a spiral elongated char- acter, immediately surrounding which are the antheridia,

Fig. 382.

Fia. 332.—Transverse section of a conceptacle of a Seaweed (Fucus vesiculosus), showing the spores in the coverings, p, and paraphyses lining the cavity. The spores eseape by an orifice o.

Fig. 333.—Two filaments of a Confervaceous Alga (Zygnema), eonjugating, 1.¢ uniting together by tubes p, which pass between the different eells. The con

tents of two cells ce unite so asto form a germinating spores In the lowe?

two eells spira] filaments are seen.

few in number, which open into the apex of the female organ, and discharge their antherozoids. ‘The result 16 the formation of cellular tissue round the ascogomum, forming what is termed a peritheciwm, and within

ascogonium large cells (asc?) are produced, in which sports

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lon.

IN CRYPTOGAMS. |

or sporidia are subsequently developed. In Lichens no sexual organs have as yet been clearly demonstrated. Amongst Fungi and Lichens there are certain bodies to be noted, which may be connected with sexual repro- duction, but the function of which is at present unknown. Embedded in the margin of the thallus in Lichens and on various parts of the plant in Fungi, certain hollow urn- shaped bodies are found, which have been termed sperma- gones

(conceptacles) (fig. 334), These are usually closed all but a small opening at the apex. From their base rise peg-shaped projections or sterigmata (fig. 335), bearing at

Fig. 334,

Fic. 334.—Two spermagones on thalli of Lichens. Fic, 835.—Sterigmata a and spermatia b of Cladonia fimbriata.

Fig. 835.

their summit elongated, sometimes curved, bodies, termed spermatia, which, when mature, are discharged through the apex of the spermagone. These are by some con- sidered the analogues of the antherozoids in other Cryptogams. There are also found other conceptacles, to which the name of pycnidia or pycnides is given. These contain large spores, which have been termed stylospores (fig. 336), but their homology is at present unknown.

Another process of reproduction is seen amongst Crypto- gams. This is termed conjugation (fig. 333). It differs from the process of fertilization just described in that it consists of a union of the contents of two similar cells, whilst fertilization essentially consists in the mutual influence of dissimilar cells. It is well seen in many Alge, such as Diatoms, Volvocinex, Conjugate, also in some Fungi, such as species of Rhizopus and Zyzygites. It may consist in the coming together of two cells,—either moving spores, as in Pandorinia, or motionless, as in Diatoms,—which completely fuse, and a compound spore, or zygospore, results ; or pro- longations of the wall of two adjacent cells meet, the partition between the two gives way and the contents from the one pass into the other, and a zygospore is formed, as inZygnema. Zygospores germinate only after a long period of rest.

Amongst Thallogens especially, though it also occurs in other Cryptogams, the asexual mode of reproduction is very common. But the manner of formation and the nature of the spores is diversified.

Amongst Alge two modes of asexual reproduction are seen,—by motile spores and by motionless or resting spores. In the former case the contents of a cell form a new cell, which escapes from the mother-cell, and moves

about by means of cilia, which are formed either all round it, as in Vaucheria (fig. 337), or as a tuft at one end, as in Cidogonium. These are termed swarm spores, or 200spores, and frequently are of different sizes, being termed respectively microgonidia and macrogonidia. After swimming about for a time they fix themselves, and develop small rhizoids from one extremity, the other growing up into the plant. The motionless spores are seen in the Florides,

formation of motionless spores is very various. They interior of distinct sacs called

Fig. 336. Fig. 337. Fig. 338.

Fic. 336.—Basidia a, stylospores 8, free stylospores c, from pyenides of Lecidia.

Fig. 837.—Zoospore of an Alga (Vaucheria), surrounded by moving cilia.

Fig. 888.—Tetraspore ¢ of one of the rose-coloured Seaweeds (Callithamnion cructatum).

thecee, asci, or cystidia (fig. 339), when they are denom- inated endospores or ascospores, and the plants are said to be thecasporous or ascosporous, When they are de- veloped on the exterior of sacs called basedia (fig. 340), they are denominated ewxospores, and the plants are basi-

Fig. 339.

Fig. 839.—Vertieal section of the fructifieation of a Fungus (Peztza), showing cellules c, bearing clavate spore-eases or thecse t, which contain nucleated cells

Fig. 340.

sp. These cells become sporidia, containing spores. eellular filaments or paraphyses.

Fig. 340.—Portion of a lamella or gill of the Mushroom (Agartcus campestris), cut transversely, showing the two lateral surfaces bearing basidia bas, with four spores spo at their apices, and eystidia cys or saes containing minute cells. The hymenium is marked h. Ata and 6 are represented the four spores.

diosporous. When produced in the midst of a gelatinous mass, without any evident differentiation, they are called myxospores, the plants being myxosporous, Both the endo- spores and the exospores may by division become septate, and form compound spores, each of the secondary spores so formed being termed a merispore. Four or eight basidiospores are usually prcduced from each basidium, In the asci numerous spores are formed. Other forms of spores seen in Fungi are the conidia, These are stalked spores which arise from a mycelium.

In Lichens we find asci which produce spores or sporidia just as in Fungi; and in addition there also exist spermo- gones with their sterigmata and spermatia as well as pyenides and stylospores. Besides the spores there are organs called soredia in Lichens. These are groups of small round cells or gonidia (fig. 97), surrounded by hyphe, which are capable of independent growth after removal from the thallus. These gonidia are now regarded by many as an Alga, upon which the hypha, which is supposed to be an ascomycetous Fungus, is parasitic.

In Chara a curious mode of asexual reproduction is seen which presents several well-marked modifications, the pro- cess always proceeding at the nodes, and consisting in the growth of a new axis from a nodal cell either isolated or united with other cells.

Along with the theesx are

In all vascular Cryptogams, Muscinez, and many Thal- Alternation

where they are formed in cells, four in each, attached logens, that process of development in which successive dif- of genera-

together in a row, or as a tetrahedron, constituting the

tetraspore (fig. 338). Amongst Fungi asexual reproduction is very common. Swarm spores are rarely formed; but the mode of

ferent generations are produced finally returning to the #°**

original form, usually termed alternation of generations, is well seen. The number of such generations varies.

In Ferns

In Equi- setaceze,

Amongst Ferns the oospore germinates and produces an asexual generation. The embryo plant formed from this spore is a simple mass of cellular tissue, no cotyledons being formed. This, then, is an Acofyledonous embryo (fig. 54). The same happens in other vascular Crypto- gams, which are therefore also Acotyledonous. The embryo so formed has a primary meristem, with an apical cell, by division of which it increases in size,—roots being formed downwards and a leaf-bearing axis upwards, upon which, eventually, the fructification (fig. 341) is formed. This consists in Ferns of the production of either stalked or sessile spore-cases or sporangia, from the epidermis on the back (Aspidium) cr edges (Pteris) of a leaf (frond), or upon a special branching axis (Osmunda), or a spicate one (Ophioglossum). ‘These, when situated on the frond, are arranged in definite clusters or sort (fig. 342), either

Fig. 341.

Fig. 341.—Frond (fructiferous leaf) of a Fern (Viphobo’us), showing sori, or round clusters of sporangia at the ends of veins. As these sori are on the back of the frond, the Fern is called dorsiferous.

Fr@. 342.—Sorus or cluster of sporangia of a Fern (Aspidium irifoliatum). The sporangia are eovered by an indusium or involucre, derived from the

epidermis of the frond. The involucreis round (orbicular), and attached by its centre in an umbilical manner. ‘The annulate sporangia are seen at the lower edge of the involucre.

rounded or elongated. With the sporangia are usually associated jointed cells or paraphyses. Frequently the sori are covered by a thin cellular layer forming an irdusiwm or involucre, or the margin of the frond folds over them, forming a false indusium. Within the sporangium spores are produced, and when ripe these escape by the rupture of the sporangium, this in many cases being provided for by the formation, at a definite point, of an annulus or ring (fig. 343) of unequally thickened cells. Hence some Ferns are annulate, others exannulate. The cell-wall of each spore is divisible into an outer layer or ewospore, and an inner or endospore. When the spore reaches the soil it germinates, and after a longer or shorter period produces the sexual generation. In this process the variously marked exospore is ruptured by the enlarging endospore, which divides so as eventually to form a flattened cellular expansion or prothallus (fig. 344) with small cellular rhizoids. Upon this, usually on the under surface, the sexual organs, consisting of antheridia and archegonia, are produced.

In Equisetacee the same alternation of two dissimilar generations occurs. Upon an asexual generation the fruc- tification is formed at the apex of a leaf-bearing axis. Peltate hexagonal stalked scales (fig. 345) are arranged

in close whorls round the apex of the axis, forming & pyramidal head (fig. 346, f), the surface of the scales being

Fig. 343. Fig. 844. Fig. 345. Fie 343.—Mature sporangium of the Male Fern (Lastrea Filix-mas). It is supported on a stalk p, some of the cells of which form an elastic ring or

annulus @ round the spore-case. The spore-case s opens at the side to dis- charge the spores.

Fie. 344.—Young plant of a Fern (Pteris paleacea), showing the commencement of the sporangiferous frond jf, arising from the impregnated ovule in the archegonium, the prothallium p being still attached.

Fig. 345.—Polygonal scale s of a species of Horse tail (Zquisetum), bearing mem- branous sacs ¢, which open on their inner surface to discharge spores.

directed tangentially to the axis. Round the margin of the inner surface of these scales the sporangia are produced | projecting towards the axis. When ripe each sporangium

Fig. 346. Fig. 349. Fig. 351,

Fic. 346.—Fructification of a species of Horse-tail (Equtsetum maximum). The stalk is surrounded by a series of membranous sheaths s s, which are fringed by numerous sharp processes or teeth. The fructification f is at the extremly of the frond, in the form of a pyramidal mass of polygonal scales, bearing spores on their under-surface.

Fie. 347.—Large spores of Club Moss (Lycopodium) enclosed in an involucre. It is sometimes ealled an oophoridium in consequence of containing germinating bodies (ovules). It represents the female organ. The involucre opens trans- versely to discharge the spores (macrospores). q

Fig. 8348.—Macrospore discharged from the oophomdium of a Lycopod (Selaginella Mertensii), with the outer coat removed to show the young cellular prothallium p at the upper end.

Fic. 349.—Vertical section of a small portion of the prothallium and upper part of the large spore of a Lycopod (Selaginella denticulata), showing the embryo e, developed from a central cell of one of the archegonia a, carried down by the growth of the suspensor, so as to be embedded in the celular tissue at the upper part of the spore.

Fig. 350.—Fructification of a species of Pepperwort (Marsilea Fabri). The sporo- carp s opens to give out a peculiar cellular cord or peduncle p, which at first was curved ina ring-like manner. This cord bears spike-like fructification f, eonsisting of antheridia and pistillidia enclosed in sacs. :

Fie. 351.—Archegonium a of a Rhizocarp (Pilularia globulifera) cut vertically after impregnation, showing the prothallium, with the embryo in its interior in an advanced state, This embryo gives origin to the leafy stem.

opens towards the stalk of the scale, and the spores are shed. each having attached to it four clavate filaments sometimes

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which are very hygroscopic. By a sexual veneration or pro-

- CRYPTOGAMS. |

termed elaters (fig. 3), ermination of these spores

lus is formed. i a sexual process has not been observed

in all genera; but in Selaginella and Isoetes, where it has pean observed, it is exceedingly instructive, as It forms a connecting link between the process as seen In Cryptogams and that observed in Angiosperms. The asexual generation produces the fructification which consists in the formation of a single sporangium in the axil of each leaf of a certain part of the axis. In those genera in which sexual orgas have been discovered these sporangia are of two sizes, termed macrosporangia (fig. 347) and microsporangia respectively. The whole fructification frequently forms a spike. In the macrosporangvwm or oophoridium few, usually four, large spores (macrospores) are formed, having each an exospore and an endospore. In the microsporan- gium (fig. 248) numerous small spores or microspores are formed of a similar structure. When the sporangia are shed the capsule decays, and the spores escape. Within the endospore of the macrospore, a development of cellular tissue takes place which eventually completely fills it and constitutes the prothallus, termed sometimes on this account endothallus (fig. 348). As it increases in size the exospore is ruptured triradiately, and the endospore projecting is also ruptured, and thus the prothallus is protruded, in the sub- stance of which archegonia are formed. The microspores, on the other hand, produce within their endospore, some-

times after the formation of a rudimentary prothallus, antherozoid mother-cells, which are discharged by the rupture of the exospore and endospore (fig. 249). – By fertilization of the oosphere of the archegonium an oospore is formed, from which the sexual generation arises. The embryo is formed from the lower part of the oospore, the upper half elongates and forms a suspensor (fig. 349) of several cells, by which the embryo is pushed downwards into the substance of the prothallium, and there develops into a young plant, rudimentary cotyledons being formed upon the young axis. It will be observed that this process resembles very much the mode of embryogeny in Phanerogams, and, indeed, from this it is but a step to the form found in Gymnosperms and thence to Phanerogams.

In Rhizocarps the sporangia are formed in the interior of ovoid sacs, termed sporocarps (fig. 350), which are usually supported on stalks, and rise from the leaves near their base, one or many on the same stalk. In each sporo-carp, microsporangia and macrosporangia are formed in various positions ; and a prothallium (fig. 351) is formed in the macrospore, asin Lycopodiaceee. From the oospores formed in it the embryos are produced, but without suspensors.

In Characee there is an alternation of a sexual with an asexual condition. From the oospore a small proembryo is first formed, from a cell of which the sexual plant is developed.

In Mosses the sexual generations are produced as lateral shoots from a filamentous proembryo or protonema (fig. 352). Upon this leaf-bearing axis either at the apex (acrocarpous) or laterally (pleurocarpous) the sexual organs arise, ‘The asexual generation rises from the oospore and constitutes what is usually termed the fruzt (fig. 353) of the moss. It has been designated the sporogonium. The Sporogonium is formed by the enlargement of the oospore into an ovoid embryo which presses against the epigone, finally rupturing it, and carries the upper portion upwards with it as the calyptra or cap, the lower portion forming a sheath or vaginula at the base. This calyptra may be either split on one side, dimidiate, or entire, then termed mitriform. The apper part of the sporogouium forms a capsule, wrn, or theca ; the lower portion acts as a

AA N/Y 161 supporting stalk or seta, which is often swollen, just beneath the capsule forming the apophysis (fig. 354, a). In Sphagnum the sporogonium is fully developed within the epigonal leaves, and when complete the axis beneath it

elongates, forming the psewdopodiwm, and projects con- siderably beyond the perichetium. The walls of the

capsule of the sporogonium consist of several layers of cells. It has a central axis or columella, surrounding which are When mature the capsule usually dehisces,

the spores.

Fig. 352. Fig. 353. Fig. 352.—Moss (funaria hygrometrica), showing the cellular protonema 7, or

proembryo, with its roots r, and buds a, 6, whence arise leafy stems bearing the organs of reproduction.

Fig. 358.—Hygrometric Cord-Moss (Funaria hygrometrica), with its urn-like theca wu supported on stalks y, which arise from pcrichetial leaves 7. The thecz are covered by a calyptra c, which splits on one side. The operculum or lid o is scen in one of the thecze from which the calyptra has fallen. The seta is twisted, and displays hygrometric propertics.

either by four longitudinal valves, as in Andreea, or most commonly by a lid or operculum (fig. 355), between which and the capsule an annulus or ring of cells is separated. On removal of the operculum the stoma or opening of the capsule is seen. The margin of this is sometimes entire (gymnostomz), more usually fringed with teeth or cellular prolongations, constituting a peristome (fig. 355, p), either in one row (aploperistomt) or in two rows (diploperistomi). Stretching across the mouth of the capsule is frequently seen a thin cellular membrane, the epiphragm or

Fig. 354. Fig. 355. Fig. 356.

Fia. 354.—Fructification of the Haii-Moss (Polytrichum), consisting of an urn- like (urceolate) case or theca a, supported on a stalk (seta) s, and covered by a calyptra c, which splits at the base.

Fig. 355.—Theca wu of the Extinguisher-Moss (Encalypta), showing the teeth of the peristome p, which fold inwards when moisture is applicd.

Fig. 356.—Vertical section of a Mushroom (Agaricus campestris). my, mycelium or spawn; rol, remains of volva or wrapper; s¢, stipe or stalk: an, annulus or ring, being the remains of the velum, veil, or cortina; /a,lamelle or gills of the hymenium /; p, the pileus.

tympanum, as in Polytrichum. The spores shed from the capsule germinate and give rise to the proembryo which by budding gives off the sexual plants.

In Hepa-

In Hepatice the sexual generation arises either directly tice.

a

In Fungi.

from the spore of the asexual generation, or a small pro- embryo is first formed. The sporogonium is of various forms, and originates differently in different groups from the oospore. It is always formed within a cellular covering or epigone. In Anthoceros the sporogonia are elongated and open by two valves, and there is a central cellular columella. In Jungermannia the sporogonia are globular,

and open by four spreading valves. There is no central

column, but the inner wall displays cellules, called elaters, fixed by one extremity, and containing one or two spiral fibres which by their elasticity scatter the spores. In Riccia the sporogonia are globular, and there are neither eldéters nor columella. x

Very little is known of the sexual reproduction of Fungi, and regarding the alternation of sexual and asexual generations in them. But we have abundant instances of alternation amongst the asexual generations, and along with this of that curious phenomenon included under the term heteraecism, which consists in the growth of one generation of a parasitic Fungus upon one host, and the development of another generation upon a different host. By tracing out this phenomenon, many forms, de- scribed formerly as distinct Species, are now shown to be generations of one and the same Fungus. The asexual spores of Fungi are produced upon certain structures which have been frequently termed the fructification. For in- stance, in basidiosporous Fungi the collection of basidia forming the hymenium is usually situated on large re- ceptacles. The structure commonly known as a fungus (fig. 356) is a receptacle produced upon a mycelium (my). In its young state it appears as a tubercle upon the mycelium covered by a volva (fig. 356, vol), or wrapper, which it bursts during growth. It consists of a pileus or cap (p), at the extremity of a stalk, the stipe (st). On the under surface of the pileus are the lamellae (la) or gills, of various forms, which constitute the hymenial (hy) layer, to which the Spores are attached. At first the hymenium is covered by a veil or ixdusium, which during

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the growth of the stipe is ruptured, the base remaining on the stipe as the annulus (an) or ring. When, as in the Mushroom, the hymenium is exposed, the fungus is said to be gymnocarpous (fig. 356). In other cases, aS in Phalloidez, it is covered over by a peridium, and the whole mass so enclosed is the gleba, and the fungus is angiocarpous (fig. 357). In ascosporous Fungi, as Spheeria, the asci are usually formed within small roundish receptacles, termed pertthecta ; and along with the asci are usually numerous abortive fila- ments or paraphyses. Sometimes these perithecia are situated upon cushions or branching masses of tissue, the stroma. In the myxo- sporous Fungi the plasmodium, or whole protoplasmic mass of the plant, forms receptacles, in each of which is a capillitium, or network of fine filaments, in the interstices of which are numerous spores.

In Lichens spores are formed in asci, which are ar- ranged along with paraphyses, forming a hymenium. in receptacles situated on the thallus, and termed apothecta or lirelle, which are sometimes (fig. 95) supported on a stalk or podetium. The hyphe, from which the ascl arise, form a layer immediately beneath the hymenium, termed the subhymenial layer, the thick mass of hyphee beneath being the hypothecium, The outermost layer of the tissue of the apothecium is termed the excipulum, :

Amongst Alge alternation of generations is very com- In Alge, ‘

|

Fig. 357,

The Truffle (Tuber cibarium), a subterranean Fun with a black tuberculated or warty external covering, and a white cellular interior containing Sporiferous cells,

In Lichens,

mon; and here, as in the case of Fungi, it may pass through several generations before reaching the original form. This is well seen in Diatoms, also in CEdogoniex, where three generations are passed through, and in Coleo- chete, where there are four dissimilar generations,— | sexual and various forms of asexual reproduction 4lter- i nating. (.H.B) iH

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EXPLANATION OF THE PLATES.

Plate I. Papaver Rhceas, Common Red Poppy, belonging to the Nat.

Ord. Papaveracez. The leaves are pinnatifid, the peduncles

have spreading hairs, the calyx consists of 2 caducous sepals, en-

closing 4 crumpled petals, the stamens are indefinite and hypo- gynous, and the ovary is surmounted by a radiating stigma.

Fig. 1. Stamens inserted on the thalamus, below the ovary with its sessile stigma. Fig. 2. Capsule opening by pores below the sessile radiating stigmas.

Plate II. Janipha Manihot and Eschscholtzia californica.

Fig. 1. Janipha Manihot, Cassava plant, belonging to the Nat. Ord. Euphorbiacee. The leaves are digitately-partite, and the flowers are in racemose cymes. Fig. 2. Racemose cyme, with a pentacoccous capsule, which separates in an elastic manner into 5 single-seeded carpels. The cyme bears male as well as female flowers. Fig. 3. Pistil with stigma. Fig. 4. Stamens and fleshy disk. Fig. 5. Seed with strophiole.

Fig. 6. Eschscholtzia californica (nat. size), belonging to the Nat. Ord. Papaveracee. 1t has a peculiar caducous calyx like a candle-extinguisher, and a tetrapetalous corolla, with numerous hypogynous stamens. Fig. 7. Hollowed end of the peduncle, with the pistil. Fig. 8. Section of ovary, with numerous seeds attached to 2 parietal placentas. Fig. 9. Ceratium or siliqueform capsule (nat. size), opening by 2 valves. Fig. 10. Section of the seed, with the Dicotyledonous embryo, which is shown separately in He. 1.

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Plate III. Malva sylvestris, Common Mallow, belonging to the

Nat. Ord. Malvacez. The leaves have 5 lobes, the inflorescence consists of cymose fascicles, and the estivation is contortive.

Fig. 1. Calyx with a three-leaved epicalyx or involucre. Fig. 2. Obcordate petal, with monadelphous stamens. Fig. 3. Tube of stamens formed by union of the filaments. Fig. 4. Pistil with numerous carpels and styles. Fig. 5. Stamen with reniform anther opening round the margin. Fig. 6. Section of ovary composed of numerous carpels.

Plate IV. Anacardium occidentale, Cashew-nut plant, belonging to

the Nat. Ord. Anacardiacez.

Fig. 1. Branch (somewhat reduced), bearing flowers and fruit. The flowers are in cymes, and the peduncles are enlarged in a pear-like form, bearing the nut (the true fruit) at their apex. Fig. 2. Flower not expanded. Fig. 3. Flower expanded. Fig.

4, Stamen and pistil, with the calyx ; one fertile stamen longer |

than the others. Fig. 5. Stamen separated. Fig. 6. Nut con- stituting the fruit. Fig. 7. Nut opened longitudinally. Fig. 8. Seed separated from the nut. Fig. 9. Cotyledons opened to show the radicle a, and the plumule.

Plate V. Sarothamnus scoparius, Common Broom, belonging to the

Nat. Ord. Leguminose or Fabacex, Sub-ord. Papilionacee. The angled branches bear ternate leaves, papilionaceous flowers, and legumes.

Fig. 1. Two-lipped calyx. Fig. 2. Broadly ovate vexillum or standard. Fig. 8. One of the ale or wings of the corolla. Fig. 4. Carina or keel. Fig. 5. Monadelphous stamens. Fig. 6. Hairy ovary with the long style, thickened upwards, and spirally curved. Fig. 7. Legume or pod.

Plate VI. Carica Papaya and Andromeda hypnoides.

Fig. 1. Carica Papaya, the Papaw tree (much reduced), belong- ing to the Nat. Ord. Papayacee. The leaves are palmately-cleft, and the flowers unisexual. Fig. 2. Portion of a racemose cyme of infundibuliform male flowers, with united petals. Fig. 3. Gamo- petalous male flower cut open, showing the ten epicorolline stamens alternately shorter. Fig. 4. Stamen. Fig. 5. Female flowers with a deeply-5-parted corolla.

Fig. 6. Andromeda hypnoides (nat. size), belonging to the Nat. Ord. Ericaces. Fig. 7. Flower of Andromeda, with _5-parted calyx, and gamopetalous campanulate corolla. Fig. 8. Back view of stamen with its 2-horned anther. Fig. 9. Front view of stamen with bicornute and biporose anther. Fig. 10. Pistil with its ovate acuminate style. Fig. 11. Capsule, 5-celled, with a central 5-lobed placenta.

Plate VII. Ginanthe crocata, Hemlock Water-Dropwort, belonging

to the Nat. Ord. Umbellifere, Leaves compound and sheathing, roots composed of fusiform sessile!knobs, stem hollow, and flowers in compound umbels, with general and partial involucres.

Fig. 1. Flower composed of 5 petals, with inflexed apicula, 5 stamens, and 2 styles with an epigynous disk. Fig. 2. Lateral view of the cremocarp

composed of 2 mericarps or achenes, with blunt convex ribs, surmounted by the lanceolate teeth of the calyx, and two styles with a disk at their base. Fig. 3. Back view of the cremocarp.

Plate VIII. Valeriana officinalis, Great Wild Valerian, belonging

to the Nat. Ord. Valerianacez, showing the roots, which are offi-

cinal, the hollow stem, the alternately-pinnate leaves, and flowers

in corymbose cymes. . Fig. 1. Separate flower, consisting of an adherent calyx, with

an obsolete limb, an irregular sympetalous corolla, exserted stamens, and 1 style. Fig. 2. Pistil separated, with ovary, style, and stigma. Fig. 3. Monospermal fruit, with the persistent pappose limb of the calyx.

Plate IX. Leontodon Taraxacum, Common Dandelion, belonging to the Nat. Ord. Composite, Sub-ord. Cichoraces. The leaves are radical and runcinate, the flowers ligulate, and arranged in capitula. The outer phyllaries (involucral leaves) are reflexed.

Fig. 1. Capitulum with reflexed phyllaries and ligulate flowers. Fig. 2. A single flower, with inferior achene (cypsela), stipitate pappus, a ligulate corolla, 5 stamens united by their anthers, and 1 style with 2 stigmas. Fig. 3. Receptacle, become dry and con- vex, with deflexed phyllaries. Fig. 4. Linear-obovate achene.

Plate X. Cuscuta verrucosa, Warty Dodder, belonging to the Nat. Ord. Cuscutacee, which is often considered as a sub-order of Convolvulacez.

Fig. 1. Leafless flowering stem of Dodder (nat. size), turning from right to left (contrary to the motion of the sun). Fig. 2. Campanulate corolla, with 5 epicorolline stamens and alternating seales. Fig. 3. Persistent calyx. Fig. 4. Capsule opening trans- versely near the base. Fig. 5. Dissepiment and 2 seeds. Fig. 6. Bilocular capsule cut transversely, showing 2 seeds in each locula- ment. Fig. 7. Roundish compressed seed. Fig. 8. Seed cut longi- tudinally, showing the perisperm with the spirally-rolled-up embryo.

Plate XI. Digitalis purpurea, Purple Foxglove, belonging to the Nat. Ord. Scrophulariacee.

Fig 1. Calyx in 5 deep segments, with the pistil. Fig. 2. Pistil separated. Fig. 3. Didynamous stamens. Fig. 4. Stamens, with the anther-lobes collateral and unopened. Fig. 5. Capsule cut transversely, showing two loculaments.

Plate XII. Myristica moschata, the Nutmeg-tree, belonging to the Nat. Ord. Myristicacez.

Fig. 1. Male plant (nat. size) with oblong} nearly elliptical leaves, and flowers in axillary umbellatecymes. Fig. 2. Perianth of male plant laid open to show the stamens with their united filaments. Fig. 3. Anther, bilocular, and opening longitudinally. Fig. 4. Female flower cut open, showing the single pistil, with short style and 2-lobed stigma. Fig. 5. Young fruit. Fig. 6. Ripe drupaceous fruit in the act of bursting, and showing the mace or arillode. Fig. 7. Section of the ripe fruit. Fig. 8. The nut, consisting of a hard endocarp enclosing the seed. Fig. 9. The oval seed. Fig. 10. The seed cut vertically. Fig. 11. Vertical section of endocarp and seed, showing ruminate perisperin and the embryo. Fig. 12, Embryo, showing 2 Jarge foliaccous plicate cotyledons. Fig. 13. Embryo with radicle and cotyledons.

Plate XIII. Euphorbia hypericifolia, Tutsan-leaved Spurge, belong- ing to the Nat. Ord. Euphorbiacez.

Fig. 1. Plant (nat. size) with opposite oblong leaves, and flowers in corymbose cymes. Fig. 2. Involucre with appendages, enclos- ing male and female flowers. Fig. 3. Involucre cut open, to show the insertion of the numerous achlamydeous male monandrous flowers, and the single naked female flower, all pedicellated. Fig. 4. Involucre deprived of its petaloid appendages, with female flower showing forked styles. Fig. 5. Involucre enclosing the ripe fruit (regma). Fig. 6. Stamen. Fig. 7. Fruit with one of the cocci separated from the columella. Fig. 8. Seed. Fig. 9. Seed cut open, showing fleshy perisperm and inverted embryo.

Plate XIV. Artocarpus incisa, the Bread-fruit tree, belonging to the Nat. Ord. Artocarpacez.

Fig 1. Branch reduced to 4rd its natural size, with cuneate-ovate pinnatifid leaves, male flowers in a club-shapcd deciduous catkin, female flowers in rounded clusters. Fig. 2. Transverse section of the male amentum with numerous flowers. Fig. 3. Male flowers. Fig. 4. Single male flower separated, with a perianth in 2 segments anda single stamen. Fig. 5. Female flowers. Fig. 6. Single female flower separated, with ovary, style, and bifid stigma. Fig. 7. Ovary. Fig. 8. Ovary laid open to show the ovule. Fig. 9. A variety of the ovary with 2 loculaments. Fig. 10, Transverse section of a bilocular ovary.

Plate XV. Cycas circinalis, a species of false Sago-plant, belonging to the Nat. Ord. Cycadacez.

Fig. 1. Plant reduced to th its natural size. The leaves are pinnately-divided and form a crown round the stem. Fig. 2. Male amentum (nat. size), consisting of scales bearing on their under side 2-valved anthers. Fig. 3. Upper side of one of the scales. Fig. 4. Under side of a scale, bearing anthers. Figs. 5, 6, and 7. Anther. Fig. 8. Pollen maguified.

Plate XVI. Arum maculatum, Cuckow-pint or Wake Robin, belong- ing to the Nat. Ord. Aracee. Fig 1. Flowering stalk, with hastate-sagittate spotted leaves, and spathe enclosmg a spadix bearing male and female flowers. Fig. 2, Amylaceous corm, whence arise buds and roots. Fig. 8. Berried fruit, after leaves and spadix have decayed, in an oblong spike, of a bright scarlet colour.

BOTANY BAY, an inlet on the eastern coast of Australia, to the S. of the city of Sydney, in the Cumber- land district of New South Wales, in 34° S. lat. and 151° 15’ E. long. In was first visited by Captain Cook in 1770, and received its name from Joseph Banks, the botanist of the expedition, on account of the variety of its flora. When, on the revolt of the New England colonies, the convict establishments in America were no longer available, the attention of the British Government, then under the leader- ship of Pitt, was turned to Botany Bay; and in 1787 Commodore Phillip was commissioned to form a penal settlement there. Finding, on his arrival, however, that the locality was ill-suited for such a purpose, he removed

northwards to the site of the present city of Sydney. The name of Botany Bay seems to have struck the popular fancy, and continued to be used in a general way for any convict establishment in Australia, The transportation of criminals to New South Wales was discontinued in 1840.

BOTHNIA, an ancient province of Sweden, which was divided into East and West by the gulf of the same name. The eastern division, which was bounded on the N. by Lapland, E. by Archangel and Olonetz, and S. by Finland, is now incorporated with the last-mentioned district, having been ceded to Russia in 1809. The western division now forms part of the Swedish province of Norrland, two departments of which are still known, the one as Vesterbotten or West Bothnia, and the other as Norrbotten or North Bothnia. The name is probably derived from the Scandinavian bottn, a lake.

BOTHNIA, Gutr or, the northern part of the Baltic, so called from the above province. See Bautic SEA.

BOTHWELL, a village of Scotland, in Lanarkshire, situated near the River Clyde, about 84 miles S.E. of Glasgow, and a favourite resort of the inhabitants of that city. It contains a Gothic church of some antiquity ; and about a mile from the village are the ruins of Bothwell Castle and the modern mansion of Lord Douglas. In the neighbourhood is the scene of the famous battle of Bothwell Bridge, which was fought between the Covenanters and the forces of the duke of Monmouth, June 22,1679. Bothwell is one of the most ancient baronies in Scotland, and gives a title to a series of families distinguished in the history of Scotland. Joanna Baillie was born in the village manse. The population of the parish in 1871 was 9193.

BOTHWELL, James HeErsurn, Earn OF, in the peerage of Scotland, only son of Patrick, third earl of Bothwell, was born about 1526, Nothing is known of his life up to the date of his father’s death, 1556, when he was served heir to his vast estates. For the next few years notices of his doings are few and obscure ; he undoubtedly held posts of high dignity, such as the wardenship of the Scottish Borders, and the office of Lord Admiral ; and it is certain that he was a vigorous opponent of the “ lords of the congregation.” In the end of 1560 he appears to have been one of the lords

who went over to France to meet their new queen (Mary). In 1562 occurred the singular and obscure episode of the conspiracy between Bothwell and Arran to carry off the queen. Arran was well known to be deeply enamoured of Mary, and Bothwell apparently intended to use this passion as a means of furthering his own designs against Murray. The plot, or the germ of it was discovered ; Arran was found to be all but insane, and an indictment was laid against Bothwell, Who fled to France and remained there till 1565, when he returned to Scotland.

forgotten 3 it was renewed by the earl of Murray, and the day of trial was fixed,

ce, and he again fled. He reappeared at court in a short time after the Marriage of the queen with Darnley,

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and began to rise rapidly into favour. He escaped from the palace after the murder of Rizzio, and with great promptitude drew together some forces for the queen’s defence. favour with the queen, and all powerful at court, In 1566 he was dangerously wounded when on a judicial tour in Liddesdale. Here the queen paid him a visit, riding all the way from Jedburgh, where she was holding a justice eyre. The fatigues of this ride of forty miles brought on a severe illness, during which her life was despaired of. After her recovery the project of a divorce from Darnley was mooted, but was declined by her, and Bothwell seems then to have resolved on the removal of her husband b any means. On the evening of the Sth of February the famous crime was committed of Darnley’s murder. Public opinion, expressing itself in placards and outcries, fastened the guilt upon Bothwell and his associates, but he was too powerful to be dealt with by the law. On the 24th April he played his last move, carrying off Mary to Dunbar Castle, which had been granted him by the Queen. A divorce from his former wife was easily procured, the dispeusation in their favour not being produced at the trial, and on the 15th May the royal marriage was completed. Mary hada few days previously pardoned Bothwell for his abduction of her, and had raised him to the rank of duke of Orkney. The fancied security in which they passed the few days after their marriage was soon and rudely dispelled. The great lords collected their forces and seized Edinburgh, Bothwell and

the queen escaping with the greatest difficulty to Dunbar. At Carberry Hill the opposing parties met; Mary surrendered to the lords, and Bothwell fled to Dunbar and thence to Orkney. Being closely pursued he took ship, was captured by a Danish cruiser, and confined for a time at Copenhagen. He was removed to Malmé and afterwards to Draxholm Castle, where he died in 1575. Hee is said to have made a death-bed confession exonerating the queen, but the authenticity of the report is more than doubtful. There is hardly a redeeming point in Bothwell's character ; he was utterly selfish and brutal, and did not even treat with courtesy or kindness the woman who had risked so much for his sake. (See Tytler and Burton's histories of Scotland.)

BOTTA, Carto Gruszprr GuGLIELMO, Italian historian, was born in 1766 at San Giorgio, in Piedmont, He studied medicine at the university of Turin, and obtained his doctor's degree when about twenty years of age. Hav- ing rendered himself obnoxious to the Government during the political commotions that followed the French Revolu- tion, he was imprisoned for nearly two years; and on his release in 1794 he withdrew to France, only to return to his native country as a physician in the French army, whose progress he followed as far as Venice. Here he joined the expedition to Corfu, from which he did not get back to Jtaly till 1798. From that year, when he was appointed by Joubert a member of the provisional government at Pied- mont, till the fall of the Napoleonic system in 1814, he continued to have considerable political influence ; and though towards the close of that period he acted with an independence that proved offensive to Napoleon himself, and on the restoration of the Bourbons adapted his conduct to the circumstances of the time, he was still in sufficient favour with the Bonapartist party to receive from them, during their brief resumption of authority in 1815, the appointment (soon afterwards resigned) of rector of the university at Rouen. Amiall the vicissitudes of his early manhood Botta had never allowed his pen to be long idle, and in the political quiet that followed 1816 he natu- rally devoted himself more exclusively to literature. By 1824 he had completed a history of Italy from 1789 to 1814 (4 vols.), on which nis fame principally rests, for

From this time onwards he was in the highest

thoug

rious work, he had not the erudition necessary for the

satisfactory restoration of the past. Though living in

Paris he was in both these works the ardent exponent of that recoil against everything French which took place throughout Europe. A careful exclusion of all Gallicisms

‘; one of the marked features of his style, which is not

unfrequently impassioned and eloquent, though at the same time cumbrous and founded upon antiquated models. Botta died at Paris in August 1837, in. comparative poverty, but in the enjoyment of an extensive and well-earned reputation. His son, Paul File Botta (1805- 1870), was a distinguished traveller and Assyrian arche- ologist. His excavations at Khorsabad (1843) were among the first efforts in the line of investigation afterwards pur- sued by Mr Layard.

The works of Carlo Botta are—Déscription de tle de Corfou, 1799 ; an Italian translation of Born’s Joannis Physiophili specimen mona- chologie, 1801 ; Souvenirs d’un voyage en Dalmatie, 1802; Mémotre sur la nature des tons et des sons, 1803; Storta della guerra dell Independenza d’ America, 1810; Camillo, a poem, 1816; Storia d’Italia dal 1789 al 1814, 1824; Storta d’Italia in continuazione al Guicoiardini, 1832, &c., &c.

BOTTICELLI, Sanpro (for ALESsANDRO), one of the most original and fascinating painters of the school of Florence, Like many Italian artists, he is called not after his father but after the master under whom he learned his first lessons in art. He was the youngest son of a citizen named Mariano Filipepi, and was born at Florence in the year 1447, It is related how as a child, though quick at whatever he chose to do, he was restless and wayward, and would not take kindly to “ any sort of schooling in reading, writing, or arithmetic; ” so that his father put him, in despair, to learn the goldsmith’s trade with a gossip of his own named Botticello. Thus his first training, like that of Ghirlandaio and many of the best artists of the time, was in jewellery and metal working. He showed talent and fancy, and was

presently transferred from the school of Botticello the goldsmith to that of Lippo Lippi the Carmelite brother, then in the height of his practice and reputation asa painter. Under that master Sandro acquired a perfect proficiency, and on his death in 1468 appears to have begun independent practice. The special character- istic of Lippo Lippi's style had been its union of a buoyant human spirit of life and enjoyment with the utmost simplicity and tenderness of religious feeling. In Botticelli there was more than all the fire of his master, and more than all his delight in beauty, together with a sentiment which was altogether personal to himself, All his crea- tions are coloured with an expression of eager and wistful melancholy, of which it is hard to penetrate the sense and impossible to escape the spell, Whether he paints a Madonna with her child surrounded by angels, or a Venus

among her Graces and Cupids, the countenances which he –

shows us are of a kindred type, and have upon them the pale cast of the same nameless passion. He was an artist of immense invention and industry, and in the early part of his career painted in oil and tempera a vast number of pictures both in the classical and the Christian vein. No other work expresses the spirit of the time in a more interesting way, or with so much imaginative refinement and technical charm. His dejected types have an infinite beauty of their own, and though his figures are not designed with perfect science, and have some tendency to attenuation, and to coarseness of the hands and feet, they are neverthe- less drawn with a determination and finish in the contours, and modelled with a fulness and delicacy of relief, which belong only to the most accomplished art.

Of all the Florentine school, Botticelli is the richest and most fanciful colourist,—often using gold to enrich the

h the continuation of Guicciardini, which he was afterwards encouraged to undertake, is a careful and labo-

lights on hair, tissues, and foliage, with a very exquisite effect. That may be the consequence of his early employ- ment upon goldsmith's work, as is, more certainly, his minute solicitude in all the accessory details and ornaments of his compositions. The patterned and embroidered dresses, the

scarves and head-gear of his figures, are often treated with an incomparable invention and delicacy. No artist has ever painted flowers with a more inspired affec- tion, and especially roses, with which he was wont to fill the backgrounds of his pictures. He preferred, it would seem, the circular form for his compositions ; and a large number of devotional pieces in this form, by his own hand and that of his scholars, are scattered through the museunis and private collections of Europe, and are among the most poetical examples of religious art that Italy has left ns. He went even beyond his master Lippo Lippi, and the sculptors Luca della Robbia, Donatello, and Desiderio da Settignano, in the touching and engaging character of the children who minister, in the form of angels, to his sacred personages. He designed choirs of such or of grown-up angels daucing between earth and heaven, or circles of them ranged in the order of the celestial hierarchies, with a variety of grouping and a graceful fire of movement that was a new thing in his art. One of the best examples of this kind of work is a round numbered 33 in the gallery of the Uffizj at Florence. Another very famous example of his devotional art is a picture of the Coronation of the Virgin executed for Matteo Palmieri, a Florentine man of letters and speculative philosopher, with whom the painter was intimate, and who gave suggestions for the design of the picture. It represents the Virgin and Christ surrounded by the celestial hierarchies according to the scheme (with some slight divergencies) of Dionysius the Areopagite,— on the ground beneath, the donor and his wife kneeling at either side of the Virgin's tomb, the Val d'Arno and the city of Florence in the distance. This picture is now the property of the duke of Hamilton. But the grandest of all his altar-pieces is that numbered 47 in the Florence Academy, with a group of life-sized saints on the ground and a dance of angelsabove. In the Uffizj isan Adoration of the Magi, in which Botticelli has introduced the portraits of Cosimo, Giuliano, and Giovanni de' Medici. By that house he, like all the artists of his time, was much be- friended ; and for Lorenzo's villa at Castello he painted the most beautiful of his pictures of classical mythology, the Birth of Venus now at the Uffizj, and the Venus with the Graces now at the Florence Academy. The National Gallery possesses two smaller but admirable works of the master inthesame vein. An allegorical figure of Fortitude, designed for a series of which the rest were painted by the brothers Pollaiuoli, and now in the Uffizj; a picture com- posed from Lucian's account of the Calumny of Apelles in the same gallery; a series

illustrating Boccaccio's story of Nastagio degli Onesti, which has passed into private hands in England—these instances will suffice to show the variety of themes upon which Botticelli exercised his genius. A St Augustine, painted by him in rivalry with Ghirlandaio in the church of the Ognissanti, and still existing, is said to have won great praise from his contemporaries for its exhibition, in the head of the saint, of "that profound cogitation and most acute subtlety which we are wont to find in persons who are of thoughtful habit and continually abstracted in the investigation of things the most deep and difficult."

In 1478 happened the attempt and failure of the con- spirators of the Pazzi family and their followers against the house of Medici. It was the custom in Florence to have the likenesses of such state offenders painted large upou the outside of the Public Palace, and in this case Botticelli was employed upon the task. It will have been soon after-

wards that he was summoned to Rome by Sixtus IV., to decorate the walls of his new chapel in the Vatican. Among the great scenes in fresco painted on those walls by Domenico Ghirlandaio, Cosimo Rosselli, Signorelli, and Perugino, three subjects from the hand of Botticelli hold their place with the noblest. They represent the Life of Moses, the Destruction of Korah, Dathan, and Abiram, and the Temptation of Christ. In 1482, probably after his return from Rome, he received a commission to paint in the Sala dell' Udienza at Florence, together with Domenico Ghirlandaio. Many of the works already men- tioned probably fall within the next ten years of Botticelli's manhood. The Boccaccio series belongs to 1487. In 1491 he was engaged, together with the brothers Ghirlandaio, upon some mosaic decorations in the cathedral of Florence which have unhappily perished. Soon after this time there came into his life a new influence which greatly changed it. It is well known how the genius of the Dominican Savonarola swept like a storm over the affairs of Italy, and what a revolution, after the passage of the French king through Florence, he brought about in the temper and policy of the republic.—driving out the merchant family who had been its untitled masters for half a century, establishing in place of their

rule a new theocracy of which he was himself the oracle and minister, turning the hearts

of old and young away from the world and from their lusts. _

Many of the first artists of the city became his most ardent followers, and among them Botticelli. What the actual effect of his conversion was upon him we have scanty means of judging, but it needs must have put an end to his painting of those old mythologies, over which in earlier days his imagination had been used to throw so singular a charm. Vasari, a devoted servant of the later Medici, and therefore a traducer of the greatest enemy that house had ever had, speaks of Savonarola's influence upon Botticelli as altogether disastrous, saying that he was " obstinate upon that side," "a partisan of the sect of Savonarola in such a fashion that, abandoning painting and having no income to live upon, he fell into the utmost disorder ;" and again how, "playing the Piagnone (the name given to the followers of Savonarola), he fell out of the way of painting, and thereby at last found himself old and poor in such a sort that if Lorenzo Medici, as long as he lived, had not supported him, and afterwards his friends and many worthy men who felt an affection for his virtues, he would, we may say, have died of hunger." We have few materials by which we can test the accuracy of this account. We know that in 1496 the young Michelangelo sent through his hands a letter addressed to this Lorenzo de' Medici (Lorenzo the younger, that is,—the son of Giuliano); that in 1498 he was living with a brother in the quarter called Sta Lucia of Ognissanti ; that in 1503 he was consulted along with other artists as to the best place for Michelangelo's colossal statue _of David. But of more importance and significance than all this is a beautiful picture of a N ativity with mystical by-scenes, in the possession of Mr Fuller Maitland, which bears an inscription in base Greek by the master himself. to construe thus :—* This picture I,

Afterwards he the twelfth of John, and we this _picture." Hence it appears to be established that Botticelli, a year and a half after the downfall and execu- tion of Savonarola, had his mind full of his instructions and prophecies; that he regarded the death of the Dominican reformer and his companions as the fulfilment of the Apocalyptic prophecies about the slaying of the

BOT T 1 Cia.

witnesses ; that he thought of the tribulations among which he lived as the “second woe” of Rev. Xi, and as coincident with the “time, times, and half a time” of that and other prophetic writings ; and finally—such is the originality and excellence of the work—that his imagination had at this time lost none of its fire nor his hand of its cunning. Weare quite without the means of deciding whether any proportion of the large existing mass of his undated works belong to the years following this; or whether we are really to think of him as failing in his wonted industry in his latter days, from regret and disappointment at his master’s fate andiat public affairs, from pre-occupation over mystical theology (which had always had an attraction for him, and, in the case of the picture painted early in his life for Matteo Palmieri, had brought upon him a charge of heresy), or, lastly, from another cause which Vasari alleges, but which we have designedly passed by till this place.

In the history of engraving there are no productions more precious, more interesting, or more problematical than a number of plates executed in a primitive style, with severe outlines and straight lines of shading, by artists of the Florentine school towards the close of the 15th century, The engravings in this manner include some two hundred and fifty pieces, covering the whole range of subjects that interested the mind of Italy at this most active and fanci- ful moment of the early Renaissance, The best known of these engravings are as follows :—three designs to the earliest book published in Florence with engraved illustra- tions, called J Monte Sancto di Dio (1471); a set of nineteen designs to an edition of the Divina Commedia of Dante (1481); a set of twenty-four Prophets; a set of twelve Sibyls; several subjects of Saints; several of mythology, such as the Death of Paris, Theseus and Ariadne, the Judgment of Paris, Loves in a Vineyard, and the like ; a famous series (long falsely ascribed to Mantegna, whose manner in engraving is easily distinguishable from this) of the Ranks and Professions of Men, the Virtues, the Arts and Sciences, the Muses, and the Planets (fifty in all); a series of fifteen setting forth the lives of Mary and of Christ; a subject of the deluge; another of the preaching of the Franciscan Fra Marco, and many more. Between the various examples of this large class there are considerable differences, but they are all unlike the work of

any other school, and all manifestly Florentine of the 15th century. Conjectures the most confident and at the same time the most conflicting have been put forward as to their author- ship. All sueh conjectures alike have been based on a few passages in Vasari's lives of Botticelli and of Mare Antonio, According to Vasari, the first Florentine who took impres- sions on paper from engravings was Maso Finiguerra, and he, says our author, was "followed by Baccio Baldini, who not having much power of designing, all that he did was with the invention and design of Sandro Botticelli." And again, Vasari says of Botticelli that, "from being a sophis- tical (7.e., thoughtful or ingenious) person, he commented a part of Dante, and made figures for the Inferno, and put them into print; upon which pursuit he spent a deal of time ; so that not working" (ie., at painting) "it was a cause of infinite disorders in his life. He put in print many more things of his own from designs which he had made, but in a bad manner." On the strength of those passages this whole class of early Florentine engravings has generally been put down by connoisseurs, as, for

| Instance, Young Ottley, Bartsch, and Passavant, as the

work of Sandro Botticelli and Baccio Baldini, jointly or apart,—each critic attributing Separate subjects to the one or the other of the artists according to his private canon of internal evidence. But a Scrupulous examination shows this internal evidence to be both very meagre and very contradictory. Nor can much be built upon the external

testimony of Vasari. The phrase " put into print " is am- biguous, and by it Vasari may mean us to understand either that Botticelli engraved the designs himself or else that he merely furnished them to be engraved by another hand. To him the chief part in the invention, to Baldini the chief part in the execution, is usually and with a fair measure of probability assigned. Vasari's information on the whole subject was evidently loose ; a Triumph of Faith of Savonarola, which he extols as Botticelli's best engraving, does not at present exist at all. None of the designs bear the evidence of Botticelli's manner in a sufficiently definite form to be undeniable. On the other hand, many of them, by their poetry, their refinement, their singularity, are quite worthy of his hand, nor do they

resemble any other contemporary style more than his. If he designed and executed, or in part executed, them, they are no slight addition to his fame, and a noble vindication of his industry during that old age of idleness, decay, and “dis- order,” which followed, if we are to believe Vasari, upon the splendid and inspired activity of his youth and man- hood. But the question is one which criticism, it is to be feared, will never have the means of fully settling. (Vasari, ed, Lemonnier, vol. v. pp. 110-127; Crowe and Caval- caselle, Hist. of Painting in Italy, vol. ii. pp. 414-430; W. H. Pater, Studtes in the History of the Renatssance ; and see also Ariadne Florentin, No. vi., by John Ruskin ; art. “ Baccio Baldini,” by E. Kolhoff in 2d ed. of Nagler’s Kiinstler-Leaikon ; and the Academy for February 1871.)

BOTTIGER, Kart Avcust, a distinguished German archeologist, was born at Reichenbach in 1760. He was educated at the famous school of Pforta, and at the University of Leipsic. In 1784, after having passed a few years as private tutor in Dresden, he was made rector of the school at Guben, where he remained for six years. He was then transferred to a similar post at Bautzen, and in 1791, through the influence of Herder, obtained the appointment of rector of the gymnasium at Weimar. In that town he entered into a circle of literary men of the highest powers, including Wieland, Schiller, and Goethe, and distinguished himself by the great versatility of his talents. He published in 1803 a lively and learned work, Sabina, oder Morgenscenen einer reichen Rémerin, giving a description of a wealthy Roman lady’s toilette, and a work on ancient art, Giriechische Vasengemdlde. At the same time he assisted in editing the Journal des Luaus und der Mode, the Deutsche Mercur, and the London and Paris. In 1804 he was called to Dresden as superintendent of the studies of the court pages, aud received the rank of privy councillor. In 1814 he was made director of studies at the court academy, and inspector of the Museum of Antiquities, He died at Dresden in 1835.

Of his numerous works, most of which are devoted to ancient art, the following seem most worthy of notice :—Jdeen zur Archiologie der Malerei, 1811; Kunstmythologie, 1811; Vorlesungen und Aufsitze mir Altherthumskunde, 1817 ; Amailthea, 3 vols., 1821-25; Ideen sur Kunstmythologie, 2 vols., 1826-36. The Opuscula et Carmina Latina were published separately in 1837, with a collection of his smaller pieces, Kleine

Schriften, 3 vols., 1837-8. A sketch of his biography has been written by his son, Karl Wilhelm Béttiger (1790-1862), for some time professor of history at Erlangen, who is well known as the author of several valuable histories (History of Germany, History of Saxony, History of Bavaria, Universal History tn biographies.)

BOTTLE. The first bottles were probably made of the skins of animals. In the [lad (iii. 247) the attendants are represented as bearing wine for use in a bottle made Of goat's skin, doxd év aiyey. The ancient Egyptians used skins f lal sane ey

- is tor this purpose, and from the language employed he peyote (ii. 121), it appears that a bottle was formed aan ea i the skin and leaving the projection of the he ig = to serve as a vent, which was hence termed

: € aperture was closed with a plug or a string.

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Skin bottles of various forms occur on Egyptian monu- ments. The Greeks and Romans also were accustomed to

use bottles made of skins; and in the southern parts. of Europe they are still used for the transport of wine. The

Fra. 1.—Roman Skin Bottles.

accompanying illustration is from specimens at Pompeii and Herculaneum. The first explicit reference to bottles of skin in Scripture occurs in Joshua (ix. 4), where it is said that the Gibeonites took "old sacks upon their asses, and wine-bottles old and rent and bound up." Skins are still most extensively used throughout Western Asia for the conveyance and storage of water. It is an error to repre- sent the bottles of these ancient Hebrews as being made exclusively of skins. In Jer. xix. 1, the prophet speaks of "a potter's earthen vessel." The Egyptians possessed vases, bottles, &c., of hard stone, alabaster, glass, ivory, bone, porcelain, bronze, silver, and gold, and also, for the use of the people generally, of glazed pottery or common earthenware. As early as Thothmes III, assumed to be the Pharaoh of the

Exodus (1490, .c.}, vases existed of a shape so elegant, and of workmanship so superior, as to show that the art was not, even then, in its infancy. In the annexed cut various specimens of these are represented.

Fic. 2.—Egyptian Bottles and Vases.—l, 2. Gold, 3. Cut glass. 4, Earthenware. 5, 7. Porcelain. 6. Hard Stone. 8. Gold, with plates and bands. 9. Stone. 10. Alabaster, with lid.

The British Museum contains a fine collection of these articles. The process of making glass bottles is desenbed under the heading Gass.

BOTTOMRY, a maritime contract by which a ship (or bottom) is hypothecated in security for money borrowed for expenses incurred in the course of her voyage, under the condition that if she arrive at her destination the ship shall be liable for repayment of the loan, together with such premium thereon as may have been agreed for; but that if the ship be lost, the Jender shall have no claim against the borrower either for the sum advanced or for tha

premium. The freight may be pledged as well as the ship, and, if necessary, the cargo also. In some cases the per- soual obligation of the ship-master is also included. When money is borrowed on the security of the cargo alone, it is said to be taken up at vespondentia ; but it is now only in rare and exceptional cases that it could be competent to the ship-master to pledge the cargo, except under a general bottomry obligation, along with the ship and freight. In consideration of the risks assumed by the lender, the bottomry premium (sometimes termed maritime interest) is usually high, varying of course with the nature of the risk and the difficulty of procuring funds.

A bottomry contract may be written out in any form which sufficiently shows the conditions agreed on between the parties ; but it is usually drawn up in the form of a bond. The document must show, either by express terms or from its general tenor, that the risk of loss is assumed by the lender,—this being the consideration for which the high premium is conceded. The lender may transfer the bond by endorsation, in the same inanner as a bill of

exchange or bill of lading, and the right to recover its value becomes vested in the indorsees.

According to the law of this country, a bottomry con- tract remains in force so long as the ship exists in the form of a ship, whatever amount of damage she may have sus- tained. Consequently, the “constructive total loss” which is recognized in marine insurance, when the ship is dam- aged to such an extent that she is not worth repairing, is not recognized in reference to bottomry, and will not absolve the borrower from his obligation. But if the ship go to pieces, the borrower is freed from all liability under the bottomry contract ; and the lender is not entitled to receive any share of the proceeds of such of the ship’s stores or materials as may have been saved from the wreck. Money advanced on bottomry is not liable in England for general average losses.

If the ship should deviate from the voyage for which the funds were advanced, her subsequent loss will not dis- charge the obligation of the borrower under the bottomry contract. If she should not proceed at all on her intended voyage, the lender is not entitled to recover the bottomry premium in addition to his advance, but only the ordinary rate of interest for the temporary loan. As the bottomry premium is presumed, in every case, to cover the risks incurred by the lender, he is not entitled to charge the bor- rower with the premium which he may pay for inswrance of the sum advanced, in addition to that stipulated in the bond.

The contract of bottomry seenis to have arisen from the custom of permitting the master of a ship, when in a foreign country, to pledge the ship in order to raise money for repairs, or other extraordinary expenditures rendered necessary in the course of the voyage. Circumstances often arise, in which, without the exercise of this power on the part of the master, it would be impossible to pro- vide means for accomplishing the voyage ; and it is better that the master should have authority to burden the ship, and, if necessary, the freight and cargo also, in security for the money which has become requisite, than that the adventure should be defeated by inability to proceed. But the right of the master to pledge the ship or goods must always be created by necessity ; if exercised without necessity the contract will be void. Accordingly, the master of a British ship has no power to grant a

bottomry bond at 2 British port, or at any foreign port where he might raise funds on the personal credit of the shipowners. Neither has he any power to pledge the ship or goods for private debts of his own, but only for such supplies as are indispensable for the purposes of the voyage. And in all

cases he ought, if possible, to communicate with the owners of the ship,

and with the proprietor of the cargo |

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before pledging their property. Facility of communication,

by telegraph and otherwise, has of late years given addi. –

tional stringency to this rule.

The bottomry lender must use reasonable diligence to | ascertain that a real necessity exists for the loan ; but he |

is not bound to see to the application of the mone advanced. If the lender has originally advanced the funds on the personal credit of the owner he is not entitled to require a bottomry obligation. A bond procured from the shipmaster by improper compulsion would be void.

The power of the master to pledge the cargo depends upon there being some reasonable prospect of benefit to it by his so doing. He has no such power except in virtue of cir- cumstances which may oblige him to assume the character of agent for the cargo, in the absence of any other party authorized to act on its behalf. Under ordinary circum. stances he is not at liberty to pledge the cargo for repairs tothe ship. If indeed the goods be of a perishable nature, and if it be impossible to get the ship repaired in sufficient time to obviate serious loss on them by delay, without including them under the bottomry contract, he has power to do so, because it may fairly be assumed, in the cage supposed, that the cargo will be | enefited by this pro- cedure. The general principle is, vhat the master must act for the cargo, with a reasonable view to the interests of its proprietors, under the whole circumstances of the case. When he does this his proceedings will be

sustained : but should he manifestly prejudice the interests of the cargo by including it under bottomry for the mere purpose of relieving the ship, or of earning the freight, the owners of the cargo will not be bound by the bottomry contract. Any bottomry or respondeutia bond may be good in part or bad in part, according as the master may have acted within or beyond the scope of his legitimate authority in granting it. If two or more bottomry bonds have been granted at different stages of the voyage, and the value of the property be insufficient to discharge them all, the last dated bond has the priority of payment, as having furnished the means of preserving the ship, and thereby preventing the total loss of the security for the previous bonds.

When the sum due under a bottomry bond over ship, freight, and cargo is not paid at the stipulated time, pro- ceedings may be taken by the bondholder for recovery of the freight and for the sale of the ship; and should the proceeds of these be insufficient to discharge the claim, a Judicial sale of the cargo may be resorted to. As a general rule the value of the ship and freight must be exhausted

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before recourse can be taken against the cargo. A bot-

tomry bond gives no remedy to the lenders against the owners of the ship or cargo personally. The whole lia- bility under it may be met by the surrender of the property pledged, whether the value so surrendered covers the amount of the bond or not. But the owners of the ship, though not liable to the bondholder for more thau the value of the ship and freight, may be further liable to the proprietors of the cargo for any sum in excess of the cargo’s proper share of the expenses, taken by the bond- holder out of the proceeds of the cargo to satisfy the bond after the ship and freight have been exhausted.

The bottomry premium must be ultimately paid by the parties for whose benefit the advances were obtained, as ascertained on the final adjustment of the average expendi- tures at the port of destination.

See the cases of the “Gratitudine,” 2 Rob. A. R., 240, 272; the “Lord Cochrane,” 8 Jur., 714; the “Cyn- thia,” 20 L. T., 7,54; the “Bonaparte,” 14

Jur., 605; Penson ». Duncan, 14 Jur., 218; Benson v. Chapman, 5 C. B., 330; 8 C. B., 950; Shee's Marshall On Insurance,

part ii; Arnould On Insurance; Pritchard's Admiralty

Digest. (3. WA.)

BOT—BOU

BOTZEN, BozEn, or Bolzano (the ancient Pons Drusi), a town of Austria, the capital of the circle of Brixen in Tyrol, is situated at a height of 1120 feet near the con- fuence of the Talfer and the Eisack, 32 miles N.N.E. of Trent. The town 1s well built in the Italian style, and has a fine old Gothic church of the 14th and 15th centuries, a castle, several churches and conveuts, and a gyninasiam. Situated at the intersection of roads from Italy, Germany, and Switzerland, it has an extensive transit trade, and its four large annual fairs date from 1024. It has also manufactures of linen, cotton, silk, hosiery, leather, and wax. It is protected from sudden inundations by a strong dike of masonry nearly two niles in length, and in some parts 24 feet thick. Botzen is mentioned as early as 378. In the 9th century it was the seat of a Bavarian couutship, but in 1027 it was presented to the prince- bishop of 'Trent by the Emperor Conrad II. F or centuries after that date it continued to be an object of strife between the Germans and Italians, until at last, in 1531, the autho- rity of the count of Tyrol was acknowledged on all hands. Since then the city has followed the fortunes of 'Tyrol.

RBOUCHES-DU-RHONE, a department of France, situated along the south coast, and, as the name imports, at the mouth of the Rhone. It is bounded on the N. by Vaucluse, from which it is separated by the Durance ; on the E. by Var, and W. by Gard ; and its area is estimated at 1963 English square miles. The western portion consists of a low and marshy plain, known as the Cainargue, which ig remarkable for its unhealthiness ; to the east of this is situated the remarkable stretch of country called the Crau, which is strewn with pebbles like the sea beach; and further east and north there are various ranges of mountains of moderate elevation belonging to the Alpine system. A few small tributaries of the Rhone and the Durance and a number of streams, such as the Arc, the Touloubre, and the Huveaune, which find their way directly to the sea, are the only rivers that properly

belong to the department. The proportion of arable land is exceedingly small, though the quantity has been considerably increased by artificial irrigation, Wheat is cultivated with success in some parts of the Camargue, and, if labour were more easily obtainable, rice might also be grown. Horses and cattle are veared in a half wild condition, and large flocks of sheep are pastured during the winter on the herbage that springs up among the pebbles of the Crau. The numbers of domestic animals in the department were in 1872 as follows :— horses 20,665, cattle 2686, sheep 262,566, and goats 17,560. ‘The only mineral furnished to any extent by the department is coal, in the mining of which between 1000 and 2000 workinen are engaged, but there are also quarries of limestone, sandstone, slate, gypsum, marl, and marble. The salt marshes, which cover an area of 2290 acres, employ more workmen than the coal-mines, and the amount of salt obtained exceeds in quantity the produce of any other department in France. There are extensive manu- factures of soaps, perfumes and oils, soda, sulphur, sugar, woollen hosiery, and leather, and a variety of other articles. The foreign commerce of the department, which is princi- pally carried on in the Mediterranean basin, is for the most part concentrated in the capital, Marseilles; the minor ports are Martigues, Cassis, and Ciotat. The department is divided into the three arrondissements of Marseilles, Aix, and Arles ; the more important towns in which (in addition to their capitals) are respectively Aubagne, Ciotat, and Roquevaire ; Martigues, Salon, and Istres; and Tarascon, Saint Remy, and Chateaurenard. Among the numerous men of mark belonging to Bouches-du-Rhone are D’Urfé, Massillon, Vanloo, Tournefort, Barthélemy, Vauvenargues, Thiers, Mignet, Achard, and Reinaud. The population, which in 1872 amounted to 554,911, contains a large pro-

portion of foreigners, mostly of Italian nationality. The total alien element in 1872 was represented by 42,855, the Italian by 33,500.

BOUFARIK (the “ Hanging Well ”), a town of Algeria, in the province of Algiers and arrondissement of Blidah, about 21 miles from the city of Algiers near the railway thence to Blidaa, It is a thoroughly French town, and only dates from 1835, when General Drouet dErlon established an

entrenched camp on what was then a mere hillock in the midst of an almost uninhabitable marsh. Shortly after Marshal Clausel determined to build a regular city, which was at first called Medina Clausel in his honour. The draining of the site and neighbourhood was a costly undertaking, and was only accomplished by the sacrifice of many lives. ‘The town is now one of the most flourishing in the country, is surrounded by vast orchards and farms, and affords a market to the pastoral Arabs of the Metidja. There are flax-dressing and spinning mills, and the manu- facture of essences and perfumes is carried on to a consider- able extent. The population, which is composed of very various elements, amounted in 1872 to 2588.

BOUFLERS, Lovis Francois, Duc DE, commonly called the Chevalier Bouflers, a peer and marshal of France, and a general of distinguished reputation, was born January 10, 1644. Having early entered the army, he was raised in 1669 to the rank of colonel of dragoons. In the con- quest of Lorraine he served under Marshal de Créquy. In Holland he served under Turenne, frequently distinguishing himself by his skill and bravery ; and when that celebrated leader was killed by a cannon-shot in 1675, he commanded the rear-guard during the retreat of the French army. After performing various military services in Germany, in Flanders, and on the frontiers of Spain, he was created, in 1690, general of the army of the Moselle, and contributed materially to the victory of Fleurus. In the following year he acted as lieutenant-general, under the king in person ; and during the investment of Mons, he was wounded in an attack on the town. He conducted the bombardment of Liége, which was defended by an enemy superior in numbers, and afterwards forced the allied generals to abandon Lux- embourg. He was entrusted with the command against King William at the siege of Namur, and took part in the victory of Steinkirk. For these important services he was raised in 1693 to the rank of marshal of France, and in 1695 was made a duke. In 1694 he was appointed governor of French Flanders and of the town of Lille. By a skilful manoeuvre he threw himself into Namur in 1695, and obstinately held out for four months during which the besiegers lost 20,000 men. In the conferences which terminated in the peace of Ryswick he had a principal share. During the following war, when Lille was again threatened with a siege by the duke of Marlborough and Prince Eugene, Bouflers was appointed to the com- mand, and made an obstinate resistance of four months. He was rewarded and

honoured by the king for his defence of Lille, as if he had been victorious. It was indeed a species of triumph; his enemy, appreciating his merits, allowed him to dictate his own terms of capitulation. When the affairs of France were threatened with the most urgent danger, Bouflers offered to serve under his junior, Villars, and was with him at the battle of Malplaquet. ere he again displayed his iilitary skill, by conducting the retreat so as to lose neither cannon nor prisoners, He died at Fontainebleau in 1711.

BOUGAINVILLE, Lovis Antoine pz, the first French circumnavigator, was born at Paris in 1729. He studied law, but soon abandoned the profession, and in 1753 entered the army in the corps of musketeers. At the age of twenty- five he published a treatise on the integral calculus, as a supplement to De |'Hépital's treatise Des injiniment petits,

In 1755 he was sent to London as secretary to the French

embassy, and was chosen a member of the Royal Society.

In 1756 he went to Canada as captain of dragoons and aide-de-camp to the marquis of Montcalm; and having distinguished himself in the war against England, was rewarded with the rank of colonel and the cross of St Louis. He afterwards served in the Seven Years' War from After the peace, when the French Govern- ment conceived the project of colonizing the Falkland

1761 to 1763,

Islands, Bougainville undertook the task at his own expense. the Spaniards, the French Government gave it up to them,

on condition of their indemnifying Bougainville. He was then appointed to the command of the frigate La Bondeuse" and the transport " L'Etoile," on a voyage of

discovery round the world. He set sail from Naates in November 1766, taking with him Commercon as naturalist, and Verron as astronomer. Having executed his commission of delivering up the Falkland Islands to the Spanish, Bougainville proceeded on his expedition, and touched at

Buenos Ayres. Passing through the Straits of Magellan, he

anchored at Otaheite, where the English navigator Wallis had touched eight months before. crossed the Pacific Ocean, and the men now suffering from scurvy, the ships came to anchor off the Island of Borou, one of the Moluccas, where the governor of the Dutch settlement supplied their wants. It was the beginning of September, and the expedition took advantage of the easterly monsoon, which carried them to Batavia. Thence they proceeded to the Isle of France, where they left Commergon and Verron. In 1769 the expedition arrived at St Malo, after a voyage of two years and four months, With the loss of only seven out of upwards of 200 men. Bougainville's account of the voyage (Paris, 1771, 4to) is written with simplicity and with some humour. The art of making astronomical observations at sea was then much less perfect than now, and, consequently, Bougainville's charts are found to be erroneous, particularly as to the longitudes. After an interval of several years, he again accepted a naval command and saw much active service between 1779 and 1782. In the memorable engagement of April 12, 1782, in which Rodney defeated the Count de Grasse, near Martinique, Bougainville, who commanded the " Auguste," succeeded in rallying eight ships of his own division, and bringing them safely into St Eustace. After the peace he returned to Paris, and solicited and obtained the place of associate of the Academy. He pro- jected a voyage of discovery towards the north pole, but this did not meet with support from the French Government. Bougainville obtained the rank of vice-admiral in 17M: and in 1792, having escaped almost miraculously from the massacres of Paris, he retired to his estate in N ormandy. He was chosen a member of the Institute at its formation ; and then returning to Paris succeeded Borda as member of the Board of Longitude. In his old age Napoleon I. made him a senator, count of the empire, and member of the Legion of Honour. He died at Paris, August, 31, 1814, He was married and had three sons, who served in the French army, His éloge, composed by Delambre, appears in the Memoirs of the Institute.

BOUGIE, or Bovetan, a fortified seaport town of Algeria, in the province of Constantine and arrondissement of Sétif, betweeen Cape Carbon and the Wady-Sahell. Among its more important buildings are the French church, the hospital, the barracks, the magazines, and the Abd- el-Kader fort, now used as a prison. ‘Trade is carried on in wax, grain, oranges, oil, and wine. A basin was constructed about 1870 in the anchorage below the town. The popula- tion in 1872 was 2820, of whom 1134 were natives, Bougie, Bugia, or Bugiah is a town of great antiquity. If it is

correctly identified with the Salda of the Romans it Bo.

But the settlement having excited the jealousy of

The expedition having

bably owes its origin to the Carthaginians, Genseric, the

king of the Vandals, surrounded it with walls and chose

it as his capital for some time; and in the 10th century it became, under the Beni-Hammad, the greatest com. mercial city of the North African coast. The Italian merchants of the 12th and 13th centuries had numerous buildings of their own in the city, such as warehouses baths, and churches. It became a haunt of pirates in the 15th century, and in the beginning of the 16th it Was captured by the Spaniards, from whom it was taken by the Turks in 1555. It was a place of little importance when it fell into French possession about 1833.

BOUGUER, Prerre, an eminent French mathematician was born in 1698. His father, one of the best hydro. graphers of his time, was regius professor of hydrography at Croisic in Lower Britanny, and author of an excellent treatise on navigation. Young Bouguer was bred to mathe. matics from his infancy, and at an early age was appointed to succeed his father as professor of hydrography. In 1727 he gained the prize given by the Academy of Sciences for his paper “On the best manner of forming and distri- buting the Masts of Ships;” and two other prizes, one for his dissertation “On the best

method of observing the Altitude of Stars at Sea," the other for his paper "On the best method of observing the Variation of the Compass at Sea." These are published in the Prix de ? Académie des Sciences. In 1729 he published Essai a'optique sur la gradation de la lumiére, the object of which is to define the quantity of light lost by passing through a given extent of the atmosphere. He found the light of the sun to be 300 times more intense than that of the moon. He was soon after made professor of hydrography at Havre, and succeeded Maupertuis as associate geometer of the Academy of Sciences. He was afterwards promoted in the Academy to the place of pensioned astronomer, and went to reside in Paris. In 1735 Bouguer sailed with Godin and De la Condamine for Peru, in order to measure a degree of the meridian near the equator, Ten years were spent in this operation, a full account of which was published by Pouguer in 1749, Figure de la Terre determinée. His later writings were nearly all upon the theory of navigation. He died in 1758.

The following is a list of his principal works :—Traité @ optique sur la gradation de la lumiére, 1729 and 1760 ; Entretiens sur la cause dinclinatson des orbites des planetes, 1734 ; Traité de na- vire, &e., 1746, 4to; La Figure de la terre determinée, &c., 1749, 4to; Nouveau traité de navigation, contenant la théorie et la pra- tique du pilotage, 1758 ; Solution des principaux problemes sur la maneuvre des Vaisseaux, 1757 ; Opérations faites pour la verified tion du degré du méridien entre Paris et Amiens ; par Mess. Bou- guer, Camus, Cassini, et Pingré, 1757.

BOUHOURS, Dominiquz, a French critic, was born at Paris in 1628. He entered the Society of the Jesuits at the age of sixteen, and was appointed to read lectures on literature in the college of Clermont at Paris, and on rhetoric at Tours. He afterwards became preceptor to the two sons of the duke of Longueville. The duke died in Bouhours's arms; and the "account of the pious and Christian death" of this great personage was his first publication. He was sent to Dunkirk to the Romanist refugees from England, and in the midst of hig missionary occupations published several books. Among these were Les Entretiens @ Ariste et d' Eugene, a work of a critical nature on the French language, printed five times at Paris, twice at Grenoble, and afterwards at Lyons, Brussels, Amster- dam, Leyden, &c. It involved him in numerous quarrels, particularly with Ménage, who,

however, continued to live on friendly terms with the author. The fame and merit of this piece recommended Bouhours go effectually to the great Colbert, that he intrusted him with the education of

his son the marquis of Scignelay. He afterwards wrote several other works in French, the chief of which are, Ta Manier de bien penser sur les owvrages desprit, 1687; Remarks and Doubts upon the Lrench Language, 1694; The Life of St Ignatius, 1679; The Art of Pleasing in Conversation ; The Life of St Francis Xaver, 1682. It was his practice to publish alternately a book on literature and a work on some subject of piety, which gave occasion to a wag, in a satirical epitaph, to remark of him, “ qu’ll servait le monde ct le ciel par semestre.” His Pensées ingenreuses des Anciens et des Modernes, though at once instructive and amusing, exposed him to censure as well as ridicule, on account of some strange misjudgments and omissions. He has classed Boileau with the least esteemed of the Italian satirical versifiers, and has omitted, in his Thoughts on the Moderns, all mention of Pascal,—a circum- stance which is doubtless to be explained by his being a disciple of St Ignatius, who, it may be supposed, would willingly forget the author of the Provincial Letters, Bouhours diced at Paris in 1702.

BOUILLON, Goprrey pz, one of the foremost leaders in the first crusade, was born at Baisy, near Gemappe in Belgium, about 1060. His father was Eustace IL, count of Bouillon in the Ardennes ; and through his mother Ida, daughter of Godfrey, duke of Lower Lorraine, he could claim descent from Charlemagne. In the contest between Henry IV., emperor of Germany, and Hildebrand, he espoused the imperial cause, and was the first to scale the walls of Rome when the emperor’s forces besieged that city in 1084. In reward for his services Henry invested him

with the titles of marquis of Antwerp and duke of

Lorraine. ~~It is said that while suffering from fever, having heard of the preparations for the first crusade, he vowed, were his health restored, to seek Palestine ; “ where~~ upon,” says William of Malmesbury, “he shook disease from his limbs, and shone with renovated beauty.” Having pawned

his lordship of Bouillon to the church of Lidége for 1300 marks, he gathered around him 80,000 infantry and 10,000 horsemen, whom he led with rare ability through Germany to the borders of Hungary, where he shamed his brother Baldwin by offering to go in his stead as a hostage to the Hungarians. On arriving in 1096 at Con- stantinople, he obtained the release of his fellow-crusader Hugh of Vermandois from the wily Greek emperor Alexius, and in the strife which that monarch's duplicity fomented evinced the sagacity and promptitude of a great general. After capturing Antioch and routing a vast Saracen host at Doryleum in Phrygia, the crusaders arrived, in 1099, at Jerusalem, which was taken after a siege of five weeks, Godfrey entering the breach among the foremost, but tarnishing his glory by ruthlessly ordering a massacre of the infidels, A Christian kingdom of Jerusalem was then founded, of which Godfrey was unanimously elected sove- reign; but he refused to wear a crown of gold where his Lord had worn a crown of thorns, and accepted, instead of the kingly title, the humbler designation of defender and baron of the Holy Sepulchre. During the single year of his rule he repelled the Saracens with admirable courage and skill, routing the Fatimite caliph of Egypt at Ascalon, and with the assistance of others of the pilgrims, drew up from the various feudal statutes of Europe the elaborate system of medizval jurisprudence known as the Assizes of Jerusalem. Godfrey died in 1100, and was buried in the church of the Holy Sepulchre; and so impartial and temperate had been his rule, that Mahometans as well as Christians bewailed his loss. He combined the favourite virtues of his age; and his exploits, in the quaint words of Gregory de Vinsauf, "were as food in the mouths of their narrators." He was as accomplished as brave, and could speak the Latin and Teutonic languages with equal

ease. 'Tasso, in the Gerusalemme Liberata, makes Godfrey the equal of Tancred in the field and of Raymond in the council, and seems scarcely to have exaggerated his aie and skill in war, his piety, wisdom, and purity of life.

BOULAINVILLIERS, Henri pz, Lord of St Saire, an eminent French writer, descended from a very ancient and noble family, was born at St Saire

in Normandy in 1658. He received his education at the college of Juilli, where he early discovered the uncommon abilities fur which he was afterwards distinguished. His historical writings are numerous and important, but deformed by an extravagant admiration of the feudal system, which he regarded as the chef d'cuvre of the human mind. He misses no opportunity of vegretting those " good old times," when the people were enslaved by a few petty tyrants alike ignorant and barbarous. His philosophical writings have now lost all their value, His pretended refutation of the system of Spinoza is a weak and imperfect exposition of that writer's opinions. He died at Paris in 1722.

His principal works (all published after his death) are— Histoire

de Vancien gouvernment de la France, &c., La Haye, 1727, 3 tom.

8vo0; Etat de la France, avec des mémoires sur Vancien gouvern-

ment, &c., Lond., 1727, 3 tom. fol.; Histoire de la Pairie de France,

&c., Lond., 1753; La Vie de Mahomet (a '*' Fable of Mahomet," as

on calls it); Histoire des Arabes, Amst. (Paris), 1731, 2 vols. mo,

BOULOGNE SUR MER, a fortified seaport of France, and the chief town of an arrondissement in Pas-de-Calais,

Plan of Boulogne.

1, 2, 8. Etablissement, — including Baths, Aquarium, and Skating Rink.

4, Place Navarin. 5. Rue Wissocq, | |

1l. Porte Gayolle.

12. Sous-Préfecture

18, College.

14. Museums.

15. St Nicholas Church.

16

7

18

19

. Cathedral. . Market Place.

. Theatre.

. English Churches. , Place Fr. Sauvage.

6

7. Palais de Justice.

8. Mairie.

9. Convent (Annonciades). 0. Place Godefroi.

is situated on the shore of the English Channel at the mouth of the River Liane (anciently Elna), in 50° 44’ N. lat. and 1° 36’ E. long., 157 miles from Paris by railway and 28 from Folkestone, Kent. It consists of two parts, the High or Old Town and the Lower or New Town. The former, situated on the top of the bill, is of comparatively small extent, and forms almost a parallelogram, surrounded by ramparts of the 15th century, and entered by ancient gate- ways. In this part are the Palais de Justice, the Chateau, the cathedral, and the Hétel de Ville,—the last built in 1774,—and the belfry tower of the 13th century is in the immediate neighbourhood. In the Chateau, now used as barracks, the Emperor Napoleon ITI. was confined after his famous attempt to effect a landing in 1840. At some distance north-west stands the cathedral church of Notre

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Dame, built (1827-1866) on the site of an old building destroyed in the Revolution, having underneath an exten- sive crypt which still remains. The New Town extends from the foot of the hill to the harbour and along the shore, and contains several good streets, some of which are, however, very steep. A main street, named succes- sively Rue de la Lampe, St Nicholas, and Grande Rue, extends from the bridge across the Liane (near the railway station) to the promenade by the side of the ramparts and the Hétel de Ville. This is intersected first by the shore- way named Quai de la Flotille, Quai de la Victoire, &c. (where there are numerous hotels), and further back by the Rue Napoléon and Rue Royale, the principal business part of the town, and where the best shops are situated. The principal buildings comprise a museum, formerly the great seminary, a hospital, a theatre, an elegant établissement (opened in 1863, containing ball-room, reading-room, &c.), a custoni-house, barracks, various churches and cor4nts, anda fish-market. Connected with the museum is a public library with 30,000 volumes and a large number of very valuable manuscripts, many of them richly illuminated. Boulogne has for a long time been one of the most Angli- cized of French cities; and in the tourist season a con- tinuous stream of English travellers reach the Continent at this point. There is regular steamboat service between the port and Folkestone, the average passage occupying 24 hours, or about three-quarters of an hour longer than from Calais to Dover. There are two English chapels in the town, and numerous boarding-schools intended for English pupils. Churchill, who died while on a visit to his friend Wilkes, in 1765, is buried in the cemetery, and the house is pointed out where Thomas Campbell expired in 1843. The shore is lined with extensive flat sands, where bathing is facilitated by the use of machines. Among the objects of interest in the neighbourhood the most remarkable is the Napoleon column or Colonne de la Grande Armée, erected on the high ground above the town, in honour of Napoleon I., on occasion of the projected invasion of England, for which he here made great pre- parations. The pillar, which is of the Doric order, 166 feet high, is surmounted by a statue of the emperor by Bosio.- Though commenced in 1804, the monument was not completed till 1841. On the edge of the cliff to the east of the port are some rude brick remains of an old building called Tour d’Ordre, said to be the ruins of a tower built by Caligula at the time of his intended inva- sion of Britain. The entrance to the harbour of Boulogne, which is tidal, is formed by two long piers running out from the mouth of

the river, and serving during fine weather as excellent promenades. On the western side is the basin excavated by Napoleon for his flotilla of flat-bottomed boats in 1804. A large wet dock, con- structed at a cost of upwards of £250,000, was opened in 1872, and adds greatly to the facilities of the port, its area being 17 acres and the length of its quay-wall 1150 yards. The depth of water in the harbour is 23 feet at spring-tide and nearly 20 at neap-tide; in the sluice of the floating basin the numbers are 293 aud 23} respectively. The foreign commerce of Boulogne, which is almost wholly carried on in British ships, consists chiefly in the importa- tion of manufactured goods, jute, silk, Australian wool, coal, machinery, hard wares, paper-hangings, malt, beer, and chemicals ; and the exportation of wine, brandy, eggs, artificial flowers, haberdashery, and musical instruments. The total value of the exports in 1871 was £12,709,675, and of the imports £11,762,500. How rapid the develop- ment of the commerce with Britain has been may be seen on mi mee! that while in 1840 the British sailing vessels =” engaged amounted only to 66, and the steam-ships to

» in 1860 the corresponding numbers were 341 and

863, and in 1871, 541 and 1061. In the extent and value of its fisheries Boulogne is exceeded by no Seaport in France. The most important branch is the herring-fishery, which is prosecuted northwards along the shores of Segt. land ; next in value is the mackerel fishery, and next again the Iceland cod. Large quantities of fresh fish are trang. mitted to Paris by railway, but an abundant supply is reserved to the town itself. The fishermen live for the most part in a separate quarter called La Beuritre. Among the numerous industrial establishments in Boulogne and its environs may be mentioned several foundries, with blast. furnaces, cement-manufactories, flax-mills, steam saw-mills, steel-pen manufactories, carriage-works, tile-works, and a fishing-net factory. Shipbuilding is also carried on to some extent. The population of the town, which in 1821 was 16,607, amounted by the census of 1872 to 39,700,

Boulogne is usually, though on somewhat dubious grounds, identified with the Gesoriacum of the Romans, At an early period it began to be known as Bononia, a name which has been gradually modified into the present form.

The town was destroyed by the Normans in 882, but restored about 912. From about that time till 1477 it was the head of a separate countship, which was united to the crown of France by Louis XI., who ingeniously recognized the Holy Virgin as the superior, and declared hinself her vassal. In 1544 Henry VIII.—more fortunate in this than Henry III. had been in 1347—took the town by siege ; but it was restored to France in the following reign.

BOULTON, Marruew, manufacturer and practical engineer, was born at Birmingham on the 14th of September 1728. He was called early into active life upon the death of his father in 1745, and soon found ample scope for the exercise of his inventive faculties in improving the manufactures of his native place. His first attempt was a new mode of inlaying steel; and he succeeded in obtaining a considerable demand for the products of his manufactory, which were principally exported to the Con- tinent, and uot uncommonly re-imported for domestic use as of foreign manufacture.

In 1762, his fortune being already considerable, he purchased a tract of barren heath in the neighbourhood of Birmingham, with a single house on it, and there founded, at the expense of £9000, the manufactory which flourished so long and was so well known under the name of Soho. His workmen were at first principally employed in the imitation of ormolu, ard in copying oil paintings with great accuracy, by means of a mechanical process which was invented by a Mr Eggington, who afterwards distin- guished himself by various works in stained glass. Boulton finding the horse-power inadequate to the various pur- poses of his machinery erected, in 1767, a steam-engine, upon the original construction of Savary, which, notwith- standing the inconvenience of a great loss of steam from condensation, by its immediate contact with the water raised, has still some advantages from the simplicity of the apparatus it requires, and has been found to succeed well upon a small scale. But Boulton’s objects required a still more powerful machine, and he had the discernment to perceive that they might be very completely attained by the adoption of the various improvements made in the steam-engine by James Watt of Glasgow, who had obtained a patent for them in 1769, the privileges of which were extended in 1775, by an Act of Parliament, to a term of twenty-five years. Boulton induced the great inventor to remove to Birmingham. They

commenced a partnership in business, and established a manufactory of steam- eugines, in which acenrate execution kept pace so well with judicious design, that its productions continued to be equally in request with the public after the expiration of

the term of that legal privilege which at first gave the roprictors the exclusive right of supplying them, and which had been confirmed in 1792 by a dccision of the

Court of King’s Bench against some encroachment on the right of the patentee. It was principally for the purpose of carrying on this manufactory with greater convenience, that the proprietors established an iron-foundry of their own at Smethwick, in the neighbourhood of Soho.

In 1785 Boulton was made a fellow of the Royal Society, about the same time with Withering, and several others of his scientific neighbours. In 1788 he turned his attention to the subject of coining, and erected machinery for the purpose, so extensive and complete, that the operation was performed with equal economy and precision, and the coms could not be imitated by any single artist for their nominal value,---each of the stamps coining, with the attendance of a little boy only, about eighty pieces in a minute, The preparatory operation of laminating and cutting out the metal was performed in an adjoining room; and all personal communication between the work- men wasrendered unnecessary by the mechanical conveyance of the work from one part of the machinery to another. A coinage of silver was executed at this mint for the Sierra Leone Company, and another of copper for the East Indies, besides the pence and half-pence at one time in circulation throughout England, and a large quantity of mouey of all kinds for Russia. In acknowledgment of Boulton’s services, and in return for some specimens of his different manufactures, the Emperor Paul made him a present of a valuable collection of medals and minerals.

In 1797 he obtained a patent for a mode of raising water by impulse, the specification of which is published in the ninth volume of the Repertory of Arts, p. 145. It had been demonstrated by Daniel Bernouilli, in the be- ginning of the century, that water flowing through a pipe, and arriving at a

part in which the pipe is suddenly contracted, would have its velocity at first very greatly increased ; but no practical application of the principle appears to have been attempted, until an apparatus was set up in 1792 by Mr Whitehurst for Mr Egerton of Oulton, in Cheshire, consisting of an air-vessel communicating with a water-pipe by a valve, which was forced open by the pressure or rather impulse of the water, when its passage through the pipe was suddenly stopped by turning the cock in the ordinary course of domestic economy ; aud although the pipe through which the water was forced up was of moderate height, the air-vessel, which was at first made of lead, was soon burst by the “momentous force,” as White- hurst termed it. The apparatus had excited much atten- tion in France, under the name of Montgolfier’s hydraulic ram ; and Boulton added to it a number of ingenious niodi- fications, some of which, however, are more calculated to display the vivid imagination of a projector than the sound judgment of a practical engineer, which had in general so strongly characterized all his productions.

He died, August 17, 1809, after a long illness, in posses- sion of considerable affluence and of universal esteem. (See Smiles's Lives of Boulton and Watt, 1865.)

BOURBON. The noble family of Bourbon, from which 80 Many European kings have sprung, took its name from = i district in the centre of France, called the ra onnaws, which in the 10th century was one of the om great baronies of the kingdom. The first of the long pe ourbons known in history was Adhémar or Aimar, aa invested with the barony towards the close of the 4 aa In 1272 Beatrix, daughter of Agnes of Pourbon and her husband John of Burgundy, married a of Clermont, sixth son of Louis IX.

a's of France. The elder branches of the family

ecome extinct, and their son Louis became duc de

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Bourbon in 1327. In 1488 the line of his descendants ended with Jean II., who died in that year. The whole estates passed to Jean's brother Pierre, lord of Beaujeu, who was married to Anne, sister of Louis XI. Pierre died in 1508, leaving only a daughter, Suzanne, who, in 1505, married Charles de Montpensier, heir of the Montpensier branch of the Bourbon family. Charles, who took the title of duc de Bourbon on his marriage, was born in 1489, and at an early age was looked upon as one of the finest soldiers and gentlemen in France. His union with Snzanune made him the wealthiest and most powerful French noble ; and after his brilliant successes in Italy and France, he became an object of dread to Louis XII., who would not give him the command of the army of Italy. In 1515 Francis I., on his accession, made Bourbon constable of France, and in that capacity he gained new honours, and was for a time in the highest favour with the king. But serious differences soon arose between them, originating, according to common report, in the violent but slighted passion of Louise, duchesse d'Angouléme, the king's nother, for the coustable. The grossest insults were heaped upon Bourbon ; his official salary and the sums he had borrowed for his war expenses remained unpaid; in the campaign against Charles V. the command of the vanguard was given to the duc d'Alengon ; and after the

death of Suz- anne de Bourbon, an action was raised by the queen dowager, who claimed to be nearest heir. In defiance of Bourbon's marriage-settlement, judgment was given against him, and he was reduced to absolute beggary. Smarting under these wrongs he entered into negotiations with Charles V., and on these coming to the knowledge of Francis at once fled from his native country and joined the emperor. He did good service in the war against his countrymen, and especially distinguished himself at the battle of Pavia, where his ungenerous sovereign Francis was taken prisoner. Bourbon, however, did not find Charles very ready to fulfil his various promises, and determined to seize a kingdom for himself. With the division under his command he penetrated into Italy, and on the 5th May 1527 appeared before the walls of Rome. In the assault on the following morning he was the first to mount the walls, and fell mortally wounded by a pistol-shot, fired, it is said, by Benvenuto Cellini. His army succeeded in taking aud sacking the town. With the con- stable ended the direct line from Pierre, duc de Bourbon. But the fourth in descent from Pierre's brother, Jacques, Louis, count of Vendéme and Chartres, became the ancestor of the royal house of Bourbon and of the noble families Condé, Conti, and Montpensier. The fourth in direct descent from Louis of Vendome was Antoine de Bourbon, who in 1548 married Jeanne d'Albret, heiress of Navarre, and who became king of Navarre in 1554, Their son became king of France, with the title Henri IV. Henri was succeeded by his son Louis XIII., who left two sous, Louis XIV., and Philippe, duc d'Orleans, head of the Orleans branch. Louis XIV.'s son, the Dauphin, died before his father, and left three sons, one of whom died without issue. Of the others the elder, Louis of Burgundy, died in 1712, and his only surviving son became Louis XV. The younger, Philippe, duke of Anjou, became king of Spain, and founded the Spanish branch of the Bourbon family. Louis XV. was succeeded by his grandson, Louis XVL., who perished on the scaffold. At the restoration the throne of France was occupied by Louis XVIII., brother of Louis XVI., who in turn was succeeded by his brother Charles X. The second son of Charles X., the duc de Berri, left a son, Henri Charles Ferdinand Marie Dieudonné d'Artois, duc de Bordeaux, and count de Chambord, who is a claimant of the French throne, and is designated by his adhcrents, Heari YW. From Louis XIV.'s brother,

Philippe, has descended another claimant of the throne. Philippe's son was the Regent Orleans, whose great grand- son, Philippe Egalité, perished on the scaffold in 1793. Egalité's son, Louis Philippe, was king of France from 1830 to 1848; his grandson, Louis Philippe (born 1838), is the present Comte de Paris.

Spanish Branch.—Philippe, due d'Anjou, grandson of Louis XIV., became king of Spain as Philip V. in 1700. He was succeeded in 1746 by his son Ferdinand V1., who died in 1759 without family, and was followed by his brother Charles III. Charles III.'s eldest son became Charles IV. of Spain in 1788, while his second son, Fer- dinand, was made king of the Two Sicilies in 1759. Charles IV. was deposed by Napoleon, but in 1814 his son, Ferdinand VIL. again obtained his throne. Ferdinand

was succeeded by his daughter Isabella, who in, 1870.

abdicated in favour of her son Alphonso, at present (1876) in possession of the Spanish kingdom. Ferdinand's brother, Don Carlos (died 1855), claimed the throne in 1833 on the ground of the Salic law, and a fierce war raged for some years in the north of Spain. His son Don Carlos, count de Montemolin (born 1818, died 1861) revived the claim, but was defeated and compelled to sign a renunciation. The nephew of the latter, Don Carlos Maria Juan Isidor (born 1848), has been for some years carrying on war in Spain with the object of attaining the rights contended for by the Carlist party.

Neapolitan Branch—The first Bourbon who wore the crown of Naples was Charles III. of Spain, who on his succession to the Spanish throne in 1759, resigned his kingdom of Naples to his son Ferdinand. Ferdinand was deposed by Napoleon, but afterwards regained his throne, and took the title of Ferdinand I., king of the Two Sicilies, In 1825 he was succeeded by his son Francis, who in turn was succeeded in 1830 by his son Ferdinand II. Ferdinand Il, died in 1859, and in the following year his successor Francis IT. was deprived of his kingdom, which was in- corporated into the gradually-uniting Italy.

Duchies of Lucca and Parma.—tIn 1748 the duchy of Parma was conferred on Philip, youngest son of Philip V. of Spain. His grandson, Charles Louis Ferdinand, became king of Etruria in 1801, but was deprived of his

possessions by the French. In 1847, however, he received the duchies of Parma and Piacenza on the death of his mother, but after two years abdicated in favour of his son, Charles III. Charles III. married the daughter of the duc de Berri, and Was assassinated in 1854. His son was proclaimed duke, but the territorics of Parma and Piacenza were seized by Victor Emanuel in 1859-60,

Coiffier de Moret, Histoire du Bourbonnats et dcs Bourbons, 2 vols. 1824; Berand, Histoire des sires et ducs de Bourbon, 1835 ; Désor- meaux, Histoire de la matson de Bourbon, 5 vols., 1782-88 é Achaintre, Histoire généalogique et chronologique dela maison royale

de Bourbon, 2 vols., 1825-6.

BOURBON, an island off the east coast of Africa, now known as Réunion. See Rxunion,

BOURBON-L'ARCHAMBAULT (the Agua Bormonis of the Itineraries), a town of Frauce, in the department of the Allier, on the Burge, 19 miles W. of Moulins. It was anciently the capital of the Bourbonnais, and gave its name to the great Bourbon family. Its mineral waters, both hot and cold, were formerly in high repute. In 1789 it changed its name for that of Burges-les-Bains, but the former designation was afterwards resumed, It contains a Gothic church of the 12th century, and the outer walls and towers of a castle finished by Anne of Beaujeu in the 15th. Population in 1872, 2400,

BOURBON-VENDEE, or NAPOLEON VENDEE, a town

of France, capital of the de artment of L called La Rocuz sur Yon, ace tial of La Vendée, now

BOURBONNE-LES-BAINS, a town of France, in the department of Haute-Marne, in the arrondissement of Langres, and 21 miles E.N.E. of that town. frequented on account of its hot saline springs, which are found on the site of the old Roman baths. 'The heat of these springs varies from 120° to 156°

Fahr. The number of visitors is upwards of 800 annually. The principal buildings are a church of the 13th century, the town-house, and the hospital ; there are also the remains of a castle and q priory. The manufacture of beet-root sugar is carried op in the town, and gypsum and alabaster are quarried in the neighbourhood. Population in 1872, 4038.

BOURCHIER, Joun, Lord Berners, born about 1474, was grandson and heir of a lord of the same name, who was descended from Thomas of Woodstock, duke of Gloucester, and had been knight of the Garter and constable of Windsor Castle. He was educated at Oxford, and was created a Knight of the Bath on the marriage of the duke of York, second son of Edward IV. He was first known by quelling an insurrection in Cornwall and Devonshire, raised by Michael Joseph, a blacksmith, in 1425, which service recommended him to the favour of Henry VII, He was a captain of the pioneers at the siege of Therouanne under Henry VIII., by whom he was made chancellor of the exchequer for life, and lieutenant of Calais and the Marches. He was appointed to conduct Mary, the king's sister, into France on her marriage with Louis XIT., and had the extraordinary fortune of continuing in favour with Henry VIII. for the space of eighteen years. He died at Calais in 1532, aged 65. By king Henry's command he translated Froissart's Chronicle, which was printed in 1593 and 1525 by Pynson, the scholar of Caxton. His other works consisted of translations from French, Spanish, and Italian novels. These were, the History of the most Noble Valyaunt Knyght, Arthur of Lytell Brytayne ; the Famous

Exploits of Sir Hugh of Bourdeaux; the Golden Boke of

Marcus Aurelius ; and the Castle of Loue. He composed also a book on the duties of the inhabitants of Calais, and a comedy entitled [te in Vineam, which used to be acted at Calais after vespers.

BOURDALOUE, Louvrs, a celebrated preacher, and one of the greatest orators that France has ever produced, was born at Bourges, August 20, 1632. At the age of sixteen he entered the Society of Jesus, of which he was destined to become one of the greatest ornaments, aud there com- pleted his studies. His able masters, who early discerned his talents, successively confided to him the chairs of humanity, of rhetoric, of philosophy, and of moral theology; and it was only after passing through these different

probationary employments that he arrived at the eminent post which was designed for him, and was deemed qualified for mounting the pulpit.

In order to form an idea of the difficulties which he had to surmount, and of the talents which he displayed, it is only necessary, on the one hand, to call to mind the ridiculous manner and inflated style of the preachers of that period ; and on the other, to figure the young Jesuit at issue with the bad taste as well as the bad habits of the time,—combating at once the passions, the vices, the weak- nesses, and the errors of humanity, and overcoming his enemies, sometimes with the arms of faith, and sometimes with those of reason.

At first he preached for somie time in the provinces, but his superiors afterwards called him to Paris, ‘This took place in 1669, at the most brilliant epoch of the age of Louis XIV., when nothing was talked of but the victories of Turenne, the festivities of Versailles, the masterpieces of Corneille and Racine, the encouragement afforded to the arts, and the general impulse given to the human mind, Bourdaloue suddenly appeared in the midst of these fase

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nations, and, far from diminishing their effects, the severity of his ministry and the gravity of his eloquence served rather to enchance their splendour. His first sermons met with prodigious success, and all voices were raiscd in loud applause of the preacher. Madame de Sevigne, sharing the universal enthusiasm, wrote to her danghter that “‘ she had never heard anything more beautiful, more noble, more astonishing, than the sermons of Father Bourdaloue.” Louis XIV. also wished to hear him, and the new preacher was in consequence sent to court, where he preached during Advent in 1670, and during Lent in 1672 ; and he was after- wards called for the Lents of 1674, 1675, 1689, and 1682, and for the Advents of 1684, 1689, and 1693. This was a thing unheard of before, the same preacher being rarely called three times to court. Bourdaloue, however, appeared there ten times, and was always received with the same ardour. J.ouis XIV. said that “he loved better to hear the repetitions of Bourdaloue than the novelties of any

one else.” After the revocation of the Edict of Nantes he was sent to Languedoc to preach to the Protestants, and con- firm the newly-converted in the Catholic faith ; and in this delicate mission he managed to reconcile the interests of his ministry with the sacred rights of humanity. He preached at Montpellier in 1686 with the greatest success, Catholics and Protestants being all equally eager to recog- nize in this eloquent missionary the apostle of truth and of virtue.

In the last years of his life Bourdaloue abandoned the pulpit, and devoted himself to charitable assemblies, hospitals, and prisons, where his pathetic discourses and conciliatory manners were very effective. He had the art of adapting his style and his reasonings to the condition and the understanding of those to whom he addressed either counsel or consolation. Simple with the simple, crudite with the learned, and a dialectician with sophists and disputants, he came off with honour in all the contests in which zeal for religion, the duties of his station, and love of mankind led him to engage. Equally relished by the great and by the commonalty, by men of piety, and by people of the world, he exercised till his death in 1704 a sort of empire over all minds; and this ascendency he owed as much to the gentleness of his manners as to the force of his reasoning. “His conduct,” says one of his con- temporaries, “is the best answer that can be made to the Lettres Provinciales.” No consideration was ever capable of altering his frankness or corrupting his probity.

Bourdaloue may with justice be regarded as the reformer of the pulpit and the founder of Christian eloquence among the French, That which distinguishes him from other preachers is the force of his reasoning, and the solidity of his proofs. Never did Christian orator infuse into his discourses more majesty, dignity, energy, and grandeur. like Corneille, he has been charged with overlabouring his diction, and accumulating idea upon idea with a needless superiiuity of illustration—of speaking more to the under- standings than to the hearts of his auditors, and sometimes encrvating his eloquence with the too frequent use of divi- sions and subdivisions. But even in subscribing to these criticisms, which are to a certain extent well founded, it is impossible not to admire the inexhaustible fecundity of his plans—the happy talent velut imperatoria virtus which he possessed, of disposing his reasonings in the order best calculated to command victory—

the logical skill with which he excludes sophisms, contradictions, and paradoxes—the art with which he lays the foundations of our duty in our interest—and, finally, the inestimable secret of converting ies details of manners and habits into so many proofs of

us Subject. Parallels have often been drawn between Bourdaloue and Massillon ; but the talents of these great pulpit orators lay in different directions, and they may, |

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therefore, be more fitly contrasted than compared. “ Be- tween Massillon and Bossuet,” says Lord Brougham, whose judgment of Bossuet errs, however, on the side of severity, (Works, vol. vii.), “and at a great distance certainly above the latter, stands Bourdaloue, whom some have deemed Massillon’s superior, but of whom an illustrious critic (D’Alembert, Eloge de Massillon) has more justly said that it was his greatest glory to have left the supremacy of Massillon still in dispute. It is certain that he displays a fertility of resources, an exuberance of topics, whether for observation or argument, not equalled by almost any other orator, sacred or profane.” If Massillon is now read with a more lively interest, he owes that advantage to the charms of his style rather than to the force of his reason- ing. Among the critics of the present day, the prefer- ence is unhesitatingly given to the rival of Racine, to the painter of the heart, to the author of the discourse on the small number of the elect; but if we consult the contemporaries of Massillon himself, we shall find that they assign him only the second rank. According to them Bourdaloue preached to the men of a vigorous and masculine age—Massillon to those of a period remarkable for its effeminacy. Bourdaloue raised himself to the level of the great truths of religion—Massillon conformed himself to the weakness of the men with whom he lived. The bishop of Clerment will always be read; but if the simple Jesuit could raise his commanding voice from the tomb, and again roll forth a majestic stream of divine truth, the courtly accents of his rival would no longer be heard, and the charms of his diction would be forgotten. The first part of his celebrated Passion, in which he proves that the death of the Son of God is the triumph of His power, has generally been considered as the great masterpiece of Christian eloquence. Bossuet has said nothing

stronger or more elevated. The second part, however, is inferior to the first, though considered by itself alike beautiful and convincing.

The discourses of Bourdaloue have been described by a celebrated French critic as embodying in them a complete course of theology. ‘This is perhaps going a little too far ; but still their general merit is very great, and for nothing are they more distinguished than their comprehensiveness. The diction of this great preacher is always natural, clear, and correct, sometimes deficient in animation, but without vacuity or languor, and generally relieved by outbreakings of much force and originality.

Two editions of Bourdaloue’s works were published at Paris by Pére Bretonneau, a Jesuit,—onc in 16 vols. 8vo, 1707-34, and the other, from which the editions of. Rouen, Toulouse, and Amsterdam were afterwards printed, in 18 vols. 12mo, 1709-34. The Versailles edition appeared in 1812-13, in 16 vols. 8vo. It is much inferior to the former. Of recent editions, the best are those of 1822-26, 17 vols. 8vo; of 1833-34; of 1840, 3 tom. 8vo; of 1847, 18 vols. ; and of 1864, 4 vols. The Sermons inédites de Bourdaloue, published by the Abbé Sicard in 1810, are apocryphal. (See Vie de P. Bourdalowe, par Madame de Prigny, 1705; Esprit de Bourdaloue, par PAbbé de la Porte; St Arnaud, Wotice sur P. Bourdaloue, 1862.)

BOURG, the chief town of the department of Ain in France, and formerly the capital of the province of Bresse, is situated 27 miles N.E. of Lyons, on the banks of the Reyssouze, a tributary of the Sadne. Its streets are narrow and crooked, and the whole town is very irregularly ‘aid out. Among its public buildings are a new prefecture, a taeatre, a library (with upwards of 22,000 volumes), an asylum, a foundling hospital, a lyceum, and a theological seminary. In the suburb of St Nicholas is the famous church of Notre Dame de Brou, which was built in the first half of the 6th century by Margaret of Austria, and is remarkable

for the richness of its sculpture and carving. Two of the squares of the town are ornamented, one with a statue of Bichat by David d’Angers, and the other by an obelisk to the memory of General Joubert. The manufactures of the place consist of cloth, linen, hats, hosiery, horn combs, and pottery; aud

there is an active trade in grain, cattle, horses, and wine. The early history of Bourg and its identification with any of the places recorded by the Roman writers have been matters of considerable dispute. In the earlier part of the Middle Ages it seems to have been called Tanum. Raised to the rank of a free town in the end of the 13th century, it was afterwards chosen by Amadeus IV. of Savoy as the chief city of the province. In 1535 it passed to France, but was restored to Duke Philibert Emanuel, who in 1590 built a strong citadel, which after- wards withstood a six months' siege by the soldiers of Henry IV. The town was finally ceded to France in 1601. In 1814 the inhabitants, in spite of the defenceless condi- tion of their town, offered resistance to the Austrians, who put the place to pillage. Vaugelas the grammarian and Lalande the astronomer were both born at Bourg-en-Bresse. Population in 1872, 12,912.

BOURGAS, Bureuaz, or Boreas, called in the Middle Ages Pyrgos, a seaport town of Turkey in the province of Rumelia, situated on a bay of the Black Sea, to which it gives its name, about 70 miles N.E. of Adrianople, in 42° 30' N. lat. and 27° 30' E. It is neatly built, and has a large public square surrounded with stalls for the accom- modation of 5000°horses. Pottery and pipes are manufac- tured with great taste from clay obtained in the neigh- bourhood, and there isa considerable trade in grain, woollen stuffs, tallow, butter, cheese, rosewater, and other productions of the surrounding country. Not far distant is Litzin, a favourite summer watering-place. In 1825 the Russians besieged the town. The population is estimated at 5000.

BOURGELAT, Craupz, who may be called the father of veterinary science, was born at Lyons in 1712, and died in 1799. He entered the profession of law, but abandoned it in disgust at having gained an unjust suit for a client. Embracing the military profession he served in the cavalry, and thus had ample opportunity of studying the diseases of animals. In 1772 he opened at Lyons a veterinary school, which soon became celebrated over Europe. His great success induced the Government to establish several similar institutions; and Bourgelat was appointed to superintend the school established at Alfort, which became, and continues to be, the chief seat of veterinary science in France. Bourgelat was a member of the Academies of Sciences of Paris and of Berlin, and corresponded with some of the most eminent men of science of histime. His works on veterinary subjects are

numerous and valuable ; perhaps the most important is the 7raité de la conformation extérieure du cheval, de sa bearté et de ses défautes, 1776.

BOURGES, a city of France, formerly the capital of the province of Berry, and now the chief town of the depart- ment of Cher, is situated about 100 miles 8. of Paris, at the confluence of the Auron and Yevre, in 47° 4’ 59’ N. lat, and 2° 32’ E. long. The sixty watch-towers by which it was formerly defended have been removed, but it is still surrounded by ramparts laid out as promenades, and its streets are remarkable for the numerous specimens which they preserve of medieval architecture. The cathedral, Which dates in its earlier portions from the 13th century, is Tegarded as one of the finest in France, and the Hotel de Ville, originally the house of Jacques Coeur, the famous Jeweller under Charles VIL, is a splendid example of the florid style of the 15th cen tury. The house of the Lallemant family, built about 1520, that of Cujas, the famous jurist, dating from the 16th century, and now used as barracks for the gendarmerie, and the gate of Saint Ours, are also

worthy of notice. The archiepiscopal palace, the great } prison, and the grand seminaire, new converted into cavalry barracks, are the most important of the other buildings, | There are also in the town a museum, a large public library and a number of colleges, A certain amount of trade 5s carried on in grain, hemp, wood, skins, wool, and cattle – and cloth, leather, and cutlery are manufactured. There are also several breweries, and the nurseries in the neigh. bourhood are famous. In 1861 the city became the seat ’ of a military arsenal, which is now of considerable import. | ance. ‘The population, stated at 22,465 in 1851, amounted _ in 1872 to 27,377. Bourges occupies the site of the Gallic town of Avaricum, mentioned by Cesar as one of the most important of all Gaul. In 52 3B. during the war of | Vercingetorix, it was completely destroyed by the Roman conqueror, but under Augustus it rose again into importance, and was made the capital of Aquitania Prima. In 259 A.D. it became the seat of a bishop, the first occupant of | the see being Ursinus. Captured by the Goths in 475, it continued in their possession till about 507, During the English occupation of France in the 15th century it became _ the residence of Charles VII., who

thus acquired the popular title of king of Bourges. In 1463 a university was founded in the city by Louis XI., which continued for centuries to be one of the most famous in France, especially in the depart- ment of jurisprudence. On seven different occasions Bourges | was the seat of ecclesiastical councils,—the most important being the council of 1438, in which the Pragmatic Sanction of the Gallican Church was established, and that of 1528 in which the Lutheran doctrines were condemned. BOURIGNON, Anrornerte, a singular enthusiast of the 17th century, who excited considerable commotion by her religious doctrines, but whose pame is now almost forgotten. She was born at Lille in the beginning of 1616 ; and her appearance as an infant was so deformed that the question of preserving her alive was seriously discussed. She manifested, while still very young, an extraordinary spirit of religious fervour, fostered, apparently, by her loneliness and the neglect of her parents. As she grew up this spirit increased in intensity. So few, it seemed to her, lived according to their professed Christian principles that she desired to be carried into the Christian countries. The unhappiness that she observed at home, from the severity of her father to her mother, gave her an invincible — repugnance to marriage,—so much so that when it was | desired that she should marry at the age of twenty she fled _ from her father's house in disguise. Her disguise, however, was soon discovered, and having fallen into the hands of a : soldier, she ran worse risks than if she had remained to face | her destiny at home. Her autobiography dwells upon these and other similar events of her life, when her virtue underwent violent assault, which she was happily able to resist. She is said to have been " endowed with a wonder- ful chastity, which remained unassailable by all force or enticement, and which not only preserved her own person pure, but diffused around her an ardour of continence."

_ Having been delivered from the hands of the soldier into which she had fallen in her wanderings, she became known to the archbishop of Cambray, under whose sanction she established a small society of nuns. She soon, however, became restless in her new occupation, in which she does not seem to have been successful. The archbishop withdrew his countenance, and for a time she returned to her native country, where she is said to have " passed many years in privacy and ina great simplicity of life." On the death of her parents she became entitled to some fortune, which she at first

declined, but afterwards took possession of. She seems then to have become the head of a hospital at Lille | for some time (1653, et seg.), but scandal having broke | out in connection with it, she left and fled to Ghent (1662).

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Here, apparently, she entered upon the higher prophetic hase of her life. ‘God revealed great secrets to her,” which she began to proclaim; and soon she gathered around her a few ardent disciples. Her prophetic views were spe-

cially expounded in one of her books published at this time.

at Amsterdam, entitled The Light of the World. Some of her disciples formed the design of settling in the island of Noordstrand in Holstein. At first she seems to have de- clined to join them, but afterwards set out for the purpose. She did not remain long, disturbances having arisen not only against her opinions, but in the ranks of her own followers. She was evidentlyimpatient of sharing her influence with any one, and is said to have been of very difficult and self-willed temper. She returned to Holland, and died there in 1680.

It is difficult to give any estimate of A. Bourignon’s character and opinions. So far as appears, she was a visionary of the ordinary type, only distinguished by the rare persistency and audacity of her pretensions. Amidst all her enthusiasms she seem to have known how to look after her own interests. She is said never to have given alms to the poor, not even to the hospital which she super- intended. She was willing to assist with her hand, but not with her money. Her main idea about religion was that it was a mere internal ecstasy, independent of both church and Bible. She had innumerable visions, from which source she chiefly drew her religious inspiration and knowledge, Among others she saw in vision Antichrist and Adam before the Fall; and she describes the appearance of the former minutely, even to the colour of his hair. Her visions and views she gave to the world in numerous treatises and pamphlets.

Her followers in Holland seem to have dwindled rapidly away, if they ever had any of the life of a distinct sect ; but, strangely, her influence revived in

Scotland in the beginning of the 18th century, so much so as to be a source of alarm to the Presbyterian Church, and to call forth not only one but several Acts of the General Assembly in denunciations of her doctrines and earnest caution against their contagion. These Acts are found severally in 1701, 1709, and 1710; and even at this last date it is alleged that “the gross heresies and errors going under the name of Bourignianism are greatly prevailing in the bounds of the national church.” This is the explanation, no doubt, of the fact that Bourignianism is amongst the heretical sects which the clergy of the Church of Scotland are taken bound to “disown” at their ordination in a series of questions appointed to be put in 1711. The very name, however, is now generally unknown in Scotland, notwithstanding this strange survival of it; and should any one turn to the Act of Assembly of 1701, which professes to enumerate the opinions of M. Antonia Bourignon, and describes them as “ impious, pernicious, and damnable,” he will hardly get more light as to the nature of these opinions than elsewhere. They present an unintelligible conglomeration without coherency or order, —such subjects as the denial of elec- tion, the permission of sin, and the bondage of the will being mixed up with the quality of Christ’s human nature, the perfection of the present life, and “that generation takes place in heaven, and that there are no true Christians in the world.” Mlle. Bourignon’s works were published in French at Amsterdam in 1686, in 19 vols. 8vo. Her Vie extériewre, by herself, to be found in the first volume is the chief authority for the earlier part of her life. La Vie continuée de Mlle, Bowrignon, which occupies the whole of the second volume (author’s name not given), treats of her life at length, but in a semi-legendary manner. her Works at least have been translated into English,—An Abridgment of the Light of the World, London, 1786; A Treatise of Solid Virtue, 1699; The Restoration of the Gospel Spirit, 1707, ;

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BOURNE, VincENT, one of the most able modern writers of Latin verse, wis born at Westminster towards the close of the 17th century. In 1710 he became a scholar at Westminster school, and in 1714 entered Trinity College, Cambridge. He graduated in 1717, and obtained a fellowship three

years later. Of his after life exceedingly little is known. It is certain that he passed the greater portion of it as usher in Westminster school. He died on 2d December 1747. During his lifetime he published several small collections of his Latin poems, and in 1772 there appeared a very handsome 4to volume containing all Bourne's pieces, but also some that did not belong to him. The Latin poems are remarkable not only for perfect mastery of all linguistic niceties, but for graceful ex- pression and genuine poetic feeling. A number of them are translations of English poems, and it is not too much to say that the Latin versions almost invariably surpass the originals. Cowper, an old pupil of Bourne's, Beattie, and Lamb have combined in praise of his wonderful power of Latin versification.

BOURNEMOUTH, a watering-place in the south of England, situated on the Hampshire coast about five miles from Christchurch. Its sheltered situation and desirable winter climate began to attract notice about 1840; and now it possesses five or six hotels, several churches, a library and reading-room, assembly-rooms, baths, and the usual accompaniments of a frequented watering-place. In 1855 a sanatorium for consumptive patients was erected by subscription, and various establishments of a similar nature haye since been founded. A pier 800 feet long was opened in 1861, and in 1870 railway communication was afforded by a branch of the South-Western froin Ring- wood. The climate is remarkable for the equability of its temperature. According to observations from 1862 to 1872 the average maximum by day in July is 71°:9, and the average minimum by night in January 35°°6. The rainfall is about 30 inches in the course of the year, and the subsoil carries off water with great readiness. The surrounding country is extremely beautiful; and the buildings of Bournemouth itself are picturesquely disposed on the slope of a richly wooded hill. Yopulation in 1871,

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BOURRIENNE, Louis Antoine FavuveLeT pz, the early friend and biographer of Napoleon, was born at Sens in 1769. His friendship with Napoleon began at the military academy of Brienne, where they were class-fellows, but they did not meet for some time after leaving school, as Bourrienne's humble birth precluded him from military service. In 1789,

having embraced the career of diplomacy, he was sent as attaché to Vienna, and thence proceeded to Leipsic where he studied for some time. In 1792 he returned to Paris and renewed his close acquaintance with Bonaparte. Towards the close of the same year he was sent as Secretary of Legation to Stuttgart, but the fall of the monarchy a few months later threw him out of office. He was imprisoned for a short time by the Saxon Govern- ment as an adherent of the Revolution, and did not return to Paris till 1795. In the following year, after a slight coldness between the friends, Napoleon invited Bourrienne to become his private secretary. The offer was accepted, and for six years the two lived on the most intimate and friendly terms. It was during this period that he accompanied Napoleon to Egypt. In 1802 implication in the disgraceful failure of the army-contractors Coulon caused his admissal. Three years later, however, he was sent as chargé d'affaires to Hamburg. 'There he was ac- cused of peculation, and was in consequence recalled and compelled to pay one million francs into the public treasury.

3ourrienne never forgave this; he became one of Napoleons bitterest enemies, and after ae first abdicatior .— 23

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held office for a short time under Talleyrand. In 1815 be was specially excluded from Napoleon's amnesty and fled to Belgium. After the fall of the emperor he sat for some years in the Chamber of Representatives, but his official salary could not support his extravagance, and in 1828 he took refuge from his creditors in Belgium. There he occupied himself in drawing up the Jfémozres of Napoleon, which were published in 1829 and 1830, The revolution of 1830 and the discomforts of his private life so preyed upon his mind that his reason became unhinged, and he had to be removed to an asylum near Caen, where he died in 1834. Bourrienne's J/émozres, 10 vols. 8vo, 1829-31, contain much interesting information regarding Napoleon, but while lively and entertaining, they are in many points to be received with caution. Some of the inaccuracies were pointed out by Boulay de la Meurthe in Bourrienne et ses erreurs, 2 vols. 1830. '

BOURSAULT, Epmunp, a French dramatist and satirist, was born at Muci- l'Eveque, Burgundy, in 1638, On his first arrival in Paris in 1651 his power of language was limited to Burgundian patois, but he soon gained such

reputation as an author, that Louis XIV. directed him to draw up a book for the education of the Dauphin. In compliauce with this order Boursault produced his Veritable étude des souverains, which pleased so greatly the king that he offered to appoint the author tutor to his son, an office which Boursault's ignorance of Latin compelled him to decline. He obtained a considerable pension as editor of a rhyming gazette, which was, however, suppressed for ridiculing a capuchin, and Boursault was only saved from the Bastille by the infivence of Condé. Two of his dramas, Hsope & la Fille and Esope a la Cour were highly popular, and Corneille declared his tragedy Germanicus to be worthy of Racine. His best comedy was Mercure Galant, or Comedie sans Titre, as it was afterwards named. He accused Moliére of impiety, and assailed LZ' Ecole des Femmes in Le Portrait du Peintre. Moliére retaliated by contemptuously referring to him in L'Impromptu du Versailles, His Satyre des Satyres was directed against Boileau, whom, however, he afterwards generously offered to assist. In return for this kindness Boileau erased Boursault's name from his satires. Boursault died at Montlugon, where he held the office of collector of taxes, September 15, 1701.

BOUSSA, a town of Africa, situated on an island in the Niger, in 10° 14' N. lat. and 6° 11' E. long. The popula- tion is estimated at about 12,000. See Borev,

BOUTERWEK, Frrepricu, a German philosopher and historian of literature, was born in Lower Saxony in 1766. He was educated at Gottingen university, and seems to have contemplated joining the legal profession ; but his literary inclinations proved too powerful, and he devoted himself entirely to works of poetry and romance. He published several poems, and a romance Graf Donemar. Towards 1790 he began to study with great eagerness the Kantian philosophy, and in 1791 delivered a series of lectures on that subject in Gottingen. He was dissatisfied with the Kantian system, regarding it as too formal, particularly in the department of ethics, and was soon attracted to the system of Jacobi, which appeared to give the element of real existence cmitted by Kant. Bouterwek's most important work, Idee einer allgemeinen Apodiktik, 2 vols. 1799, is deserving of serious study, both as a critique of Kantianism, and as a substantial contribution to philosophy. In 1802 he was made professor of philosophy at Gottingen, and

published several valuable works, among others Aisthetik, 1806; Lehrbuch der phil. Wissenschaften, 1813; and Religion der Vernunft, 1824. During his later years Bouterwek was entirely devoted to an extensive literary work, To him had been entrusted the section on poetry

and eloquence in the great German series of histories of the sciences from the Renaissance dowuwards. The first volume of the Geschichte des neuern Poeste und Beredsamkeit appeared in 1805, the twelfth and last in 1815. It ig 4 work of great research, and has very substantial merits, It is, however, somewhat unequal, the portions on German and Spanish literature being superior to any of the rest. Part of the extended work has been translated into English asa History of Spanish Literature. Bouterwek died in 1828,

BOVALI, Bovatt, or Boaxt, a town of Africa, capital of the kingdom of Loango, situated in 4° 30’ §. lat. and 19° 1’ E. long., on the right bank of a river of the same name not far from the coast. The vicinity is fertile but unhealthy, A large trade is carried on in pepper, dye-woods, ivory, and slaves. Population estimated at 15,000.

BOVES, a township of Italy, in the province of Cuneo in Piedmont, situated at the foot of the Alps, about 4 miles from the city of Cuneo. There are iron-mines and marble quarries in the neighbourhood. Population, 9549,

BOVINO (the ancient Vebinwm or Viboniwm), a fortified town of Italy, province of Capitanata, 18 miles S.S.W. of Foggia. It is the seat of a bishopric and of a court of primary jurisdiction, and has a cathedral and several churches and convents. Here the Imperialists defeated the Spaniards in 1734. Population, 7088.

BOW, the weapon of the archer. See ARCHERY, vol, ii, p. 871, and Arms anp Armour, p. 553.

BOWDICH, Tuomas Epwazp, an English traveller, born

at Bristol in 1790, was brought up by his father for com- mercial life, and in 1814 obtained an appointment on the western coast of Africa. Two years

afterwards, on his return home, he was sent out by the African Company as their agent to the king of the Ashantees. In 1819 he published a quarto volume giving an account of that remarkable people. He then seems to have spent a con- siderable time at Paris in the study of the natural sciences, During his stay in Europe he edited several works on Africa, and published an excellent pamphlet on the British settlements on the western coast of Africa. He again visited Africa in 1822, with a firm resolution of devoting himself to the exploration of its interior; but he was attacked by fever on the Gambia, and died January 10, 1824. His widow, who had accompanied him, edited several productions of his pen after his death.

BOWDITCH, NatHanin1, a self-taught Amercian mathe- matician, born in 1773, of humble parents, at Salem in Massachusetts. He was bred to his father's business as a cooper, and afterwards apprenticed to a ship-chandler. His taste for mathematics early developed itself ; and he acquired Latin that he might study Newton's Principia. In 1795 he sailed as supercargo, in which capacity he made four long voyages ; and, being an excellent navigator, he afterwards commanded a vessel, instructing his crews in taking lunar and other observations. He edited three editions of Hamilton Moore's Navigation, and in 1802 published a valuable work, New American Practical Naw- gator, founded on the earlier treatise by Moore. In 1804 he became actuary to a Boston insurance company; and in the midst of his active and useful career published a translation of the Mécanique céleste of Laplace, with annotations,—a work which will better prove the great acquirements of this self-taught philosopher than any laboured panegyric. He died at Boston in 1838. A life of Bowditch was written by his son in 1839, and is pre- fixed to the last volume, published posthumously, of the translation of Laplace.

BOWLES, Caronine ANNE. See SouTHEY, CAROLINE.

BOWLES, Wriiu1am Liszx, poet and critic, was born at King's Sutton, of which his father was vicar, in 1762, At

the age of fourteen he was entered on the foundation at Winchester school, the head-master at the time being Dr Joseph Warton. In 1781 he left as

captain of the school, and proceeded to Trinity College, Oxford, to a scholarship to which he had been elected. ‘T’wo years later he gained the chancellor’s prize for Latin verse, and soon after left the university, not taking his degree as master till 1792. In 1789 he published, in a small quarto volume, Fourteen Sonnets, which met with considerable favour at the time, were hailed with delight by Coleridge and his young con- temporaries, and have since been recognized as the first notes of the modern revolt against the artificial school of poetry, the traditions of which had descended from Pope. I’he Sonnets even in form were a revival, a return to the older and purer poetic style, and by their grace of expres- sion, melodious versification, tender tone of feeling, and vivid appreciation of the life and beauty of nature, stood out in strong contrast to the affected common-places which at that time formed the bulk of English poetry. A second edition of the little volume was called for in the same year in which it had appeared, and there have been many subsequent editions, A few short pieces were published in 1790 and 1792, which were also received with favour. After taking his degree at Oxford he entered the church, and was soon appointed to the vicarage of Chicklade in Wiltshire. In 1797 he received the vicarage of Dumbleton in Gloucester- shire, and in 1804 was presented to the vicarage of Brem- hill in Wiltshire. In the same year he was collated by Bishop Douglas to a prebendal stall in the cathedral of Salisbury. In 1818 he was made chaplain to the Prince Regent, and in 1828 he was elected residentiary canon of Salisbury. He died at Salisbury in April 1850, aged 88. Of the longer poems published by Bowles none attain a very high standard of excellence, though all are distin- guished by purity of imagination, cultured and graceful diction, and great tenderness of feeling. The most extensive were Zhe Spirit of Discovery, 1804, which was mercilessly ridiculed by Byron; Zhe Missionary of the Andes, 1815 ; The Grave of the Last Saxon, 1822; and St John in Patmos, 1833. Bowles is perhaps more celebrated as a critic of poetry than as a poet. In 1807 he published an edition of Pope’s works with notes and an essay on the poetical character of Pope. In this essay he laid down certain canons as to poetic imagery which, with slight modification, have been since recognized as true and valuable, but which were received at the time with strong opposition by all admirers of Pope and his style. The “Pope and Bowles” controversy brought into sharp contrast the opposing views of poetry, which may be rouglily described as the natural and the artificial. Bowles

maintained that images drawn from nature are poetically finer than those drawn from art; and that in the highest kinds of poetry the themes or passions handled should be of the general or elemental kind, and not the transient mauners of any society. These posi- tions were vigorously assailed by Byron, Campbell, Roscoe, and others of less note, while for a time Bowles was almost solitary. Hazlitt and the Blackwood critics, how- ever, came to his assistance, and on the whole Bowles had reason to congratulate himself on having once for all established certain principles which might serve as the basis of a true method of poetical criticism, and of having maugurated, both by precept and by example, a new era in English poetry. Among other prose works from his prolific pen was a Life of Bishop Ken, 2 vols., 1830-31.

BOWLS, one of the oldest and most popular of English pastimes, the origin of which can be traced back to the 12th ceutury. William Fitzstephens, in his Survey of London, Written during the last quarter of that century, states that in the summer holidays youths took exercise amongst other pastimes in jactu lapidwm, “in throwing of stones.”

This might be taken as referring to throwing stones by slings or other artificial means, were it not that the next pastime mentioned is “slinging of missiles to be delivered beyond a certain mark (amentatis missilibus ultra metam expediendis).” Fitzstephens was both an accurate ob- server and a careful writer, and he clearly alludes to two distinct exercises. In early days stone spheres are known to have been used for bowling, and the like thing and name were in vogue for the next two centuries, in fact till 11 Henry IV. (1409). There is little doubt, therefore, that Fitzstephens here refers to bowls. It has been a matter of speculation whether bowling was first practised in the open air on turf or under cover in alleys, and Fitz- stephens may help to decide the question. He states that the citizens went outside the city walls into the suburbs to witness these games, but the alleys were within the walls and in the midst of the population. Again, these alleys were always held up as scenes of vice and debauchery, and it is certain that had they existed at this date they would have been included in the resorts forbidden to the clergy by the constitutions of Walter de Cantilupe, bishop

of Worcester, 24 Henry III. (1240). In the Close Roll, 39 Ed. III. (1366) mem. 23, jactus lapidum, “throwing of stones,” is mentioned as one of the ludos inhonestos et minus utiles aut valentes, “games alike dishonourable, useless, and unprofitable.” But then there was a reason for this depreciation. The king was concerned lest the practice of archery, so much more important to the military spirit of the kingdom, should suffer, and the same reason prompted the action of Parliament. By 12 Rich. II. cap. 6 (1388), servants, artificers, and labourers were forbidden —amongst other games to play at gettre de jeer, or “casting of the stone,” as the practice of archery was becoming lax. This statute was confirmed by 11 Henry IV. cap. 4. (1409-10), wherein “ gettre de peer” is again forbidden. From 17 Ed. IV. cap. 3 (1477-8) it appears that bowling still remained in disrepute; for “ half-bowl” is included among the “ many new imagined plays” which were followed by all classes “to their own impoverishment, and by their ungracious procurement and encouraging do inducen other into such plays till they be utterly undone

and impoverished of their goods.” Even murders, robberies,

and felonies were the consequence. Accordingly, it was enacted that any one playing at half-bowl after the follow- ing Eastar, or the occupier or governor of any “house, tenement, garden, or other place,” where such games are permitted, should be punished by fines and imprisonment. Here it is probable that both the outdoor and indoor games are referred to, as “ house” and “garden” are men- tioned, and it may be concluded that by this time alleys had sprung into existence in towns. This then may be considered the first mention of the game as practised under cover, though it is equally clear that alleys had not entirely superseded greens.

By 3 Henry VIII. cap. 3 (1511-12) the previous statutes against unlawful games were confirmed; the word “bowls” for the first time occurs, and the game is deemed an illegal pursuit. Owing, however, to the impos- sibility of following the outdoor game except during the » summer, and the absorption of playing fields for building purposes, public alleys continued to flourish, as they were again the cause of legislation in 27 Henry VIII. cap. 25 (1535-6), whilst 33 Henry VIIL cap. 9 (1541-2) was very severe indeed on them. ‘They were distinctly mentioned by name, and it was enacted that no one

“by himself, factor, deputy, servant, or other person, shall, for his or their gain, lucre, or living, keep, have, hold, occupy, exercise, or maintain any common house, alley, or place of bowling;” and magistrates might search suspected tene- ments and make arrests. Oddly enough, however, no

punishment was to be inflicted, except binding offenders over by their own recognizances, and making them find sureties not to break the law again. Artificers, servants, and the like, might play during Christmas time in their masters’ houses and presence, but no one could at any time “play at any bowle or bowles in open place out of his garden or orchard,” whilst a licence might be granted to any one worth over £100 per annum to play privately in his own domain, but not to keep any common or open place of play. By 2 and 3 Mary, cap. 9 (1555), these licences were cancelled, evidently for religious and poli- tical reasons, as they were considered excuses for “ unlaw- ful assemblies, conventicles, seditions, and conspiracies.” The evil still continued and remained irrepressible. Stephen Gosson, in his School of Abuse (1579), says—

‘Common bowling alleys are privy moths that eat up the credit of many idle citizens ; whose gains at home are not able to weigh down their losses abroad ; whose shops are so far from maintaining their play, that their wives and children cry out for bread, and go to bed supperless often in the year.”

Again, twenty years later, Stow, in his Survey of London, states—

‘* What should I speak of the ancient daily exercises in the long bow by citizens of this city, now almost clean left off and forsaken ? I overpass it; for by the means of closing in the common grounds, our archers, for want of room to shoot abroad, creep into bowling alleys and ordinary dining houses nearer home, where they have room enough to hazard their money at unlawful games. And there I leave them to take their pleasure.”

Stow also mentions in another place that the gardens of old Northumberland House, in Coleman Street, City,

“ Were made into bowling alleys, and other parts into dinin houses, common to all comers for their money, there to bow. and hazard; but now, of late, so many bowling alleys and other

houses for unlawful gaming have been raised in other parts of the city and suburbs, that this, their ancient and only patron of

misrule, is left and forsaken of her gamesters.” Again, Goswell Street is described as ‘‘replenished with small tenements, cottages, alleys, gardens, banqueting houses, and bowling places.”

The law, doubtless, was transgressed with impunity until the beginning of the 18th century, when power was given by 2 George IT. cap. 28, § 9 (1728), and confirmed by 18 George IT. cap. 34 (1745), to commit offenders to prison. From this date alleys were rigorously suppressed, whilst greens began to increase rapidly; and, during the 18th century, no country gentleman’s mansion was considered complete without one. There is evidence that it was a royal game, since Stow states that bowling alleys were amongst the additions made by Henry VIII. to Whitehall, and the unfurtunate Charles I. was an enthusiast of the open-air pastime. During his confinement at Holmby, Northamptonshire, he frequently went over to Lord Vaux’s at Harrowden, and Earl Spencer’s at Althorpe, both of which seats possessed unrivalled bowling greens. He is said to have been engaged at the game when seized by Cornet Joyce. After the suppression of alleys “long bowling,” or “Dutch rubbers,” was practised for a short time. It consisted of bowling at nine pins, placed on a square frame 30 yards distant, but does not appear ever to have found much favour in England. The first regular bowling ciub of which there exists any trace is the Willow- bank Club founded in Glasgow at the commencement of the 19th century. The game is now chiefly practised in the northern counties of England and in Scotland. In the present era of violent athletic exercises its principal votaries are middle-aged and elderly persons, to whom it affords a pleasant and not too vehement exercise during summer evenings.

For the outdoor pastime the first requisite is a smooth and level plot of turf, well mown, watered, rolled, and kept in order,—hence the comparison, “as smooth as a bowling green.” The earliest delineation extant of the

game shows two players with a ball each, but no jack or

at and knock from its position.

BOWLS

mark to bowl at. It is presumed from this that the first cast his bowl to constitute a mark for the second ty play Probably it wag soon found expedient to introduce some definite mark, and in a 13th century MS., marked 20 Ed. IV., in the Royal Library, there is a picture of a game of bowls being played with a small cone erected at each end. Here the principle was evidently the same as at present, viz., to see who could cast his bowl nearest the mark. The modern

green may be laid out on any suitable piece of smooth

and level turf. The dimensions vary, according to the ground available, but from 90 to 150 feet in length, with a proportionate width, is found most suitable. The bowls are made of lignum vite; and, instead of being perfect spheres, are more or less oval with a bias. Formerly bias was accorded them by loading one side with lead, but now the more simple method of turning one-half of the oval smaller or leaner than the other half is universally adopted. The chief difficulty of the game consists in each player's mastering the bias of his own particular bowl. The " Jack" or mark to be bowled at consists of a white ball of smaller size, which has superseded the old-fashioned cones. "Pegs" are a length of cord, with one end firmly attached to a bone or wooden peg, and the other passing through a hole in a similar peg. They are used for measuring which of two bowls is nearest the jack ; and, if the distance be under a yard, the "standard "—consisting of a light straw or reed ——may be called into requisition. A "rub" or "set" ig when a jack or bowl, in transitu, comes in contact with any object on the green. The "footer" is the smal] plece of material—cocoa-nut matting is the best—whereon each player stands in delivering his ball. « Cast," or "point," is the term for each unit in scoring the game, which is "up" or won when the number of casts agreed on have been obtained by the winning side. A "dead bowl" is one knocked off the green, or against one lying in the ditch, or an illegally played bowl, and must at once be removed from the green. Should the boundary of the green consist of fencing, touching the fence

constitutes a dead bowl. “Mark,” or “set a mark,” means the delivery of the jack at the Commencement of a game. The jack must be bowled at least 63 feet from the footer and not over 3 feet from the edge of the green. The bowling generally takes place alternately from the two “ends” of the green. A “void end” is wnen neither side can score a cast. “Turning the jack” is when a player claims the game to be finished as the bowls then lie, and can only occur when one side has but a single bowl to deliver, all the opposite side’s bowls having been cast. For the rules of the outdoor game as now played, reference may be made to Mitchell’s Manual of Boul-playing, Glasgow, 1865.

In France, according to Cotgrave, there formerly existed a game termed carreau, somewhat similar to bowls, the jack or mark being set up on a square stone at the end of an alley.

In the United States of America a game of bowls, termed ‘Ten Pins,” is very popular. It is strictly an indoor game, played in alleys 60 feet by 4 feet. Ten Wooden pins are set up at the further end of the alley, in the shape of an equilateral triangle with the apex (termed the “king pin)” towards the players. The object is to knock dewn the greatest number of pins with the fewest balls. These are made of lignum vite, unlimited in size or weight, but perfect spheres, instead of being biassed. A game consists of ten “rolls” of three balls each (if necessary), or thirty in all. The score is kept on a large vertical slate with ten divisions, corresponding to the teu rolls, for each player. The chief point is to try and hit the king pin at the apex of the triangle, as this affords the best chance of knocking down all the pins. Shoulda player succeed in doing so with the Jirst ball of a roll he

gains “double spare,” his bowling is over for that roll, and he is entitled to add whatever number of pins he knocks down with the first to balls of the next roll to the ten already down. Should he gain another double spare with the first ball of the succeeding roll he has to wait for the first ball of a third roll before the total score for the first roll can be ascertained, and so on in succes- sion, Accordingly, should a player obtain a double spare in each roll—or ten in all—his

total reaches 300, the highest attainable. If a double spare be scored with the frst ball of the tenth roll, the player is entitled to bowl his two remaining balls at once as he has no further rolls to play. Should he knock down all the pins with the first two balls of a roll, he gains a “single spare,” his bowling is over for that roll, and he is in a similar manner entitled to add whatever number of pins he knocks down with the first ball of the next roll to the ten already down. The technical name for this method of scoring is ‘‘ counting old and new.” ‘Chere are a few ten-pin alleys in London and the suburbs, but the pastime is not much practised in England. ‘The rules will be found in The Modern Pocket Hoyle, New York. (H. F. W.) BOWRING, Six JoHN, an cminent English linguist, translator, political economist, and miscellaneous writer, was born at Exeter, October 17, 1792. He was a de- scendant of an old Puritan family ; and he became in early life an ardent disciple in the school of utilitarianisin and philosophical radicalism, whose prophet was Jeremy Bentham. He did not, however, share his master’s con- tempt for poetry and the belles lettres, but was a diligent student of literature and foreign languages, especially those of Eastern Europe. His attainments as a linguist were of remarkable extent. He stated that he knew two hundred languages and could speak one hundred. This, of course, does not mean more than that he had some slight acquaintance with them; but it is certain that he had a pretty good knowledge of forty, and these were languages of various classes. This gives him a place, with Mezzofanti and Von Gabelentz, among the greatest linguists of the world. The first fruits of his study of foreign literature appeared in Specimens of the Russian Poets, published in two volumes in 1821-23. These were speedily followed by Batavian Anthology (1824), Ancient Poetry and Romances of Spain (1824), Specimens of the Polish Poets, and Servian Popular Poetry, both in 1827, During this period he began to contribute to the newly-founded West- minster Review, of which he was appointed editor in 1825. By his contributions to the Rewew he obtained consider- able reputation as political economist and parliamentary reformer.

He advocated in its pages the cause of free trade long before it was popularized by the eloquence of Richard Cobden and John Bright. He pleaded earnestly in be- half of parliamentary reform, Catholic emancipation, and popular education. In 1828 he visited Holland, and during his stay there the university of Groningen conferred on him the degree of doctor of laws. In the following year he was in Denmark, occupying himself with prepara- tions for the publication of a collection of Scandinavian poetry. Bowring, who had been the trusted friend of Bentham during his life, was appointed his literary executor, and was charged with the task of preparing a collected edition of his works. This appeared in eleven volumes in the years 1838 and i839. Meanwhile Bowring had entered Parliament in 1835 as member for Kilmarnock ; and in the following year he was appointed head of a Government commission to be sent to France to inquire into the actual state of commerce between the two countries. was engaged in similar investigations in Switzerland, Italy, Syria, and some of the German States. ‘The results of these missions appeared in a series of reports laid before |

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the House of Commons. After a retirement of four years he sat in Parliament from 1841 till 1849 as member for Bolton. During this busy period he found leisure for literature, and published in 1843 a translation of the Manuscript of the Queen’s Court, a collection of old Bohemian lyrics, &c. In 1849 he was appointed British consul at Hong-Kong, and superintendent of trade in China, a post which he held for four years. After his return he distinguished himself as an advocate of the decimal system, and published a work entitled, Zhe Decimal System in Numbers, Coins, and Accounts (1854). The introduction of the florin as a preparatory step was chiefly due to his efforts. Knighted in 1854, he was again sent the same year to Hong-kong as governor, invested with the supreme military and naval power. It was during his governorship that a dispute broke out with the Chinese ; and the irritation caused by his “ spirited” or high-handed policy led to the second war with China. In 1855 he visited Spain, and negotiated with the king a treaty of commerce. After the usual five years of service he

rctired and received a pension. His last employment by the English Government was as a commissioner to Italy in 1861, to report on our commercial relations with the new kingdom. Sir John Bowring subsequently accepted the appointment of minister plenipotentiary and envoy extra- ordinary from the Hawaiian Government to the courts of Europe, and in this capacity negotiated treaties with Belgium, Holland, Italy, Spain, and Switzerland. In addition to the works already named he published — Poetry of the Magyars (1830); Cheskian Anthology (1832); The Kingdom and People of Siam (1859); a translation of Peter Schlemihl ; translations from the Hungarian poet, Alexander Petofi (1866); and various pamphlets. He was elected F.R.S. and F.R.G.S., and received the decorations of several foreign orders of knighthood. Bowring was twice married ; ‘his second wife survived him, with several sons, who have attained distinction in various fields. He died at Claremont, near Exeter, November 23, 1872. BOXWOOD, the wood obtained from the Euphorbiaceous genus Buus, the principal species being the well-known tree or shrub, B. sempervirens, the common box, in general use for borders of garden walks, ornamental parterres, &c. The other source of the ordinary boxwood of commerce is B. balearica, which yields the variety known as Turkey boxwood. The common box is grown throughout Great Britain, in the southern part of the European continent generally, and it appears to extend through Persia into India, where it is found growing on the slopes of the Western Himalayas. Only a very small proportion of the wood suitable for industrial uses is now obtained in Great Britain. The box is a very slow growing plant, adding not more than 14 or 2 inches to its diameter in twenty years, and on an average attaining only a height of 16 feet, with a mean diameter of 104 inches. The leaves of this species are small, oval, leathery in texture, and of a deep glossy green colour. JB. balearica is a tree of considerable size, attaining to a height of 80 feet, with leaves three times larger than those of the common box. It is a native of the islands of the Mediterranean, and grows in Turkey, Asia Minor, and around the shores of the Black Sea, and is supposed to be the chief source of the boxwood which comes into European commerce by way of Constantinople. The wood of both species possesses a delicate yellow colour ; it is very dense in structure and has a fine uniform grain, which gives it unique value for the purposes of the wood- engraver. In addition to the ever-increasing demand for the wood by engravers, a very large amount is used in the manufacture of

measuring rules, various mathematical instruments, flutes and other musical instruments, as well as for turning into many minor articles, and for inlaying,

boxwood for turnery and musical instruments is mentioned by Pliny, Virgil, and Ovid. The quantity of the wood Which passes out from Constantinople yearly is estimated at from 5000 to 7000 tons, with about 1500 tons more of inferior and small pieces. While the consumption is con- tinually increasing the present sources of supply are rapidly becoming exhausted, the forests near the sea are denuded of their best trees, and access to the wood growing in the interior of the countries around the Black Sea is difficult owing to the want of means of internal communication. The consequent increase of the cost of boxwood has led to frequent attempts to discover other woods which might take its place for the purposes of the wood engraver; but none of the numerous substitutes proposed have hitherto been found to possess the necessary combination of properties. ;

BOYACA,a village in the state of Boyaca, in the Republic of Colombia, situated about 20 miles south of the capital Tunja, and celebrated as the scene of the victory of Bolivar over the Spaniards in 1819. See Boutvar.

BOYCE, Hecror. See Borcs, vol. iii. p. 849.

BOYCE, Wiit1am, an English musical composer of eminence, was born in London in 1710, and died there in 1779. As a chorister in St Paul’s he received his early musical education from King and Dr Greene, and he afterwards studied the theory of music under Dr T’epusch. In 1736 he was appointed organist of St Michael’s church, Cornhill, and in the same year he became composer to the chapel royal. In 1749 he received the degree of doctor of music from the University of Cambridge, as an acknowledg- ment of the merit of his setting of the ode performed at the installation of the duke of Newcastle as chancellor. He became master of the king’s band in succession to Greene in 1757, and soon afterwards he was appointed principal organist tothe chapel royal. As an ecclesiastical composer Boyce ranks among the best representatives of the English school. His two church services and his anthems, of which the best specimens are By the’ Waters of

Babylon and O, Where shall Wisdom be found, are still frequently performed. Of his other works the best known are the serenade of Solomon, a setting of David's lamenta- tion over Jonathan, and twelve trios for two violins and a bass, which were long popular. One of his most valuable services to the art was his publication (1760) of a collec- tion of English church music in three volumes quarto, which included all the best compositions of the two preced- ing centuries. The collection had been begun by Greene, but it was mainly the work of Boyce.

BOYD, Zacuary, a learned clergyman of the Scottish Church, was born towards the end of the 16th century, and died in 1653 or 1654. He was for many years regent in the college of Saumur in France, but returned to his native country in 1621, to escape the persecution of the Protes- tants. In 1623 he was appointed minister of the Barony church in Glasgow, and held the office of rector of the university in the years 1634, 1635, and 1645, He bequeathed to the university the half of his fortune, a sum amounting to £20,000 Scots, besides his library and MSS. His bust over the gateway within the court com- memorates his important benefactions. The number of his published works was considerable, and eighty-six of his MSS. are said to be preserved in the library of Glasgow College. His poetical compositions are not without some merit, though the remarkable eccentricity of some of them has generally made them a source of amusement rather than edification, The common statement that he made the printing of his metrical version of the Bible a condition of the reception of his grant to the university is a mistake,

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and it is a favourite wood for small carvings. The use of

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His best known works are The Last Battle of the Soule in Death, 1629, of which a new edition, with a biography by Mr Neil, was published at Glasgow in 1831; Zion's Flowers, 1644; the English Academie ; and Songs of Zion.

BOYDELL, Joun, an engraver, chiefly known by this | plates illustrating Shakespeare, was born at Dorrington jn

1719. At the age of twenty-one he came to London and was apprenticed for seven years to an engraver, In 1746

he published a volume of views in England and Wales, and | By his good taste |

started in business as a printseller. and liberality he managed to secure the services of the best artists, and his engravings were executed with such skill that his business became extensive and lucrative, He succeeded in his plan of a Shakespeare gallery, and obtained the assistance of the most eminent painters of the

day, whose contributions were exhibited publicly for many | form a

years. The engravings from these paintings splendid companion volume to his large edition of Shake- speare's works. sustained severe losses through the French Revolution, and was compelled to dispose of his Shakespeare gallery b lottery. It had been his wish and intention to bedieath it to the nation. He died in 1804 before the lottery took place. Some years before his death he had held the position of Lord Mayor of London.

BOYER, ABEL, a well-known lexicographer and histo. rian, was born at Castres in France in 1664, Upon the revocation of the Edict of Nantes he first went to Geneva, and then to Franeker, where he finished his studies,

Finally he came to England, where he soon acquired such —

a proficiency in the English language, that he became an author of considerable note, and was employed in writing several periodical and political works. He had for many years the principal management of a newspaper called the Postboy, and he likewise published a monthly work entitled Lhe Political State of Great Britain. He died at Chelsea in 1729;

He wrote—Life of Queen Anne, folio; History of William TI, 3 vols. 8vo; Annals of the Reign of Queen Anne, 11 vols. 8vo; his best known work is

the Dictionary and Grammar of the French Language.

BOYER, ALExts, a distinguished French surgeon, was born on the Ist of March 1757, at Uzerches in Limousin, His father was in the humble station of a tailor, and the son reccived the elements of a medical education in the shop of a barber-surgeon ina provincial town. His evident talent induced his friends to procure his removal to Paris, where he had the good fortune to attract the notice of his two distinguished masters, Louis and Dessault ; and his unwearied perseverance, his anatomical skill, and finally lis dexterity as an operator, became so conspicuous, that at the age of thirty-seven he obtained the appointment of second surgeon to the Hotel Dieu of Faris, and was elected professor of operative surgery in the Ecole de Santé, ‘This latter appointment he soon exchanged for the chair of clinical surgery,—a department in which his manual dexterity and his admirable lectures on surgical subjects gained him the highest reputation, and introduced him to extensive practice. Perhaps no French surgeon of his time thought or wrote with greater clearness and good sense than Boyer; and while his natural modesty made him distrustful of innovation, and somewhat tenacious of established modes of treatment, he was as judicious in his diagnosis, as cool and skilful in manipulating, as he was cautious in forming his judgment on individual cases. In 1805 Napoleon nominated him imperial family surgeon, and, after the brilliant campaigns of 1806-7, conferred on him the legion of honour, with the title of Baron of the kmpire, and a salary of 25,000 francs. On the fall of Napoleon the merits of Boyer secured him the favour of the succeeding sovercigns of France, and he was consulting surgeon to Louis XVIII., Charles X., and Louis Philippe

Towards the close of his life Boydell |

tn 1835 he succeeded Deschamps as surgeon-in-chief to the Hopital de la Charité, and was chosen a member of the Royal Academy of Sciences of the Institute of France. From the period of his wife’s death, which he took much to heart, his health declined, and he died November 23, 1833, at the age of seventy-six. |

His two great works are—Traité complet de l’anatomie, in 4 vols. 8yo, 1797-99, of which a fourth edition appeared in 1815, and Traité des ‘maladies chirurgicales et des operations qui leur conviennent, 11 yols, 8vo, 1814-26. Of this work a new edition (the 5th), with additions by M. Ph. Boyer, in7 vols,, was published in 1844-53.

BOYER, Juan Baptiste, an eminent French physician, born at Marscilles in 1698. He devoted a long life to the special investigation and treatment of contagious epidemics, with a courage and success which have rarely been sur- passed. On the last appearance of the plague in western Europe in 1720, he was one of the physicians sent from Paris by the Government to succour the inhabitants of his native city, then visited by this great calamity. The fearless zeal and ability which he displayed on that occa- sion procured him a pension and the title of physician in ordinary to the king. Much of his subscquent life was spent in similar expeditions, devoted to philanthropy, wherever pestilential epidemics prevailed ; and the value of the services of Boyer were fully acknowledged at Paris, Tréves, Beauvais, Montagne, Brest, and at several places in the Spanish peninsula. He died in 1768.

His best known writings are—Account of the Plague at Marseilles in 1720, and Observations on the Epidemic that prevailed at Beauvais, Paris, 1750.

BOYER, JEAN PreRRE, a mulatto general, and for some time the President of Hayti, was born «at Port-au-Prince in 1776. He joined the negroes in their war of inde- pendence, but after the secession of Toussaint Ouverture with his party, was compelled to retire to France. He was well received by Napoleon, and obtained a commission in Leclerc’s expedition. After the death of Dessalines, the king of Hayti, Boyer joined Pétion in proclaiming a republic and resisting Christophe, Dessalines’s successor. He gallantly and successfully defended Port-au-Prince against the negro troops of Christophe, and on the death of Pétion was named president of the Haytian republic. Two years later the death of Christophe removed his only rival, and he gained almost undisputed possession of the whole island. Absolute power, however, produced its usual effects; Boyer became arbitrary, capricious, and cruel. In 1825 the French compelled the Haytian senate to acknowledge their supremacy, and to guarantee a pay- ment of 150 millions of francs in return for certain liberties granted, ‘The weight of this

enormous debt excited the greatest discontent in Hayti. Boyer was able to carry on his government for some years longer, but in 1842 a violent insurrection overthrew his power, and compelled him to take refuge in Jamaica. He resided there till 1848, when he removed to Paris, where he died in 1850.

BOYLE, Cuaruss, earl of Orrery in Ireland, and baron of Marston, in the county of Somerset, the second son of Roger second earl of Orrery, was born at Chelsea in 1676. He was educated at Christ Church, Oxford, and soon distin- guished himself by his learning and abilities. Like the first earl of Orrery, he was an author, soldier, and states. man. He translated Plutarch's life of Lysander, and published an edition of the epistles of Phalaris, which en- gaged him in the famous controversy with Bentley. See a and BENTLEY. He was three times member bree e da of Huntingdon ; and on the death of his an earl of Orrery, in 1703, he succeeded to ou an – entered the army, and in 1709 was raised

3 1 Of major-general, and sworn one of her Majesty's Privy council, At the battle of the Wood he acted with

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distinguished bravery. He was appointed queen's envoy to the states of Brabant and Flanders; and having dis- charged this trust with ability, he was created an English peer, as Baron of Marston, in Somersetshire. He received several additional honours in the reign of George I.; but having had the misfortune to fall under the suspicion of the Government he was committed to the Tower, where he remained six months, and was then admitted to bail. On a subsequent inquiry it was found impossible to criminate him, and he was discharged. He died, after a slight illness, on the 28th of August 1731. Among the works of Roger, earl of Orrery, will be found a comedy, entitled As you find it, written by Charles Boyle. The orrery, an astronomical instrument, invented, or at least constructed, by Graham, was uamed after the earl, who used to amuse his leisure hours with mechanical toys.

BOYLE, Joun, earl of Cork and Orrery, a nobleman distinguished for his literary attainments, was the only son of the subject of last notice, and was born January 2, 1707. He was educated at Christ Church College, Oxford,

and was led by indifferent health and many untoward accidents to cultivate in retirement his talents for literature and poetry. His works are neither numerous nor remark- able. His translation of the Letters of Pliny the Younger, with various notes, for the use of his eldest son, was published in 1751, 2 vols. 4to, He also published a Life of Swift, in several letters addressed to his second son, and Memoirs of Robert Carey, Earl of Monmouth, from a manuscript presented to him by a relation. He died November 16, 1762. His letters from Italy did not appear until 1774, when they were edited, with his life prefixed, by the Rev. J. Duncombe.

BOYLE, RicHarp, one of the greatest statesmen of the 17th century, generally styled the Great Karl of Cork, was the youngest son of Roger Boyle, and was born at Canter- bury, October 3, 1566. He studied at Benet College, Cambridge, and afterwards became a student in the Middle Temple. Having lost his parents, and being unable to support himself in the prosecution of his studies, he became clerk to Sir Richard Manwood, chief baron of the exchequer; but finding this eniployment little likely to improve his fortune, he went to Ireland. He was then about twenty-two years of age, graceful in person, and possessing many accomplishments, which enabled him to render himself useful to some of the principal persons employed in the Government. In 1595 he married one of the daughters aud co-heiresses of William Apsley. This lady died four years afterwards, leaving him a landed estate of £500 a year. He purchased land extensively, and was looked upon with great jealousy by some of the neighbour- ing proprietors, who did all they could to blacken his character. But he was fortunate enough to find a patron in Queen Elizabeth, and his fortunes, which had been broken by the Munster rebellion, rapidly improved. In consequence of various services and the great ability he displayed, he gradually rose to the highest offices; and in 1616 he was created, by king James IL, Lord Boyle, Baron of Youghall in the county of Cork. Four years later he was created Viscount Dungarvan and earl of Cork, and in 1631 he was appointed lord-treasurer of Ireland, an honour that was made hereditary in his family. He particularly distinguished himself by the noble stand he made when the great rebellion broke out in Ireland in the reign of Charles I, acting with as much bravery and military skill as if he had been trained from his infancy to the profession of arms. Having turned the castle of Lismore, his principal seat, into a fortress, he immediately armed and disciplined his servants and

Protestant tenants; and with their assistance, and a small ariny, raised and maintained at his own expense, which he put under the

command of his four sons, he defended the province of Munster, and took several strong castles. During this time he paid his forces regularly ; and when all his money was exhausted, he converted his plate into coin. Ie died on the 15th September 1644.

BOYLE, Ricuarp, earl of Burlington and Cork, son of the subject of last notice, was born in 1612. He greatly distinguished himself by his loyalty to Charles Tr, whom during his troubles he supplied with both money and troops; but at last he was obliged to compound for his estate. He contributed all in his power to the Restora- tion, and by Charles II. was created earl of Burlington (Bridlington) in 1663. He died in January 1627-8, aged eighty-six. :

BOYLZ, RoBert, one of the greatest natural philoso- phers of his age, and one of the founders of the Royal Society of London, was the seventh son and fourteenth child of Richard Boyle, earl of Cork, and was born at Lismore Castle in the province of Munster, Ireland, January 25, 1627. In his earliest years he learnt to speak Latin and French, and he was only eight years old when he was sent to Eton, his father’s friend, Sir Henry Wotton, being then provost of the college. Here he studied about three years, and was next placed as private pupil with the rector of Stalbridge in Dorsetshire, where his father had just taken up his residence. In 1638 after a visit to London he travelled in France accompanied by a French tutor, and studied above a year at Geneva. In the autumn of 1641 he visited Switzerland and Italy, spending the winter of 1641-42 at Florence. Here he studied the works of Galileo, who died near Florence the same winter. On reaching England in 1644 he learnt the death of his father, who had left to him the manor of Stalbridge and estates in Ireland. It was in the following year that be became a member of a suciety of scientific men, who in consequence of the political agitation of the times used to hold their meetings with as much privacy as possible, first in London and afterwards at Oxford ; this became subsequently famous as the Royal Society. In 1646 he settled at Stalbridge, and from that time his whole life was devoted to study, scientific research

and experiments, and authorship. After making several visits to his estates in Ireland he took up his abode at Oxford in 1654, and there enjoyed the society of many learned men. He resided at Oxford for fourteen years ; and it was during this period that he made important improvements in the air-pump, and by a long series of experiments with it made various discoveries on the properties of air, the propagation of sound, &c., which are recorded in his voluminous writings, Boyle was at the same time an ardent student of theology, aud numbered ainong his friends the eminent Orientalists Pococke, Hyde, and Clarke, and Dr Thomas Barlow, Bodleian librarian and bishop of Lincoln. At the Restora- tion he was favourably received at court, and was advised to enter the church ; but this he declined to do, alleging that it was not his vocation, and that he believed his writ- ings on religious subjects would have greater weight coming from a layman than from a paid minister of the church. His anxiety to promote the spread of Christianity appeared in various munificent acts. He bore the expense of prepar- ing a Malay translation of the Gospels and the Acts of the Apostles, and of an Irish version of the Bible. He contri- buted largely to the cost of the Welsh Bible and of a Turkish New Testament, and gave a large sum to the translator of the work of Grotius De Veritate into Arabic. He sup- ported liberally the projects for spreading the Gospel in India and in America, and gave away annually a large sum for charitable purposes. He made his first appearance as author in 1660, by the publication at Oxford of a volume entitled New Leperiments, Physico-Mechanical,

BOYLE

touching the Spring of Air and its Lffects,

devotional work entitled Seraphie Love, or some Motives and Incentives to the Love of God.

When the Royal Society was incorporated (1663) Boyle |

He communicated | many Important memoirs to the Philosophical 7 Transactions, | ’

was named a member of the council. and, in 1680, was elected president of the society, but

from a scruple about oaths he declined this honour.

Newton also took much interest, efforts that the statute of Henry IV. cap. 4, against the

multiplying of gold and silver was repealed in 1689. After ,

leaving Oxford in 1668 he settled in London ; and here he spent the rest of his days, residing in the house of his sister Lady Ranelagh. He was never married, Tn person he was tall, slender, and of a pale countenance, His constitution was far from robust, and throughout his life he suffered from feeble health and low spirits. While his scientific discoveries procured him wide and lasting renown, his private character and virtues, the charm of his social manners, his wit and conversation, endeared him to a large number of personal friends. As a man of science he was ranked by his contemporaries among the greatest ; and although some abatement of this very high estimate has since been admitted, he still holds a place of distinction as the first great investigator who carried out in his labours the principles of the Vouum Organum. So earnest was his devotion to Bacon that for many years he could not be persuaded to read the works of Descartes, lest he should be tempted out of his chosen path. His strength lay in the patient research and observation of facts. He did not display that power of divination of their meaning and of detection of their relations which is the characteristic of genius. His desire was to contribute by his researches, in the true spirit of the Baconian philosophy, to the service of man's life ; and in this he had a large measure of success, The same practical aim is apparent in his theological writ- ings. He was no controversialist, and does not appear to have taken much, if any interest in the great political and religious movements of his day. About 1690 his health began seriously to fail, and he was obliged gradually to withdraw from his public engagements. He discontinued the communication of memoirs of new discoveries to the Royal Society, resigned the post which he had long held of goveruor of the corporation for propagating the Gospel in New England, and announced by public advertisement his intention no longer to receive visits. The "retired leisure " which he thus secured was devoted to important chemical investigations, the account of which he left "as a kind of hermetic legacy to the studious disciples of that art." His health became worse in 1691. On the

23d of December of this year his sister, Lady Ranelagh, with whom he had lived for more than twenty years, died; anda week later, December 30, Boyle died himself. His remains were interred in the churchyard of St Martin's in the Fields, and his funeral sermon was preached by his friend Dr Burnet, bishop of Salisbury, author of the Listory of the Lieformation. By his will he founded and endowed the '* Boyle Lectures," the purpose of which is the demonstra- tion of the truth of the Christian religion against atheists, theists, pagans, Jews, and Mahometans.

It is unnecessary to do more than enumerate the more important publications of this laborious investigator. His first work has already been mentioned. It was followed, in 1662, by The Sceptical Chemist, subsequently reprinted with additions, His Considerations touching the Uscfulness of Experimental Natural Philosophy appeared in 1663, and was followed by a second part in 1671. His Experiments and Considerations upon colowrs, with Observations on & Diamond that Shines in the Dark, also appeared in 1668—a treatise which broke ground on a theme afterwards more profoundly treated by Newton.

and of a

Boyle | was at one time deeply interested in alchemy, and za

on experiments on the transmutation of metals, in which — It was through his —

BO Y—

His next scientific work was entitled, New Experiments and Obser- vations upon Cold (1665). This was followed by the Origin of Forms and Qualities according to the Corpuscular Philosophy (1666) ; a con- tinuation of his first work on the air (1669); Tracts about the Cosmical Qualities of things, the Temperature of the Subterraneous Regions, and the Bottom of the Sca (1669), a volume which gave rise to much discussion, its statements being founded on experiment ; Origin and Virtucs of Gems (1672) ; Essays on the Subtilty and Deter- minate Nature of Hffiuvia (1673) ; tracts on the Saltness of the Sea, the Moisture of the Air, the Natural and Preternatural State of Bodies, Cold, Hidden Qualities of the Air, Celestial Magnets, Hobbes's

Problem of a Vacuwm, and the Cause of Attraction and Suction (1674) ; Eaperimenis and Notcs about the Mechanical Origin or Production of Particular Qualities, including a discourse on electricity (1676); the Aerial Noctiluca, or some new Phenomena, and a Process of a Factitious Self-shining Substance (1680) ; New Experiments and Observations upon the Icy Noctiluca, to which ts added a Chemical Paradox (1682); a further continuation of his first work on the air (1682); Memoirs for the History of Human Blood (1684) ; Short Memoirs for the Natural Experimental History of Mineral Waters (1685); Medicina Hydrostatica (1690) ; and Hxpert-menta et Observationes Physic (1691). Of his religious and theo- logical writings we may mention, An Essay on Scripture, of which one portion was published in 1663, and the whole at a later date by his friend Sir Peter Pett; Occasional Reflections upon several Subjects (1665), a strange medley of trivialities and grave thoughts, amusing, yet not wholly unwise, which was assailed and ridiculed by Dean Swift in 4 Pious Meditation upon a Broomstick, in the Style of the Honourable Mr Boyle, and by Butler in An Occasional Reflection on Dr Charlton's feeling a Dog's Pulse at Gresham College (a neat reprint of the Occasional Reflections was published at Oxford in 1848); The Lacellency of Theology, compared with Philosophy, written in the year of the Great Plague, but not published till 1673 ; Considerations about the Reconcilableness of Reason and Religion, with a Discourse about the Possibility of the Resurrection (1655) ; A Discourse of Things above Reason, inquiring whether a Philosopher should admit any such (1681); a tract on the High Veneration Man's Intellect owes to God (1685); A Free Inquiry into the vulgarly received notion of Nature (1686); and The Chris- tian Virtwoso (1690). Several other works appeared after his death, and among these were— The General History of the Air designed and begun ; an account of his making the phosphorus, September 30, 1680; and Afedicinal Eauperiments. An incomplete edition of Boyle's works appeared at Geneva some years before his death. A useful classified abridgment was published by Dr Peter Shaw, editor of an abridgment of Bacon's Philosophical Works. The first complete edition was that of Dr Birch, which appeared, with a Life of the author, in 5 vols, folio, in 1744. Another complete edition was issued in 6 vols. 4to, in 1772. A portrait of Boyle, by Kerse- boom, which is in the possession of the Royal Society, formed part of the National Portrait Exhibition at South Kensington in 1866. Boyle bequeathed his natural history collections to the Royal Society.

BOYLE, Rocerr, earl of Orrery, fifth son of the Great Earl of Cork, was born in April 1621, and was made Baron Broghill when only five years old. He distinguished himself while a student at Dublin College, and afterwards made the tour of France and Italy. Soon after his return he married Margaret Howard, sister to the earl of Suffolk ; and passin

over to Ireland with his bride he found the country in a state of rebellion, and assisted his father in opposing the insurgents. Upon the execution of the king, he retired to his seat at Marston in Somersetshire ; but his spirit could ill brook this state of inactivity, and he therefore resolved to cross the seas, and apply to Charles II. for a commission to raise forces to restore the monarchy and recover his own estate. Under the pretence of visiting Spa for his health, he proceeded as far as London, where he received a message from Cromwell, then general of the parliamentary forces and a member of the committee of state, intimating his lntention to wait upon him. During the interview Crom- Well told him that the committee were apprised of his design ; and when Broghill assured him that the in- telligence was false, Cromwell produced copies of several of his confidential letters, which reduced him to the neces- sity of asking Cromwell's pardon, and requesting his advice a such a conjuncture. Cromwell told him, that though @ had hitherto been a stranger to his person, he was not ie his merit and character ; that he had heard how gallantly he had behaved in the Irish wars ; and he

concluded by offering him a command as general officer, exempt from all oaths and engagements,—adding that he should not be obliged to draw his sword against any but the Irish rebels. Lord Broghill, greatly surprised at so unexpected an offer, requested some time for deliberation. But Cromwell brusquely told him that he must determine instantly, that he himself was about to return to the com- mittee, who were still sitting, and that if he rejected their offer, they had determined to send him to the Tower. Broghill, finding that his liberty and life were in the utmost danger, pledged his honour that he would faithfully serve against the Irish rebels ; and accordingly, by Cromwell's instructions, he passed over into Ircland, where by many important services he fully justified the opinion which had been

formed of him. A troop of horse which he had raised was soon increased to a regiment of 1500 men, and these he led into the field against the rebels. He was speedily joined by Cromwell, who placed the highest con- fidence in his new ally, and found him of the greatest value to the interests of the commonwealth.

When Cromwell became Protector, Lord Broghill was made one of his privy council, and admitted to great intimacy and confidence. He continued for some time to assist Richard Cromwell with his counsels, till, seeing that the weak nature of that amiable man would infallibly bring on his fall, he deemed it imprudent still to cling to one whoni he could not save, and accordingly retired to kis command in Ireland, where affairs shortly after took a turn extremely favourable to the design of the king's restoration. Lord Broghill was not a little instrumental in bringing about that event; and, in consideration of his eminent services, Charles created him earl of Orrery, Sep- tember 5, 1660. He was soon after made one of the lords justices of Ireland; and his conduct, whilst at the head of affairs in that kingdom, was such as to add greatly to the general esteem in which his character was previously held.

His active and toilsome course of life at length brought on disease and infirmity; but, notwithstanding, he went over to England in 1665, at the king's desire, and mediated with success in a serious misunderstanding which existed between Charles and the duke of York.

On his return Lord Orrery, by his prudent and skilful measures, rendered abortive the scheme of a descent upon Treland by the Dutch and French, planned by the duke de Beaufort, admiral of France.

About this time a quarrel with his old friend the duke of Ormond, arising from mutual jealousies, became so serious that the disputants resorted to England to defend their respective interests. This quarrel, though of a private beginning, became at last of a public nature. Lord Orrery was impeached, but defended himself so well that the prosecution failed. He lost, however, his public employ- ments ; but, retaining the king's favour, he still came fre- quently to court, and was often consulted on affairs of importance. His last voyage to England was for the pur- pose of obtaining medical advice; but his disease, which was gout, proved mortal, and he

expired on the 16th of October 1679, in the fifty-ninth year of his age. Lord Orrery was the author of several works, chiefly dramas and poems now forgotten. Walpole remarks “that he never made a bad figure, but as a poet.” Asa soldier he was distinguished by his personal bravery and his skill in handling troops; as a statesman he was upright and manly ; and his credit ever stood high for integrity, and for generous fidelity as a friend.

BOYNE, a river of Ireland, which rising in the Bog of Allen, near Carbery in Kildare, and flowing in a N.E. direc- tion, passes Trim, Navan, and Drogheda, and enters the Irish Sea, about four miles below the last-mentioned town. It is navigable for barges of 70 tons to Navan, 19 miles from

its mouth. About a mile west of Drogheda, an obelisk, 150 feet in height, marks the spot where the forces of William III. gained the celebrated victory over those of James IT., on lst July 1690, known as the “battle of the Boyne.”

BOYSE, or Bois, Joun, one of the translators of the English Bible, was born in Suffolk in 1560. He was educated by his father, the rector of West Stowe, and at an early age exhibited great intellectual powers, being able to read Hebrew when only five years old. He completed his studies at Cambridge, particularly devoted himself to Greek, and for ten years was lecturer on that language in St John’s College. At the age of thirty-six he married, and became rector of Boxworth, in Cambridgeshire. He was selected as one of the translators of the Bible, and is said to have completed not only his own share, the Apocrypha, but that of another clergyman. He received a prebendal stall in Ely cathedral from Bishop Andrews in 1615, but bad no other preferment. He died in 1643, leaving behind him an immense mass of MSS.

BOZRAH. There are, according to the more usual opinion, two places of this name mentioned in Scripture, one a city of Edom, and the other a city of Moab. About the identification of these cities there has been much dis-

cussion, some maintaining that the former occupied the site of the modern village of el-Buseirah, about 25 miles S.E. of the Dead Sea, and that the latter was the city afterward known to the Romans as Bostra and at present as Busrah ; while others suppose that the various passages of the Scriptures all refer to one place, and others again that there are two places, but that neither of them is to be identified with Bostra. The first view seems to be freer from difficulties than the other two. Bozrah, or el-Buseirah, is now a sinall village with a strong fortress on the top of a hill. inhabitants, who number between 100 and 200, are all shepherds. Bozrah, Buzrah, or Bostra, on the other hand, is a very extensive collection of ruins of various ages, situated about 80 miles S. of Damascus. The area with- in the walls is about a mile and a quarter in length, and nearly a mile in breadth, while extensive suburbs lie without, to the east, north, and west. The principal buildings that can still be distinguished are a temple, an aqueduct, a large theatre (enclosed by a castle of much more recent workmanship), several baths, a triumphal and other arches, three mosques, and what are known as the church and convent of the monk Boheira. In 105 A.D., the city was beautified and perhaps restored from ruin by Trajan, who made it the capital of the province of Arabia. In the reign of Alexander Severus it was made a colony, and in 245 a native of the place, Philippus, ascended the imperial throne. By the time of Constantine it seems to have been Christianized, aud not long after it was the see of an extensive bishopric. It was one of the first cities of Syria that was subjected to the Mahometans, and it successfully resisted all the attempts of the Crusaders to wrest it from their hands. As late as the 14th century it was a populous city. (See Burckhardt’s Z’ravels, Robin- son’s Brblical Researches, Porter’s Damascus, Freshfield’s Caucasus.)

BOZZARIS, Marcos, a Greek patriot, was born in Suli towards the close of the 18th century. With the remnant of the Suliotes he crossed in 1803 to the Ionian islands, and in 1820, with some 800 of his countrymen, joined the sultan against Ali Pasha, They soon, however, camie over to Ali’s party, and fought gallantly against their old enemies the Turks. After the death of Ali the Suliotes carried on the war with great success, and in 1822 were Joined by a body of regular troops under Prince Mavro- cordato, At the battle of Petta the Greeks were betrayed

It is the centre of a pastoral district, and its’

and defeated with heavy loss. Bozzaris fell back t Missolonghi, which he successfully defended unt] the arrival of a Hydriote fleet compelled the besiegers to retire, In the summer of 1823 he learned that a large Turkish force had again been despatched agaiust the town, and resolving to anticipate the attack, he set out secretly with 1200 men. On the 20th of August he came upon the encampment of the Turkish vanguard, and a night attack was crowned with success. The victory of the Suliotes was saddened by the loss of Bozzaris, who fell while lead- ing on his men. The assault on the Turkish camp has been made the subject of a very fine poem by Fitz-Greene Halleck.

BRA, a town of Italy in the province of Cuneo and district of Alba, on the River Stura, 25 miles NB of Cuneo. It has three parish churches, a gymnasium, a hospital, manufactures of silk and linen goods, and a con- siderable trade in corn, cattle, wine, and silk. Population,

12,946.

BRABANT, an extensive district in the N etherlands, which formerly constituted a separate duchy, but is now divided between Belgium and Holland. The Belgian portion includes the provinces of Brabant and Antwerp, while the whole of the Dutch portion is still known by its ancient name. Godfrey the Bearded, count of Louvain, who lived in the beginning of the 12th century, was the first to assume the title of count of Brabant, which his great-grandson, Henry I. the Warrior (1190-1235) ex- changed for that of duke. The duchy passed in regular succession to Henry II. the Magnanimous (1235-1248), and Henry III. the Debonnair (d. 1261); but on the death of the latter the natural heir was supplanted by his younger brother John I. the Victorious, who added the district of Limburg to his possessions by the battle of Woeringen in 1288, in which he killed his competitor Henry of Luxem- bourg with his own hand. The next duke, John IL, is memorable for the privileges he bestowed on his subjects by the statute of the Common Weal and the charter of Cortemberg. His successor, John III. the Triumphant, had to contend against a rebellion of Brussels and Louvain,

and an offensive alliance of his neighbours, but managed to make himself not only secure but formidable. His three sons having died before him without issue, he was succeeded by his daughter, who had married Wenceslas of Luxembourg. The count of Flanders laid claim to the duchy, and, after a considerable struggle, was only bought off by the surrender of Antwerp. In 1404 the whole of Brabant was handed over to the countess of Flanders, and in 1406 her son took the title of duke. On his death at the battle of Agincourt, in which he fought on the side of the French, he was succeeded by John IV., whose marriage and divorce created much excitement in his day. In 1430, on the decease of Philip, second son of John 1V., the duke of Burgundy, Philip the Good, was also recognized as duke of Brabant; and in 1440 the country passed to the house of Austria by the marriage of Mary of Burgundy his granddaughter to Maxt- milian the emperor, who transmitted it to Charles V. and thus to the crown of Spain. In 1648 the northern portion of the duchy succeeded in freeing itself from the Spanish tyranny, while southern Brabant continued under the yoke till 1714. Brabant possessed a liberal constitution known as the Joyeuse Entrée, Blyde Inkomst, or Joyous Entrance, which, inter alia, prevented the duke from raising the clergy above the other states of the realm, from prosecuting his subjects except in the regular courts, and from appointing foreigners to political office. A consent of the three states—the clergy, the nobles, and the repre- sentatives of the chief cities—was necessary for the passing of a law ; and the towns had the right of refusing assistance

in any military expedition with the object of which they had not been previously made acquainted. The states usually met every two years, and a permanent committee of the three orders held its session in Brussels. The Brabantine court, under the native dynasty, was famous for the encouragement which it afforded to learning and literature ; and more than one of the dukes have left proof of personal culture in the shape of songs. (See Dinaux, Trouvéres Brabangons, Hainuyers, &c., 1863.)

Brapant, NortH, the modern Dutch province, has an area of 231 square miles, and in 1870 the population was 4,832,612. The surface is flat and the soil alluvial. The principal rivers are the Maas, the Aa, and the Dommel.

The capital is’s Hertogenbosch, a city of 24,395 inhabitants, and the other chief towns are Breda (14,721), Bergen-op- Zoom (8352), Helmond (5301), and Tilburg (5262),

BraBant, Sours, the modern Belgian province, has an area of 1262 square miles, and in 1870 the population was 879,814. Its general features are much the same as those of the Dutch province, though the surface is rather more varied in its elevation. The principal rivers are the Senne, the Dyle, and the Demer. The capital is Brussels with 177,954 inhabitants ; and the other cities of import- ance are Louvain (32,976), Tirlemont (12,354), Nivelles (8800), Diest (7561), and Vilvorde (6844).

BRACCIOLINI, Francesco, an Italian poet, born at Pistoia, of a noble family, in 1566. On his removing to Florence he was admitted into the academy there, and dle- voted himself to literature, At Rome he entered the service of Cardinal Maffeo Barberini, with whom he afterwards went to France. After the death of Clement VIII. he returned to his own country; and when his patron Barberini was elected pope, under the name of Urban VIIL, Bracciolini repaired to Rome, and was made secretary to the Pope’s brother, Cardinal Antonio. He had also the honour. con- ferred on him of taking a surname from the arms of the Barberini family, which were bees; whence he was after- wards known by the name of Bracciolini dell’ Api. During Urban’s pontificate the poet lived at Rome in considerable reputation, though at the same time he was censured for his sordid avarice. On the death of the pontiff he returned to Pistoia, where he died in 1645. There is scarcely any species of poetry, epic, dramatic, pastoral, lyric, or burlesque, which Bracciolini did not attempt; but he is principally noted for his mock-heroic poem Lo Scherno degli Det, published in 1618, similar but confessedly inferior to the contemporary work of Tassoni, Secchia Rapita. Of his serious heroic poems the most celebrated is La Croce Racquistata.

BRACCIOLINI, Poacio. See Poaato.

BRACELET, or ARMLET, a personal ornament, made of different materials, according to the fashion of the age and the rank of the wearer. The word is the French bracelet, which Ménage derives from braceletum, a diminutive of bracile, all formed from the Latin brachiwm, the arm, on

which it was usually worn. By the Romans it was called armilla, brachiale, occabus ; and in the Middle Ages boga, bauga, armispatha.

Tn the Bible there are three different words which the authorized version renders by “bracelet.” These are—l. Ms etzadah, which occurs in Num, xxxi. 50, 2 Sam. 1 10, and which being used with reference to men only, a be taken to be the armlet ; 2. 128 tzamid, which is ound in Gen, xxiv, 22, Num. xxxi. 50, Ezek. xvi. 11 ;— Nia these two words occur together (as in Num. xxxi. i) oa by Repdared by “ chain,” and the second by HT. The 7 WW sheroth, which occurs only in Isa, ths a ae rst peels meant armlets worn by men ; tied racelets worn by women and sometimes by

) the third, a peculiar bracelet of chain-work

worn only by women. In 2 Sam. i. 10, the first word denotes the royal ornament which the Amalekite took

TAA,

Bracelets,

from the arm of the dead Saul, and brought with the other regalia to David. There is little question that this was such a distinguishing band of jewelled metal as we still find worn as a mark of royalty from the Tigris to the Ganges. The Egyptian kings are represented with armlets, which were also worn by the Egyptian women. These, however, are not jewelled, but of plain or enamelled metal, as was in all likelihood the case among the Hebrews. In modern times the most celebrated armlets are those which form part of the regalia of the Persian kings, and which formerly belonged to the Mongol emperors of India. These ornaments are of dazzling splendour, and the jewels in them are of such large size and immense value that the pair are reckoned to be worth a million of our money. The principal stone of the right armlet is famous in the East under the name of the Devid-e-nur, or “Sea of light.” It weighs 186 carats, and is considered the diamond of finest lustre in the world. The principal jewel of the left armlet, although of somewhat inferior size (146 carats) and value, is renowned as

the Tdg-e-mah, ‘“‘ Crown of the moon.” The imperial armlets, generally set with jewels, may also be observed in most of the portraits of the Indian emperors.

Bracelets have at all times been much in use among bar- baric nations, and the women frequently wear several on the same arm. The finer kinds are of mother of pearl, fine gold, or silver; others of less value are made of plated steel, horn, brass, copper, beads, &c.

This species of personal ornament was exceedingly com- mon in Europe in prehistoric times. The bracelets of the Bronze Age were either of gold or bronze, silver being then unknown. In shape they were oval and penannular with expanding or ‘trumpet-shaped ends, having an opening between them of about half an inch to enable them to be easily slipped over the wrist. Those of gold were generally plain, hammered rods, bent to the requisite shape, but those of bronze were often chased with elegant designs showing a cultivated taste. Some forms of spiral armlets of bronze, peculiar to Germany and Scandinavia, covered the whole fore-arm, and were doubtless intended as much for defence against a sword-stroke as for ornament. The Etruscan and early Roman forms of bronze bracelet were for the most part cylindrical, with overlapping ends, or spiral and serpent-shaped. These were also the common forms in the Iron Age of Northern Europe, while silver bracelets of great elegance, formed of plaited and _inter- twisted strands of silver wire, and plain penannular hoops, round or lozenge-shaped in section and tapering to the ex- tremities, became common towards the close of the pagan period. The late Celtic period in Britain was characterized by serpent-shaped bracelets and massive armlets, with pro- jecting ornaments of solid bronze and perforations filled with enamel. In the Middle Ages bracelets were much less commonly used in Europe, but the custom has con- tinued to prevail among Eastern nations to the present time, and many of the types that were common in Europe

-in prehistoric times are still worn in Central Asia, A

treatise De Armillis Veterum,by Thomas Bartolinus, was published at Amsterdam in 1676

BRACHIOPODA

HE Bracaiopopa constitute an important and well- defined class of Invertebrates, but the exact position the group should occupy in that division of the animal kingdom is still a matter upon which anatomists have not entirely agreed. For many years the species composing the class were referred to the genus Anoma of the Lamelli- branchiata, but, as was judiciously observed by Edward Forbes, “a close examination shows that there is no rela- tionship between them, but only a resemblance through formal analogy.” Milne-Edwards separated the Mollusca into two great divisions, Mollusca and Molluscoida, and in the last he placed the Brachiopoda, Polyzoa, and Tunicata, an arrangement that has been followed by many naturalists. Although the greater number of zoologists have admitted the close connection existing between the Polyzoa and Brachiopoda, considerable doubt has been expressed with respect to the affinities and position of the latter in relation to the Tunicata; moreover, a strenuous effort has been made within the last few years by Steen- strup, Morse, Kowalevsky, A. Agassiz, and others, to de- monstrate that the affinities of the Brachiopoda and Polyzoa are with the Worms, and that they should form classes of Annulosa, and be placed close to the Annelids.

According to Agassiz, the transition between such types as Pedicellina to Membranipora and other incrusting Polyzoa is readily explained from the embryology of Theeidium, and, in fact, all incrusting Polyzoa are only communities of Brachiopods, the valves of which are con- tinuous and soldered together, the flat valve forming a united floor, while the convex valve does not cover the ventral one, but leaves an opening more or less ornamented for the extension of the lophore. Both Gratiolet and Hancock have expressed the opinion that the Tunicata are in no way related to the Brachiopoda, and that we cannot place these last and the Polyzoa along with the Tunicata in the same division. Gratiolet and some others have considered the Brachiopoda to be allied to the Crustacea, while even the asteridian affinities of the class have been hinted at by King.

No doubt can be entertained, after perusing the admirable memoirs by Morse and Kowalevsky on the embryology of Perebratula, Terebratulina, Argiope, and Thecidium, that the genera composing the class and

Amphetrite possess many important features in common, but almost any Inver- tebrate groups might be annelidilized by overrating certain points in their affinities. Mr Dall thinks that the general conclusion with reference to the affinities of the Brachiopoda will be something like this. There is much reason for supposing that all the Molluscs and Molluscoids came from the stock out of which the Worms have developed. Indeed, as Huxley has said, they are only isomerous Worms with many special modifications. It is natural, therefore, that the oldest and lowest forms should retain many of the characteristics of the oldest and most simple Worms, espe- cially those which have been modified by a tubular habit. But, on the whole, the modifications are so important that we may continue to consider (if in the specializing tendency of present study we can retain any general divisions of Invertebrates) that the Molluscoids and Molluscs do form two groups somewhat aside from others, and somewhat more nearly related to each other than to the divisions external to them, Therefore, although it may turn out that the Brachiopoda constitute a class close to the Annelids, it cannot be denied that they possess many molluscan characters that cannot be overlooked, and are, under any circumstances, entitled by their importance and numerous

distinctive features to constitute a well-defined aud separate class.

The name Bracuropop (Bpayiwv, an arm, trovs, a foot) was proposed for the class by Cuvier in 1805 and by Dumeril in 1809, and has since been very extensively adopted. Blainville in 1824 proposed ag a substitute for the Cuvierian name that of Palliobran- chiata (palliwm, a mantle ; branchia, gills), on account of the respiratory system being combined with the mantle on which the vascular ramifications are distributed, Prof, King has always adopted the latter name, and perhaps rightly objects to Cuvier’s on the ground that it ig a misnomer, for the two variously curved and cirrated brachial or labial appendages, improperly designated as arms or feet, were subsequently found uot to subserve the function of locomotive organs.

Before describing the various parts of the animal and Tw: its shell, it may be as well to mention that it had been sion many times suggested by Owen, Bronn, Huxley, Gill, and others, that the class could be advantageously

divided into two primary groups. Thus, for the first division, includin Lingula, Discina, &c., the names Lyopomata (Owen, 1858),

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Fires. 9-11,—Tretenterata,

Fig. 1.—Waldheimia craneum. A, veutial, B, dorsal valve

Fig. 2.— Rhynchonella psittacea.

Fras. 3 and 4.—Thecidium.

Fig. 5.—Spirifer. Dorsal valve, showing calcareous spiral coils.

Fie. 6.—Orthis calligramma.

Fie. 7.—Leptena transversalis. A, ventral, B, dorsal valve.

Fig, 8.—Productus horridus.

Fig, 9.—Lingula pyramidata (after Morse).

Fie. 10.—Discina lamellosa.

Fie. 11.—Crania anomala. Interior of dorsal valve, showing muscular impressions and labial appendages.

Pleuropygia (Bronn, 1862), Inarticulata (Huxley, 1869), Lyopomata (Gill, 1871), have been made use of; while for the second division, comprising Zerebratula, Rhyr chonella, &c., the names Athropomata (Owen, 1858), Apygia (Bronn, 1862), Articulata (Huxley, 1869), Arthro-

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omata (Gill, 1871) have been proposed. Prof. King, con- sidering these names to be objectionable, and in some cases ‘nadmissible on certain grounds, in 1873 substituted the name J’retenterata for the first group, the intestine being

rovided with an anal aperture, while the second group, to which he gives the name of Clistenterata, would embrace animals that are destitute of that organ ; but it must also be remembered that the presence or absence of an anal aperture has been ascertained in only three or four recent genera, and that we are compelled, in a measure, to take for granted that what we find to be the case in Tingula and Zerebratula is also so in the many extinct families and genera of which the animal cannot be examined.

With the character above enounced, we generally find structural modifications of the hinge and other differences in the animal, and especially so in what relates to the muscular system. In the opinion of Prof. King the absence of an anal vent in the Clistenterata makes them inferior to the aniferous Tretenterates.

The animal of the Brachiopod is in all cases protected by a shell composed of two distinct valves; these valves are always, except in cases of malformation, equal-sided, but not equivalved. The valves are, consequently, essentially symmetrical, which is not the case with the Lamellibran- chiata or Conchifera,—so much so, that certain Brachiopod shells received the name Lampades, or lamp shells, by some early naturalists ; but while such may bear a kind of resemblance to an antique Etruscan lamp, by far the larger number in no way resemble one. The shell is likewise most beautiful in its endless shapes and variations. In some species it is thin, semi-transparent, and glassy, in others massive. Generally the shell is from a quarter of an inch to about four inches in size, but in certain species it attains nearly a foot in breadth by something less in length, as is the case with Productus giganteus. The valves are also in some species very unequal in their respective thickness, as may be seen in Productus Llangol- lensis, Davidsonia Verneuilit, &c., and while the space allotted to the animal is very great in many species, as in Terebrutula spheeroidalis, it is very small in others belonging to Strophomena,

Lepteena, Chonetes, &c. The ventral valve is usually the thickest, and in some forms is six or seven times as great as the opposite one. The outer surface of many of the species presents likewise the most exquisite sculpture, heightened by brilliant shades, or spots of green, red, yellow, and bluish black. Traces of the original colour have also been preserved in some of the fossil forms ; radiating bands of a reddish tint have been often seen in well-preserved examples of Terebratula hastata, 7'. saculus, T. communis, T. biplicata, and of several others. Some specimens of 7'. carnea are of a beautiful pale pink colour when first removed from their matrix, and E. Deslongchamps has described the tint of several Jurassic species.

The valves have been distinguished by various names, but those of dorsal and ventral are in most general use. The ventral valve is usually the largest, and in many genera, such as Terebratula and KRhynchonella, has a prominent beak, with a circular or otherwise shaped perforation or foramen at or near its extremity, partly completed by one or two plates, termed a deltidium. Through the foramen passes a bundle of muscular fibres, termed a peduncle, by which the animal is in many Species attached to submarine objects during at least a Portion of its existence. Other forms show no indication of ever having been attached, while some that had been moored by means of a peduncle during the early portion of their existence have become detached at a more advanced stage of life, the opening becoming gradually cicatrized, as is so often seen in Strophomena rhomboidalis, Orthesina anomala, &c. Lastly, some species have adhered to submarine

objects by a larger or smaller portion of their ventral valve, as is the case with many forms of Crania, Thecidium, Davidsonia, &c. Some Cranas are always attached by the whole surface of their lower or ventral valve, which models itself and fills up all the projections or depressions existing either on the rock, shell, or coral to which it adhered. These irregularities are likewise, at times, reproduced on the upper or dorsal valve. Some species of Strophalosia and Productus seem also to have been moored during life to the sandy or muddy bottoms on which they lived, by the means of tubular spines of greater or lesser length. The interior of the shell varies very much according to families and genera. On the inner surface of both valves several well-defined muscular vascular and ovarian impres- sions are observable; they form either indentations of greater or lesser size and depth, or occur as variously shaped projections. In the Trimerellide, for example, some of the muscles are attached to a massive or vaulted

Figs. 12-18.

Fiq. 12.— Waldheimia flavescens. Interior of ventral valve. f, foramen; d, delti- dium; ¢, teeth; a, adductor impressions (= occlusors, Hancock); ¢, divaricator (= cardinal muscles, King, = muscles diducteurs principaux, Gratiolet); ¢, accessory divaricators (muscles diducteurs accessoires, Gratiolet); 6, ventral adjustor (= ventral peduncular muscles, or muscles du pedoncule paire superi- eure, Gratiolet); b’, peduncular muscle.

Fic. 13.—Waldheimia flavescens. Interior of dorsai valve. ¢,c’, cardinal process, Y, b’. hinge-plate; s, dental sockets; /, loop; g, crura; @, a’, adductor impres- sions; c, accessory divaricator; 6, peduncle muscles; ss, septum.

Fic. 14.—Waldheimia flavescens. Longitudinal section of valves. A, ventral, B, dorsal] valves; , loop; q, crura; ss, septum; ¢, cardinal process.

Fig, 15.—Terebratula vitrea. Interior of dorsal valve. J, loop; 6, hinge-plate; c¢, cardinal process.

Fre. 16,—Loop of Terebratulina caput serpentis.

Fig. 17.—Longitudinal section of Terebratella dorsata.

Fre. 18.—Longitudinal section of Magas pumilus.

(Qeferences as in fig. 14.)

platform situated in the medio-longitudinal region of the posterior half or umbonal portion of both valves. In addition to these, there exists in the interior of the dorsal valve of some genera a variously modified, thin, calcified, ribbon-shaped lamina or skeleton for the support of the labial or brachial appendages ; and so varied, yet constant in shape to certain species is this laminal apophysis, that it has served as one of the chief characters in the creation

of both recent and extinct genera. The apophysis is more or less developed in some genera than in others. In certain forms, as in Zerebratula and Terebratulina, it is short and simple, and attached to a small divided hinge-plate, the two riband-shaped lamina being bent upwards in the middle (fig. 15). The cardinal process is prominent, and on each side of the hinge-plate are situated the dental sockets; the loop in Terebratulina becomes annular in the adult by the union of the oral processes or crura (fig. 16). In Waldheimia it is elongated and reflected; the hinge- plate large, with four depressions, under which originates a niesial septum, which extends more or less into the interior of the shell (figs. 13 and 14). In Zerebratella the loop is attached to the hinge-plate and to the septum (fig. 17). In Megerlia it is three times attached, first to the hinge- plate, and then to the septum by processes from the diverging

and reflected positions of the loop. In Magas the }

apophysary system is composed of an elevated longitudinal septum reaching from one valve to the other, to which are affixed two pairs of calcareous lamellz, the lower ones riband-shaped ; attached first to the hinge-plate, they after- wards proceed by a gentle curve near to the anterior

portion of the septum, to the sides of which they are affixed; the second pair originate on both sides of the upper edge of the septum, extending in the form of two triangular anchor- shaped lamelle (fig. 18). In Bouchardia the septum only is furnished with two short anchor-shaped lamella. Many more modifications are observable in different groups of which the great family Zerebratulide is composed, and which will be found fully described in Davidson's and other authors' works on the Brachiopoda. In Thectdium (figs, 3, 4) the interior of the dorsal valve is variously furrowed to receive a testaceous ridge folded in two or more lobes. In the family Spiriferide there are two conical spires directed outwards, and nearly filling the cavity of the shell (fig. 5); while in Atrypa the broad spirally coiled lamelle are vertical, and directed towards the centre of the valve. In the Rhynchonellide there are two short slender curved lamin, while in many genera and even families, such as the Productide, Strophomenidee, Lingulide, Discinide, &c., there exists no calcified support for the labial appendages. The ventral valve in many of the genera is provided with two curved hinge-teeth, which fit into corresponding sockets in the opposite valve, so that the valves cannot be separated without breaking one of the teeth. Nearly all the genera composing the division Clistenterata have their valves articulated, while those forming the Tretenterata have theirs kept in position by the means of muscles especially adapted to that purpose ; but in one of the most natural groups, viz., that of the Productide, we find genera presenting both conditions. The intimate structure of the shell has been minutely investigated by Dr Carpenter, Prof, King, Dr Gratiolet, and several others, and been found to be distinct from that of the Lamellibranchiata and Gasteropoda. Dr Carpenter informs us that there is not in the shell of the Brachiopoda that distinction between outer and inner layers, either in structure or mode of growth, which prevails among the ordinary bivalves; that it seems obvious, both from the nature of the shell substance and from the mode in which it Is extended, that the whole thickness of the Brachiopod shell corresponds with the outer layer only of the Lamellibranchiata ; and that he has occasionally met with a second layer in recent Terebratule, within the earlier portion of the shell, but confined to only a part of the surface instead of extending beyond it. In some families composing the Clistenterata it consists, according to Prof, King, of three divisions, the innermost and middle ones which constitute the entire

thickness of the valve, being calcareous with a prismatic or fibrous structure, while the

outer divisions would consist of a very thin membrane, The innermost and intermediate divisions are in some families traversed by minute tubular canals, which pass from one surface to the other, for the most part in a vertical] direction, and at tolerably regular intervals, but just before

terminating near the outer surface of the epidermis their

orifices suddenly become dilated, the lower half of the canals being often considerably smaller in diameter than the upper half. The canals are occupied by cecal processes proceed- ing from the mantle or the fleshy covering of the animal, Their function is, according to Dr Carpenter, branchial] or subservient to respiration ; but if there exists an outer epidermis, as described by King, which covers their eX: panded terminations, there would be no conmunication between the surrounding sea water and the mantle. In the Rhynchonellide and in some other families the shell structure would, according to Dr Carpenter, consist of flattened prisms of cousiderable length, arranged parallel to each other with great regularity, and obliquely to the surface of the shell, the interior of which is imbricated by their outcrop. In certain genera, such as Lingula and Discina, no canals traverse the shell from the inner to the outer surface. The shell structure, according to Dr Gratiolet, would consist of two distinct elements, that is to say, a corneous or horny animal substance, and a testaceous one ; these occur in alternate layers of unequal thickness, The testaceous layers recall the structure observable in the Terebratulide, being traversed by numerous canals of extreme or Microscopic minuteness, As Mr Woodward observes in his excellent manual of the Mollusca, Prof. Huxley has suggested that the ceca are analogous to the vascular processes by which in many Ascidians the tunic adheres to the test, the extent of which adhesion varies in closely allied genera. It seems, however, strange that these tubular perforations should not have been essential to the species of every family composing the class if they are really subservient to respiration, The subject will therefore demand further consideration.

The anatomy of the Brachiopoda has been the subject of Soft pa elaborate investigations by Cuvier, Vogt, Huxley, Hancock, of the

Gratiolet, Woodward, Deslongchamps, King, and others, while of late years much light bas been likewise thrown on the embryology and early stages of the groups by Steenstrup, Lacaze-Duthiers, Morse, F. Miiller, Oscar Schmidt, M‘Crady, Kowalevsky, and others. Some differences in opinion, it is true, have been and still are entertained with respect to the exact function to be attri- buted to certain parts of the animal, but on all essential questions there is a pretty general agreement.

According to Morse the Brachiopoda are reproduced by eggs, generally kidney-shaped and irregular, which are discharged from the anterior margin of the shell, and drop just beyond the pallial membrane, hanging in clusters from the setx. Some uncertainty has prevailed as to Whether there is a male and female individual. Lacaze- Duthiers and Morse state that the sexes are separate, and describe them as such in Thectdium and T erebratulina, and the French zoologist goes so far as to suggest that a differ- ellce is even observable in the shell, but the statement requires Verification. Prof. Morse describes the embryo of Lerebratulina with great minuteness during its six stages of development. It is divided into two, three, or four lobes clothed with vibratile cilia, and before becoming attached swims or whirls head foremost by means of vibratile cilia which cover the body. The same distin- guished American zoologist describes with equal care the formation of the shell from its first stage of development to the adult condition. Lacaze-Duthiers alludes to two and four eye spots in the embryo of Thecidium, and states that the animal appears to be in some measure sensible to light.

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‘The mouth conducts by a narrow cesophagus to a simple stomach which is surrounded by a large granulated liver. Owen’s “hearts” have been found to be oviducts, while the true heart consists of a pyriform vesicle appended to the dorsal surface of the stomach. The digestive organs and viscera, as well as the muscles, which take up only a small Jace in the neighbourhood of the beak, are separated from the great anterior cavity, and protected bya strong membrane in the centre of which the mouth is situated. The nervous system consists of a principal ganglion of no great size. Both valves are lined by a

delicate membrane termed the pallium or mantle ; it secretes the shell, and is generally fringed with horny bristles or sete. It is composed of an outer and inner layer, between which are situated the blood channels or lacunes ; in fact, all the internal parts of the shell are lined by the inner layer of the mantle, with the exception of the spots where the muscles attach themselves to the shell. The outer layer lines closely the inner sur- face of the valves to which it adheres, and in those specics jn which the shell is traversed by canals there exist, on the surface of the mantle facing the inner surface of the valves, corresponding short cylindrical membranous pro-

“jections or lacunes, which insert themselves into the

small tubular orifices that traverse the shell. The cacal prolongations do not exist in those genera, such as Rhyn- chonella, where the shell is deprived of tubular perforations. The inner layer is rather thicker than the opposite one, and is covered with vibratile cilia, As stated by Nicholson and other anatomists, the blood channels form a remarkable system of more or less branched tubes, anastomosing with one another, and ending in the cecal extremities. This, which has been termed by Huxley the arterial system, com- municates with the perivisceral cavity by means of two or four organs, which are called pseudo-hearts, and which were at one time supposed to be true hearts. Fach pseudo- heart is divided into a narrow, elongated external portion (the so-called “‘ventricle”), which communicates, as Hancock has proved, by a small apicial aperture with the pallial cavity; and a broad, funnel-shaped so-called “ auricle,” communicating on the one hand by a constricted neck with the so-called “‘ ventricle,” and on the other by a wide patent mouth with a chamber which occupies most of the cavity of the body proper, and sends more or less branched diverticula into the pallial lobes (Huxley). The channels vary in their dispositions and details in different genera, and as they project to some small extent, leave corresponding indentations on the inner surface of the shell, so that their shape and directions can very often be traced on fossil and extinct genera as well as if the animal was still in life ; this may be seen in the numerous illustrations appended to Davidson’s and other authors’ works treating of fossil Brachiopoda. There are usually four principal arterial trunks in each lobe of the mantle; the two central ones run direct to the front, near to which they bifurcate, while the outer ones give off at intervals on the side facing the

lateral margin of the valves a series of branches which bifurcate several times, It has been observed by Hancock that the inner lamina of the mantle, and more particularly that portion of it forming the floor of the great pallial sinuses, will undoubtedly assist in purifying the blood. In 1854, in his review of Davidson's great work on British fossil Brachiopoda, Oscar Schmidt called atten- tion to an important anatomical omission, namely, the existence of a vast number of microscopic, flattened, cal- careous, denticulated plates or spiculz on certain parts of the surface of the mantle, and destined, no doubt, to stiffen and protect the portions that contain them ; and it was, moreover, observed by Hancock, and afterwards by Des- longchamps, that these calcareous plates are not to be found equally distributed over all the surface of the

mantle, but only in those portions in connection with the great lacunes or veins, the labial appendages, and the perivisceral cavity. These spicule do not appear to be present in every species, and are totally absent in Lingula, Rhynchonella, and others. Deslongchamps observes that if we examine the genera Kraussina, Terebratula, Terebra- tulina, Megerlia, and Platydia, we have a series wherein the number and consistence of the calcareous portions increase in a very rapid manner, and that the spicules lie over each other several times, leading the observers by insen- sible degrees to Zhecidium, in which the spicule are soldered together, and incrust the mantle to such an extent that it is no longer distinct from the shell itself. The brachial ap- pendages are a pair of singular organs eminently charac- teristic of the Bra- chiopoda ; they often are more cor- f rectly termed labial }/ appendages on ac- count of each mem-} ber being a prolon- gation of the lateral portion of the lips or margin of the mouth. The Lamel- libranchs or Con- chifera have analo- gous appendages,

Fig. 19. but very much less waidneimia Jtavescens. Interior of dorsal valve, to show

the position of the labial appendages. (A portion of developed. . They the fringe of cirri has been removed to show the assume different brachial

membrane and a portion of the spiral ex-

: : tremities of the arms. shapes in different 3

genera, and are supported, or otherwise, by the more or less complicated skeleton already described. The labial appendages, whatever may be the shape and convolutions they may assume, fill the larger por- tion of the cavity of the shell in front of the visceral chamber ; they are formed of a mem-

branous tube, fringed on one side with long

flexible cirri, and occupy almost the whole of the pallial cavity, but were not capable of being protruded in those families in which they were folded back upon them- selves and support- ed by a calcareous skeleton, aS in Waldheimia, Tere- bratella, Megertia, &c. Barrett, who has examined the animal of Yerebratulina caput serpentis

Waldheimia flavescens. Longitudinal section with & portion of the animal. d, A, brachial appendages; a, adductor; jc, 7, divaricator muscles; s, septum; v, mouth; z, extremity of alimentary tube. The peduncular muscles have been purposely omitted.

in life, states that it showed more of itself than Wald-

heimia cranium, which might be supposed from the labial appendages being in the first very slightly supported by a small loop. Barrett observed, likewise, that it protrudes its cirri further, that the cirri on the reflected part of the brachial appendage are shorter than on the first part, and were

Brachial or labial ap- pendages.

Muscles

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almost constantly in motion, and often seen to convey small particles to the channel at their base, and that the cirri are bent up when the brachial appendages are retracted, but are generally uncoiled and straightened when

the shell is opened, before which the animal has often been observed to protrude a few of its cirri, and move them about to ascertain if any danger threatened. In Rhynchonella, where the elongated spiral labial appendages are slightly supported only at their origin by two short calcareous processes, they can at the will of the animal, according to Owen and Morse, be unrolled and protruded to some distance beyond the margins of the valves, and when forcibly stretched ont they are said to be more than four times the length of theshell, and tosupport some 3000 cirri. We may mention, likewise, that Otto Frederick Miiller, having dredged from the Lake of Droe- es Sher hala Pakage eerie number of Zerebratulae labial appendage in its natural position; d, (probably belonging to ®ppendage extended or unrolled. Rhynchonella psittacea), and placed them in a glass of water, he observed that they gracefully extended their spirally coiled brachial appendages. It must, however, remain for ever uncertain whether, in the extinct genera Spirifera, Atrypa, and others, in which the spirally coiled fleshy labial appendages were supported throughout their entire length by a calcified skeleton, the animal could protrude them beyond the margin of the valves. In some families —Rhynchonellide, Productide, and others—these organs are spiral and separate ; in many the separation is only at their extremities. There can be very little doubt that these elegant organs, provided as they are with cirri and cilia, are not only instrumental in conveying microscopic organisms to the mouth, which, as seen in fig. 19, is situ- ated between the appendages at their origin, but are like- wise subservient to the functions of respiration. Hancock observes that to prove that the brachial organs subserve the function of gills, as well as that of sustentation, it is only necessary to refer to the manner in which the blood circles round the labial appendages and is carried to the cirri, but more particularly to its circulating through these latter orgaus, and returning direct from them to the heart,

As the number and position of the muscles differ materially in the two great divisions into which the Brachiopoda have been grouped, and to some extent also in the different genera of which each division is composed, it may be desirable to treat this subject under two separate heads. Unfortunately almost every anatomist who has written on the muscles of the Brachiopoda has proposed different names for each muscle, and the confusion thence arising is much to be regretted. In the Clistenterata, of

which the genus Terebratula may be taken as an example, five or six pairs of muscles are stated by Hancock, Gratiolet, and others, to be connected with the opening and closing of the valves, or with their attachment to or movements upon the peduncle. First of all, the adductors or occlusors consist of two muscles, which, bifurcating near the centre of the shell cavity, produce a large quadruple impression ou the internal surface of the small valve (fig. 13, a, a'), aud a single divided one towards the centre of the large or ventral valve (fig. 12, a). The function of this pair of muscles is the closing of the valves, Gratiolet, who has likewise described with great minuteness the muscles of the Brachivpoda, informs us that those which close and open

the valves were the only oues known to Pallas, but that he defined: their position and functions clearly. The same | was done by Blainville and Quenstedt, but the absence

of good figures caused much uncertainty to prevail. This

Fig. 22.

Diagram showing the muscular system (after Hancock), M. ventral, N, dorsal valve; 7, loop; V, mouth; Z, extremity of intestine; a,

Waldheimia flavescens.

adductor; ¢, divaricators; c', accessory divaricators:

peduncular muscles; 6", dorsal adjustors; P, peduncle, deficiency was subsequently supplied by Hancock and Gratiolet's admirable illustrations, Two other pairs have been termed divaricators by Hancock, or cardinal muscles ("muscles diducteurs " of Gratiolet), and have for function the opening of the valves. The divaricators proper are stated by Hancock to arise from the ventral valve, one on each side, a little in advance of and close to the adductors, and after rapidly diminishing in size become attached to the cardinal process, a space or prominence between the sockets in the dorsal valve. The accessory divaricators are, according to the same

authority, a pair of small muscles which have their ends attached to the ventral valve, one on each side of the median line, a little behind the united basis of the adductors, and again to the extreme point of the cardinal process. Two pairs of muscles, apparently con- nected with the peduncle and its limited movements, have been minutely described by Hancock as having one of their extremities attached to this organ. The dorsal adjustors are fixed to the ventral surface of the peduncle, and are again inserted into the hinge-plate in the smaller valve. The ventral adjustors are considered to pass from the inner extremity of the peduncle, and to become attached by one pair of their extremities to the ventral valve, one on each side of anda little behind the expanded base of the divaricators, The function of these muscles, according to the same authority, is not only that of erecting the shell, they serve also to attach the peduncle to the shell, and thus effect the steadying of it upon the peduncle. Gratiolet describes the peduncle with great care, and states it to be composed of two portions—Ist, of a horny sheath formed of concentric epidermic layers, very analogous to that which Vogt has described in Lingula ; and 2d, a fibrous stem enveloped by the sheath. This stem, composed of tendinous fibres, is fixed by its free extremity to different submarine objects ; the other extremity passes through the foramen, and is ended by a bulbous projection.

Such is the general arrangement of the shell muscies in the division composing the articulated Brachiopoda, making allowance for certain unimportant modifications observable in the animals coniposing the different families and genera thereof. Owing to the strong and tight interlocking of the valves by the means of curved teeth and sockets, many species of Brachiopoda could open their valves but slightly. In some species, such as 7 hecidium, the animal could raise its dorsal valve at right angles to the plane of the ventral one (fig. 4).

In the Tretenterata, of which Lingula and Discina may

b, ventral adjustors; 0,

be quoted as examples, the myology is much more com- plicated, and anatomists have differed considerably in their respective views concerning the function of some of the inuscles. ‘They have been carefully described by Owen, Vogt, Hancock, Gratiolet Woodward, and others, and more

Figs. 23, 24.

Lingula anatina. 23, interior of ventral valve; 24, interior of dorsal valve (after King). g, umbonal muscular impressions (open valves); A, central muscles (close valves); ¢, transmedial or sliding museles; 8, parietal band; /, &, J, lateral muscles (j, anteriors; &, middles; /, outsiders), enabling the valves to move forward and backward on eaeh other.

recently by King, whose views seem to carry with them a greater degree of plausibility. Of the shell or valvular muscles he makes out five pairs and an odd one, and individualizes their re- spective functions as fol- lows:—Three pairs are lateral, having their mem- bers limited to the sides of the shell ; one pair are transmedians, each mein- ber passing across the middle of the reverse side of the shell, while the odd muscle occupies the um- bonal cavity. The cen- tral and umbonal muscles effect the direct opening and closing of the shell, the laterals enable the valves to move forward and backward on each other, and the transme- cians allow the similar extremities (the rostral) of the valves to turn from each other to the right or the left on an axis subcentrically situated, that is, the medio-trans- verse region of the dorsal valve. It was long a mat- ter in discussion whether the animal could displace its valves sideways when about to open its shell, but this has been actually observed by Professors Semper and Morse, who saw the animal perform the operation. They mention that it 18 never done suddenly or by jerks, as the valves at are

Fig. 25.

Lingula anatina, Diagram showing the mus- cular system (after Hancock), The letters indicate the muscles as in figs. 23 and 24. A, dorsal, B, ventral valve; p, peduncle; ée, heart; a, alimentary tube; z, anal aperture,

first always pushed to one side several times and back again on each other, at the same time opening gradually in the transverse direction till they rest

opposite to one another and widely apart. ‘Those who have not seen the animal in

| life, or who did not believe in the possibility of the valves

crossing each other with a slight obliquity, would not consent to appropriating any of its muscles to that purpose, and consequently attributed to all the lateral muscles the simple function of keeping the valves in an opposite position, or holding them adjusted. We have not only the observations of Semper and Morse, but the anatomical investigations of King, to confirm the sliding action or lateral divarication of the valves of Lingula.

In the Clistenterata, where no such sliding action of the valves was necessary or possible, no muscles for such au object were required, consequently none took rise from the lateral portions of the valves as in Lingula; but in an extinct group, the 7rimerellide, which seem to be some- what intermediate in character between the Tretenterata and Clistenterata, have been found certain scars, which appear to have been produced by rudimentary lateral muscles, but it is doubtful (considering the shells are fur- nished with teeth, though but rudely developed), whether such muscles enabled the valves, as in Lingula, to move forward and backward upon each other. We do not yet possess any reliable observations as to the manner in which Discina opens its valves, but Mr Barrett, who observed Cranza in life, informs us that the valve opens by moving upon the straight hinge, without sliding the valve. There are muscles connected with other portions of the animal in both groups, such as the parietal muscles, strongly defined in the Tretenterata, and distinctive peculiarities of the peduncle, but the limited space at our disposal will not admit of entering upon further anatomical details,

The Brachiopoda all inhabit the sea, and are supposed to have attained their full growth in a single season. A vast amount of important and accnrate information has been collected during the past ten years with respect to the geographical distribution of recent species, as well as to the marine depths they inhabit or prefer. This important knowledge is mainly due to the numerous well conducted and equipped dredging expeditions carried on by private individuals and by the Governments of the leading mari- time states.

It would not be possible to give here the names of all those naturalists who have contributed to this portion of our information, but we cannot pass over those of Edward Forbes, J. G. Jeffreys, W. B. Carpenter, W. H. Dall, W. Thomson, E. Suess, A. Adams, H. Cuming, &c. Previous to these investigations the data we pessessed with respect to the habitat and ranges of depth were in most cases vague and unsatisfactory. It has been ascertained that the Brachiopoda are much localized, and usually occur in great numbers in their favourite haunts. Jeffreys does not believe that the habitat of any Invertebrate animal is affected by bathymetrical conditions, and that the same species will occur at various depths. We can say nothing certain with respect to the ranges of depth at which the extinct species lived, but some idea as to their probable depths can be surmised from a study of the recent species, As far as our present information will carry us the Tretenterata do not appear to have been found at a greater depth than 1360 to 2000 fathoms. Jrngula abounds in particular haunts at about half the tide-mark, and partly buried in mud, or at depths varying from three or four inches from the surface of the sea to seventeen fathoms. Prof. Morse describes a species which he found in vast numbers in a sand shoal at low water; the péduncle, six times the length of the shell, was partly encased in a sand tube (fig. 9). He observed likewise that this species (Lingalu pyramidata) had the power of moving over the

sand by the sliding motion of the two valves, using at the same time the fringes of sete, which swing promptly back and forth like a galley of oars, leaving a peculiar tract in the sand. In the motion of the setee he noticed the impulse commencing from behind and running forward. Discina has been found attached to stones at low water mark, and dredged from depths ranging from 5 to nearly 2000 fathoms. They are very often clustered together in vast numbers, each adhering by its peduncle to the surface of the shell of its neighbour, one above the other, till they form a living mass of

considerable breadth and thickness, Cranza is found in great numbers adhering to stones aud shells at depths of from 18 to 530 fathoms, The genera and species of the Clistenterata live at depths ranging from about half tide mark to that of 2600 fathoms. Terebratulina caput serpentis was found by the late R. T. Loweliviry attached to rocks at low water mark on a part of the Scottish coast, where the tide falls only a few feet, but the same species has been dredged alive from depths varying from 38 to upwards of 150 fathoms. Prof. Jukes got immense numbers of specimens of Waldheimia flavescens or Australis while boating in Aus- tralia among the reefs. They were merely washed by the tide, and he gathered them with his hand like limpets on the shore. M. Vélain picked up a small species of Kraus- sina in vast numbers on the shore in the interior crater of the island of St Paul, the shell being alternately covered with water and left dry at every tide. Kraussina rubra, from the coast of Natal in South Africa, was described by Dr Gray as having been found attached in great numbers to ascidia and stems of sea-weeds, and Mr Jeffreys had also previously noticed a small European species similarly fixed to sea-weeds. In general, however, it-may be said that the larger number of species inhabit depths varylng fron 5 to 300 or 400 fathoms. Several species live attached to coral reefs. Waldheimia cranium has been obtained from depths varying from 160 to 228 fathoms. Barrett and Jeffreys state that Terebratulina caput serpentis manifested a remarkable power and disposition to move on its peduncle, and that it was incessantly opening and fold- ing its brachial appendages, and drawing in and sucking in, by means of the whirlpool thus caused, every animalcula within its influence.

It is now necessary to say a few words with reference to the classification of the Brachiopoda, and in drawing up any scheme of arrangement due regard must be paid to the. extinct forms, which vastly outnumber those of the pre- sent seas. The first species belonging to the class were imperfectly and quaintly described as well ag figured by Fabio Columna as far back as 1606. Since then so many paleontologists have contributed to the elucidation of the fossil species that it would not be possible to give all their names ; we must not, however, omit to record those of Linneus, Defrance, Von Buch, Alcide D’Orbigny, De Blainville, Sowerby, Barrande, De Verneuil, Deslongchamps (father and son), De Koninck, E. Suess, W. King, F. M‘Coy, J. Hall, Billings, Dalman, Dall, Fischer, Pander, C. Moore,

Hichwald, Kutorga, Keyserling, Sandberger, Sequenza, Salter, Morris, Meek, and Davidson.

Various schemes of classification have been proposed, but none as yet can be said to be more than provisionally satisfactory, because before one can classify it is necessary to understand all the characters of the species one has to arrange in their more or less natural groups, and we o not yet in possession of all that necessary informa-

ion.

In 1853 Davidson divided the Brachiopoda into eight families, comprising twenty-four genera and about as many sub-genera, but during the years that have elapsed from that to the present time, about seventy more genera and

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sub-genera have been described, so that as many as one hundred and twenty-three so-termed genera have now to be classed into their respective families, a task which has not yet been satisfactorily accomplished. It is, however, very probable that the number above given has been exaggerated, and that when our knowledge has increased, some of them will have to be placed among the synonyms.

It will be necessary in every scheme of classification to admit the two great divisions Tretenterata and Clistenterata,

The TRETENTERATA would comprise the families Lin- guide, Discimde, Craniade, Trimerellide, and perhaps one or two others.

The C1isteNTERATA would include the families Tere- bratulide, Thecidede, Spiriferide, Rhynchonellide, Penta- meride, Strophomeride, Orthide, Productide, and perhaps two or three others that will have to be characterized. By far the larger number of described genera and species would find their place in this last great division and the above-named families. We will now very briefly notice some of the characters of the families above indicated.

TRETENTERATA—Family 1. Lingulidee.—Shells gene- rally either oblong or circular, with a peduncle, sometimes of considerable length, passing out between the valves or through a narrow channel in the hinge margin; texture

horny ; no calcified supports for the labial appendages ; the

fleshy spiral coils directed upwards. This family would comprise the following genera: Lingula, Lingulella, Lin- gulops, Lingulepis, Glottidia, Monobolina, Obolus, Obolella, Dignomia, Schmidtia, Acritis, Volborthia, &c. Lingulella is one of the oldest known types of animal life, while Lingula appeared for the first time about the middle of the Cam- brian period, and has continued to be represented up to the present time.

Family 2. Discintdee.—Shells more or less circular or oval shaped, attached by a peduncle passing through a foramen in the ventral valve; shell calcareous or horny ; setze extremely long, barbed with cilia of great length ; labial appendages fleshy, curved backwards, with small terminal spire directed downwards as in Crania (fig. 11). Genera — Discina, Trematis, Discinisca, Kutorgina (2), Acrotrata (4), Siphonotrata (1). Descina appeared about the middle of the Cambrian period, and has continued to exist up to the present time.

Family 3. Craniade.—Shells orbicular or limpet-like, entirely free or attached by a greater or lesser extent of the under surface of their ventral valve; labial appendages spirally coiled, directed towards the bottom of the dorsal valve (fig. 11); shell calcareous, perforated by minute canals. Genera —Crania, Craniops, Craniscus, Pholideps. The genus Crania appeared for the first time during the Silurian period, and has continued to be represented up to the present time.

Family 4. Z’rimerellide.—Shells transversely or longitu- dinally oval; ventral valves usually the largest and flattest, with a more or less developed beak and area; ventral valves generally the most convex ; hinge rudely or faintly dentary; all the genera are provided with a solid or vaulted muscular platform in the interior of both valves ; no calcareous support for the labial appendages ; shell calcareous, and in two of the genera very massive, All

the forms are extinct. Genera—Trimerella, Monomerella, Dinobolus. The species of this family are restricted to the Silurian period.

CLISTENTERATA—Family 5. Terebratulide.—Shells very variable in shape, with a prominent beak, truncated by a circular perforation, partly completed by a deltidium in one or two pieces ; labial appendages united to each other by a membrane, variously folded upon themselves, and in some genera spiral at their extremities. These appendages are entirely or partially supported by a calcified process,

ussuming great variety of shape (figs. 1, 12 to 20, and 22). All the species lived attached to submarine bodies by the means of a peduncle. Shell structure punctated. Genera —Terebratula, Terebratulina, Terebratella, Waldheimia, Megerlia, Kraussina, Kingina, Terebrirostra,Magas, Manma, Bouchardia, Platidia, Argiope, Cistella, Reusselaria, Zel- lania, Gwynia, Macandrevia, Diclasma, Megantheris, Stringocephalus, T'ropidolepis (1). Terebratula appeared at the conclusion of the Silurian period, and continues to be represented up to the present time, but the larger number of genera have had a very limited distribution in time.

Family 6. Z'hecidede.—Shells small, thick, varied in shape, attached by a larger or smaller portion of the shell substance of their ventral vaive; area flat; deltidium indistinct ; valves articulated ; loop in the dorsal valve folded into two or more lobes lying in hollows of corre- sponding shape excavated in the substance of the valve (figs. 3, 4). This loop, or apophysary ridge, supports the brachial membrane, whose thickened cirrated margin is apparently attached to the inner sides of the grooves ; shell structure punctated. Only one genus, Zhecidium. It ap- peared in the Trias, and has continued to be represented up to the present time.

Family 7. Spircferide.—Shells variable in shape, ovate, elongated or transverse trilobed, with the hinge-line at times straight and extended into wing-shaped expansions ; valves articulated, with or without a flattened area in ventral valve; animal free or attached during at least a portion of its existence by the means of a peduncle, or by muscular fibres issuing from an angular or circular foramen in the beak or area of the ventral valve; dorsal

valve internally furnished with two calcareous spiral processes, connected in different manners, and directed outwards towards the sides of the shell (fig. 5). These processes afforded support to the brachial appendages. This family composes the following impunctate or punctate genera: Spwrvfera, Cyrtia, Spirrferina, Cyrtina, Martinia, Athyris, Merista, Merrstina, Retzia, Nucleospira, Trematospira, Khynchosyira, Meristella, Zygospira, Coclospira, Rhyncho- trema, Uncites, Ambocelia, Charionella, Syringothyris, Humetria, Suessia, Vetulina (2). The first species belong- ing to this family made its appearance during the Silurian period, and the family became entirely extinct in the Inferior Oolite.

Family 8. Zthynchonellide.—Valves articulated, very variable in shape, more or less trigonal, often trilobed or ovate, smooth or plicated (fig. 2); foramen beneath a usually produced and pointed beak, completed by a deltidium at times concealed; brachial appendages fleshy and spirally rolled, flexible, and supported only at their origin by a pair of short-curved shelly processes, or throughout by two broad spirally-coiled lamelle (these spires are vertical, closely appressed, and directed towards the centre of the valve); shell structure fibrous and impunctate. This family composes the following genera: Lthynchonella, Atrypa, Eatonia, Leptocelia, Brachymerus, Anastrophia, Leiorhynchus, Oamarophoria, Rhynchopora, Thynchonellina, and one or two others. The first species appeared during the Silurian period, and representatives of the family have continued to the present time.

Family 9. Pentameride. — Shells ovate, somewhat pentagonal; valves articulated, without hinge-area; foramen angular; no deltidium; inside of ventral valve two contiguous vertical septa of greater or lesser length, which coalesce into one median plate, and then diverge to form the dental plates, enclosing a triangular trough-like chamber. In the interior of dorsal valve are two longitu- dinal septa of variable dimensions, to which the socket walls converge and which they join, forming two more or less de- veloped and inclined plates, to the produced extremities of

which were no doubt affixed the fleshy spiral labial append- ages. Shell structure impunctate. Genera— Pentamerus, Pentamerella, and perhaps one

or two others. The species of this family are limited to the Silurian, Devonian, and Carboniferous periods.

Family 10, Strophomenide (figs. 6, 7).—Shells semicir- cular, transverse, or elongated; valves usually concavo- convex, regularly arched, geniculated or depressed, so that the valve which is convex in some species is concave in others, and wee versa ; hinge-line long, straight ; area in ventral valve flat, with a fissure partly arched over by a pseudo- deltidium, while the extremity of the beak is either entire or perforated by a small circular foramen. In the dorsal valve the projecting bifid cardinal process fills up almost the entire cavity of the fissure that may not have been arched over by the pseudo-deltidium of the opposite valve. Valves sometimes uniformly convex, the dorsal one sometimes depressed with an area divided by a triangular foramen. In the interior of the dorsal valve a small, simple, projecting cardinal process is situated between prominent socket walls, to the inner extremities of which were (probably) attached the brachial appendages. Genera —Strophomena, Streptorhynchus, Strophodonta, Leptena, Orthis, Orthesina, Skenidvum, Brachyprion, Disccelosia, Meekella, Dawdsonia (?), and several others. The first species appeared during the Silurian period, and the last in the upper Lias. It may, however, be necessary to group the genera provisionally placed in the Strophomenide into one or two families or sub-families. A family Orthide might be established. Strophomena differs from Orthis in having a closed fissure, and the cardinal process bifid or trilobed, while in Orthis it is generally formed of one piece. In Strophomena it is situated directly between the dental sockets, or has between them and it a small prominent ridge, or brachial process ; for this last is scarcely developed, where it exists, and forms a marked contrast to what we find in the same valve of Orthis. There are also four more or less distinctly defined adductor depressions, which are longitudinally parallel to each other, and separated by ridges, while in Orthis these four divisions are placed in pairs one above the other.

Family 11. Productide.—Shells more or less concavo- convex, oval, semi-oval, or angular and generally auriculated ; the hinge-line straight, with or without teeth and sockets for the articulation of the valves (fig. 8) ; surface of ventral valve or hinge-line more or less furnished with tubular spines, sometimes of considerable length; no calcareous processes for the support

of the brachial appendages ; shell structure perforated by canals ; cardinal process prominent, bilobed or trilobed. Under this a narrow longitudinal ridge generally extends to about half (or more) of the length of the valve, and on each side are seen the ramified dendritic impressions, which may be attributable to the adductor muscle. Outside, and in front of these, are the two reniform impressions so characteristic of the family. Genera—Productus, Strophalonia,

Assuming that the reader is acquainted with the geo- logical divisions into which the earth's crust has been grouped, it may be observed that the Brachiopoda, after the Trilobites, occupy the most important place in the Cambrian or Primordial fauna. Thus, in 1871, out of 241 species known to Barrande as composing the animal kingdom of that period, 179 are referable to the Trilobites and other Crustaceans, 28 to the Brachiopoda, while 34 species would be divided between the Annelids, Pteropodes, Gasteropoda, Bryozoa, Cystidians, and Spongida. Sub- sequently to these researches several additional species of

Trilobites and Brachiopoda have been added to the list through the indefatigable exertions of Prof. Linnarsson, Mr Hicks, and others. The Brachiopoda, along with the groups mentioned by Barrande, are in all probability the earliest. representatives of life at present known ; for Mr Hicks has obtained undoubted examples of Lingula or Lingulella (L. primeva) from the very base of the whole Cambrian series of St David's in Wales. It is impossible for the present to offer more than an approximate com-

parison, based on numbers, of the genera and species that have existed during the various geological more or less

extended periods ; and many years will have to pass away before some master mind will be able to grapple with the accuinulated observations of a century or more, and reduce the number of genera and species within reasonable limits, from which something like reliable data may be formed. Lyell has stated that nothing is more remarkable in the Silurian strata generally of all countries than the preponder- ance of the Brachiopeda over

other forms of Mollusca. Their proportional numbers can by no means be explained by supposing them to have inhabited seas of great depth, for the contrast between the Paleozoic and the pre- sent state of things has not been essentially altered by the late discoveries made in ovr deep-sea dredgings. We find the living Brachiopoda so rare as to form about one forty-fourth of the whole bivalve fauna, whereas in the Lower Silurian rocks, and where the Brachiopoda reach their maximum, they are represented by more than twice as many species as the Lamellibranchiate bivalves. There may indeed be said to be a continuous decrease of the pro- portional number of this lower tribe of Mollusca as we proceed from the older to the newer rocks. Owing to the great number of synonyms it would not be possible at present to offer even an approximate statement with reference to the number of known species. Bigsby states that some 1754 species of Cambrian, Silurian, Devonian, and Carboniferous species of Brachiopoda have been found in America ; 1905 in Europe. It is probable that as many as between four or five thousand species of Brachiopoda

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have been described, and it is noteworthy that the species, so immensely abundant during the Cambrian, Silurian, Devonian, and Carboniferous periods, became inuch legs numerous during the Permian and Triassic, while they again became abundant, although comparatively reduced in number, during the Jurassic and Cretaceous periods. In the Tertiaries they had materially decreased in number, and they are represented at the present time by about 100 species. It has also been clearly ascertained that a certain number of genera and species passed from one system or formation into the one that followed it. Thus, approxi- mately, it may be said that nine genera appeared for the first time in the Cambrian system, fifty-two in the Silurian, twenty-one in the Devonian, seven in the Carboniferous, two in the Permian, three in the Triassic, eleven in the Jurassic, five in the Cretaceous, three in the Tertiary, and nine in the recent periods. But what wonderful changes have been operating during the incaleulable number of ages in which the creation and extinction of a large number of genera and thousands of species have taken place,—some few only of the primordial or

first created genera, such as Lingula, Discina, and Crania, having fought their way

and struggled for existence through the entire sequence of geological time. Many were destined to comparatively ephemeral duration,while others had a greater or lesser pro- longation of existence.

The importance of the study of the Brachiopoda must be obvious to all. They are, as already stated, among the first well-known indications of life in this world, and they have continued to be very extensively represented up to the present time. They are also very characteristic fossils by which rocks at great distances, whether in New Zealand or Spitzbergen, in the Himalayas or the Andes, can be identified, without its being even necessary for the Paleontologist to visit the district whence the fossils are derived; they are, as Mantell would have termed them, sure medals of creation, the date of their appearance firmly stamped upon them, and their distinctive characters so legibly impressed as to defy misinterpretation, —(T. D.)

BRACHYLOGUS, a title applied, for the first time in the middle of the 16th century, to a work which contains a systematic exposition of the Roman law, and which some

writers have assigned to the reign of the Emperor Justinian,

and others have treated as an apocryphal work of the 16th century. The earliest extant edition of this work was published at Lyons in 1549, under the title of Corpus Legum per modum Institutionum ; and the title Brachylogus tottus Julis Civilis appears for the first time in an edition published at Lyons in 1553. The origin of the work may be referred with great probability to the 12th century. There is internal evidence that it was composed subse- quently to the reign of Louis le Débonnaire, as it contains a Lombard law of that king’s, which forbids the testimony of a clerk to be received against a layman. On the other hand its style and reasoning is far supevior to that of the law writers of the 10th and 11th centuries; whilst the cir- cumstance that the method of its author has not been in the slightest degree influenced by the school of the Gloss-writers (Glossatores) leads fairly to the conclusion that he wrote before that school became dominant at Bologna. Savigny, who has traced the history of the Brachylogus with great

care, is disposed to think that it is the work of Irnerius himself. Tts value is chiefly histori- cal, as it furnishes evidence that a knowledge of Justinian's legislation was always maintained in Northern Italy. The author of the work has adopted the Institutes of Justinian as the basis of it, and draws largely on the Digest, the

| Code, and the Wovells ; whilst certain passages, evidently

taken from the Sententie Recepte of Julius Paulus, imply

{ | that the author was also acquainted with the Visigothic

code of Roman law compiled by order of Alaric II, An edition by Professor Bocking was published at Berlin in | 1829, under the title of Corpus Legum sive Brachylogus | Juris Crvilis., | BRACTON, Henry pg, a learned ecclesiastic, who was chief justiciary in the reignof Henry IIL. He is supposed to have been born at Bretton-Clovelly in Devonshire, He 'studied at Oxford, where he took the degree of doctor of | laws, and is believed to have delivered lectures in that | university. He was appointed a justice itinerant for the counties of Nottingham and Derby in 1245, and his name appears as a justiciary or judge of the Aula Regis on the | Fine Rolls in 1249 and in each of the next seventeen | years, written indifferently Bratton and Bretton, which circumstance has led Selden and others to attribute to him the authorship of the earliest treatise on the law of England in the French tongue, known as Bretone or Bretoun. In | 1254 the king assigned to him by letters patent, in which | he was designated " dilectus clericus noster," the use of a ; house in London belonging to William late earl of Derby | eee the minority of the heir, and in 1263 he was collated to the archdeaconry of Barnstaple. This office, however, he resigned in the following year; and in 1265 he was appointed chief justiciary, and held that office until ' the end of 1267, when all notice of him ceases. He wrote

a most comprehensive and systematic work on the laws of England in five volumes, entitled De Legibus et Consuetu- dinibus Angliw, which is modelled after the Jnstitutes of Justinian, and is supposed, from internal evidence, to have been completed about the time when he was appointed

chief justiciary, as it contains references to changes in the law made shortly before that time, but takes no notice of the statute of Marlborough passed in 52 Henry II. A Latin abridgment of Bracton's work was written by Gilbert de Thornton, who was appointed Chief-Justice of the King's Rench in the 17th year of the reign of Edward L., of which Selden possessed a copy, but no copy of it is at present known to exist. There are numerous MSS. extaut of Brac- ton's work, but only two editions of it have beeu printed, the first in folio in 1569, the second in quarto in 1640. The text of these editions is identical, as well as the paging.

BRADFORD, a parliamentary and municipal borough of England, situated in the northern division of the West Riding of Yorkshire and the wapentake of Morley, on an affluent of the Aire, 34 miles S.W. of York, 9 miles W. of Leeds, and 192 miles from Londou by rail. The borough comprises 7220 acres, and is divided into five townships —Bradford, Manningham, Horton, Bowling, aud Bolton. Bradford has returned two members to parliament since 1832, was incorporated in 1847, and is governed by a mayor, 15 aldermen, and 45 councillors. The parish includes the thirteen townships of Allerton, Bowling, Bradford, Clayton, Eccleshill, Haworth, Heaton, Horton, Manningham, North Bierley, Shipley, Thornton, aud Wilsden, and comprises 34,146 acres. The population of the borough in 1871 was 145,830,—68,905 males and 76,925 females,

During the Saxon period Bradford was included in the parish of Dewsbury; but William the Conqueror, who ientions it 11 Domesday Book, included it in the barony of Pontefract, which he granted to Ilbert de Lacy. The manor of Bradford remained in the hands of the De Lacies until the beginning of the 14th century, when it passed by marriage to the family of the earl of Lancaster, John of Gaunt holding it at the time of his death in 1399. The manor was held by the Crown from that time down to the reign of Charles I., who sold it for a small yearly rent to the corporation of London, Afterwards it passed into the possession of the Marsdens of Hornby Castle, but since 1795 it has been held by the Rawson family, from whom the cor- poration have recently purchased all manorial rights. In the struggle between Charles I. and the Parliamentarians, Bradford adhered to the cause of the latter, and twice successfully resisted the royal forces that besieged the town. Subsequently the earl of Newcastle defeated Lord Fairfax at

Atherton Moor, a few miles distant, and the Parliamen- tarian general retreated upon Bradford, giving the defence of the town over to his son, Sir Thomas Fairfax, who, however, was ultimately compelled to yield to the supe- rior numbers of the Royalists. From that time the career of Bradford has been almost entirely a commercial one.

Situated in a populous, well-watered valley, abundantly supplied with iron, coal, and stone, Bradford has, since the introduction of steam, made exceedingly rapid progress. During the Plautagenet and Tudor periods the manufacture of woollen cloth was carried on in Bradford, the trade being greatly assisted by the settlement of a number of Flemish weavers in the district. About the end of the 17th century, however, the worsted trade, which till then had been chiefly confiued to Norwich, was introduced into Bradford, and in course of time became the staple trade of the town. In 1773 a piece hall was erected, and for many years served as a market-place for the manufacturers and merchants of the district. On the introduction of steam- power and machiucry the worsted trade advanced with

great rapidity. The first mill in Bradford was built in 1798; there were 20 mills in the town in 1820, 34 in 1833, and 70 in 1841; and at the present time there are between 200 and 300, of much greater magnitude than the earlier factories. In the seventy years between 1801 and 1871 the population of the town increased tenfold, during which period the worsted trade has been developed to an astonishing extent. In 1833 Mr (now Sir Titus) Salt developed the alpaca manufacture in the town ; mohair was shortly afterwards introduced; and more recently Mr 8. C. Lister has introduced the silk and velvet manufacture, having invented a process of manipulating silk waste, whereby what was previously treated as refuse is made into goods that will compete with those manufactured from the perfect cocoon. In the Bradford staple trade alone it is estimated that there is uow an annual turn-over of between £60,000,000 and £70,000,000.

Bradford has been greatly improved in appearance during the last few years, many important public buildings having been crected, and new and spacious thoroughfares opened out where narrow and ungainly streets formerly existed. Amongst the more prominent public buildings may be

mentioned—-St George’s Hall, used for public meetings, concerts, &c., and capable of accommodating nearly 4000 persons, built in 1853 ; the Exchange, built in 1867, at a cost of £40,000 ; the market buildings, opened in 1872 ; and the Town-Hall, opened in 18738, and built at a cost of £100,000. The town is built entirely of the freestone which is so plentiful in the district. Many of the ware- houses are large and of cousiderable architectural beauty, and the factories are mostly of great extent, some single establishments giving employmeut to between 3000 and 4000 workpeople.

The parish church, built in 1485, on the site of an old Norman church, is dedicated to St Peter. The living is valued at £1300 per annum, There was no other church in the town until 1815, when Christ Church was built. In 1838 St James’s Church was erected, and between that date and 1853 five others were built.. More recently teu additional churches have been built by the Bradford Church Building Society, the last of the ten (St Bartholomew’s) being opened in 1872. There are now over twenty churches in the town. The dissenters have upwards of forty places of worship in bradford, many of which are large and handsome edifices. ‘The Roman Catholics likewise possess several churches.

The educational facilities of the town are considerable. The Airedale College, for the education of students intended for the Independent ministry, is situated here, and has a large annual revenue. Until a few years ago there was also a Baptist college here, but it has been removed to Rawdon, six miles distant. The Bradford Grammar School existed in the 16th century, and in 1663 received a charter of incorporation from Charles IT. Latterly, the Endowed Schools Commissioners have reconstituted the school; a new building, giving accommodation to between 300 and 400 scholars, was erected in 1873, and Mr Forster M.P., Mr Henry Brown, and others, have pres nted a number of scholarships to the school. Since 1832 there has been a Mechanics’ Institute in the town, and in 1871 a new one was erected at a cost of £32,500. There are several other educational institutions, including a Church Literary Insti- tute and a Femalc Educational Institute, and a Free Library was established in 1872. Under the direction of the school board eight or ten handsome and commodious schools have been erected.

Bradford possesses a general infirmary, a fever hospital, an eye and ear hospital, an institution for the blind, and several other charitable institutions. It has two theatres and several music halls. There are two public parks,—-Teel

Park and Lister Park,—each comprising over 50 acres, and also two smaller parks. The first temperance hall in Eng- land was erected at Bradford in 1837. There are two court- houses for the holding of the county and West Riding courts; the borough court is held in the town-hall. Nume- rous political and social clubs flourish in the town. Three daily and four weekly papers are published. Statues of the late Sir Robert Peel and Richard Oastler, “the factory king,” were put up in advantageous positions some years ago; and recently the statues of two local commercial celebrities, Sir Titus Salt and Mr S. C. Lister, have been erected. Bradford has communication with all parts of the country by the Midland, Great Northern, Lancashire and Yorkshire, and London and North-Western Railways. A branch canal in connection with the Leeds and Liverpool canal was opened in 1774, but in 1871 it was closed by injunction, in consequence of the polluted condition of its water. Since then, however, it has been purified and re-opened.

In addition to its extensive operations in connection with the worsted trade, Bradford is largely engaged in the machine, stone, coal, and iron trades. The well-known Bowling and Low Moor Ironworks are within a short dis- tance of the town. Formerly a septennial festival was held at Bradford in honour of Bishop Blaize, the patron saint of the wool-combers, but after 1825 it was discon- tinued. The market days are Monday and Thursday.

BRADFORD, Joun, was born at Manchester in the early part of the reign of Henry VIII. Being a good penman and accountant, he became secretary to Sir John Harrington, who was paymaster of the English forces in France. Brad- ford at this time was gay and thoughtless, and to support his extravagance he appropriated some of the money en- trusted to him; but being unable to bear the load of his guilt, he made restitution, and relinquished his employment. About 1547 he took chambers in the Inner Temple, and began to study law; but finding divinity more con- genial to his

taste, he removed, in the following year, to Catherine Hall, Cambridge, where he studied with such assiduity that in little more than a year he was admitted to the degree of master of arts, and was soon after made

fellow of Pembroke Hall. Bishop Ridley, who in 1550 was

translated to the see of London, sent for him to the metro- polis and appointed him hischaplain. In 1553 he was also made chaplain to Edward VI., and became one of the most popular preachers in the kingdom. Soon after the accession of Mary he was arrested on a charge of sedition and con- fined in the Tower, where he continued a year and a half. During this time he wrote several epistles which were dis- persed in various parts of the kingdom. He was afterwards removed to Southwark, and was at last brought to trial before the court in which Gardiner sat as chief, where he defended his principles to the last, in defiance of all attempts to effect his conversion, He was condemned to the flames, and suffered in Smithfield, July 1, 1555. His writings, which consist chiefly of sermons, meditations, tracts, letters, and prayers, have been published in 12mo by the Religious Tract Society.

BRADLEY, Dr Jamnus, one of the most eminent British astronomers, was born at Sherborne in Gloucestershire in March 1692. He entered Balliol College, Oxford, in 17 1, and graduated as B.A. in 1714 and as M.A. in 1717. At the house of his uncle, the Rev. James Pound, himself known as an acute observer, he had found instruments and means for carrying on a regular series of astronomical obser- vations. He became a member of the Royal Society in 1718, and though he took orders in the following year, and was presented to the vicarage of Bridstow, he did not give up his scientific pursuits. He also obtained a small Sinecure living in Wales, but in 1721 , on his appoint-

ment to the Savilian professorship of astronomy at Oxford, he resigned all his ecclesiastical preferments. In 1727 he coumunicated to the Royal Society his great paper on aberration, a remarkable combination of exact observation and profound induction. Some years afterwards Bradle began his lectures at the Oxford Museum, and in 1742 he was appointed to

succeed Harley as astronomer royal. In 1747 his minute observations led him to the second of his great discoveries, the nutation of the earth's axis, The remainder of Bradley's life was devoted to the Greenwich Observatory. In 1748 he succeeded in getting a small grant for instruments from the public funds, and in 1759 he was rewarded with a pension of £250. He continued his labours till 1761, when his health began to give way. He then retired into the country and died at Chalford, Gloucestershire, in July 1762. The immense mass of useful observatious left by him at Greenwich was singularly neglected by English astronomers; but since Bessel pre- : sented them in systematic form to the world (see BEssun, vol. ii. p. 616) their true value has been recognized, For an account of Bradley's scientific discoveries see ASTRONOMY and ABERRATION,

Copious information as to Bradley's life and works will be found in Prof. Rigaud's Memoir prefixed to Miscellaneous Works and Correspondence of tite Rev. James Bradley, 1882.

BRADSHAW, Henry, an English poet, born at Chester about the middle of the 15th century. Early displaying a taste for religion and literature, he was received while a boy into the Benedictine monastery of St Werberg in that city; and he was afterwards sent to Gloucester (now Wor- cester) College, Oxford. After studying there for a time with the novices of his order he returned to his convent, where, in the latter part of his life, he applied himself chiefly to the study of history. He died in 1513. His poetry in some respects is not inferior to that of any of his contemporaries. His works are, —(1), De antigquitate et magneficentia Urbis Cestrie ; (2), Chronicon ; (3), Hhe Life of the Glorious Virgin St Werberg, printed at London, 1521, 4to, in verse, and now extremely rare. The life of St Werberg forms only part of this work, which contains also a description of the kingdom of Mercia, a life of St Etheldred, a life of St Sexburg, the foundation and history of Chester, and the chronicles of some kings.

BRADSHAW, Joun, president of the High Court of Justice which tried Charles I., appears to have been born in 1602 at Marple Hill, near Stockport in Cheshire. He was of good family, and is believed to have been connected with Milton, the mother of the latter having married a Bradshaw. At all events, whether connected or not, the two knew and respected each other.

Milton gives a highly eulogistic account of Bradshaw's character in his Defensio Secunda, and Bradshaw left by will £10 to Milton. His education seems to have been carried on at Stockport free school, and afterwards at Bunbury and Middleton. He was called to the bar at Gray's Inn in April 1627, and in 1645 became a bencher. For some time he acted as judge in the Sheriff-Courts of London. As a lawyer he had con- siderable chamber practice, especially among those whom Clarendon calls the " factious." In 1644 he was employed by Parliament as one of the prosecutors of the Irish Lords Macguire and Macmahon. In October 1646 he was voted by the Commons as one of the commissioners of the Great Seal, and in March of the following year he was appointed chief-justice of Cheshire. On October 12, 1648, he was raised to the rank of serjeant. In January 1649, when it was found difficult to compose a court of justice for the trial of the king, Bradshaw was proposed as president, and at once elected. His demeanour on the trial is well known, but has been variously judged. He continued to retain the title of Lord President for some time after the trial,

and received large rewards from Parliament for his valuable services. On the formation of a council of state Bradshaw was elected a meniber, and for three years held office as president. After that time the presidents were elected in rotation, and held their appointment for a month. When, on the 20th April 1653, Cromwell, after dismissing the Parliament, came to dissolve the council, Bradshaw is said to have confronted him boldly, and denied his power to dissolve the Parliament. This story rests on the authority of Ludlow, who was not a witness, and who does not say that Bradshaw was president of the council on that occasion. Bradshaw, an ardent republican, ever afterwards showed himself an uncompromising adversary of Cromwell. He was returned for Cheshire in the Farliament of 1654, and spoke strongly against vesting the power in a single person. He refused to sign the "engagement" drawn up by Cromwell, and in consequence withdrew from Parliament. Some time afterwards he was concerned with Harrison and others in one of the numerous republican conspiracies, and it has even been suspected that he was at least cog- nizant of some of the fifth monarchy men's desperate plots. He failed to obtain a seat in the Parliament of 1656, and on Ist August of the same year

Cromwell ordered him to be dismissed from the chief-justiceship of Chester. It is not quite certain that this order was carried out. After the abdication of Richard Cromwell, Bradshaw again entered Parliament and became a member of the council of state. His health, however, was bad, and his last public effort was a vehement speech on the seizure of Speaker Lenthall, in which he denounced the military despotism ofthetime. He died on the 22d November 1659, and was buried in Westminster Abbey. His body was disinterred at the Restoration, and exposed on a gibhet along with those of Cromwell and Ireton. Bradshaw's character will be found very differently drawn by Clarendon (/7istory of the Rebellion, bk. xi.) and Milton (Defensio Secunda).

See Foss, Lives of Judges; Ormerod's Chester, ii. 408-9 > Beauties of England and Wales, ii. 264, sqq.; Noble, Lives of the English Regicidcs, vol. i.; Caulfield, High Court of Justicc; Godwin, History of the Commonwealth ; Ludlow's Memoirs ; Forster's States- men of the Commonwealth. On Bradshaw's connection with Milton see Masson, Life of Milton, i.

BRADWARDIN, Tuomas, Archbishop of Canterbury, surnamed the Profound Doctor, was born at Hartfield in Sussex towards the close of the 13th century. He was educated at Merton College, Oxford, where he took the degree of doctor of divinity, and acquired the reputation of a profound scholar, a skilful mathematician, and an able divine. He was afterwards raised to the high offices of chancellor of the university and professor of divinity. From being chancellor of the diocese of London, he became chaplain and confessor to Edward III., whom he attended during his wars in France. After his return from the war he was made prebendary of Lincoln and subsequently archbishop of Canterbury. He died of the plague at Lam-beth, in the ycar 1349, forty days after his consecration. Chaucer in his Nun's Priest's Tale ranks Bradwardin with St Augustine.

His great work is a treatise against the Pelagians, entitled De causa Dei, printed at London, 1613, folio, by Sir Henry Savile. He wrote also De Gcometria spcculativa, Paris, 1495, 1512, 1530;

De Arithmetica practica, Paris, 1502, 1512; De Proportionibus, Paris, 1495, Venice, 1505, folio; De Quadratura Circuli, Paris, 1495,

folio,

BRADY, Nicnonas, D.D., whose name is familiar as the translator, in conjunction with Tate, of a new metrical version of the Psalms, was born at Bandon in the county of Cork in October 1659. He received his early education at Westminster school, and then studied at Christ Church, Oxford ; but he graduated at Trinity College, Dublin. He was in due time made a prebend of Cork. He was a

zealous promoter of the Revolution and suffered in conse- quence. When the troubles broke out in Ireland in 1690, Brady, by his influence, thrice prevented the burning of the town of Bandon, after James I]. had given orders for its destruction ; and the same year he was employed by the people of Bandon to lay their grievances before the English parliament. He soon afterwards settled in London, where he obtained various preferments. At the time of his death in 1726 he held the livings of Clapham and Richmond. Besides his version of the Psalms, which was licensed in 1696, he translated Virgil's dined, and wrote several smaller poems and dramas. His prose works consist of sermons.

BRAGA, a city of Portugal, capital of a district in the province of Minho, is situated on an elevated plain near the River Cavado (Vebvs), in 41° 43' N. lat. and 8° 16' W. long. The city proper, which has extensive suburbs, is surrounded by walls and towers, and has broad and well- built streets. The cathedral, which dates from the 12th century, is an imposing structure, and contains a large uumber of interesting objects of art. Among the other churches Santa Cruz is pre-eminent. There are also several convents in the city, an archiepiscopal palace, a lyceum, a library, an orphan asylum, and a large hospital ; also the ruins of atheatre, a temple, and an aqueduct of Roman workmanship, and a great variety of minor antiquities of different ages, The principal manufactures are fire-arms, jewellery, and cutlery ; and weaving and wax-bleaching are also carried on. A large cattle market is held in June and September. About two and a half miles distant is the celebrated sanctuary of Jesus de Monte, to which pilgrim- ages are frequently made. Population, 18,467.

Braga is identified with the Bracara Augusta of the Romans, the capital of the Callaici Bracarii. About the 5th century it became the chief city of the Suevi ; it passed successively into the hands of the Goths and the Moors, and was captured from the latter by Alphonso of Castile. It has for a long time been the seat of the primate of Portugal, who also claimed to be head of the Spanish church, and before the conquest of Coimbra and Lisbon it was the residence of the Portuguese court.

BRAGANCA, a town of Portugal, the capital of the province of Tras-os-Montes on the Fervenza, 26 miles N.W. of Miranda. It consists of an upper and lower town; the former surrounded with walls, is the seat of the bishop of Braganca and Miranda, and has a citadel, a college, a hospital, and a poor-house, and some manufactures of silk and velvet. The reigning houses of Portugal and Brazil are descendants of the old dukes of Braganga. Population,

4503.

BRAHAM, Joun, a celebrated English vocalist, was born in London in 1774, of Jewish parentage, his family name being Abraham. He received his first lessons in singing from Leoni, a well-known Italian artist, and made his appearance on the stage of the Covent Garden Theatre so early as 1787, when he sang bravura airs composed for Madame Mara. On the breaking of his voice his public career was interrupted for a time, and he had to support himself by teaching the pianoforte. In a few years, however, he recovered his voice, which proved to be a tenor of exceptionally pure and rich quality. His second début was made in 1794 at the Bath concerts, to the conductor of which, Rauzzini, he was indebted for careful training, extending over a period of more than two years. In 1796 he reappeared in London at Drury Lane, the opera being Storace’s Mahmoud. With the view of perfecting himself in his art he set out for Italy in the autumn of the following year. On the way he gave some concerts at Paris, which proved so successful that he was induced to remain, contrary to his original intention, for eight months in that city. His career in Italy was one of continuous triumph; he appeared in all the principal opera-houses,

and was universally recognized as being without a rival even in that land of song. In 1801 he returned to his native country, and appeared once more at Covent Garden in the opera Chains of the Heart by Mazzinghi and Reeve. So great was his popularity that an engagement he had made when abroad to return after a year to Vienna was renounced, and he remained henceforward in England. For nearly forty years from this date his powers continued unimpaired, and he sang occasionally in public till within a year or two of his death, which occurred on the 17th February 1856. There is, perhaps, no other case upon record in which a vocalist of the first rank enjoyed the use of his organ so long; between his first and last public appearances considerably more than sixty years intervened, during forty of which he held the undisputed supremacy alike in opera, oratorio, and the concert-room. Braham was the composer of a number of vocal pieces, which being sung by himself had great temporary popularity, though they had little intrinsic merit, and are now deservedly for- gotten. The Death of Nelson, which still keeps its place as a standard popular English song.

BRAHE, Tycuo, an illustrious astronomer, descended from a noble family, of Swedish origin, which had settled in Denmark, was born on the 14th December 1546, at Knudstorp, in the county of Schonen. He learned Latin at the age of seven, and studied five years under private tutors. On the death of his father his uncle sent him, in April 1559, to study philosophy and rhetoric at Copen- hagen. The great eclipse of the sun, on the 2lst of August 1560, happening at the precise time foretold by astronomers, he began to look upon astronomy as some- thing divine; and having purchased the Eiphemerides of Stadius, he gained some knowledge of the theory of the planets. In 1562 he was sent by his uncle to Leipsic to study law ; but astronomy wholly engrossed his thoughts, and he employed all his pocket-money in purchasing books on that science. Having procured a small celestial globe, he used to wait till his tutor went to bed, in order to examine the constellations and learn their names ; and when the sky was clear, he spent whole nights in viewing the stars, He returned to Denmark in 1565, but soon left for Witten- berg, whence he was driven by the plague to Rostock. There in the following year his choleric disposition in- volved him in a duel with a Danish nobleman, in which he had the misfortune to lose part of his nose; but this defect he so skilfully supplied by means of gold, silver, and wax, that it was scarcely perceptible. In 1569 he took up his

residence at Augsburg and remained there two years, busily engaged in astronomical and chemical researches. in 1571 he returned to Denmark, and was favoured by his inaternal uncle Steno Belle with a convenient place at his castle of Herritzvad near Knudstorp for making his obser- vations, and building a laboratory. But his marrying a peasant girl occasioned a violent quarrel between him and his relatives, and the king was obliged to interpose in order to reconcile them. In 1574, by royal command, he read some lectures at Copenhagen; and the year following he began his travels through Germany, and proceeded as far as Venice. He then resolved to remove his fainily, and settle at Basel ; but Frederick IL, unwilling that Denmark should lose the honour of his residence, bestowed upon him for life the Island of Huen in the Sound, for the erection of an observatory and laboratory, and conferred on him a fee in Norway, a pension of two thousand crowns out of the treasury, and the canonry of Roschild, which brought him a thonsand more. The first stone of the observa- tory was laid on the 8th of August 1576. James VI. of Scotland, afterwards James I. of England, on his visit to Denmark to marry the Princess Anne, went to see Tycho

A partial exception must be made in favour of

Brahe in his retirement at Uranienburg, made him Several presents, and wrote some verses in his praise. Soon after the death of King Frederick, the astronomer was deprived of his pension, fee, and canonry. Finding him. self unable to defray the expenses of his observatory he went to Copenhagen, whither he carried some of his instru- ments, and continued his astronomical observations in that city, till, by the order of Christian IV., he was obliged to discontinue them. He then removed his family to Rostock, aud afterwards to Holstein in order to solicit Henry Ranzay to introduce him to the emperor; and accordingly he wag received by Rudolph II. at Prague with the most gratifying marks of respect. That prince gave him a magnificent house till he could procure for him oue better fitted for astronomical observations, assigned him a pension of three thousand crowns, and promised, upon the first opportunity, a fee for him and his descendants. But he did not long enjoy his good fortune; for, on the 24th of

October 1601, he died of a strangury, in the 55th year of his age. He was interred in a magnificent manner in the principal church at Prague, where a noble monument was erected to his inemory. Shortly before his death he had been joined by Kepler, who owes his fame to the lessons of careful observation and cautious inference impressed on him by Tycho.

The materials for Brahe's life are to be found in Gassendi, Vita TY. Brahci, 1654, For later surveys of his life and labours, see Delambre, Astronomie moderne ; Lalande, Bibliographie astronom.; Bertrand, Les Fondateurs de P Astronomie moderne ; Brewster, Martyrs of Science. For Brahe's contributions to astronomy, see Grant, History of Physieal Astronomy, and the article Asrro- NOMY.

BRAHMA SAMAJ, the new theistic church in India, owes its origin to Réjaé Ram Mohan Rai, one of the leading men whom India has produced in later times, Rém Mohan Rai was born in the district of Bardwan in 1779. He mastered at an early age the Sanskrit, Arabic, and Persian languages. Impressed with the fallacy of the religious ceremonies practised by his countrymen, he imnpartially investigated the Hindu Shastras, the Koran, and the Bible, repudiated the polytheistic worship of the Shastras as false, and inculcated the reformed principles of mono- theism as found in the ancient Upanishads of the Vedas. In 1816 he established a society, consisting only of Hindus, in which texts from the Vedas were recited and theistic hymns chanted. This, however, soon dicd away on account of the opposition it met from the Hindu community. In 1830 the Raja organized a Hindu society for prayer-meet- ings, which may be considered as the foundation of the present Brahma Samaj. The following extract from the trust-deed of the building dedicated to it will show the religious belief and the purposes of its founder. The building was intended to be "a place of public meeting for all sorts and descriptions of people, without distinction, who shall behave and conduct thenselves in an orderly, sober, religious, and devout manner, for the worship and adora- tion of the eternal, unsearchable, and immutable Being, who is the author and preserver of the universe, but not under and by any other name, designation, or title, peculiarly used for and applied to any particular being or beings by ally man or set of men whatsoever; and that no gravell image, statue, or sculpture, carving, painting, picture, portrait, or the likeness of anything shall be admitted

within the said messuage, building, land, tenements, here- ditament, and premises ; and that no sacrifice, offering, or oblation of any kind or thing shall ever be permitted therein ; and that no animal or living creature shall within or on the said messuage, &c., be deprived of life either for religious purposes or food, and that no eating or drinking (except such as shall be necessary by any accident for the preservation of life), feasting, or rioting be permitted

therein or thereon ; and that in conducting the said worship or adoration, no object, animate or inanimate, that has been, or is, oF shall hereafter become or be recognized as an object of worship by any man or set of men, shall be reviled or slightingly or contemptuously spoken of or alluded to, either in preaching or in the hymns or other mode of worship that may be delivered or used in the said messuage or building; and that no sermon, preaching, discourse, prayer, or hymns be delivered, made, or used in such worship, but such as have a tendency to the contemplation of the Author and Preserver of the universe, or to the pro- motion of charity, morality, piety, benevolence, virtue, and the strengthening of the bonds of union between men of all religious persuasions and creeds." The new faith at this period held to the Vedas as its basis. Ram Mohan Rai soon after left India for England, and took up his residence in Bristol, where he died in 1835. The Brahma Samaj maintained a bare existence till 1841, when Babu Debendra Nath Tagore, of the Tagore family of Calcutta, devoted himself to it. He gave a printing-press to the Samaj, and established a monthly journal called the Zattwabodhini Patrikd to which the Bengali language now owes much for its strength and elegance. About the year 185() some of the followers of the new religion discovered that the greater part of the Vedas is polytheistic, and a schism took place,—the advanced party holding that nature and intuition form the basis of faith. Between the years 1847 and 1858 branch societies were formed in different parts of India, especially in Bengal, and the new church made rapid progress, for which it was largely indebted to the spread of English education and the labours of the Christian mis- sionaries.

The Brahma creed was definitively formulated as follows. (1.) The book of nature and intuition supplies the basis of religious faith. (2.) Although the Brahmas do not consider any book written by man the basis of their religion, yet they do accept with respect and pleasure any religious truth contained in any book. (3.) The Brahmas believe that the religious condition of man is progressive, like the other departments of his condition in this world. (4.) They believe that the fundamental doctrines of their religion are also the basis of every true religion. (5.) They believe in the existence of one Supreme God—a God endowed with a distinct personality, moral attributes worthy of His nature, and an intelligence befitting the Governor of the universe, and they worship Him alone. They do not believe in any of his incarnations. (6.) They believe in the immortality and progressive state of the soul, and declare that there is a state of conscious existence succeeding life in this world and supplementary to it as respects the action of the universal moral government. (7.) They believe that repentance is the only way to salvation. They do not recognize any other mode of reconcilement to the offended but loving father. (8.) They pray for spiritual welfare, and believe in the efficacy of such prayers. (9.) They believe in the providential care of the divine Father. (10.) They avow that love towards Him, and the per- formances of the works which He loves, constitute His worship. (1i.) They recognize the necessity of public worship, buc do not believe that communion with the Father depends upon meeting in any fixed place at any fixed time. They maintain that they can adore Him at any time and at any place, provided that the time and the place are calculated to compose and direct the mind towards Him. (12.) They do not believe in pilgrimages, and declare that holiness can only be attained by elevating and purifying the mind. (13.) They put no faith in rites or ceremonies, nor do they believe in penances, as instrumental in obtaining the grace of God. They declare that moral righteousness, the gaining of wisdom, divine contemplation,

charity, and the cultivation of devotional feelings are their rites and ceremonies. They further say, Govern and regulate your feelings, discharge your duties to God and to man, and you will gain everlasting blessedness ; purify your heart, cultivate devotional feelings, and you will see Him who

is unseen. (14.) Theoretically there is no distinction of caste among the Brahmas. They declare that we are all the children of God, and therefore must consider ourselves as brothers and sisters.

For long the Brahmas did not attempt any social reforms. But about 1860 the younger Brahmas, headed by Babu Kesab Chandra Sen, tried to carry their religious theories into practice by excluding all idolatrous rites from their social and domestic ceremonies, and by rejecting the distinction of caste altogether. This, however, the older members opposed, declaring such innovations to be premature. The theoretical schism now widened into a visible separation, and henceforth the two parties of the Brahmas were known as the Conservatives and the Progressives. The progressive Brahmas, or, as they call their church, the " Brahma Samdj of India," have made considerable progress. 'They have built a chapel in Calcutta, which is crowded every Sunday evening ; and they encourage the establishment of branch Samajes in different parts of the country. The number of avowed Brahmas probably does not exceed 3000, but the greater part of the educated natives of Bengal sympathize more or less with the movement. (Ww. Ww. H.)

BRAHMANISM is a term commonly used to denote a system of religious institutions origmated and elaborated by the Brahmans, the sacerdotal and, from an early period, the dominant caste of the Hindi community. In like manner, as the language of the Aryan Hindts has under- gone continual processes of modification and dialectic divi- sion, so their religious belief has passed through various stages of development broadly distinguished from one another by certain prominent features. 'The earliest phases of religious thought in India of which a clear idea can now be formed are exhibited in a body of writings, looked upon by later generations in the light of sacred writ, under the col- lective name of Veda (''knowledge") or Sruti ("revelation"). The Hindi scriptures consist of four separate collections, or Sanhitas, of sacred texts, or AZantras, including hymns, incantations, and sacrificial forms of prayer, viz., the Rech (nom. sing. rik) or Rigveda, the Sadman or Samaveda, the Yajush or Yajurveda, and the Atharvan or Atharvaveda. Each of these four text-books has attached to it a body of prose writings, called Brahkmanas, which presuppose the Sanhitas, purporting as they do to explain chiefly the ceremonial application of the

texts and the origin and import of the sacrificial rites for which these were supposed to have been composed. Besides the Brakmanas proper, these theological works, and in a few isolated cases some of the Sanhitas, include two kinds of appendages, the Aranyakas and Upanishads, both of which, and especially the latter, by their language and contents, generally betray a more modern origin than the works to which they are annexed. The subject of the former class of these treatises is on the whole similar to that of the Brakmanas, which they supplement, giving at the same time somewhat more prominence to the mystical sense of the rites of worship. The Upanishads, on the other hand, are taken up to a great extent with speculations on the problems of the universe and the religious aims of nian, —subjects often touched upon in the earlier writings, but here dealt with in a more mature and systematic way. Two of the Sanhitas, the Sadman and the Yajush, owing their existence to purely ritual purposes, and being, besides, the one almost entirely, the other partly, composed of verses taken from the Rigveda are only of secondary importance for our pre- sent inquiry.. The hymns of the Rigveda constitute the

earliest lyrical effusions of the Aryan settlers in India which have been handed down to posterity. They are cer- tainly not all equally old; on the contrary they evidently represent the literary activity of many generations of bards, though their relative age cannot as yet be deter- mined with anything like certainty. The tenth and last book of the collection, however, at any rate has all the characteristics of a later appendage, and in language and spirit many of its hymns approach very nearly to the level of the contents of the Atharvan. Of the latter collection about one-sixth is found also in the Rigveda, and especially in the tenth book ; the larger portion peculiar to it, though including no doubt some older pieces, appears to owe its origin to an age not long anterior to the composition of the Brahmanas.

The state of religious thought among the ancient bards, as reflected in the hymns of the Rigveda, is that of a worship of the grand and striking phenomena of nature regarded in the light of personal conscious beings, endowed with a power beyond the control of man, though not insen- sible

to his praises and actions. It is a nature-worship purer than that met with in any other polytheistic form of belief we are acquainted with,—a mythology still comparatively little affected by those systematizing ten- dencies which, in a less simple and primitive state of thought, lead to the construction of a well-ordered pantheon and a regular organization of divine government. ‘To the wind of the early Vedic worshipper the various departments of the surrounding nature are not as yet clearly defined, and the functions which he assigns to their divine repre- sentatives continually flow into one another, Nor has he yet learned to care to determine the relative worth and position of the objects of his adoration ; but the temporary influence of the phenomenon to which he addresses his praises bears too strongly upon his mind to allow him for the time to consider the claims of rival powers to which at other times he is wont to look up with equal feelings of awe and reverence. It is this immediateness of impulse under which the human mind in its infancy strives to give utterance to its emotions that imparts to many of its out- pourings the ring of monotheistic fervour.

The generic name given to these impersonations, viz., deva (“the shining ones”), points to the conclusion, sufficiently justified by the nature of the more prominent objects of Vedic adoration as well as by common natural occurrences, that it was the beautiful phenomena of light which first and most powerfully swayed the Aryan mind. In the primitive worship of the manifold phenomena of nature it is not, of course, so much their physical aspect that impresses the human heart as the moral and intel. lectual forces which are supposed to move and animate them. The attributes and relations of some of the Vedic deities, in accordance with the nature of the objects they represent, partake in a high degree of this spiritual element ; but it is not improbable that in an earlier phase of Aryan worship the religious conceptions were pervaded by it to a still greater and more general extent, and that the Vedic belief, though retaining many of the primitive features, has on the whole assumed a more sensuous and anthropo- morphic character. This latter element is especially pre- dominant in the attributes and imagery applied by the Vedic poets to Indra, the god of the atmospheric region, the favourite figure in their pantheon, While the repre- sentatives of the prominent departments of nature appear to the Vedic bard as consisting in a state of independence of one another, their relation to the mortal worshipper being the chief subject of his anxiety, a simple method of

classification was already resorted to at an early time, con- sisting in a triple division of the deities into gods residing in the sky, in the air, and on earth, It is not, however,

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until a later stage,—the first clear indication being con- veyed in a passage of the tenth book of the Ttigveda, that this attempt at a polytheistic.system is followed up by the promotion of one particular god to the dignity of chief guardian for each of these three regions. On the other hand, a tendency is clearly traceable in some of the hymns towards identifying gods whose functions present a certain degree of similarity of nature ; these attempts would seem to show a certain advance of religious reflec. tion, the first steps from polytheism towards a compre- hension of the unity of divine essence. Another feature of the old Vedic worship tended to a similar result. The great problems of the origin and existence of man and universe had early begun to engage the Hind&i mind ; and in celebrating the praises of the gods the poet was fre- quently led by his religious, and not wholly disinterested, zeal to attribute to them cosmical functions of the very highest order. At a later stage of thought, chiefly exhibited in the tenth book of the Rigveda and the Atharvaveda, inquiring sages could not but perceive the inconsistency of such concessions of a supremacy among the divine rulers, and tried to solve the problem by conceptions of an inde. pendent power, endowed with all the attributes of a supreme deity, the creator of the universe, including the gods of the pantheon. The names under which this monotheistic idea is put forth are mostly of an attributive character, and indeed some of them, such as Prajapati (“lord of creatures”), Visvakarman («all-doer ”), occur in the earlier hymns as mere epithets of particular gods, But to other minds this theory of a personal creator left many difficulties unsolved. They saw, as the poets of old had seen, that everything around them, that man himself, was directed by some inward agent; and it needed but one step to perceive the essential sameness of these spiritual units, and to recognize their being but so many indivi- dual manifestations of one universal principle. Thus a pantheistic conception was arrived at, put forth under various names, such as Purusha (“soul”), Kama (“desire”), Bréhman (neutr. ; nom. sing. brahma) (“devotion, prayer”), Metaphysical aud theosophic speculations were thus fast undermining the simple belief in the

old gods, until, at the time of the composition of the Brahmanas and Upanishads, we find them in complete possession of the minds of the theologians. Whilst the theories crudely suggested in the later hymns are now further matured and elaborated, the tendency towards catholicity of formula favours the com- bination of the conflicting monotheistic and pantheistic conceptious ; this compromise, which makes Prajapati, the personal creator of the world, the manifestation of the impersonal Brahma, the universal self-existent soul, leads to the composite pantheistic system which forms the char- acteristic dogma of the Brahmanical period.

The spirit of Vedic worship is pervaded by a strong belief in the efficacy of invocation and sacrificial offering. The earnest and well-expressed prayer cannot fail to draw the divine power to the worshipper and make it yield to his supplication ; and offerings, so far from being mere acts of devotion which give pleasure to the god, represent the very food and drink which render him vigorous and capable of battling with the enemies of his mortal friend, This intrinsic power of invocation found an early expression in the term brdhma (neuter) (“religious devotion, prayer, hymn”); and its independent existence as an active moral principle in shaping the destinies of man became recognized in the Vedic pantheon in the conception of a god, Brihaspati or Brak- manaspati (“lord of prayer”), the guardian of the pious worshipper. This feature in the Hindi belief could scarcely fail early to engender and foster in the minds of the people feelings of esteem and reverence towards those who possessed the inspired gift of poetical expression, as

well as those who had acquired an intimate knowledge of the various forms of ritual worship. The common term used in the Veda for the officiating priest is brahmdn (masc.; nom. sing. brahma), originally denoting, it would seem, “‘one who prays, a worshipper,” or “the composer or reciter of a hymn (brdhman, u.)” In some passages the word also signifies a special class of priests who officiated as superintendents during sacrificial ceremonies, the complicated nature of which required the co-operation of several priests. It is probable that in most cases the function of the poet or composer of hymns was combined with that of a minister of worship. In the

Vedic hymns two classes of society, the royal (or military) and the priestly classes, were evidently recognized as being raised above the level of the Vis', or bulk of the Aryan community. These social grades seem to have been in existence even before the separation of the two Asiatic branches of the Indo- European race, the Aryans of Iran and India. It is true that, although the Athrava, Rathaéstdo, and Vastrya of the Zend Avesta correspond in position and occupation to the Brahman, Rajan, and Vis' of the Veda, there is no similarity of names between them ; but this fact only shows that the common vocabulary had not yet definitely fixed on any specific names for these classes. Even in the Veda their nomenclature is by no means limited to a single designation for each of them. Moreover, Atharvan occurs uot infrequently in the hymns as the personification of the priestly profession, as the proto-priest who is supposed to have obtained fire from heaven and to have instituted the rite of sacrifice ; and although ratheshtha ("standing on a car") is not actually found in connection with the Rajan or Kshatriya, its synonym rath is in later literature a not unusual epithet of men of the military caste. At the time of the hymns, and even during the common Indo- Persian period, the sacrificial ceremonial had already become sufficiently complicated to call for the creation of a certain number of distinct priestly offices with special duties attached to them. While this shows clearly that the position and occupation of the priest were those of a profession, the fact that the terms brahkmana and brahmaputra, both denoting ''the son of a brahman," are used in certain hymns as synonyms of Brahman, seems to justify the assumption that the profession had already, toa certain: degree, become hereditary at the time when these hymns were composed. There is, however, with the exception of a solitary passage in a hymn of the last book, no trace to be found in the Rigveda of that rigid division into four castes separated from one another by unsurmount- able barriers, which in later times constitutes the distinctive feature of Hindi society The idea of caste is expressed by the Sanskrit term varna, originally denoting " colour," thereby implying differences of complexion between the several classes. The word occurs in the Veda in the latter sense,\but it is used there to mark the distinction, not between the three classes of the Aryan community, but between them on the one hand and a dark-coloured hostile people on the other. The latter, called Dasas or Dasyus, consisted, no doubt, of the indigenous tribes, with whom the Aryans had to carry on a continual struggle for the possession of theland.

The partial subjection of these comparatively uucivilized tribes, as the rule of the superior race was gradu- ally spreading eastward, and their submission to a state of serfdom under the name of Sddras, added to the Aryan community an element, totally separated from it by colour, by habits, by language, and by occupation. Moreover, the religious belief of these tribes being entirely different from that of the conquering people, the pious Aryas, and especially the class habitually engaged in acts of worship, could hardly fail to apprehend considerable danger to the purity of their own faith from too close and intimate a

contact between the two races. What more natural, there- fore, than that measures should have been early devised to limit the intercourse between them within as narrow bounds as possible. In course of time the difference of vocation, and the greater or less exposure to the scorching influence of the tropical sky, added, no doubt, to a certain admix- ture of Sudra blood, especially in the case of the common people, seem to have produced also in the Aryan population different shades of complexion, which greatly favoured a tendency to rigid class-restrictions originally awakened and continually fed by the lot of the servile race. Meanwhile the power of the sacerdotal order having been gradually enlarged in proportion to the development of the minutiz of sacrificial ceremonial and the increase of sacred lore, they began to lay claim to supreme authority in regulating and controlling the religious and social life of the people. The author of the so-called Purusha-sukta, or hymu to Purusha, above referred to, represents the four castes— the Brahmanas, Kshatriyas, Vaisyars, and Sudras—as having severally sprung fron the mouth, the arms, the thighs, and the feet of Purusha, a primary being, here assumed to be the source of the universe. It is very doubtful, however, whether at the time when this hymn was composed the relative position of the two upper castes could already have been settled in so decided a way as this theory might lead us to suppose. There is, on the contrary, reason to believe that some time had yet to elapse, marked by fierce and bloody struggles for supremacy, of which only imper- fect ideas can be formed from the legendary and biassed accounts of later generations, before the Kshatriyas finally submitted to the full measure of priestly pretension.

The definitive establishment of the Brahmanical hierarchy marks the beginning of the Brahmanical period properly so called. Though the origin and gradual rise of some of the leading institutions of this era can, as has been shown, be traced in the earlier writings, the chain of their development presents a break at this juncture which no satisfactory materials enable us to fillup. A considerable portion of the literature of this time has apparently been lost ; and several important works, the original composition of which has probably to be assigned to the early days of Brahmanisin, such as the institutes of Manu and the two great epics, the Mahabharata and Ramayana, in the form in which they have been handed down to us, show manifest traces of a more modern redaction. Yet it is sufficiently clear from internal evidence that Manu's Code of Laws, though it is merely a metrical rzfacimento of older materials, reproduces on the whole pretty faithfully the state of Hindi society depicted in the sources from which it was compiled. The final overthrow of the Kshatriya power was followed by a period of jealous legislation on the part of the Brahmans. For the time their chief aim was to improve their newly gained vantage-ground by surrounding everything connected with their order with a halo of sauctity calculated to impress the lay community with feelings of awe. In the Brahmanas and even in the Purusha Hymn, and the Atharvan, divine origin had already been ascribed to the Vedic Sanhitas, especially to the three older collections. The same privilege was now successfully claimed for the later Vedic literature, go imbued with Brahmanic aspirations and pretensions; and the authority implied in the designation of Sruté or revela- tion removed henceforth the whole body of sacred writings from the sphere of doubt and criticism. This concession necessarily involved an acknowledgement of the new social order as a divine institution. Its stability was, however, rendered still more secure by the elaboration of a system of conventional precepts, partly forming the basis of Manu's Code, which clearly defined the relative position and the duties of the several castes, and determined the penalties to be inflicted on any transgressions of the limits assigned

to each of them. These laws are conceived with no humane or sentimental scruples on the part of their authors. On the contrary, the offences committed by Brahmans against other castes are treated with remarkable

clemency, whilst the punishments inflicted for trespasses on the rights of higher classes are the more severe and inhuman the lower the offender stands in the social scale. The three first castes, however unequal to each other in privilege and social standing, are yet united by a common bond of sacramental rites (sanskaras), traditionally connected from ancient times with certain incidents and stages in the life of the Aryan Hindi, as conception, birth, name-giving, the first taking out of the child to see the sun, the first feeding with boiled rice, the rites of tonsure and hair cutting, the youth's investiture with the sacrificial thread, and his return home on completing his studies, marriage, funeral, &c. The modes of observing these family rites are laid down in a class of writings called Grihya-siitras, or domestic rules. The most important of these observances is the upanayana, or rite of conducting the boy to a spiritual teacher. Connected with this act is the investi- ture with the sacred cord, ordinarily worn over the left shoulder and under the right arm, and varying in material according to the class of the wearer. This ceremony beiug the preliminary act to the youth's initiation into the study of the Veda, the management of the consecrated fire and the knowledge of the rites of purification, including the savitra, a solemn invocation to savitri, the sun, which has to be repeated every morning and evening before the rise and after the setting of that luminary, is supposed to constitute the second or spiritual birth of the Arya. It is from their participation in this rite that the three upper classes are called the twice-born. The ceremony is enjoined to take place some time between the eighth and sixteenth year of age in the case of a Brahman, between the eleventh and twenty-second year of a Kshatriya, and between the twelfth and twenty-fourth year of a Vaigya. He who has not been invested with the mark of his class within this time is for ever excluded from uttering the sacred s@vitri and becomes an outcast, unless he is absolved from his sin by a council of Brahmans, and after due performance of a purifica- tory rite resumes the badge of his caste. With one not duly initiated no righteous man is allowed to associate or to enter into counections of affinity. The duty of the Stidra is to serve the twice-born classes, and above all the Brahmans. He is excluded from all sacred knowledge, and if he performs sacrificial ceremonies he must do so without using holy mantras, No Brahman must recite a Vedic text where a man of the servile caste might overhear hin, nor must he even teach him the laws of expiating sin. The occupations of the Vaigya are those connected with trade,

the cultivation of the land and the breeding of cattle ; while those of a Kshatriya consist in ruling and defending the people, administering justice, and the duties of military profession generally. Both share with the Brahman the privilege of reading the Veda, but only so far as it is taught and explained to them by their spiritual preceptor. To the Brahman belongs the right of teaching and expounding the sacred texts, and also that of interpreting and determining the law and the rules of caste. Only in exceptional cases, when no teacher of the sacerdotal class is within reach, the twice-born youth, rather than forego spiritual instruction altogether, may reside in the house of a non-Brahmanical preceptor ; but it is specially enjoined that a pupil, who seeks the path to heaven, should not fail, as soon as circum- stances permit, to resort to a Brahman well versed in the Vedas and their appendages.

Notwithstanding the barriers placed between the four castes, the practice of intermarrying appears to have been too prevalent in early times to have admitted of measures

of so stringent a nature as to wholly repress it. To marry a woman of a higher caste, and especially of a caste Lot immediately above one’s own, is, however, decidedly pro- hibited, the offspring resulting from such a union being excluded from the performance of the sraddha or obsequiey to the ancestors, and thereby rendered incapable of inheriting any portion of the parents’ property. On the other hand, men are at liberty, according to the rules of Manu, to marry a girl of any or each of the castes below their own, provided they have besides a wife belonging to their own class, for only such a one should perform the duties of personal attend- ance and religious observance devolving upon a married woman. As regards the children born from unequal mar- riages of this description, they have the rights and duties of the twice-born, if their mother belong to a twice-born caste, otherwise they, like the offspring of the former class of intermarriages, share the lot of the idras, and are excluded from the investiture and the savitri, For this last reason the marriage of a twice born man with a Sidra woman is altogether discountenanced by some of the later law books. At the time of the code of Manu the inter. mixture of the classes had already produced a considerable

number of intermediate or mixed castes, which were care- fully catalogued, and each of which hada specific occupation assigned to it as its hereditary profession. The self-exalta- tion of the first class was not, it would seem, altogether due to priestly arrogance and ambition ; but, like a pro- minent feature of the post-Vedic belief, the transmigration of souls, it was, if not the necessary, yet at least a natural consequence of the pantheistic doctrine. To the Brab- manical speculator who saw in the numberless individual existences of animate nature but so many manifestations of the one eternal soul, to union with which they were all bound to tend as their final goal of supreme bliss, the greater or less imperfection of the material forms in which they were embodied naturally presented a continuous scale of spiritual units from the lowest degradation up to the absolute purity and perfection of the Supreme spirit. To prevent one's sinking yet lower, and by degrees to raise one's self in this universal gradation, or, if possible, to attain the ultimate goal immediately from any state of corporeal existence, there was but one way,—subjection of the senses, purity of life, and knowledge of the deity. " He" (thus ends the code of Manu) "who in his own soul perceives the supreme soul in all beings and acquires equanimity toward them all, attains the highest state of bliss." Was it not natural then that the men who, if true to their sacred duties, were habitually engaged in what was most conducive to these spiritual attainments, that the Brahmanical class early learnt to look upon themselves, even as a matter of faith, as being foremost among the human species in this universal race for final beatitude? The life marked out for them by that stern theory of class duties which they themselves had worked out, and which, no doubt, must have been practised in early times at least in some degree, was by no means one of ease and amenity. It was, on the con- trary, singularly calculated to promote that complete morti- fication of the instincts of animal nature which they considered as indispensable to the final deliverance from the revolution of bodily and personal existence.

The pious Brahman, longing to attain the summum bonum on the dissolution of his frail body, was enjoined to pass through a succession of four orders or stages of life, viz, those of brahmacharin, or religious student; grihastha (or grthamedhin), or householder ; vananvasin (or vanaprastha), or anchorite ; and sannydsin (or bhekshu), or religious mendi- cant. Theoretically this course of life was open and even recommended to every

twice-born man, his distinctive class- occupations being in that case restricted to the second station, or that of married life, Practically, however, those

belonging to the Kshatriya and Vaisya castes were, 0 doubt, contented, with few exceptions, to go through a term of studentship in order to obtain a certain amount of religious instruction before entering into the married. state, and plying their professional duties. In the case of the sacerdotal class, the practice probably was all but universal in early times; but gradually a more and more limited proportion seem to have carried their religious zeal to the length of self-mortification involved in the two final stages. Qn the youth having been invested with the sign of his caste, he was to reside for some time in the house of some religious teacher, well read in the Veda, to be instructed in the knowledge of the scriptures and the scientific treatises attached to them, in the social duties of his caste, and in the complicated system of purificatory and sacrificial rites. According to the number of Vedas he intended to study, the duration of this period of instruction was to be, pro- bably in the case of Brahmanical students chiefly, of from twelve to forty-eight years ; during which time the virtues of modesty, duty, temperance, and self-control were to be firmly implanted in the youth's mind by his unremitting observance of the most minute.rules of conduct. During all this time the Brahman student had to subsist entirely on food obtained by begging from house to house ; and his behaviour towards the preceptor and his family was to be that prompted by respectful attachment and implicit obedience. In the case of girls no investiture takes place, but for them the nuptial ceremony is considered as an equivalent for that rite. On quitting the teacher's abode, the young man returns to his family and takes a wife. To die without leaving legitimate offspring, and espe- cially a son, to perform the periodical rite of obsequies, consisting of offerings of water and cakes, to himself and his ancestors, is considered a great misfortune by the orthodox Hindi. There are three sacred " debts" which a man has to discharge in life, viz., that which is due to the gods, and of which he acquits himself by daily worship and sacrificial rites; that due to the rishis, or ancient sages and inspired seers of the Vedic texts, discharged by the daily study of the scripture ; and the " final debt" which he owes to

his manes, and of which he relieves himself by leaving a son. To these three some authorities add a fourth, viz., the debt owing to humankind, which demands his continually practising kindness and hospitality. Hence the necessity of the mau's entering into the married state. When the bridegroom leads the bride from her father's house to his own home, the fire which has been used for the marriage ceremony accompanies the couple to serve them as their garhtupatya, or domestic fire. It has to be kept up perpetually, day and night, either by them- selves or their children, or, if the man be a teacher, by his pupils. If it should at any time become extinguished by neglect or otherwise, the guilt incurred thereby must be atoned for by an act of expiation. The domestic fire serves the family for preparing their food, for making the five necessary daily and other occasional offerings, and for performing the sacramental rites above alluded to. No food should ever be eaten that has not been duly consecrated by & portion of it being offered to the gods, the beings, and the manes, These three daily offerings are also called by the collective name of vaisvadeva, or sacrifice to all the deities. The remaining two are the offering to Brahma, 7.e., the daily lecture of the scriptures, accompanied by certain rites, and that to men, consisting in the entertainment of guests. The domestic observances, many of which must be considered as ancient Aryan family customs, surrounded by the Hindiis with a certain amount of adventitious cere- monial, were generally performed by the householder himself, with the assistance of his wife. There is, however, another class of sacrificial ceremonies of a more pretentious

' alluded to both in the Zend Avesta and the Rigveda.

and expensive kind, called srauta rites, or rites based on sruti, or revelation, the performance of which, though not indispensable, were yet considered obligatory under certain circumstances. They formed a very powerful weapon in the hands of the priesthood, and were one of the chief sources of their subsistence. Owing to the complicated nature of these sacrifices, and the great amount of ritualistic formulas and texts muttered or recited during their perform- ance, they required the employment of a number of profes- sional Brahmans, frequently as many as sixteen, who had to be well

rewarded for their services. However great the religious merit accruing from these sacrificial rites, they were obviously a kind of luxury which only rich people could afford to indulge in. They constituted, as it were, a tax, voluntary perhaps, yet none the less compulsory, levied by the priesthood on the wealthy laity. It is true that the priest who refuses to accept any reward for officiating at a sacrifice is highly eulogized by the Brahmanical writers ; but such cases of disinterested zeal seem to have occurred but rarely. The manuals of Vaidik ritual generally enumerate three classes of grawta rites, viz., ishtzs, or oblations of milk, curds, clarified butter (ghee), rice, grain, &c., animal offer- ings, and libations of soma, The soma, an intoxicating drink prepared from the juice of the Asclepias acida (a kind of milk-weed, sometim:s called the moon-plant), must have played an important part in the ancient worship, at least as early aS the Indo-Persian period. It is continually In the latter work the hymns of a whole book, besides others, are addressed to it, either in the shape of a mighty god, or in its original form, as a kind of ambrosia endowed with wonderfully exhilarating powers. In post-Vedic mythology Soma has become identified with the lunar deity, to whom it seems to have had some relation from the beginning, Among the Vaidik rites the soma-sacrifices are the most solemn and complicated, and those to which the greatest efficacy is ascribed in remitting sin, conferring offspring and even immortality. They require the attendance of sixteen priests, and are divided into three groups, according :as the actual pressing and offering of the soma occupies only one day, or between one and twelve, or more than twelve days. The performance of all srauta sacrifices requires two other fires besides that used for domestic rites. The act of first placing the fires in their respective receptacles, after due consecration of the ground, constitutes the essential part of the first zshti, the agryadhana, which the house- holder should have performed byfour Brahmans immediately after his wedding. To the same class of sacrificial ceremonies belong those performed on the days of the new and full moon, the oblation at the commencement of the three seasons, the offering of first-fruits and other periodical rites. Besides these regular sacrifices, the srauta ceremonial includes a number of most solemn rites which, on account of the objects for which they are instituted and the enormous expenditure they involve, could only be per- formed on rare occasions and by powerful princes. Of these the most important are the rdjastya, or inauguration ceremony of a monarch laying claim to supreme rule, and the asvamedha,

or horse sacrifice, a rite of great antiquity, enjoined by the Brahmanical ritual to kings desirous of attaining universal sovereignty. The efficacy ascribed to this ceremony in later times was so great that the per- formance of a hundred such sacrifices was considered to deprive Indra of his position as chief of the immortals. When the householder is advanced in years, ‘‘ when he perceives his skin become wrinkled and his hair grey, when he sees the son of his son,” the time is said to have come for him to enter the third stage of life. He should now disengage himself from all family ties,— except that his wife may accompany him, if she chooses,-and repair

to a lonely wood, taking with him his sacred fires and the implemeuts required for the daily and periodical offerings. Clad in a deer’s skin, in a single piece of cloth, or in a bark garment, with his hair and nails uncut, the hermit is to subsist exclusively on food growing wild in the forest, such as roots, fruit, green herbs, and wild rice and grain. He must not accept gifts from any one, except of what may be absolutely necessary to maintain him; but with his own little hoard he should, on the contrary, honour, to the best of his ability, those who visit his hermitage. His time must be spent in reading the metaphysical treatises of the Veda, in making oblations, and in undergoing various kinds of privation and austerities, with a view to mortify- ing his passions and producing in his mind an entire indifference to worldly objects. Having by these means succeeded in overcoming all sensual affections and desires, and in acquiring perfect equanimity towards everything around him, the hermit has fitted himself for the final and most exalted order, that of devotee or religious mendicant. As such he has no further need of either mortifications or religious observances; but “with the sacrificial fires reposited in his mind,” he nay devote the remainder of his days to meditating on the divinity. Taking up his abode at the foot of a tree in total solitude, “with no companion but his own soul,” clad in a coarse garment, he should carefully avoid injuring any creature or giving offence to any human being that may happen to come near him. Once a day, in the evening, “when the charcoal fire is extinguished and the smoke no longer issues from the fire- places, when the pestle is at rest, when the people have taken their meals and the dishes are reinoved,” he should go near the habitations of men, in order to beg what little food may suftice to sustain his

feeble frame, Ever pure of mind he should thus bide his time, “as a servant expects his wages,” wishing neither for death nor for life, until at last his soul is freed from its fetters and absorbed in the eternal spirit, the impersonal self-existent Brahmi,

The neuter term trdéhmd is met with in the Rigveda both in the abstract sense of “ devotion, worship,” and in the concrete one of “ prayer, hymn.” Closely connected with it is found the masculine term brahmd, “a worshipper, a priest.” The popular belief in the efficacy of invocation constituted a prominent feature of the Vedic symbolism, which the traditional and professional activity of the poet and minister of worship did, no doubt, much to keep up and foster. In the theosophical speculations of the later Vedic poets this mystic power of devotion found its fullest expression in the recognition of the lréhmd as the highest cosmical principle, and its identification with the pantheistic conception of an all pervading self-existent essence, the primary source of the universe. Whether this identification was originally due to some extent to the influence of class- interest possibly aided by the coincidence of name, or whether it was solely the product of a highly-wrought re- ligious imagination, it is difficult to decide. Certain it is, however, that the term drdhmd began to be used about the saine time as the abstract designation of priestly function and the Brahmanical order in general, in the same way as the word kshatra came to denote the aggregate of functions and individuals of the military class

The tendency towards a comprehension of the unity of divine essence had resulted in some minds, as has been remarked before, in a kind of monotheistic notion of the origin of the universe. In the literature of the Brahmana period we meet with this conception as a common element of speculation ; and so far from its being considered incom- patible with the existence of a universal spirit, Prajdpata, the personal creator of the world, is generally allowed a prominent place in the pantheistic theories. Yet the state of theological speculation, reflected in these writings, is one

of transition. ‘The general drift of thought is essentially pantheistic, but it is far from being reduced toa regular system, and the ancient form of belief

still enters largely into it. The attributes of Prajapati, in the same wa ; have in them elements of a purely polytheistic nature, and some of the attempts at reconciling this new-fangled deity with the traditional belief are somewhat awkward. An aucient classification of the gods represented them as being thirty-three in number, eleven in each of the three worlds or regions of nature. These regions being associated each with the name of one principal deity, this division gave rise at a later time to the notion of a kind of triple diving government, consisting of Agni (fire), Indra (sky) or Vayu (wind), and Surya (sun), as presiding respectively over the gods on earth, in the atmosphere, and in the sky. Of this Vedic triad mention is frequently made in the Braéhmana writings. On the other hand the term prajapati (lord of creatures), which in the Rigveda occurs as an epithet of the sun, is also once in the Atharvaveda applied jointly to Indra and Agni. In the Brahmanas Prajapati is several times mentioned as the thirty-fourth god; whilst in one passage he is called the fourth god, and made to rule over the three worlds. More frequently, however, the writings of this period represent him as the maker of the world and the father or creator of the gods. It is clear from this discordance of opinion on so important a point of doctrine, that at this time no authoritative system of belief had been agreed upon by the theologians. Yet there are unmistakable signs of a strong tendency towards constructing one, and it is possible that in yielding to it the Brahmans may have been partly prompted by political considerations, The definite settlement of the caste system and the Brahmanical supremacy must probably be assigned to somewhere about the close of the Brahinana period. Division in their own ranks was hardly favourable to the aspirations of the priests at such a time; and the want of a distinct formula of belief adapted to the general drift of theological speculation, to which they could all rally, was probably felt the more acutely, the more determined a resistance the military class was likely to oppose to their claims. Side by side with the conception of the Brahmi, the universal spiritual principle, with which speculative thought had already become deeply imbued, the notion of a supreme personal being, the author of the material creation, had come to be considered by many as a necessary complement of the pantheistic doctrine. But, owing perhaps to his polythe- istic associations and the attributive nature of his name, the person of Prajapati seems to have been thought but insufficiently adapted to represent this abstract idea. The expedient resorted to for solving the difficulty was as ingenious as it was

characteristic of the Brahmanical aspira- tions. In the same way as the abstract denomination of sacerdotalism, the neuter brdhmd, had come to express the divine essence, so the old designation of the individual priest, the masculine term brahmd, was raised to denote the supreme personal deity which was to take the place and attributes of the Prajapati of the Brahmanas and Upanishads. By this means the very name of the god expressed the essential oneness of his nature with that of the divine spirit as whose manifestation he was to be considered. Even in the later Vedic writings Brahma is but rarely mentioned; and in some of these passages he is expressly identified with Prajapati. It is in the institutes of Manu, where, as we have seen, the system of castes is propounded in its complete development, that his definite place is assigned to him in the cosmogony. According to this work, the universe, before undiscerned, was made discernible in the beginning by the sole, self- existent spirit (6rahma). He, then, having willed to pro duce from his own substance various creatures, crcated the

waters by meditation, and having placed in them a pro- ductive seed which developed into a golden egg, he was porn in that egg as the male Brahma, the forefather (and creator) of all beings. The theory of Brahma being born from a golden egg is a mere adaptation of the Vedic con- ception of Hiranyagarbha (“ gold-embryo ”), who is repre- sented as the supreme god in a hymn of the tenth book of the Rigveda.

However the new dogma may have answered the pur-

poses of speculative minds, it was not one in which the.

people generally were likely to have been much con- cerned ; an abstract, colourless deity like Brahma could awake no sympathies in the hearts of those accustomed to worship gods of flesh and blood. Indeed, ever since the primitive symbolical worship of nature had un- dergone a process of disintegration under the influence of metaphysical speculation, the real belief of the great body of the people had probably become more and more distinct from that of the priesthood. In different localities the principal share of their affection may have been bestowed on one or another of the old gods

who was thereby raised to the dignity of chief deity; or new forms and objects of belief may have sprung np with the intellectual growth of the people. In some cases even the worship of the indigenous population may not have remained without exercising some influence in modifying the belief of the Aryan race. In this way a number of local deities would grow up, more or less distinct in name and characteristics from the gods of the Vedic pantheon. There is, indeed, sufficient evidence to show that, at a time when, after centuries of theological speculations, some little insight into the life and thought of the people is afforded by the literature handed down to us, such a diversity of worship did exist. Under these circumstances the policy which seems to have suggested itself to the priesthood, anxious to retain a firm hold on the minds of the people, was to recognize and incorporate into their system some of the most prominent objects of popular devotion, and thereby to establish a kind of catholic creed for the whole community subject to the Brahmanical law. At the time of the original composition of the great epics two such deities, Siva or Mahddeva (“ the great god”) and Vishnu, seem to have been already admitted into the Brahmanical system, where they have ever since retained their place; and from the manner in which they are represented in those works, it would, indeed, appear that both, and especially the former, enjoyed an extensive worship. As several synonyms are attributed to each of them, itis not improbable that in some of these we have to recognize special names under which the people in different localities worshipped these gods, or deities of a similar nature which, by the agency of popular poetry, or in some other way, came to be combined with them. The places assigned to them in the pantheistic system were co-ordinate with that of Brahma; the three deities, Brahma, Vishnu, and Siva were to represent a triple im- personation of the divinity, as manifesting itself respec- tively in the creation, preservation, and destruction of the universe. Siva does not occur in the Vedic hymns as the name of a god, but only as an adjective in the sense of “kind, auspicious.” One of his synonyms, however, is the name of a Vedic deity, the attributes and nature of which show a good deal of similarity to the post-Vedic god. This is Rudra, the god of the roaring storm, usually Portrayed, in accordance with the element he represents, as a fierce, destructive deity, “terrible as a wild beast,” whose fearful arrows cause death and disease to men and cattle. He is also called kapardin (“wearing

his hair spirally braided like a shell ”), a word which in later times became one of the synonyms of Siva. The Atharvaveda mentions

several other names of the same god, some of which appear even placed together, as in one passage Bhava, Sarva, Rudra, and Pasupati. Possibly some of them were the names under which one and the same deity was already worshipped in different parts of Northern India. This was certainly the case in later times, since it is expressly stated in one of the later works of the Brahmana period, that Sarva was used by the Eastern people and Bhava by a Western tribe. It is also worthy of note that in this work (the Satapatha-brahmana), composed at a time when the Vedic triad of Agni, Indra-Vayu, and Siirya was still recognized, attempts are made to identify this god of many names with Agni; and that in one passage in the Mahabhd-rata it is stated that the Brahmans said that Agni was Siva. Although this identification can scarcely be correct, it seems to point to the fact that, in adapting their specula- tions to the actual state of popular worship, the Brahmans kept the older triad distinctly in view, and by means of it endeavoured to bring their new structure into harmony with the ancient Vedic belief. It is in his character as destroyer that Siva holds his place in the triad, and that he must, no doubt, be identified with the Vedic Rudra. Another very important function appears, however, to have been early assigned to him, on which much more stress is laid in his modern worship —that of destroyer being more especially exhibited in his consort—viz., the character of a generative power, symbolized in the phallic emblem (linga) and in the sacred bull (Vandz), the favourite attendant of the god. This feature being entirely alien from the nature of the Vedic god, it has heen conjectured with scme plausi- bility, that the /ixga-worship was originally prevalent among the non-Aryan population, and was thence introduced into the worship of Siva. On the other hand, there can, we think, be little doubt that Siva, in his generative faculty, is the representative of another Vedic god whose nature and attributes go far to account for this particular feature of the modern deity, viz., Pushan. This god, originally, no doubt, a solar deity, is frequently invoked, as the lord of nourishment, to bestow food, wealth, and other blessings. He is once, jointly with Soma, called the progenitor of heaven and earth, and is connected with the marriage

ceremony, where he is asked to lead the bride to the bride- groom and make her prosperous (Sivatama). Moreover, he has the epithet kapardin (spirally braided), as have Rudra and the later Siva, and is called Pasupa, or guardian of cattle, whence the latter derives his name Pasupate. But he is also a strong, powerful, and even fierce and destructive god, who, with his goad or golden spear, smites the foes of his worshipper, and thus in this respect offers at least some points of similarity to Rudra, which may have favoured the fusion of the two gods, Vishnu occupies already a place in the Vedic mythology, though by uo means one of such prominence as would entitle him to that degree of exaltation implied in his character as one of the three hypostases of the divinity. Moreover, although in his general nature, as a benevolent, genial being, the Vedic god corresponds on the whole to the later Vishnu, the preserver of the world, the latter exhibits many important features for which we look in vain in his pro- totype, and which were most likely the results of sectarian worship or of an amalgamation with local deities. In one or two of them, suchas his names Vasudeva and Vaikuntha, an attempt may again be traced to identify Vishnu with Indra, who, as we have seen, was one of the Vedic triad of gods, The characteristic feature of the elder Vishnu is his measuring the world with his three strides, which are ex- plained as denoting either the three stations of the sun at the time of rising, culminating, and setting, or the triple manifestation of the luminous element, as the fire on earth, the lightning in the atmosphere, and the sun in the,

heavens, The modern god is represented as undergoing, for the benefit of mankind, a number of avatéras or incar- nations, ten of which are especially dwelt upon by the fervid imagination of his followers, ‘The exact time at which these several episodes were incorporated into the cult of Vishnu cannot at present be ascertained. As they are for the most part conceived in a decidedly Brahmanical spirit,—the special object for which Vishnu assumes a human form being generally to deliver the people from the oppression of some wicked tyrannous prince,—it is pro- bable that they were mostly introduced at a time when there was still some danger of the Kshatriyas defying the Brahmanical rule. Of somewhat different origin were, perhaps, two of Vishnu’s most popular and important incarnations,

viz., those in which he manifests himself in the persons of Arishna and Rama, two heroes whose exploits are cclebrated in the Maha- bharata and Ramayana. It is possible that these warriors and their legendary achievements had been favourite subjects of heroic poetry for some time previous to the overthrow of the Kshatriyas, and that, being already regarded by the latter as representatives of Vishnu, they were afterwards recognized as such by the Brahmans, and thus gave rise to the system of Avataras.

The inale nature of the triad was supposed to require to be supplemented by each of the three gods being associated with a female energy (Sakti). Thus Vach or Sarasvatt, the goddess of speech and learning, came to be regarded as the sakti, or consort of Brahma; S72 or Lakshmi, " beauty, fortune," as that of Vishnu; and Uma or Parvati, the daughter of Himavat, the god of the Himalaya mountain, as that of Siva. On the other hand, it is not improbable that Parvat?,—who has a variety of other names, such as Kali ("the black one"), Durga ('the inaccessible, terrible one"), Mahd-devt (" the great goddess"),—enjoyed already a somewhat extensive worship of her own, and that there may thus have been good reason for assigning to her a pro- minent place in the Brahmanical system. In later times a special sect, that of the Saktas, or followers of any one of the saktes, was principally devoted to her service ; and up to our own days an almost national festival, the Durgapija or Dasara, accompanied by sanguinary sacrifices, is annually, in September or October, celebrated in her honour in Northern and Western India.

A compromise was thus effected between the esoteric doctrine of the metaphysician and some of the most prevalent forms of popular worship, resulting in what was henceforth to constitute the orthodox system of belief of the Brah- manical community. Yet the Vedic pantheon could not be altogether discarded, forming part and parcel, as it did, of that sacred revelation (srati), which it had been taught was the divine source of all religious and social law (smriti, tradition"), and being, moreover, the foundation of the sacrificial ceremonial on which the priestly authority so largely depended. The existence of the old gods is therefore likewise recognized, but recognized in a very different way from that of the triple divinity. For while the triad represents the immediate manifestation of the

eternal, infinite soul—while it constitutes, in fact, the Brahma itself in its active relation to mundane and seemingly matcrial occurrences, the gods are of this world, are indi- vidual spirits or portions of the Brahma like meu and other creatures, only higher in degree. To them an intermediate sphere, the leaven of Indra (the svarloka or svarga), is assigned to which man may raise himself by fulfilling the holy ordinances; but they are subject to the same laws of being ; they, like men, are liable to be born again in some lower state, and therefore, like them, yearn for emancipation from the necessity of future individual existence. It is a sacred duty of man to worship these superior beings by

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: perfect knowledge of the divine essence.

invocations and sacrificial observances, as it is to honour the pitris, the spirits of the departed ancestors, The dead on being judged by Yama, the Pluto of Hindi mythology,

_are supposed to be either passing through a term of enjoy-

ment in a region midway between the earth and the heaven of the gods, or undergoing their measure of punishment in the nether world, situated somewhere in the southern region before they return to the earth to animate new bodies, ir Vedic mythology Yama was considered to have been the first mortal who died, and “ espied the way to” the celestia] abodes, and in virtue of precedence to have become the ruler of the departed ; in some passages, however, he is already regarded as the god of death. Although the pantheistic system allowed only a subordinate rank to the old gods and the actual religious belief of the people was probably but little affected by their existence, they continued ty occupy an important place in the affections of the poet, and were still represented as exercising considerable influence on the destinies of man. The most prominent of them were regarded as the appointed Lokapdlas, or guardians of the world ; and as such they were made to preside over the four cardinal and (according to some authorities) the intermediate points of the compass. Thus Indra, the chief of the gods,

was regarded as the regent of the Hast; Agni, the fire (egnis), was in the same way associated with the south-east ; Yama with the south ; Stirya, the sun(“HAtos), with the south-west ; Varuna, originally the representative of the all-embracing heaven (Oipavds) or atmosphere,now the god of the ocean, with the west; Vayu (or Pavana) the wind, with the north-west ; Kubera, the god of wealth, with the north ; and Soma (or Chandra) with the north-east. Th the institutes of Manu the Lokapalas are represented as standing in close relation to the ruling king, who is said to be composed of particles of these his tutelary deities. The retinue of Indra consists chiefly of the Gandharvas (etym. connected with «évravpos), a class of genii, considered in the epics as the celestial musicians ; and their wives, the Apsaras, lovely nymphs, who are frequently employed by the gods to make the pious devotee desist from carrying his austere practices to an extent that might render him dangerous to their power. Marada, an ancient sage, is considered as the messenger between the gods and men, and as having sprung from the forehead of Brahma. The interesting office of the God of love is held by Kamadeva, also called Ananga, the bodyless, because, as the myth

relates, having once tried by the power of his mischievous:

arrow to make Siva fall in love with Parvati, whilst he was engaged in devotional practices, the urchin was reduced to ashes by a glance of the angry god. Two other mytho- logical figures of some importance are considered as sons of Siva and Parvati, viz., Karttikeya or Shanda, the leader of the heavenly armies, who was supposed to have been fostered by the six Avittikds or Pleiades; and Ganesa, the elephant-headed god of wisdom, and at the same time the leader of the dii minorum gentium,

Orthodox Brahmanical scholasticism makes the attain- ment of final emancipation (muwkt:, moksha) dependent on This knowledge can only be obtained by complete abstraction of the mind from external objects and intense meditation on the divinity, which again presupposes the total extinction of all sensual instincts by means of austere practices (tapas). The chosen few who succeed in gaining complete mastery over their senses and a full knowledge of the divine nature become absorbed into the universal soul immediately on the dissolution of the body. Those devotees, on the

other hand, who have still a residuum, however slight, of ignor- ance and worldliness left in them at the time of their death, pass to the world of Brahma, where their souls, invested with subtile corporeal frames, await their reunion with the

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supreme, The pantheistic doctrine which forms the foundation of the Brahmanical belief found its earliest systematic exposition in the Mtmdnsa philosophy, Inas- inuch as its tenets were supposed to be in perfect harmony with the sacred scriptures, the Mimdnsaé was regarded as the only true orthodox school of philosophy. It divided itself into two parts or branches, viz., the Pdarva- (prior) or Karma- (work) Mimédnsd, the practical, and, no doubt, older school of Jazmnini, which propounds a system of reasoning with a view of facilitating the correct interpreta- tion of the Veda; and the Uttara- (latter) or Brahma- Mimdnsa, or commonly called Vedanta (conclusion of the Veda), the metaphysical system ascribed to Vyasa, which professes to supply a complete exposition of the theological doctrines advanced in the Veda, especially in its speculative portions, the Upanishads. But other darsanas, or philo- sophical systems, were started, which, though admitted

into the pale of orthodoxy, were yet considered as not

altogether compatible with a belief in the revealed character of the scriptures. These were the Sdénkhya school, founded by Kapila, with its more modern branch, the theistic Yoga of Patanjali ; and the dialectic Vydya of Gotama, with the atomistic Vazseshika of Kandda, The time at which these several schools originated is still very uncertain ; but itis highly probable that at least the two J/imdnsds and the Sankhya preceded Buddhism. The Vedanta seemed to be unable satisfactorily to account for the origin of matter, the existence of which its followers in later times found themselves compelled altogether to deny, and to de- clare to be a mere illusion (maya) produced by imperfect knowledge of the soul. Kapila cut

the knot by proclaiming the eternal existence of a material principle, unconscious, but endowed with volition in regard to its own develop- ment; from it all matter had emanated, and into it it would ultimately resolve itself. He called it Pradhana, (“principal ” thing) or mila-Prakriti (“original nature ”), By the side of this plastic element he recognizes the exist- ence of a primary spiritual essence (aman, ‘‘soul,” or purusha, “ person”), which is not one but manifold, and has from all beginning entered into matter. It is in itself unintelligent ; but being in the first place indued with a subtile body termed the “great one” (mahat), which con- sists of intelligence (buddhz), and is the first emanation of plastic nature, it thereby receives the faculty of knowing. A being composed only of these elements is the Sankhya ‘deity which is thus partly material, its subtile body (buddhv) being the secondary source of all further develop- ments. The immediate production of the intellectual principle is the akankadra (“‘I-making,” 7.e., egotism, self-consciousness), which, combined with the spiritual element, constitutes the intelligent, self-conscious, individual soul. In this way Kapila derives all that exists from twenty- five principles (including the two primary essences), per- fect knowledge of which qualifies the soul for emancipa- tion from its connection with matter, the source of all pain, By predicating volition of the spiritual prin- ciple and withholding it from matter, the eternal exist- ence of which he likewise recognized, Patanjali became the founder of the theistic (sesvara) Sankhya (2.e., the system with a god, sara); whereas Kapila’s doctrine was termed nzrisvara, atheistical. The Vyaya, including the Vaiseshika, on the other hand, represents the universe as having emanated from nine primary substances, five of them—viz., earth, water, light, air, and mind (manas)— existing eternally in the form of atoms ; three (ether, time, and place) being one and infinite ; and soul (aman) being either one and infinite as the supreme spirit, the omniscient Lord (svara), or manifold in the shape of the vital spirit of animate beings (jzvatman).

The teachings of these masters, especially those of

Kapila, were thus decidedly antagonistic to the doctrine of an omnipotent creator of the world on which the Br&hma- nical system was based. So far,

however, from acknow- ledging their heterodoxy, they never failed to fall back on the Veda, as the revealed source of religious belief, to establish the truth of their theories; and so much had liberty of speculative thought become a matter of tradition and necessity, that no attempt seems ever to have been made by the leading theological party to put down such heretical doctrines, so long as the sacred character of the privileges of their caste was not openly called in question. Yet internal dissensions on such cardinal points of belief could not but weaken the authority of the hierarchical body ; and as they spread beyond the narrow bounds of Brahmanical schools, it wanted but a man of moral and intellectual powers, and untrammelled with class prejudices, to render them fatal to priestly pretensions. Such a man arose in the person of a Sdakya, prince of Kapilavastu, Gautama, the founder of Buddhism (about the 5th or 6th century B.c.) Had it only been for the philoso- phical tenets of Buddha, they need scarcely have caused, and probably did not cause, any great uneasiness to the orthodox theologians, He did, indeed, go one step be- yond Kapila, by altogether denying the existence of the soul as a substance, and admitting only certain intellectual faculties as attributes of the body, perishable with it. Yet the conception which Buddha substituted for the trans- migratory soul,—viz., that of karma (“deed”), as the sum total of the individual’s good and bad actions, being the determinative element of the form of his future existence, might have been treated like any other speculative theory, but for the practical conclusions he drew from it. Buddha recognized the institution of caste, and accounted for the social inequalities attending on it as being the effects of karma in former existences. On the other hand he alto- gether denied the revealed character of the Veda and the efficacy of the Brahmanical ceremonies deduced from it, and rejected the claims of the sacerdotal class to be the repositaries and divinely appointed teachers of sacred knowledge. That Buddha never questioned the truth of the Brahmanical theory of transmigration shows that this early product of speculative thought had become firmly rooted in the Hindt mind as a point of belief amounting to a moral conviction. To the Hindu philosopher this doctrine seemed to account satisfactorily for the apparent essential similarity of the vital element in all animate beings, no less than for what elsewhere has led honest and logical thinkers to the stern dogma of predestination. The belief in eternal bliss or punishment, as the just recom- pense of man’s actions during this brief term of human life, which their less

reflective forefathers had at one time held, appeared to them to involve a moral impossibility. The equality of all men, which Buddha preached with regard to the final goal, the nirvana, or extinction of arma and thereby of all future existence and pain, and that goal to be reached, not by the performance of penance and sacrificial worship, but by practising virtue, could not fail to be acceptable to many people. It would be out of place here to dwell on the rapid progress and internal development of the new doctrine. Suffice it to say that, owing no doubt greatly to the sympathizing patronage of ruling princes, Buddhism appears to have been the state religion in most parts of India during the early centuries of our era. To what extent it became the actual creed of the body of the people it will probably be impossible ever to ascertain. One of the chief effects it produced on the worship of the old gods was the rapid decline of the authority of the

orthodox Brahmanical dogma, and a considerable develop-

ment of sectarianism. Among the great variety of deities of the pantheon, Siva, Vishnu, and Parvati have since claimed

by far the largest share of adoration, and it is in special accounts of the Saiva; Vaishnava, and Sakta sects rather than in an exposition of the Brahmanical belief, that che religious history of India from about the beginning of our éra can be dealt with satisfactorily. At that time the worship of Vishnu in his most popular avatar, in the person of Krishna, appears to have received much countenance at the hands of the priests, with a view of counteracting the growing influence of Buddhism. The sectarian Spirit gave gradually rise to a special class of works, the modern Puranas composed for the express purpose of promoting the worship of some particular deity. In the 8th or 9th century Sunkara-acharya, a Malabar Brahman of the Saiva sect and Vedanta school of philosophy, made an attempt, by engaging in controversy with the leaders of various sects, to restore the Brahmanical system of belief to its former imposing position, His example and teachings seem to have inspired the Brahmanical community with a good deal of religious zeal, and even fanaticism, and thus to have greatly contributed to the final overthrow of the Buddhists. In the 7th century the authority of Sdkya- muni's doctrine was already on the wane, as is evident from Hiouen Thsang's complaints of the number of ruined temples and deserted monasteries, and the great proportion of heretics. At the time of Sankara its decline must have been still more advanced, and a few more centuries probably sufficed to make the last living remains of the Buddhist faith disappear from the continent of India ; except, indeed, in Nepal, where it prevails to this day. There also still exists in India a very important sect which seems to have early branched off from the Buddhist doctrine, viz., the Jains. Although, in the long run, Buddhism has been unable to maintain the ground it had won from the Brahmans, the humanizing spirit of its doctrines has left a deep impress on the Hindi mind. One of the practical and least salutary effects it has produced is the adoption of monastic institutions by most of the Brahinanical sects. The maths or convents, in which a con- siderable portion of the clergy of the various religious bodies reside together, are presided over by mahants or superiors, and are scattered all over India. Sankara founded several establishments of , this kind in various parts, especially one still existing at Sringeri, on the Western Ghats, In spite of its levelling tendencies, Buddhism seems never

to have succeeded in checking the further development of the caste system. At the time of Sankara seventy-two mixed classes, or eighteen subdivisions of each of the four original castes, are said to have existed, and ever since they have become more and more numerous. Indeed, there can be no doubt that Hindiis do not feel, and perhaps never felt, their class restrictions as being in any way burdensome, or still less a disgrace to them, and that even the lowest man looks upon his caste as a privilege as high as that of the Brahman. In the opinion of the Brahmans only one original caste is now extant, viz., their own, all the others having resulted from successive intermixtures.

Mr Sherring, in his Hindu Tribes and Castes, makes the following remarks on the Brahmanical caste at the present day :—“ The Brahman occupies the highest rank among Hindus for at least three reasons. The first is his assumed sanctity. By the people generally he is regarded as a pure, stainless, twice-born being, divine as wellas human, worthy of unbounded admiration and worship. He is the priest of the Hindu religion, directing the ceremonies performed at the temples, sacred wells, sacred tanks, sacred rivers, and at all hallowed places throughout the land, He is present to sanction, and give effect to, the great social festivals of his countrymen held at marriages, at births of sons, and at deaths. He casts the horoscope, tells the lucky days, gives spiritual counsel, whispers mantras or mysterious words,

executes magical incantations and charms, and is at ones househoid god, family priest, and general preceptor and guide in behalf of the many millions of Hindus residing in the vast country lying between the Himalayas and Cape Comorin. The second reason of the Brahman’s superiority is that, for many ages, perhaps from the outset of his career, when with other Aryans he first entered the plains of India, he has been intellectually in advance of the rest of the Hindu race. . . . The third reason is a consequent of the second. The Brahman is not only a thinking, but also a reading man. He possesses and, perhaps, reads the holy canon—Vedas, Shastras, and Puranas. He has been the author of Hindu literature. . . . Light of complexion, his forehead ample, his countenance of striking significance,

his lips thin, and mouth expressive, his eyes quick and sharp, his fingers long, his carriage noble and almost sublime, the true Brahman, uncontaminated by European influence and manners, with his intense self-consciousnessg, with the proud conviction of superiority depicted in every muscle of his face, and manifest in every movement of his body, is a wonderful specimen of humanity walking on God's earth. Yet the Brahman has lived his day. His prestige is rapidly on the decline, and is only maintained at its ancient pitch in remote villages and in the fastnesses of superstition in great cities. Here, as of old, it envelopes him like a glory. But the further he moves from such places, the more dim becomes the glory until it fades away altogether. Education and other influences are treating the Brahman roughly. Yet the fault is his own. He has had a better start by reason of his great natural endow- ments than any Hindu of the other castes below him ; but he has neglected his opportunities. I fear he has been too proud, too self-satisfied to avail himself of them."

On the modern observance of religious duties Professor Wilson remarks : —" Now it is true that in the present con- stitution of Indian society the distribution of the periods of life, beyond that of the student, is never regarded except ty a few, who prefer a life of lazy mendicity, or by some half-crazed enthusiast, who thinks it possible to realize the letter of the law. The great body of the people, Brahmans included, pursue their worldly avocations as long as their faculties permit, spend the decline of life in the bosom of their families, and die peaceably and decently at home. But although the practice is discontinued, the doctrine remains and influences opinion; and devotional ceremonies, pilgrimage, penance, and abstract contempla- tion have an undue preponderance in the estimation of the people, even the best informed among them, over active duties and the precepts of morality. As to the common people they have a still lower scale, and they find a ready substitute for the inconveniences of all moral restraint in the fervour of that faith which they place in Vishnu, and the unwearied perseverance with which they train # parrot or a Starling to repeat his names, to articulate Kmshna- Radha, or Sita-Ram."

The study of the ancicnt literature of the Hindiis has taught us that some practices which have hitherto, or until recently, prevailed in India, and which have contributed so much to bringing Hindi morals into disrepute,

are but comparatively modern innovations. Thus, the rite of suttee (properly safi, t.e., “the faithful wife”), or voluntary immolation of widows, which was abolished some thirty years ago with considerable difficulty, seems to have sprung up originally as a local habit among the Kshatriyas, and, on becoming more and more prevalent, to have at Iength received Brahmanical sanction. The alleged conformity of the rite to the Hindi scriptures has been shown to have rested chiefly on a misquotation, if not an intentional garbling, of a certain passage of the Rigveda, which, so far from authorizing the concrematiou of the widow, bids her

return from the funeral pile to her home and resume her worldly duties.

Cases of infanticide are still, unfortunately, too common in many parts of India, especially among the Rajputs. To the honour of the priests be it said, however, that they have never sanctioned this abominable practice. Its origin has, it appears, to be sought in the enormous extravagance of wedding feasts, and a mistaken notion of parents being disgraced by their daughters remaining husbandless. Hence also the practice of early marriages, which is the more mischievous, as Hindt law does not allow widows to re- marry.

The cow has been held in high honour in India from eatly times. This religious feeling was not, however, carried formerly to the extreme to which it is carried now-a-days, when the slaughtering and eating the flesh of kine is considered as one of the most heinous crimes. It has, on the contrary, been shown conclusively by a Hindi scholar, that beef formed in former times a staple article of food in India, and that in showing hospitality to an honoured guest it played as prominent a part “as did the killing of the fatted calf among the Jews.”

See H. H. Wilson, Essays on the Religion of the Hindus; J. Muir, Original Sanskrit Texts; M. Miiller, History of Ancient Sanskrit Literature ; C. Lassen, Indische Alterthumskunde ; Elphin- stone, History of India, ed. by E. B. Cowell. (J. E.)

BRAHMAPUTRA, one of the largest rivers of India, with a total length of 1800 miles, rises near the lake Mansarowar in the plateau of Thibet, where it is known by the name of Sanpu, flows eastward for about 1000 miles, and skirting round the eastern passes of the Himalayas not far from the Yang-tse-kiang and the great river of Cambodia, enters the plain of British India on the north-eastern frontier of Assam. It then runs westward, dividing the province of Assam into two unequal portions, turns southward into Eastern Bengal, and joins the Ganges opposite Godlanda, the terminus of the Eastern Bengal Railway. The united stream then flows south-west, joins the Meghna, and after another southern stretch of about 100 miles, empties itself into the Bay of Bengal. The body of water formed by the union of these three noble rivers, the Brahmaputra, Ganges, and Meghné, expands during the latter part of its course into a vast estuary, studded with large islands. The Brahmaputra proper in Assam is formed by the union of three streams, in 27° 45’ N. lat. and 95° 30’ E. long.,—the Sanpu or Dihang, the Dibang, and another stream, which, although the least of the three, the Hindus have taken as the main branch, honouring it with the name of Brahmaputra, and sanctifying it in their mythology. This branch, which many European writers have accepted as the main Brah- maputra, takes its rise in a valley called the Brahmakunda, on the side of the eastern extremity of the Himalaya Mountains beneath the snowy range.

The upper part of the Brahmaputra is entirely in Thibet, and divides the broad plateau drained by the very elevated Thibetian lakes from the narrow plateau which divides the northern and southern Himalayan ranges, where the affluents of the Ganges spring from perennial snow. At the westernextremity of the Brahma- putra basin the main river is 14,000 feet above the sea, and after a course of 600 miles it is still 11,000feet high. Nothing is known ofits passage across the Himalaya Mountains. The features of the passage are probably similar to those exhibited by the gorge of the Sutlej; but itis a reproach to the science and enterprise of the 19th century to allow such a problem to remain unsolved. Eastward the basin of the Brahmaputra is bounded by that of the Yang-tse-Kiang, which here flows through tremendous gorges on its way to the plains of China and the Yellow Sea. Some contend that the basins of the Jrawadi, Salwin, and Cambodia rivers, arc interposed between the Brahma- putra and the Yang-tse-Kiang, although they approach each other within 150 miles. On the

south, the Patkai Mountains, terminating in the Manipur and Chittagong hills, separate the Brahmaputra from the Irawadi and the basins of the Aradkan coast. The principal tributaries of the Brahmaputra are the Dibru, Buri Dihing, Disang, Subansiri, Mands, Baghmi, Dharl4, and Tista. The Brahmaputra

forms many islands during its course; among which that of Majuli, enclosed by the Brahmaputra and its branch the Lohit, contains an area of 282,165 aeres, and is well inhabited. and cultivated. In Assam the Brahmaputra also bears the name of the Hiranya, and above its junction with the Ganges it is called the Jamuna. The principal towns on its banks in Assam are Dibrugarh, Tezpur, Gauhatt, Godlpara, and in Bengal Sirajganj. Its volume of water has been computed at Godlpara during its lowest ebb at 146,188 cubic feet per second. During the rains, when the river attains a height of 30 to 40 fect above its common level, its body of water may fairly be computed at four times the above quantity. The Brahma- putra is navigable as far as Dibrugarh, but in the dry season only for steamers of light draught. In the rains it overflows its banks and spreads over the country for hundreds of square miles. At Goalanda, where it joins the Ganges, the current is so strong during the rains, and the eddies and whirlpools formed by the meeting of the waters so numerous, that large and. powerful river steamers are often unable to make headway, and have to lie for days until the river subsides. The main branch of the Brahmaputra formerly flowed through the eastern district of Maimansinh, but the greater part of its water now finds its way through the Jamuna. The total length, as above stated, is 1800 miles; but if its source be taken at the Brahmakunda, the length of the river only amounts to 930 miles. Until 1765 the Brahmaputra River was unknown in Europe as a first-class river, and Major Rennel, on exploring it, was surprised to find it larger than the Ganges. The bore, or upward wave caused by the sudden influence of the tide, occurs in all the passages between the islands of the estuary formed by the united streams of the Brahmaputra, Ganges, and Meghna. (W. W. H.)

BRAIN. See Anatomy, PuysroLocy, PsycHoLoey, and MENTAL DISEASES.

BRAINERD, Davin, one of the most zcalous and suc- cessful of modern Christian missionaries, was born at Haddam, in the state of Connecticut, in 1718, and died October 9, 1747, in the house of his friend President Edwards. His heroic and self-denying labours among the American Indians wore out in the course of a few years a naturally feeble constitution, but left behind them import- ant fruits. The narrative of his mission is contained in his journal published in 1746. His life, compiled chiefly from his own diary, was written by President Edwards, and has gone through many editions. Brainerd was a man of strong mental powers, extensive knowledge, and great sagacity ; and as a preacher he was forcible and pathetic,

BRAINTREE, the Raines of Domesday Book, a market- town of Essex, eleven miles N. by E. of Chelmsford. It is one of the polling-places for North Essex, and is the seat of the Braintree Poor Law Union. The parish church, St Michael's, is a fine Gothic edifice of early date. A corn exchange anda mechanics' institute may also be mentioned. 'The bishops of London had at one time a palace in the town, but there are no remains of the building. The manufactures of silk and crape, which employ about 1000 persons, have quite superseded that of woollen cloth, which was introduced by the Flemings who fled to England to escape the persecution of the duke of Alva. Straw-plaiting is also carried on. There is a free school in the town, besides several charities. Two annual fairs of three days each are held here, commencing May 7 and October 2. Population of the parish in 1871, 4790.

BRAKE, a town in the Grand Duchy of Oldenburg, on the left bank of the Weser, about half-way between Bremen and the mouth of the river. It was for centuries the port of Bremen; and though, since the founding of Bremerhaven, it no longer possesses @ monopoly of the river traffic as before, it still continues to flourish. Large docks have been recently constructed, and a railway has been opened from the town to Bremen. Shipbuilding and the weaving of woollen cloths are carried on to some extent. Population in 1871, 3800.

BRAKE is an instrument by means of which mechanical energy may be expended in overcoming friction, It is used for several entirely different purposes, the principal of these being (a) to limit or decrease the velocity of, or in some cases to bring completely to rest, the body or system

of bodies imparting the energy; (b) to measure directly the amount of frictional resistance between two bodies 5, OF (c) to measure, indirectly, the amount of energy given out by the body or system of bodies producing it.

The first case is the familiar one occurring iu the brakes of locomotives, railway carriages, and wheeled vehicles generally, and in those applied to such machines as cranes, winches, &c. Here some system of bodies,—or for sinpli- city's sake we may say some body,—originally at rest has been set in motion, and has received acceleration up to a cer- tain velocity, the work which hag been done in that accelera- tion being stored up as "actual energy" in the body itself. Before it can be brought to rest it must part with this energy, expending it in overcoming some external resistance, Very frequently the actual energy is very large in propor- tion to the usual resistance opposing the motion of the body, so that that motion would continue for a long time, or through a great distance, before the whole energy had been expended and the body brought to rest. For the sake of convenience, and in certain cases for the sake of safety, it is often necessary that this time or distance should be greatly shortened. 'This may be done by artificially increasing the resistance for the time being, and the most convenient method of doing this is the use of a brake.

The construction of railway brakes falls to be treated in detail in the article Ramways. In other vehicles the brake belongs generally to one of two classes—it is either a block which can be pressed against a wheel by a suitable arrangement of levers under the control of the driver, or a slipper or "skid" which can be placed under a wheel, and which is attached by a chain or otherwise to the body of the vehicle. The increased resistance is due in the one case to the friction between the block and the wheel, and in the other to that between the skid and the road,

In the case of hoisting-machines the brake is used very frequently as a means of controlling the velocity of the descent of the load. In the process of "lowering by a brake," its frictional resistance is alone opposed to the load, and suitable mechanical means are provided for varying that resistance so that the velocity of the descending weight may be kept within

the desired limits, The brake used in these machines very frequently consists of a cylindrical pulley or narrow drum encircled by a flexible belt of iron or steel. One end of this belt is fastened to the framing, and it is so formed that in ordinary work the drum revolves in it without touching it. When necessary, however, the position of the movable end can be so altered as to bring a larger or smaller area into contact, the surfaces being held together with a pressure which can be varied to suit the requirements of each case. This is effected either by a simple lever (in small machines worked by the foot), or for heavier work by the aid of a screw and hand-wheel,

In what are known as “ differential” brakes the brake- band is not fixed to the frame of the machine, but both

its ends are attached to points in a movable lever in such

a way that motion of the lever affects them unequally, tightening one more than it loosens the other, or loosen- ing one more thanattightens | 4 the other. The‘principle of “.. such anarrangementis shown x in fig. 1. Here A is the pul- ley, B the brakeband, and C the working lever ; B being attached to the latterat points @ and 6 unequally distant from the fulcrum D. It is obvious that for any motion of C the angular motions of the arms Da and Dé are equal, but the instantaneous

Fia.1.—Differential Brake.

BRAKE

linear motions of the points @ and o in the directions of the band are unequal, varying directly as Da, Da, the ratio of the normals from D upon those directiong, Thus any motion of C to the right tends to tighten the lower part of the belt and to slacken the upper part, but the slackening takes place through a larger distance than the tightening, and the belt is therefore released from the drum. By moving the lever to the left, on the other hand, the opposite action occurs, and the belt is correspondingly tightened.

Instead of using the friction between two solid bodies, in some special cases the frictional resistance of a fluid is employed, as in what Professor Rankine

called fan brakes and pump brakes. In the one case the motion of revolving blades (commonly) is opposed by the resistance of the atmospheric or liquid medium surrounding them, and in the other the motion of a liquid is opposed by the resistance due to a narrow passage or orifice.

The measurement of the frictional resistance between two bodies of known material or form is often of great importance, and it is still more often of importance to measure, by means of the frictional resistance which it can balance, the amount of energy given out by some engine or machine. Both these measurements can be and are frequently made by means of brakes. For this purpose the apparatus must be so made that the actual resistance can be accurately measured,—that this resistance can be kept sensibly constant for any length of time, but can be altered at will,—and also that the brake can be kept continuously at work for any desired period, The brake used for this purpose commonly takes the form of a revoly- ing drum of iron, encircled by a ring of hard wood blocks connected together by thin iron bands. To this ring is attached a weight of known magnitude, at a known distance from the centre of the pulley. The wheel being set in motion the blocks can be gradually pressed upon it by a screw until the friction occurring is just sufficient to lift the weight and keep it off the ground or its support. So long as these conditions can be maintained the frictional resistance is exactly known, for its maguitude must be to that of the weight inversely as their distances from the centre of the wheel, and the energy expended in any given time will be equal to this resistance multiplied by the space passed through in the time by any point in the periphery of the drum.

Figs. 2and 8 show the construction of a brake of this kind, copied from drawings kindly furnished by Mr W. H. Maw, the designer. The

Fries. 2 and 8.—12 H.P. Friction Brake (designed by W. H. Maw).

drum A has a turned cylindrical surface 39 inches in diameter and 84 inches wide ; it is fixed upon the shaft B with which it revolves. The brake-ring consists of fourteen wooden blocks CC, connected

by the straps DD of hoop-iron, and so arranged that they can be tightened up by thescrew E. To the ring there is attached at Ga pin with pointed ends, from the centre of which hangs the rod H earry- ing, by means of the plate at K, the weights. The blocks are made to exert such a pressure upon the wheel that the pin G, from which the weights are suspended, remains always in the position shown, its pointed ends coineiding with the top of ganges upon the fixed wootlen beams beside the brake. This apparatus is made toa certain extent self-adjusting by means of two compensating levers. The upper end of one of these, M, moves freely through an eye N some dis- tanee below the centre of the shaft ; the hoop-iron rings are attached toits lower end at O and P, the latter further from N than the former. lf N coineided with the centre of the shaft the lever would cause no impediment to the motion of the ring along with the drum ; as it is actually placed, however, if any motion occur the point O must move through a relatively smaller distance than in the other

OB ; case, because the ratio Py is less than PB’ The consequence of this

is, that if through any cause the drum carry the ring round with it through any small distance, 0 tends to tighten the belt, and P to slacken it, but the relatively larger movement of the latter causes the final result to oe a slackening, so that the weight drops back intoits proper place. If, on the other hand, the ring begins to slide baek on the drum, a similar, but reversed, action at OP increases the pressure on the blocks, and the drum again gripping them, brings the weight back into its original position. The dash-pot L eontains a piston very nearly fitting it, below which is water or oil, its object being to prevent too sudden a fall of the weight. It is really a little brake in itself, in which the energy given out by the descend- ing weight is expended in overcoming the frictional resistance encountered by the water in passing upwards through the narrow space round the piston.

In order that a machine of this kind may be run continuously at a high veloeity it requires careful and abundant lubrication. If the surface be too small, water will have to be used, but with a well- designed and not over-worked brake, tallow is the best lubricant.

With regard to the proper proportioning of surface, numerous ex- periments with brakes of different sizes run at ditferent speeds seem to show that the

surface required varies as the energy transmitted, and (approximately) inversely as the peripheral velocity of the drum. The conclusions drawn from them, put in the most general form, are (for a brake having a cast-iron drum and wooden blocks) as follows: —Let E be the energy (in foot tbs) to be absorbed per minute (that is, the work done per minute by the machine driving the brake), T the number of revolutions of the drum per minute, R its radius (in feet), and @ the area (square inches), and 8 the breadth (inches) of the drum ; then in order that the latter may not heat, a should

not have a smaller value than °286 TP while it is frequently and very

properly made as much as ‘357 = . Expressing the same relation in

E E other terms, we have 6 = from -0038 RT 0048 RT? from

E E ‘024 +7 to -03 vy > VY being the peripheral velocity of the drum in feet per minute. 1f the work be expressed in horses’ power (P) the

equation is very nearly equivalent to)=from Oro See

Vv V A brake may have automatic apparatus attached to it for showing or registering its speed or performance. (Gag 1B AVG JEG)

BRAMAH, Josepu, a practical engineer and machinist, was born at Stainborough, in Yorkshire, on the 13th of April 1749. He exhibited at a very early age an unusual talent for the mechanical arts, and having been incapacitated, when he was about sixteen, by an accidental lameness in his ankle, for the pursuit of agricultural labour, he was apprenticed to a carpenter and joiner. When the term of his engagement had expired he obtained employment for some time in the workshop of a cabinetmaker in London, and soon after established himself as a principal in that business. His first patent for some improvements in the mechanism of water-closets was taken out in 1783. In the following year he took out a patent for the peculiar locks which have long been named after him. His fertile Invention led him to devise new arrangements for pumps, fire-engines, steam-boilers, and paper machinery, for all of which he obtained patents. The invention which has proved of most practical service, the hydraulic press, was first

brought forward in 1796. Its principle is that of the hydrostatic paradox, and it has been found of very great

use in all operations requiring the application of immense mechanical force. In 1806 Bramah patented a very ingenious printing-machine, specially adapted for bank notes, which was adopted in the following year by the Bank of England. During the latter years of his life Bramah erected some large machines at the Thames bank for sawing stones and timber, began to devise some im- provements in bridges and in locks for canals, and was at one time actually employed in the execution of some water-works belonging to the department of the civil en- gineer, which he completed with ability and success. His great and various exertions appear in some measure to have exhausted the strength of his constitution ; and his last illness was immediately occasioned by a severe cold, taken in the prosecution of his experiments in Holt Forest on the tearing up of trees. He died in his sixty-sixth year, on the 9th December 1814. (See notice of his life and works by Dr Cullen Brown in New Monthly Magazine,

1815.)

BRAMANTE, or Bramants LazzaRl, one of the most celebrated architects of Italy, famous also as a painter, was born at Casteldurante, in Urbino, in July 1444. He showed a great taste for drawing, and was at an early age placed under a painter of some distinction, Fra Barto- lommeo, called Fra Carnavale. But though he afterwards gained some fame as a painter, his attention was soon absorbed by the sister art, architecture. He appears to have studied under Scirro Scirri, an architect in his native place, and perhaps under other masters. He then set out from Urbino, and proceeded through several of the towns of Lombardy, executing works of various magnitudes, and examining patiently all remains of ancient art. At last he reached Milan, drawn thither by the fame of the great Duomo, and remained there for several years. Informa- tion as to this part of his life is singularly scanty, but he seems to have left Milan for Rome about 1500. He painted some frescoes at Rome, and devoted himself to the study of the ancient buildings, both in the city and in all the district as far south as Naples. About this time the Cardinal Caraffa, hearing of his studies in

architecture, commissioned him to rebuild the cloister of the Convent della Pace. The celerity and skill with which Bramante accomplished his task gained for him the good offices of the cardinal, who introduced him to Pope Alexander VI. He began to be consulted on nearly all the great architectural operations in Rome, and executed for the Pope the palace of the Cancelleria, or chancery, which was much admired. But under Alexander's successor, Julius II, Bramante's talents began to obtain an adequate sphere of exercise. His first large work was to unite the straggling buildings of the palace and the Belvedere. This he accom- plished by means of two long galleries or corridors enclosing acourt. The design was only in part completed before the death of Julius and of the architect. So impatient was the Pope and so eager was Bramante, that the founda- tions were not sufficiently well attended to; great part of it had therefore soon to be rebuilt, and the whole is now so much altered that it is hardly possible to decipher the original design.

Besides executing numerous smaller works at Rome and Bologna, among which is specially mentioned by older writers a round temple in the cloister of San Pietro-a- Montorio, Bramante was called upon by Pope Julius to take the first part in one of the greatest architectural enterprises ever attempted, the rebuilding of St Peter's. Bramante's designs were complete, and he pushed on the work so fast, that before his death he had erected the four great piers and their arches, and completed the cornice and the vaulting in of this portion, He alsdé vaulted in the principal chapel. After his death in 1514 his design was

much altered by the architects engaged to carry on the work, and in particular by Michel Angelo, Competent judges are strongly of opinion that Bramante's designs, if carried out, would have had a much greater effect than those which were finally adopted.

Bramaute had a great influence in Italy. By his careful study of the ancient forms of art he became the real intro- ducer of the so-called classical style. His own genius was bold and inventive, delighting in mass and breadth, but occasionally failing in the perfection of detail.

BRAMANTINO. See SuaRn1.

BRAMBANAN, a village in Java, notable for extensive and remarkable ruins of Hindu character. The place lies directly south of the great volcanic cone of Mir-Api (8640 feet) in the territory of the sultan of Yugya-karta (written by the Dutch Djokjo-karta), and 10 miles east of the capital, just on the border of the other native state called Surakarta or Solo.

The remains embrace six groups of temples, besides two buildings intended for residence, perhaps monastic. The most remarkable of the former is that called Chandi Sewu, or “The Thousand Pagodas.” The centre of the group is a large temple of cruciform plan, standing on a terraced basement, and surrounded by four (originally, perhaps, by five) concentric squares, formed by rows of small detached cells or temples, the whole area forming a square of up- wards of 500 feet to the side. Statements differ as to the exact number of these cells, but a plan given by Raffles shows 238 as now standing. They are sculptured exter- nally with mythological reliefs, each is crowned with a small dagoba of the usual Buddhistic pattern (z.¢., very like the minor domes over the west portico of St Paul’s), and probably all originally contained images of Buddha in the usual cross-legged attitude (of which a few still remain), whilst the central shrine contained, no doubt, a great image or images of Buddha also. Mr Fergusson thinks the group to be Jaina rather than Buddhist; and this a closer examination of the images and their symbols alone can decide. But similar series of shrines, clustered round a central pagoda, are found in Buddhist Pegu. There is a professed restoration of the central temple of Chandi Sewu in Raffles’s History ; but the details of this plate (pl. 40) are not to be relied on.

Another Buddhist edifice, single but more perfect, is known by the name of Chandi Kali Baneng. ‘This also is cruciform ; it stands on a boldly moulded basement, and the external decoration exhibits pilasters richly carved in scroll-work, and massive double cornices. Small Buddhas in niches remain, but the great figure which must have occupied the interior has disappeared.

A third group of temples, once, probably, the most important, is known as Lara Jongran. These are so ruined that at a short distance they present the aspect of vast and shapeless cairns of stone. One of them contains in three upper cells fine figures of purely Hindu and Brahmanical character. To the

north is Durga (here in the character of a strong but beneficent power) slaying the demon Mahishdsura,—precisely the same subject that is to be found in Moor's Hindu Pantheon, pl. 35. This is the Lara or Virgin, who gives the popular name to the group of temples. To the west is the elephant-headed Ganesha, and to the south a fine Jove-like Siva, bearded and trident-bearing. Offerings are sometimes made to these images by the peasantry, in spite of the universal Mahometan profession.

The name of the place is said by Friedrich to be pro- perly Parambdnan, and to mean probably "the Place of Teachers." The whole of the temples are alleged, in tra- ditional rhymes, to have been erected between 1266 and 1296 a.p, But the chronology and history of the older

Javanese remains is still very obscure, and probably the date of some of the Brambanan temples must be carried much farther back. The destruction of the last-described group must have been the work of earthquake, and we must suppose the date of the other buildings to be subse. quent to the destruction. Some general points worthy of note in regard to these buildings are the following :—

(1.) They are all built of hewn stoncs without the use of any ccment.

(2.) There are distinct traces showing that the exterior and interior of the buildings were once covered with a fine coat of stucco, not excepting the most elaborate sculpture in scroll-work, &e, We know that the sculptured cave-walls of Ellora, the great idols at Bamian, and the Doric order at Selinus were similarly coated ; and probably in all these cases the stucco was intended to bear colour or gilding.

(3.) No real arch exists in these buildings. The vaults and doorways are covered by the corbelling, or stepped projection, of the horizontal courses. Mr Crawfurd makes a contrary statement but that historian, usually so trustworthy, was certainly mistaken on this point.

(4.) Many of the peculiarities of this architecture, both in general plan and in ornamental details, indicate a close relation to the medieval styles of

Burmah and Camboja ; and points almost necessarily to an original common type in India, a type which as yet we cannot trace satisfactorily. In this lies a problem of interest, which the accumulation of photographs will perhaps allow of bein worked out. It is notable, however, that in the Burmese mediatl brick buildings of analogous character the true arch is used pro- fusely.—(Chiefly from the notes of a visit to Brambénan by the writer.) (H. Yau

BRANDE, Wriuttam Tuomas, chemist, was born at London in 1788. After leaving Westminster school he spent some time on the Continent, and acquired a know- ledge of French and German. On his return he began the study of medicine, and in 1806 a communication of his to the Royal Society was printed in their Z'ransactions, In 1809 he was made a fellow of the Royal Society, and became assistant to Sir Humphrey Davy at the Royal In- stitution, He succeeded Davy in the chair of chemistry in 1813, and in the same year received the Copley medal of the Royal Society. From 1816 to 1836 he was joint editor with Faraday of the Quarterly Journal of Science and Art, In 1825 he was made superintendent of the die department in the Mint, and in 1853 he received the honorary degree of D.C.L. of Oxford. He died on the 11th February 1866. Besides numerous papers, which marked him out as one of the most vigorous and able chemists of the day, Brande was the author of several important works, The Manual of Chemistry, 1819, and Elements of Chemistry, 1831, were the best works of the time, and soon became popular. He also published a Dictionary of Materia Medica in 1839, and a Dictionary of Science, Laterature, and Art in 1842, The latter is an exceedingly able and valuable work of reference; a new edition of it has recently appeared under the editorship of Mr G. W. Cox, 1875. Brande was the author of the third of the Dissertations (that on the progress of Chemical philosophy) prefixed to the supplement of the fourth edition of the En- cyclopedia Britannica.

BRANDENBURG, one of the largest provinces of Prussia, and the division from which that powerful mon- archy originally sprung. It lies between 51° and 58° 34' N. lat. and 11° 25' and 16° 10' E. long., and is bounded on the N. by Mecklenburg and the province of Pomerania, E. by Posen and Silesia, 8. by Silesia and the kingdom and province of Saxony, and W. by Anhalt and the pro- vinces of Saxony and Hanover. It has an area of 15,403 square

miles, and is divided into the two governments of Potsdam and Frankfort, the capital, Berlin, forming a sepa- rate jurisdiction, The province is a sandy plain interspersed with numerous fertile districts and considerable stretches of woodland, Its barrenness was formerly much exaggerated, and it was popularly described as the sandbox of the Holy

Roman Empire. It is generally well-watered by tributaries of its two principal rivers, the Elbe and the Oder, and is besides remarkable for the number of its lakes, of which no fewer than 600 or 700 great or small are enumerated. The mineral products comprise coal, limestone, gypsunl, alum, and potter’s earth ; barley and rye are the usual cereals ; fruits and vegetables are abundant ; and consider- able quantities of hemp, flax, hops, and tobacco are raised. The breeding of sheep receives great attention, and the province furnishes a greater export of wool than any other in the kingdom. Bees are kept in considerable numbers, especially in the neighbourhood of Sorau. The climate is cold and raw in winter, excessively hot in summer, and there are frequently violent storms of wind. The manu- facturing industry of the province is both varied and extensive, but is for the most part concentrated in the principal cities, The most important branches are the spinning and weaving of wool and cotton, the manufacture of paper, and the distillation of brandy. Educational institutions are very numerous, not only in the capital, but throughout the province, There are in all 135 towns in the province, the most important being—

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In 1871 the population was 2,863,229, of whom 2,720,242 were Protestants, 86,047 Roman Catholics, and 47,484 Jews.

BRANDENBURG, a town of Prussia, capital of the circle of West Havelland, in the government of Potsdam, and province of Brandenburg. It

is situated ou the River Havel, and on the Magdeburg and Berlin Railway, 37 miles W.S.W. of Berlin. The town is enclosed by walls, and is divided into three parts by the river,—the old town on the right and the new town on the left bank, while on an island between them is the “cathedral town,” also called, from its position, ‘ Venice.” Many of the houses are built on piles, through which the water of the river flows. The cathedral, an ancient structure of the 14th century, the old church of St Katharine, erected in 1410, and the council-house, deserve notice for their antiquity and as works of art. There are also a castle, a gymnasium, a riding academy, a public library, a theatre, and several hos- pitals. In the market-place stands a Rolandssatile, a colossal figure 18 feet in height, hewn out of a single block of stone; and a little to the N. of the town is the Marien- berg, on which the heathen temple of Triglaff and afterwards the church of St Mary’s were built. The town has a very considerable trade, with manufactures, of woollens, silks, linens, hosiery, and paper, as well as breweries, tanneries, and boat-building. Population in 1871, 25,822.

Brandenburg, originally Srennabonch, was founded by some Slavonian tribes, from whom it was captured in 928 by the emperor Henry I., who surrounded it with strong fortifications. A bishopric was founded there in 949, subject to Mayencc, and subsequently (968) to Magdeburg ; but the heathen Wends succeeded in getting oo of the town, and were only expelled by Albert the Bear

BRANDIS, Curistran Aveust, a distinguished scholar and historian of Greek philosophy, was born on 18th February 1790 at Hildesheim. His father, a physician of Some distinction, held for a time a professorship at the university of Kiel. His education was begun at the gymnasia of Holzminden and Kiel, and in 1806 he entered the university of the latter town. His attention was soon drawn from theology, in the study of which he was then éngaged, to philosophy, particularly to Plato. In 1809 he

accepted the post of private tutor in the family jof Count Adam Moltke at Niitschau, and there became acquainted with Niebuhr, whose noble character made a deep impres- sion on him. In 1812 he graduated at the university of Copenhagen, and presented as his thesis ‘‘ Commentationes

Eleatice,’a careful collection of thefragments of Xenophanes, Parmenides, and Melissus. Two years later he attended the university of Gottingen, and in 1815 presented as his inaugural dissertation at Berlin an essay On the Idea of the History of Philosophy (Von dem Begriff der Geschichte der Philosophie), In 1816 he had the offer of an extraordinary professorship at Heidelberg, but preferred to accompany Niebuhr to Italy. Six years were spent in examination of the principal libraries, and Brandis began the labours on Aristotle which were to occupy many years of his life, In 1821 he was made professor of philosophy in the newly founded university of Bonn, and in 1823 appeared his edition of the Jfetaphysics of Aristotle (Aristotelis et Theophrasti Metaphysica). To this was added in 1837 a second part, Scholia Greeca in Aristotelis Metaphysica. He became part editor, along with Boeckh and Niebuhr, of the new classical journal Rheinisches Museum, and contributed – largely to it. His articles on Socrates (1827, 1829) are particularly deserving of notice. Jn 1835 appeared the first part of his great work, Handbuch der Greschichte der Griechisch-rém. Phil., aud in 1836 the Scholia in Aristo- telem, forming the 4th volume of the Berlin edition of Aristotle. The following three years were spent in Greece, whither he had gone as instructor to the young king Otho. Some of his experiences in Greece were published in 1843 (Mittheilungen tiber .Griechenland). The remainder of his life was devoted to his history of Greek philosophy, the last part of which was published in 1866, little more than a year before his death, which took place on the 24th July

1867.

Brandis’s great work, that by which he will be best remembered, appeared at intervals from 1835 to 1866, and altogether fills six volumes. Itis characterized generally by great extent of reading, sound judgment, and critical examination of authorities. But it is to some extent defective in speculative insight and in power of ex- position. The history for the most part is moulded too rigidly on the work of the author under consideration, and the whole course of exposition follows the order of the author’s thought. Thus in many cases it is apt to degenerate into what is little more than a running commentary or summary of the original text. This is particularly noticeable in the portions on Plato and Aristotle. There is no

attempt made to bring together information from all quarters and to work the whole into an organic unity. A com- parison of the work of Brandis with that of Zeller would bring out the contrast betwcen the two methods. At the same time the Handbuch will always retain a high value, even by the side of Zeller's later work, and its best portion, that on Aristotle, is per- haps as complete and accurate an account as can be desired. That Brandis himself felt the defects of his own method of history is . shown by the fact that he threw the whole matter of his larger treatise into a smaller and more systematic form, the very title of which, History of the Developments of Greek Philosophy (Geschichte der Entwickelungen der Gricchischen Philosophie, 2 vols., in three parts, 1862, 1864, 1866), indicates the change made. This smaller work is decidedly one of the best and completest histories of Greek thought in existence.

A sketch of the life of Brandis, with full list of his works, will be found in the notice read by Trendelenburg to the Berlin Academy. 1868 ('Zur Erinnerung an C. A. Brandis," Adh. der Kon. Akad. d. Wissen., 1868, pp. 1-24).

BRANDT, Sepastran, German satirist, was born at Strasburg about 1458. He studied at Basel, took the degree of doctor, and secms to have held a professorship for some time. After his return to Strasburg he was made syndic and then chancellor of thetown. He died in 1521. Among his writings are some Latin poems and treatises on law; but the work by which he is best known is the satirical poem Das Narrenschyf, published in 1494, The Ship of Fools, though without artistic beauty of structure, and though its satire is often coarse, took the popular taste.

It was translated into Latin in 1497 by Locher, and soon appeared in almost every European language. Alexander Barclay's Ship of Fooles (1509) is a free imitation of the German poem, and an abridged prose translation was published by Watson in 1517.

RRANDY, a spirituous liquor obtained by the distillation of wine, the aroma of which is due to ether and other volatile products. It may be distilled from any wine, but red wines yield a less pure and less aromatic

spirit than light coloured varieties. In the departments of Charente and Charente Inférieure a variety of grape is cultivated exclusively for the production of brandy, the yield of which constitutes the cognac of commerce. In portions of the departments of the Landes, Gers, and Lot et Garonne, the preparation of brandy is also an important industry, and the produce is commercially known as armagnac, from the name of the district. The cognac district which produces the most rich and delicate spirit distilled is separated into distinct zones of production, according to the quality of the spirit each yields. In the centre of the district on the left bank of the Charente is the Grande Champagne, and radiating beyond it are the Petite Champagne, the Premiers Bois, and the Seconds Bots successively. The Grande Champagne is the source of the finest brandy anywhere produced ; and as the area of cultivation recedes fron that centre, the quality of the spirit proportionately lessens. The quantity of brandy exported in 1868 from Tonnay Charente was 9,187,416 gallons, valued at £1,887,678, the greater part of which was consigned to British ports ; but the exports fluc- tuate greatly according to the character of the years. Thus in 1872 the total imports to Great Britain were only 3,505,295 gallons, while in 1873 the quantity was 6,483,486 gallons, of which 6,378,398 gallons came from France. By storage in oak casks the spirit takes up a portion of tannin, which gives it a delicate golden hue, but the deeper colour of brown brandy is communicated by caramel. Cognac is kept in carefully ventilated stores for two years, during which time it decreases in bulk and strength by evaporation, but mellows and develops aroma which con- tinues to increase the longer it is kept. Brandy is very popular as a medicinal stimulant, and for use in cases of sickness, diarrheea, and spasms. It is very often adul- terated, and a vast amount of spirit which passes under the name is really either beetroot spirit or grain whisky coloured and aromatized with the cognac-flavoured cenanthic ether or Hungarian oil. See DisTinLaTion.

BRANTFORD, a town of the Dominion of Canada, in the province of Ontario, capital of the county of Brant, is situated on the Grand River, about 24 miles south-west of Hamilton. It is an important station on the Goderich and Buffalo line, with extensive engine-works and foundries. Brass, iron, and tin wares, agricultural implements, window blinds, and pottery are its principal manufactures. It is lighted with gas, and has a good supply of water. As the river is not navigable as far as the town, a canal has been

constructed which gives communication with Lake Erie. There are fine county buildings, ten churches, an orphanage, banks, and newspaper offices. Population in 1871, 8107.

BRANTOME, Prerre pz BourpEILies, SEIGNEUR DE, French historian and biographer, was born about 1549. He was the third son of the Viscount de Bourdeilles, and at an early age entered the profession of arms. He approved himself a brave soldier, and was brought into contact with most of the great leaders who were seeking fame or fortune in the wars that then distracted the Continent. Soon after the death of Charles IX. he retired from active life, and spent'his last years in writing his Memoirs of the illustrious men and women whom he had known. He died on the 15th July 1614. He left distinct orders that his manuscript works should be printed, and a first edition ap-

peared in 1665-6, not very complete. Of the later editions, the most valuable are—one in 15 volumes, 1740; another in 8 vols., 1787 ; one in 2 vols., 1842, by Buchon ; that of the Bobliothéque Elzévirienne in 3 vols., 1858-9 ; and Lalanne's edition for the Société de Histoire de France, 6 vols., 1865, seg. Brantéme can hardly be regarded asa historian proper, and his Memoirs cannot be accepted as a very trustworthy source of information. But he writes in a quaint conversational way, pouring forth his thoughts, observations, or facts without order or system, and with the greatest frankness and naiveté. His works certainly gave an adinirable picture of the general court-life of the time, with its unblushing and undisguised profligacy, There is not an homme illustre or a dame galante in all

his gallery of portraits who is not stained with vice; and –

yet the whole is narrated with the most complete uncon- sciousness that there is anything objectionable in their conduct. There does not appear to be any English trans. lation of Brantéme.

BRASIDAS, one of the most famous of the Spartan leaders in the early part of the Peloponnesian War, first distinguished himself by the relief of Methone, which was besieged by the Athenians (431 3.c.) For this service

he was publicly commended at Sparta. In 429 he was sent to assist Cnemus, and appears to have taken part in the unsuccessful attack on the Pirzeus. Two years later he accompanied the admiral Alcidas to Corcyra, but did not succeed in inducing his superior to make an attack on the city. He was severely wounded in the assault on Pylos (425), and lost his shield, which was picked up and carried in their triumph by the Athenians. When it was resolved by Sparta to carry the war into Thrace, Brasidas was selected as leader. He relieved Megara in 424, and in the same year succeeded in passing through Thessaly and in effecting a junction with Perdiccas of Macedon, He assisted Perdiccas to put down a revolted vassal, Arrhibeeus, and then, in an extremely short time, partly by his skilful policy, partly by the rapidity and boldness of his movements, succeeded in gaining possession of Acanthus, Stagira, Amphipolis, and Torone. In the spring of 423 a truce was agreed upon; but Brasidas insisted upon retaining Scione, which had capitulated.a day or two after the truce began; this was denied, however, by the Spartan general. The revolt of Mende gave him another opportunity, and he seized that town. Later in the same year he again accompanied Perdiccas @“ainst Arrhibeus, and made a most skilful retreat. He received no reinforcements from Sparta, where the leaders seemed jealous of his success, his conciliatory manners, and his dexterous policy. The Athenians, on the other hand, sent out a new armament, retook Mende, and repelled an assault on Potideea. In 422 Cleon with the fresh Athenian troops besieged Amphipolis. A swift sally, directed by the skilful generalship of the Spartan leader, was crowned with success. The Athenians were routed, and Cleon slain, but Brasidas himself was mortally wounded. He was interred at Amphipolis, the inhabitants making him the founder of their city, and instituting yearly sacrifices and games to his memory. Brasideia were also celebrated to his honour in his native city, none but pure Spartans being allowed to join in the games. Brasidas is the only Spartan general whose character displays nobility or grandeur. He had to some extent thrown off the mental stiffness produced by the rigid oligarchical institutions of his native city. He could make himself popular with the allies, and the charm of his personal character secured for Lacedzemon many a city which would not otherwise have joined the league. Thucy- dides gives him great praise, describes him as being eloquent for a Spartan, and mentions his reputation for

justice, liberality, and wisdom. Brasidas was indeed the

saviour of Sparta in the early period of the war, and had he lived the contest might have come more quickly to au end.

BRASS, an alloy of copper and zinc, the composition of which will be discussed under the heading Coprrr. In this place we have to do simply with its history, and the various applications of the alloy in the arts. Although the term prass frequently occurs in Scripture from the era of Job dowuwards, there is no indication that brass,as known in modern times, was in use previous to the period of the Roman empire. By the Romans a compound was used under the name oricalchum or auricalchum, which appears to have possessed the composition and properties of brass. With their conquests they carried a knowledge of the arts they cultivated into the countries they subdued, and from these the art of preparing the alloy extended with civiliza- tion throughout Europe. The earliest traces of brass in Great Britain are found in the medizval monumental “prasses,” found commonly over the tombs of civil and ecclesiastical dignitaries (see Brassxs). That the alloy was manufactured in England during the reign of Henry VIIL, however, is indicated from the passing of an Act of Parlia- ment prohibiting, under severe penalties, the export of brass, a prohibition which was not withdrawn till so recent a date as 1799 During the reign of Queen Elizabeth the manufacture was systematically developed and extended, and a patent for working calamine stone (the principal ore of zinc) and making brass was granted by the queen to William Humfrey and Christopher Schutz, securing to them the exclusive right of manufacturing brass. The patent rights granted to these persons were gradually ex- tended and merged into a company under the name of the “ Governors, Assistants, and Societies of the City of London of and for the Mineral and Battery Works,” which con- tinued to exercise its functions down to the year 1710. In the year 1721 it was estimated that about 30,000 persons found employment in the brass industries. From a very early date brassfounding was prosecuted in Birmingham, and by degrees it there assumed more important proportions till it has become the most distinguishing industrial feature of the town The late Mr W. Aitken, in his valuable report on brass and brass

manufactures, to which source of practical information we have to express our obligation, says :—-‘‘ What Manchester is in cotton, Bradford in wool, and Sheffield in steel, Birmingham is in brass; its articles of cabinet and general brass- foundry are to be found in every part of the world: its gas-fittings in every city and town into which gas has been introduced froni Indus to the poles.”—(Birmingham and the Midland Hardware Districts, London, 1865.)

The brass trade of the present day is, according to Mr Aitken, conducted under nine different heads —(1), brass- casting ; (2), cabinet, bell, and general brassfoundry ; (3), cock-making and plumbers’ brassfoundry ; (4), stamped brassfoundry ; (5), rolled brass, wire, and sheathing ; (6), tube-making; (7), lamp-making; (8), gas-fittings; and (9), naval brassfoundry. It frequently happens that several of these departments are carried on in the same establishment ; but numerous as are these divisions, they by no means exhaust the industries in which brass plays a principal part. Thus the pin manufacture, button-making, and the gilt jewellery trade, are eminently characteristic of Birmingham, and in these brass is the principal metallic substance employed. According to the different forms under which brass is to be employed it is fashioned by the various pro- cesses of—Ist, casting; 2d, rolling and drawing; 3d, stamping; and 4th, tube-drawiug and casing; and to these, with 5th, brass-finishing, we shall briefly allude.

Casting —The first operation necessary in connection with casting is the preparation of patterns of the object to

be cast. Castings, of course, vary in all degrees in intricacy and elaboration of details, and the getting up of the more ornaiental patterus necessitates the employment of persons of artistic ability to prepare the design, and superior artisans to finish the pattern blocks. Three classes of castings are recognized in the trade—lst, common castings, made from any plain pattern, an impression of which can be formed and the pattern taken out without breaking the mould ; 2d, cored castings, such as plumbers’ cocks and other tubular work, where the metal must be poured round a central core; and 3d, false-cored castings, where the pattern is so undercut that the mould must be built up of such a number of separable sections as the intricacies of the

pattern may require. When the mould is formed each of these sections is lifted off, the pattern is taken out, and they are then built together in their original position. This descrip- tiou of moulding requires much skill and dexterity. Moulds are made in sand of a free, fine-grained, and uniform character ; and moulding-boxes of wood or cast-iron which fit together in two or more parts, with moulding-boards of wood and clamps to hold the parts together, are employed in casting. In the forming of common castings, the lower division of the moulding-box is packed with sand, and the pattern, if deep, is driven half its depth into it, parting sand is dusted over the surface, and the upper part of the box is fitted on and similarly packed with sand. When the box is filled, a moulding-board, forming a top or bottom to it, is laid on, the two halves of the box are separated, the pattern with- drawn, and " gates" or channels formed between the mould and the aperture by which the metal is poured in. The sur- faces are then dusted over with flour or powdered charcoal, and the mould placed in an oven to dry. On their with- drawal from the oven the two parts of the moulding-box are clamped together, the molten metal is poured in, and a perfect copy of the pattern produced. In making common castings as many patterps as the superficial area of the moulding-box will accommodate are cast at once, " gates" leading to the entire series ; and for many plumbers' cast- ings, &c., a series of half patterus, with moulded gates, are fixed on two sides of a plate by which the whole may be moulded and finished at one operation. The cores for tubu- lar work are separately made, and are supported on bearings in the mould. When the casting is cold the hardened core is picked out, and the article is then ready for finish- ing. Fine ornamental castings which contain minute details are moulded with special care in very fine sand, faced with charcoal powder, which faithfully reproduces the most delicate lines. The metal is poured direct from the crucible in which it is prepared, by the aid of strong tongs, and all spilt metal is carefully swept up, cleaned, and remelted.

Sheet Rolling and Wire Drawing.—The raw material of a large proportion of the brass trade consists of sheet-brass, as from it stamped work of all kinds is prepared, and jointed tubing and sheathing are made; and, generally, the processes of rolling must be adopted when sheets of large dimensions or of great thinness are required. For the purpose of rolling the metal is melted and cast in broad flat moulds of cast-iron ; and in cases

where a large quantity is dealt with, the moulds are hewn out in granite. These moulds are rubbed with oil and powdered with charcoal before being used. The ingots for rolling, termed “ strips,” are in the cold state passed successively between rolls (pairs of chilled-iron cylinders) of large size which squeeze them out and extend them lengthwise. As often as necessary in the process the sheet is annealed in a muffle or reverberatory furnace, being allowed to cool down after each annealing. The sheet is finished, after “ pickling” in acid, by passing it through a pair of highly polished rolls. Muntz’s sheathing metal is a form of brass containing a large proportion of IV. — 28

zine, and as this alloy can be rolled out hot it is much more cheaply and expeditiously prepared than ordinary sheet brass,

Wire Drawing.—Brass wire is consumed in enormous quantities, first and chiefly for pin-making, next for shoe- rivets, then for brush-making, for paper-makers’ wire web, and many other purposes. The metal for wire drawing is rolled into long strips of a suitable thickness and cut into “strands” by means of slitting rolls. The strands, which are square in section, are drawn through a succession of circular holes in a steel draw-plate, till the desired degree of finencss is reached, and are wound upon a rotating drum or block. The wire has to be repeatedly annealed as it passes through the plates of ever-diminishing gauge.

Stamping.—A large number of useful articles, as well

as many ornamental details, which were formerly produced.

by the process of casting, are now cheaply and expeditiously made by stamping out of sheets of rolled brass. In this way the ornamentation applied to the cheaper kinds of gasaliers, balance-weights, chain-links, é&c., are formed, and cornice-pole ornaments and curtain-rings made 3 and the process is also applied to the making of door and shutter knobs, finger plates, and lamp-burners, and to the striking up of many useful articles, such as basins and other vessels. In the process of stamping, a die, in which the pattern to be formed is sunk, is prepared by the ordinary process of die

sinking, and securely fixed to a heavy iron block sunk into the ground. From each side of this block rise two cast-iron guide pillars, which act as guides to the heavy hammer or ram arranged to slide up and down between them, Into this hammer a “force,” or exact counterpart of the sunk die, is fitted, so that on the fall of the hammer the force exactly fits into the die. The work of the stamper in raising his hammer is much lightened by passing the lifting belt over a pulley attached to a shaft moved by steam-power. By this arrangement the workman has only to hold his cord sufficiently tight to. create the friction between the belt and pulley necessary to raise the weight,

and by letting go his hold, the stamp is allowed to fall with:

its full momentum against the die. In a compound of such hardness and brittleness as brass it is necessary to raise any pattern by repeated strokes, annealing the metal between each separate blow. ‘The number of blows neces- sary to bring up any pattern depends on the depth and convexity of the die. The “forces,” or counterparts of the die, are made of lead, tin, or other soft metal, while for finishing the stamping when the die contains fine details a “ force” made of brass is employed. A modification of the steam-hammer has been adapted for use in the pro- cess of stamping. Stamped work as compared with castings is deficient in depth and richness, as it is not practicable to attain any great boldness and sharpness of outline, and the “force” having to fit into every portion of the die, no undercutting is possible. Globular articles, such as balance weights, are stamped in two (or if necessary more) parts and the pieces joined by soldering. Mr James Atkins of Birmingham has patented an ingenious method of filling stamped shells, such as balance-weights, with molten iron by simply keeping the shell in water while it is being filled.

Tube-making.—Brass tubes are of three principal kinds : —lIst, ordinary soldered ; 2d, cased ; and 3d, solid tubing. Plain soldered tubes are made from sheet-brass by cutting off, with circular shears, strips of the breadth necessary for the gauge of the tube to be made. These strips are passed through “ cupping-rolls, ” by which they are partially bent round. The end of the strip is then formed into a tang, caught and drawn through a tool

called a conductor, which folds over the strip into a circular form, bringing the two edges into close contact, The tube so formed is tightly

tied up with wire at short intervals to keep the edges together in the process of soldering ; a mixture of granu. lated brass and borax is filled into the seam, and the tube is passed slowly through a strong heat in the soldering stove, which melts the granulated brass and so unites the edges. ‘The wires are then cut away, and the superfluous solder filed off, the tube is pickled in sulphuric acid, and again passed through the steel conductor. In the case of tubes which require great accuracy of internal gauge, a man- dril or solid cylinder of steel is placed inside the tube before it is finally passed through the tool. The external pressure causes the tube to fit closely to its internal support, and while the outside takes the outline of the steel conductor, the inside is made true to the shape of the mandril, Tubes of any given section are thus formed by the use of mandrils having the outline required. Ornamental patterns are impressed on plain tubes by fitting them on mandrils and passing them through a tool, which consists of a stron iron frame carrying three or more rollers so mounted that the open space between their external edges has the sec. tional form of the tube to beornamented. On the external face of these rollers is sunk the design which is to be impressed on the tube, and as it is drawn through them the powerful squeeze they give is sufficient to impress orna- ments of considerable depth and boldness. Cased-tubes or rods, that is, tubes or rods of iron cased in brass, were invented in 1803 by Sir Edward Thomason, who thus described his invention :-~“ In watching the operation of drawing brass and copper tubes upon the mandril, I found it required as much power to slide off the hollow tube from the mandril as was required to draw it on, Reasoning from the adhesion of the brass tube to the steel mandril, I found by experiment that the union of copper and iron or brass and iron could be firmly attached by pressure, and conceived that such an application would be useful for inaking copper bolts for shipping, solid brass rods for stair carpets, solid brass to go round the top of a room to suspend pictures, as curtain rods for drawing-rooms, and as balustrades for staircases.” Wood is cased in brass by a similar process, and used for such purposes as_ brass cornice-poles. Solid or seamless brass tubes, which are in very extensive demand for

locomotive and other steam boilers, are made by drawing down short thick cast cylinders of brass till they reach the desired gauge and thinness. The instrument in which this drawing is accom- plished is similar to the apparatus for impressing orna- mental patterns on plain brass tubes. Four steel rollers are mounted in a strong frame, the sectional outline of the outer surfaces of which have the size and form to which the tube is to be drawn, and through a series of such tools the cast cylinders are passed, after annealing at each opera- tion. Mr G. F. Muntz in 1852 patented a method of drawing tubes cast in an oval form in the heated state. Brass Finishing.—The operations in brass finishing com- prise “dipping, ” “ burnishing,” and “ lacquering,” and in some cases brass-work is finished by “ bronzing.” After the article to be finished has been cleaned by pickling in acid, it is passed for dipping into an earthenware jar con- taining a solution of aquafortis (nitric acid). For bright dipping the acid is used strong, and the brass is imme- diately withdrawn from the bath, but for “dead” dipping, i.¢., for producing a bitten, frosted appearance, the brass is made weaker and the metal left in it till a creamy appear- ance is seen on the surface. Burnishing is accomplished by rubbing with polished steel tools, called burnishers, the parts of dead dipped work which are to be brightened. The work is then passed through water soured with acid, rinsed, and dried in boxwood sawdust, For lacquering, the work is heated over stoves, and while it is hot, a coating of varnish, made of seed-lac dissolved in spirit, is carefully

and uniformly spread over the surface. Bronzing consists in applying to the surface of the metal an opaque pigment, which alters its colour. Ordinary brassfounders’ bronze consists of a solution of hydrochloric acid and sal-ammoniac, or of the same acid, arsenic, and smithy scales. It is chiefly to cabinet brassfoundry and stamped work that such finishing processes are applied.

Vessels of brass for cooking and other domestic purposes are very extensively employed in the East Indies, and the alloy is there also a favourite material for the bangles and other personal ornaments of the lower orders. A large trade is carried on in brass wire, for ornamental purposes, between Birmingham and various African stations; a species of currency

called Guinea rods, made from thick brass wire, is made and exported to the Guinea coast ; and a kind of cast-brass coin, called a manilla, current in the equatorial regions of Old Calabar, is frequently supplied by Birmingham manufacturers. (3. PA.)

BRASSES, MonuMENTAL, a species of engraved sepul- chral memorials which in the early part of the 13th century began to take the place of the tombs and efligies carved in stone, which formed such conspicuous features in most of the great churches. Made of hard latter or sheet brass, let into the pavement, and thus forming no obstruction in the space required for the services of the church; they speedily came into general use, and continued to be a favourite style of sepulchral memorial for three centuries. Besides their great value as historical monuments, they are specially interesting as authentic contemporary evidence of the varieties of armour and costume, or the peculiarities of paleography and heraldic designs, and they are often the only authoritative records of the intricate details of family history. Although the intrinsic value of the metal has unfortunately con- tributed to the wholesale spoliation of these interesting monuments, they are still found in remarkable profusion in England, and they were at one time equally common in France, Germany, and the Low Countries. In France, however, those that survived the troubles of the 16th century were totally swept away during the reign of terror, aud almost the only evidence of their existence is now supplied by the collection of drawings bequeathed by Gough to the Bodleian Library. The fine memorials of the royal house of Saxony in the cathedrals of Weissen and Freiberg are the most artistic and striking brasses in Germany. Among the 13th century examples existing in German churches the full length memorials of Yso Von Welpe, bishop of Verden (1231), and of Bemard, bishop of Paderborn (1340), may be mentioned. Many fine Flemish specimens exist in Belgium, especially at Bruges. Only two or three examples, and these of late date, are known in Scotland, among which are the memorials of Alexander Cockburn (1564) at Ormiston; of the Regent Murray (1569) in the collegiate church of St Giles, Edinburgh ; and of the Minto family (1605) in the south aisle of the nave of Glasgow Cathedral. England is the only country which now possesses an extensive series of these interesting memorials, of which it is calculated that there may be about 4000 still remaining in the various churches. They are most abundant in the eastern counties, and this fact has been frequently adduced

in support of the opinion that they were of Flemish manufacture. But in the days when sepulchral brasses were most in fashion the eastern counties of England were full of commercial activity and wealth, and nowhere do the engraved memorials of civilians and prosperous merchants more abound than in the churches of Ipswich, Norwich, Lynn, and Lincoln. Flemish brasses do occur in England, but they were never numerous, and they are readily distin- guished from those of native workmanship. The Flemish

examples have the figures engraved in the centre of a large plate, the background filled in with diapered or scroll-work, and the inscription placed round the edge of the plate. The English examples have the figures cut out to the outline and inserted in corresponding cavities in the slab, the darker colour of the stone serving as a background. This is not an invariable distinction, how- ever, as “figure-brasses” of Flemish origin are found both at Bruges and in England. But the character of the engraving is constant, the Flemish work being more fiorid in design, the lines shallower, and the broad lines cut with a chisel-pointed tool instead of the lozenge-shaped burin. It is interesting to find that the brass of Robert Hallum, bishop of Salisbury, the envoy of Henry V. to the Council of Constance, who died and was interred there in 1416, precisely resembles the brasses of England in the pecu- liarities which distinguish them from Continental speci- mens. Scarcely any of the brasses which now exist in England can be confidently referred to the first half of the 13th century, though several undoubted examples of this period are on record. The best known of the 13th century examples is that of Sir Roger de Trumpington (circa 1290), who accompanied Prince Edward in his expedition to Palestine, and is represented cross-legged., About half a dozen instances of this peculiarity are known. The 14th century brasses are much more numerous, and present a remarkable variety in their details. The finest specimen is that of Nicholas Lord Burnell (1315) in the church of Acton Burnell, Shropshire. The full-sized brass of Sir John d’Abernon at Stoke d’Abernon in Surrey (circa 1327) has the decorations of the shield filled in with a species of enamel. Other examples of this occur, and the probability is, that, in most cases, the lines of the engraving were filled with colouring-matter, though brass would scarcely bear the heat requisite to fuse the ordinary enamels. In the 15th

century the design and execution of monumental brasses had attained their highest excellence. One of the best examples of plate armour is that of Sir Robert Stantoun (1458) in Castle Donnington church, Leicestershire, and one of the finest existing brasses of ecclesiastics is that of Abbot de la Mare of St Albans. It is only in the 16th century that the engraved representations become portraits. Previous to that period the features were invariably represented conventionally, though some- times personal peculiarities were given. A large number of brasses in England are palimpsests, the back of an ancient brass having been engraved for the more recent memorial. Thus a brass commemorative of Margaret Bulstrode (1540) at Hedgerley, on being removed from its position, was discovered to have been previously the memorial of Thomas Totyngton, abbot of St Edmunds, Bury (1312). The abbey was only surrendered to Henry VIII. in 1539, so that before the year was out the work of spoliation had begun, and the abbot's brass had been removed and re-engraved to Margaret Bulstrode. In explanation of the frequency with which ancient brasses have thus been stolen and re-erected after being engraved on the reverse, it may be remarked that all the sheet brass used in England previous to the establishment of a manufactory at Esher by a German in 1649, had to be imported from the Continent.

See Cotman's Engravings of the most remarkable of the Sepulchral Brasses of Norfolk, 4to, London, 1813-16; and second edition, with additional plates and notes by Meyrick, Albert Way, and Sir Harris Nicolas, 2 vols. folio, London, 1839; Manual for the Study of Monumental Brasses, Oxford, 1848 ; Boutell's Monumental Brasses of England, engravings on wood, folio, London, 1849; Waller's Series of Monumental Brasses in England, London and Oxford, Parkers, 1863.

BRASSEY, THomas, an eminent English railway con- tractor, a man remarkable for his character and abilities as well as for the vast extent and singular success of his

ber 7, 1805.

his master.

of a body of 3000 men.

and in Scotland. In conjunction with his partner, Mr W.

Mackenzie, Brassey undertook, in 1840, the construction of the railway from Paris to Rouen, of which Mr Locke He subsequently carried out the extension A few years later he was engaged with his partner on five other French lines, and on his own account on the same number of lines in England, Wales, “At this time,” says The Builder, “the industrial army set in motion and controlled by Mr Brassey amounted to 75,000 men, and his weekly payments must have distributed, as the price of labour, from £15,000 to £20,000 every Saturday. The capital involved in these various contracts amounted to some £36,000,000 sterling.”

Was engineer. of the same line.

and Scotland.

But his energy and capacity were equal to still larger tasks.

He undertook in 1851 other works in England and in Scot-

land; and in the following year he engaged in the construc- tion of railways in Holland, Prussia, Spain, and Italy. One of his vastest undertakings was the Grand Trunk Railway of Canada, 1100 miles in length, with its astonishing bridge over the River St Lawrence. In this work he was asso- ciated with Peto and Betts. In the following years divisions of his industrial army were found in almost every country in Europe, in India, in Australia, and in South America. Tt must be remembered that, besides actual railway works, he originated and maintained a great number of subordinate assistant establishments, coal and iron-works, dockyards, &c., the direction of which alone would be sufficient to strain the energies of a common mind. His profits were, of course, enormous, but prosperity did not intoxicate him ; and when heavy losses came, as sometimes they did, he took them bravely and quietly. Among the greatest of his pecuniary disasters were those caused by the fall of the great Barentin viaduct on the Rouen and Havre railway, and by the failure of Peto and Betts. Brassey was one of the first to aim at improving the relations between engineers and contractors, by setting

himself against the corrnpt practices which were common. He resolutely resisted the “scamping” of work and the bribery of inspec- tors, and effected what he called the “ smothering of the engineer,” by destroying the ‘power of the inspectors and preventing all just grounds of dissatisfaction. Large hearted and generous to a rare degree, modest and simple in his taste and manners, he was conscious of his power as a leadcr in his calling, and knew how to use it wisely and for noble ends Honours came to him unsought. The cross of the Legion of Honour was conferred on him. From Victor Emmanuel he received the cross of the Order of St Maurice and St Lazarus ; and from the emperor of Austria the decoration of the Iron Crown, which it is said had not before been given to a foreigner. He died at St

Misstonarium, and other works.

undertakings, was born at Baerton, near Chester, Novem- He was the son of a landed proprietor, of ancient family, and received an ordinary commercial educa- tion ata Chester school. He began his professional career at the age of sixteen as apprentice to Mr Lawton, a surveyor, and on the completion of his term became the partner of Soon after his marriage his master died, and he assumed the sole management of the business. In the local surveys to which he devoted his attention during his early years he acquired the knowledge and practical experi- ence which were the nécessary foundation of his great reputa- tion. His first engagement as railway contractor was entered upon in 1835, when, on the invitation of the distinguished engineer Joseph Locke, he undertook the execution of a portion of the Grand Junction Railway. Soon after Mr Locke entrusted him with the completion of the London and Southampton Railway, a task which involved contracts to the amount of £4,000,000 sterling and the employment At the same time he was engaged on portions of several other lines in the north of England

Leonards at the age of 65, December 8, 1870. His life and labours are commemorated in a small volume published by Sir Arthur Helps in 1872.

BRAUNSBERG, a town of Prussia, capital of a circle in the government of Kénigsberg, on the Passaye, between three or four miles from its mouth in

the Frische Haff, It is the seat of the Roman Catholic bishop of Ermeland, and possesses numerous Roman Catholic institutions, Of these the most important are the Lyceum Hosianum, founded in 1564 by the Cardinal Bishop Hosius, and in 1818 raised to the rank of a faculty of theology, and the deaf and dumb asylum which was established in 181]. There is also a school for the education of schoolmasters, Brewing, tanning, and weaving are the most important industries of the town, which also carries on a certain | amount of trade in corn, ship timber, and yarn. The river | is navigable for small vessels, Braunsberg was founded , by the Teutonic knights in the middle of the 13th century, | Destroyed by the Prussians in 1262 it was restored in 1279, and admitted to the Hanseatic League in 1284. After numerous vicissitudes it fell into the hands of the Poles in 1520, and in 1626 it was captured by Gustavus Adolphus, The Swedes kept possession till 1632. Population in TSA, LOT,

BRAY, a seaport town and fashionable watering-place of Ireland, 12 miles S.S.E. of Dublin on the railway to Wexford. It is situated on both sides of the River Bray, which separates the two counties of Wicklow and Dublin, the portion in the latter county being known as Little Bray. The town is neatly built, and has a new parish church, a large Roman Catholic chapel, an old castle, a hospital, a court-house, several hotels, and Turkish baths, An esplanade runs along the shore for about a mile. The harbour admits small vessels only, and the trade is of little importance. There is a large brewery, which has been in existence for a considerable time. In the 12th century Bray was bestowed by Strongbow on Walter de Reddesford, who took the title of Baron of Bray, and built a castle in the town. It has since passed into the hands of various families. Its progress during the present century may be estimated by the gradual increase of the populatioun—1841,

3185 ; 1851, 3156 ; 1861, 5363; 1871, 6077.

BRAY, Sie Recrnatp, architect, was the second son of Sir Richard Bray, one of the privy council of Henry VI. Having been instrumental in the advancement of Henry VII. to the throne of England, he was greatly in favour with that prince, who bestowed upon him honours and wealth. His taste and skill in architecture are attested by those two exquisite structures,

Henry VII.’s chapel at Westminster and St George’s chapel at Windsor. He directed the building of the former, and the finishing aud decoration of the latter, to which, moreover, he was a liberal contributor. He died in 1503, and was interred in St George’s chapel.

BRAY, Dr Tuomas (1656-1730), was born at Marton, in Shropshire, and educated at Oxford. After leaving the university he was appointed vicar of Over-Whitacre, and rector of Sheldon. Bishop Compton sent him as his commissary to settle the affairs of the infant church of Maryland. He took a great interest in colonial missions, and busied himself in raising sums for purchasing small libraries for the use of missionaries; and to promote this design, he published his Bibliotheca Parochialis, and a discourse on Apostolical Charity. He endeavoured to establish a fund for the extension of the Christian faith, especially among the American Indians, and it is to his excrtions that the Society for the Propagation of the Gospel owes its existence. He was the author of Catechetical Lectures, Martyrology, or Papal Usurpation, Directorium

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BR & Zh

N presenting an account of this extensive and important country, the only American monarchy we shall give, first, a condensed view of its physical geography, meteor- ology, and natural products; secondly, a brief historical sketch of the progressive discovery of its coasts and interior, of its gradual settlement, and of the auspices under which its social institutions have developed themselves; and thirdly, an account of its existing political and social condition. Brazil is bounded on the N. by Columbia or New

@ranada, Venezuela, and the Guianas, British, French, and

Dutch; on the E. by the Atlantic; on the S. by the republics of Uruguay and the Argentine Confederation ; and on the W. by Paraguay, Bolivia, Peru, and Ecuador. It extends from about 4° N. lat. to 33° 41’S. lat., and from 35°

to 70° W. long. Its greatest length is about 2600 British miles, its greatest breadth about 2500; and it has a sea- board of about 4000 miles.

The original line of demarcation between the Portuguese and Spanish possessions was fixed by two bulls of Pope Alexander VI., the one of the 2d, the other of the 3d of May 1493. The kings of Castile and Portugal afterwards concluded the treaty of Torrizillas, which was approved by the Pope in 1529. The reunion of the two crowns in 1580 suspended all discussions about the boundaries. They, however, recommenced. after the revolution and indepen- dence of Portugal. The treaty of Utrecht in 1777 regulated many points, but the treaties always referred to rivers, mountains, and other positions passing through deserts, the names of which were not well established. For sometime past the Government of Brazil has taken great pains to establish amicably with the neighbouring states the boundary lines of the empire. In 1851 these were established with the republic of Uruguay, in 1857 with the Argentine Republic, in 1858 with Peru, in 1859 with Venezuela, in 1867 with Bolivia, and in 1872 with Paraguay ; the lines determined on have in some cases been already surveyed and marked out on the actual frontier, while at present mixed commissions from Brazil and each neighbouring country are employed in tracing out the other lines agreed upon.

With Uruguay the frontier has been marked out along a line passing from the coast in 33° 41’S. lat., through the southern portion of Lake Mirim and along the River Jaguarao, which falls into it, to its most southerly source stream, thence by a line crossing the head of the Rio Negro to the dividing ridge called the Cuchilla Sta. Anna, and afterwards down the stream of the Cuarein or Quarahim to the River Uruguay.

The Uruguay River, from the mouth of the Quarahim upwards to the confluence of the Pepiry on its right bank in 27° 10’ lat. divides Brazil from the Argentine Republic, the remainder of the mutual frontier of these countries being formed by the Pepiry to its source and the Sao Antonio from its rise to its union with the Y-Guast or Curityba, which river marks the boundary to the Parana.

Between Paraguay and Brazil the frontier runs from the mouth of the Y-Guast up the Alto Parana to the great fall of Guayrd, called Sete Quedas by

the Brazilians, and from that westward along the water-parting of the Cordillera of Maracajti, southward of the basin of the Igatimi, to the heights of Amambahy, and along these to the source of the io Apa-Estrella, following it down hence to the Paraguay.

With Bolivia the boundary lies along the Rio Paraguay from the mouth of the Apain 22°, upwards to 20° 11’, where the Bahia Negra joins it; along the Bahia Negra, and thence in a line to the lake of Caceres, cutting through the

midst of this lagoon, and passing onward to Lakes Mandioré, Gaiba, and Uberaba, and from the last to the south end of the ridge called Corixa Grande; from this in a direct line to Morro de Buenavista (Boavista), and to the sources of the Rio Verde ; along the middle of that stream to its mouth in the Guapore, and along that river and the Mamore to the Beni, where the Madeira begins in 10° 20’ 8.; a direct line thence to the source of the Yavari River (found by Chandless in 1867 to be a little south of 7° S. lat.), forms the limit of Brazil with Northern Bolivia and Central Peru. The Yavari continues the boundary between Brazil and Peru down its channel to the confluence with the Amazon at Tabatinga, and the limits commission has been at work during 1874 and 1875 in determining the position of this line. Farther on, the boundary of Brazil with Northern Peru has been described as a line passing northward from Tabatinga towards the mouth of the Rio Apaporis in the River Japura, the frontier with Peru terminating on this line where it intersects the Rio Putumayo, and that with Ecuador begin- ning there. From the mouth of the Apaporis the con- tinuation of the limit with Columbia or New Granada to that with Venezuela follows a line drawn along the water- parting of the range called the Collina do Guaicia or Serra Aracuara, which divides the streams flowing to the Guainia, or Rio Negro, above the Casiquidre, from those which join it below the anastomosis of that natural canal. This line meets the Rio Negro about 20 miles below the separation of the Casiquidre. From the Sierra Cucuhy, or Pao d’Azucar, on the opposite or left bank of the Rio Negro, the limit continues eastward over the level ground to the middle of the natural canal called the Maturacd, which in times of flood unites the Cababoris tributary of the Rio Negro with the Barria, a sub-tributary of the Casiquidre channel. Hence the limit is drawn from the Maturaca to the hill of Cupi, the first of the long range of

Serras which divide the waters flowing to the Amazon from those tributary to the Orinoco, and those passing through British, Dutch, and French Guiana to the Atlantic. This boundary follows the curves of the water-parting eastward along the Serras named Guahy and Ucuruciro; northward on those of Tapirapecé and Parima; eastward again along the Merevary and Pacaraima heights ; southward between the rivers Tacutu and Rupununy, and again generally eastward along the Serras of Acarahy and Tucumuraque to the source of the River Oyapok. This river, from its source to the Atlantic in 4° 22’ N. lat., is the present eastward limit of French Guiana. Several islets in the Atlantic belong to Brazil ; among them that of Fernando Noronha, 250 miles from Cape S. Roque, high, and having about 6 square miles of area, is important as a penal settlement of the empire.

The immense territory comprised within the line just described and the Atlantic is upwards of 3,288,000 Eng- lish square miles in area, or not far short of the extent of Europe.

The great river of the lowlands of Brazil, the Amazon, has been called the Mediterranean of South America, and is the largest stream‘of the globe in every respect, affording, with its great tributaries, free navigation over not less than 30,000 miles within Brazilian territory (see AMAZON).

After the Amazon the Tocantins is the great river of the northern watershed of Brazil. Rising in the Serra das Vertentes in Central Brazil, the Araguaya, its longer head stream, and the Tocantins flow northward for 900 miles, separated by the Cordillera Grande of Goyaz, and unite at about 300 miles from their wide estuary, called the Rio Para, formed between the island of Marajo and the main-

land. Midway in its course the Araguaya forms the remarkable island called the Ilha Bananal or Santa Anna, which is encompassed by branches of the river 220 miles in length, and contains a central lake of 80 miles in extent. The Araguaya is navigable, but the upper Tocantins is barred by falls, and

there is a rapid at some distance below their confluence round which a road has been recently made to unite the navigable portions.

The Turyasst, Maranh&o, and Paranahyba are the largest The last

named flows for the greater part of its course of 700 miles

of the other rivers of the north-eastern slope.

through level swampy lands, receiving many tributaries from castward, but few from the west; it is without obstruc- tions, and navigable for a great distance.

The Sao Francisco occupies a wide enclosed basin of the eastern highland. Rising in the Serra do Espinhaco and the Vertentes of Minas Geraes, it flows north and eastward But for a few obstacles the greater part of the river would be navigable, since it has The chief barrier is in the Falls of Paulo Affonso, about 168 miles from the sea, where the river is contracted between rocks, and plunges in a series of cascades Immediately below

in a course of 1800 miles.

great volume.

into a narrow rock-impeded channel. this, however, it spreads out as a broad calm river, which is regularly navigated by steamers from the Porto das Piranhas to the sea.

Among the rivers of the coast slope south of the Sao Francisco the chief are the Paraguasu, the largest stream of the province of Bahia, obstructed by many falls; the Rio de Contas or Jussiapé, a eonsiderable river in the

south of the province, also innavigable ; the Belmonte or

Jequitinhonha from the high mountains of Minas Geraes, interrupted by many rapids and cascades, and forming a series of magnificent falls over the eastern edge of the plateau, in which it descends at least 300 feet; the Rio Doce or Chopoté in the province of Espiritu Santo, afford- ing a considerable length of navigation, with portages at its reefs; and the

Parahyba do Sul, flowing between the Serra da Mantiqueira and the coast range of Rio de Janeiro, navigated regularly by steamers from its mouth for 60 miles to Sao Fidelio. Though these coast streams are among the little rivers of Brazil, every one of them is two or three times the length of the Thames.

The great rivers of the southern watershed are the Parana and Paraguay. The former has its rise in a broad basin, extending for a width of nearly 700 miles across southern Brazil, enclosed by the coast range of the south, the Serra da Mantiqueira, the Vertentes, and its southward interior branch running down into Paraguay. The main and longest

head stream of the Parané is called the Rio Grande or Para,

which rises in the Serra da Mantiqueira, one of its sources being on tle slope of Itatiaiosst, the highest point of the whole empire, 110 miles north-west of Rio de Janeiro. The Paranahyba joins the Grande on the right from the Pireneos range in the north, and further on the Parané-Panema, with its tributary the Tibagy, comes in on the left bank from the inner slopes of the south coast range; the Rio Pardo, Ivinhima, and Igatimi are smaller tributaries on the left bank from the interior ranges. After the con- fluence of the Grande and Paranahyba the Paran4 takes its proper name and flows southward out of Brazil in forming the limit between the empire and the republic of Paraguay. The fall of Urubupunga, 40 miles below the confluence of the Grande and Paranahyba, is an obstacle to the navigation of the upper river 3 but thence to the great “salto” of Guayra on the frontier of Paraguay, in 24° ., it is freely navigable. The fall of Guayrd, Sete-quedas, or Seven Falls, is the greatest cataract of Brazil. Immediately above it and below the large island which the Parana forms between 23° and 24° the river is about 2

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miles in width; its channel is contracted first in passing through a diagonal line of seven islands which stretches across it, and then between the walls of a rocky gorge only 65 yards in breadth, into which the whole mass of water plunges with terrific fury, descending over a slope inclined about 50°, and for a perpendicular height of about 60 feet, The roaring of the cataract

may be heard for many leagues round. Below the fall, the river rushes down in a narrow bed with high cliff-like banks, only becoming less rapid and navigable with difficulty as it leaves the Brazilian frontiey at the confluence of the Y-Guasti. This tributary, also named the Curityba, has a westward course to the Parana, from many heads in the inner side of the south coast range, and like all the tributaries of the Parana between it and the great fall, descends into the deep gorge of the main | river by a fine waterfall of 66 feet. |

The River Paraguay, the upper basin of which lies in q much lower region of the continent, in the south-western in- terior of Brazil, is far superior to the Parana in respect of ifs navigable qualities, and in the grand natural outlet it affords to the southward. Its sources are in several small lakes on the southern slope of the Serra das Vertentes, between 13° and 14°S., immediately opposite the head streams of the Tapajos, and it flows thence southward, fed by many lateral streams from the range. Its important tributary the Cuyabé, or Sao Lourengo, rises not far east of the Paraguay, but does not join it until both have passed about 400 miles south. The Taquari, the Mondego, and the Apa, the boun- dary river of Brazil and Paraguay, are important tribu- taries from the range which divides the basins of the Paraguay and Parana; and from the hills of eastern Bolivia the San Juan and Bahia Negra join the Paraguay on the right bank. Throughout its course the Paraguay affords uninterrupted navigation, and is regularly traversed by large Brazilian steamers from the Rio de la Plata to Curumbé, in the province of Matto Grosso, a distance of about 1000 miles in a direct line from Buenos Ayres. Thence smaller vesscls carry on a regular traffic for 300 miles further, by the Sao Lourenco tributary, to Cuyabd in the very heart of inner Brazil. An immense tract of the low country on each side of the upper Paraguay, called the Xarayes, between 17° and 19° lat., is subject to inundation in times of flood.

While the Amazon begins to rise in February or March, aud is at its highest flood in June, the Parana is irregular in its risings, but has its greatest volume in December, and the Paraguay again, regularly swelling and falling, is highest in June.

The surface of Brazil in respect to its elevation is divided Sin! into the higher region of plateaus, ridges, and broad ope «=f valleys, occupying the whole of the country south of the parallel of Cape 8. Roque, and the vast lowland plain of the Amazon, extending inland to the base of the Andes of Peru, Equador, and Columbia, and rising again in the d extreme north to the ranges which form the boundary with | Venezuela and Guiana.

The nucleus of the mountains and plateaus ot southern Mow Frazil is not centrally placed, but is formed by the chains # ‘ named the Serra da Mantiqueira and Serra do Espinhago, Ps which extend between 18° and 23° south lat., at a varying distance of from 100 to 200 miles from the south-east coast, These arc the highest and most important mountains of Brazil, from which the other ranges and plateaus radiate outwards north, west, and south; one of the summits of the Serra da Mantiqueira is the Pico do Itatiaiosst, which is almost certainly the culminating point of Brazil, but the elevation of its peak has been very variously estimated and measured at from 6250 to 8900 and 10,300 feet. Itacoluml, near the town of Ouro Preto, reaching about 5700 feet, and Itambe in the north of the Serra do Espinhago, 4300

feet, are the other high points of these ranges. The southern coastal range, or the Serra do Mar, begins immediately north of the Bay of Riode Janeiro, where the Oragos or Organ Mountains, with sharp peaks, rise to perhaps 7500 feet, and foilows the line of the shore south- ward at varying distances from it to near the 30th parallel. The line of the Serra do Espinhaco is prolonged northward by another maritime chain or plateau edge, more distant from the ocean, forming the eastern barrier of the great valley of the Rio Sao Francisco, and terminating where the river turns eastward to reach the sea.

A range of high plateaus, probably from 3000 to 4000 feet in general elevation, and named collectively the Serra das Vertentes, or the range of the watersheds, but bearing a multitude of different names in its local sections and branches, extends westward from the Serra do Espinhaco, nearly at right angles to its direction, traversing the entire country in curving lines inland for upwards of 2000 miles to where the plateaus of

Brazil terminate on the great bend, and the cataracts, of the Rio Madeira. This very extensive range divides the waters flowing northward to the lower Amazon and to the Atlantic shores of the north-east, from those tributary to the great basins of the Paraguay and Parana in the south. Its highest known portion is that called the Montes Pyreneos, between the heads of the Tocantins and Paranahyba in the province of Goyaz, one of the summits of which has been found to be perhaps 9600 feet above the sea (H. R. Dos Genettes, 1868). Long branches ramify northward and southward from the Vertentes ; the principal of those trending northward is that which, leaving the main line of division at the Pyreneos, curves round the basin of the Sao Francisco, terminating in many minor branches on the coast on each side of Cape 5. Rogue. A lateral branch from this divides the streams of the Tocantins and of the northern Paranahyba. Farther west the Cordillera Grande of Goyaz runs north from the Vertentes, separating the Araguaya and Tocantins, and still more inland minor ranges mark out the basins of the Xingu and Tapajos. A southward arm of the Vertentes, or rather a series of plateaus extending from it, divide the Paraguay from the Alto Parana, and run into Paraguay as the heights of Amambahy, which have an elevation of little over 2000 feet above the sea where they cross the frontier. These are the main lines of height, but over the whole of the plateau of Southern Brazil a great number of lesser ridges run out from these between each of the tributary river basins.

The extremely level character of the great northern lowlands may be judged of by this, that the banks of the Amazon where it enters Brazil at Tabatinga, more than 1500 miles in a direct line from the sea, are not more than 250 feet above the ocean level, and a continuous navigation is afforded by its tributary the Rio Negro, the Casiquiare, and the Orinoco, to the northern coast of the continent.

The great constituent of all the mountain ranges of the

Southern highlands of Brazil appears to be gneiss, varying

from schistose to coarse-grained and porphyritic, or homo- geneous and granitic ; and though much of it if seen in a small specimen would be and has been described as granite, the larger masses are always stratified. These rocks are of gteat thickness in the province of Rio, and the Serra do Mar

and Serra da Mantiqueira are wholly composed of them; not only does gniess form the great coast belt from Maranhao to the mouth of the Rio de la Plata, but it sends off a band into Minas Geraes and Goyaz, where the Pyreneos range and a great part of the mountain region are composed of it. The same rock shows itself in the cataracts of the Tocantins, Xingu, Tapajos, and Madeira, as well as in the Parima Moun- tains north of the Amazon basin, showing that the high land of Brazil is probably everywhere underlaid by it, Clay-slates

with auriferous veins occur in Minas Geraes and in the vicinity of Cuyab' in Matto Grosso, everywhere so meta- morphosed that all trace of fossils has been obliterated. True Carboniferous strata occur in Brazil, the coal basins lying just south of the tropic, and being a coast-formation not known northward of Rio. Carboniferous rocks also occur on the Guapore, a tributary of the Madeira on the Bolivian frontier. Red sandstones occupy-a large area in the province of Serigpe, underlying the Cretaceous forma- tion. The Jurassic rocks, which extend on the Andes froin: Chili to Peru, appear to be altogether wanting in Brazil. Cretaceous rocks very probably underlie the great plain of the Amazon ; they do not appear on the coast south of the Abrolhos rocks in 18° §., but they occur at intervals north- ward, and have been examined on an affluent of the River Purus in the upper basin of the Amazon. These appear to have heen deposited at a period when the northern part of Brazil was more depressed, while the southern may have been higher than itis now. 'Tertiary clays and ferruginous sandstone, in horizontal and undisturbed beds, overlie the Cretaceous rocks unconformably on the coast plains outside the plateaus and in the Sado Francisco valley; the hori- zontal deposits of the plateau of Sao Paulo evidently belong to the same group.

Surface "drift" deposits, ascribed with the greater amount of probability to the agency of glacial ice, though the hypothesis has been much disputed, occur as a great sheet of pebbles and overlying clay, extending over an im- mense area of the empire,—over the whole of the provinces south of Rio, over Minas Geraes in the north-eastern coast provinces, and in the valley of the Amazon westward to the confines of Peru, and not only on the hills but

over the lower ‘‘campos.” Deposits of immense boulders of trap and gneiss, evidently the moraines of former local glaciers, were first described by Professor Agassiz, who found them at many points along the coast land.

True coral reefs occur at irregular intervals along the northern Brazilian coast from the Abrolhos islets, which rise on the submerged border of the continent from a less depth than 100 feet, as far as the shores of Maranhio. They lie in patches at short distances from the coast, leaving navigable channels between them and the mainland. Another class of reefs, also termed “ recifes,” but of totally different origin, are the consolidated stone beaches, such as those seen at Porto Seguro, Bahia, and Pernambuco (where the reef forms the breakwater of the harbour) ; thesc are of precisely uniform character, and have been described by Professor Hartt as the consolidated cores of an ancient beach which has been separated from the mainland by the encroachment of the sea. (Geology and Physical Geography of Brazil, by Ch. Fred. Hartt, 1870.) The limestones of the upper Sao Francisco basin have celebrated bone caverns, which have been made a special object of study by the Danish naturalist Lund. In some of these the remains of extinct animals of high antiquity have been found, such as those of the mastodon, glyptodon, mylodon, toxodon, and megatherium ; and with these the stone implements and remains of man, so buried with the bones of the extinct fauna as to leave no doubt that man was conteniporaneous with them.

No volcanic appearances have been observed in Brazil. Warm Warm springs occur in several provinces; those of Itapi springs.

curt in the province of Bahia have temperatures varying from 88° to 106° Fahr. and are saline; the hot springs of pure water in Santa Catharina range from 96° to 113° Fahr., and there are a great number of alkaline springs about the district of Santa Cruz, in the province of Goyaz, ranging up to 119° in temperature. Near the village of Caldas in Minas Geraes the hot wells are very voluminous, and their somewhat stlphurous waters have temperatures between

MINERALS,

Diamonds,

106° and 113° Fahr. These are at an elevation of about 6000 feet above the sea.

The metallic and mineral products which occur in the geological formations above described are very various. Diamonds were first discovered in the Serra do Espinhago, in the vicinity of Diamantina, about 300 miles north of Rio, in 1786. In this neighbourhood there are shales, sandstones, and conglomerates; upon the sandstone there is or was a stratum of quartzite, still very distinct in many

: places, and among the sands created by the disintegration

Other gems,

Coal.

Sulphur,

of this rock, diamonds are found. This district is named the Chapada of Diamantina, a term applied to small elevated plateaus, usually consisting of horizontal deposits, aud sepa- rated by deeply eroded valleys. The diamond-producing soil extends along the Serra do Espinhago as far as the northern borders of the province of Minas, along the valley of the upper Belmonte, and in the interior of the province of Bahia, as well as in the mountains that lie south-west of the sources of the Sao Francisco. Diamonds of smaller value have also been found in the province of Goyaz (on the Rio Claro) ; in Matto Grosso, where the valley of the Paraguay about Cuyabd and Diamantino has diamonds in considerable abundance ; in Paranda, on the Rio Tibagy, a tributary of the Paran4-Panema; in Sao Pedro do Rio Grande do Sul; and in Sao Paulo ;—but the area of their distribution is far from being well ascertained. The dia- monds are generally obtained by washing; an excavation is made to reach the stratum called cascalho, a gravel com- posed principally of quartz and fragments of different rocks of the neighhourhood, and mixed with a reddish clay. The washers are seated either by a pond or running stream, and a portion of the gravel, being thrown into a large shallow wooden pan, is mixed with water and stirred

about in the current, so that the muddy water escapes and the gravel and sand remain. This is now passed through a sieve, which separates the larger gravel from the smaller ; the pebbles are then picked out, and the overseer exalining the sand easily selects any diamonds that may be present. The diamonds are often of considerable size. Burton mentions one found in the Chapada of Bahia weighing 764 carats, which when cut into a dropshaped brilliant proved to possess extraordinary play and lustre. Emeralds, sapphires, rubies, topazes, beryls, tourmalines (black, blue, or green), and amethysts are found, especially in the provinces of Minas Geraes, Garnets occur in great profusion, though of inferior quality. Rock crystals, perfectly pure and of large size, are obtained in Minas, Goyaz, Sao Paulo, and Parana ; opals, chalcedonies, agates, and carnelians are found nearly throughout the country, but have become an article of export chiefly from the banks of the Uruguay, in the pro- vince of Rio Grande do Sul.

One of the Brazilian coal basins lies in the province of Santa Catharina, between the plateau and the sea; and along the banks of the Tubarao, beds of bituminous coal of fair quality are exposed, and were first noticed in 1841. Three separate coal-fields have been traced in the province of Rio Grande do Sul: the largest is situated in the valley of the Jaguar&o (the boundary river with Uruguay), and in that of the Candiota, covering an area of about 50 miles by 30 miles; the second occurs in the valley of a tributary of the Rio Jacuahy, near the centre of the pro- vince; anda third near the village of Sao J eronymo, on the bank of the Jacuahy. The Candiota field is now being worked by an English company. At the Arroyo dos Ratos in the same province, mines have been worked on a small scale, the coal from which is used by the steam-boats which ply on the Lagoa dos Patos, or on the rivers. Bitumen is found in most of the provinces, and is worked near the south coast of the province of Babia.

Sulphur exists in a native state in the province of Rio

Grande do Norte, and in small quantity in Rio Grande do Sul, as wel] as at Furquim and Corrego do Ouro, in } the district of Minas Novas in Minas Geraes. Saltpetre saih., oceurs with salt over a large area of Minas Geraes and | Bahia, but is also abundantly formed in the floors of the calcareous

caves of the Rio Sao Francisco valley from the city of Ouro Preto downwards. Saline efflorescence js gq1! observed at innumerable localities in the drier portions of the Brazilian plateau ; efflorescences of nearly pure sul- phate of magnesia are also to be found in the valley of the Rio das Velhas in the Sao Francisco basin, and in the province of Ceara, where chloride of sodium also appears, |

Gold in Brazil is found in quartz veins traversing the old Gall metamorphic rocks, such as clay-slate, mica-slate, or iron | schist, in drift gravels and clays, and in alluvial sands and gravels derived from the wear of these. Most gold is afforded by the clay-slates traversed by auriferous quartz lodes, by the rock called Itacolumite (metamorphic rock of Lower Silurian age), and by certain iron ores known as Itabirite and Jacutinga, the latter described by Burton as _ a substance composed of micaceous iron schist and friable _ quartz, nixed with specular iron oxide of manganese and fragments of tale. Over a very large area of the province of Minas Geraes, in the vicinity .of Ouro Preto, the country is auriferous, aud here are the richest gold mines of Brazil. The celebrated Morro Velho mine is situated on the western side of the valley of the Rio das Velhas, not far from Sabard, and was at first worked by native miners, but afterwards with great success by a company, The mines of Gongo Soco lie about 20 miles east of Morro Velho, on the opposite side of the Velhas, and were at one time very productive. Another company owns a. tract of 21 square miles, not far from the Morro Velho. Other mines have been worked in this neighbourhood at the Morro de Sta Anna, at Maquiné near it, and in the Serra of Cata Branca, 2 miles east of the village of Corrego Seco, These mines with two exceptions have proved failures in working, after a period of success, and this notoriously from bad management. The mines, however, are very far from being exhausted; indeed the underground wealth of the country is as yet almost untouched. Much of the remaining portion of the province of Minas, and especially the upper basin of the Sao Francisco, is auriferous. Ja Northern Brazil the only gold mine yet opened is that of Tury-assi in the province of Maranhio; but concessions for working gold have been granted by Government im mauty parts of the provinces of Bahia, Pernambuco, Parahyha, Piauhy, Goyaz, Ceara, and S. Paulo. In southern Brazil gold is known at Cagapava, Rio Pardo, Sta. Maria, and Cruz Alta, in the province of Rio Grande do Sul; and at the first-named locality a Brazilian company is

carrying on the work of mining. Gold washings occur in almost every province, but especially in the district of Minas Novas, 200 miles north of Ouro Preto, where the metal is found in grains or nuggets in a cascalho of quartz pebbles, often cemented into a conglomerate by iron oxide. ‘hey are carried on, however, in the rudest and most irregular way, and with more modern appliances might prove very remun- erative. gq

The gold of Brazil is always alloyed with silver, and this 5ilv metal is present in many vf the galenic formations which are known in almost every province, as well as with the copper in the mines of Rio Grande do Sul. At the hill of Aragoiva, in the municipality of Sorocaba in Sao Paulo, silver was extracted nearly two centuries ago. Rich mines Mer} of mercury occur in the province of Parand not far from | the capital. Copper is abundant in the provinces of Matto? Grosso, Goyaz, and Minas, near the capital of Bahia,in | Maranhio and Ceard, but chiefly in Rio Grande do Sul, where at Santo Antonio das Lavras, in the municipality of

Oxeapava, there are the richest copper mines of Brazil, the mineral from which yields 60 per cent. of pure metal.

Manganese exists in abundance in the vicinity of Nazareth, at the head of the estuary of the Jaguaripe, adjoining the bay of Bahia. Galena mines are in operation in many parts of the empire ; the chief are those of Iporanga, Sotocaba, Iguapé in the province of Sao Paulo, and those of the Rio Abaeté and Sete Lagéas, the most productive of all, in the province of Minas. Lead mines also exist along the whole coastal region from Santa Catharina to Maran- hao, those of the hill chain of Ibiapaba on the borders of Ceara and Piauhy being important.

Every part of Brazil contains iron, in ore or in other forms, and an almost unlimited quantity appears to exist in the mountains of Minas Geraes, At Sao Joao de Ipanéma, in §. Paulo, there are heavy deposits of magnetic iron, which are mined and smelted almost on the spot ; and other seams of like character appear in the provinces of Alagéas, Ceara, Rio Grande do Norte, and Parahyba. Some of the Brazilian mines are quite free from pyrites. In 1810 a company of Swedish miners and founders settled at Ipa- néma, and erected two small refining furnaces. In 1817 they produced nearly 4000 arrobas of iron, which was manufactured on the spot into horses’ shoes,

nails, locks, and other articles. There is now a very considerable establishment, at which moulding and refining is carried on, the woods of the neighbourhood furnishing an abundant supply of charcoal. A railway is projected to unite the works with S. Paulo and its port, Not far from these mines there are extensive quarries of marble of valuable sorts.

A country sp extensive as Brazil, and so diversified in its surface, necessarily exhibits a considerable variety of climate. The great northern lowland lying entirely within the tropics has great heat, and its year is divided between the simple wet and dry seasons. The elevation of the central and southern highland of Brazil introduces great variety in the seasons and climates of the intertropical portion of that region ; and towards the south beyond the tropic a tem- perate zone is reached in which four seasons are marked, though not so distinctly as in central Europe. The whole wide plain of the Amazon basin has its rainy season from January or December till May or June, the remaining half of the year being dry, though intervals'of fine weather may occur within the wet period, and of showers in the dry season. The fall during the rainy months is excessive, raising the level of the great river full 40 feet, and much thunder and lightning always accompanies. the heavy rain. This belt of single rainy and dry season appears to terminate about the line of the River Paranahyba, between the pro- vinees of Maranhao and Piauhy ; at the town of Maranhao the annual fall has been found to be on an average 280 inches, Inland, across the higher southern watershed of the Amazon, from the interior of the provinces"of Maranhao and Piauhy, over Goyaz and northern Matto Grosso as far as the falls of the Madeira, the rainy seasons follow the passage of the sun towards and away from the southern tropic, and occur from October or November to March or April, with more or less marked intervals of drier weather.

In lower Maranhao showers also occur in October, and are called the 'Cashew rains.' On the north-east coast slope, in the provinces of Ceara, Rio Grande do N orte, and northern Bahia, the rains appear to be governed by the prevalence of the north-east winds from the Atlantic, and oceur from March or April to June, July, or August. The coastal region from southern Bahia to Sio Paulo and the Sao Francisco valley have again a more or less marked doublé rainy season between October and April or May; the

heaviest rains occur in the Sao Francisco valley from January to May, the highest freshets of the river being in

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March ; the coast rivers, such as the Rio Doce, rise first in December, and again to an almost equal swelling in March. At Pernambuco the amount of the annual rainfall is up- wards of 100 inches; at Rio de Janeiro it has decreased to 59 inches, and a gradual diminution of the quantity is observed from the Amazon southward. In Sao Paulo the rainy season is, in summer, from November till April, the greatest quantity of rain falling in January. In Sta. Catharina the rains begin to be irregular, and from this to the southward over Rio Grande do Sul the four seasons of the temperate zone begin: to be distinguishable. The whole country is, as a rule, abundantly watered, the only portion which may suffer from drought being that of the interior between the Sao Francisco and the Paranahyba, where extraordinary dryness has sometimes prevailed.

In temperature the vast Amazon basin is remarkable for Tempera- the small seasonal variation of heat, accounted for by its ture.

equatorial position and immense surface of water and forest ; within its limits the thermometer at its highest readings averages 90° and the lowest 75°. At Para the register kept by Costa Azevedo between 1861 and 1867 gave a mean temperature of 80°, a maximum of 95°, and a minimum of 68°. Observations are very deficient for the greater portion of the empire. About the Falls of the Madeira, Keller estimates the mean annual temperature at 77°, with but small variation in the seasons. In the latitude of Rio de Janeiro the’summer or January tempera- ture near the sea-level has an average of about 75°, that of July descending to about 65°; and in the extreme southern provinces the corresponding figures may fall to 70° and 50° Fahr. in summer and winter. But an immense variety of temperature and climatic condition are found on the central and southern table-lands and mountain ranges of Brazil, from the hot and humid air of the coast to the mountains

where in winter it frequently snows, and where lakes may be covered with a coating of ice. In the high plains of Rio Grande and Sio Paulo the thermometer may also fall to below the freezing point.

The prevalent winds of the greater portion of Brazil are Winds.

the trade-winds from the east, which, gathering the vapours from the whole breadth of the equatorial Atlantic, give out their excessive moisture over the northern forest plains of the Amazon, reaching inland as far as the high wall of the Andes. The east winds are strongest in the Amazon valley from July till November, mitigating the heat of the dry season. On the maritime regions of central Brazil the north-east or south-east trades prevail according to season. In the far interior the general winds take a more north and south direction, blowing usually from the south when the sun is in the northern tropic and from the north during summer. Land and sea breezes are very constant along the coasts. At the mouth of the Sao Francisco, for example, the morning is still and calm; about nine o’clock a breeze steals over the water, rippling its surface and ‘gradually increasing to a stiff wind about noon ; the breeze continues steadily till night-fall, when it again falls calm.

With the exception of the marshy banks of some of the Health.

rivers and the lowlands and swamps, where intermittent fevers are very prevalent, the country is generally healthy. On the sea-coast and inland in some of the maritime pro- vinces, epidemics of yellow fever and cholera morbus have been experienced since 1850. The mortality in the most populous towns of Brazil is not, however, above but rather below that of the large cities of Europe.

The broadly-marked features given to the landscape by Vearra- the vegetations of different characters in Brazil are distin- T!0™-

guished by several names, J/attas or heavy forests cover

the immense northern lowland which is watered by exces-

sive rains, and these occur also in belts of greater or less

width over the lower portions of the central and southern IV. — 29

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region. Catinga is the general name applied to the lower growing and open woods of the slopes of the Brazilian highland which lose their leaves in the dry season. ‘These merge into the wide open plains or gently rounded hills and ridges, covered with grass or scattered bushes, which are called the Campos geraes. The systematic burning over of these great grass lands, to allow the young crop to appear, has completely destroyed in them all trees and shrubs which cannot bear the scorching, and so has wrought a great alteration in the flora of these regions. The name Sertdo, meaning originally the interior as distinguished from the maritime country, has come to be applied to dry, hilly, and stony districts of the campos only suited for pasture. To the agricultural coast belt of the eastern provinces the name Beira mar is given.

Except on the loftiest mountains, and on the wide sertdos, the vegetation of Brazil is luxuriant beyond description. In the mountain passes in the neighbour- hood of the sea-shore, the conjoint effects of heat and moisture produce a superfluity of vegetable life, which man’s utmost efforts cannot restrain. Trees split for paling in the neighbourhood of Rio Janeiro send forth shoots and branches immediately, and this whether the position of the fragments be that in which they originally grew, or inverted. On the banks of the Amazons the loftiest trees destroy each other by their proximity, and are bound together by rich and multiform lianes. In the province of Maranhio, the roots, grasses, and other plants extending from the shores of pools, weave themselves in time into a kind of vegetable bridge, along which the passenger treads, unaware that he has left the firm earth, until the jaws of a cayman protrude through the herbage be- fore him. The vegetable productions of Brazil have a strong analogy with those of Guiana. The most common are the Composite, Leguminose, Euphorbiacee, Rubiacee, Aroidece, and ferns of the niost varied forms. The vegetation of the valleys differs from that of the campos, as it again does from that which occurs in the sertdos. Along the coast, the mangroves are the most numerous and prominent species. The most marked peculiarity of this class of plants is, that the seeds begin to shoot before they drop from the parent plant, and that

the drooping branches strike roots into the soil, They are never found inland except where the surface is scarcely elevated above the level of the sea. They flourish from Rio Grande do Sul to Maranhio, convert- ing the land into a morass wherever they are allowed to flourish unmolested. Immediately behind them numerous families of palms raise their graceful heads. The under- wood in the neighbourhood of Rio Janeiro consists principally of crotons. Every large river of Brazil has its own appropriate form of vegetable life, giving a peculiar character to its banks. The vegetation of the Amazon may be divided into three classes ;—(1) that which we find on the islands, (2) the vegetation upon the banks overflowed at regular intervals by the stream, and (3) that which stands high and dry. The difference between them consists in the character of the bark and the species of the plants. Brushwood and herbage are nowhere to be seen ; everything tends to the gigantic in size. The most various forms group awkwardly together, crossed and intertwined with leaves. The preponderance of trees with feathery foliage, and with glossy, fleshy leaves, lends alternately a tender and a luxuriant character to the scene, which is in every other respect painful from its monotony. Representatives of the most estranged natural families grow side by side. It is only on the islands, where the willow and some other plants: are found in numbers, that we are reminded of the uniformity of our northern vegetation. Cocoa trees and the vanilla, Capsicum frutescens, and different kinds of pepper, the cinnamon tree, and Brazilian cassia abound. The

flora of all the tributaries of the Amazon is similar to what we have described, until the traveller ascends above the falls, and finds himself in another region. The sources of the Madeira alone offer a partial exception, retaining a vegetation indicative of extensive plains, lakes, and morasses, The vegetation of the southern campos (corresponding to the North American prazries) is widely different. On the plains of the southern provinces we find scattered about strong tufts of greyish-green and hairy grasses, springing from the red clay. Mingled with these are numerous herbaceous flowers, of the most varied colours and elegant forms. At intervals small groves of trees, seldom exceed- ing 20 feet in height, so distant that the individual form of each is easily recognized, with spreading

fantastic branches and pale green leaves, break the monotony of the scene, Solitary myrtles, numerous varieties of pleasing fruits, and now and then a cactus, add to the variety. A similar vegetation, but with a richer variety of plants, occurs ip the diamond district. On the western declivity of the Serra do Mar, and along the upper banks of the Rio Sao Francisco, extends a wooded “ catinga ” country, of a character entirely different from that which is found in the valleys below. Malve, Euphorbiacee, Mimose, and the like, are the prevailing types on the Rio Francisco; cactuses, palms, and ferns abound on the Serra do Mar. In this latter district the ipecacuanha flourishes best. It is, however, in the glowing steppes of Pernambuco that we find the cactus predominant. In the valley of the Paraguay the most striking feature is presented by the water plants, which in one river are sufficiently strong to impede the navigation of a stream both deep and broad.

The forests of Brazil contain almost every species of useful and ornamental wood, The cocoa-tree is found in great quantities in the provinces on the sea-shore, and furnishes one of the most important items of internal com-

merce. A considerable surplus of cocoa is annually exported.

One of the most valuable sorts of timber is furnished by the Ibiripitanga or Brazil-wood (Cesalpinia brasiliensis), which yields a fine red dye. The wood itself is very hard and heavy, and takes a beautiful polish. It! grew at one time in great abundance along the coast; but being a Government monopoly (thence called pao da rainho, Queen’s wood), it was cut down in a reckless manner, and is now by no means so abundant as it once was. The other trees most worthy of mention are the jaracandé or rosewood tree, the trumpet-tree (Secropia peltata), the laurel, the soap-tree, the tapia or garlic pear-tree, and the whole family of palms. Of these the Carnauba Palm (Copermtcia certfera), which grows in the north-east coastal province, 1s perhaps the most useful tree of Brazil ; every part of it 1s valuable, and the wax yielded by its leaves is now a considerable article of trade. Not least important is the Siphonia elastica, or caoutchouc tree, which during the season is tapped every day, and furnishes in considerable quantities a gum which is poured into moulds; the export of this product from Brazil averages a value of more than £1,000,000 annually. The banana is one of the most useful of all the trees that grow in Brazil, and its fruit 18 the chief

food of the native Indians. The fruits of Brazil are numerous and excellent. The best of these are the pine-apple, the mango, the custard-apple, the guava, and the various kinds of melons and nuts.

In an empire of such vast extent as Brazil, embracing asit es does every variety of temperature and elevation, the valne?

and importance of the agricultural products cannot fail to be very great. Sosmall, however, is the number of farmers, compared with the extent of the soil, that it 18 believed that not one acre in 200 is under cultivation. In some provinces, especially those near the sea, the quantity of grain raised is not sufficient to supply the

demand, aud thus large quantities of wheat are annually imported from the United States. The reason of this is that the soil under tillage is occupied in the production of articles for foreign markets. The chief products of Brazil are cofiee, sugar, cotton, manioc or cassava flour, tobacco, rice, maize, fruits, and spices. Of these by far the most important now is coffee, while sugar ranks next in value, and cotton after sugar. The coffee plant, introduced from Arabia into the French colony of Cayenne in 1722, was soon after brought to Brazil; but it was not until 1810 that Brazilian coffee came to be highly valued in the European markets. In that year, however, Dr Lecesne, a planter, expelled by the revolution from San Domingo, settled near Rio, and introduced the most improved methods of rearing the coffee-plant. So successful has the result of the new system been, that its cultivation now extends from the Amazon to Sao Paulo; and whereas in 1818 the annual exports of coffee did not amount in value to £240,000, in 1873 the exports were worth nearly £13,000,000. The cultivation of sugar has not increased nearly in the same proportion as that of coffee, and in recent years a disease of the cane has affected the cultiva- tion seriously. It is produced in greatest quantity in the districts adjoining Bahia. The quantity of sugar exported in 1850 was 16,200 bales, representing a value of about £1,700,000; in 1873 the value of the exports was £3,120,000. Cotton is found to thrive best in the dry table-lands of the northern provinces, especially in Maranhao and Pernambuco. Its quality is considered excellent ; but the rude and expensive method of its culture, and

the high rates of carriage in these inland districts, operate very unfavourably for this branch of traffic. The annual value of cotton exported is not much above £3,000,000. The – Ilex curitibensis, and other varieties of the holly, which yields the yerba maté, or Paraguay tea, are indigenous to the southern provinces of Rio Grande, Santa Catharina, and Parana. Some attempts have been made towards the cultivation of this product, but the greater part of the tea is rudely made from the tree in its wild state in the woods. The amount annually exported to the River Plate averages between £300,000 to £400,000 in value. Tobacco is chiefly cultivated in the provinces of Bahia, Minas, 8. Paulo, and Pard, and in some localities of Riode Janeiro. Though it is inferior in quality to that of the West Indies, it is exported to the value of between £700,000 and £800,000 annually, The cultivation of cocoa, hitherto obtained from the valleys of the Amazon and Tocantins, is increasing in the provinces of Bahia and Ceard. Rice grows in consider-

able quantities, and not being much used by the natives

for food, a large surplus remains for exportation. The cassava or manioc is extensively grown, and forms the staple food of the lower classes. The root, which is the part of the plant used for this purpose, contains a deadly poison, It is easily expelled, however, by the action of fire, and the residuum is ground into a wholesome and nutritious flour or farina. Tapioca, which is extensively used in Europe, is a preparation of the starch from the root of the cassava.

The varieties of animated life in Brazil are more numerous perhaps than in any other region in the world. Of beasts of prey, the most formidable are the jaguar or South American tiger, the ocelot, the tiger-cat, the puma, the guara or red wolf, and the Brazilian fox or wild dog. Large herds of the peccary roam in the forests, in which also is to be found the tapir or anta, the largest South American mammal. The capivara, or water hog, abundant on the river banks, is the largest known rodent. Diverse species of deer inhabit the campos; representing the Edentata there are several species of armadillos and ant-eaters, and the sloths ; and of the Marsupialia, several species of opossum

occurring over the whole of Brazil. The varieties of the monkey tribe that abound in the forests appear to be almost infinite. The largest belong to the genus Stentor, including the guaribas or howling monkeys. The Simia jacchus has never been seen elsewhere. There are several varieties of bats, of which the Vespertilio leporinus and the V. spectrum are the largest. No less immense is the variety of birds, from the owra, an eagle far larger than our most powerful birds of prey, to the humming-bird, no larger than a bee. The rhea, a species of ostrich, is found in Brazil. The Bra- zilian birds are celebrated for the beauty of their plumage. “ Red, blue, and green parrots,” says Malte-Brun, “ frequent the tops of trees. The gallinaceous jaczs, the hoccos, and different kinds of pigeons, haunt the woods. The orioles resort to the orange groves; and their sentinels, stationed at a distance, announce with a screaming noise the ap- proach of man. Chattering manakins mislead the hunter ; and the metallic tones of the uraponga resound through the forest like the strokes of a hammer on an anvil, The toucan (Ramphastos) is prized for its feathers, which are of a lemon and bright red colour, with transverse stripes reaching to the extremities of the wings. The different species of humming birds are more numerous in Brazil than in any other country of America. One sort is called by the people the Granthe engera or winged flower.” Snakes of every kind abound in the marshy districts, some of which, such as the rattlesnake and the jararaca, are remarkably: venomous; while others, such as the boas, attain an enormous size and strength. A vast number of troublesome insects infest the margins of all the great rivers. Of these the most formidable is the puim, which is so small as to be scarcely visible, and inflicts a most painful and even dangerous bite. The red ant is peculiarly destructive to vegetation, and whole districts are sometimes laid waste by its ravages. The spider here attains an enormous size, but is not so venomous as might be expected from its ap- pearance. The gayest butterflies flutter through the air,— the blue shining Menelaus, the Adonis, the Nestor, and the Laertes. More than ten species of wild bees have been observed in the woods, and the greater number produce honey. The Cactus coccinellofer, and the insect peculiar to it, are found in the province of §. Paulo. Lizards and caymans abound. The quantity of turtle in the Amazon and its principal tributaries is almost incredible. The waters swarm with fish in thousands of species, many of which have not yet been described. Among the largest is the Pira ruct, the principal food of large numbers of the people of Paré and Amazonas. Of domestic animals, the

most important are the horse, the ex, and the sheep. Vast numbers of horses, sprung from the original European stock, roam at large over the extensive plains of the southern provinces. They are generally found in droves of twenty or thirty. Oxen are also allowed to wander half wild. They are hunted down with the /asso in great numbers, and are valued chiefly on account of their hides, horns, and tallow, which are exported in immense quantities. The chief cattle-breeding districts of Brazil are the island of Marajo in Para, Goyaz, Matto Grosso, Piauhy, 8. Paulo, Minas, Paranda, and Rio Grande do Sul. Sheep do not thrive in Brazil at all so well as the larger kinds of cattle.

Brazil was discovered in 1499 by Vincent Yafiez Pingon, a companion of Columbus. He descried the land near Cape St Augustine, and sailed along the coast as far as the River Amazon, whence he proceeded to the mouth of the Orinoco. He made no settlement, but took posses- sion of the country in the name of the Spanish Govern- meut, and carried home, as specimens of its natural productions, some drugs, gems, and Brazil-wood. Next year the Portuguese commander, Pedro Alvarez Cabral,

appointed by his monarch to follow the course of Vasco de Gama in the East, was driven by adverse winds so far from his track, that he reached the Brazilian coast, April 24, and anchored in Porto Seguro (16° S. lat.) on Good Friday. On Easter day an altar was erected, mass cele- brated in presence of the natives, the country declared an apanage of Portugal, and a stone cross erected in com- memoration of the event. Cabral despatched a small vessel to Lisbon to announce his discovery, and, without forming any settlement, proceeded to India on the 3d of May. On the arrival of the news in- Portugal, Emanuel invited Amerigo Vespucci to enter his service, and despatched him with three vessels to explore the country. This navigator’s first voyage was unsuccessful ; but in a second he discovered a safe port, the site of which is not accurately known, to which he gave the name of All-Saints. He remained there five months, and maintained a friendly intercourse with the natives. Some of the party travelled forty leagues into the interior. Vespucci erected a small fort, and leaving twelve men, with

guns and provisions, to garrison it, embarked for Portugal, having loaded his two ships with Brazil-wood, monkeys, and parrots.

The poor and barbarous tribes of Brazil, and their country, the mineral riches of which were not immediately discovered, offered but few attractions to a Government into the coffers of which the wealth of India and Africa was flowing, Vespucci's settlement was neglected. For nearly thirty years the kings of Portugal paid no further attention to their newly-acquired territory than what consisted in combating the attempts of the Spaniards to occupy it, and dispersing 'the private adventurers from France who sought its shores for the purposes of commerce. The colonization of Brazil was prosecuted, however, by subjects of the Portuguese monarchy, who traded thither chiefly for Brazil- wood. The Government also sought to make criminals of some use to the state, by placing them in a situation where they could do little harm to society, and might help to uphold the dominion of their nation.

The first attempt on the part of a Portuguese monarch to introduce an organized government into his dominions was made by Joio ILI. He adopted a plan which had been found to succeed well in Madeira and the Azores,—

dividing the country into hereditary captaincies, and

granting them to such persons as were willing to undertake their settlement, with unlimited powers of jurisdiction, both civil and criminal. Each captaincy extended along fifty leagues of coast. The boundaries in the interior were undefined. The first settlement made under this new system was that of S. Vincente Piratininga, in the present province of S. Paulo. Martim Affonso de Sousa, having obtained a grant, fitted out a considerable armament, and proceeded to explore the country in person. He began to survey the coast about Rio de Janeiro, to which he gave that name, because he discovered it on the first of January 1531. He proceeded south as far as La Plata, naming the places he surveyed on the way from the days on which the respective discoveries were made. He fixed upon an island, in 244° §. lat., called by the natives Guaibe, for his settlement. The Goagnazes, or prevailing tribe of Indians in that neighbourhood, as soon as they discovered the intentions of the new comers to fix themselves permanently

there, collected for the purpose of expelling them. Fortunately, however, a shipwrecked Portuguese, who had lived many years under the protection of the principal chief, was successful in concluding a treaty of perpetual alliance between his countrymen and the natives. Finding the spot chosen for the new town inconvenient, the colonists removed to the adjoining island of S. Vincente, from which the captaincy derived its name. Cattle and the sugar- cane were at an early period introduced from Madeira,

and here the other captaincies supplied themselves with both.

Pero Lopes de Sousa received the grant of a captaincy, and set sail from Portugal at the same time as his brother, the founder of 8. Vincente. He chose to have his fifty leagues in two allotments. That to which he gave the name of S. Amaro adjoined 8. Vincente, the two towns being only three leagues asunder. The other division lay much nearer to the line between Faraiba and Pernambuco, He experienced considerable difficulty in founding thig second colony, from the strenuous opposition of a neigh bouring tribe, the Petiguares; but at length he succeeded in clearing his lands of them: ; and not long afterwards he perished by shipwreck.

Rio de Janeiro was not settled till a Jater period; and for a considerable time the nearest captaincy to S. Amaro, sailing aleng the coast northwards, was that of Espiritu Santo. It was founded by Vasco Fernandes Coutinho, who having acquired a large fortune in India, sunk it in this scheme of colonization. He carried with him no less than sixty fidalgos. They named their town by anticipation, Our Lady of the Victory; but it cost: them some hard fighting with the Goagnazes to justify the title.

Pedro de Campo Tourinho, a nobleman aud excellent navigator, received a grant of the adjoining captaincy of Porto Seguro. This, it will be remembered, is the spot where Cabral first took possession of Brazil. The Tupino- quins at first offered some opposition; but having made peace, they observed it faithfully, notwithstanding that the oppression of the Portuguese obliged them to forsake the country. Sugar-works were established, and considerable quantities of the produce exported to the mother country.

Jorge de Figueiredo, Hscrivam da Fazenda, was the first donatory of the captaincy of Ilhéos, 140 miles S. of Bahia. His office preventing him from taking possession in person, he deputed the task to Francisco Romeiro, a Castilian, The Tupinoquins, the most tractable of the Brazilian tribes, made peace with the settlers, and the colony was founded without a struggle.

The coast from the Rio 8. Francisco to Bahia was granted to Francisco Pereira Coutinho; the bay itself, with all its creeks, was afterwards added to the grant, When Coutinho formed his establishment, where Villa Velha now stands, he found a noble Portuguese living in the neighbourhood who, having been shipwrecked, had, by means of his fire-arms, raised himself to the rank of chief among the natives. He was surrounded by a patriarchal establishment of wives and children; and to him most of the distinguished families of Bahia still trace their lineage. The regard entertained by the natives for Caramaru (signi- fying man of fire) induced them to extend a hospitable welcome to his countrymen, and for a time everything went on well, Coutinho had, however, learned in India to be an oppressor, and the Tupinambas were the fiercest and most powerful of the native tribes. The Portuguese were obliged to abandon their settlement; but several of them returned at a later period, along with Caramaru, and thus a European community was established in the district.

Some time before the period at which these captaincies were established, a factory had been planted at Pernambuco A ship from Marseilles took it, and left seventy men in it as a garrison; but being captured on her return, and carried into Lisbon, immediate measures were taken for reoccupying the place. The captaincy of Pernambuco was granted to Don Duarte Coelho Pereira as the reward of his services in India. It extended along the coast from the Rio S. Francisco, north- ward to the Rio de Juraza. Duarte sailed with his wife and children, and many of bis kinsmen, to take possession of his new colony, and landed in the port of Pernambuco. To the town which was there founded he gave the name of

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Olinda. The Cabetes, who possessed the soil, were fierce and pertinacious ; and, assisted by the French, who traded to that coast, Coelho had to gain by inches what was granted him by leagues. The Portuguese managed,

however, to beat off their enemies ; and, having entered into an alliance with the Tobayanes, followed up their success.

Attempts were made about this time to establish two other captaincies, but without success. Pedro de Goes obtainéd a grant of the captaincy of Paraiba between those of S. Vincente and Espirito Santo; but his means were too feeble to enable him to make head against the aborigines, and the colony was broken up after a painful struggle of seven years. Joao de Barros, the histcrian, obtained the captaincy of Maranhaio. For the sake of increasing his capital, he divided his grant with Fernan Alvares de Andrada and Aires daCunha. They projected a scheme of conquest and coloni- zation upon a large scale. Nine hundred men, of whom one hundred and thirteen were horsemen, embarked in ten ships under the command of Aires da Cunha, But the vessels were wrecked upon some shoals about one hundred leagues to the south of Maranhao ; the few survivors, after suffering immense hardships, escaped to the nearest settlements, and the undertaking was abandoned.

By these adventurers the whole line of Brazilian coast, from the mouth of La Plata to the mouth of the Amazon, had become studded at intervals with Portuguese settle— nents, in all of which law and justice were administered, however inadequately. It is worthy of observation, that Brazil was the first colony founded in America upon an agri- cultural principle, for until then the precious metals were the exclusive attraction. Sufficient capital was attracted between the year 1531 (in which De Sousa founded the first captaincy) and the year 1548 to render these colonies an object of importance to. the mother country. Their organization, however, in regard to their means of defence against both external aggression and internal violence, was extremely defective. Their territories were surrounded and partly occupied by large tribes of savages. Behind them the Spaniards, who had an establishment at Asuncion, had penetrated almost to the sources of the waters of Paraguay, and had succeeded in establishing a communica. tion with Peru. Orellana, on the other hand, setting out from Peru, had crossed the mountains and sailed down the Amazon. Nor had the French abandoned their hopes of effecting an establishment on the coast.

The obvious remedy for these evils was to concentrate the executive power, to render the petty chiefs amenable to one tribunal, and to confide the management of the defensive force to one hand. In order to this the powers of the several captains were revoked, whilst their property in their grants was reserved to them. A governor-general Was appointed, with full powers, civil and criminal. The judicial and financial functions in each province were vested in the Ouvidor, whose authority in the college of finance was second only to that of the governor. Every colonist was enrolled either in the Afilievas or Ordenanzas. The former were obliged to serve beyond the boundaries of the province, the latter only athome. The chief cities received municipal constitutions, as in Portugal. Thome de Sousa was the first person nominated to the important post of governor-general. He was instructed to build a strong city in Bahia and to establish there the seat of his government. In pursuance of his commission he arrived at Bahia in April 1549, with a fleet of six vessels, on board of which Were three hundred and twenty persons in the king's pay, four hundred convicts, and about three hundred free colonists. Care had been taken for the spiritual wants of the provinces by associating six Jesuits with the expe- dition,

Old Caramaru, who still survived, rendered the governor

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essential service by gaining for his countrymen the good will of the natives. The new city was established whiere Pahia still stands. Within four months one hundred houses were built, and surrounded by a mud wall. Sugar plantations were laid out in the vicinity. During the four years of Sousa's government there were sent out at different times supplies of all kinds, female orphans of noble families, who were given in marriage to the officers, and portioned from the royal estates, and orphan boys to be educated. by the Jesuits. The capital rose rapidly in importance, and the captaincies learned to regard it as a common head and centre of wealth. Meanwhile the Jesuits undertook the moral and religious culture of the natives, and of the scarcely less savage colonists. Strong opposition was at first experienced from the gross ignorance of the Indians, and the depravity of the Portuguese, fostered by the licen- tious encouragement of some

abandoned priests who had found their way to Brazil. Over these persons the Jesuits had no authority; and it was not until the arrival of the first bishop of Brazil in 1552, that anything like an efficient check was iinposed upon them. Next year Sousa was suc- ceeded by Duarte da Costa, who} brought with him a reinforcement of Jesuits, at the head of whom was Luis de Gran, appointed, with Nobrega the chief of the first mis- sion, joint provincial of Brazil.

Nobrega's first act was one which has exercised the most beneficial influence over the social system of Brazil, namely, the establishment of a college on the then unre- claimed plains of Piratininga. It was named S. Paulo, and has been at once the source whence knowledge and civiliza- tion have been diffused through Brazil, and the nucleus of a colony of its manliest and hardiest citizens, which sent out successive swarms of hardy adventurers to people the interior. The good intentions of the Jesuits were in part frustrated by the opposition of Duarte the governor; and it was not until 1558, when Mem de Sa was sent out to supersede him, that their projects were allowed free scope.

Rio de Janeiro was first occupied by French settlers. Nicholas Durand de Villegagnon, a bold and skilful seaman, having visited Brazil, saw at once the advantages which might accrue to his country from a settlement there. In order to secure the interest of Coligny, he gave out that his projected colony was intended to serve as a place of refuge for the persecuted Huguenots. Under the patronage of that admiral, he arrived at Rio de Janeiro in 1558 with a train of numerous and respectable colonists. As soon, however, as he thought his power secure, he threw off the mask, and began to harass and oppress the Huguenots by every means he could devise. Many of them were forced by his tyranny to return to France; and ten thousand Protestants, ready to embark for the new colony, were deterred by their representations. Villegagnon, finding his force much diminished in conse- quence of his treachery, sailed for France in quest of recruits ; and during his absence the Portuguese governor, by order of his court, attacked and dispersed the settle- ment. For some years the French kept up a kind of busli warfare ; but in 1567 the Portuguese succeeded in estab- lishing a settlement at Rio.

Mem de Sa continued to hold the reins of government in Brazil upon terms of the best understanding with the clergy, and to the great advantage of the colonies, for fourteen years. On the expiration of his power, which was nearly contemporary with that of his life, an attempt was made to divide Brazil into two governments; but this having failed, the territory was reunited in 1578, the year in which Diego Laurengo da Veiga was appointed governor. At this time the colonies, although not yet independent of supplies from the mother country, were in a flourishing condition; but the usurpation of the crown

of Portugal by Philip II. changed the aspect of affairs. Brazil, believed to be inferior to the Spanish possessions in mines, was consequently abandoned in comparative neglect for the period intervening between 1578 and 1640, during which it continued an apanage of Spain.

No sooner had Brazil passed under the Spanish crown, than English adventurers directed their hostile enterprises against its shores. In 1586 Witherington plundered Bahia ; in 1591 Cavendish burned S. Vincente; in 1595 Lancaster took Olinda. These exploits, however, were transient in their effects. In 1612 the French attempted to found a permanent colony in the island of Marajo, where they succeeded in maintaining themselves till 1618. This attempt Jed to the erection of Maranhdo and Para into a separate Hstado. But it was on the part of the Dutch that the most skilful and pertinacious efforts were made for securing a footing in Brazil; and they alone of all the rivals of the Portuguese have left traces of their presence iu the national spirit and institutions of Brazil.

The success of the Dutch East India Company led to the establishment of a similar one for the West Indies, to which a monopoly of the trade to America and Africa was granted. This body despatched in 1624 a fleet against Bahia. The town yielded almost without a struggle. The fleet soon after sailed, a squadron being detached against Angola, with the intention of taking possession of that colony, in order to secure a supply of slaves. The Portuguese, in the meanwhile, began to collect for the pur- pose of expelling the permanent intruders, and the hearty co-operation of all the natives against the invaders having been obtained through the descendants

of Caramaru, the Dutch were obliged to capitulate in May 1625. The honours bestowed upon the Indian chiefs for their assist- ance in this war broke down in a great ineasure the barrier between the two races ; and there is at this day a greater admixture of their blood among the better classes in Bahia than is to be found elsewhere in Brazil.

In 1630 the Dutch attempted again to effect a settle- ment ; and Olinda yielded after a feeble resistance. They were unable, however, to extend their power beyond the limits of the town, until the arrival of Count Maurice of Nassau in 1630. His first step was to introduce a regular government amoug his countrymen ; his second, to send to the African coast one of his officers, who took possession of a Portuguese settlement, and thus secured a supply of slaves. In the course of four years, the limited period of his government, he succeeded in confirming the Dutch supremacy along the coast of Brazil from the mouth of the S. Francisco to Maranhaio. He promoted the amalgamation of the different races, and sought to conciliate the Portu- guese by the confidence he reposed in them. His object was to found a great empire; but this was a project at variance with the wishes of his employers —an association of merchants, who were dissatisfied because the wealth which they expected to see flowing into their coffers was expended in promoting the permanent interests of a distant country. Count Maurice was recalled in 1644. His sue- cessors possessed neither his political nor his military talents, and had to contend with more energetic enemies.

In 1640 the revolution which placed the house of Braganga on the throne of Portugal restored Brazil to masters more inclined to promote its interests and assert its possession than the Spaniards. It was indeed high time that some exertion should be made. The northern provinces had fallen into the power of Holland; the southern, peopled in a great measure by the hardy descendants of the successive colonists who had issued on all sides from the central establishment of §. Paulo, had learned from their habits of unaided and successful enter- prize to court independence. ‘They had ascended the

waters of the Paraguay to their sources. They had ex- tended their limits southwards till they reached the Spanish settlements ou La Plata. They had reduced to Slavery numerous tribes of the natives. They were rich in cattle,

and had commenced the discovery of the mines, When, therefore, the inhabitants of 8. Paulo saw themselves about to be transferred, as a dependency of Portugal, from one master to another, they conceived the idea of erecting their country into an independent state. Their attempt, however, was frustrated by Amador Bueno, the person whom they had selected for their king. When the people shouted “Long live King Amador,” he cried out “ Long live Joao IV.,” and took refuge ina convent. The multitude, left without a leader, acquiesced, and this important province was secured to the house of Braganga.

Rio and Santos, although both evinced a desire of inde- pendence, followed the example of the Paulistas. Bahia, as capital of the Brazilian states, felt that its ascendeney depended upon the union with Portugal. The Government thus left in quiet possession of the rest of Brazil, had time to conceutrate its attention upon the Dutch conquests, The crown of Portugal was, however, much too weak to adopt energetic measures. ‘The tyranny of the successors of Nassau, by alienating the minds of the Portuguese and natives, drove them to revolt before any steps were taken in the mother country for the reconquest of its colonies. Joéo Fernandes Vieyra, a native of Madeira, organized the insurrection which broke out in 1645. This insurrection gave birth to one of those wars in which a whole nation, destitute of pecuniary resources, military organization, and skilful leaders, is opposed to a handful of soldiers advan- tageously posted and well officered. But brute force is unable to contend with scientific valour. Vieyra, who had the sense to see this, repaired to the court of Portugal, and discovering the weakness and poverty of the executive, suggested the establishment of a company similar to that which in Holland had proved so successful. His plan, notwithstanding the opposition of the priests, was approved of, and in 1649 the Brazil Company of Portugal sent out its first fleet. After a most sanguinary war, Vieyra was enabled in 1654 to present the keys of Olinda to the royal commander, and to restore to his monarch the undivided empire of Brazil. After this, except some inroads on the frontiers, the only foreign invasion which Brazil had to suffer was from France. In 1710 asquadron, commanded by Duelere, disembarked 1000 men, and attacked Rio de Janeiro. After having lost half of his men in a battle, Duclere and all his surviving companions were made pri- soners. The governor treated them cruelly. A new squadron with 6000 troops was

intrusted to the famous admiral Duguay Trouin to revenge this injury, They arrived at Rio ou the 12th September 1711. After four days of hard fighting the town was taken. The governor retreated to a position out of it, and was only awaiting reinforcements from Minas to retake it ; but Duguay Trouin threatening to burn it, he was obliged on the 10th October to signa capitulation, and pay to the French admiral 610,000 crusados, 500 cases of sugar, and provisions for the return of the fleet to Europe. Duguay Trouin departed to Bahia to obtain fresh spoils; but having lost in a storm twoof his best ships, with an important part of the money received, he renounced this plan and returned directly to France.

After this the Portuguese governed undisturbed their colony. The approach of foreign traders was prohibited, while the regalities reserved by the crown drained the country of a great proportion of its wealth.

The important part which the inhabitants of Sao Paulo have played in the history of Brazil has been already adverted to. The establishment of the Jesuit college had attracted settlers to its neighbourhood, and frequent

marriages had taken place beween the Indians of the district and the colonists. A hardy and enterprising race of men had spruug from this mixture, who, first searching whether their new country were rich in metals, soon began adventurous raids into the interior, making excursions also against the remote Indian tribes with a view to obtaining slaves, and from the year 1629 onwards repeatedly attacked the Indian reductions of the Jesuits in Paraguay, although both provinces were then nominally subject to the crown of Spain. Other bands penetrated into Minas and still farther north and westward, discovering mines there and in Goyaz and Cuyaba. New colonies were thus formed round those districts in which gold had been found, and in the beginning of the 18th century five principal settlements in Minas Geraes had been elevated by royal charter to the privileges of towns. In 1720 this district was separated from Sao Paulo, to which it had previously been dependent. As carly as 1618 a code of laws for the regulation of the mining industry had been drawn up by Philip IIL, the executive and judicial functions in the mining districts being vested in a provedor, and the fiscal in a treasurer, who re- ceived the royal fifths and

superintended the weighing of all the gold, rendering a yearly account of all discoveries and produce. For many years, however, these laws were little more than a dead letter. The same infatuated passion for mining speculation which had characterized the Spanish settlers in South America now begaii to actuate the Portuguese; labourers and capital were drained off to the mining districts, and Brazil, which had hitherto in great measure supplied Europe with sngar, sank before the competition of the English and French. A new source of wealth was now opened up; some adventurers from Villa do Principe in Minas, going north to the Seria Frio, made the discovery of diamonds about the year 1710, but it was not till 1730 that the discovery was for the first time announced to the Government, which immediately declared them regalia. While the population of Brazil continued to increase, the moral and intellectual culture of its inhabitants was left in great measure to chance ; they grew up with those robust and healthy sentiments which are engendered by the absence of false teachers, but with a repugnance to legal ordinances, and encouraged

in their ascendency over the Indians to habits of violence

and oppression. The Jesuits from the first moment of their landing in Brazil had constituted themselves the protectors of the natives, and though strenuously opposed by the colonists and ordinary clergy, had gathered the Indians together in many aldeas, over which officials of their order exercised spiritual and temporal authority. A more efficacious stop, however, was put to the persecution of the Indians by the importation of large numbers of negroes from the Portuguese possessions in Africa, these being found more active and serviceable than the native tribes.

The Portuguese Government, under the administration of Carvalho, afterwards marquis of Pombal, attempted to extend to Brazil the bold spirit of innovation which directed all his efforts. The proud minister had been resisted in his plans of reform at home by the Jesuits, and, determin- ing to attack the power of the order, first deprived them of all temporal power in the state of Maranhio and Para. These ordinances soon spread to the whole of Brazil, and a pretext being found in the suspicion of Jesuit influence m some partial revolts of the Indian troops on the Rio Negro, the order was expelled from Brazil under circum- Stances of great severity in 1760. The

Brazilian Company founded by Vieyra, which so materially contributed to pre- Serve its South American possessions to Portugal, had been abolished in 1721 by Joio V.; but such an instrument being well suited to the bold spirit of Pombal, he established a chartered company again in 1755, to trade exclusively

with Maranhéo and Para; and in 1759, in spite of the remonstrance of the British Factory at Lisbon, formed another company for Paraiba and Pernambuco. Pombal's arrangements extended also to the interior of the country, where he extinguished at once the now indefinite and oppressive claims of the original donatories of the cap- taincies, and strengthened and enforced the regulations of the mining districts. The policy of many of Pombal's measures is more than questionable; but his admission of all races to equal rights in the eye of the law, his abolition of feudal privileges, and the firmer organization of the powers of the land which he introduced, power- fully co-operated towards the development of the capabilities of Brazil. Yet on the death of his king and patron in 1777, when court intrigue forced him fron: his high station, he who had doue so much for his country's institutions was reviled on all hands.

The most important feature in the history of Brazil during the first thirty years following the retirement of Pombal was the conspiracy of Minas in 1789. The suc- cessful issue of the recent revolution of the English colonies in North America had filled the minds of some of the moré educated youth of that province; and in imitation, a pro- ject to throw off the Portuguese yoke was formed,—a cavalry officer, Silva Xavier, nicknamed Tira-dentes (tooth- drawer), being the chief conspirator. But the plot being discovered during their inactivity, the conspirators were banished to Africa, and Tira-dentes, the leader, was hanged. Thenceforward affairs went on prosperously; the mining districts continued to be enlarged; the trading companies of the littoral provinces were abolished, but the impulse they had given to agriculture remained.

Removed from all communication with the rest of the world except through the mother country, Brazil remained unaffected by the first years of the great revolutionary war in Europe. Indirectly, however, the fate of this

isolated country .was decided by the consequences of the French Revolution. Brazil is the only instance of a colony becoming the seat of the Government of its own mother country, and this was the work of Napoleon. When he resolved upon the invasion and conquest of Portugal, the Prince Regent, afterwards Dom Joao VI., having no means of resistance, decided to take refuge in Brazil. He created a regency in Lisbon, and departed for Brazil on the 29th November 1807, accompanied by the Queen Donna Maria I., the royal family, all the great officers of state, a large part of the nobility, and numerous retainers. They arrived at Bahia on the 21st January 1808, and were received with enthusiasm. The regent was requested to establish there the seat of his government, but a more secure asylum presented itselfin Rio de Janeiro, where the royal fugitives arrived on the 7th of March. Before leaving Bahia Don John took the first step to emancipate Brazil, opening its ports to foreign commerce, and permitting the export of all Brazilian produce under any flag, the royal monopolies of diamonds and Brazil-wood excepted. Once established in Rio de Janeiro, the government of the regent was directed to the creation of an administrative machinery for the dominions that remained to him as they existed in Portugal. Besides the ministry which had come with the regent, the council of state, and the departments of the four ministries of home, finances, war, and marine then existing, there were created in the course of one year a supreme court of justice, a board of patronage and administration of the property of the church and military orders, an inferior court of appeal, the court of exchequer and royal treasury, the royal mint, bank of Brazil, royal printing-office, powder-mills on a large scale, and a supreme military court. The maintenance of the court, and the salaries of so large a number of high officials, entailed the

imposition of new taxes to meet these expenses. Not- withstanding this the expenses continned to augment, and the Government had recourse to the reprehensible measure of altering the money standard, and the whole monetary system was soon thrown into the greatest confusion, a state of things from which the country suffers even at the present day. The bank, in addition to its private functions, farmed many of the regalia, and was in the practice of advancing large sums to the state, transactions which gave rise

to extensive corruption, and terminated some years later in the breaking of the bank.

Thus the Government of the prince regent began its career in the new world with dangerous errors in the financial system; yet the increased activity which a multi- tude of new customers and the increase of circulating medium gave to the trade of Rio, added a new stimulus to the industry of the whole nation. Numbers of English artisans and shipbuilders, Swedish iron-founders, German engineers, and French manufacturers sought fortunes in the new country, and diffused industry by their example.

In the beginning of 1809, in retaliation of the oceupa- tion of Portugal, an expedition was sent from Para to the French colony of Guiana, and after some fighting this part of Guiana was incorporated with Brazil. This conquest was, however, of short duration; for, by the treaty of Vienna in 1815, the colony was restored to France. Its occupation contributed to the improvement of agriculture in Brazil ; it had been the policy of Portugal up to this time to separate the productions of its colonies, to reserve sugar for Brazil, and spices to the East Indies, and to prohibit the cultivation of these in the African possessions. Now, however, many plants were imported not only from Guiana but from India and Africa, cultivated in the Royal Botanic Garden, and thence distributed. The same principle which dictated the conquest of French Guiana originated attempts to seize the Spanish colonies of Monte Video and Buenas Ayres, Portugal being also at war with Spain. The chiefs of these colonies were invited to place them under the protection of the Portuguese crown, but these at first affecting loyalty to Spain declined the offer, then threw off the mask and declared themselves independent, and the Spanish governor, Elio, was afterwards defeated by Artigas, the leader of the indepéndents.

The inroads made on the frontiers of Rio Grande and Sao Paulo decided the court of Rio to take possession of Monte Video; a force of 5000 troops was sent thither from Portugal, together with a Brazilian corps; and the irregulars of Artigas, unable to withstand disciplined troops, were forced, after a total defeat, to take refuge beyond the River Uruguay. The Portuguese took posses- sion of the city of Monte Video in January 1817, and the territory of Missiones was afterwards occupied, The im- portance

which Brazil was acquiring decided the regent to give it the title of kingdom, and by decree of the 16th January 1815, the Portuguese sovereignty thenceforward took the title of the United Kingdom of Portugal, Brazil, and Algarves. Thus the old colonial government dis- appeared even in name. In March 1816 the Queen Donna Maria I. died, and the prince regent became king under the title of Dom Joao VI.

Although Brazil had now become in fact the head of its own mother country, the government was not in the hands of Brazilians, but of the Portuguese, who had followed the court. The discontent arising among Brazilians from this cause was heightened by a decree assigning a heavy tax on the chief Brazilian custom houses, to be in operation for forty years, for the benefit of the Portuguese noblemen who had suffered during the war with France. The amiable character of the king preserved his own popularity, but the Government was ignorant and profligate, justice was

ill administered, negligence and disorder reigned in all itg departments. Nor was the discontent less in Portugal on account of its anomalous position. These causes and the fermentation of liberal principles produced by the French Revolution originated a conspiracy in Lisbon in 1817, which was, however, discovered in time to prevent its success, A similar plot and rebellion took place in the province of Pernambuco, where the inhabitants of the important com- mercial city of Recife were jealous of Rio and the sacrifices they were compelled to make for the support of the luxurious court there. Another conspiracy to establish g republican government was promptly smothered in Bahia, and the outbreak in Pernambuco was put down after a republic had been formed there for ninety days. Still the progress of the republican spirit in Brazil caused Dom Joao to send to Portugal for bodies of picked troops, which were stationed throughout the provincial capitals. In Portugal the popular discontent produced the revolution of 1820, when representative government was proclaimed—the Spanish constitution of 1812 being provisionally adopted, In Rio, the Portuguese troops with which the king had surrounded himself as a defence against the liberal spirit of the Brazilians, took up arms on the 26th February 1821, to force him to accept the system proclaimed in Portugal.

The prince Dom Pedro, heir to the crown, who now for the first time took part in public affairs, actively exerted himself as a negotiator between the king and the troops, who were joined by bodies of the people. After attempting a compromise the king finally submitted, took the oath, and named a new ministry. The idea of free government filled the people with enthusiasm, and the principles of a representative legislature were freely adopted, the first care being for the election of deputies to the Cortes of Lisbon to take part in framing the new constitution. As the king could not abandon Portugal to itself he determined at first to send the prince thither as regent, but Dom Pedro had acquired such popularity by his conduct in the revolution, and had exhibited such a thirst for glory, that the king feared to trust his adventurous spirit in Europe, and decided to go himself. The Brazilian deputies on arriving in Lisbon expressed dissatisfaction with the Cortes for having begun the framing of the constitution before their arrival, for Brazil could not be treated as a secondary part of the monarchy. Sharp discussions and angry words passed between the Brazilian and Portuguese deputies, the news of which excited great discontent in Brazil. An insulting decree was passed in the Cortes, ordering the prince Dom Pedro to come to Europe, which filled the Brazilians with alarm; they foresaw that without a central authority the country would fall back to its former colonia] state subject to Portugal. The Pro- visional Government of S&o Paulo, influenced by the brothers Andradas, began a movement for independence by asking the prince to disobey the Cortes and remain in Brazil, and the council of Rio de Janeiro followed with a similar repre- sentation, to which the prince assented. The Portuguese troops of the capital at first assumed a coercive attitude, but were forced to give way before the ardour and military preparations of the Brazilians, and submitted to embark for Portugal. These scenes were repeated in Pernambuco, where the Portuguese, after various conflicts, were obliged to leave the country; in Bahia, however, as well as in Maranhao and Para, the Portuguese prevailed. In Rio the agitation for independence continued. The two brothers Andradas were called to the ministry ; and the municipal council conferred upon the prince regent the title of Perpetual Defender of Brazil. With great activity he set off to the central provinces of Minas and Sao Paulo to suppress disaffected movements and direct the revolution. In Sao Paulo, on the 7th of September 1822, he proclaimed the independence of Brazil. On his return to Rio de

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Janeiro on the 12th of October he was proclaimed constitu- tional emperor with great enthusiasm.

The Cortes at Lisbon chose Bahia as a centre for resisting the independence, and large forces were sent thither. But the city was vigorously besieged by the Brazilians by land, and finally the Portuguese were obliged to reembark on the 2d of July 1823. A Brazilian squadron, under command of Lord Cochrane, attacked the Portuguese vessels, embarrassed with troops, and took several of them. Taylor, another Englishman in Prazilian service, followed the vessels across the Atlantic, and even captured some of the ships in sight of the land of Portugal. The troops in Monte Video also embarked for Portugal, and the Banda Oriental remained a part of Brazil with the title of the Provincia Cisplutina. Before the end of 1823 the authority of the new emperor and the independence of Brazil were undisputed throughout the whole country.

Republican movements now began to spread, to suppress which the authorities made use of the Portuguese remain- ing in the country; and the disposition of the earperor to consider these as his firmest supporters much influenced the course of his Government and his future destiny. The two Andradas, who imagined they could govern the young emperor as a sovereign of their own creation, en- countered great opposition in the constitutional assembly, which had been opened in Rio in May 1823, to discuss the project of a new constitution. In July the emperor resolved to dismiss them and form a new ministry, but against this the brothers raised a violent opposition. In November the emperor put an end to the angry debates which ensued in the assembly by dissolving it, exiling the Andradas to France, and convoking a new assembly to deliberate on a proposed constitution more liberal than the former project. The proclamation of a republic in the provinces of Pernambuco and Cear4, with the rebellion of the Cisplatina province, favoured by Buenos Ayres and its ultimate loss to Brazil, were the result of the coup @état of November 1823. The Brazilians were universally discontented,—on one side fearing absolutism if they sup- ported the emperor, on the other anarchy if he fell. Know- ing the danger of

an undefined position, the emperor caused the councils to dispense with their deliberations, and adopt, as the constitution of the empire, the project framed by the council of state. Accordingly, on March 25, 1824, the emperor swore to the constitution with great solemnity and public rejoicings. By this stroke of policy he saved himself and Brazil. Negotiations were opened in London between the Brazilian and Portuguese plenipotentiaries, treating for the recognition of the independence of Brazil ; and on the 25th of August 1825 a treaty was signed by which the Portuguese king, Dom Joao VI., assumed the title of Emperor of Brazil, and immediately abdicated in favour of his son, acknowledging Brazil as an independent empire ; but the treaty obliged Brazil to take upon herself the Portuguese debt, amounting to nearly two millious sterling. :

The rebellion of the Banda Oriental was followed by a declaration of war with Buenos Ayres which had supported it, and operations by sea and land were conducted against that republicin afeeble way. Meanwhile the well-deserved popularity of the emperor begau to decline. He had given himself up to the influence of the Portuguese; the most popular men who had worked for the independence were banished ; and a continual change of ministry showed a disposition on the part of the sovereign to prosecute obstinately measures of which his advisers disapproved. His popularity was regained, however, to some extent, when, on the death of his father, he was unanimously acknowledged king of Portugal, and especially when

he abdicated that crown in favour of his daughter, Donna Maria; but his line of policy was not altered, and coin- mercial treaties entered into with European states conceding them favours, which were popularly considered to be injurious to Brazilian trade, met with bitter censure.

During the year 1827 the public debt was consolidated, and a department was created for the application of a sinking fund.

The year 1828 was a calamitous one for Brazil. It began with the defeat of the Brazilian army by the Argen- tine forces, aud this entirely through the incapacity of the commander-in-chief ; and misunderstandings, afterwards compensated by humbling money-payments on the part of Brazil, arose

with the United States, France, and England, on account of merchant vessels captured by the Brazilian squadron blockading Buenos Ayres. Financial embarrass- ments increased to an alarming extent; the emperor was compelled by the British Government to make peace with Buenos Ayres and to renounce the Banda Oriental ; and to fill the sum of disasters Don Miguel had treacherously usurped the crown of Portugal. It was under these unlucky auspices that the elections of new deputies took place in 1829. As was expected the result was the elec- tion everywhere of ultra-liberals opposed to the emperor, and in the succeeding year people everywhere exhibited their disaffection. During the session of 1830 the cham- bers adopted a criminal code in which punishment by death for political offences was abolished. It was openly suggested in the journals to reform the constitution by turning Brazil into independent federal provinces, governed by authorities popularly elected, as in the United States. Alarmed at length at the ground gained by this idea in the provinces, the emperor set off to Minas to stir up the former enthusiasm in his favour from recollections of the independence, but was coldly received. On his return to Rio in March 1831 scenes of disorder occurred, and great agitation among the Liberal party. Imagining himself sure of a brilliant destiny in Europe if he lost his Brazilian crown, the emperor attempted to risk a decisive attack against the Liberals, and to form a new ministry composed of men favourable to absolutism. This step caused excited public meetings in the capital, which were joined in by the troops, and deputations went to ask the emperor to dismiss the unpopular ministry. He replied by dissolving the ministry without naming another, and by abdicating the crown in favour of the heir apparent, then only five years of age. Dom Pedro immediately embarked in an English ship, leaving the new Emperor Dom Pedro II. and the princesses Januaria, Francisca, and Paula. The subsequent career of this unfortunate prince belongs to the history of Portugal.

A provisional and afterwards a permanent regency, com- posed of three members, was now formed in Brazil, but sceues of disorder succeeded, and discussions and struggles between the republican party and the Government, and a reactionary third party in favour of the restoration of Dom Pedro, occupied the succeeding years. In 1834 a reform which was well received consisted in the alteration of the regency, from that of three members elected by the legisla- tive chambers, to one regent chosen by the

whole of the electors in the same manner as the deputies; and the councils of the provinces were replaced by legislative provincial assemblies. Virtually, this was a republican government like that of the United States, for no difference existed in the mode of election of the regent from that of a president. The ex-minister Feijod was chosen for this office. With the exception of Para and Rio Grande the provinces were at peace, but these were in open rebellion ; the former was reduced to obedience, but in the latter, though the imperial troops occupied the town, the country

was ravaged by its warlike inhabitants. The regent was now accused of conniving at this rebellion, and the oppo- sition of the Chamber of Deputies became so violent as to necessitate his resignation. Araujo Lima, minister of the home department, who strove to give his government the character of a monarchical reaction against the principles of democracy, was chosen by a large majority in his stead. The experiment of republican government had proved so discreditable, and had so wearied the country of cabals, that men hitherto known for their sympathy with demo- cratic principles became more monarchical than the regent himself ; and under this influence a movement to give the regency into the hands of the Princess Donna Januaria, now in her 18th year, was set on foot. It was soon per-

ceived, however, that if the empire could be governed by a princess of eighteen it could be managed better by the

emperor himself, who was then fourteen.

A bill was accordingly presented to legislature dispensing

with the age of the emperor and declaring his majority,

which after a noisy discussion was carried. The majority of the Emperor Dom Pedro II. was proclaimed on the

23d July 1840. Several ministries, in which various parties

predominated for a time, now governed the country till

1848, during which period the rebellious province of Rio Grande was pacified, more by negotiation than force of arms. In 1848 hostilities were roused with the British Government through the neglect shown by the Brazilians in putting in force a treaty for the abolition of the slave trade, which had been concluded as far back as 1826; on the other hand the governor of Buenos Ayres, General Rosas, was endeavouring to stir up revolution again in Rio Grande. The appearance of yellow fever in 1849, until then unknown in Brazil, was attributed to the importation of slaves. Public opinion declared against the traffic : severe laws were passed against it, and were so firmly enforced that in 1853 not a single disembarkation took place. The ministry of the Visconde de Olinda in 1849 entered into alliances with the governors of Monte Video, Paraguay, and the states of Entre Rios and Corrientes, for the purpose of maintaining the integrity of the republics of Uruguay and Paraguay, which Rosas intended to re-unite to Buenos Ayres, and the troops of Rosas which besieged Monte Video were forced to capitulate. Rosas then de- clared war formally against Brazil. An army of Correntine, Uruguayan, and Brazilian troops, under General Urquiza, assisted by a Brazilian naval squadron, advanced on Buenos Ayres, completely routed the forces of Rusas, and crushed for ever the power of that dictator. From 1844 Brazil was free from intestine commotions, and had resumed its activity. Public works and education were advanced, and the finances rose to a degree of prosperity previously unknown,

In 1855 the emperor of Brazil sent a squadron of eleven men-of-war and as many transports up the Paran4 to adjust several questions pending between the empire and the Republic of Paraguay, the most important of which was that of the right of way by the Paraguay River to the interior Brazilian province of Matto Grosso. This right had been in dispute for several years. The expedition was not permitted to ascend the River Paraguay, and returned completely foiled in its main purpose. Though the discord resulting between the states on account of this failure was subsequently allayed fora time by a treaty granting to Brazil the right to navigate the river, every obstacle was thrown in the way by the Paraguayan Government, and indignities of all kinds were offered not only to Brazil but to the

representatives of the Argentine and the United States. In 1864 the ambitious dictator of Paraguay, Francisco Solano Lopez, without previous declaration of war, captured a Brazilian vessel in the Paraguay, and

rapidly followed up this outrage by an armed invasion of the provinces of Matto Grosso and Rio Grande in Brazil, and that of Corrientes in the Argentine Republic, 4 triple alliance of the invaded states with Uruguay ensued, and the tide of war was soon turned from being an offensive one on the part of Paraguay to a defensive struggle within that republic against the superior number of the allies, So strong was the natural position of Paraguay, however, and so complete the subjection of its inhabitants to the will of the dictator, that it was not until the year 1870, after the republic had been completely drained of its manhood and resources, that the long war was terminated by the capture and death of Lopez with his last handful of men by the pursuing Brazilians. From its duration and frequent battles and sieges this war involved an immense sacrifice of life to Brazil, the army in the field having been cop- stantly maintained at between 20,000 and 30,000 men, and the expenditure in maintaining it was very great, having been calculated at upwards of fifty millions sterling, Large deficits in the financial budgets of the state resulted, involving increased taxation and the contracting of loans from foreign countries.

Notwithstanding this the sources of public wealth in Brazil were unaffected, and commerce continued steadily to increase. A grand social reform was effected in the law passed in September 1871, which enacted that from that date every child born of slave parents should be free, and also declared all the slaves belonging to the state or to the im- perial household free from that time. The same law provided an emancipation fund, to be annually applied to the ransom of a certain number of slaves owned by private individuals, Since that time the emancipation of slaves has gone on rapidly, the work having been promoted largely by the slave owners and by private philanthropy. It is estimated that since the cessation of the importing of slaves in 1853, and especially after the enactment ef 13a not less than a million of slaves have obtained their freedom; and the total extinction of slavery within the empire is not far distant. From the extremely rapid pro-

gress of this movement difficulties have been experienced in a considerable degree in procuring a sufficient supply of labour for the Brazilian plantations, but the general effect of the law has been to give new directions to the employ- ment of capital, and the construction of railroads and telegraphs, and the improvement of internal communication by roads and rivers have been largely promoted. Attention has also been strongly directed towards the further develop- ment of the provinces by the increase of European immi- gration. Enterprises of all kinds have multiplied, and public instruction has received a vigorous impulse.

The Emperor Dom Pedro II. and the empress, a sister of the king of Naples, are universally beloved and respected for their intellectual and moral endowments, and their affectionate interest in the welfare of their subjects, Princess Isabel, born in July 1846, and her son, born in October 1875, are their only surviving offspring, |

Until after the year 1872 when a complete census of i the empire was begun, every estimate of the population of Ho | Brazil was based upon the official returns of 1817-18, and these have consequently been mere approximations, varying very considerably in the hands of different authors. In the first census referred to the whole number of people was 4,396,000, including an estimated number of 800,000 Indians; in 1850 the total was reckoned roundly at 7,000,000 ; and in 1880 at 8,000,000.

In the following table the results of the census of 1872 have been incorporated, as far as these have yet been published, the remaining figures being made up from the estimates formerly given for each of the provinces, The

table also contains the area of each of the provinces, from planimetric calculatiouis made in Gotha in 1872, the official returns on this subject being most obviously exaggerated, and claiming for the empire an area equal to that of Brazil with all the surrounding republics on the north and west taken together.

Area in Population. _ Provinces. a Chief Towns. Miles. Free, | Slave. Total.

Alto Amazonas…..... 758,469 seca 979) 57,610*| Mandos. GR OUICAY ss cs00-cecsnass 412,467] 282,622) 27,199) 259,821 | Paré or Belem.

2 r Sel co S. Luiz do Mar- Maranhao…...ccccccene 141,651) 284,101! 74,989) 359,040 { Ania PIAUhy ~~.ssosesressesesee 81,779 178,427/ 23,785] 209,299 | 'Therezina, OME ances s~~-2—0r-ess0e 50,262; 689,773 31,918) 721,686*| Fortaleza. RioGrande do Norte} 20,130) 220,959 13/0201 233,979 | Natal. Parahhy ba ….eseeeseseee 20,346) 341,643, 20,914) 362,557 | Parahyba. Pernambueo ae 46,257; 752,511, 89,028) 841,539*| Recife. Alagoas… 11,642; 312,268) 35,741) 848,009*) Maceio. Serigpe … 12,088; 139,812) 21,495) 161,807 | Aracaju. pM Wer rrcrcesocescoseases 204,803) 1,120,846! 162,295/1,283,141 | Bahia. Espiritu Santo…..... 17,030 59,478} 22,659) 82,137*| Victoria. Rio de Janeiro 456,850; 270,726) 727,576 . As

Neut. Munieipty.f | 18490 2 o96'038| "48'939 Prael Rio de Janciro. Sio Paulo soso] 90,541] 680,742) 156,612) 837,354*| Sado Paulo. Parana sees} 108,557! 116,162} 10,560) 126,722*) Curitiba. Sta. Catharina…....| 18,924) 144,818! 14,984, 159,802 Desterro. Rio Grande do Sul…| 110,216 364,002; 66,876) 480,878 Poito-Alegre, Minas Geraes …..... 237,481, 1,642,449] 366,574'2,009,023 | Ouro Preto. Oe 263,373] 149,743; 10,652) 160,395*| Goyaz. Matto Grosso ….... 668,655} 53,758 6,667| 60,417*} Cuyabd.

3,288,110 AANA SGD TONE]

*The population figures marked thus are the results of the census begun in 1872; the others are made up from the most reeent provineial estimates.

The population of Brazil presents a number of distinct types as well as many varieties blended from these. The aboriginal Indians of the country have to a large extent become amalgamated with the settled population, especially in the eastern or maritime provinces; but in the vast forests and grass plains of the interior they remain in a more or less completely savage condition. In general description the Indians are of copper colour, of middle height, thick-set, broad-chested, and muscular, with well- shaped limbs and small hands and feet. The hair is black, thick, and straight; the features broad, cheek bones not generally prominent, eyes black and sometimes

oblique, like those of the Tatar races of Eastern Asia; they are of apathetic and undemonstrative nature. Their tribes and subdivisions, scattered over the enormous interior area, are countless; though these may vary somewhat in physical characteristics, in language, and customs, they belong apparently to one original stock, called by ethno- graphers, the Tupi-Guarani. Most of the semi-civilized Indians of Brazil, especially those of the eastern provinces, speak the Lingoa-Geral, a language adapted by the Jesuit missionaries from the original idiom of the Tupinambaras, one of the larger eastern tribes. The less civilized and savage Indians are termed collectively Gentios (heathens) by the Brazilians. The only tribe of the eastern coast- lands which has resisted civilization in some portion of its numbers is that of the Botocudos, inhabiting the forests between the Rio Doce and Rio Pardo, sunk in the lowest barbarism and fast disappearing. From the European— chiefly Portuguese—immigrants, by mixture with the native Indians, are descended the Mamelucos, a variety which first made itself prominent in inland raids and con- quests in the southern provinces, especially from the neigh- bourhood of Sao Paulo, whence they were named Paulistas. The negroes, introduced from Africa in immense numbers, constitute one of the largest elements of population. From these, by intercourse with the white race, have sprung the mulattoes, and the descendants of these, becoming pro- gressively whiter. ‘The Brazilian creoles, who call them- selves Brazileiros, descendants of these mixed races, prove little inferior in capacity, physical strength, or intelligence to the pure race of Portuguese. The rapidly progressing

emancipation of the African slaves in Brazil has been referred to previously. A strong desire pervades those of the slaves not born in Brazil, even though they may have been made captives when mere infants, to return to Africa. Associations have been formed among them in many parts, both for the purchase of the freedom of those stil] in bondage and for sending the freedmen back to their native country, a movement. which has actually taken place to a considerable extent. A result of the emancipation and consequent deficiency of labour, chiefly felt in the neigh- bourhood of Rio and the provinces to the south of it, has been the deportation of large numbers of slaves from the northern to the more southerly provinces.

An increase in the population of Brazil being one of the Colonies.

prime requisites for the advancement of the couutry, the state encourages immigration by every possible means, and especially of late years, since the labour question began to be serious, has made great efforts to entice European colonists. For this end an official agency was established at Rio de Janeiro in 1864, to provide for the conveyance and landing of colonists and for forwarding these to the various localities. The passage from whatever country to Brazil, and thence to the special colony inland, is also defrayed by Government, and other advantages are held out. Notwithstanding the zeal with which the many schemes of state or private colonization in Brazil have been promoted, the results have been far from satisfactory ; as far as British, German, and Swiss experience goes these have been in many instances very disastrous ; and whatever seductive representation of advantages may be held out, any scheme for the introduction of north European colonists into Brazil caunot be too strongly deprecated. Not only is the climate and soil, except perhaps of the extreme southern province, unsuited to the Anglo-Saxon race, but the abandonment of nationality and of language, of customs and laws, and the obnoxious surroundings, prove fatal to success.

The chief state colonies are at the following places. Santa Leopoldina, thirty-three miles distant from the capital of the province of Espiritu-Santo, having free access to it by the Sta. Maria River,—is chiefly a German, Swiss, and Dutch colony. tio Novo is in the same province. Mucury, in the province of Minas Geraes, is also a German colony. Canarea in the province of Sao Paulo, 14 miles from the sea-coast and near the town of the same name, is mainly English. Asswngay, 62 miles from the capital of the province of Paranda, Jtajahy, 29 miles from the port of the same name in the province of Sta. Catharina, and Blumenau, also in that province on the navigable River Itajahy, are chiefly German. Sta. Maria de Soledade, near Sao Leopoldo, in Rio Grande do Sul, is also a state colony. Several places long colonized have passed out of the colonial régime, and have been formed into municipalities. Such are Sdo Leopoldo in Rio Grande, Santa Isabel in the province of Sta. Catharina, Nova Friburgo and Petropolis in elevated districts of the Organ Mountains in Rio de Janeiro.

Private and provincial colonies are rather numerous. Of these there are eight in Rio Grande do Sul, the chief being that of Sta Cruz; Sta Catharina has two; Minas Geraes and Bahia, each one. ‘Taken together the state, provincial, and private colonies embraced, in 1873, upwards of 40,000 people. During the past two years the unsettled condition and financial difficulties of the La Plata states have thrown large numbers of foreign— chiefly Italian— settlers into destitution, and many hundreds of these have been induced, by the offer of free passage and land, to seek a new home in Brazil.

The Brazilian monarchy derives from the ancient mon- archy of Portugal the principle of hereditary succession to

Political constitu- tion.

the crown. The laws of succession are defined with great distinctness in the constitution, and are the same as in England.

In Brazil there is no privileged aristocracy, but descent from the noble families of Portugal, length of time in the service of the country, or large fortune, gives a certain claim to the privileges of aristocracy readily admitted by the Brazilians. The emperor rewards services, according to their difficulty or importance, with the titles of marquis, count, baron, or knight (mogos fidalgos). Titles are not hereditary, but if a son prove himself worthy of his father, he inherits his title. There are in the empire six orders of chivalry; those of the Southern Cross, the order of Dom Pedro I., and of the Rose, created by the first emperor between 1822 and 1829; and those of Christ, St Benoit of Aviz, and St Theodoric, adopted by Dom PedroII. The senate represents the only element of aristocracy recognized by the constitution, and the democratic element preponder- ates, but its action is modified by the complicated system of election. The constitution established four powers,— the moderating, the legislative, the executive, and the judicial.

The moderating power is vested exclusively in the emperor as chief representative of the nation, that he may maintain the equilibrium and

harmony of the other powers, He exercises this function with regard to the legislature by being empowered to choose the senators, to convoke or adjourn the general assembly, to dissolve the chamber of deputies, and to sanction the decrees of the assembly ; as regards the executive, by appointing or dismissing at will the ministers of state; and over the judicial power, by suspending the magistrates, pardoning or commuting penalties, and granting amnesties. The person of the emperor is sacred, inviolable, and irresponsible.

The legislative power is vested, for the affairs of the empire, in the general legislative assembly with the sanction of the emperor, and for the provincial affairs in the pro- vincial assemblies with the sanction of the president (governor) of the province. The'general legislative assembly consists of two chambers, that of deputies and that of senators. The deputies are nominated by indirect election. Citizens, and even manumitted slaves, born in the empire, who possess an income of £22, 10s., choose the electors in parochial assemblies, and these electors nominate the deputies. The qualification for an elector is an annual income of £45; that of a deputy an income of £90. Minors, monks, and servants, are debarred from voting ; naturalized foreigners, and persons not professing the religion of the state, are incapable of being elected deputies, but they can be senators. The deputies to the number of 122 are elected for four years, and must hold an annual session of four months, opening onthe 3d of May. The senators (58 in number) are elected for life. Every pro- vince has a number of senators, equal to half its number of deputies ; but they are nominated in triple lists, from which the emperor selects one-third. A senator must be forty years of age, and must possess a clear annual income of £180. The allowance of a senator is one-half more than that of a deputy. Each house nominates its own officers. When the two houses sit in general assembly, as at the opening and close of the session, to hear the emperor's speech, &c., the president of the senate presides, and the senators and deputies sit promiscuously. They sit apart, and proceed by way of bill, when they make laws, interpret, and suspend them; they determine the public charges, and assess the contributions, &c. The chamber of deputies has the initiative in taxes, in recruiting, and in the choice of a new dynasty. The senate has the exclusive privilege of taking cognizance of offences committed by members of the imperial family, councillors of state, senators, and

deputies, during the session ; of enforcing the responsibility of secretaries and councillors of state; of convoking the assembly in case the emperor fail to do so within two months after the period fixed by law; and also of calling it together on the death of the emperor.

The executive power is vested in the emperor, assisted by his ministers and secretaries of state, who are responsible for treason, corruption, abuse of power, acts contrary to the liberty, security, or property of the citizens, and waste of public property. From this responsibility they cannot escape upon the plea of orders from the emperor. The exe- cutive functions are such as the convocation of the general ordinary assembly ; the nomination of bishops, presidents, governors of provinces; commanders by sea and land, and ambassadors ; the formation of alliances, and all foreign negotiations ; the declaration of peace and war; and the granting letters of naturalization. .

The ministers are seven, one for each of the departments of the empire and ecclesiastical affairs; justice; war; marine; finances ; foreign affairs; and agriculture, commerce, and public works. One of these is president or premier. To these is superadded a council of state composed of twelve ordinary members, besides which it may have as many as twelve extraordinary members, all of them appointed for life. The council is divided into sections corresponding to the seven ministries, or sits in full meeting, presided over by theemperor. The prince or princess imperial, on attain- ing the age of eighteen, has a seat in this assembly. The council is merely consultative, and though its use is optional it is always heard on any important public question or appeal to the crown. The provincial governments are entrusted to a president in each, appointed by the executive power and immediately under its control: he is the supreme representative of government in the province, sanctions the resolutions of the provincial assemblies, and appoints provincial functionaries. The provincial assemblies, elected every two years by the same citizens who elect members of the chamber of deputies, deal only with matters imme- diately relating to the private or local interests of the province.

Every city, town, and village, with the surrounding district, has a municipal council composed of nine or seven members, elected directly by the citizens

who possess an annual income of £22, 10s. This council is charged with all that concerns the good of the district, meets four times a year, besides extraordinary sessions, and every meeting may last as many days as may be found necessary for the expedition of business, They impose fines to a certain amount, and even enforce their decrees by a penalty of thirty days' imprisonment. They annually draw up a municipal budget, which is submitted to the provincial legislative assembly for approval. If their revenue and the produce of fines be not sufficient to defray expenses, an allowance from the provincial treasury is granted. Their decrees are called osturas, and the penalties imposed by them are enforced by the justices of peace. 'Their enactments can be annulled by the provincial legislative assembly.

The judicial power is independent; the judges hold their offices for life, and cannot lose them except by a condemnatory sentence. They are, however, responsible for any abuse of authority, and may be summoned before a supreme court of judicial ministers. In criminal cases all proceedings are public after the indictment. In civil cases arbitrators may be appointed, whose decisions are without appeal, and no civil lawsuit can be carried on without previous declaration that conciliatory means were tried in vain.

The constitution guarantees the inviolability of the liberty, pe safety, and property of Brazilian citizens, and of their civil su")

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BRAZIL

and political rights. Individual liberty is subject only to law, and in the same way liberty of thought and of the

ress are guaranteed, No one may be persecuted on account of religious belief, and every kind of labour or industry is free which does not interfere with public well-being. No one can be arrested without written orders from lawful anthority.

For purposes of election the empire is divided into districts, each of which elects a fixed number of deputies for the general and provincial assemblies.

These are again divided into colleges and parish assemblies. There are 46 electoral districts, 408 colleges, and 1451 parish assem- blies. For administrative purposes the Brazilian territory is separated into 20 provinces, comprising 642 municipalities, including that of the capital; from various causes the number of municipalities is fluctuating. The ecclesiastical jurisdiction is exercised in 12 dioceses, one of which, that of Sao Salvador, comprehending the province of Bahia and Serigpe, isa metropolitan archbishopric. The whole of the dioceses are divided into 1473 parishes and 28 curacies. The diocese of Sao Salvador is the seat of a metropolitan court of appeal (Relagao), composed of judges of appeal (desembargadores), who decide clerical matters finally. The diocese of Sav Sebastido comprises the municipality of Rio de Janeiro, its province, those of Espiritu Santo‘and Sta. Catharina, and the eastern side of Minas Geraes. The provinces of Alagoas, Pernambuco, Parahyba, and Rio Grande do Norte form the bishopric of Olinda; Maranhado and Piauhy the bishopric of the former name; Pard and Amazonas the diocese of Belem do Pardé. The diocese of Sio Paulo includes that province, Parana, and southern Minas Geraes; that of Goyaz its province and western Minas; the remainder of Minas forms the bishoprics of Marianna in the central, and of Diamantina in the northern part of the province. The diocese of Cuyaba consists of the province of Matto Grosso. The provinces of S&o Pedro do Rio Grande do Sul and of Cearé correspond to their respective bishoprics.

The judicial division of the empire is into eleven districts, each having a court of appeal competent to try all questions affecting the judges and military commanders. From the sentences of these courts there is but one appeal to a supreme court of justice, the members of which are deno- minated ministers, and by the constitution are counsellors to the emperor: this highest court takes cognizance of offences or errors committed by its ministers, by the judges of appeal, or by archbishops or bishops in non- ecclesiastical matters.

The districts of the Courts of Appeal are groups of pro- vinces as follows : —

ATION AMAZONAS .....000.esescecee with the seat at Belém.

_ ; 8. Luiz do me -enhao and Piauhy …,..... A Pa rantiie, Ceara and Rio Grande do Norte…... a3 Fortaleza, Pernambuco, Parahyba, and Alagoas % Recife.

Bahia and Serigpe …..... eriaseawtad . S. Salvador, Rio and Espiritu Santo …..... aioe oe Rio de Janeiro. Speaulovand Parana …....0…-0.0 ni S. Paulo.

Rio Grande do Sul and Sta. Catharina Porto Alegre. – oe (Gane e h Ouro Preto. BT OUEAOSED 5. esccescsse-ceee see .es 5 Cuyaba. Sooo coos cncicniscgsese sacnnause ” Goyaz,

Causes which do not ascend above a certain value, deter- mined by law, are judged by juizes de direito within certain minor territorial limits, termed comarcas, again divided into ¢ermos or boroughs, which may include one or more municipalities, each of which has a municipal judge.

The civil laws, originally the same with those of Portugal, have been greatly modified by a number of new ones. A criminal code was organized in 1830 on the principles of Jeremy Bentham, and is considered very perfect and clear. The new form of procedure, and the new organization of

justices, is embodied in a code decreed in 1832. Finally, a new code of commerce, nearly copied from that of France was decreed in 1850.

To carry on the war of the Independence, and to crush Finance.

a subsequent revolution in the northern provinces, the Government contracted two loans in 1824-5, of the nominal amount of £3,686,200; and on the recognition of its independence by Portugal in 1825, it undertook the liability of a loan of £1,500,000. The war with Buenos Ayres, and the assistance rendered by Dom Pedro to the constitutional party of Portugal, led to two farther loans in 1829, of the nominal amount of £769,200. Internal difficulties in 1839 compelled the regency to contract another loan of the nominal amount of £411,200. The dissensions in Portugal caused a temporary suspension in the payment of the dividends on the Portuguese

loan, and in 1842, £732,600 stock were delivered to the Portuguese agents in settlement of this claim. The debt contracted and assumed by Brazil between 1823 and 1843, therefore, amounted to £7,099,200 nominal; and throughout all its difficulties and embarrass- ments the Imperial Government punctually and honourably provided for the dividends as they became due.

By the renewal in 1844 of the sinking fund, the operation of which had been suspended since 1828, the Portuguese and other loans were becoming gradually reduced. The long war with Paraguay from 1864 to 1870, however, very considerably augmented the public debt, costing the empire more than 460,000 contos of reis, or nearly £52,000,000. The public debt is now divided into the consolidated foreign and internal debts, and the floating debt. The foreign debt proceeds from loans negotiated in the London Exchange in 1865, 1871, and 1875; the internal debt from policies authorized in 1827, but mainly from a home loan of 1868. The floating debt consists of the small remaining portion of that contracted previously to 1827, of loans borrowed from various internal sources, of exchequer bills, and paper money. Under these heads the debt of the empire was officially stated on the 31st of March 1875 as follows :—

External Debt (at 5 per cent. interest), 177,166 : 222 contos.

Internal 5 na 285,592 . 200 5 Floating – AB 201,980 :973 i, Total Debt, 664,739 : 395=£74,783,000.

(177,166 : 222=177,166 contos, 222 milreis ; a conto or million of reis, gld=£112, 10s., or £1 = 8°890 milreis. 1 milreis=2s. 3d. The financial accounts are kept in paper reis, of depreciated value, in proportion varying from 194 to 214 reis paper to 100 reis gold.)

For a few years previously to the declaration of the emperor’s majority, the imperial expenditure had not been largely in excess of the revenue, and in 1836-37, the deficit only amounted to £53,600; but in 1840-41, the year of the emperor’s majority, it rose to £408,000, and in consequence of a revolution in Rio Grande do Sul it went on increasing till in 1845 it had reached nearly treble that sum. But before 1850 the deficiency had not only been made good, but a large surplus began to accumulate, which remained

at about an annual sum of £400,000 after 1853. On the outbreak of the war in 1864, increased taxation was necessary to enable the exchequer to meet the extraordinary expenses, but on the close of the ministerial accounts for 1870-71, a surplus of upwards of £900,000 remained. In amount the revenues of the empire have progressively ascended from £1,380,000 in 1837 to upwards of £6,000,000.

The financial account of the year 1872-78, presented to the Cham- bers in May 1875, was as follows :—

Revenue.

Ce eee £3,390,800 Taxes on Shipping
…...seccsecsseeseeeeceeeseeereetaeens 32,000 Export Duties
…....:ccccceesseeseee seeeeneeseeeeseceeees 1,087,700 © Railways
…..ccesececeercccceerercceceseeeeeeeeeaseees caeesaee 390,900 IB OGts ee. oc. ccteeeoicc cance: scaceh ar eeseeemecsoss tee eeeemens 47,700 Telegraphs…....cececseseeeeeeeeeeeeseneeseeseneneereens 7,700 Stamps
…...cceeceecnessscecceeeeeeteeeaeansateceecsasensers 227,000 limlhrval URED MES Sooncce ssoede ace scednoo cos ono casdeoncnnesas abs 756,000

Extraordinary receipts from bonds, issue of paper Money, and depoOsits…....sseereeceeeeeersvereseereees 281,800 Camy* Sova acess. seen. £6, 221,600

Army and Navy.

238

£6,221,600

86,200

Coe e cee eccrine sees cotece

Total state revenue 112,181 : 104 contos paper,! or £6,307,800

MSPS URCIALECCCN ES oo 25.06… 0c0scesesecedsesee seseeces 1,210,000 MAME PA) VOCCIPES <.-.....ccveceseesese cevenses cesses 256,000

Total (138,195 : 180 contos) £7,773,800

Expenditure.

Be ee £405,800 JTS a EA ee re 224,700 Bes ee MR UNS a isles. 2 Siete se caaonnd «ssc aeseee 58,900 A oes a Sa ee re eter 1,006,600 “EIT ds aR BR ead eg ee 1,358,300 JESRO CES) codtadsonantac hh emee nee ete eae ee meee 2,375,000 COMMIT COMMEMN Sara. ee oie coe. oss eonceviees caviesvessesewie 1,426,000

Total (121,874 : 462 contos) £6, 855,300

In the Budget for 1876-77 the receipts are estimated at 107,133 : 070 contos or £6,026,200 ; the expenditure at 105,378 : 914 contos or £5,927,600. ;

There are twenty-three custom houses, the amount of duties col-

lected being largest in that of the capital, next in order those of

Pernambuco, Bahia, and Para.

The effective strength of the army and navy is every year fixed by the general legislative assembly, upon the data furnished by the ministers of the two departments. The army was originally organized on the principles

established by Marshal Beresford when in the service of

Portugal. It is principally from the northern provinces that the infantry is recruited, and from the southern that

the best cavalry is obtained. A board, presided over by

H. R. H. the Comte d’Eu, marshal of the army, is charged with the reformation of military legislation, and has been in session for some years. The actual army is thus com- posed, on a peace footing :—

a. Special corps, staff engineers and sanitary corps 427 b. Unntaabeyy 2 WattSIPOS’ 6… eesckarscceceesce es 9,864 c. Cavalry, 5 regiments and 2 battalions……..... 2,484 d. Artillery, 3 regiments and 4 batteries, with 1 3.280

e. A division stationed in Paraguay, of various arms 1,894

17,949

On a war footing the army is raised to 32,000 men.

Besides the regular army there is a national guard, which was organized in 1831, and comprised nearly 750,000 men in the latest returns, in cavalry, artillery, infantry, and reserve. This force has been disbanded for the present, to be re-organized on the completion of the census begun in

1872.

The police service of the empire is performed by city guards under military organization, under the provincial legislatures. The provinces of Para, Pernambuco, Bahia, Rio Grande do Sul, and Matto Grosso possess military arsenals, recently reorganized. Military colonies for dis- ciplinary or penitentiary objects, and also for protection of the frontiers, are dotted round the outskirts of the empire.

The navy is under the control of the minister of marine, assisted-by a naval council instituted in 1855, organized after the plan of the French admiralty. There are six arsenals, and a pyrotechnical laboratory was established near Rio in 1868.

The navy is principally manned by civilized aborigines and negroes, organized in bodies called imperial sailors, with a certain military discipline. The aborigines have a peculiar aptitude for a maritime life. Officers destined for the Brazilian navy receive a suitable education in the naval school of Rio, and for some years the Government intro- duced the practice of sending the more apt scholars to serve in the British, French, and American navies. Tn this way a body of efficient naval officers has been formed.

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1 Assumed to be at 200 paper for 100 gold.

‘ea BF

BRAZIE

In 1875 the naval force was thus constituted :—

a. Steam-vessels— Number. Guns. Armour-platedisbipe …. 0.000… occeccce. 19 73 LTC eee ne ey er Lanne a I 12 CONVERSE. oes nak Decceeasece ty kas eee 8 61 . GBT D@ANSY, «5262. 7: s.41 ic eee 23 47 4 TERRORS. oc ccc ee 7 b. Sailing-vessels— Coreg ini, wie las cs NC oc) le 1 22 Sloops and smaller vessels ….....0… 2 15 | _ —= i

61 230

These vessels were manned by 4136 seamen, including gunners and marines. One armoured vessel and four corvettes were on the stocks in 1875.

The Roman Catholic is the established religion of the Rel; empire. All other forms of worship are tolerated, but may only be practised privately. Dissenters enjoy all political and civil rights, with the sole exception of being elected into the chamber of deputies. The peculiarity of the ecclesiastical organization of the Brazilian church is, that the clergy do not receive the tithes. As a conquest of the military and religious order of Christ, all the churches of Brazil belonged from the beginning to that order, whose grand-master appointed the bishops, and submitted them directly to the approbation of the Pope. The order became so powerful that the king obtained the union of the grand- mastership to the crown, and so disposed of all the livings and other benefices of the order, and paid from his treasury the salaries of the clergy, receiving the tithes from the people as acivil tax. The tithes were afterwards abolished as oppressive. This organization is still recognized by the Holy See, and in the capacity of grand-master of the order of Christ the emperor appoints all the bishops and other ecclesiastical functionaries. There are convents of Francis- cans, Carmelites, and

Benedictines. These are very rich, and generally very learned men, who are usefully employed in teaching the sciences. They pay double annual taxes as a compensation to the treasury for not paying taxes upon. transfers of property, as theirs is not transferable. |

Primary and public schools, supported by the state Edueati} through the provincial and municipal legislatures, for gratuitous instruction, have been established throughout the empire, under the general control of the ministry of the interior. In some of the provinces instruction has been made obligatory. Besides these, in which the teach- | ing is limited to moral and religious instruction, reading | and writing, the elements of grammar and arithmetic, there is a second or higher order of schools in most of the provinces, either public or private, in which such subjects as the elements of history and geography, especially that | of Brazil, the principles of the physical sciences, elementary mathematics, drawing, Portuguese, French, and English are added. The Dom Pedro II. Imperial College of the capital has twenty-two professors, and provides a course of study of seven years, at the termination of which a degree of q B.A. may be gained. Each diocese has a seminary for | theological instruction, and these, with the exception of | that of S. José in the capital, are subsidized by Govern- | ment. Military training is under the care of the war | department, and is carried on in preparatory and regimental schools, and further in military academies in the capital and in Rio Grande do Sul. A practical school of gunnery is established in the Campo Grande, near the capital ; a central college with eleven professors also educates in the higher branches of military science and engineering.

An imperial astronomical observatory has been appended | to the central college for the instruction of observers, and the recording of astronomical and meteorological pheno- | mena. There is also a state observatory in Pernambuco. The naval college is established on board a war vessel,— } the cadets being drafted to it from a preparatory naval

gid

school. A practical school of artillery is attached, and naval construction is taught in some of the higher national schools ; but students are also sent to the best European navy yards. There are two faculties of medicine, one at

Rio de Janeiro, and another at Bahia, each having a curriculum of six years, and conferring degrees. The faculties of law are seated at Sao Paulo and Recife in Pernambuco. An institute of commercial instruction is presided over by a Government commissioner in Rio. Other remarkable institutions are those for the education of the blind in Rio, and a deaf and dumb institute. An academy of fine arts is established, with schools, in Rio, as well as a conservatorium of music. A national museum of natural history was created in Rio in 1817, and is the most important of South America. Others of like character have been founded in Pard,in Ouro Preto, and in Ceara. The national public library in Rio is the most important establishment of its kind, having more than 100,000 volumes on all subjects. Extensive libraries are also attached to all the colleges and academies ; and popular libraries have been created in each of the provincial capitals.

The press is represented by six daily newspapers in the capital, of which the Diario do Rio is the oldest, having been founded in 1817. The provincial towns together have nearly 200 newspapers.

The most important of the scientific societies of the empire is the Historical, Geographical, and Ethnographical Institute of Brazil, founded in 1838. There are besides this twenty larger scientific associations in Rio and the provincial capitals. With all these appliances, however, owing to the immense territory over which the population is scattered, the spread of instruction is exceedingly difficult, and the grossest ignorance yet abounds in the interior of almost every province.

It is obvious, from the insufficient establishments for

general education, that the intellectual development of individuals must have been fer a long period achieved in a great measure by unaided exertions. Now things are better, but in the more thinly inhabited districts devotion to such pursuits must not be expected in men exclusively occupied in procuring subsistence and securing self-defence. Even where the population is more dense, a lazy feeling of animal coinfort represses the exertions of the majority. It is among the more aspiring class, who aim at the learned professions or state employment, and who are consequently obliged to cultivate their minds, that we must look for that attachment to

intellectual pursuits which is rarely acquired except from habit. In the theological seminaries, established at the seat of each bishop, little more was inculeated than a knowledge of the classics, an outworn scholastic system of logic, and a knowledge of the routine duties of a priest. The schools of medicine in Rio Janeiro and in Bahia, from the attention bestowed upon practical surgery and anatomy, have done more to awaken the mind. The situations under Government requiring a certain Proficiency in practical mathematics and natural history have also diffused a knowledge of and a taste for these pursuits. The number of foreign engineers and naturalists encouraged to settle in Brazil has rendered the natives in Some measure acquainted with all that has been of late achieved in Europe in the mathematical and experimental sciences.

In parliament and by the press the most delicate political questions have been discussed with success, and the Progress of the Government and of legislation evinces a certain adininistrative foresight and prudence rarely dis- played by other new states.

_ The Brazilians who frequent the university of Coimbra in Portugal often distinguish themselves among their fellow-students ; and notwithstanding the difficulties they

have to contend against, not unfrequently rise to the highest offices of the state.

The most remarkable writers in the Portuguese language Literature.

on political economy and commercial law were Couttinho, bishop of Pernambuco, and Silva Lisboa, afterwards Vis- count de Cayron, a senator of the empire, both Brazilians. Among historians the Brazilian Rocha Pita is distinguished, and Moraes the lexicographer of the Portuguese language belonged to Pernambuco. Portugal is poor in dramatic literature, but one of her most distinguished comic poets was the Brazilian Silva, who afterwards fell a victina to the inquisition of Lisbon. In epic poetry, on the other hand,

Portuguese literature is rich. Brazil claims the authorship of two of its most beautiful poems of this class, the Caramuru of Durio, and the Uruguay of Gama. The best of the minor poets is Gonzaga, whose collection of lyrics is well known under the title of Marilia de Dircév. iittle inferior to him is Souza Caldas, whose translation of the Psalms denotes a taleut of the first order. Claudio, Avarenga, Gregorio de Mattos, Euzebio de Mattos, Gusmao, in former times; and more recently, Odorico, Mendes, Borges de Barros, Domingos Magalhaés, Marquis of Paranagua, A. de Macedo, Porto-Alegre, Barbosa, and others are well worthy of notice as lyric poets.

Religious eloquence was formerly much cultivated in Brazil, and Vieira is one of the most original aud eloquent preachers known. In more recent times Antonio Carlos and Montalverne deserve particular notice. In the natural sciences Frei Leandro, Arruda, Camara, and José Bonifacio de Andrada are known for their works and discoveries.

In sacred music José Mauricio, a mulatto, left composi- Fine arts.

tions of merit that were executed in the chapel of D, John AL,

The Brazilians have a natural taste for music, and an Italian theatre, maintained with but little interruption in Rio de Janeiro, has assisted in improving and refining this taste. The old-fashioned Brazilian instrument, which was a particular kind of guitar, has almost disappeared from the large cities, but is still frequently employed in the pro- vinces to accompany the modinhas (romances) which are peculiar to Brazil, and which have a particular style.

The school of the fine arts of Rio de Janeiro has pro- duced some good but no remarkable painters. Of late, however, the most promising artists have been aunually sent to Italy at the public expense to prosecute their studies in that country.

The Brazilians are in general hospitable, generous, and National charitable, endowed with great pride and vanity, and character.

susceptibility of character, and are easily led away by flattery. The unlimited power they exercise over the African slaves, and the colonial

system from which they have but a short time been freed, the imperfect religious education, the facility with which they can live in abund- ance at small cost, while the climate enables them to dispense with many things necessary in other countries, the enervating effects of the hot atmosphere, all combine to stimulate the qualities and vices which we must expect in this people.

There is in the Brazilian national character, with great mildness and generosity, a certain tendency to vindictive- ness. Homicides for the sake of vengeance alone are proportionally as numerous in Brazil as in certain countries of Europe ; while the crimes against property are much fewer. The greatest number of homicides, however, takes place in the most backward provinces of the centre and north.

The Roman Catholic religion predominates in Brazil, and although there are enlightened men among the clergy, a great number of the priests are ill educated, and the institution of celibacy keeps the members of the principal

Manufac- tures.

Ship- building.

Fisheries.

Communi- cation.

families from entering the profession. Such is the want of priests that the Government finds itself obliged to send to Italy for them. Among educated classes the spirit of materialism of the French writers of the 18th century made great progress, but a considerable reaction has lately taken place. The lower classes, above all in the interior, are still deplorably superstitious.

In several of the provinces contentions have arisen of late years. between the church and freemasonry, and the excommunication of the members of the craft and the closing of the churches to which they belonged have awakened religious discussions and agitations. The Jesuit priests were

expelled from the province of Pernambuco in 1875, and the bishop of that diocese, tried before the lay tribunal, was condemned to fine and imprisonment.

Brazil is not specially a manufacturing country, and its national industries of mining (with smelting of the metals), collecting and polishing precious stones, and salt making, already referred to, with tanning and hide working, have the widest range. Thestate has, however, encouraged and in some cases subsidized special manufactures which were of value in developing the resources of the country. Among these seventeen foundries, manufacturing engines and agricultural implements, have supplied a great national want. The home hat factories of Brazil have now all but superseded the imported hats by their products. In almost every city there are manufactories of soap, oil, and candles, which are made, not only of stearine and tallow, but of wax, and in the north from the valuable Carnauba palm. Rum distilling is largely carried on in the sugar districts, and cigars are extensively made, especially at Bahia. Gold and silver smiths and jewel workers are foremost among the delicate handicraftsmen, and excel in their workmanship.

There are now two cotton-cloth factories in Rio, five in Bahia, two in Minas, and several in S. Paulo, and this branch of industry is extending.

Ship-building is diligently prosecutedin many of the ports, and Rio has launched several fine iron-clad vessels from the navy yard. A law passed in 1871 enabled Govern- ment to subsidize companies for the construction of more commodious docks, and these have been begun in Rio, Bahia, and Maranh&o, at Santos in S. Paulo, and at Paranagua in Parana.

Whale-fishery is carried on to some small extent from the ports of Bahia and Sta. Catharina. The fine coastal fisheries are not yet taken advantage of to nearly their full power ; on the other hand, large quantities of dried cod-fish are imported. On the upper Amazon and its tributaries a considerable quantity of oil is collected from the eggs of the turtle, and is sent down in earthen pots containing 50 to 60 ib weight each.

Jerked beef, an important article of general consump- tion, is chiefly prepared in the ‘“ Charqueadas” of Rio Grande do Sul.

The coastal and fluvial communications of the empire are maintained by eighteen lines of steam-vessels, which receive an annual subsidy from the state (amounting to £150,000 in 1875). A North American company, keeping up a regular traffic between the ports of Brazil and the United States, is also aided by Government. Besides these the ocean lines of large vessels from Britain, Germany, and France, touch regularly at the chief points in passing to the La Plata. Almost all the navigable rivers of Brazil have now their regular steam packets. The Amazon has been navigated by steam for nearly twenty years; and since the passing of the decree of September 1867, by which its waters were opened to the trading ships of all nations, direct commerce from foreign countries with the interior ports on its banks has begun to be developed.

BRAZIL

Within recent times the construction of railroads hag been progressing very rapidly under the Government and in private hands. In 1867 there were but six short lines working; in 1873 there were fifteen distinct railways, Three main trunk lines are being actively extended by the state : the first called the Dom Pedro II. line, passing from Rio de Janeiro to Minas Geraes, is being extended thence to the head of the navigation of the Sao Francisco, and is planned to reach the valley of the Tocantins and Para; the second trunk line is designed to unite the navigation of the Amazon with that of the Paraguay, through the head of the valley of the Tocantins and Araguaya; the third line, already partly executed, begin- ning at Rio will pass through the capitals of S. Paulo and Parana to Porto Alegre in Rio Grande do Sul, Many other lines have been begun or are projected under the superintendence of the provincial assemblies. The ordinary roads are in an exceedingly backward condition throughout the enipire, and those which are more than rude tracks are of very small extent. A fine macadamized road, however, called the ‘Union and Industry,” joins the capital with Minas Geraes, and others extend for short distances from the chief towns. There are also a few canals. It is but seventeen years since the first small line of telegraph was stretched in Brazil within the capital, but now a double line unites the maritime towns from Pernambuco to Rio Grande do Sul. Many other lines are being constructed, and in June 1874 submarine telegraphic cable was com- pleted from Europe to the Brazilian ports.

The commerce of Brazil, despite the disadvantages Commen

against which it has had at various times to contend, has been-on the whole uniformly progressive. These disadvan- tages consisted chiefly in the restrictions originally imposed on the young colony by the jealousy of the mother country, which refused to admit the Brazilian products except at certain stated seasons of the year. The exportation of native productions to the Old World was limited to the ports of Rio, Bahia, Olinda, and Paraiba. These restric- tions continued in force long after analogous measures had been exploded in the commercial systems of other countries, and were not repealed till the beginning of the present century. In 1810, all the ports of Brazil were thrown open to British goods on the payment of duty at the rate of 15 per cent., and though this rate has been greatly increased by the tariff of 1844, the average annual value of manufactured goods imported into Brazil from Great Britain alone, chiefly cotton, iron, woollen, and linen goods, amounts to nearly £4,500,000.

The value of the imports and exports of Brazil in 1808 was esti- mated at £2260; it has gradually increased, with little fluctuation, till at the present time the annual value of trade is not less than £40,000,000. The trade of the empire is mainly with Great Britain (which sends more than a third of the imports, and receives a great share of the exports), France, the United States, Portugal, Germany, the Argentine Republic, and Belgium. In the order of their value the chief exports are coffee, hides, sugar, cotton, india-rubber, tobacco, yerba-mate, diamonds, and rum. Sinee 1853 the value ot the exports from the country has in most years been somewhat i exeess of that of the imports. The whole number of ships enter- ing and leaving the Brazilian ports in recent years averages about

30,000. ,

See Brazil and the Brazilians, Rev. D. P. Kidder and J. C. Fletcher, 1857 ; The Naturalist on the River Amazons, H. W. Bates, 1869; Travels on the Amazon and Rio Negro, Alfred R. Wallace, 1853; The Amazon and Madeira, translated by Chureh, Keller, 1874; Explorations of the Highlands of Brazil, Capt. R. F. Burton, 1869 ; Journey in Brazil, Professor Louis Agassiz, 1868; Scientific Results of a Journey in Brazil by Professor Louis Agassiz, by Professor C. F. Hartt, 1870; Climat, géologie, fawne, et géographie botamque du Brésil, Emmanuel Liais, 1872; Notions on the

Chorography ¥ Brazil, J. Manoel de Macedo, translated by Le Sage, 1873; The Empire of Brazil at the Vienna Exhibition, Rio de Janeiro, 1873 ; The coast of Brazil, and trade of its ports, Lieut.~~Commr. H. H. Gorringe, Washington, 1873; Atlas do Imperio do Brazil, por Can~~ dido Mendes de Almeida, Rio de Janeiro, 1868. (K. J.)

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BRA—BRE

BRAZIL, Istanpd oF, and other imaginary islands in the Atlantic. For a long time before the discovery of America, the fancies of navigators or of cosmographers had scattered over the Atlantic a number of islands, either wholly imaginary, or so detached from the germ of truth which had suggested their existence as to represent no fact in nature. Several such islands are described in the Arabic geography of Edrisi (1153-54 a.p.), and if, passing over more than four hundred years, we take up an atlas of Minster or Mercator we shall find that the northern Atlantic, instead of presenting a vast blank as in our most recent charts, is almost as full of islands and shoals as the heaven is of stars. To our present category belongs the island of St Brandon, the supposed discovery of an Irish eremite of the 6th century, of whose voyage many wonders are related. Such also were Antilia and the Island of the Seven Cities, connected with another legend of uncertain date, which described this as the refuge of a body of Christians, who, in flight from the Saracen conquerors of the Peninsula, had, under the guidance of their seven bishops, committed themselves to the wide ocean; such were Mayda or Asmaide, the Isla Verde, or Green Isle (which the natives of the Hebrides still think they see beneath the western sun), but none more famous and recurrent than the Isle of Brazil. The name of this island eonnects itself with the red dye-woods known by that name

‘im the Middle Ages, a name that possibly also may have

been applied to other vegetable dyes, and so may descend from the Jnsule Purpurarice of Pliny. Its first appearance on a map appears to be (J. de Brazi) in the Venetian portulano of Andrea di Bianco (1436), where it is

found attached to one of the larger islands of the Azores. When this group became better known and was colonized, the island in question got the name of Terceira. And the conservative spirit of map-makers then sought a new posi- tion for that Island of Brazil which they found in the charts of their predecessors, and this island grew in (imaginary) importance and size. In time, better knowledge of the Atlantic showed that these must be exaggerated, but belief in the island's existence endured.

The conservative spirit just referred to has indeed preserved in some shape most of the names mentioned above. The name of the Seven Cities survives as applied to a volcanic district of the Island of St Michacl's (Azores). Antilia and St Brandon's Isle were con- spieuous on the maps which were probably in the hands of Columbus on his first western voyage. The latter name has disappeared indeed, but the former survives in a plural form, as applied to the West Indies (Antilles). So also it is probable that the familiar existence of '' Brazil" as a geographical name led to its bestowal upon the vast continental region of South America, whieh was found to supply dye-woods kindred to those which the name properly denoted. The older memory, however, survived also, and the Jsland of Brazil retained its place in mid-ocean, some hundred miles to the west of Ireland, both in the traditions of the forecastle and in charts. In Purday's General Chart of the Atlantic, "eorrected to 1830," we find the Mayda indeed noted as '' very doubtful," but ''/sle Verte or Green Rock" (44° 48' N. lat., and 26°10' W. long.) with the remark, '' Existence lately confirmed ;" and " Brazil Rock (high)," with no indication of doubt, in 51°10' N. lat., 15° 50' W. long. Ina chart of currents by the late Mr Findlay, dated 1853, these names appear again. But in his 12th edition of Purday's Memoir Descriptive and Explanatory of the N. Atlantic Ocean (1865), the existence of these islands is briefly discussed and rejeeted by Mr Findlay, with the intimation that their names would be entirely omitted in future editions.

Thus the official sepulture of the old tradition of the island of Brazil took place only eleven years before the date of this article (1876). And now the surface of the Atlantic, as represented in the latest Admiralty charts, shows between St Kilda and Bermuda, between Newfoundland and the Azores, but one point rising above the water, viz., the sugar loaf of Rockall, in 57° 35′ 52" N. lat., 13° 42 21" W. long. (H. Y.)

BRAZIL NUTS are the seeds of Bertholletia excelsa (2. nobilis of Miers), a gigantic tree belonging to the natural order Lecythidacee, which grows in the valleys of the Amazons and generally throughout tropical America.

The tree attains an average height of 130 feet, having a smooth cylindrical trunk, with a diameter of 14 feet 50 fect from the ground, and branching at a height of about 100 feet. The lower portion of the trunk presents a but- tressed aspect, owing to the upward extension of the roots in the form of thin prop-like walls surrounding the stem. The fruit of the tree is globular, with a diameter of 5 or 6 inches, and consists of a thick hard woody shell, within which are closely packed the seeds which constitute the so-called nuts of commerce. The seeds are triangular in form, having a hard woody testa enclosing the “kernel ;” and of these each fruit contains from eighteen to twenty- five. The fruits as they ripen fall from their lofty position, and they are at the proper season annually collected and broken open by the Indians. From Para alone it is esti- mated that upwards of two and a half millions of fruits, equal to fifty millions of “nuts,” are exported annually, in addition to the large quantities which leave other Brazilian harbours, and Demerara, Cayenne, &c. Brazil nuts are largely eaten ; they also yield in the proportion of about 9 oz. to each poundof kernels a fine bland fluid oil, highly valued for use in cookery, and used by watchmakers and artists. BRAZIL WOOD is one of several.dye woods of com- merce which come from the West Indies and South America, belonging to the genera Casalpinia and Peitophorum of the natural order Leguminosee, The species to which the various woods belong have not been well determined, but commercially they are distinguished as Brazil wood, Nica- ragua or Peach wood, Pernambuco wood, and Lima wood, each of which has a different commercial value, although the tinctorial principle they yield is similar. Commercial Brazil wood is imported for the use of dyers in billets of large size, and is a dense compact wood ofa reddish brown colour, rather bright when freshly cut, but becoming dull on exposure. The colouring-matter of Brazil wood is freely soluble in water, and it is extracted for use by simple infusion or decoction of the coarsely-powdered wood. When freshly prepared the extract is of a yellowish tint ; but by contact with the air, or the addition of an alkaline solution, it develops a brick red colour. A chemical

principle, termed brazilin, has been isolated from Brazil wood. It crystallizes into hexagonal amber yellow crystals, which are soluble in water and alcohol. The solution when free of oxygen is colourless, but on the access of air it assumes first a yellow and thereafter a reddish yellow colour. With soda-ley it takes a brilliant deep carmine tint, which colour may be discharged. by heating in a closed vessel with zinc dust, in which condition the solution is excessively sensitive to oxygen, the slightest exposure to air immediately giving a deep carmine. With tin mordants Brazil wood gives brilliant but fugitive steam reds in calico-printing; but on account of the loose nature of its dyes it is seldom used except as an adjunct to other colours. It is used to form lakes which are employed in tinting papers, staining paper-hangings, and for various other decorative purposes. : BRAZZA, the ancient Brattia, an island in the Adriatic, off the coast of Dalmatia, in the circle of Spalatro, and eight miles from that city. It has an area of 170 square miles, and a population of 15,500. The surface is rugged and mountainous, but is industriously cultivated, and its wine is accounted the best in Dalmatia. It produces also oil, figs, almonds, and saffron ; but the corn crop scarcely supplies the wants of the inhabitants for three months. There are about twelve or thirteen hamlets in the island, the most important being San Pietro, Neresi, Bol, and Milna. BREAD. See BAkrne, vol. iii. p. 250. BREAD-FRUIT. This most important food staple of the tropical islands in the Pacific Ocean is the fruit of IV. — 31

Artocarpus incisa (nat. ord. Artocarpacee). The tree attains a moderate height, has very large, acutely lobed, glossy leaves, the male flowers in spikes, and the female flowers in a dense head, which by consolidation of their fleshy carpels and receptacles form the fruit. The fruit is globular in shape, about the size of a melon, with a tuber- culated or (in some varieties) nearly smooth surface. Many varicties of the tree are cultivated, the fruits of some ripening numerous seeds, which are eaten as chestnuts; but in the best kinds the seeds are aborted, and it is only these that are highly prized as vegetables. The tree is a native of the South Sea Islands, where its fruit occupics the important position that is held by cereals in te.aperate latitudes, The fruit, which on distinct varieties ripens at different periods, affording a nearly constant supply through- out the year, is gathered for use just before

it ripens, when it is found to be gorged with starchy matter, to which its esculent value is due. It may be cooked and prepared for use in a great variety of ways, the common practice in the South Sea Islands being to bake it entire in hot embers, and scoop out the interior, which when properly cooked should have a soft smooth consistence, fibrous only towards the heart, with a taste which has been compared to that of boiled potatoes and sweet milk. Of this fruit Mr A. R. Wallace, in his Malay Archipelago, says,—“ With meat and gravy it is a vegetable superior to anything I know either in temperate or tropical countries. With sugar, milk, butter, or treacle it is a delicious pudding, having a very slight and delicate but characteristic flavour, which, like that of good bread and potatoes, one never gets tired of.” In the Pacific Islands the fruit is preserved for use by storing in pits, where the fruits ferment and resolve themselves into a mass similar in consistency to new cheese, in which state they emit an offensive odour; but after baking under hot stones they yield a pleasant and nutri- tious food. Another and more common method of preserv- ing the fruit for use consists in cutting it into thin slices, which are dried in the sun. From such dried slices a flour may be prepared which is useful for the preparation of puddings, bread, and biscuits, or the slices may be baked and eaten without grinding. The tree yields other pro- ducts of economic value, such as native cloth from the fibrous inner bark of young trees; the wood is used for canoes and articles of furniture; and a kind of glue and caulking material are obtained from the viscid milky juice which exudes from incisions made in the stem.

The bread-fruit is now found throughout the tropical regions of both hemispheres, and its first introduction into the West Indies is connected with the famous mutiny of the “Bounty,” and theremarkable history of a small company of the mutineers at Pitcairn Island. Attention was directed to the fruit in 1688 by Captain Dampier, and later by Captain Cook, who recommended its transplantation to the West Indian colonies. In 1787 the “Bounty” was fitted out under command of Lieutenant Bligh to proceed to Tahiti to carry plants thence to the West Indian Islands ; and it was after the cargo had been secured and the vessel was on her way that the mutiny broke out, and Lieutenant Bligh and some of his crew were turned adrift in a small boat in the open sea. The mutineers returned with the vessel to Tahiti, whence a number of them, with a few native men and women, sailed to the

desolate and lone islet of Pitcairn, Lieutenant Bligh ultimately reached England, and was again commissioned to undertake the work of transplanting the plants, which in the year 1792-3 he successfully accomplished.

A somewhat similar but much inferior fruit is produced by an allied species, the Jack or J ak, Artocarpus integri- folia, growing in South India, Ceylon, and the Eastern Archipelago. This tree is chiefly valuable on account of

its timber, which has a grain very similar to mahogany, and although at first light coloured it gradually assumes much of the appearance of that wood.

BREAKWATERS differ from piers in their not being necessarily adapted for commercial purposes, They do not, therefore, require to have roadways for the accommoda- tion of traffic, or parapets for keeping water or spray from passing over them. Breakwaters are artificial structures consisting generally of stones or blocks of concrete, built or deposited in deep water. Their object is to tranquillize those portions of the sea which they cover, and which thus become sheltered anchorages. They may be divided into three classes :—(1.) Vertical or nearly vertical structures of built masonry for arresting the onshore progress of the waves, aud for either reflecting them seawards or deflecting them laterally. (2.) Sloping structures of rubble stones dropped into the sea from timber stages or floating barges, and hence termed guerres perdues, having a sloping face on each side, termed a talus or glacis. These slopes, which, after the blocks have been consolidated, are generally protected above low water by stones set closely together, called pitching, are the angles of repose assumed by the loose blocks under the influence of the waves, and vary in steepness from above high water to below low water, where the force of waves is least. They vary from about 1 foot horizontal to 1 foot vertical to 7 feet horizontal to 1 foot vertical. (3.) What may be termed composite breakwaters are partly sloping and partly vertical, and act by causing the waves to break, and also by partially reflecting them seawards or deflecting them laterally. The new breakwater at Aberdeen and the Dover Admiralty pier, which acts also as a breakwater, are examples of the jirst class. Plymouth breakwater, which rises with a general sea-slope of from 2 to 5 horizontal to 1 vertical to a height of 23

feet above high water, is an example of the second class. Cherbourg, which slopes from low water to high water, above which level there is a vertical barrier rising to 124 feet above high water, is an example of the third class. Breakwaters, though passive, are nevertheless real agents by which work is done in com- bating the waves in one or other of the three modes which have been defined. For further information regarding the design of breakwaters and the details of their construction see HARBoURS,

BRECHIN, a parliamentary burgh of Scotland in the county of Forfar, 74 miles W. of Montrose, and connected by a branch-line with the Caledonian Railway. It is situated on an abrupt declivity on the north bank of the

River South Esk, here crossed by a stone bridge of very

early date. The principal buildings comprise the parish church (with steeple and spire 128 feet high)—forming part of an ancient and uncompleted cathedral, of Gothic archi- tecture, which has been injured by modern alterations, several other churches, a town-house, the public and Smith's school, a mechanics' institute, and an infirmary. The diocesan library hall of the Episcopal church contains an extensive and valuable collection of books, many of them presented by Bishop Abernethy-Drummond, and about 2000 by the late Bishop Forbes, who erected the building. Some ruins remain in the "vennel" of the Maison Dieu, or hospitium, founded by William of Brechin in 1256. The most remarkable edifice, however, is the round tower, situated in the churchyard near the cathedral. This tower is similar to those so common in Ireland, but in Scotland is only rivalled by the tower at Abernethy. Like similar buildings, it contains no stair, and the only access to the top is by means of ladders placed on wooden floors, which rest on circular stone projections within the tower. The height from the ground to the roof is 863 feet, the inner diameter within a few feet of the bottom is 8 feet, and the

, thickness of the wall at that part about 4 feet; the circum-

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ference is very near 50 feet ; the inner diameter at top is 6 feet 7 inches, the thickness of the wall 2 feet 10 inches, and the circumference 38 feet 8 inches. These proportions give the pbuilding a high degree of elegance. The top is roofed with an octagonal spire 18 feet high, which makes the whole height of the building 101 feet 9 inches. Brechin

Castle, which was a place of some strength during the Wars

of the Independence, now a seat of Lord Dalhousie, lies a

little to the south of the town. There is a public park – near the town, and two large nurseries. There are three _ extensive power-loom linen factories (one of them a build- | ing of much taste), two bleach-fields, two distilleries, a

brewery, and a paper-work ; and extensive freestone quarries exist in the neighbourhood. The town is lighted with gas, and an ample supply of water has been introduced at great expense. Weekly markets are held on Tuesdays; and statutory fairs for horses, cattle, and sheep are held at _ Trinity Muir, about a mile north of the town. Brechin unites with Montrose, Arbroath, Forfar, and Bervie in _ returning one member to parliament. The population of _ the parliamentary burgh was in 1871, 7959; and of the royal burgh, 5083.) Brechin is a placc of great antiquity, and was chosen by the

Culdees as the site of one of their convents. It is said to have been purned by the Dancsin 1012. In 1150 it was erected into a bishopric by David I. In 1572 James VI. gavea grant for founding a hospital in the burgh, which still supplies the magistrates with funds for charity. In 1645 the town and castle were harried by the marquis of Montrose. Maitland the topographer and Gillies the historian of Greece were natives of Brechin.

BRECON, or BreckNocksuire, an inland county in South Wales. Its greatest length from south to north is about 53 milcs, and its greatest breadth from east to west about 46 miles. It possesses an area of 719 square miles, or 460,158 acres, and is thus the fourth largest county in | Wales. It is said to have derived its name from Brychan, a Welsh prince, who flourished in the fifth century.

The Old Red Sandstone is the principal geological forma- tion in this county, and occupies the whole of the central portion from east to west. Along the southern boundary there extends a narrow belt of carboniferous limestone, millstone grit (“farewell rock” of the miners), and the outcrop of the coal beds,—together forming the northern rim of the coal measures in the great South Wales coal-field.

At Clydach in Llanelly, Brynmawr, Hirwaun, and a few –

_ other places on the south-eastern border of the county, _ there are extensive iron-works. The narrow projecting part of the county to the north, lying between Radnor and _ Cardigan, is occupied by the Upper and Lower Silurian beds; and there is a somewhat singular narrow peninsula _ of the former projecting into the Red Sandstone for a dis- | tance of ten miles, in a S.W. direction, and terminating at about five miles north of the town of Brecon. A belt of limestone extends from the town of Hay on the east, and _ passing in a §.W. direction through the town of Brecon, terminates at the Brecknockshire Van. A prominent band extends along the border of the Old Red Sandstone on the N.W., where it joins the Silurian beds.

The general aspect of the county is mountainous, and the scencry is marked by beauty and grandeur. A chain of the loftiest mountains in South Wales completely | encircles the south, composed in the east of the Black _ Mountains, 2545 feet in height, and the curious Sugar _ Loaf rising to the height of 1760 feet. On the west of Brecknockshire are the Van and Talsarn mountains 2596 feet, and Mount Capellante 2394 feet in height; while _ the centre of the crescent is occupied by the masses of the

Brecknockshire Beacons, the highest point of which, Cader | Arthur, or Arthur’s Chair, attains an altitude of 2910 feet. In the north, a range of barren hills, called Mynydd Bwlch _ Groes at the most westerly end and Mynydd Epynt

towards the east, enters the boundary of the county at a short distance from Llandovery in Carmarthenshire, and extending in a N.E. direction, terminates near Builth,

Of the valleys the most distinguished for beauty is that of the Usk, stretching from east to west, and dividing the county into two nearly equal portions. The Wye is the chief river, and forms the boundary on the N. and N.E. from Rhayader to Hay, a distance of upwards of twenty miles; while the Towy, the Afon Claerwen, and the Elan separate the county from Cardigan and Radnor on the N.W. and N. The Usk rises in the Carmarthenshire Van on the west, and flowing in a direction nearly due east through the centre of the county, collects the waters from the range of the Beacons in the south, and from Mynydd Bwlch Groes and Mynydd Epyut in the north, by means of numerous smaller streams (of which the Tarell and the Honddu are the most important), and enters the county of Monmouth near Abergaveny. ‘The Taff, the Hepstau, and the Tawe, all rise on the south of the Beacon range, and pass. ing through Glamorganshire, flow into the British Channel.

Llyn Safaddu, Llangorse Lake, or Breckinioc Mere, the largest lake in South Wales, is situated at the foot of the Black Mountains, and within the county. It covers an extent of nearly 1800 acres, and is about two miles long by one mile broad. Upon an artificial island in the lake traces of habitations raised on piles have lately been dis- covered, together with the bones of red deer, wild boar, and Bos longifrons. Tradition affirms that beneath the lake is a submerged town, which has been rashly identified with the Roman station Loventewm.

The climate is moist, but temperate and salubrious; and the soil of the valleys, often consisting of rich alluvial deposits, is very fertile. The cultivated crops consist of wheat, oats, barley, rye, turnips, pease, potatoes, and vetches ; of these the greater part is consumed within the county. The uplands are chiefly in pasture, and are stocked with sheep, cattle, and ponies, which with wool, butter, and oak-bark, forin the staple of a considerable trade with the adjoining English counties, and with the iron districts lying to the south. The farms are generally small, but are well cultivated in the lower parts of the county. The highland occupiers are a very humble, hard-working class of men. It is calculated that about two-thirds of the lands in the county are enclosed.

Breconshire is intersected by the Mid Wales, Brecon, and Merthyr Railway, and a branch of the London and North-Western, by means of which there is ready com- munication with all parts of the kingdom.

The principal towns are Brecon, Builth, Crickhowel, and Hay. The county returns one member to parliament, and has done so since 1536. The political influence is chiefly in the hands of Lord Tredegar and Sir Joseph Bailey. Constituency in 1875, 3574. Rents in the valley of the Usk and around Brecon are high, but on the mountain lands very low; it would be deceptive to give an average per acre. The annual value of real property paying income-tax is £316,208. The population of the county by the last census was 59,901, giving an average of 83 persons to a square mile, or 7°68 acres to each person. Of the total number 29,928 were males, and 29,973 females. The number of inhabited houses was 12,617, giving an average of 17°5 inhabited houses to a square mile, and 4°7 persons to each house. The following returns show an increase of population amounting to 34 per cent. during the last fifty years :-—

182. ..ccc-scsnaeteegde 43,826 $931. ....00-dsaen ce 47,768 TOA, «oc. ccrccss Ae eee 55,603 BBL... cscsccsn osccee ee a a ee 61,474 TEI... TST 1. iccixe eee eee 59,901

The Welsh language is still that of the peasantry and middle class, and the members of the Church of England are largely out-numbered by the Baptists, Calvinistic Methodists, and Independents.

Brecknockshire formed part of the territory of the Silures, and its occupation by the Romans could never have been very complete. After their expulsion the district (Brycheiniog) was ruled by native princes and was the scene of many a border struggle. Many of the castles which are scattered over its eastern border had their origin at this period; and some of them may be regarded as advanced posts erected by the English during the wars which preceded the formation of Offa’s Dyke. Subse- quently, when Bernard de Newmarch and his Norman followers obtained possession of the country, they were converted into regular fortresses, by which the neighbour- hood was kept in awe, and the mountain passes defended. The district between

Brecon and Builth was the scene of the last struggle between the English and Llewelyn in 1282, when the Welsh chieftain was defeated and slain. Since that date Breconshire has not been associated with any important historical events, unless we include among them the raids of Owen Glyndwr. It formed part of the Welsh Marches until their union with England in 1532. Among the eminent natives of the county may be mentioned Sir David Gam (Shakspeare's Fluellen), who lost his life at Agincourt while defending Henry V.; the ill-fated Henry Stafford, duke of Buckingham; John Penry ("Martin Marprelate"); Henry Vaughan, the poet; Dr Hugh Price, founder of Jesus College, Oxford ; Thomas Howel, bishop of Bristol (less known than his brother, the letter writer) ; Theo. Jones, historian of the county; and Mrs Siddons.

Brecon, or BREcKNocK, the capital of the county of the same name, a market and borough town, 145 miles N. by W. from London, picturesquely situated in a fine open valley, at the confluence of the Honddu and Tarell with the Usk, and nearly in the centre of the county. It is sup- posed to occupy the site of the Roman station Bannium, but it is more probable that it was partly constructed with materials drawn from that spot, which lies to the W. of the present town, on the Via Julia Montana. There are threc main streets, with several smaller ones. The houses are for the most part constructed of stone, and are gene- rally well built. Brecon has a fine cruciform church (Early English in style), which has been restored by Sir Gilbert Scott. There are two other churches, and two Indepen- dent, two Baptist, and one Calvinistie Methodist chapel. The corporation consists of a mayor, recorder, four alder- men, and twelve councillors, The borough has returned one member to parliament since 1536. Constituency in 1875, 813. The assessed taxes yield annually £1259, and the annual value of real property paying income-tax is £24,941, There are weekly markets, and several fairs in the course of the year. The quarter sessions and assizes are held here. Brecon has a foundation called the College of Christ Church, of which the bishop of St David's is ex oficio dean, but after the death of its present officers its revenues will devolve to the ecclesiastical commissioners and be appropriated to ecclesiastical uses. The ruins of the ancient castle are enclosed in the beautiful grounds of the Castle Hotel, and though unimportant in them- selves, derive an interest from their connection with the Fitzwalters, de Braoses, de Bohuns, and Staffords, successive lords

of Brecon. The principal fragment now remaining is Ely Tower, so called from its having formed the prison of Morton, bishop of Ely, where he concerted with his custodian, Henry Stafford, duke of Buckingham, the dethronement of Richard IIL, and the union of the houses of York and Lancaster. There are some fine

Roman and other remains in the immediate vicinity, Population of municipality in 1871, 5845; inhabiteg houses, 1172.

BREDA, a town of Holland in the province of North Brabant, and capital of a circle, is situated in a marshy plain on the Merck, 24 miles 8.W. of Bois-le-Duc, and 30 N.N.E. of Antwerp. It is strongly fortified and defended by a citadel (rebuilt by William ILI. of England), and the surrounding district may be laid under water when required, The town is well built, with wide and well-paved streets, ig intersected by several canals, and has a fine quay, a town. hall, an arsenal, an observatory, an orphan asylum, a cathedral, and several Roman Catholic and Protestant churches, one of the latter having a spire 362 feet in height. _ It has also a Latin school and a military academy, and manufactures of linen and woollen goods, carpets, hats, beer, and musical instruments. Population (1869), 14,179,

Breda obtained municipal rights in 1252 from Henry, but was not surrounded with walls till 1534. The old castle, which had been built in 1350 by Jan Van Polanen, was restored about the same time. In 1696 William Prince of Orange and king of England caused the erection of the new castle, which was regarded as one of the finest buildings of the period. 1t was afterwards the residence of Charles II. in his exile, and is now the seat of the military academy. The town was captured by the Spaniards in 1581, by Maurice of Orange in 1590; again by the Spaniards, under Spinola, in 1625; and by Henry of Orange in 1637. It was finally ceded to Holland by the treaty of Westphalia in 1648. During the wars of the French Revolution it was taken by Dumouriez in 1793, and again by Pichegru in 1795. Much of its celebrity is due to the various political congresses of which it has been the scene. In 1566 the nobles of the Netherlands formed there the league known as the Com- promise ; in 1575 a conference was

held between the ambassadors of Spain and those of the United Provinces; in 1667 a peace was

“signed between England, Holland, France, and Denmark; and in

1746-7 the representatives of the same powers met in the town to discuss the terms of another treaty.

BREDA, Jan Van, a Dutch painter, was the son of Alexander Van Breda, an artist of cousiderable merit, and was born at Antwerp in 1683. He imitated the style of Wouvermans and Breughel with such dexterity, that even connoisseurs are often unable to distinguish his copies of their pictures from the originals. He visited England, where he was so well employed, that in a few years he was able to retire to his native country with a competency. The earl of Derwentwater was one of his chief patrons. He died at Antwerp in 1750.

BREDOW, GasriEL GortrrieD, a German historian and professor in the university of Breslau, was born at Berlin in 1773. He is known in England by his Manual of Ancient History, which was translated into English in 1827; Researches on History, Geography, and Chronology ; and his valuable Zistorical Tables, which come down to 1811. This last work was translated into English by Major J. Bell, who continued the tables down to 1820, and produced a popular and very useful work. Bredow died in 1814.

BREEDS AND BREEDING.) The word breeds is usually applied to the varieties of domesticated animals only, but since the phenomena presented under cultiva- tion by all classes of organisms are entirely similar in character, and since, moreover, much of our knowledge on the subject has been gained from botany and horticulture, we shall include, under the one term breeds, the varieties of domestic animals and of cultivated plants. The natural and simple definition of breeding would be the art by which breeds are produced. But here the objection arises, that in this definition too much is assumed. It may be argued that our domesticated animals and plants are each

1 Many of the facts and arguments contained in the present article are taken from Mr Darwin’s work, The Variation of Animals and Plants under

Domestication, 1868, and 2d. ed. 1876 ; and in most instances it has not becn considered necessary to give the references.

BREEDS

identical with a wild prototype either living or extinct, and that man has merely deprived them of liberty and re- gulated their environment and propagation in the manner most advantageous to each kind. At the present day, when the whole range of biological thought is so largely permeated by the principles of the doctrine of evolution, this objection will probably not be advanced. Yet, when it is remembered that such an authority as Col. Hamilton Smith held the belief that each breed of dog had its wild prototype, it appears necessary to modify the definition above given. Let it be said that the art of breeding consists in changing the conditions of life and regulating the repro- duction of animals and plants.

Since a breed is a domestic variety, it implies the existence of a group of individuals marked off from their congeners by the possession of certain characters which are transmitted to their offspring. It is this transmission of peculiarities which is the essential characteristic of a breed; for any collection of domesticated organisms could be divided into groups of individuals distinguished by certain points, but such groups would not necessarily form breeds. It is evi- dent, then, that the law of heredity which asserts that “like begets like” must hold good, or the existence of breeds will be animpossibility. Again, if it were absolutely true that like begets like, that is, if the offspring were in all cases iden- tical with the parent, it is evident that neither by man’s inter- ference, uor by the operation of nature, could a breed or race arise. It seems, then, that were it not in the nature of all organic beings to reproduce their kind in the manner formu- lated in the principle of heredity, and were it not for the continuous slight infringement of it expressed by the prin- ciple of variability, breeds could not have arisen. It is therefore necessary to examine these two principles as part of the subject under consideration.

Whatever views we may entertain respecting the origin of our domestic animals and plants, there can be no doubt as to the matter of fact that breeders have always proceeded on one principle,—select the best individuals in each genera- tion and pair them. Now we have found that the

qualities of organic beings (forming in a certain sense the material on which the breeder has to work) can be generalized under two principles—heredity and variability. And in the same way the art of breeding is itself capable of a kind of gene- ralization under the principle of selection. There are thus three great principles or laws—~heredity, variability, and selection—the last relating to the art of man, the other two to those qualities of organic beings which render the art practicable.

Heredity.—The simplest form of heredity is found amongst those organisms which reproduce their kind by division into two parts similar to each other. This process is illustrated by the fission of a Moneron. The next ad- vance in complexity of reproduction occurs when the two portions into which the organism divides are dissimilar to one another; here the process by which both portions ultimately assumc the form of the parent is not one of simple nutrition, z.e., of formation of tissue like that already formed, The process by which man propagates some of his cultivated plants is one of artificial reproduction by fission. For instance, a cutting or part of a shoot, or even a leaf (as with Begonia), if placed in suitable soil, will re- produce the original plant in all its minute dctails. We are here face to face with the mystery of reproduction ; for we have the ever wonderful fact that in a few cells lies dormant the vital impetus which enables them to produce from inor- ganic pabulum a most complicated structure, which in its totality is utterly unlike themselves. And this example shows us, moreover, how essentially the same are sexual and asexual reproduction ; for there is no intrinsic difference between reproduction from a snuall part artificially separated

from a simple foliar organ (a leaf) and the same sequence of growth originating in a small portion naturally segregated from a transformed foliar organ (the ovary). The conditions of growth are not the same in the two cases, and there all essential difference ends; for the broad distinction which the congress of two individuals in one case appears to make is swept away by the facts of Parthenogenesis. In the lowest of living things we have seen that growth and reproduction are almost identical aspects of life. And this connection is not less close among higher organisms ; as Mr Herbert

Spencer observes,—‘‘ When in place of its lost claw a lobster puts forth from the same spot a cellular mass, which, while increasing in bulk, assumes the form and structure of the original claw, we can have no hesitation in ascribing this result to a play of forces like that which moulds the materials contained in a piece of Begonia leaf into the shape of a young Begonia. In the one case as in the other the vitalized molecules composing the tissues show their proclivity towards a particular arrangement ; and whether such proclivity is exhibited in reproducing the entire form or in completing it when rendered imperfect matters not.” The main fact of inheritance is so obvious that it is apt to be forgotten. Mr Darwin remarks, —‘ It is hardly possible, within a moderate compass, to impress on those who have not attended tothe subject the full conviction of the force of inheritance, which is slowly acquired by rearing animals, by studying the various treatises which have been published on the various domestic animals, and by con- versing with breeders.”? Certain peculiarities have appeared only ouce or twice in the history of the world, but have reappeared in children or grandchildren of the individuals so characterized. Thus Lambert “ the porcupine man,” whose skin was covered with warty projections, which were periodically moulted, had all his six children and two grandsons similarly affected. The mest striking cases of inheritance have, as in this instance, been observed in man ; but the very existence of the numerous breeds of domestic animals is clear evidence of the possibility of the transmission of every kind of peculiarity. For instance, it is believed that the varieties of the domestic pigeon amount to at least 150, and these races differ from each other in many ways, and all breed true to their kind. Some very curious peculiarities have been perpetuated. A race of cattle called ‘Dutch buttocked ” was formed in Yorkshire by selecting in each generation the animals with the largest hinder-quarters. When the breed began to be established it was found that the large sizc of the calves’ hind-quarters increased the dangers of parturition to a considerable extent. This case is interesting as showing that hurtful peculiarities may be inherited just as readily as those which are beneficial, and as bearing witness to the improbability of the view that there is an innate tendency to vary in the right direction. The terrible strength of inheritance exhibited by disease is a fact which is only too well established in the case of man ; and in the maladies of domestic animals the same law holds good. It appears that nearly all the diseases to which the horse is subject are hereditary,—for

instance, contracted feet, curbs, splints, spavin, founder, and weakness of the fore legs, roaring or broken and thick wind, melanosis, specific ophthalmia, and – blindness, aud even such habits as crib-biting and jibbing, are all plainly hereditary. The fact that any, even the most complex combinations of qualities are capable of hereditary transinission, is, perhaps, more forcibly brought home by considering the monetary aspect of the art of breeding, than by the fullest collection of special instances. As Mr Herbert Spencer remarks :—“ Excluding those inductions

1 Principles of Biology, London, 1868, p. 181. OS iia Wn Wh jo, Bh

that have been so fully verified as to rank with exact science, there are no inductions so trustworthy as those which have undergone the mercantile test. When we have thousands of men whose profit or loss depends on the truth of the inferences they draw from simple and per- petually repeated observations ; and when we find that the inferences arrived at and handed down from generation to generation of these deeply interested observers has become an unshakeable conviction, we may accept it without hesi- tation. In breeders of animals we have such a class, led by such experiences and entertaining such a conviction— the conviction that minor peculiarities are inherited as well as major peculiarities. Hence the immense prices paid for successful racers, bulls of superior form, sheep that have certain desired peculiarities.”1 Not only are slight and gradual changes inherited, but in some cases sudden and well-marked variations are strongly transmitted. The case of the Niata cattle is now well known; a similar case is recorded of a rabbit born with only one ear, from which a breed was formed which steadily produced one-eared rabbits. These remarkable cases of sudden and large varia- tion being inherited are closely allied to the still more curious phenomenon of the inheritance of mutilations. The most striking cases on record are those of Brown-Séquard.? In his experiments on the inheritance of artificially produced epilepsy he found that guinea pigs, after having undergone section of the sciatic nerve, often nibbled off portions of their hind legs in consequence of the anesthesia of those parts. Now the offspring of these self-mutilated animals were in thirteen cases born without toes. To appreciate the true value of this case it must be noted that Dr Brown-

Séquard has for thirty years kept guinea pigs, and has had many thousands under observation, and not a single case of congenitally toeless animals has occurred excepting among the offspring of mutilated parents. In spite of the uni- versal tendency towards the transmission of the form and qualities of the parents to the offspring, there occur capri- cious and inexplicable lapses in inheritance. It is not

possible logically to distinguish a want of inheritance:

from a case of variation ; but when the difference between the offspring and the parent consists merely in the absence in the former of a quality possessed by the parent, it may be more conveniently classed as a want of inheritance than as an instance of variation. Although a weeping or pen- dulous habit in trees is in some cases strongly inherited, in other instances the want of inheritance is equally well marked. Mr Rivers sowed above 20,000 seeds of the weep- ing ash, and not a single seedling was in the least degree pendulous. M. Borchmeyer has also observed the same fact in Germany. In all cases it must be remembered that the form and qualities which the offspring of an animal or plant will assume when fully developed are not solely dependent on the nature of the hereditary impetus with which it starts; the initial tendency is as it were calculated s9.as to impart under certain conditions a certain form to the organism. If the conditions change, the initial ten- dency will not lead to the proper result ; and it is to be noted that the apparent amount of alteration in the con- ditions is no measure of the amount of effect produced on the organism. For instance, none of the English breeds of sheep can be kept pure in France, the lambs of even the first generation lose vigour as the heat of the summer comes on, and the breed becomes absolutely degenerate. It is extremely curious that the force of inheritance which seems all powerful in England should give way so utterly under such a slight change of circumstances.

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1 Principles of Biology, 1864, No. LOS a5 2 ha Roy. Soc., No, 297 ; Brit. Assoc., 1870 ; Lancet, Jan. 1875, 195 fhe

BREEDS

The method by which a breed was formed, combining the valuable qualities of the English sheep with a congtj. tution fitted for the French conditions of life, is mogt instructive, and is a triumph of thoughtful and scientifig breeding. The successful attainment of this end is due to M. Malingié-Nouel. He found that the offspring of a crogg between a pure English ram and a French ewe inherit the desirable form of the sire, but, unfortunately, also hig undesirable constitution. He accordingly paired a ewe taken from a border district, and therefore intermediate between two breeds, with a similar intermediate ram. He thus produced a sheep "combining the four races—Berry, Sologne, Merino, and Touraine . . . without decided char. acter, without fixity, ... but possessing the merit of being used to our climate and management." It was now found that the lambs born of this mongrel ewe by purely-bred New Kent rams combined the English form with the French constitution, and transmitted this desirable com- bination to their offspring, and in this way the " Charmoise" breed was produced.

In this instance it seems as if the tendencies supplied by the ewe formed so discordant a combination that no strong tendency resulted for any of the French forms to appear, so that the form of the English ram was strongly impressed on the offspring. On the other hand, the constitutional tendencies coming from the mother's side were not dis- cordant, but united in impressing the French constitution on the offspring. This case is instructive as establishing the possibility of an important kind of acclimatization, and as bearing on a somewhat exceptional phenomenon of heredity, namely, that when both parents exhibit a given character strongly, the offspring do not inherit it so surely as when one:parent only is especially well characterized, Thus a successful breeder of laced Sebright bantams says,— "Tam confident that those that are best laced frequently produce offspring very far from perfect in their markings, whilst those exhibited by myself which have so often proved successful were bred from the union of heavily laced birds with those that were scarcely sufficiently laced."* The class of cases just noticed is, moreover, of great interest as bearing on a form of inheritance which has been named "prepotency of transmission." When the 'offspring, instead of being intermediate between the parents, strongly resemble one of them, the latter is said to be prepotent in transmitting its likeness. The famous bull Favourite is believed to have had a prepotent in- fluence on the short-horn race. It has also been observed with English race horses that

certain mares have generally transmitted their own character, while other mares of equally pure blood have allowed the character of the sire to prevail.

In other cases a remarkable weakness of transmission of character is found to exist. A striking instance is given by Mr Brent. It must be premised that the breed of pigeons known as “trumpeters” is characterized by a tuft of feathers over the beak, by a crest on the head, and by a most peculiar coo. Mr Brent crossed a trumpeter with another breed, and then recrossed the mongrels with trumpeters. But it was only at the fourth generation, when the birds had }§ trumpeter blood in their veins, that the characteristic tuft appeared, and even then the peculiar trumpeting coo was absent.

It is frequently asserted that the male is prepotent over the female in transmitting certain characters. It has been shown,° however, that such rules do not hold good except

3 Jour. Roy. Agri. Soc., xiv. 1858, p. 214, translated by Mr Pusey.

- The Poultry Book, by W. Tegetmeier, 1866, p. 245.

> The Pigeon Book, p. 46.°

8 Prosper Lucas, L’Héréd. Nat., tom. ii. 1. ii, ch. i., and Gartner, Bastarderzeugung, s. 264-266.

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‘ rene ; : * toa very limited extent, and in certain groups only. It

frequently happens that a character existing in one of the

arents is transmitted more powerfully to the offspring of _ the sex to which that parent belongs than to the opposite

sex. The large and important subject of secondary sexual characters hinges entirely on this phenomenon. The re- semblance ~~between prepotency and sexual limitation be~~ comes clear when we remember that where the offspring are of one sex it may be impossible to distinguish between these

forms of heredity. The most interesting point con- nected with secondary sexual peculiarities in relation to the subject of breeds is, that they are sometimes found in domesticated animals whose nearest wild congeners show no such limitation of character. Thus in the sheep, the males of certain races differ greatly from the females in the _ shape of their horns, in the development of fat in the tail _ (in certain fat-tailed breeds), and in the outline of the fore- head. These differences are interesting because, so far as _ we know, similar secondary sexual differences are not found in the nearest allied wild species of sheep. On the other hand, secondary peculiarities which originally distingnished _ the sexes are in some cases diminished or removed by domestication. Thus our improved breeds of pigs have to _a large extent lost the formidable tusks of the wild boar. The existence of secondary sexual characters gives a striking illustration of another important law of inheritance. This law asserts that the age at which any character first shows itself in the offspring is the same as that at which it appeared in the parent. Now,secondary sexual characters— those, for instance, presented by the male sex—have appa- rently been developed by sexual selection, and this force can only be brought to bear on variations occurring in adult animals. If, then, the male offspring do not develop the selected peculiarities until they arrive at puberty, the age at which it appeared in their male parent, it is clear that they cannot differ from the female until the age of puberty arrives. And this is well known to be the case, for at an early age the sexes are usually undistinguish- able by any secondary characters. (See Descent of Man, vol. i. chap. viii.) _ The interesting form of inheritance exemplified by the _ transmission through the female line of diseases necessarily confined to the male sex has been already alluded to. This latency of male characters is clearly illustrated by what frequently occurs to old hens. It is well known that a _ large number of female birds, when old or diseased, partly assume the secondary male characters of their species. Waterton (Hssays on Nat. Hist.) gives a curious instance of a hen which had ceased laying, and had assumed the plumage, voicc, spurs, and warlike disposition of the cock. The opposite case of the assumption by the male of female characters is illustrated by the fact that capons sometimes acquire the sitting instinct of the hen.

The possibility of characters existing in a latent condition is of the utmost moment to the breeder, since upon it de- pends the possibility of reversion

or atavism, Reversion is a matter of extreme importance to the breeder, for it is one f of the serious hindrances to the progress of his art. Since the time of the famous Bakewell during last century, Lei- _ cester sheep have been bred with the most scrupulous care, | yet grey-faced, black-spotted, or wholly black lambs occasion-

ally appear. In this case the most careful selection has been necessary to battle against the tendency of the original

colouring of the sheep to reappear. And in all cases of

selection it is this tendency that has to be struggled against _ bythe breeder. On this principle the gardener looks over _ his beds and weeds out the “rogues.” Even from seeds _ gathered from the finest cultivated varieties’ of the | heart’s-ease (Viola tricolor), plants perfectly wild both in _ flowers and foliage are frequently produced. ‘he proxi-

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mate cause of any particular case of reversion is utterly obscure ; but some of the general causes may be set down. It is frequently asserted that domestic animals or culti- vated plants, when allowed to run wild, always revert to the original parent form of the species. This assertion appears to rest on insufficient evidence, and to be an exaggerated statement of what is known on the subject. Nevertheless some weight must be allowed to it. Pigs have run wild in various parts of the world, and have every- where acquired the general characters of the wild pig, and the young have re-acquired the longitudinal stripes. This last character is interesting, since it is not in any way a direct result of the changed conditions of life, as the thicker bristles and increased size of the tusks might be supposed to be. Another well-established cause of reversion is crossing. The case is exceedingly striking when the ofispring of a cross do not resemble any near progenitor, but throw back to very remote ancestors. In illustration may be mentioned the experiments on pigeons detailed in the Variation of Animals and Plants

under Domestication (vol. i. p. 200). There can be but little doubt that all our domestic races of pigeons have descended from Columba livia, the wild rock pigeon ; the common dovecot pigeous exhibit the coloration of the parent form, and the most purely-bred fancy breeds, when of a blue colour, often show these characteristic marks. One of the above-men- tioned experiments consisted in pairing a “mongrel female barb fantail with a mongrel male barb spot, neither of which mongrels had the least blue about them.” It appears that blue barbs are exceedingly rare, that the spot has been known as a pure breed for nearly 200 years, and that a white fantail throwing any other colour is almost an unknown occurrence; nevertheless the offspring from the above two mongrels were of exactly the same blue tint over the whole back and wings as ihat of the wild rock pigeon from the Shetland Islands. Moreover, every characteristic mark of the wild pigeon was repeated in their mongrel offspring. This experiment demonstrates in the most striking way the tendency of a cross to produce reversion. The same result was also obtained by pairing black Spanish cocks with hens of various white breeds. In this case the offspring reverted to the red colouring of Gallus bankiva, whichmay be safely rankedasthe parent form of our domestic fowls. In these instances the offspring revert to a character originally possessed by the ancestors of both parents, and here the cross is in no way essential to the reversion ; it merely acts as a disturbing cause (although, probably, no other equally strong disturbing power could be named). In these cases reversion to a character of any degree of antiquity may occur. In the other class of cases where the character to which the offspring revert is one given by a single cross with a distinct variety, the tendency to re- version becomes weaker in each generation removed from. the cross, and may ultimately be obliterated. The length of time requisite to effect obliteration has formed a subject of discussion. The question can hardly be answered, but the fact that it has been asked shows at least that oblitera- tion may in some cases be effected in a practically finite period. In other cases even characters gained in this way by a single cross seem incapable of extermination. Fowls have been known to exhibit a Malay character, due to a cross with that breed forty years previously. Variability. — When in any case we find the offspring differing from the parent, we set it down at first sight as an instance of variability. But on the discovery being made that the peculiarities characterizing the offspring are derived from a remote ancestor, it can no longer be so considered, and must be attributed to

reversion. Many cases of apparent variation are due to this cause. Thus Gartner declares, and his experience is of the highest value

on such a point, that when he crossed distinct species of native plants that had not been cultivated, he never once

saw in the offspring any new character; but that, from.

the odd manner in which the characters derived from the parents were combined, they sometimes appeared as if new. It appears, therefore, that the point at which the line of distinction is drawn between reversion and variation depends in many cases on the state of our knowledge of the subject. In some other points, also, the relations between inheritance and variation are extremely intricate and difficult to unravel. These two principles are often spoken of as opposed to one another. The following case shows that any definition of variability implying that it is necessarily equivalent to a breach in the law of heredity is incorrect. Some kinds of sheep and cattle dogs are congenitally almost destitute of a tail ; and this Stone- henge attributes to the fact that under the old excise laws only those dogs whose tails had been removed were exempt from taxation; so that this mutilation was universally practised until the deficiency became hereditary. The production of a tailless breed of dogs must certainly be considered a case of variation, yet in tls case it is nota breach of the law of heredity, but a remarkable instance of obedience to that law, that is to say, of the transmission of the effects of mutilation. In other cases external causes produce some constitutional or otherwise imperceptible changes in the parent, and these in being transmitted to the offspring become correlated with some external or perceptible alteration, and in this way new characters may appear. This is undoubtedly a true case of variation ; nevertheless, strictly speaking it is due to the inherited effects of a cause acting on the parent. And it seems illogical to separate it ina radical manner from cases such as that of the tailless breeds of dogs. Considering, there- fore, the great difficulty in which the subject is enveloped, it will be well to abandon theoretical considerations, and merely to state that characters at least practically new do undoubtedly appear in the offspring. In every group of organisms a degree of variability, sufficient to give material for the breeder

to work on, probably exists. The Laplander knows and gives a name to each of his reindeer, though, as Linneus remarks, “to distinguish one from another among such multitudes was beyond my comprehension, for they were like ants on an ant-hill.” A still more striking case is that of the old Dutch florist Voorhelm, who kept above 1200 varieties of the hyacinth, and was hardly ever deceived in knowing each kind by the bulb alone. These cases are important as showing that, even in natural objects which appear identical to the unpractised eye, perceptible differences do exist. Man can effect nothing until some of his stock begin to vary in the desired direction. But horticulturists have found by experience that when any particular character is desired, the first step is to get the plant to vary in any manner, aud to go on selecting the most variable individuals even though they vary in the wrong direction, for the fixed character of the species being once broken through the desired variation wil] sooner or later appear. The great number of races of many domestic animals and plants—for instance, of pigeons, sheep, wheat, &c,—demonstrates clearly their variability in many diverse characters. In other domestic animals, however, very few distinct races exist; yet we must not conclude that these animals have not varied. There are several causes be- sides that of an inherent want of plasticity which may have peo at work. It will here suffice to allude to a few of them.

_ 1. Ifany particular group has not been especially subjected to selec- tion, the absence of distinct races in such a group is no proof of want of variability. This applies to asses (in England one):

2. If the breeder has not a large number of individuals to select from, the chance of the required variations occurring is very small.

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Hence animals kept in small lots do not form races (¢.g., sheep on small holdings).

3. If intercrossing cannot be prevented, it is obvious that any variety which may appear will have no chance of being perpetuated but will be diluted down to the normal type. This applies to cats, which, from their wandering and nocturnal habits, cannot be paired,

It may appear a truism to say that every variation must have a distinct cause, but it is a truism very often over. looked. The case of twins, each born with a peculiar crook in the little finger, is instructive, for here the con- clusion is irresistible that the same definite, though unknown, cause produced the mal-formation in the two children. This case may also serve to illustrate the extreme obscurity in which the causes of any given varia- tion are hidden, and the great difficulty of investigating them. Some general causes which induce variability may, however, be set down.

There appears to be no doubt that organisms subjected to the unnatural and changeable conditions implied by domestication are more variable than those living in a state of nature. Thus moustrosities are comparatively frequent among domestic animals and plants.1_ Domestication causes a number of changes in the condition of life; it is therefore of interest to determine which of these are the most im- portant. Contrary to what might have been expected, change of climate is not an important cause of variation. This is repeatedly shown by A. de Candolle in his Géographie Botanique; and a change to a more genial climate is certainly not necessary, for the dwarf kidney bean, which is often injured by our spring frosts, and the peach, which requires the protection of a wall, have varied much in England. (See ACcLIMATISATION.)

In some moths the colour of the perfect insect is affected by a change in the food of the caterpillar, but there seems to be no evidence that this cause has been active in inducing variability in our domestic races. On the other hand, excess of food is probably an important cause of variability. This view was held by Andrew Knight, and the same idea is expressed in the following remark of a “ preat raiser of seeds :”—“‘ It is a rule invariably with us, when we desire to keep a true stock of any one kind of seed, to grow it on poor land without dung ; but when we grow for quantity we act contrary, and sometimes have dearly to repent of it.”? Nevertheless it appears that many of the best varieties of fruit have not been produced under cultivation. Thus it is asserted that some of the finest French pears were originally found growing wild, and this was the case with an English variety of apple. The most interesting fact connected with changes in the conditions of life is that the results of such changes are capable of accumulation. It is this peculiarity that accounts for the fact that when new flowers are first

introduced into our gardens they do not vary. Thus the Swan River daisy did not break from its original colour until it had been subjected to seven years of high culture. Many facts might be given showing by what slight changes of habitat the health and general development of animals and plants may be affected ;? but with these cases we are not especially concerned. (See AccLIMATISATION.) The causes, how- ever, which induce an unstable condition of general variability are of great importance to the breeder. Of the causes not already touched on the most important is intercrossing. In considering variations under this aspect no attempt will be made to distinguish from true cases of variation the cases in which new characters are simu- lated by combinations of old ones. In the first place, itis probable that organisms propagated by sewwal reproduction Ee ee

1 J. Geoffroy St Hilaire and Moquin Tandon.

? Quoted in Var. under Domes., ii. p. 257.

3 See Var. under Domes., vol. ii. ch. xxiii., on ‘“The Definite Action of the Conditions of Life.”

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are usually the most liable to variation, For here the offspring has a double chance of being influenced by circum- stances affecting the parents; aud by the concentration of double set of tendencies into one individual, a better chance is given for the origin of variations produced by combinations of ancestral characters. In the same way, to a certain extent, a cross with a distinct variety produces a disturbance or loss of equilibrium in the reproductive system from which a tendency to the production of varia- tions results. ‘Thus Gartner asserts that seedlings from Dianthus barbatus, when crossed by the hybrid D. chinensi- barbatus, were more variable than those raised from this latter hybrid fertilized by the pure D. barbatus. Max Wichura insists strongly on an analogous result in the case of willows; and Kélreuter says that to obtain an endless number of varieties from hybrids they should be crossed and recrossed.

Some peculiarities in our domestie races are to be attri- buted to the inherited effects of habit and of disuse. Splints and ring-bones on the legs of

horses appear to be certainly hereditary; and veterinary surgeons agree in pronouncing these growths to be the result of travelling on hard roads, and of the horses being shod. ‘The effects of disuse are clearly shown in the skeletal characters of our domestic races. ‘These effects are well marked in tame

- pirds, which are necessarily prevented from exercising their

wings in flight. Thus in the domestic duck the crest of the sternum is less prominent, the furculum, coracoids, and scapule are all reduced in weight relatively to that of the whole body ; the bones of the wing are shorter and lighter, and the bones of the leg longer and heavier in comparison with the same bones in the wild duck. Closely connected with this class of facts is the subject of rudimentary organs. In organisms living in a state of nature the constant pres- sure of the struggle for existence tends to keep useless structures in arudimentary condition. But domestication, in removing this pressure, does away at the same time with the principle of economy of growth; and accordingly, we find that organs rudimentary in a state of nature become developed under domestication. Thus cultivation has made true branches out of the thorns or rudimentary branches of the wild pear. Again, the rudimentary fifth toe on the dog’s hind foot becomes in some cases considerably deve- loped, and forms the “‘ dew-claw ” of a few large breeds.

Correlation has probably played an important part in modifying domestic races ; for in selecting a given character man has frequently perpetuated many other peculiarities correlated with the first.

Finally may be mentioned the curious phenomena of “4nalogous variation.” This term is applied to those cases in which varieties of one species resemble distinct but allied species. Where this occurs it is probably due to the two forms having originated in a common progenitor, so that modifying causes evolve similar varieties in the two cases because of the similarity of the material which these forces have to act on. Analogous variation is therefore, properly speaking, a branch of the subject of reversion, and once more points out the close connection existing between the latter phenomenon and variability.

In purely bred fowls of many races, birds may occasion- ally be found closely resembling the Gallus bankwa. Here the case is one of simple reversion, and has already been alluded to. The production of spangled sub-breeds of Hamburgh, Polish, Malay, and Bantam fowls is not an obvious case of reversion to a known ancestor. It may be due, however, to descent from the parent form of the Gallinacew, considering the frequency of spangled markings throughout the order.

Selection.—Selection may be defined as the process by which the procreators of each fresh generation are chosen

out of the preceding one. But with reference to the formation of our improved breeds something more than this is meant by the term. The modern development of the art, which has been distinguished by Mr Darwin as methodical selection, always implies that the breeder has before his mind an ideal form,—a model on which he attempts to mould his strain. To be successful in this respect a man must not only possess in the highest degree the powers of discrimination, enabling him to determine which individuals are tending in the right direction, that is, which most nearly approach his ideal, but he must be able to decide, in the most judicious manner, as to which of his selected individuals ought to be paired together. The subject, therefore, falls naturally into two divisions— (1) the discrimination of individual differences, (2) the arrangement of the pairing.

1. Discrimination of Individual Differences.—The extremely fine powers of perception and the great patience required by the breeder might be illustrated by numerous instances. Sir John Sebright is said to have sometimes spent several days in weighing the rival merits of five or six birds. In Germany the merino sheep farmers do not even trust theirown judgment, but employ professional ‘‘sheep classifiers” to select the best of the flock for breeding purposes. Not merely outward form, but internal and constitutional peculiaritics have been carefully attended to by brecders. Thus, Bakewell (the first true methodical breeder of whose proceedings we have any knowledge) bred almost entirely for the early maturity and fatten-ing qualities of his strain; and again, in the improved short-horn breeds, the masses of internal fat or tallow have becn increased to an almost incredible

extent.1 Professor Low states,? as an instructive instance of the limits that should be put to the exaggeration of any one point, that even the great Bakewell appears to have made this mistake in causing a useless accumulation of fat where it was not needed. Itseems that the fat mingled less with the lean than even in the old breeds, and that it spread in layers under the skin, forming cushions of fat. He quotes a writer who ob- serves that, having with great difficulty formed a race of cattle that would “make fat,” Bakewell left his successors under the necessity of producing a breed that would ‘‘make lean.” The same kind of error was at one time committed with the improved short-horns, whose progenitors were pre-eminently good milkers; herethe breeders, by attending exclusively to other qualities, have in some cases injured the milking powers of the race. Youatt is convinced that this loss is not necessarily correlated with rapid feeding qualities.* He asserts that by careful selection a strain may be obtained (and this has, in fact, been effected) in which the cows are first-class milkers, and when dried fatten quickly and well.

In spite of these warnings against exclusiveness and exaggeration, it should be remembered that the difficulties of selection are greatly increased by attention to several points at once. An illustration of this may be taken from the less important art of fancy breeding. » An eminent fancier in speaking of the almond tumbler pigeon (a breed having five points, viz., plumage, carriage, head, beak, and eye), remarks that ‘there are some young fanciers who are over covetous, who go for all the above five properties at once ; they have their reward by getting nothing.”” Mr Darwin observes, ‘“‘We may smile at the solemnity of this precept, but he who laughs will win no prizes. a

It should be remarked, however, that ‘‘fancying” is not governed by rules identical with those which regulate breeding for economic purposes. The fancier often has to strive after extreme abnormal development, amounting to monstrosity ; it has often been remarked that he will not tolerate anything short of this extreme divergence. On the other hand the economic breeder is prevented by solid mone- tary considerations from being misled,to any great extent, by fashion. Hence, instead of the wide differences observable in ‘‘ fancied ” animals, we find a remarkable uniformity in certain characters among many of those bred for use. Thus all the improved races

of the pig closely resemble each other in their shortened legs and muzzles, their large hairless bodies and small tusks. Well-bred cattle of several distinct races exhibit a similar convergence of character.

2. Arrangement of the Pairing (including crossing).—We have already alluded to the remarkable case in which it secms an advan- tage to the offspring that one parent only should possess the desired quality in an especial degree. This may be considered an extreme case, yet it bears some relation to the principles on which breeders usually regulate the arrangement of the pairings. Generally speak- ing, individuals having certain points peculiarly well developed are matched with those excelling in other directions. It is probable that a physiological law which would formulate the exceptional cases above mentioned would also favour the more common practice ee ae ee ee ee

1Youatt, Cattle, 1834, p. 227, et seq. 2 Domesticated Antmals, 1845, p. 378. 3 Op. cit., p. 289. if

now under consideration. For it would allow the transmission of qualities from either parent, undisturbed by the influence of the other, to the offspring. In this part of his work the breeder once more finds occasion for the utmost skill and judgment ; but so dif- ficult to formulate ave the fruits of his experience that he often seems guided in his choice by instinct rather than by reason. Every new breed must originate in a few individuals possessing some spe- cial peculiaritics. Therefore, nearly-related individuals must at first be matched; in other words, close ‘‘ in-and-in” breeding must be practised, or the race cannot be ‘‘fixed.” In consequence of the uniformity obtained by pure breeding, characters otherwise unim- portant become valuable as marks of purity of race. Thus the dark red colour of the Devon cattle becomes a criterion of ‘‘ blood.”

The advantages of in-and-in breeding have been insisted upon by the improvers of our domestic breeds, and some of them have declared that no ill results follow from the practice. But in spite of this assertion it is

generally admitted that degeneration either in constitution cr in other ways does ultimately ensue; so that at any cost the breeder is absolutely compelled to admit blood from another family or strain of the same race. In speaking of this necessity in the case of sheep, Youatt says that the breeder will choose ‘‘a ram from a soil and kind of food not dissimilar to his own, . ., with points as much resembling his own sheep as may be—quite as good as those in his own flock—superior if possible in some points, inferior in none.” But in opposition to Youatt it may be argued, from the practice followed by some great poultry breeders, that animals having the same physical characters, but which have becn kept under different conditions, ought to be selected for crossing. By this means tone and vigour are infused into the stock without materially altcring its character. In other eases a different plan has been followed. For instance, Colling (for what purpose is not clear, on account of the secrecy in which he carricd out his art) crossed his short-horns with a distinct breed—the Gallo- way. He thus produced a sub-strain or family, called in reproach the ‘ Alloy,” but possessed of great merits, which, by recrossing with short-horns, became quite equal to the pure breed,? and produced animals which sold for enormous prices. This method of making one “violent” cross, and trusting to subsequent re-crossing with the pure parent form (together with long con- tinued selection), has sometimes been followed where some especial quality is required. Lord Orford’s well-known attempt to infuse pluck into his greyhounds by means of a cross with a bull-dog is a case in point, Stonehenge records a carefully-observed experiment of the same kind, which shows that the objectionable form of the bull-dog can be thoroughly eradicated even in four generations. In other cases a cross with a distinct variety is effected with the object of forming an intermediate race which shall transmit its characters.

Crossing.—An injudicious exaggeration of certain qualities, as in some cases before alluded to, has taken place in breeding long-woolled sheep. Here the fleece has been almost exclusively attended to, and the quality of the carcasé allowed to deteriorate. No doubt, an improved breed remedying this evil might have been formed by selection, but this process would have been slow and extremely difficult; and, fortunately, there existed the readier method of forming a crogs-breed race combining the desirable characteristics of both varieties. Messrs Druce and Pusey? have pointed out

the great increase of profit yielded by a cross between the long and short-woolled sheep The following table gives in the first column the number of Cotswolds, Southdowns, and sheep of a “cross breed” intermediate between them, which a given area will support ; the second gives the total value of fleece and carcase in each case for the number of animals given in the first column :—

Cotiyoldiperes eee… 100 £496 SOULN Comm eee eee ee 120 488 Crosse breeds ee ee 115 587

Crossing has, in fact, entered largely into the formation of nearly all our improved sheep.®

In some cases the offspring of a first cross between dis- tinct species possess valuable qualities, but owing to their sterility an intermediate race cannot be formed. If, how- ever, the combination is valuable the cross may be repeated at will. The breeding of mules is a familiar example of this method. In the same way cross-bred cattle, which though

- Low, p. 304. 2 Jour. Roy. Agri. S0C., XIV Sosy paelt. 3 See Mr Spooner’s excellent paper on ‘‘Cross-Breeding” in the Jour. Roy. Agri. Soc., vol. xx. pt. ii.

not sterile are yet incapable of transmitting their valuable qualities to their offspring, are bred for the butcher bya repetition of the first cross.

Some of the more important points in connection with methodical selection and the modern art of breeding haye now been briefly indicated. The results obtained have been truly astonishing. Lord Somerville graphically remarked that the modern sheep-breeder appeared to have “drawn a perfect form and then to have given it life,” These extraordinary improvements have been effected almost within the last century; and it may be objected that because selection as now practised is of modern date the differences which characterize many races of great antiquity cannot have been produced by man, This objection, however, is not valid, for it can be shown that an unnoticed and therefore unrecorded cause of modifica- tion has long been in

existence. This important agent has been named “unconscious selection ;’ it is illustrated by the following case. In speaking of two flocks of the New Leicester sheep possessed respectively by Messrs Buckley and Burgess, Youatt remarks that “both of their flocks have been purely bred from the original stock of Mr Bake. well for upwards of fifty years. There is not a suspicion existing in the mind of any one at all acquainted with the subject, that the owner of either of them has deviated in any one instance from the pure blood of Mr Bakewell’s flock ; yet the difference between the sheep possessed by these two gentlemen is so great that they have the appear- ance of being quite different varieties.’’4

Now we may feel sure that neither of these breeders intended to alter the character of his flock, he merely strove to produce the best possible New Leicester sheep, and selected those which approached his ideal most closely, Yet owing to slightly different standards of excellence having been unconsciously aimed at in the two cases, the import- ant results pointed out by Youatt arose. It is an exceed. ing remarkable fact, that changes so small as not to be perceived by the trained eye of the modern breeder may by accumulation produce obvious results in the short space of fifty years. And if such changes may occur unnoticed under the supervision of men keenly alive to the possibili- ties of change, a far greater field for this kind of modifica tion must have been offered before any such knowledge was general. An unperceived divergence of character will arise whenever men, actuated by some vague belief in heredity, begin to select the best individuals, roughly speak- ing, for reproductive purposes. Each man will uncon- sciously take a standard of excellence slightly different from his neighbours, and thus his strain will imperceptibly begin to differ from theirs. Now there can be no doubt that an amount of selection sufficient for this purpose must have been practised from a very remote period. Youatt, after an examination of the passages in the Old Testament bear- ing on the subject, asserts that some of the best principles of breeding were then understood. The antiquity of breed- ing is also proved by certain passages in ancient Chinese encyclopzedias.

The ancestors of nations at present civilized must have passed through stages in which they resembled the savages of the present day ; therefore it may fairly be assumed that customs which are found among lowly

developed savages are of great antiquity. Now few races are more barbarous than the Australians, yet even they take pains in the breed- ing of their dogs, matching the finest together and pro- viding good food for the mother in order that the young may be well nurtured. From a large body of similar evidence there can be no doubt that a degree of selection sufficient for the development of unperceived divergence has been EO Se am

4 The Sheep, p. 315.

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practised from exceedingly ancient times. The results pro- duced by prolonged sclection of this kind may be estimated in various ways. For instance, although it is certain that the pointer originally came from Spain, no such breed exists there at the prescnt day. So far as is known no efforts have ever been made to modify the pointer; but every one has wished to possess as good dogs as possible, and by an unconscious conseusus of opinion, the desire for improve- ment has resulted in a slow progressive change in a certain direction. But the amount of divergence produced by long- continued selection may be illustrated more forcibly by general considerations than by special instances. – The fact that the progenitors of many cultivated plants and domestic animals cannot with certainty be determined points out the great divergence from the wild parent form that has been effected under domestication. The genus Awchenia may serve as an illustration. There are four forms in this genus— the guanaco and vicuiia, found wild, and undoubtedly dis- tinct species, and the llama and alpaca, known only in a domesticated condition. Most professed naturalists have looked on all four forms as specifically distinct, and have made the assumption that the wild llama and alpaca have become extinct. But Mr Ledger appears to have proved conclusively! that the llama is the domesticated descendant of the guanaco, and the alpaca that of the vicufia, —so that a large amount of divergence must have been effected in this case, And as we know that careful selection was anciently applied to these animals, there is nothing inconceivable in sucha transformation having been effected. The power of long-continued selection is well shown by the fact that, in domestic animals and plants, the parts or qualities valued by man have been most modified ; thus the shecp has been prized during many ages

for its fleece, the horse for its strength and fleetness, and, accordingly, we do not find breeds of shcep differing from each other in strength and fleetness, or breeds of horses distinguished by the properties of their hair, but on the contrary both animals have pro- duced races characterized by differences in the qualities for which they are valued. The same law is even more clearly demonstrated by plants under cultivation. In the radish, which has been esteemed exclusively for its root, it is the latter that differs in the several varieties, while the flowers, seed, and foliage are almost identical in all. Again, the yaricties of the gooseberry differ much in their fruit, but hardly perceptibly in their flowers and organs of reproduc- tion. In some cases structures neglected by man have varied by correlation ; but allowing for this exception, they may be said to have escaped the effects of selection, and accordingly to have remained stationary, while the selected qualities have gradually improved.

In attempting to frame an answer to the question— How much has man actually effected? it will be well first to estimate the amount of modification which may be claimed as his work, and then to measure the efficiency of the agents by which these results are believed to have been effected,

(1.) Organic beings resemble each other in descending

degrees, so that they can be classed in groups under groups, —classes, orders, genera, &c. The doctrine of evolution gives life to this arrangement and makes it truly a “ natural” classification,—the idea of different degrees of community of descent being added to that of arbitrary classification by community of characteristics. Thus it happens that the number and distinctness of the genera contained in a natural family become to a certain extent a gauge of the amount of divergence which the modifying causes of nature have produced, since the time when all the genera were united in the parcnt form of their family. And by a similar

1 Bull. de la Soc. d’Acclimat., tom. vii., 1860, p. 457.

mnethod we may estimate the amount of divergence that man has effected. For instance, there can be no doubt that all the varieties of the domestic

pigeon are the descendants of the rock pigeon, and have sprung up under the care of man during the long period of time that has elapsed since their wild ancestor was first domesticated. These varieties amount to more than 150 in number ; and there can be no question that, supposing them to be found wild, they would be grouped under at least five distinct genera,—so great are differences existing among them. This instance gives some idea of the marvellous amount of modification that may arise under domestication.

(2.) Are the powers which man possesses of producing modification sufficient for the work assigned to them? It will be well to set down the assumptions which may fairly be made in connection with this point.

First, the labours of the great breeders teach us what enormous changes can be effected in the short space of one man's life ; and we know that the essential principles in- volved in the process were anciently known and followed,

Secondly, we may feel certain that great divergence of character is unconsciously produced during long continued selection of any kind; and we know that some kind of selection must have existed from remote periods. Logically considered, therefore, the possibility of almost any degrce of divergence having been effected turns in great measure on the question of the antiquity of selection.

It is therefore important to note that an indirect kind of selection must almost necessarily be coeval with domestica- tion. For this can be shown to be the case with tame ani- mals possessed by the rudest savage, who does not regulate their increase in accordance with even the vaguest belief in heredity. In each litter of puppies, for instance, some would necessarily be destroyed, for their master would be unable to preserve all the young ones which were produced, He would certainly not save those which were small, feeble, or deficient in any valuable quality. The finest in each generation would then be preserved, merely because it was believed that they, individually, would be useful, and not with any idea of "breeding." Nevertheless, it would in- directly follow that the superior individuals in each genera- tion would, as a rule, form the progenitors of the next one ; that is, a kind of indirect selection would arise. If then we can be sure that domestication, in some form, has existed from remote times, we may feel

tolerably certain that the above-described rude form of selection must be of nearly equal antiquity. Apart from the direct proofs on this head which we possess in the remains of the prehistoric period, there is a high antecedent probability in favour of the ex- treme antiquity of domestication ; for it is certain that tame animals are of great use to savages, and the wild progenitors of many of our domestic creatures are rendered tame with ease. This is the case with wild dogs, pigs, cattle, ducks, &c. In the case of vegetables, it appears that, in times of scarcity, savages devour almost any berries or leaves which they can obtain, often suffering terribly in consequence ; and in this way plants at all superior in nutritious qualities would assuredly be discovered. We may, therefore, con- clude—(1), that the domestication of animals and the cul- ture of plants date from exceedingly remote antiquity ; (2), that a certain amount of selection must have been nearly coeval with domestication ; (3), that some degree of divergence of character must almost necessarily have accom- panied selection ; and (4), that, consequently, the large amount of modification claimed to have been produced by man is a conceivable and credible result. (F. D.)

BREGENTZ, the ancient Brigantia, capital of the circle of Vorarlberg, in Tyrol, stands on a hill at the S.E. end of the Lake of Constance. It has an old castle, two con- vents, and an orphanage. Silk and cotton are manufac-

tured, and it carries on an active transit trade. It was long the seat of a Roman garrison, and in the Middle Ages it gave the title to a powerful family of counts, whose territory passed to Austrian possession in the 16th century. In 1646 the town was captured by the Swedes; and in 1850 it gave its name to a treaty by which Austria, Bavaria, and Wiirtemberg formed an alliance against Prussia. Popu- lation in 1869, 3686.

BREHON LAW, the law of Ireland previous to the Conquest, and of some communities of the Irish down to the 17th century (from brectheam, genitive breitheamain, a judge; root, breeth, a judgment ; compare Vergobretus, “wr-adjudicandum,” Cxs., De Bell. Gall., i. 16). Three volumes of these laws, comprising the code called the Senchus Mor, alleged to have been revised by St Patrick, have been published by a Royal Commission appointed in 1852, and other portions in the second series of

O’Curry’s Lectures on the Materials of Ancient Irish History, edited, with a learned introduction, by Dr W. K. Sullivan in 1873. The antiquated and often obsolete language both of the original text and of the interlined glosses, coupled with the fact that portions of both are cited in compilations con- sidered not later than the 10th century, are arguments for their acceptance as fragments of a primitive system un- modified by Anglo-Saxon, Danish, or Norman influences. The Roman (or civil) law is hardly traceable in them, except as regards ecclesiastical affairs, and that sub modo only. From the first-mentioned cause also, the provisions are often obscure and sometimes unintelligible ; but enough appears to indicate the general nature and much of the details of these laws.

As compared with the collections known under the generic title /eges barbarorum, they are remarkable for their copiousness, and furnish a striking example of the length to which moral and metaphysical refinements may be carried under rude social conditions. They present a state of society such as may be conceived to have existed under the older manorial organization, when the land was toa greater extent ‘folk”-land than “boc”-land, and comprised com- mons of tillage as well as of pasture. This kind of occupancy entailed annual repartitions of the tillage, recall- ing the usage of the ancient Germans (Ces., Bel. Gall., vi. 20), and of which, as practised on a minor scale in Ireland in 1782, Sir Henry Piers has given an account in his description of Westmeath (Vallancey, Coll., vi. p. 115). Traces of such repartitions survived under the name of Rundale (Irish ranndach, “partire”) in the Highlands of Scotland and in some parts of the West of England till recent times (Maine, Harly Inst., p. 101). There is no evidence, however, in the Brehon code, as now published, of merely family occupancy, in which one household living together, or even one village community, enjoyed the land and its produce in common, although such an origin may be theoretically conjectured for the institutions described. The social unit comprised separate families and households numerous enough to occupy a crich or quasi manor, within which existed a court and complete system of primary social organization. In each of these, mensal lands were set per- manently apart for the chief, and means existed by which portions of the common land could, within certain limits, be acquired in severalty by individual owners. The crich formed portion of the twath, or guast barony, one or more of which constituted the mor tuath, or petty kingdom,

equivalent to a county or several counties, governed by a re or regulus, who, in theory at least, bore allegiance, through superior veguli, to the monarch. The grades of rank were numerous, but the distinctions of wealth which grounded them appear very arbitrary. The upper classes were all "Aires." 'To be eligible to the aire grade, the freeman should possess, besides a certain amount of wealth

in cattle, a prescribed assortment of agricultural implements and household goods, the meagreness of which exemplifies the slow progress of the arts of life in early states of Society, and he should have a house of given dimensions, ranging from 17 to 27 feet in length, and containing a given number of compartments. 'he houses were of timber and wattle-work, surrounded by open spaces of prescribed extent for each class, The lower limit for this space was the distance to which the owner seated at his door could throw a missile of given weight; multiples of that distance determined its extent for the higher classes. Tacitus has noticed a like custom of keeping clear spaces round the several dwellings among the early Germans; and this regulation has probably contributed to retard the progress of the early Irish out of pastoral and agricultural into civic habits. There was a serf and slave population, who were designated ernaans, as representing the earlier Firbolg and Pictish colonists, who did not enjoy these privileges, except by the process of becoming fuidhirs or tenants of the separate lands of the nobles, who called themselves Gardel, or Gael, and claimed a different descent. Besides these tenants, or "feuers," there were dependants called ceilés, who stood to the wealthy classes in a relation re- sembling that of the clients of the Roman commonalty to their patrons. Both they and the fudhirs owed suit and homage to their flaths or lords, as well as services and rents in kind and in refections. The food-rents, biadh, corresponding to the Anglo-Saxon feorme (whence "farmer"), were supplied both at the residences of the chiefs and at the tables of their tenants, whence originated the customs of coyne and livery of later times.

The use of coined money was practically unknown, and the unit of value (sed, seota, "assets") was the cow. The celés appear to have been attached to their lords by largesses, or "commendations" of cattle which they used in

their own tribal lands. It is in the fuddhir class that a law of tenure of land originated, and possibly in these relations we may discover the rudiments of a partly-developed feudalism. The fuddhir is, in the theory of the native etymologists, the fo-tir or “land- underling,” as one who holds land of another. ‘The rules regulating these several kinds of enjoyment of the land are peculiar to the Brehon code, and, as may be observed of all its provisions, are extraordinarily minute, being designed to fix all rights and liabilities, under every prob- able state of circumstances, in values numbered, which may be one cause for the slow social progress made under their operation. For each supply of cattle to the ceilé a definite return to the adré is fixed to the end of seven years, when the property vests in the ceidé. But the supply should not exceed fixed limits if the recipient would pre- serve his status as a freeman. The Jucdhir, or base tenant, was bound to larger returns-in rent and services, and the lord might, on violation of the tenant’s engagements, resume the possession of the land ; but it would appear that during the futdhir’s occupation he could not be otherwise disturbed without a measure of compensation. On the death of the cewé or of the fuidhir, a quasi heriot was payable to the lord.

The succession to the territorial headships was elective within hereditary limits; the succession to tribal rights of occupancy, and individual rights of ownership in the separate hereditaments acquirable by individuals, was hereditary. The law of dzstribution of a deceased person’s property is very minute in its provisions, though obscure, owing to the technical description of the classes and persons entitled ; but it appears to have contemplated divisions per capita and not per stirpes. The law of marriage is remarkable for the variety of irregular relations which it appears to sanction, and for its careful protection of the separate pro-

perty of the irregular as well as of the lawful wife, both during cohabitation and on separation, which appears to have been frequent. The lawful wife seems to have had no other protection agaiust the introduction of the “adal- traich” wife than the withdrawal of her separate property, in addition to certain mulcts payable to her on the occasion. She possessed independent rights of alienating a portion of her separate property, and could, to some

extent, control the rights of alienation of her husband. The looseness of the marriage tie evidenced by these laws was one of the evils calling for reform alleged by the Irish prelates in their letter moving Pope Alexander III. to ratify the grant of the island made by Adrian IV. to king Henry II.

The practice of putting out the children of the wealthier classes to be nursed and educated may have contributed to make such relations less incompatible with domestic peace. The law of fosterage, of which few if any recognizable traces, outside the law of apprenticeship, have survived elsewhere, provides for the external nursing and educating of the children of the upper class by poorer members of the community, who, besides the fosterage-fee received with the infant, had a claim on the foster-child for support in old age. The fostering began from infancy, and ter- minated, in the case of daughters, at thirteen, and of sons, at seventeen years of age. A certain amount of instruction should be imparted. Girls of the less wealthy class should be taught to use the handmill (quern) and sieve, to bake, and to rear young cattle; those of the higher class to sew, cut out, and embroider. The boys should learn kiln- drying and wood-cutting, and those of the upper class chess-playing, the use of missiles, horsemanship, and swim- ming. The lawful food for all was porridge. Their clothing, besides the nursing clothes supplied by the parents, was according to their status, from sober coloured stuffs for the children of the less wealthy to scarlet cloth and silks for the children of those of the rank of king. Provision was made for the necessary correction of the pupil, with mulcts for excess. During the pupilage, the foster-father was entitled to all compensation for injuries to his charge, and liable to all mulcts for their offences. If the child died in its pupilage, another might be sent in its place. If returned before the completion of the term, or imperfectly educated, the foster-father should refund. The fixing of the proportionate amounts due in the several cases gives rise to much minute regulation. The law of malitary service like the others, was based on a system of fines leviable for non-attendance and even for desertion in the field. To what has been said on the land-law it may be added that public contributions were leviable for the repair of roads and bridges, and the maintenance of the chief’s or king’s fortresses ; and that each community had a public mill, fishing-net, ferry-boat, &c., besides such objects of this kind as were possessed in severalty by the wealthier members. There was also a law of waifs and strays, and of wrecks of the

sea, with provisions for the entertainment of shipwrecked seamen at the common charge of the district entitled to the distribution of the wreck. There is little meution of testamentary disposition ; and from the language employed, a Roman origin may be probably surmised for it, To counterpoise the excess of privilege incident to the possession of wealth, the mulcts payable for misfeasances and nonfeasances of all kinds were graduated in the interests of the poorer classes. Crime and breach of contract might reduce from the highest to the lowest grade.

As regards the law of contracts generally, the disabilities arising from tribal partnership, infancy, imbecility, cover- ture, and obligation to the lord give rise to many excep- tions and qualifications, the general rule being that acquiescence, after notice, by the parties jointly interested, or standing in relations of protectorship, has the effect of

validating what would otherwise be void. Distinct periods are limited within which the parties entitled to disagree may avoid the bargain ; and, in all cases, a locus peenitentioe of twenty-four hours is annexed to the oral agreement, within which time either party may rescind it. The nature and effect of a warranty on sale appears also to have been understood and provided for; and frequent reference is made to the cases arising on unsoundness, latent or supervening. There are some traces of a law of the market, but how far, if at all, it qualified the ordinary rules of contract, does not appear. ‘The Aenachs, or great fairs, were held at distant places and at long intervals of time. Various immunities are given to the persons frequenting them; anda violation of some of the necessary provisions for securing the peace and decorum of the meet- ings was exceptionally punishable with death, while almost every other offence might be condoned by a pecuniary payment. A highly interesting account of one of these great assemblages, which was held triennially at Carman, near Wexford, is given in a tract translated in the 2d series of O’Curry’s Lectures, where, among the various classes resorting there for amusement and traffic, mention is made of Greek merchants bringing commodities for sale. The laws themselves give little intimation of their own origin or sanctions, They appear to have undergone no substan- tial changes from time immemorial;

but some evidence exists of local law-making authority exercised at meetings of the freemen of the crich, subject to revision by some higher authority, and one of the objects of these fairs or comitia was to publish such enactments as well as the general body of the laws and customs from time to time. The law of torts regarded all offences, with the nominal exception of murder, as condonable by fines until the offender and those liable for him conld pay no more, when the defaulter lost his status and fell into the servile class. For some of the offences of the individual, the finné or family were responsible; for others, particular sureties. Whether this system of quasi frank-pledge did not extend to breaches of contract, as well as to cases of non-feasance, misfeasance, and breaches of the peace, appears uncertain. The scale of mulcts for the several sorts of homicides, wounds, and personal hurts, is in out- line the same with those of the other western European nations ; but, in addition to their definite fine of so much for such and such a lesion or bruise, it provides by rateable deductions for excusatory circumstances of intention, know- ledge, contributory negligence, accident, and necessity, all of which are considerable refinements on the contempor- aneous systems of the Continent. The penalty of death for murder was of ecclesiastical introduction, and, like the law ordaining the payment of tithes, appears to have fallen into desuetude before the Conquest. Chief Baron Gilbert, in Dwyer’s case (Gilb., Zv., vol. i. p. 9) has an observation apposite to the state of society disclosed by this system of measured mulcts and mutual suretyship, in treating of the state of Britain before murder had become punishable with death under the later law of Canute:—

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Imprisonment, among the Irish at the period of these laws, does not appear as detention in a common gaol, but as a personal fettering of the culprit; and some of their subtlest distinctions concern the liability of the person bound to provide the fetters, in case of the culprit’s escape. It has been suggested with much appearance of reason, that refinements of this kind, zxter apices juris, with which the Brehon law abounds, are rather exercises of the writer’s ingenuity in framing suppositional cases illustrating classes of

abstract rules than evidences of any actual application of law to the particular subjects. Such are the law of the measure of damages for injuries by bees, by cats, by the hunting hound, by traps for game, é&c., all which are elaborated to a pedantic nicety, Of the courts in which these laws were administered we have but an imperfect view. The primary local tribunal was a quasi court baron, called the Azrecht, composed of freemen of a certain status. The inferior classes were écoma airechta, that is, ““impares curiz.” The office of Brehon in the court is very obscurely indicated. The stays and imparlances (anad, esain, dithim), &c., incident to the process of bringing causes to final judgment, and the fact that damages were, in all cases of ordinary occurrence, assessed beforehand by specific tule, gave repeated opportunities for settling out of doors. There were professional advocates and means of carrying the case to courts of higher jurisdiction, but how these were consti- tuted does not appear; but mention is made of several gradations from the airecht urnaidh (sheriff’s tourns ?) to the cul-avrecht, or ulterior court, which indicates some resort by way of appeal. Their rules of evidence, in addi- tion to the testimony of the eye, admitted, in questions of title to land, that of the ear, cluais, or general report, and laidh (cantus) or history in the form of a poem publicly recited (a remarkable example of practical functions be- longing to the office of a bard) as well as the evidence of landmarks or mearing stones. These, it seems (O’Curry, 2d series, Sullivan, Introd., elxxxvii.), should be sunk under the surface, as Martin in his account of the Western Isles of Scotland (p. 114) has described :—

‘They preserve their boundaries from being liable to any debates by their successors, thus. They lay a quantity of the ashes of burnt wood in the ground, and put big stones above the same ; and for carrying the knowledge of this to posterity, they carry some boys from both villages next the boundary and then whip ’em soundly and tell it to their children. A debate having arisen between the villages of Ose and Groban in Skye, they found ashes as above men- tioned under a stone, which decided the controversy.”

This gives countenance to the tradition that, prior to the reign of Aed Slaine in the 7th century, there were no fences in the country, but all was open save the walls and mounds surrounding dwellings. It is difficult to accept this statement unreservedly, partly on account of the habit of assigning fabulous

origins indulged by all archaic, and notably so by the Irish writers, but chiefly because the Brehon code comprises a very full law of fences. The materials, dimensions, and several sorts of quick-setting of these are laid down with great particularity, and the rights and liabilities of adjoining owners are minutely described. Returning to the subject of judicial administration, we have a much clearer view given of the nature and incidents of process by which the jurisdiction of the court was made to attach, than of the constitution of the court itself. This was by distress, or the seizure of the goods of the defendant, in some cases immediate, in others preceded by summons, and, in the case of the privileged classes, by trosgad or fasting on the part of the plaintiff, a practice still known

in some parts of India, and much relied on as an evidence

of common Aryan origin for the ancient Irish and present:

Hindu legal systems. he distress might either remain in the hands of the defendant, if of the superior grade, by

way of attachment (fornasc), subject to a lien, on security for his appearing and abiding the award of the court, or if might at once be driven to a pound (forus). Here it wag kept during a certain time or “stay ” (anad), varying with the nature of the complaint, during which the defendant might have it back on like security. Failing this, a procesg of forfeiture (/obad) commenced, and ultimately the dis. tress, or so much of it as sufficed to satisfy the claim, vested in the plaintiff, the defendant receiving back the balance, if any. On security being given, the merits of the dispute were determined by the court. A proceeding analogous to the action of replevin was thus incidental to every litiga- tion ; and this appears to have been the early course of the common law in all the local courts, not proceeding on the king’s writs, both of England and Scotland, down to the times of Bracton (fo. 156. 2, Reeves’s Hist. Ling. Law,

59), and of the enactment “Quoniam attachiamenta ”

(Leges Bar, Scot., i. and exi.). One of the few cases cited in the Brehon law (vol. i. p. 65) states the procedure jn what was substantially an inter-tribal action of ejectment for recovery of land, in the incidents of which a resem. blance is found to many principles of Jurisprudence and methods of procedure of the common law of England, such as prescription, limitation, set-off, entry, ouster, distress, rescue, fresh pursuit, withernam, replevin, surety in replevin, avowry, Welsh mortgage, writ of possession, and return of distress. The case was this:—

Land had been assigned by way of Welsh mortgage in part pay- ment of a mulct or fine. The mortgagee and his descendants re mained in possession until it became a question whether the law of prescription (rwdrad) had not given them the absolute estate. To try the title, a bailiff of the claimant tribe put his horses on the land. The bailiff of the tribe in possession drove them off, ac- companying the act with an admission that formerly the claimant tribe had been in possession. The claimant's bailiff then distrained three cows of the occupier's bailiff outside his cattle shed, and drove them to the border of the territory, where they lay down. It would have been his duty here to give public notification of his proceed- ings, and to have driven his distress to the nearest pound of the external territory ; but the cows, not having been milked, escaped, and returned to their calves, which had been left behind. The distrainer, making fresh pursuit by the traces of the milk dropped

on the ground (regarded probably as a constructive keeping in view),

recaptured them at daybreak at the homestead of the owner, and, with them, in addition, distrained and impounded three [six !] others, taken from [out of] the door of the cattle-shed, by way of aitherach gabail, or second caption, to double the amount for what seems to have been considered a constructive rescue implied by the escaped beasts being again in the owner's custody. Notwithstand- ing these facts, the regularity of the proceeding was admitted by the tribe in possession, whose regudus now came forward and had back the distress, on giving pledges to try the question at law, and to return the cattle if unsuccessful, Further security was also given by him for some other liability. The action which, so far, was in the nature of replevin, now assumed the character of eject- ment, and the

personal wrong of ousting the bailiff who had made the entry merged in the question of title to the possession of the land. It was held that the period of prescription, being the time of three successions to the kingship, had not expired, one of the successions being irregular. The land was, therefore, still redeem- able, and, on taking an account and setting off the receipts, includ. ing a mulct of less amount due by the mortgagee, against the origi- nal balance due to him, it was found he had been fully paid, and a return of the cattle was awarded, and possession of the lands de- livered to the claimant. (See ‘‘On the Rudiments of the Common Law discoverable in the published portion of the Senchus Mor,” in Trans. Roy. Irish Academy, vol. xxiv. p. 88, 1867.)

It appears from this that the provisions of the statute of Marlbridge (52 Henry III. c. 4) in England, forbidding the driving of distresses beyond the bounds of the county, and of the “ Regiam Majestatem ” (re-enacted by 1 Robert, i. c. 7) in Scotland, requiring that when driven beyond the bounds of the territory the distress shall be exhibited before witnesses, are to be regarded not as merely intro- ductive enactments, but as substantially declaratory of the previous state of the common law; further, that the old opinion that “all administration of justice was at first in

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‘ the king’s hands, but afterwards, as the kingdom was

- divided into counties, hundreds, é&c., so the administration of justice was distributed among divers courts, of which the sheriff had the government of the county court, &.,” is probably grounded on an inversion of the actual progress of the facts; and that when it is said of the right to recover land in a personal action, of set-off, and of other equitable incidents of justice, that such rights did not exist at the common law, the words “in actions commenced by – original writ,” should probably be understood ; for there is no difficulty in conceiving how all the main incidents and principles of law disclosed by the Irish case could have arisen regularly in the county court,

always a court of equity for the defendant, when the bishop was associated _ with the sheriff, and the right of the suitor to be his own apparitor had not yet been abrogated by the law of Canute, re-enacted by William I. (Leg. Gul. Cong., xliv.). How these resemblances have come to exist in the early laws of the two islands may be a question for the historian and ethnologist. Itis well to know that, whencesoever derived, the common law may to so great an extent be recognized as substantially a common inheritance of all the popula- tions now organized into the United Kingdom. (8. F.)

BREISLAK, Scrriong, an eminent geologist, was born at Rome in 1748. He early distinguished himself as

professor of mathematical and mechanical philosophy in |

the college of Ragusa ; but after residing there for several years he returned to his native city, where he soon became

a professor in the Collegio Nazareno, and began to form —

the fine mineralogical cabinet in that institution. His leisure was dedicated to geological researches in the Papal His account of the aluminous district of Tolfa and adjacent hills, published in 1786, gained for him the notice of the king of Naples, who invited him to inspect the mines and similar works in that kingdom, and appointed him professor of mineralogy to the Royal Artillery. The vast works for the refining of sulphur in the volcanic dis- trict of Solfatara were erected under his direction. He afterwards made many journeys through the ancient Cam- pania to illustrate its geology, and published in 1798 his Topografia Fisica della Campania, which contains the interesting results of much accurate observation. Breislak also published an essay on the physical condition of the seven hills of Rome, which he regarded as the remains of a local voleano,—an opinion which more recent investiga- tions appear to disprove. The political convulsions of Italy in 1799 brought Breislak to Paris, where he remained until 1802, when, being appointed inspector of the salt- petre and powder manufactories near Milan he removed to that city. He died on the 18th of February 1826.

During the latter part of his career he published the following works:— Del Salnitro e dell’ Arte del Salnitraio ; Memoria sulla Fab- bricazione ¢ Raffinazione de’ Nitri ; Instruzione pratica per le piccole Fabbricazione di

Nitro, da farsi dalle persone di Cainpagna. His valuable Introduzione alla Geologia appeared in 1811; a French edition with additions was published in 1819. Finally, the Austrian Government, in 1822, took on itself the expense of publishing his Deserizione Geologica della Provincia di Milano.

; BREMEN, one of the three free cities of the new German empire, is situated on the River Weser, about 50 miles from the sea and 60 S.W of Hamburg. The latitude of the observatory is 53° 4’ 36” N., and the longitude 8° 48’ 54” E. The city consists of three parts—the old town (Alt Stadt) and its suburban extensions (Vorstadt) on the right bank of the river, and the new town, dating from the Thirty Years’ War, on the left. The riveris crossed by three bridges, of which the last was built in 1874-5. The ramparts of the old town have long been converted into beautiful promenades and gardens, but both the old and the new town are still surrounded with moats. The area of the whole city is great in proportion to its population,

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the houses in general being built to contain only one family, The public buildings, situated chiefly in the old town, comprise the following :—the cathedral, erected in the 12th century, on the site of Charlemagne’s wooden church, and famous for its Bletkeller, or lead-vault, in which bodies may be kept a long time without suffering decomposition ; the church of St Ansgarius, built about 1243, with a spire 400 feet high; the Hathhaus, a building of the early part of the 15th century, with a celebrated underground wine- cellar ; the town-house, formerly the archiepiscopal palace, and converted to its present uses only in 1819; the Schiit- ting, or merchant’s hall, originally built in 1619 for the guild of cloth-traders ; the exchange, completed in 1867 ; the theatre; the town library; the high-school, a quite recent erection; and the new post-office buildings. St Rembert’s church and the colosseum may be mentioned in

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Plan of Bremen.

1. Cathedral. 3. Museum. 5. St Ansgarius. 2. Exchange. 4. Rathhaus. 6. St Stephan At the

the Vorstadt ; and the barracks in the new town. head of the monetary establishments stands the Bremer Bank, which was founded in 1856 as a private speculation, and is only allowed to issue notes to the amount of its realized capital. Seven other banks were in operation in the beginning of 1875. There are in the city eighteen public and thirteen private schools, the former including a navigation and an industrial school, and the latter an institution for the extension of female labour.

New waterworks, constructed by an English company on the left side of the river, were opened in 1872, and supply the city with water of a good quality from the Weser; a large fire-brigade establishment has also been founded in imitation of a similar institution at Berlin; and an exten- sive park, the Birger Park, has been laid out in the old Biirger Weide, or meadows. Railway communication is rapidly increasing, and a central terminus for all the lines is proposed. The most important of those already open connect the city directly with Hanover, with Oldenburg, with Bremerhaven, with Hamburg, and with Minden. The manufactures of Bremen are of considerable extent and variety, the most important being those of tobacco, snuff, and cigars, though they have somewhat declined since the formation of the empire. In 1872 no fewer than 2500 people were employed throughout the state in preparing cigars alone, while the making of cigar-boxes occupied 250 more. ‘The shelling of rice is also largely carried on, and there are sugar-refineries, soap-works, shipbuilding- yards, sail-cloth factories, a large iron foundry, distilleries, asphalt-works, and colour-factories. In the extent of its foreign trade Bremen is one of the chief cities in Germany, and as a port of emigration it is only rivalled by Hamburg. It deals largely with the United States, Great Britain, British India, and Russia. Its principal imports consist of cotton, tobacco, coffee, rye, rice, coals, iron goods, petro- leum, glass, hides and skins, silk, wool, linen, and dyes,

and its exports of many of these articles in a manufactured state. In 1874 the arrivals were 3407 vessels, with a register of 990,101 tons,—650 belonging to Bremen, 418 to Britain, and’ 317 to Holland. Much of the shipping trade of the city is conducted at Bremerhaven and Vege- sack, because vessels drawing more than 7 feet cannot get up to the town. Among the societies of the city are a nautical association, the German Life-Boat Institution, and the cnamber of commerce.

As early as 788 Bremen, then a mere fishing village, was made the seat of a bishopric by Charlemagne ; and in 858 it was raised to an archbishopric by Ansgarius, archbishop of Hamburg, who had been driven from that eity by the Normans about 847. The importance of Bremen soon increased ; and its eitizens took an active share in the more remarkable movements of the time, such as the Crusades, the establishment of the Teutonic Order, and the founding of Riga. In 1283 they joined the Hanseatic League, and in 1289 formed a treaty with Gisalbert, their archbishop, by which he agreed to confine himself to the spiritual affairs of his diocese, leaving secular concerns to the eivic authorities. In the course of the 14th century, there was much intestine conflict in the city, and in the 15th it had to defend its commerce against the pertinacious hos- tility of the Frisian pirates ; but from both perils it issued with increased vigour. About 1522 the archbishop and most of the inhabitants declared for Protestantism, in defence of which they took a foremost part, and had on various oecasions to suffer severely. The eity was twice besieged by the imperial] forces in 1547. At the peace of Westphalia (1648) the archiepiscopal diocese was secularized and raised to a grand duchy, which was ceded to Sweden. In a war between Denmark and Sweden in 1712 it was conquered by the former, and in 1715 it was purchased from that power by Hanover along with the duchy of Verden. The transfer was confirmed by the diet of 1732, and the district now forms part of the Hano- verian province of Stade, The city of Bremen had meanwhile had its civic rights more or less thoroughly recognized during these vieissitudes. In 1806 it was taken by the French, and from 1810 to 1818 it was the capital of the department of the Mouths of the Weser. Restored to independence by the congress of Vienna in 1815, it subsequently became a member of the German confederation, and in 1867 joined the new confederation of the North German States, with which it was merged in the new German empire. It has now one vote in the fedieeat

council, and sends a representative to the imperial dict. The freedom of its port is secured, and in compensation it pays an averswm of 250,000 thalers to the customs union.

The territory of Bremen has an area of 63,400 English acres, about 5000 acres being occupied by the towns of Brenicn, Bremerhaven, and Vegesack, and about 1200 by the bed of the Weser. Of the remaining area about two-fifths are arable land and two-fifths mea- dowland, the extent of woodland being very slight. The soil is for the most part sandy, though here and there marshes or bogs occur. Of the population, which in 1873 was 180,871, 88,146 were inhabi- tants of Bremen the city, 12,129 of Bremerhaven, and 3848 of Vege- sack, and 26,753 of the rural districts. With the exception of about 2800 Roman Catholics and 271 Jews, the inhabitants are Lutherans or Calvinists of various denominations. According to the constitu- tion of 1849, modified by various enactments in 1854, the senate, whieh is the executive power, is composed of eighteen members, elected by the "burghership" on presentation by the senate. Of these, ten at least must be lawyers, and five merchants; and two of the number are nominated by their colleagues as burgomasters, who pre- side in succession, and hold office for four years, one retiring every two years. The burghership consists of 150 (formerly 300) represcnta- tives chosen from the citizeus for six years. Sixteen are elected by those of the inhabitants of the city who have attended a univer- sity, 48 by the merchants, 24 by the manufacturers and artisans, and 30 by the other citizens; of the remaining representatives 6 are furnished by Bremerhaven, 6 by Vegesack, and 20 by the eountry population The revenue in 1873 amounted to £545,531, and the ex- penditure was £1,094,222, so that the defieit was £548,691. The total debt at the end. of the year was £3,676,733. The territory and city are still outside the limits of the eustoms union. In the whole state there were in 1870 forty-five public and thirteen private schools, with a total attendance of 12,794.

BREMER, Freprika, the most celebrated Swedish novelist, was born near Abo, in Finland, on the 17th August 1801. family, was a wealthy iron master and merchant. He left Finland when Fredrika was three years old, and after a year's residence in Stockholm, purchased an estate at Arsta,

about 20 miles from the capital. There, with occasional visits to Stockholm and to a neighbouring estate, whieh

Her father, a descendant of an old German —

belonged for a time to her father, Fredrika passed her time till 1820. The education to which she and her sisters were subjected was unusually strict; their parents, espe- cially their father, were harsh and took little or no pains to understand the temperaments of the children. The cop. stant repression, the sense of being misunderstood, and the | apparent aimlessness of such an existence told with greatest force upon Fredrika, who was of a quick and eager dispo- sition, fond of praise and conscious of powers which jt seemed to her must lie for ever unused. She felt as if hep life were being wasted; there was nothing on which she could expend her energy ; no career was open to a woman, Her health began to give way; and in 1821 the whole family set out for the south of France. They travelled slowly by way of Germany and Switzerland, and retumed by Paris and the Netherlands. It was shortly after this time that Miss Bremer became acquainted with Schiller's poetical works, which made a very deep impression on her, Her home life, however, was still unsatisfying, and in her passionate longing for some work to which she could devote herself, and through which she might do some good in the world, she for a time resolved to join one of the Stockholm hospitals as a nurse. This plan was given up on the entreaty of her sister. Meanwhile, she had found relief for her pent-up feelings in writing, or rather in continuing to write, for she had been an authoress of a sort from the age of eight. In 1828 she determined to attempt publication, and succeeded in finding a publisher. The first volumeof her Sketches of Every Day Life (1828) at once attracted attention, and the second volume (1831), containing one of her best tales, The H.- Family, gave decisive evidence that a real novelist had been found in Sweden, The Swedish Academy awarded her their smaller gold medal, and the fortunate authoress became famous. From this time Miss Bremer had found her vocation. Her father had died in 1830, and her life was thereafter regulated in accordance with her own wishes and tastes. She lived for some years in Norway with a friend, after whose death she resolved to gratify a long-repressed desire for

travel, Tn the autumn of 1849 she set out for America, and after spending nearly two years there returned through England, The admirable translations of her works by Mary Howitt, which had been received with even greater eagerness in America and England than in Sweden, secured for her a warm and kindly reception. Her impressions of America, Homes in the New World, were published in 1853, and were at once translated into English. After her return Miss Bremer devoted herself to her great scheme for the advance nent or, one may say, emancipation of women. On this subject she had thought deeply, and her own experience was of value to her in shaping her ideas of what the education and function of woman should be. “She wished,” says her sister, “that women should, like men and together with them, be allowed to study at the elementary schools and academies, in order to gain an opportunity of obtaining suitable employments and situations in the service of the state. . . . She said she was firmly convinced that women could acquire all kinds of knowledge just as well as men, that they ought to stand on the same level, and that they ought to prepare themselves in the public schools and universities to become lecturers, professors, judges, physicians, and functionaries in the service of the state” (Life, &c., pp. 81-2). Some of these views were expounded in her later novels, Hertha and Father and Daughter, which naturally were not so successful as her other works. Miss Bremer not only wrote of her plans, but endeavoured, so far as she could, to induce women to devote themselves to some kind of work. She organized a society of ladies in Stockholm for the purpose of visiting the prisons, and during the cholera raised a society the object of which

‘ ‘was the care of children left orphans by the epidemic. “In 1856 she again travelled, and spent five years on the Continent and in Palestine. Her reminiscences of these ‘countries have all been translated into English. On her |rebitein she settled at Arsta, where, with the exception of a ‘yisit to Germany, she spent the remaining years of her life. Ghe died on the 31st December 1865. Miss Bremer has been called, and with justice, the Miss Austen of Sweden. ‘Her novels have the purity, simplicity, and love of domestic ‘life. which are characteristic of the English writer. She ‘is, however, inferior to Miss Austen in construction of plot and in delineation of character. Some of her best works show slight traces of overstrained sentiment, and the situations are occasionally somewhat melo-dramatic.

The Neighbours is the most popular and the best of her tales ; it is an admirable picture of Swedish home life, showing at times the quiet humour which is more prominent in Zhe H-—— Family. All the works have been translated into German and English, and the greater number of them into French. In America they have circulated very widely, and have been extremely popular. See Liye, Letters, and Posthumous Works of F. Bremer, by her sister, translated by Milow, London, 1868. BREMERHAVEN, a seaport town belonging to the free city of Bremen, on the right bank of the Weser at the mouth of the Geest, in 53° 32’ N. lat. and 8° 34’ E. long. It is built on a piece of ground surrendered to Bremen in 1827 by Hanover, and increased by treaty with Prussia in 1869. The port was opened in 1830, and there are now, besides an excellent harbour, four large wet docks, five dry docks, hydraulic cranes, and lines of railway running along the quays. The entrance is free from ice nearly all the year round, even when the other ports of the neighbouring coasts are closed, and vessels drawing 22 feet can enter safely. The town is rapidly extending and will soon be united with Geestemiinde. Among its public buildings the most remarkable is the great hospitium for emigrants, erected in 1830, which can accommodate 2500 persons. The Hanoverian fort and batteries, which formerly protected the town, have bcen removed, and their place is supplied \ by similar works farther down. The population, which in 1850 was only 3500, amounted in 1871 to 10,596. | BRENNUS, the name given in history to two kings or chiefs of the Celtic Gauls, probably not an appellative, but a title, the Cymric “brenhin” =king. (Dr Pritchard \thinks it more probably the equivalent of the Welsh proper name “ Bran.”) The first Brennus crossed the Apennines into Italy, at the head of 70,000 of the tribe of Gauls known as Senones, and ravaged Etruria, 391 B.c. Some envoys from Rome, sent to watch their movements, were said to have taken an active part in a skirmish before the walls of Clusium ; and the Gauls, failing to obtain the surrender of these men, marched at once for Rome. A Roman army of about 40,000 men was hastily despatched to meet them, and took up a position on the banks of the little river Allia, within twelve miles of the city. Here Brennus attacked and defeated them with great slaughter ; and if he had pressed on at once, Rome would have lain | at his mercy ; for the greater part of the beaten army had | placed the Tiber between themselves and the conquerors. | But the Gauls lingered on the field of battle, mutilating | the dead, and drinking to excess. The Romans gained | time to occupy and provision the

Capitol, though they had | not force sufficient to defend their walls ; their women and ! children were sent off to Veii; and when on the third day _ the Gauls marched in and took possession, they found the | city occupied only by those aged patricians who had held _ high office in the state. Too old to be of service in the little garrison, and too proud to fly, they had all solemnly | devoted themselves to death, and sat each in the porch of

his house, in full official robes, awaiting the invaders. For a while these withheld their hands from them, out of awe and reverence ; but the ruder passions soon prevailed, and they were all slaughtered. The city was sacked and burnt; but the Capitol itself withstood a siege of more than six months, saved from surprise on one occasion only by the wakefulness of the sacred geese and the courage of Marcus Manlius. (See Manuius.) At last the Gauls consented to accept a ransom of a thousand pounds of gold. As it was being weighed out the Roman tribune complained of some unfairness. Brennus at once threw his heavy sword into the scale ; and when asked the meaning of the act, replied that it meant “ Vee victis”—“ the weakest must go to the wall.” The Gauls returned home with their plunder, leaving Rome in a condition from which she took long to recover. A later legend, most probably an inven- tion, represents Camillus as having suddenly appeared with an avenging army at the moment when the gold was being weighed, and having defeated and cut to pieces Brennus and all his host (Livy, v. 49).

The second Celtic chief who bears the name of Brennus in history is said to have been one of the leaders of an inroad made by the Gatis from the east of the Adriatic into Thrace and Macedonia, 280 B.c., when they defeated and slew Ptolemy Ceraunus, then king of Macedonia. Whether Brennus took part in this first invasion or not is uncertain ; but its success, and the rich spoils brought home, led him to urge his countrymen to a second expedition, when he marched with an army of 150,000 foot and 60,000 horse through Macedonia, defeating such forces as were brought against him, and passing thence into Thessaly, ravaging as he went, until he reached

the historic pass of Thermopyle. To this point the united forces of the Northern Greeks— Athenians, Phocians, Beeotians, and /Ztolians—had fallen back ; and here the Greeks a second time held their foreign invaders in check for many days, and a second time had their rear turned, owing to the treachery of some of the natives, by the same path which had been discovered to the Persians two hundred years before. Their land force, however, succecded in getting on board the Athenian fleet, which was lying off the shore to co-operate with them. Brennus and his Gauls marched on to attack Delphi, of whose sacred treasures they had heard much. But the little force which the Delphians and their neighbours had collected—about 4000 men—favoured by the strength of their position, made a gallant and successful defence. With or without the help of Apollo, who is said to have come to the aid of his sanctuary, they rolled down rocks upon the close ranks of their enemies as they crowded into the defile, and showered missiles on them from their vantage ground. A thunderstorm, with hail and intense cold, increased their confusion, and when Brennus himself was wounded they took to flight, pursued by the Greeks all the way back to Thermopylae. Brennus killed himself, “ynable to endure the pain of his wounds,” says J ustin ; more probably determined not to return home defeated. Few of the invading force eventually escaped.

BRENTANO, Cremenys, German dramatist and novelist, was born at Frankfort-on-the-Maine in 1777. His sister Elizabeth was the well-known Bettina von Arnim, Goethe’s correspondent. He studied at Jena, and afterwards resided in Heidelberg, Vienna, and Berlin, leading a somewhat restless aud unsettled life. In 1818 his disgust with all mundane affairs reached such a height that he withdrew from ordinary life and lived in the strictest seclusion at Diilmen. This continued for six years ; the latter part of his life he spent in Ratisbon, Frankfort,and Munich. He died at Aschaffenburg 28th July 1842. Brentano belongs to the romantic school of German poetry, and his works, like all others of that class, are marked by excess of IV. — 33

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fantastic imagery and by abrupt, bizarre modes of expression, satires and poetical dramas (Satiren und Poetische Spiele, 1800); of his later dramas the best are Ponce de Léon, 1804, and Victoria, 1817; of his poems the best is Dée Grtindung Prags, 1816. On the whole his finest work is the short tale, or novelette, Geschichte vom braven Kaspar und dem schénen Annerl, a very perfect little piece, which bas been translated into English. Brentano also assisted Ludwig Achim von Arnim, his brother-in-law, in the collection of the tales and poems forming Des Knaben Wunderhorn, 1800-8. The collected works appeared at Frankfort in 1852.

BRENTFORD, a town of England, in the county of Middlesex, 8 miles west of London, ona loop line of the South-Western Railway, in 51° 28’ N. lat. and 0° 20’ W. long. It is divided by the River Brent into two parts, known as Old and New Brentford (the former the larger of the two), aud is separated from Kew by the Thames. The Grand Junction Canal joins the Brent some miles further up, so that the town has extensive water communication, and is enabled to maintain a considerable trade. Among its manufacturing establishments are gin- distilleries, a brewery, malt-kilns, soap-works, saw-mills, and colour-works. The Grand Junction Waterworks, which supply the west end of London, are stationed here, the great stand-pipe, 226 feet high, forming a striking tower-like structure. Market-gardening is largely carried on in the neighbourhood, and there is a weekly market which dates from the time of Edward I. The elections for the county of Middlesex are held in the town. Its population in 1871 was 11,091.

In 1016 Brentford, or, as it was often called, Braynford, was the scene of a great defeat inflicted on the Danes by Edmund Ironside, In 1280 a toll was granted by Edward I. for the construction of a bridge across the river, and in the reign of Henry VI. a hospital of the Nine Orders of Angels was founded near its Western side. In 1642 a battle was fought here between the royalists and the parliamentary forces, for his services in which the Scotsman Ruthven was made earl of Brentford, a title afterwards conferred on Marshal Schomberg. Brentford was during the 16th and 17th centuries a favourite resort of the London citizens ; and its inn of the Three Pigeons, which was kept fora time by John Lowin, one of the first actors of Shakespeare’s plays, has been frequently alluded to by the dramatists of the period. We have also

Shakespeare’s ‘ Fat Woman of Brentford” in the Merry Wives of Windsor, ‘ Gillian of Brentford ” in Westward Ho, and various other references in old

plays. Thomson, in his Castle of Indolence, refers to the pigs for which the town was formerly famous—

“Fen so through Brentford town, a town of mud,

An herd of bristly swine is pricked along.” The two kings of Brentford, so well known from Cowper’s allusion, scem to owe their mythical existence to Buckingham’s Rehearsal, Where Bayes prides himself on the skill of his plot, in which he supposes “‘two kings to be of the same place, as for example at Brentford.” See Atheneum, 1847, p. 1196; and Notes and Queries, 2d ser. vol. viii.

BRESCIA, or Brescrano, a province of Italy, in Lom- bardy, bounded on the N.W. by Bergamo, N.E. by Tyrol, E. by Verona, from which it is separated by the Lago di Garda, S.E. by Mantua, and §.W. by Cremona. Its area is rather more than 1643 square miles. The northern part, or about one-third, is occupied by a chain of moun- tains which belong to the Rhetian Alps; the remainder forms part of the great plain of Lombardy, and shares in its general fertility. The principal rivers, all tributaries or sub-tributaries of the Po, are the Oglio, the Mella, and the Chiese. Corn, flax, hemp, the olive, and the vine are extensively cultivated, and in some districts the traveller passes for miles through the midst of orchards. The mountainous parts, and especially the valley of Trompia, yield iron, copper, marble, alabaster, and granite. The manufactures consist principally of silk, woollen, linen, and cotton goods, iron, steel, and copper wares, glass, and

His first published writings consisted of

paper. Among the principal townships are Rovato, Chiar; Orzinuovi, Monte-Chiaro, Salo, and Ponte-vico, Popula. tion in 1871, 456,023.

Brescta, the capital of the above province, is situated between the Mella and the Garza, about 155 miles by rail from Turin, in 45° 32’ N. lat. and 10°14’

E, long. It lies at the foot of a spur of the Alps, on the summit of which is a fine old castle formerly known as the Falcon of Lombardy. The town is well built, has fine arcaded streets, and compares favourably in point of cleanliness with other cities in the North of Italy; but it has hardly so many buildings of first-class importance. The old cathedral, a remarkable specimen of the circular form, is sadly disfigured and neglected, and the new cathedral by its side (1604-1825), though built of white marble, is of little architectural merit, St Afra and San Francesco being more worthy of notice. The Broletto, or old palace of the republic, dating originally from the 12th or 13th century, is a large and interesting building; but it has suffered greatly by successive alterations. The episcopal palace contains an extensive public library, consisting principally of the books and manuscripts —many of great antiquity and value-—bequeathed to the city by Cardinal Quirini in 1750. There is an exceptionally rich collection of both medieval and classical antiquities, preserved in a beautiful Roman building, usually known as the Temple of Hercules, built by Vespasian and excavated in 1822; and throughout the numerous churches and mansions of the city are to be found many of the masterpieces of Italian art, Among the other buildings are the Loggia or communal palace erected in 1508, a theatre, a hospital, a lyceum, and vari- ous public fountains. The botanical gardens are worthy of notice. Brescia is a busy town. Its aris and cutlery have been famous for centuries; whole streets are occu: pied by coppersmiths; silk, woollen, and linen goods, paper, leather, and oil are manufactured; and an exten- sive transit-trade is carried on, The population in 187] was 38,906.

Brescia, the ancient Brixia, is supposed to have been founded by the Etruscans. It was afterwards a town of the Cenomani, and, finally, a Roman free town. After the fall of the empire it was several times pillaged by the barbarians, especially by Attila in 452. From the Lombards, under whom it was the capital of a duchy, it passed to the Franks. It was made a free imperial city by Otho the Great, and shared and suffered in the contests between the Guelfs and Ghibellines. It then fell into the power of the Signiors of Verona, and in 1378 into the hands of the Milanese. It was taken in 1426 by Carmagnola the Venetian general ; besieged by the Milanese general Picinino in 1483, but assigned to the Venetians by Pope Martin V. ; surrendered by the inhabitants to the French after the battle of Agnano (1509) ; taken in 1512 by the Venetian general, Andrea Gritti; delivered by

Gaston de F oix ; and besieged again in 1578, 1575, and 1576. It remained under the Venetian dominion till the dissolution of the republic. It was the capital of the depart- ment of Mella during the existence of the Cisalpine republic and the Napoleonic kingdom of Italy, and fell in 1814 under the yoke of Austria. In the revolution of 1849 the inhabitants rose in arms, but were overpowered, after a destructive siege, by the troops of Haynau. Jn the war of 1859 it again sided with the patriotic party, and followed the destinies of the rest of Lombardy. Brescia has at various times suffered severely from pestilence and epidemics. It was the birthplace of Tartaglia the mathematician and the writer Mazzuchelli.

BRESLAU, a city of Prussia, capital of the government of Silesia, is situated mainly on the left but partly also on the right bank of the Oder, at the influx of the Ohlau, and on the railway from Berlin to Vienna, 190 miles §.E. of the former city. The latitude of the observatory is 51° 6’ 56” N., and its longitude 17° 2’ 18” E. The city consists of a new and an old town, and a number of extensive suburbs stretching out in all directions. The fortifications, which were dismantled shortly after 1813, have given place to beautiful promenades ; and even in the older parts of the town, where the streets are generally narrow, there are

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Plan cf Breslan.

A, Konigs Platz. B, Bliicher Platz and monument.

| 3. St Elizabeth’s Church (Protestant). C, Ring Platz, |

4, Rathhaus.

5. Borse (Exchange).

6. Standehaus.

7. Royal Palace,

8. Synagogue.

9. Lieblicks Hohe. 10. Lobe Theatre.

D, Ritter Platz. E, Exercier Platz (Parade Ground). F, Tauenzien Platz. G, New Market. 1. University 2. Court-house.

the architecture of the 14th century), the townhouse (of quite recent erection), the royal palace (now used as the Government buildings), the chamber of the states, the exchange, the barracks, the theatre, the post-office, and the new court-house and prison are the more important of the secular structures. At the head of the educational institutions for which Breslau is celebrated stands the university, which was founded in 1702 by Leopold I. as a Jesuit college, and was greatly extended by the incorporation of the university of Frankfort-on-Oderin 1811. Its library contains upwards of 300,000 volumes ; and among its auxiliary establishments are botanic gardens, an observatory, an anatomical and an antiquarian museum. In 1873 its professors and teachers numbered 103, and its students 962, the majority in the Faculty of Arts. Among the minor institutions are four gymnasiums, a higher girls' school, a normal school, a school of arts and manufactures, several orphanages, a deaf and dumb institute, and a blind asylum. 'There are also seventeen hospitals and numerous charitable foundations. The town is the seat of several provincial courts, a chamber of mines, an independent Roman Catholic bishopric, and a Protestant consistory. Its manufactures, which are both varied and extensive, comprise machinery and tools, railway carriages, cast-iron goods, gold and silver work, carpets, woollen cloth, cotton goods, paper, and musical instruments. A very active export trade is carried on ; and a number of large fairs for particular kinds of goods are held every year. The popula-

tion, which was 110,702 in 1849, had increased to 171,926 in 1867, when about 33 per cent. was Roman

Catholic, 58 Protestant, and 7 Jewish. In 1871 the total amounted to 207,977.

Breslau (Latin, Vratislavia) is first mentioned by Ditmar, the chronicler, in 1000 a.p.; and its foundation seems to be of slightly earlier date. It became the seat of a bishop in 1052, and the capital of an independent duchy in 1163. In 1241 it was reduced to ashes by the Mongolian invaders; but it soon recovered its prosperity, and, its population becoming largely Germanized, it joined the Hanseatic League in 1261. On the death of Henry, the last duke, in 1335, the lordship of Breslau passed to the Bohemian crown ; and several of the Bohemian kings bestowed numerous privileges on the city, which began to extend its commerce in all directions, —

| to Russia and Tartary, Greece and Italy, the Netherlands and

Flanders. Under the stimulus of prosperity the citizens soon showed themselves disposed to assert their independence, both against the aristocratic element within their walls, and against their feudal superiors without. From 1482 to 1490 they suffered severely from the oppressive measures of Stcin, the minister of their king, Corvinus of Hungary, whom they had preferred to George Podiebrad of Bohemia. After the battle of Mohacz, Breslau passed with the rest of Silesia to the house of Austria, in whose possession it continued till 1741, when it was captured by Frederick Il. of Prussia. In 1757 it was retaken by the Austrians under Charles of Lorraine, but in the same year the Prussians again made good their claim by force of arms, and took no fewer than 21,000 men prisoners. The attempt of Laudon in 1760 to surprise the city was a failure. It was forced, however, after a lengthened siege to yield to the French in 1806-7. Their subsequent invest- ment of it in 1813 was interrupted by the peace.

BREST, a strongly fortified seaport town of France, capital of an arrondissement in the department of Finistére, in 48° 22’ N. lat. and 4° 32’ W. long. It is situated to the north of a magnificent land-locked bay, and occupies the slopes of two hills divided by the River Penfeld,—the part of the town on the left bank being regarded as Brest proper, while the part on the right is known as Recouvrance, from the chapel of the Virgin, to

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Roadstead of Brest.

for the recovery of their property. The hill-sides are in some places so steep that the ascent from the lower to the upper town has to be effected by flights of stairs ; and the second or third story of one house is often on a level with the ground story of the next. The town proper has three long parallel streets, of which the chief bears the name of Rue de Siam, in honour of the Siamese embassy sent to Louis XIV., and terminates at the remarkable swing-bridge, or Pont Impérial, constructed in 1861, which crosses the mouth of the Penfeld. Running along the shore to the south of the town is the Cours d’Ajot, one of the finest promenades of its kind in France, named after the engineer who constructed it. It is planted with trees and

adorned with two marble statues presented by the “Gouverne- ment Consulaire, Le XIIIT* Germinal, An IX.” Brest possesses comparatively few buildings of importance, with the exception of those connected with the great naval estab- lishment. The church of the priory of the Seven Saints, the church of St Louis, the old castle with its seven massive towers (dating in part from the 13th century), the exchange, the town-house, the civil hospital, and the theatre are the chief. The great convict establishment, which formerly held some 3000 prisoners, was vacated in 1860, and is now used as a store-house. The Government dockyard is very extensive, and contains a sail-loft, a slop- shop, a ropery, a foundry and steam-factory, seamen’s barracks (known as La Cayenne), and three dry-docks partly excavated in the hill-side. The Hépital de la Marine, built between 1824 and 1835, contains 26 wards, each with 53 beds, and is under the management of a large band of sisters of mercy. Among the minor establishments are a lyceum, a school of navigation, a medico-chirurgical school, an

observatory, a botanical garden, a public library of 25,000 volumes, and two others of 18,000 and 10,000. The manufactures are few, and the trade is of small extent considering the excellence of the ports. The for- mer are chiefly leather, wax-cloth, paper, and rope; and the latter deals mainly in grain, beer, brandy, and fish. Napoleon JIT. did much for the development of the com- merce of Brest, though his extensive plans for a new port, on which £600,000 were expended during his reign, have been only partially carried out. It lies at the foot of the Cours d'Ajot, and has thus much greater scope for any necessary development than the old port, which was formed by the mouth of the Penfeld. The roadstead of Brest, which is in some places three miles broad, and has an area of 15 square leagues, is formed by the promontory of Finistére on the N. and that of Kélernn on the §. It breaks up into numerous smaller bays or arms, formed by the embouchures of streams, the most important being the Anse de Kélernn, the Anse de Poulmie, and the mouths of the Chateaulin, the Dolas, the Lauberlach, and the Lan- derneau. It is defended on every side by batteries and forts, the first system of which was erected in 1680 under the personal superintendence of Vauban. The only entrance, the Goulet, is about a mile wide ; but the Mingant or Mingam rock in the middle compels vessels to pass under the batteries of either the one side or the other. In 1851 the population of the town was 36,500; in 1871 it was

66,272.

Nothing definite is known of Brest till about 1040, when it was ceded by the Count of Léon to the first duke of Brittany. In 1372 duke John IV. gave it up to the English on condition that they should restore it when peace was proclaimed. So important did he consider the place that he declared, 'He is not duke of Brittany who is not lord of Brest." On the death of Edward III. the castle was made over to the dukes; but when war was once more declared between France and England, an English garrison took possession again, and repelled every effort to dislodge it; nor was the place surrendered til] 1397, and then only in consideration of a heavy ransom. In the next century it was again captured by the English, and retaken by the French ; and by the marriage of Louis XII. with Anne of Brittany, it passed to the French crown. The advantages of the situation for a seaport town were first recognized by Richelieu, who, in 1631, constructed a harbour with wooden

wharves, which soon became a station of the French navy. Col- bert changed the wooden wharves for masonry, and otherwise im- proved the port, and Vanban's fortifications followed in 1680-88. In 1694 an English squadron, under Berkeley, was miserably defeated in attempting a landing ; but in 1794, during the revolutionary war, the French ficet, under Villaret de J oyeuse, beaten in the same place by the English admiral

BREST-LITOVSK (in Polish Brzesc, and in the chronicles Berestre and BERESTOFF), a town of Russia, in the government of Grodno, and 131 miles 8. from the city of that name, in 52° 5' N. lat, and 23° 39' E. long., at the

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junction of the navigable river Mukhovetz with the Bug, It contains two or three Greek churches, a Roman Catholic church, a Jewish synagogue—which was regarded in the 16th century as the first in Europe, a monastery, a public hospital, a Jewish almshouse, au important provision storehouse, a custom-house, and a wharf. Brest is the seat of an Armenian bishop, who has authority over the Armenians throughout the whole country ; and since 1841 the « Alex. ander" cadette-corps has been stationed in the town, The industries of the place are comparatively unimportant, but it carries on a very extensive and varied trade by means of its rivers and the Royal Canal. The principal articles of the traffic are grain, flax, hemp, wood, birch-tar, and leather. The population numbered 19,343 in 1860, 3394 being Catholics, and 10,320 Jews. In 1867 the total had risen to 22,493,

First mentioned in the beginning of the 11th century, Brest continucd to pass from one principality to another till 1392, when it was incorporated with Poland. In 1241 it had been laid Waste by Tatars, and was not restored till 1275 ; its suburbs were burned by the Teutonic knights in 1379, and in the end of the 15th cent the whole town met a similar fate at the hands of

Mengly-Gherai of the Crimea. In the reign of Sigismund diets were held' in Brest : and in 1594 and 1596, it was the meeting-place of two remarkable councils of the bishops of Western Russia. In 1706 the town was captured by the Swedes ; in 1793 it was added to the Russian empire ; and in 1794 was the scene of Suwaroff's victory over the Polish general Sierakofsky.

BRETAGNE. See Brirrany.

BRETSCHNEIDER, Kart GOTTLIEB, an eminent scholar and theologian, of the more moderate school of German rationalism, was born on the 11th February 1776, at Gersdorf in Saxony. From his autobiography, which was found amongst his papers after his death, and was published by his son in 1851, we obtain a very complete

; picture, not only of the man himself, but of the times in | which he lived, and of the influences by which he was surrounded, His father was pastor of the village of

Gersdorf, but was translated to Lichtenstein when

Bretschneider was only four years of age. He gives an

interesting account of his early childhood and school

training, of the impression produced upon him by his

father's dignified bearing, and of the agricultural pursuits

and piscatorial amusements by which the clerical and | peedeutic labours of the latter were diversified. On the death of his father, in 1789, he was sent to Hohenstein to reside with his uncle Tag. It is in keeping with the mental characteristics of the man who afterwards became famous for that cool and deliberate exercise of the reason on theological subjects, which has led many to place him among the extreme school of rationalist divines, to find him at the early age of fourteen, when he was confirmed by the pastor of Hohenstein, criticizing the religious teaching of his instructor, and pointing out that the order in which the various doctrines were taught from the Dresden catechism was not such as could commend itself to his own

experience, or the course of moral education which he had undergone. He remarks that he deems the circumstance worthy of mention, “ because it was the first time that, having turned his thoughts to the subject of religion, he could not persuade himself of the truth of what he was taught, and that a similar process may be going on in the minds of many a youth in similar circumstances, without the instructor being at all aware of it.”

In 1790 Bretschneider was sent to the lyceum of Chemnitz, where the celebrated Heyne had received his classical education. Here he remained four years, The account which he gives of the state of education in this school (which had greatly fallen away from its former reputation), and of the capacity of his instructors, is interesting, and is strikingly illustrative of the growth of that critical facuity which became so prominent a feature

in bis character. It was while at Chemnitz that Bret- schneider became acquainted with the Wolfenbtittel Irag- ments. ‘The conrector Lessing, a brother of the great Les- sing, who was the editor of the Fragments, and who was pelieved for some time to be their real author, was incon- siderate enough to warn his pupils against reading any of his brother’s works. The natural result followed. The pro- hibited books were eagerly sought after, and perused with avidity. Contrary, however, to what might at first have been expected, the persual of the Fragments made no impression on the mind of Bretschneider. The independent judgment of the youth is seen in the criticism which he passed upon the book :—‘‘I read the portion,” he says, ‘‘ which treats of the miracles of the Old Testament. But the reading made no impression upon me, for Christianity did not appear to me to rest at all upon the miracles of the Old Testament.”

In 1794 Bretschneider entered the university of Leipsic, having resolved to devote himself to the study of theology. His resolution to adopt this profession was purely the result of circumstances. ‘His father had expressed a wish that he should do so, and all his mother’s brothers were clergy- men.” The lectures which he attended were those of Platner on philosophy, of Keil and Beck and Burscher on various branches of theology, and of

Meisner and Kuhnoel on Hebrew. His autobiography contains minute and severe criticisms upon the various professors, in which the defects and mistakes of their teaching are pointed out. One or two of these may be quoted as indicative of the mental tendencies of the writer. Speaking of the lectures on philosophy, and after pointing out the defects of Platner's method, le says,—" Even at this early period, I learned from experience the impossibility for me of adopt- ing any doctrine, except on condition of its standing fully and clearly developed before me,—a peculiarity which has adhered to mc during my whole life, and has always pre- served me from mysticism and the theology of feeling." Again, in referring to the lectures of Beck on the exegesis of Scripture, the future lexicographer of the New Testa- ment appears in the remark,—"'T well remember how burdensoine the word wvetyua and mvetua dyov became, which he explained now as expressing senswm christeanum, and now as fervorem anim, and then, again, as someting else, I felt that these explanations were not correct, and consequently could not accept them." With the lectures of Keil, the successor of the celebrated Morus, Bret- schneider appears to have been better satisfied. He adopted his principle of the historical interpretation of Scripture, and entered, as he says, " with the greatest zeal upon the study of the Jewish theology and its usus loquendt. In consequence of this, a multitude of arbitrary explanations were set aside, and neither for Teller's dictionary, nor for other modern interpretations, in which new ideas are attached tv the words of Scripture, could I acquire the least relish. The efforts to explain away the devil from the Bible, to reduce the passages respecting Christ's pre-existence and higher nature to a moral sense, to make the miracles of the New Testament by exegetical subtleties mere natural events, were odious to me as denials of divine truth."

Atterspending fouryearsat Leipsic, Bretschneideraccepted the office of tutor to the sons of a Saxon nobleman, a post which he retained for some years. During this period his resolution to make the church his profession seems to have been somewhat shaken. His difficulties, however, were removed by reading the observations on assent to creeds in Reinhard's Christian Ethics, and also "by the thought that many great and estimable theologians varied widely from the church faith, and that in general society, and in the learned world, the enlightened theologians (for the term

rationalist was not common then) stood in the highest repute, and were regarded with universal respect. This state of things I supposed would be permanent, and I could not then have believed that only a single generation would pass before the enlightened theologians would be assailed with such violence and bespattered with filth as they now are, Had I been able to foresee this, I should certainly have devoted mysclf to the study of law."

In 1802 Bretschneider passed with great distinction the examination for candidatus theologiw, aud on that occasion attracted the favourable regard of Reinhard, the celebrated court-preacher at Dresden, who became his warm friend and patron during the remainder of his life. In 1804 Bretschneider established himself as pravat-docent at the university of Wittenberg, where he remained about two years, giving lectures on philosophy and theology. It was during this time that he began his career as an author. The first production of his pen was his Dogmatische Entwicklung aller in der Dogmatik vorkommenden Begrife nach den Symbolischen Schriften der evangelrsch-lutherischen und reformirten Kirche und den wichtigsten dogmatischen Lehrbiichern ihrer Theologen, nebst der Literatur vorztiglich der neueren tiber alle Theile der Dogmatik, which appeared in 1805, and reached a fourth edition in 1841, and which is distinguished for the complete account which it contains of the literature of the subject. This was followed by other works, among which may be named an edition of the book of Ecclesiasticus with a commentary in Latin, which was intended to form part of a larger work upon the Apocryphal books of the Old Testament,—an undertaking that was never carried out. The advance of the French army under Napoleon into Prussia after the battle of Austerlitz determined Bretschneider to leave Wittenberg, which as a fortified town was liable to be exposed to all the horrors of a siege. He accordingly abandoned his university career, and, through the good offices of his friend Reinhard, obtained the pastorate of Schneeberg in Saxony, on the duties of which he entered in March 1807. In 1808 he was promoted to the office of superin- tendent of the church of Annaberg, which, in addition to the properly clerical duties which belonged to the charge, involved the consideration of many matters belonging to the department of ecclesiastical law, which had to be decided in accordance with the canon law of Saxony.

Bretschneider, however, devoted himself energetically to his duties. “The Corpus Juris Saxonici,” he says, “ was almost always on my table, and I soon became perfectly acquainted with its contents.” In Annaberg he passed eight years, during which time he twice declined the offer of a professorship of theology, once from Kénigsberg and once from Berlin. The climate, however, did not agree with him, and in consequence of the demands made upon him by the discharge of his official duties, he was prevented from devoting sufficient time to his theological studies. He, therefore, began to desire a change. With a view to this, he publicly took the degree of doctor of theology in Wittenberg in August 1812. The subject of his thesis was “Capita Theologiz Judaice,” as gathered chiefly from the writings of Josephus. It was the last public doctorate of the kind, and cost him 300 thalers (£45), “an expense,” he remarks, “ which he often regretted, as the title was shortly after made common.” It may have been some little consolation to him that the people of Annaberg on his return commemorated his promotion in a number of poems composed for the occasion.

The desired change came at last. In 1816, on the death of Loeffler, general superintendent at Gotha, he was appointed, on the recommendation of Von Ammon, Reinhard’s successor at Dresden, to the vacant post, in which he remained until his death in 1848. This was the

great period of his literary activity. By a careful economy of time, he was able to discharge his official duties, and yet to possess sufficient leisure for theological study. Of the various productions of his pen, which appeared during his residence at Gotha, the following are specially worthy of note. In 1820 was published his treatise on the gospel of St John, entitled Probabilia de Evangelii et LEpistolarum Joannis Apostoli indole et origine eruditorum judiciis modeste subjecit K. G. Bretschneider. The sensation which this work produced was immense. In it he collected together with great fulness, and discussed with marked moderation of tone, the various arguments which seem to prove the non-Johannine authorship of the gospel. As might have been expected, it called forth a host of replies, several of which proceeded from some of the ablest scholars and divines of the day. To the

astonishment of every one, Bretschneider announced in the preface to the second edition of his Dogmatik in 1822, that he had never believed in the non-authenticity of the gospel, that he had only published his Probabilia to draw attention to the subject, and to call forth a more complete defence of its genuine- ness, an object which he considered had now been fully accomplished. Whatever may have been the effect pro- duced on the mind of Bretschneider himself by the various replies which appeared, they certainly did not remove the doubts of others, for the controversy still appears as far from being definitely settled as it was when the Probabilia appeared more than half a century ago. Bretschneider remarks in his autobiography that the publication of this work had the effect of preventing his appointment as suc- cessor to Tittmann in Dresden, tlie minister Von Einsiedel violently opposing the proposal of the city council to call Bretschneider to the office, and denouncing him as the “slanderer of John” (Der Johannis Schdnder).

The work by which Bretschneider conferred the greatest service upon the science of exegesis was his Lemicon Manuale Greco-Latinum in libros Novi Testamentt, which appeared in 1824, and which attained a third edition in 1840. This work is valuable for the use which its author made of the Greek of the Septuagint, of the Old and New Testament Apocrypha, of Josephus, and of the apostolic fathers in illustration of the language of the New Testa- ment.

Bretschneider’s dogmatic writings were very numerous, and many of them passed through several editions. The only one which has been translated into English is his Manual of the Religion and History of the Christian Church, which appeared in 1857,

The dogmatic position of Bretschneider seems to be inter- mediate between the extreme school of naturalists, such as Paulus, Rohr, and Wegscheider on the one hand, and that of Strauss and Baur on the other, Recognizing a supernatural element in Scripture, he nevertheless allowed to the full the critical exercise of reason in the interpreta- tion of its dogmas. As a theologian he was deficient in speculative power, and his writings are marked by a certain dryness. His mental strength lay in the possession of a

clear, cool judgment, which he never allowed to be influenced by feeling, and in the faculty of untiring industry.

For further information the reader is referred to his autobiography, Aus Meinen Leben : Selbstbiographie von Karl Gottlieb Breischneider, Gotha, 1851, of which a translation, with notes, by Professor George

E. Day, appeared in the Bibliotheca Sacra and American Biblical Repository, Nos. 36 and 38, 1852, 1853. (F. C.)

‘BREUGHEL, Jan, a Flemish painter, son of Peeter Breughel, was born at Brussels about the year 1569. He first applied himself to painting flowers and fruits, and afterwards acquired considerable reputation by his land-scapes and sea-pieces. After residing long at Cologne he travelled into Italy, where his landscapes, adorned with

small figures, were greatly admired. He left a large number of pictures, chiefly landscapes, which are executed with great skill, Rubens made use of Breughel’s hand jn the landscape part of several of his small pictures,—such ag his Vertumnus and Pomona, the Satyr viewing the Sleeping Nymph, and the Terrestrial Paradise, which by some ig regarded as the masterpiece of that great artist, Breughel died in 1642.

BREUGHEL, Prerter, a Flemish painter, was the gon of a peasant residing in the village of Breughel near Breda, After receiving instruction in painting from Koek, whose daughter he married, he spent some time in France and Italy, and then went to Antwerp, where he was elected into the Academy in 1551. He finally settled at Brussels and died there. The subjects of his pictures are chiefly humo- rous figures, like those of D. Teniers; and if he wants the Gelicate touch and silvery clearness of that master, he hag abundant spirit and comic power. Heis said to have died about the year 1570 at the age of 60 ; other accounts give 1590 as the date of his death. Several other painters of the name Breughel attained to some distinction.

BREVIARIUM ALARICANUM, a collection of Roman law, compiled by order of Alaric IT., king of the Visigoths, with the advice of his bishops and

nobles, in the twenty- second year of his reign (506 A.D.) It comprises sixteen books of the Theodosian code; the Novells of Theodosius I]., Valentinianus IIL, Marcianus, Majorianus, and Se verus ; the Institutes of Gaius ; five books of the Sententie Kecepte of Julius Paulus ; thirteen titles of the Gregorian code ; two titles of the Hermogenian code; and a fragment of the first book of the Responsa Paprant. It is termeda code (codex) in the certificate of Anianus, the king's referendary, but unlike the code of J ustinian, from which the writings of jurists were excluded, it comprises both imperial constitutions (leges) and juridical treatises (jura). From the circumstance that the Breviarium has prefixed to it a royal rescript (commonitorium) directing that copies of it, certified under the hand of Anianus, should be received exclusively as law throughout the kingdom of the Visigoths, the compilation of the code has been attributed to Anianus by many writers, and it is frequently designated the Breviary of Anianus (Breviarium Aniani). The code, however, appears to have been known amongst the Visi- goths by the title of "Lex Romana," or "Lex Theodosii," and it was not until the 16th century that the title of "Breviarium" was introduced to distinguish it from a recast of the code, which was introduced into Northern Italy in the 9th century for the use of the Romans in Lombardy. This recast of the Visigothic code has been preserved in a MS. known as the Codex Utinensis, which was formerly kept in the archives of the cathedral of Udine, but is now lost ; and it was published in the last century for the first time by Canciani in his collection of ancient laws entitled Barbarorum Leges Antique. It has been published in the present century by Walter in his Corpus Juris Germanic, Berolini, 1824. Another MS. of this Lombard recast of the Visigothic code has lately been discovered by Hanel in the library of St Gall. Neither of these MSS. comprises the whole of the Visigothic code, and it is the opinion of very competent scholars that the Lex Romana of the Lombards did not contain any portion of the Gregorian or Hemogenian code, nor the fragment of the Responsa Papiani. The chief value of the Visigothic code consists in the fact, that it is the only collection of Roman Law in which the five first books of the Theodosian code and five books of the Sententiw Recepte of Julius Paulus have been preserved, and until the discovery, of a MS. in the chapter library in Verona, which contained the greater part of the Institutes of Gaius, it was the only work in which any portion of the institutional writings of that great jurist

had come down to us. The most complete edition of the Breviarium will be found in the collection of Roman law published under the title of Jus Civile Ante-Justinianum, Berolini, 1815.

BREVIARY (Lat. breviarium), the book which contains the offices for the canonical hours. The word first occurs in the 11th century, and is said to denote that the book was an abridgment of several separate ones which had previously been in use. ‘The English equivalent for it is portuary (from the medieval Latin portiforiwm), portesse, or portuasse, the name probably indicating the portability of the volumes.

In the earliest times most of the stated public devotions of the faithful grouped themselves round the daily celebration of the eucharistic sacrifice; but by degrees other offices were added, in which the recitation of the Psalter formed the principal part. The rise of monasticism gave a great impulse to the movement, as the monks generally used the whole Psalter every week, and many of them every day. Numerous complications were added by degrees, in the shape of antiphons, responses, &c. Metrical hymns seem to date from St Ambrose in the middle of the 14th century. Select portions of holy Scripture were also read, as well as extracts from works of the Fathers and from lives of the saints.

The canonical hours are eight in number ; the night office of matins (divided into three nocturns) and seven day oflices,-—lauds, prime (at 7 a.M.), terce (at the third hour or 9 a.M.), sext (at the sixth hour, noon), nones (at the ninth hour, 3 P.M)., vespers (at sunset), and compline before retiring to rest.

From this account it will at once be seen that the Breviary services can only be carried out in a monastic community where all other duties give place to worship. Accordingly, the secular clergy of the Latin churches who are obliged to recite them daily are allowed much latitude in the way of grouping services together, and saying them at any hour that may be convenient, which quite destroys the grand theory of the nightly and seven-fold daily offices of devotion, There were three leading types of this service book in the Western churches :—(1), the Mozarabic Breviary, once in use

throughout all Spain, but now con- fined to a single foundation at Toledo ; it isremarkable for the number and length of its hymns, and for the majority of its collects being addressed to God the Son; (2), the Ambrosian, now confined to Milan, where it owes its Tetention to the attachment of the clergy and people to their traditionary rites which they derive from St

Ambrose; and (3), the Roman, which (with many minor

variations) forms the ground-work of all others except those just mentioned.

Till the Council of Trent every bishop had full power to regulate the Breviary of his own diocese ; and this was acted upon almost everywhere. Each monastic community, also, had one of its own. Pope Pius V., however, while sanction- ing those which could show' at least 200 years of existence, made the Roman obligatory in all other places. But the influence of the court of Rome has gradually gone much

beyond this, and has superseded almost all the local

"uses." The Roman has thus become nearly universal, with the allowance only of additional offices for saints specially venerated in each particular diocese. .

The Roman Breviary has undergone several revisions. The most remarkable of these is that by Cardinal Quignon (1536), which, though not accepted by Rome, formed the model for the still more thorough reform made in 1549 by the Church of England, whose daily morning and even- ing services are but a condensation and simplification of the Breviary offices. Some parts of the prefaces at the beginning of the English Prayer-Book are free translations of those of Quignon. At the beginning of last century

a movement of revision took place in France, and suc- ceeded in modifying about half the Breviaries of that country. Historically, this proceeded from the labours of Launoius and Tillemont, who had shown the falsity of numerous lives of the saints ; while theologically, it was produced by the Port Royal school, which led men to dwell more on communion with God

as contrasted with the invocation of the saints. This was mainly carried out by the adoption of a rule that all antiphons and responses should be in the exact words of Scripture, which, of course, cut out the whole class of appeals to created beings. The services were at the same time simplified and short- ened, and the use of the whole Psalter every week (which had become a mere theory in the Roman Breviary, owing to its frequent supersession by saints' day services) was made a reality. These reformed French Breviaries show a deep knowledge of holy Scripture, and much careful adaptation of different texts; but during the pontificate of the present Pope (Pius IX.) a strong Ultramontane move- ment has arisen against them. It was inaugurated by the Count de Montalembert, but its literary advocates were chiefly the Abbé Gueranger and M. Veuillot of the Univers ; and it has succeeded in suppressing them everywhere except at Lyons, where the shadow of St Irenzus still pro- tects the local rites.

The beauty and value of many of the Latin Breviaries were brought to the notice of English churchmen by one of the numbers of the Oxford T'racts for the Times, since which time they have been much more studied, both for their own sake and for the light they throw upon the English Prayer- Book.

In a bibliographical point of view some of the early printed Breviaries are among the rarest of literary curiosities, being merely local. The copies were not spread far, and were soon worn out by the daily use made of them. Doubtless many editions have perished without leaving a trace of their existence, while others are known by uniqu? copies. In Scotland the only one which has survived the convulsious of the 16th century is that of Aberdeen, revised by Bishop W. Elphinstone, and printed at Edinburgh by Walter Chepman in 1509. Four copies have been pre- served of it, of which one only is complete; but it has been sumptuously reprinted in fac-simile for the Maitland Club by the munificence of the Duke of Buccleuch. It is particularly valuable for the notices of the early history of Scotland which are embedded in the lives of the national saints, and which are considered to be very authentic. For the sake of those who are not familiar with Latin typo- graphical contractions, it would be desirable if a more readable edition were printed, with explanatory notes on the.many difficult points which occur in the rubrics.

The Sarum or Salisbury Breviary was much more widely used. ‘The first edition was printed at Venice in 1483, by Raynald de Novimagio in folio; the latest at Paris, 1556, 1557. It may be noticed as a peculiarity that, while modern Breviaries are always printed in four volumes, one for each season of the year, the editions of the Sarum never exceeded two parts.

Further information on this subject will be found in the writers on the services of the Western churches, such as Maskell and Procter. Seager has printed a small portion of the Sarum Breviary with elaborate notes. The hymns have been printed separately, with more or less completeness, by Daniel,.Newman, and others; and translations “from them form the ground-work of Hymns Ancient and Modern, now so extensively used in the Church of England. Foreign writers on this subject may be consulted by those who wish to pursue it further, but they are too numerous to be mentioned here. They will be found enumerated in biblio- graphical writers like Taccaria. (G. H. F.)

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BREWING

REWING is the art of preparing an exhilarating or intoxicating beverage by means of a process of fermentation. In the modern acceptation of the word, brewing is the operation of preparing beer and ales from any farinaceous grain (chiefly from barley), which is first malted and ground, and its fermentable substance extracted by warm water. This infusion is evaporated by boiling, hops having been added to preserve it. The liquor is then fermented.

The art was known and practised by the Egyptians many hundred years before the Christian era, and after- wards by the Greeks, Romans, and ancient Gauls, from whom it has been handed down to us. All countries, whether civilized or savage, have, in every age, prepared an intoxicating drink of some kind. Inthe second book of Herodotus, written abcut 450 B.c., we are told that the Egyptians, being without vines, made wine from corn; but as the grape is mentioned so frequently in Scripture and elsewhere as

being most abundant there, and no record exists as to the vine having been destroyed, we must conclude that the historian was only partially acquainted with the productions of that most fertile country. Pliny (Natural History, xxii. 82) informs us that the Egyptians made wine from corn, and gives it the name of zythum which in the Greek would mean drink from barley; and Hellanicus, telling of the introduction of wine at Plinthium, acity of Egypt, states : “Hence the Egyptians are thought to derive their love and use of this liquor, which they thought so necessary for human bodies, that they invented a wine made from barley.” The Greeks, who derived the greater part of their civilization from the Egyptians, obtained from them also the knowledge of artificial fermen- tation, the art of brewing in fact, and at a very early period. We find it mentioned, for example, in the writings of Archilochus, the Parian poet and satirist, who flourished about 700 8.c., that the Greeks of his day were already acquainted with the art.

Again, we learn from schylus (470 8.c.), from Sophocles (420 B.c.), and Theophrastus (300 B.c.), that the Greeks employed barley wine or beer (their zythos) in their daily life as well as in their festive meetings. There is, in fact, little doubt that the discovery of beer and its use as an exhilarating drink were nearly as early as those of the grape itself. Xenophon, in his account of the retreat of the ten thousand Greeks, written 400 years B.c., men- tions that the inhabitants of Armenia used a fermented drink made from barley. Diodorus Siculus states that the Galatians prepared a fermented beverage from barley, calling it zythos, like the Egyptians. By Sophocles and other Greek writers it is styled Bpdrov. Dioscorides mentions two kinds of beer, one he calls £360s and the other xotpyt, but he does not describe them sufficiently to enable us to distinguish them. Both, he says, were made from barley, and similar liquors were made in Spain and Britain from wheat. In the time of Tacitus (whose treatise on the manners and customs of the Germans was written in the Ist century of the Christian era), beer was their usual beverage, and from his description, imperfect as it is, there can be no doubt that they understood the method of converting barley into malt. Pliny mentions its use in Spain (Wat. Hist., xxii. 82) under the name of celia and cerva, and in Gaul under that of cerevisia or cervisia; and elsewhere (xiv. 29) he says—* The natives who inhabit the

west of Europe have a liquor with which they intoxicate :

themselves, made from corn and water. The manner of making this liquid is somewbat different in Gaul, Spain, and

other countries ; and it is called by different names, but its nature and properties are everywhere the same, The people of Spain in particular brew this liquor so well that it will keep good along time. So exquisite is the cunning of mankind in gratifying their vicious appetites, that they have thus invented a method to make water itself produce intoxication.”

The cervisca of Pliny evidently takes its name from Ceres, the goddess of corn. Plautus calls it Cerealis liquor, that is, liquor used at the solemn festival of that goddess. The art of malting and use of beer are supposed to have been introduced into Britain by the Romans, That barley was known to the latter is evident from Virgil, who uses it in the plural form, hordea, as we do the word oats ; and Pliny tells of the hordearit gladiatores, a kind of fencers, whose sustenance was barley. Beer and vine- gar were the ordinary beverages of the soldiers under Julius Cesar. The latter was made very strong, and was drunk diluted with water when on the march. Beer being so suitable to the climate, and so easily made by an agri- cultural people with plenty of corn, it was gladly welcomed, and soon became the national beverage. Previous to this, the usual drinks of the ancient Britons were water, milk, and mead (an intoxicating drink made from honey). After the expulsion of the Romans from Britain, the Saxons subdued the natives aud learned from them the art of brewing.

Dr H. J. Mann tells us that the Kaffre races of South Africa have made for ages, and still make, a fermented drink of beer from the seed of the millet (Sorghum vulgare), which is first subjected to a malting process in all essential particulars identical with our own, The seed is first induced to germinate by covering it in a warm place with moistened mats of grass, and the sprouting is then stopped by the appli- cation of heat. After simmering for some time in hot water, the malted grain is set aside to ferment in the sun— fragments of a dried succulent plant having been stirred in to play the part of yeast and start the fermentation. The scum which rises to the surface during the fermentation is skimmed away from time to time by ladles made of grass stems spread out and loosely woven together at the bowl. When the fermentation is complete the beer is poured through a mat strainer, shaped

and tasselled very much like an inverted night-cap, into the store vessel, which is made of thickly and firmly woven grass. ‘he natives of Nubia, Abyssinia, and other parts of Africa also make an intoxicating drink of great power called bousa, from the flour of the teff (Poa abyssinica), and from the durtha or millet (Sorghum vulgare), much esteemed by the natives, and perferred by many to palm or date wine, the common intoxicating drink in tropical countries. According to Mungo Park, the natives of Africa also make a beverage from the seed of the spiked or eared soft-grass (Holcus spicatus). The Russian drink kvass or quass, a thick, sour beverage, not unlike bousa, is made of barley and rye flour, mixed with water and fermented. Formerly, the spruce-fir, birch, maple, and ash trees were tapped, and their juice used in England,—the first two, indeed, till within the last fifty years. Koumiss, the drink of the Tatar race, is the fermented milk of their mares. The Chinese beverage, sam-shee, is made from rice. This is not only intoxicat- ing, but, like absinthe, peculiarly mischievous in its per- manent effects. In South America a favourite drink is palque, the fermented juice of the Amercian aloe (Agave americana). Guarapo is the juice of the sugar-cane, which, when fermented, forms the common drink of the negro

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BREW IN &

races, who also prepare a drink from rice and honey. Where

- peer has once been introduced, however, it has generally

become the national beverage, and is now in universal use in the northern and temperate parts of Europe and Asia. Beer used formerly to be made in England from wheat ; but this beverage was not so well flavoured as if prepared from barley-malt, nor did it keep long. It was esteemed in Germany and Denmark, and was called by the Germans Mumme, and by the Danes mom. The German Werss-brer ig made from wheat-malt,, with a small portion of barley-

malt added.

We are informed by William of Malmesbury that, in the reign of Henry II., the English were greatly addicted to drinking. The monasteries were remarkable for the strength and purity of their ales, brewed from malt prepared by the monks with great care and skill. The waters of Burton-on-Trent began to be famous in the 13th century. The secret of their being so especially adapted for brewing was first discovered by some monks, who held land in the adjacent neighbourhood of Wetmore. There is a document still extant, dated 1295, in which it is stated that Matilda, daughter of Nicholas de Shoben, had re-leased to the abbot and convent of Burton-on-Trent certain tenements within and without the town ; for which re-lease they granted her,

) daily for life, two white loaves from the monastery, two

_ gallons of beer for the men.

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at Vauxhall.

gallons of conventual beer, and one penny, besides seven The abbots of Burton must also have made their own malt, for it was a common cove-nant in leases of mills belonging to the abbey, that the malt of the lords of the manor, both spiritual and temporal, should be ground free of charge. Mary Queen of Scots, in the midst of her troubles, seems not to have been altogether insensible to the attractions of English beer, for when she was confined in Tutbury Castle, Walsingham her secretary asked, “At what place near Tutbury beer may be pro- vided for her majestie’s use ?”’ to which Sir Ralph Sadler, governor of the castle, made reply, ‘Beer may be had at Burton, three miles off.” Plot, in his Natural Ifistory of Staffordshire, written 200 years ago, refers to the peculiar properties possessed by the Burton waters, from which, he says, “by an art well known in this country good ale is made, in the management of which they have a knack of fining it in three days to that degree that it shall not only be potable, but is clear

and palatable as one could desire any drink of this kind to be." In 1630 Burton beer began to be known in London, being sold at "ye Peacocke," in Gray's Inn Lane, and, according to the Spectator, was in great demand amongst the visitors In 1585 Stow relates that there were 26

| brewers in the city of London, the suburbs, and West- | minster,—13 being English and 13 foreigners,—who brewed

_ 1643 the first excise was imposed on beer.

648,960 barrels of beer, of which they exported 26,400 barrels to Embden, the Low Countries, and Dieppe. In In William IIL.'s reign, the brewer sold his nut-brown ale at 16s. per barrel, and his small beer from the same grains for 6s. per barrel.

At the present day the brewing trade has reached vast proportions in Great Britain. It would appear that its extent has now attained the maximum ; the quantity pro- duced for export is likely to decline, as most of the colonies are beginning to make their own. The best colonial beer is made in Tasmania, whence it is shipped in frozen blocks to Australia and India. In Calcutta, on the hottest day, the residents now suck (not sip) their frozen pale ale. According to the report to Messrs Bass by Professor Leone Levi, the number of persons employed in and depending on the liquor trade is 1,500,000, and the capital invested in it amounts to £117,000,000. There are 5000 maltsters, 34,000 licensed brewers, 6000 dealers in ales, and 139,000

publicans, These pay nearly £8,000,000 a year for permission to make and sell the popular drink. The quantity of beer brewed in 1869 was 25,542,664 barrels, of which 521,272 barrels were exported; whilst in 1874 the exports were 573,957 barrels, of the declared value of £2,508,883. It has been estimated that Barclay & Perkins (successors to Thrale, Johnson's friend) have £1,500,000 sunk in their trade. Bass, the largest brewer in the world, pays license on 1,000,000 barrels, and there are eighteen other brewers who pay duty on 200,000 barrels. From the excise official returns we find the annual consumption per head of the population is

In England, 2 bushels of malt, 4 gallon of spirits.

” Scotland, vs ” ” 1% ” ”

” Ireland, ts ” ” to ” ”

The first essay known to us on the subject of brewing is by Basil Valentine. Boerhaave says of this treatise that it is both accurate and elegant. In 1573 H. Knanst published a work in five volumes at Erfurt, with the quaint title, On the Divine Noble Gift, the Philosophical, highly Dear, and Wondrous Art to Brew Beer. In the year 1585 Thaddeus Hagecius ab Hayck (a Bohemian), published a treatise entitled De Cerevisia, ejusque conficiendi ratione, natura, viribus, et facultatibus. This small work of fifty pages gives a very clear and accurate description of the process of brewing, To Mr Combrune, a London brewer in the earlier part of the 18th century, we are indebted for the proofs he gave of the value of the thermometer in brewing. In other respects his work entitled Z’he Theory and Practice of Brewing, is of no particular value at the present day, though it was very useful at the time in advancing the art, and ran through several editions. Previous to his time brewers had looked upon the thermometer as a scientific toy, and “rule of thumb” was the order of the day. In the year 1784 Mr Richardson of Hull brought out his Theoretic Hints on Brewing Malt Liquor, and Statistical Estimates of the Materials of Brewing, showing the use of the Saccharometer. These works would be beneficial but for the absurd mystery with which the author invests the whole subject. It was he who first brought publicly to the notice of brewers the value of the saccharometer, an improvement of his own on the hydro- meter, or water guage, invented by Martin, the Fleet Street mathematician. Mr Baverstock purchased one of these in 1768, and in 1770 received a certificate of the value of his instrument from Mr Thrale, the celebrated brewer in Southwark, who had tested it. It was not, however, till 1785 that Mr Baverstock published his HHydrometrical Observations and Experiments in the Brewertes ; 80 that Mr Richardson has the merit of bringing his improved hydrometer, which he christened saccharometer, first to the notice of the trade. By this instrument the brewer is enabled to ascertain the amount of saccharine or fermentable matter in the wort, and thus to take advantage of a parti- cularly good sample of malt, or to compensate for a bad one, so as to procure an

uniform strength. Malt varies in quality according to season, the skill of the maltster, and other circumstances. Samples of barley raised from the same seed, and grown in adjoining fields, will produce malt widely different, although this is not discovered till it has been in the mashtun. ‘The quantity of malt which suffices for a particular “length” to-day may fall far short of affording the same quantity of ale to morrow, and vice versa. In either case the saccharometer is essential, as it enables the brewer to make his ales one standard strength. The instrument is also of great service in regulating the fermentations.

Mr Richardson’s saccharometer was constructed on the principle that 36 gallons (one barrel) of water weighs 360 h, and if that quantity of water were aa into wort

“Sere

and again weighed the difference would show the weight of fermentable matter extracted from the malt. His instrument, therefore, was graduated so as to show one degree for each pound that a barrel of wort weighed more than a barrel of water. He does not, however, allow for the displacement of a certain quantity of water by the saccharine matter dissolved in it; consequently, his in- strument is not quite correct. The saccharometer of Dring and Fage and that of Long, which are both on the same principle as Richardson’s, are adjusted so as to allow for this inaccuracy; for example, if a gallon of sugar, weighing 16 Ib, be added to 35 gallons of water (together making one barrel imperial measure), their instruments show in this infusion, at 60° Fahr., the excess above that of distilled water, which, in this instance, is 6 tb gravity ; thus we have a barrel of wort, weighing 366 tb, composed of water 35 gallons, and saccharine matter 16 tb. The Excise make their calculations by Allan and Bate’s instru- ments, which are constructed on the principle of indicating the specific gravity of the wort,—that of distilled water, which is the standard of weight by which all substances have to be compared, being reckoned 1000. It is, however, easy to change the reckoning of the one to the other. Should we wish to reduce the specific gravity indicated by Allan’s or Bate’s instruments, we have only to divide the specific gravity by 2°77; or if we wish to convert the

indication of Dring and Fage’s scale into specific gravities we multiply by the same factor.

Barley is the seed of several species of Hordeum, and be- longs to the tribe of grasses, called by botanists Graminacee. It has been cultivated from the earliest times, The species most used for malting purposes are the long-eared or two- rowed barley (Hordewm distichum), and the Hordeum hexastichon, cominonly called bere or bigg. This, in con- sequence of its being more hardy and ripening more rapidly, is cultivated in Scotland and Ireland. The variety of the two-rowed most in repute is the Chevalier. This was introduced early in the present century by the rector of Stonham, in Suffolk, after whom it was named, and was the result of careful cultivation, Mr Chevalier saw some fine specimens of two-eared barley growing on a manure heap, had them saved, and cultivated them for several years, selecting only the soundest and largest seeds, until the Chevalier barley became famous and commanded large prices. The land in Great Britain suitable to the growth of the finest grain for malting is limited,—the most favour- able districts being Suffolk, Norfolk, and parts of Essex and Herts. It is, of course, cultivated in all other coun- ties, but not to the same extent. From the Agricultural Returns of Great Britain, presented to Parliament, we find that in the year 1870, there were 2,600,000 acres under barley, which, if taken together, would form a block ath larger than the counties of Suffolk and Norfolk. Taking the average yield at 32 bushels per acre, the total is 83,000,000 bushels, or more than 10,000,000 quarters, Of this, 50,000,000 bushels were converted into malt, and 4,000,000 used by the distillers. Farmers find by experi- ence that some land is not fit for the growth of this cereal, and maltsters that if it is grown on certain soils it will not make good malt. Light calcareous or friable gravelly dry soil is the best. Rich loamy soil produces an excellent crop, and sandy soil, when well manured, answers 3 but cold clayey land, even when well drained, will not produce the best malting barley It is a most precarious crop, requires but little moisture, and a wet season is fatal to it, When it is in full ear rain, or even heavy dew, will break the stalk, and if wet continues for two or three days the ears on the ground begin to grow, get stained, and become quite unfit for malting. It should remain in the stack at least @ month to season. If “got up” damp, it is liable to

generate excessive heat, in which case the growing power of the germ is destroyed, and the grain rendered useless for inalting purposes. Good barley should have a thin, clean wrinkled husk, closely adhering to a plump well-fed kernel, which, when broken, appears white and Sweet, with a germ full, and of a pale yellow colour. It is of all cereals the best adapted for malting, containing as it does more starch and far less gluten than other grain, and about 7 per cent, of ready-formed grape-sugar. Its specific gravity is from 1-280 to 1333, that of malt 1-200. A bushel of barley weighs between 53 tb and 58 bb, depending on climate, soil, and harvest ; the same quantity of bere or bigg weighs from 47 Tb to 51 tb. It cannot well be too heavy, as it gives a corresponding gravity to the malt, providing it be mellow thin-skinned, and not steely. The cuticle, or husk, forms nearly 3th of the weight of barley, and between qth and gth in bigg. According to Einhoff, 1000 parts of barley meal contain 720 of starch, 100 of water, 68 of fibrous or ligneous matter, 56 of sugar, 50 of mucilage, 36°6 of gluten, 12°3 of vegetable matter, and 2°5 of phosphate of lime, Hermbstadt gives the following percentages as the mean of ten analyses of barley made by him : —~ :

RSE. 2: en ee 10°48 a ee Nl 11°59 Cee OS cc sa5sc xo desvev eget et ARG: rca 4°91 SPAUDIBERREN 55:12 1san:e2./9:, 9. ., eet ee 0°35 15s ee ee 60°50 ie CC 4°66 ee es CM, 4°50 Oe eee ee 0°35 Soluble phosphates, &.....0c0cccccssecssseeccece 0°36 iS: ria de eee 2°30

100°00

Great care must be taken when buying for malting, for sometimes the grain is doctored by kiln-bleaching or dried at too great a heat. Several samples, too, may be mixed, in which case they will not grow regularly, as heavier barley generally requires to be longer in steep. Corns broken by the drum of the thrashing-machine being set too close spoil a sample ; those cut into sections will not ger- minate, but in warm weather putrefy, as is evident from their blue-grey and mouldy appearance, and offensive smell — whilst germinating. A good buyer will, by the use ofa skilful hand, estimate very closely the weight per bushel in bulk; his eye will tell him if the grain has been cut before being ripe, in which case there will be a variety in the

colour of the barley-corns, some being bright, and some a dead greyish yellow. In consequence of being sown in spring, and not undergoing the equalizing tendency of winter, barley is of all grain the most liable to ripen ina patchy manner, and not come to perfection simultaneously. The buyer has also to judge if it has been heated or “mow burnt” while lying in the field after being cut, or in the stack ; this it is apt to do in showery weather, or when the crop of clover, which is generally sown with or soon after the barley, is luxuriant. In this case the grain is apt to sprout, and as the process of malting is as near as can bea natural vegetation, barley once sprouted is useless to the maltster.

Maliing.—The word malt has been variously derived from roots that have respectively the meanings of grinding, soaking, and rotting. The last derivation, corresponding to the humor ex hordeo corruptus of Tacitus (Germ. 23), is the most probable. Malting consists in steeping the grain in water to supply moisture enough to cause it to germinate, and when the growth is sufficiently advanced, stopping it by drying the grain on a kiln. Before explaining the process of malting we must describe the construction of the seed, and see the chemical changes that take place. A grain of barley is composed of several parts—the inner and outer husks, the cotyledon, the corcule (which includes the plumule or future stem and the rostel), the investing membrane,

and the sear or eye, through which the seed is nourished

during the process. The hard white part is termed, botani-

cally, albumen. This is the cotyledon, and forms the chief

part of the seed, supplying the germ with food during the

first few days of its existence. With the germ, which begins to exist within an hour of being put in steep, springs also into existence the principle termed diastase. This name (from Suornp., to separate) was given it by MM. Payen and Persoz, who made numerous experiments with it. According to Muspratt, diastase may be obtained by making a paste of malted grain at a temperature of 76°,

allowing it to stand for a few minutes, and then pressing

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out the liquor, which is afterwards filtered and heated in a water bath at 170°. At this temperature a portion of the foreign nitrogenous matter coagulates, which is after- words separated by filtration. The clear filtrate, which contains tolerably pure diastase, is evaporated at a low temperature to dryness. Diastase is not only soluble itself, but has the power of dissolving starch, and converting it into soluble gum, to which is given the name dextrin, and finally into grape sugar, so called because, on analysis, it closely resembles the sugar which naturally exists in the grape. So powerful is diastase, that one part will convert 2000 parts of starch into grape-sugar. This operation will benoticed below under the head of mashing. It is on account of this wonderful power of diastase to convert starch into saccharine matter, that distillers use one part of malt in mashing to five parts of raw grain, The next part of the seed that comes under notice is the corcule, which is the embryo of the future plant. This germ, feeding on the sugar formed from the starch of the cotyledon by the action of diastase, grows upwards and downwards,—the upward

- growth being the plumule or “ acrospire,” the downward the

radicle or future root. Acetic acid (vinegar), which does not exist in raw grain in a free state, is now also formed ; this assists the diastase in its action.

The maltster’s object is to obtain as much saccharine matter as possible, with the smallest loss of substance, by converting the starch of the barley into sugar, and thus pre- paring it for the brewery, where it is changed by fermenta- tion into alcohol. Chemically, starch and sugar are com- posed of

the same elements, carbon, oxygen, and hydrogen ; but their atoms are differently arranged,—the mean results of the analyses of Berzelius, Gay-Lussac, and Thenard, giving ;/;ths of a grain of carbon more in starch than in sugar, whilst sugar contains ,3,,ths of a grain more of oxygen and ,$,ths less of hydrogen than starch.

The duty on malt forms an important item in the revenue, and stringent laws have been made to enable the excise to levy the duty, and prevent the maltster from defrauding. It may be remarked, however, that although those rules were relaxed or abolished, the process of manufacture would be carried on as it is now. The duty was first raised in the reign of Charles I. on the following scale :— English malt, 4s. 4d. ; Scotch barley-malt, 3s. 84d. ; Scotch bigg-malt, 3s. per bushel, but 2s. of this was a war-tax, and the whole was soon repealed. In 1697 a tax was again imposed (to enable William III. to carry on war with France) of 63d. per bushel. The rate has been frequently changed, and has ranged between 7d. and 4s. 53d. in England, and 7d, and 3s. 94d. in Scotland. For this and much other information we are indebted to a useful little work on malting published by W. R. Loftus. The present rate of duty on malt made from barley is 2s. 7d. per bushel, and 5 per cent. additional, making in all 2s, 824d. ; and on malt from bere or bigg, when made for consumption in Scot- land or Ireland, 2s., and 5 per cent. additional ; when the latter is imported into England the higher duty is charged. The 5 per cent. additional was imposed in 1840 on all exciseable articles, except spirits.

Table showing Quantity of Malt made in Great Britain during the years 1871 to 1874, and the amount of Duty levied :—

No. of Bushels.

Duty Levied.

ENGLAND— 1871 | 46,318,153 | £6,281,899 1872 | 51,511,682 6,986,273 From Barley.4| 3973 | 52,873,839 7I7L. 014 1874 | 53,661,020 7977 7775 ScorLanpD—

1871 2,768,187 375,435 1872 2, 956, 040 400,913

From Barley. 4| 3973 | 3°171,582 430,146

1874 2,819,612 382,410

(| 1871 37,843 3,973

1872 23, 636 2, 489

From Bigg… 4} 1973 26,931 2, 828

1874 20,600 2,163

JTRELAND—

1871 2,929, 282 397,284 1872 2,715, 412 368,278

From Barley. 4| 3973 3,365,624 456, 463

1874 3,221,329 436,893 1871 7.545 792 1872 7,014 737

From Bigg…4| yg73 ark a

Malting consists of four processes,—steeping, couching, flooring, and kiln-drying.

Steeping is performed in a large cistern of stone, or more usually brick, covered with cement, into which the barley (properly screened, to remove the small useless grains) is shot from the store-chamber above. Itis then levelled and covered with water to the depth of 5 or 6 inches, all floating kernels and refuse being skimmed off. This process is necessary for the germination of the seed not only in a chemical but also in a mechanical point of view. The seed is so hard and compact, and the husk so firmly bound to the kernel, that it would be impossible for the tender germ to make its way through it; the steeping imparts vitality to the germ, and also assists it in making its way through thehusk. The grain now swells about one-fifth in bulk and one-half in weight from the moisture absorbed ; or more precisely, 100 tb of barley would weigh, after steeping, 147 h, and 100 bushels

measure would increase to 122. By law it has to be kept at least forty hours under water, and fifty if the grain is to be sprinkled before the twelfth day. This time must depend on the kind of barley used, the soil on which it was grown, the heat of the weather, and the hardness or softness of the water in which it is steeped. More time is required in cold than in hot weather. Scotch barley requires more time, but bigg less. Fifty hours steeping will generally suffice, but sometimes seventy is necessary. The rule is—if a barleycorn, held lengthwise between the finger and thumb, breaks down into a pulpy, mealy state, the process is complete ; whereas, if the farina exudes in the form of a milky paste, it is over-steeped. In warm weather the steep-water acquires an odour from matter disolved out of the barley skin; and, in consequence of a slight fermentation caused by the organic matter in the water acting on the decayed grain, the water becomes acescent or putrid. The steep-water should then be changed. ‘This the maltster is allowed to do once during each wetting, upon giving due notice to the Excise. Whilst the barley is in steep it is guaged by the excise officers, to prevent fraud, and to calculate the duty to be paid. Wide planks are placed across the cistern to enable them to take the “dip,”—sufficient light, and headroom of at least 48 inches, being provided. Numerous experiments show that 814 bushels of good dry barley will, after forty-eight hours steep, swell to exactly 100 bushels. An allowance is therefore made of 184 per cent. on the grain found in the

cistern or couch frame, but the duty is charged on the greatest amount found, whether in the couch or on the floor or kiln, When the operation of steeping is complete the water is drained off in about half an hour by means of a gutter laid below the level of the cistern from end to end, with a proper fall, and covered with perforated iron plates. The perforated plates being movable, the gutter is easily cleaned and the plates replaced. The law requires that every cistern shall be permanently constructed with the sides and ends straight, and at right angles to each other, for facility of measurement; the depth must not exceed 40 inches in any part; the bottom must be even, with a fall of not more than half an inch per foot for drainage. No cistern can be used under a penalty of £100 until a certificate in writing

from the supervisor has been obtained, stating that he has surveyed the utensil, aud that it is constructed according to the requirements of law.

Couching.—The couch-frame is formed like the cistern, With the exception that the fourth side may be made of movable planks at least 2 inches in thickness, Before the year 1827 it was lawful to construct the couch-frame entirely of movable boards; and couches made before that date may still be used by obtaining permission from the Board of Inland Revenue. Into this frame the grain is now thrown with wooden shovels. It must not be compressed in any way, under heavy penalties, and must not exceed 30 inches in depth. If the excise officer has any suspicion that the grain has been trodden down, he may order it to be thrown hack into the cistern and levelled. The officer will then gauge it again. If he finds that the quantity has increased more than 5 or 6 per cent. accord- ing to the length of time the grain has been emptied from the cistern, any such increase over and above the 5 or 6 per cent. will be deemed conclusive evidence that the grain has been trodden or forced together. A penalty of £100 is then incurred; anda like sum for maltsters or their men refusing to return the grain tothe cistern. After twenty hours the maltster is at liberty to move the grain on to the floors ; but, in cold weather, when sufficient heat to forward germination has not generated, it is left two days, and even longer; but if left too long, the grain becomes sour. After sufficient time has elapsed, in order to prevent the heat rising too rapidly, and to equalize it through the whole body of grain, it is thrown forward on to the floors,

Flooring.—Here the grain must be kept level, with the edges straight to make it easy for the officers to gauge, which is done several times to prevent the introduction of uncharged grain. This operation of gauging requires great care, as, in large houses, a mistake of the tenth of an inch would make a difference of between 20 and 30 bushels to the maltster. On the floors an allowance of one-half is made for the rootlets; this is generally quite sufficient. Each steeping is called a “floor” or piece, and must be laid in succession according to age, the most recent next the couch, and the oldest next the kiln. Maltsters may have six floors, including grain in the couch and on the kiln, in operation at one time. Germination now progresses ; the plumule, or stem begins to grow under the husk from the same end as the root, but instead of piercing the husk, turns round and

proceeds under it to the other end of the grain. This would develop into ihe green leaf were its progress not stopped. Maltsters vary as to the length it is advisable to let the acrospire attain ; some like it not much more than half up the back of the grain, others like it $ths or even {ths of its length, because it is practically found that a friability of the starchy matter takes place pari passu with the length of the plumule. Unless the floors are worked with great skill and regularity, however, some are

apt to protrude when carried to the latter extent, shows an exhausted condition within. by weaght work the acrospire no higher than is absolutely

BREWING

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Malsters who sel]

necessary ; the higher it is worked the less starch and the

more sugar is produced, and a corresponding loss in Weight

ensues. The maltster who sells by measure, however, likes

to have the acrospire as high as he can, to increase the

bulk of his malt. The writer’s experience is that ales fine better, and keep better, when brewed from inalt well worked up. Jn large mash tuns, where the heat can be maintained, it is not of so much importance ; but in small tuns, where less than twenty quarters are mashed, if the “ spire” is up aths of the grain, so much the better, so long as it jg uni- form. The temperature on the floor rises to between 50° and 60°; the fibrils of the radicle, the “chick,” as it ig technically calied, shoot from the tip of evcry corn. The middle of the floor being the warmest starts soonest ; after a few hours, the grain is turned or stirred, so as to bring all to a similar state of forwardness. At this point comes the critical test of the maltster’s skill ; no fixed rules can be laid down ; he must be guided by experience and circuinstances, He has to consider the quality and growth of the barley,—whether it came off light or heavy soil,— the kind of malt intended to be made,—the

temperature and peculiarities of his particular malting. His principal object is to get the grain to work, and to work regularly, to accomplish which, and to check the too rapid growth of the rootlets, the grain must be turned several times daily, the interior being always brought to the surface by the shovels of the workmen. The grain is spread more thinly each time, the depth of it, originally 14 or 15 inches, being thus gradually lessened to 3 or 4. This brings it to the middle of the process; it is then thickened as gradually as it was diminished until it is thrown on the kiln, The grain now emits an agreeable odour, something like apples; and if the hand be thrust into the corn it is found wet enough to damp it; this is called sweating, The “ chick” develops into several short bushy rootlets. As the acrospire grows the constituents undergo a great change ; the gluten and mucilage almost disappear; the grain becomes white, mealy, and sweet ; carbonic acid is produced; air is absorbed, almost as by animals in breathing ; and, consequently, air is necessary to the germination of the grain. It loses during this part of the process from 1} to 3 per cent. in weight.

There can be no doubt that it is of importance to the maltster that the law allows him to sprinkle water over the “pieces” on the floor; this may be done at the expiration of ninety hours after removal from the steep, provided such grain has been kept under water fifty hours, Sprinkling is generally commenced on the fifth or sixth day, notice having been given to the Excise twenty-four hours before. If in steep less than fifty hours it may not be sprinkled till the expiration of twelve days. Sprinkling is used most by maltsters who sell by measure, and therefore want to increase the bulk of their malt; but there are seasons when it would be ditficult to make good malt unless moisture were thus supplied, to make up the water lost during sweating. Too much light is detrimental, as appears from the fact that grain under the influence of uninterrupted light is inferior, unless the sky-light be covered with a coat- ing of blue, which admits the actinic rays, and excludes the calorific and light rays, which hinder germination, Shutters on the sliding principle are the best for regulating both light and heat. Great care has to be taken not to damage the grain by turning, especially when it is spread thin. To obviate the necessity of turning as much as pos sible an instrument like a narrow shovel, called a plough, 18 used, which brings the grains underneath to the surface, and into contact with the cold air, so keeping the germination

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regular, Grain is required by law to be kept at least 168 hours on the floors, but maltsters may keep it there as much longer as they like. Barley throws out five rootlets, the middle one being the strongest ; and if the young floor has been neglected, this will shoot out three times the length of the others and turn up at the end like an awl. When the grain has germinated sufficiently, its growth is arrested by placing it on the kiln, the object being to drive off superfluous moisture and insure the keeping qualities of the malt.

Kiln-drying.—The kiln is a chamber of which the floor should be made of woven-wire or sheet-iron, or of perforated tile. The perforations are necessary to give admission to the hot air, and also to allow the detached rootlets to fall through. The kiln should have a sufficient area to allow the whole of one steeping to be dried at once, at a depth of 8 or 10 inches ; by which means the malt is more regular than when dried in two or three lots, as the portion left on the floor will grow, notwithstanding the maltster's efforts to prevent it. The opening at the top of the kiln is covered with a cowl or cupola, which answers the double purpose of excluding rain and allowing the escape of the steam. 'The furnaces are placed under the floor, nearly in the central line, and the hot air passing through the perfora- tions dries the malt, while the steam is carried off through the vent in the roof. An iron or stone plate, 4 or 5 feet square, called the "disperser," is placed over each fire to disperse the heat and prevent the malt immediately above from taking fire. The heat at first should not exceed 90°; if higher it produces a hardening or vitrifaction of the starchy matter or dextrin, and also heightens the colour of the malt ; whereas, if the malt be freed from moisture at a low temperature it may afterwards be exposed to a high heat without gaining colour. The moisture being disposed of, the heat may be gradually raised to from 125° to 135° for India pale ale malt, and to 170° or 180° for ordinary pale malt,—the difference in the kinds of malt being the amount of heat to which they are subjected on the kiln. During the process the fires should never be allowed to go out, as the smell of a green fire imparts an unpleasant flavour. During the last few hours in particular there should be a

bright, clear fire for finishing off the malt, otherwise the beer will not get bright. It will thus be seen that the pro- cess of kiln-drying is very important. Dr Ure's remarks on it are pregnant with meaning. He says, "The opera- tion of kiln-drying is not confined to the mere expulsion of the moisture from the germinated seeds, but it serves to convert into sugar a portion of the starch which re- mains unchanged, and that in a two-fold way. This is, first, by the action of the gluten upon the fecula at an elevated temperature, as also by the species of roasting which the starch undergoes, and which renders it of a gummy nature. Jf we dry one portion of the malt ina naturally dry atmosphere, and another on a moderately warm kiln, the former will yield less saccharine matter than the latter. Moreover, the kiln-dried malt has a peculiar agreeable and faintly burnt taste,—probably from a small portion of the empyreumatic oil formed in the husk, which not only imparts its flavour to the beer, but also contributes to its preservation." Kiln-drying takes from one to four days, according to the depth of malt and amount of heat used, The fire being kept always burning, great care is needed to prevent its breaking out in the night ; it is there- fore made up the last thing and then " banked up," that is, covered with a quantity of the ashes which fall through the bars. For ordinary pale malt, about three hours before it 1s thrown off the kiln the heat is raised from 150° to 180°, and during this process it requires turning two or three times, and is thrown off the kiln in a hot state. The rootlets are readily detached from the malt by the turning

on the kiln, and the treading of the men in their list slippers ; they are finally separated by screening, and are the best criterion of the colour of the malt, showing at once the amount of heat used. These malt "combs" or " cummings," as they are called, are valuable food for cattle i Winter; and the fine ones which fall through the kiln- floor on the disperser, mixed with the dust from the fire, are sald to be almost equal to Peruvian guano as a top dressing for turnips.

Malt continues to swell, by absorbing moisture from the atmosphere, for nearly three months, the time vary- ing according to the dampness of the air. Malt in store is said to be mellowing. The increase by measure of malt over

dry barley, called the "'outcast," is from 3 to 8 per cent. ; in bigg the increase scarcely amounts to 1 per cent. During the process of malting barley loses one- fifth of its weight ; in other words, 100 tb of barley converted into pale malt weighs on an average 80 ib: but as barley when kiln-dried loses 12 per cent. of moisture, the actual loss is reckoned at only 8 per cent. The late Pro- fessor Thomson thus accounted for it :——

Soluble matter carried off by steep-water ….....665 cose ies Carbonic acid formed and given off during germination…3°0 TROGHS:, onoana choagnosacosscoosnaceonodescnossesan gooDecoecnmoog eneatac 3°0 Waste (bruised and lost grains).....ccscesssee seers eas ees 0°5

Dr R. D. Thomson, who made various experiments on malt for the purpose of ascertaining its feeding and fattening properties, states the loss sustained to be

AV VEDUC TMM coment aie rere sare oeseetrn eersieisnt.naree 6°00 UITMOMIVAGHOT cesses ccisccce cuss cascxeenccecaeeeveres 0°48 (Wee G5 cena cnc sab seeeboouaaodecoonona nnoe nec oe

19°00

Bigg sustains a greater loss than barley, amounting to 7 per cent. more. The great similarity which chemical analysis shows to exist between barley and malt, proves that malting is only the beginning of the process by which saccharine matter in solution is obtained. A glance at Stein's analysis of the two will show this —

Barley. Malt. Soluble albuminous compounds…. 1:258 1:985 Insoluble fF x 10°928 9°771 tigkeerse enacuer er camersasceceeemasr 19°854 18°817 MDORGUTIMe ..cccmceeiccs sees cacaecesnent 6°500 832 TIA We IEEIY, opsopecenoossdopeNCEcudn ays 8°556 3°379 Inorganic matter….....::seseenee 2°421 2291 JDSaH BVO MATS SOCIO KET? coonoqnasanenonen tees 0°896 4°654 SHiAVT@)N Gcetocuteconsno soodaepH soAppbenonons 54°282 50°871 ILD Sco dane aachen SABRE CRETE ean cece

305 aie 100-000 | 100-000 |

The following is the composition of barley and malt, as given by Oudemans :—

Barley.

Al Kiln-dried | Kiln-dried

Air-dried. | Air-drie ac Amber.

Produce of torrification… IDESCHUIL ys naoypeseaaanoaenoasep SEP ATIG) 1) ig Aaa pono Sugar …....cceeeeeeeeeeeeee es (CMMs alnaeconesonesee coon: Albuminous substances… Fatty 6 ‘ ANG WAC gecoquomsuepoonenonant

a> wWHhnocoon4ane HAH ASOAS es on wWNWwrRonme Dw eR aAnModo Jt et on = fis (So WNWOHONOR VIAAMOANS

= wwoeoeoonoan So “TH O00 SI OU

i

=)

Albuminous compounds in barley and malt (OQude- mans)—

270

Malt.

Barley.

0°28 0°34 0°28 0°45 1°55 2°08 7°59 6°23 9°70 9°10

There are three kinds of kiln-dried malt—pale, amber, and brown, and one of roasted, called black or patent malt. We have already seen how pale East India malt is made ; also that the ordinary pale malt is dried off ata higher temperature by 30° or 40°.

Amber malt, when ground, is of a rich amber colour, hence its name. This is dried off at a heat of 180°. The fuel used during drying is different. For pale malt, coke or anthracite coal is used, but the colour and flavour of amber malt are produced by burning oak or other hard-wood faggots,—the flavour being caused by the pyroligneous acid thrown off during burning. High-coloured malts have advantages over pale ; more dextrin is produced and more albuminous matter is rendered insoluble ; it is, therefore, easier to brew good beer from them.

Brown or porter malt.is dried in yet another way. The floors of malt-kilns used for drying it must be made of thin sheet-iron or stout wire, as the heat must be raised in a few rinutes from 100° to a heat nearly approaching combustion, and lowered as rapidly. The process requires great attention, or the malt would take fire. The grain is spread thin, not exceeding 14 inches in depth; and the whole process is completed in less than two hours. The fuel used consists of faggots of beech, elm, or oak ; at first the fire is kept down by being sprinkled with water, but the last half-hour it is allowed to increase, and an intense heat is obtained. This kind of malt weighs about 32 Ib per bushel. It is sometimes called “blown malt,” from its

distended appearance. By this process the gum, sugar, and |

starch are converted into a kind of caramel, which gives the flavour so much prized in porter. It makes the malt, however, deficient in extractive matter, to the extent of from 20 to 30 per cent.

Patent malt, which is the legal colouring-matter in porter, is made and charged with duty in the same way as other malt, and then removed to the roasting premises, where it is treated like coffee, being roasted over a fire in cylinders of perforated iron. The law requires that 95 per cent. of this malt shall have the “spire” extend to one-half the length of the grain in order to prevent the introduction of raw grain. It is generally made from injured or in- ferior malt, as the high temperature in drying quite restores the appearance. ‘There is, of course, no saccharine extract from it, that having been converted into caramel or burnt- sugar; it is only wanted to supply colour and flavour. Good malt of this kind should have each grain distinct, of its own original size and shape, not adhering to each other ; and when it is bitten the inside should be of a rich chocolate colour.

Pale malt differs in appearance from barley ; the grains are plump and generally free from wrinkles, and paler than barley. Instead of the tightly-closed end, the opening through which the rootlets have passed is visible at the base of each grain ; when broken the starch should be loose, friable, and cretaceous, and should leave a white mark as of chalk when drawn along a black surface. It should be crisp to the teeth, and have a sweet and empyreumatic flavour, free from the least mould or mustiness of smell or taste. Malt should weigh from 39 tb to 43 tb per bushel. There should be no vitrified appearance when broken ; that would be due to an excess of heat at the beginning of the drying process, or to the barley having been grown in too

rich a soil, or to mixed seed being used which did not work regularly. A good test is to take 100 seeds and throw them into water, stirring them well up; good malt, being specifically lighter than water, should float on the surface; if more than 5 per cent. sink it is bad malt, Another test is to take 100 grains of malt and carefully examine the regularity of their acrospire, which should extend {ths of the length of the grain for large and Iths for small brewers. If more than 5 per cent. have projected it shows a waste of material, whereas if more than 5 per cent. have the acrospire less than half way up, it is a sign of insufficient germination.

Dr Ure’s analysis goes to show the amount of solid extract obtainable by the brewer. He takes 100 grains of malt by weight, which are powdered and dried half-an-hour by the heat from boiling water; they are then weighed, and the loss shows the quantity of moisture in the malt, This powder is then mixed with cold water, and the vessel containing it is heated in the steam-bath half an hour, the contents being occasionally stirred. The husk and insoluble matters are then drained off, washed with boiled water, and then dried and weighed,—their weight giving the insoluble matter in the malt, and the residue the soluble extract available to the brewer. Dr Ure found in several experiments the average in 100 parts by weight, to be—

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100°0

According to this, if we assume that a quarter of malt weighs 324 Ib, the total soluble extract will be 216-4 fh avoirdupois ; but as the gum and sugar in assuming the fluid form combine with the elements of water, if the extract were dried it would weigh 23 Ib; and being reduced to the basis of the barrel of 36 gallons would become, in the language of brewers, 87 tb extract per barrel, which means that, if the wort from a quarter of malt were

| evaporated down to the bulk of a barrel of 36 gallons, it

would weigh 87 ib more than a barrel of pure water. Practice shows these experiments to be correct, the extract per quarter varying, according to the sainple of malt, from 80 ib to 90 hb.

Malt is made duty-free for distillery purposes and exportation ; in both cases the maltster has to enter into a bond with two sureties for £1000 that the malt goes to its declared destination. It may also be made free of duty for cattle feeding, an Act giving great facilities being passed in 1864; it was, however, found to be useless, except in small quantities, as a condiment, and the practice of giving it is entirely discontinued. In 1870 there was nota single bushel made, as there was no demand for it. In the case of raalt damaged by fire or water, an allowance equal to the whole of the duty,.if totally destroyed, or part if the damaged malt be sold on salvage, is granted by 7 and 8 Geo. IV. c. 52, § 76. The duty on malt is payable at the end of every six weeks, but upon entering into a bond with sureties for payment, a maltster is allowed six weeks' credit. Also by 26 Vict. c. 6,§ 1, he may defer payment of half the duty on malt made between 1st January and 1st April, and the whole of the duty on malt made between the latter date and 16th May, for three months, on giving notice of his intention to the proper collector before 1st April, paying interest at the rate of 34 per cent. per annum for the accommodation, and giving bond for security.

By 7 and 8 Geo. IV. c. 52, § 46, it is provided that, if any workman, maliciously or otherwise, commits an act by which his employers are liable to a penalty, he shall be imprisoned with hard labour for not less than three or niore than twelve months. The master is liable for these

penalties incurred by the workman unless he prosecute his servant within a month of the offence, and show the Com- missioners @ certificate of such conviction. Some maltsters have a notice put np in their maltings to the effect that their men will be prosecuted if they commit the offences mentioned in the Act.

In America there are no internal taxes on materials used in brewing as such, but there is an import duty on hops and barley,—five cents per fb on the former, and 15 cents on the latter per bushel. The barley mostly used comes from Canada, the import duty being equal to about Is. 4d. on an American barrel of beer. The duty is levied in the form of a stamp-tax on the beer fermented, completed, and in barrel, at the rate of $1 per barrel of 31 gallons, and $2 per barrel of not less than 63 gallons. No restric- tions are imposed as to the materials of which it shall be made.

In Bavaria the duty is raised on malt, but not: assessed till the malt is brought to the mill to be crushed, It.is made without licence or permission, and may be sold without restriction ; but traffic in ground malt is strictly forbidden. ‘The case is the same whether the malt is used by brewers or distillers. The consumption of beer and spirits is untaxed, except through the impost on malt. The raeans adopted for-preventing fraud consist exclusively in the control exercised in the public mills by the Govern- ment inspectors. Private mills for crushing malt are only allowed when the proprietors have their mills furnished with the regulation self-acting measuring apparatus, together with the Government automatical counter. This apparatus is sealed officially, and thus it is impossible for an ounce of malt to be crushed which has not first been measured and checked, Besides these means for preventing fraud, there exists a regulation that no malt, whether tax- free or not, may be brought to any mill, or be found there, for which a certificate (polette) has not been given specifying the date, the quality, and the mill.

Americans are now making beer largely from maize meal and maize malt. The experience the writer has had of the use of the latter leads him to doubt its economy ; the ex- tract is small, and the fine flavour of the ale impaired. However, a small quantity can be used with advantage where the fermentations are sluggish or inactive,—maize being the most powerful stimulant of this process that we possess. Barley has always been considered, and with good reason, a better, and in favourable seasons a cheaper, grain than any other for malting. The reasons for this are, first, that whilst the husk permits the steep-water to pass through to the starch it effectually precludes the escape of the starch; secondly, the acrospire grows under the husk in barley, and so is protected from injury during malting, whereas in wheat, maize, é&c., the acrospire forces its way out with and at the same end as the rootlets, and therefore runs the tisk of being damaged by turning on the floors; these damaged grains become mouldy, and mould being propa- gated by means of spores, one mouldy grain may send out thousands of these spores among the good grain, and infect the previously healthy ones ; and thirdly, barley contains a large ready-made proportion of grape-sugar and starch, It is, therefore, only in bad barley seasons that there will be much demand for malt made from other grain. The average price of barley from 1872 to 1875 has been 43s., and in 1874 the average was as high as 49s. This high price, which means a material increase in the cost of manufacture, has naturally made a great inquiry for a cheaper sugar-forming product; and there is no doubt that if the duty on malt were either taken off or laid on the manufactured article, beer, large quantities of other grain dried on a kiln at from 230° to 240° would be used in bad barley seasons. Jn Germany the grain is steeped before kiln-drying for three

or four hours, to remove froin the husk the unpleasant flavour it sometimes imparts to ales ; the materials used to a considerable extent there are wheat, oats, rice, maize, and even potato starch. Beer made from rice is of a very clear pale colour, of an cxtremely pleasant, mild taste, foaming strongly, and yet retaining its carbonic acid. Dr Graham, in his instructive lectures on the chemistry of brewing, at the Society of Arts in 1874, explained how raw grain might be used to obtain a beer either alcoholic in its naturc, as brewed in England, or dextrinous, like the Bavarian beer. Mr John Prior, of the firm

of Truman and Hanbury, in his examination before a committee of the House of Commons, says, ‘If the malt Acts were not in the way, numerous substitutes for malt might be employed,” and that, amongst these, mangel-wurzel might be used to any extent ; and he goes on to say, “I have tasted as good beer brewed from that alone as any home-brewed beer I have ever tasted in my life.” The only substitute for malt allowed in Great Britain is

sugar. Of this, in its different forms, there was used in the year ending September 30, 1874—

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705,872

Tons Social b.deepesenseoancdnnn caanodeosoneudanccuss “7823 1G, IGRELENAG), Gomoonconaconpavcancogoe nboreeosnooxonUNte 54,825

768,020

being an increase over 1873 of 204,528 cwt. Sugar may

be used in brewing to the extent of one-third,—two cwt. being equal to a quarter of malt; the duty is 11s. 6d. per ewt. It is either boiled with the wort, or dissolved in the underback. Ordinary cane-sugar contains a large amount of dangerous putrefying albuminous matter. It may also be said to cause two distinct fermentations, having to be converted, by the action of the ferment, into glucose before it is broken up into alcohol ; it is, therefore, only good for ales of quick consumption. For store ales it is as well to destroy one of these fermentations, and at the same time convert the cane into grape-sugar or glucose. This is done

| by treating it with dilute sulphuric acid, the acid being

afterwards got rid of by means of chalk or lime, which combines with and carries it down. This is effected very rapidly if the temperature be increased by pressure to 250° or 300°, 1 ib of acid mixed with 600 ib of water

converting 100 % of starch or cane-sugar into glucose in three hours. This action of acids upon cane-sugar has formed the subject of a patent (Garton's), which is being worked on a large scale at Southampton, and the product is sold under the name of saccharine ; it has found great favour with brewers, as it gives a rounder flavour, and more permanent character, to the beers than when brewed from malt alone, and at the same time masks the acidity where any exists, better than starch or cane-sugar. Saccharine has beencarefullyanalysed, and the analysis shows the whole of the raw sugar to have been converted into glucose with a certain percentage of water. 'The best mode of distinguishing grape from cane- sugar is by adding to the solution to be tested, in a flask, a few drops of an alkaline solution of tartrate of copper, and then gently boiling it. If any grape-sugar is present a bright red metallic-looking precipitate of suboxide of copper is shortly thrown down ; if no grape-sugar is present the solution remains clear, with a slight blue tinge, from the addition of the copper solution.

It does not appear that the best judge can, from the taste alone, distinguish between a beer made from malt and one brewed from a mixture of malt and sugar. This is not surprising, when it is borne in mind that brewing from malt consists in subjecting the malt to those condi-

tions which are most favourable to the conversion of the

maximum quantity of the starch it contains into grape—

sugar, by the action of the diastase produced in the grain by the process of malting.

Hops are the catkins or flowers of the Humulus Lupulus, a dicecious plant belonging to the natural order Urticaceee, or the nettle family, and the Linnean Diwcia pentandria. It is the female flowers (which grow on different plants from the male flowers) that yield the hop known to commerce. The plant is mentioned by Pliny under the name of lupus salictarius (N. H., xxi. 50). It was cultivated in

the 9th century, for we find that in 822 the millers of

Corbey were freed by the abbot from all labours relating to

hops ; and hop-gardens are mentioned by Ludovicus Ger-

manicus, a few years later. Hops were introduced into England from Flanders about the time of Henry IV. There is a curious edict of Henry VIIL, forbidding the mixture of either hops or sulphur with beer; but little attention seems to have been paid to it, for in 1552 hop- plantations were formed. In 1649 the city of London petitioned Parliament against “hoppes” being used, urging that “this wicked weed would spoil the drink, and endanger the lives of the people.” It came into common use in Queen Elizabeth’s reign.

The hop-clusters are ovoid cones, consisting of scales which are the enlarged persistent bracts enclosing tlie fruit. They are covered with a tenacious yellow, waxy substance, like powder, called lupulin, and technically “condition.” Under the microscope this is seen to consist of minute semi-transparent granules, round in shape ; it is the most valuable part of the hop, containing most of its active properties. The amount of powder compared with the total weight of the hop varies from 10 to 15 or even 20 per cent. Amongst the leaves and powder of the hop, we find essential oils, resin with associated bitter principles, and tannin. When distilled with water, the powder gives 2 per cent. of its weight in essential oils (there is none in the leaves); one of these distils at 212° Fahr., but the other requires a much higher temperature for its volatilization. Other products are formed from the lupulin—among them valerianic acid, which is the dis- agreeable characteristic of old hops. The essential oils not only give the aroma, but are of importance, as through their combination the resins and bitter substances become soluble in water. The resin constitutes 50 per cent. of the powder, and is soluble in alcohol. The importance of tannin consists in its power to precipitate albuminous matter; of tannin there is only about 2 per cent. It has been suggested to increase this by using the tannic acid of commerce as a partial substitute for hops ; and experi- ments have been made in Dresden by Dr Fleck for this purpose. This must, however, be used with caution, as an excess of it would be prejudicial to a successful clarifica- tion of the beer.

The most delicate hops are Goldings, grown in East Kent, —Farnham and Worcester districts being next best, while good, strong, serviceable hops are grown in the Weald of Kent, Sussex, &c. Large quantities are imported from Germany, Belgium, America, &c., the best being Bohemian, grown near Saaz, which are very excellent in delicacy of ilavour and aroma; Bavarians grown in the district round Spalt are valuable for their cleansing and_beer-keeping qualities.

The acreage under hops in England is 65,000,—40,000 being in Kent. This is an increase of more than 15,000 acres since the commutation of the duty in 1862. In that year the duty was taken off hops, and a charge made on brewers of ls, per quarter, being at the rate of 3d. per barrel, on the Supposition that four barrels of beer were drawn from every quarter mashed, The old duty was 2d.

per Ib and 5 per cent. additional. A hop-garden costs from £70 to £100 to start, and from £27 to £30 to farm per annum. A rich, deep soil, rather inclined to moisture, ig on the whole, the best adapted for the crop; but any goi] (stiff clay only excepted) will suit, when properly prepared, It should be enriched with the kind of manure best suited to the land the hops are to be grown on; stable and cowhouse dung, old rags, shoddy, guano, sprats, and other decomposed matter are used freely; while on some land peat and lime are required. The land is first rendered fine and mellow by being ploughed and harrowed several times ; then, in the spring, a large hole is made and filled with rich mellow earth ; into this “sets” or small pieces of the roots of the kind of hop intended to be grown are planted with the buds uppermost and the earth pressed close about them. These sets take three years to come to perfection. Two or three sets to a pole, three poles to a hill, 1050 hills to an acre, is the usual calculation, The hills should be 6 or 8 feet apart, the latter being best on rich land, as there the bine runs the most. The poles ar from 12 to 18 feet high, according to the adaptability of the ground for vigorous growth, with the ends that ge into the earth charred to preserve them. In America the hop is trained on wires; this has also been introducced into England,—- Mr Farmer, of Worcester, having taken out a patent. It is very successful, but the first cost, £75 per acre, las prevented its being used

extensively. The hop crop is a most precarious one, and may be said to vary from nothing up to a ton or even 25 cwt. per acre, and in price from £3 to £25 per cwt. In proof of this, at the annual Worcester Fair in 1874, only 74 pockets were on sale, whereas the year before 1000 pockets were in the market, and 2000 more were offered for sale by sample.

The plant is very dependent on the season, and has many enemies in the insect world, in particular, the fly or aphis, which infests the crop early in its growth, feeding upon its juices and leaves, giving the latter the appearance of having been riddled with swan shot. The flies come originally from the sloe bushes, and are produced from eggs deposited in the previous autuinn. These, as well as fleas, red spiders, lice, &c., may be destroyed by syringing the plants well with soft soap and water. The mould first betrays itself in yellow and drooping leaves, finally in the hop itself, eating it up with mildew,—the presence of a few half-eaten leaves spoiling a sample. The blight coats the leaves with a thick sooty substance; and when this appears the hop dwindles away. The fire-blast, as its name implies, sears and scorches the foliage, and withers it up. All these may be seen working mischief at once in the same hop garden.

The catkins of the hop ripen early in September ; they are picked from the bine by thousands of people from London, &c., whose welfare and accommodation have been much neglected; but great changes in this respect are made by sanitary regulations which come into force this season (1875). Besides these strangers, every man, woman, and child of the resident population is made available for the season, which generally lasts three weeks. The pay is about 2d. per bushel; and in a good season a family can make 2s, 6d. a day per head.

After picking, the hops are dried on a kiln (oast-house, as its called),—the heat never being allowed to rise above

| 90°, lest the aroma and volatile oil should be thrown of.

A small portion of sulphur is sometimes added to the fire, the appearance of the sample being improved by the sul- phurous acid thus formed. This has been generally con- sidered by brewers injurious to the hop, and_ also to fermentation ; but a commission appointed by the Bavarian Government in

1855 (the late I’rofessor Liebig being one of its members), after two years of experiments, arrived at

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BREWING

the conclusion that the use of sulphur was beneficial to the hop, and not injurious to fermentation. It is frequently used while the plant is growing to cure the various diseases to which the hop, like the vine, is liable. The last process before the hops are brought to market is “bagging.” This used to be done by “‘ footing,” that is, letting the empty bag drop through a hole in the floor, and having the hops stamped down by one man, whilst two others filled ; after which they were pressed by hydraulic power. Under a new process the whole operation is effected by machinery in about eight minutes. Hop-growers, as a rule, have no stores or convenience for warehousing hops for more than a month or two; the consequence is the whole growth, whether large or sinall, gets into the hands of a few great hop merchants, who command the market.

The best hops have a yellow, golden colour, and an agreeable smell; when rubbed between the hands they leave a yellow, odoriferous, sticky powder on them, with- out any broken parts of the leaves, and yield to boiling alcohol from 12 to 15 per cent. of soluble yellow mnuiatter. A very pale green colour indicates that the hops have been gathered before they are fit; whilst a deep brown shade would show they were allowed to hang too long before being gathered, or that they have been over dried on the oast-house floor. A fair test in choosing hops for India pale ale is to make a strong decoction of them with boiling

- water, putting it into a white bottle, corked and exposed

to the sun; if in twenty-four hours the colour has become dark they are not fit for the purpose.

During the year 1852 only 34,622 ib of foreign hops were imported; in 1853 this increased to 4,739,307 ib, and in 1871 to 24,685,808. Before the hop-duty was taken off there was a great deal of betting on the crop, which

was computed as equal to so much duty; and the appearance in the Borough of a hop leaf covered with fly from one of the most favoured districts used to cause much consternation. Since the repeal of the duty brewers have

been allowed to use any bitter instead of hop, provided

such bitter does not give a factitious strength to beer, and thus become a substitute formalt. Many preparations are, in consequence, offered for sale as partial substitutes for hops; but in these none of the noxious, forbidden articles, such as Cocculus indicus, &c., &c., are found, for we learn from the laboratory returns of the Inland Revenue that, in the year 1872, only six samples of beer tested were found to be adulterated. Considering the enormous extent of our

| brewing industry (it is calculated that 900,000,000 gallons

of beer are brewed annually), such testimony to the purity of the beer is highly creditable to those engaged in the trade. From the same source, we learn that in every instance where an adulterant of a dangerous nature was used, the offending parties have been those who brewed and retailed their own beer on a very small scale.

Age alters and deteriorates the character of hops in a marked and distinct degree, much more so than in most aromatic substances; indeed, it changes them to such an

extent that, at the end of two years (when they are called |

“old olds”), they retain little but the bitter, the aroma being gone. : In the year ending 3%th September 1874, the hops

- Imported into Great Britain were—

Cwt.

0 1: 60,338

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PP OUREGICOUMPTICS .... ..ccc.. cesses see Genseeee 4,805

123,516

being a decrease on 1873 of 11,626 cwt. Wops are grown with success in Tasmania, upwards of

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450 acres being under cultivation. The Australian market, it is supposed, will be eventually supplied from thence. At present between 600 and 700 tons of hops are exported from England yearly.

Water.—Pure water, protoxide of hydrogen, is obtain- able only by art ; it is therefore impossible, even were it desirable, to use that in brewing. But good water is an indispensable element in the manufacture of good beer. It should be hard and free from organic matter; this last point cannot be urged too strongly, as this alone frequently causes failure in brewing operations. From Cohn's investi- gations we find that the germs of putrefaction are so small that no filter of charcoal or other inaterial removes them. It is also doubtful if ordinary boiling destroys these orgau- isins. Pasteur asserts they are not killed below a tempera- ture of 100° C. (= 212° Fahr.); and Lex found them alive after heating to 260° Fahr. Water charged with them is a decided loss to the brewer, as the organic matter is decom- posed during brewing and carries off some portion of the strength of the worts, besides making the beer liable to spoil. Soft water, or water that has flowed through moorland, and is free from saline matter, is bad for the brewer's purpose. When this has to be used for want of a better it should be impregnated at second hand with chloride of sodium (common salt) and gypsum (sulphate of lime). To allow for the deficiency of salt in some water the Excise allow brewers to add sufficient salt to make up, with that naturally in the water, 50 grains per imperial gallon. Soft water gives greater extracts, as it dissolves the albuminous matter in the malt more effectually than hard. With the use of very soft water as much as 100 ib of extract per quarter has been obtained; but here the goodness of the extract was the chief proof of the badness of the water; for it is dangerous to have too much albuminous matter in solution, except in the case of porter or ale that is quickly consumed, albuminous bodies being such powerful agents of change. Hence

the Burton brewers, whose beers have to stand a long time, and in all climates, are perfectly right in praising their water, which contaius a large proportion of these mineral salts. The supposed superiority of the Burton ales is due to the water, which is supplied, not from the River Trent, but from wells 20 to 120 feet deep. These wells are supplied from springs rising in the Outwood hills that forin the western side of the valley. The springs take up lime in their passage through the gypseous deposits contained in the keuper marls of the district. The presence of sulphates and carbonates of lime and the absence of organic matter make the water of that district so advantageous for brewing. The following is an analysis of the water used in one of the largest breweries in Burton, showing the amount of ingredients in the imperial gallon, represented in grains :—

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Sens os foe acces causes 18°96

e IN IRENE ane ens onedononpboasnreacvensn at: 9°95
Wanbonatevoteume…..~~c.osedese sss see 9c . 15°51 a IM@emesia…….. .~~.
ene oe are At 1:70

ve OME ete ce sasncceas cease anus 0°60 Silcic aed
dmemencscesesccdcutesec se 0°79 65°28

The water of another large firm in the same town gives by analysis 54°5 grains of sulphate, and 9°93 of carbonate of lime. ‘The temperature of water used to be a great con- sideration for refrigerating the worts; but this is now of little consequence, as in most large breweries the water used for that purpose is first brought to a point just above freezing, by means of ether spray.

We now come to the actual process of brewing, or the

art of making the materials we have described into beer. While brewing cannot be considered a difficult or a mys- terious art,—good materials, a good method, and strict attention being the secrets of success—there is no process in which rules are of less avail. To obtain complete success, it is necessary that the brewer shall have formed an opinion of his materials from personal observation, and that he should be thoroughly acquainted with the brewery in which they are to be used. It is not too much to say, that the same heats and quantities cannot properly be used in any two breweries. Bearing this difficulty in mind, we shall endeavour to point out where instructions may be safely followed, and where the circumstances of locality, &c., will subject them to certain modifications which cannot be strictly defined in an article like the present. _

Brewing consists of eight distinct processes, which may be classed as follows :-—

1. Grinding. 5. Cooling.

2. Mashing. 6. Fermenting.

3. Sparging. 7. Cleansing.

4, Boiling. 8. Racking and storing.

Grinding.—This is a very important operation ; for, if im- perfectly performed, some of the “ goodness,” or “extract ” as it is called, will be left in the grains after mashing, thus entailing a heavy pecuniary loss on the brewer. The malt is crushed rather than ground between plain metal rollers ; this is enforced by law, for the purpose of facilitat- ing the examination of the grain as to whether it has been malted or not. Previous to the passing of the Act fraudulent brewers mixed raw grain with their malt, grinding it all up fine, to prevent identification. Each corn should be well broken, that the mashing water may have free access to every particle; on the other hand, if the malt be ground too fine, it is liable to “set,” that is, form a paste in the mash tun. When this happens it will be difficult to draw the wort off, and when off it will con- tain so much of the coarser portion of the grain that the flavour and keeping qualities of the beer will be impaired. If possible the crushed malt should stand about twenty- four hours before being mashed,

care being taken to protect it from air or damp,—the object being to allow the heat generated by passing through the rollers to escape.

Mashing is the process of infusion, or mixing the malt with water at such a temperature as shall not only extract the saccharine matter existing in the malt, but shall also change the still unconverted starch into grape-sugar. This is accomplished by the principle called diastase, the power of which we have shown under the head of malting. Many mashing-machines have been invented, and many are in use. In some the malt and the water are simply brought into conjunction, and then mix them- selves as they fall into the mash-tun ; others, driven by steam, perform the operation of mixing more leisurely, and, in some cases, more effectually. The old-fashioned method of mashing is by means of iron rakes. These rakes are fixed on arms extending from the centre of the tun, and are so constructed that when set in motion, no portion of the mash escapes them. When rakes are ‘used a portion of the mashing water is first run into the tun, and part of the malt ; the machinery is then started, and, whilst the rakes revolve round the tun, the remainder of the malt and water are added. The heat of the mashing water is a very important point; the particular temperature must depend upon the quantity and quality of the malt, and the situation of and amount of radiation from the mash-tun. Not less than two or more than three barrels of water should be run on to every quarter of malt, and the heat of the water should be such, that, when all has run on, that is, when

the malt has combined with the water, the temperature of the mash shall not be lower than 148° or higher than 159° In some breweries this result will be obtained by mashing at 168°; in others it will be necessary to go as high ag 180°. Neither of these heats will do any harm so long as the heat of the mash does not exceed 152° Mog brewers and chemists think that, to ensure the best results it is necessary for the mash to stand at least two hours, It would appear, however, that this belief has no solig foundation. Recent observations have convinced the pre- sent writer that an extract as good, and perhaps sounder, is drawn from a five minutes’ mash as from one that has stood two hours,—a fact which any brewer can test for himself. The wort should be drawn off by means of severa] pipes running from different

parts of the mash-tun. It must be run off slowly at first, or the malt in the tun (“ goods,” as it is now called) will be drawn down so tightly that it will be difficult for the sparging water to run through it, It is a good plan to probe the mash now and then witha thin stick ; if the “ goods” feel tight, and difficult to pene. trate, the wort is being run off too quickly.

Sparging.— When about half the wort has run off the mash, the operation of sparging should be commenced,— the object of that process being to wash out the goodness left in the malt after mashing. The sparging-machine js made and fixed as follows:—A bar of iron having an upright pin in the centre is fixed across the mash-tun; on this pin is placed a copper bowl or pan; into this pan are screwed two or three arms, extending to the sides of the tun. These arms are about an inch and a half in diameter, and are perforated their whole length with small holes on their reverse side. The hot water being conveyed into the pan fills the arms, and, running out through the perforated holes, causes the arms to revolve round the tun. By this means an equal and continuous shower of hot water is rained upon every portion of the goods. The heat of the sparging water, like that of the mashing liquor, must be modified by circumstances. In brews of less than 10 quarters, 200° will be found to be a good heat; where larger quantities are mashed 185° may be recommended as a safe temperature.

Bowling.— When the wort runs off the mash no time should be lost in getting it into the copper or boiling back. In many modern breweries the mash-tun is placed immediately over the copper, so that the wort runs direct from the former utensil into the latter. Some coppers are built with an ordinary furnace, others are furnished with a coil; in the latter case the worts are boiled by steam passing through the coil from the boiler. Many brewers prefer to boil by steam, as it is a cleaner method, and they are able to regulate the operation to a nicety. Where the steam coil is used the boiling back is generally made of wood. While the wort is running or being pumped into the copper, the hops must be added. Here, again, no positive instructions as to quantity can be given. On this point the brewer must be guided by his customers’ tastes, the season of the year, the length of time the beer has to be kept, and the quality of the hop used. For strong store ales, from 10 tb to 13 tb of good hops to every quarter of malt is not too much; whilst for ordinary beers, to be drunk within two months, from 6 ib

to 9 ib per quarter should suffice. India pale ale and bitter beer require from 18 tb to 25 tb per quarter. Various kinds of English and foreign hops can be used in the same brewing with advantage ; the proportions of each kind must be left to the judgment of the operator. Of course, the ranker Bavarian and American hops must not be so freely used as the more delicate English growths. There is a wide differ- ence of opinion as to the length of time beer should be boiled. For beers of quick draught, an hour and a hall

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js long enough; stcck ales should have half an hour or an hour extra. The finest pale ale is never boiled longer than one hour. Where it is necessary to have two boil- ings in one brewing, the second copper should boil rather longer than the first. The boiling during the first twenty minutes should be brisk, in order to break the

rt. Cooling. — When the wort has boiled the necessary time, it is turned into the hop-back to settle. The hop-back is a utensil made of wood or iron, and fitted with a false bottom of perforated plates; these plates retain the hops in the back, whilst the wort is drawn off into the coolers. The wort should be allowed fifteen or twenty minutes to settle in the back, and when run on to the coolers should be thoroughly bright. In many breweries coolers are not used, the wort running direct from the hop-back through the refrigerator into the fermenting tun. When practicable this is an excellent plan, for worts often take harm whilst lying exposed on the coolers. In every brewery of any note the worts are cooled artificially by means of a refrigerator. Of these there are several kinds, but all are constructed upon the same principle, which is that of allowing a thin stream of wort to trickle over pipes con- taining a running stream of water. The water is either run

, direct from the mains or is pumped by an engine from a

well. In every instance it is necessary that the water shall

be several degrees colder than the heat the wort is to be

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“itched ” at, as brewers call it, in other words, the heat at which the wort is let down into the fermenting tun. This “ pitching heat” varies very much. Beers pitched at high heats, say from 62° to 66°, come soonest into condi- tion, but do not keep so well. Under ordinary circumstances 60° appears to be the best heat at which to start fermenta- tion, or, in the case of strong ale, 58°.

Fermentation.—The fermenting tun may be round or square, open or closed, and made of wood or stone. Stone squares are universal in the northern counties of England, but are rarely met with in the southern and midland counties. When beer is fermented in a stone or slate square, it should never be pitched at a lower heat than 66° or 68°; for these utensils are very cold, and there- fore liable to check or stop the fermentation. Every fermenting tun should be fitted with an attemperator. The attemperator consists of.a series of pipes fixed within the tun, and having its inlet and outlet on the outside. It should be possible to run hot or cold water through these pipes at any hour, so that the temperature of the gyle can be raised or lowered at pleasure. The work performed by

that natnral process which we call fermentation is the

conversion of saccharine matter into alcohol. It plays a

, Most impertant part in the brewer’s art, and deserves his

most careful attention. In order to obtain a quick and regular fermentation, the brewer employs yeast, or barm, as it is called in some parts of the country. Great care

_ must be taken that the yeast used shall be perfectly fresh

and healthy, for it must never be forgotten, that it is

Impossible to obtain a good fermentation from bad yeast.

Yeast that comes from porter should never be used in pale or delicately flavoured ales, as it is apt to impart a burnt taste and high colour. The quantity of yeast required depends upon the strength of the wort and the quality of the water. Strong worts require more yeast than weak ones ; andthe same rule applies to hard waters as compared with soft. Worts of about 20 ib gravity should do well with 1 Ib of yeast per barrel, whilst stronger worts require twice that quantity. As we have said, 60° seems to be the best heat at which to pitch wort, unless it is of a high gravity, or the fermenting tun be built in a very warm

place, in which case the temperature of 58° will not be too ow,

The appearance of a gyle of beer during the earlier stages of a good fernientation is very beautiful. At first the whole surface is covered with a thick white foam, which, within a few hours, curls itself into every imaginable shape and form. This increases in height, until it presents the appearance of a number of jagged rocks of snowy whiteness. With these the artistic beauties of the fermenta- tion disappear, although the fine thick head of yeast which follows delights the eye of the practised brewer, for it tells him that his fermentation is drawing towards a successful end. But the progress of the fermentation must not be judged by appearances alone. Samples should be taken from the tun at least twice a day, and weighed with the saccharometer. By this means the brewer tells at what speed the sugar is being converted into alcohol ; and when he considers the process has gone far enough, he stops it by taking away the yeast, which operation is termed cleansing. At the end of the first twenty-four hours, the gyle should attenuate 1 tb in every three or four hours, whilst the temperature should rise from 1° to 2° during the same space of time. The fermentation may proceed quicker than this without any harm ensuing; but if it does not reach the minimum speed of 1 ib in four hours, it may be said to be sluggish, and requires assisting. This is done by “rousing ” the gyle every two hours with a utensil made for the purpose. Wort fermented in stone or slate squares must be roused every hour and a hulf, without exception. If unchecked the temperature of the gyle will rise to 76° or even 80°. Any heat above 72° is likely to affect the beer injuriously, for at that tem- perature the acetous

fermentation commences. At the same time, beers for quick consumption may be allowed to rise a few degrees higher, aud will perhaps be improved by the increase of temperature. The attempera- tor must be used to prevent the gyle reaching too high a heat.

Cleansing is the act of removing the yeast from the beer, in order to stop the fermentation. There are three modes of cleansing—ls¢, by simply skimming the yeast off as it rises to the surface; 2d, by running the beer into casks, and then allowing the yeast to work out through the bung holes; and 3d, on what is called the Union, or Burton system, which is the second plan with some improvements. When beer is cleansed in the second or third mode, it is necessary to keep the casks or Unions full to the bung. They must, therefore, be refilled every two hours, either by hand or by a self-acting apparatus invented for the purpose. Brewers differ as to the time when the operation of cleans- ing should commence ; and, indeed, it is difficult to fix any limit, as much depends upon the character of the ale and the appearance of the fermentation. In the writer's opinion strong ales, worked in casks or on the Burton system, should be cleansed when they have attenuated down to 12 or 14 1b; weaker beers and pale ales should be allowed to go quite 2 tb lower before being cleansed. Stout and porter should be cleansed rather earlier than any kind of ale, in order that they may drink full in the month. When all the yeast has worked out of the beer, it is ready for the last process.

Racking and Storing.—Ales intended for quick con- sumption should be racked so soon as clean, or they will be found flat and out of condition. A few of the finest hops should be put into the cask; and in the case of pale ale the quantity should not be less than 1 ib to the barrel. The finest strong and India pale ale should be stored between two and three months before being tapped, and even at that age, must be considered young. Ales intended to be stored some months should have a porous vent peg placed in the shive to keep the ale from fretting, and save the head of the cask from being blown out. (3. A. W.)

BREWSTER, Sir Davin, natural philosopher, distin- guished especially for his original discoveries in the science of optics and his numerous and varied

contributions to scientific literature, was born on the 11th December 1781 at Jedburgh, where his father, a teacher of high reputation, was rector of the grammar school. At the early age of twelve he was sent to the University of Edinburgh, being intended for the clerical profession. Even before this, however, he had shown a strong inclination for physical inquiries, which had been fostered by his intimacy with a “self-taught philosopher, astronomer, and mathematician,” as Sir Walter Scott called him, of great local fame—James Veitch of Inchbonny. Veitch was particularly skilful in making telescopes, and may thus have had some influence in determining the precise direction of his young com- panion’s future researches. Though he duly finished his theological course and was licensed to preach, Brewster’s natural preference for other pursuits, combined with a con- stitutional nervousness, prevented him from engaging in the active duties of his profession. In 1799 he was induced by his fellow-student, Brougham, to study the inflection of light, repeating Newton’s experiments ; and from this date he carried on, almost without interruption, the course of original discovery in the science of physical optics which constitutes one of his chief claims to distinc- tion, The results of his investigations were communicated from time to time in papers to the Philosophical Transac- tcons of London and other scientific journals, and were admirably and impartially summarized by Professor James D. Forbes in his preliminary dissertation to the eighth edition of this Encyclopedia. The fact that other philoso- phers, notably Malus and Fresnel, were pursuing the same investigations contemporaneously in France does not invalidate Brewster’s claim to independent discovery, even though in one or two cases the priority must be assigned to others.

The most important subjects of his inquiries are enumerated by Forbes under the following five heads :—1. The laws of polarization by reflection and refraction, and

other quantitative laws of phenomena; 2. The discovery ‘

of the polarizing structure induced by heat and pressure ; 3. The discovery of crystals with two axes of double refraction, and many of the laws of their phenomena, including the connection of optical structure and crystalline forms; 4. The laws of metallic reflection; 5. Experi- ments on the absorption

of light. In this line of investi- gation the prime importance belongs to the discovery (1) of the connection between the refractive index and the polarizing angle, (2) of biaxal crystals, and (3) of the production of double refraction by irregular heating. These discoveries were promptly acknowledged by those best qualified to estimate their value. So early as the year 1807 the degree of LL.D. was conferred upon Brewster by Marischal College, Aberdeen; in 1815 he was made a member of the Royal Society of London, and received the Copley medal; in 1818 he received the Rumford medal of the Society ; and in 1816 the French Institute awarded him one-half of the prize of three thousand francs for the two most important discoveries in physical science made in Europe during the two preced- ing years. Among the non-scientific public his fame was spread more effectually by the invention, in 1816, of the elegant philosophical toy, the kaleidoscope, for which there was so great a demand both in England and America that for some time the supply could not meet it. An instru- ment of higher interest, the stereoscope, which, though of much later date (1849-50), may be mentioned here, since along with the kaleidoscope it did more than anything else to popularize his name, was not, as has often been asserted, the invention of Brewster. Wheatstone discovered

its principle and applied it as early as 1838 to the eon. struction of a cumbrous but effective instrument, in which the binocular pictures were made to combine by means of mirrors. ‘To Brewster is due the merit of suggesting the use of lenses for the purpose of uniting the dissimilar pictures ; and, accordingly, the lenticular stereoscope, now in exclusive use, may fairly be said to be his invention, A much more valuable practical result of Brewster’s optical researches may be traced in the vast improvement of the lighthouse system during the last half century. Jt is true that the dioptric apparatus was perfected indepen- dently by Fresnel, who had also the satisfaction of being the first to put it into operation, the French Government being in this, as in many other cases, quicker than the English to perceive the value of new scientific discoveries, But it is indisputable that Brewster was earlier in the field than Fresnel; that he described the dioptric apparatus jn 1812; that he pressed its adoption on those in authority at least as early as 1820, two years before Fresnel suggested it; and that it was

finally introduced into British light- houses mainly by his persistent efforts. The tribute paid to his memory by his successor at the head of the University of Edinburgh was therefore as just as it was graceful — “Every lighthouse that burns round the shores of the British empire is a shining witness to the uscfulness of Brewster’s life.”

Brewster’s own discoveries, important though they were, were not his only, perhaps not even his chief, service to science, The extent and variety of his contributions to scientific literature were little short of marvellous. He commenced literary work in 1799 as a regular contributor to the Edinburgh Magazine, of which he acted as editor at the age of twenty. In 1807 he entered on a much larger undertaking, which cost him long continued labour, and, especially towards its close, great vexation and anxiety. The chance suggestion of a friend, who knew his varied powers, led to the projection, under his editorship, of the Edinburgh Encyclopedia, of which the first part appeared in 1808, and the last not until 1830. The work was, as might have been expected, strongest in the scientific department, and many of its most valuable articles were from the pen of its editor. At a later period he was one of the leading scientific contributors to the Encyclopedia Britannica (seventh and eighth editions), the articles Electricity, Hydrodynamics, Magnetism, Microscope, Optics, Stereoscope, Voltaic Electricity, é&c., being from his pen. In 1819 Brewster undertook further editorial work by establishing, in conjunction with Jameson, the Edinburgh Philosophical Journal, which took the place of the Edin- burgh Magazine. After a time the title was again changed to the Edinburgh Journal of Science, sixteen volumes of which appeared under Brewster’s sole editor- ship, with very many articles from his own pen. To the transactions of various learned societies he contri buted from first to last between three and four hundred papers, and few of his contemporaries wrote so much for the various reviews. In the Worth British Review alone seventy-five articles of his appeared. A list of his larger separate works will be found below. Spccial mention, however, must be made of the most important of them all —his biography of Newton. In 1831 he published a short popular account of the philosopher’s life in Murray’s family Library ; but it was not until 1855 that he was able to issue the much fuller Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton, a work which embodied the

results of more than twenty years' patient investigation of original manuscripts and all other available sources.

Brewster's relations as editor brought him into frequent communication with the most eminent scientific men, and he was naturally among the first to recognize the benefit

that would accrue from regular intercourse among labourers in the field of science. In an article in the Quarterly Review he threw out a suggestion for 'an association of our nobility, clergy, gentry, and philosophers," which was taken up by others and found speedy realization in the British Association for the Advancement of Science. Its first meeting was held at York in 1831; and Brewster, along with Babbage and Herschel, had the chief part in shaping its constitution. It was this service mainly that was referred to when it was said of him after his death that "the improved position of men of science in our times is chiefly due to Sir David Brewster." In the same year in which the British Association held its first meeting Brewster received the honour of knighthood and the decoration of the Guelphic order of Hanover. In 1838 he was appointed principal of the united colleges of St Salvator and St Leonard, St Andrews. Two of the highest honours of the scientific world were conferred upon him in 1849, when he filled the office of president of the British Asso- ciation and was elected one of the eight foreign associates of the Institute of France in succession to Berzelius. In 1859 he accepted the office of principal of the University of Edinburgh, the duties of which he continued to discharge vigorously until within a few months of his death, which took place at Allerly, Melrose, on the 10th February 1868.

In estimating Brewster's place among scientific dis- coverers the chief thing to be borne in mind is that the bent of his genius was not characteristically mathematical. His method was empirical; he was a painstaking and accurate observer and classifier of facts rather than a theorizer; and the laws which he established, some of them, as has been pointed out, of prime importance, were generally the result of repeated experiment. To the ulti- mate explanation of the phenomena with which he dealt he contributed nothing,

and it is noteworthy in this connection, that if he did not maintain to the end of his life the corpuscular theory he never explicitly adopted the undulatory theory of light These limitations, however, are to be taken as characterizing his genius rather than as detracting from it. Few will be inclined to dispute the verdict of Forbes :—‘ His scientific glory is different in kind from that of Young and Fresnel; but the discoverer of the law of polarization, of biaxal crystals, of optical mineralogy, and of double refraction by compression, will always occupy a foremost rank in the intellectual history of the age.” In addition to the various works of Brewster already noticed the following may be mentioned :—Notes and Introduction to Carlyle’s translation of Legendre’s Hlements of Geometry (1824); Treatese on Optics (1831); Letters on Natural Magic, addressed to Sir Walter Scott (1831); The Martyrs of Science, or the Inves of Galileo, Tycho Brahe, and Kepler (1841) ; More Worlds than One (1854). (See The Home Infe of Sir David Brewster, by his daughter Mrs Gordon.)

BRIANCON, a very strongly fortified town of France, the capital of an arrondissement in the department of Hautes-Alpes, situated on a hill about 4300 feet above the level of the sea, near the source of the Durance, in lat. 44° 53’ N. and 6° 47’ E. long. It commands the road across Mount Genévre between France and Italy, and is well defended by its natural position; while the surrounding eminences are crowned with strong fortifications communicating with each other and the town by subterranean passages. The town itself is one of the highest in Europe, and the neighbouring village of St Veran has the loftiest situation of any in France. The principal buildings in Briangon are a church in the Italian style, the departmental prison, and a communal college. A single-arch bridge, 127 feet in span and 180 feet high, crosses the valley of the Clarée, affording access from the town to the principal parts of the fortifications. There is an extensive silk-factory

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in the old convent of St Catherine, which manufaciures floss silk, stockings, hats, and other silk goods; and the other industrial articles in the town comprise simall iron wares, leather, and lavender water. A considerable traffic is carried on in chalk, and in turpentine and other forest productions. The chalk, though known as Briancon chalk, is obtained at Fenestrelles in

Piedmont; the Briancon manna is a kind of resin. Briangon is identified with Brigantium, a city of great antiquity and dubious origin, which became an important military post under the Romans. For a long time after the fall of the Roman empire it maintained itself as an independent republic, and was not united to France till 1349. Made over by the peace of Ryswick to the duke of Savoy, it was restored to France in 1713. In 1815 the town made a noble defence. Population in

1872, 3579.

BRIANSK, a town of Russia, in the government of Orloff, 98 miles E.N.E. of the city of that name, in 53° 15’ N, lat., and 22° 50’ E. long., on both banks of the Desna, opposite the mouth of the River Snezheta. It is divided into four parts by several smaller streams. The town is mentioned in 1146, and then bore the names of Briansk and Debriansk. It afterwards formed a separate principality, which came to an end in 1356 with the death of Prince Basil Alexandrovitch. After the Mongolian invasion Briansk and the whole Siever country fell under the power of the Lithuanians ; but from time to time it was united with Russia, and finally became incorporated with the empire in the beginning of the 17th century in the reign of Michael Theodorovitch. Under the first Demetrius Briansk was taken by the rebels, but successfully resisted the attacks of the second impostor. Under the Empress Anna, according to the plan of Paul I., there was constructed a dock for the building of ships, but it was closed in 1739. In 1778 the town was made the capital of a department in Orloff, and in 1783 an arsenal, which still exists, was established for the manufacture of artillery. Briansk has thirteen churches, of which the cathedral was built in 1526, and restored in the end of the 17th century. In the sacristy is preserved a manuscript copy of the gospels in the writing of Michael Theodorovitch, whicli dates from 1637. In the convent of Peter and Paul is buried Oleg Romanovitch, priuce of Chernigoff and Briansk, who lived in the 13th century. There are two high schools in the town, a hospital, and a dispensary; and the industrial establishments include rope-walks, tobacco- factories, brick-works, tallow-boiling works, flour-mills, and abrewery. A considerable trade is carried on, especially in wood, pitch, linseed-oil, and cattle, which are exported to Moscow and St Petersburg. ‘There are markets twice a week, and one

annual fair. In 1860 the population was 12,816, all of the Greek Church except 268 Catholics and 35 Jews. In 1867 it amounted to 13,881.

BRIAREUS, or 4c£oy, one of the three hundred-armed (Hekatoncheires) sons of Uranus and Gaia,—his brothers being named Cottus and Gyges. The legends regarding them are various and somewhat contradictory. According to the most widely-spread myth, Briareus and his brothers were called by Zeus to his assistance when the Titans were making war upon Olympus. The gigantic enemies were defeated and consigned to Tartarus, at the gates of which the three brothers were placed. Other accounts make Briareus one of the assailants of Olympus, who, after his defeat, was buried under Mount Aitna, Homer mentions him as assisting Jupiter when the other Olympian deities were plotting against the king of godsand men, It would be difficult to determine exactly what natural phenomena are symbolized by the Hekatoncheires. They may represent the gigantic forces of nature which appear in earthquakes and other convulsions, ur the multitudinous motion of the

sea waves. The latter interpretation is rendered more probable by the fact that Briareus is frequently called a niarine deity, and is sometimes said to have been a son of Pontus and Gaia.

BRIBERY, as a public offence, may be defined as the

administration of a bribe or reward, that it may be a motive,

in the performance of functions for which the proper motive ought to be a conscientious sense of duty. When this is superseded by the sordid impulses created by the bribe, a person is said to be corrupted, and thus corruption is a term sometimes held equivalent to bribery. The offence may be divided into two great classes,—the one characteristic of despotisms, where a person invested with power is induced by payment to use it unjustly; the other, which is an unfortunate characteristic of constitutional govern- ments, where power is obtained by purchasing the suffrages of those who can impart it. The former offence is in every sense the more odious and formidable, and indeed it may be said, that until a country has outgrown it,

there is no room for the existence of elective bribery, since the nations among which justice is habitually sold appear to be far below the capacity of possessing constitutional rights.

When Samuel in his old age challenges a rigid scrutiny of his conduct, he says, "' Whose ox have I taken, or whose ass have I taken? or whom have J defrauded? whom have I oppressed? or of whose hands have I received any bribe to blind mine eyes therewith." And Amos, when denouncing the condition of the Israelites under Jeroboam, says, "They afflict the just, they take a bribe, and they

'turn aside the poor in the gate from their right." It isa natural propensity, removable only by civilization or some powerful counteracting influence, to feel that every element of power is to be employed as much as possible for the owner's own behoof, and that its benefits should be con- ferred not on those who best deserve them, but on those who will pay most for them. Hence judicial corruption is an inveterate vice of imperfect civilization. It is so deeply seated among Oriental races, that the attempts by controlling authority to eradicate it have been often futile. It has been the main impediment to the employment of natives in the British Eastern empire, since no external appearance of respectability, or apparent systematic routine of business, can be relied on as securities that the whole organization is not .ontaminated by systematic bribery. It is difficult to get the Oriental mind to understand how it is reasonable to expect the temptation of a bribe to be resisted. In the Russian empire this Oriental character- istic has had another conflict with the demands of a higher civilization. The organization of the Government requires that the empire should be honestly served by its official men, but their morality is of the humblest Oriental standard, and force will not change it. In no country, perhaps, has the offence been visited with more dire chastisement where it has been discovered, yet by the concurring testimony of all who are acquainted with Russian society, not only the official departments, but the courts of law are still influenced by systematic bribery. 'There is, perhaps, no other crime on which the force of law, if unaided by public opinion and morals, can have so little influence; for in other crimes, such as violence or fraud, there is generally some person immediately injured by the act, who can give his aid in the detection of the offender, but in the perpetration of

the offence of bribery all the immediate parties obtain what they desire, and are satisfied.

The purification of the bench from judicial bribery has been gradual in most of the European countries. In France it received an impulse in the 16th century from the high-minded chancellor L'Hépital. In England judicial corruption acquired a painful, but perhaps a wholesome renown, from the fate of the illustrious Bacon. In Scotland

for some years after the Revolution the bench was not without a suspicion of interested partiality ; but during the present century, at least, there has been in all parts of the empire a perfect reliance on its purity. The same may be said of the higher class of ministerial officers. There ig no doubt that in the period from the Revolution to the end of Queen Anne's reign, when a speaker of the House of Commons was expelled for bribery, and the great Marl- borough could not clear his character from pecuniary dis. honesty, there was much corruption in the highest official quarters. The level of the offence of official bribery has gradually descended, until it has become an extremely rare thing for the humbler officers connected with the revenue to be charged with it. It has had a more lingering exist- ence with those who, because their power is more of q constitutional than an official character, have been deemed less responsible to the public. During Walpole's adminis. tration there is no doubt that members of Parliament were paid in cash for votes; and the memorable saying, that every man has his price, has been preserved as a charac. teristic indication of his method of government.

One of the forms in which administrative corruption is most difficult of eradication is the appointment to office, It is sometimes maintained that the purity which charae- terizes the administration of justice is here unattainable, because in giving a judgment there is but one form in which it can be justly given, but when an office has to be filled many people may be equally fitted for it, and personal motives must influence a choice. It very rarely happens, however, that direct bribery is supposed to influence such appointments.

It does not appear that bribery was conspicuous in England until, in the early part of the 18th century, constituencies had thrown off the feudal dependence which lingered among them ; and, indeed, it is often said, that bribery is essentially the defect of a free people, since it is the sale of that which is taken from others without payment. It is alluded to by Fielding and Smollett, and had become conspicuous in the days of Hogarth, who represents it in its double shape of demoralization; one picture shows a reckless expenditure of money among pro- fligate expectants, whose demoralization is a systematic source of profit to them, while another presents us with the impoverished father of a family urged against his con- science to relieve thy misery of his wife and children by the sale of his vote.

In England electoral bribery has been the subject of much legislation, which culminated in the Corrupt Practices Prevention Act of 1854 (17 and 18 Vict. c. 102). By this Act the following persons shall be deemed guilty of bribery, and shall be punishable accordingly :-—

1. Every person who shall directly or indirectly, by him- self or by any other person on his behalf, give, lend, &c., or offer, promise, or promise to procure, &., any money or valuable consideration to or for any voter or any other person in order to induce any voter to vote or refrain from voting, or shall corruptly do any such act on account of such voter having voted or refrained from voting at any election.

2. Every person who shall similarly give or procure or promise, é&c., any office, place, or employment to or for any voter or other person in order to induce him to vote, &e.

3. Every person who shall make any gift, loan, promise, é&c., as aforesaid to any person to induce such person to procure the return of any person to serve in Parliament or the vote of any voter. (

4, Every person who shall, in consequence of such gift, procure or engage, promise or endeavour to procure the return of any person or the vote of any voter.

5. Every person who shall pay any money with the

intent that it should be spent in bribery, or who shall pay money in repayment of any money wholly or in part expended in bribery.

Persons so offending are guilty of a misdemeanour (in Scotland, of an offence punishable by fine and imprison- ment), and shall be liable to forfeit the sum of £100 to any person who will sue for the same, together with costs. Sect. 3 extends the offence (1) to persons who before or during an election shall receive or contract for any money, &e., for voting, or refraining, or agreeing to vote or to yefrain from voting; and (2) to persons who, after the election, receive money, &c., on account of any person having voted or refrained, &c. Such persons shall be guilty of a misdemeanour and forfeit £10.

Treating is defined in Sect. 4. Every candidate who gives, procures, or pays for any expenses incurred for meat, drink, or entertainment, or provision to or for any person in order to be elected, or for being elected, or for the purpose of corruptly influencing such person to give or refrain from giving his vote at an election, &c., shall be deemed guilty of treating, and forfeit £50 to any person who shall sue for the same; and every person corruptly accepting such meat, drink, &c., shall be incapable of voting at such election. Persons found guilty of bribery, &c., or from whom penalties as above mentioned have been recovered, shall be struck off the list of voters by the revising barrister. Prosecutions and actions under the Act must be begun within one year. Other sections of the Act prohibit giving cockades to voters at elections, or supply- ing them with refreshments on account of their having polled or being about to poll. Any candidate for a county, city, or borough found guilty by an election committee of bribery, treating, or undue influence by himself or his agents shall be incapable of being elected or sitting in Parliament for such county, city, or borough, during the Parliament then in existence. Up to 1868 disputed elections were dealt with by committees of the House of Commons, but the Parliamentary Elections Act (31 and 32 Vict. c. 125) has transferred the jurisdiction to Her Majesty’s judges (see Exxctions), The report of the judge is to have the same effect as the report of an election committee under the old law; and if he reports that corrupt practices have extensively prevailed, a commission of inquiry may

be issued under 15 and 16 Vict. c. 57. Candidates reputed by the judge to be guilty of bribery shall be incapable of being elected to the House of Commons for seven years, and during the same period may not (1) be registered as voters ; or (2) hold office under 5 and 6 Will. IV. c. 76, or 3 and 4 Vict. c. 108, or any municipal office; or (3) hold any judicial office, or act as justice of the peace. Other persons found guilty of bribery after having had.an opportunity of being heard suffer the same disquali- fications. Similar provisions against bribery, &c.,at munici- pal elections are contained in the Act 35 and 36 Vict. c. 60.

If the election commissioners, appointed under 15 and 16 Vict. c. 57, report the extensive prevalence of corrupt practices, bills may be brought in for the dis- franchisement of the constituency. Bridgewater, Bever- ley, Sligo, and Cashel were so disfranchised in 1870. Four boroughs—Totnes, Reigate, Great Yarmouth, and Lancaster—were disfranchised by the Representation of the People Act, 1867, for corrupt practices. In the case of a vacancy in a constituency where corrupt practices have prevailed at last election, the House may disfranchise it indefinitely, either by a resolution to that effect or by negativing the motion for a new writ.

_ The judges manifested great repugnance to the new Jurisdiction conferred on them by the Elections Act, and vigorously remonstrated against it during the passage of the measure through Parliament. It was feared that the

purity of the bench might be sullied by being brought into close connection with political contests. Public opinion, however, had distinctly condemned the House of Commons Election Committees, which where necessarily anything but judicial in character, and were, besides, tainted with the suspicion of being frequently actuated by political motives. Many petitions have now been tried by the judges, and in a manner which has given great satisfaction to the country. One consequence of the new system which might have been anticipated is the introduction of more precise definitions into the phraseology of election law. “Agency,” for example, and “ valuable considera- tion,” have been treated by the judges according to the ordinary meaning of the words in courts of law, and candidates have been unseated for the acts of persons, technically their “agents,” but personally unknown

to them, and for gifts, generally reputed laudable, but legally falling within the definition of bribes. Bribery flourishes most vigorously in the English borough constituencies ; and the secret voting introduced by the Ballot Act seems to have had very little effect on the practice, on account of the fidelity with which the corrupt voters keep their promises. In a recent election inquiry before commis- sioners, witnesses declared their belief that a quarter, or even more, of the constituency was permanently corrupt, and held the balance between the two political parties. Extensive bribery under the guise of charitable distribu- tions of coal, provisions, &c., seems to prevail in many constituencies, and a still more indirect form is the payment of large subscriptions to public purposes. Recently, it' has been observed, constituencies have shown a marked preference for wealthy candidates with some local connec- tion.

BRICK, a kind of artificial stone made of baked clay. The usual form of a brick is a parallelopipedon, about 9 inches long, 43 inches. broad, and 3 inches thick. The art of brickmaking dates from very early times. We read that burnt brick was used in building the tower of Babel. The walls and various other buildings of ancient Babylon were made of burnt brick ; several varieties of brick figure in Assyrian art, and most of the Assyrian literature was in the form of minute characters in baked clay (see BABYLON, Bapytonia). Brickmaking formed the chief occupa- tion of the Israelites during their degrading bondage in Egypt. The bricks were made of clay =] mixed with chop- —|-—-} ped straw, were probablysun © dried. We read (2 Sam. xii. 31) that David made thechildren of Am- mon pass through the brick kiln; and while the meaning of the statement is doubtful, it is thought that the in- struments mentioned in the context may have been used in preparation of the clay. Pliny informs us of three different kinds of bricks made by the Greeks. In Italy we have abundant evidence that the Romans used bricks largely ; and it was they, probably, who introduced brickmaking into England. By the time of Henry VIIL the art had reached great perfection; and many fine brick buildings (eg., the older part of Hampton Court) are extant from that period. Previous to the great fire of 1666, many of the London houses consisted chiefly of timber framework, filled in with lath and plaster; but after the fire, brick was used alinost exclusively in building. Much of the brickwork remaining from that time is finely

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Fig. 1.—Egyptian Brickmakers.

Brick- eartlis,

Brick- making.

carved with the chisel. From the latter part of last century (1784) till 1850, bricks in this country were subject to taxation. In Holland, where stone is scarce, bricks have been in use from a very early period, both for domestic and public buildings.

The quality of bricks depends primarily on the choice of an earth. There are three principal classes of brick- earths:—(1.) Pure clays, consisting chiefly of alumina and silica, in various proportions, and with a small percentage of other salts, iron, lime, magnesia, &c. ; (2.) Loams or sandy clays ; (3.) Marls, or earths with a considerable proportion of lime. A paste of pure clay alone (made with water), while it may be easily moulded, will shrink and crack in drying and firing, in proportion to the excess of alumina over silica; but this can be remedied by mixture with a milder earth or with sand. Loams, again, are often so loose that they require the addition of lime as a flux. The London brickmakers add lime and ashes, or breeze, to their loams aud marls, both as a flux and to prevent shrinking ; such admixtures also, as will be seen, affect colour. Brick-earths are very various in composition. The proportion of ingredients in a good earth will be something like the following :—silica, three-fifths ; alumina, one-fifth ‘ iron, lime, magnesia, manganese, soda, and potash forming the other one-fifth, The clays of which fire-bricks for furnaces are made are almost entirely free from lime, magnesia, and like substances, which act as fluxes; they are found throughout the coal measures, immediately beneath the coal. The best, that of Stourbridge, will bear the most intense heat that can be produced, without fusion. The Welsh fire-bricks, and those of Windsor, Newcastle, and Glasgow, are other well-known varieties. The Dinas fire-brick consists almost entirely of silica ; to this is added about one per cent. of lime, and the mixture, after moulding, is intensely heated. In Austria, a very

refractory siliceous brick is manufactured by M. Khern, the chief ingredient being quartz of the highest possible degree of purity.

The colour of bricks is determined by the proportion of hydrated oxide of iron and other ingredients they contain, also by the degree of heat in burning. Where iron is present without lime or such substances, a moderate red heat makes the bricks red, the intensity varying with the proportion of iron ; with more intense heat, the bricks, if slightly fusible, may be vitrified externally, and become greenish blue (e.g., the blue bricks of Staffordshire), The presence of lime changes the red colour produced by iron to a cream brown ; magnesia also arrests the development of red. Clays burning a pale red will burn yellow if mixed with a fusible white sand, such as is often found on heaths. Some clays, as those of Devonshire and Dorsetshire, burn of aclear white. The London malms give a rich brimstone yellow. ‘The art of ornamental polychrome brick-work has of late years been much developed, especially by the German architects. The principal varieties of common bricks made in England are place bricks, grey and red stocks, marl facing bricks, and cutting bricks. The first two are used in ordinary walling. The marl facing bricks, inade in the neighbourhood of London, are superior to the stocks, and used in the outsides of buildings. Cutting bricks, which are the finest kind of marl and red bricks, are used in arches over windows and doors.

The process of brickmaking varies considerably in different localities. In the following account we shall, in the first instance, confine our attention to methods adopted in the vicinity of London, and thereafter note some of the peculiarities of other systems. The most common mode of preparing the clay, in the London district, is that of maiming. Among the varicties of brick-earth found there mal is substance that can be used for bricks without any addition. But it is now rare, aud an artificial malin

BRICK

is made by mixing chalk and clay, previously reduced to pulp, and allowing the mixture to consolidate by. evapora- tion. Bricks of the best quality are made with this alone – but for the commoner sorts some of the malm is added to the clay or loam, sufficient to make it fit for brick. making.

The earth is dug up in autumn, and placed on a level Malu

floor, banked round in order to retain the malm in the process of malming. Exposed during the winter, it js nore or less broken up and pulverized by the frost, &e, The machinery for malming consists of two washing-nills, viz., the chalk and clay milis, which are placed together, not far from the brick-earth. The chalk-mill is a civcular trough in which chalk is ground in water, by two heavy wheels with spiked tires, drawn round by horses. The pulp thus made passes by a shoot into the clay-mill, another and a larger circular trough, where it gets mixed with clay that is being cut and stirred in water by knives and harrows, also put in motion by horses. The creanzy liquid malm passes through a grating into shoots which convey it to the brick-earth, over which it is distributed as equally as pos- sible. It is now left to settle for a month or more, the water being drained off at intervals, till the mass is firm enough to beara man walking over it. A thin layer of ashes, about 3 inches for every spit of earth, is spread over the surface (this process being technically called souling), and the whole is now ready for the moulding season, which commences gencrally in April.

The mass of earth, malm, and ashes is first tempered, or thoroughly turned over and mixed with the spade, while water ‘s added to give it the proper consistence. The temperea clay is then conveyed to the pug-mill,—a conical tub, in which revolves (driven by horses) a vertical shaft with horizontal knives so inclined that the clay is slowly forced down to the narrow end by their motion. Several of these knife-arms are furnished with cross knives, which assist in the cutting and kneading process. The clay comes out laterally at the bottom as a uniform mass, and is ready for moulding.

The moulder stands at a table or stool, on which are Moulding

placed some of the tempered clay in front of him, a little dry sand to the right and left, a small tub of water with the strvke in it, a brick-mould, and a stock-board, Back- wards from the stool extends the page, a pair of iron sails, on wood, on which the raw bricks are pushed away by the moulder. The brick-mould is a rectangular case of sheet- iron, without top or bottom, having the two longer sides strengthened with wood. The stock-board, supported on four pins in the mioulder’s stool, fits easily into the mould; it has often a solid elevation in the middle, for producing a hollow in the

brick. The moulder receives from the elot- moulder (usually a woman), standing on his right, a piece of clay somewhat larger than a brick. Having sprinkled sand on the stock-board, and dashed the mould, after mois- tening it, in the left sand heap, he places the mould on the stock-board, and dashes the clay into it with force, then pressing it with his fingers so as to fill the angles. With the strike (a short, smooth piece of wood) he strikes off the surplus clay; then he turns the brick out of the mould on a thin board or pallet, rather larger than the brick, and slides it along the page to the taking-off boy, who stands ready to put the bricks on a barrow of special construction ; on this, after sprinkling with sand, they are conveyed to the hack ground. The bricks are each carefully removed from the barrow between two pallets, and built up in hacks, about eight bricks high, and two in width (placed edgewisc, and in an angular direction,—the hacks being about I] feet apart, from centre to centre. They are covered with straw or reeds at night or in bad weather. When half dry the bricks are separated somewhat (sciniled), to allow

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free access of the air. ‘The time taken in drying varies from three to six weeks.

In the vicinity of London bricks are commonly burnt in clamps; the peculiarity of which process is that, as each brick contains in itself the fuel necessary for its vitrifica- tion, the breeze merely serves to ignite the lower tiers, and the heat gradually spreads over the whole. The general structure of a clamp is as follows :—-A number of walls, or necks, three bricks thick, about sixty long, and twenty-four to thirty high, are built slantingly against a central upright wall, which narrows upwards. ‘The sides and top are cased with burnt bricks. Cinders (or breeze) are distributed in layers between the courses of brick, the thickest strata being at the bottom. A single clamp will contain from 200,000 to 500,000 bricks. For firing the clamps, live holes or flues (9 inches by 7) are left in the centre of the upright, and at every seventh neck or so, extending throughout the thickness of the clamp. These are filled

used in burning is of circular form, with spherical top, and will contain about 8000 bricks. Red, blue, and drab bricks are produced in the district, besides the dust brick just referred to, which is used for the paving of footways..

In Holland, the chief material used for bricks is the Holand.

slime deposited in rivers and arms of the sea. It is collected in boats by men with long poles, having a cutting circle of iron at the end, and a bag net with which they lug up the slime. Hard bricks are made of a mixture of this slime with sand from the banks of the River Maas. The ingredients are well kneaded together, and the mixture is deposited in heaps. The mode of moulding and drying is similar to that used elsewhere. The kilns are square and will sometimes hold as many as 1,200,000 bricks. Peat turf is used in firing.

For an account of brickmaking in India the reader is referred to a paper by Major Falconnet, R.E., in the Pro- fessional Papers on Indian Engineering, May 1874.

with faggots, and fired by a coal fire at the end of each vent ; and the fire ignites the adjacent breeze. Once the clamp is fairly lighted, the mouths of the live holes are

Thus far only brickmaking by hand has been spoken of, Brick- but of recent years there has been no little activity in making by the invention of brickmaking machines, with a view to ™@chinery.

stopped with bricks and plastered over with clay, and the clamp burns till all the breeze is consumed, usually from three to six weeks. After cooling, the bricks are removed, sorted, perhaps, and stacked. (For a fuller account of the

_ most approved methods of building clamps, the reader is

referred to Mr Dobson’s excellent little treatise on brick- making, to which we are indebted for many of the details given in this paper.)

In the Nottingham district a very hard marl is often used in brickmaking; and as ordinary weathering and tempering would not make it sufficiently plastic, it is sub- jected to grinding between rollers, the hard lumps and pieces of limestone being thus crushed to powder, all pebbles

_ and hard stones having been previously picked out by the

| hovel or drying-shed, when they are built in hacks.

hand. ‘The wash-mill is only used in making arch-bricks, and the pug-mill is dispensed with, the tempering of the clay, after grinding, being done by treading and spade labour. Sometimes the clay is kept in damp cellars for a year or more to ripen. Brass moulds (technically called copper moulds) are used, and the moulder, after filling the mould, works over the clay, first on one side then on the other, with a flat implement called the plane. A boy takes the mould with its contents to the floor, where he turns out the brick, and then puts back the mould on the stool, the moulder meanwhile filling another mould. The bricks are sprinkled with sand on the floors, and turned twice at a few hours’ interval, and are then taken by boys to the They are burnt in kilns, which are made with four upright walls and a sunken floor. On the two sides of the kiln there are shallow pits with lean-to roofs to protect the fuel and fireman. ‘The doorways are narrow openings at the ends, a step above the ground, and the fire-holes are arched openings opposite each other in the side of the kiln, lined with fire-bricks. Narrow openings or flues are left between the bricks, connecting the opposite fire-holes. Each brick has some free space round it for passage of heat. The fuel employed is coal.

In the Staffordshire Potteries it is a common practice to pass the marl through several pairs of rollers, and then mix some three or four marls together, with water, by spade labour. For ordinary bricks the ground marl is mixed with marl that has been tempered but not ground. The pug-mill is employed for tiles and dust bricks,—the latter so called from coal dust being used when they are moulded. The bricks are moulded by the slop-moulding process, the mould being dipped in water only before using ; the

brick 18 emptied from the mould on the floor. (The other process 1s distinguished as that of sand-stock moulding.) The oven

economy, certainty, and rapidity of production, and improvement in the quality and appearance of the bricks. It is only in brickmaking on a considerable scale, of course, that moulding by machinery can present much advantage over hand moulding, since the cost of moulding bears so small a proportion to the total cost. The various machines that have been offered to the public may be arranged in two classes,—those which operate on the clay (with moderate pressure) in a moist and plastic state, and those in which the material used is pulverized and dry, or nearly so. A denser brick, and one less liable to shrinking, is produced in the latter case; but much care is needed in preparation of the clay, aud a much stronger compression is required, to ensure the proper tenacity. The different arrangements of rollers and pug-mills for preparation of the clay, whether plastic or dry, we need not here describe at any length. Rollers and pug-null are sometimes combined, forming a composite machine. Two or more pairs of rollers are sometimes arranged one set under another, the closest at the bottom; and opposing rollers are driven at different speeds so as to produce a rub as well as a squeeze, thus promoting disintegration. As to that class of brickmaking machines proper in which plastic clay is used, we find, in some examples, a continuous length of clay forced out from a vertical or horizontal pug-mill through a suitable mouth- piece, and the column divided into bricks by wires or otherwise. Of mouthpieces, some are simple dies, or dies fitted with cores to make hollow bricks; in others the mould is lubricated by a constant stream of water; in others, again, the mouthpiece is made with two or four rollers covered with thick cloth, which are perforated with small holes, and filled with oil to lubricate the faces of the bricks. In cutting, a frame of parallel wires may be moved across, either while the clay is at rest, or while it is in motion, by the wires being moved obliquely at an angle to compensate for the speed at which the clay travels. Or the clay may be cut by radial wires of a wheel, or again by metallic discs. Another variety of treatment of plastic clay is that in which the clay is pressed from the pug-mill into moulds of the form of brick required. In one such machine, a mould-block, with two moulds, moves backwards and forwards under the pug-mill, one mould receiving a charge while the other is having the brick pressed out of it by a piston. In another, the moulds are

arranged radially round the border of a circular table, which revolves under the pug-mill. There are piston rods in the mould which ascend an inclined spiral plane, and thus gradually lift the bricks out of the moulds, whence they are taken by a boy and placed on an endless band, — oS them IV. — 3

away. In another machine, also with revolving table, two moulds receive the charge of clay at once. While these are being filled the two that had just been filled are being subjected to considerable pressure, and the two bricks that had been pressed immediately before are in process of delivery out of the moulds, and on to a flat belt which takes them away. (This machine is also suitable for dry clay.) In yet another, a cylinder revolving under the

pug-mill presents to it successively four brick-moulds, each of which, on reaching the lowest point, is made to deposit its brick on an endless band. The annexed drawing represents one of Messrs H. Clayton, Son, & Howlett's single delivery machines for brickmaking with plastic clay, After what has been said little description will be neces. sary. A isthe pair of rollers, B the pug-mill, C the stream of issuing clay, which a little further on is cut across by

Fic. 2.—Brickmaking Machine for Plastic Clay.

means of the wire frame D. The bricks are then removed to the barrow E. These machines are often constructed for double delivery.

As an example of the second class of machines,—those for working dry, or half-dry, and non-plastic material,—we may take another machine constructed by Messrs Clayton. It affords a good practical solution of the problem of making bricks from coal shale, bind, fire-clay, or the like. The arrangement is shown in figs. 83 and 4. In fig. 3, A

Fig. 3.—Section of Machine for Non-plastic Material.

is a pan roller mill, in which a pan containing the raw material is driven round under rollers ; there are perfora- tions in the bottom, through which the ground clay escapes, and is swept by arms into a general receiver, whence a band with buckets conveys it to the hopper of the mould- ing and pressing machines C, of which fig. 4 gives another view, Here the moulds are contained in a box at B, bolted between the standards, There are two sets of pistons, one above and the other below the brick-moulds, and they simultaneously press the top and the bottom of the

brick in the mould. The lower pistons are attached to a cross bar which slides in vertical guides in the standards, and has friction rollers C on the lower extremities, in con- tact with which work two pressing cams D on the main shaft. The upper pistons E are attached as shown toa cross-head above, which is moved up and down in its guides by connecting rods and two cranks on the main

Fic. 4.—Part of Machine shown in section in fig. 3.

shaft. These pistons are hollow, and are heated by steam to prevent the brick-earth adhering to them, The prepared material is supplied to the two moulds by a feed-box which slides to and fro under the feeding hopper of the machine,

‘and thus passes alternately under it and over the moulds,

-eonveying sufficient each time to fill the latter. The prieks are delivered from the moulds by the lower pistons,

which are forced upwards by the complete revolution of the cams, and the newly-made bricks are forthwith moved forward by the approach of the feed-box with a fresh charge of the material. In another dry-clay machine con- structed by Messrs Bradley and Craven of Wakefield, two or three distinct pressures can be given to a brick, and by this means the air is gradually forced out from the interstices,

and the brick consolidated to a greater cxtent than can be ‘ effected by a single pressure.

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The varieties of brickmaking machinery are too numer- ous to be separately noticed, however briefly, but the fore- going may suffice to illustrate the general principles involved in their construction. With suitable modifications, perfor- ated or hollow bricks are frequently produced, on which there is a saving in cost of carriage, and also in mortar and labour.

Among the objects at the International Exhibition of 1874 there were several varieties of brick prepared with-

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out burning, according to a process devised by Messrs Bodmer. ‘They are made by intimately mixing certain materials of the nature of cements or mortars, and squeezing the mixture into the desired shape by hydraulic pressure in @ specially-constructed machine. Sand and selenitic lime are the constituents of one kind of brick ; these substances, together with Portland cement, of another; and a very serviceable kind of brick is prepared from blast-furnace slag, which, consisting chiefly of silicates decomposable by lime, is just as suitable for the purpose as the volcanic products, trass and pozzuolano, which have long been employed. ‘The bricks give good results on application of the usual tests.

The old invention of floating bricks (known to Pliny) was completely lost till M. Fabroni discovered they could be made from the earth known as fossil meal, which is abundant in Tuscany, and is found near Castel del Piano in the territories of Siena.

s For the drying and burning of bricks, the construction of kilns according to Hoffmann’s method is a remarkable improvement of late years. These kilns are formed by a series of arched chambers connected by passages to one main chimney fiue, each passage or flue having suitable dampers to

regulate the heat at any desired point. Small coal, slack, or peat fuel may be used, which is fed in from the top of the kilns through small openings. The waste gases from the burning and cooling chambers are made to pass successively into other chambers and give out their heat before escaping to the chimney, thus completing the drying, and effecting a partial burning, of newly-made bricks before the actual firing of the chambers in which these latter are newly set. Such kilns are no doubt beyond the means of most brickmakers, but it is perhaps a question for consideration whether bricks must necessarily be burnt in immediate proximity to the spot where the clay is obtained.

In an instructive report on the manufacture of bricks, drawn up a few years ago by a committee of the Manchester Society of Architects, the following points were specified as requiring attention, in order to improve the character of the common brick :—(a) Greater care in cleaning the clay and in thoroughly tempering it; (6) variation in the size of moulds, so as to produce uniform sized bricks from various clays; (c) moulding the brick with material of such consistency that it may not become misshapen by the effects of its own gravity ; (d) greater regularity of surface of the drying-ground ; (e) protection from extreme variations of temperature and rain in drying; (f) less frequent and more careful handling in the process of drying, so as to

preserve the edges; (g) a means of burning whereby the amount of firing shall be under control. In experiments on the absorption and retention of moisture, it was found that the bricks which parted most readily with their mois- ture at first were the longest in drying, and vice versa.

Tiles, being a thinner ware than bricks, have to be made Tiles.

of purer and stronger clay, and require more care in treat- ment, but the process of manufacture is not essentially different. The numerous varieties of tiles may be roughly arranged in three classes, viz., paving teles, roofing tiles (including the flat plain tiles, the curved pantiles, hip, ridge, and valley tiles), and dravn tiles. In weathering, the clay is spread in layers of about 2 inches thickness during winter, and each layer is allowed the benefit of at

least one night’s frost before the succeeding layer is put upon it. Sometimes the weathering is effected by sunshine. The comminuted clay is next placed in pits and allowed to mellow or ripen under water. Then it is passed through the pug-mill, and the tempered product, if necessary, slung (that is, cut in thin slices with a piece of wire fixed to two handles, in order to detect any stones), and then passed through the pug-mill again, after which it is generally ready for moulding. To take the case of pantiles (hand- moulded), the moulder turus the tile out of the flat mould ou to the washing-of frame, on the curved surface of which, with very wet hands, he washes it into a curved shape. Then he strikes it with a semi-cylindrical implement called the splayer, and conveys it on this to the flat block where he deposits it, with the convex side uppermost, and, removing the splayer, leaves the tile to dry. The tile is afterwards beaten on the thwacking-frame, to correct any warping that may have occurred, and trimmed with the thwacking-knife. In the kiln, which is constructed with arched furnaces at the base of a conical erection called the dome, the tiles are closely stacked in upright position, on a bottom of vitrified bricks. The fuel used is coal, and the burning continues usually about six days. In making pipe drain tiles, the clay is first moulded to the proper length, width, and thickness, then wrapped round a drum; the edges are closed together, and the tile is carefully shaped by the operator’s hand, sometimes assisted by a wooden tool. Tiles as. well as bricks can be made by machinery; with suitable dies, almost any form of tile may be thus had, which is producible by the advance of a given section of clay parallel to itself. In other machines pressure is exerted on the clay in a mould.

The manufacture of tesserae and encaustic tiles has been Encaustic brought to great perfection in recent times, through the tiles.

enterprise especially of Mr Minton. It is a revival and extension of a very old art, which originated, probably, with the Greeks. The tesselated pavements of the Romans, of which many specimens are still extant, were formed of small pieces of stone or marble of various colours, bedded one by one in a layer of cement. The principle on which tesseree are now made, is that dry and finely-powdered clay, compressed between steel dies, is changed into a very com- pact and hard solid body, a fact first observed by Mr Prosser in 1840. The solid pieces, which are thus pro- duced in a screw-press, are enclosed in earthenware cases or pans, call saggers, and fired in a

potter’s kiln, after which they are ready for use, unless they are required to be glazed, in which case they are dipped in a glazing composition and again fired. The mode of setting the pieces differs essentially from the Roman method. In manufacture of the tiles called encaustic, in which various designs are pro- duced by addition of clays of different colour from that of the ground, the clays first undergo sundry washings and purifications. A portion of the kind which is to form the ground first receives an inipression, in the plastic state, from a plaster in relief. The bulk of the tile is made up

with coarser clay added in a frame, and this is solidified in a screw-press. Then comes the filling in of the design, which the maker does by spreading the coloured clay in a creamy or slip state on the indented surface. After a few days’ evaporation, the surface is scraped or planed, and the tile passes successively to the drying house and the oven. The colours desired in encaustic tiles are some- times those given by the clay in ordinary treatment, some- times they are obtained by staining with manganese, cobalt, &c. The products of this branch of manufacture are much admired.

The fine ornamental bricks of various shape and colour known as terra cotta have of late been much used, especially in the facing of public buildings, and with the happiest effects. (A. B. M.)

BRIDAINE, Jacquzs, a celebrated French preacher and home-missionary, was born in 1701 at Chuslan in the department of Gard. Though a rigid Catholic in principle, he gained the good-will of the Protestants of France by the boldness with which he advocated their cause on many occasions, and the personal kindness which he displayed towards many of their number during the persecutions to which they were exposed under the Regent Orléans and Louis XV. He accomplished no fewer than 250 evange- lizing journeys through various parts of France, in the course of which he made himself universally popular, being possessed of a powerful though rugged eloquence. He was the author of a collection of Cantiques Spirituels, which has been frequently reprinted, and of five volumes of ser- mons, printed at Avignon in 1825. In the neighbourhood of this town he died in 1767.

BRIDGENORTH, aparliamentaryandm unicipal borough and market town of England, in the county of Shropshire, on both sides of the Severn, 18 miles 8.E. by E. of Shrews- bury. The river, which is here crossed by a handsome stone bridge of six arches, separates the upper from the lower town. The former is built on the acclivities and summit of a rock which rises abruptly from the river to

the height of 180 feet, and gives the town a very picturesque appearance. The railway passes under by a long tunnel, On the summit is the tower of the old castle, leaning about 17 degrees from the perpendicular ; two parish churches, one of which, St Leonard's, was rebuilt in 1862; and a large public reservoir. There are in the town a mechanics' institute, a public library—founded by the Rev. Mr Stackhouse, an infirmary, a jail, a _ theatre (1824), a market hall(1855), Arms of Bndgenortp, and a considerable number of schools and charities, Jt has manufactures of carpets, worsted, and tobacco-pipes, and some trade in agricultural produce. It returns one member to parliament. The population of the parlia. mentary borough amounted in 1871 to 7317 ; that of the municipal borough to 5876.

Bridgenorth, or Brigge, is said to have been foundcd by Ethelfleda, the daughter of Alfred, and it was fortified with a castle and walls by Robert de Belesme, earl of Shrewsbury. On the earl's rebellion the town was besieged and taken by Henry I. in 1102; and in the reign of Henry II. the castle was dismantled. Ty 1646 the town being held by a Royal garrison, sustained a remarkable siege by the Parliamentary forces, who at last obtained possession.

BRIDGEPORT, a seaport town in the county of Fair. field, Connecticut, United States, is situated on an arm of Long Island Sound, 58 miles N.E. of New York, in 41° 10' N. lat. and. 73° 11' W. long. Tt has several iron-foundries and manufactures fire-arms, metallic cartridges, sewing-machines, carriages, harness, locks, blinds, &c. The coasting trade and the fisheries are both extensive, The bar at the mouth of the harbour, which is formed by the Pequonnock Creek, has 13 feet at high water. Bridgeport is the centre of an extensive system of railways, and steam- boats ply between it and New York. The township was separated from Stratford in 1821, and

the city, formerly called Newfield, was incorporated in 1836. Population in 1870, 19,835.

BRIDGES

§ 1. Jpejinitions and General Considerations—Bridges are structures designed to carry roads across streams, gullies, or roads. A viaduct may be distinguished from a bridge, inasmuch as the object of the former is to carry a road at a considerable elevation above the surrounding country, by means of structures, similar indeed to bridges, but in which the object of the open spans is to save expense rather than to cross some obstacle which could not be passed by a level road or embankment. The aqueduct is a structure similar to the viaduct, but employed to convey or support water. A culvert may be distinguished from a bridge as an opening, the primary object of which is to let water flow past a road or other obstacle, the object being similar to that of a large drain. A large culvert might be called a small bridge, and a bridge having long approaches with many spans might be called a viaduct. The present article will treat only of Bridges. . Every bridge may be divided into two parts, the sab- structure and the superstructure. The substructure of a bridge consists of foundations, abutments, and piers. The ed supports of the bridge are the abutments, and the intermediate supports are called piers. Piers and abut- ments rest on foundations in the ground. A bridge of one span has no piers, The superstructure of a bridge consists of the roadway and the beam, arch, or chain used to carry the roadway from support to support. The dimensions and design of a bridge depend on the nature of the obstacle to be crossed and on the traffic to

which the road over the bridge is subject. The engineer is usually bound to design the cheapest structure which will perform the required duties; he‘has, therefore, in each case to consider whether a small number of large spans or a large number of small spans will be cheaper. Large spans will be desirable where foundations cannot be easily obtained, or where the height of the structure is great. The engineer has also to determine whether, considering the prices of materials, labour, and transport, one or other form of super- structure is to be preferred. The traffic to be accommodated will determine the width of the bridge and the load which the superstructure

must bear, In many cases it will also be the duty of the designer to endeavour to combine beauty with utility. Beauty does not require ornament or expense, but demands, what may be more difficult to supply, correct taste in the designer.

In Great Britain law prescribes the following minimum dimensions for the over and under bridges of railways. (An over bridge is one in which the road goes over the railway; an under bridge one in which the road goes under the railway.) Over bridges.—Width: turnpike road, 35 feet; other public carriage road, 25 feet ; private road, 12 feet. Span over two lines (narrow gauge), generally about 26 feet; head room, 14 feet 6 inches above outer rail, Under bridges.—Spans: turnpike road, 35 feet; other public carriage road, 25 feet ; private road, 12 feet. Head- room : turnpike road, 12 feet at springing of arch, and 16 feet throughout a breadth of 12 feet in the middle ; for

public road, 12 feet, 15 feet, and 10 feet in the same places ; private road, 14 feet for 9 feet in the middle ; for excep- tions the Acts must be consulted. In designing a bridge to cross a stream care must be taken to insure that the openings are suitable for the maximum floods.

The load which the superstructure of a bridge has to carry in addition to its own mass may be estimated as follows :—

]. For a public road; one hundredweight per square foot will represent the weight of avery dense crowd, This is greater than any load which ordinary carts or vans will bring on the bridge, but of late years traction engines and road rollers have been introduced, anda weight of perhaps 10 tons on each wheel on one line across the bridge ought in future designs to be provided for. The bridge must be strong enough to bear this maximum weight applied at any point, and also to bear all possible distributions of the crowd. A bridge might be fit to carry the crowd uniformly distributed over its surface, and yet fail when the crowd covered one-half of its length or width.

9. For a railway ; the maximum passing load on each line of rails may be taken as the weight of a train composed exclusively of locomotives. The bridge must be fit to bear this load distributed in all possible ways along the line. For spans above 60 feet on the usual 4 feet 84 inches gauge this load may generally be taken as equivalent to 1 ton for each foot in length of each line of way, or in engineering language, “one ton per foot run.” Where a very heavy class of locomotives is in use 1} tons per foot run must be provided for. For small spans the distribution of the load as a locomotive passes is such that the above allowance is barely sufficient. For very small spans of 8 or 10 feet the maximum passing load is a little more than the weight on the driving axle of the locomotive, or say 14 tons.

§ 2. Classification.—Bridges are classed, according to the design of their superstructure, as girders, arches, and suspen- sion bridges. A beam of wood crossing a stream, a brick arch, and a platform hung to a flexible wire rope are common examples of the three types. The essential distinction be- tween the three types may be said to be, that in all forms of the suspension bridge the supporting structure (7.e., the wire rope in the above example) is extended by the stress due to the load ; in all forms of the arch the supporting structure (.e., the ring of bricks in the above example) is compressed by the stress due to the load; and in all forms of the beam or girder the material is partly extended and partly compressed by the flexure which it undergoes as it bends under the load,—thus when a beam of wood carrying a load bends, the upper side of the beam is thereby shortened and the fibres compressed, while the lower side of the beam is lengthened and the fibres extended.

Beams or Girders may be of various materials,—wrought iron, cast-iron, and wood being chiefly employed.

Arches may be of masonry, or they may be of wrought or cast iron or steel, in which case the compressed sector of a ring is usually a continuous and stiff structure.

_ Suspension bridges are made of wire ropes or of separate links of wrought iron or steel pinned together so as to form a chain. The metal beam, arch, or suspension bridge nay be a continuous structure or an open frame; we shall

also find that in some designs the several simple types are combined so as almost to defy classification.

Whatever design be adopted, the strength or efficiency to carry a given load depends on similar considerations. The designer selects that form of superstructure which the principles of statics show to be most desirable; he calculates the maximum stress which the load can produce on each part, and then so distributes his material that the maximum intensity of stress on every part shall be a definite

fraction of the ultimate strength of the material. In metal structures, where the above principle can be very perfectly carried out, this fraction varies from one-sixth to one- third, according to the certainty with which the stresses and strength of the materials are known. In stone struc- tures the engineer has greater difficulty in calculating the stresses on each part, and relies more on empirical rules based on long experience.

I. STRENGTH AND OTHER PROPERTIES OF MATERIALS EMPLOYED IN BRIDGES,

§ 3. Classes of Stress—There are three kinds of stress, due to tension, compression, and shearing. Tension tends to cause failure by the extension or lengthening of the part strained ; compression tends to cause failure by the crush- ing of the part strained ; and shearing stress tends to cause failure by the sliding of one part of the piece across the other from which it is shorn off.

§ 4. Tenacity, or Strength to resist Tenston.—W hen tension is applied to a rod or link of any material so as to be resisted equally by each element of any imaginary section in a plane normal to the direction of the pull, this section, which is called a cross section, is said to be subject to a stress of uniform intensity. This intensity p is equal to the quotient of the whole pull P divided by the area 8 of the cross section, or

Te 145 (Se opie ee Page

The ultimate strength of a rod subject to uniform stress is proportional to the section 8, and the ultimate strength of the material is measured by the

maximum intensity of stress which it can bear, or in other words, by the stress which the unit area of cross section can bear; for example, if the unit of force employed be the weight of a ton, and the unit of area the square inch, the strength of materials will be measured in tons per square inch, or by the number of tons which will just tear asunder a rod one inch square, great care being taken that the load is so hung on the rod as to bear equally on all parts of the cross section.

The following table gives in tons or lbs. per square inch the ultimate strength 7, of some of the materials used in bridges :—

TABLE I.— Tensile Strength of Materials = f,.

Name of Material. Tons per sq. inch. Wino Mom Plate goes sanateaieeaedenncst etme 20 to 25

5 a eemnanld. Boltst cceetaaame dees cor 8s 25 to 30

“i an WARGR «2s Oe OE ose 80 to 45 Siteell WPAtes. 5..ccsccse0 2 nee RE STD csc a Oo 80 to 40 Bice MEIC Se aise cion cs tiaacsn ts Woviece soe aseenwe, mate 41 to 48 bec le Withee. caves scan ess dswcoanemas deconenpebamennempO On lO) G nie Ler nO Meese sale Sis Meni attics wen sneha 6 to 8 EAC Gans Wate ye trent Sic sucacoceesad each tas OR tO one NLM em swista stecicfstna si desyers apis Diac eie en ate a ciel eet sr 4 to 5°5 Dalles ctaanicd i eekicsccaace SB uarat ee ae 4°5 to 8°5 CMDR al i Ws woe nia Ne setae ost heaasr MaMa suet eaenssie Cee 6 to 9

Lbs. per sq. inch.

Brick (epecimens of).....5… .c…cesecsnee synensenceneeOO BO SUD Basalt Be Seca oveey eects: 07 ok eee 1000 Sandstone ,, PO ee ere mercenaries es Conmrnro ne ORB, 6 8eii ccs nciienen an omogaeeanceones aeciace 10 to 50 Ta Gee Weullte Ai Wss ehte sep pennies sane seeeeeebmdod edited Moco. 85 to 140 Roman Cement, 12 months old…….....+.0-0-+n.000 46 Portland Cement, 7 daysiold) o-...4.c-ce scree ewer 270

ae a 12 months Old… i… ccs… eedoO tot ZO

The ultimate strength P, of a bar with the cross section 8 to resist a stress uniformly distributed over that section is given in terms of /, by the expression—

Ss et ee Table I. gives some idea of the tensile strength of tne

inaterials, but for a full comprehension of the subject special treatises, or the article on the STRENGTH oF MaTERIALs,

must be consulted. No two specimens of any material ever give exactly similar results. The various brands of iron differ much; different specimens of steel differ still more; the strength is greater when the stress is applied along than when it is applied across the fibres. Iron or steel forged or drawn down to a small cross section is stronger than when in large masses ; the material in small castings is stronger than in large castings run from the same batch of metal; the skin is stronger than the rest of a casting. The variations to be expected in timber are still greater than those in metals, and the values for stones or bricks must in each case be specially determined by experiment on the special kind to be used. These warnings are applicable to the subsequent tables, which give the strength of materials to resist other kinds of stress.

§ 5. Strength to resist Crushing.—The law given for tension applies to the compression of blocks, so that the strength /, of a material to resist crushing may also be measured in tons per square inch. Thus the ultimate strength P, of a block of the cross section 8, subject to a uniform stress, is given in terms of /, the strength of the material per unit of section by the expression —

fi.” 7 > Sao

This equation is not applicable to blocks or struts of iron in which the ratio of the shortest side of the cross section to the length is less than about 1 to 5, nor to struts of timber in which this ratio is less than about 1 to 10. When this limit is passed the strut bends before failing (vide §57), and whenever this occurs the essential condition that the stress shall be uniformly

distributed no longer obtains. The flexure increases the stress on the inside of the curve assumed by the strut or pillar, and diminishes it on the outside ; but the strut will fail as soon as any part of the cross section is subject to a crushing stress of greater intensity than 7.

Tasie Il.—Ultimate Strength to resist Crushing =f,

Name of Material. Tons per sq. inch.

BORED AON Tries cess Poeun diy er velny-ee – 15 to 18 CPI 2000855, buh ident! Cet aot As oe is 37 to 65 gn EL RE Pe es 90 BOW Te ice vse ceil co cote ee rate wee 2°4 to 2°76 RMLEGH oy eres ara ts. Ream lisa oda MUSE FA So ath 2° ee eee foe en eee Cee 27 to 45 MIS sense wsiiosensriess ‘ikea AS iv elec se ha 4 Bricks— Lbs. per sq. inch. Portland Cement, 3 months old.. ..... 2460 es a ee he ees 3750 RIG TOON ia oso cs xtitnesga 2m meeps ewe 710 to 930 RF Oe ss: censcacontete: wxosses MO ha 309 is poor GQnualtey sco. ecesccc ds sceee uss 60 Wee OE 6 rinse hac A ances RO 490 Biot Pine Ete iew 5. ee cccnaess dese vcwssweeuccw seeds 930 TNS 81a ac mori ares mee 1260 Stones (specimens)— Portland Stone (on bed)... ..... Goshen te 2630 a of (GeeiMSt Ded) ccpescc tec sse. oot 2390 Bramley Fall (on bed)..... Prone ee 5100 re ao) (OPetiNet Ded): sn2’s dase eens 2950 Yorkshire Landing (on bed)..... 5380 ts Pr (agaimst bed).....:..... 5850 QU Ge. trea coe ee 5500 to 11,000 NCOUCHMBASSI EG . -5 Saas. ee ks | ee ee ee 8300 (GieEUS CONG. hereon nae eee 17,200 Sandstones (ordinary)..... .... 83300 to 4000 NONE sometime ae 330 to 500 IBF he… vc 08 cane ewan he eet tat oe See 420 to 580

§ 6. Strength to resist Shearing.—Let a bar AD of any material be firmly supported on C, as shown in fig 1, and let a strong tool B, say of steel, descend upon it in the direction of the arrow, with force sufficient to sever the part D from

BRIDGES

[STRENGTH OF MATERIAIg,

therefore cud slightly, but for true shearing the lower face ought to be square, and the tool should come down close

to the support, so that the inner face of the tool slides on the outer face of the support.

Fig 2. represents two iron links joined by an iron pin. If the links are pulled asunder the pin will be shorn

at two places, A and B, and the whole section shorn will be twice the cross section of the pin.

Fig 3 shows a joint where the pin would be shorn in four places—A, B, C, and D.

The strength of a piece of any material to resist shearing is usually assumed by engineers to be proportional to the cross section to be shorn through, and each material may consequently be said to have a certain shearing strength per square inch; in other words, the ultimate shearing strength of the material is the intensity of stress required to shear it asunder. If, therefore, P, be the ultimate strength of a bar of cross section § to resist shearing in n places, and if f, be the ultimate strength of the material, we have the expression—

l. . § « «@ aye Bye

The assumption on which this equation is font not strictly correct ; indeed, the actual shearing describ

the part A, so that the surface dividing the two parts isin the | does not correspond with any simple homogeneous stress,

plane of the face of C. This tool is said to shear the bar, and the resistance which the bar opposes to this stress is

and the form of the cross section shorn through must exer cise considerable influence on the strength of the piece to

called its strength to resist shearing. The tools practically | resist shearing. In a round pin the maximum intensity

used to shear are not quite square at the edge, and

of shearing stress is 4 of the mean intensity, and in a reck

‘

gTRENGTH OF MATERIALS. |

angular pin } of the mean intensity. See STRENGTH OF

| MATERIALS.

The pins which join the links of suspension bridges, and the rivets which join the wrought iron plates of girder bridges, are subject to shearing stress, and the area to be shorn through must be made sufficient to bear the total shearing stress on that part of the structure. Wood is strong to resist tension, and would be much employed for ties but for the difficulty of taking hold of the ends of the

_ tie in such a way that these ends shall not fail by being shorn.

Fig 4 shows the end of a balk of wood with a strap bolted to it. This strap would be torn off by the shearing

of the wood along the dotted lines ab and cd, with a stress which would be much less than that required to overcome the tenacity of the wood ; for if the dimensions of the balk of pine are 6 in. by 2 in. with an inch hole, its tensile strength will be 10 × 5 or 50 tons, while if the bolt be 1 inch diameter, and be placed 4 inches from one end, it could be torn out by shearing 16 inches of the wood ; now each inch will only resist a shearing stress of say 600 ib, so that the bolt would be torn out with only 43 tons. Thus at least eleven such bolts, each 4 inches from its neighbour, and occupying 3 feet 8 inches in length of this balk, with an iron strap of corresponding length, would be required to render the full strength of the

balk as atie available. A similar difficulty is met with when timber is joined, as in fig. 5, where shearing would take

Tasue III.—Ultimate Strength to resist Shearing =f,

Name of Material.

Tons per sq. inch.

BME ONIN 50 siccv’edissa’sce se sce devessbeseadee 14:5 ae 22 Ee IIVCLAS cnc sccenes cceceeceeccussevcetuaveva 30 to 36 SR OE loys wissio acs ao. vc mvestouast venisgineweroee 22 to ‘35 cia. 05 Sasi side nwnamssarnntncseeee ead “43 to °75 ne is

The strengths given here for wood are those obtained by testing the resistance*to shearing along the grain.

The strength of wrought iron to resist shearing may be taken as practically equal to its strength to resist tension— an assumption which facilitates the design of rivetted and other joints.

The strength of steel to resist shearing is less than its strength to resist tearing in the ratio of three to four approximately. Rivetsemployed to joint steel plates require, therefore, to be larger or more numerous than those em- ployed for iron plates of equal dimensions.

§ 7. Hlasticity—When a piece of any material is under tension or compression, it is lengthened or shortened by the stress, and the amount of extension or compression for the same length and stress varies with different materials. Approximately correct results are obtained by assuming

that the extension or compression of a given piece of the material of uniform cross section, under a uniformly distri- buted stress constant throughout its length, is proportional to the length of the piece and to the intensity of the stress.

Let p be the intensity of the stress in tons per square inch, let / be the length of a specimen of a given material in any unit, and let ¢ be the extension or compression

: : : L. observed in the same unit. Then the expression . is,

on the above assumption, a constant quantity, and this ratio is experimentally found for many materials to be sensibly constant for stresses which do not approach the ultimate strength. This constant ratio E has received the name of modulus of elasticity, and is generally expressed in tons per square inch, this being the unit in which p is measured. Thomson and Tait (Zlements of Nat. Phil.) call E the “measure of longitudinal rigidity,” a better name than the modulus of elasticity. The actual extension or compression ¢ of any piece of a structure is given by the expression— l Ws Geen Saeen) ate where p is in tons per square inch; e¢ will be given in terms of the unit in which / is expressed.

TasLE [V.—Modulus of Elasticity = K.

Name of Material Tons per sq. inch. | Name of Material. Tons per sq. inch. Wrought Iron..10,000 to 13,000 | Slate…..... 5800 to 7100 Tron Wire…..... 11,500 Red Pine…..... 650 to 850 Wire Ropes….. 6700 IL zbie Oeenerrmae nae 400 to 600 Steel Bars…..... 1.3000! toy 1OMO0O) || Oakes oe scence. 585 to 780 Cast-iron…... 6250 to 10,000 ? Teake: 1.2.2.0… 1070

The modulus of elasticity is ‘very generally assumed as equal for extension and compression, which ‘is nearly true for wrought iron and steel under any stress to which these materials can be safely subjected. The principle of con- tinuity shows that there can be no difference in the value of E for positive and negative stresses so long as. these are small. The law according to which E varies as p changes is not accurately known for any material. When the stress is small the value of E appears to be more nearly constant in wrought iron than in cast-iron, but the change in the value of E corresponding to a change from a small stress to the ultimate stress is greater in wrought iron than in cast-iron. The values in the table cannot be depended upon to give very exact results, as the elasticity of different speci- mens of the same material varies considerably ; the theory is wholly inapplicable when the breaking strain is ap- proached ; the engineer,

however, seldom requires to calcu- late the extensions or compressions when the stress is even so great as one-third of the ultimate strength. For the same reason the engineer need seldom take account of the permanent set caused by stresses exceeding those within which the material may be considered perfectly elastic. B. D. Stoney, in his work on the theory of strains on girders, gives an excellent summary of what is known experimentally concerning set and the modulus of elasticity.

§ 8. Strength to resist Tension or Crushing when the Stress zs not Axial.—When the resultant of a stress passes through the centre of surface of the cross section of the piece of a structure, and is normal to the cross section, the stress is called axial, and it is usually assumed that this stress will be borne uniformly by all the elements into which the surface of the cross section may be conceived as divided. This is not necessarily true, but it is approximately true for the forms usually employed by engineers. When the stress is not axial it cannot be considered, even approximately, as uniformly distributed ; the greatest intensity of stress will occur towards that edge of the cross section which is nearest

to the point where’ the resultant meets the plane of the cross section. The following considerations allow the maximum intensity of stress to be approximately calculated in most of the cases which are practically met with. 1. Let the cross section (fig. 6) have an axis of sym- inetry XX,, and let YY, be an axis pass- | ing through the centre of gravity of the sur- face at right angles to XX,; the axis YY, will be called the neutral axis. 2, Let the resultant stress pass through some point A in the axis XX,, at a distance 2, from the axis YY,. 3. Let the material be such that its modulus of elasticity is constant under all the intensities of stress which result from the given total stress ; then calling the whole force P, the area of the cross section §, the mean intensity of stress p), the maximum intensity of stress p,, the maximum distance of any point of the cross section from the axis x), and representing by I the moment of inertia (vide § 9) of the surface of the cross section round the axis YY,, we observe—first, that

Fig. 6.

P a and secondly, that the non-axial force may be assumed to produce a uniformly varying stress, the maximum intensity of which will occur at the distance «, from the neutral axis on the same side asa, is taken. – This uniformly varying stress is equivalent toa uniformly distributed stress of the intensity y, and a couple of the moment al, where a is the coustant rate of increase of the stress. We also know by the principles of mechanics that the force P applied at a distance x) from the centre might be replaced by an equal force P at the centre and a couple of the moment Pap.

Hence we have— P + Le i » «= Seen ora=—,

But the maximum intensity of stress due to the couple will Paw, I sidered as consisting of two parts,—first, the mean intensity of stress p), and secondly, the maximum stress due to the

couple. Hence we have—

Pax Ly Ly a . . 4s =F = py (1+ sal

This equation shows that the maximum intensity of stress increases very rapidly as 2, increases, and it must be borne in mind that the ultimate strength of any member of a structure is determined, not by the mean stress, but by the maximum stress on any part, for when the part most strained yields the structure is weakened thereby, and this failure must continue to extend until the whole yields,

§ 9. Note on the Value of I, the Moment of Inertia of the Cross Section.— Suppose the cross section divided into a very large number of rectangles, so small that the distance «x of the centre of each from the neutral axis may be taken as sensibly expressing the distance of every part of the rectangle ; then I is the sum of the products of the areas of all the elementary rectangles each multiplied into the square of its distance from the neutral axis; or calling the area of the elementary rectangle ArAy,—

It ns s ws DeBetbay.,

be 43a, 4.6, , and the maximum stress p, may be con-

The subjoined table gives the values of I for some simple geometrical forms ; the axis in all cases passes through the centre of gravity of the surface.

Taste V.—Moment of Inertia = I.

| 7 Surface. Neutral Axis, 7 Circle, radius r Diameter dort Square, side d Parallel to one side oe Square, side d Diagonal thd Rectangle with sides d and 6 | Parallel to } prbd Triangle, base }, height d Parallel to 8 sydd}

Whenever a cross section can be conceived as obtained by the addition or subtraction of one surface to or from another both surfaces having a common neutral axis, the value of I for that cross section is got by adding or subtracting the value of I for one surface to or from that for the other: thus for a ring surface, with external and internal radii and 7, the value of I is—

t7#(4*-F7,9.

The value I, of the moment of inertia of any plane surface S round an axis in its own plane parallel to the neutral axis, and at a distance 2) from that axis, is given by the equation—

I, =1+8z,?,

where I is the moment of inertia of the surface round a neutral axis, ze, round a parallel axis passing through the centre of gravity of the section. We can thus obtain the value of the moment of inertia I of complicated cross sections whenever we can divide these into rectangles, circles, or triangles ; for then, calling s,, 8), ss, évc., the sur- faces of each elementary part, 2, %, 2 the distances of the centre of each part from the neutral axis of the whole cross section, and I, I, I,, the moments of inertia of each element calculated round its own neutral axis, we have the moment of inertia of the whole round its neutral axis—

3 © » wo Apel ae,

§ 10. Specific Gravity of Materials.—In order to calcu- late the load due to the superstructure of a bridge, and the stability due to the weight of the abutments and anchorages of arches and suspension bridges, it is necessary to know the specific gravity of the materials employed—specific gravity being for the purposes of the present article defined as the weight of the material in lbs. per cubic foot. The follow- ing are the most useful numbers :—

Taste VI.— Weight per Cubic Foot of Different Materials.

Weight of cubic

Name of Material. foot in Ibe

Water (pure) at 39°74. Fabr. .....0c.c.cccsseeetees 62°425 at a ee 187°3 LS ee er eS re 100 to 135 Brickwork (OnGiIMABY) cio..6¢c0c2coonssves apse 112 Cae Se ectt acon ok ee 117 to 174 Lo on ee en 120 ee ere 164 to 172 Limestone and Marble….....0.c0ccsecesseeees 169 to 175 Cs A ee 116 to 144° Le a ore eee eee 86 to 119 ee ee ee ee 102 een 130 to 157 Sand (aan) ajo alate § 5 sfatae seers clea eee 118 BAH (GG) paccascenety ath oe ee 88°6 ROE Ski. ee eee coy tutta oe eee 156 Conerote (ordinary) si.icbcissi ssciennss wwertnnngwe any 119 Conoreite TM, CREE cacsa is sc20s.exuwininns ameeueeeneee 137 WANE ise gins sotto Cocouaiiis jak 2 77 to 125 PG oi sccm ti, Fut ROR vga. he ac 175 to 181 i ee ee ee ee 170 Castsinon. (amerage) oo. ssnss cantvenewns cade eee 444 Wrought, Lom (sverage).....ccsc¢TWN 9 Gcoyesress cape pet eens ieee oa 30 to 44 LG 2 os Ree ae eee 31 to 35

Oak (There peat) si. .4ccberetrwnsites. ones: ee 43 to 62

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§ 11. Change of Length due to Change of Temperature.— | the pier bearing load P, and w the weight of the load per

change of temperature exercises a material influence on the durability and strength of structures, and must not be lost sight of in the design of any bridge of more than common dimensions. The following short table gives the coefficient by which the length of a bar of each material measured in any unit must be multiplied to obtain the increase in length (in the same unit) resulting from a rise of temperature of 1°’centigrade.

TABLE VII.—Coeficient of Linear Expansion per degree cent.

_Cast-iron. Wrought Iron. eS or (comin a 0000011 “000012 “000008 to °000009 000012

Dry Deal, in direction of grain.

0900043

Brick (best Stock).

“0000055

Brick (Fire).

000005

Slate (Penryn).

00001

IJ. Beams orn GIRDERS.

§ 12. Haternal Forces.—The beams or girders of bridges are subject to vertical loads, and they are supported by vertical reactions at piers or abutments. The sum of the loads is, therefore, necessarily equal to the sum of the reactions at the points of support ; or calling P and P, the weights borne by two abutments (when the girder has no other support), and w,, wv, ws, &c., the loads on various parts of the girder, we have—

ee. P+ Py, = Se.

Let L be the distance between the points of support, fig. 7,

Fig. 7.

and let «,, x, x, be the distances of the several loads 7, we, w, from the abutment bearing the weight P; then, taking moments round the point of support at the above abutment, we have the upward reaction at the pier x span = the sum of the products of each weight into its distance from the point of support, or 2. . P,u= wa, and similarly PL= Sw (L—-2«). When the distribution of the loads is known, equation 2 gives the weight borne by each abutment. Applied to the case of a single load W rolling from end to end of a beam, calling # the distance of the load from the abutment supporting the weight P, equation 2 gives Wa W(L—2) aaa =— a Py L and P L Applied to the case of a uniform advancing load, such as a railway train gradually covering the whole beam (fig. 8),

Fig. 8.

calling x the distance covered by the train measured from | shearing stress resisted by the ae in a very —— oe

‘The change in the dimensions of structures due to a | unit of length, equation 2 gives

2

Be on, Gites Pi =, and P= wx These equations express the fact that the beam, as used in a bridge, is as a whole in equilibrium under a system of parallel vertical forces which may be called the eaternal forces, and which are all detcrminate so soon as the dis- tribution of load and the span are given.

§ 13. Internal Forces.—The external forces call into play certain internal forces. A beam of given design will be properly proportioned if each part has just those dimensions which are suitable to bear the maximum ¢nternal stress which any distribution of load can bring to bear upon it; and the beam will be properly designed if its form is such as to enable it to bear the load with the least possible quantity of material. A complete analysis of the

internal forces in a loaded beam would in any case be exceedingly difficult and with most designs impos- sible, but it is found by experiment that a beam will bear a given load if we provide strength enough to resist the horizontal components of those internal forces which tend to extend or compress the beam in the direction of its length, and if we also provide against the vertical com- ponents which tend to shcar the beam across in planes perpendicular to the longitudinal axis of the beam. The nature of the horizontal and vertical forces due to the elastic reaction of the material will be understood by refer- ence to figs. 9, 10, 11.

Let a model be made of four stiff light frames of wood A, A,, A,, Ag, each say 18 inches deep, 18 inches long, and 6 inches wide (fig. 9). Let these be connected with one

Figs, 9;

another by smallcylinders of india-rubber, a 0 ¢ d, a, 6, c,d, and a,b, ¢,d, These cylinders must be so attached to the frames as to be capable of resisting both extension and com- pression. The whole structure will now have somewhat the appearance of a beam, but if it is placed between two sup- ports Q, N, it will be found unsuited to curry even its own weight, because the middle frames will tend to slip down between the two others.

This tendency will be still better seen when a load is placed on the imperfect beam. Fig. 10 shows the tendency

to shear off the loaded from the unloaded part of the beam. The frame A, is forced down below the frame A; by a

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imperfect manner. To make the frame into a true beam, this tendency of the loaded frame to slip through between the others must be counteracted by tongues, T, Fut projecting from one frame and working in a groove in the neighbouring frame (wide §19). Each tongue should be made so that it does not abut against the bottom of the groove, and is thus incapable of resisting any horizontal force—it must neither prevent the whole beam nor any

part of it from being extended or compressed longitudi- |* distance By nally. :

The structure will now be found capable of carrying weights as a beam.

It deflects or bends as in fig. 1]

Fig. 11,

under the action of a load on A,; all the pieces of india-rubber above the centre of the beam are then com- pressed ; all those below the centre are then extended ; and at the sections between the frames the horizontal internal forces are wholly met by the elastic reaction due to these horizontal extensions and compressions.

At any one section, say at a distance x, from the support Q, the pieces c, and d, are just as much compressed as the pieces 6, a, are extended ; the equal and opposite parallel resultants of these forces consequently constitute a couple, and the moment of this couple must be equal to the moment of the couple tending to bend the beam at this section, or to what is called the bending moment ; now the bending moment in this simple case is due to the up- ward vertical reaction P, at N and the equal downward force with which the frame A, bears on the tongue T, ; for it is clear that, neglecting the weight of the frame, if a weight W on frame A, is borne by two forces P and P, at the two piers, the tongue next N must also bear a vertical force P, and the tongue next Q a vertical force P. The stresses borne by the india-rubber pieces are exactly the same as if the frame A, were firmly held, and a vertical force P, applied to pull up the right hand part of the beam, while the tongue T, acted as a hinge; the moment tending to turn the right hand part round in a left-handed direction would be P, (L—z,). This moment is resisted by the elasticity of the india-rubber, which must exert an equal and opposite moment round the same point, Calling s,, 8, 8, the sectional areas of the pieces of rubber, and ¥;, Yo, ¥, their distances from the axis where the section is neither extended nor compressed, and Py Po» Ps the inten- sity with which each piece is strained, the moment due to the elasticity of the pieces of rubber tending to turn back the left hand part of the beam in a right-handed direction will be Spsy. Now, if the modulus of elasticity of the rubber is constant, the stresses p,, P,P, will be propor- tional to their distance

from the unstrained axis ; thus if 6, is 18 inches from the axis and c, only 9 inches, 6, being shortened twice as much as ¢,, the stress on 6, will be twice that on c,, and calling a the stress at unit distance from the axis we have Py = ay, and p. = AYo, Dy = AYpy 80 that we way write Spsy = aSsy2 as the expression for the moment of the elastic forces. Hence equating the bending moment and the moment of the elastic forces, we have—

ho… . PL a) =adsy?.

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From this equation when the load is given we ma determine a, and hence the intensity of the stress P = ayat any distance y from the axis. If this intensity is lesg than the safe stress for the material, the beam is, at the section considered, strong enough to bear the load so far as the horizontal extending and compressing forces are concerned, Thus if the dimensions of the beam be those given above and it be supported so that L may be 6 feet and the 2 feet 3 inches, the distance y of the outermost piece of rubber from the unstrained axis 8 inches, the weight 50 Ib, and the section of the rubber in each row 2 inches (two cylinders side by side, each with a section of 1 inch) we shall have as the numerical values in the above equation, neglecting the weight of the frame itself (P, being nearly = 18-7), 18:7 × 45 in. =q (4 × 8 + 4× 4?) from which a = 2°64; then the force supported by each inch of either of the rows of rubber a, or d, will be p=8 × 2°64=21-12 Ib; the stress on each of the Inner rows will be half this amount ; the same equations give the load which (so far as that particular section is concerned can safely be placed on the frame A, consistently with a given stress per square inch on the rubber. The strength required in the tongue T, is still more easily found, the stress tending to shear it off is P,, and it must have a suffi- cient cross section to bear that shearing stress, Similar reasoning would allow us to calculate the strength of our beam at either of the two other sections where the india- rubber pieces and tongues are placed. The general relation between the external and internal forces in any beam is similar to that illustrated by the model; at any section the moment due to the elastic forces must balance the moment due to’ the external forces tending to bend the beam at that section. The problem, therefore, of determining the

strength of a beam at any section resolves itself, so far ag the horizontal forces are concerned, into finding expres-

‘sions for these two moments and equating them. The

equation thus stated will give the maximum horizontal stress thrown on the material of a given girder by a given load, or it will give the maximum load on a given girder consistent with a safe stress on the material, or if, as is generally the case in bridges, the load and maximum safe stress on the material are given, the equation will allow us to fix the dimensions required for the cross section of the beam so far as the horizontal forces are concerned. The provision

In any solid beam the stresses do not divide themselves beam the actual stress at any point will be the resultant of stress (borne by the cS oS X shows the direction of Big. ia, stress. of a given beam under a given distribution and magnitude segments into which the section divides the beam. It isa other negative. Let x be the distance of the section from the

to be made for resisting the shearing stress for which the tongues are required in the model will be explained in § 19. into horizontal and vertical components. This division is made by the engineer to simplify his calculations. In the the horizontal stress (borne by the india-rubber in the model) and the vertical = —S=3 tongue in the model). SS —\ The diagram, fig. 192, the resultant stress at each point of a beam of rectangular cross section. The curves are called the lines of principal §14, Bending Moment and Moment of Elastic Forces or Moment of Stress.—The bending moment for a given section of load is the sum of the moments, taken relatively to the section, of all the external forces acting on one of the two matter of indifference which segment is considered, but the moment on one segment will be positive and that on the left hand abutment Q of any beam of span L (fig. 13), Let P be the load borne by abutment Q, and P, the load borne by

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abutment N. Let the load on the beam, including the weight of the beam, be divided into any number of equal or unequal parts. Let those loads which lie to the left of the

Fig. 13.

section be called w,, wa, ws, &c., and let the distances of their.

centres of gravity from the section be called /,, J, 25. Let those loads which are to the right of the section be called ‘ly Ug) Us, and let their distances from the section be called 1) To 73 ec. Let the bending moment at the section be called M, then by the above definition

M = Px — Sul = Sur — P(L — x).

This bending moment is resisted at the section by the _ elastic forces in the beam called into play by compression | at the top and extension at the bottom, or, in other _ words, called into action by the stresses on the material. _ Limiting our consideration to those cross sectious which have a vertical axis of symmetry, and to those materials _ which have a constant modulus of elasticity for tension and compression, it is easy to find a general expression for the moment of the elastic forces, which will hereafter be designated by the letter. Let the horizontal axis ZZ, (fig. 14) be a line along which the material is unstrained,—

hg

Fig. 14.

| all the portions above this line being compressed, and all the f portions below this line being extended. Conceive the sec-

tion divided into little elementary surfaces, the area of each | being equal to the product of the little elementary length | Ay into the little elementary length Az, the force exerted by the elasticity of this element will be proportional to its area AyAz and to its distance y from the axis ZZ,, for the longitudinal extension or compression is directly propor- tional to this distance ; then calling a, as before, the rate at which the stress increases

with the increase of y, or in other words the intensity of the stress at the unit distance from ZZ,, we shall have for the force exerted by each element the expression aydyAz. Now, as the section is

not moved as a whole along the beam in either direction, we must have SayAyAx=0, that is to say, the sum of

the positive must be equal to the sum of the negative

forces. Let the constant quantity aAyAz be conceived as the weight w of a thin plate of the area AyAg, the moment of this weight relatively to the axis will be wy, but as we have the sum of the moments Swy= SayAyAuz= 0, the axis ZZ, round which these moments are taken must pass through the centre of gravity of the section. This axis is called the neutral axis of the beam (vide§ 18). The expression for the force exerted by each element being ayAyAa, the moment of this force, or, in other words, for the moment due to the stress, is given by the expression ay*AyAz; then for the moment p of all the forces round ZZ, we have—

20. 2. . . pHatyAyAc=al,

where I is the moment of inertia of the surface of the cross section. This expression » is Rankine’s moment of resist- ance to flexure; it may also be called the moment of the elastic forces, or, as suggested by Professor Kennedy, the momeut of stress.

The greatest intensity of stress p, occurs at the greatest distance from ZZ,, or at the distance 4d if the depth of the beam be called d, and the axis ZZ, be equidistant from top and bottom. In this case we have— ora= =A F hence we may write for sections with two axes of symmetry, and for materials having equal strengths and constant moduli of elasticity under tension and compression—

ad P= 2?

_9 fl a iol a

Now, the general condition of equilibrium between the

external forces and the elastic forces at the section is simply

M =p, hence when the beam does not break we have also— ul

Pe: hi ueis a + Mee

Whenever the amount and distribution of load on a given girder is known the bending moment M is to be calculated from equation 1, and then equation 4 allows us to calculate p,; or if we know the value of f, the ultimate strength of the material to resist tension and compression, this equa- tion enables us to find what moment M, is required to break the beam at that section, and therefore what load distri- buted in a given way the beam can bear; thus we have—

QFfT Bo ME,

In a beam of uniform strength the value of will at

afl a)

| every section be equal to the value of M,, the moment due

to external forces at that section.

When the material is not equally strong to resist tension and compression, let f, and f, be the two strengths (per unit of cross section), but let the modulus of elasticity be assumed constant as before. Then, as above, the unstrained axis will be the axis passing through the centre of gravity of the section, and the intensity of stress at any distance y above or below that axis will be ay; let y, be the distance of the uppermost element of the cross section from the horizontal axis, and let y, be the distance of the lowermost element. Then the greatest stress will occur at the top if y, be greater than y,, but at the bottom if y, be greater than y,; since, however, the material is not equally strong to resist tension and compression, it does not follow that it will give way where the stress is greatest, and the beams

will yield first at that edge where the ratio

is greatest.

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We must, therefore, on a beam of this kind ascertain whether “ or 2%

Gis ‘ is the greater, and replace 5 in equations

¢ t 3 and 4 by the value of y in the larger of the two expres- sions. Having selected y and f in this manner, we have—

fl eK Ren eat on dye §15. Modulus of Rupture.—If the above hypothesis of a constant modulus of elasticity in a given material under both descriptions of stress, and under stresses of all magnitudes, were accurate, we should require no fresh experiments to determine the values of f, and f,; these would be already known from direct experiments on tension or compression. For both wrought and cast iron beams of the maximum strength, such as will be described hereafter, experiment gives results closely in accordance with strengths calculated by equation 6; and for wrought iror. beams the hypothesis appears to be approximately true when tested by experiment with any form of beam. But it is usual, in calculating the strengths of beams or bars of simple rectangular or circular cross section, to assume that y is equal to $d and to employ equation 5 instead of equation 6. The imperfection of the theory is then to some extent corrected by determining f from direct experiments on solid rectangular bars. The value of M,,I, and d being known, f is calculated from equation 5, and the number thus determined has received the name of modulus of rupture.

Taste VITI.—Modulus of Rupture = f (Rankine). Name of Material. Wrought Iron Plate Beams… ... . Cast-iron Solid Bars …...0….00..ccccece eee Fagersta Steel (Kirkaldy) Red Pine SO Le ae Oak (British and Russian)..... Indian Teak Sandstone

Lbs. per sy. inch,

42,000

33,000 to 43,000 MSE phe isnaenctans 110,000 to 191,900 7100 to 9540 5000 to 10,000 . 10,000 to 13,600

14,770

1100 to 2360 Experiments on the modulus of rupture have generally been made by hanging weights at the centre of a rect- angular bar, supported at both ends, and increasing the weights till the bar breaks. Then let 5 and d and J be the breadth, depth, and length of the bar in inches, and W the breaking weight. M is a maximum at the centre, and, neglecting the weight of the bar, is equal to }W/; substitut- ing the value of I for a rectangle in equation 3, we get

a at bd?,

and equating M and « we have— 3W1

Le {= Dba?

or, if the span is measured in feet and called L,, while } and d are measured in inches, we have—

WL, mi 9 3) eee f=18 55. Hence the modulus of rupture is stated by Rankine to be “ eighteen times the load required to break a bar of 1 inch square, supported at two points 1 foot apart, and loaded in the middle between the points of support.”

The use of a modulus of rupture determined by experi- ment on a special form of beam is not based on any satis- factory principle. The employment of this modulus is an imperfect means of correcting a defective theory. A dif- ferent value is found for f when bars of different sizes or cross sections are tested. Even the same bar broken in different ways will give a sensibly different value for /. The use of this modulus is, however, convenient when great accuracy is not required.

§ 16. Hxpressions for the Bending Moment caused by Special Distributions of Load.—From equation 1, § 14, it is easy to |

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deduce the following valucs for the bending. moments in beams subject to various simple distributions of load :—

Case 1. Let a single load W be placed at the centre of a beam ; let M, be the moment at any section taken at the distance x from the nearest pier; let M, be the moment at the centre of the span, we have—

lL Ee gee ee, ee

M, is the maximum moment at any section of the beam, Case 2. Let a single load W be placed at the distance # from the nearest pier ; let M,, be the moment at the sec

tion where the load is applied—

3 Mwy

M,, is the greatest moment which the load at that place

produces at any part of the beam, and increases as the load rolls from the end to the centre in proportion to the product (J—2,) 2, of the parts into which the load divides the beain.

Case 3. Let the load be uniformly distributed along the beam so that each unit of length bears an equal load

wed, when the unit of length adopted is the foot, the

quantity w is called the load per foot run. Let M, and M, be as before the moments at the centre of Span, and at any distance from the nearest pier, we have—

J |

OL? agli ae M,=4w 2(l-<2).

When a uniform passing load, such as is approximately represented by a train of locomotives, of length at least equal to the span of the bridge, comes on to a bridge at one end and passes over to the other, gradually covering the whole span, the bending moment reaches a maximum for all sections when the bridge is wholly covered. The bending moment at any section for a combination of loads is the sum of the moments at that section due to each load taken separately. When many different distributions of load have to be provided for engineers are in the habit of representing the bending moment for each load by a line, the ordinates of which are the bending moments at the sections, and the abscissz the distances of the several sec- tions from one point of support. The lines having been drawn for the several loads, it is easy by superposition to find the bending moment due to the combination, and thus to pick out for each section of the girder the maximum bending moment which any combination gives Figs. 15, 15a, 150, and 15c show diagrams giving the curve of bending moments for some simple distributions.

Fig. 15 shows the line of bending moments whena single

Fig. 15.

load of 10 tons hangs at the centre of a span of 50 feet The vertical ordinates measured on the vertical scale give the bending moments at each section. Fig. 15a shows the curve of bending moments for a uniformly distributed load

The upper | drawn below the datum line where the moments are nega-

‘ of 1 ton per foot run on a span of 50 feet. curve in fig. 15 shows the curve of bending moments

200 200 00/7 fon.

—— 100

Fig. 15a.

when the loads of case 1 and 2 both occur at once. This curve is obtained by adding the ordinates in case 1 to those in case 2. Fig. 15c shows the four separate lines of

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Fig. 150.

bending moment for four separate weights, and the broken upper line is the line of bending moments for the case when the four loads all rest at once on the beam; it is got by simply adding at each point of the span the four

‘ordinates due to the four loads considered separately. The

curve in fig. 15a andthe curve ABCD in fig. 15c are para- bolas,

The bending moment at any section is reckoned as posv- twe when the external forces on the beam tend to turn the right hand side of the beam in a left-handed direction (or in the direction opposite to that followed by the hands of a watch), in other words, when the bending moment tends to bend the beam downwards between the supports. We shall hereafter see that in beams with more than two sup- ports the bending moment is at places negative, tending to bend the beam up; the curve of bending moments is

tive. Fig. 25a gives an example of a curve of bending moments of this class.

Fig. 15e.

§ 17. Moment of Elastic Forces.—On the hypothesis above stated, viz., that ‘for any one material the modulus of elasticity may be taken as constant for

all stresses, and assuming that our investigation is to be confined to those cases in which the cross section of the beam has a vertical axis of symmetry, and in which the centre of gravity lies at a point equidistant from the top and bottom of the beam, the general equation—

I 2st 72e poal=2° 7, (3, § 14), allows simple expressions of the value of y to be obtained for all practical cases by substituting for the ratio a1. ‘ , , . + its value in terms of the dimensions of the cross section. Thus, for a rectangle of the depth d and breadth 6b, a,

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where S is the area of the cross section. The following are the values for the commonest forms of cross sections.

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TABLE [X.— Values of ri for various Cross Sections.

2T

d

Form of Cross Section. | { In Terms of Linear; In Terms of the Area of Dimensions of the | the Cross Section (S) and the |

Cross Section. Depth. o8 Sb Square, side 6 |S 3 Rectangle, breadth 5 bd? 8d depth d 6 6 a nr Sd Circle, radius 7 Z 8 Hollow circle, exter- pe Sd uannen nal radius r, in- ar – 1) } q when r, differs lit- ternal 7, tle from r. Sd | “9 when moment of Hollow rectangle, in- bi —b,d,> webis neglected,and ternal depth d,, * an {4 – Sis taken as area of breadth 6, | cross section of flan- | ges only, and A (differs little from d. |

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Substituting the modulus of rupture / (Table VIIL), for P, in equation 3, § 14, we can from the above values of a section to resist any given bending moment. Thus, if we wish to know what breadth we must give a bar of wrought iron 3 inches deep, supported at points 3 feet apart, so that it may

break with 2000 Ib at the centre, we find the maximum bending moment from equation 2, § 16; and we find the value of « from equation 3, § 14, by the help of table IX. Then equating M and pw, we have—

bia ae ss « heady, 6WL 6× 2000 × 36

calculate the ultimate strength of any given cross

from which 6 Since the strength of the beam is directly proportional to the values of * table IX. shows us how to dispose of the

material in the cross section so as to obtain the maximum strength, The expression for a rectangle shows that the strength is proportional to the breadth of a beam, but to the square of its depth; and therefore, as appears in the second column, for the same quantity of material the strength of a rectangular beam increases simply as the depth, so that a deep narrow beam is preferable to a square or to a broad and flat one. The circular cross section is weak compared even with the square (the ratio for the same quantity of material is ‘846 to 1). The hollow tube is stronger than the thin rectangular plate of the same depth and cross section, but clearly the material is much best applied when wholly used in the form of two thin flat plates, separated from one another by a web of the maximum depth d which can be practically allowed. Thus the hollow rectangle is the form preferred for large girders, the material intended to resist the bending moment being placed in the top and bottom members of the girder, and kept apart by vertical webs, which add somewhat to the moment pu, but which are chiefly employed to resist shearing stress, as will be presently shown.

The I section, fig. 16, is that employed for smiall girders ; the moment of its elastic forces is exactly the same as that of a hollow rectangle, having the same values for 8, d, and d,, and having a value for 6, equal – to 26, in fig. 16 It is usual to neglect the strength to resist bending moment given by the vertical web, and to design the girder so that the top and bottom plates are alone sufficient to meet Fig. 16. this stress. The model, fig. 10, shows at once that to obtain the full resistance from the material employed to resist tension or compression consistently with a given depth, it must all be placed in two horizontal plates at the extreme top and bottom of the beam ; moreover, if 48 is the sectional area of the top or bottom member, and / is

the stress it will bear (assumed equal for tension and compression), the maximum moment which the elastic forces can exert is the sum of the moments due to the top and bottom members about the axis or tongue, 2.¢., 2(578 x $d) or Sd; or dismissing the idea of an axis through the centre of gravity of the section, we may (to refer again tv the illustrative model) take the moment of

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the elastic forces round the line running through the top row of india-rubber pieces looked upon as a fulcrum, and then the moment of the bottom row will be ag before 3J/Sd, and will be the whole moment of the elastic forces, Similarly, by taking the bottom row as the fulcrum, we see that the moment due to the top row will be the same, This moment calculated in either way is the whole moment of the clastic forces. This latter mode of considering the moment in the simple case of an I or hollow rect. augle, enables us to find the value of the moment of elastic forces for those cases in which the ultimate strength may not be the same for tension and compression, Thus, assume that the strength of wrought iron to resist tension, or jf, is 25 tons,

and its strength to resist com- pression, or f,, is 20 tons, then calling 8, the area of the bottom member at the section considered, and §, the area of the top member, we have for p» the two values 25 8,d and 20 8.d; whichever happens to be the smaller willrepresenttheavailable value of the moment of the elastic forces. Consequently we must, in order not to waste material, design the beam so that the ratio of the material in the upper member to that in the lower member shall be 5 to 4. That this ratio ought to be adopted is evident from the fact that the strength of the beam will be limited by that of the weaker member. No structure is perfectly designed unless it will when overstrained give way simul- taneously in every part. The foregoing theory, the sound- ness of which is borne out by experiment, tacitly assumés that, although the strength differs, the modulus of elasticity is constant for tension and compression. For example, if the flanges are made with sections bearing to one another the proportion of 4 to 5, the neutral axis (neglecting the web) will, assuming E constant, be at a distance from the top or larger flange equal to 4ths of the depth; then the intensity of stress varying directly as the distance from the neutral axis will for the two flanges be in the desired ratio of 4 to 5. Thus we see not only that the I, or hollow rectangle, has the advantage of being the best form fora girder, but that it allows us easily to arrange the material to the best advantage, even when its strengths to resist tension and compression are dissimilar. Values of the modulus of rupture given above are therefore not to be applied to this design of beam, but the values of f, and f, are to be taken from Tables I. and II. In the case of cast-iron the member under tension is made with six times the cross section of the member under conipres- sion, the reason being the same as that for making the ratio of the upper and lower members of the wrought iron beam 5 to 4. When a cast-iron beam is thus designed, the moment which any section can exert will for a given depth be proportional to the area 8, of the lower flange. Pro fessor Hodgkinson veri- fied this theory experi meutally, and found that the ultimate value of the moment due to elastic forces expressed in lbs and inches for beams thus designed was p = 16500 8.d. The value of the con- stant agrees closely with the tensilestrength of cast-iron, The ex- periments by Professor , Hodgkinson are there- fore consistent with the assumption, that al- though the strength of cast-iron is very different in resist ing tension and compressionn, evertheless the modulus

Fig. 17.

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| BEAMS.]

‘ elasticity is equal under the two kinds of stress. Fig. 17 _ shows the cross section usually adopted for-cast-iron girders. §18. Neutral Axvs.—The line ZZ,, fig. 14, perpendicular to the plane in which a beam is bent, and passing through the centre of gravity of any given cross section, is called the neutral axis of the beam at that point. The surface containing all the neutral axes is the neutral surface. Prac- tical engineers sometimes apply the term neutral axis to | the longitudinal line showing the neutral surface on a side elevation, but in this article, as in Rankine’s works, the _ words will be used as defined above. / When the assumption is made that the modulus of elasticity is the same for any given material whether under | tension or compression, notwithstanding any difference in the ultimate strength to resist tension or compression, then it follows, as has been shown, that the neutral surface of a bent beam will separate it into two parts, one of which is compressed while the other is extended. The neutral axis in any cross section then contains the only part of the material which is neither extended nor compressed.

If, however, the average value of E for stresses varying between zero and the maximum intensity of compression to which the beam is subjected be different from the average value between zero and the maximum intensity of tension, then the neutral axis as above defined will not be the wn- strained axis; the neutral axis is determined as soon as the cross section of the beam is known, being independent of the material used; the unstrained axis may differ in beams of the same cross section but made of different ma- terials ; for if the average of E be greater say for compres- sion than for tension, this will raise the unstrained axis

above the neutral axis, It is not improbable that the position of the unstrained axis may vary in the same beani _ with loads similarly distributed, but of different magnitude, and also with different distributious of load. Until ex- | periments shall have accurately determined the relation of E to the intensity of stress we have no means of deter- _ mining accurately the position of the unstrained axis. Even when E is constant the neutral axis, as above defined, will | not always in practice correspond with

the unstrained axis ; | for instance, in a beam which was not only bent across, but also compressed endways, the unstrained surface would no | longer contain the neutral axis as above defined. The un- strained surface might be near one edge of the beam, or, \ indeed, if the general compression were large and the bend- | ing'small, the whole beam might be under compression, so | that no part was unstrained. By restricting the use of the _ words neutral axis to the above definition, and using the words unstrained axis, or unstrained surface, for the second idea all ambiguity will be avoided. . | The actual position of the unstrained axis in any beam _ of any material subject to a bending moment depends on the relative values of the modulus of elasticity for the material under all stresses positive and negative, great and small ; but as the simple hypothesis of a constant modulus is borne out by experiment in the most important materials, it 18 unnecessary to pursue this subject further. | $19. Shearing Stress.—The theory hitherto given shows the relation between longitudinal stresses (such as are re- | sisted by the india-rubber in the model) and the load on the girder ; but in designing a girder we have also to provide | for the Shearing stress or transverse force tending at each | Imaginary cross section to make the more heavily loaded _ of the two parts into which it divides the bridge slide down past the other. This shearing stress was resisted by the tongues of the model, The total shearing stress at any | Section is the sum of all the vertical forces acting on the _ beam on one side of the section. The shearing stress at any section will be called positive if the sum of the external

| forces on the right hand part of the beam tends to lift that .

portion up. Diagrams may be conveniently used to show shearing stresses, and, as in the case of bending moments, the shearing stress at any section due to two or more loads is simply the algebraic sum of the shearing stresses due to each load.

Example 1. Load W at centre between supports (fig. 18); weight of beam neglected. The shearing stress is

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Fig. 18.

equal to $W all along the beam, being the reaction at one pier; the stress is positive to the right of the load, nega- tive to the left.

Example 2. Uniformly distributed load w per foot run (fig. 18a), The shearing stress is 4wL at the points of

50 tons

30 tans

Fig. 18a.

support, and zero at the centre of the span ; at any section distant c from the centre of the beam it is we.

Example 3. A single load rolling from right to left of a beam of span L (fig. 186). When the load is at the distance x from the right hand support the shearing stress to the right

oe nbd woe, re eo es “e The

maximum stress for each section occurs when the load reaches that section ; it is positive for the right half, and negative for the left half of the beam.

Example 4. Uniform advancing load of w perunit of length

(fig. 18c). When the load covers a length « measured from the right hand pier, the shearing stress at all points beyond

x towards the left is — ak when « is greater than $L

] \ ‘elise iil

(

!

. wt

Fig. 180

the above expression gives the maximum stress which can occur on that section with any distribution of the given uniform load. Thus the maximum shearing stress at the left end occurs when the whole bridge is loaded, and is —4wL; the maximum stress at the centre occurs when the bridge is half loaded, and is equal to — 4wL. The maxi- mum shearing stresses on the other half of the beam occur when the load comes on from the left side, and covers more than half of the beam; these stresses are equal in amount to the stresses in the left half, but are positive in sign. The scales in figures 18, 18a, correspond to the shearing stresses in examples 1] and 2 for a span of 50 feet and loads of 10 tons and 1 ton per foot run respectively. The scale in fig. 184 corresponds to the shearing stresses in ex-

/ ton per foot run

Yj

Fig. 18c.

ample 3 with a singie passing load of 14 tons. The scale in fig. 18c, example 4, gives the maximum shearing stress which the advancing load of one ton per foot run can pro- duce at each section. Asa train leaves a bridge it produces the same shearing stresses as when it comes on to the bridge from the opposite end, the same portions being similarly loaded. The

maximum shearing stress due to a passing load of this kind changes its sign at the centre of the span, as appears by diagram 18c.

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In L girders with solid vertical webs the shearing stregg jg practically all borne by the web unassisted by the top or bottom members, it being clear that these would fold down at the sides under a small fraction of the total stress Sufficient material is therefore employed in the web or upright plates to reduce the intensity of the stress to the desired amount. The shearing stress may, however, when the web is a thin iron plate, cause failure by crumpling the web, or causing it to buckle, instead of by shearing it across, This tendency is prevented by stiffening the web with anole or T irons rivetted to the sides. Mathematical analysis has not yet been very successfully applied to the determing. tion of the amount of stiffening required; experience has given a sufficient number of examples to guide the practical designer. In cast-iron girders the web is generally much jn excess of the strength required to resist shearing,

§ 20. Factor of Safety.—In designing a girder the load which it will have to carry is multiplied by a number called the factor of safety, varying from 3 to 6, and the girder ig so designed that it shall not yield at any point with legs than the load thus multiplied. If, for instance, the girder is practically to carry 1 ton per foot run, it is designed go that at no place shall it break or yield injuriously with less than say 5 tons per foot run. The multiplier is called the factor of safety. The factor of safety is required to allow for imperfections in the material as compared with picked specimens, for the wear and tear by which the strength of a structure is gradually reduced, for unforeseen loads, for jars and vibrations, for imperfection of theory, and for the sake of obtaining stiffness. This last property might be the subject of calculation, and in some cases must be separately examined. The particular factor employed depends on the judgment of the engineer. A larger factor of safety is required for a passing or moving load than for a permanent load, there being a greater uncertainty as to the stress which may be caused by vibrations or impulses due to what is sometimes called a live load. Moreover, the mere pre sence of a large permanent load tends by its inertia

to diminish the dangerous effect of the impulses or stresses due to the passing load, so that the factor of safety should

max. passing load max. permanent load being larger as this ratio increases. Rankine recommends that the factor of safety should for the moving load be double that employed for the permanent load. Sometimes the factor is more conveniently employed as a divisor to deduce the safe stress , from the ultimate strength f of the material, rather than as a multiplier for the load. Thus the same number of square inches will be obtained in the tension member of a wrought iron girder to bear 1 ton per foot run, whether we use in the calculations 25 tons as the value of f, the ultimate strength of the material, and a load w of 5 tons per foot run, or if we use 5 tons as /;, the safe stress on the material, and a load w of 1 ton per foot run ; in short, if we call the factor of safety K, we may in equation 5, § 14,

use KM = or making f=

d

be chosen with reference to the ratio

kK? we may write

_ fl Ly… 4 yo 3 : ae

The same remark applies, of course, to equation 6, § 14 § 21. Weight of Girders and Roadway.— When two girders are employed for each line of way on a railway, the weight of the iron girders per foot run will, with the usual proportions, probably lie between 0-00171 tons and 0:0025L tons, L being the span in fett. It follows from the theory given above, that for similar beams the quantity of material in the whole girder will be proportional to the square of the length, and, there- fore, the quantity per foot run will be proportional to the

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‘simple length. The constants given above are derived from practice. The weight of girders for a common road, if placed from 7 to 8 feet apart, will

be nearly the same as for railway girders of thesamespan. The weight of a cast- iron railway girder (two girders per way) will be about 0-005L tons per foot run. The weight of the roadway in a railway bridge will probably be from 0°14 to 0°22 tons per girder, or double this for each line. Fora turnpike road with metalling the weight will much exceed this, and should in each case be computed. § 22. Design of a Girder.—(1.) From the span and load to ‘be carried the engineer will determine the material and form to be employed. Cast-iron may in some districts be the cheapest material for girders under 30 feet span.

Wrought iron T girders are very generally employed for

spans of from 30 feet to 100 feet; beyond that span lattice or framed girders are more usually employed. For

extreme spans exceeding, say, 300 feet, a hollow rectangle or tubular bridge may be used, carrying the road on its top or inside the tube. The depth of the cross section is limited by the consideration that the web must be suffi- ciently stiff not to buckle; but for this consideration the deeper a girder could be made the better. In practice | the depth is made from jth to ;’;th of the span. The engineer will also determine whether he will keep the depth of the girder constant throughout or diminish the depth at the ends. It is impossible to graduate the material so as to give absolutely uniform strength at all sections, but by diminishing the depth towards the ends, /some material may be saved without attenuating the top and bottom members to such an extent as to be incon- venient. When the general character of the design has thus been settled, the engineer will compute the probable weight of the girders and roadway or total permanent ‘load; he will next determine the passing load for which | he intends to provide. _ (2.) The value of M, the bending moment, must next be | computed for a sufficient number of cross sections of the _ beam, and for various distributions of load. For a small cast- | iron girder of uniform cross section a single value of M will | be sufficient, computed for the section at the centre when _ the girder is wholly covered with the greatest uniform load and also supports the greatest single load at the centre of | the span. When, as in larger girders, the design is intended | to give a structure of approximately equal strength through- out, the maximum value of M should

be found for eight or ten sections; this maximum value will be that obtained when the bridge is wholly loaded with its maximum uni- ‘form load and has the maximum single load resting just | over the section in question. (3.) The maximum shearing stress must next be calculated ‘ for each of the above sections. The designer will bear in | mind that the maximum stress occurs at the points of | Support, and that at the centre it is greatest when the bridge is half covered with the passing load.

_ (4.) The engineer can now compute the number of square | inches 8, and §, required at each section in the upper and lower members consistently with the factor of safety he chooses to employ ; this he obtains from the expressions—

1 ps > ol ae et 9 1 M ae. . —.

Feyd

It is here assumed that the best and strongest form of girder is employed, but if a mere square or circular beam 18 to be used, the cross section will be obtained by equating the values of M and pu, using a safe modulus of rupture /,,.

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number of square inches required to reduce the stress per square inch to the safe or proof shearing stress, say 4 or 5 tons on wrought iron. When the web is a thin wrought iron plate it must be stiffened with L or angle irons. In a cast-iron girder the web must have at least the number of square inches required by the shearing stress, but the exigencies of the foundry generally require a esign resulting in a great excess of strength in this part of the beam, except in beams which are tapered towards the ends, as in fig. 19. With these beams care must be taken that

Fig. 19.

the taper is not carried to excess so as to leave insufficient metal to resist the shearing stress at M and N.

§ 23. Practical Details—The designer must be prac- tically acquainted with the forms in which his materials can be best procured. He must know the sizes in which iron or steel plates can be produced, and the forms best adapted for castings. Thus, in cast-iron beams the thickness of the web is at the bottom made equal to the thickness of the lower flange, and at the top to the thickness of the upper flange, in order to avoid permanent internal strains, which would result from unequal rates of cooling after being cast, if sudden changes of thickness in the metal were allowed. The engineer must also be familiar with the methods adopted of joining the several parts, as with the rivetting of wrought iron, the bolting together of large castings, the jointing of wood-work. He should also be acquainted with the various methods in which roadways are constructed and supported on existing bridges, and the manner in which the girders are braced one to another, so as to prevent vibration and lateral deflection due to the pressure of the wind. The examples of bridges described hereafter will give some information on these points. In long girders provision must be made by rollers, sliding plates, or suspension links for the expansion and contrac- tion due to changes of temperature. The range in Great Britain may be taken as about 45° C. If the ends of the girder could be firmly secured at a constant distance apart this change of temperature would produce a stress of about 6 tons per square inch in wrought iron, and 3 tons per square inch in cast-iron. The result in practice would be that any attempted fastening of stone or iron work would be torn loose.

§ 24. Deflection.—When a bridge has been erected its deflection at the centre under a known passing load is generally observed with the object of ascertaining whether the work has been properly done, for it is assumed that any defective material or bad jointing would increase the deflection beyond that calculated on the assumption of sound material and perfect workmanship. Sometimes the practical test applied is a rough one, a certain fraction of an inch being allowed per foot of span as a safe deflection. If an inspector of bridges, having authority, chooses to limit the deflection to a constant fraction of the span, the ratio of the depth to the span must be made sufficiently great to give the desired stiffness and maintained constant

for all spans ; equation 5 below shows that when p, 1s kept constant and d is a given fraction of L, the deflection v will be proportional to the span. For the proof or maxi- mum possible load, Rankine gives as the result of practice a

| (5.) The web will next be designed by giving it such aj value for the deflection of from yggb to stn; but one _ thickness as will, with the depth: already fixed, supply the | foot deflection in a span of 200 feet would certainly be exces-

sive. A depth equal to or greater’ than 51th of the span is certain to give sufficient stiffness, and the usual method is to assume the depth and then to observe whether experiment gives a deflection agreeing with that found by calculation. The calculation is made by finding the radius of curvature of the beam at a series of sections, and then determining the curve assumed by the whole beam either by integration or by an approximate graphic method. When the curve is known the deflection or versed sine is found either from the equations of the curve, or by actual measurement on the diagram to be presently described. Let R be the radius of curvature of the neutral surface of a beam at a given section, under a load producing a maximum stress p, at the outer elements of the section at a distance y, from the neutral surface. Consider a short length « of the beam fig. 20. Before deflection the length of the

Fig. 20.

outer element is equal to x, but after deflection (if we con- sider the upper member) the length of the outer element will be shortened to x,, while the length of the element in the neutral surface remains equal to # By similar

triangles we have x : #,=R:R—-y, or R= — , but x- x, Teall

is the extent to which the most compressed element is shortened, and by the definition of the modulus of elasticity

x we have E= p, ——, hence Py ’ L— 2,

lsc hus Ge Gees Pi from which the radius of curvature at any section can be obtained in terms of E, y,, and »,, all known quantities with a given cross section, material, and load. Another form of the same expression, which is sometimes more con-

venient, is obtained by remembering that M, = od , hence

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EI 9 a= co wie & ef ae M,’ where M is the bending moment which will produce 7). If p, is made equal to f, the maximum safe stress on the material, equation 1 or 2 gives the minimum safe radius of curvature,

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We will first consider the special case in which the beam under consideration is of equal depth and uniform strength at all cross sections, and which we wil] call a beam of class 1; these conditions can only be fulfilled by any one beam for a given constant distribution of load’: the beam of uniform strength for a load at the centre, for instance, will clearly not be the beam of uniform strength for a uniformly distributed load. In beams of class l for a given load, both y, and p, are constant, and there. fore R, by equation 1, will also be constant throughout the whole length of the beam, or, in other words, the beam will bend into a circular arc. The approximate expression for the versed sine of an arc having a chord J, and radius R will therefore give the deflection, and we have L2 oto hoe Ae 6 v= oR?

and employing for R the value given by equation 1, we have

-. LA ae eee SBy, ’ and if y, = 4d, we have _ lp, 5. ow hk ee DS 4Ed .

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If for p, we substitute f,, the maximum safe stress for the given materials, equation 4 or 5 will give the maxi- mum safe deflection, which may be called v,; we observe, then, that the safe deflection for a beam of this class will be proportional to the square of the span, and inversely proportional to the depth of the beam.

In beams of class 1, the deflections which different loads produce will be simply proportional to the values of p, pru- duced by those loads ; thus, fora given distribution of load, the deflection will be simply proportional to the load ; if we change the distribution of the load, keeping the total load constant, the same rule will give the solution; for in stance, since a load uniformly distributed produces only half the stress », which would be produced by the same load at the centre of a beam of the same span and cross section, we see that the uniformly distributed load will produce only half the deflection that would be produced by the same load at the centre of a beam of the same span and same section at the centre (both beams belonging to class 1), It would not be correct to say that a load uni- formly distributed would produce half the deflection pro- duced by the same load at the centre of the same beam, because the same beam cannot be uniformly strong through- out its length for two different distributions of load.

We may compare the deflections produced by the same load on various beams of similar cross section as follows: —By equation 4, § 14, we see that for a given moment

M, p, is proportional to : ; moreover, for equal loads, the

moment M at any cross section similarly placed will be proportional to I.; hence we may write

of tioned Pik PL Fy. Substituting this expression for p, in equation 5, we have L2 6. vo Fa,

an equation which expresses the fact that, for beams of class 1, the deflection produced by a given total load similarly applied will be proportional to the cube of the length, and inversely proportional to the breadth and to the eube of the depth. (In T girders the expression breadth must be understood as proportional to §, the section of the flange.)

Passing from beams of class 1 to beams in general, the

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BEAMS. | fundamental difference to be observed will be that the

~ eurve assumed by the neutral surface will not be that of a

circular arc, so that equation 1 is no longer true.

Where,

- however, the law according to which R varies can be stated algebraically, integration will give the value of v.

Combining equations 2 and 3 for class 1, we have

. Mls and as M,« LW ee have vx WE Now this ie Fie 1 : EI’ proportional equation can be shown to hold good for beams

_ of uniform cross section and uniform depth, which may be – ealled beams of class 2, also for beams of uniform cross ‘ section and uniform breadth, which may be called beams of

class 3, hence for the three classes of beams we may write

Rell —..- : “iE

where 2 will have different values in the three classes and for each distribution of load.

Similarly it can be proved, that where beams are so designed that the loads produce the same maximum value p, of the stress on the outer elements, we have the deflec-

, Ll? . tion proportional to Pir —equation 4 being one case of the

Ey, ; | general law ; we may therefore write ah ss &.. v=, Ey,’

where 7, is a constant differing for each class of beam and each distribution of load.

Table X. gives the values of 7 and n, for the three classes of beam, aud for two distributions of load. The value of p, in the case of a beam of uniform cross section applies to the stress at the centre; the stresses elsewhere in that beam will be less.

TaBLe X.— Values of n and n,.

W at Centre.

| w | uniformly distributed.

Description of Beam.

n ny nt Ny Uniform strength and depth..| a $ o£ 3 Uniform strength and breadth) zr 4 0°0178 | 0°1427 Uniform cross section……..... zs tr so as

In any actual bridge girder the deflection should lie between the value calculated for the beam of uniforin strength and that calculated for the beam of uniform eross section.

§ 25. Graphic Method of finding Deflection.—Divide the spat into any convenient number x of equal parts of length /, so that 2 = L; compute the radii of curvature R,, R,, R, for the several sections. Let measurements along thie beam be represented according to any convenient scale, so that calling L, and 7, the lengths to be drawn on paper, we have L = aL,; now let 7,, 7, 73 be a series of radii

such that r= a

Th a , &c., where } is any convenient

_ constant chosen of such maguitude as will allow arcs with the

radii 7,, 7,, &c., to be drawn with the means at the draughts- man’s disposal. Draw a curve as shown in fig. 21 with ares of the length 2, Zo, /3, &c., and with the radii 7,, 72, &e. (note, for a length 4/, at each end the radius will be infinite,

| and the curve must end with a straight line tangent to the

last arc), then let » be the measured deflection of this curve fromthestraight line, and V the actual deflection of the bridge;

we have V = . approximately. This method distorts the

curve, so that vertical ordinates of the curve are drawn to a scale b times greater than that of the horizontal ordinates. Thus if the horizontal scale be one-tenth of an inch to the foot, « = 120, and a beam 100 feet in length would be

drawn’ equal to 10 inches; then if the true radius at the centre were 10,000 feet, this radius, if the eurve

were undistorted, would be on paper 1000 inches, but making 6 = 50 we can draw the curve with a radius of 20 inches. If we now measure the versed sine of an are drawn with a length 10 inches and a radius 20 inches, we shall approximately find it equal to 0°64 inches, hence ¥= os = 1:54 inches. the eurve must not be so great that there is any very sensible difference between the length of the arc andits chord. This can be regulated by altering the value of 6. In fig. 21 dis- tortion is carried much too far; this figure is merely used as an illustration, and is not to be taken as an example.

§ 26. When a girder has more than two supports it is called a continuous girder. The distribution of the stresses in a continuous girder differs very materially from that in a simple girder, as will be at once apparent by the inspec- tion of fig. 22, which shows the way in which a continuous

The vertical distortion of

Fig. 22.

girder of two spans and two simple girders bend when employed to carry equal weights across equal openings. The continuous girder when both spans are loaded is bent upwards at C over the centre pier; in other words, the bending moment at this and neighbouring points is negative. The direction of the flexure changes at certain sections, as at A and A,, t.e., the bending moment is positive on one side of these sections, negative on the other side; and at the section where the direction of flexure changes the bending moment is nl. Again, when only one of two simple girders is loaded, the girder over the second span is not bent in either direction, but with the continuous girder there may bea negative bending moment produced through- out the whole unloaded span as shown in fig 23, Con-

tinuous girders require less material for the same depth,

span, and permanent load than simple girders; but the difference is hardly worth consideration, except in large

spans where the weight of the structure is great as compared with the weight of the passing load. The necessity of al- lowing the girder to expand and contract freely with changes of temperature limits the general use of large continuous girders to two spans,

Consider a continuous girder having an indefinite num- ber of supports equally spaced; let the girder be of constant depth, uniformly loaded, and so proportioned | \ as to beof uniform strength | \ at all sections. The me- thod of designing such a girder has not yet been shown, but it may be ad- mitted that the design is L i possible. Then, as we have \~F already seen (§ 24), the curvature assumed by the 7 /| girder will everywhere be constant, ze, the curves will be circular arcs of constant radius. The ¥ points of inversion of | y flexure A and B (fig. 24) Fig. 24, must therefore in this case be at a distance from C and C,,, equal to one quarter of the span ; for AA, = AB= A, B, &e., and C bisects AA). At B and B, there is no moment of flexure.

The girder might here be cut through, and if the ends B and B, were pinned on to the rest of the girder by pins capable of bearing the shearing stress, nothing would be changed in the cur- vature of the girder nor in the distri- / bution of _ stress.

Quite similarly, we

may suppose the ends B and B, of the portion BACA,B, to rest directly on sup- ports or piers in- troduced for the purpose, the rest of the imaginary girder being wholly removed, _ We shall then have (fig. 25) the curve assumed by a continuous girder of two spans of constant depth and uniform strength. The points AA, of inversion of flexure will be at a distance CA from the middle pier equal to one-

Fig. 25.

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third of the span. The top and bottom members at A and A, might vanish (if only one distribution of load were to be carried), for at this point there is only a shearing stress and no bending moment. The girder is, as it Were, made up of three girders: BA and A,B, hang on to AA,, whichis supported in the middle; half the weight of AB is borne by the pier B; half the weight of A,B, is borne by the pier B,; the rest of the weight between Band B, is borne by the middle pier. Thus let L be the length of one span in feet, w the load per foot run, P the load borne by each of the end piers, and P, the load borne by the centre pier, then we have—

2 te Se eae

hae a in 3s

The curve of bending moments can now be calculated for each girder precisely as for a simple girder ; the moment at any section is equal to the sum of the moments of all the external forces on one side of the section ; the beam between A and B will be subject to bending moments equal to

those produced by a uniform load on a simple girder if the span BA be similarly loaded. Between | and A, the moments will be negative, ¢.c., the left-handed moment produced by the downward action of all the weights to the left will exceed the right-handed moment produced by the upward reaction of the pier at B (or of the two piers B and C if the section considered lies to the right of C). The full black line in fig. 25a shows a curve of bending moments for this case.

Fig. 25a.

The maximum moment is negative and occurs over the centre pier; let it be called M,. The maximum positive moment occurs at a distance from B equal to one-third of the span ; let this moment be Mz. Then we have—

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The shearing stresses F,, Fy, F,, F,, at the points B D, A, and C, are ee) i ue: . B=Fl=Folh,

bw we hee 4s ow 4 s Seeele, Fig. 26 gives a diagram of the shearing stresses for two

Fig. 26.

spans of 60 feet, with a uniform load of 1 ton per foot run.

When the beam is of uniform depth and uniform cross section, the curves in which it deflects are no longer circular ; the defect of strength over the ceutre pier has

BEAMS. |

the effect of increasing the curvature over it, and shorten- ing the distance AA, ; analysis shows that in this case the point of inversion of flexure will be at a distance from the centre pier equal to ‘2683L; then the length of the part of the beam subject to a positive bending moment will be ‘7317L, instead of °66L as when the beam was of uniform strength; the load on each

of the end piers will be -36585wL ; the load on the centre pier 1°2685wL; and

6… – M,=134lwL, 9. . . . M,=-669wL?2, i… . ¥,=F,= 3658501, _.lC«w«;#CF=0,

12. . F,=1-26830L

In any actual bridge uniformly loaded the values of the moments and shearing stresses will be intermediate between those given for a beam of uniform strength and those for a beam of uuiform cross section. It must be observed that the above theory assumes that the girder is unstrained when being built as a whole; if, as is often the case, the separate spans are separately built and lifted into position, and then joined on the piers, special provision must be made to tring the desired bending moment over the piers into existence ; 1t is obvious that merely joining the two independent beams in the upper part of fig. 22 will not make these into a continuous girder, such as is shown in the lower figure,—to do this, besides joining the upper and lower flanges, we must pull the top flanges together over the piers and put the lower flanges under compression. This may be done practically by tilting one end, or both ends, before the junction at the centre is made, and after- wards allowing the ends to sink until the curve assumed by the girder shows that the required distribution of stress has been attained. The complete analysis of the problem of continuous girders of any number of spans equal or unequal with any number of loads has been given by Mr Heppel (Proc. &. S., 1870-71).

§ 27. Allowance for Weight of Beam. Limiting Span.— When the weight of the beam is a considerable and un- certain part of the whole load, it can be allowed for as follows. Design a beam of the desired depth and span, fit to carry a total load equal to the external or passing load W, ; calculate the weight of this beam and call it B, ; the beam so designed will really be fit to carry an external load W,—B,. Let 0, be the area of any cross section of this beam ; let 6 be the area of cross section required at the same point for the beam of weight B actually necessary to carry a total load W. Then since the strength of the properly proportioned girder of constant depth and span is simply proportional to the quantity of metal em- ployed, and therefore to the area of cross section, we have the proportion 6: 6,=W,: W,-B,, or

Wd ee °W,=B,

The weight B is given by the expression-— .. Eats

nal W,- 8B,” The whole load W is given by the expression— ee, Se

, W,-B,”

For any given design of beam there is a limiting length which cannot be exceeded (the beams of different spans being assumed to be similar in the geometrical sense). Let L, be the limiting length of a beam of a given design which for the span L weighs B, and carries a gross load W, then the ratio of B to W can be shown to increase in direct proportion to the length of the span until this ratio reaches unity. Hence—

B B. F W – ho By B or when wok ‘ WL OF. gt ew aah.

Ill. Suspension BRIDGES.

§ 28. Varieties of Suspension Bridges.—A very simple form of suspension bridge has long been used in Peru and Thibet. Two ropes are hung side by side across the gorge to be passed, a rude platform is laid on the ropes, and the dip of these is sufficiently small to allow the bridge to be crossed by men or beasts passing down from the one side to the centre and up to the opposite bank. The modern suspension bridge consists of two or more chains, from which a level platform is hung by suspension rods. The chains may in some cases be secured directly to the sides of the chasm to be crossed, but the configuration of the ground seldom allows this to be done. The chains, therefore, usually pass over pters, as in fig. 2, Plate XIX., and are led down on either side to an anchorage at a considerable distance from the piers. The chains between the piers and the anchorage are generally used to support part of the platform, The chains where they pass over the piers rest on saddles, which are made of two different types. One construction, shown in fig. 27, allows the chain to slip backwards and

forwards over it with comparatively little friction, so that the stress on the rope may be taken as equal on both sides of the saddle. In the second type, as shown in fig. 28,

Fig. 28.

the chain is secured to the saddle, which, however, is free to move horizontally on the top of the pier. With the first form of saddle the resultant pressure on the pier will not be vertical unless the chain leaves the pier with an equal inclination on each side, and even when the bridge is de- signed with an equal slope of chain on both sides of the pier, a change in the distribution of weight due to any passing load will cause some departure from the equal slope of the chains, and therefore from the truly vertical pressure on the piers. This departure is easily allowed for in the design of the pier. The friction on the saddle renders the

assumption of equal stresses on each side slightly incorrect, and with this type of saddle care must be taken to provide against the wear produced by the motion of the chain. With the second type the use of rollers under the solid saddle leaves the motion of the saddle very free ; the resultant pressure on the pier is always sensibly vertical, and the chains may leave the pier at any angle, equal or unequal. The chain must in no case be rigidly attached to the pier unless the support itself is free to rock on its base, as in fig. 29, where

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Fig. 29,

the place of the pier is taken by cast-iron struts, working on a horizontal axis.

Suspension bridges are chiefly used for very large spans, because, as we shall find, they can be constructed to carry the same load with a less weight of material than a beam or girder, subject, however, to the disadvantage of flexi- bility or deformation under a passing load,—a disadvantage which is very serious where, as in small bridges, the passing load is a large proportion of the whole load, but which is of less importance where the chief load to be carried is the weight of the structure itself. We will first consider the usual or simple suspension bridge, as shown in fig, 2, Plate XTX., and will then pass to the various modifications introduced to remedy its defects.

§ 29. Form of Chain with given Load.—Let the platform be hung from the chain by equidistant vertical rods; then the load may be treated as hanging from each joint where the rods are attached, and will consist at each joint of the weight of one subdivision of the chain and of one sub- division of the platform and its load. If the position of the vertical tie-rods be assumed as definite relatively to the points of suspension, so that the assumed loads on the joints act at known distances from the points of support, a ferm of chain, which will remain Q in equilibrium (or undis- turbed) under these loads, + can easily be found by x the following graphic me- thod :—

Let the vertical line QN (fig. 39) represent the whole load to

be carried, and the subdivisions | ZB QA, AB, BO, CD, &c., the 7 loads referred to each joint of

the chain (QA and NK will be ~ |

the portion of the load referred directly to the saddle or point of support, and will be simply half the weight of the piece of chain between the saddle and the joint pin). Let QP and NP be the weights carried by each pier,—equal if the distribution of load is symmetrical, otherwise to be determined as for a girder. Let a horizontal line, PO, represent the horizontal component of the tension to be allowed on the

C ao Pp as a G& Bs LV

Fig. 30.

BRIDGES

| ponent of the stress,

[SUSPENSION BRIDGEg,

chain, or the whole tension on that part of the chain the tangent to which is horizontal ; join O with Q, with A, B, &c.; then the lines OA, OB, &c., give the slopes of each successive link as showy in fig. 31, where the line parallel to OA in fig. 30 lies between the two spaces containing the letters O and A in fig. 31, similarly

the line parallel to OB in fig. 30 is represented by the link between the two spaces lettered O and B in fig. 31, and so forth, The line in fig. 31 lying between O and Q parallel to OQ in fig. 30, represents the direction of the force on the point of support a, being equal and opposite to the resultant of the tension on the first link and the weight carried directly by the support. The triangle QOA (fig. 30) is the polygon of forces in equilibrium at the point of support a (fig. 31). The triangle OAB is the polygon of forces in equilibrium at the first joint, and similarly each component triangle of fig. 30 represents the equilibrated forces at one joint of the chain in fig. 31. This theorem is one example of the general theory of reciprocal figures, which will be treated hereafter under the general head of ‘‘ Frames,” § 53.

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When the maximum dip is given instead of the horizontal ccm: it is easy to find the latter from the former by the method of moments when the point is known where the chain will be horizontal; for then, let the link cd, fig. 32, be horizontal ; let the dip be called y, and let the distances of weights w,, Wa, Wey &c., from the point of support @ be called x,, 22, %3, &c., and let the horizontal tension represented by PO in fig. 30 be called H. Then taking moments round the point a, we have—

ee ee

from which H can always be found. :

When the length is given of each link (or portion of the chain between the joints where the platform is suspended), and conse- quently the length of the whole chain, the problem of determining the form assumed under any distribution of load is difficult, for the proportion of the load carried by cach pier and the position of each load relatively to the piers vary when the form of the chain varies. The problem may be solved tentatively, but it is seldom attempted.

The converse problem of finding the load which will keep a chain in equilibrium when the dimensions and curve are given is per- fectly easy.

From a point 0, fig. 30, draw a series of lines parallel to the given links. At any convenient distance, OP, draw a vertical line cutting the lines diverging from O at the points Q, A, B, ©, D, &e. ‘The vertical loads required to keep the chain in equilibrium are proportional to the lengths QA, AB, BO, &c.

§ 30. Leelation between the Curve of Bending Moments and the Curve assumed by a Loaded Chain.—The vertical ordinates at the joints of an equilibrated chain, measured from a horizontal axis passing through the two points of support (these being at the same level), are proportional to the bending moments for sitmilarly chosen sections of @ girder similarly loaded.

Let us consider any joint, say that at which ws is hanging in fig. 33. Let V be the vertical component of the resultant pull on the left

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+ hand pier, and H the horizontal component.

| gySPENSION BRIDGES. |

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We know that

the vertical component is equal to the whole reaction at the pier

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a ra i>] 3S

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Fig. 33.

when the same load is carried by a girder; then, taking moments about the joint in question, we have—

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but the second member of the equation is the bending moment m, for the section at a distance J) from the pier in a girder of similar Ea and similarly loaded, therefore, whatever may be the value of

, the values of y,, y,, y3, &c., are proportional to the bending mo- ments. If, then, a curve of bending moments with the ordinates M4, My, M3, &e., be drawn for a given distribution of load, we can, with a pair of proportional compasses, construct any number of equilibrated curves, by making the values of y in these curves simply proportional to the values of m in the curve of bending moments, and by selection among these a curve of any required length may befound. If H be unity, the ordinates y,, ye, y3, &c., are equal to the bending moments,

§ 31. Chain Loaded uniformly along a Horizontal Line.—lf the lengths of the links bé assumed indefinitely short, the chain under given simple distributions of load will take the form of compara- tively simple mathematical curves known as catenaries. The true catenary is that assumed by a chain of uniform weight per unit of length, but the form generally adopted for suspension bridges is that assumed by a chain under a weight uniformly distributed relatively toa horizontal line. This curve is a parabola.

From equation 1, § 80, remembering that Zw in this case-will

w be equal to “gB» We see that the horizontal tension H at the vertex

for a span L (the points of support being at equal heights) is given by the expression —

wh? 9 (9 ne Daag ° or, calling x the distance from the vertex to the point of support, wa H= Dy

The value of H is equal to the maximum tension on the bottom flange, or compression on the top flange, of a girder of equal span, equally and similarly loaded, and having a depth equal to the dip of the suspension bridge.

Fig. 34.

Consider any other point F of the curve, fig. 34, at a distance x from the vertex, the horizontal component of the resultant (tangent to the curve) will be unaltered ; the vertical component V will be simply the sum of the loads between O and F, or wa. In the triangle FDC, let FD be tangent to the curve, FC vertical, and DC horizontal ; these three sides will necessarily be proportional respectively to the resultant tension along the chain at F, the

vertical force V passing through the point D, and the horizonta. tension at O ; hence

awa 2y hence DC is the half of OC, proving the curve to be a parabola,

The value of R, the tension at any point at a distance x from the vertex, is obtained from the equation—

H:V=DO0:FC=S =: we=5 sy,

ws4 =n + “= it ten or, a) Bin ew R=wa r/ i +a ’

Let 7 be the angle between the tangent at any point. having the co-ordinates x and y measured from the vertex, then

on ae tani = 24, a Let the length of half the parabolic chain be called s, then 4 =e + 7 wha GE oe 2 2s La ees eS 3x

The following is the approximate expression for the relation be- tween a change As in the length of the half chain and the corre- sponding change Ay in the dip :—

2 Qy2 AyAy 2Ay® s+ As=at x} y+ Quay + (ay)? =e tget a?

or, neglecting the last term,

es ince Cee as =A Y4Y See iae and ee Choe et We eee ee ier? Ohad

From these equations the deflection produced by any given stress on the chains or by a change of temperature can be calculated.

If the points of support are not at equal height (fig. 35) call the heights above the vertex y and y,, and the horizontal distances of

the vertex from the poifits of support x and 2; let y and y, be given, and x, 2, unknown. ;

The horizontal stress at the vertex will be the same as if the bridge were composed of two symmetrical halves, each having a span 2« and a dip y, or of two symmetrical halves, with a span 2a, and a dip y,; in other words—

we we,? ea 2y hy” hence et ee ee ot ae y Y1 or,

eee et wae

thus, to find the horizontal position of the vertex, we have only to subdivide the span in the ratio vy: ~y,; we may then calculate the strains on one side of the vertex as for half a bridge with the span 2a and the dip y, and on the other side of the vertex as for half a bridge with the span 2x, and the dip y,. The device of piers of different heights may be used with advantage when it is desired to throw ‘a larger portion of the weight of the bridge on one pier than the other, because of a difference in the soundness of the foundations, or for other reasons. The stresses on the loaded and un- loaded portion of the chains between the piers and the anchorage are easily determined by

methods similar to those which have been given for the stresses on each part of the main span. The same methods also give the direction of each successive link, and of the final links leading to the anchorage.

§ 32. Practical Details. — The chains of suspension bridges are either long wire ropes or true chains made of links pinned: together. Wire ropes allow the strongest known material to be adopted, namely, steel wire, which

can be bought in large quantities of a quality which does not break with less than a stress of from 55 to 60 tons per square inch of section; charcoal iron wire of the sizes used will bear 40 tons per square inch ; common sizes of wire for the purpose are from 0°16 to 0:14 inches, or say, No. 9 or 10 Birmingham wire gauge. Three or four thousand wires are not unfrequently used in one cable, and it is very essential that each wire shall take an equal part of the whole stress. It used to be thought necessary to ensure this by straining each wire separately either over the actual piers, or piers similarly placed, and binding them together when hanging, strained by their own weight with the dip proposed for the bridge. It was also thought essential that each rope should be an aggregate of parallel wires, not spun as in a hempen rope. Experiment has shown, however, that wire ropes spun with machines which do not put a twist into each wire, but lay it helically and untwisted, and with no straight central wire, are as strong as wire ropes of equal weight made with straight wires, They are, however, much more easily made. A number of ropes of this kind may, therefore, with more convenience and economy be bound together into one cable in the manner previously practised for single wires. Care should be taken to fill every interstice of the ropes with a bitumin- ous compound.

When the chains are made of links of iron their ultimate strength cannot be taken as more than 30 tons per square inch, even if the very best material is secured. It is doubtful if this ultimate strength can at present be surpassed by steel links, for although many steel links of greater strength could certainly be obtained, occasionally a comparatively weak link will be produced even by the

Fig. 36,

best manufacturers. In designing the links care must be taken to provide sufficient cross section.at the eye, AB+CD, fig. 36, as well as at EF. The -diameter of the pin BC must be such as will allow it to resist the shearing stress on it, and thé surface of the pin and eye from B to C must be sufficient to bear the crushing stress. Otherwise, although the pin may not be shorn it may be squeezed flat, and the head of the link may bulge out and be much distorted under the stress. To obtain the necessary surface, without unduly increasing the diameter of the pin, the link may be rolled with a head

GY, a

ie LZ

So or

SHH SAAT SEAS SSSI

Fig. 37.

broader than the body of thelink. The section at GH and IJ must also be sufticient to resist shearing. When two or more parallel chains are used, care must be taken that the rods suspending the platform bear equally on the

BRIDGES

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several chains. Fig. 37 shows a plan of securing this Chains of unequal dip should not be used to support ong platform, for the strain cannot be equally divided between them, inasmuch as they must deflect unequally with any passing load, or with any increase of temperature,

§ 33. Merits and Defects of Suspension Bridges.—-The great merit of a suspension bridge is its cheapness, arising from the comparatively small quantity of material required to carry a given passing load across a given span. This merit may be easily seen by considering an elementary example.

A man might cross a chasm of 100 feet hangin to a steel wire 0-21 inches in diameter, dipping 10 feet; the weight of the wire would be 12°75 tb. A wrought iron beam of rectangular section, three times as deep as it ig broad, would have to be about 27 inches deep and 9 inches broad to carry him and its own weight. It would weigh 87,500 Ib. An iron [beam of the best construction, 10 feet deep, would weigh about 120 Ib, without allowing anything for the stiffening of the centre web which would in practice be required. In each case four feet in length have been allowed for bearings at the ends of the span, The enormous difference would not exist if the beam and wire had only to carry the man, although even then there would be a great difference in favour of the wire ; the main difference arises from the fact that the bridge has to carry its own weight. The chief merit of the suspension bridge does not, therefore, come into play until the weight of the rope or beam is considerable when compared with the platform and rolling load ; for although the chain will for any given load be lighter than a beam, the saving in this respect will for small spans be more than compensated by the expense of the anchorages. In large spans the advantage of the suspension bridge is so great that we find bridges on this principle of 800 or 900 feet spall con- structed at much less cost per foot run than girder bridges of half the span. The disadvantages of the suspension bridge are, however, very great. A change in the distribution of the load causes a very sensible defor- mation of the structure ; for. the chain of the suspension bridge must adapt its form to the new position of the load, whereas in the beam the deformation is hardly sensible, equilibrium being attained by a new distribution of the stresses through the material. This flexibility of the sus- pension bridge renders it unsuitable for the passage of a railway train at any considerable speed. The platform rises up as a wave in front of any rapidly advancing load, and the masses in motion produce stresses much greater than those which could result from the same weights when at rest; moreover, the kinetic effect of the oscillations — produced by bodies of men marching, or even by impulses due to wind, may give rise to strains which cannotsbe foreseen, and which have actually caused the failure of some suspension bridges. On the 16th of April 1850 a suspension bridge at Angers gave way when 487 soldiers were passing, and of these 226 were killed by the acci- dent. Another danger peculiar to suspension bridges is that the platform may be lifted by the wind, when its oscillation will produce most dangerous strains. This accident may be prevented by tying

the platform down to the piers or abutments. Lateral oscillation produced by the wind is also dangerous, and even gathered ice and snow may be a serious increment to the load on these bridges, forming a much more considerable frac- tion of the whole weight than where the supporting structure is itself massive. Suspension bridges must be well cross-braced to resist the action of the wind. They can be much stiffened laterally by placing the chains in inclined planes, converging downwards to the platform.

§ 34. Modifications of the Simple Suspension Bridge.— Many efforts have been made to design a bridge which

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shall combine the lightness of the true suspension bridge

‘with the stiffness of the girder. Mr Dredge’s design with

sloping rods (fig. 38) gives a somewhat stiffer structure

Fig. 38.

than the bridge with vertical suspension rods ; the inclined rods throw a strain on the platform, which must be resisted either by ties along the central portion, or by struts abut- ting against the piers. The stresses on each part will be shown under the heading “ Compound Structures” (§ 62).

The design fig. 39 has been proposed by many, but is

Fig. 39,

worthless, The object of the proposers is to support each part of the platform by rods which are quite independent of other parts of the structure, and which, being originally straight, do not alter their form under stress. ‘The un- equal stretching of the long and short rods under a stress, or with a rise of temperature, is a radical defect. Mr

Ordish has proposed a plan in which the road is supported by

sloping tie rods, arranged like the struts in fig. 87, inverted. Flexible chains, like that of an ordinary suspension bridge, carry the weight of these tie rods by vertical rods, which

keep the sloping rods straight. The chain in this form | |

is not subjected to unequal loading. Various forms of bridge have been proposed, in which, as in figs. 76 and 78, two chains are braced together. These may be made thoroughly stiff bridges, with a moderate increase in the amount of metal required for the flexible bridge. They will be described under the head of “Frames.” Stiffness has also been obtained in some structures by using an auxiliary girder to stiffen the platform. This is best effected by the use for each chain of two girders, each half the length of the platform. These girders are placed as in fig. 40, being hinged together by a strong pin at B, and

Fig. 40.

held down by pins at A and A,, which should, however, be left free to move horizontally. These girders are not sensibly strained by the rise and fall of the chains due to a fall or rise of temperature ; they can also deflect freely as a whole when the chain is deflected under strain ; hevertheless, they serve to distribute the weight of a passing load over the chain, so that it cannot be sensibly distorted. Rankine has given the following rule for designing these stiffening girders. Let w, be the greatest rolling load per foot run; let be the half span of the chain; let M be the greatest bending moment which the auxiliary girders will have to resist (¢.¢., at the centre of each); let ‘F be the greatest shearing force (at the end and central Pins), then

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i 2 oes ee Pedi,

Each auxiliary half girder is in fact to be designed as a

| beam of half the span of the bridge, and capable of carry-

ing half the passing load per foot run (but not its own weight). This plan of stiffening is quite effective, but adds considerably to the weight and cost of the whole structure ; for not only have we to provide these extra girders, but extra material in the chains to carry this extra dead load.

§ 35. Maximum Span.—lIf we assume that wire can be obtained which will safely bear 15 tons per square inch, a rope (or single wire) with a dip of ;,th of the span would safely bear its own weight over a span of about one mile, and would not break till the span exceeded 4 miles. With a dip of 7th of the span a steel wire rope of the best quality would not break until the span exceeded 7 miles. These lengths.are not given as indicating practical spans for bridges, but to show the limits which with our present materials cannot be exceeded, however light the passing load may be.

IV. THe Arca.

§ 36. General Description.—An arch may be of stone, brick, wood, or metal. The oldest arches are of stone or brick. They differ from metal or wooden arches, inasmuch as the compressed arc of materials called the ring (fig. 41, London Bridge), is built of a number of separate pieces

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having little or no cohesion. Each separate stone used in building the ring has received the name of voussow, or archstone. The lower surface of the ring is called the soffit of the arch. The jovnts, or bed-joints, are the surfaces separating the voussoirs, and are normal to the soffit. A brick arch is usually built in numerous rings, so that it cannot be conceived as built of voussoirs with plane joints passing straight through the ring. The bed-joints of a brick arch may be considered as stepped and_ inter- locked. This interlocking will affect the stability of the arch only in those cases where one voussoir tends to slip along its neighbour. The ring springs from a course of stones in the abutments, called qwoims. The plane of demarcation between the ring and the abutment is called the springing of the arch. The crown of the arch is the summit of the ring. The voussoirs at the crown are called keystones. The hawnches of the arch are the parts midway between the springing and the crown. The upper surface of the ring'is sometimes improperly called the extrados, and the lower surface is more properly called the intrados. These terms, when properly employed, have reference to a mathematical theory of the arch little used by engineers. The walls, which rest upon the ring along the arch, and rise either to the parapet or roadway, are called spandrils. Thereare necessarily two outer spandrils forming the faces of the bridge; there may be one or more inner spandrils. The backing of an arch is the BY. = 39

masonry above the haunches of the ring; it is carried back between the spandrils to the pier or abutment. If the backing is not carried up to the roadway, as is seldom the case, the rough material employed between the backing and the roadway is called the Jjilling. The parapet rests on the outer spandrils. The abutments and piers have the same signification as in other bridges. The masonry arch differs from the superstructure of other bridges in the following respect : it dep2nds for its stability on the presence of a permanent load specially arranged, and so considerable in amount that the changes produced in the direction and magnitude of the stresses by the passing load are insignificant. The theories of the masonry arch often

neglect the passing load entirely, and simply teach the student how to distribute the per- manent load, so that the voussoirs may be in equilibrium, The permanent load consists of the ring, the backing, the filling, the spandrils, and the roadway. Inasmuch as the ring is that part of the structure which by its special strength and arrangement carries the superstructure in the same sense as a beam or chain carries it, the arch in this article will be treated simply as a ring of voussoirs springing from two abutments and loaded with weights, Some permanent and some passing. Where the backing strengthens the arch, it becomes virtually part of the ring,

§ 37. Hquilibrivm of a Single Voussoir.—A block, such as a voussoir, ABCD, fig. 42, resting on one of its surfaces, such as the joint AB separating it from the next voussoir, is in equilibrium when the resultant of all the forces acting upon it (including its own weight) falls within the supporting surface, while the direc- tion of this resultant makes an angle ¢ with the nor- mal to the surface less than the angle of repose ; (the tangent of the angle of repose is the coefficient of friction). If the resultant, as R,, falls without the surface, the block will heel over, pivoting on the edge A. If the resultant, as R,,, although falling within the surface of which AB is the trace, is yet much inclined to the normal, the block ABOD will slide up on the joint AB without heeling over. The block, if used as the voussoir of a bridge, must not only be in equilibrium under the forces applied to it, but must also be of sufficient strength to resist these forces. The intensity of crushing stress due to the external forces must nowhere exceed the safe crushing strength of the material. This latter condition would in most arches be fulfilled by an extremely thin ring of stones or brick if the resultant passed through the geometrical centre of the joint AB in @ direction normal to it. In that case the stress on the joint would be a uniformly distributed stress ; if, however, the resultant stress passes near oue edge, the intensity of stress at that edge will be much greater than elsewhere, and would indeed be infinite if the resultant ’ passed exactly through the edge at A or B ; while, therefore, the condition of equilibrium is satisfied if the resultant passes within either edge of the voussoir at no great inclina- tion, the condition of strength requires that this resultant shall not cut the joint very near the edge, and the common practical rule is that it shall always fall within the middle third of the joint. This rule is based on the condition that the pressure on a joint shall nowhere be negative ; in other Words, that no

tension shall occur at any part of any joint. Ths principles explained in § 8 show that the minimum

Fig. 42.

on any one stone.

are to resist practical loads. sensibly equal load on all parts of their breadth between

BRIDGES

stress on any joint p, = py – ;

Pag,

zero, when p) =

Pat,

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, or that the stress will be

Let d be the depth of the rect-

angular joint, and 4 the breadth ; then

bd?

d I = jg? and 2, = 5, and p = Se

hence P — 12Px.d

bd ae? 7 G

an equation expressing the condition that the centre of

P bd?

= Lys

pressure lies at the edge of the middle third ; any greater

value of x, will give a negative value to Py the actual resultant is, according to the theory practically in use, indeterminate within certain limits ; it is therefore useless to attempt to calculate the exact maximum stress In the rest of this article the ring is to be held to mean the middle third of the actual masonry,

We shall see that

or brick ring, wherever the theory requires that the blocks

As bridges are subject to a

the parapets, it is usual to consider a portion of the ring one foot in width, each other strip being under precisely |

similar conditions,

Similarly the joint may be spoken of

for convenience as the line which is its trace, and the

edge as the point which is its trace,

The external forces which act on any voussoir are—Ist, the vertical force, being the resultant of its own weight and the load which is directly over it; 2d, the thrust from the voussoir above it; and 3d, the reaction from the voussoir

on which it rests (fig. 43).

determine exactly what portion of the superincumbent load a voussoir may properly be said to carry, but a sufficient ap- proximation is obtained for practical purposes by assuming that the mass vertically above any voussoir is carried by the voussoir when the back of the voussoir is not much inclined, If the materials had little co- hesion, the direction of the force

produced by the load would not be vertical, but inclined at an angle depend- ing on the coefficient of fric- tion; in practice, the direc- tion of the force is uncertain

superincumbent filling.

It is sometimes difficult to

on Sa Bhp ee

Fig 48, and even variable with changes in the condition of the

If, however, the stability of the

arch is calculated with a reasonable margin or coefficient of safety, on the hypothesis that the force produced by the load is vertical, there is every probability that the arch will be stable under any actual stress which may arise in practice.

§ 38. Hquilibrium of any three Voussoirs ; Equilibrated Polygon.—The simplest arch wovld be an arch of three voussoirs resting on two abutments, and any actual arch consisting of many voussoirs may be considered as com- posed of successive triplets, the voussoirs on each side of

which act as abutments,

If, therefore, we can show the

conditions of equilibrium for three voussoirs we shall have determined the conditions for the whole ring.

Let three voussoirs be taken from any part of the ring (fig. 44), and let the lines 1, 2, and 3 represent the position of the resultants

of the three known loads W}, We, and wy

voussoirs) borne by each voussoir.

(including the weight of the

Let NA represent the position of the reaction? due to the abut-

ting voussoir on one side.

Let A be the point where the prolonga-

tion of the line NA cuts the line 1; then if the magnitude of the

forces ¢ and w, are known, these determine the magnitude and | direction of the equilibrating force ¢,, which must act at A to balance them. Let the direction AB and the magnitude of the force t, be

found by the ordinary parallelogram of forces, as in fig. 44a, and let B be the point of intersection of the direction of this force with the line 2; then the direction and the magnitude of the equilibrating force ¢, can be found as for ¢, ; similarly the direction of this force gives the point C by its intersection with the line 3, and finally we obtain, by the resolution of forces, the direction, magnitude, and posi- tion of the force ¢3, by means of which the reaction of the second abutment will keep the system in equilibrium. When the position and magnitude of ¢ are known, the position and magnitude of all the other forces are determinate ; the conditions of equilibrium are that the lines NA, AB, BO, and CQ, shall not cut the joints above or below the edges a or 8, for in that case the blocks would heel over on the edge beyond which the resultant passed ; also, the direction of the lines NA, AB, &c., must be such as not to exceed the angle of repose with the normal to the joints, otherwise one stone will slip on the other. The abutment producing by its reac- tion the force 4, must not yield with a less force than ts, and must not be pushed forward so as to produce a greater force than ¢;. The line NABOQ, if inverted, is in form identical with that which a cord would assume, loaded at the points A, B, and 0, with the loads 1, 2, and 3, and having the direction of NA determined. This line will, in the rest of this article, be called an equilibrated polygon,

When the joints are supposed indefinitely near, or the voussoirs y 3 sheets, the equilibrated polygon becomes a curve called a linear ar

The reasoning applied to three blocks is clearly applicable to any number, and we may therefore say that any series of loaded voussoirs will be in equilibrium when a reaction of known magnitude and direction is applied at one abutment, provided the equilibrated polygon required by this reaction and the given loads can be drawn so that its sides cut all the joints within the ring (or within the

Fig. 45a,

middie third, where strength is an element of the question) at an angle greater than the complement of the angle of rh for the material used, An equilibrated polygon,

C… ..Q, fora complete arch is shown in fig. 45 Fig. 45a is the diagram giving the slopes KJ, JI, &c., as for the loaded chain fig: 30 and 31

§ 39. It will be shown in next paragraph that the arch will be in equilibrium if with any value of the horizontal thrust 4 an equilibrated polygon can be drawn fulfilling the conditions required. In most arches equilibrated polygons fulfilling these conditions can be drawn with values of h varying between two limits differing by a considerable amount. In that case the smallest value of A willbe the true value, and give the true stresses ; for the abutments being inert will not give back a greater thrust than is just required to balance the structure. This would render the thrust 4 determinate if the equilibrated polygon might actually approach the true edge of the ring, but as this would require infinitely strong materials, we are still left in uncertainty as to the true value of A, but may feel sure that it will be the smallest value consistent with a safe stress on the material. If we provide abutments capable of reacting with a force A sufficient to keep the equilibrated polygon (where it cuts the joints) within the middle third, our abutment will certainly be amply strong enough, and this is the value of 4 to be adopted in all practical calculations of the stability of an arch.

In the example with the three voussoirs it is clear that equilibrium would be obtained with very widely different reactions ¢ at the one abutment. And this fact is also true fora bridge of many voussoirs. The vertical component (which may be called v) of this total thrust ¢ is indeed determinate if we suppose the point where ¢ cuts the joint to be known, being the same as

the vertical reac- tion from a beam carrying the same weights and supported at the points where ¢ and v cut the abutments ; but the horizontal component or horizontal thrust, which has been called 4, cannot be determined by any considerations hitherto mentioned,

§ 40, Euperimental Demonstration that the Equilibrium of aseries of Voussoirs is stable if any Hquilibrated Polygon can be drawn fulfilling the conditions stated above.—Let us suppose an arch, fig. 48, to be constructed, the bed-joints of which are not plane but curved, so that each stone touches its neighbour only along a horizontal line, the trace of which in a drawing may be called the point of contact. Such an arch will differ from an ordinary arch in this respect, that the centre of pressure at joints will be shown by the points of contact, while the stones will be able by rolling to alter the points of contact if not in equilibrium. In such an arch the voussoirs in the first place may be put together so as to touch at any desired series of points, but the forces called into play when external support is withdrawn will rearrange the voussoirs sa as to bring theni into equilibrium, if any equilibrated arch consistent with the loads can be drawn so that the lines forming it cut the joints inside the ring, and a model will show the points of contact, or, in other words, the places where these lines cut the joints. (It is assumed that the obliquity of the sides of the polygon to the joints which they cut is insufficient to produce slipping.)

An actual model shows the action very prettily, but the follow- ing considerations will easily allow the student to see how it is that the voussoirs always arrange themselves so as to build a true arch.

Suppose, first, that the arch consisted mercly of three stones, fig. 46, and that the weight on the centre one was so great that the linear arch, or equilibrated polygon, became sensibly two inclined straight lines like rafters. As soon as the voussoirs are left to them- selves, the pressure at the surface a, 6,, and the reaction at the surface a, b,, will lie in one straight line, which, meeting a similar straight line from the other abutment, will give one equilibrated polygon, satisfying the required conditions; but if the horizontal force required for this polygon is not supplied by the abutments, the two forces at joints 1 and 2 will, as shown by the small straight arrows, constitute a couple tending to turn the stone A round, so that the point of

contact at joint 1 will be lower, and the point of contact in joint 2 will be higher than before. The same action will occur in stone C, and the result will be that the weight may be balanced with a smaller horizontal force. At the

same time the rotation of the stones A and O, coupled with the descent of B, tends to push back the abutments N and Q, and therefore to increase their horizontal reaction supposing them to be stable. If the abutments N, Q continue to yield, the stones A

be

Fig. 46.

and B will continue to turn until the points of contact reach a, and dg, or b, and },. The horizontal thrust which the abutments require to meet will therefore diminish as the stones turn, and the little structure will only fail to support the weight in case the abutments N and Q are insufficiently strong or stable to supply the minimum thrust consistent with an equilibrated polygon

Fig. 47.

cutting the joints inside the ring (or in case the polygon cut the joints at such an angle that the stones slip). If, on the other hand, the abutments were so made as to press in upon A and C with a greater horizontal force than is consistent with two lines of pressure passing through the actual points of contact, then, as in fig. 47, the direction of the couples on the stones A and B would be reversed, and they will roll round so as to bring the points of contact more nearly into the position required to meet an excessive horizontal thrust, and at the same time the changed position of the stones, by allowing N and Q to come forward, will tend to relieve or diminish the original excessive horizontal thrust, where this is due to the elasticity of the stones N and Q, or of the stones supporting these abutments. The structure will not fail unless the points of con- tact reach a, and @,, or b, and b,, when the structure would fail by the sides being squeezed in, and the stone

B being lifted up out of the arch. This could not happen with stones of the proportions shown in fig. 47, as before the limiting position was reached, the points of contact would lie on a straight line corresponding to an infinite horizontal thrust. In conclusion we see that, whether the hori- zontal force supplied by the reaction of the abutting stones be too small or too great, the three voussoirs tend to move so as to adapt the centre of pressure and the actual horizontal force to one another. The equilibrium produced is stable, that is to say, if by some external force the arrangement of the blocks is slightly disturbed, when the force is removed the blocks return to their original position. In the above demonstration it is assumed that the blocks when first put together touch at some point not far from the centre of the bed,—a condition corresponding to reasonably good fitting in the case of the plane joints of a stone arch before the centring is removed.

If a model be prepared (fig. 48), having a number of voussoirs of wood with their bed-joints slightly curved and roughened, the result of the above theory will be very clearly and beautifully seen. The action explained in the case of three blocks holds good for any three, and therefore for the whole series. If an additional weight is placed at the crown, as in fig. 48, the crown is a little lowered, but the curve passing through the lines of contact rises at the crown and is lowered at the haunch by the rotation of the blocks, until the lines of contact at the joints arrange themselves, so that the re- sultant pressures forming the imaginary polygon pass through these lines of contact. If the extra load be placed at the haunches the crown rises, but the points or lines of contact between the voussoirs are lowered at the crown and raised at the haunches, as in fig. 48a. If one haunch only is weighted, the curve passing through the lines of contact rises at that haunch and is lowered at the other, as in

fig. 486; if the model be distorted by the hand it oscillates up and down on each side of the position of equilibrium, as a string similarly loaded would do. Figures 48, 48a, and 488 are taken from photographs of a model. (It should be remarked that the abut-

Fig. 48.

ments were screwed to the supporting board; it is obvious that otherwise they would not have been in equilibrium.) The general character of the curve passing through the points of contact may be easily conceived by thinking of a string similarly loaded and

Fig. 48a.

inverted. The equilibrated arch will be one of those forms which a string might take when similarly loaded, but when the load is changed, the length of the curve will not be constant in the arch, whereas it must be constant with any given chain. The curve pass-

Fig. 480.

ing through the points of contact corresponds with what Moseley

called the line of resistance. The direction of the pressure is not necessarily tangent to this curve, but in the ordinary form of bridge it is nearly so.

In the model each voussoir is free to roll, because the bed-joints are curved. In an actual bridge the bed-joints are plane, nevertheless, the stones do turn round to adapt themselves to the pressure, but the result of this rotation is to render the compression along the upper and lower halves of the stone unequal. One edge is more compressed than the other ; the couple tending to turn the voussolr, and actually allowed to do so in the model, is met by an equal and opposite couple, due to the unequal compression of the stone.

This couple is the necessary result of a pressure which is not axial,

~vide § 8; an cquilibrated polygon cutting the joints at various dis- tances from the centre is therefore as correct an indication of the actual forces present in a practical arch with flat joints as m the model with curved joints; but we must remember that where the joints are flat, the pressure will be unequally distributed wherever the line of the equilibrated polygon does not cut the centre of the

joint. Greater or less elastic resistance in the stone corresponds to

ter or less curvature in the surface of the joint. A small dis- tortion of the arch will restore equilibrium when the curvature is

t, or when the stone has a high modulus of elasticity. The ring With plane bed-joints is in stable equilibrium, and adapts itself to new distributions of load for precisely the same reasons as the model with curved joints, but in the one case the couple called into play to move the voussoir is actually cancelled by the new posi- tion which the points of contact assume; in the other case it is balanced by the equal and opposite couple resulting from the resistance to motion due to the hardness of the stone.

The preceding paragraph showed how to determine whether an arch was in equilibrium when a known reaction was applied at one abutment ; the experiment and reasoning now given show that the incipient yielding of an arch under loads will produce a reaction at the abutments suited to keep the whole ring in equilibrium, provided only an equi- librated polygon can be drawn, cutting the joints within the ring at suitable angles, | § 41. Practical Investigation of the Stability of a given Arch under a given Load—Joint of Rupture.—This investi- gation resolves itself into finding that equilibrated polygon or linear arch which can be drawn within the (middle third of the) ring from the crown to the lowest possible joint of the ring (or to the springing if this be possible). This lowest possible joint must in any case be treated as the springing of the arch, and if the linear arch goes out of the (middle third of the) ring above the actual springing, as will be the case in all semicircular or elliptical rings, masonry must be provided in the backing capable of taking the actual thrust into the abutment and constituting the real arch, which often differs widely from the form indi- cated by the ring of stones in the face. in a circular or segmental bridge loaded simply by its own weight generally has a smaller radius of curvature than the ring at the crown, and a much larger radius towards the haunches, Consequently, the longest linear arch which can be drawn within the ring will approach the upper surface of the ring at the crown and the soffit towards the haunches.

Fig. 49,

Fig. 49 shows a series of linear arches, all drawn for the same load, and all tangent to the upper surface of the crown of the arch, differing only in being the result of different horizontal thrusts. The curve drawn with a thick black line, tangent to the soffit, is clearly the longest linear arch which can be drawn within the ring. ay smaller value of the horizontal thrust A would give a linear arch like curve 3, and any larger value of A would give a linear arch like curve 1, and both these values of / are incompatible with equilibrium for the whole arch down to joint ©; if, therefore, the arch fails by thie yielding of the abutment, or of the lower portion of the ring, the failure will first be apparent at the joints A and B, where this black line is tangent to the ring, and at joint C, where the linear arch cuts the back of the ring. Smaller values of A will keep the stones in equilibrium above and below joint B, but unless the arch below the joint B, as well as the abutment, can resist the tendency of the arch to spread, or, in other words, supply at least the horizontal reaction h required for this linear arch, the joint B will open at the top, the centre joint A will open at the bottom, the joint C will open at the back, and the crown fall in as shown in fig. 49%. The joint B, where the longest linear arch is tangent to the soffit, is called the joint of rupture. The value of / required to make a linear arch tangent to the back of the ring at the crown pass through the edge of the joint of rupture at the soffit, is larger

than the value of / required to give a linear arch passing through the edge of any other joint at the soffit ; at the same time, it is the smallest value of % consistently with which the arch can remain in

A.

equilibrium down to B and from B to ©. In circular arches the joint of rupture generally makes an angle of about 30° with the hori- zontal plane ; in elliptical arches the angle is usually about 45°. Its position is easily found as follows :—Let y;, Ye, Yg, &e. (fig. 50), be the heights of the upper surface of the crown A above any points

Fig. 50.

B,, By, Bg at the lower edges of the soffit ; let W,, We, Wg be the weights of the portions of the arch with its load carried by the ring from b, to A, from B, to A, from Bg to A, &c. (The load is in the fg. assumed to be symmetrically disposed relatively to the centre of the span.) Let a, &, #3 be the horizontal distances of the centres of gravity of w,, w,, w; from the points B,, B,, Bs, &c. ; then taking moments round B,, B,, Bg in succession, we have, if the linear arch be assumed to pass through any point B—

Wa = hy;

taking the successive values of h for a series of joints B, we shall find that one joint gives a maximum value. This value corresponds with that of the linear arch tangent to the soffit (of the middle third) at the joint of rupture ; for this arch has the maximum thrust of any passing through the points B,, B,, &c., as appears by simple inspection of fig. 49. The joint of rupture can thus be tentatively found, and the value of h, or the thrust which the abutment must resist, is obtained at the same time. If the backing is carried well up above ©, a larger value of h than that obtained by this method would be consistent with the stability of the arch, and might actually occur ; but we need not provide for this larger value, since the yielding of the abutment under it would diminish the thrust till it fell to the value as above determined. If the abutments could resist this thrust, the bridge would then remain in equili- brium. If the arch is flat there may be no joint of rupture, and in that case the value of h is to be taken as that given by a linear arch passing through the bottom of the (middle third of the) spring- ing and tangent to the crown of the arch, t.e., to the summit of the middle third of the ring.

When the apparent springing lies much below the joint of rupture, we find that the linear arch leaves the ring on the upper surface at a joint © lower down, where failure must result by the opening of the joint at the lower sur- face, unless the pressure is taken by masonry outside the ring. Itis for this purpose that the backing is required. Obviously the best mode of supplying backing is to thicken

considered as part of the abutment.

If the load at the crown of an arch were very light, and the load at the haunches comparatively very heavy, the series of tentative curves drawn with various values of h would assume the character shown in fig.51. The longest curve which can now be fitted into the ring (drawn with a thick black line in the figure) will probably approach the soffit at the crown and be tangent to the upper surface of the ring at the haunch. In fig. 51 the longest linear arch is shown as tangent to the soffit at C. This condition could seldom be secured ; with most loads the linear arch tangent to the back of the ring at B will cut the soffit at C. Nevertheless, the value of h to be provided for will be that given by tle linear arch tangent to the soffit, If this arch leaves the middle third at B, the ring must be thickened or efficient backing provided at this point. If the abutment yield an arch thus loaded would fail, as in fig. 51a, but the case very seldom arises in practice. If the arch were not pointed at A, but curved so as to con- tain the linear arch near the crown, the piece BAB would

be lifted up as a whole without breaking at A.

Fig. 51.

The joints of rupture can be found for unsymmetrical loads as well as for symmetrical loads, but these joints will then not be at equal distances from the crown.

es Fig. 51a.

If the middle third of the ring be alone treated as effective, the designer, after finding the joint of rupture for a bridge of the usual form and with usual loads, need make no further calculation as to the arch above that joint. A linear arch which is tangent to the soffit at the joint of

the ring itself, keeping the masonry joints radial. The portion of the arch below the joint of rupture B is often

[ARCung,

rupture, and to the upper surface of the ring at the crow will probably lie within the ring at intermediate joinig and will cut them at an angle not differing much from a right angle; but the linear arch must be carried on below the joint of rupture, through the backing and the abutmen to see that it is nowhere too much inclined to the beddip joints, and never comes too near the edge of the effective masonry. ‘The horizontal thrust determined by finding the joint of rupture on the hypothesis that the middle third of the ring is the only effective part will be a safe value; but the actual value may be considerably less, since the actual linear arch called into play may le outside the middle third. Since we do not know the actual position of the resultant pressures on each voussoir, any refinement in calculating the maximum in. tensity of stress due to these resultants would be useless, If the actual horizontal thrust were known, it would be easy to determine the couple acting on each joint and due to the distance between the resultant pressure and the centre of resistance of the joints; then knowing this couple and the total thrust it would be equally easy by the principles in § 8 to determine the maximum intensity of stress. Practi. cally the thickness of the arch ring is determined by ruleg derived from experience, and the chief use of the above theory is to determine the dimensions of the abutments ; if, however, with a given load the joint of rupture were found much nearer the crown than the positions indicated above, it would be well to rearrange the permanent loads or to alter the form of the ring,

§ 42. Professor George Fuller of Belfast has communi- cated the following novel and very neat method of finding the linear arch of maximum rise (and therefore of minimum thrust) which can be drawn within the middle third of a given ring,

In fig. 52 let the dotted curves GI and HK bound the middle third of the ring. Let the span be divided into any convenient

y 2 BAS

i eT Ee A SR SS EN SE ee eee

Fig. 52.

number of parts at a, b,c… &¢. Let the load on the half arch be subdivided into a corresponding number of parts, and each partial load referred to the vertical line passing through a, 8c… & Let the curve D 1 2 3… A bea curve of bending moments for these loads, drawn to any convenient scale. This curve will also (§$ 80) be a linear arch for the given loads. Draw the straight line AB at any convenient inclination, cutting the horizontal line DB at B. Raise the verticals al, 62, c8,. . . &c., from the points 1, 2, 3, &c. Where these cut the curve DA draw horizontal lines, cutting AB at 1’, 2’, 3/,... &c. Since the ordinates of all possible linear arches are merely multiples or submultiples of the curve of bending moments, it follows that any other straight line from B to the vertical through A will have ordinates, which, if measured from DB along the verticals passing through 1’, 2’, 3, &e., will be the ordinates of a lincar arch, set off on the corresponding verticals passing through 1 and a, 2 and 6b, 3 and c, &c. AB might be called the development of the linear arch DA. Now let the curves CI and HK be developed in a similar way, so that, for instance, the ordinates measured from a to these curves are equal to the ordinates measured on the vertical passing through 1’ from DB to the developments I, G, and H, K, ; then it is clear that for the given loads any linear arch which lies within the middle third of the ring must, when developed, be represented by a straight line lying within the area I, G, H, K,, and consequently that the straight line BC, which starts from the lowest point B in this area, and 1s tangent to the curve G, Ij, will be the development of the curve of

ximum rise and minimum thrust which can be drawn within the given middle third with the given loads. The line BC determines the point C, and the ordinates of BC give the ordinates of the curve DC, the ordinates being measured on corresponding verticals. The examiple shown is the diagram for an arch of 52 feet span and

10 feet 4 inches rise, the depth of the ring at the crown being 2 feet 6 inches, and at the springing 3 feet 8inches. The loads per foot of breadth, beginning at a, are—23°04, 19°45, 16°35, 13°04, 12°01, 10°35, 8°98, 7°93, 6°32, 5°79, 5°52, 5°39 cwts The rise of the

linear arch found is 10°2 feet, and % per foot of breadth of the | 1815 ft. ewt.

an

§ 43. Empirical Expression for the Thickness of the Ring.— The ring when not of equal thickness is always made of least depth at the crown. The depth of the key stone is therefore the thickness of the ring at its smallest part.

Let D be this depth in fect, and r the radius of the arch in feet at the crown. Then we may take (Trautwine)—

oe. . .. D=CV>,

According to Rankine, C may be taken as °346 for a single arch, and ‘413 for one of a series of arches. The reason for making one of a series thicker than a single arch is, that the former has, when not loaded itself, to bear part of the thrust from its neighbours when these are loaded ; this thrust tends to throw the linear arch in the unloaded span low down in the keystone. The following is another series of values of C in practical use :—

| arch 129 ewt. =

Wor first class stonework …..... 0.2… «0 = “36 ;, second class stonework…....00…....0= ‘4 PPPOUIC a ANG TUDDIC. cn covsescesc. tee, ceswee ace CS . Ferronet gives the following rule :—Let L be the span in feet— L SO 6 0 co. ane D=1+-

Rankine, Civil Engineering, p. 427, shows that Trautwine’s rule is rational. Perronet’s can only be so when the usual proportion of rise to span is adopted.

Brickwork arches of 24 feet span and less are made 1 foot 6 inches deep at the crown ; 30 feet span, 1 foot 104 inches; 40 feet span, 2 feet 3inches. The usual flat arch of these dimensions has its ring increased by two rings of bricks towards the haunches. These do not show on the face being concealed by the spandrils. Rubble arches are made a little thicker.

§ 44. Practical Details.—The strongest and simplest form of arch is a flat circular arc, having a rise of about one quarter of the span. In these arches the springing is above the place where the joint of rupture would occur if the ving were prolonged. Those parts of an elliptical or semeircular arch which lie below the joint ©, fig. 49, are of use chiefly to improve the appearance of the arch. ‘They are virtually part of the abutment, which is some- times even considered as extending to the joint B. In a very flat arch the linear arch may be brought to coincide more truly with the axis of the ring by lightening the haunch, with which object the roadway is sometimes carried on small flat arches turned at right angles to the main arch, and having the spandrils of the main arch as abutments.

The joints between the voussoirs should be very evenly worked, so that the pressure may be evenly distributed. In brick joints the layers of mortar should be thin. Great care should be taken to provide for the drainage of the roadway above the arch. With this object the masonry should be covered with a sheet of asphalt sloping down to _ the piers or abutments, and suitable drains must be pro- vided to collect the water and discharge it through the pier or abutment.

Skew Arcnes have already been treated of under the _ general head Arcu (vol. ii. p. 330). | Considerable attention must be given to the con- _ Struction of the centres or wooden frames on which the voussoirs rest while the ring is in process of being built. Extreme rigidity is necessary, and this rigidity is best | attained by adopting one of the three following plans

(Rankine) :—1. Direct supports as in fig. 53, illustrating

Hartley’s centre for the bridge over the Dee at Chester (total span 200 feet) ; 2. Inclined struts in pairs as shown in fig. 54, being a dia- gram of the centre used in the erection of Water- loo Bridge; 3. Trussed wooden girders, of which an example is afforded by the truss used in the erection of London Bridge, fig. 55. Fig. 53.

Figure 55 shows the striking plates and wedges by which the centre is lowered after the completion of the arch, The upper and lower plates A and B are strong

Fig. 54.

beams suitably notched, and are separated by the com- pound wedge C; this wedge is kept in its place by cross wedges shown in section in the figure. When the centre

YO aoe

Fig. 55.

is to be lowered these cross wedges are knocked out, and the main wedge C driven back. Owing to defective cen- tering some large French arches sank much during con- struction, and owing partly to this cause, and partly, as it would appear, to defective mason-work, the total deforma- tion after the centres had been struck was most extraor- dinary. In Perronet’s bridge at Neuilly (vide Table XVII, § 84) the sinking, while the centre was in its place, amounted to 13 inches, and after the centre was struck a further sinking took place of 94 inches. The crown of the centering had a radius of 150 feet, but the sinking of the arch was such that for 60 feet it assumed the form of an are of a circle with a radius of 244 feet. It is remark- able that the bridge, built in 1774, of very bold design and so imperfectly executed, still stands. When the centres of Waterloo Bridge were removed no arch sank more than 14 inches. Centres have occasionally been sup- ported on strong sacks full of sand. To lower the centre the sand was allowed to escape through apertures in the sack. It is believed that this method was first employed by a French engineer, M. Beaudemoulin. The canvas sack has been advantageously replaced by wrought iron

boxes or troughs; the block supporting the centre acts as a lid resting on the sand inside; when the sand is allowed to escape the block sinks slowly down inside the box.

§ 45. Comparison of Metal with Masonry Arches.—Metal arched ribs may be used instead of rings of masonry to support a platform and roadway. ‘These arched ribs con- stitute true arches whenever, as is generally the case, all parts of the rib are compressed. The principles by which the stress on each part may be computed do not differ from those already explained for arches of masonry, but it is possible to calculate the stresses with much greater exactitude for continuous metal ribs than for voussoirs. With voussoirs we have seen that the resultant thrust at the springing is indeterminate both in magnitude and position, but we shall see hereafter that the resultant thrust, which will be called t, at the springing of a metal arch is easily rendered deter- minate. Supposing ¢ and ¢,, the thrusts due to a given load (fig. 56), to be known, then if the form of rib be made to

correspond with any linear arch for the given distribution the compression at any section of the rib will be axial and uniformly distributed ; the arch will then be strained as a chain of the same length would be strained under the same distribution of loads, extension being substituted for com- pression and dip for rise. Fig. 56 shows a rib of this kind with the approximate linear arch drawn as an equilibrated polygon by the method explained in § 38.

If the distribution of the load is altered the linear arch will also change, and the stress on each part of the rib will no longer be axial. The change in the form of the linear arch will generally be much greater for a metal than for a masonry arch, because most metal arches have light open spandrils and a light roadway, so that the passing load is considerable in comparison with the permanent load. Not improbably the linear arch, when only one haunch of a metal rib is loaded, may pass quite outside the rib for a portion of its length if this rib is made, as is usually the case, of a form containing the linear arch for a sym- metrically distributed load. On the other hand, it does not follow, as with masonry, that because the linear arch passes outside the rib the bridge will fail. The bending couple then produced can be resisted by the moment of the elastic forces of the cross section of the rib if the rib is

made strong enough. In masonry the joints open so soon as the resultant pressure passes outside the middle third of the ring; the couple required to produce equilibrium would then ‘require a negative force or tension at the opposite edge, and masonry cannot supply this tension, but in a metal rib the couple or bending moment produced by the excentricity of the stress may be resisted by the stiffness of the rib acting as a beam subject toa bending moment. Thus the strength of an arch to resist flexure is a more important element in the metal rib than in the masonry structure. It would be false to say that the ring of voussoirs had no strength to resist flexure, for we have on the contrary seen that the

moment of the elastic forces at any section of a stone ri does resist any distorting action produced by the load; butin niasonry this moment should never exceed the com paratively small value consistent with the absence of tension on ap. part of any joint. The metal rib may with safety be sub. jected to considerable tension in parts, and its strength to resist flexure can be easily increased and can be calculated with certainty. Moreover, by hinging the rib at one op both springings, as can be done with metal, the problem of determining the horizontal thrust (or total thrust) is sim. plified, the position of the thrust being thereby rendered certainly axial at this point, and then by taking into account the actual deformation of each part of the rib a complete solution of the problem of its strength can be obtained,

§ 46. Horizontal Thrust of a Metal Arch or Rib hinged at the Abutments.—By supporting a rib on pins or ip cylindrical bearings (vide fig. 62) at the abutments we determine two points traversed by the thrust. The effect of allowing free rotation is necessarily to render the bending moment zz round the centre of rotation. Hence the resultant thrust must traverse the centre of the pin, or the centre of curvature of the bearing. Knowing the point of application of the thrust we have now to determine its magnitude. The vertical component v is the same as the load on the pier of a girder of the same span equally and similarly loaded, so that the problem reduces itself to the determination of £ the horizontal component.

Fig. 57.

Let us first consider a semicireular rib (fig. 57), bearing a load uniformly distributed along the horizontal platform of the bridge (neglecting the weight of the rib). The linear areh will pass

through the eentre of the bearings N and Q, and will be a parabola. ~

Moreover, it will be that parabola which requires the rib to exert no internal forees due to its own elasticity, and tending either to push out or draw in the springings; in other words, the mb, being supposed in equilibrium before the application of the weights, will not tend to act as a spring to increase or diminish the opening between N and Q. Nevertheless, as the semicircle eannot coincide with the parabola, most parts of the rib must be subject to bending

moments, against which it will react as a bent spring. When the

linear arch, as shown in fig. 57, passes above the axis of the rib at the erown, and below it at the haunches, the upper portion of the bent rib will act as a spring, tending by its reaction to diminish the distanee between the ends N and Q, while the portions near the springing will be so bent as by their reaction to tend to increase that distanee; now, if, as is necessarily the case, the whole rib is not to act as a spring, tending either to close or open the ends N and Q, then the effeet of the bending near the haunches must exactly neutralize the effeet of the bending near the crown. We have now to find what direction of thrust at the springing will give linear areh such that the above condition may be fulfilled.

Let M be the bending moment acting at any given section, the centre or neutral axis of which is at a height y Gg. 58) above the horizontal line joining the springings; let this moment be con- sidered constant for a short length AL of the rib measured axially along the rib; let As be the short distance measured horizontally by which the moment M acting throughout the length AL would

SS Ee

increase or diminish the span of the rib at the springings, the rest of the rib being assumed free from strain. Then calling I the moment of inertia of the cross section of the rib, and E the modulus of elasticity, we shall have—

My.AL 13 -— a As= IE ? as appears from the following considerations :— In fig. 58, lets Oo=Aa@=Bb=AL; conceive the surface at AB as

fixed, and let the action of the couple M be such as to extend the

Seiwa on scones

Fig. 58.

top and compress the bottom of the rib, moving the point a to a, and the points 0 to 6,; then, calling p the intensity of the stress at a, we have (equation 4, § 14)—

wa ZBL

F

also we have (§ 24)—

and therefore—

join o and Q and draw the line 0Q,, making the angle QoQ, equal to

aod,; at Q draw QQ, perpendicular to 0Q. Then the effect of the

couple M on the length AL of the rib, the rest being unstrained,

ov be to move the point Q to Q,, and by similar triangles we ave—

eS i eR Gay: QQ=5 ae – and therefore— = NANG QQ=ET 0Q.

Then resolving the motion QQ, into horizontal and vertical com- ponents As and Av, we have by similar triangles, As: QQ,=y : 0Q, or, as above—

My.AL

LE

_But if, as above stated, the rib does not act as a spring in either direction, the span will remain constant, and the sum of all the changes in span — by all the successive lengths AL will be nil, or ZAs=0. ence, since E is constant, we have

—S = My.AL_g Phe. ~¥ An

As=

a8 @ necessary condition for the equilibrium of a loaded rib, hinged at

the abutments when these do not yield. This condition must be

satisfied whatever be the form or load of the rib, the reasoning by

which it was obtained being independent of the form either of the

- – linear arch. When the cross section of the rib is constant, e have—

=My.AL =0.

We shall now proceed to show how the linear arch satisfying this condition can be found for the case of a uniform rib. Let the line 00,0,0,0,, fig. 59, be the geometrical axis of

1 the rib, and let OC,C,C,C, be the linear arch required ; this arch

ho as shown above, cut the geometrical axis at some point, as g

CG Let C,C represent the resultant pressure on the rib at any point vain direction and magnitude, fig. 60. If this pressure be resolved into its vertical and horizontal components, the latter C,H will be

equal to the horizontal thrust 2 (constant through inear arc since the loads are vertical). ‘ i

Cs

Fig. 59.

This force applied at C, will be equivalent to an equal and parallel force, O,H,, applied at the point, O, in the axis, added to

a left handed couple, of which the moment is 2 0,0, This couple

Fig. 60.

is, for the point O,, the couple M* required for equations 1, 2, and 3, the magnitude of which, & being constant, is proportional to the vertical distance OC between the curves at any point. Equation 3 requires that the sum of all the values of My shall be equal to zero, and we now see that this condition results when the sum of all the products of OC into y is equal to zero, or when—

cp) ee Se ay OCS 0; y.OC

when the cross section is not constant the value of I inust be

substituted for the simple product y.OC.

The problem of discovering the actual linear arch which will be called into play with a given rib is now reduced to that of finding the linear arch fulfilling the condition in equation 4. We might proceed tentatively, drawing numerous linear arches, and selectin by trial that which most nearly fulfils

the condition, as propose by Mr Bell, Proc. I.C.H., vol. xxxii., but Professor Fuller of Belfast has shown, Proc. I.C.E., vol. xl., that the ordinates of the required linear arch can at once be calculated from the values of the bending moment at the several sections of a beam of equal span and similarly loaded. Let o9,9o93 (fig. 61), be the curve of bending mo- ments which, as was shown in § 30, is one form of linear arch cor- responding to the given load, the lengths 00), 20g, 003 &c., being equal and representing AL; let y as before be any ordinate of the CUrVe 00,0:03, the axis of the rib; let sg be any ordinate of the given curve of bending moments; let sc be any ordinate of the required linear arch. Then, since oc—sc—y, we have for the case of uniform cross section and hinged abutments the equation—

oo » xy (se — y)=0, or Sy.sc= 3y?* ;

- This couple is sufficient to shift the force from C, to O,, but the resultant of the force at C, and the couple would not be tangent to the geometrical axis of the rib. To alter the direction of the force in this manner a vertical component must be added, but this vertical com- ponent may be looked upon asa shearing force, which, being vertical, tends neither to extend nor to diminish the span.

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but the ratio sc: sg is constant, and may be designated by the letter k; so that we may write & (3y. sg)= %y?, from which equation we find the value of s — ?

=

) 2S eee, 2

By.sg

If the cross section is not constant we have for & the more com- plex expression—

but sc=k.sg, so that the required ordinate sc is at once obtained in terms of & and the known ordinate sg. F

When the actual linear arch oc,c,c;, &c., has been thus obtained, it is easy to calculate the horizontal thrust; for let s,c; be the maximum ordinate, the direction of the thrust will at this point of the curve be horizontal, and therefore calling W the weight on one side of this ordinate, and x the distance of its centre of gravity from the springing, we have— oe:

Care ig 4 @ ws WeH lees:

from which / can be found.

hand v being known give the position and direction of the result- ant thrust at the springing of the rib. The magnitude of the thrust at any other point is easily computed graphically or by moments

Fig. 61.

round the springing ; then the resultant thrust at a given point being known, the intensity of the stress on any part of a section at that point is to be computed by first resolving the thrust into two components, one normal to the section and one in the lane of the section; the latter gives rise to a shearing stress re to the force which causes one stone to slip on another in the masonry arch), while the component normal to the section will (if not axial) give rise to a uniformly varying stress, the magnitude of which at each distance from the axis can be computed by the formule given in § 8.

The value of A is determinate, if the direction of the rib be supposed fixed at the springing, but this cannot be ensured in large structures, and the theory need not therefore be developed. It simply requires 3 co—0.

When the rib (as is generally the case in existing bridges) abuts against a flat springing the exact value of is indeterminate. When the rib is hinged the friction at the bearing renders the thrust indeterminate within limits depending on the possible bending moment at the springing due to the friction.

§ 47. Process of Designing a Rib.—In future designs of

ribbed arches it is to be hoped that the practice will be |

adopted of allowing the rib freedom to turn at the springing, This can be done by ending the rib in a bearing, curved as in fig. 62; the resultant thrust will then be approxi- mately axial, and the stress on every part of the rib can be determined with as much accuracy as on the several parts of a girder. When the span is large a cast-iron metal arch can be made lighter than a wrought iron girder for the same load, but the imperfection of the theory of the stresses on the ribs has hitherto led to great waste of metal in their construction. In what follows it is assumed that the resultant at the springing passes through the geometrical centre of the cross section of the rib.

If the rib were to carry a load distributed only in one way we ought clearly to make the form of the axis of the rib coincide with a linear arch for that load. There would then be no bending moment on any part of the rib. As

[ARcuns,

in practice we must provide for all the possible combinations of passing load, we need take little pains in designing the curvature of the rib—a flat arc of a circle with a rise of say ith will answer well. The semi- circular or elliptical forms are not good, for no linear arch with any prac- tical distribution of load can even approximately coincide with a form in which the rib springs vertically from the abut- ments.

The general character of the cross section should be similar to that for a girder, inasmuch as the rib will have to resist bending moments as well as direct compression. The depth need not, however, be nearly so great as the depth of a girder. Let a cross section be chosen in which the area is assumed as approxi- mately say 5 per cent. more than that which would be sufficient to sustain the thrust resulting from a linear arch suitable for the maximum load and coinciding approximately with the axis of the rib. (If the load be nearly uniform per foot run of platform we may for this first

ae d is the rise of the linear arch above thu springings.) With the rib thus de. signed determine by the method given in § 46 the actual linear arches resulting from the following arrangements of passing load (combined with the permanent load) :— (I), Bridge half covered from one end; (2), three-quarters — covered from one end; (3), wholly covered ; (4), covered by the passing load over the middle half of the bridge, the haunches being unloaded. Draw these linear arches on the rib by the method given in § 38, and choosing at each one of some eight or ten selected sections the two curves which most nearlyapproach the top and bottom flanges respectively, com- pute the maximum intensity of stress on the top and bottem flanges at each section from the two thrusts corresponding to these.two linear arches; where the stress is excessive add metal; remove it where the maximum stress is less than the safe stress for the material. If no great change is made in the design this process will be sufficient, but” if the cross section is seriously modified by the alteration we must make a second approximation by recalculating the linear arches for the new form of rib, and thus proceed by trial and error until the stresses snr aiaey to the actual linear arches are met by sufficient metal at all — points. The rib need not be of uniform depth throughout, and may be increased in depth at the places where the stress due to bending moment has been found excessive.

In large spans the effect of a change of temperature must be taken into account. This can be done by finding the linear arch given by the expression —

Fig. 62.

approximation take h = where

i. Ke 5 rs = y=As,

where As is the alteration in span which would result from the expansion or contraction of the span if free to expand or contract with the change of temperature.

In a series of arches abutting against comparatively slender piers, account must be taken of the thrust trans mitted from the neighbouring arch. This thrust wil only be due to the passing load, and a part may be con sidered as taken by the pier ; the remainder which the

i RAMES. |

bier cannot counterbalance must be compounded with the reaction due to the linear arch calenlated for the permanent oad of the unloaded span. With the reaction thus com- puted the linear arch resulting in the unloaded span must he constructed, and the stresses examined on the top and bottom flanges of the rib.

The theory now given for a stiff rib used as an arch is equally applicable to a stiff rib hung as a suspension bridge.

§ 48, Wooden Arches.—Arches have occasionally been ‘built of wood with ribs elaborately constructed of bent ‘ee scarfed and bolted together; the strength of such a rib could be calculated in the way indicated for metal \ribs, but the mode of construction is not to be recoin- ‘mended. When wood is employed it should be used in ‘simple straight balks built into a framed arch. | § 49. Practical Details of Metal Arches—The common form of metal arch is a cast-iron rib of T section and of ‘small depth. This rib is intended to be sufficient, unaided, Hto bear the whole weight of the superstructure. The ‘spandrils, made of some kind of lattice work (or occasion- ‘ally a mere arcade), bear the roadway, and to some extent | stiffen the rib beneath. The rib may with advantage be made much deeper than has been the practice, and may consist of tubes framed as in the St Louis Bridge, fig. 5, Plate XVIIL., lso as to form a single stiff rib. Where, to gain head- way, a rib of small depth at the crown is desirable, the rib might with advantage be deepened at the haunches. Wrought iron is a very suitable material for small arches, where the permanent load is insufficient to prevent tension from occurring in some parts of the rib, Cast-iron and east-steel are better materials for large spans ; for moderate spans a good form of metal arch will be shown under the head of “Frames” (fig. 77), being that in which a lower member is braced to the upper member carrying the road- way so as to form a true frame; for very large spans a | single deep rib, or a frame with parallel members arranged as an arch, may be adopted.

This design has the advan- ‘| tage over that shown in fig. 77 of avoiding very long _ bracing at the abutments.

V. FRAMES.

§ 50. Preliminary.—A frame is a rigid structure composed of straight struts and ties. The struts and ties are called | the members or pieces of the frante. The frame as a whole | may be subject to a bending moment, but each bar, pillar, rod, or cord in the structure is thereby simply extended or | compressed so that the total stress on a given member is the same at all its cross sections, while the intensity of stress is uniform for all the parts of any one cross section. This result must follow in any frame, the members of which are so connected that the joints offer little or no resistance to change in the relative angular position of the members. Thus if the members are pinned together, the joint consisting of a single circular pin, the centre of which lies in the axis of the piece, it is clear that the direction of the only _ stress which can be transmitted from pin to pin will coincide _ with this axis. The axis becomes, therefore, a line of resistance, and in reasoning of the stresses on frames we may treat the frame as consisting of simple straight lines from joint to joint. When the members of a frame consist of iron rods as ties, combined with struts formed by / angle iron or T iron of the usual sizes, or by pieces of | timber of the ordinary dimensions, it is found by experiment ‘ that the stresses on the several members do not differ sen- _ sibly whether these members are pinned together with a single pin or rigidly jointed by several bolts or rivets. | Frames are much used as girders, and they also give useful designs for suspension and arched bridges. A frame used

to support a weight is often called a truss ; the stresses on the various members of a truss can be coniputed for any given load with greater accuracy than the intensity of stress on the various parts of a continuous structure such as a tubular girder, or the rib of anarch. Many assumptions are made in treating of the flexure of a continuous structure which are not strictly true; no assumption is made in determining the stresses on a frame,

except that the joints are flexible, and that the frame shall be so stiff as not sensibly to alter in form under the load. Both assumptions are consistent with the facts in the case of any bridge truss.

§ 51. Classes of Frames used as Trusses.—Frames used as bridge trusses should never be designed so that the elongation or compression of one member can elongate or compress any other member. An example will serve to make the meaning of this limitation clearer. Let a frame consist of the five members AB, BD, DC, CA, CB (fig. 63), jointed at the points A, B, C, and F B D, and all capable of resisting + / tension and compression. This frame will be rigid, 2.¢., it cannot be distorted without causing an alteration in the length of one or more of the members ; but if from a change of temperature or any other cause one or all of the mem- bers change their length, this will not produce a stress on any member, but will merely cause a change in the form of the frame. Such a frame as this cannot be sedf-strained. A workman, for instance, cannot produce a stress on one member by making some other member of a wrong length. Any error of this kind will merely affect the form of the frame ; if, however, another member be introduced between A and D, then if BC be shortened AD will be strained so as to extend it, and the four other members will be compressed ; if CB is lengthened AD will thereby be com- pressed, and the four other members extended ; if the workman does not make CB and AD of exactly the right length they and all the members will be permanently strained. These stresses will be unknown quantities, which the designer cannot take into account, and such a combina- tion ought therefore never to be adopted. A frame of this second type is said to have one redundant member.

If the members AD and CB were flexible cords there would be no redundant members; for the tightening of one diagonal would throw no sensible stress on the other diagonal, since it is supposed incapable of resisting a thrust. Both diagonals, if flexible, are required to prevent the quadrilateral from getting out of shape. Members capable of bearing only one kind of strain might receive the name of semi-members.

§ 52. External Forces on Frame.— Frames used as bridge trusses are in equilibrinm under the external forces applied to them. These forces are—(1) the loads, (2) the reactions at the points of support. The loads are to be

referred to the joints as follows :—(1) find the resultant of the load carried by any two joints; (2) resolve that load into two vertical components acting through the two joints ; (3) com- pound the several components acting at each joint into one resultant. This process gives a frame with external forces equivalent to the actual loads, but acting only at the joints. The frames are always supported at a joint, and the reactions of the supports are therefore also forces acting at joints. The load between any two joints is directly supported by the member of the frame joining them; the stresses due to the direct action of this partial load must, where great accuracy is wanted, be added to the stresses computed on the assumption that the loads have been applied directly to the joints. Generally the stresses due to the direct action of the load between two joints may

e D Fig. 63.

be neglected except where a member of the frame is em- | lines in the two figures are parallel, and correspondin ployed to carry the roadway. lines which converge to a point in one figure form a closed

Fig. 64 shows a common form of bridge truss known as | polygon in the other.”

Let a frame (without redundant members), and the external forces which keep it in equilibrium, be represented by a diagram constituting one of these two Plane figures then the lines in the other plane figure or the reciprocal will represent in direction and magnitude the forces between the joints of the frame, and, consequently, the stress op each member as will now be explained.

| Reciprocal figures are easily drawn by following definite ules, and afford therefore a simple method of computing tho stresses

on members of a frame. Fig. 64. The external forces on a framo or bridge in equilibrium under Y . : fs those forces may, by a well-known proposition in statics, be a Warren girder, with lines indicating external forces ap- | represented by a closed polygon, each side of which is parallel to

plied to the joints; half the load carried between the two one force, and represents the force in magnitude as well as in lower joints next the piers on either side is directly carried | direction. The sides of the polygon may be arranged in any order,

F provided care is taken so to draw them that in passing round the by the abutments. The sum of the two upward vertical polygon in one direction this direction may for each ‘side corres- reactions must clearly be equal to the sum of the loads. poud to the direction of the force which it represents.

The lines in the diagram represent the directions of a series This polygon of forces may, by a slight extension of the above of forces which must all be in equilibrium ; these lines may, | ‘lefinition, be called the reciprocal figure of the external forces, if for an object to be explained in the next paragraph, be the sides are arranged in the same order as that of the joints op

: ‘ : which they act, so that if the joints and forces be numbered 1,26 conveniently named by the letters in the spaces which they | 4 &c., passing round the outside of the frame in one direction, and

separate instead of by the method usually employed in | returning at last to joint 1, then in the polygon the side represent. Ee han tho ne AG tbe fg tat inline Nine on te | ing the fee 2 wile next the id roprteting the foe awl left hand the line AG, the line representing the first force This polygon folks cada the definition of a reciprocal figure given on the top left hand joint AB, the first horizontal member by Clerk Maxwell, if we consider the frame as a point in equilibrium at the top left hand the line BH, &c.; similarly each point | under the external forces. requires at least three letters to denote it; the top first left hand joint may be called ABHG, being the point where these four spaces meet. In this method of lettering, every enclosed space must be designated by a letter ; all external forces must be represented by lines outside the frame, and each space between any two forces must receive a distinctive letter; this method of lettering was first pro- posed by Mr R. H. Bow (Economics of Construction), and is convenient in applying the theory of reciprocal figures to the computation of stresses on frames. When the weight of the truss is small it is usual to refer the weights of the parts of the truss itself to the same jointsas carry the roadway, and to treat all other joints as unloaded. The reactions at the points

of supports of a framed arch or suspension bridge are inclined, as in fig. 65 ; the manner |

Z. zZ vA Fig. 66a. Fig. 665. ‘Fig. 66¢. Fig. 66d.

Fig. 66 shows a frame supported at the two end joints, and loaded at each top joint. The loads and the supporting forces are indicated by arrows. Fig. 66a shows the reciprocal figure or polygon for the external forces on the assumption that the reactions are slightly inclined. The lines in fig. 66a, lettered in the usual Manner, correspond to the forces indicated by arrows in fig. 66, and lettered sexe to Mr Bow’s method. When all the forces are vertical, as will be the case in girders, the polygon of external | forces will be reduced to two straight lines, fig. 666, superimposed . and divided so that the length AX represents the load AX, the . length AB the load AB, the length YX the reaction YX, and so forth. The line XZ consists of a series of lengths, as XA, f HANDS es DZ, representing the loads taken in their order. In sub- sequent diagrams the two reaction lines will, for the sake of

Fig. 65 clearness, be drawn as if slightly inclined to the vertical (as alia practised by Mr Bow). : ; ; of computing the stresses on these frames when the direction If there are no redundant members in the frame, there will be only

: : ° . two members abutting at the point of support, for these two mem- of these reactions is known will be first explained, and bers will be sufficient to ‘alice the reaction, whatever its direction

subsequently the manner of finding this direction will be may be; we can therefore draw two triangles, each having aS one given. side the reaction YX, and having the two other sides parallel to § 53. Reciprocal Figures.— Prof. Clerk Maxwell has given these two members ; each of these triangles will represent a poly-

: . oi . gon of forces in equilibrium at the point of su port. Of these two (Phil. Mag. 1864), the following definition of reciprocal triangles, shown in fig. 66c, select that in. walk the letters X and figures :—“ Two plane figures are reciprocal when tHey | Y are so placed that (naming the sos of the triangle E) the

consist of an equal number of lines go that corresponding | lines XE and YE are the lines parallel to the two members of the

.

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‘FRAMES. |

‘ same name in the frame (fig. 66). Then the triangle YXE is the | reciprocal figure of the three lines YX, XE, EY in the frame, and represents the three forces in equilibrium at the point YXE of the frame. The direction of YX, being a thrust upwards, shows the | direction in which we must go round the triangle YXE to find the | direction of the two other forces; doing this we find that the | force XE must act down towards the point YXE, and the force EY away from the same point. Putting arrows on the frame | diagram to indicate the direction of the forces, we see that the – member EY must pull and therefore act asa tie, and that the member XE must push and act asa strut. Passing to the point XEFA we find two known forces, the load XA acting downwards, and a push | from the strut XE, which, being in compression, must push at both ends, as indicated by the arrow, fig. 66. The directions and magni- tudes of these two forces are already drawn (fig. 66a) in a fitting position to represent part of the polygon of forces at XEFA; be-

inning with the upward thrust EX, continuing down XA, and

awing AF parallel to AF in the frame we complete the polygon by drawing EF parallel to EF in the frame. The point F is deter- mined by the intersection of the two lines, one beginning at A, and the other at E. We then have the polygon of forces EXAF, the reciprocal figure of the lines meeting at that point in the frame, and representing the forces at the point EXAF; the direction of the forces on EX and XA being known determines the direction of the forces due to the elastic reaction of the members AF and EF, showing AF to push as a strut, while EF isa tie. We have been guided in the selection of the particular quadrilateral adopted by the rule of arranging the order of the sides so that the same lctters indicate corresponding sides in the diagram of the frame and its reciprocal. Continuing the construction of the diagram in the same way, we arrive at fig. 66d as the complete

reciprocal figure of the frame and forces upon it, and we see that each line in the reciprocal figure measures the stress on the corresponding member in the frame, and that the polygon of forces acting at any point, as |JKY, in the frame is represented by a polygon of the same name in the reciprocal figure. ‘The direction of the force in each member is casily ascertained by proceeding in the manner above described. A single known force in a polygon determines the direc- tion of all the others, as these must all correspond with arrows pointing the same way round the polygon. Let the arrows be placed on the frame round each joint, and so as to indicate the direction of each force on that joint; then when two arrows point to one another on the same picce, that piece is a tie; when they point from one another the piece is a strut. It is hardly neces- sary to say that the forces exerted by the two ends of any one member must be equal and opposite. This method is universally applicable where there are no redundant members. The reciprocal figure for any loaded frame is a complete formula for the stress on every member of a frame of that particular class with loads on given joints. Some examples of these figures will be given, and the reader will easily construct others for himself.

§ 54. Warren Girders—Reciprocal Figure and Method of Computing Stresses by Method of Sections .

_ Case 1. The Warren girder loaded at each top joint,

figs. 67 and 67a. This diagram differs very slightly from

Fig. 67.

| that shown in fig. 66. The top and bottom members are in straight lines, and consequently the lines indicating the stresses on the bottom member are superim- posed one on the other instead of tadiating from Y; the loads XA and FZ are shown as directly borne by the piers. It is clear that if the road is supported by a platform reaching from the end joints to the piers, half of the load on these parts of the platform will be directly supported on the piers. These end loads are shown also in the subse- quent diagrams. The truss is generally built of equilateral

Fig. 67a.

triangles, and the inclination of the bracing to the horizon should never be less than 45°.

Case 2. Warren girder loaded on top and bottom, fig. 68. 68 shows the polygon of external forces, and 68¢

Z P Q A. S z Fig. 685. Uv V Ww Y XxX

shows half the reciprocal figure. These figures have been added to facilitate the comprehension of the complete reciprocal shown by 68a

Case 3. Warren girder with one load, not central, fig.

PS

69. The polygon RXZ, fig. 69a, represents the external forces.

Case 4. Warren girder; load on half the top joints, fig. 70. Tn designing a Warren girder it is necessary to provide for the advancing load. With a uniformly distributed load the

Fig. 70.

diagonal bracing consists of alternate struts and ties begin- ning, if supported at the bottom, with a strut at each end, or with the tie at each end if the truss is hung from the top. At the centre there will be either two ties or two struts in juxtaposition ; or, as in the case where there are an even number of loaded joints at the top, the central pair of diagonal members will be unstrained ; but an advancing load (neglecting the permanent load) will convert each diagonal member (except the end ones) alternately into a strut and a tie. It is necessary to provide for the maximum extension and maximum compression on each, taking into account the combined effects of the permanent and passing load; the latter has generally sufficient effect to

reverse the direction of the stress on the bracing near the centre, but not (in large bridges) towards the ends. Each member of the bracing towards the centre must, therefore, be so designed as to be capable of acting alternately as a strut and as a tie. The maximum stress on the top and bottom members occurs when the bridge is fully loaded.

This stress is easily calculated by the method of sections; assume the girder cut by a vertical plane at the joint or pin opposite the member in question, or in other words, by a wactieat plane pass- ing through the vertex of the triangle of which the member in question is the base ; let d be the perpendicular distance between the member and the pin, ¢ the thrust or tension on the member, and M the bending moment for the section calculated as for a ag loaded at the points corresponding to the joints. Then

= td, The stress on the diagonals corresponds to the shearing stress in the solid girder, and may consequently be calculated from the shearing diagrams, examples of which were given in § 19. The loads may be referred to the joints before drawing the diagram, and the continuous curves of figures 18 to 18¢ will be replaced by lines consisting of a series of steps such as are shown in fig. 18a. We may then proceed to calculate the stress on any diagoual as fol- lows :—Take the shearing stress for the section at the joint where the diagonal in question abuts ; if there is a load on this joint, take the shearing stress for a section close to the joint, and on that side

x

GEE

Fig. 70a.

Fig. 71.

of it which is next the diagonal in question ; call the shearing force thus found F ; let ¢ be the slope of the diagonal or the angle which it makes with the horizon, then the tension or compression on the diagonal is F cosec. 4; thus let fig. 71 represent a Warren girder of six equal bays, in which i =60°. Let the load on each top joint

[FRamns,

be 5 tons, the compressions and tensions on the diagonals are ag follows :—

TABLE XI.

oe FX cusec. 4. Compression. |} Tension b | 45× 1-1547 17°32 – 2 10 × 1°1547 D. 11°55 3 10 × 1°1547 11°55 a 4 5× 1‘1547 ad 5-77 5 5× 1/1547 577 vee 6 ie

0 × 1°1547

These stresses, given simply as an example, apply to the one special load, and are not to be confounded with the maximum stresses which an advancing load of the same intensity would produce. ‘The stresses on the two halves of the girder are sym. metrical.

The arithmetical mode of computation is the simpler where the top and bottom members are parallel and the inclination of the diagonals constant; where these conditions are not fulfilled the method by reciprocal figures is preferable.

In the actual design of any girder to suit various combinations of loads, care must be taken to design each member to suit the maximum stress Which can arise from any combination. The maxi. mum shearing stress is most easily selected by means of the dia- grams § 19. Care must be taken to meet both the maximum tension and maximum compression whenever the member is so placed that with some loads it is extended and with some compressed. We have just shown that this case arises in the diagonals near the centre of the girder. When frames are used as continuous girders, it is desirable to make the points of inflection coincide exactly with a joint. This may be done by cutting through or omitting the mem- ber opposite the joint. This allows the reactions on each pier to be easily determined by the elementary principles of statics with any load, and without taking into account the form which the beam assumes when deflected. Instead of a long continuous girder, we then have a series of girders, supported at or near the

middle of their length by the piers, while a second series hang from the first by pins at determinate points. This arrangement greatly simplifies all the calculations without sensibly diminishing the advantage derived from the use of continuous girders.

§ 55. Various Forms of Girder.—The framed girder is sometimes made of the form in fig. 72, which has the

yietebe eri L

Fig. 72.

advantage of reducing the length of the end diagonals where the stress is heaviest. The reciprocal figure for this truss uniformly loaded on the bottom %

joints is shown in fig. 72a. This girder is sometimes called a bowstring girder, though this name more properly belongs to an obsolete form with no diagonals. Z and X are the spaces between the end loads and the re- actions which, for clearness, are shown as pulling up ; but the same reciprocal would result if the reaction were shown pushing up, and the letters X and Z were placed as dotted, This form has the advantage of reducing the compression on the diagonal struts to a comparatively small amount. A great part of the shearing stress is taken by the curved upper boom ; deeper girders can be profitably used of the bowstring than of the Warren type. The long and expe sive struts in the latter form more than counterbalance

Fig. 72a.

the saving to be obtained by increasing the depth beyond about -{,th of the span. ;

The diagonal bracing in the Warren and_ bowstring | girders is sometimes arranged as in fig. 73; the girder is

| RXXSKSKS ron iene RRR ee

ete a hs Fig. 73,

WS

‘ then called a lattice-girder. It is to be treated as a series of superposed Warren girders, each bearing its share of the load. This form has a slight advantage inasmuch as the diagonal struts are stiffened by being pinned to the ties

_ where they cross.

Fig. 74 shows a very common and useful form of girder

Fig. 74,

where the uprights between the top and bottom members

are able to sustain both tension and compression, while the | diagonals are only “semi- _ members,” being flexible rods or bars, The reciprocal for this design is shown in _ fig. 74a with two joints more heavily loaded than the others. The members in fig. 74 which have no arrows on them are idle or unused, with this particular distribution of | load. When the permanent load is considerable as com- pared with the passing load, the end or two end diagonals shown dotted will not come into action with any distribu-

=

Fig. 74a.

much used when wood is employed for the compression members. It has in every case the advantage that the struts in the bracing are shorter than in the Warren girder. The lettering is arranged so that only those spaces have letters which are divided by members actually in use under this particular load.

Figs. 75 and 75a show a modification of this truss for small spans, and its reciprocal when loaded on one joint ;

Fig. 75.

the lettering here also only suits the one distribution of load, and the idle members have no arrows on them. § 56. Framed Suspension Bridges and Arches.—These __ frames, like the girders, consist of top and bottom members, braced together by ties and struts. The bridge is a Suspension bridge, if the frame is supported by inclined forees pulling outwards from the bridge as in fig. 76, and

tion of load, and may therefore be omitted. This form is |:

an arch is supported by forces pushing inwards as in fig. 77. The reciprocals of these two forms with the joints at the platform uniformly loaded are annexed. ‘These reciprocals are drawn on the hypothesis that the direction of the thrust or pull is known; and this has been chosen in this case so as to reduce the stress on NG to zero, as would necessarily be the case if NG were omitted or cut.. When this is not the case the direction of the thrust or pull at the abutments must Fig. 75a. be found in the manner explained below.

A

It is easy to design the bridge so that both the top and bottom members of the suspension bridge remain in teusion, and both those of the arch in compression under all distributions of load. This would allow wire rope to be used for both members of the suspension bridge, and cast-iron or steel for both members of the arch. The stresses on the bracing are very uniform and small as compared with those on the diagonals of a girder.

Fig. 78 shows a slight modification of the design for a

Fig. 76a. es

suspension bridge, very suitable for spans so large that the end struts in the pre- ceding form would be in- conveniently long. ‘The re- ciprocal annexed

is drawn for the case in which a double load is placed on half the bridge. The same design is suitable for an arch.

The resultant thrust or tension at the supports of framed suspension bridges or arches can only be found by a method analogous to that already explained for the solid metal rib. This method was first given by Prof. Clerk Maxwell.

Fig. 77a.

Consider any member A, fig. 79, of length L and cross-section a, made of a material having the modulus of elasticity E; under the action of a stress F, the length L will be altered by an amount –

–

AL =F F,-

320

Appropriate signs must be given to the arithmetical values of the forse and the alteration of length; thus thrust and compression may

Fig. 78.

be called negative, pull and extension positive. If every other mem-

i = z+ 4L— Sar ge reins a4 L

4 ~

< Sa –

Fig. 79. ber of the frame were absolutely rigid, the span S of the bridge A a 4 would undergo an alteration AS. The ratio al will depend merely

on the geometrical form of the frame; let g be the value of this constant ratio, so that—

L R.) galt “9, FRAT. AS=qAL=gF F; –

Let f be the force produced on the member A by a horizontal force h acting between the springings ; then by the principle of virtual velocities we have —

f:h=AS SAL,

for we may consider the structure merely as a kind of lever, by which the force # exerts a force on A, the fulcrum being the joint opposite A; then the above proportion expresses the fact that the forces A and fare inversely proportional to the spaces which the ends of the lever would move through when a small displacement occurs. Thus we may write

f=qh.

Similarly let 7, be the stress which would be produced on A by a vertical force v, applied at one springing, while the other springing was held rigidly so that the whole frame could not turn ; the ratio between f, and v is constant, depending merely on the form of the frame, so that we may write —

Ai=p?,

where p is a constant, to be found in the same manner as q ; p may be defined as equal to the whole stress preduced on the given mem- ber by a unit vertical force at the springing, and g as the whole stress produced on the same member by a unit horizontal force at the springing, the frame being held rigidly at the opposite abutment.

Then any thrust ¢ at the springing having the vertical and hori-

zontal components v and / will produce a stress F on A, equal to the sum of the stresses of f and f,, o:— F=qh+pv.

Substituting this value of F in equation 1 we have—

‘ L 2. . . AS=(q*h+p9r) a) = eg*h + epqv,

where ¢ = Fa * constant for each member.

Now, let the values of g, p, and ¢ be calculated for every member of the frame; then, calling the whole elongation SAS = &, we haye—

k=% (eq*h + epqv) .

If the abutments do not yield & = 0, and for this case—

Zepqu

Seq? ©

v is to be found as for a girder similarly loaded, and ¢, the required thrust or tension, is the resultant of 2 and v. The calculation is best made as follows : —Construct tables of the . values of ¢ and gq for each member of the frame; the method of sections or moments will answer best for the top and bottom members, and that of reciprocal figures for the diagonals; assume a cross

section for each member, based on a probable assumed value of ¢; for the required load make tables of epg and eg*, or what is equivalent,

oD) ea Si ee aa ee

: r? PL when FE is constant, make tables of the values of ve and “a: The

sum of eg? or = can then be made. If there be a load on one joint

only, find the values of v and 2, for the right and left abutments, then find Sepgv, using the value v for all members to the right of the load, and v, for all members to the left of the load ; equation 3 will now give the value of / for this single load. :

The process of finding Zepqv must be repeated for each joint which is loaded, and the whole horizontal thrust due to the load on any number of joints will be the sum of the separate values of A. When the horizontal thrust is known, the thrusts ¢ and ¢, are obtained at the two abutments by compounding the horizontal thrust with the vertical weight borne at that abutment. When ¢ and @, are known, the stresses on each member are to be computed by recipro- cal figures or any other convenient method. The process must be repeated for each combination of passing and permanent load, so as to find the maximum stress to which any member can be subjected. If the assumed cross sections are not suitable for these stresses, fresh cross sections must be assumed and the whole calculation repeated. The change in cross section will cause some change in the values of h, but this tentative vrocess need seldom be gone through more than once.

+ 49

+ 20

Fig. 80 shows half the frame of a bridge for which the calcula tions have been made. The span is 120 feet, the rise 12 feet, and the truss 5 feet deep at the créwn. The load assumed is 10 tons

in _ 1B

—— fA EG 2 TA «

a

MOO Prrrcnipinandbnccnwane sananses 1114155455 .

See

Fig. 81.

permanently on each top joint, and 10 tons of passing load. On fig. 80 are marked the stresses when the bridge is wholly covered with the passing load. On fig. 80a are marked the maxuum stresses with any distribution of load. Figs. 81 and 82 show graphi-

cally the amount of metal required in this bridge and in a girder of the same span and 12 fect deep; the breadth given in the diagram to each member is proportional to the cross section required. The quantity of metal required for the girder exceeds that for the arch in the ratio of about 175 to 100; a similar calculation for a bowstring

Fig. 82.

lattice girder 17 feet deep at the centre gives the ratio between the weights of metal required as 100 for the arch and 155 for the bowstring. Even these ratios understate the great advantage to be derived from the braced arch or suspension bridge for large spans, since they assume that the loads to be carried are the same, whereas the permanent load is in large spans much less for the lighter con-

struction of bridge. The following table shows the probable weight in tons of several different types of trusses, assuming that the maxi- mum intensity of stress on the metal in girders and arches is every- where 4 tons per square inch, that the passing load to be carried is 1-4 tons per foot run, and that the practical weight is 25 per cent. in exeess of the minimum possible weight if no metal were wasted, vide Zrans. R.S.S.A., vol. viii. p. 135. It must be re- membered that the abutments for arches will in all cases be more expensive than those for girders ; in small spans this expense will often outweigh the saving which could be effected in the super- structure by employing the arch.

TaBLe XII.— Weights of Trusses of different types.

| Weight of

Weight of |wrought iron — of

Weight of | wrought | Suspension] Welght of i

Span.| wrought iron iron Bridge, and | wooden Arch, |, a ee Ms Girder in tons. | Bowstring, |wrought iron] in tons. ae =

in tons. | or cast tron eure

| Arch, in tons. square inch.

= 3. 3. | m7 Ss.) & | ¥%. 8. @ le 1u.

Per

Feet| Total, | Pet! irotat.| foot {rotal \ort”| ‘total. |P2r hota Per ft run. . 200 83) °415| 70) +385) 41) 205} 57-1] -285! 19) 0°095 300] 2221 -74 | 180} -60| 100) °33 | 142 473] 45] 0°15 400| 475) 1:19 | 875) ‘94; 194) 485) 285 *712| 83) 0°207 500; 940! 1:88 | 700 1:4 | 330) *65 | 510 | 1:02 | 134) 0-268 600| 2,220) 3-7 |1260 2:1 | 530) °883) 870 | 1°45 | 200] 0-333 700| 3,900} 5°57 |2290 3°27| 790/1°13 }1440 | 2°06 | 280) 0-400 800} 12,800|16-{4450 5°56/1180) 1-475 384| 0°48 1000 2490) 2°49 655] 0°655 1200 5600, 4°67 1060} 0°885 1400 1580] 1°128 1600 2360) 1°475 1800 3410} 1:89 2000 4950) 2°475

The framed arch is a very suitable form for wooden bridges. The ties are few and subject to insignificant strains. In designing a series of arches supported on piers care must be taken to provide for the thrust from loaded to unloaded arches across the pier at the springing.

§ 57. Strength of Struts—When a strut or column is used as in framework to resist compression, it is usually so long in comparison with its cross section that it will bend and yield with a much less stress than would be required to crush the material. The strength of a strut of this kind can be approximately computed according to the following theory :—

_Let a strut with a cross section S be piaied or hinged at both ends, or let it , ‘ve round ends, so that if it yiclds %

1 compression it bends as in fig. 88. et the cross section have two axes of

Fig. 83. symmetry, and let the section be such that the column will bend

Fig. 84.

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in the plane of one axis; let the depth of cross section measured in this direction be called d, and the breadth measured at right angles to the depth d be called b. Let the maximum or breaking load be called P, and the maximum deflection of the longitudinal axis of the strut from its unbent position be called v, this quantity being analogous to the deflection ina beam. The moment tending to produce flexure at the cross section where vis measured will be

Pv. This moment must, as in the case of a girder, be equal to the moment of the elastic forees, which we sited know to be— py I ui= Ta ,

where p, and J have the same signification as for girders.

(J must be taken about the unstrained axis, or in other words about the axis running in the direction which has been called that of the breadth.) Hence we have—

2p, I Ped

Pu=~7> oF py = “oy 3

but we also know that for beams of uniform cross section under ae : ; iE similar internal stresses v is proportional to ; hence we have—

‘ I

2

Ite ot ys) ee) Oe RE a,

where @ is a constant depending on the material only. Let py) = 5

be the mean intensity of stress which would be produced if the load compressed all parts of the cross section equally, and let /, as before be the ultimate strength of the material per unit of cross section, then, when the beam is on the point of yielding, we must have Se= Vy + Py, Or—

Pe te = E ate aT ’ and calling 7 the radius of gyration— ly P SS pet of} nati = ’)\ oP = , f= % (item) oP =

1+73

from which f, can be computed in terms of P and a, or P in terms of fe and a.

The value of @ does not change with a change in the design of the cross section ; the values for cast iron, wrought iron, and wood determined by experiment are given in the following table, 8 being measured in square inches, P in Ibs. The table also contains values of fe.

TasBLE XIII.—Constants for the Strength of Struts and Pillars.

ies a. (CFE TA (010 eee 80,000 Ibs. ste Wrought iron …..... 36,000 Ibs. geeut Dry timber …..... 7,200 lbs. spue

When the direction of both endsof the column is fixed it must bend in the manner shown in fig. 84; if the curvature be uniform this would@have the effect of reducing the deflection v to one-fourth of the amount caused by the same stresses when the ends are hinged,

giving—

aPi? Pi eA 2 and > Z 78 a e a gt p=% (1+ fa): a Paint a: ‘ 4r3

When one end is fixed in direction and the other hinged, the ulti- mate load which the strut can bear may be taken as a mean between the strength of two pillars of the same length and cross section, one having both ends fixed in direction and the other having both ends hin . ; for similar cross sections r* is proportional to d?, the square of the depth (measured in the direction of the shorter side or axis),

2

thus the ratio a 2

2 72 :

Let 2 = —_ , and let B= 3 “a . Then from equation 2 we

have for hinged ends—

_

Hon pos + es 214 SS and from equation 3 for fixed ends—

aete 5. . . . . « . . P=7 5,8″

m has a constant value for all similar cross sections, and B a constant

IV. — 4!

322

value for any given materials and any constant ratio of J to v. Table XIV. gives the values of B for a series of these ratios, and Table XV. gives the values of for the most usual cross sections.

TABLE XIV.— Value of B (lbs. and square inches), Strength of Struts and Pillars.

q B for

B for B for Strong a Cast Iron.{ Wrought Iron. | Dry Timber. 10 187 0°033 “25 15 “42 075 9 20 “75 “133 16 25 1:16 208 2°5 30 1°69 3 3°6 35 273 408 4°9 40 2 “533 6°74 4°68 ‘833 10°

TABLE XV.—Values of n, Strength of Struts and Pillars.

Square or side d, or rectangle with smallest side d….....

Hollow rectangle, thin sides

- Circle, diameter d

Thin ring, external diameter d

Angle iron, smallest side d…….....

Cruciform, smallest breadth=d…...

2 CY INS

It is of great importance that the connections between the several struts and ties forming a frame should be so designed that the stresses produced may be axial. If this is not done the maximum intensity of stress on the strut or tie may greatly exceed those com- puted on the principles explained in the present paragraph (vide § 8).

Mr Unwin in his lectures gives the following empirical rules for the strength of wrought iron struts:—

A= > for fixed ends, . 6. che

Dy “Tap for round ends, ve ch?

where different values are given to f and ¢ according to the different cross sections of the struts.

Rectangular bars c=2500 $$f=17 tons. Cylindrical bars c=3500 f=17‘5,, Angle, T, cross, and charcoal ironec= 900 f=19 ,,

The following are Mr Hodgkinson’s formule for the strength of cast-iron cylindrical pillars, the length of which is not less than thirty times the diameter :—Let P be the load which will produce failure, d the external diameter in inches, L the length in feet, and : a constant multiplier ; then for solid pillars with either round or

at ends—

8. Page oat The value of A for rounded ends is 14-9 tons, and for flat ends

ee tons. Similarly for hollow pillars of internal diameter d, we ave 9. P=A(d4- @3°*)+1L)7,

where for rounded ends A is taken as 18 tons, and for flat ends 44°3 tons.

When the length is less than thirty times the diameter, let P be the ultimate load calculated by equations 8 and 9, and let P, be the ‘load which would crush a short block of the same sectional area S ;

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”

[FRaMs, i.e, let P,=498; let P, be the actual ultimate strength, thep according to Professor Hodgkinson’s experiments, ‘ = pee u~ 4P+3P, ° For rectangular struts of oak and pine, the smallest side hej denoted as before by d, Hodgkinson gives the formula—

10.

d? igh P=Aqy Ss, where A=3,000,000 lbs. The same unit must be employed for ¢

and 7, and S must be expressed in square inches. This formula can only give a rough approximation to the truth. In short beams the formula in § 5 would give a smaller strength than equation 1], This smaller value is, then, the true measure of the strength.

VI. CompounpD STRUCTURES.

§ 58. Many bridges have been built with superstructureg such that the stresses on the several parts or members cannot be computed by the rules hitherto given. These superstructures are generally constructed by superposing two or more types so as to form a compound structure capable of acting at once say as an arch and as a girder, These bridges may be called compound bridges. The designs are usually unworthy of imitation. Mr Robert Stevenson’s original design for the Britannia Bridge, in which the great girder would have been partly supported by chains, is an example of this type of structure in which the two parts are clearly visible. Many wooden American bridges are trusses which almost defy analysis, the designs being, however, obviously suggested by an attempt to com- bine at least two of the three main types of bridges. No advantage whatever is gained by a combination of this kind; on the contrary great disadvantage is

almost sure to follow its adoption, namely, that it will be impossible that each part of the structure should, under all circumstances, carry that portion of the load which the designer entrusted to it. For suppose a bridge constructed partly as a girder and partly as a suspension bridge, the girder being very stiff and deep and the chain perfectly flexible with considerable dip. Let the chain and girder be each fit to carry half the passing load. It is perfectly conceivable that the deflections of the two should be so different that the girder would, under the actual load, break before the chain was sensibly strained, or the difference in the relative dip of the chain and depth of the girder might be such as to cause the former to give way first. Even if the two were so designed that at a given temperature each should take the designed share of the load, a change of temperature would entirely alter the pro- portion borne by the two parts of the structure. A few forms are free from this defect, and these will now be described. .

eee AOE Be St er

SoZ. lee 7 eee Sd “Pel re | \ be Aff Ss BA SPE Sees

Fig. 85.

§ 59. Fink Truss.—This truss (fig. 85) has been much employed in America. The upright struts, numbered 1 to 7, divide the span into eight equal parts. If a weight rests on the top of each strut the whole truss may be looked upon as made up of seven distinct and independent trusses superposed on one another; strut 4 is used seven times, and is compressed with a total force of 4w. Struts 2 and 6 are used three times, and each compressed with a total foree of 2w. Struts 1, 3, 5, and 7 are used once, and each compressed with a force w. ‘The stresses on the inclined ties are at once got from the compression of the strut by the resolution of forces; and the stress on the upper member or boom is the sum of all the pulls on the ties resolved horizontally ;

a ee

CoMPOUND STRUCTURES. | a

the boom This truss would not be so light asa Warren girder if both

were made of the same depth, and if the end struts in the Warren girder did not require to be much stiffened in con- sequence of their great length. The Fink truss is, however, generally made in practice more cheaply than the Warren girder, because the depth of a girder practically depends on the greatest length of strut which is admissible, and for equal lengths of strut the Fink truss gives a deeper beam

than the Warren girder.

Fig. 86.

§ 60. Bollman Truss (fig. 86),—This truss is the result of superposing seven simple frames consisting of a top member, a strut, and two ties. The stresses are easily computed. It is one form of the old false suspension bridge already alluded to (§ 34), with the difference that the top member replaces the horizontal resistance at the points of support. The defect of this truss is that two ties supporting any strut except the central one are of unequal length; expansion or extension, consequently, affects these unequally. It is inferior to the Fink truss.

Fig. 87.

§ 61. Schaffhausen Truss.—The famous wooden bridge of Schaffhausen (fig. 87, see also § 76) is in its main parts a compound bridge, composed by superposing a series of simple frames of the type shown in 1, 2,3, and 4. Nos. l and 2 are imperfect frames, 7.c., if the joints were flexible they would collapse in consequence of the want of the diagonals across the centre parallelogram. The stiff- ness of the joints supplies this want.

§ 62. Dredge’s Suspension Bridge.—This bridge differs from the usual suspension bridge in having the suspending rods inclined, and in the use of a lower member, which may

is uniformly strained over its whole length. | be a compression member transmitting a thrust to the

piers, as in 88a, or a tension member, as in 880, with a

maximum tension at the centre. Fig. 88¢ and fig. 88d show the reciprocal figures: corresponding to those two cases. This bridge is somewhat stiffer than the ordinary suspension bridge, but is far inferior to the complete framed bridge.

§ 63. Arch or Suspension Bridge, hinged at Abutments and Centre.—Figs. 89 and 90 show two designs of con-

Fig. 89.

C

Fig. 89a.

siderable merit, consisting of two frames (the shape of which might vary considerably) hinged together at A, and

Ce B

A. Fig. 90.

supported on hinges at B and C. The direction of the sustaining forces at A and B is to be determined as for a simple pair of beams hinged at A, B, and C. Let w be the whole weight carried by the two beams, and let the

centre of gravity of this weight lie in the vertical line wa, fig. 89a; let the point a be the point where the prolongation of the less loaded beam AC cuts this vertical, then the thrust at B and C is obtained by resolving the force au equal to the whole weight into the two com- ponents ac and ad in the direction of the lines aC and aB. This thrust being known, the stress on each member of each frame can be easily computed by a reciprocal figure or otherwise. This form is only inferior to the true framed arch or suspension bridge inasmuch as it is incapable of balancing the thrust due to the passing

load on neigh- bouring spans. It is superior to the framed arch and suspension bridge inasmuch as it cannot be strained by any change of temperature

ViL Susstruorure.

§ 64. Preliminary.—The substructure of a bridge com- prises the piers, abutments, and foundations. These por- tions of the bridge usually consist of masonry in some form, including under that general head stone masonry, brickwork, and concrete. Occasionally metal work or woodwork is used for intermediate piers.

When girders form the superstructure, the resultant pressure on the piers or abutments is vertical, and the dimensions of these are simply regulated by the sufficiency to bear this vertical load.

When arches form the superstructure, the abutment must be so designed as to transmit the resultant thrust to the foundation in a safe direction, and so distributed that no part may be unduly compressed. The intermediate piers should also have considerable stability, so as to counterbalance the thrust arising when one arch is loaded while the other is free from load.

For suspension bridges the abutment forming the anchorage must be so designed as to be thoroughly stable under the greatest pull which the chains can exert. The piers require to be carried above the platform, and their design must be modified according to the type of suspension bridge adopted. When the resultant pressure is not vertical on the piers these must be constructed to meet the inclined pressure. In any stiffened suspension bridge the action of the pier will be analogous to that of a pier between two arches.

§ 65. Stabclity.—When the magnitude and direction of the thrust borne by a pier or abutment at the springing are known, the stability of any series of masonry blocks forming the pier or abutment may be studied by drawing lines showing the direction and magnitude of the resultant force on each joint. This may be done as for the voussoirs of an arch. The thrust on the upper block may be con- pounded with the weight of that block, the resultant com- pounded with the weight of the next, and so forth, until the

direction and magnitude of the thrust on the rock or earth foundation is determined.

A better method of making the drawing is shown in fig. 91; find the centre of gravity C, of block 1, the centre of gravity C,, of blocks 1 and 2 treated as a single mass, similarly C,, for blocks 1, 2,and3 Let AT be the direction of the thrust on the top block, and C,B, a vertical line though C, cutting AT in B,; let B,D, be the direction of the resultant of ¢, the thrust acting in the line AT, aud w, the weight of the first block acting in the line C,B,; and let D, be the point where the direction of this resultant cuts the first joint; similarly let B,D,, be the direction of the resultant of ¢ and the weight w,,, of the first two blocks; B,,,D,, the direction of the resultant of ¢ compounded with the weight w,~,+,, of the three first blocks, &c., &c. This method of proceeding gives the direction and magnitude of each force and centre of pres. sure D independently of the values obtained for the preceding joints. For stability the line BD must not make a greater angle with the normal to the joint than the angle of repose ; and the point D must nowhere fall beyond the edge of the joint ; for strength and safety the point D might be required to fall within

the middle two-thirds of the joint, or within the middle three. quarters. The theory by which the joints furthest from the centre of pressure would open when the centre of pressure leaves the

Fig. 91.

middle third cannot apply to such a structure as a masonry abut- ment, all parts of which are bonded together. Professor G. Fuller calculates the thickness of abutments by the following empirical rule, deduced from many practical examples:—Let c = half the span in feet ; d@ = versed sinein feet ; ¢ = thickness of abutment at springing ; then, for flat arches, in which the span does not exceed 150 feet, and the ratio of the rise to the span is not less than 116, we may write ¢= “17 (5 ae a) . From the springing to the base

d the abutment may have a batter of lin 4. This gives an abutment the cubic capacity of which will be sufficient, but it may with ad- vantage be divided into abutment proper and counterforts ; in semi- circular arches ¢ should be taken as the thickness of the abutment at a height above the springing equal to two-thirds of the radius. The maximum intensity of stress on the stone at the edge F might be approximately found by the theory explained in § 8. This theory finds a useful application in calculating the maximum inten- sity of stress which a given foundation might produce on the earth

or rock supporting it. Thus, let the section of the foundation under consideration be 1 foot in breadth, 8 feet in length from F to G, as shown in plan, fig. 92; let the centre of pressure D be 2 feet from FF, and let the total resultant thrust be about 16°5 tons, in- clined so that the horizontal component is 4 tons and the vertical component 16 tons, then the mean vertical intensity of pressure er square foot is 4 = 2, and the maximum intensity along the ine FF, is by equation 2, § 8—

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2} 14(4×2%8) rp ~~

this maximum intensity being 24 times as great as the meau intensity. Obviously, although for the sake of appearance the courses of masonry in the abutment of an arch may be left horizontal in the face, the stability is increased by inclining them at a proper angle, su that they lie normal to the thrust.

The stability of abutments may be tested by taking moments round points in the joints selected as the points beyond which the thrust must not come. The same methods apply to the auchorages of suspension bridges, and to intermediate piers, which are intended to take 8 given horizontal thrust. When metal or wooden piers are adopted their weight will generally be insignificant, and such as may be neglected in calculating their stability. Metal-work piers or wooden piers usually consist of wrought or cast-iron frame work, and the stress on eaci part of the frame, as well as the resultant stress on the foundations where each upright member reaches It,

easily calculated by the method of reciprocal figures or otherwise.

Occasionally metal piers are continuous metal structures, such as cast-iron cylinders. The maximum intensity of stress can then be calculated by resolving the thrust on the upper part of the pier into a horizontal and a vertical component, calculating the bending moment produced on each horizontal cross section by the horizontal component, and adding the intensity of stress caused by this bending moment to the mean intensity caused by direct compression. The manner in which any metal-work pier is held by its foundation against a bending moment will require special consideration ; the resultant pressure should always fall well within the base.

§ 66. Practice.—In the design of the usual masonry bridge the thickness of the pier is generally determined by practical considerations. In small arches the pier is made thick enough to allow the two rings of the two abutting arches to spring from the pier without interfering with one another, a clearance of about half a brick being often allowed between the two rings. In larger arches the piers will generally be found to vary in thickness from $th to ;},th of the span, with a slight batter (2.¢., with walls spread- ing outward towards the base). In very old bridges piers are sometimes found equal in width to the open- ing of the arch. In large bridges, or with very high piers, care must be taken that the pressure per square foot on the masonry or foundation does not exceed a safe value. The brickwork in the piers of Charing Cross bridge is subject to a compression of 9 tons per square foot ; four or five tons is a much more usual load. Eight tons per square foot may be considered a maximum for rubble stone-work, and perhaps 20 tons for the best dressed ashlar. Strong concrete may be trusted with 3tons; firm rock foundations with 9 tons, soft sandstone with 2 tons, and firm earth with from 1 to 14 tons. The depth of the first course below the surface (on dry land) should not be less than 3 feet in sand and 4 feet in clay.

When framework, either of wood or iron, is used as a pier, care must be taken by cross-bracing to provide against the effect of wind and vibration.

§ 67. Stte.—The site proposed for a pier must be carefully exainined by borings ; the ground should be uniform, for if a pier rests partly on one

formation and partly on another, unequal settlement will certainly occur, even if the weaker formation be such as would have been amply strong enough to bear the pressure had the pier been wholly founded uponit. Solid rock may be considered the best foundation, but where rock is broken up by cracks or other inequalities it is inferior to such formations as uniform gravel, chalk, and some kinds of sand and clay. These foundations may be described as incompressible. The worst foundations are afforded by those formations which can be compressed or squeezed out sideways by the imposition of weight. Muddy earth, certain clays, and certain sands are of this nature. Alternate beds of stone and slippery clay are very treacherous. The foundation should be dressed level so that the masonry may everywhere start from the same height, and therefore settle equally. Unavoidable in- equalities are better filled up by concrete than by masonry.

For foundations in water it is very important that the ground should not be such as can be scoured away by the current or wash of the water ; many bridges have failed by the undermining of the piers due to this cause. Special precautions, to be presently described, must be taken against the effects of the scour if the soil itself is not of a sufficiently resisting nature. The piers must be so placed and formed that the obstruction to the flow of water may be as small] as possible and the effect which the piers will have In altering the level of the stream above and below the bridge

must be considered. Data as to the maximum flood waters to be provided for must be examined; and provision must in some climates be made against ice by suitable cut- waters or fenders, an example of which is given in fig. 93, showing a pier of the Victoria Bridge, Montreal.

Tig. 93.—Side Elevation and Plan of Pier.

§ 68. Mode of Founding in Water.—The chief difficulty met with by an engineer about to erect a large bridge over a deep stream is to secure a sound foundation for the piers. The following are some of the principal methods of building piers in or under water :—

Cofferdams.—Cofferdams are embankments or dams which surround the site so as to exclude the water from it. They are formed in general by driving two rows of piles round the site so as to enclose between them a water-tight wall of clay puddle; in depths of less than 3 or 4 feet, where there is little current, a simple clay dam may be used. In greater depths, the timber walls consist of guide piles at intervals, with some form of sheet piling between them ; in extreme depths the timber walls may be composed of stout piles driven in side by side all round. The dam must be sufficiently strong to bear the pressure of the water against the outside when the space enclosed has been pumped dry. Rankine states that the common rule for the thickness of a cofferdam is to make it equal to the height above ground if the height does not exceed 10 feet, and for greater heights, to add to 10 feet one-third of the excess of the height above 10 feet. The " Cours de Ponts" at the school of the Ponts et Chaussées, states that a coffer- dam need never be made of greater thickness than from 4 to 6 feet, as the interior can always be sufficiently stayed inside. This method of founding is now seldom practised ; it is costly and causes great obstruction in the stream.

Caissons.—Some foundations have been constructed as follows :—A level or nearly level bed was prepared in the stream by digging or by driving piles and sawing off the heads at a uniform depth; a huge timber box, called a caisson, was then filled with masonry, and sunk on the foundation thus roughly prepared. This method is now abandoned. It was peculiarly liable to danger from the scour of the stream. The name caisson is also sometimes

applied to a mere frame with wooden walls which is floated to the site of the pier, and there sunk so as to form an enclosure, inside which concrete can be shot and can set undisturbed by the wash of the water.

Concrete in a shell is a name which might be applied to 'all the methods of founding a pier which depend on the very valuable property which strong hydraulic concrete possesses of setting into a solid mass under water. The required space is enclosed by a wooden or iron shell; the soil inside the shell is removed by dredging, or some form of mechanical excavator, until the formation is reached which is to support the pier; the concrete is then shot into the enclosed space from a height of about 10 feet, and

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concrete foundation was finished after removal of the temporary external wall shown in fig. 94.

_ Figs. 95 and 95a show a longitudinal elevation and cross section of a wooden shell, or caisson without a bottom, intended to be sunk to receive concrete. Cast-iron guide piles and sheet piling are also used for this class of foundation.

Cast-iron tubular shells are now frequently employed ; the tube forms a large hollow pile, which may descend into the ground by its own weight, or by added weight while the soil inside is removed by some kind of dredge or excavator, such as Milroy's, worked from the surface. When the lower edge of the shell has penctrated the formation to be

rammed down in layers about 1 foot thick; it soon con- | used as a foundation, the water inside may be pumped out if

solidates into a permanent artificial stone.

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unless of small size or very strong form, requires to be braced to meet the outward pressure of the concrete.

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Fia. 95.—Caisson used for a Bridge over the Cher.

concrete used for this purpose is often called béton, to distinguish it from inferior mixtures used for foundations on land. It may consist of angular stones 14 to 2 imches diameter, mixed with strong hy- draulic mortar in the proportion of from one to two volumes of stones = with one of mortar; the ~~~ final volume may be from § to § of the un- mixed materials. Béton used at Biarritz consisted of one part Portland cement, two parts sand, and three parts broken stones; at Genoa one part rich lime, two parts pozzuolana, three parts broken stones.

Pht 94 shows a section of foundations constructed by H ne a casing of piles with concrete in this manner; the Shell ls protected against scour by large stones heaped round = outside, part of the loose earth having been removed y digging. Fig. 94a shows the manner in which the

Fig. 94a.

The shell, | the soil forms a water-tight joint, or the shell may simply be

filled up with concrete shot into the enclosed water. The piers of Char- ing Cross bridge (fig. 96) were con- structed in this way; the excavation inside the tube (14 feet diameter), * was carried on by divers with helmets = until the shell had entered a few feet

into the London clay, The water

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continued ; the cylinders were loaded with about 150 tons to sink them to the final depth.

Compressed air is now very gene- rally employed inside a metal shell for those foundations in which the excavation requires the presence of workmen at the bottom of the shell The metal shell is open at the bottom, but air-tight and water-tight at all other points ; there is a chamber called an atr-lock at the upper part. This “ air-lock” serves

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The | for the exit and entrance of the workmen and materials ;

the air in this compara- tively small space is lowered to the pressure of the atmosphere before the chamber is opened for the passage of men or materials to the open air ; the air is again compressed in the air-lock before it is opened for communication with the body of the shell in which the air is permanently kept at such a pressure as wll keep the water down to the required level. The shell thus acts as a diving bell acts. It is found that men cannot in general be safely employed under a greater pressure than two atmo- spheres above the ordinary atmospheric pressure, cor: responding to a depth in water of about 65 feet. The centre pier of Saltash Bridge was, however, in 1855 by this plan carried down to a depth of 87 feet 6 inches below high water. Recently the foundations of the St Louis bridge at Cincinnati have by the same method

Frc. 96.—Cylinder, Charing C7088 Bridge.

been established at a depth of

was then pumped out and excavation

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{ 110 feet from the surface of the water. 97 a show the pier of the bridge of Argenteuil. tion was carried on in the lower chamber, the roof of which was

very strongly built . of metal, and served as the) – foundation for masonry and concrete built up round an – inner tube, serving as a pass- /

age for men and materials

to the upper chamber and “air lock.” This lock is

formed of two concentric cylinders of 38‘9feetand 108 feet diameter respectively * (fig, 97a). The annular space was divided by two vertical partitions; the doors of communication (which were air-tight) were 1°8 feet wide and 2°14 feet high, A small engine worked the . hoist by a stuffing-box passing – through the shell. A safety- valve is of course required. The upward pressure of the air requires to be counter- balanced by weights. In | the Argenteuil bridge this necessary weight was afforded by tke masonry built in the tube as the tube sank. This plan seems preferable to the method of loading the shell externally with pig or railway iron, Frequently, owing to the tenacious nature of the soil, the water cannot be driven out below the tube, and in that case a syphon must be provided passing out at the

top. The Argenteuil tube was sunk at a

mean rate of about 18 inches per diem.

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tubes. Fig. 98 shows the method em- | an | eae in building the piers of the bridge aw, at Kehl over the Rhine. In thi cases four rectangular working chambers were — sunk side by side and bolted together ; Fig 97a. each chamber communicated with the ‘ surface by two air-passages, and one central elliptical passage which remained full of water. This central passage served for the exit of the excavated material. A mass of concrete was built resting on the working chambers, and contained by wooden framework. The concrete was added at the top above water as the foundations gradually sank. At Mantes and Chalons wrought iron caissons, shaped like the usual masonry piers, have been sunk by analogous methods. _ The method of sinking cylinders by compressed air was invented by Mr Triger in 1841,

and was first used on a ! large scale by Mr Hughes at Rochester. The tubes at this bridge were designed to be sunk by having the air exhausted inside the tube, a system invented by Dr Potts,

§ 69. Piles are used either to enclose a space or to bear part of the weight of a structure; for the former purpose 4 wooden pile may be a round or square pointed piece of timber, 6 or 9 inches in diameter and 8 or 12 feet long. Bearing piles may be of any dimensions which can practi-

_ cally be procured, and several lengths of timber are often Jomted so as to form one long strut. The point is armed with metal, and the head protected by a metal ring, which

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Fig. 97.—Foundations, Bridge of Argenteuil.

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This method is not confined to cylindrical

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Figs. 97 and | prevents it from spreading when struck by the rammer Excava- | which drives the pile. Bearing piles are usually placed at

a distance from centre to centre not less than 2 feet 6

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Fic. 98.—Foundations, Bridge of Kehl on the Rhine.

inches or more than 4 feet; 3 feet is a common distance. The diameter of bearing piles varics from 9 inches to 20 inches; a pile may be considered to be driven home when, with thirty blows of a ram weighing 800 ib and falling 5 feet, it does not move #th of an inch (Rankine). A French rule gives as a limit 4 inch motion with twenty-five blows from a ram weighing 6 cwt. and falling 4 feet 3 inches. A pile which does not move more than this will bear from 600 to 1000 ib per square inch. This would give a load of 50 tons for a 13-inch pile; if, as is more usual, the load be only 8 or 10 tons for a 13-inch pile, the ultimate rate of descent may be three, four, or five times as much as the above.

Piles are used as foundations in those grounds which are compressible, or which would be squeezed out from beneath masonry under the weight to be borne. The wooden bearing piles are usually sawn off so that all the heads may be level, and a wooden grating or platform rests on the heads, over which the concrete or masonry pier may be built ; in other cases the piles come up for some distance into the concrete. An external row of wooden piles is not unfre- quently employed as a precaution against scour, but these should always be further protected by a stone bank, which will continue to protect the pier if the piles decay. A

more thorough protection against scour 18 provided by cover- ing the centre bed of the river with a concrete or stone

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Fra, 99.—Aqueduct of Guétin over the Allier.

floor, as in fig. 99, representing a pier of the aqueduct crossing the Allier at Guétin.

Cast-iron guide piles (usually hollow tubes) are used for the same purpose as wooden guide piles. They may be cast with grooves down one edge in which sheet piling is held. Cast-iron and wooden piles are frequently used as part of the open-work metal or wooden framing of piers. In situations where these piles are not liable to injury by ice, floating timber, or barges, this construction is very econo- mical, Fig. 4, Plate XIX. shows the Crumlin viaduct, with piers of this character, the construction of which will be more fully described in paragraph 79.

Fig. 100 shows the Portage bridge (234 feet high) span-

Fra. 100.—Portage Bridge.

ning the Genesee River, in the State of New York. The piers are large wooden frames.

§ 70. Screw piles are cast-iron piles which are screwed into the soil instead of being driven in. At their end is fixed a blade of cast-iron from two to eight. times the diameter of the shaft of the pile; the pitch of the screw

BRIDGES

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varies from one-half to one-fourth of the external diameter of the blade. ‘The pile is turned by levers radiating from its head. In one example of their use (Rankine) the pile was screwed in by four levers, each 40 feet in length, with eight bullocks harnessed to it. The screws were 4 feet 6 inches in diameter, and the working load borne by them was 100 fb per square inch. The piles were screwed from 20 to 45 feet deep in earth.

Disc piles have been used in sand. These piles hada flat flange at the bottom, and water was pumped in at the top of the pile, which was weighted to prevent it from rising. Sand was thus blown or pumped from below the piles, which were thus easily lowered in ground which had baffled all attempts to drive in piles by blows. In ground — which is of the nature of quicksand, piles will often slowly rise to their original position after each blow.

§ 71. Wells.—In some soils foundations may be obtained by the device of building a masonry casing like that of a well and excavating the soil inside; the casing gradually sinks and the masonry is continued at the surface. This method is applicable in running sands, ‘The interior of the well is generally filled wp with concrete or brick when the required depth has been reached, but in some cases a mere floor or inverted arch would be preferable.

VIII. Exampres.

§ 72. The task of selecting a limited number of bridges

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Fic. 101.—Pons Sublicius.

which shall represent the gradual progress in the art of construction and illustrate our present practice is one of much difficulty. Many very admirable and _ interesting structures must necessarily be passed over in

silence, and space will not admit of full details being given even of those bridges which arenoticed.

§ 73. Bridges built before the year 1000 a.p.—Herodotus mentions a bridge erected by Nitocris over the Euphrates at Babylon. It appears to have consisted of stone piers con- nected by planking, which was removed at night. The river was diverted to allow the piers to be built. Diodorus Siculus ascribes the work to

Fig. 101a.

- Semiramis.

The first bridge constructed at Rome was called the Pons Sublicius, or wooden bridge (sublica meaning a stake or Sublici pile). It is said to have been built by Ancus Martius, and Bridge rebuilt by the chief priests, who from thig circumstance were called “ Pontifices.” Fig. 101 shows the desigi of this bridge as restored by Colonel Emy (Zrazté de Vart

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de la charpenterie) from the descriptions given in the his- | the Rhine in ten days by Julius Cesar (De Bell. Gail. iv. 17). ‘sorians. This was the bridge defended by Horatius Cocles.

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| | Fic. 103.—Pons Milvius.

| OOo, TTL The Pons Milvius (fig. 103), now Ponte Molle, was built Pons ”
——————_——————_——_——_————_—— | a mile and a half from Rome
by the Censor Alius Scaurus, Milvius. sisi faiigiananite — ———— AS |
about 100 B.c. Some part of the first bridge is supposed Bice tauzivaireian!
= ——=— FE | to remain, although it has been altered from time to time.
PEO teem REE IES EPICS OPE LIGETI | The arches vary in their opening
from 51 feet to 79 feet

9 inches; the waterway between the piers is 413 feet 3 inches ; the breadth of the bridge, 28 feet 9 inches; these dimensions are given on the authority of Cresy (Hncyclo- pedia of Civil Engineering). The following bridges also Other crossed the Tiber at Rome :—The Pons Palatinus, which Reman stood on the site of the present Ponte Rotto; the Pons P™4é*- Fabricius and Pons Cestius, which still remain ; the Pons Janiculanus, which occupied the site of the modern Ponte Sisto; the Pons Vaticanus, which has disappeared ; and the Pons Ailius, built by Hadrian (13 a.p.), now the bridge

of St Angelo. This bridge (fig. 104) was repaired by Popes Nicholas III. and Clement 1X. The largest arch has a span of 62 feet 4 inches, and the width of the bridge is 50 feet

Fig. 102, also taken from the work of Colonel Emy, is in- | 9 inches.

tended to represent the design of the bridge thrown across The bridge erected by Trajan (104 A.D.) across the Trajan’s ia Bridge.

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Cross Section at Pier.

Serine

Plan at Pier. Fia, 102.—Bridge thrown across the Rhine by Julius Cesar.

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Elevation.

I Cross Section. . | Fic. 104.—Bridge of 8. Angelo.

| Danube, just below the rapids of the Iron Gate, has been the subject of much controversy. The drawing (fig. 105) | was originally taken from a bas-relief on the Trajan column at Rome. A description of the bridge is given by the ancient | historian Dion Cassius, who states that the bridge had E> piers of hewn stone, 150 feet high and 60 feet wide, with openings between them of 170 feet, spanned by arches. Doubt has been thrown on the accuracy of this description, because the design shown in fig. 105 is obviously unsuited to a span of 170 feet; nevertheless thirteen piers are still visible out of the twenty, according

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Fig. 105.—Trajan’s Bridge, to Murray’s Handbook The writer has not been able to

find any accurate measurement of the width between these

Piers, but as the Handbook speaks of the length of the |

bridge as perhaps 3900 feet, and as the Conte Marsigli, writing from personal observation, in a letter to Montfaucon, gives the total length as probably 3010 feet, there can be no doubt that the spans were very considerable, and that the representation of the design in the bas-relief is almost wholly conventional. The one point as to which it gives clear information, not supplied elsewhere, is that the superstructure was of wood. The piers seem to have been founded by sinking caissons. Murray’s Handbook gives the depth of the river as 18 feet. Apollodorus of Damascus

was the architect of this remarkable bridge. Rimini, built during the reign of Augustus, was especially admired by Palladio (Rondelet, Z'Art de bdtir). The

The bridge at Rimini.

bridge at Narni, on the road from Loretto to Rome, also Nari.

built by Augustus (Montfaucon), and the bridge of

Alcantara over the Tagus, built in the reign of the Emperor Ajcantara.

Trajan, are often cited as remarkable works. The Romans frequently adorned their bridges with a triumphal arch. A small example of this kind of bridge

at St Chamas, in France, is shown in fig. 106 (Cresy's Zn- s+ Chamas.

cyclopedia of Civil Engineering). The span of the arch is 42 feet, and the voussoirs are 3 feet 5 inches deep. Fig.

107 hows the bridge of Narses, built in the 6th century, ponte and which carried the Via Salaria across the Anio or Salaro.

IV. — 42

Lucca.

Old London Bridge.

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Teverone. This bridge was blown up during the panic caused by the approach of Garibaldi to Rome in 1867,

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Fria. 106.—Bridge at St Chamas.

We see here, perhaps, one of the earliest examples of the castle built to protect the bridge against au enemy or to enforce payment of a toll,—the bridge and castle of inedizeval romance.

§ 74. 1000 to 1300 a.p.—A very bold arch over the Serchio near Lucca is shown in plate 58 of Hann and Hosking's treatise, with the approximate date of 1000 a.b., but the authority for this date is not given. The span of the arch is 120 feet, and the roadway, which stands at a height of more than 60 feet above the water level, is only 9 feet wide ; in fact the arch is little more than a broad

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wall. Owing chiefly to the excellence of the mortar employed, this arch withstood a flood which rose nearly 30 feet above the springing of the arch. This structyp, is one of the many "' Devil's Bridges."

In the year 1178 a famous bridge was begun over the Aye}

Fia. 107.—Ponte Salaro. > . Rhone at Avignon by Saint Benezet, the head of ds of certain religious confraternities, which undertook the building or repair of bridges during the Middle Ages, and were called Fratres Pontis or Hospitalarii Pontifices, The bridge was finished in 1188. Four arches still remaip and are remarkable in having an elliptical outline with the radius of curvature smaller at the crown than at the haunch, a form which accords more truly with the linear equilibrated arch than the modern fiat ellipse with the largest radius at the crown. A description and drawing of this remarkable bridge will be found in the Dictionnaire raisonnée d' Architecture of M. Viollet-le-Duc.

A religious confraternity, founded in the first instance by a certain Mary, the maiden daughter of a ferryman, is

' said to have built a timber bridge near the site of the

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Fig. 108.—Old London Bridge, a.p. 1700.

present London Bridge, but it seems quite uncertain when the first bridge over the Thames was built. There is little doubt, however, that it was of timber, and had frequently to be reconstructed. Stow, in his Survey of the Cities of London and Westminster, gives a description of the build- ing of the first stone structure, commonly called Old Lon- don Bridge, Plate XVIII. fig. 1.1

Heavy repairs were frequently necessary, and the timber houses built on the bridge were often burnt down ; yet the main structure appears to have remained unaltered until

1 “ About the year 1176 the stone bridge over the river Thames at London was begun to be founded by the foresaid Peter of Colechurch (called priest and chaplain before), ‘near unto the bridge of timber, but more towards the west, for I read that Botolph’s wharf was in the Conqueror’s time at the head of London Bridge. The king assisted this work, a cardinal then being legate here; and Richard, archbishop of Canterbury, gave one thousand marks towards the foundation. The course of the river for the time was turned another way about by a trench cast for that purpose beginning, as is sup-

the beginning of this century. It does not seem improb- able that Peter of Colechurch and Saint Benezet may have been in communication with one another, both being heads of religious bodies engaged in similar works at the same time. Their letters to one another would interest engineers. A French brother Isembert, from Saintes, suc ceeded Peter as engineer for London Bridge.

Stow describes the partial rebuilding of the timber houses in 1645 :—

‘‘ The building was of timber, very substantial and beautiful, for

posed, east about Rotherhithe, and ending in the west about Patrick- sey, now termed Battersea. This work, to wit the arches, chapel, and stone

bridge over the Thames at London, having been thirty three years in building, was, in the year 1209, finished by the worthy merchants of London—Serle Mercer, William Almalne, and Benedick Botewrite, principal masters of work; for Peter of Colechurch deceased four years before the work was finished, and was buried in the chapel builded on the same bridge in the ye! 1205.” ;

centre. _ charter of the year 943 ; from the character of the masonry

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; the houses were three stories high, besides the cellars, which were | within and between the peers, and over the houses were stately

platforms leaded with rails and ballasters about them, very com- ~~modious and pleasant for walking and enjoying so fine a prospect up and down the river, and sonie had ypietty little gardens with | arbours.” _ The passage between the houses was made 20 feet ; pre~~ viously it had been but 14 feet, and in some parts 12 feet. These beautiful houses were burned in 1666, when they were replaced by a still finer pile of buildings, with a uniform roadway of 20 feet in width. Fig. 108 shows the bridge as it appeared in 1700. | The piers varied in thickness from 25 to 34 feet, and were raised on strong elm piles, covered with thick planks bolted together. The openings in the arches varied from 10 feet to 32 feet 9 inches. The whole waterway was 336 feet 9 inches, two-thirds of the stream being occupied by

Fra. 109.—Croyland Bridge. $75. 1300 to 1700 a.p.—The strange triangular bridge

4 at Croyland (fig. 109) is another example of a bridge prob-

ably built for or by a religious body. This structure stands at the confluence of the Welland, the Nyne, and the Catwater drain; three pointed arches, having their abut- ments at the angles of an equilateral triangle, meet in the

| middle, giving three watercourses and three roadways.

Each arch has three stone ribs, and the nine meet in the Croyland “triangular bridge” is alluded to ina

the present structure is supposed to have been built in the beginning of the 14th century. A bridge over the Trent

_ at Boston, 1534 feet in length, and consisting of 34 arches,

was also built by a religious community under Abbot Bernard. Fig. 110 shows the old bridge at Saintes as M. Viollet- le-Duc considers that it appeared towards the end of the

14th century. The following description is abridged from

his Dictionnaire rarsonnée d Architecture :—

_ “The first gate appeared on the right shore of the river, on the side of the Faubourg des Dames ; next came the Roman arch, the upper part of which was crenelated during the Middle Ages ; next on the side of the town stood a tower of oval plan, through which the road lay; the town gates with flanking towers closed the end of the bridge. From the first gate to the Roman arch the bridge was of wood, as was also the case between the great tower and the town gates, so that by the removal of this part of the roadway all com-

| munication could be cut off between the town and the tower as well

as between the bridge and the Faubourg ; moreover, the parapets were crenelated, so that the garrison of the town could at will stop all navigation.” Clearly it was quite as important in those days to be able to arrest as to facilitate communication between the two sides of the river.

The architects of the Renaissance showed great boldness

and originality in their designs. The largest arch known

_ to have been built spanned the Adda at Trezzo, constructed

by order of Bernabd Visconti, duke of Milan (latter half of

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14th century. This bridge is described in Hann and Hosking’s Bridges, as having consisted of “a single arch of

Fie, 110.—Saintes Bridge.

granite, very well constructed of stones in two courses, the innermost 34 feet thick in the direction of the radius, the outermost 9 inches, the span at low water 251 feet ; the river rises sometimes 13 feet.” The radius of the arch was 133 feet. This noble bridge was destroyed by Carmagnola.

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Fia, 11]1.—Bridge over the Ticino at Pavia.

The covered bridge over the Ticino at Pavia (fig. 111) Pavia.

was erected, under Gian Galeazzo Visconti, about the end of the 14th century. This bridge, which still exists, has seven pointed brick arches, each 70 feet in span and 64 feet in height; the depth of the arch ring at the crown is 5 feet 6 inches. The tympanum is pierced; the bricks used in

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the arches are formed to suit their position, and are hollow

Fra, 112.—Bridge of Brioude.

in the middle to diminish the weight. The roof of the roadway is carried by 100 rough granite columns.

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Fig. 112 taken from Montfaucon's Antiquité eapliquée, shows the old bridge of Brioude across the Allier in France, Montfaucon and Séguin speak of this as a Roman wor but Gauthey gives the date 1454 for its construction, and names Grenier and Estone as builders without giving his authority. The design of the bridge appears to favour the date given by Gauthey. The span was 183-73 English feet (Rennie, Proc. J.C.£.), the arch was a segment of a circle and the height 60 feet, while the width of the bridge was only 16 feet. This bridge fell in 1822.

The bridge of the Rialto at Venice (fig. 113) WAS Risa, begun in 1588, Antonio da Ponte being the architect, Vaio, The span of the arch is 91 feet, the height above the water

-level 24 feet 6 inches, and the width of the footway 72 feet. Erroneous statements are often met with that this bridge was built from a design by Michel Angelo; the mistake has arisen from the misinterpretation of a passage in the works of Vasari. Rondelet, in his Hssat Historique sur le Pont du Rialto, gives a full account of the rival

Fic. 113.—Bridge of the Rialto, Venice.

designs submitted to the senate by Antonio da Ponte and Palladio. Florence. Fig. 114 shows the singularly beautiful "Ponte della

a Trinita," erected at Florence (1566) from the designs of rinita.

observe with interest the amended design for this bridge, given in Hosking's Architectural Treatise on Bridge Build- ang, p. 241, which serves to show how easily a noble design may be spoilt by an alteration in the proportions of

Ammanati. Those who are curious in such matters may | its parts, Fra. 114. —Ponte della Trinita, Florence. York. A fine bridge over the Ouse at York, erected in the reign | “‘shaking bridge.” Further particulars concerning this

of Queen Elizabeth, was taken down some years ago ; it is shown in fig. 115. The span of the largest arch was 81 feet (Allen), and the rise 26 feet 3 inches.

The well-known Pont Neuf at Paris was built in 1604. The design has no feature calling for special remark. Fig. 116 shows the bridge over the Conway at Llanrwst in Llanrwst. Wales, the design for which was furnished by Inigo Jones

in 1634. The middle arch has a span of 58 feet. The stricture is easily set in vibration, and is known as the

Pont Neuf, Paris

and many other old English bridges will be found » Smiles’s Lives of the Engineers, chap. iii. vol. ii., edition

1874.

A bridge over the Senderud at Ispahan is described Isp as follows in Heck’s Jconographic Encyclopedia, with illustrations :—‘“It (the bridge) is 2250 feet long, 120 feet high, and 156 feet broad ; the middle way is 60 fect broad, and the sideways are paved with marble, and the latter lead through arcades, to which the ascent is by stairs

in the four towers of the bridge. The bridge has 29 | on each face. The roadway is 11 feet wide over the centre

Fig. 116.—Llanrwst Bridge, Wales. of the arch. The arch stones on the face are 2 feet 6 inches

Fie. 115.—Old Bridge at York.

arches of 50 feet span, and the pillars are 25 feet thick.’ In the illustration the arches are Moorish, and the covered sideways lofty, with 3 arches of small span over each main arch of the bridge. The design is remarkably fine. Heck calls it the bridge of Barbaruh, and states that it is named from its builder, but it is of unknown antiquity. All the bridges of Ispahan are said, in the 7th edition of the present work, to have been built under Shah Abbas L. (1585 to 1628).

Heck mentions a bridge at Loyang in China, said to have a length of 26,800 feet, and another at Focheu 22,000 feet long, both from 60 to 70 feet wide.

§ 76. 1700 to 1817.—Old Westminster Bridge (Labelye) and Old Blackfriars Bridge (Mylne), both of which have now been removed, were built in the middle of the 18th century. Their failure after so short a period was due to a defective system of foundation and to the increased scour caused by the removal of old London Bridge.

The Pont-y-tu-Prydd over the River Taff near Newbridge isshown in fig. 117. The arch measures 140 feet between the abutments, and has a rise or versed sine of 35 feet. The width of the soffit is 15 feet 10 inches at the springing, diminishing to 14 feet 5 inches at the crown by six offsets | deep, the rest of the ring being rubble masonry. This

Fic. 117.—Pont-y-tu-Prydd.

Fie. 118.—Half Truss of Wittingen Bridge.

bridge was built by William Edwards, a self-educated country mason. It was completed in 1750 after the failure

was excessive and orced up the crown, the depth of which

was very small. This failure led to the adoption of the

pierced spandrils.

7 Fig. 118 shows half of the truss for the bridge of Wit- wittingen.

ee tingen, built in 1758 by the brothers Grubenmann, prob-

= ably the finest specimen of a wooden bridge that has ever

SS =| been constructed ; the design might be analyzed as con- sisting of a series of superposed trusses, as in fig. 87, which represents the bridge at Schaffhausen built by the same gyag.

| (fe. 119) – hence oes The Schaffhausen bridge hausen.

; 1 ; , (fig. , destroye rench troops in 1799, had two

Ps .. dg a eas = arp eye oas Bdge: | = pan one of 172 eet and the porte 193 feet. The

ol a similar structure, in which the weight of the haunches | Wittingen bridge, burnt shortly afterwards, had a span

Craig- ellachie.

London Bridge.

Waterloo Bridge.

Jdd4 of 390 feet, being the largest opening ever spanned by wood.

Mr Smiles states that the first attempt to build a cast- iron bridge was made in 1755 at Lyons, and that one of

F1q. 120.—Coalbrookdale Bridge.

the arches was put together in a builders yard, but that the project was abandoned as too costly. Mr Abraham

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Fic. 121.—Cast-Iron Bridge at Craigellachie

Telford at Craigellachie (fig. 121), over the Spey, in the beginning of this century, shows a great advance in the conception of what was the safest form in which to apply cast-iron to an arch.

§ 77. 1817 to 1845.—London Bridge and Waterloo Bridge.—London new bridge (fig. 40, supra, and Plate XVIIil. fig. 2), is as fine an example of the modern stone arch bridge as can be found. The shape of the arches, the variation in their span, the slight curvature of the roadway, and the simple yet bold architectural details, are combined so as to produce a singularly beautiful structure. It is now insufficiently wide for the traffic it has to convey, but all who value beauty must earnestly desire that it may not be disfigured by having overhanging footpaths fitted to it as has been frequently proposed. London can well afford to pay for new bridges, but can by no means afford to part with a single object of real beauty.

The design was made by Mr George Rennie, and the acting engineer was his brother, Sir John Rennie. The ceutre arch has a span of 152 feet, and rises 29 feet 6 inches above Trinity high water mark; the arches on each side of the centre have a span of 140 feet, and the abutment arches 130 feet. The total length of the bridge is 1005 feet, its width from outside to outside 56 feet, and height above low water 60 feet. The two centre piers are 24 feet thick, the exterior stones are granite, the interior, half Bramley Fall and half from Painshaw, Derbyshire.

The voussoirs of the centre arch (all of granite) are 4 feet 9 inches deep at the crown, and increase to not less than 9 feet at the springing. ‘The general depth at which the foundations are laid is about 29 feet 6 inches below low water. Seven years and a quarter were spent in the con- struction of London bridge, which was opened in 1831. The total cost was £1,458,311, but the contractor’s tender for the bridge alone was £425,081.

Waterloo Bridge, Plate XVIII. fig. 3, is another fine structure of the same character (1817). :

Introduction of Suspension Bridges.—It will be ob- served that from the earliest ages in which we have records

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Darby, the owner of iron-works of Coalbrookdale, was coq), the first person who actually erected a cast-iron arch, dale | This bridge (fig. 120) crosses the Severn by a span of 100 feet, near the town of Ironbridge, which has sprung up in the neighbourhood. Each of the ribs consisted of two pieces. ‘The design is a bold and original one, and has been practically successful. Wearmouth Bridge, com- pleted in 1796, is an arch built of open cast-iron panels, acting as voussoirs; the span is 236 feet, with a ris@ of 34 feet; the springings begin 95 fect above the bed of the river ; and the width of the bridge was 32 feet. 1 contained 214 tons of cast-iron and 46 tons of wrought iron. The name of Thomas Paine, the well-known ‘ author, has been associated with the design of this

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bridge; but Mr L. D. B. Gordon (first Professor of Engineering in Glasgow) assures the writer that after | careful investigation he finds that Rowland Burdon, mem.

ber for the county, was engineer, architect, and paymaster for this remarkable bridge. It was repaired and widened by Robert Stephenson in 1858. The bridge erected by

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of the construction of permanent bridges until very lately, the stone or brick arch has been the structure princi- pally relied on. Timber bridges more or less permanent have also been employed for great spans, as in the noble bridges erected by the brothers Grubenmann (1757); and after the constructign of the bridge at Coalbrook- dale (1777) cast-iron was not unfrequently employed in England. ‘The theory of the metal arch was,

however, very imperfectly understood, and the great metal arch of | Southwark bridge (completea 1819), Plate XVIII. fig. 4 Southwark | (largest span 240 feet), is little more than a heavy and Bridge | wasteful imitation of a stone ring. By the use of timber | or cast-iron instead of stone, the opening which a bridge could span was, however, somewhat increased. An immense stride in this direction was made when suspension bridges were introduced. A bridge of this kind over the Tees, 70 Tes | feet in length, was built in 1741 for the use of miners, Bridge | Similar bridges are also said to have been used by Mr Finley in America, but the introduction of the modern suspension bridge practically dates from about 1820. (Gala- Galabies shiels bridge, 112 feet in length, was constructed in 1816, ’ also a bridge of similar dimensions at Peebles over the Peebles | Tweed). In 1819 Telford began the construction of the Menai suspension bridge (Plate XIX. fig. 2), in which the Mena span of the catenary is 570 feet and the dip 43 feet. The Bridge. | success of this structure led to the construction of many | other large suspension bridges, as at Fribourg (span 870 feet), Hammersmith (span 422 feet), Pesth (span 666 feet). This form of bridge was not, however, found suitable for railway traffic ; and on the introduction of railways engineers were for many years dependent on stone, brick, or cast-iron arches. § 78. Britannia Bridge, 1845.—The design by Robert Britami | Stephenson of a bridge to carry the Chester and Holy- Bree head Railway across the Menai Straits led to a complete revolution in engineering practice. Mr Stephenson’s first conception was that of a tube partly carried by chains, This would have practically been a suspension bridge stiffened by a girder. Under Mr Stevhenson’s direc

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tions, experiments and calculations on the strength and best form of tubes were made by Mr William Fairbairn (Sir William Fairbairn) and Mr Eaton Hodgkinson. In the course of the experiments it was found that the tube could be made self-supporting over the desired span of 460 feet ; and in consequence of this discovery the Conway and Menai tubular bridges were built, being the first great examples of properly designed girders. Some disputes arose as to the real inventor of these bridges. Sir William Fairbairn justly claimed the great merit of first perceiving that the girder might be self-supporting. Mr Hodgkinson had, perhaps, the smallest part in the

design, but the shares of Fairbairn and Stephenson respectively cannot be very rigorously apportioned ; nor is this now of much conse

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Fie. 122,—Britannia Bridge (Cross Section of Tubular Girder). .

quence. Both engineers were men of extraordinary merit, and co-operated in producing the great revolution in prac- tice which has led to the adoption of the wrought iron girder as the most common type of bridge. The first train passed through the Britannia Bridge in 1850. The following description of the structure appeared in the 8th edition of the present work. It will be seen that this de- scription is to some extent a defence of the design against criticisms asserting that the structure was unnecessarily heavy and costly. It is true that a considerably lighter bridge could now be built, but some prudence in intro- ducing so great a novelty was certainly commendable. “The Britannia Bridge which carries the Chester and Holyhead Railway over the Menai Straits (figs. 122 and 123, and Plate XTX. fig. 1) consists of two independent continuous

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BIsi5) wrought iron tubular beams, 1511 feet in length, and weigh- ing 4680 tons each, independent of the cast-iron frames inserted at their bearings on the towers. They are 15 feet wide, and vary in depth from 23 feet at the ends to 30 feet atthe centre. They rest on two abutments and three towers of masonry at a height of 100 feet above high water. The roadway is laid along the bottom, viz., one line of rails in each tube. The centre or Britannia tower, which is alto- gether 230 feet high, is built on a rock in the middle of the Straits. The bridge has thus four spans, viz., two spans of 460 feet over the water, and two spans of 230 feet over the land. On each side the weight of a single span of 470 feet is 1587 tons, and of a span of 242 feet 630 tons. These tubes repose solidly on the centre tower, but repose on roller beds on the land towers and abutments. Now, these gigantic

dimensions are by no means the only remarkable features in this work. The opponents of the Holyhead Road had imposed conditions on the Chester and Holyhead Railway which were thought insurmountable with respect to this bridge. The navigation was not to be interrupted—no scaffolding coud thus be used—and the clear height of 100 feet was to be retained throughout, – -

Fra, 123.—Britannia Bridge (Part Elevation of Tubular Girder).

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arches being objected to unless the springing and not the centre was at this elevation. The tides set through this portion of the Strait with a velocity of 9 miles per hour, and the quiet water at each turn of the tide lasts but for a very short space of time. The tubes were designed to meet all these requirements; they were so constructed at a considerable distance from their permanent site on the shores of the Straits ; they were floated upon pontoons upon these rapid tides to the base of the towers; and they were then drawn up by hydraulic presses to their required height. They were here united through the towers by the insertion of shorter lengths, and ultimately brought into the condition of continuous beams as regards strain, by the means employed for their junction. It is evident such structures would be designed specially for such varied circumstances, for example :—

“ As soon as they were completed on temporary platforms, these platforms were removed, and they became isolated beams; the ends were accordingly strengthened with cast and wrought iron framing for this special object, and had they always remained there the sides might have been throughout considerably lighter than they are; they now weigh nearly 40 per cent. of the whole weight. But in the next operation, that of floating, the tubes were liable to be supported at any point of their length, besides being sub- jected to chances of considerable distortion, and to disasters

which on more than one occasion did actually threaten | from which it was suspended burst, and one end of the their entire destruction. The stiffening frames and gussets, , beam fell through a space of no less than 9 inches on

tog which in an ordinary girder would have only been neces- loose uneven heap of planks beneath it, bulging in the sary at the ends, became therefore necessary throughout the | bottom plates, breaking all the castings, distorting seriously whole length, and even the top and bottom were consider- | the sides and stiffening frames; while the broken press ably modified, as it is evident that while overhanging the itself, which descended from a height of about 100 feet pontoons on each end to the extent of 70 feet, the top, | above, broke through the top plates and completed the instead of being in compression was thrown into extension ; | crippling of the whole section of support. It may surely the weight of the tubes was consequently much increased be doubted whether anything but a tube could have stood by these arrangements. Again, they had to be raised by | such unexampled violence ; and in proportioning the parts being suspended freely from four chains. Provision for | of a structure destined for such usage, the mere considera- this suspension from such limited attachment had also to | tion of the strain to which as an ordinary beam it would be made of a totally opposite character from that made for | be subjected, formed but a part of the problem ; no direct their vertical support when on their bed; and, ultimately, | comparison can therefore be made between the weight of when raised to their place, they remained no longer inde- | this bridge and an ordinary beam. If this were the case pendent beams, but were converted into continuous beams, | with the large spans, it is still more so with the small parts before in tension being now thrown into compression, | spans of 230 feet, which as simple beams would weigh only and vice versa; while the ends which were before subject | 230 tons each, whereas their actual weight is 650 tons. to no horizontal strain were now exposed to greater strain | But it must be borne in mind that as regards the bridge than even the centre of the span. And, last of all, during | itself these small spans were not required at all, and that the act of raising one of these enormous masses, the press | they were merely designed and used as counterpoises for

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Fre. 125.—Plan of High-Level Bridge, Newcastle.

the large tubes, for the important purpose of converting | now the arrangement of the plates in cells is almost the them into continuous beams by their overhanging weight. | only conceivable arrangement possible for obtaining the By examining their detail, it will be found they are required section, allowing access, at the same time, to every designed solely for this special purpose, their use as beams | part for construction and future maintenance. This alone being made entirely subsidiary. led to their use in the bottom of the tube, where their form «Some misapprehension exists on the object and import- | was totally unimportant. With respect to the top, however, ance of the cells of which the top and bottom of these tubes | it was of great importance, since thick plates could not be is composed. These cells are rectangular, there being eight | had, to ascertain the best form of cell for resistance to of them in the top and six of them in the bottom, and they | compression that could be devised with thin plates. A run throughout the bridge. With respect to their import- | series of valuable experiments by Mr Eaton Hodgkinson ance, it must be observed that the whole section of the top | led to the use of the rectangular cells as actually used, not of the Britannia tube at the centre is 648-25 square inches, | because such form presented any peculiar advantage over and of the bottom 585-43 square inches, and that the tube | any other form, as some have imagined, but because these is 15 feet wide; the thickness of a single plate to ensure | experiments demonstrated that cells of that magnitude and this section would therefore have been 2°7 inches for the | thickness were independent of form, and are crushed only top, and 2°3 inches for the bottom ; and had such a plate | by the actual crushing of the iron itself ; under these been procurable, nothing better could have been desired, | circumstances, the square cells were used as the best practical and the cells would be unnecessary. Suchathing, however, | method of obtaining the sectional area required. is evidently impossible, and the engineer in this, as in “ Similar misapprehension also exists as to the considera- numberless other details, had to adopt what he could obtain ; | tions which led to the rectangular form of the tubes

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themselves. Now, the result of direct experiments made | which the painting has been attended, and the protection with round, oval, and rectangular tubes—there being pre- | afforded by the roof, have also entirely preserved it from cisely the same section and weight in all three, and, con- | the slightest damage by oxidation; and it is difficult to sequently, different depths—was, that the circular tube was | conceive that even the lapse of centuries can in any way the weakest, and the oval tube the strongest, the rectangular | affect such a structure, or to doubt that it will remain ono form being intermediate. The oval tube was, indeed, first | of the most durable, as it certainly is one of the most remark- studied with a view to its use. Its form, however, was | able monuments of the enterprise of the present century.” not favourable —neither for its actual construction, nor for § 79. Newcastle High-Level Bridge. Newark Dyke Bridge. Newcastle its connection with the suspension chains which were | Crumlin Viaduct.—The High-Level Bridge at Newcastle High-Level (figs. 124 and 125, also Plate XIX. fig. 3) is a fine example P™4ee. of the true bowstring arch, in which there is no cross bracing. This bridge is also described at great length in the 8th edition ; but the type cannot be recommended for imitation, being essentially more expensive and heavier than a true girder. The bridge was opened by the Queen in y/ 1849. The design was therefore made almost at the same : LU. —— time as that for the Britannia Bridge, and is chiefly inter- N I] A> 7/11 NZ \S esting as showing a transitional form intermediate between \ Vi a | ZNZ | the arch and beam. The bridge has six spans, each of = 25 feet, and the superstructure is supported on stone piers and abutments, the height to the soffit above high water ih being 83 feet. The arched ribs are cast-iron, and the ties wrought iron. 4728 tons of cast-iron and 321 tons of wrought iron were employed in the superstructure. There are two roadways, the carriage roadway passing under the railway. The bridge cost £243,000. The solid or continuous plate girder soon led to the in- troduction of open frames, designed on similar principles. Newark Dyke Bridge (the earliest example of a Warren Newark girder bridge) carries the Great Northern line over a Dyke branch of the Trent near Newark. It was erected (1851 Bride. ——— i 53) under the direction of Mr Joseph Cubitt from the : a ae designs of Mr Charles Wild.

Fie, 126.—Newark Dyke Bridge. This bridge (figs. 126 and 127) consists of four inde- pendent girders, viz., two for each line of railway. The roadway

is beneath the girder. The top flange of each girder consists of a series of cast-iron pipes butting end to end; the

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originally intended to be used in the erection ; and practical considerations, in this case, also compelled the use of the

lower flange consists of wrought iron links, and the flanges are connected by diagonals forming a series of equilateral triangles, and these diagonals are alter- nately struts and ties. The ties are formed of wrought iron; and the struts of cast- iron: the length of each side of these triangles is 18 feet

Fig. 127.—Section of Newark Dyke Bridge.

rectangular tube. It must also be remarked, that the result of experiments made on round, oval, and rectangular

_ Wrought iron tubes, when reduced to the same depth and | 14 _} 6 inches,

| compared, was in favour of the rectangular form, although Fic) 198,-Paxt of Crumlin The length between the within ordinary limits the form was not proved to be a Viaduct. supports is 259 feet, and matter of very great importance. It may be added, that the depth from centre to

this bridge has now been in use six years, that the deflection | centre of the joint pins is 16 feet. The clear span between

has been carefully tested, from time to time, with the | the abutments is 240 feet 6 inches. ;

utmost precision, and that not the slightest perceptible The weight of iron is 244 tons 10 cwt., of which 106

increase has taken place during that period, The care with | tons 5 cwt. is wrought iron, and — tons 5 cwt. cast- -— 43

Crumlin Viaduct.

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iron, to which must be added 50 tons for the platform, making the total weight of each bridge 294 tons 10 cwt. The cost, exclusive of the masonry of the abutments, and of the permanent rails, but inclusive of the staging for fixing and the expense of testing, was £11,003.

The Crumlin Viaduct, begun in 1853, and completed in 1857 (fig 4, Plate XIX.), is a fine example of the Warren

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girder ; it was erected on the Taff Vale Extension Railway under Messrs Liddell and Gordon as engineers, by Mr T. W. Kennard as contractor. The following description is compiled from that given in Mr Humber's work:— The length of the bridge is 1800 feet, divided into two parts one consisting of seven spans of 100 feet, and the other of three similar spans. The greatest height of the road-way

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Fria, 129.—Common type of Wrought Iron Girder.

above the surface of the water is not less than 200 feet. The

piers are formed of cast-iron hollow columns, each 17 feet

long and 1 foot in diameter; the thickness of the metal

varies from 1 inch to 2th inch; these columns are arranged

in tiers, each containing fourteen columns, the distance H {

between which at the base of the pier measures 13 feet 6 inches, excepting between the centre rows, where it measures 6 feet throughout the height. The wrought iron girders are 150 feet in length and 14 feet 6 inches deep. Some details of the construction are shown in fig. 128.

Fre. 180.—Common type of Cast-Iron Girder.

Fig. 129 shows a plan and elevation and cross section for half a wrought iron girder of a usual type for small spans. Covering plates are used to connect the main plates of the top and bottom webs, and stiffening angle irons are shown at the sides.

Similarly, fig. 130 shows a plan and elevation of a cast- iron girder of a usual type.

§ 80. Niagara Suspension Bridge.—Fig. 5, Plate XIX., shows Niagara Suspension Bridge, a structure described as follows in the 8th edition :—-

“Tt crosses the Niagara River at a height of 245 feet above the water by a single span of 821 feet 4 inches, and forms the connecting link between the American States and Canada.

“The superstructure may be best described as a hollow rectangular box, 18 feet deep and 24 feet wide, on the top of which the railway is laid, while the bottom, which is 25 feet wide, forms the roadway for public traffic—both these floors are constructed of timber beams ; and each connect- ing side consists of a row of double posts or uprights of timber, each pair being 5 feet apart; between them wrought iron diagonal bars are made to pass, extending each way to the fourth pair of posts at an angle of 45 degrees. The upper or railway floor is suspended from two wire cables at intervals of 5 feet, and the lower floor ‘is suspended at similar intervals from two other wire cables which have a deflection of 10 feet more than the

| upper ones; these cables, four in number, are each 10

inches in diameter, aud composed of seven strands, each containing 520 wires, making a total of 3640 wires. One strand forms the axis round which the other six are twisted. Sixty wires are equal to 1 square inch of solid section; therefore the total area of each cable is 60-4 square inches, or the total sectional area of iron support ing the structure is 241°6 square inches.

“ Fach cable rests upon a separate saddle, there being two ou the top of each of the four towers. The saddles are placed on ten cast-iron rollers, 5 inches diameter and 254 inches long, which bear upon cast-iron plates 8 feet square and 24 inches thick, strengthened by three parallel flanges which form two compartments for the reception of the saddles.

“The ends of the cables are attached to cast-iron shoes, iM each of which is inserted a wrought iron pin which forms the connection with the anchor chains. These anchor chains are each embedded in a solid shaft of masonry 7 feet by 3 feet, enlarged at the bottom to form a 8 feet square cut in the rock. The shafts are sunk to@ depth of 25 feet on the New York side, and 35 feet on the Canada side. ¢

“Each anchor chain is composed of nine links, the eight lower links being 7 feet long, and the ninth or uppermost 10 feet long. The lowest link consists of seven : iron bars, 7 inches by 1° inches each, and amounting

ih a

BXAMPLES. |

collectively to an area of 69 square inches. They are secured to a cast-iron anchor plate, by a pin 34 inches diameter. From the fourth link the chain curves, and the section is gradually increased to an area of 93 square inches. ‘There are two towers at each end of the bridge, based upon a mass of masonry 60 feet by 20 feet, which is pierced by an arch 19 feet wide, forming the entrance to the lower roadway. The towers are 60 feet high, 15 feet uare at the base, and 8 feet square at the top.

“ Above the floors are 64 diagonal stays, extending from the saddles to the suspenders, amongst which they are equally distributed ; they are formed of wire-rope 13th inches diameter. There are also 56 stays attached at their

upper extremities to the soffit of the bridge, and at their other ends well anchored to the rocks below. The supcr- structure is thus tied down as well as suspended, and all undulations directly resisted.

“The bridge was commenced in September 1852, and opened for traffic in March 1855. The total cost was £80,000,”

The use of two chains of different versed sines is certainly a defect in this design.

There are several other suspension bridges in the United States of great span, eg., Cincinnati, 1057 feet; Brooklyn 1600 feet.

§ 81. Saltash, Victoria, and Coblentz Bridges. Fink Truss, Saltash. —Fig. 131 shows one span of Saltash Bridge erected by

PEE

Fre. 131.—Span of Saltash Bridge.

Brunel. The span is 455 feet. The pier is a column or circular pillar of solid masonry, 35 feet diameter and 96 feet high from the rock foundation to above high-

Fig. 182.—Fink Truss.

water mark. Upon this are placed four octagonal columns of cast-iron, 10 feet diameter, carried up to the level of the roadway, which is 100 feet above high-water mark. The Victoria Bridge over the St Lawrence at Montreal is a tubular bridge of great length (7000 feet), chiefly remarkable for its ice breakers, shown in fig. 93. Fig, 132 shows some details of a Fink truss as used in

America. The mode of computing the stresses on this truss has already been explained in § 59. All the struts are cast-iron tubes.

Fig. 133 shows one of the wrought iron arches of a Coblentz

bridge over the Rhine at Coblentz. of three spans of about 315 feet each. § 82. St Louis and Illinois Bridge.—The St Louis and

The bridge consists

ralatgta tga! ‘ T MF, rere pel } i ee ff i ———

Fra. 183.—Areh of Bridge at Coblentz.

Illinois bridge over the Mississippi (fig. 5, Plate XVIIL.) is the finest example of a metal arch yet erected. It is

described as follows by Sir Charles A. Hartley, who visited it in 1873 :—

“The Mississippi at St Louis is confined to a single channel 1600 feet wide and 8 feet deep at extreme low water by an embank- ment or levee on the Illinois side, which is carried up to the level of extreme high water, at which time the width is augmented to 2200 feet. Both shores are revetted below the low water, some with tubble stones, and protected by the wharf pavements above that line.

€ extreme range between high and low water is 41 feet. Owing to the narrow gorge through which the whole volume of the Mis- Sissippi flows the variations in the bed of the river are very great. Captain James B. Eads, M. Inct. C.E., the distinguished engineer

who designed the bridge and superintended its construction, informed the author that a rise of 13 feet less than high-water mark caused a scour of 18 feet, and that in the freshet of 1870 the scour reached a depth of 51 feet below low-water mark alongside the east pier. These facts induced him to believe it possible that the scour, at times of extraordinary high flood, might extend even to the rock itself. He therefore determined to establish the piers and abut- ments on the rock; and this was done by means of caissons provided with air chambers and locks at depths for the east pier and east abutment reaching 136 feet below high-water mark, or 110 feet from the surface of the water where the foundation work was actually performed,

This feat, which was satisfactorily executed in 1870-71, is quite unprecedented in the annals of engineering.

The piers and abutments are composed of coursed rubble masonry up to low-water mark. Above. this level they are faced

with grey granite from the State of Maine, which cost £10 per cubic yard in situ. The interior of the work is of magnesian lime- stone. The massive appearance of the granite rock facing is very striking.

The contract prices, and the total quantities of the steel and iron work required for the bridge, are as follows :—

2,500 tons of steel, at £60 per ton ….. .....

500 ,, wrought iron, at £40 per ton… > of 2000 lbs. 1,000 ,, rolled iron, at £28 per ton…...

200 ,, cast-iron at £16 per ton…..... of 2240 lbs.

The bridge has three spans, each formed with ribbed arches made of cast steel, a novelty in bridge building. The centre span is 520 feet and the side ones 502 feet in the elear.

The rise of the centre arch is 474 feet, that of the side ones 46 feet each. These are by far the largest arched spans in the world, and under the able direction of Colonel Read, Captain Eads’s chief assistant, they are now being rapidly erected gradually from caeh pier and abutment without the aid of eentering. Each span is composed of four double ribs of steel (well braced together at their relative distances from each other), and the tubes forming them are jointed butt to butt. They are clasped together by wrought iron couplings (which proved to be much better than steel), furnished with parallel grooves corresponding with similar grooves in the tubes. Steel pins, varying from 44 inehes to 7 inches in diameter, pass through the centre of the couplings and the ends of the tubes at every joint. The vertical bracing

between the upper and the lower tubular ribs, which are 12 feet apart from centre to centre, convert the two members into a single arch.

At the time of the author's visit two of the openings were already spanned by the steel tubes, which are all 18 inches in diameter, and 12 feet to 13 feet long, but of thicknesses varying from 14 inches to 2} inches.

The arches are to carry a double railroad track, and above the track a roadway 54 feet wide for carriages and foot passengers."

The bridge was opened, subsequently to Sir C. Hartley's visit, on the 4th July 1874.

§ 83. Projected Bridges.—The Tay Bridge is a railway bridge in course of construction (1876), to form a connec- tion between the town of Dundee and the North British Railway system in Fife, and crosses the Firth of Tay about a mile and a half to the west of Dundee. The length of the bridge exceeds two miles. It will therefore be the longest iron bridge in the world. The following descrip- tion has been furnished by Mr A. D. Stewart, who assisted the chief engineer, Mr T. Bouch, in the design of the bridge :—

Curves.—Commencing at the south shore, the bridge for the first five spans is on a curve of a quarter of a mile radius. It is then straight for a distance of a mile and a half. At the north shore, between high and low water mark, it describes a curve of a quarter of a mile radius, forming nearly a quarter of a circle towards the town of Dundee.

Gradients. —The level of the rails at the south end of the bridge is 78 feet above high water. The gradient descends 1 in 100 for the first three spans; it is level for the next two spans; it then ascends 1 to 353 towards the centre of ths bridge. Over the navi- gable part of the river it is level, and the rails are 92 feet above high water, leaving 88 feet for the passage of shipping above high water of spring tides. From this the gradient falls 1 in 734 to the end of the bridge.

Spans.—The portion of the bridge at present being executed extends to 3420 yards. Itis intended to add an opening of 120 feet and a number of 27 feet spans at the north end. The magnitude of the several spans in order,

commencing at the Fife shore, is as follows:—3 spans of 60 feet, 2 of 80 feet, 10 of 120 feet, 12 of 136 feet, 13 of 230 feet, 1 of 150 feet, 11 of 120 feet, 25 of 60 feet, 1 of 155 feet, and 6 of 27 feet—the total number of spans being thus 84.

Piers and Foundations.—The first fourteen piers are founded upon rock, which was generally covered to the depth of a few feet with clay or other soft material. These piers consist of double solid cylinders of brickwork, built with strong Portland cement mortar, connected by a wall of brickwork from low water to the super- structure. Foundations for these piers were obtained by placing caissons or hollow cylinders on their site, excavating within them, and sinking them by forcing out the water by air pressure. These caissons were built on the foreshore on a properly prepared foundation, and lined internally with brickwork to such a height that when fully sunk the brickwork extended above low water. When carried out and placed in position, this brickwork formed part of the permanent pier, and gave weight and stability to the caisson when the water was displaced from the inside. When the

whole material above the rock was thus excavated, the working chamber and shaft of the caisson were filled with eonerete, put in in a liquid state, and when this solidified the building upwards of the pier was continued, A difficulty arose in keeping the cylin. ders vertical during the sinking. This was overeome by combinin them into a single caisson. Between the fourteenth and fifteenth pier the rock disappears. At the sites of the next six piers the bed consists of a layer of hard material resting on silt. It is proposed to pile these piers from an outside staging within an oval-shaped wrought iron eaisson. After the piles are driven, their heads are to be surrounded with concrete, the water is then to be pumped out of the caisson, and brickwork to be built up to the level of about 5 feet above high water. The upper portions of these, and of al} the piers to the north of them, are to consist of east-iron columns braced together.

From the twenty-second pier northwards the bed of the river con. sists of sand, with occasional layers of coarse gravel and boulders, It was, however, necessary to modify the designs for the piers, and the method of founding and building them, according to the load each had to carry.

For the 120 and 136 feet spans there are eighteen piers. For each pier two wrought iron caissons are prepared, partly cylin. drical and partly conical in shape, and having a base of 15 feet. These are built on the fore-shore, and lined with brickwork; they are then floated out by means of pontoons having hydraulic machinery for lowering: when they have been sunk in their proper place until they take a bearing in the sand, the pontoons are removed, and by means of sand-pumps the material from the interior is removed and they sink by their own weight. During the operation of sinking, rings of wrought iron and briekwork are added to the top of the caisson, and stones are laid round the out. side to fill the void caused by the scour and pumping. Whena sufficient depth has been obtained the pumps are removed, and the interior is filled with liquid conerete; and when this has solidified, the brickwork is continued to above high water.

For the 230 feet spans, large wrought iron caissons of a eylindrical form, 31 feet in diameter, are erected on the fore-shore, one for each pier, and lined with briekwork to the height which it is intended to sink them in the sand. The upper and temporary portion of the caisson, of the same diameter as the under, but with no lining of brickwork, is placed on the top of the lower part and bolted securely toit. The compound caisson is floated out and sunk, as above described, by means of sand-pumps, and the permanent portion of the caisson is filled with concrete. The temporary portion is then unbolted by divers, and removed for further use. From the surface’ of the ground to above low water, the pier consists of a brick oval- shaped hollow cylinder, which is built on the fore-shore on girders; and when it has thoroughly set, it is also floated out and lowered on the concrete foundation. The interior of this brick pier is then filled with eoncrete, and the building of the brickwork is continued to above high water as tidal work.

For the 60 feet spans towards the north end of the bridge, the piers consist of three braced cast-iron columns placed in a row across the bridge, the western column having a rake or batter of 1 in 3. Every fourth pier is

double. Some of these were sunk as screw piles, others were founded in 6 feet cylinders, previously sunk by sand-pumps, and filled with concrete.

Superstructuwre.—The superstructure consists wholly of wrought iron girders. With the exception of two spans which have girders of the bowstring form, they have the top and bottom members straight and parallel. The bracing is of the double lattice form, crossing nearly at right angles, and from the point of intersection a vertical support is carried to the member on which the cross-girder or beam rests. The girders for the 230 feet spans, and the bow- string girders, have wrought iron cross girders resting on, and rivetted to, the lower member on which the roadway is placed. All the others have timber cross-beams resting on and rivetted to the top flange, and the roadway is above these girders. They are sent to the Tay built in convenient pieces for shipment, and rivetted together on jetties prepared near the shore. They are then floated out and raised to their places by machinery suited to their respec- tive weights. They are generally continuous in groups of four consecutive spans. In order to make eontinuity perfect, the further end of each girder is raised through a certain calculated height before rivetting it to the next.

Montreal papers state that a bridge 15,500 feet in length is about to be constructed over the St Lawrence at Montreal, from the designs of Mr Legge. It will have one span of between 500 and 600 feet, and 60 smaller spans, with a height of 130 feet above the water at high tide. The estimated cost is £800,000.

§ 84. Statistics—Table XVI., from the 8th edition, gives some statistical information as to the weight, cost, and dimensions of some of the principal cast-iron bridges.

oe

BRIDGES

Tables XVII. and XVIII. give various details regarding some important bridges of various construction and dimen-

EXAMPLES. |

INDEX oF Principat SuBJEctTs.

Chester

ae Maximum Flat Arches, Fe sou AE one Radius in ak Trezzo over Adda…... 251° ao 1384: Dorlaston, Segmental | 86°51] 18°48 761 Trilport, Elliptical … | 80°38 | 27:69 he Nantes 35 115°16 | 34°41 89°5 Neuilly aS 127°89 | 31°95 | 160° Waterloo – 120: oon 112°5 London Bridge ,, 152° | 29°6 ae Alma (Béton) ,, .../141°4 | 28-2 Grosvenor Bridge, 200: | 49° 143°

No. Total ’ NAME OF BRIDGE. bee Span. Rises aoa Con.

ings work. — Ft. In| Ft. In.| Tons Coalbrookdale …... 1 /100 6; 50 0) 3784) ... Buildwas …..... 1 |1380 0 174 | £6,034 Sunderland Bridge | 1 [286 0 260 | 27,000 Laason Bridge …... 1 | 48 0 Boe Staines Bridge …... 1 |180 0 rv: oonam Louvre …| 9 | 57 0 263 Pont @’Austerlitz.. | 5 {106 0 SSDENIS ...—. 2-0-0 Ho || Bos Hee as Bristol Bridge …... 1 |100 0 150 | 4,000 Craigellachie Bridge} 1 [150 0 8,200 Witham Bridge….. 1 | 86 0 ee Vauxhall Bridge… | 9 | 78 0 300,000 Southwark Bridge 3 pee 5 5780) 800,000 Tewkesbury Bridge | 1 [170 0 Galton Bridge …... 1 |180 0

Date of Com- pletion.

1779 1796

1796 1794 1802 1803 1806 1808

1816 1819

Thickness.

Of Of Crown jAbutments in feet.| at base. 3°510} 32-022 4°462} 19° 6°397 | 28° Sal || Sy) 4°5 40° 4°75

4:92

ANG

TaBte XVILI.—Dimensions and Cost of Large Bridges.

Maximum,

Name of Bridge.) 4p-

prox.|Span.

light.

ye |) Tee Britannia …| 125 |460

Charing-cross} 50 |154

Boyne …....] 90 |264 Cruniin …... 200 |150 |1, Craigellachic | 20 |200 “Gansta | 229 12 Deepdale….,. 150%) 60 Westminster | 20120 [1, Fribourg …... 167 Niagara …... 245 |808* Landore …...

1,

1,

Reputed Cost.

Per Foot run.

Total Amount.

aq b a A

Ft. z

511 /601,865

£

398

365 |180,000 |131

550 |140,000 1254 2

800| 39,000) 21 413] 12,200 |29°5

6201 30,000| 5

:

a

: :

|

=)

740| 20,266

160 |235,000 |202

- Platform.

Nature of Bridge.

Two lines Railway

—tubular.

Four lines Railway

—double Warren.

—lattice.

Four lines Railway

Two lines Railway —lattice on open- work piers.

One line Railway —lattice,

anid

plate girder.

One line Railway —plate girder.

Two lines Railway —lattice on open-

work piers.

Road — cast

wrought

and jron

arch, 83 feet wide.

Wire-rope Suspen-

sion Bridge—road

only,

sion Bridg

Wire-rope Suspen-

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and railway.

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BRIDGET, St, one of the patron saints of Ireland, who lived during the 6th century, was a daughter of one of the princes of Ulster, and took the monastic vow at a very early age. Her cell, the first in Ireland, was erected under a large oak tree, whence the place was called Kil-dara, the cell of the oak. The city of Kildare is supposed to derive its name from St Bridget's cell. A whole collection of miraculous stories have clustered round her name, and her reputation was not confined to Ireland, for St Bride was a favourite saint in England and in Scotland.

BRIDGET, Sz, of Sweden, was born about the year 1302. She was descended from a family of royal blood, and at the age of sixteen was married to Alpho, prince of Nericia. The husband and wife were equally devoted to works of piety, and undertook together a pilgrimage to the shrine of St Jago de Compostella. On their return both embraced the monastic life, and after the death of Alpho, his wife founded a new kind of monastery for monks and nuns. She then went on a pilgrimage to Rome, where she founded a house for Swedish pilgrims and students, and composed her Revelationes. After another pilgrimage to Jerusalem, she died at Rome in

1373. She was canonized in 1391. The order of St Bridget flourished for some time ; they had one house in Britain.

BRIDGETOWN. See Barpanos, vol. iii. p. 359

BRIDGEWATER, a municipal (and formerly a parlia- mentary) borough and seaport in Somersetshire, on the Great Western Railway, 29 miles §.8.W. of Bristol. It is pleasantly situated in a level and well-wooded country, having on the east the Mendip range and on the west the Quantock hills. The town, which is well built, lies along bothsides of the River Parret, here crossed by a handsome iron bridge. It has an ancient Gothic church with a spire 174 feet in height, a town-hall, court-rooms, a jail, a market-place, an infirm- ary, a free grammar school, and some alms-houses. The river, which is subject to a bore, often two fathoms deep at the mouth, is navigable for vessels of 700 tons up to the town. The customs duties in 1874 were £7227. The chief imports are grain, coals, wine, hemp, tallow, and timber; the exports, agricultural produce, earthenware, cement, plaster of Paris, and bath- bricks, which last constitute the staple trade of the town. The value of the imports in 1874 was £118,509, and of the exports £5011. The town returned two members to parliament till 1870, when the borough was disfranchised. Population in 1871, 10,259. Bridgewater is said to derive its name, which appears in earlier times as Brugge Walter, from a certain Walter de Douay, to whom the manor was presented at the Conquest. In the reign of Henry II. a splendid castle was built and a harbour constructed by William de Briwere; and in 1230 a Grey-Friars' monastery was founded by his son. The castle was taken by the Royalists in 1643, and was almost completely demolished after its capture by the Parliamentary forces in 1645. Admiral Blake was a native of Bridgewater.

BRIDGEWATER, Francis EGERTON, THIRD DUKE OF, who has sometimes been styled "the Father of British Inland Navigation," was born in 1736. The navigable canal which he projected for the transport of the coal obtained on his estates, was (with the exception of the Sankey canal) the first great undertaking of the kind executed in Great Britain in modern times. The construction of this remark- able work was carried out by Brindley, the celebrated engineer. (See BrrnpLEY and Canat.) The untiring per- severance displayed by the duke in surmounting the varions |

Arms of Bridgewater.

difficulties that retarded the accomplishment of his project together with the pecuniary restrictions he imposed Oa himself in order to supply the necessary capital, affords ay instructive example of that energy and self-denial on which the success of great undertakings so much depends. Though a steady supporter of Mr Pitt's administration, he never took any prominent part in politics. On his death, March 8, 1803, the ducal title became extinct.

BRIDGEWATER, tHe Rev. Francis Henry, Eicurg EARL OF, was born in 1758 and died on the 11th February 1829. He is best known as the originator of the Bridge. water Treatises. By his will he devised the sum of £8000, at the disposal of the president of the Royal Society, to be paid to the author or authors selected by the pr. sident to write and publish 1000 copies of a treatise "On the Power, Wisdom, and Goodness of God, as manifested in the Creation." Mr Davies Gilbert, who then filled the office, selected eight persons, cach to undertake a branch of this subject, and each to receive £1000 as his reward, together with any benefit that might accrue from the sale of his work, according to the will of the testator.

The treatises were published as follows:—l. Zhe Adaptation of External Nature to the Moral and Intellectual Condition of Man, by the Rev. Thomas Chalmers, D.D. 2. The Adaptation of External Nature to the Physical Condition of Man, by John Kidd, M.D. 8. Astronomy and General Physics considered with reference to Natural Theology, by the Rev. William Whewell, D.D. 4, The Hand, tts Mechanism and Vital Endowments as evineing Design, by Sir Charles Bell. 5. Animal and Vegetable Physiology considered with reference to Natural Theology, by Peter Mark Roget. 6. Geology and Mineralogy considered with reference to Natural Theology, by the Rev. William Buckland, D.D. 7. The Habits and Instinets of Animals with reference to Natural Theology, by the Rev. William Kirby. 8. Chemistry, Meteorology, and the Function of Digestion, considered with reference to Natural Theology, by William Prout, M.D. The works are of unequal merit; several of them took a high rank in apologetic literature.

BRIDLINGTON, Bretiineton, or BURLINGTON, a market-town of England, in the East Riding of Yorkshire, on the North-Eastern Railway, 23 miles from Scarborough.

‘It lies about a mile from the coast on a gentle acclivity.

The streets are narrow and the housesirregularly built. A large chamber over the old priory gateway (of the time of Richard IJ.) is used as a town-hall. The town has also a com exchange, a temperance hall, a mechanics’ institute, and two subscription libraries. The parish church of St Mary’s preserves a considerable part of the Augustinian priory which was erected in the 12th century, by Walter de Gaunt, a relative of the Conqueror, and continued to flourish till 1537, when its last prior was executed for taking part in the “ Pilgrimage of Grace.” On the coast is situated the pleasant watering-place of Bridlington Quay, which has recently increased in reputation. The harbour is enclosed by two stone piers, and there is good anchorags in the bay. The beach consists of a fine firm sand, and 1s bordered by a parade with ornamental gardens. Besides hot and cold baths, there is a chalybeate spring esteemed for its medicinal properties ; and the town is supplied with drinking-water from an intermittent fountain discovered below high water mark in 1811. The most important public building is the Victoria Rooms, which comprise 4 ball-room, a reading-room, a news-room, é&c. The united population of Bridlington and Bridlington Quay, which m 1851 was 2432, amounted in 1871 to 6203. Bridlington was placed by Henry I. under the civil jurisdiction of ths priors, and by John was allowed to hold a market and an annual fair. In 1643 the town was cannonaded by Admiral Batten, on account of the presence of Queen Henrietta, who had landed with a supply of arms. 51 George Ripley and John de Bridlington were connected with the priory ; Kent the landscape-gardener was a native of the town; and his patron, Robert Boyle, bore the title

of earl of Burlington, from which the name of Burlington House in London is derived.

BRIDPORT, a parliamentary and municipal borough and market-town of England, in the county of Dorset, 18 miles by rail N.W. from Dorchester between two branches of the River Brit, from which it takes its name. The

main part of the town is about a mile from the sea, with which it is connected by a single winding street, terminating in a quay sur- rounded by a fishing village. The principal buildings comprise a town- hall, a market-house, a jail,a custom- house, a mechanics' institute with reading and lecture rooms; there are also a school of art, alms-houses, and several charities, The parish church of St Mary, a cruciform edifice in the Perpendicular style, was restored in 1865. The harbour, which had become choked with sand, was rendered available and secure for vessels of 250 tons by extensive improvements undertaken in 1742 and 1823. The total value of the imports, which consist mainly of timber, coal, and flax, was in 1874 £89,616; and the exports amounted to £18,021. Its principal articles of manufacture have long been sail- cloth, cordage, linen, and fishing-nets. Bridport formerly returned two members to parliament, but since 1868 it returns only one. The population was 7670 in 1871. Though a place of considerable antiquity, it has very little historical importance. Its mint is mentioned in Domesday Book, In the reign of Henry VIII. the town and district had a monopoly of the supply of cordage for the Royal Navy.

BRIEG, the capital of a circle in the Prussian province of Silesia and government of Breslau, is situated on the left bank of the Oder, and on the Breslau and Oppeln Railway, 27 miles S.E. of the former town. It is well built, and has a castle (the residence of the old Piastic counts of Brieg), a lunatic asylum, a gymnasium with a good library, and several churches and hospitals. Its fortifications were destroyed by the French in 1807, and are now replaced by beautiful promenades. Brieg carries on a considerable trade, its chief manufactures being linen, cotton, and woollen goods, porcelain and machinery, hats, pasteboard, and cigars. Important cattle-markets are held there. Brieg, or, as it is called in early docwnents, Civitas | Alte Ripe, obtained municipal rights in 1250 from Duke Henry III. of Breslau, and was fortified in 1297; its name is derived from the Polish Brzeg (shore). In the 14th century it became the seat of a line of counts, by one of | whom the castle was built in 1341. Burned by the Hus- 'sites in 1428, the town was soon afterwards rebuilt, and in \ 1595 it was again fortified by Duke Joachim Frederick. In the Thirty Years' War it suffered greatly ; in that of the Austrian succession it was heavily bombarded by the Prussian forces; and in 1806 it was captured by the | French. Population in 1871, 15,372. | BROIEL, Brrevysz, or Brit, a fortified seaport town of

Holland, inthe province of South Holland, and capital of an arrondissement, stands on the north side of the island of Voorne, near the mouth of the Maese, 14 miles west of Rotterdam, in 51°54’ 11’ N. lat. and 4°9‘51” E.long. The town is well built and strongly fortified, and has an arsenal, military magazines, barracks, and a good harbour. The tower of St Catharine’s church serves as a lighthouse. | Briel is remarkable in history as having been the first place _ captured in the struggle that resulted in the independence | of the Netherlands—a fact which is commemorated in the

popular rhyme, Den eerste van April verloor duc d’Albe | syne Bril, punning on the meaning of Bril, which is the

Arms of Bridport.

| logarithms and in other useful works.

Dutch for “ spectacles.” Admiral Van Tromp was born in the town. The inhabitants, who are principally engaged as fishermen and pilots, numbered 4058 in 1869.

BRIGADE, a tactical body, composed of two or more regiments of cavalry or infantry, under the command of a general officer of the lowest grade. The term brigade is also applied to from four to eight batteries of artillery working together, and to the small detachments (eight or uine men) of engineers employed in excavating saps in siege operations. ‘Two or more brigades constitute a divi- sion, two or more divisions a corps d’arméc, two or more corps d’armée an army. .

BRIGADE-MAJOR, a third-class staff officer, appointed by the brigadier to assist him in the management of his brigade.

BRIGADIER, a general officer of the lowest grade, next in rank above a colonel, who is intrusted with the command of a brigade.

BRIGGS, Hewry, one of the greatest mathematicians of the 16th century, was born in 1556 at Warley Wood near Halifax, in Yorkshire. He studied at St John's College, Cambridge, graduated in 1581, and obtained a fellowship in 1588. In 1592 he was made reader of the physical lecture founded by Dr Linacre, and in 1596 first professor of geometry in Gresham House (afterwards Col- lege), London. In his lectures at Gresham House he proposed the alteration of the scale of logarithms from the hyperbolic form which Napier had given them, to that in which unity is assumed as the logarithm of the ratio of ten to one; and soon afterwards he wrote to the inventor on the subject. In 1616 he paid a visit to Napier at Edin- burgh in order to discuss the suggested change; and next year he repeated his visit for a similar purpose. During these conferences the alteration proposed by Briggs was agreed upon; and on his return from his second visit to Edinburgh in 1617 he accordingly published the first chiliad of his logarithms. In 1619 he was appointed Savilian professor of geometry at Oxford, and resigned his professorship of Gresham College on the 25th of July 1620. Soon after his settlement at Oxford he was incorporated master of arts in that university, where he continued a laborious and studious life, employed partly in discharging the duties of his office, and partly in the computation of In 1622 he pub- lished a small tract on the North-West Passage to the South Seas, through the Continent of Virginia and Hudson's Bay ; and in 1624 he printed at London his Arzthmetica Loga- rithmica, in folio, a work containing the logarithms of thirty thousand natural numbers to fourteen places of figures besides the index. He also completed a table of logarithmic sines and tangents for the hundredth part of every degree to fourteen places of figures besides the index, with a table of natural sines to fifteen places, and the tangents and secants for the same to ten places; all of which were printed at Gouda in 1631 and published in 1633 under the title of Zrigonometria Britannica. Briggs died on the 26th of January 1630 in the 74th year of his age. Dr Smith, in his Lives of the Gresham Pro- fessors, characterizes him as a man of great probity, a con- temner of riches, and contented with his own station, preferring a studious retirement to all the splendid circum- stances of life.

His works are—l. A Table to find the Height of the Pole, the Magnetical Declination being given, London, 1602, 4to. 2. '*Tables for the Improvement of Navigation," printed in the second edition of Edward

Wright’s treatise entitled Certain Errors in Navigation detected and corrected, London, 1610, 4to. 3. A Description of an Instrumental Table to find the part proportional, devised by Mr Edward Wright, London, 1616 and 1618, 12mo. 4. Logarithmorum Chilias prima, London, 1617, 8vo. 5. Luwcubrationes et Annotationes in opera posthuina J. Neperi, Edin., 1619, 4to. 6. Huclidis Ele~

mentorum VI. libri priores, London, 1620, folio. 7. A Treatise on the North-West Passage to the South Sea, London, 1622, 4to, reprinted in Purchas’s Pilgrims, vol. iii. p. 852. 8. Arith- metica Logarithmica, London, 1624, folio. 9. Trigonometria Bri- tannica, Goude, 1663, folio. 10. Two Letters to Archbishop Usher. 11. Mathematica ab Antiquis minus cognita. Some other works, as his Commentaries on the Geometry of Peter Ramus, and Remarks on the Treatise of Longomontanus respecting the Quadrature of the Circle, have not been published.

BRIGHTON, a parliamentary borough, and one of the most fashionable watering-places of England, is situated on the coast of Sussex between Beachy Head and Selsea Bill, in 50° 50’ N. lat. and 0° 8’ W. long. By railway it is 50 niles from London and 28 from Chichester. Its sea- frontage of handsome mansions and hotels extends upwards of three miles from Kemp Town in the east to what was formerly the suburban village of Cliftonville in the parish of Hove; while its depth inland at the centre is rather

more than a mile. In general appearance the styleof the town strikingly resembles that of London; and many of its streets and squares seem as if they had been transported as they stand from the “‘ West End.” As far, indeed, as its character is not affected by its natural situation, it js nothing more or less than a vigorous offshoot supported by the sap of the greater city, a fact which is popularly recognized by the designation of London-super-Mare, During the present century its growth has been rapid and continuous, about four hundred new houses being often built in the space of a year. _Its streets and squares already amount to four hundred; but in

comparison with this extent the number of its really remarkable buildings ig rather small, and nearly all of them are of modern date, Among its twenty Episcopalian and between thirty and forty Nonconformist churches two only need be specially men- tioned,—the parish church of St Nicholas, which was built

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Plan of Brighton.

in the reign of Henry VIL, and is probably one of the oldest buildings in the town, and Trinity chapel, in Ship Street, memorable as the scene of the labours of Frederick William Robertson. The most important of the secular edifices are the town-hall, the market, the pavilion, the aquarium, the theatre, the proprietary college, :

the Sussex county hospital, the new workhouse, the infirmary, the blind asylum, and the female orphan asy- lum. The pavilion, with its strange assemblage of domes and minarets, was built in 1784-7 as a residence for the Prince of Wales (afterwards Eg George IV.), and about 1818 it was — refashioned by Nash into agrotesque Ams of Baighion. imitation of Chinese architecture. It has afrontage to the east of 300 feet, and occupies, with its gardens, about 114 acres. In 1850 it was purchased by the town for £53,000, and its spacious rooms, greatly altered from time to time, are now appropriated to a variety of uses,—one serving as a museum, another as an assembly-room, others as picture- galleries. The pavilion dome, formerly the royal stables, is now converted into a magnificent hall for high-class musical performances; it is lighted by a glazed dome, with

‘ poor of every country and nation.”

a diameter only 20 feet less than that of the dome of St Paul’s of London. The county hospital was built in 1828 by Sir Charles Barry, at a cost of £10,000, and has since been largely extended. It is “open to the sick and

lame There are a large number of minor benevolent establishments in the town,

‘ and so various are its educational institutions that it has

been called the city of schools. Among the bathing establishments the most remarkable are Brill’s and the

|New Turkish Baths; the former includes extensive

swimming baths for both sexes.

The tendency of the currents in the channel opposite Brighton is to drive the shingle eastward, and within the memory of man large portions of the coast have thus been destroyed. To prevent this erosion the whole sea-front age of the town at the east end is protected by a great sea-wall, which was built between 1827 and 1838. It is a mile long, 60 feet high, and 23 feet thick at the base, and cost £100,000. The beach is further ribbed from north to south by various “groynes,” or jetties, one of which, constructed of concrete in 1867, at a cost of £5000, stretches about 250 feet into the sea. There are two piers / which serve as promenades. The first, an elegant chail fabric commenced by Sir S. Brown, R.N., in 1822, was

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‘opened to the public in the following year. It is 1136 feet in length and 15 feet in width, the four cast-iron columns on which it is suspended being supported by stone ‘buttresses based on oaken piles driven into the solid chalk. The cost was £30,000, and in 1836 an additional expendi- ture was necessary to repair the damage inflicted by a

great storm in November of that year, which was within a.

little of destroying the structure altogether. A new pier further to the west was opened in 1866. Its total length is 1]15feet, andit affordsaccommodation for 2000 people. The town is well supplied with water by the corporation water- ‘works, and by an artesian well, 1285 feet deep, at Warren Farm, the boring of which lasted from 1858 to 1862. The

‘sewage is effectively removed by an intercepting sewer 5 miles in length, which discharges into the sea 2 miles east ‘of the parish boundary. Since the opening of the Brighton railway in 1841 the town has developed wonderfully; but, with the exception of the railway works, no manufactur- ing establishment exists, and no tall chimneys are seen. Owing to the absence of a natural harbour the commerce lof the place is insignificant, but the mackerel and_herring- fisheries are carried on by about 120 boats. The races, which are held in August to the north and north-east of the town, and the great volunteer reviews, which of jlate years have drawn many thousands to the neighbour- ing downs, add considerably to the local trade. The town is governed by a mayor, thirteen aldermen, and a

‘council. It returns two members to parliament.

| Brighton, originally Brighthelmstone, plainly derives its name ‘from some Saxon Brighthelm, but who or what he was there seems no means of discovering. The present contracted form of the word ‘came into general use only in the end of the 18th century, but it is ‘solnetimes found in the documents of the time of Charles IJ. At

the time of the Conquest Brighton was a small fishing village, and

the lordship of the manor was bestowed by the Conqueror on his {nephew William de Warrenne, who received as rent from the fishermen 4000 herrings. In 1513 it was burnt by the French under Messire Pregent, whom the English ehronicles call Prior ‘John; and in 1545 it was again greatly damaged by Claude ‘dAnnebalte, the admiral of Francis I. At that time it is represented aga quadrangular town of four or five streets. There were then no defenees, but in 1558 a small circular fort was erected by | Elizabeth. The town seems to have rapidly recovered its prosperity, for in 1579 it possessed 80 fishing-boats, with 400 fishermen and ‘10,000 nets. The whole Elizabethan town, however, has been destroyed by the sea, whieh in 1699 swept away 160 houses, and \in 1703 and 1706 did almost as mueh damage. The modern ‘reputation of Brighton is due to Dr Richard Russell, a native of |\ Lewes, who resided there in 1750, and wrote a book on the jadvantages of sea-bathing, which led a number of people of high rank— among others the dukes of Cumberland and Marlborough— to place themselves under his direetion. The Prince Regent followed, and the

fortunes of Brighton were made. Bedford Square j Was commenced in 1810, and the building of Kemp Town took place between 1821 and 1830. A charter of incorporation was granted in }1854. In 1761 the population was only about 2000; in 1801 it had risen to 7339, by 1841 to 48,567, and by 1851 to 69,673. In 1861 there were 77,693 inhabitants in the munieipal borough, and 87,317 within the parliamentary limits, the number of houses being respectively 12,727 and 18,983, while in 1871 the municipal borough had a population of 90,011, inhabiting 14,438 houscs, and the parliamentary borough 103,758, with 16,284. See Lower's History of Sussex, 1870, and papers in the Sussex Archeological

Collections.

| BRIGHT'S DISEASE, a term in medicine applied to a class of diseases of the kidneys which have as their most pro- minent symptom the presence of albumen in the urine, and frequentlysalso the co-existence of dropsy. These associ-

_ ated symptoms in connection with kidney disease were first described in 1827 by Dr Richard Bright. Since that period the subject has been investigated by many able physicians, and it is now well established that the symptoms above

tamed, instead of being as was formerly supposed the

} result of one form of disease of the kidneys, may be depend-

_ ent on various morbid conditions of those organs. Hence

the term Bright's disease, which is retained in medical

nomenclature in honour of Dr Bright, must be understood as having a generic application.

Two varieties of Bright's disease are described, the acute and the chronic,—the former representing the inflammatory and the latter the degenerative

form of kidney disease,

Acute Bright's Disease (synonyms—acute desquamative nephritis, acute albuminuria, &c.) commonly arises from exposure to cold, from intemperance, or as a complication of certain acute diseases, such as .erysipelas, diphtheria, aud especially scarlet fever, of which it is one of the most frequent and serious consequences. In this form of the disease the kidneys become congested, their blood-vessels being gorged with blood, while the tubules are distended and obstructed by accumulated epithelium, as also by effused blood and the products of inflammation, all which are shed off and appear in the urine on microscopic examina- tion as casts of the uriniferous tubes.

The symptoms to which the condition gives rise are usually of a severe character. Pain in the back, vomiting, and febrile disturbance commonly usher in the attack. Dropsy, varying in degree from slight puffiness of the face to an accumulation of fluid sufficient to distend the whole body, and to occasion serious embarrassment to respiration, is a very common accompaniment. The urine is reduced in quantity, is of dark, smoky, or bloody colour, and exhibits to chemical reaction the presence of a large amount of albumen, while, under the microscope, blood corpuscles and casts, as above mentioned, are found in abundance.

This state of acute inflammation may by its severity destroy life, or, short of this, may by continuance result in the establishment of one of the chronic forms of Bright's disease. On the other hand an arrest of the inflammatory action frequently occurs, and this is marked by the increased amount of the urine, and the gradual disappearance of its albumen and other abnormal constituents ; as also by the subsidence of the dropsy and the rapid recovery of strength.

Of chronic Bright's Disease there are several forins, named according to the structural changes undergone by the kidneys. The most frequent of these is the large white kidney, which is the chronic form of the desquamative nephritis above mentioned.

Another form of chronic Bright's disease is the waxy or amyloid kidney, due to the degenerative change which affects first the blood-vessels and

subsequently also the tubular structures of the organ. This condition is usually found associated with some chronic ailment of an exhausting character, such as disease of bones and other scrofulous affections, or with a generally enfeebled state of health. It is marked by the passage of large quantities of albuminous urine, and is frequently accom- panied with general dropsy, as also with diarrhoea and consequent loss of strength. A third form of chronic Bright's disease is the contracted kidney, depending on the condition known as cirrhosis, in which the kidneys become re- duced in bulk, but dense in texture, from an abnormal development of their connective tissue and relative atrophy of their true structure. This form of the disease, which is commonly, though not exclusively connected with a gouty constitution, is apt to escape detection in its earlier stages from the more obscure character of the symptoms, there being less albuminuria and less dropsy than in the other varieties. Its later progress, however, enables it to be readily recognized. Dimness of vision, due to a morbid con- dition of the retina, and also hypertrophy of the heart leading to fatal apoplexy, are frequent accompaniments of this form of the disease.

A fourth variety of chronic Bright's disease is described by authors on the subject, viz., fatty degeneration of the kidneys, occasionally occurring in old age and in connection with a similar degeneration of other organs.

The kidneys being among the most important excretory organs of the body, it follows that when their function is interrupted, as it is alike in acute and chronic Bright's disease, serious results are apt to arise from the retention in the economy of those effete matters which it is the office of the kidneys to eliminate. The blood being thus con- taminated, and at the same time impoverished by the draining away of its albumen from the kidneys, is rendered unfit to carry on the processes of healthy nutrition ; and, aS @ consequence, various secondary diseases are liable to be induced. Inflammatory affections within the chest are of frequent occurrence, but the most dangerous of all the complications of Bright's disease are the nervous symp- toms which may arise at any stage, and which are ascribed tu the effects of uremic poiscning.

In the treatment of acute Bright's disease, good results are often obtained from local depletion, from warm baths, and from the careful employment of diuretics and purgatives. Chronic Bright's disease is much less amenable to treat- ment, but by efforts to maintain the strength and improve the quality of the blood by strong nourishment, and at the same time by guarding against the risks of complica- tions, life may often be prolonged in comparative comfort, and even a certain measure of improvement be experienced.

See Report on Medical Cases, by Richard Bright, London, 1827 ; On Granular Degencration of the Kidneys, by Robert Christison, M.D., Edinburgh, 1839 ; Diseases of the Kidney, by Dr G. Johnson, London, 1866; Practical Treatise on Urinary and Renal Diseases, by Wm. Roberts, M.D., London, 1865; On the Pathology and Treatment of Albuminuria, by W. H. Dickinson, M.D., London, 1868 ; Practical Treatise on Bright's Diseases of the Kidneys, by T. Grainger Stewart, M.D., Edin. 1871. (Ge O27 As))

BRIGNOLES, the capital of an arrondissement in the department of Var, in France, is situated in a fertile and pleasant valley on the right bank of the Calami, 22 miles N.N.E. of Toulon. It is neat and well built, and has a magnificent fountain, a public library, a normal school, manufactures of silk thread and leather, and an active trade in wines, brandy, liqueurs, and excellent prunes— the last distinctively known as prunes de Brignoles. The prefecture has its offices in the palace of the counts of Provence, and the old house of the Templars is occupied by the theological seminary. Brignoles is a town of great antiquity. In 1291 it gave its name to a treaty between Alphonso ITI. of Aragon and the king of France. In ancient documents it is often mentioned as Villa Puerorum, from the fact that the children of the counts of Provence were generally born and brought up in the castle. In 1524 the town was taken and pillaged by Charles V., and in 1588 it met a similar fate at the hands of the Leaguers. Popu- lation of town in 1872, 4843.

BRIL, Pav, a Flemish painter, born at Antwerp in 1554. The success of his elder brother Matthew in the Vatican induced him to repair to Rome. On the death of Matthew, Paul, who far surpassed him as an artist, succeeded to his

pensions and employments. He painted landscapes with a depth of chiaroscuro then little practised in Italy, and introduced into them figures well drawn and finely-coloured. Many of his pictures are extant in Italy. One of his best compositions is the martyrdom of St Clement, in the Sala Clementina of the Vatican. He died at Rome in 1626. (See Lanzi, History of Painting.)

BRINDISI, a fortified city and seaport of Italy, in the province of Otranto, is situated at the head of a bay of the Adriatic in 40° 39’ 27” N. lat. and 17° 28’ 44” E. long. The streets are for the most part narrow and crooked, and the town in general is in a somewhat ruinous condition. Since the restoration of its maritime import- ance, which is mainly due to the fact that it forms the great transit station in the overland route to Asia by the Mont Cenis Railway and the Suez Canal, some improvement

has taken place, and it bids fair to become one of the most flourishing cities in the country. The progress, however has hitherto been comparatively slow, and the only extensive addition which has been effected is a new stregt leading from the railway station to the harbour, 4 cathedral in rather a dilapidated state, a citadel with huge round towers (founded by Frederick II. and completed by Charles V.), and a seminary (containing a library bequeathed to the town by archbishop Leo), are the only public buildings worthy of notice. The ruins of the circular church of St Giovanni, which was destroyed by earthquake, are not without interest ; an ancient building of uncertain date is popularly regarded as the house where Virgil died ; and there isa remarkable column supposed by some to have marked the termination of the Appian Way, but more probably belonging to an ancient temple. There are ten public schools in the town. The trade was repre. sented in 1873 by imports to the value of £344,000, and exports to £325,000. The former consist mainly of raw silk, wheat and flour, coals, manufactured cottons, and petroleum ; and the latter of manufactured coral, corn, dried fruits, and olive oil. The number of vessels that arrived at the port in 1873 was 709, of which 422 were steam- ships. The harbour consists of an outer and an inner por tion, and the inner is divided into two basins, extending right and left. The outer port is about 6400 feet long by 3200

wide, the western arm of the inner portion 4800 by 800, and the eastern arm 3520 by 640. An extensive system of dredging has been in operation since 1866, and long lines of quays are being gradually constructed. Gray- ing-docks are also in course of construction ; and a lagoon, called Fiume Piccolo, close to the outer harbour, which has been a constant source of malaria, is being filled up. The population of the town, which was only 8000 in 1861, had increased to 13,755 in 1871.

Brindisi, Brundisium, or Bpevréciov, was originally, it would appear, a city of the Sallentines, from whom it was captured by the Romans in 267 8.c. Colonized by its conquerors in 244 B.C. it soon rose into importance, and became their chief naval station in the Adriatic. Hannibal vainly attempted to surprise the city, which remained faithful to Rome through the darkest days of the Punic struggle. During the war between Julius Cesar and Pompey the former endeavoured to shut up his rival's fleet in the inner harbour, by closing the entrance with wooden piles, which are frequently but erroneously supposed to have been the cause of the destruction of that part of the port. On the fall of the Western Empire Brundisium seems to have been outstripped by the neighbouring city of Hydrun- tum (Otranto). Inthe 10th century it was destroyed by the Saracens, but was rebuilt by Spathalupus the Byzantine governor, whose name still stands graven on the marble column above mentioned. After passing through various vicissitudes in common with the rest of Southern Italy, it fell into the hands of the Normans, and in the 11th century it was the scene of the chivalrous pageantry of Tan- ered's court. It was plundered in 1348 by Louis, king of Hungary, and in 1458 suffered severely from an earthquake. Some time be- fore this last disaster a more serious injury had been inflicted by Prince Giovanni Antonio Orsini, who completely choked the entrance to the inner port by sinking a number of vessels laden with stone. The commercial importance of the city rapidly declined, and it was of no interest save to the classical scholar as the birthplace of Pacuvius, and from its association with the mirthful journey of Horace and the death of Virgil.

BRINDLEY, James, a celebrated engineer, was born at Thornsett, Derbyshire, in 1716. His parents were in vely humble circumstances, andhe received little or no education. At the age of seventeen he was apprenticed toa millwright near Macclesfield, and while in this employment manifested

remarkable mechanical talent. Soon after completing his apprenticeship he set up in business for. himself as a wheelwright, and quickly became famous for his ingenuity and skill in repairing all kinds of machinery. In 1752 he designed and set up an engine for draining some coal-pits at Clifton in Lancashire. Three years later he extended his reputation by completing the machinery for a silk-m at Congleton. About 1754 Brindley became acquainted

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with the duke of Bridgewater, and an arrangement was goon come to whereby he undertook to carry out that nobleman’s scheme of inland navigation. The duke’s primary object was the carriage of coal from his estate at Worsley to Manchester. The difficulties in the way were great, but all were surmounted by the genius of Brindley, whose crowning triumph was the carrying the new canal over the River Irwell at Barton, by means of an aqueduct elevated 39 feet above the water. The great success of this canal, the first of its kind in Great Britain, encouraged similar projects, and Brindley was soon engaged extending his first work to the Mersey. He then designed and nearly completed what he called the Grand Trunk Canal, connecting the Trent and Humber with the Mersey. The Staffordshire and Worcestershire Canal, the Oxford Canal, the Stockwith and Chesterfield Canal, were all planned and carried out by him. His excessive toil broke down his strength, and he died in 1772 at the early age of fifty-six, Brindley was a man of no education; he retained to the last a peculiar roughness of character and demeanour ; but his innate power of thought more than compensated for his lack of training, It is told of him that when in any difficulty he used to retire to bed, and there remain intensely pondering his problem until the solution became clear to him. His mechanical ingenuity and fertility of resources were very remarkable; he undoubtedly possessed in the very highest degree the engineering faculty, though the kind of works to which he devoted himself has been cast into the shade by the later developments of steam traffic. Brindley was an enthusiast in his business and possessed with the idea of canals. His reported answer to the committee

who asked him what was the use of navi- gable rivers,—‘ To feed canals,” is characteristic, if not altogether authentic.

See Smiles, Lives of the Engineers, vol.i. ; Biographia Britannica.

BRIOUDE, a town of France, in the department. of Haute Loire, capital of an arrondissement, is situated on the left bank of the Allier, 39 miles N.W. of Puy. The town is ill-built, but has a fine old Gothic church (St Julien, of the 12th century, with curious mosaic ornamen- tation), a college, a public library, and beautiful fountains, which date from the 13th century. At Old Brioude, about three miles 8.S.E., are the remains of a bridge over the Allier, which consisted of a single arch 60 feet high and 206 feet in span. (See article BripcEs, p. 332.) This fell in 1822; and a new bridge of one arch, 182 feet in span, was built in 1845. Population in 1872, 4524.

Brioude, the ancient Brivas, was formerly a place of considerable importance. It was in turn besieged and captured by the Goths (532), the Burgundians, the Saracens (732), and the Normans. In 1181 the viscount of Polignac, who had sacked the town two years previously, made public apology in front of the church, and established a body of twenty-five knights to defend the relics of St Julian. For some time after 1361 the town was the headquarters of the lord of Castelnau, who was at the head of one of those bands of military adventurers which then devastated France. The knights (or canons, as they afterwards became) of St Julian bore the title of counts of Brioude, and for a long time opposed themselves to the civic liberties of the inhabitants. =

BRISBANE, a town of Australia, capital of the colony of Queensland, is situated in Stanley county, on both banks of the River Brisbane, about 25 miles from its entrance into Moreton Bay. It consists of four parts,—North and South Brisbane, Kangaroo Point, and Fortitude Valley. Among its public buildings are courts of justice, houses of parliament, a governor’s residence, a literary institute, a concert-room, a school of arts, and from twenty to thirty churches, It has also an excellent botanical garden. The river, which is about a quarter of a mile broad opposite the town, is navigable for vessels of considerable burden, and has been made more accessible by the partial removal of

the bar at its mouth. Regular steam communication is kept up with Sydney and other Australian ports, and a very flourishing trade is carried on in the export of wool, cotton, tallow, and hides, and the import of European manufac- tures. The town is the centre of a considerable railway and telegraphic system. Brisbane was founded as a penal settlement in 1825, and was named in honour of Sir Thomas M. Brisbane. In 1842 the establishment was abolished, and general colonization set in. The town was politically a part of New South Wales till 1859, when it was made the capital of Queensland. It is the seat of an Anglican and also of a Roman Catholic bishop. Its population was ouly 5225 by the census of 1861; but in 1871 it amounted to 15,029, of whom 7204 were males and 7825 females. The number of inhabited houses at the latter date was 2931.

BRISBANE, Srr THomas MaxpovueGatt, a distinguished soldier and astronomer, was born in 1773 at Brisbane in Ayrshire. He entered the army in 1789, and served in Flanders, the West Indies, and the Peninsula. In 1814 he was sent to North America ; on the return of Napoleon from Elba he was recalled, but did not arrive in time to take part at the battle of Waterloo. From 1818 to 1821 he was military commander in the South of Ireland. He was then appointed governor of New South Wales, an office which he held for four years. During that time he devoted himself most earnestly to the colony under his charge; he introduced new plants and breeds of animals, encouraged the reclaiming of waste lands, and even raised the status of the convicts by his wise measure of granting tickets-of- leave for good conduct. While in Australia he occupied himself in astronomical researches, erected a large obser- vatory, and catalogued 7385 stars scarcely before known. The Royal Society awarded him their Copley medal for this work, The Brisbane Catalogue of Stars. After his return he resided chiefly at Makerstoun in Roxburghshire, where he had a large and admirably equipped observatory. Three volumes of his observations were printed in the Transactions of the Royal Society of Edinburgh. In 1836 he was made a baronet and K.C.B.; and in 1841 he became general. He received the degree of D.C.L. from Oxford, and was elected president of the Royal Society of Edin- burgh after the death of Sir Walter Scott. Sir Thomas died on the 3lst January 1860. He

founded two gold medals for the encouragement of scientific research, one in the award of the Royal Society, the other in that of the Society of Arts.

BRISSON, Maruurin Jacques, a French zoologist and natural philosopher, was born at Fontenay-le-Comte, 3d April 1723. He studied for the church, but did not take orders, as his inclination led him towards the study of natural science. He became assistant to the celebrated Réaumur, and in 1756 published the first volume of his work on the animal kingdom, containing an account of the quadrupeds and cetacea. Of his other works on natural history the most important was the Ornithologie, 6 vols, 1760. After the death of Réaumur and the amalgamation of his museum with the royal cabinet,

Brisson gave up the study of natural history and devoted

himself to physical science. He obtained an appointment as professor in the college of Navarre, and was made instructor of the royal family in natural philosophy. Several text-books on physics were published by him, and were in considerable repute for a time, but his most important piece of work was the J'ables of Specific Gra- vities, published in 1787. Brisson died in 1806.
BRISSOT, Jean Prerre, who assumed the name De Warville, a celebrated Girondist, was born of humble parents at Chartres in January 1754. He received a good education, and entered the office of a lawyer at Paris. His first works, Théorie des Lots criminelles (1781) and Bib-

liothéque philosophique du Législateur (1782) were on the philosophy of law, and showed how thoroughly Brissot was imbued with the ethical precepts of Rousseau. The first work was dedicated to Voltaire, and was received by the old philosophe with much favour. Brissot became known as a facile and able writer,'and was engaged on the Mercure, on the Courrier de Europe, and on other papers, a connection with which was not creditable to him. He seems, indeed, to have sold his pen readily, and to have degraded himself by being associated with such men as De Morande. Ardently devoted, however, to the service of humanity, he projected a scheme for a general concourse of all the savants in Europe, and started in London a paper, Journal du Lycée de Londres, which was to be the organ of

their views. The plan was unsuccessful, and soon after his return to Paris Brissot was lodged in the Bastille on an unfounded charge. He obtained his release after four months, and again devoted himself to pamphleteering, but

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had speedily to retire for a time to London. On this second visit he became acquainted with some of the leading Abolitionists, and attempted to set up in Paris a Society of the Friends of the Blacks. As an agent of this society he paid a visit to the United States, and returned just at the outbreak of the Revolution. Into this great movement Brissot threw himself heart and soul. He edited the Patriote Franais, and being a well-informed, capable man, soon began to take a prominent part in affairs. In the National Assembly he leagued himself with the party, well known in history as the Girondists, but then frequently called the Brissotins. Of this party he was in many respects the ruling spirit. Vergniaud certainly was far superior to him in oratory, but Brissot was quick, eager, impetuous, and a man of wide knowledge. But he was at the same time timid and vacillating, and not qualified to struggle against the fierce energies roused by the events of the Revolution. His party fell before the “Moun-

Plan of Bristol.

tain ;” sentence of arrest was passed against the leading members of it on the 2d June 1793. _Brissot, persuaded by his friends, attempted to escape in disguise, but was arrested at Moulins. His demeanour at the trial was quiet and dignified ; and on the 31st October 1793 he died bravely with his comrades. His works are numerous, but their interest was merely temporary.

See Mignet, Revolut. Frang.; Carlyle, French Revolution ; and the numerous histories of the period, particularly Lamartine's Histoire des Girondins.

BRISTOL, a seaport town in the west of England, is situated in 2° 35' 28'-6 W. long., 51° 27' 63 N. lat., 108 miles from London by road, 118 by Great Western Railway, 12 miles N.W. of Bath, and 8 miles inland from Bristol Channel, with which the port communicates by the Avon. That river, as well as the Frome which unites with it at

the quay, runs through the city and forms the topographical division between Gloucestershire and Somersetshire, out of which provinces Bristol was constituted a distinct county in itself by a charter of Edward III. Its geological post tion is on the New Red Sandstone, which rises above the alluvial deposit of the rivers, while deep beneath these layers would be found the coal measures that succeed the millstone grit beds of the adjacent hills (250 feet in height) of Brandon and Kingsdown. 'The origin of the name is doubtful. Mr Seyer, the historian of Bristol, gives forty-two variations in the spelling of the word, and after showing attempted derivations from Brennus, the legendary founder of the town, Brictric, its Saxon lord, é&c., finally decides for Brigstow, or Bridge-place, an etymology accepted by the author of Words and Places. "In fact, Bristow," says the Rev. John Earle, "is a condensed compound for Zra-

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jectus ad Abonam,"! the place of the bridge at which the Avon was crossed. The vestiges of Roman occupation, however, on the site of the ancient city are scanty, and consist almost solely in the discovery at different spots of Caer Brito, one of the thirty-three early cities of Britain mentioned by Nennius, is interpreted by Henry of Huntingdon If (as now municipally) the name include the outlying heights of Clifton this interpre- 300 feet above

some coins of Severus and other emperors.

(1154 a.p.) to mean Bristol.

tation may be adopted with less hesitation. the surface of the Avon, on both sides of the river, are

Belgic British camps, with traces of superadded Roman work, one of which is comparatively perfect, a second of well-marked outline, while a third has been wantonly destroyed within the last two or three years. The existence of coins of Canute, of Harold I., of Hardicanute, of Edward the Confessor and of Harold II., of Bristol mintage, shows that the place was a centre of population under the Danes and Anglo-Saxons, but there is no positive mention of a Danish invasion except by Polydore Vergil, a 16th century

historian. The history of the town hardly begins till the subjugation of Gloucestershire by the Conqueror, in 1068.

it offered any futile resistance to the sweeping tide of con- quest. arly in the following year, three sons of Harold,

—Godwin, Edmund, and Magnus,—resolving to reconquer

the kingdom their sire had lost with his life, came at the head of fifty-two ships from Ireland up the Bristol Channel, and laying waste the coast on their way, sailed up the Avon to Bristol. Here they were sharply repulsed by the townsmen, and afterwards more thoroughly routed by Geoffry Mowbray, bishop of Coutance, nephew to the famous Tancred the crusader (Biog. Univers.) Though Bristol is mentioned in Domesday, Bristol Castle is not.

Obverse

Reverse. Corporation Seal (Motto: Vértute et Industria).

but appears first in history in connection with the constable- ship of the martial prelate just named, who held the fortress for Robert duke of Normandy against William Rufus. When the king had crushed the insurrection and driven the rebel churchman out of the realm, he granted the royalty, or Honour of Gloucester, which included Bristol, to his kinsman Robert Fitzhamon, who thus became feudal chief of the territory. Fitzhamon’s daughter, Mabel, marrying Robert earl of Gloucester, natural

son of Henry I., that noble, upon the death of his father-in-law, became lord of the tower and town of Bristol. He rebuilt the castle, which soou received as captive within its walls Robert duke of N ormandy, who was afterwards removed to Gloucester's stronghold at Cardiff. The red earl of Gloucester, as he was called, was the most powerful baron of his age ; and among his successes in war, was the capture of king Stephen at the battle of Lincoln, who was brought to Bristol, and, like Curthose, imprisoned in the castle, where he remained in chains till exchanged for Gloucester himself, who in his turn was defeated and captured by Stephen's queen at Winchester. Earl Robert died in 1147 _ a ae

- Arch. Inst. Jour., vol. xviii. 350.

Bristol is not specially named, but there is no reason to believe that

and was succeeded by William his son, whose daughter, Avisa, marrying John earl of Moreton, afterwards king John, the town and castle of Bristol became an apanage to the crown, and as such it continued to the time of Charles I. John was as many as nineteen times at Bristol, the neighbouring forest of Kingswood, which stretched 14 miles square to the east of the city, no doubt resounding frequently to the cry of his hunt. .

Henry IIL, upon the death of John, came for security to Bristol Castle, when he permitted the town to choose a mayor after the manner of London; and in like usage that the mayor of London was sworn before the constable of the Tower, so here he was directed to be sworn before the con- stable of the castle of Bristol, each fortress being distinct from its respective city. This feudal custom was continued here until Edward III. conceded, among other chartered benefits, that the new mayor should take oath of office before the retiring mayor in the Guildhall of Bristol in the presence of the commonalty. Other privileges from the same monarch were the establishment here of the wool- staple, and the empowering of the mayor and sheriff to elect from time to time forty of the "better and more honest" men of the town, as a council to rate and levy taxes, &c., which common council, in nearly the same form as instituted, is yet maintained.

Richard IT. confirmed all the grants of his predecessors, and directed that the steward and marshal and clerk of the royal household should not sit in the town of Bristol, as before had been granted to the city of London. In 1387 the king was at Bristol castle “ with,” says Froissart, “ the queen and all the ladies and damsels of her court,” having accompanied thus far his favourite, De Vere, towards Ireland. Two years later Henry Bolingbroke, with his vast northern army, surrounded the walls of this important western city which immediately surrendered. After four days’ siege the castle also capitulated, one of the terms of the treaty with the duke of York, agreed to by its governor, Sir William Courtnay, being that Lord Scrope, earl of Wilts, Sir Henry Green, and Sir John Busbie, who were within its walls, should be delivered into the hands of the duke of Lancaster. In Shakespeare’s Richard II. is a scene wherein Bolingbroke denounces these minions of the falling cause, and orders Lord Northumberland to see them de- spatched. They were beheaded in the centre of the town, where then stood the high cross. Only a few years since an unsuccessful attempt was made in the House of Lords to revive the peerage of Wilts, which included the right to wear a kingly crown in the Isle of Man, that peerage having been dormant from the time Sir William Scrope here lost his head. In 1408 Lord Spencer, another adherent of the ruined dynasty, was also executed at the same spot.

By a charter of Henry VI. the town of Bristol, with its gates, ditches, walls, and markets, was farmed to the mayor and burgesses for sixty years at the annual rent of £102, 15s. 6d. to the king’s household, and £57, 4s. 6d. to the abbot of Tewkesbury and to the castle. This yearly fine of £160 was granted by Edward IV. to Elizabeth his queen consort Richard III. released £60 of this rent, and the remainder was redeemed in the reign of Charles I.

The doctrines of the Reformation were preached here by Tyndale, Cranmer, and Latimer. The issue of the dissolu- tion of religious houses, of which thirteen encircled the outer walls of the city, was the erection here of a bishopric (1542) by the conversion of the abbey church of Austin canons into a cathedral. It has singularly escaped the notice of every writer that the episcopate was refounded in 1551, by power of letters apostolic directed by Pope Paul IV. to Cardinal Pole ; a MS. copy of the original Bull is in the Bristol Museum. The transitional epoch from the Papal to the Protestant faith was stained here by the

blood of five martyrs; to which number we may add a sixth, James Duke, who belonged to Bristol, but suffered in Kent. About the beginning of autumn 1559 “the church wardens of all the churches of Bristow,” says an unpub- lished chronicle noticed below, “‘and some of the ministers, brought forth their roods and other images, which were in their churches, to the High Cross where they were burnt.”

The detachment of the castle from the county of Glou- cester, and its grant to and incorporation with the town of Bristol by Charles I. (1629) at the request of Henrietta Maria, was another important surrender from the Crown, but the charter cost the city £949, and the castle was to be holden at a fine of £40 yearly. As London was called the King’s Royal Chamber, so Bristol was called the Queen’s Royal Chamber; but courtly favours were all practi- cally cancelled by the infliction of the ship-money tax. By the king’s writ (of October 20, 1634), £6500 was charged on Bristol for this impost, and there were further taxations in successive years. The payment of these assessments became at length so dilatory as to draw down (1638) a sharp reprimand from Government upon the mayor, with the threat,—“ if you give not his majesty better satisfac- tion we shall take a course to make you sensible of your duty” (Cal. State Papers).

The hurtful interference with the trade of the place (such as the limitation in the manufacture of soap to 600 tons yearly, which article had been from the 12th century, and is even now, one of the chief of Bristol productions) prepared the way for the easy admission of Col. Essex and his troops, when in 1643 he presented himself before the gates of the city. The Parliament held the place from 5th December 1642 to 26th July in the following year, when Prince Rupert, with his cavaliers, surrounded the walls, and storm- ing at all points frightened the governor, Col. Fiennes, who had succeeded Essex, into capitulation. In August 1645 the city was assaulted by Fairfax and Cromwell, and on the 20th day of the siege, it having been heard that the king was in full march upon the west, a storm was decided upon, and after a sharp assault on the 11th of September, Rupert surrendered. ‘‘ We had not killed of ours in the storm,” says Cromwell, “nor in all this siege, two hundred men. He who runs may read that all this is none other than the

work of God. He must be a very atheist that doth not acknowledge it” Ten years later the castle was demolished by order of the Protector. The history during the next century and a half is unmarked by any very striking events. The rise of Non- conformity ; the persecution of the Quakers, of whom 103 were in Bristol prisons at the accession of Charles II.; the visit of the sanguinary Jefferies on his famous western assizes, when six persons were condemned and executed on Redcliff hill, are some of the chief phases and incidents during this period. In 1684 was given the charter granting that “the citizens and inhabitants of Bristol and their suc- cessors hereafter for ever may and shall be a body corporate in deed, fact, and name, by the name of the Mayor, Bur- gesses, and Commonalty of the City of Brostol, with a com- mon seal.” In 1685 James II. stopped here on his way to Sedgemoor ; and he again visited Bristol in the following year, and was handsomely entertained. The bishop of Bristol at the time was Lake, one of the historical seven, who was succeeded by Trelawny, another of the seven. The greatest merchant in Bristol at this period was Edward Colston, whose profuse benevolence has made his name splendid among the citizens. In the foundation of schools and almshouses, repairs of churches, éc., he gave £70,695, a vast sum in these days. He diedin 1721. Three influen- tial societies instituted to his memory yearly assemble at public dinners, where they collect alms for lying-in women, for apprenticing boys, &c. Up to the endof 1874 the amounts

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collected from their commencement by these—the Dolphin, Anchor, and Grateful societies—have attained an aggregate of £118,013. At the election of 1774 Bristol was repre- sented in the person of the famous Edmund Burke, but his policy did not please all his constituents, and he con- sequently lost his seat here for the next Parliament. His defensive speech on the hustings of Bristol “is one of the most convincing pieces of popular oratory on record,” The Bridge Riots of 1793 and the Reform Riots of 1831 are dark spots on the history of Bright-stow, or Bright-place, as old Fuller interpreted the name. The former were the result of opposition to the prolonged impost of toll which it was prevalently understood was to cease by a certain day. About forty persons lost their lives by a charge of the . military on this occasion. The Reform Riots have been called “The Bristol

Revolution," but were simply a revolt of the lowest stratum of society, in whom mania for plunder superseded all political principle. Forty-five houses, the bishop's palace, and the prisons were burnt to the ground ; twelve of the rioters were killed by the soldiers, several perished in their own fires, four were hanged, thirty were imprisoned ; the colonel of the troops committed suicide, and the city was mulcted in £68,208 damages. The next year the cholera visited the people, when 626 died of the malady.

The nautical enterprise of Bristol has been worthy of a place that "seems to swim on the waters" and struck the eye of Pope the poet as having its streets full of ships Some remarkable voyages from the port are recorded, but perhaps none more memorable than that of Sebastian Cabot in 1497, who was the first Englishman (for he was born in Bristol) who landed in America, and the earliest to discover that portion of the continent now called the United States, and thereby to secure its English colonization. The notice in a hitherto unpublished local chronicle is as follows :— "This year (1497), on St John the Buaptist's day, the land of America was found by the merchants of Bristowe ina ship of Bristol called the 'Matthew,' the which said.ship departed from the port of Bristowe the 2d of May, and came home again 6th August following."1 A Bristol privateer brought home from Juan Fernandez the real Robinson Crusoe. The saucy"'Arethusa" frigate, celebrated for naval daring by Dibdin in song and by Capt. Chamier in romance, was built at and belonged to Bristol. The first steamboat built and fitted at the same port was the " Wye," in 1827. Bristol was the first city in the kingdom that established regular steam conimunication with the United States, the first voyage having been made by the " Great Western" in 1838. This vessel was built at Bristol at a cost of £60,000. The "Great Britain" and the ill fated ' Demerara " were also built here, the former costing £120,000.

The creation of Bristol a free port in 1848 has resulted in great increase of trade. The tonnage of foreign vessels (exclusive of Ireland) with cargoes entering the town, was in 1846, 100,722; m 1873, 411,014; in 1874, 432,940. The quantity of grain of all kinds imported between April 1874 and April 1875 was 1,062,007 quarters ; of wine, 7459 pipes; of timber, 34,740 tons ; of sugar, 83,858 tons. With respect to the shoe manufacture, in Janualy 1657, leave was given by Government to Mr Ellis of Bristol, to

send 1000 dozen of shoes to Barbadoes, and another 1000 dozen in December. The combined shoe trade now employs 5000 hands, one firm, Derham's, alone paying in wages £50,000 per annum. Fry's choco- late and cocoa works occupy between 500 and 600 hands. The soap trade engages about 400 hands. In the Great Western Cotton Works about 1500 are employed ; in the stay trade 2000 people.

Bristol stands fourth of all the seaport English towns In the amount of customs revenue reccived. The gross amount in 1864 amount Ob Cush) le ae ae

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1 These important dates have not (at least the two latter) till now been published. They are from an ancient manuscript for severa generations in possession of the Fust family of Hill Court, Gloucester shire, the ' collations"" of which are now (1876) in the keeping of Mr William George, bookseller, Bristol.

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was £1,108,000; this had increased in 1866 to £1,174,181, and decreased in 1873 to £941,679. 'The inland revenue received in the year 1874-5 was £467,091.

The boundaries of the city within its ancient limits comprised 755 acres, and the districts added by the Municipal Act (5 and 6 Wm. IV.) contained 4124 acres, making a total of 4879 acres. The population of the ancient city and of these districts according to the census returns of the present century has been as follows :—

Added Districts.

20,339 24,891 32,219 45,334 60,880 71,612 88,066 119,890

Ancient City. Total.

40,814 46,592 52,889

61,153 71,483 85,108

104,408

125,146

137,328

154,093

182,552

59,074 64,266 65,716 66,027 62,662

The entire ratcable value in 1861 was £508,988 ; in 1871, £719,983. The circuit of the municipal boundariesis15 miles. The town is divided into 10 wards, returning 48 members to the town council, selected by the burgesses, with 16 aldermen, chosen by the council,—making a total of 64 members. There arc 30 acting justices of the peace, who are appointed by the lord chancellor, the mayor being chief magistrate.

The amount of the poor-rate levied from house to house by the churchwardens in 1696 (the year before the Incorporation Act) was £2145. At the present time it is £36,000, in addition to the other rates. The rateable value for poor-rate in 1874 was £759,441, at about 1s. 9d. in the pound, or £66,451, 1s. 9d. The local taxation in 1874 was an average total of 5s. 44d.in the pound. The amount paid in 1874, not including shipping dues, was £187,573.

Architecture and Public Buildings—TYo a few great baronial families—the earls of Gloucester, the Berkeleys, and the Gaunts—in its early history, and to a few great merchants—the Canyngs, the Shipwards, and Framptons —in its later career, the architecture, principally ecclesias- tical, for which Bristol is famous, has been due. Though much of this has been destroyed, much remains. Robert Fitzhamon’s Norman tower of St Peter, the oldest church tower in Bristol, still presents its massive square to the eye. Of.the castle of Robert earl of Gloucester, the walls of which were 25 feet thick at the base, nothing remains, but there still exist some walls and vaults of the

later strong- hold, including a fine Early English cell. The grand nave of St James's church, which the same noble also erected, and wherein he was buried, yet stands. Of Fitz Harding's abbey of Austin canons, founded in 1142, the stately entrance gateway, with its sculptured mouldings, has hardly been injured by seven centuries' exposure to rudeness of weather and greater rudeness of men. The abbot's gateway, the vestibule to the chapter room, and the chapter-room itself, which is carved with Byzantine exube- rance of decoration, and acknowledged to be one of the grandest Norman rooms in Europe, are also perfect. The Karly English lady chapel, the geometrical east window, and the side aisles in their singular design and beauty are other specific features of the abbey church, now the cathe- dral. The nave just added to the 14th century structure has cost to the present time £40,000. Besides the canopied tombs of the Berkeleys with their effigies in chain mail, and similarly unique tombs of the crosiered abbots, there are memorials to Bishop Butler, to Sterne's Eliza, and to Lady Hesketh the friend of Cowper, who are all here interred. Also there is here Mason's touching epitaph: "Take holy earth, &c.," and monuments by Baily and Chantrey. All Hallow's church has a modern Italian campanile, but is in the main 15th century, with the retention of four Norman piers in the nave; and is interesting from its connection with the ancient guild of calendars, whose office it was "to convert Jews, instruct youths," and keep the archives of the town. 'Theirs was the first free library in the city, possibly in England. The

records of the church contain a singularly picturesque representation of the ancient customs of the fraternity. The chapel of the Gaunts is 13th and 14th century, and presents with its rich panelled roof, pictured windows, carved tabernacles and tombs, a concentration of medieval Gothic art. Of St Michael's, St Thomas's, and Werburgh's, only the towers (15th century) are preserved of the old structures. St Nicholas church is modern, on a crypt of the date 1503 and earlier. Temple church, with its leaning tower, 5 feet off the perpendicular, retains nothing of the Templars' period, but is a fine building of the Decorated and following style. The tower and spire of St John's (15th century) stand on one of the gateways (same date) of the city. 'This church is a parallelogram, without east or west windows or aisles, but

is built upon a groined crypt. St Mary le Port and St Augustine the Less are churches of the Perpendicular era, and not the richest specimens of their kind. St Philip's has an Early English tower, but its external walls and windows are for the most part debased Perpendicular. St Stephen's church, built between 1450 and 1490, is a dignified structure, but is chiefly interesting for it fan-traceried porch and stately tower, the latter being hardly surpassed by any parish tower in England. It was built entirely by the munificence of John Shipward, a wealthy merchant. The crown of Bristol architecture is, however, the church of St Mary Redcliff, which for grandeur of proportion, and elaboration of design and finish, is entitled to stand in the selectest rank of English parish churches, and might be compared with a lesser cathedral. It was built for the most part in the latter part of the 14th century by William Canyng, but the sculptured north porch, which has cost £2535 to restore, is externally Decorated, and internally Early English. The fine tower is also Decorated. The spire 'just added has cost £5500. The restoration of the church has extended over thirty years, at an expense of £40,000.

Among conventual remains, of the Dominican priory there exist the Early English refectory and dormitory, the latter comprising a row of fifteen original windows and an oak roof of the same date; and of St Bartholomew's hospital there is a double arch, with intervening arcades, also Early English. The small chapel of the Three Kings of Cologne, and Holy Trinity Hospital, both Perpendicular, comprise, with the remains of the Austin canonry attached to the cathedral, nearly the whole of the monastic relics.

There are many good specimens of ancient domestic architecture, notably some arches of a grand Norman hall and some Tudor windows of Colston's house, Small Street ; Canyng's house, with good Perpendicular oak roof ; and St Peter's Hospital, Jacobean and earlier.

In all there are 42 Episcopal churches, and 81 dissenters' chapels,—the latter comprising 10 Baptist, 19 Congrega- tionalist, 11 Wesleyan, and 5 Roman Catholic (besides 6 convents). The Exchange is a quadrangular colonnade, with a noble frontage by Wood of Bath. The Guildhall is modern Tudor Gothic. The Bristol Museum and Library is a fusion of the two

leading: philosophical and literary societies of the district, a spacious building in the Venetian Gothic style, having been built for their joint purposes. The geological collection is among the best provincial collections ; the library (40,000 vols.) is the largest in the west of England. There is also a free library, under the Act.

Among the endowed public schools are (1), the Cathedral school, founded 1542, and Cathedral college (1876); (2), the Grammar school, which has secured a high position, and has right of presentation to two university scholarships; (3), Queen Elizabeth's Hospital for 200 boys, who are educated and clothed free; (4), Colston's school ; (5), Baptist college for educating young men for the Baptist ministry ; 6), Redmaids' school for 120 girls, free. A Girls' Re- formatory school, the first established under the Act, owes its origin to Miss Mary Carpenter, who is still lady superintendent. Up to

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the end of 1874 there have been in this school 417 girls, of whom 66 were still there. During the last 4 years 87 have left, of whom 64 were earning a creditable living. The Royal Infirmary admini- stered in 1874 to 2792 in and 23,163 out patients; the General Hospital to 1404 in and 13,512 out patients. Muller's Orphan House comprises five buildings, which have cost £115,000. The average number of inmates is 2000 children and 120 officials. The average cost of each child, exclusive of salaries, is £13 a year. Nearly £600,000 has been given for the furtherance of the work since it was begun in 1836. There is a school-board in Bristol, with 20 attached schools, and 113 schools under inspection.

See Barrett's History of Bristol, 1789 ; Seyer's Memours of Bristol, 1821; Dallaway's Antiquities of Bristow, 1834; Evans's Chrono- logical History of Bristol, 1824; Bristol vol. of Brit. Archelog. Inst.; Taylor, Book about Bristol, 1872; Bristol and tts Environs,

1875.

BRISTOL, a town of the United States, the capital of a county in Rhode Island, is situated on a peninsula between Narraganset Bay and Mount

Hope Bay, 16 miles 8.E. of Providence by rail. Its trade and manufactures are considerable, but it is chiefly important as a summer watering-place. There is direct steamboat communication with Providence and New York. During the War of Independence the town was nearly destroyed by the English. Population in 1870, 5302.

BRITANNIA. The history of Britain begins with the invasion of Julius Caesar, 55 B.c. Csesar is the first Roman writer who mentions Britain ; before him we have only a few short notices in Greek writers, who appear to have known but little about the country. The earliest notice of Britain is in Herodotus (450 3.c.), who mentions the Zin Islands, only to confess his ignorance about them. By the Tin Islands are probably to be understood only the Scilly Isles and Cornwall, which are said to have been known to Pheenician traders some centuries before the Christian era.

More important is a passage in Aristotle, who, writing a century later than Herodotus, is the earliest writer who mentions the British Isles by name. The passage isin the De Mundo, c. 3,—“ Beyond the pillars of Hercules (Straits of Gibraltar) the ocean flows round the earth, and in it are two very large islands called British (Gperavixat Aeydpevar), Albion and Ierne, lying beyond the Keltoi.” The applica- tion of the name Britannia, to denote the larger island, is first found in Ceesar.

The etymology of the name Britannia is uncertain. Of the numerous derivations which have been proposed the most generally adopted is that which connects the word with a root brith (variegatus), in supposed allusion to the British practice of staining the body with woad ; but this is not to be considered as perfectly satisfactory.

The earliest inhabitants of Britain concerning whom we have any certain knowledge are the Celts, who formed the vanguard in the great westward migration of the Indo- European or Aryan nations; but it seems certain, from the evidence of remains found in the country, that the Celts were preceded in their occupation of it by a non-Aryan race.

The Celtic family is divided into two branches—the Gaelic and the Cymric. To the former belong the Irish and the Highlanders of Scotland, to the latter the Welsh and the inhabitants of Britanny, and to these may be added the

ancient Gauls, the remains of whose language seem to prove without doubt that they belonged to the Cymric and not to the Gaelic branch.

Of the Celtic inhabitants of Britain nothing is known be- fore the time of Czesar, whose account of them is the earliest which we possess. Somewhat abridged it is as follows :—

“The interior of Britain is inhabited by a race said to be aboriginal, the coast by invaders from Belgium, whe having come over for the sake of spoil have settled in the country. For money they use either copper or pieces of iron of a certain weight. Tin is found in the interior of the country ; iron on the coasts, but the quantity is small ; copper is imported. The timber is of the same kinds as

in Gaul, except the beech and the fir. The climate is more temperate than in Gaul, the cold being less severe.”

After a short geographical description of the island, Cxgar proceeds to speak of the inhabitants—

“‘ By far the most civilized are the inhabitants of Cantium (Kent); they do not differ much in their customs from the Gauls, The inhabitants of the interior do not for the most part sow corn, but live on milk and flesh, and clothe themselves with skins. All the Britons stain themselves with woad, which produces a blue colour and gives them a more formidable appearance in battle. They wear their hair long, and shave every part of the body except the head and the upper lip. Ten or twelve have wives in common, (Ces., B. G. v. 12-14).

Nothing is here said as to the religion of the Britons ; and we are obliged to turn for information on this head to Ceesar’s account of Druidism in Gaul. We are justified in so doing by Cesar’s statement that the religious system of the Gauls was devised in Britain, and that it was still the custom for those who wished to become thoroughly versed in it to go thither for the sake of instruction. Having said that besides the common people, who are of no account and are little better than slaves, there are in Gaul two orders,— the

Druids and the Knights,—Czesar goes on to give an account of the former —

“«The Druids are engaged in matters of religion, and have the care of public and private sacrifices. They are the arbiters in almost all disputes, public and private, and assign rewards and punishments, Whoever refuses to abide by their decision is excluded from the sacrifices, and thereby put outside the pale of the law.

‘* The Druids are exempt from military service, and from the pay. ment of taxes. Their chief doctrine is that souls do not perish with their bodies, but are transferred after death to other bodies,”— (B. G., vi. 13-14.)

These are the leading points of Cesar’s short account of the Druids, which is the earliest we possess, and is the main foundation on which has been raised the elaborate Druidic system of later writers.

Politically, Britain consisted of a number of independent tribes united in a federation of the loosest kind, in which the lead was taken by the tribe which happened at any time to be the most powerful.

The Britons appear to have kept up a tolerably close intercourse with the Continent. They are first mentioned by Ceesar as sending aid to the Veneti (a Gaulish tribe whose name is preserved in that of the present town of Vannes), in their revolt against the Roman power. ‘This was in 56 B.c.; and in the following year Czesar resolved on an invasion of Britain, partly influenced, no doubt, by the desire of taking vengeance for the help afforded by the Britons to his enemies the Veneti. C. Volusenus having been previously sent to exainine the British coast, Ceesar himself set sail from Portus Itius (probably Wissant, between Boulogne and Calais) on the night of the 26th of August 55 8.c., taking with him two legions. The opposite coast was reached early on the morning of the following day, and after a sharp struggle a landing was effected apparently somewhere near Deal. Slight resistance was now offered by the Britons, to whom peace was granted on easy terms, and the Romans hastened back to Gaul.

Early in the following summer Cesar again started from Portus Itius, this time with a force of five legions and a corresponding body of 2000 cavalry,

and landed on the coast of Britain at the same place as in the previous year. Leaving a small force to protect the ships he advanced twelve miles inland to the River Stour before meeting with the enemy. Cassivellaunus, chief of the country to the north of the Thames, had been chosen by the Britons as their general-in-chief, and under his command they for 4 time presented a fierce resistance to the invaders, but they were unable to withstand the steady onset of the Romans, and Ceesar soon reached and took by storm Cassivellaunus’’s capital. The site of this city is now unknown, but it has been

conjectured with some probability to have been Verulamium (St Albans). Cassivellaunus now sued for peace, and after receiving hostages and fixing the amount of the tribute Cesar left the country before the end of the summer, No garrison was left behind to secure the Roman conquests, which were thus practically relinquished. For nearly a hundred years after this date the history of Britain is almost a blank. The Emperor Claudius, on his accession to the empire in 41 a.p., determined to carry out Augustus’s intention of exacting the British tribute ; accord- ingly (43 a.p.) Aulus Plautius was sent to Britain with a force of four legions, and having landed without opposition, he advanced to the northern side of the Thames, and there awaited the emperor’s arrival. Plautius was soon joined by Claudius, who at once led his army against the Britons, over whom he gained a complete victory, immediately after which he returned to Rome, leaving Plautius to secure his conquests.

The war was now carried on in the west between the Roman general Vespasian, who afterwards became emperor, and the Silurian chief Caractacus (Caradoc). After a struggle of nine years Caractacus at length, in 51 a.p., met with a decisive defeat at the hands of P. Ostorius Scapula. Having fled for refuge to Cartismandua, queen of the Brigantes (a tribe occupying the district between the Tyne and the Humber), he was betrayed by her to the Romans, by whom he was taken to be led in triumph through the streets of Rome.

Ten years after this Boadicea, queen of the Iceni, a tribe occupying the present counties of Norfolk and Suffolk, took advantage of the absence in

Mona (Anglesey) of the Roman prefect, Suetonius Paullinus, to excite her people to revolt. The Roman colony of Camulodunum (Colchester) was taken and sacked, and the rebellion soon seemed seriously to threaten the Roman power. Suetonius, however, hastened up from the west, and in a single battle, fought near London, inflicted a decisive defeat on the Britons, following up his victory by a massacre in which 80,000 Britons are said to have perished. Boadicea poisoned herself to avoid falling into the hands of the Romans. The spirit of insurrection was now completely crushed ; a milder policy was adopted by the successors of Suetonius, and Roman civilization began rapidly to spread over the country.

The next event of importance is the arrival of Agricola as governor of Britain in year 78. Agricola's first task was to complete the subjection of the Ordovices (North Wales), and this having been speedily accomplished, he adopted, with great success, a policy of conciliation. He encouraged education and building, and succeeded in introducing Roman dress and manners among the Britons. This, says Tacitus, they in their ignorance called civiliza- tion, though it was but a part of their slavery. In 79 Agricola attacked the Brigantes, and reduced the country betwen the Humber and the Tyne. During five years he continued to advance further north, and in 84 he defeated 2 Caledonian chieftain, named Galgacus, in a great battle, the site of which it is impossible to fix, but it was probably not far from the eastern coast of Scotland at some place north of the Tay. Agricola was now recalled to Rome, and no attempt was made to maintain the con- quests north of the line of forts which he had built between the Forth and the Clyde.

The remainder of the period of the Roman occupation is for the most part uneventful. In 120 the Emperor Hadrian visited the country, and built a rampart between the Tyne and the Solway Frith, in order to check the inroads of the northern tribes. In 139 a wall, called the wall of Antonine, in honour of the emperor Antoninus Pius, was built by the prefect Lollius Urbicus along the

line of Agricola's forts between the Forth and the Clyde. In 207 the Emperor Severus came to Britain in order to lead in person an expedition against the Caledonian tribes. He advanced far into Caledonia, driving the

enemy before him but never meeting them in a pitched battle. No substantial advantage was gained in this desultory war, which cost the lives of 50,000 Roman soldiers. Severus built a new wall along the line of Hadrian's rampart, and died at York in 211.

The Roman empire was now in a state of decay, and its weakness offered great temptations to distant officials to seize the supreme power for themselves. About 287 the title of emperor was assumed by a man of low birth named Carausius, a native of Menapia (the district between the Scheldt and the Meuse), who had been appointed to the command of the fleet stationed in the English Channel for the purpose of protecting the coasts of Britain and Gaul from the Frisian pirates, and whose conduct in that position had been such as to draw from the emperor Maximian an order for his death. After a successful reign of seven years, in the course of which his independence was acknowledged by Maximian, Carausius was assassinated by his chief officer Allectus, who in his turn usurped the imperial title during three years, at the end of which Britain was regained for Rome by Constantius Chlorus (296). Constantius afterwards led an expedition into Caledonia, and died at York in 306.

Soon after this date the Picts and Scots begin to be heard of as invading the Roman province from the north. The Scots, who occupied the western part of Caledonia, belonged to the Gaelic branch of the Celtic family, and had crossed over from Ireland, bringing with them the name which was afterwards bestowed on their new home. 'The question as to the origin and the language cf the Picts is one which has been long under discussion, and still seems far from a definitive settlement. The Picts are now, however, generally admitted to have been a Celtic race, and the evidence of language, as far as can be judged from the very few Pictish words, chiefly proper names, which have been preserved to us, seems to indicate the Cymric rather than the Gaelic as the branch to which they belonged. (For further information on this point see Garnett, Philological Essays, and Skene, The Four Ancient Books of Wales. Garnett holds the view that the Picts were a Cymric race ; Skene believes them to have belonged to the Gaelic branch of the Celtic family.)

In 367 the Picts and Scots overran the whole country as far south as London. Theodosius, father of the emperor of that name, was sent against them, and in two campaigns he succeeded in driving them back beyond the wall of Antonine. The district thus regained between the walls of Hadrian and of Antonine was named Valentia, in honour of the reigning emperor Valentinian. This, however, was only a momentary check, and the new province was soon lost.

In 388 the title of emperor was assumed by Maximus, a native of Spain, who had served under Theodosius in the Pictish wars. Maximus took a large army of Romans and Britons into Gaul aud was recognized by Theodosius and Valentinian as sole emperor over Britain, Gaul, and Spain. Five years later he invaded Italy, but was taken and beheaded at Aquileia in 388. The army never returned to Britain, which was thus left weaker than ever. In 396 a single legion was sent by Stilicho, and the Picts were once more driven back. In 407 three successive emperors—Marcus, Gratian, and Constantine—were set up in Britain, the last of whom followed the example set by Maximus, and carried the army into Gaul, leaving Britain again helpless against the northern invaders. In 410 the Roman occupation of Britain was formally terminated by a letter addressed by the emperor eae to the cities

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of Britain, in which he told them that they must henceforth be their own defenders.

Britain first became a Roman province in the reign of the emperor Claudius, 43 a.p. It was governed by a single prefect until the reign of Severus, who divided the province into two parts, called Britannia Superior and Britannia Inferior, each governed by a prefect. In the division of the empire into four prefectures in the reign of Diocletian, Britain formed part of the prefecture of Gaul, and was governed by an officer called the vicarius, residing at York. The country was subdivided into four provinces, each governed by a prefect :—

1. Britannia Prima, the district south of the Thames.

2. Britannia Secunda, the district south of the Dee and west of the Severn.

3. Flavia Cesariensis, east of the Severn.

r 4, Maxima Cesariensis, the district between the Humber and the yne.

To these was added as a fifth province the district of Valentia, conquered by Theodosius in 368, but it appears

to have remained but a short time in the possession of the

Romans.

Our knowledge of the events of the two centuries succeeding the close of the Roman occupation of Britain is rendered most uncertain by the absence of contemporary records. The accounts given by later writers, British and Saxon, cannot be relied upon for more than the barest outline, which may be accepted in so far as it is found to be consistent with the visible results of the events of this period.

The paternal character of the Roman rule had left the Britons at its withdrawal enervated and helpless, and utterly unable to cope with the Picts, who now began to press heavily on them. Having in vain appealed for help to the Romans, the Britons applied to the Teutonic rovers who had since the later years of the Roman period been in the habit of plundering the eastern coast. Accordingly, the three tribes of Angles, Jutes, and Saxons came over, and with their assistance the Picts were driven back into their own territories. The Saxons, however, still continued to arrive in large numbers, and soon finding the occasion of a quarrel, they combined with the Picts against the Britons, and proceeded to overrun the country, driving the Britons before them into the west. The first Teutonic kingdom in Britain was that of Kent, founded in 449; and at the end of two centuries we find the Saxons in firm possession of the greater part of the country, and the Celtic tribes occupying only the extreme west. Of Arthur, the hero of the Welsh account of this period, it is impossible to speak with any certainty Although he is unknown to the Saxon chronicle, it seems unnecessary to deny his existence, and it is certain that no part of the south-western district of England, which is generally supposed to have been the scene of his

exploits, was conquered by the Saxons until after the time of his alleged victories. An attempt has lately been made (see ARTHUR) to show that the scene of Arthur's victories is to be laid in the south of Scotland, and not in the west of England. The question is one which hardly seems capable of a satisfactory settlement. For the subsequent history see ENGLAND.

See Monumenta Historica Britannica, 1848; Camden's Bri- tannia ; W.B. Jones, Vestiges of the Gael in Gwynedd ; Merivale, History of the Romans under the Empire ; Burton, History of Scot- land, vol. i.

BRITANNICUS, son of the emperor Claudius, and of his third wife Messalina, was born probably 42 a.p., though the exact date cannot be determined, He was originally called Claudius Tiberius Germanicus, and received the name Britannicus on account of the conquests made in Britain about the time of his birth. Till 48 a.p., the date of his mother's execution, he was looked upon as the heir

to the imperial dignity, but Agrippina, the new wife of Claudius, soon persuaded the feeble emperor to pass him over and adopt her son 'by a previous marriage, Lucius Domitius, known later as Nero. After the accession of Nero, Agrippina, whose lover, Pallas, had been banished, threatened to stir up revolt against the new emperor, and excited his fears against Britannicus. Poison was admin- istered to the young prince, at first without effect, but a stronger dose given at the banquet table was instantaneously fatal. The murdered boy, for he had barely completed his fourteenth year, was buried on the evening of the day in which he died. The pile was erected on the Campus Martius amidst a deluge of rain, which washed the plaster and paint from the livid and distorted face of the corpse.
BRITTANY, Briranny, or Brirany, in French, BRETAGNE, an ancient province and duchy of France, con- sisting of the great north-western peninsula of the country, and corresponding very nearly to the present departments of Finistére, Cétes-du-Nord, Morbihan, Ille et Vilaine, and Lower Loire. It is popularly divided into Upper or Western, and Lower or Eastern Brittany. While it is not a mountainous country, none of the elevations much exceeding 1200 feet, it is remarkable for the extreme ruggedness of its physical features, especially along the coast and towards

its seaward extremity. There are vast tracts of desolate moorland broken only by the melancholy monuments of a forgotten time, and gloomy water-courses worn deep into the stony strata. Elsewhere, however, beautiful valleys and romantic glens are traversed by full- flowing rivers. Agriculture is in general in a rather back- ward condition, though here and there there are signs of enterprise. Flax and hemp are largely grown ; and in the more fertile districts excellent crops of the cereals are obtained. Bees are almost universally kept, and are often objects of a kind of affection. Pasture is abundant throughout the country, and the dairy produce forms a very important item in the food of the people. Industrial pursuits, except in a few seaport towns, which are rather French than Breton, have hitherto received but little atten- tion. The Bretons are by nature conservative. They cling with almost equal attachment to their local customs and their religious superstitions. It was not till the 17th century that paganism was even nominally abolished in some parts, and there is probably no district in Kurope where the popular Christianity has assimilated more from earlier creeds. Witchcraft and the influence of fairies are generally believed in, and charms and antidotes are trust- fully resorted to. Part of this superstitious tendency may, no donbt, be attributed to the influence exerted on the minds of the people, not only by the strangeness of their natural environment, but also by the frequency uf megalithic monuments, whose origin they cannot explain, for nowhere are these monuments so numerous and varied. The costume of both sexes is very peculiar both in cut and colour, but varies considerably in different districts. Bright red, violet, and blue are much used, not only by the women, but in the coats and waistcoats of the men. ‘The reader will find full illustrations of the different styles in Bouet’s Breiz-tzel ou Vie des Bretons de 0 Armorique, 3 vols., 1844. The Celtic language is still generally spoken, especially in lower Brittany, and a considerable body of traditional story and song is current among the people. Four dialects are pretty clearly marked. The whole duchy was formerly divided -into nine bishopries,—Rennes, Dol, Nantes, St Malo, and St Brieuc, in Upper Brittany; and Tréguier, Vannes, Quimper, and St Pol de Léon in Lower; and several of the larger towns were the seats of separate counts. At the time of Cesar’s conquest of Gaul the north-westerD

peninsula was inhabited by the Celtic tribes of the Veneti, the Curiosolite, and the Osismii ; but our information in regard to them

is of the scantiest description. On the condition of this distinct, indeed, history is almost silent till the 5tl century, when the invasion of Britain by the Saxons was followed by the migration _across the channel of large numbers of the defeated islanders. The Breton chronicles contain an account of about a score of dukes from that period to the end of the 8th century ; but how far the names and the narrative are merely mythical it would be hard to deter- mine. ‘The one great fact that is clearly evident is, that a violent contest for independence was maintained against the Frankish inroads. Under the early Carlovingians the country was for a time in rather more than nominal subjection ; but it soon reasserted its

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independence. The 9th and 10th centuries are mainl

for the wars that were continually breaking out a hace ge and the rising duchy of Normandy, Though Alan V. of Brittany had been intrusted with the guardianship of the youthful William of Normandy, and had fulfilled his trust to the full, yet under his successors Conan II., Hoel V., and Alan Fergent, the old enmity between the two countries broke out again and again. On the death in 1148 of Conan III., who had been defeated in a contest with his rebellious nobles, the succession was disputed by Hoel VI. andhis brother-in-law, the count of Porhoet. The partizans of the former on their defeat submitted to Henry II. of England, who bestowed the

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Map of Brittany.

duchy on his brother Geoffrey. Geoffrey’s death two ycars after left the way open to the enterprise of Conan IV., grandson of Conan III., who had made his step-father prisoner, and was gradually obtaining possession of the whole duchy. The new duke, however, was forced not only to give his daughter Constance to Henry’s son Geoffrey, but also in th long run to abdicate in his favour, On Geoffrey’s death in 1186 the duchy became an object of dispute between the English and French kings, the latter being supported by the native nobility. To this rivalry the young duke Arthur fell a victim, murdered, as is usually supposed, by his uncle John of England. His sister Alice succeeded, under the protection of France, re was married to Pierre de Dreux, who thus became the first of a new line of dukes which lasted till the death of Francis I].in 1488. In 1491 the heiress Anne was forced to marry Charles VIII., and thus the duchy was held by the French crown. In 1532 it was formally united to France, but it retained a separate parliament till the Revolution.

Among the historians of Brittany may be mentioned Dom Lobineau, Dom Taillandier, Dom Morice, Daru, and De Courson. See also Trollope's Summer in Brittany, 1840; Mrs Bury Palliser, brittany and its Byeways, 1869 ; Du Chatellier, L' Agriculture et les classes agricoles de la Bretagne, 1862.

BRITTON, the title of the earliest summary of the law of England in the French tongue, which purports to have been written by command of King Edward IL The origin and authorship of the work have been much disputed. It has been attributed to John le Breton, bishop of Hereford, on the authority of a passage found in some MSS. of the history of Matthew of Westminster ; there are difficulties, however, involved in this theory, inasmuch as the bishop of Hereford died in 1275 (3 Edward I), whereas allusions are made in Britton to several statutes passed after that time, and more particularly to the well- known statute "Quia emptores terrarum," which was passed in 18 Edward I. It was the opinion of Selden that the book derived its title from Henry de Bracton, the last of the chief justiciaries, whose name is sometimes spelled in the Fine Rolls Bratton and Bretton, and that it was a

royal abridgment of Bracton's great work on the customs and laws of England, with the addition of certain subse- quent statutes. The arrangement, however, of the two works is different, and but a small proportion of Bracton's work is incorporated in Britton. The work is entitled in an early MS. of the 14th century, which was once in the possession of Selden, and is now in the Cambridge Uni- versity Library, "Summa de legibus Anglie que vocatur Bretone ;" and it is described as "a book called Bretoun" in the will of Andrew Horn, the learned chamberlain of the city of London, who bequeathed it to the chamber of the Guildhall in 3 Edward III., together with another book called the Mirroir des Justices. Britton was first printed in London by Robert Redman, without a date, probably about the year 1530. Another edition of it was printed in 1640, corrected by Edmund Wingate. A third edition of it, with an English translation, has been lately published at the University Press, Oxford, 1865, by F. M. Nicholls, M.A. An English translation of the work without the Latin text had been previously published by R. Kelham in 1762.

BRITTON, Joun, a topographical and antiquarian writer, was born at Kingston-St-Michael, near Chippenham, July 7, 1771. His birthplace, an old-world village of the dullest and sleepiest kind, had also the distinction of being the home of the antiquary John Aubrey. His parents were in humble circumstances, and he was left an orphan at an early age. He grew up with no better education than was to be had in the poor schools of his native Wiltshire village and neighbouring places, the last to which he was sent being at Chippenham. At the age of fourteen he became possessed of a small lot of books, and among them were Robinsan Crusoe, the Pilgrim's Progress, and The Life of Peter, Czar of Muscovy. At sixteen he went to London,

and through the influence of a relative was apprenticed to a wine merchant. Prevented by failing health from serving his full six years, he found himself adrift in the world, without money, without friends, and without education. In his hand-to-hand fight with poverty he was put to strange shifts, becoming cellarman at a tavern and clerk to a lawyer, reciting and singing at a small theatre, and com- piling a collection of common songs. During his appren- ticeship he had read much in a loose, aimless manner ; and gradually by successive small ventures he found his way into the broad paths of literature. A Salisbury publisher having projected a work on Wiltshire, invited Britton to undertake its preparation. The proposal was accepted ; and in conjunction with his friend Edward Nedlake Brayley, Britton set himself to the task. Such was the small beginning of the voluminous work entitled The Beauties of England and Wales. The Beauties of Wiltshire appeared in two volumes in 1801, a third volume being added in 1825. The authors proceeded with other counties, and nine volumes of the entire series were their work. In the course of these carly iabours Britton's attention was espe- cially drawn to antiquarian subjects ; and thenceforth lis proper field was before him, and in it he worked honour- ably. In 1805 appeared the first portion of his Archi- tectural Antiquities of Great Britain, which extended to five volumes quarto, and was nine years in publication. On its completion Britton commenced his great work on the Cathedral Antiquities of England, the section on Salisbury Cathedral being

the first published. It was completed in 1835, having been niore than twenty ycars in

rogress, and forming altogether fourteen folio volumes.

t is profusely illustrated by copperplate engravings.

As sole or joint author or editor Britton's name is attached to a large number of works of a like character. Among these may be mentioned the Historical Account of Redcliffe Church, Bristol (1818) ; Illustrations of FonthiliAbbcy (1828); Architectural Antiquitics of Normandy, with illustrations by Pugin, published in 1825-1827 ; Picturesque Antiquities of English Cities (1830); and the splendid History of the Palace and Houscs of Parliament at Westminster, the joint work of Britton and Brayley, published in 1834-36. Mr Brit- ton was a frequent contributor to the Genticman's Magazine and other periodicals ; he wrote the article ''Shakespeare" for Rees's Cycio- peedia, and the articles ''Stonehenge," " Avebury," and ""'Tumu- lus" for the Penny Cyclopedia. In his latcr years he began to write his Autobiography, but did not carry the personal narrative far. The portion published is rich in literary anecdote of the times. Britton died in London, January 1,1857, and hisremains were interred in Norwood Cemetery. A Descriptive Account of his Literary Works was published by his assistant T. E. Jones. Britton was the origina- tor of a new class of literary works. " Before his time," says Mr Digby Wyatt, " popular topography was unknown." He first com- bined antiquarian with topographical description. He effected a great improvement in the style and character of the illustrations of ancient monuments ; and the general admiration excited by the en- gravings in his works gave rise to a novel interest in his subject, and became one of the incitcments to deeper studies and investigations.

BRIVES-LA-GAILLARDE, a town of France, capital of an arrondissement in the department of Corréze, situated in a beautiful and fertile plain twenty miles from Tulle. It is surrounded with elm-planted boulevards, and possesses a number of well-preserved houses of an early date. None of its public buildings (which comprise several churches, a theological seminary, and a college) are of much importance, except the cliurch of St Martin, dating from the 13th century. The town carries on an active trade in cattle, wool, wine, oil, and grain, manufactures wax candles, copperwares, and

cotton thread, and has millstone and slate quarries. Brives is of ancient origin, and for a long time disputed the title of capital of the Lower Limousin with the city of Tulle. It was the birthplace of the Cardinal Dubois. Population in 1872, 8417.

BRIXEN, a town of Austria in Tyrol, situated in the Pusterthal at the confluence of the Eisack and Rientz, in 40° 40’ N. lat. and 11° 37’ E. long., 104 miles from

Vienna by rail. It is the seat of a bishop, and has a cathe. dral built in the 18th century, a theological seminary, a gymnasium, and several monasteries. There are iron and steel factories in the neighbourhood, and the baths of Maria-Louisa are supplied with water from a chalybeate spring. About nine miles from the town is the great fort of Franzensfeste, built in 1838, at the junction of the roads from Botzen, Innsbruck, and Pusterthal. Brixen (in Italian Bressanone) is mentioned at least as early as 901, In 1025 it became the seat of a bishop, and in 1038 was surrounded with walls. In 1174, 1234, and 1445 it was destroyed by fire; in 1519 it was stormed by the French under Gaston de Foix; and in 1525 it suffered from the rebellion of the peasants. Population in 1869, 4349.

BRIXHAM, a seaport town of England, in the county of Devon, about 200 miles from London, with a station about two miles distant on the South Devon Railway. The town is irregularly built on the clifis to the south of Torbay, and its harbour is defended by a modern break- water. It carries on a very extensive fishing and coasting trade, and is a place of resort for sea-bathing. Jn the, early part of the present century it was the seat of a con-siderable military establishment, with fortified barracks at Bury Head, and it is celebrated in history as the spot where King William landed in 1688. Population of the parish in 1871, 6542.

BROACH, or Buaxrvcg, a district of British India under the jurisdiction of the governor of Bombay, extending from 21° 22’ to 22° 11’ N. lat. and from 72° 30’ to 73° 107H long. It is bounded on the N. by the River Mahi, on the E. and §. by the territory of the Gaikwar, and on the W. by the Gulf of Cambay. – Consisting chiefly of the alluvial plain at the mouth of the River

Nerbudda, the land is rich and highly cultivated, and though it is with- out forests it is not wanting in trees. The district is well supplied with rivers, having in addition to the Nerbudda, the Mahiin the north and the Kini in the south. The area is 1820 square miles; the population: 350,322, of whom 248,343 are Hindus, 69,033 Mahometans, 3986 Buddhists, 3116 Parsis, and 24,703 belong to the aboriginal tribes. The population comprises several distinct races or castes, who, while speaking a common dialect, Gujarathi, inhabit separate villages. Thus there are Koli Kembi or Voro (Borah) villages, and others whose lands are almost entirely held and cultivated by high castes, such as Rajputs, Brah- mans, or Parsis.

Except in the city of Broach, which has two steam ginning factories and a considerable general trade, agriculture is almost the sole industry of the district. The export of cotton, the principal agri- cultural product, amounted in 1872 to 88,471 bales. The most important cereal and pulse corps ave—- for the rains, jawari (Holcus Sorghum) rice, bagri (Pencillaria spicata), tur (Cajanus indicus), and mug (Phaseolus Afwngo); and for the cold weather, wheat, til, (Scsamum indicum), pea, gram (Cicer arietinum), wal (Lablab vulgaris), castor oil, and tobacco. The total revenue of the district amounted in 1872 to £318,972, of which £266,936 was imperial land revenue ; £20,568 on account of the local land cess ; stamps yielded £22,714 ; excise, £6823 ; and assesscd taxcs, £198. The imperial expenditure in the district amounted during the same time to £72,025. Of the whole area of the district, viz., 1820 square miles, 72 per cent. are returned as cultivated, 3 per cent. cultivable but not actually under tillage, and 25 per cent., including the sites of villages, river-beds, &c., as uncultivable. There are five towns with a population of over 5000 inhabitants, —Broach, 86,932 ; Jambusat, 14,924; Ankleswar, 9414 ; Amod, 6125; and Gajera, 5239. In the first two of these towns municipalities have been established. The district contains 191 schools, with an attendance of 6525 scholars. The total number of persons receiving or who have received some education amounts to 9°5 per cent. of the entire population. The strength of the district police force is 415, giving to each man the charge of three square miles and 844 inhabitants. The principal criminal class is the Bhils, numbering about 24,000. The difficulty of arresting offenders of this race is increased by the fact that they are in league with members of theirtribe in the native states of

Baroda and Rajpipla, and can therefore with ease escape into foreign territory.

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‘ Broaou, the principal place of the district of the same name, situated on an elevated mound, supposed to be artificial, on the northern bank of the Nerbudda, about 30 miles above its mouth, in 21° 42’ N. lat. and 73° 2’ E. long. ‘The river is here a noble sheet of water, two miles wide at ebb tide, but shallow for the most part even at flood-tide, though there is then a deep but intricate channel admitting vessels of considerable burden. In 1872 the population of the town and municipality was returned at 36,932. As in the generality of eastern towns, – the streets are narrow and the houses lofty. It has a con- _ siderable trade, and annually exports large quantities of raw cotton to Bombay. Broach is thought with some aypearauce of probability to have been the Barygaza of Ptolemy and Arrian. Upon the conquest of Guzerat by the Mahometans, and the formation of the state of that name, Broach formed part of the new kingdom. On its overthrow by Akbar in 1572, it was annexed to the Mughul empire and governed by a Nawab. The Marhattas became its masters in 1685, from which period it was held in- subordination to the Peshwaé until 1772, when it was captured by a force under General Wedderburn (brother to Lord Loughborough), who was killed in the assault. In 1783 it was ceded by the British to Sindhid in acknow- ledgment of certain services. It was stormed .in 1803 by a detachment commanded by Colonel Woodington, and was finally ceded to the Hast India Company by Sindhia under the treaty of Serji Anjang4on. Distance north from Bombay 190 miles.

BROADSTAIRS, a town of England, in the county of Kent, about a mile and a half to the south of the North Foreland, and three miles from Margate, on the London, Chatham, and Dover Railway. It has a small pier for fishing-boats—built in the reign of Henry VILL, a modern Gothic church, hotels, libraries, and bathing-establish- ments; aud in the summer season it attracts a considerable number of visitors. There is an archway leading down | to the shore, which bears that it was erected by George Culmer in 1540, and not’ far off is the site of a chapel of the Virgin, to which ships

were accustomed to veil their top-sails as they passed. Population in 1871, 1926.

BROCCHI, Giovanni Bartista, a celebrated Italian mineralogist and geologist, was born at Bassano, in February 1772. He studied at the university of Pisa, where his attention was especially turned to mineralogy and botany. In 1802 he was appointed professor of ‘ botany in the new Lyceum of Brescia; but he more | particularly devoted himself to geological researches in the numerous excursions he made into the adjacent districts. The fruits of these labours appeared in different publications, particularly in his Treatise on the Iron Mines im the department of Mella ; and his Essay on the Physical Constitution of the Metalliferous Mountains of the Valley of Trompia, which appeared in 1807. His valuable resoarches procured him, in the following year, the office of inspector of mines in the recently established kingdom of Italy, which enabled him to extend his investigations over a great part of Central and Southern Italy, as well as its northern districts. In 1811 he produced a valuable Inemoir On the Mineralogy of the Valley of Fassa and the Tyrol, but his most important work is the great Geologie Fossile Subapennina con Osservaziont Geologiche sulle Apennini, e sul Suolo Adjacente, 2 vols. 4to, Milan, 1814, containing most accurate details of the structure of the Apennine range, and an account of the fossils of their Strata. These subjects were further illustrated by his Valuable geognostic map and his Catalogo ragionato di

una Raccoltx di Rocche, disposto con ordine Geografico, per servire d’Illustrazione della Carta Geognostica dell’ Italia, | Milan, 1817. His work, Dello Stato Fisico del Suolo di

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Roma, with its accompanying map, is admirable for accu- racy and judgment. In it he has corrected the erroneous views of Breislak, who

conceived that the Eternal City occupies the site of a volcano, to which he ascribed the tufa and other volcanic materials that cover the seven hills. Brocchi, on the other hand, has satisfactorily shown that they are derived either from Mont Albano, an extinct volcano, 12 miles from Rome, or from Mont Cimini, still further to the north of the city. Indeed he has shown that the streams or beds of tufa may be traced almost uninterruptedly from that mountain to Rome. Several minor papers by him, on other mineralogical subjects, appeared in the Biblioteca Italiana from 1816 to 1823. In the latter year Brocchi sailed for Egypt, and engaged with his usual ardour in exploring the geology of that country aud its mineral resources, every facility being granted by Mehemet Ali, who in 1825 appointed Brocchi one of a commission to examine and organize his conquest of Sennaar, but the naturalist, unfortunately for science, fell a victim to the climate, at Khartum, in September 1826.

BROCKHAUS, Friepricu ARNOLD, an eminent German publisher, was born in Dortmund, on the 4th May 1772. He was educated at the gymnasium of his native place, and from 1788 to 1793 served an apprenticeship in a mercantile house at Diisseldorf. He then devoted two years at Leipsic to the study of modern languages and literature, after which he set up at Dortmund an emporium for English goods. In 1810 he transferred this business to Arnheim, and in the following year to Amsterdam. In 1805, having given up his first line of trade, he, in conjunction with a friend, began business as a publisher. Two journals projected by him were not suffered by the Government to survive for any length of time, and in 1810 the complica- tions in the affairs of Holland induced him to return homewards. In 1811 he settled at Altenburg. About three years previously he had purchased the copyright of the Conversations-Lexicon, which had been begun in 1796, and in 1810-11 he completed the first edition of this celebrated work. A second edition under his own editor-ship was begun in 1812, aud was received with universal favour. His business expanded rapidly, and in 1817 he removed to Leipsic, where he established a large printing- house. Among the more extensive of his many literary undertakings were the critical periodicals—Hermes, the LInterarische Conversationsblatt (afterwards the Bldtter fiir literarische Unterhaltung), and the Zeztgenossen, and some large historical and bibliographical works, such as Von Raumer’s Geschichte der Hohenstaufen,

and Ebert's Allgem. Bibliographis. Lexicon. The work distinctively associated with his name, and with the publishing house which has been carried on by his sons, is the Conversations-Lexicon, in many ways the completest and best encyclopzedia of its kind, which has now reached its twelfth edition. Brock- haus died in 1823.

BROCKLESBY, Ricwarp, a physician of considerable reputation, was born in Somersetshire, 11th August 1722. He was educated at Ballytore, in Ireland, studied medicine at Edinburgh, and finally graduated at Leyden in 1745, In 1751 he was admitted a licentiate of the Royal College of Physicians at London, of which he afterwards became a fellow. In 1758 he was appointed physician to the army, in which capacity he served in Germany during the greater part of the Seven Years' War, and in the conrse of it was chosen physician to the hospitals for British forces. The results of his observations during this period were published in 1764, under the title of Hconomical and Medical Obser- vations from 1738 to 1763, tending to the Improvement of Medical Hospitals, We had already given many proofs of his industry and his attainments by papers published in the Transactions of the Royal Society. His Dissertation on the

Musie of the Ancients appeared in 1749, and his Oratio Harveiana in 1760. Shortly after this he was appointed by the duke of Richmond physician-general to the royal regiment of artillery and corps of engineers, an appoint- nent that gave him constant access to the laboratory of Woolwich, and it was by his advice that a professorship of chemistry was added to the establishment of the college. In his latter years he withdrew altogether into private life. The circle of his friends included some of the most distin- guished literary men of the age. His intimacy with Burke

had commenced at school, and soon ripened into the _

warmest friendship. He was also warmly attached to Dr Johnson, to whom he offered an annuity of £100 during the remainder of his life to enable him to visit the Con- tinent for the recovery of his health; and when this offer was declined, he pressed him to reside in his house, as more suited to his health than that in which he then lived. He attended the great moralist on his

deathbed. The same generous disposition was manifested in his conduct to Burke, to whom he presented £1000, a sum he had in- tended to leave him by will. Dr Brocklesby died suddenly llth December 1797. He left his entire fortune, with the exception of a few legacies, to his two nephews, Dr Thomas Young and Mr Beeby.

BRODERIP, Wit11aM Joun, a distinguished writer on natural history, was born in Bristol, probably in 1787. He was educated at the school conducted by the Rev, Samuel Seyer, and proceeded to Orie] College, Oxford, where he began the study of law. He was called to the bar in 1817, and took part for several years in editing the law reports. In 1822 he was appointed by Sir Robert Peel one of the metropolitan police magistrates, a post which he occupied for thirty-four years. All his leisure time was devoted to the favourite study of his earlier days— natural history. He was amember of most of the scientific societies, contributed numerous papers to their Transactions, and did much to further the study of zoology in England. He acted for many years as vice-president of the Zoological Society. The zoological articles in the Penny Cyclopedia were written by him, and made him widely known as an original investigator and able expositor. A series of articles contributed to Fraser's Magazine were reprinted in 1848 as Zoological Recreations, and were followed in 1852 by Leaves from the Note-Book of a Naturalist. Broderip died on the 27th February 1859.

BRODIE, Sir Bensamin Coxins, Bart., a distinguished physiologist and surgeon, was born in 1783 at Winterslow, county of Wilts, and died at Broome Park, 21st October 1862, in the 79th year of his age. His paternal grand- father, connected with the family of Brodie of Brodie, was born in Banffshire about the year 1710, and came as an adventurer to London, where he acquired considerable wealth as an army clothier. One of his sons, the father of the subject of this notice, was educated at the Charter House, and afterwards at Worcester College, Oxford, where he took holy orders. Here he probably acquired the friend- ship of the first Lord Holland, with whom he afterwards lived at Holland House. The second Lord Holland having purchased the estate of Winterslow, Mr Brodie rented a cottage near the same place. The second Lord Holland died in 1774, and directed in his will that Mr Brodie should have offered to him the presentation of the first of three livings which he had in his gift when a vacancy occurred. This

event took place in consequence of the death of the incumbent of Winterslow, and Mr Brodie became rector of the parish. In 1775 he married one of the daughters of Mr Collins of Milford, a banker of Salisbury. They had six children,—four sons and two daughters,—and the sub- ject of this sketch was their fourth child.

He received his early cducation from his father, who

appears to have been a man of energy, ability, and method and at an early age he had acquired a considerable know. ledge of the classics. When the time for choosing a profes. sion arrived, his father intimated to him that he was intended for that of medicine, and accordingly, in the autumn of 1801, he began to attend the anatomical lectures of the celebrated Abernethy in London. As his family was connected by marriage with several of the leadin

members of the profession, such as Dr Denman (the father of the first Lord Denman), Dr Baillie, and §jp Richard Croft, the young student enjoyed many advantages of distinguished professional society, but it does not appear that at this period of his.life he had any predilection for medical studies or any aptitude for surgical work. The great eminence as an operator to which he afterwards attained was gained, as he himself said, by persistent application and perseverance.

He devoted great attention to the clinical study of disease, and began to make an elaborate series of notes of cases which came under his observation. This habit he continued throughout life, and thus gradually amassed that enormous amount of practical experience which afterwards gave his advice as a consulting surgeon such weight.

Like most young adventurers in the fields of science of that day, he early began to teach. He gave many courses of lectures upon anatomy, not only as it bore on surgical practice, but as a science having important physiological and teleological relations. In 1808 he became assistant- surgeon to St George’s Hospital, and he continued on the staff of that institution for over thirty years. This gave him the opportunity of tcaching clinically, and he soon acquired a reputation as an able and fluent extempore speaker. In 1810

he was elected a fellow of the Royal Society, and in the following year communicated a series of papers “ On the Influence of the Brain on the Action of the Heart, and on the Generation of Animal Heat.” In18]2he also communicated a paper ‘“ On the Mode in which Deathis produced by certain Poisons.” These papers were founded upon a series of careful physiological experiments, having for their object to determine, first, the relation of the nervous system to the circulatory and nutritive systems in higher animals, and, second, to asccrtain, if possible, how poisons produce death. The most important fact ascertained by the first series of experiments was that the stoppage of the heart’s action at the moment of death does not depend on the removal of the influence of the brain, but on the arrest of respiration. He also pointed out some important facts which could only be accounted for by supposing that the nervous system has an influence on the production and diffusion of animal heat, an idea not then generally accepted. For these researches he received the Copley medal of the Royal Society in 1811. In 1813 he delivered the Croonian lecture, “On the Effect of the Nerves on the Heart and on the Involuntary Muscles,” and in 1814 he contributed another paper “ On the Influence of the Nerves of the Eighth Pair on the Secretions of the Stomach.” In 1816 he performed many experiments on animals, to ascer tain the influence of bile ou the food during its passage through the bowels. These papers comprehend what Brodie accomplished in physiology. They are all characterized by lucidity, conciseness, sound judgment, and a modest inter- pretation of results. They are valuable at the present time not so much for the facts they contain, most of which are

- now incorporated in the general mass of scientific knowledge,

but as admirable illustrations of the application of the experimental method of research to physiological ques- tions.

At this period of his career Brodie rapidly glided into 4 large and lucrative practice, and more especially he quickly gave evidence of superior powers as an operator, having

knowledge, coolness, and readiness of resource. From time to time he wrote upon surgical questions, contributing numerous papers to the Z'ransactions of the Royal Medical and Charurgical Society, and to the medical journals, Prob- ably his most important work is that entitled Pathological and Surgwal Observations on the Diseases of the Joints, in which he attempts to trace the commencements of disease in the different tissues which form a joint, and to give an exact value to the symptom of pain as evidence of organic disease. The thoughts suggested by this volume led to the adoption by surgeons of measures of a conservative nature in the treatment of diseases of the joints, by which the number of amputations has been reduced, and many limbs and lives have been saved. He also wrote on diseases of the urinary organs, and on local nervous affections of a surgical character. Brodie was a man of restless activity ; to use his own words, he felt "his happiness to be in a life of exertion." When released from professional cares he had recourse to literary and scientific pursuits, and especi- ally to the study of psychological questions. He was fond of reading, collecting facts, and speculating on all matters connected with mental phenomena; and in 1854 he pub- lished anonymously a work entitled Psychological Inquiries —the First Part. A second edition of this work appeared in 1855, a third in 1856, a fourth in 1862, and in the same year the Second Part was also published. This work en- joyed well-merited popularity, as it was written in clear untechnical language, and revealed the speculations of the writer concerning the mind of man. When the name of the author became known, the greatest interest was excited in the work, although it contains nothing new to professed psychologists. He wrote also occasionally for the quarterly reviews,

Brodie received many honours during his career. He was the medical adviser of three successive sovereigns, and in 1834 he was elevated to the rank of a baronet, It is generally believed that he might have been created a peer had he desired the honour. He became a corresponding member of the French Institute in 1844, D.C.L. of Oxford in 1855, and president of the Royal Society in 1858 ; and he was the first president of the Medical Council under the Act for the Education and Registration of the Medical Profession,

A complete edition of his works, with an autobiography, in three volumes, agieored in 1865, collected and arranged by Charles Hawkins, fellow of the Royal College of Surgeons of England ; and 4 generous and discriminative biographical sketch, by Professor Henry W. Acland of Oxford, appeared in the obituary notices in the Proceedings of the Royal Society for 1863. (J. G. M.)

BRODY, a town of Austria, in the circle of Zloczow, in Galicia, near the Russian frontier. It contains three large synagogues, a Jewish hospital, and a Jewish college, and rom its prevailing Jewish character has been called the German Jerusalem. There are also one Roman Catholic and three Greek churches and an industrial school. Its castle is the residence of the Counts Potocki. It is the Seat of an extensive trade carried on with Russia and Turkey, and has two large annual fairs, the principal articles of sale being wool, cotton, silk, and peltry. In 1869 the population, of which about two-thirds are J ews, amounted to 18,890. Brody was founded in 1679 under the name of Lubicz, and was raised to the rank of a‘free commercial city in 1779.

BROGLIE, Acari Lioncr Victor Cuar.es, Duc DE, peer of France, was born in Paris 28th November 1785, and died 25th January 1870. The family from which this eminent statesman descended was of Piedmontese origin, but it won its honour in the service of France. The firs; Marshal de Broglie (1639-1727) served with distinction under Louis XIV.; his son, known as the

Chevalier de Broglie (1671-1745), was raised to the highest grade in the French peerage for his gallant military service at Guastalla and at Prague in 1742, but he refused the rank of marshal of France, which was offered to him by the regent, on the ground that his father, who was stil] alive, deserved it more than he did. The next in descent was the second marshal (1718-1804), who commanded the French armies in the Seven Years’ War, for which he was created a prince of the empire, and though subsequently disgraced and exiled by the intrigues of the Condés, he was recalled in 1789 by Louis XVI. to the office of com- mander-in-chief. ‘To stem the tide of the Revolution was impossible. The marshal speedily fell from power, emi-

grated to Germany, refused the solicitation of Napoleon to return to France, and died at Miinster in 1804.

The son of this veteran followed an opposite course and met with a more untimely end. He adopted the liberal opinions of the time. He followed Lafayette and Rocham- beau to America. He sat in the Constituent Assembly, constantly voting ou the Liberal side. He’ served ag chief of the staff to the Republican army on the Rhine ; but, like many other champions of the Revolution, he was denounced, arrested, dragged to Paris, and executed on the 27th June 1794, The parting injunction he left to his son, Victor de Broglie, the subject of this notice, then a boy nine years old, was ever to remain faithful to the cause of liberty, even though it were ungrateful and unjust. His father murdered, his mother imprisoned, his property confiscated and plundered, the young de Broglie first appears in life in wooden shoes and a red cap of liberty, begging an assignat from the younger Robespierre. Yet he adhered to the cause for which his father had died ; he maintained through life the principles of 1789. He seemed to have forgotten his own rank, until he was reminded of it at the Restoration by a writ of summons to the Chamber of Peers, and in early life he served, not unwillingly, as one of the officers of the council of state of the emperor Napoleon I.

In 1815, before he had completed his 30th year, the Duc’de Broglie was summoned by Louis XVIII. to the Chamber of Peers. He combined, in a manner rare in France, the qualities we are wont to respect in the most eminent members of the British aristocracy,-——high rank, independent fortune, unblemished integrity, unflinching patriotism, and a sincere and consistent attachment to liberal opinions. The first incident in his parliamentary life was the trial of Marshal Ney, and on this occasion he had the courage to speak and vote alone for the acquittal of the prisoner, on the ground that he was not guilty of deliberate treason; no other peer of France supported his protest on that occasion. During the Restoration he continued to take an active part in the defence of liberal opinions and measures. He refused to take office in the cabinet of M. de Serre. He opposed the reactionary policy of the court. Hesupported the short-lived administration of M. de. Martignac, and he acted with the party known as the doctrinaires, of which M. Royer-Collard was the founder, and M. Guizot the ablest

representative. Mean- while, in 1816, he had married the daughter of Madame de Stael, a union of unbroken domestic happiness ; andhe had pledged himself to that sacred cause of Negro emancipa- tion, in which he was the worthy rival and ally of Clark- son, Buxton, Wilberforce, and Brougham. The revolution of July 1830 imposed fresh duties on the Duc de Broglie. Though reluctant to take office from his cold, retiring, and unambitious temperament, he consented to hold the ministry of public worship in the first cabinet of Louis Philippe's reign, and in 1832, after the death of Casimir Périer, he was prevailed upon to take the more impor- taut department of foreign affairs. In this function he

strengthened the alliance of France with England; he negotiated the Quadruple alliance ; he contributed to the settlement of the Belgian and Greek questions ; and he laboured with success to preserve the peace of Hurope. He was out of office from March 1834 to March 1835, but he returned to power at the latter date, and this time as the head of the cabinet. He was riding by the side of the king when Fieschi's "infernal machine" was fired on the royal cortege, and a bullet passed through the collar of his coat. In 1836 the Government was beaten on the question of the reduction of the five per cents., and M. de Broglie retired permanently from official life. The king, it must be said, had never found in him a congenial minister. His manner was dry and somewhat harsh, his character unbending, and for the remainder of the reign of Louis Philippe, M. de Broglie, though not in opposition, was the censor rather than the servant of the crown. With M. Guizot, though not in office, he preserved through life the relations of the closest personal friendship and political union. The overthrow of the constitutional monarchy in 1848 was a heavy blow to this parliamentary veteran, for he felt that the form and system of govern- ment to which he was most attached were at an end for ever. He consented, however, from patriotic motives to sit in the republican assemblies of 1848, and as a member of the section known as the " Burgraves " he laboured to counteract some of the evils of universal suffrage, and to avert the catastrophe which he saw to be impending over France. He shared with his colleagues the indignity of the coup @état of December 2, 1851, and remained for the remainder of his life one of the bitterest enemies of the

imperial régime, although he has been heard to remark with that caustic wit for which he was ‘famous, that the empire was “the government which the poorer classes in France desired and the rich deserved.” The last twenty years of his life were devoted chiefly to philosophical and literary pursuits. Having been brought up by his step- father, M. d’Argenson, in the sceptical opinions of the time, he gradually arrived, by study and reflection, at a full and sincere belief in the truth of the Christian religion. “‘T shall die,” said he, a “penitent Christian and an im- penitent Liberal.” His literary works, though few of them have been published, were rewarded by a seat in the French Academy, and he was also a member of another branch of the French Institute, the Academy of Moral and Political Science. In the labours of those learned bodies he took an active and assiduous part; and on his death, which took place at the advanced age of 85, just before the lamentable events of 1870, he was followed to the grave by repre- sentatives of all that is most illustrious in the political and literary society of France, revered as one of the wisest and most upright men of his age. He was succeeded in the honours of his house by Albert de Broglie, his cldest son, also distinguished by his literary works, and who has since 1871 played no inconsiderable part in the political affairs of his country as a leading member of the National Assembly, and for sometime head of the cabinet of Marshal Macmahon. (H. RB.)

BROKER, a word derived variously from the French brower, to grind, and brocarder, to cavil or higgle, and the Saxon broc, misfortune.

A broker is an agent or intermediate person appointed for transacting special business on account of another, but differing somewhat from an ordinary factor in functions and responsibility. Of this class there are various descrip- tions, exercising employment without the smallest analogy, though all are brought under the general name of brokers : of these the principal are—exchange brokers, whose pro- vince 1s to ascertain the rates and relation of exchange between countries; stock-brokers, who negotiate transac-

tions in the public funds ; insurance brokers, who effec insurances on lives or property; and pawnbrokers, who advance money on goods, on the

condition of being allowed to sell the goods if the sum advanced is not repaid with interest within a limited time. See AGENT and Ingpp. ANCE.

Separating pawnbrokers, and those dealers in old wares who are called brokers, as both distinct from the class to whom the term in its broader acceptation applies, the broker is an agent for both parties, the buyer and the seller; and for the general principles of jurisprudence applicable to his position, reference may be made to the article AcentT. It is a marked peculiarity, however, of the broker as an agent, that his quality of agency is not only palpable in the face of the transactions, but he ig agent for both parties. The function of the broker js indeed a very simple one, and easily separates itself from the usual intricacies of the law of sale and of agency. It is his proper function to find buyers and sellers, and to bring them together that they may transact with each other. Hence the rise of such a class in any department of business is an indication of its great increase. In small towns, and in narrow and peculiar departments of business, the buyers and the sellers know each other, and need not be at the expense of employing a third party. But where both bodies are numerous, and the individual members of each find enough to occupy their attention in the produc tion of their commodity, or its purchase and distribution, there is economy in the establishment of a distinct class who bring the buyer and the seller together. The broker usually gives what are called bought and sold notes to his clients, and some nice questions have arisen as to the effect of these when they do not correspond with each other or with the entry in the broker's books. The amount of broker's commission isin some few cases fixed by statute— e.g., under 10 Anne c. 19, § 120, a fine of £20 is imposed on brokers charging more than 2s. 9d. per cent. for buying or selling tallies, exchequer tickets, bank bills, ée. Generally it is settled by agreement with the principals or by the custom of trade. The brokers for the purchase and sale of goods within the city of London are a body with peculiar privileges, and acting under special licensing regulations, some of which date back to the reign of Hemry VIII. The London Brokers' Relief Act (1870) has considerably altered their position, but they must still be admitted by the court of mayor and aldermen, and the penalty of £100 for acting as a broker without qualification may still be imposed. A list of London brokers is kept by the mayor and aldermen; and if a broker has been com victed of felony or fraud, or certified by a superior judge to have been guilty of fraud, he

may be absolutely or for a time disqualified. There has been some doubt as to the class of persons falling under these regulations ; ship brokers and auctioneers, it would appear, do not.

BROMBERG, a town of Prussia, capital of a government in the province of Posen, is situated 70 miles north of the city of that name on the River Brahe, which is there crossed by a fine new railway bridge. Its public buildings com prise two Roman Catholic churches, a Protestant church, and a Jewish synagogue, a gymnasium, a semualy, @ workhouse and penitentiary, a hospital, and a military storehouse. It has large mills, manufactures linen and woollen stuffs, leather, tobacco, Prussian blue, Suga chicory, vinegar, beer, brandy, and oil, and carries on an active trausit trade. The Bromberg Canal, constructed in 1773-4 by command of Frederick II., at a cost of 0 dollars, connects the Brahe with the Netz, and thus estad- lishes communication between the Vistula, the Oder, am the Elbe. Bromberg is mentioned as early as 1252. From 1327 to 1343 it was in the hands of the Teutonic Order.

Destroyed in war it was restored by Casimir of Poland in 1346, and down to the close of the 16th century it con- ‘tinued to be a flourishing commercial city. It afterwards | suffered so uch from war and pestilence that about 1772, when the Prussians took possession, it contained only from five to six hundred inhabitants. By the treaty of Tilsit it was trausferred to the duchy of Warsaw; in 1813 it was occupied by the Russians, and in 1815 it was restored to Prussia. Population in 1871, 27,740.

BROME, ALEXANDER, a minor English poet, was born in 1620, and died in 1666. He was an attorney in the lord mayor’s court, and was the author of many of the songs and epigrams that were published in favour of the Royalists andagainst the Rump. These, together with his epistles and epigrams, translated from different authors, were all printed in one volume, octavo, after the Restoration. He pub- lished a translation of Horace by himself and others, | and was the author of a comedy entitled The Cunning Lovers. He also edited two volumes of Richard Brome’s

lays.

BROME, RIcHARD, a dramatic writer in the reign of | Charles I., and a contemporary of Dekker, Ford, Shirley,

and others, He was originally a servant of Ben Jonson ; | but he soon acquired a high literary reputation, and was addressed in some lines by his quondam master on account of his comedy entitled The Northern Lass. Brome's genius lay entirely in comedy. His plots are original and well 'managed, and his characters, which for the most part are) strongly marked, were drawn from his own experience. He has left fifteen comedies. See Ward's English Dramatic Literature, 1875, vol. ii., for a good notice of Brome.

BROMINE, one of the halogen group of non-metallic chemical elements, which comprises three other members,— chlorine, iodine, and fluorine. The whole group has many properties in common, the most marked being their be- | haviour towards hydrogen, uniting with it atom for atom, | forming gaseous condensible acid compounds, which are all) produced by similar reactions, and which yield in combina- tion with metals crystals of uniform structure. Bromine was discovered in 1826 by Balard, who extracted it from the water of the Mediterranean during his researches in connection with the sea-water. At ordinary temperatures _it is a deep brownish-red liquid, emitting a strong disagree- | able odour (wheuce its name, from BpSpos, a stink), having a | specific gravity of 2:96, freezing into a red-brown crystalline) mass at — 24°5° C., and boiling at 63°C. Its combining | equivalent or atomic weight is 80. Bromine is an element of great chemical activity, and of the highest interest in | scientific chemistry on account of its combinations, and 'especially on account of the products of its substitution | for hydrogen in organic compounds.

Although very widely disseminated, since it is found in ovean water, bromine is nowhere an abundant element. It is a constituent of some silver ores from Mexico and South Ainerica ; it is very generally found in strong saline springs, as well as associated with deposits of salt ; and it is present inmany marine plants. The waters of the Atlantic, accord- Jing to Von Bibra, contain 24 grains per gallon ; while Here- 'path's analysis gives Dead Sea water a strength of 121°5 'grains per gallou. It is only from the waters of certain 'Saline springs in America that bromine is prepared as a

direct product. At several places in western Pennsylvania and West Virginia the manufacture is carried on exten- » sively, 125,000 fb having been extracted in 1870. In Europe bromine is only obtained as a secondary product of the preparation of potash and other alkaline salts, its chief source being the mother-liquors of the kelp manufacture, brine springs, and especially the Stassfurth saline deposits, tear Magdeburg, Prussia. ‘The produce at Stassfurth in

1873 amounted to about 10,000 ib ; and it is estimated that the yield of English and French works was, taken together. about the same.

On the commercial scale bromine is prepared at Stassfurth from the liquids which have been exhausted of all their cerystallizable soda and potash salts, and from which also a deposit of chloride of magnesium has been obtained. This final mother-liquor is found to contain from 0°3 to 0°5 per cent. of bromine, in the form of bromide of potassium. ‘To separate the bromine the liquor is introduced into a sand- stone apparatus similar to that used for the evolution of chlorine from common salt,—the process and reaction being similar in both cases. In this it is mixed with black oxide of manganese and sulphuric acid in definite proportions, and heated by a current of steam. The red vapour of bromine is given off and led by a pipe into a condensing worm of earthenware, and received into a series of three Woulfe’s bottles, the first of which contains water, and the others alkaline ley and iron filings. The reaction which takes place is thus represented—

2K Br + MnO, + 3H,80, = 2K HSO,<u>MnSO</u>, 2H,0+ 2Br,

—sulphates of potash and manganese, water, and free bromine being produced from bromide of potassium, man- ganese dioxide, and sulphuric acid. Pure bromine vapour distils over at first, but as the distillation proceeds chlorine is gradually evolved, and from this the bromine may be freed by shaking up with a solution of bromide of potassium, which yields up its broniine to combine with chlorine. On account of its peculiarly irritating action on the organs of respiration, very great precautions have to

be taken to pro- tect workmen from the fumes of bromine, and it is indis- pensable that those engaged in the industry should abstain from all alcoholic liquors.

The chief industrial application of bromine and its com- pounds is in medicine, for which it is used in the form of bromide of potassium, bromide of ammonium, and bromide of sodium, besides in various combinations with alkaloids and organic substances. It is, however, most largely employed as bromide of potassium, a salt prepared on the large scale by the decomposition of potassium carbonate by the bromide of iron. It is also prepared by passing the vapour of bromine into a solution of caustic potash, whena mixture of bromide and bromate of potassium is produced. The mixed salts are reduced to a uniform bromide by burning with coal dust. Bromide of silver is employed to some extent in photography, and, according to the experi- ments of Vogel, it possesses a peculiar sensitiveness for the red, green, and yellow colours, which are not acted on by other photographic agents. During the American Civil War (1861-5) bromine came into use as a disinfectant in military hospitals, a purpose to which it was also applied in the Franco-German War in 1870-1, Forsuch purposes it was found to possess several advantages over chlorine, which, however, has the recommendation of cheapness and abundance. It has long been hoped that bromine might be substituted for iodine in the preparation of the several coal- tar colours, but hitherto the attempts in that direction have not been successful. Eosine, a tetrabromated potassium salt, is the only dye into which bromine at present enters, The use of bromine has been suggested by Dr Rudolf Wagner in several metallurgical operations, in which he anticipates it might be of great service. He proposes, in place of the pre- sent wasteful method of reducing mercury from cinnabar, to digest the cre in an aqueous solution of bromine, whereby a bromide of mercury would be formed. He also suggests that bromine might be advantageously applied to the extraction of gold from poor auriferous ore, in a manner analogous to Plattner’s chlorination process. Further, it 1s recom-

mended for the refining of gold by the formation of a bromide; and it is thought that bromine vapour might be used with advantage for toughening brittle gold.

BROMLEY, a market-town of England, in the county of Kent, 10 miles 8.E. of London. It is situated on high ground to the north of the river Ravensbourne, and since the opening of the railway has become a favourite residence for men of business from London. It has a town-hall—built in 1864, an old market-house, a literary institution, and a college, originally founded in 1666 by Bishop Warner for the residence and support of clergymen's widows. The church is a fine Gothic building, containing some handsome monuments ; and in the vicinity is a palace, erected in 1777 in room of an older structure, for the bishops of Rochester, to whom the manor has belonged since the time of Ethelbert. In the gardens attached is a mineral spring known as St Blaze's Well, which was in great repute before the Reformation. The population of the parish, which in 1861 was only 5505, amounted at the census of 1871 to 10,674. The parish includes the villages of Plaistow, Sundridge, Bickley, Widmore, Elmstead, Southboro', and Bromley Common.

BROMSGROVE, a market-town of England, in the county of Worcester, 13 miles S. by W. of Birmingham, with a station on the Birmingham and Worcester Railway, at the distance of a milé and a half. The church of St John is a fine old building, restored in 1858, with a tower and spire 189 feet in height. The free grammar school, founded by Edward VI., has been recently enlarged ; and a literary institute and a school of art have been established. The principal manufactures of the town are nails, buttons, needles, and coarse linen stuffs; and there are also waggon- works and malt-kilns. The population of the Improvement District in 1871 was 6967.

BRONCHITIS, inflammation of the mucous membrane of the bronchial tubes. Well known as one of the most conimon diseases of the climate of Great Britain, bronchitis exists in either an acute or a chronic form,

Acute bronchitis, like other inflammatory affections of the chest, generally arises as the result of exposure to cold, particularly if accompanied with damp, or of sudden change from a heated tc a cool atmosphere. The symptoms vary according to the severity of the attack, and more especially

according to the extent to which the inflammatory action spreads in the bronchial tubes. The disease usually mani- fests itself at first in the form of a catarrh, or common cold ; but the accompanying feverishness and general constitutional disturbance proclaim the attack to be something more severe, and symptoms denoting the onset of bronchitis soon present themselves. A short, painful, dry cough, accompanied with rapid and wheezing respiration, a feeling of rawness and pain in the throat and behind the breast bone, and of oppression or tightness throughout the chest, mark the early stages of the disease. In some cases, from the first, symp- toms of the form of asthma known as the bronchitic are superadded, and greatly aggravate the patient's suffering. See ASTHMA,

After a few days expectoration begins to come with the cough, at first scanty and viscid or frothy, but soon becoming copious and of purulent character. In general, after free expectoration has been established the more urgent and painful symptoms abate ; and while the cough may persist for a length of time, often extending to three or four weeks, in the majority of instances convalescence advances, and the patient is ultimately restored to health, although there is not unfrequently left a tendency to a recurrence of the disease on exposure to its exciting causes.

When the ear or the stethoscope is applied to the chest of a person suffering from such an attack as that now described, there are heard in the earlier stages snoring or cooing |

sounds, mixed up with others of wheezing or fine whistling quality, accompanying respiration. These are denominated dry sounds, and they are occasionally so abundant and distinct as to convey their vibrations to the hand applied to the chest, as well as to be audible to a bystander at some distance. As the disease progresses these sounds become to a large extent replaced by others of crackling or bubbling character, which are termed moist sounds or rales. Both these kinds of abuormal sounds are readily explained bya reference to the pathological condition of the parts. One of the first effects of inflammation upon the bronchial mucous membrane is to

cause some degree of swelling, which, together with the presence of a tough secretion closely adhering to it, tends to diminish the calibre of the tubes. The respired air as it passes over this surface gives rise to the dry or sonorous breath sounds, the coarser being generated in the large, and the finer or wheezing sounds in the small divisions of the bronchi. Before long, however, the discharge from the bronchial mucous membrane becomes more abundant and less glutinous, and accumulates in the tubes till dislodged by coughing. The respired air, as it passes through this fluid, causes the moist rales above de- scribed. In most instances both moist and dry sounds are heard abundantly in the same case, since different portions of the bronchial tubes are affected at different times in the course of the disease. .

Such are briefly the main characteristics presented by an ordinary attack of acute bronchitis running a favourable course, .

The case is, however, very different when the inflamma- tion spreads into, or when it primarily affects the minute ramifications of the bronchial tubes which are in immediate relation to the air-cells of the lungs, giving rise to that form of the disease known as capillary bronchitis. When this takes place all the symptoms already detailed become greatly intensified, and the patient’s life is placed iz imminent peril in consequence of the interruption to ths entrance of air into the lungs, and thus to the due aeration of the blood. ‘The feverishness and restlessness increase the cough becomes incessant, the respiration extremel rapid and laboured, the nostrils dilating with each effort, ant evidence of impending suffocation appears. The surface of the body is pale or dusky, the lips are livid, while breath ing becomes increasingly difficult, and is attended with suffocative paroxysms which render the recumbent postur impossible. Unless speedy relief is obtained by successful efforts to clear the chest by coughing and expectoration, the patient’s strength gives way, somnolence and delirium set in, and death ensues. All this may be brought about in the space of a few days, and such cases, particularly among the very young, sometimes prove fatal within forty-eight hours.

During life, in addition to the auscultatory signs present in ordinary bronchitis, there generally exist in this form of the disease abundant fine

moist rales at the bases of both lungs; and the appearance of these organs after death shows the minute bronchi and many of the air-cells to be filled with matter similar to that which had been expec torated, and which has thus acted as a mechanical hind- rance to the entrance of the respired air and caused death by asphyxia.

Acute bronchitis must at all times be looked upon as 4 severe and even serious ailment, but there are certain cil- cumstances under which its occurrence is a matter of special anxiety to the physician. It is pre-eminently dangerous at the extremes of life, and mortality statistics show it to be one of the most fatal of the diseases of those periods. This is to be explained not only by the well recognized fact that all acute diseases tell with great severity on the feeble frames alike of infants and aged people, but more

{ ’ particularly by the tendency which bronchitis undoubtedly has in attacking them to assume the capillary form, and _ when it does so to prove quickly fatal. The importance, therefore, of early attention to the slightest evidence of bronchitis among the very young or the aged can scarcely be overrated. Bronchitis is also apt to be very severe when it occurs | in persons who are addicted to intemperance. Again, in those who suffer from any disease affecting directly or | indirectly the respiratory functions, such as consumption or heart disease, the supervention of an attack of acute bronchitis is an alarming complication, increasing, as it necessarily does, the embarrassment of breathing. The same remark is applicable to those numerous instances of its occurrence in children who are or have been suffering from such diseases as have always associated with them a certain degree of bronchial irritation, such as measles and hooping-cough.

One other source of danger of a special character in bronchitis remains to be mentioned, viz., collapse of the jung. Occasionally a branch of a bronchial tube becomes plugged up with secretion, so that the area of the lung to which this branch conducts ceases to be inflated on inspira- tion, The small quantity of air imprisoned in the portion of lung gradually escapes, but no fresh air enters, and the part collapses and becomes of solid consistence. Increased difficulty of breathing is the result, and where a large portion of lung is affected by the plugging up of a large

, bronchus, a fatal result may rapidly follow, the danger

_ being specially great in the case of children. Fortuuately, the obstruction may sometimes be removed by vigorous coughiug, and relief is then obtained.

With respect to the treatment of acute bronchitis, in | those mild cases which are more of the nature of a simple | catarrh, little else will be found necessary than confinement in a warm room, or in bed, for a few days, and the use of light diet, together with warm diluent drinks. Additional measures arc, however, called for when the disease is more markedly developed. Medicines to allay fever and promote perspiration, such as the well-known Mindererus spirit, combined with antimonial or ipecacuan wine, are highly serviceable in the earlier stages. Later on; with the view of soothing the pain of the cough, and favouring expectora- _ tion, mixtures containing squill or tolu, with the addition jof some opiate, such as the ordinary paregorics, may be jadvantageously employed. The use of opium, however, in \any form should not be resorted to in the case of young ‘children without medical advice, since its action on them is /inuch more potent and less under control than it is in adults, Not a few of the so-called “soothing mixtures,” have been |found to contain opium in quantity sufficient to prove dangerous when administered to children ; and, indeed, it isto be feared that fatal results not unfrequently follow their incautious use in this way.

From the outset of the attack the employment of warm applications to the chest in the form of fomentations or | poultices affords great relief. Few remedial measures are /0f greater value than the frequent inhalation of steam. | This is accomplished readily enough in the case of adults by the use of an iuhaler or simply by breathing over an open-mouthed vessel containing boiling water. {n children _in whom this plan cannot be carried out in the same nianner, there is in general no difficulty in surrounding them with am atmosphere of steam by placing around them vessels | containing hot water, the vapour from which envelopes them. The relief to the congh and breathing, and the aid to expectoration afforded by this simple plan, are often sur- prising, and the cases are rare where it cannot be borne.

Should the cough persist for a length of time, and the disease threaten to become chronic, counter-irritant applica-

tions to the chest in front and behind, in the form of stimulating liniments, or even of blisters, will be rendered necessary.

When the bronchitis is of the capillary form, the great object is to maintain the patient's strength, and to endeavour to secure the expulsion of the morbid secretion from the fine bronchi. In addition to the remedies already alluded to, stimulants are called for from the first ; aud should the cough be ineffectual in relieving the bronchial tubes, the adniinistration of an emetic dose of sulphate of zinc or squill may produce a good effect.

During the whole course of any attack of bronchitis, attention must be paid to the due nourishment of the patient; and during the subsequent convalescence, which, particularly in elderly persons, is apt to be slow, tonics and stimulants may have to be prescribed.

Chronic bronchitis may arise as the result of repeated attacks of the acute form, or it may exist altogether inde- pendently. It occurs more frequently among persons advanced in life than among the young, although no age is exempt from it.

The usual history of this form of bronchitis is that of a cough recurring during the colder seasons of the year, and in its earlier stages, departing entirely in summer, so that it is frequently called "winter cough." In many persons subject to it, however, attacks are apt to be excited at any time by very slight causes, such as changes in the weather ; and in advanced cases of the disease the cough is seldom altogether absent.

The symptoms and auscultatory signs of chronic bron- chitis are on the whole similar to those pertaining to the acute form, except that the febrile

disturbance and pain are much less marked. ‘The cough is usually more trouble- some in the morning thau during the day. There is usually free and copious expectoration, and occasionally this is so abundant as to constitute what is termed bronchorrhea.

Chronic bronchitis leads to alterations of structure in the affected bronchial tubes, their mucous membrane becoming thickened or even ulcerated, while occasionally permanent dilatation of the bronchi takes placc, often accompanied with profuse foetid expectoration. In long standing cases of chronic bronchitis, the nutrition of the lungs becomes impaired, and dilatation of the air-tubes (emphysema) and other complications result, giving rise to more or less con- stant breathlessness. Chronic bronchitis is liable in some instances, particularly when accompanied with loss of flesh and strength, to be mistaken for consumption; but the physician who carefully regards the history of the case and observes the physical signs and symptoms, will in general be able to distinguish the one disease from the other.

Chronic bronchitis may arise secondarily to some other ailment. ‘This is especially the case in Bright’s disease of the kidneys, and in heart disease, of both of which maladies it often proves a serious complication.

Chronic bronchitis does not often prove dircctly fatal, nor is it necessarily inconsistent with long life. Its chief danger lies in the tendency to intercurrent. acute. attacks, particularly in the aged; and in this manner it yery-fre- quently causes death. ese

The treatment to be adopted in chronic bronchitis de- pends upon the severity of the case, the age of the patient, aud the presence or absence of complications. Attention to the general health is a matter of prime importance in all cases of the disease, more particularly among versons whose avocations entail exposure, and tonics with cod-liver oil will be found highly advantageous. The use of a respirator in very cold or damp weather is a valuable means of protection. In those aggravated forms of chronic bronchitis, where the slightest exposure to cold air brings on fresh attacks, it may become necessary, where circum-.

stances permit, to enjoin confinement to a warm room or removal to a more genial climate during the winter months.

When expectoration is attended with difficulty, such remedies as squill in combination with ammonia may prove useful, When, on the other hand, bronchorrhcea exists, astringents are called for. The inhalation of vapour contain- ing iodine or turpentine is often followed with marked benefit in this way. Where breathlessness accompanies the disease, besides the use of ethereal preparations, marked relief is often derived from large doses of iodide of potassium. Counter-irritation to the chest with turpentine, mustard, or croton oil is generally attended with good results. In aged and weak persons stimulants are an indispensable part of the treatment. Acute exacerbations of the disease, which are so apt to arise in the ckronic form, must be dealt with on the principles already indicated in treating of acute bronchitis. (J. 0. A.)

BRONDSTED, Peter Otvr, archeologist, was the son of a Danish clergyman, and was born at Horsens in Jutland on 17th November 1781. He received his academical educa- tion at the university of Copenhagen; and in 1802 he visited Paris in company with his friend Koes. After remaining there two years, they went together to Italy. Both were zealously attached to the study of antiquities ; and congeniality of tastes and pursuits induced them both, in 1810, to join Baron Stackelberg, Von Haller, and Linckh of Stuttgard, in an expedition to Greece, where they examined with attention the interesting remains of ancient art, and engaged with ardour in excavations among the ruins, which were carried on, especially by Bréndsted and Stackelberg, with very interesting results. The discoveries Brondsted made were made public in several works, which show learn- ing and sagacity such as have seldom been applied to the elucidation of antiquity with happier results. After three years of active researches in Greece, Brondsted returned to Copenhagen, where, as a reward for his labours, he was appointed professor of Greek in the university. He now began to arrange and prepare for publication the vast materials he had collected during his travels; but finding that Copenhagen did not afford him the desired facilities, he exchanged his professorship for the office of Danish envoy at the papal court in 1818, and took up his abode at Rome. He also, in 1820 and 1821, went to Sicily and the Ionian Isles to collect

additional materials for his great work ; and when the artistic illustrations were completed, he obtained leave to visit Paris to superintend the publication. In 1826, he came over to London, chiefly with a view to study the Elgin marbles and other remains of anti- quity in the British Museum, and became acquainted with the principal archeologists of England.

He returned to Copenhagen in 1832, when he immedi- ately received the appointment of director of the royal museum of antiquities, and the professorship of archeology and philology. His merits were ten years afterwards further rewarded with the honourable office of rector of the univer- sity; but an unlucky fall from his horse caused the death of this eminent man on the 26th June 1842. His principal work was the Travels and Archeological Researches in Greece, published in German and French, 1826-30. His dissertations on points of ancient art are very numerous.

BRONGNIART, ALEXANDRE, a distinguished French mineralogist, was the son of the eminent architect who designed the Bourse and other public buildings of Paris, and was born in that city in 1770. At an early age he Joined the army of the Pyrenees; but having committed some slight political offence, he was thrown into prison, and detained there for some time. On his release he was appointed professor of natural history in the Collége des Quatre Nations, and soon after succeeded Hatiy as professor in the school of mines. In 1800 he was made director of

the Sévres porcelain factory, in which he revived the almost forgotten art of painting on glass. He did not confine himself entirely to mineralogy, for itis to him that we owe the division of Reptiles into the four orders of Saurians Batrachians, Chelonians, and Ophidians. In 1816 he was elected into the Academy; and in the following year he visited the Alps of Switzerland and Italy, and afterwards Sweden and Norway. The result of his researches he published from time to time in the Journal des Mines and Dictionnaire des Sciences Naturelles. He died at Paris, October 7, 1847.

His principal works are—Traité elémeniaire de minéralogie ap. pliquée aux Arts; the Tableau des terrains qui composent Vécorce du globe, ow Essai sur la structure de la partie connue de la terre; and the Traité des Arts

céramiqucs 1845. Brongniart was also the co. adjutor of Cuvier in the admirable Essai sur la géographie minéralo- gique des environs de Paris.

BRONTE, a city of Sicily in the intendency of Catania, It stands in a healthy situation at the western foot of Mount Etna, on the river Giaretta, near a celebrated water- fall. It has considerable manufactures of linen and woollen cloths, and some paper-mills. Good wine is produced in the neighbourhood. Bronte is of comparatively modern origin, having all been built since the 16th century. It gave the title of duke to Lord Nelson. Population, 14,589,

BRONTE, Cuartotre, modern English novelist, was born on the 21st April 1816. Her father, the Rev. Patrick Bronte, was a native of county Down, Ireland; her mother, Maria Branwell, was of Cornish family. At the date of his – marriage, in 1812, Mr Bronte held the living of Hartshead in Yorkshire, and there his two eldest daughters, Maria and Elizabeth, were born. In 1815 he removed to Thornton, in the parish of Bradford, where Charlotte, her brother Patrick Branwell, and her younger sisters, Emily and Anne, were born. In 1820 he was presented to the living of Haworth, and removed in that year to the parsonage, a bleak and solitary house, standing close by the churchyard and backed by a wide expanse of moorland. Mrs Bronte died soon after their removal, and the little family of young children were left to educate and train themselves. They saw little of their father, whose health was bad, and who seems to have been eccentric in his modes of thinking aud acting. The charge of the little flock devolved upon the eldest daughter, a girl of between seven and eight when her mother died; and, under the peculiar circum- stances of their life, the children's intellectual powers and sympathies developed with rapidity. Utterly deprived of all companions of their own age, with none of the usual outlets for their pent-up energies, they lived in a little world of their own. The harsh realities around them, the bleak scenery, the coarse and rugged natures of the few inha- bitants with whom they came in contact, only impelled them to construct for themselves an ideal world, modelled after their own strange and untrained imaginations, in which they found satisfaction and reality. By the time Charlotte Bronte was thirteen years of age, it had become her constant habit, aud one of her few pleasures, to weave imaginary tales, idealizing her favourite historical heroes, and

bodying forth in narrative form her own thoughts and feelings. Nor was she alone in this curious occupation ; all the family took part in the composition of juvenile stories and magazine articles. It was a strange training for a child, boding little good for her future happiness when thrown into the ordinary routine of life.

An event which made a deep impression on this strange family circle was the entering of the two eldest girls, m 1824, at a school recently opened at Cowan’s Bridge, near Haworth, and intended for daughters of clergymen. vivid picture of this school, and one which Miss Bronte always maintained was not over-coloured, is presented 10 Jane Eyre, for the Lowood of that story is Cowan’s Bridge.

) Of all pupils the Brontes were the least likely to fall in) well with the requirements of their new mode of life. Everything was novel and repulsive to them; their peculiar |} natures were repressed and stunted; their intellectual sympathies found no food. Charlotte and Emily became | pupils later in the same year, but it was soon found neces- sary to remove Maria. Her health had given way com- | pletely, and she died a few days after her return to | Haworth in the spring of 1825. But a few months later | and Elizabeth followed her sister to the grave. The | younger girls were removed in the autumn of 1825; and | Charlotte, as the eldest of the household, took upon herself the duties that Maria had formerly discharged. For six years she remained at home leading the usual quiet, isolated life, and indulging to the full her rare faculty | of composition. She then spent one of her happiest years in aschool at Roe Head, and some of the acquaintances _ made there became life-long friends. To this school she returned in 1835 in the capacity of teacher, and for a time | her sisters were with her as pupils. After three years her health, always delicate, gave way alarmingly, and she had to be withdrawn to Haworth. Two short experiences as ‘ governess in a family having shown her how little such a life _ was suited to her, she turned her thoughts towards taking a | school, a plan which would have had the special advantage | of keeping together the three devoted sisters. Some money was advanced for this scheme by their aunt, and it was resolved that, as a preliminary step, Charlotte and Emily should study French upon the Continent. In 1842, accordingly, they found themselves in Brussels, and a new | world, a new experience, was opened up to Miss Bronte’s _ vigorous

and imaginative mind, a world to be afterwards _ reproduced in living characters. She studied hard, and _ before her return to England in January 1844 had acquired _ a very thorough knowledge of French. | She came back to a home into which a fresh element of | unhappiness had been introduced. Her brother Patrick,

a youth of fine talents, had fallen into habits of dissipation, which rapidly rendered him a hopeless drunkard. For some years the sisters had the misery of seeing daily before them the spectacle of a wasted life, of powers thrown away, and of opportunities despised. The details of his _ unfortunate story may well rest in obscurity. He lingered on till September 1848.

Meanwhile, amid their distress, the sisters, who found | refuge in their habits of composition, had made their first literary venture. During their separation, while Charlotte was in Brussels, and Anne ina situation as governess, they had been quietly pursuing their favourite occupation ; and – in 1845 they made the discovery of each other's poetical | efforts. After some correspondence with publishers they | resolved to print a small volume of poems, assuming the | noms de plume of Currer, Ellis, and Acton Bell. The _ book appeared in the spring of 1846, was barely noticed by the reviews, and attracted no public attention. The _ authors, however, were encouraged to make a further trial, and each began to prepare a prose tale. Charlotte's was The Professor ; Emily's, Wuthering Heights; Aune's, _ Agnes Grey. The Professor was refused on all hands ; _ the other two were accepted, but their publication was _ delayed for some time. Nothing daunted by her want of _ success, Charlotte devoted herself heart and soul to a new tale, Jane Eyre, which she completed in August 1847. _ The MS. was accepted by Messrs Smith and Elder ; the book _ appeared with the name of Currer Bell on the title page in October 1847, and at once achieved a decided success.

Few works of an unknown author have been received with such sudden and general acclamation. The utter and a even paradoxical disregard for the conventional which the]

book displayed, the masculine vigour and glowing energy

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with which the main characters were drawn, and its intense realism, at once seized and secured the popular favour, and showed the literary world that a new and powerful com- petitor for its honours was in the field. Its success was not so much the result of the favourable verdicts of trained judges, for these came but slowly, as of its own intrinsic force. The delineation of the harsh and rugged but powerful northern character was the revelation of a new world, and the intensest interest was excited as to the true name and abode of the unknown author. Numerous were the con- jectures as to Currer Bell, but the secret was well kept. Even the publishers were unaware of the truth, till the disclosure had to be made to them in consequence of the publication of Wuthering Heights and Agnes Grey, and of the announcement of Zhe Tenant of Wildfell Hull. The public, however, remained in the dark till after the appear- ance of the second work by the unknown, when a shrewd Yorkshireman, who knew Haworth, divined the secret and published his discovery.

Shirley, this second work, fully sustained the author’s high reputation. Yet it was written under melancholy circumstances. The death of Patrick Bronte, in September 1848, was followed by the deaths of Emily and Anne in quick succession. Emily died on the 19th December 1848 ; Anne on the 28th May 1849. Sherley was published in October 1849. The disclosure of Miss Bronte’s name as the writer at once introduced her to the great literary society of London. She met all the most prominent men of letters of the time; yet, though she was in the world, she was not of it. Her previous life and her peculiarly sensitive and retiring disposition made notoriety and atten- tion painful to her, and she gladly escaped to the quiet of Haworth parsonage. Slowly, and with long interruptions from failing health, her last work proceeded to completion. Villette was published in 1853, and was hailed with universal delight. It isin some respects the most pleasing of her works, while it at the same time exhibits some of her gravest faults. The description of the life at the foreign pension, and the whole delineation of the principal charac- ters, are reflexes of her own experience, and impress one with their vivid reality and truth. The plot, however, is unskilfully constructed, and the interest seems to shift from one set of characters to another in the progress of the story.

In June 1854 Miss Bronte was married to her father's curate, the Rev. Mr Nicholls, and for a brief period she tasted the strange new happiness of domestic life. But the seeds of decay were in her constitution; the same malady that had carried off her sisters, worked its way with fatal facility in herenfeebled frame. She died on the 31st March 1855. After her death Z'ke Professor, her first luckless tale, was published from her MSS.

A comparison has sometimes been made between Miss Bronte and Miss Austen. The points of contrast are cer- tainly more apparent than the points of similarity; and it is a fact not without significance that Miss Bronte could

'never thoroughly appreciate the merits of her great pre-

decessor. Both were consummate masters of literary expres- sion, and both finished their work with the utmost care and precision. Miss Austen is distinctly superior in skilful evolution of plot and in the nice adjustment of character and incident. But her figures are tame and lifeless when compared with those of Miss Bronte, and what she chiefly lacked, the fierce glow and fire of imagination, and the perception of depths in human nature only revealed through suffering experience, the other possessed to an almost un- rivalled extent. Miss Bronte's experience was, indeed, narrow, but it was of a rare kind, such as was peculiarly adapted to her strong and yet sensitive spirit. She had too what Goethe calls the true secret of poetic genius,

penetration to the individual and real ; what she had her- self known and felt, the deep impressions made on her mind by wild scenery, and by rugged yet genuine human natures, that she mirrored forth with living truth and fiery vehe- mence. Doubtless her strength at times approaches too near to coarseness, the situations become almost melo- dramatic, and the result may be charged with sensationalism, but the pervading sense of intense reality is more than sufficient to carry off these defects.

Of her three great works Jane Eyre will always be the one which occurs most readily in connection with her name ; it has all the vigour and individuality of a first-born work of genius. Shirley, one of the sweetest love-stories in the range of English fiction, abounds in rich humour, but

wants the perfection of artistic unity. Véllette contains, perhaps, more of the author’s personality than either of the others. The character of the heroine is in truth that of Miss Bronte herself, and the analysis of it is at times morbidly acute. The Professor has never gained much popularity, though the main conception is one of great beauty and is skilfully handled.

Of Emity Bronte’s works it is somewhat difficult to speak, Hers was a strange nature, not easily understood ; and it had but little time to develop. Some of her poems are singularly powerful, aud show uncommon abilities. Wauther- ing Heights is a literary curiosity. Uumistakably the work of a strong mind, into which the wild scenery of the north had sunk deeply, it shows absolutely no comprehension of human character. We are transplanted to a dreamland, enveloped in a lurid thunderous atmosphere, through which stalk fantastic giant beings, gloomy and devilish in their utter wickedness. It is the production of a powerful imagination, but of an imagination unrestrained by any experience of the real, and regulated by no considerations of artistic beauty and proportion.

ANNE BRONTE’s was a mind of weaker calibre. Agnes Grey is a gentle, gracefully written tale, founded on the writer’s own experiences of a governess’s life ; but it mani- fested little power or promise. Zhe Tenant of Wildfell Hall has much greater force and vigour; but the main concep- tion isan unpleasant one over which the writer had brooded until she had been seized with a morbid craving to give it shape and substance. It isa painful story, inartistically told.

Charlotte Bronte’s friend, Mrs Gaskell, has narrated her life, as only a woman of kindred genius could. Of Emily and Anne, incomparably the best notice is that prefixed by Charlotte Bronte to the second edition of Wuthering Heights and Agnes Grey. A new and uniform edition of the whole works of the three sisters, with Mrs Gaskell’s Life (which first appeared in 1875), illustrated by engravings of the principal places mentioned, is at present (1876) in course of publication.

BRONZE is an alloy formed wholly or chiefly of copper and tin, in variable proportions. It has been used from a very early period. Archzologists distinguish a bronze age in prehistoric times in Western Europe (intermediate between those of stone and iron), characterized by a general

use of the alloy for cutting instruments and other objects. The “brass” of the Bible was probably of the nature of bronze. The use of bronze in early times is noticed more particularly below.

The addition of tin to copper gives rise to a product more fusible than copper, and thus better suited for casting. The alloy is also harder and less malleable. The proportions in which copper and tin are combined to make bronze vary according to the object for which the alloy is designed. With about 7 parts copper to 1 part tin, bronze is very hard, brittle, and sonorous Soft bronze, again, which bears drifting, rolling. and drawing, is generally composed of 16 copper to 1 tin; while a flexible tenacious alloy, good for nails and bolts, is made of 20 copper to 1 tin, In preparing bronze for statues, bas-reliefs, &c., the qualities chiefly looked

at are fusibility and hardness, also readiness to acquire g° fine patina on exposure, though it appears this may be acquired by bronzes differing widely in composition. A common statue bronze is formed of copper 80, tin 20. Bell metal, for large bells, is generally made with about 3 parts copper to 1 part tin; for house bells, 4 copper to 1 tin, The bronze of bells (as of various other objects) sometimes contains a little zinc, lead, &c., in addition to the primary ingredients, ‘The Chinese tam tams or gongs, are made of bronze forged by the hammer ; they contain about 20 per cent. tin, the rest copper only. The secret of their manu- facture seems to have been revealed by MM. Julien and Champion, who fiud that a bronze of this nature, though at the common temperature brittle as glass, may, at a dull red heat, be forged aud beaten out as easily as soft tin, The speculum metal employed in telescopes is of 2 copper to 1 tin; and on the other hand, with larger proportions of copper, we have an alloy suitable for machinery bearings, and also for medals, 8 copper to 1 tin; another for brass ordnance or bronze cannon, 9 copper to 1 tin; another for mathematical instruments, 12 copper to 1 tin, &c. The hardness and resistance to oxidation of bronze fit it admir- ably for coins, and many ancient bronze coins have come tous but little deteriorated, though buried, for ages in damp soil, or immersed in water. The composition of the present bronze British coinage is (in 100 parts) 95 copper, 4 tin, 1 zine.

A few years ago some very beautiful Chinese and Japanese bronzes were exhibited in Paris, remarkable chiefly for the dead black colour of their patina. From analyses by M. Morin it appeared that they contained a large proportion of lead, the average composition being copper 80 parts, lead 10, tin 4, zinc 2, and the remaining four parts consisting of iron, nickel, arsenic, silver, and gold. According to M. Christofle, lead is not essential for production of a fine black patina; and it renders the alloy brittle. Bronze can be covered with a black, red, brown, or green patina, as desired, by suitable oxidation or sulphurization. }

Some important researches on bronze for field-guns have lately been made by Colonel Uchatius of Vienna; and the steel bronze he produces is said to be quite equal to steel in hardness, homogeneousness, resistance, and other qualities ; while it is less affected by atmospheric agency, and less costly. He casts the bronze (which contains 8 per cent. tin, the rest copper) in a cast-iron ingot mould, with a core of wrought-copper 50 mm. indiameter. Then after boring out the hollow ingot to a diameter of 80 mm. he forces through it a series of six conical pistons of hardened steel, slightly larger in diameter than the bore. The interior is then excessively hard and ready for rifling, The hardness, elasticity, and solidity diminish from within outwards. These new bronze guns have been found to bear several hundred discharges successively without the slightest ap- parent deformation or other injury. a

It is only of late years that the changes produced in bronze by addition of phosphorus have been scientifically investigated ; and from experiments by Messrs Montefiore, Kiinzel, Kirkaldy, and others, phosphor bronze is proved to have great superiority to ordinary bronze in tenacity, elasticity, and tensile strength (being to it much what.steel is to wrought iron), The presence of oxides in ordinary bronze accounts for its possessing these qualities in less degree, and phosphorus increases them by reduction of the nietal. Phosphor bronze is further greatly improved m tensile strength by being drawn into wire or rolled into sheets; and it resists the action of sea-water much better than copper. Such a substance cannot fail to find many important applications, military, industrial, and domestic. In virtue of its reducing properties, we may add, phosphor bronze. can be platinized better than any other metal,

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BRONZE

The alloy known as aluminium bronzeis one endowed |

with great strength, malleability, and ductility. It is forined of 10 parts aluminium and 90 of copper.

In the melting of ordinary bronze, reverberatory fur- naces have long been used, as rapid fusion is desirable in order to prevent loss of tin, zinc, or lead by oxidation. Bellfounders often use dome-topped furnaces, as their alloy does not require so intense a heat for fusion ; but there is some waste of material with these. The copper is melted first, and covered with small charcoal or coke ; and the tin is rapidly thrust down to the bottom of the melted mass. After stirring, the alloy is poured into the moulds, in which the cooling should be as rapid as possible. Sometimes pressure is applied during cooling, in order to make the cast free from pores.

In the old method of bronze-casting, known as the cire perdue, wax is first used for the thickness of the statue (between core and mould, which are of baked clay), and is melted and run off before the metal is poured in,—the core and mould being held apart by stays of iron wire. In the present day large works are never cast in one piece, but in several, which are afterwards united by heating and appli- cation of fused metal. A model is made in plaster, and a piece mould of Caen sand, about 14 or 2 inches thick, made round it, the sizes of the pieces being determined by the shape and character of the portions they occupy. These pieces are backed with plaster of Paris to about a foot in thickness, with indentations cut in their horizontal thickness, into which the succeeding portion of the mould fits. ‘The mould is then taken to pieces, dried, and rebuilt in the casting-pit. It is then filled with core-composition in a liquid state, and when this is sufficiently hardened, again taken to pieces. The core thus obtained is thoroughly dried, and reduced in size by scraping away as much of the material as would represent the thickness of the metal to be cast. This done, the mould is again built up over the core, and the pit filled, &c., as in the other process. The statue is completed after its removal from the mould by cutting off the jets,

removing roughnesses where they occur, and giving greater sharpness to the details when necessary.

Statues and various ornamental objects may also be manufactured by the process of electro-deposition from a metallic solution; and some excellent results have been obtained in this way by Oudry, Christofle, Elkington, and others. While the method offers some advantages in regard to cheapness, lightness, c&c., of the products, the

_ bronzes thus produced are not so hard and durable as those

got by casting, and are thus less suited for exposure. Bronzing is the process by which a bronze-like surface is produced on objects made of metal, plaster, wood, or other material. It may be done variously. The green bronze colour is sometimes produced on metal with vinegar alone, or dilute nitric acid, or sal-ammoniac. To give an antique appearance to newly made articles of bronze or brass, it is recommended to dissolve three-quarters of an ounce of sal-ammoniac and a drachm and a half of bin- oxalate of potash (salt of sorrel) in a quart of vinegar, moisten a soft rag or brush with the solution, and rub over the clean bright metal till its surface becomes quite dry through the friction. This process should be repeated several times, and the object should be kept a little warm. With a solution of chloride of platinum (which is, however, an expensive liquid) almost any colour can be imparted to copper, brass, iron, or new bronze, according to the degree of dilution and number of applications. The following solution is suitable for bronzing coins and medals :—Two parts of verdigris and one part of sal-ammoniac are dissolved in vinegar, the solution is boiled, skimmed,.and diluted with water till it has only a weak metallic taste,

and on further dilution lets fall no precipitate. This golu- tion is made to boil briskly and poured on the objects. These are well washed with clean water and then lacquered,

Objects of cast-iron may be made to assume a fine bronze appearance by being coated with a very thin layer of vege- table oil, and then placed in a drying oven, the tempera ture being such that oxidation of the iron and

decomposi- tion of the oil take place simultaneously. Another mode of bronzing iron (lately recommended by Weiskopf) is with a solution of one part sylvate of silver in twenty parts of oil of lavender. The object is lightly coated with this, and warmed rapidly up to 302°C. For bronzing tin or white metal a solution may be used consisting of 1 oz. sal- ammoniac, > oz. alum, and 2 oz, arsenic, dissolved in 1] pint of strong vinegar.

A good method of bronzing wood, porcelain, stoneware, composition picture and looking-glass frames, &c., is first to coat the article with a thin solution of water glass, using a soft brush, Bronze powder is then dusted on, and any excess not adherent is knocked off by a few gentle taps. The article is next heated to dry the silicate, and tho bronze becomes firmly attached. Bronze powders are pre- pared of many different shades. In Messrs Brandeis's process the alloy used (generally copper-zinc) is laminated into very fine leaves, which are then ground. The powder is washed out and dried, and by revolving in a box, which contains some mineral varnish, the particles receive a coating of the varnish. Bronze powders are also prepared from leaf gold ground with honey on a stone, mosaic gold ground with bone ashes, compounds of tungsten and soda, and in other ways.

As regards cleansing of bronze statues that have become coated with dirt in large towns, it has been found that a dilute solution of caustic alkalies removes the overlying dirt and allows the green patina to become visible. Where the metal was not originally oxidized, the alkali simply cleanses it and does not promote any formation of green rust. An occasional rubbing with oil (all excess being carefully removed) is also found to preserve a fine bronze surface. The shining brown colour of gun barrels or other arms, is sometimes imparted by first producing a very thin uniform film of oxide or rust on the iron, eg., with vapour of nuriatic acid, and giving a gloss to the surface by rub- bing wax over it, or coating it with a shellac varnish. But the most common material for browning is the butter or chloride of antimony, sometimes called bronzing-salt. It is mixed with olive oil and rubbed on the iron, which is slightly heated. A little aquafortis is then rubbed on to quicken the operation ; the barrel is then cleaned, washed with water, dried and polished, either with a steel burnisher, or by rubbing with white wax, or is varnished with a very weak solution of shellac and spirit of wine. (See Ure's Dictionary of Arts, &c.)

Greek and Roman Bronze.

The bronze (Greek, yaAxés; Latin, ws) of classical anti- quity consisted chiefly of copper, with an alloy of one or more of the following metals, zinc, tin, lead, and silver, the quantity and the character of the alloy changing as times changed, or as was required for different purposes. Among existing bronze remains the copper is found to vary from 67 to 95 per cent. At present the only valuable results which we possess are derived from the analysis of coins (Von Bibra, Die Bronzen und Kupferlegirungen der alten und dltesten Volker, Erlangen, 1869), from which it appears that for their bronze coins the Greeks adhered to an alloy of copper and tin till 400 3B.c., after which time they used also lead with increasing frequency. Silver is rare in their bronze coins. The Romans also used lead as an alloy in their bronze coins, but gradually reduced the

quantity, and under Caligula, Nero, Ve spasian, and Domitian, coined pure copper coins ; afterwards they reverted to the mixture of lead. So far the words yaAxés and «ws may be translated as bronze. Originally, no doubt, yadkds Was the name for pure copper. It is so employed by Homer, who calls it épvOpds (red), ai@wyp (glittering), daevvds (shin- ing), terms which apply only to copper. But instead of its following from this that the process of alloying copper with other metals was not practised then, or was unknown to the poet, the contrary would seem to be the case from the passage (Iliad, xviii. 474) where he describes Hephzestus as throwing into his furnace, copper, tin, silver, and gold, to make the shield of Achilles, so that it is not always possible to know whether when he uses the word xaAxds he means copper pure or alloyed. Still more difficult is it to make this distinction when we read of the mythical Dactyls of Ida in Crete or the Telchines or Cyclopes being acquainted with the smelting of xarxés, It is not, however, likely that later Greek writers, who knew bronze in its true sense, and called it xaAxés, would have employed this word without qualification to objects which they had seen unless they had meant it to be taken as bronze. When Pausanias (iii. 17, 6) speaks of a statue, one of the oldest figures he had seen of this material, made of separate pieces fastened together with nails, we understand him to mean literally bronze, the more

readily since there ‘exist very early figures and utensils of bronze so made, The earliest employment of bronze for artistic purposes was to hammer it out in thin plates and fasten them together with nails. This process was called sphyrelaton. The next stage was casting, in connection with which the earliest Greek artists of fame are Theodorus and Rheecus of Samos (Pausanias, viii. 14, 8, and x. 38, 5). It has been supposed that their merit consisted in introducing the process of casting statues hollow, that is, with an inner core of some material which could afterwards be removed and leave the figure light, less costly, and no less durable. There are remains of Assyrian bronze, probably older than the time of Theodorus and Rheecus, cast with an inner core of iron ; and there is also in the British Museum an early Etruscan statuette from Sessa on the Volturno, with a core of this metal, which from its being split down the side, owing to the expansion of the iron, shows how unserviceable the iron was for this purpose. Obviously the power of casting in bronze, whether solid or hollow, was a very great gain to sculptors, whose models worked in the clay with the rapidity of their inspiration could thus be accurately and at once reproduced. The difficulty and expense of the process must have been against it as compared with marble ; yet it was frequently employed, and in the case of colossal statues it had no rival. Of these the Colossus of Rhodes —a figure of the sun-god Helios, said to have been 70 cubits high—was an example of the utmost that art could do with bronze. It was thrown down by an earthquake after standing fifty-six years. A statue of Zeus at Tarentum by Lysippus was 40 cubits high, and though it could be moved with a touch of the hand, yet it resisted the force of storms by means of a support at the point of the greatest stress. The oldest seat of bronze-founding, at least to any extent, was the island of Delos, and next to that the island of Aigina, and yet copper does not appear to have been found in either. Between the two there existed a rivalry in the time of the sculptors Myron and Polycletus, of whom the former used the bronze of Delos, the latter that of Aigina. More celebrated than either was the bronze of Corinth, which some believed to have been first obtained by the melting together of statues of ordinary bronze, gold, and silver at the burning of that town. Pliny says that it consisted of gold, silver, and copper, and was considered more precious than silver and little less valuable than gold.

BRONZE

There were three kinds of it—ore white, having almost the appearance of silver, in which silver predominated ; another | yellow, because of the great quantity of gold in it; anda third in which all three metals were equaliy represented, ‘ But the Corinthian bronze was used rather for drinking. cups and utensils than for statues. statues as given by Pliny was to bring the mass of copper to a liquid state, and then to throw into it a third part of old bronze and 124 per cent. of plumbum argentarium, z.¢., tin and lead in equal parts.

The process of casting

Of the vast number of bronze statues by ancient sculptors

nothing beyond a few fragments remain ; but if the colossal bronze head of Venus in the British Museum be taken as a typical example, it will show with what fineness and thin- ness those figures were cast; or, again, as an instance of the quality of Greek bronze we may take the bronzes of Siris, also in the British Museum, on which a very thin plate of bronze will be seen in some parts of the figures beaten out

nearly half an inch till it reaches the thinness of note-paper,

Works in relief (répevya), whether beaten out or chased, like those just mentioned, or cast, are comparatively rare,

though this branch of art was largely practised even by the greatest sculptors, On the other hand, it does not appear to have been carried out by them to the extent in which it is found in Germany and Italy after the beginning of the llth century,—for instance, in the reliefs on cathedral gates. The temple of Athene Chalkioikos in Sparta, with its walls covered with bronze reliefs, stands out as an exception. By the time of the Byzantine empire, when the power of modelling had declined, and a taste for glittering appearance took its place, the process of ornamenting bronze with reliefs was superseded by inlaying it with silver and other materials. As to the colour of the ancient bronzes little can now be said, because from lying so long in the earth they have become covered with what is technically called a patina, which is generally some shade of green, though sometimes also nearly blue, and at other times drab, ‘This blue colour is very brilliant in

bronzes from Herculaneum and Pompeii. A difference of soil very probably makes a different patina, but something may also be due to varieties in the alloy. Perhaps the finest examples of patina are to be found among the bronze mirrors, in which there seems to have been generally a considerable quantity of silver for the sake of obtaining a highly reflecting surface. It does not appear that the pro- cess of gilding bronze was carried to any extent in classical times, unless, perhaps, in the production of finger-rings, of which a considerable number remain. But if larger works in bronze fail, there is an abundance of statuettes, candelabra, mirrors, cist@, and vessels of all kinds—Greek, Roman, and Etruscan. One fact to be noticed is that the great number of bronze mirrors which exist are nearly all Etruscan. A few may be Roman from the Latin inscrip- tions which they bear, and a few also come from Greece. But the general rule of their being Etruscan reminds us of the reputation which the Etruscans enjoyed for the produe-tion of works in bronze, not of high art, but of what might be called industrial art. They were celebrated also for modelling in clay ; and that, as Pliny states, was the stage of art which immediately preceded casting in bronze, and went hand in hand with it.

The art of bronze casting, which had sunk with the Byzantine empire, was again revived with great vigour 2 Germany in the 11th century, from which period are the bronze gate of the cathedral at Hildesheim (1015) and the column decorated with reliefs on the model .of the column of Trajan in Rome (1022). In the 12th century the art spread southward to Italy, and at first was taken UP energetically in‘Lower Italy. But though many interesting works of this kind exist also from the 13th and 14th

centuries, it was not till the 15th that the art obtained its complete inastery under the Florentine artists. In the following century, again, it is found carried with extra- ordinary skill in Germany at Nuremberg, Augsburg, Munich, and Coburg. Since then, however, the higher order of sculpture in bronze may be said to have reverted to nearly its ancient limits, that is, the production of statues and groups in the round. (See Dr OC. Bischoff, Das

Kiipfer in der vorehristlichen Zeit, Berlin, 1865 ; and L, R. v. Fellenberg, Analysen von antiken Bronzen,

1865.

BROOCH, or Broacu, (from the French broche), an awl or bodkin. A spit is sometimes called a broach, and hence the phrase “to broach a barrel.” The term is now used to denote a clasp or fastener for the dress provided with a pin, having a hinge or spring at one end, and a catch and loop at the other. Brooches were universally used among the more civilized nations of antiquity. They were made of many materials, and in innumerable varieties of ornamental design, the forms varying according to the period of their manufacture, or the taste and culture of the people using them. They are unknown in the Swiss Lake settlements of the Bronze Age, though pins and bracelets are abundant. Brooches of the Bronze Age are extremely rare in Britain, although they occur in considerable numbers and of elegant forms in North Germany and Scandinavia. The simplest is similar to that which has been reproduced in modern times as the “ patent safety- pin,” but having the ends prolonged into flat spirals and the clasp flattened and engraved with ornamental designs. Another characteristic form was produced by winding a long wire into a flat double-spiral, of which one end formed the pin and the other the catch. A third form consisted of two round ornamented plates connected by a bow-shaped centre piece. In the early Iron Age the brooches of Central Europe exhibit an immense variety of forms, which are for the most part bow-shaped or harp-shaped, with spring-pins, akin to the types found in the Etruscan cemeteries of Certosa and Villanova recently explored. The Frankish group exhibits three well-defined types, viz., an imitation of animal forms, a simple disc, and a cruciform type, of which there are innumerable varieties of form. The Merovingian brooches were made in gold, silver, or bronze, adorned with precious stones, filagree-work, or enamel; but whatever the richness of the brooch, the pin was always of iron. The Scandi- navian or Northern group exhibits a similar cruciform variety more massive in form and richly chased, the ter- minating knobs fashioned into the similitude of animals’ heads. This form occurs also in Anglo-Saxon graves in England. The Anglo-Saxon brooches were exquisite works of art, ingeniously and tastefully constructed. In Kent the circular form predominates. They are often of gold, with a central boss

exquisitely decorated, the flat part of the brooch being a mosaic of turquoises, garnets on gold- foil, mother of pearl, c&c., arranged in geometric patterns, and the gold work enriched with filagree or decorated with dragonesque engravings. Sometimes the brooch was cruci- form and ornamented with chased work and settings of paste or precious stones. The Scandinavian brooches of the Viking time were oval and bowl-shaped, formed of an under shell of impure bronze gilt on the convex side, and covered by an upper shell of open chased-work ornamented With bosses, or open crown-like ornaments, or animals' heads. The geographical distribution of these peculiar brooches indicates the extent of the conquests of the Northmen. They occur in northern Scotland, England, Ireland, Iceland, Normandy, and Livonia. The Celtic group is characterized by the penannular form of the ting of the brooch and the greater length of the pin.

They are usually of bronze or silver, chased or engraved with intricate designs of interlaced or dragonesque work in the style of the illuminated Celtic manuscripts of the 7th, 8th, and 9th centuries. The Hunterston brooch, which was found at Hawking Craig in Ayrshire, is a well- known example of this style. Silver brooches of immense size, some having pins 15 inches in length, and the penan- nular ring of the brooch terminating in large knobs resembling thistle heads, are occasionally found in Viking hoards of this period, consisting of bullion, brooches, and Cufic and Anglo-Saxon coins buried on Scottish soil. In medizeval times the form of the brooch was usually a simple, flat circular disc, with open centre, the pin being equal in length to the diameter of the brooch. hey were often in- scribed with religious and talismanic formule. The Highland brooches were commonly of this form, but the disc was broader, and the central opening smaller in proportion to the size of the brooch. They were ornamented in the style so common on Highland powder-horns, with engraved patterns of interlacing work and _foilage, arranged in geometrical spaces, and sometimes mingled with figures of aninials,

BROOKE, Frances, a clever novelist and dramatic writer, whose maiden name was Moore, was born in the earlier part of the 18th century. Of her novels, some of which enjoyed considerable popularity in their day, the

most important were The History of Lady Julia Mande- ville, Hnuly Montague, and The Excursion. Her dramatic pieces and translations from the French are now wholly forgotten. She died in Jannary 1789, two days after her husband.

BROOKE, Henry, novelist and poet, was born at Rantavan, county Cavan, in 1708. His father was rector of Killinkere; his mother was a daughter of the bishop of Elphin, At an early age he entered Dublin University, where he was noticed by Swift, who predicted great things of him. About 1724 he proceeded to London, where he managed to gain the affection and esteem of Pope. He studied law in the Temple, and in 1728 married his ward and cousin, Catherine Meares, a girl of fifteen. His first literary venture appears to have been the poem Universal Beauty (1730), in which there is exceedingly little that can be admired or even tolerated. A much more successful venture was the drama Gustavus Vase. The prohibition of this play induced the author to publish it, and the sale of the printed copies was enormous. Brooke is said to have cleared 1000 guineas by it. In 1740 his health gave way ; he retired to Rantavan, and never returned to his life in London. In 1745 he was made barrack-master at Mullingar, and his well-meant pamphlet, Secret History and Memoirs of the Barracks of Ireland, excited much ill- feeling against him. He spent the remaining years of his life in literary work. His dramas were numerous, and some of them kept the stage for a considerable length of time. The work by which he is best known, The Fool of Quality, begau to appear in 1768. It is the product of the matured experience of the author, and though deficient in many of the qualities that go to form the excellence of a work of fiction, it is forcibly and clearly written, and contains much sound and advanced thinking on social problems. Brooke died in 1783. An edition of the Fool of Quality was published in 1859 by the Rev. Charles Kingsley, in whose extravagantly eulogistic preface will be found all the information we have with regard to the author’s life and character.

BROOKE, Sir James, Rajah of Sarawak, in the island of Borneo, and Governor of Labuan, was born at Coombe Grove near Bath, April 29, 1803. It is sometimes errone- ously stated that he was born in Bengal, a mistake arising from the fact that his father a member of the Civil Service

of the East India Company, had long lived there. His mother was a woman of superior understanding, and to her care he owed his careful early training. He received the ordinary school education, entcred the service of the East India Company, and was sent out to India about 1825. On the outbreak of the Burmese war, he was despatched with his regiment to the valley of the Brahmaputra ; and, being dangerously wounded in an engagement near Rung- pore, was compelled to return home (1826). After his recovery he travelled on the Continent before going to India, and circumstances led him soon after to leave the service of the Company. In 1830 he made a voyage to China, and during his passage among the islands of the Indian Archipelago, so rich in natural beauty, magnificence, and fertility, but occupied by a population of savage tribes, continually at war with each other, and carrying on a system of piracy on a vast scale and with relentless ferocity, he conceived the great design of rescuing then from barbarism and bringing them within the pale of civiliza- tion. His purpose was confirmed by observations made during a second visit to China, and on his return to England he applied himself in earnest to making the necessary pre- parations. Having succeeded on the death of his father to a large property, he bought and equipped a yacht, the “Royalist,” of 140 tons burden, and for three ycars tested its capacities and trained his crew of twenty men, chiefly in the Mediterranean. At length, on October 27, 1838, he sailed from the Thames on his great adventure. Ou reach- ing Borneo, after various delays, hc found the Rajah Muda Hassim, uncle of the reigning sultan, engaged in war in the province of Sarawak with several of the Dyak tribes, ‘who had revolted against the sultan. He offered his aid to the rajah ; and with his crew, and some Javanese who had joined them, he took part in a battle with the insur- gents, and they were defeated. For his services the title of Rajah of Sarawak was conferred on him by Muda Hassim, the former rajah being deprived in his favour. It was, however, some time before the sultan could be induced to confirm his title (Scptember 1841). During the next five ycars Rajah Brooke was engaged in establishing his power, in making just reforms in administration, preparing a code of laws, and introducing just and humane modes of dealing with the

degraded subjects of hisrule. But this was not all. He looked forward to the development of commerce as the most effective means of putting an end to the worst evils that afflicted the archipelago; and in order to make this possible, the way must first be cleared by the suppression, or a considerable diminution, of the prevailing piracy, which was not only a curse to the savage tribes engaged in it, but a standing danger to European and American traders in those seas. Various expeditions were therefore organized and sent out against the marauders, Dyaks and Malays, and sometimes even Arabs. Captain Keppel, and other commanders of British ships of war, received permission to co-operate with Rajah Brooke in these expeditions. The pirates were attacked in their strongholds, they fought desperately, and the slaughter was immense. Negotiations with the chiefs had been tried, and tried in vain. The capital of the sultan of Borneo was bombarded and stormed, and the sultan with his army routed. He was, however, soon after restorcd to his dominion. So large was the number of natives, pirates and others, slain in these expeditions, that the ‘head-money ” awarded by the British Government to those who had taken part in them amounted to no less than £20,000. In October 1847 Rajah Brooke returned to England, where he was well received by the Government; and the Corporation of London con- ferred on him the freedom of the city. The Island of Labuan, with its dependencies, having been acquired by purchase from the sultan of Borneo, was erected into a British colony,

and Rajah Brooke was appointed Governor and commander. in-chief. Ile was also named consul-general in Borneo, These appointments had been made before his arrival jy England. The university of Oxford conferred on him the honorary degree of D.C.L., and in 1848 he was created K.C.B. He soon after returned to Sarawak, and was carried thither by a British man-of-war. In the summer of 1849 he led an expedition against the Seribas and Sakuran Dyaks, who still persisted in their piratical practices and refused to submit to British authority. Their defeat and wholesale slaughter wasa matter of course. At thetime of this engage. ment Sir James Brooke was lying ill with dysentery. He visited twicc the capital of the sultan of Sala, and concluded a treaty with him, which had for one of its objects the expulsion of the sea-gypsies and other tribes from his dominions. In 1851

grave charges with respect to the operations in Borneo were brought against Sir James Brooke in the House of Commons by Joscph Hume and other members, especially as to the ‘‘ head-money ” reccived. To meet these accusations, and to vindicate his proceedings, he came to England, The evidence adduced was so conflicting that the matter was at length referred to a Royal Commis- sion, to sit at Singapore. As the result of its investigation the charges were declared to be “not proven.” Sir James, however, was soon after deprived of the governorship of Labuan, and the head-moncy was abolished. In 1867 his house in Sarawak was attacked and burnt by Chinese pirates, and he had to fly from the capital, Kuching. With a small force he attacked the Chinese, recovered the town, made a great slaughter of them, and drove away the rest, In the following year he came to England, and remained there for three years. During this time he was smitten with paralysis, a public subscription was raised, and an estate in Devonshire was bought and presented to him. He made two more visits to Sarawak, and on each occasion had a rebellion to suppress. He spent his last days on his estate at Eurrator in Devonshire, and died there, June 11, 1868, Notwithstanding differences of opinion with regard to some of Sir James Brooke’s proceedings, it is not to be denied that he was a man of the highest personal character. In his public conduct he was undoubtedly actuated by a noble ambition, and he displayed rare courage both in his conflicts in the East and under the charges advanced against him in England. His Private Letters (1838 to 1853) were pub- lished in 1853. Portions of his Jowrnal have also been edited by Captains Mundy and Keppel.

BROOKES, Josuua, English anatomist, was born in 1761. Ata very early agehe devoted himself to medical science, and attended the Icctures of the most eminent sur- geons in London and Paris. After he had completed his studies, he began to teach anatomy and physiology, and continued to do so during forty years of his life, training no fewer than 5000 students, many of whom afterwards became famous in different parts of the world. His museum, which contained specimens not only of human and comparative anatomy, but also of natural history m all its branches, was arranged on a system combined from the various methods of Cuvicr, Blumenbach, Linneus, and other naturalists, and cost its proprietor about £30,000. Many of his treatiscs are printed in the 7’ran- sactions of the various scientific

societies of which he was a member. He died suddenly at London, January 10,

1838.

BROOKLYN, a city of the United States of North America, capital of King’s County, New York, is situated on the western end of Long Island, immediately opposite the city of New York, from which it is separated by the East River, an arm of the sea, about three-quarters of a mile in breadth. Lat. 40° 41’ N., long. 73° 59’ W. The city now includes not only Brooklyn proper, but also, by 4

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recent act of the legislature, all the county towns of the western part of the island, so that it now covers a larger area than any other city in the United States. From Hunter’s

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Plan of Brooklyn.

Point to Bay Ridge it has a river frontage of nearly nine miles. The ground on which the city is built exhibits considerable juequalities of surface, and thus increases the picturesqueness of its appearance, while the practical disadvantages of such

a site have becn overcome by skilful engineering. The streets, with the exception of Fulton Street, the principal thoroughfare, are generally straight, have a width of from 60 to 100 feet, and cross each other at right angles. Chief among the public buildings are the city-hall (an edifice of white marble dating from 1845-6), the county court- house (erected in 1862), the county jail (1837), the peni- tentiary, the state arsenal, and the city hospital. Besides the last-mentioned institution the benevolent establishments of Brooklyn include the Long Island College Hospital, St Mary’s and St Peter’s hospital, the female orphan asylum, the marine hospital, the Graham institution for the relief of aged women, and numerous other charities. The churches number between 200 and 300, many of them are beautiful buildings, but none claim special notice except the new Roman Catholic Cathedral, which is only rivalled by the corresponding building in New York. Of literary and artistic institutions the most remarkable are the Mercantile Library (dating from 1857), the Brooklyn

Institute (founded by Augustus Graham), the Long Island Historical Society, the Art Association, the Academy of Design, the Academy of Music, and the Philharmonic Society. There are three theatres, and an opera house, which dates from 1862. The educational establishments comprise the Packer Collegiate Institute (founded in 1853) for female education, the Polytechnic Institute for boys (started in 1854), the Adelphi Academy for both sexes (founded in 1863), the Roman Catholic College of St John, upwards of fifty public grammar and primary schools, and numerous private institutions. Though Brooklyn in some measure serves as a suburb of residence to New York, and many of its inhabitants carry on their business in the larger city, its own industrial and commercial activity is very great. It has flour-mills, sugar-refineries, lager-beer breweries, distilleries, tobacco factories, and chemical works ; and manufactures steel, brass, and copper wares, engines, machinery, and printing-presses. The grain trade is of enormous extent, the warehouses being capable of holding about 12,000,000 bushels; and sugar, coffee, oil, hides, and

wool are also largely imported. Most of the river front- age is lined with basins, wharves, and docks, the most im- portant being the Atlantic dock (constructed about 1846) with an area of 40 acres, the Erie basin of 60 acres, the Brooklyn basin of 40 acres, the Wallabout basin, and the United States navy yard. This last occupies a total area of 144 acres, and has extensive wharfage, and a dry dock, built of granite, at a cost upwards of $2,113,000. The city is supplied with water by an claborate system of reservoirs, of which the most distant is 19 miles away in the vicinity of Hempstead. Its principal pleasure ground is Prospect Park, which embraces more than 600 acres, partly covered with forest trees. A lake of 50 acres is being excavated, and there is a large well 60 feet in diameter, which will furnish the necessary water to keep it fresh. Washington Park, on the site of ancient fortifica- tions, is also a pleasant spot, and there are various other open grounds throughout the city. At the west end is situated the well known Greenwood cemetery, which con- tains about 520 acres of finely-varied ground, a good part of which is still adorned with natural wood.

The traffic of the city is facilitated by tramway lincs ; and its conection with New York, which has hitherto been dependent on steam-boat ferries, is to be rendered more convenieut by a large bridge in course of construction. This bridge, which crosses the East River near its western extremity, is 85 feet wide, and has a river span of 1596 and a total length of 5989 feet. The total cost is estimated to exceed $13,000,000.

The first settlement of Brooklyn, or as it was formerly called Breuckelen, dates from 1636, when a few Walloon colonists took up their residence on the spot that still bears the name of Wall- about (Waalbogt or Walloons' Bay). English and Dutch settlers followed ; and in 1667, a patent or charter was granted to the town by Governor Richard Nicolls. The first church had been erected the previous year. In 1698 the population only amounted to 509 persons, of whom sixty-five were slaves. In 1776 the site of the present town was the scene of the battle between the Americans and British, which is usually known as the battle of Long Island. In 1816 Brooklyn was incorporated as a village, and in 1834 it became a chartered city. Williamsburg was founded by Richard W. Woodhull, in the early part of the present century ; it attained the rank of a village in 1827, and was recognized as a city in 1851. The population of Brooklyn was in 1800, 3298 ; in 1820, 7175; in 1830, 15,292; in 1840, 36,233; and in 1850, 96,850. In 1855 the number of inhabitants within the new boundaries was 205,250, of whom 48,367 belonged to Williamsburg; in 1860 this had increased to 266,661, and in 1870 to 396,099, and now (1876) it is estimated at 500,000. (See Stile's History of the City of Brooklyn, 3 vols., 1867-70.)

BROOKS, Cartes Surgiey, an English novelist, aud dramatic and miscellaneous writer, was born in 1815. He was the son of an eminent London architect, and received his education at a public school in the city. Applying himself to the study of law, he passed the usual examina- tion for admission; but instead of pursuing further the professional path, he turned aside and began to feel~his way towards the broader field of literature, He wrote, sometimes alone, sometimes in conjunction with others, slight dramatic pieces of the burlesque kind, and became a newspaper reporter. In this capacity he was for many years engaged on the Morning Chronicle, For the same paper he afterwards undertook to write the parliament- ary summary, and was appointed special commissioner to carry out

investigations on the subject of labour and the poor. For this purpose he travelled in Southern Russia, Egypt, and Syria; the results of his inquiries appearing first in the form of letters to the editor, and afterwards in a separate volume, under the title of The Russvans of the South (1856). Brooks was for many years on the staff of the Jllustrated London News, contributing the weekly article ou the politics of the day, and the two series entitled ‘Nothing in the Papers” and “By the Way,” besides other occasional pieces. In 1854 he joined the staff of

Punch, and noteworthy among his numerous contributions were the weekly satirical summaries of the parliamentary debates, entitled “The Essence of Parliament.” His long service as newspaper reporter gave him special aptitude for this playful parody. In 1870, on the death of Mark Lemon, “ dear old Shirley,” as his friends used to call him, was chosen to succeed to the editorial chair. He added to his reputation by several good novels, the first of which, Aspen Court, was published in 1855. It was followed by The Gordian Knot (1860), The Silver Cord (1861), and Sooner or Later (1868). Brooks was a great Jetter- writer, deliberately cultivating the practice as an art, and imitating the style in vogue before newspapers and telc- graphs suppressed private letters. He had an astonishing memory, was brilliant as an epigrammatist, and was a great reader, and a most genial and admirable companion. Though he nearly reached his sixtieth year, he retained all the charm of youthful freshness and brightness. He was in his element with a group of children, reading to them, sharing their fun, and always remembering the birthdays. He died in London, February 23, 1874. His remains were interred, near those of his friends Leech and Thackeray, in Kensal Green cemetery. Asa novelist Shirley Brooks holds a high rank, but not the highest. His novels prob- ably suffered in some respects froni the manner of their pro- duction, the slow piece-meal writing for periodical literature. But they possess qualities of an order which will save them from the swift oblivion that overtakes so many books of their class. He shows in them a large knowledge of men, especially of Londoners, a fair acquaintance with the world of books and the world of art, a fertile imagination, and much critical acumen. And these qualities are set off to the best advantage by the charm of an admirably vigorous and polished style. In

this respect, and in the force of his refined satire, he bears some likeness to his greater friend, the author of Vanity Fair.

BROOME, Witt1am, the coadjutor of Pope in translat- ing the Odyssey, was born at Haslington in Cheshire, in 1689. He was educated upon the foundation at Eton, and was captain of the school a whole year, without any vacancy occurring by which he might have obtained a scholarship at King's College. Being by this delay super- annuated, he was sent to St John's College by the contri- butions of his friends, and obtained a small exhibition there, His fondness for metrical composition was then such that his companions familiarly called him " Poct." He appeared carly in the world as a translator of the Jlad into prose, in conjunction with Ozell and Oldisworth, the translation being superior, in Toland's opinion, to that of Pope. Broome was introduced to Pope, who was then visiting Sir John Cotton at Madingley, near Cambridge, and gained so much of his esteem that he was employed to make extracts from Eustathius for the notes to the transla- tion of the Ziad, and in the volumes of poetry published by Lintot, commonly called Pope's Miscellanies, many of his early pieces were inserted.

When the success of the J/iad gave encouragement to a version of the Odyssey, Pope, weary of the toil, called Fenton and Broome to his assistance ; and taking only half the work upon himsclf, divided the other half between his partners, giving four books to Fenton and eight to Broome. To the lot of Broome fell the second, sixth, eighth, eleventh, twelfth, sixteenth, eighteenth, and twenty-third, together with the burden of writing all the notes. The price at which Pope purchased this assistance was £300 paid to Fenton and £500 to Broome, with as many copies as he wanted for his friends, which amounted to £100 more. The payment made to Fenton is known only by hearsay ; Broome's is very distinctly told by Pope in the notes to the Dunciad. It is evident that, according to Pope's own esti-

of Burgundy, was born at Dijon in 1709.

mate, Broome was unfairly treated. If four books could merit £300, eight, and all the notes, equivalent at least to four more, had certainly a right to

more than £600. Broome probably considered himself as injured, for he always spoke of Pope as too much a lover of money, and Pope pursued him with avowed hostility. He not only named Broome disrespectfully in the Dunciad, but quoted him more than once in the Bathos, as a proficient in the art of sinking, It has been said that they were afterwards reconciled, but their peace was probably without friendship. Broome after- wards published a Jfiscellany of Poems. He never rose to very high dignity in the church; he became rector of Sturston in Suffolk, where he married a wealthy widow; and afterwards, when the king visited Cambridge, in 1728, he was made doctor of laws. In the same year he was presented to the rectory of Pulham. Towards the close of his life he amused himself with translating some of the Odes of Anacreon, which he published in the Gentleman's Magazine, under the name of Chester. He died at Bath in 1745, (See T. W. Barlow, Memoir of William Broome, 1855.) BROSELEY, formerly BuwarprEsLEy, a market-town

on the Severn, in the county of Shropshire, 146 miles from

London. It is a place of considerable trade in iron, having near it productive mines of that mineral, as well as of coal. There are also manufactories of tobacco-pipes, bricks, and tiles. Population of parish in 1871, 4639.

BROSSES, CHaRLEs DE, first president of the parhament He studied law with a view to the magistracy, but the bent of his mind was towards literature and the sciences. He travelled through Italy in 1739 in company with his friend M. de Sainte- Palaye; and on his return to France published his Lettres sur PEtat Actuel de la Ville Souterraine d' Herculaneum, Dijon, 1750, 8vo, which was the first work upon that inter- esting subject. A collection of letters, written during his Italian tour, entitled Lettres Historiques et Criteques, in three vols. 8vo, was published at Paris after hisdeath. In 1760 he published a dissertation, Sur le Culte des Dieux Fitiches, 12mo, which was afterwards inserted in the Encyclopédie Méthodique. At the solicitation of his friend Buffon, De Brosses undertook his Hzstozre des Nuvigations aux Terres Australes, which was published in 1756, in two vols. 4to, with maps. It was in this work that M. de Brosses first laid down the geographical divisions of Australasia and Polynesia, which were afterwards adopted by Pinkerton and succeeding geographers.

In 1765 appeared his Trazté de la Formation Mécanique des Langues, a work distinguished by much research, and containing an admirable exposition of the purely empirical theory of the origin of language. Full recognition of its merits will be found in Dr Tylor's work, Primitive Culture. M. de Brosses had been oceupied, during a great part of his life, on a translation of Sallust, and in attempting to supply the lost chapters in that celebrated historian. At length in 1777, he published L' Histoire du Septiéme Siecle de la République Romame, 3 vols. 4to, to which is prefixed a Icarned life of Sallust, reprinted at the commencement of the translation of that historian by De Lamalle. These literary occupations did not prevent the author from discharging with ability his official duties, nor from carrying on a constant and exten- sive correspondence with the most distinguished literary characters of his time. In 1758 hesucceeded the Marquis de Caumont in the Académie de Belles Lettres ; but he was never admitted a member of the French Academy, in con- sequence, it is said, of the opposition of Voltaire.

Besides the works already mentioned, he wrote several memoirs and dissertations in the collections of the Academy of Inscriptions, and in those of the Academy of Dijon. He also contributed various articles to the Dzcteonnaire Encyclopédique, on the subjects of grammar, etymology,

music, &c., and he left behind him several MSS., which were unfortunately lost during the revolution. He died in 1777.

BROUGHAM, Henry, first Lord Brougham and Vaux, man of letters, man of science, advocate, orator, statesman, aud Lord High Chancellorof England, was bornat Edinburgh

- on the 19th September 1778, and died at Cannes in France

on the 7th May 1868. During a great portion of a life extended to the unwonted term of ninety years, but espe- cially in the third and fourth decades of the present century, from 1820 to 1840, no Englishman in any civil career played so conspicuous a part in public affairs or enjoyed so wide a fame as Henry Brougham. His indomitable energy, his vehement

eloquence, his enthusiastic attachment to the cause of freedom, progress, aud humanity, to which he rendered so many signal services, caused him to be justly regarded as one of the most extraordinary and illustrious men of his age and of his country. He brought to all he undertook a vigour and variety of intellect almost un- paralleled ; for his ambition was to excel in all things, and he seemed to aspire to universal fame. “There go,” said Mr Rogers, as he drove off one morning from Panshanger, “Solon, Lycurgus, Demosthenes, Archimedes, Sir Isaac Newton, Lord Chesterfield, and a great many more iu one post-chaise.” No man ever commanded with more effect the applause of listening senates, or could better rouse the depths of popular enthusiasm. His boundless command of language, his audacity, his memory stored with every sort of knowledge, his animal spirits and social powers, gave him the lead everywhere, and he was not slow to take advantage of his splendid talents and acquirements in every mode of life. His striking and almost grotesque personal appearance added to the etfect of his voice and manner ;— a tall disjointed frame, with strong bony limbs and hands, that seemed tu interpret the power of his address; strange angular motions of his arms; the incessant jerk of his harsh but expressive features ; the exquisite modulations of his voice, now thundering in the loudest tones of indig- nation, and now subdued to a whisper which penetrated to the very walls of the House of Commons and riveted the attention of the audience ; a power of mingling tenderness and scorn, argument and invective, in sentences which rose in accumulated involutions, but righted themselves at last, all contributed to give him the magical influence which a great actor exerts over a crowded theatre. Yet in the midst of all his triumphs, the companions of his early life and those who were best acquainted with his cha- racter, knew that his extraordinary gifts and powers did not include all the elements of true greatness. He wanted that moral elevation which inspires confidence and respect, and which is even more essential than genius to the highest achievements and the most lasting fame. At times his eccentricity rose to the verge of insanity, as if the reins by which he guided his fiery temper had slipped from his hand. At the bar there were greater and better advocates ; on the bench there were more sure and learmed judges ; in science he made no real discoveries ; in letters, notwithstanding the prodigious activity of his pen, he has left no work of lasting celebrity ; and although as an

orator he was in his best days unequalled, he himself –

outlived the evanescent glories of his eloquence. Hence it has come to pass, that within fifty years of his most brilliant period, and within ten years of his death, the figure of Lord Brougham has already become somewhat indistinct. The generation which was fascinated by his eloquence and amused by the endless coruscations and evolutions of his character is passing away, and it has become a task of difficulty to preserve a faithful record of So strange and wonderful a phenomenon. That, however, which remains, and must ever remain as the noblest

memorial of his life, is his unvarying devotion to the pro- gress of liberal opinions, to the reform of the law, to popular education, to the emancipation of the negro race from slavery, and to the maintenance of peace. In this sense, he was, as he was once portrayed by an accomplished caricaturist of the day, a citizen of the world, Of every human right, Brougham was a champion; of every human wrong, an avenger.

We shall not attempt in this notice of his life to follow the innumerable incidents of his long and varied career, or to enumerate the speeches and writings which he threw off like sparks on every imaginable occasion. Our object is rather to convey to the reader a just impression of the man, as he appeared to those who knew him as he was, and who still recall the transcendent effects of his energy. Lord Brougham has been unfortunate in his biographers. The memoir of him prepared by Lord Campbell, aud published after the death of the author and of the subject of it, is written in a carping and derisive tone, unworthy of a distinguished rival. Lord Brougham’s autobiography, which also appeared after his death, was begun when he had passed his eightieth year; his faculties were impaired, his memory was failing, and the work is full of inaccuracies, which his successors were not authorized to correct. Yet we are indebted to it for some interesting particulars of his early life, which no one but himself could have preserved.

In his later years, after Lord Brougham had taken his seat Ancestry.

in the House of Peers, he was wont to trace his paternal descent to Udardus de Broham, in the reign of Heury II.; and some memorials of that doughty crusader still decorate the baronial hall at Brougham. He claimed, besides, an infusion of pure Norman blood from Harold, Lord of Vaux in Normandy, whose title he added to his own. But these were the delusions of an enthusiastic mind. No real connection has been established between the ancient lords of Brougham Castle, whose inheritance passed by marriage from the Viponts into the family of the De Cliffords, and the Broughams of Scales Hall, from whom the chancellor was really descended. Brougham Hall was purchased from one James Bird by Brougham's great-grand-uncle, who.left it to his grandfather, an active attorney and agent to the duke of Norfolk for his grace's Cumberland property. His father, Henry Brougham, was sent to Eton, and afterwards travelled on the Continent. The sudden death of a young lady to whom this gentleman was about to be married, deeply affected him: he started in 1777 for a short tour in Scotland, but as fate would have it he never recrossed the border or revisited Brougham. In Edinburgh he took lodgings at the house of Mrs Syme, the widow of a clergyman, and a sister of Principal Robertson, the historian. This lady had a daughter of singular beauty and merit. Mr Brougham fell in love with her and agreed to settle in Edinburgh as a condition of obtaining her hand, They were married by Dr Robertson, and in the following year the eldest son, the illustrious subject of this notice, was born at No. 19 St Andrew Square. No feeling in life was more deeply rooted in the heart of Lord Brougham than his intense affection and veneration for his admirable mother. He repaid her early care and judicious guidance by the most ardent and unvarying devotion. He will- ingly laid all the triumphs of his career at her feet ; and she lived to see him attain the proudest heights of fame and power. Nor was he less attached to the memory of his great uncle, the principal. To his dying day he would retrace with affectionate emotion the influence that accom- plished scholar and excellent man had upon his own education. He well remembered his person and his precepts, for Dr Robertson only died in 1793, and nearly seventy years afterwards Lord Prougham, presiding over the Social Science meeting at Glasgow, was touched by

Early life.

hearing a “paraphase,” by his great kinsman, sung in Glasgow cathedral, the authorship of which was probably known only to himself. His parentage on his mother’s side being Scotch, and Scotland the place of his birth and education—and, indeed, of his entry into life—he naturally retained many Scottish peculiarities of manner and intona- tion ; yet Brougham was not a Scotchman, he was some- what eager to throw off his Scottish character, and he said in after life that there was no place he should visit so unwillingly as Edinburgh.

From his earliest age Brougham showed signs of extra- ordinary talents and energy. His mother averred that he

spoke distinctly several words when he was eight months.

and two weeks old, In his cradle he was the terror of his nurses, and as he grew older his grandmother compared him to the admirable Crichton from his excelling in every- thing he undertook. When barely seven he was sent to the High School of Edinburgh, where he gained a triumph over Luke Fraser, his tutor, by successfully justifying the use of some Latin words which Fraser had condemned in

an exercise, and in Angust 1791, when he was not yet

thirteen, he left the schvol as dux, or head of the fifth form, taught by the headmaster, Dr Adam. He entered the university of Edinburgh in the winter of 1792, and in addition to the study of Greek under Professor Dalzell, he applied himself to the natural sciences under Professor Playfair, and especially to mathematics. At twelve one’ of his cousins met him with a huge quarto under his arm, which turned out to be Laplace’s Mécanique Céleste, in French. In the mathematical class he hit upon the binomial theorem before he had been teught it; and he was soon conversant with the Principia of Newton. It was characteristic of his astonishing memory that he carried with him through life all he had learned in boyhood. We have seen him in later years vary the monotony of a legal argument by working a

problem in algebra, or exchanging a Greek epigram with Lord Wellesley, in the inidst of grave debates of politics or of laws. In 1794 he set to work to master the fluxional calculus ; and in the following year he sent a paper to the Royal Society on some new phenomenon of light and colours, which was printed inthe Transactions of that learned body. A paper on porisms was published in the same manner in 1798, and in 1803 his scientific reputation was so far established that he was elected a fellow of the society. But these efforts were more remarkable for their precocity than for their novelty. In spite of his taste for mathematical reasoning Brougham's mind was not an accurate or exact one; and his pursuit of the physical sciences was rather a favourite recreation than a solid advantage to him. He continued his experiments in optics-through life, however, and would sometimes impart observations, which he took for discoveries, to the French Academy of Science. An enthusi- astic discourse on Newton and the Newtonian philosophy was written by him in his eighty-fifth year, when a statue of the great philosopher was erected at Grantham, and at that age he was still fond of commenting upon the Principia, But whilst Henry Brougham was following lectures in every branch of knowledge at. the university, his inherent animal spirits and sociable nature made him the ring- leader of the gayest and wildest youths of the time. Practical jokes, wrenching knockers, braving the watch, and wasting the small hours of the night, were pastimes as familiar to him as the gravest discussions, " Looking back," says he, in his Aemoirs, "to these pranks reminds me of the inexhaustible fund of spirits one possessed, and how that capital foundation of never-tiring energy and endless restlessness enabled some of us to work on with unfailing strength to the end of life ; and even now, writing at nearly ninety years of age, I can recall them—not. boys'

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but young men's freaks—with pleasure and even cxulta: tion ; yet I agree with the old beggar Ochiltree, in the best of all Scott's works, saying —'Aye, aye! they were daft days thae, but they were a' vanity and waur.'" The spirit of these "daft days," these mad-cap hours, clung to Brougham

through life; and long after he had held hig great seal of England, perhaps while he held it, he was just as ready to play his part in scenes of the wildest merriment as he had been at the university.

As early as 1792 he founded a debating society of a very juvenile character, to which several persons afterwards distinguished in life belonged. This society, however, sub- sequently merged in the “ Speculative Society,” which hada hall and library of its own in the college. Here Brougham, Horner, Jeffrey, Cockburn, Murray, and Moncreiff tried their early powers, and gave the promise of that eloquence which eventually placed them all in Parliament or on the bench of justice. Brougham surpassed them all, not, indeed, in depth of knowledge or soundness of reasoning, but in the astonishing flow of his language, his readiness in reply, the grace of his elocution, and his withering gift of sarcasm and ridicule, that of oratory was unquestionably the first. his natural strength and of the advantages to be derived from this faculty in a country which is largely governed and swayed by rhetoric, he applied himself with peculiar zeal to the art of public speaking. He made himself perfectly conversant with the great masterpieces of ancient eloquence, which he knew toa great extent by heart; he ever maintained that the highest effects of the orator could only be achieved by diligent preparation and constant study ; he bestowed extreme care upon the modulation of his voice, which was one of extraordinary compass and strength; even his gestures and attitudes were the result of thought, and it was remarked that in concluding the

elaborate peroration of his speech on the queen’s trial, –

he assumed the majestic bearing with which a minister of the Scottish Church invokes the blessing of God in dismissing his congregation. Both by study and by practice, then, oratory was his chief art, and he con- tinued through life to cultivate it with the enthusiasm of an actor, who never entirely attains to the fulfilment of his own ideal. No doubt, in the resistless’ torrent of his invective, in appeals to the passions of his audience, in the rapid and lucid exposition of facts, in the skilful arrange- ment of his discourse, which was highly artificial, and im the power of wielding enormous and intricate sentences, Brougham was unrivalled. He entered the House of Commons, as we shall presently see, soon after the voices of Fitt

and Fox had been hushed for ever. Except Canning, there was no one in Parliament who could be

compared to Brougham, and he rapidly rose to a height of,

distinction which became at one moment supremacy. Yeton looking back, even to the most celebrated and successful of his efforts, subsequently revised and published by himself, little remains which can lay any claim to the dignity of classic eloquence. Notwithstanding Lord Brougham's study and enthusiastic admiration of Demosthenes, nothing was more unlike the stern simplicity and grandeur of the great Athenian—" Densus, et brevis, et semper instans sibt" —than the declamation of Lord Brougham. The force of the current was wasted in a flood which overleapt its banks and broke its barriers. The effect was more intense than permanent. Even in the judgment of his own con- temporaries, Canning surpassed him in wit; Plunket in felicity of diction; Lyndhurst in terseness, policy, and cogency of argument ; Ellenborough in dignity : but none of them possessed his marvellous versatility, and it seemed as if he had borrowed from each of these great speakers @ share in some gift, which they possessed in higher perfec-

Of all the remarkable powers he possessed Oratorical Conscious of Powers.

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tion than himself. Of all the branches of human know- ledge to which Brougham directed his attention, and in which he attained to more or less proficiency, the study of the law was the least congenial to him. He speaks of it in early life as "the cursedest of all cursed pro- fessions," and even in 1808, when he had come to England and acquired a certain degree of fame, he writes to Lord Grey: "Odious as that profession is (as God knows there are few things so hateful), I am quite clear that it would be folly in me to neglect so certain a pro- spect." He added that he was setting out on the Northern Circuit with too slender a provision of law,—his stock of practice being so small that he had never yet seen a nisi prius trial,—but thought he might push through the thing with a little presence of mind and quickness. Fortunately for his future career, he had followed for two years the lectures of the professor of civil law in the university of Edinburgh ; and, as Lord Campbell admits, so far legalized his mind that he had gained a

considerable insight into both Roman and feudal jurisprudence. These seeds of law, implanted in a powerful intellect, gave him a breadth of view not always combined with the techni- ealities of the English bar.

On the 23d May 1800 he was admitted to the Faculty of Advocates. It does not appear that he ever held a brief in the Court of Session, but he went a circuit or two, where he defended or prosecuted a few prisoners, and played a series of tricks on the presiding judge, Lord Esk- grove, which almost drove that learned person to distrac- tion. The Scottish bar, however, as he soon perceived, offered no field sufficiently ample for his talents and his ambition. He resolved to transfer himself to London. He had already appeared as junior counsel in a Scotch appeal to the House of Lords. In 1803 he was entered at Lincoln's Inn, and on the 22d November 1808 he was called to the English bar by that learned society. It is a curious indication of the importance already attached to him as a party man, that the Tory attorney-general and the solicitor-general cf the day thought it worth while to come down to Lincoln's Inn to endeavour to oppose his special call, which had been asked for, but was defeated by a single vote. He was called in the ordinary course in the ensuing term.

_ in this interval of time, however, he had struck a fresh vein which ensured to him power, popularity, celebrity, aud for the time a subsistence. The Kdin- burgh Review was founded in the autumn of 1802, under circumstances which have often been related, by the young and aspiring lights of the northern metropolis. The polished style and judginent of Jeffrey, the wit of Sydney Smith, the wisdom of Horner, brought to bear on the literature and politics of the day, and amongst them all Brougham was the most ready, the most versatile, the most satirical, and eager to fly at any game which might be on foot. To the first four numbers of the Review Brougham contributed twenty-one articles; to the first twenty numbers eighty articles, wandering through every imaginable subject—science, politics, colonial policy, literature, poetry, Surgery, mathematics, and the fine arts. The article on Lord Byron's.Hours of Idleness, which stung the poet into a satirist, and gave the world English Bards and Scotch Reviewers, was attributed to his pen; and Lord Cockburn used to relate that on one occasion Brougham wrote off an entire number, including one article on the operation of lithotomy and another on the music of the

Chinese. What, however, was of more importance to the youthful author and to the world, was that Brougham stood henceforth indissolubly pledged to the cause of the Liberal party, and to those principles of progress and reform to which he was destined to render so many signal services.

‘attached to the cause. were suddenly’

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The Edinburgh Review is the standard of that cause, and Brougham never rested until he had planted it on the loftiest battlements of the fortress. The prodigious success of the Jteview, and the power he was known to wield in ait made him a man of mark from his first arrival in London, Removal to He was welcomed at Holland House. He obtained the London. friendship of Lord Grey and the leading Whig politicians.

His wit and gaiety made him an ornament of society, and

he sought to extend his literary reputation by the publication

of an elaborate work on the colonial policy of the empire.

But his hopes of obtaining a seat in Parliament were not

yet realized. He was still eating his commons at Lincoln’s

Inn. He was still in search of a career. Thus it fell out

that, in 1806, Mr Fox being then Secretary of State, he

was appointed secretary to a mission of Lord Rosslyn and

Lord St Vincent to the court of Lisbon, with a view to counteract the anticipated French invasion of Portugal.

The mission lasted two or three months 3 it led to no results. Brougham came home out of humour and out of pocket; and meantime the death of Mr Fox put an end

to the hopes of the Whigs and to the broad-bottomed –

administration, The party to which Brougham had attached

himself remained out of office for three-and-twenty years. Brougham was disappointed by the abrupt fall of the ministry, and piqued that his Whig friends had not pro- vided him with aseat in Parliament, the more so as some of his early friends and rivals were already launched on their political career. Nevertheless, he exerted his pen with prodigious activity during the election of 1809 ; and Lord Holland declared that he had filled the booksellers' shops with articles and pamphlets. The result was small. No seat was placed at his own disposal. He was too poor to contest a borough ; and Perceval and Eldon obtained a majority greater than the majorities of Addington or Pitt. Fortunately for Brougham two questions at this time arose, which gave him a strong hold on the feelings and com- mercial interests of the country ; and he was not slow to take advantage of them and lend them all the support of his energy and genius. When he entered public life the aboli- Slave tion of the slave-trade was well nigh carried by the trade. untiring exertions of Wilberforce, Thornton, Clarkson, Macaulay, and others. An immense organization had been formed, more especially by the Quakers and other non- conformists, to bring the whole force of public opinion, awakened by the call of humanity and justice, to bear upon the horrors of a system which was still defended by the West India interest and the Government. Brougham allied himself to the leaders of this movement, and he remained through life not only faithful, but passionately He combated, in and: out of Parliament, every attempt to elude the restrictions on the trade in man. One of the first measures he carried in the House of Commons was a bill to make the slave-trade felony. He laboured incessantly to induce foreign couutries to abolish the abhorred traffic, and he had at length the happiness, as Chancellor of England, to take a part in the final measure of negro emancipation throughout the British colonies, These services endcared him to a class of highly couscientious and influential persons, with whom he might not otherwise have been closely connected, and their support was of no small effect on the greatest triumph of his life, his election for the county of York in 1830, Although till 1808 Brougham had uo practice at the English bar, he had argued some Scotch appeals in the House of Lords and some prize cases at the " Cock-pit." He

had acquired some knowledge of international law, and some experience of the prize courts. This circumstance probably led to his being retained as counsel for the Liverpool merchants who had petitioned both Houses of Orders in Parliament against the Orders in Council, framed ‘in retalia-~ Ceuncil

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tion for the Berlin and Milan decrees. Brougham con- ducted the lengthened inquiry which took place at the bar of the House, and he displayed on this occasion a mastery over the true principles of political economy and interna- tional law which at that time no one else possessed. It seems incredible (though even now the delusion is not

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but, on the contrary, when in later years differences arose between himself and the Whigs, he leaned rather to the Conservative side and he was uniformly opposed to any measure whieh might over- throw the balance of the constitution.

But in the years he spent out of Parliament occurrences took place which gave ample employment to his bustling aetivity, and led the way to one of the most important passages in his life,

He had been introduced in 1809 by Lord Dudley and Sir William Adviser f Drummond to the society of the Princess of Wales, whose house at Prin ‘ Kensington, and afterwards at Blackheath, was the resort of the Wa]

entirely dissipated) that the Government of a great com- mercial nation should ever have thought that one of the smal |

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most effectual and essential modes of carrying ou war and destroying an enemy is to shut out the trade of neutrals, not perceiving that such measures react with at least equal force against ourselves, and destroy the very sinews by which the burden of war can be sustained. The trade of the country was

in truth suffering more from these fatal restrictions than from the war itself; and nothing in the whole collection of Lord Brougham's harangues is more forcible or more ably reasoned than the speeches in which he described those sufferings, and denounced the cause of them.

Nevertheless, in 1808, he was unsuccessful. Neither the evidence taken during a six months' inquiry nor the eloquence of the impassioned advocate prevailed. It was not until 1812, when Brougham was himself in Parliament, that he resumed his attack on the Orders in Council with increased authority and vigour, aided by Mr Baring, and still more, perhaps, by the peril and disgrace of the quarrel with America, and he ultimately conquered. No answer was made to his great speech on that occasion, except an intimation from the Treasury bench that the Orders in Council would be revoked. Of this great triumph Brougham afterwards said: "It was second to none of the efforts made by me, and not altogether without success, to ameliorate the condition of myfellow-men. In these I had the sympathy and aid of others, but in the battle against the Orders in Council I fought alone."

most agreeable society in London. Canning, Granville Leveson, Dudley, Rogers, and Luttrell were constantly there. But it was not till 1812 that the princess consulted him on her private affairs, after the rupture between the Prinee and the Whigs had beeome more decided. From that time Brougham, in conjunction with Mr Whitbread, became one of the princess's chief advisers; he was attached to her service, not so much from any great liking or respect for herself, as from an indignant sense of the wrongs and insults inflicted upon her by her husband. We shall not attempt to follow the details of these deplorable transactions, whieh are fully related elsewhere, but one memorable scene, as related by Lord Brougham, cannot be passed over in silence. The Princess Charlotte, irritated and alarmed by her father's threats to break up her household and to marry her to the Prinee of Orange, escaped in July 1814 from Warwick House, flung herself into a hackney coach in Cockspur Street, and drove to her mother's residence in Connaught Place. Mr Brougham, who was dining with a friend, was imme- diately sent for, and on his arrival, half asleep from fatigue, found with extreme surprise what had occurred. The duke of Sussex, the duke of York, Lord Chancellor Eldon, the bishop of Salisbury, and others subsequently arrived, but except the royal dukes, none of these personages were admitted toan audience. Brougham, a young bartis- ter of thirty-six, became and remained the chief adviser of this young princess of eighteen, the heiress to the crown. His advice to her was, —*' Return at once to Warwiek House or Carlton House, and on no account pass a night elsewhere." The debate was long and painful ; the grievances of the princess were numerous. At length, as day began to dawn, Brougham took her to the window, and pointing to the empty street and park, said, ''In a few hours these thorough- fares will be crowded. I have only to show you from this window to these multitudes, they will rise in your behalf; Carlton House will be attacked ; troops will be called out; blood will be shed ; and whatever be the result, it will be known that your running away was the cause of this mischief. You would never get over it.'

Parlia- It was considered imprudent and impossible that a man so gifted | This remonstrance prevailed, and the princess returned to Carlton mentary and so popular as Brougham had now become should remain out | House with her uncle the duke of York at five in the morning, life. of Parliament,

and by the influence of Lord Holland, the duke of | This anecdote is so graphically told by Lord Brougham in several

Bedford was induced to return him to the House of Commons for the borough of Camelford. He took his seat early iu 1810, having made a vow that he would not open his mouth fora month. The vow was kept, but kept for that month only. He spoke on the fifth March in condemnation of the conduct of Lord Chatham at Walcheren, and he went on speaking for the rest of his life. In four months, such was the position he had acquired in the House that he was regarded as a candidate for the leadership of the Liberal party, then in the feeble hands of George Ponsonby. Some little time before a squib of infinite drollery was published in the New Whig Guide, by Lord Palmerston, under the significant title of “Trial of Harry Brougham for Mutiny.” ‘The mutiny consisted in his ealling the Right Honourable George Ponsonby an ‘‘old woman.” When the negotiation took place in 1812 between the Prince Regent and Lords Grey and Grenville for the formation of a Whig Government, it was expected that the presidentship of the Board of Trade would be accepted by Brougham, who was not unwill- ing to quit the bar altogether for political office. But this gleam of parliamentary success and official anticipation soon vanished. The Tories continued in power. Parliament was dissolved. Camel- ford had passed into other hands. Brougham was induced to stand for Liverpool with Mr Creevy against Canning and General Gas- coyne. The Liberals were defeated by a large majority, and what made the sting of defeat more keen was, that another seat was speedily provided for Creevy, whilst Brougham was left out in the cold. He remained out of Parliament during the four eventful years, from 1812 to 1816, which witnessed the termination of the war, and he did not conceal his resentment against the Whigs. Brougham’s position at this time was difficult and anomalous. Burning with political ambition, and conseious that he had no superior in the arena of the House of Commons, he had lost his scat in Parliament ; he was distrusted and feared by some of the leading members of the Liberal party, and, as he said himself in a letter to Lord Grey, ‘‘it is their pleasure to consider me as flung overboard to lighten the ship.” Yet he stood aloof, not only from the extreme views of demagogues like Hunt and Cobbett, but also from the milder radicalism of Hobhouse and Burdett. Indeed, it deserves to be remarked, that fond as Brougham was of popular applause, and deeply imbued as he was with

Liberal opinions, he never conde- scended to flatter the Radical party or to ally himself with them ;

places that we preserve it. But it has not been corroborated by any of the other persons present ; and in a letter written by Brougham himself to Earl Grey on the following day, he said nothing of this touching appeal, but relates that the princess went back be- cause the duke of York came, armed with full powers from the tegent to fetch her away. It is not improbable that the scene thus described is apocryphal, or at least embellished by Lord Brougham's imagination, for in his later years he was apt to mis- take for actual oecurrenees the creations of his own fancy.

In 1814, the Princess of Wales, having been prohibited by Queen Charlotte from attending the drawing-rooms given to the allied sovereigns on their visit to England, resolved to go abroad. This unfortunate scheme was strongly opposed by the Princess Charlotte, and not less so by Mr Whitbread and Mr Brougham. The latter addressed a letter to the Princess of Wales on the eve of her departure, in which he pointed out with great sagacity and good sense the fatal consequences of her withdrawal from England. "As long as you remain in this country," he said, 'I will answer for it that no plot can succeed against you. But if you are living abroad, surrounded by the base spies and tools who will always be planted abont you, ready to invent and swear as they may be directed, who can pretend to say what may happen ? I declare, I do not see how a proposition hostile to your Royal Highnesss marriage could be resisted if you continued living abroad." How completely these predictions were fulfilled is sufficiently known. Brougham appears to have had but little correspondence with the princess during her residence in Italy. But in 1820, when she resolved to return to England on the accession of George IV., he was sent by the Government conjointly with Lord Hutchinson, to dissuade her from that step and to offer her terms. Brougham certainly disapproved of her return; but for some mysterious reason he withheld the proposed terms of compromise until it was too late, and when they were laid before the queen at St Omer she rejected them with scoru. The death of Mr Whitbread and of the Princess Charlotte, which had occurred in the interval, had removed two important checks on the rashness of the queen ; and Brougham, who had failed to prevent her from going away, was equally unable to prevent her

return. It has even been surmised that, froma love of mischief and of power, he desired it. p F

Meanwhile Brougham had at length, in 1816, been again returne

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to Parliament for Winchelsea, a borough of the earl of Darlington,

and he instantly resumed a commanding position in the House of

Commons. He succeeded in defeating the continuance of the ineome tax ; he distinguished himself as an advoeate for the edueation of the people ; and on the death of Romilly he took up with ardour the great work of the reform of the law. 1t has taken half a eentury to work out the plans of these early law reformers, and the last year or two have given usa national system of edueation and a new judicature with an entirely new form of proeedure. But not the less glorious and valuable were the serviees of those who first engaged in these great tasks. more than the select committee which sat, with Mr Brougham in the chair, in 1816 and the three following years, to investigate the state of edueation of the poor in the metropolis. The inquiry was extended so far as to inelude the great collegiate foundations of Eton, Winchester, and the Charter House ; and the report of the committee was attacked with great virulenee by Bishop Monk in the Quarterly Review and by Sir Robert Peel in the House of Commons. In time, however, the exposure of abuses bore fruit, and we owe to it some of the most importantimprovements of the age. Brougham, however, was as far as ever from obtaining the leadership of the party to which he aspired. Indeed, as was judiciously pointed out by Lord Lansdowne in 1817, the opposition had no reeognised efficient leaders ; their warfare was carried on in separate courses, indulging their own tastes and tempers, without eombined action. Nor was Brougham mueh more successful at the bar. The death of George III. suddenly changed this state of things. Queen Caroline at onee, in April 1820, appointed Mr Brougham to be Her Majesty’s attorney-general, and Mr Denman her solicitor- general. They immediately took their rank in court accordingly ; and, indeed, this was the sole act. of royal authority which marked the queen’s brief and unhappy reign. In July Her Majesty came from St Omer to England; ministers sent down to both Houses of

Parliament the seeret evidence whieh they had long been collecting against her ; and a bill was brought into the House of Lords for the deposition of the queen and the dissolution of the king's marriage. The long repressed spirit of opposition in the nation against a bigoted and tyrannieal Government was inflamed to a conflagration by the sense of the queen's wrongs. Guilty or innocent (and no one could dispute the excessive levity of her conduct), she was regarded by the people of England as a persecuted woman, a deserted wife, an outraged mother ; and these eharges were brought against her by those who were guilty of far greater offences. ''My mother would not have been so bad," the Prineess Charlotte is reported to have said, '' if my father had not been much worse." Themes such as these, worked upon by the eloquence of Brougham and the activity of the queen's friends, produced a popular commotion, which in any other country would have caused bloodshed, and perhaps revolution.

The defence of the queen was conducted by Brougham, assisted by Denman, Lushington, and Wilde, with equal courage and ability. He hurled back defianee on the prosecutors, and threatened, if driven to the last extremity, to retaliate on the person of the sovereign; though if he had set up the marriage of the Prinee with Mrs Fitzherbert as a valid marriage (which it certainly was not), he would thereby have annulled the subsequent marriage of his royal client. He demolished piece by piece with merciless severity the whole fabric and tissue of Italian evidence, raked together and paid for by the Milan commission ; and he wound up the proceedings by a specch of extraordinary power and effort. The peroration was said to have been written and rewritten by him seventeen times. At moments of great excitement such declamation may be of value, and in 1820 it was both heard and read with enthusiasm. But to the ealmer judgment of another generation this celebrated oration seems turgid and overstrained. The truth is, that there were moments in the course of the trial when the evidence pressed so hardly on the queen that her counsel were on the point of throwing up the case. But a generous feeling, impelled by an immense popular sympathy, prevailed. It was certain the bill could never pass the House of Commons, where the same appeals might be made to a less judicial assembly. The final majority in the Lords dwindled to nine ; and Lord Liverpool announced that he should hot proceed with the bill.

This vietory over the court and the ministry raised Henry Brougham at once to the pinnacle of fame. He shared the triumph _ of the queen. His portrait was in every shop window. A piece of

plate was presented to him, paid for by a penny subseription of peasants and mechanics, With his wonted disinterestedness in money matters, he refused to accept a sum of £4000 which the queen herself placed at his disposal, He took no more than the usual fees of counsel, while his salary as Her Majesty's attorney-general re- mained unpaid, and was discharged by the Treasury after her death. But from that moment his fortune was made at the bar. His practiee on the northern circuit instantly quintupled. One of his finest speeches was a defence of a Durham newspaper which had attacked the clergy for refusing to allow the bells of the churches | in Durham to be tolled on the queen's death ; and by the admis-

Nothing exasperated the Tory party

sion of Lord Campbell, a rival advoeate and an unfriendly critic, he rose suddenly to a position which no man has before or sinee attained to in the profession. The meanness of George IV. and Lord Eldon refused him the silk gown to whieh his position at the bar entitled him, and for some years he led the cireuit as an outer barrister, to the great loss of the senior members of the cireuit, who could only be employed against him. His praetice rose to about £7000 a year, but it was again falling off betore he became Chancellor.

The death of Lord Castlereagh in 1822, and the advance- ment of Canning to the office of Foreign Secretary, materi- ally changed the character of Lord Liverpool's Govern- ment. Canning and Brougham sat on opposite benches— the one a follower of Pitt, the other of Fox; and they were constantly pitted against each other. Sometimes their rhetorical conflicts assumed an intense violence, as when Brougham accused the minister of "the most monstrous truckling for the purpose of obtaining office that the whole history of political tergiversation could furnish." Canning indignantly exclaimed, " It is false ;" and the quarrel was with some difficulty appeased, though Brougham was not supposed to be very ready to employ any

weapon sharper than his tongue. But Canning and Brougham were in truth rivals rather than antagonists ; and the more liberal influence of the former in the ministry had aimost brought them into union upon the leading questions of the day, always excepting that of parlia- mentary reform, Had Canning lived and maintained himself in power, it might have fallen to his lot to carry Catholic Emancipation and a more moderate measure of parliamentary reform. But if, as is believed, Earl Grey was excluded from Mr Canning's Government by an ex- press stipulation of the king, it follows a fortiord that the attorney-general of Queen Caroline could never be a minister of George IV. That sovereign had shown on several occasions that the attacks made on him by Brougham were never forgotten or forgiven; and Canning, whose own position at court was difficult enough, had certainly not the power to overcome the king's resentment. Brougham, however, promised and gave his shortlived administration an independent support—unlike Lord Grey, who fiercely and ungenerously attacked it.

To this period of his life belong two occurrences which University cannot be passed over in silence. In 1825 the first steps of London. were taken, under the auspices of Brougham, for. the establishment of a university in London, absolutely free from all religious or sectarian distinctions, a scheme which has grown and ripened in half a century into no unworthy rival of the other universities of northern and southern Britain. In 1827 Brougham contributed to found the "Society for the Diffusion of Useful Knowledge,"—an S. D. U. K. association which gave an immense impulsion to sound popular literature. Its first publication was an essay on the "Pleasures and Advantages of Science," written by himself. One can hardly imagine at the present time with what avidity this paper was read, for it had no novelty of substance and no great merit of style. But a thirst for knowledge seemed suddenly to have seized the nation. It broke forth in mechanics' institutes and every form of instruction. To use his own language on a cele- brated occasion—" the schoolmaster was abroad ;" and the excitement he had contrived to kindle on these subjects tended to hasten a great crisis in our political life. In the following year (1828) he delivered his great speech on "Law Reform," which lasted six hours in the delivery in a thin and exhausted House,—a marvellous effort,—which embraced every part of the existing system of judicature, and concluded with one of his noblest perorations. "It

was the boast of Augustus," he said, "and it formed part of

the glory in which his early perfidies were lost, that he found Rome of brick and left it of marble,—a praise not

unworthy of a great prince, and to which the present reign lV. — 48

Member for York,

Whig ministry.

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also has its claims. But how much nobler will be the sovereign's boast, when he shall have it to say that he found law dear and left it cheap ; found it a sealed book, left it a living letter; found it the patrimony of the rich, left it the inheritance of the poor; found it the two-edged sword of craft and oppression, left it the staff of honesty and the shield of innocence !" .

The death of Canning, the failure of Lord Goderich, and the accession of the duke of Wellington to power, again changed the aspect of affairs; but the resolution of mini- sters to carry Catholic Emancipation disarmed the Opposi- tion, whilst it split the Tory party. Graver events were impending. The French Revolution of 1830, following close upon the death of George IV., awakened a passionate excitement throughout Europe, and especially in this country. The days of Tory government were numbered, The cry of "Reform" was raised; and the leader to "ride the whirlwind and direct the storm" was Henry Brougham. Then it was that the united county of York spontaneously returned him to the new House of Com- mons as their representative. It was the proudest moment of his life, for he was literally not only the representative of the county of York, but of the people of England. A stranger by birth to that great province, and without an acre of land in it, he, by his talents, eloquence, public services, and love of freedom alone, triumphed over the proud Yorkshire families, and took his seat in the House

of Commons with a power no Englishman of this age has.

possessed. The Parliament met in November. Brougham's first act was to move for leave to bring in a bill to amend the representation of the people; but before the debate came on the Government was defcated on another question ; the duke resigned, and Earl Grey was commanded by William IV. to form an administration.

Amongst the difficulties the new premier and the Whig party had to encounter aud to surmount, none was greater than that arising from the position, the attitude, and the talents of Mr Brougham. He was not the leader of any party ; he had no personal following in the House of Commons ; he was distrusted by the Whigs, who looked up to Lord Althorp as their chief; he was dreaded alike by friends and foes; but there stood, in solitary might, the formidable member for the county of York, armed with invincible eloquence, and backed by the suffrages of the people. He himself had repeatedly declared that nothing would induce him to exchange his position as an inde- pendent member of Parliament for any office, however great ; and, no doubt, as an independent member of Parlia- ment he exercised at that moment a power greater than any office could give. On the day following the resigna- tion of the Government, he reluctantly consented, in low and angry tones, to postpone for one week his motion on parliamentary reform. The attorney-generalship was offered to him by Lord Grey; it was indignantly rejected. Brougham himself affirms that he desired to be master of the rolls, which would have secured him a large income for life, and left him free to sit in the House of Commons. But this was positively interdicted by the king, and objected to by Lord Althorp, who declared that he could not undertake to lead the Howse with so insubordinate a follower behind him. Meanwhile Brougham had discovered, at a meeting of several leading members of his party at Holland House, that he was not taken freely into their counsels ; he came home exasperated and vowing venge- ance against them. Lord Grey, personally, would, have preferred to retain Lord Lyndhurst as his chancellor; but it was impossible to leave Brougham out, and he was only to be brought into the ministry by the offer of the great seal, When the question was considered at the first nieet- ing of the inchoate ministry at Lansdowne House, Lord

Holland said to his colleagues, ‘I suppose it inust be so, but this is the last time we shall meet in peace within these walls.” Brougham himself hesitated, or affected to hesitate. He was undoubtedly reluctant to quit the House of Commons and his seat for Yorkshire. His mother, with great wisdom, dissuaded him from accepting these treacher- ous gifts and honours. He alleged that, as the ministry might be of short duration, he was making a large sacrifice in giving up his professional income for a pension of £4000 a year and a peerage which he had no other means to support. But he yielded to the representations of Lord Grey and Lord Althorp, that without him as Chancellor

the Government could not be formed. On the 22d Nov- Lord ember 1830 the great seal was delivered to him by the Chaueellor, –

king, and he took his seat on the Woolsack that evening as speaker of the House of Lords, being still a commoner, On the following day, after he had sat to hear a Scotch appeal, the patent of his peerage as Baron Brougham and Vaux was brought down. ‘The Lord chancellor then quitted the woolsack, robed, and was introduced as a baron by the Marquis Wellesley and Lord Durham.

The mind of man can conceive nothing more vivid and more various than the chancellorship of Lord Brougham. It lasted in all exactly four years—no more; but the times were burning with excitement, and the chancellor emkodied and expressed the fervour of the times. To rival Lord Bacon in the philosophy of the closet and Lord Hardwicke in the courts of equity, to declaim like Chatham in the House of Lords, and jest like Sheridan at Lord Sefton’s dinners, seemed alike easy tasks to Brougham. He never doubted of his own capacity to play every part in turn,— judge, statesman, orator, philosopher, buffoon; and he did play them all with as much success as an imitation can bear to a reality. Unhappily the verdict of time has proved that there was nothing of permanence, and little of originality, in the prodigious efforts of his genius. He affected at first to treat the business of the Court of Chancery as a light affair, though in truth he had to work hard to master the principles of equity, of which he had no experi- ence. His manner in court was desultory and dictatorial. Sometimes he would crouch in his chair, muffled in his wig and robes, like a man asleep ; at other times he would

burst into restless activity, writing letters, working problems, interrupting counsel, Mortal offence he gave to Sugden, then the leader of the Equity bar, who detested his person and despised his law. But upon the whole Brougham was a just and able judge; and if few of his decisions are cited as landmarks of the law, still fewer of them have been overruled. His wonderful powers of despatch enabled him to work off the arrears of the court in ten months, a thing which had never before occurred in human memory, and in September 1831 he boasted that not a cause re- mained for hearing before the Lord Chancellor. Yet towards the close of his tenure of office in the spring of 1834, he complained to his colleagues of the tremendous drudgery he had undergone; he had sat up all the nights of winter, he said, to write seventy elaborate judgments, and he conceived that he wasill requited forthe sacrifices he had made.

His duties as a judge, however, ranked second in his eyes to his duties as a politician and a legislator; and he took a most active and prominent part in the defence of all the great measures of Lord Grey's Government. We say in the defence of them, for he had less hand in the preparation of them than he wished it to be believed. His own statement that he had called his friends together and submitted to then a complete scheme of parliamentary reform is entirely unsupported, and, indeed, formally contradicted. The draft of the Reform Bill was prepared by a committee of four other members of the Cabinet, and accepted with some hesitation by Brougham. But once launched in the contest,

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BROUGHAM

especially in the House of Peers, it owed a great deal to the vigour with which he defended it. The king, William IV., appears at first to have been amused and flattered by the attentions of his chancellor, who made infinite exertions to ingratiate himself with the court. But his manner, which was at first obsequious, became dictatorial ; his restless eccentricity and his passion for interfering with every department of state, alarmed and irritated the king, and at last the former liking was turned into bitter aversion.

It would be superfluous in this place to follow the fortunes of the Reform Bill of 1832, and we shall confine ourselves to a brief notice of the part which Lord Brougham took in promoting it ‘The first grand crisis in the con- test occurred in April 1831, when General Gascoyne’s amendment ‘was carried against the Government.

“The king grants permission to Earl Grey, and to his chancellor Lord Brongham, to create such a number of peers as will be sufficient to ensure the passing of the Reform Bill,—first calling up eldest sons.

(Signed) Wriiam R,

‘©Winpsor, May 17, 1832.”

It is enough to say that this extraordinary document has never been seen by any one, and is not kuown to exist, therefore its exact tenor must be a mystery. The king was not at Windsor on the 17th May, but at St James’s; and the Cabinet asked for an assurance of His Majesty’s inten- tions on the following day (the 18th), which they would not have done if a written promise had been given the day before. This story, therefore, is incredible, and in Lord Brougham’s autobiography nothing is said of this written paper Lord Grey and Lord Brougham were both of them strongly averse to the creation of peers, which was fiercely urged on them by some of their colleagues, such as Lord Durham and Sir John Hobhouse. Lord Brougham has even intimated a doubt whether at the last extremity they should have used the power the king had at one time most reluctantly given them. But they both knew that their honour, and possibly their lives, were staked on carrying the bill; and, fortunately, they were relieved from the dire necessity of swamping the House of Lords by the influence of the king and the duke of Wellington over the Tory majority.

It is surprising that Lord Grey’s administration, which had achieved so great a work in passing the Reform Bill, and was supported by an immense majority in the reformed Parliament, should so soon have come to an end, But

Lord Grey was perpetually threatening to resign office ; Lord Althorp longed for retirement ; the question of the Irish Church led to the secession of four important mem- bers of the Cabinet ; the queen was hostile; and the king was alarmed and dissatisfied with the Whig ministers. In J uly 1834 the crisis arrived, and having carried on the govern- ment for three years and 231 days, Lord Grey resigned. Lord Brougham had contrived to monopolize the authority and popularity of the Government, and no doubt his in- satiable activity contributed to this result; and there were those who accused him of having intrigued to bring it about, with a view to superseding Lord Grey himself. But this imputation is unjust. Brougham, however, had caused Mr Littleton, the Irish secretary, to suggest to Lord Wellesley, the lord-lieutenant, that some of the clauses in the Irish Coercion Bill might be withdrawn on its renewal, with a view to conciliate O'Connell. Lord Althorp was of the same opinion ; but Lord Grey refused to entertain the proposal, and on this rock the ship struck. Brougham declared with great vehemence that it was madness to resign, aud that for his own part he had not tendered his resignation, Very much by his exertions the Cabinet was re- constructed under Lord Melbourne, and without Lord Grey; and he appeared to think that his own influence in it would be increased. He laboured at the time under extreme mental excitement,! and in this state he unfortunately pro- ceeded to make a journey or progress to Scotland, where his behaviour was so extravagant that it gave the final stroke to the confidence of the king. At Lancaster he joined the bar-mess, and spent the night in an orgy. In a country house he lost the great seal, and found it again in a game of blindman's-buff. At Edinburgh, in spite of: the coldness which had sprung up between himself and the Grey family, he was present at a banquet given to the late premier, and delivered a harangue on his own services and his public virtue. All this time he continued to correspond with the king in a strain which created the utmost irrita- tion and amazement at Windsor. He seemed totally un- conscious of the abyss which was opening at his feet. He was not the Bacon but the Wolsey of the 19th century.

The term opened in November with the usual formalli- Fall of But on the 16th of that month the king dismissed Whig his ministers. The chancellor, who had dined at Holland ™™S#Y

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House, called on Lord Melbourne in his way home, and learned the intelligence. Melbourne made him promise that he would keep it a secret till the morrow; but the moment he quitted the ex-premier, he sent a paragraph to the 7imes relating the occurrence, and adding that ‘‘the queen had done it all.” That statement, which was totally unfounded, was the last act of his official life. The Peel ministry, prematurely and rashly summoned to power, was of no long duration, and Brougham naturally took an active part in overthrowing it. Lord Melbourne was called upon in April 1835 to reconstruct the Whig Govern- ment with his former colleagues. But, formidable as he might be as an opponent, the Whigs had learned by ex- perience that Brougham was even more dangerous to them as an ally, and with one accord they resolved that he should not hold the great seal or any other office. The great seal was put in commission, to divert for a time his resentment, and leave him, if he chose, to entertain hopes of recovering

it. These hopes, however, were soon dissipated ; and Later par- although the late chancellor assumed an independent liamentary position in the House of Lords, and even affected to protect !#bours.

the Government, his resentment against his ‘‘noble friends”

1 Mr Greville records in his Journal a conversation with Lord Mel- bourne of the 23d September in this year, from which it is clear that Melbourne was perfectly aware of the state the chancellor was in, and that he hardly thought him of sound mind. He added, “The king can’t bear these exhibitions in Scotland.”

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Judicial services,

soon broke out with uncontrolled vehemence. Throughout the session of 1835 his activity was undiminished. Bills for every imaginable purpose were thrown by him on the table of the House, aud it stands recorded in

Zansard that he made no less than 221 reported speeches in Parliament in that year. But in the course of the vacation a heavier blow was struck. Lord Cottenham was made Lord Chancellor. The breach had manifestly become irrepar- able. Even Lord Brougham's buoyant and daring spirit sunk for a time under the shock. A dreadful period of depression succeeded to the wild frenzy of the preceding years, and during the year 1836 the voice of Lord Brougham was unheard. He passed the spring and summer in West- moreland, and avoided all political conversation and corre- spondence. Fifty-six years of his life were spent, and not much more than twenty of them had been spent in Parlia- ment, where he had earned the most prodigious reputation and influence of modern times, " What is the House of Lords without Brougham ?"—we have heard Lord Lynd- hurst say—' Brougham 7s the House of Lords." For more than thirty years after his fall he continued to take an active part in its judicial business and in its debates. still a power in the tone of that voice, raised as it always was in the cause of peace, humanity, and freedom; but it would have been better for his fame if he had died in the midst of his glory His reappearance in Parliament on the accession of Queen Victoria was marked by sneers at the Court, aud violent attacks on the Whigs for their loyal and enthusiastic attachment to their young sovereign; and upon the outbreak of the insurrection in Canada, and the miscarriage of Lord Durham's mission, he overwhelmed his former colleagues, and especially Lord Glenelg, with a torrent of invective and sarcasm, equal in point of oratory to the greatest of his earlier speeches. But why pursue the painful narrative of these writhings of a wounded spirit and a broken ambition? Without avowedly relinquish- ing his political principles, Brougham had estranged him- self from the whole party by which those principles were defended. Flattered, and not unwilling to be flattered, by the Tories, he fought side by side with Lyndhurst, and paid the most fulsome court to the duke of Wellington and a long train of women of quality and men of fashion.

Amongst the humorous expedients resorted to in order to keep his name before the public, a false report of his death was sent up from Westmoreland in 1839, which obtained credence from the persons to whom it was addressed, The newspapers published articles on the melancholy event, and in the Morning Chronicle Mr Sheil exclaimed —

“* The extravagant and erring spirit hies To his confine,” whilst he paid a just tribute to the splendid talents and services of the deceased.

It is more agreeable to dwell on the judicial services he continued assiduously to render in the Privy Council and the House of Lords. The Privy Council, especially when hearing appeals from the Colonies, India, and the courts maritime and ecclesiastical, was his favourite tribunal. He had practised a good deal before it (or, as he always called it, ‘‘the Cock-pit,” so named because the cock-pit of Henry VIII. was the site of the present council chamber) when a young man, before he was called to the English bar ; its vast range of jurisdiction, varied by questions of foreign and international law, suited his discursive genius. He had remodelled the judicial committee in 1833, and it still remains one of the most useful of his creations ; and he at one time aimed at making himself the president of this committee. To this board Lord Brougham devoted for about sixteen years a very considerable amount of time and labour, and many of his most able and elaborate judgments are recorded in the Privy Council reports which have contributed to build up

There was:

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and perfect the modern jurisprudence of India, and to main- tain principles of toleration in the Church of England. He ceased to attend the Privy Council in 1850. But he continued to the close of his life to hear appeals in the House of Lords, where his early knowledge of Scotch law was of peculiar value

In the year 1860, a second patent was conferred upon Second him by Her Majesty Queen Victoria, with a reversion of his patent of peerage to his youngest brother William Brougham. The Pe*tge.

preamble of this patent stated that this unusual mark of honour was conferred upon him by the Crown as an acknowledgment of the great services he had rendered, more especially in promoting the abolition of slavery and the emancipation of the negro race. The peerage is thus perpetuated in a junior branch of his family. Lord Brougham’s inarriage

with Mrs Spalding had given him no male heirs,and his only daughter died in early life unmarried.

Upon the portal of one of those delightful villas which Retire- nestle amongst the olive trees and the carob trees at ment at Cannes, along the shores of the Mediterranean, are inscribed “*™*

the lines— *‘Inveni portum : spes et fortuna valete. Sat me lusistis ; ludete nunc alios.”

Such was the haven, such the abode, in which Lord Brougham found repose from the triumphs and the dis- appointments of his agitated existence. The pure and genial air of the South calmed his nerves and perhaps prolonged his life. There he returned with undiminished pleasure to the head-springs of science, philosophy, and literature. His spirits were more equable; his mind more calm ; his society charming. There, then, he spent a con- siderable part of the later years of his life ; and there, when the hour of departure came, his remains mingled with the dust. An accident had attracted his attention to the spot about the year 1838. He bought a tract of land ; he built on it; and the Villa Louise Eleonore recalled by its name the adored memory of his lost and only child. Cannes, when he first visited it, was little more than a fishing village on a picturesque coast. His choice and his example made it the sanatorium of Europe.

The fame of Lord Brougham had long extended far beyond Last the frontiers of his native land. The generous and lofty Ye”.

sentiments which he clothed in forcible language touched the heart of mankind. But there was something peculiarly congenial to his own mercurial temperament in the life and genius of France. In 1833 the Academy of Moral and Political Science had conferred upon him the high rank of an associate of the Institute. The Academy of Science did not disdain to listen to his demonstrations. The French, with their lively sympathy for brilliant intellectual power, forgave him all his eccentricities. He has been known to tutoyer M. Guizot. He onceasked the French Government to give him an island with a state prison on it. He would drop in to tea at the Tuileries in his checquered trousers, and sometimes bring a friend with him, utterly regardless of social usages and etiquette. His

French, though fluent enough, was as barbarous and dissonant a brogue as ever tortured the ears of a Parisian. Nobody knew what he would do next. After the revolution of 1848 he asked M. Cremieux (in utter forgetfulness of French law) to have him made a French citizen. But friendship in France is warm and tenacious. Lord Brougham had contributed as much as any man to efface old hatreds and to establish a lasting alliance between France and Great Britain. He judged even her faults in a kindly and indulgent spirit ; and of all the tributes to his memory which have issued

from the press, none is at once more truthful and more — eee

1 Thus the judgment on the case of Escott v. Martin, which estab- lished the validity of baptism administered by a Wesleyan minister or a layman, was prepared and delivered by Lord Brougham,

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tender than the discourse pronounced by M. Mignet in the Institute of France in honour of their great associate. Upon that southern coast the last days of this veteran combatant in the fields of law and politics were spent. There at Cannes, upon the 7th May 1868, in the ninetieth year of his age, he expired; and if Westminster proffered no sepulture to the greatest orator of our times, he rests, at least, in the spot which had his latest affections.

To what precedes we have little to add, for who can attempt to portray so multifarious, inconsistent, and variable a being? The irritability of his temper and the egotism of his character made him not only formidable as an antagonist but dangerous asa friend. Yet at bottom he had genuine warmth of heart and good nature. He was a devoted son, an affectionate parent and brother; covetous to a degree of power and patronage, but prodigal in the use of it ; disdaining money, yet happy to bestow it on others ; fond of courting the great, yet not insensible to the sufferings and the sympathy of the humble and the poor. With unbounded self-confidence, he wanted self-con- trol, and at times under the influence of grief, of resentment, of ambition, of disappointment, or of success, he was scarcely accountable for his actions, still less for his language. His imagination conjured up occurrences which had never taken place; and he changed as rapidly as a chameleon, uncon- scious of the transformation. Hence it came to pass that

whilst men marvelled at his astonishing gifts, they ceased to trust his character; and the splendid promise of the morning of his life was overcast before its close. ;

The activity of Lord Brougham's pen was only second to the volubility of his tongue. He carried on a vast and incessant correspondence of incredible extent. For thirty years he contributed largely to the Hdinburgh Review, and he continued to write in that journal even after he held the great seal. The best of his writings, entitled " Sketches of the Statesmen of the time of George III.," first appeared in the Review. These were followed by the "Lives of Men of Letters and Science" of the same period. Later in life he edited Paley's Natural Theology; and he published a work on political philosophy, besides innumerable pamphlets and letters to public men on the events of the day. He published an incorrect translation of Demosthenes's Oration for the Crown. A novel entitled Albert Zunel was attributed to him. A fragment of the History of England under the House of Lancaster employed his retirement, but we think it was published without his name, and certainly without success. In 1838 Messrs Black of Edinburgh published an edition of his speeches in four volumes, 8vo, elaborately corrected by himself. The last of his works was his posthumous Autobiography. Yet ambitious as he was of literary fame, and jealous of the success of other authors, he failed to obtain any lasting place in English literature. His style was slouching, involved, aud incorrect. Like his handwriting, which was precipitate and almost illegible, except to the initiated, his composition bore marks of haste and carelessness, and nowhere shows any genuine originality of thought. The collected edition of his works and speeches published by Griffin in 1857, and reissued by Black, of Edinburgh, 1872, is the best ; and it was carefully revised by himself, with introductions to the different pieces. His autobiography is of some value from the original letters with which it is interspersed. But Lord Brougham's memory was so much impaired when he began to write his recollections, that no reliance can be placed on his statements, and the work abounds in mani- fest errors. (H. R.)

BROUGHTON, Huveu, a learned scholar and divine, was born at Oldbury in Shropshire in 1549. After receiv- ing the rudiments of his education at a

provincial school, he went to Cambridge, where in due time he was chosen a

fellow of Christ's College, and took orders in the church. During his career at the university he laid the foundation of the Hebrew scholarship for which he was afterwards so distinguished, From Cambridge he went to London, where his eloquence gained him many and powerful friends. In 1588 he published his first work, "a little book of great pains," entitled the Consent of Scriptures. This work was strongly opposed at both the great universities, and the author was obliged to defend it, which he did in a series of lectures. In 1589 he went to Germany, where he fre- quently engaged in discussions both with Romanists and with the learned Jews whom he met at Frankfort and else- where. In 1591 he returned to England, and published an Laplication of the article of Christ's descent into Hell, which, like his former treatise, elicited a violent opposition. In 1592 he once more went abroad and cultivated the acquaint- ance of the principal scholars of the different countries through which he passed. Such was the esteem in which he was held, even by his opponents, that he was offered a cardinal's hat if he would renounce the Protestant faith, which, however, he declined to do. On the accession of James he returned to England ; but not being engaged to co-operate in the new translation of the Bible then begun, he retired to Middleburg in Holland, where he preached to the English congregation. In 1611 he returned tc England, where he died the following year. Some of his works were collected and published in a large folio volume in 1662, with a sketch of his life by Dr Lightfoot, but many of his theological MSS. remain still unedited in the British Museum.

BROUGHTON, Tuomas, a learned divine, and one of the original writers in the Biographia Britannica, was born at London, July 5, 1704. At an early age he was sent to Eton, where he soon distinguished himself by his acuteness and studious disposition. Being superannuated on this foundation, he removed about 1722 to the university of Cambridge ; and, for the sake of a scholarship, entered himself of Caius College. Here two of the principal objects of his attention were the acquisition of the modern languages, and the study of mathematics, under the famous Professor Sanderson. In May

1727, Broughton, after graduating as B.A., was admitted to deacon's orders, and in the succeeding year was ordained priest, and took the degree of M.A. He then removed from the university to the curacy of Offley in Hertfordshire. In 1789 he was instituted to the rectory of Stepington, or Stibington, in the county of Huntingdon. He was soou after chosen reader to the Temple, by which means he became known to Bishop Sherlock, then Master, who conceived so high an opinion of Broughton's merit, that in 1744 he presented him to the valuable vicarage of Bedminster near Bristol, with the chapels of St Mary Redcliff, St Thomas, and Abbot's Leigh annexed. He was afterwards collated by the same patron to the prebend of Bedminster and Redcliff, in the cathedral of Salisbury. Upon receiving this preferment he removed from London to Bristol, where he married the daughter of Thomas Harris, clerk of that city, by whom he had seven children. He died December 21, 1774.

BROUGHTON, Jonun Cam Hosnouse, Lorp, an Eng- lish statesman, was the eldest son of Sir Benjamin Hob- house, first baronet, and was born at Redlands, Bristol, June 27, 1786. He was educated at Westminster School and Trinity College, Cambridge, where he tcok his degree of B.A. in 1808. During his residence at Cambridge he became the intimate friend of Lord Byron; and in the summer of 1809 the two friends set out together on a tour in the South of Europe. They visited Spain (then the theatre of the great war with Napoleon), Portugal, Greece. Albania. and Turkey. The winter was spent at

Athens, and in 1810 Hobhouse returned home. In the campaigns of 1813 and 1814 he accompanied the allied armies, and was present at the great battle of Dresden. In the winter of 1816-17 he rejoined Byron in Italy, and they visited Venice and Ronie together. Hobhouse had been trained in the Liberal school of politics, and had written pamphlets and review articles in defence of liberal doctrines. He had by this time become what was then contemptuously called a "downright radical." In 1816 he published anonymously a work in two volumes entitled, The Sub- stance of some Letters written by an English Gentleman Resident at Paris during the last Reign of the Emperor Napoleon, His aim in it was to correct certain

misrepre- sentations which were current of the events of the Hundred Days. The tone ot the book gave great offence to the English Government ; and being translated into French was equally offensive to the Government of the Restoration. The French translator and printer were both prosecuted in 1819 for “atrocious libel” on the Government; and were sentenced to fine and imprisonment, the former for twelve months, the latter for six. On 13th December of the same year the speaker’s warrant was issued for the arrest of Hobhouse, and he was committed to Newgate. He made an unsuccessful application to Chief-Justice Abbott (Lord Tenterden) for discharge by habeas corpus, and he was not liberated till about the end of February. The treatment which he had suffered gave him the prestige of a martyr to the dominant Toryism, and in the eyes of the multitude this was his glory. At the close of 1818 he had contested the borough of Westminster, Sir Francis Burdett desiring him as a colleague, and giving £1000 towards the necessary expenses of his candidature, But he was beaten by his rival, George Lamb, the brother of Lord Melbourne. He now came forward again, and was returned by a large majority (1820). In the first session of parliament he pro- duced a powerful impression, first by his severe speech on the suppression of a Liberal meeting at Oldham, and soon after by the vigorous support he gave to the bill for disfranchis- ing the borough of Grampound. During the next twelve years he was the ardent and courageous advocate of all Liberal nieasures,—among them, of the repeal of the Test and Corporation Acts, and of Catholic Emancipation. In August 1831 he succeeded to the baronetcy, and six months later was called to office as Secretary for War under the ministry of Earl Grey. In April 1833 he was named Chief- Secretary for Ireland, but lost his seat at the new election. In the following year he was returned M.P. for Nottingham, and received the appointment of Chief-Commissioner of Woods and Forests under Lord Melbourne. Retiring with the Liberal party in the autumn, he resumed office in April 1835 as President of the Board of Control, a post for which he was well qualified, and which he held till September 1841. He was recalled to the same office under the Russell Administration in 1846, and held it till 1852. Meanwhile he had lost his seat for Nottingham and had been returned for Harwich. In 1851 he was raised to the peerage, and from that time showed himself disposed to “rest and be thankful.” He gradually ceased to take part in public affairs, and returned to the studies and literary

enjoyments of his youth. Lord Broughton published a volume of Imitations and Translations from the Classics ; an account

of his Journey through Albania and other Provinces of

Turkey with Lord Byron ; and Historical Illustrations of the Fourth Canto of “Childe Harold.” He was also a contributor to periodical literature. In 1828 he married Lady Julia Hay, youngest daughter of the Marquis of Tweeddale, by whom he had three daughters, but no son. His wife died many years before him. Lord Broughton died in London, June 3, 1869. As he left no male issue his peerage became extinct,

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BROUKHUSIUS, or Brorxuuizen, Jan, a distin- guished scholar, born in 1649 at Ainsterdam, where his father was a clerk in the Admiralty. His father dying when he was very young, he was taken from literary pursuits, in which he had made great progress, and placed with an apothecary at Amsterdam, with whom he lived several years, Not liking this employment, he entered the army, and in 1674 was sent with his regiment to America, in the fleet under Admiral de Ruyter, but returned to Holland the same year. In 1678 he was sent to the garrison at Utrecht, where he contracted a friendship with the celebrated Grevius ; and here he had the misfortune to be so deeply implicated in a duel, that, according to the laws of Holland, his life was forfeited. Greevius, however, wrote immediately to Nicholas Heinsius, who obtained his pardon. Not long afterwards he became a captain of one of the companies then at Amsterdam ; and was thus enabled to pursue his studies at his leisure. His company being disbanded in 1697, he received a pension, upon which he retired to a country-house near Amsterdam, He died in 1707, aged fifty-eight.

As a classical scholar, he is distinguished by his editions of Pro- pertius and Tibullus, the former published in 1702, the latter in 1708. His Carmina were published at Utrecht, 1684, in 12mo; and in a more handsome form by Van Hoogstraatten, Amsterdam, 1711, 4to. His Dutch poems were also published at Amsterdam, 1712, 8vo, by the same house, with a life prefixed.

BROUSSA, Brussa, or Brusa, in Turkish Bursa, a city of Asiatic Turkey, in the province of Anatolia, and capital of the sanjak of Khodavendkiar, is situated in a fertile valley, at the northern foot of Mount Olympus or Keshish Dagh, 57 miles S.S.E. of Constantinople. Its streets are narrow and dark, and its houses are for the most part built of wood ; but its numerous minarets give it a magnificent appearance from a distance, and the rich variety of colour- ing that everywhere meets the eye has a very striking effect. It is abundantly supplied with water, which flows down the middle of many of the streets, and rises every here and there in beautiful fountains. On the top of a rock in the heart of the town stands the ancient citadel, the walls of which date from thel 3th century, and are of Greek construc- tion; and on the west side is the Byzantine church of Elijah, which is now known as the Daud Monasteri mosque, and contains the tomb of Orkhan. The most important of the other mosques, the number of which is said to be upwards of 600, are Ogldé Jami, or the mosque of the three sultans ; the Yeshil Jami, or the green mosque ; and Ghazi Unkiar Jami, or the mosque of the conqueror. There are also in the town three Greek churches, one Armenian, and several synagogues. Many of its colleges, bazaars, and caravanserais are buildings of considerable importance, and bear comparison with those of Constantinople. Broussa is the seat of a provincial governor, of a mollah or judge, who ranks as third in the kingdom; and of a mufti or spiritual chief. The Greeks and Armenians have each an archbishop in the town. Asa commercial city Broussa ranks with the most flourishing in the empire. The town of Gemlik at the head of Mudani Bay, from which it is about 20 miles distant, serves as its port. It manufactures carpets, tapestry, and various kinds of silk goods, the material for the latter being obtained from the mulberry- plantations of the neighbourhood. In 1862 there were no fewer than sixty silk factories belonging to Italians, French- men, and Germans. About a mile and a half from the town are the famous baths of Broussa, which are fed by several mineral springs varying in temperature up to 184°, and from a hill in the vicinity is obtained a good supply of meerschaum clay. The population of Broussa is variously estimated,—by Mostras (Dict. Géog. de ’ Empire Ottoman, 1873) in 1863 at 70,000, by Dr C. Sandreczki in 1844 at 60,000, and by Consul Sax at 40,000, .

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Broussa, the Prusa of the classical writers, founded, it is said, at the suggestion of Hannibal, was for a long time the seat of the Bithynian kings. It continued to flourish under the Roman and Byzantine emperors till the 10th century, when it was eaptured and destroyed by Seif-ed-daulet of Aleppo. Restored by the Byzantines, it was again taken in 1327 by the Ottomans after a siege of ten years, and continued to be their capital till Amurath I. removed to Adria- nople. In 1402 it was pillaged by the Tatars; in 1413 it resisted an attaek of the Karamanians ; in 1512 it fell into the power of Ala Eddin ; and in 1607 it was burnt by the rebellious Kalenderogli. In 1833 it was seized by lbrahim Pasha, and from 1852-55 afforded an asylum to Abd-el-Kader. 1n modern times it has suffered several times from earthquake and conflagration, especially in 1855.

BROUSSAIS, Francors JosepH Victor, a celebrated French physician, was born at St Malo in 1772. From his father, who was also a physician, he received his first instructions in medicine, and he studied for some years at the college of Dinan. At the age of seventeen he entered one of the newly-formed republican regiments, but ill health compelled him to withdraw after about two years. He resumed his medical studies, and aftcr passing some time in the hospitals of St Malo and Bryt, obtained an appointment as surgeon inthe navy. In 1799 he proceeded to Paris, where in 1803 he graduated as M.D. In 1805 he again joined the army in a professional capacity, and served in Germany, Holland, Italy, and Spain. In 1814 he returned to Paris, and was appointed assistant-professor to the Military Hospital of the Val-de-Grace, where he first promulgated his peculiar doctrines. His theory, which strongly resembles that of John Brown, points to excita- tion or irritation as the fundamental fact in life. He found the principal cause of disease in over-irritation, which, primarily local, extends itself through sympathy to the other organs of the body, as in fever. His lectures were attended by great numbers of students, who received with the utmost enthusiasm the new theories which he pro- pounded. In 1816 he published his Zxamen de la doctrine médicale géniralement adoptée, which drew down upon its author the hatred of the whole medical faculty of Paris. By degrees his doctrines triumphed ; and were adopted in the writings and practicc of the best physicians, and even in the medical school itself, long before their propounder held office in that institution. In 1831 he was appointed professor of general pathology in the academy of medicine, and

taught with great applause till his death in 1838. The recent development of physiological science has shown that his theories are but partially true, and are of little value as a general explanation of disease. Of his works, which are very numerous, the most important are the Hxamen and De (Irritation et de la Folie.

BROUSSONET, Pierre Marre Avcusts, a distin- guished French naturalist, was the son of a schoolmaster, and was born at Montpellier in 1761. He was educated for the medical profession, and at the age of eighteen was appointed to fill a professor's chair. Botany seems to have been the science to which he was at first chiefly devoted ; and he laboured with much zeal to establish the system of Linneus in France. With this view, as well as for his own improvement, he went to Paris, ind visited the various museums and collections. He next came to England, and was admitted in 1782 an honorary member of the Royal Society. He published at London the first part of his work on fishes, Ichthyologie Decas I, On his return to Paris he was appointed perpetual secretary to the Society of Agriculture, an office which the intendant Berthier de Sauvigny resigned in his favour. In 1789 he was nomi- nated a member of the Electoral College of Paris, and for some time had the charge of superintending the supply of provisions for the capital. Under the Convention he had to leave Paris, and after some dangers he made his way to Madrid. The enmity of the French emigrants, however, drove him from Spain, and afterwards from Lisbon, where

he had sought an asylum. At last he went out as physician to an embassy which the United States sent to the emperor of Maroceo ; and on this occasion his friend Sir Joseph Banks, informed of his distresses, remitted him £1000. After residing for some time at Marocco, he obtained from the French Directory permission to return to France, and was appointed by them consul at Teneriffe, where he resided for two years. On his return in 1797 he was chosen member of the Institute, and was reinstated in his botanical professorship at Montpellier, with the direction of the botanical garden. He was afterwards elected a inember of the legislative body, but died of apoplexy on the 27th July 1807. France is indebted to him for the

intro- duction of the Merino sheep and the Angora goat. None of his works are now of importance.

BROUWER, Aprian, a Dutch painter, was born at Haarlem in 1608, of very bumble parents, who bound him apprentice to the painter Frank Hals. Brouwer had an admirable eye for colour, and much spirit in design ; and these gifts his master appears to have turned to his own profit, while his pupil was half starved. As the result of this ungenerous treatment, Brouwer was frequently brought into low company and dissipated scenes, which he delineated with great spirit and vivid colouring in his pictures. The unfortunate artist died in a hospital at Antwerp in 1640, at the early age of thirty-two, consequently his works are few and rarely met with. The largest collection of his mas- terpieces is in the picture gallery at Munich,

BROWN, Cuarites Brockpen, the first American novelist who acquired an European reputation, and the first American who made literature a profession, was bcrn of Quaker parents in Philadelphia, January 17, 1771. A youth of dclicate constitution and retiring habits, he early devoted himself to study; his principal amuscment was the invention of ideal architectural designs, devised on the most extensive and elaborate scale. This characteristic talent for construction subsequently assumed the shape of utopian projects for perfect commonwealths, and at a later period of a series of novels distinguished by the ingenuity and consistent evolution of the plot. The transition between these intellectual phases is marked by a juvenile rcmance entitled Carsol, not published until after the author’s death, which professes to depict an imaginary community, and shows how thoroughly the young Amcrican was inspired by Godwin and Mary Wollstonecraft, whose principal writings had recently made their appearance. From the latter he derived the idea of his next work, Alcuin, an enthusiastic but inexperienced essay on the question of wcman’s rights and liberties. From Godwin he learned his terse style, condensed to a fault, but too laconic for eloquence or modu- lation, and the art of daveloping a plot from a single psychological problem or mysterious circumstance. The novels which he now rapidly prcduccd offer the strongest affinity to Caleb Williams, and if inferior to that remarkable work in the subtlety of mental analysis, greatly surpass it in affluence of invention and intensity of poetical feeling. All are wild and weird in conception, with incidents border- ing on

the preternatural, yet the limit of possibility is never transgressed. In Wieland, the first and most striking, a seemingly inexplicable mystery is resolved into a case of ventriloquism. Arthur Mervynisremarkable forthe descrip- tion of the epidemic of yellow fever in New York in 1798, which had proved fatal to the author's most intimate friend. Edgar Huntly, a romance rich in local colouring, is remark- able for the effective use made of somnambulism, and anticipates Cooper's introduction of the Red Indian into fiction. Ormond is less powerful, but contains one character, Constantia Dudley, which excited the enthusiasticadmiration of Shelley, who was also deeply entranced by Brown's other romances. '" Nothing," asserts Mrs Peacock, "so blended

itself with the structure of his interior mind as the creations of Brown." The two had, indeed, nearly every leading trait in common, although Brown's weak health and narrow circumstances restrained him from carrying his enthusiastic aspirations into practice. Two subsequent novels, designed as representations of ordinary life, proved failures, and Brown betook himself to less ambitious literary pursuits, compiling a general system of geography, editing a periodical, and an annual register, and writing political pamphlets which attracted considerable attention at the time. He died of consumption, February 22, 1810. He is depicted by his biographer as the purest and most amiable of men, and in spite of a certain formality due, perhaps, to his Quaker education, the statement is borne out by his correspondence. As a novelist he ranks very high ; he is the precursor of Hawthorne, and hitherto his only American rival. (Greatly inferior to Hawthorne in truth of natural description and insight into human character, he surpasses him in narrative and constructive ability. Wieland and Edgar Huntly especially are thrill- ing and exciting in the highest degree, while preserved by the constant, presence of a psychological problem from degenerating into mere sensationalism. Most of Brown's novels have been reprinted in England, but none recently. His life by his friend Dunlop (Philadelphia, 1815) is a grievous piece of bookmaking, but is interesting from the subject, An edition of his works in 6 vols. was published at Philadelphia in 1857. (R. G.)

BROWN, Joun, D.D., an English divine and author, was born at Rothbury, Northumberland, in November 1715. He was the son of Jolin Brown, a descendant of the Browns of Coalstown near Haddington, who at the time of his son's birth was curate of Rothbury. He was educated at St John's, Cambridge; and after graduating as B.A. with great distinction, he returned to his father's house at Wigton, received deacon's and priest's orders from Sir George Fleming, bishop of Carlisle, and in 1739 went to Cambridge to take his M.A. degree. In 1745 he distin- guished himself as a volunteer, and was soon afterwards appointed one of his chaplains by Dr Osbaldeston, on his admission to the bishopric of Carlisle. It was probably during his residence at Carlisle that Brown wrote his poem entitled Honour, inscribed to Lord Lonsdale. His next poetical production was his Hssay on Satire, addressed to Dr Warburton, to whom it was so acceptable, that he took Brown into his friendship. He also introduced him to Ralph Allen, of Prior Park, near Bath, to whom in 1751 Brown dedicated his Essay on the Characteristics of Lord Shaftesbury. In 1754 he was promoted by the earl of Hardwicke to the living of Great Horkesley in Essex, and in the following year he took the degree of doctor of divinity at Cambridge. In this year also he published his tragedy of Barbarossa, which, under the management of Garrick, was acted with considerable applause, though it was sharply censured when published. This tragedy was followed by a second, entitled Athelstane, which was represented at Drury Lane theatre. This was also well received by the public, but did not become so popular as Barbarossa. Among the most remarkable of his other pro- ductions are the Lstemate of the Manners and Principles of the Times, a bitter satire; the Additional Dialogue of the Dead, which was a vindication of Chatham's policy ; and the Dissertation on the Rise, Union, and Power, é&c., of Poetry and Music. Dr Brown, who had an hereditary tendency to insanity, and from early life had been subject at times to fits of excessive melancholy, committted suicide on the 23rd of September 1766.

BROWN, Joun, author of the Self-Interpreting Bible, was born at Carpow, in Perthshire, in 1722. He was almost entirely self-educated, having acquired a knowledge

of Latin, Greek, and Hebrew while employed as a shepherd. He was, for a great part of his life, minister of the Burgher branch of the Secession Church in Hadding- ton, and also discharged the duties of professor of divinity. Though he had not enjoyed the advantages of a regular education, he mastered the classical tongues, as well as several modern and Oriental languages, and gained a just reputation for learning and piety. Hedied in 1787. The best of his works, which are very numerous, are his Self-Interpreting Bible and Dictionary of the Bible, works that were long very popular in Scotland. He also wrote a valuable Body of Divinity.

BROWN, Joun, the founder of the Brunonian theory of physic, was born in 1735 at Lintlaws or at Preston, Berwickshire. He was originally destined for the employ- ment of a weaver, but the boy's talents attracted the atten- tion of his schoolmaster, through whose endeavours his parents were encouraged to allow him to begin study for the church. At the age of twenty be came to Edinburgh and entered the classes at the university, supporting him- self by private tuition. In 1759 he seems to have discon- tinued his theological studies, and to have begun the study of medicine. He soon attracted the notice of Dr Cullen, who engaged him as private tutor to his family, and treated him in some respects as an assistant professor. Brown, however, thought that Cullen did not advance his candida- ture for a vacant chair, and the friendship between the two was soon completely broken. In 1780 appeared the Llementa Medicine, expounding the new, or as it was then called the Brunonian, theory of medicine. The fundamental idea of this theory was the division of diseases into two classes, sthenic and asthenic, the one caused by excess, the other by deficiency of excitement, and the con- sequent method of treatment by debilitating or stimulat- ing medicines. That Brown's ideas should have excited the discussion they did seems now incredible. Shortly after the publication he obtained the degree of M.D. at St Andrews, and in 1786 he set out for London in the hope of bettering his fortunes. He died of apoplexy in October 1788. A Jxfe of Brown by Beddoes was published in 1801. An edition of his works, with notice of his life by his son, W. C. Brown, appeared in 1804.

BROWN, Joun, D.D., an eminent Scottish divine, son of the Rev. John Brown of Whitburn, and grandson of the Rev. John Brown of Haddington, was born at Whitburn, Linlithgowshire, on the 12th July 1784. He studied at

Glasgow university, and afterwards at the divinity hall of the "‘ Burgher" branch of the "Secession" Church at Sel- kirk, under the celebrated Lawson. In 1806 he was ordained minister of the Burgher congregation at Biggar, Lanarkshire, where he continued to labour for sixteen years with growing popularity. Transferred in 1822 to the charge of Rose Street church, Edinburgh, he at once took a high rank as a preacher. Deficient in imagination and in spontaneity of utterance, he had nearly all the other qualities of a pulpit orator,—-a powerful and flexible voice, a presence at once winning and commanding, clear and persuasive reasoning, and a habitual earnestness, rising not unfrequently into fervour. In 1829 he succeeded Dr Hall in the pastoral charge of Broughton Place church, Edin- burgh, where his congregation speedily became one of the largest in the city. In 1835 he was appointed one of the professors in the theological hall of the Secession Church, and, great as was his ability as a preacher and pastor, it was probably in this sphere that he rendered his most valuable service to his own denomination and the church at large. He had been the first in Scotland to introduce in his pulpit ministrations what is known as the exegetical method of exposition of Scripture, and he fully availed himself of his position asa professor to illustrate the

method and extend its use. To him probably more than to any other man is due the abandonment of the radically vicious principle of interpretation according to the " analogy of faith," which practically subordinated the Bible to the Creed. To his favourite task of exegesis, which he him- self described as the main object of his public life, Dr Brown bronght a rare critical sagacity, exact and extensive scholarship, unswerving honesty, and a clear, logical style. His expository works, noted below, have accordingly a permanent value. Dr Brown was naturally of a retiring disposition, but the strength of his convictions forced him to take a prominent part in the chief religious and political discussions of his time. He had a considerable share in the Apocrypha controversy, and he was throughout life a vigorous and consistent upholder of anti-state-church or "voluntary" views. His two sermons on The Law of Christ respecting civil obedience, especially in the payment of tribute, called forth by a local grievance from which he had personally suffered, were afterwards published with exten- sive additions

and notes, and are still regarded as an admirable statement and defence of the voluntary prin- ciple. In a discussion which agitated his denomination for several years in regard to the nature and extent of the atonement, Dr Brown took a part which led to a formal charge of heresy being preferred against him. In 1845, after the to him peculiarly painful ordeal of a somewhat protracted trial, he was acquitted by the Synod. From – that time he enjoyed the thorough confidence of his deno- mination (after 1847 “the United Presbyterian Church ”), of which in his later years he was generally regarded as the leading representative. Dr Brown died on the 13th October 1858.

Dr Brown’s chief works were—Expository Discourses on First Peter (1848) ; Hxposition of the Discourses and Sayings of owr Lord (1850) ; Heposition of our Lord’s Intercessory Prayer (1850); The Resurrec- tion of Life (1851) ; Exposition of the Epistle to the Galatians (1858) ; and Analytical Exposition of the Epistle to the Romans (1857). See Memoir of John Brown, D.D., by John Cairns (1860).

BROWN, Jonny, an American abolitionist, celebrated as the originator of the Harper’s Ferry insurrection, was born in Torrington, Connecticut, on the 9th May 1800. Originally intended for the church, he was compelled to give up study for this purpose on account of inflammation in the cyes. He then took up the business of a tanner, which he carried on for twenty years. Not being very successful in trade, he started business as a wool-dealer in Ohio in 1840. Failing also in this he removed to Essex county, New York, in 1849, and began to reclaim a large tract of land which had been granted to him. After two years he returned to Ohio and resumed his business as a wool-dealer. In 1855, with his four sons, he migrated to Kansas, and at once took a prominent position as an anti-slavery man. He became renowned in the fierce border warfare which was carried on for some years in Kansas and Missouri, and gained particular celebrity by his victory at Ossowattomie. About this time he seems to have formed the idea of effecting slave liberation by arming the slaves and inciting them to rise in revolt against their oppressors. As the first step in this scheme, he designed to seize the arsenal of Harper’s Ferry, where an immense stock of arms was kept. On the night of the 10th October 1859, he, with a handful of well-armed and resolute companions, overpowered the small guard and gained

possession of the arsenal. During the next niorning he made prisoners of some of the chief men of the town, but there was no rising of slaves as had been expected. The townsmen, too, recovered from their astonishment at the audacity of the act, and a bold attack was made on the arsenal. Fresh assailants poured in from the country round, and on the morning of the 18th the

arsenal was recaptured, and Brown, severely wounded, was taken prisoner. On the 27th October he was tried at Charlestown for treason and murder, and was found guilty. The sentence passed upon him, death by hanging, was carried into execution on the 2d December. His fate made an extraordinary impression on the excited feelings of the Americans, and his name has become a household word among the Abolitionists.

BROWN, Ropert, the founder of the Brownists, a numerous sect of dissenters in the reign of Queen Elizabeth, was born in 1550. He was the son of Anthony Brown of Tolthorp in Rutlandshire, whose father ontained, by a charter of Henry VIII, the singular privilege of wearing his cap in the king's presence. Robezt was educated at Cambridge, and was afterwards a schoolmaster in Southwark. About the year 1580 he began to pro- mulgate his principles of dissent from the Established Church; and the following year he preached at Norwich, where he soon attracted a numerous congregation. His unmeasured assaults upon the Church of England form of government gained for him many followers. His sect daily increasing, Dr Freake, bishop of Norwich, with other ecclesiastical commissioners, called him before them. Being insolent to the court, he was committed to the custody of the sheriff's officer, but was released at the inter- cession of his relative the Lord Treasurer Burghley. Brown now left the kingdom, and with permission of the States, settled at Middleburg in Zealand, where he formed a church after his own plan, and preached without molesta- tion. The removal of persecution, however, broke up the unity.of the party ; numerous sects appeared, and Brown soon returned to England. He fixed his residence at Northampton, where, for his indiscreet attempts to gain proselytes, he was cited by the bishop of Peterborough, and, refusing to appear, was finally excommunicated for contempt. The solemnity of this

censure, we are told, immediately effected his reformation. He moved for absolution, which he obtained, and from that time became a dutiful member of the Church of England. This happened about the year 1590; and, in a short time afterwards, Brown was preferred to a rectory in Northamptonshire, where he kept a curate, and where he might probably have died in peace; but having some dispute with the constable of his parish relative to the payment of rates, he proceeded to blows, and was afterwards so insolent to the justice, that he was committed to Northampton jail, where he died in 1630, aged eighty. Brown boasted on his death-bed that he had been confined in thirty- two different prisons. He wrote a Treatise of Reformation without tarrying for any, and two other pieces, making together a thin quarto, published at Middleburg in 1582. See Brownists,

BROWN, Rosert, a celebrated botanist, who may be said to be the founder of the modern science of vegetable physiology, and to have placed the natural system of the classification of plants, originally introduced by Jussieu, upon that surc and ever-widening basis on which it has ever since remained. With the exception of the early years of his life his career was uneventful. His private life is little known ; and though his researches were familiar to the learned members of nearly all the European and American academies, which numbered him among their members, his very existence, until the journals of the day proclaimed his decease, was almost unsuspected by the fashionable world of the great city in which he had passed upwards of half a century. His biography may be best read in his works,—a very few words sufficing to record the salient points of his life. Robert Brown was the second and only surviving son of the Rev. Jas. Brown, Episcopalian minister of Montrose, by Helen, daughter of the Rev. Robert

Taylor, and was born on the 21st December 1773. He was educated at the grammar school of his native town, where he had as contemporaries, among others less known to fame, Joseph Hume and James Mill. In 1787 he entered Marischal College, Aberdeen, where he soon distinguished himself. Two years afterwards, his father quitting Montrose for Edinburgh, Brown

removed to the university of that city, and there continued his studies for several years, but without taking a dogree, though destined for the medical profession. In 1791 his father died, and in 1816 his mother; both are interred in the Canongate churchyard, in the burying ground belonging to Bishop Keith, It was about 1790 that young Brown's taste for botany attracted the attention of Dr Walker, then professor of natural history in the university. THis first contribution to the science of which he was destined to be so eminent a cultivator was made on the 26th June 1792, in the shape of a paper on the plants of Forfarshire, read before the Natural History Society ; the MS. is still contained in the archives of the Royal Physical Society (Journal of Botany, 1871, p. 321). During his student days he also discovered many plants new to Scotland, which were communicated to Withering for his Arrangement of British Plants.

In 1795 he obtained a commission in the Forfarshire regiment of Fencible Infantry as "ensign and assistant surgeon," and while serving in the North of Ireland steadily pursued his botanical studies, and had the advantage of the companionship of Capt. Dugald Carmichael of Appin, afterwards well known as an investigator of the lower orders of plants. Having occasion to pass several months of 1798 and of subsequent years in London, he studied in the library and museum of Sir Joseph Banks, P.R.S., whose acquaintance he had been fortunate enough to make by the discovery of a rare moss, Glyphomitrion Daviesti. ''The result of this friendly intercourse was that he was recalled from Ireland, and in the summer of 1801 quitted his not altogether congenial medico-military pursuits, to take the more agreeable post of naturalist to the expedition fitted out under Capt. Flinders for the survey of the then almost unknown coasts of New Holland. Ferdinand Bauer, after- wards familiarly associated with Brown in his botanical discoveries, was draughtsman ; Wm. Westall was landscape painter ; and among the midshipmen was one afterwards destined to rise into fame as Sir John Franklin. The narrative of that expedition is part of the biography of its botanist. In 1805 the expedition returned to England, having obtained, among other acquisitions, nearly 4000 species of dried plants, many of which were new. Brown was almost immediately appointed librarian of the Linnean Society, of which learned body he had been an associate since 1798, and to the presidency of which he afterwards attained. In this position, though one of no great emolument, he had abundant opportunities

of pursuing his studies; but it was not until 1810 that the first volume of his great work, in Latin, the Prodromus Florcee Nove Hollandice et Insulee Van Diemen, appeared. It at once revolutionized systematic botany, not only by the great number of new species it described, but also by the novel views of the general affinities of plants which Were promulgated in its pages. Almost immediately it took the rank it has ever since maintained as one of the canons of botanical science. Humboldt soon after its publication dedicated his well-known work on the plants of the N ew World to Brown (Roberto Brownio, Britanniarum glorice atque ornamento, totam Botanices Scientiam wngento meryfico complectanti), and long after, in his Kosmos, styled him facile princeps botanicorum. The Prodromus is now rave in its original edition, the author having suppressed it, hurt at the Ldinburgh Review having fallen foul of its Latinity ; it is chiefly known through a German reprint.

BROWN

With the exception of a supplement published in 1830, no more of the work appeared. In 1810 Brown became librarian to Sir Joseph Banks, who on his death in 1820 be- queathed to him the use and enjoyment of his library and collections for life. In 1827 an arrangement was made by which these were transferred to the British Museum, with Brown's consent and in accordance with Sir Joseph's will. Brown now became keeper of this new botanical department, an office which he held until his death thirty years after- wards. Soon after Banks's decease he resigned the librarian- ship of the Linnean Society, and in 1849 became president, in which office he continued until 1853. His subsequent life was occupied with numerous brilliant discoveries and researches in vegetable anatomy, physiology, and classifica- tion ; these are familiar to every student, and may be read in any botanical text-book. Long before his death they secured his fame as the first botanist of the day. Honours flowed thickly in upon him, In addition to being a fellow of the Royal Society he received its Copley Medal in 1839. In 1833 he was elected one of the five foreign associates of the Institute of France,—the other competitors, nearly all of whom afterwards attained the same honour, being Bessell, Von Buch, Faraday, Herschcl, Jacobi, Meckel, Mitscherlich, Cirsted, and Plana. He was also a mem- ber of nearly all the learned societies and academies of this and other countries, D.C.L. of Oxford,

LL.D. of Edinburgh, and knight of numerous orders, among others of the Order “pour le Mérite” of Prussia. In the “ Aca- demia Czsarea Naturee Curiosorum” he sat under the cognomen of Ray.

On the 10th June 1858 he died in the 85th year of his age, in his house in Soho Square, bequeathed to him by Sir Jos. Banks. His place in botanical science has long been fixed; it is not necessary now to discuss it. His works are all standards, being distinguished by their thoroughness and conscientious accuracy, and displaying powers at once of minute detail and of broad generalization, —qualities rarely combined. Indeed, so careful was he in preparing his discoveries for the press that he directed in his will that, should any of his writings be republished, they should be printed verbatim et lateratim. In private life he was exceedingly modest, and he shrank from notoriety of every kind. Sensationalism and self-seeking he despised ; fame came to him unsought. His reserved manner to those not intimately acquainted with him could never make him universally popular; but few will deny his warm- heartedness to his friends, the singleness of his purpose, and the purity of his life. Those who knew him in his most intimate relations bear witness that in mind he was simple, truthful, and upright, and that he was wise and faithful in council.

In 1825-34 Dr Brown’s works up to that date were collected and published in four divisions by Nees von Esenbeek, in German, under the title of Vermischte botanische Schriften (Leipsic and Nur- emberg). In 1866 the Ray Society reprinted, under the editorship of his friend and suecessor in the keepership of the Botanical De- partment of the British Museum, Mr J. J. Bennet, his complete writings, the Prodromus alone excepted. In these Aiscellaneous Works (2 vols., with atlas of plates), the history of his discoveries can be best followed. No special biography of him is ever likely to appear, as his career contained few of the elements essential to a con- tinuous narrative of general interest. In the necrologies of the socie- ties and academies which numbered him among their members, there will, however, be found sketches of his life more or less complete.

BROWN, SamveEt, chemist, poet, and essayist, was born at Haddington on the 23d February 1817, and died 26th September 1856. He was the son of Dr Samuel Brown, the founder of itinerating libraries, and grandson of the

author of the Sef-Jnterpreting Bible. In 1832 he entered the university of Edinburgh, and almost from the first devoted himself with passionate enthusiasm to the study of chemistry. The ultimate problems of the science spe-

cially attracted his attention, and he came to be persuaded that elements usually regarded as chemically simple and primary were transmutable into each other. Believing that he could demonstrate this in the case of carbon and silicon, he became a candidate for the chair of chemistry in Edin- burgh university in 1843; but he withdrew his application on finding his proof inconclusive. In 1849 he delivered in Edinburgh a series of lectures of great value on the history of chemistry from the earliest times to Lavoisier. In 1850 he published the tragedy of Galileo, which had considerable merit. He was also an occasional contributor of articles on general literature as well as on subjects con- neeted with his favourite science to the leading reviews. His time, however, was chiefly spent in his laboratory; and at the date of his death in 1856 he believed that he was within a very little of demoustrating the great funda- inental theory in which lis own faith had never wavered. Though his work was thus left incomplete, he did enough to entitle him to a place in the foremost rank of those who have cultivated the higher chemistry. An interesting col- lection of his essays and papers, which display general literary power of a very high order, was published in two volumes in 1858.

BROWN, Tuomas, of facetious memory, as Addison designates him, was the son of a farmer at Shiffnal in Shropshire, and was born in 1663. He was entered at Christ Chureh College, Oxford, whence he was soon obliged to abscond on account of the irregularities of his life. He was for some time schoolmaster at Kingston-on-Thames, and afterwards went to London, where he had recourse to the usual refuge of half-starved wits—scribbling for bread. He published a great variety of poems, letters, dialogues, &ce., full of humour and erudition, but coarse and indelicate. Though a good-natured man, he had the unhappy quality of preferring rather to lose his friend than his joke. He died in 1704, and was interred in the cloister of

West- minster Abbey. An incomplete edition of his works was published in 1707, in 4 vols. 12mo.

BROWN, Dr THomas, one of the most original and subtle of Scottish psychologists, was born on the 9th January 1778, at Kirkmabreck, Kirkcudbright, of which parish his father was the clergyman. In 1780 the family removed to Edinburgh, but he was not placed at any of the schools in that city. At the age of seven he was sent to London, and began his regular education at a school in Samberwell, from which he was soon afterwards removed to Chiswick. At Chiswick he was thoroughly grounded in classics, and began to give promise of great ability, par- ticularly in the department of verse composition, one of his school poems being deemed worthy of insertion in a magazine. He was a boy of a refined, gentle nature, intensely studious, a devourer of literature of all kinds, and much loved by his companions. After attending two other schools at Bromley and Kensington, he returned to Edin- burgh, and in 1792 began his course at the university by joining the logic class, then conducted by Professor Finlayson. During the summer of 1793 he made acquaint- ance with Dugald Stewart's Philosophy of the Human Mind, and found himself irresistibly attracted towards inetaphysical speculation. He joined Stewart's class, that of moral philosophy, in the following session, and quickly introduced himself to the professor's notice by reading to hiny a paper of objections to one of his theories, marked by great acuteness and ability. His attendance on the classes at the university seems to have been somewhat desultory ; it does not appear that he ever passed through the regular curriculum of arts studies. But he carried on his reading with great vigour, and while still a student made his first appearance in the arena of philosophical disputation. His attention had been drawn towards Darwin's Zoonomia,

which was then exciting a lively sensation in the literary world. His remarks on this book were published in 1798 and were received with great approval as one of the best and mmost mature examinations of the theory. His next contribution to literature was an article in the second number of the Hdinburgh Review on the philosophy of Kant. It is acute, like all that Brown ever wrote, but it shows neither sufficient knowledge nor adequate

apprecia- tion of the philosopher it handled. Meantime he had been devoting himself to the study of medicine, having relin- quished that of law, to which for a while he had applicd. His graduation thesis, De Somno, which was thouglhit worthy of being published, is a fine piece of psychologico- medical analysis. A few months later appeared two volumes of his poems, which were not received with miich favour. Nor did his later poetical efforts attain much popularity, with the partial exception of the Paradise of Coquettes. They all show refined feeling and sweetness of diction, but they are wanting in the elements of true poetry. They are faint echoes of Akenside and Beattie, neither of whom can stand much dilution. Brown's real strength lay altogether in metaphysical analysis, and a favourable opportunity for calling it forth soon presented itself. Some captious objections had been raised against the appointment of the celebrated Leslie to the professorship of mathematics, ou the ground that he had approved of Hume's doctrine of causality. The Humian theory was believed to lead inevit- ably to scepticism and infidelity, and these consequences were, of course, charged upon Leslie. Brown undertook the defence not of Leslie but of Hume, and in his examina- tion of Hume's doctrine showed that in reality the theory was in no way inimical to the interests of true religion or theology. This examination, at first but a pamphlet, swelled out in its third edition (1818) into a bulky treatise, Inquiry into the Relation of Cause and Effect, containing not merely a criticism of Hume, but an elaborate theory of the causal relation. This relation Brown regards as nothing but constancy of antecedence and sequence, while at the same time he admits an intuitive belief in the permanency or universality of the causal connection. The work isa fine specimen of Brown's faculty of analysis, which it exhibits in its very best aspect.

As early as 1806 Dr Brown had engaged in practice as a physician, having been received into partnership with Dr Gregory ; but though very successful in his profession, he was by nature more strongly attracted towards a literary life. He had twice failed in his application for a profes- sorship in the university of Edinburgh, when in the session 1808-9 he was called upon to deliver a few lectures to the class of moral philosophy, in consequence of the temporary illness of Dugald Stewart. In the following year, Stewart's health still incapacitating him from active exertion, Dr Brown delivered the

lectures for the greater part of the session. His success in conducting the class was unequivocal; the enthusiasm of the students was such as one reflects on with a little wonder. They were fascinated not more by the splendid rhetoric of the lecturer than by the novelty and ingentity of the views presented. In the summer of 1810 it was resolved to appoint Brown as colleague to Dugald Stewart, and in the ensuing session he began his course as professor of moral philosophy. During the few remaining years of his life he published only his poems, but he was busily engaged in preparing an abstract of his lectures to serve as a handbook for the class. His health, never strong, gave way completely under the pressure of his work. A voyage to London, which had been recom- mended, proved of no avail, and he died on the 2d April 1820, at the early age of forty-two. After his death were published the first part of his proposed text-book, Physiology of the Human Mind, and the Lectures on the Philosophy

of the Human Mind, 4 vols., of which the Physwlogy is an abstract. The fame achieved by the Lectures when pub- lished surpassed even what they had attained when delivered. It is no exaggeration to say that never before or since has a work of metaphysics beenso popular. In 1851 the book had reached its 19th edition in England, and in America its success was perhaps greater. Since that time, however, its popularity has declined with almost equal rapidity; judgments on its merits are now as severe as they were formerly favourable, and the name of Brown may be said to be a dead letter in the annals of philosophy. It is interesting to inquire how far this extravagant laudation and neglect are justifiable ; and it is of importance to know exactly what were Brown’s contributions to mental science, and how far his system is consistent and true.

Some part of Brown’s popularity is no doubt to be accounted for from the fact that he was the leader of a revolt against the estab- lished system of philosophical thought in Scotland. It had come to be looked upon as established that in the common sense philosophy of Reid alone were metaphysical truth and sounduess to be found. Brown not only showed that in many points of detail the earlier Scottish psychology was in fault, above all in their crucial doctrine of perception, but changed the whole aspect of

the science by treating it- from a thoroughly new and original standpoint. Still more of his fame was due to the lively impression made by his brilliant rhetorical powers. It was a novelty to find the most subtle analysis expounded in the most richly poetical language. Philosophical diction had been dry enough in Reid, and though Dugald Stewart was a master of literary exposition, his eloquence was of a chaste and elegant kind. Brown's, on the other hand, is florid and ornamental to excess, and one soon wearies of the copious quotations from poets like Akenside, Beattie, or Young. Yet the style had, and still has, a certain fascination. But in addition to these extraneous causes, one cannot help acknowledging as the main reason for Brown's quick accession to fame, his undeniable acute- ness and originality. His mind was extraordinarily quick and active ; there is not one of his lectures which does not contain either some addition to the older doctrine, or some new and striking applica- tion of it. What a mind of such fertility and subtility might have achieved had the thinker been spared a little longer, it would be hard to say. But it must not be forgotten in estimating his merits, that we possess only part of his system, and that he had not brought his psychology to bear upon the deeper problems of metaphysics.

Of positive contributions made by him to mental science, the following are perhaps the most important :—(1.) General con- ception of the object and method of psychology. According to him mental phenomena are to be treated by the recognized methods of physical science. Complex mental facts are to be resolved into their simple elements; and sequences of such facts are to be analyzed so as to bring out the general laws of their connection, Analysis is thus the one instrument to be employed. (2.) View of mental processes and rejection of the ordinary doctrine of faculties. Just as physical science has to analyze and trace the connections of the various phenomena or modes of appearance of matter, without ever reaching the essence which lies behind them, so psychology treats all mental facts as states or modes or modifications of the mind. Perceptions, abstractions, emotions, or desires are simply the mind in the several states of perceiving, abstracting, feeling, or desiring. The so-called faculties are nothing but the various modes in which mental activity manifests itself. Consciousness is not to be distinguished from the several mental states. Meutal modifi- cations may be classified according to what gives rise to them ; they spring

up either after some internal cause, or after some other mental mode. In the first case they may be called external states, in the second, internal. The internal may be again divided into intellectual and emotional, (3.) Analysis of touch into touch proper and the muscular sense. This is perhaps the most valuable of Brown's contributions. There are no doubt anticipations of the division, particularly in De Tracy, whom Brown had studied, but his originality is, we think, beyond question. The analysis has since been carried out much more perfectly than by Brown. (4. Theory of extension. Brown was one of the first to attempt the resolution of our kuowledge of extension into a series of muscular feelings, successive in time. His analysis is exceedingly acute, though in many points it must now be looked upon as erroneous. (5.) Doctrine of perception. According to him, all that we know of the external world consists of the feelings of resistance, outness, and extension, which are combined into one complex state; but our intuitive belief in the causal principle compels us to postulate a real existence as lying behind and giving rise to these feclings. (6.) Prominence given to the doctrine of suggestion or association, All internal intellectual states may be reduced to simple sucgestions,

z.é., Where one state arises in consequence of another, and to relative suggestion, where the relation between two states gives rise to a third state. Brown analyzes with great skill the powers of sugges- tion or association, and illustrates very fully the primary and secondary states. Under the headof relative suggestion, he discusses at great length the perception of resemblance or similarity, and draws out an elaborate theory of generalization, intended to supple- ment the defective view of the Nominalist and to reduce to its proper sphere the supposed abstract idea of the Conceptualist. The analysis was highly popular in its time, but has little of real novelty in it. (7.) Ethical doctrine. To this Brown added little ; indeed, the weakest part of his psychology is that bearing upon the will, which he identifies with desire. With regard to conscience, he postulates the existence of a primitive susceptibility tomoral emotion; v.¢., a certain ethical feeling is infallibly excited by those actions of agents which are right or wrong.

On the whole, it will be seen from this brief statementof what was new in Brown's philosophy, that it occupies an intermediate place between the earlier Scottish school and the later analytical or associational psychology. Tothe latter Brown really belonged, but he had preserved certain doctrines of the older school which were out of harmony with his fundamental view. He still retained a small quantum of intuitive beliefs, and did not appear to see that the very existence of these could not be explained by his theory of mental action. This intermediate or wavering position accounts for the comparative neglect into which his works have now fallen. They did much to excite thinking, and advanced many problems by more than one step, but they did not furnish a coherent system, and the doctrines which were then new have since been worked out with greater consistency and clearness.

For asevere criticism of Brown, see Sir W. Hamilton's Discussions and Lectures on Metaphysics ; and for a high estimate of his merits, see J. S. Mill's Examination of Hamilton. The only German writer who seems to have known anything of Brown is Beneke, who found in him anticipations of some of his own doctrines. See Die Neue Psychologie, pp. 320-330. (R. AD.)

BROWN, Utysszs MAXIMILIAN, a celebrated general in the imperial armies, son of Ulysses,. Baron Brown and Camus, a colonel of culirassiers, was descended of an ancient Irish family, and was born at Basel in 1705. After study- ing at Limerick, Rome, and Prague he entered the army, becoming in 1723 captain in the regiment of his uncle, Count George Brown, and in 1725 lieutenant-colonel. He served with great distinction in Corsica and Italy, and in 1739 was made field-marshal-lieutenant, and counsellor in the aulic council of war. After the death of the Emperor Charles VI. he became one of the foremost generals in the army of the Empress-Queen Maria Theresa, and gained a high reputation for military skill, On the ontbreak of the Seven Years' War, Count Brown, with the rank of field- marshal, assembled his army in Bohemia, and repulsed the Prussians at the battle of Lowositz, He was mor- tally wounded at the great battle of Prague, and was ae into the town, where he expired on the 20th June

1757.

BROWN, WittiaMm LAURENCE, born at Utrecht, January 7, 1755, was the son of the Rev. William Brown, minister of the English church in that city. The father, having been appointed professor of ecclesiastical history at St Andrews, returned to Scotland in 17 D7, and his son was in due time sent to the grammar school of that city. At the age of twelve he entered the university, and after passing through the classes of divinity, removed in 1774 to the university of Utrecht, where he combined with the study of theology that of the civil law. In 1777 he was appointed to the charge of the English church in Utrecht, which had been previously held by his father and uncle. About 1788 he was appointed to the professorship of moral philosophy and ecclesiastical history in the university of Utrecht, to which was soon added the professorship of the law of nature. The war which followed the French Revolu- tion finally drove Dr Brown from the place of his nativity, In January 1795 he made his escape to England. In London he experienced such a reception as was due to his literary talents and moral worth ; andin 1795 the magis- trates of Aberdeen appointed him to the chair of divinity on the retirement of Dr George Campbell, and soon after he

was made principal of Marischal College. In the year 1800 he was appointed chaplain in ordinary to the king, and in 1804 dean of the chapel royal, and of the Order of the Thistle. He died on the 11th of May 1830, in the seventy-sixth year of his age,

His most widely known works were an Essay on the Natural Lquality of Men, 1793, which gained the Teyler Society’s prize ; a treatise On the Existence of the Supreme Creator, 1816, to which was awarded the first Burnet prize of £1250; and 4A Comparative View of Christianity, and of the other Forms of Religion which have cuisted and still exist in the World, particularly with regard to their Moral Tendency, 1826.

BROWNE, Cuartes Farrar, an American humorous writer, best kuown under his nom de plume of Artemus Ward, was born at Waterford, Maine, in 1834. He began life as a compositor and occasional contributor to the daily and weekly journals. In 1858 he published in the Cleve- land Plaindealer the first of the “ Artemus Ward ” series, which in a collected form attained great popularity both in America and England. In 1860 he

became editor of Vanity Fair, a humorous New York weekly, which proved a failure. About the same time he began to appear as a lecturer, and by his droll and eccentric humour attracted large audiences. In 1866 he visited England, where he became exceedingly popular both as a lecturer and as a contributor to Punch. In the spring of the following year his health gave way, and he dicd of consumption at Southampton on the 6th March 1867. For a critical estimate of his works see the article AMERICAN LiTERA-TURE, vol. i. p. 728.

BROWNE, Isaac Hawxtns, an English poet, was born in 1705 at Burton-upon-Trent, of which place his father was minister. He received his grammatical instruction first at Lichfield, and then at Westminster, whence, at sixteen years of age, he was removed to Trinity College, Cambridge, of which his father had been fellow. After taking his master's degree he removed to Lincoln's Inn, where he applied closely to the study of the law. Not long after the commencement of his professional studies, he wrote a poem on Design and Beauty, which he addressed to his friend Highmore the painter. Here also he wrote his most popular poem, entitled The Pipe of Tobacco, in which he gave imitations of Cibber, Ambrose Philips, Thomson, Young, Pope, and Swift, who were then all living. In 1744 he married the daughter of Dr Trimnell, archdeacon of Leicester. He was elected in 1744 and again in 1748 to serve in parliament for the borough of Wenlock in Shropshire, near which place he possessed a considerable estate, left to him by his maternal grandfather. In 1754 he published his poem De Anime Immortalitate, in which, besides a judicious choice of matter and arrange- ment, there is thought to be a happy imitation of Lucretius aud Virgil. The wide popularity of this poem produced several English translations of it, the best of which is given by Soame Jenyng, in his Méscellanies. The author intended to have added a third book, but of this he had left only a fragment. He died, after a lingering illness, in 1760, In 1768 his son published an elegant edition of his poems, in large octavo,

BROWNE, James, LL.D., man of letters, for a number of years sub-editor of the seventh edition of the Encyclopedia Britannica, was born at Coupar-Angus in 1793. He was educated at Edinburgh and afterwards removed to St Andrews, where he studied for the church. He wrote The Llistory of Edinburgh for Ewbank's Picturesque Views of that city, 2 vols.,1823-25. In

1826 he became a member of the Faculty of Advocates, and obtained the degree of LL.D. from King's College, Aberdeen; and in this same year he published a Critical Examination of Macculloch's Work on the Highlands and Islands of Scotland. In 1827

he published at Paris his Apergu sur les Hreroglyphes @Lgypte ; and in the following year there appeared his Vindication of the Scottish Bar from the Attacks of Mr Brougham. He was now appointed editor of the Cale- donian Mercury ; and two years later he became sub-editor of the Lneyclopedia Britannica, to which he contributed a large number of valuable articles. He also published in 1838 a History of the Highlands and Highland Clans, 4 vols. 8vo, of which various editions have since appeared. His mental activity was remarkable, and frequently urged him to exertions beyond his strength. He died in 1841, from a stroke of apoplexy, brought on by his unremitting labours.

BROWNE, Peter, bishop of Cork and Ross, an able writer on theology, was born in Ireland some time after the Restoration. He entered Trinity College, Dublin, in 1682, and after ten years' residence obtained a fellowship. In 1699 he was made provost of the College, and in the same year published his Letter in answer to a Book en- tutled " Christianity not Mysterious," which was recognized as the ablest reply yet written to Toland. It expounds in germ the whole of his later theory of analogy. In 1710 he was made bishop of Cork and Ross, which post he held till his death in 1735. In 1713 he had become somewhat notorious from his violent onslaught on the fashion of drinking healths, a polemic which he carried on in several pamphlets. His two most important works are the Procedure and Limits of the Human Understanding, 1728, an able though sometimes captious critique of Locke's essay, and Things Divine and Supernatural conceived by Analogy with Things Natural and Human, more briefly referred to as the Divine Analogy, 1733. The doctrine of analogy was intended as a reply to the deistical conclusions that had been drawn from Locke's theory of knowledge. Browne holds that not only God's essence, but his attri- butes are inexpressible by our ideas, and can only be con- ceived analogically. This view was vigorously assailed by Berkeley in his Aleiphron (Dialogue

IV.), and great part of the Diwne Analogy is occupied with a defence against that criticism. The bishop emphasizes the distinction between metaphor and analogy ; though the conceived attributes are not thought as they are in themselves, yet there is a reality corresponding in some way to our ideas of them. The doctrine of analogy is interesting, and has an interesting history in English theology. Its most logical expression may be found in the Bampton Lectures of the late Dean Mansel.

BROWNE, Sir Tuomas, a distinguished English writer, was born in London on the 19th October, 1605. He was educated at Winchester School, and afterwards at Broad- gate Hall (Pembroke College), Oxford, where he graduated B.A. in January 1626. He took the further degree of M.A. in 1629, studied medicine, and practised for some time in Oxfordshire. Between 1630 and 1633 he left England, travelled through Ireland, France, and Italy, and on his way home received the degree of M.D. at the university of Leyden. He returned to London in 1634, and two years later, after a short residence in Yorkshire, settled in practice at Norwich. In 1642 a copy of his Feligio Medict was printed from one of his MSS. without his knowledge, and he was compelled to put forth a correct

edition of the work, which appears to have been composed

as early as 1634. Its success was very great, and the author at once became celebrated as a man of letters. In 1646 appeared his Pseudodowia Epidemica, or Enquiries into Vulgar and Common Errors, which added to his fame. In 1658, on the occasion of the discovery of some ancient urns in Norfolk, he wrote his Zydriotaphia or Urnburial, to which was appended The Garden of Cyrus. These four works were all that he published, though several tracts,

notably the Christian Morals and Antiquities of Norwich, were prepared for publication, and appearcd after his death. In 1671 he received the honour of knighthood from Charles ITI. on his visit to Norwich; and in 1682 he died on his seventy-seventh birthday.

Browne is in every way a remarkable and peculiar writer. His writings are among the few specimens of purely lite- rary work produced during a period of great political excitement and discord. England was passing through its greatest convulsion ; events of mighty moment were being transacted round him, and he remained placidly indifferent. While the grandest minds of his country were busied with the important affairs of state, he was revising his Leligio Medici, and his book was published in the very year in which the civil war broke out. While England was torn with civil discord, and the liberty of her children was being bought with their blood, Browne serenely pursued his studies at Norwich, to all appearance as indifferent to con- temporary events as if he had belonged to another planet. Just when there came a lull in the conflict, when the royal power was broken, and the air was filled with doubts, anxieties, and negotiations, Browne published his Pseudo- doxia Epidemica. The death of the king, the expulsion of the parliament, the establishment of the protectorate, passed by him like a breath which he heeded not. But the unearthing of some sepulchral urns at once roused his attention, and furnished occasion for a train of most magnificent and majestic reflections on the short space of human life, on the signs and symbols of mortality. A mind like this is a psychological curiosity, and its pecu- liarities are faithfully reflected in the form and inatter of his works. In some respects, of course, he resembles his contemporaries ; in his, as in all other writings of the 17th century, there is a plentiful display of erudition, copious citation of authorities, and lavish quotation from older writers. Some part also of the peculiarity of his style may be ascribed to the general tendency of the language at that period. It was a time of unusual richness of diction ; great writers did not hesitate to coin words and phrases as occasion required them, and ample raw material was supplied by the great mass of literature, which had beeu but recently opened up, and which was then being assimi- lated. But Browne stands apart from his contemporaries by reason of the peculiar and unique cast of his mind. Deeply speculative, imbued with the Platonic mysticism which taught him to look upon this world as only the image, the shadow of an invisible system, he regarded the whole of ex- perience but as food for contemplation. Nothing is too great or too small, too far removed or too near at hand for him ; all finds a place in the universe of being, which he seems to regard almost from the position of an outsider. His general mood may be characterized as the metaphysical ; not that he speculated

systematically on the problems ‘of existence, but because he dwells repeatedly, and with evident delight, upou what transcends the little sphere of our life, and, like Shakespeare, is fond of meditating on the outward and visible signs of mortality, and on what lies beyond the grave.

Of Browne, however, as of our greatest writers, it is true that the style is the man. The form of his thought is as peculiar and remarkable as the matter; the two, indeed, react upon one another. It is a style altogether unique,—rich, with a lavish use of metaphor avd analogy—majestic and swelling, and with a fine antique flavour about it. Much of its quaintness, no doubt, depends on the excessive employment of Latinized words, great part of which have never succeeded in making their way into the standard language; but the peculiarities of the vocabulary do not entirely exhaust those of the style. Of his four master- pieces the Religio Medici is that in which we are most in

contact with the writer himself. The book was a puzzle to contemporaries, and is still hard to understand. It is the confession of faith of a mind keen and sceptical in some aspects, but on the whole deeply imbued with the sense of the mysteriousness of true religion, and willing to yield itself up without reserve to the requirements of faith. “J love,” he says, “to lose myself in a mystery, to pursue my reason to an O, Altitudo!” The Vulgar Errors isa wonderful storehouse of out-of-the-way facts and scraps of erudition, exhibiting a singular mixture of credulity and shrewdness. The style is more direct and simple than in the other works. The Garden of Cyrus is a continued illustration of one quaint conceit. ‘The whole universe is ransacked for examples of the Quincunx, and he discovers, as Coleridge says, “ quincunxes in heaven above, quincunxes in earth below, quincunxes in the mind of man, quincunxes in tones, in optic nerves, in roots of trees, in leaves, in everything !” But the whole strength of his genius and the wonderful charm of his style are to be sought in the Urnburial, the concluding chapter of which, for richness of imagery and majestic pomp of dictiou, can hardly be paral- leled in the English language. For anything at all resembling it we must turn to the finest passages of Jeremy Taylor or of Milton’s prose writings.

The best edition of Sir T. Browne is that by Simon Wilkin, 4 vols., 1886,—3 vols. (Bohn), 1851, where full biographical and bibliographical information will be found. Prefixed to it is John- son's celebrated Life.

BROWNE, Wittiam, an English poet, descended of a good family, was born at Tavistock in Devonshire, in 1590. Having passed through the grammar school of his native place, he was sent to Exeter College, Oxford, and became tutor to Robert Dormer, afterwards earl of Carnarvon. After having received in 1624 the honorary degree of M.A., he was taken into the family of William, earl of Pembroke, and improved his fortune so much that he is said to have purchased an estate. Nothing seems to be known of his after life, and no date has ever been given for his death. All his work was done in his youth, the first part of Britannia's Pastorals having been published in 1613, The Shepherd's Pipe in 1614, and the second part of the Pastorals in 1616. He belongs to the school of Spenser, and his merits may be summed up briefly as extreme sweetness of verse, idyllic nature-painting, and richness of descriptive faculty. The Pustorals are about the finest specimens we have in earlier literature of luxuriant sensuous description of ordinary country life. They were highly popular in their fime. (See Wood, Athen. Oxon.)

BROWNE, WILLIAM GeoRGE, an eminent traveller, was born at Great-Tower-Hill, London, July 25, 1768. At seventeen he was sent to Oriel College, Oxford, Having had a moderate competence left him by his father, on leaving the university he applied himself entirely to literary pursuits. But the faine of Bruce's travels, and of the first discoveries

made by the African Association, determined him to become

an explorer of Central Africa. Accordingly, he left England at the close of 1791 and arrived at Alexandria in January 1792. He spent a few months in visiting Siwah, the sup- posed site of the temple of Jupiter Ammon, and employed the remainder of the year in examining the whole of Egypt. In the spring of 1793 he visited Suez and Sinai, and in May set out for Darffir. This was his most important journey, in which he acquired a great variety of original information. He endured much hardship, and was unable to effect his purpose of returning by Abyssinia. He did not reach Egypt till 1796; after this he spent a year in Syria, and did not arrive in London till

September 1798. In 1800 he published his travels in Africa, Egypt, and Syria, from the year 1792 to 1798, in one volume 4to. The work was highly esteemed, and is classed by Major Rennell

among the first performances of the kind; but, from the ! tune further to have her existence endangered in 1837 by

abruptness and dryness of the style, it never became very popular, In 1800 Browne again left England, and spent three years in visiting Greece, some parts of Asia Minor, and Sicily. In 1812 he set out on a more extensive journey, proposing to penetrate to Samarkand, and survey the most interesting regions of Central Asia. He spent the winter in Smyrna, and in the spring of 1813 proceeded through Asia Minor and Armenia, made a short stay at Erzeroum, and arrived on the Ist of June at Tabriz, where he met Sir Gore Ouseley. About the end of the summer of 1813 he left Tabriz for Teheran, intending to proceed thence into Tartary ; but unhappily he never reached that destination, Near the banks of the Kizil-Ouzen his party were attacked by banditti, and, according to the report of the survivors, Browne was plundered and murdered. Suspicion at- tached to his companions, and even to the Persian Govern- ment, but nothing occurred to confirm these surmises. Some bones, believed to be his, were afterwards found and interred near the grave of Thevenot, the celebrated French traveller. His volume of travels in Africa has already been mentioned. Robert Walpole published in the second volume of his Memoirs relating to European and Asiatic Turkey (4to, 1820), from papers left by Browne, the account of his journey in 1802 through Asia Minor to Antioch and Cyprus; also “ Remarks written at Constantinople.”

BROWNING, Exizazero Barrett, the most distin- guished poet of her sex that England has produced, was born in London in the year 1809. She was the daughter of Mr Barrett, an English country gentleman. From a very early age, almost before the years of childhood had passed, she exhibited a remarkable preference for the arts, but cspecially that of the poetic. Previous to ~~attaining her fifteenth year she had written verse upon which~~

~~was the stamp of true genius—poems eminently worthy of pre~~ servation, Whatever she wrote, however, was sacred to all eyes save those of her father, to whom she refers in the first collected edition of her poems as “my public and my critic.” Her physical constitution was most fragile and delicate, but nature scemed to have supplemented her deficiency

in this respect by bestowing upon her an unusually sensitive.

mental and spiritual organization. One who knew her intimately, Miss Mitford, has described her.as a ** slight delicate figure, with a shower of dark curls falling on each side of a most expressive face, large tender eyes, richly fringed by dark eye-lashes, and a smile like a sunbeam.” All descriptions of Miss Barrett concur in this, that she possessed a grace and a delicacy which defied representa- tion by the artist. Her studies were early directed to the poets of antiquity, and, under the guidance of her blind tutor, Boyd, whose name she always warmly cherished, she mastered the rich treasures of Aischylus The sublime Grecian possessed for hera charm which was only equalled by the fascination held over her wondering spirit by our own Shakespeare. Her knowledge of Greek literature was most profound ; she was intimately familiar with all the Attic writers in tragedy and comedy. Yet this did not prevent her from drinking at the wells of English unde- filed. Her correspondence with eminent contemporaries of both sexes proves her to have been thoroughly acquainted. with English literature in its progress from Chaucer down- wards. The circumstances of her own life, and her lack of robust health, conspired to make her seek, even more than she might have otherwise done, the communion of the great departed in arts and letters, Not being able to pass from place to place without fatigue and danger, the solitude she was compelled to maintain probably threw her still nore ardently into those pursuits which, while dear to the mind, were probably injurious tothe body. Most frail from her birth, as we have already seen, it was her misfor-

the bursting of a blood-vessel in the lungs. By the exercise of extreme care her life was preserved, but the incident was succeeded by a long period of weakness and suffering. Some two years after this first severe shock to her system, and before she had quite recovered from its effects, she was again assailed by misfortune, experiencing the keenest anguish on witnessing the

death of ~~her favourite brother, who was drowned at Torquay. As might have been expected from one of her clinging and affectionate disposi~~ tion, a long period of danger followed this catastrophe, and when at length she was able to be removed to her father's

house, it was only to become an invalid, with the prospect

of a life couch-ridden to its close. This period of seclusion

lasted for seven long years; and the interval was em- ployed by Miss Barrett in eagerly devouring all the books

which could be brought within her reach. At this time also she was sedulously cultivating the art that was afterwards to ensure for her immortality. When she was in her thirty-seventh year, that is, in 1846, she was married to Mr Browning, and the union was singularly felicitous. More cannot be said, as the author of The ting and the Book still lives. Mr Browning bore his wife to Italy, and for some years the sunny skies of the south were instru- mental in giving to Mrs Barrett Browning that health which had so long forsaken her in her native land. The villa of the Brownings in Florence was the resort of many noble spirits, eminent either for patriotism or in the arts. Mrs Browning died at Florence in the year 1861, after testifying in many ways her singular devotion to the country of her adoption. The poetry of this writer is distinguished for its emotional spirit; had her imagination equalled her capacity for feeling she might have taken rank with the highest of our poets. Sensibility and intuition, those endowments of Supreme importance to writers of genius, whose greatness is to grow in proportion to their understanding and inter- pretation of human life, were in her united in a degree seldom witnessed. The aspirations she indulged, and the character she doubtless wished to be impressed upon her own works, were well set forth when she observed on one occasion, "we want the touch of Christ's hand upon our literature as it touched other dead things; we want the sense of the saturation of Christ's blood upon the souls of our poets, that it may cry through them in answer to the ceaseless wail of the sphinx of our humanity, expounding agony into renovation, Something of this has been per- ceived in art when its glory was at the fullest. Something of a yearning after this may be seen among the Greek Christian poets, something which would have been much with a stronger faculty."

Imbued fully with this idea of the sacredness of poetry, Mrs Browning went to the deepest fount of all inspiration—the human hcart—and endeavoured to read clearly its intimate relations with God. A peculiar tenderness breathes through her writings, whether of the humblest or the most ambitious description. Almost her first work bore upon it the traces of her Greek studies, being an excellent translation of the Prometheus. Another very early production, Zhe Drama of Exile, is un- questionably marked by great sublimity of thought, though the conception may lack the mighty outlines of the majestic Milton. Eloquent and sustained, however, the poem made manifest a pure and original writer. Mrs Browning's genius had two sides—the lyric and the dramatic. Her lyrical capabilitics were of the highest order; she was greater probably in this particular than either Campbell or Tennyson, though on several occasions Campbell touched the loftiest point such a writer can attain. The heart, which has always given our lyric poets their greatest power, was the strength of Mrs Browning ; her song was a living

voice, eloquent with passion, In one of her lyrics she uttered her conclusion upon the human mystery, "know- ledge by suffering entereth, and life is perfected by death." The spirituality of her " Vision of Poets" is a noticeable quality, and it is in a loftier strain than that of "The Two Voices," though cast in the same mould. Wandering amongst the minor poems of Mrs Browning, such for instance as "The Romaunt of Margret," '" Isobel's Child," "Bertha in the Lane," and "the Swan's Nest among the Reeds," is like standing in the forest alone, with the wailing wind and the flying rain as the only assurances of an existence sublimer than our own. Yet she has thereby reached the profoundest depths of the human heart. But cven when most depressed she does not losefaith—confidence in the triumph of the good and the right. To her it was not always necessary to understand the wrong which she beheld ; she saw it and hated it, and she has helped men by her writings to do something towards making an end of it. "The Cry of the Children" is a striking illustration of her keen feeling and eloquent power as a philanthropist. She felt for all who are in any way crushed or bruised by the pressure of society, and of social distinctions, or of social

misfortunes. Her poetry bears the impress of tender and profound sympathy with human suffering in every form.

The range of this author's powers was wide, as may be gathered by a comparison between such poems as "A Child's Thought of God" and "Casa Guidi Windows." In the latter she attained her ripest growth and greatest intellectual strength. The poem is as sustained as anything which she ever wrote, and more perfect than the remain- ing lengthy poems. 'The '" Casa Guidi Windows" had the advantage of a direct and powerful inspiration. From her windows at Florence Mrs Browning looked out upon the Italian people struggling for freedom, and her enthusiasm was enkindled. Her utterances were therefore in accord- ance with the fulness of her heart, lavish and unrestrained. The extraordinary wealth and strength of imagery which the poem contains must have been noticed by every reader, and it includes doubtless much of her finest writing. In the inditing of the sonnet, always conceded to be a most difficult task, Mrs Browning was very successful. She is the equal of Wordsworth in this respect, and her 'Sonnets from the Portuguese" (but thinly disguised, and giving really the history of her own feelings) are a compact and remarkable series of verses. They present us with a coin- plete study of a human heart as it is affected by the passion of love. First, there is the soul expecting death, when suddenly life is revivified by love ; then the grave, which had seemed inevitable, is put behind the soul ; and finally comes the sequel, the marriage of those whose history has been traced in the Sonnets. The unity and psychological interest of this series of poems are their most prominent features.

Mrs Browning's fame chiefly rests upon Aurora Leigh, except with diligent and reverent students of her other works. The longest poem, nevertheless, which came from her hand is the one, to quote her own words, into which her "highest convictions upon life and art have entered." Yet it has had the result of causing a wide diversity of opinion upon its merits. Extravagant encomiums or unjust asper- sions are generally awarded to it. For a poem of such magnitude unity is essential, and this we find to be lacking, It has not the one purpose-—never ignored and never for- gotten —which runs through Jn Memoriam. One of its great charms, however, viz., its intense subjectivity, will prevent Aurora Leigh from falling into desuetude. The writer unfolds with great beauty of expression the truth that that is real art

which assists in any degree to lead back the soul to contemplate God, the supreme artist of the universe. But notwithstanding its philosophy, as a solution for many

of the problems of our social existence, the poem must be pronounced a failure. It is charged with passages of lofty poetry, though occasionally it falls into mediocrity. It is to be regarded rather as an autobiography (which indeed it claims to be) than as a poem characterized by fine concep. tion or perfect exccution. The position of Mrs Browning as a poet is now yielded. Her genius was perhaps as great as that of any poet of our generation, but circumstances retarded its highest possible development. In certain intel- lectual qualities she was inferior to Tennyson and the author of Sordello, but in others she was their superior. Be her exact niche, however, what it may, she occupics a favoured place in English literature, and is undoubtedly one of the few leading poets of the 19th ceutury. Her poetry is that which refines, chastens, and elevates. Much of it is imperishable, and although she did not reach the height of the few mighty singers of all time, she has shown us the possibility of the highest forms of the poetic art being within the scope of woman's genius. (Gc. B. 8.) BROWNISTS, a religious sect, which sprang up towards the close of the 16th century, and which received its name

from the first promulgator of the doctrines, Robert Brown.

Their numbers increased rapidly, and Sir Walter Raleigh, in a speech in 1592, estimated them at no less than twenty thousand. The harsh measures that were taken against them, and the disgust generally excited by the tone of their attacks upon the Established church, for a time stamped out the sect in England. But the remnant found a refuge in Holland, and the church established there between 1593 and 1608 included many eminent men, such as Ainsworth, Johnson, Smyth, Jacob, Clifton, and Robin- son, and gradually increasd in numbers. Soon, however, differences of opinion began to arise; some, with Smyth, carried out the principles of Brownism to their full extent, and became absolute Separatists ; others, with Robinson, adopted a milder form of opposition to the church, which ultimately resulted in Independency. The stronger stream of tendeucy set in towards

this latter form of doctrine, and the Brownists soon faded out of view and gave placc to the Independents. The occasion of the Brownists' separa- tion was not any fault they found with the faith, but only with the discipline and form of government of the other churches in England. They charged corruption equally on the Episcopal form and on that of the Fresbyterians by consistories, classes, and synods ; nor would they join with any other Reformed church, because they were not assured of the sanctity and regeneration of the members who com- posed it, on account of the toleration of sinners, with whom they maintained it an impiety to communicate. They condemned the solemn celebration of marriages in the church, maintaining that, as matrimony was a_ political contract, the confirmation of it ought to come from the civil magistrate. They would not administer baptism to the children of such as were not.members of the church, or of such as did not take sufficient care of their children already baptized. They rejected all forms of prayer, and held that the Lord's Prayer was not to be recited as a prayer, having been given only for a rule or model whereon all our prayers are tobe formed. The form of church govern- ment which they established was democratical. When a church was to be gathered, such as desired to be members of it made a confession and signed a covenant, by which they obliged themselves to walk together in the order of the gospel. 'The whole power of admitting and excluding members, with the decision of all controversies, was lodged in the brotherhood. 'The church officers were chosen from among themselves, for preaching the word and taking care of the poor, and were separated to their several offices by fasting, prayer, and imposition of hands by some of the brethren. But they did not erect the priesthood into a

As the vote of the brotherhood made a man a minister, and gave him authority to preach the word and administer the sacraments among them, so the same power could discharge him from his office, and reduce him to the And as they maintained that the bounds of a church were defined by the number of those who could meet together in one place, and join in one communion, so the power of these officers was confined The minister or pastor of one

distinct order.

condition of a mere layman again.

within the same limits. church could not administer the Lord’s Supper to another, nor baptize the children of any but those of his own society.

Any lay brother was allowed the liberty of prophesying, or of giving a word of exhortation to the people ; and it was usual for some of them, after sermon, to ask questions, and Ina word, every church on the Brownists’ model is a body corporate, having full power to do everything which the

reason upon the doctrines which had been preached.

good of the society requires, without being accountable to

any presbytery, synod, assembly, convocation, or other

jurisdiction whatever. (Sce Fuller, Neal, Fletcher, Hanbury, and Masson, Life of Milton, vol. ii, pp. 534, seg.) BRUCE, Jamus, a celebrated African traveller, was born at Kinnaird House, Stirlingshire, on the 14th December 1730. He was educated at Harrow, and at first turned his attention to the bar. After his marriage, however, he entered into business as a wine-merchant, but soon gave up any active share in the concern. His wife had died within a year of their marriage, and Bruce, after acquiring a knowledge of the Spanish and Portuguese languages, travelled on the Continent for some time, returning to England in 1758. He then made a proposal to the English Government that they should make a descent upon Spain at Ferrol, assuring them from his own observation that the coast was without defence at that place. His suggestions were not adopted ; but Lord Hali- fax, to whom he had been introduced, and who had consulted him about the exploration of the Nile, appointed him soon afterwards to the consulship at Algiers. He arrived at that place in March 1762, and after spending a year in the study of Arabic and other Oriental languages, set out through Tunis, Tripoli, and the North of Africa. He then visited Rhodes and Cyprus, and explored great part of Syria and Palestine, making very careful drawings of Palmyra and Baalbec. These drawings were afterwards presented to the king and placed in the royal library at Kew. It was not till June 1768 that Bruce arrived at

Alexandria, aud prepared to start on his great exploring expedition. From Cairo he sailed up the river as far as Syene ; he then struck across the desert to Kosseir, and reached Jidda in May 1769. He remained for some time in Arabia, set sail from Loheia on the 3d September, and ou the 19th arrived at Massowah. There he was detained for some time; but at last, on the 15th February 1770, he made his way to Gondar, the capital of Abyssinia. He gained great favour with the Abyssinian king, and remained with him till October, when he set off up the Bahr-el- Azrek, which he looked upon as the main branch of the Nile. On the 14th November he reached the sources of the Bahr-el-Azrek, and proudly imagined himself to have solved the great geographical problem. Slowly and with great difficulty he made his way back through the deserts of Nubia, On the 29th November 1772 he reached Assouan on the Nile. Thence he returned into the heart of the desert to recover his baggage, which had been abandoned in consequence of the death of all his camels. In January 1773 he arrived at Cairo. On his way home

to England he spent some time at Paris, where he was

warmly received by Buffon and other eminent men of science, The celebrated Zravels did not appear till 1790, when they were published in five large quarto volumes,

profusely illustrated. The work was received with favour om account of its freshness and interest, but with almost universal incredulity. The Zvravels were looked upon as veritable travellers’ tales, not entitled to any respect as authentic narrative. Succeeding investigations, however, have thoroughly dispelled these suspicions, and reinstated the book in popular estimation. Bruce died in 1794, in consequence of a fall down the staircase of his own house. A second edition of his work, on which he was engaged at the time of his death, was published in 1804.

BRUCE, Micwartz, a minor Scottish poet, was born at Kinnesswood, Kinross-shire, 27th March 1746, and was the son of a weaver. He was early sent to school, but his attend- ance was often interrupted. He had frequently to herd cattle on the hills in summer, and this early companionship with

nature greatly influenced his mind and awoke the latent poetry of his genius. Delicate from birth he grew up contemplative, devotional, and humorous, the pet of his family and his friends. His parents gave him an education superior to their position; at fifteen, when his school education was completed, his father was enabled to send Michael to Edinburgh University, which he attended during the four winter sessions 1762-5. In 1765 he got einploy- meut as a teacher during the summer months at Gairney Bridge, receiving about £11 a year in fees. He became a divinity student of a dissenting Scotttish sect known as the Burghers, and in the first summer of his divinity course accepted the charge of a new school at Forrest Mill, where "he lead a melancholy kind of life." Poverty, disease, and want of companions depressed his spirits, but in that solitariness he wrote " Lochleven," a poem inspired by the memories of his childhood. In consequence of advanced consumption he had to give up the school, and returned to lis father's house, where he wrote lis last and finest poem, "Elegy written in Spring," and died on 5th July 1767, aged twenty-one years and three mouths. As a poet his reputation has been increased, first, through sympathy for his early death, and secondly, from the alleged theft by Logan of several of his poems. The Rev. John Logan, minister of. Leith, a fellow-student of Bruce, edited in 1770 the Poems on several occasions, by Michael Bruce, in which the "Ode to the Cuckoo" appeared. In the preface he stated, "To make up a miscellany, some poems written by different authors are inserted." In a eollection of his own poems in 1781, Logan printed the " Ode to the Cuckoo" as his own ; of this the friends of Bruce were aware, but did not challenge it. Dr M'Kelvie, in his Life and Works of Bruce (1837), was the first to claim for him the authorship of the Ode, and of other verses of which Logan had hitherto been the reputed author. This claim rests on the oral tradi- tion of his birthplace and the evidence of a few of his friends; it was made nearly fifty years after Logan's death, and no explanation can be given of this great lapse of time. Of direct testimony there is none, and irrelevant matter is brought in affecting Logan's character, while Logan's authorship rests on such ground as publication under his own name, and his reputation as author during his lifetime. By reiteration of Bruce's claims in many forms popular opinion has been gained for him, though Isaac D'Israeli, Thomas Campbell, Robert Chambers, and David Laing have strenuously supported Logan.. The dispute cannot now, perhaps, be satisfactorily settled, owing to the conflict

of evidence and lapse of time ; but on the whole it may be doubted whether M ‘Kelvie has proved his case. All Bruce’s poems breathe the thoughts of a shepherd lad, as Bloomfield’s retained the fresh observations of a farmer’s boy. With two exceptions they are immature and lack strength; his imagery is in great measure borrowed; his rhymes evince a paucity of poetical skill. His early attempts are weak imitations of Milton, ate! and Young, his

favourite poets. His “ Lochleven” and “ Elegy written in Spring” are alone worthy of preservation, and both were composed in his last year. The former abounds in happy word-painting and moral reflections. The tale of Levina, which forms about the half of the poem, and is by far the prettiest flower in the bouquet, bears distinct marks of the same hand that wrote “ Runnimede.” The “ Elegy” is most affecting, when read in the knowledge of the circum- stance of its having been written by a dying youth of twenty-one :— “* Led by pale ghosts I enter death’s dark gate, And bid the realms of light and life adieu.”

It is a death song, remarkable for exquisite beauty and chaste simplicity. Bruce is not to be compared with another young Scottish poet, Robert Nicoll. His life wanted the fulness and strength, his poems the wide and vivid sympathies of his later compeer.

BRUCE, Ropert, king of Scotland. See Scotuann.

BRUCHSAL, a town of the Grand Duchy of Baden, in the circle of Carlsruhe, 14 miles from the city of that name, on the Salzbach. From 1056 to 1801 it was the seat of the bishop of Spires, whose magnificent palace is still extant ; and it has an old castle of the 12th century (now used as a prison), a town-house, a gymnasium, a hospital, barracks, and a considerable trade in wine. Pop- ulation in 1872, 9762. The town was originally the seat of an imperial palace, and its name is said to be derived from bruch a marsh, and sala, royal possession. The Peasants’ War first broke out at Bruchsal, which has been several times reduced to ashes in

subsequent conflicts, In 1849 it was the scene of an engagement between the Prussian troops and Baden insurgents.

BRUCK, the name of two towns of Austria—

(1.) Bruck on THE Mur, the chief town of a circle in the province of Steyermark, situated at the junction of the rivers Mur and Miirz, with a station on the railway from Vienna to Trieste, 25 miles N.W. of Gratz. It contains about 2900 inhabitants, and has a considerable transit trade. The principal building is the palace of the ancient princes of Bruck, which dates from the 14th century.

2, Bruck on THE LeyTHa, the chief town of a circle in Lower Austria, with the castle of the counts of Harrach. It lies on the Vienna and Buda railway, 20 miles S.E. of Vienna. Population, 4203.

BRUCKENAU, a town and fashionable watering-place of Bavaria, in the circle of Tower Franconia, on the Sinn, 16 miles N.W. of Kissingen. The mineral springs, which are five in number, situated in the pleasant valley of the Sinn, 2 miles from the town, were a favourite resort of Louis I. of Bavaria. Population in 1871, 2825.

BRUCKER, James, theologian, historian, philologer, and biographer, was born at Augsburg on the 22d of January 1696. His father, who was a respectable burgher, destined him for the church; and his own inclinations ‘ccording with his father’s wishes, he was sent at the usual age to pursue his studies in the university of Jena. Here he took the degree of master of arts in 1718; and in the following year he published his Tentamen Introductionis in Historiam Doctrine de Ideis, in 4to,—a work which he afterwards amplified and completed, and republished under the title of Historia Philosophica Doctrine de Ideis, at Augsburg in 1723. He returned to his native city in 1720; but here his merit having attracted envy rather than recompense, he was induced to accept of the office of parish minister of Kaufbevern in 1723. In the same year he published a memoir De Vita et Scriptis Cl. Htringeri, Augs. 8vo, His reputation having been at length estab- lished by these learned works, in 1731 he was elected a member of the Academy of Sciences at Berlin ; and soon afterwards he was invited to Augsburg to fill the honour-

able situation of pastor and senior minister of tne church of St Ulric. He published in the same year three disserta- tions relating to the history of philosophy, under the title of Otewm Vindelicum sive Meletematum Historico-philoso- phicorum Triga, Augsburg, 1731, 8vo. Besides several smaller dissertations on biography and literary history, printed at different times, and which he afterwards collected in his AMzscellanea, he published at Ulm, in 1737, Neue Zusdtze verschiedener Vermehrungen, &c., zu den kurtzen Fragen aus der philosophischen Historie, 7 vols. 12mo. This work being a history of philosophy in question and answer, contains many details, especially in the department of literary history, which he has chosen to omit in his greater work ou the same subject. He was forced by the booksellers, in opposition to his own opinion, to adopt the erotematic method, which at that time had been rendered popular by the writings of Hubner and Rambach.

In 1741, at Leipsic, appeared the first volume of his great work, Historia Critica Philosophie, a mundi incuna- bults ad nostram usque cetatem deducta. Four other ponderous quartos, completing the first edition of this elaborate history, followed in 1744, Such was the success of this publication, that the first impression, consisting of four thousand copies, was exhausted in twenty-three years, when a new and more perfect edition, the consummation of the labours of half a century devoted to the history of philosophy, was in 1767 given to the world in six volumes quarto, The sixth volume, consisting entirely of supple- ment and corrections, is applicable to the first as well as to the second edition. Of the merits of this work we shall speak in the sequel.

His attention, however, was not wholly occupied by this stupendous undertaking. The following books would of themselves have been sufficient to exhaust the industry of any ordinary author :—Pinacotheca Scriptorum nostra cetate literis ulustrium, &e., Ausgburg, 1741-55, folio, in five decades. hrentempel der Deutschen Gelehrsamkeit in welchem die Bildnisse gelehrter Manner unter den Deutschen aus dem XV., XVI, und XVII. Jahrhundert aufgestellet, und thre Geschichte, &c., entworfen sind, Augsburg, 1747-49, 4to, five decads. nstitutiones Historie Philosophice,

Leipsic, 1747, 8vo, second edition, ibid, 1756; a third has been published since Brucker's death, with a con- tinuation by Professor Born of Leipsic, in 1790. Afis- cellanea Historie Philosophice Literarie Critice olim spar- sim edita, nunc uno fasce collecta, Augsburg, 1748, 8vo. Erste Anfangsgrunde der philosophischen Geschichte, als ein Auszug seiner grossern Werke, znveyte Ausgabe, Ulm, 1751, 8vo. He likewise superintended and corrected an edition of Luther's translation of the Old and New Testment, with a Commentary extracted from the writings of the English theologians, Leipsic, 1758-70, folio, six parts. His death ensued before the completion of this work, which has since been accomplished by Teller. He died at Augsburg in 1770; and he may be added to the catalogue of Huetius, to prove that literary labour is not incompatible with sound health and longevity. (See Saxii Onomasticon; Biographie Universelle ; Gesner's Isagoge.) .

It is only by his writings on the history of philosophy that Brucker is now known in the literature of Europe. In this study his great work forms an important era, and even at the present day it is the most extensive and elaborate upon the subject. It is, however, a work of which the defects are great, and its errors have been important in their consequences, in proportion to the authority it has acquired. We shall, therefore, hazard a few general observa- tions on the defects which chiefly detract from the perfection and utility of the Critical History of Philosophy,

If Brucker had carried into this study a penetration equal to his diligence, and had his general comprehension of the scope and

nature of the subject corresponded with the elaborate minuteness of his details, he would have left us a work which might have had some pretensions to be considered as a rational history of human opinion. He lived, however, at a period when these different qualities were only beginning to be conjoined, and when as yet the history of philosophy had been written merely as a chronicle of the passing theories of individuals and sects. 'To give to the science of history a regular and connected form, and to arrange the narra- tive of successive events, and still more of successive opinions, according to the relation they bear to principles of established

influence, was an attempt of which few in that age had any con- ception, and of which Brucker certainly had none. In civil history it was then believed that the historian had fulfilled all the duties of his office if he strung together the events which were known or believed to have occurred, in good language, and garnished them occasionally by a few general reflections on the absolute motives of human action. A very different notion is now held of the functions of tle historian. He who at present attempts to write the history of any country must reflect, before he begins, what were the chief occurrences in that history, and what were the revolutions which the manners and constitution of that particular nation have under- gone. He must bear with him, from the commencement to the conclusion of his labours, a constant impression that every occur- rence should be more or less considered, not only as it took place, and as it bore an influence on contemporary affairs, but as it may

have remotely contributed to the events, and the opinions, and the’

character of succeeding times. But if this be true in regard to the histories of particular nations, it is evident that, by how much the traces of opinions are more light and evanescent than those of events, by how much the speculations of philosophers whose writings have either perished or come down to us mutilated and obscure are more difficult to be appreciated in their causes, and connections, and consequences, than the actions of warriors and statesmen,—by so much the more is it necessary in philosophical than in civil history to combine reasoning with erudition, and to substitute the researches of the philosopher for the details of the chronicler. History and philosophy are two different things ; and he who would write the history of philosophy must excel in both. Bacon had long ago required this union, and had pointed out the manner in which the historian of literature should endeavour to establish those principles of connection which constitute the soul and charm of such a history; how, by detecting the union of effects and causes, he might be enabled to determine the circumstances favourable or adverse to the sciences; and how, in short, by a species of enchantment, he might evoke the literary genius of each different age. ‘The fulfilment of this plan was, however, far beyond the capacity of Brncker, and was au undertaking of which he had even no conception. Better qualified by nature and education for ainas- sing than

arranging matcrials, he devoted his principal attention to a confused compilation of facts, leaving to others their applica- tion, the discovery of their mutual connections, and the formation of the scattered fragments into a whole.

The merit of his great work consists entirely in the ample collection of inaterials. The reader who would extract any rational view of the progress of opinion must peruse it with a perpetual commentary of his own thoughts. He will find no assistance from his author in forming any general views, or in tracing the mutual dependencies of the different parts of the subject. Brucker has dis- covered the fountains of history, but he has made us drink of them without purifying the dranght. Even in this respect his merit has been greatly overrated. Vast as is the body of materials which he has collected, we are always missing those very things which we might reasonably have expected would have been the first objects of a rational inquirer, and we are continually disappointed of the information we are most anxious to acquire. The idle and slavish attention which he has bestowed on previous compilers has fre- quently diverted him from the study of the original authors themselves. Quoting the passages of the ancients from others, or trusting perhaps to the reference of an index, he has frequently overlooked those very testimonies which could have given us the most authentic knowledge of the opinions or characters of ages and individuals. He has often presented the authorities he has adduced, mutilated or misapplied ; and this either from not having sufficiently studied these passages in their general connection with the system they illustrate, or from having been unable to withdraw them from the obscurity in which they were involved. He has shown no critical sagacity in distinguishing the spurious from the authentic, or in balancing the comparative weight of his authorities. He has frequently transcribed where he ought to have explained the words of the original authors ; and, without taking into account the different value of the same term in different nations and ages, he has left us to apply a doubtful or erroneous meaning to words which might have becn easily rendered by other expressions, and to suppose a distinction in the sense where there only existed a difference in the language. The glaring errors, even, which occa- sionally occur in his expositions of the Grecian philosophy, while they are inconsistent with any critical knowledge of the tongue,

would make us suspect that he was in the habit of relying on the treacherous aid of translations. In short, if we knew nothing more of the ancient philosophers than what we acquire from Brucker we should be often obliged to attribute to them opinions so obscure, or so absurd, that we must either believe ourselves wrong in the interpretation, or be unable to comprehend the cause of all the admiration and reverence they have received.

He has discovered little skill in his analysis of the different systems of philosophy ; and the confusion of what is essential and principal with what is accidental and subordinate clearly evinces that these abridgments were thrown together while acquiring, in detail, a knowledge expressly for the purpose, instcad of being the consummation of a long and familiar meditation on the subjects in all their modifications and dependencies. He has dwelt with the most irksome minuteness on cvery unimportant and doubtful circumstance in the lives of the philosophers ; but he has too often overlooked the particular and general causes that produced an influence on the destinies of their philosophy. The aphoristic method which he has adopted prevents him from following a conse- cutive argument throughout its various windings. The most convincing reasoning in his hands loses much of its demonstration and beauty; and every ingenious paradox comes forth from his alembic a mere caput mortwwm,—a residue from which every finer principle has been expelled. | Where the genius of the philosopher is discovered more in the exposition and defence than in the original selection and intrinsic stability of his tenets, Brucker hag not found the art of doing justice both to the philosopher and to his opinions, or of conveying to the reader any conception of the general value of the original. This last defect, it must, however, be acknowledged, is nore or less inseparable from every abstract of opinions, where it is always necessary to separate in some degree what is essential to the subject from what is peculiar to the man. He has relieved the sterility of his analysis by noue of the elegancics of which the subject was susceptible. Without any pretension to purity, his diction is defective even in precision ; and his sentences, at all times void of harmony and grace, are abrupt, and often intricate in their structure. (W. H.)

BRUGES (in Flemish Bruce), a city of Belgium, the capital of West Flanders, is situated in the midst of a fertile plain, intersected by the canals of Ghent, Ostend, and Sluys, in 51° 12’ N. lat. and 3° 13’ E. long. It is, in a direct line, about 7 miles from the sea, 12 miles E. of Ostend, 24 N.W. of Ghent, and 60 miles in the same direction from Brussels. The history of Bruges dates from about the 3d century of the Christian era. In the 7th it had emerged into importance; and its corporation of weavers, which afterwards in its best days numbered 50,000 men, was already highly renowned in the time of Charle- magne. In the 9th century Bruges became subject to the counts of Flanders, who resided there, and made the city one of the most populous and wealthy in Europe by the great advantages and immunities which they offered to merchants and manufacturers. The inhabitants guarded with the most jealous care the privileges which they some- times received and sometimes exacted from their rulers, and not unfrequently rose in arms for their defence. Though Bruges, and Ghent, and other Flemish towns owned a common lord, their interests were never identified, and they seldom let an opportunity pass of doing each other as much injury as possible. In the middle of the 14th century Bruges passed by marriage into the hands of the dukes of Burgundy, under whom it reached the highest point of its prosperity. The magnificence of the Flemish court was such that no European monarch could equal or approach it. When the wife of Philip the Fair of France visited Bruges at the beginning of the 14th century, ‘There are hundreds here,” she exclaimed, “who have more the air of queens than myself ;” and to such an extent was this extravagance ultimately carried that Charles V. was obliged, in the 16th century, to repress it by severe sump- tuary laws. In 1430 Philip the Good, duke of Burgundy, instituted at Bruges the chivalric order of the Golden Fleece, a compliment to the town, no small portion of whose prosperity arose from its woollen trade. In the 14th and 15th centuries, Bruges was the chief emporium of the cities of the Hanseatic league; and merchants from every quarter of the world found there a ready market for their

goods, The argosies of Venice and Genoa came laden with the produce of the East; ships of every nation took in and discharged their cargoes at the quays; the ware- houses were filled with bales of wool from England, and

with silk from Persia. Not the least famous of the manu- factures was that of tapestry, in which the people of Bruges acquired great skill a century before the looms of Beauvais or the Gobelins were set up. The prosperity of Bruges was undiminished till it passed under the dominion of the house of Hapsburg. For a violation of some of their prerogatives, the inhabitants imprisoned the Archduke Maximilian in 1488, and a terrible vengeance was inflicted upon the town for this outrage. Its trade was transferred to Antwerp, and its ruin was ultimately completed by the religious persecutions of the bloody duke of Alva at the end of the 16th century. Such of the inhabitants as escaped with their lives fled to England and introduced into that country many of the artsand manufactures which they and their forefathers had cultivated with success for many generations. In more modern times the town has frequently suffered from the effects of war. In 1704 it was besieged by the Dutch, and in 1708 and 1745 it was captured by the French. The contrast between the Bruges of the 15th century and the Bruges of recent times is as striking as it is painful. As Wordsworth says — '*In Bruges town is many a street Whence busy life hath fled, Where, without hurry, noiseless feet The grass-grown pavement tread."

The great circumference of the city, its numerous squares and streets, and the number and magnificence of its public buildings, all attest its former importance; while the comparative absence of commercial activity, and the general air of desolation, bear witness to its present insig- nificance. Its trade has, however, considerably revived during the present century, and its great advantages in canal and railway communication, its spacious docks and excellent quays, and the great fertility of the surrounding country, are once more restoring it to its high place among cities, Of the public buildings of Bruges the most remark- able are the Church of Notre Dame, containing a sculpture of the Virgin and Child, said to be by Michel Angelo, effigies in copper of Charles the Bold and Mary of Bur- gundy, who are buried in the church; the cathedral of St Sauveur, built of brick, but internally the hand- somest church in Bruges, with some fine pictures by Hem- ling (or, more correctly, Memling,—see Atheneum, No. 2513) and Peter Porbus; the hospital of St John, a chari- table institution, where sick persons are attended by the sisters of charity; the exchange, which is the oldest in Europe; the courthouse, a fine building, partly on the site of the old palace of the counts of Flanders; and the Hotel de Ville, a small but handsome

edifice, dating from 1377 and restored in the present century, in the niches of which there were formerly statues of the old counts of Flanders, which were destroyed by the French revolutionists in 1792. The belfry-tower in the great square, of which Longfellow sings so finely, is the most beautiful structure ‘of the kind in Europe, and its chimes are the best in Belgium. It was erected at the end of the 14th century, and is still used for communicating the alarm of fire by a flag or a light to all parts of the city. In this same square is a house in which Charles IT. resided during his exile from England. Among the conventual establishments the most important are the Béguinage and the English nunnery. The town is likewise well provided with the means of education. There is a medical school, to which is attached a museum of natural history and a botanical garden. For the higher departments of school training there is an excellent atheneum, annually subsidized by Government, besides a

‘ Portsmouth, April 9, 1806.

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theological seminary, a school of navigation, and an insti- tution for the deaf and dumb and blind. The academy of painting is in a very flourishing condition, and offers many advantages to the student, as instruction is given gratis in drawing and architecture. The public library in the town- hall contains upwards of 15,000 volumes, ‘The charitable institutions of Bruges are both numerous and well organized. They are all the more necessary, that the number of persons in the city requiring support is unusually great. In the poorhouse alone there is accommodation for nearly 600 individuals, and it is almost always completely filled. The most important manufacture in Bruges is that of lace. The other manufactures consist of linens, woollen and cotton goods, soap, leather, tobacco, starch, pottery, and_ bells. There are also some small breweries and distilleries, and dyeing and bleaching establishments ; and ship-building is also carried on. The exports from Bruges comprise the products of the rich agricultural district that surrounds the town; the imports include metals, dyewoods, wines, fruits, oil, cotton, and wool. Despite the number of canals, the inhabitants of Bruges are very ill supplied with water for domestic purposes ; every house is accordingly provided with a tank or butt to receive rain-water. The quantity collected in

the public tanks is distributed through the city in pipes. Of the canals the largest is that to Ostend, wide and deep enough to allow vessels of 500 tons to pass up from the sea. The ramifications of these canals intersect the city in all directions, and are crossed by upwards of fifty bridges, whence the name of the town is derived. Population in 1838, 44,374; in 1846, 49,308 ; in 1851, 50,698 ; in 1866, 49,819.

See Weale’s Bruges et svs environs, 1865 ; Gilliodts van Severen, LE’ Inventaire des archives de la ville de Bruges, 3 vols.

BRUMATH, or Brumpt, a town of Lower Alsace, in the circle of Strasburg, on the River Zorn. It has a castle and niineral wells, and occupies the site of the ancient Brucomagus. Fopulation in 1871, 5619.

BRUNCK, Ricuarp Francois Purrpre (1729-1803), a French scholar, was born at Strasburg, 20th December 1729. He was educated at the Jesuits' college at Paris, but having early entered the public service, he soon forgot his Latin and Greek. At the age of thirty he returned to his native town and resumed his studies, paying special attention to Greek. The nature of the office which he held put considerable sums of money at his disposal, which he expended in publishing editions of the Greek classics. The first work which he edited was the Anthologia Greca, in which his innovations on the established mode of criticism startled European scholars ; for wherever it seemed to him that an obscure or difficult passage might be made intel- ligible and easy by a change of text, he did not scruple to make the necessary alterations, whether the new reading were supported by manuscript authority or not. With the assistance of Schweighauser, then an unknown youth, he next brought out editions of the Greek dramatists, charac- terized by the same peculiarities as the Anthologia, and ultimately the Gnomict Poetw Greci. In 1781 he pub- lished an edition of Virgil, for which he was pensioned by the French king. At the outbreak of the Freuch Revolution, in which he took an active part, he lost his pension, and was reduced to such extremities that he was obliged to sell a portion of his library. In 1802 his pension was restored to him, but too late to prevent the sale of the remainder of his books. He had brought out an edition of Plautus in 1788, and was in the act of republishing it when he died, June 12, 1803.

BRUNDUSIUM, or Brunpisrum. See Brinpist.

BRUNEL, IsamBarp Krnepom (1806-1859), one of the most distinguished civil engineers of the age, was born at He was the only son of Sir

Marc Isambard Brunel, from whom he inherited some rare intellectual gifts, and to whom he owed his first education. From his earliest years he took an eager and intelligent interest in all the plans and undertakings of his father,

who had then just completed tle construction of the remarkable block machinery at Portsmouth. He displayed in child- hood singular powers of mental calculation, great skill and rapidity as a draughtsman, and a true feeling for art. After attending some private schools, he was sent at the age of fourteen to Paris, to study mathematics, and to recover his knowledge of French. From November 1820 to August 1822 he studied at the Collége Henri Quatre ; and in holiday intervals he used to visit the engineering works going on in Paris, and send his father drawings and descriptions of them. In 1823 he entered his father's office as assistant-engineer, just at the time when the project of the Thames Tunnel began to occupy the attention of Sir Isambard ; and from 1825, when the work was begun, till 1828, when it was stopped by an irruption of the river, he displayed a singular energy, inventiveness, and power of application in that struggle of science against natural obstacles on a vast scale. He had even then the power, which distinguished him in later years, of doing almost without sleep for many nights when work was pressing. During the later part of the contest which ended by a second irruption in January 1828, he was both nominal and actual resident engineer of the Thames Tunnel. Left for nearly two years without regular professional occupa- tion, Brunel employed himself in scientific researches, enjoy- ing intercourse with Babbage, Faraday, and other friends. In November 1829 he sent in designs and plans for the projected Suspension Bridge over the Avon at Clifton. In consequence of objections raised by Telford, the referee of the bridge committee, Brunel's plans were rejected. But on a second competition, early in 1831, he sent ina new design, and this was accepted. Brunel was appointed engineer to the trustees, and the works were begun in 1836. Delay had been caused by want of funds, and from the same cause the works were afterwards suspended for some years, and were not completed during Brunel's lifetime. In March 1833, Brunel, at the age of twenty-seven, attained one of the highest professional positions by his appointment as engineer of the newly-projected Great Western Railway. For several years his energies were taxed to the utmost by the conflict with obstructive landowners and short-sighted critics; but he showed himself equal to the occasion, not only as a professional man, but as a persuasive negotiator. For solidity of construction and for skill and beauty of design the Great Western Railway, though one of the first made in England, holds a very high place. Among the triumphs of the engineer are the Hanwell Viaduct, the Maidenhead

Bridge, and the Box Tunnel, at the time the longest in the world ; and, on extensions of the line, the great bridges at Chepstow and Saltash. The now notorious “battle of the gauges” took its rise from Brunel’s introduc- tion of the broad gauge on this line. In 1846 he resigned his office as engineer of the Great Western Railway. In 1844 he had recommended the adoption of the Atmospheric System on the South Devon Railway, but after a year’s trial this system was abandoned. The lastand greatest of Brunel’s railway works was the Royal Albert Bridge of the Cornwall Railway, crossing the River Tamar at Saltash. This work, sanctioned by parliament in 1845, was con- structed between 1853 and 1859. In addition to the ardu- ous labours of railway engineering, Mr Brunel had taken a leading part in the systematic development of ocean steam navigation. As early as October 1835 he had suggested, to the amusement of the directory of the Great Western Railway, that they should “make it longer, and have a steamboat to go from Bristol to New York, and call it the

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Great Western.” The project was taken up, and the “Great Western” steamship was designed by Brunel, and built at Bristol under his superintendence. It was much longer than any steamer of the day, and was the first steamship built to make regular voyages across the Atlantic. While the vessel was building a controversy was raised about the practicability of Brunel’s scheme, Dr Lardner asserting dogmatically that the voyage could not be made, and backing his assertion with an array of figures. His view was widely accepted, but the work went on, and the voyage was accomplished in 1838. A greater work was at once undertaken, and the “ Great Britain” was built. This was the first large iron steamship, the largest ship afloat at that time, and the first large ship in which the screw-propeller was used. She made her first voyage from Liverpool to New York in August and Sep- tember 1845 ; but in the following year was carelessly run upon the rocks in Dundrum Bay on the coast of Ireland. After lying there nearly a

year without material damage she was got off and was employed in the Australian trade. Brunel soon after began to meditate a vaster project still, the construction of a vessel large enough to carry all the coal required for a long voyage out, and if coal could not be had at the out port, then to carry enough also for the return voyage. It seemed to him, further, that a great increase of size would give many advantages for navigation. During his connection as engineer with the Australian Mail Company he worked out into a practical shape his concep- tion of a “great ship ;’ and in 1852 lis scheme was laid before the Directors of the Eastern Steam Navigation Company. It was adopted, the projector was appointed their engineer, and after much time occupied about con- tracts and specifications, the work was begun in December 1853. Immense difficulties in the progress of construction caused delays from time to time. The operations of launching was several times attempted in vain; but at length the gigantic vessel, the now familiar “‘ Great Eastern,” was got afloat (31st January 1858). Much remained to be done to complete the ship ; and her engineer, over- worked and worn out with the worry of the launching processes, broke down and did not live to see her sail on her first voyage. In addition to the great works already described, Brunel was employed in the construction of many docks and piers. The first of these was the Monkwearmouth Docks, for which he made the designs in The construction, after a new design, was begun in 1834. He was afterwards engaged in works of the same kind at Bristol, Plymouth, Briton Ferry, and Brentford, and on a pier at Milford Haven. He was a zealous promoter of the Great Exhibition of 1851, and was a member of the committee on the section of machinery and of the building committee. He paid much attention to the subject of improvement of large guns, and designed a floating gun-carriage for the attack on Cronstadt in the Russian war (1854); he also designed and superintended the construction of the hospital buildings at Renkioi, on the Dardanelles (1855), The genius, energy, and industry of Brunel in his profession were not more remarkable than the high moral tone which characterized his whole life, and the fascinating qualities which gave him immense per- sonal influence, and made hii the delight of the social circle. With single-hearted truthfulness he devoted him- self to his chosen work; he was singularly free from pro- fessional jealousy, and was always ready to commend and help others. With robust health, which he enjoyed through many years, he had the two invaluable qualities of good spirits and good temper. In his relations with

his subordinates he was considerate and kindly, at the same time that he demanded faithful service according to a high: standard. He cared nothing for popularity. He enjoyed

the beauties of a fine landscape, and was an enthusiastic lover of the fine arts. In the course of his busy life he several times went to Italy and Switzerland; aud in 1847 he bought a small estate in Devonshire, to make his home there. The pressure of business, however, did not allow him to spend much of his time in the country. In 1830 Brunel was elected F.R.S., and he was afterwards a meinber of many other scientific societies. In 1857 the honorary degree of D.C.L. was conferred on him by the university of Oxford. In July 1836 he married ; he left two sons and a daughter surviving him. For the sake of his health he spent the winter of 1858-59 in Egypt, return- ing to England in May. He was on board his “ great ship” on the 5th September 1859, and the same day was attacked with paralysis. The ship sailed on her first voyage on the 7th, and her great projector passed away on the 15th of the month. His remains were interred in Kensal Green Cemetery. In 1870 appeared Zhe Life of I. K. Brunel, C.E., by his sou Isambard Brunel, of Lincoln’s Inu, chancellor of the diocese of Ely. (Ww… ¢.)

BRUNEL, Sir Marc Isamparp (1769-1849), was born at Haqueville, in Normandy. His family had for several centuries held a respectable station in the pro- vince, living as farmers and small landowners on the estate on which he was born, and numbering among its members Nicholas Poussin. He was educated at the seminary of St Nicaise at Roucn, with the intention of his enter- ing holy orders; but his predilection for the physical sciences was so strong, and his genius for mathematics and mechanics so decided, that, on the advice of the superior of-‘the establishment, he was removed to follow a more congenial career. His father then destined him for the naval service, which he entered on the appointment of the Marshal de Castries, the minister of marin2, and made several voyages to the West Indies, In this position, although only in his seventeenth year, his mechanical talents developed themselves actively on many occasions, and he surprised his captain by the production of a sextant of his manufacture with which he

took his observations. On his return to France in 1792, he found the Revolution at its height, and like all who entertained royalist principles, he was contpelled to seek safety in emigration. He effected his flight with considerable difficulty, and found refuge in the United States of America, where, driven by necessity to the exercise of his talents as a means of support, he followed the bent of his inclination and became a civil engineer and architect. His first engagement was on the survey of a tract of land near Lake Erie ; he then became engaged in cutting canals, and was employed to erect an arsenal and cannon foundry at New York, where he applied several new and ingenious machines. His highly orna- mental design for the House of Assembly at Washington was rejected, as being inconsistent with the simplicity of a republic ; he was, however, engaged to design and super-intend the construction of Bowery Theatre, New York, since destroyed by fire, the roof of which was peculiar and original,

The idea of substituting machinery for manual labour in the making of ships' blocks had long occupied his mind ; and, in 1799, having matured his plans, he determined to visit England. Earl St Vincent was at that time at the head of the Admiralty, and after the usual delays and difficulties, which were ulti mately overcome chiefly through the powerful influence of his steady friend and patron Earl Spencer, aided by the recommendation of Brigadier- General Sir Samuel Bentham, who at once perceived and appreciated the merit of the machines and the talent of the inventor, the system was adopted, and the machinery erected. The construction of the machines was entrusted to Mr Henry Maudslay, whom Brunel had selected with

true discrimination, and by whom he was ably assisted. The beautiful simplicity of these machines, their perfect adaptation to their various purposes, and, notwithstanding the recent advances in mechanics, their continuing for nearly half a century in active work, without any improve-ments having ever been suggested, must rank them as among the most complete and ingenious pieces of mechanism ever invented.

The block machinery was completed in 1806, and it was estimated that the economy produced by it in the first year was about £24,000, two-thirds of

which sum was awarded to the ingenious inventor, who was soon after engaged by the Government to erect extensive saw-mills, on iniproved principles, at Chatham and Woolwich. He there suggested modifications of the systems of stacking and seasoning timber, which were afterwards carried into effect. Some time previously, he had invented the ingenious little machine for winding cotton-thread into balls, which, simple as it may at first sight appear, has exercised grcat influence on the extension of the cotton trade.

He found time also to invent an instrument for combin- ing the use of several pens, so as to produce simultaneously a number of eopies of a manuscript ; a simple and portable copying-machine ; and a contrivance for making the small boxes used by druggists, which had been previously imported in large quantities from Holland. A nail-making machine also occupied his attention; and he discovered the system of giving the efflorescent appearance to tinfoil, by which it was fitted for o:namental purposes. Among other more important improvements may be mentioned that of cutting veneers by circular saws of large diameter, to which is mainly due the present extensive application of veneers of wood to ornamental furniture. About the year 1812 he had devised a scheme for making shoes by inachinery ; and, under the countenance of the duke of York, the shoes so manufactured, in ‘consequence of their strength, cheapness, and durability, were introduced for the use of the army; but at the peace in 1815, manual labour becoming cheaper, and the demand for military equipments having ceased, the machines were laid aside.

Steam1 navigation also attracted his attention, and he became deeply interested in establishing the Ramsgate steam vessels, which were among the first that plied success- fully on the River Thames; and on board of them it is believed that the double engines were first used. About this period, after much labour and perseverance, he induced the Admiralty to permit the application of steam for towing vessels to sea, the practicability of which he had strenuously urged. The experiments wire tried chiefly at his own expense ; a small sum in aid had been promised, but it was eventually withdrawn before the completion of the trials, the Admiralty considering the attempt ‘“ too chimerical to be seriously entertained.” He introduced various im- provements in the steam-engine, and for nearly ten years

persevered in the attempt to use liquefied gases as the source of motive power, in which he was ably assisted by his son, The necessary experiments were most laborious, and needed all the persevering energy and resources of a mind determined not to be foiled; in spite, however, of his efforts, after a great sacrifice of time and money, the plan was abandoned.

The whole power of his mind, however, was for many years concentrated on one great object, the construction of the tunnel for communication from shore to shore beneath the bed of the River Thames. It is said that the original idea occurred to him, as applied to the Neva at St Peters- burg, in order to avoid the inconvenience arising from the floating ice,—a plan which he offered to the E:mperor Alex- ander, on the occasion of his visit to England in 1814. Undismayed by previous signal failures in the attempt

to construct a tunnel beneath the Thames, Brunel, confident in his own powers, persevered, and in 1824, under the auspices of the duke of Wellington, who always entertained a favourable view of the practicability of the scheme, a company was formed for its execution ; and after numerous accidents aud suspensions of the works, this great and novel undertaking was successfully accomplished, and the tunnel opened to the public in the year 1843.

In the prosecution of the work he received great assist- ance from his son, Isambard Kingdom Brunel, aud in a scientific point of view the construction of the tunnel will be regarded as displaying, at the same time, the highest professional ability, an amount of energy and skill rarely exceeded, and a fertility of invention and resources, under what were deemed insurmountable difficulties, which will secure to the memory of Sir Isambard Brunel a high posi- tion among the engineers of England.

He received the order of the Légion d’Honneur in 1829, and the honour of knighthood in 1841. He was a cor- responding member of the French Institute, and a fellow of the Royal Society. He joined the Institution of Civil Engineers in the year 1823, and constantly attended the meetings, took part in the discussions, and promoted the society’s interests by every means in his power.

He was unaffected and simple in his habits, and possessed Ngndomitable courage, perseverance, and industry; whilst his benevolence constantly prompted him to kindly and considerate actions. His labours had so seriously impaired his health, that for some years after the completion of the tunnel he was unable to mix in active life. He died on the 12th of December 1849, inhis 81st year. (See Richard Beamish, Memoirs of Sir Mare Isambard Brunel, 1862.)

BRUNELLESCHI, Finirpo, (1377-1446), one of the greatest Italian architects, the reviver in Italy of the Roman or Classic style, was born at Florence in 1377. His father, a notary, had destined him for his own profession, but observing the boy's talent for all sorts of mechanism, placed him in the guild of goldsmiths. Filippo quickly became a skilled workman, and, eagerly desirous to excel, perfected himself in the knowledge of sculpture, perspec- tive, and geometry,—whatever, in short, was useful for the architectural art, to which he found himself attracted. He designed some portions of houses in Florence, and in 1401 he was one of the competitors for the design of the gates of the baptistery of San Giovanni. He was unsuc- cessful, though his work obtained praise, and he soon after- wards set out for Rome. He studied hard, and resolved to do what he could to revive the older classical style, which had died out in Italy. In 1407 he returned to Florence, just at the time when it was resolved to attempt the completion of the cathedral church of Santa Maria del Fiore, Brunelleschi's plan for effecting this by a cupola was approved, but it was not till 1419, and after innumer- able disputes, that the work was finally entrusted to him. At first he was hampered by his colleague Ghiberti, of whom he skilfully got rid. He did not live to see the com- pletion of his great work, and the lantern on the summit was put up not altogether in accordance with the instruc- tions and plans left by him. The great cupola, one of the triumphs of architecture, exceeds in some measurements that of St Peter's at Rome, and has a more massive and striking appearance. Besides the masterpiece Brunelleschi executed numerous other works, among the most remarkable of which are the Pitti Palace at Florence, and the churches of San Lorenzo and Spirito Santo, and the still more elegant Capella dei Pazza. He died in 1446, and was buried in the great church of Santa Maria. See ARCHITECTURE, vol. i. p. 436.

BRUNET, Jacquzs CHARLES, the eminent bibliographer, was born at Parisin 1780, and died in 1867. He was the

son of a bookseller, and at an early age began the study which occupied the whole of his after life. In 1802 he printed a supplement to the Dictionnaire Bibliographique of Duclos and Cailleau, and in 1810 there appeared the first edition of his chef-d'wuvre, the Manuel du Libraire. With the exception of a few pamphlets and minor disserta- tions, Brunet published nothing beyond successive editions of his great bibliographical dictionary, which had come to be recognized as the first book of its class in European literature. The last (fifth) edition in six volumes was completed in 1865.

BRUNI, Leonarpo (1369-1444), author of the History of Florence, was an eminent scholar of the 15th century. He was born at Arezzo, and is generally known as L. Aretino. He was secretary to the papal chancery under Innocent VII. and John XXII. From 1427 to his death in 1444 he was chancellor to the republic of Florence. He was buried at the expense of the state in Sta. Croce, where his laurelled statue is still to be seen. His History of Florence comes down to 1404.

BRUNN, the capital of the Austrian margraviate of Moravia, is situated for the most part between two hills at the confluence of the Schwarzawa and the Zwittawa, 69 miles N. of Vienna and 115 W.S.W. of Prague, with both of which it is connected by railway. Lat. 49° 11' 39' N., long. 16° 39' 35" E. On one of the hills known as the Spielberg stands the castle of the same name, which has long been used as a prison, and is famous for its connection with the patriotic Silvio Pellico, who was confined within its walls for about eight years. The old town, which is com- paratively small, still retains some of its fortifications, but most of them have given place to promenades, Its streets are narrow aud crooked but well-paved, and it contains many of the most important buildingsin the city. Exten- sive suburbs have grown up around it, and since 1849 form portions of the same commune. There are fine public gardens and a large park known as the Augarten, presented to the town by the Emperor Joseph II. The Rathhaus, which dates from 1511, has a fine Gothic portal, and contains several interesting antiquities. The eccle- siastical buildings comprise the cathedral

of St Peter’s, situated on the lower hill; the fine Gothic church of St James, built in the 15th century, with its iron tower added in 1845, and a remarkable collection of early typo- graphy ; the church of the Augustine friars, dating from the 14th century ; that of the Minorites with its frescoes, its holy stair, and its Loretto-house; the bishop’s palace ; a splendid Jewish synagogue ; and several monastic estab- lishments. As the capital of the province Briinn is the seat of the chief legal and military courts, and thus possesses various official edifices, the old Jesuit convent having been turned into barracks. It is also the seat of a Roman Catholic bishop and of a Protestant consistory. Its educational and benevolent institutions comprise a theo- logical seminary, a gymnasium, several academies and schools, an agricultural society, a botanic garden, an infirmary, an orphanage, a blind asylum, a deaf-mute institution, a lunatic asylum, and several hospitals, of which the most important is the great hospital of St Anna. The national museum for Moravia and Silesia, though com- paratively poor, must also be mentioned, Briinn is one of the chief seats of the woollen manufacture in the Austrian dominions, and the centre of a large miscellaneous trade. Considerable quantities of silk and cotton goods are mauu- factured, as also leather, paper, tobacco, oil, and sugar. There are also steam-flour-mills, engineering works, and breweries. There is a remarkable viaduct in the immediate neighbourhood of the town. Briinn probably dates from the 9th century. In the 11th it was bestowed by Duke Wratislas IT. on his son Otto. Briinn is a place of great

strength, and held out successfully against sieges—in 1428 by the Hussites, in 1467 by King George of Bohemia, in 1645 by the Swedish general Torstenson, aud in 1742 by the Prussians. In 1805 it was the headquarters of Napo- leon before the battle of Austerlitz. Its population in 1569 was 73,771.

BRUNO, St, the founder of the Carthusian order of mouks, was born at Cologne about the year 1030. He was educated at Cologne, and afterwards at Rheims, where he was appointed to superintend the studies in all the chief schools of the diocese. Many of his pupils afterwards became distinguished, and in the number was Pope Urban If. In 1084, after some

disputes with Manasses, the archbishop of Rheims, he retired with six companions into the desert of Chartreuse, where he built an oratory, with cells at a little distance from each other. Six years after- wards he went to Rome, where Urban II. pressed him to accept the archbishopric of Reggio. He declined the honour, and withdrew into the solitudes of Calabra, where he died October 6, 1101. He wrote treatises on the Psalins and on sone of the Epistles,-but none of his works are extant. His canonization took place in 1514. (See Mrs Jameson's Legends of the Monastic Orders, 124-134; Butler's Lives of the Saints, vol. ii. 592.) This saint is not to be confounded with others of the same name,—the bishop and apostle of the Prussians (970-1008), and the great archbishop of Cologne (925-968).

BRUNO, Grorpano, the most genial and interesting of the Italian philosophers of the Renaissance, was born at Nola about the year 1548, Little is known of the life of tlus knight-errant of philosophy ; the very date of his birth rests in obscurity. What we do know is attractive enough to render it matter of regret that the materials should be so scanty. In his fifteenth year he entered the order of the Dominicaus at Naples, and is said to have composed a treatise on the ark of Noah. Why he should have submitted to the bonds of a discipline palpably unsuited to his fiery and vehement spirit, we cannot tell. He soon found the restraints intolerable, and became an outcast from his church and a wandcrer on the face of the earth. His opinions with regard to some of the Romish mysteries seem to have been too liberal to find toleration with so strict an order as that of St Dominic. He was accused of impiety, and after enduring persecution for some years, he fled from Rome about 1576, and wandered through various cities, reaching Geneva in 1577. The home of Calvinism was no resting-place for him, and he tra- velled on through Lyons, Toulouse, aud Montpellier, arriving at Parisin 1579. Everywhere he bent his irre- pressible energies to the exposition of the new thoughts which were beginning to effect a revolution in the thinking world. He had drunk deeply of the very spirit of the Renaissance, the determination to open his eyes and see for himself this noble universe, unclouded by the mists of authoritative philosophy and church tradition. The discoveries of Copernicus, which were unhinging men's minds and teaching them to look upon their little world in a new light, were eagerly accepted by him, and he used them as the lever by which to push aside the antiquated system that had come down

from Aristotle, and which was loaded with the weight of that great thinker's name. For Aristotle, indeed, he hada perfect hatred. Like Bacon and Telesius he infinitely preferred the older Greck philosophers, who had looked at nature for themselves, and whose specula- tions had more of reality in them. He had read widely and deeply, and in his own writings we come across many cx- pressions familiar to us in earlier systems. Yethis philosophy is no eclecticism. He owed something to Lucretius, some- thing to the Stoic nature-pantheism, something to Anaxa- goras, to Heraclitus, to the Pythagoreans, and to the Neo-

platonists, who were partially known to him; above all, he had studied deeply and profoundly the great German thinker Nicolas of Cusa, who was indeed a speculative Copernicus. But his own system has a distinct unity and originality ; it breathes throughout the fiery spint of Bruno himself.

Bruno had been well received at Toulouse, where he had lectured on astronomy ; even better fortune awaited him at Paris. He was offered a chair of philosophy, provided he would receive the Mass. He at once refused, but was perinitted to deliver lectures. These seem to have been altogether devoted to expositions of a certain logical system which Bruno had taken up with great eagerness, the Ars Magna of Raymond Lully. With the exception of a comedy, J7 Candelajo, all the works of this period are devoted to this logic. The most important of them is the treatise De Umbris Idearum. It has seemed to many a curious freak of Bruno's that he should have so eagerly adopted a view of thought like that of Lully, but in reality it is in strict accordance with the principles of his philosophy. Like the Arabian logicians, and some of the scholastics, who held that ideas existed in a threefold form,—ante res, in rebus, aud post res,—he laid down the principle that the archetypal ideas existed metaphysically in the ultimate unity or intelligence, physically in the world of things, and logically in signs, symbols, or notions. These notions were the shadows of the ideas, and the Ars Magna furnished. him with a general scheme, according to which their rela- tions and correspondences should be exhibited. It supplied not only a memoria technica, but an organon, or method by which the genesis of all ideas from unity might be represented intelligibly and easily.

It provided also a substitute for either the Aristotelian or the Ramist logic, which was an additional element in its favour.

In the train and under the protection of the French ambas- sador, Michel de Castelnau, Bruno passed over in 1583 to England, where he resided for about two years. He was much disgusted with the brutality of the English manners, which he paints in no flattering colours, and he found in Oxford pedantry and superstition as rampant as at Geneva. But he indulges in extravagant eulogies of Elizabeth, and he formed the acquaintance at London of Sir Philip Sidney, Fulke Greville, and other eminent Englishmen. At Oxford he was allowed to hold a disputation with some learned doctors on the rival merits of the Copernican and so-called Aristotelian systems of the universe, and, according to his own report, had an easy victory. The best of his works were written in the freedom of English social life. The Cena de le Ceneri, or Ash Wednesday conversation, devoted to an exposition of the Copernican theory, was printed in 1584. In the same year appeared his two great metaphy- sical works, De la Causa, Principio, ed Uno, and De UInfinito, Universo, e Mondi,; in the year following the Erowt Furort and Cabala del Cavallo Pegaseo. In 1584 also appeared the strange dialogue, Spaccio della Bestia Trionfante, or Expulsion of the Triumphant Beast, an allegory treating chiefly of moral philosophy, but giving at the same time the very essence and spirit of Bruno's philosophy. The gods are represented as resolving to banish from the heavens the constellations, which served to remind them of their evil deeds. In their places are put the moral virtues. The first of the three dialogues contains the substance of the allegory, which, under the disguise of an assault on heathen mythology, is a direct attack on all forms of anthropomorphic religion. But in a philosophical point of view the first part of the second dialogue is the most important. Among the moral virtues which take the place of the beasts are Truth, Pru- dence, Wisdom, Law, and Universal Judgment, and in the explanation of what these mean Bruno unfolds the very inner essence of his system. 'Truth is the unity and

substance which underlies all things; Prudence or providence is the regulating power of truth, and comprehends both liberty and necessity ;

Wisdom is providence itself in its supersensible aspect, —in man it is reason which grasps the truth of things; Law results from wisdom, for no good law is irrational, and its sole end and aim is the good of man- kind ; Universal Judgment is the principle whereby men are judged according to their deeds, and not according to their belief in this or that catechism. Mingled with his allegorical philosophy are the most vehement attacks upon the established religion. The monks are stigmatized as pedants who would destroy the joy of life on earth, who are avaricious, dissolute, and the breeders of eternal dissensions and squabbles. The mysteries of faith are scoffed at. The Jewish records are put on a level with the Greek myths, and miracles are laughed at as magical tricks. Through all this runs the train of thought resulting naturally from Bruno's fundamental principles, and familiar in modern philosophy as Spinozism, the denial of particular providence, the doctrine of the uselessness of prayer, the identification in a sense of liberty and necessity, and the peculiar defini- tion of good and evil. Altogether the Spaccio, as it is the most popular, is the most characteristic of Bruno's works.

In 1586 he returned to Paris with Castelnau, but was soon driven from his refuge, and we next find him at Marburg and Wittenberg, the headquarters of Luther- anism. There is a tradition that here or in England he embraced the Protestant faith ; nothing in his writings would lead one to suppose so. Several works, chiefly logical, appeared during his stay at Wittenberg. In 1588 he went to Prague, then to Helmstadt. In 1591 he was at Frankfort, and published three important metaphysical works, De Z'riplici Minimo et Mensura ; De Monade, Numero, et Figura; De Immenso et Innumerabilt- bus. He did not stay long at Prague, and we find him next at Zurich, whence he accepted an invitation to Venice. It was a rash step. The emissaries of the Inquisition were on his track ; he was thrown into prison, and in 1593 was brought to Rome. Seven years were spent in confinement. On the 9th February 1600 he was excommunicated, and on the 17th was burned at the stake.

As has been said, for an estimation of Bruno's philosophy, the most important works are the two Italian dialogues and the three last-mentioned Latin treatises. It is not an easy mitter to put his opinions into small

compass, for the general form of exposition adopted by him, the dialogue, imposes a certain looseness on his own mode of thinking.

To Bruno as to all other great: thinkers, the end of philosophy is the search for unity. Amid all the varying and contradictory phenomena of the universe there is something which gives coherence and intelligibility to them. things ; it must contain in itself the universe, which develops from it; it must be at once all and one. This unity is God, the universal substance,—the one and only principle, or causa immanens,—that which is in things and yet is distinct from them as the universal is distinct from the particular. He is the efficient and final cause of all, the beginning, middle, and end, eternal and infinite. By his action the world is produced, and his action is the law of his nature, his necessity is true freedom. He is living, active intelligence, the principle of motion and creation, realizing himself in the infinitely various forms of activity that constitute individual things. To the infinitely actual there is necessary the possible ; that which determines involves somewhat in which its determinations can have existence. This other of God, which is in truth one with him, is matter. The universe, then, is a living cosmos, an infinitely animated system, whose end is the per- fect realization of the variously graduated forms.

Nor can this unity be something apart from the

The unity which sunders itself into the multiplicity of things may be called the monas monadum, each thing being a monas or self-existent, living being, a universe in itself, Of these monads the number is infinite, The soul of nan is a thinking monad, and stands mid-way between the divine intelligence and the world of external things. As a portion of the divine life, the soul is immortal. Its highest function is the contemplation of the divine unity, discoverable under the manifold of objects.

Such is a brief summary of the principal positions of Bruno’s philosophy. It seems quite clear that in the earlier works, particnlarly the two Italian dialogues, he approached more nearly to the pantheistic view of things than in his later Latin treatises. The unity expounded at first is simply an anima mundi, a living universe, but not intelligent. There is a distinct development

traceable towards the later and final form of his doctrine, in which the universe appears as the realization of the divine mind.

The Italian works of Bruno, formerly exceedingly rare, have been collected and published in two volumes, by A. Wagner, 1880. An edition of the Latin works was begun by Gfrérer in 1834, but has not been completed. The most complete monograph on him is that by C. Bartholmess, 2 vols. 1846-47 ; the most recent life is that by Domenico Berti, 1868. The best systematic account of his philo- sophy is that by Carriere, Philosophische Weltanschawung der Reformationszeit, 1847, pp. 411-494. The relations between his philosophy and that of Cusanus are treated in Clemens, G. Bruno und Nicolaus von Cusa, 1847. An English translation by Morehead (not, as is generally supposed, by Toland) of the Spaccio is dated 1713. It was probably printed before that time, and it is now excessively rare. Toland translated the preface to De I'Infinito ; it is found in his Posthumous Works. There is a French translation of part of the Spaccio, Le Ciel Reformé, 1750. Lasson has translated De la Causa into German, 1872, with introduction and notes.

The earlier literature with regard to Bruno is copious; it will be found in Bayle, Buhle, and Tennemann. (R. AD.)

BRUNSWICK (German BravunscHwEI@), a duchy and state of Northern Germany, forming part of the new German Empire, and included in the Prusso-German Zollverein. It consists of three larger and five smaller portions of territory lying mainly between 51° 38' and 52° 28' N. lat., and between 9° 20' and 11° 30" E. long. The principal part, containing the cities of Brunswick, Wolfenbiittel, and Helmstedt, is situated between Hanover and Prussia, to the 8.E. of the former, and has its surface diversified by hill and plain. The part containing Holz- minden and Gandersheim extends eastward from the Weser to Goslar, and is intersected by branches of the Hartz Mountains. The Blankenburg portion lies to the 8.E. of the two former, between Prussia, Anhalt, and Hanover, and is traversed by the Hartz. Of the smaller portions some form enclaves in Hanover and others in Prussia.

Brunswick has an area of 1424 English square miles, and is divided into six circles, comprehending thirteen cities, and between four and five hundred

smaller towns and villages. Besides the cities already mentioned the most important are Schdningen, Seesen, and Schoppenstedt. The population was in 1812, 209,527 ; in 1852, 271,208 ; in 1861, 281,708; and in 1871, 311,175. Of the last number 302,989 were Protestants, 7030 Roman Catholics, and 1171 Jews. The proportions in the political divisions

were as follows :—

Extent Inhabitants. iia “aie: || agee | 1867 1871. Brus Wl OS soso aaiajstaseioin cor 209 61,232 | 82,828 | 90,845 Wioltembiutclumsessesteces 294 50,423 | 59,454 | 60,739 ilelinsted temveceseseeree 804 41,155 | 52,028 | 53,705 Holzminden .....+ 22) 41,290 | 42,129 | 41,581 Gandersheim ….....- 212 89,277 | 43,480 | 42,322 Blankenburg…..... 184 | 19,855 | 22,928 | 22,528

1424 | 253,932 | 302,792 |811,715

IV. — 51

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Brunswick also possesses in Prussian Silesia the princi- pality of Oels, which from 1647 to 1792 belonged to Wiirtemberg. A portion of the Hartz Mountains is common to Brunswick and Hanover, and is consequently known as the Communion-Hartz. Various minor arrange- ments have been made with Prussia for the more convenient organization of this district since the formation of the new German empire. The highest point of the mountains in the Brunswick territory is the Wormberg, 3230 feet in height. The principal rivers by which the duchy is watered are the Ocker, the Weser, the Aller, and the Leine. The lower parts of the country are generally fertile and well cultivated ; the higher are mostly covered with forests of fir, oak, and beech. A very extensive improvement has been effected in the circle of Helmstedt by the draining of the Drémling swamp, and the rectification of the courses of the Allerand the Ohre. Ofthe whole duchy 32:7 per cent. is arable, 27°3 consists of meadow and pasture, and 31°8 is under wood. Agricultural and pastoral pursuits con- stitute the principal employment of the inhabitants ; and the peasant class are usually well to do. The principal articles of cultivation are grain, potatoes, beetroot, flax, hops,

and fruits. The growing of tobacco, which was formerly of great importance, is now very limited. In 1870 there were in the duchy 25,344 horses, 83,558 head of cattle, 386,757 sheep, 75,616 swine, 39,167 goats, 55,829 geese, and 8385 bee stocks. The mineral wealth of the country, which is chiefly derived from the Hartz Mountains, consists of copper, lead, iron, gold, silver, sulphur, coal, salt, and alum. In 1867 the total yield of coal was 219,400 tons, of iron ore 58,400, of pig-iron 143,000, of cast-iron 1584; the copper amounted to 383 tons; the lead to 710, and the vitriol to 1339. The manufactures, which are comparatively small, comprise (besides the preparation of the ores) spinning, weaving, and brewing. The principal iron-works are at Riibeland, Wieda, Delligsen, and Oker; and the chief centres of general industry are Brunswick and Schéningen. An active trade is carried on by means of the extensive railway communica- tion with the rest of Germany.

The educational institutions comprise two ecclesiastical seminaries, an anatomical and surgical college, an architec- tural school at Holzminden, an agricultural school at Schéppenstedt, 5 gymnasiums, 25 burgher schools, and upwards of 400 village schools, besides several important establishments in the capital (see below). There is an ex- tensive lunatic asylum at Konigslutter, opened in 1865.

According to the constitution of 1832, which has been frequently modified, the Government is an hereditary mon- archy, with a legislative assembly of representatives. These are chosen, by the law of 1851, twenty-one by those citizens who pay the largest amount of taxes, ten by the towns, three by the clergy, and a certain number by the communes. They hold office for six ycars, one-half going out triennially ; and when they are not in session, they are represented by a standing cominittee of seven members. In the federal council the duchy has two votes, and it sends three deputies to the imperial diet. The ducal contingent, which still wears its famous black uniform, forms part of the 10th federal army corps. The state is the proprietor not only of a large proportion of the mines and forests in the duchy, but also of its railways. From these sources it derives a considerable part of its revenue, which in recent years has been augmented by the farming out of lotteries. By the budget for the pcriod 1873-5, the annual receipts were fixed at

7,429,400 marks, or £371,470. The total debt, which had been mainly incurred for the forma-

tion of the railways, amounted to 65,400,000 marks, or £3,270,000.

| then prince-regent.

BREURS WEwk

exceptions, of Saxon race. The country people speak dialects of Low German, while High German is employed by the educated classes in the citics.

The more immediate ancestor of the house of Brunswick was Henry the Lion, who, in the 12th century, held the united duchies of Bavaria and Saxony ; but having refused to aid the Emperor Frederick Barbarossa in his wars with the Pope, he was, by decree of the diet in 1180, deprived of both duchies, and only left the possession of his allodial domains of Brunswick and Liineburg. His grandson, Otho, was invested in 1235 with these domains as a fief of the empire, and thus became the first duke of Brunswick. The two principalities which had been severed were united by Ernest the Confessor, but on his death in 1546, they were again divided between his two sons; the elder (or rather his son Augustus) receiving Brunswick-Wolfenbiittel, or Bruns- wick, and the younger Brunswick-Liineburg, or Hanover. The ducal residence, which had before been at Wolfen- biittel, was in 1754 removed to Brunswick by Duke Charles. His successor, Duke Charles William Ferdinand, married Augusta, daughter of George III. of England He com- manded the Prussian troops at Auerstadt in 1806, and soon after died of the wounds he had received in the battle. His possessions were immediately seized by Napoleon, and formed part of the kingdom of Westphalia till after the battle of Leipsic, when the duchy was restored to its rightful possessor, Frederick William, youngest son of the preceding duke. This prince fell at the head of his troops at Quatre Bras, and was succeeded by Charles Frederick, the elder of his two sons,who, being at that time a minor, was placed under the tutelage of George IV. of England, The duke entered on the exercise of his authority in October 1823, but in consequence of a re- volution in 1830 was obliged to abdicate in 1831 in favour of his brother William, the present duke. During the long

reign of duke William many important changes have taken place in the internal organization of the duchy, and most of them have been in the direction of greater civil liberty. Of great moment was the establishment of a new criminal code in 1840; and publicity of parliamentary discussion, the freedom of the press, the introduction of jury-trials in criminal cases, and the legitimation of Christian-Jewish marriages were secured in 1849. In 1851 military service was recognized as binding on all, and the election of members of parliament was placed more directly in the hands of the people. In 1864 the Stolgebiihren, or taxes paid to the established clergy on the occasion of a baptism, a marriage, or a burial, were made no longer leviable on Jews, Roman Catholics, or other dissenters. The intro- duction of the German commercial code was effected in 1864, and freedom of trade was introduced in the same year. Treaties of mutual inheritance exist between the houses of Hanover and Brunswick; and should the present duke, who is still unmarricd, die without issue, the duchy will pass to the house of Hanover. The ex-duke, to whose sons the right would first have descended, died childless at Genevain August 1873. He had spent his life in pitiable devotion to certain hobbies, the most remarkable of which was the collection of valuable diamonds. His various treasures were bequeathed to the city of Geneva, but the will is disputed by the present duke.

BRUNSWICK, the capital of the above duchy, is situ- ated on the Ocker, 37 miles E,S.E. of Hanover by rail, and 52 W.N.W. of Magdeburg, in 52° 16’ N. lat. and 10° 32’ E. long. In spite of the numerous alterations effected during the present century, the city is still of an antiquated appear- ance, and is for the most part contained within the limits of its old fortifications. These, which were dismantled in 1797, have given place to a regular circle of gardens and

The people of Brunswick are, with comparatively few | promenades, which rank among the finest in Germany,

The ducal palace is a handsome modern structure, erected since 1865, when tke most of the previous building, which only dated from 1831, was destroyed by fire. The famous Quadriga of Rietschel, which perished at the same time, has been replaced by a copy by Howald. Among the ten or

twelve churches in the town the most important are the cathedral of St Blaise, built by Henry the Lion in 1173; St Magnus's, which is the oldest, dating from 1031 ; St Andreas, with a spire 318 feet high; and St Catherine's, a building of the 13th century. The educa- tional and charitable institutions of Brunswick are numerous and important. Of the former may be mentioned the Collegium Carolinum, founded in 1745, the great United Gymnasiums (which include the former commercial gym- nasium, the Martineum, and the Catherineum), the Medico- Chirurgical College, and the Academy of Forestry ; while among the latter are a deaf and dumb institution, a blind asylum, an orphanage, and various hospitals and infirmaries. There are also two public libraries, a museum, a theatre, and several scientific societies. A monument, 60 feet high, to Duke Frederick William, who was slaiu at Quatre Bras, gives its name to Monuments-Platz, and another to the S.E. of the town perpetuates the memory of Schill and his com- panions. The trade of Brunswick, formerly restricted by obsolete legislation, is gradually increasing. The principal articles of manufacture are coarse cloth and leather ; and, to a smaller extent, gloves, papier-maché, and paper wares. The town has long been famous for a special kind of beer, called Mumme, from the name of the Brunswick brewer who in- vented it in 1492. In 1867 the population amounted to 50,369, inhabiting 3487 houses, and divided into 10,850 families. In 1871 it had increased to 57,883.

Brunswick is said to have been founded about 861 by Bruno, duke of Saxony, from whom it was named Brunonis Vicus. Afterwards enlarged and fortified by Henry the Lion, it became one of the most important cities of Northern Germany. Fora long time its constitu- tion was rather peculiar, as it consisted of five separate townlets, each with its own walls and gates, its own council and Rathhaus, —a con- dition of which traces are still evident. In the 13th century it ranked among the first cities of the Hanseatic league, but it never succeeded in obtaining imperial freedom. After this, however, it declined, in consequence of the many divisions of territory among the branches of the reigning house, the jealousy of the neighbouring states, the Thirty Years' War, and more recently the French occupation. In 1830 it was the scene of a violent revolution, which led to the removal of the reigning duke.

BRUNSWICK, a town of the United States of America, in Cumberland County, Maine, 27 miles N.N.E. of Portland, on the right bank of the Androscoggin River, which, with a fall of about 50 feet in half-a-mile, supplies a large amount of water-power. Numerous industrial establishments have been erected, the most important being a cotton factory, flour-mills, and bleach-works. The lumber-trade, which was formerly of great extent, has been in great measure replaced by the building and owning of ships. Besides possessing an excellent system of graduated schools, Brunswick is the seat of Bowdoin College, founded in 1802, and of the Maine Medical School, which dates from 1820. The river is crossed by two bridges, one of which unites the town with Topsham, and the other belongs to the Keu- nebec and Portland railway. Population in 1850, 4927 ; in 1870, 4687, or including the neighbouring village, 6186.

BRUNTON, Mrs Mary (1778 ~~1818), a novelist of the early part of the 19th century, was born on the Ist November 1778, in the island of Barra, Orkney. Her father, Colonel Balfour, was a man of importance in the island, and she received a very careful and excellent educa~~ tion, At the age of twenty she married the Rev. Mr Brunton, minister of Bolton in Haddingtonshire, who in 1803 received a call to a church in Edinburgh. In 1811 Mrs Brunton published anonymously her first novel, Self- Control, It at once became very popular ; the first edition

was sold off ina month, and a second and third quickly followed. The book was especially recommended by its high moral and religious tone; it was a novel with a purpose. As a work of art, it cannot take a high place; the plot is extravagant and improbable, and the characters have none of the charni of reality about them. The story is constructed after the model of Clarissa, and contains the usual virtuous heroine and vicious hero, with an unusual number of abductions and mysteries. Her second novel, Discipline, was published in 1814, and was received with equal favour. Mrs Brunton died on the 19th December 1818. An unfinished tale, Hmmeline, was published after her death by her husband, with a notice of her life.

BRUSHES anp BROOMS are implements composed of a solid basis in which a tuft or tufts of hair or of vegetable or other fibres are secured. They

are mentioned by various ancient writers, as Homer, Sophocles, and Euripides. Perhaps the earliest notice is the figurative “ besom of destruction” (Isa. xiv. 23). Brushes are of two kinds, simple and compound. The former consist of but one tuft, as hair pencils and painters’ tools. The latter have more than one tuft. Brushes with the tufts placed side by side on flat boards, as plasterers’ brushes, are called stock- brushes. The single tuft brushes, or pencils for artists, are made of the hair of the camel, badger, goat, and other animals for the smaller kind, and pig’s bristles for the larger. The hairs for pencils are carefully arranged so as to form a point in the centre, and, when tied together, are passed into the wide end of the quill or metal tube and drawn out at the other end to the extent required. The small ends of the quills having been previously mois- tened, in drying contract and bind the hair. A similar effect is produced with metal tubes by compression. Compound brushes are—first, set or pan-work ; second, drawn-work, Of the former, an example is the common house-broom, into the stock of which holes are drilled of the size wanted. The necessary quantity of bristles, hair, or fibre, to fill each hole is collected together, struck on the working bench at the thick ends, dipped into molten cement chiefly composed of pitch, bound round with thread, dipped again, and then set into a hole of the stock with a peculiar twisting motion only to be acquired by practice. In drawn-brushes, of which those for shoes, teeth, nails, and clothes are examples, the holes are more neatly bored, and have smaller ones at the top communicating with the back of the brush, through which a bight or loop of wire passes from the back of the stock. Half the number of hairs or fibres needed for the tufts to fill the holes are passed into the bight of the wire, which is then pulled smartly so as to double the hairs and force them into the loop-hole as far as possible. With all brushes, when the holes have been properly filled, the ends of the fibres outside are cut with shears, either to an even length or such form as may be desired. The backs are then covered with veneer or other material to conceal the wire and other crudities of the work. A process called trepanning is adopted with some small brushes. The drawholes come out at some inconspicuous part of the stock, and the hairs or fibres having been properly secured, the holes are plugged up in order to conceal them as mucli as possible.

The bristles used in this manufacture are imported chiefly from Russia and Poland, and are sorted into black, grey, yellow, white, and lilies. They vary

in length, and are separated by the workman striking a quantity held in the hand smartly on a bench, the thick ends downwards. He then applies them to a gauge to ascertain the lengths of those that project, and, seizing them between his finger and thumb, draws them out of the bundle and places them with those of corresponding dimensions. They are sorted according to thickness by a process culled "‘ dragging,

which consists in passing them through a kind of comb, which retains those that are too stout to go between the teeth. By repeating this with finer combs the bristles can be assorted to any number of sizes required. Various other substances are now used in place of bristles, and this was greatly stimulated by the scarcity of these during the Russian war. In 1803 whalebone fibres were patented in England for the purpose, and in 1810 twigs of broom, mallow, rushes, and other shrubs and plants. In 1842 the shafts of quills prepared and split up, and in 1872 horn and similar substances were used in the same way. The latter are softened by steeping them in an infusion of sage leaves or plants of that class, then flattened, rolled out, and extended and moulded so as to disintegrate them into threads. In 1844 a brush was patented made of stiff fibre and bristles, hard in one part and soft in another, so that the softer parts should follow the harder, and take up what the latter left. The same inventor also made tooth-brushes on the same principle. The hairs of the squirrel, horse, badger, bear, and other animals are also uscd for brushes, and those from the ears of cows and from the ichneumon, amongst others, for artists’ pencils. When necessary the bristles are bleached by sulphur or other chemical agents. In the United States a kind of sorghum or broom-corn is extensively cultivated for the manufacture of brooms, and especially by the Shakers of New York State. The seed of the crop alone, it is stated, often pays the expense of cultivation, being, when mixed with other corn, good food for cattle aud horses.

One of the most important purposes to which brushes have been applied is that of sweeping chimneys. So far back as 1789 John Elin patented an arrangement of brushes with this purpose in view. He was followed at intervals by others, and the use of these machines having been found

practicable, the Acts 3 and 4 Vict. c. 85, and 27 and 28 Vict. e. 37, put an end tv the cruelties previously prac- tised, prohibiting the employment of children in sweeping chimneys.

Revolving brushes for cleaning rooms were patented in 1811, and others have followed. In 1825 they were con- structed to take the place of teazles for raising the wool or pile of woollen and other cloths, and they are now used for polishing and other purposes in various manufactures, The first patent in which they were applied to hair-dressing appears in 1862. The patented invention for sweeping and cleaning roads by means of revolving brushes and other contrivances are very numerous. The first appears in 1699. It is that of Edmund Henning for “a new engine for sweeping the streets of London, or any city or town.” No specification was enrolled, but the invention included the loading and removal of the refuse “ with great ease and quickness.” A long iuterval elapsed before anything further was done in this direction, the next patent being that of W. Ranyard, on Ist November 1825, which con- sisted of a number of brushes mounted upon two rims or placed upon an axis, which was raised on a vehicle or barrow. Boase and Smith’s followed in 1828, including scraping, sweeping, and watering. From 1836 a succession of inventors follow each other rapidly, amongst whom frequently appears “Joseph Whitworth.” Some of the most recent patents are Greenwood’s, 17th February 1878 ; Robinson’s, 4th April 1874; Sinclair and Clayton’s, 20th February 1875; Kitson’s, 21st April 1875. Many of these inventions include the removal of the refuse, as well as scraping. Some propose watering in addition; but the simplest and most easily managed is that most com- monly used, which scrapes or sweeps the mud and rubbish to the sides of the road. A particular point in Mr Kitson’s invention seems to be to clear out the dust and mud from between the joints of the paving stones,

An improvement in brushmaking was patented in 1830 by Timothy Mason, which consisted in cutting grooves in the stocks or bases of brushes instead of boring holes, the grooves increasing in width from the outer surface. The hairs or bristles are tied up into tufts or knots, dipped in cement, placed in the grooves, and wedged tightly by the use of a blunt tool, which operation

causes the tufts to expand and hold firmly in the enlarged recess. Various contrivances have been patented by which brushes might be self-supplied with water, soap, paste, paint, and the like, when in use, by means of receptacles or pipes being attached to them for the purpose.

One of the greatest advances in the brushmakiug of the present day is the Woodbury machine, an American inven- tion for bunching, wiring, and inserting bristles in the stock. In this machinea metal comb of uniform thickness is filled with bristles, holding them by the middle, so that one-half of the bristles appear above the surface of the comb, the other underneath. The comb thus charged moves in guideways, and discharges the bristles from each division successively into a channel in which, by an ingenious contrivance, they are brought gradually into a horizontal position and a proper quantity taken up to form a tuft, which is movedalong anincline. At the bottom of this is a hollow cylinder that does not enter, but is placed firmly against the tuft hole in the brush stock. A plunger now acts upon the bristles. The end of the plunger is slotted crossways ; one slot receives the bristles, the other a piece of wire. The plunger is made to descend and double the bristles into a loop at the middle. Other mechanism unwinds the binding wire from a reel, straightens the wire, and passcs the proper quantity through the enlarged upper portion of the slot, and at the same time cuts off the length required. The plunger now descends further, receiving a rotatory motion on its vertical axis, winds the wire by forcing it into the thread of a nut at the lower portion of the cylinder, and fastens it round the double end of the bunch. The end of the wire now acts aS a tap, cutting a female screw in the end of the block, whilst the upper end of the wire thread, by expand- ing, acts as a pawl, and prevents the unscrewing of the tuft. This machine is described in the Scventific American, 1872, p. 31, with illustrations.

For further information on the subject of brushes, the reader will find the abridgement of specifications relating to brushing and sweeping, published at the Patent Office, a most useful mauual, (J. J. L.)

BRUSSELS (French, Bruxelles ; Flemish, Brussel ; Ger- man, Briissel), capital of Belgium and of the province of South Brabant, is situated on the small River Senne, about 50 miles from the sea, in 50° 51’ N. lat., 4° 22’ E.

long. It lies in the midst of a beautiful and fertile country, and is picturesquely built on the top and sides of a hill, which slopes down to the Senne. The general contour of the old town of Brussels is pentagonal, and is well defined by the boulevards, which occupy the site of the old forti- fications ; but extensive additions have been made, especi- ally to the east and south, and present a very irregular outline

Brussels may be considered to consist of two parts, each presenting characteristics peculiar to itself. The New Town or upper part of the city is dry and healthy, and contains a very large number of handsome buildings, both public and private. The lower part is the more ancient and interesting of the two, but is damp, and in summer unhealthy, from the exhalations of the river and the numerous canals. In the former are situated nearly all the public offices, the royal palace, the chamber of deputies, the residence of the foreign representatives, and the prin- cipal hotels. The latter contains the Hétel de Ville, and

some of the best remains of the old Gothic architecture, and is the seat of nearly all the trade and commerce of the town. The facilities for commerce are very consi- derable. Though the Senne is not navigable itself, and is in fact now (1876) in process of being arched over to afford room for a new boulevard, it supplies water to some of the canals that intersect the lower portion of the city. By these canals Brussels communicates with the great Belgian cities, Mechlin, Ghent, Bruges, and Antwerp on the north, and Charleroi on the south. It further enjoys the advantage of railway communication with France and Germany, and the chief towns of the Belgian dominions. The streets are for the most part well paved, well lighted, and abundantly supplied with excellent water. There are

in the town innumerable fountains, some of which are handsomely ornamented with sculptures in stone and bronze. Of these the best are Les Fontaines des Fleuves in the Hétel de Ville, Za Fontaine de Minerve in one of the great squares, and the Muannekin-pis behind the Hdtel de Ville. Some of the streets are macadamized, but the majority of them are

causewayed, while the ¢rottoirs are either flagged or paved with flint-stones. Inthe new town some of the streets are remarkably handsome; they contain a considerable number of shops and cafés similar to those of Paris, and form the chief promenades of the inhabi- tants. In the old town they are for the most part narrow and sombre. There are fourteen squares in Brussels, many of which are used as market-places. Of these the

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Plan of Brussels.

largest are the Place du Grand Sablon, the Place Royale,

and the Grande Place before the Hotel de Ville. In the last- uamed square, surrounded for the most part with houses that date from the time of the Spanish possession, the Counts Egmont and Horn were beheaded in 1568, by order of the duke of Alva, who surveyed the scene from the windows of the Brood-Huys (otherwise Maison du Roi), a remarkable specimen of Gothic architecture still extant. In the Place de la Monnaie are the mint, the exchange, and the great theatre. In the Place des Martyrs, the heroes who fell in the Revolution of 1830 are interred. In front of the palace is the

Public Park, a fashionable summer promenade, which covers an area of about 14 acres. It is beautifully laid out with walks, adorned at moderate dis- tances with groups of sculpture; and as it is planted with trees which shade it from the sun, the grass is

always fresh and green. In the lower town is the Allée Verte, an equally fashionable promenade, which runs par- allel with the Mechlin canal, having a triple row of linden trees on each side, and leads towards the village of Lacken, where, since 1815, the king has had a suburban castle.

Of the public buildings of Brussels the most remarkable are the cathedral church of St Michel et Ste Gudule, the Hotel de Ville, and the Palace of Justice, a modern erection. The cathedral was built in 1010, and in it was held the first chapter of the order of the Golden Fleece in 1535. It contains a remarkable pulpit, and some splendid specimens of stained glass. [rom its towers a fine view of the surrounding country may be obtained. The Hotel de Ville, built in 1400, is profusely ornamented; it has a tower 360 feet in height. The other public buildings of Brussels are for the most part handsome, but are quite

uninteresting. The principal hospitals are those of St Peter and St John, which are both admirably managed, and contain together about 1000 beds. The patients are waited upon by the sisters of charity. As in all the large Belgian towns, there is, besides two other nunneries, a con- vent of Beguins, which formerly numbered 1000 nuns. The mass of the native population are Catholics; but as the English residents are very numerous, there are several Pro- testant churches. The Jews have a synagogue at Brussels, and hold their grand consistory there.

The number of charities in Brussels is very great; of these the most important are the Foundling Hospital, the Orphan Asylum, and the Société Philanthropique, whose object is to prevent mendicity. There are besides numerous alms-houses, which annually give relief to about 35,000 persons, Some of these establishments are supported entirely by subscription ; others of them are subsidized by Government. Great attention is paid to the education of poor children. The communal expense for public instruc- tion

amounted in 1873 to 858,150 francs. Among the educational establishments are the gymnasium, the poly- technic school, the Royal Athenzeum, a Lancasterian school, and many public and private academies, besides the Free University, which was founded in 1834 by a company belonging to the liberal party. The number of students at the university amounted in 1874 to nearly 580; while at the Royal Athenzeum the number in the same year was 772, There is also a well-conducted veterinary and agricultural school.

Some of the societies of Brussels are very celebrated. The Royal Conservatorium of Music had 529 pupils on its roll in 1874. The Royal Society was founded in 1769. The geo- graphical establishment of Vandermaelen, instituted in 1830, is in a flourishing condition. The botanical garden is one of the best in Europe, and there is also a large zoological garden. The Palais de l'Industrie contains an admirable museum of natural history, and an extensive and valuable collection of books and manuscripts, whiclt is accessible to the public. The number of books is 234,000, of which 2000 belong to the 15th century, while the manuscript department, known as the Bubliothéque de Bourgogne, con- tains about 22,000 MSS., many of which are beautifully illuminated. From sixty to sixty-five thousand francs are annually voted for the maintenance of the library. Eminent literary men and others are sometimes allowed to take books home, but the number to whom this privilege is conceded never exceeds 100 annually. There are numerous printing and lithographic presses in constant operation in Brussels, a large number of the former being engaged in the republication of standard works that appear in France.

The principal manufactures of Brussels are those of lace and tulle, carpets, woollen, linen, and cotton fabrics, jewellery, and articles of vertu. The most remarkable of these is that of lace. The finer sorts of flax used in the manufacture cost from £12 to £16 sterling per tb. An English yard of this lace costs £8. The persons who spin the thread work in rooms almost completely darkened, and are thus compelled to concentrate their attention ; and the thread spun in this way is said to be finer and more delicate than any that has hitherto been produced by other raeans, Excellent carriages are made in Brussels two-thirds cheaper than those of England, but inferior to them in quality.

In 1837, the population of Brussels was 104,265 ; in 1846, 123,874 ; in 1849, 138,189 ; in 1850, 142,289 ; and in 1873, 180,172. At the last date there were 365,404 in the nine contiguous communes. In 1846, the houses in the town numbered 13,563, and in 1866, 18,543.

The history of Brussels, though it does not date from so

remote a period as that of other Flemish cities, can still be clearly traced back to the 7th century. At that time St Gery, bishop of Cambray, built a chapel on one of the small islands in the river, and by his eloquence aud piety soon attracted a large congregation. The site being well adapted for building, a hamlet soon sprung np, and speedily became a town, which in the 1]th century was walled in and fortified. Though in commercial importance Brussels did not at this time equal Ghent or Bruges, its traffic in cloth was very considerable, and its workers in iron and steel were not surpassed by any in Europe. In the 14th century the various trades were incorporated into guilds, who regulated the taxes and other financial matters of the city, and drew up a code of municipal laws, in which the principle of trial by jury was admitted. These arrange- ments had scarcely been completed, when a dreadful fire visited the city and nearly burnt it to the ground. At the end of this century a general persecution of the Jews in Europe took place. In Brussels, many of them were put to death, and the value of the confiscated property amounted to upwards of half a million sterling. At the beginning of the 15th century, Brussels was again visited by a destruc- tive fire, from the effects of which it speedily recovered by the patriotic exertions of its rulers, and soon became more distinguished than ever as a seat of learning, art, and science. In 1489, and again in 1587, it was visited by the plague, which, on the former of these occasions, carried off many thousands of the inhabitants. Its horrors were enhanced by the ensuing fainine, which lasted for four years,

Brussels was highly favoured by Charles V., who often resided in the city, and raised it to the rank of capital of the Netherlands. Under his son Philip II. it became the centre of the great revolutionary movement, which resulted in the independence of the United Province. In 1598 Brussels passed into the dominion of the Austrians, and soon began once more to prosper. In

1695 the French under Marshal Villeroy besieged Brussels, but were obliged to retire after doing much damage to the town; and in 1706 the city opened its gates to Marlborough. In 1746 it was again besieged by the French under Marshal Saxe, and after a siege of three weeks was obliged to surrender. In 1792 it fell into the hands of General Dumouriez, who being soon after defeated at Louvain, evacuated Brussels for a while, but again entered it in 1794. From that year till 1814, it remained in the possession of the French, as capital of the department of the Dyle. On the fall of Napoleon, Belgium aud Holland were united into one kingdom under William of Nassau, and Brussels was the seat of government alternately with the Hague. In 1830, however, after a sanguinary conflict of four days in the streets of the city, the Belgians declared their independence; and erecting their state into a separate kingdom, offered the crown to Leopold of Saxe-Coburg, whose long and peaceful reign (1831-1865) contributed greatly to the development of the resources of the country.

BRUTON, a market-town of England, in the county of Somerset, pleasantly situated in the valley of the Brue, about 10 miles 8.S.W of Frome by rail. It has a town- hall, a hexagonal market-cross, a grammar school, and some manufactures of hair-cloth, woollens, and hosiery. Population of hundred in 1871, 3701.

BRUTUS, The name of a distinguished plebeian family at Rome. The first who bore it was Lucius Junius Brutws, one of the first two consuls, 509 B.c. According to the legends, his mother was the sister of Tarquinius ‘“ Superbus,” the last of the Roman kings, and at his father’s death, his elder brother had been put to death by the reigning family in order to get possession of his wealth. Junius, the younger, owed his safety to his reputed

dulness of intellect (whence his surname of Brutus), which character, however, he had assumed with a view both to his present security and future revenge. The opportunity came when Lucretia, wife of Collatinus, was outraged by Sextus Tarquinius ; and he took a leading part, together with her husband and father, in expelling the family of the Tarquinii from Rome. He and Collatinus were there- fore elected consuls,—or rather pretors, which was the original title. In a conspiracy formed afterwards for the

restoration of the banished dynasty, the two sons of Brutus were found to be deeply implicated, and were executed by sentence of their father, and in his sight. The Etruscans of the cities of Veii and Tarquinii making an. attempt to restore Tarquinius to the throne, a battle took place be- tween them and the Romans, in which Junius Brutus engaged Aruns, son of the deposed king, in single combat on horseback, and both fell by each other's hands. The Roman matrons are said to have mourned a year for him, as "the avenger of woman's honour," and a statue was erected to him on the Capitol.

Many members of the family rose to eminence in the Republic, and are found, as plebeians, ranged on the popular side. The most distinguished of these was DEctius Junius Brutus, consul, 325 B.c.

In later times came Marcus Junius Brutus, a jurist of high authority, considered as one of the founders of Roman civil law, to whom Cicero dedicates his treatise called Orator. His son, of the same name, made a great reputation at the Roman bar, chiefly by undertaking pro- secutions, and from the vehemence and bitterness of his speeches became known as "the Accuser."

Decius Junius Brutus first served under Julius Ceesar in Gaul, and afterwards commanded his fleet, and was held by him in great honour and esteem. Nevertheless, whether from patriotism or from lower motives, he joined in the conspiracy against his patron, and, like his relative Marcus Junius Brutus, was one of his assassins. He afterwards resisted the attempt of Antony to obtain absolute power; and after heading the republican arnties against him for some time with success, was deserted by his soldiers in Gaul, betrayed by one of the native chiefs, and put to death by order of Antony, 43 B.c.

Best kuown of all is Marcus Junrus BRrutTws, son of a father of the same name (treacherously put to death by order of Pompey during the civil wars), and of Servilia, sister of Cato of Utica. Young Marcus was only eight years old at his father's death, and was educated with great care by his mother and uncles. He at first practised as an advocate. In spite of his father's fate, he at first supported the cause of Pompey against Caesar, but was pardoned by the latter after the victory of Pharsalia, and subsequently appointed by

him to the government of Cisalpine Gaul. His justice and moderation won him great honour from the provincials under his rule. Influenced probably by his friend Caius Cassius, he afterwards joined in the conspiracy against the egrcat dictator, and was one of the foremost in his assas- sination. He maintained the cause of the republic by seizing and holding against Antony's forces the province of Macedonia, where he was joined by Cassius. But at Philippi they were defeated by Antony and Octavianus Cesar, and rather than be taken prisoner, he fell on his sword, 42 B.c. He was an earnest student through all his active life, and is said to have been employed in his tent, on the night before the battle of Pharsalia, in making an abridgment of Pausanias.1_ He wrote several philoso- phical treatises and some poetry, but nothing has survived. He combined with these tastes the incongruous occupation

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Where I left reading ?"" Suakesp, Jul. Cesar, Act iv. se. 3.

of a money-lender, Cicero and King Ariobarzanes being amongst his clients. His second wife was his cousin Portia, daughter of Cato.

BRUTUS, or Brute, is asserted in the fabulous history of Geoffrey of Monmouth to have been the grandson of Alneas, and to have destroyed the race of giants in Britain, to which he gave his name, founding there the city of New Troy, afterwards London.

BRUX, a city in the circle of Saatz, in the Austrian king- dom of Bohemia, on the River Bila. It consists of an old town, surrounded with walls, and three suburbs, and con- tains, besides the courts and public offices of the circle, nine churches, three monasteries, a gymnasium, barracks, a military college, and an educational establishment of Piarists. Its inhabitants are partly engaged in the coal- mines, and in the preparation of salts from the Seidlitz waters in the vicinity. A battle was fought here in 1421 between the Hussites and Saxons; and in 1646 the Swedes captured the fort of Landswert, now dismantled. Population in 1869 (including Taschenberg), 6102.

BRUYERE, JEAN DELA. See LA BRuYERE,

BRYANT, Jacos (1715-1804), a writer on theological and mythological subjects, was born at Plymouth in 1715. His father had a place in the customs there, and was after- wards stationed in Kent, where his son was first sent to a provincial school, whence he was removed to Eton, Here he appears to have remained till 1736, the date of his election to King's College, Cambridge, where he took his degrees of bachelor and master of arts in 1740 and 1744. He returned to Eton in the capacity of private tutor to the duke of Marl- borough, then marquis of Blandford ; and the good taste which his pupil showed through life, in the protection of the fine arts, and in the pursuit of science, sufficiently demon- strated the beneficial influence of his instructor's example. In 1756 he went to the Continent as private secretary to the duke of Marlborough, then master-general of the ordnance and commander-in-chief of the forces in Germany ; and he was rewarded after his return, for his various ser- vices to the family, by a lucrative appointment in the ordnance, which allowed him ample leisure to indulge his literary tastes. Bryant died in his eighty-ninth year, on the 14th November 1804, in conscquence of a fall from his chair while reaching up for a book in his library. He left his library to King's College, having, however, previously made some valuable presents out of it to the king and to the duke of Marlborough. He bequeathed £2000 to the Society for the Propagation of the Gospel, and £1000 for the use of the superannuated collegers of Eton School.

His principal works are the New System or Analysis of Ancient Mythology, wherein an attempt is made to divest tradition of fable, and to reduce truth to tts original purity, 3 vols. 4to, 1774-76, which is fantastic and now wholly valueless ; dn ddress to Dr Priestley on the Doctrine of Philosophical Necessity, 8vo, 1780 ; Vindicre Flaviane ; Observations on the Poems of Thomas Rowley, in which the authenticity of these poems is ascertained, 2 vols. 12mo, 1781 ; Treatise on the Authenticity of the Scriptures, and the Truth of the Christian Religion, 1792; Observations upon the Plagues inflicted upon the Egyptians, 8vo, 1794; Observations on a Treatise, entitled Description of the Plain of Troy, by Mr de Chevalier, 4to, 1795: 'A Dissertation concerning the War of Troy, and the eapedition of the Greeks, as described by Homer, showing that no such expedition was

ever undertaken, and that no such city in Phrygia existed, 4to, 1796 ; Observations on the Vindication of Homer, written by JB.S. Morritt, Esq., 4t0o, 1799 ; The Sentiments of Philo Judeus concern- ing the Word of God, 8v0, 1797 ; Dissertations on various Subjects in the Old Testament.

BRY AXIS, a Greek sculptor, the contemporary of Scopas and Praxiteles, with whom he took part in the sculptures of the mausoleum at Halicarnassus, about 345 B.c. Of his other works the following are mentioned :—five colossal figures of gods at Rhodes, Bacchus (Leber Pater) at Cnidus, a group of Aisculapius and Hygeia at Megara, Apollo in

| the grove of Daphne at Antioch, a statue of Pasiphaé, and

a portrait of Seleucus (it is not said which). On doubtful authority he is also said to have been the sculptor of a group of Jupiter and Apollo with a lion at Patara, and of a statue of Scrapis. Before his time there is no mention of statues of Asculapius or Serapis, and it is supposed that the types which we now have of these deities were intro- duced by Bryaxis. The statue of Apollo at Daphne represented the god in his character of Musagetes, with long flowing drapery girt at the waist. The Bacchus at Cnidus must have been similarly draped ; and altogether Bryaxis seems to have shown as much preference for draped and mature forms as Praxiteles displayed for nude and youthful figures.

BRYDGES, Str Samvurt Ecerron (1762-1837), a miscellaneous writer, was born 30th November 1762. He studied at Queen’s College, Cambridge, and adopted the pro- fession of law. In 1790 he persuaded his elder brother that their family were the heirs to the barony of Chandos, being descended from a younger branch of the Brydges who first held the title. The case was tried and lost, but Brydges never gave up his claim, and used to sign himself Per legem terre B, C. of 8. (i.e. Baron Chandos of Sudeley). It has been said that he underwent the labour of re-editing Collins’s Peerage, for the sole purpose of inserting a statement about his supposed right. In 1814 he was made a baronet, and in 1818 he left England. He died at Geneva in 1837. Sir Egerton was a most prolific author ; he is said to have written 2000 sonnets in one year. His first volume of poems was published in 1785 ; of

his other numerous works, including novels, political pamphlets, and bibliographies, perhaps the most important are Censura Literaria, 10 vols., 1805-9, and Autobiography, Times, Opinions, and Con- temporaries of Sir S. E. Brydges, 1834.

BRZEZANY, a town of Austria, in Galicia, 8.E. from Lembergo n the River Zlota-Lipa, in 49° 30’ 25” N. lat. and 24° 41’ 39” long. It possesses a Roman Catholic, a Greek, and an Armenian church, a castle, a convent, and a gymnasium ; and it carries on a considerable manufacture of linen and leather. The population in 1869, including some contiguous villages, amounted to 9290.

BUBASTIS, the great name of the Egyptian goddess Bast, supposed to hold the same plaze in the Egyptian Pantheon as Artemis or Diana. The triad of Memphis consisted of three gods—Ptah or Vulcan, the Greek Hephaistos; Bast, the wife of Ptah and mother by him of Nefer-Atum, or “the good Tum;” and Sexet, formerly called Pasht, the sister or antithesis of Bast. This last goddess was also called Merienptah, or “the beloved of Ptah.” Although the names of Bast, Sexet, and Merienptah are written with different hieroglyphs, their types are exactly alike, being that of a lion-headed goddess having on her head the sun’s disk entwined by an ureus. Sexet and Bast appear both to have personified fire acted upon by Ptah, the cosmic demiurgos, and Vulcan. Owing to the pantheistic ideas prevalent in Egypt, Bast was identified at times with Neith, the Egyptian Athene or Minerva, and Athor, the Aphrodite or Venus. Her type and attributes were also those.of Tefnu or Daphne, the pupil or daughter of the sun; and it was probably from her relation to this goddess, who, with her twin brother Su or Sés, represented the Apollo and Artemis of the religious, and the Gemini, or Twins, of the zodiacal system, that Bast was identified with Diana. Bast was supposed to be the beneficent portion of the element fire and the bringer of good fortune; her sister and rival Sexet to represent the malevolent deity of the element and the bringer of ill-fortune. Ata later period Bast has the head of a cat substituted for that of a lion, and holds in her hands a vase or situlus. About the time of the 26th dynasty, figures of her, made of porcelain, abound, representing the goddess seated and sometimes holding a

sistrum. Her local worship was principally carried on at Bubastis, the modern Tel Basta. The Speos Artemidos, or Sheik Hassan, Anxtata supposed to be Letopolis near Memphis. The cat was sacred to this goddess, and mummies of this animal are found at Bubastis, the Speos Artemidos, and Thebes, sometinies in bronze or wooden figures in‘shape of the cat seated ona pedestal, carved in form of the vase which was the hieroglyphic name of the goddess. Connected with Bubastis were the Bubasteia or festival of tle goddess, celebrated with great pomp at the city of Bubastus, and the largest and most important in Egypt. The Egyptians flocked to it by water, accompanied by music; and as many as 700,000 are said to have been present on the occasion. A nome was also named after this goddess, and the capital city called Bubastus or Bubastis was on the site of the present Tel Basta on the Bubastite branch of the Nile. In later times the canal of Necho started from it to the Red Sea, and the adjoining lands were given by Psammetichus to the Greek mercenaries. It is, however, mentioned in inscriptions of the earlier periods of history, and was an important city. Taken by the Persians under Memnon, its walls were razed, and it sunk gradually in importance. The nome struck some bronze coins of small size in the eleventh year of the Emperor Hadrian, 127 A.D., with a goddess holding in her hands a small animal, possibly a cat. Many antiquities and remains are found in the ruins of the city.

Brugsch, Geogr. Inschrift, i. 188-236; Jablonski, Panth. Agypt., iii. p. 68; Diodorus, i. 27; Herodot. ii. 67, 187-156; Rev. Arch. 1868, 195; Wilkinson, Mann. and Cust., iv. 277, v. 208.

BUCCANEERS, a band of piratical adventurers of different nationalities united in their opposition to Spain, who maintained themselves chiefly in the Caribbean Seas during the 17th century.

The island of St Domingo was one of several in the West Indies which had early in the 16th century been almost depopulated by the oppressive colonial policy of Spain. Along its coast there were several isolated establishments presided over by Spaniards, who were deprived of a free and convenient market for the produce of the soil by means of the monopolies imposed by the mother country. Accordingly English, Dutch, and French vessels were welcomed with eagerness, and their cargoes readily bought.

The island, thinned of its former in- habitants, had become the home of immense herds of wild cattle, which multiplied with great rapidity ; and it became the habit of the hardy smuggler to provision his ship at St Domingo. The natives still left upon the island were skilled in preserving flesh by means of fire and smoke at their little establishments called Boucans. The adventurers learned “ boucanning ” from the natives ; and gradually Hispaniola became the scene of an extensive and illicit butcher trade. A sailor in those days when piracy abounded was expert with his weapons, and was almost a fighting man by trade. Spanish monopolies were the pest of every port from Mexico to Cape Horn; and the seamen who had sailed the Caribbean were filled with a natural hate of everything Spanish. The pleasures of a roving life gained upon them, while the monotony of its routine was broken by occasional skirmishes with the forces organized and led by Spanish officials. Out of such conditions arose the Buccaneer, alternately sailor and hunter, even occasionally a plauter,—roving, bold, not over- scrupulous, not unfrequently savage, with an intense detestation of the power and the representatives of Spain.

In the year 1625 indirect assistance and encouragement previously given culminated in a combined venture on behalf of the Buccaneers by the Governments of England and France. Lach nation contributed a band of colonists, and selected the island of St Christopher, in the West

Indies, where the settlers of both nations were simul- taneously planted. The English and French were, however, not over-friendly ; and in 1629, after the retirement of several of the former to an adjoining island, the remaining colonists were surprised and partly dispersed by the arrival of a Spanish fleet of thirty-nine sail. Many were carried off, and threats were freely used as to the future settlement of the island. But on the departure of the fleet the scattered bands returned, and encouragement was given to their countrymen in St Domingo. For buccaneering had now become a most profitable employment, operations were extended, and a storehouse secure from the attacks of the Spaniards was required. The small island of Tortuga lying to the N.W. of Hispaniola was seized for this purpose in 1630, converted into a

magazine for the goods of the rivals, and made their headquarters, St Domingo itself still continuing their lucrative hurting ground.

Spain was not indifferent to this proceeding, though she could not prudently take immediate action. Eight years, however, had not gone, ere, watching her oppor- tunity when many Buccaneers were absent in the larger island on their ordinary pursuit, she attacked Tortuga, and massacred every settler she could seize. But the hunters to the number of 300 returned; and the Buccaneers, now distinctly seen to be in open hos- tility to the Spanish arms, began to receive recruits from every European trading nation, and for three-quarters of a century became the acknowledged scourge of the Spanish American trade and dominions.

France, throughout all this, had not been idle in watching over her own interests. She had named the Governor of St Christopher "Governor-General for the French West India Islands," and in 1641 he took posses- sion of Tortuga for the Crown of France, expelled all English from the island, and attempted the same with less success in St Domingo. England had at home something vastly more important to attend to, and the Buccaneers had to maintain themselves as best they could,—now mainly on the sea.

In 1654 the Spaniards regained Tortuga from the French, into whose hands it again, however, fell after a period of six years. But this state of matters was, as may be readily conceived, too insecure even for these rovers, and they would speedily have succumbed to the perils of their mode of life, had not a refuge been found for them by the fortunate conquest of Jamaica in 1655 by the navy of Cromwell, on behalf of the English Commonwealth. These conquests were not made without the aid of the Buccaneers themselves. The taking and retaking of Tor- tuga by the French was always with the assistance of the roving community; and at the conquest of Jamaica the

English navy had the same influence in its favour..

The Buccaneers, in fact, by this time constituted a mer- cenary navy, ready for employment against the power of Spain by any other nation, on

condition of sharing the plunder to be obtained; and they were noted for their daring, their cruelty, and their extraordinary skill in sea- manship.

Their history now conveniently divides itself into three distinct epochs. period of their rise to the capture of Panama by Morgan in 1671, during which time their characteristic peculiarity as robbers was that they were hampered neither by Govern- ment aid nor, till near its close, by Government restriction. The second, from 1671 to the time of their greatest union and power, 1685, when the scene of their operations was no longer merely the Caribbean, but principally the whole range of the Pacific, from California to Chili. The third and last period exteuds from that year onwards; it was a time of disunion and disintegration, when the inde-

The first of these extends from the

pendence and rude honour of the previous periods had degenerated into unmitigatcd vice and srutality.

It is chiefly during the first period that those leaders flourished whose names and doings have been associated with all that was really influential in the exploits of the Buccaneers,—the most prominent being Mansvelt and Morgan. The commerce of Spain, which had been gradu- ally dwindling since the wreck of the Invincible Armada and the death of Philip II., had by the middle of the 17th century become utterly insignificant. The Buccaneers were thus deprived of the plunder of the Spanish mercantile marine. But Spanish settlements remained; and in 1654 the first great expedition on land, attended by con- siderable difficulties, was completed by the capture and sack of New Segovia in Honduras, on the mainland of America. The Gulf of Venezuela, with its towns of Mara- caibo and Gibraltar, were attacked and plundered under the command of a Frenchman named L/Ollonois, who per- formed, it is said, the office of executioner for the whole crew of a Spanish vessel manned with ninety seamen. Such successes removed the Buccaneers further and further from the pale of ordinary civilized society, fed their revenge, and inspired them with an avarice almost equal to that of the original settlers from Spain. Mansvelt, in- deed, in 1664, popular among all the Buccaneers, conceived the idea of

their permanently settling as a body of regular colonists upon a small island of the Bahamas, named Providence, and Henry Morgan, a Welshman, intrepid and unscrupulous, joined him in some preliminary cruises. But the untimely death of Mansvelt nipped-in the bud the only rational scheme of permanent settlement which seems at any time to have animated the members of this wild community ; and Morgan, now elected commander, swept the whole Caribbean, and from his headquarters in Jamaica led triumphant expeditions to Guba and the mainland. He was leader of the expedition wherein Porto Bello, one of the chief and best fortified ports in the West Indies, was surprised, taken, and plundered.

But this was too much for even the adverse European powers ; and in 1670 a treaty was concluded between England and Spain, proclaiming universal peace and friend- ship among the subjects of the two sovereigns in the New World, formally renouncing hostilities of every kind, with- drawing commissions granted to privateers, and agreeing to forget the past and for the future to punish all offenders, Great Britain was to hold all her possessions in the New- World as her own property (a remarkable concession on the part of Spain), and consented, on behalf of her subjects, to forbear trading with any Spanish port without licence obtained. On the proclamation of the treaty in Jamaica, the Buccaneers rose to a man, ready for the most daring exploit which it had yet been in their power to achieve ; they resolved to carry the terror of their name to the shores of the Pacific.

Accordingly, in 1671 Morgan embarked 2000 men on board a fleet of thirty-nine ships, sailed for a convenient port in the Caribbean, and crossed the Isthmus to lay siege to Panama. After a difficult journey, on foot and in canoes, they found themselves nearing the shores of the South Sea and in view of the turrets of the fated city. On the morning of the tenth day they commenced an engage- ment which, ere the close of the evening, ended in the rout of the defenders of the town. It was taken, and, acci- dentally or not, it was burnt. Neither sex nor condition was spared in the barbarities which ensued; and the conquerors returned laden with spoil. Morgan was not even true to his own men in the division of the hooty ; he returned to Jainaica, became respectable under Govern- ment, was after a little made deputy-governor of the island, and took advantage of his position to punish his IV. — 52

former associates. He died, by the favour of Charles IL., the “ gallant” Sir Henry Morgan.

From 1671 to 1685 is the time of the greatest daring, prosperity, and maritime power of the Buccaneers. But the expedition against Panama had not been without its influ-

ence. Notwithstanding the vigour with which they executed.

their piratical projects in the Caribbean, and the many successes which they obtained on land, including a second plunder of the unfortunate city of Porto Bello, their thoughts ran frequently on the great expedition across the Isthnius, and they pictured to themselves the shores of the South Sea as a far wider and more lucrative field for the display of their united power.

In 1680 those longings took formidable shape. A body of marauders over 300 strong, well armed and pro- visioned, landed on the shore of Darien and struck across the country; and the cruelty and mismanagement displayed in the policy of the Spaniards towards the Indians were now in small part revenged by the assistance which the natives eagerly rendered to the adventurers. They acted as guides during a difficult journey of nine days, kept the invaders well supplied with food, provided them with skilfully constructed canoes, and only left them after the taking of the fort of Santa Maria, when the Buccaneers were fairly embarked on a broad and safe river which emptied itself into the South Sea. With John Coxon as commander they entered the Bay of Panama, where rumour had been before tiem, and where the Spaniards had hastily prepared a small fleet to quell this dangerous attempt to carry insecurity and terror into the Pacific. But the valour of the Buccaneers won for them another victory, and within a week they escaped from the confinement of canoes, and took possession of a small fleet of four Spanish ships ; and now successes flowed upon them. The Pacific, formerly free from their intrusion, showed many sail of merchant vessels, while on land opposition south of the Bay of Panama was of little avail, since few were acquainted with the use of fire-arms, and defence as an art was utterly unknown Coxon and seventy of his men returned as they had gone, but the others under Sawkins, Sharp, and

Watling, roamed north and south, on islands and mainland, and remained for long ravaging the coast of Peru. Never scant of silver and gold, but often in want of the neces- saries of life, they continued their practices for a little longer ; then, evading the risk of recrossing the Isthmus, they boldly cleared Cape Horn, and arrived in the Indies, in the not very tender hands of the representatives of the different Governments there. Again in 1683, however, numbers of them under John Cook departed for the South Sea by way of Cape Horn, near which they hailed a Thames built ship fitted out apparently as a trader, but in reality for the purposes of privateering. Thus straight from England the Buccaneers were now receiving a great accession to their numbers and their strength ; and Eaton, the commander of the new vessel, told Cook of a certain Captain Swan who would probably be met with soon, pro- secuting the same dangerous business. They sailed northward, and on the death of Cook, Edward Davis, undoubtedly the greatest and most prudent commander who ever led the forces of the Buccaneers at sea, took command of his ship. Davis parted with Eaton, who left for the East Indies, but Swan arrived, and the two captains began a cruise which was disastrous to the Spanish trade in the Pacific.

In 1685 they were joined in the Bay of Panama by large numbers of Buccaneers who had crossed the Isthmus under Townley and others, This increased body of men required an enlarged measure of adventure, and this in a few months was supplied by the Viceroy of Peru. That officer, sole representative of the Spanish sovereign in the

vast kingdom, saw that the trade of the colony was cut off, that supplies were stopped, that towns were burned and cleared of the precious metals, and that settled life was broken in upon by the harassing and repeated attacks of the unsparing marauders, and he resolved by vigorous means to put an end to this state of matters. But this was not easily accomplished. In this same year, indeed, a fleet of fourteen sail hove in sight of the united forces of the Buccaneers in the Bay of Panama. ‘The ten ships of the pirates were miserably deficient in cannon, and hung off. The Spaniards evidently were not aware of their advantage, and the two fleets, after remaining in

proximity for three days, separated without testing their strength except in the way of a small and distant cannonade.

At this period the power of the Buccaneers was at its height. But the combination was now too extensive for its work, and the different nationality of those who composed it was a source of growing discord. Nor was the dream of equality ever realized for any length of time. The immense spoil obtained on the capture of wealthy cities was indeed divided equally among the crew of the attacking ships, the commander alone getting an extra share. But in the gambling and debauchery which followed, nothing was more common than that one-half of the conquerors should find themselves on the morrow in most pressing want; and while those who had prudently retained or fortunately increased their store of the precious metals would willingly have directed their course honie- wards, the others clamoured for renewed attacks upon tle hated Spaniards. The separation of the English and French Buccaneers, who together presented a united front to the Spanish fiect in 1685, marks the beginning of the

third and last epoch in their history—that of disunion, —

decay, and extinction as an unaided community.

The brilliant exploits begun in this third period by the sack of Leon and Realejo by the English under Davis have, even in their variety and daring, a sameness which deprives them of interest, and the wonderful confederacy is now seen to be falling gradually to pieces. The skill of Davis at sea was on one occasion displayed in a seven days' engagement with two large Spanish vessels, and the interest undoubtedly centres in him. 'Townley and Swan had, however, by this time left him, and after cruising together for some time, they, too, parted. In 1688 Davis cleared Cape Horn and arrived in the West Indies, while Swan's ship, the "Cygnet," was abandoned as unseaworthy, after sailing as far as Madagascar. 'Townley had hardly joined the French Buccaneers remaining in the South Sea ere he died, and the Frenchmen with their companions crossed New Spain to the West Indies. And thus the Pacific, ravaged so long by this powerful and mysterious band of corsairs, was at length at peace from California to Cape Horn.

The West Indies had by this time become hot enough even for the banded pirates. They hung doggedly along the coasts of Jamaica and St Domingo, but their day was nearly over. Only once again—at the siege of Carthagena—did they appear great; but even then the expedition was not of their making, and they formed an accession to regular forces organized in France. After the treachery of the French commander of this expedition a spirit of unity and despairing energy seemed reawakened in them ; but this could not avert and scarcely delayed the rapidly approaching extinction of the community.

The proximate causes of the disappearance vf this remarkable body of men are to be found in Huropean policy. The accession of William of Orange to the English throne in 1689 had raised the jealousy of Louis XIV., and the war which ensued was protracted and severe. French and English rovers in the Caribbean could

not but take the part of their countrymen at home, and the continuance of hostilities effected the severance of the bond of unity which had for three-quarters of a century kept the subjects of the two nations together in schenies of aggression upon a common foe. The peace of Ryswick in 1697 only left England and France free to pay court to Spain, whose king, weak in body and mind, was evidently hastening to the grave. The succession to the crown was believed to depend upon his will, and the two nations used all their influence, both in the Old World and in the New, to ingratiate themselves into the favour of the Spanish monarch. But that which really stopped the career of the Buccaneers so effectually as to prevent its

being resumed was the fact, of so vast importance in the.

history of Spain and of Europe, that in 1700 Philip V., first of the Bourbon dynasty, ascended the Spanish throne. Spain, so little in herself, yet always great under great kings, now degraded and fallen, almost immediately rose before the eyes of astonished Europe as a gigantic power in the Old World and in the New.

But the fall of the Buccaneers is no more accounted for fully by these circumstances than is their rise by the alienation and massacre of the islanders of St Domingo. There was that in the very nature of the community which, from its birth, marked it as liable to speedy de- cline.

The principles which bound the Buccaneers together were, first, the desire for adventure and gain, and, in the second place, hatred of the Spaniard. The first, as that which could produce union among men of different nationalities, hardly deserves to be called a principle. There was perhaps much to gain, but it could be had nearly always by private venture under the colours of the separate European powers. Only one thing prevented this, and it is connected with their second and great principle of union, namely, that they warred not with one another, nor with every one, but with a single and a common foe. For while the Buccaneer forces included English, French, and Dntch sailors, and were complemented occasionally by not inconsiderable bands of native Indians, the instances during the time of their prosperity and growth are few in which we find them turning upon one another, and treating their fellows with the savagery which they exulted in displaying against the subjects of Spain, The exigencies, moreover, of their perilous career readily wasted their suddenly acquired gains.

Settled labour, the warrant of real wealth, was beneath the dignity of those who lived by promoting its insecurity. Regular trade—though rendered attractive by smuggling— and pearl gathering and similar operations which were spiced with risk, were open in vain to them. For, as the licence of the debauchee was in almost every case substituted for the cares and pleasures of domestic life, so a hand-to-mouth system of supply and demand rooted out gradually the prudence which accompanies any mode of settled existence. In everything permanency was what was not aimed at, because the whole policy of the Buccaneers, from the beginning to the end of their career, was one of pure destruction, and was therefore ultimately suicidal.

It has already been seen how great was the influence of the Buccaneers upon the power and the colonial tactics of Spain. But it was more beneficial to the world and more ruinous to Spain, that they opened the eyes of the world, and specially of the nations from whom these Buccaneers had sprung, to the whole system of Spanish American government and

commerce—the former in its ~~yottenness, and the latter in its possibilities in other hands. That effected, all was effected, since the extent of Spanish power was known. From this, then, along with other causes, dating primarily from the helplessness and pre~~

sumption of Spain, there arose the West Indian possessions of Holland, England, and France.

A work published at Amsterdam in 1678, entitled De Americaensche Zee Roovers, from the pen of a Buccaneer named Exquemelin, was translated into scveral European languages, receiving additions at the hands of the different translators. The French translation by Oexmelin isnamed Histoire des Avanturiers quise sont signalcz dans les Indes ; the English edition is entitled The Bucaniers of America. Other works are Raynal's History of the Settlements and Trade of the Europeans in the East and West Indies, book x., English translation 1782; Dampier's Voyages ; Geo. W. Thornbury's Monarchs of the Main, &c., 1855; Lionel Wafer's Voyage and Description of the Isthmus of America, 1699; and the Histoire dc isicEspagnole, etc., and Histoire et description gcnerat dela Nouvelle France of Pére Charlevoix. The statements in these works are to be received with caution. A rcally authentic narrative, however, is Captain James Burney's History of the Buccaneers of America, London, 1816. (7? 83)

BUCCARI, a royal free town of the Hungarian crown, situated in the comitat of Fiume, on a small bay of the Adriatic, in 45° 18' 46" N. lat. and 14° 32' 11" E, long. Its harbour is of rather limited dimensions, but the road- stead is excellent, though the approach is not unattended with danger. The staple industry is the weaving of linen ; shipbuilding is also carried on, and there is an active coasting trade in fish, wine, wood, and coal. The tunny- fishery is of some importance. In the neighbourhood of the town is the old castle of Buccaricza, and further south the flourishing little port of Porto Ré or Kraljevicza, The population of Buccari in 1869 was 2116.

BUCCINO, a town of Italy in the province of Principato Citeriore, and district of Campagna, situated on the River Botta, which is here crossed by an ancient Roman bridge. Buceino is identified by means of inscriptions

found on the spot, as the ancient Volceiwm or Volcentium, which was a considerable municipal town in Lucania. Population, 6049.

BUCER, Martin (1491-1551), originally Marrin Kunorn, an eminent German reformer, born at Schelestadt, a town of Alsace, near Strasburg. At the age of fifteen he entered the order of St Dominic, and as he was a youth of great promise he was sent to prosecute his studies at Heidelberg. There he studied the works of Erasmus and Luther, and was present at a disputation of the latter with some of the Roman Catholic doctors. He became a convert to the Reformed Church, abandoned his order, and soon afterwards married a nun. He did not, however, remain strictly a Lutheran. On the great question of the sacrament of the Lord's Supper, his opinions were decidedly those of Zwingli rather than of Luther. Although differ- ing from them in doctrine he was anxious to be in church unity with the Lutheran party, and constantly endeavoured to bring about a coalition. In 1548 he was sent for to Augsburg to sign the agreement, called the Interim, between the Papists and Protestants, His warm opposition to this project exposed him to many difficulties and hardships, which induced hiin to accept the invitation of. Archbishop Cranmer to fix his residence in England. On his arrival, in 1549, he was appointed to teach theology in the univer- sity of Cambridge. King Edward VI. had the greatest regard for Bucer. Having heard that he had suffered much from: the cold, from want of a German stove, he sent him a hundred crowns to purchase one. Bucer died of a complication of disorders in 1551, and was buried at Cam bridge with great funereal pomp. Five years afterwards, in Mary's reign, his body was dug up and burnt, and his tomb demolished ; but it was subsequently re-constructed by order of Queen Elizabeth. Bucer's name is familiar in English literature from the use made of the reformer's doctrines by Milton in his divorce treatises.

BUCH, Leorotp von (1774-1853), an eminent German. geologist and geographer, was born at Stolpe in Pomerania, April 25, 1774. In 1790 he studied at the mining school of Freiberg under the celebrated Werner, one of his

fellow-students there being the illustrious Alexander Von Humboldt. At the age of twenty-three he published his Attempt at a Mineralogical Description of Landeck, and also an Attempt at a Geognostic Description of Silesia. He was at this time a zealous upholder of the Neptunian theory of his illustrious master. In 1797 he met his old school-fellow Von Humboldt at Salzburg, and with him explored the geological formations of Styria and _ the adjoining Alps. In the spring of the following year, Von Buch extended his excursions into Italy; where his faith in the Neptunian theory was for the first time shaken. In his previous works he had advocated the aqueous origin of basaltic and other formations ; he was now not less clearly convinced that these owed their existence to volcanic action. In 1799 he paid his first visit to Vesuvius, which he did not again see till 1895, when he was accompanied by Humboldt and Gay-Lussac. They had the good fortune to witness a remarkable eruption, which supplied Buch with data for refuting many erroneous ideas then entertained regarding the activity of volcanoes. Three years before he had explored the south of France, and directcd special attention to the extinct voleanoes of Auvergne. The aspect of the Puy de Dome, with its cone of trachyte and its strata of basaltic lava, induced him to abandon as untenable the doctrines of Werner on the formation of these rocks. The scientific results of his investigations he embodied in his G'eognostical Observations during Travels through Germany and Italy, Berlin, 1802-9, 2 vols. 8vo. From the south of Europe Von Buch repaired to the north, and spent two years among the Scandinavian islands, making many important observations on the geography of plants, on climatology, and on geology. He also estab- lished the fact that the whole of Sweden is slowly but continuously rising above the level of the sea from Frederickshall to Abo. The details of these discoveries are given in his Zravels through Norway and Lapland, Berlin, 1810. In 1815 he visited the Canary Islands in company with Christian Smith, the Norwegian botanist. His obser- vations here convinced him that these and other islands of the Atlantic owed their existence to volcanic action of the most intense kind, and that the groups of islands in the South Sea are the remains of a pre-existing continent. The physical description of the Canary Islands was pub- lished at Berlin in 1825. After leaving the Canaries Von Buch proceeded to the Hebrides and the coasts of Scotland and Ireland. His geological excursions even into countries already repeatedly visited were continued without inter- ruption till his 78th year.

Hight nionths before his death, he visited the mountains of Auvergne ; and on returning home he read a paper on the Jurassic Formation before the ’ Academy of Berlin. The circumstances of Von Buch’s life were singularly favourable to scientific pursuits. He in- herited from his father a fortune more than sufficient for all his wants. He was never married, and was completely unembarrassed by family ties. His excursions he always undertook on foot, with a staff in his hand, and the large pockets of his over-coat filled with papers and geological instruments. Under this guise, the passer-by would not easily have recognized the man whom Humboldt pro- nounced the greatest geologist of his time. He died at Berlin on the 4th of March 1853. In addition to the works already mentioned Von Buch published others, of which we may specify the magnificent Geological Map of Germany, in 42 sheets, Berlin, 1832.

BUCHANAN, Gzorce (1506-1582), a celebrated Scottish historian and scholar, was born in February 1506. His father, a younger son of an old family, was the possessor of the farm of Moss, in the parish of Killearn, Stirling-

attended Killearn school, but not much is known of his early education. In 1520 he was sent by his uncle to the university of Paris, where he prosecuted his studies with great ardour, and especially trained himself in poetical composition. In 1522 his uncle died, and Buchanan being thus unable to continue longer in Paris, returned to Scot- land. After recovering from a severe illness, he joined the French auxiliaries who had been brought over by the duke of Albany, and took part in an unsuccessful inroad into England. In the following year he entered the university of St Andrews, where he graduated as B.A. in 1525. He had gone there chiefly for the purpose of attend- ing the celebrated John Major or Mair’s lectures on logic ; and when that teachcr removed to Paris Buchanan accompanied him. In 1527 he became B.A., and in 1528 M.A. at Paris. Next year he seems to have been appointed regent or professor in the college of Ste Barbe, and taught there for upwards of three years. In 1532 he became the friend and tutor of Gilbert Kennedy, earl of Cassilis, with whom he returned to Scotland about the beginning of 1537.

While residing at Paris Buchanan had been converted to the Protestant faith, and his first production in Scotland was the poem Somnium, attacking with keen satire the Franciscan friars and monastic life generally. This assault on the monks was not displeasing to James V., who engaged Buchanan as tutor to one of his natural sons, and encouraged him to a still more daring attack. Under these circumstances the Franciscanus was written, and it is not surprising that the author became an object of bitterest hatred to all of the Roman Catholic faith. Nor was it yet a safe matter to assail the church. In 1539 there was a bitter persecution of the Lutherans, and Buchanan among others was arrested. He managed to effect his escape, and with considerable difficulty made his way to London and thence to Paris. At Paris, however, he found his resolute enemy, Cardinal Beaton, and on the invitation of Andrew Govea, proceeded to Bordeaux. Govea was then principal of the newly-founded college of Guienne at Bordeaux, and by his exertions Buchanan was appointed professor of Latin. During his residence there several of his best works, the translations of Medea and Alcestis, and his two great dramas Jephthes and Baptistes, were completed.

After three years he rcturned to Paris, and in 1544 was appointed regent in the college of Cardinal le Moine, a post he held till 1547. He then accepted Govea's invitation to a chair in the new Portuguese university of Coimbra, afterwards one of the most celebrated seats of learning in Europe. But he had not been long in Portugal when Govea's death exposed him to the unwearied persecution of the priests. Buchanan was several times examined by the officers of the Inquisition, and finally was confined to a monastery, where he was condemned to hear edifying lessons from the monks. During his imprisonment, which lasted several months, he began his famous version of the Psalms. On his release he sailed for England, but soon made his way to Paris, where, in 1553, he was appointed regent in the College of Boncourt. He remained in that post for two years, and then accepted the office of tutor to the son of the Marshal de Brissac.

In 1560 or 1561 he returned to Scotland, and in April 1562 we find him installed as tutor to the young queen Mary, who was accustomed to read Livy with him daily. Buchanan now openly joined the Protestant or Reformed Church, and in 1566 was appointed by the earl of Murray principal of St Leonard's College, St Andrews. Two years before he had

received from the queen the valuable gift of the revenue resulting from Crossraguel Abbey.

shire, but he died at an early age, leaving his widow and | He was thus in good circumstances, and his fame was children. in poverty. George, the third son, is said to have steadily increasing. So great, indeed, was his reputation

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for learning and administrative capacity that, though a layman, he was made moderator of the General Assembly in 1567. He had sat in the Assemblies from 1563.

The part Buchanan took in the affairs of Queen Mary is well known, He accompanied the Regent Murray into England, and his Detection (published in 1572) was produced to the commissioners at Westminster. In 1570, after the assassination of Murray, he was appointed one of the preceptors of the young king, and it was through his tuition that James acquired his great scholarship. Buchanan was a strict and severe master, and kept his pupil in salutary awe and obedience. James long remembered the feelings of dread with which he was accustomed to regard his formidable pedagogue.

While discharging the functions of royal tutor he also held other important offices. He was for a short time director of chancery, and then became lord privy seal, a post which entitled him to a seat in the Parliament. He appears to have continued in this office for some years, at least till 1579. He died on the 28th September 1582.

His last years had been occupied with two of his most important works. The first was the treatise De Jure Regni apud Scotos, published in 1579. In this famous work, composed in the form of_a dialogue, and evidently intended to instil sound political principles into the mind of his pupil, Buchanan lays down the doctrine that the source of all political power is the people, that the king is bound by those conditions under which the supreme power was first committed to his hands, and that it is lawful to resist, even to punish, tyrants. A theory such as this was not likely to be palatable to James. The

book was condemned in 1584, and again in 1664; while in 1683 it was burned by the loyal scholars of Oxford.

The second of his large works was the history of Scotland, Rerum Scoticarum Historia, completed shortly before his death and published in 1582. It is of great value for the period personally known to the author, which occupies the greater portion of the book. The earlier part is to a considerable extent based on the work of Boece and repeats the legendary history which was for so long an article ot faith to every Scotchman.

Buchanan is the greatest scholar that Scotland has produced. For mastery over the Latin language he has never been surpassed by any modern writer. His style is not rigidly modelled upon that of any classical author, but has a certain freshness and elasticity of its own. He wrote Latin as if it had been his mother tongue. Butin addition to this perfect command over the instrument of expression, Buchanan had a rich vein of poetical feeling, and great powers of thought. His translations of the Psalms and of the Greek plays are more than mere versions ; they have a peculiar grace and felicity. The smaller satirical poems are masterpieces of wit and expressive language, while the two tragedies, Baptistes and Jephthes, are works whose merits have not perhaps been generally recognized.

There are two complete editions of Buchanan's works, one by Ruddiman, 2 vols. fo., 1715; the other by Burman, 2 vols. 4to, 1725. His life has been written by Dr Irving, Memoirs of the Life and

Writings of George Buchanan, 2d edition, 1817. The Jephthah and Baptist have been translated by A. Gibbs, 1870.

BUCHANAN, Jamzs (1791-1863), fifteenth President of the United States, was born in Franklin County, Penn- sylvania. His father, of the same name, was an Irishman who had eight years before emigrated from Donegal, and had become a well-to-do farmer. The son completed his education at Dickinson College, Carlisle, and took his degree in 1809. He then applied himself to the study of the law, was admitted to the bar in 1812, and settled at Lancaster in Pennsylvania. Notwithstanding his youth he soon gained considerable reputation, and with it a large

and growing practice. In 1812 he joined a party of volunteers who, under the command of Judge Shippen, marched to the defence of Baltimore against the British ; but their services were not wanted. He was at this time a zealous federalist. In 1814 he was elected member of the State Legislature, and constantly recommended the vigorous prosecution of the war. He was re-elected the following year; and in 1820 he became a member of Congress. Among his important early speeches were those on a deficiency in the military appropriation, in January 1822; on the bankrupt law, in March following, when he successfully opposed its extension to all citizens whether traders or not ; and on the tariff question, on which he maintained that duties ought to be levied for revenue only. He uttered grave warnings against forming alliances with Mexico and the South American Republics, the condition of which was not calculated to inspire hopefulness, and insisted on the immense importance of Cuba, both commercially and strategically, to the United States. In 1828 he supported General Jackson at the Presidential election, and was at the same time re-elected to Congress. In the following year he succeeded Daniel Webster as head of the judiciary conimittee, and in this capacity conducted the trial on impeachment of Judge Peck,—one of the causes célébres of American jurisprudence. On completing his fifth term, Buchanan retired from Congress (1831), and the next year was appointed envoy extraordinary and minister plenipotentiary to St Petersburg. His mission is marked by the negotiation of the first treaty of commerce between the United States and Russia,—a treaty by which important privileges in the Baltic and the Black Sea were secured to the former. On his return from Russia he was elected United States senator ; aud he retained his seat till 1845. In the great struggle between President Jackson and the party headed by Mr Calhoun, Buchanan warmly defended the president and his claims. In the first years of the movement against slavery, he saw the large results which were likely to follow, and desired to suppress the agitation in its infancy, and this by suppressing the discussion of the subject in Congress. He advocated the recognition by Congress of the independence of Texas, and at a later time its annexation. During the presidency of Van Buren, Buchanan greatly distinguished himself in support of the principal measure of the Government—the establishment of an independent treasury. In 1845 he was appointed Secretary of State under

President Polk ; and at the close of his term of office in 1849 he retired into private life. But four years later he accepted from President Pierce the post of United States Minister to Great Britain. In 1854 he was the originator and one of the three members of the Ostend Conference on the subject of the acquisition of Cuba by the United States, and with his colleagues maintained that, on the principle of self-preservation from dangers of ths gravest kind, an armed intervention of the United States and the capture of the island from the Spaniards would be justifiable. He returned from England in 1856, and the same year was elected, as Democratic candidate, to the Presidential chair. For a short time there

seemed to be ground for hope that political passions and

excitement would subside. But this hope was soon found to be fallacious. The troubles in Kansas and the large ques- tions involved in them gave rise to new discussions and division. The president gave his support tothe pro-slavery party, and dissensions grew during his administration to such an extent that disruption and war between North and South followed the election of his successor, President Lincoln. From the close of his administration in 1860 till his death, Buchanan led a retired life. He died at Wheat- land in Pennsylvania, June 1, 1868. Two years before his death he published an account of his administration.

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BUCHAREST, Buxuworest, BuKorEst, or, as itis called by the inhabitants, Bucurzsci (that is, according to their own etymology, City of Joy), is the capital of Roumania, the residence of the prince and the seat of a bishop. It is situated in a hollow on the River Dimbovitza, a tributary of the Danube, in 44° 25’ 30” N. lat. and 26° 5’ 24” E. long., and occupies an area of more than 20 English square miles, The number of its cupolas and minarets, and the profusion of acacia, poplar, and other trees that fill the nuulerous spaces of unoccupied ground, give it a picturesque appearance from a distance. The arrangement of its streets is very irregular, and in many districts it cannot be said that there are streets at all. In general the roadways are either unpaved or only laid with rough blocks of different sizes. A few streets, indeed (and notably the Podo Mogo- choi, which is the most important), have been paved with Aberdeen granite. The city is lighted with gas

produced from English coal; and a considerable but far from satis- factory supply of water is obtained from the river and distributed partly by water-carts and partly by iron pipes. Of the public buildings few are of much architectural importance ; the national theatre is one of the largest, and the “academy ” one of the finest. The latter is occupied by the university, a library of 26,000 volumes, a public museum of antiquities and natural history, and a large theatre, which is used by the senate during the parliamentary session. The palace, an insignificant building, was founded by the Golesco family in the 18th century. There are 116 Greek churches in the city, of which the most remarkable are the Metropolitan, St George, St Spiridion, and Sarindar, The Roman Catholics have a parish-church in the centre of the town and several chapels; there are Lutheran and Calvinistic churches, with schools attached for both boys and girls; and the Jews, who number about 15,000, have ten synagogues. There are about a score of conventual establishments, the majority belonging to the Greek Church. The Brancovano hospital, founded by the family of that name, has accommodation for between 200 and 300 patients, the military hospital for 390, the Culza for 200, the Philanthropic for 100, and the Pantelemonu for 120. The Marcutza insane asylum can receive 220; and the Helena asylum, founded by the Princess Helena in 1862, has room for 220 orphan girls. There is also a children’s hospital for 100 patients, and a lying-in hospital for 40. In Bucharest there is always a numerous garrison, and the arsenal and barracks on the plateau of Dealu and the cavalry and infantry barracks at St George are both extensive establishments, -Cafés and coffee-gardens abound, and are allowed to remain open all night. There are two public gardens, the Cismegiu in the centre of the town, about a mile in circumference, and the Kisilev on the outskirts, which is traversed by the fashionable promenade known as the Chaussée. Public locomotion is facilitated by about 500 droshkas in summer and as many sledges in winter ; and a tramway has recently been laid down by an English company. The monetary business of the city is extensive,—its principal establishments being the Bank of Roumania, founded in 1865, with a capital of one million sterling, and the Société Financiére de Roumanie, with a capital of six million francs. The manufacturing industry is slight, the principal article being Turkish cloth ; but the trade both in foreign and native goods is of very considerable extent. The mercantile portion of the community is largely composed of foreigners—Germans, Greeks, Frenchmen, Swiss—

who keep themselves very much apart from each other. Division into classes and nationalities is a marked feature of the whole Bucharest population. The Boyards, though their aristocratic pretensions are no longer recognized by law, are as exclusive as ever. There are about 20,000 Transylvanians who fill subordinate positions; the droshka-

drivers are mainly Russians of the Lipovani sect ; and Bul- garians, Armenians, gypsies, and many others swell the motley multitude. In spite of the fact that the number of deaths is frequently in excess of the number of births, the increase of the population is rapid, and house-rents have become very high ; and that it is more the habits of the people than the unhealthiness of the city that is to blame for the death-rate is shown by the steady internal increase of the Jewish community. About eighteen newspapers are published in the city-—three daily and the others twice or thrice a week. The railway system, begun by the opening of the line to Giurgevo on the Danube in 1869, is rapidly extending, and there is direct communication with Western Europe by the lme to Lemberg. The population, which was 121,754 in 1859, had increased by 1870 to 200,000, and is now stated at 251,000.

Bucharest owes its foundation in the 13th century to Radel the Black of Wallachia. Burnt in 1595 by Sinan Pusha it was soon afterwards restored, but it was not till the 18th century that it appeared much in European history. It was frequently of importance in the contests for the neighbouring provinces, which so often broke out between the Turks and their northern rivals Austria and Russia; and in 1812 it gave its name to the treaty by which Bessarabia and a third of Moldavia were ceded to the latter power. In the war of 1828 it was occupied by the Russians, who made it over to the prince of Wallachia in the following year. A rebellion against Prince Bibesko in 1848 brought both Turkish and Russian interference, and the city was again held by Russian troops from 1853 to 1854. On their departure an Austrian garrison took possession and remained till March 1857. In 1858 the international congress for the organization of the Danubian principalities was held in the city; and in 1861 the union of Wallachia and Moldavia was proclaimed. Prince Couza, the first ruler of the

united provinces, was driven from his throne by an insurrection in Bucharest in 1866.

BUCHEZ, Puiiere JosepH BENJAMIN (1796-1867), French author and politician, was born at Matagne-la-Petite, in the department of the Ardennes. He finished his gene- ral education in Paris, and afterwards applied himself to the study of natural science and medicine. Hatred of the Government of the Restoration, and enthusiasm for demo- cratic ideas, were at that time widely diffused among the young men of the schools of Paris, and these passions gained full possession of the mind of Buchez. With his friends Bazard and Flotard he founded, in 1821, a secret associa- tion—a system of French carbonarism-:~~which spread rapidly aud widely, and displayed itself in repeated attempts at re~~ volution. In one of these attempts—the affair at Belfort— which cost General Berton, Colonel Caron, and four soldiers of Rochelle their lives, he was gravely compromised, although the jury which tried him did not find the evidence sufficient to warrant his condemnation. In 1825 he gra- duated in medicine, and soon after he published, along with M. Trelat, a Précis elémentaire d'Hygiéne. About the same time he became a member of the Saint-Simonian Society, presided over by Bazard, Enfantin, and Rodriguez, and contributed to its organ, the Producteur. He left it in consequence of aversion to the strange theological dogmas of its spiritual chief, M. Enfantin, and began to elaborate what he regarded as a Christian socialism. For the expo- sition and advocacy of his principles he founded a periodical called L'Huropéen. In 1833 he published an Jntroduction a la Science de l Histoire, which was received with con- siderable favour, and of which a second edition, improved and enlarged, in two volumes, appeared in 1842. Notwith- standing its prolixity and discursiveness, this is both an in- teresting anda meritorious work. The part of it which treats of the aim, foundation, and methods of the science

of history is truly valuable. On the other hand, what is most distinctive in M. Buchez's theory—the division of historical development into four great epochs originated by four universal revelations, of each epoch into three periods corresponding to desire, reasoning, and performance, and of each of

these periods into a theoretical and practical age— seems entitled to no higher commendation than that of being ingenious. (See Flint's Phelosophy of History in Hurope, i., 242-252). M. Buchez next edited, along with M. Roux Laverne, the Histoire parlementaire de la Révolu- tion Francaise (1833-38, 40 vols). This vast, laborious, conscientious publication is one of the chief sources of information regarding the early periods of the first French Revolution. There is a review of it by Mr Carlyle (Miscellanzes), the first two parts of whose own history of the French Revolution are mainly drawn from it. The editors worked under the inspiration of a strong admiration of the principles of Robespierre and the Jacobins, and in the belief that the French Revolution was an attempt to realize Christianity.

M. Buchez gave a general exposition of his views in his Essai @un Traité complet de Philosophie au point de vue du Catholicisme et du progrés (3 vols. 1839-40). Perhaps the fundamental doctrine of this treatise is that the primi- tive, intellectual, moral, and religious ideas of men cannot be adequately explained as innate, or as derived from sensation, sentiment, or reasoning, but must have been imparted by divine revelation. It is substantially iden- tical with the fundamental! doctrine of De Bonald, although Buchez infers from it democratic instead of theocratic consequences. Great prominence is given to the concep- tion of progress which is attained by generalization from a comprehensive survey of geology, physiology, and his- tory. The author sets very distinctly before himself also the aim of organizing the sciences into a single compre- hensive system. This he thought could only be accom- plished through an a priort synthetic method, and not, as had previously been attempted, by the analytical and ex- perimental method. It was partly owing to the reputation which he had acquired by these publications, but still more owing to his connection with the Vational newspaper, and with the secret societies hostile to the Government of Louis Philippe, that he was raised, by the Revolution of 1848, to the presidency of the Constituent Assembly. He speedily showed that he was not possessed of the firmness, decision, and political capacity needed in a situation so dificult and in days so tempestuous. He retained the position only for a very short time. After the dissolution of the Assembly he was not re-elected. Thrown back into private life, he resumed his studies, and added several works: to those which have been already mentioned. A Travté de Politique, which may be

considered as the com- pletion of his Zraité de Philosophie, is the most important of the productions of the last period of his life. His brochures are very numerous and on a great variety of subjects, medical, historical, political, philosophical, &>. He died in 1865. He found a disciple of considerable ability in M. Ott, who has advocated and applied his principles in various writings, the most recent of which, perhaps, places the metaphysical theory of Buchez in as favourable a light as it can be seen under. (R. F.)

BUCHU or Buxa Leaves are the produce of several shrubby plants belonging to the genus Barosma (Nat. Order, Rutacec), natives of the Cape of Good Hope. The principal species, B. crenulata, has leaves of a smooth leathery texture, oblongo-ovate in shape, from an inch to an inch and a half in length, with serrulate or crenulate margins, on which as wellas on the under side are con- spicuous oil cells. The other species which yield buchu are B. serratifolia, having linear-lanceolate sharply serrulate

leaves, and &. betulina, the leaves of which are cuneate obovate, with denticulate margins. They are all, as found in commerce, of a pale yellow-green colour ; they emit a peculiar aromatic odour, and have a slightly astringent bitter taste. Buchu leaves contain a volatile oil, to which evidently their therapeutic influence is due, and are said to yield a bitter extractive principle, which has received the name of diosmin. The leaves of a closely allied plant, Lmpleurum serratulum, are employed as a substitute or adulterant for buchu. Buchu leaves are chiefly used in European pharmacy in inflammatory disorders of the bladder and urinary organs; in the United States they are much employed by vendors of secret medicines. An infusion of the leaves is tonic, sudorific, and diuretic. At the Cape buchu has great reputation in gout and rheumatism, and as a stomachic stimulant; and in the form of buchu brandy and buchu vinegar it is applied as an em- brocation in sprains, contusions, and rheumatic pains,

BUCKEBURG, the capital of the principality of Schaumburg-Lippe, is situated at the foot of the Harrl- berg on the River Aue, about 6 miles from Minden, on the Minden and Hanover Railway. It hasa castle surrounded by a park, a gymnasium, a normal seminary, a library, an orphanage, a

synagogue, and three churches, one of which has the appropriate inscription, Leligionis non structure exemplum. ‘The first houses of Biickeburg began to gather round the castle about 1365; and it was not till the 17th century that the town was surrounded with walls, Popu- lation in 1871, 4686,

BUCKINGHAM, County or, BucKINGHAMSHIRE, or Bucks, an inland county of England, between 51° 25’ and 52° 10’ N. lat., and 0° 28’ and 1° 12’ W. long., is bounded N. by Northamptonshire W. by Oxfordshire, 8. by Berk- shire, and E. by Bedfordshire, Hertfordshire, and Middle- sex. It is the thirty-third in size of the English counties, measuring 53 miles at its greatest length and 27 at its greatest breadth, and containing, according to the last ordnance survey, 467,009 acres, or uearly 730 square miles. The aspect of the country is agreeably diversified by the distribution of forests, rivers, hills, pasture, and arable land. In the southern portion of the county the forests, consisting chiefly of beeches (from the Saxon name of which tree, boc, the county is said to derive its name), were at one time very extensive, but have of late years been greatly thinned; woods of considerable extent are still to be found in the northern parts. The principal rivers of Buckinghamshire are the Thames, which separates it from Berkshire and Surrey, and receives as tributaries the Colne and the Thame ; and the Ouse, with its tributary the Ousel, which belougs to the north of the county. The only hills in Bucks worthy of mention are the Chilterns which cross it in a north-westerly direction, and rise at two or three points to the height of about 900 feet. Of the roads which pass through the county the most important are that which connects London with Chester and Holyhead, by which the mails were forwarded to Ireland before the introduction of railways, the great western road connecting the metropolis with Bath and Bristol, and the roads to Oxford and Birmingham. ‘The only canal of any importance is the Grand Junction, from which branches proceed to several of the larger towns. The London and North-Western Railway passes through the north-east of the county, and the Great Western through a small part of its southern extremity, while minor branches belonging to both these systems afford ready communication between the more important places. The principal junctions are Prince’s Risborough, Aylesbury, Verney, and Bletchley.

The agricultural capacities of Bucks vary considerably in different parts of its extent. The vale of Aylesbury, lying between hills on either side, is one of the most fertile and

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valuable districts in England, and is divided in nearly equal proportions between pasture and tillage. Towards the north, however, the soil greatly degenerates, and sometimes does little more than pay the expense of cultivation. In 1875 the proprietors holding land of less and of more than one acre in extent numbered 6420 and 3288 respectively,— the largest owners being Lord Carington with 14,835 acres, and Earl Brownlow, with 11,785. The farms are not gener- ally large. The largest do not exceed 500 acres, while there are many of not more than 20 or 30 acres. The average size in 1871 was 70 acres. In 1874 there were 60,182 acres under wheat, 28,902 in barley, 23,257 in oats, 16,663 in beans, and 7136 in pease; 1463 were occupied by potatoes, 19,641 by turnips, 29,272 were in temporary grass, and 186,941 in permanent pasture. About 24,500 are covered with wood, and 1637 with orchards. Neither flax nor hops are grown. The quantities of cattle reared and fed in Bucks are very considerable,—the total number enumerated in the year 1874 being 37,147. The number of milch cows is estimated at upwards of 27,000; and the 1aige supply of dairy-produce is rapidly conveyed to London by rail, where it finds a ready market. Hogs are exten- sively reared on many farms, and are found to be a source of considerable profit to the farmer. Their numbers amounted in 1874 to upwards of 40,500. In many parts of the county, especially at Aylesbury, great numbers of ducks are fattened for sale in the London markets.

The manufactures of Buckinghamshire are neither very extensive nor very important. The principal are those of lace and straw plait. The proportion of persons chiefly engaged in agriculture is about 13 per cent. of the popula- tion ; in trade and manufactures about 18 per cent.

Bucks was originally divided into eighteen hundreds ; it is now divided into eight, viz., Newport, Buckingham, Ashendon, Cottesloe, Aylesbury, Burnham, Stoke, and Desborough, the last three forming what is well known as “The Chiltern Hundreds.” That of Aylesbury still retains its

ancient designation of the ‘‘three hundreds of Aylesbury.” The number of parishes in the entire county is computed at 202, part of those of Ibstone, Ickford, Kingsey, and Lewknor extending into Oxfordshire. The market-towns are Amersham, Aylesbury (in all respects the most important town in the county, though Buckingham is the capital), Beaconsfield, Buckingham, Chesham, Great Marlowe, High Wycombe, Ivinghoe, Newport-Pagnell, Olney, Prince’s Risborough, Stony Stratford, Wendover, and Winslow. There are many other interesting, though not very important, places in Buckinghamshire, of which we may mention Chalfont St Giles—the residence for a time of the poet Milton, where he completed Paradise Lost and began Paradise Regained ; Hampden, the manor- house of which was for many generations the abode of the family of that name, and in the churchyard of which the patriot (who fell at Chalgrove in 1643) is buried ; Medmenham, in the old abbey of which a celebrated club of ‘‘ Franciscans,” of which John Wilkes, Bubb Doddington, and other political notorieties of last century were members, held their convivial meetings; Pitstone, in the abbey of which Queen Elizabeth used frequently to reside in her younger days; Beaconsfield Manor, at one time the property of the poet Waller; Stoke Poges, celebrated by Gray in his Elegy and Long Story ; Slough, for many years the residence of Sir William Herschel, and the place where his great telescope was constructed and still stands ; Salt- hill (not far from Slough), where the Eton Montem, now abolished, used to be held ; Olney and Weston Underwood, familiar to all the readers of Cowper ; Butler’s Court or Gregories, the seat of Edmund Burke ; Bradenham, the mansion of the elder D’Israeli; and Hughenden Manor, the well-known residence of his son, The principal seats

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in Buckinghamshire are Stowe, the property of the duke of Buckingham, and celebrated for its grounds, and its collections of pictures and statues ; Bulstrode, once a seat of the dukes of Portland, now the property of the duke of Somerset ; Wotton House, belonging to the duke of Buckingham, Penn House to Earl Howe, the Abbey, High Wycombe, to Lord Carington, Dropmore to the Hon. George Fortescue, Aston Clinton to Sir A. Roths- child, Ditton Park to the duke of Buccleuch, Hedsor to Lord Boston, Cliefden to the duke of Westminster, Latimer to Lord Chesham, Peterley House to Lord Dor- mer. The antiquities of the county are comparatively few. It is traversed by the three ancient roads known as Icknield Street, Akeman Street, and Watling Street ; it has remains, in some cases very slight, of the baronial castles of Lavendon and Whitchurch, of the abbeys of Missenden, Notley, and Burnham, and of the monastery of Mursley, and a number of interesting examples of early ecclesiastical architecture, the most important being the churches of Chetwode, Stewkley, and Willesdon.

Bucks is in the Norfolk circuit. The quarter-sessions are held at Aylesbury; the assizes used to be held alter- nately at that town and Buckingham, but are now held only at Aylesbury. The Reform Bill of 1832 reduced the number of members returned by Bucks to the House of Commons from fourteen to eleven. It now returns eight, three of whom represent the county and five the parlia- mentary boroughs. In 1871 the number of the county electors 1egistered was 7610. The result of the county elections is declared at Aylesbury. Bucks is governed by a lord-lieutenant and custos, 60 deputy-lieutenants, a high sheriff, and about 200 magistrates. It lies in the ecclesi- astical province of Canterbury, and for the most part in the diocese of Oxford, and in arch-deaconry of Bucking- ham, which comprises the deaneries of Amersham, Ayles- bury, Bletchley, Buckingham, Burnham, Claydon, Ivinghoe, Mursley, Newport, Waddesdon, Wendover, and Wycombe, in all about 180 benefices. ‘The total income of endowed charities in the county was ascertained in 1863-4 to be £16,308, of which £3305 go to education and £3034 for maintenance of alms-houses. There were 11,315 paupers in 1871, of whom 441 were lunatics or idiots, and the previous year the poor rates amounted to £94,577.

The population in 1851 was 163,554, of whom 80,990 were males and 82,564 females. In 1871 it had increased

‘to 175,879, the males being 86,059 and the females 89,820.

The increase since 1801 was 63 per cent. The parlia- mentary boroughs (the first of which returns two members and the others one each) are Aylesbury, with 28,760 inhabitants ; Buckingham, 7545; Chipping Wycombe, 10,492; Great Marlowe, part of which is in Berkshire, 6627. The towns of more than 2000 inhabitants, not corporate towns, nor included in any parliamentary borough, are Amersham, with a population of 2726 ; Chesham, with 6488 ; Newport-Pagnell, with 3824. The number of in- habited houses in the county in 1871 was 37,257 ; unin- habited, 1667 ; building, 184.

BuckincuaM, the chief town of Buckinghamshire, a parliamentary and municipal borough and market-town in the hundred of the same name, 58 miles by a branch of the North-Western Railway from London, is situated on the left bank of the River Ouse, which surrounds it on every side but the north and is crossed by three bridges. The town consists principally of one long street, straggling over a considerable extent of surface. The houses, which are chiefly of brick, are neat and clean, though somewhat humble in character. The only public buildings of im- portance are the town-hall, a brick structure dating from the end of the 18th century, and the church, dedicated to St Peter and St Paul, which is built of freestone on the

site of the old castle, has a handsome spire, 150 feet high, and has been restored and extended under the direction of Sir G. G. Scott, who was born in the neighbourhood. There are also a jail, a union workhouse, and several dissenting churches. An endowed free school for boys, who were clad in green coats by the will of the founder, Gabriel Newton, is now incorporated with the national school, which is intended to accommodate 300 pupils. The grammar-school of the town was founded by Edward VI., and occupies the chapel of the guild of the Holy Trinity, founded by Arch- deacon Stratton in 1268. The manufactures, which include bone-grinding, malt-making, and tanning, are of compara- tively small importance. Lace-making with

bobbins still occupies a small part of the female population. There are also some corn-mills in the neighbourhood, and a few lime quarries. The borough of Buckingham formerly returned two members to Parliament, but since 1868 it has only returned one. It is governed by a mayor, four alderinen, and twelve councillors. Population of parliamentary borough in 1871, 7545; of municipal borough, 3703. Buckingham is a town of great antiquity. It was fortified with earthen ramparts by Edward the Elder in 918, and in 1010 it was captured by the Danes. It is mentioned as an ancient borough in Domesday Book, but does not seem to have returned members to Parliament till the reigu of Henry VIII. In the reign of Edward III it was a wool. staple, but not long after its prosperity began to decline. From Queen Mary it received a charter in 1554. It was the headquarters of Charles I. for a few days during his war with the Parliament. In 1725 a third part of the town was burnt to the ground.

BUCKINGHAM, Georce Vituiers, Duke or (1592- 1628), born August 20, 1592, was a younger son ef Sir George Villiers of Brooksby. His mother, who was left a widow early, educated him for a courtier's life, and the lad, being by nature little studious and contemplative, took kindly to the training. He could dance well, fence well, and talk a little French, when in August 1614 he was brought before the king's notice, in the hope that he would take a fancy to him.

The moment was favourable. Since Salisbury's death James had taken the business of government upon himself. But he wanted some one who would chat with him, and amuse him, and would also fill the office of private secretary, and save him from the trouble of saying No to importunate suitors. It would be an additional satisfaction if he could train the youth whom he might select in those arts of states- manship of which he believed himself to be a perfect master. His first choice had not proved a happy one. Robert Carr, who had lately become earl of Somerset, had had his head tumed by his elevation. He had grown peevish toward his master, and had placed himself at the head of the party which was working for a close alliance with Spain.

The appearance of Villiers, beaming with animal spirits and good humour, was therefore welcomed by all who had an interest in opposing the designs

of Spain. With such powerful backing Villiers prospered at court, became a gentleman of the bed-chamber, was knighted, and received a pension of £1000 a year. For some little time, however, Somerset's pre-eminence was maintained. But the charge of murder brought against him completed his ruin, and Villiers at once stepped into the place which he had vacated. In August 1616 he was raised to the peerage as Viscount Villiers. In January 1617 he became earl of Buckingham. In January 1618 he was a marquis by the same title. Estates to the value of some £15,000 a year were settled on him. With the exception of the earl of Pembroke he was the richest nobleman in England.

Those who expected him to give his support to the anti- Spanish party were at first doomed to disappointment. As

yet he was no politician, and he contented himself with carrying out his master's orders, whatever they were. In his personal relations he was kindly and jovial towards all who did not thwart his wishes. But James had taught him to consider that the patronage of England was in his hands, and he took good care that no man should receive promotion of any kind who did not in one way or another }ay court tohim. As far as can be ascertained, he cared less for money than for the gratification of his vanity. But he had not merely himself to consider. His numerous kinsfolk were to be enriched by marriage, if in no other way, and Bacou, the great philosopher and statesman, was all but thrust from office, because he had opposed a marriage suggested for one of Buckinghain's brothers, whilst Cran- field, the first financier of the day, was kept from the Treasury till he would forsake the woman whom he loved, to marry a penniless cousin of the favourite.

In the meanwhile Buckingham had found an appropriate position in the mastership of the horse, which gave him control over the royal stables. In January 1619 James made him lord high admiral of England, hoping that the ardent, energetic youth would impart something of his own fire to those who were intrusted with the oversight of that fleet which had been almost ruined by the peculation and carelessness of the officials. Something of this, no doubt, was realized under Buckingham's eye. But he himself never

pretended to the virtues of an administrator, and he was too ready to fill up appointments with men who flattered him, and too reluctant to dismiss them, if they served their couutry ill, to effect any permanent change for the better.

It was about this time that he first took an indepen- dent part in politics. All England was talking of the revo- lution in Bohemia in the year before, and men's sympathy with the Continental Protestants was increased when it was known that James's son-in-law had accepted the crown of Bohemia, and that in the summer of 1620 a Spanish force was preparing to invade the Palatinate. Buckingham at first had thrown himself into the popular movement. Be- fore the summer of 1620 was at end he had swung round, and was in close agreement with Gondomar, the Spanish ambassador. He had now married Lady Catherine Manners, the daughter of the earl of Rutland, who was at heart a Roman Catholic, though she outwardly conformed to the English Church, and this alliance may have had something to do with the change.

Buckingham's mistakes were owing mainly to his levity. If he passed briskly from one camp to the other, an impar- tial observer might usually detect some personal motive at the bottom. But it is hardly probable that he was him- self conscious of anything of the sort. When he was in reality acting under the influence of vanity or passion it was easy for him to persuade himself that he was doing his duty to his country.

The Parliament which met in 1621 broke out into a loud outcry against the system of monopolies, from which Buck- ingham's brothers and dependants had drawn a profit, which was believed to be greater than it really was. At first he pleaded for a dissolution. But he was persuaded that it would be a wiser course to offer to put himself at the head of the movement, and when he came forward to say that he would rather sacrifice his brother than countenance wrong doing, he only gave utterance to those sentiments of patriotism which he really felt, when patriotism did not call upon him to sacrifice his own wishes. When, at a later period of the session, Bacon's case was brought forward, he made no attempt to meet the attack directly, but he did his best to shield the falling chancellor from the extreme penalties demanded by his adversaries. It was not long before he showed on

how shallow a basis impulsive gener- osity rests. Bacon clung, after his fall, to the possession ot

York House, the home of his childhood. Buckingham desired to purchase it, and he stood in the way of the king's favour to the great philosopher till he had consented to sell him the house.

In the winter of 1621, and the succeeding year, Bucking- ham was entirely in Gondomar's hands; and it was only with some difficulty that in May 1622 Laud argued him out of a resolution to declare himself a Roman Catholic. In December 1621 he actively supported the dissolution of Parliament, and there can be little doubt that when the Spanish ambassador left England the following May, he had come to an understanding with Buckingham that the Prince of Wales should visit Madrid the next year, on which occasion the Spanish Court hoped to effect his conversion to the Roman Catholic Church before giving him the hand of the Infanta Maria. By this time Buckingham had gained over Charles an influence which he never lost; and when he carried him in February 1623 to Madrid it was with the hope of effecting a great political object. The Palatinate had gradually fallen into the possession of Spain and of the Catholic League, and the two young men fondly expected that the grave statesmen of the Spanish monarchy would break with their co-religionists in Germany in order to present the Palatinate as a marriage gift to Charles.

It was not long before it became plain to Buckingham that the Palatinate was not to be gained at Madrid. From that time he urged the prince to return. Charles was not to be persuaded so soon to relinquish the hope of carrying his bride home with him to England. But at last his eyes were opened, and when the two young men sailed together from Santander in September, it was with the final resolu- tion to break entirely with Spain.

James had gratified his favourite in his absence by raising him to the highest title known in the English peerage. But the splendour which gathered round the new duke was owing to another source than James's

favour. He had put himself at the head of the popular movement against Spain, and when James, acknowledging sorely against his will that the Palatinate could only be recovered by force, summoned the Parliament which met in February 1624, Buckingham, with the help of the heir apparent, took up an independent political position. James was half driven, half persuaded to declare all negotiations with Spain at an end. For the moment Buckingham was the most popular man in England.

It was easier to overthrow one policy than to construct another. The Commons would have been content with sending some assistance to the Dutch, and with entering upon a privateering war with Spain. James, whose object was to regain the Palatinate, believed this could only be accomplished by a Continental alliance, in which France took part. As soon as Parliament was prorogued, negotia- tions were opened for a marriage between Charles and the sister of Lewis XIIJ., Henrietta Maria. But a difficulty arose. James and Charles had engaged to the Commons that there should be no concessions to the English Catholics, and Lewis would not hear of the marriage unless very large concessions were made. Buckingham, impatient to begin the war as soon as possible, persuaded Charles, and the two together persuaded James to throw over the promises to the Commons, and to accept the French terms. It was no longer possible to summon Parliament to vote supplies for the war till the marriage had been completed, when remonstrances to its conditions would be useless.

Buckingham, for Buckingham was now virtually the ruler of England, had thus to commence war without money. He prepared to throw 12,000 Englishmen, under a German adventurer, Count Mansfeld, through France into the Pala- tinate. The French insisted that he should march through Holland. It mattered little which way he took. Without

provisions, and without money to buy them, the wretched troops sickened and died in the winter frosts. Buckingham’s first military enterprise ended in disastrous failure,

Buckingham had many other schemes in his teeming brain. He had offered to send aid to Christian IV., king of Denmark, who was proposing to make

war in Germany, and had also a plan for sending an English fleet to attack Genoa the ally of Spain, and a plan for sending an English fleet to attack Spain itself.

Before these schemes could be carried into operation James died on March 27, 1625. The new king and Buckingham were at one in their aims and objects. Both were anxious to distinguish themselves by the chastisement of Spain, and the recovery of the Palatinate. Both were young and inexperienced. But Charles, obstinate when his mind was made up, was sluggish in action and without fertility in ideas, and he had long submitted his mind to the versatile and brilliant favourite, who was never at a loss what to do next, and who unrolled before his eyes visions of endless possibilities in the future. Buckingham was sent over to Paris to urge upon the French Court the importance of con- verting its alliance into active co-operation.

There was a difficulty in the way. The Huguenots of Rochelle were in rebellion, and James had promised the aid of English ships to suppress that rebellion. Bucking- ham, who seems at first to have consented to the scheme, was anxious to mediate peace between the king of France and his subjects, which would set him free from foreign enterprises, and save Charles from compromising himself with his Parliament by the appearance of English ships in an attack upon Protestants. When he returned his main de- mands were refused, but hopes were given him that pcace would be made with the Huguenots. On his way through France he had the insolence to make love to the Queen of France. Unless the testimony of his warmest admirers is false, he had convinced himself by a sad experience that women found it difficult to resist his seductive tongue and his handsome face.

Soon after his return Parliament was opened. It would have been hard for Charles to pass through the session with credit. Under Buckingham's guidance he had entered into engagements involving an enormous expenditure, and these engagements involved a war on the Continent, which had never been popular in the House of Commons. The Com- mons, too, suspected the marriage treaty contained engage- ments of which they disapproved. They asked for the full execution of the laws against the Catholics, and voted but little money in return. Charles adjourned then to

Oxford, that he might plead with them more persuasively. Before they met there, the English ships had found their way into the hands of the French, to be used against Rochelle, The Commons met in an ill-humour. They had no confidence in Buckingham, and they asked that persons whom they could trust should be admitted to the king's council before they would vote a penny. Charles stood by his minister, and on August 12 he dissolved his first Parliament.

Buckingham and his master set themselves to work to conquer public opinion. On the one hand, they threw over their engagements to France on behalf of the English Catholics. On the other hand they sent out a large fleet to attack Cadiz, and to seize the Spanish treasure-ships. Buckingham went to the Hague to raise an immediate supply by pawning the crown jewels, to place England at the head of a great Protestant alliance, and to enter into fresh obligations to furnish money to the king of Denmark. It all ended in failure. The fleet returned from Cadiz, having effected nothing. The crown jewels produced but a small sum, and the money for the king of Denmark could only be raised by an appcal to Parliament. In the mean- while the king of France was deeply offended by the treat-

ment of the Catholics, and by the seizure of French vessels on the ground that they were cngaged in carrying goods for Spain.

When Charles's second Parliament met on February 6, 1626, it was not long before, nnder Eliot's guidance, it asked for Buckingham's punishment. He was impeached before the House of Lords ona long string of charges, Many of these charges were exaggerated, and some were untrue. But as long as Charles refused to listen to the complaints of his minister's incompetency, the only way in which the Commons could reach him was by bringing criminal charges against him. Charles dissolved his second Parliament as he had dissolved his first.

To find money was the great difficulty. Recourse was had to a forced loan, and men were thrown into prison for refusing to pay it. There had been disasters to Charles's allies in Germany, and a French war was impending in addition to the Spanish one. The French were roused to reprisals by

Charles’s persistence in seizing French vessels. Unwilling to leave Rochelle open to the entrance of an English fleet, Richelieu laid siege to that stronghold of the French Huguenots. On June 27, 1627, Buckingham sailed from Portsmouth at the head of a numerous fleet, and a considerable land force, to relieve the besieged city.

His first enterprise was the siege of the fort of St Martin’s, on the Isle of Rhé, The ground was hard, and the siege operations were converted into a blockade. On September 27, the defenders of the fort announced their readiness to surrender the next morning. In the night a fresh gale brought over a flotilla of French provision boats, which dashed through the English blockading squadron. The fort was provisioned for two months more. Buckingham re- solved to struggle on, and sent for reinforcements from England, Charles would gladly have answered to his call. But England had long since ceased to care for the war. There was no money in the exchequer, no enthusiasm in the nation to supply the want. Before the reinforcements could arrive the French had thrown a superior force upon the islaud, and Buckingham was driven to retreat with heavy loss.

His spirits were as buoyant as ever. III luck, or the misconduct of others, was the cause of his failure. He had new plans for carrying on the war. But the Parliament which met on March 17, 1628, was resolved to exact from the king an obligation to refrain from encroaching for the future on the liberties of his subjects.

In the parliameutary battle, which ended in the conces- sion of the Petition of Right, Buckingham took an active share as a membcr of the House of Lords. He resisted as long as it was possible to resist the demand of the Com- mons, that the king should abandon his claim to imprison without showing cause. When the first unsatisfactory answer to the petition was made by the king on Juue 2, the Commons suspected, probably with truth, that it had been dictated by Buckingham. They prepared a remon- strance on the state of the nation, and Coke at last named the duke as the cause of all the misfortunes that had occurred, Though on June 7 the king granted a satisfac- tory answer to the petition, the Commons proceeded with their remonstrance, and on June 11 they informed the king that Buckingham had “ so abused his powers,” that it was no longer safe to continue him in office.

Once more Charles refused to surrender Buckingham, and a few days later he prorogued Parliament in anger. The popular feeling was greatly excited. Lampoons circu- lated freely from hand to hand, and Dr Lambe, a quack doctor, who dabbled in astrology, and was believed to exer- cise influence over Buckingham, was murdered in the streets of London. Rude doggerel lines announced that the duke should share the doctor's fate.

With the clouds gathering ronnd him, Buckingham went down to Portsmouth to take the command of one final ex- pedition for the relief of Rochelle. For the first time even he was beginning to acknowledge that he had undertaken a task beyond his powers. There was a force of inertia in the officials which resisted his cfforts to spur them on to an enterprise which they believed to be doomed to failure. He entered gladly into a scheme of pacification proposed by the Venetian ambassador. But before he could know whether there was to be peace or war, the knife of an assassin put an end to his career. John Felton, who had served at Rhé, had been disappointed of promotion, and had not been paid that which was due to him for hig ser- vices, read the declaration of the Comimons that Bucking- ham was a public enemy, and eagerly caught at the excuse for revenging his private wrongs under cover of those of his country. Waiting, on the morning of August 23, beside the door of the room in which Buckingham was breakfasting, he stabbed him to the heart as he came ont. The man who for four years had been practically the ruler of England fell dead upon the ground. He had only com- pleted his thirty-sixth year three days before. (s. R. @.)

BUCKINGHAM, Gerorce ViILuiErs, Seconp DuxKs oF (1627-1688), was born at London January 30, 1627, about a year and a half before the murder of his father. He was educated at Cambridge, returned from a Continental tour on the outbreak'of the civil war, and at once threw in his lot with the king. The detachment in which he held a command was defeated at Nonsuch, and he with difficulty effected an cscape from England. His estates were con- fiscated by Parliament, and part of them were bestowed upon Fairfax. He returned with Charles II. and took part in the battle of Worcester, after which he again fled. About 1657 he returned secretly to

England and married one of Fairfax’s daughters. Arrested by order of Cromwell, he was thrown into the Tower and kept in confincment for some time. After the Restoration he recovered his estates, and rose to high favour with Charles IJ. He was a mau of great talent, but utterly without principle, versatile and whimsical to the last degree.

«¢ A man so various that he seemed to be Not one, but all mankind’s epitome.”

He was a profligate aud a statesman, a musician, au alchemist, a writer of farces, and a courtier,—“ everything by starts, and nothing long.” He was radically fickle, and could not be faithful to any party. In 1671 his power was at its height. He had done much to bring about the dismissal of Clarendon, had formed the famous council called the Cabal, and was in fact prime minister of England. But the measures he and his associates passed were little calculated to allay the strong popular feeling against the Government. The Cabal was quickly dissolved, and Buckingham, with his usual versatility, at once became an ardent friend of the democratic leaders. Soon afterwards he seems to have been disgusted with politics, and gradually withdrew from court. After the death of Charles he retired to his seat at Helmsley in Yorkshire, and devoted himself to hunting and other country amusements. He died on the 17th April 1688, in the house of one of his tenants, having been seized with a fever produced by sitting ou the damp ground after being heated with riding. He was buried in Westminster Abbey. Buckingham was the author of some farces, comedies, and miscellaneous poems, but he is chiefly remembered in English literature by the Rehearsal, a clever parody upon Dryden and other stilted tragedians. His works were collected in 1704.

BUCKINGHAMSHIRE, Joun SHerrretp, DuKE oF (1649-1721), was the son of Edmund, second earl of Mulgrave, and succeeded to that title on his father’s death in 1658. At the age of seventeen he joined the fleet in

the war against the Dutch, but was not in any engagement. In 1672, however, on the renewal of hostilities, he distin- guished himself by his bravery, and was appointed to the command of a ship. He afterwards served

with the land forces, and for a short time joined Turenne, in order to study the art of war. On the accession of James he received a seat in the privy council, and was made lord- chamberlain. He was not among the lords who invited over the Prince of Orange, but he acquiesced in the Revolu- tion, and was ultimately received into the cabinet council of William. In 1694 he was made marquis of Normanby. In 1702, on the accession of Anne, with whom he was a personal favourite, he became lord privy seal and lord-lieutenant of the North Riding of Yorkshire. In the following year he was made duke of Normandy, and duke of Buckinghamshire. Under the administration of Marl- borough and Godolphin, he threw in his lot with the high Tory party, and in 1705 was deprived of the seal. Two years later he was dismissed from the privy council. In 1710, when the Tories recovered power, Buckingham became lord steward; and in 1711 he was raised to the dignity of lord president. After the death of Anne he held no stateappointment. He died 24th February 1721. His works consist of two tragedies, a few small poems of little value, and of the rhymed ZHssay on Poetru. His Essay on Satire is said to have been revised by Dryden, and is sometimes printed among the latter's works. The Hssay on Poetry was highly praised by Addison, Pope, and other critics of the time, but the praise must have been due to the rank and not to the abilities of the poet. His works were published in 1723.

BUCKLAND, Tue Very Rev. Wiii1am (1784-1856), the eldest son of the Rev. Charles Buckland, rector of Templeton and Trusham, in the county of Devon, was born at Axminster in Devonshire, 12th March 1784. He was educated at the ancient Grammar School of Tiverton, and at Winchester, and in 1801 was elected by examination a scholar of Corpus Christi College, Oxford. In 1805 he proceeded to the degree of B.A., and in 1808 he was elected a fellow of his college. From early boyhood he had exhibited a strong taste for natural science; his innate bias was at this time stimulated by the lectures of Dr Kidd on mineralogy and chemistry, and his attention was thus more especially drawn to the then infant science of geology. He now devoted himself systematically to an examination of the geological structure of Great Britain, making many excursions on horseback, and investigating both the order of superposition of the strata and the characters of the organic remains which they contained. In 1813, on the resignation of Dr Kidd, he was 'appointed reader in mineralogy in Oxford; and the interest

excited by his lectures was so great that in 1819 a readership in geology was founded and especially endowed by the Treasury, Dr Buckland being the first holder of the new appointment. In 1818 Dr Buckland was elected a fellow of the Royal Society, and in 1824 he was chosen president of the Geological Society of London, of which he had long been a fellow. In 1825 he resigned his fellowship at Corpus, and was presented by his college to the living of Stoke Charity, near Whitchurch, Hants, and in the same year he was appointed by Lord Liverpool to a canonry of the cathedral of Christ Church, Oxford. In the same year, aiso, he married Mary, the eldest daughter of Mr Benjamin Morland of Sheepstead House, near Abingdon, Berks, by whose high intellectual abilities and excellent judgment he was materially assisted in his literary labours. During the succeeding twenty years he laboured diligently in various departments of his favourite science, visiting many interesting localities, both at home and abroad, accumulating extensive collections, and communicating numerous memoirs

to learned societies. In 1845 he was apppointed by Sir Robert Peel to the vacant deanery of Westminster, and was soon after inducted to the living of Islip, near Oxford, a preferment attached to the deanery. In 1849 his health began to give way under the increasing pressure of his multifarious duties; and the latter years of his life were overshadowed by a long and serious illness, arising from disease of the base of the skull, which compelled him to live in retirement, to the deep regret of a wide circle of friends and acquaintances. He died 24th August 1856, at the advanced age of seventy-three, and he was buried in | a spot which he had himself chosen in Islip churchyard. Dr Buckland was a man many-sided in his abilities, and of a singularly wide range of attainments. Apart from his published works and memoirs in connection with the special department of geology, he accomplished in other directions much that entitles him to remembrance. Few men, indeed, ever more laboriously and consistently devoted a long life to the advancement of the cause of truth and to the benefit of their fellow-men. In addition to the work entailed upon him by the positions which he at different times held in the Church of England, he entered with

great enthusiasm into | many practical questions connected with agricultural and | sanitary science, and various social and even medical ‘ problems. As a teacher he possessed powers of the highest order ; and the university of Oxford is enriched by the large > and valuable private collections, illustrative of geology and mineralogy, which he aiassed in the course of his active lite,and which are now known as the “‘ Buckland Museum.” it is, however, upon his published scientific works that Dr Buckland’s great reputation is mainly based. His first great work was the well known Relzguice Diluviane, or Observations on the Organic Remains attesting the Action of a Universal Deluge, published in 1823, in which he supplemented his former observations on the remains of extinct animals discovered in the cavern of Kirkdale in Yorkshire, and expounded his views as to the bearing of these and similar cases on the Biblical account of the | Deluge. Thirteen years after the publication of the Reliquic, Dr Buckland was called upon, in accordance with the will of the earl cf Bridgewater, to write one of that remarkabie series of works, known as the Bridgewater Treatises. The design of these treatises was to exhibit the “‘ power, wisdom, and goodness of God, as manifested in the creation,” and none of them was of greater value, as evinced by its vitality, than that on geology and mineralogy. Originally published in 1836, it has gone through four editions, and though not a ‘“‘manual” of geological science, it still possesses a high value as a rich storehouse of geological and paleontological facts bearing upon the particular argument which it was designed to illustrate.

Of Dr Buckland’s numerous >riginal contributions to the sciences of Geology and Paleontology, the following may be mentioned as being the most important:—1. ‘‘On the Structure of the Alps and adjoimmg parts of the Continent, and their relation to the Second- ary and Transition Rocks of England ” (Annats of Phil. 1821); 2. ‘Account of an Assemblage of Fossil Teeth and Bones of Elephant, Rhinoceros, Hippopotamus, Bear, Tiger, and Hyena, and Sixtcen other Animals, discovered in a Cave at Kirkdale in Yorkshire” (Pail. _ Trans); 3. ‘*On a Series of Specimens from the Plastic Clay near Reading, Berks, with observations on the Formation to which these Beds belong” (Z’rans. Geol. Soc. Lond); 4. ‘On the Megalosaurus or Great Fossil Lizard of Stonesfield” (2b7d) ; 5. ‘*On the Cycade- cides, a Family of Plants found in the Oolite Quarries of the Isle of Portland ” (Jbid); 6. ‘‘ On the Discovery of a New Species of Ptero- dactyle in the Lias

of Lyme Regis” (bid); 7. ‘‘ On the Discovery of Coprolites or Fossil Feces in the Lias of Lyme Regis, and in other Formations” (Ibid); 8. “On the Evidences of Glaciers in Scotland and the North of England ” (Proc. Geol. Soc. Lond); 9. ‘* On the South- Western Coal District of England (joint ce with Mr Conybeare, Trans. Geol. Soc. Lond); 10. ‘On the Geology of the eighbour- hood of Weymouth, and the adjacent parts of the Coast of Dorset” (joint paper with Sir H. de La Beche, Trans. Geol. Soc. Lond.)

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BUCKLE, Henry Tromas (1821-1862), the son of Thomas Henry Buckle, a wealthy London merchant, and his wife, Jane Middleton, was born at Lee, in Kent, Noy- ember 24, 1821. He was a feeble and delicate child, who took no pleasure in the society and amusements of other children, but who loved to sit for hours hearing his mother read the Bible, and whose own love of reading was called forth by a present from her of the Arabian Nights. In his mother he found unfailing mental sympathy and stimulus, and her share in the education of his mind and the forma- tion of hischaracter was very great. Although she was of a naturally strong religious temperament, a painful personal experience had given her a horror of imposed doctrines, and, according to the testimony of Miss Shirreff, she refrained from teaching dogmatically even such views as were full of hope and consolation to herself. To her Buckle seems specially to have owed his faith in progress through the triumph of truth, his taste for speculation, and his love of poetry, In common with his father he had a keen interest in politics, a very retentive memory, and a fondness for reciting Shakespeare. Even as a child he showed conversational power, and the only game he cared for was playing at “parson and clerk,” with a cousin of about his own age, he himself taking the part of preacher. Owing to his delicate health he was only a very short time at school, and never at college, but the love of reading having been early awakened in him, he was allowed ample means of gratifying it. In every fair estimate of his character due weight must be given to the fact that he was a self-educated man, although one placed in exceptionally favourable circumstances, and that while he had in a large measure the merits which flow from self-education he could not altogether

escape the defects which naturally accompany them. He gained his first distinctions not in literature but in chess, being reputed, before he was twenty, one of the first players in the world. His father died in January 1840, and in July of that year his mother, his unmarried sister, and himself left England and travelled in France, Italy, and Germany for a year, during which time, as also after his return home, he studied diligently modern languages. From the spring of 1843 to that of 1844 was likewise spent on the Continent. He had by that time formed the resolution to direct all his reading and to devote all his energies to the preparation of some great historical work, and during the next seventeen years, with rare self- denial, he bestowed ten hours each day in working out his purpose. At first he contemplated a history of the Middle Ages, but by 1851 he had decided in favour of a history of civilization, The six years which followed were occupied in writing and rewriting, altering and revising the first volume, which appeared in June 1857. It at once made its author a literary and even social celebrity,—the lion of a London season. On 19th March 1858 he delivered at the Royal Institution a lecture on the Influence of Women on the Progress of Knowledge, which was published in Fraser's Magazne for April 1858, whence it has been reprinted in the first volume of the JMfiscellaneous and Posthumous Works. The professed aim of this his first and _ only lecture in public was to prove that women naturally prefer the deductive mcthod to the inductive, and that by encouraging in men deductive habits of thought, they have rendered an immense, though unconscious, service to the pro- gress of knowledge, by preventing men of science from being as exclusively inductive as they would otherwise be ; but the facts and reasons adduced in support of these proposi- tions were few and indecisive, the discourse being in the main simply an eloquent general pleading for the combina- tion of deduction and induction in scientific investigation. On Ist April 1859, a crushing and desolating afflicticn fell upon him in the death of his mother. It was under the

immediate impression of his loss that he concluded a review he was writing of Mr J. 8. Mill's Hssay on Liberty with an argument for immortality, based on the yearning of the affections to regain communion with the beloved dead,—on the impossibility of standing up and living, if we believed the

separation were final. The argument is a strange one to have been used by a man who had maintained so strongly that ‘““we have the testimony of all history to prove the extreme fallibility of consciousness,” The review appeared in F’raser’s Magazine, May 1859, and is now to be found also in the Aftscellaneous and Posthumous Works. The second volume of his history was published in May 1861, Soon after he left England for the East, in order to recruit his spirits and restore his health. From the end of October 1861 to the beginning of March 1862 was spent by him in Egypt, from which he went over the desert of Sinai and of Edom to Syria, reaching Jerusalem on April 19, 1862. After staying there eleven days, he set out for Europe by Beyrout, but at Nazareth he was attacked by fever; and, endeavouring to shake it off and struggle onwards, when rest was what he required, he fell a victim to it at Damascus on May 29, 1862, aged forty. The marble altar-tomb over his grave has inscribed on it an ancient Arabic couplet which signifies,—

‘The written word remains long after the writer ; The writer is resting under the earth, but his works endure.”

The three volumes of Buckle’s Miscellaneous and Post- humous Works, edited by Miss Helen Taylor, and published in 1872, contain the lecture delivered at the Royal In- stitution, and the review of Mill’s Liberty, which have been already mentioned, “A Letter to a Gentleman on Pooley’s Case,” “Fragments,’—of which the portions relat- ing to Queen Elizabeth appeared in Mraser’s Magazine about five years after the author’s death,—and ‘“‘ Common- place Books,” composed of abstracts of works read, and collections of facts and ideas meant to be wrought into his magnum opus, or, at least, to assist him in comprehend- ing the history of civilization. The ‘ Common-place Books” fill the second and third volumes, and it may be reasonably questioned whether matter so unsifted and unformed as is the bulk of that of which they consist should ever have been published.

The fame of Buckle must rest wholly on his so-called Ihistory of Civilization in England. It is a gigantic unfinished introduction, of which the plan was, first, to state the general principles of the author’s method and the general laws which govern the course of human progress ; and secondly, to exemplify these principles and laws through the histories of certain

nations characterized by prominent and peculiar features,—Spain and Scotland, the United States and Germany. Its chief ideas are,—l, That, owing partly to the want of ability in historians, and partly to the complexity of social phenomena, extremely little has as yet been done towards discovering the principles which govern the character and destiny of nations, or, in other words, towards establishing a science of history ; 2. That, while the theological dogma of predestination is a barren hypothesis beyond the province of knowledge, and the metaphysical dogma of free will rests on an erroneous belief in the infallibility of consciousness, it is proved by science, and especially by statistics, that human actions are governed by laws as fixed and regular as those which rule in the physical world; 3. That climate, soil, food, and the aspects of nature, are the primary causes of intel- lectual progress,—the first three indirectly, through deter- mining the accumulation and distribution of wealth, and the last by directly influencing the accumulation and distribution of thought, the imagination being stimulated and the understanding subdued when the phenomena of

the external world are sublime and terrible, the under- standing being emboldened and the imagination curbed when they are small and feeble; 4. That the great division between European and non-European civilization turns on the fact that in Europe man is stronger than nature, and that elsewhere nature is stronger than man, the consequence of which is that in Europe alone has man subdued nature to ls service; 5. That the advance of European civiliza- tion is characterized by a continually diminishing influence of physical laws, and a continually increasing influence of mental laws; 6. That the mental laws which regulate the progress of society cannot be discovered by the metaphysical method, that is, by the introspective study of the indi- vidual mind, but only by such a comprehensive survey of facts as will enable us to eliminate disturbances, that is, by the method of averages; 7. That human progress has been due, not to moral agencies, which are stationary, and which balance one another in such a manner that their influence is unfelt over any long period, but to intellectual activity, which has been constantly varying and advanc- ing :—‘‘The actions of individuals are greatly affected by their moral feelings and passions; but these being antagon- istic, to the passions and feelings of other individuals,

are balanced by them, so that their effect is, in the great average of human affairs, nowhere to be seen, and the total actions of mankind, considered as a whole, are left to be regulated by the total knowledge of which mankind is pos- sessed ;” 8. That individual efforts are insignificant in the great mass of human affairs, and that great men, although they exist, and must “at present” be looked upon as dis- turbing forces, are merely the creatures of the age to which they belong; 9. That religion, literature, and government are, at the best, the products and not the causes of civiliza- tion; 10. That the progress of civilization varies directly as “scepticism,” the disposition to doubt and to investigate, aud inversely “as credulity” or “the protective spirit,” a disposition to maintain, without examination, established beliefs and practices.

These are all the general truths which are contained in Buckle’s theory of history. And obviously, however ably advocated, however solidly established they might be, they must fall short of constituting a science of history, unless that science be one of unparalleled simplicity and vagueness. But probably none of them are completely made out; probably none of them are quite true; while several of them seem to be nearly altogether false. Buckle either could not define, or cared not to define, the general conceptions with which he worked, such as those denoted by the terms “ civilization,” “history,” “science,” “law,” “ scepticism,” and “ protective spirit;” the consequence is that his arguments are often fallacies. Whenever he treats of matters metaphysical, psychological, or theo- logical, he shows plainly that his mind had been little exercised on such subjects. He assumes, without the slightest evidence, that law and free will, orderly historical development and providential government, the metaphysical method and the method of averages, obeying nature and ruling nature, are so many alternatives of which the terms contradict and exclude each other; it does not seem to have occurred to him that freedom and law, historical order and providential government, internal and external obser- vation, might co-exist, or that Bacon might have had reason in writing—“natura non nisi parendo vincitur.” The looseness of his statements and the rashness of his inferences regarding statistical averages make him, as a great authority has remarked, the enfant terrible of moral statisticians. He denies the influence of race without adequate consi- deration, and so exaggerates the power of

climate, soil, food, and the aspects of nature, as at times to be fairly chargeable with physical fatalism. He neglects to raise

the essential question, Must not certain moral conditions be realized before the accumulation and distribution of wealth are possible? In attempting to prove the unpro- gressiveness of moral knowledge he gives us such asser- tions as these :—“‘ That the system of morals propounded in the New Testament contained no maxim which had not been previously enunciated, and that some of the most beautiful passages in the Apostolic writings are quotations from Pagan authors is well known to every scholar.” “Systematic writers on morals reached their zenith in the 13th century, fell off rapidly after that period, were, as Coleridge well says, opposed by the ‘genius of Protestantism,’ and by the end of the 17th century became extinct in the most civilized couutries,”-—although the facts are, that the passages in the Apostolic writings known to be quota- tions from Pagan authors are just three in number, two of which have no claims to beauty, and that there have been more systematic writers on morals in the 19th century than there were writers of all kinds during the 13th. The reasoning employed to show that intellectual forces have been far more potent than moral forces in producing progress has many flaws, which have been often pointed out. What Buckle himself says of the achievements of Richelieu, Adam Smith, Voltaire, and others, and of the effects of the protective spirit in France and England, and of religious intolerance in Spain and Scotland, is irrecon- cilable with his doctrines that great men, government, and religion have had almost no influence on civilization. His paradox about scepticism and credulity is partly a truism inaccurately expressed and partly its exaggeration.

The larger part of Buckle’s first volume, and the whole of the second, are composed of surveys of positive his- tory, undertaken to prove the last of the general theses

already mentioned. The rest of these theses are ignored,

and some of them are even by implication contradicted, when he engages in actual historical work. Perhaps the historical work performed by him is none the worse on that account. The chief aim of the historical portion of

the first volume is to trace the working of the protective spirit in its political form, and to show its civil tendencies. Hance, the most civilized country in which that spirit is very powerful, is chosen as the field of illustration, and the history of the intellect and policy of France is laid before us In outline, and compared and contrasted with that of England, the development of which is held to have been comparatively spontaneous and normal. The first chapter of the second volume gives a general view of the history of the Spanish mind from the 5th to the middle of the 19th century, designed to show why the protective spirit has prevailed in Spain in a religious form, and how it has isolated the Spanish nation from the rest of the world, weakened and degraded it, and hitherto frustrated all efforts at improvement. The other four chapters are designed to explain what Mr Buckle supposes to be the largest and most important fact in the history of Scotland, —the combination in its people of liberality in politics with illiberality in religion. In order to accomplish the explanation it is found necessary to argue that the Scottish Reformation was the work of the nobles, animated by hostility to the Roman Catholic priesthood; that the Pro- testant clergy, owing to being despised by the governing class, united themselves with the people, advocated demo- cratic principles, and, favoured by the course. of events, acquired an immense authority, the result of which was the general prevalence of extreme religious bigotry ; that the Scotch philosophy of the 18th century, although a reaction against the theological spirit of the 17th, retained the theological method; and that, owing to its deductive character, that philosophy has been inaccessible to the average intellect of the nation, and powerless to free it

from the grasp of superstition. On the proof of these positions Buckle lavished labour, learning, and ingenuity, and, it will be generally admitted, attained some con- siderable results. But the results were by no meaus so great or certain as he himself imagined. Few competent judges will deny that, in regard alike to France and Scot- land, he overlooked influences which had been as powerful in shaping the characters of these nations as those on which he laid exclusive stress. No explanation of French history can be satisfactory which does not attach due weight to the series of events by which the unity of France was built up, and which only begins aftcr that

unity was com- pleted ; no explanation of Scottish history can be satis- factory which slurs over the wars with England. The French Revolution was, as Buckle represents it, a reaction against the protective spirit,—but it was a great deal more, and that he did not see; the Scottish Reformation was due in some measure to the antagonism between the nobility and priesthood, as he has amply shown, but he might easily have still more amply shown that it was very far from wholly due to it. To some extent the Scotch philosophy of the 18th century was a reaction against the theological spirit of the 17th, as he saw; but toa much greater cxtent it was a natural development of British and even European thought, which he should not have overlooked. ‘That either the Scottish philosophy or the Scottish intellect was essentially deductive he wholly failed to make out, and would never have tried to make out, had it not been that his views as to the difference between induction and deduction were strangely vague and confused. Hume was not as deductive as Hobbes, Adam Smith, at least as a political economist, was less deductive than Malthus and Ricardo. Black was less so than Dalton and Davy. To say that deduction is a prominent

characteristic of Hutcheson, Reid, or Dugald Stewart, is”

glaringly contrary to fact. If their writings show any particularly Scottish trait, it is Scottish caution manifest- ing itself in suspicion of deduction.

Buckle had a high ideal of the historian’s duties, and he laboriously endeavoured to realize it; but he fancied himself far more successful in the attempt than he really was, and greatly underrated what had been accomplished by others. He brought a vast amount of information from the most varied and distant sources to confirm his opinions, and the abundance of his materials never perplexed or burdened him in his argumentation, but examples of well- conducted historical inductions are rare in his pages. He sometimes altered and contorted the facts; he very often unduly simplified his problems ; he was very apt when he had proved a favourite opinion true to infer it to be the whole truth. His intellect was comprehensive aud vigorous, but neither classically cultured nor scientifically disciplined ; it was amazingly stored with facts, but not rich in ideas ; it was ambitious in aspiration, confident to excess in its own powers, and exceptionally unconscious of where its knowledge ceased and its ignorance began. It was

deficient in imagination, poetical feeling, and sympathy. Heuce Buckle was narrow and harsh in his judgments on certain great periods of time and large classes of men, on antiquity and the Middle Ages, on the clergy and statesmen, on heroes and martyrs. But he was fearlessly honest according to his lights, and gave expression to the ost distasteful of his opinions with a manly openness. He paid great attention to his style, and it has been pronounced, by an eminently competent judge, “equal to the subject, precise enough for the demands of science, full, flowiug, and flexible enough for every purpose of eloquence. Lucid when the business of the writer is to state, explain, or illustrate, it ascends, when anger at the oppressor or sympathy with the oppressed call upon it, to tones worthy

of Edmund Burke himsclf denouncing the corruptions of England or the wrongs of India.”

References.—Besides the works of Mr Buckle mentioned above, see In the Morningland, and especially Pilgrim-M: emories, by J.S. Stuart- Glennie; A. von Oettingen’s Morailstatistik, i. 155-172 ; J. G. Droy- sen’s Erhebung der Geschichte zwm Rang einer W wssenschaft, reprint- ed in his Grundriss der Historik from v. Syhbel’s Zeitschrift, ix. (1862); Laurent’s Philosophie de Uhistorie, 215-237 ; Bouillier’s Morale ct Progrés, 201-230; Etienne’s Positivisme en histoire (Rev. d. Deux Mondes, Mars 15™° 1868); Edinburgh Review, for April 1858, art. vil.; Prof. Masson in Maemillan’s Magazine for July, August, and September 1861; J. H. Burton, Phylax on Buckle ; J. Hutchison Stirling on ‘‘ Buckle, his Problem and his Metaphysics” in the North American Review, July 1872, and on “Mr Buckle and the Aufklarwng,” in the Journal of Speculative Philosophy, October 1875, &c. Ce, Fs)

BUCKWHEAT, the seeds of various species of Lago- pyrum, chiefly I. esculentum, a herbaceous plant, native of central Asia, but cultivated in Europe on account of its seeds. The seeds, as enclosed in their dark brown tough rind, are three-sided in form, with sharp angles, similar in shape to beech-mast, whence their name from the German Buchweizen, beechwheat. Buckwheat is grown in Great Britain only to supply food for pheasants and to feed poultry, which devour the seeds with avidity. In the northern

countries of Europe, however, the seeds are employed as human food, chiefly in the forin of cakes, which when baked thin have an agreeable taste, with a darkish somewhat violet colour. The meal of buckwheat is also baked into crumpets, as a favourite dainty among Dutch children, and in the Russian army buckwheat groats are served out as part of the soldiers' rations, which they cook with butter, tallow, or hemp-seed oil. Buckwheat is also used as food in the United States; and by the Hindus it is eaten on " bart" or fast days, being one of the phalahas or lawful foods for such occasions. When it is used as food for cattle the hard sharp angular rind must first be removed. As compared with the principal cereal grains, buckwheat is poor in nitrogenous substances and fat ; but the rapidity and ease with which it can be grown render it a fit crop for very poor badly tilled land. Ac- cording to Payen it contains—nitrogenous matter 13°10 per cent., starch 64°90, fat 3-00, water 13-00, cellulose and ash 6°00. An immense quantity of buckwheat honey is collected in Russia, bees showing a marked preference for the flowers of the plant. A dye-stuff is obtained from the leaves of a species of buckwheat, Polygonum tinctorium, which may be used for producing a yellow or olive colour on cotton, according to the mordant employed.

BUDA (German, Oren), a royal free town of the king- dom of Hungary, is situated in 47° 29' 10" N. lat. and 19° 2' 55" E. long., on the right bank of the Danube, opposite the capital Pesth, with which it has been united since 1849 by a suspension bridge of much beauty, 1227 feet long and 39 feet wide. The nucleus of the town is the " fortress," which occupies an oblong elevation of por- phyry rock, not unlike the Acropolis of Athens. It contains the royal palace, the mansions of Counts Sandor, Teleki, and Erdédy, the residence of the governor in command, the arsenal, and several buildings for official purposes. _ The palace includes the court church—where the regalia of Hungary are preserved, a picture gallery, and a library. Around this central portion there have grown up various suburbs, known respectively as the Wasserstadt, the Land- strasse, the Neustift, the Christinenstadt, and the Taban or Rascian town, the last of which derives its name from its Servian inhabitants, who are mainly vineyard owners. In the Wasserstadt are the church of St Anne and Elizabeth, and the military hospital ; in Christinenstadt, the Horvath gardens, with the summer theatre,

and the large mansion- house of Count Caracsonyi; and in Old Buda are the royal barracks, part of which was once the monastery of

Mariazell. There are in the town upwards of fifteen churches, as well as several convents, and a Jewish syna- gogue. The educational establishments include a gymna- sium of the highest class, an upper commercial school, five normal institutions, a school of design, a school of music, and about sixteen schools of lower grade. There is also an observatory inthe town. Buda has long been celebrated for its mineral baths, which are five in number. The Bruckbad and the Kaiserbad were both founded bythe Turks, and the buildings retain traces of Turkish occupation. The temperature of the wateris about 118° Fahr. The town is commanded by the eminences known as tle Spiessberg or Nap Hegy, and the Blocksberg or Gellert Hegy, the latter of which is crowned by a citadel. The industry of Buda com- prises the making of cannon, type-founding, silk-weaving, coach-building, and the manufacture of majolica, copper wares, and gunpowder. A somewhat active trade is carried ou in the red wine produced in the neighbouring vineyards, and Old Buda is the seat of a good deal of river traffic. The Danube Steam-Navigation Company have a consider- able establishment there, in which a number of their vessels are built. In 1869 the population of the commune was 53,988. Old Buda was known to the Romans for its mineral springs; but the modern town dates only from the Middle Ages. In 1247 King Bela built a castle, which was originally regarded as belonging to Pesth; but the town which gradually gathered round it soon acquired an independent importance. In 1526 it was captured by the Turks, and in their hands became a place of pilgrimage, as well as an important military post. In 1686 it was wrested from them by Charles of Lorraine. During the Hungarian wars of the present century it played a distinguished part. In January 1849 the fortress was seized by the Austrian general Windischgratz; but in May it was taken by storm by the Hungarians under Gérgey. On their departure the Russians took possession, but shortly afterwards handed the place over to the Austrian forces.

BUDAUS, or Bunt, Guittaume (1467-1540), de- scended of an ancient and illustrious family, was a native of Paris. At an early age he was sent to the

schools of Paris, and afterwards to the university of Orleans to study law. He passed his time, however, in idleness, and being heir to a large fortune, was left, on his return to Paris, to follow his passion for gaming and pleasure. It was ouly when the fire of youth began to cool that he was seized with an irresistible passion for study; and having disposed of his hunting equipage, he abandoned business of every descrip- tion, and applied himself wholly to literature. Without assistance, he made rapid progress, particularly in the Latin and Greek languages. The work which gained him greatest reputation was his treatise De Asse, the first edition of which was published at Paris in 1514, He was held in high esteem by Francis I., who was persuaded by him and by Da Bellay to found the Royal College of France, for teaching languages and sciences. He was sent by the king to Rome as ambassador to Leo X., and in 1522 was made master of requests. He died in Paris in 1540. Of

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UDDHISM is the name of a religion which formerly prevailed through a large part of India, and is now professed by the inhabitants of Ceylon, Siam, and Burma (the southern Buddhists), and of Nepal, Tibet, China, and Japan (the northern Buddhists)! It arose out of the philosophical and ethical teachings of Siddhartha Gautama,

1 The number of Buddhists is now probably about 450,000,000. Professor Max Miiller, Chips from a German Workshop, i. p. 214.

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his works, printed at Basel in 4 vols. folio in 1557, the most important is the Commentarti Grece Lingue, which first appeared in 1529,

BUDAUN, a district of British India, in the Rohilkhand division, under the jurisdiction of the Lieutenant-Governor of the North-Western Provinces, lies between 27° 38’and 28° 29’ N. lat., and 78° 21’ and 79° 35’ E. long., and is bounded on the N. by the British district of Moradabad, on the N.E. by the district of Bareilly, on the S.E. by that of Shahjahanpur, on the 8. by

Farukhabad and Main- puri, and on the west by Aligarh and Bulandshahr. The country is low, level, and is generally fertile, and watered by the Ganges, the Ramganga, the Sot or Yarwafddar, and the Mahawd. The area is 2004°84 square miles, of which 1376°94 square miles are under cultivation, 382°54 square miles cultivable but not actually under cultivation, and the rest uncultivable waste. The district population in 1872 amounted to 934,348 souls, residing in 193,589 houses, and inhabiting 2364 villages. Of the total popu- lation, 794,532 or 85:1 per cent. were Hindus, 139,687 or 14°9 per cent. Mahometans, 129 Christians and others of unspecified religion. Rice, wheat, sugar-cane, cotton, pulses, oil-seeds, and varieties of millet form the principal agricultural products of Budaun. The chief routes through the district are the roads from Farukhabad to Moradabad, from Agra to Bareilly, from Aligarh to Moradabad, and from Delhi to Bareilly. In 1870-71, the total revenue amounted to £130,424, of which £111,722 or 85 per cent. was derived from the land. In 1872-73 Budaun district contained 303 schools, attended by 4848 pupils. The following towns in the district have upwards of 5000 inhabitants :— Budaun, the administrative headquarters, — area, 335 acres, population 33,322; Islamnagar, popula- tion 5424; Ujhani, 7656; Sahaswan, 17,063; Bilsi, 5282 ; Al4pur, 5347. Budaun district was ceded to the British Government in 1801 by the Nawab of Oudh. During the mutiny of 1857, the people of Budaun sided with the rebels, and the European officer in charge of the district ouly saved his life by flight.

BUDDAUS, Joun Francis (1667-1729), a celebrated Lutheran divine, and one of the most learned men Ger- many has produced, was born at Anklam, a town of Pome- rania, where his father was minister. He studied with great distinction at Greifswald and at Wittenberg, and having attained to eminence in languages, theology, and history, was appointed Greek and Latin professor at Coburg, afterwards professor of ethical science and politics in the university of Halle, and at length, in 1705, professor of divinity at Jena, where, after having acquired a very great reputation, he died in 1729.

His principal works are,—A large historical German Dictionary, Leipsic, 1709, folio; Historia Ecclesiastica Veteris Testamentt, Halle, 1709, 4 vols. 4to; Hlementa Philosophie Practice, Instrumentalis, et Theoretic, 3 vols.

8vo, which has passed through a great number of editions ; Sclecta Juris Nature et Gentium, Halle, 1704, 8vo ; Miseel- lanea Sacra, Jena, 1727, 3 vols. 4to; and Jsagoge Historico- Theo-

logica ad Theolodiam Universam, singulasque ejus partes, 2 vols. 4to.

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the eldest son of Suddhédana, who was raja in Kapilavastu, and chief of the tribe of the Sakyas, an Aryan clan seated during the 5th century B.c. on the banks of the Kohana, about 100 miles N. of the city of Benares, and about 50 miles S. of the foot of the Himalaya Mountains.

We are accustomed to find the legendary and the miracu- lous gathering, like a halo, around the early history of religious leaders, until the sober truth runs the risk of being altogether neglected for the glittering and edifying false-

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hood. Buddha has not escaped the fate which has befallen the founders of other religions ; and as late as the year 1854 the late Professor Wilson of Oxford read a paper before the Royal Asiatic Society of London in which he maintained that the supposed life of Buddha was a myth, and “ Buddha himself merely an imaginary being.” No one, however, would now support this view; and it is admitted that, under the mass of miraculous tales which have been handed down regarding him, there is a basis of truth already sufficiently clear to render possible an intelligible history, which will become clearer and clearer as older and better authorities are made accessible,

The chief sources of our at present available information regarding the life of Buddha are—l, The Manual of Buddhism, published in 1860 by the Rev. R. Spence Hardy, compiled from various Sinhalese sources; 2, The transla- tion into English (published by Bishop Bigandet in Rangoon iu 1858 under the title Legend of the Burmese Buddha) of the translation into Burmese of a Pali work called by 3igandet Mallulingara-Wouttoo, of unknown author and date ; 3, The original Pali text of the Jataka commentary, written in

Ceylon in the 5th century a.D., edited in 1875 by Mr Fausbéll of Copenhagen (this is our best authority) ; 4, Mr Beal's recently published translation into English (under the title The Romantic Legend of Sakya Buddha) of a translation into Chinese, made in the 6th century a.D., of a Sanskrit work, called Abhinishkramana Sitra; 5, A Sanskrit work called the Lalita Vistara, undoubtedly very old, but of unknown author or date, the text of which has appeared in the Bibliotheca Indica in Calcutta, and a translation through the Tibetan into French by M. Foucaux in Paris (1848). The first three books represent the views of the southern Buddhists, whose sacred books are in Pali, and last the two those of the northern Bud- dhists, whose sacred books are in Sanskrit. The former are much the more reliable aud complete, the latter being inflated to a great length by absurd and miraculous legends, the kernel of fact at the centre of which agrees in the main with the account found in the former. These have their iniraculous incidents too, the relation of the Sanskrit sources to the Pali resembling in many respects that of the apocryphal gospels to the New Testament.

As there has been little or no intercommunication be- tween the two churches since the 3d century B.c., great reliance may reasonably be placed on those statements in which they agree; not indeed as a proof of the actual facts of the Buddha's biography, but as giving us the belief of the early Buddhists concerning it. It is to be regretted that the books we have to compare are, as yet, of so comparatively modern a date ; but, after the respective eanons had once been fixed, it is not likely that translators would deviate very materially from the text of the bio- graphies, so sacred to them, with which they had to deal. The southern canon—usually called the Tripitaka or three collections—was finally determined about 250 B.c., at the Council of Pataliputra on the Ganges, held under the auspices of the Emperor Asoka the Great; and the northern about the commencement of our era at the Council of Jalandhara, in Kashmir, held under Kanishka, a powerful Indo-Scythian monarch. To the former belongs the Bud- dhavansa, or History of the Buddhas, on which, together with its commentary, our three southern accounts are chiefly based ; to the latter belongs the Lalita Vistara, the last of the authorities mentioned above.

At the end of this article will be found a description of -those parts of the canon as yet published ; for what 1s 'known of the contents of the

unpublished parts the student is referred, for the northern, to B. H. Hodgson's Essays, pp. 17 et seg. and 36 e¢ seg.; to Csoma KG6rosi in the Asiatic Researches, vol. xx.; Burnouf, Intr., 34-68 ;

and Képpen, ii. 279; for the southern to Hardy's Zastern Monachism (1850), p. 166 et seg., and to M. Barthélemy St-Hilaire's papers in the Journal des Savants for Feb. and March 1866.

Parr l.—Tue Lire or Gautama Buppwa.

At the end of the 6th century p.c. the Aryan tribes from the Panjéb had long been settled on the banks of the Ganges; the pride of race had put an impassable barrier between them and the conquered aborigines ; the pride of birth had built up another between the chiefs or nobles and the mass of the Aryan people; and the super- stitious fears of all yielded to the priesthood an unques- tioned and profitable supremacy ; while the exigencies of occupation and the ties of family had further separated each class into smaller communities, until the whole nation had became gradually bound by an iron system of caste. The old child-like joy in life so manifest in the Vedas had died away ; the worship of nature had developed or degene- rated into the worship of new and less pure divinities ; and the Vedic songs themselves, whose freedom was little compatible with the spirit of the age, had faded into an obscurity which did not lessen their value to the priests. The country was politically split up into little principalities, each governed by some petty despot, whose interests were not often the same as.those of the community. A con- venient belief in the doctrine of the transmigration of souls satisfied the unfortunate that their woes were the natural result of their own deeds in a former birth, and though unavoidable now, might be escaped in a future state of existence by present liberality to the priests. While hoping for a better fate in their next birth, the oppressed people turned for succour and advice in this to the aid of astrology and witchcraft—a belief in which seems to underlie all religions, and is only just dying out among ourselves. The philosophy of the day no longer hoped for an immor- tality of the soul, but looked for a release from the misery which it found inseparable from life, in a complete extinction of individual existence. The inspiriting wars against the enemies of the Aryan people, the

infidel deniers of the Aryan gods, had given place to a succession of internecine feuds between the chiefs of neighbouring clans; and in literature an age of poets had long since made way for an age of commentators and grammarians, who thought that the old poems must have been the work of gods. But the darkest period was succeeded by the dawn of a reforma- tion; travelling logicians were willing to maintain theses against all the world ; whilst here and there ascetics strove to raise themselves above the gods, and hermits earnestly sought for some satisfactory solution of the mysteries of life. These were the teachers whom the people chiefly delighted to honour; and though the ranks of the priest- hood were for ever firmly closed against intruders, a man of lower caste, a Kshatriya or Vaisya, whose mind revolted against the orthodox creed, and whose heart was stirred by mingled zeal and ambition, might find through these irregu- Jar orders an entrance to the career of a religious teacher and reformer. hy.

The population was most thickly scattered within 156 miles of Benares, which was already celebrated as a seat of piety and learning ; and it was at Kapilavastu, a few days' journey north of Benares, that in the 5th century B.c.1 a raja Suddhddana ruled over a tribe who were called the

1 The date is somewhat uncertain. For the date of Buddha's death, which occured in his eightieth year, see below, p. 432. The title raja, now familiar to English ears, is used, since that of king would be misleading. The resemblances which may be found between the posi- tion of these rajas and those of the German and Italian dukes of the Middle Ages form not the only coincidence between the age of Luther and that of Buddha.

Sakyas, and who from their well-watered rice-fields could see the giant Himalayas looming up against the clear blue of the Indian sky. Their supplies of water were drawn from the River Rohini, the modern Kohana; and though the use of the river was in times of drought the cause of disputes between the Sakyas and the neighbouring Koliyans, the two clans were then at peace; and two daughters of the raja of Koli, which was only 11 miles east of Kapila- vastu, were the principal wives of Suddhddana. Both were

childless, and great was the rejoicing when, in about the forty-fifth year of her age, the elder sister, Mahamiaya, promised her husband a son. In due time she started with the intention of being confined at her pareut's home, but the party halting on the way under the shade of some lofty satin trees, in a pleasant garden called Lumbini on the river side, her son, the future Buddha, was there unexpectedly born. The marvellous stories which gathered round the belief in his voluntary incarnation and immacu- late conception, the miracles at his birth, the prophecies of the aged saint at his formal presentation to his father, and how nature altered her course to keep a shadow over his cradle, whilst the sages from afar came and worshipped him, will be referred to hereafter under the head of later Buddhism.

He was in after years more generally known by his family name of Gautama, but his individual name was Siddhartha. When he was nineteen years old he was married to his cousin Yasodhara, daughter of the Koliyan raja, and gave himself up to a life of Oriental luxury and delight. Soon after this, according to the southern account, his relations formally complained to. the raja that his son lived entirely for pleasure without learning anything, and asked what they should do under such a leader if war arose. Gautama, hearing of this, is said to have appointed a day for a trial of his prowess, and by defeating all his competitors in manly exercises, and surpassing even his teachers in knowledge, to have won back the good opinion of the disaffected Sakyas. This is the solitary record of his youth; we hear nothing more till, in his twenty-ninth year, it is related that, driving to his pleasure-grounds one day, he was struck by the sight of a man utterly broken down by age, on another occasion by the sight of a man suffering from a loathsome disease, and some months after by the horrible sight of a decomposing corpse. Each time his charioteer, whose name was Channa, told him that such was the fate of all living beings. Soon after he saw an ascetic walking in a calm and dignified manner, and asking who that was, was told by his charioteer the character and aims of the ascetics. The different accounts of this vary so much as to cast great doubts on their accuracy.) It is, however, clear from what follows, that about this time the mind of the young Rajput must, from Some cause or other, have been deeply stirred. Many an earnest heart full of disappointment or enthusiasm has gone through a similar struggle, has learnt to look upon all earthly gains and hopes as worse than vanity, has envied the calm life of the cloister,

troubled by none of these things, and has longed for an opportunity of entire self. surrender to abstinence and meditation.

Subjectively, though not objectively, these visions may be supposed to have appeared to Gautama. After seeing the last of them, he is said to have spent the afternoon in his pleasure-grounds by the river side; and having bathed,

- They all agree in making the four visions phantoms, saying that it was an angel who appeared under these forms, and was visible only to Buddha and his charioteer, who was specially inspired to say what he did. Some make all four visions appear on the same day, others on different days, and there are other discrepancies. Compare Jataka, p. 59, with Bigandet, pp. 34, 35; Hardy, M. B., pp. 158-155; Beal, pp. 107-111, and 115—123,

to have entered his chariot in order to return home. Just then a messenger arrived with the news that his wife Yasodhara had given birth to a son, his only child. “This,” said Gautama quietly, “is a new and strong tie I shall have to break.” But the people of Kapilavastu were greatly delighted at the birth of the young heir, the raja’s only grandson. Gautama’s return becaine au ova- tion ; musicians preceded and followed his chariot, while shouts of joy and triumph fell on his ear. Among these sounds one especially attracted his attention. It was the voice of a young girl, his cousin, who sang a stanza, saying, “Happy the father, happy the mother, happy the wife of such a son and husband.” In the word “happy” lay a double meaning ; it meant also freed from the chains of existence, delivered, saved.2 Grateful to one who, at such a time, reminded him of his highest hopes, Gautama, to whom such things had no longer any value, took off his collar of pearls and sent it to‘her. She imagined this was the beginning of a courtship, and began to build day-dreams about becoming his principal wife, but he took no further notice of her and passed on. That evening the dancing-girls came to go through the Natch dances, then as now so common on festive occasions in many parts of India; but he paid them no attention, and gradually fell into an uneasy slumber. At midnight he awoke; the dancing-girls were lying in the ante-room ; an overpowering loathing filled his soul. He arose instantly with a mind fully made up,—“ roused into activity,” says the Sinhalese

chronicle, “like a man who is told that his house is on fire.” He called out to know who was on guard; and finding it was his charioteer Channa, he told him to saddle his horse. While Channa was gone Siddhartha gently opened the door of the room where Yasodhara was sleeping, surrounded by flowers, with one hand on the head of their child. He had hoped to take the babe in his arms for the last time before he went, but now he stood for a few moments irresolute on the threshold looking at them. At last the fear of awakening ¢ Yasodhara prevailed ; he tore himself away, promising himself to return to them as soon as his mind had become clear, as soon as he had become a Buddha,—z.e. Enlightened,— and then he could return to them not only as husband and father, but as teacher and saviour. Itis said to have been broad moonlight on the full moon of the month of July, when the young chief, with Channa as his sole companion, leaving his father’s home, his wealth and power, his wife and child behind him—went out into the wilderness to become a penniless and despised student, and a homeless wanderer. This is the circumstance which has given its name to the Sanskrit work, the fourth of those mentioned above, of which Mr Beal has given us a version through the Chinese, the Mahdbhinishkramana Siitra, or Sitra of the Great Renunciation.

Next is related an event in which we may again see a subjective experience given under the form of an objective reality. Mara, the great tempter, appears in the sky, and urges Gautama to stop, promising him, in seven days, a universal kingdom over the four great continents if he will but give up his enterprise. When his words fail to have any effect, the tempter consoles himself by the confident hope that he will still overcome his enemy, saying, “ Sooner or later some lustful or malicious or angry thought must arise in his mind ; in that moment I shall be his master Ae and from that hour, adds the Burmese chronicle, “as a 2 eee le

- The word used was nibbuta, the past participle passive of a verb, from the root of which is derived the word nirvana; in Pali, nibdana. Jataka, p. 60.

- Hardy, M. B., p. 157; but compare Bigandet, p. 39, and Jataka, p. 61, lines 28, 29. Beal, p. 181, gives a similar expression on & subsequent occasion, p. 165.

shadow always follows the body, so he too from that day always followed the Blessed One, striving to throw every obstacle in his way towards the Buddhahood.”! Gautama rides a long distance that night, only stopping at the bauks of the Anoma beyond the Koliyan territory. There, on the sandy bank of the river, at a spot where later piety erected a dagaba (a solid dome-shaped relic shrine), he cuts off with his sword his long flowing locks, and taking off his ornaments, sends them and the horse back in charge of the unwilling Channa to Kapilavastu. The next seven days were spent alone in a grove of mango trees near by, whence the ascetic walks on to Rajagriha, the capital of Magadha, and residence of Bimbisara, one of the then most powerful rulers in the valley of the Ganges. He was favourably received by the raja, a friend of his father’s; but though asked to do so, he would not as yet assume the responsibilities of a teacher. He attached himself first toa Brahman sophist named Alara, and afterwards to another named Udraka, from whom he learnt all that Hindu philosophy had then to teach.? Still unsatisfied, he next retired to the jungle of Uruvela, on the most northerly spur of the Vindhya range of moun- tains, and there for six years, attended by five faithful disciples, he gave himself up to the severest penance and self-torture, till his fame as an ascetic spread in all the country round about “like the sound,” says the Burmese chronicle “of a great bell hung in the canopy of the skies.” At last one day, when he was walking in a much enfeebled state, he felt on a sudden an extreme weakness, like that caused by dire starvation, and unable to stand any longer he fell to the ground. Some thought he was dead, but he recovered, and from that time took regular food and gave up his severe penance, so much so that his five disciples soon ceased to respect him, and leaving him went to Benares. There now ensued a second struggle in Gautama’s mind, described in both southern and northern accounts with all the wealth of poetry and imagination of which the Indian mind is master. The crisis culminated on a day, each event of which is surrounded in the Buddhist accounts with the wildest legends, on which the very thoughts pass- ing through the mind of Buddha appear in gorgeous descriptions as angels of darkness or of light. To us, now taught by the experiences of centuries how weak such exaggerations are compared with the effect of a plain unvarnished tale,

these legends may appear childish or absurd, but they have a depth of meaning to those who

1 The word Buddha is always used in the Pali texts as a title, not as aname. The historical Buddha, the Gautama of this article, taught that he was one of a long series of Buddhas, who appear at intervals in the world, and all teach the same doctrine. After the death of each Buddha his religion flourishes for a time and then decays, and is at last completely forgotten ; until a new Buddha appears, who again preaches the lost truth (or Dharmma). The next Buddha will be Maitreya Buddha, the Buddha of kindness. A short account of each of the twenty-four legendary Buddhas who immediately preceded Gautama will be found in the Jataka, pp. 2-44. See also Mahavansa, p. 1; Hardy, M. B., p. 49, et seg.

2 The question of the relation between Buddhism and Hindu philo- sophy is one of extreme interest, but also of extreme difficulty. Except in its elementary principles Buddhist philosophy is at present very little understood ; and our knowledge of the Hindu systems is derived from text books, all of which are probably post-Buddhistic, and are ascribed to authors of whom absolutely nothing is known. It seems clear that before the time of Buddha there was much philo- sophical activity in Northern India, and that his system and that of the six orthodox Hindu sects grew up side by side. Many of the technical terms are common to Buddhism and to one or more of the other systems, of which the Sankhya and the Yoga, ascribed to Kapila and Patanjali respectively, come the nearest to Buddhism in their general views. A popular account of the six systems will be found in Professor Monier Williams's Indian Wisdom, pp. 48-154, and the student who wishes for further information is referred to the authori- ties there quoted. Beal has some interesting notices of Buddha's discussions with Hindu ascetics, pp. 152-161 and 169-177

3 Bigandet, p. 49; and compare Jataka, p. 67, line 27.

strive to read between the lines of such rude and inarticu- late attempts to describe the indescribable. That which (the previous and subsequent career

of the teacher being borne in mind) seems to be possible and even probable appears to be somewhat as follows. ;

Disenchanted and dissatisfied, Gautama had given up all. that most men value, to seek peace in secluded study and self-denial, Failing to attain his object by learning the wisdom of others, and living the simple life of a student, he had devoted himself to that intense meditation and penance which all philosophers then said would raise men above the gods. Still unsatisfied, longing always for a certainty that seemed ever just beyond his grasp, he had added vigil to vigil, and penance to penance, until at last, when to the wondering view of others he had become more than a saint, his bodily strength and his indomitable resolution and faith had together suddenly and completely broken down. Then, when the sympathy of others would have been most welcome, he found his friends falling away from him, and his disciples leaving him for other teachers. Soon after, if not on the very day when his followers had left him, he wandered out towards the banks of the Nairanjara, receiving his morning meal from the hands of Sujata, the daughter of a neighbouring villager, and set himself down toeat it under the shade of a large tree (a Ficus religiosa), to be known from that tiine as the sacred Bo tree or tree of wisdom. There he remained through the long hours of that day debating with himself what next to do. All his old.temptations came back upon him with renewed force. For years he had looked at all earthly good through the medium of a philosophy which taught him that it, without exception, coutained within itself the seeds of bitterness, and was altogether worthless and impermanent; but now to his wavering faith the sweet delights of home and love, the charms of wealth and power, began to show themselves in a different light, and glow again with attractive colours. He doubted, and agonized in his doubt; but as the sun set, the religious side of his nature had won the victory, and seems to have come out even purified from the struggle. He had become clear in his mind, the Buddha, the Enlightened One,and had determined in the main to adhere to his belief; but from that night he not only did not claim any merit on account of his self- mortification, but took every opportunity of declaring that from such penances no advantage at all would be derived. Allthat night he is said to have remained in deep medita- tion under the Bo tree ; aud the orthodox Buddhists believe that for seven times seven nights and days he continued fasting near the spot, when the archangel Brahma

came and ministered tohim. As for himself, his heart was now fixed,—his mind was made up,—but he realized more than he had ever done before the power of temptation, and the difficulty, the almost impossibility, of understanding and holding to the truth. For others subject to the same temptations, but without that earnestness and insight which he felt himself to possess, faith might be quite impossible, and it would only be waste of time and trouble tu try to show to them “the only path of peace.” To one in his position this thought would be so very natural, that we need not hesitate to accept the fact of its occurrence as related in the books. It is quite consistent with his whole career that it was love and pity for humanity—otherwise, as it seemed to him, helplessly doomed and lost—which at last overcame every other consideration, and made Gautama resolve to announce his doctrine to the world.

Gautama had intended to proclaim his new gospel first to his old teachers Alara and Udraka, but finding that they were dead, he determined to address himself to his former five disciples, and accordingly went to the Deer- forest near Bénares where they were then living. An old

a or hymn of the northern Buddhists tells us how the uddha meets, full of his newly-discovered mission, an acquaintance on the way, who, struck with his appearance, asks him what religion it is that makes him so glad and yet socalm. Gautama tells him that he has now become free from all desires, &c. But his acquaintance, apparently not caring much about these details, further asks him where he is going. The reply is striking. “I am now going,” says Buddha, “to the city of Benares to establish the kingdom of righteousness, to give light to those en- shrouded in darkness, and open the gate of immortality to men.” His acquaintance only sneers at his high-flown pretensions, asking what he means by all this. The Buddha adds, ‘“‘I have completely conquered all evil passious, and am no longer tied dowa to material existence; and I now only live to be the prophet of perfect truth.” His acquaint- ance replies, “In that case, venerable Gautama, your way lies yonder,” and turns away in the opposite direction.?

Nothing daunted, the new prophet walked on to Benares, and in the cool of the evening weut on to the Deer-forest where the five ascetics were living.

Seeing him coming, they resolved not to recognize as a superior one who had broken his vows; to address him by his name, and not as “master” or “teacher ;” only, he being a Kshatriya, to offer him a seat. He understands their change of manner, calmly tells them not to mock him by calling him “the venerable Gautama;” that they are still in the way of death, where they must reap sorrow and disappointment, whereas he has found the way to salvation and can lead them to it. They object, naturally enough, from a Hindu point of view, that he had failed before while he was keep- ing his body under, and how can his mind have won the victory now, when he serves and yields to his body. Buddha replies by explaining to them the principles of lis new gospel; and it will be necessary here to anticipate somewhat, and explain very briefly what this was, as the narrative will otherwise be difficult to follow.

The Buddhist Way of Salvation.—Everything corporeal is material, and therefore impermanent, for it contains within itself the germs of dissolution. So long as man is bound up by bodily existence with the material world he is liable to sorrow, decay, and death. So long as he allows unholy desires to reign within him, there will be unsatisfied longings, useless weariness, and care. To attempt to purify himself by oppressing his body would be only wasted effort ; it is the moral evil of a man’s heart which keeps him chained down in the degraded state of bodily life,.—of union with the material world. It is of little avail to add virtue to his badness, for so long as there is evil, his goodness will only ensure him for a time, and in another birth, a higher form of material life; only the complete eradication of all evil will set him free from the chains of existence, and carry him to the “other side,” where he will be no longer tossed about on the waves of the ocean of transmi- gration. But Christian ideas must not be put into these Buddhist expressions. Of any immaterial existence Buddhism knows nothing. The foundations of its creed have been summed up in the very ancient formula pro- bably invented by its founder, which is called the Your great Truths. These are—1l, That misery always accom- panies existence ; 2, That all modes of existence (of men or

1 Beal, p. 245. Mr Beal translates the first clause, “to turn the wheel of the excellent law ;” but the chakra is no ordinary wheel, it is the royal chariot wheel, and the expression rendered “turn,” from the root writ, is more

exactly ‘‘to set rolling onward.” A chakra- varti is a universal monarch, the wheels of whose chariot roll on un- resisted over the known world, and the figure employed in the gatha undoubtedly means that Buddha was about to set rolling the royal chariot wheel of a universal kingdom of riglit, or, in other words, to start or found such a kingdom. Compare Beal, p. 244, note, and p. 142 ; and Childers’s Pali Dictionary, s.v., Dhammacakkamn.

animals, in earth and heaven) result from passion or desire (tanha) ; 3, That there is no escape from existence except by destruction of desire ; 4, That this may be accomplished by following the fourfold way to Nirvana. Of these four stages, called “the Paths,” the first is an awakening of the heart. There are few that do not acknowledge that no man can be really called happy, and that men are born to trouble as the sparks fly upwards, but the majority glide through life filling up their time with business or with pleasure, buoyed up with ever-changing hopes in their mad pursuit of some fancied good. When the scales fall from their eyes, when they begin to realize the great mystery of Sorrow, that pain is inseparable from existence, and that all earthly good leads to vexation of spirit, when they turn for comfort and for guidance to the Enlightened One, then they may be said to be awake, and to have entered the Jirst stage of the Buddhist way of salvation. When the awakened believer has gone further, and got rid, firstly, of all cmpure desires, and then of all revengeful feelings, he has reached the second stage; in the third he successively be- comes free (1) from all evil desires, (2) from ignorance, (3) from doubt, (4) from heresy, and (5) from unkindliness and vexation. “As even at the risk of her own life a mother watches over her child, her only child, so let him (the Buddhist saint) exert good-will without measure towards all beings.”?

The order here observed is very remarkable. The way to be freed from doubt and heresy lies through freedom from impurity and revenge and evil longings of all kinds ; or, in other words, if a man awakened to a deep sense of the mystery of sorrow wishes to understand the real facts of existence, wishes to believe not the false or the partly false, but the true altogether, Buddha tells him not to set to work aud study, not to torture himself with asceticism or privation, but to purify his mind from all unholy desires and

passions; right actions spring from a pure mind, and to the pure in heart all things are open. Again, the first enemy which the awakened believer has to fight against is sensuality, aud the last is unkindliness; it is impossible to build anything on a foundation of mire; and the topstone of all that one can build, the highest point he can reach, the point above purity, above justice, above even faith is, according to Buddha, Universal charity. Till he has gained that the believer is still bound, he is not free, his mind is still dark ; true enlightenment, true freedom are complete only in Love.

The believer who has gone thus far has reached the last stage ; he has cut the meshes of ignorance, passion, and sin, and has thus escaped from the net of transmigration ; Nirvana is already within his grasp; he has risen above the laws of material existence; the secrets of the future and the past lie open before him ; and when this one short life is over, he will be free for ever from birth with its inevitable consequences, decay, and death. No Buddhist now hopes to reach this stage on earth; but he who has once entered the ‘“ paths” cannot leave them; the final perseverance of the saints is sure; and sooner or later, under easier conditions in some less material world, he will win the great prize, and, entering Nirvana, be at rest for ever.®

But to return to the narrative. For reasons too long to be specified here, it is nearly certain that Buddha had a commanding presence, and one of those deep, rich, thrilling

2 Metta Sutta, as translated by Sir Coomara Swamy. Sutta Nipata, p. 39, verse 7.

8’ For the four Truths and the four Paths see Hardy, Manual of Buddhism, p. 496; Hastern Monachism, p. 288; Csoma Korési, Astatic Rescarches, vol. xx. p. 294 ; Burnout, Introduction, p. 629, and Lotus de la Bonne Lot, p. 517 ; Fausboll, Dhammapada, pp. 35, 195, 346 ; Childers, Pali Dictionary, p. 269, s.v. Nibbana ; Gogerly in the J.R.A.S., Ceylon Br., 1845, pp. 24, 25.

voices which so many of the snecessful leaders of men have possessed. We know his deep earnestness, and his thorough conviction of the truth of his

new gospel. When we further remember the relation which the five students mentioned above had Jong borne to him, and that they already believed those parts of his doctrine that are most repugnant to our modern feelings, —the pessimist view of life and the transmigration of souls,—it is not difficult to understand that his persuasions were successful, and that his old disciples were the first to acknowledge him in his new character. The later books say that they were all converted at once ; but, according to the most ancient Pali record,—though their old love and reverence had been so rekindled when Gautama came near that their cold resolu- tions quite broke down, and they vied with each other in such acts of personal attention ~~as an Indian disciple loves te pay to his teacher,—yet it was only after the Buddha had for five days talked to them, sometimes separately, some~~ times together, that they accepted in its entirety his plan of salvation.!

Gautama then remained at the Deer-forest near Benares

until the number of his personal followers was about three- score, and that of the outside belicvers somewhat greater. The principal among the former was a rich young man named Yasa, who had first come to him at night out of fear of his relations, aud afterwards shaved his head, put on the yellow robe,? and succeeded in bringing many of his former friends and companions to the teacher, his mother and his wife being the first female disciples, and his father the first lay devotee. It should be noticed in passing that the idea of a priesthood with mystical powers is altogether repugnant to Buddhism ; every one’s salvation is entirely dependent on the modification or growth of his own inner nature, resulting from his own exertions. The life of a recluse is held to be the most conducive to that state of sweet serenity at which the more ardent disciples aim ; but that of a layman, of a believing householder, is held in high honour ; and a believer who does not as yet feel himself able or willing to cast off the ties of home or of business, may yet “enter the paths,” and by a life of rectitude and kindness ensure for himself a rebirth under more favourable conditious for his growth in holiness. _ After the rainy season Gautama called together those of his disciples who had devoted themselves to the higher life, and whom, for want of a better name, we may call nonks, and said to them, “ Beloved Rahans, J am free from the five passions which, like an immense net, hold men and angels in their power; you too, owing to my teaching, enjoy the

same glorious privilege. There is now laid on us a great duty, that of working effectually for men and angels, and gaining for them also the priceless blessing of salvation. Let us, therefore, separate, so that no two of us shall go the same way. Go ye now and preach the most excellent law, explaining every point thereof, unfold- ing it with diligence and care. . . . For my part I shall go to the village of Sena, near the deserts of Uruwela.”* Throughout his career Gautama yearly adopted the same plan, collecting his disciples round him in the rainy season, ard after it was over travelling about as an itinerant preacher ; but in subsequent years he was always accompanied by some of his most attached disciples.

In the solitudes of Uruwela, there were at this time three brothers, fire-worshippers and hermit philosophers, who had gathered round them a number of scholars, and enjoyed a considerable reputation as teachers. Gautama settled among them, and after a time they became believers

1 Jataka, p. 82, lines 11-19.

2 See on this point below, p. 435. ‘ 3 Compare Bigandet, pp. 85, 86, with Gogerly, J.R.A.S., Ceylon Br., 1852, pp. 14, 15.

in hissystem,—the elder brother, Kasyapa, taking henceforth a principal place among his followers. His first set sermon to his new disciples is related by Bishop Bigandet under the name of the Sermon on the Mount, the subject of which was a jungle-fire which broke out on the opposite hillside. He warned his hearers against the fires of concupiscence, anger, ignorance, birth, death, decay, and anxiety ; and taking each of the senses in order he compared all human sensations to a burning flame which seems to be something it is not, which produces pleasure and pain, but passes rapidly away, and ends only in destruction.*

Accompanied by his new disciples, Gantama walked on to Rajagriha, the capital of King Bimbisara, who, not unmind- ful of their former interview, came out to welcome him. Seeing Kasyapa, who as the chronicle puts it, was as well known to them as the banner of the city, the people at first doubted who was the teacher and who the disciple ; but Kasyapa put an end

to their hesitation by stating that he had now given up his belief in the efficacy of sacrifices either great or small ; that Nirvana was a state of rest only to be attained by a change of heart; and that he had become a disciple of the Buddha. Gautama then spoke to the king on the miseries of the world which arise from passion, and on the possibility of release by following the way of salvation, which has been briefly sketched above. The raja invited him and his disciples to eat their simple mid-day meal at his house on the following morning ; and then presented Gautama with a garden called Veluvana or Bamboo-grove, afterwards celebrated as the place where the Buddha spent many rainy seasons, and preached many of his most complete discourses. There he taught for some time, attracting large numbers of hearers, among whom two, Sariputra and Moggallana, who afterwards became conspicuous leaders in the new crusade, then joined the Sangha, or Society, as Buddha's order of mendicants was called.

Meanwhile the old Raja Suddhddana, who had anxiously watched his son's career, heard that he had given up his asceticism, and had appeared as an itinerant preacher and teacher. He sent therefore to him urging him to come home, that he might see him once more before he died. The Buddha accordingly started for Kapilavastu, and stopped according to his custom in a grove outside the town. His father and his uncles and others came to see him there, but the latter were angry and would pay him no reverence. It was the custom to invite such teachers and their disciples for the next day's meal, but they all left without doing so. The next day, therefore, Gautama set out at the usual hour, carrying his bowl to beg for a meal. As he entered the city he hesitated whether he should not go straight to the raja's house, but determined to adhere to his custom. Itsoon reached the raja's ears that his son was walking through the streets begging. Startled at such news he rose up, seizing the end of his outer robe, and hastened to the place where Gautama was, exclaiming, "T]lustrious Buddha, why do you expose us all to such shame? Is it necessary to go from door to door begging your food? Do you imagine that I am not able to supply the wants of so many mendicants?" 'My noble father," was the reply, "this is the custom ofall our race." " How so?" said his father, "Are you not descended from an illustrious line of kings? no single person of our race has ever acted so indecorously." ' My noble father," said Gautama, "you and your family may claim the privileges of royal descent; my descent is from the prophets

(Buddhas) of old, and they have always acted so; the customs of the law (Dharma) are good both for this

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4 Comp. Big., p. 99, with Hardy, M.B., p. 191, who gives the Pali name Gditta-pariyaya-sutta, The sermon on the lessons to be drawn from burning.

world and the world that:is to come. But, my father, when a man has found a treasure it is his duty to offer the most precious of the jewels to his father first. Do not delay; let me share with you the treasure I have found." Suddhddana, abashed, took his son's bowl and led him to his house. There the women of the-palace came to welcome him, but not Yasodhara, whom he had not seen since he had watched her sleeping in their chamber with their new-born babe by her side on that eventful night now seven long yearsago. 'I will wait and see," she had said ; "perhaps I am still of some value in his eyes; he may ask, or come. I can welcome him better here." Gautama noticed her absence, and remembering, doubtless, that a recluse could not touch or be touched by a woman, he said, "The princess is not yet free from desire as I am; not having seen me so long she is exceeding sorrowful. Unless her sorrow be allowed to take its course, her heart will break. She may embrace me; do not stop her." He then went to her, and when she saw him enter,—not the husband she had mourned so long, but a recluse in yellow robes with shaven head and shaven face,—though she knew it would be so, she could not contain herself, and fell on the ground, and held him by the feet, and wept; then remembering the impassable gulf between them, she rose and stood on one side. The raja thought it necessary to apologize for her, telling Gautama how entirely she had continued to love him, refusing to enjoy comforts which he denied himself, taking but one meal a day, and sleeping ona hard uncanopied bed. The different accounts often tell us the thoughts of the Buddha on any particular occa- sion; here they are silent, only adding that he then told a Jataka story, showing how great had been her virtue in a former birth! And then they parted: she became an earnest hearer of the new doctrines; and when long afterwards the Buddha was induced, much against his inclination, to established an

order of female recluses, his widowed wife Yasodhara became one of the first of the Buddhist nuns. >.

The next daya great festival was to take place to celebrate the marriage of Gautama's half-brother, Nanda. Gautama went to the pavilion and said to Nanda, "the greatest festival after all is the destruction of all evil desires, the life of a recluse, the knowledge of truth, and the attainment of Nirvana." He then gave him his alms- bowl, and Nanda followed him to the Nigrodha grove where he was staying. On their arrival there Gautama asked him if he would not enter the Society; but Nanda, though tenderly attached to his half-brother, with whom he had been brought up as a play-fellow (Gautama having no brothers of his own), did not yet desire to give up the world After much persuasion, however, he consented, and became a disciple. A few days afterwards Yasodhara dressed Rahula, her child and Gautama's, in his best, and told him to go and ask his father for his inheritance. "I know of no father," said the child, "but the raja. Who is my father?' Yasodhara took him in her arms, and hold- ing him up to the window pointed out to him the Buddha, who was then taking his mid-day meal at the palace. "That monk," she said, " whose appearance is so glorious, is your father; he has four mines of wealth; go to him, aud entreat him to put you in possession of your inheri- tance." Rahula went up to Gautama and said to him, without fear and with much affection, " My father, how happy I am to be near you." Gautama silently gave him his

blessing; but presently, when he rose to go, Rahula followed ee ee

1 Jétaka, 91,9. These Jataka stories are most interesting, contain- ing as they do the oldest known versions of many of tne nursery songs, and fairy tales, and comic stories, and fables, which are the common property of Europe in the present day. See Fausbdll's papers enumer- ated in the report of the Philological Society for 1875, p. 64.

him asking for his inheritance. None of the people stopped him, aud Gautama still said nothing. When they reached

the Nigrodha grove, he called Sariputra, and _ said,

“Beloved disciple, Rahula is asking for a worldly inheri- tance which would avail him nothing; I will give him a spiritual inheritance which will not fade away; let him be admitted among us.” When Suddhddana heard this he was exceedingly grieved ; he had lost his two sons as far as all worldly hopes were concerned, and now his grandson was taken from him. Full of sorrow he determined to save other parents a similar affliction, and going to Gautama asked him to establish a regulation that no one should in future be admitted to the Society unless he had the consent of his parents. Gautama granted this request, and after some more interviews with his father returned to the Bambu grove at Rajagriha.

Eighteen months had now elapsed since the turning-point of Gautama’s career—his great struggle under the Bo tree. Thus far all the accounts agree, and follow chronological order. From this time they simply narrate disconnected stories about the Buddha, or the persons with whom he was brought into contact,—the same story being usually found in more than one account, but not often in the same order. It is not as yet possible, except very partially, to arrange chronologically the snatches of biography to be gleaned from these stories. They are mostly told to show the occasion on which some memorable act of Gautama’s took place, or some memorable saying was uttered, and are as exact as to place as they are indistinct as to time. It would be impossible within the limits of this article to give any large number of them, but space may be found for one or two,

A merchant from Siimaparanta having joined the Society was desirous of preaching to his relations, and is said to have asked Gautama’s permission to do so. “The people of Sinaparanta,” said the teacher,‘ are exceedingly violent. If they revile you what will you do?” “TI will make no reply,” said the mendicant. “And if they strike you?’ “I will not strike in return,” was the reply. “ And if they try to kill you?” “ Death is no evil in itself ; many even desire it, to escape from the vanities of life, but I shall take no steps either to hasten or to delay the time of my departure.” These answers were held satisfactory, and the monk started on his mission.

At another time a rich farmer held a harvest home, and Gautama, wishing to preach to him, is said to have taken his alms-bow! and stood by the side of the field and begged. The farmer, a wealthy Brahman, said to him, “ Why

do you come and beg? I plough and sow and earn my food ; you should do the same.” “I, too, O Brahman,” said the beggar, “ plough and sow ; and having ploughed and sown I eat.” “You profess only to be a farmer; no one sees your ploughing, what do you mean ?” said the Brahman. “ For my cultivation,” said the beggar, “ faith is the seed, self-combat is the fertilizing rain, the weeds I destroy are the cleaving to existence, wisdom is my plough, and its guiding-shaft is modesty ; perseverance draws my plough, and I guide it with the rein of my mind ; the field I work in is the law, and the harvest that I reap is the never-dying nectar of Nirvana. Those who reap this harvest destroy all the weeds of sorrow. ”

On another occasion he is said to have brought back to her right mind a young mother whom sorrow had for a tirne deprived of reason. Her name was Kisagotami. She had been married early, as is the custom in the East, and had a child when she was stilla girl. When the beautiful boy could run alone he died. The young girl in her love for it carried the dead child clasped to her bosum, and went from house to house of her pitying friends asking them to give her medicine for it. But a Buddhist convert thinking

“she does not understand,” said to her, “My good girl, I my- self have no such medicine as you ask for, but I think I know of one who has.” ‘Oh, tell me who that is?” said Kisagotami. “The Buddha can give you medicine ; go to him,” was the answer. She went to Gautama; and doing homage to him said, ‘‘ Lord and master, do you know any medicine that will be good for my child?” “ Yes, I know of some,” said the teacher. Now it was the custom for patients or their friends to provide the herbs which the doctors required ; so she asked what herbs he would want. “I want some mustard-seed,” he said; and when the poor girl eagerly promised to bring some of so common a drug, he added, “ you inust get it from some house where no son, or husband, or parent, or slave has died.” “Very good,” she said; and went to ask for it, still carrying her dead child with her. The people said, “Here is mustard-seed, take it ; ” but when she asked, “ In my friend’s house has any son died, or a husband, or a parent, or slave?” They answered, “‘ Lady ! what is this that you say? the living are few, but the dead are many.” Then she went to other houses, but one said “TI have lost a son,” another “ We

have lost our parents," another "I have lost my slave." At last, not being able to find a single house where no oné had died, her mind began to clear, and summoning up resolution she left the dead body of her child in a forest, and returning to the Buddha paid him homage. He said to her, '" Have you the mustard seed?" ' My lord," she replied, "I have not; the people tell me that the living are few, but the dead are many." Then he talked to her on that essential part of his system, the impermanency of all things, till her doubts were cleared away, she accepted her lot, became a disciple, and entered the " first path."

For forty-five years after entering on his mission Gautama itinerated in the valley of the Ganges, not going further than about 150 miles from Benares, and always spending the rainy months at one spot—usually at one of the viharas, or homes,} which had been given to the Society. In the twentieth year his cousin Ananda became a mendicant, and from that time seems to have attended on Gautama, being constantly near him, and delighting to render him all the personal service which love and reverence could suggest. Another cousin, Dewadatta, the son of the raja of Koli, also joined the society, but became envious of the teacher, and stirred up Ajatasatru (who having killed his father, Bimbisara, had become king of Rajagriha) to persecute Gautama. The account of the manner in which the Buddha is said to have overcome the wicked devices of this apostate cousin and his

parricide protector is quite legendary ; but the general fact:

of Ajatasatru's opposition to the new sect and of his subse- quent conversion may be accepted. The rival teachers, or sophists, as might be expected, were bitter enemies of the new philosophy, and the Brahmins did all they could to put down a faith which inculcated such dangerous doctrines as the equality within the Society of all ranks and castes, and the possibility of salvation without sacrifices or the assistance of the priests. They instigated certain men to murder Moggallana, one of the two chief disciples, and made several attempts on the life of the teacher himself ; but many of the chiefs, and the great bulk of the common people, are represented, with probable truth, as being uni- formly in favour of his doctrine, though the number of those who actually joined the Society was comparatively small.

The confused and legendary notices of the journeyings

1 These houses were at first simple huts, built for the mendicants in some grove of palm trees as a retreat during the rainy season ; but they gradually increased in splendour and magnificence till the decay of Buddhism set in. See the authorities quoted in the Journal of the Royal Asiatic Society for 1875, p. 22 of the article on “ Two Sinhalese Inscriptions.’

of Gautama are succeeded by tolerably clear accounts of the last few days of his life. Ona journey towards Kusi- nagara, a town about 120 miles N.N.E of Benares, and about 80 niles due E. of Kapilavastu, the teacher, being then eighty years of age, had rested for a short time in a grove at Pawa, presented to the Society by a goldsmith of that place named Chunda. Chunda prepared for the mendi- cants a mid-day meal, consisting of rice and pork ; and it may be noticed in passing how highly improbable it is that any Buddhist would have invented the story of the Buddha’s last illness having been brought on by such a cause. He started for Kusi-nagara in the afternoon, but had not gone far when he was obliged to rest, and soon afterwards he said, “ Ananda, I am thirsty ;” and they gave him water to drink. Half-way between the two towns flowsthe River Kukushta. There Gautama rested again, and bathed for the last time. Feeling that he was dying, and careful lest Chunda should be reproached by himself or others, he said to Ananda, “ After I am gone tell Chunda that he will receive ina future birth very great reward ; for, having eaten of the food he gave me, I am about to pass into Nirvana and if he should still doubt, say that it was from my own mouth that you heard this. There are two gifts which will be blest above all others, namely, Sujata’s gift before I attained wisdom under the Bo tree,-and this gift of Chunda’s before I enter the final rest of Nirvana.” After halting again and again the party at length reached the River Hiranyavati, close by Kusi-nagara, and there for the last time Gautama rested ; and lying down under some Sal trees, with his face towards the south, he talked long and earnestly with Ananda about his burial, and about certain rules which were to be observed by the Society after his death. Towards the end of this conversation, when it was evening, Ananda broke down and went aside to weep, but Gautama missed him, and

sending for him comforted him with the promise of Nirvana, and repeated what he had go often _said before about the impermanence of all things,— “OQ Ananda ! do not weep ; do not let yourself be troubled. You know what I have said ; sooner or later we must part from all we hold most dear. This body of ours contains within itself the power which renews its strength for a time, but also the causes which lead to its destruction. Is there anything put together which shall not dissolve? But you, too, shall be free from this delusion, this world of sense, this law of change. Beloved,” added he, speaking to the rest of the disciples, “‘ Ananda for long years has served me with devoted affection. He knows all that should be done ; after I am gone listen to his word.” And he spoke to them at some length on the insight and kindness of Ananda. About midnight Subhadra, a Brahman philosopher of Kusi-nagara, came to ask some questions of the Buddha ; but Ananda, fearing that this might lead to a longer discus- sion than the sick teacher could bear, would not admit him. Gautama heard the sound of their talk, and asking what it was, told them to let Subhadra come. He began by asking whether the six great teachers? knew all laws, or whether there were some that they did not know, or knew only partially. “This is not the time,” was the answer, “ for such discussions. To true wisdom there is only one way, the path that is laid down in my law. Many have already followed it, and conquering the lust and pride and anger of their own hearts, have become free from ignorance and doubt and wrong belief, have entered the calm state of universal kindliness, and reached Nirvana even in this life. Save in my religion the twelve great disciples, who being good themselves rouse up the world, and deliver it from

2 These are perhaps the teachers of the six systems of orthodox Hindu philosophy referred to above (note 2, p. 427); but the meaning of this expression, and of that in Buddha’s reply about the “twelve great disciples,” is not clear, 3

indifference, are not to be found. O Subhadra! I do not speak to you of things I have not experienced. Since I was twenty-nine years old till now I have striven after pure and perfect wisdom, and following the good path, have found Nirvana.” A rule had been made that no follower of a rival

system should be admitted to the Society without four months' probation. So deeply did the words or the impres- sive manner of the dying teacher work upon Subhadra that he asked to be admitted at once, and Gautama granted his request. Then turning to his disciples he said, " When I have passed away and am no longer with you, do not think that the Buddha has left you, and is not still in your midst. You have my words, my explanations of the deep things of truth, the laws I have laid down for the Society ; let them be your guide ; the Buddha has not left you." Soon afterwards he again spoke to them, urging them to reverence one another, and rebuked one of the disciples who spoke indiscriminately all that occurred to him. To- wards the morning he asked whether any one had any doubt about the Buddha, the law, or the Society ; if so, he would clear them up. No one answering, he said, " Beloved mendicants, if you revere my memory, love all the disciples as you love me and my doctrines." Ananda expressed his surprise that amongst so many none should doubt, and all be firmly attached to the law. But Buddha laid stress on the final perseverance of the saints, saying that even the least among the disciples who had entered the first path only, still had his heart fixed on the way to perfection, and constantly strove after the three higher paths, "No doubt," he said, "can be found in the mind of a true disciple." After another pause he said, '" Beloved, that which causes life, causes also decay and death. Never forget this ; let your minds be filled with this truth. I called you to make it known to you." These were the last words Gautama spoke; shortly afterwards he became unconscious, and in that state passed away.

Part [I.—Earty BuppHIsM.

The accounts of Gautama's cremation and of the distri bution of his relics are full of the miraculous, but it seems that the body was burnt with great reverence by the local rajas of Malva, Even before this ceremony had taken place dissensions began to break out in the Society,—one member of the order, Subhadra (not the Brahman men- tioned above), having even gone so far as to rejoice that now at last they were free from cuntrol, and could not always be told to do this, or not to do that. Struck by this language, the chief disciples began at once to consider the expediency of holding a council, where all points of difference should be definitively set at rest. Chief among the leaders was the aged Kasyapa of Uruvela, whose distinguished position

before his conversion, and his great learning, were not the only grounds of the respect in which he was held by the infant Society. He had been one of those most intimate with Gautama; so much so, that on one occasion, when walking together and talking ~~of the deepest truths of their belief, the two friends had entered into a more than usual confidence and intercom~~ munion of thought and feeling, and had then changed robes with one another in token of their sympathy and love. Sariputra and Moggallana were dead ; but Ananda, the beloved disciple, and Upili, who though of low caste origin was looked up to in the Society as the greatest authority on points of conduct and discipline, were of one opinion with Kasyapa as to the advisability of a council. This was agreed upon; the disciples first separated and went to their homes, and when they met again for the rainy season in that vihidra at Rajagriha, which had been the first gift to the Society, the council was held under the

ance of Ajatasatru, the powerful raja of Magadha. ‘number of believers present was five hundred, but if any

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presidency of Kasyapa, and with the patronage and assist- The

discussion took place no tradition of it has survived. We are only told that at each daily sitting of the council, which lasted seven months, Ananda or Upali repeated some portion of the law, and the whole assembly chanted it after them. A second council is said to have been held one hundred years later in Vaisali, about 70 miles N, of Rajagriha, and another was certainly held about 250 B.c. under the Buddhist emperor Asoka, in his capital Pitaliputra, the Palibothra of the Greeks and the modern Patna, There is reasonable ground for belief that the sacred books of the Buddhists at present existing in Ceylon are substantially the same as the canon settled at this last council of Pataliputra, and it is from these books that the modern accounts on which we are as yet obliged to depend purport to have been and, with some alterations and additions, undoubtedly have been derived. The orthodox Buddhists hold the present canon to be identically the same as that settled at the first council of Rajagriha ; but the internal evidence of those parts of the canon which have as yet been published tends to show that they cannot possibly have been composed in their present state imme-

diately after Buddha’s death. The date, derived from Ceylon, which is usually assigned to that event is 543 B.c. ; but those scholars who have devoted most attention to the point hold this calculation to contain a certain error of about 60 years, and a probable error of 80 to 100 more; so that the date for the death of Buddha would have to be brought forward to 400 B.c., or a few years later. As the date of Asoka’s council has been determined with certainty to have been within a year or two of 250 B.c., there remains an interval of a century and a half between the first council and the earliest records now accessible te us, an interval amply sufficient for the growth of the supernatural element which they so largely contain. When these records have been published in the original Pali, it may be possible to decide how far some portions are older than the rest, and how far it is possible to hold that they reproduce any earlier canon ; at present we can only claim in the following brief outline to give an account of Buddhism as it existed 150 years after the decease of its founder. But when it is recollected that Gautama Buddha was himself learned in all the learning of his time ; that he did not leave behind him a number of deeply simple sayings from which his followers subsequently built up a system, but had thoroughly elaborated a system of his own before his mission began ; that during his long career as teacher he had ample time to repeat the principles and details of the system to his disciples over and over again, and to test their knowledge of it; and finally, that his principal disciples were, like himself, accustomed to the subtlest metaphysical distinctions, and trained to that wonderful command of memory which Indian ascetics then possessed,—-when these facts are, recalled to mind, it will be seen that much more reliance can be placed upon the doctrinal parts of the existing Buddhist canon than upon correspondingly late records of other religions, or on the biographical parts of the Buddhist canon itself.

The ABHIDHARMA or Philosopny. Buddhism does not attempt to solve the problem of the ultimate origin of the kosmos.! It takes asits own ultimate fact the existence of the material world and of conscious beings living

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1“ When Malunka asked Buddha whether the existence of the world is eternal or not eternal he made him no reply ; but the reason of this was, that it was considered by Buddha as an inquiry that tended to no profit.”—Hardy, M.B., 375. Only a Buddha can comprehend how effects are produced by karma, or how the universe was brought into existence.—Jbid., p. 8, note.

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within it; and it holds that everything is subject to the law of cause and effect, and that everything is constantly, though perhaps imperceptibly, changing. Though in its principles it anticipates much that modern science has proved, in its details it does not, as might be expected, rise much above the beliefs most current at the time of its origin; but it has formulated them into a hypothetical system sufficiently consistent with itself to have satisfied Buddhists for more than 2000 years, however little consist- ent with actual truth. Scattered through space, it teaches, there are innumerable circular worlds in sets of three. All of these are exactly similar to our own, in the centre of which rises an enornious mountain, called Maha Meru, which is surrounded by seven concentric circles of rock of an enormous height, and the circle enclosed by the outer- most is divided into four quarters, or great continents, part of one of which is Jambudvipa, the earth in which we live. On the heights of Mahi Meru, and above it and the rock circles, rise the twenty-four heavens, and beneath it and the earth are the eight great hells. These heavens and hells are part of the material world, subject like the rest of it to the law of cause and effect, and the beings within them are still liable to rebirth, decay, and death. Betwcen Maha Meru and the outmost circle of rocks, the sun, noon, and stars revolve through space ; and it is when they pass behind the first circle of rocks that*they appear to the inhabitants of Jambudvipa to set. This world, like each of the others scattered through space, is periodically destroyed by water, fire, or wind, but the sum of the demerits of the beings (men, animals, angels, &e.) who lived within it produces each time a new world, which in its turn is fated to be destroyed. The number of these beings never varies save on those few occasions when one of them either in earth or heaven attains Nirvana; in every other case, as soon as an individual dies, another is produced under more or less material conditions, according as the sum of the former

individual’s demerits, minus the sum of ifs merits, was, at the time of its death, large or small. A belief in such liypotheses seems inconsistent with a funda- mental tenet of Buddhist philosophy, that there are only two sources of knowledge, experience, and inference ; but the hypotheses themselves are too intimately involved in the whole scheme of Buddhism to leave much doubt as*to their having formed part of the original ‘doctrine of its founder. They are, however, scarcely distinctive of Bud- dhism, but, like the pessimist view of life, are rather modifications of previous beliefs which Buddhism adopted into its system, and from the consequences of which it promised to relieve those who followed out its teachings.? The two ideas of the utter vanity of all earthly good and the inevitable law of rebirth, decay, and death will be seen to lead naturally to the belief in Nirvana. Iflife be an evil, and death itself be no delivery from life, it is necessary to go further back to discover the very origin, the seed, so to speak, of existence ; and by destroying that to put an end at last to the long train of misery in which we are compelled to go again and again through the same weary round of experiences, always ending in disappointment. This seed of existence Buddhism finds in “ Karma,” the sum of merit and demerit, which, as each one’s demerit is the greater of the two, often comes practically to much the same thing as sinorerror. It forms the second link in the Buddhist chain of causation,” and arises itself from ignorance. Destroy

1 On the Buddhist cosmogony, see Hardy, Afanuwal of Buddhism, chap. 1; Burnouf, Lotus, &c., pp. 842, et seq.; Beal, Catena of Buddhist Scriptures from the Chinese, Part 1.; aud Childers’s Pali Dict., under the names given by Hardy.

? Paticca-samuppada, the twelve nidanas. See Childers in Cole- brooke’s Hssays (1873), vol. ii. p. 453, Gogerly in the Journal of the R.AS., Ceylon Br. 1845, p. 18, 1867, p 127.

that ignorance which brings with it such a progeny, cut the links of this chain of existence, root out karma with the mistaken cleaving to life, and there will be deliverance at last—deliverance from all sorrow and all trouble in the eternal rest of Nirvana. Anything less than this would be a mockery of hope ; for there is no life outside the domain of transmigration,

and by the inevitable law of change that which causes existence of any kind would itself be the cause also of decay, and bring with it after atime the whole chain of evils from which the tired heart of man seeks relief.

To reach this end, to destroy karma, and thus to attain Nirvana, there is only one way—the fourfold path already explained above, which is also summed up in the Buddhist books in the eight divisions, “right views, right thoughts, right speech, right actions, right living, right exertion, right recollection, and right meditation.” By these means ig- norance will be overcome and karma destroyed, and after the organized being has been dissolved in death, there will be nothing left to bring about the production of another life, For it must be understood that while Buddhism occasionally yielded so far to popular phraseology as to make use of the word soul, it denies altogether that the word is anything more than a convenient expression, or that it has any counterpart in fact. Birth is not rebirth, but new birth ; transmigration of soul becomes a transfer of karma; metempsychosis gives way to metamorphosis. As one generation dies and gives way to another—the heir of the consequences of all its vices and all its virtues, the exact result of pre-existing causes—so each individual in the long chain of life inherits all of good or evil that all its predecessors have done or been, and takes up the struggle towards enlightenment precisely there where they have left it. There is nothing eternal, but the law of cause and effect, and change ; the kosmos itself is passing away; even karma can be destroyed ; nothing is, everything becomes. And so with this organized life of ours, it contains within itself no eternal germ ; it passes away like everything else, there only remains the accumulated result of all its actions. One lamp is lighted at another; the second flame differs from the first, to which it owes itsexistence. A seed grows into a tree and produces a seed from which arises another tree different from the first, though resulting fromit. And so the true Buddhist saint does not mar the purity of his self-denial by lusting after a positive happiness which he himself is to enjoy hereafter. He himself will cease to be, but his virtue will live and work out its full effect in the decrease of the sum of the misery of sentient beings.

A not unnatural confusion has arisen from the fact that the result of each man’s actions is held not to be dissipated as it were into many streams, but concentrated together in the formation of one new sentient being. This link

of connection between the two otherwise distinct individuals has led to expressions in Buddhist writings which when read by Christians seemed to infer the existence of a soul. Phrases used of those living saints who have entered the fourth path, and have practically attained Nirvana, have also been supposed by nistake to apply to Nirvana itself. And when further Nirvana has been described in glowing terms as the happy seat; the excellent eternal place of bliss, where there is no more death, neither decay ; the end of suffering; the home of peace; the other side of the ocean of existence; the shore of salvation ; the harbour of refuge; the medicine for all evil; the transcendent, formless, tranquil state; the Truth, the Infinite, the Unspeakable, the Everlasting,—it has been supposed by some European scholars to mean a blissful state, in which the soul (!) still exists in an everlasting trance. There can,

® From the third book of the Maha Vagga, which is the third part of the first Pitaka. Gogerly, in the Journal of the Royal Asiatic So- ciety, Ceylon Branch, 1845, p. 24 ; this summary is constantly quoted.

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however, now be no longer any doubt on the point. Spence Hardy and Bigandet find in the modern Sinhalese and Burmese books the same opinion as Alvis and Gogerly and especially Childers have found in the more ancient authori- ties ; and though the modern books of the Northern Bud- dhists are doubtful, Eugéne Burnouf has clearly proved that their older texts contain only the same doctrine as that held in the South. Buddhism does not acknowledge the existence of a soul as a thing distinct from the parts and powers of man which are dissolved at death, and the Nirvana of Buddhism is simply Extinction.!

It will seem strange to many that a religion which ignores the existence of God, and denies the existence of the soul, should be the very religion which has found most acceptance among men, and it is easy to maintain that had Buddha merely taught philosophy, or had he lived in later ages, he might have had as small a following as Comte. Gautama’s power over the people arose in a great degree from the glow of his practical philanthropy, which

did not shrink in the struggle against the abuses most peculiar to his time; his philosophy and his ethics attracted the masses, from whose chained hands they struck off the manacles of caste, and in leaving the school for the world they insensibly became a religion. But there is no reason to believe that Gautama intended either at the beginning or the end of his career to be the founder of a new religion. He seems to have hoped that the new wine would go into the old bottles, and that all men, not excepting even the Brahmins, would gradually adopt his, the only orthodox, form of the ancient creed. However the question of the historical succession or connection between the different systems of Hindu philosophy be ultimately settled, whether any of them were post-Buddhistic or not, they afford at least sufficient evidence that beliefs very inconsistent with the practical creed of the masses met with little opposi- tion from the priests so long as they were taught only in schools of philosophy; and Buddhist morality was not calculated to excite anger or hatred. But the very means which Gautama adopted to extend and give practical effect to his teaching, while giving it temporary success, led to its ultimate expulsion from India. It was his Society rather than his doctrine, the Sangha rather than the Dharma, which both gave to his religion its practical vitality and excited the active hostility of the Brahmins. .

The SANGHA or Society, the Buddhist-Order of Mendicants. —It was a logical conclusion from the views of life held by Gautama that any rapid progress in spiritual life was only compatible with an ascetic life, in which all such contact with the world as would tend to create earthly desires could be reduced as much as possible; and accordingly from the first he not only adopted such a mode of life for himself but urged it on his more earnest disciples. He contem- plated no such division between clergy and laity as obtains in Christian countries, and constantly maintained that there was no positive merit in outward acts of self-denial or penance; but holding that family connections and the possession of wealth or power were likely to prolong that mistaken estimate of the value of things, that clinging to life which was the origin of evil, he taught that to forsake the world was a necessary step towards the attainment of spiritual freedom. Little by little, as occasion arose, he laid down rules for the guidance of those who thus devoted themselves to the higher life, and insensibly as he did SO,

1 On Nirvana, see Gogerly, Journal of the R. A. S., Ceylon Branch, 1867-1870, Part i. p. 180; Alvis, Buddhist Nirvana, Colombo, 1871 ; Childers, Pali Dict., sub. v., Nirvana; Burnouf, Jntr., 18-20, 78, 83,. 155, 516-522, and esp. 589 et seq., and Lotus, 355 ; Hardy's Zastern Monachism, 280-809 ; Bigandet, p. 320-323 ; Wassilief, Der Bud- dhismus, p. 101. On the other side, Prof. Max Miller, Buddha- ghoshe's Parables, xxxix-xlv.: Mohl, Journal Asiatique, 1856, p. 94; and Obry, Du Nirvana Bouddhique, Paris, 1868.

the Society became more and more like one of the monkish orders which sprung up afterwards in the west. But not even now has the order becomea priesthood. It possesses 1o mystic powers of regeneration or confirmation or absolu- tion from sin; it works no miracles by consecration or by prayer, and its doors are always open alike to those who wish to enter and to those who wish to leave it. Ina system which acknowledged no Creator and no God, the monks could never become the only efficient intercessors between man and his Maker; and since salvation was held to be and to depend upon a radical change in man's nature, brought about by his own self-denial and his own self-control, the monks could never obtain power over the keys of heaven and hell. When successive kings and chiefs were allowed to endow the society, not indeed with gold or silver, but with the few necessaries of the monkish life, including lands and houses, it gradually ceased in great measure to be the school of virtue or the most favourable sphere for intellectual progress, and became thronged with the worthless and the idle; but in the time of its founder it undoubtedly contained few besides those who longed under his guidance first to train themselves and then to preach to others the glad tidings of rest ; that hope, to us so uninviting and so cold, to them—to whom life, under their glowing sky and under the oppressive weight of tyranny in church and state, was a burden too heavy to be borne —to them so welcome and so sweet, of utter rest in annihilation. For admittance to the Society no other credentials were at first required than the simple wish of the applicant; afterwards on different occasions a few neces- sary conditions were imposed, the applicant being obliged to state that he was free from contagious disease, consump- tion, and fits; that he was neither a slave nor a debtor nor a soldier, that is, that he was suc juris; and

that he had obtained the consent of his parents. At first, also, the candidate was admitted without any ceremony by merely shaving his head, putting on the yellow robes, and leading an ascetic life ; afterwards a simple ceremony was adopted, probably identical with that now in use in Ceylon, an excellent accoant of which has been given in the Journals of the Ceylon Asiatic Society for 1852 and of the Royal Asiatic Society for 1873. At first also there is no mention of any distinction within the ranks of the society ; but the preparatory rank of novice was very early introduced, and later on, as the religion became more and more corrupted, the order became more and more subdivided, until in Tibet, in the 14th century, we find a complete episcopal hierarchy.

fiules of the Order.—The most usval names applied in the sacred books to the senior members of the order are Sramana and Bhikshu, and to the novices Samanera. The first, from which the third is derived, means one who exerts himself, controls himself; the second means simply a beggar. Self-conquest and poverty, then, were to be the distinguish- ing characteristics of the “sons of Sakya,” but it was not left to them to decide for themselves how far this self- suppression and abstinence were to be carried. The teacher gave a number of rules and directions which have been handed down to us more or less correctly in the Vinaya, the first part of the Buddhist canon, and which are summed up in the “ Patimokkha,” a book which, though not included in the canon, cannot. be much later than the great council of Asoka, about 250, and is regarded with much reverence by the monks, from its having from time immemorial been ordered to be read twice monthly in every monastery. These rules may be roughly divided into two divisions, those which are obligatory, and those which, not being obligatory, are recommended to such as wish to work out their own salvation to a point further than that attainable by the ordinary rules. And first, as to food. No monk can eat solid food except between sunrise and noon, and

total abstinence from intoxicating drinks is obligatory. The usual mode of obtaining food is for the monk to take his begging-bowl, a brown earthenware vessel, in shape nearly like a soup tureen without its cover, and

holding it in his hands, to beg straight from house to house. He is to say nothing, but simply stand outside the hut, the doors and windows of which in India are usually large and open. If anything is put into his bowl he utters a pious wish on behalf of the giver and passes on; if nothing is given he passes on in silence, and thus begs straight on without going to the houses of the rich or luxurious rather than to those of the poor and thrifty. As the food of all classes consisted almost exclusively of some form of curry, the mixture was not so very incongruous, and when enough had been given, the monk retired to his home to eat it, thinking the while of the impermanence and worth- lessness of the body which was thus nourished, and of the processes through which the food would have to pass. To express a Buddhist idea in the quaint words of Herbert, “Take thy meat, think it dust, then eat a bit, and say withal, Earth to earth I commit.” From the first it was permitted to wealthy or pious laymen to invite one or more monks to take their mid day meal at their houses, and this was frequently done, especially on full moon days ; it was also allowed to the laity on special occasions to bring food to the monastery. For the stricter monks further vows are mentioned of abstinence from animal food, of eating the whole meal without rising, of refusing all invitations and all food brought to them, of eating everything in the bowl without leaving or rejecting anything, and so on; but it is doubtful whether they are ever observed now, and they were formerly taken only for a time. Much later a practice sprung up of the order possessing rice fields, letting them out to be cultivated on condition of receiving a share of the produce, and then having their meals cooked at home by some lay follower or even slave.

As regards residence, Gautama considered a lonely life in the forest to be the most conducive to self-conquest ; but as he himself, after having lived apart from the world, spent his life from the commencement of his prophetic career among men, so from the first the lonely life was adopted only by the most earnest, and that only for a time. The majority of the monks lived in companies in groves or gardens, and very soon the piety of laymen provided for them suitable monasteries, several of which were built even in the lifetime of Buddha, During the fine weather the monks often travelled from place to place, as their teacher did, but during the rainy season they always settled in one spot in or near a town; and near the ancient cities of India have been lately discovered extensive ruins on the

site of the monasteries mentioned in the Pali books. On the other hand, there have been found numerous rock caves, many of which, especially in Ceylon, were evidently meant for solitary hermits, and they often bear inscriptions in the old Pali character, brought by Asoka's son Mahendra to Ceylon in the 3d century B.c.

As regards clothing, the monks were to be habited in clothes of no value, put together from cast-off rags; but here again the practice of Buddha himself, and that followed by the large majority of the brethren, was to dress in simple robes of dull orange colour, first torn to pieces and then sewed together again, so as to form two under garments, and one upper garment to cover the whole of the body except the right shoulder. All three are simply lengths of cotton cloth ; the two under ones, the antara-vasaka and the sanghati, being wrapt round the middle of the body, and round the thighs and legs respectively; and the upper one, the uttarasanga, being first wrapt round the legs and then drawn over the left shoulder. The colour was probably at first chosen as the one regarded with most contempt,

because of its being nearly the same as that of very old rags of the common white cotton cloth, and because cloths of that colour were of no value at all for ordinary purposes ; but the orange-coloured robes, from their very peculiarity as a sign of the members of the Sangha, soon came to be looked upon as an honour, and were sought after on that account alone; so that the Dhammapada, a collection of ethical verses, one of the books in the Buddhist canon, has to give a warning that those who are not free from sin (kasava) are not worthy of the orange colour (kisdva). In Buddhist countries men's ordinary dress is merely a cloth wrapt round the loins, whereas the monks are to cover the whole body, and are not permitted at any time to lay their robes aside. To do so would be to lay aside their membership of the order, to put on or to put off the robes being current ex- pressions for joining or leaving the Society. Of course no ornaments are allowed, and even the natural ornament of hair is not permitted, complete tonsure bemg obligatory on all, No monk should possess more than one change of robes, and minute rules in detail are laid down to guard against any brother even

by indirect methods taking any steps to procure himself new ones; to provide them spon- taneously is the duty and privilege of the laity.

It is scarcely necessary to state that sexual intercourse, theft, and murder entail upon the culprit irrevocable expul- sion from the order; while the ease with which the Society could be left provided an escape for those who found the vow of continence too hard to keep. On the vow of poverty a few words ought to be said. In his individual right no monk is to possess more than the following eight articles: 1, 2, 8, the three robes mentioned above ; 4, a girdle for the loins ; 5, an alms-bowl; 6, a razor; 7,a needle; 8, a water-strainer, through which he is to strain all he drinks— not only to remove impurities, but also and chiefly to pre- vent the accidental destruction of any living creatures. This individual vow of poverty has however been swallowed up by the permission given to the community to possess not only books and other personal property, but even lands and houses. Gautama himself is said to have received such gifts on behalf of the Sangha, which at the time of its expulsion from India must have rivalled in wealth the most powerful orders of the Middle Ages ; and in some Buddhist coun- tries at the present day the Society possesses enormous tracts of the most valuable land. But water-drinking celli- bates, who take only one meal a day, and dress in a simple uniform, could never indulge in unbounded personal luxury. Many metnbers of the order enjoy the fascinating sense of wealth, so completely contrary to all the principles of their religion, and to the precepts laid down by their Teacher for the attainment of spiritual progress; they are often lazy and not seldom avaricious ; but in the southern church at least they are not disgraced by gluttony or drunkenness, and have never given way to the weak vanity of dress, or of the pomp and pride of ritual.

The vow of obedience was never taken by the Buddhist monks or nuns, and in this may be noticed a fundamental difference between them and their brethren and sisters in the West. Mental culture, not mental death, was the aim set before the Buddhist ascetic by the founder of his order. Each one is to conquer self by himself; and the observance of no ceremony, the belief in no creed, will avail him who fails in obtaining this complete self- mastery. Outward respect and courtesy to his superiors are exacted from the novice, but his own salvation and his usefulness as a teacher depend on his self-culture. He is to obey not his brother, but the law; his superior has nu

supernatural gifts of. wisdom or of absolution, and by himself must the ascetic stand or fall. A few simple rules of discipline are laid down, but the highest punish- ment is to compel the fallen brother to return to the world,

which he has not sufficient self-control to reject. Twice a month, when the rules of the order are read, a monk who has broken them is to confess his crime. If it be slight some slight penance is laid upon him, to sweep the courtyard of the wihara, or to sprinkle dust round the sacred Bo tree, but no inquisitorial questions are put toany one. Charges may be brought against a monk for breach of the ordinances laid down by Buddha, and must then beexamined into bya chapter, but none can change or add to the existing law, or claim obedience from any other member of the order, however young.

The daly life of the novice should, according to a manual in Sinhalese called Dina Chariyawa, be about as follows. He shall rise before daylight and wash, then sweep the wihara and round the Bo tree, fetch the drinking water for the day, filter it, and place it ready for use. Returning toa solitary place he shall then meditate on the regulations. Then he shall offer flowers before the sacred digaba or Bo tree, thinking of the great virtues of the Teacher, and of his own faults. Soon after, taking the begging-bowl, he is to follow his superior in his daily round for food, and on their return is to bring water for his feet, and place the alms-bowl before him. After the meal is over, he is to wash the alms-bowl, then ayain retire, and meditate on kind- ness and love. About an hour afterwards he is to begin his

studies from the books, or copy one of them, asking his |

superior about passages he does not understand. At sun- set he is again to sweep the sacred places, and lighting a lamp, to listen to the teaching of his superior, and repeat such passages from the canon as he has learnt. If he finds he has committed any fault le is to tell his superior; he is to be content with such things as he has, and, keeping under his senses, to grow in wisdom without haughtiness of body, speech, or mind.1 The superiors, relieved by the novices from any manual labour, were expected to devote themselves all the more ‘earnestly to intellectual culture and meditation.

There are five principal kinds of medi- tation, which in Buddhism takes the place of prayer. The first is called Maitri-bhaivana, or meditation on Love, in which the monk thinks of all beings, and longs for happi- ness for each. First, thinking how happy he himself would be if free from all sorrow, anger, and evil desire, he is then to wish for the same happiness for others; and lastly, to long for the welfare of his foes, remembering their good actions only, and that in some former birth his enemy may have been his father or his friend, he must endeavour in all earnestness and truth to desire for him all the good he would seek for himself. The second is Karuna-bhavana, or meditation on Pity, in which he thinks of all beings in distress, realizes as far as he can their un- happy state, and thus awakens the sentiment of pity. The third meditation is Mndita-bhavana, or meditation on Gladness, the converse of the last. The fourth is Asubha- bhavana, or Purity, in which the monk thinks of the vileness of the body, and of the horrors of disease aud cor- ruption, how everything corporeal passes away like the foam of the sea, and how by the continued repetition of birth and death mortals become subject to continual sorrow. We hear of the mirage in the desert cheating the unwary traveller's eyes with the promise of water to quench his burning thirst ; but this mirage of human life, raising hopes of joy that turns bitter in the drinking, is a more real mockery. The fifth is Upeksha-bhavana, or the meditation on Serenity, wherein the monk thinks of all things that men hold good or bad,—power and oppression, love and hate, riches and want, fame and contempt, youth and

beauty, decrepitude and disease,—and regards them all with.

fixed indifference, with utter calmness and serenity of mind.

1 For Dina ehariyawa, see Hardy, Hastern Monachism, 24-28 ; for the five meditations, ibid. pp. 243, et seq.

nothing in comparison with character or insight.

BUDDAITS®

The Duty of the Laity.—Gautama's ideal was that all men should sooner or later join the order, and thus that an end should be put at once to individual existence and to misery and sin; but even those who did not enrol them-

selves in the Sangha could obey many of the precepts, and

by a virtuous life here raise themselves in their next birth to a higher and less material state of existence. Laymen could thus take the “three refuges,” and keep five of the “ten precepts,” viz., not to take life, to steal, to lie, to commit adultery or fornication, or to drink strong drink.? There are also ten commandments applicable to the laity, viz., to avoid taking life, theft, illicit intercourse, lying, slander, swearing, idle talk, covetousness, anger, and wrong belief, 7.¢., either superstition, doubt, or heresy; the first three are sins of the body, the next four sins of the mouth, the last three sins of the mind. The following short ex- tracts from the Buddhist Scriptures will perhaps give a better idea of the lay position in the Buddhist system than any longer description in modern terms. In answer to a question as to what he considered the summum bonum, Gautama is reported to have said—

“1. To serve wise men, and not to serve fools, to give honour to whom honour is due,—this is the greatest blessing. 2. To dwell in a pleasant land, to have done good deeds in a former birth, to have right desires for one’s self, —this is the greatest blessing. 3. Much in- sight and much education, a complete training and pleasant speech, —this is the greatest blessing. 4. To snecour father and mother, to cherish wife and child, to follow a peaceful calling,—this is the greatest blessing. 5. To give alms, and live righteously, to help one’s relatives, and do blameless deeds,— this is the greatest bless- ing. 6. To cease and abstain from sin, to eschew strong drink, not to be weary in well doing,—this is the greatest blessing. 7. Rever- ence and lowliness, contentment and gratitude, the regular hearing of the law,—this is the greatest blessing. 8. To be long-suffering and meek, to associate with members of the Sangha, religious talk at due seasons,—this is the greatest blessing. 9. Temperance and chastity, a conviction of the four great truths, the hope of Nir- vana,—this is the greatest blessing. 10. A mind unshaken by the things of the world, without anguish or passion, and secure, — this is the greatest blessing. 11. They that act like this are invincible on every side, on every side they walk in safety, and theirs is the greatest blessing.” 3

Self-conquest and universal. charity, these are the fonnd- ation thoughts, the web and the woof of Buddhism, the melodies on the variations of which its enticing harmony is built up. Such a religion could never remain buried in

the cloister, or remain the privilege of the few. From the first it became an appeal to the many, and addressed itself not to the learned or the rich but to all mankind, to men and women, slaves and bondinen, Brahmins and Siidras, nobles and peasants alike. The abuses of caste and priest- craft could no longer grow and thrive among men whio looked at every question from a rationalistic standpoint, while their hearts were aglow with real and practical philanthropy. In Guatama's view men differed one from another not: by the accident of birth, but by their own attainments and character; the same path to the same salvation lay equally open to all; and even in this life the poor and the despised were welcomed to the ranks of the order, where wealth was abandoned, and birth went for It is true that, like Christianity, it did not in so many words condemn any of the political institutions amid which it arosc ; there

| 1s nothing said, at least in the older books, against slavery

or despotism or wealth; and even as regards caste, Gautama did not directly interfere with it outside the limits of his Society. But the new wine soon burst the old bottles ;

2 Hardy, Manual of Buddhism, p. 460.

- 3 The above is from the Pali text of the Khuddaka Patha, edited by Childers, in the Journal of the Royal As. Soc., new series, vol. iv. part ii. Translations have been published by Prof. Childers, Joc. cit. ; by Sir Coomara Swamy in his Sutta Nipdta, p. 72; and by Gogerly, in the Ceylon Friend for June 1839.

the principles of the new crecd were quite inconsistent with oppression and wrong of every kind; and the government of Asoka, as Buddhist emperor of India, was probably the most enlightened, and certainly the most philanthropic, which the natives of India have had.

Part Il1.—Larrer Buppuism.

It is not surprising that teaching so earnest and so high, so deep-reaching and so radical, should have met with eager acceptance among a people intensely religious, to whom the doctrines of the priests held out so little hope in exchange for the privileges it claimed from them on behalf of an oppressive caste. It is only to be regretted that the history of Buddhism in India lies under so thick a cloud that very little is known of it with certainty. Imme diately after the death of Gautama the first council of 500 was held at Rajagriha, as related above, and the young church, in the vigour of its purity and fresh enthusiasm, spread very rapidly among the surrounding tribes. In less than 150 years after the death of its founder, the new religion had become the most powerful in Northern and Central India, and was the state religion of Magadha, whose kings claimed the superiority over the whole peninsula. It probably continued to gain in the number of its adherents till two or three centuries later, but soon after the com- mencement of our cra it began to decay ; though Fa Hian, a Chinese pilgrim, who visited India about 400 a.p., found it still flourishing over a large area, it was certainly not increasing, and scarccly maintaining its ground. Hiouen Thsang, another Chinese pilgrim, has left us an account of his journey made about two centuries later, and he found Buddhism in a much lower condition even than it had fallen to in the time of Fa Hian. In the 8th and 9th centuries a great persecution arose, and the Buddhists were so utterly exterminated that there is now not a Buddhist in all India ; although of course the effects of so great a movement could not pass away, and it left its mark for ever on the Hinduism which supplanted it. The full reasons for this revolution are not known: but so much is clear, that long before its expulsion Buddhism had become very cor- rupt; the order had become wealthy and idle; and the laity, instead of following the precepts of the Teacher, had gone back to the old devil-worship, witchcraft, and astrology, which always underlay thcir nominal beliefs. From the great body of his followers the ethics and philo- sophy of Guatama were concealed by the mass of legends and superstitions which had grown up around the story of his life ; and though the Buddhists no longer propitiated the favour of the gods by sacrifices of living beings, they rested their hopes more on their liberality to the monks than on the hardcr duties of self-control and charity,—the latter

word having thus become even more limited in its meaning

than it has among ourselves. Thcir worship of the relics of the Buddha came very near to rank idolatry; their reverence for their ancestors came very near to worship, and was a dangerous source of emolument to the monks ; while the old Hindu gods were regarded much more highly than was at all consistent with the Buddhist Abhidharma Buddhism had, however, been introduced into Ceylon, at a time when it was comparatively pure, by Mahendra and Sanghamitra, the son and daughter of the emperor Asoka. It became at once the state religion, and the only religion of the island, on which Brahminism had never gained much hold. Protected there by its isolated-position, and by the patriotic spirit which identificd it with the Sinhalese nation, whose hereditary enemies, the Tamils, were first Jains and afterwards Hindus, it has retained almost its pristine purity to modern times. From Ceylon it was introduced into Burma in the 5th century a.D., whence it

penetrated into Arakan, Kambaya, and Pegu, and finally into Siam in the 7th century of our era. As already mentioned, it became, in a Jess pure form, the state religion of Kashmir about the time of Christ, and was thence carried to Nepal and to Tibet and China. It would be impossible within the limits of this article to trace its various fortunes in these countries, but the following remarks may not be out of place. It would be hazardous as yet to attempt to trace chrono- logically the growth of the Buddhist legends, but in one or other of the Buddhist books are found the following ideas, the growth of which was, under the circumstances, almost inevitable. Gautama himself became regarded as omni- scient, and as absolutely sinless ; he was supposed to have descended of his own accord from heaven into his mother’s womb, and to have had no earthly father ; angels were said to have assisted at his birth, immediately after which he walked three paces, and in a voice of thunder proclaimed his own greatness. On his formal presentation to his father, an aged saint is said to have worshipped him and pro- phesied that he would become a Buddha, who would show the people the way of salvation. When the babe was five months old, he was left under a tree, where he meditated so deeply that he worked himself into a trance; and five wise men who were journeying northwards through the air, being miraculously stopped over the place where he was, came down and

worshipped him, the hymn put into their mouths surprising us in the midst of so absurd a legend by its beauty ; in five stanzas they announce that the babe shall be the teacher of a law which shall be the water to extinguish all the fires of the sorrows of life, the light to enlighten the world, and the chariot to carry us through this wilderness to the promised land; that he shall deliver men from the bonds and shackles of the world, and be the great physician to heal all their diseases, and do away with the miseries of life and death. The only other legend we have of his youth is one in which he is said to have surpassed all his contemporaries in feats of bodily and mental skill, and even to have taught his teachers,—the later forms of this legend bearing a curious resemblance to some parts of the apocryphal ‘‘ Gospel of the Infancy.” In the accounts of his father’s home and of his marriage he is surrounded with all the state and wealth of the eldest son and heir to a powerful monarch, whereas it is apparent from the geographical and other details that his father’s power can only at most have extended a few miles from his home. It was a pious task to make his abnegation and condescension greater by the comparison between the splendour of the position he abandoned and the poverty in which he afterwards lived; and in countries distant from Kapilavastu the inconsistencies between these glowing accounts and the very names they contain would pass unnoticed by credulous hearers, With the same object of magnifying the person of Buddha, he is related in the legends to have performed at various times a very large number of miracles, mostly mere manifestations of power of no direct advantage to any one, and only designed to impress those who beheld or might hear of them with a belief in his great superiority over other teachers. Of several of thesc legends we have different versions in authorities of different ages, and it is exceedingly interest- ing and instructive to notice how the supernatural parts of the story gradually grow. Among the northern Buddhists of Kashmir, Tibet, Nepal, and China, these legends have assumed much larger dimensions than among the southern Buddhists in Burma, Siam, and Ceylon, the former having evolved a theory of the spirit of the Buddhas still working in the church, while the latter remain at the standpoint appareut in the canon as fixed by the council of Asoka. The amplification of Buddhism by its northern disciples will be described under the heading Lamaism. It is

enough to notice here that it is called by them the Great Vehicle, in contradistinction to that of the southern church, which they call, not without some contempt, the Little Vehicle ; and the Great Vehicle, while holding fast to the real foundation of Buddhism, its ethical views of self- conquest and charity, has in fact developed an entirely new' religion. This is based on the worship of Maitreya, the Dhyani-buddhas, Manjisri, and Avalokitéswara, personi- fications respectively of charity, meditation, serenity, and wisdom. The first of these appears in ancient Buddhism as the name of the Buddha to come, and the last is the holy spirit of the northern Buddhist church. Among the Dhyani-buddhas, who are philosophical abstractions cor- responding to the earthly Buddhas, Amitabha, 2.¢., Infinite Light, is the heavenly counterpart of Gautama, and soon took the most important place. Avalokitéswara " pro- ceeded" from him, and manifests him to the world since the death of Buddha; and his worship in the 10th century of our era bore its full fruit in the invention of a being, Adibuddha, the origin of all things, who, using the wisdom within him, produced by meditation the five Dhyani- buddhas, of whom Amitabha is the fourth,—a notion curiously similar to the theosophy of the Gnostics, and utterly opposed to the Agnostic materialism of Buddha.

In Tibet especially, the development in doctrine was followed by a development in ecclesiastical government, which runs so remarkably parallel with the development of the Romish hierarchy as to awaken an interest which could scarcely otherwise be found in the senseless and fatal corruptions which have overwhelmed the ancient Buddhist beliefs. The Buddhism introduced into that country in the 7th and 8th centuries of our era was a form of the Great Vehicle, already much corrupted by Siva-ism, a mixture of witchcraft and Hindu philosophy; but it worked a great change among the savage races who then inhabited those remote valleys. In the 13th century the country was possessed by independent chiefs, who struggled with the abbots of the great monasteries for power over the people ; and the crozier proved itself in the long run more powerful than the sword. We then find the two leading priests or archbishops, the Pantshen Lama and the Dalai Lama, claiming to be official incarnations of Amitabha and Avalokitéswara ; and the latter as such succeeded in obtain- ing superior political and secular power, leaving to his brother pope his high ecclesiastical position and the aroma of holiness—a division of power

which has again resulted in a Guelph and Ghibelin-like rivalry. Lamaism, with its shaven priests, its bells and rosaries, its images and holy

BUDGELL, Eustace (1685-1736), a literary man of some eminence in his time, the son of Dr Gilbert Budgell, was born at St Thomas, near Exeter. He was educated at Christ Church, Oxford, from which he removed to the Inner Temple, London; but instead of studying law, he devoted his whole attention to literature. He was befriended by Addison, who was first cousin to his mother, and who, on being appointed secretary to Lord Wharton, lord-leutenant of Ireland in 1710, took Budgell with him as one of the clerks of his office. Budgell, who had read the classics and the best English, French, and Italian authors, took part with Steele and Addison in writing the Tatler. He was also a contributor to the Spectator and the Guar- dian,—his papers being marked with an X in the former, and with an asterisk in the latter. He was subsequently made under-secretary to Addison, chief secretary to the lords justices of Ireland, and deputy-clerk of the council, and was afterwards chosen a member of the Irish parlia- ment. In 1717, when Addison became principal secretary

water, its popes and bishops, its abbots and monks of many grades, its processions and feast-days, its confessional and purgatory, and its worship of the double Virgin, so strongly resembles Romanism, that the first Catholic missionaries thought it must be an imitation by the devil of the religion of Christ ; and that the resemblance is not in externals only is shown by the present state of Tibet — the oppression of all thought, the idleness and corruption of the monks, the despotism of the Government, and the poverty and beggary of the people.

Of the sacred books of the Northern Buddhists, we have in the original debased Sanskrit only the "' Lalita Vistara" a legendary life of Buddha, published in the Bibliotheca Indica at Calcutta, the trans- lations of which are mentioned in the beginning of this article. Of the canon of the Southern Buddhists, which is about twice the length of our Bible, we have in the original Pali only—1. the Dhammapada, a collection of didactic poems edited by Mr Fausbéll of Copenhagen, with a Latin translation in 1855; 2. The Khuddaka Patha, a small collection of hymns published by Professor

Childers, with English translation, Journal of the Royal Asiatic Society for 1869 ; and 8. The Upasampada-kammavaca, the ritual by which laymen areadmitted to the order, published by Mr Dickson in the Journal of the Royal Asiatic Socicty for 1873. The Patimokkha, a manual of the rules of the order in Pali, has been published by Mr Minayeff with a Russian translation, in 1867. A fuller account by the writer of this article of all the work already accomplished in the editing of Pali texts, dictionaries, and grammars, will be found in the Report of the Philological Society for 1875. Of European works on Buddhism the following are the most important, and references will be found in them to the many smaller treatises on the subject:—Eugéne Burnouf, Introduction a Vhistoire du Bouddhisme Indien, 1844, and Le Lotus de la Bonne Lot, 1852; The Rev. Spence Hardy's Hastern Monachism, 1850, Manual of Buddhism, 1860, and Legends and Theories of the Buddhists, 1866, all compiled from Sinhalese sources; Bishop Bigandet's Legend of the Burmesc Buddha, 1858, 2d edition 1866 ; St Julien's Histoire de la vie de Hiouen Thsang, 1853, and Mémoires sur les contrées occidentales, 1856 ; Professor Lassen's Indische Altcrthwms-kunde, vol. ii. 1849, 2d edition 1875 ; Wassilief Der Buddhis- mus, scine Dogmcn und Literatwr, 1860, of which a French translation appeared in Paris in 1865 ; Képpen's Religion des Buddha, vol. i. on Southern Buddhism, 1857, vol. ii. on Lamaism, 1859; The Rey. Samuel Beal's Yravcls of Fa Hian and Sung Yun, 1869, Catena of Buddhist Scriptures from the Chinesc, 1871, and Romantic His- tory of Sdkya Buddha from the Chinese-Sanskrit, 1875 ; Captain Rogers's Buddhaghosha's Parables (from the Burmesc), with intro- duction by Professor Max Miiller, 1870 ; Schlagintweit's Buddhism in Tibet, 1863; A. Schiefner, Hine Ttbetische Lebensbeschrcibung Schakjanumis, 1849; Hodgson, Hssays, 1874. A very large number of other writings on Buddhism have also been published either separately or in different learned journals in Europe and India. Those who wish to refer to those papers will find a list, very complete up to date, of all works, large or small, on the subject*™i Otto and Ristner's Buddha and his Doctrines, a biblio- graphical essay published in 1869 by Messrs Triibner and Co. of London. (T. W. R. D.)

of state in England, he procured for Budgell the place of accountant and comptroller-general of the revenue in Ireland. But the next year, the duke of Bolton being appointed lord-lieutenant, Budgell wrote a lampoon against

Mr Webster, his secretary, in which the duke himself was not spared. ‘This led to his removed from his post of accountant-general, upon which he returned to England, and, contrary to the advice of Addison, published his case ina pamphlet. In the year 1720 he lost £20,000 by the South Sea scheme, and afterwards spent £5000 more in unsuccessful attempts to get into parliament. This com- pleted his ruin, He at length employed himself in writing pamphlets against the ministry, and published many papers in the Craftsman. In 1733 he began a weekly periodical called the Bee, which he continued for above a hundred numbers. By the will of Dr Matthew Tindal, who died in 1733, a legacy of 2000 guineas was left to Budgell ; but the bequest (which had, it was alleged, been inserted in the will by Budgell himself) was successfully disputed by

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Tindal’s nephew and nearest heir, the continuator of Rapin’s Lhistory of England. ence the satirist— ‘Let Budgell charge low Grub Street on my quill, And write whate’er he please—except my will.”

It was thought that he had some hand in publishing Dr Tindal’s Christianity as Old as the Creation ; for he often talked of an additional volume on the subject, but never published it. After the cessation of the Bee, he became so involved in lawsuits that he was reduced to very distressing straits. He then studied law, and was called to the bar, attending the courts for some time; but being unable to make any progress, and finding his prospects utterly ruined, he determined to put an end to his life. Accordingly, in 1736, he took a boat at Somerset-stairs, after filling his pockets with stones, ordered thé waterman to shoot the bridge, and while the boat was passing under it threw him. self into the river. On his desk was found a slip of paper with the words—‘‘ What Cato did, and Addison approved, cannot be wrong.”

Besides the works mentioned above, he wrote a transla- tion of the Characters of Theophrastus He never mar- ried, but left one natural daughter, who afterwards assumed his name, and became an actress at Drury Lane.

BUDGHT (lit. a bag or small sack), the name applied to an account of the ways and means by which a minister of finance purposes to defray the

expenditure of the state. In the United Kingdom the chancellor of the exchequer, usually in April, lays before the House of Commons a statement of the actual results of revenue and expenditure in the past finance year ending March 31, showing how far his estimates have been realized, and what surplus or deficit there has been in the income as compared with the expendi- ture. This is accompanied by another statement in which the chancellor gives an estimate of what the produce of the revenue may be in the year just entered upon, supposing the taxes and duties to remain as they were in the past year, and also an estimate of what the expenditure will be in the current year. If the estimated revenue, after allowing for normal increase of the principal sources of income, be less than the estimated expenditure, this is deemed a case for the imposition of some new, or the increase of some existing, tax or taxes. On the other hand, if the estimated revenue shows a large surplus over the estimated expenditure, there is room for remitting or reducing some tax or taxes, and the extent of this relief is generally limited to the amount of surplus realized in the previous year. The chancellor of the exchequer has to take parliament into confidence on his estimates, both as regards revenue and expenditure ; and when the taxation and expenditure obtain the assent of parliament, the results as thus adjusted become the final budget estimate for the year. This system of annual review and adjustment of the public finances obtains not only in the British colonies, but is carried out, with remarkable despatch for so great an empire, in British India. The Indian budget, giving the results of income and expenditure in the year

ending December 31, and the prospective estimates, is.

laid before the Imperial Parliament in the course of the ensuing session. The budget, though modified by different forms, has also long been practised in France, the United States, and other constitutional countries, and of late years has in some cases been adopted by arbitrary powers. Russia began the publication of annual budgets in 1866; Egypt has followed the example; and Turkey, if financially reinstated, will have to submit to a more strict account of her income and expenditure. Apart from national budgets, to be discriminated (1) as budgets passing under parlia- mentary scrutiny and debate from year to year, and (2) budgets emitted on executive authority,

there are in all the greater countries local and municipal taxations and expendi-

tures of only less account than the national. The ordinary budget of the city of Paris has increased from £1,600,000 in the reign of Louis Philippe to £8,000,000 at the present time; while the extraordinary budget, relating chiefly to public improvements and the city debt, is over £4,000,000 more. In federal governments, such as the United States, the German Empire, or the Argentine Republic, the budgets of the several states of the federation have to be consulted, as well as the federal budget, for a knowledge of the finances. The local taxation of the United Kingdom is equal to nearly one half the imperial revenue, and requires in its various provinces the same process of examination. The budget is an essential part of the machinery of representative Governments ; and in the rapid progress of state loans, it has begun to be acknow- ledged by despotic Governments as a necessary basis of confidence between them and their creditors,

BUDWEIS (in Bohemian, Ceske Budegovice) the capital of a circle in the Austrian kingdom of Bohemia, is situated on the right bank of the Moldau, at its junction with the Maltsch, in 48° 59’ N. lat. and 14° 30’ E. long. It is well built and partially fortified. Chief among its public buildings are the council house—a handsome structure, and the cathedral, with a great detached tower, built ‘in 1500; it has also an episcopal palace, two gymnasiums, a theological seminary, a training college, a deaf and dumb institution, a theatre, a hospital, and a poorhouse; and a short distance to the north stands the castle of Frauenburg, belonging to Prince Schwarzenberg. Its manufactures are very various, and comprise pottery, nails, wire, parquetry, musical instruments, black-lead pencils, sugar, beer, vinegar, and liqueurs. There are silver and gold mines in the mountains to the east of the town, which are stil] worked with considerable profit. The railway from Budweis to Linz, laid in 1827 for horse-cars, was the first line con- structed in Germany. Budweis was founded by Ottocar IL. in 1256, and was received into the number of privileged cities by Frederick II. In 1611 the town was captured by the people of Passau, but was retaken by the imperial

general Bonquoi, In 1742, it was besieged by the Bavarians. Population in 1869, 17,413.

BUENOS AYRES, the largest and most important province of the Argentine Republic, is bounded on the N. by the Parana, which separates it from the province of Entre Rios, and by the provinces of Santa Fé, Cordova, and San Luis; on the E. by the Atlantic; on the S. by Patagonia; and on the §. and W. by the country of the Indians, which extends westwards to the Andes. The area of the province is estimated at about 440,000 square miles. Its seaboard along the Rio de la Plata and the ocean is upwards of 900 miles in length. According to the last census of 1869 the population was 488,706, of which 171,404 belong to the city of Buenos Ayres ; in the present year (1876) it may be estimated at 600,000, of which 220,000 belong to the city, and 380,000 to the province. By the last returns the number of immigrants is from 60,000 to 90,000 per annum, the greater part of whom remain in the province of Buenos Ayres.

The general aspect of the country, as viewed from the sea, is eminently uninteresting. From the mouth of the Plata to the Bahia Blanca the sea-line presents an unbroken series of sand-dunes, varied here and there with low ridges of rock. From this latter point to the Patagonian frontier, the aspect of the coast is less monotonous, though equally destitute of life or interest. Though Buenos Ayres is the only province of the Argentine Republic that borders upon the sea, and though all the exports and imports of the country pass through it, it possesses very few harbours. One of these (that of the city of Buenos Ayres) is extremely bad ; another (that of Bahia Blanca, near the southern

extremity of the province), possesses great natural advan- tages, which are by no means adequately appreciated. It might be turned to good account as a starting-point for vessels engaged in trade with the South American states that border upon the Pacific, but the difficult and some- times dangerous navigation of the adjoining seas counter- balances in the meantime the other advantages which it offers. The interior of the country, except where it is intersected by the low mountain ranges of the Ventana and Vaulcan in its southern portions, and the spurs of the Andes in the west, is one vast plain,

of which by far the larger part is laid out in estanczas, or cattle farms, though the soil is in itself well adapted for producing all the European cerealia, Agricultural pursuits, however, are by no means in favour with the natives, who cannot bring themselves to engage in any pursuit that cannot be prosecuted on horseback. ‘‘ Every man, woman, and child in the country rides,” says Parish. “One might fancy one’s self in the land of centaurs, amidst a population half-men, half-horses. Even beggars ride on horseback.” Some of the cattle-farms are of immense extent ; one in particular is mentioned by travellers as comprising more than 300 square miles of land, and yielding an enormous revenue to the proprietor. Some of the largest of them belong to British settlers, and are worked by British servants. The cattle were formerly hunted down and killed merely for the sake of their hides and tongues, while the carcases were abandoned to beasts and birds of prey. They are now slaughtered in abattoirs, where every part of the animal is made available. The beef is salted for exportation; the tallow is boiled down, and now forms an important item in the farmer’s revenue ; and the trade in hides is steadily increasing, Beef and an infusion of the native tea are the staple food of the natives. In the province of Buenos Ayres there are 45,500,000 sheep, which give a yield of 136,500,000 fb unwashed wool; 5,116,000 cows; and 1,500,000 horses. This gives the unusual average of 200 sheep, 20 cows, and 6 horses to every inhabitant. The sheep-farms cover over 40,000,000 acres; and the number of shepherds may be estimated at 30,000, of whom at least a quarter are Irish or Scotch. The total value of exports from Buenos Ayres in 1872 was £9,148,638,—the most important being wool 203,610,000 ib, sheep-skins 72,970,000 tb, ox and cow-hides 3,121,758, jerked beef 916,220 qq., tallow 1,182,240 qq. The value of imports in 1872 may be stated approximately at’ £12,600,000, of which Great Britain contributed £3,800,000, France £3,200,000, Spain £800,000, Brazil £700,000, United States £700,000, Italy £600,000, Belgium £600,000, Germany ££00,000, other countries £1,200,000.

Of the cereals grown in Buenos Ayres the most import- ant is maize, which is indigenous to the country, Wheat thrives well in the southern parts of the proviuce, but the in- habitants rarely grow more than enough to supply their own necessities. In the event of a surplus it is commonly exported to Brazil. The vine, fig, orange, and olive have been intro- duced from the Old World,

and are found to suit the climate admirably ; but the most valuable of European fruits is the peach. A considerable fruit trade is carried on in coasting vessels by merchants for the most part Italian or French,

The geographical position of Buenos Ayres is such as to enable it completely to control the foreign commercial relations of the entire republic of which it forms a part. The exclusive policy which it has always pursued on this point has often involved it in serious quarrels, not only with many of the South American states and the other pro- vinces of the Argentine Republic, but with England and France. Since the expulsion of General Rosas, the-naviga- tion of the Parana and Uruguay has been thrown open, and other measures have been taken to place both the province

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BUENOS AYRES

and city of Buenos Ayres on a level with the other pro vinces of the republic.

The only towns of any importance, besides the capital, are San Nicolas, which is situated on the Parana, abont 200 miles N.W. of Buenos Ayres, and contains a population of about 10,000; San Pedro, also on the Parana, about 150 miles from the capital, in the same direction, with a population of 1000; Chascomus, on a lake of the same name, a place of considerable importance ; Dolores, 150 miles south of Buenos Ayres ; Villa de Mercedes, Chivilcoy, Las Flores, and Belgrano.)

Buenos Ayrss, the capital of the Argentine Republic and of the province of Buenos Ayres, is situated on the right bank of the estuary of the La Plata, in 34° 39’ S. lat. and

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Plan of Buenos Ayres.

HsPlaza de Mayo and the Areades.

4. Vietoria Theatre. 5. University and Mu- seum.

A Reeoleta Cemetery.

B Plaza Libertad.

C Plaza Marta or Del | K Plaza Monserrat. Retiro, and Statue | L Plaza Independencia.

San | M Mercado Constitucion

6. Colon Opera House.

of General 7. Arehiepiseopal Palace.

Martin. i and Railway Station. 8. Cathedral. D Plaza del Parque. | N Mereado de Septiembre , 9. Congress Hall. — E Arsenal. : and Railway Station. | 10. Franco – Argentine

Theatre. {1. Custom House ana Government House.

1. Barraeks. 2. Railway Station. 3. Colisio Coneert Hall.

F Plaza Lorea and Mar- | et. G Plaza Vietoria.

opposite bank, and at the same time so shallow, that ships drawing 15 or 16 feet of water must anchor seven or eight miles from the city. Small craft generally anchor in what are called the inner roads, abreast of the city. The depth of water is never sufficient to admit of their coming to shore.

The town of Buenos Ayres is situated in a vast plain extending westwards to the Andes. The level uniformity of its outline is only broken by the spires of the various churches, The stranger, on landing, is struck with the

regularity of the streets, which are quite straight, and intersect each other at distances of 150 yards, forming squares like those of a chess-board, with the cleanly appear- ance of the houses, and the general air of independence that distinguishes the inhabitants. The houses till lately had never more than two stories, and commonly only one, the rooms of which open into each other, and were chiefly supplied with furniture of a very inferior description from the United States. A chimney was a thing unknown, and the old Spanish brazero alone was employed in heating the damp and white-washed rooms.

Of the public buildings may be noticed the Government house, which is situated on the beach, a residence for the president of the Republic; the cathedral, which is sur- mounted by a handsome dome, and has a large portico with twelve Corinthian pillars ; the cabildo or town-house, in. which justice is administered ; the churches of La Merced, San Francisco, and San Domingo; and the custom-house. The Plaza dela Victoria, round which some of these edifices are grouped, is the handsomest square in Buenos Ayres. In the centre of it is a handsome monu- ment, erected as a memorial of the War of Independence. When the number of British residents in the town began rapidly to increase application was made to General Rosas for a site for a church. This was immediately granted, and the minister for the time being set an example of liberality and toleration to his countrymen by laying the foundation-stone of the edifice, which cost in all about £4000, half of which was defrayed by the British Government. The Scottish residents have built a small Presbyterian chapel, and the Roman Catholic portion of the English subjects are allowed the use of one of the national churches, in which a priest performs the service. In 1842 the Methodists erected a meeting-house, which is used by all denominations of the British Dissenters. The Protestant Germans, who are pretty numerous, have a church in connection with the Established Church of Prussia. To each of these places of worship schools are attached for children of both sexes. The

facilities for education are very considerable, and of these the inhabitants avail themselves extensively. Besides the denominational schools already alluded to, there is a university, attended by about 500 students, and possessing a valuable library. The sons of the wealthier families of the city are very frequently sent to Europe to complete their education at

some of the great schools and colleges in France and |

England. The Buenos Ayreans inherit from their ancestors much of that passion for music which characterizes the Spaniard. Poetry also is much cultivated among them. Besides its university, Buenos Ayres contains many literary and scientific institutions. Of these the most important are the school of medicine, the academy of jurisprudence, a special academy of mathematics and the physical sciences, a normal school, and a society for the promotion of agti- culture. The charitable societies, though not very numer- ous, are rather important. Spanish is the language spoken by the Buenos Ayrean descendants of the old Spanish settlers.

Buenos Ayres was founded in 1535 by a Spanish expedition under Don Jorge de Mendoza, who landing at this place after many hard- ships, bestowed upon it the name it now bears in commemoration of the fine weather which prevailed at that time. At first he endeavoured to conciliate the native Indians, but hostilities soon broke out, and, despite their utmost efforts, the Spaniards were obliged to abandon the new settlement ; and after almost incredible difficulties succeeded in reaching Asuncion in Paraguay, with their numbers reduced by three-fourths. In 1580 another expedition under Don Juan de Garay took possession of the site of the old fort and established themselves there, founding cities and establishing settlements in every direction with such success that in 1620 a new government was erected, under the name of the government of the Rio de la Plata. _ Buenos Ayres became the capital, and the seat of a new bishopric created at this time by Pope Paul V., at the request of Philip III. of Spain. After the lapse of a century, Buenos Ayres began to rise into suchimportance as to excite the jealousy and alarm of the home Government. The insane restrictions imposed upon her foreign and internal commerce led only to continual heart-burnings with the parent country, and

Buenos Ayres soon became a rendezvous for the smugglers of such nations as were strong enough to set Spain at defiance. After numerous modifications of its government, and of its relations to the parent state, the provinces of the Rio de la Plata were in 1776 crected into a vice-royalty, of which Buenos Ayres continued to be the capital. Two ycars later the old commercial restrictions were abolished and a new commercial code promulgated, so liberal as to be called the ‘‘ Free-Trade Regulations.” According to the old system the Buenos Ayreans were only allowed to export merchandise to the Portuguese settlements in Brazil, and the quantity was limited to 2000 fanegas of wheat, 500 quintals of jerked beef, and 500 of tallow. All intercourse with other countries was strictly prohibited. By the new system, nine ports in Spain, and twenty- four in the colonies were declared puertos habilitados, or ports of entry. The effects of the new policy was immediately visible. Of hides, forinstance, the staple commodity of the country, the exports to Spain before 1778 only amounted to 150,000 annually; after that year they rose to from 700,000 to 800,000. In 1805, and again in 1807, the British invaded Buenos Ayres; and though the natives applied for assistance to the home authorities, they were told that they must defend themselves as they best might, as Spain could send them no help. They accordingly rose in arms, and twice expelled the invaders. In the following year they were threatened with invasion by the prince regent of Portugal. The resolution which they displayed on the occasion prevented that prince from insisting upon his claims. In 1810 the circumstances of the country involved the establishment of a provisional junta,— a policy which was construed by the Spanish Cortes into an act of rebellion. A civil war ensued ; and Ferdinand, on his restora- tion after the expulsion of the French from Spain, instead of trying to conciliate the malcontents by timely concccssions, obstinately refused to accede to their lawful demands. The result of this was that, on the 9th of July 1816, deputies from the provinces of the Rio de la Plata assembled in congress at Tucuman, solemnly declared their separation from Spain, and_ their deter- mination to constitute a free and independent state. Buenos Ayres continued to be the capital of the new republic, which was governed by authorities constituted in that city. The exclusive policy of the capital soon bred discontent in the provinces, the governors of which began to cry out for a federation in opposition to the Central Government of Buenos Ayres. By their influence the new constitution, which conferred on a chief magistrate residing in the capital

very extensive civil and military powers over the whole republic, was repudiated, and a civil war was the consequence. Various assemblies were held, and attempts were made to establish the constitution on a sufficiently wide basis to reconcile the interests of all parties—but always without success ; and from 1827 till the expulsion of Rosas in 1852, no meetings of the constituent assembly took place, After 1827, the confederation was obliged to delegate to the Executive Government of Buenos Ayres the undivided charge of the national business, such as the management of the public debt, the maintenance of relations with foreign powers,

the defence of the country in the event of war, &c. While these internal dissentions were going on, war was declared between the young confederation and the empire of Brazil, and Buenos Ayres was blockaded for a year and a half by a Brazilian fleet. In 1828, however, the siege was raised by the intervention of the English, and by the decisive battle that took place at Ituzaingo favourable to the Argentine arms. This foreign war thus ended, the civil war broke out once more, and was only temporarily checked by the accession of General Rosas to power in 1835. Aiming at territorial aggrandizement, Rosas soon became involved in war with the neighbouring states of Paraguayand Uruguay. England, France, and Brazil interfered, with the intention of effecting an amicable arrange- ment between the belligerents. Rosas rejected their mediation ; and the united fleets of England and France took possession of the Buenos Ayrean fleet which was engaged in the siege of Monte Video, and opened the navigation of the Parana to the merchant- men of all nations. In the subsequent operations Rosas sustained severe losses, yet obstinately refused to yield. In 1848 the English fleet returned home, and was followed by the French in the follow- ing year. Brazil was now left to carry on the war alone, but she found ready allies in some of the provinces of the Argentine Confederation, which had long regarded with hatred and aversion the supremacy arrogated by Buenos Ayres. With the assistance of these and the adjoining states of Uruguay and Paraguay, a large army was raised, which, under the command of General Urquiza, defeated Rosas at the battle of Monte Caseros,

February 3, 1852. Rosas after his downfall fled to England. Urquiza was appointed provisional director of the confederation ; but the Buenos Ayreans protested against his policy, which threatened to undermine the prerogatives they had been long struggling to secure. Civil war again broke out ; and in 1853 Buenos Ayres was besieged by the forces of the other states of the confederation. On the 20th of June the siege was raised, and a temporary accommodation effected.

Since the establishment of the Argentine Republic in 1861 the city and province of Buenos Ayres have both very considerably developed their resources. In the province there are now 450 miles of railway, and 2228 miles of telegraph lines ; in the city there are six lines of tramway, which traverse the town in every direction. Most of the railways and three of the tramway lines belong to English companies. There are thirteen different lines of steamers trading between Europe and the Port of Buenos-Ayres. Population (1876) estimated at about 220,000.

BUFFALO, the English name of Bubalus,a genus of Ruminant Mammals, belonging to the family Bovidew, and including the well-known Indian and South African species. The Indian Buffalo (Bubalus buffalus) is characterized by its arched forehead, large horns compressed at the base, slightly triangnlar, and curved in the form of a half moon, and its thick hide covered sparingly with coarse hairs, which become still more scanty in aged individuals. It is a native of India and of the islands forming the Indo-Malay Archipelago, where it now occurs in a state of domestication, and forms a valuable beast of burden ; but although it has for ages been under the control of man, the Bainsha or tame buffalo shows little or no variation from the wild form. The Arna or Wild Buffalo is found in great herds through- out India and the adjacent islands, frequenting swampy grounds in the neighbourhood of woods, eating the long, coarse grass which abounds in such localities, and loving above all things to roll itself in mire, or to plunge up to the ears in any pool or stream it may come upon. ‘This fondness for moisture is equally marked in the tame variety, and is decidedly inconvenient when the animal, laden with goods, yields to its instinct and lies down in any stream that may cross its path, The rutting season occurs in autumn, when several females follow a single male, forming for the time a small herd. The period of gestation lasts for ten

months, and the female produces one or two calves at a birth, The Arna is a powerful and courageous animal, capable it is said of overthrowing an elephant, and generally more than a match even for the male tiger, which usually declines the combat when not impelled to it by hunger. The Indian driver of a herd of tame buffaloes does not shrink from entering a tiger-frequented jungle, his cattle, with their massive horns, making short work of any tiger that may come in their way. Buffalo fights and fights between buffaloes and tigers form principal features in the public entertainments of Indian princes. In Ceylon the

buffalo is put to more useful purposes, where, according to Tennent, the natives make an ingenious use of it when shooting waterfowl in the salt marshes. ‘“ Being an object to which the birds are accustomed, the Singhalese train the buffaloes to the sport, and concealed behind the animal, browsing listlessly along, they guide it by ropes attached to its horns, and thus creep undiscovered within shot of the flock.” These are known as “sporting buffaloes.” The domestic buffalo has spread from its original home in India over the greater part of Southern Asia and of North Africa, and was introduced towards the close of the 6th century into Greece and Italy, forming an invaluable beast of burden in the marshy districts of those countries, where the great breadth of its feet, somewhat resembling in this respect those of the reindeer, give it a decided advantage over the horse and ox. It grazes in herds in the Pontine marshes, where, according to Scaliger, it will lie for hours submerged almost to the muzzle. The milk of the buffalo is plentiful and of excellent quality, the Hindoos making it into a kind of butter called ghee ; its flesh, however, is not held in much estimation.

The Cape Buffalo (Bubalus caffer) is nearly equal in size and fully equal in strength and courage to its Indian congeuer, from which it is readily distinguished by the form of its horns, these being immensely broad at the base, where they approximate so closely as almost to meet, thus forming, especially in old bulls, a solid rugose mass impenetrable to bullet, and extending from the eye to the back of the head, then spreading horizontally and curving upwards and inwards to the tips, which are usually 4 feet apart. ‘The hide, which is thick and tough, is thinly clad with hair, old animals

being entirely naked with the excep- tion of a slight fringe along the back and withers. This buffalo roams in herds over the plains of Central and Southern Africa, always in the near vicinity of water. Formerly herds sometimes numbered five or six hundred, but such has been the havoc wrought among them in recent years by hunters that rarely are they to be seen in com- panies of more than ten, while in the colonized portion of South Africa they are rapidly dying out. Nor is man their only enemy, for by night when he ceases to disturb they are liable to the attack of the lion, and by this means the wounded, of which there are great numbers, and the diseased are cut off. The Hon. W. H. Drummond, in his work on The Large Game of South Africa (1875), gives it as his opinion that in “a few years a buffalo will be as scarce as an elephant now is.” This species has never been domesticated, probably owing more to the uncivilized condition of the native inhabitants than to any special intractability in the buffalo itself. Like its Indian ally it is fond of the water, which it visits at regular intervals during the twenty-four hours; it also plasters itself with mud which, when hardened by the sun, protects it from the bite of the great gadflies which in spite of its thick hide seem to cause it considerable annoyance. It is also relieved of a portion of the parasitic ticks, so common on the hides of thick-skinned animals, by means of the red- beaked rhinoceros birds, a dozen or more of which may be seen yartly perched on its horns and partly moving about on its back, and picking up the ticks on which they feed. The hunter is often guided by these birds in his search for the buffalo, but oftener still they give timely warning to their host of the dangerous proximity of the hunter, and have thus earned the title of “the buffalo’s guardian birds.” The Cape Buffalo is the most formidable of the large game of South Africa. Generally, however, it attacks only when wounded, although‘ rogues ” or “soli- taires*—terms applied to old bulls which for some reason or other have been expelled from the herd and which wander about morose and savage— often attack without

provocation. When wounded they immediately charge in the direction from which the fire proceeded, and on his skill in avoiding this charge the life of the hunter depends. In buffalo hunting, as in bison hunting, it is specially

impor- tant “ to kill with a single bullet.” The hide of the Cape Baffalo is made by ihe Kaffres into shields impervious to musket shot.

BUFFALO, an American city, the capital of Erie County, in the State of New York, U.S., about 293 miles N.W. from New York, in 42° 53’ N. lat. and 78° 55’ W. long. It is a port at the east end of Lake Erie, at the mouth of Butfalo River, and at the head of Niagara River, which is here crossed by a fine iron railroad bridge. The city runs for about five miles along the shore of the lake and Niagara River. In population Buffalo is the third city in New York, and the eleventh in the United States. It was founded in 1801, became a military post in 1813, and was bummed by the British on the last day of the year 1813. After the war, the place was rebuilt, and in 1832 it attained the rank of a city. In 1820 it contained 2095 inhabitants. After the opening of the Erie Canal in 1825, its growth was rapid, the population being 8653 in 1830, 18,213 in 1840, 42,261 in 1850, 81,129 in 1860, 117,714 in 1870, and 134,238 in 1875. The city commands a fine view of the lake ; the climate is pleasant and healthful ; the streets,

broad and generally lined with trees, are well paved, lighted, –

and supplied with sewers. There are many fine residences with attractive grounds, and numerous squares and public places. A combination of parks or pleasure grounds has been laid out, extending to over 500 acres. It comprises three sections, situated respectively in the northern, western, and eastern parts of the city, connected by boulevards which together afford a drive of nearly 10 miles. The most prominent public buildings are the City and County Hall, a granite structure, in the form of a double Roman cross, with a tower 245 feet high, just erected at a cost of over $2,000,000; the United States Custom House and Post Office, the State Arsenal, and the Erie County Penitentiary, which is one of the six penal establishments of New York, intermediate between the reformatories and the state prisons. A state asylum for the insane is in process of construction at North Buffalo, with a front of about 2700 feet and a capacity for 600 patients. I+ will be one of the largest institutions of the kind in the United States, and will cost not less than $3,000,000. The city contains 76 churches, the most imposing edifices being St Joseph’s Cathedral (Roman Catholic) and St Paul’s (Episcopal). The public schools comprise a central grammar school and thirty-six

district schools. Four orphan- asylum schools are also maintained. One of the eight state normal schools is situated here. Among other educa- tional institutions are Canisius College, founded by the Jesuit fathers; St Joseph's College, conducted by the Christian brothers; Martin Luther College (theological) ; St Mary's Academy and Industrial School for girls, and the Medical College of the University of Buffalo. The charitable institutions of the city are numerous. There are several libraries, the most important being that of the Young Men's Association, with about 30,000 volumes, and the Grosvenor Free Library, which contains about 15,000 volumes of valuable reference works. The former society has a commodious hall and library building adjoining. The Society of Natural Sciences has made an extensive collection of minerals and fossil casts, and the Buffalo Historical Society has a large library and cabinet. There are published in the city eight daily newspapers, includ- ing four in German, one tri-weekly, fourteen weeklies, four monthlies, and three quarterlies. The city is divided into thirteen wards, and is governed by a mayor and twenty- six aldermen. It has a paid fire department, with steam

fire-engines and a fire-alarm telegraph, has an efficient police, and is well supplied with water from the Niagara, River. The assessed value of property in 1873 was about

$38,000,000.

The position of Buffalo on the great water and railway channels of communication between the West and the East gives it a commercial importance surpassed by that of few other American cities. Its harbour is capacious, and is protected by extensive breakwaters. The city is the centre of an important system of railroads. Besides other lines which converge here, it is the eastern terminus of the Lake Shore and Michigan Southern Railway, of the Canada Southern, and of a branch of the Grand Trunk Railway of Canada ; it is the western terminus of the Erie Canal, the New York Central Railway, and a division of the Erie Railway. There has been a large decrease in the extent of the lake commerce since 1862, owing to the increase of railroad facilities. The registered marine of the port, June 30, 1874, comprised 801 vessels of 162,789 tons, of which 533 were canal

boats. The annual value of the imports from Canada is between $2,000,000 and $3,000,000 ; the exports are less than $500,000. Since 1870 Buffalo has been a port of foreign entry for imports, which are con- veyed thither, in bond, by rail from New York, &. The number of lake vessels that arrived in 1874 was 3720; the clearance numbered 3727; 7643 canal boats arrived, and about the same number cleared; the latter carried 1,448,172 tons of freight, valued at $46,244,875. The immense quantities of grain moving from the Western States to the seaboard constitute the most important feature of the commerce of the city. The aggregate receipts (including flour) by lake and Grand Trunk and Canada Southern Railways in 1874 were 70,030,555 bushels. The receipts during the ten years ending with 1874 amounted to 522,874,944 bushels. For receiving, storing, and transferring this vast amount of produce to canal boats and railway cars, there are thirty elevators, capable together of storing 6,875,000 bushels, and of trans- ferring no less than 2,672,000 bushels a day. Many of these elevating warehouses are costly structures of stone, or of iron and brick. Several of them have grain “ driers ” attached. Live-stock and lumber from the Western States and Canada, and coal from Pennsylvania, are also leading items in commerce. In 1874, 504,594 cattle, 783,800 sheep, 1,431,800 hogs, and 21,937 horses, amounting in in value to nearly $60,000,000 passed through Buffalo. For the accommodation of this traffic, extensive and well-arranged yards have been erected at the east end of the city. The receipts of lumber by lake in 1874 amounted to 145,624,639 feet, besides about 40,000,000 shingles, and 25,000,000 staves. The imports of coal comprised 800,000 tons. The coal trade is rapidly increasing. The manufacturing interests of Buffalo are extensive, and have grown with marked rapidity in recent years. The leading establishments are blast furnaces, rolling-mills, foundries, breweries, tanneries, manufactories of agricultural imple- ments, and flour-mills. Of the last-named there are eleven, with a yearly capacity of 839,000 barrels, the average annual production of flour being about 250,000 barrels. Wooden ship-building was formerly carried on here, but it has been superseded by iron ship-building. Two extensive establishments are devoted to this industry; these have constructed the finest lake steamers, besides supplying the Government witli a number of iron revenue vessels. The number of ships built at Buffalo in 1874 was thirty-seven, but they were mostly small ones. Many canal boats are also built there.

BUFFIER, Craupe (1661-1737), a writer ou grainmar and history of considerable note, but more remarkable for his researches in psychology and metaphysics, was born in

Poland May 25, 1661, of French parents, who returned to their native country shortly after their son's birth, and settled at Rouen. He was educated at the Jesuits' college there, aud was received into the order at the age of nineteen. Soon after his admission a dispute with the archbishop regarding certain points in theology compelled him to leave Rouen. He went to Rome, but did not long remain there ; and on his return to France he retired to the college of the Jesuits at Paris, where he spent the rest of his life, studying and writing, and fulfilling with much success his duties as a college lecturer. He seems indeed to have been an admirable teacher, having, as his works show, a great power of lucid and precise exposition. Buffier's object in his T'ratté des vérités premiéres, his best known philo- sophical work, is to discover the ultimate principles upon which all knowledge is based, to lay down " propositions so clear and obvious that they can neither be proved nor refuted by other propositions of greater perspicuity." The basis of all human knowledge and the foundation of every other truth he finds in the sense we have of our own exis- tence and of what we feel within ourselves. He thus takes as the foundation of his philosophy substantially the same ground as Descartes, cogito ergo sum; but the superstruc- ture is reared on very different principles. Descartes tried to reach a knowledge of the not-self by an a@ priorz or

metaphysical proof of the divine existence. Buffer rejects'

this sort of evidence as useless. I want, he in effect says, to obtain a certain knowledge of what is distinct from myself, and this I can never do by mere metaphysical demonstration, which only gives me the hypothetical cer- tainty of ideas logically connected together; in order to know what exists distinct from myself I must have re- course to "'common sense." Common sense he defines to be "that disposition which nature has placed in all or mest men, in order to enable them, when they have arrived at the age and use of reason, to forma common and uniform judgment with respect to objects different from the internal sentiment of their own perception, which

judgment is not the consequence of any anterior principle.' The truths which this "disposition of nature" obliges us to accept can neither be proved nor disproved; they are admitted in all countries and at all times; and they are practically followed by all men, even by those who reject them speculatively. But Buffier does not claim for the truths of common sense the same absolute certainty as characterizes either the knowledge we have of our own existence or the logical deductions we make from our thoughts; they possess merely the highest probability, and the man who rejects them is, as he pointedly puts it, to be considered a fool, but he is not in so doing guilty of a con- tradiction. The greater part of the 7'razté is devoted to an enumeration and exainination of those truths. They are such as the following :—" There are other beings and other men in the world besides myself ;" "All men have not combined to deceive me." But axioms like "2+4+2=4," or "the whole is greater than a part" are mere logical con- nections of ideas, not truths of common sense. Buffier's aversion to scholastic refinements and unmeaning defini- tions has not unfrequently given to his writings an appear- ance of shallowness and want of metaphysical insight ; but his merit as one of the earliest to recognize the psycho- logical as distinguished from the metaphysical side of Descartes's principle, and to use it, with no inconsiderable skill, as the basis of an analysis of the human mind, similar to that enjoined by Locke, will always be acknowledged. In this he has anticipated the spirit and method as well as many of the results of Reid and the Scotch school. The Traité appeared in 1717, and was followed in 1724 by the Liléments de Métaphysique. Buffier also wrote a "French Grammar on a new plan," and a number of historical

essays. Most of his works appeared in a collected form iu 1732, and an English translation of the Zratté was pub- lished in 1780.

BUFFON, Gerorce Louis Lecterc, Comre DE, was born on 7th September 1707, at Montbard, in Burgundy, and died at Paris on. the 15th April 1788. His father, M. Leclere de Buffon, was councillor of the Burgundian parliament, and his mother, Anne Christine Marlin, appears to have possessed considerable natural gifts. Buffon was the eldest of five children, and does not seem to have been in any way a precocious child. On the

contrary, he seems from his earliest years to have been characterized more especially by great perseverance, patience, knowledge of the value of time, and exceptional powers of steady appli- cation and protracted labour. He was originally destined to his father's profession, and studied law at the college of Jesuits at Dijon ; but he soon exhibited a marked predilec- tion for the study of the physical sciences, and more particularly for mathematics. Whilst at Dijon he made the acquaintance of Lord Kingston, a young Englishman, who was at the time staying there along with his tutor, a man of ability and discernment. In this agreeable com- panionship, Buffon travelled through Italy, being then nineteen years of age. Returning to France, he commenced to study at Angers, still in company with Lord Kingston ; but having quarrelled with a young Englishman at play, and subsequently wounded him, he was compelled to leave this town. He thereupon removed to Paris, and during his sojourn in the capital he translated Newton's //uaions and Hales's Vegetable Statics, which he subsequently presented to the Academy of Sciences. From Paris he proceeded to England, where he remained three months ; but his travels seem to have ended here. At twenty-five years of age he succeeded to a considerable property, inherited from his mother, and from this time onward his life was a completely independent one, and he was enabled to devote himself entirely to his scientific pursuits. He returned now to France, and lived partly at Montbard and partly at Paris.

Though loving pleasure, and not keeping himself free from the prevalent vices of the age in which he lived, Buffon spent the remainder of his life in regular scientific labour, employing an amanuensis, and thus securing a permanent record of his work. At first he directed his attention more especially to mathematics, physics, and agriculture, and his chief original papers are connected with these subjects. In the spring of 1739 he was elected a member of the Academy of Sciences; and at a later period of the same year he was appointed keeper of the Jardin du Roi and of the Royal Museum, This appears to have finally deter- mined him to devote himself to the biological sciences in particular, and he commenced to collect materials for his Natural History. In the preparation of this voluminous work, he associated with himself Daubenton, to whom the descriptive and anatomical portions of the treatise were entrusted, and the first three volumes made their appear- ance in the year 1749. In the year 1752 (not in 1743 or 1760,

as sometimes stated), he married Marie Frangoise de Saint-Belin. He seems to have been fondly attached to her, and felt deeply her death, which took place at Mont- bard in 1769. The remainder of Buffon's life, as a private individual, presents nothing of special interest. He belonged to a very long-lived race, his father having attained the age of ninety-three, and his grandfather eighty-seven years. He died himself at the age of eighty-one, of vesical calculus, having refused to allow of any operation for his relief. He left one son, George Louis-Marie Leclerc, who was an officer in the French army, and who died by the guillotine, at the age of thirty, on the 10th July 1793 (22 Messidor, An II.), having espoused the party of the duke of Orleans.

BUG—BUG

Buffon was a member of the French Academy, perpetual treasurer of the Academy of Sciences, Fellow of the Royal Society of London, and member of the Academies of Berlin, St Petersburg, Dijon, and of most of the learned societies then existing in Europe. Of handsome person and noble presence, endowed with many of the external gifts of nature, and rejoicing in the social advantages of high rank and large possessions, he is mainly known by his published scientific writings. Without being a profound original investigator, in the modern sense of this term, Buffon possessed considerable power of generalization, along with the art of expressing his ideas in a clear and generally attractive form. His chief defects as a scientific writer are, that he was given to excessive and hasty generalization, so that his hypotheses, however seemingly brilliant, are often destitute of any sufficient basis in observed facts, whilst his literary style is not unfrequently theatrical and turgid, and a great want of method and order is commonly observable in his writings.

His great work is the Histoire Naturelle, générale et particuliére; and it can undoubtedly claim the merit of having been the first work to present the previously isulated and apparently disconnected facts of natural history in a popular and generally intelligible form. The sensation which was made by its appear- ance in successive parts was very great, and it certainly effected much good in its time by generally diffusing a taste for the study of nature. For a work so vast, however—aiming, as it did, at being little less than a

general encyclopedia of the sciences,—Buffon's capacities may, without disparagement, be said to have been in- sufficient, as is shown by the great weakness of parts of the work (such as that relating to mineralogy). The Histoire Naturelle passed through several editions, and was trans- lated into various languages. The edition most highly prized by collectors, on account of the beauty of its plates, is the first, which was published in Paris (1749-1804) in forty-four quarto volumes, the publication extending over more than fifty years. In the preparation of the first fifteen volumes of this edition (1749-67) Buffon was assisted by Daubenton, and subsequently by Guéneau de Montbéliard, the Abbé Bexon, and Sonnini de Manon- court. The following seven volumes form a supplement to the preceding, and appeared in 1774-89. These were succeeded by nine volumes on the Birds (1770-83), and these were followed by five volumes on Minerals (1783-88). The remaining eight volumes, which complete this edition, appeared after Buffon's death, and comprise Reptiles, Fishes, and Cetaceans. They were executed by Lacépéde, and were published in successive volumes between 1788 and 1804, A second edition was commenced in 1774 and completed in 1804, in thirty-six volumes quarto. It is in most respects similar to the first edition, except that the anatomical descriptions are suppressed, and the supplement recast. Of the remaining editions of Buffon, the best is that which was commenced under the editorship of Lamouroux, and completed under that of Desmarets, in forty volumes octavo (1824-32). It is the only modern edition in which the anatomical descriptions of Daubenton are preserved. Though not without his enemies—scientific and clerical—Buffon had many warm friends, and his death was marked by the delivery of highly laudatory addressess, by Condorcet at the Academy of Sciences, Vicq-d'Azir at the Académie Frangaise, and Bressonet before the Society of Agriculture. Extravagantly belauded by some, and vehemently attacked by others, we can recognize his merits without blinding ourselves to his defects.

This brief notice of his life may be fitly closed by the following quotation from Cuvier, in which the great French naturalist, whilst rejecting some speculations which recent

science has generally accepted as probable, ascribes to Buffon the honour of being the first to clearly apprehend what is now admitted as the true principle of guidance in investigating the order of the universe :—“ It is impossible to defend, in all their details, either the first or the second of Buffon’s theories of the earth. This comet which strikes off portions of the sun, these vitrified and incandescent planets which refrigerate by degrees, some more rapidly than others, those organized beings which appear successively on the surface of the planets, as their temperature becomes sufficiently lowered, can only be regarded as flights of fancy. But Buffon has not less the merit of having been the first to point out clearly that the actual condition of the globe is the result of a succession of changes, of which we can find the evidences to-day ; and it is he who first drew the observa- tion of all investigators to the phenomena by which these changes can be unravelled.” (H. A. N.) BUG, a name common to all the species belonging to the Cumicide, a family of Hemipterous Insects, the best known example of which is the House Bug or Bed Bug (Cimex lectularius), This disgusting insect is of an oval shape, of a rusty red colour, and, in common with the whole tribe to which it belongs, gives off an offensive odour when touched ; unlike the others, however, it is wingless, The bug is pro- vided with a proboscis, which when at rest lies along the inferior side of the thorax, and through which it sucks the blood of man, the sole food of this species, It is nocturnal in its habits, remaining concealed by day in crevices of bed furniture, among the hangings, or behind the wall paper, and shows considerable activity in its nightly raids in search of food. The female deposits her eggs at the begin- ning of summer in crevices of wood:and other retired situa- tions, and in three weeks they emerge as small, white, and almost transparent larve. These change their skin very frequently before undergoing metamorphosis, which in their case is “incomplete,” the pupa closely resembling the perfect insect, and attaining its full development in eleven weeks, Two centuries ago it was a rare insect in Britain, and probably owes its name, which is derived from a Celtic word signifying “ghost” or “goblin,” to the terror which its attacks at first inspired. Other species of bugs suck the blood of many of the lower warm-blooded animals, but the majority, as in the genus 7%ngis, confine themselves to the juices of plants. BUGENHAGEN, Jonann (1485-1558), surnamed Pomeranus, a German Reformer, was born at Wollin, in Pomerania, on the 24th June 1485. He was educated at the university of Greifswald, and gained high

distinction as a classical scholar. In 1505 he was made rector of a school at Treptow, and was soon afterwards selected by the abbot of a neighbouring convent as one of the lecturers to the monks. In 1520 he received a copy of Luther's work on the Babylonish captivity, which speedily wrought a change in his views. He warmly embraced the principles of the Reformation, and succeeded in bringing over the aged abbot and several others. He made his way to Wittenberg in the following year, was warmly received by Luther and Melanchthon, and quickly became a foremost man in the Reformation movement. He was specially qualified for organizing the new church, and his activity spread itself over a wide district. In 1528 he arranged the church affairs of Brunswick and Bamburg; in 1530 those of Lubeck and Pomerania. In 1537 he was invited to Denmark by king Christian III, and remained five years in that country, organizing the church and schools. He passed the remainder of his life at Wittenberg, braving all the perils of war and persecution rather than desert the place that was dear to him asthe home of the Reformation. He died on the 20th April 1558. Among his numerous works is a history of Pomerania, which remained un-published till 1728, Pomerania in IV. Libros Divisa,

BUGULMA, a town of European Russia, in the govern- ment of Samara, 243 miles from the city of that name, on the small river Bugulminka, a sub-tributary of the Volga, in 54° 32' N. lat. and 52° 47' E. long. The town rose into existence about 1741-5, and was peopled by soldiers, exiles, and peasants. During the Pugacheff insurrection it was vainly besieged by the rebels. In 1781 it was made a town of the Ufa government; in 1806 it was transferred to Orenburg, and in 1851 to Samara. Its principal importance is derived from its situation at the junction of two great roads from Ufa and Orenburg, by which it maintains an extensive transit trade. A great annual fair is held from 14th to 21st of September (o. s.). Population in 1867, 5455.

BUGURUSLAN, a town of European Russia in the government of Samara, situated at the junction of the rivers Kinell and Tarkhanka, 177 miles E.N.E. of Samara, in 53° 39' N. Jat. and 52° 25' E. long. It dates from about 1748, and in the time of the Pugacheff revolt was the scene of the outrages of Karpofi's band. Its changes from government to government coincide with

those of Bugulma. The principal buildings are two or three churches, a inonastery, a hospital, anda caravanserai. It manufactures leather, wax, potash, and beer, and carries on a_ pretty extensive trade. There are two annual fairs. Population in 1867, 7450.

BUHLE, Joann Gorriies (1763-1821), distinguished as a scholar and an historian of philosophy, was born at Brunswick, and graduated at the university of Gottingen, where he obtained a chair at a very early age. Thence he was called to the professorship of ancient languages at Moscow. After his return to Brunswick he was appointed to the chair of natural law, which he held till his death in 1821. Buhle's activity was great, and the productions of his pen are numerous. He edited Aratus and part of Aristotle (the Bipontine edition, 5 vols.), the first volume of which is a masteily survey of Aristotelian literature. His fame, however, is principally derived from his labours on the history of philosophy. The Geschichte der philos. Vernunft, 1793, was suspended after the first volume, but the Handbuch der Geschichte der Philosophie, 8 vols. 1796-1804, ig a vcry complete and valuable work. More important than either of these is the Geschichte der neuern Philosophie, forming one of the great series of histories of the sciences from the Renaissance. It is a work of much learning, and is well written ; its faults are general weakness in critical appreciation and want of due sense of proportion. The History of Modern Philosophy has been translated into French, 6 vols. 1806.

BUHL-WORK, otherwise Bool, Boule, or Boulle-work, is a kind of inlaying and ornamentation of cabinet-work, so named after the inventor André Charles Boule, a celebrated French cabinetmaker (1642-1732). By a happy selection of different woods from India and Brazil, arranged with great taste, and the use of brass, ivory, gold, tortoise- shell, &c., Boule produced upon his furniture arabesques and pictures, representing a variety of animals, flowers, and fruits; and he finally succeeded in producing historical scenes, as battles and hunts, landscapes, and other artistic effects. Louis XIV. appreciated his abilities, gave him lodgings in the Louvre, and, in 1672, appointed him engraver in ordi- nary of the royal seals. In the patent authorizing this he reccived also the designations of 'architect, painter, carver in mosaic, artist in cabinet-work, chaser, inlayer, and de- signer of figures." His skill was great in all these branches, and he carried

them to a high degree of artistic perfection in timepieces, screens, furniture, and other articles. He worked for the royal residences and for foreign princes, and attained fortune and position.

The beginnings of art in carving are found amongst the

relics of prehistoric races, and when it arrived at the degree of perfection it afterwards attained in the East, inlaying was a natural result. We find this to have been practised by the ancient Egyptain and other Asiatic races. Its attendant, veneering, was also employed by them, workmen applying the veneer with glue being represented on the Egyptian monuments. As civiliza- tion advanced westward, the Greeks and Romans followed in the art, the latter race inlaying their furniture with marquetry or tarsia-work, using ivory, ebony, box, palm, bird's-eye maple, beech, and other woods. Their bronze articles they damascened with ornaments of the precious metals and metallic amalgams. 'The spirit of the Middle Ages was adverse to the development of this art, and but few traces of it are found. In the South Kensington Museum is a coffer of cypress, with flat surface imagery filed in with coloured wax composition, that dates from the 14th century. The Venetians derived their marquctry from Persia and India, as is indicated by the geometric pat- — terns inlaid with ivory, metal, and woods, stained of various colours. Florence took a prominent place in this manufac- ture in the 15th century. Certosina-work was the result ; it was so called from the great Certosa, Charterhouse, cr Carthusian monastery, between Milan and Pavia, in the choir-fittings of which this kind of ornament, ivory inlaid into solid cypress and walnut wood, is employed. Work in the Persian style, with its geometric figures, still reaches us from Bombay, the present great seat of the Parsees. The Renaissance artists chiefly employed wood in making furniture, ornamenting it with gilding and painting, and inlaying it with agate, carnelian, lapis-lazuli, marble of various tints, ivory, tortoise-shell, mother-of-pearl, and various woods. Boule improved upon this by inlaying brass devices into wood or tortoise-shell, which last he greatly used according to the design he had immcdiately in view, whether flowers, scenes, scrolls, &c.; to these he sometimes added enamelled metal. In this process the brass is thin, and, like the ornamental wood or tortoise-shell,

forms a veneer. In the first instance the production of his work was costly, owing to the quantity of valuable material that was cut away and wastcd, and, in addition, the labour lost in separatcly cutting for each article or copy of apattern. By a subsequent improvement Boule effected an economy by gluing together various sheets of material and sawing through the whole, so that an equal number of figures and matrices were produced at one operation. Boule adopted from time to time various plans for the improvement of his designs. He placcd gold-leaf or other suitable material under the tortoise-shell to produce such effect as he required; he chased the brass-work with a graver for a like purpose, and, when the metal required to be fastened down with brass pins or nails, these were hammered flat and disguised by orna- mental chasing. He also adopted, in relief or in the round, brass feet, brackcts, edgings, and other ornaments of appropriate design, partly to protect the corners and edges of his work, and partly for decoration. He subsequently used other brass mountings, such as claw-feet to altars and pedestals, or figures in high or low relief, according to the effect he desired to produce. Boule's contemporary, Reisner, a German, used a variety of woods, tulip-wood more espe- cially, in the production of flowers and other ornamental designs, contrasting the dark with the light kinds, crossing the grain, and employing other ingenious devices. After him this particular style was called Reisner-work. The Spaniards of the 16th century used silver for inlaying.

See Grande Dictionnaire Universel du X1Xe siecle; Pierer's Um- versal-Lexikon, Altenberg, 1868; Encyclopédie des Gens du Monde ; Bemrose's Buhil-work ond Maryuetry, a very useful manual; Pollen's Furniture and W ood-work.

It is not unfrequently called practical architecture; but the adoption of this term' would tend only to confuse, by rendering it difficult to make the distinction generally understood between architecture as a fine or liberal art and architecture as a mechanical art. The execution of works of architecture necessarily includes building, but building is frequently employed when the result is not architectural ; a man may be a competent builder without being an architect, but no one can be an accomplished architect unless he be competent to specify and direct all the operatious of building. A scientific knowledge of the principles of. masonry, carpentry, joinery, &c., and of the

qualities, strength, and resistance of materials, though of the utmost importance to an architect, must be attended by a minute acquaintance with a great variety of less ambitious details. Such are those which relate to the arrangement of a plan for the greatest possible degree of convenience on the smallest space, and at the least expense ; its transference to the ground ; the preparation and forma- tion of foundations ; the arrangement and construction of drains, sewers, and vent-shafts; the varieties of walling with stone, and of laying bricks in brickwork; the merit of the various modes of bonding and tying walls, both lengthwise and across ; the arrangement of gutters on roofs, to get sufficient fall, and to conduct the water to the least inconvenient places for fixing trunks to lead it down 3 the arrangement and formation of flues ; the protection of walls from damp, of timber from moisture and stagnant air, and of metals generally from exciting causes ; the cost of materials and labour, and the quantity of each required to produce certain results, Together with these, an archi- tect ought to be practically acquainted with all the modes of operation in all the trades or arts employed in build- ing, and to be able minutely to estimate beforehand the absolute cust involved in the execution of a proposed structure. The power to do the latter necessarily involves that of measuring work, and ascertaining the quantities done. These things may certainly be referred to the sur- veyor or measurer, but they are not the less incumbent on the architect, who cannot be said to be thoroughly master of building, or the practice of his profession, unless he be skilled in these operations.

Building includes what is called construction, which is the branch of the science of architecture relating to the practical execution of the works required to produce any structure ; it will therefore be necessary to explain the subject in a general manner before entering upon building in detail.

It may, perhaps, be useful to premise that, should it occur to some readers that the present article has too great a tendency to supply information on the manner of building in a modern style, and that the earlier method is not elaborated, it must be remembered that, although the styles of architecture have varied at different periods, buildings, wherever similar materials are employed, must be constructed on much the same principles. Greater scientific knowledge of the natures and properties of materials has, however, given to the modern workman immense advantages over his

mediaeval brother craftsman, and caused many changes in the details of the trade, or art of building, although stones, bricks, mortar, &c., then as now, formed the element of the more solid parts of all edifices. The introduction of fir, too, in place of the more

solid and durable timber oak, has likewise occasioned similar changes, too numerous to mention in detail, in the sister arts of carpentry and joinery, probably also causing the division of the carpenter's trade of the medieval . period, Certain exceptional features of medizval work did exist, and most, if not all, will, itis hoped, be found referred to in this article.

GENERAL PRINCIPLES OF ConsTRUCTION.

The object of construction is to adapt and combine fit Stability materials in such a manner that they shall retain in use the the object forms and dispositions assigned to them. If an upright °f ¢n-

: : struction. wall be properly constructed upon a sufficient foundation, wai) the. combined mass will retain its position, and bear pressure acting in the direction of gravity, to any extent that the ground on which it stands and the component materials of the wall can sustain, But pressure acting laterally has a necessary tendency to overturn a wall, and therefore it will be the aim of the constructor to compel, as far as possible, all forces that can act upon an upright wall to act in the direction of gravity, or else to give it permanent means of resistance in the direction Opposite to that in which a disturbing force may act. Thus when an Arch. arch is built to bear against an upright wall, a buttress or other counterfort is applied in a direction opposed to the pressure of the arch. In like manner the inclined roof of Roof. a building, spanning from wall to wall, tends to thrust out the walls ; and hence a tie is applied to hold the opposite sides of the roof together at its base, where alone a tie can be fully efficient, and thus the roof is made to act upon the walls wholly in the direction of gravity; or where an efficient tie is inapplicable, buttresses or counterforts are added to the walls, to enable them to resist the pressure outwards. A beam laid horizontally from wall to

wall, as Beam. a girder to carry a floor and its load, may sag or bend downwards, and tend thereby to force out the walls 5 OH the beam itself may break. Both these contingencies are obviated by trussing, which renders the beam stiff enough to place its load on the walls in the direction of gravity, and strong enough to carry it safely. Or if the beam be rigid in its nature, or uncertain in its structure, or both (as cast-iron is), and will break without bending, the constructor, by the smith's art, will supply a check and ensure it against the possible contingency.

Perfect stability, however, is not to be attained with Materials, materials which are subject to influences beyond the control of man, and all matter is subject to certain influences of that nature. The influences mostly to be contended against are heat and humidity, the former of which produces movement of some kind or to some extent in all bodies; the latter, moveinent in many kinds of matter; whilst the two acting together contribute to the disintegration ordecay of materials available for the purposes of construction. These pervad- ing influences the constructor seeks to counteract, by the selection and disposition of his materials accordingly. From the tenacity of wrought iron, and its almost plastic character in the hands of the smith, it is employed to tie Iron. together other more bulky but less costly and more rigid materials ; but on account of its exceeding susceptibility of heat, and its consequent expansion and contraction, wrought iron must be used in short lengths only, unless where protected from great alternations of heat and cold.

The rapid decay, too, of wrought iron when exposed to humi- dity, and especially when it is alternately wet and dry, will teach the constructor not to expect enduring stability

Timber. | Timber, being practically unchangeable in the direction of its | and the aid of every .other collateral and super-imposed length from the mere absorption of either heat or humidity, | stone in order to resist the loosening effect which water in and at the same time practically both inextensible and incom- | powerful action is sure to produce. pressible in that direction, and being also readily wrought In the application of construction to any particular Particulgy and easily combined alike with other timber and with | object, the nature of the object will greatly affect the objects of iron, is a

valuable material in the hands of the constructor ; | character of the constructions and the materials of which struc but it shrinks and swells in the direction of its thickness, | they are to be formed. fem and, in consequence, is subject to rapid decay when exposed Every piece of construction should be complete in itself, Rach come to alternations of moisture and dryness ; and although in | and independent as such of everything beyond it. A door plete in many varieties timber is perdurable and unchangeable in | or a gate serves its purpose by an application wholly foreign itself, form if it be kept either altogether free from moisture or | to itself; but it is a good and effective or a bad. and in- always wholly wet, its quality of inextensibility is greatly | effective piece of construction, independently of the posts diminished in value to the constructor on account of the | to which it may be hung. Whilst the wheel of a wheel- comparatively slight resistance it offers to compressing barrow, comprising fellies, spokes, and axle-tree, is a piece power, and the comparative ease with which its fibrous | of construction complete in itself, and independent as such structure is torn asunder. From this cause it cannot be | of everything beyond it, an arch of masonry, however large grasped or otherwise held so that its power of resisting | it may be, is not necessarily a piece of construction com- extension may be made available in any degree proportioned | plete in itself,—it would fall to pieces without abutments. to its strength; whilst its quality of incompressibility in | Thus, a bridge consisting of a series of arches, however Bridge, the opposite direction is of less value to the constructor for | extensive, may be but one piece of construction, no arch many purposes which require that quality in the material, | being complete in itself without the collateral arches in the because it absorbs moisture by the ends of the fibre more | series to serve as its abutments, and the whole series being readily, and with a far more mischievous effect, than it does | dependent thereby upon the ultimate abutments of the in the direction in which it is compressible. Hence timber | bridge, without which the structure would not stand. This rots more rapidly by the ends than by the sides. illustration is not intended to apply to the widely distended

Stone. Stone and brick, the other main available materials in | masses of the older bridges, by which each pier becomes general construction, keep their places in combination by | sufficient to abut the arches springing from it,

but which means of gravity. They may be merely packed together, | tend, in providing for a way over a river, to choke up the but in general they are compacted by means of mortar or | way by the river itself, or compel the river to throw it cement, so that although the main constituent materials | down, or otherwise destroy its own banks. A bridge, of are wholly incompressible, masses of either or of both | which the way is formed upon arches of masonry, may be combined in structures are compressible until the setting | thus but one piece of construction; and in like manner, Pointed medium has indurated to a like condition of hardness. | that paragon of constructive skill, the complete church, church or That kind of stone is best fitted for the purposes of general | whether cathedral or otherwise, as built in the Pointed cathedral construction which is least absorbent of moisture, and at | style when that style was practised in full accordance with the same time free to work. Absorbent stone exposed to | true constructive principles, is but one piece of construc- the weather rapidly disintegrates ; and for the most part | tion. As in the long series of arches in a bridge, viaduct, uion- absorbent stone is so hard that it cannot always be used | or other such work, in which the piers are vertical supports with a due regard to economy. When, therefore, fitting | to the bridging structure, and may be of no greater stone of both qualities can be obtained, the harder stone | substance than is necessary to bear the weight coming can be exposed to the weather, or to the action which the | directly by vertical pressure from the superincumbent softer stone cannot resist, and forms the main body of the | structure and its possible load, but throwing all the pressure structure of the latter so protected. The hard and the soft | arising from weight acting laterally, or as thrust, upon should be made to bear alike, and should therefore be | terminal abutments,—nothing may be omitted, as nothing coursed and bonded together by the mason’s art, whether | can be removed from the structure of the Pointed arch the work be of stone wrought into blocks and gauged to | cathedral, or other church built in that style, the whole thickness, or of rough dressed or otherwise unshaped | system of which is bridge-like in construction, without rubble compacted with mortar. leaving something unsupported or unresisted that requires

Brick. Good bricks are less absorbent of moisture than any | vertical support or lateral resistance. The western towers

in his works if he makes them dependent upon wrought iron, C‘ast-iron is brittle, and may not be exposed with impunity to transverse strain, especially if such strain be attended by action tending to induce vibration ; it expands and contracts under the influence of heat, but it resists compression in every direction, and if used in small bodies, is valuable as a means of connecting other materials.

stone of the same degree of hardness, and are better non- conductors of heat than stone. As the basis of a stable structure, brickwork is more to be relied upon than stone in the form of rubble, when the constituents bear the relation to one another last above referred to, the setting material being the same in both ; because the brick, by its shaped form, seats itself truly, and produces by bonding a more perfectly combined mass; whilst the imperfectly shaped and variously sized stone as dressed rubble can neither bed nor bond truly,—the inequalities of the form having to be compensated for with mortar, and the irregularity of size of the main constituent accounted for by the introduction of larger and smaller stones. The most perfect stability isto be obtained, nevertheless, from

truly wrought and accurately seated and bonded blocks of stone, mortar being used to no greater extent than nay be necessary to exclude wind or water, to prevent the dis- integrating action of both upon even the most durable stone. When water alone is to be dealt with, and especially when it is liable to act with force, mortar is necessary for securing to every block in the structure its own full weight

of a Pointed cathedral form effective abutments to the long series of arches of the inner ranges over the piers which stand between the nave and the aisles on both sides, whilst turrets or massive buttresses and deep porches upon the northern and southern transept fronts perform the same services in respect of the arches of the transepts. The counteracting east end of the chancel forms a true con- structive abutment to the arches of the chancel,

whilst the tower, with, it may be, a spire upon it, at the intersection of the four grand compartments of the cross, gives, by its weight, abuttal to them all. The want of this last-named grand and essential body in the system is but too strongly marked in many of the English cathedrals, by the iron bars which have been applied to tie in the arches of the nave,

transepts, and chancel, and to relieve the piers upon which the transept arches bear at a higher level from the thrust to which, being without the weight of a tower upon them, they have continually yielded. Transversely the weight and the thrust of the vaulted ceilings of the nave are brought up to, and thrown against, the piers of the clere- story, which stand upon the main piers or columns of the interior below, and are abutted by flying buttresses, which carry the thrust down to the pinnacle-weighted buttresses of the outer aisle walls, which have already received the weight and thrust of the vaulted ceilings of the aisles themselves. Corbels in the walls and spreading capitals upon shafts take the weight directly, and leave the walls and piers but little encumbered in the middle, so that the vertical structure is continued upwards without bearing upon the springing stones of the arches.

But it is not necessary that the arch employed should be the Pointed arch, to produce combinations as effective in construction as the most perfectly designed and extensively elaborated work of the kind referred to as models of con- structive skill; the skill consists in a full and clear per- ception of the bearing and leaning of every part, and of the means necessary to support and counteract the bearings and the leanings within the reasonable limits of the work

the springing walls, or under the arch whose thrust is to be resisted ; yet in the construction of retaining walls, accord- ing to the common practice, the counterfort is placed on that side which receives the pressure, where its utility is very questionable, except to keep the retaining wall from falling back against its load, which, from the transverse section generally given to

such walls, they would be apt to do, if not so propped up by their counterforts. Wharf and quay walls, and the revetment walls of military works, may require a face unbroken by projections ; but this is not the case with retaining walls for roads and railways, where a long line of projecting buttresses would be unobjectionable, the counterforts becoming buttresses and merely changing places with the wall. On account of the common practice

of battering the faces of retaining walls in curved lines, and Battering,

of radiating the beds of the brickwork composing them from the centre of curvature in every part, the back of the wall must contain more setting material than the face, with the same quantity of solid brick, that is, if the work be bonded through. Counterforts must be built in the same courses, and consequently must have still thicker beds of compres- sible mortar than the wall; or the bond between the wall and its counterfort must be dropped, and the counterfort thus become utterly inefficient.

with reference to its object and purpose—to the end that the work may become complete in itself, and independent as a plece of construction of everything beyond it.

The retaining walls in the cutting upon the line of the Examples extension of the London and North-Western Railway, from at Camden Camden Town to Euston Square, are, according to the 1°”.

In making reference to the noble works of construc- tion above referred to, in which the art of the mason is mainly employed, as works exhibiting construction most fully and most truly, the hall must not be passed over without remark, and of all the great halls of the class to which Westminster Hall belongs, it is itself the most effective as a work of construction ; and its effect is wholly produced by the magnificent roof which covers it. This roof is a piece of carpentry admirably designed to resolve it into a compact body to act upon the walls in the direction of gravity alone. But the designer may not have felt quite certain of the results, so whilst erecting massive walls on which to place his elaborate combination of timber, he threw up against the lateral walls a series of flying but- tresses to check any tendency of the roof to spread under its own weight in the absence of a thorough transverse tie ;

for these buttresses are said to be independent of the walls, not being built into them.

An application of the principles of construction exhibited in the most perfect works of constructive skill ever executed, as above indicated, may be made in the rougher operations of mere practical utility. The sides of cuttings through certain earths in the formation of lines of inland communi- cation, whether carriage roads, railways, or canals, are sometimes required to be widened out to an inordinate extent because of the looseness or slipperiness of the soil, or must otherwise be retained or held upright by special constructions. The expense of the first formation of a cutting under given circumstances is easily calculable, and so is the time within which the work may be effected. Experience has proved that there is for every soil a limit in depth beyond which it becomes more expedient to drift the required way, and construct a vaulted tunnel of sufficient dimensions, than to make an open cutting with the requisite slopes. Even when the first cost would not decide the question, the preference is nevertheless often given to the tunnel because of the greater secnrity of constructed work.

Before proceeding to the consideration of the means of enabling opposite retaining walls to assist each other, it may be worth while to consider, whether retaining walls are generally constructed so as best to adapt their com- ponents to the duty to be performed. No one would place a buttress intended to resist the thrust of an arch within

common practice, built wholly of brickwork in radiating courses and with counterforts following their own contour. In this case the centre of gravity of the wall falls wholly

Fig. 1.

Transverse section of the Euston Incline retaining walls, one-half as executed with cast-iron struts to counterforted and reclining walls, and the other half with the brick-built abutting beam to counter-arched retaining walls strutted at the toes of the springing walls by inverted arehes.

Fig. 2.

Plan of the above showing the part as executed above the fron struts, with the rails passing underneath, and the other part at the level of the rails, with the inverts in plan under them.

behind its base, and the counterforts not commencing until

the wall has reached one-third its height render it still

more dependent for support upon the ground it is intended to retain. It is well known that these extensive walls, though furnished with all the collateral works necessary to protect them from exposure to undue influences, and although set nearly one-fourth of their height in the ground, failed to a considerable extent. cast-iron beams, across from the opposite walls, as shown in

V. — 57

A system of strutting with Strutting.

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fig. 1, to make each aid the other, was applied to meet the | flexure ;— subject, of course, as to all these, to the nature emergency ; but this is limited to the upper parts of the | of the materials, workmanship, and mode of structure. walls. The positive strength which such constructions should Strength of Abutting struts from opposite walls, occurring at intervals | possess depends much, of coursc, upon the nature of the the con- | only, leave the intermediate portions of the walls exposed | soil, and its susceptibility of being affected by external structions,

[GENERAL PRINCIPLES

Brick cutting is to accommodate, by a built beam of brickwork, | the retaining constructions must have, but there can be no beam. in vertical courses, supported on an arch, and prevented from | question that too much strength is better than too little, Built rising under the pressure by au invert upon it, as in fig. 3. | and it is generally cheaper to pay in materials than in abutting This built beam will then be, as it were, a piece of walling | labour

to save materials. beams. turned down on its vertical transverse section, and will) == sis : resist any pressure brought upon it through the buttress t MMe walls, to the full extent of the power of such a wall built . Yl Yl vertically to bear weight laid upon its summit; the Cy Uy a pressure would be applied in the line of the greatest power Vy Vii hig YW of resistance, and there would be no tendency to yield, Q Y : : GW, except toa crushing force. Let such transverse buttress WY : Cn walls, so strutted apart, with the road between them, be yy, G the springing walls of longitudinal counter-arched retaining Yy V4/ walls, which, being built vertically and in horizontal J, : Yy courses, but arched in plan, against the ground to be Vi ; Uy retained, will carry all the force exerted against them to l/Ue q Y their springing walls, and the springing walls or buttresses MY ‘ ears : Yf will communicate, through the struts, the power of Wy 5 3 Y resistance of each side to the other, and thus insure the Fy “Yip GY security of both. Ye : Y Yj /, é CULL il Fig. 4.—Transverse section through the centre of a Bay. inte H in The diagrams, figs. 4 and 5, represent a cutting 65 feet Anexample . HAT eet deep to the level of the rails. It is assumed that the – a cut- See eaaadatedetelateweit ground at the top may stand for the first 15 feet at less ™™8 H ait ie Hi than 2 to 1, and that it may, therefore, be cheaper to run out to that depth with slopes, leaving 50 feet from the rails, or about 52 feet in all, to be retained. As the bricklayer may follow up the excavator with bay after bay, Fig. 3.—Built abutting Beams. his work lying mostly on the side and out of the way of ; the excavator, the latter would run out the spoil without This arrangement may be carried to any extent in height, | interruption, his work being benched onwards and shored by repeating the abutting beam or strut at such intervals as he proceeded. As every compartment, with its as the thrust to be resisted and the strength of the buttress | buttresses, invert, abutting beams, and counter-arches is springing-walls may require. complete in itself, the ground being backed against the parse of ‘To constructions thus arranged, any requisite power may | counter-arches as the work rises, the shoring would come

to pressure from behind without support, unless these intermediate portions are so disposed as to communicate the pressure upon them to the struts. Hence a common retaining wall, abutted at intervals, would require these intervals to be more or less distant, in proportion to the strength of the wall between them. Instead, therefore, of a continuous wall on each side of the

cutting, buttress walls should be placed at intervals, opposite to one another, and strutted apart at their toes by an inverted arch (as in fig. 2); and above, at a height sufficient for whatever traffic the

be given, by altering the quantity of materials in each part, —the length of the buttresses transversely of the cutting, the number of struts to each pair of buttresses, or the length of the compartments. The thickness of the buttresses should be in proportion to their height and length, and their length should be in proportion to the flatness and weight of the struts with their arches, and to the space in‘height between any two of them, as well as to the magnitude of the thrust brought to them by the counter-arched retaining walls. The inverted arch below and the built beam above must, of course, have sufficient substance to enable them to resist, without yielding in any direction, the pressure brought to them through the buttresses; and the retaining walls themselves must have substance given to them according to their height, to the pressure they are liable to receive from behind, to the length of the compartments, and to the extent of their

influences ; but it depends, even in a greater degree, upon the manner in which the constructions can be applied to the ground they are intended to retain. A very slight power will retain at rest a body which the exertion of great force could not stop if once in motion, and a half-brick counter-arch, set in close contact with undisturbed ground, would hold safely up what three times the substance would not stop if there were space and opportunity for motion between the ground and the brickwork. It is impossible, therefore, to state precisely what is the least strength which

out, and be sent on for use on the forward benches. The invert may be turned upon footings in half-brick rings, to get the largest quantity of solid resisting matter in the curved line. At a height from the surface of the rails sufficient for headway—assumed at 14 feet 6 inches—a 14-inch bonded arch is turned from buttress to buttress, springing from skewbacks on corbelled courses. Upon the back of this arch the abutting beam is built of brick on end and edge, bonded as a wall, with beds vertical and widening over the haunches of the discharging arch and under the similar inverted arch turned upon it; so that although the beam be in the centre but 21 inches deep, it presents an abutment at each end of three times that depth. The

object of the invert over the abutting beam is to stiffen it, and to bring down and distribute the weight and pressure from the buttresses more effectually. The built beam, and its sustaining and stiffening arches,

nail

Drains.

| ivic struc- |

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should be composed of particularly well-formed bricks of really good quality, set in cement or in some quick-setting mortar, that there may be no yielding to the pressure which inust be immediately thrown upon this part of the construction. Another built beam, of greater depth, because of the absence of any inverted arch to stiffen it, is thrown across over the back of a semicircular arch, with its abutting ends extended in like manner.

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To relieve the work from water, a drain being run along over the middle of the inverts, or side-drains being passed by ring culverts through the buttresses, drain-shafts are carried up at the backs of the buttresses against the springings of the counter-arches, to within a few feet of the surface. These shafts, being steened with open joints at intervals to admit drainage water and communicating with the draius below, prevent the possibility of water lodging about the backs of the counter-arches, or even in the ground itself. The drain shafts should be semi-domed with bricks set dry and covered in, and the walls also backed up with good clean gravel, through which the surface water may percolate and pass freely down to the shafts.

The constructions are assumed to be of brickwork, for the obvious reason that the cases supposed being clay cuttings, brick is the material which would be most economical. But if masonry be cheaper, it may of course be used with the same effect. Where a cutting intersects loose beds of

laminated stone, and particularly strata inclined to the horizon, so asto be unsafe with the ordinary slopes, such constructions are available; and in cases where the sides of the cutting will stand vertically or nearly so, as in chalk, it may be useful to apply similar construc- tions, though of slighter character, to check the separation and fall of masses from the precipitous sides. It is obvious, too, that these constructions present the means of security, when the stratum forming the base of any cutting is too weak to bear the weights of slopes, or of retained sides, without rising between them. Sheet-piling may be driven to any depth along the backs of the counter-arched walls so as to be retained at the head by the walls; and thus in effect the walls would be carried down to a safe depth, even through the weak stratum; whereas such piling at the toes of slopes is commonly found to be almost if not wholly useless, for the want of a stay to the head.

The ignitibility of timber, and the rapidity with which it burns when placed in circumstances so favourable to that effect as by its disposition in an erected building, have led to its prohibition for the purposes of the main enclosures

of houses and buildings generally, in London, and in many

of the larger provincial towns. It is possible, however, so

to protect timber employed in the enclosures and for the

internal partitions and floors of buildings as to render mere

dwelling-houses practically incombustible. Whilst, how-

ever, the liability of timber to take fire and to burn may in

a great measure be counteracted, and notwithstanding that

this material combines the advantage of economy with

security, stone and brick are undoubtedly better adapted

for the main structure of a building. Brick or stone, or

brick and stone together, with a sctting material, ought to

be employed, but in such manner only as to be free from

dependence upon other and less trustworthy materials.

The most perfect erections as buildings are those in the

composition of which this principle has been understood

and fairly practised. Ifadventitious aid be given to brick

or stone walls by foreign materials, the materials ought to

be at the least harmless. Iron in bulk is not a proper Iron.

substance to incorporate with walls because of its great

expansibility by heat ; but iron used in thin lamina, as

hoop-iron laid in walls in the bed-joints of the brick or Hoop-iron.

stone, cannot be productive of any bad consequences, while

it is most beneficial in that form as a tie to the structure. Bricks come ready shaped to the hands of the workman Bricks and

‘in a form the best adapted for the arrangement in the con- stoue.

struction of a wall which, under the designation of bond, gives it such a degree of consistency that a weight placed upon the top is carried by the wall in every part throughout its whole thickness, and throughout a greater or less proportion of the length according to the height of the wall. Stone, on the other hand, comes to the workman without regular form; and with skill on his part to dispose and arrange the materials, good erections may be produced of rubble ; for although the thickness of which walls may be built of rubble with safety will depend in a great degree upon the quality of the mortar, much depends also on the skill of the workman in bedding and bonding the stones. Under any circumstances, however, a wall so composed

cannot safely be charged with heavy weights, or be exposed to the vibrating action of floors, until the mortar shall have indurated to some extent; whereas a wall of brickwork is secure by the horizontal bedding of the bricks, and by the effect of the transverse bond which the alterna- tion of header and stretcher almost necessarily produces. Stone, again, may be dressed to any shape, and so as to mould it to every variety of construction with the smallest possible quantity of mortar or cement. From blocks with rough hammer-dressed parallel beds, up to the most complete and perfectly wrought parallelopipeds adapted to any arrangement of bond that may be best adapted to the structure, and with combinations of rudely formed and perfectly formed pieces of stone, walls may be built of stone of greater strength than the best brick can be made to yield, whilst stone walls are liable to be inferior in every respect to brick-built walls of ordinary quality.

Some combinations of the two kinds of materials have Combina- the effect, however, of making a better wall than could be tions of the produced by the main constituent in the form employed ‘*™ alone. A stone-rubble or pebble built wall is greatly im- proved by one or two bonding courses of brickwork at short intervals; and a brick wall is improved and adapted for a higher purpose by thorough courses, at intervals, of good stone, wrought to bed and joint truly ; whilst on the other hand, a wall substantially of stone-rubble or pebble, and faced with brickwork, is essentially an unsound wall ; and in like manner a brick wall faced with wrought stone is liable to be weaker than the brickwork would have been without the stone. ‘

With regard to the thicknesses of the walls of buildings, Thickness – it is generally considered that these should be governed by of walls.

the height of the structure; but they ought not to be determined by that condition alone. Chimney-breasts, or other buttress-like projections, built up with a wall, and extending to more than the thickness of the wall, make it in fact stronger in its transverse section, and justify less general thickness in the body of the wall, whilst window and other openings in a wall leave piers which ought to be of greater thickness than the mere height would require. But all returns, indeed, whether as chimney-breasts or as cross walls, built and bonded with a wall, tend to render unnecessary the full

thickness which the height might require ; whilst, as just intimated, the omission of portions of a wall for door and window openings should be compensated for by additional substance to the parts which remain. Walls subjected to undue action, such as that arising from slight joists tailed into them, or that occasioned by inclined timbers, as under galleries in churches, chapels, and theatres, require to be of greater thickness than they otherwise would; whilst it is quite wonderful to what great heights brick walls may be built with safety, if they are well built, and exposed to no other action than direct vertical weight. When, indeed, such walls stand upon a sufficient foundation, direct vertical weight without motion is a means of security to the walls so long as the weight is reasonably within the power of resistance of the materials to crushing pressure. The object to be looked at, therefore —the walls being honestly built—is, as before remarked, to make the weight to be imposed upon any wall act upon its solids vertically and steadily,

Floors upon girders, or framed to strong trimmers—the girders or the trimmer-joists running into and bearing upon the piers or solids of the walls —are far preferable to what are termed single floors, of which each joist runs into the wall. Glirders as the basis of floors render plates in the walls wholly unnccessary, by depositing the weight in the right places, without requiring plates to carry it on from the weaker to the stronger places; and being of necessity stout and rigid, they form a fair tie and strut to the walls into which their bearing ends are tailed. Whether girders or trimmer-joists be employed for placing the weight of floors upon the walls of a building in the safest manner, the bearing tinbers ought to be placed upon pieces of stone as templets built into the walls, and to be made to take a cog-hold of the templets, so as to enable them to tie and stay the walls by means of the cogs. It is by means of the girder bearing upon the solids of the walls, though with bad carpentry, that the French are able to cary up their soft, coursed-rubble, stone walls to heights that would certainly be unsafe if the walls were seamed with wooden plates, and shaken by floors of single joist ; such, for instance, as a wall of a total height of say 85 feet, with a thickness of 18 English inches on the ground-floor and through six stories, or about 65 feet, and finished by a gable,—the basement being vaulted with walls about 20 inches thick. It is by means of the solidity given to the floors by the girders, and the solid bearings which the girders obtain, that the

floors are able to carry the dead weight of matter which renders them practically fireproof, as described below, in addition to the moving weights to which the floors of buildings are necessarily exposed in use. We can and do frame floors most effectively by carpentry alone; whereas the French do the work so badly, that no important bearing is, or indeed may be, trusted by them to the framed joint—dog-nailed stirrup straps of iron being always brought in aid. But the common practice in England is to use single or unframed floors, which carry the weight and the vibration to which floors are exposed into the walls, over voids as well as over solids; while the French frame their floors to or upon girders, by means of which the floors are brought to bear

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upon the solids of the walls. less exposed to vibratory action, but are both tied together and strutted apart with better effect by the stout girders stiffened by joists than by joists which themselves require

[GENERAL PRINCIPLES

The walls are thus not only

some foreign aid to stiffen them, Moreover, single floors of joists, unless trimmed at frequent intervals, when, indeed, they may be termed half-framed, are supposed to require plates of timber laid along the inside faces of outer walls and upon internal walls. This defect is avoided by French builders, who exclude all timber, except the bearing ends of girders, from their walls, and use framed floors.

When the walls of a building have reached their full Wall-plate height, the wall-plate comes into use legitimately—to cope 44 roof. the walls, in fact, and to form a curb as a base upon which to place the roof, which should deposit its weight, never- theless, by means of its tie-beams upon the plates over the solids of the wall below, and which should, moreover, oversail, so as to cover and effectually shelter from the weather the enclosing walls also.

In setting forth the structural advantages derivable from Cast-iron the use of girders as the bases of floors, it may be necessary girders. to repeat the warning already intimated against the use of girders of a material of uncertain strength, and of treacher- ous character when exposed to transverse strain. Cast-iron is of uncertain strength, mainly because of the imperfec- tions which the most skilful founders, with the best materials and every appliance at command, cannot always avoid, and which are most liable to occur in the production of complex forms in long lengths ; whilst careless founding and rapid cooling are contingencies connected with the production of cast-iron girders—which are necessarily long and complex castings. Cast-iron is treacherous, inasmuch as it is brittle and liable to be startled into fracture by impact trifling when compared with what it may have borne safely as a dead-weight. Proving long metal castings by straining them upon their transverse section does but aggravate imperfections, and leave the casting weaker ; whilst no dead-weight proof is proof against blows or other action inducing vibration. It is only under circum- stances which do not admit of concussive action upon the beam, or which prevent it from vibrating under any shock that may reach it, that cast-iron can be safely used in beams of long lengths to carry heavy weights, without some appliance to mitigate, at least, the imperfections which this substance exhibits. The application of wrought iron tension bars as soles to beams and girders of cast-iron Tension would prevent the most serious consequences from attend- bars. ing the failure of the casting, if the beam were also prevented by binders, or by other sufficient means, from turning round when the blow produces an oblique fracture. Wrought iron girders can be and are now extensively used to carry floors, partitions, and even walls with safety.

Inasmuch as some soils are liable to change in form, Founda- expanding and contracting under meteorological influences, tions as clays which swell when wetted and shrink when dried, concrete foundations are commonly interposed upon such soils to protect the building from derangement from this cause ; or rather, for that purpose walls of the cheaper material, concrete, instead of the more expensive brick or stone structure, are brought up from a level sufficiently below the ordinary surface of the ground. When concrete is used to obviate the tendency of the soil to yield to pres- sure, expanse or extent of base is required; and the concrete, being widely spread,

should therefore be deep or thick as a layer, only with refcrence to its own power of transmitting to the ground the weight of the wall to be built upon it, without breaking across or being crushed.

But when concrete is used as a substitute for a wall, in carrying a wall down to a low level, it is in fact a wall, wide only in proportion to its comparative weakness in the

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. to walls.

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Footings

Concrete.

OF CONSTRUCTION. |

absence of, manipulated bond in its construction, and encased by the soil within which it is placed.

The foundation of a building of ordinary weight is, for the most part, sufficiently provided for by applying what are technically termed footings to the walls. The reason for a footing is, that the wall obtains thereby a bearing upon a breadth of ground so much greater than its own width or thickness above the footing, as to compensate for the difference between the power of resisting pressure of the wall and of the ground or ultimate foundation upon which the wall is to rest. It will be clear from this, that if a building is to be erected upon rock as hard asthe main constituent of the walls, no expanded footings will be necessary ; if upon chalk, upon strong or upon weak gravel, upon sand, or upon clay, the footing must be expanded with reference to the power of resistance of the stratum to be used as a foundation; whilst in or upon made ground, or other loose and badly combined or imper- fectly resisting soil, a solid platform bearing evenly over the ground, and wide enough not to sink into it, becomes necessary under the constructed footing. For this purpose the easiest, the most

familiar, and, for most purposes, the most effectual and durable, is a layer of concrete, which may be formed so as to cover a surface large enough to obtain from the most yielding soil the amount of resistance to pressure required to support the weight of the intended building. It will be evident that upon a concrete founda- tion a footing or expanded base may or may not be required to a wall, according to the hardness of the concrete and the kind of wall to be built; but it is perhaps better to give the footing to the wall than to wait for the sufficient induration of the concrete to enable the wall to do without a footing; and better still, to lay the concrete of such height only with reference to the spread or extent of base beyond the toesof the footing, as the gravel of which the concrete is made would stand at in an uncombined condi- tion. Concrete, indeed, is at all times more safely to be regarded as a substance to be placed as a layer, than as a substance to be set up as a wall; for although excellent erections as walls may be made of concrete—as erections in the same form may be made of tempered clay or of pisé- work—neither concrete nor tempered clay is to be regarded as a proper substance with which to form the lofty walls of buildings in towns. The use of lime concrete involves walls of a considerable thickness; Portland cement concrete, a stronger material and having the property of hardening rapidly, is more commonly used for thin walls. Several patents have been taken for erecting buildings with concrete walls by the construction of troughs formed of frames and movable boards or shutters. But considerable doubt exists as to the extent to which such walls can be built, as many have cracked, proved leaky, and shown other faults; whilst much economy does not result except where the work is very plain and straightforward, where little is spent on sub- sequent finish, and where the materials can be obtained at very little cost either for themselves or for carriage.

Construction for Protection against Fire.—Houses seldom take fire from common accidents, such as occur to the lighter movable furniture and to drapery ; but, for the most part, from the exposure of timber in or about the structure to the continued action of fire, or of heat capable sooner or later of inducing the combustion of timber ; and as the source is most commonly in defective gas-piping, or in some stove, furnace, flue, pipe, or tube, for generating or for conveying heat, or for removing the products of com- bustion, much of the real danger to buildings from fire would be prevented

by avoiding that degree of proximity of timber to all such things as can lead to its com- bustion. With a view to lessen the danger to which buildings with timber in their structure are exposed from

fire, it will be well to consider how far the timber and wooden fittings commonly used may be necessary either to the stability of the buildings, or to the comfort and con- venience of the inhabitants, But it is not our intention to describe here the various modes of fire-proof construc- tion, but only to notice the principles upon which ordinary buildings may be rendered nearly incombustible. So long as danger of fire is brought to buildings through pipes and tubes, the necessity must be admitted of guarding the combustible materials used in buildings from any chance of becoming ignited. When heat is produced and passed through pipes in any manufactory, whether it be to act as power, or for drying or for warming, the fires used may be guarded, and the machinery which regulates the intensity of the heat to be transmitted may be under constant care ; but even in such cases there can be no certainty that the heat shall not at some time arrive at the point of danger. But when heat is diffused throughout dwelling-houses by means of apparatus which is committed to persons unskilled in its use, and unconscious or careless of the danger which may arise from neglect, it seems impossible to lay down inflexible rules for distances from timber which shall render it safe from heated pipes. Twelve or fifteen inches may not be a greater distance than safety requires under some circumstances, whilst there are many cases in which the actual contact of such pipes with timber is hardly inconsistent with safety. When the air about heated bodies is not confined, as it would be within the timbers of an ordinary floor, a distance between the timber and the heated surface equal to the longest diameter of the tube or pipe will be found sufficient if the temperature of the pipe does not exceed that of boiling water. It is to be understood that a piece of wood will bear a powerful dead- heat upon its sides for an indefinite period without ignit- ing, unless a transverse section of the fibre, as at or around a live knot, or where a branch had been lopped, present itself to the action. It is by the end that a piece of wood exposed to

powerful heat most readily ignites. The gases evolved in the substance of the timber by the action of heat applied to its surface, expanding as they are evolved, are thrown out by the pores among the fibres at the ends, if the ends are near enough to the action to allow of this effect, with less power than may be enough to obtain vent for the inflammable gases laterally.

The English Government, when it has legislated upon such matters, has generally confined itself to making provision that the enclosing walls of buildings should be formed of incombustible materials. In provisions regard- ing the least thicknesses of such walls, these were generally determined with reference to the height of the building, and to the area to be enclosed, as an indication of the probable lengths of the walls; and this both for the pur- pose of promoting safety of structure, and of checking the spread of fire from building to building. As, however, in most cases greater thickness is required in the side wall of an ordinary dwelling-house ina town to render its structure secure than is necessary to enable it to check the spreading of fire, such walls are frequently made of greater thickness than would be necessary to fulfil the objects which the Legislature has had in view, if the walls were not supposed to extend the whole length of the two longer sides of a parallelogram without intermediate cross or return walls. A solid, well-built brick wall, one brick or 9 inches thick, between two ordinary dwelling-houses of five or six squares in area each, will prevent the communication of fire through it from one to the other. But, in towns, ordinary dwelling- houses, which occupy each an area of five or six squares, are generally disposed in plan as parallelograms, having their opposite sides 18 or 20 feet, and 28 or 30 feet respectively in length, and are seldom carried up to less height than 35

Protective measures

against fire,

Buildings Acts.

Partitions.

Partitions as formed in Paris.

or 40 feet; and walls of such lengths and heights could hardly be deemed safe if not more than one brick thick. Consequently, a greater thickness has been prescribed as the least thickness of the walls of buildings of the sizes indicated. In the older Metropolitan Building Acts much greater thicknesses were prescribed for the walls likely to be the longer walls; whilst the only necessity for more than one brick rises from structural requisites, and not from any insufficiency of a wall of solid brickwork one brick thick as a means of preventing the spread of fire.

But the requisites of the structure would be as weli fulfilled by one-brick walls upon the long sides as by 13 brick walls, if the ordinary internal cross partition for dividing a house into front and back rooms were built of brickwork abutting upon, and at right angles to, the longer walls, and carried up coursed and bonded withthem. That is to say, party-walls of one brick or 9 inches in thickness, connected at their ends by 14-brick or 13-inch front and back walls, and at or about the middle of their length by other 9-inch cross walls, would be at the least as strong as 14-brick party-walls, though connected in the same manuer at the two ends, but without the abutting and connecting cross wall of brickwork. Instead, however, of such internal cross walls, hollow partitions of timber are commonly used in all stories above the basement story ; and it is by these partitions, and by the light and highly inflammable wooden stairs, that fire extends itself rapidly throughout ordinary dwelling-houses ; whilst the substitu- tion of a brick wall for the cross timber partition would in most cases justify the abatemcut of a half brick of the thickness otherwise necessary to party-walls, and give an indestructible internal support to the floors, whereby also one of the means by which fire travels rapidly through a house would be removed. It is true that there must be openings as doorways, and fittings in them for doors, in such internal partition wall; but the wall could not carry fire up from floor to floor through its own heart, as the hollow wood-lathed quartering partition carries it. Doors and shutters, and door window linings, in and against brick or stone walls, may take fire and burn in any story of an ordinarily built dwelling-house, without carrying it beyond the story in which the fire occurs; for a plastered ceiling of the most common description will resist the action of flame upon its surface for a long time,

and plastering of really good quality, though upon wood laths, will keep fire off from the joists by which it is held up, almost without danger, so long as the fire acts upon the face only of the plastering. If, however, fire reach the joists through the agency of hollow quartering partitions, the enemy has turned the flank of the plastering, and the floors and skirtings above and behind it taking fire, the building almost inevitably falls a prey to the flames. Any step, indeed, from the hollow quartering partition towards a solid wall is a step towards security. A brick wall is, perhaps, the best.internal partition for all the purposes of strength and security from fire; and in small houses, which will not afford the expense of 9-inch walls, half-brick walls with 9-inch jambs at the doors, and short 9-inch piers on alternate sides of the partition, at intervals of 3 or 4 feet in length, will give sufficient strength; but even quartering partitions, if based upon brick walls, may be rendered nearly proof against fire by brick-nogging them, especially if care be taken to fill in with brickwork between the joists over the head of one partition and under the sill of another, as well as between the timbers of the partitions. Filling in between the joists, and up as high as the skirtings go, will do something, indeed, towards diminishing the dangerous tendency of even lathed and plastered timber partitions ; whilst the adoption of the plan now commonly practised in Paris, in forming not only internal partitions,

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but the rearward external enclosures of buildings, would secure to the structure the structural efficiency of timber on end in carrying weight, and give the solid and incom- bustible character of a brick or stone wall to a partition or enclosure which is structurally of timber. The plan referred to is, to frame and brace with timber quarterings much in the manner practised in England, except that the timber used in Paris is commonly oak, and is generally seasoned previously. The framed structure being complete, strong oak batten-laths, from 2 to 3 inches wide, are nailed up to the quarterings horizontally, at 4, 6, or even 8 inches apart, according to the character of the work, throughout the whole height of the enclosure or partition ; and the spaces between the quarterings, and behind the laths, are loosely built up with rough stone rubble, which the laths prevent from falling out until the next process has been effected. This is, to apply a strong mortar, which in

Paris is mainly composed of plaster of Paris, which is there of excellent quality, laid on from both sides at the same time, and pressed through from the opposite sides so that the mortar meets and incorporates, embedding the stone rubble by filling up every interstice, and with so much body on the surfaces as to cover up and embed also the timber and the laths—in such a manner, indeed, as to render the concretion of stone and plaster, when thoroughly set, an independent body, and giving strength to rather than recciving support from the timber.

[CoNSTRUCTION,

The English brick-nogged partition is, in point of struc- Partitions

ture, nothing without the aid of timber. ‘The plastering is merely spread upon the surfaces of brick and wood, and is fragile in the extreme, and always liable to crack and drop off. ‘This lathed and plastered partition is composed of the hollow framework of the timber quarters, with two slight thicknesses of mortar, as plastering, hung upon slighter laths, over and between which the flaccid mortar forms a key for itself; but all necessarily depends upon the timber, and fails with it wherever decay or fire may destroy it.

Only second in importance to the internal partition as a Stairs.

source of danger, or as a means of safety, are the stairs; and the stairs are second in importance only when the partitions are made to carry the floors of the several stories, In England, and in London particularly, even when the steps and intermediate landings are of stone, it is but too common to find the passage from the street door to the foot of the stairs, and the floors which connect flight with flight at the several landings, either wholly of wood or of slight stone paving laid upon wooden joists or bearers, Any stone paving upon wooden joists will certainly retard the action of fire upon the joists, especially if assisted by a well-plastered ceiling; but in this, again, if the floors be not formed of wholly incombustible materials, the French practice as to floors would be better than ours.

In Paris stone stairs are far less common in modern houses than they are in London in houses of corresponding character and date; but wooden

staircases in Paris are rendered alinost as safe as common stone staircases are in England, by a process similar in character to that applied to partitions and enclosures. The result is an almost incombustible structure. Wooden staircases formed between brick or stone walls, or between partitions of the kind above described as commonly made in modern buildings in Paris (that is, filled with a solid inass of conereted rubble), may perhaps be set on fire, but they can hardly burn.

It has been remarked that a mere plastered ceiling will Ceilings resist the action of fire for a long time, although the plas-

tering be upon wooden laths, and the laths nailed to joists of timber; and as fire does not readily act downwards, flooring boards may take fire from above without any immediately serious consequence to the joists under them,

so long as there is no access of air from below. But the Eng- lish indoor plastering upon laths is commonly of the most fragile kind, and the slightest weight falling upon the back of a ceiling will make a breach through it, whilst the floors are commonly of deal laid upon fir joists, and are exposed to the action of fire from below directly the lathed and plas- tered ceiling has failed ; if, indeed, the fire have not found its way to the joists under the flooring boards by the hollow lathed and plastered quartering partitions. In the timber enclosures and partitions, which economy induces the Paris builder to introduce as substitutes for walls, the timber is so embedded in and made part of a solid concrete, as to be protected from almost every casualty of which it is suscep- tible. But the French render their floors also so nearly in- combustible as to leave but little to desire in that respect, and in a manner attainable with single joists, as well, at the least, as with joists framed into girders. According to their practice, the ceiling must be formed before the upper surface or floor is laid, as the ceiling is formed from above instead of from below. The carpenters’ work being com- pletc, strong batten-laths are nailed up-to the under sides of the joists, as laths are in England; but they are much thicker and wider than our laths, and are placed so far apart that not more, perhaps, than one-half of the space is occupied by the laths. The laths being affixed—and they must be soundly nailed, as

they have a heavy weight to carry—a platform, made of rough boards, is strutted up from below parallel to the plane formed by the laths, and at about an inch below them. Mortar is then laid in from above over the platform and between and over the laths, to a thickness of from 24 inches to 3 inches, and is forced in under the laths, and under the joists and girders. The mortar, being gauged, as plasterers term it, or rather, in great part composed of plaster of Paris, soon sets sufficiently to allow the platform to be removed onwards to another compartment, until the whole ceiling is formed. The plaster ceiling thus produced is, in fact, a strong slab or table, in the body of which the batten-laths which hold it up are incorporated, and in the back of which the joists,

from which the mass is suspended, are embedded. The

finishing coat of plastering is then laid on. Such a ceiling will resist any fire that can act upon it from below, under ordinary circumstances ; and it would be difficult for fire to take such a hold from above as to destroy the joists to which a ceiling so composed is attached, the laths and the under side of the joists being alike out of its reach; and consequently such a ceiling alone would diminish the danger from fire, although the floor above the joists were laid with deal boards.

A boarded floor, however, in Paris is a luxury not to be found in the dwellings of the labouring classes, nor, indeed, are boarded floors to be found in any dwelling- houses but those of the more costly description. Whether the proposed surface is to be boarded or not, how- ever, the flooring joists are covered by a table of plaster above, as completely as they are covered by a plaster ceiling below. Rongh battens, generally split and in short lengths stout enough to bear the weight of a man without bending, are laid with ends abutting upon every joist, and as close together as they will lie without having been shot or planed on their edges. Upon this rough loose floor, mortar of nearly similar consistence to that used for the ceilings is spread to a thickness of about three inches ; and as it is made to fill in the voids at the ends and sides of the floor-laths upon the joists, the laths become bedded upon the joists, whilst they are to some cxtent also incorporated with the plaster. The result is a firm floor, upon which, in ordinary buildings, paving-tiles are laid, bedded in a tenacious cement. It

must be clear that the timbers of a floor so encased could hardly be made to burn

even if fire were let in between the floor and ceiling. But it has been already stated that the practice of making these incombustible floors is connected with the use of walls which have no timber laid in them bedwise, and that the timber enclosures employed instead of walls, and the internal partitions, are rendered practically incom- bustible, whilst the wooden staircase which economy dictates to the Parisian builders—the freestone which is used in building walls being altogether too soft for the purpose— is also rendered, in the manner already shown, almost unassailable by fire.

It may be remarked with reference to the einployment Expansion of any substance such as cinder, being of the nature of of plaster pozzuolana, or volcanic scoria, in mortar, to form a floor in floors.

the manner above described (about 3 inches thick), that as all such mortars expand in setting, the walls of buildings inay be forced out by the expansion of the plaster floors, if the whole surface of the floor in any story be at once covered with the mortar. A margin of 4 or 5 inches on every side should be left void until the expansion has taken place, when the floor may be completed with an assurance of close joints, and without injury to reasonably stable walls.

When a boarded floor is required, as the surfaces of the true joists lie under the mortar, a base for the boards is formed of what English carpenters would call stout fillets of wood, about 24 inches square, ranged as joists, and strutted apart to keep them in their places, over the mortar table, to which they are sometimes scribed down, and that to these fillets, or false joists, the flooring boards are secured by nails; so that in truth the boarded floor is not at all connected with the structure of the floor, but is formed upon its upper coat of plaster. The wooden floor thus becomes a mere fitting in an apartment, and not extending beyond the room the floor might

burn without communicating fire to the stairs, even if the stairs were readily ignitible.

The practice now in Paris, in respect of floors, is to form Floors with the structure of wrought iron joists rolled to the form iron joists.

known with us as 1, T, and T iron, and to fill in with the same strong plaster between, below, and above the iron, and so to form a slab of plaster from 6 to 8 inches thick, according to the bearing and the depth of the iron bars—the bars being enveloped in the plaster ; and the ceiling is formed as before described by laths resting on the lower flanges. In order to lighten the weight of the solid plaster, earthen pots have been placed between the joists and the spaces filled up with the mortar.

The necessity which arises with us of dividing the upper Upper stories of houses into more rooms, as bed-rooms, than are partitions,

commonly required in the lower stories, will be made an objection to any process that would render the partitions heavier ; but it is not in the upper stories that the lathed and plastered partition is most dangerous in respect of fire. Generally the stairs may be enclosed by solid partitions throughout almost the whole height of an ordinary dwelling- house without occasioning any inconvenience as regards the greater weight of such a partition; and generally, too, the partition which divides the front from the back rooms of such houses may be carried up throughout the whole height of a house without removing the bearing, if the house be judiciously disposed. But even if a partition rest upon a beam or girder, a very slight addition to the scant- ling of the timber will make up for the additional weight which the filling in of the partition would involve, if the materials of the core be well chosen ; and it is well known that a piece of timber placed over a void as a bressummer, and carrying a wall, resists the action of fire for a long time, and the longer if it be of oak or other hard wood. It is not necessary, however, that the timber employed in parti-

Coring.

Use of timber.

Weather- boarding.

Brick and timber fronts.

Building trades.

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tions and enclosures should be of oak; though it is desirable that main bearing timbers, in situations which render them most liable to be exposed to the action of fire in the event of casualty, should be of such timber rather than of fir; but the quarterings, or partition timbers, which the plaster concrete wholly encases, may be of fir as safely almost as of oak.

The core used in Paris consists for the most part of chips and spalls arising in the process of dressing the soft free- stone which is the main constituent of the walls of most buildings in that city. Almost any hard material, however, will furnish rubble fit for the purpose, which must be angular and irregular in form, so as to allow the mortar to pass freely through the rubble, and embed it all. Rubble of brick material, as broken burrs, or even of old bricks freshly broken, will answer very well; but if brickbats or shreds of plain tiles be used, care must be taken in packing not to bring flat beds together, or the mortar will not pass through and make a perfect concrete. Rubble of almost any kind may be used; but the kinds of stone which are themselves concretions, and present rough surfaces upon the fracture, are the best, while schistose or scaling slaty stones are the worst for the purpose. But there is no better substance for coring partitions upon the plan described than clay burnt into a kind of brick rubble.

The same process applied to external enclosures will justify the use of timber in their structure in situations and under circumstances in which it may be properly prohibited when the timber is merely lathed and plastered, or even brick-nogged, for brick-nogging adds nothing, as already remarked, to the strength of a partition or an enclosure, but rather takes from it, being itself a source of infirmity. But chimneys and their flues, with their con-geners, stoves and furnaces, ought not, under any circum- stances, to be formed in an enclosure in which timber is employed as a part of the structure.

Under some circumstances, again,—that is to say, when any street of a town is so wide and the buildings to be built fronting it are to be of such small elevation, as to make the communication of fire from one side to the opposite side practically impossible, if the buildings adjoining laterally are effectually separated from one another by suflicient walls, party or otherwise, and these project before the outside faces of the front and back cnclosures so as effectually to prevent fire from passing round them,—the temperature of dwelling-honses may be much more easily maintained and regulated if the outside surface be boarded. Weather-boarding is a safe and economical, as well as a neat, wholesome, and equable outside casing for the fronts of a dwelling-house, if the boarding be backed up solidly, and the timber quarterings necessary to secure it be properly filled in between and behind with brick or stone work, or with rubble and concrete in the manner already described. Brickwork builds up badly with the raking braces of timber-framed enclosures, and the concrete described would not be so perfect with weather-boarding on one side as if the mortar were thrown in from both sides ; but raking braces are less essential to enclosures which are filled in and backed with a heavy body of brick- work or concrete, than when mere lathing or even brick- nogging is to be employed on the inside. A 9-inch brick wall may, indeed, be very well built up with framed quarterings without raking braces, if the work be built between and around the quarterings, carrying, that is to say, the inner half-brick before the inside faccs of the quar- tering, and so as to show on the inside a plain brick wall.

Building Trades.—The artificers whose trades properly belong to the builder’s business are the digger or excavator, bricklayer, mason, sawyer, carpenter, joiner, cabinetmaker, slater, plumber, plasterer, modeller, carver, glazier, smith,

founder, ironmonger, gasfitter, painter, and decorator. In this order the works of the tradcs will be described, and we now proceed to tlie ordinary routine of the practice of building. The two publications which should be noticed here as comprising more detailed references to these trades are Gwilt’s Hncyclopedia of Architecture, 8vo, 1869, edited by Wyatt Papworth

; and Cresy’s Encyclopedia of Civil Engineering, 8vo, 1861,—these will not, therefore, be noticed in the list at the end of each trade.

Foundation.—The architect having furnished the specifi- Founda- cation and working-drawings of his design, the first step tion.

is to prepare the foundation; and as this relates to the bricklayer as well as to the mason, we say what is necessary respecting it here. Much in this particular, it is evident, must depend on localities. It is not of so much importance that the ground be hard, or even rocky, as that it be com- pact, and of similar consistence throughout; that it be so constituted as to resist entirely and throughout, or yield

equally to the superincumbent weight. But in the ordinary ©

processes of building little requires to be said of the artificial preparation of foundations beyond the notice of it already given. When a good, hard soil is easily accessible, as solid gravel, chalk, or rock, we have nothing to do but to remove the surface mould, dig to the sound bottom, and at once to put in the footings. On softer ground it was usual to employ footings at least double the width of the wall, and frequently more; but since the invention, or rather revival, of the use of concrete, this is seldom or never done. In this case, or when the ground is a deep clay, be the material used what it may, it should at least go so deep as not to be affected by change of temperature, or the rising and falling of springs, as the alternate shrink- ing and swelling of the ground must affect the building. Frost seldom penetrates a foot into the ground in this country ; but in clay soils, fissures, the consequences of drought, are found 3 feet and more in depth. The basis should, therefore, be below this point in such a stratum. If the ground be springy, it should be drained, if possible ; if not, a foundation should be made with concrete as low as the lowest level of the water; or if very deep or boggy,

piles must-be used. The plan of building on sleepers and Planking.

planking, so common some years ago, is very bad, as they rot after a time, and the building settles in all directions, as the greater weights crush the decayed timbers sooncr

than do the lighter portions of the building. Where ground

is alternately wet and dry, the best timber soon decays ; even piles should always be kept in the water. The use

of concrete, except in very peculiar cases, has entirely Concrete.

superseded every other artificial foundation. It may be defined asa sort of rough masonry, composed of broken pieces of stone or gravel, cemented together with lime prepared in various ways, and thoroughly mixed with it, and not laid by hand but thrown at random into the trenches, to form the depth required.

Any hard substance, broken into small pieces, will make good concrete. That most used is gravel, or ballast. This should not be too fine, as the sand which may be in it will mix with the lime and form a sort of mortar, assisting to cement the stones together. If broken stones or masons' chips are used, it is desirable to add some sharp sand with them. The general rule is, that no piece of stone should exceed a hen's egg in size. In this country the lime is generally ground, which is bad, as the core or unburnt portion is ground up with the good lime. About one-sixth part of lime is generally used ; chalk lime should not be used in a damp situation. It is mixed with the ballast by scattering it among the stones, and turning it all over with a shovel, water being at the same time thrown upon the mass. It is then, while hot, filled into the trenches, sometimes by shooting from stages

erected for the purpose 6 or 8 feet above the work ; but this process has been very justly censured as uncertain by eminent engineers, who prefer to put it in layers of not more than one foot in thickness, and to level each course, ramming it down thoroughly. When the lime is too hastily put into the trenches, and has not had time to be thoroughly slaked, the process will continue, and the mass will puff or swell and sometimes cause considerable mischief. Wing walls of bridges have been thrust out by this means. To make a solid concrete all the interstices of the gravel should be filled with the sand, and the lime and the water will be absorbed without any increase of bulk. Jn France the lime is first made into a paste, and the mixture is then

called béton, not concrete; this is a more scientific process for obtaining a sound substance. In some experiments made by the Architectural Publication Society, where the materials were carefully mixed, no change took place in the bulk ; but some experimentalists, practical men, and writers differ on this point, and assert there is a loss of one-seventh in bulk when set. The lime, if it can be procured, should be hydraulic; and concrete is much improved by the addition of the volcanic sands. French authors recommend, as good proportions, one-fifth hydraulic lime, one-fourth pozzuolana, one-eighth sharp sand, and the rest broken stone or gravel; or 20 per cent. hydraulic lime, the same of trass, the same of sharp sand, 15 per cent. of gravel, and 25 per cent. of broken stone. Perhaps the very best concrete is made of a simple mixture of gravel, sand, and Portland cement. It is unnecessary to enter into the details of foundations in water, as this but seldom comes within the ordinary builder’s province.

Digger or Kxcavator.—The digger works with a pick-axe and aspade or shovel. With the pick-axe he breaks down the soil if it be hard or very stiff, and throws it out with the shovel ; but compacted sand and alluvial soil are spitted aud thrown out with the spade alone, without previous breaking down. When rock occurs in a foundation, the assistance of the quarryman is requisite to cut through or blast it, as the occasion may require. The digger should be required to produce a perfect level in every direction, and especially in trenches for walls; nor may this be done by replacing loose matter, but the level must be produced on the solid or undisturbed bed. A good excavator will dig and throw out, of common soil, into a basket or wheelbarrow, 8 or 10 yards per diem ; but of stiff clay or firm gravel not more than 6 yards.

When the excavation has to be dug to a depth about the height of a man it will be necessary to strat the ground to prevent its falling in, especially if it be of a sandy, loose, or watery nature. This is done by placing on each side of the cutting upright planks against the soil, which may be either open or close, according to the quality of the soil, aud against these one or more horizontal waling pieces secured by horizontal cross pieces or struts, and wedging up as necessary. On these struts are formed the landings or stages on which the lowest workman throws the soil he digs up, which is then again thrown up by a second man to another stage or to the surface,

according to the depth. Sometimes the soil is hoisted in baskets or tubs raised by a windlass worked by hand, or by a horse-run. When the work has been executed for which the excavation was prepared, the digger has to fill in over and around it, carefully ramming the soil to prevent inequalities on the surface by the soil sinking, and to prevent water soaking in which might affect the foundations.

BRICKWORK,

The tools and implements employed by the bricklayer are the trowel, plumb-rule, rod, level, square, bevel, line-pins

and lines, raker, jointer, crow-bar, pick-axe, and rammer, together with a hod and spade for his labourer. Besides these there are sundry others, as an axe, saw, and rubstone, used in ctutting and gauging bricks, and some which are peculiar to tiling and paving. A pug-mill and screens for mixing and tempering mortar, and tubs and pails for water, are alsoauxiliaries of great importance.

In ordinary practice the bricklayer’s scaffolds are carried Scaffolding,

up with the walls, and are made to rest on them. Having built up the walls as high as he can reach from the ground, he plants a row of poles, which vary in height from 30 to 40 and even 50 feet, parallel to and at a distance of about 4 feet 6 inches from the walls, and from 10 to 12 feet apart. To these, which are called standards, are attached by means of cords other poles called ledgers, horizontally and on the inside, with their upper surface on a level with the highest course of the wall yet laid; and on the ledgers and wall short transverse poles, called putlogs or putlocks, are laid as joists to carry the floor of scaffold boards. These putlocks are placed from 4 to 6 feet apart, according to the length and strength of the scaffold boards; and the ends which rest on the walls are carefully laid on the middle of a stretcher, so as to occupy the place of a header brick, which is inserted when the scaffolds are struck after the work is finished. On the floor of the

scaffold thus formed the bricklayer stands, and the materials are brought up ladders to him by labourers in hods from the ground below ; or they are hoisted up in baskets and buckets by means of a pulley-wheel and fall; or by the horse-run, which is more generally used, formed of a level pathway in which the horse moves, drawing up the load by the intervention of snatch blocks and guide wheels ; or by the now usual hoisting-machine, worked by men, horses, or steam- power. The mortar is placed on ledged boards about 3 feet square, at convenient distances ; and the bricks are strewn on the scaffold between the mortar boards, leaving a clear way against the wall for the bricklayers to move along unobstructedly. The workman then recommences the operation of bricklaying, beginning at the extreme left of his course, and advancing to the right until he reaches the angle or quoin in that direction, or the place where his fellow-workman on the same side may have begun. Thus he goes on with course after course until the wall is as high as he can conveniently reach from that scaffold, when another ledger is tied to the poles, another row of putlocks laid, and the boards are removed up to the new level. The ledger and most of the putlocks, however, remain to give steadiness to the temporary structure, and so on to the full height of the wall, the poles being pieced out by additional lengths as may be required. If a soaffold be very much exposed, and run to a great height, it must be braced. This is done by tying poles diagonally across on the outside to the standards and ledgers, and it may be further secured by tying the ends of some of the putlocks to the ledgers; but an outside scaffold should never be attached in any way to the building about which it stands. A scaffold should never be loaded heavily, as well on account of the work as of the scaffold itself; for the putlocks resting, as they do, on single bricks, in a green wall, they exert au injurious influence on it, which every additional pound weight on the scaffold must necessarily increase, and the putlocks themselves are liable to be bent or broken. A constant and steady supply of bricks and mortar on the part of the labourers, without overloading the scaffold at any one time, should be strictly required.

The suspended scaffold is a very ingenious contrivance, Suspended by which pointing and other external repairs of a house can S¢affold.

be performed at a comparatively small cost, and without

interference with the thoroughfare. The front can also be

painted by the same means. Although known at least iV 5:

Mortars and cements.

Lime.

Rich lime- stones,

before 1825, it is only of late years that this scaffold has been much used. A couple of planks are secured side by side to form a platform, which is guarded by a railing all round to prevent the workmen falling off. ‘To iron bands are secured pulleys and ropes, passing over other pulleys made fast to two or more beams projecting out of the upper windows, or secured to the roof-timbers, by means of which the workmen employed can raise or lower the scaffold to any position where it is wanted to get access to the work to be done.

Brickmaking.—The manufacture of bricks forms the subject of a separate article, Sec p. 279 of the present voluine.

Mortars and Cements.—A few observatious on the com- position of mortars and cements for bricklaying will be necessary here. Mortar is of two kinds, —common mortar, or that mixture of lime and sand ordinarily used in building ; and hydraulic mortar, or that which will set under water. Cement is a name given to the produce of certain argilla- ceous stones, after calcination, which will set rapidly in the air, becoming a hard adhesive substance in a short time, aud will also set under water, both without admix- ture of any other substance. The naine is given, too, to certain artificial imitations of these substances, possessing the same properties; and besides, to various bituminous or oleaginous compositions, used in building for similar purposes.

Pure lime, which is an oxide of a metal called calcium, does not exist in a natural state. It is, however, found abundantly in the conditions of

carbonates and sub- carbonates, in chalk, and in the various other descriptions of limestones. Its chemical qualities and analysis will be described under the proper headings in this work. Limes are generally classed, since the publication of the work of Vicat, as—(1) rich limes, (2) poor limes, (3) limes slightly hydraulic, (4) hydraulic limes, and (5) eminently hydranlic limes. with the first two of this division. The first operation is to drive off the water, which all limestones contain in a greater or less degree, and the carbonic acid gas, which is done by calcining or burning in a kiln at red heat; this must be kept up for several hours, care being taken to avoid any approach to vitrification. By this process it is slightly diminished in bulk, loses nearly half its weight, and becomes caustic lime. The lime is next converted into

water over it from time to time till it hisses and cracks with considerable force and some noise, gives off a large quantity of hot vapour, and falls into a powder. The rich limes, which are the purest oxides of calcium, increase to double their bulk in the process. The poor limes swell to a much less degree. The hydrates thus formed absorb water, and easily take the form of a paste. They contain rather less than one-third water to two-thirds lime. In this state, if treated with pure water, frequently renewed, every particle of the rich limes, and very nearly the whole of the poor limes, will be taken up in solution. In the pro- cess of slaking too much water should not be used, as it “drowns” the lime, according to the expression of the workmen. When in the form of paste it begins to absorb carbonic acid, which is always present in air in considerable quantities, and gradually to crystallize again, and so to harden. If the air be excluded from the hydrate of pure lime, it may be kept for almost any length of time. Alberti (lib. ii. cap. 11) says that he once discovered some in an old ditch, which from certain indications must have been there 500 years, and was as soft as honey or marrow, and per- fectly fit for use.

The rich limestones give a white lime, which easily slakes, and increases in bulk ; but it is curious that though

BUI UDAWas

[BRICK WORK,

the stones differ so much in outward appearance and in texture, the lime, if they be well burued, is the same. The softest chalk and the hardest rag-stone or marble yield an equally good lime, the calcium which they contain being the same nuneral. But as chalk generally contains water, irregularly distributed in some places and not in others, and as it does not exhibit the change that marbie or stone does, it is frequently unequally burned, and therefore slakes imperfectly. It is said by Higgins (Mortars and Cements, p. 29), however, that lime made from chalk absorbs carbonic acid more rapidly than that made from stone; but experience does not seem to warrant this con- clusion. magnesia, manganese, or metallic oxides. of this they are more liable to vitrify in burning, and do not slake so freely. The lime is generally of a browner colour than that from rich limestones, which is said to be a

proof of the presence of the above-nained metallic oxides. If, however, they be ground so as to facilitate the slaking of

every particle, and if used immediately being made up, poor

limes produce a mortar which becomes harder than that from the rich limes, and which resists water better. In fact, works where the latter have been used have been

found to fail entirely by the action of running water, which, as before has been said, will continue to remove the whole of a rich lime particle by particle.

it is found that the mixture of some kind of hard matter Sands.

in particles or granules facilitates the setting of mortar, and renders it harder aud more adhesive than when used alone, besides the saving of limestone and expense of burning. The harder this material and the sharper the particles the better, as the brick or stone has always some irregularities on the surface, into which these angles or sharp points

| may enter, and form what is called a key. The substance

-sand and _ pit-sand. In treating of mortar we have to deal |

most generally used is sand, which is classed as river- The former is usually preferred, as it is more free from earthy matters, particularly soft loams or clay. Mortar made with sand containing one- seventh or one-eighth part of fat clay moulders in winter like marl,—a circumstance which proves the propriety of freeing from clay the sand used in mortar. If pit-sand be used it should be well washed. Scarcely any material is better than crushed quartz, or flint, from the sharpness of the angles of the particles ; in fact, it is said that very

_ sharp sand, with an inferior lime, will make a more adhesive a hydrate by a process called “ slaking,” or throwing pure |

mortar than soft sand with the best lime.

The practical mixing of mortar will be noticed further on.

Where sand

is scarce, other materials are sometimes used, the principal Other and cheapest of which is burned clay. The Romans used ™terials. At present Burned the custom is to throw up clay mixed with fuel in loose “@Y

this extensively in the form of pounded tile.

heaps, to burn it slowly, and then to grind it in a mill with a proper quantity of lime. The French writers at one tine asserted that burned clay, if not equal to pozzuo- lana, was very nearly so; and large quautities were used as hydraulic mortars at various public works. Where the water was fresh, as at Strasburg, the work stood very well; but where these mortars were exposed to the action of sea-water, they failed and went to powder in three or four years. Vicat gave great attention to the subject; and though he attributed much of the fault to the imper- fect carbonization of the materials, it appears with but little doubt there is some inherent difference between the pozzuolanas and other volcanic products aud those produced artificially. After long investigation, Vicat was of opinion that this failure was due to the quantity of hydrochloride of magnesia always present in sea-water; but in what way this affected the burned clay and not the volcanic products he was unable to explain.

A very excellent mortar, much used by engincers in

Poor limestones are those which contain silica, Poor lime In consequence stoues.

Tass.

Natural cements.

CEMENTS. |

tunnels, is composed of one part of moderately hydraulic lime, one part of coal ashes, one part of burned clay, and two parts of sharp sand. The vitrified refuse of furnaccs, called slag, and the scorize from the iron-works, have also been crushed and used instead of sand; and with lime, slightly hydraulic, produce good mortar. The former is preferred to the latter, as having sharper and harder par- ticles, and containing much less iron. Coal cinders have been used, and seem to have some hydraulic properties ; they should, however, be employed with caution, for it is considered they make the lime “short.” Wood cinders are too alkaline to be used with safety.

The vitrified and calcined products of volcanoes make most excellent materials for mortars, particularly where required to be eminently hydraulic. The principal of them

a. is the pozzuolana, which abounds in Italy. It is called so

from being found in great abundance at Pozzuoli, near Naples, and is, in fact, the basis of all the best Roman mortars, ancient as well as modern. It is usually sent to England from Civita Vecchia. It varies in colour from reddish brown to violet red, and is sometimes greyish; it has a roughly granulated appearance, and sometimes resembles a cinder in texture, and has frequently a spongy appearance. Acids have little effect on it, and it is not soluble in water. A similar earth is found in the centre of France. But one long known in this country comes from the village of Brohl, near Andernach, on the Rhine; this is called tarrass or trass. These materials have a wonderful effect in rendering even the rich limes eminently hydraulic, and in less propor- tions improving the hydraulic limes. Vicat says, these

mortars begin to set under water the first day, grow hard in the third, and in twelve months are as hard as the bricks themselves The mixture of common lime with these materials, according to the French writers, should be 1 of pounded lime to 24 of pozzuolana, or to 2 of trass; or 1 of lime to 1 of sand and 1 of pozzuolana.

In addition to the hydraulic limes, which have been thus described, there is a peculiar class of stones, which, when burned and pulverized, may be used as mortar, without admixture of sand or any similar substance ; and which will not only set rapidly under water, but will acquire an unusual degree of hardness and tenacity. These are called natural cements. Mr Parker is supposed to have been thé inventor ; at any rate, that gentleman took out a patent about sixty years ago for what he called Roman cement. His materials were the argillo-calcareous nodules, or septaria, found in the Isle of Sheppey, and commonly called bald-pates. They contain about 70 per cent. of carbonate of lime, about 4 per cent. of oxide of iron, 18 per cent. of silica, and 6 or 7 per cent. of alumina. ‘The process is simply to break the stones into small pieces, and burn them in running kilns with coal or coke; they are then ground to a powder, and headed up into casks for use. The success of Parker’s cement led to experiments in other places, and the same process was carried on with other argillo-calcareous nodules, as the septaria at Hawick ; those in Yorkshire, which produce the cement called Atkinson’s ; and those in the Isle of Wight, which produce the Medina cement. Similar substances were also discovered, and the same processes carried on in France and in Russia. All these cement-stones effervesce with acids, and lose about one-third of their weight in burning. Parker considered that the more the stones were burned short of absolute vitrifica- tion the better; but this is not the practice in the present day, though, no doubt, sound in theory. When taken from the kiln these stones will not slake without being pulverized ; and if kept dry, and not exposcd to the air, the cement will be good almost any length of time ; but it rapidly absorbs both water and carbonic acid if not carefully closed up, and falls back into a state of subcarbonate, from which it

is said it may be recovered by fresh burning, but it is doubted whether it is ever so good as on the first calcination.

The great utility of these cements, and the expense of Artificial obtaining the stone, induced manufacturers to endeavour cements.

to discover some method of making an article by artificial means which should resemble the natural cements. Mr Frost seems to have been the first who attempted it ona large scale; but though he was assisted by the science of General Pasley, the results did not come up to the expected standard. Of course, the object was to produce an argillo-calecareous substance containing the same chemi- cal qualities as the natural nodules, which might be burned in kilns as they are. The attempt to combine argil in the form of burned clay, to be mixed with lime instead of pozzuolana, had partially failed, as has been stated above. The experiments conducted by General Pasley, and by Vicat at Meudon in France, were all based ou the principle of mixing together, in a mill, with a quantity of water, masses of chalk and clay, just as the brickmakers do for the production of malm bricks, but in the proportion of about four of the former to one of the latter. The fluid mixture is run out into shallow receivers, and when dry is cut into small blocks or lumps, and burned exactly as the natural nodules are. The difficulty was to give the materials the full degrce of calcination short of vitrification. A successful result seems to have been at last

attained by the inventors of the Portland cement, so called Portland from its near resemblance to Portland stone in its colour, cement.

It not only possesses the property of setting more quickly, and has greater powers of cohesion than the natural cements, but it may be used with a superabundance of water in the form of grout, which they cannot be; above all, it seems

to resist the action of sea-water beyond all others; and it .

is proof against water when used as a mortar in setting brickwork, and in the composition of concrete for founda- tions. It also forms a very supcrior cement for plasterer’s

work. A prepared patent carbonate (Westmacott's patent) Westma- is used in combination with chalk, grey, and all other cott's

limes. All the carbonic acid being removed from the lime ?#%nt

in its burning, 75 per cent. of this acid is restored by its mixture with the prepared patent carbonate, and its indura- tion immediately commences, instead of the lime gaining the carbonic acid by atmospheric influence through a lengthened period. It is used as a quick stucco for rapid plastering ; and as a carbonated lime for external use it is in the course of a few days converted into a stone mortar.

Selenitic mortar is the name given to a eomposition Scott's

lately invented by Major-General Scott. to observe, about eighteen years ago, that a limestone capable of conversion by burning into a hydraulic lime might furnish a good cement by simply allowing a smali portion of sulphuric acid gas to pass into the kiln during the burning of the lime. Having found difficulty in carry ing out this process, he now mixes with the water used in the preparation of the mortar a small quantity of sulphate of lime (i.e., plaster of Paris, or gypsum) or green vitriol. Tt has the advantage, when used for plastering, of allowing the setting coat to be applied in forty-eight hours after the first coat has been put on, This mortar is said to save half the lime, is four times as strong, and sets in one quarter of the time required by common mortar. The lime will take six parts of sand, and is said to be an excellent substitute for Portland cement for concrete at less cost.

Asphalt, or mineral pitch (see ASPHALT), has lately Bituminous

He was the first Selenitic ortar.

come into extensive use for paving, for covering the backs cements.

of arches, or rendering the walls of basements where wet is likely to soak through, also as a damp-course over the footings of walls to prevent the rise of damp, and for lining cisterns and tanks to prevent the escape of the fluid. The best qualities are the Val de Travers and the Seyssel,

both obtained from France. In using asphalt for paving, a bed of concrete, made of the best hydraulic lime, is first prepared, and made fair at top by a rendering of similar mortar. The asphalt will not dissolve with heat by itself, but will calcine in the caldron. A small quantity of pure inineral pitch is therefore first put in ; when this is hot the asphalt is added, and soon dissolves; a quantity of powdered stone-dust is then stirred in, and a small portion of quicklime. The mixture in its melted state is then laid on the bed of concrete (which must be quite dry), and spread close and fair, some sand being sprinkled over the top and well trowelled in. The best proportions are said to be about 2 pints of mineral pitch to 10 Ib of asphalt and one-fourth bushel of stone-dust. Another method of forming a paving is to place on the concrete a layer about 3 inches in thickness of hot asphalt in powder, and then to ram it down with hot iron rammers, until it has come to its proper consistency; it is then finished as usual. This has been lately much used for roadways in the city of London and elsewhere. The same material has been com- pressed into tiles about 6 inches square, and these laid on a good foundation. A very inferior imitation is made by mixing a quantity of sharp sand with gas-tar, heated in a caldron, and then adding some quicklime. This may do for rendering walls, &c., to keep out wet, but it is of very little use as paving. Gravel coated with tar, and theu laid and set in tar, rammed down, and sanded over, makes a very good pavement for ordinary footpaths.

As before noticed, particular attention must be paid to cleansing the sand to be used for mortar of every particle of clay or mud that may adhere to or be mixed up with it. Sea-sand is objectionable for two reasons: it cannot be perfectly freed from a saline taint, and the particles are moreover generally rounded by attrition, caused by the action of the sea, which makes it less efficient for mortar than if they retained their natural angular forms. Lime should not be slaked until the moment it is to be mixed up with the sand in mortar, but the sooner that is done after it is burnt the better. The proportion of lime to sand generally taken, and the best, is one to three ; but if both the materials be of good quality, that is, if the lime slake freely, and become a

fine pungent impalpable powder, perfectly clear from argillaceous or any other foreign matter, and the sand be clean and sharp, one part to four is enough ; more is injurious. The ingredients should be well mixed together, and with just as much water as will suffice to make the compound consistent and _paste-like. Of late years, in lieu of sand, burned clay, as above noticed, has been much used in localities where it is diffi- cult to obtain the former material. This is ground up with lime in a mill, but unless very great care is taken in its manufacture the result is a very poor substitute for sand and lime mortar; and brick and lime rubbish have also been used in like manner, with an equally inferior result, Rain or other soft water should be used for the pur- pose of making mortar, and not spring or hard water, though any other may be preferred to what is brackish even in the slightest degree. Higgins recommended that lime-water should be used in preference to pure water. A

quick-setting cement, such as those which are commonly

used in building in England, and known as Parker's or Roman cement, and Portland cement, can only be mixed or gauged as it is required for use. A bricklayer will keep a labourer fully employed in gauging cement for him alone. It is mixed with sand in the proportion of from about two or three to about five or six of sand, to one of the cement, according to the qnality of the latter; and the labourer as he gauges on one board supplies the mixture to the bricklayer fit for use on another board, a spadeful at a time ; it must then be applied within half

a minute, or it sets and is spoiled and wasted, for it should never be worked up again.

The average size of bricks in England is a fraction Brick under 9 inches long, 4$ inches wide, and 24 inches walls.

thick ; and in consequence of this uniformity of size, a wall of this material is described as of so many bricks in thickness, or of the number of inches

which result from multiplying 9 inches by any number of bricks; a 9-inch or one-brick wall; a 14-inch or one-brick-and-a-half wal] (134 inches would be more correct, in fact, for although a joint of mortar must occur in this thickness, yet the fraction under the given size of the brick is enough to form it); an 18-inch or two brick wall, and so on.

The great art in bricklaying is to preserve and maintain Bricklay- a bond, to have every course perfectly horizontal, both ing.

longitudinally and transversely, and perfectly plumb

(which last, however, may not mean upright, though that

is the general acceptation of the term, for the plumb-rule may be made to suit any required inclination, as inward against a bank, for instance, or in a tapering tower) ; and also to make the vertical joints recur perpendicularly ove each other, which is vulgarly and technically called keeping

the perpends. By bond in brickwork is intended that Bonding,

arrangement which shall make the bricks of every course cover the joints of those in the course below it, and so tend to make the whole mass or combination of bricks act as much together, or as dependently one upon another, as possible. ‘The workmen should be strictly supervised as they proceed with it, for many of the failures which have occurred may be referred to their ignorance or carelessness in this particular. The object of bonding will be under- stood by reference to the diagram, fig. 1, Plate XX. Here, it is evident, from the arrangement of the bricks, that any weight placed on a would (supposing, as we are obliged to suppose, that every brick bears equally, throughout its whole length, a stress laid on every part of it) be carried down and borne alike in every course from 6 toc; in the same manner the brick d is upborne by every brick in the line e f, and so throughout the structure. But this forms a longitudinal bond only, which cannot extend its influence beyond the width of the brick ; and a wall of one brick and a half or two bricks thick, built in this manner, would, in effect, consist of three or four half-brick-thick walls, acting independently of cach other, as shown in the plan at @ in the diagram under fig 1. If the bricks were turned so as to show their short sides or ends in front, instead of their

long ones, certainly a compact wall of a whole brick in thickness would be produced ; but the longitudinal bond would be shortened one-half, as at g ch, and a wall of any greater thickness, in the same manner, must be composed of so many independent oue- brick walls, as at in the plan before referred to, To obviate this, to produce a transverse, and yet preserve a true longitudinal bond, the bricks are laid in alternate courses of headers and stretchers, or of ends and sides, as shown in fig. 2, thus combining the advantages of the two modes of arrangement a 6 c and gy ch fig. 1, na be fig. 2. Each brick in fig. 2 showing its long side in front, or being a stretcher, will have auother lying parallel to it, and on the same level, on the other side, to receive the other ends of the bricks showing as headers in front, which in their turn bind, by covering the joint between them, as shown in the end of such a wallat d. Thus a well-bonded 9-inch or one-brick wall is produced. ‘The end elevations of the same wall at e and f show how the process of bonding is pursued in walls of one and a half and two bricks thick, the stretcher being abutted in the same course by a header,—thus, in a 14-inch wall, inverting the appear- ance on the opposite sides, as seen at e, and producing the same appearance in an 18-inch wall, asat7/. Ju the diagrain

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English bond.

Closers.

BONDING. |

under fig. 2, at g, is the plan of a 14-inch wall, showing the headers on one side, and the stretchers on the other, and at / is the plan of the course immediately above it, in which the headers and stretchers are inverted; at & and i are shown in the same manner the plans of two courses of an 18-inch wall. This is called English bond. ‘Thicker walls are constructed in the same manner by the extension of the same principle.

But a brick being exactly half its length in breadth, it is impossible, commencing from a vertical end or quoin, to make a bond with whole bricks, as the joints must of necessity fall one over the other. This diff culty

is obviated by cutting a brick longitudinally into two equal parts, which are called half headers. One of these is placed next to a whole header, inward from the angle, and forms with

it a three-quarter length between the stretchers above and

below, thus making a regular overlap, which may then be preserved throughout ; half headers so applied are technically termed closers, and are shown next the upright angle of the wall fig. 2, and the first joits inwards from the square ends by the headers in the plans at g and &. A three-quarter stretcher is obviously as available for this purpose as a half header, but the latter is preferred, because, by the use of it, uniformity of appearance is preserved, and whole bricks are retained on the returns. In walls of almost all thicknesses above 9 inches, to preserve the transverse, and yet not destroy the longitudinal bond, it is frequently necessary to use half bricks ; but it becomes a question whcther more is uot lost in the general firmness and consistence of the wall by that necessity, than is gained in the uniformity of the bond. It may certainly be taken as a general rule, that a brick should never be cut if it can be worked in whole, for a new joint is thereby created in a coustruction, the difficulty of which consists in obviating the debility arising from the constant recurrence of joints. Great attention should be paid to this, especially in the

alone. In Flanders, Holland, and Rhenish Germany, which are bricklaying countries, no kind of bond is found but what is known in England as English bond. But it has lately been noticed that the medizval brick buildings in the north-east of Germany are worked in Flemish bond, or as it is there called ‘“ cross-bond ; ” and it is also to be seen at Brussels in work of about the end of the 18th century. Many of the buildings designed by Inigo Jones in England, and perhaps all of those by Sir C. Wren, are executed in Flemish bond, which name, it has been suggested, might have been derived from the word “ flemishing ” used by workmen, and thus applied to brickwork as meaning work better “ finished off” than the other kind.

ht, has been attempted to improve the bond in thick Herring- walls by laying raking courses in the core between external bone work.

stretching courses, and reversing the rake when the course recurs. This obviates whatever necessity may exist of using half bricks in the heading courses, but it leaves triangular interstices to be filled up with bats, as is shown in Plate XX. fig. 4. This represents the plan of 36-inch or three-brick wall with raking courses at a, between ex- ternal ranges of stretchers, and lying on a complete course of headers, and at 6 a wall of the same thickness herring- boned ; courses of headers would bed and cover this also, and, in the second course above, the raking or herring- boning would be repeated, but the direction of the bricks reversed, It will be seen that the latter deinands, in addi- tion to the triangular filling in bats at the outer ends of the diagonally placed bricks, half bricks to fill up the central line of interstices, rendering herring-boning more objectionable in that particular, though it has some advan- tages over simply raking, or thorough diagonal courses in other points. Neither mode should, however, be had recourse to for walls of a less thickness than three bricks, aud that indeed is almost too thin to admit of any great advantage from it.

quoins of buildings, in which half bricks most frequently occur; and there it is not only of consequence to have the greatest degree of consistence, but the quarter bricks used

Not second in importance to bonding is, that the brick- Walls to work be perfectly plumb, or vertical, and that every course be vertical be perfectly horizontal, or level, both longitudinally and 24 !evel-

No Flemish | bond | abroad.

as closers are already admitted, and the weakness con- sequent on their admission would only be increased by the use of other bats, or fragments of bricks.

Another mode of bonding brickwork, which may be supposed to have arisen from the appearance of the ends of a wail according to the former mode of arrangement (see ¢ and f, fig. 2), instead of placing the bricks in alternate courses of headers and stretchers, places headers and stretchers

alternately in the same course, fig. 3. The plans below this at c and d are of two courses of a 14-inch wall, with their bond, showing in what manner the joints arc broken in the wall horizontally as well as vertically on its face. This is called Flemish bond. Closers are also necessary to this variety of bond; half bricks also will occur in both, but what has been said with reference to the use of them in the former applies even with more force to the latter, for they are more frequent in Flemish than in Inglish, and its transverse tie is thereby rendered less strong. Their occurrence is a disadvantage which every care should be taken to obviate. The arrangements of the joints, however, in Flemish bond, presenting a neater appearance than that of English bond, it is generally preferred for external walls when their outer faces are not to be covered with some composition; but English bond should have the preference when the greatest degree of strength and compactness is considered of the highest importance, because it affords, as we have already noticed, a better transverse tie than the other. mm

Mr W. Hosking was the first to notice (in the last edition of this work) that what is in England called Flemish bond is unknown in Flanders, and is practised in the British Isles

transversely, The lowest course in the footings of a brick wall should be laid with the strictest attention to this latter particular ; for the bricks being of equal thickness through- out, the slightest irregularity or incorrectness in that will be carried into the superimposing courses, and can only be rectified by using a greater or Jess quantity of mortar in one part or another, so that the wall will of course yield unequally to the superiucumbent weight, as the work goes on, and perpetuate the infirmity, To save the trouble of keeping the plumb-rule and level constantly in his hands, and yet to insure correct work, the bricklayer, on clearing the footings of a wall, builds up six or eight courses at the external angles (Plate XX. fig. 5), which he carefully plumbs and levels across, and from one to the other. These form a gauge for the intervening parts of the courses, a line being tightly strained from one end to the other, resting on the upper and outer angles of the gauge bricks of the next course to be laid, as at @ and 4, and with this he makes his work range. If, however, the length be great, the line will of course sag; and it must therefore be carefully set and propped at

sufficient intervals. Having carried up three or four courses to a level, with the guidance of the line, the work should be proved with the level and plumb- rule, and particularly with the latter at the quoins and reveals, as well as on the face. A smart tap with the eud of the handle of the trowel will generally suffice to make a brick yield what little it may be out, while the work is so green, and not injure it. Good workmen, however, take a pride in showing how correctly their work will plumb with- out tapping. In work which is circular on the plan, both the level and the plumb-rule must be used, together with

Laying bricks.

Mortar joints and beds.

a gauge-mould or a ranging trammel, for every course, as it must be evident that the line cannot be applied to this in the manner just described. For every wall of more than one brick thick, two men should be employed at the same time, one outside and the other inside; one man cannot do justice from one side even to a 14-inch wall.

Bricks should not be merely acd ; every brick should be rubbed and pressed down in such a manner as to force the mortar into the pores of the bricks, and so produce absolute adhesion. Moreover, to make brickwork as good and perfect as it may be, every. brick should be made damp, or even wet, before it is laid, especially in hot weather, otherwise it immediately absorbs the moisture of the mortar, and, its surface being covered with dry dust, and its pores full of air, no adhesion can take place ; but if the brick be damp, and the mortar moist, the dust is enveloped in the cementitious matter of the mortar, which also enters the pores of the brick, so that when the water evaporates their attachmeut is complete. To wet the bricks before they were carried to the scaffold would, by making them heavier, add materially to the labour of carrying ; in dry weather they would, moreover, become dry again before they could be used, and for the bricklayer to wet every brick himself would be an unnecessary waste of his time; boys may therefore be advantageously em- ployed to dip the bricks on the scaffold, and supply them in a damp state to the bricklayer’s hand. A watering-pot with a fine

rose to it should also be used to moisten the upper surface of the last laid course of bricks preparatory to strewing the mortar overit. In bricklaying with quick- setting cements all this is of even more importance ; in- deed, unless the bricks to be set with cement are quite wet it will not attach itself to them at all.

As mortar is a more yielding material, used in brick- work merely for the purpose of making the detached por- tions of the staple adhere, by filling up their interstices and excluding the air, and the object is to produce as unyielding and consistent a mass as possible, no more should be used than is sufficient to produce the desired result. No two bricks should be allowed to touch, because of their inaptitude to adhere to each other; and no space between them should be left unoccupied by mortar which may produce adhesion. When the bricks are a fraction under 24 inches thick, four courses of bricks and mortar, or brickwork, are usually allowed 11 inches in height ; aud if they are fully that thickness, four courses are allowed 114 inches. The result of thick beds of mortar between the bricks is, that the mortar is pressed out after the joint is drawn, on the outside, in front; and being made convex instead of slightly concave, the joints catch every drop of rain that may trickle down the face of the wall, and are thus saturated; the moisture freezes, and in thawing bursts the mortar, which crumbles away, and creates the necessity, which is constantly recurring, of pointing the joints to preserve the wall. The diagram, fig. 6, shows the section of a 9-inch wall, with the joints on the side a as drawn, and on the side 6 as bulged, in consequence of the quantity of mortar in them yielding to the weight above. This, too, is in addition to the inconvenient settling, which is the con- sequence of using too much mortar in the beds. In practice, bricklayers lay the mortar on the course last finished, and spread it over the surface with the trowel, considering that it will fill the space between the bricks of that course, in addition to what they may have placed in the edges of the outside joints; but the mortar ought not to be so thin as to fall into the joints by its own weight ; so, unless they press it down, half the height of

Fig. 6,

the space between the bricks remains unoccupied, and the wall is consequently hollow, incompact, and necessarily imperfect. To obviate this, it is common to have thick walls grouted in every third or fourth course ; that is, Grouting, mortar made liquid, and called grout, is poured on and spread over the surface of the bricks, that it may run in and fill up the joints completely. This, at the best, is but doing with grout what should be done with mortar; and filling or flushing up every course with mortar requires very little additional exertion, and is far preferable. It also assists in making the house warmer and drier, by preventing the passage of wind or damp through the joints.

All the walls of a building that are to sustain the same Walls to floors and the same roof should be carried on simultaneously ; be carried under no circumstances should more be done in one part UP !~ than can be reached from the same scaffold, until all the sie walls are brought up to the same height, and the ends of the part first built should be racked back, as at a 8,

Plate XX. fig. 2, and not carried up vertically with inerely the toothing necessary for the bond, as at a 0, fig. 3.

Brickwork should never be carried on in frosty weather, Frost. nor even when it is likely that frost will occur before the walls can be covered in or become so dry as not to be affected by frost. Covering an unfinished wall with a thick layer of straw when frost may supervene is a very useful precaution ; and on the straw weather-boarding should be laid, to prevent access of moisture from rain or snow. Merely wet weather may be guarded against by following the directions given above as to flushing every course of the work well up with mortar, so that no interstices be left into which water raay insinuate itself, and by covering the walls with boards to act as a coping when the men are not actually at work on them; the joints in the face of a wall that is not to be plastered in any way should be pro- tected in this manuer with great care.

After the footings of a wall (above noticed) have been Damp- — brought up to the level of the finished surface of the proof Mite ground, or to the underside of the joists of the lowest floor, °°””* {nil there should always be introduced a damp-proof course, intended to prevent that rise of damp from the soil in the brickwork which is the cause of so much disfigurement and

injury to buildings. This damp course is formed in various ways, as a layer of asphalt, or asphalt canvas, or some similar material. One of the best and most usual, as the materials are always at hand, is formed of two courses of slates, well break- ing joint, and set in cement. Another is Taylors or Jennings's patent stoneware damp course, which being pierced horizontally admits air to the space under the floor and thus ventilates it.

Where the ground would come against the walls of a basement story, it is requisite, in order to keep them dry, either to form an open drain or area, or to make what is called a dry area. This is done by building up against the soil a thin wall of brick- work not less than 8 inches from the main wall, and either straight or curved, and covering it over above the ground with stone or slate, as in fig. 7. Thus any water coming through the thinner wall falls down, and is conveyed away or soaks through the bottom. This thinner wall requires

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artition

TILING. |

ventilated

Besides the outer or main walls of a house, there are interior walls, or partitions as they are called. These in large structures are always executed in brickwork ; in smaller ones they are usually constructed of timber ; and these timbers are often filled in between the uprights by brickwork formed of bricks laid flat or on edge according to the thickness of it. A plate of wood is occasionally introduced to strengthen the work, which is then plastered over This is called a brick-nog partition. In many of the model lodging-houses in London the partition walls have been constructed a half brick in thickness in good mortar, for the whole height of the building, the floor joists being fixed against them to steady them.

Another sort of wall consists of two skins of brickwork with a few inehes between them; this is called a hollow wall. The two skins, either both of

half a brick thick, or tlie outer one of one brick and the inner one of half a brick, are tied together by iron band-ties at various intervals. These

tile has a hole pierced through it near one end, to receive the oak pin by which it is hooked to the lath. The tiles are laid in mortar and sometimes in hay, or moss, on the laths, which in England are of oak or fir, with an overlap of 6, 7, or 8 inches. The greatest overlap or smallest gauge makes the securest work, thongh it does not present so good an appearance externally as a longer gauge does; and it requires, moreover, a greater number of tiles and laths, thereby adding materially both to the weight and the cost. The great overlap and the mortar (or hay or moss) are both necessary to prevent the rain and snow from driving in between and under the tiles, especially when of a low pitch. Plain tiling requires the pitch of the roof to be at an angle of at least 50°, and is one of the heaviest coverings that can be used, though it is at the same time one of the warmest. The tiles, however, readily and rapidly absorb moisture, which they communi- cate to the Jaths and rafters under them, to the serious injury of both the latter; and the mortar in which they are set requires to be frequently pointed, the constant

when straight are sometimes found to transmit the wet blown through the outer facing to the inner one, so a bend or loop is formed in the centre of the tie, which throws

atmospheric changes to which it is exposed occasioning it Other de- to crumble and fall away in no long time. Terro-metallic scriptions tiles are made with projections at the back to catch on the o% tiling.

. part of two sorts—plain tiling and pantiling.

off the water. This hollow space tends to make the houses both dry and warm, but it is said to form receptacles for insects, &e. An addition to such walls has been lately made by a series of these looped ties supporting a course of slates placed not quite vertical but sloping back slightly. The next

course of ties is built in at such a level that it fixes the top of this first course of slate in place, and pro- vides a starting for the next course. Thus, in the heart of the wall there is a continuous surface of slates, slightly overlapping at joists and at beds, and so placed that what- ever moisture blows through the outer skin is not able to | penetrate, but will trickle down the slates to the bottom of

support from the main one, and the cavity has to be | i

the cavity in the hollow wall. This is one of the many building patents of Mr John Taylor.

A rod of brickwork will consume about 4500 bricks, though the number will be a few more or less than this,

_ as the bricks happen to be below or above the average size,

and as the joints are made thicker or thinner. The quantity of mortar, it is evident, will be affected by the latter consideration also; but in London it is generally | reckoned at from ninety toa hundred striked bushels to | the rod, or from four to four and a half cart-loads, each containing about one cubic yard. The labour on a rod of brickwork may be done on an average by a labourer in four days ; this, however, does not include making and turning the mortar, nor scaffolding. Many things will, however, affect the time in which the work may be performed, both of the bricklayer and his labourer ; the former can do one-fourth as much more, at the least, in walls which are to be plastered, as in those in which he has to keep the perpends and draw the joints, &c., and more in thick walls than in thin ones ; and the capability of the latter will depend, inversely, on the rate at which the former can proceed, on the distance he may have to carry the bricks and mortar to the foot of the ladder, and mainly on the height he has to carry the materials up the ladder. In great heights, however, the materials should be hoisted.

Tiling being much less in vogue than formerly, in con- sequence of the better appreciation of the superior qualities of slate for covering roofs, and the moderate cost at which slates are now furnished to the builder, it no longer maintains its separate artificer, but is performed, when it is required, by the bricklayer. Tiling is for the most Plain tiles are simple

parallelograms, generally about 10} inches in length, 6 inches wide, and $ of an inch thick ; and cach

} laths.

laths, in lieu of pegs. Italian tiles have been made in England since about 1840, and are occasionally used. They are slightly curved, fit easily one into another, and have a horizontal indentation across the upper part to prevent the wind drifting the rain over the head of the tile. They have either wide or narrow vertical rolls. Taylor’s new roofing tiles have a plane surface with slightly turned up edges at the sides, and a lump on the surface near the upper edge to prevent the upper tile slipping. The cover tile is of a similar size and form. They are recommended as half the weight of the common tiling ; they are abont as

light as slating, and may be laid to nearly as flat a pitch. pantiles.

Pantiles are parallclograms of irregular surface, straight in the direction of their length, which is 13} inches, but twisted in the transverse section. Measuring the whole surface across, a tile is 9 inches wide, but in a right line from point to point not more than 7, and its thickness is half an inch; a small tongue or lip is bent down at one

_ end from its flatter convexity, on the under side, to hook

it to the lath by, instead of a wooden pin through it, as in a plain tile. Pantiles are set dry or in mortar, on They are not laid side by side, but overlap laterally as in fig. &;. consequently all the overlap they have longitudinally is 3 or 4 inches only, or enough to prevent rain and snow from driving up under the upper, over the end of the lower tile; and hence pantiling is but little more than half the weight of plain tiling. It is, however, a much less warm covering for houses, and is more liable to be injured by violent gales or gusts of wind than the latter is; but again, 1t presents a far more pleasing appearance to the eye. Pantiling will not bear a much flatter pitch than the other. It is greatly improved by being pointed on the inside with lime and hair. Sometimes, indeed, the whole of the work is, as we have said, set in mortar ; but this mode has disadvantages to which pointing internally is not liable, and its superiority in other respects is questionable.

In both pan and plain tiling large concave tiles are used to cover the hips and ridges ofa roof. These are not generally made to overlap each other in any situation, but are set in mortar, and fastened with nails and hooks fitted for the purpose, and driven into the woodwork of the roof. In addition to these an ornamental ridging or cresting is often imtroduced. A variety of patterns are now made for this purpose. Another form of

Fic. 8.—Pantiling.

Coping.

Brick cornices.

Pointing.

pantile very useful for common purposes is the Bridgewater tile; it is rather wider than the common tile and has a double roll, being about 164 inches wide and 14 inches long.

As plain tiling is heavier than slating, the plates and rafters of the roofs have to be made stouter than is neces- sary for slates, consequently the expense of the roofing is added to, supposing that the same thickness of wall be suffi- cient. The tile also imbibes one-seventh part of its weight or about 5 oz. of water in ten minutes, and takes many days to dry again thoroughly, this necessarily tending to deteriorate the timbers.

When the top of a brick wall is not protected by a roof, it must be covered or coped in some manner, or it will soon be destroyed by the weather. Sometimes this is done by means of a course of bricks set across it on their edges in cement, and called a barge course, but it is a very imperfect covering, for water will trickle down the face of the wall on both sides, as the coping brick can be no longer than the thinnest wall is in thickness. Two double courses of

plain tiles may be put side by side under the barge course,

making a projection over each face of about 14 inch, as

This is much better than the barge Elevations.

shown in fig. 9. Section.

Barge course. Tile creasing.

ae za at 7 or

Fic. 9.—Coping.

course alone; but still the covering receives no inclination outwards to throw the water off; the upper surfaces are all horizontal. The same objection exists to foot-paving tiles, which are also used as a coping ; but none of these methods is available for any wall above 9 inches in thickness. Stone coping, therefore, which may be made of sufficient width, and be both weathered and throated, is much to be preferred. One of the greatest faults in the modern practice of building, both architecturally as a matter of taste, and practically as a matter of prudence, is, that these copings, and cornices which serve as such, do not project sufficiently to protect the wall from the weather. A massive and well-projected cornice on a wall serves as a roof or pent-house to it; and, besides imparting great beauty to the plainest structure, protects the wall from the premature decay of its upper part especially, and of the joints generally, if it be unplastered brickwork, which thereby calls for the frequent repetition of pointing. Effective and pleasing cornices and blocking-courses may be formed with uncut bricks alone; and these, set in cement, would, with judicious management, add materially both to the appearance and durability of brickwork, without the foreign aid of either a

the plasterer or the mason. Figs. 10 and es 11 show two of the ap- Va

proved niodes of form- ing plain copings in brickwork to gardenand other walls.

From the injury which accrues to the joints of brickwork through bad management in its execution and imperfect protec- tion when executed,

arises the necessity, so frequent at the present day, of pointing. Sometimes frost will have supervened before the surfaces of the joints in a wall are dry ; consequently, the mortar bursts and peels away, and the whole then requires to be pointed. Preparatory to this operation the scaffold, if it has been struck, must be

Fig. 10. Brick Copings.

Fig. 11.

re-erected, the mortar raked out of the joints to a depth of about 3 of an inch, or deeper if the injury have reached further ;—this can be done by a labourer ;—a bricklayer then goes over the whole with a hard hair brush and water – to cleanse and moisten the joints; and then, with mortar prepared for the purpose, he carefully fills them all up, and neatly draws them with his trowel. This mortar must be of the best quality; it is generally compounded with a certain proportion of forge or smith’s ashes, which gives it a blue tinge, and adds greatly to its power of resisting the action of the weather. Cement is somctimes used instead of this blue mortar. If peculiar neatness be re- quired, every joint is marked with a narrow parallel ridge of a fine white putty, in the composition of which bone-lime forms a principal ingredient. The former is called fiat- joint, and the latter tuck-pointing. If it be an old wall that requires pointing, a scaffold must be erected before it ; and where the putlocks cannot be rested on window-sills and the like, half bricks are generally drawn from the wall to make rests for them, and restored again when the work is done. The former process is then gone through with a common wall; but if it require tuck-pointing, the whole surface is well washed, and then coloured to look like new brickwork, before the pointing is done. The gauged arches over the windows and doors are always coloured, and the joints drawn with peculiar neatness. If in the original building of the wall the perpends have not been preserved, that is, if the vertical joints have not been made to fall perpendicularly in the alternately recurring courses, the workman in pointing stops up the old

joints, which are irregular, with putty of a brick colour, and forms false new ones in the proper places.

Arches in brickwork are plain, rough-cut, or gauged. Arches, Plain arches are built of uncut bricks, and the bricks being Plain.

parallelopipeds, an arch built of them must be made out with mortar ; that is, the difference between the outer and inner periphery of the arch requiring the parts of which an arch is made up to be wedge-formed, as in fig. 12,

iw» i\Jr, AMS \ = Fig. 12. which the brick is not, the difference must be made in mortar, as in fig. 13, so that the inner or lower angles of bricks used for this purpose should all but touch. The mortar should be more consistent than that used in ordinary walling ; and the centre on which an arch of this kind is set or built should not be struck or removed until the work is thoroughly hard, or rather all such arches should be set in cement which will harden immediately. In con- sequence of this inherent defect in uncut-brick arches, in extensive continuous works, such as sewers, tunnels, vaults, &e., it is advisable to make them in thin independent rings of half-brick or onc-brick thick, as the case may be; that is, a 9-inch arch should be in two half-brick arches, as at a, fig. 6, Plate XX., and an 18-inch arch in two one-bricks, as at 6, each arch in the latter case being bonded in itself as in a common 9-inch wall with headers and stretchers. It is evident that, by this mode of structure, a greater quantity of the solid material comes into the back or outer ring or arch than into the lower one; and if they had been bonded together into one arch, as at c, all that difference must have been made up with mortar. Morcover, whatever pressure comes on the outer ring is carried by it directly to the inner or lower, from whose joints, however, the mortar cannot escape or be pressed out, the inner angles of the bricks, by meeting, preventing it below, and the bricks of the upper arch, which conveys the

Fig. 13.

BU PL DING

pressure, are themselves opposed to the back of the same joints, so that its power of resistance is made equal

ARCHES. | ABS It is generally held that nothing but its own components Plates and

should be admitted into a brick wall, except what is wood- bricks.

to that of the bricks themselves, except at the ends; which, in such works as we have supposed, are remote, and may be protected by the use of cement in their joints, whilst mortar is used in the rest. Rough arches are those in which the bricks are roughly cut with an axe to a wedge form, and are used over openings, such as doors and windows, when the work is to be plastered on the outside, or in plain back fronts, outhouses, garden-walls, &c., when, however, they are neatly pointed with what is called a tuck or tucked joint. Semicircular and elliptical arches are generally made plain, or without cutting the bricks ; but arches composed of a smaller segment of a circle (vulgarly and technically called scheme arches), if not gauged, are cut or axed. Very flat arches are distinguished by the term camber, from the French cambrer, to round like an arch. employed over windows and doors in external work, and they too are either cut or gauged. Gauged arches are composed of bricks which are cut and rubbed to gauges and moulds, so as to form perfectly fitting parts, as in masonry. Gauging is equally applicable to arches and to walling, as it means no more than the bringing every brick

It is arches of this kind which are generally

absolutely necessary for its connection with the other parts of a building, such as wall-plates and wood-bricks (and that these should be avoided as much as possible), tem- plets, lintels, &c. Wall-plates are applied to receive the ends of the joists, and distribute the weight of the floor to which they belong equably along the walls. If the joists tailed singly on the naked bricks, their thin edges would crush those immediately under them, and the rest of the brickwork would escape immediate pressure altogether. Wall-plates may be avoided by the use of framed floors, which are carried by a few large beams, under whose ends stout pieces of timber or stone, 2 or 3 feet in length, are placed. These supports are intended, like a wall-plate, to distribute the weight over a considerable part of the wall, and prevent the

necessity of placing the beam on the naked friable bricks, and are called templates. As bond timbers and wood-plates are now interdicted by the Build- ings Act in London, the joists have to be tenoned into trimming joists carried by brick, stone, or iron corbels. Lintels are used over square-headed windows and doors, instead of arches in brickwork. They are useful to pre- serve the square form and receive the joiner's fittings, but

Lintels.

they should always have discharging arches over them, and Discharg-

exactly to a certain form, by cutting and rubbing, or should not tail into the wall at either end more than a few 126 arches

grinding it to a certain gauge or measure, so that it will jg OVeT Open-

exactly fit into its place, as in the finer works of masonry. Gauged brickwork is set in a putty instead of common mortar, but it is seldom used except for arches in the fronts of houses, &c., which are to be neatly finished. These are for the most part straight, and are generally from 11 to 12 inches in depth, or the height of four courses of brickwork. Their value as arches will be best understood by reference to the diagram, fig. 7, Plate XX., by which it appears that all the material between the soffit of the straight arch or head of the opening 0c, and the dotted line b fc, is useless, the intrados or soffit of the really efficient part of the arch being at that dotted line itself. This is the arc of an angle of 60°,—its chord, the width of the opening, being the base of an equilateral triangle constructed on it, and the joints are the radii of a circle whose centre is at a. 4 d and ¢ e, the continuations of the sides of the triangle or radii a 6 and a ¢, are technically termed the skew-back of the arch. Sometimes the arc is made under a more acute angle, in which case the skew-back is less, that is, the external angles c bd and bc e are less obtuse; a smaller unavailable portion of the arch is thus left between the arc and its chord, but that portion is less securely retained under the flatter segment, because the joints or radii diverge less, or are more nearly parallel. These gauged arches being, as they for the most part are, but a half brick in thickness, and not being tied by a bond to anything behind them—for, indeed, almost the whole, if not the whole, of their height is occupied behind by the reveal and the wooden lintel—

require to be executed with great care and nicety. Itisa common fault with workmen to rub the bricks thinner behind than before, to insure a very fine joint in front.

This tends to make the work bow outwards; it should | rather be inverted, if it be done at all, though the best

work is that in which the bricks are gauged to exactly the same thickuess throughout. The same fault occurs when a gauged arch is inserted in an old wall, on account of the difficulty of filling up with cement the space behind the bricks. Fig. 8, Plate XX. is a transverse section of fig. 7, and the gauged arch, lintel, &c., in it show the total discon- nection of the gauged arch with auy surrounding brickwork to which it might be bonded. The absurdity of construct- ing arches circular on plan, especially in a thin unbonded shell of bricks, is so clear as hardly to require notice.

inches, that the discharging arch be not wider than absolutely necessary. Fig. 9, Plate XX., indicates the ele- vation of the inside of part of an external wall with a window in it, and shows the lintel over the opening with a discharging arch over it, and wood-bricks under its ends, on the jambs of the opening. Discharging arches should be turned over the ends of beams, and templets also, as in fig. 10. They may generally be quadrants of a circle or even flatter, and should be turned in two or more half bricks over doors and windows, and other wide openings, but over the ends of beams they need not be in more than one half brick. Wood-bricks are used to prevent the necessity of driving wedges into the joints of brickwork to nail the joiner’s work to. Theyare pieces of timber generally cut to the size and shape of a brick, or portion of one, and worked in as bricks in the inner face of a wall, where it is known the joiners have occasion for something of the kind. This is principally in the jambs of the windows and doors for their fittings, and along the walls, at proper heights, for the skirtings or wainscotting, as the case may be. The use of bond timbers in brick walls is objectionable because of their liability to shrink and swell, to decay, and to be set on fire; and in England the use of timber in walls has, since the extension of the manufacture of iron in these countries, been in a great degree superseded by that metal in the form known as hoop iron. Thin and narrow strips of this metal are laid in the bed joints of mortar, at intervals more or less frequent according to the nature and character of the work, with the best effect in respect of compactness and consequent strength. An

_ improvement on the straight band has been introduced by

Mr Tyerman, whereby a notch is made and the tongue bent down, which coming at each hollow of the bricks tends to afford a better hold on the mortar.

It will be generally found that a brick wall built with mortar and faced with ashlar has settled inward to a less or greater extent, as the work has been more or less carefully performed. Indeed, in the nature of things it cannot be otherwise, unless the brick backing be worked in some cement which sets and hardens at once; for the outer face is composed of a layer of unyielding material, with few and very thin joints, which p erhaps do not occupy a fiftieth part of its height, while the back is built up of an infinity of small parts, with fully one-eighth its height

IV. — 59

ings.

Wood- bricks,

Bond timber.

Hoop iron.

Brick and

ashlar work.

Discharg- ing arches under

openings.

Chimneys and flues.

Chimney hopper.

Pargotting.

of joints, which are composed of material that must both yield to pressure and shrink in drying. Some part of the ill effect attendant on this is obviated by the bond-stones, which tail in or run through the wall, and tend,to keep the discordant materials together; but still much of it remains. And besides this, the internal or cross walls, which have ne stone in them, will either settle down and shrink away from the external walls, or drag them inward, as they happen to be well or ill bonded or tied. For these reasons, brickwork built in this manner with masonry should be executed with exceedingly well-tempered mortar, made with no more lime than is absolutely necessary to cement the particles of sand together, and the sand again to the bricks, worked as stiff as it can be, and laid in as thin courses as may be to answer the purpose required of it. Above all, work of this kind must not be hurried, but allowed time to dry and shrink as it goeson. In some- large edifices the brickwork is carried up and com- pleted, and after a sufficient time has elapsed for the work to have settled, the ashlaring is carried up and worked in with the bond stones set in the brickwork for the pur- pose.

Discharging arches over vacuities having been disposed of incidentally, we have now only to speak of them under openings, in which situation their use is to distribute the superincumbent weight equally over the substructure, or along the foundation as the case may be. For this purpose the arch is inverted, as shown in fig. 4, Plate XXI.; and by means of it the weight brought down by the piers is carried along the footings, which are thus equally borne upon throughout their whole length. Arches of two half bricks are indicated here, that being sufficient for ordinary purposes, and to develop the principle ; in large and heavy works, arches of three half bricks, and even greater may be judged necessary. Any arc between a quadrant and a semicircle may be used with advantage; but an arc of less than 45° cannot be recommended for the inverted dis- charging arch under piers. Arches require abutments whether they are erect or inverted ; this is often forgotten when inverted arches are used.

Not the least important part of the bricklayer’s art is the formation of chimney and other flues. Great tact is required in gathering-over properly above the fire-place, so as to conduct the smoke into the smaller flue, which itself requires to be built with great care and precision, that it be not of various capacity in different parts, in one place contracted toa narrow

straight, and in another more widely expanded, and so on. ‘There is now often introduced at the level of the mantel, a plate with an opening in it through which the smoke ascends. ‘This, which is called a chimney-hopper or chimney lintel, is very useful not only to ensure the proper gathering of the flue, as the brickwork of the flue is formed at once upon it, but as a substitute for the usual register, and it also renders needless the usual iron chimney bar required to support the breast. It is absolutely necessary that flucs be of a certain magnitude, but the bore should be regulated by the size of the fire- place, or rather by the quantity of smoke to which it is required to give vent. Jor large kitchen fires it is con- sidered best to have two flues.

Practical men differ as to whether a tapering flue, or an enlarging flue is best for carrying away smoke. They are usually made of one size throughout. Of late years cylindrical earthenware tubes have been used with advan- tage, and of a smaller bore than the common 9-inch by 14-inch capacity. With glazed tubes it has been found that the soot falls down with thunderclaps and other strong vibrations. Flues of brick are plastered or pargetted with a mortar in which.a certain proportion of cow-dung is mixed, which prevents it from cracking and peeling off with

the heat to which it is exposed. The part brought out into the room from the wall, and over the opening, is called the breast. The flooring in the opening is called the hearth, fig. 8, Plate XXI. ; itis set on the bricks or stones of the wall, and is usually of stone, although cement and iron plate are sometimes used. The slab is that part of the floor of a room which is immediately before the fire-placc, and along the extent of its front. In basement rooms, this slab is supported by a brick wall brought up from the ground ; but in upper rooms the slab is supported by a flat half brick arch called a brick trimmer, which is turned from the chimney breast under the hearth on one side to the trimmer joist on the other, which is generally made some- what thicker than the other joists for this purpose. The chimney-piece which comes in front is fixed by the mason after the carpenter’s work is done.

The plate above mentioned assists in ensuring a proper Causes of

draught to the flue, and preventing a smoky chimney. smoky These are frequently caused by want of sufficient air to feed “muss. the fire, which must be supplied from the room itself or by a tube brought from the outside

of the building. Another cause of smoke is too short a funnel, especially if the flue be a large one, as formerly built for sweeping by boys. Every fire-place must have its own flue. Other causes are—one fire overpowering the other, when there are two in one large room, or two rooms communicating by a door- way, or when the tops of chimneys are commanded by higher buildings, or by a hill, so that the wind sometimes blows almost perpendicularly into the tops of the chimneys that lie in its way and beats down the smoke. A down- draught is usually produced by the difference of the exter- nal atmosphere from that in the room; this often brings down the smoke of a neighbouring chimney ; it can occasionally be obviated by raising one of them, or by fixing on it one of the exhausting pots now manufactured for the purpose. The bad construction of fire-places is another cause of smoky chimneys, the throat being too large for the fire. We shall not attempt to describe the many patent and other inventions submitted for curing these nuisances, but what is known as Billings's terminal must be exeepted. It con- sists of a low conical top about a foot high, placed on the flue, and screened on each side by a terra-cotta baffler, rising somewhat higher than the pot ; the wind striking the former is thrown upwards and assists in extracting the smoke; the latter prevents the smoke of one flue being blown down the adjoining ones in the same stack. The common terra-cotta pot with louvre sides is also useful and ornamental.

Brick and tile paving is performed by the bricklayer. Paving in Brick-paving is either flat or on edge, in sand or in mortar brick. or cement. Brick flat-paving in sand, that is, with the bricks laid on their broadest surfaces, and bedded in and on dry sand, is very slight and fragile, and brick flat-paving set and bedded in mortar is very little better; for if the soil on which the paving is laid be light and sandy, the bricks are easily displaced by being pressed unequally ; and if it be clayey it will probably be moist, and the thin porous brick absorbing the moisture, will generally become saturated, and present a damp unwholesome floor. Paving with bricks on their edges, however, forms a much better floor, and is preferable to a stone paving, if the latter be laid on the ground without the intervention of footings. Brick-on-edge paving in sand is generally used in beer cellars, pantries, dairies, stables, &c., as its numerous open joints allow wasted or discharged fluids readily to escape ; and it is both cool and dry under ordinary circumstances.

In mortar or cement, bricks on their edges form a sound, dry floor; the smallness of the surface exposed by each brick in this manner leaves them, of course, less susceptible of partial pressures, and the depth from the soil to the

1 Sey

Sewers and ains,

surface is such that damp rarely shows through. The paving brick differs from the common brick only in thick- ness, its dimension in that direction ; being rather less than 2 inches, in- stead of 24 inches, and in being rather harder and more compact. Dutch clinkers are paving bricks, smaller and much harder than the Fic. 14.—Paving of English, and of a light yellow colour ; Dutch Clinkers. they are 6 inches long, 3 inches wide, and 1} inch thick, and are always set on edge and herring-boned, that is, instead of being placed in parallel lines, they are set at right angles to each other, as in fig. 14, yet with a perfectly even face. Paving tiles are made 92 inches and 114 inches square, though they are called 10-inch and 12-inch or foot tiles respectively, the former being 1 inch, and the latter 13 inch thick ; they are set in courses, as stone paving would be, the alternating courses breaking joint. A sort of tiles called terro-metallic are manufactured for stabling and similar purposes.

Here may be mentioned the extended manufacture of ornamental tiles. The tiles formed in intaglio and ena-

- melled, similar to those used by the Moors in Spain, have

enabled the architect to break through the monotonous surface of brick buildings, and to introduce ornamental forms and colour without the necessity of resorting to plaster and stucco. From the geological position of London and many other towns, bricks must always be the prevailing material for building purposes; such means, therefore, for the safe introduction of colour and ornament are especially desirable and should be carefully studied. With this, too, has come the extended use of ornamental

brickwork by the introduction of moulded bricks of all forms, and of many colours, together with a material of a like nature, by which decorative work of a more ornamental character can be obtained, namely terra-cotta, or prepared clay moulded or wrought and then burnt ina kiln, Tiles as above referred to are made for mosaic and tesselated pavements in plain colours (some being enamelled), for halls, footways of land- ings, ecnservatories, &c., also glazed tiles for hearths, and white and toned tiles, with the encaustic tiles of many colours, for walls. The former are manufactured of all sizes, so that by the combination of certain forms and colours an endless variety of patterns are obtainable. For pavements they require to be carefully set in cement on concrete, and in cement on walls.

Sewers and drains which are not cylindrical should be built with concave bottoms; this keeps the stream more together, and enables it the better to carry its impurities along with it, whereas a flat-bottomed drain offers a large surface for the particles of soil to attach themselves to, and the stream of water being more scattered is less efficient in force. Drains near houses, and in other places where it may be necessary to open them at any time, may be of the form of which a, fig. 1, Plate XXI. is a section, with a flat covering of stone paving, or large paving tiles, set and jointed with cement. Gun-barrel drains, of 9-inch or 12-inch diameter, as at 6, are the best in exposed situations, because they are the strongest ; but as there is no mode of cleaning, if they are too long to be raked, but by breaking them up, they should not be employed except with a con- siderable fall and a frequent or constant stream of water through them, as from a pump trough, rain-water trunks, &c. They are constructed on a barrelled centre of wood, which the bricklayer drags on as he advances with his work, finishing as he goes. No drain should have an inclination or fall of less than one-quarter of an inch to a foot; and where the stream is infrequent and dull, as much more would be a great advantage. Large sewers, which are accessible from the ends, or from side entrances,

for men to clear or remove any accidental obstructions, are best made circular, elliptical, or egg-shaped, as in fig. 15. The last two shapes are gen

ally preferred, because in proportion to the capacity the height is greater. The form in fig. 15 maintains the greatest possible depth with a small quantity of fluid, and combines this qualification with those of great strength to resist external pressure and large capacity with a given amount of materials The form shown at ¢, fig. 1, Plate XXI., is now

Fria. 15.—Section of Sewer.

disused, though it was long advocated for sound work-

manship and regular joints. A rate of fall of 1 in 120, or 1 inch in 10 feet, is desirable, although less will suffice for a main sewer.

Pipes or hollow cylinders of well-made and well-burnt Pipe glazed stoneware form the most efficient house-drains. 47@ins.

Such pipes are put together with great accuracy with sockets, so as to fit spigot and faucet fashion; movable tops are provided so as to give access to them at any part required, without taking up and relaying the drain from one or other of its ends, as was so often the case with the old brick drain. Proper bends, junctions, syphons, é&c., are also made of the same material. In using pipes for drains, it should be borne in mind that a little larger than large enough is better than the reverse of this. No pipes should be laid down for a house-drain of less bore than 6 inches, nor should earthenware be used for drains requiring a greater bore than 12 inches; the material is too weak to allow of more, and the material is not strong enough to stand more than a dead pressure. Glazed stoneware pipes are also employed for small sewers in side streets, or to take off the collected soil and water from a short row of houses into the main brick sewer, and thence to a water- course or to a reservoir of a main drainage scheme.

In building drains it is of great importance that proper Traps.

traps should be constructed to prevent the ascent of foul air and the passage of vermin. At every sink there should be a bell-trap, and a well-trap within that, or near the hither end of the drain. Suppose e drain leading from a kitchen or scullery to the common drain of the house, in which it meets that which may come from the water- closet and other places. The bell-trap in

the sink itself will prevent the return of smell when it is constantly in use, but it is liable to be left out, broken, or otherwise injured, or it may become dry by evaporation ; it is, therefore, necessary to have a trap not so liable to such ordinary contingencies. Let a well be made 18 inches or 2 feet in diameter, square or round, and 2 feet 6 inches or 3 feet deep, across and below the level of the drain, as shown in plan, fig. 2, Plate XXI., and in longitudinal section, fig. 3; it must be built around with brick in cement, and be plastered on the inside with the same material, which will make it capable of retaining fluids. Uprightly across this well, and in the transverse direction of the drain, must be placed a sound piece of paving stone, so long that its ends may be inserted in the sides of the well, as shown in fig. 12, and so wide that its upper edge shall touch the covering of the drain, and that its lower may reach 6 or 9 inches down into the well below the bottom of the drain. Mortar or cement must prevent the passage of air between the upper edge of this trap-stone and the cover of the well and drain, and the trap is com- plete. The water coming from the sink flows along the drain from a to 6 (fig. 3), where it falls into the well, and filling it up to that level it flows on again from ¢ in the direction of d, to the cess-pool or common sewer from which, however, no smell can return; for the trap-stone

Ventila- tion.

Cesspools and tanks.

Earth closets

e, the lower half of which is thus immersed in water, com- pletely bars the passage. It is evident, however, that if the well should leak the water in it may fall below the lower edge of the stone, and the efficiency of the trap be destroyed ; but if it be made perfect in the first instance, there can be no danger of any inconvenience that a bucket of water thrown into the sink will not cure. It is from the drying up of the fluid in water-traps that uninhabited houses are so frequently offensive. These well-traps form an effectual bar to vermin, and they may, therefore, be advantageously placed at the entrance of water-closet drains, to prevent rats from getting at the soil-pipes, which they will gnaw and destroy if they can get access to them. Internal drains, or

those which go through a house, should always pass under the doorways if possible, in external walls at least. If, however, circumstances should render it absolutely necessary that a drain be taken through a wall, an arched ring or bull's eye should be made for it to pass by

All the traps to the drains should be ventilated, as well as the head of the drain itself, by a tube carried up to the top of the house, and away from any opening where the foul air could be blown into any of the rooms, The sewers should also be ventilated, if not by the gully or side gratings, then by a grating placed over them in the centre of the roadway There have been numerous sugges- tions for ventilating shafts in the lines of main drainage, but nothing beyond a tall lamp-post has been carried out, and no doubt this is sufficient.

In country houses where the drainage is used for manure to the gardens or land, the drain from the closets may be led into a brick or iron tank or cesspool, the surplus water being carried off by an overflow drain. Cesspools are strongest if made cylindrical, and should be bricked round and domed at the top, with a manhole in it for access, Which should be fitted with a stone, having a ring in it by which the stone can be raised. But whether they are made to retain fluids or not is not a matter of conse- quence, if they be placed in a secluded situation, where, if the object be not to get rid of the waste, there is seldom, at least, any desire to retain it. In towns and cities where the common sewering is as complete as it ought to be, and water-closets are used instead_of privies, cesspools are unnecessary, as the soil becomes so much diluted by the water that goes. down with it, that it flows readily enough through the private drains to the common sewer, and so on with the rest, to the common receptacle. Some- times, indeed, it may be found necessary to clean out the well-traps before described, but this cannot often occur. Galvanized tanks are occasionally used in some parts of the country, with pumps attached, by which the sewage can be rendered available r the garden. Earth closets on Dr Moule's system, or the cinder-sifting ash closets, are valuable for preventing the waste of an important manure. For workmen's cottages in large towns and villages they must be of great service, but whether they are adapted to a town house, or are applicable on an extensive scale for the relief of town drainage, is a question which still remains unsolved.

The principal publications on Brickwork are as follows :—Moxon, Mechanick Exercises, 4to, 1682; Langley, London Prices of Brick- layers' Work, &c., 2d edition, 8vo, 1750; Saunders, Observations on Brick Bond, 8vo, 1805, and reprinted in vol. i. of the Civil Engineer and Architect's Journal, 1838; Elmes, Foundations, 8vo, 1808; Nicholson, Architectural Dictionary, 4to, 1819; Davy, Construc- tion of Foundations, 8vo, 1889; Dempsey, Builder's Guide, 8vo, 1852. The foreign publications are mostly comprised in the list at the end of the Masou-work. For Ornamental Brickwork, see Degen, Constructions en Briqucs, 4to, no date; Essenwein, Norddeutsch- lands Backstein Bau im Mittelaltcr, folio, 1863; Runge, Essai sur les Constructions en Briqucs en Italie, folio, 1849 – Street, Brick and Marble Architecture in Italy, 8vo, 1855.

BUTLEDING

[MASON-WORK.

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Mason-Work.

The word mason is derived directly from the French macon, Which signifies indifferently a bricklayer or mason. Du Cange attributes the origin of the word to the low Latin maceria, a wall; but a more probable derivation is that from the old German meizan, to cut. Among our- selves, at present, we reckon three sorts of artificers— rubble or rag-stone masons, freestone masons, and marble masons. This last branch, however, is rather that of the carver or statuary. The art of working or reducing stone to the proper shape for the mason to set, 7.¢., to place them in the walls, &c., has generally been called stone-cutting, and depends very much on the nature of the stone for its details. Stone masonry is the art of building in stone.

The mason's tools consist of a handsaw, for cutting soft stones ; a drag, which is a flat piece of iron wherewith to finish its surface; chisels and gouges for forming mould. ings, gauges and moulds for sinking them to the proper forms; a mallet, chisels, tools, and points for working the harder stones ; a level, a plumb-rule, a square, a bevel, with rules of various sorts wherewith to try the surfaces in the progressive stages of the work. Granite

is brought to a face by the scabbling hammer or granite axe, and the operation is called nidging. In rubbed work a surface is obtained by smoothing it with sand or gritstone. Marbles are polished by being rubbed with the gritstone, then with pumice-stone, and lastly with emery powder.

Rubble walls are scaffolded with single, and ashlar- fronted or other gauged stone walls with double-fronted scaffolding,—the former tailing one end of the putlocks in the wall, and the other having an inner row of standard poles, and ledgers parallel to the outer, making the scaffold entirely independent of the wall. In some places, however, it is the custom to dispense altogether with an external scaffold in building stone walls, particularly with gauged stones. With light and plain work this may be done without much inconvenience or retardation; but if the work be heavy or delicate, considerable delay and incor- rectness result. Sometimes the finer work, such as that to mouldings, flutes, and foliate or other enrichments, is merely boasted or roughed out before the stones are set, and finished afterwards, but this can be done well only from a secure floor or scaffuld on which the workman may feel he can move freely and surely. For large and elaborately decorated structures, such as a public building, a me- chanical scaffolding has to be erected, by which some economy is effected through diminishing labour, or some emergencies met attendant on the works themselves. Where the face of a stone is worked in the shop and may have some weeks or months labour on it, it becomes a valuable work worth careful handling. Hence the old- fashioned kind of scaffolding, of poles and ropes, has been much superseded by the so-called whole timber or framed scaffold, with its tramway and crab engines aloft. It is usually formed by laying square timbers on the ground to receive similar uprights, which are secured by iron ties to it; on the heads of these are placed horizontal timbers, which are also secured to the uprights, and the whole is kept from changing position by timber struts and braces. On these another range may be erected, and so on to the required height. Tramways are placed on it, and a travel- ling crane, worked by hand labour or by steam, raises the neavy weights, carries them to their places, and at once deposits them in the work with great ease. By the use ofa steam-lift, with a long arm to reach many feet above it, cn the first stage of the frame scaffold, no other scaffold is necessary except a slight one for the use of the workmen to set the stone.

The clock tower at the Houses of Parliament was built by a scaffold formed of two timbers,

Tools,

Scaffolding

BUILDING STONES. |

each 2 feet 3 inches deep and 14 inches wide, running across from side to side, on which rails were fixed to carry a travelling platform of the whole width which went the reverse way. To one side of the first named timbers was suspended a platform which carried the machinery for raising the materials from the bottom up the central shaft ; they were then raised on to the traveller which carried them at once to the required spot for fixing. When a certain height of work had been done, the huge timbers were raised by six screw-jacks working together, and rested on the new wall, the jacks being removed and prepared for another raising when necessary. The Victoria Tower was erected on a somewhat similar principle, but having two travellers working upon a circular tramway on a strong trussed framing, the ends of each secured to a central drum. To raise the materials a strong under-trussed parallel framing was formed on one side, which brought them up on the outside of the tower.

Stones used in Building.—It may be useful to give a list of the stones principally used in building, according to their geological formation, with some practical remarks upon each.

Of igneous rocks of volcanic origin, the varieties which are used on the continent of Europe are those light stones called tufa and pumice, and the stone called peperino. The two former were extensively employed by the Romans in the filling in of vaulting, on account of their great lightness. The latter stone, which is obtained in large quantities near Rome, was used by that people extensively, particularly for substructures, being obtained in large blocks. Of the second division of igneous rocks, the trappean, porphyry and serpentine have been used, but chiefly as ornamental coloured stones, and have been generally classed as marbles. Of the third division, the supersilicated rocks, granite alone is now extensively employed, not

only in engineering works, but in public buildings and dwellings. It is got from the quarries by splitting the blocks with wedges, and is so hard that it cannot be cut by any ordinary saws. It has to be worked first with large hammers, and then reduced by pointed chisels, and consequently is very expen- sive in building. Machinery is used very largely in cutting and also in polishing it. Some very good specimens come from Corn- wall and Devonshire, but by far the best are from Dundee and Aberdeen. A variety of the latter, called Peterhead granite, is only to be equalled by the finest Oriental granites. The Kingstown granite from near Dublin is much used locally.

Of the aqueous rocks, mechanically formed, and of the arenacecous varieties, gravel is used for concrete, and sand in making mortar.

. Sandstones and gritstones are very extensively used. These are either laminated, as the York stone, used generally for paving, as it can readily be split into large surfaces of small relative thick- ness, or compact, as Old Red Sandstones, which stand very well in- ternally, but perish sadly with the weather, as may be seen at Chester Cathedral. The New Sandstones, the best of which is the Calverley stone got near Tunbridge Wells, are easily quarried, but if sawn, the wet saw and sand must be used. The finer grained compact sandstones, which are comparatively free from iron, and form very good building-stones, are very numerous. Such are the Bramley Fall, used for bridge copings, plinths, &c.; the Park Spring, Elland Edge, Whitby, and others, all in Yorkshire; the Hollington in Staffordshire; the Mansfield in N ottinghamshire ; and the Minera quarries at Wrexham. A bed of the last is much used at Chester and Liverpool for building purposes, and it has just been introduced into the London market, for which city it is thought it will be very eligible, on account of its lasting qualities ; it has been also used at the National Safe Deposit Company’s offices in London. Scotland can boast of some of the finest quarries of sandstone, the best, perhaps, being the Craigleith, much used at Edinburgh. The College, courts of law, Register House, Custom- house, Royal Exchange, National Monument, and many churches and private residences there, are built of this excellent material, which has also been extensively exported to Hamburg, Altona, Gothenburg, and other places. Humbie stone has also been much used, both at Edinburgh and at Glasgow, where it forms the Royal Exchange and Royal Bank; it is

easier to work than Craigleith. Glamis 1s also a fine sandstone ; the castle there, as well as those at Inverquharity and Cortachy, and Lindertis House, are built of this material. In Fifeshire, at Cullalo, are quarries whence the stones for the monument to Lord Melville at Edinburgh, and that to Lord Nelson at Yarmouth, were obtained. In addition to beauty and durability, these stones have the merit of being capable of re- ceiving the finest and smoothest forms from the chisel of the work- man. Another class of sandstones are commonly called jirestones, as they endure the action of fire better than most others. Of these the best known is the Reigate stone, which is the principal material

‘used at Windsor Castle, Hampton Court, and in many old buildings

round London. The Minera stone already mentioned is another.

Of mechanically-formed aqueous stones classed as argillaceous, the Clunch. Clunch only is used in building. It may be seen in Ely and Peterborough cathedrals, and many other medieval buildings, and is a beautiful material for interior carved work, but will not stand the weather.

Of the aqueous stones classed as chemically formed, there is Travertine. none of note but the Tyavertine, or, properly speaking, Tiburtine.

This is a coarse grained stone, of warm colour, found in large blocks, and extensively used at Rome, both in ancient and modern build- ings, of which the cathedral of St Peter’s may be cited as an instance, but it is unknown in England. _ Of aqueous rocks, organically derived, the calcareous claim prin- Limestones. cipal attention. The chief of these are the limestones, which are classed as compact, magnesian, or oolitic limestones. Of the first, Compact the best, in the south of England, is that called Chilmark, of which limestones. Salisbury Cathedral and Wilton Abbey, and many other fine build- ings, have been erected. In the Midland counties the Tottenhoe stone, of which Dunstable Priory, Woburn Abbey, Luton church, &e., are built, is an excellent stone. There is also a stone of high quality got at Hopton

Wood, near Worksworth in Derbyshire, used at Chatsworth, Belvoir, Drayton Manor, &c. Ancaster stone, near Sleaford in Lincolnshire, has been used for a number of years; also Ham Hill, near Yeovil, in Somersetshire. Of magnesian lime- Magnesian stones we may name the Anston and Bolsover Moor stones, used limestones. formerly at Southwell Minster, and lately at the Houses of Parlia- ment; the Tadcaster stones, used at York, Beverley, and Ripon Minsters, and very many other buildings; the Roche Abbey, used at the building of that name, and very many other churches in York- shire and Lincolnshire ; the Brodsworth, near Doncaster ; and the Huddlestone, near Sherburne in Yorkshire.. These stones contain a great deal of carbonate of magnesia, from which they take their name, are of beautiful texture, and stand well in the country as building stones, but fail in London.

A very excellent limestone for rough walling, especially for Gothic work, is that called Kentish Rag. It is found in large quantities in Kentish the neighbourhood of Maidstone; it is very hard, and is worked Rag. with large hammers instead of the saw. Jambs, strings, and mould- ings are sometimes worked of it, but the hardness makes the work expensive ; these, as well as the quoin stones and dressings, are therefore formed of Caen or Bath or other local stones. Kentish Rag does not answer for interior work.

The most important subdivision of the limestones used in magonry Oolitic is the Oolitic. They are so called because they resemble, when stones. broken, a conglomerate of globular eggs; they are also named roe- stones, from their resemblance to what is called the hard roe of a fish.

Very good examples of these are the Barnack stone from Northamp- tonshire, of which Peterborough Cathedral, Croyland Abbey, Bur- leigh House, &c., are erected, and the Ketton stonc, used at most of

the colleges in Cambridge, and at Bury St Edmunds, Bedford, Stamford, Doulting in Somersetshire, and at Wells Cathedral and surrounding churches. But the principal English oolites used in masoury are the Bath and the Portland. The former, as its name Bath imports, is found in the neighbourhood of Bath. The chief quarries stone. are the Box Hill, Combe Down, Farleigh Down, and Corsham Down ;

all these quarries vary in quality at different depths. The Corsham Down is said to produce the finest in quality, and the Box Ground stone to be the hardest; but everything in the use of this stone depends on the bed selected. Large quantities of a similar stone are imported from Caen, in Normandy. This is more compact in tex-

ture than Bath, and therefore fitter for carving, but does not appear

to stand our climate so well. The best variety of this stone is said

to be the D'Aubigny stone. Almost all these oolites can be sawn

with a common dry saw, which saves a great deal in the labour of conversion. But, without doubt, the best of all this class of stones

is that from the Island of Portland ; for beauty of texture, and for Portland durability, it perhaps exceeds any stone in the world. It seems the Stone. only one unaffected by the smoke of London; and therefore the greater number of its buildings, St Paul's among the rest, are of this stone. Being of hard texture, however, it must be sawn by the

use of sand and water, and is much more expensive to work than

the softer oolites. There are between fifty and sixty quarries on the island. The best are said to be those on the north-eastern side ;

but, as with all stones, there is good and bad in every quarry, and everything depends on the selection. It is said that when Sir Christopher Wren built St Paul's Cathedral, he had this stone quarried and exposed to the weather on the sea-beach for three years, before he suffered it to be used.

Of siliceous stones, flint is sometimes used for rough walling and Siliceous for ornamental facing with brickwork ; but in England this work stones. ~ is done by the bricklayer, and not the mason. ,

The only remaining class is that of the mcfamorphic rocks, of Metamor- which the crystalline or saccharine and the serpentinous limestone phic rocks are used ; but these are all species of marbles, used more as orna- or

marbles. mental than as constructive building-stones, and need not be dwelt upon here.

Medieval work.

Building in stone more diffi- cult than briek- laying.

Setting stones.

Use of mortar

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Many of the early buildings of the Middle Ages were entirely constructed of masses of concrete, often faced with a species of rough cast. The early masonry seems to have been for the most part worked with the axe and not with the chisel, A very excellent example of the contrast between the earlicr and later Norman masonry may be seen in the choir of Canterbury Cathedral. In those times the groining was frequently filled in with a light tufa stone, said by some to have been brought from Italy, but more pro- bably from the Rhine. The Normans imported a great quantity of stone from Caen, it being easily worked, and particularly fit for carving. The freestones of England were also much used ; and in the first Pointed period, Purbeck and Bethersden marbles were em- ployed for column shafts, &e. The methods of working and setting stone were much the same as at present, exeept that, as the roads were then in a very bad state, and in many places the only means of conveyance was by paek-horses, the stones were used, in much smaller sizes. The methods of setting out work were, however, different from those of other styles, as might be expected from the difference of forms. As time went on the art of masonry advaneed till, in England, in point of execution it at length rivalled that of any country. : ;

From the regular and determined form of bricks, modes

or systems for setting or arranging them may be formed, and any workman, by habit and an exertion of memory merely, may become competent to build a brick wall as well as it can be built, but it is not so with stone used in common masonry walling. The workman in this material has for the most

part to deal with masses of all forms and of all sizes, and a continual exercise of the judgment is required from him beyond the tact or skill which may be acquired by practice. For this reason workmen are gene- rally less to be trusted to their own discretion in stone building than even in bricklaying. The young mason should be extremely careful to avoid making the beds of stones concave or hollow; for if this be done, in any case where the stones have to bear much pressure, they will flush or break off at the joints and disfigure the work. The best or highest sort of stone walling is the easiest to set; it is that in which the stones are all tooled and gauged in regular parallelogramic figures, to range in courses and suit the thickness of the wall to which they are to belong ; and the most dificult to execute properly is that in which amorphous stones are used, the mason being allowed merely to dress them roughly with his hammer or axe, and fit them in as he best can to form the most compact mass: this is called rubble walling.

From the brittle nature of stone, great tact is required in setting, to prop or bear up the longer pieces in every part, or they will break across, and thus occasion more injury than could accrue if the whole mass had been inade up of small pieces. Very long lengths, therefore, should be avoided, even in regular tooled courses, with which the bearing is or should be perfectly even, and a settling down of the work itself is hardly to be feared. There is a certain medium which may be preserved; and although the object is obviously, in stone as in brick walls, to form a compact mass, as unbroken into parts as possible, a mason will act judiciously in breaking a very long stone into two or more shorter ones, and working them in that state, though he thus makes two or more additional joints, well knowing that he has the power of counteracting to a certain extent the ill effect of joints made by himself, but that those made by accident are irremediable.

The observations made in the section on brickwork, ou the use of mortar, will apply here also. Of whatever quality the stone may be of which a wall is to be built, it should consist as much of stone and as little of mortar as possible. If the stone be inferior in durability and power of resisting the action of the atmosphere to the mortar, besides the certain fact that the mortar will yield until it has set hard, and so far act injuriously, no ulterior

good is gained; and if the stone be the more durable material, the niore of it that enters into the wall the better. Indeed,

in rough walling, if the stones be pressed together until the !

more prominent angles on their faces come into actual contact, the interstices being occupied by mortar, it will be better than if a thick yielding mass were allowed to remain between them. Absolute contact, however, should not be permitted, any more than in brickwork, lest the shrinking of the mortar in drying leave the stones to such unequal bearing as the prominent parts alone would afford. Stone being generally of a less absorbent nature than brick, it is not a matter of so much importance that it be wetted before setting ; nevertheless, adhesion on the part of the mortar is more certain and more complete, if the stones be worked in at least a damp state.

What bond is, and the necessity for it, have also been Bonding,

shown in the preceding section; and bond is of not less importance in stone walling than in bricklaying. We have also hinted above at the greater difficulty of understanding, forming, and preserving it in the former, and can now only add a few observations in addition that can be of any use, and these with reference to rubble walling particularly. Instead of carefully making the joints recur one over the other in alternate courses, as with bricks and gauged stones, the joints should as carefully be made to lock, so as to give the strength of two or three courses or layers between a joint in one course and one that may occur vertically over it in another. In bonding through a wall, or transversely, it is much better that many stones should reach two-thirds across alternately from the opposite sides than that there should be a few thorough stones, or stones extending the whole thickness of the wall. Indeed, one of the many faults of stone masons is that of making a wall consist. of two scales or thin sides, with thorough stones now and then laid across to bind them together, the core being made up of mortar and small rubble merely. This isa mode of structure that should be carefully

guarded against. There is no better test of a workman’s tact and judgment in rubble walling than the building of a dry wall, or wall without mortar, affords. Walls are frequently built with mortar that without it would have fallen down under their own weight in a height of 6 feet, in consequence of their defective construction,—thus rendering it evident that they are only held together by the tenacity of the mortar, which is very seldom au equivalent for a proper bond of stone. Masons are very apt to set thin broad stones on their narrow edges to show a good face, by which the wall is injured in two ways ; the practice tends to the formation of a mere case on the surface of a wall, and it for the most part exposes the bed of the stone to the atmosphere, as a stone is more likely to be broad in the direction of its bed than across it.

The footings of stone walls ought to consist of the largest Footing

stones which can be conveniently procured, It is better to have them of a rectangular form than any other ; and if they are not square, their largest surfaces should be laid horizontally. With this shape and disposition they will make the greatest resistance to sinking. When footings can be obtained the full breadth of the wall in one piece, they are to be preferred; but if not, then every alternate stone in the course may be the whole breadth. Each course should be well bedded in mortar.

Rubble walling is either coursed or uncoursed. latter sort, fig. 5, Plate XXI., the work is carried on with stones of any sizes, as they occur, and without reference to their heights, somewhat in the manner of the Cyclopean walling of antiquity,—the interstices of the larger being filled up with smaller stones. For this work the mason uses no tool but the trowel to lay on the mortar, the scabling hammer to break off the most repulsive irregu- larities from the stones, and the plumb-rule to keep his work perpendicular. ‘The line and level are equally un- necessary, as the work is independent of cousiderations

In the Rubble

walls.

Uncoursed

work.

which are affected by them. An attentive and intelligent workman will, however, make a sound wall with this species of construction, by fitting the stones well together and packing them with as little mortar as possible, yet filling every crevice with it, and carefully bonding through to secure compactness, transversely at the least.

In coursed rubble walling, fig. 6, Plate XXI., the line and level are used, the work is laid in courses, each course being carefully brought up to the same level in itself, though no attention is paid to uniformity in the heights of the different courses. For this species of walling the

stones are generally thoroughly dressed by the workman

in the gross before he begins building. He is careful to get parallel beds to them, and he brings the best face of each stone to a tolerably even surface at right angles to the beds ; the ends, too, receive some little attention, and for this purpose he uses an axe in addition to his scabling hammer. The quoins in coursed rubble walling are gene- rally built with peculiar neatness and precision, and they are set to serve as gauge courses for the rest. This, when well executed, makes a sound and excellent wall. It presents, however, rather a rough and homely appearance, and in finer works must be covered with stucco or cement, or faced with ashlar.

Ashlar is an external rind of gauged stones in equal courses, having tooled or closely-fitting joints to give a wall a neat and uniform appearance ; it is axed, tooled, or rubbed, as may be thought most in character with the structure, or that part of it to which it is to belong. Ashlar stones, or ashlars as they are commouly called, are made of various sizes on the surface, as the char- acter of the edifice may require or convenience demand, and vary in thickness from 5 to 8 or 9 inches.. Some of the ashlar stones must, it is clear, be used transversely as bond stones, or the facing, having nothing to connect it with the wall behind, would soon totter and fall. Bond stones are

generally put in alternate courses, with the backing to the jambs of openings, such as windows, and oftener, if these do not recur within a length of 5 or 6 feet ; the bond stones themselves, too, should not fall in the same vertical chain, except when they are in the jambs of openings, but should break in their alternate courses. Ashlar is commonly set in fine mortar or in putty. It is generally recommended that ashlars should not be made regular parallelopipeds, but run back irregularly to tooth in with the backing, the vertical joints being left open from about an inch within the face of the wall, and the upper surface or bed of the stones made narrower than, though perfectly parallel to, the lower. These things may exert a slightly beneficial influence under some circumstances; but the mode of construction involved is so radically bad, that unless the backing is set in a quick-setting cement, or is so well packed as to be proof against its general tendency to settle away from the ashlar facing, no method of the kind can materially improve it. A well-compacted wall of coursed rubble, the courses being frequently made up of whole stones and faced with ashlar, may be made tolerably -sound and trustworthy. Brick backing, with ashlar facing, cannot be considered as good, though it has the advantage of not requiring battening and lathing for inside plastering, as the stone-backed wall does. Uncoursed rubble with ashlar has all the disadvantages of both the preceding, with nothing to recommend it before either of them. A thin inner brick wall, like a hollow wall, is very often necessary, where it is anticipated that the rain will be beaten through the stone-work by the impetuosity of the wind. The settlement of these two kinds of work during the setting of the mortar is so different, that the walls often separate ; or where this is prevented by bond stones, the walls bulge outwards and bear unequally on their base.

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These evils are best prevented by using as little mortar as possible in the interior parts of the wall, and not raising the wall a great height at a time.

In order to give an uniform colour to a stone or ashlar Badigeon. wall, masons mix up pounded chippings of the stone they have used with some lime, salt, whiting, and size, and a little ochre, with which they colour the

stone as they clean off the work. It is called badigeon, and is used also on plastered walls, where joints are sometimes drawn in colour to represent stone-work. Small d:-fects in the stone are filled up with the same, or with shell-lac and the pounded stone.

There are many different sorts of walling or modes of Local varie- structure arising from the nature of the materials furnished ties. in various localities. That of most frequent occurrence, perhaps, is a manner in which either squared, broken, or rounded flints are used. These depend entirely on the ¥iints. care with which they are arranged, and on the mortar with which they are compacted, as also on a coursed chain, which is commonly introduced at short intervals of larger stones or of bricks, to act as a bond; the quoins, too, in this species of structure are generally constructed of dressed Pisé work. stones or of brick. Another sort of building is that of Pisé work, which from its economy as well as its general utility, has been much used in various countries. It consists of merely compressing earth in moulds or cases, whereby houses of two or three stories in height can be raised. Strong earths, with a mixture of small gravel, form the best material. The earth cannot be used when it is either too dry or too wet; when prepared it is put into the moulds and rammed down. The openings for the doors and windows must be left at the time of building the walls; and the openings have to be faced with wood for hanging the doors or for inserting the frames. The exterior decora- tions are best made of stone or brick; wood will not unite very well with the Pisé; the flues are also formed of brick-work. The exterior should be cemented or rough-casted, which should only be done when the wall is quite dry, or the cement will be cast off by the damp. The walls require to be bonded at the angles by thin rough planks to each course of about 3 feet in height, and the interior walls to be likewise so tied to the main ones. Such work has lasted over a century and a half. It was extensively practised at Lyons and in the south of France during the last century. Several attempts have been made of late years to build Concrete concrete walls for houses, and with much success. The buildings. process is similar to that already described. One patentee has been enabled to produce a cheap material wherewith he has built every part of a house,—walls, floors, staircase, and a flat roof, and even the doors, the material being set in an iren frame, thus rendering the house perfectly in- combustible. Several

such “monolithic doors” have lately been put up in London in place of plate iron doors.

Whatever objections lie against bond timber in brickwork Bond apply with equal force at least to the use of it in stone timbers. walls. Hoop-iron bond is not only available in all kinds of stone walling, including the highly-wrought close-jointed kind, but it is invaluable, as it may be used both longitu- dinally and transversely as it may in brickwork ; whilst it compels the building mason to bring his work up to a true and fair bed as often as the bond is to be laid in it. Dis- Discharg- charging arches, it must be evident, are as necessary in and 78 arches. to stone walls as to walls of brick, and they may be treated much in the same manner. See fig. 10, Plate XX., and fig. 4, Plate XXI.

When walls are not entirely of masonry, in the ordinary Uses of course of economic building, stone is frequently used for stone. copings, cornices, string and blocking courses, sills, land- ings, pavings, curbs, steps, stairs, hearth-stones and slabs, and chimney-pieces; to these may be added quoins and architectural decorations, or dressings for windows, doors,

Quoins.

Copings.

Throating.

Cramps.

Joggles, &.

Cornices.

String course.

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&c., though both the former and latter are not unfrequently executed in plaster composition or cements. Quoin-stones are gauged and wrought blocks with parallel beds and vertical faces, placed on the angles of

buildings in the Greek, Roman, and Italian styles, with the intention of adding to their beauty and strength, as in fig. 7, Plate XXI.; they are used in all kinds of walling, and are generally made to project before the face of that to which they are attached, mostly with a weathered angular joint, or with a rectangularly grooved or moulded one. The quoins are coursed with the rest of the wall if it be of stone, and are made to occupy the exact space of a limited number of courses of brick in a brick wall, or of flints where these are used. Copings in Italian work to cover walls, parapets, &c., are worked with a plain horizontal bed, two vertical faces, and an inclined or weathered back or upper surface,— either forming an acute angle with the outer and wider, and an obtuse angle with the inner and narrower face, to throw the water off, shown at a fig. 9, Plate XXL; or slop- ing to both sides from the middle, as at 6; the latter is technically termed saddle-back coping. In both cases they are made to project over the wall or parapet on both sides ; and in the projected part of the bed under the edge or edges towards which the inclination is given, a channel or groove, called a throat, is cut, to intercept the water in its inclination to run inwards to the wall. On gables or other inclined planes the coping is neither weathered nor throated, as the water is necessarily impelled along its course to the lower end, and not over the sides. It is a curious circum- stance that the medizval designers rarely made their copings to project on the inside of a parapet, as shown in fig. 16, so that the exterior projection, which was returned up, was perhaps intended as much for effect as use. To protect the sepa- rate stones of a coping course from

the danger of being displaced by high Yy f winds or other accidental causes, and Yyy Y to form a chain through its whole YY length, the stones are linked together WYvyn by cramps of copper or iron let into Wy

their backs and run with lead. These metals, however, especially the iron, for the most part act very inju- riously, from their exceeding sensibility to atmospheric changes, and their greater or less tendency to oxidation ; indeed, the stone invariably suffers more than the work benefits from the metal cramps. Tenons, dowels, joggles, or dovetails, of stone, of hard word, or of slate set in Port- land cement, applied so as to be protected from the weather, are far better, and would answer every desirable purpose sufficiently. Lead dowels, when small, are occasionally used. The value of

joggling and doweling to stone-work is well exemplified in the construction of Eddystone light- house. Cornices are but ramified copings, and are or inay be subjected to the same general laws. Care must be taken, however, in arranging them, that their centre of gravity be not brought too far forward, in the anxiety to project them sufficiently, lest they act injuriously on the wall by pressing unequally, and their own seat be also endangered. String courses economically, in contradistinc- tion to architecturally, are meant to protect a set-off in a wall, by projecting over its lower face in the manner of a coping, as in fig. 7, Plate XXI., atc; the beds are worked parallel, and the outer face vertical or at right angles to them, but so much of the upper surface is weathered or sloped off as protrudes from the upper part of the wall to carry the water off; and, for the reason above stated with regard to copings, the lower bed just within the outer face is throated. A stone string course, cramped or dovetailed in the bed, forms an excellent chain round a brick wall ;

Fria. 16.—Copings.

BULL DENG

[MASON-WORK.

but the part of it in the wall should be of the exact height of one, two, or more courses of ‘brickwork. The woodcut, fig. 17, is a usual cornice or string course in the later period of medizval art in England. A blocking course is either a very thick string projecting over or flush with the face of the lower part of the wall to cover a set-off; or it is a range of stone over a crowning cornice to bring the centre of gravity more in on the wall than it otherwise would be ; in the former case it is treated exactly as a string, excepting that, if it be flush below, there is no occasion for a throat; in the latter it has a horizontal case bed, parallel Fis. 17.—Cor- vertical sides, and a weathered back or upper

surface. Sills are weathered and throated like the parts of Sills. a string course, Plate XX1., fig. 7, aand 6; yet in medieval work they may be seen flush with the upright of the wall. They are laid across window openings as a base to the sash-frame ; distinct sills in the same line may, indeed,

be considered as an intercepted string course. In the ordinary practice of building, window sills are seldom set

in brick walls until they are absolutely required to set the sash-frames on; or they are set but not bedded, except at

the ends. The object of this is to prevent any settlement that may occur in the piers from breaking the sills across

on the unyielding part of the wall under the windows. A necessity for this, however, can only arise from bad con- struction; for with a good bond in the brickwork, all would settle together, and the sills might be completely bedded across at once.

Landings are platforms of stone, either over an area Landings before a door, at the head of a flight of stairs, or as the floor of a balcony. They are made four, five, six, or eight inches in thickness, according to their extent and bearing – if not one piece of stone they are of nicely jointed pieces joggled and plugged together, and are worked on the face and edges just as their situation may demand. They should also be very carefully pinned into the walls. Fig. 18 will show the danger, should they not be so, through the full length of their insertion. If the front edge be pinned up, as at A, but a vacancy be left, as at B, the point C will become the fulcrum of a lever, and the landing have a tendency to turn at that point, and to break at the edge C. Every step and land- ing should have 8 inches hold in a brick wall. All landings Fie 18.—Extremity of Land- should be well joggled ; the joint we: joggles made as at a, fig, 19, he, and that at 6 a she joggle. technic Institution . in London arose, SfGfF7 no doubt, from the carelessness of the workmen, who put two landings toge- ther, in which two and filled the open be a large fossil in the stone close to the wall in the land- ing 6, which, having no support from the other landinga, gave way, and caused the destruction of the lower portion of the staircase npon which it fell.

Blocking

is called by workmen a An accident at the Poly-

Fic. 19.—Joggles.

she-joggles were worked, as in fig. 20, space with plaster. There happened to

Fic. 20.—Joggles badly joined.

course, — >

|

)

Pavings.

Turbs,

teps.

thimney- ieces,

MASON-WORK. |

Stone pavings are prepared and laid in various ways. Ordinary paving is of self-faced or of tooled York; and for better purposes it is of rubbed Portland stone. For entrance halls, square stones, with the angles slightly cut off, the four spaces thus obtaincd being filled up by a small square of black or other coloured stone, makes a neat paving, which is replaced by marbles in best houses and public buildings, if a tesselated pavement be not required. Stone paving that is not exposed to the sun and air, if next the ground, should be laid on footings of brick or stone, or it will be constantly damp should the soil be close and clayey; but in yards, open areas, &c., it may be laid on the ground, bedded in sand, and jointed with mortar or cement. Stone-paved floors should be formed on brick arches, or on a timber floor prepared for the purpose; the latter, how- ever, is a very bad mode of supporting paving, as the impression derived from the presence of the stone is, that the floor is incombustible ; but if it be bedded on combus- tible material, the danger to human life in the event of fire is greater than if the stone paving did not exist at all. It is worked, cut, and set more or less expensively, according to circumstances. A curb is a range or course of thicker and stronger stone to

bound a pavement, and is either flush with the paving showing as a step on its outer edge, or is raised above it to receive a balustrade, and shows on the outer side as a blocking course; in the latter situation it is generally joggled and plugged in the joints, The term step or steps alone is usually understood to mean external steps, whether arranged in long or short flights, or the single step in a doorway into which the door-frame is tenoned. A step should have a plain horizontal bed, and a very slightly weathered tread or upper surface,—the front or riser worked plain and vertical, or with a moulded nosing, and the back sunk with a jogegle or bird's-mouth joint to receive the step or landing above or behind it. Steps for areas or back courts are often made of 2 or 24 in. stone for the tread, the riser being formed of a 43 or 5 in. stone, both tailed into a wall at one or both ends. This is much lighter in effect. Slate is sometimes used for the treads.

Stairs are but a flight or combination of steps used in- ternally, and the general principle of designing staircases, as regards the rise and tread of steps, setting out curves, curtails, landings, &c., are given in the part treating of

and plugs. The material of which chimney-picces, if not of wood, are composed, varies from the coarsest stone to the finest marble ; and the labour on them varies to a still greater extent.

Masonry to receive architectural decorations is generally Decorative worked into the walls as they are carried up; but as they masonry.

are seldom homogeneous either in matter or construction, the result is mostly the converse of what it purports to be, for the work is more frequently weakened than strengthened by the decorative masonry. Stones of which columns are to be composed, whether each column is to be of one stone or more, are generally roughly boasted out before they are set, and are finished afterwards to traversing moulds and templets with a plumb-rule, whose sides are cut to the diminution obtained from the bottom and upper diameters, whatever it may be. Flutes are cut at the same time and in the

same manner. The beds of the joints in columns should be worked with the greatest precision, so as to obtain parallel planes, that they may fit firmly and closely together; they must not, however, be worked hollow to make a close joint externally, or the arrises will chip off. It is considered a good plan, where the columng are large, to put a piece of thin milled lead between thie beds, cut circular, and extending to within a short distance of the surface, and that the rest be filled with a fine adhesive putty, made as nearly of the colour of the stone as possible. This makes a solid bed, and protects the arrises effectually ; but it will not do so well for slight columns, because it narrows the bed so materially. A joggle or dowel of hard wood, slate, or cast-iron let into the core might be a sufficient counteraction, and it would certainly add to the stability of a polylithic shaft. The

| other parts of a columnar composition may be sufficiently _cramped and joggled together with wood and metals,

according to the situation, though it may be again re- marked, that neither wood nor metal should be used,

unless it can be protected from access even of the atmo-

joinery. The chief difference between these and other |

staircases consists in the fixing, the one being framed with wooden strings, while the other have no strings, but are supported entirely by the walls. If there bea wall at each end, they are simply built in at the time the work goes up; but if they are supported at one end only, they are called

securely. wedged into the wall; on which and on the sup- port each derives at one edge from the step below, they wholly rely. If they are square in section, they are called solid steps ; but as the under side or soffit, then, is irregular, it is usual to make the steps of somewhat a triangular shape, so as to present a continued soffit, In this case they are called arris, or feather-edge steps. taken that there are no sudden or irregular changes in the curves, These may be easily avoided by the method shown in the portion relating to joinery for the easing of the curves and ramps in handrails.

In houses built of stone the flues are usually formed in brickwork. The chimney-pieces consist of plain jambs, or boxings, or other vertical sides more or less decorated and moulded, and of the architrave or transverse covering or mantel, fig. 8, Plate XXI., with its shelf or cornice. The parts of a chimney-piece are generally put together with an adhesive plaster or cement, and affixed to the wall or chimney-breast behind with cramps, holdfasts,

sphere.

Sections for Roman mouldings are given in the part relating to joinery, but as those used in Grecian architecture are parts of conic sections, and not struck by compasses, we give a short problem by which they may all easily be set out. Both Roman and Grecian mouldings are shown on Plate XIII. of vol. ii.

Let an ovolo be the moulding required (fig. 21), the height of which (to the point where the moulding curves backward) is AC or BD, and the greatest projection AB or CD; and let CE bea

, tangent line, or line which the curve must touch but not cut. | Produce CA to F, and make AF equal to AC, and AG to ED. | Divide GB BE each into the same number of equal parts as 5. | Draw the co-ordinates

geometrical stairs, and depend entirely on their being _ from F and C to the

Care should be |

| theirintersections will | trace the curve.

respective numbers,

If BE be more than half the whole height, the curve is an ellipse ; if exactly half the height, itis a parabola; and if BE be less than half BD, the curve will be a hyperbola. All other mouldings can be drawn by this method, it being re- membered that cymas, ogees, and all reflex curves, must be divid- ed and drawn in two separate portions.

The mouldings in medieval architecture differ entirely from those of other styles. They are chiefly formed by a combination of curves stopped by right lines or worked into other curves and hollows. The mouldings differ in

IV. — 60

—Construction of Ovolo.

ry Lia |

Columns.

Greek and Roman mouldings.

Medieval mouldings.

Working the mould- ings.

Arches.

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each of the several periods of the style in England, and also in the variations of the style as practised here and in each country on the Continent. We insert an outline, fig. 22, of a window jamb at Sleaford church, Lincolushire, to show the forms and combination of an example during the Decorated period. A full description of those used in each style would exceed our limits, nor, indeed, is it a subject within the scope of this article. They are sometimes set out with the compasses, and many often appear to have been drawn by eye. We must refer our readers to the works of Professor Willis, F. A. Paley, and of J. H. Parker, for any details re- quired about them. A very curious treatise was pub- lished by Professor Willis, called the Architectural Nomenclature of the Middle Ages, which goes at great length into the subject. A bead or astragal seems to

have been called a bowtelle ;

Fia. 22.—Outline of Window Jamb at Sleaford Church.

a torus, a grete bowtelle; a hollow or scotia, a casement; an ogee, a ressaunte, and so on,

The methods of working mouldings in the stones at the builder's command have been already noticed at the commencement of this section. The soft stones and marbles are easily shaped into mouldings with the chisel and the mallet, and are sawn and the surfaces even finished with a plate having a fineedge. These stones will take mouldings of minuter character than the harder stones, which have to be worked with force, and require pointed tools to form the faces. The hardest material, granite, again, has to be stunned with heavy picks to make an impression, so that only bold ornaments have a good effect ; much money has been thrown away in details more suitable for softer materials. Good effect is obtained by the contrast of axed and polished surfaces. A designer should visit the places where buildings in granite have been erected for a knowledge of a proper application of that material.

The earliest arches were circular and, of course, easily set out. But as the Pointed styles came in, several methods were used for describing them. Pointed arches may be classed as—Ist, lancet; 2d, equilateral ; 3d, depressed ;

Fie, 23.—Laneet Arch.

Fig. 24.— Equilateral Arch.

and 4th, four-centred or Tudor. In the first the centres, as I, 2, in fig. 23, are outside the arch ad. At West-

minster Abbey the arches of the choir are so acutely pointed that the distances 1a and 26 are nearly two-thirds of the entire opening a 6. In the nave at York the points are without the arch at a distance of about one-fifth the opening a 6, In equilateral arches the centres are exactly on the points a 6 in fig. 24, so that the apex c, joined to a and 6, will form an equilateral

triangle. The nave arches at Wells are of this description, and also those at Lincoln (see vol. ii, Plate XVIIL fig. 1). In later times the arches were of lower pitch, as fig. 25, and then, of course, the centres 1 and 2 were within the arch ab, At Salisbury Cathedral the distance al is one-sixth of 6, while in the choir at Lincoln (vol. ii., Plate XVIIL., fig. 2) it is as much as two-fifths. To describe arches which shall be similar to one another throughout a building, however the openings may differ, this principle must always be borne in mind, that the centres are to be always distant from the points a6 by some aliquot portion of the whole opening. ‘This is the more important, as the lines of tracery will not fall into their proper places except the arches are set out upon some regular principle. If the arches are not equilateral, some distance from each point a 6 should be first determined on (say one-third the opening a 6), and after this, whatever the span of the other arches may be, one-third its own opening is to be taken from the points 8, as the centres from which to strike its curves. The only exception is that, in medieval buildings, the arches to the doorways are frequently some- what flatter than those of the windows.

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-t lane ee -----+, : ee

es f@ b Fra. 25.—Depressed Arch.

centres instead of two. As there has been great mis- apprehension as to four-centred arches, some persons treat- ing them as parts of conic sections, whereas they are really parts of segments of circles, it is thought well to give two methods of describing these arches.

First, when the width AB, fig. 26, of the arch, and the apex height OC, are given, anda tangent to the upper circleas CD. In this case draw AD perpendicular to AB, and set out Al equal to AD; draw C3 perpendicular to CD, and make CE equal to AD or Al ; join 1E and bisect the same asshown by a perpendicular meet- ing CE produced in 3 ; join 31 and produce towards F, then 1 and

— one nen ---H— — — -- ++ = == 22 een en tse ee OT ts os iat ae oe ae 4 Fic, 26.—Four-centred Arch,

3 will be the centres for half the arch ; and, transferring the points across, 2 and 4 will be the centres for the otherhalf. In the second case, when the width AB and the height OC, and the centres of the small circles 1, 2, are given. Make AD equal to Al, join CD (which will be a tangent to the upper curve), draw C3 at right angles

In the Tudor Four-cen- period the arches are very frequently drawn from four tred arches

Window racery.

MEDIEVAL WORK. |

thereto, make CE equal to Al, join 1E, bisect the same, and proceed as before. ‘The points FG, as has before been explained, are the points where the circles will meet each other. The joints to these arches will all radiate to their respective centres.

Specimens of various sorts of the tracery which adorn the windows of the medieval periods, and are in fact their greatest glory, are shown in Plates XVIIL, XIX., and XX. of vol. ii The designs for tracery are almost in-finite, and the various methods of setting them out would filla volume. But although they display such ingenuity and fancy that one would think the design to be quite arbitrary, it will be found that they are all, or very nearly all, set out on the principle of geometrical intersections. An example will show the principles on which the medieval architects proceeded to describe the tracery, and also the method of finding the joints of the various pieces of stone.

Let «wb (fig. 27) be the opening of the arch; as there are to be two mullions, divide the same into three equal parts, as ac, cd, db; then determine the points from which to strike the arch. In

this instance, for the sake of simplicity, we make it equilateral (as in fig. 24); a and 0 then are the centres for striking the main

Fia. 27.—Construction of Window Tracery.

arch aweg, bfg, and the height og is that of an equilateral triangle. Produce the springing line, and the same opening of the

‘compasses through ¢ and d will give the principal inner branches

of the tracery ce, df. From the centre 0, with an opening extend- ing to the middle of the lights ac, db, strike a semicircle ; raise perpendiculars from d and ¢ to 1 and 2; draw a line through 1 and 2; on this and the springing line will be found the centres of the lower ogees ; bisect the part of go cut off by 1 2 in hk, which is in fact the same thing as dividing the whole height og into three ; divide 2 g into three parts, at 3 and 4; through 3 draw a horizon- tal line, and set off from 3 distances one-third of the width od, or draw the perpendicular lines as shown, which is better; then 5 and 6 will be the centres of the upper quatre-foil. From the line 1 2, on the same perpendicular as last, set down similar points, as at 7. These will be the centres for the lower subdivision as shown. Next draw ¢h f and subdivide by similar perpendicu- lars, and where the lines intersect, as at 8, @ will be the centres for the upper subdivisions. The lines thus drawn will form a species of skeleton diagram, as shown on the right side of fig. 27, which is called the element of the tracery, and is in fact the centre line of the mullion, as shown by a, fig. 28. On each side of this, using always the same centres for the same branches, draw lines, showing the face (or what

eC

1 H the workmen call the nose) of the mullion, and | bE answering to b¢; and then others answering to ee a } the sides of the mullion, as de. Any other mould- t tal | ings upon their sides or faces may be drawn in ----- 4 edna’ anon

like manner. Put in the cusping as shown, and the tracery is complete. The practical pg 98.—Mullion. stone-mason will take care never to make a

joint where there is an angle of any sort, as the point of a cusp. In all cases the joints must tend to the centres of the circles from which they are struck,

and where the lines branch off in two direc- tions, the joints must not be in one line, but must tend in two, or

sas many directions as there are branches, and each to the centre of

such respective branch. When the lines are perpendicular, as at cand d, and at the joint below 2, the joints are horizontal. A close

-inspection of fig. 27, where they are carefully drawn, will fully

elucidate the matter. The elaborate west window at York Cathedral (see Plate XVIII. of vol ii.) is entirely set out on this principle ; and so is the still more remarkable instance, the eastern window at Carlisle, which is composed of 86 pieces of stone, and the design for which is drawn from 268 centres.

All the upper construction of windows and doors, and of aisle arches, should be protected from superincumbent pressure by strong relieving arches above the labels, as shown by the dark tints in fig. 27, which should be worked in with the ordinary masonry of the walls, and so set that the weight above should not press on the fair work, in which case the joints of the tracery, &., will sometimes flush or break out.

In medieval vaults the crowns a0, cd, are not level, yedieval but all have a slight curve or spring, as shown in fig. 29, vaulting.

and the filling-in between them also is_ slightly curved, so as to partake in some degree of the character of the dome as well as of the groined arch; and for the most part the ribs in early vaulting are not true segments of ellipses, but approximations drawn by the compasses. The triumph of medieval stone-masonry, however, is that species of groin known as fan-vaulting. It is unlike that of any other age or time. The roofs of King’s College Chapel at Cambridge and of Henry VII.’s Chapel at West- minster are eminent and late examples. The earliest are supposed to be in the cloisters of Gloucester

Cathedral. It is impossible in our limited space to give demonstrations of them, and we must refer our readers to the admirable treatise on the subject by Professor Willis, published in the first volume of the Transactions of the Royal Institute of British Architects. The filling-in between the ribs of medizval groins is generally of clunch, or of some soft stone, over which a layer of concrete is sometimes placed in such manner as to bind all together and to resist the thrust.

The bold and beautiful termination to medizval towers, gpires

which. we call a spire, and the French call leche, is another proof of the skill of the medieval masons. ‘These are generally octagonal, and rise partly from the wall of the tower and partly from arches thrown angle-wise from wall to wall inside, to cut off the corners, as it were, and afford a springing to the spire. The wonder of these construc- tions is their extreme lightness and thinness. The top of the spire at Salisbury is 411 feet from the ground, of which the tower takes up 207 feet, leaving, of course, 204 feet for the height of the spire itself; this is only 9 inches thick at the bottom, diminishing to 7 inches, or on an average only about the 300th part of its height. It has been attempted to show mathematically that the joints of a spire would be stronger if formed at right angles to its face; but they would then slope inwards and hold the wet, which in sudden frosts would do most serious injury ; practically, therefore, it is found best to lay the courses on a level bed. They should, however, be frequently doweled and cramped together, but not with metal, for the extreme thinness of the stone would soon cause it to rust and break out the stone.

The principal publications on masonry are as follows :—

English.—Moxon, Mechanick Exercises, 4to, 1677-93, 1700; Batty Langley, Ancient Masonry, fol., 1736 ; Nicholson, Practical Builder, 4to, 1823, &c.; Practical Treatise on Masonry, 8vo0, 1828 ;

Guideto Railway Masonry, 8vo, 1839-46 ; and Practical Masonry, Bricklaying, &c., 4to, 1830; Dobson, Rudimentary Treatise on Masonry,

1849, 1856; Robson, Masons', Bricklayers', and Decora- tors' Guide, 4to, 1862.

Forcign.—De Orme, Nouvelles inventions pour bien bastir, &c., fol., 1561 ; JoussedelaFléche, Secretsd' Architecture, fol., 1642 ; Bosse, La Pratiqué du trait pour la Coupe des Pierres, fol., 1643 ; Derrand, Des Traits et Coupe des Voutes, fol., 1643; Dela Rue, Tratté de la Coupe des Pierres, fol., 1728; Frézier, Traité de Stéréotomie, 4to, 1737 ; and Eléments de Stéréotomie, 1759 ; Simonin et Delagardette, Traité de la Coupe des Pierres, 4to, 1792; Douliot, Traité speciale du Coupe des Pierres, 4to, 1825 ; Vorlegeblatter fiir Maurer, fol., 1835 ; Adhemar, Tratté dela Coupe des Pierres, fol., 1836-40 ; Normand, Epures d'Escaliersen Pierre, 4to, 1838; Le Roy, Trattéde Géometrie descriptive, 4to, 1850; Claudel et Laroque, Slagonnerie Pratique, 8vo, no date; the article Maconnerie in the various Encyclopédies ; and the general treatise by Rondelet, L'Art de bien bdtir, with supplement by Blouet, fol., 1842-46.

SAWYER-WORK.

The labour of the sawyer is applied to the division of large pieces of timber or logs into forms and sizes to suit the purposes of the carpenter and joiner. His working-place is called a saw-pit, and his almost only important tool a pit-saw. A cross-cut saw, axes, dogs, files, compasses, lines, lamp-black, black-lead, chalk, and a rule, are all accessories which may be considered necessary to him.

The facility with which sawing whole timber is now done by the aid of the upright saw-frame, and smaller timber by the circular-saw bench, has in large factories and workshops caused the saw-pits to be out of date; timber after it has been cut at the mills can be again reduced into sizes and scantlings at a rapid rate, and with great exactitude and little labour. In some country parts, however, the saw-pit is still used. Unlike most other artificers, the sawyer can do absolutely nothing alone; sawyers are therefore always in pairs,—one of the two standing on the work, and the other in the pit under it. The log or baulk of timber being carefully and firmly fixed on the pit, and lined for the cuts which are to be made in it, the top-man standing on it, and the pit-man below or off from its end, a cut is commenced, the former holding the saw with his two hands by the handle

above, and the other in the same manner by the box handle below. The attention of the top-man is directed to keeping the saw in the direction of and out of winding with the line to be cut upon, and that of the pit-man to cut down in a truly vertical line, The saw being correctly entered, very little more is required than steadiness of hand and eye in keep- ing it correctly on throughout the whole length. In the operations of the carpenter and joiner much depends on the manner in which the sawyers have performed their part. The best work on the part of the carpenter cannot retrieve the radical defects in his materials from bad sawing ; and although the joiner need not allow his work to suffer, bad sawing causes him great loss of wood and immense additional and otherwise unnecessary labour. Planks or boards, and scantlings, on coming from the saw- pit, should be as straight and true in every particular, except mere smoothness of surface, as if they had been tried upon the joiner's bench ; and good workmen actually produce them so. Saw-mills, too, by the truth and beauty with which they operate, show the sawyer what may be effected ; for though he can hardly hope to equal their effect, he may seek to approach it.

CARPENTRY.

Carpentry or carpenter's work has been divided into three principal heads, namely, descriptive, constructive, and mechanical. 'Che first shows the lines or methods for form- Ing every species of work by the rules of geometry; the

second comprises the practice of reducing the timber into particular forms, and joining the forms so produced so as to make a complete whole according to the intention or design; and the third displays the relative strength of the timbers and the strains to which they are subjected by their disposition. Here, we have merely to describe the practical details of carpenters' work in the operations of building. The carpenter works in wood, which he receives from the sawyer in beams, scantlings, and planks or boards, which he cuts and combines into bond-timbers, wall-plates, floors, and roofs. He is distinguished from the joiner by his operations

being directed to the mere carcass of a building —to things which have reference to structure only. Almost everything the carpenter does in and to an edifice is abso- lutely necessary to its stability and efficiency, whereas tke joiner does not begin his operations until the carcass is complete; and every article of joiners' work might at any time be removed from a building without undermining it or affecting its most important qualities. Certainly, in the practice of building, a few things do occur regarding which it is difficult to determine to whose immediate province they belong ; but the distinction is sufficiently broad for general purposes. The carpenter, with the bricklayer or mason and some of the minor artificers, constructs the frame or hull; and the joiner, with the plasterer and others, decorates and rigs the vessel. On the former the actual existence of the ship depends, and on the latter depends her fitness for use.

The carpenter frames or combines separate pieces of timber by scarfing, notching, cogging, tenoning, pinning,

and wedging. The tools he uses are the rule, the axe, the Tools,

adze, the saw, the mallet, hammers, chisels, gouges, augers, wimbles, pincers, hook-pins, a square, a bevel, a pair of compasses, and a gauge, together with the level, square, and plumb-rule ; besides these, planes (for making grooves, rebates, and mouldings), gimlets, pincers, a sledge-hammer, a maul or beetle, wedges, and a crow-bar may be con- sidered useful auxiliaries, though they are not absolutely necessary to the performance of works of carpentry. Planing and other machines are used to diminish the great manual labour of working the surface of planks and boards, and of moulding, tenoning, and other similar oper- ations ; and so elaborate are some of these machines, that a four-panelled door can now be made complete in a couple of hours, which formerly was considered a good day's work for a man. Circular-saws are employed for working up larger timbers; and for ripping up boards or scantlings of moderate thickness, they are now used in all work- shops.

The fir timber in general use is imported from Memel, Riga, Dantzig, and Sweden. Memel timber is the most convenient for size, Riga the best in quality, Dantzig the strongest, and Swedish the toughest. Riga timber can always be depended upon. Red pine may be used wher- ever durability and

strength are objects; Quebec yellow pine for light dry purposes. In selecting timber, spongy heart, porous grain, and dead knots are to be avoided; the brightest in colour, and where the strong red grain appears to rise on the surface, are the best to be chosen. For joists and main timbers, the best woods are from Dantzig, Memel, or Riga; for partitions aud minor timbers, American red wood, which not being so strong as the Baltic timber, must be cut toa little larger size. For sleepers, window-sills, and some parts of a roof, oak is used ; for framing, Christiania deals or battens; for panelling, Christiania white deal or American yellow piue; for upper floors, Dram or Dram- men and Christiania whites ; for ground floors, Stockholm and Gefle yellows; for warehouse floors and staircases, Archangel and Onega planks ; for best floors, St Petersburg, Onega, Dram, and Christiania battens. American deals

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~ailding }p beams.

BUILDING UP BEAMS.]

should not be used for floors, as they are softer; and Swedish deals are bad for framing, as they warp. For interior finishings generally, Baltic red and white woods, and the American red and yellow pine, are to be preferred.

We must first proceed to consider the means by which form in the work of the carpenter is to be secured,and the connections by which the various strains are excited and communicated. The following practical remarks on various joints are abridged from the article by Prof. Robison in the former editions of this work.

The joinings practised in carpentry are almost infinitely various, and each has advantages which make it preferable in some circumstances. Many varieties are employed merely to please the eye. We do not concern ourselves with these ; nor shall we consider those which are only employed in connecting small works, and can never appear on a great seale ; yet even in some of these, the skill of the carpenter may be discovered by his choice; for in all cases it is wise to make every, even the smallest, part of his work as strong as the materials will admit. He will be particularly attentive to the

changes which will necessarily happen by the shrinking of timber as it dries, will consider what dimensions of his framings will be affected by this and what will not, and will then dispose the pieces which are less essential to the strength of the whole in such a manner that their tendency to shrink shall be in the same direction with the shrinking of the whole framing. If he do other- wise, the seams will widen, and parts will be split asunder. He wil! dispose his boardings in such a manner as to contribute to the stiffness of the whole, avoiding at the same time the giving them positions which will produce lateral strains on truss beams which bear great pressures ; recollecting, that although a single board has little force, yet many united have a great deal, and may frequently perform the office of very powerful struts.

Our limits confine us to the joinings which are most essential for connecting the parts of a single piece of a frame (when it cannot be formed of one beam, either for want of the necessary thickness or length), and the joints for con- necting the different sides of a trussed frame.

Much ingenuity has been bestowed on the manner of building up a great beam of many thicknesses, and many singular methods are practised ; but when we consider the manner in which the cohesion of the fibres performs its office, we see that the simplest are formed on the same principles as the inost refined, and they are less apt to induce false notions of the strength of the assemblage. Thus, were it required to build up a beam for a great lever or a girder, so that it may act nearly as a beam of the same size of one log, it may either be done by plain joggling, as in Plate XXII. fig. 1, A, or by scarfing, as in B or C. Tf it is to act asa lever, having the gudgeon on the lower side at C, we believe that most artists will prefer the form Band ©. We may fre- quently gain a considerable accession of strength by this building up of a beam, especially if the part which is stretched by the strain be of oak, and the other part be fir. Fir being so much superior to oak as a pillar, and oak so much preferable as a tie, this construction seems to unite both advantages. But much better methods of making powerful levers, girders, &c., are obtained by trussing. Observe that the efficacy of both methods dependsentirely on the difficulty of causing the piece between the cross joints to slide along the timber towhich itadheres. Therefore, if this be moderate, it is wrong to make the notches deep ; for as soon as they are so

deep that their ends have a force sufficient to push the slice along the line of junction, nothing is gained by making them deeper ; and this requires a greater expenditure of timber.

Scarfings of beams are frequently made oblique, as in Plate XXII. fig. 2; but this seems a bad practice. It

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begins to yield at a point where the wood is erippled and splintered off, or at least bruised out a little. As the pressure increases, this part, by squeezing broader, causes the solid parts to rise a little upwards, and gives them some tendency, not only to push their antagonists along the base, but even to tear them up a little. For similar reasons we disapprove of the favourite practice of many artists to make the angles of their scarfings acute, as in fig. 3. This often causes the two pieces to tear each other up. The abutments should always be perpendicular to the directions of the pressures. ‘This law is also to be extended to the abutments of different pieces of a frame, and the artist must even attend to the shrinking of the timbers by drying. When two timbers abut obliquely, the joint should be most full at the obtuse angle of the end ; because, by drying, that angle grows more obtuse, and the beam would then be in danger of splintering off at the acute angle. é

It is evident that the nicest work is indispensably Wedging.

necessary in building up a beam. ‘The parts must abut on each other completely, and the smallest play or void takes away the whole efficacy. It is usual to give the abutting joints a small taper to one side of the beam, so that they may require moderate blows of a maul to force them in, and the joints may be perfectly close when the external surfaces are even on each side of the beam. But we must not exceed in the least degree, for a very taper wedge. has great force; and if the pieces be driven together by very heavy blows, the whole is left in a state of violent strain, and the abutments are perhaps ready to splinter off by a small addition of pressure. It is not unusual to leave some abutments open enough to admit a thin wedge reaching through the beam. Nor is this a bad practice, if the wedge is of material

which is not compressed by the driving or the strain of service. Iron would be preferable for this purpose, and for the joggles, were it not that, by its too great hardness, it cripples the fibres of timber to some distance. In consequence of this it often happens, that in beams which are subjected to desultory and sudden strains (as in the levers of reciprocating engines), the joggles or wedges widen the holes, and work themselves loose ; therefore skilful engineers never admit them, and indeed admit as few bolts as possible, for the same reason ; but when resisting a steady or dead pull, they are not so improper, and are frequently used.

Beams are built up, not only to increase their dimensions in the direction of the strain (which we have hitherto called their depth), but also to increase their breadth, or the dimensions perpendicular to the strain. Sometimes the breadth of girder is doubled, if it is thought too weak for its load, and when the thickness of the flooring must not be increased.

The mast of a great ship of war must be made bigger Masts and This is one of the uprights.

athwartship, as well as fore and aft. nicest problems of the art; and professional men are by no means agreed in their opinions in regard to it. We shall content ourselves here with exhibiting the different methods. The most obvious and natural method is that shown in Plate XXII. fig. 4. It is plain that (inde pendent of the connection of cross bolts, which are used in them all when the beams are square) the piece C cannot bend in the direction of the plane of the figure without bending the piece D along with it. This method is much used in the French navy ; but it is undoubtedly imperfect. Fig. 5 exhibits another method. The two halves of the beam are tabled into each other in the same manner as in fig. 1. It is plain that this will not be affected by any unequal swelling or shrinking, because this is insensible in the direction of the fibres; but when bent in the direction ab, the beam fig. 4 is weaker than bent in the direction

Scarfing.

cf. Each half of fig. 4 has, in every part of its length, a thickness greater than half the thickness of the beam. It is the contrary in the alternate portions of the halves of fig. 5. When one of them is bent in the direction AB, it is plain that it drags the other with it by means of the cross butments of its tables, and there can be no longi- tudinal sliding. But unless the work is accurately executed, and each hollow completely filled up by the table of the other piece, there will be a lateral slide along the cross joints sufficient to compensate for the curvature ; and this will hinder the one from compressing or stretching the other in conformity to this curvature.

The imperfection of this method is so obvious that it has seldom been practised; but it has been combined with the other, as is represented in fig. 6, where the beams are divided along the middle, and the tables in each half are

alternate, and alternate also with the tables of the other

half. Thus 1, 3, 4 are prominent, and 5, 2, 6 are depressed. This construction evidently puts a stop to both slides, and obliges every part of both pieces to move together. ab and cd show sections of the built-up beam corresponding to AB and CD. No more is intended in this practice by any intelligent artist, than the causing the two pieces to act together in all their parts, although the strains may be unequally distributed on them. Thus, in a built-up girder, the binding joists are frequently mortised into very ditferent parts of the two sides. But many seem to aim at making the beam stronger than if it were of one piece; and this inconsiderate project has given rise to many whimsical modes of tabling and scarfing.

The practice in the British dockyards is somewhat different from any of these methceds. The pieces are tabled

as in fig. 6, but the tables are not thin parallelopipeds,

but thin prisms. The two outward joints or visible seams are straight lines, and the table 1 rises gradually to its greatest thickness in the axis. In like manner, the hollow 5, for receiving the opposite table, sinks gradually from the edge to its greatest depth in the axis. Plate XXII, fig. 7, No. 1, represents a section of a round piece of timber built up in this way, where the full line

EF, GH is the section corresponding to AB of fig. 6, and the dotted line EG, FH is the section corresponding to CD. This construction, by making the external seam straight, leaves no lodgment for water, and looks much fairer to the eye; but it appears to us that it does not give so firm a hold when the mast is bent in the direction EH. The exterior parta are most stretched and most compressed by this bending; but there is hardly any abutment in the exterior parts of these tables. In the very axis, where the abutment is the firmest, there is little or no difference of extension and compression. But this construction has an advantage, which, we imagine, much more than compensates for these imperfections, at least in the case of a round mast ; it will draw together by hooping incomparably better than any of the others.

Joggles of elm are sometimes used in the middle of the large tables of masts; and when sunk into the firm wood near the surface, they must contribute much to the strength. But it is very necessary to employ wood not much harder than the pine, otherwise it will soon enlarge its bed and become loose, for the timber of these large trunks is very soft.

The most general reason for piecing a beam is to increase its length. This is frequently necessary, in order to procure tie-beams for very wide roofs. Two pieces must be scarfed together. Numberless are the modes of doing this, and almost every master carpenter has his favourite nostrum. Some of them are very ingenious ; but here, as in other cases, the most simple are commonly the strongest. We do not imagine that any, the most

ingenious, is equally strong with a tie consisting of two pieces of the same scantling Jaid over each other for a certain length, and firmly bolted together. We acknowledge that this will appear an artless and clumsy tie-beam, but it will be stronger than any that is more artificially made up of the same thickness of timber. The next simplest and most obvious scarfing is that represented in Plate XXII, fig. 8, Nos. 1 and 2. If considered merely as two pieces of wood joined, it is plain that, as a tie, it has but half the strength of an entire piece, supposing that the bolts (which are the only connections) are fast in their holes. No. 2 requires a bolt in the middle of the

scarf to give it that strength, and in every other part is weaker on one side or the other. If the bolts were sufficiently numerous and sufficiently firm, so as to produce a great degree of adhesion or of friction betwcen the parts, this joint might be made almost as strong as the entire beam, since there is nothing to prevent the co-operation of each side with the other throughout its extent; but much of the strength would be lost if the bolts became loose, even in an inconsiderable degree. But the bolts are very apt to bend by the violent strain, and require to be strengthened by uniting their ends by irou plates,—in which case it is no longer a wooden tie. The form of No. 1 is better adapted to the office of a pillar than No. 2, especially if its ends be formed in the manner shown in the elevation No. 3. By the sally given to the ends, the scarf resists an effort to bend it in that direction. Besides, the form of No. 2 is unsuitable for a post, because the pieces by sliding on each other by the pressure are apt to splinter off the tongue which confines their extremity. Figs. 9 and 10 exhibit the most approved form of a scarf, whether for a tie or for a post. The key represented in the niiddle is not essentially necessary ; the two pieces might simply ineet square there. This form, without a key, needs no bolts (although they strengthen it greatly), but, if worked very true and close, and with square abutments, will hold together, and will resist bending in any direction. But the key is a very great improvement, and will force the parts together with perfect tightness, but it must not be over driven. The form of fig. 9 is by far the best (it is sometimes said to be tabulated, that is, to render the joints as close as possible, and the juncture more independent of any bolts which might be placed similarly to those in fig. 8, No. 1),—be- cause the triangle of fig. 10 is much more readily splintered off by the strain or by the key than the square wood of fig. 9. It is far preferable for a post, for the reason given in speaking of fig. 8, No. 1 and No. 2. Both may be formed with a sally at the ends equal to the breadth of the key. In this shape fig. 9 is well suited for joining the parts of the long corner posts of spires and other wooden towers. Fig. 9, No. 2 differs from No. 1 only by having three keys ; the principle and the longitudinal strength are the same. The long scarf of No. 2, tightened by the three keys, enables it to resist bending much better.

None of these scarfed tie-beams can have more than one third of the strength of an entire piece, unless with the assistance of iron plates; for if the key be made thinner than one-third, it has less than one-third of the

fibres to pull by. We are confident, therefore, that when the lieads of the bolts are connected by plates, the simple form of fig. 8, No. 1, is stronger than those more ingenious scarfings. It may be strengthened against lateral bending by a little tongue, or by a sally, but cannot have both.

The strongest of all methods of piecing a tie-beam would Fishing 4

be to set the parts end to end, and grasp them between other pieces on each side, as in Plate XXIIL, fig. 1. This the ship-carpenter calls fishing a beam ; it is a frequent prac- tice for occasional repairs. Perronet used it for the tie-beams or stretchers by which he connected the opposite feet of

beam.

JOINTS. |

a centre, which was yielding to its load, and had pushed aside one of the piers above 4 inches

Where the beams stand square with each other, and the strains are square with the beams and in the plane of the frame, the mortise and tenon is the most perfect junction. A pin is generally put through both in order to keep the pieces united, in opposition to any force which tends to part them. Every carpenter knows how to bore the hole for this pin, so that it shall draw the tenon tight into the mortise, and cause the shoulder to butt close, and make neat work ; and he knows the risk of tearing out the bit of the tenon beyond the pin, if he draw it too much. We may just observe, that square holes and pins are much preferable to round ones for this purpose, bringing more of the wood into action, with less tendency to split it.

Ship-carpenters have an ingenious method of making long wooden bolts, not passing completely through, which take a very fast hold, though not nicely fitted to their holes, which they must not be, lest they should be crippled in driving. They call it fox-tail wedging. They stick into the point of the bolt T, Plate XXIII, fig 2, thin wedges of hard wood, so as to project a proper distance ; when these reach the bottom of the hole by driving the bolt. they split the end of it, and squeeze.it hard to the side. This may be practised with advantage in carpentry. If the ends of the mortise are

widened inwards, and a thin wedge be put into the end of the tenon, it will have the same effect, and make the joint equal to a dove-tail ; but this risks the splitting the piece beyond the shoulder of the tenon, which would be unsightly, and may be avoided by two very thin wedges a and ¢ beiug struck in near its angles, projecting equally; at a very small distance within these are to be placed two shorter ones 6, d, and more within these if necessary. In driving this tenon, the wedges a and ¢ will take first, and split off a thin slice, which will easily bend without breaking. The wedges 6, d will act next, and have a similar effect, and the others in succession. The thickness of all the wedges taken together must be equal to the enlargement of the mortise towards the bottom.

When the strain is transverse to the plane of the two – beams, great care must be taken by the artist in placing his mortise A mortise in a girder for receiving the tenon of a binding-joist of a floor should be as near the upper side as possible, because the girder becomes concave on that side by the strain. But as this exposes the tenon of the bind- ing-joist to the risk of being torn off, we are obliged to mortise further down. The form in Plate XXIII, fig. 3, generally given to this joint is extremely judicious. The sloping part a 6 gives a very firm support to the additional bearing ¢ d, without much weakening of the girder. This form should be copied in every case where the strain has a siniilar direction

The joint that most of all demands the careful attention of the artist is that which connects the ends of beams, one of which pushes the other very obliquely, putting it into a state of extension. ‘The most familiar instance of this is the foot of a rafter pressing on the tie-beam, and thereby drawing it away from the other wall. When the direction is very oblique (in which case the extending strain is the greatest), it is difficult to give the foot of the rafter such a hold of the tie-beam as to bring many of its fibres into the proper action. There would be little difficulty if we could allow the end of the tie-beam to project to a small distance beyond the foot of the rafter; but, indeed, the dimensions which are given to tie-beams for other reasons are always sufficient to give enough of abutment when judiciously employed. Unfortunately this joint is very liable to fail from the effects of the weather. It is much exposed, and frequently perishes by rot, or becomes so soft and friable that a very small force is sufficient either

for pulling the filaments out of the tie-beam, or for crushing them together. We are therefore obliged to secure it with particular attention, and to avail ourselves of every circum- stance of construction.

One is naturally disposed to give the rafter a deep hold by a long tenon, but it has been frequently observed in old roofs that such tenons break off. Frequently they are observed to tear up the wood that is above them, and push their way through the end of the tiebeam, This in al! probability arises from the first sagging of the roof, by the compression of the rafters and of the head of the king- post. ‘The head of the rafter descends, and the angle with the tie-beam is diminished by the rafter revolving round its step in the tie-beam. By this motion the heel or inner angle of the rafter becomes a fulcrum to a very long and powerful lever much loaded. The tenon is the other arm, very short; and being still fresh, it is therefore very powerful. It therefore forces up the wood that is above it, tearing it out from between the cheeks of the mortise, and then pushes it along. Carpenters have therefore given up long tenons, and give to the toe of the tenon a shape which abuts firmly, in the direction of the thrust, on the solid bottom of the mortise, which is well supported on the under side by the wall-plate. This form, represented in Plate XXIII, fig. 4, has no tendency to tear up the end of the mortise. The tenon has a small portion a} cut perpendicular to the surface of the tie-beam, and the rest 6c is perpendicular to the rafter.

But if the tenon is not sufficiently strong (and it is not so strong as the rafter, which is thought not to be stronger than is necessary), it will be crushed, and then the rafter will slide out along the surface of the beam. It is there- fore necessary to call in the assistance of the whole rafter. It is in this distribution of the strain among the various abutting parts that the varieties of joints and their merits chiefly consist. We can only mention a few here that have met with most general approval.

The aim in fig. 5, Plate XXIII, is to make the abutments Varione The action is the forms of same as against the jogele on the head or foot of a Joints.

exactly perpendicular to the thrusts.

king-post. This is a very effectual joint; it is not, how- ever, much practised. It is said that the sloping seam at the shoulder lodges water ; but the great reason seems to be a secret notion that it: weakens the tie-beam. Fig. 6 exhibits a form that is more general, but certainly worse. The shoulder-joint is sometimes formed like the dotted line abedcfg of fig. 6. This is much more agreeable to the true principle, and would be a very perfect method, were it not that the intervals 6d and d/ are so short that the little wooden triangles 6 ed, dc f will be easily pushed off their bases 6d, df. Fig. 7, No. 1, seems to have the most general approbation, but we fail to perceive its peculiar merits. It is the joint recommended by Price, and copied into books of carpentry as the true joint for a rafter foot. The visible shoulder-joint is flush with the upper surface of the tie-beam. The angle of the tenon at the tie nearly bisects the obtuse angle formed by the rafter and the beam, and is therefore somewhat oblique to the thrust. The inner shoulder ac is nearly perpendicular to bd. The lower angle of the tenon is cut off horizontally as ated. Fig. 8 is a section of the beam and rafter foot, showing the different shoulders. Fig. 7, No. 2, is a simpler, and in our opinion a preferable joint. We observe it practised by the most eminent carpenters for all oblique thrusts; but it surely employs less of the cohesion of the tie-beam than might be used without weakening it, at least when it is supported on the other side by the wall-plate. Fig. 7, No. 3, is also much practised by the best carpenters. Fig. 9, No. 1, is pro- posed by Mr Nicholson as preferable to fig. 7, No. 3,

because the abutment of the inner part is better supported. This is certainly the case, but it supposes the whole rafter to go to the bottom of the socket, and the beam to be thicker than the rafter. Some may think that this will weaken the beam too much, when it is no broader than the rafter is thick ; in which case they think that it requires a deeper socket than Nicholson has given it. Perhaps the advantages of Nicholson’s construction may be had by a joint like fig. 9, No. 2.

Whatever is the form of these butting joints, great care should be taken that all parts bear alike; and the artist will attend to the magnitude of the

different surfaces. In the general compression the greater surfaces will be less compressed, and the smaller will therefore change most. When all has settled, every part should be equally close. Because great logs are moved with difficulty, it is very troublesome to try the joint frequently to see how the parts fit; therefore we must expect less accuracy in the interior parts. This should make us prefer those joints whose efficacy depends chiefly on the visible joint. It appears from all that has been said on this subject, that a very small part of the cohesion of the tie-beam is sufficient for withstanding the horizontal thrust of a roof, even though very low pitched. If, therefore, no other use is made of the tie-beam, one much slenderer may be used, and blocks may be firmly fixed to the ends, on which the rafters might abut, as they do on the joggles on the head and foot of a king-post. A tie-beam may have to carry a floor or ceiling (sometimes the workshops and store-rooms of a theatre), and therefore requires a great scantling, but frequently beams have little to do, and contain an unneces- sary quantity of timber. It is therefore of importance to ascertain the most perfect manner of executing such a joint, and we have directed the attention to the principles that are really concerned in the effect. In all hazardous cases the carpenter calls in the assistance of iron straps ; and they are frequently necessary, even in roofs, not- withstanding this superabundant strength of the tie-beam. But this is generally owing to bad construction of the wooden joint, or to the failure of it by time.

There needs but little to be said of the joints at a joggle worked out of solid timber; they are not near so diffi- cult as the last. When the size of a log will allow the joggle to receive the whole breadth of the abutting brace, it ought certainly to be made with a square shoulder ; or, which is still better, an arch of a circle having the other end of the brace for its centre. Indeed, this in general will not sensibly differ from a straight line perpendicular to the brace. By this circular form the settling of the roof makes no change in the abutment; but when there is not sufficient stuff for this, we must avoid bevel joints at the shoulders, because these always tend to make the brace slide off. The brace in Plate XXIII, fig. 10, No. 1, must not be joined as at 6, but as at a, or in some equivalent manner.

When the very oblique action of one side of a frame of carpentry does not extend, but compresses, the piece on which it abuts, there is no difficulty in

the joint. Indeed a joining is unnecessary, and it is enough that the pieces abut on each other; and we have only to take care that the mutual pressure be equally borne by all the parts, and that it do not produce lateral pressures, which may cause one of the pieces to slide on the butting joint. A very slight mortise and tenon is sufficient at the joggle of a king-post with a rafter or straining beam. It is best, in general, to make the butting plain, bisecting the angle formed by the sides, or else perpendicular to one of the pieces. In fig. 10, No. 2, where the straining beam a cannot slip away from the pressure, the joint a is preferable to 6, or indeed to any uneven joint, which never fails to

produce very unequal pressures on the different parts, by which some are crippled, others are splintered off, &c.

When it is necessary to employ iron straps for strength- Placing ening a joint, considerable attention is necessary that we Straps.

may placethem properly. The first thing to be determined is the direction of the strain. This must be resolved into a strain parallel to each piece, and another perpendicular to it; and then the strap which is to be made fast to any of the pieces must be so fixed that it shall resist in the direc- tion parallel to the piece. Frequently this cannot be done ; but we must come as near to itas we can. We can hardly give any general rules. Fig. 30 shows the nature of the strap or stirrup by which the king-post carries the tie-beam. The strap that we 4 observe most generally ill placed is that 3 which connects the foot of the rafter with the beam. It only binds down the rafter, and Jhepeams does not act against its horizontal thrust. It | f< should be placed farther back on the beam, £ | with a bolt through it, which will allow it to # turn round. It should embrace the rafter almost horizontally near the foot, and should be notched square with the back of the rafter. It is represented in fig. 11, Plate XXIII. By moving round the eye-bolt, it follows the rafter, and cannot pinch and cripple it, which it always does in its ordinary form. We are of opinion that straps which have eye-bolts in the very angles, and allow all motion round them, are of all the most perfect. A

branched strap, such as may at once bind the king-post and the two braces which butt on its foot, will be more serviceable if it have a joint. When a roof warps, those branched straps fre- quently break the tenons, by affording a fulcrum in one of their bolts. An attentive and judicious artist will consider how the beams will act on such occasions, and will avoid giving rise to these great strains by levers. In the fore- going reasoning upon the direction of straps, regard has been had especially to the economizing of their immediate strength ; but it may happen that the principal purpose of the strap will be answered by its pressing the rafter firmly upon the beam, and this effect may be produced by a certain deviation from the horizontal position, with but little diminution of the strength of the strap,—a deviation which lias also the advantage of allowing the strap to embrace the whole of the beam, without weakening it by driving a bolt through it. We must not, however, run the risk of crippling the end of the beam. A skilful carpenter never employs many straps, considering them as auxiliaries foreign to his art, and subject to imperfections in workmanship which he cannot discern or amend. We must refer the reader to Nicholson's Carpenter and Jowner's Assistant for a more particular account of the various forms of stirrups, screwed rods, and other iron-work, for carrying tie-beams, &c.

The diagrams of Plate XXIV. will illustrate the use of the before-described joints on a smaller scale in the further operations of the carpenter's work.

Ordinary scarfing is the cutting away equally from the ends, but on the opposite sides, of two pieces of timber, for the purpose of tying or connecting them lengthwise, and is done to wall-plates-and bond-timber. The usual mode is by cutting about three-fifths through each piece on the upper

Fig. 30.

Further illustra tion of

joints.

Scarfing.

face of the one and the under face of the other, about 6 or —

8 inches from the end, as in fig. 1, Plate XXIV., transversely, making what is technically termed a calf or kerf, and longitu- dinally from the end, from two-fifths down on the same side, so that the pieces lap together with a sort of half dovetail. The heavy supervening weight of the wall and joists renders it impossible that they should be drawn apart without tear- ing the fibres asunder or lifting the weight. Nevertheless

these joints are generally spiked, and it is always required that they be made to fall in or under a pier. Notching is either square or dovetailed ; it is used in connecting the ends of wall-plates and bond-timber at the angles, in letting joists down on beams or binders, purlines on prin- cipal rafters, &c. Nos. 1, 2, 3, 4, and 5, fig. 2, show varieties of notches applied as we have described No. 1 is a simple square notch ; No. 2, a dovetailed notch. No. 3 is the notch most commonly used; it is similar to No. 1, but that the ends are allowed to run on so that the one piece grasps the other, and each forms a cog to the other. No. 4 is an oblique-angled, dovetailed notch; and No. 5 shows how joists are notched or let down on beams and binders, and purlines on principal rafters. A notch is cut into the under edge of the joist or purline an inch or an inch and a half in depth, and considerably shorter than the beam, binder, or rafter is in thickness. Notches are also cut down on the upper angles of the bearing pieces, as long as the rider is thick, as deep as the notch before described: of the latter is, and so far in as to leave a thick- ness on its own edge equal to the length of the notch in the riding joist or purline. In the diagram one joist is indicated in its place let down in the notch, and another indicates the notch in its own edge, and leaves exposed the notches in the binder. Cogging, or corking, as it is vulgarly termed, is the last-mentioned species of notch extended on one side, and leaving a narrow tooth or cog alone in the bearing-piece flush with its upper face, No. 1, fig. 3. It is used principally in tailing joists and beams on wall-plates and templets, and the cog is here made narrower, because the end of the joist or rider coming immediately beyond the plate, that part which forms the shoulder of the notch would be liable, on being strained, to be chipped off or torn away, if it were not kept as long as

possible; and it is not of so much importance. to guard –

against weakening a wall-plate which is supported along its whole length, as a beam, binder, or principal rafter, which rests on distant points alone. No. 2 of the same figure shows another mode of tailing on joists and beams by a dovetail notch, which, to distinguish it from the flat notches, Nos. 2 and 4, fig. 2, is called corking, or cogging also, though the operation certainly is not cogging. This is a good mode if the timber be so well seasoned as not to be likely to shrink more; but it would be improved by allowing the rider to take a bearing in a notch like that to No. 1 before the dovetail commenced, as at No. 3, for in the ordinary mode it is weakened in a point of great importance. Whatever notches and cogs for beams and joists are required in wall-plates and templets, should be made before they are set on or in a wall; for, as they are always bedded in mortar, anything that may break the set must be avoided. A cog-hold is best obtained through the agency of a chair of cast-iron, which should, however, be itself cogged or joggled to a stone templet laid in the wall under it, and be capped or covered by another broad flat stone, as an inverted templet, with a joggle from the chair running up into it.

Tenoning implies mortising also as a matter of course. They are the names of the two operations necessary to one result,—that of producing a connection between two pieces by inserting part of the end of one into a hole of similar size cut in the side or face of the other. A tenon is formed by cutting in on each side or edge of a piece of timber, near its end, transversely, to a certain depth, or rather, leaving a certain part of the breadth or depth uncut, and then cutting in longitudinally from the ends as far from each edge as the transverse cuts have been made in depth, thus removing two square prisms and leaving a third undivided. This is the tenon. An excavation in the side of a piece of timber, of a certain depth, in the direction of its thickness, parallel

to its edges, and bounded lengthwise by lines at right angles to them, is a mortise. Tenons and mortises are made of exactly corresponding size, and are most frequently at equal distances from one or the other side or edge of the two pieces to be conjoined; and for the most part, too, every angle

formed in the process of tenoning, both internal and external, isa right angle. Tenons are called joggles in some situations, when they are not intended to be borne upon, and their use is merely to keep the piece of timber to which they belong steadily in its place, without being liable to slight accidents from lateral pressure or violence, In combining timbers by means of mortises and tenons, to produce as great a degree of strength as possible, it must be obvious that the object to be kept in view isto maintain the end or tenon of the one as large and efficient as it may be, and weaken the other as little as possible in forming the mortise. For the efficiency of the mortised piece in a horizontal bearing, it is clear that as much of its thickness should be below the mortise as possible, as at a, fig. 4; for if it be put low, as at 6, the superincumbent weight on the tenon would more readily split or rend it in the direc- tion of the grain, as indicated; but the case is inverted with the tenoned pieces. With the mortise at a the tenon could only have the efficacy of so much of the piece to which it belongs as there is of it above its under surface, which is a very small part of its depth ; whereas with the tenon at 6 it would command the power of the greatest part of the depth. To guard as much as possible against the danger of too great a mortise and too small a tenon on one side and the other, and to obviate the difficulty arising from the efficiency of one or the other of the two pieces being affected by putting the tenon too high or too low, a com- pound, called a tusk tenon, is used for almost all horizontal bearings of any importance, especially to joists and binders, to trimmers, beams, girders, bressummers, &c. The body of the tenon in this is a little above the middle of the end, and it runs out 2, 3, or 4 inches, or more, as the case may require. Below it the tusk protrudes, and above

it the shoulder is cut down at an obtuse angle with the

horizontal line, giving the strength of the whole depth of the timber above the under tusk to the tenon, and giving it a bearing in a shallow mortise, whilst a greater depth of the mortised piece than the tusk rests on receives the body of the tenon, and so protects its comparatively narrow margin from undue pressure. The diagram No. 1, fig. 5, shows the tusk tenon, with the section of a beam into which it is mortised; and No. 2 indicates perspectively

the appearance of the mortise in front. Pinning is the inser- Pinning.

tion of nearly cylindrical pieces of wood or iron through a tenon, to detain it in the mortise, or prevent it from being drawn out by any ordinary force. For this purpose the pin is inserted either in the body, or beyond the thickness,

-of the mortised piece, as indicated at a, fig. 5, or at a, fig. 6. Wedging (see b, b, No. 2, fig. 25) is the insertion of Wedging.

triangular prisms, whose converging sides are under an extremely acute angle, into or beside the end of a tenon, to make it fill the mortise so completely, or bind it so tightly, that it cannot be easily withdrawn. The wedging of ten- ons also assists in restoring to the mortised piece of timber much of the strength it had lost by the excision of so much of its mass, which indeed the tenon itself does if it fit closely in every direction; but the assistance of the wedge renders the restoration more perfect than the tenon could secure of itself, by compressing the fibres of both, longi- tudinally to those of the one, and transversely to those of the other, thus removing the tendency of the mortised piece to yield in any degree in the weakened part, though it cannot make up the loss in its tenacity occasioned by

the scission of its fibres. In scarfing, cogging, and notching, the shoulders are

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always cut in with the saw; but the cheek is for the most part struck out with the mallet and chisel, or adze, as may be most convenient. Tenons should be made entirely with the saw. Mortises are generally bored at the ends with an auger whose diameter equals their thickness; the inter- vening part is taken out with a wide chisel, cutting in the direction of the fibre ; and the ends are squared down with a chisel whose breadth just equals the thickness of the mortise. Wood pins must be rent to insure the equal tenacity of their whole mass. Wedges are cut with the saw, but straight-grained stuff is always preferred for them.

Bond-timbers and wall-plates should be carefully notched together at every angle and return, and scarfed at every longitudinal joint. The scarf shown at fig. 1, Plate XXIV., is sufficient; and the notch at No. 3, fig. 2, may be preferred where notching is required; neither pinning nor nailing, however, can be of great use to either the notch or the scarf. Bond-timbers are passed along and through all openings, and are not cut out until such openings are to be permanently occupied, that is, by windows with their sash-frames, &c., because they assist in preventing irregular settlements, by helping to carry the weight of a heavy part along the substruction generally, instead of allowing it to press unduly upon the part immediately under it.

It is the duty of the carpenter to supply the bricklayer or mason with wood bricks in sufficient quantity, and to direct him where they should be placed to receive the joiner's fittings, or the battening, which the carpenter himself may have to put up for the plasterer.

The carpenter makes and fixes or sets centres of all kinds, whether for single arches or niches, or even in bridge construction.

Centres for arches.

edges.

turned or set correctly on an incorrect or unstable centre. Descriptions of various sorts of flooring are noticed in the earlier part of this article as for fireproof structures ;

Floors.

and also under Brickwork and Mason-work. The timbers or |

framework of ordinary house and warehouse floors is called naked flooring, and it is distinguished as single, double, and framed. Of these the first, under ordinary circum- stances, is the strongest.

Single flooring (Plate XXV. figs. 1, 2) consists of one row or tier of joists alone, bearing from one wall or partition to

Single flooring.

flooring boards on the upper surface or edges of the joists,and the ceiling, if there be one, on the lower. Joists in single floors should never be less than 2 inches in thickness, because of their liability to be split by the brads or nails of the boards if they are thinner; and they should never be much more, because of the keying of the ceiling, which is injuriously affected by great thickness of the joists. Twelve inches from joist to joist is the distance generally allowed; that dimen- sion, however, from centre to centre of the joists would be bet- ter Strength toalmost any extent may be given by adding to the depth of the joists, and diminishing the distance be- tween them ; and they may be made firm, and be prevented from buckling or twisting, by putting struts between them. The struts are short pieces of batten, fig. 31, which should not be less than an inch, and need not be more than an inch and .a half thick, and 3 or 4 inches wide, placed diagonally between the joists, to which they are nailed, in a double series, or crossing, as indicated by the full and dotted lines in Plate XXIV. fig. 7; and they should be made to range in a right line,

Fre. 31.—Strut.

that none of their effect may be lost; and these ranges | would be gained in any other respect by doing so. When

BUILDING

Large centres are framed in distinct ribs, and | are connected by horizontal ties ; whilst small ones are made | of mere boards cut to the required sweep, nailed together, | and connected by battens notched into or nailed on their | Precision and stability are nevertheless equally and © absolutely necessary, as it is impossible for an arch to be |

not to injure the ceilings, that they with difficulty receive

_a mode sometimes adopted of making every third or fourth

_ vening joists ; and to these, ceiling joists are notched and another, without any intermediate support, and receiving the |

or rows should be repeated at intervals not exceeding 5 or 6 feet. The struts should be cut at the ends with exactly the same inclination or bevel, to fit closely. Great care should be taken, too, not to split the struts in | nailing; but the trouble of boring with a gimlet is saved by making a slight nick or incision with a wide-set saw for each nail, of which there should not be less than two } at each end; and the nails used should be clasp-nails. If the struts were notched into the joists, as in fig. 32, it would 4 add very materially to their efficiency, but perhaps not in proportion to the additional labour it would involve. This strutting should be done to single floor- ing under any circumstances, as it adds materially to its firmness and indeed to its strength, by making the joists trans- mit any stress or pressure from one to another. Fg The efficiency of single flooring is materially affected by Trimming, the necessity which constantly occurs in practice of trimming | round fire-places and flues, and across vacuities. Trimming | is a mode of supporting the end of a joist by tenoning it i into a piece of timber crossing it, and called a trimmer, | instead of running it on or into the wall which supports .

Fie, 82.—Herring- | bone Strutting. |

the ends of the other joists generally. A trimmer requires for the most part to be carried or supported at one or both of its ends by some of the joists, which are called . trimming joists, and are necessarily made stouter than if

they had to bear no more than their own share of the

stress. Commonly it is found enough to make the trim-

mers and trimming joists from half an inch to an inch thicker than common joists. In trimming, tusk tenons should be used ; and the long tongue or main body of

the tenon should ruh not less than 2 inches through,

and be draw-pinned and wedged, moreover, if it do not completely fill the mortise in the direction of the length of

the latter.

The principal objection, however, to single flooring is, Objection that sound readily passes through, the attachment of the to single boards above and of the ceiling below being to the same 9° joists throughout. Another objection, and one already referred to, is the necessity of making the joists so thin,

the flooring brads in their upper edges without splitting. A partial remedy for both these disadvantages is found in

joist an inch or an inch and a half deeper than the inter-

nailed, or nailed alone, as shown in Plate XXIV. fig. 7.

This, by diminishing the number of points of contact be

tween the upper and the lower surface, for the ceiling joists J must be carefully kept from touching the shallower joists

of the floor, is less apt to convey sound from one story to another, and allows conveniently thin joists to be used for

the ceiling without affecting those of the floor.

Double flooring (see Plate XXIV. fig. 8, Nos. 1 and 2, Double and Plate XXV. fig. 3) consists of three distinct series of #78 — joists, which are called binding, bridging, and ceiling joists.

The binders in this are the real support of the floor ; they run from wall to wall, and carry the bridging joists above and the ceiling joists below them. Binders need not be less and should not be much more than 6 feet apart, that is, if the bridging or flooring joists are not inordinately weak. The bridging joists form the upper tier, and are notched down on the binders with the notch No. 5, Plate XXIV. fig. 2. The ceiling joists range under the binders, and are notched and nailed as shown at No. 1, fig. 8; but the notch must be taken entirely out of the ceiling joists, for the lower face or edge of the binder may not be wounded by any means or on any account, and, moreover, no good

a

FLOORING. |

it is an object to save height in the depth or thickness of this species of floor, the ceiling joists may be tenoned into the binders, instead of being nailed to them; in this case the latter must be chase-mortised on one side, fig. 33, for the convenience of receiving the former when they are themselves set and fixed. XXIV. fig. 9, Nos. 1 and 2, and Pl te XXV. fig. 4). Girders are large beams, in one or more pieces, according to the length required, and the size and strength of which timber can be procured. They are intended for longer bearings than mere binders may be trusted at, and may be strengthened by forming a built beam. The principle of constructing girders of any depth, says Tredgold, in his Carpentry, is the same as that of building beams, and when properly conducted they are as strong as any truss can be made of the same depth. The most simple method consists in bolting two pieces together, with keys between to prevent the parts sliding upon each other,—the upper one of hard compact wood, the lower of tough straight grained wood. The joints should be at or near the middle of the depth ; the thickness of all the keys added together should be greater than one-third more than the whole depth of the girder; and if they be made of hard wood, the breadth should be about twice the thickness. They may be held together by bolts. Fig. 34 is a good form held by bands, and, if the upper timber be cut so as to be smaller towards the ends, would admit of these hoops being driven on till perfectly

Fies. 34, 35.—Girders,

tight. In fig. 35 the parts are tabled or indented together instead of being keyed, and a king-bolt is added to tighten the joints, Girders may be further strengthened to almost any extent by trussing ; but to be efficient, the height of the truss must always be greater than the depth of the beam itself, and the strength is increased by extending that height as the space or bearing increases. A truss is indeed a wooden arch, whose lateral thrust will of course be

BUILDING

greater the smaller the angle subtended by it, and vice versa. It has been a commonly received opinion, that a truss less than the depth of a girder adds materially to its strength ; but experiments have proved that very little advantage is gained by such a one, even when executed in the best manner, and that, badly executed, the beam or girder is weaker with the truss than without it. In some situations the flooring joists can be raised to a certain height to allow of the head of the truss, which is usually made' of iron, being placed at a sufficient height to be truly

Fia. 36.—Trussed Girder.

efficient. Such is the trussed girder shown in fig. 36, intended for a great length. A common mode of strength- ening a beam or bressummer, is to cut the timber in hale longitudinally, whereby any defects in the interior can be seen ; then to reverse the pieces, end for end, and bolt them well together. Some additional strength is obtained by putting between the timbers a plate of wrought iron about the depth of the beam and about half an inch in thickuess, and then boiting the three together, as in Plate XXIV. fig. 9, No. 3.

Binders are made dependent on the girders by means of double tusk tenons, and on and to them the bridging and ceiling joists are attached as above described. Plate XXIV.

fig. 9, No. 1, shows the transverse section of a compart- Plans of ment or bay of a framed floor ; No. 2 the same longitudinally floors.

of the girder and of the bridging and ceiling joists, and transversely of the binders. Plate XXV. fig. 1, is the plan of a single floor of joists tailing in on wall-plates with two chains of struts, and trimmed to a fireplace. Fig. 2 is a floor similar to fig. 1, with ceiling joists nailed to deeper flooring joists at intervals, as in Plate XXIV. fig. 7. Fig. 3 is the plan of a double floor; and fig. 4 is that of a framed floor of joists, bays of which are shown in section in Plate XXIV. figs. 8, 9. It is to be observed, with reference to the diagram fig. 9, No. 1, that binders ought not to be framed into the girders opposite to one another, as they are here shown to be as a matter of convenience, since

the girder is unduly weakened by being mortised on both sides at the same place. Cast-iron shoes render mortising the one forming a tenon upon the other almost unnecessary; and in like manner cast-iron shoes laid into a wall npon stone templets give a good and safe bearing to the girders ; but it is not everywhere that cast- iron shoes are attainable, and mortises and tenons may be made anywhere.

The above descriptions of the three sorts of flooring Medieval apply to floors which are to have a ceiling as in house flooring.

building, or may be left open, as usual in warehouses. But in house building according to the practice of the medizval period, these timbers would be left exposed. They would all require to be planed smooth, the girders moulded, the binders partly so, and the joists perhaps only stop-chamfered, which is done by cutting the arris of the timber to an angle along its whole length, but stopping short of the ends by a few inches, when it is returned into the arris by a cant. The underside of the joists in a framed floor may be lined with chamfered boarding or formed into panels and ornamented,—a boltel or a set of mouldings forming a frame or cornice all round against the binder. The girders would rest upon stone corbels, either moulded or decorated with foliage or figures, or all three united. Viollet le Duc, in his valuable Dictionnaire raisonné de lV Architecture, gives several examples of such a floor,

Pillars.

Partitions.

of one of which we avail ourselves, from a house at Rheims of the 15th century (fig. 37). He gives an example also of

BINDER

Fie. 37.—Medieval Flooring.

a floor formed of a girder into which joists are laid formed of square timbers cut in half through the diagonal. These are fixed close together like a succession of v's, thus vvvvv, and boarded over. The top of the angle space formed by two joists is filled up with a small angle fillet presenting a flat surface. The whole effect is unique.

In medizval carpenters' work it was always the rule only to mould the useful members, and so it was also as regards the carving. Most of the old wood carving is so contrived as to be wrought out of the same plank or thickness as that which is moulded, or else is a separate piece of wood, in a spandril for instance, enclosed within the constructional members. In joining their work, which was of oak, they trusted entirely to tenoning and pinning with stout oak pins.

Although cast-iron columns and stanchions have for some years been preferred to timber posts as supports to girders of warehouse floors, lately the latter have again come into use from their known greater resistance to fire, whereas cast-iron soon succumbs to the great heat and the effects of water upon it. Such posts are usually made of fir or of oak, the dimensions of which vary according to their compound of crushing force and stiffness which is as 25 to 40. The caps to them should be long, so that they may not press into the girders, and if practicable, iron dowels should pass through the girders to catch the bases of the posts in the floor above.

Partitions of timber are called quartering partitions, and they are generally framed. Common quartering partitions, which rest on a wall or floor, and have nothing to carry, consist merely of a sill, a head, and common up-rights called studs to receive the lath for plastering ; these last may be simply joggled or tenoned into the head and sill, as shown in Plate XXIV. fig. 4, c, and stiffened by struts or stretching pieces put between them and nailed. When, however, a quartering partition is over a vacuity, or rests only on certain points, and has, moreover, to sustain a weight, a floor perchance, it is framed and trussed with king or queen posts and trussing pieces as to the tie-beam of a roof, and is thence called a trussed partition ; and the filling in of common uprights or quarters for the laths is generally performed by joggling them at one end into either head or sill, and nailing them securely to the trussing pieces. In the diagram, Plate XXV. fig. 5, it is

supposed that an opening or doorway is to be made in the partition, so that the timbers of the truss are placed around it with queen- posts, and a small internal truss is pnt over the door-head to prevent it from sagging, and to carry the long part of the partition, which we supposed required to bear a floor, so that the partition acts also, in fact, the part of a trussed

girder in the most available form. Fig. 6 presents another method of framing a similar partition. Such partitions should be set up in every story before the beams and joists of the floors are laid, that their horizontal timbers may be notched on to the wall-plates, and that the joists or binders may be notched on to them if occasion require it ; but they should be fixed rather below than above the level of the wall-plates, because they are not liable to settle down so much as the walls, though even that will depend ina great degree on the nature of the walling, and its liability to yield. As the whole weight on partitions is supported by the principal posts, their scantlings must be first con- sidered, which should be done in two different ways : first, when the studs are to be filled in with brickwork and rendered thereon, when they are called brick-nog partitions ; or secondly, when they are to be lathed and plastered on both sides, or to be wainscoted.. Thin partitions of wood only are called framed partitions and are considered in the portion relating to the joiner.

Roofing is another very important branch of the art of Roofing,

carpentry. The most simple form is a shed-roof or lean- to, which is merely obtained by pieces of wood being laid across in the position of an inclined plane to throw off the water. Rectangular buildings are usually covered by a roof in the form of a prism, the vertical section of which is an isosceles triangle. The height of this, or as it is technically called, the pitch of a roof, has varied in different ages, to suit the exigencies of the climate or the taste of the designer. A few examples showing the insertion of the foot of a principal rafter into a tie-beam, the struts into a post, and the heads of struts, are given in Plate XXIII.

To relate all the specialities which the carpenter may Specialities have to do in some particular buildings, as a church, for °f caper The mode of “”

instance, would far exceed our limits. executing such things would be the same as already de- scribed, the style only making a difference in the result. Pewing or benching—the pulpit and reading-desk, stalls, screenwork, font cover, gallery front, &c.—all depend on the architect’s designs. Again, shop fronts are now almost a speciality, together with shop-fittings; and among the minor things in a house are the cupboards, closets, bath, cisterns, kitchen-dresser, plate-rack, dust-bin when not of wholly of brick,—also stable fittings if the improved iron fittings be not used. Centering for arches and for bridges, wharf-walls, spires, turrets, belfries, church bell hangings, gables, are all embraced in carpenter’s work, as well as timber houses, the manner of framing which, and the names of the different timbers, will be found described in Le Muet’s work (1747) and others of that period, and illus- trated in many valuable publications, by Nash, Richardson, Habershon, Clayton, Viollet de Duc, Parker, Dollman, and others ; and not least of such works in timber are the barn, porches, lych gates, palings, with chests and presses, and tables and chairs formerly.

Pugging floors, firring down joists, bracketing and cradling for plastering, and some other things, are operations per- formed indifferently by the carpenter or the joiner, as less or greater precision is required in the performance.

See Moxon, Mechanick Exercises, 4to., 1679 ; Godfrey Richards, Translation of the First Book of A. Palladio, 8vo, 1676 ; Smith, Carpenter’s Companion, 8vo, 1735; Price, British Carpenter, 4to, 1733-85 ; Batty Langley, Builder’s Complete Assistant, 8vo, 1738, and his Builder’s and Workman’s Treasury of Designs, 4to, 1740; Swan, Carpenter’s Complete Instructor, 4to, 1759 and 1768 ; Pain, British Palladio, fol., 1786 and 1804, and his Practical House Carpenter, 4to, 1774; Nicholson, Carpenter’s New Guide, 4to, 1792, his Builder’s New Director, 4to, 1824, and his Architec- tural Dictionary, 4to, 1835; Tredgold, Principles of Carpentry, edit. by Barlow, 4to, 1853; Weale, Carpentry, 4to, 1849; New- land, Carpenter’s Assistant, &c., fol., 1860; Laxton, Examples of Building Construction, large

fol., 1855-58 ; Tarbuck, Encyclopedia of Practical Carpentry and Joinery, &c., 4to, 1857-59; A. W.

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JOINERY. |

Pugin, Chancel Screens, 4to, 1851, and his Details of Ancient Timber Houses, 4to, 1836 ; Bury, Ecclesiastical Woodwork, 4to, 1847; Brandon, -d4nalysis of Gothic Architecture, 4to, 1849 ; Dollman, Ancient Pulpits, 4to, 1849; A. Pugin, Ornamental Gables, 4to, 1831; and the following foreign publications: Jousse, Le Theatre de Vart de Charpentier, fol., 1650; Le Muet, Maniére de bien bastir, fol., 1623, translated by Pricke, fol., 1670 and 1675 ; Emy, LD Art de la Charpenterie, fol., 1841-42 ; Krafit, L'Art de la Char- penterie, fol., 1805; L'Art de la Charpente, fol., 1819-22, and Supplement by Thiollet, fol., 1840 ; Viollet de Duc, Dictionnaire, SvONLSos, Cc.

JOINERY.

Joinery is one of the useful arts which contributes most niaterially to the comfort and convenience of man. As the arts of joinery and carpentry are often followed by the same individual, it appears at first view natural to conclude that the same principles are common to both these arts ; but a closer examination of their objects leads to a different conclusion. The art of carpentry is directed almost wholly to the support of weight or pressure, and therefore its principles must be found in the mechanical sciences. Ina building it includes all the rough timber- work necessary for support, division, or connection ; and its proper object is to give firmness and stability. The art of joinery has for its object the addition in a building of all the fixed wood-work necessary for convenience or ornament. The joiner's works are many of them of a complicated nature, and require to be executed in an expensive material; therefore joinery requires much skill in that part of geometrical science which treats of the projection and description of

lines, surfaces, and solids, as well as an intimate knowledge of the structure and nature of wood. A man may be a good carpenter without being a joiner at all; but he cannot be a joiner without being competent, at least, to all the operations required in carpentry. The rough labour of the carpenter renders him in some degree unfit to produce that kind of accurate and neat workmanship which is expected from a modern joiner ; but it is no less true, that the habit of neatness and the great precision of the joiner make him a much slower and less profitable workman than the practised carpenter in works of carpentry. In carpentry, as before observed, framing owes its strength to the form and posi- tion of its parts; but in joinery, the strength of a frame depends upon the strength of the joinings. The import- ance, therefore, of fitting the joints together as accurately as possible is obvious. It is very desirable that a joiner should be a quick workman, but it is still more so that he should be a good one; that he should join his materials with firmness and accuracy; that he should make surfaces even and smooth, mouldings true and regular, and the parts intended to move so that they may be used with ease and freedom. It is also of the greatest importance that the work, when thus put together, should be con- structed of such sound and dry materials, and on such principles, that the whole should bear the various changes of temperature and of moisture and dryness, so that the least possible shrinkage or swelling should take place.

In early times very little that resembles modern joinery was known; every part was rude, and joined in the most artless manner. The first dawnings of the art appear in the thrones, stalls, pulpits, and screens of our cathedrals and churches ; but even in these it is of the most simple kind, and is indebted to the carver for everything that is worthy of regard. Whether in these monuments the carver and the joiner had been one and the same person we cannot now determine, though we imagine, from the mode of joining in some of them, that this was the case. With the revival of classic art great changes took place in every sort of construction. Forms began to be introduced in architecture which could not be executed at a moderate

expense without the aid of new principles, and these principles were discovered and published by practical joiners. As might naturally be expected, these authors had but confused notions, with their scanty geometrical knowledge ; and, accordingly, their descriptions are often obscure, and sometimes erroneous. The change from the heavy mullioned casement and its guard of iron bars to the sash windows necessitated some new method of protection, and boxing shutters were invented. The framed wainscot of small panels gave way to the large

‘bolection moulded panelling. Heavy doors, which were

fomerly hung on massive posts, or in jambs of cut stone, were now framed in light panels, and hung in moulded dressings of wood. The scarcity of oak timber, and the expense of working it, led to the importation of fir timber from the north, which gradually superseded all other material except for the choicest works. But the art is still far short of perfection, and in some respects it seems to have retrograded. It is seldom that large glued-up panels will now stand well. Mouldings of great girth give at the mitres, doors wind, and skirtings shrink from the floors in a way seldom seen in old houses. The sashes, perhaps, are made better than the heavy barred windows of a century and a half ago. In no other respect, however, has joinery made the progress which has been made in other arts. The improved state of machinery has also done but little for its excellence, though the circular saw-bench, the planing-machines, the moulding-machines, and the niortising-machines have done much to reduce the cost of labour. This last machine was suggested in the seventh edition of this work (1830), attention having been drawn to the subject from the improvements in the art of block-making, and it is now used in most of the large establish- ments throughout the country.

The joiner operates with saws, planes, chisels, gouges, hatchet, adze, gimblets, and other boring instruments (which are aided and directed by chalked lines), gauges, squares, hammers, mallets, and a great many other less important tools; and his operations are principally saw- ing and planing in all their extensive varieties, setting out, mortising, dovetailing, &c. Descriptions of the tools, with instructions for using them, may be found in

Moxon’s Mechanick Exercises, 4to, London, 1677-80, and in Nichol- son’s Mechanical Exercises, London, 1812.

There is likewise a great range of other operations, none of which can be called unimportant, such as paring, gluing up, wedging, pinning, fixing, fitting, and hanging, and many things besides which depend on nailing, &c., such as laying floors, boarding ceilings, wainscoting walls, bracketing, cradling, firring, and the like. In addition to the wood on which the joiner works, he requires also glue, nails, brads, screws, and hinges,—and accessorily he applies bolts, locks, bars, and other fastenings,—together with pulleys, lines, weights, white-lead, hold-fasts, wall-hooks, &c., &c.

The joiners’ work for a house is for the most part prepared at the shop, where every convenience may be supposed to exist for doing everything in the best and readiest manner; so that little remains to be done when the carcass is ready, but to fit, fix, and hang, that is, after the floors are laid. The sashes and frames, the shutters, back flaps, backs, backs and elbows, soffits, grounds, doors, &ec., are all framed and put together, that is, wedged up and cleaned off, at the shop; the flooring boards are pre- pared, that is, faced, shot, and gauged with a fillister re- bate; and the architraves, pilasters, jamb linings, skirtings, mouldings, &c., are all got out, that is, tried up, rebated, and moulded, at the shop. The joiner very often turns the house he has to fit up into a workshop ; for benches, and a fire for his glue-pot, are nearly all he requires, should he not have the now usual “ general joiner” machine.

Materials.

Woods shrink irregularly.

drying, they contracted nearly 14 per

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There is no art in which it is required that the structure and properties of wood should be so thoroughly under- stood as in joinery. The practical joiner, who has made the nature of timber his study, has always a most

decided advantage over those who have neglected this most im- portant part of the art.

It is well known that wood contracts less in proportion, in diameter, than it does in circumference ; hence a whole tree always splits in drying. Mr Knight has shown that, in consequence of this irregular contraction, a board may be cut from a tree that can scarcely be made by any means to retain the same form and position when subjected to various degrees of heat and moisture. From the ash and the beech he cut some thin boards in different directions relatively to their tranverse septa, so that the septa crossed the middle of some of the boards at right angles, and lay nearly parallel with the surfaces of others. Both kinds were placed in a warm room, under perfectly similar cir- cumstances. Those which had been formed by cutting across the tranverse septa, as at A in fig. 38, soon changed their form very considerably, the one side becoming hollow, and the other round; and in

ceut, in width. The other kind, in which the septa were nearly parallel to the surfaces of the boards, as at B, retained, with very little variation, their primary form, and did not contract in drying more than 32 per cent. in width. (Philosophical Transactions, part ii, for 1817 ; Philosophical Magazine, vol. |. p. 437.) As Mr Knight had not tried resinous woods, two specimens were cut from a piece of Memel timber ; and to render the result of the observations more clear, conceive fig. 38 to represent the section of a tree, the annual rings being shown by circles. BD represents the manner in which one of our pieces was cut, and AC the other. The board AC contracted 3°75 per cent. in width, aud became hollow on the side marked 6. The board BD retained its original straightness and contracted only 0-7 per cent. The difference in the quantity of contraction is still greater than in hard woods. From these experiments, the advan- tages to be obtained merely by a proper attention in cutting out boards for panels, &c., will be obvious; and it will also be found that panels cut so that the septa are nearly parallel to their faces, will appear of a finer and more even grain, and require less labour to make their surfaces even and smooth. But as this system would necessitate the rejection of all but the heart of the tree for superior work, a method has been adopted which it is said was first used by the billiard-table makers. Let AC, fig. 39, represent the piece above referred to by the same letters. It will become hollow on the side marked 6, no doubt

because the rings of the wood when cut across are relieved from tension, and endeavour to expand themselves. To counteract this it is customary, in all good work, to rip the plank down the centre, and then to “ turn the stuff inside out ” as it is popularly called. This is done by reversing the wood, end

for end, so as to bring the WE EZ),

heart against heart, and the outside against outside, as wag is shown in fig. 40 (without “| which the glue joints are sometimes liable to fly), and also so as to reverse the circular parts of the grain. In wood that has the larger transverse septa, as the dak,

Fig. 38.

Fig. 39.

‘ for example, boards cut as BD will be figured, while those

cut as AC will be plain.

There is another kind of contraction in wood whilst drying, which causes it to become curved in the direction of its length. In the long styles of framing we have often observed it ; indeed, on this account, it is difficult to pre- vent the style of a door, hung with centres, from curving, so as to rub against the jamb. A very satisfactory reason for this kind of curving has been given by Mr Knight, which also points out the manner of cutting out wood, so as to be less subject to this defect, which it is most desir- able to avoid. The interior layers of wood, being older, are more compact and solid than the exterior layers of the

| same tree; consequently, in drying, the latter contract

more in length than the former. This irregularity of con- traction causes the wood to curve in the direction of its length, and it may be avoided by

cutting the wood so that the parts of each piece shall be as nearly of the same age as possible. But as this would also necessitate the rejec- tion of a great deal of stuff, a simpler method is found, which is always to turn the heart of the wood outwards. Thus, in framing a door, the heart should always go against the jambs, and the sap side to the panels.

Besides the contraction which takes place in drying, wood undergoes a considerable change in bulk with the variations of the atmosphere. In straight-grained woods the change in length is nearly insensible, and hence they are sometimes employed for pendulum rods; but the lateral dimensions vary so much that a wide piece of wood will serve as a rude hygrometer. The extent of variation decreases in a few seasons, but it is of some importance to the joiner to be aware that even in very old wood, when the surface is removed, the extent of variation is nearly the same as in new wood.

It appears from Rondelet's experiments (L'Art de batir, article "' Menuiserie," tom. iv. p. 425, 1814), that in wood of a mean degree of dryness, the extent of contraction and expansion, produced by the usual changes in the state of the atmosphere, was, in fir wood, from 335 to 75 of its width, and in oak, from 73, to ~4. Consequently, the mean extent of variation in fir is 3, and in oak, 445; and, at this mean rate, ina fir board about 123 inches wide, the difference in width would be {5th of an inch. This will show the importance of attending to the maxims of construction we have already laid before the reader ; for, if a board of that width should be fixed at both edges, it must unavoidably split from one end to the other.

The kinds of wood commonly employed in joinery are Kinds of — —the oak, the different species of pine, mahogany, and Wo

sometimes lime-tree and poplar. Of the oak there are two species common in Britain; that which Linneus has named Quercus Robur is the most valuable for joiners' work ; it is of a finer grain, less tough, and not so sub- ject to twist as the other kind. Oak is also imported from the Baltic ports, from Germany (that known as wainscot), and from America. These foreign kinds being free from knots, of a straighter grain, and less difficult to work, they are used in preference to British species. The greater part of joiners' work is executed in fir imported from the north of Europe. Yellow fir is

used for outside work, as doors and sashes, and for floors where there is likely to be much wear. Very good red pine deals have been imported from Canada. Inside work is almost always framed of white fir. Some very good panels when not too wide, and excellent mouldings, are made of American pine. White fir is often used for internal work, and yellow pine is much used for mouldings. The forest of Braemar, in Aberdeenshire, furnishes yellow fir of an excellent quality, little inferior to the best foreign kinds. For the general purposes of joinery, the wood of the larch seems to be the best ; this useful tree thrives well on the Scottish hills. Some fine specimens of it have been obtained from Blair-

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MOULDINGS. |

Athol. It makes excellent steps for stairs, floors, framing, and most other articles. Mahogany, in joinery, is only used where painted work is improper, as for the hand-rails of stairs, or for the doors and windows of principal rooms. For doors it is not now so often used as it was formerly, its colour being found to be too gloomy to be employed in large masses. Lime-tree, and the different species of poplar, make very good floors for inferior rooms ; and may often be used for other purposes, in placcs where the car- riage of foreign timber would render it more expensive. Lime-tree is valuable for carved work, and does not become worm-eaten; but carving is at present seldom used in joinery.

From these timbers, the oak and fir especially, the joiner obtains the battens, fillets, boards, and planks, with which he performs all his works, cutting them into scantlings and thin deals as he requires them.

Battens are narrow boards running from half an inch to an inch and a half or 2 inches thick, and from 3 to 6 or 7 inches wide. A piece of stuff of too small a scantling to be a batten is called a fillet. The term board is applied to sawed stuff when its width exceeds that of a batten, and its thickness does not exceed 2 inches or 22 inches. The term plank is applied to large pieces of stuff whose width is great in proportion to their thickness, and whose

thickness nevertheless does not exceed 3 or 4 inches. In London these terms are used in much more restricted senses than they are here described to mean, because of the fixed and regular sizes and forms in which stuff for the joiner's use is for the most part brought to market there. A batten, to a London joiner, is a fine flooring board from an inch to an inch and a half in thickness, and just 7 inches wide. A board is a piece cut from the thickness of a deal whose width is exactly 9 inches; and nearly everything above that width, and not large enough to be called a scantling of timber, is a plank.

Mouldings, in the Roman and Italian styles, as used in joinery, are generally composed of parts of circles, and differ somewhat from those used in stone. (See Plates XIII, &c., illustrating the article ARCHITECTURE, in vol. ii.) Mouldings are almost the only part of modern joiners' work which can, in strictness, be called ornamental, and conse- quently that in which the taste of the workman is most apparent. 'The form of them should be distinct and varied, forming a bold outline of a succession of curved and flat surfaces, disposed so as to form distinct masses of light and shade. If the mouldings be of considerable length, a greater distinction of parts is necessary than in short ones. Those for the internal part of a building should not, how- ever, have much projection; the proper degree of shadc may always be given, with better effect, by deep sinkings judiciously disposed. The light in a room is not sufficiently strong to relieve mouldings, without resorting to this method; and hence it is that quirked and under-cut mouldings are so much esteemed. The following present

Y yy Vip Y Fia. 41. Fia. 42 Fra, 43, Fie. 44. Rounded Edge. Bead, Torus. Torus and Bead.

the convex side to the eye:—fig. 41 is merely a rounded edge; fig, 42, of small size, is a bead; fig. 43, of larger size, a torus; and fig. 44 shows the torus and bead

together. If there be a deep sinking under a bead (as fig. 45), it is called a quirked or cock bead ; if there be two

Li bat jal Fia. 45. Fia. 46. Fia. 47, Fic. 48, Quirked Bead. Double-quirked Bead. Reeds, Ovolo.

such sinkings, so as to show three-quarters of a circle in the bead, it is called (fig. 46) a double-quirked bead ; two or more beads, side by side (as fig. 47) are called reeds ;

Fia. 49.—Hollow.

N. ‘.

\Fic. 50.—Flutes.

the fourth part of a circle, or half a bead (as fig. 48), is called an ovolo, or quarter round. A moulding composed of two convex parts is also called an ovolo, the upper part

Fia. 51.—Cavetto. Fie. 52.—Scotia.

of the curve being continued round into the bed similar to a quirk, as fig. 44. In concave mouldings a simple curved grooving, as fig. 49, is called a hollow, and two or more

Fics. 58, 54.—Forms of Cyma recta.

such grooves are flutes, as fig. 50. A hollow forming the fourth part of a circle is called a cavetto, fig. 51; a

Fics. 55, 56.—Forms of Cyma reversa.

deep hollow between two fillets, as used in base mouldings, is a scotia, fig. 52. Mouldings which are partly convex

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Ma

Fia. 57. Rebate.

Fic. 58. Groove.

Fic. 59. Necking.

Fic. 60. Fillet.

and partly concave, are of two sorts, the cyma recta, as figs. 53 and 54, and the cyma reversa or ogee, as figs. 55 and

Joining angles.

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56, which may be made of greater or less projection. Grecian mouldings are all similar in principle, but the parts are of conic sections instead of circles, as explained above,

. 1473. .

: A plain square sinking on the edge of a board, as fig. 57, for the purposes of framing, is called a rebate ; if away from the edge, as fig. 58, a groove; placed under a cap (as fig. 59), or as a necking (as fig. 60), it is called a fillet ; three such fillets under an ovolo, when composing part of the capital of a column, are called annulets. In all kinds of framing the mouldings which rise above the styles are called bolection mouldings (see fig. 82).

The mouldings during the medieval period used by the carpenter and joiner, who were perhaps the same person, seldom varied from those cut by the mason, except that they were somewhat more refined and less in size, as appro- priate to the material out of which they were to be cut. “They are such as would not be executed in any other material ; they are sharp, delicate, minute, and quaintly under-cut. Every curve is subtle; every alternation of round and flat and hollow thoughtfully contrived, graceful, and yet vigorous; they are very often unlike any stone mouldings,” says Mr G. E. Street, in a lecture in 1865 on “English Woodwork in the 13th and

14th Centuries,” printed in the Zransactions of the Royal Insti tute of British Architects. ‘In the stalls at Selby there is an elaborate cap only 13 inches in height; and at Win- chester a band iths of an inch in height, and yet consisting of four distinct members, and showing in elevation as many as eight distinct lines.” The woodcuts appended will suffice to explain the author’s mean- », ing. Fig. 61 is a mullion from 7/77 Y stalls at Winchester Cathedral, ‘// and fig. 62 from St Mary’s Hospital at Chichester. Figs. 63 and 64 are arch mouldings from the same stalls; and fig. 65, the cornice of a screen in Old Shoreham church. Fig.

Fics. 61, 62.—Medieval Mullions.

66 is a cap and base from the stalls at Winchester.

Fies. 63, 64, 65.—Medieval Mouldings and Cornice.

When an inclined or raking moulding is intended to join with a level moulding, at either an exterior or an interior angle, the form of the level moulding being given, it is necessary that the form of the inclined moulding should be determined, so that the corresponding parts of the surfaces of the two mouldings should meet in the same plane, this plane being the plane of the mitre. This may be otherwise expressed by saying that the mouldings should mitre truly together.

When the length of a joint at an angle is not consider- able, it is sufficient to cut the joint in such a manner that when the parts are joined, the plane of the joint shall bisect the angle. This kind of joint is shown for two different

angles, by fig. 67, and is called a mitre. When an angle of considerable length is to be joined, and the kind of work does not require that the joining should be concealed, fig. 68 is often employed; the small bead renders the appearance of the joint less objectionable, M4 because any irregularities from shrinkage are not seen in the shade of the quirk of the bead. A bead upon an angle, where the nature of the work does not determine it to be an

arris, is attended with many ad- vantages; it is less liable to be injured, and admits of a secure joint without the appearance of one. Fig. 69 shows a juint of this description, which should always be used in passages. Fig. 70 represents a very good joint for an exterior angle, whether it be a long or a short one. Such a joint may be nailed both ways. But the joint represented by fig. 71 is superior to it ; the parts, being drawn together by the form of the joint itself, can be fitted with more accuracy, and joined with certainty. The angles of pilasters are often joined by this last method. Interior angles are com- monly joined as shown in fig. 72. If the pre. 63.—Capand upper or lower edge be visible, the joint Base from Me- is mitred, as in fig. 67, at the edge only, “i#val Stalls.

the other part of the joint being rebated, as in fig. 70. In this manner are put together the skirting and dado

Fics. 67-72.—Different forms of Joints

at the interior angles of rooms, the backs and backlinings of windows, the jambs of door-ways, and various other

Fic. 74.—Mitre- dovetail.

a

Fic. 73.—Dovetail. Fic. 75.—Lap-

dovetail

parts of joiners’ work. Fig. 73 is an excellent method of joining angles for drawers, frames for lead cisterns, boxes,

&c., and is commonly called a dovetail. Ifa portion of the junction is cut off at an angle of 45°, as fig. 74, while the portion at 6 is dovetailed, it is called a mitre dovetail; while if the portion at a (in fig. 75) passes the other portion at right angles, it is called a lap-dovetail. A very good joint is shown in fig. 76, the angles being brought together at an angle of 45°, two or more saw

curfs are cut with a dovetail saw, and thin pieces of wood glued in as shown; this is called a keyed mitre.

Fig. 77 shows four methods for securing planks together as practised in France during the medizval period, from Viollet le Duc's Ductionnatre. pra, 76,—Keyed Mitre. He does not appear to show the junction formed by running a tongue of one piece through another piece and pinning it on the outside, as practised now in England in furniture, as tables, &c.

Fic. 77. —Medieval Joints.

Glue is a viscid tenacious matter used as a cement to connect objects together. The common or animal glue is made from certain portions of animals reduced after certain processes by boiling to the required consistency, and dried in cakes. The best marine glue is composed of caoutchouc dissolved in naphtha, to which shellac is added, and heated until amalgamated. It is insoluble in water, sufficiently solid to give strength, and adhesive to an in- tense degree. Glue is used principally in putting framed work together, but not at all in fixing; and even for the former purpose it is much less used by good workmen than by bungling hands. When the stuff is well seasoned, and the trying up, setting out, mortising, and tcnoning are well and accurately executed, there is no necessity for glue on the tenons and shoulders ; the wedges alone need be glued, to attach them to the sides of the tenons, that their effect may not depend on mere compression. Joiers are gene- . rally furnished with a cramp, with which to force the joints of framing into close contact; it is either of wood acting by means of wedges, or of iron with a screw. This, too, is unnecessary with good work, every joint of which may be brought perfectly close without great violence of any kind. The cramp will sometimes give bad work the semblance of good, but it cannot make it really so. If any cracking and starting be heard in the joiner's work of a new building, it generally indicates one of two things: either the cramp has been required in putting the framing together, or, having been put together, it has been forced out of winding in fixing, and the constrained fibres are seeking to regain their natural position. A good workman does not require cramp, nor will his work, if he has been supplied with seasoned stuff, ever require to be strained ; and consequently the cracking and starting of joiners' work indicate unfit stuff or bad work, or

perhaps both, It is true that glued joints will sometimes fly ; but when they do, there need be no hesitation in determining the

presence of both bad work and stuff in an improper state.

It is seldom possible to procure boards snfficiently wide for panels without a joint, on account of heart shakes, which open in drying. In cutting out panels, for good work, shaken wood should be carefully avoided. That part near the pith is generally the most defective. If the panels be thick enough to admit of a cross or feather tongue in the joint, one should always be inserted, for then, if the joint should fail, the surfaces will be kept even, and it will prevent light passing through, A very good way also is to glue a piece of strong canvas on the back of the panel when the work is not intended to be seen on both sides. Sometimes plane surfaces of considerable width and length are introduced in joiners' work, as in dado, window backs, &c.; such surfaces are commonly formed of inch or inch and quarter boards joined with glue, and a cross or feather tongue ploughed into each joint. When the boards are glued together, and have become dry, tapering pieces of wood, called keys, are grooved in across the back with a dovetailed groove. These keys preserve the surface straight, and also allow it to shrink ahd expand with the changes of the weather. It would be an endless task to describe all the methods that have been employed to glue up bodies of such varied forms as occur in joinery ; for every joiner forms methods of his own, and merely from his being most familiar with his own process, he will per- form his work, according to it, in a better manner than by another, which to an unprejudiced mind has manifestly the advantage over it. The end and aim of the joiner, in all these operations, is to avoid the peculiar imperfections and disadvantages of his materials, and to do this with least expense of labour or material. The straightness of the fibres of wood renders it unfit for curved surfaces, at least when the curvature is considerable. Hence, short pieces are glued together as nearly in the form desired as can be, and the apparent surface is covered with a thin veneer ; or the work is glued up in pieces that are thin enough to bend to the required form. Sometimes a thin piece of wood is bent to the required form upon a

cylinder or saddle, and blocks are jointed and glued upon the back; when the whole is completely dry it will preserve the form that had been given to it by the cylinder. The curve should be made a little “quicker” than the curve intended, as the stuff will always spring back a trifle on being released. A piece of work glued up in thicknesses should be very well done ; but it too often happens that the joints are visible, irregular, and in some places open; therefore other methods have been tried.

Large pieces of timber should never be used in joinery, because they cannot be procured sufficiently dry to prevent them splitting with the heat of a warm room. Therefore, the external part of columns, pilasters, and works of a like kind, should be formed of thin pieces of dry wood; and,

‘if support be required, a post, or an iron pillar, may be

placed within the exterior column. Thus, to form columns of wood, so that they shall not be liable to split, narrow pieces of wood are used, not exceed- ing 5 inches in width, These are jointed like the staves of a cask, and glued together, with short blocks glued along at each joint. Fig. 78 is a plan of the lower end of a column glued up in staves; the bevel at A is used for forming the staves, that at B is used for adjusting them when they are glued together. A similar plan must be made for the upper end of the column, which will give the width of the upper end of the staves. The bevels taken from the plan, as at A and bk, IV. — 62

Fie. 78.—Jointing of Column.

Joining with glue.

Bending wood,

Framing.

are not the true bevels ; but they are those generally used, and are very nearly true when the columns are not much diminished. The same method may be adopted for form- ing large pillars for tables, &c. If a column have

flutes, with fillets the joints should be in the fillets, in order to make the column as strong as possible ; also, if a column be intended to have a swell in the middle, proper thickness of wood should be allowed for it. When columns are small they may be made of dry wood, and turned in a lathe, when they can be moulded at the same time. Balusters for stairs are made thus. To secure small columns against splitting, a hole should be bored down the axis of each column

If a piece of wood be boiled in water for a certain time, and then taken out and immediately bent into any particular form, and it be retained in that form till it be dry, a permanent change takes place in the mechanical relations of its parts; so that though, when relieved, it will spring back a little, yet it will not return to its natural form The same effect may be produced by steaming wood ; but though both these methods have been long practised to a considerable extent in the art of ship-building, we are not aware that any general principles have been discovered either by experiment or otherwise, that will enable us to apply them in joinery, where so much precision is required. They do not seem to have been tried ; and before they can be rendered extensively useful, the relation between the curvature to which the wood is bent, and that which it assumes when relieved, should be determined, and also the degree of curvature which may be given to a piece of a given thickness. The time that a piece of wood should be boiled or steamed, in order that it may be in the best state for bending, should be made the subject of experiments; and this being determined, the relation between the time and the bulk of the piece should be ascertained, A novel and very simple and effective way of boiling sash-bars or thin articles has been adopted,

Fie, 79.—Boiling Sash-bars.

as shown in fig. 79. Take a piece of common cast-iron pipe of sufficient diameter, stop up one end with a plug of wood driven tight, fill the pipe with water, raise one end in a sloping position, leaning it on a pile of bricks, and kindle a fire under the pipe. For the joiner’s purposes the process might perhaps be greatly improved by saturating the convex side of each piece with a strong solution of glue immediately after bending it. By filling, in

this manner, the extended pores, and allowing the glue to harden thoroughly before relieving the pieces, they would retain their shape better.

The object in framing is, to reduce the wood into narrow pieces so that the work may not be sensibly affected by its shrinkage ; and, at the same time, it enables us to vary the surface without much labour. Besides this, as the strains from the grain of the wood are in different directions, the work is prevented from winding on its face. From this view of the subject, the joiner will readily per- ceive that neither the parts of the frame nor the panels should be wide. And as the frame should be composed of

narrow pieces, it follows that the panels should not be very long, otherwise the frame will want strength. ‘The panels of framing should not be more than 15 inches wide and 4 feet long, aud panels so large as this should be avoided as much as possible. The width of the framing is commonly about one-third of the width of the panel. Frames in joinery are usually connected by mortise and tenon joints, with grooves to receive the panels. Wainscoting, doors, window-shutters, &c., are framed in this manner.

In framing or framed work, the outer vertical bars which are mortised are called styles ; and the transverse, those on whose ends the tenons are formed are called rails (Plate XXVL fig. 2). In doors the open spaces or squares formed internally by the rails and styles are divided in the width by bars parallel to the styles. These are tenoned into the rails, and are called munnions or mountings, or, vulgarly, muntins. The frame being formed by trying up, setting up, mortising, and tenoning, the inner or face edges of the styles, and of the highest and lowest rails, and both edges of the muntins and of the inner rails, are grooved with the plough to receive the edges and ends of the filling-in parts or panels of the framework. Panels are either flat, raised, or flush (Plate XXVI. fig. 3). Flat panels are no thicker than the groeves into which they are fitted, and consequently their faces are as much below the surface of the framing as the groove is in from each side of the styles and rails. Raised panels are thicker than the groove in the framing, but are not so thick as to reach the surface; nor is the panel thickened

through its whole extent. It fits exactly into the groove, and thickens gradually for an inch or two, and then sets off at a right angle with the surface, increasing suddenly three or four sixteenths of an inch. A panel may be raised on one side only, or on bothsides, Flush panels are rebated down from one face to the distance the plough groove is in from the surface of the framing ; and the back of a panel thus rebated on one side is worked down to be even with the other edge of the groove, leaving a tongue to fit it exactly ; for if it be required to make panels flush on both sides, this is generally effected by filling in on the back or flattened side with an extraneous piece. Panels of external doors and shutters may be rendered more secure by boring them, and inserting iron wires, as noticed in the Transactions of the Society of Arts, vol. xxv. p. 106. Fram- ing is not, however, often finished in the manner above described, especially with raised and flush panels; mouldings are generally introduced, and are either struck or worked in the solid substance of the framing, or are in separate pieces or slips, and laid in with brads. If a moulding be struck or laid in on one side ouly, and the other is left plain, the framing is described as moulded and square, a flat panel being in that case understood; if the panel be raised the framing will be described as moulded with a raised panel on one side, and square or flush on the other. It may be moulded with a flat panel, or moulded with a raised panel, on both sides; and the moulding may, as before intimated, be either struck in the solid or laid in any of the preceding cases. Mouldings which are laid in round the panels of framing are neatly mitred at the angles, and bradded, to appear as much as possible as if they were struck in the solid. In nailing or bradding the mouldings, the brads should be driven into the framework, and not into the panels. Framing with sunk panels, in some kinds of work, has the edges of the rails and styles either stop- chamfered or slightly curved. With a flush panel the moulding is always either a bead, or a series of beads called reeds ; and is, in the case of a single bead, which is most common, always struck on the solid frame, and the work is called bead-flush; but reeds are generally struck on the panel in the direction of the grain, and laid in on the panel across it, or along the ends; this is termed reed-flush,

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Ma@ises angtenons for-ames.

“JOINERY. |

Flush panels in inferior works have a single bead struck on their sides in the direction of the grain alone, the ends abutting plainly, and this is termed bead-butt, the fact that the panels are flush being inferred.

The plainest quality of framing, in which it is square on both sides, is used in the fittings of inferior bed-rooms, inner closets, and the plainer domestic offices, but always internally; framing moulded on one or both sides, in rooms and places of a greater degree of importance, and in places where the work may be more generally seen ; in some cases a flat panel may be enriched by a small moulding laid on its surface, leaving a margin between it and the larger moulding at itsextremities. This may be done in drawing-rooms and apartments of that class, especially if they be in an upper story; and raised panels should be confined to the framed fittings of dining-rooms and other apartments on a ground or principal story. Framing with flush panels is almost restricted to external doors, &c., one side of a door being bead-fiush, and the other flat and moulded, perhaps, or the face may be moulded with a raised panel, and the back bead-flush ; and this for principal entrances. Bead-butt framing is found in external doors to offices, é&e. Partitions between rooms are often made of framing as above described. Lately some sliding partitions have been put forward, one of which consists of two or three large sliding framivgs, and felt is relied upon to render them sound proof. This is by Stone; while that by Williams consists of a series of framings pivoted at top and bottom, and with the pivots running on grooves at top and bottom, so that the shutters may be formed into a pilaster-like mass at the side of the room.

It is of the utmost importance in framing that the tenons and mortises should be truly made. After a mortise has been made with the mortise chisel, it should be rendered perfectly even with a float,—an instrument which differs from a single cut or float file only by having larger teeth. An inexperienced workman often makes his work fit too tight in one place, and too easy in another, hence the mor- tise is split by driving the parts together, and the work is never firm; whereas if the tenon fill the mortise equally, without using any considerable force in driving the work together, it is

found to be firm and sound. The thickness of tenons should be about one-fourth of that of the framing, and the width of a tenon should never exceed about five times its thickness, otherwise, in wedging, the tenon will become bent, and bulge out the sides of the mortise. If the rail be wide, two mortises should be made, with a space of solid wood between ; fig. 80 | mn: shows the tenons for a wide rail.) | i

If the tenon occurs at the end of a piece of framing, it must be set back a little, so as to allow sufficient solid wood to forma sound mortise ; this |} is called a haunching (see e¢, fig. 81). | In thick framing, the strength and ||/| ile firmness of the joint is much in- | Me ib eg creased by putting a cross or feather Fic. 80.—Tenons for wide tongue in on each side of the tenon ; Railing.

these tongues are about an inch in depth, and are easily put in with a plough proper for such purposes. The projected figure of the end of a rail, as in fig. 80, shows these tongues put in; in the style there are grooves ploughed to receive them. Sometimes these projections are left in the solid wood itself, in which case they are called stwmp tenons. Sometimes, in thick framing, a double tenon in the thick- ness is made; but we give the preference to a single one, when tongues are put in the shoulders, as we have described ; because a strong tenon is better than two weak ones, and there is less difficulty in fitting one than two, The panels of framing should be made to fill the grooves, so as not

to rattle, and yet to allow the panels to shrink without splitting. When the mouldings are stuck on the framing, as is often the case in large stuff, it becomes necessary to find the lines to bring the angles together. In square framing, this is done simply by cutting ab, d, as in fig. 81, at a mitre; but if the framing be oblique angle, it is done by scribing ; the angle at ab being determined by the eye, cd is cut parallel to it. Where large pro- jecting or bolection mouldings are used, the French have a very excellent way of framing (fig. 82), which it would be well to imitate in this country. Here C is the panel round which the moulding B is framed and mitred, the whole is

then framed into A, which is a section both of the styles and rails. When a frame consists of curved pieces they are often joined by means of pieces of hard wood called keys. Fig 83 is the head of a Gothic window frame joined with a key, with a plan of the joint below it. A cross tongue is put in on each side of the key, and the joint is tightened by means of the wedges, a, a. It is, however, a better method to join such pieces by means of a screw bolt instead of a key, the cross tongues being used whichever method is adopted. Where the ends of the bolts cannot be allowed to project, they should be fixed as bed bolts.

Doors are made two and four panelled for the most part when the panels are flat and theframing square, six-panelled when the latter is moulded, and six, eight (as figs. 2 and 3, Plate XXVI., to which the details in the following description will apply), or even ten-panelled when the framing is of the superior descriptions. Doors which are hung in two equal widths to occupy the doorway, and are hung to the opposite side posts or jambs of the frame, are said to be folding-doors or double-margined,—that is, the styles or margins are repeated necessarily in the middle where they meet. The style, muntin, and rails to doors are the same as in framing or wainscoting; and the panels may be moulded in the same manner. Doorways are fitted with jamb linings, and architraves or pilasters. Jamb linings, as A in fig. 86, when they exceed 9 or 10 inches in width, should always be so framed to correspond with the door on the outer faces; or they may be made solid. Narrow and plain jamb linings to inferior rooms are rebated on one side of the lining only, and the rebate forms the frame into which the door is fitted. To superior work they are rebated on both sides, as if it were intended to put a door on each side. The jambs are fixed to the inner edges of the grounds, which are fixed to the wall to receive the architrave or other decorations to the opening, and to stop the plastering; if they are wide, and not framed, backings are put across to stiffen them ; and these backings are dovetailed into the edges of the grounds.

Fia. 81.—Fitting Monld- ings to Framing.

Fie. 82.—Bolection Mouldings.

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It requires a considerable degree of care to hang a door, Hanging a shutter, or any other piece of work in the best manner. 400rs.

In the hinge, the pin should be perfectly straight, and truly cylindrical, and the parts accurately fitted together.

~The hinges should be placed so that their axes may be in

Hinges.

Bevel for edge of door.

Joining plain and moulded work,

the same straight line, as any defect in this respect will produce a considerable strain upon the hinges every time the hanging part is moved, will prevent it from moving freely, and is injurious to the hinges. In hanging doors, centres are often used instead of hinges ; but, on account of the small quantity of friction in centres, a door moves too easily, so that a slight draught of air accelerates it so much in falling to, that it shakes the building, and is dis- agreeable. This may be in some degree remedied by placing a small spring to receive the shock of the door.

The greatest difficulty, in hanging doors, is to make them to clear a carpet, and be close at the bottom when shut. To do this, that part of the floor which is under the door when shut, or the width of the jambs, may have a piece of wood about a quarter of an inch thick above the general level of the floor, which, with placing the hinges so as to cause the door to rise as it opens, will be sufficient unless the carpet should be a very thick one. Several mechanical contrivances have been used for either raising the door, or adding a part to spring close to a floor’as the door shuts. The best method now in use, and the simplest, is the invention of the rising or skew-butt hinge. The parts of this which. bear on each other are made with a double

bevel, so that, if more than half opened, the door falls against the wall by its own weight; if less than half open, it closes itself.

Various kinds of hingesare in use. Sometimes they are concealed, as in the kinds of joints called rule joints; others project, and are intended to let a door fold back over projecting mouldings, as on pulpit doors and outside folding shutters. When hinges project, the weight of the door acts with an increased leverage upon them, and they soon get out of order, unless they be strong and well fixed. The door of a room should be hung so that, in opening the door, the interior of the room cannot be seen through the joint. This may be done by making the joint according to fig. 84. The bead should be continued round the door, and a common butt-hinge answers for it

Fie. 84.—Door-Joint. Fre. 85.—Bevel for Edge of Door.

The proper bevel for the edge of a door or sash may be found by drawing a line from the centre of motion C (fig. 85) to e, the interior angle of the rebate ; ed drawn perpendicular to C e gives the bevel required. In practice the bevel is usually made less, leaving an open space in the joint when the door is shut; this is done on account of the interior angle of the rebate often being filled with paint.

The extension of the princivle of ploughing and tonguing work together is one of the most important of the improvements that have been introduced by modern joiners. It is an easy, simple, and effectual method of combination, and one that provides against the greatest defect of timber-work, its shrinkage. By means of this method, the bold mouldings of medizval architecture can be executed with a comparatively small quantity of material; and even in the mouldings of modern architecture it saves much labour. For example, the moulded part of an architrave may be joined with the plain part, as shown by fig. Architrave.

86. If this method be compared with the old method of

glueing one piece upon another, its advantage will be more evident.

Architraves and pilasters are variously sunk and moulded Archi- according to the fancy of the designer. They are fixed to t™ves. the grounds with their

internal edges exactly fitting to the rebates in the jambs, and they form the enriched margin or moulding of the frame in which the door is set. Architraves are mitred at the upper angle, but pilasters have generally a console or an enriched block or cap resting on them, to which they fit with a square joint; both the one and the other either run down and are scribed to the floor, or rest on squared blocks or bases, which may be the height of the skirting board, or of the whole base. The architraves, skirtings, and surbase mouldings, are Fixing fixed to pieces of wood called grounds, as A, fig. 86; and as Sounds. the straightness and accuracy of these mouldings depend upon the care that has been taken to fix the grounds truly, | it will appear that fixing grounds, which is a part often left to inferior workmen, in reality requires skill and attention ; besides, they are almost always the guide for the plasterer. Where the plasterer's work joins the grounds, they should . have a small groove ploughed in the edge to form a key for the plaster. In old work the ground was generally hidden, but in modern work it is frequently shown, which is a saving of stuff; thus, instead of architraves being prepared

A B \ ULL ee

Fria. 87.—Door-Jamb and Fie. 88.—Ground and Ground. Mouldings.

as in fig. 86, they are made as shown in fig. 87, where A is the rebated and beaded door-jamb, and B the ground, which is generally splayed at the back as a key to the plastering instead of being grooved. On this a thin piece of stuff is bradded to form the double-faced architrave, instead of sinking out of the solid, and on this the ogee or ovolo moulding is nailed. Again with base mouldings, A (fig. 88) is the ground fixed against the wall, on the top of which is nailed the upper moulding B, and C shows the skirting and lower moulding, fixed against a fillet on the floor.

We have thus far spoken chiefly of joinery as per- Fixing formed at the beuch ; but by far the most important part joiner remains to be considered; for, however well a piece of "™ work may have been prepared, if it be not properly fixed, it cannot fulfil its intended purpose. As in the preceding part, the general principles will be stated that ought to be made the basis of practice ; and these illustrated by par- ticular examples. When the carcass of a building is ready for the joiner, the first thing to be done is to cut the bond

timber out of the openings, set the sash frames, and fill them with old sashes or with oiled paper on frames, to exclude the weather, but admit light. The flooring joists are then proved with straight-edges, and any inequalities in them are renioved with the adze; the flooring boards are

‘next cut down to their places, and are turned with their

faces downwards until the ceilings are done. First, how- ever, the pugging is done, if any be intended. This is to prevent sound passing through the floor when finished, and is sometimes called deafening sound-boarding. It is effected by nailing fillets to each side of the joists, near the bottom, and laying on these pieces of rough boards across

and close together; then there is put a layer of mortar mixed with chopped straw, or sometimes clay, sawdust, or small shells.

The preparation given to flooring boards in superior work is planing the face, shooting the edges, and gauging to a thickness,—the common fillister or stop rebate plane being used to work down to the gauge mark, from the back of every board, and about half an inch in on each edge. When a board is to be laid, it is turned on its face in the place it is to occupy, and the workman with his adze cuts away from the back over every joist down to the gauge rebate, so that on being turned over it falls exactly into its place, and takes the same level with all its fellows, which have been brought to the same gauge; then follows the process of laying, and the result must, if the work be done well, be a perfectly even and level surface. The slight inequalities of surface which may occur are reduced with a smoothing-plane, the brads being previously punched below the surface if the floor be face-nailed. Floors are in ordin- ary cases either laid straight joint or folding, and are edge- nailed, as fig. 89, or face-nailed. According to the folding method, two boards are laid, their heading joints all on the same joist, and of course in the same straight line, and nailed at such a distance apart that the space is a little less than the aggregate width of the three, four, or five boards intended for it; these boards are then put to their places,

and, on account of the narrowness of the space left for |

them, they rise like an arch between its abutments. The workmen force them down by jumping upon them. Accor- dingly, the boards are never soundly fixed to the joists, nor can the floor be laid with any kind of evenness or accuracy. This method should be avoided in all good work. Straight joint flooring is when every board is laid separately, or one at a time, the heading joint or joints being broken or covered regularly in every case. Dowelling is the driving- pins of wood or iron half their length, into the edge of the last laid board, the outer edge of which has been skew-nailed, their other ends running into holes prepared for them in the inner edge of the next board, in the way the head of a cask is held together, and then its outer edge is skew-nailed in the same manner, and so on. Tonguing is effected by grooving both edges of every board, and fitting thin slips and tongues into them. The boards are usually

forced together by pressure as with a clamp applied to the |

outer edge. The nail used in face-nailing floors is called a

flooring brad ; it has no head, but a mere tongue projecting © on one side of the top of the nail, which is put in the |

direction of the grain, that it may admit of being punched in below the surface level, otherwise the superficial inequa- lities could not be reduced when the floor was completed, because of the projecting heads of the nails. For side or edge nailing, however, clasp-nails, nails whose heads extend across on two of the opposite sides, are used.

As boards can seldom be got long enough to do without joints, it is usual, except in very inferior work, to join the ends with a tongued joint, as shown in fig. 89, where B

Fig. 89.—Tongued Joint. is the joint. The etched board is first laid, and edge-nailed

Fie. 90.—Forked Boards.

to the joist. In oak floors the ends are forked together sometimes, as shown at A (fig. 90), in order to render the joints less conspicuous. The joints

should be kept as distant from one another as possible.

In laying floors the advice of Evelyn only to tack the

boards down the first year, and nail them down for good |

the next, is certainly the best method when it is convenient

to adopt it; but, as this is very seldom the case, we must expect the joints to open more or less as the wood has been more or less seasoned. Now, these joints always admit a considerable current of cold air; and also, in an upper room, unless there be a counter floor, or pugging, the ceil- ing below may be spoiled by spilling water, or even by washing the floor. To avoid these disagreeable results, the boards should be ploughed and a tongue inserted into each joint, according to.the old practice. When the boards are narrow, they might be laid without any appearance of nails, in the same way as a dowelled floor is laid, the tongue serving the same purpose as the dowels. In this case the cross or feather tongues for the joints should be used. A new system of flooring has for some years been used in London, to which the name of “ Victoria floors” has been given. A rough floor of boards, three-quarters of an inch thick, is first laid, and the rest of the joiners’ work fixed, and the plastering finished. When all is done, a floor formed of inch or inch and quarter plank, ripped down the middle, and consequently very little more than 5 inches wide, is laid; the rough boarding being first covered with a layer of shavings, or old newspapers, or other waste paper. These boards are dowelled on one edge and nailed on the other, and a very sound floor is thus formed, which neither springs nor creaks. A wainscot floor can be laid

| well on this principle. Another early operation in joinery is the fixing of the Fixing framed grounds for the doors and windows, and for the frames.

skirting (Plate XXVI. fig. 5, and woodcuts, figs. 86, 87, and 88) to which the plasterers may float their work. The skirting grounds are generally

dovetailed at the angles, and are well blocked out, so that they may not vibrate on being struck, or yield to pressure when the plasterer’s straight-edge passes roughly over the surface ; they must also be set with the utmost truth and precision. When the floors are cut down and the grounds fixed, the joiner’s operations in a building should be suspended until the plasterers have finished, or nearly so, and then the floors may be laid. By deferring this operation until that period, the workmen of the two different trades are pre- vented from interrupting each other, and indeed injuring each other’s work ; and joiners always find employment in

the shop preparing, as before intimated. If the part to be fixed consists of boards jointed together, but not framed, it should be fixed so that it may shrink

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or swell without splitting or winding. ‘The nature of the .

work will generally determine how this may be effected. Let us suppose that a plain back of a window is to be fixed. Fig. 91 is a section showing B the back of the window, A the window- sill, D the floor, C the skirting, and E the wall of the house. The back is supposed to be prepared as previously stated, and is kept straight by a dovetailed key a.

Now, let the back be firmly nailed to the window-sill A, and let a narrow piece d, with a groove and cross tongue in its Wh upper edge, be fixed to bond timbers or mmgguamZ) plugs in the wall, the tongue being Fic. 91.— Back of inserted also into a corresponding groove 4 Window.

in the lower edge of the back B. It is obvious, that the |

tougue being loose, the back B may contract or expand, as a panel in a frame.

In getting out skirtings, if the work be of a superior Skirtings,

description, the boards should be tried up as for framing in every way except bringing to a width, which need not be done. The face edges,

however, must be worked with great precision, and moulded or rebated as the case may require. Rebating or tonguing will be perhaps necessary when the skirting consists of more than one piece. that the different

Scribing.

Fixing skirting.

Dado.

pieces may be made to fit neatly and firmly together ; and all but the lowest piece must of necessity be brought to a width, as well as tried up in other particulars. A skirting in a single width is called by that term; but when it is made up of more than one part it is designated a base ; the lowest board is then called the skirting board, and the upper the base moulding or mouldings (Plate XXVI. figs. land 5). The skirting board is not brought to a width because the labour would be lost according to the ordinary mode of fixing it. The board is applied to its place with its lower edge touching the floor ; but as the most perfectly wrought floors are found to have some slight unevenness of surface so close to the wall, a straight edge would not fit closely down to it inevery part. The board is therefore propped up atone end or the other until the upper or faced edge is perfectly parallel with the average line of the floor, or rather so as to be perfectly level. A pair of strong compasses, such as are used by the carpenter, is taken, and opened to the greatest distance the lower edge of the skirting board is from the floor throughout its length; the outer edge near the point of one leg of the compasses is then drawn along the floor, whilst the point of the other, being kept vertically above it, is pressed against the face of the board, on which it marks a line exactly parallel to the surface of the floor, indicating, of course, every, even the slightest, irregularity there may be in it. If the floor be not a very uneven one, the excluded part may be ripped off with the hand or the panel saw, which may generally be made to follow the traced or inscribed line exactly ; if, however, the line be a very irregular one, having quick turns in it, the hatchet must be used. ‘This operation is called scribing, and the result of it is evidently to make the skirting fit down on the floor with the utmost precision. Care must be taken in performing the

operation that the upper edges of the skirtings be not only level, but that all which are in immediate connection be scribed to the same height, that their upper edges may exactly correspond.

In the principal rooms of a house, the skirting C (fig. 91) is usually grooved into the floor D, and fixed only to the narrow piece d, called a ground. (See also Plate XXVI. fig. 5.) By fixing in this manner, the skirting covers the joint, which would otherwise soon be open by the shrinking of the back, and from the skirting being grooved into the floor, but not fastened to it, there cannot be an open joint between the skirting and floor. When it.is considered that an open joint in such a situation must become a receptacle for dust anda harbour for insects, the importance of adopt- ing this method of fixing a skirting will be apparent. As grooving a floor is attended with considerable labour, and as the boards will sometimes twist, it is more common now to nail a small fillet to the floor, against which the back of the skirting rests, and, of course, has full room for expansion. Before skirtings are fixed, vertical blocks are put at short intervals, extending from the floor to the narrow grounds, and made exactly flush with and true to the latter, and are firmly nailed. These form a sound back- ing, to which the skirtings may be bradded or nailed, and so prevented from warping or bending in any manner. If, however, the skirting be not very wide, and be sufficiently stout to stand without a backing, a fillet only is nailed along the floor as a stop for its lower edge; but this is rendered unnecessary if the skirting be tongued into the floor, as the tongue will answer every purpose of a stop (fig. 5, Plate XXVI.) The ends of skirtings should be tongued into each other when it is necessary to piece them in length ; and on returns or angles the end of one should be tongued into the returned face of the other in the square parts, and mitred in the oblique-angled or moulded parts.

The dado of a room should be fixed inthe same manner as explained above for window backs (fig. 91). When @

chair-rail or surbase is required, grounds similar to those for the base are fixed to range like them with the face of the plastering ; the surbase itself

must be wide enough to cover the grounds and the joints formed by them and the plastering completely ; it is in effect a cornice to the stereo- bate (or pedestal, as the three parts may be termed of base, dado, and surbase), and the space or dado between it and the base is generally understood to be wainscoted, though it is more frequently plastered.

In fixing any board above 5 or6 inches wide, similar Fixing

precautions are necessary as those detailed in fig. 91, other- wise it is certain to split when the house becomes inhabited. We may, in general, either fix one edge and groove the other, so as to leave it at liberty, or fix it in the middle and leave both edges at liberty. Sometimes a wide board, or a piece consisting of several boards, may be fixed by means of buttons screwed to the back, which turn into grooves in the framing, bearers, or joists, to which it is to be fixed. If any shrinking takes place the buttons slide in the grooves. In this manner the landings of stairs are fixed, and it is much the best mode of fixing the top of a table to its frame.

large boards,

The parts of the outside frame of a sash are distin- Sashes.

guished by the terms applied to the similar parts of common framing. The upright sides are styles, and the transverse or horizontal ones, which are tenoned into the ends of the styles, are rails ; but the inner framework or divisions for the panes are called merely upright and cross bars (these bars, according to the way they are moulded, are called lamb’s tongue, ovolo, beaded, &c.),—the upright being the mortised, and the cross bars the tenoned, as with the outer framework (Plate XXVI. fig. 1). Sashes are got out like common framing ; the parts are tried up, set out, and mor- tised and tenoned, exactly in the same manner, allowance being made in the length of the rails and all tenoned pieces in the setting out, as in common framing also, for the portions of the mortised styles and upright bars which are worked away in forming the moulding and rebate. The meeting rails of sashes which are in pairs, to be hung with lines, are made thicker than the other parts by the thickness of the parting bead, and they are bevelled or splayed off, the one from above and the other from below, that they may meet and fit closely. When the framework is completed, although it cannot

be put together because of what has just been referred to, the rebate is formed by the sash fillister on the further part of the face edge, and the moulding struck on its hither angle. These things being done, the moulded edges are either mitred or scribed at the shoulders and haunches, and the sash may be put together. If sash bars are mitred at the joints, they require dowels in the cross bars to act as tenons; but if they can be scribed, dowelling is not necessary. Sashes are either hung upon hinges or hung with lines, pulleys, and weights. Fixed sashes are put into frames, of which every part may be solid but the stop, which must be put in behind the sash to detain it. Sashes hung with binges are usually called casements, and require solid rebated frames; but there can be no stops to them, except their own movable fastenings, and the outer stop, which of course the rebate furnishes.

These are usually known as French casements, or sash doors, French as they are called when they open down to the ground or casement

floor; they have now taken the place of sash windows, where they may lead from the room to garden paving, or to a balcony, or may be used for similar purposes. The ordin- ary arrangement for an aperture is that of two leaves work- ing on hinges at the sides inwards or outwards, meeting in the centre of the opening. With the former, which is the usual mode, one leaf is secured to the head and sill by bolts either round or sunk in; the other leaf, when closed, is secured to the first by a handle fixed on the second and turning over a staple fixed on the first. If the casement

should be a high one, this second leaf often requires a bolt at top and bottom, to secure it against the force of the wind, which by bending it admits the cold air and wet. When it is placed towards an exposed aspect, and is thus subject to driving rains, it is necessary to take many precautions for the prevention of wet being blown through the meet- ing surfaces all round the casements. To effect this object, the styles, rails, and frames are sunk and beaded in various ways. Figs. 92 and 93 represent sills and

Fies. 92-97.—French Casement fittings

bottom rails; and fig. 94, meeting rail, styles, and frame, which last is an ordinary arrangement in France. An improvement to the mere handle for securing the leaf of the casement is that of affixing au upright metal rod, which is turned by the handle C, fig. 92, on the leaf being closed, and by hooks at top and bottom as B, fig. 95, catching into a plate fixed for them, and effectually fastening it. A simpler method has been shown where, in lieu of the rod, a reeded bar, as D, fig 96, is moved to and fro as the leaf is required to be opened or shut, the top and bottom of the bar being rounded as shown at E, fig. 97, so as to slide into two segmental plates I, secured to the sill and lintel, Fig. 96 is a plan of the two casements, and 97 a plan of the head and sill. The metal rod, which is of brass, is called the Espagnolette bolt. Another mode of securing the casements has lately been introduced, whereby a flat plate, the whole height of the opening, is inserted in a groove formed in one edge of the meeting style of a leaf; and on this being closed the plate is shot forward by a handle into a groove in the other leaf, fasten- ing the two together, the plate forming a stop against both the wind and the rain. This isa patent arrangement of Arch. Smith and Co. Fig. 98 is a plan of the usual French casement used at Paris. A shows the two leaves of the casement when shut; B is a plan of the shutters in their boxing, CC the shutters when closed, D the bolt, E the inside architrave and F the Persiennes, or outside blinds, shut against the stone reveals, and so provided for by the architect, instead of being an addition made by the upholsterer after the work is done, and perhaps spoiling the design. The ordinary mode is for them to be hung with projecting hinges to admit of their being folded back into the face of the wall, which is a hideous arrangement for any facade, except perhaps one of plain brickwork or plain cement. GG shows the position of the blinds when shut, and H is the outside architrave. Much difficulty arises in preventing the rain and wind from penetrating under such

doors. The French raise the doors very much to secure this, as shown in figs. 92 and 94. In England various metuods have been adopted by forming second sills of metal cast into shapes to

form gutters and throats ;

, perhaps the best arrange- % ment is the “patent sill ‘. or water bar” (fig. 99), ‘ as now manufactured by

Archibald Smith and Co. A metal plate A is screwed to the face of the bottom rail. An arrangement in metal B is screwed to the upper weathering of the wood sill O, having on its outer edge a plate D hinged to it. When the door is opened this plate falls down, and when the door or leaf is shut, a pin E, let into the underside of the bottom rail, forces up the hinged plate D, and presses it against the first named plate A, making all tight. Fig. 100 is a section of a medizeval moulded bottom rail found in France. When the window lights are carried up over the casements, as is very often the case, the upper lights are generally fixed ; but it is better that one or two of them should be ren-

Fie. 98.—Section of French Window.

BOTTOM RAIL or CASEMENT,

aAcIsSLAo

Fic. 99.—Water Bar.

dered available for ventilating the apartment when it is This will be

not desirable to have the door itself open. effected by hinging the light on the bot- tom rail, with the necessary means of opening and closing it, or placing it on centre hinges at the sides.

Sashes hung with lines require cased frames (Plate XXVI. figs. 1, 4), to receive the pulleys and weights. The sill of — the frame is made, as in the former cases, solid, is sunk and weathered, and is generally made of a more durable material than the rest of the frame ; the sides in the direction of the thickness of the frame are of one and a quarter or one and a half inch board, very truly tried up, and grooved to receive a parting bead ; for it must be obvious that sashes hung with lines to run vertically up and down within the height of the frame must be themselves in two heights, and must pass each

other in separate and dis- tinct channels. The ends of these boards are fixed into the upper face of the solid sill below, and into a similar board parallel to the sill which forms a head above, and they are ealled pulley pieces, or styles, because they receive the pulleys, which are let into them near their upper ends.

Fia. 100.—Ancient French Bottom Rail.

Fitting of sashes.

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Linings from 4 to 6 inches in width, and from three- fourths of an inch to an inch in thickness, are nailed on to the edges of the pulley pieces, and to the sill and head above and below, inside and outside, in the direction of the breadth of the sash frame, and are returned along the head in the direction of its length. The outside linings are made to extend within the pulley pieces about half an inch, to form a stop for the upper and outer sash; and the inside linings are made exactly flush with their inner faces. The casing is completed by fixing thin linings on the outer edges of the outside and inside linings, parallel to the pulley pieces, to prevent anything from impeding the weights, Thin slips called parting-beads are fitted tightly into the grooves previously noticed in the pulley pieces, but they are not fixed, as the upper sash can be put in or taken out only by the temporary removal of the parting-bead. An inner or stop bead is mitred round on the inside to complete the groove or channel for the lower sash; the stop bead covers the edge of the inside linings on the sides and head, and is fixed by means of screws, which may be removed without violence when it is required to put in or take out the sashes. A hole covered with a movable piece large enough to allow the lead or iron weight to pass in and out, is made in each of the pulley pieces, so that the sashes may be hung after the frames are set, and to repair any accident that may occur to the hangings in after use (Plate XXVL. fig. 4). It may be remarked that sash fraines require greater truth and precision from the workman than anything else in the joiners’ work of a building ; and unless the stuff employed be quite sound and perfectly seasoned all the workman’s care will be thrown away.

Sashes, it may be remarked, are never fitted until these frames are immovably fixed, so thatif there be any inaccuracy in the latter, the sashes are cut away or pieced out to make them fit ; but, as they are intended to traverse, the fitting in that case can only apply to one particular position, and in every one but that there must be something wrong. Any incorrectness in the sash-frame, again, must throw the shutters and their back flaps out; indeed, the sash-frame, though apparently a secondary part of the arrangement, is that which affects all the rest. beyond anything else. When sashes have been fitted, a plough groove, wide and deep enough to receive the sash-line, is made in the outer edges of the styles, for about two-thirds of their length, at their upper ends. They are then primed and glazed, and when the putty is sufficiently set the joiner hangs them. Heis furnished with sash-line, which is made of the best flax well plaited together, tacks, and iron or lead weights, which are generally made cylindrical, with a ring at one end, to which the line may be attached. A sash is weighed, and two weights are selected which together amount to within a few ounces of a counterpoise. The line is then passed through the pulley, which was previously fixed in the pulley style; the end is knotted to a weight which is passed in at the hole left for the purpose ; and at a sufficient distance, which a common degree of intelligence will readily deter- mine, the line is cut off and the end tacked into the groove in the style of the sash. Other modes of attaching the sash-line to the sash are also used.

Of recent inventions connected with windows there are some for enabling the parting-beads to be taken out, or are dispensed with, so that sashes may be readily cleaned without the operator standing on the sill, a dangerous practice, and without the use of the glazier’s horse, which tends to injure the inside painting. A contrivance for easily opening and closing sashes of large size by an arrange- ment of cords and pulleys, which likewise secure it when shut, is patented by Mr Meakin. Another, having

objection to this invention may be that both upper and lower sashes must be opened at the same time. There are other useful arrangements for opening windows, such as those used in the wards of hospitals, where the opening is

divided into about four horizontal lights working on pivots, all opening to any required extent by a rack and pinion. A sash fastener with a second spring, which clips the projection on the lower sash when the fastening is closed, and another where the shape of the arm of the fastener is altered, both prevent the sash being opened from without by a knife, a common mode of forcing an entrance into buildings, Patent wrought windows, and patent wrought iron water-tight windows and frames suitable for churches, parsonage houses, &c., are readily obtainable,

The fittings of a window which has boxed shutters consist Window of back linings, grounds, back elbows and soffit, together fittings,

with shutters and back flaps, and architraves (or pilasters) round on the inside to form a moulded frame (figs. 1 aud 4, Plate XXVI.) Back linings are generally framed with flush panels ; they fit in between the inside lining of the sash frame and the framed ground, to both of which they are attached, and form the back of the boxing into which the shutters fall back. They are tongued into the inside lining by their inner edge, and on the outer edge the ground is nailed, and they are set at right angles to the sash-frame, or obtusely outwards, as the shutters may be splayed or not. The back is the continuation of the window fittings from the sash-sill to the floor on the inside; the elbows are its returns on both sides under the shutters, and the soffit is the piece of framing which extends from one side of the window to the other across the head, or from back lining to back lining. These are all framed to correspond with the shutters on the face ; but, as they are fixed, their backs are left unwrought. are framed in correspondence with the door and other framed work of the room to which they belong, in front, and generally with a flush panel behind ; the back-flaps are in one or two separate breadths to each shutter, according to the width of the window and the depth of the recess ; they are made lighter than the shutters themselves, and they should, when shut to, present faces exactly correspond- ing with those of the shutters, both internally and externally. The shutters are hung to the sash-frame with butt hinges, and the back flaps are hung to their outer styles with a hinge called a back-flap, from its use. The shutters and their back flaps are hung in one, two, or more heights, as may be found convenient. The moulded margin round the boxings of a window on the inner face are made to harmonize generally with the similar parts of the

doors of the room or place to which it belongs. See other examples of shutters and their boxing in fig. 98. The fixing and hanging of window fittings or dressings are hardly less important, for the accuracy required, than the making and fixing of the sash-frame itself; the slightest infirmity or inaccuracy in any part will be likely to derange some essential operation.

To this old manner of forming shutters must be added Rolling

the rolling shutters of Clark, Bunnett, Francis, Snoxell, and others. These can be fixed either at the top, bottom, or side of the window as convenient, and are made of wood, steel, iron, or of wood and iron, many of them requir- ing machinery to raise and to lower them. The advantages consist in the small space occupied, the great security obtained, and the rapidity and ease in opening and shutting them. They are, however, apt to stick, and some are noisy, but one is called the “noiseless self-coiling revolving steel shutter.” Oue variety consists in a sheet of well-tempered corrugated steel, which coils up on itself

counterbalancing rack slips for hanging sashes, dispenses | like a roll of paper; another is a self-acting wood revolv-

with the use of sash lines, pulleys, and sash weights. An

ing shutter, with hardened steel bands.

Window shutters Shutters, —

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tairs.

STAIRS. |

The construction of stairs is generally considered the highest department of the art of joinery. The principal object to be attended to is that the stairs should afford a safe and easy communication between floors at different levels, The strength of a stair ought to be apparent as well as real, in order

that those who ascend it may feel conscious of safety. ‘To make the communication safe, it should be guarded by a railing of proper height and strength ; in order that it may be easy, the rise and width (or tread) of the steps should be regular and justly propor- tioned to each other, with convenient landings; there should be no winding steps, and the top of the rail should be of a convenient height for the hand. The first person that attempted to fix the relation between the height and width of a step, upon correct principles, was, we believe, Blondel, in his Cours d’ Architecture. His formula is applicable to very large buildings, but not to ordinary dwellings. Mr Ashpitel, who investigated the subject at length, gives the following rules for buildings of seven different classes :—

Tread breadth Rise height | Tread breadth Rise height in inches. in inches. in inches. in inches. oh ae ee 5S Pe Ba ae 6 NE pci 5g “Ean ee sae 63 Stn ee bicsinced AO 9 I SM a it 8 sors 6}

These dimensions give angles of ascent varying from 24° to 37°. Of course the projection of the nosing is not reckoned.

Hawksley’s patent treads for staircases to public thorough- fares are composed of iron frames, in which small blocks of wood, placed the end way of the grain, are so secured as to present to the foot a roughened surface. They appear to be durable, and to admit of easy renewal of the wood when worn or injured.

The forms of staircases are various, commencing with a straight flight, which should only be used toa low story. In towns, where space cannot be allowed for convenient forms, they are often made triangular, circular, or elliptical, with winding steps, or are made of a mixed form, with straight sides and circular ends. In large mansions, and in other situations where convenience and beauty are the chief objects of attention, winding steps are never intro- duced when it is possible to avoid them. Good stairs, therefore, require less geometrical skill than those of an inferior character. The best architectural effect is produced by rectangular staircases, with ornamented railing and newels. In Gothic structures scarcely any other kind can be adopted with propriety for a principal staircase. Modern architecture admits of greater latitude in this respect,—the end of the staircase being sometimes

circular, and the hand-rail continued, beginning from either a scroll or a newel.

When a rectangular staircase has a continued rail, it is necessary that it should be curved so as to change gradually from a level to an inclined direction. This curvature is called the ramp of the rail. The plan of a staircase of this kind is represented by WSs

S

ABCD in fig. 101; and fig.

103 shows a section of it, \ supposing it to be cut through at a6, on the plan. The hand-rail is supposed

the bottom, and the form | || ||| || of the cap of the newel a ought to be determined so SSS \ SN N

that it will mitre with the Fse. 101.—Plan of Rectangular hand-rail. Let H in fig. Staircase.

102 be the section of the hand-rail, and a the radius of the newel; then the form of the cap may be traced at

C. The sections of hand-rails are of various shapes ; some of the most common ones are too small; a hand-rail should never be less than would require a square of which the side is 24 inches to circumscribe it. For the level landings of a stair- case the height of the top of the hand-rail should never be more than about 40 inches, and in any part of the inclined rail the height of its upper side above the middle of the width of the step should be 40 inches, less the rise of one step when measured in a vertical direction. To describe the ramps, let rs in fig. 103 be a vertical line drawn through the middle of the width of the step; set rw equal to rs, and draw wit at right angles with the back of the rail, cutting the horizontal line s¢ in ¢ ; then

from the point 4, as a centre, describe the curve i rR of the rail. When there . yy ‘il is a contrary flexure, as Wa in the case before us, the method of describing the lesser curve is the same. The hand-rail of a stair generally begins with a scroll, and the first step of the stair is generally finished with what is called a curtail, a form corresponding closely to the scroll. There are a great variety of geometrical spirals ; but as they all finish on a point, and as all architectural scrolls and volutes finish on a circle or eye, the usual mathematical scrolls are inapplicable. The earliest spiral adapted to architecture was that of De Lorme. Since his time several systems have been invented, particularly that

Fie. 102.—Section of Hand-Rail and Newel.

Fig. 103.—Section for Construction of Ramps.

| K – Fig. 105. Fig. 106. Fras. 104 to 106 illustrate the construction of the Ionic Volute.

of Goldmann; the best is that derived from the Ionic volute (fig. 104).

The height, eye, and number of revolutions of the IV — 63

spiral being given to describe the curve, let AB be the total height, and AC the intended height of the eye, and let the spiral be required to make two revolutions. Divide BC into four times as many parts as there are revolutions required (4× 2=8), because there are four quadrants in every revolution. Draw any line DE equal to the height of the spiral. Set down from D half the number of the parts and one more (4+1=5); this is the top of the eye. Set down half AC at O, and describe the eye; then at O set up half a part to I, and make FG, FH=OF; then, as in fig 105, draw OG, OH, GI, and from O draw a line parallel to GH, and divide the same into as many parts as there are to be revolutions. Fig. 105 is for one, and fig. 106 for two revolutions. Bisect Olat X; make 21= 2X, and join XI; and through 1 draw MN parallel to OF to meet OG aud XI. Draw the quarter circles, as in the diagram,— HD being the first opening of the compasses, GP the next, and H, G, I, K, L, M, and N being the centres. To describe the scroll let AB, as

in fig. 107, be the width across, usually about 10 or 12 inches ; let EB be the intended diameter of the eye; and let the scroll be required to make one revolution and a half, or six quadrants (these are shown at greater size by the side of fig. 108), then proceed as last directed, and complete the scroll, also dot in the lines of the nosings and risers, For the curtail step transfer the lines of nosings a, and the lines of the risers 6, to another place, as in fig. 108, and set out the thick- ness of the veneer within the line of nos- ing, the part within this represents the solid block of the curtail, The places of the balusters are shown in fig, 107. It is obvious that in every geometrical staircase, the half of a cylinder placed upright in the well-hole would touch the wreathed string ,— F in all parts, another a little less would touch all parts of the hand-rail. Let us suppose ACB, as in fig. 109, to be the ; plan of half a cylinder so set up- right in the well- hole, and let us sup- pose A'E to be the height of the same, Divide the curved line ACB into any convenient number of parts, and set the same off by compasses on the straight line from C to A' and C to B'. Or, in case ACB is a semicircle, divide the line AB, draw the diameter CD, making aD equal to three-fourths of the radius, and draw _DA, DB', and the rest of the lines through the points of

Fig. 108.

Fries. 107, 108 illustrate the formation of Scroll and Curtail Step.

Fic. 109.—Construction of Hand-Rail.

division, as shown in the diagram. Then A'B' is the stretch out or length of the circumference ACB unrolled, But A'E is said to be the whole height. From E set down the respective heights of the winders, step by step, as shown. Now let G be the representation of the cylinder, with the different lines squared up and across, these will give a representation of the curve at which the winders must ascend, and which, of course, must regulate the hand-rail. The other faint lines show the edge of the covering.

Fig. 112 represents the plan of a staircase, beginning with a scroll, and having steps winding round the circular

part of the well-hole. In (F77™ >, ie 11 the first place, let the end “* le Li. ei of the steps be developed “Ly 7 according to the method we ype have just given (fig. 110 i

shows this development). Now the hand-rail ought to ; follow the inclination of a

\ line drawn to touch the — SY nosings of the steps, except < where there is an abrupt yN

Cc : ie

\ NY

YJ

IBN

B

WI, —-

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Fig. 111. Fig, 112. Fries. 110-112.—Development of Circular Hand-Rail.

transition from the rake of the winding to that of the other steps ; at such places it must be curved,—the curve may be drawn by the help of intersecting lines, as in fig. 111. The part which is shaded in fig. 109 represents the hand- rail and ends of the steps when spread out, and the hand- rail is only drawn close to the steps for convenience, as it would require too much space to raise it to its proper position. This development of the rail is called the falling- mould. We will now refer to fig. 113, and will suppose the inner semicircle of ACB to be the plan of the well- hole, and eA, aB, the width of the rail; then the outer shaded part ACB will be the plan of the rail on the level; ADEB is the cy- linder referred to before—ADE being the angle at which the stairs ascend. Now since by the

principles of Conic Sections the ob- lique section of a circular cylinder is an ellipse, if the cylinder be circular the lines may then be found Fie. 113.—Tracing the Face-Mould by a trammel. Be it of i ae

what section it may, the delineation of a cylinder cut at any angle ADE may be found by dividing it into equal parts, and setting up the ordinates al, 62, &c., as shown. This delineation is a plan “on the oblique,” or the face-mould of the rail, to be cut “on the plumb.”

The wood used for hand-rails being of an expensive kind, it becomes of some importance to consider how the plank may be cut so as to require the least quantity of material for the curved part of the rail. Now, if we were

to suppose the rail executed, and a plain board laid upon the upper side of it, the board would touch the rail at three points; and a plank laid in the same position as the board would be that out of which the rail could be cut with the least waste of material. Let it be required to find the moulds for the part a6 of the rail in fig. 112, and to avoid confusing the lines in the small figure, the part a6 has been drawn to a larger scale in fig. 114. The plain board mentioned above would touch the rail at the points marked C and B in the plan; draw the line CB, and draw a line parallel to CB, so as to touch the curve at the point E, Then E is the other point on the plan ; and a’, e, and 0’, are the heights of these points in the development in fig. 110. Erect perpendiculars to CB, from the points C, E, and B (fig. 114), and set off Ca’ in fig. 114 equal to a’c in fig. 110, Ee’ equal to de’, and Bd’ equal to fb. Through the points C and E, draw the dotted line Ch; through a’, e, draw a line to meet CE inh; and through the points a’, 6’, draw a line to meet CB in g; then join 2g, and make (i perpendicular to hg. Now, if Cd be equal to Ca, and perpendicular to Cz, and dz be joined, it will be the angle which the plank makes with the horizontal plane, or plan. Therefore, draw FD parallel to Cz, and thence find the section, which is the same thing as would be obtained by projecting vertical lines from each point in the hand-rail against the surface of a board laid to touch it in three points. The inexperienced work- man will be much assisted in applying the moulds if he acquires a clear notion of the position when executed.

To find the thickness of the plank, take the height to the under side of the rail cr in the development (fig. 110), and set it off from s, in the line Cz, to 7, in fig. 114; from the point r draw a line parallel to dz, and the distance between those parallel lines will be the thickness of the plank. The mould (fig. 114), which is traced from the plan, is called the face mould. It is applied to the upper surface of the plank, which being marked, a bevel should be set to the angle dC, and this bevel being applied to the edge will give the points to which the mould must be placed to mark out the under side. It is then to be sawn out, and wrought true to the mould. In applying the bevel, care should be taken to let its stock be parallel to the line d i, if the plank should not be sufficiently wide for dz to be its arris. In the method fig. 113, ADE, on the rise of the stair, is the bevel. After the rail is truly wrought to the face-mould, the falling-mould (fig. 110), being applied to its convex side, will give the edge of the upper surface, and the surface itself will be formed by squaring from the convex side, holding the stock of the square always so that it would be vertical if the rail were in its proper situation. The lower surface is to be parallel to the upper one. The sudden change of the width of the ends of the steps causes the soffit line to have a broken or irregular appearance ; to avoid this, the steps are made to begin to wind before the curved part begins. Different methods of proportioning the ends of the steps are given by Nicholson, Roubo, Rondelet, and Krafft. We cannot in this place enter into a detail of these methods, nor can we give the varied systems of cutting the rail in the spring and in the plumb, about which so much has been written, but for the reader’s information a list of the

Fia. 114.—Ilustrating the Tracing of Moulds.

principal writers on Staircases and Hand- Railing is subjoined.

Exercises, or the Doctrine of Handyworks, 4to, 1677. The introduc- tion of the geometrical staircase, or stair supported on one side by the wall, invented, says Palladio, by the famous Luigi Cornaro (the first English example of which is said to be that erected in stone by Sir Christopher Wren

in St Paul’s Cathedral), led to the greatest changes in the art of joinery, inasmuch as the lines for setting them out necessitated a very considerable knowledge of geometry. The hand-rails of these stairs offered most difficulties, and an imperfect attempt to remove them was first made by Halfpenny, in his Art of Sound Building, published in 1725. Price, the author of the British Carpenter, published in 1788-35, was more successful, and his remarks show a considerable degree of knowledge of the true nature and object of his researches. The publication of this book must have produced a considerable sensation in the trade, for it was soon followed by many other works of different degrees of merit. Of these the publications of Langley and of Pain were the most popular, and were followed by Roubo, L’Art de Menuisier, folio, 1771; Skaife, Key to Civil Architecture, 8vo, 1774; Transactions of the Soctety of Arts, &c., for 1814; Treatise on the Construction of Staircases and Hand-Rails, 4to, 1820; Rondelet, Traité de V Art de bdtir, tom. iv. 4to, 1814; Krafft, Traité sur Art de la Charpentier, part ii., folio, 1820; Jeakes, Orthogonal System of Hand-Railing, 1849 ; Ashpitel, On Hand-Ratls and Staircases, 4to, 1851; Galpin, Joiner’s Instructor, Statrcasing and Hand-Railing, 4to, 1858; and Riddell, Hand-Railing Simplified, folio, Phila- delphia, 1856 and 1860.

The establishment of the principles of joinery on the sound basis of geometrical science was reserved for Nicholson. In his Car- penter’s New Guide and Carpenter and Joiner’s Assistant, published in 1792, 4to, he has made some most valuable corrections and addi- tions to the labours of his predecessors. This writer has been the founder of all the subsequent works on the subject ; his books have been published again and again, in various forms, with additions from time to time, by different hands, as Galpin’s Joiner’s Own Book, showing Improvements since the Days of the late Mr Nicholson, 4to, 1856. Corresponding improvements were also made in the practice of joinery, for which we are much indebted to an architect, Mr James Wyatt.

For revived medieval and Elizabethan joinery, particularly as adapted to windows and staircases, see Weale’s Carpentry, 4to, 1849, and Shaw, Details of Elizabethan Architecture, 4to, 1839. Many modern improvements are given in Laxton’s Examples of Building Construction, fol., 1855-58, and in Newland’s Carpenter and Joiner’s Assistant, fol., Liverpool, 1860.

The principles of joinery were cultivated in France by a very different class of writers. The celebrated Blondel, an architect of great eminence, had given details for the construction of shutters, wainscoting, doors, hinges, fastenings, &., in his work Distribution des Maisons de Plaisance, 4to, 1737-88. In the extensive work of Frezier, entitled Coupé des Pierres et des Bois, 3 vols. 4to, 1739, all the leading principles are given and explained with tedious minuteness, offering a striking contrast to the brevity of English writers. The first elementary work on that part of geometrical science which contains the principles of joinery appeared in France in 1705, from the pen of the celebrated Gaspard Monge, who gave it the name of Géométrie Descriptive. The most celebrated French work which treats of joinery is Rondelet's L'Art de bdtir, which occupied fourteen years (from 1802 to 1816) in publication. It is also the best foreign work on the subject ; but it is little adapted to the state of joinery in England. In practice the French joiners are very much inferior to the English workmen. Their work is rough, slovenly, and often clumsy, and at the best is confined to external effect. The neatness, soundness, and accuracy, which is common to every part of the works of an English joiner, is scarcely to be found in any part of the works of a French one. The little correspondence, in point of excellence, between their theory and practice leads us to think that their theoretical knowledge is con- fined to architects, engineers, &c., instead of being diffused among workmen, as it isin England. See also Thiollet et Roux, Nowveau Recueil de Menwiserie, 1887; Viollet-le-Duc, Dict. Ratsonné du Mobilier Francais, 8vo, 1858, &c. ; and Nosban, Manuel de Menutserie, 4to, 1849. Much also may be learned from Emy, Traité de la Charpente, fol., 1847—particularly with regard to framing. The publications of other nations do not call for parti- cular notice.

CABINET-MAKING.

Cabinet-making, or that part of the art of working in wood which is applied to furniture, has some affinity with joinery, the same materials and tools being employed in

Nothing appearsto have been written on joinery untilJoseph Moxon, Biblio- a fellow of the Royal Society, published a work entitled Mechanich graphy.

both, and the mode of execution being the same. Correct- ness and strict uniformity are not so essential in movable, as in the fixed parts of buildings; they are also more under the dominion of fashion, and therefore are not so confined by rules as the parts of buildings. Cabinet-mak- ing offers considerable scope for taste in appropriate and beautiful forms, and also in the choice and arrangement of coloured woods. It requires considerable knowledge of per- spective, and also that the artist should be able to sketch with freedom and precision. If the cabinet-maker intend to follow the higher departments of his art, it will be necessary to study the different styles of architecture, in order to make himself acquainted with their peculiarities, so as to impress bis works with the same character as that of the rooms they are to furnish.

In cabinet-work the French workmen are certainly superior to the English, at least as far as regards external appearance ; but when use as well as ornament is to be considered, the latter certainly carry away the palm. The appearance of French furniture is much indebted to a superior method of polishing, which is now generally known in England. The method of making and using French polish is minutely described in Dr Thomson's Annals of Philosophy, vol. xi. pp. 119 and 371. For niany purposes, however, copal varnish (such as coach- makers use) is preferable ; it is more durable, and bears an excellent polish. Foreign oak is much used for cabinet- work ; and lately, the fine curled oak that is got from excrescences produced by pollard and other old trees has been used with success in furniture, When well managed it is very beautiful, and makes a pleasing variety. It is relieved by inlaid borders of black or white wood, but these should be sparingly used. Borders of inlaid brass, with small black lines, give a rich effect to the darker coloured kinds, as in buhl-work. Cedar is occasionally used for small fittings, or for cupboards where woollens and furs are stored. Ebony and imitation ebony are useful for cases, Russian birch has of late years been largely in request for bedroom furniture from the cleanly appearance of it. But of all woods mahogany has maintained its place since the first introduction of it in the end of, last century. The japanner is now seldom employed to give a colour to wood, as variety can be obtained by staining, heightened by varnishing; or the plain deal or pine is polished or varnished like mahogany or oak. Patterns or lines are

stencilled or burnt in according to one or other of the many patents now before the public.

Many curious works on furniture were published in the reigns of Louis XIV. and XY.; those by Sir W. Chambers and the Adams also deserve attention. Cruden's Joiner's and Cabinet-maker's Dar- ling, 8vo, 1770, is a curious book. In ornamental composition much benefit may be derived from Tatham's Etchings of Ancient Ornamental Architecture, London, 1799; Percier and Fontaine's Recueil des décorations intériewres comprenant tout ce qui a rapport av Ameublement, Paris, 1812 ; and, for general information, Shera- ton's Cabinet Dictionary, 1803, and his Cabinet-naker and Uphol- sterer's Drawing-Book, 4to, 1798, may be referred to. Bridgen's Designs for Furniture, fol. 1826, and Shaw's Details of Elizabethan Architecture, 4to, 1839, are of much value. But the most impor- tant works that can be consulted at the present time are the various illustrated publications relative to the Great Exhibitions in London and Paris (1851, 1855, and 1862), where some of the finest specimens of carpentry in the world were exhibited. The most accessible to

the English reader are the Art Journal and the Illustrated London News.

SLATER-WORK.

The slater works his material, slates, for the protec- tion of a building by covering the roof timbers with it, in the same manner as a bricklayer works his tiles. Besides this, which is his chief business, he supplies sawn slates for shelving in larders and dairies, for tanks and cisterns, for pavements, steps, and landings, for panels of doors, for

[CABINET-MAKING

covering hips and ridges, and a few other purposes. Enamelled slate for chimney-pieces, lavatories, and similar applications is of great utility.

The slater's principal tool is a large knife or chopper Tools.

called a saixe, sax, or zax, with which, before he begins to work on a roof, he shapes and trims the slates on the ground, sitting on one end of a stool,

which forms a sort of bench and has uprights by which to square the slate. With this knife he strikes off the unevenness on one side of a slate, making it as nearly straight as he can; he then runs a gauge along it, marking the greatest width the slate will bear, and, cutting to that line, makes it perfectly parallel. He next, with a square, brings the thickest and best end to right angles with the sides, generally by chopping, but sometimes by sawing; and then marking upward from the squared foot or tail, makes two nail holes, where, by calculating the gauge the slate in hand will bear, he knows the batten must come. He also uses a drag, which is a long flat piece of iron having a cutting edge at the top and hooked on each side ; when he has to strip a roof, he forces it between the slates, and pushes out or cuts off the heads of the nails, and thus the slate is loosened. He has also a couple of knee pads to kneel upon while at work,

The best slate obtained in Britain is from the quarries Qualities of of Bangor in Carnarvonshire. The Llangollen quarries slate.

are remarkable for the size of the slates that can be obtained. The Delabole quarries in Cornwall have been worked for a considerable period, and supply a grey blue slate. Good slate is also procured in the neighbourhood of Tavistock in Devonshire. An esteemed pale blue green slate is obtained from Kendal in Westmoreland. Cumber- land sea green slates are shipped from Maryport. Whitland Abbey green slates are much in vogue. The Ballachulish quarries in the north of Scotland are extensive, and supply a good quality. In Ireland are several, of which the Valentia, co. Kerry ; Killaloe, co. Tipperary ; Benduff, co. Cork ; and those in co. Wicklow, are the best.

The best slate is of a bluish-grey colour, which breaks before the zax like well-burnt pottery, and will ring in the same manner on being struck. Whitish or light grey- coloured slate is for the most part stony; dark blue or blackish slate, on the other hand, cuts very freely, but it absorbs moisture and decays rapidly. The best slates have a hard and rough feel, whilst an open absorbent slate feels smooth and greasy.

Though slate is classed among the incombustible materials, it must not be depended upon for resisting fire, as unfortunately it will crack and fall to pieces at no very high temperature.

The scantlings of slate are cut in the quarries to set Sizes.

sizes, and these are split into tablets, thicker or thinner according to the size of the slab and the nature of the slate; for the inferior qualities are neither so compact in material, nor so clearly laminated or schistose, as the superior, and will not therefore rend so freely. The sizes of slates best known in the British market are distinguished by the names of ladies, countesses, duchesses, and queens. Ladies measure 15 inches by 8, countesses 20 inches by 10, duchesses 24 inches by 12, and queens 36 inches by 24, and they are valued in pro- portion to their magnitude. Besides these, there is a slate which equals the queen in extent of surface, but is of very much greater thickness; this is called Welsh rag. A smaller slate, again, which is less indeed than the lady, and is cut from the refuse of large scantlings, is called a double; in size it does not often exceed 12 inches by 6. Westmoreland slates are thick and heavy like the Welsh rag, but do not generally run so large.

The principle on which slates are laid is the same as that

which is employed in plain tiling. To a roof with pro- jecting eaves a wide board is placed over the ends of the rafters; but when the eaves tail into gutters, the gutter-board is. made wide enough to receive the eaves-course For light slating it is necessary to board a roof all over with three-quarter inch rough boarding. This is done by the carpenter ; but for strong heavy slates, fillets or laths or battens are considered sufficient ; and these are laid by the slater himself, to suit the length of his slates. Three inches wide and one inch thick is a sufficient size for them, if the rafters be not more than 12 inches apart. Against gable or party-walls, a feather-edged board called a tilting fillet is laid to turn the water from the wall. A preferable plan, however, is to board all roofs; it gives a better bed for the slates, and fewer are broken if there be occasion for workmen to walk over them in repairing or in cleaning out the gutters. The expense, too, is but trifling beyond that of the laths. A still further benefit is obtained by bedding the slates in mortar or in hay, which fills up the spaces left by the thickness of the first slate, and with the boarding tends to keep the roof cooler in summer and warmer in winter, a very desirable result for the habitable rooms close under them.

Where the roofs are finished with diagonal boarding on purlins without rafters, it makes a very sound bedding for slates. All the slates being gauged to a width, and dressed as above described, and sorted in lengths, they are then taken up to the roof in rotation, beginning with the longest and largest for the lowest courses. The first course the slater lays is little more than half the length of that which is intended to cover it, and is necessary to break the joints at the eaves. This is called the doubling eaves-course; and the covering eaves-course is brought to the same foot line, completely to cover it. Then to ascertain the gauge :— from the length of the slate deduct the bond, which should riever be less than 2 inches, and need not be more than 34 inches, and the half of what remains will be the gauge. Thus, if the bond be fixed at 3 inches, and the slate is 2 feet 3 inches in length, the gauge will be 1 foot. This gauge or margin is set up from the foot of the eaves-course at each end, and a line strained to mark it along the whole length, and so on, to the ridge or top, where another half-course is required to complete the work, and that is in its turn secured by a covering of sheet lead with a roll. To a hipped roof care is taken to complete every course up to the angle, by cutting slates to fit its slope; and these are also covered by an overlap of sheet lead with a roll, it being nailed or screwed to the hip rafter, and the Pp

head bossed over. Slate ridging with a roll, as fig. 115, or with a groove for receiving an orna- mented cresting, is now very usual, and even a common ridge tiling is neces- sary to prevent theft of the lead in some localities. Fig. 116 shows specimens of the orna-

Fie. 115,—Ridge of Roof.

mental red ridging tiles occasionally used, continuously |

or some lengths of a plain tile apart. In fig. 115, A, A are the two portions of the slate roll ridging, B_ being the roll with a hole drilled at each end for the insertion of a pin to fix the lengths; C the ridge piece fixed in the head of the king-post D; E the rafter; F the lath on

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Fig. 116.—Hidging Tiles.

which G, the slating, is nailed. In nailing a slate, it must not be strained or bent in the slightest degree, or it wili certainly fly in some sudden atmospheric change, to which it is of course constantly liable, even if it escape fracture from being trodden on by the workmen themselves or by others. Copper, being less liable to oxidize from exposure to common causes than any other metal that will answer the purpose, should always be used for slate nails. Zinc is also occasionally used; and iron tinned and painted nails are sometimes substituted by dishonesty on the part of the workman or builder, or bad economy on that of the proprietor. ‘The French method of fixing slates by means of wire clips which hold the bottom of the slates is unusual in England. A method has lately been introduced of effecting it with lead clips, which is said to dispense with a certain proportion of slates. Each slate is held in some- thing of the same manner which the slater now adopts when a broken slate has to be replaced, and the main advantage is supposed to be that the slates are firmer.

The mode above described of ascertaining the gauge or margin by the bond, is equally applicable to every sort of roof-covering that is made up of small inflexible parallelo- gramic slabs or tablets; and it should be borne in mind that the greater the angle is at which the rafters rise, or, in technical language, the higher the pitch of the roof, the less the bond may be, and vice versa. With slabs or tablets that vary in length, too, as slates generally do as they are brought to market, it is the bond which it is of importance to observe ; but if they are of an invariable length, as tiles are, it is sufficient that the gauge or margin be attended to.

A very light and neat covering is produced by laying Patent wide slates side by side, and covering their joints with slating.

narrow slips bedded in putty, the overlap at the ends being no more than the bond is with the usual mode. It is known as patent slating, and was introduced by Mr Wyatt, who never, however, obtained a patent for it. In- deed it is in principle the mode which was adopted in ancient Greece in covering the roofs of temples. Neither boards nor fillets are used, the slates

bearing from rafter to rafter, which may be 2 feet or more apart, and to the rafters the slates are screwed. The covering slips are also screwed, as well as bedded in putty. Slating of this kind may be laid at no greater elevation than 16*, whereas for slating in the ordinary way the angle should never be much less than 25°, though large slates with a 34 inch bond, carefully laid and pointed, may perhaps be trusted at a rise of 20°. This mode of applying slate is not without the disadvantage attend- ing the fixing of any substance that freely takes up and readily parts with heat. In expanding and contract- ing, the joints are too often destroyed, and leaks are the common consequence. .

Thatching is an admirable covering for securing warmth Thatching.

in winter and covlness in summer; but it is subject to injury by birds, and to risk from fire. It is still occasionally used in picturesque cottages, arbours, and similar build- ings, and was much used for churches in Norfolk and Suffolk. The thatcher requires a common stable fork, to toss up the straw together before being made into bundles; a thatcher’s fork, to carry the straw from the heap up to the roof; a thatcher’s rake, to comb down the straw straight and smooth; a knife, or eaves knife, to cut and trim the straw to a straight line; a knife, to point the twigs; a half glove of leather, to protect the hand when driving in the smaller twigs or spars; a long flat needle ; a pair of leather gaiters to come up above the knees, used when kneeling on the rafters; and a gritstone to sharpen the knives. Wheat straw lasts from 15 to 20 years, and oat straw about 8 years. Reed thatching, as done in the West

Tools.

Action of iron on lead.

Use of solder.

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of England, is the truss after the ears have been cut off, leaving the clean, sound pipe straw, of which a thickness of 3 inches is laid on the common thatching with spars only. The materials required are straw or reeds, laths,

nails, withes, and rods. A load of straw, laid on about 12 to 16 inches in thickness, will do a square and a half; a bundle of oak laths, 1+ inches wide, and from ¢ to 2ths thick, nailed about 8 inches apart, 1 square; a hundred of withes, 3 squares; a pound of rope yarn, 1 square; a hundred of rods, 3 squares; and 23 hundred of nails, 1 square. Probably thatched roofs were formerly orna- mented by a species of cresting, for in some parts of the country the withes or willow twigs that bind the thatch are sometimes arranged on the tops of ricks and cottages in an interlacing manner, terminating at the apex or at each end with a spike with a rudely formed cock. Viollet-le- Due, in his Dectionnazre, alludes to the custom of forming the ridge in mud, in which plants and grasses were inserted to prevent the earth being dissolved and washed away by the rain.

PLUMBER-WORK

Lead, as the name imports, is the material in and with which the plumber works. The principal operations of this trade are directed to the covering of roofs and flats, laying gutters, covering hips, ridges, and valleys, fixing watertrunks, making cisterns and reservoirs, and laying on the requi- site pipes and cocks to them, fixing water-closet apparatus, setting up pumps, and applying indeed all the hydraulic machinery required in economic building, The plumber’s tools are knives, chisels, and gouges for cutting and trim- ming, rasps or files and planes for fitting and jointing, a dressing and flatting tool for the purposes its name expresses, iron hammers and wooden mallets for driving and fixing, ladles in which to melt solder, grozing irons to assist in soldering, a hand-grate or stove which may be conveniently moved from place to place for melting solder and heating the grozing irons, a stock and bits for boring holes, and a rule of two feet in length divided into three parts, two of boxwood, the third of steel, for passing into places he may have to exantine; also compasses, lines, and chalk for setting out and marking, and centre-bits of all sizes for .making perforations, together with weighing apparatus, as the quan- tities of most of the materials used by the plumber must be either proved or determined by weight. The waste of lead in working is very trifling, as cuttings all go to the melting pot again with little or no loss but that of refound- ing or casting; and even old lead is taken by the lead merchant in exchange for new at a very trifling allow- ance for tare and the cost of reworking. A

plumber is always attended by a labourer, who dves the more labori- ous work of carrying the materials from place to place, helps to move them when necessary, melts the solder and heats the grozing irons, attends to hold the one or the other, as neither may be set down or put out of hand when in use, and assists in some of the minor and coarser operations.

In boarding roofs, flats, and gutters for lead, clasp-nails or flooring brads should be used ; and the first care of the plumber should be to punch them all in from an eighth to a quarter of an inch below the surface, and stop the holes carefully and completely with putty, or a chemical process will ensue on the slightest access of moisture should the iron heads of the nails come in contact with the lead, and the latter will, in the course of no long period, be completely perforated over every one of them. Neither should lead in surfaces of any extent be soldered, or in any manner fastened at the edges, without being turned up so as to make sufficient allowance for the expansion and contraction which it is constantly undergoing during the various changes

in the temperature of the atmosphere. It may be taken, indeed, as a general rule, that solder should be dispensed with as much as possible. Like glue to the joiner, it is indispensable in many cases; but like glue also, it is in common practice made to cover many defects, and much bad work, that ought not to exist. The soft solder used by plumbers on account of its melting easily is a composi- tion of tin and lead in equal parts, fused together, and run into moulds in shape not unlike the bars of a gridiron. In the operation of soldering, the surfaces of the metal intended to be joined are scraped and rendered very clean ; they are then brought close together, and sprinkled with resin or borax at the joints to prevent oxidation while soldering. The heated solder is then brought in a ladle and poured on the joint, and smoothed and finished by a hot grozing iron and rubbed down with a cloth.

Sheet lead, whether cast or milled, is supplied of various Sheet lead,

weight or thickness, and is always described as of such weight (4 to 12 pounds) to the superficial foot. There are very few purposes, indeed, in building, in which lead of less than 6 tb to the foot should be used, and very few iu which the weight needs to exceed 10. For roofs, flats, and gutters, under ordinary circumstances, 7 or 8 tb lead is a very fair and sufficient average ; for hips and ridges, lead of 6 ib to the foot is thick enough ; and for flashings 5 Ib lead need not be objected to.

harder, but milled lead is of more even thickness through- out, bends without cracking, which is not always the case with cast lead, and makes neater work. Sheets of cast lead run from 16 to 18 feet long and 6 feet wide ; milled sheets are made of about the same width, and 6 or 8 feet longer than cast sheets. Neither the one nor the other may be safely used on flats, or in gutters exposed to the wide range of temperature of our climate, in pieces of more than half the length and half the breadth of a sheet ; that is to say, from 8 to 12 feet long, and 3 feet wide, are the limits within which sheet lead will expand and contract without puckering aud cracking ; and to allow it to move freely it is laid with rolls and drips in such a manner that any extent of surface may be covered with the effect of continuity, though the pieces of lead forming the covering be of such small sizes as above stated. But all fixing, whether by soldering or otherwise, is to be carefully

avoided. A roll is a piece of wood made about 2 inches Rolls.

thick and 24 inches wide, rounded on one edge, and fixed with that edge uppermost, so as to come 4 inches within half the width of a sheet, that the edges may be turned up and folded round and over it, being lapped by, or lapping the edge of the adjoining sheet (Plate XXVI. fig. 7). Lead sufficiently stout, dressed neatly and closely down to the boards under it, and over the rolls at its edges, will require no fastening of any kind, unless it be so light as to be movable by the wind. Rolls are used mostly in roofs and flats; drips principally in gutters, though they may be required in long flats. The drip is formed in the first instance by the carpenter in laying the gutter boards, according to an arrangement with the plumber. It is a difference made in the height of the gutter of from 14 inches to 3 inches, where one sheet terminates in length, and meets another in continuation. The end of the lower is turned up against the drip, and that of the upper is

dressed down over it, so as effectually to prevent the water from driving up under it. Where the fall is not great, a piece should be cut out across the higher gutter board, so that the top of the under-lead may lie level with the board.

Gutters should have a fall of at least an eighth of an inch to Gutters.

the foot, and in flats it should be rather more, for such a covering is only so called in contradistinction to the pitch of a roof; ends and sides which are against a wall should

Cast lead has been pre- Cast and | ferred for the former purposes, because its surface igs milledlead

turn up against it from 5 to 7 inches, according to circum- stances ; and the turning up under the slates, tiles, or other roof covering, to a gutter, should be to the level of that against the wall at the least. The turning up against the wall should be covered by a flashing. This is a piece of lead let into one of the joints of the wall above the edge of the gutter lead, and dressed neatly down over it, to pre- vent water from getting in behind it (Plate XXVL. fig. 6). Parallel or box-gutters are necessary next parapets where a,curb roof is formed, and are useful in valleys of small roofs where the depth for it can be obtained. Fig. 117 is a section of such a gutter next to a parapet wall, in which A is the wall plate; B the tie- beam of the roof; C a bearer for carrying one end of the gutter bearer D, the other end being tenoned into the pole plate K; E the gutter boards carried by its bearers; G the lead gutter, laid in somewhat of an oval shape by the small angle fillets, which are useful in preventing the lead being returned at a right angle, where it is sometimes cracked in lay- ing; H the flashing; I the eaves’ board for raising the last row of slates, over which the lead is fixed; L the common rafter; M the slating; N the principal rafter forming part of the truss of the roof; O the saddle- back coping of the wall, throated on both sides. Where thick walls could be obtained, it was usual to form this sort of gutter below the timbers of the roof, whereby they were kept dry,and damage from the overflowing of the gutter prevented. The same result is occasionally achieved by a cornice projecting more than usual, the gutter being formed on it in place of

a real blocking course. If the gutters and flats are to be often walked upon, they should be protected by deal lattice work raised on fillets but not fixed. Snow falling down the slopes is prevented by this from stopping the gutters, and it also lessens the action of the sun upon the lead-work. Lead on ridges and hips and the top and sides of dormers, not being in sufficient masses to be secured by its own weight, must be fastened by nails bossed over.

In making cisterns and reservoirs, unless they be cast (and – these are now disused), the sheets of lead must of necessity be joined by soldering ; but the water they are intended to contain protects the lead from the frequent and sudden changes to which in other and more exposed situations it is exposed. The lead-work forms a lining to a wood case, which has grooved and tongued sides and a bottom. But cisterns are now commonly made of zinc, or of galvanized iron, or of slate; the last two do not require a casing, but may perhaps be enclosed in a closet. Service or water pipes to and from the cisterns, as also waste or overflow pipes, are also made of lead, and described by their bore, as % in., 2in.,inch,and soon. They are generally supported and attached to the wall by means of iron holdfasts. Iron water pipes are fixed where lead will probably be stolen. The opinion that some waters are injured by coming in con- tact with the lead of cisterns and pipes, has led to the for- mation of pipes of tin encased in lead. The water companies are now requiring a water regulator to be put to each closet, or a water waste preventor where the constant supply is obtained, but these are a very troublesome addition to the plumber’s work, on account of the difficulty of keeping them in working order. The constant supply system re-

Fig, 117. —Gutter and Roof-Timbers.

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quires taps of a different construction from those used in other cases ; these are called “ screw down valves,” from their action, and resist the pressure of the water. As re- pairs must occasionally be needed to the main pipes, it is recommended that, to prevent inconvenience, one or more cisterns be always provided in the house for containing two days’ supply of water.

Rain-water trunks and pipes are made of a certain number of pounds weight to the yard in length, according to the bore or calibre that is required. The pipes are fitted with large case heads above, to receive the water from the gutter spouts, and with shoes to deliver the water below; they are fixed or attached tothe walls of buildings of stone usually with flanges of lead, which are secured by means of spike nails,—iron and other metals having superseded lead where brick is used or economy requires the substitution.

The varieties of water-closet apparatus, of which Under. hay's patent is one of the best, are too numerous to be here described. Pumps of all kinds and powers are amongst the other matterscoming within the plumber's province, together with cocks, bosses, ferules, washers, valves, balls, grates, traps, funnels, service boxes, and a numerous collection of other articles.

A metal occasionally used for roofs in lieu of lead is known by the name of Wetterstedt's patent marine metal. It is composed of lead and antimony. Its advantages are its malleability, great tenacity, elasticity, and durability, and its resistance to acids, oxidation, and the action of the sun and atmosphere. It is manufactured in sheets of certain sizes, from 3 ib to 8 ounces per foot, according to the pur- poses for which it is required, the latter weight being useful for lining damp walls. It should be secured with wrought copper nails, A patent metallic canvas is also manu- factured of various substances and strength, serving for waterproof and secure covering.

Sheet copper was formerly used on account of its lightness to cover roofs and flats. The thickness generally varied from 12 to 18 ounces per square foot. It was laid like lead, but the plates being of small size were soldered together. It will be well to notice that water collected from copper channels must not be used for culinary pur- poses, as a film of verdigris is formed, which is poisonous. Copper is much used for roofing in foreign countries.

Lead and copper, where economy is required, are super- seded by zinc, which is not only much cheaper, but when good is nearly as durable, and is not so liable to be corru- gated by the action of the sun. Zinc is subject to oxida- tion; but the oxide, instead of scaling off as that of iron does, forms a permanent coating on the metal. Its expan- sion and contraction are greater than those of any other metal. Zinc sheets as manufactured vary in quality, some being very brittle. That supplied by the Vielle Montagne Zine Mining

Company possesses a high reputation for purity and excellence. Zinc must be laid like lead, without fixing either by nails or solder. No. 13 gauge, weighing 19 oz. 10 drs., is the least for roofs, flats, and gutters on boarding. No. 14, a medium thickness, weighing 21 oz. 13 drs., is used for roofs and flats ; and No. 15 or 16, weighing 24 oz. and 26 oz. 3 drs. per foot superficial, for best work and roofs without boards. Zinc pipes are extensively used as chimney pots ; stamped and moulded ornamental zine for dormers, Mansard roofs, vanes, guttering, and rain-water pipes, cisterns, &c. ; and perforated zine for blinds and for ventilation.

Tin cannot class with the building materials in England, although it is extensively used for covering roofs in America and in Russia.

The best publications on this trade are the makers' price books and lists of articles made and sold by them. See also the article METALLURGY.

Patent marine metal.

Copper roofing.

Zinc roofs.

Tin roofing.

Tools

Materials.

| highest work of the plasterer,—the making imitations of

PLASTER-WORK.

No art in the cconomy of building contributes more to produce internal neatness and elegance, and no one is less absolutely important, so far as the use and stability of a structure are concerned, than that of the plasterer. | The very general application of plaster is of compara- tively late date ; for wainscoted walls, and boarded or boarded and canvascd ceilings, or naked

joists alone, are frequently found in houses of rather over a century old, both in England and on the Continent; and a return to this state of completion in the present day is the result of the attempts of the medizval school of archi- tects, and their cry of “no shams,” which has not been | quite successful among themselves, for plaster and cement are used by many. The walls of houses were formerly | plastered above the wainscoting and coloured, while the ornamented plaster ccilings of the time of Henry VIIL, | Elizabeth, and James I., are still the admiration of lovers of the art. Still carlicr specimens of the plasterer’s skill | are extant in the pargetted and ornamented fronts of half- | timber houses.

For the more common operations of plastering compara- tively few tools and few materials are required. The plasterer is attended by a labourer, who supplies his boards with mortar, and by a boy on the scaffold with him a | feed his hawk, which is a piece of wood about 10 inches | square with a handle under it, for carrying up small por- tions of plastering mortar to the wall or ceiling, to be there delivered and spread by the trowel, a thin plate of hardened iron or steel with a wooden handle, similar to that used by the bricklayer. The plasterer is obliged to keep this implement particularly clean and dry when he is not actu- ally using it, lest itrust in the slightest degree, as it is clear | that the brown oxide of iron would sadly discolour his finer work on touching it again:with the trowel. He is necessarily | furnished with a lathing hammer, a hand float, a quirk | float, and a derby or darby, which is a long two-handled float for forming the floated coat of lime and hair ; brushes for fine or rough work ; three or four jointing trowels for mitres, &c. ; jointing rules ; moulds for cornices, which are of wood, but for work of any importance the frame is made of wood and the outline cut out of a copper (or more usually zinc) plate,—these are inserted in the wooden stock, and narrow pieces of wood are fixed to the moulds transversely | to guide and steady them along the screeds ; a straight edge, wherewith to bring the plastering on a wall or ceiling to a | perfectly even surface by traversing it in every direction ; | a screen, having metal wires to act as a sieve for separating | the coarser materials which enter into the composition of | plastering mortar,—these are thrown against its outer face, | to separate the particles which are too large for the perpose from the finer,—the sand and lime, too, are mixed much more efficiently and completely by screening them together | than in any other mauner; a spade and hod like

these ef | the bricklayer’s labourer ; a rake to separate the hair used _ in the mortar and distribute it throughout the mass; end | a server for the hawk boy to beat up the mortar, and to deliver it in small pats on the hawk.

The plasterer, as the term imports, works in plastic, adhe- | sive compositious, which are laid on walls, both internaily | and externally, to stop crevices, reduce inequalities, and produce au even, delicate surface, capable of receiving eny decoration that may be applied to it, either in celoer or otherwise. These compositions are as various as the modes | of applying them, the rudest being a compost of loam, a | marly clay, and lime; this is nsed only fer the commenest purposes, and being laid on in one coat, is washed over with a thin mixture of lime and water, a process termed | lime-whiting. There are many grades from this to the |

marbles and other costly stones, from the purest calcined gypsum mixed with a solution of gum and isinglass and colourizg matter to produce the required imitation. His materials are laths, lath nails, lime, sand, hair, and plaster, a variety of stuccoes and cements, together with various ingre- dients to form colouring washes, &c. Scaffolding is not Scaffolding, generally required for new work, but with old work it is sometimes necessary. Under ordinary circumstances, the plasterer is enabled to wash, stop, and whiten the ceil- ings and walls of rooms from trestles, with boards laid across them. In lofty saloons and halls, churches, &c., scaffolding is indispensable. It is necessary, too, to a front that is to be plastered in any way ; but this may be afterwards washed, repaired, and coloured from a ladder, without the interven- tion of a scaffold, except perhaps the suspended scaffold now s9 much used.

Laths are narrow strips of some straight-grained wood, Lathing, generally of fir, thongh oak laths are sometimes used, in lengths of 3 and 4 feet, or to suit the distances at which the joists of a floor or the quarterings of a partition are set, and in thickness from 3th to 2ths of an inch ; those of the greater thickness are called lath and a half. Lath nails are either wrought or cut; cut nails are in common use in England with fir laths. Coarse stuff is composed of ox Coarse or horse hair from the hide, in addition to lime and sand stuff. mortar ; this is intended to act as a sort of mesh to net or tie it together, and form a coarse but plastic felt. The hair should be long, and

free from all grease and filth. Road drift is unfit to be used in place of clean sharp sand in mortar, unless it be completely cleansed from all animal and vegetable matter, and of mud and clay. Fine stuf is made of fine white lime, exceedingly well Fine stuf. slaked with water, or rather macerated in water to make the sleking complete; for some purposes a small quantity of hair is mixed up with this material. The mere paste, when allowed to evaporate until it is of a sufficient consistence for working, is called putty. Gauge stuff is composed of Gauge about three-fourths of putty and one-fourth of calcined stuff. gypsum or plaster of Paris; this may be mixed only in smal] quantities at a time, as the plaster or gauge renders it liable to set very rapidly. Bastard stucco is made of Stucco. two-thirds fine stuff, without hair, and one-third of very fine and perfectly clean sand. Common stucco is composed of about three-fourths of clean sharp sand and one-fourth of the best lime, well incorporated. This must be protected irom the air from the time it is made up until it is required to be laid on the walls. Parker's (or Parker's Roman) cement, when of good quality, with fine clean sharp sand, Cements. in the proportion of about three of sand to one of cement, and well executed, forms a very good external coating for walls. It is vulgarly called " comps," a contraction of " com- position." Portland cement, so called because the mortar formed by it when mixed with sand is supposed to present the appearance of stone from the Portland quarries, is in much esteem for an outside stucco, as the colour to which it dries is sufficiently agreeable to the eye without any colouring wash, whereas Parker's cement is too often of a dark dirty tint, requiring painting or colouring to render it tolerable. Portland cement is also much valued as being proof against water when used as a mortar in setting brick- work, and in the composition of concrete for foundations. The patent selenitic cement already described (page 459), is stated to be an excellent substitute for Portland cement ; it takes double the usual quantity of sand, and is stronger even then than ordinary mortar. Plastering is finished in much less time than by the common mode.

A class of cements capable of taking a brilliant polish resembling marble, and consequently very suitable for internal decoration, deserves to be mentioned. The chief

PLASTER-WORK. |

of these are Keene’s marble cement and Parian cement. They become excessively hard iu a short time, and are cap- able of being paiuted in a few days. The principal com- ponent is said to be obtained by the precipitation of

i Under « simée dum. tiercfiore, m which the joists are

alum by an alkali, which gives a white powder of great.

brilliancy. Tints can be made up with these cements for coloured decorative work. Cements made by the mixture of oil with various substances were formerly much used both

here and abroad. The best knowu in England was called — Hamelin’s mastic, that in France the mastic de Dhil.

These cements being very expensive, and requiring to be constantly painted, have now gone nearly out of use. outside plastering they form a very fine clean surface, as may be seen in the quadrant in Regent Street aud other buildings of that date, but in many instances it has been taken off and Portlaud cement substituted.

Blue lias lime was formerly greatly esteemed as a cement for outside work, but the carelessness of the burners has tended much to limit its use, there being a large pro- portion of underburnt stone left in it. The workmen also would not take the requisite pains for slaking this lime, and manufacturers therefore ground it, by which operation the core becomes mixed up with the properly burnt material, and the efficiency of the lime is destroyed. The lumps should be

For |

broken as small as nutmegs, then immersed in water on a— sieve until air-bubbles freely rise to the surface; the lime |

so wetted is to be left ina heap covered by damp sand for twenty-four hours, after which time it should be screened and nixed with the proper quantity of sand and the least possible quantity of water. To one of lime may be put not more than from two to two anda half of sand. When slaked it does not increase in bulk.

The various coatings of plastering are distiuguished . thus. On laths, plastering in one coat simply is said to be laid, and in two coats, laid and set. In three-coat plaster- ing on laths, however, the first is called the pricking up, the second is said to be floated, and the third set. On brick or stone walls, plastering in one plain coat is termed rendering ; with two coats, a wall is said to be rendered and set ; and in three, rendered, floated, and set.

Before beginning to lath a ceiling, the plasterer proves the

under face of the joists, to which he has to work, by apply- | ing a long straight edge, aud makes up for any slight in-

equalities in them, when the work is not to be of a very superior description, by nailing on laths or slips to briug them as nearly even as he can. great, or if the work is to be of fiue quality, he recurs to the carpenter, who takes off inordiuate projections with his adze, and nails on properly dressed slips where the joists do not come down low enough, and thus brings the whole to a perfect level. This operation is called firring, or furring. If it be a framed floor with ceiling joists the plaster has to work to, it is tolerably sure to be straight ; but the carpenter must have firred down on the beams or

binders to the level of the ceiling joists, unless the ceiling | ” . | his le& and te sxizs eer the eaxface of the set, while

joists have been nailed to the beams or binders, when nothing of this kind is necessary. If a ceiliug is to be divided into compartments or panels, the projecting or depending portions must be bracketed or cradled down to

receive the laths. It is an importaut point to be attended |

to in plastering on laths, and in ceilings particularly, that the laths should be attached to as small a surface of timber

as possible, because the plastering is not supported or |

upborne by its adhesion or attachment to the wood, but by the keying of the mortar itself, which passes through between the laths, and bends round over them. If then the laths are in constantly recurring contact with thick joists and beams, the keying is as constantly intercepted, and the plastering in all such places must depend entirely on the portions between them which are properly keyed.

When the inequalities are |

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| layer of morvar or qe rake

necessariir Gack, 2 aarrow filet should be nailed along the middle wnéier tie wiwie wength of them all, to receive the laths and besp Dem at -tfficient distance from the timber ve allew Ge piserermng to key under it; thus too the surface max tw aude murs perfectly even, as it is in single floor: thet meomies mestiyoecu. This being all arranged, the plasters: rommenues lathing. The laths should be of the stronger sar. «Thin weak laths, if used in a ceiling, are snvs T rei Neenalines, by sagging with or yielding to the weicn Hmaciei w them ; ome or two weak ones in a ceilme af oiteewue ang lathe may be the ruin of the best piece & wos. Ther should be previously sorted, the weak, ereimei aad imotiy, & there be such, being re served for Imfatwrwerks. zad ihe best and straightest selected for the work mist EzQurtamee, so that the workman shall find none w xs end waat ix not fit to be brought in. Taking 2 lk tna wil ecack across three or four openings, he strikes & uml may & om one of the intermediate joists, at about thre~acnan sf am mek from the one before it, and then secure: ae amis of cas and the one that it mects of the last rew wait me aad. leaving the other end of the lath he has just asi we t# secured op the same manner with that which shall mes = of “he aezt bay im

continuation. It is of importanc: sisy Gat m ceiline-work he pay attention to the bonime of at wor’. [a lathing on quartering partitions and bemeuet wills. wae bondimg is not a matter of much importans: gut tile thickness of the timbers behind the letter of as =m cmueqmence aa in 2 ceiling, becanse the tootimr whet we siicaness of the lath itself affords to the plastemmr & exemcit te suppers it vertically ; but, neverthsless, the mat campiete the keying, even in works of this kind die teteer. tm te wething above will not pro- tect it from ery emmimc cumse to fall forwards, or away rom the lens 4“The tmaner or weaker sort of lath is generally conmdarst siicertiy sarong for partitions.

When tne lattanc = cumpieted, she work is either laid Plastering

or pricked ap. aceoriaur a & is tw be finished with one, two, or tree coms. Lave i 2 tolerably thick coat of coarse stuf or Lm sui Saw teonr’t to 2 tolerably even surface with tne crewel oni. Zor this She mortar must be well sempre’. amd of movdexte consistence,—thin or moist enough to past Taniiy seme Genween the laths, and bend with its own weacts wre: Gem. med at the same time stiff enongh te leave mv Gauser thas = will fall apart, —a contin- gency, however, Ghai Im price feqnentiy cecurs in con- egnence of badly wmmmmused or badly tempered mortar, unduly closs latmenc. a srfiexent force not having been

“used with propacr commsant mersar to force it through | and form Hers.

i= Ge vurr x wi be of two ecnata, that is, laid end si weer te eo = aifficiently dry, it is roughly swe Wik £ Het Hmem w soughken its surface, and then the sez. roms et fe son, is put on. This is dune with the comman wevei alone, or only assisted by 2 wetted heg’s nnsie bras vwiee® the workman uses with

= eer = be

he presses and sniwminst S Wak the towel in his right. If the laid work Snodid Lew: Genome very dry, it must be slightly moisvene? tetiare ce wes of pws on, or the latter, in shrmking, will creck eu Sil vey =This is generally done by sprikiur or anew Te water over the surface from the brash. Por Gumi ar terse-sat work, the first, or pridkine =p, & ronety aul wm We laths, the principal obiect beinc we make ae kerma sompiete.and form a . : viel

the next coat may sitach ise. Ik musi of curse, te kept of tolerably equal thickness threwciim aut sinuid stand about one- quarter or thressucrane at ut meit a the aurface of the laths. When % 2s insted. ened vile the mortar is still quite moist. tht TimsTa smiles ot awe it all over

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Plastering on walls.

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with the end of a lath in parallel lines from 3 to 4 inches apart. The scorings should be made as deep as possible without laying bare the laths; and the rougher their edges are the better, as the object is to produce a surface to which the next coat will readily attach itself. When the pricked up coat is so dry as not to yield to pressure in the slightest degree, preparations may be made for the floating. Ledges or margins of lime and hair, about 6 or 8 inches in width, and extending across the whole breadth of a ceiling or height of a wall or partition, must be made in the angles or at the borders, and at distances of about 4 feet apart throughout the whole extent; these must be made perfectly straight with one another, and be proved in every way by the application of straight edges; techni- cally these ledges are termed screeds. The screeds are gauges for the rest of the work; for when they are ready, and the mortar in them is a little set, the interspaces are filled up flush with them ; and a derby float or long straight edge being made to traverse the screeds, all the stuff that projects beyond the line is struck off, and thus the whole is brought to a straight and perfectly even surface. To perfect the work, the screeds on ceilings should be levelled, and on walls and partitions plumbed. When the floating is sufti- ciently set and nearly dry, it is brushed with a birch broom as before described, and the third coat

or set is put on. This for a fine ceiling that is to be whitened or coloured must be of putty; but if it is to be papered, which is very unusual, ordinary fine stuff, with a little hair in it, will be better. Walls and partitions that are to be papered are also of this latter, or of rough stucco, but for paint the set must be bastard stucco trowelled. This coat must be worked of exactly the same thickness throughout, to pre- serve to the external surface the advantage that has been obtained by floating. For all but the last-mentioned, the set on floated work, the trowel and brush are considered sufficient to produce fine and even work; but trowelled stucco must moreover be hand floated. In this operation the stucco is set with the trowel in the usual manner, and brought to an even surface with that tool to the extent of two or three yards. The workman then takes the hand- float in his right hand, and rubs it smartly over the surface, pressing gently to condense the material as much as pos- sible. As he works the float he sprinkles the surface with water from the brush in his left hand, and eventually produces a texture as fine and smooth almost as that of polished marble.

But lathing and plastering on laths as practised in England is at best a very flimsy affair, and greatly requires improvement. Stronger laths than the laths commonly employed, put on further apart, and with headed wrought nails, and the plastering laid on upon both sides in upright work, or both above and below the ceilings at the same time, two men working against one another, will produce work in some degree worthy of the name. The practice of the French in this respect is well worthy the consideration, and to a great extent the imitation, of English plasterers.

The process of plastering on the naked brick or stone wall differs but little, except in name, from that we have described as the mode on lath. The single coat is called rendering, and it need differ only in the quantity of hair, which may be less than is necessary for laying on lath, and in the consistence of the mortar, which may be made more plastic, to work easier, and becatise in a moister state it will attach itself more firmly to the wall; the wall, how- ever, must itself be well wetted before the rendering is applied. The set is the same, and is put on in the same manner as to two-coat work on lath. For three-coat or floated work, the first or rough rendering should be made to fill up completely whatever crevices there may be in the

work behind it, and be incorporated with it as much as possible. As its name imports, its surface may, indeed should, be rough ; but it is not scratched or lined as the similar coat on lath is. For this, too, the wall must be pre- viously wetted, that the mortar may the better attach itsclf to it. For the floating, screeds must be formed as before described, and the consecutive process is exactly the same as on lath, both for the floated and for the set coat. In almost every case in which plastering is to be floated, the workman finds a guide for the feet of his wall screeds in the narrow grounds which the joiner has previously fixed for his skirtings; from these he plumbs upwards, and makes his work perfectly fush with them.

Mouldings and cornices (as large combinations of mould- ings and flat surfaces immediately under the ceilings of rooms are called) are formed with running moulds, and are generally executed before the setting coat is put on the walls and ceiling. If the cornice do not project more than about an inch and a half, or 2 inches, from the ordinary work, a backing of lime and hair will be sufficient ; and if any one part only happen to be more than ordinarily pro- tuberant, a row of nails from 6 to 12 inches apart stuck into the wall or ceiling in the line of that part will give it sufficient support. But if the general mass of the cornice be more than that amounts to, and extend more than 6 or 8 inches along the ceiling, it must be bracketed out, and the bracketing lathed and pricked up, as for ordinary work. This pricking up, or other preparation, must of course be perfectly set before the cornice is run; and there should be one-fourth of an inch at least of clear space between the preparation and the mould in the nearest part. A wooden screed or parallel straight edge is tacked on with brads to the wall, and another on the ceiling, if the cornice be large and heavy, as guides or gauges for the mould, whose rests are chased to fit them ; and then one man laying on gauge stuff in an almost fluid state with an angular trowel, another works the mould backwards and forwards over iG, which strikes off what is superfluous, and gives the con- verse of its form to the rest. The mould is never taken down from the work at right angles to the line of it, but is drawn off at the end, so that none of the parts of the moulding or cornice is injured or torn by it,

which must otherwise frequently be the case, from the peculiar forms at times given to the details. If a cornice be too large and heavy to be executed at once, it may be done in the same manner at two or more times, in so many parts; and if any part or parts of a moulding or cornice is to be enriched, the space for itis left vacant by the mould, and the enrich- ment is afterwards supplied. As a cornice cannot be completed up to the angles by the mould, it is worked by hand in those situations to a joint. The joinings are termed mitres, and in forming them the plasterer uses the jointing tools we have already described.

Mouldings and e cornices,

Models for enrichments are made by the modeller, Enrich- according to the design or drawing submitted to him, and ments.

from them the plasterer makes wax or gelatine moulds, or, as in ordinary practice, the modeller supplies the moulds in which the ornament is cast in plaster of Paris. If the ornament be in recurring lengths or parts, as is usually the case, only one length or part is modelled, and casts of as many as are required are taken from the mould; some single ornaments, again, which are very large, require to be moulded and cast in parts, which are put together by means of cement. When the cast ornaments are sufficiently dry the pieces are scraped and trimmed, and the joints made clean and even; and they are set in the cornice with plaster of Paris, with white lead, or with a composition called iron cement, as the case may require. If the castings have something in the cornice to rest upon, the first will do; but if there is nothing to retain or attach them but the

Outside cement- work,

Decay of _ stuccoes and cements,

PLASTER-WORK. |

to wooden cradling behind and above them. In plastering a wall with common stucco (and its use is mostly for outside work), the first thing to be done is to

remove the dust from it by brushing, and then to wet

very completely with water Ifthe wall to be stuccoed be an old one, or one of which the joints have been drawn, the mortar of the joints must be chipped or even raked out, and the bricks picked, to expose a new and porous surface to the plastering before brushing and wetting. The wall

is then covered with stucco in a fluid state, applied with a

broad and strong hog's bristle brush, like common white- washing, When this is nearly dry the stucco must be laid on as in common rendering, unless the work is to be floated, when the process is nearly similar to that in floated plas- tering. Screeds must be formed at the highest and. lowest extremities of the wall, or of that part of the wall which is in the game vertical line, and is not intercepted by string courses, and be returned at the angles, putting the whole surface into asort of frame. These must be made perfectly straight and plumb, so as to be quite out of winding by the careful application of the plumb-rule and straight edge. Inner vertical screeds must then follow at three or four feet apart across the whole surface, and be made to range exactly with the outer ones, and then the interstices must be filled in as before. As the work is made good it must be well rubbed with the hand float, as in the execution of trowelled stucco internally, to compress the material, and produce a hard, even, and glossy surface. Preparations for cornices and other projections from the straight surface of the work must have been previously made in or on the brick or stone-work by the protrusion of bricks, tiles, or whatever may be best suited to form a core ; and the mouldings and cornices are run with moulds, in the manner described for the same things internally, ouly that in work of this kind no plastic material but the stucco itself is used,—that is, there is no preparation of any softer material than the stucco itself put under it. In running cornices in this material, workmen are very apt to mix a little plaster of Paris with the stucco to make it set under the mould, and thus give sharpness and fulness to the mouldings; but this should not be permitted ; for the plaster is not qualified to stand the weather as the stucco is, and, if mixed with it, will produce premature decay. When the stucco is perfectly dry, it may be painted in oil colours, or be coloured in distemper ; and in either case it is

generally (though not invariably) ruled over the surface with a lead point, to give it the appearance of gauged stone-work.

Rendering in the Roman and Portland cements is executed almost exactly in the same manner as stucco rendering is, only that it is laid on the saturated wall directly, without the preliminary operation of roughing in, ‘or washing the surface with a solution of the material. The sanie process, too, is followed in floating this cement, and with the same exceptions; and as, in addition to its superior hardness and capacity for duration, it is a quick-setting cement, it is far preferable to any of the common stuccoes for running cornices, mouldings, &c. These cements may, like stucco, be painted in oil, or coloured ; but instead of a size colour, which is used for almost every other purpose in plastering, the colour for this com- position is mixed with diluted sulphuric acid. This too may be lined and tinted to imitate stone and stone-work of any description. :

It may not be amiss here to refer to some of the causes of the premature decay which takes place in stuccoes and cements when used externally as a coating to walls. The

cement, one of the last two must be used. Flowers and other ornaments on ceilings which are too large and heavy to be trusted to adhesive matter alone, must be screwed

primary cause is the presence of muddy earth and decayed animal and vegetable matter in the sand used with the lime and cement. To this may be added frequent im- purities in the limes and cements themselves, particularly of argillaceous matter in the former, and sometimes the too great proportions of lime or cement to sand. ‘These things might, however, remain quiescent for a long time, if the work were well protected from access of moisture, which is the grand exciting cause. The paint, or distemper wash, on the surface, is generally sufficient to prevent the rain

which may beat against a vertical face from penetrat- ing, especially if the work have been well hand-floated and trowelled, to make it close and compact; but the evil arises from exposure above, and from the numberless horizontal unfloated surfaces which are constantly pre- sented, These receive and collect the water, and convey in streams over the vertical surfaces what is not imme- diately absorbed ; and the work thus becoming saturated, frost seizes and bursts it, or warmth calls the vegetative powers of the impurities in it into action, and the whole is covered with a green sward. Let the sand of which a plaster composition is to be formed, whether with lime or cement, be washed until it no longer discolours clean water, and be well compounded with cementitious matter free from impurities with which it is so frequently charged ; let the work be well hand-floated and trowelled, particularly on the backs or upper horizontal surfaces of projections, and protected above by projecting eaves or otherwise ; and the work, with common care and attention to paint or distemper at intervals, will last as long as anything of the kind can be expected, or is found, to last anywhere.

A cheap and useful covering for external walls, which are Rough cast, protected by projecting eaves, in plain buildings, is rough cast. This is executed in the following manner :—The surface is first roughed, or indented, and then well brushed with a stiff brush to remove all dust or loose earth. It is then covered with the rough cast, which consists of a small quantity of mortar diluted with water, to which a trowel of pure lime is added to make it about the thickness of cream. After the workman has done all within his reach the scaffolding is lowered, and he proceeds with the remainder. Another process is somewhat dearer. After having been roughed or indented, the wall is sprinkled with water, and then rendered with lime and hair; and when that is set, another coat of the same material is superadded, laid as evenly as it can be without floating, and as soon as a piece of two or three yards in extent is executed, the workman lays on it an almost fluid mixture of clean fine gravel and strong lime, which have been well mixed together. This is immediately washed with any ochreous colour that may be desired, and the whole dries into one compact mass. A third process, called stuccoing, is performed by the workman laying on a few trowels of stucco, which he spreads as much as possible ; a second workman provided with a brush and a small wood float follows him, and after sprinkling the mortar with water he rubs over that part he has wetted

with the float, and at the same time it may be whitened with lime alone. When the lime is very good this makes very good work,

In renovating and repairing plastering the whole surface Repairs. is first well washed to remove the dirt which may have attached itself, and as much of the earthy matter of the previous coat of whitening or colouring as will come away ; any injuries the work may have received, such as cracks and fractures, are then repaired ; and when the new stuff is quite dry, the joinings are scraped to produce an even surface, and the whole is again whitened or coloured once or twice or oftencr as may be required, to make it bear out well. Stuccoed walls which have been painted must

Incised plastering.

Sgraftito.

Scagliola.

Other imitation marbles.

be well rubbed with pumice stone, to take off the old paint

as much as possible before the new work is proceeded

with.

For a decoration to rooms having plastered walls, instead of papering or flat painting, or for a suitable orna- mentation for the interior of churches built at small outlay, the old system of pargetting has been revived, The usual stucco or other plaster finish is, while still wet, stamped over with a pattern made of brass, or for rougher work of wood, to any geometrical or other form in accord- ance with the style of architecture ; this indents the sur- face. Jt may be left all of one colour, or the open por- tions of the device may be filled in with another coloured plaster.

Another revived method, especially for outside work, now much in use is called sgraffito. It was in vogue with the Italian artists about two centuries

since, who executed some very elaborate specimens of ornamentation with it. The process is briefly as follows :—First, mix with the mortar some colouring substance of the tint desired for the pattern of the design; then apply a thin coat of it to the wall. When this coat is nearly dry, apply on it another coat similarly prepared but of the colour intended for the grounding, and then, a mould having been prepared in zinc of the exact outline of the pattern, it is to be applied to the surface, its outer edge marked round, and with a sharp tool as much of the upper coat of plaster is cut away as comes within the pattern, down to the face of the lower coat. By a careful arrangement of pattern, a consider- able variety of colouring may be employed; and even three coloured coats can be put on, cutting through some- times one, sometimes two, as may be desired to represent the design. As the colour is in the material itself, there is no fear of its scaling and so presenting a bad appear- ance; and it is a comparatively cheap process for the decoration of a new surface which cannot be painted for some time. The process has been adopted in England with coloured cements for outside work.

Under the plasterer’s trade it may be desirable to men- tion some of the varieties of artificial marbles, scagliola, and other similar work for the decoration of buildings. Scagliola is a species of plaster or stucco invented about 1600-50 in Italy. The work is lathed and plastered as usual, and then the artist commences, preparing his material, which is composed of the purest gypsum broken into small pieces and calcined, passed through a very fine sieve and mixed up with glue, isinglass, &c. In this solution the colours are diffused that are required to be imitated in the marble ; or the colours are prepared separately, and after- wards mingled and combined nearly in the same manner that a painter mixes the primitive colours on his palette to compose his different tints. When the gypsum is prepared and mingled, it is laid on the plaster, and then floated with proper moulds of wood, the artists during the floating using the colours necessary for the imitation, by which means they become mingled and incorporated with the surface. The process of polishing follows, first by means of pumice stone, then with tripoli and charcoal and fine and soft linen; after this the surface is rubbed with a piece of felt dipped in a mixture of oil and tripoli, and last of all with pure oil. The imitation may be so good that except by fracture or by sound it cannot be discovered to be a counterfeit. .

Marezzo marble is made of cement mixed with fibre for strength and to resist a blow. Slabs are bedded on plaster of Paris, and with cramps and dowels like marble. Every variety of marble can be imitated in it, and it receives a high and permanent polish. The Marbre Universel Company have put forward a new manufacture of a similar descrip- tion.

BUTL DING

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MopELLING, CarveD Work, anp GILpINe.

The modeller copies the drawings of the designs which Modelling

may have been prepared for the enrichments, in what- ever material they are to be cast, whether in plaster, in metals, or in composition of any kind, for the plasterer, smith, or decorator. The model is made of soft wood, by the usual chisels and gouges, or ina finely-tempered and plastic clay called modelling clay, or in wax. The modeller works the clay with his fingers, assisted by a few ivory, bone, or steel tools for finishing off. neatly and sharply, and for working in parts which he cannot reach with his fingers. The best workman is one who can do most to- wards producing the required forms with his fingers, unassisted by artificial tools, as a greater degree of ease and freedom almost always results from the use of the hands alone. The model being completed, it is moulded, that is, a mould or moulds are made from it of a preparation of resin or of gelatine, sometimes of plaster of Paris; the moulds, if they have to be formed in portions, are fitted exactly to each other at the cdges, and in these moulds casts in plaster of Paris or other material are made to any extent that may be required. For smith’s work the wood model is sent to the founder for casting in metal. For carved work, such as caps of columns, shields, medallions, consoles, &c., the model may be sent to the mason or stone carver for the completion of the block, which may have been left in a boasted state by the mason when setting it.

The modeller having some pretensions to be considered an artist rather than a mere artificer, is for the most part paid according to his merits, rather than for so much time, according to the ordinary mode of determining the value of artificers’ works.

The carver is strictly an independent artist, whose busi- Carved ness it is to cut ornaments and enrichments in solid and work.

durable material, such as stone and wood, so that, like the modeller, he must be paid according to the taste and power he may exhibit in his works, rather than as a common artificer. The art of carving has, however, been in a great measure superseded by modelling and casting, In works of a free style, or of a medieval character, the carver is often left free to exercise his own taste and fancy or talents in the execution, with or without a sketch by the

architect before him. The decorator, in addition to casts Decorative in plaster of Paris, now makes use of composition orna- work.

ments, which are formed of a mixture of whiting and glue pressed into moulds ; or of papier méché, which is paper pressed into nSoulds ; or of a composition of a thin coat of plaster of Paris poured into the mould, and then covered with coarse canvas, the result being to all appearance a plaster cast, but it is far lighter in weight,—a figure the size of life being readily moved about by one person. It was an old process revived by the late Mr Owen Jones, and well carried out for him by M. Desachy, in the elaborate ornamented ceiling at St James's Hall, Piccadilly.

Gilding is applied to castings as well as to carvings; but the former being, almost as a matter of course, less sharp and spirited in their flexures and details, as well as less firm in substance than the latter, castings can less bear to be further subdued by the application of foreign matters to their surfaces than carvings may. Gilding is the appli- cation of gold leaf to surfaces, which require, however, to be previously prepared for its reception. The work is first primed with a solution of boiled linseed oil and carbonate of lead, and then covered with a fine glutinous composition called gold size, on which, when it is nearly dry, the gold leaf is laid in narrow slips with a fine brush, and pressed down with a piece of cotton wool held in the fingers. As the slips must be made to overlap each other slightly, to insure the complete covering of the whole surface, the loose

GLAZING. |

edges will remain unattached ; these are readily struck off with a large sable or camel-hair brush, fitted for the pur- pose; and the joints, if the work be dexterously executed, will be invisible. This is called oil gilding, and it is by far the best fitted for the enrichment of surfaces in archi- tecture, because it is durable, and is easily cleaned, and does not destroy or derange the forms under it so much as burnished gilding does. The latter requires the work to be covered with various lamin of gluten, plaster, and bole, which last is mixed with gold size, to secure the ad- hesion of the leaf.

GLAZING.

The business of the glazier, the manufacture of whose

material has of late years improved and progressed in a |

very remarkable degree, may be confined to the mere fit- ting and setting of glass; even the cutting of the plates up into squares being generally an independent art, requir- ing a degree of tact and judgment not necessarily possessed by the building artificer.

The glazier is supplied with a diamond or other cutting tool, laths or straight-edges of various lengths, a square, a glazing-knive, a hacking knife, a hammer, a duster, a sash- tool, a two-foot rule, and a machine called a glazier’s horse, which he fixes outside a window sill, and stauds on to reach the upper panes for glazing or cleaning purposes, without removing the sash, and so injuring the beads and paint.

His materials are simply glass, putty, and priming or paint. The glass is supplied by the glass-cutter, of the quali- ties and sizes required for the particular work to be executed. The putty is made by the glazier himself, or by a labourer, of fine clean powdered chalk or whitening, well mixed and combined with linseed oil, and kneaded to the con- sistence of dough. No more putty should be made at once than is likely to be worked up in the course of a few days, as, the oil drying out, it becomes hard and partially set, and is therefore less available for its purposes. Priming is a thin solution of white (with a little red) lead, mixed in linseed oil. For ordinary glass, the sashes are sent to the glazier from the joiner, after having been fitted into their places, and only require to be glazed before they are per- manently set

or hung. Supposing that no preliminary – process is required, such as stopping (the result of bad joiners' work) and knotting (and knotty stuff should not be admitted in sashes), the sashes require to be primed. The priming is laid on every part of the sash except the outer edges of the styles and of the bottom and top rails, with the sash tool or painting brush, that is, if the sashes are intended to be painted; for if not, the rebates only mustbeprimed. The object of thisis to prepare the material of which the sash is composed for the reception of the putty, which would not otherwise attach itself so firmly as it does after this preparation. The priming being sufficiently dry, the workman cuts the panes of glass down into their places, making every one fall readily into the rebates without binding in any part; indeed the glass should fit so nicely as not to touch the wood with its edges anywhere, and yet hardly allow a fine poiut to pass be- tween it and the sash-bar or rebate, the object being to encase it completely in putty, and yet that the putty should not be in greater quantity than is absolutely necessary. The glass being fitted or cut down, the workman takes the glazing-knife in his right hand, and a lump of putty in the palm of his left, the sash being laid on its face, that is, with the rebates upward, before him ; with the knife he lays a complete bedding of putty on the returning narrow stops of the rebates, all round to every pane. This being done, the panes of glass are put on it as they have been fitted, and cvery one is carefully rubbed down with the

PUIE DING

O09 fingers, forcing the putty out below and round the edges of the glass, until they are nearly brought into contact with the wood or other material of the sash. The rebates are. then filled in with putty behind, the mass forming exactly a right-angled triangle, its base being the extent of the stop of the rebate, and its perpendicular the depth from the glass to the outer edge of the rebate; and the third side or hypothenuse is neatly smoothed off. The sash being then turned on its edge and held upright by the left hand, the protruded putty of the bedding, or back putty as it is called, is struck off with the knife, and the section of it neatly drawn. The sashes are now deposited on their faces to allow the putty to set, and then they may be hung and painted.

To very large squares, and to plate glass, needle points, or small nails called sprigs, are used to retain the material securely in its place while the putty is soft and yielding. These have to be carefully inserted, for if they fix the glass it is apt to fly at any sudden vibration. Large squares and plate glass are usually inserted after the sashes are hung, to prevent risks of breakage. Where the bar and frame can be made to allow of it, large squares are secured in their place by wood beads screwed to the rebate in lieu of putty. In this case the edge of the glass is first covered with a piece of flannel, or thin india-rubber, to fill up crevices,‘and so prevent admission of dust, and stop any current of air.

Lead-work, as it is termed, is the glazing of frames Lead-work.

rather than of sashes with small squares or quarries of glass, which are held together by reticulations of lead ; and these are secured to stout metal bars, which are fixed to the window frames. Leaden reticulating bars are grooved on their edges to receive the quarries, and are tied by means of leaden ribands or wires to the saddle bars, which, in their turn, are affixed to the stouter bars before men- tioned, if the bay or frame be so large as to require both. This is now extensively carried on in the painted glass window shops, where the glass is cut to patterns, and shows outlines of figures, costumes, &c. “Stained glass” is obtained by mixing colours in the pot while in the furnace, hence the term “ pot metal” for it. A kind of coloured glass has only a skin of colour on one side of the white inaterial, aud hence is termed “ flashed glass.”

Besides all the varieties of clear glass, the glazier has Varieties of now at his command the many qualities of obscured glass, glass.

beyond the ground and painted glass of former days ; the lace-pattern glass, executed by laying a pattern on the material which has been covered with a varnish, placing it in a box filled with a fine powder, which when shaken adheres to the varnished portions, and then put- ting it in a kiln where it becomes fixed; the patent rough plate for conservatories, workshops, &c., and its fluted varieties ; the rough cast plate for workshops and store-houses ; the stained ornamented quarry for church windows, &c. Lastly, there is the engraving on glass by aid of the sand blast,—a new and easily managed method, con- sisting in a jet of air blown violently through a tube,

carrying with it particles of fine sand. The action is very rapid, and it reduces the surface in a few minutes to the condition of ground glass. A piece of lace, however, is sufficient to arrest the action of the sand. Reece's patent embossed and coloured glass is useful for screens and for windows which are not meant to be looked through. Coming within the scope of the glazier's business is the novel pavement light, consisting of a frame of iron cast with small many-sided apertures, into which are placed a series of dome-shaped or prism-shaped blocks of glass, reflecting the light falling upon them. They dis- tribute the light to a greater extent than a piece of rough plate-glass, and like Chappuis's and other reflectors require to be kept clean. Moore's window ventilator allows of the

Smith- work.

Founder's work.

Gasfitting.

admission of air through its louvres, which are worked by @ wire or cord as necessary. Hartley's patent perforated glass attempts to gain the same end by small slits formed in the pane.

For publications relating to the glazier's chief material, see the

article Guass. For patterns of lead-work, see Shaw's reprint of W. Gidde, Booke of Sundry Draughies, 8vo, 1615.

SMITH-WORK AND GASFITTING.

The smith is the worker in wrought metals of all kinds required chiefly by the carpenter and joiner, who fixes them in the building. Smithery is the art of uniting several lumps of iron into one lump or more, and forging them to any desired shape. The earlier parts are done at the forge and on the anvil with the hammer, and hence is produced " wrought work," whether for useful or for ornamental purposes. Machinery has been brought extensively to the smith's assistance, for rolling, drilling, planing, &c. The ornamental

portion of his work is wrought iron shaped by hand into devices and patterns according to the various styles of architecture, as in gates, railings, standards, hinge bands, locks, handles, knockers, lanterns, candlesticks, and other lighting contrivances, which are also executed in brass-work and in cast-iron.

The founder’s work is all cast metal, such as for orna- mental gates and railings, rain-water pipes, cistern heads, and other portions, guttering, stable-fittings, coal-plates, &c. These commonly require to be fitted and fixed by the smith. The founder supplies all fire-grates, stoves, and other apparatus for warming and also for ventilation.

The gasfitter is a smith who supplies and fixes cast-iron pipes for diameters above two inches, and wrought iron for those of smaller bore, where gas is required to be used. A three-quarter inch pipe is considered by some as the least size to be used even for supplying rooms on an upper story; tin or composition metal pipes are fixed for sizes under half an inch, and also flexible tubes. It is recommended that no pipes should be embedded in the plastering, as is usually the case. In Paris the gas pipes must be seen for their whole length, and where passing through a floor or partition they must be let through a larger pipe having both ends open. Lights should not be fixed within 36 inches beneath wood-work. The solar or sun light is one of the modern additions for lighting large halls, as well as for dwelling- rooms; the globe lights, and some others of the same kind, all assist also in ventilating the apartments by tubes carrying off the products of combustion, which tubes are ordinarily fixed in the thickness of the floor ; and as the air therein is raised toa very high tempera- ture, great precautions are required to prevent danger by fire to the timbers, and also where the tubes pass through the roof. The effect of continued hot air on wood is little understood by the public generally. The star light, an invention of the late Mr Owen Jones, consists of a num- ber of jets placed either horizontally or slightly inclining upwards at the jets ; this is productive of a pleasing and brilliant light. There are many varieties of gas burners, such as the one called a fish tail, from which the form of the flame is the worst as regards economical results ; the bat’s-wing is better, and the argand is the best. The latter is a metal ring, pierced with numerous small holes, which divide the flame and allow of the proper combus- tion of the gas. Besides the common

metal burners, there are some made with a soapstone or other cap, to pre- vent corrosion; and one of the better class is Bronner’s patent burner, into which the gas is admitted through a very smnall opening adapted for supplying only a certain quantity of gas per hour. The usual burners have a

BUILDING

[GASFITTING.

large opening up to where the gas is consumed, and hence a waste of it.

For publications relating to the smith and founder’s trade, see the article Iron; also Brandon, Analysis of Gothic Architee- ture, 4to, 1847; Viollet-le-Duc, Diet. Rats., s.v. Grille and Serrurerie; Wyatt, Metal Work, fol., 1852; Jousse, La fidéle ouverture de Vart du Serrurerie, fol., 1627; L’ Art du Serrurerie, in Description des arts ct metiers, fol., 1767; Fordrin, Livre du Ser- rurerte, fol., 1723; Cottingham, Smith, Founder’s, éc., Director, 4to, 1823; Pugin, Designs for Iron and Brass Work, 4to, 18385; Shaw, Examples of Ornamental Metal-Work, 4to, 1825; Welldon, The Smith’s Right Hand, 8vo, 1765; Leconte, Choix de nouveaux modeéles de Scrrurerie, fol., 18388 ; Scott, Ornamental Designs, fol., 1852 ; King, Orfevrerie et owvrages au moyen age, fol., 1853-60 ; Tijou, A New Booke of Drawings, fol., 1693 ; Bordeaux, Serrurerie du moyen age, 4to, 1858; Bury et Hoyau, Afodéles de Serrurerie, fol., 1826 ; Thiollet, Mfodéles, &c., fol., no date; Lachave, Balcons, &c., fol., 1864; Normand, Guwvres, d&c., fol., 1824.

Hovusz-PAINTING.

The real object of painting is to protect wood, metals, and stuccoes from the action of the atmosphere, by cover- ing them with a material which is capable of resisting it. A continued succession of moisture and dryness, and of heat and frost, soon effects the decomposition of woods, causes oxidation in most of the metals used for economic pur- poses, and destroys the generality of stuccoes if their surfaces be exposed nakedly to it. A solution of ceruse or white lead in linseed oil spread over them prevents these injuries in a great measure, and for a considerable period of time; and as the application of such an unction can be repeated without much trouble or expense as often as occasion may require, it may be said to furnish a

protection against the contingencies named. In addition to the utility of painting, it is also available as an ornament, by bringing disagreeably or diversely coloured surfaces to a pleasing and uniform tint, or by diversifying a disagreeable monotony of tint, to suit the taste and fancy; and this is done in a great measure by the addition of various pigments to the solution before mentioned.

The painter works with brushes of various sizes, made Tools.

of hog's bristles, or of hair with a mixture of bristles, and pencils made of badger's hair; these, with the addition of pots to hold his colours, a grinding-stone and grinder or muller for grinding or triturating them, a pallet and a pallet knife, dusting brushes and a scraping knife for cleaning iron-work before repainting, are almost his only implements. In painting the outside of windows he sometimes uses the glazier's horse. His materials are com- paratively few also; but for some purposes these require a great variety of ingredients, the preparation and combination of which, however, now devolves principally on the manufacturer or colourman, and not on the painter himself, is worked on the stone until they become a very fine powder ; with some, the more they are ground the better is the colour. The powder is moistened with a little water or oil, as necessary, from time to time. They should all be ground separately; it is not good to produce a tint by mixture until they are well prepared. Only the quantities necessary for the work undertaken should be got ready. Common colours are those which are produced by the addition to white lead (or zinc white) and oil of lamp-black, red lead, or any of the common ochres; blues, greens, rich reds, pinks, and yellows, &c., being more costly, are taken as such. Unfiatted white is a common colour ; flat- ted it classes with the rich colours. If the same surface be painted of two different tints, it is said to be in party colours. The substance generally constituting nine-tenths of the body of paint is carbonate of lead, commonly called white lead, the quality of which is therefore of the greatest importance

The colours are ground with a muller, which Colours,

Painting ood-work.

HOUSE-PAINTING. |

to the durability of the work. It is said to improve by being kept for several years before use. Three qualities are manufactured, and there are six or more chief modes of adulteration recorded, which accounts in some measure for the great difference in painters' prices, and the re- lative values of their work when done. 'The other metal- lic white paint occasionally used, especially in water colour painting, is zinc white. It is well known for its intense whiteness, its resistance to sulphurous and other deterior- ating causes, and its harmless qualities to the workman and the inmates of the house under decoration. Zinc white possesses less body than white lead, and great care is requisite that the colour when ground in oil is of sufficient cousistence to be laid on a flat surface without showing through ; any oil in excess will form a slight glutinous coating on the surface, retaining every particle of dust brought in contact with it, until it has evaporated. In general this white does not dry so quickly as the other colour, but this defect is remedied by the application of proper drying oils. It is asserted that in consequence of the great durability of the colour, the paint may be washed for a succession of three, four, and even five years ; and that after each successive washing the surface will be found as clear and bright as when fresh painted.

In painting or laying on the colour, the brush must be constantly at right angles to the face of the work, only the ends of the hairs, in fact, touching it, for in this manner the paint is at the same time forced into the pores of the wood and distributed equally over the surface. If the brush be held obliquely to the work, it will leave the paint in thick masses wherever it is first applied after being dipped for a fresh supply into the pot, and the surface will be daubed, but not painted. Paint- ing, when properly executed, will not present a shining, smooth, and glossy appearance, as if it formed a film or skin, but will show a fine and regular grain, as if the surface were natural, or had received a mere stain with- out destroying the original texture. Imitative grainings, however, and the varnishes which are intended to protect them, and make them bear out, necessarily produce a new and artificial texture; and for this reason some consider them to a greater or less extent disagreeable, however well the imitations may be effected. Carved mouldings and other enrichments have to be picked out with a pencil or small brush, that the quirks, &c., be not choked up.

As it must be presumed that all the wood submitted to the operations of a painter, which has passed through the hands of the joiner, is already well seasoned and pro- perly dry, it is only necessary to say generally, that the work should be free from moisture of any and every kind before paint is applied to it, or it will at the least prove useless, and probably injurious rather than beneficial. This remark applies alike to wood and to plastered work, both internal and external; that is, whether they be sub- jected to the more violent changes of the weather or not. Dampness or moisture in woods, stopped in or covered up with paint, will, under ordinary circumstances, tend to their destruction ; and in stuccoes it will spoil the paint, and most probably injure the plastering itself also. The first thing the workman has to attend to in painting uew wood-work is to prepare its surface for the reception of paint, by counteracting the effect of anything that may tend to prevent it from becoming identified with the material, Thus, in painting pine-woods, the resin in the knots which appear on the surface must be neutralized, or a blemish will appear in the finished work over every resinous part. In best work the knots should be cut out to a slight depth at the bench, and the holes filled up with a stiff putty made of white lead, japan, and turpentine. The next best way is to cover them with

gold or silver leaf. The usual method is to cover them with a size knotting, which is a preparation of red lead, white Jead, and whitening made into a thin paste with size. The common coating of red ochre is worth nothing.

The next process is that of priming, which consists in Coats of giving acoat of white lead with red lead and a little drier paint.

in linseed oil. This is the first coat, upon which the look of the finished work much depends. Inequalities or unevenuesses of surface must be reduced with sand-paper or pumice-stone, or made up with putty. The necessary process for killing knots will generally leave a film, which must be rubbed down; and the heads of nails and brads having been punched in, will present indentations, which should be stopped, as well as any cracks or other imperfections, with putty. A second coat is then given, consisting of white lead and linseed oil. It should have a good body, and be laid even. This coat, when thoroughly dry, is in best work rubbed down with fine sand paper and carefully examined to ascertain if any further stop- ping be required ; and then the third coat or ground colour is applied, of a somewhat darker tint than wanted when finished, having sufficient oil for easy working, but not too fluid,—about two-thirds oil and one-third turpen- tine are used. The flatting coat follows, the object of which is to do away with the gloss or glaze of the oil, by obtaining a flat appearance. White lead is mixed with turpentine, with sometimes a little copal varnish; the colouring matter is added, but always lighter than the ground colour, or it would when finished appear in a series of shades and stripes. Flatting must be executed quickly, on account of the evaporation of the turpentine, and the brush is generally, if not always, carried up the wall and not across it. Some painters use a large quantity of turpentine in the several coats for quick work, as it dries more rapidly ; but for good and lasting work no turpentine should be used. Flatted work is generally done only to best apartments, chief staircases, entrance halls, &c., and omitted in the upper rooms, in bedrooms, and in basements. All new wood-work should be painted a sufficient number of coats to “bear out” as it is called; this is a precaution against each coat being so much diluted with turpentine or other fluid as not to cover sufficiently, which is seen by a deadness in one part and a glaze in another. The priming coat and three others should be sufficient. Sometimes

plaster and new wood are first done over with clearcole, which is white lead ground up in water and size added. This prevents absorption of the oil, but the paint added subsequently is apt to blister or to crack off; it therefore should not be allowed.

Plaster and stucco to be painted requires some care in Painting on the workmanship of it, as noticed under “ Plaster-work,” plaster.

supra, to prevent bubbles, and must be quite dry. Some persons recommend a priming or a second coat of strong double size; the next coat then consists of white lead in oil as stiff as possible, and then another coat of size, and so on; but such work should be repudiated. A good first coat of priming, as much as the stucco will absorb, is essential.

All new outside work should be primed with red lead Outside or litharge, mixed in linseed oil; the second coat is of painting.

the same mixture if four-coat work is to be done, and in this coat all defects are to be made good; the third and fourth coats, as may be determined upon, are generally of the tint required.

In painting old work, where two coats are generally Old work.

considered sufficient, the surface must be well washed to get rid of all dirt and grease, and then rubbed down with pumice-stone to remove all inequalities. The work then receives one coat, after which any holes are stopped by the painter with putty; the second and perhaps a third

Metal painting,

Graining,

Marbling.

coat, or a flatting coat, are then applied. Sometimes each |

of the earlier coats is rubbed down.

Old ceilings and soffits of stairs are either washed to clean off the dirt and grease, stopped (which is cutting out the cracks and stopping them with new plaster), and whitened by a coat of whitening or Spanish white mixed with size; or after the two first operations they are finished in distemper, which is white lead and size; it presents a better appearance. Colouring is also done to plastered walls, the white being mixed in half linseed oil and half turpentine, and some earth added to make the tint re- quired. Limewhiting is done by the bricklayer's labourer. Stucco or plaster-work, which is intended to be painted, but which is not sufficiently dry to receive the oil, may have a coating of water colours, or distemper colour, as it is called, in order to give a more finished appearance to that part of the building. The colour selected should be ground very fine, and incorporated with the whiting and parchment, or other strong size. Two coats will be required to make it bear out uniformly. When the stucco is sufficiently dry, and it is desired to be painted, the whole of the above colouring has to be washed off, and the painting proceeded with as described for new work,

Metal-work, not being absorbent, only requires when new to have a priming, and one, two, or three coats of oil paints, as may be considered necessary. It should have a coat as soon after it leaves the founder or smith as pos- sible, to prevent early stages of oxidation. Old work should be cleaned, scraped, and filed if necessary, to remove rust, broken paint, and dirt.

Graining is understood among painters to be the imi- tating of the several different species of ornamental woods, as satin-wood, rose-wood, king-wood, air-wood, mahogany, wainscot or oak, and others. After the necessary coats of paint have been put on to the wood, a ground is then laid of Naples yellow and ceruse, diluted with turpentine if for satin-wood, which is left todry. The painter then prepares small quantities of the same yellow and ochre with a little brown, and boiled oil and turpentine, and having mixed this, spreads it over some small part of his work. The flat hog's hair brushes being dipped in the liquid and drawn down the newly laid colour, the shades and grainings are produced. To obtain the mottled appearance, the camel's hair pencils are applied, and when completed the work is left to dry, and afterwards covered by a coat or two of good copal varnish. Imitation wainscot requires the use of combs of various degrees of

fineness to obtain the grain (whence the process is calledcombing by some persons), and the flower is got by wiping off the colour with a piece of rag. When dry it is over-grained to obtain a more com- plete representation of the natural wood, and then varnished. Ifthe work be done in water colour and not in oil, beer grounds to act asa drier are mixed with the colour ; this sets it ready for varnishing. A “ patent graining-machine,” a sort of roller with a pattern upon it, has lately been introduced. The writer of this article suggested some years ago that deal well sized to prevent absorption might be at once grained either wainscot or pollard oak, without the preliminary operation, delay, and smell of painting. When dry it is to be varnished as usual. The effect is somewhat better than that obtained by the usual method of graining.

Marbling is the imitation of real marbles, granites, &c., some of which are represented by splashing on the carefully prepared ground, which should have been painted and often rubbed and polished to vbtain an even surface ; others have to be painted in colours, and then well varnished. The most expert at this sort of imitation do their work so as to prevent its easy detection except by the touch.

PUTEDIWG

Ornamental painting embraces the execution of friezes Ornamental and the decorative parts of architecture on walls and ceil- painting,

ings in chiaroscuro (or light and shade) or monochrome colouring. The ground is well prepared, and of the tint of the proposed work; the ornament and figures are drawn upon it, and are then painted and shaded to give them their due effect. This kind of work is sometimes painted on cloth and then fastened up. When the ornamental work is of a similar pattern throughout, as mouldings, fretwork,

a running ornament, d&., it is effected by stencilling, Stenciling,

This method consists in drawing a certain length of the pattern on paper, which is pricked through with a large sized needle, then laid on the wall to

be ornamented, and struck with a small linen bag containing powdered chalk; the chalk enters the apertures, and fixes itself against the paint, The painter then draws it, or fills in the pattern with colours. Another method is to cut out the pattern where possible, and the paper, being stiffened with size, is laid on the surface, and a brush filled with the colour passed over it ; the paper is carefully removed and laid on a fresh place, and soon. The pattern may then be touched up when dry with another tint, or with gold, or another pattern with minuter detail laid on it, and the operation repeated. A wall surface may be covered with such an ornamentation, of which paper hangings are a cheap substitute.

Many of these methods of decoration having been styled Unpainted shams, the promoters of real woods advocated the dis- Woods.

use of paints, &c. This has led to the increased use of deals and pines for inside doors, wainscots, linings, shutters, and the like, which, if not left as completed by the trades- men, are sized and varnished or polished. But in such a case a good selection of the wood is necessary, and it has to be picked. Another method is to stain the timber, as of roofs, galleries, and the like, or the joiners' work, so that it represents various tints of oak, aud this is pro- tected by a coat or two of varnish. These systems are open to the objection that the varnish, especially in towns, darkens rapidly, and every coat of it adds to the defect, so that in a few years paint is required to give the work the clean and lively appearance the wood originally possessed. Real wainscot, mahogany, and other woods are usually polished; the first is sometimes varnished after being properly prepared to prevent the rise of the grain which occurs when it is touched by a liquid.

Varnishing having been frequently referred to, we must Varnish- notice that there are many varieties useful for various pur- ™&

poses, Like white lead, oil, and turpentine, they are subject to much adulteration, whereby the work is deprived of its proper consistency, and the painter and his employer dis- satisfied with the result. There are drying varnishes made with spirit of wine; these are applied to some furniture, mouldings, &c. Varnishes made with essential oils, especi- ally those made with oil of turpentine or ether and pure copal, are very solid, and better than those made with fat drying oils, which, from their colour being dark, are

used only with grounds of a dark colour. Varnish can some- times be tinted to correct defects of colour in graining, &c. For wood-work copal varnish in oil should alone be used.

It is not within our province to enter upon the higher Decorative class of painting on walls, which comes under the trade of work.

the decorator, including that of the gilder and the artistic draughtsman and colourist, nor upon the higher class of paper-hangings. Decorations must necessarily depend upon the taste and skill required or employed in producing

them. Paper-hangings are paid for by the piece or yard, Wall- a piece being made in England twelve yards long and papers.

twenty inches wide, and the hanging is charged at so much the piece. A dozen of borders is twelve yards long; they are charged by the yard for the material, and by the dozen for hanging. Sizing and otherwise preparing the

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walls may be requisite before hanging the papers; and washing old papers from off the walls should always be insisted upon by the owner of a house, as accumulations of paste, colours, and size are apt to breed vermin, and, as some think, to give rise to fevers. French paper-hang- ings are only eighteen inches wide and nine yards long. Wood-linings, old panelled wainscoting, and other irregular surfaces, require to be canvased and papered before the decorative paper is hung, otherwise it is liable to crack with the shrinking of the wood.

‘ decorations for apartments.

The principal publications on house painting arc as follows: —Tingry, Painter’s and Varnisher’s Guide, 8vo, 1832, 3d edit.; Higgins, Painter’s and Deeorator’s Companion, 4to, 1841; Arrow- smith, House Decorator’s and Painter’s Guide, 4to, 1840 ; Field, Rudi- ments of the Painter’s Art, 12mo, 1850, and his Chromatography, 4to, 1841; Smith, The Art of House Painting, 12mo, 1687, improved by W. Butcher, 8vo, 1821; Whittock, Decorative Painter’s Guide, 4to, 1841; Moxon, Grainer’s Guide, 1842; Barber, Painter’s Assistant, 12mo, 1852; Wood and Marble Imitator’s Manual, 8vo, Edinb. There are two or three French journals which give ex- amples of imitations of woods and marbles, and illustrations of (W. P.)

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BUILDING SOCIETIES, or societies '' for the purpose of raising, by the subscriptions of the members, a stock or fund for making advances to members out of the funds of the society upon freehold, copyhold, or leasehold estate by way of mortgage," may be "either terminating or permanent" (37 and 38 Vict. c. 42, § 13). :

A "terminating" society is one " which by its rules is to terminate at a fixed date, or when a result specified in its rules is attained;" a " permanent " society is one "which has not by its rules any such fixed date or specified result, at which it shall terminate" (§ 5).

A more popular description of these societies would be,—Societies by means of which every man may become 'his own landlord," their main purpose being to collect together the small periodical subscriptions of a number of members, until each in his turn has been able to receive a sum sufficient to aid him materially in buying his dwelling- house.

The origin and early history of these societies is not very clearly traceable. A mention of " building clubs" in Birmingham occurs in 1795; one is known to have been established by deed in the year 1809 at Greenwich ; another is said to have been founded in 1825, under the auspices of the earl of

Selkirk at Kirkcudbright in Scot- land, and we learn (Scratchley On Building Societies, p. 5) that similar societies in that kingdom adopted the title of ‘“‘ menages.”

When the Friendly Societies Act of 1834 gave effect to the wise and liberal policy of extending its benefits to societies for frugal investment, and generally to all associa- tions having a similar legal object, several building socie- ties were certified under it,—so many, indeed, that in 1836 a short Act was passed (6 and 7 Will. IV. cap. 32), confirm- ing to them the privileges granted by the Friendly Societies Act, and according to them the additional privileges (very valuable at that time) of exemption from the usury laws,

simplicity in forms of conveyance, power to reconvey by a mere endorsement under the hands of the trustees for the time being, and exemption from stamp duty. This Act remained unaltered till 1874.

The early societies were all “ terminating,’—consisting Terminat- of a limited number of members, and coming to an cnd as ing soon as every member had received the amount agreed Societies.

upon as the value of his shares.

Take, as a simple typical example of the working of such a society, one the shares of which are £120 each, realizable by sub- scriptions of 10s. a month during 14 years. Fourteen years hap- pens to be nearly the time in which, at 5 per cent. compound interest, a sum of money becomes doubled. Hence the present value, at the commencement of the society, of the £120 to be real- ized at its conclusion, or (what is the same thing) of the subscrip- tions of 10s. a month by which that £120 is to be raised, is £60. If such a society had issued 120 shares, the aggregate subscriptions for the first month of its existence would amount to exactly the sum required to pay one member the present value of one share. One member would accordingly receive a sum down of £60, and in order to protect the other members from loss, would execute a mortgage of his dwelling-house for ensuring the payment of the future sub- scription of 10s. per month until every member had in like manner obtained an advance upon his shares, or accumulated the £120 per share.

As £60 is not of itself enough to buy a house, even of the most modest kind, every member desirous of using the society for its ori- ginal purpose of obtaining a dwelling-house by its means would require to take more than one share. In this respect the Act of 1836 presented a curious inconsistency; it limited the amount of each share to £150, and the amount of the monthly contributions on each share to £1, but did not limit the number of shares a member might hold. If its purpose in this respect was to confine the operation of these societies to the industrial classes, it was de- fective. The only rational explanation of the provision is that it was ‘an anticipation of the modern system of limited liability.

The earlier formed societies (in London at least) did not Names of usually adopt the title “ Building Society ;” or they added to societies.

it some further descriptive title, as “ Accumulating Fund,”

“ Savings’ Fund,” or “Investment Association.” Several

are described as “Societies for obtaining freehold property,” IV. — 65

Permanent societies.

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or simply as ‘ Mutual Associations,” or ‘“ Societies of Equality.” The building societies in Scotland are mostly called “ Property Investment Companies,” or by some similar name. Although the term “ Benefit Building Society” occurs in the title to the Act of 1836, it was not till 1849 that it became in England the sole distinctive name of these societies ; and it cannot be said to be a happy description of them, for as ordinarily constituted they undertake no building operations whatever, and merely ad- vance money to their members to enable them to build or to buy dwelling-houses or land.

The name “ Building Society,” too, leaves wholly out of sight the important functions these societies fulfil as means of investment of small savings. The

Act of 1836 defined them as societies to enable every member to receive the amount or value of a share or shares to erect or purchase a dwelling-house, &c., but a member who did not desire to erect or purchase a dwelling-house might still receive out of the funds of the society the amount or value of his shares, improved by the payments of interest made by those to whom shares had been advanced.

About 1846 an important modification of the system of these societies was introduced, by the invention of the “permanent” plan, which was adopted by a great number of the societies established after that date. It was seen that these societies really consist of two classes of members; that those who do not care to have, or have not yet re- ceived, an advance upon mortgage security are mere inves- tors ; and that it matters little when they commence invest- ing, or to what amount, while those to whom advances have been made are really debtors to the society, and arrangements for enabling them to pay off their debt in various terms of years, according to their convenience, would be of advantage both to themselves and the society. By permitting members to enter at any time without back- payment, and by granting advances for any term of years agreed upon, a continuous inflow of funds, and a continu- ous means of profitable investment of them, would be secured. The interest of each memper in the society would terminate when his share was realized, or his advance paid off, but the society would continue with the accruing sub- scriptions of other members employed in making other advances.

Under this system Building Societies have largely in- creased and developed. In the county of Middlesex alone, 1600 societies were certified between 1836 and 1874; in

‘ that of Lancaster, 1300; and the total number of societies

Starr Bow- kett societies,

established in England and Wales cannot be less than between 5000 and 6000.

Deducting the terminating societies which have reached their ter- ination, and the permanent societies which have failed or been dissolved, it is

estimated that more than 2000 societies are still in existence. The operations of some of these societies are very extensive. The Queen's Building Society at Manchester has an income of £734,578, and assets amounting to £910,224 ; a society at Halifax has an income of £261,654, and assets £430,683 ; one at Burnley £221,508 income, and £324,919 assets (Report of Registrar, 1875), There are also several large societies in Scot- land,

The total funds and income of building societies cannot be accurately ascertained ; but the Royal Commissioners who inquired into the subject in 1872, estimated the total assets of the societies in 1870 at 17 millions, and their annual income at 11 millions. The larger societies are in the North of England, where, indeed, all classes of provident associations, notably friendly societies and co-operative societies, are more fully developed than in the South. To this remark, however, there is one exception, viz., the Birkbeck Building Society, London, whose receipts for the year 1874 amounted to 44 millions, but by far the larger portion of that enormous sum consisted of deposits paid to the society as a banker.

A variety of the terminating class of societies has met with some favour of late years, under the name of ''Starr Bowkett " or "'mutual" societies, of which about 200 have been established. They differ from the typical society above described, in the contri-

bution of a member who has not received an advance being much smaller, while the amount of the advance is much larger, and it is made without any calculation of interest. Thus a society will issue say 500 shares, on which the contributions are to be 1s. 3d. per week, and, as soon as asum of £300 has accumulated, will allot it by ballot to one of the shareholders, on condition that he is to repay it without interest by instalments in 10 or 12% years, and at the same time to keep up his share-contributions. The fortunate recipient of the appropriation is at liberty to sell it, and frequently does so at a profit ; but (except from fines) no profit whatever is earncd by those who do not succeed in getting an appropriation, and as the number of members successful in the ballot must necessarily be small in the earlier years of the society, the others frequently become dis- contented and retire. These societies cannot, of course, borrow money, for as they receive no

interest they cannot pay any. The plan has recently been modified by granting the appropriations alternately by ballot and sale, so that by the premiunis paid on the sales (which are the same in effect as payments of interest on the amount actually advanced) profits may be earned for the investing members.

A further modification of the ‘‘ mutual” plan is to make all the appropriations by sale. The effect of this is to bring the mutual society back to the ordinary form ; for it amounts to precisely the same thing for a man to pay 10s. a month on a loan of £60 for 14 years, as for him to borrow a nominal sum of £84 for the same period, repayable in the same manner, but to allow £24 off the loan as a ‘‘ bidding” at the sale. The only difference between the two classes of societies is that the interest which the member pays who bids for his advance depends on the amount of competition at the bidding, and is not fixed by a rule of the society.

In 1874 an Act was passed at the instance of the building societies Act of conferring upon them several valuable privileges, and relieving 1874.

them of some disabilities and doubts, which had grown up from the

judicial expositions of the Act of 1836. Building societies are now

incorporated bodies, and the members, and all who derive title

through them, henceforth will not have to trace that title through

a succession of trustees for a society. Again, a distinct declaration

is given to the members of entire freedom from liability to pay any-

thing beyond the arrears due from them at the time of winding up,

or the amount actually secured by their mortgage deeds. Power to

borrow money is also expressly given to the societies by the Act, but upon two conditions :—that the limitation of liability must be made

known to the lender, by being printed on the acknowledgment for. the loan, and that the borrowed money must not exceed two-thirds

of the amount secured by mortgage from the members, or, in a tcr-

minating society, one year's income from subscriptions.

Previous to the passing of the Act (or rather to the judicial deci- sion in Laing v. Read, which the clause of the Act makes statutory) there had been, on the one hand, grave doubts on high legal author- ity whether a society could borrow money at all; while, on the other hand, many societies in order to raise funds carried on the business of deposit banks to an extent far exceeding the amounts used by them for their legitimate purpose of investment on mort- gage. Itis now enacted, that if a society borrow more than the statute authorizes, the directors accepting the loan shall be person- ally responsible for the excess.

The history of building societies thus briefly traced shows great progress in the past and equal promise for the future. The social and moral utility of societies established for the direct purpose of aiding a man to become proprietor of his dwelling-house is obvious, and the extent to which that purpose has been effected is very con- siderable.

It may be mentioned that building societies flourish in America. (notably in Massachusetts, where they are called ''Mutual Loan Fund Associations," and Pennsylvania), and in the British colonies, especially that of Victoria, Australia. (E. W. B.)

BUITENZORG, the capital of an assistant-residency in the island of Java, is situated in 6° 37' S. lat. and 106° 52' E. long., and is 66 miles 8. of Batavia, with which it has been connected by rail since 1872. Lying 830 feet above the level of the sea, and possessing a salubrious climate, it is becoming a favourite place of residence for the Dutch of the greater city. Its principal buildings com- prise the new church, which serves both for Protestant and Roman Catholic worship, a mosque, the regent's mansion, excellent barracks for the garrison, a prison, built in 1848, a bathing establishment, and the country palace of the governor-general. This splendid edifice occupies the site of the old castle, which was founded in 1744 by Baron van

Imhof, enlarged by Daendels in 1809, restored by Van der Capellen in 1819, and destroyed by an earthquake in 1834. The botanical gardens, laid out in 1817 by Van der Capellen, are among the finest and most extensive in the world. In

the neighbourhood of Buitenzorg is Battou-Toulis-Coca- batou, a sacred wood held in high veneration by the natives.

BUJALANCE, a town of Spain, in the province of Cordova, and about 25 miles E. of that city. It contains a Moorish castle flanked with towers, two hospitals, a found- ling asylum, and a seminary for the education of girls. Leather and woollen cloth are manufactured. Population

8946.

BUKOWINA, a duchy and crown-land of the Austrian empire, bounded on the N. and N.W. by Galicia, W. by Hungary and Transylvania, 8. by Moldavia, and E. by Moldavia and Russia. It has an area of 4036 English square miles, and the population in 1869 amounted to. 511,964, of whom 255,919 were males and 256,045 females. The country, especially in its southern parts, is largely occupied by offshoots of the Carpathian mountains. Its northern border is skirted by the Dniester, and a con- siderable section is drained by the Pruth, but by far the

larger portion belongs to the system of the Danube, and is.

watered by the head streams of the Sereth, the Moldava, and the Bistritza. The climate is healthy but severe, especially in winter; and the soil, particularly in the north, is of gréat fertility. A large part of the surface, — according to official statistics in 1870, no less than 1,050,849 acres, or nearly one-half of the whole,—is occupied by woodland ; and the very name of the country is derived from the abundance of beech-trees. Wheat, rye, oats, maize, barley, beans, potatoes, flax, and hemp are all more or less cultivated ; and about 643,319 acres of arable land are under tillage. Gardens and meadows occupy 301,706 acres, vineyards 11, and pasture 290,531. In 1870 the number of horses in the duchy was 42,649, cattle

224,424, sheep 217,918, goats 18,786, and swine 133,385, while the bee stocks amounted to no fewer than 27,091. The mineral productions comprise copper, iron, lead, silver, coal, salt, sulphur, and alabaster, some of which, however, are only yielded in very moderate quantities. In1870 the iron ore obtained amounted to 5808 tons, the copper to 945, and the salt 2590. The principal mineral springs are at Dorna-Watra, Jakobeny, and Lopuszna, but none of them as yet are much frequented. The country is divided into the eight districts of Czernowitz, Kimpolung, Kotzmann, Radautz, Sereth, Storozynec, Suczawa, and Wisznitz, the capital Czernowitz forming a separate and ninth division. There are seven towns in all, eight market-villages, and 456 hamlets, the most populous places being Czernowitz with 33,884 of a population, Radautz 9429, Suczawa 7450, Sereth 6486, Kuszusmare 6419, and Kimpolung 5561. Industrial activity is still comparatively slight, the most important establishments being the breweries, of which there were fifteen in 1870, and the distilleries, which numbered forty-nine. The population is of various origin,— about 180,000 being Roumanians, 200,000 Ruthenians, and the rest Germans, Poles, Jews, Hungarians, &c. The German language alone is used in twenty-one of the village schools, and Roumanian in forty-nine, while in many both are inuse. In 1869 there were 376,946 adherents of the Greek church, 74,347 Catholics, 11,393 Protestants, and 47,772 Jews, the total population amounting to 511,964, while in 1857 it was only 456,920. The Bukowina diet _ consists by the law of 1861 of thirty members, includ- ing, besides the bishop, ten appointed by the landed proprietors, seven by the towns, and twelve by the rural communes. Five members are sent to the im- perial diet. Originally a part of Transylvania, Bukowina, passed in 1482 to Moldavia, and in 1775 to Austria, who united it in 1786 as the Czernowitz circle with Galicia, but in 1849 raised it to its present independ- ence.

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BULACAN, the chief town of a province of the same name in the Philippine island of Luzon, situated on an arm of the Pampanga delta, about 15 miles N. of Manila. With the exception of the churches and a few stone buildings, it was completely destroyed by fire in 1859, oe since been rebuilt. Population estimated at about

10,000.

BULANDSHAHR, a district of British India, in the Meerut division, under the jurisdiction of the Lieutenant- Governor of the N.W. Provinces; lies between 28° 3’ and 28° 43’ N. lat., and 77° 28’ and 78° 32’ E. long. It is bounded on the N. by the district of Meerut; on the E. by the districts of Moradabad and Budaun; on the 8. by the district of Aligarh ; and on the W. by the districts of Gurgaon and Delhi. The district stretches out in a level plain, with a gentle slope from north-west to south-east, and a gradual but very slight elevation about midway between the Ganges and Jumna. Principal rivers, the Ganges and Jumna,—the former navigable all the year round, the latter only during the rains; minor rivers, Hindan and East Kali Nadi, not navigable. The Ganges canal intersects the district, and serves both for irrigation and navigation. Area of Bulandshahr district, 1910 square miles, of which 1368 are under cultivation ; 346 cultivable, but not actually under cultivation ; and the rest uncultivable waste. Population in 1872, 936,593 souls, residing in 182,694 houses, and inhabiting 1566 villages ; persons per square mile, 490; per village, 598; per house, 51. Of the total population 760,602 or 81:2 per cent. were Hindus ; 175,900 or 18°8 per cent. Mahometans ; and 91 Christians and others. .

Cotton, indigo, sugar, wheat, tobacco, barley, millet, and various kinds of pulse, form the principal agricultural products. The chief traffic routes are—(1), Road from Meerut to Aligarh ; (2), from Delhi to Bareilly ; and (8), between Delhi and Anupshahr. The East Indian Railway passes through the district. Total revenue in 1870-71, £176,422, of which £155,675, or 88 per cent., was from land. The regular constabulary police consisted of 528 men in 1870-71, besides the rural or village watch. Bulandshahr district contained 302 schools in 1872-78, attended by 6959 pupils. The following twelve towns in the district have upwards of 5000 inhabi- tants :—1. Baran or Bulandshahr, the administrative headquarters, situated on the right bank of the Kali Nadi, on the route from Bareilly to Delhi, in 28° 24’ N. lat. and 77° 56’ E. long. ; area, 111 acres ; population, 14,804; municipal income in 1872, £1075; expenditure, £1139, 2s. ; rate of municipal taxation, 1s. 53d. per head. 2. Dibai—area, 106 acres; population, 7782; municipal income, £346, 16s. 9d.; expenditure, £298, 7s. 4d.; rate of taxa- tion, 103d. per head. 3. Anupshahr—area, 123 acres; population, – 9336 ; municipal income,

£598, 14s.; expenditure, £532, 14s.; rate of taxation, 1s. 38d. per head. 4. Jahangirabad—114 acres ; population, 9408 ; municipal income, £571, 3s. 5d. ; expenditure, £456, 12s. 9d.; rate of taxation, 1s 2§d. 5. Shikarpur—area, 115 acres ; population, 11,150; municipal income, £485, 19s. 6d. ; expenditure, £408, 11s. 9d. ; rate of taxation, 92d. per head. 6. Dankaur—area, 251 acres; population, 5423; municipal income, £189, 2s. 4d. ; expenditure, £163, 9s. 1d. ; rate of taxation, 83d. perhead. 7. Jhajhar—area, 50 acres ; population, 5632 ; municipal income, £241, 15s. 5d.; expenditure, £199, 2s. 9d. ; rate of taxa- tion, 108d. perhead. 8. Jewar—area, 78 acres ; population, 7399 ; municipal income, £282, 14s. 4d. ; expenditure, £233,17s. 1d.; rate of taxation, 93d. per head. 9. Siyana—area, 65 acres ; population, 6268; municipal income, £294, 14s. 5d. ; expenditure, £251, 9s. 4d.; rate of taxation, 114d. 10. Gulaothi—area, 44 acres ; population, 5608 ; municipal income, £239, 0s. 8d. ; expenditure, £223, 2s. 7d. ; rate of taxation, 104d. per head. 11. Khurja—area, 206 acres ;

opulation, 26,858 ; muncipal income, £2301, 14s.; expenditure, £3028, 10s. ; rate of taxation, 1s. 83d. per head. 12. Sikandarabad —area, 199 acres ; population, 18,349 ; municipal income, £988 ; expenditure, £5389, 10s. ; rate of taxation, 1s. 0¢d. per head. The climate of the district is liable to extremes, being very cold in the winter and excessively hot in the summer.

Towards the end of the last century, the district passed into the hands of Perron, a French common sailor, who had won his way up to the rank of a generalin the Marhatta service. Its annexation formed one of the leading points in the Marquis Wellesley’s policy, and it was ceded to us by the Scindia treaty of 1803. Bulandshahr enjoyed a bad conspicuousness in the mutiny of 1857, when the Gujar peasantry plundered the towns.

Agricul- ture.

Minerals,

Communi- cation.

Divisions,

Towns.

Population.

516

BULGARIA, otherwise known as the vilayet Tuna or province of the Danube (though the two do not absolutely

coincide), is a political division of European Turkey, which

stretches along the right bank of the Danube from the influx of the Timok to its mouth, and is bounded on the south by the main chain of the Balkan, which separates it from Rumelia. On the east it is washed by the Black Sea, and on the west is conterminous with Servia. Its area is estimated at 32,932 square miles. described as a great table-land, sloping with more or less regularity towards the river, having its surface broken with numerous offshoots and underfalls of the southern mountains, and furrowed by the channels of the many streams to which those heights give rise. By far the larger proportion of the area belongs to the basin of the Danube, which in this part of its course receives from the right the Jibritza, the Ogust, the Shit, the Isker, the Vid, the Osma, the Yantra, the Lom, and the Kosliashilar. A few streams (mostly small) find their way directly to the Black Sea, the only one of importance being the Kamtchyk, which drains the eastern extremity of the Balkan. In summer many of the smaller streams are almost dried up ; but before harvest is fairly over, the wet season frequently sets in, and in spring again there is an abundant rainfall. Throughout the most of the province the soil is excellent, and if it were properly cultivated would yield the richest crops. As it is, the inhabitants are able not only to supply their own wants, but to furnish a considerable export of agricultural produce. The cereal most abundantly grown is wheat, but Indian corn is also pretty common with the Mussulman farmers. Little hay is made, and turnips are quite unknown. Potatoes are only cultivated by the Tatar settlers in the Dobrudsha. The peach, the apri- cot, the grape, and many other fruits come to great perfec- tion ; and wine is manufactured in considerable quantities, but in a very careless and rude manner. The buffalo is the animal chiefly used in agricultural labour, though horses are sufficiently common. Cows, pigs, and goats are also kept, and sheep-farming is largely carried on in many parts, but the character of the various stocks is very poor. The mineral wealth of the province is totally neglected, and its rich supplies of timber

are often heedlessly wasted. Roads can hardly be said to exist ; for though several have been constructed by enterprizing pashas, they have soon been allowed to fall into total disrepair. A single railway line stretches from Kustendji to Chernavoda on the Danube A considerable amount of traffic, however, is carried on by the river, and the export trade on the Black Sea is of growing importance. The province is politically divided into the sandjaks of Rustchuk, Nissa, Widdin, Tirnova, Sofia, Varna, and Tulcha. Its principal towns are Widdin, Nikopoli, Sistova, Rustchuk, Rassova, and Hirsova along the Danube ; Kustendji, Baltshik, and Varna on the coast; and Babadagh, Basarjyk, Shumna, Tirnova, Lovatz, and Vratza. The population, which amounts to from two to two and a half millions, is of various elements, and is estimated as follows :— Bulgarians proper… .cose Five cecsies nnes about 1,500,000

Osniamilia Tums he. ceee ee eee oe 500,000 AN AIEOONS pes. eho vice ec en ee ee from 80,000 to 100,000 Cireassiamsy.. sa 5.19 eee », 70,000 to 90,000 P3200 20 ene ere. 60,000 or 70,000 Roumammians: .....00ceeeseees cee seen 35,000 or 40,000 Le: SO nA, Sa Orne Omi tn! . 20,000 or 25,000 SIO E 5 2. c’siGairns neta ene eee eee about 10,000 PJ 1.5 521, niierreme Bee clon nan Oe >», 10,000 TE COM MN so cp san cidonter xe eas eee » 10,000 CC nCn ee ge 7,000 or 8,000 dd. eT en Re 4,000 or 5,000 Germans, Italians, Arabs, &C. .....ccccesceeeceeees say 1,000

The population along the coast is of a very mingled description, the genuine Bulgarian looking down on the

It may be roughly.

BULGARIA

Gagaous, as he calls the mongrel race, with no small con- tempt. The Tatars are emigrants from the Crimea, who were permitted to leave the Russian empire after the last war. They are industrious and prosperous, but the Cir- cassians, who have fled from the Caucasus at the advance of Russia, are for the most part very poor. The Turks, Tatars, Albanians, and Circassians are Mahometans; the Roumanians, the Armenians, and most of the Russians

belong to the Greek Church ; and the Gypsies are part Mahometan, part Christian, and part Pagan.

The Bulgarians were originally a people of Ugrian or Finnish ex- History,

traction,—according to Professor Résler, a Samoyede race. They appear for the first time in history about 120 3.c., when a band, under the leadership of a chieftain ealled Vound, took refuge in Armenia and settled on the banks of the Araxes. They are next mentioned by Bishop Eunodius as marching towards the left bank of the Danube, and in the following century they became known to the Byzantine empire as a hostile power. About 660 they seem to have broken up into several divisions, of which the most important crossed the Danube under Asparuch (third son of Kubrat, who had delivered them from the domination of the Avars), settled in Meesia, subjugated the Slavonic population, and extorted tribute even from the Greek emperor. The kingdom thus founded gradually extended northwards to the country of the Theiss, and south over a large part of the peninsula. Its most prosperous period was the reign of Simeon (893-927), who not only made himself formidable to the Greeks as a warrior, but also took an interest in the internal pro- gress of his eountry, securing the establishment of Christianity, which had been introduced by Boris or Bogoris about 862, and bestow- ing his patronage on the early efforts of native literature. After his death decay began; the Russians aud Petchenegs invaded the country, and the Byzantine emperors took no rest till the Bulga- rians, sadly diminished in numbers, acknowledged the supremacy of Basilius in 1019. More than a century and a half later, two brothers, Peter and Asan or Yusan, headed a successful insurreetion, and founded what is known as the Bulgaro-Wallachian kingdom of the Asanides, which, after maintaining itself against the Byzantines and the Hungarians, and even becoming master of Macedonia and Thrace, at last fell under the Tatar yoke, and was finally subjugated to Turkey by the fatal battle of Kossova.

The Bulgarians retain but little trace of their Finnish origin ; Race and that they were recognized as belonging to that raee is shown by the Language

name Unnogonduri, applied to them by the Byzantines. They still have high cheek bones ; their hair is light and thin ; their eyelids do not open wide ; and the general form of the face is frequently oval. Of their condition in

heathen times little is known, though a few important deductions, such as that they had slaves, can be drawn from the questions presented by them to the Pope in 866. (See Acta Conciliorum, v.) They were so far Slavonicized by the 9th century that the church service was held in Slavonic. At present, though their language is still fundamentally Slavonic, and 1s usually placed between the Russian and the Servian, yet it is largely mingled with Turkish and Persian, and has even a consider- able clement of Italian and Greek. The Turkish influence not only appears in the vocabulary, but it is no uncommon thing, especially in the more pretentious forms of speech, for Slavonic verbs to be conjugated in the Turkish mode. A grammar was published in 1852 by A. and D. Kyriak Canckof, and Miklosch has devoted him- self to the study of the dialects. Of early literary remains there.is an almost total lack ; but a number of popular songs that seem to have been handed down, perhaps from heathen times, have been collected. (See Dozon's Les Chants Populaires Bulgares, Paris, 1874.) These songs have little or no poetic merit, but are full of wild cosmogonic myths. The modern literature is written in a dialeet which is hardly understood by the mass of the people, and its existence is largely due to foreign influence. The alphabet in use is a compound of letters from the seeular and eeclesiastical alphabets of Russia.

Though nominally members of the Greek Church, the Bulgarians Religion.

are In many respects as pagan as they were centuries ago, and their superstitions are almost countless. The elergy, appointed by the heads of the church at Constantinople, are deplorably ignorant, and frequently know as little as their flocks of the meaning of the prayers which they read in Greek. Their arbitrary and oppres- sive dealings excited a strong movement of revolt about 1860, and the bishops were expelled from many of the towns. A junc- tion with the Roman Catholics, to whom the national church of Bul- garia has frequently shown a leaning, was proposed by one patty, which soon found numerous supporters; but the agitation will probably end in the establishment of an independent Bulgarian hierarchy.

No inconsiderable number of Bulgarians are to be found beyond Emigra- They form a more or less im- tion.

the province that bears their name. portant element in the whole region from the Danube to the Aigean, and from the Black Sea to Eastern Albania. Goehlert reckons that

there are 4,000,000 in the Turkish empire, and Professor Szabo makes their number in Servia 100,000. As early as the 14th cen- tury emigration took place to the Banat, where the Bulgarians number upwards of 23,000; and in Transylvania there is a colony which retains its dialect. (See Denkschriften d. Wien. Akad., Phil.- hist. Cl., 1856.) Much more important are the Bulgarian settle- ments in Bessarabia, which in 1862 numbered 70,000 inhabitants. These began to be formed as early as 1787, and received strong acces- sions from 1801 to 1812. The chief town which owed its existence to this transmigration is Bolgrad, on Lake Yalpuk, which passed with a portion of Bessarabia to Moldavia in 1851. About 1865 it had 9000 inhabitants.

For further information the reader may consult Jochmus's " Journey into the Balkan in 1847″ (Jour. R. Geog. Soc. 1854); Fraihn, in Men. de l'Acad. de St Petersbourg, série vi. tom. i.; Lejean, Ethnographie dela Turquie d Europe, 1861 ; St Clair and Brophy, Residence in Bulgaria, 1869; Tozer, The Highlands of Turkey, 1869; Sax," Skizze von Bulgarien," in Afittheil. der K. K. Geogr. Gesellsch. in Wien, 1869; Kanitz, Serbien, Hist.-ethnogr. Reisestudien, 1868, and Donau, Bulgarien, und der Balkan, 1875; Bradaska, " Die Slaven in der Turkei" (Petermann's Mittheil., 1869, xii); R. Roésler, Riimanische Studien, 1871.

BULGARIN, Tuappius (1789-1859), a distinguished Russian writer, was born in Lithuania. His father was an officer under Kosciusko in the last disastrous Polish cam- paign. By some influence of friends Thaddaus was entered at the college for military cadets at St Petersburg, and after- wards received a commission in the Russian army, with which he served against Napoleon and in Finland. He then left the Russian army, joined the Poles under Napoleon, and took part in nearly all the great campaigns in Spain, Germany, and Russia. After the fall of the emperor he took up his residence in Warsaw, and devoted himself to literature, writing in his native Polish language. In 1819 he removed to St Petersburg, learned Russian, and became Russian in every way. He edited, alone or in conjunction with

Gretch, the Northern Archives, the Northern Bee, and the Russian Thalia, In 1829 his first novel, Juan Vuizhagen, gained great popularity. A continuation was afterwards published under the title Peter Ivanovitch Vuizhagen. Uis other works comprise two novels, Demetrius and Mazeppa, an Account of Russia (Russia in an historical, statistical, geo- graphical, and literary point of view), and his Remznascences. An English translation of his best novel, Jvan Vuizhagen, was published in 1831. {

BULGARUS, the most celebrated of the famous “Four Doctors” of the law school of Bologna. He is some- times erroneously called Bulgarinus, which was properly the name of a jurist of the 15th century. Bulgarus was a native of Bologna, and was regarded as the Chrysostom of the Gloss-writers, being frequently designated by the title of the “ Golden Mouth ” (os aureum). The time of his birth is not known. A popular tradition represents him to have been a pupil of Irnerius, but unfortunately nothing is known of Irnerius after 1118 a.p. Bulgarus, on the other hand, died in 1166 a.p., having attained a great age, and having become childish before his death. There is thus no inseparable difficulty in point of time in accepting this tradition as far as regards Bulgarus, although Savigny considers the general tradition to be inadmissible which represents all the Four Doctors to have been pupils of Irnerius. Martinus Gosia was the next most celebrated of the Four Doctors. He and Bulgarus were the chiefs of two opposite schools at Bologna, corresponding in many respects to the Proculians and Sabinians of Imperial Rome, Martinus being at the head of a school which accommodated the law to what his opponents styled the equity of “the purse” (egquitas bursalis), whilst Bulgarus adhered more closely to the letter of the law. The school of Bulgarus ultimately prevailed, and it numbered amongst its adhe- rents Joannes Bassianus, Azo, and Accursius, each of whom in his turn exercised a commanding influence over the course of legal studies at Bologna. Bulgarus took the leading part amongst the Four Doctors at the diet of Roncaglia in 1158, and was one of the most trusted advisers of the Emperor Frederick I. His most celebrated work is his commentary De Regulis Juris,

which was at one time printed amongst the writings of Placentinus, but has been properly reassigned to its true author by Cujacius, upon the internal

evidence contained in the additions annexed to it, which are undoubtedly from the pen of Placentinus. Savigny considers this Commentary, which is the earliest extant work of its kind emanating from the school of the Gloss-writers, to be a model specimen of the excellence of the method introduced by Irnerius, and a striking example of the brilliant results which had been obtained in a short space of time by a constant and exclusive study of the sources of law.

BULL, Papat. See BuLts anD BRIEFs.

BULL, Grorce (1634-1710), bishop of St David's, was born at Wells, and educated at Tiverton school, Devonshire. He entercd Exeter College, Oxford, but had to leave in consequence of his refusal to take the oath of allegiance to the Commonwealth. He was ordained privately by Bishop Skinner in 1655. The first benefice he enjoyed was that of St George's near Bristol, from which he rose successively to be rector of Suddington in Gloucestershire, prebendary of Gloucester, archdeacon of Llandaff, and in 1705 bishop of St David's. He died February 17,1710. During the time of the Commonwealth he adhered steadily, though with great prudence, to the forms of the Church of England, and in the reign of James II. preached very strenuously against the errors of Romanism. His works are among the most solid contributions made to theological learning by the Church of England. They uniformly display great erudition and powerful thinking. The Harmonia Apostolica, published in 1670, is an attempt to show the fundamental agreement between the doctrines of Paul and James with regard to justification. The Defensio Fidet Nicene, his greatest work, published in 1685, tries to show that the doctrine of the Trinity was an article of faith in the Christian church before the Council of Nicza. It still retains value as a thoroughgoing examination of all the pertinent passages in early church literature. The Judicium Fclesie Catholice obtained for him the thanks of the French clergy. His last treatise, Primitive and Apostolical Tradition, was published shortly before his death. The best edition of his works is that in 7 vols., published at Oxford by the Clarendon Press, under the superintendence of the Rev. E. Burton. This edition contains the Life by Nelson. The Harmonia, Defensio, and Judicitum are translated in the Library of Anglo- Catholic Theology.

BULL, Joun, a distinguished English composer and organist, was born in Somersetshire about 1563. In 1591 he was appointed organist in the Queen's chapel in suc- cession to Blitheman, from whom he had received his musi- cal education ; in 1592 he received his degree of doctor of music at Cambridge University ; and in 1596 he was made music professor at Gresham College, London. As he was unable to lecture in Latin according to the foundation-rules of that college, the executors of Sir Thomas Gresham made a dispensation in his favour by permitting him to lecture in English. He gave his first lecture on 6th October 1597. — He afterwards visited France and Germany, and was every- where received with the respect due to his talents. The story told by Anthony Wood of Dr Bull's feat at St Omer, which consisted in adding, within a few hours, forty parts to a composition already written in forty parts, is simply impossible. Honourable employments were offered to him by various Continental princes ; but he declined them, and returned to England, where he was appointed organist to James I. in 1607, and in the same year resigned his Gresham professorship. In 1613 he again went to the Continent on account of his health; and, in the Nether- lands, entered into the service of the archduke. In 1617 he was appointed organist to the cathedral of Nétre Dame

at Antwerp, and he died in that city on the 12th March 1628. The usual statement that he died at an earlier date at Hamburg or Liibeck is incorrect. Little of his music has been published, and the opinions of critics differ much as to its merits) A claim made on his behalf to the composition of the music of the English national anthem has given rise to much discussion, but it seems now generally agreed that the claim is not well founded. Contemporary writers speak in the highest terms of Bull's skill as a performer on the organ and the virginals. BULLA (literally a bubble) was the term used by the Romans for any boss or stud, such as those on doors, sword-belts, shields, &c. It was applied, however, more particularly to an ornament, generally of gold, worn sus- pended from the neck by children of noble birth until they assumed the toga virilis, when it was hung up and dedi- cated to the household gods. See Costume. In ecclesi- astical and medizval Latin, bw//a denotes the metal seal of oval or circular form, bearing the name and generally the image of its owner, which was attached

to official docu- ments. The bulla of the empire was of gold, while the Papal bulla was of lead. See Bunts and Briers. BULLFINCH (Pyrrhula vulgaris), a species of coniro- stral bird belonging to the family Wringillide, of a bluish- grey and black colour above, and generally of a bright tile-

red beneath, the female differing only in having its colours

somewhat duller than the male. It is a shy bird, not associating with other species, and frequents well-wooded districts, being very rarely seen on moors or other waste lands. It builds a shallow nest composed of twigs lined with fibrous roots, on low trees or thick underwood, only a few feet from the ground, and lays four or five eggs of a bluish white colour speckled and streaked with purple. The young remain with their parents during autumn and winter, and pair in spring, not building their nests, how- ever, till May. In spring and summer they feed on the buds of trees and bushes, choosing, it is said, such only as contain the incipient blossom, and thus doing immense injury to orchards and gardens. In autumn and winter they feed principally on wild fruits and on seeds. The note of the bullfinch, in the wild state, is soft and pleasant, but so low as scarcely to be audible ; it possesses, however, great powers of imitation, and considerable memory, and can thus be taught to whistle a variety of tunes. Bull- finches are very abundant in the forests of Germany, and it is there that most of the piping bullfinches sold in this country are trained. They are taught continuously for nine months, and the lesson is repeated throughout the first moulting, as during that change the young birds are apt to forget all that they have previously acquired. The bullfinch is a native of the northern countries of Europe, occurring in Italy and other southern parts only as a winter visitor. White and black varieties are occasionally met with; the latter, it is said, on the authority of White of Selborne, may be produced by feeding the bullfinch exclusively on hemp-seed, when its plumage gradually changes to black. It-breeds in confinement, and hybrids between it and the canary have been produced. ;

BULLINGER, Hetnricn (1504-1575), an eminent Re- former, was born at Bremgarten, near Zurich. He studied at Emmerich and Cologne, where he read some of Luther’s works, and after his return home lectured at the abbey of Kappel. In 1527 he heard Zwingli at Zurich, and in the following

year he accompanied him to the great conference at Berne. He was made pastor at Bremgarten in 1529, and married one Anna Adlischwegler, formerly a nun. In 1531 he had to fly to Zurich in consequence of the Catholic victory at Kappel, and was soon afterward appointed minister of the principale church. He was a powerful upholder of the Zwinglian doctrine of the Lord's

Supper, and wrote an able defence against Luther. He had also numerous controversial writings against the Anabaptists. His printed works are very numerous, and many of them were translated into English. They form ten vols. folio. Bullinger died at Zurich in 1575.

BULLION is a term applied to the gold and silver of the mines brought to a standard of purity. The term is of commercial origin, and has reference to the precious metals as a medium of exchange. It followed from this office of gold and silver that they should approximate in all nations toa common degree of fineness; and though this is not uniform even in coins, yet the proportion of alloy in silver, and of carats alloy to carats fine in gold, has been reduced to infinitesimal differences in the bullion of commerce, and is a prime element of value even in gold and silver plate, jewellery, and other articles of manufac- ture. All the 'new gold and silver coinage of France, Germany, Spain, Italy, Belgium, and the United States— probably of a still wider circle of the principal coining countries in the world—contain nine-tenths of pure metal. The coinage of Russia is on the British standard of eleven- twelfths, as nearly as it can be expressed in simple fractions of pure gold and silver, the alloy in silver being a little more in all cases than the alloy in gold. Bullion; whether in the form of coins, or of bars and ingots stamped, is sub- ject, as a general rule of the London market, not ouly to weight but to assay, and receives a corresponding value.

The recognition of gold and silver from the earliest times as a convenient means of purchase, their ultimate adoption as a prevailing standard of value, their coinage by all the richer states into pieces of money, in virtue of which their circulation and absorption have been immensely increased, and the extent to which they have become the necessary financial reserve of Governments, banks, trading companies, and merchants, have given to

these metals a greatly more extended use and importance than they could have acquired in the ordinary process of arts and manufactures ; though even in this latter sphere, as gold and silver become more abundant and communities richer, the purposes to which they are applied and the demand for them are susceptible of much expansion. Writers of high authority have attempted at various periods to estimate the produc- tion of gold and silver, and correlatively their use and con- sumpt in the monetary system and the arts; but there is scarcely any subject of statistical inquiry on which it is so difficult to arrive at more than conjectural results. Yet in view of the theoretical speculations that arose on the Cali- fornian and Australian gold discoveries, the produce of these new fields of supply may here be worthy of notice. The Californian mines were computed to have in three years yielded gold to the value of £35,000,000 sterling. The Australian mines,' still more prolific, were estimated in three years from their opening to be equal to an annual produce of £20,000,000 sterling. Such results, sustained over a considerable period of years, presented a phenomenon similar to the more slowly developed effects of the discovery of the South American mines in the 16th century ; and it must be admitted that California and Australia, after many reverses in their mining industry, remain the most gold-productive countries in the world. But their produce of bullion has of late years much fallen in amount.

The director of the United States' Mint, in his report for 1875, estimates the annual yield of gold and silver in California and other United States possessions at $100,000,000, or about £20,000,000. The total export of bullion and specie from Australia, after deducting the import (chiefly intercolonial), varied in the fifteen years 1858-1872 from 114 to 74 millions sterling per annum, the general tendency being towards the lower amounts in the later years (Statistical Abstract for Colonial and

other Possessions of United Kingdom, 1874). The annual average export in these fifteen years was £9,747,635, and must be held to measure amply the produce of the gold and silver mines of Australia. The annual production of bullion in the United States and Australia cannot, on these data, be estimated at more than 28 millions sterling. Humboldt found the annual

produce of the gold and silver mines of America, Europe, and Northern Asia, at the beginning of the century, to be about £9,700,000. The yield of gold and silver from the same sources in 1850-57 was estimated by M‘Culloch, in the Commereial Dictionary, to be £14,000,000. The old gold and silver mines can hardly have become more productive since the advent of the Californian and Australian diggings, so that it would appear the latter have increased the visible annual supply of gold and silver about threefold, or from £14,000,000 to £42,000,000. Japan, so far as can be judged from the exchanges, must now be added to the list of gold-producing countries. For several years in succes- sion Japan has exported considerable and apparently increasing amounts of treasure, or gold and silver coins of itsown mint. In 1874 this export amounted to $13,332,794,

or nearly three millions sterling (Sir Henry Parkes’s | Summary of Consular Reports). During the first six |

months of 1875 the imports of bullion from Yokohama to London were £1,257,170 gold, £95,080 silver; and not improbably the next great access of the product of gold- mines may be froni that part of the world. But notwith- standing this marked increase of gold and silver since 1850, when one considers the increase of population, the still greater increase of trade and industry, and the vast extension of financial and commercial affairs in the same period, it may be held doubtful whether gold and silver have lost any of their old proportion to the need for them and to the work they have to do.

When the coffers of the great banks of Europe were filled with the virgin gold of California and Australia, one of the first consequences was a desire on the part of countries in which silver was either a collateral standard of value with gold, or the sole standard of value, to discard the silver standard and adopt gold as the sole standard, involving in either case a large displacement of silver coinage and reserve, and a large infusion in its room of gold coinage and reserve. This result was exhibited in the mint opera- tions both of France and England. In the former country silver retains its quality of legal tender in a modified degree; but the proportion of silver authorized by the Bank Charter Act of 1844 has long disappeared from the bullion reserve of the Bank of England, which now con- sists wholly of

gold. It was one of the first resolutions of the German Empire, on the conclusion of the war of 1870-71, not only to make gold the sole standard, but to dislodge all the old silver money of the German States ; and in the same connection it may be observed, that the director of the United States' Mint, in reporting £20,000,000 as the annual produce of the United States' mines, uses this fact as an argument for the immediate resumption of specie payment—or, in other words, that the American people, by a strenuous effort, should strive to keep as much of the bullion-product of their mines at home as may enable the whole currency of the Union to become either gold and silver, or of convertible gold value. This preference for the more precious metal as the sole standard of value, and for gold and silver coin as a medium of general circulation, may be expected to extend throughout the world in proportion as the produce of the mines may be increased; and in this respect alone there is_a vast opening for the beneficial use both of gold and silver. It gives some idea of the immense service of bullion in the international exchanges, as well as in the replenishment of

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the internal metallic circulations, to observe that in the thirteen years 1858-70 the annual average registered import of gold and silver (real value) to the United Kingdom was £27,083,330, the average annual export £22,095,346; and that in the same thirteen years the average annual coinage of gold and silver in the Royal Mint was £4,854,661, or nearly equal to the annual excess of imports over exports of bullion, which flows in all this volume through London to and from every part of the globe—(Statistical Abstract for United Kingdom, 1872).

While the production of gold has declined of late years from the maximum attained after the Californian and Australian discoveries, the production of silver has begun to increase, and in the rapid development of minerals containing this metal, is generally expected to increase in the future. But it would seem premature from the facts of past experience to anticipate any permanent depreciation of the value of silver in relation to gold. The price of silver in the market of London from 1833 to 1873 ranged from 59d. to 625d. per oz., and during that time fully maintained its standard value in par with that of gold— (Table of Messrs Pixley and Abell, bullion-brokers,

Lon- don). But in the subsequent years a decline in the price of silver has occurred, and it fell in 1875 to 56d. per ounce. This may be the result of temporary causes, such as (1) the fact of £20,000,000 of German silver, displaced by the new gold coinage hanging over the market; and (2) a cessation of demand for India and China, which the ex- changes of the East with Europe may at any time alter.

BULLS AND BRIEFS, Papat, are the two kinds of authoritative letters issued by the popes in their official capacity as head of the church, the bulls being the more important. They are distinguished from each other by several marks.

A bull is written on thick polished parchment, com- monly in angular Gothic characters, and in Latin; it is always open; it commonly begins with the name of the Pope, but without adding any number (e¢g., Pius, not Pius IX.), then follows the term epzscopus, then servus servorum Der, then either the phrase ad perpetuam rei memoriam, or the greeting in Domino salutem et apostolicam benedictionem. It closes with the place and the date, which is commonly given according to the kalends, nones, or ides of the month and the year of the pope. The chief mark, however, of a bull is the seal. The popes use three kinds of seals—1, the signet-ring; 2, since the end of the 5th century, the bulla ; 3, from the 13th century, the annulus piscatoris. A bull is sealed with the second, the bulla, and from this it derives its name. The bulla is a globular seal of lead ; on the one side there is, in modern times, the heads of St Peter and St Paul, with the letters S. PE. and S. PA.; on the other side is the name of the Pope. For- merly the bulla often bore other impressions; the name of the Pope was always given, but sometimes the title Papa was impressed on the opposite side; sometimes a Scriptural image, such as the Good Shepherd. The popes evidently began to use this particular seal when, from the growing weakness of the empire, the temporal authority of the bishop of Rome began to be a real thing, and the popes assumed the consular dress and insignia; for the budla had been used by the emperor of Constantinople, and its use was permitted to many of the great officers of state who were accustomed to act for the emperor. The bulla was the common imperial seal, and was used not merely by the emperors of the East, but also by the early German emperors, and even by some of the minor European sovereigns. It was sometimes made of gold,

sometimes of silver, often of lead, and it was not until the earlier part of the Middle Ages that the leaden bulla became the dis- tinctive mark of a Papal charter,

“¢ Non auro, non argento, sacra Bulla refulget, Insignit chartas plumbea forma sacras. x

The word bulla—meaning first a bubble, then any kind of small ornament “ quas? injlata,” then a seal of a globular shape—came to be applied to a charter sealed with such a globular seal, and since the 15th century, exclusively to Papal letters of the first rank. If the bull is in forma gratiosa the seal is attached by threads of red and yellow silk ; if in forma rigorosa, hemp is used. If the Pope issues a bull before he is enthroned, nothing is put on the seal, and the bull is commonly called bulla blanca. Before the time of Nicholas IV. such bulls were only valid if confirmed after enthroning. Since then they have been valid without confirmation. Consistorial bulls are issued after consultation with the consistory of cardinals, and are signed by all the cardinals consulted. Ducange (Gloss, Med. et Inf, Lat.) says that consistorial bulls are often sealed with the signet-ring.

A brief is not so important as a bull. It is written upon white paper, or thin parchment, in modern cursive characters, and is sometimes sent open, sometimes closed. It begins with the name of the Pope, then the title Papa, then the number of the Pope, then the phrase ad perpetuam rei memoriam, or in Domino salutem et apostolicam bene- dictionem ; it ends with the name of the place, and the date (the day of the month, the year a.D., and the year of the Pope), and, finally, the words swb annulo piscatoris. The principal mark of the brief is its seal. It is sealed with red wax, with the signet called ‘‘the fisherman’s ring,” which dates from the 13th century, and bears a represen- tation of St Peter fishing in a boat, and the name and the number of the Pope. The distinction between briefs and bulls is not much older than the 15th century. In the early Middle Ages the word breve was used to denote all sorts of short charters, and Ducange in his Glossary gives over a hundred different kinds of these. Papal bulls and briefs, like all other important legal instruments, are liable to be forged, and hence Roman Catholic jurists have made a special study of the various marks by which

they are able to tell the age of a charter. The bulls and briefs of greatest importance have been published in Bullaria col- lections which have been put forth at different times under the authority of the church. The most important of those collections is the Bullarium Magnum Romanum, a Leone Magno usque ad Benedictum X1V., Luxembourg,1727-1758, 19 vols. fol., and its continuations.

BULOW, Friepricn WILHELM (1755-1816), a Prussian general, was born at Falkenberg on the 16th February 1755. He entered the army at the age of fourteen, rose slowly, and in 1797 was placed at the head of a battalion. He took part in the campaigns of 1806-7, and in 1809 was made major-general and brigadier of infantry. On the renewal of the war against France in 1813 he took the field with the rank of lieutenant-general, was engaged in the battle of Méckern, and stormed the defences of Halle. He was victorious over Oudinot at Luckau and Grossbeeren, and over Ney at Dennewitz. He led the attack on the fortifications at Leipsic, and was conspicuous in the Prussian victory at Laon. To him also belonged the honour of closing the campaign by the capture of Mont- martre. For his valuable services he was raised to the rank of general, and made Baron Dennewitz, with a hand- some revenue, During the Hundred Days he commanded the fourth army corps, and by his rapid march contributed to Bliicher’s success at Waterloo. After the conclusion of the war he retired to Kénigsberg, where he died on the 25th February 1816.

BULWER, Sir Henry Lyrron Earte (1804-1872), statesman and diplomatist, created a peer, under the title of Baron Dalling and Bulwer, in 1871. See Datiine.

BUL—BUN

BULWER-LYTTON, Str Epwarp GerorcE EARLE Lytton (1806-73), brother of the preceding, created a peer, under the title of Baron Lytton, in 1866. See LyTron.

BUNDELKHAND, an extensive tract, consisting partly of British districts and partly of native states, in the North- Western Provinces of India, lying between 23° 52’ and 26° 26’ N. lat., and 77° 53’ and 81° 39’ E. long. It is

bounded on the N. by the Jumna, on the E. by the Baghalkhand or the Rewa state, on the S. by the Central Provinces, and the W. by the state of Gwalior.

It comprises the British districts of Hamirpur, Jalaun, Jhansi, Lalatpur, and Banda ; the semi-independent states of Orchha or Tehri, Datiya, and Samthar ; and the follow- ing petty states held under grants from the British Govern- ment, viz.:—Ajegarh, Alipur4, Ashtgarhi Jagir, Tori- Fathpur, Bijnd and Pahari Banké, Baronda, Bawani, Bert, Bihat, Bijawar, Charkhari, seven Chaubiyané Kalinjar Jagirs, Chhatrapur, Garrauli, Gaurihar, Jasu, Jigni, Khaniyé Dhana, Lugh4s{, Naigaon Ribahi, Panna, and Sarila, Length of Bundelkhand—200 miles from 8.E. to N.W. ; breadth, 155 miles ; area variously estimated from 18,099 to 23,817 square miles,

The surface of the country is uneven and hilly, except in the N.E. part, which forms an irregular plain cut up by ravines scooped out by torrents during the periodical rains. The plains of Bundelkhand are intersected by three mountain ranges, the Bindhachal, Panna, and Bander chains, the highest elevation not exceeding 2000 feet above sea-level. Beyond these ranges the country is further diversified by isolated hills rising abruptly from a common level, and presenting from their steep and nearly inacces- sible scarps eligible sites for castles and strongholds, whence the mountaineers of Bundelkhand have frequently set at defiance the most powerful of the native states of India. The general slope of the country is towards the north-east, as indicated by the course of the rivers which traverse or bound the territory, and finally discharge themselves into the Jumna.

The principal rivers are the Sindh, Betwa, Ken, Baighin, Paisuni, Tons, Pahuj, Dhas4n, Berma, Urmal, and Chandra- wal. The Sindh, rising near Sironj in Malwa, marks the fron- tier line of Bundelkhand on the side of Gwalior. Parallel to this river, but more to the eastward, is the course of the Betwa. Still further to the east flows the Ken, followed in succession by the Baighin, Paisuni, and Tons. The Jumna and the Ken are the only two navigable rivers. Notwithstanding the large number of streams, the depres- sion of their channels and height of their banks render them for the most part unsuitable for the purposes of irrigation, —which is conducted by means of jhals and tanks. These artificial lakes are usually formed by

throwing embankments across the lower extremities of valleys, and thus arresting and accumulating the waters flowing through them. Some of the tanks are of great capacity ; the Barwd4 Sdgar, for instance, is 2} miles in diameter. Diamonds are found, particularly near the town of Panna, in a range of hills called by the natives Band-Ahil.

The mines of Mahardjpur, Rajpur, Kimera, and Gadasia contain the finest diamonds; one dug from the last is reputed to be the largest in the world. It was kept in the fort of Kalinjas among the treasures of Raj&4 Himmat Bahadur. In the reign of the Emperor Akbar the mines of Panna produced diamonds to the amount of £100,000 annually, and were a considerable source of revenue, but for many years they have not been so profitable.

The tree vegetation consists rather of jungle or copse than forest, abounding in game which is preserved by the native chiefs. There are also within these coverts several varieties of wild animals, such as the tiger, leopard, hyena, wild boar, z2lgdi, and jackal.

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British Bundelkhand contains a population of 2,161,495 souls. The total population of Bundelkhand, British and native, has been estimated at 2,260,714. The people represent various races. The Bundelds,—the race who

gave the name to the country,—-still maintain their dignity

as chieftains, by disdaining to cultivate the soil, although by no means conspicuous for lofty sentiments of honour or inorality. An Indian proverb avers that “one native of Bundelkhand commits as much fraud as a hundred Dandis” (weighers of grain, and notorious rogues). About Datiya and Jhans{ the inhabitants are a stout and handsome race of men, well off and contented.

The prevailing religion in Bundelkhand is Hinduism.

The principal crops are wheat, jodr, cotton, indigo, sugar- cane, a red dye called dch, various kinds of millets and pulses, and mahudé (Bassia latifolia). Carpets are manu- factured at Jhansi, and paper at Kalpi. Bamboo and Acacia catechu from the jungles form important articles of trade. Principal routes—(1), from Allahabad to Nasirabad through Banda; (2), from Fathipur toS4gar through Banda; (3), from Cawnpur to Jabalpur ; (4), from Cawnpur to Gund through Kalpi and Jhansi; (5), from Band4 to Gwalior; and (6) from Agra to Sagar. The Jabalpur line of the East Indian Railway passes through the native states of Bundelkhand. Principal towns, —Kalpi, Banda, Jhansi, Datiya, Urcha, Jalaun, Chhatrapur, Mahobd, and Teh4ri. The climate of Bundelkhand is sultry and unhealthy.

Hisrory.—Chandra Varma, chief of the Chandel Rajputs, appears to have established the earliest paramount power in Bundelkhand towards the close of the 9th century a.p. Under his dynasty the country attained its greatest splendour in the early part of the 11th century, when its Raja, whose dominions extended from the Jumna to the Nerbudda, marched at the head of 36,000 horse and 45,000 foot, with 640 elephants, to oppose the invasion of Mahmud of Ghazni. In 1188 the Chandel dynasty was overthrown by Pirthwi Raj, the ruler of Ajmir and Delhi, after which the country remained in ruinous anarchy until the close of the 14th century, when the Bundelas, a spurious offshoot of the Garhwa tribe of Rajputs, established themselves on the right bank of the Jumna. One of these took possession of Urcha by treacherously poisoning its chief. His successor succeeded in further aggrandiz- ing the Bundeld state, but he is represented to have been a noto- rious plunderer, and his character is further stained by the assassina- tion of the celebrated Abulfazl, the prime minister and historian of Akbar. Jajhar Sinh, the third Bundela chief, unsuccessfully revolted against the court of Delhi, and his country became incor- porated for a short time with the empire. The struggles of the Bundelas for independence resulted in the withdrawal of the royal troops, and the admission of several petty states as feudatories of the empire on condition of military service. The Bundelas, under Champat Rai and his son Chhatra Sal, offered a successful resistance to the proselytizing efforts of Aurungzebe. On the occasion of a Mahometan invasion in 1732, Chhatra Sal asked and obtained the assistance of the Marhatté Peshwa, whom he adopted as his son, giving him a third of his dominions. The Marhattas gradually ex- tended their influence over

Bundclkhand, and in 1792 the Peshwa was acknowledged as the lord paramount of the country.. The Marhatta ‘ied was, however, on the decline ; the flight of the Peshwa from

is capital to Bassein before the British arms changed the aspect of affairs, and by the treaty concluded between the Peshwa and the British Government, the districts of Band’ and Hamirpur were transferred to the latter. Two chiefs then held the ceded districts, Himmat Bahadur, the leader of the Sanydsis, who promoted the views of the British, and Shamsher, who made common cause with the Marhattés. 1n September 1803, the united forces of the Eng- lish and Himmat Bahadur compelled Shamsher to retreat with his army. In 1809 Ajaigarh was besieged by a British force, and again three years later Kalinjar was besieged and taken after a heavy loss. In 1817, by the treaty of Poonah the British Government acquired from the Peshwa all his rights, interests, and pretensions, feudal, territorial, or pecuniary, in Bundelkhand. In carrying out the pro- visions of the treaty, an assurance was given by the British Govern- ment that the rights of those interested in the transfer should be scrupulously respected, and the host of petty native principalities in the province is the best proof of the sincerity and good faith

with which this clause has been carried out. During the mutiny of

1857, however, many of the chiefs rose against us, especially the Rani of Jhansi.

BUNDI, a Rajput state of India, under the political

superintendence of the Government of India through its agent in RAjputand, situated between 24° 58’ and 25° 55’ N. lat., and 75° 23’ and 76° 36’ E. long. It is bounded on the N. by the native states of Jaipur and Tonk ; on the E. by the state of Kotal; on the S. by Sindhid’s territories aud on the W. by the state of Udaipur. Many parts a the state are wild and hilly, inhabited by a large Mina population, a race of robbers. Two rivers, the Chambid and the Nij, water the state; the former is navigable by country boats. Area, 2291 square miles; population in 1871-72, 224,000, or 97 to the square mile. The chieftain and the greater part of his followersare Rajputs. Principal crops—TIndian corn, jodér, wheat, pulses, and oil-seeds.

Iron is found. The chief's annual income amounts to £50,000, derived from land-tax levied both in kind and money, and from customs. Thefts and petty robberies are still of frequent occurrence. Our political relations with Bundi commenced in 1804 during the Marhatté war, and in 1818 its chief accepted our protection. The present ruler has managed the state for the last fifty years, and done much to improve the condition of the people. Bundi pays an annual tribute of £4000 to the British Government. BUNKER HILL, a small elevation, 110 feet high, in

the town of Charlestown, 1 mile N. of Boston, in Massa-

chusetts. One of the most celebrated battles in the war of

American independence was fought here on the 17th of

June 1775. The British remained masters of the field

after a long and bloody contest. A commemorative obelisk,

221 feet high, has been erected in the centre of the

grounds included within the redoubt on Breed's Hill. See Boston, vol. iv. p. 72.

BUNSEN, CuristiAN CHARLES JosIas, BARON VON (1791-1860), was born 25th August 1791, at Corbach,

an old town in Waldeck, one of the the smallest of German principalities.

He was of honourable but humble origin. His father, to eke out the scanty subsistence provided by

his few acres of land, had entered a regiment "granted" to Holland by the prince. agement, he attended conscientiously to the drudgery of his post during twenty-nine long years, to return at last, in

Without promotion or encour-

1789, a widower, with broken health and a miserable pension. Brighter days were in store for him through the affections of his second wife and the birth of Christian. It is on record, how joyous were the evenings in that old-fashioned Corbach home, when, after reading a chapter from the family Bible, and devoutly praying with his household, the kindly old man loved to prune, by pithy remarks and snatches of proverbial lore, the redundant enthusiasm and all-embracing fervour of his son. To the latter, success and a host of fond admirers seem from the first never to have been wanting. Nor did humility of demeanour, exquisite sympathy with all men, and an almost unexampled power of work ever fail him. The Corbach grammar school was brilliantly passed, and after it a first year of university studies, at Marburg, devoted to divinity. But Gottingen in those days attracted all superior minds, and the youth of eighteen found himself on his way thither with the last savings from his father's purse, intent upon appeasing his desire for those wider regions of philological and historical learning in which he knew his strength must lie. Again all avenues of outward success opened to the unpretending student ; although so young he was entrusted with lessons at the Latin school, and soon after with the office of private tutor to W. C. Astor, only son of the well- known merchant king of New York. Bunsen soon became the acknowledged though unobtrusive centre of a chosen band of students, few only of whom have failed to attain that reputation to which their abilities seemed to call them,

1 Mr W.C. Astor, " the landlord of New York," as he has been called, died in November 1875. : LY =5s6

or that degree of public usefulness to which in an hour of genuine enthusiasm they one and all vowed to aspire. "Right royal in all his ways," as a poet has fitly described him, he sympathized with the favourite pursuits of each, wrestled with all, made them to love each other, and held high among them tlie ideals of youth and of science. It was quite a day of rejoicing in Gottingen when Bunsen had won the university prize essay of the year 1812 by a treatise on the Athenran Law of Inheritance, and again a few months later wlien the university of Jena granted him, unsolicited, the honorary degree of doctor of philosophy.

The time had now come for Mr Astor to travel. Bunsen had seen little of the world before then. Only one journey had he made, but that one was to Weimar, and in company with Arthur Schopenhauer, one of his Gottingen acquaintances, a man of genius, whose fate it has been to live unknown and to become after death not famous only, but the founder of a numerous and turbulent school of metaplysicians. Bunsen was introduced to Goethe, and bore away the impress of the society that assembled around the great poet. In 1813, a journey was undertaken to South Germany, during which Mr Astor was well pleased to see his friend revelling in the company of choice spirits at each centre of intellect, and shared in his exultation over the crushing blow that had fallen upon Napoleon at Leipsic. Some months later they separated at Géttingen, Astor to return to New York, with an understanding that they would meet for further travel two years later, and Bunsen to resume his studies which had lost nothing of their vast range. It seemed to Bunsen a purpose not exceeding the limits of a man's life to comprehend the his- tory of all Teutonic races in religion, laws, language, and literature. That was the heroic age of comparative philo- logy ; and thus we see Bunsen, who had read Hebrew when a boy, plunging into Arabic at Munich, Persian at Leyden, and Norse at Copenhagen, as opportunities offered for each.

At the close of 18)5 Bunsen found his way to Berlin, to lay before Niebuhr the historian what was then already a many years' plan of learned inquiry. This step led to important consequences in the life of Bunsen. Niebuhr not only approved of the Titanic scheme, and hoped that Prussia, in which all the hope of Germans then began to be centred, would in time find money for assisting it, but so powerful an impression did he receive on that occasion, that when they met again two years later, Niebuhr, having meanwhile become Prussian envoy to the Papal court, exerted all his influence to draw Bunsen into official life. Of the two intervening years it will suffice to relate that they had been spent by Bunsen in assiduous labour among the libraries and collections of Paris and Florence, whither the hope of meeting his former pupil, Mr Astor, had led him; and that he contracted during his stay in the capital of France a love for the peculiar graces of French genius which never left him through life.

Fascinated by the condescending friendship of Niebuhr, by the glories of Rome, and also by the charms of English society, Bunsen continued his stay in that city. In July 1817 he married Miss Waddington, eldest daughter and co-heiress of Mr B. Waddington of Llanover, Monmouth- shire. Even then his purposes in life remained purely scientific. Little did he dream that the Eternal City was to become his home for twenty-one years, or that one of the most difficult problems of European diplomacy would there be entrusted to his hands.

When Niebuhr obtained the consent of his Government for the appointment of Bunsen as secretary of the Roman embassy, negotiations were being actively carried on between Berlin and Rome for a new establishment of the Papal Church in the Prussian dominions. This had become

necessary, since 1815, by the addition of several millions of Catholics to the population of that mainly Protestant country, of which they now formed no less than two-fifths, An agreement was the fruit of these labours, by which the king of Prussia allowed the publication within his do- minions of a Papal bull (called De salute animarum), circumscribing the Catholic dioceses, and determining the position of the Romanist hierarchy. During this period of initiation into the mysteries of Papal statecraft, Bunsen had occasion to learn that the Vatican began, under the fostering care of the Jesuit order, to revive from the inanition into which the French Revolution and its effects had thrown it. So universal and so strong was the wave of reaction in those days throughout Europe, that Protestant and Catholic rulers agreed in the conviction that of all conservatism the apex and supreme exponent must be the Pope, as represent- ing “the most ancient succession of sovereigns,” as “ up- holder of things as they are.” Considering themselves the Pope’s born allies, they closed their eyes to that stealthy encroachment of absolute Romish power into the dioceses within their territory with which the present generation is becoming, acquainted in America as well as in Europe. Bunsen was among those who first discerned the coming danger. To direct official attention towards it, to ward it off by fairness and impartiality towards his Catholic fellow- subjects, to preserve

religious peace in his country, thence- forward became the main object of his official labours.

At first his success was great. In Berlin the king and his minister, and at Rome each successive Pope and his cardinal secretary, bestowed upon him every mark of con- fidence and even of affection. King Frederick William III. had made his acquaintance as early as 1822 during a brief stay at Rome, and had taken unwonted pleasure not only in his conversation generally, but even in the outspoken but elegant frankness with which Bunsen defended his views when at variance with one or two of his sovereign's favourite theories. He evinced his appreciation of the youthful diplomatist by desiring him to undertake the legation after Niebuhr's retirement from his office.

In the Papal Government, also, Bunsen's honest en- deavours to preserve a good understanding were readily acknowledged, and formed the basis for one of the rarest life friendships, and yet a most real one, with Monsignor Capaccini, the confidential adviser of successive Popes in foreign affairs, who never swerved from his principle of both receiving and meeting every communication of the Prussian envoy with equal trust and truthfulness.

A few words will explain the causes which eventually led to a failure of Bunsen's pacific efforts. Marriages between Romanists and Protestants (or so-called mixed marriages) had formerly been of rare occurrence in Prussia. Before the iron will of Frederick the Great, the naive demands of the hierarchy of Silesia—the chief of which is a promise on oath that all children shall be brought up as Catholics—had dwindled into a passive attitude on their part. After the accession of Rhineland and Westphalia to the Prussian monarchy had added to the frequency of such marriages, it was truly fortunate that a prelate of moderate views in matters ecclesiastical and a good patriot—Count Spiegel—held the archiepiscopal see of Cologne (1825). With him, who forbade processions of his own accord as lead- ing to immorality, and who favoured a more enlightened education of candidates for holy orders, an arrangement which would leave the consciences of spouses and priests unviolated was practicable. It was easily obtained by Bunsen's personal negotiation with the archbishop. The other Prussian bishops also consented ; but such was the slothfulness of the

absolute king’s Government, that the death of that wise archbishop (1835) occurred before its ratification, and such their blindness to reality that they

offered to promote a narrow-ininded ascetic, Baron Droste, to the vacant post. “Is your king mad?” bluntly exclaimed the cardinal-secretary whilst hastening to accept, on the part of the Vatican, the proffered tool of Papal aggression! Before two years had passed the religious strife was in a blaze everywhere,—Jesuit advisers more eagerly listened to at Rome, Prussian bishops all but unanimous in their opposition against moderate counsels, and (so the Government was informed) the leader- ship of these machinations against the internal peace of Prussia entrusted to members of that uniformly Ultramon- tane body, the Belgian bishops. In this extremity Bunsen was again summoned to Berlin from his post. It is difficult at this distance of time to discern how far the advice he may have given was founded upon too sanguine a view both of the power of an absolute king, unaided by an emancipated public opinion, a free press, or a parlia- ment, and of the intensity of the agitation raging in Catholic districts. But this much is known that, when the seizure of the chief offender in his archiepiscopal palace at Cologne was resolved upon, Bunsen understood that the archbishop would forthwith be placed before the ordinary judges of the country for disobedience to its laws. This was never done, and the seizure was so mismanaged that the incriminat- ing documents are said to have been destroyed before the judicial authorities had set foot in the palace. Thus a complete failure was the result of this very unsafe step. The Government thought it easier to leave Bunsen unsup- ported when, after his return to Rome, he courageously attempted to convince the Vatican of the archbishop’s guilt, and, in the hope of burying the matter in oblivion, they accepted Bunsen’s offer of resignation, in Apri 1838. It may not be irrelevant to mention here that the king’s successor, Frederick William IV., on his elevation to the throne in 1840, released Baron Droste from prison. This romantic king established his policy towards the Vatican on the principle of granting liberty of action to the Papal power,—a liberty so well employed both before and since the revolution of 1848, that at this moment (1876) all the energies of a powerful chancellor and a united Germany are

taxed to the utmost to find a basis for harmonious co- existence between modern states and the hierarchy of Rome.

When Bunsen left the Eternal City a politically disap- pointed man, he was able, nevertheless, to look back upen a term of years filled with everything that could adorn life— intense domestic contentment, intimacy with distinguished inen of every nation who had sojourned in Rome during his twenty-one years' residence there, success in establish- ing institutions which, like the Archeological Institute, the German Hospital, and the Protestant chapel, have outlived his stay, experience in public affairs, and a deepening of his religious convictions. Religion had become the centre of his most tender emotions, of his intellectual activity, of his practical aspirations. To restore to the Bible that place in the households of his country which it had possessed in the first generations after the Reformation, to revive the knowledge and the love of the German reformers' hymns, to give his people such a Book of Common Prayer, resting upon the liturgies of all Christian ages, as would help congregations in" presenting themselves a living sacrifice," to rekindle the fervour of other days for works of self-devotion and charity, to work out a Christian philosophy of history,—such were the purposes to which he devoted his happiest and best hours in each succeeding year. Whilst he was at Rome a book of ancient hymns and a liturgy were printed.

Bunsen always looked back in later years upon his Roman tinie as men are apt to remember their college days. Right joyous had been his intercourse with artists such as Thorwaldsen, Rauch, Wolff, Cornelius, Schnorr, Overbeck,

Schinkel, Felix Mendelssohn. He had become one of the best-informed men among art-collections, and was so attracted by the charms of Roman topography as to surrender to the temptation of contributing volumes to the German Description of Rome.

Few strangers have ever lived on terms of greater intimacy with Italians, or possessed a more entire command of their language than Bunsen. He was a believer in their national revival and political future at a time when Italy

was “a geographical expression” only and when her art treasures and her blue sky were her only acknowledged qualitics. Among Americans Mr Ticknor ; among Russians Italinsky, Joukovsky, and Al. Tourgeniefti; among French- men the Duc de Blacas, Comte de St Aulaire, Chateaubriand, Champollion, Ampére, and others became his friends. But his most cherished intercourse was with English visitors and residents,! to which he owed an acquaintance with British life such as has rarely been possessed by any foreigner who never had set foot in this country.

Towards England, then, did he turn his face in 1838 to eujoy the leisure occasioned by his removal from the Capitol, and in England, except when he held a brief diplomatic appointment as Prussian ambassador to Switzer-land from 1839 to 1841, the remainder of his official life was spent.

Between the Crown Prince of Prussia and Bunsen a very close intimacy had sprung up ever since they met at Berlin in 1828. They were attracted to cach other by similarity of literary tastes, of poetic temperament, and of religious aspiration. In their enthusiasm for each other, the prince as well as the public servant fondly hoped, year alter year, that diversity of character and of self-grown conviction, however marked, would tend rather to compensate defects than to disturb harmonious action. Their correspondence lately published (in part) by Ranke, the historian, shows the truthfulness and the durability of this remarkable friendship, and helps to explain why its results were not commensurate to the moral worth and intellectual capacity of the men who were united by it.

The new king had no sooner ascended the throne under the name of Frederick William IV. than he contemplated the erection of an Anglo-Prussian bishopric at Jerusalem, intended to represent European Protestantism as a united power, and to give a rallying point to Protestant missions in Syria and Palestine. The time seemed propitious for this fantastic scheme. The four allied powers, under the leadership of Great Britain, had reinstated the sultan in the possession of Syria. The Turkish Government would therefore readily grant a similar representation to Protestant churches to that possessed by Orthodox Greeks and Roman Catholics. King Frederick William summoned Bunsen to his capital, and instructed him to negotiate in London the establishment of such a bishopric

on Mount Zion. In an incredibly short time (June to November 1841) Bunsen succeeded in bringing it about, with the English Govern- ment's courteous assent, and the energetic furtherance of the archbishop of Canterbury and the bishop of London, Prussia paying in a capital which secured one-half of its endowment, whilst the other half was to be raised in England. Much suspicion was felt and opposition raised against any association of the Church of England with German Protestantism, in both countries alike, though from

1 One of these, and a very valued correspondent of Bunsen, was Lord Clifford, well known as a devout Roman Catholic. He had made the struggle between Berlin and the Vatican the subject of earnest study, and was enabled by his high social position to obtain from documents a more dispassionate view of it than, perhaps, any contemporary witness of the events. His testimony, thcrefore, expressed in a letter to Bunsen of 3lst March 1838, may claim a place in this sketch. Lord Clifford writes, —" Your public career here has been of benefit to the peace of Europe."

opposite motives. To Bunsen this 'special mission brought in a rich harvest of friendly feeling among the leaders of both parliamentary parties, so that when Queen Victoria selected his name out of three proposed by the chivalrous courtesy of the Prussian king for the post of Prussian ambassador, he found himself well received by all classes of English society The king's visit to England in February 1842, as sponsor to the Prince of Wales, helped to prove the earnest desire of Prussia to seek the friendship of Great Britain. An event, however, which directed the eyes of the British public even more to Bunsen than royal favour was the publication of Arthur Stanley's Life of Dr Arnold, in whose private letters an admiration amounting almost to enthusiasm for his German friend was expressed with a fervour unusual to Arnold's stately reserve. Although not palatable to the growing ritualistic school, and not always considered a safe theologian by the partizan leaders of the low Church, Bunsen retained to the last the affection of the British nation, among whom he spent thirteen eventful years.

In the year 1844 his advice was asked by the king on the constitutional changes,—from absolutism to a repre- sentative government,—upon which Prussia, although in a first-rate financial military and administrative condition, found herself irresistibly constrained to enter. His advice, though studiously conservative, was considered of too sweeping a nature, and the king contented himself in 1847 with convoking an assembly composed of all members of the eight provincial diets of the monarchy, and clothed with scarcely any constitutional powers

On the question of church organization, also, the king and his friend were fated to disagree more strongly than they had expected. Bunsen's views had developed into a system essentially Presbyterian, though with an Episcopal headship. He held up the constitution of the Episcopal Church of America as, perhaps, the best type to follow, because it contained personal rule organically allied to the free power of the laity. He recommended these ideas to his countrymen as well as to his sovereign ina book entitled The Church of the Future, which has not been without influence in the church constitution now (1876) about to become law in Prussia.

The king's expectations of a quiet time for maturing his work of reconstruction in church and state were rudely broken in upon by the French Revolution of February 1848. Bunsen's warning voice had been raised in vain; the discontent of the educated classes helped to weaken the distracted councils of Frederick William IV., and, though a constitution was eventually promulgated, Prussian politics succumbed under the tutelage of the Austrian premier, Prince Schwarzenberg, in 1849 Bunsen's diplomatic labours were mainly directed to settle, as German com- missioner, the dispute with Denmark about the duchies of Holstein and Schleswig, Great Britain having offered her mediation. In these duchies a strong agitation of several years' standing had roused the German population, which occupies the whole of the former and part of the latter, to oppose the centralizing tendencies of the Danish Government. During the troubles of March 1848 they had taken up arms against Denmark and found assistance in Germany, then for the first time aspiring again to the position of a national power. This disturbance of the public peace of Europe was, however, regarded with so much disfavour by all powers, and secretly also by the sovereigns of Prussia and Austria, that the Danes obtained, in 1852, a European protocol,

which reversed the political autonomy of the two duchies, and settled the crown of Denmark, after the death of the king and his son, upon Prince Christian of Gliicksburg. It was the fate of Bunsen to be obliged to add his signature to this protocol, although

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it contained an abrogation of those “constitutional riglits of Schleswig and Holstein,” upon which he had dilated in a Letter to Viscount Palmerston, printed in April 1848.

The unity of Germany was another of those wishes in which Bunsen and his royal patron had been one ever since the beginning of their acquaintance, and yet found them. selves widely apart when the question came to be practically tested. The king sincerely aimed at the resuscitation of the venerable German empire, fancying that the leadership within the federation of sovereigns might be divided between Austria and Prussia, yet so as to leave a kind of ceremonial primacy to the former. Enlightened Germans, on the contrary, had then already arrived at the conviction that the leadership must be in Prussian hands. Austria, hampered as she is by the numerical preponderance of non- German populations, and the divergence of her interests from those of Germany, should, they thought, take her place within a wider federation. Gradually and almost imper- ceptibly did this truth work its way through time-honoured tradition. Bunsen was one of its most eloquent apostles, in his official correspondence as well as in pamphlets published in 1848. Several times he was sanguine enough to believe such a policy to be permanently grasped in Berlin, but the king’s vacillating temper and his adherence to tradition refused to be wrought upon beyond the approval of half-measures, Thus the opportunity was lost, the potentiality of the Prussian military power neglected, anda gnawing disappointment left in the minds of the best patriots throughout Germany.

With small hopes, and with no other wish but to serve as long as possible a sovereign whose friendship and confidence had outlived their former agreement on matters of religion and policy, Bunsen continued in the thankless task of representing Prussia after the downfall of those proud

hopes that had pictured forth a revival of the German nationality under Prussian leadership. His main object, pursued under every difficulty, and seized with energy on every favourable opportunity, was to dissociate the policy of Berlin from that of St Petersburg and Vienna, and to draw closer whatever bonds of common sentiment or interest existed between the English and German com- munities. He was not tardy, therefore, in advising his royal master in an anti-Russian sense when the Crimean war began. As had so often been the case, the king's understanding went along with much that Bunsen wrote, and hopes were entertained that a Prussian participation in the war, containing the threat of an invasion of the north- western frontier of Russia, would force that country into compliance with the demands of the Western powers. But traditional policy again prevailed, mixed with the king's unconquerable aversion to Napoleon III., and his grow- ing mistrust of Lord Palmerston's political principles. The alliance of the Western powers was declined, Prussia preserved towards her Eastern neighbour what is techni- cally called a "benevolent neutrality," and the king accepted Bunsen's proffered resignation of his post as minister in London in April 1854.

The remaining years of Bunsen's life were spent in almost unbroken literary labours, first at a villa on the banks of the Neckar, near Heidelberg, and at the last in Bonn. In the politics of the day his interest was as keen as ever, and readily did he give his advice when advice was asked, as happened frequently on the part of the prince and princess of Prussia then residing at Coblentz, who have since risen to the exalted position of emperor and empress of Germany. But declining health determined him not to enter the Prnssian Lower House, in which a seat was offered him by the liberal majority in the city of Magdeburg. His Signs of the Times, however, an elaborate pamphlet, published in 1856, acted like a first trumpet-call

against the aggressive demeanour of the reactionary clique, who were utilizing, in the interests of despotism and obscurantism, the horror of revolutionary outbreaks then felt by the quiet middle classes of Germany. Its publica- tion prepared the way, more perhaps thau any other event, for

that rise of liberal opinion in Prussia which showed its power in the next reign.

Twice only was Bunsen tempted away from his Heidelberg retreat to show himself at Berlin,—once, at the king's desire and as his guest, in September 1857, to attend the meeting of the Evangelical Alliance, in the main objects of which he sympathized as warmly as King Frederick William IV. On that ocvasion, and after much confidential intercourse, the two friends parted never to meet again on this side of the grave. One of the last papers signed by the king before his mind gave way in October of that year was that which raised Bunsen to the rank of baron, and conferred upon him a life peerage. In 1858 the Regent (now Emperor) William having addressed a special request to Baron Bunsen uot to fail him at the openiug of his first parliament, he took his seat in the Upper House, and supported actively during a brief autumn session, but without ever making a speech, the regent's new cabinet, of which several of Bunsen's political and personal friends were members.

Literary work was, however, the centre of his life throughout that time. Two discoveries of ancient MSS. which occurred during his stay in London, containing, the one a shorter text of the Hpistles of St Ignatius, and the other an unknown work On all the Heresies, by Bishop Hippolytus, had already given him an opportunity for enlarging upon the history of the first centuries of the Christian Church. He now concentrated all his efforts upon producing a Bible translation with commentaries that would open the sacred volumes afresh to the understanding and the hearts of a generation gradually estranged from them. Whilst this " Bible-work," was in preparation, and to pave the way for its reception, he printed a book considered by many to contain his most matured thoughts, under the title of God im History. The progress of man- kind, he contends, marches parallel to the conception of God formed within each nation by the highest exponents of its thought. At the same time he carried through the press, ably assisted by Mr Birch the Egyptologist, the con- cluding volumes of his work (published in English as well as in German) gypt's Place in Unwersal History—con- taining a reconstruction of Egyptian chronology, together with an attempt to determine the relation in which the language and the religion of that country stands to the development of each among the more

ancient non-Aryan and Aryan races, between which its curious civilization seems to have formed a kind of connecting link. Those who desire to know Bunsen's ideas on this subject may find them most fully developed in two volumes published in London before he quitted England—Outlines of the Philosophy of Universal History as applied to Language and Religion. It will be seen even from this brief outline that his "first love" had never lost its hold upon him, and that the desire "to trace the firm path of God through the stream of ages" continued his purpose for life.'

But asthma and all other concomitants of a malady that had announced itself for years now began to disturb, uot the mental alacrity or the spirits of Bunsen himself, but the hopes of his family and those among his friends who had imagined that he would be allowed to complete the works undertaken. Ordered to spend his winters in a more genial climate, he repaired to Cannes in 1858 and a) Sa

1Tt may be mentioned that Bunsen contributed the article LUTHER,

one of the finest biographies of the great Reformer, to the eighth edition of the present work, 1857.

1859, not without a lengthened visit to Paris, where he revelled, as in younger days, in the contact with men of learning. In May 1860 he purchased a house in Bonn, hoping against hope, pushing forward the publication of his Bibel-Werk, and even preparing lectures for students upon those subjects which he had most at heart. But the hand of death was upon him. He thanked God daily for teaching him how to support pain at the close of a life so eminently exempt from bodily suffering. And whenever, in the closing weeks of his existence on earth, a relaxation of asthma ensued, fervent prayer flowed from his lips, powerful attestation of his religious belief, loving exhorta- tion to those from whom he was soon to be removed. Baron Bunsen died on November 28, 1860, and lies buried in the churchyard of Bonn, not far from the grave of his early friend and benefactor Niebuhr.

“Let us walk in the light of the Lord” (Isa. ii. 5) is the text which Baroness Bunsen placed on his tomb. One of his last requests having been that she would write down recollections of their common life, she published his Memoirs in 1868, which contain much of his private corre- spondence. The German translation of these Memozrs has added extracts from unpublished documents, throwing a new light upon the political events in which he played a part. Baron Humboldt’s letters to Bunsen were printed in 1869, and Ranke published in 1873 a large portion of the correspondence that passed between King Frederick William IV. and Bunsen. (c. v. B.)

BUNTING, a word of uncertain origin, properly the common English name of the bird called by Linneus Emberiza miliaria, but now used in a general sense for all members of the family Hmberizide, which are closely allied to the Finches (Fringillide), though, in Professor Parker’s opinion, to be easily distinguished therefrom—the Emberizide possessing what none of the Wringillide do, an additional pair of palatal bones, “ palato-maxillaries.” It will probably follow from this diagnosis that some forms of birds, particularly those of the New World, which have hitherto been commonly assigned to the latter, really belong to the former, and among them the genera Cardinalis and Phrygilus. The additional palatal bones just named are also found in several other peculiarly American families, namely, Tanagride, Icteride, and Mniotiltide—whence it may be perhaps inferred that the Hmberizide are of Transatlantic origin. The Buntings generally may be also outwardly distinguished from the Finches by their angular gape, the posterior portion of which is greatly deflected ; and most of the Old-World forms, together with some of those of the New World, have a bony knob on the palate— a swollen out growth of the dentary edges of the bill. Correlated with this peculiarity the maxilla usually has the tomia sinuated, and is generally concave, and smaller and narrower than the mandible, which is also concave to receive the palatal knob. In most other respects the Buntings greatly resemble the Finches, but their eggs are generally distinguishable by the irregular hair-like markings on the shell. Inthe British Islands by far the commonest species of Bunting is the Yellow Hammer (Z. citrinella), but the true Bunting (or Corn-Bunting, or Bunting-Lark, as it is called in some districts) is a very well-known bird, while the Reed-Bunting (Z. scheniclus) frequents marshy soils almost to the exclusion of the two former. In certain localities in the south of England the Cirl-Bunting (Z.

cirlus) is also a resident ; and in winter vast flocks of the Snow-Bunting (Plectrophanes nivalis), at once recognizable by its pointed wings and elongated hind-claws, resort to our shores and open grounds. This last is believed to breed sparingly on the highest mountains of Scotland, but the majority of the examples which visit us come from northern regions, for it is a species which in summer

inhabits the whole circumpolar area. The Ortolan (2. hortulana), so highly prized for its delicate flavour, occasionally appears in England, but this island seems to lie outside its proper range. On the continent of Europe, in Africa, and throughout Asia, many other species are found, while in America the number belonging to the family cannot at present be computed. As already stated, the beautiful and melodious Cardinal (Cardinalis virgmianus), commonly called the Virginian Nightingale, must be included in this family, as also the Bobolink (Dolichonyz oryzivorus), a bird for sapidity perhaps surpassing the far-famed Ortolan, and intimately connecting the Hmberizide with the Jcteride. Whether any species of the family inhabit the Australian Regiun is as yet doubtful, but it would seem possible that several genera of Australian birds hitherto classed with the /ringillide may have to be assigned to the Hmberizide. (A. N.)

BUNTING, Jazsez, D.D., a distinguished Wesleyan minister, who exerted an influence in his denomination second only to that of John Wesley himself,~~was born at Manchester 13th May 1779, and died on the 16th June 1858. He was educated at the grammar school of his native town. At the age of nineteen he began to preach, and a year later (1799) he became a member of the Con~~ ference. He continued in the active discharge of his ministerial duties for upwards of fifty-seven years—his successive spheres of labour being Manchester, Liverpool, and London. In 1834 he was appointed president of the newly-founded Wesleyan theological college, and in this position, which he held till his death, he succeeded in materially raising the standard of education among Wesleyan ministers. He was four times chosen to be president of the Conference, was repeatedly secretary of the “ Legal Hundred,” and for eighteen years was secretary to the Wesleyan Missionary Society. In these and other offices he found ample scope for that great

natural sagacity and power of administration which did so much for the consolidation and extension of the Wesleyan denomination. Dr Bunting was a popular preacher, and an effective plat- form speaker. Two volumes of his sermons were published posthumously in 1862. The first volume of a memoir, by his son, appeared in 1860.

BUNYAN, Joun (1628-1688), the most popular religi- ous writer in the English language, was born at Elstow, about a mile from Bedford, in the year 1628. He may be said to have been born a tinker. The tinkers then formed a hereditary caste, which was held in no high estimation. They were generally vagrants and pilferers, and were often confounded with the gipsies, whom in truth they nearly resembled. Bunyan's father was more respect- able than most of the tribe. He had a fixed residence, and was able to send his son to a village school where reading and writing were taught.

The years of John's boyhood were those during which the Puritan spirit was in the highest vigour all over England; and nowhere had that spirit more influence than in Bedfordshire. It is not wonderful, therefore, that a lad to whom nature had given a powerful imagination

and sensibility which amounted toa disease, should have

been early haunted by religious terrors. Before he was ten, his sports were interrupted by fits of remorse and despair ; and his sleep was disturbed by dreams of fiends trying to fly away with him. As he grew older, his mental conflicts became still more violent. The strong language in which he described them has strangely misled all his biographers except Mr Southey. It has long been an ordinary practice with pious writers to cite Bunyan as an instance of the supernatural power of divine grace to rescue the human soul from the lowest depths of wicked- ness. He is called in one book the most notorious of

profligates; in another, the brand plucked from the burning. He is designated in Mr Ivimey's History of the Baptists as the depraved Bunyan, the wicked tinker of Elstow. Mr Ryland, a man once of great note among the dissenters, breaks out into the following rhapsody :—" No man of

common sense and common integrity can deny that Bunyan was a practical atheist, a worthless contemptible infidel, a vile rebel to God and goodness, a common profli- gate, a soul-despising, a soul-murdering, a soul-damning, thoughtless wretch as could exist on the face of the earth. Now be astonished, O heavens, to eternity! and wonder, O earth and hell! while time endures. Behold this very man become a miracle of mercy, a mirror of wisdom, goodness, holiness, truth, and love." But whoever takes the trouble to examine the evidence will find that the good men who wrote this had been deceived by a phrase- ology which, as they had been hearing it and using it all their lives, they ought to have understood better. There cannot be a greater mistake than to infer from the strong expressions in which a devout man bemoans his exceeding sinfulness, that he has led a worse life than his neighbours. Many excellent persons, whose moral character from boy- hood to old age has been free from any stain discernible to their fellow-creatures, have, in their autobiographies and diaries, applied to themselves, and doubtless with sincerity, epithets as severe as could be applied to Titus Oates or Mrs Brownrigg. It is quite certain that Bunyan was, at eighteen, what, in any but the most austerely puritanical circles, would have been considered as a young man of singular gravity and innocence. Indeed, it may be remarked that he, like many other penitents who, in general terms, acknowledge themselves to have been the worst of mankind, fired up, and stood vigorously on his defence, whenever any particular charge was brought against him by others. He declares, it is true, that he had let loose the reins on the neck of his lusts, that he had delighted in all transgressions against the divine law, and that he had been the ringleader of the youth of Elstow in all manner of vice. But when those who wished him ill accused him of licentious amours, he called on God and the angels to attest his purity. No woman, he said, in heaven, earth, or hell, could charge him with having ever made any improper advances to her. Not only had he been strictly faithful to his wife ; but he had, even before his marriage, been perfectly spotless. It does not appear from his own confessions, or from the railings of his enemies, that he ever was drunk in his life. One bad habit he contracted, that of using profane language ; but he tells us that a single reproof cured him so effectually that he never offended again. The worst that can be laid to the charge of this poor youth, whom it has been the fashion to represent as the most desperate of reprobates, as a village Rochester, is, that he had a great liking for some diversions, quite

harmless in themselves, but con- demned by the rigid precisians among whom he lived, and for whose opinion he had a great respect. The four chief sins of which he was guilty were dancing, ringing the bells of the parish church, playing at tipcat, and reading the history of Sir Bevis of Southampton. A rector of the school of Laud would have held such a young man up to the whole parish as a model. But Bunyan's notions of good and evil had been learned in a very different school; and he was made miserable by the conflict between his tastes and his seruples.

When he was about seventeen, the ordinary course of his life was interrupted by an event which gave a lasting colour to his thoughts. He enlisted in the Parliament- ary army, and served during the decisive campaign of 1645. All that we know of his military career is, that, at the siege of Leicester, one of his comrades, who had

taken his post, was killed by a shot from the town. Bunyan ever after considered himself as having been

gaved from death by the special interference of Providence.

It may be observed that his imagination was strongly impressed by the glimpse which he had caught of the pomp of war. To the last he loved to draw his illustra- tions of sacred things from camps and fortresses, from guns, drums, trumpets, flags of truce, aud regiments arrayed each under its own banner. His Greatheart, his Captain Boanerges, and his Captain Credence are evidently portraits, of which the originals were among those martial saints who fought and expounded in Fairfax's army.

In a few months Bunyan returned home, and married. His wife had some pious relations, and brought him as her only portion some pious books. And now his mind, excit- able by nature, very imperfectly disciplined by education, and exposed, without any protection, to the infectious virulence of the enthusiasm which was then epidemic in England, began to be fearfully disordered. In outward things he soon became a strict Pharisee. He was constant in attendance at prayers and sermons. His favourite amuse- ments were, one after another, relinquished, though not without many

painful struggles. In the middle of.a game at tipeat he paused, and stood staring wildly upwards with his stick in his hand. He had heard a voice asking him whether he would leave his sins and go to heaven, or keep his sins and go to hell; and he had seen an awful coun- tenance frowning on him from the sky. The odious vice of bell-ringing he renounced; but he still for a time ventured to go to the church tower and look on while others pulled the ropes. But soon the thought struck him that, if he persisted in such wickedness, the steeple would fall on his head ; and he fled in terror from the accursed place. To give up dancing ou the village green was still harder ; and some months elapsed before he had the forti- tude to part with his darling sin. When this last sacrifice had been made, he was, even when tried by the maxims of that austere time, faultless. All Elstow talked of him as an eminently pious youth. But his own mind was more uuquiet than ever. Having nothing niore to do in the way of visible reformation, yet finding in religion no pleasures to supply the place of the juvenile amusements which he had relinquished, he began to apprehend that he lay under some special malediction ; and he was tormented by a succession of fantasies which seemed likely to drive him to suicide or to Bedlam.

At one time he took it into his head that all persons of Israelite blood would be saved, and tried to make out that he partook of that blood; but his hopes were speedily destroyed by his father, who seems to have had no ambi- tion to be regarded as a Jew.

At another time Bunyan was disturbed by a strange dilemma: “If I have not faith, Iam lost; if I have faith, I can work miracles.” He was tempted to cry to the puddles between Elstow and Bedford, “Be ye dry,” and to stake his eternal hopes on the event.

Then he took up a notion that the day of grace for Bedford and the neighbouring villages was past; that all who were to be saved in that part of England were already converted ; and that he had begun to pray and strive some months too late.

Then he was harassed by doubts whether the Turks were not in the right, and the Christians in the wrong. Then he was troubled by a maniacal impulse which prompted him to pray to the trees, to a broomstick, to the parish bull. As yet, however, he was only entering the valley of the shadow

of death. Soon the darkness grew thicker. Hideous forms floated before him. Sounds of cursing and wailing were in his ears. His way ran through stench and fire, close to the mouth of the bottom-

less pit. He began to be haunted by a strange curiosity about the unpardonable sin, and by a morbid longing to commit it. But the most frightful of all the forms which his disease took was a propensity to utter blasphemy, and especially to renounce his share in the benefits of the redemption. Night and day, in bed, at table, at work, evil spirits, as he imagined, were repeating close to his ear the words, “Sell him, sell him.” He struck at the hobgoblins ; he pushed them from him; but still they were ever at his side. He cried out in answer to them, hour after hour, “Never, never; not for thousands of worlds ; not for thousands.” At length, worn out by this long agony, he suffered the fatal words to escape him, “Tet him go if he will.” Then his misery became more fearful than ever. He had done what could not be for- given. He had forfeited his part of the great sacrifice. Like Esau, he had sold his birthright ; and there was no longer any place for repentance. “None,” he afterwards wrote, ‘“‘knows the terrors of those days but myself.” He has described his sufferings with singular energy, sym- plicity, and pathos. He envied the brutes; he envied the very stones on the street, and the tiles on the houses. The sun seemed to withhold its light and warmth from him. His body, though cast in a sturdy mould, and though still in the highest vigour of youth, trembled whole days together with the fear of death and judgment. He fancied that this trembling was the sign set on the worst reprobates, the sign which God had put on Cain. The unhappy man’s emotion destroyed his power of diges- tion. He had such pains that he expected to burst asunder like Judas, whom he regarded as his prototype.

Neither the books which Bunyan read, nor the advisers whom he consulted, were likely to do much good in a case like his. His small library had received a most unseason- able addition, the account of the lamentable end of Francis Spira. One ancient man of high repute for piety, whom the sufferer consulted, gave an opinion which might well’ have produced fatal consequences. “TI am afraid,” said Bunyan, “that I have committed the sin

against the Holy Ghost.” ‘Indeed,’ said the old fanatic, “I am afraid that you have.”

At length the clouds broke; the light became clearer and clearer; and the enthusiast who had imagined that he was branded with the mark of the first murderer, and destined to the end of the arch-traitor, enjoyed peace and a cheerful confidence in the mercy of God. Years elapsed, however, before his nerves, which had been so perilously overstrained, recovered their tone. When he had joined a Baptist society at Bedford, and was for the first time ad- mitted to partake of the eucharist, it was with difficulty that he could refrain from imprecating destruction on his brethren while the cup was passing from hand to hand. After he had been some time a member of the congregation, he began to preach ; aud his sermons produced a powerful effect. He was indeed illiterate; but he spoke to illiterate men. The severe training through which he had passed had given him such an experimental knowledge of all the modes of religious melancholy as he could never have gathered from books; and his vigorous genius, animated by a fervent spirit of devotion, enabled him not only to exercise a great influence over the vulgar, but even to extort the half-contemptuous admiration of scholars. Yet it was long before he ceased to be tormented by an impulse which urged him to utter words of horrible impiety in the pulpit.

Counter-irritants are of as great use in moral as in physical diseases. It should seem that Bunyan was finally relieved from the internal sufferings which had embittered his life by sharp persecution from without. He had been five years a preacher, when the Restoration

put it in the power of the Cavalier gentlemen and clergymen all over the country to oppress the dissenters ; and, of all the dissenters whose history is known to us, he was perhaps the most hardly treated. In November 1660 he was flung into Bedford jail; and there he remained, with some intervals of partial and precarious libarty, during twelve years. His persecutors tried to extort from him a promise that he would abstain from preaching ; but he was convinced that he was divinely set apart and commissioned to be a teacher of righteous- ness, and he was fully determined to obey God rather than man. He was brought before several tribunals, laughed at, caressed,

reviled, menaced, but in vain. He was facetiously told that he was quite right in thinking that he ought not to hide his gift; but that his real gift was skill in repairing old kettles. He was con- pared to Alexander the coppersmith, He was told that if le would give up preaching he should be instantly liberated. He was warned that if he per- sisted in disobeying the law he would be hable to banishment, and that if he were found in England after a certain time his neck would be stretched. His answer was, “If you let me out to-day, I will preach again to- morrow.” Year after year he lay patiently in a dungeon, compared with which the worst prison now to be found in the island is a palace. His fortitude is the more extra- ordinary because his domestic feelings were unusually strong. Indeed, he was considered by his stern brethren as somewhat too fond and indulgent a parent. He had several small children, and among them a daughter who was blind, and whom he loved with peculiar tenderness. He could not, he said, bear even to let the wind blow on her; and now she must suffer cold and hunger; she must beg; she inust be beaten ; “yet,” he added, “I must, I must do it.” While he lay in prison, he could do nothing in the way of his old trade for the support of hisfamily. He determined, therefore, to take up a new trade. He learned to make long-tagged thread laces; and many thousands of these articles were furnished by him to the hawkers. While his hands were thus busied he had other employments for his mind and his lips. He gave religious instruction to his fellow-captives, and formed from among them a little flock, of which he was himself the pastor. He studied inde- fatigably the few books which he possessed. His two chief companions were the Bible and Fox’s Book of Martyrs. His knowledge of the Bible was such that he might have been called a living concordance; and on the margin of his copy of the Book of Martyrs are still legible the ill-spelt lines of doggrel in which he expressed his reverence for the brave sufferers, and his implacable enmity to the mystical Babylon.

At length he began to write, and though it was some time before he discovered where his strength lay, his writings were not unsuccessful. They were coarse, indeed, but they showed a keen mother wit, a great command of the homely mother tongue, an intimate knowledge of the English Bible, and a vast and dearly bought spiritual experience. They therefore, when the corrector of the press had improved the syntax and the spelling, were well received by the humbler class of dissenters.

Much of Bunyan’s time was spent in controversy. He wrote sharply against the Quakers, whom he seems always to have held in utter abhorrence. It is, however, a remarkable fact that he adopted one of their peculiar fashions; his practice was to write, not November or December, but eleventh month and twelfth month.

He wrote against the liturgy of the Church of England. No two things, according to him, had less affinity than the form of prayer and the spirit of prayer. Those, he said with much point, who have most of the spirit of prayer

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are all to be found in jail; and those who have most zeal for the form of prayer are all to be found at the alehouse. The doctrinal Articles, on the other hand, he warmly praised, and defended against some Arminian clergy- men who had signed them. The most acrimonious of all his works is his answer to Edward Fowler, afterwards bishop of Gloucester, an excellent man, but not free from the taint of Pelagianism.

Bunyan had also a dispute with some of the chiefs of the sect to which he belonged. He doubtless held with perfect sincerity the distinguishing tenet of that sect, but he did not consider that tenet as one of high importance, and willingly joined in communion with pious Presbyterians and Independents. The sterner Baptists, therefore, loudly pronounced him a false brother. A controversy arose which long survived the original combatants. In our own time the cause which Bunyan had defended with rude logic and rhetoric against Kiffin and Danvers was pleaded by Robert Hall with an ingenuity and eloquence such as no polemical writer has ever surpassed.

During the years which immediately followed the Restoration, Bunyan’s confinement seems to have been strict. But as the passions of 1660 cooled, as the hatred with which the Puritans had been regarded while their reign was recent gave place to pity, he was less aud less harshly treated. The distress of his family, and his own patience, courage, and piety, softened the hearts of his persecutors. Like his own Christian in the cage, he found protectors even among the crowd at Vanity Fair. The bishop of the diocese,

Dr Barlow, is said to have interceded for him. At length the prisoner was suffered to pass most of his time beyond the walls of the jail, on condition, as it should seem, that he remained within the town of Bedford.

He owed his complete liberation to one of the worst acts of one of the worst governments that England has ever seen. In 1671 the Cabal was in power. Charles II. had concluded the treaty by which he bound himself to set up the Roman Catholic religion in England. ‘The first step which he took towards that end was to annul, by an unconstitutional exercise of his prerogative, all the penal statutes against the Roman Catholics ; and in order to disguise his real design, he annulled at the same time the penal statutes against Protestant Nonconformists. Bunyan was consequently set at large. In the first warmth of his gratitude he published a tract, in which he compared Charles to that humane and generous Persian king, who, though not himself blessed with the light of the true religion, favoured the chosen people, and permitted them, after years of captivity, to rebuild their beloved temple. To candid men, who consider how much Bunyan had suffered, and how little he could guess the secret designs of the court, the unsuspicious thankfulness with which he accepted the precious boon of freedom will not appear to require any apology.

Before he left his prison he had begun the book which has made his name immortal. The history of that book is remarkable. The author was, as he tells us, writing a treatise, in which he had occasion to speak of the stages of the Christian progress. He compared that progress, as many others had compared it, to a pilgrimage. Soon his quick wit discovered innumerable points of similarity which had escaped his predecessors. Images came crowd- ing on his mind faster than he could put them into words, quagmires and pits, steep hills, dark and horrible glens, soft vales, sunny pastures, a gloomy castle, of which the courtyard was strewn with the skulls and bones of murdered prisoners, a town all bustle and splendour, like London on the Lord Mayor’s Day, and the narrow path, straight as a

rule could make it, running on up hill and down hill, through city and through wilderness, to the Black River and the Shining Gate. He had found out, as most people would have said, by accident, as he would doubtless

have said, by the guidance of Providence, where his powers lay. IIe had no suspicion, indeed, that he was producing a masterpiece. He could not guess what place his allegory would occupy in English literature ; for of English litera- ture he knew nothing. Those who suppose him to have studied the Faery Queen might easily be confuted, if this were the proper place for a detailed examination of the passages in which the two allegories have been thought to resemble each other. The only work of fiction, in all pro- bability, with which he could compare his Pilgrim was his old favourite, the legend of Sir Bevis of Southampton. He would have thought it a sin to borrow any time from the serious business of his life from his expositions, his controversies, and his lace tags, for the purpose of amusing himself with what he considered merely as a trifle. It was only, he assures us, at spare moments that he rcturned to the House Beautiful, the Delectable Mountains, and the Enchanted Ground. He had no assistance. Nobody but himself saw a line till the whole was complete. He then consulted his pious friends. Some were pleased. Others were much scandalized. It was a vain story, a inere romance, about giants, and lions, and goblins, and warriors, sometimes fighting with monsters, and sometimes regaled by fair ladies in stately palaces. The loose atheistical wits at Will's might write such stuff to divert the painted Jezebels of the court ; but did it become a minister of the gospel to copy the evil fashions of the world? There had been a time when the cant of such fools would have made Bunyan miserable. But that time was past; and his mind was now in a firm and healthy state. He saw thatin employing fiction to make truth clear and goodness attractive, he was only following the example which every Christian ought to propose to him- self ; and he determined to print. .

The Pilgrim's Progress stole silently into the world. Not asingle copy of the first edition is known to be in existence. The year of publication has not been ascer- tained. It is probable that during some months the little volume circulated ouly among poor and obscure sectaries. Butsoon the irresistible charm of a book which gratified the imagination of the reader with all the action and scenery of a fairy tale, which excrcised his ingenuity by setting him to discover a multitude of curious analo- gies, which interested his feelings for human beings, frail like himself, and struggling with temptations from within and from without, which every moment drew a smile fron him by some stroke of quaint yet simple pleasantry, and

nevertheless left on his mind a sentiment of reverence for God and of sympathy for man, began to produce its effect. In puritanical circles, from which plays and novels were strictly excluded, that effect was such as no work of genius, though it were superior to the liad, to Don Quixote, or to Othello, can ever produce ona mind accustomed to indulge in literary luxury. In 1678°came forth a second edition with additions; and then the demand became immense. In the four following years the book was reprinted six times. ~~The eighth edition, which contains the last im~~ provements made by the author, was published in 1682, the ninth in 1684, the tenth in 1685. The help of the engraver had early been called in; and tens of thousands of children looked with terror and delight on execrable copperplates, which represented Christian thrusting his sword into Apollyon, or writhing in the grasp of Giant Despair. In Scotland, and in some of the colonies, the

A copy has been discovered in very recent times, and a fac-simile reprint of it was published in 1875.

Y £s 525

Pilgrim was even more popular than in his native country. Bunyan has told us, with very pardonable vanity, that in New England his dream was the daily subject of the con- versation of thousands, and was thought worthy to appear in the most superb binding. He had numerous admirers in Holland, and among the Huguenots of France. With the pleasures, liowever, he experienced some of the pains of eminence. Knavish booksellers put forth volumes of trash under his name, and envious scribblers main- tained it to be impossible that the poor ignorant tinker should really be the author of the book which was called his.

He took the best way to confound both those who counter- feited him and those who slandered him. He continued to work the gold-field which he had discovered, and to draw from it new treasures, not indeed with quite such ease and in quite such abundance as when the precious soil was still virgin, but yet with success, which left all competition far behind. In 1684 appeared the second part of the Pagrus Progress. It was soon followed by the Holy War, which if the Pilgrim’s Progress did not exist, would be the best allegory that ever was written.

Bunyan’s place in society was now very different from what it had been. There had been a time when many dissenting ministers, who could talk Latin and read Greek, had affected to treat him with scorn. But his fame and influence now far exceeded theirs. He had so great an authority among the Baptists that he was popularly called Bishop Bunyan. His episcopal visitations were annual. From Bedford he rode every year to London, and preached there to large and attentive congregations. From London he went his circuit through the country, animating the zeal of his brethren, collecting and distributing alms, and making up quarrels. The magistrates seem in general to have given him little trouble. Lut there is reason to believe that, in the year 1685, he was in some danger of again occupying his old quarters in Bedford jail. In that year the rash and wicked enterprise of Monmouth gave the Government a pretext for prosecuting the nonconfor- mists ; and scarcely one eminent divine of the Presbyterian, Independent, or Baptist persuasion remained unmolested. Baxter was in prison: Howe was driven into exile: Henry was arrested. Two eminent Baptists, with whom Bunyan had been cngaged in controversy, were in great peril and distress. Danvers was in danger of being hanged ; and Kiffin’s grandsons were actually hanged. The tradition is that, during those evil days, Bunyan was forced to disguise himself as a waggoner, and that he preached to his congregation at Bedford in a smock-frock, with a cart- whip in his hand. But soon a great change took place. James the Second was at open war with the church, and found it necessary to court the dissenters. Some of the creatures of the Government tried to secure the aid of Bunyan. They probably knew that he had written in praise of the indulgence of 1672, and therefore hoped that he might be equally pleased with the indulgence of 1687. But fifteen years of thought, observation, and commerce with the world had made him wiser. Nor were the cases exactly parallel. Charles was a professed Protestant; James was a professed Papist. The object of Charles’s indulgence was disguised; the object of James’s indulgence was patent. Bunyan was not deceived. He exhorted his hearers to prepare themselves by fasting and prayer for the danger which menaced their civil and religious liberties, and refused even tospeak to the courtier who came down to remodel the corporation of Bedford, and who, as was supposed, had it in charge to offer some municipal dignity to the bishop of the Baptists.

Bunyan did not live to see the Revolution. In the summer of 1688 he undertook to plead the cause of a son

with an angry father, and at length prevailed on the old man not to disinherit the young one. This good work cost the benevolent intercessor his life. He had to ride through heavy rain. He came drenched to his lodgings on Snow Hill, was seized with a violent fever, and died in a few days (August 31). He was buried in Bunhill Fields ; and the spot where he lies is still regarded by the Nonconformists with a feeling which seems scarcely in harmony with the stern spirit of their theology. Many Puritans, to whom the respect paid by Roman Catholics to the reliques and tombs of saints seemed childish or sinful, are said to have begged with their dying breath that their coffins might be placed as near as possible to the coffin of the author of the Pugrim's Progress.

The fame of Bunyan during his life, and during the century which followed his death, was indeed great, but was almost entirely confined to religious families of the middle and lower classes. "Very seldom was he during that time mentioned with respect by any writer of great literary eminence. Young coupled his prose with the poetry of the wretched D'Urfey. In the Spiritual Quixote, the adventures of Christian are ranked with those of Jack the Giant-Killer and John Hickathrift. Cowper ventured to praise the great allegorist, but did not venture to name him. It is a significant circumstance that, till a recent period, all the numerous editions of the Pilgrim's Progress were evidently meant for the cottage and the servant's hall. The paper, the printing, the plates, were all of the meanest description. In general, when the educated minority and the common people differ about the merit of a book, the opinion of the educated minority finally prevails. The Pilgrim's Progress is perhaps the only book about which, after the lapse of a hundred years, the educated minority has come over to the opinion of the common people.

The attempts which have been made to improve and to imitate this book are not to be numbered. It has been done into verse; it has been done into

modern English. The Pilgrimage of Tender Conscience, the Pilgrimage of Good Intent, the Pilgrimage of Seek Truth, the Pilgrimage of Theophilus, the Infant Pilgrim, the Hindoo Pilgrim, are among the many feeble copies of the great original. But the peculiar glory of Bunyan is that those who most hated his doctrines have tried to borrow the help of his genius. A Catholic version of his parable may be seen with the head of the virgin in the title-page. On the other hand, those Antinomians for whom his Calvinism is not strong enough, may study the Pilgrimage of Hephzibah, in which nothing will be found which can be construed into an admission of free agency and universal redemption. But the most extraordinary of all the acts of Vandalism by which a fine work of art was ever defaced was committed so late as the year 1853, It was determined to transform the Plgrim's Progress into a Tractarian book. The task was not easy; for it was hecessary to make two sacraments the most prominent objects in the allegory, and of all Christian theologians, avowed Quakers excepted, Bunyan was the one in whose system the sacraments held the least prominent place. Tlowever, the Wicket Gate became a type of Baptism, and the House Beautiful of the Eucharist. The effect of this change is such as assuredly the ingenious person who made it never contemplated. For, as not a single pilgrim passes through the Wicket Gate in infancy, and as Faithful hurries past the House Beautiful without stopping, the lesson which the fable in its altered shape teaches, is that none but adults ought to be baptized, and that the Eucharist may safely be neglected. Nobody would have discovered from the original Pilgrim's Progress that the author was not a Pedobaptist. To turn his book into a

book against Pedobaptism, was an achievemeut reserved for au Anglo-Catholic divine. Such blunders must neces- sarily be committed by every man who mutilates parts of a great work, without taking a comprehensive view of the whole. (a.)

Bunyan's works were first published in a collected form in 1692 (2 vols. folio). Of more recent editions, one of the best is that by George Offor (8 vols. 8vo, 1853). The Pilgrim's Progress has probably passed through a larger number of editions than any other book except the Bible. Southey's

edition (1880) contains a life of Bunyan, which was afterwards (1839) published separately.

BUNZLAU (1.), the chief town of a circle in the government of Liegnitz in Prussian Silesia, on the right bank of the Bober, about 27 miles from the city of Liegnitz by the Berlin and Breslau Railway, which crosses the river by a noble viaduct. The older part of the town is still surrounded witli fortifications. Its public institutions comprise a gymnasium, a normal college, an orphan asylum, aud the provincial lunatic asylum. The house is shown where Opitz was born in 1597, and in the market-place is a cast-iron obelisk to field-marshal Kutusoff. The Bunzlan pottery is famous; woollen and linen cloth are manu- factured, and there is a considerable trade in grain and cattle. Bunzlau (Boleslavia) received its name in the 12th century from Duke Boleslas, who separated it from the duchy of Glogau. Its importance was increased by numerous privileges and the possession of extensive mining works. It was frequently captured and recaptured in the wars of the 17th century, and in 1739 was completely destroyed by fire. In 1813 it was the scene of a battle be- tween the French and the Allies. Population in 1871, 8812.

BUNZLAU (2.), the chief town of a circle in Bohemia, on the left bauk of the Iser, in 50° 25’ N. lat. and 14° 54’ KE, long. It has a town-house and castle, supposed to have been built in the 10th century—which is now used as barracks,—a military hospital, a Piaristic college, and a gymnasium. Its manufactures include cotton, woollen, and linen cloth, leather, and soap. Bunzlau is frequently called Jung Bunzlau to distinguish it from Alt Bunzlau, a village on the Elbe. Population (1869), 8695.

BUONAFEDE, Apprano (1716-1798), an Italian writer on philosophy and social economy, was born at Comachio, in Ferrara, in 1716. He became professor of theology at Naples in 1740, and entering the religious body of the Celestines in 1734, rose gradually to be general of the order. He died at Rome in 1793. His principal works, generally published under the assumed title of Agatopisto Cromazano, are on the history of philosophy, Della Istoria e delle Indole di ogni Filosofia, 7 vols., 1772, seg.; and Della [estaurazione di ogni Filosofia ne Secoli xvi., xvii., xviii, 3 vols., 1789 (which has been translated into German by Heydenreich). The second of

these is of great import- ance for the estimation of the Italian philosophers of the 16th century. His other works are Jstoria critica e Jilosofica del suicidio, 1761; Delle conquiste celebri esuminate col naturale diritto delle genti, 1763; Storia critica del moderno diritto di natura e delle genti, 1789 ; and a few poems and dramas.

BUONARROTI See MicnEt AneELo.

BUOY, a floating body used as a means of denoting any desired spot in a river, channel, or other place fre- quented by shipping. Buoys are made of various shapes and material, such as a small log of wood 6 or 8 inches diameter aud about twice that length, an ordinary cask, or a special structure either of iron or wood, varying in strength, shape, and size according to the duty it is required to perform. Before an anchor is let go, a buoy is generally attached to it, the length of the buoy-rope being slightly greater than the depth of water at high tide. This is done that if for any reason it should become necessary to slip the cable, both anchor and cable may be afterwards recovered

the more readily, their position being denoted by the buoy, and also because it is of service to know the position of the anchor before attempting to weigh it. The buoys most commonly used for this purpose are of the shape of two cones brought together at their bascs, and are made of sheet iron, usually galvanized ; they are called Nun-buoys.

Mooring-buoys are placed in convenient positions so that ships may make fast to them instead of dropping their anchors, and are generally provided with large ring and eye bolts for this purpose. Such buoys are usually of a cylindrical shape, and are made either of iron or wood. They must have sufficient buoyancy to support the weight of a cable of the required strength for the size of ship it is sutended to moor, and at the same time be high enough out of the water to make themselves conspicuous. One of the largest and most approved mooring buoys recently made consisted of a cylinder 9 feet long and 6 feet 9 inches diameter, the edges of the ends being rounded off ; it was made of iron plates 2 inch thick, and was divided into two water-tight compartments by an iron flat passing through the axis of the

cylinder ; a watertight iron trunk was fitted, passing through the buoy at the centre, at right angles to the flat, for the cable to go through, so that it might be secured on the upper surface of the buoy. ~

Buoys are also used to mark the positions of sands and shoals. A usual shape given to them in rivers and sheltered places is that of a frustum of a cone, the smaller end being placed downwards, and the name of the buoy—a name which indicates the shoal it marks—being painted in large letters on the upper end. In more exposed positions the buoys have to be larger and stronger, and are usually made of an egg-shape flattened at the bottom. The largest and most approved are made of iron plates 4 inch and 3 inch thick, with a smaller buoy of similar shape, built within the larger one, so as to divide it into two water- tight compartments. The advantage of the division in this case, and in the case of the mooring buoy described above, is, that the buoy is less liable to be sunk by collision with passing vessels, since if one compartment is damaged the other has sufficient buoyancy to float the whole. The largest of these buoys are about 15 feet 6 inches high, and 10 feet diameter at the widest part, the inner buoy being 9 feet high and 8 feet diameter.

A bell which is frequently placed on a buoy is of great service at night or in foggy weather, the motion of the buoy as it is tossed about by the waves causing the bell to ring.

BUPALUS anp ATHENIS, Greek sculptors, about 540 8.c., lived in the island of Chios, which at that time had a school of sculptors who had acquired some celebrity by their works in marble, which material they had intro- duced as a substitute for the bronze and wood previously employed for sculpture. Bupalus was the more celebrated of the two brothers. ‘Their father was Archermus, also a sculptor ; and it seems from the few notices of their works which exist, that they produced only draped figures, from which it is inferred that their art had not yet advanced to the study of the human figure itself. The Graces, who are now only known as nude figures, were represented as draped by Bupalus for the Temple of Nemesis in Smyrna. He is said also to have made a figure of Tyche (Fortune) for that town. They worked apparently only for the towns in Asia Minor and the Greek islands. Yet Pliny (Wat. Hist. xxxvi. 11) says that sculptures from their hands were

to be seen in the pediment of the temple of Apollo on the Palatine at Rome, whither they had been brought by Augustus, who seems to have had a taste for early Greek work. But if this is true, and if the figures at all fitted into the peculiar space of a temple pediment, it would follow that they had originally been designed for a similar purpose, and that, therefore, these early artists were able to produce

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figures for architectural decoration, which hardly seems probable. There is a story that Bupalus had made a caricature portrait of the poet Hipponax, who was known for his ugliness, and that the poet replied by some verses, the sting of which caused the sculptor to hang himself.

BUPHONIA, called also Dirroxta, a religious festival held on the 14th of the month Skirophorion (July) at Athens, when the very ancient ceremony was gone through of sacrificing an ox to Zeus, under the following circumstances.—The ox was driven forward to the altar, on which grain was spread, by members of the family of the Kentriade, on whom this duty devolved hereditarily (xévtpov, from which the name is derived, means a goad). When it began to eat, one of the fantily of the Thaulonide advanced with an axe, slew the ox, then immediately threw away the axe, and fied. The axe was now carried before the court of the Prytaneum (see AREoPAGUS), and there charged with having caused the death of the ox, for which it was thrown into the sea. Meantime the sacrifice of the ox was accepted in the usua] manner.

BURCKHARDT, Joun Lupwic (1784-1817), a cele- brated Swiss traveller, was born at Kirchgarten, near Lausanne, November 24,1784. After studying at Leipsic and Géttingen he visited England in the summer of 1896, carrying a letter of introduction from the celebrated Blumenbach to Sir Joseph Banks, who, with the other. members of the African Association, accepted his offer to explore the interior of Africa. After studying in London and Cambridge, and inuring himself to all kinds of hardships and privations, he left England in April 1809 for Malta, whence he proceeded, in the following October, to Aleppo. In order that he might acquire Arabic thoroughly he disguised himself as a Mussulman, under the name of Sheik Ibrahim Ibn Abdallah ; and, after two years passed in that part of Asia, he

had so mastered the language as not to be distin- guished from the natives, and had acquired such accurate knowledge of the contents of the Koran, and of the com- mentaries upon its religion and laws, that after a critical examination the most learned Mussulmans entertained no doubt of his being really what he professed to be, a learned doctor of their law. During his residence in Syria he visited Palmyra, Damascus, Lebanon, and thence repaired to Cairo with the intention of joining a caravan, and travelling to Fezzan, in the north of Africa, In 1812, whilst waiting for the departure of the caravan, he under- took a journey to the Nile, as far up as Mahass; and then, in the character of a poor Syrian merchant, he made a journey through the Nubian desert which Bruce had traversed, passing by Berber and Shendy to Suakin, on the Red Sea, whence he performed the pilgrimage to Mecca by way of Jiddah. After enduring privations and sufferings of the severest kind, he returned to Cairo in a state of great exhaustion ; but in the spring of 1816 he travelled to mount Sinai, whence he returned to Cairo in June, and there made preparations for his intended journey to Fezzan, and exploration of the sources of the Niger. Several hindrances prevented his prosecuting this intention, and finally, in April 1817, when the long expected caravat: prepared to depart, he was seized with an illness of which he died in October. He had from time to time carefully transmitted to England his journals and remarks, and a very copious series of letters, so that nothing which appeared to him to be interesting in the various journeys he made has been lost. He bequeathed his collection of 800 vols. of Oriental MSS. to the library of Cambridge university.

His works were, Travels in Nubia, 1819 ; Travels in Syria and the Holy Land, 1822; Travels in Arabia, 1829 ; Notes on the Bedouins and Wahabys, 1830 ; Arabic Proverbs, 1830.

BURDER, Georaz, one of the founders of the London Missionary Society, was born in London, June 5, 1752,

and died there May 29, 1832. He was pastor of the Independent church at Lancaster from 1778 to 1783. Afterwards, he was for twenty years minister of the West Orchard chapel at Coventry. At the end of this period he removed to London, where for twenty-nine years he officiated at the Fetter

Lane chapel. For many years he performed gratuitously the duties of secretary to the London Missionary Society, and edited, with much success, the Evangelical Magazine. eis chiefly remembered now as the author of the Village Sermons, which appeared at intervals from 1799 to 1812, and were at last completed in six volumes. They have had an extraordinarily wide circulation, and have passed through numerous editions. He edited many works,—among others the Pélgrim's Progress, Collings's Weaver's Pocket-book, or Weaving Spiritu- alized, and Henry's Bible with Improvements.

BURDETT, Sir Francis (1770-1844), Baronet, was born on the 25th of January 1770. The rudiments of his education he received at Westminster school, whence he removed in due time to Oxford. He did not wait to graduate at that university, but in 1790 set out on a Con- tinental tour, in the course of which he became strongly imbued with the revolutionary principles then dominant in France and other countries. On his return to England in 1793 he married the youngest daughter of Thomas Coutts, a London banker, with whom he received a large fortune. In 1796, through the influence of the duke of Newcastle, he was chosen M.P. for Boroughbridge, on which occasion he had as colleague John Scott, afterwards Lord Eldon. In 1797 he succeeded his grandfather in the baronetcy, his father and elder brother having predeceased him. At the outset of his political career he was a zealous supporter of ultra-liberal measures. In 1802, after a protracted contest, he was elected M.P. for Middlesex, in opposition to the former member, Mr Mainwaring. The election, however, was declared void, and in the subsequent canvass he was defeated. In 1806 he again stood for Middlesex and was again defeated, but when he stood for Westminster in the same year he was elected by a large majority. In March 1810 he wrote a letter to his constituents, denying the right of Government to commit for libel, as they had recently done. This letter was brought under the notice of the House, and the speaker issued a warrant for the committal of Sir Francis to the Tower. The baronet, how- ever, disputed the right of the House, and had to be removed from his own residence by force. There was some collision in consequence between the military and the populace who were devoted to Sir Francis. At the pro- rogation of parliament he was released, and lost uo time in prosecuting the Speaker and the Sergeant-at-arms, but without success. On the occasion of the Manchester riots in 1819 he wrote a letter to his constituents, for which

he was tried for libel, found guilty, and condemned to three months' imprisonment, and to pay a fine of £1000. In 1837 he ceased to represent Westminster, and when he was returned for North Wiltshire he joined the Conserva- tive party, which he supported during the remainder of his political career. He died January 23, 1844.

BURG, a town of Prussian Saxony, on the River Ihle, and on the railway from Berlin to Magdeburg, 14 miles N.E. of the latter. It has long been noted for its woollen manufactures, which afford employment to a great part of its population. The town formerly belonged to the Querfurt principality, but was ceded to Brandenburg in 1687. It owes its prosperity to the large influx of industrious French, Palatinate, and Walloon refugees, which took place in the end of the 17th century. Popula- tion in 1871, 15,184.

BURGAGE is a form of tenure, both in England and Scotland, applicable to the property connected with the

old municipal corporations and their privileges. The term is of less practical importance in the English than in the Scottish system, where it still holds an important place in the practice of conveyancing, real property being there generally divided into feudal-holding and burgage-holding, It is usual to speak of the English burgage-tenure as a relic of Saxon freedom resisting the shock of the Norman con- quest and its feudalism, but it is perhaps more correct to consider it a local feature of that general exemption from feudality enjoyed by the municipia as a relic of their ancient Roman constitution. The reason for the system preserving its specifically distinct form in Scottish convey- ancing is because burgage-holding was an exception to the system of subinfeudation which remained prevalent in Scotland when it was suppressed in England. While other vassals might hold of a graduated hierarchy of overlords up to the crown, the burgess always held directly of the sovereign. It is curious that while in England the burgage-tenure was deemed a species of soccage, to distin- guish it from the military holdings, in Scotland it was strictly a military holding, by the service of watching and warding for the defence of the burgh. In England the franchises enjoyed by burgesses, freemen, and other con- suetudinary

constituencies in burghs, were dependent on the character of the burgage-tenure.

BURGDORF (in French, BErTHouD), a town in the Swiss canton of Bern, on the River Emme, about 14 miles by railway from the chief city. It is situated 1840 feet above the level of the sea, and consists of an upper and lower part, which are connected by a spiral arrangement of streets. Its houses are substantially built, and it has an ancient castle, a town-house, a hospital, an orphanage, and a public lbrary. Ribbons and damask, tobacco and chocolate are manufactured ; and a large trade is carried on in the dairy produce of the Emmenthal. From the Lueg about 44 miles to the N.E. a view of the whole Bernese Alps can be obtained. The castle of Burgdorf was built at a very early date, and the town became the capital of Lesser Burgundy and the residence of the dukes of Zéhringen. In 1270 they were succeeded by the lords of Kyburg, who, in 1326, pawned their possessions to Ulrich of Signan. In 1384 the town and countship were purchased by Bern for 37,000 florins, and the Bernese magistrates held rule till 1798. Pestalozzi had his educa- tional establishment in the castle for a number of years. Population in 1870, 5078.

BURGER, Gottrriep Aucust (1748-1794), a cele- brated German poet, was born on the lst of January 1748 at Wolmerswende, a village in the principality of Halber- stadt, where his father was Lutheran minister. In his childhood he showed little inclination to study ; the Bible was the only book which had any attraction for him, and his first attempts in versification were imitations of the Psalms. It is to this first direction of his studies that we are to attribute the Biblical phrases, and the allusions to Christi- anity, which we find even in his amatory poetry. He was fond of solitude, and indulged in all the romantic senti- ments which deserts and the gloom of forests inspire. From the school of Aschersleben, where his maternal grand- father resided, and which he quitted in consequence of receiving a severe chastisement for composing an epigram, he was sent to the institution at Halle. But at neither of these places did he make much progress, having a taste only for the lessons in prosody and versification. In 1764 Biirger, who was intended for the clerical office, began to attend the course of lectures given by the professors of the university. Klotz, a learned classical scholar, admitted him into the select number of the young men whose talents he

took a pleasure in cultivating ; but this society appears not to have produced the same favourable effect on the

moral character of Biirger as on his genius. His conduct prejudiced his grandfather Bauer against him; and it was with difficulty that he obtained from him some further assistance, with permission, in the year 1768, to repair to Géttingen to prosecute the study of the law, This change did not make him more regular in his studies ; his morals became corrupted; and his grandfather withdrew his pro- tection. Biirger contracted debts; and his situation would have become altogether desperate had not some friends interfered to assisthim. An association, memorable in the annals of German literature, and into which Birger was now admitted, had just been formed at Gottingen ; it reckoned among its members Boje, Biester, Sprengel, Hélty, Miiller, Voss, the two Counts Stolberg, C. F. Cramer, and Leisewitz. All of these were persons versed in Greek and Roman literature, and at the same time they all idolized Shakespeare. Biirger, in a great measure, owed his style to the enthusiasm which he showed, in common with his literary friends, for our great dramatist. The Religues of Ancient English Poetry, published about this time by Dr Percy, gave an additional impulse to the direction which his mind had taken, and suggested to him some of his most admired productions. Of all his friends, Boje was the one who exercised the greatest influence over him in the choice and treatment of his subjects; and it is to his severe observations that the poetical stanza of Birger owes a great part of that elegance and roundness which characterize it. To the same friend he was indebted also for some improve- ment in his circumstances. On the recommendation of Boje he was appointed to the collectorship of Altengleichen, in the principality of Calenberg. The following winter, some fragments of a ghost story, which he heard a peasant girl singing by moonlight, caught his imagination, and sugested his celebrated ballad of Leonora. This remarkable production at once established his reputation as a poet. About this time he married a Hanoverian lady, named Leonhart ; but this union proved only a source of bitterness, as an unhappy attachment to her younger sister soon after sprung up in his heart. The loss of a sum of money, of which his grandfather had made him a present, was the first commencement of his embarrassments ; the taking of a large farm, which

he did not know how to manage, increased them. The dismissal from his place, in 1784, in consequence of suspicions (probably ill-founded) raised against the fidelity of his accounts, gave the finishing stroke to his misfortunes. He had a little before lost his wife, whose death was hastened by the culpable passion which Biirger cherished in his heart. Left with two children, and reduced to the inconsiderable emoluments of Zhe Almanack of the Muses, which he had edited since 1779, he removed to Gottingen with a view to giving private lessons there, and in the hope of obtaining a professor's chair in the department of belles-lettres. Five years later the title was conferred on him, but without a salary ; and this was the only public recompense obtained during his whole life by a man who was one of the favourite authors of his nation, aud who, while yet young, had achieved the highest reputation. Scarcely were the ashes of his wife cold when he espoused her sister, whose name his poems have made but too famous. She died in childbed in the beginning of 1786. From that moment his own life only lingered on ; and the fire of his genius seemed extinguished with the passion which had so long nourished it. He had scarcely strength enough, in the intervals of his dejection, to finish his Song of Songs, a sort of dithyrambic or nuptial hymn, intended to celebrate his second marriage, and which is a strange mixture of frantic passion, religious devotion, and the most bombastic expression. It was the last production of Birger.

Having studied the philosophy of Kant, he had an idea

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of deriving some aavantage from it at Gottingen, where it had not yet been taught. He undertook to explain it in a course of lectures, which were attended by a great number of students The satisfaction which the university expressed to him for two cantatas which he composed in 1787, on the occasion of the fifty years' jubilee of this illustrious institu- tion, and his appointment to the situation of professor extraordinary, reanimated his spirits. Fortune appearing to smile on him once more, he formed the design of marrying again. During one of the moments when he was most occupied with this idea he received a letter from Stuttgart, in which a young woman, whose style indicated a cultivated mind, and her sentiments an elevated and feeling heart, after describing to him with enthusiasm the impression which

his poetry had made upon her, offered him her hand and heart. ‘The information which he received respecting the character, the fortune, and personal accomplishments of his correspondent having excited his curiosity, he took a journey to Stuttgard, and brought back with him a wife who embittered and dishonoured the rest of his days. In less than three years le saw himself under the necessity of obtaining a divorce from her; and the ruin of his health aggravated the absolute disorder of his finances. Confined to a small chamber, the favourite poet of Germany wasted the remainder of his strength in translations for foreign booksellers ; but sickness and grief soon deprived him even of this resource, and he must have died in a state of the most abject poverty if the Government of Hanover had not relieved his necessities. He died June 8, 1794, in the forty-seventh year of his age.

Biirger is only remarkable as a lyric poet; for after having tried all the different species of this class of com- positions, he has succeeded eminently only in the song and the ballad. We shall perhaps characterize his genius sufficiently by saying that his imagination is more fresh than rich,—that he has more sensibility than elevation, more naiveté and good nature than delicacy or taste. His style is striking from its clearness and its energy, and an elegance which is rather the result of labour than of natural grace ; he possesses, in short, all the qualities which please the multitude. Allowing the title of poet only to those whose writings were calculated to become popular, he early habituated himself to reject whatever appeared to him not sufficiently intelligible and interesting to all classes of readers. He is always clear and forcible; and if at certain times there appears a want of selection and care in the details, yet the sentiments are uniformly noble, and the moral purpose of the majority of his pieces is irreproachable. Of the first three editions of Biirger’s works, published at Gottingen, two appeared in 1778 and 1789, in 3 vols. 8vo; and the third, after his death, was published by his friend Ch. Reinhard, in 4 vols., 1796. Later editions of his poems are very numerous.

BURGERSDYK, or Burcerspictus, Francis, a cele- brated Dutch logician, was born at Lier, near Delft, in 1590, and died at Leyden in 1629, in the thirty-ninth year of his age. He studied at the university of Leyden, and after completing his academical career there with great distinc- tion, travelled through Germany and France. On arriving at Saumur in the latter country he

began to study theology, and was so successful, that, while still a very young man, he was appointed professor of philosophy in that town. This office he held for five years, at the end of which period he returned to Leyden, where he accepted the chair of logic and moral philosophy, and afterwards that of natural philosophy. His Logic was at one time widely used, and is still a very valuable compendium. His treatise on ethics, entitled /dea Philosophie Moralis, was published posthumously in 1644.

BURGESS, Dantex (1645-1712), a learned and witty dissenting divine of the 17th century. born at Staines,

in Middlesex, of which parish his father was minister. He was educated at Westminster school, and in 1660 was sent to Magdalen Hall, Oxford, but not being able conscientiously to subscribe the necessary formule, he

quitted that university without taking his degree. In | s. fresco and in distemper, specimens of which are in the

1667, after taking orders, he was appointed by Lord Orrery to the head-mastership of a school recently established by that nobleman at Charleville in Munster, and soon after he became private chaplain to Lady Mervin, near Dublin. On his return from Ireland he openly avowed his Presbyterian principles, and frequently preached in con- tempt of the severe laws against nonconformity. For these offences he was imprisoned, but soon regaining his liberty he went to London, where he speedily collected a large con-gregation, as much by the somewhat fanatical fervour of his piety as by the ludicrous illustrations which he frequently employed in his sermons. Besides preaching, he gave in- structions to private pupils, of whom the most distinguished was Heury St John, afterwards Lord Bolingbroke.
3URGESS, Tue Riewt Rev. THomas (1756-1837), bishop of Salisbury, was born at Odiham, in Hampshire. Ile was educated at Winchester, and in 1775 he removed to Oxford, where he gained a scholarship at Corpus Christi College. Before graduating, he edited a reprint of Burton’s Pentalogia. In 1781 he brought out an edition of Dawes’s Miscellanea Critica, with numerous annota- tions, a work so favourably received on the Continent that it was reprinted verbatum at Leipsic in 1800. In 1783 he became a

fellow of his college, and two years later undertook a journey to Holland, where he prosecuted his researches for some time, On his return he was appointed chaplain to Shute Barrington, bishop of Salisbury, through whose influence he obtained a prebendal stall in the cathedral of that town. ‘In 1789 he published his Considerations on the Abolttion of Slavery, in which he advocated the principle of gradual emancipation. From Salisbury he removed to Durham, where he effected much good among the poorer classes, by publishing and distributing suitable religious works. In 1803 he was promoted by his old schoolfellow Addington, then prime minister, to the vacant see of St David’s, which he held for twenty years, and where he gave evidence of his philanthropic disposition by establish- ing the Society for the Promotion of Christian Knowledge, aud founding the College of Lampeter, which he liberally endowed. In 1820 he was appointed first president of the Royal Society of Literature recently founded; and three years later he was promoted to the see of Salisbury, over which he presided for twelve years, prosecuting his benevolent designs with unwearied industry. One of the most important of the many services which he rendered to the church, was the establishment of a Church Union Society for the assistance of infirm and distressed clergy- men, to which he bequeathed £3000. In the midst of his useful and laborious career, he was cut off by an attack of dropsy, February 19, 1837. He bequeathed his library and a large sum of money to Lampeter College. A list of iis works, which are very numerous, will be found in his biography by J. S. Harford, 2d ed., 1841. In addition to those already referred to may be mentioned his Essay on the Study of Antiquities; The First Principles of Christian Knowledge ; Reflections on the Controversial Writings of Dr Priestley ; Emendationes in Suidam et Hesychium et alios Lesxicographos Grecos; The Bible, and nothing but the Bible, the Religion of the Church of England. BURGHLEY, Winuiam Ceciz, Lorp. See Crctt. BURGKMAIR, Hans or Joun, a celebrated engraver on wood, believed to have been a pupil of A. Diirer, was born at Augsburg in 1473, and died about 1531. Professor Christ ascribes to him about 700 woodcuts, most of them distinguished by that spirit and freedom which we admire

in the works of his supposed master. His principal work is the series of 135 prints representing the triumphs of the Emperor Maximilian I. ‘They are of large size, exccuted in chiaroscuro, from two blocks, and convey a high idea of his powers. Burgkmair was also an excellent painter in

galleries of Munich and Vienna, carefully and solidly finished in the style of the old German school. See Kugler’s Handhook of Flemish, Dutch, and German Schools, by Crowe.

BURGLARY, or Nocrurnat Houst-Breakine (burgi latrocinium), which by the ancient English law was called hamesucken (a word also used in the law of Scotland, but in a somewhat different sense), has always been looked upon as a very heinous offence. The definition of a burglar, as given by Sir Edward Coke, is “he that by night breaketh and entereth in a mansion-house with intent to commit a felony.” “The offence and its punishment are regulated by 24 and 25 Vict. c. 96. Night, for the pur- poses of that Act (sec. 1), is deemed to commence at nine o’clock in the evening of each day, and to conclude at six o’clock in the morning. Sec. 51 extends the definition of burglary to cases in which a person enters another’s dwelling- house with intent to commit felony, or being in such house commits felony therein, and in either case breaks out of such dwelling-house by night. The punishment is penal servitude for life, or any term not less than five years, or linprisonment not exceeding two years, with or without hard labour and solitary confinement.

BURGOS, the capital formerly of the kingdom of Old Castile, and now of a separate province, stands on the slope of a hill, the base of which is skirted by the River Arlanzon, 75 miles from Madrid, in lat. 42° 21’ N., long. 3° 43’ W. It is a considerable town, consisting of Vout 1400 houses, originally girt into the form of a segment of a circle by a wall, some portions of which still remain. On the opposite bank of the river, and connected with the more ancient part of the town by three stone bridges, are the suburbs (Barrio de la Vega), tastefully laid out in pleasure-grounds, while lower down in the midst of the stream is an island furnished with seats and walks as a public promenade. The streets and squares are exceedingly irregular, although spacious and well built. The principal square is the Plaza Mayor, or Plaza de la Constitucion, in the centre of which is a bronze statue of Charles IJ. The

most important public building is the cathedral, begun by Bishop Maurice, traditionally an Englishman, in 1221, but not completed till 1567. It is built in an irregular florid Gothic style, and contains eight chapels, the most famous of which is the Capilla del Condestable, containing the tombs of several of the Velasco family, the hereditary constables of Castile. (See View and Plan in Street's Gothic Archi- tecture of Spain, and history by Orcajo, MWistoria de la Catedral de Burgos.) Besides the cathedral there is the Hotel de Ville, or Casa de Ayuntamiento (where the bones ef the Cid and his wife are preserved in a walnut casc),the Palace of Velasco, the church of St Paul, and a beautiful Doric arch, erected in honour of Fernando Gonzalez. There is a fine approach to the city through the massive gate of Santa Maria, surmounted by a statue of the Virgin and Child, and with figures of Fernando Gonzalez, Charles I, the Cid, and Diego Porcelos in the niches. The hospitals of Burgos are seven in number, and well supported ; they are the Hospital San Juan (founded in 1479), the Hospital de la Conception, San Julian, San Quirce, Del Rey, Militar, and the Hospicio y Casa de Epositos. The educational wants of the district are supplied by four primary schools, which are liberally endowed from the municipal funds, and give gratuitous instruction to a con- siderable number of pupils. There is also a normal school and

» Seminario Conciliar, in which the higher branches are taught. But the most important educational establish- nent is the Instituto Superior which has a staff of 21 professors, and annually enrols about 250 students. The university, founded in 1550 and restored in 1776, has been long defunct. Burgos is the see of an archbishop, who has for his suffragans the bishops of Pamplona, Palencia, Santander, and Tudela. It has several monasteries, amongst which may be mentioned San Pablo, built about 1415 and now occupied as a store; La Merced, converted into a hospital ; the Monasterio de Fredesval, and others. About two miles distant from the town stands the Carthusian convent of Miraflores, built in room of an earlier erection about 1480-7 ; whilst a little below the promenade of the Isla stands the Santa Maria la Real de las Huelgas, founded by Alphonso VIIL., the abbess of which was invested with almost royal prerogatives, and held an unlimited sway over more than fifty villages. Burgos is the official residence of a

military staff, and is well provided with barracks and storehouses. The jurisdiction of its courts extends over the whole azdiencia, including Alava, Guipuzcoa, Logroiio, Santander, Soria, and Biscay.

Besides furnishing a mart for the agricultural produce of the neighbouring districts, Burgos carries on a considerable export trade in linen and woollen stuffs, made in imitation of English goods. The principal articles of manufacture are paper, hats, stockings, and leather goods. Its popula- tion, which is said at one time to have numbered 80,000, amounted to 25,721 at the census of 1860, which was an increase of 10,931 since 1845.

The history of Burgos cannot be carried back beyond the end of the 9th century. There is no trace of its existence during the occupation of Spain by the Romans. We find the nucleus of it existing in 884, when Diego Porcelos, at the command of Alphonso the Great, built a castle on the right bank of the Arlanzon to check the progress of the Moors. From that time forward it steadily increased in importance, reaching the height of its prosperity in the 15th century, when, alternately with Toledo, it was occupied as a royal residence, but rapidly declining when the court was finally removed to Madrid. Being on one of the principal military roads of the kingdom, it suffered severely during the Peninsular War. In 1808 it was the scene of the defeat of the Spanish army by the French under Marshal Soult. It was unsuccessfully besieged by Wellington in 1812, but was surrendered to him at the opening of the campaign of the following year. (See Waring, Architectural Studies im Burgos.)

BURGOYNE, Joun, an English general in the American War of Independence, was born about 1730, and died in 1792. He is generally supposed to have been a natural son of Lord Bingley, but according to his latest biographer this is not the case. He entered the army when young, and made a runaway marriage with a daughter of the earl of

Derby. In 1761 he sat in parliament for Midhurst, and

in the following year he served as brigadier-general in Portugal. On the outbreak of the American war he was

appointed to a command, and in 1777 he was at the head of | 1e Li | of the dynasty. On the disintegration of the Carlovingian

the British reinforcements designed for the invasion of the colonies from Canada. In this disastrous expedition he gained possession of Ticonderoga and Fort Edward ; but, pushing on, was detached from his communications with Canada, and hemmed in by a superior force at Saratoga. Ou the 17th October his troops, about 3500 in number, laid down their arms, The success was the greatest the colonists had yet had, and it proved the turning point in the war. The indignation in England against Burgoyne was great, but perhaps unjust. The general himself resigned all his appointments, and demanded a trial, but without avail. In 1782, however, he was restored to his rank, and made

commauder-in-chief in Ireland. His Dramatic and Poctical Works appeared in 2 vols., 1808. One comedy, Zhe Heiress, kept the stage for long. (See De Fonblanque, Political and Military Episodes from the Life and Cor- respondence of Right Hon. J. Burgoyne, 187 6.) BURGOYNE, Sir Joun Fox, son of the preceding, was born in 1782, and died October 7, 1871. He was edu- cated at Eton and Woolwich, obtained a commission, and served in 1800 in Abercromby's expedition to the Mediter- ranean. He afterwards served in the Peninsular campaigns, but before the end of them was sent with Pakenham's division to New Orleans. During the years of peace Bur- goyne took an active part in promoting the movement for national defences, and in 1845 was appointed Inspector- General of Fortifications. He was engaged at 'Alma, Balaklava, and Inkerman, and conducted the siege of Sebastopol till his recall in March 1855. After the con- clusion of peace he received a baronetcy, and was made general, and in 1868 was raised to the rank of field-marshal. BURGUNDIO, an illustrious jurist of the university of Pisa, sometimes erroneously styled Burgundius. He assisted at the Lateran Council in 1179 and died at a very advanced age in 1194. He was a distinguished Greek scholar, and is considered on the authority of Odofredus to have trans- lated into Latin the various Greek fragments which occur in the Pandects, soon after the Pandects were brought to

Bologna, with the exception of those in the 27th book, the translation of which has been attributed to Modestinus.

The Latin translations which have been ascribed to Bur-

gundio were received at Bologna as an integral part of the text of the Pandects, and form part of that known as The Vulgate in distinction from the Florentine text. BURGUNDY (French, Bourgogne) has at various periods been the name of different political and geographical areas. The Burgundiaus (Burgundi or Burgundiones) seem to have been a people of German race, who are first found settled between the Oder and the Vistula. At an early period they came into conflict with the Alemanni, whom they defeated; and in the beginning of the 5th century they crossed into Roman Gaul under their leader Gundicar. The Romans not only permitted them to settle within the limits of the empire, but caused the inhabitants of the district to yield up to them one-half of their houses, two-thirds of the cultivated land, and a third of their slaves. The new-comers thus founded, in the country between the Aar and the Rhone, what is usually known as the first kingdom of Burgundy, which lasted till 534, when it was incorporated in the Frankish empire. Gundicar was succeeded in 436 by Gunderic, who somewhat extended his kingdom. In 470 it was parcelled out among his four sons—Chilperic, Gundibald, Godegisil, and Gondemar, who had their head- * quarters respectively at Geneva, Besancon, Lyons, and Vienne; but it was ultimately reunited in the hands of Gundibald, who is faious for his patronage of the Catholic ecclesiastics and his codification of the Burgundian law, which is consequently known as Lex Gundibaldia, or Lot Gombette. Cundibald was succeeded in 516 by his son Sigismund, who in turn gave place to Gundimar, the last

empire, Boson, the husband of Ermengarde, the daughter of the Emperor Louis I1., founded the kingdom of Cisjuran or Lower Burgundy, but in 882 he recognized the overlord- ship of Charles the Stout. His territory included what was afterwards known as Franche Comté, a part of the later province of Burgundy, Dauphiné, Provence, and part of Languedoc and Savoy. In 888 Beson’s example was followed by Rudolph, a Swiss count of Guelf race, wlio, supported by a large body of civil and ecclesiastical digni- taries

called together by him at St Moritz in Valais, estab- lished a kingdom known as Transjuran or Upper Burgundy.

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His son, Rudolph, bartered his rights to the Italian crown – for the Cisjuran kingdom, and thus united both Burgundies into what is frequently called the kingdom of Arles, which after various vicissitudes was finally united to the German empire by Conrad II. in 1033.

On the foundation of the Lower Burgundian kingdom by Boson, his brother Richard remained faithful to Charles the Bald of France, and was invested with the duchy of Burgundy, which had been held by various members of the Carlovingian family. King Robert II., however, took possession of it, and bestowed it in 1015 on his son, afterwards Henry I. On the accession of the latter to the throne of France, he gave the duchy to his brother Robert, with whose descendants it continued for a con- siderable period. In 1361 that elder line of dukes expired, and the duchy was seized by king John, and in 1363 presented by him to his son Philip the Bold as a reward for his bravery at the battle of Poitiers. Thus commenced that famous line of dukes which played so great a part in the history of France during the 14th and 15th centuries, and by the splendour of its achievements and the magni- ficence of its patronage rivalled the greatest dynasties of

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Parts of Burgundy, Nivernais, &c.

the time. Philip’s marriage with Margaret of Flanders – brought him the countships of Burgundy (Franche Comté), Flanders, Artois, Réthel, and Nevers; and at a later period he purchased the countship of Charolais from the count of Armagnac. He was succeeded in 1404 by John the Fearless (Jean sans Peur), who was assassinated at the Bridge of Montereau in 1419, and left the duchy to his son Philip the Good. This duke survived till 1467, and during that time had greatly extended his territory. By very questionable proceedings he obtained possession of Hainault and Holland.

Namur was purchased in 1429; * and in the following year Brabant and Limburg also fell into his grasp. In 1435 there were further yielded to him, by treaty with France, Macon, Auxerre, Bar-sur-Seine, and various other towns in that district. His son, Charles the Bold, followed in the same course of territorial aggrandize- ment, and his ambitious projects gradually extended, till he began to aim at the founding of a great Gallo-Belgian kingdom ; but his splendid plans came to an untimely end with his own death at the battle of Nancy in 1477, when he was trying to wipe off the disgrace inflicted on his arms by the Swiss at Morat. His daughter and heiress,

Mary, married the Archduke Maximilian, son of Frederick III. ; and- with the exception of the duchy of Burgundy . proper, which remained a fief of the French crown, brought with her all the vast inheritance of her father. In 1512 Maximilian incorporated the territory with the German empire under the title of the circle of Burgundy. It was gradually diminished by the encroachments of France, and by the liberation of the Netherlands, so that at the Revolu- tion it only consisted of Brabant, Limburg, Luxerabourg, and parts of Flanders, Hainault, Namur, and Guelders.

The duchy meanwhile had been raised with some addi- tions to the rank of a province, and formed a military governorship. It was bounded on the N. by Champagne, E. by Franche Comté and Bresse, S. by Lyonnais and Dauphiné, and W. by Bourbonnais and Nivernais. It was divided into eight districts—Auxerrais, the country of the Mountain, Auxais, Dijonnais, Autunais, ChAlonnais, Charo- lais, and Maconnais. It possessed a separate assembly of states general, which met every three years at Dijon, the capital, under the presidency most frequently of the governor of the province. The bishop of Autun was at the head of the clergy; the nobility and gentry had a leader of their own election ; and the corresponding place in the third estate belonged to the mayor of Dijon.

See Derichsweiler’s Geschichte der Burgunden, 1863; Barante’s

Histoire des ducs de Bourgogne, 10 vols. 1824; and De Laborde’s Les ducs de Bourgogne, 1871.

BURHANPUR, a town of British India in the Nimér district of the Central Provinces, situated on the north bank of the River Tapti, in 21° 81’ N. lat. and 76° 20’ E. long, at a distance of 280 miles N.E. of Bombay, and 2 miles from the Great Indian Peninsula Railway station of Lélbagh, Tt was founded in 1400 a.p. by a Mahometan prince of the Farukhi dynasty of Khandesh, whose successors held it for 200 years, when the Farukhi kingdom was annexed to the empire of Akbar. It formed the chief seat of the Govern- ment of the Deccan provinces of the Mughul empire till Shah Jahan removed the capital to Aurangdbad, in 1635. Burhanpur was plundered in 1685 by the Marhattds, and repeated battles were fought in its neighbourhood in the struggle betweeen that race and the Musalmans for the supremacy of India. In 1739 the Mahometans finally yielded to the demand of the Marhattds for a fourth of the revenue, and in 1760 the Nizdm of the Deccan ceded Burhanpur to the Peshwa, who in 1778 transferred it to Sindhid4. In the Marhatté war the army under General Wellesley, afterwards the duke of Wellington, took Burhanpur (1803), but the. treaty of the following year restored it to Sindhid. It remained a portion of Sindhid’s dominions till 1860-61, when, in consequence of certain territorial arrangements, the town and surrounding estates were ceded to -the British Government. Under the Mughuls the city covered an area of about 5 square miles, and was about 103 miles in circumference. In the “ Ain-i- Akbari ” it is described as a “ large city, with many gardens, inhabited by all nations, and abounding with handicrafts- men.” Sir Thomas Roe, who visited itin 1614, found that the houses in the town were “ only mud cottages, except the prince’s house, the chan’s, and some few others.” In 1865-66 the city contained 8000 houses, with a population of 34,137, which had decreased to 29,303 in 1872. Burhdn- pur is celebrated for its muslins, flowered silks, and bro- cades, which, according to Tavernier, who visited it in 1668, were exported in great quantities to Persia, Egypt, Turkey, Russia, and Poland. The gold and silver wires used in the manufacture of these fabrics are drawn with considerable care and skill; and in order to secure the purity of the metals employed for their composition, the wire-drawing under the native rule was done under Government inspec- tion. The town of Burhdnpur and its manufactures have

long been on the decline. The buildings of interest in the town are a palace, built by Akbar, called the Lal Kil4 or the Red Fort, and the Jumé Masjid built by Aurungzebe. A considerable number of Boras, a class of commercial Mahometans, reside here. Municipal income of the town in 1872, £3514, 10s.; expenditure, £2321, 12s. BURIAL snp BURIAL ACTS. The practice of burying in churches or churchyards is said to have been connected with the custom of praying for the dead, and it would appear that the earlier practice was burying in the church itself. ‘In England, about the year 750, spaces of ground adjoining the churches were carefully enclosed and solemnly consecrated and appropriated to the burial of those who had been entitled to attend divine service in those churches, and who now became entitled to render back into those places their remnants to earth, the common mother of mankind, without payment for the ground which they were to occupy, or for the pious offices which solemnized the act of interment” (Lord, Stowell). The right to burial in the parish churchyard is far from being merely an ecclesiastical privilege, but at the same time it is intimately bound up with the laws of the Church Establishment. It is a common law right, controlled in many points by the provisions of the law ecclesiastical. This double character is sufficient to explain the controversy which has so long raged round the subject of burials in England. Every man, according to the common law, has a right to be buried in his own churchyard, or, as it is sometimes put, in the churchyard of the parish where he dies. But the churchyard, as well as the church itself, is the freehold of the parson, who can in many respects deal with it asif it were a private estate. A statute of Edward I. (35, st. 2) speaks of the churchyard as the soil of the church, and the trees growing in the church- yard “as amongst the goods of the church, the which laymen have no authority to dispose,” and prohibits “the parsons from cutting down such trees unless required for repairs.” Notwithstanding the consecration of the church and churchyard, and the fact that they are the parson’s freehold, a right of way may be claimed through them by prescription. The right to burial may be subject to the payment of a fee to the incumbent, if such has been the immemorial custom of the parish, but not otherwise. The spirit of the ancient canons regarded such burial fees as of a simoniacal complexion, inasnruch as the consecrated grounds were among the res sacrw—a feeling which Lord Stowell says disappeared after the Reformation. No person can be buried in a church without the consent of the incumbent, except when the owner of a

manor house prescribes for a burying-place within the church as belonging to the manor house. In the case of Rex v. Taylor it was held that au information was grantable against a parson for opposing the burial of a parishioner; but the court would not interpose as to the parson's refusal to read the burial service because he never was baptized—that being matter for the ecclesiastical court. Strangers (or persons not dying in the parish) should not be buried, it appears, without the consent of the parishioners or churchwardens, " whose parochial right of burial is invaded thereby." According to a recent case, a clergyman may be punished for refusing to read the burial service over a person who had ceased to be a parishioner, but was buried in a family vault. While burial is a common-law right, the mode of burial is said to be of ecclesiastical cognizance, and a mandamus to inter a body in an iron coffin was in one case refused. Lord Stowell permitted the use of iron coffins on condition of an increased rate of payment to the parish, observing that the common cemetery is not res wnius etatis, the property of one generation now departed, but of the living and of generations yet unborn, and is subject only to temporary appropriation (Gilbert v. Buzzard, 2 Consistory Reports,

O37 333). One of the canons of 1603 requires the clergyman under penalty of suspension for three months to bury the corpse without refusal or delay, " unless the party deceased were excommunicated majori excommunicatione, for some grievous and notorious crime, and no man able to testify of his repentance." It appears that persons dying in a state of intoxication must be buried with the funeral service of the church. On the other hand no service but that of the Church of England may be used, anésno layman or unauthorized person can read or assist in reading a burial service over a dead body in consecrated ground. Nor, it seems, does the church recognize "such an indecency" as burial without service. There are probably many questions as to the common right of burial to which the law has as yet provided no specific answer. In the meantime many attempts have been made to pass a Burials Bill, the main feature of which is the permission to use in churchyards religious services other than that of the Church of England.

The necessity for providing new cemeteries, caused by the natural increase of population, has led to a good deal of legislation, and an Act was passed

(10 and 11 Vict. c. 65) to consolidate certain provisions usually contained in Acts authorizing the making of cemeteries. Sec. 23 allows the bishop to consecrate a part of any such cemetery " for the burial of the dead according to the rites of the Estab- lished Church." 'The 15 and 16 Vict. c. 85, for discon- tinuing burials in the metropolis and opening new burial grounds, was extended to other towns by the 16 and 17 Vict. c. 134. The new burial ground is to be divided into consecrated and unconsecrated portions ; and provision is made for building a 'cemetery chapel for the use of the church, and, if necessary, another for dissenters. By 20 and 21 Vict. c. 81, ground may be consecrated for the burial of poor persons. The same Act allows a burial board to appeal to the archbishop when the ordinary refuses to consecrate a new burial ground, and if after the archbishop confirms the appeal the bishop still refuses to consecrate, the archbishop may licence the grave for interments as if it were consecrated. The 30 and 31 Vict. c. 133 (amended in the following year) provided facilities for cheapening the expense of consecration and for allowing limited owners to convey sites of land for churchyards. The practice of burying suicides on a public highway, with a stake driven through the body, is prohibited by 4 Geo. IV. c. 52, which requires the coroner to direct their private interment, without religious rites, in the churchyard, within twenty-four hours after the inquest, and between the hours of nine and twelve at night. Bodies may not be removed from burial grounds without licence from a Secretary of State, except when the removal is from one unconsecrated place to another, and is authorized by the ordinary. A coroner may disinter the body in a case of violent death. -—

In Scotland the obligation of providing and maintaining the churchyard rests on the heritors of the parish. The guardianship of the churchyard belongs to the heritors and also to the kirk-session, either by delegation from the heritors, or in right of its ecclesiastical character. The right of burial appears to be strictly limited to parishioners, although an opinion has been expressed that any person dying in the parish has a right to be buried in the church- yard. The parishioners have no power of management. The presbytery may iuterfere to compel the heritors to provide due accommodation, but has no further jurisdiction. It is the duty of the heritors to allocate the churchyard. The Scotch law hesitates to attach the ordinary incidents of real property to the churchyard, while English law treats the

ground as the parson’s freehold. It would be difficult to say who in Scotland is the tage! —_ of the

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soil. Various opinions appear to prevail, ¢.g., as to grass growing on the surface and minerals found beneath. The difficulty as to religious services does not exist. On the other hand, the religious character of the ground is hostile to many of the legal rights recognized by the English Law.

BURIAL RITES. See FUNERAL.

BURIATS, a Mongolian race, who dwell in the vicinity of the Baikal Lake, for the most part in the government of Irkutsk andethe Trans-Baikal territory. They are divided into various tribes or clans, which generally take their names from the locality they frequent. These tribes are subdivided according to kinship. In 1857 the Buriats numbered 190,000, about two-thirds of whom were in the Trans-Baikal territory. They have high cheek-bones, broad and flat noses, and sparse hair on the chin. ‘The men shave their heads like the Chinese, and leave a tail at the top. In summer they dress in silk and cotton gowns, in winter in furs and sheepskins. Their principal occupation is the rearing of cattle; and some of them possess about 500 oxen and nearly 1000 horses. Some tribes, especially the Idinese, the Kudinese, the Alarese, and the Khorinese, also engage in agriculture,—a department of activity which was totally neglected till 1796, when the last-mentioned tribe first turned its attention toit. As early as 1802 the produce of the Irkutsk government was no less than 9800 quarters of grain; and in 1839 the Buriats had 229,500 acres under cultivation. Their soil is generally fertile, and they have an elaborate system of irrigation by canals and trenches. Their only implements are the plough and the harrow. Wheat, rye, spring corn, and oats are their principal crops; and a large quantity of hay is made for their cattle. A good deal of activity is also shown in trapping and fishing. In religion the Buriats are mainly Buddhists; and their head lama (Khambo Lama) lives at the Goose Lake (Gusinoe Ozero). Others are Shamanists, and their most sacred spot is the Shamanic stone at the mouth of the River Angar. A few only, about 9000 or 10,000, are Christians. A knowledge of reading and writing is diffused, especially among the Trans-Baikal Buriats, who possess books of their own, chiefly

translated from the Thibetan. Their own language is Mongolian, and presents three distinct dialects, of which the Selengese is nearest to the written form. The Russians became acquainted with the Buriats in the beginning of the 16th century. In 1631 there was built in their territory, for the purpose of bringing them into subjection. the Bratski block-house, whence arose the Russian designa- tion of Bratski applied to the Buriats. This building was followed by the Kanski block-house in 1640, the Ver-kholenski in 1641, the Udinski in 1648, the Balaganski in 1654, and finally in 1661 by Irkutsk itself. The Buriats frequently besieged these posts and attacked the Russians, and in 1661 they even slew the Russian ambassador, Zabolotski ; but in the end of the 17th century they were finally subdued. (See Gmelin, Siberia ; Pallas, Mongol. Volkersch. ; Castren, Versuch einer Burdtisch. Sprachlehre.)

BURIDAN, Jean, a celebrated philosopher who flourished in the 14th century, was born at Bethune in Artois, but in what year is not known. He studied at Paris under William of Occam, and became an ardent nominalist. The legend which represents him as having been involved, when a student, in the terrible drama of the Tour de Nesle has no discoverable historical basis. He Jong held the office of professor of philosophy in the university of Paris; in 1327 he was its rector; in 1345 he was deputed to defend its interests before Philip of Valois and at Rome. He was alive in 1358, but the year of his death has not been recorded. The tradition that he was forced to flee from France along with other nominalists, and that he settled in Vienna, and there founded the

university in 1356, is unsupported by evidence and in contradiction to the fact that the university of Vienna was founded by Frederick II. in 1237. An ordinance of Louis XI., in 1473, directed against the nominalists, prohibited the reading of his works. These works treat of logic, metaphysics, physics, ethics, and politics; theology is deliberately avoided on the ground that it does not rest on reason alone, and does not proceed exclusively by argumenta- tion. In philosophy Buridan acknowledged no other authority than that of reason. He followed Occam in resolutely denying all objective reality to universals. He held that singulars or individuals alone exist, and

that universals are mere words. ‘Genera et species non sunt nisi termini apud animam existentes vel etiam termini vocales aut scripti, qui non dicuntur genera aut species nisi secundum attributionem ad terminos mentales quos desig- nant.” Occam had not gone so far. The chief aim of his logic is commonly represented as having been the devising of rules for the easy and rapid discovery of syllogistic middle terms,—the construction of a dialectical pons astmorum,—but there is nothing in his writings to warrant this representation. The parts of logic which he has treated with most minuteness and subtility are the doctrines of modal propositions and of modal syllogisms. In comment- ing on Aristotle’s Vicomachean Ethics he dealt in a very independent and interesting manner with the question of free will. The conclusions at which he arrived aro remarkably similar to those long afterwards reached by John Locke. The only liberty which he ascribes to the soul is a certain power of suspending the deliberative process and determining the direction of the intellect. Otherwise the will is entirely dependent on the view of the mind, the last result of examination. The comparison of the will unable to act between two equally balanced motives to a hungry ass unable to eat between two equal and equidistant bundles of hay is not found in any of his works, and may have been invented by his opponents to ridicule his determinism. His works are—Summula de dialectica, 1487 ; Compendium lagicee, 1489 ; Queestiones in viii. Libros physicorum, &c., 1516 ; In Aristotelis Metaphysica, 1518 ; Qucestiones in a. libros ethicorum Aristotelis, 1489 ; Queestiones in viti. libros politicorum Aristotelis, 1500. There may be consulted regarding him, besides the general histories of philosophy, Bayle’s Dictionary, art. “ Buridan ”; Prantl’s Geschichte der Logik, bk. iv. 14-38; and Stéckl’s Geschichte der Philosophie des Mittelalters, Bd. ii. 1023- 1028. (R. F.)

BURKE, Epmunp, one of the greatest names in the history of political literature. There have been many more important statesmen, for he was never tried in a position of supreme responsibility. There have been many more effective orators, for lack of imaginative suppleness prevented him from penetrating to the inner mind of his hearers ; defects in delivery weakened the intrinsic persuasiveness of his reasoning; and he had not that commanding authority of character and personality which has so often been the secret of triumphant eloquence. There have been many subtler, more original, and more systematic thinkers about the conditions of the social

union. But no one that ever lived used the general ideas of the thinker more successfully to judge the particular problems of the statesman. No one has ever come so close to the details of practical politics, and at the same time remembered that these can only be understood and only dealt with by the aid of the broad conceptions of political philosophy. And what is more than all for perpetuity of fame, he was one of the great masters of the high and difficult art of elaborate composition.

A certain doubtfulness hangs over the circumstances of Burke's life previous to the opening of his public career.

BURKE

The very date of his birth is variously stated, and has given rise to sharper controversy than the small import- The most probable opinion is that he was born at Dublin on the 12th of

ance of the discrepancies can deserve.

January 1729, new style. Of his family we know little more than that his father was a Protestant attorney, prac- tising in Dublin, and that his mother was a Catholic, a member of the family of Nagle, He had at least one sister, from whom are descended the ouly existing repre- sentatives of Burke's family; and he had at least two brothers, Garret Burke and Richard Burke, the one older and the other younger than Edmund. 'he sister, after- wards Mrs French, was brought up and remained through- out life in the religious faith of her mother ; Edmund and his brothers followed that of their father. In 1741 the three brothers were sent to school at Ballitore in the county of Kildare. This school was kept by Abraham Shackleton, an Euglishman, and a member of the Society of Friends. He appears to have been an excellent teacher and a good and pious man. Burke always looked back on his own connection with the school at Ballitore as among the most fortunate circumstances of his life. Between hiniself and a son of his instructor there sprang up a close and affectionate friendship, and, unlike so many of the exquisite attachments of youth, this was not choked by the dust of life, nor parted by divergence of pursuit. Richard Shackleton was endowed with a grave, pure, and tranquil nature, constant and austere, yet not without those gentle elements that often redeem the drier qualities of his religious

persuasiou. When Burke had become one of the most famous men in Europe, no visitor to his house was more welcome than the friend with whom long years before he had tried poetic flights, and exchanged all the sanguine confidences of boyhood. And we are touched to think of the simple-minded guest secretly praying, in the solitude of his room in the fine house at Beaconsfield, that the way of his anxious and overburdened host might be guided by a divine hand.

In 1743 Burke became a student in that famous institu- tion at Dublin which numbers among its sons so many of the shining names of the 18th century in literature, politics, and law. Oliver Goldsmith was at Trinity College at the same time as Burke. But the serious pupil of Abraham Shackleton would not be likely to see much of the wild and squalid sizar. Henry Flood, who was two years younger than Burke, had gone to complete his education at Oxford. Burke, like Goldsmith, achieved no academic distinction. His character was never at any time of the academic cast. The minor accuracies, the limitation of range, the treading and re-treading of the same small patch of ground, the concentration of interest in success before a board of examiners, were all uncongenial to a nature of exuberant intellectual curiosity and of strenuous and self-reliant originality. His knowledge of Greek and Latin was never thorough, nor had he any turn for critical niceties. He could quote Homer and Pindar, and he had read Aristotle. Like others who have gone through the conventional course of instruction, he kept a place in his memory for the various charms of Virgil and Horace, of Tacitus and Ovid; but the master whose page by night and by day he turned with devout hand, was the copious, energetic, flexible, diversified, and brilliant genius of the declamations for Archias the poet and for Milo, against Catiline and against Antony, the author of the disputations at Tusculum and the orations against Verres. Cicero was ever to him the mightiest of the ancient names. In our own literature Milton seems to have been more familiar to him than Shakespeare, and Spenser was perhaps more of a favourite with him than either.

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It is too often the case to be a mere accident that men who become eminent for wide compass of understanding and penetrating comprehension, are in

their adolescence unsettled and desultory. Ofthis Burke is a signal illustra- tion. He left Trinity in 1748, with no great stock of well- ordered knowledge. He ueither derived the benefits nor suffered the drawbacks of systematic intellectual discipline. It would seem that in most cases of vigorous and massive faculty, the highest powers are only thoroughly awakened and concentrated by some stimulus that awakens personal and independent activity. Not the advantages of acquisi- tion, but the necessity of production, are with such men the effectual incentive to the exercise of their ‘fullest capacity.

Burke, after taking his degree at Dublin, went in the year 1750 to London to keep terms at the Temple. ‘The ten years that followed were passed in obscure industry. We know hardly any of the details of this period in his life with satisfactory. accuracy or on decisive authority. In that respect at least unlike Cicero, Burke was always extremely reserved about his private affairs. It shows a gratuitous meanness of spirit to explain this reserve by supposing that there was something discreditable or sinister to conceal. All that we know of Burke exhibits him as inspired by a resolute pride, a certain stateliness and imperious elevation of mind. Such a character, while free from any weak shame about the shabby necessities of early struggles, yet is naturally unwilling to make them prominent in after life. ‘There is nothing dishonourable in such an inclination. ‘I was not swaddled and rocked and dandled into a legislator,” wrote Burke when very near the end of his days: “ Wztor in adversum is the motto for a man like me. At every step of my progress in life (for in every step I was traversed and opposed), and at every turnpike I met, I was obliged to show my passport. Otherwise no rank, no toleration even, for me.”

All sorts of whispers have been circulated by idle or malicious gossip about Burke’s first manhood. He is said to have been one of the too numerous lovers of his fascinat- ing countrywoman, Margaret Woftington. It is hinted that he made a mysterious visit to the American colonies. He was for years accused of having gone over to the Church of Rome, and afterwards recanting. There is not a tittle of positive evidence for these or any of the other statements to Burke’s discredit. ‘The common story that he was a candidate for Adam Smith’s chair of moral philosophy at Glasgow, when Hume was rejected in favour of au obscure nobody (1751), can be shown to

be wholly false. Like a great many other youths with an eminent destiny before them, Burke conceived a strong distaste for the profession of thelaw. His father, who was an attorney of substance, had a distaste still stronger for so vagrant a profession as letters were in that day. He withdrew the annual allowance, and Burke was launched on the slippery career of the literary and political adventurer. In fairer words, he set to work to win for himself by indefatigable industry and capability in the public interest that position of power or pre-eminence which his detractors acquired either by accident of birth and connections, or else by the vile arts of political intrigue. He began at the bottom of the ladder, mixing with the Bohemian society that haunted the Temple, practising oratory in the free and easy debat- ing societies of Covent Garden and the Strand, and writing for the booksellers.

In 1756 he made his first mark by a satire upon Bolingbroke, entitled A Vindication of Natural Society. It purported to be a posthumous work from the pen of Bolingbroke, and to present a view of the miseries and evils arising to mankind from every species of artificial society. The imitation of the fine style of that magnificent writer but bad patriot is admirable. As a satire the piece

is a failure, for the simple reason that the substance of it might well pass for a perfectly true, no less than a very eloquent, statement of social blunders and calamities. Such acute critics as Chesterfield and Warburton thought the performance serious. Rousseau, whose famous discourse on the evils of civilization had appeared six years before, would have read Burke’s ironical vindication of natural society without a suspicion of itsirony. There have indeed been found persons who insist that the Vindication was a really serious expression of the writer’s own opinions. This is absolutely incredible, for various reasons. Burke felt now, as he did thirty years later, that civil institutions cannot wisely or safely be measured by the tests of pure reason. His sagacity discerned that the rationalism by which Bolingbroke and the deistic school believed them- selves to have overthrown revealed religion, was equally calculated to undermine the structure of political govern- ment. This was precisely the actual course on which speculation was entering in France at that moment. His Vindication

is meant to be a reduction to an absurdity. The rising revolutionary school in France, if they had read it, would have taken it for a demonstration of the theorem to be proved. The only interest of the piece for us lies in the proof which it furnishes, that at the opening of his life Burke had the same scornful antipathy to political rationalism, which flamed out in such overwhelming passion at its close.

In the same year (1756) appeared the Philosophical Inquiry into the Origin of our Ideas on the Sublime and Beautiful, a crude and narrow performance in many respects, yet marked by an independent use of the writer's mind, and not without fertile suggestion. It attracted the attention of the rising esthetic school in Germany. Lessing set about the translation and annotation of it, and Moses Mendelssohn borrowed from Burke's speculation at least one of the most fruitful and important ideas of his own influential theories on the sentiments. In England the Inquiry had considerable vogue, but it has left no per- manent trace in the development of esthetic thought in this country.

Burke's literary industry in town was relieved by frequent excursions to the western parts of England, in company with William Burke. There was a lasting intimacy between the two namesakes, and they seem to have been involved together in some important passages of their lives; but we have Edmund Burke's authority for believing that they were probably not kinsmen. The seclusion of these rural sojourns, originally dictated by delicate health, was as wholesome to the mind as to the body. Few men, if any, have ever acquired a settled mental habit of surveying human affairs broadly, of watching the play of passion, interest, circumstance, in all its comprehensiveness, and of applying the instruments of general conceptions and wide principles to its interpretation with respectable constancy, unless they have at some early period of their manhood resolved the greater problems of society in independence and isolation. By 1756 the cast of Burke's opinions was decisively fixed, and they underwent no radical change.

He began a series of Hints onthe Drama. He wrote a portion of an Abridgment of the History of England, and brought it down as far as the reign of John. It included, as was natural enough in a warm admirer of Montesquieu, a fragment on law, of which he justly said that it ought to be the leading science in every well-ordered commonwealth. Burke's early interest in America was shown by an Account of the European Settlements on that continent. Such works were evidently a sign that his mind was turning away from abstract speculation to the great political and economic fields, and to the more visible conditions of social stability

and the growth of uations. This interest in the concrete phenomena of society inspired him with the idea of the Annual Register (1759), which he designed to present a broad grouping of the chief movements of each year. The execution was as excellent as the conception, and if we reflect that it was begun in the midst of that momentous war which raised England to her climax of territorial greatness in East and West, we may easily realize how the task of describing these portentous and far-reaching events would be likely to strengthen Burke's habits of wide and laborious observation, as well as to give him firmness and confidence in the exercise of his own judgment. Dodsley gave him £100 for each annual volume, and the sum was welcome enough, for towards the end of 1756 Burke had married. His wife was the daughter of a Dr Nugent, a physician at Bath. She is always spoken of by his friends as a mild, reasonable, and obliging person, whose amiability and gentle sense did much to soothe the too nervous and excitable temperament of her husband. She had been brought up, there is good reason to believe, as a Catholic, and she was probably a member of that communion at the time of her marriage. Dr Nugent eventually took up his residence with his son-in-law in London, and became a popular member of that famous group of men of letters and artists, whom Boswell has made so familiar and so dear to all later generations. Burke, however,.had no intention of being dependent. His consciousness of his own powers animated him with a most justifiable ambition, if ever there was one, to play a part in the conduct of national affairs. Friends shared this ambition on his behalf; one of these was Lord Charlemont. He introduced Burke to William

Gerard Hamilton (1759), now only remembered by a nickname derived from the circumstance of his having made a single brilliant speech in the House of Commons, which was followed by years of almost unbroken silence. Hamilton was by no means devoid of sense and acuteness, but in character he was one of the most despicable men then alive. There is not a word too many nor too strong in the description of him by one of Burke's friends, as "a sullen, vain, proud, selfish, cankered-hearted, envious reptile." The reptile's connection, however, was for a time of considerable use to Burke. When he was made Irish Secretary, Burke accompanied him to Dublin, and there learnt Oxenstiern's eternal lesson, that awaits all who penetrate beltind the scenes of government, quam parva sapientia mundus regitur.

The penal laws against the Catholics, the iniquitous restrictions on Irish trade and industry, the selfish factious- ness of the Parliament, the jobbery and corruption of administration, the absenteeism of the landlords, and all the other too familiar elements of that mischievous and fatal system, were then in full force. As was shown afterwards, they made an impresssion upon Burke that was never effaced. So much iniquity and so much disorder may well have struck deep on one whose two chief political senti- ments were a passion for order and a passion for justice. He may have anticipated with something of remorse the reflection of a modern historian, that the absenteeism of her landlords has been less of a curse to Ireland than the absenteeism of her men of genius. At least he was never an absentee in heart. He always took the interest of an ardent patriot in his unfortunate country ; aud, as we shall see, made more than one weighty sacrifice on behalf of the principles which he deemed to be bound up with her welfare.

When Hamilton retired from his post, Burke accompanied him back to London, with a pension of £300 a year on the Irish Establishment. This modest allowance he hardly enjoyed for more than a single year. His patron having discovered the value of so laborious and powerful a subaltern.

wished to bind Burke permanently to his service. Burke declined to sell himself into final bondage of this kind. When Hamilton continued to press his odious pretensions they quarrelled (1765), and Burke threw up his

pension. He soon received a more important piece of preferment than any which he could ever have procured through Hamilton.

The accession of George III. to the throne in 1760 had been followed by the disgrace of Pitt, the dismissal of Newcastle, and the rise of Bute. These events marked the resolution of the court to change the political system which had been created by the Revolution of 1688. That system placed the government of the country in the hands of a territorial oligarchy, composed of a few families of large possessions, fairly enlightened principles, and shrewd poli- tical sense. It had been preserved by the existence of a Pretender. The two first kings of the House of Hanover could only keep the crown on their own heads by conciliating the Revolution families and accepting Revolution principles. By 1760 all peril to the dynasty was at an end. George IIL, or those about him, insisted on substituting for the aristocratic division of political power a suvstantial concen- tration of it in the hands of the sovereign. The ministers were no longer to be the members of a great party, acting together in pursuance of a common policy accepted by them all as a united body ; they were to become nominees of the court, each holding himself answerable not to his colleagues but to the king, separately, individually, and by department. George III. had before his eyes the government of his cousin the great Frederick ; but not every one can bend the bow of Ulysses, and, apart from difference of personal capacity and historic tradition, he forgot that a territorial and commercial aristocracy cannot be dealt with in the spirit of the barrack and the drill-ground. But he made the attempt, and resistance to that attempt supplies the key- note to the first twenty-five years of Burke’s political life.

Along with the change in system went high-handed and absolutist tendencies in policy. The first stage of the new experiment was very short. Bute, in a panic at the storm of unpopularity that menaced him, resigned in 1763. George Grenville and the less enlightened section of the Whigs took his place. They proceeded to tax the American colonists, to interpose vexatiously against their trade, to threaten the liberty of the subject at home by general warrants, and to stifle the liberty of public discus- sion by prosecutions of the press. Their arbitrary methods disgusted the nation, and the personal arrogance of the ministers at last disgusted the king. The system received a temporary check. Grenville fell, and the king was forced

to deliver himself into the hands of the orthodox section of the Whigs. The Marquis of Rockingham (July 10, 1765) became prime minister, and he was induced to make Burke his private secretary. Before Burke had begun his duties, an incident occurred which illustrates the character of the two men. The old duke of Newcastle, probably desiring a post for some nominee of his own, conveyed to the ear of the new minister various absurd rumours prejudicial to Burke,—that he was an Irish papist, that his real name was O'Bourke, that he had been a Jesuit, that he was an emissary from St Omer's. Lord Rocking- ham repeated these tales to Burke, who of course denied them with indignation. His chief declared himself satisfied, but Burke, from a feeling that the indispensable confidence between then: was impaired, at once expressed a strong desire to resign his post. Lord Rockingham prevailed upon him to reconsider his resolve, and from that day until Lord Rockingham's death in 1782, their relations were those of the closest friendship and confidence.

The first Rockingham administration only lasted a year and afew days, ending in July 1766. The uprightness and

good serse of its leaders did not compensate for the weak- ness of their political connections. They were unable to stand against the coldness of the king, against the hostility of the powerful and selfish faction of Bedford Whigs, and, above all, against the towering predominance of William Pitt. That Pitt did not join them is one of the many fatal miscarriages of history, as it is one of the many serious reproaches to be made against that extraordinary man's chequered and uneven course. An alliance between Pitt and the Rockingham party was the surest guarantee of a wise and liberal policy towards the colonies. He went further than they did, in holding, like Lord Camden, the doctrine that taxation went with representation, and that therefore Parliament had no right to tax the unrepresented colonists. The ministry asserted, what no competent jurist would now think of denying, that Parliament is sovereign ; but they went heartily with Pitt in pronouncing the exercise of the right of taxation in the case of the American colonists to be thoroughly impolitic and inexpedient. No practical difference, therefore, existed upon the important question of the hour. But

Pitt’s prodigious egoism, stimulated by the mischievous counsels of men of the stamp of Lord Shelburne, prevented the fusion of the only two sections of the Whig party that were at once able, enlightened, and disinterested enough to carry on the government efficiently, to check the arbitrary temper of the king, and to command the confidence of the nation. Such an opportunity did not return.

The ministerial policy towards the colonies was defended by Burke with splendid and unanswerable eloquence. He had been returned to the House of Commons for the pocket borough of Wendover, and his first speech (January 27, 1766) was felt to be the rising of a new light. For the space of a quarter of a century, from this time down to 1790, Burke was one of the chief guides and inspirers of a revived Whig party. The “age of small factions” was now succeeded by an age of great principles, and selfish ties of mere families and persons were transformed into a union resting on common conviction and patriotic aims. It was Burke who did more than any one else to give to the Opposition,“under the first half of the reign of George IIL, this stamp of elevation and grandeur. Before leaving office the Rockingham Government repealed the Stamp Act ; con- firmed the personal liberty of the subject by forcing ou the House of Commons one resolution against general warrants, and another against the seizure of papers ; and relieved private houses from the intrusion of officers of excise, by repealing the cider tax. Nothing so good was done in an English parliament for nearly twenty years tocome. George Grenville, whom the Rockinghams hadfdisplaced, and who was bitterly incensed at their formal reversal of his policy, printed a pamphlet to demonstrate his own wisdom and statesmanship. Burke replied in his Observations on a late Publication on the Present State of the Nation (1769), in which he showed for the first time that he had not only as much knowledge of commerce and finance, and as firm a hand, in dealing with figures as Gren- ville himself, but also a broad, general, and luminous way of conceiving and treating politics, in which neither then nor since has he had any rival among English publicists.

It is one of the perplexing points in Burke’s private history to know how he lived during these long years of parliamentary opposition. It is certainly not altogether mere impertinence to ask of a public man how he gets what he lives upon, for independence of spirit, which is so hard to the man who lays

his head on the debtor’s pillow, is the prime virtue in such men. Probity in money is assuredly one of the keys to character, though we must be very care- ful in ascertaining and proportioning all the circumstances. Now, in 1769, Burke bought an estate at Beaconsfield, in

the county of Buckingham. It was about 600 acres in extent, was worth some £500 a year, and cost £22,000. People have been asking ever since how the penniless man of-letters was able to raise so large a sum in the first instance, and how he was able to keep up a respectable establishment afterwards. The suspicions of those who are never sorry to disparage the great have been of various kinds. Burke was a gambler, they hint, in Indian stock, like his kinsmen, Richard and William, and like Lord Verney, his political patron at Wendover. Perhaps, again, his activity on behalf of Indian princes, like the Raja of Tanjore, was not disinterested and did not go unrewarded. The answer to all these calumnious inuendoes is to be found in documents and title-deeds of decisive authority, and is simple enough. It is, in short, this. Burke inherited a small property from his elder brother, which he realized. Lord Rockingham advanced him a certain sum (£6000). The remainder, amounting to no less than two- thirds of the purchase-money, was raised on mortgage, and was never paid off during Burke’s life. The rest of the story is equally simple, but more painful. Burke made some sort of income out of his 600 acres; he was for a short time agent for New York, with a salary of £700; he continued to work at the Annual Register down to 1788, But, when all is told, he never made as much as he spent ; and in spite of considerable assistance from Lord Rocking- ham, amounting it is sometimes said to as much as £30,000, Burke, like the younger Pitt, got every year deeper into debt. Pitt’s debts were the result of a wasteful indiffer- ence to his private affairs. Burke, on the contrary, was assiduous and orderly, and had none of the vices of profu- sion. But he had that quality which Aristotle places high among the virtues,—-the noble mean of Magnificence, standing midway between the two extremes of vulgar ostentation and narrow pettiness. He was indifferent to luxury, and sought to make life, not commodious nor soft, but high and dignified ina refined way. He loved art, filled his house with statues and pictures, and extended a generous patronage to the painters. He was a collector of books, and, as

Crabbe and less conspicuous men discovered, a helpful friend to their writers. Guests were ever welcome at his board ; the opulence of his mind and the fervid copiousness of his talk naturally made the guests of such a man very numerous. Von invideo equidem, miror magis, was Johnson's good-natured remark, when he was taken over his friend's fine house and pleasant gardens. Johnson was of a very different type. There was something in this external dignity which went with Burke's imperious spirit, his spacious imagination, his turn for all things stately and imposing. We may say, if we please, that Johnson had the far truer and loftier dignity of the two; but we have to take such men as Burke with the defects that belong to their qualities. And there was no corruption in Burke's outlay. When the Pitt administration was formed in 1766, he might have had office, and Lord Rockingham wished him to accept it, but he honourably took his fate with the party. He may have spent £3000 a year, where he would have been more prudent to spend only £2000. But nobody was wronged ; his creditors were all paid in time, and his hands were at least clean of traffic in reversions, clerkships, tellerships, and all the rest of the rich sinecures which it was thought no shame in those days for the aris- tocracy of the land and the robe to wrangle for, and gorge themselves upon, with the fierce voracity of famishing wolves. The most we can say is that Burke, like Pitt, was too deeply absorbed in beneficent service in the affairs of his country, to have for his own affairs the solicitude that would have been prudent.

In the midst of intense political preoccupations, Burke always found time to kecp up his intimacy with the bril-

liant group of his earher friends. He was one of the com- manding figures at the Club at the Turk's Head, with Reynolds and Garrick, Goldsmith and Johnson. The old sage who held that the first Whig was the Devil, was yet compelled to forgive Burke's politics for the sake of his magnificent gifts. "TI would not talk to him of the Rock- ingham party," he used to say, "' but I love his knowledge, his genius, his diffusion and affluence of conversation." And everybody knows Johnson's vivid account of him: " Burke, Sir, is such a man that if you met him for the first time in the street, where you were stopped by a drove of oxen, and you and he stepped aside

to take shelter but for five minutes, he'd talk to you in such a manner that when you parted you would say, 'This is an extraordinary man,'" They all grieved that public business should draw to party what was meant for maukind. They deplored that the nice and difficult test of answering Berkeley had not been undertaken, as was once intended, by Burke, and sighed to think what an admirable display of subtlety and brilliance such a contention would have afforded them, had not politics "turned him from active philosophy aside." There was no jealousy in this. They did not grudge Burke being the first man in the House of Commons, for they admitted that he would have been the first man anywhere.

With all his hatred for the book-man in politics, Burke — owed much of luis own distinction to that generous richness and breadth ot judgment which had been ripened in him by literature and his practice in it. Like some other men in our history, he showed that books are a better pre- paration for statesmanship than early training in the subordinate posts and among the permanent officials of a public department. There is no copiousness of literary reference in his work, such as over-abounded in our civil and ecclesiastical publicists of the 17th century. Nor can we truly say that there is much, though there is certainly some, of that tact which literature is alleged to confer on those who approach it in a just spirit and with the true gift. The influence of literature on Burke lay partly in the direction of emancipation from the mechanical formulz of practical politics; partly, in the association which it engendered, in a powerful understanding like his, between politics and the moral forces of the world, and between political maxims and the old and great sentences of morals ; partly in drawing him, even when resting his case on prudence and expediency, to appeal to the widest and highest sympathies; partly, and more than all, in opening his thoughts to the many conditions, possibilities, and " varieties of untried being," in human character and situation, and so giving an incomparable flexibility to his methods of political approach.

This flexibility is not to be found in his manner of com- position. That derives its immense power from other sources ; from passion, intensity, imagination, size, truth, cogency of logical reason. Those who insist on charm, on Winningness in style, on subtle harmonies and fine exquisiteness of suggestion, are disappointed in Burke: they even find him stiff and over-

coloured. And there are blemishes of this kind. His banter is nearly always ungainly, his wit blunt, as Johnson said, and often unseasonable. As is usual with a man who has not true humour, Burke is also withont true pathos. The thought of wrong or misery moved him less to pity for the victim than to anger against the cause. Again, there are some gratuitous and unredeemed vulgarities ; some images that make us shudder. But only a literary fop can be detained by specks like these. :

The varieties of Burke's literary or rhetorical method are very striking. It is almost incredible that the superb imaginative amplification of the description of Hyder Ali's descent upon the Carnatic should be from the same pen a8

the grave, simple, unadorned Address to tne King (1777), where each sentence falls on the ear with the accent of some golden-tongued oracle of the wise gods. His stride is the stride of a giant, from the sentimental beauty of the picture of Marie Antoinette at Versailles, or the red horror of the tale of Debi Sing in Rungpore, to the learning, positive- ness, and cool judicial mastery of the Report on the Lords' Journals (1794), which Philip Francis, no mean judge, declared on the whole to be the ‘‘ most eminent and extra-ordinary ” of all his productions. But even in the coolest and dryest of his pieces, there is the mark of greatness, of grasp, of comprehension. In all its varieties Burke's style is noble, earnest, deep-flowing, because his sentiment was lofty and fervid, and went with sincerity and ardent disciplined travail of judgment. He had the style of his subjects ; the amplitude, the weightiness, the laboriousness, the sense, the high flight, the grandeur, proper to a man dealing with imperial themes, with the fortunes of great societies, with the sacredness of law, the freedom of nations, the justice of rulers. Burke will always be read with delight and edification, because in the midst of discussions on the local and the accidental, he scatters apophthegms that take us into the regions of lasting wisdom. In the midst of the torrent of his most strenuous and passionate deliverances, he suddenly rises aloof from his immediate subject, and in all tranquillity reminds us of some permanent relation of things, some enduring truth of human life or human society. We do not hear the organ tones of Milton, for

faith and freedom had other notes in the 18th century. There is none of the complacent and wise-browed sagacity of Bacon, for Burke's were days of personal strife and fire and civildivision. We are not exhilarated by the cheerful- ness, the polish, the fine manners of Bolingbroke, for Burke had an anxious conscience and was earnest and intent that the good should triumph. And yet Burke is among the greatest of those who have wrought marvels in the prose of our English tongue.

Not all the transactions in which Burke was a combatant could furnish an imperial theme. We need scarcely tell over again the story of Wilkes and the Middlesex election. The Rockingham ministry had been succeeded by a com- posite Government, of which it was intended that Pitt, now made Lord Chatham and Privy Seal, should be the real chief. Chatham's health and mind fell into disorder almost immediately after the ministry had been formed. The duke of Grafton was its nominal head, but party ties had been broken, the political connections of the ministers were dissolved, and, in truth, the king was now at last a king indeed, who not only reigned but governed. The revival of high doctrines of prerogative in the Crown was accom- panied by a revival of high doctrines of privilege in the House of Commons, and the ministry was so smitten with weakness and confusion as to be unable to resist the current of arbitrary policy, and not many of them were even willing to resist it. The unconstitutional prosecution of Wilkes was followed by the fatal recourse to new plans for raising taxes in the American colonies. These two points made the rally- ing ground of the new Whig opposition. Burke helped to smooth matters for a practical union between the Rock- ingham party and the powerful triumvirate, composed of Chatham, whose understanding had recovered from its late disorder, and of his brothers-in-law, Lord Temple and George Grenville. He wasactive in urging petitions from the freeholders of the counties, protesting against the unconstitutional invasion of the right of election. And he added a durable masterpiece to our political literature in a pamphlet which he called Thoughts on the Cause of the Present Discontents (1770). The immediate object of this excellent piece was to hold up the court scheme of weak, divided, and dependent administrations in the light of its

real purpose and design ; to describe the distempers which had been engendered in parliament by the growth of royal influence and the faction of the king's friends; to show that the newly-formed Whig party had combined for truly public ends, and was no mere family knot like the Grenvilles and the Bedfords ; and, finally, to press for the hearty concurrence both of public men and of the nation at large in com- bining against "a faction ruling by the private instructions of a court against the general sense of the people." The pamphlet was disliked by Chatham on the one hand, on no reasonable grounds that we can discover ; it was denounced by the extreme popular party of the Bill of Rights, on the other hand, for its moderation and conservatism. In truth, there is as strong a vein of conservative feeling in the pamphlet of 1770 as in the more resplendent pamphlet of 1790. "Our constitution," he said, "stands on a nice equipoise, with steep precipices and deep waters upon all sides of it. In removing it from a dangerous leaning towards one side, there may be a risk of oversetting it on the other. Every project of a material change in a government so complicated as ours is a matter full of difficulties ; in which a considerate man will not be too ready to decide, a prudent man too ready to undertake, or an honest man too ready to promise." Neither now nor ever had Burke any other real conception of a polity for England than government by the territorial aristocracy in the interests of the nation at large, and especially in the interests of commerce, to the vital importance of which in our economy he was always keenly and wisely alive. The policy of George III., and the support which it found among men who were weary of Whig factions, disturbed this scheme, and therefore Burke denounced both the court policy and the court party with all his heart and all his strength. Eloquence and good sense, however, were impotent in the face of such forces as were at this time arrayed against a Government at once strong and liberal. The court was confident that a union between Chatham and the Rocking- hams was impossible. The union was in fact hindered by the waywardness and the absurd pretences of Chatham, and the want of force in Lord Rockingham. In the nation at large, the late violent ferment had been followed by as remarkable a deadness and vapidity, and Burke himself had to admit a year or two later that any remarkable robbery at Hounslow Heath would make more conversation than all the disturbances of America. The duke of Grafton went out, and Lord North became the head of a Govern- ment, which lasted twelve years (1770-1782), and

brought about more than all the disasters that Burke had foretold as the inevitable issue of the royal policy. For the first six years of this lamentable period Burke was actively em- ployed in stimulating, informing, and guiding the patrician chiefs of his party. ‘‘Indeed, Burke,” said the duke of Richmond, “ you have more merit than any man in keeping us together.” They were well meaning and patriotic men, but it was not always easy to get them to prefer politics to fox-hunting. When he reached his lodgings at night after a day in the city or a skirmish in the House of Commouis, Burke used to find a note from the duke of Richmond or the marquis of Rockingham, praying him to draw a protest to be entered on the Journals of the Lords, and in fact he drew all the principal protests of his party between 1767 and 1782. The accession of Charles James Fox to the Whig party, which took place at this tiie, and was so important an event in its history, was mainly due to the teaching and influence of Burke. In the House of Com- mons his industry was almost excessive. He was taxed with speaking too often, and with being too forward. And he was mortified by a more serious charge than murmurs about superfluity of zeal. Men said and said again that he was Junius. His very proper unwillingness to stoop to

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deny an accusation, that would have been so disgraceful if it had been true, made ill-natured and silly people the more convinced that it was uot wholly false. And the preposterous charge has never wholly died out. But what- ever the London world may have thought of him, Burke’s energy and devotion of character impressed the better minds in the country In 1774 he received the great distinction of being chosen as one of its representatives by Bristol, then the second town in the kingdom.

In the events which ended in the emancipation of the American colonies from the monarchy, Burke’s political genius shone with an effulgence that was worthy of the great affairs over which it shed so magnificent an illumina- tion. His speeches are almost the one monument of the struggle on which a lover of English greatness can look back with pride and a sense of worthiness, such as a church- man feels when he reads Bossuet, or an Anglican when he turns over the pages of Taylor or of Hooker. Burke’s attitude in these high transactions is really more impressive than Chatham’s,

because he was far less theatrical than Chatham ; and while he was no less nobly passionate for freedom and justice, in his passion was fused the most strenuous political argumentation and sterling reason of state. On the other hand he was wholly free from that quality which he ascribed to Lord George Sackville, a man “apt to take a sort of undecided, equivocal, narrow ground, that evades the substantial merits of the question, and puts the whole upon some temporary, local, accidental, or per- sonal consideration.” He rose to the full height of that great argument. Burke here and everywhere else displayed the rare art of filling his subject with generalities, and yet never intruding common-places. No publicist who deals as largely in general propositions has ever been as free from truisms; no one has ever treated great themes with so much elevation, and yet been so wholly secured against the pitfalls of emptiness and the vague. And itis instruc- tive to compare the foundation of all his pleas for the colonists with that on which they erected their own theoretic declaration of independence. The American leaders were impregnated with the metaphysical ideas of rights which had come to them from the rising revolutionary school in France. Burke no more adopted the doctrines of Jefferson in 1776 than he adopted the doctrines of Robespierre in 1793. He says nothing about men being born free and equal, and on the other hand he never denies the position of the court and the country at large, that the home legisla- ture, being sovereign, had the right to tax the colonies. What he does say is that the exercise of such a right was not practicable; that if it were practicable, it was inexpe- dient; and that, even if this had not been inexpedient, yet, after the colonies had taken to arms, to crush their resistance by military force would not be more disastrous to them than it would be unfortunate for the ancient liberties of Great Britain. Into abstract discussion he would not enter. ‘“‘Show the thing you contend for to be reason; show it to be common sense; show it to be the means of attaining some useful end.” ‘The question with me is not whether you have a right to render your people miserable, but whether it is not your interest to make them happy.” There is no difference in social spirit and doctrine between his protests against the maxims of the English common people as to the colonists and his protests against the maxims of the French common people as to the court and the nobles; and it is impossible to find a single prin- ciple either asserted or implied in the speeches on the American revolution which was afterwards repudiated in the writings on the Revolution in France.

It is one of the signs of Burke's singular and varied eminence that hardly any two people agree precisely which of his works to mark as the masterpiece. Every speech or

tract that he composed on a great subject becomes, as we read it, the rival of every other. But the Speech on Conciliation (1775) has, perhaps, been more universally admired than any of his other productions, partly because its maxims ar2 of a simpler and less disputable kind than those which adorn the pieces on France, and partly because it is most strongly characterized by that deep ethical quality which is the prime secret of Burke's great style and literary mastery. In this speech, moreover, and in the only less powerful one of the preceding year upon American taxation, as well as in the Letter to the Sheriffs of Bristol in 1777, we see the all-important truth conspicuously illustrated that half of his eloquence always comes of the thorough- ness with which he gets up his case. No eminent man has ever done more than Burke to justify the definition of genius as the consummation of the faculty of taking pains. Labour incessant and intense, if it was not the source, was at least an inseparable condition of his power. And magnificent rhetorician though he was, his labour was given less to his diction than to the facts; his heart was less in the form than the matter. It is true that his manuscripts were blotted and smeared, and that he made so many alterations in the proofs that the printer found it worth while to have the whole set up in type afresh. But there is no polish in his style, as in that of Junius for example, though there is something a thousand times better than polish. " Why will you not allow yourself to be per- suaded," said Francis after reading the Meflections, " that polish is material to preservation?" Burke always accepted the rebuke, and flung himself into vindication of the sense, substance, and veracity of what he had written. His writ- ing is magnificent, because he knew so much, thought so comprehensively, and felt so strongly.

The succession of failures in America, culminating in Cornwallis's surrender at York Town in October 1781, wearied the nation, and at length the persistent and powerful attacks of the opposition began to tell. "At this time," wrote Burke, in words of manly self-assertion, thirteen years afterwards, "having a momentary lead (1780-2), so aided and so

encouraged, and as a feeble instrument in a mighty hand,—I do not say I saved my country,—I am sure I did my country important service. There were few indeed at that time that did not acknow- ledge it. It was but one voice, that no man in the kingdom better deserved an honourable provision should be made for him." In the spring of 1782 Lord North resigned. It seemed as if the court system which Burke had been denouncing for a dozen years was now finally broken, and as if the party which he had been the chief instrument in instructing, directing, and keeping together must now in- evitably possess power for many years tocome. Yet ina few months the whole fabric had fallen, and the Whigs were thrown into opposition for the rest of the century. The story cannot be omitted in the most summary account of Burke's life. Lord Rockinghain came into office on the fall of North. Burke was rewarded for services beyond price by being made Paymaster of the Forces, with the rank of a Privy Councillor. He had lost his seat for Bristol two years before, in consequence of his courageous advocacy of a measure of tolerance for the Catholics, and his still more courageous exposure of the enormities of the commercial policy of England towards Ireland. He sat during the rest of his parliamentary life (to 1794) for Malton, a pocket borough first of Lord Rockingham's, then of Lord Fitzwilliam's. Burke's first tenure of office was very brief. He had brought forward in 1780 a compre- hensive scheme of economical reform, with the design of limiting the resources of jobbery and corruption which the Crown was able to use to strengthen its own sinister influence in Parliament. Administrative reform was, next

to peace with the colonies, the part of the scheme of the new ministry to which the king most warmly objected. It was carried out with greater moderation than had been foreshadowed in opposition. But at any rate Burke's own office was not spared. While Charles Fox's father was at the pay-office (1765-1778) he realized as the interest of the cash. balances which he was allowed to retain in his hands, nearly a quarter of a million of money. When Burke came to this post the salary was se'tled at £4000 a year. He did not enjoy the income long. In July 1782 Lord Rock- ingham died; Lord Shelburne took his place ; Fox, who inherited from his father a belief in Lord Shelburne's duplicity, which his own experience of him as a

colleague during the last three months had made stronger, declined to serve underhim. Burke, though he had not encouraged Fox to take this step, still with his usual loyalty followed him out of office. This may have been a proper thing to do if their distrust of Shelburne was incurable, but the next step, coalition with Lord North against him, was not only a political blunder, but a shock to party morality, which brought speedy retribution. Either they had been wrong, and violently wrong, fora dozen years, or else Lord North was the guiltiest political instrument since Strafford. Burke attempted to defend the alliance on the ground of the substantial agreement between Fox and North in public aims. The defence is wholly untenable. The Rockingham Whigs were as substantially in agreement on public affairs with the Shelburne Whigs as they were with Lord North. The movement was one of the worst in the history of English party. It served its immediate purpose, however, for Lord Shelburne found himself (February 24, 1783) too weak to carry on the government, and was suc- ceeded by the members of the coalition, with the duke of Portland for prime minister (April 2, 1783). Burke went back to his old post at the pay-office and was soon en- gaged in framing and drawing the famous India Bill, This was long supposed to be the work of Fox, who was politi- cally responsible for it. We may be sure that neither he nor Burke would have devised any government for India which they did not honestly believe to be for the advantage both of that country and of England. But it cannot be disguised that Burke had thoroughly persuaded himself that it was indispensable in the interests of English freedom to strengthen the party hostile to the court. As we have already said, dread of the peril to the constitution from the new aims of George III. was the main inspiration of Burke's political action in home affairs for the best part of his political life. The India Bill strengthened the anti- court party by transferring the government of India to seven persons named in the Bill, and neither appointed nor removable by the Crown. In other words, the Bill gave the government to a board chosen directly by the House of Commons; and it had the incidental advantage of confer- ring on the ministerial party patronage valued at £300,000 a year, which would remain for a fixed term of years out of reach of the king. In a word, judging the India Bill from a party point of view, we see that Burke was now completing the aim of his project of economic reform. That measure had weakened the influence of the Crown by limiting its patronage. 'The measure for India weakened the influence of the Crown by

giving a mass of patronage to the party which the king hated. But this was not to be. The India Bill was thrown out by means of a royal

intrigue in the Lords, and the ministers were instantly'

dismissed (December 18, 1783). Young William Pitt, then only in his twenty-fifth year, had been Chancellor of the Exchequer in Lord Shelburne's short nuinistry, and had refused to enter the coalition Government from an honour able repugnance to join Lord North. He was now made prime minister. The country in the election of the next

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year ratified the king's judgment against the Portland combination ; and the hopes which Burke had cherished for a political life-time were irretrievably ruined.

The six years that followed the great rout of the orthodox Whigs were years of repose for the country, but it was now that Burke engaged in the most laborious and formid able enterprize of his life, the impeachment of Warren Hast ings for high crimes and misdemeanours in his government of India. His interest in that country was of old date. It arose partly from the fact of William Burke's residence there, partly from his friendship with Philip Francis, but most of all, we suspect, from the effect which he observed Indian influence to have in demoralizing the House of Commons. 'Take my advice for once in your life," Francis wrote to Shee; "lay aside 40,000 rupees for a seat in Parliament: in this country that alone makes all the difference between somebody and nobody." 'The rela- tions, moreover, between the East India Company and the Government were of the most important kind, and occupied Burke's closest attention from the beginning of the Ameri- can war down to his own India Bill and that of Pitt and Dundas. In February 1785 he delivered one of the most famous of all his speeches, that on the nabob of Arcot's debts. The real point of this superb declamation was Burke's conviction that ministers supported the claims of the fraudulent creditors in order to secure the corrupt advantages of a sinister parliamentary interest. His pro- ceedings against Hastings had a deeper spring. 'The story of Hastings's crimes, as Macaulay says, made the blood of Burke boil in his veins. He had a native abhorrence of cruelty, of

injustice, of disorder, of oppression, of tyranny, and all these things in all their degrees marked Hastings's course in India. They were, moreover, concentrated in individual cases, which exercised Burke's passionate imagina- tion to its profoundest depths, and raised it to such a glow of fiery intensity as has never been rivalled in our history. For it endured for fourteen years, and was just as burning and as terrible when Hastings was acquitted in 1795, as in the Select Committee of 1781 when Hastings's enormities were first revealed. 'If I were to call for a reward," wrote Burke, 'it would be for the services in which for fourteen years, without intermission, I showed the most industry and had the least success, I mean in the affairs of India ; they are those on which I value myself the most; most for the importance ; most for the labour ; most for the judgment; most for constancy and perseverance in the pursuit." Sheridan's speech in the House of Commons upon the charge relative to the Begums of Oude probably excelled anything that Burke achieved, as a dazzling performance abounding in the most surprising literary and rhetorical effects. But neither Sheridan nor Fox was capable of that sustained and overflowing indignation at outraged justice and oppressed humanity, that consuming moral fire, which burst forth again and again from the chief manager of the impeachment, with such scorching might as drove even the cool and intrepid Hastings beyond all self-control, and made him cry out with protests and exclamatious like a criminal writhing under the scourge. Burke, no doubt, in the course of that unparalleled trial showed some prejudice ; made some minor overstatements of his case; used many intemperances; and suffered himself to be provoked into expressions of heat and impatience by the cabals of the defendant and his party, and the intolerable incompetence of the tribunal. It is one of the inscrutable perplexities of human affairs, that in the logic of practical life, in order to reach conclusions that cover enough for truth, we are constantly driven to premises that cover too much, and that in order to secure their right weight to justice and rcason, good men are forced to fling the two-edged sword of passion into the same scale But a ia es were

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mere trifles, and well deserve to be forgiven, when we think that though the offender was in form acquitted, yet Burke succeeded in these fourteen years of laborious effort in laying the foundations once for all of a moral, just, philanthropic, and responsible public opinion in England with reference to India, and in doing so performed perhaps the most magnificent service that any statesman has ever had it in his power to render to humanity.

Burke's first decisive step against Hastings was a motion for papers in the spring of 1786 ; the thanks of the House of Commons to the managers of the impeachment were voted in the summer of 1794. But in those eight years some of the most astonishing events in history had changed the political face of Europe. Burke was more than sixty years old when the states-general met at Ver- sailles in the spring of 1789. He had taken a prominent part on the side of freedom in the revolution which stripped England of her empire in the West. He had taken a prominent part on the side of justice, humanity, and order, in dealing with the revolution which had brought to England new empire in the East. The same vehement passion for freedom, justice, humanity, and order was roused in him at a very early stage of the third great revolution in his history—the revolution which overthrew the old monarchy in France. From the first Burke looked on the events of 1789 with doubt and misgiving. He had been in France in 1773, where he had not only the famous vision of Marie Antoinette at Versailles, "glittering like the morning star, full of life, and splendour, and joy," but had also supped and discussed with some of the destroyers, the encyclopzedists, "the sophisters, economists, and calculators." His first speech on his return to England was a warning (March 17, 1773) that the props of good government were beginning to fail under the systematic attacks of unbelievers, and that principles were being propagated that would not leave to civil society any stability. The apprehension never died out in his mind; and when he knew that the principles and abstractions, the un-English dialect and destructive dialectic, of his former acquaintances were predominant in the National Assembly, his suspicion that the movement

would end in disastrous miscarriage waxed into certainty. —

The scene grew still more sinister in his eyes after the march of the mob from Paris to Versailles in October, and the violent transport of the king and

queen from Versailles to Paris The same hatred of lawlessness and violence which fired him with a divine rage against the Indian malefactors was aroused by the violence and lawlessness of the Parisian insurgents. The same disgust for abstrac- tions and naked doctrines of right that had stirred him against the pretensions of the British Parliament in 1774 and 1776, was revived in as lively a degree by political con- ceptions which he judged to be identical in the French Assembly of 1789. And this anger and disgust were exasperated by the dread with which certain proceedings in England had inspired him, that the aims, principles, methods, and language which he so misdoubted or abhorred in France were likely to infect the people of Great Britain.

In November 1790 the town, which had long been eagerly expecting a manifesto from Burke's pen, was electrified by the Leflections on the Revolution in France, and on the proceedings in certain societies in London relative to that event The generous Windham made an entry in his diary of his reception of the new book. " What shall be said," he added, "of the state of things, when it is remembered that the writer is a man decried, persecuted, and proscribed ; not being much valued even by his own party, and by half the nation considcred as little better than an ingcnious mad-man?" But the writer now ceased to be decried, persecuted, and proscribed, and his book was seized as the expression of that new currerit of opinion in Enrope which the more

tecent events of the Revolution had slowly set flowing. Its vogue was instant and enormous. Eleven editions were exhausted in little more than a year, and there is probably not much exaggeration in the estimate that 30,000 copies were sold before Burke's death seven years afterwards, George III. was extravagantly delighted; Stanislaus of Poland sent Burke words of thanks and high glorification and a gold medal. Catherine of Russia, the friend of Voltaire and the benefactress of Diderot, sent her con-gratulations to the man who denounced French philosophers as miscreants and wretches. "One wonders," Romilly said by-and-by, "that Burke is not ashamed at such success." Mackintosh replied to him temperately in the Vindicice Gallice, and Tom Paine replied to him less temperately but far

more trenchantly and more shrewdly in the Rights of Man. Arthur Young, with whom he had corresponded years before on the mysteries of deep ploughing and fattening hogs, added a cogent polemical chapter to that ever admirable work, in which he showed that he knew as much more than Burke about the old system of France as he knew more than Burke about soils and roots. Philip Francis, to whom he had shown the proof-sheets, had tried to dissuade Burke from publishing his performance. The passage about Marie Antoinette, which has since become a stock piece in books of recitation, seemed to Francis a merc piece of foppery ; for was she not a Messalina and a jade? “JT kuow nothing of your story of Messalina,” answered Burke ; ‘am I obliged to prove judicially the virtues of all those I shall sec suffering every kind of wrong and contumely and risk of life, before I endeavour to interest others in their sufferings?. . . Are not high rank, great splendour of descent, great personal elegance, and outward accomplishments, ingredients of moment in forming the interest we take in the misfortunes of men?. . I tell you again that the recollection of the manner in which T saw the queen of France in 1774, and the contrast between that brilliancy, splendour, and beauty, with the prostrate homage of a nation to her, and the abominable scene of 1789 which I was describing, did draw tears from me and wetted my paper. These tears came again into my eyes almost as often as I looked at the description,—they may again. You do not believe this fact, nor that these are my real feelings; but that the whole is affected, or as you express it, downright foppery. My friend, I tell you it is truth ; and that it is true and will be truth when you and Tare no more; and will exist as long as men with their natural feelings shall exist ” (Corr. iii. 139).

Burke’s conservatism was, as such a passage as this may illustrate, the result partly of strong imaginative associa- tions clustering round the more imposing symbols of social continuity, partly of a sort of corresponding conviction in his reason that ‘there are certain permanent elements of human nature out of which the European order had risen and which that order satisfied, and of whose immense merits, as of its mighty strength, the revolutionary party in France were most fatally ignorant, When Romilly saw Diderot in 1783, the great encyclopedic chief assured him that submission to kings and belief in God would be at an end all over the world in a very few years. When Condorcet described the Tenth Epoch in the long

development of human progress, he was sure not only that fulness of light and perfection of happiness would come to the sons of men, but that they were coming with all speed. Only. those who know the incredible rashness of the revolutionary doctrine in the mouths of its most powerful professors at that time ; only those who know their absorption in ends and their incousiderateness about means, can feel how profoundly right Burke was in all this part of his conten- tion. Napoleon, who had begun life as a disciple of Rousseau, confirmed the wisdom of the philosophy of

Burke when he came to make the Concordat. That measure was in one sense the outcome of a mere sinister expediency, but that such a measure was expedient at all sufficed to prove that Burke's view of the present possibilities of social change was right, and the view of the Rousseauites and too sanguine Perfectibilitarians wrong. As we have seen, Burke's very first piece, the satire on Bolingbroke, sprang from his conviction that merely rationalistic or destructive criticism, applied to the vast complexities of man in the social union, is either mischievous or futile, and mischievous exactly in proportion as it is not futile.

To discuss Burke's writings on the Revolution would be to write first a volume upon the abstract theory of society, and then a second volume on the history of France. But we may make one or two further remarks. One of the most common charges against Burke was that he allowed his imagination and pity to be touched only by the sorrows

of kings and queens, and forgot the thousands of oppressed _

and famine-stricken toilers of the land. ‘‘ No tears are shed for nations," cried Francis, whose sympathy for the Revolution was as passionate as Burke's execration of it. "When the provinces are scourged to the bone by a mer- cenary and merciless military power, and every drop of its blood and substance extorted from it by the edicts of a royal council, the case seems very tolerable to those who are not involved in it. When thousands after thousands

are dragooned out of their country for the sake of their |

religion, or sent to row in the galleys for selling salt against law,—when the liberty of every individual is at the mercy of every prostitute, pimp, or parasite that has access to power or any of its basest substitutes,—my mind, I own, is not at once prepared to be satisfied with gentle pallia- tives for such disorders" (francis to Burke, November 3, 1790). This is a very terse way of putting a crucial objection to Burke's whole view of French affairs in 1789. His answer was tolerably simple. The Revolution, though it had made an end of the Bastille, did not bring the only real practical liberty, that is to say, the liberty which comes with settled courts of justice, administering settled laws, undisturbed by popular fury, independent of every- thing but law, and with a clear law for their direction. The people, he contended, were no worse off under the old monarchy than they will be in the long run under assem- blies that are bound by the necessity of feeding one part of the community at the grievous charge of other parts, as necessitous as those who are so fed; that are obliged to flatter those who have their lives at their disposal by tolerating acts of doubtful influence on commerce and agriculture, and for the sake of precarious relief to sow the seeds of lasting want; that'will be driven to be the instru- ments of the violence of others from a sense of their own weakness, and, by want of authority to assess equal and proportioned charges upon all, will be compelled to lay a strong hand upon the possessions of a part. As against the moderate section of the Constituent Assembly this was just.

One secret of Burke's views of the Revolution was the contempt which ,he had conceived for the popular leaders in the earlier stages of the movement. In spite of much excellence of intention, much heroism, much energy, it is hardly to be denied that the leaders whom that move- nent brought to the surface were almost without exception inen of the poorest political capacity. Danton, no doubt, was abler than most of the others, yet the timidity or temerity with which he allowed himself to be vanquished by Robespierre showed that even he was not a man of commanding quality. The spectacle of men so rash, and so incapable of controlling the forces which they seemed to have presumptuously summoned, excited in Burke both indignation and contempt. And the leaders of the Consti-

tuent who came first on the stage, and hoped to make a revolution with rose-water, and hardly realized any more than Burke did how rotten was the structure which they had undertaken to build up, almost deserved his contempt, even if, as is certainly true, they did not deserve his indig- nation. It was only by revolutionary methods, which are in their essence and for a time as arbitrary as despotic methods, that the knot could be cut. Burke's vital error was his inability to see that a root and branch revolution was, under the conditions, inevitable. His cardinal position, from which he deduced so many important conclusions, namely, that the parts and organs of the old constitution of France were sound, and only needed moderate invigora- tion, is absolutely mistaken and untenable. There was not a single chamber in the old fabric that was not crumbling and tottering. The court was frivolous, vacil- lating, stone deaf and stone blind; the gentry were amiable, but distinctly bent to the very last on holding to their privileges, and they were wholly devoid both of the political experience that only comes of practical responsi- bility for public affairs, and of the political sagacity that only comes of political experience. The parliaments or tribunals were nests of faction and of the deepest social incompetence. The very sword of the state broke short in the king's hand. If the king or queen could either have had the political genius of Frederick the Great, or could have had the good fortune to find a minister with that genius, and the good sense and good faith to trust and stand by him against mobs of aristocrats and mobs of democrats; if the army had been sound and the states-general had been convoked at Bourges or Tours instead of at Paris, then the type of French monarchy and French society might have been modernized without convulsion. But none of these con- ditions existed.

When he dealt with the affairs of India, Burke passed over the circumstances of our acquisition ef power in that continent. "There is a sacred veil to be drawn over the beginnings of all government," he said. "The first step to empire is revolution, by which power is conferred; the next is good laws, good order, good institutions, to give that power stability." Exactly on this broad principle of political force, revolution was the first step to the assump- tion by the people of France of their own government. Granted that the Revolution was inevitable and indispens- able, how was the nation to make the best of it? And how were surrounding nations to make the best of it? This was the true point of view. But Burke

never placed him- self at such a point. He never conceded the postulate, because, though he knew France better than any body in England except Arthur Young, he did not know her condi- tion well enough. “Alas!” he said, “they little know how many a weary step is to be taken before they can form themselves into a mass which has a true, political personality.” And how true this was, it will perhaps take more than a century fully to show. But then nations like individual men are often driven to travel over a weary road that has been long prepared for them by the far-reaching errors of their forefathers, and it was only by the journey of which he wisely forewarned them, that they could hope to arrive at the goal of which he unwisely despaired for them.

Burke’s view of French affairs, however consistent with all his former political conceptions, put an end to more than one of his old political friendships. He had never been popular in the House of Commons, and the vehemence, sometimes amounting to fury, which he had shown in the debates on’the India Bill, on the regency, on the impeach- ment of Hastings, had made him unpopular even among men on his own side. In May 1789—that memorable | month of May in which the states-general marched in

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impressive array to hear a sermon at the church of Nétre Dame at Versailles —a vote of censure had actually been

passed on him in the House of Commons for a too severe –

expression used against Hastings. ox, who led the party, and Sheridan, who led Fox, were the intimates of the Prince of Wales ; and Burke would have been as much out of place in that circle of gamblers and profligates as Milton would have been out of place in the court of the Restoration. The prince, as somebody said, was like his father in having closets within cabinets and cupboards within closets. When the debates on the regency were at their height we have Burke’s word that he was not admitted to the private counsels of the party. Though Fox and he were on friendly terms in society, yet Burke admits that for a considerable period before 1790 there had been between them “ distance, coolness, and want of confidence, if not total alienation on his part.” The younger Whigs had begun to press for

shorter parliaments, for the ballot, for redistribution of political power. Burke had never looked with any favour on these projects. His experience of the sentiment of the populace in the two greatest concerns of his life,—American affairs and Indian affairs, —had not been likely to prepossess him in favour of the popular voice as the voice of superior political wisdom. He did not absolutely object to some remedy in the state of representation (Corr. ii. 387), still he vigorously resisted such proposals as the duke of Richmond's in 1780 for manhood suffrage. The general ground was this : —" The machine itself is well enough to answer any good purpose, provided the materials were sound. But what signifies the arrangement of rottenness ?"

Bad as the parliaments of George III. were, they con-

tained their full share of eminent and capable men; and,

what is more, their very defects were the exact counterparts of what we now look back upon as the prevailing stupidity in the country. What Burke valued was good government. His Report on the Causes of the Duration of Mr Hastings' s Trial shows how wide and sound were his views of law reform. His Thoughts on Scarcity attest his enlightenment on the central necessities of trade and manufacture, and even furnished arguments to Cobden fifty years afterwards. Pitt's parliaments were competent to discuss, and willing to pass, all measures for which the average political intelligence of the country was ripe. Burke did not believe that altered machinery was at that time needed to improve the quality of legislation. If wiser legislation followed the great reform of 1832, Burke would have said this was because the politi- cal intelligence of the country had improved.

Though averse at all times to taking up parliamentary reform, he thought all such projects downright crimes in the agitation of 1791-2. This was the view taken by Burke, but it was not the view of Fox, nor of Sheridan, nor of Francis, nor of many others of his party, and difference of opinion here was naturally followed by difference of opinion upon affairsin France. Fox, Grey, Windham, Sheridan, Francis, Lord Fitzwilliam, and most of the other Whig leaders, wel- comed the Revolution in France. And so did Pitt, too, for some time. " How much the greatest event it is that ever happened in the world," cried Fox, with the exaggeration of a man ready to dance the

carmagnole, “and how much the best!” The dissension between a man who felt so passionately as Burke, and a man who spoke so impulsively as Charles Fox, lay inthe very nature of things. Between Sheridan and Burke there was an open breach in the House of Commons upon the Revolution so early as February 1790, and Sheridan’s influence with Fox was strong. This divergence of opinion destroyed all the elation that Burke might well have felt at his compliments from kings, his gold medals, his twelve editions. But he was too fiercely im earnest in his horror of Jacobinism to allow mere party associations to guide him. In May 1791 the thundercloud

burst, and a public rupture between Burke and Fox took place in the House of Commons.

The scene is famous in our parliamentary annals. The minister had introduced a measure for the division of the province of Canada and for the establishment of a local legislature in each division. [ox in the course of debate went out of his way to laud the Revolution, and to sneer at some of the most effective passages in the Reflections. Burke was not present, but he announced his determina- tion to reply. On the day when the Quebec Bill was to come on again, Fox called upon Burke, and the pair walked together from Burke’s house in Duke Street down to Westminster. The Quebec Bill was recommitted, and Burke at once rose and soon began to talk his usual language against the Revolution, the rights of man, and Jacobinism whether English and French. ‘There was a call to order. Fox, who was as sharp and intolerant in the House as he was amiable out of it, interposed with some words of contemptuous irony. Pitt, Grey, Lord Sheffield, all plunged into confused and angry debate, as to whether the French Revolution was a good thing, and whether the French Revolution, good or bad, had anything to do with the Quebec Bill. At length Fox, in seconding a motion for confining the debate to its proper subject, burst into the fatal question beyond the subject, taxing Burke with inconsistency, and taunting him with having forgotten that ever-admirable saying of his own about the insurgent colonists, that he did not know how to draw an indictment against a whole nation. Burke replied in tones of firm self-repression ; complained of the attack that had been made upon him ; reviewed Fox’s charges of

inconsistency ; enumerated the points on which they had disagreed, and remarked that such disagreements had never broken their friendship. But whatever the risk of enmity, and however bitter the loss of friendship, he would never cease from the warning to flee from the French constitution. ‘But there is no loss of friends,” said Fox in an eager under tone. “ Yes,” cried Burke, ‘“‘ there 7s a loss of friends. I know the penalty of my conduct. I have done my duty at the price of my friend—our friendship is at an end.” Fox rose, but was so overcome that for some moments he could not speak. At length, his eyes streaming with tears, and ina broken voice, he deplored the breach of a twenty years’ friendship on a political question. Burke was inexorable. To him the political question was so vivid, so real, so intense, as to make all personal sentiment no more than dust in the balance. Burke confronted Jacobinism with the relentlessness of a Jacobin. The rupture was never healed, and Fox and he had no relations with one another henceforth beyond such formal interviews as took place in the manager’s box in Westminster Hall in connection with the impeachment.

A few months afterwards Burke published the Appeal Jrom the New to the Old Whigs, a grave, calm, and most cogent vindication of the perfect consistency of his criticisms upon the English Revolution of 1688 and upon the French Revolution of 1789 with the doctrines of the great Whigs who conducted and afterwards defended in Anne’s reign the transfer of the crown from James to William and Mary, The Appeal was justly accepted as a satisfactory performance for the purpose with which it was written. Events, how- ever, were doing more than words could do, to confirm the public opinion of Burke’s sagacity and foresight. He had always divined by the instinct of hatred that the French moderates must gradually be swept away by the Jacobins, and now it was all coming true. The humiliation of the king and queen after their capture at Varennes; the com- pulsory acceptance of the constitution; the plain incom- petence of the new Legislative Assembly; the growing violence of the Parisian mob, and the ascendency of the

Jacobins at the Common Hall; the fierce day of the 20th of June (1792), when the mob flooded the Tuileries, and the bloodier day of the 10th of

August, when the Swiss guard was massacred and the royal family flung into prison ; the murders in the prisons in September; the trial and execution of the king in January (1793) ; the proscription of the Girondins in June, the execution of the queen in October—if we realize the impression likely to be made upon the sober and homely English imagination by such a heightening of horror by horror, we may easily understand how people came to listen to Burke's voice as the voice of inspiration, and to look on his burning anger as the holy fervour of a prophet of the Lord.

Fox still held to his old opinions as stoutly as he could, and condemned and opposed the war which England had declared against the French republic Burke, who was profoundly incapable of the meanness of letting personal estrangement blind his eyes to what was best for the com- monwealth, kept hoping against hope that each new trait of excess in France would at length bring the great Whig eader to a better mind He used to declaim by the hour in the conclaves at Burlington House upon the necessity of securing Fox; upon the strength which his genius would lend to the administration in its task of grappling with the sanguinary giant ; upon the impossibility, at least, of doing either with him or without him. Fox's most im- portant political friends who had long wavered, at length, to Burke's great satisfaction, went over to the side of the Government. In July 1794, the duke of Portland, Lord Fitzwilliam, Windham, and Grenville took office under Pitt. Fox was left with a minority which was satirically said not to have been more than enough to fill a hackney coach. 'That is a calumny," said one of the party, "we should have filled two." The war was prosecuted with the aid of both the great parliamentary parties of the country, and with the approval of the great bulk of the nation. Perhaps the one man in England who in his heart approved of it less than any other was William Pitt. The difference between Pitt and Burke was nearly as great as that between Burke and Fox. Burke would be content with nothing short of a crusade against France, and war to the death with her rulers. 'J cannot persuade myself," he said, "that this war bears any the least resemblance to any that has ever existed in the world. I cannot persuade myself that any examples or any reasonings drawn from other wars and other politics are at all applicable to it" (Corr. iv. 219). Pitt, on the other hand, as Lord Russell truly says, treated Robespierre and Carnot as he would have treated any other French rulers, whose ambition was to be resisted, and whose interference in the affairs of other nations was

to be checked. And he entered upon the matter in the spirit of a man of business, by sending ships to seize some islands belonging to France in the West Indies, so as to make certain of repayment of the expenses of the war.

In the summer of 1794 Burke was struck to the ground by a blow to his deepest affection in life, and he never recovered from it. His whole soul was wrapped up in his only son, of whose abilities he had the most extravagant estimate and hope. All the evidence goes to show that Richard Burke was one of the most presumptuous and empty-headed of human beings. “He is the most impu- dent and opiniative fellow I ever knew,” said Wolfe Tone. Gilbert Elliott, a very different man, gives the same account. ‘‘ Burke,” he says, describing a dinner party at Lord Fitzwilliam’s in 1793, “has now got such a train after him as would sink anybody but himself : his son, who is quite nauseated by all mankind ; his brother whois liked better than his son, but is rather oppressive with animal spirits and brogue; and his cousin, William Burke, who is just returned unexpectedly from India, as much ruined as

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when he went years ago, and who is a fresh charge on any prospects of power Burke may ever have. Mrs Burke has in her train Miss French [Burke’s niece |, the most perfect She Paddy that ever was caught. Notwithstanding these disadvantages Burke is in himself a sort of power in the state. It is not too much to say that he is a sort of power in Europe, though totally without any of those means or the smallest share in them which give or maintain power in other men.” Burke accepted the position of a power in Europe seriously. Though no man was ever more free from anything like the egoism of the intellectual coxcomb, yet he abounded in that active self-confidence and self-assertion which is natural in men who are conscious of great powers, and strenuous in promoting great causes. In the summer of 1791 he despatched his son to Coblentz to give advice to the royalist exiles, then under the direction of Calonne, and to report to Beaconsfield their disposition and prospects. Richard Burke was received with many compliments, but of course nothing came of his mission, and the only impression that remains with the reader of his prolix story is his tale of the two royal brothers, who afterwards became Louis XVIII. and Charles

X., meeting after some parting, and embracing one another with many tears on board a boat in the middle of the Rhine, while some of the courtiers raised a cry of “ Long live the king ”—the king who had a few weeks jbefore been carried back in triumph to his capital with Mayor Pétion in his coach. When we think of the pass to which things had come in Paris by this time, and of the unappeasable ferment that boiled round the court, there is a certain touch of the ludicrous in the notion of poor Richard Burke writing to Louis XVI. a letter of wise advice how to comport himself.

At the end of the same year, with the approval of his father, he started for Ireland as the adviser of the Catholic Association. He made a wretched emissary, and there was no limit to his arrogance, noisiness, and indiscretion. The Irish agitators were glad to give him two thousand guineas and to send him home. The mission is associated with a more important thing, his father’s Letters to Sir Hercules Langrishe, advocating the admission of the Irish Catholics tothe franchise. This short piece abounds richly in maxims of moral and political prudence. And Burke exhibited considerable courage in writing it; for many of its maxims seem to involve a contradiction, first, to the principles on which he withstood the movement in France, and secend, to his attitude upon the subject of parliamentary reform. The contradiction is in fact only superficial Burke was not the man to fall unawares into a trap of this kind. His defence of Catholic relief, and it had been the conviction of a life-time, was very properly founded on propositions which were true of Ireland, and were true neither of France nor of the quality of parliamentary representation in England. Yet Burke threw such breadth and generality over all he wrote that even these propositions, relative as they were, form a short manual of statesmanship.

At the close of the session of 1794 the impeachment of Hastings had come to an end, and Burke bade farewell to Parliament. Richard Burke was elected in his father’s place at Malton. The king was bent on making the champion of the old order of Europe a peer. His title was to be Lord Beaconsfield, and it was designed to annex to the title an income for three lives. The patent was being made ready, when all was arrested by the sudden death of the son who was to Burke more than life. The old man’s grief was agonizing and inconsolable. “The storm has gone over me,” he wrote in words which are well known, but which can hardly be repeated too

often for any who have an ear for the cadences of noble and pathetic speech,— “The storm has gone over me, and J lie like one of those old oaks which the late hurricane has scattered about me.

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I am stripped of all my honours; I am torn up by the roots and lie prostrate on the earth, ... Iam alone. i have none to meet my enemies in the gate… . I live in an inverted order. They who ought to have succeeded me have gone before me. They who should have been to me as posterity are in the place of ancestors.”

A pension of £2500 was all that Burke could now be persuaded to accept. The duke of Bedford and Lord Lauderdale made some remarks in Parliament upon this paltry reward to a man who, in conducting a great trial on the public behalf, had worked harder for nearly ten years than any minister in any cabinet of the reign. But it was not yet safe to kick up heels in face of the dying lion. The vileness of such criticism was punished, as it deserved to be, in the Letter toa Noble Lord (1796), in which Burke showed the usual art of all his compositions in shaking aside the insignificances of a subject. He turned mere personal defence and retaliation into an occasion for a lofty enforce- ment of constitutional principles, and this, too, with a relevancy and pertinence of consummate skilfulness. There was to be one more great effort before the end.

In the spring of 1796 Pitt’s constant anxiety for peace had become more earnest than ever. He had found out the instability of the coalition and the power of France. Like the thrifty steward he was, he saw with growing concern the waste of the national resources and the strain upon commerce, with a publis debt swollen to what then seemed the desperate sum of £400,000,000. Burke at the notion of negotiation flamed out in the Letters on a Regicide Peace, in some respects the most splendid of all his compo- sitions. They glow with passion, and yet with all their rapidity is such steadfastness, the fervour of imagination is so skilfully tempered by close and plausible reasoning, and the whole is wrought with such strength and fire, that we hardly know where else to look either in Burke’s own writings or elsewhere for such an exhibition of the rhetorical resources of our language. We cannot wonder that the whole nation was stirred to the very

depths, or that they strengthened the aversion of the king, of Windham, and other important personages in the Government, against the plans of Pitt. The prudence of their drift must be settled by external considerations. Those who think that the French were likely to show a moderation and practical reasonableness in success, such as they had never shown in the hour of imminent ruin, will find Burke's judgment full of error and mischief. Those, on the contrary, who think that the nation which was on the very eve of surrendering itself to the Napoleonic absolutism was not in a hopeful humour for peace and the European order, will believe that Burke's protests were as perspicacious as they were power- ful, and that anything which chilled the energy of the war was as fatal as he declared it to be.

When the third and most impressive of these astonishing productions came into the hands of the public, the writer was nomore. Burke died on the 8thof July 1797. Fox, who with all his faults was never wanting in a fine and generous sensibility, proposed that there should be a public funeral, and that the body should lie among the illustrious dead in Westminster Abbey. Burke, however, had left strict injunctions that his burial should be private ; and he was laid in the little church at Beaconsfield. It was the year of Campo Formio. So a black whirl and torment of rapine, violence, and fraud was encircling the Western World, as a life went out which, notwithstanding some eccentricities and some aberrations, had made great tides in human destiny very luminous. (J. MO.)

BURKE, Ropert O'Hara (1821-1861), one of the great explorers of the continent of Australia, was born in 1821 at St Clerans in Galway, Ireland. He left the Belgian college where he had been educated to enter the military

service of Austria, but in 1848 returned to Ireland, and obtained a post in the mounted police. He next went to Australia, and served for some time as police-inspector, first in Melbourne and then in the district of Beechworth, till the outbreak of the Crimeau War induced him to return to Europe to take part in the campaign. Peace was restored, however, before he arrived, and he accordingly went back to Australia and resumed his connection with the police force. In 1860 he was appointed one of the leaders of a Government exploring expedition, and in this capacity had the honour of being one of

the first Europeans to traverse the continent from south to north. A short account of the enterprise—so brilliantly successful in its achievements and so disastrous in its termination—is given in the article AUSTRALIA, vol. iii. p. 106; and fuller details will be found in the Journal of the Royal Geographical Society for 1862. The remains of the explorer were interred by Howitt's relief party in 28° 20' S. lat. and 141° E. long.

BURLAMAQUI, Jean Jacques (1694-1748), a celebrated writer on natural law, was. born at Geneva on the 24th June 1694. He received a careful education, aud while passing through his university course devoted himself with such success to the study of ethics and law of nature, that at the age of twenty-five he was designated honorary professor. Before taking possession of his chair he travelled through France and England, and made the acquaintance of the most eminent writers of the period. On his return he began his lectures, and soon gained a wide reputation, from the simplicity of his style and the precision of his views. He continued to lecture for fifteen years, when he was compelled to resign from ill-health. His fellow-citizens at once elected him a member of the council of state, and he gained as high a reputation for his practical sagacity as he had for his theoretical knowledge. He died at Geneva onthe 3d April 1748. His works were Principes du Droit Nature, 1747, and Principes du Droit Politique, 1751. These have passed through many editions, and were very extensively used as text-books. The most convenient collected edition is that by Dupin, in 5 vols., 1820. Burlamaqui's style is simple and clear, and his arrangement of the material good. His fundamental principle may be described as rational utilitarianism, and it in many ways resembles that of Cumberland.

BURLINGTON, a city and port of entry of the United States, capital of Chittenden county, in Vermont, 38 miles N.W. of Montpelier, in 44° 27' N. fat., and 73° 10' W. long. It has a fine situation on the eastern shore of Lake Champlain, and is laid out with great regularity around a central square. Its principal buildings are the Vermont University (which occupies the summit of the slope on which the city is built), the Vermont Episcopal Institute, the court-houses, a jail, a custom-house, and a marine- hospital. The university was founded in 1791, and was endowed by the State with 29,000 acres of land,—to which in 1865 were added 150,000 acres of national grant by the incorporation of the agricultural college. There is a medical school attached,

Burlington carries on an extensive trade in lumber, and has the most important share in the shipping traffic of the lake. Its harbour is defended by a breakwater, and a lighthouse was erected at the mouth of the bay in 1862. To the north of the Onion River, but united to Burlington by a bridge, lies the flourishing village of Winooski, with factories and mills. The history of Burlington only dates from 1783; its first church from 1795, and its incorporation as a city from 1864. Popula- tion in 1870, 14,387,

BURLINGTON, a city and port of entry of the United States in Burlington county, New Jersey, 18 miles N.E. of Philadelphia, on the Delaware, in 40° 5’ N. lat. and 73°

10’ W. long. It is well built, has an abundant supply of water, and forms a favourite summer resort for the inha- bitants of Philadelphia. Its educational institutions are of considerable importance, and comprise an Episcopal college, founded in 1846; St Mary’s Hall, also under Episcopalian management; two large boarding schools; and a number of public schools, which are well endowed. There is also a town-hall and a valuable library. Though it has greatly declined with the rise of Philadelphia, Burlington still maintains a respectable shipping trade; in 1871 it had 131 vessels with a registered tonnage of 12,525. The first settlement of the city dates from 1667, and was principally due to a number of Quakers. New Beverly, as the place was originally called, grew rapidly in importance, and was the seat of the Government of New Jersey till 1790. It had a large trade with the West Indies, and was raised to the rank of a bishopric, Queen Anne endowing the church with an extensive estate. Population in 1870, 5817.

BURLINGTON, a city of the United States, the capital of the county of Des Moines in Iowa, on the right bank of the Mississippi, 207 miles by rail from Chicago. It occupies a natural amphitheatre formed by the limestone bluffs which slope backward from the river. Among the educational institutions the chief place is held by the Busi- ness College, founded in 1865, andthe Baptist University, which dates from 1854. There are about eight public schools, fifteen churches, and a public library. The com- mercial activity of the city is very great, and is gradually increasing. Its industrial establishments comprise flour- mills, pork-packing warehouses, foundries,

breweries, and soapworks ; and the neighbourhood furnishes an abundant supply of coal, building stone, and lime.

1834, it ranked for several years (1837~40) as the capital of Iowa. Population in 1860, 6706; in 1870, 14,933. BURMAH. The Burman empire, or Independent Burmah, is situated in the S.E. of Asia, in the region beyond the mountains which form the eastern frontier of Bengal. It was formerly of very considerable extent, but its limits have been greatly contracted by British conquest. On the W. where it is conterminous with the British terri- tories in India, the Burman empire is bounded by the province of Arakdn, surrendered to the British in 1826, the petty states of Tipperah and Munnepore, and the province of Assam, from which it is separated by lofty ridges of

mountains; on the S. by the British province of Pegu,

acquired in 1853; on the N. by Assam and Tibet ; and on the E. by China and the Shan states. Its limits extend from 19° 30’ to 28° 15’ N. lat., and from 93° 2’ to 100° 40’ E. long., comprising a territory measuring 540 miles in length from north to south, and 420 in breadth, with an area of 190,520 English square miles.

The city is also | the centre of a considerable railway system. Laid out in |

That portion of Asia in which the Burman empire is.

situated slopes from the central mountains towards the south ; and the Burmese territory is watered by four great Streams, namely, the Irawadi and the Kyen-dwen, which

unite their courses at 21° 50’ N. lat., the Sittang or: The first two rivers have their |

Pounloung, and the Salwin. Sources somewhere in the northern chain of mountains in the interior, one head stream of the Irawadi probably coming from Tibet; the Salwin further to the east in Tibet ; and the Sittang, which is the smallest of the four, in the hills to the S.E. of Mandalay; they all run ina southerly course to the Indian Ocean. The Irawadi and the Salwin are large

rivers, which in the lower part of their course overflow the flat country on their banks during the ‘season of the rains, and in the upper force their way through magnificent defiles. The former is navigable a considerable distance above Bhamo; but the latter is

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practically useless as a means of communication, owing to the frequent obstacles in its channel. The Burmese empire with its present limits contaius no maritime districts, and only isolated tracts of alluvial plain ; it is in the main an upland territory, bounded at its southern extremity by a frontier line at the distance of about 200 miles from the mouths of the Irawadi, in 19° 30’ N. lat. From this point the country begins to rise, and thence for about 300 miles farther it contains much rolling country intersected by occasional hill ranges; beyond this it is wild and mountainous.

Though inferior in point of fertility to the low-lying Produc- tracts of British Burmah, the upland country is far from tions.

being unproductive. ‘The chief crops are rice (of which the Burmese count 102 different sorts), maize, millet, wheat, various pulses, tobacco, cotton, and indigo. The sugar- cane appears to have been long known to the Burmese ;

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Sketch-Map of Burmah.

but, though the climate and soil are extremely favourable, it is not generally cultivated. A cheap and coarse sugar is obtained from the juice of the Palmyra palm, which abounds in the tract south of the capital. The cocoa and areca palms are not common. ‘The tea-plant, which is indigenous, is cultivated in the hills by some of the mountain tribes at the distance of about five days’ journey, and by others in still greater perfection at the distance of about ten days’ journey, from the capital. It seems, however, to be another plant, probably the Hlaodendron persicum, which furnishes the principal ingredient in the hlapét, or pickled ‘tea, that forms one of the favourite condiments of Burmah. Cotton is grown in every part of the kingdom ‘and its dependencies, but chiefly in the dry lands and climate of the upper provinces. Indigo is indigenous, ‘and ‘is ‘uni- versally cultivated, but in a very rude manner; it is still

Forests.

Minerals.

more rudely manufactured, and is wholly unfit for exporta- tion.

The most common fruits in Burmah are the mango, the orange, the citron, the pine, the custard apple, the jack, the papaya, and the plantain. The yam and the sweet potato are grown, but not extensively; the common potato is unknown. Onions are produced; and capsicum, which, after salt, is the most ordinary condiment used by tle Bur- mese, is cultivated everywhere.

The forests of Burmah abound in fine trees, Among these the teak holds a conspicuous place ; some of the finest teak forests were lost to the Burmese, however, with Pegu. Almost every description of timber known in India is pro- duced in the Burmese forests, from which also an abundant supply is obtained of the varnish employed by the Shans and the Burmese in their manufacture of lacquered ware. Sticklac of an excellent quality is obtained in the woods.

Burmah is rich in minerals, and produces gold, silver, copper, tin, lead, antimony, bismuth, amber, coal, petroleum, nitre, natron, salt, limestone, and marble, the jade or yu of the Chinese, sapphires, and other precious stones. Gold is found in the sands of different rivers, and also towards the Shan territory on the eastern frontier ; but the demand is very much greater than the native supply. Silver is got also near the Chinese frontier. The mountainous dis- tricts of the Shan territory contain almost all the other metals; but they are not worked, and the copper and tin, which are seen in the capital, are imported from China. Iron is found in several places, and is wrought especially at Poukpa, near a mountain of that name to the eastward of the old capital Pagén, and also at Maedoo, north-west of the capital ; but, owing to ignorance and the want of proper methods, about 30 or 40 per cent. of the metal is lost in the process. Large deposits of rich magnetic oxide, as yet untouched, exist in the ridges east of the capital near the banks of the navigable river Myit-Ngé, and the same dis- trict contains lime in great abundance and of remarkable whiteness ; while statuary marble, equal to the best Italian specimens, is found about 15 miles north of the capital and east of the Jrawadi. Mines of amber are wrought, among other places, at Hookhong or Payendwen, near the sources of the Kyen-dwen, and their produce must be abundant if one may judge from the price of the article at the capital. Nitre, natron, and salt are found in various quarters. Sulphur also occurs in some places, as in the district of Silleh-Myo and in the neighbourhood of the petroleum wells ; but the quantity is comparatively

small, and a supply has to be obtained from China. Coal has been dis- covered in patches, but not in any quantity worth working. Petroleum, which is used by all ranks among the Burmese for burning in lamps, and also for smearing wood as a pre- servative against insects, is found near the village of Ye-nang-gyoung, on the banks of the Irawadi. Here are upwards of one hundred pits or wells, with a general depth of from 210 to 240 feet ; though some of them are deeper, and reach to the depth of 300 feet. Theshaft is of a square form, from 3 to 4 feet across, and lined with horizontal balks. The liquid appears to boil up from the bottom like an abundant spring, and is extracted in buckets, and sent to all quarters of the country. The annual yield is calcu- lated at 11,690 tons. A good deal is now imported into England.?

The precious stones which are produced in the Burmese territories are chiefly the sapphire and the ruby. They are found about 60 or 70 miles in a north-east direction from the capital, over an area of about 100 square miles, by sinking pits in the gem beds. The varieties of the sapphire

+ An article on the Burman flora, by S. Kurtz, will be found in the

Journal of the Asiatic Society of Bengal for 1874. 2 See Appendix to Yule's Narrative.

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found there are the 4lwe or oriental sapphire, the red or oriental ruby, the purple or oriental amethyst, the yellow or oriental topaz, besides different varieties of chrysoberyl and spinelle. The Crown lays claim to the produce of these rivers ; and all the stones that exceed the valuc of £10 are sent to the treasury. No stranger is ever permitted to approach the spots where these precious stones are found. The yu or jade mines are situated in the Mogoung district, about 25 miles south-west of Mcinkhoom. During certain seasons no fewer than 1000 men—Shans, Chinese, Pan- thays, and Kakhyens—are engaged in the excavation of the stonc, which is found in the form of rounded boulders, sometimes of considerable size. Each digger pays so much a month for the right of search, and all he finds becomes his own. Momien, in Yunnan, was formerly the chief seat of the manufacture of the jade, and still produces a con- siderable quantity of small articles.

The country of the Burmese, abounding in forests, affords Animals

extensive shelter to wild animals. The elephant and the rhinoceros—both the one-horned (J?. indicus) and the two- horned (2. swmatranus)—are found in the deep forests of the country. The tiger and the leopard are numerous, as well as the wild hog, and several species of deer, such as the Indian roe, the axis, and the barking deer (Cervus muntjac). In the Irawadi is found, as far up as Bhamo, a peculiar kind of dolphin. The rivers and lakes abound with fish, from which the inhabitants prepare their favourite condiment of ngapee. A detailed description of several of the species will be found in Day's contributions to the Proceedings of the Zoological Society, 1869, 1870. Of birds, the jungle-fowl is common, and is seen in coveys in all the forests of the country ; while domestic breeds, often of very large size, are kept in great numbers, not only for the sake of the eggs or the flesh, but also to afford amuse- ment of a barbarous kind. Aquatic birds of various kinds are very numerous, such as geese, darters (/lotus melano- gaster), scissor-bills (Jthyncops nigra), adjutants (Leptoptelos argala), pelicans, cormorants, cranes (Gus antigone, in Burmese gyoja), whimbrels, plovers, and ibises. There are also peacocks, and varieties of pheasants, partridges, and quails.®

The domestic animals are the ox, the buffalo, and the horse. Oxen are used for draught in the upper country, and buffaloes in the southern parts. They are of a good description, and, ranging in the luxuriant pastures of the plains, they commonly appear in high order. The buffalo is confined to agricultural Jabour, and the ox alone is used as a beast of burden or of draught. The Burman horses. which are rarely more than thirteen hands bigh, are never used but for riding. Elephants arc kept for the pleasure of the king, and the taming of those that are newly caught is one of the favourite spectacles of the people. A white elephant (apparently an albino), when found, is greatly prized, and is kept at court as a sacred appendage of royalty. The dog is neglected, and is seen prowling about the streets, a prey to famine and disease. Cats are numer- ous; and about the capital a few goats and sheep, of a puny race, are kept more for curiosity than for use. A few asses are also seen, which are brought from China. The camel is not known.

The Burmese in person have the Mongoloid character- Inhabi- istics, common to the Indo-Chinese races, the Tibetans, tm

and tribes of the Eastern Himalaya. They may be gene-

3 Journal As. Soc. of Bengal, 1833.

4 The specimens that are most highly prized are of an emerald green ; but red and pale pink are also favourite colours.

5 An important addition to the natural history of the country has just been made by the representatives of the late Mr E. Blyth in the shape of a '* Catalogue of the Mammals and Birds of Burmah," pub-

lished as an extra number of the Journal of the As. Soc. of Bengal,

1875.

rally described as of a stout, active, well-proportioned form ; of a brown but never of an intensely dark complexion, with black, coarse, lank, and abundant hair, and a little more The name they give their own race is Mran-md (as written), generally pronounced Ba-ma, and from this the various forms of

beard than is possessed by the Siamese.

« Burmah" appear to have been taken. Besides the Burmese proper, there are numerous tribes of Paloungs, Toungthoos, Karens, and others toward the east, many of them in a state of semi-independence ; and all round the northern frontier and along the ranges that traverse the

upper regions, vast hordes of Kakhyens or Singphos}main-

taina rough, cateran life, and come down to levy black mail on the more peaceful inhabitants. The Shans constitute a great number of small principalities along the whole eastern border, subject some to Burmah, some to China, some to Siam, and in some cases owning a double

allegiance, according to their position. The Shans everywhere profess Buddhism, and have some kind of literature and the traces of culture. To their race the Siamese themselves belong. The Kakhyens are square-faced, strong-jawed, and oblique- eyed. They are still in a low state of civilization, are destitute of letters, and continue in paganism. Their chiefs are supported by offerings in kind,—receiving, for example, a leg of every animal that is killed. One kind of industry—the manufacture of toddy and arrack—is extensively carried on, and the whole population are regular consumers of the produce.!_ Various other tribes, as the Pwons and the Kakoos, are scattered throughout the empire ; but they are not of much individual importance. The population of the country has been variously esti- mated and grossly exaggerated by the ignorance of Euro- peans, who have raised it to 17,000,000, 19,000,000, and even 33,000,000. Mr Craufurd, on the best data that he could procure, rated the inhabitants at 22 to the square mile, which, under the now contracted limits of the empire, would give a total population of 3,090,000, and Colonel Yule estimated, in 1855, that, within the area between

the British frontier and 24° N. lat., it probably did not

exceed 1,200,000, while within the whole empire at its widest limits there were not more than 3,000,000. Count Bethlen states, in 1874, that he obtained statistics of the houses in Burmah from a Burmese official, which made the number 700,000, without including those among the Shans to the east of the Salwin; so that if we allow five inhabi- tants to each we have 3,500,000 for a total population, and if we include the Shans probably 4,000,000.

The Burmese government is a pure despotism, the king dispensing torture, imprisonment, or death, according to his sovereign discretion. The chief object of government seems to be the personal honour and aggrandizement of the monarch ; and the only restraint on the exercise of his prerogative is the fear of an insurrection. He is assisted in his administration by a public and a privy council, known respectively as the Hlot-dau and the Byadeit ; all questions, before they are submitted to the public advisers of his majesty, are debated in the privy council, which consists generally of four Atwen-woons, to whoni are attached deputies, secretaries, and other officers

(Tsaré dau-gyis, “reat royal writers ;” Than-dau-zens, “receivers of the royal voice”), who carry messages, and report from time to time the proceedings of the council to the king. The Hlot- dau also usually consists of four ministers or Woongyis, and is presided over by the crown-prince (Einshé-men, or lord of the eastern house). The paymaster-general is an officer of high importance ; and the other officers of distine- tion are the king’s armour-bearer and the master of the

1 See for details regarding the Shans and Kakhyens Anderson’s Ha

pedition to Eastern Yunan, ch. v. 200 words in the Shan, Kakhyen, Paloung, and Leesaw languages.

jurisdiction.

Appendix B contains a list of

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elephants, but the latter have no share in the administration of public affairs. The king may order any of those great officers to be punished at his pleasure ; and a minister may, by his order, be seized by the public executioner, and laid at the side of the road for hours under the burning sun with a weight upon his breast ; and after undergoing this disgraceful punishment, may continue to discharge his high function as before. The country,at large is ruled by pro- vincial governors, and is divided into provinces (or Myos), townships, districts, and villages. The civil, military,

judicial, and fiscal administration of the province is vested

in the governor, or Myo-woon, who exercises the power of life and death, though in all civil cases an appeal lies from his sentence to the chief council at the capital. In all the townships and villages there are judges with a subordinate But from a mere detail of the provincial administration and judicial institutions of the Burmese, their extreme inefficiency can scarcely be known. No Burmese officer ever receives a fixed salary. The higher class is paid by an assignment either of land or of the labour and industry of a given portion of the inhabitants, and the inferior magistrates by fees,

perquisites, and other emoluments ; and hence extortion and bribery prevail amongst all the functionaries of the Burmese Government. Justice is openly exposed for sale; and the exercise of the judicial functions is so lucrative, that the two executive councils have by their encroachments deprived the regular judge of the greater part of his employment.

The Burmese laws are mainly contained in the Dham- masat, a code ascribed to Manu, but guite different from the Manu's Code of the Brahmans. It is said to have been introduced into Burmah from Ceylon by Buddaghosha, the traditional apostle of the Indo-Chinese nations." The criminal code is barbarous and severe, and the punish- ments are shocking to humanity. Gang robbery, desertion from the king's service, robbing of temples, and sedition or treason, are considered the most heinous crimes, and are cruelly punished, the criminal being in some cases em- bowelled, or thrown to wild beasts. Decapitation is the general mode of execution, but crucifixion and fracture of the limbs are also practised, and women are usually put to death by the stroke of a bludgeon across the throat. For minor offences, fines, whipping, and imprisonments are the punishments adjudged. In important cases torture 1s ap- plied both to principals and witnesses; and the jailers often torture their prisoners in order to extort money from them. The English and American prisoners during the war of 1824 were frequently tortured, and had to pay fines to the jailer in order to procure milder treatment. 'Trial by ordeal is sometimes resorted to, as well as other superstitious modes of procedure. 'The administration of justice, however vexatious and expensive, is far from efficient; and the police is as bad as can possibly be conceived.

There are no hereditary honours under the Burmese Ranks of Government. All the public functionaries may be dis- society. missed from their offices, and deprived of their rank at the caprice of the sovereign; while any subject, with the excep- tion of a slave or outcast, may aspire to the first offices in the state, to. which, in reality, persons of very mean origin do frequently attain. The great officers of Government hold the first rank after the king and the princes of the blood, and are distinguished by a chain or badge, which is the order of nobility, and of which there are different degrees, dis- tinguished by the number of strings or small chains which compose the ornament. Three of open chain-work mark the lowest rank; three of neatly-

twisted wire the next; there are then six, nine, twelve, and finally twenty-four, which the king alone is entitled to wear. But every article possessed net = S ee

2 A translation has been made into English by Richardson. IV. — 7o

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by a Burman for use or ornament—his ear-rings, cap of ceremony, horse-furniture, the material of his drinking-cup, if it be of gold or any other metal, the colour and quality of his umbrella (an article in general use, and one of the principal insignia of rank), whether it be of brown varnished paper, red, green, gilded, or plain white, the royal colour— all indicate the rank of the person; if any of the lower orders usurp the insignia of a higher class, he may be slain with impunity by the first person who meets him; and so exclusive is the aristocratical spirit of the higher orders, thet such a usurpation would be sure of punishment.

When a merchant acquires property he is registered by a royal edict under the name of Thuthé or “ rich man,” which gives him a title to the protection of the court, while it exposes him also to regular extortion. The priesthood form a separate order, who are interdicted from all other employ- ment, and are supported by voluntary contributions. They are distinguished by the yellow colours in their dress, which it would be reckoned sacrilege in any other person to wear. A formal complaint was made, during the conferences with the British previous to the peace, because some of their camp followers were seen dressed in yellow clothes. There is also an order of nuns and priestesses, who make a vow of chastity, but may at any time quit their order.

The free labouring population consist of proprietors or common labourers ; and they are all considered the slaves ot the king, who may at all times call for their services as soldiers, artizans, or common labourers. Hence a Burman, being the property of the king, can never quit the country without his especial permission, which is only granted for a limited time, and never to women on any pretence. The British and others who had children by

Burmese women during a residence in the country experienced the greatest dificalty, even with the aid of heavy douceurs, in taking them along with them. The Dhammasat numbers seven classes of slaves, of which the most important are prisoners of war, and those who have mortgaged their services for a debt. The class of outcasts consists of the slaves of the pagodas, the burners of the dead, the jailers and execu- tioners (who are generally condemned criminals), and the lepers and other incurables, who are held in great abhorrence, and treated with singular caprice and cruelty. They are condemned to dwell alone, and in a state of disgrace ; and any man who is infected with leprosy, however high his rank, is foreed, by continual bribes to the officers of justice, zw purchase au exemption from the penalties which attach to him. Prostitutes are also considered as outcasts. The women in Burmah are not shut up as in many other parts of the East, and excluded from the sight of men; on the contrary, they are suffered to appear openly in society, and have free access in their own name to the courts of law, where, if ill-treatment is proved, divorce is readily obtained. In many other respects, however, they are exposed to the mest degrading treatment. They are sold far a time to straugers ; and the practice is not considered shameful, nor the female in any respect dishonoured. They are seldom

nfaithful to their new master; and many of them have proved essentially useful to strangers in the Burmese dominions, being generally of industrious and domestic habits, and not addicted to vice.

The taxes from which the public revenue arises are in general rude and ill-contrived expedients for extortion, and #ze vexatious to the people at the same time that they are little productive to the state. The most important is the house or family tax, which is said to be assessed by a Domesday Book, compiled by order of Mentaragyi in 1783. The amount varies greatly in different years, and to a remarkable extent in different districts. Next in order is the tax on agriculture, which is also very irregularly imposed. A large part of the cultivated land of the

kingdom is assigned to favourites of the court or to public

functionaries in lieu of stipends or salaries, or is appro-

priated to the expenses of public establishments, such as war-boats, elephants, &c.; and this assignment conveys a right to tax the inhabitants according to the discretion of the assignee. The court favourites who receive these grants generally appoint agents to manage their estates; they pay a certain tax or quit-rent to the crown, and their agents extort from the cultivators as much more as they can by every mode of oppression, often by torture. Besides this stated tax, extraordinary contributions are levied by the council of the state directly from the lords and nobles to whom the lands are assigned, who in their turn levy it from the cultivators, and generally make it a pretence for plunder and extortion. Taxes are also laid on fruit-trees, on the sugar palm, on the tobacco-land, on the teak | forests, on the petroleum springs, on mines of gold and precious stones, on the fishery of ponds, lakes, rivers, and ; salt-water creeks, on the manufacture of salt, on the eggs of the green turtle, and on esculent swallows' nests. As the consumption of wines, spirits, opium, and other intoxicating drugs is forbidden by law, they cannot, of course,

be subject to any tax. In many of the useful arts the Burmese have not made Arts and

any great advances, while in others they are possessed of manufu

no small amount of proficiency. The architecture of re- ‘7

ligious edifices erected in the Middle Ages is of striking

and effective character, though only of brick. The general

style bears evidence of an Indian origin; but numerous

local modifications have been introduced. Perhaps the

feature of most interest is the use of the pointed arch as

well as the flat and the circular, and that at a time long

anterior to its employment in India. Modern buildings

are chiefly of wood; palaces and monasteries, carved with

extraordinary richness of detail, and often gilt all over,

present an aspect of barbaric splendour. The dagobas, or

solid domes, which form at once the objects and the

localities of Buddhist worship, are almost the only brick

structures now erected; and these are often gilt all over.

In carving the Burmese artisans display unusual skill and

inventiveness, and give full scope to the working of a

luxuriant and whimsical fancy. As in our mediaeval wood-

work, sometimes there is often displayed a large amount of

satirical and facetious caricature. The application of gilding is carried to an extravagant extent; as much as £40,000 is said to have been expended on this article for a single temple. The finest architectural monuments are to be found in the deserted city of Pagan; and many of the most magnificent are greatly shattered by earthquakes. The number of religious buildings, small and great, throughout the country is enormous; at every turn the traveller finds pagodas or kyoungs (monasteries), or lesser shrines, or zayats (resting-places for travellers founded by the Buddhists in order to acquire religious merit). The ordinary buildings are of a very slight construction, and the architect is prevented from giving them any great height by the whimsical prejudice of the people against any one walking over their heads. ‘The whole process of the cotton manufacture is performed by women, who use a rude but efficient species of loom, and produce an excellent cloth, though they are much inferior in dexterity to the Indian artisans. Silk cloths are manufactured at different places from Chinese silk. The favourite pat-

terns are zigzag longitudinal stripes of different colours,

and the brilliance of the contrasts is frequently gorgeous

in its results. The dyeing of the yellow robes of the

priests is effected by means of the leaves of the jacktree.

‘ For full details the reader ought to consult Captain Yule’s chapter on Pagan.

BUBWAH

The common, coarse, unglazed earthenware is of an excel- lent quality; and a better description of pottery is also The art of making porcelain, however, is entirely Tron ore, as already mentioned, is smelted; but the Burmans

made. unknown, and this ware is imported from China.

cannot manufacture steel, which is brought from Bengal.

Bell-founding has been carried to considerable perfection ; and the craftsmen take pride in the magnitude of some of

their productions. Perhaps the largest specimen is that in

the neighbourhood of Amarapura, which measures 16 feet

across the lip and weighs about 80 tons. Coarse articles of cutlery, including swords, spears, knives, also muskets and matchlocks, scissors, and carpenters’ tools, are manu- factured in the capital, and gold and silver ornaments are produced in every considerable place in the country. Em- bossed work in drinking cups and the like is executed with great richness of effect. North of the capital, and east of the Irawadi, as before stated, is an entire hill of pure white marble, and there are sculptured marble images of Gautama or Buddha. The marble is of the finest quality ; and the workmen give it an exquisite polish by means of a paste of pulverized fossil wood. The chief seat of the manufacture of lacquered wares is at Nyoun-goo, near . the ancient city of Pagan. Since Burmah was deprived of its harbours and

maritime districts, its foreign commerce has been extremely limited. The trade of the country centres chiefly in the capital. The imports are rice, pickled and dried fish, and foreign commodities obtained from Bengal, the Asiatic Archipelago, and Europe. Petroleum, saltpetre, lime, paper, lacquer-ware, cotton and silk fabrics, iron, cutlery, some brass ware, terra japonica, sugar, and tama- rinds are given in exchange. One of the most important branches of the trade of the country was formerly that maintained with the Chinese province of Yunnan ; but it has been for a considerable period in abeyance owing to the disturbed state of the frontier counties. The principal marts of this trade, which wa# carried on at annual fairs, were Madé, near the capital, and Bhamo. The Chinese caravan, setting out from the western province of Yunnan at the close of the periodical rains, generally reached Burmah in the beginning of December, after a journey of six weeks over difficult and mountainous roads. The principal fair was held at Bhamo, comparatively few traders arriving at the capital. The articles imported from China were raw silk, wrought copper, orpiment or yellow arsenic from the mines in Yunnan (of a very fine quality, which found its way into Western Asia, and into Europe through Calcutta), quicksilver, vermilion, iron pans, brass-wire, tin, lead, alum, silver, gold and gold-leaf, earthenware, paints, carpets, rhubarb, tea, honey, velvets and other wrought silks, spirits, musk, verdigris, dry fruits, paper, fans, umbrellas, shoes, and wearing apparel. ‘The metals were chiefly pro- duced in the province of Yunnan. The articles sent to China consisted of raw cotton, by far the most consider- able article of export ; feathers, chiefly of the blue jay, for ornamenting the dresses of ceremony of the Chinese man- darins; esculent swallows’ nests, ivory, rhinoceros’ and deers’ horns; sapphires, used for buttons to the caps of the Chinese officers of rank, jade, and amber, with a small quantity of British woollens. The trade of the northern part of Burmah proper is chiefly carried on at large fairs held in connection with religious festivals. One of the most important articles, in addition to European cloth goods, is salt, for their supply of which all the hill- tribes are dependent on Burmah.*

The currency used by the Burmese is of the rudest description. For the smaller payments lead is employed ;

1 An interesting survey of the various trade-routes from Burmah to

China is given by Mr J. Corytonin the Jour. of the R. Geogr. Soc. for

1875.

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and for the larger payments silver almost exclusively. This is not coined into pieces of any known weight and fineness; and in every payment of any consequence the metal must be weighed and is generally assayed, for which a premium is paid to the bankers or money-changers of 21 per cent., besides 1 per cent. which they say is lost in the operation. There are three or four different alloys of silver in common use as money; the best is Bau, which is almost pure; next is Dain, with about 6-4 per cent. of copper; and so on through several grades. An attempt was made by King Mentaragyi to introduce a coinage ; but his plans failed because he fixed the current value of his money considerably above the real value of the silver. The high rate of interest for money—which is 25 per cent., and 60 per cent. when no security is given—is another proof of the low state of commerce among the Burmese. seeds of the Abrus precatorius (Khyin Rhwe), a little red and black pea, serve as the smallest weight ; they ordinarily weigh about a grain, but vary from one to two. Two of them make a rhwe-kyi, four rhwe-kyis a great pae, four great paesa mat, four matsa kyap, and 100 kyaps a piktha (peissa) or viss, which is equal to 3°6516 fb avoirdupois.

The Burmese year is divided into three seasons and twelve Calendar.

months, beginning with what corresponds to our April, and every third year a month is intercalated. Every pakka or half-month consists of 15 days (ret) of 60 narih each. The ret is divided into the nay or period from sunrise to sunset, and the gnyin or period from sunset to sunrise,— the 60 narih being assigned in different proportions to the two periods in each of the twelve months, the first month having 30 in each period, and the second 30 in the daytime and 28 in the night, and soon. The Burmese have bor- rowed their astronomy and astrology, as well as this divi- sion of the day, from the Hindus. They are ignorant of oceanic navigation; and in their voyages to

Calcutta, during the fine season, they creep along the coast, never losing sight of it.

The Burmese proper use a monosyllabic language, spoken with distinctive tones, like the Chinese and several other Indo-Chinese tongues. Its vocabulary shows distinct re- lation to Chinese on one side and to Tibetan on another. In contrast with Siamese it is a very soft and flexible langnage, and its monosyllabic character is somewhat modi- fied in pronunciation. It has no distinctly sibilant sound, the only letter approximate to “s” having a resemblance rather to the English “th.” It is a literary language, and has been under cultivation for perhaps six or seven centuries. It is written with an alphabet of Indian origin, which pro- bably came in with Buddhism ; and most of the letters are of a more or less circular form. The Pali remaining the dialect of sacred literature, the Burmese has been almost confined to secular uses. It has developed a poetic diction of such complete individuality that it is unintelligible with- out special study. Another peculiar dialect, largely mingled with Pali elements, is spoken at court, and also requires separate study, as it substitutes a vocabulary of elaborate artificiality subordinate to the etiquette of the courtiers. The word for “to go,” for example, is different according as it is said that the king goes, or the prince goes, or the priest goes. Of the literary forms in which the Burmese express themselves, the favourite one is the drama, which appears under the various forms of masquerades, puppet shows, ballet-opera, and farces, as well as in the more dignified character of the regular tragedy. ‘The moral character of the plays is often of the lowest kind, the utmost licence both

of speech and action being allowed on the stage. The scenery is of a very simple and purely suggestive kind, a

single branch of a tree standing for a forest, and frequently the filling up of the dialogue is largely left to the ingenuity

of the actors, little more than hints of the plot being con

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Religion.

tained in many of the librettos. The popular interest in the dramatic exhibitions is intense, and, as in Siam, the same piece often drags its slow length along for days together. Specimens of the plots will be found in the appendixes to Yule's Narrative, Williams's Through Bur- mah, and Bastian's Reisen. The national chronicles, or chronicles of the kings (Maha-Radza Weng), go back at least in name to the early centuries of the Christian era, but their historical value is of a very dubious kind. Libraries are common throughout the country, principally in the monasteries. Though a certain kind of paper is manufactured from bamboo pulp, the usual material of the books is the palm leaf, while for ordinary notebook pur- poses a kind of black tablet, called a parabeik, and a steatite pencil areemployed. A dictionary of Burmese was published by Judson at Maulmein in 1852; Schleiermacher made the language the object of a remarkable study in his Influence of Writing upon Language, 1835; and Bastian has contributed au essay on the literature to the Zeitschrift der Deutschen Morgenl. Gesellschaft, 1863, and has also published an interesting sketch of the peculiarities of the language in his Sprachvergleichende Studien, Leipsic, 1870.

The Burmese are votaries of Buddha, and the rites, doctrines, and priesthood are in their main features the same as in other countries where Buddhism prevails, Every Burman must, at some period or other of his life, spend some time in a monastery; and it is no uncommon thing for a man to retire for a longer or shorter period from the bustle of life without any intention of permanently adopting the yellow robe which is the distinctive mark of the regular monk. Dr Bastian has supplied a great many interesting details on the religious beliefs and ceremonies of the people, but they are as yet unfortunately scattered through the pages of his Zravels. Neither Christianity nor Mahometanism has made niuch progress, though a cer- tain number of Mahometans have existed, especially at the capital, for a long time, and have mosques there. Foreigners enjoy religious toleration, but the Burmese rulers view any attempt to convert the natives to the Christian or any other foreign faith as an interference with their allegiance. An American mission was settled in the country in 1815, under the conduct of Dr Judson before mentioned, who brought to this perilous service zeal and

discretion; but it entirely failed of success, not from any bigotry on the part of the natives, but from the opposition of men in power. On the war breaking out with the British the missionaries were imprisoned, and narrowly escaped with their lives, and on their release they retired to prosecute their labours in the British province of Martaban. There are now in the capital representatives of both English and French missionary agencies,

Education throughout the Burman empire is still in the ecclesiastical stage, but the educational statistics compare favourably with those of many portions of Europe. The first book, according to Dr Bastian, which is put inte the hands of the boys in the monastery schools is the Sin- pungyt, or Great Basket of Learning, in which the mean- ing of the Burmese letters lis explained. After this they learn the injunctions of religion in the Mengalasut, and next the prayers of Gautama in the Pharitgyi, which is written in Pali, so that their study consists in mechanically committing it tomemory. They then proceed tothe Djats (stories or legends) in which the Burmese words are mingled with Pali expressions and contractions; later on they pass to the study of Saddo or grammar, and finally to that of the Yok or general cyclopedia. For those who enter the monastic profession there remain the Pali texts. The historical books are then read, as well as the Pu-

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~~of dialectics are the common possessions of the educated Burmese, and an unshaken conviction in the truth of their religion is almost universal.~~

~~It is probable that Burmah is the Chryse Regio of Ptolemy, a name parallel in meaning to Sonaparanta, the classic Pali title assigned to the country round the capital in Burmese documents. The royal history traces the lineage of the kings to the ancient Buddhist monarchs of India. This no doubt is fabulous, but it is hard to say how early communication with Gangetic India began. From the 11th to the 13th century the old Burman empire was at the height of its power, and to this period belong the splendid remains of architecture at Pagan. The city and the dynasty were destroyed by a Chinese (or rather Mongol) invasion (1284 a.p.) in the reign of Kublai~~

~~Khan. After that the empire fell to a low ebb, and Central Bur- mah was often subject to Shan dynasties. In the early part of the 16th century the Burmese princes of Toungoo, in the north-east of Pegu, began to rise to power, and established a dynasty which at one time held possession of Pegu, Ava, and Arakan. They made their capital at Pegu, and to this dynasty belong the gorgeous descriptions of some of the travellers of the 16th century. Their wars exhausted the country, and before the end of the century it was in the greatest decay. A new dynasty arose in Ava, which subdued Pegu, and maintained their supremacy throughout the 17th and during the first forty years of the 18th century. The Peguans or Taleins then re- volted, and having taken the capital Ava, and made the king prisoner, reduced the whole country to submission. Alompra, left by the conqueror in charge of the village of Monchaboo, planned the deliverance of his country. He attacked the Peguans at first with small detachments ; but when his forces increased, he suddenly advanced, and took possession of the capital in the autumn of 1753. In 1754 the Peguans sent an armament of war-boats against Ava, but they were totally defeated by Alompra; while in the districts of Prome, Donabew, Loonzay, &c., the Burmans revolted, and expelled all the Pegu garrisons in their towns. In 1754 Prome was besieged by the king of Pegu, who was again defeated by Alompra, and the war was transferred from the upper provinces to the mouths of the navigable rivers, and the numerous creeks and canals which intersect the lower country. In 1755 Apporaza, the king of Pegu's brother, was equally unsuccessful, after which the Peguans were driven from Bassein and the adjacent country, and were forced to withdraw to the fortress of Syriam, distant twelve miles from Rangoon. Here they enjoyed a brief repose, Alompra being called away to quell an insurrection of his own subjects, and to repel an invasion of the Siamese ; but returning victorious, he laid siege to the fortress of Syriam and took it by surprise. In these wars the French sided with the Peguans, the English with the Burmans. Dupleix, the governor of Pondicherry, had sent two ships to the aid of the former; but the master of the first was decoyed up the river by Alompra, where he was massacred along with his whole crew. The other escaped to Pondicherry. Alompra was now master of all the navigable rivers; and the Peguans, shut out from foreign aid, were finally subdued. In 1757 the conqueror laid siege to the city of Pegu, which capitulated, on condition that their own king should govern the country, but that he should do homage for his kingdom, and should also surrender his~~

~~daughter to the victorious monarch. Alompra never contemplated the fulfilment of the condition; and having obtained posesssion of the town, abandoned it to the fury of his soldiers. In the following year the Peguans vainly endeavoured to throw off the yoke. Alompra afterwards reduced the town and district of Tavoy, and finally undertook the conquest of~~

~~BURMAH~~

~~the Siamese. His army advanced to Mergui and Tenas- serim, both which towns were taken ; and he was besieging the capital of Siam when he was taken ill He imme- diately ordered his army to retreat, in hopes of reaching his capital alive; but he expired on the way, in 1760, in the fiftieth year of his age, after he had reigned eight years. In the previous year he had massacred the Eng- lish of the establishment of Negrais, whom he suspected of assisting the Peguans. He was succeeded by his oldest son Noungdaugyi, whose reign was disturbed by the rebellion of his brother Tshen-byo-yen or Shembuan, and afterwards by one of his father's generals. He died in little more than three years, leaving one son in his infancy ; and on his decease the throne was seized by his brother Tshen-byo-yen. The new king was intent, like his prede- cessors, on the conquest of the adjacent states, and accor- dingly made war in 1765 on the Munnipore kingdom, and also on the Siamese, with partial success. In the following year he defeated the Siamese, and, after a long blockade, obtained possession of their capital. But while the Bur- mans were extending their conquests in this quarter, they were invaded by a Chinese army of 50,000 men from the province of Yunnan. This army was hemmed in by the skill of the Burmans; and, being reduced by the want of provisions, it was afterwards attacked and _ totally destroyed, with the exception of 2500 men, who were sent in fetters to work in the Burmese capital at their several trades. In the meantime the Siamese revolted, and while the Burman army was marching against them, the Peguan soldiers who had been incorporated in it rose against their companions, and commencing an indis- criminate massacre, pursued the Burman army to the gates of Rangoon, which they besieged, but were unable to capture. In 1774 Tshen-byo-yen was engaged in reducing the marauding tribes. He took the district and fort of Martaban from the revolted Peguans ; and in the following year he sailed down the Irawadi with an army of 50,000 men, and, arriving at Rangoon, put to death the~~

~~aged monarch of Pegu, along with many of his nobles, who had shared with him in the offence of rebellion. He died in 1776, after a reign of twelve years, during which he had extended the Burmese dominions on every side. He was succeeded by his son, a youth of eighteen, called Tsengoo- men (Chenguza of Symes), who proved himself a blood- thirsty despot, and was put to death by his uncle, Bhodau- phra or Mentaragyi, in 1781, who ascended the vacant throne. In 1783 the new king effected the conquest of Arakan. In the same year he removed his residence from Ava,! which, with brief interruptions, had been the capital for four centuries, to the new city of Amarapura, " the City of the Immortals."~~

~~The Siamese who had revolted in 1771 were never afterwards subdued by the Burmans; but the latter re- tained their dominion over the sea-coast as far as Mergui. In the year 1785 they attacked the island of Junkseylon with a fleet of boats and an army, but were ultimately driven back with loss; and a second attempt by the Burman monarch, who in 1786 invaded Siam with an army of 30,000 men, was attended with no better success. In 1793 peace was concluded between these two powers, the Siamese yielding to the Burmans the entire possession of~~

~~1 The frequent change of capital is quite remarkable in Burmese his- tory. In the earlier periods, it is probable that the chronicles have made it seem more frequent than it is, by running the history of minor contemporaneous kingdoms into that of one great monarchy. But in more recent times the capital has been shifted from Prome to Pagan, from Pagan to Panya, fron Panya to Ava, and from Ava to Amarapura; and since the present monarch was visited by the English embassy of 1855, he has caused Amarapura to be abandoned, and has built a new city at Mandalay, which is at present the chief city in the empire.~~

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~~the coast of Tenasserim on the Indian Ocean, and the two important seaports of Mergui and Tavoy.~~

~~In 1795 the Burmese were involved in a dispute with the British in India, in consequence of their troops, to the amount of 5000 men, entering the district of Chittagong in pursuit of three robbers who had fled from justice~~

~~across the frontier. Explanations being made and terms of accommodation offered by General Erskine, the command- ing officer, the Burmese commander retired from the British territories, when the fugitives were restored, and all differences for the time amicably arranged.~~

~~But it was evident that the gradual extension of the British and Burmese territories would in time bring the two powers into close contact along a more extended line of frontier, and in all probability lead to a war between them. It happened, accordingly, that the Burmese, carrying their arms into Assam and Munnipore, penetrated to the British border near Sylhet, on the N.E. frontier of Bengal, beyond which were the possessions of the chiefs of Cachar, under the protection of the British Government. The {Burmese leaders, arrested in their career of conquest, were impatient to measure their strength with their new neighbours. It appears from the evidence of Europeans who resided in Ava, that they were entirely unacquainted with the dis- cipline and resources of the Europeans. They imagined that, like other nations, they would fall before their superior tactics and valour; and their cupidity was inflamed by the prospect of marching to Caleutta and plundering the country. At length their chiefs ventured on the open violation of the British territories. They attacked a party of sepoys within the frontier, and seized and carried off British subjects, while at all points their troops, moving in large bodies, assumed the most menacing posi- tions. In the south encroachments were made upon the British frontier of Chittagong. The island of Shaparee, at the mouth of the Naf river, had been occupied by a small guard of British troops. These were attacked on the 23d September 1823 by the Burmiese, and driven from their post with the loss of several lives; and to the repeated demands of the British for redress no answer was returned. Other outrages ensued ; and at length, in February 1824, war was declared by the British Government.~~

~~Hostilities having commenced, the British rulers in India resolved to carry the war into the enemy's country; an armament, unfer Commodore Grant and Sir Archibald Campbell, entered the Irawadi River, and anchored off Rangoon on the 10th May 1824. After a feeble resistance this great seaport surrendered, and the troops were landed. The place was entirely deserted by its inhabitants, the provisions were carried off or destroyed, and the invading force took possession of a complete solitude. On the 28th May, Sir~~

~~A. Campbell ordered an attack on some of the nearest posts, which were all carried after a feeble defence. Another attack was made on the 10th June on the stockades at the village of Kemmendine. Some of these were battered by artillery ; and the shot and shells struck such terror into the Burmese that they fled in the utmost precipitation. It soon, however, became apparent that the expedition had been undertaken with very imperfect knowledge of the country, and without adequate provision. The devastation of the country, which was part of the defensive system of the Burmese, was carried out with unrelenting rigour, and the invaders were soon reduced to great difficulties. The health of the men declined, and their ranks were fearfully thinned. The monarch of Ava sent large reinforcements to his dispirited and beaten army ; and early in July an attack was commenced on the British line, but proved unsuccess- ful. On the 8th the British assaulted. The enemy were beaten at all points ; and their strongest stockaded works, battered, to pieces by a powerful artillery, were in general~~

~~abandoned. With the exception of an attack by the prince of Sarawadi in the end of August, the enemy allowed the British to remain unmolested during the months of July and August. This interval was employed by Dikewa: Campbell in subduing the Burmese provinces of Tavoy and Mergui, and the whole coast of Tenasserim. This was an important conquest, as the country was salubrious and afforded convalescent stations to the sick, who were now so numerous in the British army that there were scarcely 3000 soldiers fit for duty. An expedition was about this time sent against the old Portuguese fort and factory of Syriam, at the mouth of the Pegu River, which was taken; and in October the province of Martaban was reduced under the authority of the British.~~

~~The rainy season terminated about the end of October ; and the court of Ava, alarmed by the discomfiture of its armies, recalled the veteran legions which were employed in Arak4n, under their renowned leader Maha Bandoola, in vain attempts to penetrate the British frontier. Bandoola hastened by forced marches to the defence of his country ; and by the end of November an army of 60,000 men had surrounded the British position at Rangoon and Kemmendine, for the defence of which Sir Archibald~~

~~Campbell had only 5000 efficient troops. The enemy in great force made repeated attacks on Kemmendine without success, and on the 7th December Bandoola was completely routed by Sir A. Campbell. The fugitives retired to a strong position on the river, which they again entrenched ; and here they were attacked by the British on the 15th, and driven in complete confusion from the field.~~

~~Sir Archibald Campbell now resolved to advance on Prome, about 100 miles higher up the Irawadi River. He moved with his force on the 13th February 1825 in two divisions, one proceeding by land, and the other, under General Cotton, destined for the reduction of Donabew, being embarked on the flotilla. 'Taking the command of the land force he continued his advance till the 11th March, when intelligence reached him of the failure of the attack upon Donabew. He instantly commenced a retrograde march ; on the 27th he effected a junction with General Cotton's force, and on the 2d April carried the entrench- ments at Donabew with little resistance, Bandoola having been killed by the explosion of a bomb. The English general entered Prome on the 25th, and remained there during the rainy season, On the 17th September an armistice was concluded for one month. In the course of the summer General Morrison had conquered the province of Arakan ; in the north the Burmese were expelled from Assam ; and the British had made some progress in Cachar, though their advance was finally impeded by the thick forests and jungle.~~

~~The armistice having expired on the 17th October, the army of Ava, amounting to 60,000 men, advanced in three divisions against the British position at Prome, which was defended by 3000 Europeans and 2000 native troops. But the British still triumphed, and after several actions, in which the Burmese were the assailants and were partially successful, Sir A. Campbell, on the 1st December, attacked the different divisions of their army, and successively drove them from all their positions, and dispersed them in every direction. The Burmese retired on Meaday and afterwards on Mellone, along the course of the Irawadi, where they occupied, with 10,000 or 12,000 men, a series of strongly fortified heights and a formidable stockade. On the 26th they sent a flag of truce to the British camp ; and a negotiation having commenced, peace was proposed to them on the following conditions :—l1s¢, The cession of Arakan, together with the~~

~~provinces of Mergui, Tavoy, and Yea ; 2d, The renunciation by the Burmese sovereign of all claims upon Assam and the contiguous petty states; 3d, The~~

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~~Company to be paid a crore of rupees as an indemnification for the expenses of the war; 4¢h, Residents from each court to be allowed, with an escort of fifty men ; while it was also stipulated that British ships should no longer be obliged to unship their rudders and land their guns as formerly in the Burmese ports. This treaty was agreed to and signed, but the ratification of the king was still want- ing ; and it was soon apparent that the Burmese had no intention to sign it, but were preparing to renew the contest. On the 19th January, accordingly, Sir A. Campbell attacked and carried the enemy's position at Mellone. Another offer of peace was here made by the Burmese, but it was found to be insincere; and the fugitive army made at the ancient city of Pagan-Myo a final stand in defence of the capital. They were attacked and overthrown on the 9th~~

~~February 1826; and the invading force being now within~~

~~four days' march of Ava, Dr Price, an American missionary, who with other Europeans had been thrown into prison when the war commenced, was sent to the British camp with the treaty (known as the Treaty of Yandabo) ratified, the prisoners of war released, and an instalment of 25 lacs of rupees. The war was thus brought to a successful ter- mination, and the British army evacuated the country. For some years the relations of peace continued undisturbed. Probably the feeling of amity on the part of the Burmese Government was not very strong ; but so long as the prince by whom the treaty was concluded continued in power, no attempt was made to depart from its main stipulations. That monarch, Phagyi-dau or Noungdaugyi, however, was obliged in 1837 to yield the throne to a usurper who appeared in the person of his brother, Kounboungmen or Tharawadi. The latter, at an early period, manifested not only that hatred of British connection which was almost universal at the Burmese court, but also the extremest contempt. For several years it had become apparent that the period was approaching when war between the British and the Burmese Govern- ments would again become inevitable. The British resident, Major Burney, who had been appointed in 1830, finding his presence at Ava~~

~~agreeable neither to the king nor to himself, removed in 1837 to Rangoon, and shortly after- wards retired from the country. Ultimately it became necessary to forego even the pretence of maintaining relations of friendship, and the British functionary at that time, Captain Macleod, was properly withdrawn, in 1840, alto- gether from a country where his continuance would have been but a mockery. The state of sullen dislike which fol- lowed was after a while succeeded by more active evidences of hostility. Acts of violence were committed on British ships and British seamen. Remonstrance was consequently made by the British Government, and its envoys were sup- ported by a small naval force. The officers on whom devolved the duty of representing the wrongs of their fellow-countrymen and demanding redress, proceeded to Rangoon, the governor of which place had been a chief actor in the outrages complained of ; but so far were they from meeting with any signs of regret, that they were treated with indignity and contempt, and compelled to retire without accomplishing anything beyond blockading the ports. A series of negotiations followed; nothing was demanded of the Burmese beyond a very moderate compen- sation for the injuries inflicted on the masters of two British vessels, an apology for the insults offered by the governor of Rangoon to the representatives of the British Government, and the re-establishment of at least the appearance of friendly relations by the reception of a British agent by the Burmese Government. But the obduracy of the king— known as the Pagdn-men, who had succeeded his father in 1846—led to the refusal alike of atonement for past~~

~~'wrongs, of any expression of regret for the display of~~

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~~gratuitous insolence, and of any indication of a desire to maintain friendship for the future. Another Burmese war was the result, the first shot being fired in January 1852. As in the former, though success was varying, the British finally triumphed, and the chief towns in the lower part of the Burmese kingdom fell to them in succession. The city of Pegu, the capital uf that portion which, after having been captured, had again passed into the hands of the enemy, was recaptured and retained, and the whole province of Pegu was, by proclamation of the Governor-General, Lord Dalhousie, declared to~~

~~be annexed to the British dominions on the 20th December 1852. No treaty was obtained or insisted upon,—the British Government being content with the tacit acquiescence of the king of Burmah without such documents ; but its resolution was declared, that any active demonstration of hostility by him would be followed by retribution.~~

~~About the same time a revolution broke out which resulted in Pag4n-men's dethronement. His tyrannical and barbarous conduct had made him obnoxious at home as well as abroad, and indeed many of his actions recall the worst passages of the history of the later Roman emperors. The prince of Mendoon, who had become apprehensive for his own safety, made him prisoner in February 1853, and was himself crowned king of Burmah towards the end of the year. The new monarch, known as Mendoon-men, has shown himself sufficently arrogant in his dealings with the European powers, but has been wise enough to keep free from any approach towards hostility, and, indeed, has latterly displayed a desire to live on peaceful terms with the Indian Government. The loss of Pegu was long a matter of bitter regret, and he absolutely refused to acknowledge it by a formal treaty. In the beginning of 1855 he sent a mission of compliment to Lord Dalhousie, the Governor-General ; and in the summer of the same year Major Arthur Phayre, de facto governor of the new province of Pegu, was appointed envoy to the Burmese court. He was accompanied by Captain (now Colonel) Henry Yule as secretary, and Mr Oldham as geologist, and his mission added largely to our knowledge of the state of the country ; but in its main object of obtaining a treaty it was un- successful. It was not till 1862 that the king at length yielded, and his relations with Britain were placed on a definite diplomatic basis. Much interest has been taken of recent years'in the restoration of the trade between China and British Burmah by the old routes overland, and various important journeys in elucidation of the problem have been successfully undertaken. In 1863 Dr Clement Williams, at that time resident in the capital, received the king's per- missicn to proceed to Bhamo, and safely accomplished his voyage to the upper defile of the Irawadi beyond that town in the months of January and February. His recall to the capital prevented his further advance.~~

~~In 1867 a treaty was signed by which British steamers were permitted to; navigate Burmese waters, and the ap- pointment of British agents at Bhamo~~

~~or other stations for the collection of customs was formally authorized, and in the following year a Government expedition, consisting of Captain Williams as engineer, Dr Anderson as naturalist, and Captain Bowers and Messrs Stewart and Burn as repre- sentatives of the commercial interest of Rangoon, was despatched under the leadership of Major Sladen, political resident at Mandalay. The royal steamer Yaynan-Seha, or "The Honesty," was placed by the king at the service of the expedition, and letters of recommendation were fur- nished to the Burmese officials, but in other respects scant courtesy was shown to the party. Escorted by fifty armed police, the explorers advancedin safetyabout 135 miles north- east of Bhamo to Momien or Teng-yue-Chow, a principal town of the Mahometan insurgents, known to the Burmese~~

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~~as Panthés; but beyond this it was considered imprudent to proceed on account of the disturbed condition of the country. In 1869 Captain Storer was appointed first Bri- tish resident at Bhamo; and about the same time the Ira- wadi Flotilla Company started a monthly steamer service to that town, which has now become almost fortnightly. The king's interest in the commercial development of his coun- try was shown by his erecting and garrisoning a series of guardhouses through the dangerous parts of the Kakhyen hills. In 1874 Lord Salisbury sent another expedition, consisting of Colonel Horace Browne, Mr Ney Elias, and Dr Anderson, with instructions to proceed, if possible, right across the country to Shanghai in China; and to ensure the success of the undertaking, Mr Margary, a gentleman familiar with the Chinese language and customs, was com- missioned to start from Shanghai and meet the party at Momien or the neighbourhood. The king's reception of the new mission, which arrived on December 23, 1874, at Mandalay, was favourable in the extreme. On the 15th of January 1875 the explorers reached Bhamo; and two days afterwards Mr Margary arrived from Hankow. After the mission had proceeded to the banks of the Nampoung, a river which joins the Tapeng some distance east of Ponline, they heard rumours of hostile preparations in front; and Mr Margary volunteered to proceed to Man- wyne to find the truth of the reports. On receiving from him word that the way was clear, his companions advanced; but on the 23d of February their camp was attacked~~

~~by the Chinese, and they were ultimately com- pelled to retreat with the sad knowledge that their gallant pioneer had fallen at Manwyne by the hands of cowardly assassins. The Burmese officials stood nobly by the mis- sion, though the enemy assured them that their quarrel was not with them but with the 'white devils." Some fears have been entertained of disagreements between the court of Mandalay and the British authorities, partly in regard to the allegiance of some Karen tribes, and partly in connection with the claim fora right of way for British troops through the Burmese dominions in case of active measures being required to obtain redress from the Chinese Goverument for the murder of Mr Margary. Happily these fears have been disappointed ; the mission of Sir Douglas Forsyth has come to a peaceful if not altogether a successful termina- tion, and a commission has been formed to settle the Karen boundary. While a certain amount of suspicion in regard to British policy still remains in the king's mind, he seems more and more disposed to co-operate with his European allies, and shows himself friendly to the European resi- dents in his capital. His reign has been several times disturbed by internal dissensions, and the general condition of the country can hardly be regarded as one of stability. Personally he is an orthodox and devoted Buddhist, and is largely under the influence of ecclesiastical advisers. In 1874 he was recrowned at Mandalay, in compliance with the requirements of a prophecy, and he attempts to enforce stringent sumptuary laws in accordance with his creed. It is satisfactory to know that while some of his officials are undoubtedly hostile to European in- terests, the great mass of the people seem genuinely favour- able.~~

~~See Sangermano, Burmese Empire ; Captain Hiram?Cox, Journal of a Residence in the Burman-Empire, 1821; Syme's Embassy to the Kingdom of Ava, 1800 ; Snodgrass, Narrative of the Burmese War, 1827; Wayland, Life of Judson, 1853 ; Mason, The Natural Productions of Burna, Maulmein, 1850 ; C. T. Winter's Six Months in British Burmah, 1858; Yule, Narrative of the Mission sent by the Gov.-Gen. of India to the Court of Ava in 1855, 1858; Bastian, Reisen in Birma in den Jahren 1861-1862, 1866 ; Clement Williams, Through Burmah to Western China, Noies of a Journey in 18638, 1868 ; Anderson's Expedition to E. Yunan vid Bhamé, 1871, and Mandalay and Momein, 1876 ; Trant's Two Years in Ava; A. R. M'Mahon's The Karens and the Golden Chersonese, 1876.~~

BURMAH, Bartisu, the country acquired by the British Indian Government after the two wars with the Burman empire, is situated between 10° and 22° N. lat., and 92 and 100° E. long. It is bounded on the N. by Inde- pendent Burmah, on the E. by Siam, on the 8. by the Indian Ocean, and on the W. by the Bay of Bengal and the Chittagong division of Bengal. The province of British Burmah extends along the eastern shore of the Bay of Bengal, and is geographically divided into four portions,— Arakan, extending from the Naf estuary to Cape Negrais, and consisting of a narrow strip of country between the sea and the high mountain chain called Yoma; the valley of the Irawadi, which, divided from the Sittang valley by the Pegu Yoma range, unites with it in its southern por- tion ; the valley of the Salwin; and Tenasserim, a narrow strip, separated from Siam by a lofty chain of hills running from north to south. For administrative purposes the country is divided into three commissionerships, Arakan, Pegu, and Tenasserim, and into fifteen districts, viz, Akyab, Ramree, Sandoway, Northern Ardkin, Rangoon, Bassein, Myanoung, Prome, Thayet-myo, Toungoo, Shwegyen, Am- herst, Tavoy, Mergui, and Salwin.

Physical Aspects.—The greater part of the province is covered with hills, forests, estuaries, and river beds. The eastern and southern part is particularly mountainous, thinly populated, and much intersected by streams. In the central part of the province the valley of the Irawadi unites with the valley of the Sittang at its lower end, and forms an extensive plain, stretching from Cape Negrais on the west to Martaban on the east. The more northern of these valleys are rugged and hilly, and are so densely covered with jungle that but little cultivation can be carried on. A chain of mountains called the Yoma range forms the boundary of the Arakdn division on the east. It is the continuation of the Patkoi and Bardil range, which shoots forth from the Himalayas at their north-eastern extremity, runs south, forms the eastern boundary of Assam and Bengal, and turning south-east, gradually diminishes both in breadth and elevation till it ends in the rocky promon- tory of Cape Negrais. Blue Mountain, one of its peaks, on the northern boundary of the province, is said to rise 8000 feet above the sea-level; but within the province the range nowhere attains a height much above 4000 feet. The same Yoma range forms the western boundary of the

Irawadi valley ; and the Poung Loung range, rising to a supposed height of 7000 feet, bounds the Sittang valley towards the east. The Pegu Yoma range forms the water- shed between these two streams, The mountains of Tenas-serim rise to a height of 5000 feet, with a breadth varying from 10 to 40 miles; they are covered with pathless jungle, and devoid of human habitations of any kind.

Rivers.—Beginning from the extreme west the following are the principal rivers :—The Naf estuary is on the western boundary. The Mroo River, an arm of the sea, about 40 miles to the eastward, is fram 3 to 4 miles broad at its mouth, The Koladan or Arakan River rises near the Blue Mountain in about 23° N, lat., and is navigable for 40 miles from its mouth by vessels of 300 or 400 tons burden. The Talak, Aeng, Sandoway, Toungoop, and Gwa are streams of minor importance. The mouth of the last, however, forms a good port and haven for steamers. or vessels of from 9 to 10 feet draught. The Irawadi rises in about 28° N. lat. and 97° 30’ E. long., and flows for upwards of 600 miles before reaching the British possessions, through which it has a course of 240 miles to the sea in a 8.8.W. direction. As it approaches the coast it divides into nume- rous branches, converting the lower portion of the valley into a net-work of tidal creeks. Its principal branches are the Bassein River, Thekkay-thoung, Yuay, Dayaybhyoo, Pyenmaloo, Pyengazaloo, Dalla, Phyapoon, Donyan, Thana-

teat, and China Buckir rivers. It is navigable for river steamers as far as Bhamo, nearly 400 miles beyond the British frontier, The river when full runs about five miles anhour. The Hleing rises close to Prome, where it is called the Myitmakat stream, and flowing in a southerly direction nearly parallel to the Irawadi, it next takes the name of the Hleing, and finally of the Rangoon River, and falls into the sea a few miles below Rangoon. Its priucipal tributaries are the Nyoungdon, an offshoot of the Irawadi, and the Pegu and Poozoondoung rivers. It is navigable by vessels of the largest size for some distance above Rangoon, but owing to the Hastings shoal, formed at the junction of the Pegu, the Poozoondoung, and the Rangoon rivers, vessels of more than 6 feet draught cannot ascend beyond the shoal at low

~~tide. TheSittang River rises far north of British territory, which it enters just about Toungoo, and flowing southwards, falls into the Gulf of Martaban, when it widens so rapidly that it is impossible to tell where the river ends and the gulf begins. Its principal tributary is the Shwegyen River. A bore, or tidal wave, sweeps up this river, and its effect is felt as faras Shwegyentown. The Biling River rises in the Poungloung hills, flows southward, and falls into the Gulf of Martaban. The Salwin River rises in Tibet, flows south through the Shan states, and falls into the sea at Moulmein. The Attaran rises in the chain of hills which forms the boundary between the kingdom of Siam and British Burmah, and flows in a south-westerly direction through dense teak forests and an almost uninhabited country. The Gyne has numerous villages on its banks, and is navigable for 180 miles by country boats. The Tenasserim River falls into the sea by two mouths, the northern of which is navigable for large ships.~~

~~There is only one canal in the province, connecting the Pegu and the Sittang rivers. The lakes are the Thoo, Lahgyin, and Kandaugyee.~~

~~A large part of the province is covered with forests, but the state reserved area only amounts to 133 square miles. The teak plantations lie in the Rangoon division. The total receipts from the forests in 1871-72 amounted to £77,240.~~

~~Population.—-The total area of the province is 88,556 square miles; the population was returned by the census of 1872 at 2,747,148, giving an average of 31 inhabitants to the square mile. The Buddhists numbered 2,447,831, Mahometans 99,846, Hindus 36,658, Christians 52,299, and aborigines 110,514. The villages, townships, &c., numbered 14,107; the inhabited houses, 535,533. Only ten towns in the province had a population exceeding 10,000,—Rangoon, the capital, containing 98,745.~~

~~Productions.—Rice is the staple product of the province, and in 1871-72 1,836,021 acres were devoted to its culti- vation. Other food grains covered 4860 acres; sesamum, 25,502 acres; sugar-cane, chiefly cultivated in the gardens around the cultivators' houses, 3179 acres; and cotton, principally grown in the hill clearings, 14,120 acres. The fibre of the indigenous cotton is short but strong, and it adheres with great tenacity to the seed. The export of cotton is increasing, Tobacco, grown on sandbanks or in the dry beds of~~

~~streams, inferior in quality, and wholly used for home consumption, occupied 12,866 acres. The other crops produced in the province are indigo, vegetables, hemp, mixed fruits, &c. The system of cultivation known in Bengal as the jim, that is clearing virgin soil by burning, cultivating it for one or two years, and then leaving it again to the jungle, is here extensively practised under the name of toungya cultivation. Although discouraged on account of its wasteful character it cannot be altogether prohibited, as it is the only means of subsistence fora large part of the population. Seven great embankments have been con- structed in the province for the protection and extension~~

~~of regular cultivation. The average rent per acre of rice land varies from 1s. to 10s., while the high land, on which other grains can be cultivated, fetches generally from 3s. to 4s. per acre Of the total area of the province (88,556 square miles) only 3414 square miles are cultivated ; 51,117 square miles are cultivable, and the rest uncul- tivable waste~~

~~Internal Communication is chiefly carried on by water. Steamers ply on the Irawadi between Thayetmyo, Prome, Myanoung, Henzada, and Rangoon. There is also steam communication from Calcutta, via Akyab, to Rangoon and Moulmein, and between Tavoy and Mergui. There were, however, 814 miles of road in the province in 1871-72.~~

~~Mines — The only mines in the province are those worked for tin in the southern portion of the Tenasserim division. This mineral (a binoxide) exists over a large extent of country in the Mergui and Tavoy districts, and is obtained by re- moving and washing the pebble and boulder deposits of the river beds. Samples of the tin-stone, once washed, have produced about 70 per cent. of metal, and twice washed 75 per cent. The ore is therefore very rich, and the metal produced is of excellent quality. Hitherto these deposits have been washed by Chinese and natives of the country in a very rough and unscientific manner, and the tin- stone is smelted in a most primitive way, the produce realized being 68 per cent. of metal. European capitalists have now begun to turn their attention to the subject, and arrangements are being made to lease out certain tracts. Coal exists on the banks of the Tenasserim River, and in other parts of the province, but it has~~

never been worked to any extent. Lead has been found in Toungoo, and on Maingay's Island in the Mergui Archipelago, but nothing has been done towards utilizing it. This mineral also exists in the Shwegyen district, as well as gold, antimony ore, and iron-stone. The quantity of the precious metals is, however, very small, and the workers make but a poor living Limestone exists in several parts of the province, and quarries are worked pretty extensively in Thayetmyo and Bassein; stone might also be excavated in Sandoway if a demand existed.

Manufactures.—Mills are employed in the seaport towns for husking rice and for sawing timber. There were in 1871-72 twenty-six steam rice mills in the province ; five years before there were only three ; and the number rapidly increases with the demand for rice for shipment to Europe, to the Straits, and to China. Silk and cotton goods are manu- factured in large quantities, chiefly, however, for home use, and by small hand-looms. A loom forms a regular piece of furniture ina Burmese household; it is worked by the female members of the family. The cotton cloths thus manu- factured are rough but strong; some of the silk goods fetch a high price. A coarse description of salt is made on the sea-coast, used chiefly in the preparation of WVgapee (a mess of half-salted, half-decomposed fish and other in- gredients), which forms a favourite article of food among the Burmese. The manufacture of salt has lately fallen off, owing to the introduction of Liverpool salt, which undersells the local article. The other manufactures of the province consist of gold and silver bowls (of peculiar and elaborate workmanship), lacquered ware, carved and gilt work, and dyes, especially cntch, an extract of the Acacia Catechu.

Trade.—The total value of the trade of the province in 1871-72 was £10,777,705 ; exports, £5,452,148 ; imports, £5,325,557. The value of the sea-borne trade was—ex- ports, £4,236,997 ; imports, £4,220,723—total, £8,457,721; and of the inland trade—exports, £1,245,150; imports, £1,104,832. The most important article of sea-borne ex- ports is rice. The trade increased from 380,009 tons in 1865 to 470,893 tons in 1871, and made a sudden rise to 700,784

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~~tonsin 1872. Next in importance is the timber trade, ship- ments of which during the year 1872 amounted to 87,545 tons, of the value of £91,210. The other articles of export are cotton, cutch, hides, horns, ivory, jade stone, petroleum, rice and paddy, precious stones, stick-lac, tobacco, &c. The articles of import consist of betel-nut, cotton twist and yarn, crockery ware, cutlery, gunny bags, hardware; cotton, silk, and woollen piece goods ; raw silk, spirituous liquors wines, beers, &c., sugar and tobacco.~~

~~Finances.—The gross revenue from all sources in 1871-72, £1,363,452, of which £1,217,053 was from imperial taxa- tion, £37,320 for provincial services, and £109,079 from local funds. The land revenue of the province was £344,523. Owing to the sparse population and vast extent of country cultivable but uncultivated, the rates of assessment range low. No class of landed proprietors, like the zamindars of Bengal, exists in Burmah. The cultivators themselves hold the land from Government, the extent of their holdings averaging about 5 acres, The exceptions are, where grants of waste land have been made to Europeans or natives of India, but such grants are but little cultivated. The light land tax of the province is supplemented by a capitation tax, peculiar to Burmah ; and by the rice duty, which, from the circumstances of the local trade, falls on the producer, and is equivalent to a tax of 14 per cent. ad valorem on this article of export. The capitation tax is a poll-tax on the male population of the province, from 18 to 60 years of age, with the exception of immigrants during the first five years of their residence, religious teachers, school- masters, Government servants, and those unable to obtain their own livelihood. In 1871-72 it was levied on 556,035 persons, and yielded a revenue of £226,954. The expenditure on the civil administration of the province in 1871-72 was £497,002. For the protection of British Burmah 5016 fighting men, Europeans and natives, were maintained in 1871 at a total cost of £276,200. The strength of the police in 1871 was 5319. The prisons consist of two great central gaols, Rangoon and Moulmein, chiefly for long-term convicts, with twelve subordinate gaols and lock-ups.~~

~~Education has not made much progress in British Burmah under the English plan of public instruction; but the people have a wide-spread system of primary education of their own in the monastic schools. Setting aside these monastic schools, the educational machinery of the province consists of~~

~~seven Government schools, educating 505 boys; fifteen aided missionary schools, teaching 1494 pupils; and twenty-two other unaided schools under Government inspection, teaching 499 pupils. é~~

~~Christianity has spread largely among the Karen tribes, chiefly through the work of American missions.~~

~~Climate.—The climate of British Burmah is moist and depressing for part of the year, but cooler than that of India. Some of the forest tracts during the monsoons, and after the cold weather has set in, are impregnated with deadly malaria; but the coast and the frontier ranges are not unhealthy. The prevalent complaints amongst Europeans are fever, dysentery, and hepatic diseases, from which the natives also suffer. On the whole, however, the climate of British Burmah seems better adapted to the European constitution than any part of India, and of late the statistics of the British troops show a very low rate of disease and mortality. The rainfall varied in 1871 from 245°85 inches at Moulmein to 54°85 inches at Thayetmyo. The average temperature is greatly affected by the sea breeze,—being 80° Fahr, at the sea-coast, and 90° in the interior.~~

~~Form of Government.—The highest authority in the province of British Burmah is the chief commissioner and agent to the Governor-General of India, established under a resolution of the Government of India, dated January~~

~~1862. The chief commissioner is assisted by a secretary and assistant-secretary, three commissioners of revenue and circuit. thirteen deputy-commissioners, one superintendent of hill-tracts, twenty-two assistant-commuissloners, four collectors of sea-customs, a director of public instruction, an inspector-general of police, an inspector-general of prisons, and a conservator of forests. A political agent is established at the court of Mandalay, and an assistant political agent at Bhamo, for facilitating British trade with Independent Burmah and China. The judicial officers are—the recorder of Rangoon, the judicial commissioner, the judge of the town of~~

~~Moulmein, the judge of the Small Cause Court, Rangoon, and three town magistrates. For history, see the preceding article.~~

~~BURMANN, Prerer (1668-1741), a Dutch classical scholar, was born at Utrecht on the 26th June 1668. He was educated at the public school in his native place, and at the age of thirteen entered the university. He devoted himself particularly to the study of the classical languages, and became unusually proficient in Latin composition. As he was intended for the legal profession he spent some years in attendance on the law classes. For about a year he studied at Leyden, paying special attention to philo-sophy and Greek. On his return to Utrecht he took the degree of doctor of laws (March 1688), and after travelling through Switzerland and part of Germany, settled down to the practice of law. In December 1691 he was appointed receiver of the tithes which were originally paid to the bishop of Utrecht, and five years later he was nominated to the professorship of eloquence and history. To this chair was soon added that of Greek and politics. In 1714 he paid a short visit to Paris and ransacked the libraries, bringing back a " great treasure of useful observa- tions." In the following year he was appointed successor to the celebrated Perizonius, who had held the chair of history, Greek language, and eloquence at Leyden. His numerous editorial and critical works spread his fame as a scholar throughout Europe, and engaged him in many of the stormy disputes which were then so common among men of letters. He died on the 31st March 1741.~~

~~Of his editions of classical works the following may be noted :— Phedrus, 1698 ; Horace, 1699; Valerius Flaccus, 1701 ; Petronius Arbiter, 1709 ; Velletus Paterculus, 1719 ; Quintilian, 1720 ; Ovid, 1727 ; Luwean, 1740. He also published an edition of Buchanan's works, continued Greevius's great work, Thesaurus Antiquitatum et Historiarum Italie, and wrote a small manual of Roman antiquities, Antiquitatum Romanarum Brevis Deseriptio, 1711. His poems and orations were published after his death.~~

~~BURNES, Sir ALExanper (1805-1841), a traveller in Central Asia, was born at Montrose in 1805. While serving in India, in the army of the East India Company, which he had joined in his seventeenth year, he made himself acquainted with Hindostani and Persian, and thus obtained an appointment as interpreter at Surat in 1822. Transferred to Cutch in 1826 as~~

assistant to the political agent, he turned his attention more particularly to the history and geography of North-Western India and the adjacent countries, which at that time were very imper- fectly known. His proposal in 1829 to undertake a journey of exploration through the valley of the Indus was not carried out owing to political apprehensions; but in 1831 he was sent to Lahore with a present of horses from King William to the Rajah Rungit Sing, and took advan- tage of the opportunity for extensive investigations. In the following years his travels were extended through Afghanistan, across the Hindu Kush to Bokhara ard Persia. The narrative which he published on his visit to England in 1834 added immensely to our knowledge of the countries traversed, and was one of the most popular books of the time. The first edition brought the author the sum of £800, and his services were recognized not only

by the Royal Geographical Society of London, but also ty that of Paris. Soon after his return to India in 1835 he was appointed to the court of Sindh to secure a treaty for the navigation of the Indus; and in 1836 he undertook a political mission to Dost Mohammed at Cabul. On the restoration of Shah Shujah in 1839, he became regular political agent at Cabul, and remained there till his assassination in 1841 (November 2), during the heat of aninsurrection. The calmness with which he continued at his post, long after the imminence of his danger was apparent, gives an heroic colouring to the close of an honourable and devoted life. A narrative of his later labours was published in 1842 under the title of Cabool.

BURNET, Gitpert (1643-1715), bishop of Salisbury, was born at Edinburgh in 1643, and was descended of an ancient family of the county of Aberdeen. His father had been bred to the law, and was at the Restoration appointed one of the lords of Session, with the title of Lord Crimond. Gilbert, the youngest son, was at ten years of age sent to Marischal College, Aberdeen, where he was admitted A.M. before he was fourteen years of age. His own inclination led him to the study of the civil and feudal law; but he after- wards changed his views, and, to the great satisfaction of his father, began to apply to divinity. He received ordina- tion before the age of eighteen ;

~~and Sir Alexander Burnet, his cousin-german, offered him a benefice, which, however, he refused to accept. :~~

~~In 1663, about two years after the death of his father, he went to England ; and after six months stay at Oxford and Cambridge, returned to Scotland, which he soon left again to make a tour of some months, in 1664, in Holland and France. At Amsterdam, by the help of a Jewish rabbi, he perfected himself in the Hebrew language; and likewise became acquainted with the leading men of the different persuasions tolerated in that country— Calvinists, Arminians, Lutherans, Anabaptists, Brownists, Papists, and Unitarians. In each of these sects he used frequently to declare he met with men of such unfeigned piety and virtue that be became fixed in a strong principle of universal charity, and an invincible abhorrence of all severities on account of religious dissensions.~~

~~Upon his return from his travels he was admitted minister of Saltoun, in which station he served five years in the most exemplary manner. He drew upa memorial, in which he took notice of the principal errors in the con-duct of the Scottish bishops, which he observed not to be conformable to the primitive mstitution, and he sent a copy of it to several of them. This exposed him to their resentment ; but to show he was not actuated bya spirit of ambition, he led a retired course of life for two years, which so endangered his health that he was obliged to abate his excessive application to study. In the year 1668 he was appointed professor of divinity in the university of Glasgow ; and, according to the usual practice, he read his lectures in the Latin language. It was apparently at this period that he laid the chief foundation of that theological learning for which he became so distinguished. In 1669 he published his Modest and Free Conference between a Conformist and Nonconformist. He became acquainted with the duchess of Hamilton, who communicated to him all the papers belonging to her father and her uncle ; upon which he drew up the Memoirs of the Dukes of Hamilton, afterwards printed at London, in folio, in the year 1677. The duke of Lauderdale, hearing that he was engaged in this work, invited him to London, and introduced him to Charles IT. He returned to Scotland, and married Lady Margaret Kennedy, daughter of the earl of Cassillis, a lady of great knowledge, and highly esteemed by the Presby- terians, to whose~~

~~sentiments she was strongly inclined. As there was some disparity in their ages, that it might be~~

~~BUBSRET~~

~~sufficiently evident that the match was wholly owing to inclination, and not to avarice or ambition, the day before their marriage he delivered to the lady a deed, by which he renounced all pretensions to her fortune, which was~~

~~very considerable, and must otherwise have fallen into his hands, she herself having no intention to secure it. His~~

~~Vindication of the Authority, Constitution, and Laws of the~~

~~Church and State of Scotland was printed at Glasgow, in 8vo, in the year 1673. This was considered so material a service to the Government, that he was offered a bishopric, with a promise of the next vacant archbishopric; but he~~

~~did not accept of it, because he could not approve of the~~

~~measures of the court, the great aim of which he perceived to be the advancement of popery. The publication itself was one of those which the author could not afterwards recollect with much satisfaction.~~

~~His intimacy with the dukes of Hamilton and Lauderdale procured him frequent messages from the king and the duke of York, who had conversations with him in private. But Lauderdale, who was the most unprincipled man of the age, conceiving a resentment against him on account of the freedom with which he spoke to him, represented at last to the king that Dr Burnet was engaged in an opposi- tion to his measures; and on his return to London he perceived that these suggestions had entirely deprived him of the king's favour, though the duke of York treated him with greater civility than ever, and dissuaded him from going to Scotland. He accordingly resigned his professor- ship at Glasgow, and settled in London. About this time the living of Cripplegate being vacant, the dean and chapter of St Paul's (in whose gift it was), hearing of his circum- stances, and the~~

~~hardships which he had undergone, made him an offer of the benefice; but, as he had been informed of their first intention of conferring it on Dr Fowler, he generously declined it. In 1675, at the recommendation of Lord Hollis, whom he had known in France as ambas- sador at that court, he was appointed preacher at the Rolls chapel, by Sir Harbottle Grimstone, master of the rolls, notwithstanding the opposition of the court; and he was soon afterwards chosen lecturer at St Clement's, and became one of the most popular preachers in town. The first volume of his History of the Reformation of the Church of England was published in folio in 1681, the second in 1683, and the third in 1715. For this great work he received the thanks of both Houses of Parliament. Of the first two volumes he published an abridgment in the year~~

~~1683.~~

~~In 1682, when the administration was changed in favour of the duke of York, being much resorted to by persons of all ranks and parties, in order to avoid returning visits, he built a laboratory, and for above a year pursued a course of chemical experiments. Not long after he refused a country living of £300 a year offered him by the earl of Essex on condition that he should reside in London. When the inquiry concerning the popish plot was on foot he was frequently sent for and consulted by the king, who offered him the bishopric of Chichester, then vacant, if he would engage in his interests; but he refused to accept it on these terms. He preached at the Rolls till 1684, when he was dismissed by order of the court.~~

~~On the accession of James II. tothethrone, having obtained leave te quit the kingdom, he first went to Paris, and lived in great retirement, till, contracting an acquaintance with Brigadier Stouppe, a Protestant gentleman in the French service, he made a tour with him into Italy. He met with an agrecable reception at Rome. Pope Innocent XI. hearing of his arrival, sent the captain of the Swiss guard to acquaint him he would give him a private audience in bed, to avoid the ceremony of kissing his holiness's slipper ; but Dr Burnet excused himself as well ashe could. Here,~~

~~with more zeal than prudence, he engaged in some religious disputes; and, on receiving an intimation from Prince Borghese, he found it necessary to withdraw from this stronghold of priestcraft, and pursued his travels through Switzerland and Germany. He afterwards came to Utrecht, with an intention to settle in some of the seven provinces. There he received an invitation from the prince and prin- cess of Orange (to whom their party in England had recommended him) to come to the Hague, and accepted the invitation. He was soon made acquainted with the secret of their councils, and advised the preparation of a fleet in Holland sufficient to support their designs and encourage their friends. His known share in the councils of the Prince of Orange, and the pamphlets which he sent over to England, excited against him the intensest enmity of James. A prosecution for high treason was commenced against him both in England and Scotland; but having received the intelligence before it was announced to the States he avoided the storm by petitioning for, and obtaining without any difficulty, a bill of naturalization, in order to his intended marriage with Mary Scott, a Dutch lady of ¢on- siderable fortune.~~

~~Being now legally under the protection of Holland, he omitted no opportunity of supporting and promoting the design which the prince of Orange had formed of deliver- ing Great Britain; and, having accompanied him in the capacity of chaplain, he was in the year 1689 advanced to the see of Salisbury. He declared for moderate measures with regard to the clergy who scrupled to take the oaths, and many were displeased with him for advocating the toleration of Nonconformists. '" As my lord of Salisbury," says the earl of Shaftesbury, "has done more than any man living for the good and honour of the Church of England and the Reformed religion, so he now suffers more than any man from the tongues and slander of those ungrateful churchmen ;. who may well call themselves by that single term of distinction, having no claim to that of Christianity or Protestant, since they have thrown off all the temper of the former, and all concern or interest with the latter." The same noble writer has elsewhere mentioned him in the following terms of commendation :—" The bishop of Salis- bury's Exposition of the Articles is, no doubt, highly worthy of your study. None can better explain the sense of the church than one who is the greatest pillar of it since the first founders,— one who best explained and asserted the Reformation itself, was chiefly instrumental in saving it from Popery before~~

~~and at the Revolution, and is now the truest example of laborious, primitive, pious, and learned episcopacy."[1]~~

~~In 1693, after the publication aud condemnation of Blount's anonymous pamphlet, King William and Queen Mary Conquerors (see BLouNT), an opportunity was taken by Burnet's enemies to bring a pastoral letter of his before the House of Commons. After a warm discussion the letter was condemned to be burned by the common hang- man.~~

~~In 1698 he lost his wife by the small-pox; and as he was almost immediately after appointed preceptor to the duke of Gloucester, of whose education he took great care, this employment, and the tender age of his children, induced him the same year to supply her loss by a marriage with Mrs Berkeley, a widow, who was eldest daughter of Sir Richard Blake. In 1699 he published his Laposition of the Thirty-nine Articles, which occasioned a charge against him in the Lower House of Convocation in the year 1701, but he was vindicated in the Upper House. His speech in the House of Lords in 1704 against the Bill to prevent occasional conformity was severely attacked. He~~

~~1 Shaftesbury's Letters, p. 28, 37.~~

~~formed a scheme for augmenting the small livings, which he pressed forward with such success, that an Act of Parliament was passed in the second year of Queen Anne, for the augmentation of the livings of the poor clergy. He died in 1715, and was interred in the church of St James's, Clerkenwell, where a monument was erected to his memory. ; fie~~

~~Bishop Burnet's History of his Own Time, consisting of two large volumes in folio, was not published till several years after the author's death; the first volume appeared in 1724, and the second in 1734. An account of his life was added by his youngest son Sir Thomas Burnet, one of the judges of the Court of Common Pleas. The History itself was not printed without mutilations; but after an interval of nearly a century, an edition containing all the passages which had formerly been suppressed, was published under the superintendence of the learned Dr Routh. (Oxford, 1823, 6 vols. 8vo.)~~

~~This is a work of great and intrinsic value; without it our knowledge of the times would be exceedingly imperfect. His materials are not always very carefully digested, and the style is sometimes supposed to be too familiar; but these defects are abund- antly compensated for by the copiousness of his information, the benevolence of his sentiments, and the earnestness of his manner. In general Burnet's statements may be accepted with great confidence, his judgment is always sound and sober, and he possesses considerable skill in the delineation of character. The best editions of his two great works are·-History of his Own Time, 6 vols., Oxford, 1833; History of the Reformation, 7 vols., by N. Pocock,~~

~~1865~~

~~Besides the works mentioned above the following are worthy of notice :— Some Passages of the Life and Death of John Earl of Rochester,' Lond. 1680, 8vo; The Life and Death of Sir Matthew Hale, Kt., sometime Lord Chief-Justice of his Majestie's Court of Kings Bench, Lond. 1682, 8vo; The History of the Rights of Princes in dispos- ong of Heclesiastical Benefices and Church Lands, Lond. 1682, 8vo; The Life of William Bedell, D.D., Bishop of Kilmore in Ireland, Lond. 1685, 8vo; Reflections on Mr Varillas's " History of the Revolutions that have happened in Hurope in matters of Religion," and more particularly on his Ninth Book, that relates to England, Amst. 1686, 12mo; A Defence of the Reflections on the Ninth Book of the first volume of Mr Varillas's " History of Heresies," being a Reply to his Answer, Amst. 1687, 12mo; A Con- tinuation of Reflections on Mr Varillas's " History of Heresies," particularly on that which relates to English Affairs in his Third and Fourth tomes, Amst. 1687 , 12mo. He took a very conspicuous part in the continued contro- versy which was in his time maintained against the papists ; and a complete catalogue of his polemical works would occupy no small space. The following translations deserve to be mentioned :—Utopia, written in Latin by Str Thomas More, Chancellor of England : translated into Linglish, Lond. 1685, 8vo; A Relation of the Death of the Prinutive Persecutors, written originally in Latin, by L. C. Ff. Lactantius: Englished by Gilbert Burnet, D.D., to which he hath made a large preface concerning Persecution, Amst. 1687, 12mo,~~

~~BURNET, Tuomas (1635-17 15), best known as the author of The Sacred Theory of the Earth, was born at Croft in Yorkshire about the year 1635, but is supposed to have been descended of a Scottish family. He was edu- cated at the free school of N orthallerton, and in June 1651 was admitted a pensioner of Clare Hall at Cambridge, under the tuition of Tillotson, who continued to remember~~

~~1 "© Which," says Dr Johnson, "the critick ought to read for its elegance, the philosopher for its arguments, and the saint for its piety " (Lives of English Poets, vol. i. p. 303).~~

~~him with kindness. In the year 1654 he removed to Christ's College, on the election of Dr Cudworth to the mastership, and there he obtained a fellowship in the year 1657. In 1661 he became senior proctor of the university. He was successively domestic tutor to Charles duke of Bolton, and to James earl of Ossory, afterwards duke of Ormond, grandson to the first duke ; and by the interest of the latter nobleman he was chosen master of the Charter- house in 1685. Among the electors some of the bishops opposed him on account of his wearing a lay habit ; but the duke was satisfied that he possessed the more essential qualifications of a life and conversation suitable to his clerical character. After this appointment he took the degree of D.D. In his capacity of master he made a noble stand against the illegal attempts to admit Andrew Popham as a pensioner of the house, strenuously opposing an order of the 26th of December 1686, addressed by James II. to the governors dispensing with the statutes for the occasion.~~

~~Dr Burnet published his Telluris Theorita Sacra, or Sacred Theory of the Earth, at London in 1681. This work, contain- ing a fanciful theory of the earth's structure, attracted an unusual share of public attention, and he was afterwards encouraged to issue an English translation, which was printed in folio, 1684-1689. Addison commended the author in a Latin ode, but his theory was attacked by Dr Keill, Mr Whiston, and Mr Warren, to all of whom he returned answers. His reputation obtained for him an intro- duction at court by Archbishop Tillotson, whom he succeeded as clerk of the closet to King William. He seemed already to be on the direct road to~~

~~much higher preferment, when he suddenly marred his prospects by the publication, in 1692, of a work entitled Archwo- logie Philosophice : sive Doctrina antiqua de Rerum Originibus, in which he treated the Mosaic account of the fall of man as an allegory. The method of treatment excited a great clamour against him; and the king was obliged to remove him from his office at court. Ot this book an English translation was executed by Mr Foxton, Lond. 1729, 8vo. Dr Burnet published several other minor works before his death, which took place at the Charter-house on the 27th September 1715. Two posthumous works were published several years after his death—De Fide et Officiis Christianorum, 1728, and De Statwu Mortuorum et Resurgentium Tractatus, 1723 ; in which he main- tained the doctrine of a middle state, the millennium, and the limited duration of future punishment. A Life of Dr Burnet by Heathcote appeared in 1759.~~

~~BURNETT, James, Lorp Monzgoppo. See Monzoppo.~~

~~BURNEY, Cuaruus, Doctor of Music (1726-1814), was born in the ancient city of Shrewsbury, the capital of Shropshire, on the 7th of April 1726. He received his earlier education at the excellent free-school of that city, and was afterwards sent to the public school at Chester, His first music master was Mr Baker, organist of Chester Cathedral, and a pupil of Dr John Blow. Returning to Shrewsbury when about fifteen years old, he continued his musical studies for three years under his half-brother, Mr James Burney, organist of St Mary's Church, and was then sent to London as a pupil of the celebrated Dr Arne, with whom he remained three years. In 1749 he was appointed organist of a church in the city, with a salary of £30 a year ; and he was also engaged as conductor of a concert established at the King's Arms, Cornhill. In that year and the next he composed the music of three dramas for Drury Lane theatre—Alfred, Robin Hood, and Queen Mab. Being threatened with a pulmonary affection he went, on the advice of his physician, in 1751 to Lynn, in Norfolk, where he was elected organist, with an annual salary of £100, and where he resided for the next nine years. During that time he began to entertain the idea of writing a general history of music. In 1760 he returned to London in good health, and with a young family; the eldest of whom, a girl of eight years of age, surprised the public by her attainments as a harpsichord player. In 1766 he produced, at Drury lane, a free English version and adaptation of J. J. Rousseau's operetta Le~~

~~Devin du Village, under the title of The Cunning Man, which was favourably received. The university of Oxford conferred~~

~~upon him, on 23d June 1769, the degrees of bachelor and doctor of music, on which occasion he presided at the performance of his exercise for these degrees. This con- sisted of an anthem, with an overture, solos, recitatives, and choruses, accompanied by instruments, besides a vocal anthem in eight parts, which was not performed. His friend, C. P. E. Bach, requested a copy of this exercise, and had it performed in St Catharine's Church at Hamburg, under his own direction, in 1773. It was repeatedly performed at Oxford, "after it had fufilled its original destination," as Burney tells us (Hist. of Music, vol. iii. p. 329); and he apologizes as follows for saying so much about it :—" It is hoped that the reader will pardon this egotism, which has been extorted from me by occasional and sinister assertions, 'that I neither liked nor had studied church music,'" (Ibid). In 1769 he published An Essay towards a History of Comets. Amidst his various professional avocations, Burney never lost sight of his favourite object,—his History of Music,—and. therefore resolved to travel abroad for the purpose of collecting materials that could not be found in Great Britain. Accordingly, he left London in June 1770, furnished with numerous letters of introduction, and proceeded to Paris, and thence to Geneva, Turin, and the principal cities of Italy. The results of his observations he published in Zhe Present State of Music in France and Italy (1 vol. 8vo, London, 1771). Dr Johnson thought so well of this work, that, alluding to his own Journey to the Western Islands of Scotland, he said, '' I had that clever dog Burney's Musical Tour in my eye." In July 1772 Burney again visited the Continent, to collect further materials, and, after his return to London, published his tour under the title of Zhe Present State of Music in Germany, the Netherlands, and United Provinces (2 vols. 8vo, London, 1773). In 1773 he was chosen a Fellow of the Royal Society of London. In 1776 appeared the first volume (in 4to) of his long-projected History of Music; in 1782 the second volume; and in 1789 the third and fourth. Though severely criticised by Forkel in Germany and by the Spanish ex-Jesuit, Requeno, who, in his Italian work Saggj sul Ristabilimento dell' Arte Armonica de Greci e Romani Cantori, Parma, 1798 (2 vols. 8vo), attacks Burney's account of the~~

~~ancient Greek music, and calls him lo scompigliato Burney, the History of Music was generally recognized as possessing great merit. The least satisfactory volume is the fourth, the treatment of Handel and Bach being quite inadequate. Burney's first Tour was translated into German by Ebeling, and printed at Hamburg in 1772; and his second Tour, translated into German by Bode, was published at Hamburg in 1773. A Dutch translation of his second Tour, with notes by J. W. Lustig, organist at Groningen, was published there in 1786 The Dissertation on the Music of the Ancients, in the first volume of Burney's Mistory, was translated into German by J. J. Eschenburg, and printed at Leipsic, 1781. Burney derived much aid from the first two volumes of Padre Martini's very learned Storia della Musica, Bologna, 1757-1770. One cannot but admire his persevering industry, and his sacrifices of time, money and personal comfort, in collecting and preparing materials for his History; and few will be disposed to condemn severely errors and oversights in a work of such extent and difficulty. In 1779 he wrote for the Royal Society an account of the infant Crotch, whose remarkable musical talent excited so much attention at that time In 1784 he published, with an Italian title- page, the music annually performed in the Pope's chapel at Rome during Passion Week. In 1785 he published, for the benefit of the Musical Fund, an account of the first commemoration of Handel in Westminster Abbey in the preceding year, with an excellent life of Handel. In 1796 he published Memoirs and Letters of Metastasio, 3 vols.~~

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~~8vo. 'Towards the close of his life, Burney contributed to the Rev. Dr Rees's Cyclopedia all the musical articles not belonging to the department of Natural Philosophy and Mathematics. For these articles he received £1000, which seems a remarkable remuneration, considering that most of his materials were merely transcribed from his own History of Music. In 1789, through the treasury influence of his friend Edmund Burke, he was appointed organist to the chapel of Chelsea Hospital, and he resided in the hospital for the remainder of his life. He was made a member of the Institute of France, and nominated a correspondent in the class of the Fine Arts, in the year 1810. He died at Chelsea College on the 12th of April~~

~~1814, and was interred in the burying-ground of the college on the 20th of the same month.~~

~~Burney had a wide circle of acquaintance among the distinguished artists and literary men of his day. At one time he thought of writing a life of his friend Dr Samuel Johnson; but he retired before the crowd of biographers who rushed into that field. His character in private as well as public life appears to have been very amiable and exemplary. Dr Burney's eldest son, James, was a distinguished officer in the royal navy, and died a rear-admiral in 1821. He published several works of merit. A notice of his second son, the Rev. Charles Burney, D.D., an eminent Greek scholar, will be found below, and of his second daughter Frances (Madame D'Arblay) under the heading D'ARBLAY. The Diary and Letters of Madame D'Arblay contain many minute and interesting particulars of her father's public aud private life, and of his friends and contemporaries. A life of her father, by Madame D'Arblay, appeared in 1832.~~

~~Besides the operatic music above mentioned, Burney's known compositions consist of—1. Six Sonatas for the harpsichord ; 2. Two Sonatas for the harp or piano, with accompaniments for violin and violoncello ; 3. Sonatas for two violins and a bass: two sets » 4. Siz Lessons for the harpsichord ; 5. Six Duets for two German flutes ; 6. Three Concertos for the harpsichord ; 7. Six concert pieces with an tn- troduction and fugue for the organ ; 8. Six Concertos for the violin, &c., in cight paris ; 9. Two Sonatas for pianoforte, violin, and violon- cello; 10. A Cantata, &c.; 11. Anthems, &c.; 12. XIT. Canzonetti a due voci in Canone, poesia dell' Abate Metastasio.~~

~~BURNEY, Cuartezs (1757-1817), son of the preceding, an eminent classical scholar, was born at Lynn, in Norfolk, in 1757. At the age of eleven he was sent to the Charter- house in London, whence he removed to Caius College, Cambridge. He quitted the university without taking his degree ; but in 1791 he received the diploma of LL.D. from Aberdeen, and in 1808 that of D.D. from Cambridge. In 1783 he married the daughter of Dr Rose, the trans- lator of Sallust, and continued for some time to assist his father-in-law in the management of his academy. He con- tributed at this time many articles to the Monthly Review, and afterwards edited for two or three years the London Magazine. Some of his contributions to the first of~~

~~these periodicals gained him much credit not only among English but among Continental scholars. In the course of time he realized a handsome fortune, great part of which he expended in the formation of his splendid library. The manuscripts and rare books collected by him were con- sidered so valuable that at his death, which happened in 1817, they were purchased by the nation and deposited in the British Museum.~~

~~BURNEY, Frances. See D'ArBLay.~~

~~BURNLEY, a manufacturing town and municipal and parliamentary borough of England, 22 miles N. of Manchester, in a valley on the River Burn, from which it derives it name, and in the immediate vicinity of the Leeds and Liverpool canal. Its streets are well paved, and there is an abundant supply of water. Among its buildings of note are the frequently restored church of St Peter's; a market hall, erected in 1866; and a literary institution~~

~~and exchange. It also possesses a Church of England institute, with a considerable library, a free grammar school, and several charities. Its staple manufacture 1s cotton, which in 1872 gave employment to 7972 men and 8267 women of twenty years of age and upwards. Worsted, which was formerly the chief article, is still manufactured to a considerable extent. Calico-printing, machine-making, brewing, tanning, and several other important industries are carried on in the town; and in the neighbourhood there are iron mines and stone quarries, which gave employment in 1872 to 1376 and 360 workmen respectively. From the number of Roman remains found at various times on the spot, Burnley seems to be the site of some Roman station; and it has also been suggested that it may coincide with Brunnanburh, the famous battle-field of the Saxons. There are but few facts of importance in its history. During the cotton famine it suffered severely, and the operatives were employed in an extensive system of improvements, to which the present satisfactory condition of the town is mainly due. In 1861 it was incorporated by royal charter, the government being placed in the hands of a mayor, eight aldermen, and twenty-four councillors ; and in 1867 it was entrusted with the right of electing one member of Parliament. The popuiation of the parliamentary borough in 1871 was 44,320 persons,~~

~~of whom 21,368 were males and 22,952 females; the inhabited houses were 8804, and the registered electors 5628.~~

~~BURNOUF, Eveiyz (1801-1852), an Oriental scholar, was born at Paris in 1801. He was educated for the legal profession, but soon after taking his degree began to devote himself entirely to the study of Oriental languages. In 1826 he published an Zssaz sur le Pali, and in the following year Observations Grammaticales sur quelques Passages de U Essai sur le Pali. The next great work he undertook was the deciphering of the Zend manuscripts brought to France by Anquetil du Perron. By his labours a knowledge of the Persian language and religion was first brought into the scientific world of Europe. He caused the Vendidad Sadé to be lithographed with the utmost care, and published it in folio, 1829—43. The contributions he made to Oriental literature in the Journal Asiatique were numerous and im- portant. From 1833 to 1835 he published his Commentaries sur le Yaena, Pun des livres liturgiques des Perses ; in 1840 he began the publication of the Sanskrit text and Trench translation of the Bhagavata Purana, which was completed in three folio volumes. His last works were Introduction & UV Histoire du Bouddhisme Indien, and a translation of Le Lotus de la Bonne Lot. The latter work was passing through the press when the author died on the 28th May 1852. He was a member of the Académie des Inscriptions, and from 1832 had held the post of professor of Sanskrit in the Collége de France.~~

~~BURNOUF, Jean Louis (1775-1844), the father of Eugéne Burnouf, was born in 1775. During the intervals of leisure left him by his commercial employment he prosecuted his studies in classical literature, and in 1808 was appointed assistant-professor at the Lycée Charlemagne. He soon afterwards obtained the chair of rhetoric at the Lycée Imperial, which he held till 1826, when he was made the inspector of the Academy. In 1817 he had been appointed professor of Latin eloquence: at the Collége de France, and from 1811 to 1822 he acted as president of the Ecole Normale. In 1830 Burnouf was named inspector- general of studies, and on his resignation of this post in 1836 was made librarian of the university. He died in 1844. His most important work was the Méthode pour étudier la Langue Grecque, 1814, which marks an epoch in the study of Greek in France. He also~~

~~published a valuable edition of Sallust and some excellent translations of Tacitus, and of parts of Sallust and Cicero.~~

~~BU R—BUR~~

~~BURNS, Ropert (1759-1796). In a company of German critics who were weighing the claims and estimat- ing the rank of the poets, their contemporaries, the leader of their chorus, the genial humorist, Jean Paul Richter, is said to have hushed his audience when the name of Goethe was introduced, exclaiming—" We are not to sit in judgment on that sacred head." Scotsmen are apt to attach the same half-superstitious reverence to the name which is, more than any other, that of Scotland condensed in a personality, the representative of what is noblest and also of much that is erring in their race.~~

~~Robert Burns was born on the 25th of January 1759, in a cottage about two miles from Ayr, the eldest son of a small farmer, William Burness, of Kincardineshire stock, who wrought hard, practised integrity, wished to bring up his children in the fear of God, but had to fight all his days against the winds and tides of adversity. 'The poet," says Mr Carlyle, his best biographer, "' was fortunate in his father—a man of thoughtful intense character, as the best of our peasants are, valuing knowledge, possessing some and open-minded for more, of keen insight and devout heart, friendly and fearless: a fully unfolded man seldom found in any rank in society, aud worth descending far in society to seek. . . . Had he been ever so little richer, the whole might have issued otherwise. But poverty sunk the whole family even below the reach of our chea) school system, and Burns remained a hard-worked plough-boy."~~

~~Through a series of migrations from one unfortunate farm to another; from Alloway (where he was taught to read), to Mt. Oliphant, and then (1777) to Lochlea in Tarbolton (where he learnt the rudiments of geometry), the. poet re- mained in the same condition of straitened circumstances. At the age of thirteen he thrashed the corn with his own hands, at fifteen he was the principallabourer. The family kept no servant, and for several years butchers' meat was a thing unknown in the house. "This kind of life," he writes, "the cheerless gloom of a hermit and the unceasing toil of a galley-slave, brought me to my sixteenth year." Mis naturally robust frame was~~

~~overtasked, and his nervous con- stitution received a fatal strain. His shoulders were bowed, he became liable to headaches, palpitations, and fits of de- pressing melancholy. From these hard tasks and his fiery temperament, craving in vain for sympathy in a frigid air grew the strong temptations on which Burns was largely wrecked,—the thirst for stimulants and the revolt against restraint which soon made headway and passed all bars. In the earlier portions of his career, a buoyant humour bore him up; and amid thick-coming shapes of ill he bated no jot of heart or hope. He was cheered by vague stirrings of ambi- tion, which he pathetically compares to the " blind groping of Homer's Cyclops round the walls of his cave." Sent to school at Kirkoswald, he became, for his scant leisure, a great reader—eating at meal-times with a spoon in one hand and a book in the other,—and carrying a few small volumes in his pocket to study in spare moments in the fields, "The collection of songs," he tells us, "was my vade mecum. I pored over them driving my cart or walking to labour, song by song, verse by verse, carefully noting the true, tender, sublime, or fustian." He lingered over the ballads in his cold room by night; by day, whilst whistling at the plough, he invented new forms and was inspired by fresh ideas, "gathering round him the memories and the tradi- tions of his country till they became a mantle and a crown." It was among the furrows of his father's fields that he was inspired with the perpetually quoted wish—~~

~~''That I for poor auld Scotland's sake Some useful plan or book could make, Or sing a sang at least."~~

~~An equally striking illustration of the same feeling is to~~

~~be found in his summer Sunday's ramble to the Leglen~~

~~BURNS~~

~~wood,—-the fabled haunt of Wallace,—which the poet confesses to have visited " with as much devout enthusiasm as ever pilgrim did the shrine of Loretto." In another reference to the same period he refers to the intense sus- ceptibility to the homeliest aspects of Nature which through- out characterized his genius. " Scarcely any object gave me more—I do not know if I should call it pleasure—but something which exalts and enraptures me—than to walk in the sheltered side of a wood or high~~

~~plantation in a cloudy winter day and hear the stormy wind howling among the trees and raving over the plain. _I listened to the birds, and frequently turned out of my path lest I should disturb their little songs or frighten them to another station." Auroral visions were gilding his horizon as he walked in glory, if not in joy, "behind his plough upon the mountain side ;" but the swarm of his many-coloured fancies was again made grey by the atra cura of unsuc- cessful toils.~~

~~Burns had written his first verses of note, " Behind yon hills where Stinchar (afterwards Lugar) flows," when in 1781 he went to Irvine to learn the trade of a flax-dresser. "Tt was," he says, "an unlucky affair. As we were giving a welcome carousal to the New Year, the shop took fire and burned to ashes; and I was left, like a true poet, without a sixpence." His own heart, too, had unfortunately taken fire. He was poring over mathematics till, in his own phraseology,—still affected in its prose by the classical pedantries caught from Pope by Ramsay,—" the san entered Virgo, when a charming /illette, who lived next door, overset my trigonometry, and set me off ata tangent from the scene of my studies." We need not detail the story, nor the incessant repetitious of it, which marked and sometimes marred his career. The poet was jilted, went through the usual despairs, and resorted to the not unusual sources of consolation. He had found that he was ''no enemy to social life," and his mates had dis covered that he was the best of boon companions in the lyric feasts, where his eloquence shed a lustre over wild ways of life, and where he was beginning to be distin- guished as a champion of the New Lights and a satirist of the Calvinism whose waters he found like those of Marah.~~

~~In Robert's 25th year his father died, full of sorrows and apprehensions for the gifted son who wrote for his tomb, wn Alloway kirkyard, the fine epitaph ending with the characteristic line—~~

- ~~For even his failings leaned to virtue's side."~~

~~For some time longer the poet, with his brother Gilbert, lingered at Lochlea, reading agricultural books, miscalcu- lating crops, attending markets, and in a mood of reforma- tion resolving, "in spite of the world, the flesh, and the devil, to be a wise man." Affairs, however, went no better with the family; and in 1784 they migrated to Mossgiel, where he lived and wrought, during~~

~~four years, for a return scarce equal to the wage of the commonest labourer in our day. Meanwhile he had become intimate with his future wife, Jean Armour; but the father, a master mason, discountenanced the match, and the girl being dis- posed to "sigh as a lover," as a daughter to obey, Burns, in 1786, gave up his suit, resolved to seek refuge in exile, and having accepted a situation as book-keeper to a slave estate in Jamaica, had taken his passage in a ship for the West Indies. His old associations seemed to be breaking up, men and fortune scowled, and "hungry ruin had him in the wind," when he wrote the lines ending—~~

~~'* Adieu, my native banks of Ayr,"~~

~~and addressed to the most famous of the loves, in which he was as prolific as Catullus or Tibullus, the proposal—~~

~~'" Will ye go to the Indies, my Mary.~~

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~~He was withheld from his project and, happily or un- happily, the current of his life was turned by the success of his first volume, which was published at Kilmarnock in June 1786. It contained some of his most justly celebrated poems, the results of his scanty leisure at Lochlea and Mossgiel ; among others "The Twa dogs,"—a graphic idealization of Aisop,—'" The Author's Prayer," the '¢ Address to the Deil," "'The Vision" and " The Dream," " Halloween," "The Cottar's Saturday Night," the lines "To a Mouse" and "To a Daisy," "Scotch Drink," "Man .was made to Mourn," the " Epistle to Davie," and some of his most popular songs. This epitome of a genius so marvellous and so varied took his audience by storm. "The country murmured of him from sea to sea." " With his poems," says Robert Heron, " old and young, grave and gay, learned and ignorant, were alike transported. I was at that time resident in Galloway, and I can well remember how even plough-boys and maid-servants would have gladly bestowed the wages they earned the most hardly, and which they wanted to purchase necessary clothing, if they might but procure the works of Burns. This first edition only brought the author £20 direct return, but it introduced him to the literati of Edinburgh, whither he was invited, and where he was welcomed, feasted, admired, and patronized. He appeared as a portent among the~~

~~scholars of the northern capital and its university, and manifested, according to Mr Lockhart, "in the whole strain of his bearing, his belief that in the society of the most eminent men of his nation he was where he was entitled to be, hardly deigning to flatter them by exhibiting a symptom of being flattered."~~

~~Sir Walter Scott bears a similar testimony to the dignified simplicity and almost exaggerated independence of the poet, during this annus mirabilis of his success. " As for Burns, Virgilium vidi tantum, I was a lad of fifteen when he came to Edinburgh, but had sense enough to be interested in his poetry, and would have given the world to know him. I saw him one day with several gentlemen of literary reputation, among whom I remember the celebrated Dugald Stewart. Of course we youngsters sat silent, looked, and listened. . . . I remember. . . his shedding tears over a print representing a soldier lying dead in the snow, his dog sitting in misery on one side, on the other his widow witha child in herarms. His person was robust, his manners rustic, not clownish. . . . His countenance was more massive than it looks in any of the portraits. There was a strong expression of shrewdness in his linea ments; the eye alone indicated the poetic character and temperament. It was large and ofa dark cast, and literally glowed when he spoke with feeling or interest. I never saw such another eye in a human head. His conversation expressed perfect self-confidence, without the least intrusive forwardness. I thought his acquaintance with English poetry was rather limited ; and having twenty times the abilities of Allan Ramsay and of Ferguson he talked of them with too much humility as his models. He was much caressed in Edinburgh, but the efforts made for his relief were extremely trifling." Laudatur e alge. Burns went from those meetings, where he had been posing professors (no hard task), and turning the heads of duchesses, to share a bed in the garret of a writer's apprentice,—they paid together 3s. a week for the room. It was in the house of Mr Carfrae, Baxter's Close, Lawnmarket, " first scale stair on the left hand in going down, first door in the stair." During Burns's life it was reserved for William Pitt to recognize his place as a great poet, the more cautious critics of the North were satisfied to endorse him as a rustic prodigy, and brought upon themselves a share of his satire. Some of the friendships contracted during this period—as for Lord Glencairn and Mrs Dunlop—are among the most pleasing and permanent in literature ; for genuine kind-~~

ness was never wasted on one who, whatever his faults, has never been accused of ingratitude. But in the bard's city life there was an unnatural element. He stooped to beg for neither smiles nor favour, but the gnarled country vak is cut up into cabinets in artificial prose and verse. In the letters to Mr Graham, the prologue to Mr Wood, and the epistles to Clarinda, he is dancing minuets with hob- nailed shoes. When, in 1787, the second edition of the Poems came out, the proceeds of their sale realized for the author £400. On the strength of this sum he gave himself two long rambles, full of poetic material—one through the border towns into England as far as Newcastle, returning by Dumfries to Mauchline, and another a grand tour through the East Highiands, as far as Inverness, returning by Edinburgh, and so home to Ayrshire.

In 1788 Burns took a new farm at Ellisland on the Nith, settled there, married, lost his little money, and wrote, among other pieces, " Auld Lang Syne" and "Tam O' Shanter." In 1789 he obtained, through the good office of Mr Graham of Fintry, an appointment as excise-officer of the district, worth £50 per annum. In 1791 he removed to a similar post at Dumfries worth £70. In the course of the following year he was asked to edit and supply the Melodies of Scotland with Symphonies and Accompaniments for the Pranoforte and Violin : the poetry by Robert Burns. To this work he contributed about one hundred songs, the best of which are now ringing in the ear of every Scotchman from New Zealand to San Francisco. For these, original and adapted, he received a shawl for his wife, a picture by David Allan representing the "Cottar's Saturday Night," and £5! The poet wrote an indignant letter and never afterwards composed for money. Unfortunately the " Rock of Independence " to which he had proudly retired was but a castle of air, over which the meteors of French political enthusiasin cast a lurid gleam. In the last years of his life, exiled from polite society on account of his revolu- tionary opinions, he became sourer in temper and plunged more deeply into the dissipations of the lower ranks, among whom he found his only companionship and sole, though shallow, sympathy. 'To have Jacobin tendencies, to rejoice at the downfall of the Bastille, was regarded as the sign of an abandoned character, as it was

~~twelve years ago in Scotland to embrace the cause of the Northern States in the American War.~~

~~Burns began to feel himself prematurely old. Walking with a friend who proposed to him to join a county ball, he shook his head, saying "that's all over now," and adding a verse of Lady Grissel Baillie's ballad—~~

~~**O were we young as we ance hae been, We sud hae been galloping down on yon green, And linking it ower the lily-white lea, But were na my heart light I wad dee."~~

~~His hand shook; his pulse and appetite failed ; his spirits sunk into a uniform gloom. In April 1796 he wrote— I fear it will be some time before I tune my lyre again. By Babel's streams I have sat and wept. I have only known existence by the pressure of sickness and counted time by the repercussions of pain. I close my eyes in misery and open them without hope. I[look on the vernal day and say with poor Ferguson—~~

~~"*Say wherefore has an all-indulgent heaven Life to the comfortless and wretched given."~~

~~On the 4th of July he was seen to be dying. On the 12th he wrote to his cousin for the loan of £10 to save him from passing his last daysin jail. On the 21st he was no more. On the 25th, when his last son came into the world, he was buried with local honours, the volynteers of the company to which he belonged firing three volleys over his grave.~~

~~It has been said that " Lowland Scotland as a distinct~~

~~nationality came in with two warriors and went out with two bards. It came in with William Wallace and Robert Bruce and went out with Robert Burns and Walter Scott. The first two made the history, the last two told the story and sung the song." — But what in the minstrel's lay was mainly a requiem was in the people's poet also a prophecy. The position of Burns in the progress of our literature may be shortly defined ; he was a link between two eras, like Chaucer, the last of the old and the first of the new—the~~

~~inheritor of the traditions and the music of the past, in some respects the herald of the future.~~

~~The volumes of our lyrist owe part of their popularity to the fact of their being an epitome of melodies, moods, and memories that had belonged for centuries to the national life, the best inspirations of which have passed into them. But in gathering from his ancestors Burns has exalted their work by asserting a new dignity for their simplest themes. He is the heir of Barbour, distilling the spirit of the old poet's epic into a battle chant, and of Dunbar, reproducing the various humours of a half-sceptical, half-religious philosophy of life. He is the pupil of Ramsay, but he leaves his master, to make a social protest and to lead a literary revolt. The Gentle Shepherd, still largely a court pastoral, in which "a man's a man" if born a gentleman, may be contrasted with the " Jolly Beggars "—the one is like a minuet of the ladies of Versailles on the sward of the Swiss village near the Trianon, the other like the march of the mezenads with Theroigne de Mericourt. Ramsay adds to the rough tunes and words of the ballads the refinement of the wits who in the " Easy" and " Johnstone" clubs talked over their cups of Prior and Pope, Addison and Gay. Burns inspires them with a fervour that thrills the most wooden of his race. We may clench the contrast by a representative example. This is from Ramsay's version of perhaps the best known of our songs,—~~

~~'¢ Methinks around us on each bough~~

~~A thousand Cupids play;~~

~~Whilst through the groves I walk with you, Each object makes me gay.~~

~~Since your return —the sun and moon With brighter beams do shine,~~

~~Streams murmur soft notes while they run As they did lang syne."~~

~~Compare the verses in Burns—~~

~~'¢ We twa hae run about the braes~~

~~And pou't the gowans fine ;~~

~~But we've wandered mony a weary foot Sin auld lang syne.~~

~~We twa hae paidl'd in the burn, Frae morning sun till dine :~~

~~But seas between us braid hae roar'd Sin auld lang syne."~~

~~Burns asa poet of the inanimate world doubtless derived hints from Thomson (z.e., the poet, not his correspondent), but in his power of tuning its manifestations to the moods of the mind he is more properly ranked as a forerunner of Wordsworth. He never follows the fashions of his century, except in his failures—in his efforts at set panegyric or fine letter-writing. His highest work knows nothing of "Damon" or " Musidora." He leaves the atmosphere of drawing-rooms for the ingle or the ale-house or the mountain breeze.~~

~~The affectations of his style are insignificant and rare. His prevailing characteristic is an absolute sincerity. ms love for the lower forms of social life was his besetting sin ; Nature was his healing power. Burns compares himself to an A®olian harp, strung to every wind of heaven, — His genius flows over all living and lifeless things with a sympathy that finds nothing mean or insignificant. An uprooted daisy becomes in his pages an enduring emblent of the fate of artless maid and simple bard. He disturbs~~

~~;'~~

~~_of superior virtue he places himself above them.~~

~~B URN~~

~~a mouse's nest and finds in the " tim'rous beastie " a fellow- mortal doomed like himself to "thole the winter's sleety dribble," and draws his oft-repeated moral. He walks abroad and, in a verse that glints with the light of its own rising sun before the fierce sarcasm of the " Holy Fair," describes the melodies of a "simmer Sunday morn." He loiters by Afton Water and " murmurs by the running brook a music sweeter than its own." He stands by a roofless tower, where "the howlet mourns in her dewy bower," and "'sets the wild echoes flying," and adds to a perfect picture of the scene his~~

~~famous vision of " Libertie." In asingle stanza he concentrates the sentiment of many Night Thoughts—~~

~~'The pale moon is setting beyond the white wave, And Time is setting wi' me, O."~~

~~For other examples of the same graphic power we may~~

~~refer to the course of his stream— '¢ Whiles ow'r a linn the burnie plays As through the glen it wimpled," &c.,~~

~~or to the " Birks of Aberfeldy" or the "spate" in the dialogue of the " Brigs of Ayr." The poet is as much at home in the presence of this flood as by his " trottin' burn's~~

~~meander." Familiar with all the seasons, he represents the~~

~~phases of a northern winter with a frequency characteristic of. his clime and of his fortunes; her tempests become anthems in his verse, and the sounding woods " raise his thoughts to Him that walketh on the wings of the wind ;" full of pity for the shelterless poor, the '" ourie cattle," the "silly sheep," and the "helpless birds," he yet reflects that the bitter blast is not "'so unkind as man's ingratitude." This constant tendency to ascend above the fair or wild features of outward things, or to penetrate beneath them, to make them symbols, to endow them with a voice to speak for humanity, distinguishes Burns as a descriptive poet from the rest of his countrymen. rivalled by Dunbar and James I., more rarely by Thomson and Ramsay. The "lilt" of Tannahill's finest verse is even more charming. But these writers rest in their art ; their main care is for their own genius. The same is true in a minor degree of some of his great English successors. Keats has a palette of richer colours, but he seldom con- descends to " human nature's daily food." Shelley floats in a thin air to stars and mountain tops, and vanishes from our gaze like his skylark. Byron, in the midst of his revolutionary fervour, never forgets that he himself belongs to the "'caste of Vere de Vere." Wordsworth's placid affection and magnanimity stretch beyond mankind, and, as in " Hart-leap-well" and the " Cuckoo," extend to bird and beast; he moralizes grandly on the vicissitudes of common life, but he does not enter into, because by right "From the Lyrical Ballads," it has been said,~~

~~"it does not appear that men eat or drink, marry or are given in marriage." We revere the monitor who, consciously good and great, gives us the dry light of truth, but we love the bard, nostree delete, who is all fire—fire fram heayen and Ayrshire earth mingling in the outburst, of fassion and of power, which is his poetry and the inheritance of his race. He had certainly neither culture nor phjlosophy enough to have written the "Ode on the Recollections of Child- hood," but to appreciate that ode requires an education. The sympathies of Burns, as broad as Wordsworth's, are more intense ; in turning his pages we feel ourselves more decidedly in the presence of one who joys with those who rejoice and mourns with those who mourn. He is never shallow, ever plain, and the expression of his feeling is so terse that it is always memorable. Of the people he speaks more directly for the people than any of our more considerable poets. Chaucer has a perfect hold of the~~

~~As a painter he is.~~

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~~homeliest phases of life, but he wants the lyric element, and the charm of his language has largely faded from untutored ears. Shakespeare, indeed, has at once a loftier vision and a wider grasp; for he sings of '"Thebes and Pelops line," of Agincourt and Philippi, as of Falstaff, and Smug the joiner, and the " meanest flower that blows." But not even Shakespeare has put more thought into poetry which the most prosaic must appreciate than Burns hasdone. Thelatter moves in a narrower sphere and wants the strictly dramatic faculty, but its place is partly supplied by the vividness of his narrative. His realization of incident and character is manifested in the sketches in which the manners and pre- vailing fancies of his countrymen are immortalized in connection with local scenery. Among those almost every variety of disposition finds its favourite. The quiet households of the kingdom have received a sort of apotheosis in the " Cottar's Saturday Night." It has been objected that the subject does not afford scope for the more daring forms of the author's genius; but had he written no other poem, this heartful rendering of a good week's close in a God-fearing home, sincerely devout, and yet relieved from all suspicion of sermonizing by its humorous touches, would have secured a permanent place in our literature.~~

~~It transcends Thomson and Beattie at their best, and will smell sweet like the actions of the just for generations to come. Lovers of rustic festivity may agree with Professor Craik in holding that the poet's greatest performance is his narrative of "' Halloween," which for easy vigour, fulness of rollicking life, blended truth and fancy, is unsurpassed in its kind. Campbell, Wilson, Hazlitt, Montgomery, Burns himself, and the majority of his critics, have recorded their preference for "Tam 'O Shanter," where the weird superstitious element that has played so great a part in the imaginative work of this part of our island is brought more prominently forward. Few passages of description are finer than that of the roaring Doon and Alloway Kirk glimmering through the groaning trees ; but the unique excellence of the piece consists in its variety, and a perfectly original combination of the terrible and the ludicrous. Like Goethe's Walpurgis Nacht, brought into closer contact with real life, it stretches from the drunken humours of Christopher Sly to a world of fantasies almost as brilliant as those of the Midsummer Night's Dream, half solemnized by the severer atmosphere of a sterner clime. The contrast between the lines ' Kings may be blest," &c., and those which follow, beginning " But pleasures are like poppies spread," is typical of the per- petual antithesis of the author's thought and life, in which, at the back of every revelry, he sees the shadow of a warn- ing hand, and reads on the wall the writing, Omnia mutantur. With equal or greater confidence other judges have pro- nounced Burns's masterpiece to be ' The Jolly Beggars." Certainly no other single production so illustrates his power of exalting what is insignificant, glorifying what is mean, and elevating the lowest details by the force of his genius. "The form of the piece," says Mr Carlyle, "is a mere cantata, the theme the half-drunken snatches of a joyous band of vagabonds, while the grey leaves are floating on the gusts of the wind in the autumn of the year. But the whole is compacted, refined, and poured forth in one flood of liquid harmony. It is light, airy, and soft of movement, yet sharp and precise in its details ; every face is a portrait, and the whole a group in clear photography. The blanket of the night is drawn aside; in full ruddy gleaming light these rough tatterdemalions are seen at their boisterous revel wringing from Fate another hour of wassail and good cheer." Over the whole is flung a half-humorous, half- savage satire—aimed, like a two-edged sword, at the laws and the law-breakers, in the acme of which the graceless crew are raised above the level] of ordinary gipsies, footpads, IV. — 72~~

and rogues, and are made to sit "on the hills like gods together, careless of mankind," and to launch their Titan thunders of rebellion against the world. "« A fig for those by law protected ; Liberty 's a glorious feast ;

Courts for cowards were erected, _ , Churches built to please the priest.'

A similar mixture of drollery and defiance appears in the justly-celebrated "Address to the Deil," which, mainly whimsical, is relieved by touches of patlios curiously quaint. "The effect of contrast," it has been observed, "' was never more happily displayed than in the conception of such a being straying in lonely places and loitering among trees, or in the familiarity with which the poet lectures so awful a personage,"—we may add, than in the inimitable outbreak, anticipatory of Professor Maurice, at the close—

'¢O would you tak a thought an' men'."

Mr Carlyle, in reference to this passage, cannot resist the suggestion ofa parallel from Sterne. '' He is the father of curses and lies, said Dr Slop, aud is cursed and damned already. Iam sorry for it, quoth ny Uncle Toby."

Burns fared ill at the hands of those who were not sorry for it, and who repeated with glib complacency every terrible belief of the system in which they had been trained. The most scathing of his Satzres, under which head fall many of his minor and frequent passages in his major pieces, are directed against the false pride of birth, and what he conceived to be the false pretences of religion. The apologue of " Death and Dr Hornbook," " The Ordination," the song " No churchman am I for to rail and to write," the "Address to the Unco Guid," " Holy Willie," and above all "The Holy Fair," with its savage caricature of an ignorant ranter of the time called Moodie, and others of like stamp, not unnaturally provoked offence. As regards the poet's attitude towards some phases of Calvinism prevalent during his life, it has to be remarked that from the days of Dunbar till now there has been a degree of antagonism between Scotch verse and the more rigid forms of Scotch theology.

~~It must be admitted that in protesting against hypocrisy he has occasionally been led beyond the limits prescribed by good taste. He is at times abusive of those who differ from him. This, with other offences against decorum, which here and there disfigure his pages, can only be condoned by an appeal to the general tone of his writing, which is reverential. Burns had a firm faith in a Supreme Being, not as a vague mysterious Power, but as the Arbiter of human life. Amid the vicissitudes of his career he responds to the cottar's summons,' Let us worship God."~~

~~'« An atheist's laugh 's a poor exchange For Deity offended "~~

~~is the moral of all his verse, which treats seriously of religious matters. His prayers in rhyme give him a high place among secular Psalmists.~~

~~Like Chaucer, Burns was a great moralist, though a rough one. In the moments of his most intense revolt against conventional prejudice and sanctimonious affecta- tion, he is faithful to the great laws which underlie change, loyal in his veneration for the cardinal virtues—Truth, Justice, and Charity,—and consistent in the warnings, to which his experience gives an unhappy force, against trans- gressions of Temperance. In the " Epistle to a Young Friend," the shrewdest advice is blended with exhortations appealing to the highest motive, that which transcends the calculation of consequences, and bids us walk in the straight path from the feeling of personal honour, and "for the glorious privilege of being independent." Burns, like Dante, "loved well because he hated, hated wickedness that hinders~~

~~BURNS~~

~~loving," and this feeling, as in the lines—" Dweller in yon dungeon dark," sometimes breaks-bounds; but his calmer moods are better represented by the well-known passages in the "' Epistle to Davie," in which he preaches acquiescence in our lot, and a cheerful acceptance of our duties in the sphere where we are placed. This philosophie douce, never better sung by Horace, is the prevailing refrain of our author's Songs. On these there are few words to add to the acclaim of a century. They have passed into the air we breathe; they are so real that they seem things rather than words, or, nearer still, living beings. They have taken all hearts, because they are the~~

~~breath of his own; not polished cadences, but utterances as direct as laughter or tears. Since Sappho loved and sung, there has been no such national lyrist as Burns. Fine ballads, mostly anony- mous, existed in Scotland previous to his time ; and shortly before a few authors had produced a few songs equal to some of his best. Such are Alexander Ross's ""' Wooed and married," Lowe's "Mary's Dream," "Auld Robir Gray," "The Land o' the Leal," and the two versions of "The Flowers o' the Forest." From these and many of the older pieces in Ramsay's collection, Burns admits to have derived copious suggestions and impulses. He fed on the past literature of his country as Chaucer on the old fields of English thought, and— '« Still the elements o' sang, In formless jumble, right and wrang, Went floating in his brain."~~

~~But he gave more than he received ; he brought forth an hundred-fold ; he summed up the stray material of the past, and added so much of his own that one of the most conspicuous features of his lyrical genius is its variety in new paths. Between the first of war songs, composed in a storm on a moor, and the pathos of " Mary in Heaven," he has made every chord in our northern life to vibrate. The distance from '' Duncan Gray" to " Auld Lang Syne" is nearly as great as that from Falstaff to Ariel. There is the vehemence of battle, the wail of woe, the march of veterans "'red-wat-shod," the smiles of meeting, the tears of parting friends, the gurgle of brown burns, the roar of the wind through pines, the rustle of barley rigs, the thunder on the hill—all Scotland isin his verse. Let who will make her laws, Burns has made the songs, which her emigrants recall "by the long wash of Australasian seas," in which maidens are wooed, by which mothers lull their infants, which return 'through open casements unto dying ears "— they are the links, the watchwords, the masonic symbols of our race.~~

~~In his " Vision " the poet imagines his Muse (probably as real to him as to Homer) descending to address her votary beside the plough. After paying through her lips a generous tribute to his predecessors, he draws, as usual, a lesson from his own career, "by passion driven." The goddess counsels him to 'preserve the dignity of man" and "trust the universal plan," and leaving a wreath of green holly to deck his brows, passes "in light away."~~

~~The poet passed away in darkness, but his name will never disappear from our literature. He stands before us as a feature of Nature; and the fact that he cannot be moved from the hearts of his countrymen, that they recognize and respect a man who has refused to mutilate human vature, and who at once celebrates and strives to harmonize its ethnical and Christian elements, marks a gulf still fixed between Scotland and the Spain with which Mr Buckle has associated it. "The generous verse of Burns," says Dr Craik, "springs out of the iron-bound Calvinism of the land like flowing water from Horeb's rock."~~

~~The first edition of Burns's Poems was published at Kilmarnock in~~

~~1 vol. 8vo, in 1786; the second edition was published in Edinburgh in 1787 (2 vols. 8vo); the third edition appeared at Dumfries m~~

~~1793. After the poet's death Dr Currie of Liverpool issued a collected edition of his works, with a Life, for the benefit of his widow and family (4 vols. 8vo, Lond. 1800). This included letters as well as poems, but was far from being complete. The edition of Allan Cunningham (8 vols. 8vo. Lond. 1834) contains a large number of~~

~~ieces that are not to be found in Currie's edition. The Life and Works of Burns, by Dr Robert Chambers (Edin. 1851-2), has the distinctive feature that the poems are arranged in chronological order, and interwoven with the narrative of the poet's life, which is,~~

~~erhaps, the fullest and most precise in its details that has appeared. The Kilmarnock Popular Edition (2 vols. Kilmarnock, 1871) pos- sesses special interest from the fact that the first volume contains an exact reprint, with fac-simile title-page, of the original editions of 1786. it deserves notice that within a year of the publication of the first Edinburgh edition, two separate editions of the poems were issued in America, at New York and Philadelphia, 1788.~~

~~The Life of Burns, by J. Gibson Lockhart (1828), has passed through several editions. Among the numerous critical estimates of the poet the~~

~~foremost place is given by universal consent to the essay of Carlyle, which first appeared in the Edinburgh Review (1828), and is reprinted among his miscellaneous essays. (J. N.~~

~~BURNTISLAND, a parliamentary burgh and seaport of Scotland, in the county of Fife. It possesses a good pier, a dry dock, and a commodious harbour. Distilling and the herring-fishery are carried on, and a good deal of coal and pig-iron is exported. Itis the northern station of the ferry across the Firth of Forth in connection with the North British Railway from Granton, from which it is about five miles distant. The burgh unites with Kirk- caldy, Kinghorn, and Dysart in sending one member to Parliament. The population in 1871 was 3422.~~

~~BURSLEM, a town of England, in the county of Stafford- shire, 18 miles south of Macclesfield, and 150 miles from London. It stands on a gentle eminence near the Trent and Mersey canal, and is the principal town of the potteries' district. It contains a town-hall, erected in 1865, a market-house, a news-room, and a mechanics' institute; but its most interesting building is the Wedg- wood Institute, founded in 1863 in honour of the great manufacturer, who was born in the town in 1730. It com- prises a school of art, a free library, and a museum ; and the exterior is richly and peculiarly ornamented, to show the progress of fictile art. The tower of the parish church is of some antiquity, though the building itself is of modern date. The town is mentioned in Domesday Book as Bar- cardeslim, and it appears at an early period as a seat of the pottery trade. Its prosperity was greatly increased in the end of the 18th century by the opening of the Grand Trunk canal, Population of township in 1872, 20,971.~~

~~BURTON, Rozzrt (1576-1640), author of the Anatomy of Melancholy, was born at Lindley, Leicestershire, on the th February 1576. He attended the grammar schools of Nuneaton and Sutton Coldfields, and at the age of seventeen entered Brasenose College, Oxford. In 1599 he was elected student of Christ Church, and in 1614 took the degree of B.D. In 1616 he was presented to the vicarage of St Thomas, and in 1636 to the rectory of Segrave. He died on the 25th January 1639-40. The Anatomy of Melancholy, what tt is, with all the kinds, causes, symptoms, prognostics, and several cures of wt: In three partitions, with their several sections,~~

~~members, and sub-sections, philosophically, medicinally, historically opened and cut up: By Democritus Junior, with a satyrical preface conducing to the following discourse, was pub- lished in 1621. Our information with regard to the strange author of this strange book is very scanty. Anthony Wood's account of him has often been quoted; it repre- sents what must have been his contemporaries' opinion of him. A very curious anecdote is told of the method he adopted to dissipate the morbid melancholy which weighed upou him. He used to go to the bridge foot and hear the ribaldry of the bargemen, which rarely failed to throw him into a violent fit of laughter. His book is truly a~~

~~does not seem to have been at any time fortified.~~

~~marvellous production, aud proves at least one thing, that the author was a thorough classical scholar. Indeed the work is a cento of quotations, and, like the Jntellectual System of Cudworth, has served as a storehouse of learned material. Sterne is not the only one who has borrowed from the author of the Anatomy. The book itself is essentially unsystematic, but has a fine flavour of thorough- going ill-humour about it. This world was a dreary farce, and life was something to be laughed at. With a certain class of readers it has always been a favourite. Charles Lamb is a typical instance of a reader in Burton. The introductory poem has some curious analogies of style and thought to the Allegro and Penseroso of Milton.~~

~~BURTON-ON-TRENT, an English town, in the north- east part of the hundred of Offiow, and the eastern division of the county of Stafford. It is situated on the west bank of the River Trent, and is distant from Stafford 25 miles, from Derby 11 miles, and about 126 miles from London. The parish comprises over 9625 acres, and is divided into the townships of Burton-on-Trent, Burton Extra, Branston, Horninglow, and Stretton on the Staffordshire side of the river, and Stapenhill and Winshill on the Derbyshire side.~~

~~The history of the town may be said to begin with the erection of a church or monastery by the river side towards the close of the 9th century. But from that time we learu little concerning the place or its progress for about a hundred years. In 1002, the Burton abbey was founded by Wulfric, earl of Mercia, and substantially endowed. In 1540 it was surrendered to Henry VIII., who, in 1549, made a grant of it with all its lands and properties to his secretary Sir William Paget, the ancestor of the present lord of the manor, the marquis of Anglesey. In the time preceding the foundation of the abbey, the importance of the town was probably equal to that of the majority of Saxon boroughs, but it seems subsequently to have made but little progress, and even to the close of the 16th century to have had its character and condition mainly determined by the fact of its being the centre of an important ecclesiastical district. Notwithstanding the situation of the town being such as to have made it always the key to one of the great high roads between the Midland Counties, it It was the scene, however, of many frays. Especially notable is the battle which was fought at the Old Bridge on the~~

~~18th of March 1321, between the forces of Edward Il. and Thomas earl of Lancaster, in which the latter was defeated. — During the civil war of the 17th century, Burton was repeatedly taken and re-taken. The consequences to the town were serious, entailing pernianent injury to its interests in trade. Previous to the outbreak of the war the woollen trade had been the staple of the town, although it had also long been noted for its alabaster works, lut the frequent plunderings of that unquiet time all but ruined these industries.~~

~~In the year 1255 the greater part of the town was destroyed by fire, and in 1514 it was nearly swept away by floods. The latter form of disaster has frequently recurred. In 1771, in 1792, in 1795, in 1852, and twice in 1875 the town was visited by heavy floods, which inundated the greater part of it, and inflicted considerable damage. In 1875 the depth of water in several streets was from 4 to 5 feet, and the current strong and dangerous.~~

~~In the year 1698 an Act of Parliament was obtained for making the Trent navigable as far as Burton, and for many years the " Burton Boat Company," as it was called, did good service as carrying-agents for the trade of the town. The opening of the Midland Railway in August 1839 was followed by results more marked even than such as have commonly attended the introduction of railways. The progress of the town since that date has been constant and~~

~~for the last twenty years remarkably and increasingly rapid.~~

~~During the earlier years of the present century the cotton mills of Burton were so extensive as to give employ- ment to several hundred hands, but since 1849 the cotton trade has been discontinued. The demands of the brewing trade of late years, both as regards space and labour, seem to have made it difficult for any competing industry to exist. At any rate it must be admitted that at the present time the town derives all its commercial prosperity from the manufacture of ale, the recognized superiority of which is in a great measure due to the fact that the water used in its production, and obtained from wells sunk in the neighbour- hood of the breweries, is impregnated with sulphate of lime derived from the gypseous deposits of the district. The brewing trade of Burton is comparatively of recent~~

~~develop- ment, although the brewing of superior ale within the town was undoubtedly known as one of the features of the place in the days when the abbey flourished. The trade, as distinguished from private brewing, is reckoned to have commenced about the year 1708, and forty years later it had so extended as to have found a market at St Peters- burg and the Baltic ports. Inthe year 1796, so flourishing had the trade become that there were then in the town no fewer than nine brewing firms. That most famous of Burton ale products known as "India Pale," or " Bitter Beer," was first manufactured, as a beverage suited to the climate of the East, about the year 1823, and for some years India was its only market. The favour it has since obtained at home it owes to accident. A vessel carrying some hogsheads of India pale ale was lost in the channel, and its cargo sold for the benefit of the underwriters. In this way it was that bitter beer first became known as a beverage in this country, and so rapid was its popularity, that since 1828 the pale ale trade has taken the lead in the commercial transactions of the town. The development of the Burton brewing trade generally from that date to the present time has been imarvellous, but especially so since 1862 The magnitude which it has now attained may be inferred from the following facts and statistics. There are in all some thirty breweries in the town, the largest of which are those of Messrs Bass & Co. and of Samuel Allsopp & Sons. Last year (1875) the quantity of malt mashed in the several breweries together was 737,190 quarters, to contain which in the form of ale would require 2,948,761 barrels of 36 gallons each. The average price per barrel being 48s., we are enabled to set down the amount of brewing business done in the town, in one year alone, at £7,000,000. A calculation has been made by which it has been found that if all the barrels (2,948,761) of ale brewed in twelve months were put end to end in a straight line, that line would measure no less than 1535 miles. The Messrs Bass & Co. alone brew 250,000 quarters per annum; 8. Allsopp & Sons alone 200,000 quarters. The business premises of the former firm cover 50 acres of freehold and 100 acres of leasehold property. Traversing these premises they have six miles of railway and six locomotives their own exclusive property. They employ over 2000 men and boys, and pay in wages to employés in Burton alone about £2000 per week. §. Allsopp & Sons have also private lines of railway, extending over 10 miles. These lines, Allsopp's and Bass's and others, as they connect with the outer railway system, intersect the town at many points, The amount paid to the several railway companies (Mid- Jand,~~

~~North Staffordshire, and London and North Western) by the several brewing firms for carriage of ale in the course of 1875 for that year alone was £517,665.~~

~~_ The sanitary conditions of the town has been greatly puiproved since the passing of " Burton-upon-Trent Act, 1853." Under this Act, the town is divided into three~~

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~~wards, the Burton-upon-Trent Ward, the Burton Extra Ward, and the Horninglow Ward; and the local govern- ment is vested in a board of commissioners, twenty-seven in number, elected by the wards. Of public works in Burton the most notable is the New Bridge over the Trent, which was erected at a cost of £20,000, and was opened for traffic on the 22d June 1864. It is 469 yards in length, and has twenty-nine arches, supported by light but solid buttresses. The old bridge, which this one superseded, was of a curved form and extremely narrow. It had thirty- four arches, and is said to have been the longest bridge in the kingdom. The new cemetery, which occupies a plot of land 12 acres in extent, is situated in the township of Stagenhill, and was constructed at a cost of £13,000. It is divided into three parts, devoted to the separate burial of members of the Church of England, of nonconforming churches, and of the Church of Rome. It contains two mortuary chapels, and the honse of the registrar.~~

~~Although, in some old records, Burton is styled a borough, it is certain it was not possessed of a charter of incorpora- tion, nor has it yet obtained one. 'The police are those of the county. About five years ago the Burton Infirmary was opened, and has since been considerably enlarged. A new post-office is being erected, of dimensions suitable to the increasing growth of the town. There are three local newspapers published weekly. On the Derbyshire side of the river, and skirting its bank is the public recreation ground, The principal banking firm is the " Burton, Uttoxeter, and Ashbourne Union Bank," established 1839.~~

~~Burton is included in the diocese of Lichfield. Besides the Church of England, which has seven places of worship, there are the following denominations represented,—Pres- byterian, Congregational, Wesleyan,~~

~~Baptist, Free Church Methodist, Primitive Methodist, and Roman Catholic. The educational interests of the town are well cared for, there being, besides board schools, a grammar school, an endowed school, and three other schools of a voluntary character.~~

~~Commensurate with the increase of trade has been the increase of population. In 1801, when the first census was taken, it was a very little over 6000. From that year onwards to 1851 it steadily but very gradually increased. The ten years ending 1861 show the first great advance, the population being then 17,358. In 1871 it had grown to 23,748, and as the increase since then has been at the rate of over 1000 per annum, the population cannot now (1876) be less than 30,000.~~

~~BURTSCHEID, or Borcerte, a town of Prussia, in the government of Aix-la-Chapelle (Aachen), and immediately to the S.E. of that city, with which it is connected by lines of houses. It occupies the slopes of a hill on the Wormfluss, and, like Aix-la-chapelle, is famous for its mineral springs. One of these, known as the Mill-bath spring, is the hottest of Central Europe, having a tempera- ture of 155° Fahr. The water is employed both externally and internally, and the establishments for its use are exten- sive and convenient. The town carries on the manu- facture of woollen yarn and cloth, cast-iron goods, and machinery, and possesses an important trade. Burtscheid grew up round a Benedictine monastery, founded probably in the 10th century by Gregory, son of the Greek emperor Nicephorus Phocas, and brother-in-law of Otto IL. of Germany, and is said to have taken its name of Porcetum from the number of wild swine in the neighbourhood. In the 13th century the Benedictines became defunct, and a number of nuns from the convent of St Salvatorberg, near Aix-la-Chapelle, entered into possession. Their establish- ment continued till 1802, when it was broken up by the French. Population in 1872, 10,081.~~

~~BURU, BoeEro, or Bovro, an island of the East Indian Archipelago, belonging to the residency of Amboyna, and~~

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~~According to |~~

~~situated about 250 miles E. of Celebes. Melvill von Carnbée it has an area of 3487 square miles, and extends from 3° 18’ to 3° 50’S. lat. Its surface is for the most part very mountaimous, though the seaboard district is frequently alluvial and marshy from the deposits of the numerous rivers by which the island ig traversed. Of these, estimated at no less than 125, comparatively few are navigable except the Kayeli or Wai Apoe, which is the largest of all. The priucipal peaks are the Tomahoe (Kapala-Lemadang, Saniane or Buru-dome), 8529 feet in height, the Filehet, and the Palamatta. In the middle of the western portion of the island lies the large lake of Wakaholo, with a circumference of 37 miles, and a depth of about 100 feet. By far the larger part of the country is covered with natural forest and prairie land, but such portions as have been brought into cultivation are highly fertile. Coffee, rice, and a variety of fruits, such as the lemon, orange, banana, pine-apple, and cocoa-nut are readily grown, as well as sago, red-pepper, tobacco, and cotton. The only important export, however, is cajeput oil, a sudorific distilled from the leaves of the Melaleuca Cajuputi, or white-wood tree, of which about 8000 bottles are manufactured annually and sent to Java and other parts of the archipelago. The native flora is very rich, and the teak, ebony, and canari trees are especially abundant. Among the animals are buffaloes, hogs, deer, crocodiles, lizards, and snakes ; and ducks, doves, cockatoos, and birds of paradise are the chief representatives of the feathered species. According to Mr Wallace, the inhabitants are mainly of two partially amalgamated races—Malays on the sea-coast like those of Celebes, and Alfuros in the interior akin to those in Ceram. The latter are still completely pagan, live in scattered hamlets, and have come very little in contact with any civilization. Among the maritime population a small number of Chinese, Arabs, and other races are also to be found. The island is divided by the Dutch into the regencies of Kayeli, Ilat, Lumaćteh, Waaisama, Massareteh, Foggi, Bara, Licella, Talisa, Ma- rulat, and Leliali. The village of Kayeli is inhabited by eleven Mahometan tribes, who were compelled by Arnold de Vlaming in 1657 to gather together from the different parts of the island, while all the clove-trees were mercilessly exterminated. Before the arrival of the Dutch the islanders were under the dominion of the sultan of Ternate ; and it~~

was their rebellion against him that gave the Europeans)

the opportunity of effecting. their subjugation. In 1854 the port of Kayeli was declared free to all nations without customs on either ship or cargo.

See T. J. Willer, [et ciland Boeroe, zijne exploitatie en Halfoersche Instellingen, Amsterdam, 1858; Wallace's Indian Archipelago ; Veth's Woordenboek van Nederl. Indie.

BURY, a manufacturing town and parliamentary borough of England, in the county of Lancaster, on the Irwell, 8 miles N.N.W. of Manchester. duced in the 14th century, and ef such importance in the

reign of Elizabeth that she appointed an officer to stamp

the cloth, still gives employment to 1000 of the population, but it has been greatly surpassed in extent by the cotton manufacture, which with its various branches gave employ- ment in 1872 to 16,256 men and women of the age of twenty years or upwards. 'The auxiliary and supplemental trades of engine-making, spindle-making, calico-printing, bleaching, and dyeing are also largely carried on ; the paper manufacture employs about 600 people; upwards of 1000 miners find work in the neighbouring coal-pits ; 1200 workmen are engaged in the iron manufacture, and nearly 200 in the stone quarries. The town has been not only greatly extended but also greatly improved since the middle of the century ; it is well drained, and has a good supply of water. It contains a town-hall, an atheneum (including

The woollen-trade, intro-

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a museum), a free grammar school, founded by the Rev. Roger Kay, a mechanics' institute, and several public libraries. The parish church of St Mary's was rebuilt in 1776. The government, which was at one time in the hands of three constables, appointed by the earl of Derby, the lord of the nianor, was afterwards entrusted to a board of cominissioners under a local Act ; but the town has applied for municipal incorporation. Bury is a place of considerable antiquity, and was formerly the seat of a baronial castle,

~~which was destroyed by the Parliamentary forces in 1644. Sir Robert Peel was born at Chamber Hall in the neighbour- hood, and his father did much for the prosperity of the town by the establishment of extensive printworks. A monu- nient to the statesman now adorns the market-place. 'The parliamentary borough, which comprises the townships of Bury and Elton, has returned one member to Parliament since the Reform Bill of 1832. Its population in 1871 was 41,344, of whom 19,849 were males, and 21,495 females ; the inhabited houses numbered 8279, and the registered electors 5518.~~

~~BURY, RicHarp pg. See AUNGERVYLE, vol. iii. p. 85.~~

~~BURY ST EDMUNDS, a market-town and municipal and parliamentary borough of England, in the county of Suffolk, on the Lark, 26 miles N.W. of Ipswich, and 71 miles from London. It is governed by a mayor, six alder- men, and eighteen counciilors, and returns two members to Parliament. 'The town is pleasantly situated on a gentle eminence, in a fertile and richly cultivated district, is clean and well built, and has a good drainage system. It is sup- posed to be the Villa Faustini of the Romans, and numer- ous Roman remains have been dug up on the spot. It was the Beodericsworth of the Saxons, and by them was made a royal town of East Anglia. Its present name is derived from St Edmund, the king and martyr, who was taken prisoner and put to death by the Danes in 870. In 1020 a monastery was founded there by Canute, which for mag- nificence and splendour surpassed every other establishment of the kind in Britain, with the exception of that of Glastonbury. It was 505 feet long and 212 wide, and contained twelve chapels. The abbot had a seat in Parlia- ment, with the power to inflict capital punishment, and judged in all civil causes within the liberty. The privilege of coining was granted to the abbot by Edward the Con- fessor, and both Edward I. and Edward If. had mints in the town. In 1327 the people of the town and neighbour- hood attacked the monastery and reduced a large part of it to ashes. The tower or church-gate, one of the finest specimens of Norman architecture in the kingdom, and the western gate, erected about the middle of the 14th century, with a small portion of the walls, are all that now remains of that magnificent structure. St Mary's church, a fine Gothic edifice, with a beautifully carved roof, was erected in the earlier part of the 15th century, and contains the tomb of Mary Tudor,~~

~~Queen of Louis XII. of France. St James's church is also a very fine building, containing several handsome monuments. The free grammar school, founded by Edward VIL. has two scholarships at Cam- bridge, and six exhibitions to each university. The town has a shire-hall where assizes for the county and liberty are held, a handsome and commodious corn exchange, a guildhall, news and assembly rooms, a theatre, a savings-bank, botanic gardens, a county jail, a general hospital, and about 100 almshouses. The market-days are Wednesday and Saturday. Wednesday's market is very important, both for corn and cattle, but particularly for the latter, being second only to that of Norwicn, which is the largest in the Eastern counties. About a mile below the town the river becomes navigable for barges to Lynn, whence coals and other com- modities were formeily brought, but of late years, since the~~

~~| formation of the railway, the river has been but little used.~~

~~There are four lines of railway,—in connection with London and Cambridgeshire for the north, Thetford to Norwich and West Norfolk, Ipswich and East Suffolk, and Col- chester for Essex. In the vicinity is Ickworth, the magni- ficent seat of the marquis of Bristol. The town was the birthplace of Bishop Gardiner, and gives the title of viscount to the Keppel family (Earls of Albemarle). Population in 1871, 14,928.~~

~~BUSBECQ, AucieR GHISLEN DE (1522-1592), a Flemish diplomatist and traveller, was born at Commines in 1522, and was educated at the universities of Louvain, Paris, Venice, Bologna, and Padua. He was engaged in several important employments and negotiations, and in particular was twice sent as ambassador by the Emperor Ferdinand I. to the court of Soliman IJ. Te ade a collection of curious inscriptions and manuscripts; and in his second journey to Constantinople he carried with him an artist to make drawings of the rarest plants and animals. In 1562 he returned to Vienna, and was appointed tutor to the sons of the Emperor Maximilian IJ. Busbecq died at St Germain, near Rouen, October 28, 1592. THe wrote a Discourse of the State of the Ottoman Empire, and a Rela- tion of his Two Journeys to Turkey. A translation of the Travels in Turkey was published in Glasgow by Robert Urie in L761.~~

~~BUSBY, Ricwarp (1606-1695), D.C.L., head-master of Westminster school, was born at Lutton in Lincolnshire in 1606. He was educated at the school which he after- wards superintended for so long a period, and first signalized himself by gaining a king's scholarship. From Westminster he removed to Christ Church College, Oxford, where he graduated in 1628. In his thirty-third year he had already become renowned for the obstinate zeal with which he sup- ported the falling dynasty of the Stuarts, and was rewarded for his services with the prebend and rectory of Cudworth, with the chapel of Knowle annexed, in Sonmiersetshire. Next year he became head-master of Westminster school. His reputation as a teacher soon became so great that many of the noblest families entrusted their children to his care. He himself once boasted that sixteen of the bishops who then occupied the bench had been birched with his "little rod." No school in England has on the whole produced so many eminent men as Westminster did under the régime of Busby. Among the more illustrious of his pupils may be mentioned South, Dryden, Locke, Prior, and Bishop Atterbury. He wrote and edited many works for the use of his scholars. His original treatises (the best of which are his Greek and Latin grammars), as well as those which he edited, have, however, long since fallen into disuse. Busby died in 1695, in his ninetieth year, and was buried in Westminster Abbey, where his effigy is still to be seen.~~

~~BUSCA, a town of Italy, in the province of Cuneo, 9 miles from the city of that name, on the left bank of the Macra, a confluent of the Po. It contains a college, a hospital, and two botanic gardens. The inhabitants are engaged in the culture of the silkworm and the mann- facture of leather and ironwares; and there are marble and alabaster quarries. It is the site of some Roman antiquities. Population, 9533.~~

~~BUSCHING, Anron Friepricu (1724-1793), one of the founders of modern scientific geography, was born at Stadthagen in Schaumburg-Lippe, on the 27th September 1724. In his youth he was harshly treated by his father; but a clergyman of the name of Hauber, pleased with his talents, undertook to give him gratuitous instruc- tion, and afterwards enabled him to continue his studies at Halle. There, by application and good conduct, he acquired numerous friends, and in 1748 was appointed tutor in the family of the~~

~~Count de Lynars, who was then going as ambassador to St Petersburg. On this journey he became~~

~~sensible of the defective state of geographical science, and resolved to devote his life to its improvement. Withdraw- ing as soon as possible from the count's family, he went to reside at Copenhagen, and devoted himself entirely to this new pursuit. In 1752 he published a Description of the Counties of Schleswig and Holstein, a work that was much approved. In 1754 he removed to Gottingen, and married Christiana Dilthey, a young lady of some temporary reputa- tion as a poetess. Here a work in which he dissented from some of the Lutheran tenets lost him the appointment in 1757 to the theological chair, for which he had become a candidate. Two years later he was appointed professor of philosophy; but in 1761 he accepted an invitation to the German congregation at St Petersburg. There he organized a school, which, under his auspices, soon became one of the most flourishing in the North of Enrope, but a disagreement with Marshal Munich led him, in spite of the empress's offers of high advancement, to return to Germany in 1765. He first went to live at Altona; but next year he was called to superintend an extensive educa- tional establishment, known as the Greyfriars Gymnasium (Gymnasium zum Grauen Kloster), which had been formed at Berlin by Frederick the Great. Here he superintended the progress of every pupil, and inspected the minutest details conuected with the prosperity of the institution, besides giving lectures on the history of the arts and sciences. He continued to prosecute his various labours till a dropsy, under which he had long suffered, terminated his life on the 28th May 1793. His writings and example gave a new impulse to education throughout Prussia, and the Government was so sensible of the value of his services that they allowed his extensive correspondence to pass free of postage.**

~~Few authors, even in Germany, have been more prolific than Biisching. As enumerated by Meusel in his Lexicon of German Authors, his works amount to more than a hundred. They may be classed under the heads of Geography and History, Education, Re- ligion, and Biography. The first class comprehends those upon which his fame chiefly rests ; for although he~~

~~did not possess the geographical genius of D'Anville, he may be regarded as the creator of modern Statistics. His magnum opus is the Neue Erdbeschreibung, (New Deseription of the Globe). The first four parts, which compre- hend Europe, were published in four volumes (1754-1761), and have been translated into many of the European languages. They appeared in English with a preface by Murdoch, in six volumes 4to, London, 1762. In 1768 the fifth part was published, being the first volume upon Asia, containing Asiatic Turkey and Arabia, It displays an immense extent of research, and is generally considered as his masterpiece. Biisching was also the editor of a valuable colleetion entitled Magazin fir Historie und Geographie, 2 vols. 4to, 1767-93 ; also of Wochentl. Nachrichten von neuen Landkarten, Berlin, 1773-87.~~

~~His elementary works on education long held a distinguished place in this branch of literature, but his theological writings are not much esteemed. In biography he wrote a number of articles for the above mentioned Magazin, and a valuable collection of Bet- triige cur Lebensgeschichte merkwiirdiger Personen, 6 vols. 1783-9, including a very elaborate life of Frederick the Great.~~

~~BUSHIRE, or AsuscHEHR, a town of Persia, in the province of Fars, situated in the Persian Gulf. The surrounding country is a parched and barren desert, con- sisting of brown sand or grey clay and rock, unenlivened by any kind of vegetation. The town, which is of a triangular form, occupies the extremity of a peninsula eleven miles long and four broad, and is encircled by the sea on all sides except the south. It is fortified on the land side by a mud wall with round towers. The houses being mostly built of white stone gives the city, when viewed from a distance, a rather clean and handsome appearance, but on closer inspection the streets are found to be narrow, irregular, ill-paved, and filthy. Almost the only handsome buildings are the sheikh's palace and the British residency. Ships of 300 tons are obliged to lie in the roads six miles from the town. The water immediately east of the town~~

~~is deep, but its navigation is impeded by a bar, which can only be passed by vessels drawing not more than 8 or 9 feet of water, except at spring-tides,~~

~~when there is arise of from 8 or 10 feet. Bushire carries on a considerable trade, particularly with Calcutta, Bombay, and Java. Its im- ports are indigo, sugar, rice, spices, steel, cotton and woollen goods, coffee, &c.; and its principal exports are raw silk, opium, Kerman wool, shawls, silk goods. carpets, horses, dried fruits, wine, grain, copper, turquoises, pearls, asafoetida, and gall-nuts. 'The climate is excessively hot, particularly in the months of June, July, and August. The water is very bad; that fit for drinking requires to be brought in goat-skins from wells, distant 14 mile from the city walls. The population is variously estimated at from 10,000 to 20,000.~~

~~Theimportance of Bushire has much increased of late years. It is now not only the headquarters of the English naval squadron in the Persian Gulf, and the land terminus of the Indo-European line of telegraph, but it also forms the chief station in these seas of the British Indian Steam Navigation Company, which runs its vessels weekly between Bombay and Bussorah, and it is further expected that, if our Foreign J uris- diction Act should be applied to Persia, an appellate court will be formed at Bushire. In the meantime several Euro- pean mercantile houses have been established in the town, and there can be no doubt that if the means of communica- tion with the interior were improved, trade would rapidly increase. Notwithstanding, indeed, the drawbacks of bad roads, insufficient means of transport (wheeled carriages being unknown and beasts of burthen being few and dear), want of security, and illegal exactions, the annual value of the Bushire trade is now estimated at £600,000, of which one-quarter represents the exports and three-quarters the imports, the balance of trade against Persia at this single port thus amounting to about £300,000 a year, which is met by a constant drain of the precious metals to India. During the late war with Persia (1856-57) Bushire sur- rendered to a British force, and remained in our occupation for some mouths. The town yields a yearly revenue of about £15,000, mainly derived from customs, and is the chief place of a district, extending for 300 miles along the sea-coast from Dilem to Congoon, which is assessed in the Shirdz register at about £25,000 per annum. At Rishirc, in the vicinity of Bushire, there are extensive ruins, among which bricks stamped with cuneiform legends have been found, showing that the place was a very old Elamite settlement under the kings of Susa. It continued also to flourish under the name of Riv-Ardeshir, during~~

~~the Sassanian period, and only fell into decay after the Arab conquest, its place as the great emporium of trade being successively taken by Sirdf (the modern Tahiri), Keis, and Ormuz. The British commercial factory was transferred from Gombroon (modern Bander Abbass) to Bushire during the last century ; but the duties of the Bushire resident at present are exclusively political. (H. ©. EB.)~~

~~BUSHMEN, or BossEsMANs, so named by the British and Dutch colonists of the Cape, but calling themselves Saab or Saan, are an aboriginal race of South Africa, allied in some respects to the Hottentots, but differing from them in several essential points, and along with these having nothing whatever in common with the Kaffre or the Negro. The area in which they are found in nomadic families may be described as extending from the inner ranges of the mountains of Cape Cclony, through the central Kalahari desert to near Lake Ngami, and thence north-westward to the districts about the Ovambo River north of Damara Land, in about 18° S. lat., or only over the most barren portions of the South African deserts, into which they have been pressed by the encroachments of the Kaffre, Hottentots, and Europeans, a few also remaining in the most inaccessible~~

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~~clefts of the Drakenberg range about the sources of the Vaal. They rank with the savages of Australia as the lowest existing type of mankind, human nature being nowhere seen in a more destitute or degraded condition. The Bushmen with whom the colonists of the south have come most in contact are of very small stature, of a dirty yellow colour, and generally repulsive countenance, In type they somewhat resemble the Mongolians ; the cheek-bones are large and prominent, the eyes deeply set and crafty in expression, the nose small and depressed; the hair appears in small woolly tufts with spaces between. Among 150 of their number measured by the traveller Barrow, the tallest man was 4 feet 9 inches, the tallest woman 4 feet 4 inches. A hollowed back and protruding stomach, with thick hinder parts and small limbs, are frequent characteristics of their figure, but many of them are well-proportioned, all being active and capable of enduring great privations and fatigue. Northward the Bushmen appear to improve both in general condition and in stature. Those met with towards Lake Ngami by Dr~~

~~Livingstone are described by him as differing from those of the thirsty plains of the Kalahari, being of darker colour and of good proportions ; some of those seen by the traveller Baines in this region are also noticed as being taller, some 5 feet 6 inches in height. Their clothing consists of a mantle of skins, termed a kaross ; but they are fond of ornament, and decorate the arms and legs with beads and iron or copper rings, and the women sometimes stain their faces with red colour. For dwellings in the plains they have low huts formed of reed mats, or may simply occupy a hole in the earth ; in the mountain districts they make a shelter among the rocks by hanging mats on the windward side. They do not possess cattle, and have no animals of any sort excepting a few half-wild dogs, nor have they the smallest rudiments of agriculture. Living by hunting, they are thoroughly acquainted with the habits and movements of every kind of wild animals, following the antelope herds in their migrations, Their weapon is a small bow, strung with twisted sinew, used with arrows, which are neatly made of areed with a barbed head of bone, sometimes tipped with a triangular piece of iron, and always coated with a gummy poisonous compound, which is variously made in different localities. The chief sources of the poison are the milky juice of the Amaryllis toxicaria, which is abundant in South Africa, or of the Euphorbia arborescens, generally mixed with the venom of snakes or of a large black spider of the genus Mygale ; or the entrails of a very deadly caterpillar, called N'gwa or "Kaa, are used alone. From their use of these poisons the Bushmen are held in great dread by the neigh- bouring races. A rude implement, called the graaf stock or digging-stick by the boers,—consisting of a sharpened spike of hardwood over which a stone, ground to a circular form and perforated, is passed and secured by a wedge,— is used by the Bushmen in uprooting the succulent tuberous roots of the several species of creeping plants of the desert. These perforated stones have a special interest in indicating the former extension of the race of the Bushmen, since they are found far beyond the area now occupied by their families.~~

~~There does not appear to be the least approach to any tribal unity in the wandering groups of the Bushmen ; they have no chiefs, bodily strength alone forming a dis- tinction among them. Their language, which exists in several dialects, is not intelligible to the Hottentots, but has in common with it the nasal, snapping, hissing, or grunt- ing sounds, only used more~~

~~numerously. The Hottentot language is more agglutinative, the Bushman's more mono- syllabic ; the former recognizes a gender in names, the latter does not ; the Hottentots form the plural by a suffix,~~

~~O76 the Bushmen by repetition of the name; the former count up to twenty, the latter can only number two, all above that being "many." The Bushmen possess a remarkable faculty which is not known in any other South African natives, that of graphic illustration; the rocks of the mountains of Cape Colony and of the Drakenberg have everywhere examples of Bushman drawings of men, women, children, and animals characteristically sketched. Rings, crosses, and other signs drawn in blue pigment on some of the rocks, and believed to be some centuries old, have given rise to the speculation that these may be remains of a hieroglyphic writing ; aud the discovery of drawings of men and women, with antelope heads, in the recesses of the Drakenberg in 1873 (Orpen in Cape Monthly Magazine, July 1874), also very ancient, recalls the mythological figures of Egypt. The Bushmen are not deficient in a certain intelligence, and are valued as servants by the boers, being much more energetic than the Hottentots ; of all the South African races they have the greatest aptitude for music and the dance. A regularly planned and wholesale destruction of this race on the borders of the colony in the earlier years, reduced their numbers to a great extent ; and though this cruel hunting of the Bushmen has ceased, their children are still captured by the boers as servants. In reta- liation, the Bushmen have long been the scourge of the farms on the outer borders of the colonies, making raids on the cattle and driving them off in large numbers. On the western side of the deserts they are generally at enmity with the Koranna Hottentots, but on the eastern border of the Kalahari they have to some extent become tributary to the Bechwana Kaffres. Formerly occupying a much larger area, it appears probable that the Bushmen are the earliest remaining aborigines of South Africa, and that they existed there before the Kaffres, and perhaps also anterior to the Hottentots. The discoveries of the dwarf race of the Akka by Dr Schweinfurth beyond the Upper Nile basin, of the little Bushman-like Obongo on the western equatorial coast- land by Du Chaillu, and of the Okota, an undersized people leading a miserable existence in bark huts on a branch of the Ogowé River, by De Compiégne in 1874, point to a former more general distribution of this primi- tive race.~~

~~Barrow's South Africa, 1801-3; Burchell's Travels, 1822; Livingstone's Misstonary Travels, 1857; Baines's Explorations, 1864; Merensky's Siid-Afrika, 1875.~~

~~BUSHNELL, Horacg, D.D. (1802-1876), an American theologian, was born at Litchfield in Connecticut, in April 1802, and died on the 17th of February 1876. He studied at Yale College, where he graduated in 1827, after which he was for eleven months editor of the Journal of Commerce, and then teacher in a school in Norwich (Connecticut). In 1829 he became tutor in Yale College. His first study was law, but in 1831 he resolved to devote himself to theo- logy, and in 1833 he was chosen pastor of the North Con- gregational Church in Hartford (Connecticut), where he remained twenty-four years. During the remainder of his life he had no settled charge, but he continued to be dih- gently employed both as a preacher and asanauthor. He took an active part in the establishment of the university of California, and was asked to become its president. Having determined to value truth more highly than peace or con- sistency, Bushnell thought, and expressed his conclusions, with such freedom as to bring on himself a charge of false doctrine. In 1849 he published God in Christ, with an introductory Dissertation on Language as related to Thought, in which, it was said, he expressed heretical views as to the Trinity. He was acquitted by seventeen votes to three, but his influence with his church was such that it withdrew from the " Consociation " by which he had been tried, and thenceforward stood alone, a true " congregational " church,~~

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~~whose minister was amenable to no external authority. Bushnell formally replied by writing Christ in Theology, in which he employs the important argument that spiritual facts can only be expressed in approximative and poetical language, and concludes that an adequate dogmatic theology cannot exist. That he did not deny the divinity of Christ he proved in Zhe Character of Jesus, forbidding his possible classyfication with Men. He has also published Christian Nurture, (1847); Sermons for the New Life, (1858); Mature and the Supernatural, (1858); Christ and his Salvation, (1864); Work and Play, (1864); The Vicarious Sacrifice, grounded on~~

~~Principles of Unwersal Obligation, (1865) ; Moral Uses of Dark Things, (1868) ; Sermon on Living Subjects; Women's Suffrage, the Reform against Nature, (1869); and Forgiveness and Law, (1874).~~

~~BUSIRIS, the name of a mythical king of Egypt not found either on the monuments or in the chronological~~

~~lists, but mentioned by the later Greek writers and~~

~~mythologists. By Apollodorus he was made the son of /Egyptus, and an Egyptian king, or else the son of Poseidon and Lyssianassa. After Egypt had been afflicted for nine years with famine Phrasius, a seer of Cyprus, arrived in Egypt and announced that the cessation of the famine would not take place until a foreigner was yearly sacrificed to Zeus or Jupiter. Busiris commenced by sacrificing the prophet, and continued the custom by offering a foreigner on the altar of the god. It is here that Busiris enters into the circle of the myths and parerga of Heracles, who had arrived in Egypt from Libya, and was seized and bound ready to be killed and offered at the altar of Zeus. Heracles burst the bonds which bound him, and, seizing his club, slew Busiris with his son Amphidamas, and his herald Chalbes. This exploit is often represented on vase paintings, the Egyptian monarch and his companions being represented as negroes. Although some of the Greek writers made Busiris an Egyptian king and a successor of Menes, about the sixtieth of the series, and the builder of Thebes, those better informed by the Egyptians rejected him altogether; they do not even admit that he wasthe lieutenant of Osiris set over the lands opposite Phoenicia and the Mediterranean, nor do they recognize him as living two centuries after Perseus and later than Heracles. Various esoterical explanations were given of the myth, and the name not found as a king is recognized in that of one or more cities of the same name in Northern Egypt. The legend was unknown both to Homer and to Hesiod, and appears after the Greeks were more intimately acquainted with Egypt, and had seen the wall-paintings, or imperfectly understood the popular tales and traditions of the people, for there is no solid reason to believe that human sacrifices were ever offered in the country.~~

~~BUSIRIS, the name of an Egyptian town, the capital of the Busirites nomos, or Busirite nome, called in the hieroglyphs Pa-osiri, or Place of Osiris, the~~

~~eponymous deity of the place. It is the modern Abusir, and lay, according to Herodotus, in the middle of the Delta. It was supposed to be close to the entrance of the gates of the Aahlu, or Elysium, and the nome to be that called in the hieroglyphs Kahebs ; and Busiris itself may have been the Egyptian Zattu. Close to the town, which lay on the Phatnitish or Pathmitish arm of the Nile, was the pyramid of the king Sahura, the successor of Uskafan, a king of the 4th dynasty ; this was called the Sa-ba, or pyramid of the " Rising Soul," and some supposed that the name Pa-sahura, or "city of Sahura," may have been the origin of the name Busiris instead of Pa-osiri. The later Greek authors gave many different versions of the name mixed up with their own mythology, such as that Isis had there interred Busiris in the wooden figure of a cow, and that the place was hence called Bousosiris, or that the goddess had there buried~~

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~~Osiris, when killed by Typhon, in the body of the same animal enveloped in bandages—legends evidently confused with the burial of the Apis in the Serapeum which lay in the vicinity. The shrine of the goddess Isis was situated in it, and a great annual festival and lamentation of Osiris held there, which appears from an inscription of the temple of Denderah to have taken place on the 14th day of the month Choiak. At the time of the privilege, conferred un the nomes of Egypt by the Emperor Hadrian, of coining the money struck at the time of his visit to that country, and dated in the 11th year of his reign 117 a.p., the Busirite nome issued small bronze pieces on which is the goddess Isis standing holding a cow or goat in one hand anda serpent in the other. Demetrius of Phalerum, the philosopher, exiled by Ptolemy Philadelphus, is said to have died at Busiris 284 B.c., having put an end to his life by the bite of an asp. The city was destroyed by the Emperor Diocletian in the 3d century a.D., but the Copts and Arabs have preserved its name in Bousiri and Abusir. Another village of the same name is supposed to have existed in the Letopolite nome.~~

~~Herodotus, ii. 59, 61, 165 ; Apollodorus,. ii. 1, 5 ; Diodorus, i. 17; Isocrates, Orat., ii.; Hyginus, Fad., ii. 45; Schol. Apollon. Rhod.,~~

~~iv. 18, 96; Gerhard, Trinkschalen, 8. s. 9; Tochon D'Annecy, Recherches sur les Medailles des nomes, p. 190.~~

~~BUSSORAH, Bassora, Batsora, or Basra, a celebrated city of Asia, in the government of Baghdad, situated in 47° 34’ E. long., 30° 32’ N. lat., on the western banks of~~

~~the Shatt-el-Arab. ° It is about 70 miles from the mouth of |~~

~~that noble stream, which is navigable to the city for ships of 500 tons burden after passing the bar at its mouth; this, however, they can only conveniently do at spring-tides.~~

~~Bussorah is surrounded by walls, which are kept in a | They have five gates, and are at | Two |~~

~~tolerable state of repair. the lowest computation about seven miles in circuit. canals, cut from the river, surround the town on either side, and uniting beyond it on the western side, form a complete ditch to the fortifications. The houses are meanly built, partly of sun-dried and partly of burnt bricks, with flat roofs surrounded by a parapet; and the bazaars, though stocked with the richest merchandise, are miserable structures, not arched as in Baghdad and the Persian towns, but covered with mats laid on rafters of date trees, which hardly afford protection from the scorching rays of the sun. The streets are irregular, narrow, and unpaved, and the town itself is disgustingly filthy. Of the vast area within the walls, the greater proportion is occupied with gardens and plantations of palm trees, intersected by a number of little canals, cleansed twice daily by the ebb and flow of the tide, which rises here about 9 feet. The largest of these canals, which approaches the old English factory and the palace of the governor, situated about two miles from the river, is continually crowded with small vessels. The town has scarcely any public buildings that deserve notice. It has khans and coffee-houses without number, a wretched. hummam (or bath), and upwards of forty mosques, of which one only is worthy of the name ; and this, with the palace of the governor, and the old English factory, which are all contiguous to one another, are the only decent buildings in the place. The old English factory, which was established at Bussorah by the East India Company, about the middle of the last century, ceased to exist with the expiration of the trading privileges of the company. The building has now passed into private hands, and the British vice-consul, who protects our trading interests, resides at the modern village of Maghil, which has been~~

~~built in a healthy position on the right bank of the river a few miles from the Turkish town. The population of Bussorah is a heterogeneous mixture of all the nations in the East, and consists of Turks, Arabs, Indians, Persians, Armenians, Jacobites, and Jews.~~

~~The Arabs constitute the principal class; and the Turks, though they are masters of the town, are almost the least numerous.~~

~~Bussorah is a great emporium of Indiancommerce, Six or eight English ships arrive in the course of a year from India ; but the chief part of the traffic is carried on in Arabian bottoms; and the merchants of Muscat possess some of the finest vessels that navigate the Indian seas. From various parts of Hindustan Bussorah receives silk, muslin, linen, white and blue cloths for the clothing of the Arabians, gold and silver stuffs, various metals, sandal- wood, and indigo; pearls from Bahrein, and coffee from Mocha; shawls, fruit, and the precious metals from Persia ; spices from Java; and European commodities, which are scarce and dear, from different parts. The trade with the interior is conducted by means of caravans to Aleppo and Baghdad, whence the goods are conveyed to Constantinople, The returns are made in Indian goods, bullion, pearls, dates, copper, raw silk, gall-nuts; and the horses, which arc very strong and beautiful, are exported in large numbera by the English.~~

~~The situation of the town is unhealthy, owing to the inundations of the river, from which noxious exhalations arise; and strangers are commonly attacked by fever after a short residence. The adjoining country is fertile, producing, besides rice, wheat, barley, and dates of different species, a variety of fruits and vegetables, such as apricots, apples, figs, olives, pomegranates, and grapes ; and cabbages, broccoli, lettuce, onions, pease, beans, and truffles, in vast quantities. There are whole fields of roses, which the inhabitants cultivate for the purpose of making attar. The liquorice plant also grows amidst the palm groves on the borders of the river.~~

~~The city of Bussorah was originally founded by Omar, 636 A.D., on a canal eight miles S.W. from its present site, where the town of Zobeir now stands ; and its situation was so favourable for commerce that in a few years it~~

~~became a large and flourishing city. The canal, however, soon became useless, and the city was abandoned. The present city was conquered by the Turks in 1668, and since that period has been the scene of many revolutions. It was taken in 1777, after a siege of eight months, by the Persians under Sadick Khan. In abouta year it fell again into the hands of the Turks, who were again deprived of it by the sheikh of the Montefik Arabs. The town was in the October following recovered by Soliman Pasha, who encountered the sheikh on the banks of the Euphrates, and put him to flight ; and it has since remained in the hands of the Turks.~~

~~Under the government of the Turks Bussorah has dwindled down to a mere second-rate town, the permanent population at present (1876) being certainly under 10,000. In the river there is perhaps a greater show of activity just now than in past times, as the Turks employ a considerable naval force in the Persian Gulf to support their land operations against the Arabs, and the Bussorah roads form the headquarters of the squadron, while two or three Turkish steamers also ply upon the river, and have their depéts upon its bank. There are two steamers also belonging to the Tigris and Euphrates Navigation Company (besides a war steamer maintained by the British Government in virtue of a special firman), which convey merchandise and passengers between Baghdad and Bussorah ; and, lastly, the vessels of the British India Steam Navigation Company visit Bussorah every week from Bombay and Bushire ; but as the trade fostered by these means is entirely one of transit, it confers little benefit on the town or its inhabi- tants. The village of Maghil, however, on the banks of the Euphrates, at the distance of three or four miles from Bussorah, where the wharves and store-house of the European IV. — 73~~

~~companies are situated, is becoming a considerable place, and may be expected ultimately to supersede the Turkish town. The terminus of the Constantinopleline of telegraph, which furnishes an alternative means of communication between England and India, is at F4o, near the mouth of the Euphrates, and at the distance of about 60 miles below Bussorah. A good deal of attention has of late years been directed to Bussorah in connection with the proposal for a railway to unite the Mediterranean with the Persian~~

~~Gulf, either by way of the Tigris or Euphrates valley. In no case, however, would it be desirable to establish the terminus of such a railway at Bussorah, where the climate would prove most destructive to European life. The most eligible site for the terminus would be either at Kowait on the sea-coast, 50 miles south of Bussorah, or at the Persian~~

~~town of Mohamreh, where the Karin River disembogues |~~

~~into the Euphrates, Quite recently the Turkish Govern- ment has decided to dissociate the Bussorah district, with its dependencies, from Baghdad, and to attach it to the newly-created province of Arabia, the headquarters of the~~

~~pashalic being established at El Hassa; but such an >~~

~~arrangement is not likely to be permanent. (H. ©. R.)~~

~~BUSTARD (corrupted from the Latin Avis tarda, though | the application of the epithet! is not easily understood), the — largest British land-fowl, and the Otis tarda of Linneus, | which formerly frequented the champaign parts of Great~~

~~Britain from East Lothian to Dorsetshire, but of which the native race is now extirpated.~~

~~described it as an inhabitant of the Merse, no later writer than the former has adduced any evidence in favour of its Scottish domicile. The last examples of the native race~~

~~Its existence in the northern | locality just named rests upon Sibbald's authority (circa 1684), and though Hector Boethius (1526) unmistakably |~~

~~|~~

~~were probably two killed in 1838 near Swaffham, in Norfolk, | a district in which for some years previously a few hen- | birds of the species, the remnant of a plentiful stock, had |~~

~~maintained their existence, though no cock-bird had latterly been known to bear them company. In Suffolk, where the~~

~~neighbourhood of Icklingham formed its chief haunt, an |~~

~~end came to the race in 1832; on the wolds of Yorkshire~~

~~|~~

~~about 1826, or perhaps a little later; and on those of |~~

~~Lincolnshire about the same time. writing in 1813, says that none had been seen in their~~

~~favourite haunts on Salisbury Plain for the last two or |~~

~~three years. In Dorsetshire there is no evidence of an indigenous example having occurred since that date, nor in Hampshire nor Sussex within the present century. From other English counties, as Cambridgeshire, Hertfordshire,~~

~~and Berkshire, it disappeared without note being taken of | the event, and the direct cause or causes of its extermination |~~

~~can only be inferred from what, on testimony cited by Mr Stevenson (Birds of Norfolk, ii. pp. 1-42), is known to have led to the same result in Norfolk and Suffolk. In the latter the extension of plantations rendered the country unfitted for a bird whose shy nature could not brook the~~

~~growth of covert that might shelter a foe, and in the former |~~

~~the introduction of improved agricultural implements, notably the corn-drill and the horse-hoe, led to the discovery and generally the destruction of every nest, for the bird's chosen breeding-place was in wide fields—" brecks, " as they are locally called,—of winter-corn. Since the extirpa- tion of the native race the Bustard is known to Great Britain only by occasional wanderers, straying most likely from the open country of Champagne or Saxony, and occurring in one part or another of the United Kingdom some two or three times every three or four years, and chiefly in midwinter.~~

~~An adult male will measure nearly four feet from the~~

~~a a er ee ae 'It may be open to doubt whether tarda is here an adjective. Several of the medieval naturalists used it as a substantive.~~

~~Of Wiltshire, Montagu, |~~

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~~tip of the bill to the end of the tail, and its wings have an expanse of eight feet or more,—its weight varying (possibly through age) from 22 to 32 pounds. This last was that of one which occurred to the younger Naumann, the best biographer of the bird (Vogel Deutschlands, vii. p. 12), who, however, stated in 1834 that he was assured of the former existence of examples which had attained the mass of 35 or 38 pounds. The female is considerably smaller. Com- pared with most other birds frequenting open places the Bustard has disproportionately short legs, yet the bulk of its body renders it a conspicuous and stately object, and when on the wing, to which it readily takes, its flight is not inferior in majesty to that of an. Eagle. The bill is of moderate length, but, owing to the exceedingly flat head of the bird, appears longer than it really is. The neck, especially of the male in the breeding-season, is thick, and the tail, in the same sex at that time of year, is generally carried in an upright position, being, however, in the paroxysms of courtship turned forwards, while the head and neck are simultaneously reverted along the back, the wings are lowered, and their shorter feathers erected. In this posture, which has been admirably portrayed by Mr Wolf (Zool. Sketches, pl. 45), the bird presents a very strange appearance, for the tail, head, and neck are almost buried amid the upstanding feathers before named, and the breasts are protruded to a remarkable extent. The Bustard is of a pale grey on the neck and white beneath, but the back is beautifully barred with russet and black, while in the male a band of deep tawny-brown —in some examples approaching a_ claret-colour—descends froin either shoulder and forms a broad gorget on the breast. The secondaries and greater wing-coverts are white, con- trasting vividly, as the bird flies, with the black primaries. Both sexes have the ear-coverts somewhat elongated—whence doubtless is derived the name Ofis (Gr. wris)—and the male is adorned with a tuft of long, white, bristly plumes, springing from each side of the base of the man- dible. The food of the Bustard consists of almost any of the plants natural to the open country it loves, but in winter it will~~

~~readily forage on those which are grown by man, and especialiy coleseed and similar green crops. To this vegetable diet much animal matter is added when occasion offers, and from an earth-worm to a field-mouse little that lives and moves seems to come amliss to its appetite.~~

~~Though not many birds have had more written about them than the Bustard, much remains to be determined with regard to its economy. A moot point, which will most likely always remain undecided, is whether the British race was migratory or not, though that such is the habit of the species in most parts of the European continent is beyond dispute. Equally uncertain as yet is the question whether it is polygamous or not—the evidence being perhaps in favour of its having that nature. But one of the most singular properties of the bird is the presence in some of the fully-grown males of a pouch or gular sack, opening under the tongue. This extraordinary feature, first discovered by James Douglas, a Scotch physician, and made known by Albin in 1740, though its existence was hinted by Sir Thomas Browne sixty years before, if not by the Emperor Frederick II., has been found wanting in examples that, from the exhibition of all the outward marks of virility, were believed to be thoroughly mature ; and as to its function and mode of development judgment had best be suspended, with the understanding that the old supposition of its serving as a receptacle whence the bird might supply itself or its companions with water in dry places must be deemed to be wholly untenable. The structure of this pouch—the existence of which in some~~

~~| examples has been well established,—1is, however, variable ;~~

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~~and though there is reason to believe that in one form or another it is more or less common to several exotic species of the family Otcdide, it would seem to be as inconstant in its occurrence as iu its capacity. As might be expected, this remarkable feature has attracted a good deal of attention (Journ. fir Ormth. 1861, p. 153; Lbis, 1862, p. 107; | 1865, p. 148; Proc. Zool. Soc. 1865, p. 747 ; 1868, p. | 741; 1869, p. 140; 1874, p. 471), and the researches of Professor Garrod, the latest investigator of the matter, shew~~

~~that in an example of the Australian Bustard (Otis australis) examined by him there was, instead of a pouch or sack, simply a highly dilated cesophagus—the distention of which, at the bird's will, produced much the same appearance and effect as that of the undoubted sack found at times in the O. tarda.~~

~~The distribution of the Bustards is confined to the Old World—the bird so called in the Fur-Countries of North | America, and thus giving its name to a lake, river, and cape, being the Canada Goose (Bernicla canadensis). In the Palearctic Region we have the 0. tarda already men- tioned, extending from Spain to Mesopotamia at least, and from Scania to Morocco, as well as a smaller species, 0. tetraw, which often occurs as a straggler in, but was never an inhabitant of, the British Islands. 'T'wo species, known | indifferently by the name of Houbara (derived from the | Arabic), frequent the more southern portions of the Region, and one of them, 0. macqueeni, though having the more eastern rauge and reaching India, has several times occurred in North-western Europe, and once even in England. In the east of Siberia the place of O. tarda is taken by the nearly-allied, but apparently distinct, O. dybovskii, which would seem to occur also in Northern China. Africa is the chief stronghold of the family, nearly a score of well-marked species being peculiar to that continent, all of which have been by later systematists separated from the genus Oévs. India, too, has three peculiar species, the smaller of which are there known as Floricans, and, like some of their African and one of their European cousins, are remarkable for the ornamental plumage they assume at the breeding-season. Neither in Madagascar nor in the Malay Archipelago is | there any form of this family, but Australia possesses one large species already named. From Xenophon's days (Anab. i. 5) to our own, the flesh of Bustards has been esteemed as of the highest flavour. 'The Bustard has long been protected by the game-laws in Great Britain, but, as | will have been seen, to little purpose. A few attempts have been made to reinstate it as a denizen of this country, but none on. any scale that would ensure success. Many of the older authors considered the Bustards allied to the Ostrich, a most mistaken view, their affinity pointing apparently towards the Cranes in one direction and the Plovers in another, (A. N.)~~

~~BUSTO ARSIZIO, a town of Italy, in the province of | Milan and district of Gallarate, about 19 miles N.W. of the | city of Milan by rail. Its church of Santa Maria was planned by Bramante, and contains frescoes by Gaudenzio Ferrari; and St John's is also a noble building. Cotton is | manufactured in the town, and the vine is cultivated in the | neighbourhood. Population in 1870, 12,909.~~

~~BUTADES, wrongly called DrsutapEs, a Greek modeller in clay, whom fable describes as the first who modelled the human face in that material. The story is that his daughter, smitten with love for a youth at Corinth where they lived, drew upon the wall the outline of his shadow, and that upon this outline her father modelled a face of the youth in clay, and baked the model along with the clay tiles which it was his trade to make, This model was preserved in Corinth till Mummius sacked thattown. This incident led Butades to ornament the ends of roof-tiles with human faces, a practice which is attested by numerous existing~~

~~is about 225 square miles.~~

~~examples. He was a native of Sicyon, and probably lived about 600 B.c., at which date Corinth seems to have been a flourishing centre of working in clay.~~

~~BUTCHER-BIRD, a name frequently given to the Shrike family of Birds (Laniade), and particularly to the Great Grey Shrike (Zanius excubitor). See SHRIKE.~~

~~BUTE, County oF, is composed of three groups of islands which lie in the Firth of Clyde, betwixt the coasts of Ayrshire on the east, and Argyllshire on the north and west, viz., Bute, from which the county takes its name, with Inchmarnoch, a mile to westward ; the two Cumbraes, less than a mile apart; and Arran, with the Holy Isle and Pladda islet, separated from each other by about a mile; the groups themselves being divided by channels from five to eight or ten miles in width. The area of the county Before the application of steam to navigation and the introduction of the railway system, the voyage from Glasgow to Bute, Cumbrae, or Arran was always~~

~~tedious and disagreeable, and sometimes fraught with peril, being performed in small and generally open sail-boats, often occupying days, and occasionally even weeks ; now, by rail and steamer, the several islands can be reached in an hour and a half or two hours from Glasgow. In consequence of those facilities, and their acknowledged salubrity of climate, beauty and sub- limity of scenery, and scientific and historic interest, the chief islands of Buteshire have for years attracted increas- ing numbers of tourists, artists, and men of science from all parts of the world. Buteshire, with the exception of some half-dozen small estates, is in the hands of four great proprietors. Arran, Holy Isle, and Pladda belong to the duke of Hamilton, and Bute and Inchmarnoch to the noble marquis who derives his title from the former. The Larger Cumbrae is the property of the earl of Glasgow and Lord Bute; and the Lesser Cumbrae, with its single farm, belongs to the earl of Eglinton. The proprietors of Bute and the Larger Cumbrae,—whose residences are respectively Mount Stuart, a few miles from Rothesay, and- the Garrison, a handsome marine villa in the heart of Mill- port,—have given every encouragement to feuing and to all public improvements ; consequently the beautiful water- ing-places in their vicinity have grown rapidly in population and importance. The census of 1871 gives the resident population of Buteshire at 16,977, 7623 males and 9354 females. Of these 10,094 were in Bute, 5259 in Arran, and 1624 in the Cumbraes. Since then the numbers are known to have largely increased, and in summer the popula- tion must be vastly greater. The electoral roll, which grows of course with the growth of the better class of feuars and householders, numbers at present 1150 voters. Prior to 1832 Buteshire, alternately with Caithness-shire, sent a member to Parliament,—Rothesay enjoying at the same time the privilege of sharing a representative with Ayr, Campbelton, Inveraray, and Irvine. On the passing of the Reform Bill of 1832, Rothesay was merged in the county, which since then has had a member to itself. Buteshire and Renfrewshire form one sheriffdom, with a sheriff-substitute resident in Rothesay, where are also situated the county buildings, including the court-house, prison, and public offices. The circuit courts are held at Inveraray.~~

~~Bute, the most important of the several islands in the Firth of Clyde which constitute the county of the same name, is situated about 18 miles west of Greenock, and 40 by water from Glasgow. It is about 15 milesin length,~~

~~extending from the picturesque “ Kyles”—the narrow winding strait which separates the island on the north from the district of Cowal—to the Sound of Bute, about 8 miles in width, which separates it on the south from Arran. In breadth the island is unequal, from the deep indentations,~~

~~on both sides, of its numerous bays, but it averages from 3 to 5 miles, having on the east the Cumbraes 5 miles and the Ayrshire coast 8 miles off, and on the west Inch- marnoch (with an area of 675 acres) close at hand, and Ardrishaig, the highway to the Hebrides, within little more than two hours’ sail of Rothesay.~~

~~The island has an area of 31,161 acres, two-thirds of which are arable, the remainder consisting of hill-pasture, plantings, moors, and sheets of water. Of the latter there are six. The largest, Loch Fad, 3 miles from Rothesay, is nearly 3 miles in length and about $ mile in breadth. From this copious source the Rothesay cotton-spinning mill, the first establishment of the sort erected in Scotland, derived by gravitation its propelling power. The mill continued in active operation, giving employment to some hundreds of people, until a few years ago, when, from the machinery having become antiquated and other causes, it ceased to be remunerative, and was closed. There are still two factories in the neighbourhood, with more modern machinery, for the weaving of cloth, but they are driven by steam-power. Loch Fad has a peculiar interest attach- ing to it, from having, on its western bank, the cottage built in 1827 by Edmund Kean, the great tragedian, who there found it “glorious through the loopholes of retreat to peep on such a world.” The cottage, after Kean’s death, fellinto the hands of Mr J. B. Neilson, the ingeni- ous inventor of “ the hot-blast,” and is now the property of Lord Bute. Notwithstanding the change of hands, the drawing-room is still retained precisely as Kean lett it. Loch Ascog, within two miles of Rothesay, is less than Loch Fad, but quite as useful. It covers an area of 72 acres, and supplies the inhabitants of Rothesay with excellent water for domestic purposes. Quien Loch covers 54 acres, Greenan Loch 12, Loch Dhu 9, and Lochantarb 5 acres. The climate of Bute is mild, genial, and healthful, and is likened, not unfrequently, to that of Devonshire or of Mont- pellier. The mountains of Argyll and the peaks of Arran breaking the~~

~~clouds as they pass from the Western Ocean, less rain falls on Bute than on any other part of the west coast ; and the sea-breeze, generally blowing from the west and south, keeps the air cool in summer, and prevents snow from remaining or frost from continuing long in winter. The soil of Bute, for the most part light and gravelly, produces, under skilful treatment, excellent crops, particularly of potatoes, which, being readily disposed of by the acre while growing, are conveyed in barrels day by day to the Glasgow market. The farmers are a respect- able class of men, intelligent, able-bodied, and long-lived. Coal has been found in the island, but of inferior quality and doubtful quantity. Supplies of this indispensable mineral are therefore brought from the fields of Ayrshire and Lanarkshire. Native limestone has been burned and used, but of late years it has given way almost entirely to Irish lime, which is extensively imported for building and manuring purposes. Of soft red sandstone, slate, and whinstone there is no lack, but they are chiefly used in the building of dykes and the gables and back walls of tene- ments, white sandstone and slates being largely imported for the front elevations and roofing of the better class of houses, which are now rapidly increasing in number. At Kailchattan there is an abundance of superior clay, and a thriving brick and tile work. Granite of a grey complexion, susceptible of a high polish, is also found at Kilchattan.~~

~~The islands of Bute and Inchmarnoch, excepting the small estates of Ascog and Ardbeg, the burgh lands, and one or two trifling holdings adjoining the town, belong to the marquis of Bute, whose favourite seat, Mount Stuart, is four miles from Rothesay on the eastern shore. The house, for which a much better site, commanding a~~

~~view all round the island, might have been found, was begun in 1719 by the second earl, and finished after his death, in 1723, by Lady Bute, a daughter of the first duke of Argyll. It is a plain unpretentious mansiou of moderate dimensions, recently much improved internally by the present marquis.~~

~~To the geologist, Bute offers little attraction as compared with Arran ; yet the masses of conglomerate on the beach and forming the bold cliffs at Craigmore ; the dykes of trap which crop up strikingly through the red~~

~~sandstone and conglomerate at Ascog, and which may be traced shore-ward towards Bogany Point and across the island to Ettrick Bay; and the vitrified forts at Dunnagoil (Garroch- head) and Island-bui (Kyles),—whether the result of volcanic action or only of beacon fires is doubtful,—will not be found unworthy of his notice. To the anti- quary and the student of medieval history Bute offers ample scope. The Druidical monuments, and the barrows, cairns, and cists are numerous throughout the island, as are also the remains of ancient chapels. For an account of Rothesay Castle and its deeply interesting historical associations, see RoTHEsAy. Another object of interest is St Blane's chapel, picturesquely situated in a sheltered nook in the parish of Kingarth. It is believed to have been founded in the reign of Malcolm Canmore, towards the close of the 11th century, on the site of a much older edifice. This seems not improbable, as St Blane, who is said to have been a nephew of St Cattan, lived in the latter half of the 6th century. At all events, the names of both saints have been perpetuated in connection with the chapel and the neighbouring bay of Kilchattan. In the year 1204, Walter, Steward of Scotland, anxious "for the souls of kings David and Malcolm, and the souls of his own father and mother," as well as for "the salvation of himself and heirs," granted a charter conveying St Blane's, with all its valuable belongings in Bute, "to the monastery at Paisley, and the monks serving God therein." Time out of mind the chapel has been a ruin, surrounded by numerous graves of the forgotten dead; and having passed long ago from the custody of the church, it again belongs, with the lands attached to it, to a Stuart, Lord Bute.~~

~~There are still extant and habitable several old mansions in Bute, one or two of which may be pointed out. The most considerable is Kames Castle, three miles north-west of Rothesay. It stands in an extensive well-wooded park opposite the fine bay of the same name. It was long the residence of the Bannatyne family, a member of which, Lord Bannatyne, a judge of the Court of Session, projected the Highland Society in 1784, and founded the village of Port-Bannatyne, an abode of hardy fishermen, and now also a flourishing watering-place. Kames estate and castle are now the property of Lord Bute. Ascog House, about three miles from Rothesay in the opposite direction coastwise, is another old mansion in the Scottish baronial style. Standing on a richly-wooded height, it commands extensive views of the firth, and whether regarded from the road or the water contributes largely to~~

~~enhance the beauty of perhaps the finest landscape in the island. The estate of Ascog belonged at one time to a branch of the Bute family. In 1815 it was purchased by the late Mr Robert Thom, C.E., of the Rothesay spinning-mill, who acquired celebrity by successfully engineering the introduction of water to the town of Greenock.~~

~~The island is divided into four parishes,—Rothesay, New Rothesay, Kingarth, and North Bute.~~

~~Rothesay, with its population of 7760 souls, has two Established churches, with a Gaelic chapel, two Free churches, with a Gaelic chapel, one United Presbyterian church, and three chapels — Episcopalian, Baptist, and Roman Catholic; while at Kingarth there are two~~

~~churches, Established and Free ; at Ascog one, a Free church ; and in North Bute an Established and a Free church. The school accommodation is likewise ample, both in town and country.~~

~~Touching the origin of the name of Bute, there is con- siderable doubt. It has been written Both, Bote, Boot, and Botis, and may thus be derived from " Both," which isthe Irish for" a cell," St Brendan, an Irish abbot, having, it is said, caused a cell to be erected in the island in the 6th century ; or it may have been derived from the old British words "' Ey Budh," or the Gaelic words " Ey Bhiod," signifying the "island of corn," or " island of food," from its fertility as compared with the neighbouring islands and Highland districts. Although now all but obsolete, Gaelic was formerly the current language spoken. The Butemen in fighting times were called Brandanes, a distinction which they prized ; and the numerous small landed proprietors, in virtue of a charter granted them in 1506 by James IV., took the title of baron, which became hereditary in their families. The title is now all but extinct, the lands which conferred it having passed by purchase from time to time, with one or two trifling exceptions, into possession of the Bute family. The descendants of the Brandanes were among the earliest to take part in the volunteer move- ment, by furnishing a couple of batteries to Lord Lorne's battalion of Argyll and Bute Artillery Volunteers, as well as a company to the Renfrewshire Rifles.~~

~~Great improvements have been recently made and are now (1876) in progress in Bute. The renovation, all but completed, of the grand old castle, and the formation of the esplanades of Rothesay,—together with the erection of an aquarium, and of an iron pier, where the accom- modation was wanted, at the entrance to the bay, will tend, with other appreciated advantages, to give the island and shores of Bute a higher place than ever among the attractions of the Clyde. R. H.)~~

~~BUTE, Joun Stuart, THIRD Eart or (1713-1792), for a brief time prime minister of England, was born in 1713, and was educated at Eton. Horace Walpole, who was one of his contemporaries there, tells us that Bute "studied simples in the hedges about Twickenham." For many years he resided in the remote island of Bute, where he appears to have diligently studied mathematics, mechanics, and natural science. He married the daughter of Mr and the celebrated Lady Mary Wortley Montagu, an alliance which subsequently brought the large Wortley estates into his family. A mere accident introduc2d him at court; a shower of rain interrupted a cricket match at Cliefden, and led to his services being required by the Prince of Wales. He received a bedchamber appointment in the household of the prince. Prince Frederick died, however, next year, and Lord Bute lived in retirement. On the formation of a separate household for the princess and the young princes, he received the appointment of groom of the stole, somewhat to the dissatisfaction of the old king, George I, who gave him the gold key of office in an ungracious way. In the household of the Prince of Wales Lord Bute acquired great influence over the mind of the youthful heir of the throne and his mother. The scandal of the last century associated his name most intimately with that of the princess, but for this cruel and persistent rumour there appears to be no foundation either in con- temporary literature or in the large inedited Bute MSS.~~

~~Lord Bute does not appear to have had much to do with the education of the future king and his brothers, which was chiefly left in episcopal hands. He took, how- ever, Some part in the direction of his studies, and is known to have read Blackstone's Commentaries, when still in MS., with him. Heseems also to have inculcated him with the writings of Bolingbroke, whose theory was that a king~~

~~should not only reign but govern, and who had sketched out the ideal of a patriot king. The constant language of the Princess Dowager, re-echoed by the groom of the stole, was "George, be king!" In 1760 George II. died, and the young king proceeded to put in practice the teachings he had received. This marked an important era in constitu- tional history. Then began the era of the " king's friends ; " the royal will was to be supreme; the ministers were simply to act ministerially, giving expression to and carry- ing out the sovereign's pleasure. It is manifest that this doctrine weakened the responsibility of ministers and the authority of parliament, and invited dangers in the direc- tion both of absolutism and of anarchy. Bute, however, was prepared to carry out a scheme very like Strafford's "Thorough" with zeal and energy. The day after the accession Bute was made a privy councillor. A. little later he was made secretary of state. Afterwards he was made Knight of the Garter. The king told the ministers, " Lord Bute is my very good friend;" and the royal will was expressed through him. 'The extraordinary spectacle was witnessed, on the meeting of parliament, of a man with no political connection, who had never been in the cabinet, and who had never served in any ministerial office, being practically prime minister. What he was in reality he soon became in name. In the Shelburne Correspondence we find him asserting that there was nothing which he could not do. The ministers at the time of the accession, who both in the Eastern and the Western World were main- taining the war with France with the greatest glory and success, were William Pitt, the duke of Newcastle, and Mr Legge. The last, Mr Legge, was ignominiously dismissed. Pitt could not carry the support of the cabinet in his pro- posal.to declare war against Spain, and therefore resigned, — a resignation which probably prevented a dismissal. Such insults were heaped upon the duke of Newcastle that, although he long clung to office, he was at last compelled to resign.**

~~As premier, Bute showed considerable ability. Lord Mausfield said he never knew any man come to business so late who did it so well, and he proved an extremely good speaker. He also gave considerable patronage to literature and art. He had several distinct points of policy. He wished to close the era of war and make peace with France. He wished to sever the political connection between England and Hanover. He wished to humble the~~

~~dominant Whig families, and to make the king supreme. In all these objects he was to a considerable extent successful. The popular feeling against the peace was intense. Still the minister had secured a large majority in the House of Commons ; but although he had spoken much of purity of election, it is not to be denied that there had been extensive bribery in the elections. Confident of the royal support and a parliamentary majority, he seemed secure of a long lease of power.~~

~~After being premier for eleven months, to the astonish- ment of all, he suddenly resigned. He was unable to face the black tide of personal unpopularity which set in so heavily against him. Wilkes's publication of the Worth Briton had both expressed and intensified his unpopularity. He was in danger of being impeached ; he was in danger of being torn in pieces by the mob. He went about dis- guised. He attempted to conciliate popularity by recalling Pitt to office; but Pitt would only return with his Whig friends, to which the king would not consent. Then Lord Bute's courage gave way. His own explanation was, ""' The ground I stand upon is so hollow that I am afraid, not only of falling myself, but of involving my royal master in my own ruin." But although he resigned office, his influence with the king was hardly impaired. It was the king's custom, at least for some time, to write a minute daily journal of~~

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~~To the geologist, Bute offers little attraction as compared with Arran ; yet the masses of conglomerate on the beach and forming the bold cliffs at Craigmore ; the dykes of trap which crop up strikingly through the red sandstone and conglomerate at Ascog, and which may be traced shore-ward towards Bogany Point and across the island to Ettrick Bay; and the vitrified forts at Dunnagoil (Garroch- head) and Island-bui (Kyles),—whether the result of volcanic action or only of beacon fires is doubtful,—will not be found unworthy of his notice. To the anti- quary and the student of medieval history Bute offers ample scope. The Druidical monuments, and the barrows, cairns, and cists are numerous throughout the island, as are also the remains of ancient chapels. For an account of Rothesay Castle and its deeply interesting historical associations, see RotHEsay. Another object of interest is St Blane's chapel, picturesquely situated in a sheltered nook in the parish of Kingarth. It is believed to have been founded in the reign of Malcolm Canmore, towards the close of the 11th century, on the site of a much older edifice. This seems not improbable, as St Blane, who is said to have been a nephew of St Cattan, lived in the latter half of the 6th century. At all events, the names of both saints have been perpetuated in connection with the chapel and the neighbouring bay of Kilchattan. In the year 1204, Walter, Steward of Scotland, anxious "for the souls of kings David and Malcolm, and the souls of his own father and mother," as well as for "the salvation of himself and heirs," granted a charter conveying St Blane's, with all its valuable belongings in Bute, "to the monastery at Paisley, and the monks serving God therein." Time out of mind the chapel has been a ruin,~~

~~surrounded by numerous graves of the forgotten dead; and having passed long ago from the custody of the church, it again belongs, with the lands attached to it, to a Stuart, Lord Bute.~~

~~There are still extant and habitable several old mansions in Bute, one or two of which may be pointed out. The most considerable is Kames Castle, three miles north-west of Rothesay. It stands in an extensive well-wooded park opposite the fine bay of the same name. It was long the residence of the Bannatyne family, a member of which, Lord Bannatyne, a judge of the Court of Session, projected the Highland Society in 1784, and founded the village of Port-Bannatyne, an abode of hardy fishermen, and now also a flourishing watering-place. Kames estate and castle are now the property of Lord Bute. Ascog House, about three miles from Rothesay in the opposite direction coastwise, is another old mansion in the Scottish baronial style. Standing on a richly-wooded height, it commands extensive views of the firth, and whether regarded from the road or the water contributes largely to enhance the beauty of perhaps the finest landscape in the island. The estate of Ascog belonged at one time toa branch of the Bute family. In 1815 it was purchased by the late Mr Robert Thom, C.E., of the Rothesay spinning-mill, who acquired celebrity by successfully engineering the introduction of water to the town of Greenock.~~

~~The island is divided into four parishes,—Rothesay, New Rothesay, Kingarth, and North Bute.~~

~~Rothesay, with its population of 7760 souls, has two Established churches, with a Gaelic chapel, two Free churches, with a Gaelic chapel, one United Presbyterian church, and three chapels—Episcopalian, Baptist, and Roman Catholic; while at Kingarth there are two~~

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~~churches, Established and Free ; at Ascog one, a Free church ; and in North Bute an Established and a Free church. The school accommodation is likewise ample, both in town and country.~~

~~Touching the origin of the name of Bute, there is con- siderable doubt. It has been written Both, Bote, Boot, and Botis, and may thus be derived from " Both," which isthe Irish for" a cell," St Brendan, an Irish abbot, having, it is said, caused a cell to be erected in the island in the 6th century ; or it may have been derived from the old British words " Ey Budh," or the Gaelic words "' Ey Bhiod," signifying the 'island of corn," or "island of food," from its fertility as compared with the neighbouring islands and Highland districts. Although now all but obsolete, Gaelic was formerly the current language spoken. The Butemen in fighting times were called Brandanes, a distinction which they prized ; and the numerous small landed proprietors, in virtue of a charter granted them in 1506 by James IV., took the title of baron, which became hereditary in their families. The title is now all but extinct, the lands which conferred it having passed by purchase from time to time, with one or two trifling exceptions, into possession of the Bute family. The descendants of the Brandanes were among the earliest to take part in the volunteer move- ment, by furnishing a couple of batteries to Lord Lorne's battalion of Argyll and Bute Artillery Volunteers, as well as a company to the Renfrewshire Rifles.~~

~~Great improvements have been recently made and are now (1876) in progress in Bute. The renovation, all but completed, of the grand old castle, and the formation of the esplanades of Rothesay,—together with the erection of an aquarium, and of an iron pier, where the accom- modation was wanted, at the entrance to the bay, will tend, with other appreciated advantages, to give the island and shores of Bute a higher place than ever among the attractions of the Clyde. R. H.)~~

~~BUTE, JoHn STUART, THIRD EARL oF (1713-1792), for a brief time prime minister of England, was born in 1713, and was educated at Eton. Horace Walpole, who was one of his contemporaries there, tells us that Bute 'studied simples in the hedges about Twickenham." For many years he resided in the remote island of Bute, where he appears to have diligently studied mathematics, mechanics, and natural science. He married the daughter of Mr and the celebrated Lady Mary Wortley Montagu, an alliance which subsequently brought the large Wortley estates into his family. A mere accident introduced him at court; a shower of rain interrupted a cricket match at Cliefden, and led to his services being required by the Prince of~~

~~Wales. He received a bedchamber appoiutment in the household of the prince. Prince Frederick died, however, next year, and Lord Bute lived in retirement. On the formation of a separate household for the princess and the young princes, he received the appointment of groom of the stole, somewhat to the dissatisfaction of the old king, George II., who gave him the gold key of office in an ungracious way. In the household of the Prince of Wales Lord Bute acquired great influence over the mind of the youthful heir of the throne and his mother. The scandal of the last century associated his name most intimately with that of the princess, but for this cruel and persistent Tumour there appears to be no foundation either in con-temporary literature or in the large inedited Bute MSS.~~

~~Lord Bute does not appear to have had much to do with the education of the future king and his brothers, which was chiefly left in episcopal hands. He took, how- ever, some part in the direction of his studies, and is known to have read Blackstone's Commentaries, when still in MS., with him. He seems also to have inculcated him with the writings of Bolingbroke, whose theory was that a king~~

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~~should not only reign but govern, and who had sketched out the ideal of a patriot king. The constant language of the Princess Dowager, re-echoed by the groom of the stole, was "George, be king!" In 1760 George II. died, and the young king proceeded to put in practice the teachings he had received. 'This marked an important era in coustitu- tional history. Then began the era of the '" king's friends ; " the royal will was to be supreme; the ministers were simply to act ministerially, giving expression to and carry-ing out the sovereign's pleasure. It is manifest that this doctrine weakened the responsibility of ministers and the authority of parliament, and invited dangers in the direc- tion both of absolutism and of anarchy. Bute, however, was prepared to carry out a scheme very like Strafford's~~

~~"Thorough" with zeal aud energy. The day after the~~

~~accession Bute was made a privy councillor. A. little later he was made secretary of state. Afterwards he was made Knight of the Garter. The king told the ministers, " Lord Bute is my very good friend;" and the royal will~~

~~was expressed through him. The extraordinary spectacle was witnessed, on the meeting of parliament, of a man with no political connection, who had never been in the cabinet, and who had never served in any ministerial office, being practically prime minister. What he was in reality he soon became in name. In the Shelburne Correspondence we find him asserting that there was nothing which le could not do. The ministers at the time of the accession, who both in the Eastern and the Western World were main- taining the war with France with the greatest glory and success, were William Pitt, the duke of Newcastle, and Mr Legge. The last, Mr Legge, was ignominiously dismissed. Pitt could not carry the support of the cabinet in his pro- posal.to declare war against Spain, and therefore resigned, —a resignation which probably prevented a dismissal. Such insults were heaped upon the duke of Newcastle that, although he long clung to office, he was at last compelled to resign.~~

~~As premier, Bute showed considerable ability. Lord Mausfield said he never knew any man conte to business so late who did it so well, and he proved an extremely good speaker. Healso gave considerable patronage to literature and art. He had several distinct points of policy. He wished to close the era of war and make peace with France. He wished to sever the political connection between England and Hanover. He wished to humble the dominant Whig families, and to make the king supreme. In all these objects he was to a considerable extent successful. The popular feeling against the peace was intense. Still the minister had secured a large majority in the House of Commons; but although he had spoken much of purity of election, it is not to be denied that there had been extensive bribery in the elections. Confident of the royal support and a parliamentary majority, he seemed secure of a long lease of power.~~

~~After being premier for eleven months, to the astonish- ment of all, he suddenly resigned. He was unable to face the black tide of personal unpopularity which set in so heavily against him. Wilkes's publication of the Worth Briton had both expressed and intensified his unpopularity. He was in danger of being impeached ; he was in danger of being torn in pieces by the mob. He went about dis- guised. He attempted to conciliate popularity by recalling Pitt to office; but Pitt would only return with his Whig friends, to which the king would not consent. Then Lord Bute's~~

~~courage gave way. Hisown explanation was, “ The ground I stand upon is so hollow that I am afraid, not only of falling myself, but of involving my royal master in my own ruin.” But although he resigned office, his influence with the king was hardly impaired. It was the king’s custom, at least for some time, to write a minute daily journal of~~

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~~events and transmit it to Lord Bute. Both Grenville who succeeded him, and Rockingham who succeeded Grenville, regarded him with the utmost jealousy. Grenville made it an absolute condition that Bute should retire from the presence and counsels of the young king. He retired to Luton ; he afterwards travelled on the Continent under the name of Sir John Stuart He complained bitterly that he was not allowed “ to enjoy that peace, that liberty, which is the birthright of the meanest Briton, but which has been long denied me.”~~

~~The influence of Lord Bute over the king was great for a time, but it has been much exaggerated. After a few years it seems to have declined altogether. Both the king and Lord Bute soon disclaimed its existence, and there is no lack of corroboratory evidence But it was impossible to eradicate the notion that there was a _back-stairs influence personified in Lord Bute. He was denounced in popular addresses before the king himself as a betrayer of the constitution, and mobs regularly broke his windows. Wilkes reviled him ; Junius thundered against him. Lord Chatham declaimed against him as one behind the throne greater than the throne itself. For twenty years he was regarded with invincible hostility and suspicion, yet we find him complaining tliat he had not the influence of an alderman in obtaining a position for his son. Horace Walpole gives a curious account of an offer being made to Chatham shortly before his death of making him premier with a dukedom, he himself being a secretary of state. The facts are not well ascertained, but Lord Mountstuart, afterwards first marquis of Bute, wrote to assert upon his honour that his father, Lord Bute, assured him that he had not thought of coming into place again.~~

~~Lord Bute had purchased an estate at Luton in Bedford- shire, where Adams, the Scottish architect, had built him a magnificent residence. Here he formed an immense library, a superb collection of astronomical and~~

~~philosophical instruments, and an admirable gallery of pictures, which are preserved in a large house appropriated to them in Warwick Square, London. On the summit of a plain Tuscan pillar in the grounds is an inscription in honour of his great friend and benefactress the Princess Dowager. He took great delight in architecture, and among other edifices built himself a marine villa on the edge of the chff, in Hampshire, overlooking the Needles and the Isle of Wight. father to his children, and to have taken a greater pleasure in simple, natural delights than he could have found in courts. His death was occasioned through that intense love of natural science which had followed him through life. Seeing a new plant on the cliff he climbed towards it, and received a severe fall, which brought on an illness of which he died.~~

~~The eleven months' premiership, during which he was mayor of the palace, was a singular episode in his prolonged life,—a remarkable and unconstitutional experiment in politics which has never been repeated. Lord Bute pos- sessed great virtues, great energy and ability,and was as able a premier as Newcastle, Grenville,or Rockingham. But the royal favouritism on which he relied proved the greatest bar to his political success, and has left a slur, exaggerated, but not altogether ill-deserved, on his memory. (F. A.)~~

~~BUTLER, Axpan (1710-1773), a hagiologist, was born in Northampton in 1710. After completing his education at the Roman Catholic college at Douay, he was appointed professor of philosophy, and afterwards professor of divinity. In 1745 he travelled through France and Italy in company with the earl of Shrewsbury and some other gentlemen. On his return he was sent as member of a mission to Staffordshire, but was soon afterwards appointed chaplain to the duke of Norfolk, whose nephew he educated and~~

~~He is said to have been an admirable tutor and~~

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~~accompanied on a Continental tour. After returning to England he was made president of the English college at St Omer's, where he remained till his death in 1773. His great work, the Lives of the Saints, was first published in 5 vols. 4to, 1745, and has passed through many editions. It exhibits great~~

~~industry and research, with considerable power of expression, and is in all respects the best work of its kind in English literature.~~

~~BUTLER, Carus (1750-1832), nephew of the pre- ceding, a miscellaneous writer, was born at London in 1750. He was educated at Douay, and in 1775 entered at Lincoln's Inn. He had considerable practice as a conveyancer, and after the passing of the Act Geo. III. ce. 32 was called to the bar in 1791. In 1832 he received the silk gown, and was made a bencher of Lincoln's Inn. He died on the 2d June in thesame year. His literary activity was enormous, and the number of his published works is very great. The most important of them are the Reminiscences, 1821-1827 ; Horce Biblice, 1797, which has passed through several editions ; Hore Juridice Subsecive, 1804; Book of the ftoman Catholic Church, which was directed against Southey and excited some controversy ; lives of Erasmus, Grotius, and some others. He also edited his uncle's Lives of the Saints and Fearne's Essay on Contingent Remainders, and completed Hargrave's edition of Coke upon Littleton.~~

~~BUTLER, James, DUKE oF ORMonD. See ORMOND.~~

~~BUTLER, JosEpu, Bishop of Durham, one of the most distinguished writers on theology and ethics, and perhaps the man of greatest intellectual power in the English church during the 18th century, was born at Wantage, in Berkshire, on the 18th May 1692. His father was a respectable linen- draper of that town, who had retired from business some time before the birth of Joseph, his youngest son. The family belonged to the Presbyterian community, and it was their wish that young Butler should be educated for the ministry in that church. The boy was placed under the care of the Rev. Philip Barton, master of the grammar schoo] at Wantage, and remained there for some years. He was then sent to a dissenting academy at Gloucester, which was afterward removed to Tewkesbury. The head- master was Mr Samuel Jones, a man of considerable abilities, several of whose pupils afterwards attained to eminence in the church, Butler's fellow-student and most intimate friend was Secker, who afterwards became archbishop of Canterbury.~~

~~While at this academy two important events occurred in Butler's life. He gradually became dissatisfied with the principles of Presbyterianism, and~~

~~after much deliberation resolved to join the Church of England. In this resolution his father reluctantly acquiesced. About the same time he began to study with care Clarke's celebrated Demonstration of the Being and Attributes of God, which had been published a few years previously. With great modesty and secrecy Butler, who was then in his twenty-second year, wrote to the author propouuding certain difficulties with reeard to the proofs of the unity and omnipresence of the Divine Being. Clarke answered his unknown opponent with a gravity and care that showed his high opinion of the metaphysical acuteness displayed in the objections, and published the correspondence in later editions of the Demonstration. Butler acknowledged that Clarke's reply satisfied him on one of the points, and he subsequently gave his adhesion to the other.~~

~~In March 1714 he was entered at Oriel College, Oxford. Little is known of his life at the university; his most attached friend was Edward Talbot, son of Dr William Talbot, afterwards Bishop of Durham. In 1718, on the recommendation of Talbot and Clarke, he was nominated preacher at the Chapel of the Rolls, and continued there till 1726. In 1721 he had been appointed by Bishop~~

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~~Talbot to the living of Houghton, and in 1725 his kind patron presented him to the wealthy rectory of Stanhope. In the following year he resigned his preachership at the Rolls, and published the first edition of the Sermons.~~

~~For nearly eight years hc remained in perfect seclusion at. Stanhope, and our information as to his general mode of life is exceedingly scanty. He was only remembered in the neighbourhood as a man much loved and respected, who nsed to ride a black pony very fast, and whose known benevolence was much practised upon by beggars. In 1733 he was made chaplain to Lord Chancellor Talbot, and in 1736 prebendary of Rochester. In the same year he was appointed clerk of the closet to Queen Caroline, and began to take part in the brilliant metaphysical society which she loved to gather round her. He met Berkeley frequently, but in his writings does not refer to him.~~

~~In 1736 appeared the Analogy, which at ouce took its place as the completest answer to the general deistical reasoners of the times, and as the best defence of revealed religion.~~

~~In 1736 Queen Caroline died; on her deathbed she recommended Butler to the favour of her husband. George, however, had not his consort's partiality for metaphysics, and seemed to think his obligation sufticiently discharged by appointing Butler in 1738 to the bishopric of Bristol, the poorest sce in the kingdom. The severe but dignificd letter in which Butler significd his acceptance of the prefer- ment, must have shown him that the slight was felt and resented. 'T'wo years later the bishop was presented to the rich deanery of St Paul's, and in 1746 was made clerk of the closet to the king. In 1747 itis said the primacy was offered to Butler, who declined to accept it, saying that 'it was too late for him to try to support a falling church." The story has not the best authority, and though the desponding tone of some of Butler's writings may give it colour, it is not in harmony with the rest of his life; for in 1750 he accepted the see of Durham, vacant by the death of Dr Edward Chandler. His charge to the clergy of the diocese, the only charge of his known to us, is a weighty and valuable address on the importance of external forms in religion, It gave risc to a most absurd rumonr that the Lishop had too great a leaning towards Romanism.~~

~~Of his life at Durham few incidents are known. He was very charitable, and expended large sums in building and decorating his church and residence. His private expenses were exceedingly small. He did not long survive his promotion. Shortly after the change to Durham his constitution began to break up, and he died on the 16th June 1752, at Bath, whither he had removed for his health. We was buried in the cathedral of Bristol, and over his grave a monument was erected in 1834, with an epitaph by Southey. According to his express orders, all his MSS. were burned after his death.~~

~~Butler was never married. His personal appearance has been sketched in a few lines by Hutchinson :—" He was of a most reverend aspect ; his face thin and pale ; but there was a divine placidness which inspired veneration, and expressed the most benevolent mind. His white hair hung gracefully on his shoulders, and his whole figure was patriarchal."~~

~~Underneath the meagre facts of his life, ekcd out by the few letters left by him or anecdotes told about him, there can be traced the outlines of a great but somewhat severc spirit. He was an earnest and decp-thinking Christian, melancholy by temperament, and grieved by what seemed to him the hopelessly irreligious condition of his age. His intellect was profound and comprehensive, thoroughly qualificd to grapple with the deepest problems of meta- physics, but by natural preference occupying itself mainly with the practical and moral. Man's conduct in life, not~~

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~~his theory of the universe, was what interested him. His style has frequently been blamed for its obscurity and difficulty. These qualities, however, belong not so much to the form as to the matter of his works. The arguments are invariably compressed, aud can never be taken individually. All are parts of one organic whole. Constant attention is thus required in order to grasp the relations of each isolated piece of reasoning. Above all, however, the special obscurity of the Analogy results from the difficulty of keeping constantly in mind the exact issue involved. Butler himself resolutely restricts his argument within the narrow limits prescribed for it, but it is difficult for any ordinary reader to keep this constantly in mind.~~

~~His great work, The Analogy of Religion, Natural and Revealed, to the Course and Constitution of Nature, cannot be adequately appreciated unless taken in counection with the circumstances of the period at which it appeared. It was intended as a defence against the great tide of deistical speculation, which in the apprehension of good men seemed likely to sweep away the restraints of religion, and make way for a general reign of licence. Deism, as a fact in English thought, takes its rise mainly from Locke, though traces of it are not wanting in Herbert of Cherbury. Whether or not the Essay on the Human Understanding should be held responsible for its results is a disputed question ; but there tan be no doubt that from the positions there laid down the general principles of the deists were drawn. Knowledge, in the strict sense of the word, had been restricted by Locke to the perception of the relations among ideas ; reason was defined as the faculty which com- pared and compounded such ideas; and though with regard to God, faith was still admitted, the only part of the divine nature~~

~~withdrawn from the province of knowledge was the inscrutable essence, which was equally unknown in the case of all real beings. The whole course of nature, including man's moral powers, was therefore subjected to reason ; life must be regulated by reason. If, therefore, religion were to enter as a factor into the conduct of man, it must exhibit to reason the title deeds of its existence; Christianity must be reasonable. But with such a view of knowledge it was easy for the deists to make a successful attack upon at least one portion of the Christian scheme. A mystery by its very definition involved elements not capable of being represented ~ in clear ideas ; it was therefore unreasonable, aud must be absolutely rejected. Christeanity not Mysterious is the title of Toland's most famous work.~~

~~The course of their argument soon carried the deists farther. They were willing to grant the fact of God's existence ; it was a dictate of reason. But they were not prepared to go beyond that, and the necessary deductions fromit. The truths of natural religion thus took the form of inferences drawn from certain premises ; they were dis- played in a coherent, perfectly rational system. Revealed religion, on the other hand, was confessedly imperfect, con- tained things not in accordance with natural reason, incul- cated duties on grounds of mere authority, was not uni- versally and completely known, and must therefore be rejected. As Tindal puts it, "No religion can come from a Being of infinite wisdom and perfection but what is abso- lutely perfect. A religion absolutely perfect can admit of no alteration, and can be capable of no addition or diminution. If God has given mankind such a law, he must likewise have given them sufficient means of knowing it; he would other- wise have defeated his own intent in giving it, since a law, so far as it is unintelligible, ceases to be a law." It was against this whole tendency of thought that Butler directed his Analogy. The method and course of his argument will appear more plainly when it has been considered what were the premises on which he proceeded, and what the object he had in view.~~

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~~Butler is a typical instance of the English philosophical mind. He will admit no speculative theory of things. To him the universe is no realization of intelligence, which is to be deciphered by human thought ; it is a~~

~~constitution or system, made up of individual facts, through which we thread our way slowly and inductively. Complete know- ledge is impossible; nay, what we call knowledge of any part of the system is inherently imperfect. ‘ We cannot have a thorough knowledge of any part without knowing the whole.” So far as experience goes, ‘‘to us probability is the very guide of life.” Reason is certainly to be accepted; it is our natural light, and the only faculty whereby we can judge of things. But it gives no completed system of knowledge, and in matters of fact affords only probable conclusions. In this emphatic declaration, that knowledge of the course of nature is merely probable, Butler is at one with Hume, and some of his expressions are exactly paralleled in the writings of the great sceptic, who was a most diligent student of the bishop’s works. What can come nearer Hume’s celebrated maxim, —‘‘ Anything may be the cause of anything else,” than Butler’s conclusion, “so that any one thing whatever may, for aught we know to the contrary, be a necessary condition to any other?”~~

~~It is this strong grasp of the imperfect character of our knowledge of nature and of the grounds for its limitation that makes Butler so formidable an opponeut to his deistical contemporaries. He will permit no anticipations of nature, no a@ priort construction of experience. “The constitution of nature is as it is,’ and no system of abstract principles can be allowed to take its place. Heis willing with Hume to take the course of experience as the basis of his reason- ing, seeing that it is common ground for himself and his antagonists. In one essential respect, however, he goes beyond Hume. ‘The course of nature is for him an un- meaning expression, unless it be referred to some author ; and he therefore makes extensive use of the teleological method. This position is assumed throughout the treatise, and as against the deists with justice, for their whole argument rested upon the presupposition of the existence of God, the perfect Ruler of the world.~~

~~The premises, then, with which Butler starts are the exist- ence of God, the known course of nature, and the necessary limitation of our knowledge. What does he wish to prove 4 It is not his intention to prove God’s perfect moral government over the world or the truth of religion. His work is in no sense a philosophy of religion. His purpose is entirely defensive ; he wishes to answer objections that have been brought against religion, and to~~

~~examine certain difficulties that have been alleged as insuperable. And this is to be effected in the first place by showing that from the obscurities and inexplicabilities we meet with in nature we may reasonably expect to find similar difficulties in the scheme of religion. If difficulties be found in the course and constitution of nature, whose author is admitted to be God, surely the existence of similar difficulties in the plan of religion can be no valid objection against its truth and divine origin. That this is at least in great part Butler's object is plain from the slightest inspection of his work. It has seemed to many to be an unsatisfactory mode of arguing and but a poor defence of religion; and so much the author is willing to allow. But in the general course of his argument a somewhat wider issue appears. He seeks to show not only that the difficulties in the systems of natural and revealed religion have counterparts in nature, but also that the facts of nature, far from being adverse to the principles of religion, are a distinct ground for inferring their probable truth. He endeavours to show that the balance of probability is entirely in favour of the scheme of religion, that this probability is the natural conclusion from an inspection of nature, and that, as religion is a matter of practice, we are~~

~~bound to adopt the course of action which is even probably the right one. If, we may imagine him saying, the precepts of religion are entirely analogous in their partial obscurity and apparent difficulty to the ordinary course of nature dis- closed to us by experience, then it is credible that these precepts are true; not only can no objections be drawn against them from experience, but the balance of probability is in their favour. This mode of reasoning from what is known of nature to the probable truth of what is contained in religion is the celebrated method of analogy.~~

~~Although Butler's work is peculiarly one of those which ought not to be exhibited in outline, for its strength lies in the organic completeness with which the details are wrought into the whole argument, yet a summary of his results will throw more light on the method than any description can.~~

~~Keeping clearly in view his premises—the existence of God and the limited nature of knowledge,—Butler begins by inquiring into the fundamental prerequisite of all natural religion—the immortality of the soul. Evidently~~

~~the stress of the whole question is here. Were man not immortal, religion would be of little value. Now, Butler does not attempt to prove the truth of the doctrine; that proof comes from another quarter. The only questions he asks are—Does experience forbid us to admit immortality as a possibility? Does experience furnish any probable reason for inferring that immortality is a fact? To the first of these a negative, to the second an affirmative answer is returned. All the analogies of our life here lead us to conclude that we shall continue to live after death ; and neither from experience nor from the reason of the thing can any argument against the possibility of this be drawn. Immortality, then, is not unreasonable ; it is probable. If, he continues, we are to live after death, it is of importance for us to consider on what our future state may depend ; for we may be either happy or miserable. Now, whatever speculation may say as to God's purpose being necessarily universal benevolence, experience plainly shows us that our present happiness and misery depend upon our conduct, and are not distributed indiscriminately. Therefore no argument can be brought from experience against the possibility of our future happiness and misery likewise depending upon conduct. The whole analogy of nature is in favour of such a dispensation ; it is therefore reasonable or probable. Further, we are not only under a government in which actions considered simply as such are rewarded and punished, but it is known from experience that virtue and vice are followed by their natural consequents—happiness and misery. And though the distribution of these rewards is not perfect, all hindrances are plainly temporary or acci- dental. It may therefore be concluded that the balance of probability is in favour of God's government in general being a moral scheme, where virtue and vice are respectively rewarded and punished. It need not be objected to the justice of this arrangement that men are sorely tempted, and may very easily be brought to neglect that on which their future welfare depends, for the very same holds good in nature. Experience shows man to be in a state of trial so far as regards the present; it cannot, therefore, be unreasonable to suppose that we are in a similar state as regards the future. Finally, it can surely never be advanced as an argument against the truth of religion that there are many things in it which we do not comprehend, when experience exhibits to us such a copious stock of incom- prehensibilities in the ordinary course and constitution of nature.~~

~~It cannot have escaped observation, that in the foregoing course of argument the conclusion is invariably from experience of the present order of things to the reasonable- ness or probability of some other system—of a future state. The inference in all cases passes beyond the field of~~

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~~experience ; that it does so may be and has been advanced as a conclusive objection against it.~~

~~exactly adjusted to them. That the divinity may possibly be endowed with attributes which we have never seen exerted, may be governed by principles of action which we cannot discover to be satisfied,—all this will freely be allowed. But still this is mere possibility and hypothesis. We never can have reason to infer any attributes or any principles of action in him, but so far as we know them to have been exerted and satisfied…. Are there any marks of distributive justice in the world? If you answer in the affirmative, I conclude that since justice here exerts itself, it is satisfied. If you reply in the negative, I conclude that you have then no reason to ascribe justice in our sense of it to the gods. If you hold a medium between affirma- tion and negation, by saying that the justice of the gods at present exerts itself in part, but not in its full extent, I answer, that you have no reason to give it any particular extent, but only so far as you see it at present exert itself." (Works, ed. 1854, iv. 161-2, cf. p. 160.) In short no argument from experience can ever carry us beyond ex- perience itself. However well grounded this reasoning may be, it altogether misses the point at which Butler aimed, and is indeed a misconception of the nature of analogical argument. Butler never attempts to prove that a future life regulated according to the requirements of ethical law is a reality ; he only desires to show that the conception of such a life is not irreconcilable with what we know of the course of nature, and that consequently it is not unreasonable to suppose that there is such a life. Hume, it will be observed, readily grants as much, though he hints at a formidable difficulty which the plan of the Analogy prevented Butler from facing, the proof of the existence of God. Butler seems willing to rest satisfied with his opponents' admission that the being of God is proved by reason, but it would be hard to discover how,**

~~upon his own conception of the nature and limits of reason, such a proof could ever be given. It has been said that it is no flaw in Butler's argument that he has left atheism as a possible mode of viewing the universe, because his work was not directed against the atheists. It is, however, in some degree a defect; for his defence of religion against the deists rests on a view of reason which would for ever pre- clude a demonstrative proof of God's existence.~~

~~If, however, his premises be granted, and the narrow issue kept in view, the argument may be admitted as perfectly satisfactory. From what we know of the present order of things, it is not unreasonable to suppose that there will be a future state of rewards and punishnients, distributed according to ethical law. When the argument from ana- logy seems to go beyond this, a peculiar difficulty starts up. Let it be granted that our happiness and misery in this life depend upon our conduct,—are, in fact, the rewards and punishments attached by God to certain modes of action, the natural conclusion from analogy would seem to be that our future happiness or the reverse will probably depend upon our actions in the future state. Butler, on the other hand, seeks to show that analogy leads us to believe that our future state will depend upon our present conduct.~~

~~His argument, that the punishment of an |~~

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~~imprudent act often follows after a long interval may be admitted, but does not advance a single step towards the conclusion that imprudent acts will be punished hereafter. So, too, with the attempt to show that from the analogy of the present life we may not unreasonably infer that virtue and vice will receive their respective rewards and punish- ments hereafter; it may be admitted that virtuous and vicious acts are naturally looked upon as objects of reward or punishment, and treated accordingly, but we may refuse to allow the argument to go further, and to infer a perfect distribution of justice dependent upon our conduct here. Butler could strengthen his argument only by bringing forward prominently the absolute requirements of the ethical consciousness, in which case he would have approximated to Kant's position with regard to this very problem. That he did not do so is,~~

~~perhaps, due to his strong desire to use only such premises as his adversaries the deists were willing to allow.~~

~~As against the deists, however, he may be allowed to have made out his point, that the substantial doctrines of natural religion are not opposed to reason and experience, and may be looked upon as credible. The positive proof of them is to be found in revealed religion, which has disclosed to us not only these truths, but also a further scheme not discoverable by the natural light. Here, again, Butler joins issue with his opponents. Revealed religion had been declared to be nothing but a republication of the truths of natural religion (Tindal, Christianity as Old as the Creation), and all revelation had been objected to as impossible. To show that such objections are invalid, and that a revelation is at least not impossible, Butler makes use mainly of his doctrine of human ignorance. Revela- tion had been rejected because it lay altogether beyond the sphere of reason and could not therefore be grasped by human intelligence. But the same is true of nature; there are in the ordinary course of things inexplicabilities ; indeed we may be said with truth to know nothing, for there is no medium between perfect and completed comprehension of the whole system of things, which we manifestly have not, and mere faith grounded on probability. Is it unreasonable to suppose that in a revealed system there should be the same superiority to our intelligence? If we cannot explain or foretell by reason what the exact course of events in nature will be, is it to be expected that we can do so with regard to the wider scheme of God's revealed providence ? Is it not probable that there will be many things not explicable by us? From our experience of the course of nature it would appear that no argument can be brought against the possibility of a revelation. Further, though it is the province of reason to test this revealed system, and though it be granted that, should it contain anything im- moral, it must be rejected, yet a careful examination of the particulars will show that there is no incomprehensibility or difficulty in them which has not a counterpart in nature. The whole scheme of revealed principles is, therefore, not unreasonable, and the analogy of nature and natural religion would lead us to infer its truth. If, finally, it be asked, how a system professing to be revealed can substantiate its claim, the answer is, by means of the historical evidences, such as miracles and fulfilment of prophecy.~~

~~It would be unfair to Butler's argument to demand from it answers to problems which had not in his time arisen, and to which, even if they had then existed, the plan of his work would not have extended. Yet it is at least important to ask how far, and in what sense, the Analogy can be regarded as a positive and valuable contribution to theology. What that work has done is to prove to the consistent deist that no objections can be drawn from reason or experience against natural or revealed religion, and, consequently, that the things objected to are not incredible~~

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~~and may be proved by external evidence. But the deism of the 17th century is a phase of thought that has no living reality now, and the whole aspect of the religious problem has been completely changed. Toa generation that has been moulded by the philosophy of Kant and Hegel, and by the historical criticism of Strauss and the later German theology, the argument of the Analogy cannot but appear to lie quite outside the field of controversy. To Butler the Christian religion, and by that he meant the orthodox Church of England system, was a moral scheme revealed by a special act of the divine providence, the truth of which was to be judged by the ordinary canons of evidence. The whole stood or fell on historical grounds. A speculative construction of religion was a thing abhorrent to him, a thing of which he seems to have thought the human mind naturally incapable. The religious consciousness does not receive from him the slightest consideration, whereas it is with its nature and functions that the scientific theology of the present time is almost entirely occupied. The Analogy, it would appear, has and can have but. little influence on the present state of theology ; it was not a book for all time, but was limited to the controversies and questions of the period at which it appeared.~~

~~Throughout the whole of the Analogy, it is manifest that the interest which lay closest to Butler's heart was the ethical. His whole cast of thinking was practical. The moral nature of man, his conduct in life, is that on account of which alone an inquiry into religion is of importance. The systematic account of this moral nature is to be found in the famous Sermons preached at the Chapel of the Rolls, especially in the first three. In these sermons~~

~~Butler has made substantial contributions to ethical science, and it may be said with confidence, that in their own department nothing superior in value appeared during the long interval between Aristotle and Kant. To both of these great thinkers he has certain analogies. He resembles the first in his method of investigating the end which human nature is intended to realize ; he reminds of the other by the con- sistency with which he upholds the absolute supremacy of moral law.~~

~~In his ethics, as in his theology, Butler had constantly in view a certain class of adversaries, consisting partly of the philosophic few, partly of the fashionably-educated many, who all participated in one common mode of thinking. The key-note of this tendency had been struck by Hobbes, in whose philosophy man was regarded as a mere sensitive machine, moved solely by pleasures and pains. Human nature had come to be looked upon as essentially selfish ; disinterested actions were sneered at as impossibilities by the many, and were explained away into modifications of selfishness by the scientific moralists. Cudworth and Clarke, it is true, had tried to place ethics on a nobler footing, but their speculations had been of the abstract kind, which was always distasteful to Butler. They were not practical enough, were not sufficiently "'applicable to the several particular relations and circumstances of life." He desired to base ethical law not on abstract theory, but on the actual facts of human nature.~~

~~The fundamental view of things from which he starts in his inquiry may be called the teleological. '" Every work, both of nature and art, is asystem; and as every particular thing both natural and artificial is for some use or purpose out of or beyond itself, one may add to what has been already brought into the idea of a system its conduciveness to this one or more ends." Ultimately this view of nature, as the sphere of the realization of final causes, rests on a theological basis ; but Butler does not introduce prominently into his ethics the specifically theological groundwork, and may be thought willing to ground his principle on ex- perience. The ethical question then is, as with Aristotle,~~

~~what is the réAos of man? He is placed in the world with many courses of action opento him, What is that line of activity which is correspondent to, or~~

~~is the realization of, his true nature? The answer to this question is to be obtained by an analysis of the facts of human nature, whence, Butler thinks, “ it will as fully appear that this our nature, z.¢., constitution, is adapted to virtue, as from the idea of a watch it appears that its nature, 2.¢., con- stitution or system, is adapted to measure time.” Such analysis had been .already attempted by Hobbes, and the result he came to was that man naturally is adapted only for a life of selfishness,—his end is the procuring of plea- sure and the avoidance of pain. A closer examination, however, shows that this at least is false. The truth of the counter propositions, that man is vce: wodurexds, natu- rally social, and that the full development of his being is impossible apart from society, becomes manifest on the slightest examination of the facts. For while self-love plays a most important part in the human economy, there is no less evidently a natural principle of benevolence, prompting actions which have for their end the good of others. Moreover, among the particular passions, appetites, and desires there are some whose tendency is as clearly towards the general good as that of others is towards our own satisfaction. Finally, that principle in man which reflects upon actions and the springs of actions, which approves some and disapproves others, unmistakably sets the stamp of its approbation upon conduct that tends towards the general good. It is clear, therefore, that’ we were made for society; man is {@ov woAutixdv, and from this point of view the sum of practical morals might be given in Butler’s own words,—“ that mankind is a com- munity, that we all stand in a relation to each other, that there is a public end and interest of society, which each particular is obliged to promote.” But deeper questions remain.~~

~~The threefold division into passions and affections, self- love and benevolence, and conscience, is Butler’s celebrated analysis of human nature. In the handling of the several parts he shows remarkable psychological power, and succeeds in obviating many of the difficulties drawn from the principles of the selfish theory of ethics. He is especially concerned to show that self-love and benevolence are in no sense opposed to one another. This he does by examining the function of self-love and the relation it bears to the passions. ‘The special desires or affections are the expressions of wants in our nature which are to be satisfied by the possession of definite things. The objects of the desires are therefore the things naturally adapted to satisfy them, and not the pleasure which is the~~

~~ac- companiment of satisfaction. The passions tend towards their objects as ultimate ends, and are consequently unselfish or disinterested. On the other hand, self-love aims at procuring happiness for the individual; and happiness means the general satisfaction of desires. Self- love is therefore distinct from the particular desires, but is completely dependent on them. Its end is the attainment of pleasure, and it desires external things only as means towards this. In itself it has no actual content; it only directs the particular passions towards their ends, and frequently, by fixing its attention too much upon its own goal, personal happiness, is in danger of defeating its own endeavours. Self-love is therefore distinct from and in no way opposed to the particular affections which are them- selves disinterested. Just as little opposition is there between self-love and disinterested benevolence. An affection which finds its gratification in some external object and rests in it as a final end, is in no sense opposed to self-love. This is one of the most important parts of Butler's ethical psychology.~~

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~~Up to this point he has merely analyzed the various parts of human nature, and has pointed out the course of action corresponding to each. But in a system or organ- ism the parts do not exist for themselves but for the whole. The idea of human nature is not completely expressed by saying that it consists of reason and the several passions. "Whoever thinks it worth while to consider this matter thoroughly should begin by stating to himself exactly the idea of a system, economy, or constitution of any particular nature ; and he will, I suppose, find that it is one or a whole, made up of several parts, but yet that the several parts, even considered as a whole, do not complete the idea, unless in the notion of a whole you include the relations and respects which these parts have to each other." This fruitful conception of man's ethical nature as an organic unity Butler owes directly to Shaftesbury and indirectly to Aristotle ; it is the strength and clearness with which he has grasped it that gives peculiar value to his system.~~

~~The special relation among the parts of our nature to which Butler alludes is the subordination of the particular passions to the universal principle of reflection or con- science. This relation is the peculiarity, the cross, of man ; and when it is said that virtue consists in following nature, we mean that it~~

~~consists in pursuing the course of conduct dictated by this superior faculty. Man's function is not fulfilled by obeying the passions, or even cool self-love, but by obeying conscience. That conscience has a natural supremacy, that it is superior in kind, is evident from the part it plays in the moral consti- tution. We judge a man to have acted wrongly, ie., unnaturally, when he allows the gratification of a passion to injure his happiness, 2.e., when he acts in accordance with passion and against self-love. It would be impossible to pass this judgment if self-love were not regarded as superior in kind to the passions, and this superiority results from the fact that it is the peculiar province of self-love to take a view of the several passions and decide as to their relative importance. But there is in man a faculty which takes into cousideration all the springs of action, including self- love, and passes judgment upon them, approving some and condemning others. From its very nature this faculty is supreme in authority, if not in power ; it reflects upon all the other active powers, and pronounces absolutely upon their moral quality. Superintendency and authority are constituent parts of its very idea. Weare under obligation to obey the law revealed in the judgments of this faculty, for it is the law of our nature. And to this a religious sanction may be added, for "consciousness of a rule or guide of action, in creatures capable of considering it as given them by their Maker, not only raises immediately a sense of duty, but also a sense of security in following it, and a sense of danger in deviating from it." Virtue then consists in following the true law of our nature, that is, conscience. Butler, however, is by no means very explicit in his analysis of the functions to be ascribed to conscience. He calls it the Principle of Reflexion, the Reflex Principle of Approbation, and assigns to it as its province the motives or propensions to action. It takes a view of these, approves or disapproves, impels to or restrains from action. But at tunes he uses language that almost compels one to attribute to him the popular view of conscience as passing its judgments with unerring certainty on individual acts. Indeed his theory is weakest exactly at the point where the real difficulty begins. We get from him no satisfactory answer to the inquiry, What course of action is approved by conscience? Everyone, he seems to think, knows what Virtue is, and a philosophy of ethics is complete if it can be shown that such a course of action harmonizes with human nature. When pressed still further, he points to justice, veracity, and the common good as comprehensive ethical~~

ends. JIlis whole view of the moral government led him to look upon human nature and virtue as connected by a sort of pre-established harmony. His ethical principle has in it no possibility of development into a system of actual duties ; it has no content. Even on the formal side it is a little difficult to see what part conscience plays. It seems merely to set the stamp of its approbation on certain courses of action to which we are led by the various passions and affections ; it has in itself no originating power. How or why it approves of some and not of others is left unexplained. Butler's moral theory, like those of his English contemporaries and successors, is defective from not perceiving that the notion of duty can only have real significance when connected with the will or practical reason, and that only in reason which wills itself have we a principle capable of development into an ethical system.

It has frequently been made the ground of objection to Butler's philosophy of man's moral nature that he did not carry his analysis far enough, and that he accepted as ultimate facts what are really compounded of simpler elements. His distinction between self-love and the passions has in particular been rejected on the plea that the end of appetite or desire is not the object suited to satisfy it, but pleasure, or at least the removal of uneasiness. This last, however, is fairly included under Butler's expression, "gratification of the passions." The removal of uneasiness no doubt results in pleasure, but it is not the pleasure that removes the uneasiness. What is really sought is the object that will satisfy us, that will fill up the want in our existence, and with which we, so to speak, identify ourselves. With regard to the general objection, even were it granted that self-love and benevolence are developments from the passions, the relations between them would none the less hold good. Self-love is not superior to the passions, because it has been originally created their superior, but because under the sphere of its inspection and decision the particular desires are included ; it stands above them because they form the objects upon which it works. Further, growth or development, deeply considered, does not invalidate authority or superiority in kind. The ethical consciousness, like all other parts of our nature, grows ; it is only by degrees and slowly that man comes to the full recognition of the reason that lies in him and forms

~~his true personality. He is moral at first only dvvape, and the varying conditions of experience are requisite in order to afford the means of development from this mere poten- tiality. The customary observances and legal precepts, in which the common ethical consciousness of humanity has given expression to itself, are being continually tested by comparison with the formal requirements of the inner law of duty, and change gradually as they are found at various epochs to be imperfect realizations of reason. The ulti- mate goal of all such progress is that state of ethical observance in which rights and duties come to be recog- nized as the outcome of human personality, and the realiza- tion of true freedom.~~

~~Bartlett, Memoirs of Butler, 1839. The best edition of Butler's works is that in 2 vols., Oxford. Editions of the Analogy are very numerous; that by Fitzgerald, 1849, contains a valuable Life and Notes. Whewell has published an edition of the Three Sermons, with Introduction. The analyses of the Analogy by Duke (1847) and Wilkinson (1847), Chalmers's Prelections (posthumous works, ix.), Napier's Lectures, (1864), and Swainson's Handbook may be consulted with advantage. For the history of the religious works contemporary with the Analogy, see Lechler, Ges. d. Hngl. Deis- mus; Pattison, in Essays and Reviews ; Hunt's Religious Thought in England, vols. ii. and iui.; A. S. Farrar, Critical History of Free Thought. For Butler's ethics see Mackintosh, Whewell, and Jouff- roy. It is quite surprising that German historians of ethics should ignore Butler. Feuerlein, Fichte, Wuttke, and Trendelenburg totally omit mention of his name; Vorlinder, in his Ges. d. Phil. Moral, Rechts- und Staats-lehre d. Englinder u. Franzosen, de- votes three pages to Butler and fifteen to Bolingbroke. (R. AD.)~~

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~~BUTLER, Samuzt (1612-1680), whose name appears to have been spelt Boteler in official documents to the end of his life, was born at Strensham onthe Avon in Worcestershire. He was baptized on the 8th of February 1612. His father, who was of the same name and was then churchwarden, 1s variously represented as a substantial farmer (owning a small freehold, and leasing from Sir William Russel a considerable farm valued at £300 a year), and as "a man of but slender fortune," who was barely able to educate his~~

~~son at a free school. The author of Hudibras was appa- rently educated at the college (or cathedral) school, Worcester, and the house in which he was born was pulled down (being considered incapable of repair) about 1873. Hardly any other particulars of his youth are recorded, and his later education (if he received any) is equally uncertain. He has been loosely asserted (as is the case with many other distinguished persons of his century) to have studied at both Cambridge and Oxford, but the balance of testimony seems to be against his having belonged to either univer- sity. The time between the completion of his education (circa 1630) and the Restoration, a period of fully thirty years, appears to have been spent by him in three different households, with Mr Jefferies of Earl's Croome in Worcester- shire, with the countess of Kent at Wrest in Bedfordshire, and with Sir Samuel Luke at Woodend or Cople Hoo in the same county. He served Mr Jefferies in the capacity of justice's clerk, and is supposed to have thus laid the foundation of his remarkable knowledge of law and law terms. He also employed himself at Earl's Croome in general study, and particularly in painting, which he is said to have thought of adopting asa profession. It is probable, however, that art has not lost by his change of mind, for, according to one of his editors, in 1774 his pictures "served to stop windows and save the tax; indeed they were not fit for much else." At Wrest, where he is said to have been gentleman to the countess, he pursued his studies iu painting, drawing, and music; probably, also, in other directions, for Wrest contained a good library. Here he met and worked for Selden. But his third sojourn, that at Cople Hoo, was not only apparently the longest, but also much the most important in its effects on his career and works,~~

~~We are nowhere informed, nor is it at all clear, in what capacity Butler served Sir Samuel Luke, or how one who was not only in temper and sympathies, but also from early associations, a decided royalist, came to reside in the house of a noted Puritan and Parliament man. In the family of this "valiant Mamaluke," who, whether he was or was not the original of Hudibras, was certainly a rigid Pres- byterian, "a colonel in the army of the Parliament, scoutmaster-general for Bedfordshire and governor of New-port Pagnell," Butler must have had the most abundant opportunities of studying from the life those who were to be the victims of his great future satire. But we know not how long he held his situation (whatever it was)~~

~~under the knight of Cople, and we hear nothing positive of him till the Restoration, immediately after which he was appointed secretary to Lord Carbery (then President of Wales) and steward of Ludlow Castle. Contradictory documents exist respecting his tenure of the latter office, one speaking of him as "late steward" in January 1662, the other (a protection against arrest) addressed to him as steward in September 1667. About this time he married a Mrs Herbert, according to Aubrey a widow with a good jointure, on whose means he lived comfortably. Aubrey knew him well and could hardly be wrong on such a point, especiallyas his testimonyas to Butler's livingin comparative comfort is confirmed by another authority to be afterwards mentioned. It should, however, be observed that other accounts state that Mrs Herbert's fortune was lost through~~

~~bad securities. Late in 1662 the first part of Hudibras was published. On the 26th of December Pepys bought it, and though neither then nor afterwards could he see the wit of it, he repeatedly testifies to its extraordinary popularity. This popularity is most clearly proved by the issue of a pirated edition within a month, and by the appear- ance of a spurious second part within the year. This latter compliment (which it will be remembered was also paid to Butler's spiritual ancestor Cervantes) determined the poet to bring out the second part, which was licensed on November 7, 1663, and which if possible exceeded the first in popularity. From this time till 1678, the date of the publication of the third part, we hear nothing certain and hardly anything at all of Butler. He appears at some period to have visited France. He is said to have received a gift of £300 from Charles I1., and to have been secretary to Buckingham when the latter was Chancellor of the University of Cambridge. Most of his biographers, in their eagerness to prove the ill-treatment which Butler is supposed to have received, disbelieve both these stories, perhaps without sufficient reason. It must be allowed that it is scarcely a valid argument that Butler, if he had been secretary to Buckingham, would not have spoken so severely of that nobleman in his Characters (Remains, 1754), when it is remembered that he satirized Sir Samuel Luke, to whom he held nearly the same relation, with certainly equal virulence. Two years after the publication of the third part he died (September 25, 1680), and was buried by his friend Mr William~~

~~Longueville (a bencher of the Middle Temple) in the churchyard of St Paul's, Covent Garden. He was, we are told, "of a leonine-coloured hair, sanguine, choleric, middle-sized, strong." Portraits exist at Oxford and elsewhere which represent him as somewhat hard-featured. Two personal anecdotes, and perhaps two only, are recorded of him. One is the well-known story which tells how Wycherly laboured hard to secure for the neglected poet the patrou- age of Buckingham, how an interview was at last arranged, from which the duke was, alas! called off by the passage of ''a brace of ladies," and how the opportunity was lost. The other bears suspicious marks of having been made up as setting fora witticism of Lord Dorset's. Dorset, it seems, was anxious to know the author of Hudibras, and prevailed on a common friend to bring him to a tavern. At the first bottle Butler was quiet and reserved, at the second full of wit and spirits, at the third dull and stapid,—upon which Dorset's comment was that Butler was "like a nine-pin, little at both ends, but great in the middle." Of these stories it may be said, as of most such, that they may be true and cannot be proved to be false.~~

~~Of the neglect of Butler by the Court something must be~~

~~said. It must be remembered that the complaints on the~~

~~subject supposed to have been uttered by the poet all occur in the spurious posthumous works, that men of letters have been at all times but too prone to complain of lack of patronage (a fact which makes it probable that Dryden, Otway, Oldham, é&c., in alluding to Butler, spoke as the proverb of that day went, "one word for him and two for themselves"), that the actual service rendered by Butler was rendered when the day was already won, and that the pathetic stories of the poet starving and dying in want are contradicted by the best authority—Mr C. Longueville (son of the poet's friend)—who asserted that Butler, though often disappointed, was never reduced to anything like want or beggary, and did not die in any person's debt. But the most significant story on the subject is Aubrey's, that "he might have had preferments at first, but would not accept any but very good, and so got none."~~

~~Three monuments have been at different times and places erected to the poet's memory,—the first in 1721 by~~

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~~Alderman Barber in Westminster Abbey. This was the occasion of some rather misplaced wit from Pope and others. In 1786 a tablet was placed in St Paul's, Covent Garden, by some inhabitants of that parish. This was destroyed in 1845. Some thirty or forty years ago another was set up at Strensham by a Mr Taylor of that place. Perhaps the happiest epitaph ou him is one by Dennis, which (borrowing, indeed, its most striking expression from Cowley) sets forth that Butler "was a whole species of poets in one."~~

~~Butler's published works during his life consisted of the three parts of Hudibras (the second and third – were republished together in 1674, with notes by the author) ; of an Ode on Duval (the famous highwayman) ; and of two pamphlets attributed to Prynne. In 1715 three volumes, entitled Posthumous Works of Mr S. Butler, were published with great success. Their contents, however, are all spurious except one or two short pieces. The poet's papers remained in the hands of his friend Mr Longueville, and were not published till 1759, when Mr Thyer, librarian at Manchester, edited two volumes of verse and prose under the title of Genuine Remains. The most remarkable of the prose writings are characters of the kind popular in the 17th century, and partaking largely of the faults usual in such pieces. To this some additional fragments were added in 1822; a fragment of a tragedy on Nero is also spoken of. In 1726 Hogarth executed some illustrations to Hudibras, which are among his earliest but not, perhaps, happiest productions. In 1744 Dr Zachary Grey published an edition of Zudibras, which has been repeatedly reprinted, and has formed (with that of Nash in 1793) the basis of all subsequent editions. It contains an enormous mass of notes, displaying little critical or literary power, but abounding in curious information. A worthy edition is still to seek ; but that of the late Mr R. Bell is convenient, aud supplies much information, which is generally accurate. Mr Bohn's (of Hudzbras only) is also useful. Butler's lesser works would of themselves fairly sustain, though perhaps they would hardly create, a great reputation. Abundance of happy thought, of ingenious expression, and of vigorous verse, may be found in the Miscellaneous Thoughts, the Ode on Duval, and the Sateres on the Royal Society (The~~

~~Elephant in the Moon) and on Critics. But the splendour of Hudibras has somewhat paled their fire,~~

~~Hudibras itself, though probably quoted as often as ever, has perhaps dropped into the class of books which are more quoted than talked of, and more talked of than read. In reading it, it is of the utmost importance to compre- hend clearly and to bear constantly in mind the purpose of the author in composing it. This purpose is evidently not artistic but polemic, to show in the most unmistakable characters the vileness and folly of the anti-royalist party. Anything like a regular plot—the absence 'of which has often- been deplored or excused—would have been for this end not merely a superfluity but a mistake, as likely to divert the attention and perhaps even enlist some sympathy forthe heroes. Anything like regular character-drawing would have been equally unnecessary and dangerous—for to represent anything but monsters, some alleviating strokes must have been introduced. The problem, therefore, was to produce characters just sufficiently unlike lay-figures to excite and maintain a moderate interest, and to set them in motion by dint of a few incidents not absolutely uncon-nected,—meanwhile to subject the principles and manners of which these characters were the incarnation to ceaseless satire and raillery. The triumphant solution of the pro- blem is undeniable, when it has once been enunciated and understood. Upon a canvas thus prepared and outlined, Butler has embroidered a collection of flowers of wit, which~~

~~only the utmost fertility of imagination could devise, and the utmost patience of industry elaborate. In the union of these two qualities he is certainly without a parallel, and their combination has produced a work which is unique. The poem is of considerable length, extending to more than ten thousand verses, yet Hazlitt hardly exaggerates when he says that "'half the lines are got by heart ;" indeed a diligent student of later English literature has read great part of Hudibras though he may never have opened its pages. The tableaux or situations, though few and simple in construction, are ludicrous enough. The knight and squire setting forth on their journey; the routing of the bear-baiters; the disastrous renewal of the contest ; Hudibras and Ralph in the stocks ; the lady's release and conditional~~

~~acceptance of the unlucky knight ; the latter's deliberations on the means of eluding his vow; the Skimmington ; the visit to Sidrophel, the astrologer ; the attempt to cajole the lady, with its woeful consequences ; the consultation with the lawyer, and the immortal pair of letters to which this gives rise complete the argument of the whole poem. But the story is as nothing; through- out we have little really kept before us but the sordid vices of the sectaries, their hypocrisy, their churlish ungracious- ness, their greed of money and authority, their fast and loose morality, their inordinate pride. The extraordinary felicity of the means taken to place all these things in the most ridiculous light has never been questioned. The doggrel metre, never heavy or coarse, but framed so as to be the very voice of mocking laughter, the astounding similes and disparates, the rhymes which seem to chuckle and to sneer of themselves, the wonderful learning with which the abuse of learning is rebuked, the subtlety with which subtle casuistry is set at nought can never be missed. Keys like those of L'Estrange are therefore of little use. It signifies nothing whether Hudibras was Sir Samuel Luke of Bedfordshire or Sir Henry Rosewell of Devonshire, still less whether Ralph's name in the flesh was Robinson or Pendle, least of all that Orsin was perhaps Mr Gosling, or Trulla possibly Miss Spencer. Butler was probably as little indebted to mere copying for his characters as for his ideas and style. These latter are in the highest degree original. The first notion of the book, and only the first notion, Butler undoubtedly received from Don Quixote. His obligations to the Satyre Ménippée have been noticed by Voltaire, and though English writers have sometimes ignored or questioned them, are not to be doubted by any student of the two books. The art (perhaps the most terrible of all the weapons of satire) cf making characters without any great violation of probability represent them- selves in the most atrocious and despicable light was never perhaps possessed in perfection except by Pithou and his colleagues and by Butler. Against these great merits some defects must certainly be set. As a whole, the poem is no doubt tedious, if only on account of the very blaze of wit, which at length almost wearies us by its ceaseless demands on our attention. It should, however, be remembered that it was originally issued in parts, and therefore (it may be supposed) intended to be read in parts, for there can be little doubt that the second part was written before the first was published, A more real defect, but one which Butler shares with all his contemporaries from Jonson downwards, is the tendency to delineate humours instead of characters, and~~

~~to draw from the outside rather than from within. This also may be partially palliated by some remarks made above.~~

~~Attempts have been made without much success to trace the manner and versification of Hudibras, especially in Cleveland and in the Musarum Delicice (lately reprinted) of Sir John Mennis (Pepys's Minnes) and Dr Smith. But if it had few ancestors it had an abundant offspring, A~~

~~list of seventeen direct imitations of Z[udibras in the course of a century was given in the Retrospective Review, and may be found in Mitford's Butler. Portions of it have been at different times translated into Latin with no great success. Complete translations of considerable excellence have been made into French by John Townley (London, 1757, 3 vols.), and into German by D. W. Soltau (Riga, 1787) ; specimens of both may be found in Bell's edition. Voltaire tried his hand at a compressed version, but not happily. (c. SA.) BUTLER, Wiuam Arcuer (1814-1848), a brilliant writer on theology and the history of philosophy, was born at Annerville, near Clonmel, probably in 1814. His father was a Protestant, his mother a Roman Catholic, and he was brought up in the Romish faith. At the age of nine he was sent to Clonmel school, where he distinguished himself not so much by rigid attention to his class work as by general brilliancy and power. Even when a boy he was strongly drawn towards the imaginative and poetical, and some of his early verses show an astonishing precocity. After leaving Clonmel school he entered Trinity College, Dublin. Two years before he had joined the Protestant church. His career at college was remarkably brilliant. The studies to which he specially devoted himself were the literary and metaphysical; and he was particularly noted for the extreme beauty of his style, both in speaking and in written exercises. In 1834 he gained the ethical moderatorship, newly instituted by Provost Lloyd, and continued in residence at college, pursuing his favourite studies. Many papers were about this time contributed by him to the Dublin University Magazne ; it is to be regretted that these have not been collected. In 1837 he made up his mind to enter the church, and in the same year he was elected to the professorship of moral philosophy, specially founded for him through the exertions of Provost Lloyd. About the same time he was~~

~~presented to the prebend of Clondehorka, in Donegal, and resided there when not called by his professorial duties to Dublin. In 1842 he was promoted to the rectory of Raymoghy. His lectures and his sermons were equally admired for their strength of thought and richly imaginative style. In 1845 appeared in the /rish Ecclesiastical Journal his Letters on Development, written under a great press of business, but in every way worthy of the author, and the best reply made to the famous essay of Newman which had called them forth. Butler's life was but short. He caught cold when returning one day from public service ; the cold termi- nated in fever, which proved fatalin a fewdays. He died on the 5th July 1848. His Sermons, published in two vols. by Woodward and Jeremie, have been universally recog- nized as among the most important recent contributions to theology. They are remarkable not only for rare brilliancy of style, but for subtilty and force of thought. The diction is at times too ornate and rhetorical, but it is not to be forgotten that the sermons were hurriedly written, were never revised, and were all the work of a young man. Their uncommon excellence deepens the regret at the early death of the author. The Lectures on the History of Ancient Philosophy, edited in a masterly manner by W. Hepworth Thompson (2 vols. 1856; 2d ed., 1 vol. 1875), have taken their place as the best among the few British works on the history of philosophy. The ihitroductory lectures, and those on the early Greek thinkers, are not of the highest value, and though they evidence wide reading, do not shew the complete mastery over the material that is found in Schwegler or Zeller. The lectures on Plato, however, are of great value, and furnish a most admirable and en- thusiastically conceived exposition of the Platonic sys- tem. Butler was evidently attracted by the lofty spirit of Platonism, and sets forth its main features with the warmest admiration. In details he is not altogether to be~~

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~~trusted, but any defects in his scholarship are amply sup- plied in the valuable notes of his editor.~~

~~See Memoir of W. A, Butler, prefixed by Rev. J. Woodward to first series of Sermons.~~

~~BUTO, an Egyptian goddess, called in the language Uat or Uatiu, the eponymous goddess of the town Buto in Northern Egypt, supposed to be modern Kum el Aman and Kum el gir, on the western banks of the Damietta branch of the Nile. The goddess herself personified Lower Egypt, and as such wore the tesér or red crown, whether in her human form, or typified as a vulture, or ureus, in which respect she resembled Nat or Neith. She presided over fire, and resided in it or the solar eye, and was identified with the goddesses Bast and Sexet or Merienptah, of which she may have been another type. Buto was also considered to represent the Greek Latona, and the ureeus Mahur, and this again connected her with Lower Egypt or the Delta. She was considered to be the regent and mistress of the lands Pe and Tep, districts of her name, of the land of Hanebu or the Greeks, and of Yaneter, the divine land or Arabia, also of Axhu the capital of Xrud, another of the names of Lower Egypt. 'The ideas of the Grecks that she personified darkness, and that the mygale or shrew-~~

~~mouse was sacred to her, are incorrect; for, as already~~

~~stated, Uat presided over the element of fire, and the shrew-mouse appears from the inscriptions on the base of figures of this little animal to have been dedicated to Horus, like the Apollo Smintheus of the Greeks. The name was also given to the capital of a nome ruled over by the deities Har or Horus and Uat or Buto. The Greeks supposed that Buto was the capital of Chemmites or Phthenotes close to the Boutike Lake, the present Burullos, near the old Sebennytic branch of the Nile. It contained several temples, and in that of Buto oracles were delivered, and the temple was 10 orgyai or fathoms high. 'The most remarkable object, however, in it was the monolith shrine 40 cubits or about 60 feet square, with a roof of stone, 4 cubits or about 6 feet thick, and &000 tons weight. It was brought from Elephantina. It appears from an inserip- tion found at Cairo that, during the Persian occupation of Egypt, Khabash, then the ruler of Egypt, had given the nomos Phthenotes to the state of Buto, but that this arrangement was not recognized by Xerxes. Subsc- quently the older arrangement was restored by Ptolemy Lagus about 313 B.c.~~

~~Herodotus, ii. 15; Reinisch, Denkmdler in Miramir, s. 201; Wilkinson, Mann. and Cust., iii. 830, 331, iv. 271-3, v.40; Brugsch, Geographie, i. s.~~

~~58; Jablonski, Panth. Aigypt, iii. 84-116 ; Zeit- schrift fiir ceegyptische Sprache, 1871, p. 1 and foll.~~

~~BUTRINTO, a fortified town of European Turkey on the coast of Albania, in the sandjak of Delvino, directly opposite the island of Corfu, and situated at the mouth of a stream which connects the Lake of Vatzindro with the bay. It has a small harbour, and is the seat of a Greek bishop. In the neighbourhood are the ruins of the ancient Buthrotum, consisting of a Roman wall, about a mile in circumference, and some remains of both later and Hellenic work. Buthrotum was a Roman colony in the time of Strabo, but makes little figure in ancient history. The modern city belonged to the Venetians till 1797, when it was seized by the French, who in 1799 had to yield to the Russians and Turks. Population, 1500.~~

~~BUTTER, is the fatty portion of the milk of mammalian animals. The milk of all mammals contains such fatty constituents, and butter from the milk of goats, sheep, and other animals has been and may be used ; but that yielded by cow's milk is the most savoury, and it alone really con- stitutes the butter of commerce. The milk of the various breeds of cattle varies widely in the proportion of fatty matter it contains; its richness in this respect being~~

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~~greatly influenced by season, nature of food, state of the animals' health, and other considerations. "While the pro- portion of cream to milk in the case of most breeds ranges from one-twentieth to one-tenth, in the case of the celebrated Alderney cattle it amounts to as much as from three to four-tenths. Dr Parkes (Practical Hygiene) gives the following as the average composition of unskimmed milk having a sp. gr. of 1:030 :—~~

~~(CECI eee Bee duos ae 4-0 TE oye age eten ooeemees Bee sca ee: os ee ee 37 Lactin (Sugar of Milk) .....00. 0.0 cccecccccccees 5°0 2011S cat gnceer SU SOS cn ane oe 0°6 HOA OWES ho oies ccc ncsescccesesecccece pes: RVC Tee eo oe bicde Hacemmnce ski ay~~

~~On a low average each pint of milk ought to yield a full half-ounce of butter. 'The fat or butter is disseminated through freshly-drawn milk in minute, clear globules, each of which is enclosed in a thin membranous sac or bag; and being specifically lighter than the mass of the fluid, the globules gradually rise to the surface, bringing mixed with them a proportion of milky matter, and form cream. Usually the cream is skimmed off the surface of the milk for making butter, but by some the churning is performed on the milk itself without waiting for the separation of the cream. 'The operation of churning causes the rupture of the oil sacs, and by the coalescence of the fat so liberated butter is formed. Details regarding churning and the preparation of butter generally will be found under Darry.~~

~~Fresh or unsalted butter of good quality should present a rich straw-yellow colour. At ordinary temperatures it has a firm uniform consistency, while it is soft enough to cut and spread easily under the knife without breaking or crumbling. It should possess a faint sweet odour, and a bland, soft, delicate flavour, melting in the mouth without any indication of grittiness. Pure butter is a complex chemical compound, consisting in large part of fats or~~

~~glycerides of tlie non-volatile acids, palmitic acid, and-~~

~~butyroleic acid, with occasionally stearic acid. With these there occur small proportions of glycerides of the volatile acids, butyric, capronic, caprylic, and caprinic acid, to which the butter owes its distinguishing flavour and char- acteristics, as it has the non-volatile acids in common with other fats, though in different proportions. Butter when unadulterated and prepared with ordinary care should contain at least 85 per cent. of pure fat, the remainder consisting of casein, water, and salt. The casein is derived from milk, which is never perfectly washed out, but in butter of good quality this ought not to amount to more than from 3 to 5 per cent. Water may be present to the extent of from 5 to 10 per cent. without the butter being subject to a charge of adulteration ; and a small proportion of salt is commonly worked into the butter in its prepara- tion, but in what is sold as fresh or sweet this should only be froin 4 to 2 per cent. of the whole weight.~~

~~When butter is exposed to the air for some time, especially in warm weather, or in hot, confined situations, it quickly becomes rancid, acquiring thereby a distinct dis- agreeable odour aud a biting taste, owing to the~~

~~develop- ment of a volatile fatty acid under the influence of a species of fermentation, which is doubtless caused by the nitrogenous substance, casein, it contains. The more completely, there- fore, all milky and curdy matter is washed out of butter the less will be the tendency to set up and develop fermenta- tion. The preservation or curing of butter depends for its efficacy on the employment of some agency by which fermentative action may be prevented ; but there are also Several ways by which its development may be retarded and the material kept sweet for a considerable period. Rancidity may be corrected to some extent by melting the alfected butter and pouring it into ice-cold water. As a~~

~~means also of retarding rancidity, butter is in some parts of France and the East melted up and heated till the water it may contain is evaporated, when the casein which rises as a scum to the surface is carefully skimmed off ; but butter cannot be so melted without injuriously affecting its delicate flavour. By keeping fresh butter in a very cool place covered with pure water renewed daily, it will remain sweet for a considerable time. A. still better method, recommended by M. Payen (Substances Alimentaires) is to use water acidulated with either tartaric acid or vinegar. It is also said that sugar in the form of a syrup poured over the butter is an excellent medium for retarding rancid fermentation. Butter, however, which is to be kept for a considerable length of time is "cured," or preserved by incorporating with it some substance or substances which act upon the nitrogenous material it contains, and thus prevent fermentation ; and for this purpose common salt is the agent chiefly relied on. The salt used should be pure, dry, and finely powdered. About 5 per cent. of salt is sufficient for the purpose of curing; and when the quantity exceeds 8 per cent. it ought to be regarded as an adulteration. Butter very lightly salted for keeping only a short time is said to be powdered. A mixture much used for curing butter in Continental dairies is thus prepared :— One part each of sugar and nitre are mixed up with two parts of common salt and reduced to a very fine powder. This mixture is thoroughly kneaded into the butter in the proportion of about 1 oz. to every ib. After standing over for a fortnight butter so prepared will be ready for use and have a soft, agreeable taste, which it will retain a long time. In the preservation of all butter, the exclusion of air, as much as~~

~~possible, is of the utmost consequence. It is, therefore, packed for sale in oaken kegs or glazed earthenware jars, filled quite full, and covered with a clean linen cloth on which salt is sprinkled. When in use the kegs should also be closely covered over, and the surface of the butter kept under brine. *~~

~~Butter of good quality is a most digestible form of fat, while its flavour is so delicate and little pronounced that it is always acceptable to the palate. It is used most extensively by all classes, not only in the direct form with bread at nearly every meal, but also as entering very largely into the preparation of pastry, puddings, sauces, fancy cakes, and biscuits. Taking into account the daily con- sumption of this article, it is evident that the amount used in a year bya population such as that of Great Britain must be very great, an inference borne out by the fact that in 1875 the imports were 1,619,808 cwts., valued at £9,050,025, and, though no means exist of accurately estimating the home produce, it may safely be regarded as equal to the whole imports. The countries whence butter is imported into Great Britain are chiefly Germany, Holland, Denmark, and especially France. A large proportion of the French butter comes from the department of Calvados — Isigny being the centre of the best butter-making district. The value of the total produce of France in 1867 was estimated at 250 millions of francs.~~

~~Butter is a substance which affords great scope for adulteration, and its composition makes accurate detection of certain foreign matters a matter of considerable labour and difficulty. Other animal fats, such as lard, beef and mutton dripping, and tallow, with certain vegetable fats, are the chief adulterants. Such adulterations may be suspected by their characteristic smell, and detected by their different melting points, by microscopical examination, and by their ethereal solutions. Messrs Angell and Hehner have pro- posed a convenient method of estimating the fusing points of fat by placing a given weight of definite size on the fat, and observing the temperature at which it sinks into the sub- stance. They find that the sinking-point for genuine butter~~

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is remarkably constant, and that it is affected in pro-| in the great majority of butterflies. Owing to this variety

pertion to the amount and sinking point of any adulteraut fats used. Their analysis of butter depends upon the much smaller proportion of non-volatile, insoluble fatty acids it contains, as compared with fats used as adulterants. — Under the name of butterine an artificial substitute for butter has been introduced in America, and imported into England from New York. It is the same as the artificial butter or " niargarine-mouries," which has been for some years manufactured in Paris according to a method made public by the eminent chemist M. Mége-Mouries. Having surmised that the formation of butter contained in milk was due to the absorption of fat contained in the animal tissues, M. Mouries was led to experiment on the splitting up of animal fat. The process he ultimately adopted consisted in heating finely-minced beef suet with water, carbonate of potash, and fresh sheep's stomachs cut up into small fragments. The mixture he raised to a cemperature of 45° C. (113° Fahr.) The influence of the pepsine of the sheep's stomach with the heat separated the fat from the cellular tissue; he removed the fatty matter, and submitted it when cool to powerful hydraulic pressure, separating it into stearin and oleomargarin, which last alone he used for butter-making. Of this fat about the pro- portions of 10 Ib with 4 pints of milk and 3 pints of water were placed in a churn, to which a small quantity of arnotto was added for colouring, and the whole churned together. The compound so obtained when well washed was in general appearance, taste, and consistency like ordinary butter, and when well freed from water it was found to keep a longer time. According to French official reports artificial butter goes much further as food than the genuine article, and forms a perfectly wholesome dietetic material. The Parisian octroi officials have recognized the efficiency of the substitute by imposing on it the same duties which are chargeable on ordinary butter. The company estab- lished for the manufacture in France had in 1874 seven manufactories, in which four hundred men were employed. There can be no doubt that a pure, sweet fat, such as is

manufactured by the process of M. Mége-Mouries is a safer

and more wholesome article than the unsavoury rancid butter which is sold so freely among the poorer classes. See Datry.

BUTTERFLIES anp MOTHS, the common English names applied respectively to the two groups of Insects which together form the order Lepidoptera (Gr. Aeris, a scale, and rrepdy, a wing), an order characterized by the constant presence, in a greater or less degree, of scales on the wings. The two groups may, as a rule, be readily distinguished from each other, although, so far as our present knowledge goes, there is nothing in the structure or habits of either group which divides it entirely from the other. All butterflies are diurnal in their flight, while moths, with many exceptions, are crepuscular or nocturnal.

The bodies of butterflies and moths, like those of all other insects, consist of three distinct parts—the head, bearing the organs of sense; the thorax, the organs of locomotion; and the abdomen, the organs of generation. On the head are placed (1) the antennz, composed of numerous articulations, and supposed to be organs of hearing. They differ greatly in form among the Lepidop- tera; those of butterflies, however, agreeing generally in having their ends knobbed or clubbed, hence the term Rhopalocera (pé7adov, a club ; xépas,a horn), often applied to this group. The antenne of moths assume a great variety of forms—prismatic, serrate, pectinate, moniliform, and filiform,—and are often beautifully feathered, especially in the males, whose antenne are usually ampler than

those of the females ; but in no case are they knobbed, as '

iu the form of their antennz, moths have been termed Heterocera (€repos, various ; xépas,a horn). In butterflics these organs are also straight, and stand out rigidly in front of the head, while in moths they are usually curved and can generally be folded back on the body. (2) The eyes in the Lepidoptera consist of two masses of hexagonal facets, placed one on each side of the head, and forming what are known as compound eyes. These contain in some cases no fewer than 16,000 facets each, while in many species a pair of ocelli, or simple eyes, are found concealed among the scales and placed between the com- pound organs. The hairy appearance of

~~the eyes in many of the Nymphalide is owing to the presence of minute hairs planted at the angles of the numerous facets. Com- pound eyes are not found among the larve of buiterflies and moths, but they are in most cases provided with six ocelli on each side of the head. (3) The month, the parts of which in insects are considered by comparative anatomists to be typically developed in the masticatory mouth of beetles (Coleoptera), assumes in butterflies and moths the suctorial form—the latter being merely a modi- fication of the former; thus the mandibles, labium, and labrum, which are fully developed when the nature of the food renders mastication necessary, are in a rudimentary condition i the Lemdoptera, whose chief food is the nectar of flowers, while the maxille, on the other hand, are enormously developed ; being concave on their inaer sides, these by approximating form a tube known as the proboscis or tongue. This when at rest is coiled up into a ball in front of the head, and is partly concealed by the palpi projecting on both sides. In the moths belonging co the family Bombycide, the organs of the mouth are rudimentary, so that these insects after entering upon the imago state are incapable of feeding.~~

~~'the thorax bears the organs of locomotion, consisting of Thom)~~

~~three pairs of legs and two pairs of wings. The former are covered with hairs and scales, and terminate in hooks modified to suit the habits of the various species. Butter- flies use the legs almost entirely for resting, very rarely for walking, and in some groups, as the Vymphalide,~~

~~the front pair is rudimentary. The wings consist of a Wing:!~~

~~double layer of colourless membrane traversed by numerous nervures (Plate XXVII. fig. 1), and covered with minute scales implanted in the wing membrane by a short stalk, and placed together like tiles on a roof. The scales vary in form in different species and in different por- tions of the wings of the same species, while under a high power of the microscope they are seen to be minutely corrugated ; and it is to these corrugations acting upon the colourless rays of light, and producing the phenomena of "interference," that many of the loveliest butterflies owe the brilliancy of their wings. The splendour of those organs in the majority of butterflies, and in some moths, is sometimes equally shared by both sexes, but more usually the females are less couspicuously coloured than the males. This difference,~~

amounting often to total dissimilarity, Darwin, in accordance with his descent- theory, attributes in great part to the action of sexual selection. ‘ Several males,” he says, “may be seen pursu- ing the same female.” The latter he supposes selects the most gaily-coloured, and thus the plainer-coloured males have been gradually eliminated ; but there is no proof whatever that the female shows any such discrimination in selecting a mate, while many known facts seem to point in an opposite direction. Mr A. R. Wallace maintains, on the other hand, that the duller colours of the females have been acquired for protective purposes, the females requir- ing such protection more than the males owing to their generally slower flight, and to the fact that after impregna-

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tion they take several days to deposit their eggs, during | those of certain species of Coleoptera found in the same which the life of the male is of no further consequence to | neighbourhood, and these have their wings when at rest

the perpetuation of the species. Whatever may be the true interpretation of this phenomenon, it is certain that many butterflies and moths of both sexes are so coloured as to be to a greater or less extent protected thereby. Many moths, which rest by day clingiug to the trunks of trees, so exactly resemble in the colour of their upper wings the bark on which they rest as only to be distin- guished on close examination ; while many small species which habitually rest on leaves are often mistaken for the droppings of birds. The upper surfaces of the wings of butterflies are in almost all cases the more gaily coloured, and when at rest, these are raised perpendicularly over the back, so as only to expose the under surfaces, which are often dull coloured, and in some cases have been shown to be directly imitative of surrounding objects. The best example of this is to be found in the Malayan butterfly, Kallima paralekta, and its Indian ally, Kallima inachis, both brilliant and conspicuous insects on the wing, but which no sooner alight than they become invisible. The under surfaces of their wings, though varying greatly, yet form in every case a perfect representation of a leaf in some stage or other of decay, the butterfly at the same time disposing of the rest of its

~~body so as to bear out the deception. How this is effected is best told by Mr Wallace, who was the first to observe it, in his valuable work on the Malay Archipelago.~~

~~"The habit of the species is always to rest on a twig and among dead or dried leaves, and in this position, with the wings closely pressed together, their outline is exactly that of a moderately sized leaf slightly curved or shrivelled. The tail of the hind wings forms a perfect stalk and touches the stick, while the insect is supported by the middle pair of legs, which are not noticed among the twigs and fibres that surround it. The head and antenne are drawn back between the wings so as to be quite concealed, and there is a little notch hollowed out at the very base of the wings, which allows the head to be retracted sufficiently."~~

~~Moths, when at rest, have the hind wings folded close to the body, while the fore-wings cover all, and it is the latter that usually show an assimilation in colour to surrounding nature. Many butterflies and moths, there seems good reason to believe, are coloured in imitation of other and often widely different species possessing some special means of protection, as sting or nauseous juices, the mimetic forms, it is supposed, sharing with their models in immunity from the attacks of insectivorous animals. The phenomena of mimickry were first observed by Bates among the Heliconide, a family of South American butterflies, remarkable for their great numbers, the gaudiness of their colouring in both sexes and on both surfaces of their wings, and for their comparative slowness of flight. It was found that, owing to the nauseous nature of their juices, those brilliant butterflies were left unmolested by insect-eaters. It was also observed that several species of a genus closely allied to our Cabbage Butterflies, totally different both in the colour and form of the wings from the Heliconide, so closely resembled particular species of the latter as not to be distinguishable from them on the wing. Exactly similar phenomena have been observed in the tropical regions of Asia and Africa, where the similarly protected Danaide and Acreide find imitators among the otherwise unprotected Papilios and Diademas. There are two families of day-flying moths, Sesiide and Ageriide, with clear trans- parent wings, the scales being confined mainly to the margins and nervures, which in their wings and in the form and colour of their bodies might be readily mistaken for bees or~~

~~wasps, a similarity recognized in such specific names as bombiciformis, apiformis, vespiformis, &c., applied to different species of these moths. Other species of the same~~

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~~closed over their bodies like the elytra of beetles.~~

~~Butterflies and moths undergo complete metamorphosis, Metamor- that is, after emerging from the egg, and before attaining phosis.~~

~~the full development of the imago, they pass through the larva and pupa stages—the latter being one of total inactivity in so far as the outward manifestations of life are concerned. The eggs vary greatly in shape, and are deposited in a great variety of situations—on the under sides of leaves, on the outside of the cocoon, as in the Vapourer Moth (Orgyia antiqua), the female of which is wingless, glued together in rings round the smaller branches of fruit trees, as in Clascocampa neustria, or in thie interior of hives, the larvee afterwards feeding on the wax, as in the Honey-comb Moth (Galleria cerella), They thus show a remarkable instinct in depositing their eggs in situations where the larve may afterwards obtain their appropriate food, although they themselves can have no~~

~~knowledge of that food. The caterpillar emerges from the Cater- Unlike the perfect Pillar.~~

~~egg usually in a week or ten days. insect it is provided with a masticatory mouth. It has three pairs of legs on the anterior segments of its body, corresponding to the six legs of the future imago, besides which it is provided with a variable number of conical feet or prolegs placed posteriorly, and which are merely processes of the external covering of the caterpillar. Goossens, a Continental naturalist, has recently observed that the number of prolegs in some species differs at different ages, and gives a case in which a caterpillar with originally six prolegs acquired two additional pairs after the third moult. The body cavity is almost entirely occupied with the diges- tive system, and with that concerned in the production of the silky material used in forming the cocoon. Silk is secreted as a viscous fluid in tubes, which after many con- volutions widen into a~~

~~large reservoir filled with the yellow liquid, narrowing again into a tube extending to the mouth, where it communicates with the outside by means of a conical and jointed papilla known as the spimneret. Through this organ the viscous fluid is forced in two exceedingly delicate streams, which coalesce, and on exposure to the atmosphere harden into a single continuous thread. The silky material is not completely formed till the caterpillar reaches maturity. Caterpillars are either smooth skinned or more or less covered with hairs ; in the former case they are a favourite food of insectivorous animals, while in the latter they are almost universally rejected,—recent investigations on this subject going to prove that the hairs on certain species of caterpillars have a power of stinging, somewhat analogous to that possessed by the hairs on the surface of a nettle.~~

~~No sooner does the caterpillar emerge from the egg than it begins to eat voraciously, and in a few days has grown so large that a change of skin becomes necessary. The old skin is cast off, and with it the entire internal lining of the alimentary canal, and in the majority of butterflies and moths five such changes take place before the cater- pillar has attained its full growth, while the Tiger Moth (Arctia caja) is said to cast its skin at least ten times. Those moultings do not usually affect the appearance of the caterpillar, except in enlarging it; but in the case of Samia cecropia, a species of Bombycide, the larve are said to pass from black to various shades of green and azurc- blue in the course of their moultings. The larve of the family Psychide—the larger members of which are found in America and Australia—have the curious habit of con- structing cases which they carry about with them, aud within which they afterwards undergo transformation. Each larva has but a single case, and when this gets too~~

~~"clear wing" group have opaque wings closely resembling | narrow it splits longitudinally and is enlarged by interpos-~~

~~ing a new portion between. Moths and butterflies remain in the larval condition for periods varying from three years, asin the Goat Moth (Cossus ligniperda), to a few weeks, as in the Cabbage Butterfly (Dzerss brassicee), which usually has two broods in the season, while many species whose larve leave the egg in autumn, as the Blue Butterfly~~

~~(Polyommatus alexis), remain torpid throughout winter at~~

~~this stagc, and waken up to resume feeding in spring. During this period they increase enormously in weight ; thus the larva of the Privet Hawk Moth (Sphinx lgustrz) which casts its sixth and last skin on the twenty-second day after emerging from the egg, attains its greatest size ten days after, having in the meantime increased to 11,312 times its original weight ; while the Goat Moth (Cossws ligniperda), which remains in the larval condition for three years, has grown in that period 72,000 times heavier. Having attained its full growth the instincts of the cater- pillar undergo a change; it ceases to eat and begins to weave a couch or cocoon by which it is more or less enclosed. It then throws off its skin and appears as a pupa or chrysalis incapable of eating or of locomotion, the only apparent sign of life which it manifests being a convulsive twitching when irritated. Examined more closely, however, life is seen to be exerted in very great intensity in this stage of apparent quiescence. The immense digestive system of the caterpillar dwindles greatly, the rudiments of wings begin to show themselves, forming slight prominences on each side of the chrysalis shell, while the organs of the inasticatory mouth are being transformed into those of the suctorial. In assuming the pupa condition caterpillars dispose of themselves in a great variety of ways. Many, like the common Cabbage Butterfly, ascend walls and palings, to which they attach themselves by a silken belt, others, as silkworms, spin around them a solid cocoon of pure silk; while the majority of Sphinx Moths form burrows in the ground, which they line with silk and after- wards varnish to keep out the moisture,—one of these (Sphina ligustri) remaining thus buried from August till June. Those larvee which feed on the wood of trees, as Cossus ligmperda, generally form tough cocoons of chips of wood and of silk within the tunnels which they have bored in the tree, and their pupz have the power of forcing themselves along those passages till they reach the bark, where they remain until about to emerge from the egg, when they pierce it also. The~~

~~cocoon of the Puss Moth (Cerura vinula), composed of the same materials as in the preceding instance, is usually placed in a crevice of the bark of a tree, where by exposure to the atmosphere it becomes hard as horn, the moth only making its escape after discharging a liquid by which one end of the cocoon is softened. Hairy caterpillars are usually deficient in silk, and in forming their cocoons mix what they have of this with the hairs of their body. A beautiful net-like cocoon is woven by a South American moth belonging,to the Bombycide, which it suspends from the top of an outstanding leaf. 'When the caterpillar," says Bates, " begins its work it lets itself down from the tip of the leaf which it has chosen by spiuning a thread of silk, the thickness of which slowly increases as it descends. Having given the proper length to the cord (about 6 inches) it proceeds to weave its elegant bag, placing itself in the centre and spinning rings of silk at regular intervals, connecting them at the same time by means of cross threads, so that the whole when finished forms a loose web with quadrangular imeshes of nearly equal size throughout." The duration of the pupa stage varies from a few weeks to several months ; i, varies also in the same species according to the season at which it becomes encased ; thus the pupa of Vanessa urtice at the beginning of summer usually develops in fourteen days, and at midsummer in eight or nine days, while if~~

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~~it becomes encased in autumn it remains a pupa during the winter. By applying heat the process can be accelerated, and it can be equally retarded by refrigeration. mature the pupa case cracks towards the anterior end, and the butterfly or moth crawls forth with wings which, though at first small and crumpled up, in a few hours attain their full size. The male insect goes in search of the female, and when the latter has deposited her eggs the main object in the life of the imago is attained and both sexes die. Among the Bombycide this occurs in two or three days, owing to the atrophied condition of the organs of the mouth. With butterflies courtship is generally a more prolonged affair, several males pursuing the same female, and breaking each others wings in the conflicts that thus frequently ensue. Butterflies appear in many cases to be gregarious, flying in great flocks. Bates states that at one place in South America he noticed eighty different species flying about in enormous uumbers in the sunshine, and these, with~~

~~few exceptions, were males, the females remaining within the forest shades. Darwin also describes a "' butterfly shower," which he observed ten miles off the South American coast, extending as far as the eye could reach; " even by the aid of the telescope," he adds," it was not possible to see a space free from butterflies. That they are occasionally migratory as well as gregarious is borne out by the obser- vations of Sir J. Emerson Tennent, who witnessed in Ceylon a mighty host of butterflies of a white or pale yellow hue, "apparently miles in breadth and of such prodigious extension as to occupy hours and even days uninterruptedly in their passage."~~

~~The food of Lepidopterous insects consists chiefly of Food.)~~

~~the sweet liquids drawn from the nectaries of flowers, which they reach by means of their long proboscis or tongue. Many of the Sphingide are said to do this without settling on the flowers, and one of these, the Humming Bird Hawk Moth of South America (Maecroglossa titan), in its mode of flight and of poising itself before a flower while extracting the juice, bears such close resemblance to certain of the smaller humming birds inhabiting the same distrit, that Bates often shot it for one of the latter, and it was only after considerable experience that he learnt to distinguish the bird from the moth when onthe wing. Although their food is thus usually the sweetest liquids drawn from love- liest vessels, still some of the most brilliant species seem to prefer more vulgar fare. Thus the showy Purple Emperor (Apatura ws) prefers above all things to suck the juices of putrid animal substances, and the surest way to secure specimens of this butterfly is by setting such baits near its haunts. Mr Wallace states that in Malacca he caught a large and brilliant butterfly which had settled on the dung of some carnivorous animal, where he had also observed it on the previous day, and he adds that it is a habit of many of the finest butterflies to suck up the liquid from muddy spots on the roadside.~~

~~When Imago,~~

~~Butterflies and moths are widely distributed all over the Distri- globe, occurring, however, in greatest variety and abundance tion.~~

~~in tropical lands. They are found as far north as Spitzbergen, on the Alps to a height of 9000 feet, and to double that height on the Andes. In Britain~~

there are only 66, and in the whole of Europe 390 species of butterflies ; while within one hour's walk of Par& in Brazil, Bates found no fewer than 700 species. There are 1910 species of British moths, the majority of which are nocturnal and crepuscular ; while in tropical America day-flying moths seem to be most common, and may be seen in company with the sunshine-seeking butterflies, This paucity of nocturnal moths has been attributed to the great number of night-flying or crepuscular insectivorous bats and birds which haunt those regions. Many species both of moths and of butterflies have a very wide distribution ; the Painted Lady (Vanessa

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cardui), a common British species, being found in every quarter of the globe ; and our finest butterfly, the Swallow Tail (Papilio machaon), occurring throughout Europe, Asia as far as the Himalayas, and South Africa. Other species are extremely local, asthe Scotch Argus (Lyccena artaxeraes), confined to a few Scottish hillsides. Keferstein estimates the total number of Lepidoptera at 66,000 species—6000 butterflies and 60,000 moths. That such estimates, how ever, are not to be relied on is sufficiently proved by the fact that Bates gives the number of species as above 200,000. The geographical distribution of certain groups of Lepv- doptera has been well wrought out by Mr Wallace and other naturalists who have studied them in their native homes ; but the division of this great order into geographical zones has still to be satisfactorily accomplished. Koch has recently proposed to place them in five such groups—(1) the European or Western fauna, including Northern Asia, the North of Africa (a region exceedingly poor in Lem- doptera, owing probably to the want of great forests, and to the marshy nature of vast tracts of land), and the northern parts of North America; (2) the African fauna, allied to the preceding ; (3) the South Asiatic or Indian ; (4) the Australian and Polynesian, allied to the Indian ; and (5) the American fauna, distinguished by its exceeding richness,

~~BUTTERFLIES.—Linnzus included all butterflies under the single genus Papilio, but later writers have divided them into several well-defined families, and into numerous genera. 'The largest and most magnificent species belong to the Ornithoptera or " Bird-winged Butterflies," a genus of Papilidnide, whose wings, measuring fully 7 inches across, are of a velvety black and brilliant green colour, the latter in such species as Ornithoptera croesus being replaced by fiery orange, while the body is golden, and the breast crimson. They are distributed over the islands of the Malay Archipelago, reaching, according to Mr Wallace, their maxi- mum of size and beauty in the Moluccas. The Papzlzos are a closely allied group, smaller in size but equally brilliant in the colour and form of their wings. They are exceedingly numerous and are widely distributed over both hemispheres, One species only is found in Britain, the handsome Swallow~~

~~Tail (Papilio machaon) (Plate XXVII. figs. 1, 2), formerly~~

~~abundant in many parts of England, but now confined to the fen districts of Cambridgeshire, Norfolk, and Huntingdon. When alarmed the larves of this and of other species of Papilios protrude from the upper part of the neck a soft forked horn that usually diffuses a penetrating and unplea- sant odour. One of the most elegant of exotic species is the Malayan Papilio memnon, with black and blue wings, 6 inches in expanse, and with the edges of the hind pair gracefully scalloped. This butterfly, though common enough in collections, has recently gained additional in- terest from the fact, discovered by Mr Wallace, of the remarkable variety in the form of the females, a variety which has led to their being described under several specific names. In one group the females resemble the males in shape, though differing greatly—as many female butterflies do—in colour. In another group they differ both in colour and in the form of the hind-wings. These, Mr Wallace says, are "lengthened out into large spoon- shaped tails, no rudiment of which is ever to be perceived in the males or in the ordinary form of the females." He also found that in shape and colouring those tailed females when on the wing, closely resembled another butterfly belonging to a different section of the same genus, Papzlo coén, which he considers is thus mimicked by the erratic females of Papilio memnon. Strange to say both forms of female are produced from the eggs of either form. The genus Parnassius, which seems peculiar to the Alpine or~~

~~subalpine countries of Europe and the North of Asia, |~~

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~~belongs also to the Papilionide. One species, Parnassius apollo (Plate XXVIL., fig. 3), has semi-transparent wings, spotted with black and vermilion, and is common in most of the mountain ranges of Europe, where it forms a very striking object. The Brimstones (Conepteryx), the Clouded Yellows (Colvas, Plate XX VII. fig. 4), and the White Butter- flies (Pteris, Plate XX VII. fig. 6), many of which are abun- dant in Britain, and the larve of which in most cases make great havoc among garden vegetables, belong to the family Pieride. That the caterpillars of this group are not fatal to the very existence of certain of our most useful vegetables is due solely to the ravages of the ichneumon flies, the larvee of which are parasitic upon these cater- pillars, to such an extent that in every hundred larve of the common Cabbage Butterfly, there are probably not more than two or three entirely free from the ichneumon fly (Microgaster glomerata), and few caterpillars so attacked ever reach maturity. The species belonging to the family Nymphalide have only four legs fitted for walking, the anterior pair being rudimentary. They include the ma- jority of the showy butterflies of temperate regions, as the Peacock Butterfly (Vanessa io, Plate XXVII. fig. 9), con- spicuous from the "eyes" on the upper surface of its wings. The brilliant colouring of the upper surface is in marked contrast to the sombre hues of the under, which give it when resting on the branch of a tree the appearance of a dried leaf, and so is to a considerable degree protective. The Fritillaries (Argynnis, Plate XXVIII. fig. 2) have the under surfaces of the wings ornamented with shining silvery disks, and, except a few tropical species, are the only butterflies which have the under surface more gaily coloured than the upper. The Purple Emperor (Apatura iris) is one of the largest and most striking of British species. It is a powerful flyer, frequenting the tops of the highest trees, and is thus difficult of capture unless when brought near the ground by the attraction of some putrid carcase. To tke same family belongs Vymphalts jaswus (Plate XX VIII. figs. 7 and 9), one of the most beautiful of European species. The HeliconIde (Plate XXVILI. fig. 7) area family of South American butterflies, so numerous both in species and in individuals, and of such showy colours on both surfaces of the wings, as to form, says Bates, 'a feature in the~~

~~physiognomy of the forest compensating for the absence of flowers." Their wings are long and narrow, they fly lazily, and might thus be supposed to be specially liable to the attacks of insectivorous animals. As already stated, such is not the case, these insects being apparently protected by the nauseous character of their juices. It is this group which is chiefly mimicked in South America, finding imitators in several species of Leptalis, a genus of butterflies belonging to the family Pzeride, also in several species of Hrycinidw, and in no fewer than three genera of day-flying moths all belonging to edible groups. The family Morphide (Plate XXVIII. fig. 8) contains the largest and most splendid of the South American buttertlies. Their wings, often 7 inches in expanse, are generally of a brilliant metallic blue, which, as the insect flies, flashes in the sunlight so as to be visible, it is said, a quarter of a mile off. They are found most abundantly in forest glades, through which they sail, only flapping their wings at considerable intervals at a great height, "seldom," says Bates, " descending nearer the ground than 20 feet." _ The Satyride (Plate XXIX. fig. 6) are found in every quarter of the globe, and seem equally at home on open plains, in forests, and on the slopes of mountains. Their larvee feed chiefly on grass, and have the almost unique habit of remaining concealed by day and of coming forth at night to feed. The Marbled White (Arge galathea) is the species oftenest met with in Britain. The Hetazre of Brazil, the wings of which are partly transparent, belong to this~~

~~Classifica- tion of moths.~~

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~~family. One of these, Hetaira esmeralda, says Bates, 'has one spot only of opaque colouring on its wings, which is of a violet and rose hue; this is the only part visible when the insect is flying low over dead leaves in the gloomy shades where alone it is found, and it then looks like the wandering petal of a flower." The Hesperidee or Skippers (Plate XXIX. figs. 13 and 15), so called from their jerky hesitating mode of flight, show, in the thick-ness of their bodies, the only partially erect way in which they hold their wings when at rest, and the enclosure of their pupa in a cocoon, @ distinct approach to the other great division of the Lepidoptera—the moths.~~

~~Morus.—The vast collection of species included under this term form eight principal groups, divided into numerous families.~~

~~1. The Sphingina or Sphinx Moths (Plate XXX. figs. 5 and 6), so called from the curious habit which the larvee have of raising the anterior segments of their bodies, and remaining motionless in this position for hours, thus bearing a fanciful resemblance to the fabled Sphinx, are for the most part crepuscular and day-flying. They are also known in the type family as Hawk Moths from the strength and velocity of their flight. In common with the vast majority of moths they are furnished with a spine or strong bristle on the anterior margin of the inferior wings, which being received by a process of the under surface of the superior pair, maintains them in a horizontal or somewhat inclined position in repose. They are also usually pro- vided with a greatly elongated tongue, with which they sip their food from flowers, and some species have the power of producing a humming sound. To this group belong the clear-winged moths, Sesiide (Plate XXX. fig. 12) and Age- rvide, all day-fliers, and looking more like the becs, wasps, and ichneumons which they are supposed to imitate, than moths; also the family Uranide (Plate XXIX. figs. 9 and 14), the species of which are among the most brilliant of Lepidoptera,—their wings being of velvety black, relieved by numerous bars of golden green, and the inferior pair prolonged into an elegant tail, closely resembling the same appendage in many of the Papilios. They are all day-fliers, and this, together with their gay colouring and airy forms, led to their being at first classed among butterflies, a position which fuller acquaintance with them in the larva and pupa stages showed to be untenable. The typical species occur in tropical America, where they fly with amazing rapidity and perform annual migrations. The Death's-Head Moth (Acherontia atropos) is the largest of European Sphinges, and owing to the peculiar squeaking sound which it utters when alarmed, the death's-head-like markings on the upper surface of its thorax, and its sudden appearance in districts where it may not have been noticed for years, it has for centuries been an object of superstitious dread to the unedu- cated. Its beautifully marked larve feed upon the leaves of the potato, and bury themselves in the ground preparatory to undergoing metamorphosis. The Death's-Head is fond of honey, in search of which its instinct leads it to enter hives, the inmates of which do not attempt to drive it out by means of their stings, but make every endeavour to raise a waxen~~

~~wall between the moth and their food stores. It is widely distributed over Europe, Asia, and Africa, while closely allied, but still larger forms occur in Australia,~~

~~2. The Bombycina (Plate XXX. figs. 14, 20-25) are noc- turnal moths, with the organs of the mouth in many cases so atrophied as to be unfit for use. These live but a few days, during which the male seeks the female and the latter deposits her eggs. They include the silkworm moths, so important to man from the silken cocoons in which they enclose their pup. The silk-producing species are very numerous, but only a few of them have as yet been turned~~

~~j to useful account.~~

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~~The chief of these are the common Silkworm Moth (Bombyx mori), a native of China, where its cocoons appear to have been utilized by man from time immemorial. During the 6th century it was introduced into Europe, where it soon flourished wherever the mulberry tree, the leaves of which are the sole food of the silkworm, abounded. On these the larves feed for thirty days, after which they begin to spin an oval cocoon of a close tissue of the finest silk, usually of » golden yellow colour, but some- times white, and which when unravelled forms a continuous thread 1100 yards long. In order te obtain a fresh supply of eggs, the silkworm breeder allows a few of the pup to develop into moths ; and such is the change wrought pon this species by centuries of domestication that, it is said, they rarely if ever attempt to use their wings. They pair, and the female at once settles on the leaves provided for her, where she deposits her eggs and dies. The Arrindy Silkworm (Attacus cynthia), so called from the native name of the castor-oil plant on which its larve feed, is a native of India. The cocoon is very large, but the thread 1s too fine to be readily wound off, and it is therefore usually carded, the yarn being woven into a coarse silk cloth of great durability. The Tusseh or Tussur Moth (Antherea mylitta) is also a native of Upper India, occurring abun- dantly in the jungles, where its cocoons, so concealed by the leaves as only to be detected by the presence of the dung of the larve on the ground, are collected. The Tusseh silk is darker and coarser than that of the common silk- worm, but resembles it in~~

~~being readily wound off. In China there are two oak silkworms from which a coarse silk is obtained, used for the clothing of the Chinese poorer classes ; but the most important of the oak-feeding species is the Yama-mai (Antherea yama-mai) of Japan, the silk produced from which was, at least until lately, reserved for the use of the Japanese imperial family. This moth is a beautiful insect, about 6 inches across the wings, of a bril- liant golden-yellow colour, with a transparent spot or "eye" near the centre of each wing. Its cocoon is nearly as large as a pigeon's egg, and is of asilvery white within, although externally of a yellowish green. In 1861 it was introduced into France, where it now flourishes, and there is good reason to believe, from the nature of its food and its hardi- ness, that the Yama-mai may yet be profitably reared in Great Britain. 7Z'opcea luna, which feeds upon the liquid- ambar trees in the southern parts of the United States, with wings of a lemon colour, each with a " transparent eye," and the hind pair prolonged into an elegant tail, is one of the loveliest species of Bombycina. ts cocoon is formed of the finest silk. Other well-known formsare the Eggars (Lastocampa, Plate XXX. fig. 26); the Proces- sional Moth (Cnethocampa processionea), so called from the habit its caterpillars have of congregating in companies of~~

~~| several hundreds, and of marching to their feeding-grounds~~

~~in regular columns; the Vapourers (Orgyia, Plate XXXI. figs. 2, 3, 4), whose females being almost wingless deposit their eggs on the outside of their cocoons, and the Psyches (Psychide), whose females in many cases have neither wings, legs, nor antenne, and never lcave the tubes in which they have passed the larva and pupa stages.~~

~~3. The Noctuina (Plate XXXI. figs. 9 and 14) form an exceedingly large group of nocturnal moths, although even here there are a few exceptional instances of day-flying species. They are distinguished by their stout bodies and narrow forewings, under which when reposing they conceal the inferior and in many cases more brightly-coloured pair. The majority of the species are small and dull in their colours, while a few are among the largest of known insects—the Great Owl Moth of Brazil (H7rebus strix) measuring nearly a foot from tip to tip of its wings.~~

~~4. The Geometrina (Plate XXXI. figs. 13 and 15) in the~~

larval condition have only four prolegs, the usual number being ten, aud in moving these are brought close up to the last pair of thoracic limbs, thus giving the caterpillar a looped appearance, hence the term “ loopers” usually ap- plied to these moths ; they then hold on by the prolegs, and releasing those in front carry the body forward until the arched appearance is gone. They thus move by an alternate process of looping and straightening their bodies.

remarkable from the peculiar conformation of their wings. Each of these organs is split longitudinally into several branches, all of them delicately fringed. In the genus Pterophora (Plate XXXI. fig. 26) the fore wings are divided into two, and the hind wings into three branches ; while in Orneodes (Plate XXXI. fig. 27) each wing is split into six, and these when the insect is at rest are folded together after the manner of a fan.

CoLLECTION AND PRESERVATION oF LEPIDOPTERA.— Collection Butterflies affect special localities with which it is well for 2nd pre-

The larves of Geometers have also the curious habit of fixing themselves by their hind feet to the branch of a A suitable 8°7¥2#!o-

shrub, throwing the remainder of their bodies out, and remaining motionless in this position for hours, thus exhibiting an enormous amount of muscularenergy. They are all protectively coloured, aud in the attitude just described so resemble the surrounding twigs as to be readily mistaken for them. Geometers are to be found in sunshine and by night, in midsummer and at midwinter, the Early Moth (Hybernia rupicapraria) being caught in January.

5. The Pyralidina (Plate XXXI. figs. 17, 19, 20, 23) are a group of small moths readily distinguished by their long slender bodies and large forewings. One of these, Pyralis wtis, is very destructive to vines, and another, Pyralis farmalis, feeds upon meal and flour. The Galleride, a family of Pyralidine moths, deposit their eggs in the hives of bees, where the

~~caterpillars, enclosed in silken cases, devour the wax ; but the Zydrocampide (Plate XXXI. fig. 12), which also belong to this section, are pro- bably the most wonderful of all Lepidopterous insects, their larve being aquatic, living and feeding in the water, and many of them breathing by gills similar to those of caddis- worms.~~

~~6. The Tortricina (Plate XXXI. fig. 16) include a great number of small moths exceedingly injurious to orchard and other trees. They are known as "leaf-rollers" from the habit which most of their larve have of rolling up the leaves on which they feed, and thus forming a shelter for themselves. The Green Tortrix (Zortrix viridana) occurs in the larva state on the oak, to which it often does great injury by stripping the trees of their leaves in the month of June. Throughout Southern Europe the vine is liable to the ravages of another species, @nectra pillariana, while few of our fruit trees are exempt from the occasional attacks of some species or other of the Carpocapside, the fruit-eating family of this group.~~

~~7. The Tineina (Plate XVIII. figs. 21, 24, 25) contain the sinallest of the Lepidoptera, and are best known as clothes moths. These clothe themselves at our expense in the warmest woollen garments, which they traverse in all directions, leaving behind a gnawed aud worn-out path, so thin and bare as to yield to the slightest pressure. They also destroy furs, hair, feathers, and many other articles of domestic economy, and are the exterminating pests of zoological museums. To them we no doubt owe the de- struction of the most perfect specimen of the Dodo known, which was once preserved in the Ashmolean Museum of Oxford. By means of their maxille these little larve shear down the surface of various substances, and uniting the particles by means of their glutinous silk, they thus form protecting habitations, which partake of the nature of the woollen or other stuffs on which the foresight of their parents has placed them. When they themselves increase in bulk, so as to find their abodes as inconvenient as a Strait waistcout, they split them down the middle, and interpose a piece proportioned, no doubt, to their expected as well as actual increase. They add to the length also by fresh materials to the anterior end. The Zinea granella lives in granaries, where it forms an abode for itself by enveloping several grains in a silken web. These it after- wards eats,~~

~~8. The insects of the remaining group, D'terophorina, are~~

~~the collector to make himself acquainted. hunting ground having been selected, the following apparatus is necessary :—a bag-net made of gauze or some equally light material, with a wooden or metal ring and a handle, which may also be used as a walking-stick, for capturing the specimens ; pill boxes into which to transfer them from the net; and a wide-mouthed glass stoppered bottle, into which about forty leaves of the common laurel, bruised and cut into shreds, have been previously put. Exposure for a short time to the fumes arising from these shreds will cause the death of the inmates of the pill boxcs. They may also be readily killed by pressing the thumb-nail against their thorax. For "setting" Lepidoptera, which if possible should be done before the insect stiffens, entomolo- gical pins are required, and these should be gilt in order to prevent the appearance of verdigris at the point where the pin enters the specimen; also a setting-board, with an upper layer of cork, and having a groove in which to lay the body of the insect; and small triangular strips of cardboard known as braces with which to set the wings. The process of drying should not be artificially hastened, as by exposure to heat the wings are certain to warp and the body to shrivel. Should the insect have stiffened before setting, or have been badly set, it can readily be softened again by placing it, as is done in the British Museum, in a shallow earthen vessel containing a layer of damp sand, and covering it with a close-fitting lid until sufficiently soft for resetting. Day-flying moths must be sought for in much the same way as butterflies, while nocturnal species may be regularly met with on the sallow, the honeysuckle, the lime- tree, and the ivy, when these are in flower; and when these and similar natural sources fail, the moth-collector has in sugar and light two admirable devices for securing specimens. A quantity of the coarsest brown sugar reduced by the addition of beer and water to a syrup, and to which a little rum is added as required, is applied with a brush to the sheltered aspect of the trunks of trees on the outskirts of woods or in the neighbourhood of heaths. At nightfall the collector, lamp in hand, visits the sugared locality, and if the evening be favourable, that is, if it Le warm and dull, he is almost certain to have his pains rewarded by an abundance of specimens, chiefly belonging to the Woctuina. Moths, it is well known, are readily attracted by light, and in a country or suburban house, in the vicinity of trees, a lamp placed outside an open window, which is sheltered from the~~

~~wind, with another lamp in the interior of the room, will, if the night be close and dark, be almost certain to attract numbers of moths. Mr Wallace adopted this plan while collecting in Borneo, and he states that in twenty-six nights he collected 1386 moths, " but that more than 800 of these were collected on four very wet and dark nights." In towns moths may often be caught flying about lamp-posts. In preserving the larger moths, especially the Sphingina, it is necessary to slit up their stout bodies and remove the contents, replacing ° these with wadding or paper. The drawers of cabinets containing Lepidoptera should be provided with a layer of cork and then papered, with a small bag of camphor attached to a corner to ward off the attacks of the dust-lice, or "mites" as they are usually, but incorrectly, called, the~~

~~presence of which is made known by the appearance of a fine powder lying underneath the infected specimens. Insects in this condition should be thoroughly soaked in a solution of spirits of wine and camphor. The appearance of grease on thick-bodied moths is by uo means uncommon, but may be removed by dipping the insect in spirits of turpentine and embedding it in calcined magnesia till dry. The collector should be careful to keep a register of all his specimens, giving the localities where they were found, and recording any observations that may have been made at the time on their food, habits, &c. A small ticket attached to the pin of each specimen, and bearing its number in the register, is the best way of connecting the specimens in the cabinet with the entries in the register J. GI.)~~

~~BUTTMANN, Purirp Kart (1764-1829), a German philologist, was born at Frankfort-on-the-Main in 1764. He was educated at the gymnasium in his native town and at the university of Gottingen. In 1789 he obtained an appointment in the library at Berlin, and for some years he edited Spener's Journal. In 1796 he became professor at the Joachimsthal Gymnasium, a post which he held for twelve years. In 1806 he was admitted to the Academy of Sciences, and in 1811 was made secretary of the Historico-Philological Section. He died in 1829. Buttmann's writings gave a great impetus to the scientifie study of the Greek language, and his grammar is~~

~~still a work of value. The first edition of the Grrechische Grammatik appeared in 1792, and in 1863 the book was in its 21st edition. It has been translated into English. The Lewlogus, a valuable study on some words of difficulty occurring principally in the poems of Homer and Hesiod, was published in 2 vols., 1818-25. The English translation by Fishlake has passed through five editions Buttmann's other works were Ausfiihrliche Griechische Sprachlehre, 2 vols., 1819-27; Mythologus, a collection of essays, 1828-9; and editions of some classical authors. Of these last the most im- portant are Demosthenes in Midiam, 1823, and the con- tinuation of Spalding's Quentilian.~~

~~BUTTON, from the French bouton, a small piece of metal or other material used to connect different parts of a garment together by means of a button-hole, and also used for ornamentation. These apparently insignificant articles have produced a great alteration in our style of dress, for without them it would have been impossible to have reduced the flowing robes of our forefathers into our present simple costume. By this process we have lost the picturesque, as far as our garments are concerned, but have gained in com- pactness and utility. Indeed, the occupations of the present age could not be carried on in the togas and dresses of ancient times. The button manufacture did not assume any special form until towards the close of the reign of Elizabeth. In paintings, commencing with the 14th ceutury, studs or buttons appear as ornaments on the dresses of both sexes; but they were ornaments merely, being drawn without button-holes, and placed where they could serve no practical purpose. They are in general represented as of gold or ivory. At the commencement of the 17th century the trade had greatly increased, but the making of buttons by the needle seems to have been the principal method.~~

~~Matthew Boulton, who became the senior partner in the afterwards celebrated firm of Boulton and Watt, as early as 1745, introduced great improvements in the manufacture of buttons, particularly inlaid and steel. When the Soho Works were established near Birmingham, one of the departments was occupied in making steel buttons with facets, that produced a hundred and forty guineas the gross. Gilt buttons came into fashion shortly after the accession of George TIL A large shipping trade in buttons was then carried on with the Continent and America, and the~~

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~~workmen's wages at Birmingham averaged from £2 to £4 perweek. John Taylor, originally a cabinetmaker, appears to have had a principal hand in promoting improvements in this industry at that time, as far as gilt, plated, and lacquered buttons are concerned. The value of those turned out weekly in his establishment is said to have been about £800. Ralph Heaton improved the making of shanks, a separate branch, shortly before the commencement of thie present century.~~

~~The metal button trade was in a very flourishing con- dition, when, indirectly, Lord Nelson may be said to have been the means of overthrowing it. The late B. Sanders was lu easy circumstances In Denmark when he was ruined by the bombardment of Copenhagen under our great naval commander. Sanders then came to Birmingham to seek such competence as energy and perseverance could afford. He started in the button manufacture, at first in a small way, introducing a covered button made of cloth or lasting, with an iron shank. His son, of the same name, invented a flexible shank button, that is, one with a tuft of canvas protruding from the back instead of a shank, through which the needle could pass in any direction. It was patented in 1825 and had an enormous sale, The Sanders took out another patent for a similar button covered with silk. A fancy silk button with a central ornament was patented by William Elliott in 1837, which had a great run, so much so that sixty looms were employed in London in making the special material required ; and Elliott secured a fortune, although his patent was contested and many imitations were started. But all these kinds of buttons were found to wear on the edges, to remedy which John Chatwin patented a corded edge button. It is said that horn buttons were used as early as 1801, but we find from old Birmingham directories that there were horn-button makers as far back as 1777. At the former period the commonest qualities were 54d. per gross. Hutton in his History of Birmingham refers to "our grandmothers" wearing horn buttons nearly the size of a crown piece. The hoof or horn button is cut into form and dyed and pressed into beautiful designs. This great improvement, however, appears to have been effected by M. Emile Bassot of Paris, who intro . duced important changes resulting in material progress.~~

~~The manufacture is still prosecuted in England, but it is of secondary importance.~~

~~The materials of which buttons are made are as various as their forms. Gold, silver, and other metals, glass, porcelain, horn, bone, india-rubber, mother-of-pearl, and other nacreous productions of shell-fish,! various woods, vegetable ivory, &c.,2 are employed ; and for covered but- tons, lasting, brocade, twist, velvet, silk, mohair, &c. The Birmingham Directory for 1784 mentions paper buttons ; and, according to the same authority, a button was produced by "an artist of eminence," which was inlaid with divers other metals; it was first attempted about sixty years previously ; and then, "though in no respect so complete as at present, met with great and merited encouragement." Buttons have been often expensively jewelled, and the gold and silver are plain or ornamented, sometimes resembling drops in filigree-work. There was one in use in England about the middle of the last century~~

~~1 The shells are brought from various parts of the world, and vary considerably in price. The white-edged Macassar are the best ; the yellow-edged Manilla the next. Those from the Persian Gulf and Red Sea vary much in value, which depends upon the purposes to which they can be applied. Those from the Pacific are beautiful, but, being generally dark in colour, their value is much affected by the turns of fashion. The " Panama shells" are the least valuable, and are gener- ally only used for inferior sorts of buttons.~~

~~2 Vegetable ivory is not very suitable for buttons ; it is too soft, and the unavoidable waste in manufacture renders it expensive.~~

~~formed of polished brass and ruled with such fine lines that light was reflected in prismatic colours. Some buttons have fetched enormous prices, even when made of what is now a common material. Mother-of-pearl buttons have been sold at a guinea each. In 1790 Henry Clay of Birmingham patented a method of manufacturing buttons of slate or slit stone; and, in 1800, Joseph Barnett intro- duced a button with two shanks or other fastenings on one button.~~

~~Such was the origin of the button industry in England, and other nations have not been behind. The Seventific American gives the following account of its commencement in the United States:—~~

~~‘The first manufacturer of buttons in this country was Samuel Williston. While he was dragging along as a country store- keeper,—his eyes having failed him while studying for the ministry,—his wife bethought her that she could cover by hand the wooden buttons of the time, and thus earn an honest penny. From this the couple advanced in their ambition until they had perfected machinery for covering buttons, the first employed in this country. From this sprang an inimense factory, and then others, until Samuel Williston made half the buttons of the world. His factories are still running at Easthampton, coining wealth for the proprietors. ... . Heis now (1871) between seventy and eighty years of age, is worth five or six millions, and has given four hundred thousand dollars to Easthampton for a seminary and for churches; two hundred thousand dollars to South Hadley Female seminary ; and eo nundred thousand dollars to Amherst College, besides lesser~~

~~ifts.”~~

~~; The factories of Samuel Williston & Co., above referred to, at Easthampton, Massachusetts, were established about the year 1848, and give employment to about 250 opera- tives. The annual cost of the materials used is estimated at $75,000, and the value of the produce exceeds $200,000. The button manufacture is also carried on extensively in New York and Philadelphia, and at Waterbury (Conn.). Buttons are also imported extensively. ‘There are five im- porters in New York (1876). Joel Hayden of Haydenville began to make flexible buttons in the States in the year~~

~~1834,~~

~~Other countries have not been backward in this branch of industry. Bohemia, particularly at Prague and the neighbouring towns, is the great seat of the glass button manufacture, and great numbers are made in France. The porcelain button manufacture has been taken possession of by France, Minton and Co., the celebrated Staffordshire firm, who worked the invention of R. Prosser of Birming- ham, having been driven out of the field~~

~~by the good work, attended by greater cheapness, of the foreign makers. There is one factory at Milan, and great numbers of the cheaper kinds of buttons are made in the Rhenish provinces of Prussia. Vienna has suppressed the competition of English makers in some kinds of pearl buttons. Its opera- tions in this branch are of a most extensive character, quite rivalling those of Birmingham.~~

~~" Button making," says the Birmingham Directory for 1777, "was originally a very tedious and expensive process. The button consisted of one solid piece of metal; and the ornaments upon the face of it were the work of an engraver. To obviate this, the press, stamp, and engine for turning the moulds were invented. This led to other improvements, the bones and hoofs of animals Were introduced into the manufacture ; by these various means the prices of buttons were reduced."~~

~~In the manufacture of covered buttons the sheet-irou is first scaled by the use of acids, and then cut into proper shape and size by a machine, The neck or collet of the button is japanned after having been stamped and cut. The hollow between the neck and shell is filled in with brown paper or button board. When the parts are put together they are pressed, which brings them into shape and con- Solidates them.~~

~~It would be impossible in the space that could be devoted~~

~~to the subject here, to describe in detail the various modes in which the numerous forms of buttons are manu- factured,—especially as it would require elaborate illustra- tion. We must, therefore, confine ourselves to noticing some of the special and more recent patents, referring the reader to works where he can obtain such further informa- tionas he may require. In 1840 Joseph Parkes took outa patent for improvements in the manufacture of covered buttons made by dies and pressure, by the application of horn as a covering material. MHarris's patent for improve- ments in horn buttons and their dies was obtained in April 1841. This invention related to applying flexible shanks to horn buttons, a mode of ornamentation by inlaying the front surfaces, and also gilding or silvering their surfaces, and to a mode of constructing dies so as to facilitate the process of engraving, the die being also so formed that the horu or hoof employed could not be expressed outside the circumference of the button. Hugh Willoch's patent,~~

~~dated 5th May 1874, related to a button with a removable head to enable the shank to pass through the button hole. The head is hollow and is partly filled with caoutchouc. It ig perforated to admit the shank top, a short transverse bar which, on being turned one-fourth round, falls into an internal groove in the material of the button head, and is retained in that position by the elasticity of the india-rubber. Empson and Palmer's patent, dated 4th July 1874, refers to improvements in linen buttons, and is also applicable to buttons covered with other fabrics. They are composed of a front and back shell, with a bar formed across the face of a raised concentric circle from the back shell (which is all the metal that need be visible in the finished button), the shells permitting ample room for the covering fabrics to be gathered in and held between them. They are considered to resist the injury common to linen buttons during the processes of washing, inangling, and ironing. Tylor's patent, of 13th July 1874, relates to polishing ivory, bone, and similar buttons in a revolv- ing drum with revolving brushes inside. Harrison's inven- tion (8th September 1874) consists in arranging the pierc- ing tools, so that the thread holes for the buttons are made in the pierced metal in front of the shaping and cutting- out tools, and the metal around the groups of piercings is shaped or " domed," aud cut out. The result is that at each descent of the compound tool three or more groups of the thread holes are pierced in the sheet metal, and three or more finished buttons are made. 'The piercings in the sheet metal made by the last descent of the compound tool form the thread holes of the buttons made by the next descent of the said compound tool. When the thread- holes of the button are made in a central depression, a shaping tool for making the said depression is placed between each piercing tool and cutting-out tool. This invention is also applicable to the manufacture of washers, rings, links for chains, and other like articles from sheet- metal. The patent of G. F. Champorez of Berlin, Prussia, relates to improvements in the manufacture of steel or iron and steel dies, and to certain contrivances for producing the same, the said dies being in depression or relief, with- out recourse to the hitherto universally employed engrav- ing tool. Cole's patent (10th February 1875) relates to a composition for dress-fastenings generally, consisting of black composition of equal parts by weight of gas tar or tar varnish, whiting or chalk or clay, and lamp black or vegetable black. For a coloured composition transparent varnish, or the waste refuse of it, is substituted for gas tar or tar varnish, and a powdered pigment of the. required colour is~~

added. ‘The materials should be thoroughly mixed and converted into a plastic, pasty mass, which is consolidated and hardened by rolling and drying. To give

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toughness short pieces of fibrous material may be intro- duced. The articles are shaped from the composition by stamping in stamps or presses, and then varnished and polished. ‘

Messrs Green, Cadbury, & Richards, Birmingham, manu- facturea linen button called “‘Thevery Button”(Shakespeare), in addition to others of innumerable kinds, and studs for shirts, collars, and wristbands, not ouly of plain materials but of gold and silver and jewelled. They employ about 400 hands, and turn out weekly from 10,000 to 15,000 gross (12 dozen to the gross) of their linen buttons. The pro- prietors of this establishment take great interest in the welfare of their workpeople, and few of the adults have been in their employment less than from eight to eighteen years. There is a sick club in connection with the works, anda library containing at present about 1000 volumes. Fines are inflicted for certain irregularities; these, how- ever, are not appropriated by the firm, but are expended, half in the purchase of books, and half as a contribution to the sick club.

The following is a comparative statement of the number of button manufactories at the localities where these articles are principally made, taken from the Directories of 1875 :—

London, 58; Birmingham, 161; Paris, 140; Berlin, 49; Hamburg, 5; Darmstadt, 3; Offenbach on the Maine, 3; Lubeck, 2; Barmen (Prussia), 27; Elberfeld, 9; Breslau, 2; Liidenschied (Westphalia), 14 ; Stuttgart, 6 ; Vienna— metal, 15; porcelain, 5; shirt, 6; silk, 11; Brussels, 5 ; New York city, 19; Brooklyn (N.Y.), 3; Philadelphia, 13; Waterbury (Conn.), 8; Boston (Mass.), 3, Attle- borough (Mass.), 3; Springfield (Mass.), 2; Newark (N. Jersey), 4.

~~Abstracts of Specifications of Patents(Patent office); Ure's Dictionary of Arts and Manufactures ; Resources, Products, &c., of Birmingham and Midland Hardware District ; Strutt's Habits of the English ; Newton's London Journal; Birmingham Directories, 1777, &c. ; Hutton's History of Birmingham, Great Industrics of the United States. (J. J. L.)~~

~~BUXTON, a market-town and fashionable watering- place of England, in the county of Derby, 31 miles N.W. of Derby, and 160 from London, connected with Derby by the Buxton and Rowsley extension line, and with Manchester by the Stockton, Disley, and Buxton Railway. It occupies a high position, being 900 feet above the sea-level, in an open hollow, surrounded at a distance by hills of considerable elevation, except on the §.W. side, where the~~

~~Scarree 9) f MARKETS~~

~~Plan of Buxton.~~

~~Wye, which rises about half a mile off, makes its exit. The old town (HIgh Buxton) is rather higher than the new, and consists of vue wide street, and a considerable market place with an old cross With the exception of some good inns and lodging-houses, the buildings in this part are commonplace. The new town is of a more elegant char-~~

~~acter, and has been greatly extended within the last twenty or thirty years. The crescent is a fine range of buildings in the Doric style, erected by the duke of Devonshire in 1779-86, at a cost of £120,000. It contains hotels, a ball. room, a bank, a library, and other establishments, and the surrounding open grounds have been laid out in terraces and gardens under the control of the Buxton Improvements Company. The Old Hall Hotel at the west. end of the crescent is remarkable as the site of the mansion built by the earl of Shrewsbury in the reign of Queen Elizabeth, which was the residence of Queen Mary of Scotland when she visited the town. The new church was erected in 1812 by the duke of Devonshire; the edifice which it superseded has since been restored. The mineral waters of Buxton, the most noted in England, are particularly efficacious in cases of rheumatism and gout. There are numerous public and private baths, the most important of which are those in the new and spacious establishment at the eastern end of the~~

~~crescent. The springs supply hot and cold water at a very short distance of each other, flowing at the rate of 60 gallons a minute. The former possesses a uniform temperature of 82° Fahr., and the principal substances in solution are, according to the analysis of Dr Muspratt in 1860—carbonate of lime, carbonate of maguesia, chloride of sodium, chloride of calcium, and silica. There is also a~~

~~'chalybeate spring known as St Anne's well, situated at the~~

~~S.W. corner of the crescent, the water of which when mixed with that of the other springs proves purgative. The Devonshire Hospital, formerly known as the Bath Charity, is a benevolent institution, supported entirely by voluntary subscriptions, for the reception and free treatment of poor patients from any part of the country. About 900 or 1000 persons are annually indebted to its founders, The Buxton season extends from June to October, and during that period the town is visited by thousands annually. The public walks are tastefully laid out. The Cavendish Terrace, 500 yards long, forms a fine promenade; there are excellent drives in the park, which occupies more than 100 acres, and the neighbourhood of the town is rich in objects of interest. Of these the chief are—Poole's Hole, a vast stalac- tite cave, about half a mile distant, now lighted with gas ~ for the convenience of visitors ; Diamond Hill, which owes its name to the quartz crystals which are not unfrequent in its rocks; and Chee Tor, a remarkable cliff, on the banks of the Wye, 300 feet high. Ornaments are manufac- tured by the inhabitants from alabaster and spar; and excellent linie is burned at the quarries near Poole's Hole. Other places of interest, but more distant, are the caverns and mires of Castleton, Haddon Hall, and Chatsworth, the seat of the duke of Devonshire. The population in 1871 within the jurisdiction of the Local Board of Health was 3717 ; but the fluctuating population during summer varies from 4000 to 5000 at a time.~~

~~To judge from the remains of baths and other structures which have at various times been discovered, and the fact that they are situated near the crossing of two military roads, it seems almost cer- tain that the mineral springs of Buxton were known to the Romans ; but by what name they were then designated has not been ascer- tained. We find them a favourite resort in the period before the Reformation, when the patients were in the habit of~~

~~offering their crutches or articles of attire to the image of St Anne, the tutelar saint, in token of their gratitude for benefit derived from the springs. Sir William Basset, at the command of Henry VIII., destroyed the " tabernacle " and prohibited the practice ; but the wells seem to have lost none of their reputation by the loss of their saint, and continued to be a favourite resort in the last part of the century. Their praises were sounded in 1572 by John Jones, " Phisition at the King's Mede, near Darby," in The Benefits of the Ancient Baths of Buckstones, and at a later period they were celebrated by Hobbes and Cotton in their respective accounts of the wonders of the Peak. See also Thomas Brown's Tour in Derbyshire, and among modern works, Sir Charles Scudamore's Tepid Springs of Buxton, 1839 ; Robertson's AMfineral Waters, 1854; .L. Jewitt's History of Buxton.~~

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~~BUXTON, Jepeprau, a prodigy of skill in numbers, was born in 1704, at Elmton, near Chesterfield in Derby- shire. Although his father was schoolmaster of the parish, and his grandfather had been the vicar, his education had been so neglected that he could not write ; and his know- ledge, except of numbers, was extremely limited. How he came first to know the relative proportions of numbers, and their progressive denominations, he did not remember; but on such matters his attention was so constantly rivetted, that he frequently took no cognizance of external objects, and when he did, it was only with reference to their numbers. He worked out every question after his own method, without any external aid, and without understand- ing the common rules of arithmetic. He would stride over a piece of land or a field, and tell the contents of it almost as exactly as if it had been measured by the chain. In this manner he measured the whole lordship of Elmton, con- sisting of some thousand acres, and gave the contents not only in acres, roods, and perches, but even in square inches. After this, for his own amusement, he reduced them into square hairs'-breadths, reckoning forty-eight to each side of the inch. His memory was so great, that in resolving a question he could leave off and resume the operation again at the same point after the lapsc of a week, or even of several months. His perpetual application to figures prevented the smallest acquisition of any other knowledge. On his return from church it never appeared that he had brought away one sentence, his mind having been~~

busied in his favourite occupation. His wonderful faculty was tested in 1754 by the Royal Society of London, who acknowledged their satisfaction by presenting him with a handsome gratnity. During his visit to the metro- polis he was taken to see the tragedy of Richard III. performed at Drury Lane theatre, but his whole mind was given to the counting of the words uttered by Garrick. Similarly, he set himself to count the steps of the dancers ; and he declared that the innumerable sounds produced by the musical instruments had perplexed him beyond measure. He lived till about the age of seventy, and died at the place of his birth.

BUXTON, Sir Tuomas Foweri (1786-1845), a dis- tinguished philanthropist, whose name is inseparably asso-

ciated with that of Wilberforce in the abolition of slavery, |

was born in Essex, April 1,1786. He was not educated at any of the public schools, and at about the age of eighteen he entered Trinity College, Dublin, with a very slender stock of acquirements. But he was aware of his defects, and laboured so earnestly that he came out one of the first men of his time, and with an extraordinarily high reputa- tion as a speaker. In 1809 he married Harriet Gurney, sister of the celebrated Mrs Fry. As his own means were not of themselves sufficient to support his family, he entered in 1808 the brewery establishment of Truman, Han- bury, and Co., of which his uncles, the Hanburys, were part- ners. He devoted himself to business with characteristic enthusiasm, became a partner in 1811, and soon had the whole concern in his hands. In 1816 he brought himself into notice by his speech in behalf of the Spitalfields weavers, and in 1818 he published his able Jnquiry into Prison Discipline. The same year he was elected member for Weymouth, a borough for which he continued to sit till 1837. In the House of Commons he had a high reputation as an able and straightforward speaker, devoted to philan- thropic schemes. Of these plans the most important was that for the abolition of slavery in the British colonies. Buxton devoted his life to this object, and through defeat and opposition, despite the attacks of enemies and the Temonstrances of faint-hearted friends, he remained true to it. Not till 1833 was he successful, and even then only partially, for he was compelled to admit some clauses

~~against which his better judgment had decided. In 1837 he ceased to sit in the House of Commons. He travelled on the Continent in 1839 to recruit his health, which had given way, and took the opportunity of inspecting Con- tinental prisons. He was made a baronet in 1840, and then devoted himself to a plan for ameliorating the condition of the African negroes, The failure of the Niger expedition was a blow from which he never recovered. He died on the 19th February 1845. (See Memoir and Correspondence of Sir T. F. Buxton, edited by his son, Charles Buxton, 1848.)~~

~~BUXTORF, or Buxtorer, Joun (1564-1629), the first of a lineof distinguished scholars, whose Hebrew and rabbini- cal learning shed lustre upon the university of Basel during the 17th century, was born at Camen in Westphalia on the 25th December 1564, The original form of the name was Bockstrop, or Boxtrop, from which was derived the family crest or insignia, which bore the figure of a goat (Bock in German signifying "'he-goat"). His early education was received at the schools of Hamm and Dortmund. After the death of his father, who was minister of Camen, Buxtorf resumed his studies, which had been interrupted for a short time by that event, at Marburg, and the newly- founded university of Herborn, at the latter of which Olevian and Piscator had been recently appointed profes- sors of theology. It was under the teaching of Piscator that Buxtorf first imbibed a love for the Hebrew language and literature, that department in which he was destined afterwards to become so famous. So great was his pro- gress in these studies, that Piscator acknowledged that he was far surpassed by his pupil. At a later date Piscator received the assistance of Buxtorf in the preparation of his Latin translation of the Old Testament, which was published at Herborn in 1602-3. From Herborn Buxtorf repaired to Heidelberg, and thence to Basel, to which latter university he was attracted by the reputation of John James Gryneus and Hospinian. After a residence of some time at Basel, Buxtorf proceeded to Zurich, for the purpose of attending the lectures of Bullinger, and after that to Geneva, where he enjoyed for a short time the instructions of Beza. On his return to Basel, Grynzus, who had been greatly impressed by the character, talents, industry, and great learning of the youth, and was desirous that the services of one who promised to become a scholar of great distinction should be secured to the university, procured him a situation as tutor in the family of Leo Curio, son of Coelius Secundus Curio, so celebrated for his sufferings on account~~

of the Reformed faith. This arrange- ment exercised a decisive influence upon the future life, public and private, of Buxtorf. At the instance of Grynens, Buxtorf undertook the duties of the Hebrew chair in the university, and discharged them for two years with such ability and acceptance, that at the end of that time he was unanimously appointed to the vacant office. From this date (1590) to his death in 1629, a period of thirty-nine years, Buxtorf remained in Basel, and devoted himself to the study of Hebrew and rabbinical literature with an energy and zeal that have rarely been paralleled in the history of any scholar. He is said never to have devoted fewer than eight or ten hours daily to study. Not satisfied with perusing the works of the rabbins, he received into his own house many learned Jews, that he might discuss with them the more difficult and abstruse points treated of in the writings of their country- men. So great, indeed, became his reputation for pro- found and extensive knowledge of rabbinical books, that he was frequently consulted by Jews themselves on matters relating to their ceremonial law. Probably no Protes- tant scholar ever possessed so complete a knowledge of the contents of the rabbinical writings as Buxtorf, and he

seems to have well deserved the title which was conferred upon him of "Master of the Rabbins." His partiality for Jewish society exposed him, indeed, on one occasion to considerable annoyance. He had received a Jew named Abraham into his house in order to assist him in the editing of his great Rabbinical Bible. Abraham's wife was confined of a boy, whose circumcision, agreeably to Hebrew usage, had to take place on the eighth day after birth, and it was necessary that at least two Jewish wit- nesses should be present at the ceremony. Buxtorf obtained permission from the chief officer of the town council to allow two Jews from a distance to assist on the occasion, while he himself, his son-in-law, and two citizens of Basel, were also present. This proceeding, however, gave great offence to the authorities of the city, the laws against the Jews being at this time exceedingly stringent. The result was that Buxtorf and his son-in-law were each fined 100 florins, the father of the boy 400 florins, while the officer of

~~the municipality and the two citizens were punished with three days' imprisonment. Notwithstanding this occur- rence, however, Buxtorf's relations with the city of Basel were of a friendly kind. He remained firmly attached to the university which first recognized his merits, and declined two invitations which were offered him, from Leyden and Saumur successively, to fill the Hebrew chair in these famous schools. His correspondence with the most distin- guished scholars of the day was very extensive, and in the rich collection of letters preserved in the library' of the university of Basel, are contained materials for a literary history of the time which it is hoped may be one day utilized.~~

~~The works which Buxtorf published during his life are too numerous to be all enumerated in this brief notice, and for a com- plete list of them the reader is referred to the authorities cited at the close of the article. The following, however, may be mentioned. In 1602 appearcd his Manwale Hebraicum et Chaldaicum, which reached a seventh edition in the year 1658. In the following year was published his Synagoga Judaica, which appeared first in Ger- man and was afterwards translated into Latin in an enlarged form, and which constitutes a valuable repertory of information regarding the opinions and ceremonies of the Jews. In 1607 he published his Lexicon Hebraicum et Chaldaicum cum brevi Lexico Rabbinico Phitlo- sophico, which was reprinted at Glasgow so recently as 1824. In 1618 there appeared in two folio volumes his great Rabbinical Bible, containing, in addition to the Hebrew text, the Chaldee Paraphrases or Targums, which he punctuated after the analogy of the Chaldee passages in Ezra and Daniel (a proceeding which has been condemned by Richard Simon and others), and the Commentaries of the more celebrated Rabbins, with various other treatises. Of this work it may be said that Rosenmuller's judgment will approve itself to most Hebrew scholars,—that " this edition is indispensable to every one who desires thoroughly to study the criticism and exposition of the Old Testament."— (Rosenmuller, Handbuch fir die Literatur der Biblischen Kritik und Exegese, vol.i.p. 259). The Bible was followed by his Tiberias, sive Commentarius Masoreticus, so named from the eo school of Jewish criticism which had its seat in the town of~~

~~iberias. It was in this work that Buxtorf controverted the views of Elias Levita regarding the late origin of the Hebrew vowel points, a subject which~~

~~gave rise to the. famous controversy between Cappellus and his son John Buxtorf, which will be referred to in the following article. Buxtorf did not live to complete the two works on which his reputation chiefly rests, viz., his great Lexicon Chaldaicum, Talmudicum, et Rabbinicwm, and the Concorduntie Bibliorum Hebraicorwm, both of which were edited by his son. They are monuments of untiring labour and industry, and possess an enduring value. The former work has been recently (1869) re- published at Leipsic with some additions by Bernard Fischer, Ph.D., and the latter was assumed by Fiirst as the basis of his great Hebrew concordance, which appeared in 1840. For additional information regarding his writings the reader is referred to Athene Raurice, pp. 444-448; to the article "“‘ Buxtorf” in Ersch and Gruber's Encyclopedia ; to the Theologttal Cyclopedias of Herzog, and of Wetzer and De Welte, sub voce ‘‘ Buxtorf"; to Niceron's Memoires, vol. xxxi. pp. 206-215 ; to Schrokh's Kirchengeschichie, vol. v. (Post- Reformation period) pp. 72 sy., Leipsic, 1806 ; and to Meyer's Ge-schichte der Schrift-Erklarung, vol. iii., Gottingen, 1804, (F.C.)~~

~~BUXTORF, or Buxrorrr, JoHn (1599-1664), com- monly called "junior," to distinguish him from his father, |~~

~~BUZXTORE~~

~~the subject of the preceding notice. He was born at Basel on the 13th August 1599, and at a very early age displayed remarkable aptitude for the acquisition of languages. When only four years old he was sent to school, at which age he is said to have been able to read Latin, Greek, and Hebrew, in which he had been instructed by his father, At the age of twelve he entered the university, where he speedily distinguished himself above not only his equals, but his seniors in years, to so great a degree that when only sixteen he received the diploma of master of arts from the hands of his own father. From this time he devoted himself to the study of theology, turning his atten- tion especially to the Hebrew language and its cognate dialects, and then proceeding to the study of rabbinical Hebrew, in which he soon attained such proficiency, that he is said, while still a young man, to have read through not only the Mishna, but also the Jerusalem and Babylonian Gemaras, or commentaries upon the text of the Talmud. In conformity with the excellent custom, so long prevalent on the Continent, of visiting several~~

~~universities before finally settling down to life-long professional work, Buxtorf proceeded to Heidelberg in 1617, where he listened to the prelections of the theologians Pareus, Scultetus, and the elder Alting. In 1619 he repaired to Dort, while the famous Synod was still sitting, and there made the acquaint- ance of many of the divines who took part in its proceedings. At the close of the Synod he made a short journey in company with the deputies from Basel, through the Netherlands and England, and thence through France back to Basel. On his return he found that his father's great Rabbinical Bible was in course of publication, and as there was no lexicon suitable for the study of the Chaldee Targums, comprised in the work, he undertook the compilation of such a lexicon, which appeared at Basel in 1622 under the title of Lexicon Chaldaicum et Syriacum, with a recom- mendatory preface from his father, detailing the circum- stances under which the work had been executed. Still thirsting for knowledge, he repaired in 1623 to Geneva, to enjoy the instructions of the elder Turretin, Diodati, and Tronchin ; while in return Turretin and Dav. Clericus did not disdain to avail themselves as pupils of his pre-eminent knowledge of Hebrew and of the rabbinical dialect. So great by this time had become his reputation as a scholar, that he was offered by the authorities of the city of Bern the chair of logic at Lausanne, which he declined, preferring to return to Basel, where in 1624, he was appointed general deacon to the church of Basel (Communis Ecclesiee Basileensis Diaconus), and three years later deacon of St Peter's church. On the death of his father in 1629, Buxtorf was unanimously designated as the fittest person to succeed so distinguished a Hebraist ; and by the advice of his physicians, who were of opinion that the labours involved in the discharge of the duties of a public preacher would be injurious to one whose constitution was feeble, he finally accepted the office. From this date until his death © he remained at Basel, declining two offers which were made to him from Groningen and Leyden, to accept the Hebrew chair in these two celebrated schools. To mark their appre- ciation of his patriotic conduct, the governing body of the university founded in 1647, specially for his behoof, a third theological professorship, that of " Commonplaces and Con- troversies," the duties of which Buxtorf discharged for seven years along with those of the Hebrew chair. When, however, the professorship of the Old Testament became vacant in 1654 by the death of Theodore Zuinger, Buxtorf _ resigned the chair of theology, and accepted that of the Old Testament instead, holding both offices, and~~

~~for some time that also of chief librarian to the university, until his death in 1664. The course of his private life was chequered by many domestic bereavements. He was four times married,~~

~~BUZ—BYN~~

~~his three first wives dying shortly after marriage, and the fourth predeceasing her husband by seven years. His children also all died young, with the exception of two boys, the younger of whom, John James, became first his father's colleague, and shortly after his successor in the chair of Hebrew.~~

~~A considerable poen of his public life was spent in controversy regarding dispute points in Biblical criticism, in reference to which he had to defend the views advanced by his father. The attitude of the Reformed churches at that time, as opposed to the Church of Rome, led them to take up and maintain many opinions in regard to Biblical questions, which were not only erroneous in point of fact, but which were altogether unnecessary for the stability of their position, Having renounced the dogma of an infallible church, it was deemed necessary to maintain as a counterpoise, not only that of an infallible Bible, but, as the necessary foundation of this, of a Bible which had been handed down from the earliest ages to the present time without the slightest alteration or change in its text. The letters in which the Old Testament was written, were, it was asserted, the same as those in which the two tables of the law had been written ; the vowel points and accents which accompanied them had been given by divine inspiration; and the words themselves had not undergone the slightest change from the time they had flowed from the pens of the respective writers. The Masoretic text of the Old Testament, therefore, as compared either with that of the recently discovered Samaritan Pentateuch, or of the Septuagint, or of the Vulgate, was alone the " Hebrew Verity," wherein the true words of the sacred writers were to be found. Although many of the Reformers, as well as learned Jews, had long seen that these assertions could not be made good, there had been as yet no formal controversy upon the subject. It was reserved for a learned and acute Frenchman, Ludovicus Cappellus the younger, professor of Hebrew at Saumur, to enter the field, and by a series of controver- sial writings effectually to dispel the illusions which had long~~

~~prevailed in many minds As early as 1622 or 1623, Cappellus had submitted in manuscript to the elder Buxtorf a work on the modern origin of the vowel points and accents, which he had been led to undertake in consequence of the statements made by the Swiss pro- fessor in his Tiberias, or Commentary on the Masora, in which he had controverted the views of Elias Levita on the date origin of the points. Buxtorf saw the force of the arguments employed by Cappellus, but counselled him not to publish his work, pointing out the injury which it would do to the Protestant cause, and the advan- tage which it would afford to Romish controversialists on the ques- tion of the infallible accuracy of the text of Scripture. Cappellus, however, was not to be deterred by fear of consequences. He sent his MS. to Thomas Erpenius of Leyden, the most learned Orientalist of his day, by whom it was published in 1624, under the title Arcanum Punctationis revelatum, with a laudatory preface, but without the author's name In this work Cappellus adduced those arguments and considerations which have satisfied most scholars since his day that the vowels and accents are the invention of the Masoretes, and that they are not older than the fifth century of the Christian era. It is worth noting that although the elder Buxtorf lived five years after the publication of the work, he made no public reply to it, and it was not until 1648, nearly a quarter of a century afterwards, that Buxtorf, junior, published his Tractatus de punc- toruwm origince, antiquttate, ct authoritate, oppositus Arcano puncta- tionis revelato Ludovici Cappelli. In this treatise he endeavoured to prove by copious citations from the rabbinical writers, and by arguments of various kinds, that the points, if not so ancient as the time of Moses, were at least as old as that of Ezra, and thus pos- sessed the authority of divine inspiration. In the course of the work he allowed himself frequently to employ contemptuous epithets towards Cappellus, such as ''innovator," '' prophet," ''revealer," "a seer of visions," ''dreams," &c. Cappellus was not the man to remain silent in such circumstances. He speedily prepared a second edition of his work, in which, besides replying to the argu- ments of his opponent, and fortifying his position with new ones, he retorted his contumelious epithets with interest. Owing to various causes, however, among which may be mentioned the distrust with which Cappellus was coming to be regarded on account of his critical opinions among Protestants themselves, this second edition did not see the light until thirty years after his death, when it was published at Amsterdam in 1685, in the edition of his collected works.~~

Besides this controversy, Buxtorf engaged in three others with the same antagonist, on the subject of the integrity of the Masoretic text of the Old Testament, on the antiquity of the pre- sent Hebrew characters, and on the Lord's Supper. Into the details of these, however, our space does not allow us to enter. In the two former Buxtorf supported the untenable position that the text of the Old Testament had been transmitted to us without any errors or alteration, and that the present square or so-called Chaldee characters were coeral with the original composition of the various books. These views were triumphantly refuted by his great oppo-

nent in his Critica Sacra, and in his Diatriba de veris et antiquis Ebraicorum literis. Besides the works which have been already mentioned in the course of this article, Buxtorf edited the great Lexicon Chaldaicum, Talmudicum, et Rabbinicum, on which his father had spent the labour of twenty years, and to the completion of which he himself gave ten years of additional study, and the great Hebrew Concordance, which his father had little more than begun. In addition to these, he published new editions of many of his father's works, as well as others of his own, complete lists of which may be seen in the Athenee Raurice, and other works enu- merated at the close of the preceding article. (F. C.)

BUZZARD, a word derived from the Latin Luteo, through the French Busard, and used in a general sense "for a large group of Diurnal Birds-of-prey, which contains, among many others, the species usually known as the Common Buzzard (Buteo vulgaris, Leach), though the English epithet is now-a-days hardly applicable. The name Buzzard, however, belongs quite as rightfully to the birds called in books '" Harriers," which form a distinct subfamily of Falconide under the title Circine, and by it one species, the Moor-Buzzard (Circus cruginosus), is still known in such places as it inhabits. " Puttock" is also another name used in some parts of the country, but per- haps is rather a synonym of the Kite (Afilvus ictinus). Though ornithological writers are almost unanimous in dis- tinguishing the Buzzards asa group from the Eagles, the grounds usually assigned for their separation are but slight, and the diagnostic character that can be best trusted is probably that in the former the bill is decurved from the base,

~~while in the-latter it is for about a third of its length straight. The head, too, in the Buzzards is short and round, while in the Eagles it is elongated. In a general way Buzzards are smaller than Eagles, though there are several exceptions to this statement, and have their plumage more mottled. Furthermore, most if not all of the Buzzards, about which anything of the kind is with certainty known, assume their adult dress at the first moult, while the Eagles take a longer time to reach maturity. The Buzzards are fine-looking birds, but are slow and heavy of flight, so that in the old days of falconry they were regarded with infinite scorn, and hence in common English to call a man "a buzzard" is to denounce him as stupid. Their food consists of small mammals, young birds, reptiles, amphibians, and insects, —particularly beetles,—and thus they never could have been very injurious to the game- preserver, though they have fallen under his ban, if indeed they were not really his friends, but at the present day they are so scarce that in this country their effect, whatever it may be, is inappreciable. Buzzards are found over the whole world with the exception of the Australian region, and have been split into many genera by syste- matists. In the British Islands we have two species, one resident (the B. vulgaris already mentioned), and now almost confined to a few wooded districts; the other the Rough-legged Buzzard (Archibuteo lagopus), an irregular Winter-visitant, sometimes arriving in large bands from the north of Europe, and readily distinguishable from the former by being feathered down to the toes. The Honey- Buzzard (Pernis apivorus), a summer-visitor from the south, and breeding, or attempting to breed, yearly in the New Forest, does not come into the subfamily Buteonine, but is probably the type of a distinct group, Pernince, of which there are other examples in Africa and Asia. (A. N.)~~

~~BYNG, Grorer (1663-1733), Viscount Torrington, a distinguished English admiral, was born at Wrotham, Kent, and at the age of fifteen went to sea as a volun- teer. After being several times advanced, he was in 1702 raised to the command of the '" Nassau," a third rate, and was at the taking and burning of the French fleet at Vigo; and the next year he was made rear-admiral of the red. In 1704 he served in the grand fleet sent to the Mediterranean, under Sir Cloudesley Shovel, as rear-admiral~~

~~of the red, and reduced Gibraltar. He was in the battle of Malaga, which followed soon afterwards, and for his gallantry in that action received the honour of kinghthood. In 1718 he was made admiral and commander-in-chief of the fleet, and was sent with a squadron into the Mediterranean for the protection of Italy. This commission he exccuted so well that the king made him a handsome present, and sent him full powers to negotiate with the princes and states of Italy, as there should be occasion. He procured the emperor's troops free access into the fortresses which still held out in Sicily, sailed afterwards to Malta, and brought out the Sicilian galleys, and a ship belonging to the Turkey Company. By his advice and assistance the Germans retook the city of Messina in 1719, and destroyed the ships which lay in the basin—an achieve- ment which completed the ruin of the naval power of Spain. The Spaniards being much distressed offered to quit Sicily ; but the admiral declared that the troops should never be suffered to depart from the island till the king of Spain had acceded to the quadruple alliance, and to his conduct it was entirely owing that Sicily was subdued, and the king forced to accept the terms prescribed him by the alliance. On his return to England he was made rear-admiral of Great Britain, a member of the privy council, Baron Byng of Southill, in the county of Bedford, and Viscount Torrington in Devonshire. He was also made one of the Knights Companions of the Bath upon the revival of that order in 1725. In 1727 George II., on his accession to the crown, placed him at the head of naval affairs as first lord of the Admiralty. He died January 15, 1733, in the seventieth year of his age, and was buried at Southill, in Bedfordshire.~~

~~BYNG, Tue Hon. Jonn (1704-1757), British admiral, fourth son of the subject of the preceding notice, entered the navy at an early age, became captain in 1727, and in 1745 was made rear-admiral of the red. In the year 1755 the British Government received intimation that the French were fitting out a naval expedition in Toulon, and it behoved them to attend to the defences of Gibraltar and Minorca. Nothing, however, was done until the intentions of the French were too apparent, and Byng was then en- trusted with ten miserably equipped ships of war, and set sail from Spithead on the 7th April 1756. He put in at Gibraltar to receive stores, and there learnt that the French had made good their descent upon Minorca, On the 19th May he came in sight of St Philip's, still held by the British, but failed to establish communications with the governor. On the following day he engaged with~~

~~the French fleet, which was inferior in number of vessels, but vastly superior in armament and equipment. There seems no doubt that the division under Byng's charge did not second with sufficient eagerness the bold attack made by Admiral West. The action was indecisive, and next morning Byng called a military council, and it was resolved that, under the cir- cumstances, it was hopeless to attempt anything further, and that Minorca must be left to its fate. The fleet returned to Gibraltar. The indignation of the English at the transaction was intense, and the Government took advantage of it to avert from themselves the charge of incapacity. Byng was at once superseded and brought home under arrest. A court-martial on his conduct sat during December 1756 and January 1757, and found that the admiral had not done his utmost to relieve St Philip's, or to defeat the French fleet, though they fully acquitted him of cowardice or treachery. The only punishment open to them to inflict was that of death, and they passed their sentence with the utmost reluctance, coupling it with an earnest recommendation to mercy. No attention was paid to this or to other attempts to mitigate what was felt to be an unduly severe punishment for mere incapacity.~~

~~BY N—BYR~~

~~The unfortunate admiral was shot on the 14th March WT.~~

~~BYNKERSHOEK, Corne ius Van (1673—1743), a dis. tinguished Dutch jurist, was born at Middleburg in Zeeland, In the prosecution of his legal studies, and while holding the offices first of member and afterwards of president of the supreme court, he found the common law of his country so defective as to be nearly useless for practical purposes, This abuse he resolved to reform, and took as the basis of a new system the principles of the ancient Roman law. His works are very voluminous. The most important of them are the Observationes Juris Romani, published in 1710, of which a continuation in four books appeared in 1733; the treatise, De Dominio Maris, published in 1721; and the Queestiones Juris Publici, published in 1737. Complete editions of his works were published after his death ; one in folio at Geneva in 1761, and another in two volumes folio at Leyden in 1766.~~

~~BYROM, Joun (1691-1763), a poet and miscellaneous writer, was born at Kersall, near Manchester, and educated at Trinity College, Cambridge. His first poetical essay, the well-known Colin and Phebe, appeared in the Spectator, No. 603. After leaving the university he studied medicine at Montpellier, and became a convert to the mystical theology of Bouriguon and Boehme. He was elected a member of the Royal Society in 1723. Having reduced himself to narrow circumstances by a precipitate marriage, he supported hiraself by teaching a new method of short- hand writing, of his own invention, till he succeeded to an estate on the death of an elder brother. He was a man of lively wit, of which, as opportunity offered, he gave many specimens. A collection of his miscellaneous poems was printed at Manchester, in two vols. 8vo, 1773, and reprinted at Leeds in 1814, with a life of Byrom by an anonymous writer. Byrom's Private Journal and Correspondence have appeared among the publications of the Chetham Society (vols. xxxiv. and xliv.)~~

~~BYRON, Gzorce Nort Gorpon Byron, Lorp (1788- 1824). The portrait of the most remarkable figure in the literature of this century is still too often made up on the principle of putting in all the shadows and leaving out all the lights. Not only the facts of his own life, but even the records and traditions of his ancestry, are partially selected in this way. It is true, no doubt, that a man's immediate ancestors must be supposed to have most influence on his character, and that Byron's immediate ancestors were far from being quiet, respectable people. His father, Captain Byron, was a profligate officer, whose first wife was a divorced lady with whom he had eloped to France, who married a second time only to find the means for paying his debts, and who left his wife as soon as her fortune was exhausted. His mother, Catherine Gordon, heiress of Gight in Aber-deenshire, was a fitful and passionate woman, who knew no stable halting-place between the extremes of indulgent fondness and vindictive disfavour. His grand-uncle, whom he succeeded in the title, had killed his neighbour and relative, Mr Chaworth, in a drunken brawl, had been tried before the House of Lords on the charge of murder and acquitted, but had been so wrought upon by remorse and the sense of public opprobrium, that he shut himself up at Newstead, let the place go to ruin, and acquired such a bad repute by his solitary excesses that he was known as the "wicked Lord Byron." Even in this wild ancestry it is easy to detect the corruption of good~~

~~things. In other parts of the family line the nobler elements are seen running clear and pure. The poet's grandfather, Admiral Byron, " Foul- weather Jack," who had as little rest on sea as the poet on land, had the virtues without the vices of the race, Farther down the family tree we find the Byrous distinguishing themselves in the field. Seven brothers fought in the~~

~~BY RON~~

~~battle of Edgehill. None of the family would seem to have been stirred by the poetic impulse in the brightest period of English song, but later on, under Charles II., there was a Lord Byron who patronized literature, and himself wrote gome verses in which he professed — *¢ My whole ambition only doth extend To gain the name of Stedman's faithful friend."~~

~~Sir Egerton Brydges, however, has found a poetic ances- try for Byron by connecting the Byrons of the 17th century with the family of Sydney.~~

~~The poverty into which Byron was born, and from which his accession to high rank did not free him, had much to do in determining his future career. That he would have written verses in whatever circumstances he had been born we may safely believe ; but if he had been born in affluence we may be certain that, with his impressionable disposition, he would never have been the poet of the Revolution—the inost powerful exponent of the modern spirit. By the time of his birth (at Holles Street, London, January 22, 1788), his father had " squandered the lands o' Gight awa," and his mother was ou her way back from the Continent with a small remnant of her wrecked fortune. Mrs Byron took up her residence in Aberdeen ; and her," lame brat," as she ealled him in her fits, was sent for a year to a private school at 5s. a quarter, and afterwards to the grammar school of the town. Many little stories are told of the boy's affectionate gratitude and venturesome chivalry, as well as of his exacting and passionate temper. 'The sisters Gray, who were his successive nurses, found him tractable enough under kind treatment. HIs mother, whose notions of discipline consisted in hurling things at him when he was disobedient, had no authority over him ; he met her vio- lence sometimes with sullen resistance, sometimes with defiant mockery ; and once, he tells us, they had to wrench from him a knife which he was raising to his breast. At school he passed from the first to the fourth class, but witb all his ambition to excel he was~~

~~too self-willed to take kindly to prescribed tasks, too emotional for dry intellectual work ; and he probably learned more from Mary Gray, who taught him the Psalins and the Bible, than he did from his schoolmaster. Before he left Aberdeen, which he did on the death of his grand-uncle and his accession to the peerage in May 1798, he gave a remarkable proof of the precocious intensity of his affections by falling in love with his cousin Mary Duff. So strong a hold did this passion take of him, that six years afterwards he nearly went into convulsions on hearing of her marriage.~~

~~When Byron's name was first called in school with the prefix "Dominus," the tradition is that he burst into tears,— from pride, M. Taine conjectures, —-from pain at the gulf thus placed between him and his school-fellows, the Countess Guiccioli. Soon after, his mother, who had frequently taken advice for the cure of his lame foot, went with him to Nottingham, and placed him under the cure of an empiric, who tortured him to no purpose. The torture was renewed under the advice of a London physician at Dr Glennie's school at Dulwich, at which he was entered in the summer of 1799 ; and at last the foot, as he wrote to his old Scotch nurse, was so far restored that he was able to put on a common boot. He was two years with Dr Glennie, and though he made little progress in his classical studies, he had the run of his master's library, and added greatly to his general information. Before he left for Harrow he had contracted another passion for his cousin Margaret Parker, so intense that he could not sleep nor eat when he was looking forward to meeting her. He went to Harrow in 1801, "a wild northern colt," as the head-master said of him, very much behind his age in Latin and Greek. This deficiency he never quite overcame, though he worked enough to get into the same form with boys of his own age.~~

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~~Antiquarian studies never had any charm for him. But though, according to his own account, he was always evicketing, rebelling, and getting into mischief, his brain was not idle. Partly to keep up his school repute for " general information," he read every history he could lay hands on, and not without system either, for he set himself deliberately to know sornething about every country. He also went through all the British classics, both in~~

~~Johnson and in Anderson, and most of the living poets. Few boys left Harrow with such a store of useful learning. Many anecdotes are told of the warmth of his friendships at Harrow, and his chivalry in defending his juniors. In the vacation of 1803 he again fell in love—this time more seriously—with Miss Chaworth, whose grandfather " the wicked Lord Byron" had killed. In the melancholy moods of his after life her rejection of him was often a subject of passionate regret.~~

~~Byron's residence at Cambridge (Trinity College, 1805 to 1808, with interval of a year) added little to his know- ledge of academical learning. The arts in which he qualified himself to graduate were swimming, riding, fencing, boxing, drinking, gaming, and the other occupa- tions of idle undergraduates. When he went up to Cambridge he was wretched, he tells us, partly from leaving Harrow, partly "from some private domestic circumstances of different kinds," chiefly, it may be presumed, the want of money; but his friend Scrope Davies lent him large sums, and he lived with a certain reckless happiness which had a great deal more to do with his moodiness and melancholy than the libertine excesses with which he is popularly credited. Much more important than his residence in Cambridge, as bearing on his mental development, was his year's residence at South- well. From that happy period, which saw the serious dawn of his genius, M. Taine has picked out only the unhappy violent quarrel with his mother, which was the cause of its termination. His intimacy with the Pigotts, and the expansion of his poetic impulses under their genial encouragement, are much more worthy of notice than this culmination of miserable bickerings which he was now strong enough to laugh at, when the domestic storm was over. He had scribbled many verses at Harrow, but had been too shy to show them to his roystering friends ; and now finding for the first time an admiring audience, he put forth his powers in earnest, as he could do only under the influence of love or defiance. The result came before the public in the Hours of Idleness, published by Ridge of Newark in March 1807.1 The poems in that collection have something of the insipidity of the circumstances that gave them birth, but the fact of publication bound him to his vocation to a degree of which he was uot at all aware. Hitherto his ambition had pointed towards pclitics as his natural field, and he said as much in the somewhat dis- dainful preface to his poems. Putting his ambition into verse, he characteristically compared himself to a slumbering~~

~~volcano, and longed to burst on the world asa Fox or a Chatham. But the Hours of [dleness decided his career for him. When he went back to Trinity College he could not help eagerly watching their effect. Again and again he wrote 'to the friendly Miss Pigott to hear how they were succeeding. He was prepared for defeat, he said, and he promised to take vengeance on adverse critics. He was made a new man by the publication ; he had tasted public applause and hungered for more of it. It was then that he carefully examined himself, and took stock of his acquirements in the very remarkable document dated~~

~~1 He had previously printed a volume for private circulation, and it is characteristic of his docility, under gentle influences, that he burnt the first impression when Mr Becher rebuked him for the too warm colouring of one of the poems,~~

~~November 30, 1807, to which we are indebted for our knowledge of the extent of his studies. In the midst of his rollicking set at Cambridge he was secretly girding up his loins, and collecting his powers to make a grand struggle for fame. Perhaps no poet was ever drawn out so directly by the thirst for public honour; no poet ever appealed so directly to the public eye and heart. He launched himself bodily before the world, alniost ravenous for sympathy aud homage.~~

~~It is generally said that but for the savage attack of the Edinburgh Review in the spring of 1808 Byron might never have returned to poetry. But the fact is that the review did not appear till a year after the publication of Hours of Idleness, and in the interval Byron, for all his farewell to poetry, was "scribbling," as he called it, more furiously than ever. "I have written," he wrote to Miss Pigott, six months before the Edinburgh attack, "214 pages of a novel; one poem of 380 lines, to be published (without my name) in a few weeks with notes; 560 lines of Bosworth /eld, and 250 lines of another poem in rhyme, besides half a dozen smaller pieces. The poem to be published is a satire." This satire was the poem which he afterwards converted into a reply to the Edinburgh Review. He anticipated censure, and fore-armed himself—always as eager to defy reproof as he was to win applause. Apparently he put off publishing his satire till all his critics~~

~~should have had their say, and he should know clearly where to hit. When the attack came it wounded him bitterly; but a friend who called on him at the time thought from the fierce light in his eye that he had received a challenge. He was in no hurry to publish ; he worked at leisure, with a confident consciousness of his powers, and Lnglish Bards and Scotch Reviewers did not make its appearance till the spring of 1809. When it did appear the authorship was soon discovered, and it was the talk of the town. To us who look back upon it dispassion- ately, and compare its somewhat heavy and mechanical couplets with the exquisite lightness and fitting-point of its antitype the Dunciad, the satire appears to possess no great force; but the personalities told at the time, when there was a vague unrest in the literary world at the out- spoken severity and sometimes truculent malice of the Scotch review, and the injured poet had his revenge in a general acknowledgment that the objects of his wrath deserved castigation, and that the lash was well laid on.~~

~~Svon after the publication of his satire, Byron, in June 1809, left for his travels ou the Continent; and one would have expected that the young lord, with the wreath of triumph still fresh on his head after his first literary battle, would have gone on his journey with satisfaction and hopeful curiosity. He sailed in deep dejection, with all the bitterness of a man who feels himself friendless and solitary, and he returned after two years' wandering in Spain, Albania, Greece, Turkey, and Asia Minor, sadder than before. Why was this? Those who identify him with his own Childe Harold, are ready with the answer that he-had lived a life of dissolute pleasure, and was already, at the age of twenty-one, experiencing the pains of satiety and exhaustion. But this is not borne out by such scanty light as he and his friends have thrown on his life at this period. He himself always protested, both in public and private, against being identified with Childe Harold. Childe Harold's manor was an old monastic residence ; he left his country in bitter saduess; in the original MS. his name was Childe Burun ; he left behind him a mother and a sister; and he passed through the scenes of Byron's travels. But there the resemblance ends. The resemblance is really confined, as the author alleged, to local details. There is no reason to disbelieve what the author affirmed, that Childe Harold was a purely fictitious~~

~~character, " introduced for the sake of giving some connec. tion to the piece." To make him what he intended—"a modern Timon, perhaps a poetical Zeluco,'—the poet drew, no doubt, upon his own gloomier moods ; he felt occasionally as he makes Harold feel habitually, but the process was much more dramatic than the world, in spite of his pro- tests, took for granted. Byron, with all his bitter moods of forlorn despondency, was too susceptible a spirit to ''stalk in joyless reverie" through the south of Europe, as his letters home testify. And we know that his picture of the Bacchanalian feasts in the monastery, with " Paphian girls," and " flatterers and parasites," is not at all like what actually occurred at Newstead Abbey. There were no 'laughing dames" there, except the domestics, and the flatterers and parasites were his bosom friends whom he loved with a romantic ardour. They held "high jinks" there as any young men might have done, masqueraded about in monkish habits to be in whimsical conformity with the place, practised pistol-shooting in the old hall, had a wolf and a bear chained at the entrance, had the garden dug up in search of concealed treasure, found a skull there, had it made into a cup, and passed this cup round after dinner, with the conceit that their mouths did it less harm than the worms, and that when its wit had ceased to sparkle, it had better be filled with Burgundy to make other wits sparkle than lie rotting in the earth, Byron himself was too poor, as Moore has remarked, to keep a harem, had such been his wish. He is known to have had a romantic passion for a girl who used to travel with him in England in boy's clothes ; but whoever thinks he was satiated with this poor creature's devotion to him, should read the concluding stanzas of the second canto of Childe Harold, where the poet speaks in his own person, and laments her death in language utterly out of keeping with the dark unfeeling mood of his "modern Timon." One can then understand why he should have said that "he would not for worlds be a man like his hero." There is really very little of the personage Childe Harold in the poem ; the poet simply has him by his side as a connecting link, while he describes the scenes through which he passed. In the two last cantos, indeed, Byron, angry that the public had identified him with Childe Harold, and then more defiant of public opinion, hardly cared to keep up the separation between his own character and the pilgrim's ; and in the last canto he avowedly makes them coalesce. To look for the causes of~~

~~moodiness and melancholy in material circumstances is a very foolish quest ; but we may be certain that insufficiency of this world's money, and the daily vexations and insults to which his rank was thereby exposed, had much more to do with Byron's youthful gloom than satiety of this world's pleasures. His embarrassed finances, and the impossibility of securing the respect due to his title, formed a constant source of annoyance, put his whole system into a morbid condition, in which every little slight and repulse festered and rankled with exaggerated virulence. From the daily humiliations and impertiuences to which his false position exposed him, aggravated by his jealous and suspicious irritability, he may have turned sometimes to Childe Harold's consolations—" the harlot and the bowl," but his nature prompted him rather to forget his vexations in purer and worthier objects. Unfor- tunately for him, such impetuous and passionate affections as his could rarely find the response for which he craved. In those few cases where devotion was repaid with devotion, the warmth of his gratitude was unbounded ; he loaded poor Thyrza's memory with caresses, careless of what the world might say, remembering only that the poor girl clung to him with unselfish love; and he returned his sister's tender regard with an ardour and constancy that showed | how highly he prized and how eagerly he reciprocated~~

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~~BYRON~~

~~sincere affection. Circumstances that would have fallen lightly on a less sensitive man preyed upon his self- torturing spirit. In his dejection he had taken pleasure in the romantic notion of collecting the portraits of his friends, and one of them refused to sit on the ground that he could not afford it. Another friend, invited to say good-bye, excused himself on the ground that he had to go shopping with his mother. Another prop on which he leaned also precipitated him into the Slough of Despond. His ambition pointed to political distinction, and having given fair youthful proof of the power he felt to be in him, his pride taught him to look for a warm welcome from his party chiefs when he came of age, but on the contrary, there was a haggle over his admission. Lord Carlisle held coldly aloof, and he had to wait with savage indignation till the marriage certificate of his grandfather~~

~~was fished up in Cornwall before he could take his seat. This cold but perfectly correct and formal indifference added another pang to the bitterness with which he took leave of his country. When after two years' absence he returned, still dogged by impecuniosity and the incivilities, real and imagined, that follow in its train, he "found fresh cause to roam." Nursed as he had been in superstitions, he could hardly keep from crying out that the stars had combined against him, when in the months following his return friend after friend went to the grave. Matthews was drowned in the Cam ; Wingfield died of fever at Coimbra ; and he heard of both deaths on the sameday. His mother died in the same month, and in spite of all their quarrels, he felt the bereavement bitterly,~~

~~But the death which most deeply wounded lim came later. Nothing ever racked him with sharper anguish than the death of her whom he mourned under the name of Thyrza. To know the bitterness of his struggle with this sorrow, we have only to look at what he wrote on the day that the news reached him (October 11, 1811) ; some of his wildest and most fiercely misanthropical verse, as well as some of his sweetest and saddest, belongs to that blackest of dates in his calendar. It is time that something were done to trace this attachment, which has been strangely overlooked by the essayists and biographers, because it furnishes an important clue to Byron's character, and is, indeed, of hardly less importance than his later attachment to the Countess Guiccioli. Mr John Morley, in an essay which ought to be read by everybody who wishes to form a clear idea of Byron's poetry as a revolutionary force in itself and an index to the movement of the time, remarks upon the respect which Byron, with all his raillery of the married state in modern society, still shows for the domestic idea. It is against the artificial union, the marriage of convenience, that Byron's raillery is directed ; he always upholds singleness of attachment as an ideal, however cynically or mournfully he laments its infrequence, and points with laughter or with tears at the way in which it is crossed and cut short by circumstances when it does exist. Byron is not a railer against matrimony, except as i counterfeit of the natural union of hearts. His attach- uent to Thyrza shows that in this, as in other matters, he was transparently sincere. It is commonly taken for granted that his youth before, and, indeed, after his marriage with Miss Milbanke, was a featureless level of promiscuous debauchery ; hut those who look more narrowly into the facts cannot fail to~~

~~see that, whatever may have been the number of his "light of loves,"—his fugitive passions were innumerable,—and however often he may have lapsed into vulgar rakery in bitter despair or reckless wantonness, he was always pining for some constant love, and cursing the fate that had denied it to him. This purer sentiment was always enshrined in his heart of heart, from his boyhood to tue end of his days. Who Thyrza was can probably never~~

~~be known, but in trying to convey the impression that she was merely imaginary, probably with the intention of shielding his friend's memory, by declaring him innocent of a relationship unsanctioned by society, Moore really did Byron an injustice. The poor girl, whoever she was, and however much she was deified after her death by his imagination, would really seem to have been his grand passion. Her "dear sacred name" his hand, he says years afterwards, would have trembled to write; he wished it to "rest ever unrevealed;" and when he was questioned by the Countess Guiccioli, he was deeply agitated, and begged her not to recur to the subject. We find him in his Journal, with her in his memory, writing with contempt of the amours of some of his acquaintances, and scoffing at the idea of their applying the name of love to favours that could be purchased. She is the presiding genius of his series of Hastern Tales; be has recorded the fact that when he drew the portrait of Zuleika his whole soul was full of her memory, and her image was again before him when he described the relationship between Zara and the disguised Gulnare. Conrad, with all his conscious villany, had one redeeming passion—' love unchangeable, un- changed." The Giaour, too, loved but one; he learnt that lesson, he said, from the birds ; he despised " the fool still prone to range," and "envied not his varied joys." All these portraitures of single-hearted devotion are tributes to the memory of Thyrza, the "more than friend," com- memorated in the second canto of Childe Harold. Medora's song in the Corsair, " Deep in my soul that tender secret dwells," though not flawless as a lyric, is one of his most beautiful expressions of this mournful sentiment in a subdued key. When we realize how bitterly he lamented her death, and how he could not even bear to write her name, there seems some reason for believing that the mysterious object of Manfred's love and remorse is another of the forms that she took in his~~

~~imagination. Whoever cares to look into the matter will find many little corrobora- tive particulars. It is quite in keeping with the morbid self-accusing tendency, the exaggerated moral sensibility, which Byron showed all his life through, that he should have been consumed with remorse at a recollection which colder-hearted men of the world bear about with them every day without a pang.~~

~~For some months after his return to England, Byron lived at Newstead very unhappily. He wrote that he was growing nervous, "really, wretchedly, ridiculously, fine- ladically nervous." He could not arrange his thoughts ; he feared his brain was giving way, and it would end in madness. He felt at times a strange tendency to mirth. Sometimes he thought of seeking relief in a warfare against society, and he besought one of his friends, when he heard of his deepening crimes, to remember the cause. The inconsistency between this hunger for sympathy and the reckless ferocity of the resolution, shows how distempered his mind was by care and sorrow, "like sweet bells jangled, harsh, and out of tune." At other times he thought more soberly of parliament as a diversion. All his life through, however, "' most of his convulsions ended in verse." He found occupation in correcting the proof-sheets of Childe Harold. He went up to London, not to plunge into a lawless and pitiless course of crime, but te enter upon a political career. He spoke two or three times in the House of Lords on the House-Breaker's Bill, and a petition for Roman Catholic Emancipation, but the publication of Childe Harold put an end at once to his parliamentary ambitions. "When Childe Harold was published," he says, "nobody thought of my prose after- wards, nor indeed did I."~~

~~It has often been asked what was the cause of the instantaneous and wide-spread popularity of Childe Harold,~~

~~which Byron himself so well expressed in the saying, "I awoke one morning and found myself famous." Chief among the secondary causes was the warm sympathy between the poet and his readers, the direct interest of his theme for the time. In the spring of 1812 England was in the very crisis of a struggle for existence. It was just before Napoleon set out for Moscow. An English army was standing on the defensive in Portugal, with difficnlty~~

~~holding its own ; the nation was trembling for its safety. The dreaded Bonaparte's next movement was uncertain: it was feared that it might be against our own shores. Rumour was busy with alarms. All through the country men were arming and drilling for self-defence. The heart of England was beating high with patriotic resolution.~~

~~What were our poets doing in the midst of all this? Scott, then at the head of the tuneful brotherhood in popular favour, was celebrating the exploits of William of Deloraine and Marmion. Coleridge's Christabel was lying in manuscript. His poetic power was, as he said himself, "in a state of suspended animation." Southey was floundering in the dim sea of Hindu mythology. Rogers was content with his Pleasures of Memory. Wordsworth took a certain meditative interest in public affairs, but his poems, " dedicated to liberty," though fine as compositions, have not the fire and sinew, the ardent directness of popular verse. In the earlier stages of the war Campbell had electrified the country with his heart-stirring songs ; but by 1812 he had retired from the post of Tyrtzeus to be- come the poet of Gertrude of Wyoming. Moore confined himself to political squibs and wanton little lays for the boudoir. It was no wonder that, when at last a poet did appear whose impulses were not merely literary, who felt in what century he was living, whose artistic creations were throbbing with the life of his own age, a crowd at once gathered to hear the new singer. There was not a parish of Great Britain in which there was not some household that had a direct personal interest in the scene of the pilgrim's travels—" some friend, some brother there." The effect was not confined to England ; Byron at once had all Europe as his audience, because he spoke to them on a theme in which they were all deeply concerned. He spoke to them, too, in language which was not merely a naked expression of their most intense feelings; the spell by which he held them was all the stronger that he lifted them with the irresistible power of his song above the passing anxieties of the moment. Loose and rambling as Childe Harold is, it yet had for the time an unconscious art ; it entered the absorbing tumult of a hot and feverish struggle, and opened a way in the dark clouds gathering over the combatants through which they could see the blue vault and the shining stars. If the young poet had only thrown himself forward to ridicule the vanity of their struggles, he would most certainly have been spurned aside in the heat of the fight with anger and contempt ; but he was far from being~~

~~a heartless cynic ; his sympathy with the Spanish peasant, his worship of the scenic won- ders of the country, his admiration of the beroism of the women, his ardent battle-cry of freedom, burst through his thin pretence of cynicism, The pulse of heroism— heroism conscious of the worst that could happen, and undismayed by the prospect—beat beneath the garb of the cynic. It may have been by unconscious art, but it was not without dramatic propriety, that Byron turned in his second canto from the battlefields of Spain and the tremendous figure of war—~~

~~"* With blood-red tresses deepening in the sun, And death-shot glowing in his fiery hands—"~~

~~to " August Athena," "ancient of days," and the " vanished hero's lofty mound." In that terrible time of change, when~~

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~~every state in Europe was shaken to its foundation, there was a profound meaning in placing before men's eyes the departed greatness of Greece; it rounded off the troubled scene with dramatic propriety. Even the mournful scepticism of Childe Harold was not resented at a time when it lay at the root of every heart to ask, Is there a God in heaven to see such desolation, and withhold His hand ?~~

~~The attention of the public once caught by his sympathy with them, it was rivetted by the theatrical fascination of the character of the pilgrim, whom they persisted in identifying with himself. Young,a man of genius, a lord, and unhappy—unhappy with a sorrow that could not be repressed,—here was a mystery over which speculation could never tire. On Byron himself the first effect of his fame was almost to endanger his poetic gift. He became acquainted with Moore, and went into the fashionable world as a "lion." He had never been in " society" before, and he took to gay life with all the impressionable facility of his character. He was even caught one evening by Mr Dallas in full court dress, and though he repented and did not go, this contemplated breach of his democratic principles, in gratitude for some kind words from the regent, shows how ductile his character was, and how easily he might have been lost to serious poetry if circumstances had not in his youth excluded him from the society of his rank, His docility~~

~~under new influences was shown in the frank way in which he retracted hard saying after hard saying of his Hnglish Bards, and in the fact that though he was sufficiently scornful of the gay world to write the Waltz (1813), he strenously denied the authorship. Yet he soon began to tire of fashionable gaieties and to long for solitude.~~

~~Byron's poetic power did not advance in strength during the four years of his connection with high life. As he had been led to employ the Spenserian stanza by Campbell's Gertrude of Wyoming, which reached his hands just as he was setting out on his travels, be began now to try the metres in which Scott had made his fame. He produced in rapid succession the Giaour (May 1813), the Bride of Abydos (December 1813), Corsair (January 1814), Lara (August 1814), Szege of Corinth (January 1816), Parisina (February 1816). The best of these is the first ; but they were received with an enthusiasm which rose higher and higher with each successive publication. It is quite clear that it was against his intention that he had been identified with Childe Harold, but it is equally clear that though the self-restrained, stern, dark-browed heroes are personifica- tions of only one side of his character, one series of moods, and are as nnlike as possible to the complete Byron, he was not unwilling that they should be accepted as types of himself. There was another reason for this than a morbid desire to represent himself as worse than he really was. All Byron's friends from his boyhood upwards declare him to have been of a very shy disposition. Never having been in the fashionable world before the spring of 1812, he was far from being at his ease in it ; and he masked his shyness under a haughty and reserved manner. How severe a restraint this wes on his natural manner may be inferred from the delight with which he escaped from it in the society of his boon companiéns. It galled his vanity to be thus constrained by people for whom he had no great respect, and it is impossible to help conjecturing that he courted identification with his silent heroes, with their "vital scorn of all," and "chilling mystery of mien," in order to supply a romantic explanation of a reserve which was really due to unconquerable shyness. The influence of personal vanity on Lord Byron's actions, counterbalanced as it was and concealed by an equal warmth of generous feeling, is all but incredible. It was part of that amazing~~

~~sensitiveness to the impressions of the present which was the secret of much of the weakness of his character and much of the power of his poetry.~~

~~In November 1813 Byron proposed for the hand of Miss Milbanke, only daughter of Sir Ralph Milbanke, a wealthy baronet, and granddaughter and heiress of Lord Wentworth, "an eligible party," he owned in a letter to Moore, though he "did not address her with these views." His suit was rejected, but she expressed a desire to correspond with him. In September 1814 he made another proposal, which was~~

~~accepted, and the marriage took place on January 2, 1815. | On 10th December a daughter, named Augusta Ida, was |~~

~~born. On 15th January 1816 Lady Byron left her husband's house in London on a visit to her father at Kirkby Mallory. On the way she wrote an affectionate letter to Byron, beginning " Dear Duck," and signed " Your Pippin." A few days after he heard from her father that she had resolved never to return to him, and this intelli- gence was soon confirmed by a letter from herself. In the course of next month a formal deed of separation was drawn up andsigned. This is Moore's account of the affair. Lady Byron's account, published on the appearance of Moore's Zzfe, differs chiefly as regards the part taken by her parents in bringing about the separation. Byron suspected her mother's influence. Lady Byron took the whole responsibility on herself. Before she left town she thought Byron mad, and consulted Dr Baillie. Dr Baillie persuaded her that this was an illusion. She then told her parents that she desired a separation. The grounds on which she desired this were submitted by her mother to Dr Lushington, who wrote that they justified a separation, but advised a reconciliation. Then Lady Byron had an interview with Dr Lushington, and communicated certain facts, after which he declared a reconciliation impossible. A celebrated living authoress, who was slightly acquainted with Lady Byron, has, it is well known, made a definite statement on this subject, implicating a member of Lord Byron's own family. It is enough, however, to say that~~

~~there is no evidence in support of the statement, and that | itis virtually contradicted by Lady Byron's own behaviour, |~~

~~as she remained on intimate terms with the relative referred to after the separation from her husband.~~

~~The real causes of the separation between Byron and his wife must always remain more or less matter of debate, no absolute proof being possible, and disputants reasoning on the presumptions according to temperament and preposses- sion. Byron's own statement that ‘“‘the causes were too simple ever to be found out,” probably comes nearest the truth.~~

~~That their tempers were incompatible, that without treating | her with deliberate cruelty he tried her forbearance in |~~

~~many ways, and behaved as no husband ought to do, that for her own happiness she had every reason to demand a separation, will readily be believed. After his marriage a huge accumulation of debtors began to press their claims ; no less than nine executions were put in force in his house during the year; and Byron, under the indignities to which he had daily to submit, acted with an insane violence which might have justified any woman in believ- ing that she was not safe under the same roof with him. Tt would have required a very peculiar temper to be com- patible with his under the circumstances. A placid, good- tempered woman, with strong good sense, and a boundless affection, which could forget and forgive his most unreason- able outbreaks, might have lived with him happily enough, finding in his sunny moods of playfulness and endearment ample compensation for his fits of gloominess and violence. But Lady Byron was very far from being a woman of that mould, A wife who could coldly ask Byron “ when he meant to give up his bad habit of making verses,” possessed a terrible power of annoying such a man ;_her perfect self-~~

~~command and imperturbable outward serenity, her power of never forgetting an injury and taking revenge with angelic sweetness and apparent innocence of vindictive intention, must have been maddening. ‘The serene way in which she clung to and promoted the maid, Mrs Clermont, in the face of Byron's intolerable dislike to the woman, was gall and wormwood to him. An even-tempered man might have lived with such a person comfortably on terms of mutual politeness ; but for a haughty-tempered,~~

~~violent, fitful, moody man it would have been impossible to find a more incompatible partner.~~

~~Why, at the time of the separation, did not the public look upon Byron and his wife as simply an ill-assorted pair who could not agree, and were better to separate? From the first it was rumoured that Lady Byron refused to tell the cause of their separation, whence the public naturally inferred that it must be too terrible to be revealed, and busied themselves inventing and circulating crimes of suitable magnitude. Retribution fell upon Byron for his identifying himself with crime-stained buccaneers. The publication, by an indiscreet friend, of his Marewell to Lady Byron, and the verses entitled A Sketch, let loose the flood-gates of popular indignation in the press. On the Farewell indeed, there was some difference of opinion. A lady correspondent of the Courier declared that "if her husband had bidden her such a farewell she could not have helped running into his arms and being reconciled immediately." If Lady Byron had been such a woman— we have no right to blame her because she was not—the separation, in all probability, would never have taken place. The vast majority in English society resented the publica- tion of the Farewell as an unworthy attempt to put his wife in the wrong, by holding up her unforgiving temper for public reprobation. We now know that the farewell was written in all sincerity and bitterness of heart, with the tears falling on the paper as he wrote, and that it was published by the indiscreet zeal of a friend to whom he had sent the verses. The fierce attack upon Mrs Clermont in the Sketch was universally condemned as unmanly. The two poems are chiefly interesting now as showing the poet's ungovernable incontinence, his passionate craving for sympathy, and the utter distemper of his mind in the bewilderment of misfortune.~~

~~Byron took final leave of England in April 1816. From~~

~~| that date the external events of his life, down to his~~

~~memorable interference in the cause of Greek independence present comparatively little variety, andexcite comparatively little interest. Nothing occurred after this to give a new turn or a new colour to his poetic career; the powerful influences which had conspired to torture music out of him were modified by the lapse of time, but very little, if at all, by the incidents~~

~~of his life. The bitter feelings with which he left England, the angry sense of injustice and spirit of proud and revengeful defiance, alternating hysterically with humble self-reproach and generous forgive- ness, passed into lighter forms, but they never ceased to rankle. Like Manfred, he asked in vain for oblivion.~~

~~In the thick of his troubles, before leaving England, Byron conceived that he had never been "in a situation so completely uprooting of present pleasure, or rational life for the future." But his going abroad was really a most fortunate step both for his happiness and for the exercise of his genius. Abroad he consented to the sale of Newstead, and his income enabled him to live without being subject to the constant indignities which were such a torture to him at home. There also he found the solitude which he had always desired. ""' Society," he wrote in a letter to Moore, "'as now constituted, is fatal to all great original undertakings of every kind," and in his case certainly this was true. His first place of residence abroad was Diodati,~~

~~a villa in the neighbourhood of Geneva. He spent the summer there, making two excursions to Switzerland,—one with Hobhouse, a shorter one with Shelley, who also was living at Geneva at the time. His travels through Flanders past the field of Waterloo appear in the third canto of Childe Harold (May to July 1816); the idea of writing Manfred on his way to Geneva (begun September 1816, finished February 1817) occurred to him on the Jungfrau, where the scene is laid. In November 1816 he removed to Venice, and lived there, with the exception of short visits to Ferrara and Rome, till December 1819, writing fourth canto of Childe Harold (June 1817), Beppo (October 1817), Ode to Venice (July 1818), first canto of Don Juan (September 1818), Jlazeppa (October 1818), second canto of Don Juan (December 1818), third and fourth cautos (finished November 1819). The~~

~~bare |~~

~~catalogue of his literary work shows that the reports of the | debauchery in which he lived at Venice, and from which |~~

~~he is said to have been rescued by the Countess Guiccioli, must be taken with a qualification. His acquaintance with this lady began in April 1819, and a mutual attachment sprang up at once. In December 1819 he removed to Ravenna. In the following month the Countess Guiccioli, having separated from her husband, occupied, under her father Count Gamba's presence and sanction, a suite of rooms in the same house with Byron at Ravenna; and though the families were formally separate, the union was not broken till Byron's departure for Greece. When, two years later, in 1821, the Gambas, in consequence of their connection with revolutionary movements, were ordered to quit Ravenna, Byron removed to Pisa and lived with them under the same roof as before. Leigh Hunt, who also was received into Byron's house with his wife and children, has given us a somewhat ill-natured but sufficiently faithful picture of his life here, which was simply that of~~

~~a busy domesticated literary man, with a taste for riding, |~~

~~swimming, and marksmanship. During Byron's residence here Shelley was drowned in the Gulf of Spezzia. In September 1822, the Gambas were~~

~~ordered by the Tuscar Government to quit Pisa, and Byron removed with them to Genoa. His life at Genoa has been described with traces~~

~~of airy malice, but with much vivacity and abundance of |~~

~~detail, by Lady Blessington.~~

~~While he lived with the Countess QGuiccioli Byron's literary industry was prodigious. The following is the list :—Translation of the first canto of Jforgante Maggiore, February 1820; the Prophecy of Dante, March 1820;~~

~~translation of Francesca de Rimini, March 1820; Marino~~

~~Faliero, April to July, 1820; fifth canto of Don Juan, October to November 1820; The Blues, November 1820 ; Sardanapalus, January to May 1821; Letters on Bowles, February and March 1821; Zhe Two Foscari, June to~~

~~_ often incomplete and inharmonious.~~

~~July 1821; Cain, July to September 1821; Vision of |~~

~~Judgment, September 1821; Heaven and Harth, October 1821; Werner, November 1821 to January 1822; De-~~

~~formed Transformed, begun November 1821, finished | The god of his idolatry was Pope, towards whoin his~~

~~August 1822; Don Juan, sixth, seventh, and eighth cautos, February 1822; ninth, tenth, and eleventh cantos, August 1822; Zhe Age of Bronze, January 1823; The Island, February 1823; Don Juan, twelfth and thirteenth cantos, February 1823.~~

~~This quict industrious life, however, did not cure him of his constitutional melancholy and restlessness. The curse of his nature was that he exhausted his pleasures too quickly. He too soon became dissatisfied with past triumphs. Much as he cujoyed the success of the works which poured with such rapidity from his pen, he began to harp on what he might have done; began to think that the tide was turning against him in England, and to hunger for new distinction. In this spirit, towards the end of~~

~~BYRON~~

~~1821 he commenced those negotiations for the publication of a journal in England in conjunction with Shelley and Leigh Hunt, which ended in the abortive Liberal. The Vision of Judgment, the greatest of modern satires, appeared in the first number of the Lederal, in the summer of 1822; only three more numbers were published. Accord- ing to Moore, the sign of an intention to take an active part in alliance with English Radicalism did more to make Byrou unpopular in England than the most shocking of his poems. It was fortunate for his popularity that a more glorious enterprise offered itself to him in the Greek struggle for independence. He was brought into connection with this through the London Greek committee, of which he was appointed a member in May 1823. Heat once decided to take action, raised 50,000 crowns, bought an English brig of 120 tons, and sailed from Genoa with arms and ammuni- tion in July. The high hopes with which he set out were soon broken down; the Greeks had no plans, and he was compelled to spend five months of inglorious delay at Cephalonia. Reaching Missolonghi in December, after a chase by Turkish cruisers, he found dissension among the Greek chiefs and insubordination among their followers. He was appointed commander-in-chief of an expedition against Lepanto; but before anything could be done he was seized with fever, and died on the 19th April 1824. It is yet, perhaps, too soon to hazard a speculation as to the permanence of Byron's fame. That he holds a lower place in the opiniou of the present generation than of his own, sofar at least as concerns his own country, is undeniable, and is probably due to the fact that poets now are tried by more strictly artistic standards; verses are judged, propor- tions measured, rare and precious excellences appreciated with the jealous scrutiny and skilled recognition of professional workmen. 'Tried by such standards, Coleridge, Keats, and Shelley must be pronounced Byron's superiors. The greatest modern authority on versc, Mr Swinburne, comments justly on Byron's imperfect mastery of his materials :—-" One native and incurable defect grew up and strengthened side by side with his noblest qualities—a feeble and faulty sense of metre. No poet of equal or inferior rank ever had so bad an ear. His smoother cadences are often vulgar and facile ; his fresher notes are His verse stumbles and jingles, stammers and halts, where is most need for a swift and even pace ef musical sound. The rough sonorous changes of the songs in Zhe Deformed Transformed~~

~~rise far higher in harmony, and strike far deeper into the memory than the lax, easy lines in which he at first indulged ; but they slip too readily into notes as rude and weak as the rhymeless, tuneless verse in which they are so loosely set, as in a cheap and casual frame. The magnificent lyric~~

~~_ measures of Heaven and Earth are defaced by the coarse~~

~~obtrusion of short lines with jagged edges—no small offence in a writer of verse." In point of metre, too, Byron showed none of the originality which we should expect in a poet who delighted in his materials for their own sake.~~

~~sympathies were drawn chiefly by the elder poet's modern and practical point of view, and quick interest in passing affairs, and he began by imitating with very indifferent success Pope's satiric couplet. But his successes were achieved in more popular measures. He was the' least possible of an antiquarian poet, whether in matter or in form. His way was to take up any measure that struck him as effective, and try his hand on it. Campbell's example suggested the Spenserian stanza; Scott and Coleridge the rapid octosyllables of his Zastern Tales ; and he would never have thought of the ottava rima of Beppo and Don Juan but for Frere's Whistlecraft. Whistlecraft appeared in 1817, and the moment it fell into his hands Byron~~

~~Di ho N~~

~~recognized the value of the instrument, and lost no time in making it his own.~~

~~It was not on the artistic side that Byron's strength lay. Words were far from niggardly in their supplies to him ; they flowed in upon him with sufficient readiness for free and direct expression ; his thoughts were not blunted, his conceptions were not turned awry by hopeless struggling with stubborn material, but language was not pliant in his hands for the finer achievements of art. The truth is, he felt too deeply to be a poet of the very highest rank ; the feeling of the monient took too large and embarrassing a hold of him to leave his hand free for triumphs of execu- tion. 'This interfered both with the perfecting of details, and with the severe ordering of parts into an~~

~~artistic whole. In Byron we are always struck more with the matter than with the form. It is lis theme that absorbs attention, and the impetuous vehemence and stormy play of passion with which he hurries iton. This is, doubtless, an insecure foundation for lasting fame. The work of a man so keenly alive to the impressions of the hour, so closely bound up with his generation as Byron, runs a risk of perishing when the things that most deeply stir that generation have ceased to stir mankind. The secret of his tremendous power was his passionate synipathy with his own time. By the accidents of birth and circumstances, he was placed in opposition to the existing order of things, and his daring temper made him the exponent of the spirit of revolution. He is the greatest modern preacher of "liberty, equality, and fraternity." His little aristocratic assumptions were as superficial as his professions of anti- quarian poetic loyalty. Nothing irritated him more than to deny him auy of the privileges of his rank, but he never used the advantage of his social superiority in any of the contests in which he was involved, and in his loves and his friendships he showed regard only for the individual. He was a warm champion of the established fame of Pope against innovators, but he practised the innovations himself with such effect that he has been called—a foolish enough phrase, certainly, but intelligible—'"the interpreter of Wordsworth to the multitude." Abroad, Byron's influence was, from the appearance of Childe Harold, no less con-spicuous than at home. It has even been said that he was the first Englishman who made English literature known throughout Europe. Even such men as Lamartine, who deplored Byron as an incarnation of Satan, acknowledged his power; Lamartine says that Byron was "a second Ossian to him," and tells us that he was afraid to read him in his youth lest he should be perverted to his beliefs. Heine invited the compliment of being called " the German Byron." He is believed to have largely influenced the revolutionary movement in Germany, and he gave a direct stimulus to the liberators of Italy. Byron is the favourite poet of our English speaking fellow-subjects in India ; the educated Bengalee knows him by heart. On the Continent his influence has rather increased than diminished. Only the other year a glowing eulogy of his genius was written by Castelar, the literary leader of republicanism in Spain. At home of late we have been accused of neglecting Byron, and the fact is significant. Such stormful and melancholy poetry as his must always be at the height of its popularity in times of conflict. The disturbed state of the Continent is more favourable to~~

~~its spirit than the piping times of peace which have prevailed for a generation in England. Men who are content with the old things, and men who renounce old things with a light heart, can have little affinity with his deep-rooted sadness, his pride of defiant struggle, his flashes of defiant merriment; all this seems 'hysterical, affected, and unreal,—-and unreal it no doubt is, in the sense that the feelings of men under the tension of conflict must appear full of false notes to men~~

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~~who look on out of a normal condition of settled tran- quillity.~~

~~The most hopeful circumstance for the permanence of Byron's name is that he stands at the opening of a new era as its largest literary figure. Sooner or later, as new phases of thought and sentiment supervene upon the old, his writings must pass out of the catalogue of popular literature, but his personality will always fascinate. He is like Hamlet in this respect. It may safely be predicted that Byron will not cease to be read till Hamlet has ceased to be studied. There is nota little in common between the characters, in spite of superficial difference. In the desolation of his youth, in his moodiness, in his distempered mobility between the extremes of laughter and tears, in his yearning for sympathy, his intensity of friendship, his dark fits of miusanthropy, lis habit of brooding over the mysteries of life, Byron unconsciously played the character of Hamlet with the world for his stage, and left a kindred problem for the wonder of mankind,—a problem which no~~

~~'analysis can make clear, and which every one may pray that~~

~~it be not given them to understand.~~

~~It has often been said that Byron could draw but one character, and that his own. This is not more than a half truth. It is true that Byron's genius was more lyrical than dramatic. 'Many people," he said himself, "think my talent essentially wundramatic, and I am not clear that they are not in the right." But he also said that while he, "like all imaginative men, embodied himself with the character while he drew it," he did so "not a moment after the pen was from off the paper." The difference between saying that Byron~~

~~loved to picture himself in various circumstances, and that he could not set himself to the artistic portraiture of any character in which he was not interested, may not be great, but it is the difference between a true view and a false view of his artistic method. He was undramatic in this sense, that his imagination did not enter freely and self- delightedly into various forms of life. When Moore thought he had found a beautiful subject for Byron's genius, and wrote the details to him, Byron could not enter into the situation. His Monody on Sheridan is weak, because it was not spontaneous. But when he found a situation or a character which naturally attracted him, and which he was able to understand, his method was not, as is implied by the language in which his want of dramatic faculty is often expressed, to bring the situation or the character nearer to his own experience, but he tried to identify himself with the life of his subject, and laboured at details with almost pre-Raphaelitic minuteness. We do right to call him undramatic still, because a dramatic genius is doing constantly and by the law of his nature what Byron could only do rarely and with a limited range. But it is wrong to say that he was always drawing himself. There are considerable intervals between Sardanapalus, Marino Faliero, Alp, Lara, and Manfred, although in those and in all his leading characters we are more struck with what they have in common with their author, the affinity that led him to deal with their fortunes, than we are with their separate individualities. The Countess Guiccioli has given in the case of Marino Faliero a good example of the way in which he prepared himself for his work. He was struck with the tradition of Faliero's conspiracy in his old age against the state which he had served so well in youth and middle age, immediately after his arrival in Venice, but at first he was unable to satisfy himself as to the motive. The ordinary histories, which he searched through with care, ascribed it to an old man's jealousy of a young wife, but this Byron's instinct rejected. He passed hours in the hall. of the great council, stared at the record of Faliero's decapitation, lingered about the tomb, and called up and realized every recorded circumstance of his life, keenly~~

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~~studied the characters of living Venice. It was not till four years afterwards that he satisfied himself as to the motive, and the discovery of an old~~

~~document afterwards proved that his reading of history was correct. In other cases he showed the same studious care for accuracy, the~~

~~very opposite of rash and dashing identification of~~

~~characters with himself. In most of his tales and dramas there is an historical basis, and the basis is scrupulously ascertained. He particularly prided himself upon the truth of his local colouring.~~

~~The most interesting and complete portrait of Byron is perhaps that drawn by Lady Blessington, who saw him at Genoa a few months before his departure for Greece. It is not so favourable as some, but it is peculiarly valuable because taken from a definite point of view, that of a clever woman of the world and practised critic of appearance and manner. 'I had fancied him," she says, "taller, with a more dignified and commanding air, and I looked in vain for the hero-looking sort of person with whom I had so long identified him in imagination. His appearance is, however, highly prepossessing, his head is finely shaped, and the forehead open, high, and noble, his eyes are grey and full of expression, but one is visibly larger than the other, his mouth is the most remarkable feature in his face, the upper lip of Grecian shortness, and the corners descending, the lips full and finely-cut. In speaking he shows his teeth very much, and they are white and even, but I observed that even in his smile—and he smiles frequently—there is something of a scornful expression in his mouth that is evidently natural, and not, as many suppose, affected. . . . His countenance is full of expression, and changes with the subject of conversation ; it gains on the beholder the more it is seen, and leaves an agreeable impression… . He is very slightly lame, and the deformity of his foot is so little remarkable that I am not now aware which foot it is. His voice and accent are peculiarly agreeable, but effemi- nate—clear, harmonious, and so distinct that, though his general tone in speaking is rather low than high, not a word is lost… .. I had expected to find him a dignified, cold, reserved, and haughty person, resembling those mysterious personages he so loves to paint in his works, and with whom he has been so often identified by the good- natured world, but nothing can be more different ; for were I to point out the prominent defect of Lord Byron, I should say it was flippancy, and a total want of that natural self- possession and dignity which ought to characterize a man of~~

~~birth and education." Such, judged by the social stand- ard of his own country, was the look and personal manner of the greatest literary power of this century.~~

~~The best edition of Byron's works is that published by Murray, with illustrative extracts from his letters and diaries, and from the criticisms of his contemporaries. A selection from his works, edited and prefaced by Mr A. C. Swinburne, is published by Moxon. The facts of his life may be studied in Moore's Life, Letters, and Journal of Lord Byron, supplemented by Leigh Hunt's Lord Byron and his Contemporaries, Lady Blessington's Conversations with Lord Byron, Trelawney's Recollections of Shelley and Byron, and the Countess Guiccioli's Lord Byron jugé par les témoins de sa vie (translated under the title of Recollections of Lord Byron). Numerous allusions to Byron occur in the published memoirs of his contemporaries, such as the Shelley Memorials and Crabb Robinson's Diary. Karl Elze's~~

~~biography (translated), although often mistaken in its conception of his character, is valuable as a collection of facts. (W. M.)~~

~~BYRON, Hon. Joun (1723-1786), admiral and cir- cumnavigator, second son of the fourth Lord Byron, and grandfather of the poet, was born November 8, 1723. While still very young accompanied Anson in his voyage of discovery round the world. During many succes- sive years he saw a great deal of hard service, and so constantly had he to contend, on his various expeditions, with adverse gales and dangerous storms, that he was aptly nicknamed by the sailors "Foul-weather Jack." It is~~

~~to this that Lord Byron alludes in his famous Fpistle to Augusta — '* A strange doom is thy father's son's, and past Recalling as it lies beyond redress,~~

~~Reversed for him our grandsire's fate of yore, He had no rest at sea, nor I on shore.~~

~~In 1769 he was appointed governor of Newfoundland. In 1775 he attained his flag rank, and in the following year became a vice-admiral. In 1778 he~~

~~was despatched with a fleet to watch the movements of the Count d'Estaing, and in July 1779 fought an indecisive engagement with him off Grenada. He soon after returned to England, retiring into private life, and died April 10, 1786,~~

~~BYSTROM, Jonann Nicotaus (1783-1848), Swedish sculptor, was born December 18, 1783, at Philipstad. At the age of twenty he proceeded to Stockholm and studied for three years under Sergell. In 1809 he gained the academy prize, and in the following year visited Rome. He sent home a beautiful work, The Reclining Bacchante, in half life size, which raised him at once to the first rank among Swedish sculptors. Oh his return to Stockholm in 1816 he presented the crown prince with a colossal statue of himself, and was entrusted with several important works. Although he was appointed professor of sculpture at the academy, he soon returned to Italy, and with the exception of the years from 1838 to 1844 continued to reside there. He died at Rome in 1848. Among Bystrém's numerous productions the best are his representations of the female form, such as Hebe, Pandora, Juno suckling Hercules, and the Girl entering the Bath. His colossal statues of the Swedish kings are also much admired.~~

~~BYZANTINE EMPIRE. See Greex Emrire.~~

~~BYZANTINE HISTORIANS. The historians who have related the transactions under the Eastern, Greek, or Byzantine empire, for the millennium intervening between the death of Theodosius and the Turkish conquest of Con- stantinople, are collectively classed together under the above designation. Until, however, the middle of the 6th century, they are, with one conspicuous exception, too merely frag- mentary to deserve special notice. This exception is Pro- coptus, the Polybius of his age, whose histories are of such importance as to demand a separate article. We shall arrange his successors in chronological order, distinguishing between the historians properly so called and the chronologers.~~

~~Historrans.—I. Acatutas of Myrina in A®tolia, was born under Justinian, about 536 a.D., and is believed to have died under Tiberius the Second, about 580. His char- acter as an epigrammatist and an editor of poetry has been already considered under the head ANtHoLoay. Weare in- debted to him in his historical capacity for an extremely valu- able narrative of six of~~

~~the most eventful years of the Greek empire, 553-558. The first book details the conquest of Italy from the Goths by Justinian's general Narses; the remainder describe, along with other incidents, the Persian war of 554-556, the two great earthquakes of 554 and 557, the great plague, the rebuilding of St Sophia, and Belisarius's last exploits against the Bulgarians. The history terminates abruptly, and was probably left un- finished. As a narrator, Agathias is sensible and impartial, but deficient in general knowledge, and far below the standard of a philosophic historian. His style is rhetorical, but not unpleasing. II. MenanpEr Prorecror, the far in- ferior imitator of Agathias, lived under Mauricius, whose reign began in 581, and continued the history of Agathias to the date of the accession of that emperor. His work was comprised in eight books, which are entirely lost, with the exception of numerous extracts relating to embassies preserved in the collection epi zpeoBeGv—the 27th and only existing book of the extensive compilation of historical excerpts made by the Emperor Constantine Porphyrogenitus.~~

~~BYZANTINE~~

~~III. TaeopHYLactus of Simocatta, a sophist and civilian of Egyptian extraction, wrote the history of the Emperor Mauricius (582-602) in eight books, all of which are pre- served. The work seems to have been completed under Hera- clius. Theophylactus lived until 628 or 629. He is an accurate and not inelegant writer, but frequently trivial and frigid. IV. Joannus of Epiphaneia, a contemporary of Theophylactus, wrote the history of the wars of the Greeks and Persians from the latter part of Justinian's reign until the restoration of Chosroes II. by Mauricius (591). His history has never been printed, but is said to exist in MS. at Heidelberg.. V. The Emperor Constan- TINE PORPHYROGENITUS (reigned 911-959). Among the many services rendered to literature by this learned sove- reign is to be enunierated his history of his grandfather Basil the Macedonian, emperor from 867 to 886. VI. GENEsIUs, who lived in the time of Constantine Por- phyrogenitus, wrote by his ordei the history of Basil If. and of his four immediate predecessors (813-886). The work is brief and meagre, but is almost the only authority we possess for a portion of the period described. VII. JoANNES CAMENIATA, a native of Thessalonica, and cross-bearer to the archbishop, wrote an account, which has 'been~~

~~preserved, of the sack of that wealthy city by the Saracens in 904. Cameniata himself was one of the captives, and his narrative is very lively and valuable. VIII. Leo Diaconus, an ecclesiastic in the latter half of the 10th century, is the author of an indifferently written, but honest and instructive, narrative of the remarkable period of national recovery under the emperors Romanus Ii., Nicephorus Phocas, and John Zimisces, when Crete was reconquered, Syria invaded, and the Russians driven out of Bulgaria (959-975). Leo wrote at least as late as 993. IX. NicerHorus BryEennivs, the son-in-law of the Emperor Alexius Comnenus, and one of the first statesmen and generals of his time, wrote in four books the history of the empire under the Comneni from 1057 to 1081. X. His still more celebrated wife, ANNA CoMNENA, daughter ot the Emperor Alexius, and the marvel of her sex at that extremely low period of female education, wrote (1148) the history of her father in fifteen books. The period of Alexius is peculiarly interesting as that in which the barrier of By- zantine isolation was broken down, and the East and West brought into contact by the encroachments of the Normans on the Eastern empire and by the Crusades. We cannot be too grateful to the Princess Anna for her vivid sketch of the arrival of the Crusaders at Constantinople, and the relations between them and the Byzantine court. Her work, however, must be used with great caution. Gibbon's employment of it is an example of his usual discernment. XI. Her history was continued by Joannus CINNAMUS, one of the most eminent of all the Byzantine histo- tians. He was one of the imperial notaries under the reign of Manuel Comnenus (1143-1180), an office nearly corre- sponding to that of a modern secretary of state. He had, consequently, great administrative experience, and a thorough knowledge of the relations of the empire with foreign states, and of the internal affairs of the latter. He is thus in an excellent position for writing history, besides which his own judgment and sagacity are of a very superior order, and his style is commonly terse and clear. Like most writers who have themselves participated in the transactions they describe, he is not altogether exempt from partiality. His history comprehends the period from the death of Alexius Comnenns in 1118 to the siege of {conium by Manuel Comnenus in 117 6, four years before the death of that emperor. There is little doubt that Cinnamus brought his work down to the close of Manuel's reign, and that the conclusion is lost. XIL. Niceras~~

COMINATUS, or CHONIATES, a patrician and holder of

many important public offices under the emperor Isaac Angelus at the beginning of the 13th century, described the same period as Cinnamus, but continued his narrative to 1206. The latter books of Nicetas's history possess especial importance, inasmuch as they contain the Byzan- tine account of the taking of Constantinople by the Latins in the fourth crusade (1204). Nicetas's own palace was burned and plundered, and he escaped with difficulty to Nicaea, where he composed his history under the protec- tion of the emperor Theodore Lascaris. His narrative, though too rhetorical, is striking and pathetic ; it neces- sarily requires careful comparison with the Latin accounts. The remainder of his history is also valuable. He is also said to be the author of an account of the statues destroyed by the Latins, which, however, is thought to have been interpolated by a later writer. It has been published by Wilken (Leipsic, 1830). XII. Gzorarus ACROPOLITA, an eminent scholar and diplomatist, who lived from 1220-1282, wrote the history of the Eastern empire during its subjugation by the Latins (1204-1261). The work is so brief that it has been regarded as merely an epitome of Acropolita's original history. XIV. Grorcrus PACHYMERES, a priest and ecclesiastical jurist under Michael and Andronicus Palzologus, wrote the history of these emperors (1258-1308) in thirteen books. Pachymeres is one of the best of the Byzantine historians ; his style is sin- gularly good for his age, and his tone dignified and impartial. XV. NicEPHorus GREcoRAS, a man of great learning, but passionate and untrustworthy as an historian, wrote the history of his country from 1204-1358, in thirty-eight books, the last fourteen of which remained unpublished until 1855, when they were edited at Bonn by Immanuel Bekker. After the recovery of Constantinople by the Greeks in 1261, Byzantine politics entered into a new phase ; the feeble and distracted empire, unable to make head against the Turks, was compelled to lean for support upon the European powers, which it sought to obtain by patching up the long-standing religious schism. Greeks and Latins, however, were equally resolved to concede nothing save in appearance, and the history of the time is to a great extent that of hollow negotiations, meant only to deceive. In these Gregoras had a considerable share ; he also took an active part in the internal religious contro- versies of

his church, and his personal knowledge of affairs imparts considerable value to his history. He was at one time a favourite of the Emperor Cantacuzenus, but was subsequently persecuted by him. He possessed extensive attainments, and is especially celebrated for having anticipated the astronomers of Pope Gregory XIII. in the correction of the Julian Calendar. XVI. The Emperor JOHN CANTACUZENUS, after his abdication, wrote the history of his times from 1320-1357, including the fifteen years of his own eventful reign. This "is written," as Dr Plate observes, " with elegance and dignity, and shows that the author was a man of superior intelligence, fully able to understand and judge of the great events of history ;" but Gibbon's remark is no less just that Cantacuzenus " presents, not a confession, but an apology of the life of an ambitious statesman. Instead of unfolding the true counsels and characters of men, he displays the smooth and specious surface of events, highly varnished with his own praises and those of his friends." The truth is arrived at by a comparison of Cantacuzenus with the rival and inimical narrative of Nicephorus Gregoras, so far as they cover the same ground. XVII. Joannes CaNANus wrote an account of the siege of Constantinople by Amurath IL. in 1422; and XVIII. Joannzes ANacNostzs described the capture of Thessalonica by the same Sultan in 1430. XIX. Micuart Dvucas, the chief historian of the fall of the Greek empire, escaped from the sack of Constantinople

to Lesbos, where he entered into the service of the prince of that island, and wrote his history after the reduction of Lesbos by the Turks in 1462. It commences in 1342, and goes down to the conquest of Lesbos. Ducas is the most difficult and barbarous of all the Byzantine historians, and the only one who appears entirely unacquainted with classical models. At the same time he is among the most intelligent, impartial, and sagacious. The ruin of the Greek empire has also been recorded by XX. Grorcius Purantzes and XXI. Laonicus CHALCo- CONDYLES Both of these were eminent among the states- men of their disastrous period, and Phrantzes in par- ticular played a very important part in diplomacy. Broken hearted at the capture of his native city and the death of his son and daughter in slavery, he retired to a monastery in Corfu, where he wrote his Chronicon about 1477, to which

~~year it extends. It commences at the year 1259, but by far the most valuable portion is that which records the transactions of the author's lifetime, and the value of this is very great. Chalcocondyles, beginning at 1298, brings his history down to the invasion of the Morea by the Turks in 1463, He also is an accomplished man, of much experience in public business; and although his digressions respecting the affairs and manners of other nations are irrelevant, and betray ignorance, they are interesting as an index to the knowledge possessed by his countrymen at his time.~~

~~II. CHRONICLERS AND CHRONOLOGERS.—The chrono- logers usually published' in the Byzantine collection are frequently very valuable, but neither their lives nor their writings need detain us long. They are I. Gzorerus Syn- CELLUS, the attendant (syncellus) upon the patriarch Tarasius, about the beginning of the 9th century. His unfinished chronicle extends from Adam to Diocletian, and was con- tinued to 813 a.p. by IL. TaropHaneEs IsAURUS, a martyr in the cause of image worship. IIJ. Leo Grammaricus and TV. Georcrus Monacuvs continued Theophanesto 948 and 944 respectively. V. The chronicle of the Syrian JoANNES MALALAS extends from the beginning of the world to the year 566. Malalas is usually supposed to have lived in the 9th century, and to have left his work incomplete, but some regard him as contemporary of Justinian. VI. NicEPHORUS PaTRIARCHA, Patriarch of Constantinople under Leo the Armenian, early in the 9th century, compiled a chronological history from the murder of the Emperor Mauricius to his own times, and an abridged chronological manual of events from the Creation. VII. Jutius PoLiux, a writer of the 10th century, compiled a chronology, chiefly of ecclesiastical occurrences, to the year 963, which has only been printed as far as the death of Valens (377). VIII. The contemporary chronicle of Hippotyrus of Thebes is of little value. IX. The valuable Chroni- con Paschale, which extends to 1042, is the work of three anonymous writers. There has been considerable difficulty in settling the respective claims to originality of X. JoANNES Scyruitza and XI. Grorcius CrpRreNvs, but the latter was probably the copyist. The contrary opinion has prevented the publication of Scylitza's work, with the exception of the portions not transcribed by Cedrenus. These extend from 1057 to 1080. The chronicle of Cedrenus reaches from the Creation to the former of these dates. XII. The chronicle of ConstaNTENE MANASSES is written in political verses, and extends from the beginning~~

~~of the world to the accession of Alexius Comnenus in 1281. XIII. Micuart Gtycas, a writer of mncertain date, published a general chronology down to the year 1118. XIV. The abbreviated chronicle of Jozt reaches the capture of Constantinople by the Latins in 1204 XV. The chronicle of Groraius Copinus, a writer of the 15th century, comes down to the capture of Constantinople, and~~

~~His TQ@RIANS~~

~~is associated with a compilation respecting the antiquities of the city, which is of much greater value.~~

~~The contribution of the Byzantine historians to literature may be compared with the part enacted by the Byzantine empire in the history of the world. That empire added nothing to the treasures of civilization, but it preserved much. Like the earth in winter, it seemed barren and unlovely, but it kept the good seed hidden in its bosom for better days. Had it perished before the intellectual revival of Western Europe, the solution of continuity between ancient and modern culture would have been irreparable. In like manner the Byzantine historians pre- served the traditions of historical composition, while their brethren of the West were merely chroniclers and annalists, They have safely embalmed in their generally unattractive pages a vast mass of most valuable information, for which we are in most cases solely dependent upon them, and they aid us to reconstruct the polity, and to some extent the social life, of what was for several centuries the only really civilized Christian state in the world. They are undoubtedly for the most part perfectly ignorant of the significance of their own times; they have postponed what was really interesting to barren details of battles and court intrigues and have wasted opportunities which would have been invaluable to a philosophic historian. Cinnamus and Ducas are the only two with any claim to this character, and Anna Comnena is the only artist. When, however, all their disadvantages are taken into consideration, it will probably be deemed that they are much better than might have been expected. They were isolated from all the rest of the known world by prejudice, policy, and religious hatred. There was no scientific or other intellectual niove- ment in their times, no aspiration for liberty, no conception of a more liberal culture; they were crushed by a rigid~~

~~despotism, and enthralled by an abject superstition. Under these circumstances the good sense and sagacity of many among them are very remarkable, and are chiefly to be explained by the large proportion among them of men accus- tomed to practical life and public affairs. Their roll in- cludes sovéreigns, generals, prime ministers, secretaries of state, diplomatists, and other important public officers ; even the ecclesiastics among them are not recluses but men versed in business. The Byzantine civil service was the strong point of the empire, and its solid if prosaic qualities are admirably reflected by its literary representatives.~~

~~The first collective edition of the Byzantine historians was pub- lished at Paris, 1648-1702, in 27 volumes, with a preface by Labbe, and notes and translations by Fabrotus, Combefisius, arid others. lt was reprinted, with additions, at Venice, 1729-33. These editions are superseded by the great edition of Bonn, 1828-55, in 48 volames, undertaken at the recommendation and under the superintendence of Niebuhr, and continued after his death under the patronage of the Royal Prussian Academy. 'The separate. volumes are edited by Bekker, Dindorf, Hase, and other distinguished scholars ; neverthe- less, according to Brunet, "de bons textes des historiens byzantins restent encore 4 donner." Like former collections it contains seve- ral works of value not strictly belonging to Byzantine history, but illustrative of it. No guide to Byzantine history is comparable to Gibbon, whose narrative of this period is an unparalleled literary feat of masterly and impartial condensation. See likewise Lebeau, Histoire du Bas Empire, Paris, 1824-36. Mr Finlay's volumes are also invaluable companions to the Byzantine historians. _Of special works on the subject, the most important is Hankius, De Byzantina- rum rerum scriptoribus Gracis, Leipsic, 1677, a book distinguished by extensive and accurate erudition, but necessarily deficient as respects the writers not published in the author's day. It contains notices of Byzantine ecclesiastical writers also. Special points of interest are discussed in Von Hammer's essay in the Gottingen Annals, (vol. 6) on the correction of the Byzantine historians from Ottomam sources; in Heyne's Antiquatates Byzantine (1808-11); and in Hullman's Geschichte des Byzantinischen Handels (1808). Sabatier's great work on Byzantine numismatics also affords much illustrative matter, and there is a lively sketch of the general social condition of the Eastern Empire in Angustin Marrast's Esquisses Byzantines. (Paris, 1874.) (R. G.)~~

~~BYZANTIUM~~

~~BYZANTIUM, an ancient Greek city on the shores of the Bosphorus, occupied the most easterly of the seven hills on which the modern Constantinople has been built. It is said to have been founded by a band of Megarians, 667 B.c., but the original settlement having been destroyed in the reign of Darius Hystaspes by the Satrap Otanes, it was recolonized by Pausanias, who wrested it from the hands of the Medes after the battle of Platea (479 3.c.)— a circumstance which has led several ancient chroniclers to ascribe its foundation to him. Its situation, said to have been fixed by the oracle of Apollo, was remarkable for beauty and security. Its position on the Bosphorus gave it com- plete control over the extensive corn-trade carried on by the merchants of the West with the northern shores of the Euxine; the absence of tides and the depth of its harbour rendered its quays accessible to vessels of large burden; while the tunny and other fisheries at the mouth of the Lycus were so lucrative as to procure for the deeply-curved bay into which that river fell the appellation of the Golden Horn. The greatest hindrance to its continued prosperity consisted in the miscellaneous character of the population, partly Lacedemonian and partly Athenian, who flocked to it under Pausanias. From this circumstance it was a subject of dispute between these states, and was alternately in the possession of each, till it achieved its independence of both only to fall into the hands of the Macedonians ; and from the same cause arose the violent contests of its intestine factions, which ended in theestablish- ment of a rude and turbulent democracy. About seven years after its second colonization, Cimon wrested it from the Lacedemonians; but in 440 B.c., it revolted and returned to its former allegiance. Alcibiades, after a severc blockade (408 3.c.), gained possession of the city through the treachery of the Athenian party; and it continued an ally of Athens until 405 B.c., when it was retaken by Lysander after the battle of Agos-potami, and placed undera Spartan harmost. It was under the Lacedemonian power when the Ten Thousand, exasperated by the conduct of the governor, made themselves masters of the city, and would have pillaged it had they not been repressed by the firmness and promptitude of Xenophon. In 390 zc. Thrasybulus, with the assistance of Heraclides and Arche- bius, succeeded in expelling the Lacedzmonian oligarchy, and in restoring democracy and the Athenian influence both in Byzantium and Chalcedon. After having withstood an attempt under~~

~~Epaminondas to restore it to the Lacedeemonians, Byzantium joined with Rhodes, Chios, Cos, and Mausolus, king of Caria, in throwing off the yoke of Athens, but soon after sought Athenian assistance when Philip of Macedon, having overrun Thrace, advanced against~~

~~it. The succours which were sent from Athens under |~~

~~Chares, on their arrival suffered a severe defeat from Amyntas, the Macedonian admiral, but in the following year gained a decisive victory under Phocion, and compelled Philip to raise the siege. The deliverance of the besieged from a surprise, by means of a flash of light which revealed the advancing masses of the Macedonian army, has rendered this siege peculiarly memorable. As a memorial: of the miraculous interference the Byzantines erected an altar to Torch-bearing Hecate, and stamped a crescent on their coins as a symbol of the portent, a device which is retained by the Turks to thisday. They also granted the Athenians extraordinary privileges, and erected a monument in honour of the event in a public part of the city. During the reign of Alexander, Byzantium was compelled to acknowledge the Macedonian supremacy ; after the decay of the Macedonian power, it regained its independence, but suffered from the repeated incursions of the Scythians. The losses which they sustained by land roused the Byzantines to indemnify themselves on the vessels which~~

~~| political privileges.~~

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~~still crowded the harbour, and the merchantmen which cleared the straits; but this had the effect of provoking a war with the neighbouring naval powers. The exchequer being drained by the payment of 10,000 pieces of gold to buy off the Gauls who had invaded their territories about 279 B.c., and by the imposition of an annual tribute which was ultimately raised to 80 talents, they were compelled to exact a toll on all the ships which passed the Bosphorus, — a measure which the Rhodians resented and avenged by a war, wherein the Byzantines were defeated. The retreat of the Gauls enabled Byzantium to render considerable services to Rome in the contests with Philip IL., Antiochus, and Mithridates. During the first years of its alliance with Rome it held the rank of a free and confederate city; but having sought~~

~~the arbitration of the capital on some of its domestic disputes, it was subjected to the imperial jurisdiction, and gradually stripped of its privileges, until reduced to the status of an ordinary Roman colony. In recollection of its former services, the Emperor Claudius remitted the heavy tribute which had been imposed on it ; but the last remnant of its independence was taken away by Vespasian, who, in answer to a remonstrance from Apollonius of Tyana, taunted the inhabitants with having "forgotten to be free." During the civil wars, it espoused the party of Pesceunius Niger; and though skilfully defended by the engineer Periscus, it was besieged and taken (196 a.p.) by Severus, who destroyed the city, demolished the famous wall, which was built of massive stones so closely rivetted together as to appear one block, put the principal inhabitants to the sword, and subjected the remainder to the Perinthians. This overthrow of Byzantium was a great loss to the empire, since it might have served as an effective protection against the Goths, who afterwards sailed past it into the Mediterranean. Severus, however, afterwards relented, and, rebuilding a large portion of the town, gave it the name of Augusta Antonina. He ornamented the city with baths, and surrounded the hippodrome with porticoes ; but it was not till the time of Caracalla that it was restored to its former It had scarcely begun to recover its former flourishing position when, from the capricious~~

~~f resentment of Gallienus, the inhabitants were once more~~

~~put to the sword, and the town given upto be pillaged. From this disaster the inhabitants recovered so far as to be able to give an effectual check to an invasion of the Goths in~~

~~the reign of Claudius IL, and its fortifications were greatly~~

~~strengthened during the civil wars which followed the abdication of Diocletian. Licinius, after his defeat before Adrianople, retired to Byzantium, where he was besieged by Constantine, and compelled to surrender. To check the inroads of the barbarians on the north of the Black Sea, Diocletian had resolved to transfer his capital to Nicomedia ; but Constantine, struck with the advantages which the situation of Byzantium presented, resolved to build a new city there on the site of the old, and transfer the seat of government to it. The design was quickly put into execu-~~

~~tion, and the new capital was inaugurated with special ceremonies 330 a.p. See CoNSTANTINOPLE.~~

~~The ancient historians invariably note the profligacy of the inhabitants of Byzantium. They are described as an idle and depraved people, spending their time for the most part in loitering about the harbour, or carousing over the fine wine of Maronea. In war they trenibled at the sound of a trumpet, in peace they quaked before the shouting of their own demagogues ; and during the assault of Philip II. they could only be prevailed on to man the walls by the savour of extempore cook-shops distributed along the ramparts. The modern Greeks attribute the mtroduction of Christianity into Byzantium to St Andrew; and it cer- tainly had some hold there in the time of Severus,~~

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~~C~~

~~1 is the third letter of the English alphabet, and of the C other alphabets derived from the Latin. Its history has been singular. It was the same in form as the Greek r, but inclined at a different angle, thus, ¢ (see under ALPHABET), and by degrees it was rounded into C. It occupied the same place in the alphabet, and had the same phonetic value,—that of the sonant guttural g, the corresponding surd being represented, as in Greek, by K. (See under B for the distinction between sonants and surds.) 'These two sounds became confused at Rome at an early time—before 450 3.c., and perhaps much earlier. The k-sound was lost and the symbol C represented both the g-sound, as in macister, lecio, and the original k-sound, as in censor, consul. The symbol K, however, was not entirely lost; itis found irregularly in inscriptions of all dates down to the times of the empire, and regularly as an initial abbreviation of Kalende, Karthago, Koso (the proper name). Inthe 3d century B.c., the distinction between the two sounds was revived; but the symbol K was not replaced in ordinary use. C remained as the representative of the surd, losing its original sonant value; while a modification of it (G) was introduced to represent the sonant. The symbol retained its old value only when as the initial letter it represented the names Gaius and Gneus,—which, in consequence, are often erroneously written and sounded Caius and Cneus. With this changed value the symbol C~~

~~passed into the languages which are represented by the Latin alphabet. In some of them it has undergone yet further change. Before ¢ and 7 in Italian, though still written, it is sounded as ch, This change from the guttural to the palatal is the result of assimilation, due to the following vowels. There is no evidence to show that it was established before the 7th century 4.p. In France (as commonly in England) ¢ before ¢ and 7 has the sound of s. This is only a further change in the same direction as the Italian; and before a in French an original c has the sound sh, and is spelt ch, as in champ (campus), chambre (camera). Exceptions to this rule are generally words incorporated into classical French (z.¢., the descendant of the old dialect cf the Isle de France) from other dialects, as those of Normandy or Picardy, or are introduced from the Italian, as cavalier, &c. Our English ch (pronounced tch) for original ¢ (as in chin for Old English cin, child for cid) is due probably to Norman influence, but here, as often, it is difficult to differentiate the results of the many disturbing causes which have operated upon our language.~~

~~As a numeral, C (for centwm) denotes 100. In music, plaved after the clef, it indicates that the measure is of the value of four crotchets.~~

~~CAABA. See Kaaspa and Mzcca. —~~

~~CABAGAN, a town of Luzon, one of the Philippine Islands, in the province of Cagayan, situated on the N.E. coast. It is the second largest city in the province, and has a population of 11,100.~~

~~GABANIS, Prerre Jean Grorce (1757-1808), a dis- tinguished French physiologist, was born at Cosnac in 1757. His father was a lawyer of eminence, and chief magistrate of a district in the Lower Limousin. His education was at first entrusted to the priests, but at the age of ten he was transferred to the College of Brives. showed great aptitude for study, but his independence of spirit was so excessive that he was almost constantly in a state of rebellion against his teachers, and was finally dismissed from the school. After a year's residence at home he was taken to Paris by his father and left to carry~~

~~He |~~

~~on his studies at his own discretion. He attended classes at the university, and read with particular delight Locke's essay On the Human Understanding. Two years lad been spent in close and assiduous study, when in 1773 he received the offer of the post of secretary to the prince-bishop of Wilna. He accepted it and passed two years at Warsaw, viewing with disgust and contempt the petty intrigues and jealousies that accompanied the first partition of Poland.~~

~~On his return to Paris he devoted himself mainly to poetry, for which he had always a strong inclination, He was intimate with the poet Roucher, and was introduced by Turgot to the society of Mme. Helvetius, where he met such men as Diderot, D'Alembert, D'Holbach, Condillae, Franklin, and Jefferson. About this time he ventured to send in to the Academy a translation of the passage from Homer proposed for their prize, and though his attempt passed without notice, he received so much encouragement from his friends that he contemplated translating the whole of the Iliad.~~

~~At the earnest desire of his father he relinquished these pleasant literary employments, and resolved to engage in some settled profession. " After deliberation he fixed upon that of medicine, and began his studies under Dubreuil. In 1789 his Observations sur les Hépitaux procured him an appointment as administrator of hospitals in Paris. From inclination and from weak health he never engaged much in practice as a physician. His interest lay entirely in the deeper problems of medical and physiological science, and these he investigated with unusual closeness and minute- ness. Nor had he quite given up his fondness for literary society; his residence at Auteuil on the outskirts of the capital enabled him still to continue his intercourse with Diderot, Condillac, and others. He had even the pleasure of reading to Voltaire part of his translation of the Jlad, and of receiving warm commendation from the veteran critic. Buthe had long ceased to occupy himself with that work ; and in his Serment d'un Médecin, which appeared in 1789, he bade a formal adieu to poetry.~~

~~In the great political struggle of the time Cabanis espoused with enthusiasm the cause of the Revolution, to which he was attached from principle, and of which the opening prospects were congenial to his active and ardent mind, During the two last years of Mirabeau's life he was intimately connected~~

~~with that extraordinary man, who had the singular art of pressing into his service the pens of all his literary friends. Cabanis united himself with this disinterested association of labourers, and contributed the Travail sur ' Education Publique, a tract which was found among the papers of Mirabeau at his death, and was edited by the real author soon afterwards in 1791. During the illness which terminated his life, Mirabeau confided himself entirely to the professional skill of Cabanis. Of the progress of the malady, and the circumstances attending the death of Mirabeau, Cabanis drew up a very detailed narrative, which is not calculated, however, to impress us with any high idea of his skill in the treatment of an acute inflammatory disease. Condorcet was another distin- guished character with whom Cabanis was intimate, and whom he endeavoured, though without success, to save from the destiny in which he afterwards became involved by the calamitous events of the Revolution. Shortly after this he married Charlotte Grouchy, sister to Madame Condorcet and to General Grouchy,—a union which was a great sources of happiness to him during the remainder of his life.~~

~~CAB—CAB~~

~~After the subversion of the Government of the terrorists, Cabanis, on the establishment of central schools, was named professor of /Zygzéne in the medical schools of the metropolis. Next year he was chosen member of the National Institute, and was subsequently appointed clinical professor. He was afterwards member of the Council of Five Hundred, and then of the Conservative Senate. The dissolution of the Directory was the result of a motion which he made to that effect. But his political career was not of long continuance. A foe to tyranny in every shape, he was decidedly hostile to the policy of Bonaparte, and constantly rejected every solicitation to accept a place under his Government.~~

~~For som: years before his death his health became gradually more impaired, and he retired from the laborious duties of his profession, spending the greatest part of his time at the chateau of his father-in-law at Meulan. Here he solaced himself with reading his favourite poets, and even had it in contemplation to resume that translation of the [liad which had been the first effort of his youthful muse. The rest of his time was devoted to acts of kind- ness and beneficence, especially towards the poor, who flocked from~~

~~all parts to consult him on their complaints. Cabanis died May 5 1808, leaving a widow and a daughter.~~

~~A complete edition of Cabanis's works was begun in 1825, and five volumes were published. One of his minor works, Coup d@'eil sur les révolutions et les réformes de la médecin, has been translated into English. His principal work, Rapports du physique et du moral de' hommes, consists in part of memoirs, read in 1796 and 1797 to the Institute, and printed among their Transactions. It is an admirable sketch of physiological psychology, and is replete with information. Psychology is with Cabanis directly linked on to biology, for sensibility, the fundamental fact, is the highest grade of life and the lowest of intelligence. All the intellectual processes are evolved from sensibility, and sensibility itself is a property of thenervous system. 'he soul is not an entity, buta faculty; thought is the function of the brain. Just as the stomach and intestines receive food and digest it, so the brain receives impressions, digests them, and has as its organic secretion, thought. Alongside of this harsh materialism Cabanis held another principle, the application of which altogether changes his theory. He belonged in biology to the school of Stahl, the vitalist or animist, and in the posthumous work, Lettre sur les causes premiéres, the consequences of this opinion became clear. Life is something added to the organism ; over and above the universally diffused sensibility there is some living and productive power to which we give the name of Nature. But it is impossible to avoid ascribing to this power both intelli- gence and will. In us this living power constitutes the ego, which is truly immaterial and immortal. These results Cabanis did not think out of harmony with his earlier theory, and it is possible that a point of view may be attained whence both appear justified. The Lettre was not published till 1824, when it appeared with notes by F, Bérard.~~

~~CABARRUS, Francois (1752-1810), conspicuous in Spanish history as a financier, was born at Bayonne, where his father was a merchant. Being sent into Spain on business he fell in love with a Spanish lady, and marrying her, settled in Madrid. Here his private business was the manufacture of soap ; but he soon began to interest himself in the public questions which were ventilated even at the court of Spain. The enlightenment of the 18th century had penetrated as far as Madrid; the king, Charles III., was~~

~~favourable to reform; and a circle of men animated by the new spirit were trying to infuse fresh vigour into an enfeebled state. Among these Cabarrus became conspicuous, especially in finance. He originated a bank, and a company to trade with the Philippine Islands; and as one of the council of finance he had planned many reforms in that department of the administration, when Charles III. died (1788), and the reactionary Government of Charles IV. arrested every kind of enlightened progress. The men who had taken an active part in reform were suspected and prosecuted. Cabarrus himself was accused of embezzle- ment, and thrown into prison, After a confinement of~~

~~two years he was released, created a count, and employed in many honourable missions; he would even have been sent to Paris as Spanish ambassador, had not the Directory objected to him as being of French birth. Cabarrus took no part in the transactions by which Charles IV. was obliged to abdicate and make way for Joseph, brother of Napoleon, but his French birth, and intimate knowledge of Spanish affairs recommended him to the Emperor as the fittest person for the difficult post of minister of finance. In this capacity Cabarrus died (1810). His beautiful daughter Thérése, under the name of Madame Tallien (afterwards Princess of Chimay), played an interesting part in the later stages of the French Revolution.~~

~~CABATUAN, a town of the Philippine Islands, in the province of Iloilo, in Panay, situated on the banks of the River Tiguin, which changes from an almost empty channel to an impetuous torrent, so that navigation is frequently impossible. The town, which was founded in 1732, has about 23,000 inhabitants, who are principally engaged in the cultivation of rice and the manufacture of cocoa-nut oil. See Bowring's Philippine Islands.~~

~~CABAZERA, a town of the Philippine Islands, capital of the province of Cagayan in Luzon, with a population of about 15,000. Tobacco-growing is the most important occupation of the district.~~

~~CABBAGE. The parent form of the variety of useful culinary vegetables included under this head is generally supposed to be the wild or sea cabbage (Brassica oleracea), a plant found near the sea coast of various parts of~~

~~England and continental Europe, although Alph. de Candolle considers it to be really descended from the two or three allied species which are yet found growing wild on the Mediterranean coast. In any case the cultivated varieties have departed very widely from the original type, and they present very marked and striking dissimilarities among themselves. The wild cabbage is a comparatively insignifi- cant plant, growing from 1 to 2 feet high, in appearance very similar to the corn mustard or charlock (Sinapis arvensis), but differing from it in having smooth leaves. The wild plant has fleshy, shining, waved, and lobed leaves (the uppermost being undivided but toothed), large yellow flowers, elongated seed-pod, and seeds with conduplicate cotyledons. Notwithstanding the fact that the cultivated forms differ in habit so widely, it is remarkable that the flower, seed-pods, and seeds of the varieties present no appreciable difference.~~

~~The late Dr Lindley proposed the following classification for the various forms, which includes all yet cultivated :— 1. All the leaf-buds active and open, as in wild cabbage and kale or greens; 2. All the leaf-buds active, but forming heads, as in Brussels sprouts; 3. Terminal leaf-buds alone active, forming a head, as in common cabbage, savoys, &c. ; 4. Terminal leaf-bud alone active and open, with most of the flowers abortive and succulent, as in cauliflower and broccoli ; 5. All the leaf-buds active and open, with most of the flowers abortive and succulent, as in sprouting broccoli. The least variety bears the same relation to com- mon broccoli as Brussels sprouts do to the common cabbage, Of all these forms there are numerous gardeners' varieties, all of which reproduce faithfully enough their parent form by proper and separate cultivation. Under Dr Lindley's first class, common or Scotch kale is a variety which formerly was in extensive cultivation, and is still found in the cottage "kail-yards" or gardens of the Scottish peasantry. It sends up a stout central stem, growing upright toa height of about 2 feet, with close-set, large thick plain leaves of a light red or purplish hue. The lower leaves are stripped off for use as the plants grow up, and used for the preparation of broth or "Scotch kail," a dish at one time in great repute in the north-eastern~~

~~districts of Scotland. ‘Tall or German greens, which grow to the height of 4 feet, with bright green very much curled leaves, have largely superseded kale in cultivation. A very remarkable variety of open-leaved cabbage is cultivated in the Channel Islands under the name of the Jersey or branching cabbage. It grows to a height of 8 feet, but has been known to attain double that altitude. It throws out branches from the central stem, which is sufficiently firm and woody to be fashioned into walking-sticks ; and the stems are even used by the islanders as rafters for bearing the thatch on their cottage-roofs. Several varieties are cultivated as ornamental plants on account of their beautifully coloured, frizzled, aud laciniated leaves. Brussels sprouts, which represent -Dr Lindley’s second class, are miniature cabbage-heads, about an inch in diameter, which form in the axils of the leaves, They form a tender and delicate table vegetable. ‘The third class is chiefly repre- sented by the common or drumhead cabbage, the varieties of which are distinguished by difference in size, form, and colour. In Germany it is converted into a popular article of diet under the name of Sauerkraut by placing in a tub alternate layers of salt and cabbage. An acid fermentation sets in, which after a few days is complete, when the vessel is tightly covered over and the product kept for use with animal food. Cabbages contain a large percentage of nitro- genous compounds as compared with most other articles of food. Their percentage composition is—water, 93-4; albu- men, 1°8; starch and dextrin, 3°3; woody fibre, 0°5; and mineral ash, 0°8. Red cabbage is chiefly used for pickling, and the Savoy is a hardy green variety, characterized by its very wrinkled leaves. The Portugal cabbage, or Couve Tronchuda, is a variety, the tops of which form an excellent cabbage, while the midribs of the large leaves are cooked like sea-kale. Cauliflower, which is the chief representative of class four, consists of the inflorescence of the plant modified so as to form a compact succulent white mass or head; this is upon the whole the most highly prized cultivated form of the plant, and has been in use from very remote times. Broccoli is merely a variety of cauliflower differing from the other in the form and colour of its inflorescence and its hardiness. Broccoli sprouts, the representative of the fifth class, is a form of recent intro- duction, and consists of flowering sprouts springing from the axils of the leaves. Kohl-rabi is a peculiar and excep- tional variety of cabbage in which the stem, just above ground, swells into a fleshy turnip-like mass. It is much cultivated in certain districts as a food for cattle. The varieties of cabbage,~~

~~like many other Cruciferous plants, are possessed of anti-scorbutic properties; but unless eaten when very fresh and tender they are difficult of digestion, and have a very decided tendency to produce flatulence.~~

~~Several species of palm, from the fact of yielding large sapid central buds which are cooked as vegetables, are known as Cabbage Palms. The principal of these is Areca oleracea, but other species, such as the Coco Palm, the Maximiliana regia, Arenga saccharifera, &c., yield similar edible leaf-buds.~~

~~CABBALA anp CABBALISTS. See Kaspara.~~

~~CABENDA, or Cazinpa, a seaport town of Western Africa, in Lower Guinea, 40 miles north of the mouth of the Zaire, on the right bank of the Bele, in 5° 33’ S. lat., 15° 40’ E. long. From the great beauty of its situation, and the fertility of the adjacent country, it has been called the paradise of the coast. The harbour is well sheltered and commodious, and the trade is considerable. Popula- tion about 16,000.~~

~~CABET, Etienne (1788-1856), an active French Communist, was born, the son of a cooper, at Dijon in 1788. He chose the profession of advocate without |~~

~~succeeding in it, but erelong became notable as the persevering apostle of republicanism and communism. He assisted in a secondary way in the Revolution of 1830, and obtained a legal appointment in Corsica under the Govern- ment of Louis Philippe; but, being dissatisfied with the moderation of the new rule, he began to attack it even in public, and was dismissed. Elected, notwithstanding, to the Chamber of Deputies, he was prosecuted for his bitter criticism of the Government, and obliged to go into exile in England. On the amnesty of 1839, he returned to France, and attracted some notice by the publication of a badly-written and fiercely democratic history of the Revolution of 1789 (4 vols., 1840), and of a social romance, Voyage en Icarie, in which he set forth his peculiar views, These works met with~~

~~some success among the radical working-men of Paris. An opportunity at length occurred of realizing his schemes. Pressed by his friends, he made arrangements for an experiment in communism on American soil. In his journal, Ze Populaire, he announced' the purchase of a considerable tract of land on the Red River, Texas, and a treaty by which Cabet was made the dictator of an intending colony, and the depositary of all the funds, community of property being the distinctive principle of the society. Accordingly, in 1848, an expedition of 150 sailed to America; but unexpected difficulties arose and the complaints of the disenchanted settlers soon reached Europe. Cabet, who had remained in France, had more than one judicial investigation to undergo in consequence, but was honourably acquitted. In 1849 he went out in person to America, but on his arrival, finding that the Mormons had been expelled from their city Nauvoo, in Illinois, he transferred his settlement thither. There, with the exception of a journey to France, where he returned to defend himself successfully before the tribunals, he re- mained, the dictator of his little society. In 1856, how-ever, he was expelled, and died the same year at St Louis, He had not the advantages of either birth or eloquence, or even of ability. The little success he obtained was due entirely to the singularity of his opinions, and the straight forward persistency with which he advocated them.~~

~~CABEZA DEL BUEY (i.c., bullock's head), a town of Spain, in Estremadura, in the province of Badajoz, and 86 miles E.8.E. from the cityof that name. It manufactures woollen cloth, and has a population of 6500.~~

~~CABINET, a conventional, but not a legal, term employed to describe those members of the Privy Council who fill the highest executive offices in the State, and who, by their concerted policy, direct the Government, and are responsible for all the acts of the Crown. The Cabinet now always includes the persons filling the following offices, who are therefore called Cabinet Ministers, viz :—The First Lord of the Treasury, the Lord Chancellor, the Lord President of the Council, the Lord Privy Seal, the five Secretaries of State, the Chancellor of the Exchequer, and the First Lord of the Admiralty. The Chancellor of the Duchy of Lancaster, the Postmaster General, the First Commissioner of Works, the President of the Board of Trade, the Chief Secretary for Ireland, the President of the Poor Law Board, and the Vice-~~

~~F'resident of the Education Committee are sometimes members of the Cabinet, but not necessarily so. Hence the Cabinet must consist of at least eleven members, and it has sometimes included as many as seventeen. But the better opinion appears to be that a large Cabinet is an evil. Mr Disraeli in 1874 acted wisely in restricting the numbers of his colleagues to eleven besides the Prime Minister. When Lord Grenville in 1806 brought Lord Chief Justice Ellenborough into the Cabinet by combining his judicial office with that of Lord President, the appointment was strongly reprobated, and the experi- ment has never been repeated. The Master-General of the~~

~~CABIN T~~

~~Orduauce used to have a seat in the Cabinct, and the duke of Wellington sat there for a short time as Commander-in- Chief. Of late years there has been no military officer in the Cabinet, a thing much to be regretted. Ina few in- stances privy councillors of very high standing, as the duke of Wellington, Lord Sidmouth the marquis of Lans- downe, and Lord Russell, have been summoned to the Cabinet without office. There is no constitutional objec- tion to summoning any privy councillor to the Cabinet by command of the sovereign.~~

~~The word "Cabinet," or 'Cabinet Council," was originally employed as a term of reproach. Thus Lord Bacon says, in his essay Of Counsel (xx.), "The doctrine of Italy and practice of France, in some kings' times, hath introduced Cabinet Councils—a remedy worse than the disease ; " and, again, " As for Cabinet Councils, it may be their motto Plenus rimarum sum." Lord Clarendon—after stating that, in 1640, when the great Council of Peers was convened by the king at York, the burden of affairs rested principally on Laud, Strafford, and Cottington, with five or six others added to them on account of their official position and ability—adds, "These persons made up the Comnuittee of State, which was reproachfully after called the Juncto, and enviously then in Court the Cabinet Council." And in the Second Remonstrance in January 1642, Parliament complained "of the managing of the great affairs of the realm in Cabinet Councils, by meu unknown and not publicly trusted." But this use of the term, though historically curious, has in truth nothing in common with the modern application of it. It meant, at that time, the employment of a select body of~~

~~favourites by the king, who were supposed to possess a larger share of his confidence than the Privy Council at large Under the Tudors, at least from the later years of Henry VIIL, and under the Stuarts, the Privy Council was the Council of State or Government. During the Common-wealth it assumed that name.~~

~~The Cabinet Council, properly so called, dates from the reign of William III. and from the year 1693, for it was uot until some years after the Revolution that the king discovered aud adopted the two fundamental principles of a constitutional Executive Government, naniely, that a ministry should consist of statesmen holding the same politi- cal principles and identified with each other ; and, secondly, that the ministry should stand upon a parliamentary basis, that is, that it must command and retain the majority of votesin the Legislature. It was long before these principles were thoroughly worked out and understood, and the perfection to which they have been brought in modern times is the result of time, experience, and, in part, of accident. But the result is that the Cabinet Council for the time being 7s the Government of Great Britain ; that all the powers vested in the sovereign (with one or two exceptions) are practically exercised by the members of this body ; that all the members of the Cabinet are jointly and severally responsible for all its measures, for if differences of opinion arise their existence is unknown as long as the Cabinet lasts,—when publicly manifested the Cabinet is at an end; and lastly, that the Cabinet, being respousible to the sovereign for the conduct of executive business, is also collectively responsible to Parliament both for its executive conduct and for its legislative measures, the same neu being as members of the Cabinet the servants of the Crown, and as Members of Parliament and leaders of the**

~~1 Thus, under Charles IL., in 1671, the king's confidential advisers were Clifford, Arlington, Buckingham, Ashley, and Lauderdale. The initial letters of their names spell the word " Cabal ; " and Lord Macaulay affirms that the word cabal was popularly used as synony- mous with cabinet. But the word cabal certainly never was applied to any other cabinet ; and the cabal itself was not in truth a cabinet at all.~~

~~majority responsible to those who support them by their votes and may challenge in debate every one of their actions. In this latter sense the Cabinet has sometimes been described as a Standing Committee of both Houses of Parliament.~~

~~This in reality is the form to which the active governing machinery of the British Constitution has now been brought. It has been ingeniously argued by Mr Bagehot, in his Essays on the Constitution, that "the Cabinet is a board of control, chosen by the Legislature, out of the persons whom it trusts and knows, to rule the nation," and that the choice of the Crown and of the Prime Minister, who frames the list of Cabinet Ministers to be laid before the sovereign, is in fact circumscribed and predetermined by the position which a small number of men in each party have acquired in Parliament. No man can long remain a Cabinet Minister who is not in Parlia- ment; and of those who sit in either House of Parliament, but a small proportion have attained to the rank or influ- ence that fits a man to be a Cabinet Minister. This is especially the case in the House of Commons, largely composed of men engaged in various professions ; for it is easier to find men of high senatorial rank and experience in the House of Peers than in the other House, because in England members of the Peerage are frequently trained and educated from early life for high office and the public service. The Cabinet, therefore, really originates in the Legislature, thongh its functions are the functions of executive government, and although it disposes on behalf of the Crown of a vast amount of power, patronage, honours, &., to which the authority of the Legislature does uot extend. The Cabinet has, moreover, one most important power, which it derives entirely from the Crown, namely, that of dissolving the Legislature to which it owes its own existence—though this is in fact no more than an appeal to the nation at large, whose representative the Levisla- ture is. The power of dissolving Parliament is one usually, though not always uureservedly, entrusted by the sovereign to the Prime Minister ; but if withheld when solicited, the ininister would resign.~~

~~Instances are not wanting in our history in which the direct action of the sovereign has overthrown a Cabinst, or prevented a Cabinet from being formed. In 1784 George III dismissed the Coalition Ministry. In 1807 the king also dismissed Lord Grenville's Cabinet, in the teeth of Lord Erskine's~~

~~declaration of the high Whig doctrine, that the king had handed over every power of government, and even his own conscience, to his responsible advisers. In these instances the Crown succeeded, and the new Parliament ratified the change. Notso in 1834 when William IV. dismissed Lord Melbourne's Cabinet, placed the duke of Wellingtou for some weeks in sole possession of all the Cabinet offices, and called Sir Robert Peel to power. In 1812 Lord Moira was defeated in the attempt to form a Cabinet by the refusal of the regent to consent to a change in the household; and in 1839 a similar reason was alleged by Queen Victoria to prevent the acces- sion to office of Sir Robert Peel. But though this step was defended and sanctioned by a minute of the Whig Cabinet of the day, it is now generally regarded as uncon- stitutional, and the objection was never repeated.~~

~~One of the consequences of the close connection of the Cabinet with the Legislature is that it is desirable to divide the strength of the ministry between the two Houses of~~

~~arliament. Mr Pitt's Cabinet of 1783 consisted of him- self in the House of Commons and seven peers. But so aristocratic a Government would now be impracticable. In Mr Gladstone's large Cabinet of 1868, eight, and afterwards nine, ministers were in the House of Commons and six in the House of Peers. Great efforts were made to strengthen~~

~~the ministerial bench in the Commons, and a new principle was introduced, that the representatives of what are called the spending departments—that is, the Secretary of State for War and the First Lord of the Admiralty—should, if possible, be members of the House which votes the supplies. Mr Disraeli followed this precedent.~~

~~Although the Government of this country is one of extreme publicity, it is to the credit of the good sense and good faith of Englishmen that the deliberations and pro- ceedings of the Executive Government are veiled in impene- trable secrecy, until the moment when the result of them is made known. Beyond the meagre announcement in the Court Circular of the bare fact that a Cabinet has been held, and that certain ministers were present, nothing is communicated to the public. Cabinets are usually con- voked by~~

~~a summons addressed to “ Her Majesty’s Confi- dential Servants,” by direction of the Prime Minister; and the ordinary place of meeting is the Foreign Office, but they may be held anywhere. No secretary or other officer is present at the deliberations of this council. No official record is kept of its proceedings, and it is even considered a breach of ministerial confidence to keep a private record of what passed in the Cabinet, inasmuch as such memoranda may fall into other hands. But on some important occasions, as is known from the Memoirs of Lord Sidmouth, the Correspondence of Earl Grey with King William IYV., and from Sir Robert Peel’s Memoirs, published by per- mission of the Queen, Cabinet minutes are drawn up and subinitted to the sovereign, as the most formal manner in which the advice of the ministry can be tendered to the Crown and placed upon record. More commonly, it is the duty of the Prime Minister to lay the collective opinion of his colleagues before the sovereign, and take his or her pleasure on public measures and appointments. The sovereign never presides at a Cabinet, and at the meetings of the Privy Council, where the sovereign does preside, the business is purely formal. It has been laid down by some writers as a principle of the British Constitution that the sovereign is never present at a discussion between the advisers of the Crown ; and this is, no doubt, an established fact and practice. But like many other political usages of this country it originated in a happy accident. King William and Queen Anne always presided at weekly Cabinet Councils. But when the Hanoverian princes ascended the throne, they knew no English, and were barely able to converse at all with their ministers ; for George I. or George IT. to take part in, or even to listen to, a debate in council was impossible. When George III. mounted the throne the practice of the independent deliberations of the Cabinet was well established, and it has never been departed from. In no other country has this practice been introduced, and perhaps this is one reason why in many instances constitutional government has failed to take root.~~

~~Differences of opinion, of course, occur in all bodies of meu, and arguments are frequently presented with greater ability and temper in private than in public debate. These differences are decided in the Cabinet, as in all committees of council, by the majority of votes, and the rule helds good in all of them that ‘‘no man shall make publication of how the minority voted” The vote once taken and the question decided, every member of the Cabinet~~

~~becomes equally responsible for the decision, and is equally bound to support and defend it. A decided difference of opinion cannot be persisted in or publicly expressed without withdrawing from the Cabinet, as when Mr Gladstone quitted Sir Robert Peel's administration upon the proposal to endow Maynooth. Hence it arises that resignations, or threats of resignation, are much more common than the public imagine; and a good deal of tact and management is continually exercised~~

~~in reconciling these differences. A serious " division in the Cabinet" is, as is well known, an infallible sign of its approaching dissolution. There are cases in which a minister has been dismissed for a departure from the con- certed action of his colleagues. Thns, in 1851, Lord Palmerston having expressed to the French ambassador in London his unqualified approbation of the coup d'état of Louis Napoleon against the Assembly, when the Cabinet had resolved on observing a strict neutrality on the subject, Lord Russell advised Her Majesty to withdraw from Lord Palmerston the seals of the Foreign Department, and his lordship never again filled that office.~~

~~A clause was introduced into the Act of Settlement of 1705 requiring all Acts of State to be transacted in the Privy Council and signed by all the members present. This provision was found to be inconvenient, and was repealed two years afterwards. According to modern usage only one kind of public document is signed by all the mem- bers of the Cabinet, as privy councillors, and that is the order for general reprisals which constitutes a declara- tion of war. Such an order was issued against Russia in 1854, and was signed by all the members of Lord Aber- deen's Cabinet.~~

~~Upon the resignation or dissolution of @ ministry, the sovereign exercises the undoubted prerogative of selecting the person who may be thought by the Court most fit to form a new Cabinet. In several instances the statesmen~~

~~selected by the Crown have found themselves unable to~~

~~accomplish the task confided to them. But in more favour- able cases the minister chosen for this supreme office by the Crown has the power of distributing all the political offices of the Government as may seem best to~~

~~himself, subject only to the ultimate approval of the sovereign. The First Minister is therefore in reality the author and constructor of the Cabinet; he holds it together; and in the event of his retirement, from whatever cause, the Cabinet is really dissolved, even though its members are again united under another head, as was the case when Lord Melbourne succeeded Lord Grey in 1834, and when Mr Disraeli succeeded Lord Derby in February 1868. Each member of the Cabinet, in fact, holds office under the First Lord of the Treasury, and in the event of resignation it is to him that the announcement of such an intention should be made.~~

~~The best account of the Cabinet council and of the other execu- tive machinery of the constitution is to be found in Mr Alpheus Todd's Essay on Parliamentary Government in England (2 vols. 8vo, 1867-69), where all the authorities are collected—Hallam, May, John Austin, Lord Macaulay—and a vast quantity of political infor- mation, compiled from debates and bearing on this subject. Mr Bagehot's Essay on the English Constitution contains an ingenious comparison, or rather contrast, between the British Cabinet and the administrative mechanism of the United Statesof America. (H.R.)~~

~~CABIRI (KaBerpor), in Mythology, usually identified with the Dioscuri (Castor and Pollux), in common with whom they were styled peydAor @eot (magni Dri), and had the power of protecting life against storms at sea, the symbol of their presence being the St Elmo fire. The worship of the Cabiri was local and peculiar to the islands of Lemnos, Imbros, and Samothrace, extending also to the neighbour- ing coast of Troy, in which places it appears to have been inherited from a primitive Pelasgic population. It was, however, in Samothrace that this worship attained its chief importance, coming first into notice apparently after the Persian war, and from that time extending its influence down into the Roman period. The point of attraction was in the religious Mysteries, initiation into which was sought for, not only by large numbers of pilgrims, but also by such persons of distinction as Philip and Olympias—the parents of Alexander, his successor Lysimachus, Arsinoé, and those Roman commanders whose duties led them to that quarter.~~

~~100 fathoms, or 200 yards.~~

~~What the rites were in which the Mysteries consisted is unknown, and it is therefore impossible to say how far they may have been organized on the model of the Mysteries of Eleusis, though it is clear that Athens took a considerable part in being the first to extend the influence of the Samothracian Mysteries. Initiation included also an asylum or refuge, if required, within the strong walls of Samothrace, for which purpose it was used among others by Arsinoé, who afterwards caused to be erected there (276-247 B.c.), to record her gratitude, a monument, the ruins of which were explored in 1874 by an Austrian archeological expedition (Untersuchungen auf Samothrake, by Conze, Hauser, and Niemann, Vienna, 1875).~~

~~In Lemnos an annual festival was held, lasting nine days, during which all the fires in the island were extinguished and fresh fire brought from Delos. From this and from the statement of Strabo (x. 437), that the father of the Cabiri was Camillus, a son of the god Hephestus, it has been thought that the Cabiri must have been, like the Curetes, Corybantes, and Dactyls, daemons of volcanic fire. But this is very uncertain. In Lemnos they fostered the growth of the vine and fruits of the field, and from their connection with Hermes in Samothrace, it would seem that they had also aided the fertility of cattle. Both the names and the number of the Cabiri are doubtful. On late authority theyare given as Awieros, Axiokersa, and Axiokersos, with a fourth called Kadmilos or Kasmilos; but in the usual tradition they were Dardanos, Jasion, and Harmonia. Jasion, who was a favourite of the goddess Demeter, instituted the Mysteries. Harmonia married Cadmus of Thebes, whose name is to be recognized in Kadmi'os, one of the Cabiri. On the other hand it has been argued that there were only two Cabiri, Dardanus and Jasion, cor- responding as deities to the Greek Poseidon and Apollo, or Uranus and Gea, z.e., sky and earth. On these points, the statements of ancient writers are not only few but generally irreconcilable with each other. On Etruscan bronze mirrors representations of what are called the Cabiri frequently occur, consisting of two youthful figures, some- times with the addition of a female figure, apparently their sister; sometimes there are three brothers. This subject is dealt with in detail by Gerhard in his Ltruskische Metall- Spiegel.~~

~~CABLE, a rope or chain used for connecting a ship with her anchor. Chain cables are generally used, but on account of their weight they are unsuitable for moor- ing in very deep water, when several lengths of cable would be hanging at the "hawse pipe; " and they cannot be used, also on account of their weight, when it is required to lay an anchor out at some distance from the ship. Hempen cables are, therefore, supplied to all ships as well as chain cables. For sizes, number, and lengths of cables carried by ships of the Royal Navy and required by Lloyd's rules to be supplied to merchant ships, see article ANCHOR.~~

~~The length of a chain cable is 100 fathoms, and that of a hempen cable 101 fathoms. The term "a cable's length," by which the distance of vessels from each other 1s usually given in nautical parlance, is understood to mean Cables are sometimes made of common chain, but the best and most approved are made of stud-link chain, as shown in fig. 1, which gives the rela- 'tive proportions of the various parts. Cables are made in lengths of 121 fathoms, connected together by " joining shackles," as shown at D. Each length is "' marked" by a piece of iron-wire being twisted round the stud of one of the links, the wire being placed on the first stud inside the first shackle,—i.e., the stud nearest to the shackle on the side remote from the anchor,—on the second stud inside the second shackle, and so on, so that the length of cable~~

~~621~~

~~which is out may always be known. For instance, if the mark is on the sixth stud inside the first inboard shackle, it is known that six lengths, or 75 fathoms, of cable are out, measuring from that shackle. In joining the lengths together the round end of the shackle should be placed towards the anchor. The end links of each length C, C are made without studs in order to receive the shackles, and it is necessary to make them of iron of greater diameter than that used for the stud links. in order to keep them of equal strength. The stud keeps the link from collapsing, and increases its strength considerably.~~

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~~Fie. 1. —Stud-link Chain.+~~

~~The next links B, B in their turn have to be enlarged to enable them to take the increased size given to the links C, C. It will be observed from the sketch of the shackle D that the pin is made oval, its greater diameter being in the direction of the strain. Ths pin of the shackle which attaches the cable to the anchor, and is called the “anchor shackle” in distinction from the “ joining shackles,” may project and be secured by a forelock ; but as any projection would be detrimental when the chain is running out (some- times with great rapidity) through the hawse pipes, the pins of the joining shackles are made as shown, and are secured by a small pind. This small pin is kept from coming out by being made a little short, so that a lead pellet may be driven in at either end to fill up the holes in the shackle, which are made with a groove, so that as the pellets are driven in they expand or dovetail, and thus keep the small pin secure in its place.~~

~~The cables are stowed in the chain lockers, the inner ends being firmly secured to the ship by a “slip.” This is done to render it impossible for the cable to run out and be lost accidentally, the slip being provided so that the cable may be let go without difficulty if stress of weather or any other cause renders such a proceeding imperative. It is necessary to fit one or two swivels in each cable to avoid turns being taken in it as the ship swings. When a ship is moored with two anchors the cables are attached to a mooring swivel (fig. 2); if this is not done the cables get entwined around each other, forming what is termed a “foul hawse,” which is a troublesome thing to clear.~~

~~The cable is hove up in large vessels by a capstan, and in small ones by a windlass. It is brought directly to the capstan, the mner end passing to the deck pipe, and thence to the chain lockers; or it is brought in by means of a messenger, which is an endless chain passing round the capstan and a roller on each side of the deck near the hawse pipes. The cable is stoppered to the~~

~~messenger by rope or iron nippers, and as the messenger goes round with the capstan the cable is brought in, the nippers being shifted as required. Messengers are now almost entirely superseded by the improved make of capstans.~~

~~Various means for checking the caple as it is running out, and for holding it, have been devised. The old-~~

~~1 The dimensions marked in the figure are those for one-inch chains and signify so many diameters of the iron of the common links,—thus forming a scale for all sizes.~~

~~fashioned plan is to fit a strong iroa lever called a “ com- presser” under the deck pipe, fixed at one end in such a position that when the other end is hove round by a tackle the cable will be jammed between the compresser and the lower edge of the pipe. In place of compressers, or to act in conjunction with them, several kinds of stoppers have been used, fitted either at the deck pipes, or just inside the hawse pipes ; those patented by Harfield and Co. find the most favour in the Royal Navy, but the compressers are~~

~~Fic. 2.—Mooring Swivel.~~

~~almost invariably fitted with them. Ships are generally held when “ riding at anchor” by one or two turns of the cable being taken round the “ riding bitts,” which are strong structures of iron or wood, placed for this purpose near the hawse pipes. “Stopper bolts”’—z.e., ring-and-eye bolts, placed in the deck forward—are also fitted, to which the cable may be secured while the turns are being put on or taken off the riding bitt, while the mooring swivel is being attached, or at other times. (T. M.)~~

~~CABOT, Sxpastran,! the renowned navigator, contemporary of Columbus, was the son of John Cabot, a Venetian merchant, and was born in Bristol, England, while his father was a resident of that city. On the disputed question of his birthplace, Richard Eden (Decades of the New World, fol. 255) says Sebastian told him that, when four years old, he was taken by his~~

~~father to Venice, and returned to England while still very young, " whereby he was thought to have been born in Venice." Stow, in his Annals, under the year 1498, styles " Sebastian Gaboto a Genoas sonne, borne in Bristow." Galvano and Herrera also give to England the honour of his nativity. Neither the year of his birth nor that of his death can be stated with precision ; conjecture fixes the former event in about 1476. No instructive details of his early life, until he had passed his twentieth year, can now be recovered.~~

~~The discoveries of Columbus infused into young Sebastian an ardent desire to emulate his brilliant achievements. Henry VII. resolved to enter the new field of maritime discovery, which had already rewarded Spain with the Antilles ; and the Cabots having proposed to the king the project of shortening the voyage to India by sailing west, to them was confided its execution.~~

~~The first patent was granted March 5, 1496 (11th Henry VIL.), to " John Gabote, citizen of Venice ; to Lewes, Sebas- tian, and Santius, sonnes of the said John." It empowered them to seek out, subdue, and occupy, at their own charges, any regions which before had "been unknown to all Christians." They were authorized to set up the royal banner, and possess the territories discovered by them as~~

~~) Gabote, Patent of 1496; Kabotto, Patent of 1498; Cabote, Eden ; Gaboto, Gomara.—Stow.~~

~~CA B—C AB~~

~~the king's vassals. Bristol was the only port to which they were permitted to return; and a fifth part of the gains of the voyage was reserved to the Crown. 'The discoverers were vested with exclusive privilege of resort and traffic.~~

~~With respect to Lewes and Santius, the chronicles are silent. John and Sebastian sailed from Bristol in the "Matthew" in the following year (1497), and, as now seems probable, returned to England after the first discovery had been made (see BrisTou, p. 350). There is in the account of~~

~~the Privy Purse expenses of Henry VII. the following entry:—" 10th August 1497. To him that found the New Isle, £10."~~

~~Although it is probable that the Island of Newfoundland was discovered in this voyage, a careful scrutiny of the various maps and chronicles sustains the belief that the Cabots saw the mainland of America before any other,— the term Terra primum visa having been used to distinguish the continent, or what was believed to form a part of it. The relation of Sebastian (see Hakluyt, 111, p. 7) does not warrant the inference that the first land seen was an island,~~

~~The most precise account of the discovery is from a map drawn by Sebastian Cabot, and engraved in 1549 by Clement Adams, which is known to have hung in Queen Elizabeth's gallery at Whitehall. The notice runs as follows :·—" In the year of our Lord 1497, John Cabot, a Venetian, and his son Sebastian, discovered that country which no one before his time had ventured to approach, on the 24th of June, about five o'clock in the morning. He called the land Terra primum visa, because, as I conjecture, this was the place that first met his eye in looking from the sea. On the contrary, the island which lies opposite the | land he called the island of St John,—as I suppose, because it was discovered on the festival of St John the Baptist."~~

~~On Sebastian Cabot's map of 1544, the original of which is in the Geographical Cabinet of the Imperial Library at Paris (see fac-similein Jomard's Jfonumentsde la Géographie), nothing is designated above the sixtieth parallel. Prima tierra vista is delineated between 45° and 50°, with the island St Juan (corresponding with Prince Edward), within the great gulf at the embouchure of what is plainly the St Lawrence. The authenticity of the map being accepted, the "land first seen" could be no other than the coast of Nova Scotia, or island of Cape Breton.~~

~~A second " patent" to John Cabot, dated 3d February _ 1498, authorized him to take six English ships, of not — more than 200 tons, in any port in the realm, " and them convey and lede to the lande and isles of late found by the said John in oure name and by oure commandment." Before the expedition was ready, John Cabot -died, and Sebastian, with a fleet of five vessels, sailed from Bristol in May 1498. It is believed that this is the~~

~~voyage referred to by Peter Martyr, Gomara, Fabyan, and by Sebastian himself in his letter to Ramusio. Cabot, upon falling in with the coast, ascended it as high as latitude 673°, probably passing into Hudson's Bay. He persevered in the effort to find an open channel to India, until his sailors, appalled by the danger of navigating the ship among icebergs, broke out in open mutiny and compelled him to turn back. He then retraced his course, pausing at Baccalaos to refit; and, after examining the coast as far south as 38°, returned to England. Sebastian took with him in this voyage three hundred men, with the purpose, as Gomara states, of colonizing the newly-found regions. Thevet, French cosmographer, relates that Cabot landed these emigrants where the cold was so intense that nearly the whole company perished, although it was in July. Cabot brought to England three native inhabitants of the countries he had visited; his great achievement was the discovery of eighteen hundred miles of sea-coast of the North American continent.~~

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~~Except the vague report of a voyage undertaken by him in 1499, nothing more appears relative to Sebastian until 1512, when he is found living at Seville, engaged in revising the Spanish king's maps and charts. The death of Ferdinand put an end to a design to renew the search for a north-west passage to Cathay, and Cabot, who was to have commanded, returned to England. In 1517 he undertook, with Sir Thomas Perte, another voyage,— whether of discovery or conquest in Spanish America is uncertain. In 1518 Sebastian revisited Spain, and was appointed pilot-major. After the conference of Badajos, a squadron was: fitted out under Cabot to pursue Spanish discovery iu the Pacific. It set sail in August 1526, but some of his chief officers having spread disaffection in the fleet, Cabot abandoned the original plan as impracticable, and put into the La Plata. He sailed up this river 350 leagues, built a fort at one of the mouths of the Parana, which stream he ascended in boats, and also penetrated some distance up the Paraguay. Failing to obtain the aid he solicited, and weakened by the assaults of the natives, Sebastian was forced to leave the coast for Spain.~~

~~He now, for the second time, returned to England, and notwithstanding a demand by the emperor that "he might be sent over to Spain," settled at Bristol. Edward VI., in 1549, granted the now aged seaman a pension of two hundred and fifty marks. Hakluyt states that the office of Grand Pilot of England was created for him. It was at this period that he explained to the king the phenomenon of the variation of the needle. He was active in promoting the expedition of 1553 to Russia, the success of which gave him the life appointment of Governor of the Muscovy Company.~~

~~Cabot is supposed to have died in London, in 1557, sixty-one years subsequent to the date of his first commis- sion from Henry VII., and not far from eighty years old. The place of his burial is unknown, and we are indebted to Eden for the death-bed scene of this intrepid navigator, who saw the American continent before Columbus or Amerigo Vespucci. His character is extolled by contem- poraries, and was distinguished for lofty courage and unflagging perseverance in the execution of his designs. Few lives exhibit such incessant activity in the pursuit of an idea. The maps and discourses drawn and written by himself would, if in existence, have shed much light on an illustrious career ; but, with the exception of a map said to have been recovered in Germany, and another existing in France, no trace of them remains. The memoir by Richard Biddle, London and Philadelphia, 1831, though faulty in arrangement, is still the best.~~

~~CABRA, a town of iSpain, in the province of Cordova, about 28 miles S.E. of that city, situated in a fertile valley near the source of the river of the same name. It contains a cathedral church (de la Asuncion) which was formerly a mosque, and has also a theatre, a hospital, a college, and several monasteries. There still remains a part of its old castle called the Tower of Homage; and the abyss 'into which Don Quixote's Knight del Bosque precipitated himself is pointed out. The fields of clay in the neighbour- hood afford materials for a considerable trade in bricks and pottery ; and there is an abundant supply of wine, vinegar, oil, and flour from the surrounding districts. The manu- facture of coarse linen, woollen, and hempen stuffs is con- siderable. 'There are some interesting Moorish remains to be seen in the town and suburbs. Cabra is a town of great antiquity and is identified with the Ba bro or Augabro of Pliny, which was probably of Punic origin. It was delivered from the Moors by Ferdinand III.~~

~~in 1240, and entrusted to the order of Calatrava, but in 1331 it was Tecaptured by the king of Granada. In the reign of Henry TV. it was bestowed on the count of Baena. For several centuries it was the seat of a bishop. Population 11,076.~~

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~~CABUL, or KAsut, in modern days the capital of AYGHANISTAN (g. v.) The city stands on the right bank of the river called after it, on the fork made by the junction of the Loghar River, where the productive plain, which extends nurth to the foot of Hindu Kush, narrows rapidly into the gorges from which the streams issue. The city stands in 34° 303' N. lat., 69° 6' E. long., at an altitude of 6396 feet above the sea.~~

~~Cabulis about 3 miles in circuit; it was formerly walled, but now is not so. The mountains surround it pretty closely except where the plain opens to the N.E. It is triangular in form, the Bala-Hissar or Acrepolis, in which the Amir resides, forming the 8.E. angle, and rising about 150 feet above the plain. The old wall had seven gates, of which two alone remain, viz., the Lahori and the Sirdar.~~

~~The city is divided into six mahalas or quarters, and these again into kuchas or sections, which are enclosed and have gates. In tumult these enclosures form small separate fortresses. The streets hardly merit the name, and nowhere could admit wheel carriages; they are narrow passages, frightfully dirty after rain. The houses are of sun-dried brick and wood, seldom more than two stories in height. There are no public buildings of any moment; some mosques are spacious, but none have any magnificence. There are thirteen or fourteen sarais for foreign traders, but they bear no comparison with those of Persia. The public baths lack cleanliness, and the odour of the filth. which is used as fuel is most offensive. The greatest ornament of the city was the arcaded and roofed bazaar called Chihdr Chétd, ascribed to Ali Mardin Khan, a noble of the 17th century, who has left behind him many monuments of his munificent public spirit both in Cabul and in Hindustan. Its four arms had an aggregate length of about 600 feet, with a breadth of 30. The display of goods was remark- able, and in the evening it was illuminated. This edifice was destroyed by Sir G. Pollock on evacuating Cabul, as a memento of the treachery of the city. The several crafts, such as~~

~~saddlers, drapers, braziers, armourers, congregate together, as is usual in the East and to some extent in the south of Europe. Itinerant traders also parade the bazaars, each with his peculiar cry. The old-clothesman of London is represented by the Moghul of Cabul, with his cry of " Old bullion, old clothes!"~~

~~Including the Bala Hissar, Cabul contains about 9000 houses, giving a probable population of 50,000 to 60,000. In summer the population is more dense.- Without the limits of the old city to the westward is the fortified quarter of Chandol, once a detached village, now a large suburb occupied by the Kizilbashes (see AFGHANISTAN), and 'con- taining 1500 to 2000 houses. It has independent bazaars, baths, mosques, &c.~~

~~The river of Cabul is traditionally said to have several times flooded or swept away the city. There is but one bridge within the city limits, but there are others above and below in the vicinity. The city is well supplied with water, chiefly by canals drawn from the two rivers, and the streets are frequently intersected by covered aqueducts. There are also many wells, water being found at moderate depth throughout the valley.~~

~~Though there is some malarious influence in autumn from the marshy ground north of the city, Cabul is on the whole healthy. In addition to good water it has at most seasons a fine atmosphere, and an excellent supply of food. The children are chubby and ruddy. Vast supplies of fruft of fine quality are brought into the markets from the gardens of the Koh-daman and adjoining valleys. And the shops for the sale of fruit, fresh and dried, are a notable feature in the bazaars.~~

~~Cemeteries are numerous in the vicinity, including places of Jewish and common burial. One of the graveyards near~~

~~the shrine called Sh&h Shahid contains a tomb bearing in Roman characters the following inscription :—" Here lyes the body of Joseph Hicks, the son of Thomas Hicks and Edith, who departed this lyfe the eleventh of October 1666." An annual day in spring is appropriated to visiting the tombs, as in~~

~~continental Europe. The graves are sprinkled, garlands placed, and small repairs executed.~~

~~Many sacred shrines are interspersed among the cemeteries and gardens. The gardens are often on acclivities, formed into terraces, supplied with springs, and abounding in song-birds. Both shrines and gardens are greatly resorted to by the Cabulis, who are passionately fond of this kind of recreation. Most of the roads are bordered by running waters, and shadowed by mulberry, willow, or poplar trees. The tomb of the illustrious Sultan Baber stands about a mile to the west of the city in a singularly charming spot, on a slope spreading before the sun. The grave is marked by two erect slabs of white marble. Near him lie several of his wives and children ; the garden has been formerly enclosed by a marble wall ; a clear stream waters the flower-beds. From the hill that rises behind the tomb there is a noble prospect of his beloved city, and of the all-fruitful plain stretching to the north of it.~~

~~The geographical position of Cabul, in a tolerably open country intervening between the passes which lead to India on the one side, and those which lead to Turkestan on the other, is highly favourable to trade. Baber exalts the importance of its traffic in his day, saying that the products of Khorasan, Rm (Turkey), Babylonia, and China were all to be found there. People in easy circumstances are numerous. The presence of a court and a considerable military force contributes to the bustle of the place, and imparts animation to many trades. But the people do not excel in any handicraft or manufacture.~~

~~Cabul is believed to be the Ortospanum or Ortospana of the geographies of Alexander's march, a name conjectured to be a corruption of Urddhasthdna, "high place." But the actual name is perhaps also found as that of a people in this position (Ptolemy's Kabolite), if not in the name of a city apparently identical with Ortospana, Carura, in some copies read Cabura. It was invaded bythe Arabs as early as the thirty-fifth year of the Hegira, but it was long before the Mahometans effected any lasting settlement. In the early Mahometan histories and geographies we find (according to a favourite Arabic love of jingle) Kabul and Zdbul constantly associated. ZAbul appears to have been the country about Ghazni. Cabul first became a capital~~

when Baber made himself master of it in 1504, and here he reigned for fifteen years before his invasion of Hindustan. In modern times it became a capital again, under Timur Shah (see AFGHANISTAN), and so has continued both to the end of the Durrani dynasty, and under the Barakzais, who now reign. (H. Y.)

CaBuL (K4bul), is also the name of the province includ- ing the city so called. It may be considered to embrace the whole of the plains called Koh-daman and Beghram, &c., to the Hindu Kush northward, with the Kohestan or hill couutry adjoining so far as it is in actual subjection to the Amir's authority. Eastward it extends to the border of Jalalabad at Jagdalak ; southward it includes the Loghar district, and extends to the border of Ghazni; north-west- ward it includes the Paghman hills, and the valley of the upper Kabul River, and so to the Koh-i-Baba. Roughly it embraces a territory of about 100 miles square. Wheat and barley are the staple products of the arable tracts. Artificial grasses are also much cultivated, and fruits largely, especially in the Koh-daman. A considerable part of the population spends the summer in tents. The

villages are not enclosed by fortifications, but contain small |

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private castles or fortalices. The revenue of Cabul province has been stated at £180,000.

For the CaBuL River, see fully under AFGHANISTaN,

CACAO. See Cocoa.

CACERES, the capital of the province of the same name in Estremadura, in Spain, 20 miles south of the Tagus, and 24 miles west of Truxillo, on a ridge of hills which stretch from east to west. It is the residence of the bishop of Corias, and contains a handsome episcopal palace, as well as a public school, a college, and several charitable institutions, The monastery and college of the Jesuits was one of the finest in the kingdom, but has been secularized and converted into a hospital. In the neighbourhood are large gardens, well-cultivated fields, and extensive pasture grounds ; while in the

~~town are oil and fulling mills, soap-works, tanneries, and lime-kilns. There is also some trade in wool. Caceres occupies the site of the ancient Castra Cecilia, and was a place of some importance both under the Romans and under the Moors. There are several fine specimens of the domestic architecture of the Middle Ages, such as the houses of the duke of Abrantes, the count de la Torre, and the count de los Carbajales. The bull-ring, a iodern structure of granite, is one of the most remarkable buildings of its kind in Spain. Population, 13,466.~~

~~CACHAO, or, as it is variously spelled, Kacno, Kecuo, Hecuo, or KresHo, formerly known as Donk-king and now officially as Bacthian or Bac-king, is the largest city of Anam, and the capital of the province of Tonquin. It is situated on the west side of the Tonquin River, about eighty miles from the sea, in 105° 35' E. long., 21° N, lat. It is of great extent. The principal streets are wide and airy, and for the most part are paved with bricks and small stones, but the others are narrow and ill paved. Most of the houses are constructed of mud or sun-burned bricks and timber, and thatched with leaves, straw, or reeds, and are generally one story in height. The public edifices are spacious, particularly the royal palace, which is several miles in circuit, and is surrounded by high walls. Besides this palace there are to be seen the ruins of one still more magnificent, said to have been six miles in circumference. Cachao is a place of some commercial resort ; its imports are long cloths, chintz, arms, pepper, and other articles, which are exchanged for gold and manufactured goods, namely, beautiful silks and lackered ware, which last is generally reckoned superior to any in the East. The English factory, which stood on the banks of the river north of the city, and that of the Dutch, south of it, have long been withdrawn. Cachao is peculiarly liable to fires; und to prevent or extinguish these, the city is governed by a rigid police, and divided into wards. Fires for domestic use are only permitted during certain hours of the day. About the middle of the 18th century the city was nearly burnt to the ground by a conflagration, which was the work of incendiaries. In 1873 Francois Garnier, the famous French explorer, with an expedition of two hundred men and two ships, having come into collision with the authorities, took possession of the city after capturing the fort of Hanoi, which was constructed on European principles and defended by a large garrison. Not long after he was assassinated by the natives; but his victory led to a treaty between the~~

~~French Government and the Anamese, by which the port is declared open to the flags of all nations.~~

~~CACHEO, or Cacnao, a town of Western Africa in Senegambia, in the land of the Papels, a few miles inland from the mouth of the River Cachao or San Domingo. It is a fortified post of the Portuguese, and carries on 4 trade in gold dust and ivory. Population 15,000.~~

~~CACHOEIRA, a town of Brazil, in the province of Bahia, and 62 miles N.W. from the city of that name, 1s situated on the River Paraguassu, which is subject to~~

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~~heavy floods. It contains a town-house, a prison, a con- vent of Carmelites, and some five or six churches, and carries on an active trade in tobacco, coffee, and sugar. Population 15,000.~~

~~CACONGO, a small kingdom of Western Africa, sepa- rated from Congo by the river Zaire. The surface is nountainous but fruitful, the climate healthy though un- suited for Europeans, A strong tendency to adopt Europ- can customs and conveniences is displayed by the inhabi- tants, who carry on a considerable trade at the seaport towns of Mallemba and Cabinda. The capital] is Kinguela.~~

~~CACTUS. This word, applied in the form of xéxros by the ancient Greeks to some prickly plant, was adopted by Linnzeus as the family title of a group of curious suc- culent or ficshy-stemmed plants, most of them prickly and leafless, some of which produce beautiful flowers, and are now so popular in our gardens that the name has become familiar. As applied by Linnzus, the name Cactus is almost conterminous with what is now regarded as the natural order Cactacee, which embraces several modern genera. It is one of the few Linnzan generic terms which have been entirely set aside by the names adopted for the modern divisions of the group.~~

~~The Cacti may be described in general terms as plants having a woody axis, overlaid with thick masses of cellular tissue forming the fleshy stems. These are extremely various in character and form, being globose, cylindrical, columnar, or flattened into leafy expansions or thick joint-like divisions, the surface being either ribbed like a melon, or developed into nipple-like protuberances, or variously angular, but in the greater number of the species furnished copiously with tufts of horny spines, some of which are exceedingly keen and powerful. These tufts show the position of buds, of which, however, compara- tively few are developed. The stems are in most cases leafless, using the term in a popular sense; the leaves, if present at all, being generally reduced to minute scales. In one genus, however, that of Pereskva, the stems are less succulent, and the leaves, though rather fleshy, are developed in the usual form. The flowers are frequently large and showy, and are generally attractive from their high colouring. In one group, represented by Cereus, they consist of a tube, more or less elongated, on the outer surface of which, towards the base, are developed small and at first incon- spicuous scales, which gradually increase in size upwards, and at length become crowded, numerous, and petaloid, forming a funnel-shaped blossom, the beauty of which is much enhanced by the multitude of conspicuous stamens which with the pistil occupy the centre. In another group, represented by Opuntia, the flowers are rotate, that is to say, the long tube is replaced by a very short one. At the base of the tube, in both groups, the ovary becomes developed into a fleshy (often edible) fruit, that produced by the Opuntia being known as the prickly pear or Indian fi~~

~~The principal modern genera are ranged under two sub- divisions, which are separated by the differences in the flower-tube just explained. Those with long-tubed flowers, the Cactew|tubulosw, form the genera Melocactus, Mam- millaria, Echinocactus, Cereus, Pilocereus, Echinopsis, Phyllocactus, Epiphyllum, &c.; while those with short- tubed flowers, the Cactew rotate, are referred to Rhipsalis, Opuntia, Pereskia, and one or two of minor importauce. These plants, whether viewed as the Cactus family or the natural order Cactew or Cactacee, belong almost entirely, if not exclusively, to the New World; but some of the Opuntias have been so long distributed over certain parts of Europe, especially on the shores of the Mediterranean and the volcanic soil of Italy, that they appear in some places to have taken possession of the soil, and to be~~

~~distinguished with difficulty from the aboriginal vegetation. The habitats which they affect are the hot dry regions of tropical America, the aridity of which they are enabled to withstand in consequence of the thickness of their skin, and the paucity of evaporating pores or stomates with which they are furnished,—these conditions not permitting the moisture they contain to be carried off too rapidly. Occurring thus as they do in situations where ordinary vegetation could not exist, they may be considered as one of the means which nature has provided for the support of man and animals' where other means of subsistence fail. The stems are filled with wholesome though insipid fluid, and the succulent fruit are not only edible but agreeable. In fevers the fruits are freely administered as a cooling drink, and when bruised are regarded as a valuable remedy for the cure of ulcers. The Spanish Americans plant the Opuntias around their houses, where they serve as impenetrable fences.~~

~~MeEtocactus, the family of Melon-thistle or Turk's-cap Cactuses, contains, according to Labouret, a monographer of the order, about thirty species, which inhabit chiefly the West Indies, Mexico, and Brazil, a few extending into New Granada. The typical species, M. communis, forms a succulent mass of roundish or ovate form, from 1 foot to 2 feet high, the surface divided into numerous furrows like the ribs of a mclon, with projecting angles, which are set with a regular series of stellated spines,—each bundle consisting of about five larger spines, accompaniced by smaller but sharp aculei or bristles,—and the tip of the plant being surmounted by a cylindrical crown called a cephalium, 3 to 5 inches high, composed of reddish-brown acicular bristles, closely packed with cottony to- mentum. At the summit of this crown the small rosy-pink flowers are produced, half protruding from the mass of wool, and these are succeeded by small red berries. These strange plants usually grow in rocky places with little or no earth to support them; and it is said that in times of drought the cattle resort to them to allay their thirst, first ripping them up with their horns and tearing off the outer skin, and then devouring the moist succulent parts. The fruit, which has an agreeably acid flavour, is frequently eaten in the West Indies. The Melocacti are distinguished by the distinct cephalium or crown which bears the flowers.~~

~~MAMMILLARIA.—This group, which comprises nearly 300 species, mostly Mexican, with a few Brazilian and West Indian, is called Nipple Cactus, and consists of globular or cylindrical succulent plants, whose surface instead of being cut up into ridges with alter- nate furrows, as in Melocactus, is broken up into teat-like cylin- drical or angular tubercles, spirally arranged, and terminating in a radiating tuft of spines which spring from a little woolly cushion. The flowers issue from between the mammille, towards the upper part of the stem, often disposed in a zone just below the apex, and are either purple, rose-pink, white, or yellow, and of moderate size. The spines are variously coloured, white and yellow tints predominating, and from the symmetrical arrangement of the areole or tufts of spines they are very pretty objects, and are hence fre- quently kept in drawing-room plant cases.~~

~~EcuHinocactvs is the name given to the group bearing the popular name of Hedgehog Cactus. It comprises some 200 species, of which more than half are natives of Mexico, and the rest are scattered through South America, extending as far south as Buenos Ayres. They have the fleshy stems characteristic of the order, these being either globose, oblong, or cylindrical, and either ribbed as in Melocactus, or broken up into distinct tubercles, and most of them armed with stiff sharp spines, set in little woolly cushions occupy- ing the place of the buds. The flowers, produced near the apex of the plant, are generally large and showy, yellow and rose being the prevailing colours. They are succeeded by succulent fruits, which are exserted, and frequently scaly or spiny, in which respects this genus differs both from Afelocactus and Mammillaria, which have the fruits immersed and smooth. One of the most interesting species is the E. Visnaga, of which some very large plants have been from time to time imported. A specimen weighing one ton, and measuring 9 feet high, and 3 feet in diameter, was received at Kew some years since, but owing to injuries received during transit, it did not long survive. These large plants have from forty to fifty ridges, on which the buds and clusters of spines are sunk at inter- vals, the aggregate number of the spines having been in some cases computed at upwards of 50,000 on a single plant. These spines are used by the Mexicans as toothpicks, whence the name Visnaga.~~

~~CrrEus.—This group bears the trivial name of Torch Thistle. It comprises about 150 species, scattered through South America and the West Indies. In one series, numbering between twenty and thirty species, sometimes separated under the name of Echinocereus, the stems are short, branched or simple, divided into few or many~~

~~ridges, all armed with sharp formidable spines ; but in the greater number of species the stems are columnar or elongated, some of the latter creeping on the ground or climbing up the trunks of trees, rooting as they grow. One of the former group, C. pectinatus, produces a purplish fruit resembling a gooseberry, which is very good eating ; and the fleshy part of the stem itself, which is called Cabeza del Viego by the Mexicans, is eaten by them as a vegetable after removing the spines. To the latter group belongs C. gigan- teus, the largest and most striking species of the genus, a native of hot arid desert regions of New Mexico, growing there in rocky valleys and on mountain sides, where the tall stems with their erect branches have the appearance of telegraph poles. The stems grow toa height of from 50 feet to 60 feet, and have a diameter of from 1 foot to 2 feet, often unbranched, but sometimes furnished with branches which grow out at right angles from the main stem, and then curve upwards and continue their growth parallel to it ; these stems have from twelve to twenty ribs, on which at intervals of about an inch are the buds with their thick yellow cushions, from which issue five or six large and numerous smaller spines. The fruits of this plant, which are green oval bodies from 2 to 3 inches long, contain a crimson pulp from which the Pimos and Papagos Indians prepare an excellent preserve ; and they also use the ripe fruit as an article of food, gathering it by means of a forked stick attached to along pole. The Cereuses include some of our most interesting and beautiful hothouse plants.~~

~~PitocEREvs, the Old Man Cactus, forms a small group with tallish erect fleshy angulate stems, on which, with the tutts of spines, are developed hair-like bodies, which, though rather coarse, bear some resemblance to the hoary locks of an aged man. 'he plants are nearly allied to Cereus, differing chiefly in the floriferous portion developing these longer aud more~~

~~attenuated hair-like spines, which surround the base of the flowers, and form a dense woolly head or cephalium. The most familiar species is P. senilis, a Mexican plant, which though seldom seen more than a foot or two in height in greenhouses, reaches from 20 feet to 30 feet in its native country.~~

~~Ecuinoesis is another small group of species, separated by some authors from Cereus. They are dwarf, ribbed, globose, or cylin- drical plants; and the flowers, which are produced from the side instead of the apex of the stem, are large, and in some cases very beautiful, being remarkable for the length of the tube, which is more or less covered with bristly hairs. There are about thirty species known, their geographical range extending from Mexico and Texas to Brazil, Bolivia, and Chili.~~

~~Puybiocactus, the Leaf Cactus family, consists of about a dozen species, found in Mexico and Brazil. They differ from all the forms already noticed in being shrubby and epipiytal in habit, and in having the branches compressed and dilated so as to resemble thick fleshy leaves, with a strong median axis, and terete woody base. The margins of these leaf-like branches are more or less crenately notched, the notches representing buds, as do the spine-clusters in the spiny genera ; and from these crenatures the large showy flowers are produced. As garden plants the Phyllocacti are amongst the most ornamental of the whole family, being of easy culture, free blooming, and remarkably showy, the colour of the flowers rang- ing from rich crimson, through rose-pink, to creamy white. They are often called Epiphyllwm, which name is, however, properly restricted to the group next to be mentioned.~~

~~EPIPHYLLUM.—This name is now restricted to two or three dwarf branching Brazilian epiphytal plants of extreme beauty, which agree with Phyllocactus in having the branches dilated into the form of fleshy leaves, but differ in having them divided into short truncate leaf-like portions, which are articulated, that is to say, provided with a joint by which they separate spontaneously; the margins are crenate or dentate, and the flowers, which are large and showy, magenta or crimson, appear at the apex of the terminal joints. In £. truncatwn the flowers have a very different aspect~~

~~from that of other Cactee, from the mouth of the tube being oblique and the segments all~~

~~reflexed at the tip. The short separate pieces of which these plants .~~

~~are made up grow out of each other, so that the branches may be said to resemble leaves joined together endwise.~~

~~RHIPSALIS, a genus of about thirty tropical American species, con- tains some of the plants once referred to Cactus. It isa very hetero- geneous group, being fleshy-stemmed with a woody axis, the branches being angular, winged, flattened, or cylindrical, and the flowers small, short-tubed, succeeded by small, round, pea-shaped berries. Rhipsalis Cassytha, when seen laden with its white berries, bears no inconsiderable resemblance to a: branch of mistleto. All the species are epiphytal in habit.~~

~~Opuntia, the Prickly Pear, or Indian Fig Cactus, is a large typical group, comprising some 150 species, found in North America, the West Indies, and warmer parts of South America, extending as far as Chili. In aspect they are very distinct from any of the other groups. They are fleshy shrubs, with terete woody stems, and numerous succulent branches, composed in most of the species of separate joints or parts, which are much compressed, often elliptic or suborbicular, dotted over in spiral~~

~~lines with small fleshy caducous leaves, in the axils of which are~~

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~~placed the areoles or tufts of glochidiate or hooked spines of two forms. The flowers are mostly yellow or reddish-yellow, and they are succeeded by pear-shaped or egg-shaped fruits, having a broad scar at the top, furnished on their soft fleshy rind with tufts of small spines. 'The sweet juicy fruits of O. vulgaris and O. Tuna are much eaten under the name of prickly pears, and are greatly esteemed for their cooling properties. Both these species are extensively cultivated for their fruit in Southern Europe, the Canaries, and~~

~~Northern Africa; and the fruits are not unfrequently to be seen in Covent Garden Market and in the shops of the leading fruiterers of the metropolis.~~

~~The cochineal insect is nurtured on a species of Opuntia (0, coccinellifera), separated by some authors under the name of Nopalea, aud sometinies also on O. Tuna. Plantations of the nopal and the tuna, which are called nopaleries, are established for the purpose of rearing this insect, the Coceus Cacti, and these often contain as many as 50,000 plants. The females are placed on the plauts about August, and in four months the first crop of cochineal is gathered, two more being produced in the course of the year. The native country of the insect is Mexico, and it is there more or less culti-vated ; but the greater part of our supply comes fron: New Granada and the Canary Islands.~~

~~PERESK1A ACULEATA, or Barbados Gooseberry, the Cactus Perceskia of Linneus, is the only remaining generic type; and this differs from the rest in having woody stems and leaf-bearing branches, the leaves being somewhat fleshy, but otherwise of the ordinary laminate character. The flowers are subpaniculate, white or yellowish. This species is frequently used as a stock on which to graft other Cacti, There are about a dozen species known. (T. MO.) ©~~

~~CADAHALSO, Jose pe (1741-1782), a Spanish poet and writer, was born at Cadiz in 1741. He was educated at Paris, and before completing his twentieth year had travelled through Italy, Germany, England, and Portugal, and had studied with care the languages and literatures of these countries. On his return to Spain he entered the army, and rose to the rank of colonel. He was killed at the siege of Gibraltar, 27th February 1782. His first published work was a tragedy after the French model, Don Sancho Garcia, printed in 1771. In the following year he published his Lruditos a la Violeta (Fashionable Learning), a satire on superficial knowledge, which was very successful. In 1773 appeared a volume of miscellaneous poems, and after his death there was found among his MSS. a series of fictitious letters, somewhat after the style of the Lettres Persanes, or the Citizen of the World, which were published as Moorish Letters, and have been frequently reprinted. The complete edition of his works, with life by Navarrete, appeared at Madrid, in 3 vols., 1818.~~

~~CADIZ (in Latin Gades, and formerly called Cales by the English), the capital of a province of the same name in Spain, is built on the extremity of a tongue of land projecting about five miles into the sea, in a direction N.W. from the Isla de Leon, in 36° 31’ N. lat., 6° 18’ W. long,, 94 miles by rail south of Seville, and 13 from Xeres. The city, which is six or seven miles in circumference, 1s surrounded by a wall with five gates, one of which communi- cates with theisthmus. Seen from adistance off the coast, it presents a magnificent display of snow-white turrets rising majestically from the sea; and for the uniformity and elegance of its buildings, it must certainly be ranked as one of the finest cities of Spain, although, being hemmed in on all sides, its streets and squares are necessarily con- tracted. Every house in the city annually receives a coating of whitewash, which, when it is new, produces a disagree- able glare in the streets. The most characteristic feature of Cadiz is the marine promenades, fringing the city all round between the ramparts and the sea, especially that called the Alameda on the eastern side, conimanding a vieW of the shipping in the bay and the ports on the opposite shore. The principal square is the Plaza de San Antonio, sur- rounded by handsome houses with elegant facades, the centre pleasantly shaded with trees, and furnished with numerous seats of marble. Communicating with it is the principal street (Calle Ancha), in which are the exchange and houses of the nobility. The houses are generally lofty~~

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~~‘nd well-built, with open central courts, surmounted by turrets and flat roofs in the Moorish style. The principal ‘public buildings are the two cathedrals (one built in the 13th century, the other begun in 1720, but not completed till 1840); the Hospicio or Casa de Misericordia, adorned ‘with a marble portico, and having an interior court with Doric colonnades; the bull-ring, with room for 12,000 spectators ; the two theatres, the prison, the custom-house, and the lighthouse of San Sebastian on the western side, rising 172 feet from the rock on which it stands. Besides the Hospicio already mentioned, which sometimes contains 1000 inmates, there are numerous other charitable institu tions, such as the women’s hospital, the foundling~~

~~institu- tion, the admirable Hospicio de San Juan de Dios for men, and the lunatic asylum. Gratuitous instruction is 5! Catalin es puerto VY~~

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~~ONE ENCG.MILE ———~~

~~Plan of Cadiz and its environs.~~

~~A, Fort San Sebastian.~~

~~B, Fort Santa Catalina.~~

~~C, The Alameda,~~

~~1. Hospital.~~

~~2. Academy of Fine Arts.~~

~~given to a large number of children, and there are several mathematical and commercial academies, maintained by different commercial corporations, a nautical school, a school of design, a theological seminary, ¢ flourishing medical school, an Academia de Nobles Artes (founded in 1789, principally by the exertions of Governor O'Reilly), an excellent observatory, and a hydrographic depét. There are several public libraries attached to the various educa- tional establishments, but none of any note. The museum is filled for the most part with wretched copies of ancient masterpieces, but in the church of the Capuchinos, which was formerly a monastery, is an unfinished picture of the marriage of St Catherine by Murillo, the last effort of his pencil, as he met his death by falling from the scaffold on which he was painting.~~

~~Cadiz is the see of a bishop, who is suffragan to the archbishop of Seville; but its chief conventual and monastic institutions have been suppressed. Its noble bay, more~~

~~3. Custom-House.~~

~~4, Capuchinos.~~

~~5. Old and New Cathedrals. 6, Sta. Marta.~~

~~by the isthmus and the headlands which lie to the N.E., has principally contributed to its commercial importance. The outer bay stretches from the promontory and town of Rota to the mouth of the Guadalete; and the inner bay, protected by the forts of Matagorda and Puntales,~~

~~'affords generally good anchorage, and contains a harbour~~

~~formed by a projecting mole, where vessels of small burden may discharge. The entrance to the bays is rendered somewhat dangerous by the low shelving rocks (Cochinos and Las Puercas), which encumber the passage, and by the shifting banks of mud deposited by the Guadalete and the Rio Santi Petri. On the mainland, at the mouth of the latter river, is the village of Caracca, which contains about 6000 inhabitants, and possesses a naval arsenal~~

~~and dockyard ; and on the isthmus are situated the well-~~

~~frequented sea-bathing establishments.~~

~~The commercial greatness of Cadiz is no longer: what it was in the 17th and 18th centuries. At one time it was the great focus of intercourse between Spain and the Spanish colonies; and from 1720 to 1765 it enjoyed a monopoly of the traffic with Spanish America, which had previously been in the hands of Seville. Its pro- sperity began to decline when the trade of San Domingo, Cuba, Porto Rico, and the other islands was opened up to the greatér ports of Spain, and decayed almost entirely in the beginning of the present century, when the colonies achieved their independence. An attempt was-made by the Spanish Government in 1828 to restore its former greatness, by making it a free warehousing port, but this valuable privilege was withdrawn in 1832. Since the opening of the railway to Seville and the improvements effected in the harbour, the commercial activity has greatly increased ; and in spite of the disturbing influences of political revolutions, Cadiz is still one of the most important ports in Spain. It is the European terminus of many of the principal mail-lines from the colonies both in the east and west. Besides the Xeres wine, for which it received in 1872 no less than £2,458,487 from Britain alone, it exports quicksilver, brandy, oil, provisions, flour, and wool. The salt trade, which was formerly of considerable extent, is almost extinct. The imports consist chiefly of sugar~~

~~and coffee from Havana and Porto Rico, English coal from Cardiff, cocoa, hemp, flax, linens, dried fish, hides, cotton and woollen manufactures, rice, spices, indigo, staves, and timber. The total number of vessels that entered in 1872 was 1140, of which 494 were steamships ; and the total tonnage was 287,850. Of the sailing vessels 179 were British and 136 Italian, of the steamships 127 British and 281 Spanish. The manufactures of Cadiz are unimportant, though a considerable stimulus to industry is given by the Sociedad economica de Amigos del Pais, which introduced the cochineal plant, and grants medals for improvements in manufactures.~~

~~Cadiz is strongly fortified with ramparts and bastions, and defended by the forts of San Sebastian, Santa Catalina, Matagorda, and Puntales Castle. On the neighbouring coast the isthmus is protected by an intrenchment called the Cortadura, or Fort San Fernando.~~

~~From its almost insular position it enjoys a mild and serene climate, the mean annual temperature being about 64° Fahr., while the mean summer and winter temperatures vary only about 10° above and below this point. From the same cause it labours under a great deficiency of water, which must either be collected in cisterns from the tops of the houses or brought at great expense from Santa Maria on the opposite coast. Population in 1845, 53,922, and in~~

~~1860, 71,521.~~

~~Cadiz is identical with the ancient Agadir, Gadir, or Gaddir (in~~

~~Greek Gadeira), which was a flourishing Phenician colony long before the beginning of classical history, and continued in the~~

~~than 30 miles in circuit, and almost entirely Jand-locked | hands of the Carthaginians, though somewhat disaffected to them,~~

~~till after the Punic wars, when Spain became a Roman province. C. Julius Cesar conferred the civitas of Rome on all its citizens in 49 B.c.; and not long after L. Cornelius Balbus Minor bnilt what was called the “ New~~

~~City," constructed the harbour which is now known as Puerto Real, and erected the bridge across the strait of Santi Petri, which unites the Isla de Leon with the mainland, and is now known as the Puente de Zuazo, after Juan Sanchez de Zuazo, who restored it in the 15th century. Under Augustus, when it was the residence of no fewer than 500 equites, it was made a municipium with the name of Augusta Urbs Gaditana, and its citizens ranked next to those of Rome. Some remains of the ancient city, and particularly of the temple of Hercules, are said to be visible below the sea. After the fall of Rome it was destroyed by the Goths, and remained in obscurity under the Moors, from whom it was retaken by Alphonso the Wise in 1262, but it emerged again when the discovery of America made it valuable as a market for colonial produce. In more recent contests Cadiz has been subjected to several disasters. It was taken and pillaged in 1596 by the British fleet, under Essex and Howard, in revenge for the Spanish Armada. It was attacked, but without success, by Lord Wimbledon in 1626, and by the duke of Ormond and Sir George Rooke in 1702. It was bombarded by Nelson in 1800. In 1808 the Spanish patriots in Cadiz brought the French fleet, which lay in the bay blockaded by Admiral Collingwood, toa surrender ; and they were in turn subjected to a protracted siege of two years by Marshal Victor, from which they were relieved by the successes of Wellington in the Peninsula. It was once more re- duced by the Duke d'Angouléme in 1823, and remained in the hands of the French till 1828. In 1868 the city was the centre of the revolution which effected the dethronement of Queen Isabella.~~

~~CADMIUM, a metal closely allied to zinc. It was discovered in 1817 by Stromeyer and Hermann, independ- ently, but in a similar manner. The former chemist, in the execution of his duties as inspector of pharmaceutical products in Hanover, found a substance, sold as oxide, to be really carbonate of zinc, and, applying to the manufacturer for explanation of the reason of the substitution of the latter product for the former was informed that, although the best zinc, in which no iron could be detected, was eniployed, the oxide could not be produced without a slight discoloration from oxide of iron. On investigation by Stromeyer, it was found that the discoloration was due not to iron but to the oxide of a new metal, which he succeeded in isolating, and named cadmium, from the old chemical name for zinc oxide (Cadmia fossils). About the same time, the~~

~~sale of an oxide of zinc supplied by Hermann, a chemical manufacturer, who produced it from the waste of the Silesian zinc furnaces, was stopped in Prussia as being contaminated with arsenic,—the reason obviously being that the acid solution of the substance in question gave a bright yellow precipitate when heated with sulphu- retted hydrogen. 'The erroneous character of this inference was, however, soon demonstrated by Hermann, who made a careful investigation of the subject, and discovered the nature of the new metal, but not before Stromeyer had published the results of his observations.~~

~~Cadmium does not occur in the metallic state in nature, and there is only one definite mineral known which contains it in quantity, namely, the sulphide, or green- ockite, which occurs at Bishopstown, in Renfrewshire, in small isolated crystals of a bright orange-yellow colour, belonging to the hexagonal system, in a doleritic rock associated with prehnite. This contains 77:7 per cent. of cadmium and 22:3 per cent. of sulphur, corresponding to the formula CdS, and is isomorphous with voltzite, the rhombohedral form of sulphide of zinc. Although an extremely rare mineral in the pure state, being confined to the single locality mentioned above, sulphide of cadmium is often present in zinc blende, the richest varieties contain- ing 3 per cent. of cadmium. Among these are the yellow radiated blende of Przibrain in Bohemia, Eaton in New Hampshire, and Engis and Corfali in Belgium. It is also found in the carbonates and silicates of zinc from most of the localities producing these ores, but in what state of com- bination is doubtful, as it is not generally found in quantity sufficient to be appreciated by the analysis of samples,—~~

~~CA D—CAD~~

~~being only discoverable when the ore is treated for zinc on the large scale, in the first products of the reducing processes,~~

~~Cadmium is a white metal with a slight bluish tinge by reflected light ; it is whiter than lead or zinc, but less so~~

~~than silver, has a high lustre when polished, and breaks,—~~

~~under a gradually increasing strain, with the fibrous or sealy fracture characteristic of a soft tough metal. It may be readily crystallized in octohedra, differing in this respect from the allied metal zinc which is rhombohedral, It is somewhat harder than tin, but less so than zinc, and like the former metal it emits a peculiar crackling sound when bent. It is malleable, and may be rolled into thin sheets. The specific gravity after fusion is 8°604, which is increased by hammering to 8°694. The specific heat is 0:05669 (Regnault), or 0°0576 (Dulong and Petit). The electric conductivity is 22°10, or somewhat lower than that of zinc; the thermal conductivity does not appear to have been determined. It melts at a temperature below redness (315° to 320° C.), and boils at the temperature of 860° C,, giving off a vapour of an orange-yellow tint. The principal coloured lines with their relative intensity observed in the spectrum of cadmium vapour are, according to Huggins's notation, 502', 6391, 6568, 88955, 9181, 9531, 9861, 147310, 15171, 15361, 17471, 184319, 23158, 25626 32394, "The most brilliant of these are chiefly in the green and blue field.~~

~~Chemically cadmium belongs to the diatomic group of elements ; its symbol is Cd, and its equivalent 58. It unites readily with most of the heavy metals, forming alloys, which with gold, copper, and platinum, are brittle, while those with lead and tin are malleable and ductile, The alloy of % silver and 4 cadmium is very tenacious; but that, in the reverse proportion, of 3 silver and 2 cadmium is brittle. An alloy of two parts of cadmium, two of lead, and four of tin, known as Wood's fusible metal, melts at a somewhat lower point than the similar alloy where bismuth takes the place of cadmium, or Darcet's fusible metal (see BismuTH). It forms several amalgams, among which those containing equal parts of mercury and cadmium and two of mercury to one of cadmium are remarkable for their cohesive power and malleability ; whereas that containing 22 per cent. of cadmium is hard and brittle. The amalgams of the former class have been proposed at different times for use in stop- ping teeth, but are not now so employed. When exposed to damp air cadmium becomes rapidly covered with a dull film of suboxide, but as with zinc the oxidation is only super- ficial, the crust formed protecting the metal below from further change. When heated to a redness in air it burns, forming a yellowish brown oxide. It also, when in a state of vapour, decomposes water at a red heat, with the~~

~~forma- tion of oxide of !cadmium, hydrogen being evolved. It is soluble with evolution of hydrogen, in sulphuric, hydro- chloric, nitric, and even acetic acid, forming colourless salts. When treated with an aqueous solution of sulphurous acid, it dissolves -without evolution of hydrogen, sulphite and sulphide of cadmium being found in the liquid.~~

~~Oxide of cadmium, CdO, is a yellowish brown powder of the specific gravity 6°95, varying in depth of tint accord- ing to the temperature at which it is prepared. It may be produced by burning the metal in air or by calcining the nitrate or carbonate. It is readily reducible by hydrogen or carbon, at a high temperature, but below that necessary for the reduction of zinc oxide. If a mixture of the oxides of the two metals be heated in a current of hydrogen in a glass tube, the oxide of cadmium is reduced, volatilizes, and condenses in the cooler part of the tube, while the oxide of zinc remains unchanged. Oxide of cadmium is @ strong base, forming salts similar in constitution to those formed by oxide of zinc, and those of the earthy and alkaline metals, The most important of these is the sulphate,~~

~~Cd8O,, which is produced when the metal or its oxide is dissolved in sulphuric acid, forming crystals containing either one or four atoms of water, the former being deposited from a boiling solution, and the latter at the ordinary temperature of the air. The uses of cadmium salts are very limited ; the sulphate is employed to a small extent as a lotion in inflammation of the eyes, similarly to the sulphate of zinc, and the iodide in photography and in medicine for the same purposes as iodide of potassium. The only compound of any real importance is the sulphide, CdS, which produces several brilliant yellow and orange colours. These are quite permanent, unlike the yellow produced by lead, chromium, or other metals, which are all more or less subject to discoloration when exposed to the action of sulphuretted hydrogen in the atmosphere. It is produced when sulphuretted hydrogen, or an alkaline sulphide, is added to the solution of any cadmium salt, as an orange-red powder, which becomes carmine-red when heated. Ata white heat it melts, and solidifies on cooling in lemon-yellow scales of a micaceous structure. When the precipitated sulphide is~~

~~heated in hydrogen it is de- composed, forming cadmium vapour and sulphuretted hydrogen, which reunite in the cooler part of the tube, producing crystals exactly similar to the native mineral greenockite.~~

~~The best test for cadmium is afforded by the colour of the deposit formed on charcoal when it is volatilized and oxidized before the blowpipe flame. This is of a reddish brown colour, and usually shows the colours of thin plates from the tenuity of the film; whereas zinc under the same conditions gives a deposit which is bright yellow while hot, but becomes white on cooling. The precipitation as a yellow sulphide from an acid solution is another distin- guishing character, as sulphide of zinc does not separate except from neutral or alkaline solutions. In quantitative analysis it is always estimated as oxide, being separated from solution as carbonate by precipitation with carbonate of sodium, which is converted into oxide by calcination. Cadmium, like lead, may also be separated from its solution in acids by means of zinc, which precipitates it in a dendritic form, like the well-known lead tree.~~

~~The production of cadmium is restricted to a very few loca- lities. At Engis in Belgium it occurs in zinc blende to the extent of about 0°2 per cent. The oxide formed, together with oxide of zinc in the calcination of the blende, is in the subsequent reducing process in the ordinary Belgian zinc furnace (see Zinc), reduced and volatilized in the first period of the operation, before the heat is raised sufficiently to pro- duce much zine vapour, and the vapour, on coming in contact with the air, burns with a characteristic brown flame as dis- tinguished from that of zinc, which is bluish green. The deposit formed in the condensing tubes, and in the nozzles (allonges) in front of the retorts, during this part of the process is comparatively rich in cadmium oxide, averaging about 14 per cent. It is put aside until a sufficiency is collected, when it is enriched by a second distillation up to about 6 per cent., this 'second product being finally reduced by a third distillation with carbon at a dull red heat. The furnace contains fifteen retorts, four of which are reserved for the reduction of the enriched oxide. Cast- Iron tubes are used, as the vapour of the metal readily penetrates clay retorts. The loss on the process is very considerable, only 30°12 per cent. of the whole amount of cadmium contained in the material treated being re- covered ; 21°17 per cent. is left in the residues, and 48°71 per cent. escapes condensation. The~~

~~total produce of cadmium is very small; about one-half of the amount is produced at Engis, and the remainder in Silesia. In 1874 the production of cadmium in Lower Silesia amounted to 25 cwt., valued at £990, or about £800 per ton ; but owing i~~

~~to the small demand many works had given up the manu- facture. (H. B.) CADMUS, in Greek Legend, was the founder of the town of Thebes originally called Cadmeia, and according to the tradition was a son of Agenor, king of Phcenicia, whence he had proceeded to Greece in search of his sister Europa, but failing to find her had, in obedience to an oracle, settled at Thebes. He there founded a town over which he in time became king, received from the gods Harmonia, a daughter of Ares and Aphrodite, as his wife, by her had a family on whom fell heavy misfortunes, and finally retired with her to Illyria, where they both died in peace, and were transformed into snakes which watched the tomb while their spirits were translated to Elysium. At the marriage all the gods were present, and the muses sang. Harmonia received a dress (peplos) worked by Athena, and a necklace made by Hephestus. Their offspring were Semele, Ino, Autonoé, Agave, and a son Polydorus. On his first settle- ment at Thebes, Cadmus had slain a dragon, which guarded a spring, and at the orders of Athena had sown its teeth in the ground, from which there sprang a race of fierce armed men (Spartoi). By throwing a stone among them Cadmus caused them to fall upon each other till only five survived, and they became the founders of the noblest families of Thebes. Cadmus, however, because of this bloodshed, had to do penance for a long year (¢.e., eight years). Such is the legend. When Greek writers came to explain it they identified Cadmus as a Pheenician hero who had introduced into Greece the Phcenician writing, mining, and other arts or institutions of civilization. But his name is Greek rather than Phoenician, and like Cadmilus in Samothrace appears to mean "order," and to indicate a person who has instituted order in a state. He may have adopted much from the early Phcenician traders ; but from the fact of Thebes having been one of the seats of the primitive Pelasgi, and from the occurrence of Cadmilus in Samothrace, also a seat of the Pelasgi, it is very probable that Cadmus was originally a purely Greek hero. CADUCEUS (kxnpuxetov), the symbol of office carried by public heralds, by Mercury~~

~~(Hermes), as herald or messenger of the gods, and by Ivis, Victory, and Eirene. It consisted of a staff round which two serpents were twined in a knot, their heads meeting at the top of the staff. Mercury, it was said, had seen two serpents fighting and knit together so, and had chosen this as a symbol of the quarrels which it was his duty to assist in settling. Sometimes a pair of wings are attached to the staff to indicate the speed of Mercury as a divine messenger. In the British Museum there is a bronze caduceus, found in a tomb in Sicily, which appears, from the inscription engraved on it in early Greek letters, to have belonged to a public herald of the town of Longena. CAEDMON, or Crpmon (the former way of spelling is that of Bede, the latter that of Florence of Worcester), is the name of the earliest Anglo-Saxon or Old English poet of whom we have any knowledge. The meaning of the name has been much disputed. Sir Francis Palgrave, despairing of finding a native derivation, suggested (Arche- ologia, vol. xxiv.) that the poet might have been so called from the Chaldaic name for the book of Genesis, which is ""b' Cadmin," in the beginning, or " Cadmon," beginning, from the opening words of the first chapter of Genesis. He thought that he might even have been an " Eastern visitor," who had arrived in Britain from the East, mastered the language, and come out as a vernacular poet. A hypo- thesis so fanciful as this last may be at once rejected, Another suggestion of the same lively writer connects the name with the Adam Cadmon (the primitive and ideal man) of the Cabalists. It is true that Cabalistic specula- tions cannot be traced back with certainty beyond the 9th century, but it is quite possible that the word may have~~

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~~been recognized as an important word in the East, and as bearing a distinct philosophic or theosophic meaning at a far earlier date. On the other hand, in favour of the view which gives to the name a native origin, it may be urged that Bede, though he only employs the word once, says in that passage that the poet's nocturnal visitant "called him by his name," and said, " Cwdmon, &c." Does not this look as if the name had a homely and north-country sound in Bede's ears? If so, What did it mean? Sir Francis Palgrave maintains that no Anglo-Saxon derivation can be found for the first part of the name. Dr Bouterwek, how- ever (in a work on Cedmon,~~

~~published at Elberfeld in 1845), together with Professor Sandras, explains ced as meaning a boat in Anglo-Saxon, whence the former trans- lates the name 'pirate,' the latter '"boat-man." This would be satisfactory if it rested on any ground of fact ; but unfortunately this word "ced" is a pure invention of Professor Bouterwek's ; neither the Anglo-Saxon language, as known to us, nor the Old English of the first three centuries after the Conquest, nor any local dialect contains any such word. On the whole, Sir Francis Palgrave's first suggestion seems to involve the least difficulty. "'Cadmon" means "beginning" in the Targum of Onkelos, the Chaldee version of the Scriptures, which was in popular use among the Jews from the lst century B.c. downwards, and some learned ecclesiastic at Whitby who had visited the Holy Land may have given to the poet the name Cadmon (which in Anglo-Saxon mouths became Czdmon), because he was to sing of the "beginning" of things.~~

~~The few particulars that are known of the life of Czedmon are all to be found in Bede's Feclesiastical History, a book so well known that an abridgement of thei is all that will be necessary here. Czedmon was probably a ceorl, employed under the " villicus " or bailiff of the lands belong- ing to the monastery of St Hilda at Whitby. He had arrived at mature age, and had embraced Christianity at the call of the devoted Irishmen who from Iona and from Lindisfarne, through two-thirds of the 7th century, spread the light of faith through the regions of northern England. He used to attend festive meetings; but when the song went round, and the harp was passed into his hands, Cedmon, ignorant of the rough old battle-songs of the heathen time, could sing nothing. On one such occasion he is said to have left the feast and gone to the stables, where it was his turn that night to attend to the horses and plough-oxen. He fell asleep, and dreamed that a person appeared to him, who, calling him by his name, said, " Ceedmon, sing me something." On his replying that he could not sing, and that on this account he had left the revellers, the other replied, " Nevertheless thou shalt sing for me." " What," said Cedmon," must Ising?" '" Sing," he answered, "of the beginning of created beings" (prin- cipium creaturarum). Thereupon Czedmon began to sing verses which he had never heard or learned, praising and magnifying the Creator who had made heaven and earth for the children of men. Awaking from his sleep he~~

~~remembered the verses which had come to him in his dream, and added others to them. :~~

~~In the morning he went to the bailiff who was over him and told him what had happened ; the bailiff took him to the abbess. St Hilda assembled a company of pious and learned persons, and before them trial was made of Cadmon's gift. He told his story, and repeated the verses, and they all judged that he had received an inspiration from above. They explained to him then and there a passage*from holy writ, and desired him to versify it. He went away and returned the next morning with his task most excellently performed. The abbess then received him "cum omnibus suis" (it is not easy to determine whether this phrase applies to his kith and kin or merely to his worldly goods)~~

†

~~CH DMON~~

~~into the monastery ; and there he lived as a monk for the remainder of his life, employing diligently his leisure hours in the cultivation of the gift which he had received. The English poets who, up to the time when Bede wrote, had attempted to write religious poems in imitation of Czedmon, had, in the historian's opinion, fallen far short of him,~~

~~How long he lived in the monastery we are not informed, —~~

~~The narrative of his death, beautiful in its piety and simplicity, relates how, after an illness of fourteen days, he desired to be removed to the infirmary, where, on the same night, after receiving the Eucharist by way of viaticum, and "signing himself with the sign of the holy cross," he sank into a peaceful slumber from which he never woke.~~

~~Florence of Worcester speaks of:him, under the year 680, as that celebrated monk of St Hilda's Abbey who had received from heaven the free gift of poetic inspiration, William of Malmesbury, in the Gesta Pontzficum (lib. iii. § 116), says that his relics had been discovered at Whitby shortly before he wrote (early in the 12th century), and had been, according to popular report, the occasion of miracles,~~

~~An important question remains— whether Czedmon was really the author of the metrical paraphrase of Genesis, Exodus, part of the book of Daniel, &c., which usually goes by his name. The unique MS. containing this paraphrase came into the hands of Archbishop Usher in the 17th century, and was by him given to the French scholar, Francis Dujon, better known as " Junins," who bequeathed it to the Bodleian Library. Itis in a hand of the latter part of the 10th century, and contains no indication of authorship. The poem opens as follows:—~~

~~Us is riht micel thet we rodera weard, Wereda wuldor-cining, wordum herigen,—~~

~~(For us it is very right that we should praise with our words the Guardian of the heavens, the glorious King of hosts.) A number of very curious illustrations, etchings heightened with green and red colour, are in the earlier portion of the MS.; engravings of them may be seen in the 24th volume of the Archeologia. Obviously the only means of identifying this anonymous poem as the work of Czedmon is to compare it, as to its opening and contents, with the poem described by Bede. The substance of Cedmon's opening, according to Bede, was this: " Now we-ought to praise the author of the heavenly kingdom, the power of the Creator and His counsel, the deeds of the Father of glory. How He, since He is eternal God, is the author of all wonders, who, the Almighty Guardian of the human race, first created for the sons of men the heaven, to be the roof of their abode, and afterwards the earth." The opening of the paraphrase, though more diffuse, agrees with that here described pretty well as to its general meaning, except that the heavens are represented in it as created for the angels rather than for the children of men, who do not come upon the scene till later. Were there no other evidence, it might seem not unreasonable to identify the paraphase with the poem of Czedmon. But here a new difficulty meets us. King Alfred translated Bede's Eecle- stastical History, and when he comes to this passage he gives us a metrical version of Bede's Latin description of the opening, which he seems to intend his hearers to take for the zpsissema verba of Ceedmon. Of this there are two indications :—first, he renders Bede's words, "quorum [se. versuum | iste est sensus," into "thara endebyrdnes this is," "their order is this;" secondly, he omits a long sentence immediately following the description of the opening, in which~~

~~Bede explains that from the difficulty of translating verses literally from one language into another he has merely given the sense and not the "ordo ipse verborum." Now Alfred tells us that he does give the order (end ebyrdnes) of the words, and he leaves untranslated the passage which~~

~~— re te~~

~~CAEHE—CAE~~

~~affirms that only the general sense is given. The verses which he inserts begin thus : — Nu we sceolon herian heofon-rices weard, Metodes mihte and his mod-gethone,—~~

~~(Now must we praise the Warder of the heavenly kingdom, the might of the Creator, and the thought of His mind.) In short, Bede's description is turned with great literalness into Anglo-Saxon verses. But are these Cedmon's? If they are, then the paraphrase is not the work of Cedmon ; for not one line in the opening as given by Alfred agrees with the paraphrast's opening. However, in spite of the circumstances mentioned above, the judgment of criticism will not identify Alfred's verses with the true work of Cedmon. 'They are so bald, so literal, that the conviction forces itself upon us that Alfred is here merely translating from Bede's Latin, and amusing himself with making his version metrical. On the other hand the paraphrast is a genuine poet ; variety, force, and colour are the ever-present attributes of his poetic diction ; hs imagination is bold and fertile ; his moral purpose clear and pervading—in fact he is just such a man as we should conceive the real Cedmon to have been. .~~

~~The other point of comparison between the paraphrase and Bede's description relates to the contents of Czedmon's poem. "He sang," says the historian, "the creation of the world, the origin of man, and all the history of Genesis ; and made many verses on the departure of the children of Israel out of Egypt, and their entering into the land of promise, with many other histories from holy writ ; the incarnation, passion, resurrection of our Lord, and His ascension into heaven ; the coming of the Holy Ghost, and the preaching of the apostles ; also the terror of future judgment, the horror of the pains of hell, and the delights of heaven." With this account the contents of the paraphrase which we have agree, up to a certain point, remarkably~~

~~well. It may be said, generally, to embrace the whole history of Genesis, except that portion which relates to events posterior to the time of Isaac. It then passes to the history of Moses and his statutes, " Moyses démas," briefly giving the thread of events till it arrives at the passage through the Red Sea, on which the writer enlarges with evident enjoyment.' An abrupt transition is then made to the book of Daniel ; the story of the three children saved out of the fiery furnace is told; Daniel's dream-wisdom is set forth, and the doom denounced against Belshazzar. Then what is called the second book of the paraphrase, the beginning of which coincides with a change of handwriting in the MS., commences, and now the resemblance to Bede's description ceases. This book opens with the complaints of the fallen angels in hell and the lamentations of the souls detained in the Limbus Patrum ; the descent of Christ after his passion to liberate these souls is described ; the resurrection is barely mentioned, but the intercourse of Christ with his apostles previous to his ascension, and the ascension itself, are told at some length. The book concludes with a description of the terrors of the Day of Judgment. Such a poem cannot be said to corres- pond with Bede's description; but then it must be remembered that, partly on account of the change of hand and of subject, partly on account of the presence in it of later linguistic forms, the ascription of this second book of the paraphrase to the author of the first has always been held problematical. On the whole, although the grounds of a confident judgment do not exist, the analysis of the evidence here attempted points to the conclusion that the first book of the paraphrase, though not the second, may with considerable probability be assigned to Caedmon.~~

~~Some writers have assigned other extant poems to Czdmon, e.g., the Halga Réd (Holy Rood) of the Vercelli codex, a passage in which has been found to tally with the~~

~~Runic inscription on the Ruthwell Cross, and also the frag- ment called Judzth, in the MS. volume containing Beowulf, But the evidence in favour of either supposition may be set down as nz; nor does the style in Judith, still less in the Halga Rod, agree with that of the Paraphrast. (7. A.)~~

~~CAEN, or, as it is called in the old. chronicles, Capon, CatTuim, CaHEM, or CAAM, the capital of an arrondisse- ment in the department of Calvados in France. It stands about 80 or 90 feet above the level of the sea, in an extensive valley, on the left bank of the Orne, at the influx of the Odon, 9 miles from the English Channel, and 122 west of Paris, in 49° 11’ 14” N. lat., 0° 21’ 15” W. long. The town is handsome and well built; the streets, of which the most important is the Rue St Jean, are generally wide, straight, and clean; and the houses, being of freestone, have a very good appearance. Hardly any remains of its once extensive ramparts and towers are now to be seen ; but the castle, founded by William the Conqueror and completed by Henry L,, is still en:ployed as barracks, though in a greatly altered condition. The city contains several ancient churches and other buildings, affording fine speci- mens of the Norman style of architecture. Among these are the church of St Pierre, dating from the 14th century and surmounted by a handsome stone spire, the finest in Normandy, 242 feet in height; the magnificent churches of the Abbaye Aux Hommes, or St s«tienne, and the Abbaye Aux Dames, or Trinity, both founded in 1066,— the former by William the Conqueror, where a plain grey marble slab in the pavement now marks his long since desecrated tomb, and the latter by his queen Matilda, who was interred there. The old convent of the Capuchins is now occupied by the society of Le Bon Sauveur, which, founded by two poor girls about 1730, has grown into a most important institution, and maintains an asylum for the insane of both sexes, a charitable dispensary, a school for the education and industrial training of deaf and dunib children, and various minor establishments. Caen is the seat of a high court of appeal for the departments of Cal- vados, Manche, and Orne, and has tribunals of primary instance and commerce, a chamber of commerce, a consevl de prudhommes, a university (founded in 1431 by Henry VI. of England), a royal college, a school of hydrography, a public library of 45,000 volumes, an extensive botanic garden, a museum belonging to the society of Norman antiquaries, and a theatre. There is a local Académie des sciences, arts, et belles-lettres, which has published a series of Mémoires since 1754. The commerce of Caen is consider- able. It exports barley, flour, potatoes, wine, brandy, fruit, cattle, hardware; and imports timber from Norway, coal, pig-iron, oats, wheat, and oil-seeds. Its manufactures are of comparatively small importance with the exception of rape and colza vil, though there is a certain turn-out of caps, table-linen, cotton fabrics, leather, earthenware,~~

~~and cutlery; breweries, dye-works, and ship-building yards are also in operation. The manufacture of lace, formerly of great extent, has very much declined. A fine kind of oolitic stone, in great favour as a building material, is quarried in the neighbourhood. Several. large fairs are held annu- ally. At high water, vessels of 150 or 160. tons can come up to the harbour, which consists of a part of the river bed and a basin 1896 feet in length by 164 in breadth, and has communication with the sea not only by the river, but also by a canal debouching at Ouistreham. A canal to connect it with the sea is in course of construction, which will render it accessible to large vessels. The town is situated on the main line of railway from Paris to Cher- bourg, and is connected by branch lines with Courseulles on the coast, and with Laval inland.~~

~~Though Caen is not a town of great antiquity, the date of its foundation is unknown. It existed as early as~~

~~the 9th century, and when, in 912, Neustria was ceded to the Normans by Charles the Simple, it was a large and important city. Under the dukes of Normandy, and par- ticularly under William the Conqueror, it rapidly increased. It became the capital of Lower Normandy, and in 1346 was besieged and taken by Edward III. of England. It was again taken by the English in 1417, and was retained by them till 1459, when it capitulated to the French, in whose possession it has since continued. In 1793 the city was the focus of the Girondist movement against the Convention. Among the numerous celebrities to whom Caen has given birth may be mentioned Malherbe, Boisrobert, Huet bishop of Avranches, and Tannegui Lefebvre. Population in 1872, 39,415 in the city, and 41,210 in the commune.~~

~~See L'Abbé de la Rue, Fssais historiques sur la ville de Caen, 1820- 42: Mancel, Histoire de la ville de Caen, 1844; Vauthier, ditto, 1843;~~

~~L' Abbé Daniel, Embellissements de la ville de Caen, 1842 ; Freeman's Norman Conquest, vol. iii.; Macquoid's Normandy, 1874.~~

~~CERE (Kaipe), called by the Greeks Agylla ("AyvAXa), which is probably an Etruscan name, a city of Southern Etruria, near the coast of the~~

~~Tyrrhenian Sea. Its site is occupied by the modern Cervetri (Cere vetus), situated in the district of Civita Vecchia, about 32 miles from Rome. In the Virgilian legend of AEneas, Czere appears as the seat of the Etruscan king Mezentius; but the earliest fact in its genuine annals is its participation in an attack on the city of Alalia in Corsica. It afforded a refuge to the Tar- quins on their expulsion from Ronie, and it was afterwards chosen by the Romans as the securest hiding-place of their treasures during the Gallic occupation of their city. In the time of Strabo the city had become of little import- ance, and was even outgrown by the neighbouring village of Aque Ceretane. It continued, however, to rank as a municipium, and in the 4th century of the Christian era had a "bishop" of its own; but in 1250 it was deserted by a large part of its inhabitants, who removed to what is now the village of Cert. The chief building of modern date in Cervetri is the castle of the Ruspoli family, who are in possession of the seigniory. From the inhabitants being admitted to the privilege of Roman citizenship, but without the right of suffrage, the "' Czrite franchise" came to be a proverbial expression denoting disfranchisement. A large number of interesting Etruscan remains have been found in the tombs of Czre, among which may be specially mentioned 'paintings of high antiquity and inscriptions showing one of the sepulchres to have belonged to the Tarquin or Tarchnas family.~~

~~See Dennis, Cities and Cemeteries of Etruria, vol. ii.; Visconti, Antichi monumenti discoperti nel ducato di Cere, 1836 ; Canina, Descrizione di Cere Antica, 1838 ; Griffii, Monumenti di Cere Antica, 1841; Transactions of the Royal, Society of Literature, vol. i1.; Noél des Vergers, L'Etrurie et les Etrusques, 2 vols. 1862-4; Aug. J. Hare, Days near Rome, 1875, vol. lii.; Journal des Savants, 1848, &c.; and various articles in the Annali and Bulletino dell' eee di Corrisp. Archeol. di Roma, especially 1869, 1873, and~~

~~CAERLEON, the Jsca Silurum of the Romans, is situated upon the right bank of the river Usk, about 33 miles N. of Newport in Monmouthshire. Its name appears to be a corruption of the Latin Castrum Legzonis,' and there can be no doubt that the place was the station of the second Augustan legion, and ranked as a colony and capital of Britannia Secunda in the period of Roman dominion. The existing remains of ancient Caerleon still a situ are unimportant, consisting only of fragments of the city walls and a grass-grown amphitheatre (comprising an area of 222 feet by 192 feet), in~~

~~which the tiers of seats are indistinctly visible. The hamlet on the opposite bank of the river~~

~~1 Nennius, writing about two centuries before Geoffrey of Monmouth, says (c. 56), '* Bellum gestum est in urbe Leogis, que Britannice Cair Lion dicitur."~~

~~C A R—C A E~~

~~preserves its Roman name of Ultra Pontem, and it ig probable that the connecting bridge was a pontoon similar in character to that which survived to the close of the last century. The local museum is rich in objects of interest collected (chiefly through the zeal of Mr J. E. Lee, the author of /sca Silurum), either in Caerleon or its immediate neighbourhood. It includes a tesselated pavement of much beauty brought from Caerwent, four Tuscan pillars which are thought to have supported a temple of Diana, a large number of inscribed and sepulchral stones, a series of coins from the time of Otho to that of Honorius, stone coffins, amphore, antefixa, amulets, enamels, and Samian ware of home and foreign manufacture. It is remarkable that on two inscriptions the name of Geta (the younger son of Severus) has been mutilated and partially effaced — evidence of the hatred in which the civil governor was held by his brother Caracalla. In the recent restoration of the Parish church (in style Early English, with traces of rude Norman) a good deal of Roman masonry was brought to light, and upon the hill side, which formed the burial place of the ancient city, fragments of urns and memorial slabs are even now often exhumed. Enough has been discovered to prove) that Caerleon was a place of great importance in Roman times, but not enough to support the hyperbolical language of Giraldus Cambrensis (borrowed from Geoffrey of Monmouth) that its "splendid palaces, with their gilded roofs, once emulated the grandeur of Rome" (bk. ix. c. 12). Although the chief historic interest attaching to Caerleon is derived from the impress left uponit by Roman occupation, it has also a less substantial claim to notice in connection with the romance of Arthur and the Round Table. It was hither the "blameless king" came at Pentecost to be crowned, and made high festival with the chieftains from Lothian and Orkney, from Gower and Carados. Here, too, if we follow the Jaureate's version, Arthur took counsel with " Dubric, the high saint " and~~

~~Guinevere climbed— '*The giant tower, from whose high crest, they say, j Men saw the goodly hills of Somerset, 4~~

~~And white sails flying on the yellow sea." (Ldylis of the King, Enid.)~~

~~The lofty mound upon which this tower is said to have stood is close to the Roman amphitheatre, to which the name of Arthurs Round Table has been given. The tumulus is evidently artificial, and may perhaps have supported the keep of the castle mentioned in Domesday, the ruins of which, now limited to a solitary bastion on the river side, were very extensive even in Leland's time.~~

~~The grantee of Caerleon at the Norman Conquest was William de Scohies, and the lordship was subsequently enjoyed by the Crown and the great families of, Clare and Mortimer. From the latter it devolved to King Edward IV., and in later times has been held by the Morgans of Llantarnam and the Howes, Lords Chedworth. The chief proprietor at the present time is Sir Digby Mackworth, Bart.~~

~~The ecclesiastical history of Caerleon reaches back to the first introduction of Christianity into Britain, when it was constituted the seat of an archbishopric. It senta representative to the councils of Sardis (347 a.p.) and Rimini (359); and in the persecution of Diocletian during the previous century two of its citizens, Aaron and Julius, are said to have suffered martyrdom. The see was transferred to St David's in the 11th century, and at the present time Caerleon is included within the diocese of Llandaff. Some remains of a Cistercian priory may still be traced, but even the memory of Dubricius, the stout opponent of the Pelagian heresy, has perished with his dwelling-place. (c, J. B.)~~

~~CAERMARTHEN. See CaRMARTHEN.~~

~~CAERNARVON. See Carnarvon.~~

~~CHS—C AS~~

~~C/ESALPINUS, Anpreas (1519-1603), one of the most distinguished of the Italian natural philosophers of the Renaissance, was born at Arezzo in~~

~~Tuscany in 1519. Of his family nothing is recorded, nor does he appear to have left any progeny, or to have been married.~~

~~We have no account of his life till we find him seated in the botanical chair of the university of Pisa, where also he studied, if he did not teach, anatomy and medicine. His first publication was entitled Speculum Artis Medic Hippocraticum, in which it were too much to expect he should have released himself from the shackles of his venerable guide ; but he has left evident proofs, in a passage often quoted, of his having a clear idea of the circulation of the blood, at least through the lungs. In botany his inquiries were conducted on a more original plan, and their result was onc of the most philosophical works in that science, issued from the press at Florence in 1583, in one volume quarto. The title-page is sufficiently arrogant in tone,—De Plantis libri XVI, Andree Cesalpini Aretini, Medici clarissimi doctissimique, atque Philosophi celeberrimt ac subtilissimz ; yet Ceesalpinus appears to have been the editor, and prefixed, in his own name, an elegant and learned epistle dedicatory to Francis de' Medici, grand duke of Tuscany. This book, now rarely to be met with, is not only the unacknowledged source from which various subsequent writers, and especially Morison, derived their ideas of botanical arrangement, but it was a mine of science to which: Linnzus himself gratefully avowed his obligations. Linneus's copy of the book evinces the great assiduity with which he studied it; he has laboured throughout to remedy the defect of which Haller complains of the want of synonyms, has subjoined his own generic names to nearly every species, and has particularly indicated those remarkable passages, at pages 13 and 15, where the ger- mination of plants and their sexual distinctions are explained. In the former we trace the first rudiments of a natural classification of plants by the differences in their cotyledons, or, in other words, we find the origin of the natural systems of Linnzus and Jussieu; in the latter passage we detect the fundamental principle of the Linnean artificial system. Nor were these merely inci- dental suggestions of the author. He pursued his in- quiries to a conclusion on which the existence of botany as a science depends, and which the no less eminent Conrad Gesner detected about the same time, though his ideas respecting it were not then made public. The principle to which we allude is the classification of plants by their parts of fructification alone. This was afterwards extended, by the greatest writers on the subject, as Ray and~~

~~Tournefort, and more completely by Linnzeus, to the discrimination of their genera by the same parts, more particularly con- sidered and contrasted. To this more extensive conclusion, indeed, the principle directly and inevitably leads. Czsal- pinus used it himself with such success as to develop some of the most important characters for generic dis- tinctions, such as the flower being superior or inferior with respect to the fruit; the heart of the seed situated at its summit or base; the seeds, or the cells of the seed- vessels, solitary or otherwisc; the partitions of certain pericarps parallel or contrary to their valves. Linnzus remarks that Cesalpinus, though the first systematical botanist, found out as many natural classes, or orders, as his followers, He did not indeed define well the philoso- phical limits of genera in the vegetable kingdom, and therefore his work cannot be regularly quoted throughout for generic synonyms. The want of plates of his own, and of references to other authors, renders, as we have already hinted, some of his names and descriptions unin- telligible. Yet Linnzeus has in manuscript filled up many blanks which he had been obliged to leave in his own~~

~~633~~

~~Classes Plantarum, where the system of Cxsalpinus first assumed a synoptical form. The latter might probably have adopted a more clear and methodical mode of arrang- ing and explaining the botanical part of his subject, had he not had in view the vague and desultory manner of Pliny, whom he closely imitates in the materials of his numerous chapters, as well as in his style of description. A small and unimportant Appendix to this work, of nineteen pages, appeared at Rome in 1603, which is of very rare occurrence, but may be found reprinted in Boccone's Museo di Piante Rare, p. 125. The herbarium of over 760 plants which he left is said to be still preserved at Florence.~~

~~Cesalpinus having been settled at Pisa when the great Galileo first presumed to doubt the infallibility of the Aristotelian philosophy, and, most likely, at the time when that rising philosopher became professor of mathematics in the same university, we can hardly imagine him to have been free from the party-spirit which so disgracefully mani- fested itself there. He seems to have retained his pro- fessorship till 1592, when he~~

~~removed to Rome in attendance on Pope Clement VIII. He died in 1603 at the age of eighty-four.~~

~~Cesalpinus printed at Rome, in 1596, a quarto volume of above two hundred pages, entitled De Mctallicis, dedicated to Pope Cle- ment VIII. which, like his botanical publications, is now extremely rare. In the philosophy of this work Aristotle is his guide ; in its method and composition, Pliny. A prefatory address to the pope declares it to have been undertaken in opposition to a certain trea- tise on the same subject, which, though written with diligence and elegance, contained many things inconsistent with the principles of philosophy, and subversive of the Peripatetic doctrines, and with the author of which, as being excommunicated by the holy church of Rome, no measures were to be kept.~~

~~The Questionum Peripateticarum libri quinque, published at Rome in 1603, diverge considerably from the pure doctrine of Aris- totle, and by the emphasis laid on the universal and common intel-~~

~~ligence inherent in matter, approximate rather to the pantheism of the Stoics.~~

~~CHSAR, Carus Jutius, was born July 12, 100 B.c., according to others in 102 B.c., of a family who for many years had held high offices in the state. He was the greatest man of the Roman or perhaps of all the ancient world. It is not without reason- that his name has remained among us as the title of sovereignty, or that his memory survives as the standard of comniauding greatness ; yet the very completeness of his character makes it difficult to obtain a clear grasp of his individuality. In every relation of life he attained apparently without effort to the highest excellence, as a citizen, a politician, an orator, a general, a companion, a man of letters, and a far-seeing organizing statesman. Yet study will make it clear to us that his greatness has not been overrated, and the more we conteinplate his position and his work, the less opportunity we shall find for blame or criticism. He entered into active 'life at a great crisis of his country's history. A strong national individuality, firmness, and unity of char- acter and purpose had gradually won for Rome the supremacy of Latium, of Italy, and of the world. But the qualities which were able to acquire an empire were not able to govern it. The time was now passed when the senate presented an example of dignity~~

~~and magnanimity, when a sense of law and justice and persistency of aim and object sufficed to extenuate a cruelty which knew no limit but the realization of its will. It was truer now than in the time of Horace that Rome was falling by the weight of its own greatness. The long struggle between the patricians and plebeians for political equality served rather to strengthen than loosen the cohesion of the state. But the nations which lay outside the city could not be assimilated without severe struggles. The equality of Latins and Italians with the citizens of Rome might be~~

~~won by the efforts of a demagogue, but could only be assured by an entire change of government. Failure to effect the purposes of government had diminished the sense of responsibility in the ruling class. Jugurtha had been able to discover that Roman virtue was accessible to bribes, The direction of provinces at once gratified and stimulated the avarice of statesmen. The riches of the world which were beginning to flow into the imperial city excited the desire for more. There existed at the same time the demoralization which accompanies the breaking up and abandonment of old principles of conduct, and an unsettled yearning for the adjustment of pressing difficulties. We may credit the Gracchi with a far-seeing grasp of the wants of their country, but they could not but appear to their contemporaries as mischievous revolutionists. Sulla attempted to give new strength and power to a system which had sunk into hopeless decay. Marius was inspired rather with a rough contempt for expedients which could never be successful, than with a patriotic desire to elevate the people from whom he sprung. Theimpotence of statesmen to understand or to regulate the age led to the employment of violence and bloodshed. A domestic enemy had forced the gates of Rome, and each political victory was sealed with the blood of the vanquished. The senate which had conquered the world was unable to defend itself; it could neither recover its former power nor bring into being a new constitution. It could not exercise the ordinary functions of government without entrusting to a citizen powers which might be turned against its own existence. It is difficult to imagine what would have been the destiny of a world from which the cohesive force which bound it to-~~

~~gether might at any time be removed. If Rome had perished in this crisis she would have left but a faint impress upon the nations who owned her sovereignty. The long reign of law and order, from which we derive the chief legacies which Rome has left to the modern world, was yet to come. That the newly-founded empire did not fall before the onslaught of an eastern despot, or break up into separate provinces governed by rebellious citizens, is due, as far as we can see, to Julius Cesar alone. It is difficult to see how such a man could have been produced by the wants of any age, but there is no doubt that the course of future history was marked out in no slight degree by the genius and foresight of this single individual. Cesar displayed at the very outset of his career the same versatility, energy, and courage which distinguished him till its close. When ordered by Sulla to put away his wife, who was connected with the Marian party, he refused to obey, although he lost by the refusal his wife's dower, his priesthood, and his fortune. Although compelled to quit Rome to avoid the dictator's anger, he did not deprive his country of his services. His diplomacy served to obtain from Nicomedes, king of Bithynia, a fleet, which was used in the reduction of Mitylene, and by his personal bravery in the siege he won from Marcus Thermus the reward of a civic crown. He served in Cilicia against the pirates, whose extinction was to be the great glory of his rival, and either at this or at a later time (for authorities differ on this point) had an adventure with them, which displays his subtlety and resource. Taken prisoner by them at the island of Pharmacussa he sent the main body of his com- panions and attendants to seek his ransom. During his stay of forty days, he ingratiated himself with his captors, and promised them in jest that when once set free he would return and crucify them, and he kept his word. When he was released he armed some vessels of Miletus, found the pirates in the anchorage where he had left them, took them into Pergamus, and handed them over to the civil arm. When a student under Apollonius Molo at Rhodes, on the outbreak of the Mithridatic war, he passed,~~

~~of his own accord, to the continent, drove the king's general from the province, and restored the shaken allegiance of the subject towns. A Roman citizen of birth was expected not only to be a general and a statesman but an orator, He must be practised in every branch of the art of govern- ment.~~

~~Czsar attained distinction in the forum with the same ease as he had won it in the field. He accused Dolabella of extortion in the provinces in 77 B.C., and Antonius of a similar offence in 76 B.c. In neither pro- secution was he successful, but he gained in both a reputa- tion for eloquence and public spirit. To perfect himself in oratory he sought the instruction of Apollonius before men- tioned, under whom Cicero had also studied, and who had striven with little success to curb the extravagance of his redundant diction. Perhaps it is to him that we owe the massive and monumental eloquence, the pure and chastened taste of the Commentaries. The chronology of these events is uncertain, but in 74 B.c. Caesar returned to Rome, and was elected pontiff and military tribune. Not untried in war and in affairs, tinged with Greek culture but not weakened by it, in the prime of youth and the fulness of fascination, he was fitted in every way to gain the favour of his country- men, and to play his part in the game of politics, which required then, if ever, an open brow and secret thoughts. For the next twelve years Caesar, with the exception of a short absence in Spain as queestor, remained at Rome. During the whole of this time he lent his assistance to the task of strengthening and reviving the democratic party, which had sunk very low after the death of Marius. He was thus brought constantly into connection with Pom- pelus, and it is difficult for us to determine whether Cesar supported Pompeius because he perceived that his ends were those which he himself wished to gain, or whether Pompeius courted the democratic party for the purpose of his own aggrandizement. In 70 3.c. Pompeius, in con- junction with Crassus, repealed the Sullan constitution, and in the measures which were necessary for this pur- pose he had the full approval and support of Caesar. The power of the tribunes was restored, that of the senate diminished. The control of the law courts, which Sulla had given back to the senate, and which had been abused to shield from punishment high-born plunderers of the pro- vinces, was now divided among the senate, the equites, who were tlie great capitalists, and the tribuni cerarii, who represented a still more popular element. Cvesar in this conduct was true to the principles which auimated his whole career, a desire to give equality to the citizens, and recognition to the subjects of Rome, and to obliterate as far as possible the scars of civil dissension. In 68 B.c. he lost his aunt and his wife, one the widow of Marius, the other the daughter of Cinna. In the orations which he pronounced over them in the forum, he was able to reha- bilitate the reputation of the leaders of his party. At his aunt's funeral he~~

~~caused busts of Marius to be carried in the procession, and the people were roused to recall at once the greatness of their general, whose memory had been so long proscribed, and the generous conrage of his kinsman in restoring it. As the power of the senate became weakened, respect for the old safeguards of the constitution became less strong. It was therefore not unnatural, when Rome was suffering from the attacks of enemies whom she could not quell, that she should invest her former general with an extraordinary command, and seek in new expedients a remedy which the constitution had failed to supply. Such was the origin of the Gabinian and Manilian laws, the first of which conferred on Pompeius a command against the pirates of the Mediterranean, while the second gave him control of the Mithridatic war. Never had such power been concentrated in the hands of a single citizen. He was invested with absolute control for three years over the whole~~

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~~of the Mediterranean Sea, from the Straits of Gibraltar to the innermost bays of the Levant, and over the coasts for fifty miles inland. Under him were twenty-five prectors of senatorial rank chosen by himself. He had ample authority for levying troops and raising money. By the Manilian law he obtained in addition command over the whole of the East, "so that there remained scarcely a spot of land within the wide Roman dominions that had not obeyed him." These laws were opposed by the friends of the senate and by those who still cherished respect for the old constitution of the city. They were supported by Cxsar and by Cicero, and were carried by the public voice. We need not see in this action of Cesar's a desire either to get rid of Pompeius as a rival, or to earn future favour by present support ; we may rather conclude that he saw more clearly than the statesmen of his time the growth of a new order and the decay of the old, and the necessity of fresh and even perilous expedients to meet wants which had not before arisen.~~

~~After the departure of Pompeius, Csesar held the xdile- ship with Bibulus. His business in this office was to take charge of the public buildings, to repair the old, to furnish such new ones as were required, and to keep the multitude in good temper by a due magnificence in their national games,~~

~~‘This office was to Cesar the occasion of fresh triumphs. Bibulus supplied the money, but Cesar showed how it might best be spent, and gained the whole credit of the generosity displayed. He decorated the forum,—that small space under the Capitoline hill, on which every successive master of Rome has for good or for evil left his mark, He built, either at this or at a later time, the basilica Julia, which has again come to light in our generation, the first of those imperial erections which were imitated by his successors, and which extended the long line of colonnades and halls of justice far beyond the narrow limits of the Septimontium. He built porticoes under the Capitol for the reception of works of art, the plunder of Grecian cities : and he struck a deeper chord in the hearts of his country- men when by his order the trophies won by Marius from barbaric kings and peoples glittered one morning freshly adorned and gilded in the place from which they had been removed by Sulla. The defenceless city was terrified at the number of gladiators which he proposed to exhibit in the Great Games, and restricted him to three hundred and twenty pairs, but he made amends by arming them with accoutrements of silver, an act of magnificence remembered even in times when the city was sated with profusion.~~

~~In the following year, 64 3.c., he was concerned in measures which show the consistency of his political cha- racter He supported the agrarian law of Rullus (which, as far as we know its provisions, proposed to settle the poorer citizens in the waste lands of Campania and else- where), because, although its provisions miglit be defective, its principles were good, and calculated to lessen the ine- quality between the different members of the state. Cicero may, with the responsibility which attached to him as consul, have been right in procuring its rejection as ill-digested and premature. Cvzesar’s support of the inipeachment of Rabirius for the murder of Saturninus thirty-seven years before, was perhaps intended to show that party feeling should never be suffered to cover the commission of a crime, to assert again the principles of democracy which had been long unpopular, and also to deter young aristocrats from imitating the excesses of Sulla. These principles once asserted, there was no need to carry the prosecution to extremities. In the year following, 63 B.c., he was elected Pontifex Maximus, a signal mark of his popularity. This office placed him at the head of the state religion.~~

~~Although he did not obtain it without bribery, yet we.~~

~~tannot believe that he would have been elected unless the~~

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~~people had felt confidence in the dignity and integrity of his character, and if he had been the frivolous and abandoned libertine which some historians represent him to have been at this time. De Quincey has remarked that we are presented with a touching picture of his home life on the morning of his candidature. His mother Aurelia accompanied him to the portico of the house, with a mingled feeling of hope for his success and fear for his safety, and he answered to her expressed anxieties that he would return a conqueror or a corpse. We may believe that to his mother he owed many of his most commanding qualities, Throughout her life he treated her with deep affection and respect, and we have abundant proof that Cesar possessed to the full that strong family affection which always accompanies a noble nature, and which the Romans of that day have by some writers been so strangely supposed to have been without.~~

~~An event was at hand of suffieient seriousness to try the mettle of the strongest. The conspiracy of Catiline has perhaps been exaggerated by the vanity of Cicero; but allowing for this exaggeration, it threatened serious danger to the state, and it affords a conclusive proof of the impotence of the Roman government at this time. We shall find the closest parallel in the military pronunciamientos of modern Spain. Catiline had probably little design beyond obtaining the best places of government for himself and his friends at any cost. If OCzxsar had joined this movement he might have mastered it and directed it to his own purposes ; had he been an unprincipled adventurer he might have framed for himself combinations more likely to succeed. There is no proof that Czesar was an accomplice in this villany. Probability is against it, What we do know is that on December 5th he spoke against the execu- tion of the conspirators. In this we have evidence of his strong common sense and political foresight. He saw that it was bad policy to break the laws in order to punish their violation. He knew also that the dead alone come back to haunt the living. "If an adequate punishment," he: said, "can be devised for these men's offences let it be inflicted ; if their offence transcends all punishment, let us punish them by~~

~~the laws of our country." It would have been well for Cicero if he had followed this advice. Such language was thoroughly consistent in the mouth of a man who had done his best to remedy the excesses of Sulla, from which he himself had suffered, and who had lost no opportunity of inculcating political moderation. The next year, 62 B.c., Cesar was pretor. At the close of it Pompeius returned from the conquest of Mithridates, and quietly disbanded his army. The time had not arrived for Cesar to lay aside the toga. In 61 B.c., at the age of forty, he assumed as propreetor his first important military command, and laid the foundation of a reputation as the greatest of generals, which should never be allowed to overshadow his higher merit as a statesman and the regenerator of his country.~~

~~Before Czesar could leave Rome for his province it was necessary that he should clear himself from the load of debt which oppressed him, and this he was enabled to do by the assistance of Crassus. A charge of insolvency has been allowed to weigh too heavily upon the character of Cesar, and has received too much importance as a motive for his actions. It can be accounted for ky supposing an over-recklessness of means to gain important public ends, and a culpable carelessness in his privateinterests, which are not without a parallel in statesmen of modern times, whose character is above suspicion. We have little positive information about his campaign in the Peninsula, the main operations of which were carried on in Galicia and Portugal. Ceesar appears to have exhibited on a small field the same qualities which distinguished him in a large sphere. He was proclaimed imperator by his soldiers, was voted a~~

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~~triumph by the senate, and while he added to the riches of the state, was careful to render his own fortune more secure. He was a candidate for the consulship in the following year, aud would gladly have conducted his canvass by proxy, while he kept his army outside the gates in readiness for his promised triumph. But Cato and the senate would not permit this violation of the law. Ceesar at once obeyed, surrendered his triumph, and obtained the consulship. He formed at this time an alliance with Pompeius and Crassus, which is generally known as the first triumvirate. It was merely a political union for common purposes, and was not, like the second~~

~~triumvirate, an organized form of government. Pompeius and Crassus had been enemies, and were now reconciled by Cesar. Cato, the champion of the senate, could not be included in this alliance, and Cicero was too vacillating in his policy and too weak in character to command the confidence of either of his former friends. The objects of the coalition were not so much to secure the personal aggrandizement of its members, as to form a strong and united front against those who wished to maintain a form of government which had become impossible, and was therefore hurtful to the state. It is possible that both Pompeius and Cesar foresaw that under a new constitution Rome would be subject to a single head, while Crassus was not reluctant to join himself to two men, one of whom must be the ruler of the future. The democracy which raised Cesar to pewer wished to obtain for its favourite the command of an army which would ensure the preponderance of his counsel in coming changes. Cesar himself, conscious of the pressing need of important measures, and the inability of the senate to provide them, was ready with the frankest generosity to work with any one whose ideas were on this point coincident with hisown. The alliance was cemented by the marriage of Pompeius to Julia, Caesar's daughter, while Caesar married Calpurnia, the daughter of Piso. Czesar's colleague in the consulship was M. Bibulus, the devoted servant of the senate, who both as edile and pretor had submitted as a foil to set off the greatness of his companion. He offered a vain opposition to Czsar's measures, and when he found that he could not prevent their being carried by the use of the political machinery in his power, he retired to his house and announced his intention of " observing the heavens" during the rest of his consulship, a process which ought technically to have rendered invalid all acts passed during that time. We do not possess a full account of the laws carried by Cesar while he stood at the head of the state, but we know enough to show us that he used his opportunities to enforce the same political principles which he had always con- sistently professed. He ordered the proceedings of the senate to be published, and so rendered its deliberations amenable to public opinion. He passed an agrarian law similar to that of Rullus, but without the defects which had procured its rejection. He carried a measure of just relief for the eguites or capitalists, not so much with a view of gaining their support as to make a fair concession to an important class of the community. He declared Ptolemy, king of Egypt, and Ariovistus,the German, friends of the Roman people. He made regulations for the better government of the provinces, and~~

~~remedied the worst abuses under which the provinces groaned. He was the author of a great measure for the suppression of bribery and corruption amongst public functionaries, which were at that time a stigma on the state. Other resources of a similar tendency were carried by his subordinates. The senate had intended that Czesar, on laying down his office, should be rendered as harmless as possible, and for that reason had assigned to the consuls the charge of woods and forests in Italy. The people, however, were able to~~

~~sure asylum of political refugees.~~

~~CHASAR~~

~~protest successfully against the injustice. The tribune~~

~~Vatinius obtained the passing of a law which gave to~~

~~Cesar the province of Cisalpine Gaul or Northern Italy for~~

~~five years, with three legions ; and the senate of its own~~

~~accord added the charge of Gaul and the Alps with an additional legion. Casar thus obtained a field of action worthy of his genius. He stayed near the city just long enough to secure the election of his friends as consuls, and to provide against the repeal of the measures which he had passed, and then set out for the country which has ever since been identified with his name.~~

~~It is not our object to describe in detail the marvellous work which occupied Ozesar for the next eight years. No part of his life has been written with greater fulness, nor is there any for which we possess more abundant material. It must suffice to give a short sketch of the masterly campaigns by which a free and chivalrous people were reduced to absolute obedience, new countries were opened up to the knowledge and enterprize of Rome, and a form was given to the development of the civilization of France, of which she has preserved the main features to the present day. In his first campaign (55 B.c.) Caesar gained two important victories. He defeated at Autun the Helvetii who were leaving Switzerland with the intention of settling themselves on the fertile seaboard of the Atlantic, and forced the~~

~~greater number of them to return to the homes which they had left. He attacked a nobler foe in the Germans under Ariovistus, the friend of the Roman people, and in the neighbourhood of Miihlhausen cut them to pieces, and drove the few survivors across the Rhine. This mighty stream now became the boundary of the Roman empire. All central Gaul was quelled by his bold attack, and the Germans were cowed into quietude, but the Belge, a mixed race of warlike qualities, remained unsubdued. In the next year (57 B.c.) Caesar marched against them, and scattered their confederacy to the winds. The Nervii made a better stand, and Cesar was forced to expose his life, and to fight like a common soldier. But they, too, sustained a crushing defeat, and the submission of the Veneti and the coast cantons to Publius Crassus left only the northern tribes, such as the Morini and Menapii, independent of the Roman rule. The work of Crassus had been imperfectly performed, and in the following year (56 B.C.) the Veneti threw off the yoke. The whole coast from the Loire to the Rhine joined the insurrection. Cesar hurried from Italy, and taking measures for the security of the north and south, prepared to attack the Veneti by sea. Victorious by sea as by land by new and skilful devices, he disabled their powerful fleet, and sold the defeated captives into slavery to a man. The Morini and Menapii alone remained unconquered, protected more than any thing else by the natural strength of their country. Czsar marched against them, but was forced to desist from the attack. With this exception, the whole of Gaul had been reduced to obedience in three campaigns. Cesar now turned his arms against the Germans. He cut to pieces the Usipetes and Tenchteri, who had crossed the lower Rhine, after treacherously depriving them of their leaders, who had come of their own free will into his camp. There is no excuse for this violation of international law, which was very properly rebuked by Cato in the senate ; but Cesar might have replied that the precedents of Roman history had not inculeated a spirit of fairness or forbearance towards alien enemies. He built a bridge across the Rhiue, and remained eighteen days on the other bank. The same year (55 B.c.) witnessed his first expedition to Britain, whither he was led partly from curiosity, and partly by a desire to detach from the Celtic confederacy a land which was the The islanders made @~~

~~He~~

~~brave resistance, and Cesar was compelled to retreat.~~

~~CHSAR~~

~~was so much dissatisfied with the result of the campaign, that he made great preparations for renewing the attack in 52 z.c. On this occasion he penetrated further into the interior and crossed the Thames, but Cassivellaunus, to whom the defence of his country had been entrusted, followed the Roman army with his war chariots, and successfully impeded their operations. Cesar, before he left, imposed a tribute and demanded hostages, but it was difficult to conceal that he retired discoinfited from a land which he had to all appearance seriously intended to subdue. The next two years witnessed the final struggle of the Gauls to regain their freedom. Inspirited by the resistance of the Germans and the Britons, and inflamed by the death of Dumnorix, they determined to make a simultaneous attack on the Roman garrisons, which this winter were scattered more widely than usual. Q. Titurius Sabinus and L. Aurelius Cotta were the first assailed. Deceived by Ambiorix, king of the Eburones, their whole division was annihilated. A similar attack was made upon Q. Cicero in the territory of the Nervii, but Caesar was near enough to bring assistance. The insurrection was checked and a terrible vengeance exacted from the Eburones. Acco, prince of the Carnutes, was executed by the victors. His death spurred his tribesmen to greater exertions. In the winter of 53-52 B.c. they roused the spirit of their countrymen. The post of honour was held by the Arverni, under their prince Vercingetorix, an heroic leader, whose name casts lustre on this last vigorous but hopeless struggle. A new plan of defence was adopted. Instead of defending every town against the Romans, it was determined to burn those places which could not be held, and to concentrate their forces in those strong positions which gave a good hope of success. Thus the campaign clusters round the names of Avaricum, Gergovia, and Alesia. The first of these towns (Bourges) was taken in the spring of 52 B.c. The second, the capital of the Arverni, was attacked by Cesar in vain, and an attempt to remedy the disaster led to amore decisive defeat. The star of Coesar began to pale. The Hiedui, who had before hesitated to join the insurrec- tion, now avowed their hostility, and the whole nation rose like one man to cast off the yoke of the invader. The final struggle was concentrated round the hill-town of Alesia. Vercingetorix, faithful to his~~

tactics, took refuge here with 80,000 infantry and 25,000 horse. Czesar had been able to join his forces with Labienus, and invested the hill on every side. The mighty masses of the Gallic landsturm crowded from all quarters to release their champion. Cesar was at once besieger and besieged. In this supreme crisis his genius triumphed. The provisions of Alesia were exhausted. Czesar repulsed the double attack on both his lines, and Vercingetorix, disdaining to fly, delivered himself into the power of his conqueror. Had the result been otherwise, it is possible that Cesar might have been driven irom Gaul, and the floods of barbarians pouring down over Italy would have anticipated history by five hundred years. Tae following year (51 B.c.) saw the final pacification of the country. In eight years Cesar had done his work -most thoroughly. Gaul never afterwards attempted to revolt, but remained a rich and contented member of the Roman empire. On no subject-country was impressed more com- pletely the language, laws, and civilization of its masters. If it had been possible so gradually to extend the bounds of Roman dominion as to convert dangerous hordes of undis- ciplined tribes into contented allies, Caesar shows us how it might have been done. Even the patriotism of an emperor of the French cannot but admit that it was better for his country that Cesar should conquer than Vercingetorix. Whilst Caesar had been engaged in the conquest of Gaul, the bands which held the triumvirate together had gradually become loosened. The three members of the coalition had

met at Lucca in 56 B.c., and had arranged that Cxsar's command in Gaul should be continued for another five years ; that Pompeius and Crassus should be elected consuls for 55 B.c.; and that on the expiration of their office Crassus should have Syria for his province and Pompeius the two Spains. These arrangements were carried out, but in September 54 B.c. Julia, the daughter of Cesar and the wife of Pompeius, died. A project for a double alliance of a similar kind was rejected by Pompeius. In 53 B.c. Crassus was slain in Parthia. In 52 3.0. it became clear that Pompeius was asserting his independence, was draw- ing nearer to Cato as an ally, and was becoming more disposed to act as the champion of the senate. From this time till the outbreak of the civil war, it was more and more evident that a collision between the two great rivals was inevitable, although Cesar did his

~~best to avert the catastrophe. The details of the final quarrel are complicated and difficult to understand. By the law of Vatinius Czsar's command expired in 54 B.c., by that of Trebonius it was continued till 49 B.c. It is comparatively unimportant whether his imperiwm would determine at the end of February or the end of December in that year. It had been arranged among the triumvirs that Czsar should be consul in 48 B.c. According to strict Roman law he must announce himself personally as a candidate, which he could not do whilst he was still in command of an army. Pompeius had, in 52 B.c., secured to Cesar exemption from the restriction by a tribunician law, but there was some doubt whether this had not been rendered invalid by a subsequent enactment. In the same year it had been decreed that no one should hold a governorship until five years had elasped from his laying down the office of consul or senator In 51 B.c. the question of appointing a successor to Cxsar came before the senate, and it was finally determined that his command should come to an end on the Ides of November, 49 3.c. The object of the senate was that some interval should elapse between Cesar's consulship and proconsulship. Czsar knew that he could not trust himself to the power of his enemies, but he displayed his usual moderation. He gave up the two legions which were demanded from him for tha Parthian war, and by means of Curio, whom he had won over to his side, he proposed to the senate that Pompeius and himself should simultaneously disarm. To the surprise of the aristocratic party the motion was carried. Marcellus refused to accept the decision on the plea that Cesar was bringing his army into Northern Italy. He called on Pompeius to put himself at the head of the legion in Campania, and declare war against the invader. Czsar made one more ineffectual attempt at compromise. The propositions brought by Curio to the new consuls on January 1, 49 B.c., were contemptuously rejected, and Cesar was peremptorily ordered to resign his command, Although he had only one legion with him at Ravenna he could not hesitate. He crossed the frontier of Italy, and arrived at Ariminum.~~

~~Ceesar crossed the Rubicon in the middle of January, 49 B.c., and he was murdered on the Ides of March, 44 B.c. During this space of a little over five years he crushed in every part of Europe the armies of his enemies, and laid deep and strong the foundations of the imperial power of his successors. He spent barely fifteen months of this time in Rome. He did not~~

now, as his enemies had expected, march at once upon the capital. He observed that a surer way lay open to him of securing the possession of Italy by seizing the central heart of the peninsula, which in ancient as in modern times has held out delusive hopes to patriot people and rebellious kings of taming the proud tyranny of the Tiber city. Here the solitary church of St Pelino marks the site of Corfinium, once the destined home

of Latin independence, and the city of Aquila languishes under the snows of the Gran Sasso d'Italia, a monument of the vain but chivalrous struggle of the emperors against the popes. Into these upland valleys, lying midway between the two seas, Cesar dashed with irresistible force, and town after town fell before him and his lieutenants. Pompeius moved slowly towards Brundusium, whither he was followed by the conqueror. Czesar was unable to prevent the em- barkation of his troops for Greece, but when 'by the end of March he reached Rome he was already the undisputed master of Italy.

In his next operations Ceesar displayed to a marvellous degree his ability and resources, and showed how the suc- cess of his projects depended entirely upon his personal exertions. HIs lieutenants were seldom fortunate; but, like Napoleon, his presence was worth an army, and, like Frederick the Great, he knew how to spring at once from the deepest embarrassments to the triumph of victory. At Ilerda his army was cooped up between two rivers, and all communication with Rome cut off. By a clever stratagem he surrounded Afranius and Petreius, and compelled them to surrender. At Dyrrachium he was in a worse position, encamped on a barren ridge, encompassed by a far superior army on the land side, and cut off from the sea, which was in the power of his enemies. Even when he had received his reinforcements he could not hold his own against greater numbers. Yet he was able to take advantage of the first mistake of Pompeius, and the victory of Pharsalus was crushing and complete. At Alexandria, where his stay is difficult to account for even by the attractions of Cleopatra, he nearly fell a victim to a popular tumult, yet he was no sooner extricated from his difficulties than he marched into Asia, saw and conquered the son of the great Mithri- dates, and placed the affairs of the East on a basis of security. In Africa he had allowed the Pompeians to attain a dangerous efficiency of

~~organization by his delay at Alexandria, and it was only through the extremest caution that he was enabled to assemble his tardy forces. But the battle of Thapsus deprived the senate of their last and noblest champion, and left Czesar the master of the Roman world. The capitulation of Ilerda took place in August 49 B.c., the winter of 49-48 B.c. was passed on the coast of Illyria, the battle of Pharsalus was fought on August 9, 48 B.c., and Pharnaces was defeated at Zela on August 2, 47 B.c, Cesar's stay at Rome was chequered by the mutiny of the legions in Campania, and the difficulty of assembling his troops; yet he was able to land in Africa before the end of 47 B.c., and he won the victory of Thapsus on April 6,46 3.c. In July of that year he entered Rome as conqueror, and could now find leisure to govern the world which he had subdued.~~

~~During four separate days he celebrated four triumphs over Gaul, Egypt, Pontus, and Africa. Vercingetorix, who struggled in vain to save his country, Arsinoe the sister of Cleopatra, aud the son of Juba, king of Mauretania, followed his triumphal car. The citizens were publicly feasted at the dictator's expense, a distribution of money was made to the pour, and the strange magnificence of the games celebrated in memory of his daughter Julia fulfilled the promise of the splendour of his edileship. One more struggle was necessary before peace was finally secured. The sons of Pompeius, Cneus and Sextus, had collected a large army in Spain, which had always been the stronghold of their cause. The battle of Munda, fought on March 17, 45 B.c., resulted in their entire defeat, but Caesar was compelled to be absent from the capital from the end of 46 B.c. till September 45 B.«,~~

~~dt may be questioned whether Czesar was himself anxious to receive the title of king, which his admirers were without doubt desirous to force upon him, Such a title would~~

~~CMBSAR~~

~~have added but little to his real power over every depart. ment of the state. After the expulsion of the kings the Roman constitution came eventually into such a form that, while every interest was represented, the whole power could never come into the hands of one individual. The two consuls were a check upon each other, and they were themselves subordinate to the senate.~~

~~The tribunes occupied an entirely different position to the other magis-trates, and defended the interests of the mass of the citizens. The senate itself was controlled by the censor, and the working of the political machine was so ordered that a single nagistrate could, either by his personal objec-tion, or by a skilful use of divine sanctions, obstruct any measure of a rash or unusual character. The chief officers of the state were occasionally suspended by the appoint- ment of a dictator for extraordinary emergencies, but it had probably never occurred to any statesman that the whole of these well-balanced and often conflicting authorities might come to be concentrated in the person of one man, Yet it was by these means that the republic became a monarchy, and that Czesar became emperor. He was five times consul and four times dictator, and at his death was dictator elect for life. He had the tribunician power conferred upon him, which, among other advantages, rendered his person inviolable. Instead of the censorship he was invested with the new office of preefectus morum, which he used to curb the luxury and extravagance induced by the influx of conquered wealth. His opinion was, as princeps senatus, asked first in the senate; his effigy was struck upon the coins. The exaggerated and half-divine honours which the servility of the senate invested added but little to his power, but the title of «mperator, with which many a successful general had been saluted on the field of battle, was now prefixed to his name as a perma- nent addition, aud has remained, together with the family name of him who first bore it, as the title of highest sovereignty throughout the civilized world.~~

~~The complex of authorities thus placed in his hands he used in a manner to justify the confidence of those who entrusted them to him. It is difficult to give an accurate account of his administration. Mommsen, in the brilliant chapter which at present closes his history of Rome, has scarcely dis-tinguished with sufficient care between Czesar's intentions and his acts, and between his measures and those of his successors. Yet we have ample evidence that much was done and much more conceived. If we follow the authority of Suetonius we find that he reformed the calendar by intercalating three months in the year 46, and making arrangements for the future, which lasted unchanged till the 16th century. He increased the number of the senate to nine hundred, and made it more thoroughly representative of all classes and all parts of the empire. He increased the num- ber of the magistrates, did his best to heal the wounds left by the civil~~

~~war, and reformed the courts of justice. He confined donations of corn to the poorer citizens, and while by the rebuilding of Carthage and Corinth he found a refuge for many who would have starved at home, he did his best to prohibit absenteeism, and to discourage the tillage of the soil of Italy by slaves. He gave the rights of citizenship to men of science and to professors of liberal arts, enforced the laws without favour, and attempted with little success to restrain the luxury of the age. He prepared the way for the work of his successor, who found Rome of brick and left it of marble. He intended to codify the law, and to provide public libraries of Greek and Latin works, the care of which he entrusted to Varro, the most learned of the Romans. He is credited with the design of draining the Pontine marshes, a work yet to be performed ; of con- verting the Fucine lake into a fertile plain, an enterprise begun by Claudius and completed by Prince Torlonia ; of~~

~~piercing the isthmus of Corinth ; of making a road from the Adriatic to the Tiber; and further, of subduing the Parthians, and returning through Scythia and Germany into Italy, after extending the limits of the empire to the stream of the ocean.~~

~~However this may be, it is certain that at the time of his death he was preparing an expedition against the Parthians. It is useless to speculate whether his absence from the city would have been short or long. There is evidence that he did not feel at his ease in the capital, that he considered his personal work to be accomplished, aud that his plans could be better carried out by his suc- cessor. Yet nothing can excuse the shortsighted wicked- ness and folly of those who murdered him. We need not repeat the well-known story, how in the Ides of March, 44 B.c., Cesar was murdered in a meeting of the senate, and fell at the feet of the statue of Pompeius, pierced with wounds from head to foot, only one of which was fatal. There is no reason to believe that the con- spiracy had been long in preparation, or that it was motived on the one hand by a desire for personal aggrandizement, or still less, on the other, by a devoted patriotism. It began in spite, and continued in folly. A very slight degree of political foresight might have convinced those who assented to the plot that the people would not be on their~~

the whole. Had Cesar been writing history instead of military memoirs, he might have allowed himself greater freedom of ornament. We know, from his treatise on grammar (De Analogia), often quoted by grammarians, that his success in literature was the result of careful study and meditation. As an orator he was acknowledged to be second to Cicero alone, and he is one of the few men in history who have quelled a rebellion by a speech.

In this sketch of Czesar's life we have found but little to blame, and have been able to add few shadows to the

| picture. The stories which the jealousy of contemporaries

have preserved against him are too frivolous to be recorded, while the dignity, sweetness, and nobleness of his character cannot be concealed. We have preferred rather to attempt to construct from very imperfect materials some faint resemblance of the marvellous personality of him whom

the genius of Shakespeare rightly recognized as " the fore- most man of all this world."

The principal ancient authorities for the life of Cesar are the biographies of Plutarch and Suetonius, the letters and orations of

| Cicero, and the Commentaries on the Gallic and Civil Wars written

| the battle-field of imperialists and republicans.

side, and that they would precipitate the very conclusion » which they desired to avert. Those who deified Brutus in |

the French Revolution knew but little of Roman history, or confounded hin with the expeller of the Tarquins. Dante is a better judge, whose ardent love of liberty did not blind him to the necessity of a strong and united government for his nativeland. The divine poet relates to us with an appalling realism, that in the centre of the earth, in the bottom of the pit of hell, Lucifer holds in his three mouths the three greatest malefactors the

~~world has ever seen,— Brutus and Cassius, who betrayed their sovereign and their country, and Judas Iscariot, who betrayed his Master with a kiss.~~

~~Under different circumstances Czsar might have won as great a reputation as a man of letters as he has acquired as a general and a statesmen. He was fully aware that a change in the literary language of his countrymen was as necessary as in their government and constitution. The rude though vigorous dialect of Plautus, or even of Varro, was not suited to be the organ of civiliza- tion throughout a subject world. A widespread knowledge of Greek had made the Romans aware of their own deficiencies, and the united efforts of all men of culture to give form and refinement to the Latin tongue culminated in the glories of the Augustan age. Cicero and Livy, Virgil and Horace, have remained as examples of Latin style during the whole of the Christian era. The language~~

~~in which they wrote must have differed widely from any- | _ metropolis of Palestine, 30 miles north of Joppa, and about~~

~~thing which was spoken by their most cultivated contem- poraries. It is not unreasonable to feel some regret that the cultivated language did not follow a course of develop- Ment more suited to its inherent character, and that Lucretius and Caesar were not adopted by the rhetoricians of the empire as models for precept and imitation. The excellence of the Latin language lies in its solidity and precision ; its defects lie in a want of lightness and flexibility. Lucretius found it sufficient to express with admirable clearness very complex philosophical reasoning, and Cesar exhibited its excellencies in their purest and chastest form. It isa misfortune that the Commentaries are not more often studied as a masterpiece of literature, but are relegated by the irony of fortune to the lower forms of schools. Their style is faultless, not a word is thrown away or used with a doubtful meaning, every expression is In its place, and each touch serves to enhance the effect of~~

~~by or ascribed to Czesar himself. 'To these may be added Appian's Civil War, Dion Cassius, Velleius Paterculus, Sallust's Catzlinc, the Epitomes of Livy, and Lucan's Pharsalia. His life has been perpetually narrated in ancient and modern times, and has been For English readers, the account given by Merivale, both in his History of the Romans under the Empire, and in the Fall of the Roman Republic, is readable and adequate ; the fullest and~~

~~fairest examination of the original authorities is in Long's Decline of the Roman Republic, vols. iiii—v. Thearticle in Smith's Biographical Dictionary is excellent, but by far the most brilliant picture of Ceesar's character and work is to be found in Mommsen's History of Rome (published 1856, translated into English 1866). Mominsen is extremely favourable to Cesar, but unfair to his opponents. The Histoire de César of Napoleon III., which extends only to the outbreak of the civil war, is especially valuable from the maps and plans which accompany it. The German student will find a full and satisfac- tory repertory of all that is known about the subject in Drumann, Geschichte Rons. (0. B.)~~

~~CASAR, Sir Jurius (1557-1636), a learned civilian,~~

~~_ descended by the female line from the Dukes de' Cesarini~~

~~in Italy, was born near Tottenham in Middlesex. He was educated at Oxford, and afterwards studied at thc university of Paris, where in the year 1581 he was created doctor of the civil law. Two years later he was admitted~~

~~to the same degree at Oxford, and also became doctor of~~

~~the canonlaw. He held many high offices during the reigns of Elizabeth and James I., and for the last twenty years of his life was master of the rolls. He was so remarkable for his bounty and charity to all persons of worth, that it was said of him that he seemed to be the almoner-general of~~

~~the nation. His manuscripts, many of which are now in the British Museum, were sold by auction in 1757 for up-~~

~~wards of £500. See E.Lodge, Life of Sir Julius Cesar, 1810. CAESAREA, the name of two towns in Palestine :— I..Ca@sarza Parestina, now Kaisaryah, the Roman~~

~~the same distance north-west of Jerusalem. It was built about 22 B.c, by Herod, on the site of an earlier town called Turris Stratonis. Vast sums of money were spent in the erection of its more important buildings, among which were a temple dedicated to Cwsar, a theatre, and an amphitheatre.~~

~~The most stupendous work, however, was the semicircular mole, constructed of immense blocks of stone brought from a great distance, and sunk to the depth of twenty fathoms in thesea. It protected the port on the south and west, leaving only a sufficient opening for vessels to enter from the north, so that within the enclosed space (which, according to Lieutenant Conder, measures 300 yards across) a fleet might ride in all weathers in perfect security. The site of the city is now marked by an extensive mass of ruins, among which may still be traced the substructions of all the above-mentioned buildings, as well as those of~~

~~the cathedral built by the Crusaders, an old fortress on the site, it is supposed, of Herod's "Drusus tower," two aqueducts, and a variety of minor structures. The line of the walls of the medieval town can still be made out, and in some parts that of the more extensive Roman works. The southern part of the mole is also intact. Cesarea was made the seat of a colony by Vespasian, and took for a time the title of Flavia, but its earlier name was maintained to the time of its complete decay. In the 4th century it was the see of Eusebius, the church historian, and during the crusading period was one of the chief posts of the invaders. Il. Casarea Purp, 95 miles north of Jerusalem, and about 35 south-west of Damascus, situated at the southern base of Mount Hermon, near one of the sources of the Jordan. It has been identified with Baalgad or Beth-Rehob, and was certainly known for a long time as Panium or Panias, the cave at the foot of the mountain being dedicated to Pan. Herod erected a temple to Augustus in the neighbourhood ; and the town was much enlarged and beautified by Philip the Tetrarch, who named it Ceesarea in honour of Tiberius the emperor, adding the cognomen of Philippi to distinguish it from the town last noticed. It continued to be a place of some importance till after the time of the Crusades, and was successively the seat of a Greek and a Latin bishopric. Its site is occupied by the modern Banids or Panias, a paltry and insignificant village, with numerous ruins in the vicinity. On the top of a conical hill above the village stands the castle of Subeibeh, which possibly dates from the time of the Phoenicians, and has been one of the most remarkable fortresses in Palestine from that day to this. CAHSAREA, or Katsarien, a city in Asiatic Turkey, formerly one of the most important~~

~~places in Cappadocia, and at present the chief town of a sanjak in the province of Karaman, situated on the Kara-su, between two spurs of the Mons Argzeus, in 38° 42’ N. lat. and 35° 20’ E. long. Jt is the seat of an Armenian bishop, and the commercial centre of an extensive and highly populous district; its markets are well supplied with European goods, and its inhabitants noted for their enterprise. Its principal manufactures are cotton and morocco leather. Recently it has become the scene of a considerable Protestant move- ment, and a girls’ school, the first in the city, has been established. The ruins of an earlier Mahometan town are immediately contiguous, and a little to the south are the ruins of the ancient city. The latter was known originally as Mazaca, and afterwards as Eusebia; and only received its present name fromthe Emperor Tiberius. It was for a time the seat of the Cappadocian kings; but it suffered greatly at the hands of Tigranes, who carried off its inhabi- tants to his new city of Tigranocerta. Under the later Roman empire it recovered to such an extent that it was supposed to contain 400,000 inhabitants when it was cap- tured by Sapor in the reign of Valerian. The present population, of which about two-thirds are Turks and the rest mainly Armenians and Greeks, is estimated at about~~

~~10,000.~~

~~CAFFRARIA KAFFRARIA, CAGLI (the ancient Calles), a walled town of Italy, in the province of Pesaro e Urbino, at the confluence of the Cantiano and Busso, the former of which is crossed there by an ancient Roman bridge It is the seat of a bishop, and has a cathedral and several churches and monasteries, in one of which, Santo Domenico, is preserved a famous fresco by Giovanni Santi, the father of Raffaelle. The principal occupation of the town is the manufacture of leather. Population 10,213. CAGLIARI, the capital of the island of Sardinia, and chief town of its southern province, is situated in the recess of the bay to which it gives its name, not far from the~~

~~See Arrica (vol. 1 p. 263) and~~

~~mouth of the River Mulargia, in 39° 33’ 14” N. lat. and 9° 7’ 48” E. long. It has a splendid appearance from the sea, occupying as it does the slope and~~

~~summit of a hill, which is crowned by a noble castle. This building gives the name of Castello, or, in Sardinian, Casteddu, to the district containing the vice-regal palace, the cathedral, the university, the theatre, the chief mansions of the nobility, and the public seminaries. To the west of the Castello lies the district of Stampace, with the Corso, and to the east that of Villanuova with its pleasant promenades,—both consisting for the most part of narrow, irregular, and ill. paved streets, but the former inhabited by the wealthier citizens. The slope between the castle and the bay igs occupied by the Marina, a well-built quarter, containing the residences of the merchants and consuls, the bonded warehouses, and the lazaretto; while to the west of the town is the spacious suburb of St Avandrace, nearly a mile in length. The university, which possesses the four faculties of theology, law, medicine, and arts, was founded in 1596 by Philip of Spain, was restored in 1720, and was remodelledin 1764. It has a library of upwards of 22,000 volumes, and numbers from 100 to 200 students. Besides the cathedral, which was built by the Pisans during the 14th century (though the present front only dates from 1703), Cagliari contains about thirty churches and twenty convents, of which the Capuchin monastery is interesting for remains of Roman reservoirs. There is a considerable museum both of antiquities and natural history, as well as a recently erected observatory ; and the benevolent institu- tions comprise an orphanage, and a large civil hospital, under the superintendence of a medical board and the sisters of mercy, with a separate wing set apart for the accommodation of lunatic patients. There are also in the town a mint, an extensive custom-house, and – barracks, Cagliari is the see of an archbishop, and the seat of the Sardinian Cortes, and of the judicial court for the southern division of the island. The bay, formed by the projection of Cape Carbonara and Cape Pula, and stretching inland for a distance of 12 miles, with an extreme width of 24 miles, contributes greatly to the commercial importance of the city; and the harbour, situated at the south angle of the wall of the Marina quarter, is one of the safest in the Mediterranean, being well sheltered from every wind except the south. Frequent proposals have been made to extend the area by the construction of a breakwater, but this has not as yet been effected. Cagliari is the chief port of Sardinia, and possesses by far the greatest part of the export trade, which principally consists of corn, fruits, oil, wine, cork, lead, and a few native manufactures. Most important of the last class is salt, procured, at the rate of 683,000 quintals per annum, from~~

~~the salt-pans to the west of the town. In 1873 the total value of exports from the province, most of which pass through the port, was £519,234; while the imports of the same year were of the value of £368,028. There is regular steam com- munication with Naples, Leghorn, and Genoa, as well as less frequently with other ports. The railway from Caglian to Iglesias, a distance of 334 miles, opens up the most important lead mines at present in operation, and a line of 58% miles leads to Oristano. There is a submarine telegraph to Malta and another to Béne in Algeria, The climate of the town, in spite of the proximity of the salt swamp already mentioned, is excellent ; and water, the want of which was formerly severely felt, is now supplied by an English company. Population in 1871, 33,039.~~

~~The modern city occupies the site of the ancient Carales or Caralis, which was founded by the Carthaginians, and passed into the hands of the Romans after the first Punic war. Of the buildings erected by the latter people there are several extensive remains,—those of an amphitheatre cut out in great part from the rock, a large aque: duct, a circular temple, &c.; while in the suburb of St Avandrace ate~~

~~numerous Roman sepulchres, of which the most interesting is that of Atilia Pomptilla. In the civil war between Cesar and Pompey, and during the empire, Cagliari was an important naval station; and, though it never obtained the status of a Roman colony, its inhabi- tants received the right of citizenship. Under Tiberius its popu- lation was augmented by the introduction of 4000 Jews, whose descendants were only expelled by the Spaniards in 1492. After the fall of the Western empire the city continued under the Van- dals to be the capital of the island, and retained its importance during the Middle Ages. In 1353 the Genoese were disastrously beaten in the neighbouring sea by the Aragonese and the Venetians. In 1708 the town was bombarded by the English under Admiral Lake ; in 1717 it was captured by the Spaniards ; in 1779 it suffered from a great famine ; and in 1793 it was bombarded by the French. From 1799 to 1815, while Savoy was in the hands of the French, Cagliari afforded a residence to the king of Sardinia.~~

~~CAGLIARI, Paoto. See VERONESE,~~

~~CAGLIOSTRO, Atussanpro, Count (1743-1795), the arch-impostor of modern times, was born at Palermo in 1743. Joseph Balsamc—for such was the count's real name—gave early indications of those talents which afterwards gained for him so wide a notoriety. He received the rudiments of his education at the convent of Cartagirone; where, being employed to read to the monks during dinner, he scandalized the good fathers by repeating the names and detailing the adventures of the most notoriously profligate females of hisnative town. For these and similar misdeeds he was expelled from the convent and disowned by his rela- tions. He now signalized himself by the ingenuity with which he contrived to perpetrate crimes without exposing himself to the risk of detection. He began by forging tickets for the theatres; then he forged a will; he next robbed his own uncle, and ultimately committed a murder. For the last offence he was imprisoned and brought to trial; but through a defect in the evidence, he escaped with his life. On his release he engaged a goldsmith, by name Marano, to assist him in searching for a hidden treasure,— Marano paying 60 oz. of gold in advance to defray expenses. On arriving at the cave where Joseph declared the treasure to be, six devils, prepared beforehand, rushed out upon the goldsmith, beat him soundly, and left him insensible. Dreading the vengeance of Marano, Balsamo quitted Sicily, and visited in succession Greece, Egypt, Arabia, Persia, Rhodes (where he took lessons in alchemy and the cognate~~

~~sciences from the Greek Althotas), Malta, Naples, Rome,~~

~~and Venice. At Rome he married a beautiful but unprincipled woman, with whom he travelled, under a variety of names, through the various countries of Europe. It is unnecessary to recount the various infamous means which he employed to support himself during his travels. At Strasburg he reaped an abundant harvest by professing the art of making old people young ; in which pretension he was seconded by his wife Lorenzo Feliciani, who, though only twenty years of age, declared that she was sixty, and that she had a son a veteran in the Dutch service. In Paris he was implicated in the affair of the diamond neck- lace; and though he escaped conviction by the matchless impudence of his defence, he was imprisoned for other reasons in the Bastille. On his liberation he visited England, where he succeeded well at first; but he was ultimately outwitted by some English lawyers, and was~~

~~confined for a while in the Fleet. Leaving England, he travelled through Europe till he arrived at Rome, where he was arrested in 1789. He was tried and condemned to death for being a Freemason, but the sentence was afterwards commuted to perpetual imprisonment. He died in the fortress prison of San Leoin1795. The best account of the life, adventures, and character of Joseph Balsamo is contained in Carlyle's Miscellanies. Dumas's novel, Memoirs of a Physician, is founded on his adventures. See also aseries of papers in the Dublin University Magazine, vols. lxxviii. and lxxix. CAGNOLA, Lute, Marquis (1762-1833), a celebrated architect, a native of Milan. He was sent at the age of~~

~~fourteen to the Clementine College at Rome, and afterwards studied at the university of Pavia. He was intended for the legal profession, but his passion for architecture was too strong, and after holding some Government posts at Milan, he entered as a competitor for the constructiun of the Porta Orientale. His designs were commended, but were not selected on account of the expense their adoption would have involved. From that time Cagnola devoted himself entirely to architecture. After the death of his father he spent two years in Verona and Venice, studying the architectural structures of these cities. In 1806 he was called upon to erect a triumphal arch on the occasion of Eugene Beauharnais's marriage with the princess of Bavaria. The arch was of wood, but was of such beauty that it was resolved to carry it out in marble. The result was the magnificent Arco della Pace in Milan, one of the grandest erections of modern architecture, surpassed in dimensions only bythe Arcdel'Ktoile at Paris. Among other works executed by Cagnola are the Porta di Marengo at Milan, the Campanile at Urgnano, and the chapel of Santa Mar- cellina in Milan. He died on the 14th of August 1833.~~

~~CAGOTS, a people found in the Basque provinces, Béarn, and Gascony. During the Middle Ages they were popularly looked upon as crétins, lepers, heretics, and even as cannibals. Entirely excluded from all political and social rights, they were not even allowed to enter a church but by a special door, or to remain except in a part where they were carefully secluded from the rest of the wor- shippers. To partake of the mass was never permitted~~

~~them. They were compelled to wear a distinctive dress, to which, in some places, was attached the foot of a goose or duck (whence they were sometimes called Canards). And so pestilential was their touch considered that it was a crime for them to walk the common road barefooted. The only trades allowed them were those of butcher and carpenter, and their ordinary occupation was wood-cutting. Their language is merely a corrupt form of that spoken around them; but a Teutonic origin seems to be indicated by their fair complexions and blue eyes. Their crania have a normal development ; their cheek-bones are high; their noses prominent, with large nostrils; their lips straight; and they are marked by the absence of the auricular lobules. Upon the last peculiarity great stress is laid by anthropolo- gists, and it is held to point to a Gothic origin. The common opinion of authorities is that this people are descendants of the Visigoths, and M. Michel derives the name from caas.(dog) and Goth. But opposed to this etymology is the fact that the word cagot is first found in the for of Béarn not earlier than 1551, while the older MSS. call these peoples Chrétiens, or Chrestiaas, a term which, on this hypothesis, would have its origin from the fact that these Visigoths, left behind in Aquitaine, were Christians, while the Gascons were still Pagans. On the contrary, M. Marca, in his Histoire de Béarn, holds that the word signifies "hunters of the Goths," and that the Cagots are descendants of the Saracens. Again, some would make them descendants of the Albigenses; others of crétins (they are sometimes called Crétins) ; and others of lepers, declaring their name to be connected with the Celtic caccod and the Spanish gafo. In the laws of Navarre (1704) they are indeed styled gaffos, and treated as lepers; but in those of Béarn, they are clearly distinguished from them.~~

~~Small communities, believed to be of the same race, and existing in a similar social condition, being classed with them as "les races maudites," are to be found in Maine, Anjou, Poitou, and Aunis, under the name of Collaberts (a word said by Ducange to be derived from cum and libertus, and signifying "neither free nor slave"); in Brittany, under the names Cahets, Caqueux, Cacous, IV. — 81~~

~~Caquins, or Cacvas ; in Auvergne, under that of Marrons. Considerable numbers of the Colliberts still live in the Marais mouillés de la Sevre; and the Cagots may be found round Jaca, in Guipuzcoa, in Navarre, at Cherbitua @ Anhauze in the valley of Azun, near Saint-Jean-Pied-de- Port and Saint-Jean-le-Vieux, and in the villages of Ago- tetchiac, Tailhapé, and Ainchicharburu, but in largest num- bers in Labour, in the Basque arrondissement of Bayonne.~~

~~Sce Michel, Histoire des races maudites ; 1' Abbé Venuti, Re- cherehes sur les Cahets de Bordeaux, 1754; Bulletins de la Société Anthropologique, 1861, 1867, 1868, 1871; Annales medico-psycho- logiques, Jan. 1867 ; M. Lagneau, Questionnaire sur P&hnologie de la Franee.~~

~~CAHORS, a town in the south of France, formerly the capital of Cahourcin or Upper Quercy, and now of the department of Lot, on the high road between Paris and Toulouse, 358 miles S.W. from Paris, and 60 miles north of Toulouse, in 44° 27' N. lat., 1° 24' E. long. It stands on the right bank of the River Lot, on a rocky peninsula formed by a bend in the stream, and communicates with the opposite shore by three bridges,—one, the Pont Valendré, built in the 13th century, and surmounted by three massive towers. In the moré ancient part of the town the streets are narrow and the houses antique; but in the modern and more elevated quarter there are many handsome buildings, with terraces which command an extensive view. The most remarkable building is the cathedral, built in the 11th or 12th century, and occupying the site, if not actually consisting of the remains, of an ancient Roman temple. Besides it, there is the theological seminary, the prefecture (formerly an episcopal palace), an academy, a theatre, a public library, and a monument erected to Fénelon in front of the cathedral. Cahors is the see of a bishop, and the seat of judicial and commercial tribunals of the first class. Its university, founded by Pope John XXII. in 1332, was incorporated with that of Toulouse in 1751. The principal articles of manufacture are stoneware, cotton-yarn, woollen stuffs, and paper; and it has a considerable traffic in oil, hemp, flax, hides, truffles, and a strong deeply-coloured wine, which is made in the neighbouring districts. Popu- lation of the town in 1872, 13,061, and of the commune~~

~~14,593.~~

~~Cahors is the ancient Divona, afterwards called Civitas Cadur- eorum, from the Celtic tribe of which it was the capital, and still ex- hibits traces of its greatness during the Roman sway. The most con- spicuous remains are those of an immense aqueduct, which conveyed the water to the city from a distance of about 19 miles by a precipi- tous route along the mountain sides, and crossed the valley of Larroque-des-ares on a bridge 180 feet high. There are also remains of baths and a theatre, a marble altar in front of the prefecture (erected, according to the inscription, in honour of Lucterius Leo); and a cclebrated fountain, supposed to be the fountain Divona, and now called Des Chartreux, from the Carthusian convent to which it has been attached.~~

~~After the decline of the Roman empire Cahors passed in succession into the hands of the Goths, the Franks, the Saracens, and the Normans ; and in the 12th century it was the subject of severe fighting between the English and French. In 1572 the Protestant party in the town were strong enough to prevent thcir fellow-citizens following the example of Paris; and yct a few years later, in 1580, we find the opposition to Henry of Navarre so violent that he only made himself master of the place after several days of conflict. The bishops of Cahors, who date from the 4th century, had formerly also the title of count, and used to lay their sword and gauntlets on the altar when about to officiate. During the Middle Ages the town is said to have been a great seat of the Caorsini (Cawertschen or Cauder- Walsche), who preecded the Lombards as usurers and money- changers.~~

~~See Chaudruc de Crazannes, Coup @eil sur les monuments histor-~~

~~tques du departement du Lot ; Dufour, La commune de Cahers au moyen age, 1846.~~

~~CAILLE, Nicotas Louis DE LA. See LA CAILieE. CAILLIE, or Catti#, René (1799-1838), a French~~

~~traveller in Africa, was born in 1799 at Mauzé, and died in 1838. His schvol education extended no farther than~~

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~~reading and writing; and at the age of sixteen he com- menced his career by a voyage to Senegal. But already Robinson Crusoe had kindled within bim an enthusiastic admiration for the life of the discoverer; and in 1897, having collected 2000 franes by toiling on an indigo plan- tation, he set out on his most important mission. From Kakundy he travelled east by Cambaya, Kankan, Time, and Tangrera, and north-east by Donasso as far as Galia, through a hitherto unvisited district; and from Galia he passed through the country explored by Mungo Park to Timbuctoo, which he reached on April 20, 1828. He thus won the prize of 10,000 francs offered by the Geographical Society of Paris to the first traveller who should gain exact information of Timbuctoo, to be compared with that given by Mungo Park. THe also received the order of the Legion of Honour, a pension, and other distinctions, and it was at the public expense that his Journal d'un Voyage a Tembouctou et Jenné dans ? Afrique Centrale, &ec., was published in 1830.~~

~~CAIN, the eldest son of Adam and Eve according to the narrative of the Jehovist (Gen. iv.) Various derivations of the name have been suggested, the most probable being from 132, ''to obtain," the word used in Gen. iv. 1: "Eve bare Cain, and said, I have gotten a man from the Lord." According to the Biblical narrative (Gen. iv.) Cain was a tiller of the ground, while his younger brother, Abel, was a keeper of sheep. Enraged at the acceptance of Abel's offering by the Lord, and the rejection of his own, he slew his brother in the field) As a punishment he was expelled from Eden, and condemned to be a "fugitive and a vagabond" on the earth, a mark being set upon him "lest any finding him should kill him." He took up his abode in the land of Nod, on the east of Eden, where he built a city, which he named after his son Enoch. The narrative presents a number of difficulties, which commentators have sought to solve with more ingenuity than success. On the reason for the preference of Abel's offering to Cain's some light is thrown by the references in the New Testament (Heb. xi. 4; 1 John iii. 12). The phrase "the Lord set a mark upon Cain" is perhaps more aceurately rendered "the Lord gave a sign to Cain," and has been variously explained as referring to some pledge of safety given to Cain personally, or to some sign of warning and prohibition to mankind in general. There is an apparent contradic- tion between the condemnation of Cain to lead a nomadic life~~

~~(ver. 12) and his subsequent settlement in a city, which it has been sought to reconcile by making the doom refer to the natural restlessness of the criminal and estrange- ment from the Adamic home. The endeavours that have been made to fix the precise locality of the land of Nod are based upon mere conjecture. The implied existence of @ considerable population on the earth (ver. 14) furnishes another difficulty, of which no explanation that has been offered seems completely satisfactory. The parallelism between the list of Cain's descendants (Gen. iv. 18) and the list of the descendants of Seth (Gen. v.) has led several critics to identify the two, though it is denied by others that the mere similarity of the names gives any reasonable ground for doing so.~~

~~A Gnostic sect of the 2d century were known by the name of Cainites. They are first mentioned by Ireneus, who connects them with the Valentinians. They believed that Cain derived his existence from the superior power, and Abel from the inferior power, and that in this respect he was the first of a lme which included Esau, Korah, the Sodomites, and Judas Iscariot.~~

~~CAIRN (in Welsh, Carne), a heap of stones piled up in a conical form. In modern times cairns are often erected as landmarks. In ancient times they were erected as sepulchral monuments or tribal and family cemeteries.~~

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~~The Duan Hireanach, an ancient Irish poem, describes the | creased supply of gold attendant on the Australian and~~

~~erection of a family cairn ; and the Senchus Mor, a collec- tion of Irish laws ascribed to the 5th century, prescribes a fine of three three-year-old heifers "for not erecting the tomb of thy chief." Meetings of the tribes were held at them, and the inauguration of a new chief took place on the cairn of one of his predecessors. It is mentioned in the Annals of the Four Masters that, in 1225, the O'Connor was inaugurated on the cairn of Fraech, the son of Fiodhach, of the red hair. In medizval times cairns are often referred to as~~

~~boundary marks, though probably not originally raised for that purpose. In a charter by King Alexander II. (1221), granting the lands of Burgyn to the monks of Kinloss, the boundary is described as passing "from the great oak in Malevin as far as the Rune Pictorum," which is explained as "the Carne of the Pecht's fieldis." In Highland districts small cairns used to be erected, even in recent times, at places where the coffin of a distinguished~~

~~_ person was "rested" on its way to the churchyard.~~

~~Memorial cairns are still occasionally erected, as, for instance, the cairn raised in memory of the Prince Consort at Balmoral, and " Maule's Cairn," in Glenesk, erected by the earl of Dalhousie in 1866, in memory of himself and certain friends specified by name in the inscription placed upon it. See Barrows.~~

~~CAIRNES, Joun Expiorr, a distinguished political economist, was born at Drogheda in 1824, and died on the 8th July 1875. After leaving school he spent some years in the counting-house of his father, who was an extensive brewer. His tastes, however, lay altogether in the direc- tion of study, and he was permitted to enter Trinity College, Dublin. He took the degree of B.A. in 1848, and six years later commenced as M.A. After passing through the curriculum of arts he engaged in the study of law and was called to the Irish bar. But he does not appear to have felt any very strong inclination for the legal profession, and during some years he occupied himself to a large extent with contributions to the daily press, treating of the social and economical questions that affected Ireland. The subject to which at this time he devoted most attention was political economy, which he studied with great thoroughness and care, While residing in Dublin he made the acquaintance of Archbishop Whately, who conceived a very high respect for his character and abilities. In 1856 a vacancy occurred in the chair of Political. Economy at Dublin founded by Whately, and Cairnes received the appointment. In accord- ance with the regulations of the foundation, the lectures of his first year's course were published. The book ap- peared in 1857, with the title Character and Logical Method of Political Economy, and did not, perhaps, receive so much attention as it deserved. It follows up and expands J. 8. Mill's treatment in the Hssays on some Unsettled Questions m Political Economy, and forms a most admirable intro- duction~~

~~to the study of economics asa science. In it the author's peculiar powers of thought and expression are dis- played to the best advantage. Logical exactness, precision of language, and firm grasp of the true nature of economic facts, are the qualities characteristic of this as of all his other works. If the book had done nothing more, it would still have conferred inestimable benefit on political economists by its clear exposition of the true nature and meaning of the ambiguous term law. To the view of the province and method of political economy expounded in this early work the author always remained true, and several~~

~~of his later essays, such as those on Polttical Economy and –~~

~~Land, Political Economy and Laissez-Faire, are but reitera- tions of the same doctrine.~~

~~His next contribution to economical science was a series of articles on the gold question, published partly in Mraser's Magazine, in which the probable consequences of the in-~~

~~Californian gold discoveries are analyzed with great skill and ability. The general conclusions arrived at in these papers with regard to the effects of the depreciation of gold—that finished manufactures would be on the average least altered in price; that raw produce, particularly the portion derived from the animal kingdom, would be most seriously affected ; and that, on the whole, the section of the population most nearly concerned in the movement would be the class of labourers or artisans—are highly interesting, and have been confirmed to a remarkable extent by recent statistical researches. The further infer- ences drawn as to the international results likely to follow on the introduction into the several currencies of so large a mass of gold have not been borne out to the same extent. The facts were too complex to admit of accurate prediction. The articles attracted much attention at the time, and were highly commended by the most competent judges. A critical article on M. Chevalier's work On the Probable Fall in the Value of Gold, which appeared in the Edinburgh Review for July 1860, may be regarded as the sequel to these papers.~~

~~In 1861 Cairnes was appointed to the professorship of political economy and jurisprudence in Queen's College, Galway, and in the following year he~~

~~published his ad- mirable work Zhe Slave Power, one of the finest speci- mens of applied economical philosophy. The inherent dis- advantages of the employment of slave labour are exposed with great fulness and ability, and the conclusions arrived at have taken their place among the recognized doctrines of political economy. To a very large extent the opinions expressed by Cairnes as to the probable issue of the war in America were verified by the actual course of events.~~

~~During the remainder of his residence at Galway Pro- fessor Cairnes published nothing beyond some fragments and pamphlets, mainly upon Irish questions in which he was deeply interested. The most valuable of these papers are the series devoted to the consideration of university education in Ireland. His health, at no time very good, was still further weakened in 1865 by a fall from his horse, which inflicted severe injury on one of his legs. He was ever afterwards incapacitated from active exertion, and was constantly liable to have his work interfered with by attacks of illness. In 1866 he was appointed professor of political economy in University College, London. He was compelled to spend the session 1868-69 in Italy, but on his return continued to lecture till 1872. During his last session he conducted a mixed class, ladies being ad- mitted to his lectures. His health soon rendered it impos- sible for him to discharge his public duties; he resigned his post in 1872, and retired with the honorary title of Emeritus Professor of Political Economy. In 1873 his own university conferred on him the degree of LL.D.~~

~~The last years of his life were spent in the collec- tion and publication of some scattered papers contributed to various reviews and magazines, and in the prepara- tion of his most extensive and important work, The Political Essays, published in 1873, comprise all the papers relating to Ireland and its university system, together with some other articles of a somewhat similar nature. The Essays in Political Economy, Theoretical and Applied, which appeared in the same year, contain the essays to- wards a solution of the gold question, brought up to date and tested by comparison with statistics of prices. Among the other articles in the volume the more important are the criticisms on Bastiat and Comte, and the Essays on Polztecal Economy and Land, and on Political Economy and Laissez- Faire, which have been referred to above. In 1874 appeared his largest work, Some Leading~~

~~Principles of Political Economy, newly Expounded, which is beyond doubt a~~

~~worthy successor to the great treatises of Smith, Malthus, Ricardo, and Mill. It does not expound a completed system of political economy; many important doctrines are left untouched; and in general the treatment of problems is not such as would be suited for a systematic manual. The work is essentially a commentary on some of the principal doctrines of the English school of economists, such as value, cost of production, wages, labour and capital, and international values, and is replete with keen criticism and lucid illustration. While in fundamental harmony with Mill, especially as regards the general conception of the science, Cairnes differs from him to a greater or less extent on nearly all the cardinal doctrines, subjects his opinions to a searching examination, and generally succeeds in giving to the truth that is common to both a firmer basis and a more precise statement. The last labour to which he devoted himself was a republication of his first work on the Logical Method of Polttical Economy, which had long been out of print The second edition appeared in April, a few months before the author's untimely death.~~

~~Taken as a whole the works of Cairnes form the most important contribution to economical science made by the English school since the publication of J. S. Mill's Principles. As has been already pointed out, they possess especial value by reason of the writer's firm grasp of thenature, method, and limits of the science he is engaged in expound- ing. It is not possible to indicate more than generally the special advances in economic doctrine effected by him, but the following points may be noted as establishing for him a claim toa place alongside of Ricardo and Mill :—(1.) His exposition of the province and method of political economy. He never suffers it to be forgotten that political economy is a sctence, and consequently that its results are entirely neutral with respect to social facts or systems. It has simply to trace the necessary connections among the phe- nomena of wealth, and dictates norulesfor practice. Further,~~

~~he is distinctly opposed both to those who would treat~~

~~political economy as an integral part of social philosophy, and to those who have attempted to express economic facts in quantitative formule, and to make economy a branch of applied mathematics. According to him political economy is a mixed science, its field being partly mental, partly physical. It may be called a positive science, because its premises are facts, but it is hypothetical in so far as the laws it lays down are only approximately true, 7.¢., are only valid in the absence of counteracting agencies. From this view of the nature of the science, it follows at once that the method to be pursued must be that called by Mill the Physical or Concrete Deductive, which starts from certain known causes, investigates their consequences, and verifies or tests the result by comparison with facts of experience. It may, perhaps, be thought that Cairnes gives too little attention to the effects of the organism of society on economic facts, and that he is disposed to over- look what have recently been called by Mr Bagehot the postulates of political economy. (2.) His analysis of cost of production in its relation to value. According to Mill, the universal elements in cost of production are the wages of labour and the profits of capital. To this theory Cairnes objects that wages, being remuneration, can in no sense be considered as cost, and could only have come to be regarded as cost in consequence of the whole problem being treated from the point of view of the capitalist, to whom, no doubt, the wages paid represent cost. The real elements of cost of production he looks upon as labour, abstinence, and risk, the second of these falling mainly, though not necessarily, upon the capitalist. In this analysis he to a considerable extent follows and improves upon Senior, who had previously defined cost of pro- duction as the sum of the labour and abstinence neces-~~

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~~sary to production. (3.) His exposition of the natural or social limit to free competition, and of its bearing on the theory of value. He pvints out that in any organized society there can hardly be the ready transference of capital from one employment to another, which is the indispensable condition of free competition ; while class distinctions reuder it impossible for labour to transfer itself readily to new occupations. Society may thus be regarded as consisting of a series of non-competing industrial groups, with free competition among the members of any one group or class, Now the only~~

~~condition under which cost of production will regulate value is perfect competition. It follows that the normal value of commodities—the value which gives to the producers the average and usual remuneration—will depend upon cost of production only when the exchange is confined to the members of one class, among whom there is free competition. In exchange between classes, or non- competing industrial groups, the normal value is simply a case of international value, and depends upon reciprocal demand, that is to say, is such as will satisfy the equation of demand. This theory is a substantial contribution to economical science, and throws great light upon the general problem of value. At the same time, it may be thought that Cairnes has overlooked a point brought forward prominently by Senior, who also had called attention to the bearing of competition on the relation between cost of production and value. The cost to the producer fixes the limit below which the price cannot fall without the supply being affected ; but it is the desire of the consumer—z.e., what he is willing to give up rather than be compelled to pro- duce the commodity for himse]f—that fixes the maximum value of the article. To treat the whole problem of natural or normal value from the point of view of the producer is to give but a one-sided theory of the facts. (4.) His defence of the wages fund doctrine. This doctrine, expounded by Mill in his Principles, has not been universally accepted even by British economists, and has recently been assailed with great vigour by Thornton and F. D. Longe. In consequence of these attacks it has been relinquished by Mill, but Cairnes still undertakes to defend it. He cer- tainly succeeds in removing from the theory much that has tended to obscure its real meaning, and in placing it in its very best aspect. He has also shown the sense in which, when treating the problem of wages, we must refer to some fund devoted to the payment of wages, and has pointed out the conditions under which the wages fund may increase or decrease. But he has not, it seems to us, been successful in showing that the theory is fruitful, or gives any satisfactory explanation of the many complicated questions connected with the varying rates of wages. These points, of course, do not comprehend all or nearly all that Cairnes has handled in his peculiarly fresh and attractive manner. The Leading Principles, for instance, contain admirable discussions on trades unions and protec- tion, together with a clear analysis of the difficult theory of international trade and value, in which there is much that is both novel and valuable, while numerous minor topics are treated throughout the volume. The Logical Method~~

~~contains the best exposition and defence known to us of Ricardo's theory of rent; and the Hssays contain what is probably the most complete and successful criticism of Bastiat's economic doctrines. (R, AD.)~~
~~CAIRNGORM, or CarrNcoruM, a name _ popularly applied to a wine-yellow or brown variety of rock crystal found, among other localities, on the Grampian Mountains in the south-east of Banffshire, Scotland, the central peak being called Cairngorm. The colour of the crystals, which is due to a minute proportion of iron oxide, varies, passing through those above noted as belonging properly to cairngorms, into a dull grey, smoky quartz, and to a black~~

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~~variety, called morion. The same stone is found in com- merce passing under the names of false topaz, Brazilian topaz, occidental topaz, and cinnamon stone (pierre de cannelle of the French). It is found in many parts of the world, Brazil producing the finest deep brown varieties ; but fine stones also come from India, Bohemia, Mexico, and Pennsylvania. It is also found at the Carnbrae Mines, in Cornwall. In the cairngorm district masses weighing as much as 25 ib have been obtained, and an Edinburgh lapidary cut nearly £400 worth of ornamental stones out of a single crystal. The cairngorm is chiefly used for Scotch jewellery, the mounting of gold and silver plaid- brooches, setting in the lids of snuff-mulls, the handles of dirks, &c., and the ornamentation of other articles connected with the Highland costume. The stones are most effec- tively set by covering the undersets entirely with oblong facets arranged in regular rows, surrounding the table with triangular facets and keeping the stone as thick as possible. By this means great brilliancy, combined with depth of colour, is secured.~~

~~CAIRO (in Arabic, Masr-al-Kahira, or, as the lower classes of the population call it, simply Masr), the modern capital of Egypt, occupies the natural centre of the country,~~

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~~Ground-Plan of Cairo.~~

~~J. Karameydan (Place Mehemet Ali). 4. French Theatre. 2. Rosetti Gardens. 5. Opera House. 3. Post-Office. 6. English and German Churches.~~

~~being situated on the east bank of the Nile, 12 miles above the apex of its delta, 150 miles by rail from Alexandria, and 80 west from Suez, in 30° 2' 4" N. lat. and 31° 15' 26" E. long. It is built partly on the plain and partly on the lower slopes of the rocky range of Mokattem, on a spur of which stands the citadel, 250 feet above the level of the town. The prospect from the ramparts of this fortress is one of great magnificence and beauty. Below lies the city with its strongly-built walls and lofty towers, its gardens and squares, its palaces, and its mosques, in all the beauty of their delicately-carved domes and minarets covered with fantastic tracery, the port of Bulak, the gardens and palace of Shubra, the broad river studded with islands, the valley of the Nile dotted with groups of trees, with the pyramids~~

~~on the north horizon, the fields, gardens, and villas on the west, and on the east the barren cliffs, backed by an ocean of sand.~~

~~As far as the portion within the walls is concerned, Cairo oscupies a site of about seven miles in circumference ; but during the reign of the khedive (properly hidiv), who was born in the city in 1830, it has extended, especially towards the river, so as to have a circuit of at least 8 or 9 miles. Its improvement has kept pace with its extension, and it can no longer be altogether described as little better than a labyrinth of tortuous lanes, narrow, unpaved, and continually swept with clouds of dust blown from huge mounds of rubbish outside the walls. New streets have been cut through the more crowded districts; and the Ezbekeeyah, the principal square of the city, which was formerly allowed to lie waste, has been transformed into public gardens with a lake in the centre, while houses and shops of considerable pretensions have sprung up in the neighbourhood. Most important of the new streets is the Boulevard Mehemet Ali, which traverses the city in an _ almost northerly direction from the Citadel to the Ezbe- keeyah. Between the western side of the older city and the river most of the ground has been laid out in building lots, and in various parts, as particularly in the direction of Bulak, it is already covered with regular rows of houses, and forms the district of Ismaileeyah. Bulak, in fact, is not so much a distinct town as a mere suburb of the larger city. Gas has been laid down in all the principal streets, and water is supplied by a company to the~~

~~houses of all those who comply with the necessary regulations. In spite of all these innovations, however, the city largely retains its Oriental character, and in a hundred of its narrow streets it is easy to forget that any change at all has taken place.~~

~~The most of the houses of the poorer classes consist of miserable mud hovels, with filthy courts, dilapidated windows, and tattered awnings. In marked contrast to these are the houses of the wealthier citizens, built generally in a style of elaborate arabesque, the windows shaded with projecting cornices of graceful woodwork, and ornamented with stained glass. A winding passage leads through the ornamented doorway into the court, in the centre of which is a fountain shaded with palm-trees. The principal apartment is generally paved with marble ; ,in the centre a decorated lantern is suspended over a fountain, whilst round the sides are richly inlaid cabinets and windows of stained glass; and in a recess is the dian, a low, narrow cushioned seat running round the walls. The basement story is generally built of the soft calcareous stone of the neighbouring hills, and the upper story, which contains the harem, of painted brick.~~

~~The town is walled off into quarters, deriving their names from the character or condition of their occupants, and is intersected in its whole breadth by a canal which conveys the waters of the Nile from Old Cairo to the dif- ferent parts of the city. The citadel or El-Kalah was built by Saladin about 1166, but it has since undergone frequent alteration, and now contains a palace erected by Mehemet Ali, and a mosque of Oriental alabaster founded by the same pasha on the site of "Joseph's Hall." In the centre is a well called Joseph's Well, sunk in the solid rock to the level of the Nile. Next to the citadel in importance are the mosques, 400 in number, including, however, many that are falling to ruins. The most magnificent is the Mosque of. Sultan Hasan, standing in the immediate vicinity of the citadel. It dates from 1357, and is celebrated for the grandeur of its porch and cornice, and the delicate honey- comb tracery which adorns them. Besides it there is the Mosque of Tulun (founded 879 a.p.), exhibiting very ancient specimens of the pointed arch; the Mosque of Sultan el~~

~~Hakem, the fanatical patron of the Druzes, founded in 1003; the Mosque Al Azhar ("The Splendid "), which is principally famous as the seat of a Mahometan university, in which gratuitous instruction is given in the Koran ; and the Mosque of Sultan Kalaoon, attached by its founder to the great Morostan or madhouse, which he established in 1287. The Morostan is no longer used for its original purpose, having been superseded by an asylum at Bulak. There is also a large general hospital situated between Bulak and Old Cairo, under the charge of uative doctors.~~

~~On the east of the city are the splendid structures erroneously known to Europeans as the tombs of the caliphs ; they really belong to the Circassian or Borgite Mamelukes, a race extinguished by Mehemet Ali. Their lofty gilt domes and fanciful network of arabesque tracery are falling to ruins, and the mosques attached to them are the haunts of a few solitary sheikhs, and of hordes of Arab beggars.~~

~~Among the buildings which owe their existence to modern European influence, the Italian opera, the French theatre, and the hippodrome may be mentioned. In Bulak is situated the Government printing-press, established by Mebemet Ali, from which numerous Oriental works and translations of French originals are issued from time to time ; and in a building by the river side is accommodated the unrivalled collection of Egyptian antiquities made by M. Mariette for the khedive. The manuscripts which were formerly scattered among the various mosques and other institutions were recently collected to form a public library in the palace of the Darb Algamamiz or Sycamore Street. The catalogue already occupies 333 pages, and the collec- tion is especially rich in copies of the Koran and works of grammatical exegesis. In 1875 a geographical society was founded by the khedive for purposes of African discovery. A few periodicals are published in the city, but in this respect Cairo is much behind Alexandria. The scheme of public instruction is mainly that which was organized by Mehemet Ali, and embraces primary, preparatory, and special schools. In 1872 there were 1025 students and 141 teachers in the Government colleges, and the national schools were attended by 4721 pupils, while in the Mosque Al Azhar 6774 were enrolled. The higher scholastic in- stitutions comprise a commercial and a juridical school at the Darb Algamamiz, a school of arts and industry at Bulak, and military schools at the Abbasseeyah. There are~~

~~several Christian churches and missionary stations in the city, and most of these maintain some educational machinery, so that there are Armenian, Greek, Coptic, Roman Catholic, and Protestant schools. Of special in- terest to Englishmen is Miss Whately's institution in"the Abbasseeyah road.~~

~~The commerce of Cairo is of considerable extent and variety, bnt consists mainly in the transit of goods. Gum, ivory, hides, and ostrich feathers from the interior, cotton and sugar from Upper Egypt, indigo and shawls from India and Persia, sheep and tobacco from Asiatic Turkey, and European manufactures, such as machinery, hardware, cutlery, glass, and woollen goods, are the more important articles. The traffic in slaves, which was at one time so striking a feature of the place, is still carried on to a certain extent. In Bulak are several factories founded by Mehemet Ali for spinning, weaving, and printing cotton, and a paper-mill established by the khedive in 1870 at a cost of about £80,000. Various kinds of paper are manufactured, and especially a fine quality for use in the Government offices. In the island of Rhoda, or Roudah, there is a sugar-refinery of considerable extent, founded in 1859, and principally managed by Englishmen. Silk goods, saltpetre, gunpowder, leather, &c., are also manu- factured. Am iron bridge has been erected over the Nile between the Kasr ed Dubbara on the right bank and~~

~~CAIRO~~

~~Gezirah on the left; and new carriage roads, bordered by acacias and sycamore trees, have been constructed to Heliopolis and the pyramids of Gizeh respectively. The terminus of the railway lines of the delta and isthmus is situated to the north of the city, but the Upper Egypt line stops short on the left bank of the river at Embabah opposite Bulak, and the trains have to: be.taken across by a ferry.~~

~~From the central situation of Cairo, and its proximity to the hot sandy deserts, the temperature is much higher there than uear the coast; but the diseases which infest it, such as the plague, ophthalmia, and malignant fevers, seem to originate in its "stifled filth," and other local causes, which advancing civilization will greatly remove, rather than in the unhealthiness of its situation. Its death-rate is greater than that of any European capital, but this is partly to be accounted for by the fact that numbers of natives~~

~~come to the city in order that their last hours may be spent within its walls. The greatest mortality is during winter, and a larger proportion of deaths is cansed by consumption than — by any other disease. The average temperature throughout the year is 71°°16 Fahr.; but the mean of the separate months varies from 54° in January to 86° in August. The temperature by night is sometimes 40° below the highest point reached during the day, more especially in March and April, when the south and south-west winds prevail, and the therniometer frequently rises to upwards of 100° in the shade. In 1871 the number of rainy days was only 9, and the total duration of the fall was 9 hours 8 minutes,~~

~~The population of Cairo is of a very mingled description, and presents a very pictnresque and interesting appearance. About the beginning of this century it was estimated to amount to about 200,000, which was supposed to comprise 121,000 Mahometans, 60,000 Copts, 4000 Jews, and a number of Franks, Greeks, and Armenians. It now num- bers about 350,000, which may be distributed in the fol- lowing proportions :—285,000 natives, 25,000 Nubians and natives of the Soudan, 10,000 Turks, 30,000 Jews and Levantines, and upwards of 19,000 Europeans. The Ger- man and English colonies are both pretty numerous, and possess each its own church. '~~

~~About 23 miles S.W. of the citadel, and 12 mile from the S.W. angle of the city, lies the town of Misr-al-'Atikah, or Old Cairo, situated on the Nile near the mouth of the canal which now flows through Cairo, and opposite to the famous Nilometer at the south end of the Island of Raudah. It occupies the site of the ancient Roman city or fortress of Babylon, of whose origin various stories of apparently little value are told by Diodorus and others. The place appears in Ptolemy's Zables, and Strabo mentions that it was the headquarters of one of the three Roman legions that garrisoned Egypt. Roman masonry survives as part of a convent enclosure, which is known by the names Kasr-es-Shammah ("Palace of Perfume") and Dair-en- Nasarah ("Convent of Christians"). The name Babylon of Egypt, or Babylon simply, is frequently employed im medizval writings as synonymous with Cairo, or as denoting the successive Mahometan dynasties of Egypt. This use may have been influenced by the association of the other Babylon, as represented by Baghdad, with the power of Islam; but at the same time it was a real survival from the ancient name; for Babylon on the Nile is~~

~~mentioned by Gregory of Tours (crea 580 .p.), in connection with the Granaries of Joseph—t.e., the Pyramids. Here Amru the famous conqueror of Egypt for the Caliph Omar (638) founded a city to which was given the name of Fostat, 1b is said from Amru's skin tent (so called in Arabic). This continued to be the capital of Egypt for upwards of 330 years. In 973 it was superseded by a new city founded shortly before by Jauher (Gewher), captain of the first~~

~~Fatimite caliph, Al Mocz, whose army had conquered Egypt in 969. It is said that the new city was originally the camp of Jauhar whilst besieging Fostat, which gradu- ally grew into a town, and got the name of Al Kahirah ("Victrix"), whence our Cairo. In 1176 the city was attacked by the Franks; and shortly afterwards it was fortified by Saladin, From 1507 to 1798 it remained the capital of the Turkish province of Egypt; but in the latter year it was captured by the French, who kept posses- sion till they were driven out in 1801 by the Turkish and English forces. Mehemet Ali secured his position by the massacre of the Mamelukes in the citadel in 1811, and laid the basis of the present independence of Egypt.~~

~~CAISSON, in engineering work, is a chamber of iron or wood which is used in the construction of subaqueous foundations,—such as those required for the piers of bridges, &c. Its object is the same as that of a cofier-dam, viz., to allow the work to be carried on below the water- level,—but it is used in places where either the water or the permeable soil is too deep to allow a dam to be erected. In cases where the bridge piers- are hollow cylinders of iron, they not unfrequently form their own caissons,—their own weight, or that of ballast placed upon them, forcing their lower edges into the ground. Tle material left within them is dredged up or excavated as they de- secend. Where, however, the soil is not so soft, or is mixed with stones, this self-lowering becomes impossible. The lower part of the caisson is then commonly formed into an air chamber, open at the bottom, and resting upon the bed of the river. Air is pumped into this at a pressure corresponding to its depth below the surface of the water, and the excavation is carried on by men working in the compressed air as in a large diving-bell. In some cases the masonry of the pier is built within the caisson~~

~~on the top of the chamber as it descends, the chamber itself being eventually filled up with masonry or concrete, and left to form the permanent base of the structure ; in others the caisson is lowered (as the excavation goes on) by weights ; and when the required depth has been reached, the masonry is commenced within the air-chamber, and the whole caisson raised again as the building proceeds. Probably the largest caissons ever used are' those of the East River Suspension Bridge (a structure still unfinished) at New York, of which one was 172 feet long by 102 feet wide. See BripcEs. For military caissons see FoRTIFICATION,.~~

~~CAITHNESS, the most northern county of the Scottish mainland, bounded W. and S. by Sutherlandshire, and E. and N. by the Northern Ocean, is situated between 58° 8' and 58° 40' N. lat., 3° 0' and 3° 55' W. long., and has an extreme length of 53 miles, an extreme breadth of 33, a coast line of 105 miles, and an area of 455,708 acres or 712 square miles. The form of Caithness resembles an irregular triangle, having as its greatest side the line of coast on the 8.E., stretching from the Ord of Caithness to Duncansby Head. The surface of the county generally is flat and tame, consisting for the most part of barren moors, and being almost entirely destitute of trees. It presents a gradual slope from the north and east upwards to the ridge of hills on the west and south, which separates it from Sutherlandshire, and on the southern boundary, where it is bifurcated, attains considerable elevation. The one branch, called the Maiden Paps, contains the peak of Morven, 2334 above the level of the sea; the other, continuing in the line of the main ridge, juts into the sea, and terminates in the huge granitic precipice of the Ord. In the centre of the county, hemmed in by the hills on the western boundary, the ridge of the Maiden Paps, and the sea, is a large undulating plain comprising nearly four-fifths of the Whole extent. On its southern side it is broken up by Several detached hills, and in the interior contains a con-~~

~~siderable number of small lakes. The most depressed part of the county lies in the peninsula formed in the north- east corner by the indentation of Dunnet Bay and Sinclair Bay. The more elevated portion presents a light sandy soil, which admits of considerable cultivation, but the low, grounds are coyered with extensive morasses, producing only heath and rough grass.~~

~~The geological formation consists chiefly of sandstone, sandstone flag, and occasionally limestone ; but granite and gneiss are also found in the west. On the east Caith- ness presents a precipitous coast, with scarcely a creek in which a vessel, even of small size, can find shelter. On the northern coast, where the Pentland Firth separates it from the Orkney islands, stand at the distance of 13 miles from each other the two bold headlands of Duncansby Head on the north-east and Dunnet Head on the north-west. The latter, the most northern point of Scotland, is situated in 58° 40' N. lat. and 3° 21' W. long., and is crowned by a lighthouse, with a fixed light, built on the rock 346 feet above the level of the sea; while the former is marked by the white steeple of Cannisby on the west. The navigation of the Pentland Firth is attended with considerable danger, from the strength and eddies of the current. Off the island of Stroma, which is separated from the mainland by a strait three miles broad, is a small vortex called the Swalcliue ; while nearer the shore are the " Merry Men of Mey," a group of breakers caused by eddies between projecting headlands. On the east coast, in addition to the harbour of Wick, erected in 1831, at a cost of above £40,000, and since improved at further expense, there is a small harbour at Sarclett and another at Staxigoe, a small pier at Clyth and another at Lybster. On the northern coast Scrabster roads in Thurso Bay afford tolerably good anchorage, while at Thurso and Sandside Bay are com- modious harbours for larger vessels.~~

~~The climate of Caithness is variable, but not unhealthy; and though the winter stornis fall with great severity on the unsheltered coast, yet from its proximity to a large expanse of sea the cold is not intense and snow seldom lies many days continuously. In winter and spring the northern shore is subject to frequent and disastrous gales from the N. and N.W. The waters of Forss, Thurso, and Wick, are the principal streams which traverse the county, but none of them are of any particular importance. The largest lochs are those of Watten and Cathel ; there are numerous small ones weil stocked with trout.~~

~~A great change has been effected in the agricultural position of Caithness, chiefly by the late James Traill, Esq. of Ratter. The farms along the coast are still mostly in the hands of small farmers, who cultivate the soil only during the intervals of the fishing-season; but inland, in the more elevated districts, and along the banks of the principal streams, the land is let out into~~

~~large farms, with leases long enough to encourage the holder to improve the soil and practise a rotation of crops. The average extent of land held by each occupier, in 1874, was 39 acres, much larger than the average in Sutherlandshire, which only amounted to 10 acres in the same year. In the pasturage ground, black cattle and sheep, chiefly of the Leicester and Cheviot breeds, are reared for the southern markets ; and, independently of the weekly corn-markets at Thurso and Wick, the rapidity of communication with the south is opening up a valuable market for the produce of the dairy and farmyard.~~

~~The principal crops raised are oats, beans, potatoes, and turnips ; wheat can be grown only where draining has been carried to considerable perfection. In 1874 there were only 87 acres in wheat, 1895 in barley, 70 in rye, and 27 in peas; while oats occupied 33,071 acres, turnips 14,045,. and potatocs 2190. In the same year there were 21,567~~

~~acres in permanent pasture, and 6222 in temporary grass, while only 440 were covered with wood. The number of cattle of all kinds in the county was 22,616, sheep 108,829, horses 4969, and pigs 1789. But the great source of profit to the inhabitants is to be found in the fisheries of cod, ling, lobsters, and herring, which abound all around the coast. The most important is the herring-fishery, though it has considerably lessened in value during the last twenty or thirty years. Beginning about the end of July the season lasts for about six weeks, the centre of operations being at Wick and the surrounding districts. The number of fishermen employed in 1874 was 4304; and the value of boats, uets, lines, &c., for the same year, was estimated at £112,270. Besides those more immediately engaged in manning the boats, the fisheries give employment to a large number of coopers, curers, packers, and others. The salmon-fisheries on the coast and at the mouths of rivers were formerly very productive, and are still let at high prices. At intervals along the coast are valuable quarries of freestone and slate, and of excellent flag for pavements ; but the county is far from rich in other minerals, Slight traces of lead and irof have been found in the mountainous districts ; and indications of coal, or rather of bituminous shale, have been noticed at Cannisby. The only article of manufacture is~~

~~woollen cloth. The Highland Railway, opened in 1873, enters the county.'from Sutherlandshire, and curves through the centre to Wick, passing Altnabreac, Secotscalder, Halkirk, Georgemas, Bower, Watten, and Bilbster ; while a branch line runs from the Georgemas junction to Thurso.~~

~~The early history of Caithness may, to some extent, be traced in the various character of the remains and the diversity of its local nomenclature. Picts' houses, Nor- wegian names, and Danish mounds attest that the Celts were successively displaced by these different tribes ; and the number and strength of its fortified keeps leave us to infer that its annals present the usual record of feuds, assaults, and reprisals. Circles of erect stones, as at Steinster Loch and Bower, and the ruins of Romanist chapels and places of pilgrimage in almost every district, illustrate the changes which have come over its ecclesiastical condition. The most important remains are those of Bucholic Castle, Girnigo Castle, and the tower of Keiss; and on the 8.E. coast the castles of Clyth, Swiney, Forss, Latheron, Knockinnan, Berridale, Achastle, and Dunbeath,—of which the last is romantically situated on one of the detached pillars of sandstone rock that are frequent along the Caithness coast. About six miles from Thurso stand the ruins of Braal Castle, the residence of the ancient bishops of Caithness, and on the shores of the Pentland is situated the mythical site of John o' Groats' House. The total number of landowners in 1872-3 was 1030,—among the most important being the duke of Portland, with 81,605 acres ; Sir John Sinclair of Tollemache, with 78,053 ; Mrs Thomson Sinclair of Fenswick, with 57,757 ; Sir Robert Anstruther of Balcaskie in Fife, with 36,597 ; and the earl of Caithness, with 14,460.~~

~~Caithness is divided into ten civil and twelve quoad sacra parishes, and contains twelve churches and two chapels of ease belonging to the Establishment (in four of which there is service in Gaelic); seventeen belonging to the Free Church (in seven of which there is service in Gaelic) ; one United Presbyterian, and one Roman Catholic at Wick.~~

~~The county returns one member to the imperial par- liament. The parliamentary constituency in 1875-76 was 1172. The principal towns are Wick and Thurso; the most important villages are Broadhaven, Castletown,~~

~~Louis- burgh, Sarclett, and Staxigoe. The population in 1831 was 34,529; in 1841, 36,343 ; in 1851, 38,709; and in 1871,~~

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~~39,992. In the last year the males numbered 18,937, and the females 21,055; and there were in the county at the saine date 7474 inhabited houses, 203 vacant, and 43] building.~~

~~CAIUS, Kays, or Keyz, Dr Jounw (1510-1573), tho founder of Caius College in Cambridge, was born at Nor- wich in 1510. He was admitted while very young a student at Gonville Hall, Cambridge. From his exercises performed there it seems probable that he intended to prosecute the study of divinity. He visited Italy, where he studied under the celebrated Montanus at Padua ; and in 1541 he took his degree in physic at Bologna. In 1543 he visited several parts of Italy, Germany, and France; and returning to England, he began to practise first at Cam- bridge, then at Shrewsbury, and afterwards at Norwich. He removed to London in 1547, and was admitted fellow of the College of Physicians, of which he was for many years president. In 1557, being then physician to Queen Mary, he obtained a licence to advance Gonville Hall into a college, and he endowed it with several considerable estates, adding an entire new square at the expense of £1834. Of this college he accepted the mastership, which he held till within a short period of his death. He was physician to Edward VI., Queen Mary, and Queen Elizabeth. Towards the end of his life he retired to lus own college at Cambridge, where having resigned the mastership to Dr Leggie of Norwich, he spent the remainder of his life as a fellow commoner. He died in July 1573, and was buried in the college chapel. Dr Caius wasa learned, active, and benevolent man. In 1557 he erected @ monument in St Paul's to the memory of Linacre, In 1563 he obtained a grant for the College of Physicians to take the bodies of two malefactors annually for dissection ; and he was the inventor of the insignia which distinguish the president from the rest of the fellows.~~

~~His works are—1l. Annals of the College from 1555 to 1572. 2. Translation of several of Galen's works, printed at different times abroad. 3, Hippocrates de Medicamentis, first discovered and pub- lished by Dr Caius; also De Ratione Vietus, Lov. 1556, 8vo. 4. De Mendcti Methodo, Basel,~~

~~1554; Lond. 1556, 8vo. 5. Account of the Sweating Sickness in England, Lond. 1556, 1721. It is en- titled De Ephemera Britannica. 6. History of the University of Cambridge, Lond. 1568, 8vo ; 1574, 4to, in Latin. 7. De Thermis Britannicis ; but it is doubtful whether this work was ever printed. 8. Of some Rare Plants and Animals, Lond. 1570. 9. De Canibus Britannicis, 1570, 1729. 10. De Pronunciatione Greece: et Latine LTingue, Lond. 1574. 11. De nbris propriis, Lond. 1570. He also wrote numerous other works which were never printed.~~

~~CAJAZZO, or Ca1azzo, a town of Italy, in the province of Terra di Lavoro, and district of Piedimonte, situated on~~

~~'a height on the north bank of the Volturno, about 11~~

~~miles from Capua. It possesses a fine cathedral, and is defended by a castle of Lombard origin ; but is principally interesting for the ruins of the Roman Calatra, which are still found in the town and neighbourhood. These consist chiefly of remains of the outer walls, and a cistern, which still affords a good supply of water. Various inscriptions are also extant, and the inhabitants point out a tomb which they maintain to be that of A, Atilius Calatinus. Calatia was originally a Samnite town, and is frequently mentioned in the earlier wars of the Romans. At a later date it became a municipal city of some importance, but makes no appearance in history. The population of the present town is 5892.~~

~~CAJEPUT OIL, a volatile oil obtained by distillation from the leaves of Jfelaleuca leucadodendron, and probably other species. The trees yielding the oil are found throughout the Indian Archipelago, the Malay peninsula, and over the hotter parts of the Australian continent; but the greater portion of the oil is procured from Celebes Island. The name Cajeput is derived from the native Kayu-putt_ or white wood. The oil is prepared from leaves~~

~~collected in a hot dry day, which are macerated in water, and distilled after fermenting for a night. As imported into Europe it has a greenish colour owing to the presence of a minute proportion of copper, which can be separated, leaving the oil perfectly colourless. This oil is extremely pungent~~

~~to the taste, and has the odour of a mixture of turpentine and camphor. When dropped in water, it diffuses itself over the surface, and then entirely evaporates. Chemically, the oil consists in large part of the bihydrate of cajputene, from which cajputene having a hyacinthine odour can be obtained by distillation from anhydrous phosphoric acid. Like other volatile oils, the cajeput is a powerful stimulant, and is used medicinally where such medicines are required. Some practitioners have given it a high character as a remedy for cholera; but it does not appear to have any claim as a specific in the treatment of that disease. The dose taken internally as a stimulant, antispasmodic, and diaphoretic, is about five drops. It is used externally as a rubefacient, and is also resorted to occasionally with advan- tagein toothache. The oil from some species of Hucalyptus bears a close resemblance in odour and properties to cajeput.~~

~~CAJETAN, Carpina (1469-1534), was born at Cajeta in the kingdom of Naples in 1469. His proper name was Thomas de Vio, but he adopted that of Cajetan from his birthplace. Heentered the order of the Dominicans at the age of sixteen, was for some time professor of divinity, and in 1508 became general of the order. For his zeal in defending the Papal pretensions, in a work entitled Of the Power of the Pope, he obtained the bishopric of Cajeta. He was afterwards raised to the archiepiscopal see of Palermo, and in 1517 was made a cardinal by Leo X. The year following he went as legate into Germany, to quiet the commotions raised by Luther against indulgences ; but the Reformer, under protection of Frederick elector of Saxony, set him at defiance; for though he obeyed the cardinal's summons in repairing to Augsburg, yet he rendered all his proceedings ineffectual. Cajetan was employed in several other negotiations and transactions, being as able in business as in letters. He died in 1534. He wrote commentaries upon portions of Aristotle, and upon the Swmma of Aquinas, and inade a careful translation of the Old and New Testa- ments, excepting Solomon's Song, the Prophets, and the Revelation of St John.~~

~~CALABAR is a district of somewhat indefinite bound- aries, situated on the West Coast of Africa, in the Bight of Biafra, between 4° 20' and 6° N. lat., and between 6° 30' and 9° E.long. The name corresponds to no geographical or political unity, but is convenient as provisionally com- prehending a stretch of country of considerable commercial importance.~~

~~The coast line is frequently regarded as extending from the Nun mouth of the Niger, to the neighbourhood of the Cameroon Mountains, and thus includes the estuaries of the Brass River or Tuwon-Toro, the San Nicholas or Kola Toro, the New Calabar, and the Bonny, which are all deltaic branches of the Niger, as well as the San Pedro or Kan Toro, and the important embouchure of the united streams of the Cross River, the Old Calabar, and the Great Qua River. The interiorfof the country is still unexplored, and the inland boundary is left completely vague. 'The soil of the whole country, for 150 miles or further from the sea, is purely alluvial ; and the surface is literally covered with bush except in the very limited areas under cultivation. Further inland, especially in the direction of the Cameroon Mountains, the elevation Increases, the soil becomes more varied and decidedly rocky, and the forest grows clearer of underwood. This higher region is rich in natural productions, furnishing—hesides the palm-oil which forms the main article of foreign trade on the coast—ebony, bamboos, sugar, pepper, yams, Indian corn, plantains, and a variety of woods.~~

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~~Leaving the western portion which belongs to the delta of the Niger for treatment in the article on that river, we will confine our attention here to the district watered by the Old Calabar, the Cross River, and the Qua, which more particularly deserves the name of Calabar. The common estuary of these three rivers enters the ocean about 5° N. lat. and 8° 20' E. long. It is about 10 or 12 miles wide at its mouth, and maintains nearly the same width for about thirty miles above the bar. At the junction with the Cross River the Old Calabar forms quite a labyrinth of channels and islands, and it is also united with the Qua by a number of creeks.~~

~~The exact position of the sources of these rivers has never been ascertained, but, according to native report, that of the Old Calabar is situated in the neighbourhood of Iko, which is not very far beyond Uyanga, the furthest point inland reached by Captain Hopkins and the Rev. Samuel Edgerley in their journey of exploration in 1872. The truth of this report is rendered almost certain by the diminished size of the stream in the vicinity of~~

~~Uyanga ; and it is thus probable that the mountains in which both it and its sister streams take their rise are the Rimsby range, forming a western extension of the Cameroons. The Qua River is comparatively small, and navigation is impeded, at no great distance up, by sand-banks and fallen trees. Further inland its course is also broken by rapids and several cataracts.~~

~~The country watered by these rivers is occupied by a great number of separate tribes, such as the Efik, the Ekoi, the Ibami, the Okéyéng, and the Aqua, who are politically independent of each other and speak separate languages. Of these the most important are the Efik, or people of Calabar in the strictest sense of that word, which was originally applied by the Portuguese discoverers to the tribes on the coast at the time of their arrival, when as yet the present inhabitants were unknown in the district. It was not till the early part of the 18th century that the Efik, owing to civil war with their kindred the Ibibio, migrated from the neighbourhood of the Niger to the shores of the Old Calabar, and established themselves at Ikoritungko or Creek Town. In order to get a better share in the European trade at the mouth of the river a body of colonists from this city migrated further down and built Obuténg or Old Town, and shortly afterwards a rival colony established itself at Aqua Akpa or Duke Town.~~

~~For a time it seemed as if Creek Town would disappear before its younger competitors, but it was again raised to power by King Eyo Eyo, who defied th«, interference of his rivals. The only political bond of union between the various towns is the Egbo, a kind of secret society into which admittance is obtained on the payment of a certain fee to each of the existing members. The power of this association is almost unlimited, and is used principally for the benefit of its members, Formerly it was one of the greatest curses of the country, from the barbarous customs mingled with its rites ; but it is, under European direction, being turned into a means of promulgating a more civilized code of laws through the various towns, and it forms a kind of constitutional defence against the despotism of individual kings. However unsatisfactory the condition of the country still is, there is no doubt European influence of a beneficial kind is gradually making itself felt. The universal belief in the most terrible kinds of witchcraft is slowly being shaken ; the use of the esere or Calabar bean as an ordeal, and for~~

~~purposes of religious purgation, is becoming much less frequent ; the murder of twin children is no longer a national custom ; and the massacre of his slaves on the death of a king has been abolished. The present king of Creek Town is at least nominally a Christian ; and, according to Consul Livingstone, "'hundreds~~

~~of decently-dressed natives of both sexes regularly attend divine service" at the mission stations. These number five or six, and are supported by the United Presbyterian Church of Scotland, which began its labours here in 1846.~~

~~The predominant language, not only among the people of Calabar proper, but also of the various tribes on both sides of the Cross River, is Efik, which bids fair to be the common commercial speech of the whole district. It is really a modified Ibibio, and presents traces of what is known as alliterative concord, though;this is by no means a universal characteristic. It has been reduced to writing by the missionaries, who have employed the ordinary English alphabet. Considerable progress has been made in the formation of an initiatory literature; no fewer than 65 volumes having proceeded from the mission press. Most important of these are the Efik translation of the New Testament by H. Goldie (1862), the translation of the Old Testament by Dr A. Robb (1868), and a Dictionary of the Efik by H. Goldie, published in 1862. Captain James Broom Walker of Duke Town, who has explored various parts of the country, presented several charts to the Royal Geographical Society, which are reproduced in the United Presbyterian Missionary Record for 1872 and 1875.~~

~~See Hope M. Waddell, Twenty-nine Years in the West Indics and Central Africa, 1866 ; " Details of Explorations of the Old Calabar River," by Captain Becroft in Journ. Roy. Geogr. Soc., 1844;~~

~~W. Nicholas Thomas in Proceed. of Roy. Geogr. Soc. on '*The Oil Rivers of West Africa," 1873.~~

~~CALABAR BEAN, the seed of a leguminous plant, Physostigma venenosum, a native of tropical Africa. The plant has a climbing habit like the scarlet runner, and attains a height of about 50 feet, with a stem an inch or two in thickness. The seed pods, which contain two or three seeds or beans, are 6 or 7 inches in length ; and the beans are about the size of an ordinary horse bean but much thicker, with a deep chocolate brown colour. They constitute the E-ser-e or ordeal beans of the negroes of Old Calabar, being administered to persons accused of witchcraft or other crimes. In cases where the poisonous material did its deadly work it was held at once to indicate and rightly to punish guilt; but when it was rejected by the stomach of the accused, innocence was held to be satisfactorily estab-Jished. A form of duelling with the seeds is also known among the natives, in which the two opponents divide a bean, each eating one-half; that quantity has been known to kill both adversaries. Although thus highly poisonous, the bean has nothing in external aspect, taste, or smell to dis-tinguish it from any harmless leguminous seed, and very disastrous effects have resulted from its being incautiously left in the way of children. The beans were first intro- duced into England in the year 1840; but the plant was not accurately described till 1861, and its physiological effects were investigated in 1863 by Dr Thomas R. Fraser. In that year an alkaloid was isolated from the seeds to which the name physostigmine was applied ; and under the name eserine another alkaloid was prepared from them; but it is not yet quite certain that the two substances are essentially different. Dr Fraser's investigations, which were conducted with an alcoholic extract of the seeds, showed that the active principles exerted a remarkable influence in contracting the pupil of the eye, and in counteracting the influence of atropine. The antagonism of physostigmine and atropine and its relations to many other alkaloids have subsequently been the subject of very numerous investiga- tions. A committee of the British Medical Association under Professor Hughes Bennett found that the antagonism between sulphate of atropine and extract of Calabar bean exists only within narrow limits, so that for practical purposes atropine is useless as an antidote to Calabar bean. The investigation of the same committee into the relations~~

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~~of hydrate of chloral and Calabar bean, however, proves that they are mutually antagonistic, but as the toxic influence of the Calabar bean is very rapid, it is necessary to administer the chloral as soon as possible after Be Calabar bean is taken. Calabar bean in the formof powder and extract is used in medical practice. It hag been chiefly employed by ophthalmists to produce contrae- tion of the pupil, but it is also used in tetanus, neuralgia, and rheumatic diseases.~~

~~CALABOZO, or Cauaposo, a town of Venezuela, formerly capital of the province of Caracas, but now of that of Guarico, is situated 120 miles 8.S.W. of the city of Caracas on the left bank of the River Guarico. It lies so low that during the rainy season it is frequently surrounded by the floods; and in the summer it is exposed to extreme heat, the average temperature being 88° Fahr. It is well built, with streets running at right angles, and it has several fine churches, a college, and public schools, Its situation on the main road from Aragua to Apure makes it the seat of a considerable trade; and the surrounding country affords extensive pasture for cattle. There are thermal springs in the neighbourhood. Originally a small Indian village, Calabozo owes its existence as a town to the Compania Guipuzcoana, who made it the seat of one of their mercantile stations in the beginning of the 18th century. In 1820 it was the scene of a battle in which Bolivar and Paez beat the Spanish general Morales, Population in 1873, 5618.~~

~~CALABRIA, the name given by the Romans to the peninsula at the south-eastern extremity of Italy, and now given to the peninsula at the south-western extremity. The former district was called by the Greeks Iapygia and Messapia, though these terms were variously used, and sometimes also included all the south-east of Italy, from Lucania to the Garganian promontory. In the time of Augustus, Calabria was the district south and east of a line drawn from the neighbourhood of Tarentum to that of Brundisium, corresponding to the modern Terra d' Otranto. The principal cities were Tarentum (Taranto), Brundisium (Brindisi), and Hydruntum (Otranto), all of which are ports, The inhabitants were Sallentines and Calabrians or Messapians, both probably of Pre-Hellenic or Pelasgic race; Niebuhr, however, considered the Calabrians to be Oscan intruders distinct from the other tribes.~~

~~Ancient Calabria was a country of low hills with very gentle ascents, having a soil of Tertiary limestone formation, no rivers, and scarcely any small streams, and, during summer, a climate of intolerable heat, but exceedingly fertile, producing the olive and vine.~~

~~Owing to its position Calabria was long defended by the Greeks against the Goths, Lombards, and Saracens, and was the last portion of Italy lost by the Byzantine emperors. In the time of the Norman monarchy, in the 11th century, there took place a curious change in the application of the name, the cause and exact date of which are not known with any certainty. An explanation possessing some probability is, however, given. The Byzantines, it is likely, extended the name Calabria to all their possessions in Southern Italy ; and when their possessions in the south- eastern peninsula became greatly inferior in importance to that in the south-western (Bruttium) they applied the name to the latter instead of the former. It was uot, however, till after the Norman Conquest that the name was universally employed in this the modern sense,~~

~~In modern times Calabria, until the consolidation of the Italian kingdom, was the name of one of the four provinees into which the continental part of the kingdom of Naples, or of the Two Sicilies, was formerly divided ; and it is now the name given to three out of the sixty-nine provinces of the present division of Italy. It is the most southern part~~

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~~of Italy, being bounded on the N. by the province of Basilicata, on the E. by the Gulf of Taranto, on the W. by the Tyrrhenian Sea, and on the S. by the Ionian. It extends from Cape Spartivento (37° 56’ N, lat.) to Monte Pollino on the southern border of Basilicata’(40° 0’ N. lat.)~~

~~The territory is well watered, and exceedingly rugged and mountainous ; but the summits of the hills are covered with extensive forests of oak, beech, elm, and pine, and towards the coast the branches of the Apennines open up into fertile valleys. Earthquakes and violent storms are very common; and there is extreme heat during the summer season, on the~~

~~approach of which the wealthier inhabitants migrate annually to the lofty table-land of La Sila, where their flocks are fattened in the extensive pastures. The agriculture of Calabria is in a very rude and barbarous condition, a circumstance a is partly attributable to the extreme fertility of t oil. The principal productions are corn, wine, raw silkN@live oil of an inferior quality, cotton, rice, liquorice, and _ saffron. Manna, collected from the manna-ash (Ornus rotundifolia), was at one time a somewhat important article of com. merce ; but very little is now collected. Oranges, lemons, figs, mulberries, honey, and tobacco are also produced. The horses of Calabria are remarkable for their high spirit and compact form. There are considerable fisheries of the tunny, the swordfish, the anchovy, and mullet.~~

~~The three provinces into which Calabria is now divided are Calabria Citeriore, Calabria Ulteriore Seconda, and Calabria Ulteriore Prima.~~

~~Calabria Citeriore, or Cosenza, is the most northern of the three provinces, and has an area of 2613 square miles, with a population in 1871 of 440,468. The southern and central districts are covered by the vast forests of La Sila, which furnished timber for the navies of antiquity. The' principal rivers are the Crati, which after a course of 60 miles falls into the Gulf of Taranto, and the Neto, which rises in the heart of La Sila, and falls into the Adriatic. The principal towns are Cosenza, Rossano, Paola, and Castrovillari.~~

~~Calabria Ulteriore Seconda, or Catanzaro, on the south of Calabria Citra, having a coast line from the Punta dell'~~

~~Alice to the Callipari on the east, and from the Savuto to |-~~

~~the mouth of the Messina on the west, has an area of 2100 square miles. Population (1871) 412,226. At Catanzaro is a manufactory of silk; at Maida there are some seams of coal, antimony, and alabaster, which might be made available for exports. The principal towns are Catanzaro, Cotrone, Nicastro, and Monteleone.~~

~~Calabria Ulteriore Prima, or Reggio, the most southerly province of Italy, contains an area of 1250 square miles, with a population (1871) of 353,608. On the northern frontier are the mines of Lo Stilo, from which the iron is obtained for the Government foundries. The principal towns are Reggio,~~

~~Gerace, and Palmi. A railway line now runs from Reggio to Taranto, along the coast of the Ionian Sea and the Gulf of Taranto.~~

~~CALAHORRA, the capital of the judicial district and diocese of the same name, in the province of Logrojio, Spain, 24 miles S.E. of Logrofio, in 42°12'N. lat., 2° 0' W. long. It occupies an elevated site on the left bank of the River Cidacos, near its junction with the Ebro, and contains a cathedral in the mixed Gothic style, dating mainly from the 15th century, an episcopal palace, and several con- ventual and other schools. The climate is cold and damp, but the soil in the neighbourhood produces in abundance grain, pulse, flax, wine, and oil. Population in 1860, 7106. Calahorra is the ancient Calagurris Nassica, celebrated for its extraordinary fidelity to Sertorius in his war with Pompey and Metellus ; and in the suburbs may still be traced the Temains of an ancient Roman circus, an aqueduct, and a~~

~~65] naumachia. Under the empire it was a municipium, and enjoyed the rights of Roman citizenship. It was the birthplace of Quintilian.~~

~~CALAIS, a town of France, capital of a canton of the same name, in the arrondissement of Boulogne and the department of Pas de Calais, 26 miles E.S.E. of Dover, and 185 miles by rail from Paris, in 50° 57' 45" N, lat., 1° 51' E. long. Calais is a fortress of the first class, and was formerly a place of great strength, but it would now probably not be able to defend itself long against modern artillery. It is built in a rectangular form, having one of its longer sides towards the sea, while on the E. and S. it is surrounded by low and marshy ground which can be flooded to strengthen its defences. Overlooking the town on the W. is the citadel, erected in 1641 by Cardinal~~

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~~Plan of Catais.~~

~~5. Bathing establishment. 6. Lighthouse. 7. Wotel de Ville de St Pierre les~~

~~1. Church of Nétre-Dame. 2. Church of the Courgain. 8. Hotel de Ville and Place de~~

~~lArmée. Calais. 4. Museum and Theatre. Richelieu. In the centre of the town is the great market-~~

~~place, in which stands the Hétel de Ville (rebuilt in 1740, restored in 1867), with busts of Eustache de St Pierre, the Duc de Guise, and Cardinal Richelieu. Near the Hotel de Ville is the Zour du guet, or watch-tower, used as a lighthouse until 1848. The Church of Nétre Dame was almost entirely rebuilt at the end of the 15th century, during the English occupancy of Calais; its lofty tower serves as a landmark for sailors. At the end of the Rue de la Prison is the Hétel de Guise, built as a guildhall for the English woolstaplers. It was given to the Duc de Guise as a reward for the recapture of Calais, and hence its name. The building which was formerly the Hétel Dessin, immortalized by Sterne in the Sentimental Journey, is now used as a museum. The harbour of Calais is shal- low, admitting vessels of from 400 to 500 tons only at high water. The French Government contemplates the con- struction of a large harbour of refuge near Calais. There are two lighthouses at the entrance to the harbour, and a still larger one on the fortifications, with a revolving light visible 20 miles off. The principal institutions are the schools of design, hydrography, and artillery, a public library with 10,000 volumes, and public baths. The im- ports are chiefly from Great Britain, and consist of coal, iron, woollen and cotton fabrics, linen, skins, machinery, and colonial produce. Of late years the importation of timber~~

~~from Norway has greatly increased. The exports comprise corn, wine and spirits, eggs, silk, fruit, vegetables, glass, and sugar. 'The fisheries are much less important than those of Boulogne. The manufacture of tule or bobbin-net was introduced from Nottingham by the English in 1818, and is one of the main sources of the prosperity of the town and suburbs. Calais~~

~~communicates with Great Britain by submarine telegraph, laid down in 1851. Steamers carry- ing the mails cross twice a day to Dover and back. It is the principal landing-place for English travellers on the Continent. The number of passengers who crossed both ways was 208,432 in 1875, being an increase of 66 per cent. in the last ten years. The terminus of the proposed tunnel beneath the channel is near Sangatte, a village six miles west of Calais. The project has received the sanction of the French and English Governments. Population (in 1872) 12,843; the adjoining manufacturing suburb of St Pierre les Calais had 20,409 inhabitants in 1872, more than 1800 of whom were English.~~

~~Calais was a petty fishing-village, with a natural harbour at the mouth of a stream, till the end of the 10th century. Tt was first improved by Baldwin IV., count of Flanders, in 997, and afterwards, in 1224, was regularly fortified by Phillip of France, count of Boulogne. It was besieged in 1346, after the battle of Crécy, by Edward III., and held ont resolutely by the bravery of Jean de Vienne, its governor, till famine forced it to surrender. Its inhabitants were saved from the cruel fate with which Edward menaced them by the devotion of Eustache de St Pierre and six of the chief citizens, who were themselves spared at the prayer of Queen Philippa. The city remained in the hands of the English till 1558, when it was taken by the duke of Guise at the head of 30,000 men, from the ill-provided English garrison only 800 strong, after a siege of seven days. It was held by the Spaniards from 1595 to 1598, but was re- stored to France by the treaty of Vervins.~~

~~CALAMIS. See ArcH#oxoey, vol. ii. p. 354.~~

~~CALAMY, Epmunp (1600-1666), a Presbyterian divine, was born at London in February 1600, and educated at Pembroke Hall, Cambridge, where his opposition to the Arminian party, then powerful in that society, excluded~~

~~him from a fellowship. Dr Felton, bishop of Ely, how-.~~

~~ever, made him his chaplain, and gave him a living which he held till 1626. He then removed to Bury St Edmunds, where he acted as lecturer for ten years. In 1636 he was appointed to the rectory of Rochford in Essex, which~~

~~was so unhealthy that he had soon to leave it; and in 1639 he was chosen minister of St Mary Aldermanbury in London. Upon the opening of the Long Parliament he distinguished himself in defence of the Presbyterian cause, and had a principal share in writing the work commonly known under the appellation Smectymnuus, against Epis- copacy. The initials of the names of the several contri- butors formed the name under which it was published, viz., S. Marshal, E. Calamy, T. Young, M. Newcomen, and W. Spurstow. Calamy was afterwards an active member in the assembly of divines, and a strenuous opposer of sectaries. In Cromwell's time he lived privately, but was assiduous in promoting the king's return; for this he was afterwards offered a bishopric, but declined it. He was, however, made one of Charles's chaplains. He was ejected for nonconformity in 1662, and was so affected by the sight of the devastation caused by the great fire of a that he died shortly afterwards, October 29,~~

~~CALAMY, Epmunp (1671-1732), grandson of the pre- ceding, was born in London, April 5, 1671. He was educated at a private academy, and studied at the university of Utrecht. While there, he declined an offer of a pro- fessor's chair in the university of Edinburgh made to him~~

~~by Principal Carstairs, who had gone over un purpose to find a person properly qualified for such an office. After his return to England in 1691 he began to study divinity; and having joined the Nonconformists, he was in 1692 unani- mously chosen assistant to Matthew Sylvester at Blackfriars, In 1694 he was ordained at Annesley's meeting-house in Little St Helen's, and soon afterwards was invited to become assistant to Daniel Williams in Hand-Alley. In~~

~~1702 he was chosen one of the lecturers in Salters' Hall,~~

~~and in 1703 he 'succeeded Vincent Alsop as pastor of a large congregation in Westminster.~~

~~He drew up the table of contents to Baxter's History of his Life and Tunes, which was sent to the press in 1696; made some remarks on the work itself, and added to it an index ; and, reflect- ing on the usefulness of the book, he~~

~~saw the expediency of continuing it, as Baxter's history came no farther than the year 1684. Accordingly, he composed an abridgment of it, with an account of many other ministers who were ejected after the restoration of Charles II. ; their apology, containing the grounds of their nonconformity and practice as to stated and occasional communion with the Church of England ; and a continuation of their history until the year 1691. This work was published in 1702. He after- wards published a moderate defence of nouconformity, in three tracts, in answer to some tracts of Dr Hoadly. In 1709 Calamy made a tour to Scotland, and had the degree of doctor of divinity conferred on him by the universities of Edinburgh, Aberdeen, and Glasgow. In 1713 he published a second edition of his Abridgment of Baxter's History of his Life and Times, in which, among various additions, there is a continuation of the history through the reigns of William and Anne, down to the passing of the Occasional Bill. At the end is subjoined the re- formed liturgy, which was drawn up and presented to the bishops in 1661. In 1718 he wrote a vindication of his grandfather and several other persons against certain reflections cast upon them by Archdeacon Echard in his History of England; and in 1728 appeared his continua- tion of the account of the ministers, lecturers, masters, and fellows of colleges, and schoolmasters, who were ejected, after the Restorution in 1660, by or before the Act of Uniformity. He died June 3, 1732. Besides the pieces already mentioned, he published many occasional sermons.~~

~~CALAS, Jean (1698-1762), a Protestant merchant at Toulouse, who was barbarously murdered under forms of law which were employed to shelter the sanguinary dictates of ignorant and fanatical zeal. He was born at La Caparéde, in Languedoc, in 1698, and had lived forty years at Toulouse. His wife was an Englishwoman of French extraction. They had three sons and three daughters. His son Louis had embraced the Roman Catholic faith through the persuasions of a female domestic who had lived thirty years in the family, In October 1761 the family consisted of Calas, his wile, Marc-Antoine their son, who had been educated for the bar, Pierre their second son, and this domestic. Antoine being of a melancholy turn of mind, was continually dwelling on passages from authors on the subject of suicide, and one night in that month he hanged himself in his father's warehouse. 'The crowd, which collected on so shocking @ discovery, took up the idea that he had been strangled by the family to prevent him from changing his~~

~~religion, and that this was a common practice among Protestants. The officers of justice adopted the popular tale, and were sup- plied by the mob with what they accepted as conclusive evidence of the fact. he fraternity of White Pemitents buried the body with great ceremony, and performed 4 solemn service for the deceased as a martyr; the Francts- cans followed their example; and these formalities led to the popular belief in the guilt of the unhappy family.~~

~~Being all condemned to the rack in order to extort confes- sion, they appealed to the parliament ; but this body, being as weak as the subordinate magistrates, sentenced the father to the torture, ordinary and extraordinary, to be broken alive upon the wheel, and then to be burnt to ashes ; which diabolical decree was carried into execution on the 9th of March 1762. Pierre Calas, the surviving son, was banished for life; the rest were acquitted. The distracted widow, however, found some friends, and among them Voltaire, who laid her case before the council of state at Versailles; and the parlianient of Toulouse was ordered to transmit the proceedings. These the king and council unanimously agreed to annul; the chief magistrate of Toulouse was degraded and fined; old Calas was declared to have been innocent ; and every imputation of guilt was removed from the family. See Causes Célébres, tom. iv.~~

~~CALASIO, Marto pe (1550-1620), a Franciscan, and professor of the Hebrew language at Rome, was born in 1550 at a small town in Abruzzo, from which he took his name. His Concordance of the Bible (which occupied him forty years) was published at Rome in 1621, the year after his death. This work has been highly approved and commended both by Protestants and Roman Catholics, and is indeed an admirable work ; for, besides the Hebrew words of the Bible, which compose the body of the book, with the Latin version over against them, there are in the margin the differences between the Septuagint version and the Vulgate; so that at one view may be seen wherein the three Bibles agree, and wherein they differ. At the beginning of every article there is a kind of dictionary, which gives the signification of each Hebrew word, affords an opportunity of comparing it with other Oriental languages (Syriac, Arabic, and Chaldee), and is~~

~~extremely useful for determining more exactly the true meaning of the Hebrew words. It has been several times reprinted ; but the original edition is the best.~~

~~CALATAFIMI, a town of Sicily, in the province of Trapani and district of Alcamo, about 30 miles from Palermo. It lies between two hills in a fine corn country, and is celebrated for its cattle and its cheese. In one of its churches, Santa Croce, there is a fine altar of mosaic work; and in the neighbourhood are the extensive and well-preserved ruins of Segesta. On the hill above the town stands the Saracenic castle of Kalat-al-Fimi, from which it derives its name, and about four miles distant is the battle-field on which Garibaldi won his first victory over the Neapolitans on May 15,1860. Population, 9414.~~

~~CALATAYUD, a town of Spaiu, in the province of Saragossa in Aragon, 45 miles S.W. of the city of that name, in 41° 24' N. lat., 1° 35' W. long. It stands on the left bank of the River Jalon, near its confluence with the Jiloca, partly on the plain and partly on a rocky slope, which is covered with remains of ancient Moorish fortifica- tions. It is generally spacious and well built, and contains several squares, the largest of which is used as the market- place, numerous convents, three hospitals, a fort, a pro- vincial and municipal hall, an episcopal palace, a college, barracks, a theatre, and a bull-arena; there are also two collegiatas, or collegiate churches, both of them handsome edifices, and eleven other parish churches. The principal articles of manufacture are coarse brown paper, leather, and woollen stuffs. The soil of the neighbourhood is fertile and well cultivated. Calatayud is a Moorish city, and receives its name (Job's Castle) from Job the nephew of Musa ; but it stands near the site of the ancient Bzlbilis, the birthplace of the poet Martial, and was for the most part built out of its ruins. Population, 9830.~~

~~CALCAR, or Kaucxer, Jonn DE (1499-1546), an eminent painter, born at Calcar, in the duchy of Cleves, in 1499. He was a disciple of Titian at Venice, and~~

~~perfected himself by studying Raffaelle. He imitated those masters with such success as to deceive the most skilful critics. Among his various pieces 1s a Nativity, represent- ing the angels around the infant Christ, which he arranged so that the light emanated wholly from the child. He died at Naples in 1546.~~

~~CALC-SPAR, or CaLcarEous Spar, is the popular name for certain of the crystalline forms of carbonate of lime or calcite (CaCO,), containing in 100 parts 56 of lime and 44 of carbonic acid. The name includes only the varieties of calcite which belong to the rhombohedral or hexagonal order, to the exclusion of aragonite, which, having the same composition, belongs to the rhombic or right prismatic system, the two minerals forming a striking example of dimorphism, Cale-spar is also the same in chemical com- position as marble, limestone, chalk, stalagmitic deposits, &c., which are among the most abundant ingredients in the rocky masses of the earth. The primary form of calc-spar is an obtuse rhombohedron, the faces of which are inclined to each other in the terminal edges at an angle of 105°°5, and all secondary crystals, however various they may be, tend to break or split up into that primary form. The variety of crystalline forms assumed by the mineral is exceedingly great, upwards of 800 being enumerated, of which 700 have been figured by Count Bournon in his treatise on carbonate of lime. The forms, although thus numerous, fall chiefly under the two heads of rhombo- hedrons, of which Iceland spar is a type, and scalenohedrons, which may be represented by the variety known as dog's- tooth spar. (See Mineratocy.) Pure cale-spar is a transparent, colourless mineral with a vitreous lustre; its specific gravity is about 2°721; and in hardness it is inter- mediate between gypsum and fluor-spar, occupying the third place in the standard scale. It is frequently tinted in red, yellow, green, brown, and grey, from the presence of foreign matter. Pure, transparent rhombohedral crystals, obtained by cleavage or otherwise, are distinguished as Iceland spar, on account of the largest and finest crystals being found in that island, or as doubly-retracting spar (German, Doppel- spath), from their exhibiting in the highest degree the double refraction of light. Before the blow-pipe it is reduced to caustic lime, and moistened with hydrochloric or other acid it displays a brisk effervescence. It occurs abundantly in almost all parts of the world,—Andreasberg in the Hartz and the Derbyshire lead mines being noted localities for large fine crystals. Magnificent cleavage rhombohedrons~~

are obtained from Iceland, one having been noted which exceeded 6 yards long and 3 yards high. Pro- fessor Dana notices one nearly transparent crystal, weigh- ing 165 ib, now in the cabinet of Yale College, found in the Rossie Lead Mine, New York State, and he cites a large number of other localities in the United States where crystals occur. Iceland spar, on account of its high double refracting property, is very extensively employed in optical research. It is most conveniently used in the form of a Nicol's prism, which consists of a long rhomboidal crystal cut obliquely into two equal portions in a plane perpendicular to the plane of the longer diagonal of the base. The two halves are cemented together in their original position with Canada balsam; and in this condi- tion the ordinary ray undergoes total reflection from the prism, whilst the extraordinary ray passes through.

CALCHAS, the most famous soothsayer among the Greeks at the time of the Trojan war, was the son of Thestor. He foretold to the Greeks the length of time they would be engaged in the siege of Troy, and when the fleet was detained by adverse winds, at Aulis, he explained the cause and demanded the sacrifice of Iphigenia. When the Greeks were visited with pestilence on account of Chryseis, he disclosed to them the reasons of Avollo's

anger. After the return of the Greeks from Troy he is said to have retired to Colophon. According to the story, his death was due to chagrin at being surpassed in a trial of soothsaying skill by one Mopsus. It had long been predicted that he should die whenever he met his superior in divination.

CALCULATING MACHINES. Mathematicians and astronomers have felt in all ages the irksomeness of the labour of making necessary calculations, and this has led to the invention of various devices for shortening it. Some of these, such as the Abacus, Napier's Bones (invented by the father of logarithms), and the modern Sliding Rule, are rather aids to calculation than calculating machines. Pascal is believed to have been the original inventor of a calculating machine; its use was limited to addition, multiplication, &c., of sums of money, and as it required the constant intervention of a human operator the results were subject to the ordinary errors of manipulation. After him came the celebrated Leibnitz, Dr Saunderson, who, blind from his childhood, became professor of mathematics in Cambridge,

~~and others. But all their machines were completely cast into the shade by the wonderful inventions of the late Charles Babbage. He knew well the immense value that absolutely correct tables possess for the astro- nomer and the navigator, and that a machine which could produce them with speed was a very great desideratum. The first calculating machine he invented he called a differ- ence engine, because it was to calculate tables of numbers by the method of differences. By setting at the outset a few figures the attendant would obtain by a mechanical operation a long series of numbers absolutely correct. The difference engine was not intended to answer special ques- tions, but to calculate and then print numerical tables, such as logarithm tables, tables for the Vawtical Almanac, &c. An interesting account of some of the errors which are found in what are considered reliable tables is given in a paper by Babbage in the Memoirs of the Astronomical Society, 1827.~~

~~Every numerical table consists of a seriesof numbers which continuously increase or diminish. As an example take the squares of the natural numbers, 1, 4, 9, 16, 25, 36, &c. Designate "tine séres by No If we subtract each term from the-onesfollowime it we geea@ | See | ee | or hewn seties, 3) 5, 7, 9 Ge, | NP at a which is called the series of ~-———— first differences ; designate this by Al, If in the same way we subtract each term of this series 4 from the succeeding term, we get what is called the series of | ®% | / second differences, every term § jg ——— g of which is in this instance 2. Designate this series by A?. 25 As the different series were obtained by subtraction, it is quite evident that by revers- ing the process we shall obtain the original table. Sup- pose we are given the first terms of N, A?, and A?%, ze, 1, 3, 2. If we add 3, the first term of A}, to 1, the first term of N, we get 4, the second term of N; and if we add 2, the first term of A?, to 3, the first term of A}, we get 5, the second term of A!; and this added to 4, the second term of N, gives us 9, the third term of N. Similarly we obtain 16 by adding 9, 5, and 2 together, and 25 by adding 16, 7, and 2. Hence, given 1, 3, 2, we can, by a process of additions, obtain the series of square numbers. All numerical tables can be calculated entirely by this method or by repetitions of it.~~

~~— The main characteristics of the difference engine, de- signed and partially constructed by Babbage, are these :— It consisted of several~~

~~vertical columns of figure-wheels~~

~~Table of First Second~~

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~~like large “draught men” one above another, to the number of six in éach column. The natural numbers from 0 to 9 were cut on the rims of the figure wheels ; hence each figure-wheel in a column could represent gq digit. Thus the lowest wheel gave the units digit, the second wheel the tens digit. The number 5703 would be represented on the wheels of a column as in the margin. The different columns were to represent the successive series of differences [4 above referred to, and were called the table column, the first difference column, dec.~~

~~“The mechanism was so contrived that whatever might be the numbers placed respectively on the figure wheels of each of the different columns, the following succession of operations took place as long as the handle was moved, Whatever number was found upon the column of first differences, would be added to the number found upon the table column, The same first difference remaining upon its own column, the number found upon the column of second differences would be added to that first difference.” Similarly for all the othercolumns. For example, suppose we are calculating the cubes of the natural numbers. At a certain stage of the work we would find 125 shown by the wheels of the table column, 91 by those of the first difference column, 36 by those of the second difference column, and 6 on the lowest wheel of the third difference column. On making a turn of the handle the 91 would be added to the 125, which would then show 216; at the~~

~~Table ae oe ieee ifference | Difference | Difference | Cee. Column, | Column. | Column.~~

~~1 2 9 3 5 1 6 6~~

~~After one Turn … 2 J~~

~~1 2 4~~

~~6 fi 2 6 After two Turns…) 3 1 | 4 6 4~~

~~33 9 8 6~~

~~same time 36 would be added to the 91, so that the first difference column would then show 127; moreover 6 would be simultaneously added to the 36, which would thus become 42, and the 6 would remain unaltered. Another turn and we would get 343, 169, 48, 6 on the different columns. Had the engine been completed it would have had columns for six orders of differences, each of twenty places of figures, whilst the first three columns would each have had half a dozen additional figures.~~

~~It was about 1822 that Babbage having constructed a small model of his engine sent an account of it to Sir Humphrey Davy, then president of the Royal Society of London. Government heard of the invention, and, having received from the Royal Society a favourable report on the merits and utility of the engine, advanced money towards its construction, Sums of money were at irregular intervals voted for this purpose ; but so great were the difficulties to be overcome, so entirely new even were many of the tools uecessary, so much time was occupied in testing the value of each proposed contrivance, that in 1834 only a portion was completed. The construction of the machine here stopped, although the Royal Society had again, in 1829, reported most favourably on the engine as regards its practicability, immense utility, and the progress it had made. The Government had already advanced £17,000 (over and above what Babbage had spent, besides giving his personal superintendence without any remuneration), and they saw no definite limit to the amount it would cost;~~

~~aud Babbage had a delicacy in pressing for the com- pletion of the difference engine, as he had recently designed a new machine, the analytical engine, which, if completed, would entirely supersede it. The portion completed is in King's College, London.~~

~~It will be noticed that the use of the difference engine was limited to the working of such problems as can be solved by successive additions or subtractions. The analytical engine, on the other hand, was designed to work out any problem that the superintendent knew how to solve. It consists of two parts, each of a number of vertical columns of figure wheels, similar to those of the difference engine ; on the one set called the " variables," which we shall designate by V,, V., &c., the numbers of the special problem or formula are placed ; the other set is called the "mill," and performs the required operations of multiplica- tion, division, addition, or subtraction. Its working was directed by means of two sets of cards—"operation" cards, which instructed the mill whether to multiply, divide, add, or subtract, and "variable" cards, which indicated to the inill the particular columns, ?¢.¢., numbers on which it was to perform this operation. An example will make this clear, Suppose we wish to solve the equations~~

~~az + by =o, On the wheels of V,, the first column of the variables, the~~

~~number a is placed, 6 on V., con V,, and so on. Six columns in all are required for this. It is evident that~~

~~L= = a Hence, to get x,werequire the products of fand ce, band g, &c. To get these the superintendent intimates~~

~~to the mill by means of an " operation" card that a multi- plication is to be performed, then points out by a "variable" card what are the two numbers, 7.e., the two columns to be multiplied, and on what column the result is to be placed. In the first case the columns indicated would be V,, V,, and V, respectively. By another opera- tion card and another variable card, the mill would then be instructed to multiply the numbers on V, and V,, and to place the result on V,, Similarly ca and 6d would be obtained on V, and V,,. The superintendent would then instruct the mill to subtract the number on V, from that on V,, to place the result (fe—bg) on V,, and similarly, fa—6d would be placed on V,,, By a new operation card the mill would now be put~~

~~into a “ dividing” state, and a variable card would tell it that V,, was to be divided by V,,, and the result given on V,,. This would be the value of. Similarly for y. The number of cards can be greatly diminished. Thus, for the four multiplications one card would suffice. The cards are of pasteboard (say) and have holes punched in them,—a “multiplication” card having a certain number of holes bored in it and arranged in a particular way, a “division” card a different arrangement of holes, &c. The cards are so placed in the machine that certain levers drop through these holes, while others;are unaffected, and the machinery in connection with the levers is put out of gear or not as is desired. In this way the mill is put into a condition in which it multiplies (say) the numbers indicated to it. The variable cards act in a similaf manner. When an operation card and a variable card are given to the engine, the numbers on the assigned columns are transferred to the mill, the operation is per- formed, and the numbers and the result are placed on the propercolumus. The series of cards used for any one prob- Jem would enable the machine to solve any other similar problem. Babbage says of the engine, “The analytical engine is therefore a machine of the most general nature. Whatever formula it is required to develop, the law of its development must be communicated to it by two sets of~~

~~cards. When these have been placed the engine is special for that particular formula. The numerical constants must then be put on the wheels, and on setting the engine in motion it will calculate and print the numerical results of that formula.” In the construction of this engine he overcaine one Of the greatest difficulties in such an instru- ment, that of effecting the carrying of tens. The engine was designed so as to foresee these carriages, and act upon that foresight, and thus a great reduction of the time necessary to niake a given calculation was at once obtained by effecting all carriages simultaneously instead of in succession. He says of it, “The analytical engine will contain—1°, apparatus for printing on paper, one, or if required, two copies of its results ; 2°, means for producing a stereotype mould of the table or results it computes. The engine would compute all the tables it would itself require. It would have the power of expressing every number to fifty places of figures.” It would;multiply two numbers of fifty figures each,~~

~~and print the result in one minute. Its construction was never begun, but Babbage left complete plans of every part of it.~~

~~In the Edinburgh Review for July 1834 appeared an account of the principles of Babbage's difference engine. Herr George Scheutz, a printer at Stockholm, read it, and shortly afterwards he and his son Edward set about con- structing a calculating machine. By 1843 they produced one capable of calculating series with terms of five figures, with three orders of differences, also of five figures each, and of printing its results. Provided with a certificate to this effect from the Royal Swedish Academy of Sciences, they endeavoured unsuccessfully to get orders for their machine. In 1853, with the aid of grants from the Swed- ish Government, the Messrs Scheutz finished a second machine which was exhibited in England, and at the Paris exhibition of 1855. It eventually went to America. It was about the size of a small square pianoforte. It could calculate series with four orders of differences each of fifteen figures. It printed the results to eight figures, the last of which was capable of an automatic correction where neces- sary for those omitted. "It could calculate and stereotype without a chance of error two and a half pages of figures in the same time that a skilful compositor would take to set up the types for one single page."~~

~~A new machine by the Messrs Scheutz was constructed about 1860 by Messrs Donkin for the Registrar-General for the sum of £1200. It has been used in the calculation of some of the tables in the Huglish Life Table, published in 1864. Dr Farr says of it, " The machine has been extensively tried, and it has upon the whole answered every expectation. But it is a delicate instrument, and requires considerable skill in the manipulation. It approaches in- fallibility in certain respects; but it is not infallible, except in very skilful hands. The weakest point is the printing apparatus, and that admits of evident improvement."~~

~~M. Staffel and M. Thomas (de Colmar) have invented machines which can perform addition, subtraction, multipli- cation, division, and"extraction of the square root. M. Thomas's machine is extensively used.~~

~~Sir William Thomson has recently invented an instrument (no description of which has yet been printed) which is able to solve any linear differential equation with variable coefficients.~~

~~Professor Tait has also invented the principle of a machine, which, if constructed, will integrate any linear differential equation of the second order with variable coefficients.~~

~~See the article ‘‘ Calculating Machines” in Walford’s Insurance Cyclopedia, where many references will be found, and a translation of General Menambrea’s article on Babbage’s Analytical Engine in Taylor’s Scientific Memoirs, vol. iii. S98.) *~~

~~CALCULUS. See DirrERENTIAL AND INTEGRAL CaL- CULUS.~~

~~CALCUTTA, the capital of India, and seat of the Supreme Government, is situated on the east bank of the Hugli River, in latitude 22° 33′ 47” E. and longitude 88° 23’ 34” N. It lies about 80 miles from the seaboard, and receives the accumulated produce which the two great river systems of the Ganges and the Brahmaputra collect throughout the provinces of Bengal and Assam. From a cluster of mud villages at the close of the 17th century, it has advanced with a rapid growth to a densely inhabited metropolis, which, with its four suburbs, contains a popu- lation of 892,429 souls. The central portion, which forms the Calcutta municipality, has a population returned in 1872 at 447,601. In the same year its maritime trade amounted to 523 millions sterling, of which the exports formed 313 millions, and the imports 203, showing an excess of exports over imports of 11 millions sterling.~~

~~The history of Calcutta practically dates from the year 1686. In 1596 it had obtained a brief entry as a rent-~~

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~~paying village in the survey of Bengal executed by com- mand of the Emperor Akbar. But it was not till 90 years later that it emerged into history. In 1686 the English merchants at Huglf, finding themselves compelled to quit their factory in consequence of a rupture with the Mughul authorities, retreated about 26 miles down the river to Sutanati, a village on the banks of the Hugli, now within the boundaries of Calcutta. Their new settlement soon extended itself along the river bank to the then village of Calcutta, and by degrees the cluster of neighbouring hamlets grew into the present town. In 1689-90 the Bengal servants of the East India Company determined to make it their headquarters. In 1696 they built the original Fort William, and in 1700 they formally purchased the three villages of Sutanati, Calcutta, and Gobindpur from Prince Azim, son of the Emperor Aurungzebe.~~

~~The site thus chosen had an excellent anchorage, and was defended by the river from the Marhattds, who harried the districts on the other side. A fort, subse- quently rebuilt on the Vauban principle, and a moat,~~

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CGiround-Plars of Calcutta.

1. Almshouses. 7. Asiutic Society. 2. Leper Asylum. 8. Small Cause Court. 3. Church Mission. 9. Church (R.C.) of the Sacred Heart. | 4. Catholic College. 10. Mosque. 5. Baptist Chapel and Mission. 11. Baptist Chapel. 6. St Thomas R.C. Church. 12. Home Department. \

designed to form a semicircle round the town, and to be connected at both ends with the river, but which was

never completed, combined with the natural position of

Calcutta to render it one of the safest places for trade in India during the expiring struggles of the Mughul empire. It grew up without any fixed plan, and with little regard to the sanitary arrangements required for a town. Some parts of it lie below water mark on the Hiugli, and its low level throughout rendered its drainage a most difficult problem. Until far on in the last century, the jungle and paddy fields closely hemmed in the European mansions with a circle of malaria; the vast plain (mazddn), with its gardens and promenades, where the fashion of Calcutta now displays itself every evening, was then a swamp during three months of each year; the spacious quadrangle known as Wellington Square was built upon a filthy creek. A legend relates how one-fourth of the

European inhabitants perished in twelve months, and |

13. Treasury. 19, St John's Church.

14. Town Hall. 20. Foreign Department.

~~15. Supreme Court. 21. New Post Office. :~~

~~16. Bank of Bengal. 22. Sudder Dewanny Adulut.~~

~~17. Stationery Office. 23. Government Iron Bridge Yard.~~

~~18, Metealf Hall.~~

~~during seventy years the mortality was so great that the name of Calcutta, derived from the village of Kalighat, was identified by mariners with Golgotha, the place of a skull.~~

~~The chief event in the history of Calcutta is the sack of the town and the capture of Fort William in 1756, by Sur4j-ud-Daulé, the Naw4b of Bengal. The majority of the English officials took ship and fled to the mouth of the Hugli River. The Europeans who remained were com- pelled, after a short resistance, to surrender themselves to the mercies of the young prince. The prisoners, number- ing 146 persons, were driven at the point of the sword into the guard-room, a chamber scarcely 20 feet square, with but two small windows. Next morning only 23 were taken out alive, among them Mr Holwell, the annalist of the "Black Hole." 'This event took place on June 20, 1756. The Mahometans retained possession of Calcutta for about seven months, and during this brief period the~~

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~~name of the town was changed in official documents to Alinagar. In January 1757 the expedition despatched from Madras, under the command of Admiral Watson and Colonel Clive, regained possession of the city. They found many of the houses of the English residents demolished, and others damaged by fire. The old church of St John's lay in ruins. The native portion of the town had also suffered much. Everything of value had been swept away, except the merchandise of the Company within the fort, which had been reserved for the Nawab. The battle of Plassey was fought on June 23d, 1757, exactly twelve months after the capture of Calcutta. Mir Jafar, the nominee of the English, was created Nawab of Bengal, and by the treaty which raised him to this position he agreed to make restitution to the Calcutta merchants for their losses. The English received £500,000, the~~

~~Hindus and Mahometans £200,000, and the Armenians £70,000. By another clause in this treaty the Company was per- mitted to establish a mint, the visible sign in India of ter- ritorial sovereignty, and the first coin, still bearing the name of the Delhi emperor, was issued on August 19th, 1757. 'The restitution money was divided among the sufferers by a committee of the most respectable inhabi- tants. Commerce rapidly revived, and the ruined city was rebuilt. Modern Calcutta dates from 1757. The old fort was abandoned, and its site devoted to the Customs House and other Government offices. A new fort, the present Fort William, was commenced by Clive, a short distance lower down the River Hugli. It was not finished till 1773, and is said to have cost two millions sterling. At this time also the mazddén, the park of Calcutta, was formed; and the salubrity of its position induced the European inhabitants gradually to shift their dwellings eastward, and to occupy what is now the Chauringhi (Chowringhee) quarter.~~

~~From this time the history of Calcutta presents a smooth narrative of advancing prosperity. No outbreak of civil war nor any episode of disaster has disturbed its progress, nor have the calamities of the climate ever done mischief which could not be easily repaired. A great park (maiddn), intersected by roads, and ornamented by a garden, stretches along the river bank. 'The fort rises from it on its western side, the stately mansions of Chauringhi with Government House, the high court, and other public offices, line its eastern and northern flank. Beyond the European quarter lie the densely populated clusters of hnts or "villages" which compose the native city and suburbs. Several fine squares, with large Yeser voirs and gardens, adorn the city, and broad well-metalled streets connect its various extremities.~~

~~Up to 1707, when Calcutta was first declared a presi- dency, it had been dependent upon the older English settlement at Madras. From 1707 to 1773 the _presi- dencies were maintained on a footing of equality ; but in the latter year the Act of Parliament was passed, which provided that the presidency of Bengal should exercise a control over the other possessions of the Company; that the chief of that presidency should be styled Governor-General ; and that a supreme court of judicature should be established at Calcutta. In the previous year, 1772, Warren Hastings had taken under the~~

~~immediate manage- ment of the Company's servants the general administra- tion of Bengal, which had hitherto been left in the hands of the old Mahometan officials, and had removed the treasury from Murshiddbad to Calcutta. The latter town thus became the capital of Bengal, and the seat of the Supreme Government in India. In 1834 the Governor- General of Bengal was created Governor-General of India, and was permitted to appoint a Deputy-Governor to man- age the affairs of Lower Bengal duriag his occasional~~

~~absence. It was not until 1854 that a separate head was appointed for Bengal, who, under the style of Lieutenant- Governor, exercises the same powers in civil matters as those vested in the Governors in Council of Madras or Bombay, although subject to closer supervision by the Supreme Government. Calcutta is thus at present the seat both of the Supreme and the Local Government, each with an inde- pendent set of offices. Government House, the official residence of the Governor-General of India, or Viceroy, is a magnificent pile of buildings to the north of the fort and the mazddn, built by Lord Wellesley in 1804. The official residence of the Lieutenant-Governor of Bengal is a house called Belvedere, in Alipur, the southern suburb of Calcutta. Proposals have been made from time to time to remove the seat of the Supreme Government from Calcutta. Its unhealthiness, especially in the rainy sea- son, its remoteness from the centre of Hindustan, and its distance from England, have each been animadverted upon. These disadvantages of Calcutta have now, however, been almost entirely removed, or their consequences have been mitigated, by the conquests of science and modern engineering. 'The railway and the telegraph have brought the Viceroy at Calcutta into close contact with every corner of India; while an ample water supply, improved drainage, and other sanitary reforms, have rendered Cal- cutta the healthiest city in the East,—healthier, indeed, than some of the great European towns. English civiliza- tion has thus enabled Calcutta to remain the political capital of India. The same agency still secures the city in her monopoly of the sea-borne trade of Bengal. The River Hugli has long ceased to be the main channel of the Ganges ; but Calcutta alone of all the successive river capitals of Bengal has overcome the difficulties incident to its position as a deltaic centre of~~

~~commerce. Strenuous efforts of engineering are required to keep open the "'Nadiyad Rivers," namely, the three off-shoots of the Ganges which combine to form the Hugli. Still greater watchfulness and more extensive operations are demanded by the Hugli itself below Calcutta, to save it from the fate of other deltaic streams, and prevent it from gradually silting up. In 1853 the deterioration of the Hugli channel led toa proposal to found an auxiliary port to Cal- cutta on the Matlah, another mouth of the Ganges. A comniittee, then appointed to inquire into the subject, reported that "the River Hugli was deteriorating gradually and progressively." At that time "science had done nothing to aid in facilities for navigation," but since then' everything has been done which the foresight of modern knowledge conld suggest, or the power of modern capital could achieve. Observations on the condition of the river are taken almost hourly, gigantic steam dredgers are con- tinually at work, and the shifting of the shoals is carefully recorded, By these means the port of Calcutta has been kept open for ships of the largest tonnage, and now seems. to have out-lived the danger which threatened it.~~

~~Statistics. — Caleutta may, in one sense, be said to extend across the Hiugli, and to include Howrah on the western side of the river, as well. as the three separate municipalities on the eastern bank, known as the suburbs of Calcutta, the north suburban town, and the south subur- ban town. The total population of the area thus defined was returned by the census of 1872 at 892,429 souls. Calciitta proper, or the central portion, which lies, roughly speaking, between the old Mar- hatta ditch and the Hugli, is governed by a distinct municipality. In 1752 Mr Holwell estimated the number of houses within its limits at 51,132, and the inhabitants at 409,056 persons ; but both these estimates were probably much too high ; in 1822 the number of inhabitants was returned at 179,917; in 1831 at 187,081; in 1850 at 361,369 ; and in 1866 at 377,924. In 1872 a regular census was taken under the conduet of the municipality. The results present features of doubtful accuracy. They were as follows :— Area, 8 square miles; number of houses, 38,864; population,— Hindus, 291,194; Mahometans, 133,131; Buddhists, 869; Christians, 21,356; "other" denominations not separately classified, 1051;~~

grand total, 447,601; total of males of all denominations, 299,857; females, 147,744; average number of persons per house, 11; number of persons per square mile, 55,950. The length of the roads in the town is about 120 miles. The present governing body was created in accordance with the provisions of Act 6 of 1863 (Bengal Council). It consists of the justices of the peace for Calcutta, with a salaried chairman, who is a member of the civil service. All the members are nominated by the Government, but a deputy-chairman is chosen by the justices out of their own body. As the justices are not in any sense representative, the power and respon- sibility are to a great extent centred in the chairman ; but of late years, by means of departmental committees, the co-operation of the ordinary members has been enlisted. Out of about 100 justices who are resident in Calcutta exactly one-half are Europeans. In 1874 the ordinary revenue of the municipality amounted to £240,656, of which £160,000 was raised by rates, and £37,000 by licences. The ordinary expenditure for the same year amounted to £233, 374, of which £80,000. was devoted to interest on loans and sinking fund, £32,000 to general expenses, £30,000 to roads, two items of £22,000 to lighting and water supply, and £13,000 to conservancy. Including capital account, receipts, loans, suspense account, and cash balances, the total amount at the disposal of the justices during the year was £433,938. The aggregate expenditure under both revenue and capital account amounted to £382,823. The total loan liabili- ties of the corporation are £1,466,060, and the total of interest and sinking fund payable yearly is £100,474. The average rate of municipal taxation per head of the population is about 10s. 8d. The most important undertaking under the care of the municipality is the water supply. The present system dates from 1865, when the sanction of Government was given to the construction of works which now pour upwards of 6 million gallons a day of filtered water into the city. The source of supply is from the Hugli at Palta, about 16 miles above Calcutta. The works there consist of two large suction pipes, 30 inches in diameter, through which the water is drawn from the river by three engines, each of 50 horse power no- ininal ; the water is then passed into six settling tanks, each 500 feet long by 250 feet wide. Here it is allowed to stand for 36 hours, when it is permitted to run off to the filters, eight in number, the area of each being 200 by 100 feet. After filtration the water is made to flow

~~over a marble platform, where its purity can be observed. It is then conducted to Calcutta by a 42-inch iron main. These works cost £525,432. They were finished in 1870, and connected with pipes laid under 100 miles of streets. The total number of house-connections up to December 31,1874, was8159. The total quantity of water delivered during that year amounted to 2,524,566,300 gallons, being considerably over the estimated average of 6 million gallons daily, or about 13 gallons per head of the population. The total cost for the same year of the water-supply (inclusive of interest) was £55,547, or about 5d. per 1000 gallous.~~

~~The drainage works are on an equally effective scale. The main sewers are underground, and for the proper discharge of their con- tents in the direction of the Salt Lake, a pumping station is main- tained at an annual cost of £3000. The system of underground drainage, although not entirely completed, had cost in 1874 a capital sum of £620,000. In 1863, on the constitution of the present municipality, a health officer with an adequate establish- ment was appointed. The practice of throwing corpses into the river has been put down, and the burning ghdts and burial-grounds have been placed under supervision. All refuse and night-soil are removed by the municipality, and conveyed by a special railway to the Salt Lake. The town is lighted by a private gas company, 2723 gas lamps and 730 oil lamps being paid for at the public expense. The fire brigade consists of 2 steam fire-engines, and 5 hand engines, its annual cost being about £2000. The polzee of Calcutta is under the control of a commissioner, who is also the chairman of the justices. Beneath him there is a deputy-commis- sioner. The force consists of 4 superintendents, 155 subordinate officers of various grades, 1292 constables, and 6 mounted con- stables, maintained in 1873 at a cost of £41,227, of which Government contributed one-fourth. Several minor bodies, such as the river police, Government guards, &c., bring the entire strength of the force in the town and on the river to 2313 men. The great majority are natives, the number of European sergeants and constables being only 50.~~

~~In 1872-73 the statistics of edweation in Calcutta were as follows : —There were 3 Government colleges, namely, the Presidency College, founded in 1855, and attended by 709 pupils; the Sanskrit College, established in 1824, attended by 26 adult pupils, of whom 17 are Brahmans; the Calcutta~~

~~Madrasa or Mahometan College founded in 1781, number of pupils 528. There are also five colleges mainly supported by missionary efforts, aided by Government, and attended by 305 pupils. The total number of schools in Calcutta reported on by the Educational Department is 260, with 19,445 scholars ; 157 of them are male schools, teaching 16,155 boys; the remaining 103 are for girls, and teach 3290 pupils. According toa different principle of classification, 36 schools teach English to 9445 hoys, 121 teach the vernacular only to 6620 boys, 99 are vernacular~~

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~~schools for girls with 3244 pupils, and 4 are normal schoolsy instructing 90 male teachers and 46 female. Of the total number of pupils in these schools, 47°7 per cent. are ascertained to be Hindus, 13°5 Christians, 2°6 Musalmans, and the remaining 36°2 per cent, are of unascertained religions. The total ascertained expenditure was £25,011, of which sum the Government contributed £9160, The Government School of Art was attended in 1872-73 by 94 students, of whom 88 are Hindus, 4 Musalmans, and 2 Eurasians, Calcutta has also an inmiportant school of medicine, or medical college, with a large hospital attached and every facility for a thorough scientific training.~~

~~The medical charities of Calcutta comprise the Medical College Hospital, just uamed the General Hospital, the Native or Mayo Hospital, the Municipal Pauper Hospital, and minor dispensaries, Of these the General Hospital is confined almost solely to Europeans, The total amount contributed by Government to these institu- tions is £30,000. The number of persons treated during the year 1872-73 was 251,039, of whom 20,805 were indoor patients. Of these 64°9 per cent. were men, 16°3 women, and 18°8 children, The rate of mortality in cholera cases was 484°3 for every thousand treated.~~

~~Mortuary returns are collected in Calcutta by the police inspectors, aud compared with the registers kept by paid clerks of the munici- pality at the burning ghdts and burial-grounds. In 1873 the total number of deaths thus ascertained was 11,557, or 25°82 per thousand. The death rate among the Christians was 31°5, among the Hindus 26°1, and among the Mahometans~~

~~24°7. The highest death rate was in January, November, and December, and the low- est in June and July.~~

~~The mean temperature of Calcutta is about 79° Fahr. The high- est temperature recorded during the last 18 years is 106° in the shade, and the lowest 52°°7. 'The extreme range is therefore a little over 53°, while the mean temperatures of December and May, the coldest and hottest months, are 68°5 and 85° respectively. The average rainfall during 36 years has been 66 inches,—the highest rainfall on record being 93°31 inches in 1871, and the lowest 43°61: inches in 1837. By far the greater part of the rain falls between the months of June and October.~~

~~Like the rest of the seaboard of the Bay of Bengal, Calcutta is exposed to periodical cyclones, which do much mischief. The greatest pressure of the wind registered is 50 Tb to the square foot. In the storms of 1864and 1867 the anemometer was blown away. A great loss of life and property was caused along the Hugli by the storm of October 5th 1864. In Calcutta and its suburbs 49 persons were killed, and 16 wounded, 102 brick houses were destroyed, and 563 severely damaged ; 40,698 tiled and straw huts were levelled' with the ground. The destruction of shipping in the port of Calcutta appears greatly to have exceeded that on record in any previous storm. Out of 195 vessels only 23 remained uninjured, and $1, with an aggregate tonnage of 27,653 tons, were totally wrecked. On November 2, 1867, the force of the wind was not less violent, but there was no storm wave, and consequently the amount of damage done was much less,~~

~~Tue Porr or Catcutta, extending 10 miles along the Hugli, with an average width of working channel of 250 yards, and with moorings for 169 vessels, is under the management of a body of 9 European gentle- men styled " Commissioners for making Improvements in the Port of Calcutta." This body was constituted in 1870, and has since that date received considerable additions to its powers. In 1871 they were appointed " Bridge Com- missioners," to take charge of the floating bridge over the Hugli, and to work it when completed. This bridge, finished in 1874, now supplies a permanent connection between Calcutta and the railway terminus on the Howrah side of the river. It is constructed on pontoons, and affords a continuous roadway for foot passengers and vehicles. The traffic returns for~~

~~41 weeks in 1875 were £7593; the cost of the bridge has been £220,000. The main duty of the Port Commissioners has hitherto con- sisted in providing accommodation, by jetties and ware- houses, for the shipping and native boats, which carry on the great and increasing trade of Calcutta.~~

~~In the year 1873-74 the income of the commissioners from all sources was £114,709, and the expenditure £78,260. The total.~~

~~amount of capital expended up to that year was £580,339, including a debt of £400,123. The number of vesscls arriving am~~

~~'departing in 1861-62 was 1793, with an aggregate tonnage of~~

~~1,337,632 tons; in 1873-74, the number of vessels was 1927, ton- nage 2,437,447. The number of steamers, and especially of steamers passing through the Suez Canal, is greatly on the increase.~~

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~~. The growth of the commerce of Calcutta may be scen from the following figures:—In 1820-21 the total value of the exports and im- ports, including treasure, was £10, 454,910; in 1830-31,£8,756, 382 ; in 1840-41, £15,202,697 ; in 1850-51, £18,754,025; in 1860-61, £31,794,671 ; in 1870-71, £49,316,738. The value of the customs duties (including salt) was in 1820-21, £151,817; 1830-31, £121,321; 1840-41, £495,515; 1850-51, £1,038,365 ; 1860-61, £2,270,654 ; 1870-71, £3,548,926. Cotton goods first became an important article of import .in 1824; oil seeds were first exported in 1835; the exports of jute on a large scale date from 1860, those of tea from 1864. Among the chief articles of import in 1870-71 were—apparel, value £186,767 ; beer, £140,859; coal, £109,185 ; cotton manufactured, £11,624,712 ; machinery, £194,198 ; metals, £1,311,547 ; railway materials, £710,357 ; salt, £652,632 ; spices, £150,150; spirits, £162,635 ; wine, £214,191; wood, £156,903 ; woollen manufactures, £347,116 ; treasure, £2,255,244; Government shipments, £981,557 ; total value of imports, £21,198,478. Among the chief articles of export in 1870-71 were—cotton raw, £2,020,159 ; cotton manufactured, £811,825; dyeing materials, £153,113 ; grain and pulse, £2,630,451 ; hides and skins, £1,573,655 ; indigo, £2,285, 202 ; jute, £2,585,390 ; jute manufactured, £664,898 ; lac,~~

~~£194,576; metals, £215,920; opium, £5,490,395; saltpetre, £440,138 ; seeds, £2,921,117 ; silk, £1,508,801 ; silk manufactured, £244,076 ; spices, £215,018 ; sugar, £674,149; tea, £1,117,712; tobacco, £152,716 ; woollen manufactures, £136,052; bullion and treasure, £1,021,638 ; Government treasure, £228,534 ; total value, of exports, £28,118, 260.~~

~~The internal trade of Calcutta is conducted partly by railway, and partly by water traffic. There is no railway station within the limits of the municipality, but three sepa- rate railways have their terminus in the immediate neigh- bourhood. The East Indian Railway, whose terminus is across the river at Howrah, brings down the produce of the North-Western Provinces and Behar, and connects Calcutta with the general railway system of the Peninsula. The Eastern Bengal Railway and the South – Eastern Railway have their terminus at Sidldah, an eastern suburb of Calcutta. The former is an important line running across the Delta to the junction of the Ganges and Brahmaputra at Goalandé. The latter is a short railway, intended to connect the metropolis with Port Canning, in the Sundarbans. The three chief lines of water traffic are—(1), the Calcutta canals, a chain of channels and rivers passing round and through the Sundarbans, open at all seasons of the year, and affording the main line of communication with the Ganges and the Brahmaputra ; (2), the Nadiya rivers, three in number, which branch off in a more directly southern course from the Ganges, above its junction with the Brahmaputra, and ultimately become the Hugli—these are with difficulty navigable during the dry season; (3), the Midnapur and Hijili canals, leading south towards Orissa. (W. W. H.~~

~~CALDANI, Lropotp Marco Antonio (1725-1813), a distinguished Italian anatomist and physician, was born at Bolegna in 1725. After holding various minor appoint- ments, he was chosen assistant to the celebrated anatomist Morgagni at Padua; but disgusted with the envy which his distinguished position drew upon him, he removed to Venice. Soon after, however, he was appointed to the professorship of the theory of medicine, with the pro- mise of being elected to succeed Morgagni, who was then old and infirm. In 1772 he published his Zlements of Pathology, and soon afterwards the Elements of Physio- logy. In the same year he took possession of the chair of anatomy, vacant by the death of Morgagni,and endeavoured, though without success, to found an anatomical museum. At~~

~~the age of seventy-six, though threatened with blind- ness, he published, with the assistance of his nephew, a valuable series of anatomical plates. He died in 1813, at the age of eighty-eight.~~

~~CALDER, Str Ropert (1745-1815), Baronet, was born at Elgin, in Scotland, July 2, 1745 (o.s.) He belonged to a very ancient family of Morayshire, and was the second son of Sir Thomas Calder of Muirton. He was educated at the grammar school of Elgin, and at the age~~

~~of fourteen entered the British navy as midshipman. In 1766 he was serving as lieutenant of the '" Essex," under captain the Honourable George Faulkner, in the West Indies. Promotion came slowly, and it was not till 1782 that he attained the rank of post-captain. He acquitted himself honourably in the various services to which he was called, but for a long time had no opportunity of distin- guishing himself. In 1796 he was named captain of the fleet by Sir John Jervis, and took part in the great battle off Cape St Vincent (February 14, 1797). He was selected as bearer of the despatches announcing the victory, and on that occasion was knighted by George III. He also received the thanks of parliament, and in the following year was created a baronet. In 1799 he became rear-admiral ; and in 1801 he was despatched with a small squadron in pursuit of a French force, under Admiral Gantheaume, conveying supplies to the French in Egypt. In this pursuit he was not successful, and returning home at the peace, he struck his flag. When the war again broke out he was recalled to service, was promoted vice-admiral in 1804, and was employed in the following year in the blockade of the ports of Ferrol and Corufia, in which (amongst other ports) ships were preparing for the invasion of England by Napoleon I. He held his position with a force greatly inferior to that of the enemy, and refused to be enticed out to sea. On its becoming known that the first movement directed by Napoleon was the raising of the blockade of Ferrol, Rear-adimiral Stirlirg was ordered to join Sir R. Calder and cruise with him to intercept the fleets of France and Spain on their passage to Brest. The approach of the enemy was concealed by a fog; but on July 22, 1805, their fleet came in sight. It still out- numbered the British force; but Sir Robert entered into action. After a combat of four hours, during which he captured~~

~~two Spanish ships, he gave orders to discontinue the action. He offered battle again on the two following days, but the challenge was not accepted. The French admiral, Villeneuve, however, did not pursue his voyage, but took refuge in Ferrol. In the judgment of Napoleon, his scheme of invasion was baffled by this day's action ; but much indignation was felt in England at the failure of Calder to win a complete victory. He was, nevertheless, again sent out in August, and prevented Villeneuve from effecting a junction with the French fleet. at Brest. In consequence of the strong feeling against him at home he demanded a court-martial. This was held on the 23d of December, and resulted in a severe reprimand:of the vice- admiral for not having done his utmost to renew the engagement, at the same time acquitting him both of cowardice and disaffection. False expectations had been raised in England by the mutilation of his despatches, and of this he indignantly complained in his defence. The tide of feeling, however, turned again; and in 1815, by way of public testimony to his services, and of acquittal of the charge made against him, he was appointed commander of Portsmouth. He died at Holt, near Bishop's Waltham, in Hampshire, August 31, 1818.~~

~~CALDERON DE LA BARCA, Pepro (1600-1681), the most eminent representative of the Spanish national drama, was born in Madrid, January 17,1600. His pros- perous life was undistinguished by striking incidents. He received his education at Salamanca, and after having been, as would seem, for some years a retainer or dependant of various noblemen, in 1625 entered the army, where it is hinted that he did not distinguish himself. He had begun to write for the stage in 1622, and in 1636 he was summoned to court, and soon became habitually employed as a writer of court spectacles by King Philip 1V., a munificent patron of authors and artists. He was also made a knight of Santiago, and saw some further military service in Cata-~~

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~~lonia; but in 1651 he entered the church, and from that period wrote nothing but spectacular plays for representa- tion at court, and the religious pieces kuown as Autos Sacramentules. He received various ecclesiastical pre- ferments from Philip IV., and prolonged his days in wealth and honour until~~

~~his death on May 25, 1681. Very few traits of his personal character have been preserved, and little else can be extracted from the sonorous eulogium of his friend and biographer Vera Tassis than that he was held in esteem for gravity, urbanity, aud modesty. A surer testimony to his character is the spirit of his works, which are animated throughout by a lofty ideal of honour and religion according to the conceptions of his age and country, and are wholly free from the usual impurity of the stage. He must evidently have been a highly accom- plished man, possessed of a large stock of erudition.~~

~~The entire nuniber of pieces comprised in Hartzenbusch's edition of Calderon, which does not include the autos sacramentales, is 122. There are 72 autos. It is of course impossible to notice here more than a fraction of this prodigious mass of dramatic poetry. We shall briefly characterize the classes under which it admits of being distributed, adducing a few of the more remarkable dramas as representatives of the whole, and following in the main the admirable arrangement of Schack.~~

~~1. Religious Dramas.—Of these Schack reckons sixteen, including The Stature of Prometheus and Life isa Dream. This division comprises some of Calderon's most famous pieces, in particular The Wonder-working Magician, in which the brilliancy of his poetical imagination is displayed to the fullest extent, and by Shelley's translation of which le is hitherto best known in England.. The subject—the voluntary surrender of a human soul to the Evil One— offers striking analogies and equally strong contrasts to Goethe's Faust. The comparison of the two pieces is most instructive, and most forcibly attests the vast progress in depth of thought and complexity of emotion of the modern over the medizval world. Zhe Devotion of the Cross is another of the most remarkable pieces of this class, rich in poetical beauties, and exhibiting Catholic antinomianism in its most unmitigated form. There is a deeper vein of~~

~~thought in Life is a Dream, in which the poet is compara-.~~

~~tively free from ecclesiastical influences, and which is also one of his most striking and original productions. Zhe Constant Prince, founded on Don Ferdinand of Portugal's captivity, is the very flower of Spanish religion, courtesy, and chivalry, and, like Life is a Dream, is an excellent~~

~~acting play. Zhe Schism of England and The Dayspring in~~

~~Copacavana, apart from their great poetical merits, are interesting as indications of the national feeling with regard to nearly contemporary events.~~

~~2. Nineteen of Calderon's dramas are classed as _his- torical tragedies. These generally exhibit his talent for effective theatrical situation in the most advantageous light; but in psychological depth and truth he is far behind the great dramatic masters of other countries. The most celebrated of these pieces are founded on incidents in Spanish and Portuguese history, from the posthumous coronation of Ifiez de Castro to the heart-rending story of Gomez Arias's Leman, and the powerful domestic tragedy of the Alcalde of Zalamea, which displays more individu- ality in the delineation of personal character than is usual with him. Nowhere can a fuller insight be obtained into the peculiarities of the Spanish character and the national ideal while the nation was still a great Catholic and Cru- sading power. Calderon's treatment of historical fact, it need hardly be said, is frequently as free as Shakspeare's. The most remarkable of his historical plays, whose plots are not derived from the history of his own country, are No Monster like Jealousy, a most powerful tragedy on the~~

~~story of Herod and Mariamne; Zhe Locks of Absalom, so greatly admired by Shelley ; and Zenobia the Great.~~

~~3. The subjects of twenty-four of Calderon's pieces are derived from mythology, chivalric romance, or novels, Most of these are merely spectacular, affording little scope for strictly dramatic power, but dazzling from the opulence of the poet's invention, and the sweetness and variety of his versification. He has here given lis imagination the freest rein, and is nowhere more truly himself. Mo Magic like Love, a play on the story of Circe; Hecho and Narcissus ; and The Bridge of Mantible may be cited as characteristic examples.~~

~~4, Sixteen romantic dramas, generally melodramas or tragi-comedies, form the transition from Calderon's tragic to his comic theatre. None of his plays~~

~~are more distin- guished for ingenuity of conception and grace of style The Loud Secret is perhaps the most celebrated, but the rest are of hardly inferior merit.~~

~~5. We now come to Calderon's comedies of intrigue, the so-called "comedies of cloak and sword," his delineations of the manners of his day, and of the actual human life around him. His range is an exceedingly liniited one in comparison with that of the English dramatists. It hardly transcends the sphere of ordinary good society,—the valets and other representatives of the lower orders being for the most part merely conveutional types. The motive of his pieces, moreover, seldom comprehends more than the two prime factors of love and jealousy. Within these limits, however, his perception is commonly correct, and his characters are depicted with more individuality and subtlety than in his more serious pieces. Even his high- flown strain of chivalric sentiment and his punctilious formality correspond to fact. They are artificial indeed, but not affected, for they actually represent the ideal of the best contemporary society, and represent the Spanish cavalier, if not precisely as he was, yet as he wished to be esteemed. 'The capital merit of these pieces, however, is the prodigious ingenuity of the plots, and the fertility of invention by which our attention is kept continually on the stretch. Calderon's expedients are inexhaustible; every fresh incident surprises, and none appears capricious or unnatural. Twenty-five plays are included under this head. The Fairy Lady and 'T%s ill keeping a House with Two Doors are perhaps the most generally known; all however are nearly upon a level.~~

~~6. Autos Sacramentales.—A volume might be written upon this most peculiar of all the forms of the modern European drama. We can only describe it here as a development of the mystery or miracle play of the Middle Ages, designed like it for public representation on some specified religious occasion, and falling like it into two classes, the strictly Biblical play, of which Calderon's Brazen Serpent is an instance, and the religious allegory. The latter is Calderon's characteristic department, and nothing can surpass the boldness and quaintness of his personifications. Man, the World, Guilt, the Morning Star, the Synagogue, and Apostacy figure, for example, among his innumerable dramatis persone. The riches of his invention and his diction are nowhere more abundant; but the profoundness of his~~

~~philosophy and theology have been greatly over-estimated by writers of his own religious communion.~~

~~7. Minor Pieces.—Calderon also composed numerous farces, interludes, and other brief occasional pieces, the greater part of which are lost.~~

~~Calderon received the Spanish drama from his predeces- sors in a flourishing condition, exhausted, in conjunction with his numerous gifted contemporaries, every phase of which it allowed, and left it at his death in a condition of total decay. His retirement from the theatre in middle~~

~~life was probably occasioned by the conviction that it admitted of no further development. In his relation to his predecessors he appears as an innovator, chiefly in the simplification of metrical forms. Though at least half of each of his plays is still in complete rhyme, he nevertheless resorts to assonances more liberally than his forerunners. If, on the one hand, this brings him nearer to the language of reality, it on the other sometimes betrays him iuto verbosity. In his earlier pieces the exuberance of his genius, and the example of the popular lyrical poets of the day, tempted him into conceits and extravagances of diction which are less apparent in his later works. He yet has more fire and colour than any other of the Spanish dramat- ists, and may be described as the one amoung them in whom the Oriental element is most largely developed. He shares with his rivals the reproach of repetition, of calculated stage effect, and of stereotyped formis of expression, which become at length mere convention and surplusage. The peculiarity of the form of composition cultivated by Calderon renders it difficult to assign his relative rank among poets of the first class. The Spanish drama is a creation swt generts, and all attempts at a comparison between it and other theatrical forms must be futile for want of acommon measure. The art of Calderon attains its purpose not less completely than that of Shakespeare or Sophocles ; all that can be said in its disparagement is that this purpose is less elevated. It falls below the art of Greece, inasmuch as it makes no pretension to represent the ideal either of divinity or of manhood ; and below the art of Shakespeare, inasmuch as, instead of offering a mirror to universal nature, it is restricted to the representation or poetic expression of a temporary and accidental phase of manners. It is the most perfect~~

~~embodiment conceivable of all the romantic and chivalrous elements of Spanish national life ; there is not, perhaps, such another example in literature of the wonderful power of poetry to eliminate all baser matter, and present the innermost idea of a society in untarnished brightness. Calderon is also the most perfect representative of the state of feeling induced by unconditional allegiance to the Catholic Church, at the critical moment when the scales of faith and knowledge are yet in equilibrium. Great Catholic poets may yet arise, with even more than Calderon's depth of conviction, but none can again enjoy Calderon's serenity. There is no disturbing element in his world, either of innovation or of resistance ; he is everything which by theory a consummate Catholic poet ought to be. It is therefore but logical that he should be set up as the rival of Shakespeare by the partisans of the medieval revival, of whom Frederick Schlegel is the most eminent literary representative. It would be a waste of time to contrast the conventional uniformity of his pieces, reducible to five or six types at most, with Shakespeare's infinite variety; the faint in- dividualization of his characters with Shakespeare's mira- culous subtlety ; his class prejudices with Shakespeare's universal sympathy; his stereotyped cast of thought with Shakespeare's comprehensive wisdom. It is enough to remark, that greatly as he is admired and widely as he is read, he has not contributed a single appreciable element to the literature of any country but his own, while Shakespeare has revolutionized the taste of Europe. His relation to his contemporaries is also different from Shake- Speare's. Shakespeare isa sun among stars; Calderon the brightest star of a group. We shall render him most justice, not by instituting a vain parallel with Shakespeare, or even Goethe, but by regarding those qualities which he necessarily has in comnion with all poetical dramatists. In these respects it is impossible to praise him too highly. Nothing can surpass the fertility, ingenuity, and consistency of his constructive faculty on the one hand, or the affluence of**

~~lis imagery and melody of his versification on the other. The poet and the playwright are happily combined in him ; the development of his plots holds the spectator in suspense from first to last, and the diction, except in designedly comic passages, seldom lapses below the pitch of dignified and exquisite poetry. Even the extravagance of his hyperboles appears almost~~

~~natural amid the geueral torrent of impassioned feeling. The interminable length of many of his speeches is certainly a fault, and is partly attributable to the fluency and facility of his metre. If we regard him as a tragic poet, we must allow him power, restricted by the absence of any philosophical view of human nature or destiny. As a contic poet he excels in the vis comica of situation ; but his dialogue is more remarkable for vivacity than humour. His proper and peculiar sphere is that of the fancifully poetical. His inventiveness is here equal to any feat of construction, and his imagination to any opulence of adornment. After Shakespeare and Aristophanes, no dramatist has understood so well how to transport his reader or spectator to an ideal world.~~

~~Calderon's metrical forms, although, as already stated, less rich and intricate than those of the earlier Spanish dramatists, are nevertheless a great obstacle to his being adequately translated. No language but the German, in fact, is adapted to render him. Gries's version in that language is very celebrated. Schlegel and Schack have rendered some plays very well; and the autos have been translated by Lorinser, Shelley's version of some scenes of the Wonder-working Magician is incomparably the best English interpretation, and no reproduction in our language will ever be perfectly successful that does not proceed upon his principle of intermingling blank verse with irregular lyrical metres. Mr Fitzgerald and Mr D. F. M'Carthy, two excellent translators, have erred,—the former by resorting to blank verse entirely, the latter by discarding it altogether. Mr Fitzgerald's version is too English, and Mr M'Carthy's too Spanish ; the peculiar delicacy of the assonant rhyme, which he has endeavoured to preserve throughout, is entirely imperceptible in our language. Mr Fitzgerald has rendered six plays, and Mr M'Carthy eleven. There is perhaps no more congenial field for a writer of a poetical temperament than the translation of Calderon.~~

~~The chronology of Calderon's pieces is unsettled, but' much has been done toadjust it. Many of them were printed during his life, but the first collective edition was that published in 1685 by his friend Vera Tassis. It is not quite complete, and some plays, in- cluding most of the author's dramatic trifles, are irremediably lost. The best edition is that by Hartzenbusch in Aribau's Biblioteca de Autores Espafioles (4 vols., Madrid, 1848-50). It does not contain the autos, which were published at Madrid in 1717 and in 1759-60.~~

~~There is also a good edition by Keil (Hamburg, 1827-30). Accounts of Calderon will be found in Bouterwek, Ticknor, and other his- torians of Spanish literature; but the best and fullest is that by Schack in his Geschichte der dramatischen Literatur und Kunst in Spanien, vol. iii. (Berlin, 1846.) (R. G.)~~

~~CALDERWOOD, Davin (1575-1650), an historian of the Church of Scotland, was born in 1575. Hewas educated at Edinburgh, where he took the degree of M.A. in 1593. About 1604 he became minister of Crailing, near Jedburgh, aud he speedily began to take part in the ecclesiastical proceedings of that period, and was conspicuous for his resolute opposition to the introduction of Episcopacy. In 1617, while James was in Scotland, a Remonstrance which: had been drawn up by the Presbyterian clergy was placed in Calderwood's hands. He was sumnioned to St Andrews and examined before the king, but neither threats nor promises could make him yield, and deliver up the roll of signatures to the Remonstrance. He was deprived of his charge, committed to prison at St Andrews, and afterwards removed to Edinburgh. The privy council, which long exercised an undefined and despotic jurisdiction, ordained him to be banished from the kingdom for refusing to~~

~~acknowledge the sentence of the High Commission. On giving security to banish himself from the kingdom before the ensuing Michaelmas, and not to return without the royal licence, he was released from prison. He accompanied Lord Cranstoun to Carlisle, where that nobleman presented a petition in his favour to the king; but it was followed by no beneficial result. The subsequent application of Lord Cranstoun to the privy-council, and to the bishops, was attended with no better success. He lingered in Scotland, publishing a few tracts, till the 27th of August 1619, when he sailed for Holland. Where he chiefly resided in that country we are not informed, but Bishop Guthry states, that "in the time of his exile he had seen the wild follies of the English Brownists in Arnheim and Amsterdam." During his residence in Holland he pub- lished various works, and, among the rest, his Altare Damascenum. At one period his enemies supposed him to be dead ; and he has recorded a very extraordinary attempt to impose upon the world~~

~~a recantation fabricated in his name. Calderwood appears, to have returned to Scotland in 1624, and he was soon afterwards appointed minister of Pencaitland, in the county of Haddington. During the remainder of his life he continued to take an active part in the affairs of the church, and he introduced in 1649 the practice, now confirmed by long usage, of dissenting from the decision of the Assembly, and requiring the protest to be entered in the record. His last years were devoted to the preparation of a History of the Church of Scotland. In 1648 the General Assembly urged himn to complete the work he had designed, and voted him a yearly pension of £800. He left behind him an historical work of great extent and of great value, not indeed as a masterly composition, but as a storehouse of authentic materials for history. An abridgment, which appears to have been prepared by him- self, was published after his death. An excellent edition of the complete work was published by the Wodrow Society, 8 vols. 1842-49. The manuscript, which belonged to General Calderwood Durham, was presented to the British Museum. A copy, transcribed under the inspection of Wodrow, is among the archives of the church ; another belongs to the library of the university of Glasgow; and, as Dr M'Crie has stated, "in the Advocates' Library, besides a complete copy of that work, there is a folio volume of it, reaching to the end of the year 1572. It was written in 1634, and has a number of interlineations and marginal alterations, differing from the other copies, which, if not made by the author's own hand, were most probably done under his eye." Calderwood died at Jed- burgh on the 29th of October 1650, aged seventy-five. He appears to have been a man of unbending integrity, fearless in maintaining his opinions, and uniformly con- sistent in his professions; but as human virtues are never perfect, his decision of character had some tendency to deviate into that obstinacy from which good men are not always exempted.~~

~~CALEDONIA, used in general somewhat loosely to denote the northern portion of Britain during the period of the Roman occupation of the island, had originally a more restricted application. It is proposed in this article to give, from a geographical as well as an historical point of view, a brief account of what seems to have been known regarding it in ancient times.~~

~~The word Caledonia is first met with in the fourth book of Pliny's Historia Naturalis (circa 77 a.D.), where, in the very meagre notice of Britain, the~~

~~Caledonian forest (Caledonia sylva) is given as the northern boundary of the Roman part of the island. Its next appearance is in the Agricola of Tacitus (96 a.p.) Here, both in the brief geographical description of Britain, chaps. x. and x1, and in the account of Agricola's campaigns, chaps. xxv.—~~

~~CAL—-C AL~~

~~XXxvili., Caledonia is unquestionably Britain north of the Firth of Forth. On turning to the geographer Ptolemy (circa 120 a.d.), we fail to meet with the term except as the name of one of the many tribes among which he hag parcelled out the " Bretannic Island, Albion." To explain this it is not necessary to assume that Ptolemy was ignorant of the wider acceptation in which Caledonia had recently come to be employed among the Romans. It is more reasouable to suppose that, as he avowedly drew the materials for his tables from earlier, chiefly from Tyrian sources, he judged it prudent to follow in the main long- recognized authorities. Yet even in Ptolemy we have an indication either of the importance of the Caledoniangs among their neighbours or of the occasional use of the word as a general name for all the northern tribes. Twice he gives the Deucaledonian Ocean as bounding Britain in the uorth, that is, after the necessary correction for his mistake in making the whole of the northern part of the island trend to the east instead of to the north, as washing the shores of modern Scotland on the west. Confused and inaccurate in some respects as the Alexandrian geographer's tables are, they, notwithstanding, contain a surprising amount of information regarding the leading features of the coast-line of Britain, thefcorrectness of much of which can be verified by existing names. His account of the tribes and their towns, especially towards the north, is, as might have been expected, much less definite and trust- worthy. In order to be able to give here some notice of the Ptolemaic geography of North Britain, Caledonia may for the moment be regarded as a synonymous terin. Ptolemy's error in turning the northern part of the island to the east has already been noticed. How he was led into it there are no means of determining. One effect of it is to exaggerate greatly the length of the Solway Firth and displace the Hebrides from their true position, as may be seen by referring to certain maps appended to several MSS. of the Geography and given with some editions of it. The error ean easily be rectified; and when this is done the outline of the coast will be found to be~~

~~wonderfully correct. Commencing with the promontory of the Noouantai (Mull of Galloway) in the south-west and proceeding northwards along the shores of the Deucaledonian Ocean, we have in succession the Bay of Rerigonios (Loch Ryan), the Bay of Ouindogara (Ayr), the estuary of the Klota (Clyde), the Bay of Lelaamnonios (Loch Fyne), Cape Epidion (Mull of Kintyre), the outlets of the River Longus (Loch Linnhe'), outlets of the River Ituos, Bay of Ouolsas (Lochalsh'), outlets of the River Nabaios, and Cape Tarouedoum or Orkas (Dunnet Head). Coming down the east coast, said to be washed by the German Ocean, we find Cape Ouirouedroum (Duncansbay Head), Cape Oueroubium (Noss Head 1), the outlets of the River Ila, the High Bank, outlets of the River Loxa, estuary of the Ouarar (Moray Firth), estuary of the Touaisis (Spey 1), outlets of the River Kelnios (Deveron?), the promontory of the Taizalai (Kinnaird's Head), outlets of the River Deoua (Dee), estuary of the Taoua, outlets of the River Tina (Tay), estuary of the Boderia (Firth of Forth), outlets of the River Alaunos, outlets of the River Ouedra (Tyne?). On the south, bounded by the Hibernian Ocean, we have the peninsula of the Noouantai (the Rhinns of Galloway), outlets of the River Abraouannos (Luce 4), estuary of the Iena (Cree), estuary of the Deoua (Dee), outlets of the River Noouios (Nith), outlets of the Itouna (Eden). The country is represented as inhabited by the following et ae i 1 The orthography of the names that follow is that of the text of Ptolemy (Wilberg's), and not of the Latin translation. With a few exceptions they are evidently intended to express native terms by means of Greek (perhaps originally Tyrian) characters, and it seems undesirable to obscure them further by presenting them in 'those of another language.~~

~~CALEDONIA~~

~~tribes, sixteen in number:—the Noouantai, dwelling under~~

~~(i.¢., east) of the peninsula of the same name (Wigtonshire), | under a leader whom 'Tacitus names Galgacus.~~

~~their towns Loukopibia and Retigonion ; east of them the Selgoouai (along the Solway Firth, and inland), their towns Karbantorigon, Ouxellon (Dumfries?), Korda, Trimontion ; still further east, the Otadinoi, probably along the south-east coast, their towns Kouria and Bremenion ; and the Damnonioi, occupying apparently the basins of the Clyde, Forth, aud Tay~~

~~(in part), their towns Kolania, Ouandouara (Ayr ?), Koria, Alauna (Stirling?), Lindon, Ouiktoria (near Perth) ; the Kaledonioi, in the district from Loch Fyne to the Moray Firt, with the Caledonian forest to the west of them; eastward the Ouakomagoi (Banff and parts of Moray and Aberdeen), their towns Banatia, Tameia, the Winged Camp, Touaisis; east of these the Taizaloi (part of Aberdeenshire), their town Deouana (Aberdeen), and the Ouenicones (Forfarshire), their town Orrea (Forfar?) ; while occupying the west of Argyll and Inverness, part of Ross-shire, and the whole of Sutherland aud Caithness, were in succession the Epidivi (in Kintyre), Kerones, Kreones, Karnonakai, Karinoi, Kornauioi (Caith- ness), Decantai, Lougoi, and Smertai. Near the pro- montory of Orkas were the islands of Okitis and Doumna ; north of which lay the Orkades (Orkneys), about thirty in number, and still farther north Thoule (Shetland 2).~~

~~Ptolemy's description is the only detailed one we have till we come down to the 16th century. It is matter for regret that the Antonine Jtinerary, so useful an aid to the identification of the Ptolemaic towns in the southern part of the island, does not extend to the north, and that the lists of the anonymous geographer of Raveuna are so corrupt as to be almost useless. About the middle of the last century a new element of confusion was introduced into what was tangled enough previously, by the publica- tion of Bertraw's well-known forgery De Situ Britannie, falsely ascribed to Richard of Cirencester, which being accepted as genuine by Roy, Chalmers, Stuart, and others, has been the means of giving currency to many unfounded notions regarding the nature and extent of the Roman conquests in North Britain.~~

~~The written history of Caledonia as well as of the rest of what is now Scotland commences with the warlike opera- tions in Britain of Agricola, the lieutenant of the Emperor Domitian. (See BriTaNNIA, p. 353.) In the third year of his command this famous general, wlio was fortunate enough to have his son-in-law Tacitus as his biographer, determined to attempt the annexation of the northern portion of the island. Accordingly, in 80 a.p., he advanced as far as the estuary of the Taus, or as Wex reads, the Tanaus. Whatever the true reading may be, the supposition that on this occasion Agricola reached the Tay is untenable; though, whether the river referred to be the English Tyne, the T'weed, or the Scotch Tyne, it is impossible to say. The succeeding summer found him as far north as the isthmus formed by~~

~~the firths of Clota and Bodotria (Clyde and Forth). On it he erected a line of forts, with the intention apparently of making it the northern boundary of the empire in those parts. In the following year he crossed the Clota, and overran additional territory "in that part of Britain which looks towards Ireland." Information having now reached him that the remoter and still unconquered tribes were forming a combination against the Romans, he resolved to anticipate then, and (83 A.D.) carried the war beyond the Bodotria into the country of the Caledonians. That summer an engagement was fougbt, which, though it resulted in favour of the invaders, taught the Romans that they had no ordinary foe to cope with. On the approach of winter both sides retired to their quarters to make pre- parations for renewing the struggle. Next season (84) Agricola, ou resuming the offensive, found himself con-~~

~~fronted by a grand union of all the tribes of Caledonia, The Roman general had previously despatched a fleet to ravage the coast, and on continuing his march northwards, encountered the enemy, upwards of 30,000 strong, near Mount Graupius; for there can be little doubt that this, the reading of Wex and Kritz, ought to be adopted instead of the Grampius of the common editions. The exact locality of the conflict that ensued has been the theme of much profitless controversy; but we shall probably not greatly err in placing it somewhere on the borders of Kin- cardineshire. General Roy, whose conjecture is usually followed, fixed on Ardoch in Perthshire. A careful study, however, of the whole narrative leads one to look for the field of battle farther north, and nearer the coast. Tacitus, writing on the model of Thucydides and Livy, has put into the mouth of each leader, on the eve of the engagement, a speech of his own composition, in which he describes the feelings that may be supposed to have actuated the hostile armies. That ascribed to Galgacus is a splendid specimen~~

~~of polished sarcasm, mixed with impassioned appeals to the~~

~~patriotism of his hearers. Might, however, prevailed over right, and the Caledonians were defeated with a loss of 10,000 men. Agricola, now thinking he had pushed his conquests far enough, made no attempt to pursue his beaten foe, but at once led his army back to the territory of the~~

~~Boresti (a/. Horesti), whose name is probably pre- served in the modern Forfar. Here he gave orders to the commander of his fleet to sail round the island, a feat which the latter accomplished. Soon after he himself was recalled to Rome by his jealous master,~~

~~Notwithstanding Agricola's success, the Romans seem to have been quickly obliged to abandon part of their con- quests, for in less than forty years (129 a.p.) Hadrian's wall, which ran from the Tyne to the Solway, became the northern limits of their empire in Britain. About twenty years later a second Agricola appeared in the person of Lollius Urbicus, the lieutenant of Antoninus Pius. Almost nothing is known of his actions, but he seems to have once more carried the arms of Rome to the Clyde and Forth, if not beyond them, and to have erected on the line of Agricola's forts the more substantial work now known by the name of the emperor he served (see ANTo- NINUS, WALL OF). The natives must soon have recovered the lost ground; but scarcely anything is known henceforth of the state of affairs in the north till 208, when, if we may trust the historian Dion Cassius, as abridged by Xiphiline, the Emperor Severus determined to attempt the subjuga- tion of the whole island. At that time the two most powerful tribes of North Britain were the Mzatz, close to Hadrian's Wall, and the Caledonians beyond them. Pro- tected by their native fastnesses, the latter offered him such a resistance that, without being able to.brifig them to a decisive engagement, he lost through disease, fatigue, and: the sword, no fewer, it is said, than 50,000 men. Having reached what is termed the northern extremity of the island, but which was in all likelihood merely the northern coast of Aberdeenshire, Severus retreated southwards in a very feeble state of health, partly induced by the fatigues he had undergone. A league formed the next year between the Caledonians and the Mzatz, both of whom had already cast off his authority, led him to make preparations for a new cainpaign, with the avowed determination of extirpat- ing the whole race. In the midst of these, however, he died at York in 210.~~

~~For a whole century afterwards the ancient writers are almost silent regarding Caledonia. In the year 310 we hear for the first time of the Picts ; and in 367 Theodosius, an able Roman general, was sent into Britain by Valen- tinian I. to defend the Britons of the south against the.~~

attacks of the men of the north, represented by Ammianus Marcellinus as being the Picts divided into two tribes (the Dicaledones and the Vecturiones), the Saxons, the Attacotti, and the Scots. He was so far successful that the countries between the walls of Hadrian and Antoninus became yet again a subjected province, named Valentian by Theodosius, in honour of the emperor,—a conquest, however, which can have lasted but a brief period. Hence- forth, if we except the effusions of the poet Claudian, the scanty notices of Britain to be met with during several succeeding centuries present the same sad tale of sufferings inflicted on the now effeminate Britons of the south by their warlike neighbours, till at length the settlement of large bodies of Saxons in England changed the aspect of affairs.

The etymology of the word Caledonia has been variously given. Celydd (in Welsh, a woody shelter) is the popular derivation ; but Isaac Taylor (Words and Places, p. 44) thinks the word may possibly contain the root gael, and if

so, the Caledonians would be the Gaels of the duns or hills. | Equally obscure are the ethnological relations of the people, | the most probable opinion being that which regards them |

as belonging 'to the British branch of the great Celtic family. A casual inference, hazarded by Tacitus (Agricola, chap. xi.), that the red hair and large limbs of the inhabj- tants of Caledonia point clearly to a German origin, must not be pressed too far. There were probably even in his day Teutonic settlements along our eastern and northern shores, but it seems too much to assume that that race was the dominant one north of the Forth. It is a still more doubtful question to what race the Picts belonged. But the discussion of these and other points belongs to the his- tory of ScoTLanp (q.v.) (See Claudit Ptolemar Geographa, ed. Wilberg, Essendiz, 1838 ; Roy's Military Antiquities of the Romans in North Britain, London, 1793; Burton's History of Scotland, vol. i., Edin. 1867.) (J. M'D.) CALENBERG, or KaLensere, a former principality of Hanover, which was traversed by the Weser and the Leine, and had an area of about 1050 square miles. It derived

~~its name from an ancient castle, now in ruins. In the Middle Ages it belonged to Liineburg, and after passing from one branch to another of the house of Brunswick, it came, in 1705, to Ernst August, electoral prince of Hanover,~~

~~CALENDAR~~

~~CALENDAR is a method of distributing time into certain periods adapted to the purposes of civil life, as hours, days, weeks, months, years, d&c.~~

~~Of all the periods marked out by the motions of the |~~

~~celestial bodies, the most conspicuous, and the most intimately connected with the affairs of mankind, are the solar day, which is distinguished by the diurnal revolution~~

~~of the earth and the alternation of light and darkness, and |~~

~~the solar year, which completes the circle of the seasons. But in the early ages of the world, when mankind were chiefly engaged in rural occupations, the phases of the moon must have been objects of great attention and interest,——hence the month, and the practice adopted by many nations of reckoning time by the motions of the moon, as well as the still more general practice of combin- ing lunar with solar periods. The solar day, the solar year, and the lunar month, or lunation, may therefore be called the natural divisions of time. All others, as the hour, the week, and the civil month, though of the most ancient and general use, are only arbitrary and conven- tional.~~

~~Day.——tThe true solar day is the interval of time which~~

~~elapses between two consecutive returns of the same |~~

~~terrestrial meridian to the sun. By reason of the inclined position of the ecliptic, and the unequal progressive motion of the earth in its orbit, it is not always of the same absolute length. But as it would be hardly possible, in the artificial measurement of time, to have regard to this small inequality which is besides constantly varying, the mean solar day is employed for all~~

~~civil purposes. This is the time in which the earth wowld make one revolution on its axis, aS compared with the sun, if the earth moved at an equable rate in the plane of the equator. The mean solar day is therefore a result of computation, and is not marked precisely by any astronomical phenomenon; but~~

~~its difference from the true solar or apparent day is so |~~

~~small as to escape ordinary observation.~~

~~The subdivision of the day into twenty-four parts, or hours, has prevailed. since the remotest ages, though different nations have not agreed either with respect to the epoch of its commencement or the manner of distributing the hours. Europeans in general, like the ancient Egyptians, place the commencement of the civil day at midnight, and reckon twelve morning hours from midnight to mid-day, and twelve evening hours from mid-day to~~

~~midnight. Astronomers, after the example of Ptolemy, regard the day as commencing with the sun's culmination, or. noon, and find it most convenient for the purposes of computation to reckon through the whole twenty-four hours. Hipparchus reckoned the twenty-four hours from midnight to midnight. Some nations, as the ancient Chaldeans and the modern Grecks, have chosen sunrise for the commencement of the day; others, again, as the Italians and Bohemians, suppose it to commence at sunset. In all these cases the beginning of the day varies with the seasons at all places not under the equator. In the early ages of Rome, and even down to the middle of the 5th century after the foundation of the city, no other divisions of the day were known than sunrise, sunset, and mid-day, which was marked by the arrival of the sun between the Rostra and a place called Greecostasis, where ambassadors from Greece and other countries used to stand. The Greeks divided the natural day and night into twelve equal parts each, and the hours thus formed were denomi- nated temporary hours, from their varying in length according to the seasons of the year. The hours of the day and night were of course only equal at the time of the equinoxes. The whole period of day and night they called vuxOjpepov. ! Weex.—-The week is a period of seven days, having no reference whatever to the celestial motions,—a circumstance to which it owes its unalterable uniformity. Although it did not enter into the calendar of the Greeks, and~~

~~was not introduced at Rome till after the reign of Theodosius, it has been employed from time immemorial in almost all eastern countries; and as it forms neither an aliquot part of the year nor of the lunar month, those who reject the Mosaic recital will be at a loss, as Delambre remarks, to~~

~~| assign to it an origin having much semblance of probability.~~

~~It might have been suggested by the phases of the moon, or by the number of the planets known in ancient times, an origin which is rendered more probable from the names universally given to the different days of which it is com- posed. In the Egyptian astronomy, the order of the planets, beginning with the most remote, is Saturn, Jupiter, Mars, the Sun, Venus, Mercury, the Moon. Now, the day being divided into twenty-four hours, each hour was con- secrated to a particular planet, namely, one to Saturn, the following to Jupiter, the third to Mars, and so on according to the above order ; and the day received the name of the~~

~~planet which presided over its first hour. If, then, the first hour of a day was consecrated to Saturn, that planet would also have the 8th, the 15th, and the 22nd hour; the 23rd would fall to Jupiter, the 24th to Mars, and the 25th, or the first hour of the second day, would belong to the Sun. In like manner the first hour of the 3rd day would fall to the Moon, the first of the 4th day to Mars, of the 5th to Mercury, of the 6th to Jupiter, and of the 7th to Venus. The cycle being completed, the first hour of the 8th day would return to Saturn, and all the others succeed in thesame order. According to Dio Cassius, the Egyptian week commenced with Saturday. On their flight from Egypt, the Jews, from hatred to their ancient oppressors, made Saturday the last day of the week.~~

~~The English names of the days are derived from the Saxon. 'The ancient Saxons had borrowed the week from some Eastern nation, and substituted~~

~~the names of their own divinities for those of the gods of Greece. In legisla- tive and justiciary acts the Latin names are still retained.~~

~~Latin. English. Saxon. Dies Solis. Sunday. Sun's day. Dies Lune. Monday. Moon's day. Dies Martis. Tuesday. Tiw's day. Dies Mercuzii. Wednesday. Woden's day. Dies Jovis. Thursday. Thor's day. Dies Veneris. Friday. Friga's day. Dies Saturni. Saturday. Seterne's day.~~

~~Montu.—Long before the exact length of the year was determined, it must have been perceived that the synodic revolution of the moon is accomplished in about 294 days. Twelve lunations, therefore, form a period of 354 days, which differs only by about 114 days from the solar year. From this circumstance has arisen the practice, perhaps universal, of dividing the year into twelve months. But in the course of a few years the accumulated difference between the solar year and twelve lunar months would become considerable, and have the effect of transporting the commencement of the year to a different season. The difficulties that arose in attempting to avoid this inconveni- ence induced some nations to abandon the moon altogether, and regulate their year by the course of the sun. The month, however, being a convenient period of time, has retained its place in the calendars of all nations ; but, instead of denoting a synodic revolution of the moon, it is usually employed to denote an arbitrary number of days approaching to the twelfth part of a solar year.~~

~~Among the ancient Egyptians the month consisted of thirty days invariably ; and in order to complete the year, five days were added at the end, called supplementary days. They made use of no intercalation, and by losing a fourth of a day every year, the commencement of the year went back one day in every period of four years, and con- sequently made a revolution of the seasons in 1461 years. Hence 1461 Egyptian years are equal to 1460 Julian years of 3654 days each. This year is called vague, by reason of its commencing sometimes at one season of the year, and sometimes at another.~~

~~The Greeks divided the month into three decades, or periods of ten days,—a practice which was imitated by the French in their unsuccessful attempt to introduce a new calendar at the period of the Revolution. This division offers two advantages: the first is, that the period is an exact measure of the~~

~~month of thirty days ; and the second is, that the number of the day of the decade is connected with and suggests the number of the day of the month. For example, the 5th of the decade must necessarily be the Sth, the 15th, or the 25th of the month; so that when the day of the decade is known, that of the month can scarcely be mistaken. In reckoning by weeks, it 1s necessary to keep in mind the day of the week on which each month begins.~~

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~~The Romans employed a division of the month and a method of reckoning the days which appear not a little extraordinary, and must, in practice, have been exceedingly inconvenient. As frequent allusion is made by classical writcrs to this embarrassing method of computation, which is carefully retained in the ecclesiastical calendar, we here give a table showing the correspondence of the Roman months with those of modern Europe.~~

~~s 2 March. Say. April. 25 May. August. OS February. bapa r . . . iad December. Novices 1 Calendez. Calende. Calende. Calende.~~

~~2 6 4 4 4 8) 5 8 3 8~~

~~4 4 Prid. Nonas. | Prid. Nonas. | Prid. Nonas. 5 3 None. None. None. 6 | Prid. Nonas. 8 8 8 i None. 4 7~~

~~8 8 6 6 6~~

~~9 i 5 5 5 10 6 4 4 A il 5 3 3 3) 12) 4 Prid. Idus. Prid. Idus. Prid. Idus. 13 3 Idus. Idus, ldus. 14 Prid. Idus 19 18 16 15 ldus. 18 17 15~~

~~16 17 17 16 14~~

~~i? 16 16 15 13~~

~~18 15 15 14 2~~

~~19 14 14 118} LL~~

~~20 18: 183 1 10~~

~~21 ee 1) 11 9 2D, 11 11 10 8 23 10 10 9 if~~

~~24 9 9 3 6 25 8 8 7 5~~

~~26 7 ff 6 4~~

~~27 6 6 5 8~~

~~28 5 5 4 Prid. Cal. Mart.~~

~~29 4 4 5~~

~~80 3 3 Prid. Calen. 81 | Prid. Calen. | Prid. Calen. | |~~

~~Instead of distinguishing the days by the ordinal num- bers first, second, third, &c., the Romans counted back- wards from three fixed epochs, namely, the Calends, the Nones, and the Ides. The Calends (or Kalends) were invari- ably the first day of the month, and were so denominated because it had been an ancient custom of the pontifis to call the people together on that day, to apprize them of the festivals, or days that were to be kept sacred during the month. The Ides (from an obsolete verb ¢duare, to divide) were at the middle of the month, either the 13th or the 15th day ; and the Nones were the ninth day before the Ides, counting inclusively. From these three terms the days received their denomination in the following manner :— Those which were comprised between the Calends and the Nones were called the days before the Nones; those between the Nones and the Ides were called the days before the Ides ; and, lastly, all the days after the Ides to the end of the month were called the days before the Calends of the succeeding month. In the months of March, May, July, and October, the Ides fell on the 15th day, and the Nones consequently on the 7th; so that each of these months had six days named from the Nones. In all the other months the Ides were on the 13th and the Nones on the 5th; consequently there were only four days named from the Nones. Every month had eight days named from the Ides. 'The number of days receiving their denomination from the Calends depended on the number of days in the month and the day on which the Ides fell. For example, if the month~~

~~contained 31 days, and the Ides fell on the 13th, as was the case in January, August, and December, there would remain 18 days after the Ides, which, added~~

~~to the first of the following month, made 19 days of Calends. In January, therefore, the 14th day of the month was called the mineteenth before the Calends of February (countiug inclusively), the 15th was the 18th before the Calends,and so on to the 30th, which was called the third before the Calends (tertio Calendas), the last being the second of the Calends, or the day before the Calends (pridie Calendas).~~

~~Year.—The year is either astronomical or civil. The solar astronomical year is the period of time in which the earth performs a revolution in its orbit about the sun, or passes from any point of the ecliptic to the same point again; and consists of 365 days 5 hours 48 min. and 46 sec. of mean solar time. The civil year is that which is employed in chronology, and varies among different nations, both in respect of the season at which it com- mences and of its subdivisions. When regard is had to the sun's motion alone, the regulation of the year, and the distribution of the days into months, may be effected without much trouble ; but the difficulty is greatly increased when it is sought to reconcile solar and lunar periods, or to make the subdivisions of the year depend on the moon, and at the same time to preserve the correspondence between the whole year and the seasons.~~

~~Of the Solar Year.—In the arrangement of the civil year, two objects are sought to be accomplished,—first, the equable distribution of the days among twelve months; and secondly, the preservation of the beginning of the year at the same distance from the solstices or equinoxes. Now, as the year consists of 365 days and a fraction, and 365 is a number not divisible by 12, it is impossible that the months can all be of the same length, and at the same time include all the days of the year. By reason also of the fractional excess of the length of the year above 365 days, it likewise happens that the years cannot all contain the same number of days if the epoch of their commence- ment remains fixed ; for the day and the civil~~

~~year must necessarily be considered as beginning at the same instant ; and therefore the extra hours cannot be included in the year till they have accumulated to a whole day. As soon as this has taken place, an additional day must be given to the year.~~

~~The civil calendar of all European countries has been borrowed from that of the Romans. Romulus is said to have divided the year into ten months only, including in all 304 days, and it is not very well known how the re- maining days were disposed of. The ancient Roman year commenced with March, as is indicated by the names September, October, November, December, which the last four months still retain. July and August, likewise, were anciently denominated Quintilis and Sextilis, their present appellations having been bestowed in compliment to Julius Cesar and Augustus. In the reign of Numa two months were added to the year, January at the beginning, and February at the end; and this arrangement continued till the year 452 3.c., when the Decemvirs changed the order of the months, and placed February after January. The months now cousisted of twenty-nine and thirty days alternately, to correspond with the synodic revolution of the moon, so that the year contained 354 days; but a day was added to make the number odd, which was considered more fortunate, and the year therefore consisted of 355 days. This differed from the solar year by ten whole days and a fraction ; but, to restore the coincidence, Numa ordered an additional or intercalary month to be inserted every second year between the 23rd and 24th of February, consisting of twenty-two and twenty-three days alternately, so that four years contained 1465 days, and the mean length of the year was consequently 3664 days. The additional month was called Mercedinus, or Merce-~~

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~~donius, from merces, wages, probably because the wages of workmen and domestics were usually paid at this season of the year. According to the above arrangement, the year was too long by one day, which rendered another correc- tion necessary. As the error amounted to twenty-four days in as many years, it was ordered that every third period of eight years, instead of containing four intercalary months, amounting in all to ninety days,~~

~~should contain only three of those months, consisting of twenty-two days each. The mean length of the year was thus reduced to 3654 days ; but it is not certain at what time the octennial periods, borrowed from the Greeks, were introduced into the Roman calendar, or whether they were at any time strictly followed. It does not even appear that the length of the intercalary month was regulated by any certain principle, for a discretionary power was left with the pontiffs, to whom the care of the calendar was committed, to intercalate more or fewer days according as the year was found to differ more or less from the celestial niotions, This power was quickly abused to serve political objects, and the calendar consequently thrown into confusion, By giving a greater or less number of days to the intercalary month, the pontiffs were enabled to prolong the term of a magistracy, or hasten the annual elections; and so little care had been taken to regulate the year, that, at the time of Julius Cesar, the civil equinox differed from the astronomical by three months, so that the winter months were carried back into autumn, and the autumnal into summer.~~

~~In order to put an end to the disorders arising from the negligence or ignorance of the pontiffs, Czesar abolished the use of the lunar year and the intercalary month, and regulated the civil year entirely by the sun. With the advice and assistance of Sosigenes, he fixed the mean length of the year at 3654 days, and decreed that every fourth year should have 365 days, the)other years having each 365. In order to restore the vernal equinox to the 25th of March, the place it occupied in the time of Numa, he ordered two extraordinary months to be inserted between November and December in the current year, the first to consist of thirty-three, and the second of thirty-four days. The intercalary month of twenty-three days fell into the year of course, so that the ancient year of 355 days received an augmentation of ninety days; and the year on that occasion contained in all 445 days. This was called the last year of confusion. The first Julian year com- menced with the lst of January of the 46th before the birth of Christ, and the 708th from the foundation of the city. In the distribution of the days through the several months, Cesar adopted a simpler and more commodious arrangement than that which has since prevailed. He had ordered that the first, third, fifth, seventh, ninth, and eleventh months, that is January, March, May, July, September, and November, should have each thirty-one days, and the other months thirty, excepting February, which in common~~

years should have only twenty-nine, but every fourth year thirty days. This order was interrupted to gratify the vanity of Augustus, by giving the month bearing his name as many days as July, which was named after the first Cesar. A day was accordingly taken from February and given to August; and in order that three months of thirty-one days might not come together, September and November were reduced to thirty days, and thirty-one given to October and December. For so frivolous a reason was the regulation of Caesar abandoned, and a capricious arrangement introduced, which it requires sonie attention to remember.

The additional day which occurred every fourth year was given to February, as being the shortest month, and

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mon years in defect, and contained only 364 days.

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was inserted in the calendar between the 24th and 25th day. February having then twenty-nine days, the 25th was the 6th of the calends of March, sexto calendas ; the preceding, which was the additional or intercalary day, was called bis-sexto calendas,— hence the term bissextile, which is still employed to distinguish the year of 366 days. The English denomination of /eap-year would have been more appropriate if that year had differed from coin- In the ecclesiastical calendar the intercalary day is still placed between the 24th and 25th of February ; in the civil calendar it is the 29th.

The regulations of Cesar were not at first sufficiently understood ; and the pontifis, by intercalating every third year instead of every fourth, at the end of thirty-six years had intercalated twelve times, instead of nine. This mistake having been discovered, Augustus ordered that all the years from the thirty-seventh of the era to the forty- eighth inclusive should be common years, by which means the intercalations were reduced to the proper nunfber of twelve in forty-eight years. No account is taken of this

~~blunder in chronology ; and it is tacitly supposed that the calendar has been correctly followed from its commence- ment.~~

~~Although the Julian method of intercalation is perhaps the most convenient that could be adopted, yet, as it supposes the year too long by 11 minutes 14 seconds, it could not without correction very long answer the purpose for which it was devised, namely, that of preserving always the same interval of time between the commencement of the year and the equinox. Sosigenes could scarcely fail to know that this year was too long; for it had been shown long before, by the observations of Hipparchus, that the excess of 3654 days above a true solar year would amount to a day in 300 years. The real error is indeed more than double of this, and amounts to a day in 128 years; but in the time of Cresar the length of the year was an astronomical element not very well determined. In the course of a few centuries, however, the equinox sensibly retrograded towards the beginning of the year. When the Julian calendar was introduced, the equinox fell on the 25th of March. At the time of the Council of Nice, which was held in 325, it fell on the 21st; and when the reformation of the calendar was niade in 1582, it had retrograded to the 11th. In order to restore the equinox to its former place, Pope Gregory XIII. directed ten days to be suppressed in the calendar; and as the error of the Julian intercalation was now found to amount to three days in 400 years, he ordered the intercalations to be omitted on all the centenary years excepting those which are multiples of 400. According to the Gregorian rule of intercalation, therefore, every year of which the number is divisible by four without a remainder, isa leap year, excepting the centurial years, which are only leap years when divisible by four after omitting the two ciphers. Thus 1600 was a leap year, but 1700, 1800, and 1900 are common years; 2000 will be a leap year, and 80 on.~~

~~As the Gregorian method of intercalation has been adopted in all Christian countries, Russia excepted, it becomes interesting to examine with what degree of accuracy it reconciles the civil with the solar year. According to the best determinations of modern astronomy (Le Verrier's Solar Tables, Paris, 1858, p. 102), the mean geocentric motion of the sun in longitude, from the mean equinox during a Julian year of 365°25 days, the same being brought up to the present date, is 360°+27"°685. Thus the mean length of~~

~~860° th e r = . = 9 e solar year is found to be 360° 4 27”-685 ×7 86572) = 86002422~~

~~days, or 365 days 5 hours 48 min. 46 sec. Now the Gregorian rule gives 97 intercalations in 400 years; 400 years therefore conta 365 × 400 +97, that is, 146,097 days; and consequently one year contains 365-2425 days, or 365 days 5 hours 49 min. 12 sec. This exceeds the true solar year by 26 seconds, which amount to a day~~

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~~in 8323 years. It is perhaps unnecessary to make any formal pro- vision against an error which can only happen after so long a period of time ; but as 3323 differs little from 4000, it has been proposed to correct the Gregorian rule by making the year 4000 and all its multiples common years. With this correction the rule of inter- calation is as follows :—~~

~~Every year the number of which is divisible by 4 is a leap year, excepting the last year of each century, which is a leap year only when the number of the century is divisible by 4; but 4000, and its multiples, 8000, 12,000, 16,000, &c. are common years. Thus the uniformity of the intercalation, by continuing to depend on the number four, is preserved, and by adopting the last correction the commencement of the year would not vary more than a day from its present place in two hundred centuries.~~

~~In order to discover whether the coincidence of the civil and solar year could not be restored in shorter periods by a different method of intercalation, we may proceed as follows :—The fraction 0°2422, which expresses the excess of the solar year above a whole number of days, being converted into a continued fraction, becomes~~

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~~which gives the series of approximating fractions, i i 8 31 1382 163 Re.~~

~~4 29° 33° 198’ 545’ 673°~~

~~di ; The first of these, 7» gives the Julian intercalation of one day~~

~~in four years, and is considerably too great.~~

~~L It supposes the year to contain 365 days 6 hours.~~

~~i oe The second, 59° gives seven intercalary days in twenty-nine~~

~~years, and errs in defect, as it supposes a year of 365 days 5 hours 47 min. 35 sec.~~

~~pe The third, 35> gives eight intercalations in thirty-three years, or~~

~~seven successive intercalations at the end of four years respectively, and the eighth at the end of five years. This supposes the year to contain 365 days 5 hours 49 min. 5°45 sec.~~

~~0 ee~~

~~The fourth fraction, [5g = 99 799 =3 × 33 4 99° combines~~

~~three periods of thirty-three years with one of twenty-nine, and would consequently be very convenient in application. It sup- poses the year to consist of 365 days 5 hours 48 min. 45 sec., and is practically exact.~~

~~The fraction 35 offers a convenient and very accurate method~~

~~of intercalation. It implies a year differing in excess from the true year only by 19°45 seconds, while the Gregorian year is too long by 26 seconds, It produces a much nearer coincidence between the civil and solar years than the Gregorian method ; and, by reason of its shortness of period, confines the evagations of the mean equinox from the true within much narrower limits. It has been stated by Scaliger, Weidler, Montucla, and others, that the modern Persians actually follow this method, and intercalate eight days in thirty- three years. The statement has, however, been contested on good authority ; and it seems proved (see Delambre, Astronomie Moderie, tom. i. p.81) that the Persian intercalation combines the two periods 7 8 ee 31 .~~

~~59 and gg. If they follow the combination 59 733733 = jag their~~

~~determination of the length of the tropical year has been extremely exact. The discovery of the period of thirty-three years is ascribed to Omar Cheyam, one of the eight astronomers appointed by Gelal- Eddin Malech Shah, sultan of Khorassan, to reform or construct a calendar, about the year. 1079 of our era.~~

~~If the commencement of the year, instead of being retained at the same place in the seasons by a uniform method of intercalation, were made to depend on astronomical phenomena, the intercalations would succeed each other in an irregular manner, sometimes after four years and sometimes after five ; and it would occasionally, though rarely indeed, happen, that it would be impossible to deter- mine the day on which the year ought to begin. In the calendar, for example, which was attempted to be introduced in France in 1793, the beginning of the year was fixed at the midnight preceding the day in which the true autumnal equinox falls. But supposing the instant of the sun's entering into the sign Libra to be very near midnight, the small errors of the solar tables might render it doubt- ful to which day the equinox really belonged ; and it would be in vain to have recourse to observation to obviate the difficulty. It is therefore infinitely more commodious to determine the commence-~~

~~ment of the year by a fixed rule of intercalation ; and of the various methods which might be employed, no one, perhaps is on the whole more easy of application, or better adapted for the purpose of com- putation, than the Gregorian now inuse. Buta system of 31 inter- calations in 128 years would be by far the most perfect as regards mathematical accuracy. Its adoption upon our present Gregorian calendar would only require the suppression of the usual bissextile once in every 128 years, aud there would be no necessity for any further correction, as the error is so insignificant that it would not amount to a day in 100,000 years.~~

~~Of the Lunar Year and Luni-solar Periods.—The lunar year, consisting of twelve lunar months, contains only 354 days; its commencement consequently anticipates that of the solar year by eleven days, and passes through the whole circle of the seasons in about thirty-four lunar years. It is therefore so obviously ill-adapted to the computation of time, that, excepting the modern Jews and Mahometans, almost all nations who have regulated their months by the moon have employed some method of intercalation by means of which the beginning of the year is retained at nearly the same fixed place in the seasons,~~

~~In the early ages of Greece the year was regulated entirely by the moon. Solon divided the year into twelve months, consisting alternately of twenty-nine and thirty days, the former of which were called deficient months, and the Jatter fudd months. The lunar year, therefore, con- tained 354 days, falling short of the exact time of twelve Junations by about 8°8 hours. The first expedient adopted to reconcile the lunar and solar years seenis to have been the addition of a month of thirty days to every second year. Two lunar years would thus contain 25 months, or 738 days, while two solar years, of 3654 days each, con- tain 7303 days. The difference of 74 days was still too great to escape observation ; it was accordingly proposed by Cleostratus of Tenedos, who flourished shortly after the time of Thales, to omit the biennary intercalation every eighth year. In fact, the 74 days by which two lunar years exceeded two solar years, amounted to;thirty days, or a full month, in eight years. By inserting, therefore, three additional months instead of four in every period of eight years, the coincidence between the solar and lunar year would have been exactly restored if the latter had contained only 354 days, inasmuch as the period "contains 354×8+3×~~

~~30=2922 days, corresponding with eight solar years of 365} days each. But the true time of 99 lunations is 2923-528 days, which exceeds the above period by 1-528 days, or: thirty-six hours and a few minutes. At the end of two periods, or sixteen years, the excess is three days, and at the end of 160 years, thirty days. It was therefore proposed to employ a period of 160 years, in which one of the intercalary months should be omitted ; but as this period was too long to be of any practical use, it was never generally adopted. The com- mon practice was to make occasional corrections as they became necessary, in order to preserve the relation between the octennial period and the state of the heavens; but these corrections being left to the careof incompetent persons, the calendar soon fell into great disorder, and no certain rule was followed till a new division of the year was proposed by Meton and Euctemon, which was immediately adopted in all the states and dependencies of Greece.~~

~~The mean motion of the moon in longitude, from the mean equinox, duringa Julian year of 365-25 days (accord- ing to Hansen's Tables de la Lune, London, 1857, pages 15, 16) is, at the present date, 13 × 360° + 477644"°409 ; that of the sun being 360°+27-685. Thus the corre. sponding relative mean geocentric motion of the moon from the sun is 12 × 360° + 477616"°724 ; and the duration of the mean synodic revolution of the moon, or lunar month, ; 360° :~~

~~IS therefore 12 × 360° + 477616″ 724 × 365°25 = 29530588~~

~~days, or 29 days, 12 hours, 44 min. 2°8 sec.~~

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~~The Metonic Cycle, which may be regarded as the chef- @eeuvre of ancient astronomy, is a period of jnineteen solar years, after which the new moons again happen on the same days of the year. In nineteen solar years there are 235 lunations, a number which, on being divided by nine- teen, gives twelve lunations for each year, with seven of a remainder,'to be distributed among the years of the period, The period of Meton, therefore, consisted of twelve years containing twelve months each, and seven years containing~~

~~thirteen months each ; and these last formed the third, fifth, eighth, eleventh, thirteenth, sixteenth, and nineteenth years of the cycle. Asit had now been discovered that the exact length of the Junation is a little more than twenty- nine and a half days, it became necessary to abandon the alternate succession of full and deficient months 3 and, in order to preserve a more accurate correspondence between the civil month and the lunation, Meton divided the cycle into 125 full months of thirty days, and 110 deficient months of twenty-nine days each. The number of days in the petiod was therefore 6940. In order to distribute the deficient months through the period in the most equable manner, the whole period may be regarded as consisting of 235 full months of thirty days, or of 7050 days, from which 110 days are to be deducted. This gives one day to be suppressed in sixty-four ; so that if we suppose the months to contain each thirty days, and then omit every sixty-fourth day in reckoning from the beginning of the period, those months in which the omission takes place will, of course, be the deficient months.~~

~~The number of days in the period being known, it is easy to ascertain its accuracy both in respect of the solar and lunar motions. The exact length of nineteen solar years is 19 × 365°2422 = 6939°6018 days, or 6939 days 14 hours 26°592 minutes ; hence the period, which is exactly 6940 days, exceeds nineteen revolutions of the sun by nine and a half hours nearly. On the other hand, the exact time of a synodic revolution of the moon is 29530588 days; 235 lunations, therefore, contain 235 × 29°530588 = 6939-68818 days, or 6939 days 16 hours 31 minutes, so that the period exceeds 235 lunations by only seven and a half hours,~~

~~After the Metonic cycle had been in use about a century, a correction was proposed by Calippus. At the end of four cycles, or seventy-six years, the accumulation of the seven and a half hours of difference between the cycle and 235 lunations amounts to thirty hours, or one whole day and six hours. Calippus, therefore, proposed to quadruple the period of Meton, and deduct one day at the end of that time by changing one of the full months into a deficient month. The period of Calippus, therefore, consisted of three Metonic cycles of 6940 days each, and a period of 6939 days; and its error in respect of the moon, consequently, amounted only to six hours, or to one day in 304 years. This period exceeds seventy-six true solar years by~~

~~fourteen hours and a quarter nearly, but coincides exactly with seventy-six Julian years ; and in the time of Calippus the length of the solar year was almost universally supposed to be exactly 365} days. The Calippic period is frequently referred to as a date by Ptolemy.~~

~~EccLESIASTICAL CALENDAR.—The ecclesiastical calendar, which is adopted in all the Catholic, and most of the Protestant countries of Europe, is luni-solar, being regulated partly by the solar, and partly by the lunar year,—a cir- cumstance which gives rise to the distinction between the movable and immovable feasts. So early as the 2d century of our era, great disputes had arisen among the Christians respecting the proper time of celebrating Easter, which governs all the other movable feasts. The Jews celebrated their passover on the 14th day of the first month, that 1s to say, the lunar month of which the fourteenth day either falls on, or next follows, the day of the vernal equinox.~~

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~~Most Christian sects agreed that Faster should be cele- brated on a Sunday. Others followed the example of the Jews, and adhered to the 14th of the moon ; but these, as usually happened to the minority, were accounted heretics, and received the appellation of Quartodecimans. In order to terminate dissensions, which produced both scandal and schism in the church, the Council of Nice, which was held in the year 325, ordained that the celebration of Faster should thenceforth always take place on the Sunday which immediately follows the full moon that happens upon, or next after, the day of the vernal equinox. Should the 14th of the moon, which is regarded as the day of full moon, happen on a Sunday, the celebration of Easter was deferred to the Sunday following, in order to avoid con- currence with the Jews and the above-mentioned heretics. The observance of this rule renders it necessary to reconcile three periods which have no common measure, namely, the week, the lunar month, and the solar year; and as this can only be done approximately, and within certain limits, the determination of Easter is an affair of considerable nicety and complication. It is to be regretted that the reverend fathers who formed the Council of Nice were not advised to abandon the moon altogether, and appoint Easter to be celebrated on the first or second Sunday of April. The~~

~~_ ecclesiastical calendar would in that case have possessed all~~

~~the simplicity and uniformity of the civil calendar, which only requires the adjustment of the civil to the solar year ; but they were probably not sufficiently versed in astronomy to be aware of the practical difficulties which their regula- tion had to encounter.~~

~~Dominical Letter—The first problem which the con- struction of the calendar presents is to connect the week with the year, or to find the day of the week corresponding toa given day of any year of the era. As the number of days in the week and the number in the year are prime to One another, two successive years cannot begin with the same day; for if a common year begins, for example, with Sunday, the following year will begin with Monday, and if a leap year begins with Sunday, the year following will begin with Tuesday. For the sake of greater generality, the days of the week are denoted by the first seven letters of the alphabet, A, B, C, D, E, F, G, which are placed in the calendar beside the days of the year, so that A stands opposite the first day of January, B opposite the second, and so on to G, which stands opposite the seventh; after which A returns to the eighth, and so on through the 365 days of the year. Now, if one of the days of the week, Sunday for example, is represented by E, Monday will be represented by I', Tuesday by G, Wednesday by A, and so on; and every Sunday through the year will have the same character E, every Monday F, and so with regard to the rest. The letter which denotes Sunday is called the Dominical Letter, or the Sunday Letter ; and when the dominical letter of the year is known, the letters which respectively correspond to the other days of the week become known at the same time.~~

~~Solar Cycle—In the Julian calendar the dominical letters are readily found by means of a short cycle, in which they recur in the same order without interruption. The number of years in the intercalary period being four, aud the days of the week being seven, their product is 4× 7=28 ; twenty-eight years is therefore a period which includes all the possible combinations of the days of the week with the commencement of the year. This period is called the Solar Cycle, or the Cycle of the Sun, and restores~~

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~~the first day of the year to the same day of the week. |~~

~~At the end of the cycle the dominical letters return again in the same order on the same days of the month; hence a table of dominical letters, constructed for twenty-eight years, will serve to show the dominical letter of any given~~

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~~year from the commencement of the era to the reformation. The cycle, though probably not invented before the time of the Council of Nice, is regarded as having commenced nine years before the era, so that the year one was the tenth of the solar cycle. To find the year of the cycle, we have therefore the following rule :—Add nine to the date, divide the sum by twenty-eight ; the quotient is the number of cycles elapsed, and the remainder is the year of the cycle. Should there be no remainder, the proposed year is the twenty- eighth or last of the cycle. This rule is conveniently x+9~~

~~=i date, and the symbol 7 denotes that the remainder, which arises from the division of x+9 by 28, is the number~~

~~Thus, for 1840, we have il GG:~~

~~28 28? therefore ew).= 1, and the year 1840 is the first of the solar cycle. In order to make use of the solar cycle in finding the dominical letter, it is necessary to know that the first year of the Christian era began with Saturday. The dominical letter of that year, which was the tenth of the cycle, was consequently B. The following year, or the 11th of the cycle, the letter was A; then G. The fourth year was bissextile, and the dominical letters were it. Be: the following year D, and so on. In this manner it is easy to find the dominical letter belonging to each of the twenty- eight years of the cycle. But at the end of a century the order is interrupted in the Gregorian calendar by the secular suppression of the leap year; hence the cycle can only be employed during a century. In the reformed calendar the intercalary period is four hundred years, which number being multiplied by seven, gives two thousand eight hundred years as the interval in which the coincidence is restored between the days of the year and the days of the~~

~~week. This long period, however, may be reduced to four hundred years ; for since the dominical letter goes back five places every four years, its variation in four hundred years, in the Julian calendar, was five hundred places, which is equivalent to only three places (for five hundred divided by seven leaves three) ; but the Gregorian calendar suppresses exactly three intercalations in four hundred years, so that after four hundred years the dominical letters must again return in the same order.~~

~~Hence the following table of dominical letters for four hundred years will serve to show the dominical letter of any year in the Gregorian calendar for ever. It contains four columns of letters, each column'serving for a century. In order to find the column from which the letter in any given case is to be taken, strike off the two last figures of the date, divide the preceding figures by four, and the remainder will indicate the column. The symbol X, employed in the formula at the top of the column, denotes the number of centuries, that is, the figures remaining after the last two have been struck off. For example, required the dominical letter of the year 1839? In this case X = 18,~~

~~expressed by the formula , In which x denotes the~~

~~required.~~

~~4/]r opposite 39, in the table we find F, which is the letter of the proposed year.~~

~~. It deserves to be remarked, that as the dominical letter of the first year of the era was B, the first column of the following table will give the dominical letter of every year from the commencement of the era to the reformation. For this purpose divide the date by 28, and the letter opposite the remainder, in the first column of figures, is the dominical letter of the year. For example, supposing the date to be 1148. On dividing by 28, the remainder is 0, or 28; and opposite 28, in the first column of letters, we find D, C, the dominical letters of the year 1148,~~

~~therefore = 2; and in the second column of letters,~~

~~TABLE I.—Dominical Letters.~~

~~7x Xx x oe Ne Years of the Century. (+),=1 (4)=? G@= a (4) = 0 C E G B, A 129 Sie So B D F G 2 30 58 86 A Cc i F 3 31 59 87 G B D E 4 32 60 88 F, i A, G (OM 183 DAC 5 33 61 89 D F A B 6 34 62 90 C EK G A i 35 G3) Ol B D F G ‘ 8 66 62 Bb) AG 0, B E, D RE | » 37 G5 53 F A c D 10’ 38 “66 994 E G B C 11 39 67 95 D F A B 12 40 68 96 C,B E, D G, F A, G 13 41 69 97 A C E F 14 42 70 98 G B D E 15, 43° WAleo9 F A C D 16 44 72 E, D G, F B, A C, B 7~~ ~~45) 73 C E G A 18 46 74 ; B D F G 19 47 75 A Cc E F 20 48 76 G, F B, A bc E, D 2 490 77 K G B C 22, 450) 78 D F A B a Hc, Cc E G A 24 52 80 B, A D, Cc F,E G, F wy 52) teal G B D EK 26 54 82 _F A C D Zima) 83 E G B C 28 56 84 DC F, E Wc: B, A TABLE I].—Thc Day of thc Week. Month. Dominical Letter, Jan. Oct. A B Cc D E F G Feb. Mar. Nov. D E F G A B Cc April July Cc) miiicc ‘i: E F May B Cc D E ¥ G A Junc gb. 1% | ¢ n Bl nc August c D = F G A B Sept. Dec. rF |~~ ~~o B c | D E 1 8 | 15 | 22 |] 29] Sun. Sat, Frid. | Thur. | Wed. } Tues Mon 2 | (90) Teta Mon. | Sun. Sat. Frid. | Thur. | Wed. | Tues. 3 {10417 | 24 | 81 | Tues. | Mon. | Sun. Sat. Frid. | Thur. | Wed. 4111/18, 25 Wed. | Tues. | Mon Sun, Sat. | Frid. | Thur. & | 12° | 9 26 Thur, | Wed. | Tues. | Mon. } Sun. Sat. | Frid. 6 | 13 | 20: 27 Frid. | Thur. | Wed.’} Tues. | Mon. } Sun. Sat. «| Tees Sat. Frid. | Thur. | Wed. | Tues. | Mon Sun.~~

~~Lamar Cycle and Golden Number.—In connecting the~~

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~~when the first leap year falls on the fourth. In the former case the number of days in the period becomes 6940 and in the latter 6939. The mean length of the cycle is there- fore 69393 days, agreeing exactly with nineteen Julian years.~~

~~By means of the lunar cycle the new moons of the calendar were indicated before the reformation. As the cycle restores these phenomena to the same days of the civil month, they will fall on the same days in any two years which occupy the same place in the cycle; conse. quently a table of the~~

~~moon's phases for 19 years will serve for any year whatever when we know its number in the cycle. This number is called the Golden Number, either because it was so termed by the Greeks, or because it was usual to mark it with red letters in the calendar. The Golden Numbers were introduced into the calendar about the year 530, but disposed as they would have been if they had been inserted at the time of the Council of Nice. The cycle is supposed to commence with the year in which the new moon falls on the Ist of January, which took place the year preceding the commencement of our era. Hence, to find the Golden Number N, for any year x, we have wa (tt!~~

~~NTS to the date, divide the sum by 19 ; the quotient is the number of cycles elapsed, and the remainder is the Golden Number, When the remainder is 0, the proposed year is of course the last or 19th of the cycle. It ought to be remarked that the new moons, determined in this manner, may differ~~

~~'from the astronomical new moons sometimes as much as two days. The reason is, that the sum of the solar and lunar inequalities, which are compensated in. the whole period, may amount in certain cases to 10°, and thereby cause the new moon to arrive on the second day before or after its mean time.~~

~~Dronysian Period.—The cycle of the sun brings back the days of the month to the same day of the week; the lunar cycle restores the new moons to the same day of the month; therefore 28 × 19 = 532 years, includes all the variations in respect of the new moons and the dominical letters, and is consequently a period after which the new moons again occur on the same day of the month and the same day of the week. This is called the Dionysian or Great Paschal Period, from its having been employed by Dionysius Exiguus, familiarly styled " Denys the Little," in determining Easter Sunday. It was, however, first pro- posed by Victorius of Aquitain, who had been appointed by Pope Hilary to revise and correct the church calendar. Hence it is also called the Victorian Period. It continued in use till the Gregorian reformation.~~

~~Cycle of Indiction.—Besides the solar and lunar cycles, there is a third of 15 years, called the cycle of indiction, frequently employed in the computations of chronologists. This period is not astronomical, like the two former, but~~

~~De which gives the following rule: Add]~~

~~lunar month with the solar year, 'the framers of the eccle- | has reference to certain judicial acts which took place at siastical calendar adopted the period of Meton, or lunar | stated epochs under the Greek emperors. Its commence-~~

~~cycle, which they supposed to be exact. A different arrangement has, however, been followed with respect to the distribution of the months. The lunations are sup- posed to consist of twenty-nine and thirty days alternately, or the lunar year of 354 days; and in order to make up nineteen solar years, six embolismic or intercalary months, of thirty days each, are introduced in the course of the cycle, and one of twenty-nine days is added at the end. This gives 19 × 354 + 6 × 30 + 29 = 6935 days, to be distributed among 235 lunar months. But every leap year one day must be added to the lunar month in which~~

~~nent is referred to the lst of January of the year 313 of the common era. By extending it backwards, it will be found that the first of the era was the fourth of the cycle of indiction. The number of any year in this cycle will~~

~~therefore be given by the formula vee » that is to say,~~

~~add 3 to the date, divide the sum by 15, and the remainder 1s the year of the indiction. When the remainder is 0, the proposed year is the fifteenth of the cycle.~~

~~Julian Period.—The Julian period, proposed by the celebrated Joseph Scaliger as an universal measure of~~

~~the 29th of February is included. Now if leap year | chronology, is formed by taking the continued product of~~

~~happens on the first, second, or third year of the period, there will be five leap years in the period, but only four~~

~~the three cycles of the sun, of the moon, and of the indiction, and is consequently 28 × 19 × 15 = 7980~~

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~~years. In the course of this long period no two years can be expressed by the same numbers in all the three cycles. Hence, when the number of any proposed year in each of the cycles is known, its number in the Julian period can be determined by the resolution of a very simple problem of the indeterminate analysis. It is unnecessary, however, in the present case to exhibit the general solution of the problem, because when the number in the period corre- sponding to any one year in the common .era has been ascertained, it is easy to establish the correspondence for all other years, without having again recourse to the direct solu- tion of the problem. We shall therefore find the number of the Julian period corresponding to the first of our era.~~

~~We have already seen that the year 1 of the era had 10 for its number in the solar cycle, 2 in the lunar cycle, and 4 in the cycle of indiction; the question is therefore to find a number such, that when it is divided by the three numbers 28, 19, and 15 respectively, the three quotients shall be 10, 2, and 4.~~

~~Let x, y, and z be the three quotients of the divisions ; the number sought will then be expressed by 28 x + 10, by 19 y + 2,~~

~~orby 152+ 4. Hence the two equations 22+ 10=19y+2=1524+ 4,~~

~~To resolve the equation 28 x + 10 = 19 y+2,ory=at+ “zt 8 let 7m = a 2 we have then x = 2 m + _~ a =m’; then m = 9 m’+ 8; hence = 18m +16 + m’=19 m’ + 16……..~~ (1). ~~Again, since 28 zx + 10 = 15 z + 4, we have 152=28%+6, orz=22 —- == 2 Mee” = wy thew? z = 16.0.4 6, andzx=7n+3 +5~~

~~Let 5 =; then n’ = 2 n’; consequently i i ed ee: (2). Equating the above two values of x, we have~~

~~a 15 nw’ + 3 = 19 m’ + 16; whence n’ = mm’ + = 4m’ + 18 Let ae =p; we have then page~~

~~4m’ = 15 p — 18, and m’,= 4 p —~~

~~13~~

~~Let P= =p; then p = 4p’ — 18;~~

~~whence m’ = 16 p/ — 52 — p! =15 p’ — 52.~~

~~Now in this equation p’ may be any number whatever, provided 15 p’ exceed 52. The smallest value of p’ (which is the one here wanted) is therefore 4 ; for 15× 4=60. Assuming therefore p’=4, we have m’=60-52=8; and consequently, since x=19 im’+16, @=19×8+16=168. The number required is consequently 28 × 168 + 10= 4714.~~

~~Having found the number 4714 for the first of the era, the corre- spondence of the years of the era and of the period is as follows :—~~

~~Era, 1, We Shoon a: Period, 4714, 4715, 4716,...4713 + 2; from which it is evident, that if we take P to represent the year of the Julian period, and x the corresponding year of the Christian era, we shall have P = 4713 + 2, and x = P — 4718.~~

~~With regard to the numeration of the years previous to the com- mencement of the era, the practice is not uniform. Chronologists, im general, reckon the year preceding the first of the era — 1, the hext preceding — 2, and so on. In this case~~

~~Era, -1, — 2, — 3,... — 2, . Period, 4718, 4712, 4711,...4714 — 2;~~

~~| whence~~

~~P = 4714 — x, and x = 4714 — P,~~

~~| But astronomers, in order to preserve the uniformity of computa- _ tion, make the series of years proceed without interruption, and~~

~~teckon the year preceding the first of the era 0. Thus Era, 0, -1, Soy eee as Period, 4713, 4712, 4711,...4713-2;~~

~~therefore, in this case wile 0, and ¢ = 4713 — P.~~

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~~Reformation of the Calendar.—The ancient church calen- dar was founded on two suppositions, both erroneous, namely, that the year contains 3651 days, and that 235 lunations are exactly equal to nineteen solar years. It could not therefore long continue to preserve its corre- spondence with the seasons, or to indicate the days of the new moons with the same accuracy. About the year 730 the venerable Bede had already perceived the anticipation of the equinoxes, and remarked that these phenomena then took place about three days earlier than at the time of the Council of Nice. Five centuries after the time of Bede, the divergence of the true equinox from the 21st of March, which now amounted to seven or eight days, was pointed out by John of Sacrobosco, in a work published under the title De Anni Ratione; and by Roger Bacon, in a treatise De Reformatione Calendarii, which, though never published, was transmitted to the Pope. These works were probably little regarded at the time ; but as the errors of the calendar went on increasing, and the true length of the year, in consequence of the progress of astronomy, became better known, the project of a reforma- tion was again revived in the 15th century; and in 1474 Pope Sextus IV. invited Regiomontanus, the most cele- brated astronomer of the age, to Rome, to superintend the reconstruction of the calendar. The premature death of Regiomontanus caused the design to be suspended for the time; but in the following century numerous memoirs appeared on the subject, among the authors of which were Stoffer, Albert Pighius, John Schéner, Lucas Gauricus, and other mathematicians of celebrity. At length Pope Gregory XIII. perceiving that the measure was likely to confer a great eclat on his pontificate, undertook the long- desired reformation ; and having found the Governments of the principal Catholic states ready to adopt his views, he issned a brief in the month of March 1582, in which he abolished the use of the ancient calendar, and substituted that which has since been received in almost all Christian countries under the name of the Gregorian Calendar or~~

~~New Style. The author of the'system adopted by Gregory was Aloysius Lilius, or Luigi Lilio Ghiraldi, a learned astronomer and physician of Naples, who died, however, before its introduction ; but the individual who most con- tributed to give the ecclesiastical calendar its present form, and who was charged with all the calculations necessary for its verification, was Clavius, by whom it was completely developed and explained in a great folio treatise of 800 pages, published in 1603, the title of which is given at the end of this article.~~

~~It has already been mentioned that the error of the Julian year was corrected in the Gregorian calendar by the suppression of three intercalations in 400 years. In order to restore the commencement of the year to the same place in the seasons that it had occupied at the time of the Council of Nice, Gregory directed the day following the feast of St Francis, that is to say the 5th of October, to be reckoned the 15th of that month. By this regulation the vernal equinox which then happened on the 11th of March was restored to the 21st. From 1582 to 1700 the difference between the old and new style continued to be ten days; but 1700 being a leap year in the Julian calendar, and a common year in the Gregorian, the differ- ence of the styles during the 18th century was eleven days, The year 1800 was also common in the new calendar, and, consequently, the difference in the present century is twelve days. From 1900 to 2100 inclusive it will be thirteen days.~~

~~The restoration of the equinox to its former place in the year, and the correction of the intercalary period, were attended with no difficulty ; but Lilius had also to adapt the lunar year to the new rule of intercalation. The lunar~~

~~cycle contained 6939 days 18 hours, whereas the exact time of 235 lunations, as we have already seen, is 235 x 29°530588 = 6939 days 16 hours 31 minutes. The difference, which is 1 hour 29 minutes, amounts to a day in 308 years, so that at the end of this time the new moons occur one day earlier than they are indicated by the golden numbers. During the 1257 years that elapsed between the Council of Nice and the reformation, the error had accumulated to four days, so that the new moons which were marked in the calendar as happening, for example, on the 5th of the month,~~

~~actually fell on the lst. It would have been easy to correct this error by placing the golden numbers four lines higher in the new calendar; and the suppression of the ten days had already rendered it necessary to place them ten lines lower, and to carry those which belonged, for example, to the 5th and 6th of the month, to the 15th and 16th. But, supposing this correction to have been made, it would have again become necessary, at the end of 308 years, to advance them one line. higher, in consequence of the accumulation of the error of the cycle to a whole day. On the other hand, as the golden numbers were only adapted to the Julian calendar, every omission of the centenary intercalation would require them to be placed one line lower, opposite the 6th, for example, instead of the 5th of the month ; so that, generally speaking, the places of the golden numbers would have to be changed every century. On this account Lilius thought fit to reject the golden numbers from the calendar, and supply their place by another set of numbers called pacts, the use of which we shall now proceed to explain.~~

~~Epacts.—Epact is a word of Greek origin, employed in the calendar to signify the moon's age at the beginning of the year. The common solar year containing 365 days, and the lunar year only 354 days, the difference is eleven ; whence, if a new moon fall on the 1st of January in any year, the moon will be eleven days old on the first day of the following year, and twenty-two days on the first of the third year. The numbers eleven and twenty-two are therefore the epacts of those years respectively. Another addition of eleven gives thirty-three for the epact of the fourth year ; but in consequence of the insertion of the intercalary month in each third year of the lunar cycle, this epact is reduced to three. In like manuer the epacts of all the following years of the cycle are obtained by successively adding eleven to the epact of the former year, and rejecting thirty as often as the sum exceeds that number. They are therefore connected with the golden numbers by the formula ae in which n is any whole number ; and for a whole lunar cycle (supposing the first epact to be 11), they are as follows: 11, 22, 3, 14, 25, 6, 17, 28, 9, 20,1, 12,23, 4 Loo. (,015).29.. it the order is interrupted at the end of the cycle; for the epact of the following year, found in the same manner, would be 29 + 11 = 40 or 10, whereas it ought again to be 11 to correspond with the moon's age and the~~

~~golden number 1. The reason of this is, that the intercalary month, inserted at the end of the cycle, contains only twenty-nine days instead of thirty ; whence, after 11 has been added to the epact of the year corresponding to the golden number 19, we must reject twenty-nine instead of thirty, in order to have the epact of the succeeding year ; or, which comes to the same thing, we must add twelve to the epact of the last year of the cycle, and then reject thirty as before.~~

~~This method of forming the epacts might have been con- tinued indefinitely if the Julian intercalation had been followed without correction, and the cycle been perfectly exact; but as neither of these suppositions is true, two equations or corrections must be applied, one depending on~~

~~the error of the Julian year, which is called the solar equa- tion; the other on the error of the lunar cycle, which is called the lunar equation. The solar equation occurs three times in 400 years, namely, in every secular year which ig not a leap year; for in this case the omission of the intercalary day causes the new moons to arrive one day later in all the following months, so that the moon's age at the end of the month is one day less than it would have been if the intercalation had been made, and the epacts must accordingly be all diminished by unity. Thus the epacts 11, 22, 3, 14, &c., become 10, 21, 2, 13, && On the other hand, when the time by which tle new moons anticipate the lunar cycle amounts to a whole day, which, as we have seen, it does in 308 years, the new moons will arrive one day earlier, and the epacts must consequently be increased by unity. Thus the epacts 11, 22, 3, 14, &e., in consequence of the lunar equation, become 12, 23, 4, 15, &c. In order to preserve the uniformity of the calendar, the epacts are changed only at the commencement of a century ; the correction of the error of the lunar cycle is therefore made at the end of 300 years. In the Gregorian calendar this error is assumed to amount to one day in 3123 years, or eight days in 2500 years, an assumption which requires the line of epacts to be changed seven times successively at the end of each period of 300 years, and once at the end of 400 years; and, from the manner in which the epacts were disposed at the reformation, it was found most correct to suppose one of the periods of 2500 years to terminate with the year 1800.~~

~~The years in which the solar equation occurs, counting from the reformation, are 1700, 1800, 1900, 2100, 2200, 2300, 2500, &c. Those in which the lunar equation occurs are 1800, 2100, 2400, 2700, 3000, 3300, 3600, 3900, after which, 4300, 4600, and so on. When the solar equation occurs, the epacts are diminished by unity ; when the lunar equation occurs, the epacts are augmented by unity ; and when both equations occur together, as in 1800, 2100, 2700, &c., they compensate each other, and the epacts are not changed.~~

~~In consequence of the solar and lunar equations, it is evident that the epact, or moon's age at the beginning of the year, must, in the course of centuries, have all different values from one to thirty inclusive, corresponding to the days in a full lunar month. Hence, for the construction of a perpetual calendar, there must be thirty different sets or lines of epacts. These are exhibited in the subjoined table (Table III.) called the Hatended Table of Epacts, which is constructed in the following manner. The series of golden numbers is written in a line at the top of the table, and under each golden number is a column of thirty epacts, arranged in the order of the natural numbers, beginning at the bottom and proceeding to the top of the column. The first column, under the golden number 1, contains the epacts, 1, 2, 3, 4, &c., to 30 or 0. The second column, corresponding to the following year in the lunar cycle, must have allits epacts augmented by 11 ; the lowest number, therefore, in the column is 12, then 13, 14, 19, andsoon. The third column, corresponding to the golden number 3, has for its first epact 12 + 11 = 23; and in the same manner al] the nineteen columns of the table are formed. Each of the thirty lines of epacts is designated by a letter of the alphabet, which serves as its index or argument. The order of the letters, like that of the numbers, is from the bottom of the column upwards.~~

~~In the tables of the church calendar the epacts are usually printed in Roman numerals, excepting the last, which is designated by an asterisk (*), used as am indefinite symbol to denote 30 or 0, and 25, which in the last eight columns is expressed in Arabic characters, for 4 reason that will immediately be explained. In the table~~

~~t~~

~~here given, this distinction is made by means of an accent placed over the last figure. At the reformation the epacts were given by the line D.~~

~~The year 1600 was a leap year; the intercalation accord- |~~

~~ingly took place as usual, and there was no interruption in the order of the epacts; the line D was employed till 1700. In that year the omission of the intercalary day rendered it necessary to diminish the epacts by unity, or to pass to the line C. In 1800 the solar equation again occurred, in consequence of which it was necessary to descend one line to have the epacts diminished by unity ; but in this year the lunar equation also occurred, the anticipation of the new moons having amounted to a day ;~~

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belonging to the present century is therefore C. In 1900 the solar equation occurs, after which the line is B. The year 2000 is a leap year, and there is no alteration. In 2100 the equations again occur_ together and destroy each

_ other, so that the line B willserve three centuries, from

1900 to 2200. From that year to 2300 the line will be A. In this manner the line of epacts belonging to any given century is easily found, and the method of proceeding is obvious. When the solar equation occurs alone, the line of epacts is changed to the next lower in the table ; when the lunar equation occurs alone, the line is changed to the next higher; when both equations occur together, no change takes place. In order that it may be perceived at

_ the new moons accordingly happened a day earlier, which | rendered it necessary to take the epacts in the next higher

line. There was, consequently, no alteration; the two equations destroyed each other.

once to what centuries the different lines of epacts respec- tively belong, they have been placed in a column on the left hand side of the following table.

The line of epacts TasieE ITI.—Latended Table of Epacts.

GOLDEN NUMBERS.

¥ Years. 3 = aan nT [nnn eee eeeeees commer > lie ae Se) ee Be eee |e? |g | x0 | 11 we 51800 8700 | © | * | 11 | 22| 3/14/25] 6 | 17 |} 28! 9 | 20 ; 1900 2000 2100 | B | 29/ 10/21) 2/13! 24] 5116/27! 8} 19 2200 2400 m bos) 8) 20| 1919!) 98) 4) 15 | 96)| 7 | 18 2300 2500 u | 27 We) ie 2) Fa)25 | 6 | 17 || 2600 2700 2800 | t | 26} 7/|18/|29]10/] 21} 2/13! 24! 5! 16 2900 3000 s p2>| 6147/28) 9) 20) 1/429! 981 4] 15 3100 3200 3300 |} r | 24/ 5116/27] 8|19}] *|11/] 92] 3] 14 3400 3600 q tae] Pieiereey 7118 | 89 | 10 | 211 2) 13 3500

~~3700 p | 220 93)| 145) © 117 | 28) 9 | 20] 14:19 1 3800 3900 4000 | n j 21} 2/13) 24] 5/16/27} 8/19! *1/ 411 4100: mm) | | 125) 93 § | 5 | ee | 7 | 18 | 29 | 10 4200 4800 4400 | 1/19; *} 11/22] 3/14)25! 6/17/28! 9 4500 4600 i |/Pise| ou roma) 70) Teele!) 5 | 16 | 97 | 8 4700 4800 4900 | i | 17/| 28; 9/20] 1/12/23! 4/15196| 7 5000 5200 m | 16] 27 | Sid | ©1411) 92) 3)qa4) a5 | 6 5100 5300 ee letos| 26) 7ets| 200-10) | oa | 2) ys |.94 | 5 5400 5500 5600 | f | 14/25; 6117] 28| 9!20| 1/12/93] 4 5700 5800 e-| 13 | 24) 5 | 1681 27 | 8119 | *| 11] Bl 3 5900 6000 6100 | d | 12/28; 4/15/26] 7/18/29] 10!/21/| 2 6200 6400 el |) 22 et eee) 6 1 a7 he | oso] 1 i ——<— _ | |S | | | | | | | —= tl 6300 6500 bein 21) 29) te toe] % te |/o7 1! sii9] * || \ 6600 6800 ae Sze | 1298) 245 | 86 | 7] 18 | 29 | 10 6700 6900 Melee) tea) a |Ridaige2e|) sendd | 25% 6 | 17 | 28 9 7000 7100 7200 | N | 7/ 18/29; 10; 21} 2/18/24] 5] 16/27] 8 7300 7400 R96 | iy ees 920) | 1 | 12 | 83) 4) 15 | 26h 7 moo 7600 7700 | H | 5| We) 27| §| 19) *!/11 122!) 3/14] 25 fF 6 7800 8000 Gy ols) 265) 7 | 8 | 99 | 10 | ah} 2119) 24 |] 5 7900 8100 Me ie eo) 6 | ie 28 | 9 e920 boi | 120) 28 | 4 8200 8300 8400 | E} 2/18) 24) 5/16/27/ glig9! *{11j{ 22] 8 1500 1600 8500 |D | 1] 12/ 23) 4/15/26! 7/181! 29/10; 21 || 2~~

~~In like manner, if the~~

~~The use of the epacts is to show the days of the new moons, and consequently the moon's age on any day of the year. For this purpose they are placed in the calendar (Table IV.) along with the days of the month and dominical~~

~~letters, in a retrograde order, so that the asterisk stands | beside the Ist of January, 29 beside the 2nd, 28 beside the~~

~~_ 3rd, and so on to 1, which corresponds to the 30th. After _ this comes the asterisk, which corresponds to the 31st of January, then 29, which belongs to the Ist of February, and so on to the end of the year. The reason of this dis-~~

~~tribution is evident. If the last lunation of any year ends,~~

~~| for example, on the 2nd of December, the new moon falls~~

~~on the 3rd; and the moon's age on the 31st, or at the end of the year, is twenty-nine days. The epact of the follow- ing year is therefore twenty-nine. Now that lunation having commenced on the 3rd of December, and consisting of thirty days, will end on the lst of January. The 2nd of January is therefore the day of the new mvon, which is~~

~~indicated by the epact twenty-nine. new moon fell on the 4th of December, the epact of the following year would be twenty-eight, which, to indicate the day of next new moon, nmiust correspond to the 3rd of January.~~

~~When the epact of the year is known, the days on which the new moons occur throughout the whole year are shown by Table IV., which is called the Gregorian Calendar of~~

~~Epacts. For example, the*¥olden number of the year 1832, is opi be 9, and the epact, as found in Table~~

~~TII., is twenty-eight. This epact occurs at the 3rd of January, the 2nd of February, the 3rd of March, the 2nd of April, the 1st of May, &c.; and these days are consequently the days of the ecclesiastical new moons in 1832. The astronomical new moons generally take place one or two days, sometimes even three days, earlier than those of the calendar.~~

~~IV. — 85~~

~~674~~

~~January jf February | March April May June — — —

~~8 fe c] s |r| s lal 22 yes i D 7 |G (38 5 23 8 |B 6 {HE i 67 | Asi 6″ FC 4 24 7 Ve Ay 3 Lit F 5 |B 5 |D] 3 25 6 |D 4 1G G 4 1C 4.8 2 26 1 5 |E 3 A A 3 D 3 F 1 27 4 \F 2 6 B 2 |E 2|G 'a 28 3 1G 1 {Cc C Uy ie 17) aie} 28 Zo 2 ,A D ~ le => |85 28 30 1 1B Ki} 29 [PA | 29 |e 1997 ie Wg ; : el, There are some artifices employed in the construction of this table, to which it is necessary to pay attention. The thirty epacts correspond to the thirty days of a full lunar month; but the lunar months consist of twenty-nine and thirty days alternately, therefore in six months of the year the thirty epacts must correspond only to twenty-nine days. For this reason the epacts twenty-five and twenty- four are placed together, so as to belong only to one day in the months of February, April, June, August, September, and November, and in the same months another 25', dis- tinguished by an accent, or by being printed in a different character, is placed beside 26, and belongs to the same day. The reason for doubling the 25 was to prevent the new moons from being indicated in the calendar as happening twice on the same day in the course of the lunar cycle, a thing which actually cannot take place. For example, if we observe the line B in Table III., we shall see that it contains both the epacts twenty-four and twenty-five, so~~

~~that if these correspond to the same day of the month, two new moons would be indicated as happening on that day within nineteen years. Now the three epacts 24, 25, 26, can never occur in the same line; therefore in those lines in which 24 and 25 occur, the 25 is accented, and placed in the calendar beside 26. W 25 and 26 occur in the same line of epacts, the 25 is not accented, and in the calendar stands beside 24. The lines of epacts in which 24 and 25 both occur, are those which are marked by one of the eight letters 4, ¢, £, 2, 7, B, E, N, in all of which 25' stands in a column corresponding to a golden number higher than 11. There are also eight lines in which 25 and 26 occur, namely, ¢, f, 1, p, s, C, F, P. Inthe other 14 lines, 25 either does not occur at all, or it occurs in a line in which neither 24 nor 26 is found. From this it appears, that if~~

~~CALENDAR~~

~~TABLE IV.—Gregorian Calendar.~~

~~[ECCLESIASTICAL~~

~~September] October~~

~~i November | December~~

~~L| £~~

~~G F | 22~~

~~A G] 24~~

~~B A| 20~~

~~G B | 19~~

~~| D C | 1s~~

~~E DI 17~~

~~F E | 16~~

~~G F| 15~~

~~A G] 14~~

~~B A| 13~~

~~C BI] 12~~

~~D C] i E D| 10~~

~~F JE] 9~~

~~G FI 8~~

~~A Gee~~

~~B a~~

~~C 6/B| 5~~

~~D SGb a~~

~~E 4}d| 3~~

~~F 3 1B] 2~~

~~G 2|F] 4~~

~~A i eet~~

~~B *}al 29~~

~~C B | 28~~

~~D c | 27~~

~~E DI} 26~~

~~F 25/26] B }25/25 G G 9504 F | 24 | A A 23 |G} 23 |B B | | 22 |e~~

~~the golden number of the year exceeds 11, the epact 25, in six months of the year, must correspond to the same day in the calendar as 26; but if the golden number does not exceed 11, that epact must correspond to the same day as 24. Hence the reason for distinguishing 25 and 25'. In using the calendar, if the epact of the year is 25, and the golden number not above 11, take 25; but if the golden number exceeds 11, take 25'.~~

~~Another peculiarity requires explanation. The epact 19' (also distinguished by an accent or different character) is placed in the same line with 20 at the 3lst of December. It is, however, only used in those years in which the epact 19 concurs with the golden number 19. When the golden uumber is 19, that is to say, in the last year of the lunar cycle, the supplementary month contains only 29 days. Hence, if in that year the epact should be 19, a new moon would fall on the 2nd of December, and the lunation would terminate on the 30th, so that the next new moon would arrive on the 3lst. The epact of the year, therefore, or 19, must stand beside that day, whereas, according to the regular order, the epact corresponding to the 3lst of December is 20; and this is the reason for the distinc tion. é~~

~~As an example of the use of the preceding tables, suppose it were required to determine the moon's age on the 10th of April 1832. In 1832 the golden number i~~

~~1832-1~~

~~or century is C. In Table IIT. under 9, and in the line C, we find the epact 28. In the calendar, Table IV. look for April, and the epact 28 is found opposite the second day. The 2nd of April is therefore the first day of the moon, and the 10th is consequently the ninth day of the moon.~~

~~= 9, and the line of epacts belonging to the~~

~~| determined from the epact, and not by the true fall moon,~~

~~CALE~~

~~Again, suppose it were required to find the moon's age on~~

~~the 2nd of December in the year 1916. In this case the~~

~~= *)= 17, and in Table IIL, opposite to 1900, the line of epacts is B. Under 17, in line B, the epact is 25'... In the calendar this epact first occurs before the 2nd of December at the 26th of Novem- ber. The 26th of November is consequently the first day of the moon, and the 2nd of December is therefore the seventh day.~~

~~Easter.—The next, and indeed the principal use of the calendar, is to find Easter, which, according to the regula- tion of the Council of Nice, must be determined from the following conditions :—1st, Easter must be celebrated on a Sunday ; 2nd, this Sunday must follow the 14th day of the paschal moon, so that if the 14th of the paschal moon falls on a Sunday, then Easter must be celebrated on the Sunday following ; 37d, the paschal moon is that of which the 14th day falls on or next follows the day of the vernal equinox ; 4th, the equinox is fixed invariably in the~~

~~calendar on the 21st of March. Sometimes a misunder- standing has arisen from not observing that this regulation is to be construed according to the~~

~~tabular full moon as~~

~~ECCLESIASTICAL. |~~

~~golden number is~~

~~which, in general, occurs one or two days earlier.~~

~~From these conditions it follows that the paschal full moon, or the 14th of the paschal moon, cannot happen before the 21st of March, and that Easter in consequence cannot happen before the 22nd of March. If the 14th of the moon falls on the 21st, the new moon must fall on the 8th; for 21 — 13 = 8; and the paschal new moon cannot happen before the 8th; for suppose the new moon to fall on the 7th, then the full moon would arrive on the 20th, or the day before the equinox. The following moon would _ be the paschal moon. But the fourteenth of this moon falls at the latest on the 18th of April, or 29 days after the 20th of March; for by reason of the double epact that occurs at the 4th and 5th of April, this lunation has only 29 days. Now, if in this case the 18th of Aprilis Sunday, then Easter must be celebrated on the following Sunday, or the 25th of April, Hence Easter Sunday cannot happen earlier than the 22nd of March, or later than the 25th of April. ,~~

~~Hence we derive the following rule for finding Easter Sunday from the tables :—1st, Find the golden number, and, from Table III, the epact of the proposed year. 2nd, Find in the calendar (Table IV.) the first day after the 7th | of March which corresponds to the epact of the year; this _ willbe the first day of the paschal moon. 3rd, Reckon thir- teen days after that of the first of the moon, the following will be the 14th of the moon, or the day of the full paschal _ moon, 4th, Find from Table I. the dominical letter of~~

~~the year, and observe in the calendar the first day, after the~~

~~fourteenth of the moon, which corresponds to the dominical | letter; this will be Easter Sunday.~~

~~Exvample.—Required the day on which Easter Sunday falls in the year 1840? Ist, For this year the golden~~

~~| number is (““4*) 17, and the epact (Table LIT.~~

~~_ tine C)is 26. 2nd, After the 7th of March the epact 26 _ first oceurs in Table ILI. at the 4th of April, which, there- fore, is the day of the new moon. 3rd, Since the new moon falls on the 4th, the full moon is on the 17th (4+ 13 = 17). 4th, The dominical letters of 1840 are E, D (Table I.), of which D must be taken, as E belongs only to January and February. After the 17th of April D first occurs in the calendar (Table IV.) at the 19th. Therefore, in 1840, Easter Sunday falls on the 19th of April. The operation is in all cases much facilitated by means of the following table :—~~

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~~NDAR~~

~~TaBLe V.—Perpetual Table, showing Easter. a ae~~

~~7)~~

~~_ Dominical Letter, pact. For Leap-Years use the seconp Letter. A B Cc D E F G~~

- ~~Apr.16 | Apr. 17. Apr.18} Apr, 19 | Apr. 20 | Apr. 14 | Apr. 15 i = We ag My) SIS, I) me Bl ee. ae 2 vo) GS oe te eg a Ie eee TS oo Ia 1S 3 « on |g) ER 8 | ye te] 4 » Fe; Tov ., Wl] wl We) f MEL LT as 5 oe SiGe il. at . ag) Bel © ow » 16 6 ” 9 » 10! , Hy} » 12 » 13 » 14 » 8 7 ” 9 ” 10 ” 1] ” 12 | ” 13 ” 7 ys 8 8 ” 3 » 10 »n il ” 12; » 6 ” 7 ” 8 9 ” 9 ” 10 ” 11 ” 5 | ” 6 ” 7 | =a 8 10 ” 9 » 10) ” ao ” 5 ” 6 ” 7 ” 8 il 7 9 ” 3 ” = ” 5 ” 6. ” 7 » Sf 12 ” 2 ” 3 ” 4 ” 5 ” 6 ” 7 ” 8 13 or) 2 ” 3 ” 4 ” 5 ” 6 ” 7 ” 1 14 × 21 8) 4 4] » 5] 4, 6/Maral) 5 11° 15 $4, & 12) Si. ean) | 16 » 2] , 3! , seer) Oo) er 7 7 W | ce Ie 4 OP dO] gm) Fl 18 ee ee ee ee ee ee Eo PR eit) es 28] gue! 20) eee tT 20 » 261 » 27| ,, 2} ,, 20) ,,880) | Bl Mar 21 1» OP we 27] 4, 8B) 4, 29, 88) Foal mag 22 me 20) oh BE ge GON 4, 29i|° 4 02ai) eee Sos 25 ae 218 = 27 | ap 243 mee » 23 seueeee 3) e 24 Apr. 23 | Apr. 24 Apr. 25 | Apr. 19} Apr. 20 Apr. 21 Apr. 22 25 » 23) ,. 24] 4, 251 4 19] , 20) 4, 21) 4, 22 26 ee ee ae ee eee 27 -2t| 5 ty) » US|. WT cee tt oe 28 » Tow & It ast & 1a) 2 age Sat ey 29 ¢ 16 eT S| ere, 20), 2, 15~~

~~Such is the very complicated and artificial, though highly ingenious method, invented by Lilius, for the determination of Easter and the other movable feasts, Its principal, though perhaps least obvious advantage, consists in its being entirely independent of astronomical tables, or indeed of any celestial phenomena whatever ; so that all chances of disagreement arising from the inevitable errors of tables, or the uncertainty of observation, are avoided, and Easter determined without the possibility of mistake. But this advantage is only procured by the sacrifice of some accuracy; for notwithstanding the cumbersome apparatus employed, the conditions of the problem are not always exactly satisfied, nor is it possible that they can be always satisfied by any similar method of proceeding. The equinox is fixed on the 21st of March, though the sun enters Aries generally on the 20th of that month, some- times even on the 19th. It is accordingly quite possible that a full moon may arrive after the true equinox, and yet precede the 21stof March. This, therefore, would not be the paschal moon of the calendar, though it undoubtedly ought to be so, if the intention of the Council of Nice were rigidly followed. The new moons indicated by the epacts also differ from the astronomical new moons, and even from the mean new moons, in general by one or two days. In imitation of the Jews, who counted the time of the new moon, not from the moment of the actual phase, but from the time the moon first became visible after the conjunc: tion, the fourteenth day of the moon is regarded as the full moon ; but the moon is in opposition generally on the 16th day ; therefore, when the new moons of the calendar nearly concur with the true new moons, the full moons are considerably in error. The'epacts are also placed so as to indicate the full moons generally one or two days after the true full moons ; but this was done purposely, to avoid the chance of concurring with the Jewish passover, which the framers of the caleudar seem to have considered a greater evil than that of celebrating Easter a week too late.~~

~~We will now show in what manner this whole apparatus of methods and tables may be dispensed with, and the Gregorian calendar reduced to a few simple formule of easy computation.~~

~~And, first, to find the dominical letter. Let I, denote the number of the dominical letter of any given year of 'the era.~~

~~Then, since every year which is not a leap year ends with the same day as that with which it began, the dominical letter of the~~

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~~following year must be L—1, retrograding one letter every com- mon year. After x years, therefore, the number of the letter will be L—2. But as L can never exceed 7, the number 2 will always exceed L after the first seven years of the era. In order therefore to render the subtraction possible, L must be increased by some multiple of 7, as 7m, and the formula then becomes im+L—-2%. In the year preceding the first of the era, the dominical letter was C; for that year, therefore, we have L=3; consequently for any succeeding year x, L=7m+3 — x, the years being all supposed to consist of 365 days. But every fourth year is a leap year, and the effect of the intercalation is to throw the dominical letter one place farther back. The above expression must therefore be diminished~~

~~by the number of units in A or by Gio (this notation being used~~

~~to denote the quotient, i @ whole number, that arises from dividing x by 4). Hence in the Julian calendar the dominical letter is given~~

~~. x by the equation L=7m+3 — «- (2):~~

~~This equation gives the dominical letter of any year from the commencement of the era to the reformation. In order to adapt it to the Gregorian calendar, we must first add the 10 days that were left out of the year 1582; in the second place we must add one day for every century that has elapsed since 1600, in consequence of the secular suppression of the intercalary day; and lastly we must deduct the units contained in a fourth of the same number, because every fourth centesimal year is still a leap year. Denoting therefore the number of the century (or the date after the two right-hand digits have been struck out) by c, the value of L must be increased~~

~~by 10 + (c — 16) — (: ra We have then e- 16~~

~~xz L=im+3- % — (Z),.+ 10 + (€ — 16) — Ci .~~

~~that is, since 3 + 10 = 18 or 6 (the 7 days being rejected, as they do not affect the value of L),~~

~~Ps ce — 16% L=tm+6-«~ (4),,+ — 16) — (7 Ta!~~

~~This formula is perfectly general, and easily calculated. As an example, let us take the year 1839. In this case,~~

~~a 1839 3 xz = 1839, (7),.= (*),,= £59; ¢ = 18) t= 16 — 2,~~

~~c — 16 and (’ ere wn ©~~

~~Hence —~~

~~L= 7m + 6 — 1839 - — 459 ++ 2-0 Lf — 2290 =7 × 328 = 2290. b= 6 = letter F.~~

~~The year therefore begins with Tuesday. It will be remembered that in a leap year there are always two dominical letters, one of which is employed till the 29th of February, and the other till] the end of the year. In this case, as the formula supposes the inter- calation already made, the resulting letter is that which applies after the 29th of February. Before the intercalation the dominical letter had retrograded one place less. Thus for 1840 the formula gives D; during the first two months, therefore, the dominical letter is E. In order to investigate a formula for the epact, let us make~~

~~E = the true epact of the given year ;~~

~~J = the Julian epact, that is to say, the number the epact would have been if the Julian year had been still in use, and the lunar cycle had been exact ;~~

~~S = the correction depending on the solar year ;~~

~~M= the correction depending on the lunar cycle ;~~

~~then the equation of the epact will be~~

~~E=J+S8+M; so that E will be known when the numbers J, S, and M are deter- mined. : The epact J depends on the golden number N, and must be~~

~~de- termined from the fact that in 1582, the first year of the reformed~~

~~calendar, N was 6, and J 26. For the following years, then, the golden numbers and epacts are as follows :~~

~~1583, N= 7, J= 264+ 11 — 30= 7; 1584,N= 8 J= 7+11 = 18; 1585, N= 9, J=18+11 = 29; 1586, N=10, J = 29+ 11 — 30=10; and, therefore, in general J = Gn), . But the~~

~~numerator of this fraction becomes by reduction 11 N — - 40 or 11N — 10 (the 30 being rejected, as the remainder only is sought) = N+ 10(N — 1); therefore, ultimately,~~

~~a = >)~~

~~30 ia~~

~~CALENDAR~~

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~~On account of the solar equation 8, the epact J must be dimin- ished by unity every centesimal year, excepting always the fourth,~~

~~After x centuries, therefore, it must be diminished by # — (3). ~~

~~Now, as 1600 was a leap year, the first correction of the Julian in- tercalation took place in 1700; hence, taking c¢ to denote the number of the century as before, the correction becomes (¢ — 16)~~

~~5 (“ = = © which must be deducted from J. We have there-~~

~~4~~

~~Se — (¢ — 16) + (45%)...~~

~~With regard to the lunar equation M, we have already stated that in the Gregorian calendar the epacts are increased by unity at the end of every~~

~~period of 300 years seven times successively, and then the increase takes place once at the end of 400 years. This gives~~

~~fore~~

~~eight to be added in a period of twenty-five centuries, and = in zx~~

~~- Se ot ae centuries. But 5 = 3 (zc a) Now, !from the manner in~~

~~which the intercalation is directed to be made (namely, seven times successively at the end of 300 years, and once at the end of 400),~~

~~it is evident that the fraction eS must amount to unity when the~~

~~number of centuries amounts to twenty-four. In like manner, when the number of centuries is 24 + 25 = 49, we must haye = = 2; when the number of centuries is 24 + 2 × 25 = 74, then~~

~~5 = 8; and, generally, when the number of centuries is 24 +~~

~~n xX 25, then 5 =n+1. Now this is a condition which will~~

~~evidently be expressed in general by the formula n ~· (25~~

~~Hence the correction of the epact, or the number of days to be in- tercalated after « centuries reckoned from the commencement of one e+1 of the periods of twenty-five centuries, | ad (25 Jw> . The $ w last period of twenty-five centuries terminated with 1800 ; there- fore, in any succeeding year, if c be the number of the century, we shall have x =e — 18 andzx+1=c- — 17. Let ——-3 . then for all years after 1800 the value of M will be given by the~~

~~e-18 -a formula (yer~~

~~=a,~~

~~4, therefore, counting from the begin-~~

~~ning of the calendar in 1582,~~

~~c-15-a wn feat~~

~~By the substitution of these values of J, S, and M, the equation of the epact becomes~~

~~N+10(N — 1) c— — 16 c-15-a n= (: p= 16) +(rad at aad~~

~~c- 17~~

~~25~~

~~be 0 till c — 17 = 25 or c = 42; therefore, till the year 4200, a may be neglected in the computation. Had the anticipation of the new moons been taken, as it ought to have been, at one day in 308 years instead of 3124, the lunar equation would have occurred only twelve times in 3700 years, or eleven times successively at the end of 300 years, and then at the end of 400. In strict accuracy, therefore, ought to have no value till c — 17 = 37, or ¢ = 54, that is to say, till the year 5400. The above formula for the epact is given by Delambre (Hist. de ' Astronomie Moderne, tom. i. p. 9); it may be exhibited under a variety of forms, but the above is perhaps the best adapted for calculation. Another had previously been given by Gauss, but inaccurately, inasmuch as the correction depending on was omitted.~~

~~Having determined the epact of the year, it only remains to find — Easter Sunday from the conditions already laid down. Let P = the number of days from the 21st of March to the 15th of the~~

~~paschal moon, which is the first day on which Easter Sunday~~

~~can fall ; p = the number of days from the 21st of March to Easter Sunday, L= the number of the dominical letter of the year ; 1 = letter belonging to the day on which the 15th of the moon falls; then, since Easter is the Sunday following the 14th of the moon, we have :~~

~~p=P+(L- J),~~

~~which is commonly called the nwméber of direction. ‘~~

~~It may be remarked, that as a =~~

~~w? the value of a will~~

~~oe~~

~~ECCLESIASTICAL. |~~

~~The value of L is always given by the formula for the dominical letter, and P and / are easily dedueed from the epact, as will appear from the following considcrations.~~

~~When P = 1, the full moon is on the 21st of March, and the new moon on the eighth (21 — 13 = 8), therefore the moon’s age on the 1st of March (which is the same as on the Ist of January) is twenty- three days; the epaet of the year is consequently twenty-three. When P = 2 the new moon falls on the ninth, and the epaet is con- sequently twenty-two ; and, in general, when P beeomes 1 + 2, E becomes 23 — x, therefore P+ E=1+ 2 + 23 – w= 24, and P =24-—K. In like manner, when P=1,7=D = 4; for D is the dominieal letter of the ealendar belonging to the 22nd of March. But it is evident that when / is inereased by unity, that is to say, when the full moon falls a day later, the epact of the year is dimin- ished by unity ; therefore, in general, when 7 = 4 + x, E = 23 — 2, whenee / + E = 27 and? = 27 — E._ But P ean never be less than 1 nor Z less than 4, and in both eases E = 23. When, therefore, E is greater than 23, we must add 30 in order that P and Z may have positive values in the formula P = 24 — EF and? =27-E. Henee there are two eases,~~

~~When < 24,~~

~~P=24 —-E t= 27 – B, or (77-2) : r~~

~~7~~

~~=54-E = 67 – E, or (7%) ‘ if T~~

By substituting one or other of these values of P and J, aeeording as the ease may be, in the formula p =P + (L — 12), we shall have a, or the number of days from the 21st of March to Easter Sunday. It will be remarked, that as L — / eannot either be 0 or negative, we must add 7 to L as often as may be neeessary, in order that L — / may be a positive whole number.

By means of the formule which we have now given for the domin- ical letter, the golden number, and the epaet, Easter Sunday may be computed for any year after the reformation, without the assist- ance of any tables whatever. As an example, suppose it were required to compute Easter for the year 1840. By substituting this number in the formula for the dominieal letter, we have « = 1840,

— -16 e-16=2, (=),,= 0, therefore:

L=7m + 6 — 1840 — 460 + 2 = 7m — 2292 =7 × 328 — 2292 = 2296 — 2292 = 4

When E > 23, :

~

pt MOBI DE IEIE A. ooo ceeevenenccetaiconan sel (1). For the golden number we have N == a ; | . a ees seetenae ose eee: (2). For the epact we have (Aas) Ca Ve (ZB A = 27; likewise c-16 = 18-16 = 2, =1, a = 0; therefore Le ee (8).

Now sinee E > 23, we have for F and J, P=54—E = 54-26 = 28,

Se 7 a(2 en . oe 7 jas (2 eonsequently, sinee p = Pj+ (L—2), p= 28 + (4-3) = 29;

that is to say, Easter happens twenty-nine days after the 21st of March, or on the 19th April, the same result as was before found from the tables.

The principal church feasts depending on Easter, and the times of their celebration, are as follows :—

~~Septuagesima Sunday……. 9 weeks : First Sunday in Lent……. is ; 6 weeks pee Ash Wednesday……. .c.c000 (46 days a Rogation Sunday…….0…. 5 weeks } Ascension day or Holy Thursday 39 days (after Pentecost or Whitsunday …….. 7 weeks (Easter. 2, 8 weeks~~

~~The Gregorian calendar was introduced into Spain, Portugal, and part of Italy, the same day as at Rome. In France it was received in the same year in the month of December, and by the Catholic states of Germany the year following. In the Protestant states of Germany the Julian calendar was adhered to till the year 1700, when it was decreed by the diet of Ratisbon that the new style and the Gregorian correction of the intercalation should be adopted. Instead, however, of employing the golden numbers and epacts for the determination of Easter and~~

~~the movable feasts, it was resolved that the equinox and the paschal moon should be found by astronomical com- putation from the Rudolphine tables. But this method, though at first view it may appear more accurate, was soon found to be attended with numerous inconveniences, and was at length, in 1774, abandoned at the instance of Frederick II. king of Prussia. In Denmark and Sweden the reformed calendar was received about the same time as in the Protestant states of Germany. It is remarkable that Russia still adheres to the Julian reckoning.~~

~~In Great Britain the alteration of the style was for.a long time successfully opposed by popular prejudice. The inconvenience, however, of using a different date from that employed by the greater part of Europe, in matters of history and chronology, began to be generally felt ; and at length, in 1751, an Act of Parliament was passed for the adoption of the new style in all public and legal transac- tions. The difference of the two styles, which then amounted to eleven days, was removed by ordering the day following the 2d of September of the year 1752 to be accounted the 14th of that month; and in order to pre- serve uniformity in future, the Gregorian rule of intercala- tion respecting the secular years was adopted. At the same time, the commencement of the legal year was changed from the 25th of April to~~

~~the Ist of January. In Scotland, the new style was adopted from the begin- ning of 1600, according to an Act of the privy council in December 1599. This fact is of importance with reference to the date of legal deeds executed in Scotland between that period and 1751, when the change was effected in England. With respect to the movable feasts, Easter is determined by the rule laid down by the Council of Nice; but instead of employing the new moons and epacts, the golden numbers are prefixed to the days of the full moons. In those years in which the line of epacts is changed in the Gregorian calendar, the golden numbers are removed to different days, and of course a new table is required when- ever the solar or lunar equation occurs. The golden numbers have been placed so that Easter may fall on the same day as in the Gregorian calendar. The calendar of the church of England is therefore from century to century the same in form as the old Roman calendar, excepting that the golden numbers indicate the full moons instead of the new moons.~~

~~Hesrew CaLenDAR.—In the construction of the Jewish calendar numerous details require attention. The calendar is dated from the Creation, which is considered to have taken place 3760 years and 3 months before the commence- ment of the Christian era. The year is luni-solar, and, according as it is ordinary or embolismic, consists of twelve or thirteen lunar months, each of which has 29 or 30 days. Thus the duration of the ordinary year is 354 days, and that of the embolismic is 384 days. In either case, it is sometimes made a day more, and sometimes a day less, in order that certain festivals may fall on proper days of the week for their due observance. The distribu- tion of the embolismic years, in each cycle of 19 years, is determined according to the following rule :—~~

~~The number of the Hebrew year (Y) which has its commencement in a Gregorian year (x) is obtained by the addition of 3761 years; that is, Y = x + 3761. Divide the Hebrew year by 19; then the quotient is the number of the last completed cycle, and the remainder is the year of the current cycle. If the remainder be 3, 6, 8, 11, 14, 17, or 19 (0), the year is embolismic ; if any other number, it ig ordinary. Or, otherwise, if we find tle remainder~~

~~2Y +1 R (19 ,~~

~~the year is embolismic when R < 7.~~

~~The calendar is constructed on the assumptions that the mean lunation is 29 days 12 hours 44 min. 33 sec., and that the year commences on, or immediately after, the new moon following the autumnal equinox. The mean solar year is also assumed to be 365 days 5 hours 55 min. 252% sec., sé that a cycle of nineteen of such years, con- taining 6939 days 16 hours 33 min. 34 sec., is the exact measure of 235 of the assumed lunations. The year 5606 was the first of a cycle, and the mean new moon, appertain- ing to the Ist of Tisri for that year, was 1845, October 1, 15 hours 42 min. 434 sec., as computed by Lindo, and adopting the civil mode of reckoning from the previous midnight. The times of all future new moons may conse- quently be deduced by successively adding 29 days 12 hours 44 min. 34 sec. to this date.~~

~~To compute the times of the new moons which determine the commencement of successive years, it must be observed that in passing from an ordinary year the new moon of the following year is deduced by subtracting the interval that twelve lunations fall short of the corresponding Gregorian year of 365 or 366 days; and that, in passing from an embolismic year, it is to be found by adding the excess of thirteen lunations over the Gregorian year. Thus to deduce the new moon of Tisri, for the year immediately following any given year (Y), when Y is~~

~~ordinary, subtract (if) days 15 hours 11 min. 20 sec., embolismic, add (i) days 21 hours 32 min. 485 sec.,~~

~~the second-mentioned number of days being used, in each case, whenever the following or new Gregorian year is bis- sextile.~~

~~Hence, knowing which of the years are embolismic, from their ordinal position in the cycle, according to the rule before stated, the times of the commencement of successive years may be thus carried on indefinitely without any difficulty. But-some slight adjustments will occasionally be needed for the reasons before assigned, viz., to avoid certain festivals falling on incompatible days of the week. Whenever the computed conjunction falls on a Sunday, Wednesday, or Friday, the new year is in~~

~~such case to be fixed on the day after. It will also be requisite to attend to the following conditions :—~~

~~If the computed new moon be after 18 hours, the following day is to be taken, and if that happen to be Sunday, Wednesday, or Friday, it must be further postponed one day. If, for an ordinary year, the new moon falls on a Tuesday, as late as 9 hours 11 min. 20 sec., it is not to be observed thereon ; and as it may not be held on a Wednesday, it is in such case to be postponed to Thursday. If, for a year immediately following an embolismic year, the computed new moon is on Monday, as late as 15 hours 30 min. 52 sec., the new year is to be fixed on Tuesday.~~

~~After the dates of commencement of the successive Hebrew years are finally adjusted, conformably with the foregoing directions, an estimation of the consecutive intervals, by taking the differences, will show the duration and character of the years that respectively intervene. According to the number of days thus found to be com- prised in the different years, the days of the several months are distributed as in Table VI.~~

~~The signs + and — are respectively annexed to Hesvan and Kislev to indicate that the former of these months may sometimes require to have one day more, and the latter sometimes one day less, than the number of days shown in the table,—the result, in every case, being at once determined by the total number of days that the year may happen to contain. An ordinary year may comprise 353, 354, or 355~~

~~CALENDAR~~

~~| HEBREW.~~

~~days ; and an embolismic year 383, 384, or 385 days. In these cases respectively the year is said to be imperfect, common, or perfect. The intercalary month, Veadar, is introduced in embolismic years in order that Passover, the 15th day of Nisan, may be kept at its proper season, which is the full moon of the vernal equinox, or that which takes place after the sun has entered the sign Aries. It always precedes the following new year by 163 days, or 23 weeks and 2 days; and Pentecost always precedes the new year by 113 days, or 16 weeks and 1 day.~~

~~TaBLE VL—Hebrew Months.~~

~~Hebrew~~

~~Ordinary | Embolismie Month Year Year Tisri 30 30 Hesvan 29+ 29+ Kislev 30— 30—- Tebet 29 29 Sebat 30 30 Adar 29 30 .(Veadar) (as) (29)~~

~~30~~

~~The Gregorian epact being the age of the moon of Tebet at the beginning of the Gregorian year, it represents the day of Tebet which corresponds to January 1; and thus the approximate date of Tisri 1, the commencement of the Hebrew year, may be otherwise deduced by subtracting the epact from~~

~~Sept. 24 ordinary Oct. 24 } ae { embolismic~~

~~The result so obtained would in general be more accurate than the Jewish calculation, from which it may differ a day, as fractious of a day do not enter alike in these com- putations. Such difference may also in part be accounted for by the fact that the assumed duration of the solar year is 6 min. 3923 sec. in excess of the true astronomical value, which will cause the dates of commencement of future Jewish years, so calculated, to advance forward from the equinox a day in error in 216 years. The lunations are estimated with much greater precision.~~

~~The following table is extracted from Woolhouse's Measures, Weights, and Moneys of all Nations :-—~~

~~TasLE VII.—Hebrew Years.~~

~~\ Hebrew year.~~

~~Yr. 7 a] Jewish yer of Commencement ay Pome Comme ear. Days (1st of Tisri). — Days. (1st of Tisri).~~

~~ee~~

~~2 Oct. 1845 |. 5625 | 355} Sat. | 1 Oct. 1864 21 Sept. 1846 354 | Thur. | 21 Sept. 1865~~

~~5606 | 354 | Thur. 07/355; Mon.~~

~~08 | 383} Sat. | 11 Sept. 1847 385 | Mon. |10 Sept. 1866 09 | 354 | Thur. | 28 Sept. 1848 353 | Mon. |30 Sept. 1867 10| 355} Mon. |17 Sept. 1349 354 | Thur. | 17 Sept. 1868 11} 385| Sat. | 7 Sept. 1850 385 | Mon. | 6 Sept. 1869 12| 353] Sat. 127 Sept. 1851 355 | Mon. | 26 Sept. 1870 13 | 384 | Tues. | 14 Sept. 1852 || 383] Sat. |16 Sept. 187]~~

~~3 Oct. 1872 355 | Mon. | 22 Sept. 1873 383/| Sat. | 12 Sept. 1874 355 | Thur. | 30 Sept. 1875 354 | Tues. | 19 Sept. 1876 385| Sat. | 8 Sept. 1877 355 | Sat. {28 Sept. 1878 354 | Thur. |18 Sept. 1879 383 | Mon. | 6 Sept. 1880 355| Sat. | 24 Sept. 188] 383 | Thur. | 14 Sept. 1882~~

~~3 Oct. 1853] &33 | 354 | Thur. 23 Sept. 1854 |: 13 Sept. 1855 || 2~~

~~30 Sept. 1856~~

~~£14] 355} Mon. 515 | 355| Sat. © 16 | 383 | Thur. S17 | 354} Tues. "18|355| Sat. | 19 Sept. 1857 19/ 385 | Thur. | 9 Sept. 1858 20 | 354 | Thur. | 29 Sept. 1859 21} 353 | Mon. | 17 Sept. 1860 22/385} Thur.| 5 Sept. 1861 23 | 354 | Thur. | 25 Sept. 1862 24 | 383| Mon. | 14 Sept. 1863~~

~~HEBREW. |~~

~~CALENDAR~~

~~Taste VII.—Hebrew Years (continued).~~

~~Commencement (st of Tisri).~~

~~Tues. | 2 Oct. 1883~~

~~Sat. | 20 Sept. 1884 Thur. | 10 Sept. 1885 Thur. | 30 Sept. 1886 Mon. | 19 Sept. 1887 Thur. | 6 Sept. 1888 Thur. | 26 Sept. 1889 Mon. | 15 Sept.-1890~~

~~Sat. |° 3 Oct. 1891 Thur. | 22 Sept. 1892 Mon. | 11 Sept. 1893 Mon. |' 1 Oct. 1894 Thur. | 19 Sept. 1895 Tues. | 8 Sept. 1896 Mon. | 27 Sept. 1897 Sat.~~

~~117 Sept. 1898 Tues. | 5 Sept. 1899 Mon. | 24 Sept. 1900~~

~~Sat. | 14 Sept. 1901~~

~~| Thur. Tues.~~

~~2 Oct. 1902 22 Sept. 1903~~

~~Sat. | 30 Sept. 1905 Thur. | 20 Sept. 1906 Mon. } 9 Sept. 1907~~

~~Sat. | 26 Sept. 1908 Thur. | 16 Sept. 1909 Tues. | 4 Oct. 1910~~

~~Thur. | 12 Sept. 1912 Thur. Thur. | 9 Sept. 1915 Thur. | 28 Sept. 1916 Mon. |17 Sept. 1917~~

~~Sat. | 7 Sept.1918 Thur. | 25 Sept. 1919 Mon. | 18 Sept. 1920~~

~~Mon. ; 3 Oct. 1921 Sat. | 23 Sept. 1922 Tues, | 11 Sept. 1923 Mon. | 29 Sept. 1924 Sat. |19 Sept. 1925 Thur. | 9 Sept. 1926 Tues. | 27 Sept. 1927 Sat. | 15 Sept. 1928 Sat. | 5Oct. 1929 Tues. | 28 Sept. 1980 Sat, | 12 Sept. 1931 Sat. | 1 Oct. 1932 Thur. | 21 Sept. 1933 Mon. | 10 Sept. 1934 Sat. | 28 Sept. 1935 Thur. | 17 Sept. 1936 Mon. | 6 Sept. 1937 Mon. | 26 Sept. 1938 Thur, | 14 Sept. 1939~~

~~Thur. | 3 Oct. 1940 Mon, | 22 Sept. 1941 Sat. |12Sept. 1942 Thur. | 30 Sept. 1943 Mon. }18 Sept. 1944 Sat. | 8 Sept. 1945 Thur. | 26 Sept. 1946 Mon. | 15 Sept. 1947 Mon, | 4 Oct. 1948 Sat. | 24 Sept. 1949 Tues, | 12 Sept. 1950 Mon. | 1 Oct. 1951 Sat. | 20 Sept. 1952 Thur. | 10 Sept. 1953 Tues. | 28 Sept. 1954 Sat. [17 Sept. 1955 Thur. | 6 Sept. 1956 Thur. | 26 Sept. 1957 Mon. | 15 Sept. 1958~~

~~Sat. | 10 Sept. 1904 |}~~

~~Sat. | 23 Sept. 1911}~~

~~2 Oct. 1913 || Mon. | 21 Sept. 1914 || ™~~

~~Jewish ae | Year. Days. 5720 | 355~~

~~Zl hood!~~

~~221 383 355 354~~

~~D| 354~~

~~385 353~~

~~3538 | Mon. 385 |} Thur. 354 | Thur. 385 | Mon.~~

~~Commencement (1st of Tisri).~~

~~Sat. | 3 Oct. 1959 Thur. | 22 Sept. 1960 Mon. | 11 Sept. 1961~~

~~Sat. | 29 Sept. 1962 Thur. | 19 Sept. 1963 Mon. | 7 Sept. 1964 Mon. | 27 Sept. 1965 Thur. | 15 Sept. 1966 Thur. | 5 Oct. 1967 Mon. | 23 Sept. 1968~~

~~Sat. | 13 Sept. 1969 Thur. | 1 Oct. 1970 Mon. | 20 Sept. 1971~~

~~Sat. | 9Sept. 1972 Thur. | 27 Sept. 1973 Tues. | 17 Sept. 1974~~

~~Sat. | 6Sept. 1975~~

~~Sat. |25 Sept. 1976 Tues. | 13 Sept. 1977~~

~~Mon. | 2 Oct. 1978 Sat. |22 Sept. 1979 Thur. | 11 Sept. 1980 Tues. | 29 Sept. 1981 Sat. |18 Sept. 1982 Thur. | 8 Sept. 1983 Thur, | 27 Sept. 1984 Mon. | 16 Sept. 1985 Sat. | 4 Oct. 1986 Thur. | 24 Sept. 1987 Mon. | 12 Sept. 1988 Sat. | 30 Sept. 1989 Thur, | 20 Sept. 1990 Mon. | 9 Sept. 1991 Mon. | 28 Sept. 1992 Thur. | 16 Sept. 1993 Tues. | 6 Sept. 1994 Mon. | 25 Sept. 1995 Sat. | 14 Sept. 1996~~

~~Thur. Mon.~~

~~2 Oct. 1997 21 Sept. 1998 11 Sept. 1999 30 Sept. 2000 18 Sept. 2001~~

~~7 Sept. 2002 27 Sept. 2003 . |16 Sept. 2004~~

~~4Oct. 2005 23 Sept. 2006 . |13 Sept. 2007 30 Sept. 2008 19 Sept. 2009~~

~~9 Sept. 2010 . |29 Sept. 2011 17 Sept. 2012~~

~~5 Sept. 2013 25 Sept. 2014 14 Sept. 2015~~

~~Mon. Thur. Mon. Mon. Sat. Tues. Mon. Sat. Thur. Tues. Sat. Sata | Thur. Mon. Sat. Thur. Mon. Date Thur.~~

~~3 Oct. 2016 21 Sept. 2017 10 Sept. 2018 30 Sept. 2019 19 Sept. 2020~~

~~7 Sept. 2021 26 Sept. 2022 116 Sept. 2023~~

~~3 Oct. 2024 23 Sept. 2025 12 Sept. 2026~~

~~2 Oct. 2027 21 Sept. 2028 110 Sept. 2029 28 Sept. 2030 18 Sept. 2031 | 6 Sept. 2032 24 Sept. 2033 14 Sept. 2034~~

~~679~~

~~TaBLe VII.—Hebrew Years (continued). Jewish aig Commencement Jewish "~ Commencement Year. Days. (ist of Tisri). Year. Days (ist of Tisri), 5796 | 354/Thur.| 4 Oct. 2035 |/ 58151355] Sat. | 3 Oct. 2954 97 | 358 | Mon. | 22Sept. 2036 |} 16 | 354| Thur. | 23 Sept. 2055 98 385 | Thur. | 10 Sept. 2037 |, 17/383) Mon. 11 Sept. 2056 99 | 354 | Thur. | 30 Sept. 2038 18 | 355) Sat. | 29 Sept. 2057 5800 | 355 | Mon. | 19 Sept. 2039|| 19/354/ Thur. |19 Sept. 2058 01/383} Sat. | 8Sept.2040]/ 20/383} Mon. | 8 Sept. 2059 02 | 354 | Thur. | 26 Sept. 2041 21/355] Sat. | 25 Sept. 2060 _03 | 385 | Mon. | 15 Sept. 2042) 22) 885] Thur. | 15 Sept. 2061 = 04 | 853 | Mon. | 5 Oct. 2043|| $23 |354|Thur.| 5 Oct. 2062 $05 | 355 | Thur. | 22 Sept. 2044'| $24 | 353| Mon. | 24 Sept. 2063 © 06 384) Tues, | 12 Sept. 2045 | © 25 | 385 | Thur. |11 Sept. 2064 307 | 355} Mon. | 1 Oct. 2048 S26 | 3541 Thur. | 1 Oct. 2065 08 | 353| Sat. | 21 Sept. 2047 27 | 355} Mon. | 20 Sept. 2066 09 | 884/ Tues. | 8Sept.2048]} 28/383] Sat. |10 Sept. 2067 10 | 355 | Mon. | 27 Sept. 2049 29 | 354 | Thur. | 27 Sept. 2068 11| 355] Sat. [17 Sept. 2050|| 301355} Mon. |16 Sept. 2069 12 383/Thur.| 7 Sept. 2051 31/383} Sat. | 6 Sept. 2070 13 | 354] Tues. | 24 Sept. 2052 32 | 355 | Thur. | 24 Sept. 2071 14! 885| Sat. |18Sept.2053|| 831 384| Tues. | 13 Sept. 2072~~

~~OO a.~~

~~MAHoMETAN CALENDAR.—The Mahometan era, or era of the Hegira, employed in Turkey, Persia, Arabia, &c., is dated from the flight of Mahomet from Mecca to Medina, which was in the night of Thursday the 15th of J uly 622 A.D.; and it commenced on the day following. The years of the Hegira are purely lunar, and always consist of twelve lunar months, commencing with the approximate new moon, without any intercalation to keep them to the same season with respect to the sun, so that they retrograde through all the seasons in about 323 years. They are also parti- tioned into cycles of 30 years, 19 of which are common years of 354 days each, and the other 11 are intercalary years having an additional day appended to the last month. The mean length of the year is therefore 35444 days, or 354 days 8 hours 48 min., which divided by 12 gives 29336 days, or 29 days 12 hours 44 min., as the time of a mean. lunation, and this differs from the astronomical mean lunation by only 2°8 seconds. This small error will only amount to a day in about 2400 years.~~

~~To find if a year is intercalary or common, divide it by 80; the quotient will be the number of completed cycles and the remainder will be the year of the curreut cycle; if this last be one of the numbers' 2, 5, W, 10) 13,86, 18)°O8, 24, 26, 89, the year is inter- calary and consists of 355 days; if it be any other number, the year 1s ordinary.~~

~~Or if Y denote the number of the Mahometan year, and~~

~~11 VY4+14 r=(30),~~

~~the year is intercalary when & < 11. Also the number of intercalary years from the year 1 up to the~~

~~(2 @ Aree year VY inclusive = =~~

~~atl ity y-1=(30 w°~~

~~To find the day of the week on which any year of the Hegira begins, we observe that the year 1. began on a Friday, and that after every common year of 354 days, or 50 weeks and 4 days, the day of the week must~~

~~necessarily become postponed 4 days, besides the additional day of each iutercalary year.~~

~~Hence if w = 1 2D 3 4 5 6 fi indicate Sun. Mon. | Tues. | Wed. | Thur. | Frid. | Sat.~~

~~the day of the week on which the year Y commences will be~~

~~) w> and_the same up to the7year~~

~~EY 1, w=2+4 = Be: = w (rejecting sevens).~~

~~1 Y+3 17+3 But, 30(—5— Arts ee VY+3 tiene al ny+3 gives 120 (—3— \ p= i2+ 44 r- (———),»~~

~~11 V+3 11 Y+3 Sean oe (35), =5+2V+43 (73*”), (rejecting sevens),~~

~~680 CALE~~

~~So that ie Ate S w=6 (+), +3 (73>), (rejecting sevens),~~

~~the values of which obviously circulate in a period of 7 times 30 or 210 years.~~

~~Let C denote the number of completed cycles, and y the year of the cycle; then VY = 30 (+ y, and~~

~~wad (5), + 6(4), +3 (7 Le a (rejecting sevens).~~

~~From this formula the following table has been constructed :—~~

~~TasLe VIII. Year of the Number of the Period of Seven Cycles = (+) r Current Cycle @) 0 1 2 3 4 5 6 of 8 Mon. | Sat. | Thur. | Tues. | Sun. | Frid. | Wed. 1} 9} 17| 25] Frid. | Wed. | Mon. | Sat. | Thur. | Tues. | Sun. *2/*10/*18)/*26| Tues.| Sun. | Frid. | Wed. | Mon. | Sat. | Thur. 3) 11) 19] 27} Sun. | Frid. | Wed. | Mon. } Sat. | Thur. | Tues. 4) 12) 20] 28|‘Thur. | Tues. | Sun. | Frid. | Wed. | Mon. | Sat. *5)*13 *21|*29| Mon. | Sat. | Thur. | Tues. | Sun. | Frid. | Wed. 6| 14] 22) 30] Sat. | Thur. | Tues. | Sun. | Frid. |~~

~~Wed. | Mon. | S728 Wed. | Mon. | Sat. | Thur. | Tues. | Sun. | Frid. *16)*24 Sun. | Frid. | Wed. | Mon. | Sat. | Thur. | Tues.~~

~~To find from this table the day of the week on which any year of the Hegira commences, the rule to be observed will be as follows :—~~

~~Rule.—Divide the year of the Hegira by 30; the quotient is the number of cycles, and the remainder is the year of the current cycle. Next divide the number of cycles by 7, and the second remainder will be the Number of the Period, which being found at the top of the table, and the year of the cycle on the left hand, the required day of the week is immediately shown.~~

~~The interealary years of the cycle arc distinguished by an asterisk.~~

~~For the computation of the Christian date, the ratio of a mean year of the Hegira to a solar year is~~

~~Year of Hegira 35444 , Mean solar year 365°2422 — 0970224.~~

~~The year 1 began 16 July 622, Old Style, or 19 July 622, according to the New or Gregorian Style. Now the day of the year answering to the 19th of July is 200, which, in parts of the solar year, is 0°5476, and the number of years elapsed = Y —1. Therefore, as the inter- calary days are distributed with considerable regularity in both calendars, the date of commencement of the year Y expressed in Gregorian years is~~

~~0970224 (Y — 1) + 622°5476,~~

~~or 0°970224 Y + 621°5774. This formula gives the following rule for calculating the date of the commencement of any year of the Hegira, according to the Gregorian or New Style.~~

~~Rule.—Multiply 970224 by the year of the Hegira, cut off six deciinals from the product, and add 621°5774. The suin will be the year of the Christian era, and the day of the year will be found by multiplying the decimal figures by 365.~~

~~The result may sometimes differ a day from the truth, as the intercalary days do not occur simultaneously; but as the day of the week can always be accurately obtained from the foregoing table, the result can be readily adjusted. :~~

~~Example.—Required the date on which the year 1362 of the Hegira begins.~~

~~970224 1362 1940448 5821344 2910672 970224 1321 -445088~~

~~621°5774~~

~~19430225 365 1125 1350 675~~

~~8°2125~~

~~NDAR~~

~~Thus the date is the 8th day, or the 8th of January, of the year~~

~~1943.~~

~~To find, as a test, the accurate day of the week, the proposed year of the Hegira, divided by 30, gives 45 cycles, and remainder 12, the year of the current cycle.~~

~~Also 45, divided by 7, leaves a remainder 8 for the number of the period.~~

~~Therefore, referring to 3 at the top of the table, and 12 on the left, the required day is Friday.~~

~~The tables, page 670, show that 8th January 1943 is a Friday ; therefore the date is exact.~~

~~For any other date of the Mahometan year it is only requisite to know the names of the consecutive months, and the number of days in each; these are —~~

~~[MAHOMETAN,~~

~~Muharram,. . . . . 80|Shaaban, . . . | ee Saphar,. 4 . . . . 20) Raniadan, .. . Rabial., ... 80 | Shawall . . . Rebia ll., ... 29] Dulkeads, . . . |e Jomadal., ... 80| Dulheggia,. . . . . 8 Jomeadel.,. 2. 2 = 28 and in intercalary years 30 Rajah . . 5 Ae~~

~~The ninth month, Ramadan, is the month of Abstinence observed by the Turks,~~

~~The Turkish calendar may evidently be carried on indefinitely by successive addition, observing only to allow for the additional day that occurs in the bissextile and intercalary years ; but for any remote date the computation according to the preceding rules will be most efficient, and such computation may be usefully employed as a check on the accuracy of any considerable extension of the calendar by induction alone.~~

~~The following table, taken from Woolhouse's Measures, Weights, and Moneys of all Nations, shows the dates of commencement of Mahometan years from 1845 up.to 2047, or from the 43rd to the 49th cycle inclusive, which form the whole of the seventh period of seven cycles. Through- out the next period of seven cycles, and all other like periods, the days of the week will recur in exactly the same order. All the tables of this kind previously pub- lished, which extend beyond the year 1900 of the Chris- tian era, are erroneous, not excepting the celebrated French work, L'Art de vérifier les Dates, so justly regarded as the greatest authority in chronological matters. The errors have probably arisen from a continued excess of 10 in the discrimination of the intercalary years.~~

~~TABLE IX.—Mahometan Years.~~

~~43d Cycle. 43d Cycle—continued. Year of Commencement Year of Commencement Hegira. (ist of Muharram). Hegira. (1st of Muharram).' 1261 | Frid. | 10 Jan. 1845 | 1286* | Tues. | 13 April 1869 1262* | Tues. | 30 Dec. 1845 | 1287 | Sun. | 3 April 1870 1263 Sun. | 20 Dec. 1846 | 1288 | Thur. | 23 Mar. 1871 1264 | Thur 9 Dec. 1847 || 1289* | Mon. | 11 Mar. 1872 1265* | Mon. | 27 Nov. 1848 || 1290 Sat 1 Mar. 1873 1266 Sat. 17 Nov. 1849 ce 1267* | Wed. | 6 Nov. 1850 44th Cycle. 1268 | Mon. | 27 Oct. 1851 1269 | Frid. | 15 Oct. 1852 || 1291 Wed. ; 18 Feb. 1874 1270* | Tues 4 Oct. 1853 || 1292* | Sun. 7 Feb. 1875 1271 Sun. | 24 Sept. 1854 |} 1293 | Frid. |~~

~~28 Jan. 1876 1272 | Thur.| 13 Sept. 1855 || 1294 | Tues. | 16 Jan. 1877 1273* | Mon.'| 1 Sept. 1856 || 1295* | Sat. 5 Jan. 1878 1274 Sat. 22 Aug. 1857 || 1296 Thur. | 26 Dec. 1878 1275 | Wed. | 11 Aug. 1858 || 1297* | Mon. | 15 Dec. 1879 1276* | Sun. | 31 July 1859 || 1298 Sat. 4 Dec. 1880 1277 Frid. | 20 July 1860 || 1299 Wed. | 23 Nov. 1881 1278* | Tues 9 July 1861 || 1300* | Sun. | 12 Nov. 1882 1279 Sun. | 29 June 1862 || 1301 Frid. 2 Nov. 1883 1280 | Thur. | 18 June 1868 || 1302 Tues. | 21 Oct. 1884 1281* | Mon. 6 June 1864 | 1303* | Sat. | 10 Oct. 1885 1282 Sat. 27 May 1865 || 1304 Thur. { 30 Sept. 1886 1283 Wed. | 16 May 1866 || 1305 Mon. | 19 Sept. 1887 1284* | Sun. 5 May 1867 || 1306* | Frid. 7 Sept. 1888 1285 Frid. | 24 April 1868 | 1807 | Wed. | 28 Aug. 1889~~

~~C.A/L' END AOR 681~~

~~a T : ——— ee~~

~~: 4th Cycle—continued. 47th Cycle. ee : f Commencement Year of Commene WenTHOT Ne Frecisa. (ist of Muharram), Hegira. (st of = nel ae edinematner) flare Res a | 1308* | Sun. | 17 Aug. 1890 || 1881 | Thur. | 15 June 1961 i 1454 | Mon. | 12 Apri 2 i 1309 | Frid. |} 7 Aug. 1891 || 1382* | Mon. ;} 4 June 1962 1455 -; Frid. | 1 rea Soe ae Tues 04 Des ai 1310 | Tues | 26 July 1892 | 1383 | Sat. | 25 May 1963 1456* | Tues. | 21 Mar. 2034 || 1465 | Sun. | 14 Dec. 2042 1311* | Sat. |15 July 1893 || 1384 |, Wed. | 13 May 1964 1457 | Sun. | 11 Mar. 2035 || 1466*.| Thur.| 3 Dec. 2043 "1312 | Thur. {| 5 July 1894 ||'1385* | Sun. 2 May 1965 1458* | Thur. | 28 Feb. 2036 | 1467 | Tues. | 92 Nov 2044 '1313 | Mon. |.24 June 1895 || 1386 | Frid. | 22 April 1966 1459 | Tues. | 17 Feb. 2037 || 1468 | Sat. | 11 Nov. 2045 1314* | Frid. | 12 June 1896 || 1387* | Tues. | 11 April 1967 1460 | Sat. | 6 Feb. 2038 | 1469* | Wed. | 31 Oct. 2046 1315 | Wed. | 2June 1897 |} 1388 Sun. | 31 Mar. 1968 1461* | Wed. | 26 Jan. 2039 |] 1470 Mon. 21 O t. 2047 1316* | Sun. | 22 May 1898 || 1889 | Thur. | 20 Mar. 1969 1462 | Mon. | 16 Jan. 2040 5 ee 1317 | Frid. | 12 May 1899 || 1390* | Mon. | 9 Mar. 1970 . : .~~

~~1318 Tues. 1 May 1900 |} 1391 Sat. | 27 Feb. 1971 a 1319* | Sat. | 20 April 1901 1392. et 16 Feb. 1972 1320 | Thur. | 10 April 1902 |} 1393 Sun. 4 Feb. 1973 see , P 1394 | Frid. | 25 Jan. 1974 TaBLe X.—Principal Days of the Hebrew Calendar. 45th Cycle. 1395 .| Tues. | 14 Jan. 1975 ae F 1396* | Sat. |. 3Jan. 1976 Tisri 1, New Year, Feast of Trumpets. 1821 | Mon. | 30 Mar.~~

~~1903 || 1397 .| Thur. | 23 Dec. 1976 ” 3,1 Fast of Guedaliah. 1322* | Frid. | 18 Mar. 1904 || 1398* | Mon. | 12 Dec. 1977 » 10, Fast of Expiation. 1323 | Wed. 8 Mar. 1905 || 1399 Sat. 2 Dec. 1978 D9 15, Feast of Tabernacles. 1324 { Sun. | 25 Feb. 1906 || 1400 | Wed. | 21 Nov. 1979 » 21, Last Day of the Festival.~~

~~-1825* | Thur. | 14 Feb. 1907 || 1401* | Sun. | 9 Nov. 1980 » 22, Feast of the 8th Day.~~

~~1326 | Tues.} 4-Feb. 1908 || 1409 | Frid. | 30 Oct. 1981 _» 28, Rejoicing of the Law.~~

~~1327* | Sat. | 23 Jan. 1909 |} 1403 | Tues. | 19 Oct. 1982 Kislev 25, Dedication of the Temple.~~

~~1328 | Thur.} 13 Jan. 1910 || 1404* | Sat. 8 Oct. 1983 Tebet 10, Fast, Siege of Jerusalem.~~

~~1329 | Mon. 2Jan. 1911 || 1405 | Thur. | 27 Sept. 1984 Adar 13, Fast of Esther,) In embolismic~~

~~1330* } Frid. | 22 Dec. 1911 || 1406* | Mon. | 16 Sept. 1985 ox 14 Eurim, years. Veadar.~~

~~1331 | Wed. | 11 Dec. 1912 || 1407 | Sat. | 6 Sept. 1986 Nisan 15, Passover.~~

~~1332 | Sun. | 30 Nov. 1913 || 1408 | Wed. | 26 Aug. 1987 Sivan 6, Pentecost.~~

~~1333* | Thur.} 19 Nov. 1914.|! 1409* | Sun. | 14 Aug. 1988 Tamuz 17,! Fast, Taking of Jerusalem.~~

~~1884 | Tues. | 9 Nov. 1915 || 1410 | Frid. | 4 Aus. 1989 Ab 9,1 Fast, Destruction of the Temple.~~

~~1335 | Sat. | 28 Oct. 1916 ae 1337 | Mon. | 7 Oct. 1918 TABLE X1.—— Principal Days of the Manometan Calendar. 1338* | Frid. | 26 Sept. 1919 || 1411 [apres 24 July 1990 1339 | Wed. | 15 Sept. 1920 || 1419* sat. | 13 July 1991 Muharram 1, New Year.~~

~~1340 Sun. 4 Sept. 1921 | 1413 | Thur. 2July 1992 i 10, Ashura.~~

~~1841* | Thur. | 24 Aug. 1922 | 1414 Mon. | 21 June 1993 Rabia I, 11, Birth of Mahomet.~~

~~1842 | Tues. | 14 Aug. 1923 | 1415* | Frid. | 10 June 1994 Jomada I, 20, Taking of Constantinople,~~

~~13843 Sat. 2 Aug. 1924 |) 1416 | Wed. | 31 May 1995 Rajab 15, Day of Victory. 1344* | Wed. | 22 July 1925 || 1417* | Sun. | 19 May 1996 96 20, Exaltation of Mahomet.~~

~~| 1845… Mon. | 12 July 1926 || 1418 Frid. 9 May 1997 | Shaaban 15, Borak's Night.~~

~~1346* | Frid. 1 July 1927 || 1419 Tunes. | 28 April 1998 Shawall 1, 2, 3, Grand Bairam.~~

~~| 1347 Wed. | 20 June 1928 || 1490* | Sat. | 17 April 1999 Dulheggia 1, Kurban Bairain.~~

~~1348 | Sun. | 9 June 1929 || 1421 | Thur. | 6 April 2000 1349* "| Thur. | 29 May 1930 || 1492 | Mon. | 26 Mar. 2001~~

~~)1350 | Tues.' 19 May 1931 || 1493* | Frid. | 15 Mar. 2002 =F, ° 'iods~~

~~' a) = pall aa eg Taste XII.— E£pochs, Eras, and Periods. 46th Cycle. 1425 | Sun. | 22 Feb. 2004~~

~~i 1426* | Thur. | 10 Feb. 2005 eatie Christian Date of — Christian Date of 1351 Sat. 7 May 1932 || 1497 Tues. | 31 Jan. 2006 z Commencement, ae Commeneement.~~

~~1852″ | Wed. | 26 April 1933 || 1498* | Sat. | 20 Jan. 2007 ae~~

~~P1853. | Mon. 16 April 1934 || 1429 | Thur. | 10 Jan. 2008 |Grecian Mun-Sidonian era, . Oct. 110B.c.~~

~~13854 | Frid. | 5 April 1935 || 1480 | Mon. | 29 Dec. 2008 ‘dane era, 1 Sep. 5598n.c,|} Caesarean eraof}. —–~~

~~. 1355* | Tues, | 24 Mar. 1936 || 1431* | Frid. | 18 Dec. 2009 Civil era of Con- = Antioch, 1Sep. 48,, 1356 | Sun. | 14 Mar. 1987 || 1432 | Wed. | 8 Dec. 2010 stantinople,.| 1 Sep. 5508 ,, | Julian year, lJan. 45,, 1357* | Thur.} 3 Mar. 1938 || 1433 Sun. | 27 Nov. 2011 Alexandrian | Spanish era, 1Jan. 38,, 1358 | Tues. | 21 Feb. 1939 || 1434* | Thur. | 15 Nov. 2012 era, . . . (29 Aug.5502 ,, |j Actian era, lJan. 30,,~~

~~} 1359 | Sat. | 10 Feb. 1940 | 1435 | Tues. | 5 Nov. 20138 Ecclesiastical . Augustan era,.{14 Feb. 27 ,, 1360* | Wed. | 29 Jan. 1941 || 1436* | Sat. | 25 Oct. 2014 era of An- Vulgar Chris-~~

~~1361 |. Mon. 19 Jan. 1942 || 1437 | Thur. | 15 Oct. 2015 tioch, 1 Sep. 5492 ,, tianera,. .| 1Jan. 1aD~~

~~1362 | Frid. | 8 Jan. 1943 || 1438 | Mon. | 3 Oct. 2016 Julian Period, | 1Jan. 4713 ,, || Destruction of 1863″ | Tues. | 28 Dec. 1948 || 1439* | Frid. | 22 Sept. 2017 | | |Mundanc era,.| Oct. 4008 ,, || Jerusalem, ./ 1Sep. 69,, 1364 | Sun. | 17 Dec. 1944 || 1440 | Wed. | 12 Sept. 2018 Jewish Mun- Era of Macca-~~

~~3365 | Thur.| 6 Dec. 1945 _ dane era, Oct. 3761 ,, bees, . . |24 Nov. 166 ,, 1366* | Mon, | 25 Nov. 1946 49th Cycle. Era of Abraham) 1 Oct. 2015 ,, || Era of Diocle-~~

~~1367 | Sat. | 15 Nov. 1947 Era of the i © tae, ella sep. sao4ee. 1368* | Wed. 8 Nov. 1948 || 1441 Sun. 1 Sept. 2019 Olympiads, .| 1July 776 ,, || Era of Ascen- 1369 | Mon. | 24 Oct. 1949 | 1442* | Thur. | 20 Aug. 2020 Roman era, . |24 April 753 ,, sion, . . (12 Nov. 295 ,, 1370 Frid. | 13 Oct. 1950 || 1443 Tues. | 10 Aug. 2021 Era of Nabo- Era of the 1371* | Tues. 2 Oct. 1951 | 1444 Sat. | 30 July 2022 nassar, . .|26Feb. 747 ,, Armenians, .| 7 July 552,, 1372 | Sun. | 21 Sept. 1952 | 1445* | Wed. | 19 July 2023 Metonic Cycle, |15July 432 ,, || Mahometan era 1873 | Thur. | 10 Sept. 1953 |} 1446 | Mon. 8 July 2024 Grecian or Syro- ofthe Hegira,|16 July 622 ,, 1374* | Mon. | 30 Aug. 1954 |). 1447* | Frid. | 27 June 2025 Macedonian Persian era of~~

~~} 1375 | Sat. | 20 Aug. 1955 || 1448 | Wed. | 17 June 2026 era, 1Sep. 312,, |} Vezdegird, .|16 June 632 ,, 1376* | Wed. | 8 Aug. 1956 |} 1449 Sun. 6 June 2027 Tyrian era. ./19Oct. 125,,~~

~~1877 | Mon. | 29 July 1957 || 1450* | Thur. | 25 May 2028 S——_ us — 1378 | Frid. | 18 July 1958 || 1451 | Tues. os May picts~~

~~4 72790* / ; .~~

~~i. ia if a nae eee pale 23 fe 2031 1 If Saturday, substitute Sunday immediately following.~~

~~2 If Saturday, substitute Thursday immediately preceding.~~

~~IV. — 86~~

~~682~~

~~The principal works ou the calendar are the following :—Clavius, Romani Calendarii a Gregorio XIII. P. M. restituti Explicatio, Rome, 1608; L'Art de vérifier les Dates; Lalande, Astronomie, tom. ii.; Traité de la Sphére et du Calendrier, par M. Revard, Paris, 1816; Delambre, Traité de Ul Astronomie Théorique et Pra- tique, tom. ili. ; Histoire del' Astronomie Moderne ; Methodus technica brevis, perfacilis, ac perpetua construendi Calendarium LEcclesiasti-~~

~~CALENDER, a mechanical engine employed for dressing and finishing cloths and various descriptions of fabrics, preparatory to sending them into the market. It is also used by calico-printers to prepare the surface of their cloths for the operations of printing. The first object of calendering is to produce in the cloth as perfect extension and smoothness of surface as can be attained,—so that no wrinkle or doubled folding may remain in it. The second end attained by the calendering of cloth is the compression of the yarn or threads of which the texture is composed, which in some degree divests them of their cylindrical shape, and reduces them to a degree of flatness, which, by bringing them more closely into contact with each other, gives to the fabric a greater appearance of closeness and strength than it would otherwise possess. The opera- tion of the calender also improves the~~

~~superficial appearance, by flattening down al] knots, lumps, and other imperfec- tions, from which no material from which cloth is fabricated can ever be entirely freed during the previous processes of spinning and weaving. And, thirdly, in certain fabrics it is desirable that cloth should receive, by means of friction, an additional lustre or polish, which is distinguished by the appellation of glazing. For the accomplishment of these objects the agencies on which the calenderer has to rely are moisture, heat, pressure, and friction, and these he variously combines to produce many different effects.~~

~~The term calender, which really means only the chief mechanical engine employed, gives the general name to the finishing establishments where all the varied operations of cloth-lapping are carried on ; and it is as usual to say that goods are packed as that goods are dressed at a calender. The common domestic smoothing-iron may be regarded as a form of calendering utensil; as is also the old-fashioned domestic mangle, which consists of a cylinder applied to a plane, upon which it is rolled backward and forward, until some degree of smoothness is produced by this reciprocating motion. A form of mangle, consisting of an enormously heavy cylinder, which is worked forwards and backwards over a plane surface, is still used in calendering establish- ments for the finishing of very heavy linens and similar goods.~~

~~The smoothing calender completes the substitution of cylindrical for plane surfaces, all the parts which operate upon the cloth being of that form. This ingenious engine, which was introduced into Britain from Flanders and Holland during the persecution of the Huguenots, has, since its introduction and adoption, undergone no very material or important alteration or improvement in point of theoretical principle ; nor, until the extension of the cotton manufacture had introduced a general spirit of mechanical improvement, were any great advances made in the practical applications of it~~

~~Calenders are constructed with from two to five rollers or cylinders, technically termed " bowls,"—three or five- bowl calenders being most frequently employed. The materials of which these cylinders are made are wood, compressed paper, and metal, such as chilled cast-iron, brass, or~~

~~copper. They are variously arranged in relation to each other, and as mechanical arrangements are re- quired—lIst, for varying pressure; 2d, for applying heat within a metal bowl from steam, hot iron, or burning gas ;~~

~~CA L—~~

~~CAL~~

~~cum, Stylo tam novo quam vetere, pro cunctis Christianis Europe populis, &c., auctore Paulo Tittel, Gottingen, 1816 ; Formole ang. litiehe pel caleolo della Pasqua, e correzione di quello di Gauss, con critiche osservazioni sd quanto ha scritto del Calendario il Delambri, di Lodovico Ciccolini, Rome, 1817; E. H. Lindo, Jewish Calenday Sor Sixty-four Years, 1838 ; W. 8. B, Woolhouse, Measures, Weights, and Moneys of all Nations, 1869. (T. G.—W. S. B, W.)~~

~~and 3d, for varying the rate of motion of a pair of the bowls so as to produce friction—the gearing of a calender is somewhat complex. Commonly a three-bow] calender has an upper aud under cylinder of paper, the central one being of metal, and in such an implement either two pieces may pass through at the same time, or one piece may receive two pressures. An ordinary five-bowl calender hag the first, third, and fifth cylinders of paper, the inter- mediate being of metal, and here four successive pressures may be given. Fig. 1, Plate XXXIL, is an elevation of a five-roller calender for finishing cloth. A, A are two paper rollers, of 20 inches diameter each. B, B are two cast-iron cylinders, externally turned until perfectly smooth; their diameter is 8 inches, allowing the substance of iron to be 2 inches, and leaving a perforation of 4 inches diameter, C is a paper roller of 14 inches diameter; D,D is the framing of cast-iron for containing the bushes in which the journals of the rollers revolve ; E, E are two Jevers by which the rollers are firmly pressed together while the cloth is passing through.~~

~~Fig. 2 is an end view of the same calender, with the wheels for glazing cloth. The wheel on the upper cylinder is 10 inches diameter, the wheel on the under cylinder is 13 inches diameter ; they are connected by the wheel F, which coninunicates the speed of the upper cylinder, so that the wheel on the under cylinder being nearly one-third of an inch more in diameter, the difference of their motions retards the centre paper roller, by which means~~

~~the upper cylinder passes over the cloth one-third faster than the cloth passes through the calender, and polishes it in con- sequence,~~

~~The construction of paper or pasteboard rollers for calenders is a process of great interest and importance. The frequent heating and cooling to which the apparatus is subject necessarily produces warping and splitting in wooden bowls, which are thereby rendered useless, but the substitution of paper afforded a radical cure for these defects as well as a collateral advantage arising from its being susceptible of a much higher degree of superficial~~

~~'polish, which is always transferred to the cloth. In the construction of paper cylinders an axis or journal of malleable iron and two circular plates of cast-iron of the same diameter as the cylinder to be made are, in the first place, provided. A plate is secured on one end of the journal. The entire space between the two iron plates is then to be filled with circular pieces of paper or pasteboard, exceeding by about 1 inch in diameter the iron plates, and having each a correspondent perforation, through which the iron journal passes. A cylinder is thus formed, the substance of which is of paper locked together by plates of iron at the extremities, and susceptible of immense compression which it receives in a hydraulic press. After undergoing this preparation, the cylinder is exposed to strong heat in a confined apartment in which the paper contracts and becomes loose. It is again put into the press, more sheets of paper are added, and this process g0es on till the cylinder has gradually acquired the requisite compression. It is then re-exposed to the ordinary tem- perature. of the atmosphere, and by its re-expansion pre sents a body almost remarkably compact, its specific gravity in this state being greater than even that of silver.~~

~~j Ch p=~~

~~The only operation now required is that of turning its superficies until correctly cylindrical ; and this is a work of immense labour and patience.~~

~~For dressing muslins, gauzes, lawns, and other goods of a light kind, a smaller species of calender is employed. It censists of only three cylinders of equal diameter (gene- rally about 6 inches), and is easily moved by a common winch or handle. The middle cylinder is iron, and the others are of~~

wood or pasteboard. All the cylinders are _ of equal diameter, and are moved with equal velocities by _ means of small wheels. This machine is always used in a cold state. _ By means of the calender, also, is produced the waved or watered surface, known as moiré among the French, and best seen in the silk textures called moire antique, and in woollen moreens. The effect is produced in a variety of ways, the principal method employed consisting of pass- _ ing two webs laid above each other through the calender _ at the same time. The threads of the web not running | perfectly parallel to each other are at some places super- _ imposed, and at other points they fit into alternate spaces, _ —the result being that at the places where the threads press directly on each other a higher gloss is produced, which gives the watered appearance to the texture. Water- _ ing is also effected on a single thickness of material by moving the web to the right and left as it enters the calender, and thus varying the direction in which it travels over a bowl on which there are a series of engraved lines | running in a parallel direction. Embossed patterns, or imitations of the grain of leather, &c., for bookbinders' _ cloth, are produced by means of a calender having a bowl _ of brass or other metal on which the pattern is engraved. | When a paper cylinder is used along with an embossing cylinder, the paper must be turned "ta such exact pro- | portion to the embossed bow] that it will repeat the pattern accurately on its circumference, so that the depressions on | the one bow] always fit accurately into the elevations on _ the other. For many purposes a covering of leather, felt, _ or lead is used for the cylinder which works against that

on which the pattern is engraved. _ Goods after passing through the calender are folded, either by machinery or on long pins by hand-working into a variety of forms according to their nature and destina- _ tion, and when so folded they are submitted to a very _ powerful compression either in a screw-press or in an _, hydraulic press. Fig. 3, Plate XXXIL, is a perspective view of an hy- _ draulic press. A is the piston, 8 inches diameter, working in the cylinder B, and kept water-tight by passing through acollar of leather; D, a cast-iron plate raised by the piston . A, between which and the entablature E, E the goods to be pressed are laid ; C,C,C, C, four malleable iron columns, _ 2 inches diameter, having screwed ends, with nuts, by which the entablature and the base F, F are firmly con- nected together; G, a cistern for holding water to supply the _ two force-

~~pumps H and I, the largest of which has a piston _ If inch diameter, and the other one of + inch diameter, which is used to give the highest pressure; K, K, weights to balance the pump-handles which fit into the sockets at J, J. |The pistons of the force-pumps are made water-tight by collars of leather, kept in their place by the screwed 'Pieces m and n. ¢,¢,e¢ is a pipe communicating with the pumps and the large cylinder B ; there isa stopcock at /, _ which shuts this communication when required. Fig. 4 is an enlarged view of the force-pump piston, to _ show the method of keeping the rod parallel. _._An illustration of a glazing calender as used by | bleachers and calico-printers, with further details as to finishing processes, will be found under BLEACHING. See 4 also Caxico-Printinc.~~

~~'district of Abbeville, South Carolina.~~

~~Om i 683~~

~~CALEPINO, Amsrocio (1435-1511), an Augustine monk, born at Bergamo in 1435, was descended of an old family of Calepio, whence he took his name. He devoted his whole life to the composition of a polyglott dictionary, first printed at Reggio in 1502. This gigantic work was afterwards augmented by Passerat and others. The most complete edition, published at Basel in 1590, comprises no fewer than eleven languages. The best edition is that published at Padua in seven languages in 1772. Calepino died blind in 1511.~~

~~CALHOUN, Joun CaLpwetn (1782-1850), a leading politician of the United States, was grandson of an Irish Presbyterian, who founded Calhoun settlement, in the It was there that John Calhoun was born in 1782. For some years he assisted his widowed mother in the management of her farm, but at the age of eighteen he commenced to study for the bar. He graduated with honours at Yale College, and spent eighteen months at Litchfield, at that time the only law school in the country. He then returned to practise in his native district of Abbeville. While there, in June 1807, the searching of the Chesapeake having aroused strong feeling in America, Calhoun drew up for a public meeting a resolution expressive of indignation against Great Britain, and supported it in a speech of such power that he was soon after elected a meniber of the legislature, and in November 1811, became member of Congress, where he continued to be an enthusiastic and~~

~~prominent adherent of the war party. For seven years (commencing with 1817) he acted with credit as secretary of war under Monroe; in 1825 he became Vice-President of the United States under J. Quincy Adams; and in 1829 he was re-elected under General Jackson. He now began to be looked upon as champion of the South; and, though he had supported the protective tariff of 1816, he became an eager advocate of free-trade,—that policy being, even popularly, recognized as specially advantageous to the cotton-growing States. He is, however, best known as a strenuous defender of slavery, and as the author of a doctrine to which the Civil War may be traced,—the doctrine of " nullification," according to which each State has the right to reject any act of Congress which it considers unconstitutional. This view was in 1829 adopted by the legislature of his native State, and drawn up in a document, mainly prepared by Calhoun, which was known as the " South Carolina Exposition," and which was approved by Virginia, Georgia, and Alabama. In 1832 the legislature of South Carolina carried the theory into practice by passing laws uullifying the obnoxious tariff of that year; but its opposition was crushed by the firmness of General Jackson, who declared that he would resort to force, if necessary. 'The most important of the other political acts of Calhoun are his defence of the right of veto which belongs to the president, his advocacy of the annexation of Texas, and his maintenance of the cause of peace, when war with Great Britain was threatened by the claims of the United States to Oregon. He died at Washington on the 31st March 1850. His works, with memoir, were published posthumously in 6 vols. in 1853-4, by Richard K. Cralle, who had been his amanuensis. They include a dissertation On the Constitution and Government of the United States ; and from this book we learn that he advocated the election of two presidents, one by the free and another by the slave States, the consent of both of whom should be essential to the passing of any law. Calhoun's speeches were always directly to the point, clear, and forcible, while he seldom indulged in the imaginative or purely rhetorical. The integrity and worth of his character have been spoken of in the highest terms even by political opponents.~~

~~CA LIOCO+*# RIN TING~~

~~ALICO-PRINTING is the process of imprinting on C textile fabrics patterns of one or more colours on a white or coloured ground. Though, as the name implies, the art is directed primarily, as it is by far most extensively, to calico or.cotton textures, the same methods of ornamentation are also employed for certain woollen, linen, and silk fabrics, and the process of printing is also applied to unwoven yarns, notably in the case of worsted yarns intended for use in the weaving of tapestry carpets. But as certain of the processes employed for printing cotton agree essentially with those used for woollen and silk fabrics, it will be unnecessary here to refer specially to any other than the methods employed in the printing of calico proper.~~

~~There is a curious passage in Phiny's Natural History (xxxv. 42), from which it is evident that calico-printing in his time (the Ist century) was understood and practised in Egypt. The following is a translation of this passage :—~~

~~"There exists in Egypt a wonderful method of dyeing. The white cloth is stained in various places, not with dye- stuffs, but with substances which have the property of absorbing (fixing) colours. These applications are not visible upon the cloth ; but when the pieces are dipt into a hot caldron containing the dye, they are drawn out an instant after dyed. The remarkable circumstance is, that though there be only one dye in the vat, yet different colours appear on the cloth; nor can the colours be after- wards removed. A vat which would of itself only confuse the colours on cloth previously dyed, in this way imparts several colours from a single dye-stuff, painting as it boils." It is evident enough that the substances employed to stain the cloth, as Pliny expresses it, were different mordants, which served to fix the dye upon the cloth, Thus if we suppose certain parts of.a piece of cotton cloth to be impregnated with alumina, and the cloth afterwards dyed with madder, after the clearing, those parts only impregnated with the mordant would retain their red colour, while the remaining parts will continue white. a)~~

~~The general opinion is, that this ingenious art originated in India, and from that country made its way into Egypt. Whether this notion be well or ill founded, it is certain that calico-printing was known and executed by the~~

~~Indians at a very early period. Their colours were beautiful and fast, and the varieties of pattern and the number of colours which they knew how to fix on different parts of the cloth gave to their printed calicoes a beauty and a value of no ordinary kind; but their processes are so tedious and so clumsy that they could be put in practice only where labour was exceedingly cheap.~~

~~It was not till towards the close of the 17th century that calico-printing was introduced from India into Europe, having probably been practised first in Holland, to which country a knowledge of the art was carried by the Dutch East India Company. Evidence exists which shows that calico-printing was commenced in the neighbourhood of London so early as the year 1676, and there the art con- tinued long to be practised. In 1738 it extended to Scotland, and took firm root in the country around Glasgow, but it was not till 1764 that it was introduced to what is now its chief centre, Lancashire. The extent of the industry in Great Britain at the present day is probably unequalled by the combined production of all other nations of the world. The other European countries where the art is prosecuted~~

~~to any considerable extent are France, Switzerland, and.~~

~~Germany, to the last of which the annexation of the Rhine Provinces, consequent on the war of 1870-1, has~~

~~added a famous centre of the industry. The art ig alsg extensively cultivated in the United States, while Oriental communities still continue to prosecute it in their own pe. culiar fashions.~~

~~In Europe the art has been in a great measure created~~

~~anew. Py the application of machinery, and by the light thrown on the processes by the progress of chemistry, the tedious methods of the Indians have been wonderfully, simplified ; and the processes are remarkable for the rapidity with which they are now executed, and for the beauty, fastness, and variety of the colours which are applied on the surface of cotton. ments, that at the present time in Manchester a piece (25 yds.) of calico can be printed in the short period of one | minute; and the quantity of calicoes printed in Great Britain, in one year cannot measure less than three quarters of a~~

~~million of miles, seeing the exports alone of printed cotton piece goods during the year 1874 amounted to~~

~~So great have been these improve.~~

~~1,003,101,107 yards, ofa value of £19,602,706, an amount~~

~~} exceeded by 140,000,000 yards in 1872.~~

~~Grey calico is prepared for printing by an elaborate pro- cess of BLEACHING, for the details of which the reader is~~

~~referred to the article under that head, vol. iii. p. 811.~~

~~The bleached cloth previous to printing is generally passed through a shearing machine, which removes from its surface the fine downy pile and short threads, thus prepar- ing a smooth uniform surface capable of taking a sharp distinct impression from the engraved printing-blocks or rollers. The printing processes which follow are exceed- ingly complex and varied, demanding for their proper execution an extended range of chemical knowledge and mechanical ingenuity ; and as commercial success depends largely on the tasteful and harmonious colouring of patterns, no little artistic ability and discrimination is required for~~

~~_ the efficient superintendence of such works.~~

~~There are two modes of.printing,—natnely, block-printing , and machine-printing. The former has been practised from time immemorial; the latter is a modern invention, and originated after the introduction of the art of printing into Great Britain. In the ease of block-printing the figure~~

~~intended to be communicated to the cloth is cut out upon~~

~~a block of sycamore, the parts which are to make the impression being left prominent, and the rest of the block cut away, just as practised for wood engravings. When the figure is too complicated, and the lines too fine, to admit of being cut in wood, it is made by means of small~~

~~| pieces of copper, which are very ingeniously driven into the~~

~~block, and the interstices are filled up with felt.~~

~~By means of a modern invention several colours may be applied at once on the cloth by means of one block. The machine used for this purpose, which is called a “ toby,” consists of a box divided into several compartments filled with various colours, which are in communication through~~

~~tubes with bottles filled with the same colours; and by~~

~~means of a gentle pressure the colouring fluid in each of the compartments of the machine is propelled through the felted cloth which covers each compartment. The block, being: pressed against the cloth, takes the colour which is to be conveyed to the white calico by the block- printer. is~~

~~By Continental printers an intricate apparatus for print- ing called the Perrotine, from the name of its inveutor,~~

~~is employed; but it has never been introduced to any~~

~~considerable extent in England. In this machine the intended figures are engraved upon a flat copper plate 0~~

~~about @ square yard or more in size.. Upon this plate the~~

~~)~~

~~|-|)~~

~~_ chine is similarly mounted round the~~

~~periphery of the central bowl or cylin- | der a. _ engraved copper cylinder 5 presses, and _ between them the cloth to be printed anda thick cloth or blanket pass. The _ cylinder is supplied with the printing _ material by means of a furnishing rod-~~

~~from the cylinder by means of the _ colour doctor e, a steel blade which fits closely to the surface of the roller, and vtemoves all colour except that which fills the engraved~~

~~_ box, &c., as shown in diagram fig. 1. and other fine mechanical adjustments the pitch of each toller can be arranged so that its particular colour falls on _ the proper place with the utmost exactitude, producing a~~

~~colour to be applied is spread. The plate is then pulled backwards, the excess of colour being removed by a "doctor,' and the colour remaining on the engraving is then printed on the white cloth.~~

~~Printing is now almost universally. accomplished by means of cylinder machines, in which the impression is given by one or a series of engraved copper cylinders; a different cylinder being required for each separate colour or shade in the pattern. The cylinders are made about 3 feet 6 inches long and 6 inches in diameter ; and in estab- lishments of any considerable extent many thousands of. these are kept in stock, involving an enormous outlay of capital. There are three different methods in practice for engraving patterns or portions of patterns on the cylinders. In the first, the " die and mill" process, a cylindrical steel die is engraved with the pattern, which is afterwards trans- ferred to a "mill" or cylinder of soft steel. The pattern on the mill is in relief, and after hardening it is by pres- sure impressed into the copper roller. The diameter of the mill is such that the repeats of the pattern fit with the utmost precision when transferred to the copper roller. The "die and punch" process is a modification of the fore- going, in which small patterns are impressed on the copper cylinder by means of a punch which has the pattern in relief traasferred to it from a sunk steel die, The third process by which engraved rollers are prepared is by the aid of the pentagraph, a most complex and ingenious machine, with which by the movement of a single tracer in the deep lines of an enlarged pattern cut in a zinc plate, these lines are reproduced on the original scale, traced at five different places through a coating of bitumin- ous varnish on the surface of the cylinder. After the~~

~~_ engraving is complete, the cylinder is placed in a bath of~~

~~dilute nitric acid, by which the pattern is bitten in along the surfaces of the metal exposed by the scratching of the~~

~~pentagraph points.~~

~~~ Calico-printing machines are arranged to print with any~~

~~number of such cylinders, from one up to as many as~~

~~twenty ; but in practice few machines carrying more than eight cylinders are employed. The accompanying dia-~~

~~| grammatic section (fig. 1.) illustrates the arrangements _ hecessary for printing one colour, and~~

~~each of the separate colours on a ma-~~

~~Against this central bowl a the~~

~~ler c, which revolves in the colour-box 2 d. The superfluous colour is removed =~~

~~Fig. 1.~~

~~portions. The lint doctor f similarly removes all impuri-~~

~~_ ties which adhere to the roller after it has communicated~~

~~its impression to the cloth. Fig 2 shows the elevation of a six-colour machine by Messrs Mather and Platt of Manchester, to whose courtesy we are indebted for illustra-~~

~~| tions of the most recent and approved forms of apparatus. 'The essential parts of this machine consist of the central Iron bowl or cylinder A, and the six radiating arms B,~~

~~each of which holds in position an engraved roller colour- By means of screws~~
~~~

~~perfect pattern. In printing, the white calico is batched at C, and the cloth D passes inwards over tension rails, proceeding round the periphery of the bowl A, receiv- ing from each roller B a separate colour or mordant, and issuing at D', printed and ready for the further processes to~~

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~~Fje, 2.—Cylinder Printing-Machine—six colours.~~

~~be hereafter detailed. Around the central bowl A are lapped, for the sake of elasticity, several folds of cloth. Between the central bowl and the cloth to be printed there passes, Ist, an endless band of cloth or blanket, seen enter- ing at E and issuing at E'; and 2d, a " grey back" or web of unbleached calico, used to keep the blanket clean, which enters at F and issues at F'.~~

~~By whatever mechanical means the printing is performed, whether by hand- block, perratine, or cylinder machine, the effect is precisely the same, and the colours or mordants employed are in all cases alike. The substances to be printed on the surface of the calico have to be brought to a proper consistency for printing by means of thickeners, with which they are mixed up in colour pans. Although~~

~~_ these are only mechanical agents, it is found in the prac- | tical operation of printing that particular thickeners are~~

~~more suitable for certain colours or mordants than others, and the printer is guided by experience in selecting that thickening adjunct which gives the clearest impression. Among the numerous thickeners available, those most com- monly employed are wheat flour and starch, potato starch, dextrin or British gum, and gum-senegal or other varieties of gum-arabic. The~~

~~mordant or the colour and its appropriate thickeners are placed in a range of colour pans, in which the materials are thoroughly incorporated. A pair of these pans (one in section), as constructed by Messrs Mather and Platt, embracing the most recent and approved appliances, is shown in fig. 3. In the cut, A represents the driving pulleys, B the driving shaft, wheels, and catch-box, ¢ wheels for giving a rotary motion tu the brass stirrers d. E is the colour pan, of copper, double cased, made to swivel on centres or pivots f! and jf. Through /! water and through f? steam are supplied to the space between the outer and inner body of the pan for the purpose of boiling and cooling down the contents of the pan alternately as required. The supply of steam or~~

~~of water to thes2 pipes is regulated by the tap g. H is the framing, J stands, with the necessary appliances for turning over the pans to empty their contents, K a pipe and swivel tap for supplying water to the pans. I.is the main steam pipe to 71, m the water pipe to 7? and K, and ~· and o are taps for washing out and for condense water respectively.~~

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~~Fic. 3.—Colour Pans.~~

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~~The variety of methods by which colours ure produced on calicoes is almost endless, and the processes employed, both chemical and mechanical, as well as the tinctorial agents used, are also very numerous and diversified. The processes are in practical works generally classified under the heads of numerous differeut styles, combinations of several of which are frequently employed iu the production of asingle pattern It is at once impossible and~~

~~unneces- sary to enter into details of these various styles here; but they all resolve themselves into a few general groups, under which heads they will be briefly treated of. In certain styles a mordant, or chemical substance, which possesses an affinity for both the cloth and the dye-stutl, is the substance printed in the cylinder machine, and the calico has to undergo a subsequent process of dyeing by which those portions of the cloth which received the mordant are alone permanently dyed Again, the colour-box may con- tain all the ingredients necessary for the production of the colour, but to develop it in the fibre it is necessary to expose the printed cloth to the oxidizing influence of the atmosphere, or otherwise produce an oxidation of the dye- stuff by which the colour is developed and fixed. By a third process the colour is prepared and applied direct to the cloth mixed with some agent which, under the in- fluence of heat and 'moisture, either mechanically attaches or chemically precipitates the colour in the fibre. And a fourth process, which may be regarded as a modification of the third, consists of mixing the dye with powerful mordanting substances, which, after printing, are merely dried, the mordant volatilizing sufficiently to fix the dye, not very fast, on the cloth. There are thus these four divisions—~~

~~I. Dye colours. IIT. Steam colours. II. Oxidation colours. IV. Spirit colours.~~

~~Along with these different methods patterns are also produced and modified by means of substances applied to cloth already dyed or printed in order to remove the colour from certain portions of it which are either intended tg remain white, or to receive some other colour afterwards, These substances are known as " discharges," and examples of their action are seen in printed Turkey reds and bandannas.~~

~~Sometimes a substance is applied to cloth before it is dyed, in order to prevent the indigo, or any other colour from being fixed on those parts to which it is applied, that they may remain white, or be afterwards made to receive other colours. Substances possessed of this property are called ' resists."~~

~~Dyx Cotovurs.~~

~~Under this head are included prints prepared by printing the pattern in one or more mordants—substances which have an affinity for the fibre on the~~

~~one hand and the dye. stuff on the other. The mordanted cloth is subseqnently submitted to a process of dyeing, when the dye-stuff is fixed only on such parts of the cloth as have been impregnated with the mordant. By using more than one mordant, by mixing them, or by employing the same at different degrees of strength, a variety of shades or colours is produced in the process of dyeing with one dye-stuff.~~

~~Mordants—The principal mordants employed for dye colours are the following :—~~

~~1, Red Liquor. —The acetate of alumina mordant or "red liquor" of the calico-printer is prepared by partly decom- posing aluni, held in solution by impure acetate of lime, commonly called pyrolignite of lime; sulphate of lime precipitates and acetosulphate of alumina is thus obtained. Red liquors thus prepared have a specific gravity of 1-08, and are composed as follows :—~~

~~Composition of four red Mordants per Gallon.~~

~~Substances, Mardant A. Mordant B. Mordant C. | Mordant D,~~

~~grains. joz. grs | grains. 'oz. gers.) grains. oz. grs.| grains. joz. gr& Alumina ..} 1680 0/3 8367/1830 0.4 80/1239 0.2 3642164 4/4 414 Sulphuric | | acid …../2642 516 20/2800 06 1753017 06 3921664 6/3 352 Acetic acid|3369 8/7 3807/3970 09 32/1281 7.2 406|8679 2/8 179 Ammonia . | and water; 674 11 236} 910 02 35) 693 it 255~~

~~In the manufacture of 'red liquor," sulphate of alumina is frequently substituted for alum, and acetate of lead for pyrolignite of lime.~~

~~2. Iron Inquor.—The oxides of iron are much used as mordants, either in the state of protoxide or peroxide. The salt most employed is the impure pyrolignite of protoxide of iron, which is prepared either by decomposing green copperas with pyrolignite of lime, or by placing m large vats pyrolignous acid and old iron, when, after a few months, the iron, which is gradually oxidized, dissolves in the acid, and gives rise to pyrolignite of protoxide of iron. This valuable mordant is thickened with calcined farina, flour, starch, or gum, and applied on the calico. After being exposed for a few days in a moist atmosphere, it loses a part of the acid, and becomes partially peroxidized. Pyrolignite of iron of the specific gravity of 1-05 gives @ black with madder and several "tannin" substances. Varl- ous shades of purple are obtained by adding different pro- portions of water to the mordant previously to applying it to the cloth ; and various shades of chocolates are pro duced by mixing this with the alumina mordant previously described, and then dyeing also with madder.~~

~~These two mordants are the principal employed for madder colours ; but several others are employed for special shades. Among these may be enumerated the aluminate~~

~~CALICO-PRINTING~~

~~of soda or alkaline pink (used as a mordant when it has to | act as a resist for another colour such as aniline black), and acetates of chromium, copper, tin, and other metals.~~

~~Dye Colours.—The principal dye colour is madder or some of its derivatives, including artificial alizarin, the dyeing principle of madder obtained synthetically from anthracene. Madder is the root of a plant, Rubia tinctoria, a native of Central Asia, but introduced and extensively culti- vated in south Europe, especially at Avignon in France. For the purposes of the calico-printer, madder-root is pre- pared by simply grinding, or in the form of flowers of madder (fleurs de garance), of garancin, of garanceux, or of alizarin. Fleurs de garance is powdered madder deprived of its soluble constituents and redried, whereby the tinctorial strength of the preparation is increased nearly one-half. Garancin is prepared by boiling powdered madder in sulphuric acid ; garanceux is spent madder similarly prepared ;~~

~~and alizarin, the chief tinctorial principle of madder, is obtainable from garanciu by the action of superheated steam. Among the chemical principles of tinctorial value yielded by madder there is, besides alizarin, an allied substance named purpurin. Alizarin of precisely similar composition and behaviour is now artificially made from anthracene, one of the products of coal-tar, and purpurin also is obtainable by the oxidation of artificial alizarin. By chemical agency the essential ingredients of madder are thus now produced in a cheaper, more convenient, and more effective form than it was formerly possible to extract them from the cultivated root. Madder extract, garancin, and alizarin dye heavier and more brilliant 'colours than madder, and they require less soaping or other treatment to clean the whites after dyeing. Madder extract and artificial alizarin are also used as steam colours.~~

~~We may now briefly follow the stages in printing a madder style, taking for example a calico printed in four 'colours' (the technical namé for whatever is printed by the machine, whether mordant or dye), with a padding or blotch.of weak iron liquor. In this case the mordants or colours are—~~

~~Black from strong solution of iron liquor.~~

~~Purple from weak solution of iron liquor.~~

~~Red from solution of red liquor.~~

~~White resist of solution of citric acid (lime juice).~~

~~Purple pad or cover of weak iron liquor, which falling on the acid resist forms a soluble ferric citrate.~~

~~Drying.—The cloth after receiving these impressions passes into a drying apparatus, generally a closed chamber, highly heated by radiation from steam-chests of cast-iron. Through such a chamber the cloth passes up and down over numerous rollers, traversing a long distance before it j ollerges dry and ready for the next process. Another~~

~~means of drying, employed in some of the best establish- ments, such as Thornliebank, is by passing the cloth round a long series of revolving steam~~

cans or cylinders, the metallic surface of which is covered with felt. Recently a most effective system of drying has been introduced, which consists of forcing a strong current of heated air through an enclosed chamber by the action of a fan, connected with _which is an apparatus filled with pipes, through which the | air passes, while surrounding the pipes is a steam space. | By this plan any temperature may be obtained, and the current of air adjusted by the speed of the fan. _ Ageing.—From the drying apparatus the goods pass to the ageing room, a lofty and spacious chamber (fig. 4), where they are exposed to the combined influence of heat and steam. The pieces pass, as shown by the arrows, up and down over rollers from end to end of the room, travelling over a long space, for twenty minutes or thereby. The atmosphere is rendered moist by jets of steam blowing from pipes a, a, and hot by radiation from the same and

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other steam pipes. A difference of four degrees is main- tained between the dry and wet thermometers ; the readings average 80° and 76° Fahr. The cloth takes up about 5 per cent. of its weight of moisture in its passage and as it issues at the further end of the apartment, it is piled up in loose bundles, and so left for two or three days in a warni moist atmosphere. The object of the operation of ageing is to precipitate the mordants in the fibre of the cloth, they in the meantime being partly decomposed with the disengagement of abundant fumes of acetic acid. The practical development of the modern process of ageing is due to the scientific ingenuity of the late Mr Walter Crum of Thornliebank, the method previously practised having

been tedious and uncertain, depending upon variable states

of the weather.

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~~Fic. 4.—Vertical Section of Ageing Room.~~

~~Dunging.—It is next necessary to remove any superfluous uncombined mordant which may be on the cloth, and to~~

~~| take away the thickening agent with which the mordant~~

~~was printed. These objects are accomplished by passing the goods through hot water, in which it was formerly the practice to dissolve cow's dung, hence the name; but now some of the numerous dung substitutes are chiefly used, the principal of which are the silicate and the arseniate of soda. The first operation in dunging is to pass the pieces through the " fly dunging " apparatus,—a cast-iron trough with rollers top and bottom,—by which the cloth is made to pass, in the open state, through the hot solution. This operation fixes the mordant in the fibre and prevents it from spreading to unmordanted parts of the cloth in the subsequent washing and dyeing operations to which it is subjected. Immediately after the fly-dunging the goods are washed and submitted to a second dunging, this time in a different kind of apparatus, through which they are _ passed in a coil or loose rope form. They are then _ thoroughly washed at a machine to remove the last traces _of thickening matter and all uncombined ingredients. Dyeing.—At this point the goods are ready for dyeing, the most important process in the whole series of opera- tions. The dye-beck or vat, one form of which is shown in longitudinal and transverse section in fig. 5, consists of~~

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~~DZ~~

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~~Fic. 5.—Sections of Dye Vat.~~

~~an iron cistern or trough A, into which the dyeing solution is introduced. Running along the whole length of the~~

~~trough is a steam pipe 6, perforated at intervals, by which the requisite heat for the dyeing operation is raised and maintained. Sloping upward from the steam pipe is a perforated diaphragm of iron or midfeather c, and mounted on a strong framework over the trough is the winch D, which by its revolutions, effected by spur wheels, keeps the cloth moving down and up continuously into and out of the trough. A peg rail e runs along the length of the trough, which keeps the pieces from becoming entangled in their course. . The figure shows the course of a chain of pieces being dyed on the endless system, in which about twenty-five pieces are sewn together, and passed in a spiral form up and down from end to end and back again, to go over the same. course continuously throughout the entire time necessary for completing the operation.. Another and more common method of arranging the pieces in the dye- ‘ vat is to pass two pieces, tied together end to end, over the winch between each separate pair of pegs, in which case the pieces revolve between the same pegs throughout the operation. Whichever method is followed, the opera- tion and results are precisely the same. The required quantity of cold water is admitted into the trough, the pieces are arranged on the winch, the dye-stuff is intro- duced, and the machinery set in motion. Steam is then turned on, and the liquid is heated gently and gradually till it reaches about 180° Fahr. The process is continued for from an hour and a quarter to about two hours, during which time great care is taken to maintain the temperature arrived at, and to keep the pieces in constant circulation in and out of the vat. On the completion of the operation steam is shut off, and the pieces are rinsed through cold water, after which they are carefully and repeatedly washed. Fig. 6 presents a sectional view of an apparatus devised by Messrs Mather and Platt for loose washing after dyeing.~~

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~~Fia. 6.—Mather and Platt's Washing Apparatus~~

~~In this machine there are two water-boxes a, b, and three bowls ¢, d, e, which are mounted horizontally in relation to each other. The central large bowl d, instead of being circular, has an irregular curved outline of alternate elevations and depressions. Against this irregular-shaped bowl the two side bowls ¢ and e are made to press, and they move back and forward, following the irregular outline, pressed by powerful springs 7 acting on the axes on which they are mounted. They have thus a rubbing action in addition to their motion of revolution, an arrange- ment which produces a kind of flapping and squeezing action analagous to hand-washing.~~

~~Clearing.—At this point the dyed calicoes present a very unpromising appearance, the mordanted portions which have absorbed the dye being dull and heavy in colour, while the whites-have a sickly pink aspect. The operations~~

~~of clearing are necessary to remove all the dye-stuff which is loosely attached to the whites, and to develop and brighten the tints of dyed pattern. A variety of processes are pursued to accomplish this object, but in all the action of soap and some " chemick" or chlorine solution plays the principal part. The soap used must be free from all excesg of alkali, and besides its detergent action it is supposed to be decomposed and give up part of its fatty acid to the lake formed by the mordant and the dye-stuff. The processes for clearing such calicoes as here described are as follows, After washing out of the dye-beck the goods are passed into a soaping beck, very similar in construction to the dye. beck, but surmounted with a pair of squeezing rollers instead of the winch of the dyeing apparatus. In this they are treated with a hot solution of soap; they are then washed out, squeezed, and again soaped,—the second time at a higher temperature than the first. After another washing they are "' chemicked " in a weak chlorine solution, prepared by mixing chloride of lime with soda ash, with excess of soda, and from that a final washing in pure water should leave the goods clear and~~

~~bright, ready for the finishing operations they receive in common with all other styles.~~

~~The reds and pinks produced by an alumina mordant with madder or artificial alizarin receive a different treat- ment. Mr Charles Dreyfus of Manchester, in a paper of great practical value communicated to the Society for the Promotion of Scientific Industry,! says of these colours; "They were some time ago dried and steamed; by the steaming afurther quantity of colouring matter was com- bined to the mordant, and the shades thus obtained were fuller than if the goods had not been steamed. Now, instead of steaming only, the goods are passed through preparations the basis of which are fatty acids or fatty or resinous compounds; they are steamed after this prepara- tion. Ican speak highly of the good results obtained with some of these preparations, both as regards shade and saving of colour. The only difficulty is to obtain a good white; this can be overcome by careful and proper treatment of the goods. For reds and pinks there isa special and extra operation, commonly called the 'cutting.' It consists in passing the goods soaped and well washed through diluted nitromuriate of tin; the reds and pinks seem to be. destroyed, becoming of a deep orange, but the subsequent soaping brings out again the brilliancy of the shade." —~~

~~The processes above described are followed, with only modifications as to strength of mordants and the clearing operations, for the printing of calicoes with the madder pre parations,—garancin, garanceux, and alizarin. The colours produced by these substances are as brilliant as madder colours, but they do not possess such fastness. On the other hand, the whites are not deeply stained in the dye-beck, and they generally require only a simple padding through a weak chlorine solution, and washing to clear the whites and pre- pare the goods for finishing. Some garancin and alizarm shades stand soaping well, and are improved in tone by such atreatment. Artificial alizarin and madder extract are now however chiefly used as steam colours, and to such perfec tion has printing in that style attained that the dye-house has been abandoned altogether in certain Continental establishments. The retention of dye-colour printing may now indeed be looked on as a question of comparative expense, which is determined chiefly by the price of fuel~~

~~Turkey Red.~~-The production of this beautiful colour belongs rather to the province of Dyeing than to calico- printing ; but as patterns are produced on it by means 0 discharges, it is necessary to include a notice of it under the head of dye colours. It is obtained with madder,

~~garancin, and both natural and artificial alizarin, but the pieces previously to being dyed have to undergo a long series of operations, which consist in passing them suc- cessively in olive oil and carbonate of soda, and hang- ing them in the air between the processes. They are then passed into a weak solution of red mordant, and afterwards of gall-nnts or sumach, well washed, and dyed in madder. When this has been effected, the colours are brightened by being boiled under pressure in a solution of soap and chloride of tin. On cloth so prepared certain discharge mixtures, principally tartaric acid properly thickened, are printed, and the pieces are passed through a solution of chloride of lime which removes the red, leaving a white pattern on a red ground. Ifa mineral colour or mordant is printed with the discharge it is left on the cloth in place of the discharged Turkey red, and thus various shades are produced in the brilliant red ground. In bandauna printing the Turkey red calico is folded between metallic plates, which are perforated with designs, and so arranged that each figure of the design corresponds through the pile of prints so folded. The whole is then submitted to pressure, and a chlorine liquor is forced by pressure to percolate through the mass, which destroys the red colour in all those parts where the perforated plates allow the bleaching liquor to circulate.~~

~~Although madder and its various derivatives are the principal dye colours, there are various others which may be and sometimes are so treated. Of these the most important is logwood, the wood of Hematoxylon campech- tanum, which, although chiefly used as an oxidation colour, also yields with alumina and iron mordants black and sombre slate tints, which, however, do not possess the peculiar fastness of madders. Sapanwood and peachwood are also used as dye colours, the mordant aud method of dyeing being the same as for madder or garancin; the cloth, however, does not receive the same treatment after dyeing, and does not require it, because these colours~~

are much more easily removed from the parts of the cloth which are destitute of mordant. Beautiful reds and pinks are produced by means of cochineal; but this dye-stuff is chiefly used as a steam colour and for mousselines de laine.

_ The mordant in the case of calicoes is either alumina or

oxides of tin, and the method of proceeding is similar tu that already described for madder and garancin colours.

— Quercitron bark (Quercus tinctoria), and flavin—a prepara-

‘ process of oxidation after printing in the machine. | oxidation may be induced either by exposure of the pieces _to atmospheric influences, by passing them through a _ solution containing an oxidizing agent, or by printing with the material some chemical substance which on exposure

tion from it, fustic, the wood of Maclura tinctoria, and

| Persian berries, the fruit of Rhamnus infectorvus, are all used as dye colours, chiefly for the production of various shades of yellow. _ Dreyfus states that mahogany has lately been brought out

In the paper above quoted, Mr C.

as a colour-giving substance, that it gives with the tin and

_ alumina mordants very bright and fast shades of brown,

much more brilliant than those made from catechu, and

_ that he has dyed some very good specimens with Spanish _ mahogany,

OxIDATIon Contours.

Under this head is included a class of tinctorial

| substances which attach themselves to cotton fibre without the intervention of any mordant, but which for the

~~development and fixation of their colour must undergo a The~~

~~to heat gives off oxygen. The materials principally treated~~

~~in this manner are indigo, catechu, aniline black, and~~

~~certain blacks obtained from logwood. The processes adopted for the printing of indigo and aniline black—the~~

~~two most important styles under this head—will make the practical application of the oxidation principle clear.~~

~~Indigotin, the colouring principle of indigo, is a substance obtainable from several other plants besides the Species of Indigofera, from which it is commercially prepared, It is a body altogether insoluble in water, alcohol, ether, oils, or dilute acids or alkalies; but in presence of a variety of substances it takes up an additional equivalent of hydrogen, and thus is converted into white indigo, a colourless substance soluble in solutions of alkalies and alkaline earths, The change is thus represented.~~

~~Indigotin Hydrogen White Indigo~~

~~2(C,H,NO) + 2H = C,,H,,N,0,.~~

~~White indigo is a most unstable compound, taking up oxygen with great facility either from the air or from certain solutions, and thus becoming retransformed into blue indigo. Advantage is taken of these circumstances in printing indigo colours; the colour is hydrogenized and dissolved, in which condition it is applied to calico, and on exposure of the pieces so dyed to the influence of oxygen the blue colour is both developed and fixed in the fibre. The following are the principal styles in practice :—~~

~~Indigo-blue dips.—This fine blue colour is produced in the old copperas vat method by putting in a vat hold- ing 2000 gals. of water 60 b of finely ground indigo, to which is gradually added 120 tb of green ecopperas, or sulphate of protoxide of iron, together with 180 tb of slaked lime. Owing to~~

~~the lime removing the sulphuric acid from the salt of iron, the protoxide of that metal is liberated, and by its affinity for oxygen it decomposes the water, liberating hydrogen, which in its nascent condition reacts on the blue indigo, and thus transforms it into white indigo, which is soluble in the excess of lime employed in the operation. A zinc vat of recent introduc- tion is now much more generally adopted than the above, its advantages being that the indigo is much more quickly converted, and by avoiding the abundant precipitate of sulphate of lime a better class of work is produced. The zinc vat is prepared by adding to the 2000 gals. of water 20 Ib of ground indigo, 30 tb of iron filings, 30 tb of finely powdered zinc, and 35 tb of lime. The powdered zinc in presence of the lime decomposes the water, giving off hydrogen, which is taken up by the indigo, which then as white indigo dissolves in the lime.~~

~~By whichever process prepared, the dye-vat being ready, a piece of calico is hooked on a wooden frame and well stretched out; it is then dipped into the vat for fifteen minutes, taken out, and left exposed to the air for five minutes. The piece of calico, which is white when it comes out of the vat, gradually becomes green and then blue, owing to the oxygen of the air oxidizing the white indigo, and transforming it into blue, which is insoluble in water and fixed on the calico. The number of successive dips that the piece undergoes varies according to the various shades of blue which the printer requires. The pieces, after having been passed into a weak solution of sulphuric acid or " sours," which fixes the indigo thoroughly, only require to be well washed and dried.~~

~~To produce the well-known style of print which con- sists in a blue ground and white design, it is necessary to print a resist, pass the pieces into a vat containing lime, and then dye them in the above indigo vat. The prin- cipal resist used is the blue resist, a mixture of sulphate, acetate, and sometimes nitrate of copper, and the solution is thickened with British gum, or calcined flummery, together with pipe-clay for the block, and flour for the machine printing. When the cloth on which this paste has been printed is dipped into an indigo vat, the indigo is oxidized before it reaches the surface of the ag~~
~~After~~

~~dyeing, the pieces are passed through weak sulphuric acid, not only to remove the oxide of copper, which has been precipitated, but also to fix the indigo on the calico, by liberating it entirely from its lime combination. Various other resist pastes are employed when it is desired to print other colours over the white portions, as for example, when orange or yellow grounds are desired the mixture cousists of a salt of copper to resist the blue indigo vat, with a salt of lead to produce the chromate of lead by treatment with bichromate of potash after the blue dyeing is complete. The late J. Lightfoot of Accrington devised and patented, in 1867, a method of printing reduced indigo simultaneously with the mordants for madder, garancin, and other dye colours, by which a combiuation of indigo blue with other tints can be obtained of perfect clearness and brilliancy, without resorting to the complex and tedivus processes involved in discharging colours, repeated printings, &c., when colours are blocked ona blue ground, The success of his process depends on the preparation of a pulp of indigotin and tin, in which he carefully avoided any excess of tin salt, so that it does not attract the alizarin in the madder beck, and in consequence leaves the indigo effects clear and unclouded.~~

~~China Blue.—This style of print is obtained by printing on the calico a mixture composed of pulverized indigo and sulphate of protoxide of iron, to which is sometimes added orpiment, and thickened with British gum. The pieces so printed are passed alternately, by means of rollers, first into a milk of lime, and then intoa solution of sulphate of protoxide of iron, when there ensues one of the most in- teresting phenomena of calico-printing ; for as fast as the blue indigo is reduced into white indigo, instead of being dissolved by the lime of the bath, it is retained with force through the molecular attraction of the fibre of the calico, and prevented leaving the cloth until it is fixed by the exposure of the piece to the oxygen of the atmosphere. The pieces then only require to be passed into weak sulphuric acid, washed, and dried, in order to be com- pleted. This process is not now much used.~~

~~Pencil Blue is obtained by reducing blue into white indigo, by boiling it for several hours with protochloride of tin and alkalii When the indigo is well~~

~~reduced, citrate of soda and starch are added; and after the whole is carried to the boiling-point, the calico is printed with it, passed into a milk of lime, washed, and dried.~~

~~Antline Black is a most beautiful and fast colour, pre- pared by mixing a salt of aniline with a metallic salt and an oxidizing agent, which substances on exposure gradually react on each other, and develop a rich velvety black. There is thus produced one of the most unalterable colours known, resisting soap, acids, and even chlorine to a remark- able extent. It is a colour of recent introduction, having been first printed by Mr John Lightfoot of Accrington, in 1859, and patented in 1863 ; but it is now in very exten- sive use, many different methods for producing it having been devised and patented. The most extensively employed system is that patented in 1871 by Mr Lightfoot, the originator of the colour, which is thus given by Mr Dreyfus — 30 pints chlorate of ammonia, prepared either by means of tartaric acid and chlorate of potash, or by another process without tartaric acid, are thickened with 6 to 8 ib wheat starch and 6 to 8 ib best dark British gum. When this colour has been well boiled, it is allowed to get cool, and then 7 pints of a solution of the purest and most neutral aniline salt that it is possible to get are added ; this solution is made with 8 tb of salt to the gallon of water, with three-quarters to one pint of sulphide of copper paste. After the mixture is printed, the pieces are lightly dried and hung in the ageing room in a moist warm atmosphere, with the dry bulb thermometer about 80° and~~

~~CALICO-PEREINTERG~~

~~the wet bulb 10° lower. From thirty hours to two days are required to develop the colour, the 'printer judging of the progress of the ageing by the tint. According to Mr William Mather an ordinary ageing machine wil] effectually "age" the aniline black, if ouly a proper current of air is maintained of the requisite moisture and tempera- ture. This is readily accomplished by having a properly contrived outlet to the chamber at the top, the draught of which is controllable, and inlets for fresh air in the sides of the chamber. This mode Mr Mather states is in successfy] operation, and by simple mechanical contrivances may be universally adopted. When the pattern has assumed a deep bottle-green tint, the goods are removed and~~

~~passed through a solution either of bichromate of potash, of car- bonate of soda, or of both mixed, and then soaped and dried. When aniline blacks are to be further printed with steam colours or dye colours, as is commonly the case, the treat. ment of the pieces after ageing is modified according to the necessities of the case.~~

~~Chrome Black is an oxidation colour produced by printing with logwood liquor and passing the goods through a bath of bichromate of potash, when the colouring principle of the logwood—hematoxylin—undergoes a special oxidation, The colours obtained from catechu are also fixed by oxidation, the colouring principle—catechuin—being only soluble in its unoxidized condition, and when oxidized after printing, it yields various browns and drabs, which have a very high degree of fastness,~~

~~Steam Co1Lours.~~

~~The various processes of printing included under this head are of modern introduction, but they have steadily risen in importance, till now they embrace the largest part of the art, having so largely and rapidly superseded all other styles that the process would appear to be destined to become the predominant style of the future. Indeed, to such perfection have steam colours been brought that in some Continental establishments, it appears, the dye- house has been altogether closed and steam colours only now printed. As compared with the printing of dye colours the " topical" or steam-colour style is simple, direct, and expeditious, requiring no tedious dyeing, and only light soaping, clearing, and finishing operations. By the dyeing processes alone the range of shades which it is practicable to print on one piece is strictly limited by what the mordants and their various combinations will yield with the particular dye-stuff used. But in steam colours there is no limit to the number and variety of shades which may be produced, each colour-box on the cylinder printing- machine containing the whole ingredients essential to the production and fixation of a separate and distinct shade or colour. In addition to this the steaming process can be and is extensively employed to supplement the effect of madder-printed or Turkey red goods by printing steam-colours into the whites, produced either by resist pastes or by discharges printed on the dyed texture.~~

~~The distinguishing peculiarities of steam colourscon~~sist— lst, in printing direct and at one operation on the cloth the whole of the materials of the dye and its fixing agent properly mixed and thickened; and 2d, in submitting the printed cloth to the influence of steam, which effects the fixation of the colour. The effect produced by the com- bined heat and moisture of the steaming process is, in the case of certain combinations, purely mechanical, while m others a chemical reaction ensues. In the printing of what are termed pigment colours, or, in other words, insoluble coloured powders such as used by painters, they are simply mechanically fastened or glued to the cloth by means of albumen, or some body of similar constitution, which coagulates and becomes insoluble on the application of @

~~certain heat. In the case of the regular steam colours and auiline dyes there is printed on the cloth a chemical mix- ture or solution, which on the application of heat produces a reaction resulting in the precipitation of an insoluble compound in the fibres, or a volatilization of the solvent medium is caused, so that in both cases the same result— an insoluble precipitate— is produced.~~

~~With the development of steam colours efforts have been made with success to improve on the original crude and unsatisfactory manner in which the steaming was performed. The old method, still largely employed, consists in wrap- ping the printed cloth around a perforated cylinder of copper, called a "column," into one end of which a pipe passes for the admission of steam. Around the column are first wrapped several folds of felt, above which comes~~

~~white calico, next the printed goods, and lastly an outer |~~

~~envelope of white calico. When so prepared the column is set perpendicularly on a steam pipe, a stop cock is opened, and steam is admitted into the interior of the column, which presses through and acts on the printed goods. Immediately on the conclusion of the process the column~~

~~must be dismounted and the goods run off, otherwise steam |~~

~~might condense in the cloth and cause certain colours to run, | The most common arrangement for steaming, however, |~~

~~consists of the chest or "cottage," which is a cylindrical steam-tight chamber, into which a carriage is introduced. The carriage is mounted with a series of rollers on which the pieces to be steamed are hung, or, in a different arrange-~~

~~)~~

~~ment, the cloth is fastened on a range of hooks projecting |~~

~~from a steam pipe.~~

~~are heated by steam before the carriage is thrust into the | chest, to prevent condensation of steam on the cold spikes, and consequent rust-staining of the cloth. Fig. 7 shows a~~

~~Fia. 7.—Section of Steaming Chest.~~

~~sectional view of an ordinary steaming chest by Messrs | A represents the body of the chest ; B |~~

~~Mather and Platt. the steam-tight door, which draws up when the chamber is to be opened ; C the carriage or waggon fitted with a range of square wooden rollers E. The rollers are all geared to move by means of a cog-wheel F, which is turned by the attendant outside the chamber. The carriage is run in upon the rails D; steam is admitted by the perforated steam-pipe G; H isa tap for running off condensed water, and J is a safcty-valve. While one carriage is in the chamber another is being filled and prepared outside to take its place when the goods are sufficiently steamed. The steaming chest is at best only a crude and discon- nected manner of performing one process in printing, and as all the others are continuous, it forms an awkward break in the series. To obviate this, and to secure expedi- tion and continuity, a method of steaming has been devised~~

~~In the latter arrangement the hooks |~~

~~‘the waggons f”~~

~~691~~

~~by M. Cordillot of Moscow and Mr William Mather of Salford, which they patented in 1874. Their apparatus of which a sectional illustration is shown in fig. 8, they claim will effectually steam 1000 pieces of 25 yards per~~

~~We ERR~~

~~Fic. 8.—Cordillot and Mather’s Steaming Apparatus.~~

~~day. According to their specification, it consists. of “a brick or other chamber a, the roof of which is lined witha curved steam jacket 6, connected by side pipes ¢ c to the perforated pipe d near the floor. At each end of the chamber a is an opening closed by a steam-tight door e, through which openings the waggons for receiving the steamed fabrics are admitted and discharged. The fabric is fed into the chamber a over the feed roller g and between the small guide roller or tube A and copper troughs 7 and 2, both of which and the tube & are heated by steam and~~

~~| project on each side of the wall to collect any moisture _ that may run down. _it is carried around three or other convenient number of~~

~~When the fabric is in the chamber~~

~~rollers marked j, the last of which delivers it into one of The rollers are all heated by steam to~~

~~_ prevent condensation, and as very moist steam is required | for some colours, the supply pipe passes through water | before entering through the pipes g into the curved jacket~~

~~b, and thence going by the side pipes ¢ ¢ into the perforated pipe d as before described. ‘“ When the apparatus is in~~

~~_ operation the steamed fabrics are deposited in one of the | waggons, as shown in the figure, and when one is full both~~

~~end doors are opened to allow the last waggon near the left-~~

~~hand door to be discharged and to move the full waggon one step towards the exit door by the introduction of an empty waggon through the right-hand door ; this brings another waggon in position for receiving the steamed fabrics, and while this is being filled the full waggon (after the four empty ones introduced to fill up the chamber at starting have passed through) that had been discharged can be emptied and brought back to the entrance door." The waggons are made of strong wire and are heated up before entering the chamber. By this system the patentees affirm that the goods are long enough exposed to the steam to allow the chemical reactions to take place in the cloth, so that the colours neither print off nor run during the remainder of the process, aud the fixation is completed while the goods lie in the waggons inside the chamber. 'This system of steaming is in successful operation in some Man- chester print-works.~~

~~Steam colours include two distinct classes of work—l1st, pigment colours, or the series fixed by a mechanical effect produced in steaming ; and 2d, ordinary steam colours, in which the fixation is effected more by chemical agency.~~

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~~Pigment Colours are so named because the tinctorial agents employed are coloured lakes, and the insoluble mineral powders used otherwise as painters' colours. Only a limited number of painters' colours are so used, as, for a variety of reasons, many of them are not suitable for calico-printing. Colours containing arsenic, for example, and some others which produce brilliant effects, cannot be used on account of their highly poisonous nature. Others are excluded on account of their cost, some are too dull and muddy in colour, and some are liable to tarnish or darken on exposure to light, air, moisture, or other influences. The pigments which are most extensively useful are ultramarine blue, Guignet's er chrome green, and chrome orange, all of which are very largely used by themselves or in combination with other colours. Lamp black is also employed for the production of a solid grey, and vermilion- red with some other metallic sulphides are sometimes, though rarely, printed as pigment colours. The principal lakes used are carmine, corallin lake (a derivative of phenol or~~

~~carbolic acid), black logwood lake, and several others prepared from the dye-woods with tin and alumina salts. The aniline dyes on their first introduction were also worked as pigment colours, and printed with albumen.~~

~~The first medium employed for fixing mineral pigments and lakes to calico was a solution of India rubber in coal naplitha, an agent which, so far as clearness and permanency of the printed colour is concerned, was perfectly satisfactory. The steaming dissipated the highly volatile naphtha and left the thin film of caoutchoue mixed with the colour firmly adherent to the tissue. But the inflammability of the copious naphtha fumes evolved gave rise to many serious accidents, and the method had on that account to be abandoned. No other medium has been found to give so satisfactory results as the protein compounds, of which albumen obtained from the white of eggs is the type. Besides egg albumen, blood albumen, lactarin or casein from milk, and gluten from wheaten flour are used as agents for fixing pigments. In printing with albumen advantage is taken of its well-known peculiarity of coagulating and becoming quite insoluble at a temperature under the boiling point. It is mixed with the colour and deposited on the cloth in its soluble state, when, by the operation of steaming, it coagulates and remains firmly attached to the tissue, imprisoning with it the particles of colour with which it was mixed. The cloth is not in reality dyed, but has only a coloured pattern mechanically fastened or glued to it. Egg albumen gives the most delicate and clear shades, but recent improvements in the preparation of blood albumen render it increasingly available for bright colours. 'Lactarin and gluten, dissolved by means of caustic alkalies, are used for printing ultramarine and other pigment colours. The length of time that pigment colours are left in the steaming apparatus varies from half-an-hour to an hour.~~

~~Ordinary Steam Colours.—The essential features of this style consist in printing direct on the cloth the dyeing material, mixed in proper proportion, with any necessary mordant, and certain acids or salts to keep the mixture in solution. On the application of moist heat after printing, the acid is evaporated or a chemical decomposition takes place in the case of the salt, and an insoluble precipitate is produced in the fibre. Steam colours possess great brilliancy, but they have not the fastness and solidity of madder-dyed~~

~~goods. The dyes in the case of steam colours must be in the form of decoctions or prepared extracts of the special chemical tinctorial principles. Such prepara- tions have of recent years come into very wide use, and with the progress of chemical science they are daily attaining greater prominence and perfection, so that the older applica- tion of crude materials is rapidly being supplanted by the~~

~~use of agents of known strength and quality. Thus, ag already mentioned, inadder extract and artificial] alizarin, treated as steam or "topical" colours, have largely taken the place of madder root as a dye colour, and by the pre- paration of artificial alizarin from anthracene, printers are now rendered independent of the vegetable kingdom as a source of their hitherto most important dye-stuft.~~

~~As a preparatory to printing, the cloth is mordanted or prepared by passing it through a solution of stannate of soda, and treating with a very weak solution of sulphuric acid which decomposes the stannate, combining with the soda, and leaves the stannic acid (peroxide of tin) precipitated in the fibres. Cloth thus prepared has much purer and brighter shades than simple bleached calico. The common steam colours include black and chocolate from logwood liquor, orange from annatto, yellow from Persian berry liqnor and from bark liquor, green from Persian berries and yellow prussiate of potash, purple from logwood and red prussiate of potash, dark red from sapanwood and bark liquor, reds, purples, and chocolate from madder extract and alizarin, and blues from Prussian blue. Iron, alumina, and other mordants are used with these colours according to their character and the nature of the shades desired, The solvent principally employed is acetic acid, which readily volatilizes in the steaming process, but oxalic acid is also employed to keep certain special oxides in solution during the printing. Oxidizing agents, as the chlorate or bichromate of potash, are also required for the development of some colours. Steam blue is printed, not by using the Prussian blue colours ready formed, but by effecting the chemical reaction on the cloth itself, which results in the blue colour. In some cases yellow prussiate of potash is used, which yields Prussian blue; again, when the red prussiate is employed, Turnbull blue is the result; but a mixture of~~

~~both, to which a proportion of ferro-prus- siate of tin, called tin pulp, is added, is the source of the best steam blue. The reaction by which the colour is developed will be understood by instaucing the development of Prussian blue from the yellow prussiate. It is mixed with an acid—tartaric, oxalic, or sulphuric—or the whole three combined, and printed on the cloth. Inthe steaming the added acid combines with the potassium of the prussiate and liberates ferrocyanic acid, which is further decomposed into cyanide of iron, abundant fumes of hydrocyanic acid (prussic acid) being meantime evolved. On withdrawing the goods from the steaming chest after this decomposition is complete the pieces are quite colourless, but exposure to the atmosphere in an ageing chamber, or passing them through an oxidizing solution, such as the bichromate of potash, develops the characteristic blue of Prussian blue.~~

~~Aniline Colours,—These colours now constitute the largest and most important section of steam-fixed dyeing materials, and in their behaviour and method of printing they form a class by themselves. The range of aniline colours now embraces almost every possible shade; and in no other department of scientific and technical research has equal activity been displayed within the few years which have passed since these colours were introduced; and the rewards of investigation have been commensurate. The number of colours introduced, and the methods of preparing them which have been suggested are beyond computation, and the list of those which are now in current use is exceedingly extensive. In addition to the dyes procured from aniline many more of an allied nature are prepared from other derivatives of coal-tar, phenol, naphthalin, and anthracene, some of which have also come into extensive use, and the applicability of others has been demonstrated. The topical use of these colours in connection with extract of madder, Guignet's green, ultramarine, &c., has exercised a powerful influence in improving the art of design in con-~~

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~~nection with calico-printing, placing as they do at the disposal of the designer an unlimited range of the most striking, brilliant, and pure colours. Aniline colours have a powerful affinity for animal substances, dyeing silk and woollen tissues readily without the intervention of any mordant. Taking~~

~~advantage of this property aniline colours were, on their introduction, printed as dye colours, albumen being used as a mordant. An albuminous solution was printed and fixed on the cotton, and on its introduction, so prepared, into the dye-vat the albumen readily took up the colour, while the unmordanted portions merely imbibed an easily discharged stain. Aniline colours were also printed with albumen in the manner~~

~~already described as applied to pigments and coloured lakes ;~~

~~and the patents secured by Mr Walter Crum, in 1859, for the application of gluten and lactarin in printing, had reference chiefly to the use of aniline colours. The process of fixing these colours now generally adopted is known as the arsenite of alumina process. In this process the dye is dissolved in water or acetic acid, carefully filtered through a fine cloth and mixed with acetate of alumina, a thickener, and arsenious acid dissolved in glycerine. This mixture is printed on the cloth, which is then introduced into the steaming chest. In the steaming, acetic acid is liberated and arsenite of alumina formed, which with the aniline colour is precipitated in the fibres as a brilliant insoluble lake.~~

~~Sprrit CoLtours.~~

~~This style of printing consists simply of a modification of the process for ordinary steam colours, but excluding the steaming. All the decoctions and extracts used for regular steam colours may be employed in this method, but they are mixed with such large proportions of the mordants and acids that were they submitted to the action of steam the fibre would be quite destroyed. When printed, spirit colours are therefore simply dried and aged for several hours, after which they are rinsed in water, washed, and dried. The style yields very brilliant but very loose and fugitive colours, and is now falling into disrepute.~~

~~FINISHING PRocESSES.~~

~~After the prints have undergone the various operations described above, they are submitted to a series of processes, whose object is to give to the fabrics such an appearance as will please the eye of the buyer. All the finishing~~

| processes have one common end, namely, to fill up the interstices which exist in the fabrics, and thus give to | | the calico a more substantial and glossy appearance ; and

this is effected by filling the cloth with boiled starch,

CALICUT, or KotrKop, a seaport town of India on the

| western coast, in the British district of Malabar and the

presidency of Madras, situated about 560 miles 8. of Bom- _ bay,in 11 15’ N. lat. and 75° 52’ E. long. The town | stauds on the sea-shore in a low and unsheltered position ; _ and as there is neither river nor harbour, ships are com- _ pelled to anchor in five or six fathoms water, about two or

_ three miles from land. The houses are for the most part

built either of suu-dried brick or laterite, and have a tidy

| appearance. In the quarter of the Moplahs or Mapillas _ there are several mosques, and the Portuguese quarter pos- _ Sessesa Roman Catholic church One of the largest build-

ings is the jail, which can accommodate 600 prisoners. The port is frequented by vessels frum the Red Sea and the Persian Gulf, which return with freights of rice, cocoa- huts, ginger, cardamoms, sandal-wood, and teak. The

_ Weaving of cotton, for which the place was at one time so

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farina, or sour flour, which is obtained from wheat flour which has been allowed to ferment. To these are often added large quantities of sulphate of lime or baryta, and other similar substances, with the object of imparting to the cloth a weight and appearance of solidity which it does not really possess. The finishing processes are varied according to the nature of the

~~print, muslins requiring a quite distinct method of treatment from ordinary calicoes, and furniture chintzes also receive a finish peculiar to glazed goods. Some of the apparatus employed in finishing will be found figured under the heading BLEacuine, where also the subject is entered into in some detail. As the general features of finishing, including water – mangling, drying, damping, starching, and calendering are the same both for white cottons and prints, it is unnecessary here to detail these operations. The machines and operations in a, finish- ing-room may be briefly noticed as follows, The goods are opened by passing over a winch at a considerable eleva- tion, and if necessary stretched in breadth on a machine which evens the texture and draws it out laterally. They. are then passed into the chloring machine, which has two rollers, one of brass and one covered with india-rubber. The lower one is made to revolve in an aqueous solution of chlorine, and as the cloth passes between the rollers it is saturated with this solution. It passes immediately through a box containing a vapour of steam, which at once arrests the action of the chlorine, the momentary contact being con- sidered sufficient to brighten the white ground without giving time for the colours to be affected. From the steam- ing box the piece passes through a water mangle, where pure water is spurted on the cloth, and after passing through the trough it receives a hard squeeze to extract as much moisture as possible before the drying is reached. The machine is a range of steam cans, generally made of copper. The next operation is that of starching, the machinery of which is almost identical with that used for chloring, starch paste, however, occupying the place of the chlorine liquor. The lower roller revolves in and carries up the starch to the cloth, which passes round the upper rollers and becomes saturated by the squeezing action produced and regulated by the screws and levers of the machine. After starching, the goods pass direct to another drying machine, whence they are taken to be damped by a slight sprinkling of water, which they receive in passing over a simple machine for the**

| purpose, consisting of a rapidly revolving brush throwing up

a fine spray. Calendering is the next and final operation, after which each piece is separated and folded up by a plait- ing machine, or hooked by hand. It is then made up in the ordinary book form, and after being pressed in a screw or hydraulic press is ready for the market, (J. PA.)~~

~~famous that its name became identified with its calico, is no longer of any importance. Calicut is uf considerable antiquity ; and about the 7th century it had its population largely increased by the immigration of the Moplahs, a fanatical race of Mahometans from Arabia, who entered enthusiastically into commercial life. It was the first place in India visited by any European navigator, for it was there that Vasco de Gama arrived in May 1498, ten months and two days after his departure from Lisbon. At that time it was a very flourishing city, and contained several stately build- ings, among which was especially mentioned a Brahminical temple, not inferior to the largest monastery in Portugal. In 1509 the Marshal Don Fernando Continho made an unsuccessful attack ou the city ; and in the following year it was again assailed by Albuquerque with 3000 troops. On this occasion the palace was plundered and the town burnt ; but the Portuguese were finally repulsed, and fled~~

~~to their ships after heavy loss Not long after they con- cluded a peace with Prince Zamorin or Tamuri, and were allowed to build a fortified factory in the town. An Eng- lish factory was founded in 1616. The town was taken in 1765 by Hyder Ali, who expelled all the merchants and factors, and destroyed the cocoa-nut trees, sandal-wood, and pepper vines, that the country, reduced to ruin, might pre- sent no temptation to the cupidity of Europeans. In 1782 the troops of Hyder were driven from Calicut by the British ; but in 1789 it was taken and destroyed by his~~

~~ALIFORNIA, the name originally given to a portion of the region of western North America bordering on the Pacific Ocean, and apparently taken from a Spanish romance (Las Sergus de Esplandian), in which the author speaks of "the great island of California, where a great abundance of gold and precious stones is found." This romauce was published in 1510, and, becoming quite popular, the name of California probably struck the fancy of some one of the officers or companions of Cortez, and was applied by them to the newly-discovered country, perhaps on account of its~~

~~association with a region fabu- lously rich in gold, the early Spanish discoverers in America always expecting to find an El Dorado in every new region they entered~~

~~As at first used, the name of California was applied to toe coast and the territory at a little distance from it, nortn of Mexico; gradually it Was extended over what we now call the "Great Basin," and with no well-defined limits to the north At the present time, the name California means only the State of California, one of the United States of America, and the peninsula is called Lower California. To the Spanish Americans these natural divisions of the country were and still are known as Upper and Lower California (Alta and Baja California), and the two were called " Las Californias "—the Californias.~~

~~The first discovery of the coast of Lower California was made in 1534, by an expedition sent out by Cortez, and consisting of two ships, commanded by Bezerra de Mendoza, and Hernando de Grijalva ; and later, the gulf now known as the Gulf of California was discovered and navigated by Cortez himself; after whom it was for a time called El Mar de Cortez, and later El Mar Vermejo (the Red or Vermilion Sea), in consequence of the red colour which it has at times, and which is probably due to the multitudes of small animalcule (crustaceans ?) inhabiting its waters. In 1540 the mouth of the Colorado River was discovered by Alarcon, in command of a fleet sent out by Mendoza for geographical exploration In 1542 the coast of California proper was explored by Cabrillo as far north as Cape~~

~~Mendvcino, in latitude 44° In 1578 Sir Francis Drake |~~

~~entered the Pacific, and coasted along the shores of the American continent, reaching a point as far north as 48°. Whether he discovered the bay and harbour of San Francisco has been and still is a matter of dispute. By some he is supposed to have tarried and refitted his ships at what is now known as Sir Francis Drake's Bay; by others he is believed to have done this in the Bay of San Francisco itself. The evidence seems to decidedly preponderate in favour of the first of these suppositions. In 1602 the bays of San Diego and Monterey were discovered by Viscaino ; but more than a hundred and fifty years elapsed before the latter was visited again, and before settlements began to be made on the coast of Upper California. The~~

~~peninsula (Lower Calitornia) was entered by Jesuit missionaries in 1697, and a permanent mission established at Loreto ; where, and at other points, the Jesuits maintained them-~~

~~†~~

~~son Tippoo, who carried off the inhabitants to Beypore, and treated them with great cruelty. In the latter part of 1790 the country was occupied by the British; and under the treaty coucluded in 1792, whereby Tippoo was de prived of half his dominions, Calicut fell to the British. After this event the inhabitants returned and rebuilt the town, which in 1800 consisted of 5000 houses. The present population is upwards of 25,000, composed largely of Moplahs, but including about 4000 or 5000 Portuguese, besides Parsees, English, &c.~~

~~ORNIA~~

~~selves, on the whole successfully, until 1767, when they were expelled from the country by order of Charles III. of Spain, and all their property turned over to the Franciscan monks. Later, the Dominicans obtained exclusive posses- sion of the peninsula; and the Franciscans, not unwill- ingly, withdrew to Upper California, where they established themselves, built numerous missions, and throve remarkably until Mexico became independent of Spain in 1822; this event was a death-blow to the establishments of the Franciscans, which from that time forward lost ground from year to year, and finally were broken up altogether in 1840. The treatment by the fathers of the natives of the country was successful so far as the accumulation of material wealth was concerned, but not in the slightest degree conducive to their intellectual advancement or development, as the so-called converts were simply the slaves of the "good fathers." Tbe whole number of the mission establishments was twenty-one, —the first founded in 1769, the last in 1820. They were all on or near the coast or bay of San Francisco, and the fathers displayed most excelleut judgment in selecting for their sites the very garden-spots of the country. The number of the aboriginal inhabitants of California has rapidly decreased within the past forty or fifty years. The various authorities agree in fixing their number at over 100,000 in 1823, In 1863, according to the census made by the Indian Depart- ment, there were only 29,000; the~~

~~census of 1870 gave about the same results, namely, 29,025, 5784 being actually enumerated, and the remainder merely an estimate. It is certain that the decrease in the Indian population was at one time exceedingly rapid; it would appear, however, that at present it is much less so. The few that are left are mostly a degraded, miserable set of beings.~~

~~During the time of the flourishing of the missions of California, the connection of the country with Spain through Mexico was a very loose one. Gradually a trade of some importance sprang up between the Atlantic and Pacific sides of the continent. Boston had for a number of years an entire monopoly of this business, which con- sisted chiefly of an exchange of groceries and cotton goods for furs and hides. The voyage usually lasted two years or more, and the profits were large. A few Englishmen and Americans wandered into California from different parts of the world between 1810 and 1830; and some adventurous and daring men found their way across the continent, in the pursuit of the dangerous and exciting business of hunting and trapping. It is estimated that there were, in 1830, as many as 500 foreigners on the west side of the Sierra Nevada. Of all these early pioneers, John A. Sutter is the one who is best known, from the fact that the first effective discovery of gold, by the Americans, was made by men in his employ; and also on account of the generous hospitality with which he welcomed the first comers into Calfornia, notably Fremont and his party.~~

~~In 1842 Commodore Jones of the American navy captured the fort of Monterey, raised the stars and stripes, and took~~

~~possession of the country for the United States; but the next day he hauled down his colours, and apologized for his mistake. About this time the attention of the United States Government began to be strongly attracted towards California ; and, as is universally believed in that State, the French and the English were also looking in that direction, with a view to a future possible taking possession of the country All the circumstances connected with the seizing of California by the United States will probably never be known. rities at Washington, having determined on a war with Mexico, and fully aware of the importance to the United States of an extension of their~~

~~territory on the Pacific, resolved to take possession of California, so that after the termination of the war, matters being settled on the basis of utr possidetis, that country would become a part of the United States. At all events, Fremont being accidentally engaged in conducting a scientific expedition on the Pacific coast, received in May 1846, verbal instructions from an officer dispatched from Washington in a national ship, and who had crossed from Vera Cruz to Mazatlan. In con- sequence of these instructions, he turned back, made his way at once to Sutter's Fort, then to Sonoma, where he organized a battalion of mounted riflemen; and on the 5th of July he called his forces together, and recommended a declaration of independence. On the 2d of the same month a United States frigate had arrived at Monterey, where, on the 7th, the commander hoisted the American flag, issuing at the sanmie time a proclamation, in which California was declared to be, from that time forth, a portion of the United States. This was followed by some fighting with the native Californians, and much bitter discussion and dissension among the different officers of the navy and army, who were concerned in the conquest of the country. The principal result was, that Fremont, who was tried by court-martial, found guilty of mutiny, and sentenced to lose his commission, was ever afterwards con- sidered by the people to have been the real conqueror of California; and, in consequence, he came near beiug elevated to the Presidency. The country was entirely pacified before June 1847; and in March 1848 a treaty was ratified between the Governments of the United States and Mexico, by which the whole of Upper California was ceded to the United States, just at the moment when the discovery of gold on the American River was beginning to attract attention ; and when the news of the ratification reached the Pacific coast, the excitement had already spread far and wide; San Francisco was deserted, and the whole population of the country was at work in the mountains, digging gold. The discussion as to what should be done with California, when acquired, began in Congress in 1846 ; and the question of slavery or no slavery in the new territory was at once raised. A most furious conflict followed, and nothing was accomplished during that session or the next ; even as late as the adjournment of Congress, on the 4th of March 1849, the only progress made towards creating a Government for the new territory, was that the United States revenue laws had been extended over it, and San Francisco made. a port of entry. In consequence of this the people themselves got together in September 1849, and a~~

~~constitution was framed forbidding slavery, and in other respects resembling the. constitutions of the free American States On the 7th of September 1850, a bill finally passed Congress, admitting California into the Union as a State, and without slavery, but leaving New Mexico and Utah open to its introduction. At the same time the celebrated "Compromise Measures" became a law and these were supposed to have settled the question of slavery for ever in the republic; the lapse of a few years proved, however, that this was a problem which admitted of no~~

~~It appears pretty clear, however, that the autho-.~~

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~~peaceful solution. By the treaty with Mexico, the United States did not acquire the Peninsula of Lower California, although they had military possession of it at that time. It was probably known to the authorities at Washington that it was a region of little value, as compared with the country to the north of it, or California proper.~~

~~Lower Cairornia.—Under this designation is com- prised the whole peninsula, and it extends from Cape St Lucas to the boundary between the United States and Mexico, which is a line "drawn from the middle of the Rio Gila, where it unites with the Colorado, to a point on the coast of the Pacific one marine league due south of the southernmost point of the port of San Diego." The breadth of the peninsula varies very much, it being from five to six times as great between the parallels of 27° and 28° ag it is opposite the Bay of La Paz. The area of Lower California has been estimated as 58,000 square miles ; the recent charts of the American Hydrographic Office, based on original surveys, make the peninsula narrower than it was formerly believed to be, and its area has not been computed since these surveys were made; it will probably not exceed 50,000 square miles.~~

~~The interior of Lower California is chiefly known to us, as to its physical and geological structure, from a reconnaissance made by Messrs Gabb and Loehr, of the State Geological Survey of California, in 1867. This exploration was set on foot in order that some information might be obtained relative to the value of a concession made by the Mexican~~

~~Government to an American company. This grant was expected to lead to a settlement of the country, but the whole thing turned out a failure.~~

~~According to Mr Gabb, the peninsula is divided into three distinct portions. The northern and southern extremities have much in common with each other, while the middle division differs decidedly from the others in its physical characters. The most southern division consists chiefly of granitic rocks and high ranges, which with their spurs cover nearly the whole area from Cape St Lucas to La Paz. Within this district, and lying between the spurs of the mountains, are many small valleys, some of which are very fertile, and well supplied with water. According to the American hydrographic charts, there are in this part of the peninsula two well-defined ranges, and the culminating point is given as 6300 feet in altitude. It is in this region, about half-way from Cape St Lucas to La Paz, that the principal mines of the peninsula are situated; and these are the only ones which, thus far, have proved to be of much value. They are in the districts of San Antonio and Triunfo. In 1867 these mines were producing at the rate of about $20,000 in value of silver per month ; and, from recent newspaper notices, it would appear that they are still worked with success. The ores are, however, refractory, and not easily treated.~~

~~Proceeding northwardly into the middle section of the peninsula, the granitic masses unite and form one mountain range, which runs parallel with the coast of the gulf, and at a distance of fifteen or twenty miles from it. It is known as the Sierra Gigantea, or del Gigante, and has an elevation of from 3000 to 4000 feet. Crossing this range and descending its western slope, its inclination is found to be very gradual, the granitic mass being flanked on that side by heavy accumulations of sandstone, which has a gentle dip away from the crest of the ridge. This sandstone is quite destitute of fossils, but is believed by Mr Gabb to be of Miocene age. It is cut by numerous voleanic dykes, and also contains great quantities of material of eruptive origin, in the form of interstratified masses. In this portion of the peninsula the settlements are confined to the eastern base of the Sierra Gigantea. Here, at numerous points along the coast, there are sinall valleys, with good harbours~~

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~~adjacent ; and these little patches of country are very fertile and adapted to the growth of tropical and semi- tropical plants. By far the greater portion of the region, however, is extremely barren and forbidding; although occasional deep ravines and narrow valleys offer a marked contrast to the general sterility of the rest of the country. The northern division of the peninsula is considerably broken by mountain ranges, resembling in this respect the southern extremity. The culminating point is put down on the American hydrographic charts at 9130 feet in altitude, and it is called Mount Calamahue. Between the ranges are broad valleys, covered with grass, and said to possess some agricultural value, although as yet almost entirely unoccupied.~~

~~The dryness of the climate is the characteristic feature of the peninsula of Lower California; and although there are no reliable statistics of the rainfall it is undoubtedly very small. It is, indeed, very irregular, there being long periods of absolute dryness, in certain regions at least. The yearly average fall over the whole peninsula, for a long period of years, would perhaps not exceed three or four inches. As in the drier portion of Upper California, so here, when the rain does fall, it occasionally comes down in almost destructive quantity, over a very limited area, in the form of what are popularly known as "cloud-bursts."~~

~~Owing to the dryness of the climate in part, and also to the character of the Mexican Government, all the numerous attempts which have been made to settle Lower California have proved failures. The population at present is estimated at from 8000 to 15,000, about two-thirds of whom live near the southern extremity of the peninsula. The harbours on both coasts are numerous, and that of Magdalena Bay is hardly inferior in extent and availability to the Bay of San Francisco itself. Whale-fishing on the west coast, and especially about Sebastian Viscaino Bay, was, a few years ago, carried on very extensively. In the winter of 1848 there were fifty American ships anchored in the bay and lagoons of Magdalena, chiefly engaged in capturing the 'California Grey" whale (/thachianectes glaucus, Cope). The pearl-fisheries of Lower California have also for many years been of some importance; they are conducted by companies, and the divers are chiefly Yaqui Indians. The total value of the pearls obtained, within the last century and a half, has been estimated at five or six millions of dollars; but this, of~~

~~course, can hardly be considered as being anything more than a rough approximation. On the whole, the prospects of Lower California are not very cheering; dryness and sterility are the dominating features of a very large portion of the country. The emigration schemes have all failed, and not without considerable suffering to the unfortunate people who from time to time have been deluded into the belief that the peninsula was a rich and fertile region. The attempts at mining for copper, which have been made at various points north of Triunfo, have all proved unsuccess- ful.~~

~~THe StTaTE oF Catirornis. Area.—This is what is now always meant when the word "California" alone is used. It isin part the equivalent of the " Upper California" (Alta California) of the Spanish,—the present state of Nevada, and also the territories of Arizona and Utah, as well as parts of Wyoming and New Mexico, having been also included under that somewhat vague designation.. Cali- fornia extends from the boundary already defined on the south to the parallel of 42°, which is the dividing line between this State and Oregon. On the east, the 120th meridian forms the boundary from 42° south to the intersection of that meridian with the 39th parallel, which takes place within the waters of Lake Tahoe, near its southern end. From this point the boundary runs obliquely~~

~~_ coast and Mississippi Valley States.~~

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~~in a south-easterly direction to the intersection of the 35th parallel with the Colorado River, and thence down the river to the Mexican boundary line opposite the mouth of the Gila. The whole area thus embraced has been variously estimated at from 155,000 to 188,981 square miles. The last-mentioned figures are those given in the latest document published in connection with the United States census,—General Walker's Statistical Atlas,—as well as in the feport of the Commissioner of the United States General Land Office for 1866. It is believed, however, that the first-named figures are much nearer the truth than the other higher statement, and that the area of California is somewhere between 155,000 and 160,000 square miles.~~

~~Topography.—The surface and climate of California, although extremely varied in character, bear everywhere a peculiar impress, very different from that of the Atlantic The division of the year into two seasons—the wet and the dry—marks this portion of the Pacific coast in the most decided manner, and this natural climatic area coincides almost exactly in its extension with that of the State of California itself, Soon after crossing the Oregon line, we enter a region of summer and winter rains; and, in Lower California, although the entire precipitation is exceedingly small, it is, on the whole, decidedly tropical in its character,~~

~~Before, however, the nature of the Californian climate can be understood, it will be necessary to give some account of the physical structure of the State, and to indicate the interesting and somewhat peculiar character of the relief of its surface. California may be divided into three quite distinct portions, and these are very different from each other in impertance,—the central being much the most densely populated, and in every respect the most valuable. This central portion is embraced between the parallels of 35° and 40°, and has, on its eastern side, the Sierra Nevada, and on its western the Coast Ranges, with the Pacific Ocean at their western base. Between these two mountain chains lies the Great Central Valley, which forms so marked a feature in the topography of tae state. This valley is drained by the Sacramento River, flowing from the north, and the San Joaquin from the south, the two uniting about midway between the northern and southern extremities of the valley, and entering the Bay of San Francisco through Suisun and San Pablo bays, which latter is, in fact, but the northern expansion of San Fran- cisco Bay itself. Suisun Bay, on the other hand, is rather the partly submerged delta of the united rivers, being shallow, and containing large, low islands covered with a dense growth of "tule" (Scirpus palustris). The entire length of the Great Valley is about 450 miles; and its breadth, which is small in its northern part, and gradually increasing towards the sonth, averages about 40 miles, including the lower foot-hills, so that the entire almost level area contains about 18,000 square miles, The direction of the valley is parallel with that of the ranges between which it is enclosed, or about N. 31° W.; but it gradually takes a more northerly course to the north of the Bay of San Francisco, in harmony with the change in the trend of the coast beyond the parallel of 39°, From the mouth of the Sacramento to Redding, at the northern head of the valley, the rise is 556~~

~~feet in 192 miles; and from the mouth of the San Joaquin to Kern Lake it is 282 feet in 260 miles. A striking feature of the Sacramento River is the fact that for 200 miles north from the mouth of the Feather River it does not receive a single tributary of any note, although walled in by high mountain ranges. Indeed, the whole of the Great Valley 18 thus surrounded ; the only break being at San Francisco, where the channel which connects it with the sea—~~

~~length would be about 430 miles.~~

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~~the Golden Gate—is only one mile wide in its narrowest part. The region thus enclosed, computing it from the divide, or water-shed, of the enclosing mountain ranges, is 520 miles in length, and it has an average breadth of 110 miles. This gives an approximate area of 57,200 square wiles, as stated by U.S. Irrigation Commissioners, their estimates having been made on the basis of the State Geological Survey maps. The drainage of this entire area reaches the sea through the Golden Gate. But before noticing the lakes and rivers which belong to the Great Valley, it will be desirable to give some idea of the moun- tain ranges in which these rivers take their rise ; and it should be added in justice, that nearly all that is known of the detailed structure and elevation of the mountain chains of California is due to the work of the Geological Survey.~~

~~The Sierra Nevada, or Snowy Range, of California is, on the whole, the largest and most interesting chain of mountains within the limits of the United States. Its scenery is attractive, and in some respects quite unique ; its vegetation is unsurpassed in grandeur, unless it be by that of the Australian forests; its mining resources are large, and have been the direct cause of the rapid peopling of the Pacific side of the continent and of the building up of eleven States and Territories in what was before almost an unknown region. In general altitude, the Sierra Nevada does not much excel some of the ranges of the Rocky Mountains proper, although it has one summit higher than any yet ascertained to exist in the United States, not including, however, the Alaskan territory. The length of the chain, from Mount San Jacinto to Mount Shasta, is about 600 miles ; but, on some accounts, it would be more proper to consider the Sierra as beginning at the~~

~~Tahichipi Pass and terminating at Lassen's Peak, in which case its The breadth of this great mass of mountains varies from 75 to 100 miles; and it narrows towards the north, while its altitude also declines in the same direction. The slope of the range is every- where long and gradual on the west, and short and precipitous to the east, in which latter direction, of course, the general level of the Great Basin is attained, and this is from 4000 to 5000 feet above the sea. The highest part of the range is between the parallels of 36° 30' and 37° 30'; here the passes are about 12,000 feet in elevation above the sea-level, and the peaks range from 13,000 to 14,886 feet in altitude, the culminating point, Mount Whitney, being about 600 feet higher than any peak yet measured in the Rocky Mountains. From this peak, going~~

~~' north, the range declines gradually, and at the point where~~

~~the Central Pacific Railroad crosses it the summit is only 7000 feet above the sea; this is in latitude 39° 20'. The slope of the Sierra in the central part of the State opposite Sacramento is about 100 feet to the mile, the range being there seventy miles in breadth between the valley and the crest; farther south, opposite Visalia, the average rise is as much as 240 feet to the mile, up to the summit of the passes, and 300 feet to the peaks. In this part of the range, the slope on the east is very abrupt, being as much as 1000 feet to the mile from the summit to the level of Owen's Valley, a descent of about 10,000 feet. The western side of the Sierra Nevada is furrowed by extremely deep and precipitous gorges, or cafions, as they are universally called in California. These are narrow at the bottom, where there is usually barely room for the river to run at an ordinary stage of water; their sides slope upwards at a very steep angle, often as much as 30°; and they are sunk from 1 to 3000 feet, or even more, below the general ievel. These cafions become more and more marked features of the range as we proceed north in the Sierra ; and where the volcanic formations have spread themselves uniformly~~

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~~over the flanks of the mountains, so us to form a smooth and almost level surface, as is the case over an extensive area, the contrast between the deep~~

~~and precipitous cafions and the plain-like region, with its gentle slope to the west, in which they have been excavated, is a very marked one.~~

~~The Coast Ranges form a large mass of mountains, almost as broad as the Sierra, but much inferior to it in elevation, and at the same time more complicated in details. The Sierra Nevada is essentially one range or chain, with great simplicity of structure. It is only here and theie that, along the crest or near it, a double line of summits exists, with deep longitudinal valleys between, which are occasionally occupied by lakes, as in the case of Lake Tahoe; while the Coast Ranges, on the other hand, are made up of numerous broken and indistinct chains, each of which usually has a distinct name, the different groups of ranges having, however, on the whole a well-marked parallelism with the coast. Near the Bay of San Francisco the culminating summits are about 4000 feet in altitude; to the north and south of the bay the elevation of the ranges increases. Monte Diablo, twenty-eight miles distant from San Francisco in a north-north-easterly direction, is 3856 feet in height, and forms a well-known land-mark, being, from its somewhat isolated position on the north, a very conspicuous object over much of the central portion of the state. The view from its summit is remarkably com- prehensive, as is that from Mount St Helena, at the head of Napa Valley, sixty miles north of San Francisco, and 4343 feet in height.~~

~~The flanks of the Coast Ranges on the western side of the Great Valley are very scantily provided with forests, and there is not a single stream on that side permanent enough to reach either the Sacramento or San Joaquin throughout the entire year. The only streams which carry water in summer on the west side of the Sacramento Valley are Puta, Cache, and Stoney creeks, and these all disappear during the dry season, soon after leaving the foot-hills. On the western side, however, the conditions are greatly changed. The rain-fall, almost entirely cut off on the eastern slope of the Coast Ranges, becomes considerable on the western side of the more elevated Sierra, and numerous large rivers are fed from the melting snow during the summer, although, towards the close of the dry season, the body of water which they carry has usually become very much diminished. The streams tributary to the Sacra- mento on the east side are—the Feather, Yuba, American, Consumnes, Mokelumne, and several other smaller ones. The Feather has the largest drainage area of any river having its source in the~~

~~Sierra. It runs for a long distance parallel with the Sacramento, receiving on the east all the drainage which would otherwise run into that river. There are no lakes in the Sacramento division of the Great Valley ; but at its southern extremity there are several, one of which is of large Size, having an area of not less than 700 square miles. This is Tulare Lake, which, together with Kern and Buena Vista lakes, receives the drainage of the southern part of the Sierra, by the Kern, Kaweah, King's, and other smaller streams. Tulare Lake is quite shallow, being only 40 feet deep; its banks are low and reedy (hence the name, Tularc, a place of reeds or tuies), and in wet seasons it overflows them, and becomes greatly extended in area. At such times the excess of the drainage passes off into the San Joaquin; but in dry seasons the evaporation is so great that there is no discharge in that direction. The northern branch of the San Joaquin heads in the grand group of summits of which Mounts Maclure, Lyell, and Ritter are the culminating points ; the southern rises on the north side of Mount Goddard. The united stream issues from the mountains at Millerton; and, after gaining the centre of the valley, it turns and runs at right~~

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~~angles to its former course, receiving three important tributaries and several smaller ones on the east, but not a single permanent one from the west. 'The area of the Sierra drained by the San Joaquin is only about half that of which the Feather collects the surplus waters.~~

~~There are several large mountain lakes in California, some of which are of pure and fresh water, while others are alkaline, being without any outlet. The finest of these is Tahoe, which lies on the very summit of the Sierra, and at an elevation of about 6200 feet. It has a length of about twenty miles, and is 1500 feet deep, its water being extremely pure, as it contains only three grains of solid matter to the gallon. The overflow of this body of water passes off by the Truckee River, and enters Pyramid Lake, where it "sinks," or disappears by evaporation. Clear Lake is another beautiful sheet of water, in the Coast Ranges, and about the same length as Lake Tahoe, but much narrower and more irregular in shape. Owen's Lake is the "sink " of Owen's River, and is about eighteen miles long. Mono Lake is the sink of the streams rising in the Sierra between Mount Dana and Castle Peak. It is~~

~~about fourteen miles long, and nine wide, and lies at an elevation of about 7000 feet above the sea-level. There are several other large alkaline lakes in Lassen and Modoc counties, which receive the drainage of the eastern slope of the Sierra, within the limits of the State. Death Valley is the sink of the Amargosa River, and it has evidently been once an extensive lake, although now only a mud-flat in ordinary winters, and a dry, alkaline, desert plain in summer. All these lakes and depressions show very plainly, by the terraces which surround them, that the water was formerly much more abundant, and stood at a higher level than it now does.~~

~~North of the parallel of 40°, where the Coast Ranges and the Sierra unite, and the Great Valley disappears, the country is extremely rough and very thinly inhabited. The seven counties which are included within the region north from the head of the Sacramento Valley to the State line had in 1870 a population of only 19,269, and they had all lost in numbers during the previous decade. The counties of Lassen, Siskyou, and Modoc, which are embraced in the north-eastern corner of the State, are chiefly covered with volcanic plains, very dry and barren, lying between pre- cipitous, although not very lofty, ranges. The waters of this region have no drainage to the sea. These three counties, with an area as large as that of Belgium, had in 1870 a population of only 8175, or less than one to the square mile. 'The north-western corner of the State is also extremely rough and mountainous, and a large part of it quite uninhabitable. The ranges which intersect it, and which are known as the Siskyou, Salmon, and Scott Mountains, seem to be geologically the continuation of the Sierra Nevada. They are from 6000 to 8000 feet in height ; but they have never been accurately mapped, and very little is definitely known about them, although gold washings have been carried on for many years in some of the valleys bordering the Klamath River and its tribu- tarles.~~

~~That portion of California which lies to the south and east of the southern inosculation of the Coast Ranges and the Sierra, comprising an area of fully 50,000 square miles, is also very thinly inhabited, with the exception of a narrow strip along the coast. Nearly all of San Diego and San Bernardino counties belongs to the Great Basin system, having no drainage to the sea. Los Angeles County, how- ever, has within its borders some of the most fertile lands in the state. These form a strip about twenty miles wide along~~

~~the coast; the north-eastern half of the county on the other hand, is extremely barren. The region lying east of the Sierra Nevada, and between the crest of that~~

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~~range and the boundary of the State, chiefly divided between the two counties of Mono and: Inyo, is also a very moup. tainous tract of country. Owen's River runs through jt from north to south for a distance of 180 miles, emptying into the lake of the same name, lying at the south end of Owen's Valley, and with no outlet. Here the scenery jg extremely grand, the valley being very narrow and the ranges on either side elevated from 7000 to 10,000 feet above the lake and river. The Inyo range, on the east, ig quite bare and destitute of timber, and its summits are only occasionally whitened with snow for a few days during the winter, the precipitation being almost entirely cut of by the Sierra on the west. East of Owen's Lake are several parallel ranges of mountains ; and beyond them, at a distance of about forty miles from the lake, is Death Valley, which is about 150 feet below the sea-level. The name was given in allusion to the fate of a party of emigrants, who perished here, many years ago, from thirst, and perhaps starvation. Between Owen's Lake and Death Valley are the Panamint Mountains, which have lately been the scene of considerable mining excitement. A portion of the extreme southern part of the State in San Diego County is also below the sea-level. Here is a depressed area of fifty miles in length, the width of which is un- known ; in its lowest part it is over 300 feet beneath the level of the sea. Dry Lake occupies the greatest depression of this area at the entrance to the Coahuila Valley.~~

~~There are many fine points in the scenery of California, some of which have already become well known from the descriptions of pleasure-travellers who have flocked to the State from all parts of the world. The granite pinnacles and domes of the Highest Sierra opposite Owen's Lake; the snowy cone of Mount Shasta, rising 10,000 feet above the adjacent plains ; the lovely valleys of the Coast Ranges, with their peculiar vegetation,—all these have their charms; but the point which is most attractive of all is the Yosemite Valley. This is situated' in the Sierra, about 150 miles in a direct line, a little south of east, from San Francisco. Its elevation is 3950 feet~~

~~above the sea, and it is hemmed in by cliffs varying from 2000 to 3000 feet in elevation. The principal features of the Yosemite, and those by which it is distinguished from all other known valleys, are—first, the near approach to verticality of its walls ; second, their great height, not only absolutely, but as compared with the width of the valley itself ; and finally, the small amount of talus or débris at the base of these gigantic cliffs. The waterfalls in and about this valley are also of wonderful beauty and variety. Those of the Yosemite Creek, which descend from the cliffs on the north side, are most remarkable for their height, which is, in the whole, not less than 2600 feet, but divided into three parts, with one vertical fall of 1500 feet. The Nevada and Merced Falls of the Merced River, which flows through the whole length of the valley, combine great height with a large body of water, and are wonderfully grand. The Half Dome is one of the most striking features of the Yosemite, its elevation being 4737 feet above the bottom of the valley, with an absolutely vertical face of 1500 feet at the summit, turned towards the Tenaya Fork of the Merced, above which it rises. The scenery of the cafion of the Tuolumne River, which flows parallel with the Merced, a few miles further north, is also extremely picturesque, and remarkable especially for the great number and variety of the cascades which occur at short intervals in the deep gorge, the walls of which are bare and almost vertical precipices, in places more than a thousand feet high. The river, which is not much less than a hundred feet wide, falls 4650 feet in a distance of twenty-two miles, A few miles farther down, the narrow gorge opens out into & beautiful valley, in many respects a wonderful counterpart~~

~~of the Yosemite, although inferior to it in grandeur. This is called the Hetch-Hetchy. Above the Yosemite Valley the scenery of the High Sierra is very attractive, immense conical knobs or domes of granite being a prominent and very characteristic feature of this and other portions of the Sierra. Mount Dana, a little over 13,000 feet in height, dominates over the region above the Yosemite; and from its summit, which is quite easy of access, a magnificent panorama may be had of the Sierra Nevada, with Mono Lake, nearly 7000 feet below, spread out like a map, and beyond it the lofty, and,~~

~~in some instances, snow-clad ranges of the Great Basin, while several well-formed and very large volcanic cones are seen just to the south of the lake.~~

~~Climate.—The climate of California presents many fea- tures of interest, differing considerably from those obtain- ing in the Eastern and Mississippi Valley States, which have furnished a majority of the immigrants to the Pacific coast and Great Basin. There can be no doubt that emigration to California has, especially within the past few years, been gteatly stimulated by the desire of people at the East to escape the sudden changes, the intense heats of summer, and the bitter colds of winter, which characterize the climate of the whole country east of the Rocky Mountains.~~

~~The climate of California is very different in different parts of the State, according to distance from the ocean, situation with reference to the mountain ranges, and al- titude above the sea-level. But there are certain peculiar features which obtain all over the State. In the first place, the division of the year into two seasons—a dry and a rainy one—is the most marked general characteristic of the Californian climate. But, as one goes north, the wiuter rain is found to begin earlier and last longer; while, on the other hand, the south-eastern corner of the State is almost rainless. Again, the climate of the Pacific coast, along its whole length, is milder and more uniform than that of the States in a corresponding latitude east of the mountains. Thus, we have to go as far north as Sitka, in latitude 57°, to find the same mean yearly temperature as that of Halifax, in latitude 44° 39. And in going south along the coast, we observe that the mean temperature of San Diego is six or seven degrees less than that of Charleston and Vicksburg, which are nearly in the same latitude as San Diego, and situated, one on the Atlantic, the other on _ the Mississippi River. But, in addition, we notice that the means of summer and winter are much nearer the mean of the year in California than in the east. Thus, comparing Washington and San Francisco, we have—~~

~~Mean of Mean of Mean of Year. Summer. Winter. San Francisco,.. ... oocheascncne 56 60 51 DMOHIMGTON,.....0.0cc.00e 56°07 76°3 36°05~~

~~This condition of things is not so marked as we advance ; Into the interior of California; but everywhere in the _ state the winters are comparatively~~

mild, and the heat of summer is much less disagreeable in its effects, because the | air is exceedingly dry and the evaporation proportionately rapid. The climate of San Francisco is indeed wonderfully uniform; and the bracing, cool air which sweeps in from the ocean during the afternoons of the summer, although _ not favourable to persons with weak lungs or sensitive throats, is the very breath of life for those who are in vigorous health. One great drawback to the enjoyment of the dclightful climate of California, however, is the dust of summer, which seems, until one becomes accustomed to it, quite unbearable. A more serious difficulty in this State is the extreme variability in the amount of rain which falls from year to year; and this uncertainty is something _ Which must always be present in the mind of the farmer

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as likely seriously to influence his future. Some years are so dry that the crops are almost an entire failure, except directly on the coast, or where artificial irrigation is practised ; other years are so wet, that serious inundations occur. During the interval from 1850 to 1872, the yearly rain-fall ranged, at San Francisco, from 7-4 inches to 49-27 inches. In going southward from San Francisco, the mean rain-fall decreases along the coast, and at San Diego it is only about 10 inches. At Fort Yuma it is a little over 3 inches, In the Sierra the annual precipitation Increases as we rise in altitude; it is almost entirely in the form of snow at elevations greater than 6000 or 7000 feet; and this snow, as it melts during the summer, fur- nishes a store of water of immense importance to the State, supplying, as it does, the numerous ditches or small canals, which have been built, in connection with great reservoirs high up in the mountains, for supplying the miners, and which are more and more utilized for agricultural purposes,

_as the placer-mining claims cease to be worked. As there

is no fall of rain or snow of any consequence on the Sierra during the summer, the accumulated stock of the previous winter melts gradually, and after a succession of dry seasons, it almost entirely disappears from the summits of the range. If, on the other hand, two or more rainy winters

~~follow each other, the crest retains a large amount of snow to add to the next year's stock. The climatic conditions are such, however, that there are no true glaciers formed anywhere in the Sierra, although the traces of former oues are everywhere visible along the highest part of the range. These ancient glaciers once covered the summits and extended quite low down in some of the valleys,— notably in that of the Tuolumne, where the ice-flow may once have been from thirty to forty miles in length. Tha walls of the Hetch-Hetchy Valley are beautifully scored and polished by former glaciers, which once entirely filled the upper portion of this grand cafion, The nearest approach to a glacier which at present exists in the Sierra is to be found on Mount Shasta, on the north side of which, and almost at the summit, are large masses of ice having many of the characteristics of the genuine glacier.~~

~~The winds of California are, during the summer, exceed- ingly regular in their movement. As the interior becomes heated by the sun, the air rises, and a current of colder air rushes from the sea to take its place. Wherever there is an opening, therefore, in the Coast Ranges down to the level of the sea, there the wind will blow through it fiercely during the hottest part of the summer day, towards the interior. Thus, in going from the Bay of San Francisco towards the mountains, or up either the Sacramento or the San Joaquin Valley, the wind will be with the traveller. In fact the current spreads out fan-shaped from that point, and reaches far up from the ocean. A very strong wind and cool and bracing weather at San Francisco are indica- tions of exceptionally hot days in the interior. At night the breeze slackens, and usually ceases altogether, a light mist often enveloping the city of San Francisco. At the same time, the cooler air draws gently down the mountain slopes, in opposition to its direction during the day. In the iaterior, the days, in summer, are extremely warm, the thermometer sometimes rising to 120° in the shade, and 160° or 170° in the sun. The farther one goes from the Bay of San Francisco, the hotter it becomes. At night, however, the radiation is rapid, and the temperature falls, so that a warm covering is almost always needed. The south-eastern corner of California is exceedingly dry, and has a very high temperature. At Fort Yuma the mean of the year is 76°, and the heat in summer is almost intolerable, the thermometer ranging above 90°, sometimes for weeks, both~~

~~by night and by day. Among the peculiarities of the Californias this is not one of the least striking, that, as one~~

~~leaves the Sacramento and San Joaquin plains, and travels into the mountains, it becomes quite perceptibly warmer, at least for the first 2000 or 3000 feet of ascent. Thus, the mean temperature of the year at Colfax, 2400 feet above the sea-level, was, for 1871, 1°°6, and for 1872, 1°-4 higher than that of Sacramento, which is only 30 feet above the sea. As high up as 8000 or 10,000 feet the days in summer are comfortably warm, and even on the high peaks of the Sierra, at 12,000 or 13,000 feet of altitude, at mid-day it is usually so warm that an overcoat is not needed. At night, however, at these elevations, it is almost always so cold that frost occurs, although occasion- ally it is very warm all night long, even at as great an altitude as 8000 feet. It adds very much to the pleasure of travelling in the High Sierra that the weather is, by day, almost all summer long, delightfully mild and clear, and without rain; so that one of the greatest discomforts to which tourists are exposed in Switzerland and most other regions of pleasure-travel is here entirely unknown.~~

~~Geology.—The geological structure of California is com- paratively simple, although the extreme paucity of fossils in the rocks of the gold region for a long time rendered it impossible to ascertain the age of the auriferous belt. It is also true that, for similar reasons, the formations which make up the main body of the Coast Ranges were not easily made out. A geological survey was authorized by the legislature in 1860, and continued, with occasional stop- pages, until 1874. In the published volumes and maps which have been issued in the course of this work, almost all that is known with accuracy in regard to the geology and mineral resources of the State may be found.~~

~~The Sierra Nevada first claims attention, as being the dominating range. It has a central core or axis of granitic rock, which forms almost the whole body of the range in its southern portion, diminishing in width as it is followed towards the north. All the higher points of the Sierra, in its most elevated portion, are of granite. Farther north there are a few high peaks of metamorphic rock, and many of the summits are capped with volcanic~~

~~materials. Flank- ing the granite is a very heavy mass of slaty metamorphic rocks, commonly known as the auriferous belt of the Sierra. This consists chiefly of argillaceous, chloritic, and talcose slates, with a great variety of other metamorphic rocks in snialler amounts, and some large, apparently isolated patches of limestone, which succeed one another in the line of direction of the axis of the range. The strike of the slates is usually parallel with that of the axis of the range, and their dip is, in general, at a high angle towards the east. Low down in the foot-hills, sandstones of Tertiary and Cretaceous age occur in considerable quantity. From the Stanislaus River towards the south, these strata are Tertiary, and they form quite a broad belt on White River and Pose Creek. On the American River, and north of it, the Cretaceous rocks are occasionally well developed and full of organic remains. All these beds rest in almost horizontal position on the upturned edges of the auriferous slates, showing that the elevation and metamorphism of the chain of the Sierra took place previous to' the Cretaceous epoch. These beds are of marine origin; but there are very extensive masses of sedimentary materials higher up in the Sierra which are fluviatile and fresh-water deposits, and they are associated with great quantities of volcanic detri- tus and solid lava which has evidently come down from the higher portions of the chain. The eruptive materials do not usually lie where they were ejected, but seem to have been carried far from their original position by cur- rents of water, as they are made up, in great part, of rolled or brecciated masses, and are interstratified with gravels and finely laminated clays. These latter often contain impressions of leaves and whole trunks of trees, usually~~

~~CALIPFPORATA~~

~~silicified, as well as bones of land and aquatic animals, The character of these fossil remains indicates that the formation is of late Tertiary age, and it may be considered as Pliocene. Although the crest of the Sierra is frequently crowned by large masses of volcanic materials, there are no indications of present activity along the range, and only occasionally can remains of ancient crateriform openings be seen. In Plumas County, however, and especially in the neighbourhood of Lassen's Peak, there are several sol- fataric areas and well-formed cinder cones, some of which exhibit very marked appearances of recent action. From here northward,~~

~~volcanic masses cover more and more of the higher regions, and almost the whole of the north-eastern corner of the State is exclusively occupied by rocks of this character. lLassen's Peak (10,577 feet) and Mount Shasta (14,440 feet) are both extinct volcanoes, and the latter has, near its summit, hot springs and indications of sol fataric action. The auriferous slates of the Sierra contain occasional fossils; and, in quite a number of localities, these have been found in close proximity to well-marked and productive veins of quartz, which are now, or have formerly been, extensively worked for gold. These fossils are of Jurassic age, and no Silurian or Devonian forms have ever been discovered anywhere in the Sierra, In Plumas County, Triassic fossils have also been discovered, but only in one locality of limited extent. These are, however, identical with species belonging to the Alpine Trias, which have been found in large quantities, and in numerous localities, on the eastern side of the Sierra, and which prove that this interesting group of rocks has a wide distribution on the Pacific side of the continent. The limestone belt, already mentioned, appears to be entirely destitute of organic remains, except in the extreme northern part of the State, where, in one or two localities, it has been found to contain well-marked carboniferous types. Farther south, this rock has become much metamorphosed, and is in many places converted into marble, while its organic remains appear to have become entirely obliterated.~~

~~The Coast Ranges are made up almost entirely of Cre- taceous and Tertiary marine strata, chiefly sandstones and highly bituminous shales. The Cretaceous rocks occur from the Cafiada de las Uvas northward along the east side of the Coast Ranges, gradually occupying more and more space in a northerly direction. After passing the Bay of San Francisco, this formation makes up nearly the whole mass of the mountains, which grow more elevated and rougher towards the north, the rocks being much meta-morphosed and broken by granitic intrusions. In the vicinity of Clear Lake (latitude 39°) there is a belt of voleanic materials, accompanied by hot springs, and solfataric action, crossing the ranges from east to west. The Coast Range mountains have been much disturbed, and in part elevated during the most recent geological epoch, as large masses of strata of Pliocene age are found in various localities to have been turned up on edge; but volcanic activity seems to have been more general and continued to a later date in the Sierra than in the Coast Ranges. Scme of the granitic~~

~~masses along the shores of the Pacific are more recent than the Miocene Tertiary, 48 strata of this age have been uplifted and turned up on edge by the protruding granite. Indeed, everything in the Coast Ranges points to great geolegical disturbances as having occurred ata very recent date. Among the illustra- tions of this condition of things, the changes produced by earthquakes in modern times may be cited. Like all the rest of the Pacific coast, California is liable to these disturbances, and this circumstance has undoubtedly had considerable influence in retarding the settlement of the State. No year has been known, since the conquest of the country by the Americans, so disastrous as were the spring~~

~~CAMBIBPORNGA~~

~~and summer of 1812; the destruction of life at that time would probably have been large if California had been as thickly settled as it now is. During the whole of May of that year the southern part of the State was violently agitated, and the disturbances continued with more or less severity through the entire summer. So frequent and violent were the shocks that the people abandoned their houses and slept on the ground, In September the missions of San Juan Capistrano and La Purisima were destroyed, and thirty or forty persons killed at the first-named place ; also a considerable number at Purisima, but how many was never ascertained. At Santa Barbara a tidal wave rushed into the interior; but the inhabitants, haying observed the previous recession of the sea, had fled to the adjacent high ground, and thus escaped destruction. In the year 1808, in the months of June and July, there were numerous shocks at the Presidio of San Francisco. On the 8th of October 1865 the whole region adjacent to the Bay of San Francisco was violently disturbed, and many buildings thrown down, while hardly one of brick or stone within the city itself escaped injury ; but few lives were lost, although great alarm was felt. Since that time there has been no severe shock having its focus near the coast; but in 1872 the whole Sierra Nevada, and the adjacent State of Nevada, were most violently shaken, the centre of the shock having been along the axis of the range, from which the waves were propagated east and west with about equal velocity. Immense quantities of rock were thrown down from the granite pinnacles in the Highest Sierra. The small settle- ment of Lone Pine, in Owen's Valley, at the east base of the mountains, was completely demolished, and between~~

~~twenty and thirty persons killed. Luckily the heaviest part of the shock was limited to a region hardly at all inhabited, so that the destruction of life was insignificant in comparison with the extent and violence of the disturbance. Lighter shocks continued to be felt, for two or three months after the first severe one, through the whole extent of Owen's Valley. The extinct or dormant volcanoes, of which there is a fine group midway in the valley between its two extremities, showed no signs of being affected by this exhibition of the seismic forces. There are in the Coast Ranges long and very straight fissures in the rocks, which have been produced by earthquakes in modern times; and these have, in some instanees, been accompanied by changes in the relative level of the ground on each side. Mining.—California was for many years chiefly known to the world as the region where gold was obtained in extraordinarily large quantities. The excitement occasioned by the discovery of the precious metal was very great through- out the United States, and this and the finding of an equally important auriferous region in Australia, only two or three years later, produced an immense effect on the commerce of the world, stimulating emigration in a way never before dreamed of. The existence of gold had long been known in California, and washings had been carried on in the southern part of the country, near the San Fernando Mission, for several years, having commenced there as early as 1841. No discovery had been made, however, which attracted much attention, or caused any excitement, previous to the occupation of the country by the Americans. In January 1848, a piece of native gold was picked up in an excavation made for a mill-race on the South Fork of the American River, at a place now called Coloma. It was several months, however, before the number of persons brought together by this discovery had become large; but, by the end of December, washing for gold was going on all along the foot-hills of the Sierra,~~

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~~excitement exteuded to the eastern Atlantic States in the course of the autumn and winter succeeding the discovery ; and, in the spring of 1849, the rush of emigration across the plains, and by way of the Isthmus of Panama, com- menced ; and it was estimated that 100,000 men reached California during that year, among whom were representa- tives of every~~

~~State in the Union. The emigration to the land of gold was continued, with but little abatement, during the three succeeding years; but the excitement fell off in a marked degree in 1854, at which time there was a decided reaction throughout the United States in regard to mining matters. The Californian discoveries had given rise to a general search for metalliferous deposits in the Atlantic States; and this had been followed by wild speculations, a great deal of money having been sunk in opening new mines, and in attempting to develop old ones which had never yielded anything of value. How many miners were actually at work in California at the time of the greatest excitement can only be a matter of conjecture. It is generally believed that not less than 50,000 men were engaged in mining for gold at the close of the year 1850. Those who had good opportunities for observing think that there were as many as 100,000 at work in 1852 and in 1853. At the time of their greatest productiveness, the yield of the Californian gold washings reached about sixty- five millions of dollars in value a year; this was from 1850 to 1853. If there were 75,000 miners actually employed at this time, the average amount obtained must have been fully $8 a day per man. The average is thought by many to have been as high as $20 a day during the year follow- ing the first discovery. At this time the diggings for gold were chiefly along the rivers. These were "flumed,"— that is, the water was taken out of the natural channel by means of wooden flumes,—and the accumulations of sand and gravel in the former beds were washed. All the small "gulches " or ravines leading down the sides of the steep and narrow valleys, or cafions, were worked over, either with or without the aid of water. These were the first and richest "placers," and in them the precious metal was most unequally distributed. Those who first got hold of the rich bars on the American, Yuba, Feather, Stanislaus, and the other smaller streams in the heart of the gold region, made sometimes from one to five thousand dollars a day ; these rich spots were chiefly very limited in area, and after one was worked out, it might be days or weeks before another was found.~~

~~During the year 1851 the miners, not finding any longer room for employment on the river-bars, began to extend their " prospecting " to the higher ground, and it was not long before it was discovered that the so-called "high gravels"—that is, the detrital deposits of Tertiary age—contained gold, although the quantity was so small that washing it in the~~

~~ordinary way was not profitable. This led, in 1852, to the invention of the "hydraulic process" of working the auriferous detritus, the idea of which is due to E. E. Matteson, a native of Connecticut. This process has now received an immense development, successive improvements having been made in the method and the machinery for applying it, until the results have become indeed wonderful. The " sluice" which is used with it, and, in fact, in all gold-washing in California at present,— almost without exception,— is also a Californian invention. Previous to its introduction, first the " rocker" and then the "tom" were employed. During the first years of the Californian excitement there was much wandering about within the State and in the adjacent territories in search of new "diggings," the miners seeming to have the fixed idea~~

~~from the Tuolumne River to the Feather, a distance of 150 | that somewhere an auriferous centre or focus would be~~

~~miles. The first adventurers came from Mexico, the South~~

~~found, vastly richer than any thing previously discovered.~~

~~American coast, and even from the Sandwich Islands. _ The | They were an excitable body of men, and frequently left~~

~~valuable localities in search of something better, always hoping that deposits of unheard-of richness would be developed. Occasionally a kind of frenzy would seem to seize on them, and thousands would flock to some new and perhaps distant locality, on the strength of newspaper reports, where many would perish from disease and starvation, the rest returning in poverty and rags. Thus, in 1855, the Kern River fever raged through the State, at least 5000 miners going to that distant region of the Sierra, only to find that the gold deposits were limited in extent, and already worked out. In 1858 the " Fraser River rush" occurred; and this was more disastrous to California than the most deadly pestilence would have been; forit caused a terrible amount of suffering. Nearly 20,000 men left the State for that remote region, where few met with even moderate success, while all suffered great privations, and many died, the survivors coming back in a state of complete destitution. The shallow' placer diggings " of California are now pretty well worked out, and the gold at present is chiefly obtained from the hydraulic mining operations and from the quartz veins. The deep or high gravels, as they are indiscriminately called, and which are worked by the hydraulic process, lie chiefly in Nevada, Placer, and Sierra counties, in the region extending between the branches of the American and Yuba rivers. These gravels are usually associated with heavy deposits of volcanic materials, and, indeed, they are often entirely covered by immense flows of lava, under which the work- ings are carried by means of tunnels.~~

~~All the operations connected with the exploitation of the large hydraulic "claims" are usually on a grand scale. As much as twenty-five, or even fifty, tons of powder are sometimes used in a single blast to loosen the gravel, so that it can be acted on with ease by the jet of water thrown from the "pipes." To give an idea of the force of the agent thus employed, it may be stated that, when a six-inch nozzle is used, under a head of 300 feet, as is sometimes done, not less than 1600 cubic feet of water are discharged in one minute, with a velocity of 140 feet per second. The water, as it thus issues from the nozzle, feels to the touch like metal ; and it retains its cylindrical form unbroken until it strikes the gravel bank at a distance of a hundred or more feet. The detritus, thus powerfully acted on, crumbles~~

~~rapidly, and the disintegrated material is carried by the current into the sluice-boxes, where it leaves its auriferous particles in the "rifles," which are chinks or cavities between the bars or blocks of wood or stone with which the bottom of the sluice are lined. Gold-mining in the solid rock—or quartz-mining, as it is usually called, because the gangue or vei-stone which carries the gold is almost exclusively quartz—is also extensively carried on in California, having been begun as early as 1851. The mines are scattered over the State from San Diego to Plunias counties ; but the most important and productive ones are in Amador and Nevada. The distribution of the gold in the veins is exceedingly irregular, and, consequently, the business of quartz-mining has been, in most cases, a very uncertain one. A large number of the principal workings are on, or in the neighbourhood of, what is known in California as the " Great Quartz Vein," or the " Mother Lode," an immense development of quartz, which has been traced from Mariposa County to Amador, over a distance of eighty miles,—not continuously, but in a series of nearly parallel belts, or lenticular masses, with barren intervals between them ; these have very nearly the same direction, and are parallel with the axis of the Sierra. It is on the Great Quartz Vein that the celebrated Mariposa mines are situated ; which, however, have not, on the whole, proved successful. In the same position are the mines of Amador County, among which the one formerly called the Hayward Mine is~~

~~the best known, and for a long time one of the most profit- able. The mass of quartz worked in this mine was of great size, although of low tenure in gold. It was, for some years, the deepest mine in the country; but several of those on the Comstock Lode in Nevada have now attained a considerably greater depth.~~

~~Silver-mining has been attempted in many localities in Silver~~

~~California, and much money spent in trying to develop the argentiferous lodes which have from time to time been discovered. A few years ago, there was a great excitement on the very summit of the Sierra in regard to supposed valuable silver-bearing veins, and particularly at a locality called Meadow Lake, in Nevada County. Quite a number of mining camps and towns were built up, one of which had for a time several thousand~~

~~inhabitants. N othing permanently valuable was discovered, however, and the region was soon entirely abandoned. The most persistent efforts have been made, for the past ten years, to work argentiferous deposits in the volcanic rocks near the summit of the Sierra, in Alpine County, at and near Silver Moun- tain. Although it does not appear that any mine in this region has been successful, the expenditure is still kept up. Slate Range, a little to the east of Owen's Lake, was the scene of considerable excitement some ten or twelve years ago, rich silver ores having been discovered there; but it was found that mining could not be made profitable in that distant region destitute of water and fuel. Quite recently, the Panamint Range, in the same vicinity, has attracted much attention, The only paying silver mines in the State seem, however, to be those in the Inyo Range, at Cerro Gordo, where the ore is chiefly galena, rich in silver, and also containing considerable gold. The yield of this district in the year 1872 was nearly a million of dollars in value, six-tenths of which was silver.~~

~~Quicksilver has been extensively mined in California, the Quick~~

~~mine of this metal at New Almaden, Santa Clara County, having been worked previous to the gold excitement. All the workable deposits of cinnabar thus far known to exist are situated in the Coast Ranges, and they are chiefly limited to the metamorphic Cretaceous group of rocks, in .which they are associated with serpentine, imperfect jasper, horn- stone, and chalcedony. By far the most important mines are those at New Almaden, a few miles west of San Jose. These produced, in their palmy days, during the years 1853 to 1857, and 1861 to 1869, from 2,500,000 to 3,500,000 ib of quicksilver per annum. In 1870, the production had fallen off to 1,000,000 Ib. The total production of the New Almaden mines between 1850 and 1870 was a little over 40,000,000 tb. The New Idria Mine is in Monterey County, about ninety miles south of New Almaden. This has also been, for some years, a quicksilver-producing locality of considerable importance. Cinnabar also occurs in con- siderable quantity at numerous places north of the Bay of San Francisco, in Napa and Lake counties. The most important mine in this region is the Redington, near Knoxville, in Lake County, The export of this metal from California was, in former years, very large, reaching, in 1868, the amount of 44,506 flasks, or 3,404,709 tb; in 1870, it was only 6,359 flasks, although the production for that year was estimated~~

~~at 28,600 flasks, or 2,187,900 hb, of which 12,000 were the product of the New Almaden mine, 7600 of the New Idria, and of the remainder, about one-half was from the Redington, and the rest from various smaller mines north of the Bay of San Francisco.~~

~~Copper ores occur in a great many localities within the Copper~~

~~limits of the state of California, and at some of these a large amount of work has been done, although at the present time there does not seem to be a single locality where the ores of this metal are now mined. Quite large masses of nearly pure native copper, mixed with the red oxide have~~

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~~been found in tne north-western corner of the State, and also farther south in the Coast Ranges. No permanent mine has, however, yet been developed at any point on the west of the Great Valley. Jn the foot-hills of the Sierra, at a place known as Copperopolis, in Calaveras County, there is a very extensive deposit of copper ore, which was actively mined some ten years ago, producing very largely for a time. The mass of ore here was, in places, as much as 30 feet wide, although not of high grade. In 1864 the value of the shipments of copper ore from California was a little over a million dollars; this was almost all from one mine, the Union, at Copperopolis. Tin has been discovered at one locality in the southern part of the State, in the Temescal Range, about forty miles south-east of Los Angeles; and mining was attempted here, but the locality has been for some time abandoned. Zine and lead occur, in the form of the sulphuret, ina great number of the quartz veins of the gold-bearing belt ; they are geuerally present, however, only in small quantity, and have not been made the object of mining enterprise. Iron ores are also found, in several localities, in large quantity ; the want of suitable cheap fuel has prevented these ores from being utilized, and all the iron consumed on the Pacific coast comes from the Atlantic States or from Great Britain. Coal of the true Carboniferous period does not occur anywhere on the North American continent west of the eastern base of the Cordilleras; but there are, at various points, extensive deposits of lignite and imperfect coal; in some of these, the woody structure is entirely~~

~~obliterated, and the substance may with propriety be called coal. It is rarely the case, however, that it does not contain a large percentage of water. These deposits are both of Tertiary and Cretaceous age; but at the localities extensively worked in California and on Vancouver Island, the beds belong exclusively to the last-named group. The only mines of coal of any consequence in California are those of Monte Diablo, so called because situated on the 'north slope of that mountain, and a few miles from the entrance of the San Joaquin River into Suisun Bay. The coal raised at these inines is of tolerably good quality for domestic use; but it cannot be used for ocean steaming or for making gas, as it contains a large amount of sulphur, and from 10 to 12 per cent. of water. These mines have yielded of late about 175,000 tons per annum. There is also a large deposit of about the same quality, and the sanie geological age, on Eel River, in Mendocino County. This is too far from navigable water to be utilized at present, as it cannot compete with the more accessible deposits on Vancouver Island, and at Bellingham and Coos bays, or with those more recently opened near Seattle in Washington . Territory. Petroleum was thought likely, at one time, to become of great importance as a product of California, and several millions of dollars were expended in boring and searching for it, but almost entirely without success. The great bituminous slate formation, of Miocene age, which stretches along the coast from Monterey to Los Angeles, does, indeed, contain a large amount of combustible matter, which may at some future time become of economical value. At present there seems to be no immediate prospect of this ; and it is certain that the geological conditions are such that flowing wells, like those of Pennsylvania, will not be found on the Pacific coast. Borax is one of the mineral produc- tions of California, which is becoming of some importance. The value of the exports of this article from San Francisco in 1873 was over $400,000. Of this, however, a consider- able portion came from the adjacent State of Nevada. Sulphur has been mined in several localities, to some extent, for the manufacture of sulphuric acid. Marble occurs in many places in the Sierra Nevada, and is quarried for ordi- nary architectural purposes. Granite and freestone are abundantly distributed ; the former exists in inexhaustible~~

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quantity on the line of the Central Pacific Railroad, the latter near San Franciscv and in many other places in the Coast Ranges.

fauna.—Somewhat over a hundred species of mammalia Mammalia

have been found in California. Among the most interesting are the grizzly bear (Ursus horribilis), formerly very com- mon, but now only met with in out-of-the way localities ; they are especially abundant in the Coast Ranges south of Monterey—the Santa Lucia Range. They are savage and powerful animals, but do not care to attack men unless suddenly intruded upon, or when with their young. The black bear (U. americanus) is still pretty common in the higher parts of the mountains ; and the so-called cinnamon and brown bear are supposed to be varieties of this species. The sea lions (Humetopias stellert) are of little value com- mercially, but they excite a great deal of interest on account of their size, their strange gambols and extraordinary noises; they abound on the coast, and especially on the Farallones. Visitors to San Francisco from abroad rarely fail to go to the beach opposite Seal Rock, an isolated point near the city, and almost always crowded with these animals, whose curious habits can be watched from the mainland at a short distance. The beaver (Castor cana- densis) was formerly very common in the State, and many are still left. The spermophiles, or ground squirrels, are extremely abundant, and great nuisances; the ground is often honey-combed for miles with their burrows. The large hare-squirrel and the tiny pine-squirrel are common in the mountains. Gophers are very troublesome to the farmers; there are five species of them, the largest (Thomomys bulbivorus) being abundant in the central por- tion of the State near the coast. The elk (Cervus cana- densis), formerly found in great numbers in California, is now almost exterminated, unless it be in the northern counties, in the recesses of whose forests they may be still occasionally seen. The deer (C. lewcuwrus) is quite com- mon, at a distance from settlements, and especially in the southern High Sierra. A few antelopes are still met with ; but when the Aunericans first entered California, these animals were seen in immense herds all over the plains of the San Joaquin and Sacramento valleys. The mountain

sheep (Ovis montana) is also nearly exterminated. Of Birds.

~~birds, over three hundred and fifty species have been described as occurring in California. Some of the most characteristic of this State are the road-runner (Geococcyx californianus), nearly allied to the cuckoo, but like a pheasant in its habits of running and inability to fly; the California woodpecker (Melanerpes formicivorus), which has the curious habit of boring holes in the bark of trees and filling them with acorns, which fit most accurately and closely in the cavities thus made. The object of this arrangement appears to be, to allow the grubs to fatten inside the acorns, which thus in time are found to contain a nice meal for the provident bird. The California vulture (Cathartes californianus), the largest flying bird in North America, is not limited to this State, but is common there. The sage hen (Centrocercus urophasianus) is a fine game bird, fourid in abundance on the east slope of the Sierra, among the "sage-brush." Two species of quail are very abundant, and very characteristic, in the State,—Oreortyx pictus and Lophortyx californica, They both have elegant crests of long narrow feathers, in one species turned back- wards, in the other forwards. the coast; salmon are caught in great numbers in the Sacramento River, and are an important article of food, especially in Oregon. Sturgeon are also abundant; and as their flesh is sold at a very low price, it is much eaten by those who are obliged to be economical. The salmon is also in this respect a very valuable fish. The so-called " rock- fish" are among the fish most abundant in the San Fran-~~

~~Fish are very abundaut on Fishes.~~

~~704. C A rigs~~

~~cisco market, and perhaps the most characteristic. They belong to the genus Sebastes, and there are several species of different colours. Smelts are abundant; but they are not truo smelts, and are inferior to them as an article of food. There are several fish of the flat-fish family, and called soles and turbot; although in no case are the species identical with those found on the Atlantic coast orin Euroope. The Tom-cod is abundant in the winter months, and although sinall, it is one of the best of the fishes of the coast. The barracouta (Sphyrena argentea) is decidedly the best- flavoured fish found on the coast; but it is not at all common, The oysters of the Californian coast are small ; bat foreign ones are planted in the Bay of San Francisco,~~

~~where they grow rapidly. Hard-shell clams and mussels are abundant, and are eaten in considerable quantity. The haliotis called Abelone is taken in great numbers, but eaten exclusively by the Chinese. Crabs, lobsters, and shrimps, are abundant on the coast; and they are used to some extent as food. The variety of species of the crab family is very great, and some of them are very large. Quite serious attempts have been made, under the auspices of the United States Fish Commissioner, to introduce some of the eastern fishes into Californian waters, especially the shad; but these trials have not yet led to any satisfactory results,~~

~~Flora — The vegetation of California has many features of interest The great extent of the State and the varied character of its surface are strongly impressed upon its flora. A great number of botanists and professional seed collectors have visited California from time to time; but no general review of all the species has ever been made, although such a one is now in progress under the auspices of the Geological Survey. The entire number of species found in the State is estimated at about 2500. There is not so great a variety of forest-trees as would naturally have been expected ; and many of the most useful varieties are entirely wanting. The forests have, in places, and especially along the Sierra, at an elevation of from 2000 to 6000 or 7000 feet, a character of grandeur hardly surpassed in any part ofthe world. Many of the trees are of gigantic dimensions. Coniferous trees greatly predominate in the densely wooded portion of the State. Of the pines, the sugar pine (Pinus Lambertiana) is perhaps the finest tree, reaching occasionally 300 feet in height. Its wood is valuable for inside work, and it is much used in the Sierra, where the tree is chiefly found. This, and the Pinus Coulter, have cones of great size. Pinus sabiniana, the digger pine or nut pine, is the characteristic tree of the foot-hills of the Sierra, where it occurs associated with the black oak (Q. sonomensis), sparsely scattered over the hill- sides, and never in dense forests. This is the foot-hill arboreal vegetation, Rising a litle higher, at an elevation of 3000 to 5000 feet, the pitch pine (P. ponderosa), the sugar pine, the ,white or bastard cedar (Lzbocedrus decurrens), and the Douglas spruce (Abies Douglasw) are the predominating and characteristic trees. Still higher, the firs come in, namely the Picea grandis and the amabilis, as well as the tamarack pine (P. contorta). This belt ranges at from 7000 to 9000 feet elevation in the Sierra, through the central portion of the State. The big tree (Seqguovta gigantea)~~

~~belongs to the same belt as the sugar pine, Douglas spruce, and pitch pine. This tree occurs in groves or patches from latitude 36° to 38° 15', nowhere descending much below 4000 feet in elevation, or rising above 7000. There are eight or nine of these patches of big trees, and by far the largest is that one which extends along the tributaries of King's and Kaweah rivers, about thirty miles N,N.E. of Visalia. This belt is probably over ten miles in length, the trees are, however, not grouped by themselves, but stand scattered among other species.~~

~~ORNIA~~

~~| The tallest big tree yet discovered measures 352 feet in height, The circumference of the largest, near the ground sometimes reaches nearly 100 feet. Many are over fifty feet in circumference, at 6 feet above the ground. One in the Calaveras Grove, which was cut down, measured 24 feet and 1} inches in diameter, without the bark, at 6 feet above the ground ; this would probably have measured about 27 feet with the bark. Its age was a little less than 1300 years. As the big tree is exclusively limited to California and to the Sierra Nevada, so the only other species of the same genus, the redwood (S. sempervirens), is peculiarly a Coast Range tree. It is found chiefly in the counties north of San Francisco Bay, where it forms magnificent forests, exclusively limited to this one species.~~

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~~elevated, or too dry for cultivation under any circumstances. A considerable portion of the Great Valley will not yield sufficiently to pay for cultivation, uuless a thorough system of irrigation should be adopted. Extensive districts produce valuable crops when the season has been wet enough ; and an excess of rain which is injurious in one part of the State is of great benefit in another. The number of acres of "improved land" in the state, as given by the census of 1870, was 6,218,133 ; but Mr Hittell, in the third edition of his Resources of California, published in 1867, estimates the amount of cultivated land at only 1,000,000 acres. The same authority says, "' Not more than one acre in ten could now be tilled profitably." Allowing the census~~

~~returns to be correct, the proportion of improved land |~~

would be about one-eighteenth of the whole. Owing to the peculiarities of the climate, and especially its mildness in winter, and the dryness of tlie summer, the whole system of cultivation is very different in California from what it is in the Mississippi Valley and the Eastern States. If the season is favourable, that is, if rain falls in abundance by November, so that the ground becomes soft enough to plough, then sowing is begun at once, and the best crops are raised when the " latter rains,'—as they are usually called,—which fall in March and April, are tolerably abundant, and yet not so much so as to cause inundations. June and July are the harvest months, and the grain can

remain out of doors during the whole summer without ,

injury, or until it can be conveniently carried away, barns being little used. Almost everything, except ploughing,

scale, with the help of machinery ; and the profitable farms arc usually of great size, comprising many thousand acres.

wool, 11,391,743 tb ; potatoes, 2,049,227 bushels; wine, 1,814,656 gallons; butter, 7,969,744 Ib. Barley is the most certain crop raised, and wheat and wool are the most important for exportation. The Californian wheat is of the finest quality, and is largely shipped to foreign countries. In 1873, according to the statistics of the San Francisco Commercial [ferald, the shipments of wheat and flour were as follows :—to Great Britain, of flour, 245,708 barrels, and of wheat, 9,152,303 quintals; to China, flour, 125,891 barrels; to Central America, flour, 42,835 barrels; to Japan, flour, 9566 barrels; to Panama, flour, 12,777 barrels ; to Australia, wheat, 22,400, bushels; with other smaller amounts to numerous ports in and about the Pacific. The total shipments for the years 1871-1873 were as follows :—

Flour, barrels.

Wheat, quintals Barley, quintals.

Tel pgoedeeeeeeeene 232,094 1,311,679 12,371 S72 oeeeaaeeneeeeees 247,088 6,071,383 176,153 S72) Soeeeeeeee 479,417 9,175,960 260,890

~~Fruit is an item of great importance in the agriculture of California, the quantity raised being very large, and the quality excellent. The pear, plum, apricot, and grape are especially good ; and large quantities would be sent to the Eastern States if the distance were not such as to make it difficult and expensive to transport this bulky and perish- able commodity. A large amount of capital has been invested in the manufacture of wine. As early as 1861 a million of gallons were made in that year, and in 1870 the product was estimated at 2,500,000 gallons. The principal wine-producing districts are in the vicinity of Sonoma, north of the Bay of San Francisco, and in the region about Los Angeles. 'The value of the exports of wine has not increased much in the last three or four years; in 187 3 it was $356,373. The quantity of wine which might be produced in California, if there were a market for it, would~~

~~be very large; but the quality is not all that could be desired, although the persons engaged in this business are sanguine in the belief that, with time and experience, the difficulties will be overcome, and their products be largely in demand in the Eastern States where at present there is scarcely any sale for them.~~

~~California is a country particularly adapted to raising sheep, and the wool interest is a very important one. The winters are so mild that shelter for the flocks is not required, and they have no other food than that which they pick up for themselves on the lower plains in winter, and in the higher mountain valleys in the summer. The summit valleys of the Sierra are literally alive with sheep during the months of July, August, and September, count- less herds being driven there from the parched-up plains at the base of the range. In 1873, according to the Com- mercia) Herald, about 30,000,000 tb of wool were exported from San Francisco, and 3000000 ib consumed in the home manufactories.~~

~~Manufactures.—The value of the manufactures of Cali- fornia is given, in the census report of 1870, at $66,594 536 the increase having been rapid within the past ten years ; previous to 1860 almost every manufactured article used in the State was imported from the East or from Europe. The great distance of the Pacific coast from the manufac- turing districts of the~~

~~world offers a heavy premium for the establishment of various industries, especially for those which furnish bulky and inexpensive products, such as~~

~~| wooden wares, agricultural implements, machinery, coarse iu connection with agricultural work, is done on a large |~~

~~articles of clothing, and vehicles. The drawbacks are, the~~

~~_ high price of labour, where the Chinese cannot be employed ; the absence of good coal, and the scarcity of other fuel ; According to the census of 1870, the amount of the prin- | cipal productions of the soil was in that year as follows :— wheat, 16,676,702 bushels; barley, 8,780,490 bushels; |~~

~~the distance of the water-power from the principal markets, and its high cost at all points, which is due to the necessity of building long canals, dams, and other appliances for storing and utilizing the water; and the absence of those woods which are most needed for the innumerable uses to which this material is put in manufacturing. There are certain articles, however, which have to be made in Calli- fornia, because the people of other countries find it difficult to ascertain exactly what is needed to meet the require- ments of the Pacific coast. Thus, mining machinery is a very important article of Californian manufacture, and many improvements have been made in this department, called out by the peculiar wants of this State and of Nevada. The manufacture of heavy woollen goods, especially blankets, is an item of importance, there being three large establish- ments of this kind in San Francisco. Leather is tanned in considerable quantity in the coast counties, and the exports of this article amounted in value, in 1872, to the sum of $258,692. Boots and shoes are manufactured in large quantity for home consumption and from native leather.~~

~~Population.—The population of California is concen- trated in and around San Francisco ; and it becomes rapidly less dense as one recedes from the centre. The extreme northern and southern counties are very thinly inhabited. The ceutral part of the State, embraced between the parallels of 36° 20’ and 40° including only one-third of its whole area, contained in 1865 over ninety-five per cent. of the population. A region of 4000 square miles adjacent to the Bay of San Francisco includes probably half of the entire number of inhabitants in the State,—San Francisco alone, by the last~~

~~census, having 38 per cent. of the whole. The reasons of this concentration around the bay are not diffi- cult to find; the climate is more agreeable and healthier, and the valleys which open out to its waters are the most delightful and most fertile portions of the state. The desire of concentration is strongly felt in a region where the country is so thinly settled, and — ee~~

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~~of communication are not great, and schools and churches far apart, or wanting altogether. Those who have made fortunes in mining come to "the Bay" to spend thei ; those who have lost their all, or become ' strapped,"— to use the miner's phrase,—go to the great city to find employment. And San Francisco is not only the metro- polis of California, but of the whole Pacific coast. There is not another city or town having one-teuth of its popu- lation anywhere from Alaska to Panama. It has the only really good harbour along the entire line of coast from Lower California north to Puget Sound, that of San Diego excepted, and this has a desert region behind it, where settlements cannot be made. The population of San Francisco, by the census of 1870, was 149,473, having increased to that number in the previous decade from 56,802, the gain of the city being relatively consider- ably greater than that of the State itself. Sacramento city, the capital, is the only other town in California which has as much as one-tenth of this number. It is claimed, indeed, that the present (1876) population of San Francisco is not less than 250,000, the increase having been unusually large during the past year, which has been, on the whole, a very prosperous one for the State. The other large towns are—Sacramento, 16,283; Oakland, 10,500; San Jose, 9089; Grass Valley, 7063 ; and Los Angeles, 5728,—all these figures being those of the census of 1870. The population of the whole State, according to the same authority, was, in 1870, 582,021, an increase of 53 per cent. since the previous census of 1860. The growth of California has not been in the years from 1860 to 1870 as rapid as in the decade preceding that, when the increase amounted to 310 per cent. Remarkable as has been the development of this State, it does not equal that of some of those of the Mississippi Valley during the same period. Thus Iowa gained more between the years 1860 and 1870 than did California,~~

~~although having only one-third of the area of that State ; and in the decade previous to that her gain was relatively nearly equal to that of the Golden State, and actually twice as great. The actual increase of popula- tion in Massachusetts, with its area of only 7800 square miles, was greater in the years 1860-1870 than was that of California.~~

~~The brilliant discoveries of metalliferous deposits in Nevada, wholly developed within the past fifteen years, have added much to the wealth and resources of California, for the ties of business are nearly as strong between the two States as if there were no political line of division between them. Nearly all the capital invested in the region at the eastern base of the Sierra came from the Pacific side of the mountains, and most of the machinery used there has been constructed in San Francisco. Nevada takes a large amount of the surplus agricultural products of California, and gives bullion in exchange, that being the only thing she produces for exportation.~~

~~The Chinese element in California is a peculiar and~~

~~interesting feature. By the last census there were 49.310 of that race in the State. They are settled in great numbers in San Francisco, where they are house-servants, and opera- tives in the manufacturing establishments, which could not be successfully carried on with white labour. They also work the abandoned placers, although the amount of their gains in this operation must usually be very small, as the are only allowed to occupy spots supposed by the white men to have been quite worked out. 'The white miners have a great dislike to Chinamen, who are frequently driven away from their claims, and expelled from districts by mobs. In such cases the officers of the law do not ordinarily interfere ; and, no matter how much the unfor- tunate yellow men may be beaten or despoiled, the law does not attempt to restore them to their rights or avenge their wrongs" (Hittell, in Resowrces of California, 3d ed. p. 375).~~

~~General Considerations.—Finally, California lias in its favour its immense extent of area, its variety of physical configuration, the fertility of a portion of its soil, and, above all, the mildness and attractiveness of its climate. Its position on the Pacific is one which justifies the confident expectation that~~

~~the commercial interests of San Francisco will continue to increase in magnitude, since it must always concentrate the trade of an immense area. There are some conditions which may eventually operate powerfully to retard the development of this State. Of these the most important is, perhaps, the wastefulness of the present method of agriculture, by which crops are continually taken from the soil, and nothing restored to it. Another serious matter is the constant wholesale destruction of the forests going on in the Coast Ranges and in the Sierra; there is reason to fear that this will eventually have a disastrous effect on the regimen of the rivers, causing inundations in the spring and excessive droughts in summer. The danger from earthquakes has already been alluded to; and there is no question that it has had and will continue to have an influence in retarding the growth of the State, as there is not the least doubt that it similarly affects the whole South American Pacific coast. The facility with which the legislature can be manipulated, and brought to sanction schemes fraught with injury to the people, is not a circum- stance peculiar to California ; although, in several instances, heavy blows have in this way been struck at the prosperity of San Francisco. The distrust of the legislature often leads the people to reject that which is good, from the fear that an undertaking which looks well at the start may be so managed as to result in ruin. Thus, it seems impossible to carry out any general system of irrigation, or of forest culture and preservation, desirable as these things may be, because the people have no confidence in anything which has to be managed by the legislature, or which can be interfered with by that body at any time, and diverted to the subservience of private ends, to the injury of the public. (5. D. Ww.)~~

~~CALIGULA, Carus Casar, the third of the Roman emperors, was the son of Germanicus and Agrippina, and was born in 12 a.p. He was brought up in his father's camp among the soldiers, and received the name Caligula, from the calige, or foot-soldiers' shoes, which he used to wear. In 32 he was summoned to Tiberius, who was then living at Caprez, and did all in his power to ingratiate himself with the tyrant. Perhaps about 35 he married his first wife, Junia Claudia, who died in the following year. Caligula seems then to have resolved upon obtaining the succession to the empire. For this purpose he leagued himself with Macro, commander of the pretorian guards,~~

~~whose wife he had seduced, and there can be no doubt that the death of Tiberius was hastened by one or both of them. The senate conferred the imperial power upon Caligula alone, although Tiberius, the grandson of the preceding emperor, had been designated as co-heir, and he entered on his first consulship in July 37. For an account of his reign and character see Roman History.~~

~~CALIPH, or Kua ir, the sovereign dignitary among the Mahometans, vested with an almost absolute authority in all matters relating to religion and civil polity. In the Arabic it signifies successor or vicar, the caliphs bearing the same relation to Mahomet that the popes, in~~

~~the estimation of Roman Catholics, bear to St Feter. It isat this day one of the titles of the grand seignior or sultan, who claims to be successor to Mahomet, through the line including Abu-Bekr, Oman, and Othman (the Sun- nite view), and also of the Sophi or Sufi of Persia as claimant through Ali (the Shiite view). The history of the rule of the Sophis may occasionally remind the student of the saying current respecting Russian autocracy some fifty years ago, that it was " despotism tempered by assassina- tion." When Louis XTV. was one day, in the presence of some courtiers, extolling the government of the Sophis as something approaching to an almost ideal excellence, the Marshal d'Estrees replied, "' But, sire, I have seen three of them strangled during my lifetime." One of the chief functions of the caliph, in his quality of imaum or chief priest of Islamism, was to begin the public prayers every Friday in the chief mosque, and to deliver the khootba or sermon. In after times they had assistants for this latter office ; but the former was always performed by the caliph in person, The caliph was also obliged to lead the pilgrims to Mecca in person, and to march at the head of the armies of his empire. He granted investiture to princes and sent swords, standards, gowns, and the like, as presents to princes of the Mahometan religion, who, though they had thrown off the yoke of the caliphate, held of it as vassals. The caliphs usually went to the mosque mounted on mules; and the Seljukian sultans, though masters of Baghdad, held their stirrups and led their mules by the bridle some distance on foot, till the caliphs gave~~

~~them the sign to mount on _ horseback, At a window of the caliph's palace there always hung a piece of black velvet 20 cubits long, which reached to the ground, and was called the caliph's sleeve ; this the grandees of his court kissed daily with great respect. After the destruction of the caliphate by Hulagu, the Maho- wetan princes appointed a particular officer in their respec- tive dominions to sustain the sacred authority of caliph. In Turkey this officer is called mufti, and in Persia sadne. The successions of caliphs continued from the death of Mahomet till the 655th year of the Hegira, when Baghdad was taken by the Tatars, After this, however, there were persons who claimed the caliphate, as pretending to be of the family of the Abbassides, and to them the sultans of Egypt rendered great honours at Cairo, as the true successors of Mahomet ; but this honour was merely titular, and the right allowed them only in matters of religion; and though they bore the sovereign title of caliphs, they were subjects and dependents of the sultans. In the year of the Hegira 361, a kind of caliphate was erected by the Fatimites in Africa, and lasted till it was suppressed by~~

~~'Saladin. Historians also speak of a third caliphate in~~

~~Yemen or Arabia Felix, erected by some princes of the family of the Jobites. The emperors of Marocco assume the title of grand scherifs, and pretend to be the true~~

~~_ caliphs, or successors of Mahomet, though under another~~

~~name. For particulars concerning the caliphs and caliphate~~

~~_ see works bearing on Mahometan rule, such as Ockley's~~

~~History of the Saracens ; Gibbon's Decline and Fall, chap. I.; Von Hammer, Histoire des Ottomans ; and for a brief survey, Freeman's [Zistory and Conquests of the Saracens, Oxford, 1856. See also articles ABBASSIDES and MAHOMET- ANISM,~~

~~CALISTHENICS. See Gymnastics.~~

~~CALITRI, a town of Italy, in the province of Principato Ulteriore and district of Sant? Angelo de' Lombardi, about 40 miles §.E. of Benevento. It~~

~~is situated on an eminence hear the River Ofanto, and is supposed to occupy the site of an ancient town called Aletrium. Its principal buildings are the parish church and a Benedictine convent. Popula- tion, 6629~~

~~CALIXTUS, the name of three differcnt popes or bishops of Rome. Little is known of Catrxrus I., bishop of Rome from about 220-226 a.p., during the reigns of Heliogabalus and Severus. Catrxrus IL., Guido of Vienne, was elected in 1119, after the death of Gelasius IT. Tn 1122 he concluded with the Emperor Henry the important treaty of Mentz, by which the mutual rights of the church and the empire were definitely settled. He died in December 1124. Caxrxtus III., Alphonso de Borgia, was raised to the Papal chair in 1455 at a very advanced age. He was feeble and incompetent. The great object of his policy was the excitement of a crusade against the Turks, but he did not find the Christian princes responsive to his call. He died in 1458.~~

~~CALIXTUS, Grorcius (1586-1656), a celebrated Lutheran divine, born at Middleburg in Holstein in 1586, After studying at Helmstadt, Jena, Giessen, Tiibingen, and Heidelberg, he had an opportunity of travelling through France and England, where he became acquainted with the leading Reformers, and saw the different forms which the Reformed church had assumed. On his return he was appointed professor of divinity at Helmstadt by the duke of Brunswick, who had admired his abilities in a contest which he had when a young man with the Jesuit Augustine Turrianus. After becoming a master of arts he published a book, Disputationes de Preecipuis Religionis Christiane Capitibus, which provoked the hostile criticism of several learned men; and on his elevation to the professorship he published his Lpitome of Theology, and soon after his Lipitome of Moral Theology, which gave so great offence as to induce Statius Buscher to charge him with a secret leaning to Romanism. Scarcely had he refuted the accusa- tion of Buscher, when, on account of his intimacy with the Reformed divines at the conference of Thorn, and his desire to unite them with the Lutherans, a new charge was preferred against him, principally at the instance of Calovius, of a secret attachment to Calvinism. The disputes to which this gave rise, known in the church as the Syncretistic controversy, lasted during the whole lifetime of Calixtus, and distracted the Lutheran Church, till a new controversy arose with Spener and the Pietists of Halle. Calixtus died in~~

1656. There is a monograph on Calixtus by Henke, 2 vols. 1853-56 ; see also Dorner, Gesch. d. Protest. Theol., pp. 606-624.

CALLAO, the chief port of Peru, lies 84 miles from Lima, the capital city, in 12° 4'S. lat., 77° 13' W. long. It is built on a flat point of land in the recess of a spacious and well-sheltered bay, which is partly enclosed by the islands of San Lorenzo and Fronton, and affords the best anchorage on the Peruvian coast. The modern town lies half a mile north of the site of an older city, destroyed. by an earthquake and invasion of the sea in 1746. It con- sists mainly of houses built of wicker-work and plastered with mud, stronger buildings being dangerous from the frequency of earthquakes; but a walled quadrangular fortress, built by the Spanish Government between 1770 and 1775, extends over about 15 acres, and is now used for the custom-house offices and stores. There are also several forts mounting cannon, and among the public buildings are the military and naval Government offices and barracks, three Catholic churches and a Protestant

| chapel, two clubs, a hospital, and four banks. Several

newspapers are published in the town. Callao 'is the headquarters of the Pacific Steam Navigation Company in South America (incorporated in 1840), and the works in connection with their large fleet of steam-vessels—foundries, carpenters' shops, flour-mills, bakeries, and gas- works—occupy a large area near the custom-house. A large steam sugar-refinery is also in operation. Harbour works, consisting of sea walls of concrete blocks, and docks, with

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berthing space for thirty large vessels, begun in 1871, were completed in February 1875, superseding the old and inconvenient pier and boat harbour. These works comprise also eighteen steam-cranes for loading goods, a triple line of railway along the dock walls, gas illumination, and supplies of fresh water. A floating dock, 300 feet in length, capable of taking up a vessel of 21 feet draught, and 5000 tons weight, was built in Glasgow and sent out to Callao harbour in 1863. The phenomenon of the bubbling up of sulphuretted hydrogen gas in the harbour, known as " Callao painter," from its action on the paint of ships, has generally been ascribed to volcanic

~~action, the belief having been that Callao is in the crater of an extinct volcano ; but the borings for the new works discovered the cause of this to be in strongly impregnated springs forcing their way up through a stratum of clay and mud. Callao communicates with Lima by carriage road, and by a railway, completed in 1852, which is now extended through the capital towards Oroya over the Maritime Andes. The Pacific Company despatches or receives an ocean steamer almost every week to or from Liverpool by Valparaiso, the Strait of Magellan, and Rio de Janeiro ; a separate bi-weekly steam line unites the port with Valparaiso, and communi- cation is maintained with Panama by steamers four times a month each way. French and German steam lines have also headquarters at Callao. Trade is carried on mainly with Britain, the United States, France, Italy, Germany, Norway, and Central America, an average of nearly 2000 vessels entering the harbour annually, and frequently clearing in ballast for the Guano Islands, although expor- tation from the former main source of supply of guano — the Chincha Islands — ceased in 1872. This substance continues to be the most valuable export; after it come sugar, cotton, wool, hides, silver, and gold. Callao imports timber and railway material, wheat, ice, cattle, coal, and mixed cargoes of manufactures from foreign countries, and considerable quantities of flour from Chili. The whole value of imports and exports exceeds £6,000,000 annually. Since 1850, with the exception of the years between 1856 and 1861, when the immigration was prohibited by Congress, Chinese coolies have been imported in consider- able numbers through Callao froin the Portuguese possession of Macao in China. Perhaps 100,000 male Chinese have been introduced under contracts to serve for eight years ; the passages have too often been attended with great hard- ships and frightful mortality, but the Chinese prove valuable workers on the great railroads now constructing in Peru.~~

~~Though the climate of Callao is good, having the pure breeze from the Pacific, and a temperature rarely exceeding 77° or falling below 65° Fahr., yet, in the absence of all hygiene, diseases, such as fevers and smallpox, are very prevalent, and the rate of mortality is high. The popula- tion, in default of recent exact enumeration, may be taken at from 15,000 to 18,000 ; the census of 1866, the latest, gave 14,800, a decrease of upwards of 2000 in seven years, and the number was further reduced by the havoc made by~~

~~yellow fever in 1868. The traffic and business, and with these probably the population, of the port are, however, increasing.~~

~~CALLCOTT, Str Aucustus Watt (1779-1844), Knt., R.A., one of the most distinguished of English landscape painters, was born at Kensington in 1779, and died there in 1844. His first study was music; and he sang for several years in the choir of Westminster Abbey. But at the age of twenty he had determined to give up music, and had exhibited his first painting at the Royal Academy. He gradually rose to distinction, and was elected an associate in 1807 and an academician in 1810. In 1827 he received the honour of knighthood ; and, seven years later, was appointed surveyor of the royal pictures. His two prin-~~

~~cipal subject pictures—Raphael and the Fornarina, and Milton dictating to his Daughters, are much inferior to his landscapes, which are placed in the highest class by their refined taste and quiet beauty. Callcott always chose to paint nature in her lovely and placid aspect; and has therefore been called the English Claude.~~

~~CALLCOTT, Jonn Watt (1766-1821), brother of the preceding, was born at Kensington in 1766, and was the son of a builder. At the age of seven he was sent to a neighbouring day school, where he continued for five years, studying chiefly Latin and Greek. During this time he frequently went to Kensington church, in the repairs of which his father was employed, and the impression he received on hearing the organ of that church seems to have roused his love for music. The organist at that time was Henry Whitney, from whom Callcott received his first iwnusical instruction. He did not, however, choose music ag a profession, being desirous to become a surgeon, only when on witnessing a surgical operation he found his nervous system seriously affected by the sight, he determined to devote himself to music. His intimacy with Dr Arnold and other leading musicians of the day procured him access to artistic circles; and his successful competition for the prize offered by a musical society called the "Catch Club" soon spread his reputation as composer of glees, catches, canons, and other pieces of concerted vocal music. On these his reputation as a creative musician is mainly founded. In them he displays considerable skill and talent, and some~~

~~of his glees retain their popularity at the present day. They are well adapted to the voice, and their melodies are pleasing and not without feeling. As an instrumental composer Callcott never succeeded, not even after he had taken lessons from Haydn. But of far greater importance than his compositions are his theoretical writings, and it is chiefly for the sake of the latter that he is noteworthy beyond other English composers of equal merit. His Musical Grammar, published in 1806 (3d edition, 1817), was long considered as the standard work of musical instruction in this country, and has not been superseded up to the present day by any other book produced by an English musician. It is a scholarly and lucid treatment of the rudiments of the art, but at present, of course, antiquated to a great extent, and, indeed, all but useless to the student of modern music. Callcott wasa much esteemed teacher of music for many years. Healso held the position of organist at various churches. In 1800 he took his degree of Mus. D. at Oxford, and in 1805 he succeeded Dr Crotch as musical lecturer at the Royal Institution. Towards the end of his life his artistic career was frequently interrupted by ill-health. He died, after much suffering, in 1821. A posthumous collection of his most favourite vocal pieces was published with memoir of his life by his son-in-law, Mr W. Horsley, him- self a composer of note. Numerous other works remain in manuscript.~~

~~CALLCOTT, Mrs Marra Granam (1786-1844), daughter of Admiral Dundas, became the wife of Sit Augustus Callcott in 1827. With her first husband, Capt. Graham, R.N., she travelled in India, South Africa, and South America, where she acted for some time as teacher of Donna Maria, who became queen of Portugal in 1826; and in the company of her second husband she spent much time in the south of Europe. She published accounts of her visits to India (1812), and to the environs of Rome (1820) ; Memoirs of Poussin (1820) ; a History of France; a History of Spain (1828); Hssays toward a History of Painting (1836); Little Arthur's History of England | (1836); and the Seriptwre Herbal (1842). ; |~~

~~CALLIMACHUS, a celebrated Greek poet, was a native of Cyrene, and a descendant of the illustrious house of~~

~~the Battiade, whence by Ovid and others he is called Battiades. He flourished under Ptolemies Philadelphus and Euergetes, and probably succeeded Zenodotus as chief librarian of the famous Alexandrian library, an office he held from about 260 B.c. till his death, which took place about 240 Bc. He was regarded, according to Quintilian, as the prince of Greek elegiac poets. His style is elegant and nervous, yet his excellences are rather the result of excessive elaboration than of genuine poetic power: hence Ovid (Am., i. 15) says of him—Quamvis ingenio non valet, arte valet. Perhaps the Hymn to Apollo should be excepted from this criticism. Callimachus was a learned critic and grammarian, and the instructor of Eratosthenes, Aristo- phanes of Byzantium, and Apollonius Rhodius. He wrote in prose and in verse on a great variety of subjects; but his only existing works are six hymns, seventy-three epigrams, and some fragments of elegies. Of the various imitations of Callimachus by the Roman poets, the small poem by Catullus, De comu Berenices, is the most cele- brated.~~

~~Among the numerous editions of his works the following may be noticed : —By Grevius with Spanheim's Commentary, Utrecht, 1697 ; by Ernesti, Leyden, 1761 ; by Bloomfield, Lond., 1815; by Volzer, Lips. 1817 ; Fragmenta, by Neke, 1844; Hymni et Ept- grammata, by Meineke, 1861; Callimachea, by Schneider,—i. (Hymni), 1870, ii., 1847.~~

~~CALLIMACHUS, an architect and statuary, the in- ventor of the Corinthian column, was probably a native of Corinth. He is said to have derived the idea of the Corinthian capital from observing an acanthus plant sur- rounding a tile-covered basket which had been placed over atomb, His era is uncertain ; but as the Corinthian column was used in 396 B.c., by Scopas, the architect of the temple of Athena Alea at Tegea, he must have lived before that time. Though Callimachus worked admirably in inarble he is said to have spoiled his original couceptions by excessive elaboration, which rendered his style artificial. (ey, H7., xxxiv. 8, s. 19.)~~

~~CALLIOPE, the muse of epic poetry. She was so named from the sweetness of her voice, and was the last of the nine sisters. Her distinguishing office was to record heroic actions; and she-is represented with a tablet and style, or a roll of paper in her hand. See Muses.~~

~~CALLIRRHOE, in Greek legend, was a daughter of the river god Achelous, and becaine the wife of Alemzon, who had wandered from Argos to be purified in the water of the Achelous from the crime of having killed his mother Kriphyle. He had taken with him from Argos the ill- omened necklace and peplos of Harmonia, with which his mother had been misled by Polynices, but he had left them in Arcadia. Callirrhoe pressed so hard to obtain them that he was compelled to go for that purpose to Phegeus, the king of Psophis in Arcadia, with whom he had left them. While returning he was waylaid by Phegeus and killed. Callirrhoe now implored the gods to cause her two young sons to grow at once to manhood to avenge their father's death. This was granted, and her sons slew Phegeus with his two sons, and returning with the necklace and peplos, dedicated them at Delphi.~~

~~CALLISTHENES, a philosopher of Olynthus, and a relation and pupil of Aristotle, through whose recommen- dation he was appointed to attend Alexander in his Asiatic expedition, 334 B.c. He had the imprudence to censure the conqueror's adoption of Oriental customs, inveighing especially against the servile ceremony of adoration. Hav- ing by the boldness of his censures rendered himself highly obnoxious to the king, he was accused of being privy to a treasonable conspiracy; and after being kept in chains for seven months he died, either by torture, or of a disease arising from excessive obesity. Callisthenes wrote an~~

~~account of Alexander's expedition, a history of Greece, and other works, all of which have perished.~~

~~CALLISTO, in Greek Mythology, an Areadian nymph, who was transformed into a bear as a penalty for having born to Zeus a son, Arcas, from whom the Arcadians, or bear-people, derived their name (Ovid, JJetam., ii. 468, fol.) Arcas, when hunting, encountered the bear Callisto, and would have shot her, had not Zeus with swift wind carried up both to the skies, where he placed them as a constellation. Artemis, as goddess of hunting, was styled Callisto in Arcadia, and had the symbol of a bear.~~

~~CALLISTRATUS, an Athenian orator, whose eloquence made such an impression on Demosthenes that he resolved to devote himself to oratory.~~

~~On account of the surrender of Oropus to the Thebans Callistratus, despite his magnifi- cent defence, was condemned to death, 361 B.c. He fled to Methone in Macedonia, where it is said he founded the city of Datum, afterwards Philippi. Having returned to Athens, he was put to death.~~

~~CALLISTRATUS, an Athenian poet, whose works have nearly all perished. He is now only known as the author of the hymn in honour of Harmodius and Aristogiton, who fell in their attempt to put down the dynasty of the Pisistratide at Athens. This ode, which is contained in Athenzus, has been beautifully translated by Thomas Moore.~~

~~CALLOT, Jacques (1593-1635), a French engraver, was born in 1593 at Nancy in Lorraine, where his father was a herald at arms. He early discovered a very strong predilection for art, and at the age of twelve quitted home without his father's consent, and set out for Rome, where he intended to prosecute his studies. Being utterly destitute of funds he joined a troop of Bohemians, and arrived in their company at Florence. In this city he had the good fortune to attract the notice of a gentleman of the court, who supplied him with the means of study ; but he removed in a short time to Rome, where, however, he was recognized by some relatives, who immediately compelled him to return home. Two years after this, and when only fourteen years old, he again left France contrary to the wishes of his friends, and reached Turin before he was over- taken by his elder brother, who had been despatched in quest of him. As his enthusiasm for art remained undiminished after these disappointments, he was at last allowed to accompany the duke of Lorraine's envoy to the Papal court. His first care was to study the art of design, of which in a short time he became a perfect master. Philip Thomasin instructed him in the use of the graver, which, however, he ultimately abandoned, substituting the point as better adapted for his purposes, From Rome he went to Florence, where he remained till the death of Cosmo IL, the Mzcenas of these times. On returning to his native country he was warmly received by the then duke of Lorraine, who admired and encouraged him. As his fame was now spread abroad in various countries of Europe, many distinguished persons gave him commissions to execute. By the Infanta Isabella, sovereign of the Low Countries, he was commissioned to engrave a design of the siege of Breda; and at the request of Louis XIIT. he designed the siege of Rochelle, and the~~

~~attack on the Isle of Ré. When, however, in 1631, he was desired by that monarch to execute an engraving of the siege of Nancy, which he had just taken, Callot refused, saying, "I would rather cut off my thumb than do anything against the honour of my prince and of my country ;" to which Louis replied—that the duke of Lorraine was happy in possessing such subjects as Callot. Shortly after this he returned to his native place, from which the king failed to allure him with the offer of a handsome pension. He died in 1635 at the age of forty-two. He engraved in all about 1600 pieces,~~

~~the best of which are those executed in aquafortis. No one ever possessed in a higher degree the talent for group- ing a large number of figures in a small space, and of repre- senting with two or three bold strokes the expression, action, and peculiar features of each individual. Freedom, variety, and naiveté characterize all his pieces. His Fairs, his Miseries of War, his Sieges, his Temptation of St Anthony, and his Conversion of St Paul will be sought after and admired as long as there are artists to learn and a public to appreciate.~~

~~CALMAR, or Kamar, the capital of a province of the same name in Sweden, on Calmar Sound opposite the island of Oland, about 190 miles from Stockholin, in 56° 40' N. lat., 16° 20' E. long. It is built on the island of Quarnholm, and communicates with the suburbs on the mainland by a bridge of boats. Most of the houses are built of wood; but the cathedral, erected in the 17th century by Nicodemus Tessin the younger, the castle, the town-house, and other public edifices are of stone, of which there are good quarries in the island of Oland. It has a gymnasium, and several smaller educational establishments. The harbour is safe and commodious, but a large part of the trade has been transferred to Stockholm. Besides its manufactures of woollen stuffs, leather, tobacco, and potash, the town carries on shipbuilding and an export trade in flax, timber, iron, alum, pitch, &c. Calmar was once a flourish- ing and strongly-fortified town ; and, previous to the con- flagration of 1647, was built on tle mainland. It is frequently mentioned both in the military and political annals of Sweden, and especially gives name to the treaty by which Sweden, Denmark, and~~

~~Norway were, in 1397, erected into one kingdom under Queen Margaret. Popula- tion in 1868, 9420.~~

~~CALMET, Dom Avcustinz (1672-1757), a scholar and Biblical critic, born at Mesnil-la-Horgne in Lorraine, in 1672. In his fifteenth year he went to the university of Pont-a-Mousson, which he attended for a single session. In 1688 he joined the Benedictines at the abbey of St Mansin, into whose order he was publicly received in the following year. His theological and philosophical studies he com- pleted at the abbey of Munster, to which he was sent in 1704 with the rank of sub-prior. He here organized an academy of eight or ten monks, the sole business of whose life was to assist him in preparing his Commentary on the Bible. The publication of this voluminous work, begun in 1707, was not completed till 1716. Two years after this latter date he was rewarded for his services with a presenta- tion to the abbey of St Leopold at Nancy, and ten years after to that of Sénones, where he died in 1757. His attachment to his country and congregation was such, that he refused a bishopric iz partibus offered to him by Pope Benedict XIII. Besides his Commentary, he wrote many other works, of which the most important are his Histoire de l' Ancien et du Nouveau Testament, an introduc- tion to the Ecclesiastical Wistory of Fleury ; Dictionnaire historique, critique, et chronologique dela Bible, an extremely learned, but by no means judicious work; and Histoire unwerselle sacrée et profane, 15 vols. 4to. The Dictionary of the Bible has been translated into English, and is a well- known work.~~

~~CALMUCKS, Katmucks, or Katmurxs, a people of Mongolian race who inhabit various parts of the Russian and Chinese empires, as well as other portions of Central Asia. They are of the middle height, fairly proportioned, and of considerable strength ; their cheek-bones are pro- minent, the chin short, the nose turned up, the beard thin, and the hair scrubby. For the most part still in the nomadic stage, they inhabit conical felt tents, which they set up in regular lines like the streets of a town. Their wealth consists entirely in small but high-spirited~~

~~horses, excellent cattle, and broad-tailed, rough-fleeced sheep. 'They are so much addicted to gaming that they not unfrequently stake everything they~~

~~possess, {[n relj- gion they are adherents of Lamaism, and their conduct is greatly under the control of their priests. Their language is closely connected with Mongolian proper, and ig written with a similar alphabet ; its grammar and vocabulary have been made known to Europeans more especially by A. Zwick about 1853. Of their literature the great propor. tion is religious, and is derived from [Indian originals. he Siddhi Kiir, a collection of stories, which is one of their most famous productions, was published with a German translation, a glossary, and notes, by B. Jiilg, at Leipsic in 1866. As early as the 16th century the Calmucks pos- sessed an extensive district of Central Asia between the Altai mountains and the Thian Shan, and between the desert of Gobi and the Balkash or Tengis Lake ; and they were also settled in what is now the southern part of the Yeniseisk government, where indeed they were first met by Russian emigrants. At that time they bore the name of Derben Oirat, or Four Confederates, being divided into the four tribes of Jungars, Turguts, Khoshots, and Durbots, In the 17th century the Calmucks grew extremely strong, and after violent feuds united themselves, under the leader- ship of Batur and his son Galdan, into the powerful Jun- garian kingdom. 'The strife which preceded the unifica- tion occasioned important movements of some Calmuck bands towards the E. and 8.E. of Russia. Under Kour- liuk, the great mass of the Turguts appeared for the first time within the Russian territory on the eastern side of the Volga in 1630. They conquered the nomadic Nogais of the district, but on this first occasion turned back to the Kirghiz steppes. In 1636 as many as 50,000 dibithas, or more than 200,000 men and women crossed the Emba, and took possession of the Trans-Volga steppes of the present Astrakhan government ; and plundering incursions began to be made on the Russian settlements, in Saratoff, Penza, and Tamboff, while Tobolsk, in Siberia, had to defend itself with arms in 1646. After the fall of Keur liuk, in an attack on Astrakhan itself, the Calmucks became less aggressive, and in 1655 passed of their own accord under Russian authority. Down to the middle of the 18th century bands, however, continued to arrive, and the depredations on Russian ground did not cease during all the long reign of the Khan Ayuka (1670-1724), This chief more than once broke his oath to the Russian Govern- ment; but he also on several occasions supplied very important contingents to the imperial army. His power is shown by the fact that his court was visited in 1718 by an ambassador from China. In the reign of the Empress Catharine the Russian~~

~~Government created great discontent among the Calmucks by their general treatment, and still more by refusing to confirm Ubashi, the grandson of Ayuka, in his dignities. A Calmuck chieftain from Jun- garia skilfully took advantage of this condition of affairs to persuade Ubashi and his subjects to return to Jungaria, and attempt its conquest. The result was the wonderful and disastrous flight of the Calmucks from Russia in 177], so graphically described by De Quincey. The number of the fugitives amounted, according to some authorities, to 120,000. Harassed on all sides .by savage troops of Cossacks and Khirghises, the wretched Calmucks pursued their way across the barren steppes, and their main body was routed in a terrible battle on the shores of the Bal- kash. The remnauts were settled on the banks of the ll by the Chinese emperor Kien Long, and there their de-scendants are still to be fonnd. There still remained in Russia the Durbots, who were living in the Don territory, and those of the Astrakhan Calmucks who at the time of the flight happened to be on the right bank of the Volga.~~

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~~- mills, paper-mills, aud flour-mills in operation.~~

~~— In medicine.~~

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~~CAL—CAL~~

~~The total number now in the Russian empire may be esti- mated at 120,000. In the Chinese territory, where they are known as Eliots, or Oliits, their numbers are consider- able, but are not precisely known.~~

~~See Pallas, Mongolische Volkerschafien, 1776-1802 ; Bergmann, Nomadisehe Streifereien unter den Kalmiicken ; Helmersen, Dzr Teleakische See und die Teleuten in dstl. Aliat, 1838 ; Quatremére, "Qbserv. gcogr. et hist. sur les Calmouks," in Journ. des Savants, 1839; Honinaire de Hell, Les steppes de la mer Caspienne, 1843 ; Tchihatcheff, Voyage d' Altat, 1846 ; Semenoff, Slovar Ross. Timp.~~

~~CALNE, «a town of England, in the county of Wiltshire, connected with the Great Western railway system by a branch line opened in 1863, and situated abont 16 mile; directly east of Bath. It stands in a valley intersected by the little brook of Calne, and is surrounded by the high table-land of Marlborough Downs and Salisbury Plain. The town is clean and well paved, and contains an ancient church (St Mark's) with a tower by Inigo Jones, and a town-house considerably enlarged by the marquis of Lansdowne, whose seat of Bowood is about two miles distant. The educational establishments include Bentley's grammar school founded in 1660, national and infant schools, and an institution for training female servants, which was endowed by Mrs Guthrie, to whom the town is also indebted for a children's hospital. The principal trade of Calne is the curing of bacon; and there are also flax- The manufacture of broad cloth, at one time of great importance, is almost extinct. Calne formerly returned two members to parliament, but the number is now reduced to one. Population of the municipal borough in 1871, 2468, and of the parliamentary, 5315. From the remains found in the vicinity, Calne seems to have been an important Roman station. It was the occasional residence of the West Saxon kings; and is celebrated in legendary ecclesiastical history for the escape of Dunstan at the synod held there in 997.~~

~~CALOMEL, mercurous chloride, or subchloride of mereury (HgCl), is a compound of mercury of great value {t occurs uative as horn quicksilver in the mercury mines of Idria, at Obermoschel, in Bavaria, Horowitz in Bohemia, and Almaden in Spain, in the form of translucent tetragonal crystals, with an adamantine lustre, and a dirty white grey or brownish colour.~~

~~A great number of processes are available for the preparation of calomel for pharmaceutical purposes. The directions of the British Pharmacopaia are as follows :— Sulphate of mercury 10 oz., mercury 7 oz., common salt 5 oz, and boiling distilled water. The sulphate of mercury is to be moistened with part of the water, and it and the mercury rubbed up together until all metallic globules disappear. The salt is then added, and the whole thoroughly triturated, after which it is sublimed in a vessel of such capacity that the calomel, instead of forming a crystalline crust on the sides as it would do in a vessel of small dimensions, shall fall in the form of a fine~~

~~impalpable powder on the floor of the receiver. The sublimate is to be washed until the washings cease to be darkened on the addition of a drop of sulphide of ammonium. The reaction in the above case may be represented thus :~~

~~$HgSO_4 + Hg + 2NaCl = Na_2SO_4 + 2HgCl$. After thorough washing the calomel has to be dried at a temperature not exceeding 212° Fahr., and preserved in a Jar away from the light, exposure to which darkens it by partial decomposition into corrosive sublimate $HgCl_2$ and metallic mercury. Calomel when so prepared is a dull, heavy, white, nearly tasteless powder, which is rendered yellowish by trituration in a mortar or when heated. It 18 entirely insoluble in water, alcohol, or ether, and Volatilizes, below a red heat, without fusion. When sublimed in a confined chamber it forms a crust or cake,~~

~~wl the inner surface of which is covered with crystals in fine quadrangular prisms, having a transparent dirty-white appearance.~~

~~Calomel is one of the mildest and most frequently employed of all mercurial preparations, producing its effects with little localirritation. It exercises a powerful influence on the secreting organs, stimulating the liver and intestinal glands to increased activity, on which account it is much relied on in cases of functional derangement of the liver. It is usually combined with other remedial agents, each exercising an influence in modifying the effect or increasing the activity of the other. Thus as a purgative it is com- bined with jalap, scammony, colocynth, and other similar substances. The much used Plummer's pill, which is essentially the same as the compound calomel pill of the British Pharmacopeia, contains in addition to calomel an equal weight of oxysulphide of antimony, with guaiacum and castor oil. It is employed both in Europe and America as an alterative in chronic skin diseases, in liver affections, and in disorders of the digestive system. On account of its tastelessness calomel is a convenient aperient for children, who however appear to be less susceptible to its effects than adults. It has been used in very large doses in the treatment of cholera; and it is a convenient medium for producing salivation. Suspended in gum or glycerine water it has been used for hypodermic injection ; and in~~

~~the form of an ointment it is one of the most useful of external applications in the case of obstinate skin diseases.~~

~~CALONNE, Cartes ALEXANDRE DE (1734-1802), a French statesman, was born at Douai in 1734. He was descended from a good family and entered the profession of the law, in which he rapidly attained success. He became in succession advocate to the general council of Artois, procureur to the parliament of Douai, and finally master of requests, a dignity which gave him the right of sitting in the general council. He seems to have been a nan of great business capacity, gay and careless in tempera- ment, and thoroughly unscrupulous in political action. In the terrible crisis of affairs preceding the French Revolu- tion, when minister after minister tried in vain to replenish the exhausted royal treasury and was dismissed for want of success, Calonne was summoned to take tlie general control of affairs. He assumed office in 1783, and at first everything seemed to prosper. Money flowed in readily, and the gaiety of the minister gave courage to the court. But his prosperity was hollow and rested on no secure foundation. Calonne had levied taxes until it was impossible to extract more from the impoverished people. He had borrowed till his credit. was entirely gonc, and he at last found himself compelled to disclose to the king the true state of affairs, and to lay before him what in his opinion was the only measure that could restore France. The first step in this proposed plan was the convocation of the notables, and the writs summoning them were issued in December 1786. Onthe 22d February of the following year Calonne disclosed to the notables his anxiously expected scheme for reconstituting the finances. The main provisions of this plan were the redistribution of the taxes, so that the whole might not fall on the unprivileged classes, the imposition of a land tax on the revenues of the nobles, and of a similar tax un the incomes of the clergy, and the abolition of corvees and the gabelle. All Calonne's eloquence could not succeed in rendering this scheme palatable either to the notables or to the people. The noblesse and clergy strenuously resisted any attempt to infringe upon their privileges, and the people were begin- ning to feel that in a convocation assembled to settle the affairs of France the nation itself had no part. Calonne had opened the floodgates, and was powerless to resist the torrent. His fall, however, was primarily due to the~~

indignation of the court. He was dismissed from office in April, and exiled to Lorraine. Soon afterwards he passed over to England, and during his residence there kept up a polemical correspondence with Necker on the finances. In 1789, when the States-General were about to assemble, he crossed over to Flanders in the hope of being allowed to offer himself for election, but he was sternly forbidden to enter France. In revenge he joined the Bourbon party at Coblentz, wrote in their favour, and expended nearly all the fortune brought him by his wife, a wealthy widow. In 1802, having again taken up his abode in London, le received permission from Napoleon to return to France. He died 30th October 1802, about a month after his arrival in his native country. Calonne was the author of several works on the financial and political condition of France during the period of the Revolution, which are still of value.

CALPURNIUS, Tirvus, a Roman bucolic poet, under whose name eleven eclogues have been transmitted to us, is interesting as the first imitator of Virgil in pastoral poetry, and from the controversy respecting his date. His eclogues usually occur in MS. along with the Cynegeticon of Nemesianus, who undoubtedly flourished under Carinus (284 a.p.), aud hence he has been generally refcrred to the same epoch. 'This view is expressed in a famous passage of Gibbon (ch. xii.), where Calpurnius is cited as an authority for the spectacles exhibited with unusual splen- dour by Carinus. Gustavus Sarpe, in an ingenious disquisi- tion published in 1819, first maintained that Calpurnius had lived as early as the reign of Nero; his arguments have been repeated and greatly fortified by Moritz Haupt (1854), and have convinced the most recent authorities, Teuffel, the latest and most accurate historian of Latin literature, and Mr Pinder. This thesis would indeed be

untenable if the last four eclogues could be ascribed to-

Calpurnius, as they contain manifest imitations of Statius. Haupt, however, seems to have proved from internal evidence that they are the work of Nemesianus. Upon attentive consideration, however, it appears to the present writer that Calpurnius cannot have written either under Nero or under Carinus. 1. The first eclogue is indirectly dedicated to a sovercign,

~~complimented as the auspicious successor of a lawless tyrant, by whom a large proportion of the senate had been executed or imprisoned (ver. 60-62, 69-73). This censure is inapplicable to Carus, and the compliment could in no case have been addressed to his son and successor Carinus. It is almost equally inappro- priate to Nero's predecessor, Claudius, who was popular with the senate (Suet. in Claudio, 12, 46). 2. The acces- sion of the new emperor is hailed as the termination of war (Ecl. i. ver. 46-50) and the harbinger of a durable peace (i. 54; iv. 127, 131, and other passages). But Nero's accession took place at a period of profound peace, and Carinus's at one of extensive foreign hostilities. 3. Carinus cannot have been intended, inasmuch as no mention is made of his own or his father's military renown or of the association of his brother in the empire ; uor can he have been represented as favourable to the senate, which he notoriously detested (Vopiscus in Carino, c. 17). If, on the other hand, the poet had written to celebrate the acces- sion of Nero, he would not have omitted to celebrate the then omnipotent Agrippina. 4. Calpurnius's description of the games in the amphitheatre (#cl. 7) differs from the account of Vopiscus in the Augustan history,—whatever is especially celebrated by the one being omitted by the other. Calpurnius dwells wholly on the zoological, Vopiscus on the musical and dramatic features of the entertainment ; the former has not a word to say on the nova spectacula indicated by the latter as the distinguishing features of the show—the thousand pantomimists, the four~~

~~hundred performers on wind instruments, the wrsi mimym agentes, It may also be remarked that Calpurnius speaks of the amphitheatre as looking down upon the Tarpeian rock, which, according to the preferable opinion, was op the opposite side of the Capitoline hill to the Campus Martius, where the games were exhibited by Nero (Suet. in Nerone, 12).~~

~~It remains, therefore, to-discover an emperor to whom the panegyric of Calpurnius can apply, whose predecessor should have been a scourge to his subjects in general and to the senate in particular, and whose own accession at an early age should have been hailed asa pledge of permanent tranquillity—one, moreover, who should have exhibited public spectacles in the amphitheatre. All these conditions are fulfilled by Gordian IIT, whose~~

~~accession at the age of thirteen or sixteen (238 a.p.) closed a series of civil wars and revolts which had proved fatal to six emperors, while the character of Maximus, virtually his immediate prede. cessor, entirely corresponds to the description of Cal- purnius. Maximus's ferocity had been chiefly indulged at the expense of the senate (Capitolinus, passim), and the public relief at Gordian's accession is significantly expressed by the great preponderance of inscriptions celebrating the tranquillity, of which he was regarded as the harbinger, among the legends of the medals struck during his reign, Other medals attest the fact of his having exhibited wild beasts in the Flavian amphitheatre (Gori, vol. iii. pp. 115-121). It may be added that the imperial favourite upon whose patronage Calpurnius relies may be plausibly identified with Timesitheus, Gordian's virtuous ministerand father-in-law ; and that the mention (Zl. i. 77-78) of the comet which signalized the succession of the prince is illustrated by the appearance of a comet in China, which would probably be visible in Italy, in September 238, three months after Gordian's proclamation as sole emperor. (Williams, Chinese Observations of Comets, p. 21.) This comet continued visible in China for forty-one days. Calpurnius's statement that it had been conspicuons for twenty days when he wrote enables us, if our hypothesis be correct, to indicate the date of his literary début with remarkable precision.~~

~~In this case Calpurnius is not strictly entitled to the distinction of having led the way in the bucolic imitation of Virgil,—fragments of two anonymous eclogues having been recently discovered and published which undoubtedly belong to the age of Nero. He is, however, Virgil's first follower of any mark, and no important modification has been introduced into his treatment. He is unquestionably a skilful literary craftsman, a fair scholar and an apt courtier, and not devoid of real poetical feeling. The bastard style of pastoral cultivated by him, in which the description of nature is made the writer's pretext, while ingenious flattery is his real purpose, nevertheless excludes genuine pleasure, and consequently genuine poetical achieve- ment. He may be fairly compared to the minor poets of the reign of Anne. No biographical particulars respecting him are known except his complaints of his poverty.~~

~~Calpurnius was first printed in 1471, together with Silius Italicus- He has been frequently republished, generally in company wit Gratius and~~

~~Nemesianus. The best edition is in vol. ii. of Werns-~~

~~dorf's Poet Latini Minores. TVhe most recent is that by Glaeser, Gottingen, 1842. (R. G.)~~

~~CALTAGIRONE, or Catatacirong, a town of Sicily, the seat of a bishop, in the province of Catania, and about 34 miles S.W. of the city of that name, is situated on two rocky eminences united by a bridge, about 2170 feet above the level of the sea. It is well built and possesses a fine market-place, the ruins of a castle, a cathedral, several churches, and ten convents, a casa communale or town-house, built on ancient substructions, an orphanage, and @~~

~~CAL—~~

~~hospital. Its inhabitants are said to have a much greater amount of culture than is common in the provincial towns of Sicily, and great encouragement is given by the higher classes to the cause of education. The most remarkable industry in the town is the manufacture of terra-cotta figures, representing different types of Italian costume. The remains of an aqueduct, an ancient subterranean road cut out of the rock, and various mosaics and other antiquities discovered by excavation, show that the site of the town was already occupied at a very early date; and according to some an identification may be effected with Hybla Minor. The present city, however, owes its origin to the Saracens, who defeated the Greeks there in 831, and remained in possession till 1060. Population, 25,978. CALTANISETTA, or Catataniserta, the capital of a province of the same name in Sicily, is situated in an extensive and fertile plain, dominated by Monte San Giuliano, near the right bank of the Salso, 62 miles S.E. of Palermo. Itis well built, and contains several handsome edifices, is defended by a castle, and is the seat of judicial courts. In the neighbourhood, at Terra-Pilata, are several springs emitting hydrogen gas, a mud-volcano, and extensive sulphur-works ; and about 2 miles distant is the Abbey of Santo Spirito, founded by Roger I., where a great national festival is held every Whitmonday. The town is of Saracenic origin, as indeed its name suggests—Kalat-al-Nisa, the Ladies' Castle ; but it has been completely modernized. In 1820 the people of Palermo were defeated near it by the Neapolitan General Pepe. Population, 26,156. CALVADOS, a department in the north of France, extending from~~

~~48° 46’ to 49° 25’ N. lat., and from 0° 26’ E. to 1° 10’ W. long., formed out of that part of Lower Normandy which comprised Bessin, Bocage, the Champagne de Caen, Auge, and the western part of Lieuvin. It is said to have received its name from a ledge of rocks, stretching along the coast for a distance of about 15 miles between the mouths of the rivers Orne and Vire, on which the Calvados, a vessel of the Spanish Armada, was wrecked in 1588. It is bounded N. by the English Channel, E. by the department of Eure, 8. by that of Ome, W. by that of Manche, and has an area of 2132 square miles. ‘The southern part of the department is somewhat elevated, being crossed by a mountain range, and forms a continuation of the great water-shed between the basins of the Seine and Loire ; but the rest of the surface is gently undulating, and consists of extensive valleys watered by numerous streams which fall into the English Channel. The coast is high, and generally inaccessible, except at the mouths of the principal rivers, such as the Touques, the Dives, the Orne, and the Vire, which are navigable at high tide for several miles inland, and are indicated by lighthouses at their mouths. The valleys, which generally slope in a direction from south to north, afford abundant pasturage for horses and cattle, and the agriculture of the district is superior to that of most of the other departments. Wheat, potatoes, and all kinds of vegetables are raised in great quantities for the markets of the interior and for exportation. The orchards of the Auge district produce a very superior kind of cider, of which upwards of 30,000,000 gallons are made in the department ; while Isigny is the centre of a large domestic and export trade in butter, cheese, and other dairy produce. Poultry is reared to a considerable extent for the Paris market. In the larger towns, of which on account of the agricultural pursuits of the inhabitants there are very few, there are manufactories of lace, woollen yarn and cloth, linen, calicoes, flannel, shawls, cutlery, and earthenware. Besides these the paper-mills, oil-mills, tanneries, refineries of beet-root and foreign sugar, distilleries, and bleach-fields, scattered throughout the department, give employment to~~

~~| a great number of hands.~~

~~Although seams of coal are found and wrought at Ligny, most of the coal used in the department is imported from England or Belgium. Build- ing stone and fuller's earth are plentiful. The fisheries along the coast are extensively prosecuted for Parisian consumpt, and consist chiefly of lobster, oyster, herring, and mackerel fishing. There is a canal from Caen to Ouistreham. A line of railway from Paris to Cherbourg runs through the country and gives off five branches. The department is divided into six arrondissements,——Caen, Falaise, Bayeux, Vire, Lisieux, and Pont I'nivéque, the chief towns of which bear the same name. ' The principal port is Honfleur. The population in]872 was 454,012.~~

~~CALVART, Denis (1555-1619), a Flemish painter, born at Antwerp in 1555. After studying landscape- painting for some time in his native city he went to Bologna, where he perfected himself in the anatomy of the human form under Prospero Fontana, and so completely lost the mannerism of Flemish art that his paintings appear to be the work of an Italian. From Bologna he went to Rome, where he assisted Sabbatini in his works for the Papal palace, and devoted much of his time to copying and studying the works of Raffaelle. He ultimately returned to Bologna, and founded a school, of which the greatest ornaments are Guido and Domenichino. His works are especially admired for the power of grouping and colouring which they display. He died at Bologna in 1619~~

~~CALVERT, Grorcz, Lorp BaLttimore (1582-1632), one of the principal secretaries of state under James I., was born at Kipling in Yorkshire in 1582. He was educated at Oxford, and after travelling on the Continent entered public service as secretary to Robert Cecil, afterwards earl of Salisbury. In 1617 he was knighted, and in 1619 he was made one of the principal secretaries of state. He retained office for five years, at the end of which term he resigned, alleging as a reason that he had recently adopted the Catholic faith. He still continued at court, however, in the capacity of a privy-councillor. In 1625 he was made Baron Baltimore, in the county of Longford, Ireland, and among other rewards he received for his services was a patent as lord of the province of Avalon in Newfoundland. As this colony was much exposed to the attacks of the French he left it, and obtained another patent for Mary- land, in the north of Virginia. He died in 1632 before the grant was confirmed, but in that year it was made out in the~~

~~name of his son Cecil. The city of Baltimore derives its name from the title of this family.~~

~~CALVI, a fortified town in Corsica, the capital of an arrondissement, is situated on a peninsula in the bay to which it gives its name, 38 miles W.S.W. of Bastia, in 42° 34’ 7” N. lat. and 8° 45’ 10” E. long. Its position is unsheltered, and its ancient fortifications present a mournful appearance, while its climate is rendered unhealthy by the exhalations from the neighbouring lagoon. Since the foundation of Ile Rousse by Paoli it has greatly decayed, and its interest is now mainly historical or antiquarian. The most important buildings are the old palace of the Genoese governor and the church with the monuments of the Baglioni family. Calvi was founded in the 13th cen- tury by Giovanniello of Pietra Allerata, one of the military adventurers of that restless period. In 1278 it passed into the hands of the Genoese, and fron that date it was remarkable for its adherence to their side. It was attacked by De Thermes in 1553, and two years after it stood no fewer than three sieges with such determined resistance that the Genoese senate caused Civitas Calvi semper fidelis to be carved on the chief gate of the city, which still pre- serves the proud inscription. In 1794 Calvi was captured by the English, but it was retaken by the Corsicans in the following year. Population in 1872, 2164.~~

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~~CALVIN~~

~~CALVIN, Joun (1509-1564), was born at Noyon, in | at once to the rigour of his abstinence and the ardour with~~

~~Picardy, July 10,1509. Hisfather, Gerard Calvin or Cauvin,? was a notary-apostolic and procurator-fiscal for the lordship of Noyon, besides holding certain ecclesiastical offices in connection with that diocese. The name of his mother was Jeanne Lefranc; she was the daughter of an innkeeper at Cambray, who afterwards came to reside at Noyon. Gerard Calvin is described as a man of considerable sagacity and prudence, and on this account held in esteem by the leading men of the district. His wife added to~~

~~considerable personal attractions the graces of a vivid and earnest piety. Their family consisted of four sons, of whom John was the second, and two daughters.~~

~~Of Calvin's early years only a few notices remain. His father destined him from the first for theological studies, being moved to this by the evidences afforded in his boy- hood of a religious tendency, and perhaps also by a shrewd apprehension of the kind of pursuits in which he was most fitted to excel. The esteem in which the father was held opened for the boy a place in the household of the noble family of De Montmor, where he received his elementary education along with the children of the house, though at his father's expense. In his thirteenth year his father, whose circumstances were not affluent, procured for him from the bishop the office of chaplain in the Chapelle de Notre Dame de la Gesine. A few days after his appoint- ment he received the tonsure, and on the 29th of May 1521 he was installed in his office. The plague having visited Noyon, the young De Montmors were sent to Paris to pursue their studies there, and thither Calvin accompanied them, being enabled by the income received from his benefice to meet the expense of a residence in the metropolis. His first school was the Collége de la Marche, at that time under the regency of Maturin Cordier, a man of excellent character, of sound learning, and of high repute as a teacher. To him Calvin ever acknowledged himself indebted for the benefits received under his tuition, In dedicating to him his Commentary on the First Epistle to the Thessalonians, as " eximize pietatis et doctrine viro," he declares that so had he been aided by his instruction that whatever subse- quent progress he had made he only regarded as received from him, and " this," he adds," I wish to testify to posterity that if any utility accrue to any from my writings they may acknowledge it as having in part flowed from thee." From this institution he removed to the Collége Montaigu, where he had for instructor a Spaniard, who is described as a man of learning, and to whom Calvin was indebted for the culture of his already acute intellect, by the study of dialectics and the scholastic philosophy. Whilst at school the future reformer distinguished himself by his superior abilities, and his indefatigable assiduity. He speedily outstripped all his competitors in grammatical studies, and by his skill and acumen as a student of philosophy, gave fruitful promise of that consummate excellence as a reasoner, in the department of speculative truth, which he afterwards~~

~~displayed. Intensely devoted to study he cared little for the pastimes in which his fellow scholars indulged; he shunned society, and was more disposed to censure the frivolities of those around him than to seek the solace of their companionship; severe to others he was still more so to himself, and his pale face and attenuated frame bore witness ae OS SE eee.~~

~~1 The family name of Calvin seems to have been written indifferently Cauvin, Chauve, Chauvin, Calvus, Calvinus. In the contemporary notices of Gerard and his family, in the capitular registers of the cathe- dral at Noyon, the name is always spelt Cauuin. The anagram of Calvin is Alcuin, and this in its Latinized form Alcuinus appears in two editions of his Institutio as that of the author (Audin, Vie de Calvin, ' 1,520). The syndies of Geneva address him in a letter written in 1540, and still preserved, as '' Docteur Caulvin." In his letters written~~

~~in French he usually signs himself "Jean Calvin." He affected the title of " Maitre," for what reason is not known.~~

~~which he prosecuted his studies. In his nineteenth year he, through the influence of his father, obtained the living of Marteville, to which he was presented on the 27th of September 1527. After holding this preferment for nearly two years, he exchanged it in July 1529 for the cure of Pont PEvéque, a village near to Noyon, and the place to which his father originally belonged. He appears to have been not a little elated by his early. promotion, and although not ordained, he preached several sermons to the people, But though the career of ecclesiastical preferment was thus early opened to him, Calvin was destined not to become a priest of the Church of Rome. A change came over the mind both of his father and himself respecting his future career. Gerard Calvin, looking at things only from a worldly point of view, began to suspect that he had not chosen the most lucrative profession for his son, and that the law offered to a youth of his talents and industry a more promising sphere.? His son, on the other hand, had come under an influence of a very different kind, but which, with still more decisive impulse, inclined him to relinquish the ecclesiastical life. Through the counsels of his relation, Pierre Robert Olivetan, the first translator of the Bible into French, he had been led for the first time to study the sacred volume, and to test his religious opinions and practices by~~

~~its dictates, The result was that, though not yet detached from the faith of the Romish church, he was very willing to relinquish all thoughts of becoming a priest in that communion. He accordingly readily complied with his father's suggestion ; and having resigned his cure, he removed from Paris to Orleans, in order to study law under Pierre de l'Etoile, a distinguished jurisconsult, and at that time professor there. On this new pursuit Calvin entered with characteristic ardour, and such was his progress in legal knowledge, that he frequently occupied the chair of the professor, while his general reputation for ability and scholar- ship stood so high that, on leaving Orleans, he received the grade of doctor without payment of the usual fees, as a compliment to his merits, Other studies, however, besides those of law had occupied him whilst in this city, God, who had destined him for a very different career, was in His providence preparing him for the work he had to do. His mind, at first hardened by the influence of early superstition, was, he himself tells us, brought by sudden conversion into a state of docility.? An ardent desire to attain proficiency in sacred knowledge took possession of him, and though this did not lead him to renounce other studies, it rendered him frigid in the pursuit of them. At all times, indeed, a diligent student, he seems at this time to have been impelled by his zeal beyond those bounds which a wise regard to health would impose. It was his wont, aftera frugal supper, to labour till midnight, and in the morning when he awoke, he would, before he arose, recall and digest what he had read the previous day, so as to make it thoroughly his own. 'By these protracted vigils," says Beza, "he secured indeed a solid erudition, and an ex- cellent memory; but it is probable he at the same time sowed the seeds of that disease which occasioned him various illnesses in after life, and at last brought upon him premature death."4~~

~~From Orleans Calvin went to Bourges to prosecute his studies under a learned Italian of the name of Alciati, whom Francis I. had invited into France, and settled as a professor of law in that university. Here he became acquainted with Melchior Volmar, a German, then pro- fessor of Greek at Bourges, and a man of sound erudition~~

~~2 Calv., Pref. ad Comment. in Psalmos. 3 Pref. ad Psalmos. * Jo. Calvini Vita, sub init.~~

as wellas exemplary character By hiin Calvin was taught Greek, and introduced to the study of the New Testament in its original language, a service which he gratefully acknowledges in one of his printed works+ The conversa- tion of Volmar also seems to have been of use to him in deepening his religious convictions, and confirming him in his attachment to the doctrines of the Reformation. These were now beginning to be widely diffused through France. Twelve years had elapsed since Luther had published his theses against indulgences,—twelve years of intense excite- ment and anxious discussion, not in Germany only, but in almost all the adjacent kingdoms In France there had not been as yet any overt revolt against the Church of Rome, but multitudes were lending a friendly ear to the Reformed doctrines, and a few were in secret rejoicing in having heartily embraced them To such Calvin united himself whilst at Orleans, and after his removal to Bourges he became a teacher, both in private conference with inquirers and by discourses in more public assemblies. “Before a year had elapsed,” says he, speaking of his con- version, ‘‘all who were desirous of a purer doctrine were in the habit of coming to me, though a novice and a tyro, for the purpose of learning.”? And Beza tells us that he not only fortified the few believers who were in the town, but preached often in some of the neighbouring mansions and hamlets, whereby he wonderfully advanced the kingdom of God in many families, among which he specifies that of the lord of Ligniéres, who with his lady heard with approval the new doctrines. In engaging in such efforts, Calvin appears to have yielded to a constraining sense of duty rather than to have followed the bias of his own inclina- tions. ‘ By nature,” says he, ‘“ somewhat clownish (sub- rusticus), I always preferred the shade and ease, and would have sought some hiding-place ; . but this was not permitted, for all my retreats became like public schools.”4 Nor did he infuse any of the enthusiasm which usually marks the young reformer into his addresses. “He taught the truth,” says Beza, “not with affected eloquence, but with such depth of knowledge and so much solid gravity of style, that there was not a man who could hear him without being ravished with admiration.” 5

~~His residence at Bourges was cut short by the sudden death of his father, which occasioned his return to his native place. Immediately after his father's decease, he seems to have paid a hasty visit to Paris, and then to have retumed to Noyon, where he resided for a couple of years or so. At the close of this period he appears to have teturned to Paris, where he apparently resided from 1529 to 1522, as letters written by him are dated from Paris in these years. While there he lodged with a tradesman, Etienne de la Forge, who early fell a victim to his zeal for the Reformation, and " whose memory," Calvin says, "should be blessed amoug believers as a holy martyr for Christ." In his house the friends of evangelical truth Were wont to meet, and Calvin not only associated with them, but frequently preached in their assemblies. To the great joy of all such, he at length entirely relinquished his legal pursuits and devoted himself afresh to theology, — siviug himself up wholly to the work, preaching with great energy. and using all the means in his power to win converts to the truth, as well as to confirm those by~~

~~Whom it had been already embraced. By this time the~~

~~Reformation had attracted so many adherents in France, that the upholders of the established system became infuriated, and attempted to stay its further progress by ee i Fimist. Ded., Comment. mn Ep. II. ad Corinthios precfiz. Pref. id Psalmos.~~

- ~~Wist. Hecles., t. i. pp. 6, 7; Lille, 1841. 4 Pref. ad Psalmos. * Mist, Hecles. ubi. sup. 8 Calv., Contr. Libertinos, c. 4.~~

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~~the most cruel persecutions. It was whilst these were raging that Calvin issued his first publication, an edition of Seneca's tract De Clementia, with au elaborate commentary, This book he published at his own cost, and dedicated to Claude Hangest, abbot of St Eloi, a member of the De Montmor family, with whom Calvin had been brought up. The commentary, which is written in that pure and terse Latinity which characterizes all Culvin's works composed in the language of ancient Rome, displays extensive acquaint- ance with ancient literature, though the author has fallen into the extraordinary mistake of running the two Seuecas, father and son,~~

~~into one, and making the philosopher die 115 years old. It has been suggested that Calvin published this work with a view to influence the king to put a stop to the persecution of the Protestants, but there is nothing in the treatise itself or in the commentary to favour this opinion, .~~

~~This work was published in April 1532, and seems to have brought Calvin more of honour than of profit. It appears, indeed, that he had some difficulty in paying the cost of its publication; and it is probable that it was partly in order to meet this that he sold at this time the slender patrimony which his father had left him. He at this time also relinquished the ecclesiastical preferments which he had hitherto continued to hold, an act which, though demanded by the change that had taken place in his religious views, was entirely voluntary on his part, and, when viewed in connection with his then straitened circum- stances, must be put to the credit of his integrity and disinterestedness. He was now in his twenty-fourth year, and was already recognized 'as at the head of the Reforma- tion movement in France. An occasion soon occurred which brought him into open collision with the dominant party. Nicholas Cop, the newly-elected regent of the Sorbonne, had to deliver an oration according to custom in the Church of the Maturins, on the feast of All Saints. Being intimate with Calvin, he pronounced an oration which the latter had prepared for him, " of a totally different sort," says Beza, "from what was customary." It was, in fact, a defence of the Reformed opinions, especially of the doctrine of justification by faith alone. This was more than the Sorbonnists could bear, and Cop, being summoned to appear before the parliament, found it necessary to make his escape from Paris to Basel. An attempt was at the same time made to seize Calvin, but being forewarned of the design by his friends, he also made his escape. His lodgings, however, were searched, and his books and papers seized, to the imminent peril of some of his friends, whose letters were found in his repositories. He himself retired first to the castie of Lord de Hazeville near Mantes, and after that to Saintonge, where he was the guest of Louis du Tillet, a canon of Angouléme, and where at the request of his host he prepared some short discourses, which were circulated in the surrounding parishes, and read in public to the people. He subsequently removed to Nerac, the residence of the queen of Navarre, the only sister of Francis I, who then favoured the Reformers, and through whose intercession the storm that had broken out against them was for the time abated. Here he**

~~became acquainted with the venerable Jacques Lefevre d' Estaples, a scholar and man of science, whom the queen had rescued from the fury of the Sorbonnists, and engaged as tutor tu her children. By him Calvin was warmly received, and his future eminence as a reformer of the church predicted.~~

~~It has been asserted that it was whilst resident at Saintonge that Calvin prepared the first sketch of his Institutio Christiane Religionis ; but this has not been proved. His residence in that retirement continued only~~

~~? Hist, Eccles., vol. i. p. 9.~~

~~for a very few months; for, in 1534, we find him first at Noyon, his native place, and soon after again in Paris. Here he was compelled to remain concealed, in consequence of the measures which the enemies of the Reformation were still pursuing against its adherents. At the risk of his life, however, he came forth to meet one whom he was after- wards to encounter under very different circumstances, the Spanish physician, Servede or Servetus, who was even then engaged in propagating his heretical notions concerning the Trinity. Servetus having expressed a desire to have a con- ference with Calvin, it was arranged that they should meet and discuss their conflicting opinious ; but though Calvin waited for him long at the time and place appointed, Servetus failed to make his appearance, " being," says Beza, ""' unable to endure the sight of Calvin," but more probably deterred by the danger to which both were exposed from the hostility of the ruling powers. Calvin's design in acceding to this colloquy seems to have been a kindly one towards Servetus. " Not without danger to my life," he himself says, "I offered to deliver him from his errors."! Nor was Servetus the only errorist whom Calvin endeavoured at this time to confute. The Anabaptists of Germany had spread into France, and were disseminating many wild and fanatical opinions among those who had seceded from the Church of Rome. Among other notions which they had imbibed, was that of a sleep of the soul after death. To Calvin this notion appeared so pernicious, that he composed and published a treatise in refutation of it, under the title of Psychopannychia. In this work he chiefly dwells upon the evidence from Scripture in favour of the belief that the soul retains its intelligent~~

~~consciousness after its separation from the body,—passing by questions of philosophical speculation, as tending on such a subject only to minister to an idle curiosity.~~

~~The Psychopannychia was published in 1534 at Orleans, whither Calvin had been constrained, in consequence of the violence of the persecution at Paris, to retreat. On his way thither he stopped for some time at Poitiers. Here many gathered round him desirous of instruction from him ; and in a grotto near the town he celebrated for the first time the communion in the Evangelical Church of France, using a piece of the rock as a table. From this time forward his influence became supreme, and all who had imbibed or become tinged with the Reformed doc- trines in France turned to him for counsel and instruction, attracted not only by his power as a teacher, but still more, perhaps, because they saw in him so full a development of the Christian life according to the evangelical model. M. Renan, no prejudiced judge, pronounces him "the most Christian man of his time," and attributes to this his success as a reformer. Certain it is that already he had drawn upon him the notice of those who were seeking to extinguish in blood the light which had been kindled, and which he was so prompt to hold up to view; so that he was obliged to seek safety in flight. In company with his friend Louis du Tillet, whom he had again gone to Angou- léme to visit, he set out for Basel. On their way they were robbed by one of their servants, who so entirely stripped them of their property, that it was only by borrow- ing ten crowns from their other servant that they were enabled to get to Strasburg, and thence to Basel. Here Calvin was welcomed by the band of scholars and theologians who had conspired to make that city the Athens of Switzer- land, and especially by the learned Simon Grynzeus, and by Wolfgang Capito, the leader of the Reformation at Basel. Under the auspices and guidance of the latter, Calvin applied himself to the study of Hebrew.~~

~~Francis I., desirous to continue the-persecution of the Protestants, but anxious at the same time not to break with~~

~~"1 Calvini Refut. Errorum Serveti, Opp., t. viii. p.b11.; Ed. Amstel.~~

~~CALVIN~~

~~the Protestant princes of Germany, resorted to the unworthy expedient of instructing his anibassador to assure the latter that it was only against the Anabaptists, and other parties who called in question all civil magistracy, that his severities were exercised. Calvin, indignant at the calumny which was thus cast upon the Reformed party in France, hastily prepared for the press his Jnstitutes of the Christian Religion, which he published as a confession of the Reformed faith, and dedicated to the king. Some obscurity rests over the early history of this book. The question has arisen whether it appeared first in French or in Latin, The probability ig that it appeared first in French, for the French dedication to Francis I. is dated Ist August 1535, whilst the earliest Latin edition came out in 1536.2 Of the edition of 1535, however, no copy is known to be extant; the first French edition with a date is that of 1540, but this was after several editions in Latin had appeared. In its first form the work consisted of only six chapters, and was intended merely as a brief manual of Christian doctrine. It appeared anonymously, the author having, as he himself says, nothing in view beyond furnishing a statement of the faith of the persecuted Protestants, whom he saw cruelly cut to pieces by impious and perfidious court parasites? In this work, though produced when the author was only twenty- five years of age, we find a complete outline of that theo- logical system which has since borne his name. In none of the later editions, nor in any of his later works, do we find reason to believe that he ever changed his views on any essential point from what they were at the period of its first publication. Such an instance of maturity of mind and of opinion at so early an age, would be remarkable under any circumstances; but in Calvin's case it is rendered peculiarly so, by the shortness of the time which had elapsed since he gave himself to theological studies. It may be doubted also if the history of literature presents us with another instance of a book written at so early an age, which has exercised such a prodigious influence upon the opinions and practices both of contemporaries and of posterity. After a short visit to the court of the duchess of Ferrara, which at that time afforded an asylum to several learned and pious fugitives from persecution, Calvin returned to France to arrange his affairs before finally taking farewell of his native country. His intention was to settle at Basel, and to devote himself to study. But being unable, in con- sequence of the disturbed state of the country, to reach Basel by the ordinary route, he had to take the route through Geneva. Whilst in this city his further progress was arrested, and his resolution to pursue the~~

quiet path of studious research was dispelled, by what he calls the "formidable obtestation " of Farel.4 After many struggles and no small suffering, this energetic spirit had succeeded in planting the evangelical standard at Geneva; and anxious to secure the aid of such a man as Calvin, he entreated him on his arrival to relinquish his design of going farther, and to devote himself to the work in that city, Calvin at first declined, alleging as an excuse his need of securing more time for personal improvement, whict could not be obtained were he engaged in ministeria. work. To the ardent Farel this seemed a mere pretext for indolence. "TI tell you," he continued, "in answer to this pretence of your studies, in the name of Almighty God, that if you will not devote yourself with us to this work of the Lord, the Lord will curse you as one seeking not Christ so much as himself." Startled by this denun- ciation, and feeling as if God had laid his hand on him to detain him, Calvin consented to remain at Geneva, where

2 This edition forms a smali Svo of 514 pages, and 6 pages of index. It appeared at Basel from the press of Thomas Platter and Balthasat Lasius in March 1536.

3 Pref. ad Psalmos. 4 Thid.

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he was immediately appointed teacher of theology. He was also elected preacher by the magistrates with the consent of the people, but this office he would not accept until it had been repeatedly pressed upon him. His services seem to have been rendered for some time gratui- tously, for in February 1537, there is an entry in the city registers to the effect that six crowns had been voted to him, "since he has as yet hardly received anything." Calvin was in his twenty-eighth year when he was thus constrained to settle at Geneva; and in this city the rest of his life, with the exception of a brief interval, was spent. The post to which he was thus called was not an easy one. Though the people of Geneva had cast off the yoke of Rome, they were still "'but very imperfectly en- lightened in divine knowledge; they had as yet hardly emerged from the filth of the papacy."! This laid them open to the incursions of those fanatical teachers, whom the

~~excitement attendant upon the Reformation had called forth, and who hung mischievously upon the rear of the reforming body. To obviate the evils thence resulting, Calvin, in union with Farel, drew up a condensed statement of Christian doctrine consisting of twenty-one articles. This the citizens were summoned, in parties of ten each, to profess and swear to as the confession of their faith—a process which, though not in accordance with modern notions of the best way of establishing men in the faith, was gone through, Calvin tells us, "with much satisfaction." As the people took this oath in the capacity of citizens, we may see here the basis laid for that theocratic system which subsequently became peculiarly characteristic of the Genevan polity. Deeply convinced of the importance of education for the young, Calvin and his coadjutors were solicitous to establish schools throughout the canton, and to enforce on parents the sending of their children to them; and as he had no faith in education apart from religious training, he~~

~~drew up an elementary catechism of Christian doctrine~~

~~which the children had to learn whilst they were receiving secular instruction. Of the troubles which arose from~~

~~fanatical teachers, the chief proceeded from the efforts of~~

~~the Anabaptists; but these Calvin and his colleagues so effectually silenced by means of a public disputation held~~

~~onthe 18th of March 1537, that they never afterwards~~

~~appeared at Geneva. In the course of this year also, the peace of Calvin and his friends was much disturbed, and their work interrupted, by a turbulent and unprincipled preacher named Peter Caroli, who, after many changes of religious profession (with none of which, however, had he associated anything of true religion, or even much of ordinary morality), had assumed the character of a stickler for orthodoxy. In this character he accused the Geneva~~

~~divines of Sabellianism and Arianism, because they would~~

~~not‘enforce the Athanasian creed, and had not used the words “Trinity” and “ Person” in the confession they had drawn up. In a synod held at Bern the matter was fully discussed, when a verdict was given in favour of the Geneva divines, and Caroli deposed from his office and banished. Thus ended an affair which seems to have occasioned Calvin much more uneasiness than the char- acter of his assailant, and the manifest falsehood of the charge brought against him, would seem to justify. Two brief tracts, intended to expose the evils and warn against the seductions of Popery, one entitled De Fugienda Idolatria, the other De Papisticis Sacerdotus, must be added to the labours of Calvin this year.~~

~~Hardly was the affair of Caroli settled, when new and Severer trials came upon the Genevan Reformers. The severe simplicity of the ritual which Farel had introduced, and to which Calvin had conformed; the strictness with EE~~

~~1 Beza, Vit. Calv. an. 1536.~~

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~~which the ministers sought to enforce not only the laws of morality, but certain sumptuary regulations respecting the dress and mode of living of the citizens; and their deter- mination in spiritual matters not to submit to the least dictation from the civil power, led to such violent dis sensions that Calvin and his colleagues refused to administer the sacrament to the people. For this they were banished from the city. They went first to Bern, and soon after to Zurich, where a synod of the Swiss pastors had been convened. Before this assembly they pleaded their cause, and stated what were the points on which they were prepared to insist as needful for the proper discipline of the church. They declared that they would yield in the matter of ceremonies so far as to employ unleavened bread in the eucharist, to use fonts in baptism, and to allow festival days, provided the people might pursue their ordinary avocations after public service. These Calvin regarded as matters of indifference, provided the magistrates did not make them of importance, by seeking to enforce them; and he was the more willing to concede them, because he hoped thereby to meet the wishes of the Bernese brethren, whose ritual was less simple than that established by Farel at Geneva. But he and his colleagues insisted, on the other hand, that for the~~

~~proper maintenance of dis- cipline, there should be a division of parishes—that excommunications should be permitted, and should be under the power of elders chosen by the council, in conjunc- tion with the clergy—that order should be observed in the admission of preachers—and that only the clergy should officiate in ordination by the laying on of hands, It was proposed also, as conducive to the welfare of the church, that the sacrament of the Lord's Supper should be ad- ministered more frequently, at least once every month, and that congregational singing of psalms should be practised in the churches. On these terms the synod interceded with the Genevese to restore their pastors; but through the opposition of the Bernese this was frustrated, and a second edict of banishment was the only response.~~

~~Calvin and Farel betook themselves, under these cireum- stances, to Basel, where they soon after separated, Farel to go to Neufchatel, and Calvin to Strasburg. At the latter place Calvin resided till the autumn of 1541, occupying himself partly in literary exertions, partly as a preacher in the French church, and partly as a lecturer on theology. In 1539 he attended the convention at Frankfort as the companion of Bucer, and in the following year he appeared at that at Hagenau and Worms, as the delegate from the city of Strasburg. He was present also at the diet at Ratisbon, where he became personally acquainted with Melanchthon, and formed with bim a friendship which lasted through life. It is to this period of his life that we owe the completed form of his Jnstitutio, his Commentary on the Epistle to the Romans, and his Tract on the Lord's Supper. Notwithstanding his manifold engagements, he found time to attend to the tenderer affections; for it was during his residence at Strasburg that he married Idelette de Bures or van Buren, the widow of a person named Stérder, whom he had converted from Anabaptism. In her Calvin found, to use his own words, .“ the excellent companion of his life," a “ precious help" to him amid his manifold labours and frequent infirmities. She died, in 1549, to the great grief of her husband, who never ceased to mourn her loss.~~

~~During his absence, disorder and irreligion had prevailed in Geneva. An attempt was made by Sadolet, bishop of Carpentras, to take advantage of this so as to restore the papal supremacy in that district ; but this design Calvin, watchful over the interests of his ungrateful flock, though exiled~~

~~from them, completely frustrated by writing such a reply to the letter which the bishop had addressed to the~~

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~~Genevese, as constrained him to desist from all further efforts. Heseemsalso to have kept up his connection with Geneva by addressing letters of counsel and comfort to the faithful there who continued to regard him with affection. It was whilst he was still at Strasburg that there appeared at Geneva a translation of the Bible into French, bearing Calvin's name, but in reality only revised and corrected by him from the version of Olivetan. Meanwhile the way had been opened for his return to the post whence he had been driven in that city. In the summer of 1541, the decree of his banishment was revoked, and in the following September he yielded to the earnest entreaties of his now penitent flock, and returned to Geneva, where he was received with the utmost enthusiasm. He entered upon his work with a firm determination to carry out those reforms which he had originally purposed, and to set up in all its integrity that form of church policy which he had carefully matured during his residence at Strasburg. He now became the sole directive spirit in the church at Geneva. Farel was retained by the Neufchatelois, and Viret, soon after Calvin's return, removed to Lausanne. His duties were thus rendered exceedingly onerous, and his labour became excessive. Besides preaching every day in each alternate week, he taught theology three days in the week, attended weekly meetings of his consistory, read the Scriptures once a week in the congregation, carried on an extensive correspondence on a multiplicity of subjects, prepared commentaries on the books of Scripture, and was engaged repeatedly in controversy with the opponents of his opinions. "J have not time," he writes to a friend, "* to look out of my house at the blessed sun, and if things continue thus, I shall forget what sort of appearance it has. When I have settled my usual business, I have so many letters to write, so many questions to answer, that many a night is spent without any offering of sleep being brought to nature." We cannot in this sketch follow him through all the details of his brief but busy life after he returned to Geneva ; we can only afford to notice slightly the leading events.~~

~~Of the controversies in which Calvin embarked, one of the most important was that in which he defended his doctrine concerning predestination and election. His first antagonist on this head was Pighius, a Romanist, who, resuming the controversy between Erasmus and Luther on the freedom of the will, violently attacked Calvin for the views he had expressed on that subject. Calvin replied to him in a work published in 1543, in which he defends his own opinions at length, as well by general reasonings as by an appeal to both Scripture and the Fathers, especially Augustine. So potent were his reasonings in the esteem of his opponent, that the latter, though owing nothing to the gentleness or courtesy of Calvin, was led to embrace his views. A still more vexatious aud protracted con- troversy on the same subject arose in 1551, in which Calvin was called to defend his views against Bolsec, originally a Carmelite friar, but who having renounced Romanism had fled from France and come to Geneva, where he appeared as a physician. In becoming a physician, however, he had not relinquished theological studies, and being a zealous opponent of predestinarian views, he was tempted on one occasion, after a sermon on the subject by Calvin to attack him in the public assembly. Calvin replied with equal vehemence ; and an officer of. police, scandalized that such a scene should occur in church, took Bolsec into custody. The pastors resolved to have a conference with him before the council; and for two days the discussion was con- ducted by him and Calvin with much ability on both sides. The council were at a loss what course to take; uot that they doubted which of the disputants was right, for they all held by the views of Calvin, but they were unable to~~

~~determine to what extent and in which way Bolsec should be punished for his heresy. The question was submitted to the Swiss churches, but they also were divided jn their judgment, some counselling severity, others gentle measures. The result was that Bolsec was banished from Geneva. The enemies of Calvin insinuated that he counselled the infliction of a heavier penalty; but this he himself in a letter to Bullinger indignantly denies. In this controversy ultimately several others, including Castellio, Fabri, and even Bullinger and Melanchthon took part against Calvin, and only Beza appeared as a zealous coadjutor. But the most memorable of all the contro.~~

~~versies in which Calvin was engaged, was that into which he was brought in 1553 with his old antagonist Servetus, After many wanderings, and after having been condemned to death for heresy at Vieune, from which he was fortunate enough to make his escape, Servetus arrived in July 1553 at Geneva. He appears to have remained in quiet here for som? time, and was about to leave for Zurich when, at the instigation of Calvin, he was arrested and conveyed to prison on the charge of blasphemy. This charge was founded on certain statements in a book published by him in 1553, entitled Christiantsmi Restitutio, in which he animadverted in terms needlessly offensive on the Catholic doctrine of the Trinity, and advanced sentiments strongly savouring of Pantheism.1 At the trial which followed Calvin appeared as his accuser, and the conflict was con- ducted between the two with much ability on both sides, and at the same time with no small keenness and bitter. ness. After a protracted trial, the accused was condemned to be burnt to death, and was accordingly burned at Champel near Geneva, on the 27th of October 1553. Frarel attended him in his last hours, and accompanied him to the place of execution. He had an interview also with Calvin on the morning of the fatal day, when he asked his forgiveness, but refused to retract any of his expressions, Calvin has been much censured. not to say vituperated, for his share in this unhappy transaction. In order to aggra- vate the charge against him it has been alleged that it was by his invitation that Servetus came to Geneva, that it was by his urgency that the magistrates, over whom his influence was unbounded, condemned Servetus to death, and that it was to gratify a personal pique and through hatred of Servetus that he thus cruelly and relentlessly pursued him. Of these allegations not one can be proved, and some are undoubtedly false. It is not trne that Calvin induced Servetus to come to Geneva; on the contrary, when Servetus intimated a wish to visit that city if it pleased Calvin that he should do so, Calvin intimated very plainly that it did not please him, and refused to pledge himself for his safety should he come, as he was resolved, should he come, to prosecute him to the death.? That Calvin influenced the magistrates to condemn Servetus 1s true only in the same sense in which any public prosecutor, who pleads before the judge for the condemnation of one against whom he brings a criminal charge, may be said to influence the judge to condemn him. As for the assertion that Calvin's influence with the magistrates was unbounded, this falls to the ground before the fact that at this time he was in~~

~~a state of antagonism with the dominant party.' That Calvin hated the doctrines which he found in Ser- vetus's book there can be no doubt, and that he thonght the author of such views as were there advanced~~

~~1 A digest of Servetus's views is given by Dorner, Entwrckelungs-geschichte der Lehre von d. Person Christi, ii. pp. 649-656, Eng. trans., div. ii., vol. ii. pp. 161-168.~~

~~2 Si mihi placeat huc se venturum recipit. Sed nolo fidem meal interponere. Nam si modo valeat mea autoritas vivum exire nunquam patiar.—Calvin to Farel, 12th Feb. 1546. ih~~

~~3 See art. "Servet? by Trechsel in Herzog's Real-Encyclopeedte, VO xiv. p. 297.~~

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~~deserving of death, if he refused when reasoned with to recant, is unhappily true; but that he was actuated by personal spite and animosity against Servetus himself there is no evidence; on the contrary we have his own express declaration that, after Servetus was convicted, he used no urgency that he should be put to death, and at their last interview he told Servetus that he never had avenged private injuries, and assured him that if he would repent it would not be his fault if all the pious did not give him their hands.! There is the fact also that Calvin used his endeavour to have the sentence which had been pronounced against Servetus mitigated, death by burning being re- garded by him as an "'atrocity," for which he sought to substitute death by the sword.? All that can be justly charged against Calvin in this matter is that he took the initiative in bringing on the trial of Servetus, that as his accuser he prosecuted the suit against him with undue severity, and that he approved the sentence which con- demned Servetus to death. When, however, it is remem- bered that the unanimous decision of the Swiss churches and of the Swiss state Governments was that Servetus deserved to die ; that the general voice of Christendom was in favour of this; that even such a man as Melanchthon affirmed the justice of the sentence;? that an eminent English divine of the next age should declare the process against~~
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~~him "just and honourable," 4 and that only a few voices here and there were at the time raised against it, candid and impartial men will be ready to accept the judgment of Coleridge, that the death of Servetus was not "Calvin's guilt especially, but the common opprobrium of all European Christendom." ©~~

~~The heresy of Servetus was not extirpated by his death, but none of his followers were visited with severer penalties than that of banishment from Geneva. The trials of~~

~~several of these, with the conferences and controversies |~~

~~connected with them, occupied much of Calvin's time for several years. somewhat vexing dispute with the Lutherans 'respecting the Lord's Supper, which ended in the separation of the evangelical party into the two great sections of Lutherans and Reformed,—the former of whom hold that in the eucharist the body and blood of Christ are objectively and~~

~~consubstantially present, and so are actually partaken of by |~~

~~the communicants, whilst the latter maintain that there is only a virtnal presence of the body and blood of Christ, and consequently only a spiritual participation thereof through faith, In connection with these controversies on points of faith, Calvin was for many years greatly disquieted,~~

~~and sometimes even endangered, by the opposition offered |~~

~~by the libertine party in Geneva to the ecclesiastical discipline which he had established there. His system of church polity was essentially theocratic; it assumed that every member of the state was also under the discipline of the church; and he asserted that the right of exercising this discipline was vested exclusively in the consistory or body of preachers and elders. His attempts to carry out these views brought him into collision both with the authorities and with the populace,—the latter being enraged at the restraints imposed upon the disorderly by the exercise of church discipline, and the former being inclined~~

~~to retain in their own hands a portion of that power in |~~

things spiritual which Calvin was bent on placing

; Fidelis Expositio Errorum Serveti, sub init. Calvini Opp. t. ix.

Calvin to Farel, 20th Aug. 1553. _ * Tuo judicio prorsus assentior. Affirmo etiam vestros magistratus Juste fecisse quod hominem blasphemum, re ordine judicata, interfece- tunt.—Melanchthon to Calvin, 14th Oct. 1554.

» Field On the Church, bk. iii. c. 27, vol. i. p. 288, ed. Camb. 1847, .. Notes on English Diwines, vol, i. p. 49. See also Table Talk, vol. I. p. 282, ed. 1835.

He was also involved in a protracted and |

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exclusively in the hands of the church rulers. His daunt- less courage, his perseverance, and his earnestness at length prevailed, and he had the satisfaction, before he died, of seeing his favourite system of church polity firmly established, not only at Geneva, but in other parts of Switzerland, and of knowing that it had been adopted substantially by the Reformers in France and Scotland. Nor was it only in religious matters that Calvin bnsied himself; nothing was indifferent to him that concerned the welfare and good order of the state or the advantage of its citizens. His work, as has been justly said, "embraced everything ;" he was consulted on every affair, great and small, that came before the council,—on questions of law, police, economy, trade, and manufactures, no less than on questions of doctrine and church polity. To him Geneva owed her trade in cloths and velvets, from which so much wealth accrued to her citizens; sanitary regulations were introduced by him which made Geneva the admiration of all visitors; and in him she reverences the founder of her college, which still flourishes, and from which so many learned men have gone forth.

Amidst these multitudinous cares and occupations, Calvin found time to commit to writing a number of works besides those provoked by the various controversies in which he was engaged. The most numerous of these were of an exegetical character. Including discourses taken down from his lips by faithful auditors, we have from him expository comments or homilies on

~~nearly all the books of Scripture, written partly in Latin and partly in French. In the estimation of many, these constitute the most valuable of his works. His candour and sincerity as an inquirer into the meaning of Scripture—his judiciousness, penetration, and tact in eliciting his author's meaning—his precision, condensation, and concinnity as an expositor—the accuracy of his learning, the closeness of his reasoning, and the elegance of his style, all conspire to confer a high value on his exegetical works, and to make them at once rich sources of biblical knowledge and admirable models of biblical exposition.~~

~~But it is chiefly as a theologian and the head of a theological school that Calvin is now known. This renders it fitting that some account should be here given of his theological system. This is developed in his Institutio, which, though produced originally at an early period of his life, was so frequently and carefully revised by him, that in the form in which it has come down to us it presents his most matured views and thoughts. In some of his tracts and polemical writings certain of his doctrines are more fully expounded, illustrated, and defended; but nowhere has he advocated any tenet which is not in sub- stance to be found in the Jnstitutio.~~

~~Much of Calvin's theology is common to him with all evangelical divines, and in the parts which are more peculiar to him and his school he follows closely in the steps of Augustine. The following may be regarded as his characteristic tenets, though all are not peculiar to him.~~

~~Man as a sinner is guilty and corrupt. The first man was made in the image and likeness of God, which not only implies nan's superiority to all other creatures, but indicates lis original purity, integrity, and sanctity. From this state Adam fell, and in his fall involved the whole human race descended from him. Hence depravity and corruption, dif- fused through all parts of the soul, attach to all men, and this first makes them obnoxious to the anger of God, and then comes forth in works which the Scripture calls works of the flesh (Gal. v. 19). Thusall are held vitiated and per- verted in all parts of their nature, and on account of such cor- ruption deservedly condemned before God, by whom nothing is accepted save righteousness, innocence, and purity. Nor is that a being bound for another's offence ; for when it is~~

~~said that we through Adam's sin have become obnoxious to the divine judgment, it is not to be taken as if we, being ourselves innocent and blameless, bear the fault of his offence, but that, we having been brought under a curse through his transgression, he is said to have bound us. From him, however, not only has punishment overtaken us, but a pestilence instilled from him resides in us, to which punishment is justly due. Thus even infants, whilst they bring their own condemnation with them from their mother's womb, are bound uot by another's but by their own fault. For though they have not yet brought forth the fruits of their iniquity, they have the seed shut up in them ; nay, their whole nature is a sort of seed of sin, there- fore it cannot but be hateful and abominable to God (Instit. bk. ii. ch. i. sect. 8).~~

~~To redeem man from this state of guilt, and to recover him from corruption, the Son of God became incarnate, assum- ing man's nature into union with His own, so that in Him were two natures in one person. 'Thus incarnate He took on Him the offices of Prophet, Priest, and King, and by His humiliation, obedience, and suffering unto death, followed by His resurrection and ascension to heaven, He has perfected His work and fulfilled all that was required in a Redeemer of men, so that it is truly affirmed that He has merited for man the grace of salvation (bk. ii. ch. 13-17). But until a man is in some way really united to Christ so as to partake of Him, the benefits of Christ's work cannot be attained by him. Now it is by the secret and special operation of the Holy Spirit that men are united to Christ and made members of His body. Through faith, which is a firm and certain cognition of the divine benevolence towards us founded on the truth of the gracious promise in Christ, men are by the operation of the Spirit united to Christ and are made partakers of His death and resurrection, so that the old man is crucified with Him and they are raised to a new life, a life of righteousness and holiness. Thus joined to Christ the believer has life sin Him and knows that he is saved, having the witness of the Spirit that he is a child of God, and having the promises, the certitude of which the Spirit had before impressed on the mind, sealed by the same Spirit on the heart (bk. iii. ch. 33-36). From faith pro- ceeds repentance, which is the turning of our life to God, proceeding from a sincere and earnest fear of God, and consisting in the mortification of the flesh and the old man within us and a vivification of the Spirit. Through faith also the believer receives~~

~~justification, his sins are forgiven, he is accepted of God, and is held by Him as righteous, the righteousness of Christ being imputed to him, and faith being the instrument by which the man lays hold on Christ, so that with His righteousness the man appears in God's sight as righteous. This imputed righteousness, however, is not disjoined from real personal righteousness, for regeneration and sanctification come to the believer from Christ no less than justification ; the two blessings are not to be confounded, but neither are they to be disjoined. The assurance which the believer has of salvation he receives from the operation and witness of the Holy Spirit ; but this again rests on the divine choice of the man to salvation; and this falls back on God's eternal sove- reign purpose, whereby He has predestinated some to eternal life while the rest of mankind are predestin- ated to condemnation and eternal death. Those whom God has chosen to life He effectually calls to sulva- tion, and they are kept by Him in progressive faith and holiness unto the end (bk. iii, passim). The external means or aids by which God unites men into the fellow- ship of Christ, and sustains and advances those who believe, are the church and its ordinances, especially the sacrameuts, The church universal is the multitude gathered~~

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~~from diverse nations, which though divided by distance of time and place, agree in one common faith, and it is bound by the tie of the same religion; and wherever the word of God is sincerely preached, and the sacraments are duly administered, according to Christ's institute, there beyond doubt is a church of the living God (bk. iv. ch. 1, sect, 7-11). The permanent officers in the church are pastors and teachers, to the former of whom it belongs to preside over the discipline of the church, to administer the sacra. ments, and to admonish and exhort the members; while the latter occupy themselves with the exposition of Scrip. ture, so that pure and wholesome doctrine may be retained, With them are to be joined for the government of the church certain pious, grave, and holy men as a senate ip each church ; and to others, as deacons, is to be entrusted the care of the poor. The election of the officers in a church is to be with the people, and those duly chosen and called are to be ordained by the laying on of the hands of the pastors (ch. 3,~~

~~sect.4~16). The sacraments are two— Baptism and the Lord's Supper. Baptism is the sign of initiation whereby men are admitted into the society of the~~

~~church and, being grafted into Christ, are reckoned among~~

~~the sons of God ; it serves both for the confirmation of faith and as a confession before men. The Lord's Supper isa spiritual feast where Christ attests that He is the life-giving bread, by which our souls are fed unto true and blessed immortality. That sacred communication of His flesh and blood whereby Christ transfuses into us His life, even as if it penetrated into our bones and marrow, He in the Supper attests and seals; and that not by a vain or empty sign set before us, but there He puts forth the efficacy of His Spirit whereby He fulfils what He promises. In the mystery of the Supper Christ is truly exhibited to us by the symbols of bread and wine; and so his body and blood, in which He fulfilled all obedience for the obtaining of rightcousness for us, are presented. There is no such presence of Christ in the Supper as that He is affixed to the bread or included in it or in any way circumscribed; but whatever can express the true and substantial communication of the body and blood of the Lord, which is exhibited to believers under the said symbols of the Supper, is to be received, and that not as perceived by the imagination only or mental intelligence, but as enjoyed for the aliment of the eternal life (bk. iv. eh, TDi:~~

~~The incessant and exhausting laboursto which Calvin gave himself, could not but tell on the strongest constitution: how much more on one so fragile as his! Amid many suffer ings, however, and frequent attacks of sickness, he manfully pursued his course for twenty-eight years; nor was it till his frail body, torn by many and painful diseases—fever, asthma, stone, and gout, the fruits for the most part of his sedentary habits and unpausing activity—had, as I were, fallen to pieces around him, that his indomitable spirit relinquished the conflict. In the early part of the year 1564 his sufferings became so severe that it was manifest his earthly career was rapidly drawing to a close. On the 6th of February of that year he preached his last sermon, having with great difficulty found breath enough to carry him through it. He was several times after this carried to church, but never again was able to take any part in the service. With a noble~~

~~disinterestedness he refused to receive his stipend, now that he was no longer able to discharge the duties of his office. In the midst of his sufferings, however, his zeal and energy kept him m continual occupation; when expostulated with for such unseasonable toil, he replied, "' Would you that the Lord should find me idle when He comes?" After he had retired from public labours he lingered for some months, enduring the severest agony without a murmur, and cheer- fully attending to all the duties of a private kind which his~~

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~~diseases left him strength to discharge. A deep impression seems to have been made on all who visited him on his deathbed ; they saw in him the noble spectacle of a great spirit that had done its life-work, calmly and trustfully passing through the gate of suffering into the long-desired and firmly-expected repose of heaven. He quietly expired in the arms of his faithful friend Beza, on the evening of the 27th of May, in the fifty-fifth year of his age.~~

~~Calvin was of middle stature; his complexion was somewhat pallid and dark ; his eyes, to the latest clear and lustrous, bespoke the acumen of his genius. He was sparing in his food and simple in his dress; he took but little sleep, and was capable of extraordinary efforts of intellectual toil. His memory was prodigious, but he used it only as the servant of his higher faculties. Asa reasoner he has seldom been equalled, and the soundness and penetration of his judgment were such as to give to his conclusions in practical questions almost the appearance of predictions, and inspire in all his friends the utmost confidence in the wisdom of his counsels. As a theologian he stands on an eminence which only Augustine has surpassed; whilst in his skill as an expositor of Scripture, and his terse and elegant style, he possessed advantages to which Augustine was a stranger. His private character was in harmony with his public reputation and position. If~~

~~somewhat severe and irritable, he was at the same time scrupulously just, truthful, and steadfast; he never deserted a friend or took an unfair advantage of an antagonist ; and on befitting occasions he could be cheerful and even facetious among his intimates. "T have been a witness of him for sixteen years," says Beza, "and I think I am fully entitled to say that in this man there was exhibited to all an example of the life and death of the Christian, such as it will not be easy to depreciate, such as it will be difficult to emulate."! (Ww. L. A.)~~

~~CALVISIUS, Seraus (1556-1617), a German astro- nomer and chronologer, was born at Groschleben, in Thuringia, in 1556. He studied at Helmstidt, where he made great progress in classical literature, as well as in the sciences in which he afterwards became so distinguished. He was offered a professorship of mathematics at Frankfort, and afterwards one at Wittenberg, both of which he declined. He agreed, however, to conduct the school of music, established at Pforte,—an office which he afterwards exchanged for a similar situation at Leipsic. At Frankfort he published, in 1585, his Opus Chronologicum, a work compiled on astronomical principles. He likewise organized a system of chronology, embodying the history of the world, upon an ingenious and original plan, highly commended by Casaubon and Scaliger. This work, which was strongly condemned in the Index Hxpurgatorius, has been frequently reprinted. In 1612 Calvisius published his Zlenchus Calendarii Gregoriani, et duplex Calendarti melioris forma, in which he attempts to prove the inadequacy of the Gregorian calendar, and proposes to introduce a new system based upon astronomical prineiples. The only proof now extant of his musical knowledge is his treatise entitled Melodive condende ratio. He died at Leipsic in 1617.~~

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~~1 Vt. Calv. sub jin. his is the principal source for the facts of Calvin's life. Beza's narrative has been expanded and illustrated from other sources by Dr Henry in his Leben Calvins, of which an English translation has appeared in 2 vols. 8vo, by the Rev. H. Stebbing. Audin has written a life of Calvin in French, full of misrepresentations and blunders. A highly respectable work has appeared on the same subject from the pen of M. Dyer, in 1 vol. 8vo. M. Bungener has also Teeently sent forth a Life of Calvin, which has been translated into English, Edin., 1863. Of Calvin's works, two editions appeared at Geneva, one in 12 vols. fol. in 1578, the other in 7 vols. fol. in 1617. An edition, hitherto reputed the best, was published at Amsterdam In 9 vols. fol. in 1671. A new edition in 4to is at present in course of publication, carefully edited by G. Baum, E. Lunitz, and E. Reuss, at Brunswick. An English translation has been issued at Edinburgh In 58 vols. 8vo.~~

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~~CALYDON (Kadvédv), an ancient town of tolia, 7h miles from the sea, on the River Evenus. It was said to have been founded by Calydon, son of A°tolus ; to have been the scene of the hunting, by Meleager and other heroes, of the famous Calydonian boar, sent by Artemis to lay waste the fields; and to have taken part in the Trojan war. In historical times, it is first mentioned (391 B.c.) as in the possession of the Achzeans, who retained it for twenty years, by the assistance of the Lacedemonian king Agesilaus, notwithstanding the attacks of the Acarnanians. After the battle of Leuctra (371 Bc.) it was restored by Epaminondas to the AXtolians. In the time of Pompey it was a town of importance; but Augustus removed its inhabitants to Nicopolis, which he founded to commemorate his victory at Actium (31 B.c.)~~

~~CALYPSO, in Grecian mythology, was a daughter of Oceanus and Tethys, or of Nereus, or of Atlas, and reigned in the mythical island of Ogygia. When Ulysses was shipwrecked on her shores, Calypso entertained the hero with great hospitality; and by the united influence of her love and spells, she prevailed on him to remain and share her honours. In this manner seven years had been spent, when Ulysses was seized with an irresistible desire to revisit his native country. Calypso tried every expedient, and even the promise of eternal youth, to induce the hero to remain ; and when all her efforts had proved unavailing, and he set sail, grief at his departure occasioned her death. (Hesiod, Theog. 359; Hom., Od. i. 50, v. 28, vii. 254 ; Apollod. i. 2, § 7.)~~

~~CAM, Diogo, a Portuguese discoverer, of noble birth, belonging to the latter half of the 15th century, is famous for having carried on, under Alphonso V., the discoveries in Western Africa commenced by Don Henry. He sailed round capes Gongalvez and Catharina ; and having obtained great influence with the king of Congo, opened up that couutry for the introduction of Christianity. On his first voyage (1484) he was accompanied by Martin Behem, the astronomer and cosmographer. Subsequently Cam pene- trated as far as 22° S. lat.~~

~~CAMALDULIANS, Camarpuntans, or CAMALDOLITES, an order of religious persons, founded by Romuald, an Italian, in the beginning of the~~

~~11th century, in the desolate waste of Camaldoli, or Campo Malduli, on the lofty heights of the Apennines. Their rule was that of St Benedict; and their houses were never erected at less than five leagues from cities. The monks were divided into cenobites and eremites. The Camaldulians, till the close of the 11th cen- tury, were called generally Romualdins ; previously, Camal- dulian was a particular name for those of thedesert Camaldoli. Guido Grandi (1671-1742), a Camaldulian monk, and mathematician to the grand duke of Tuscany, published Camaldulian Dissertations, on the origin and establishment of this order. Pope Gregory XIII. was a Camaldulian.~~

~~CAMARINA, an ancient city of Sicily, situated on the south coast, near the mouth of the Hippuris or Fiume di Camarana, as it is still called, about 20 miles E. of Gela or Terranova. It was originally founded by the Syracusans in the 6th century B.c., but was shortly afterwards destroyed by the mother city, because it had thrown off its allegiance. Restored in 495 B.c. by Hippocrates of Gela, it was again depopulated by Gelon, the conquerer of Syracuse, and did not receive a permanent establishment till 461. During the next century the mainspring of its political action was usually antipathy to Syracuse, but on the Athenian invasion it ultimately sent assistance to the beleaguered city. The Carthaginians struck a severe blow at its prosperity in the 5th century B.c., and in 258 a large part of its inhabitants were sold as slaves by the Roman consuls. The town con- tinued to exist in the 2d century of the Christian era, and its site is still marked by a considerable mass of ruins. My xivee~~

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~~Kapdapwav, "Do not stir Kamarina," a proverb somewhat equivalent to our advice to "let well alone," is said to have been originally the answer of the Delphic oracle to the citizens when they consulted as to the draining of a neigh- bouring lake.~~

~~CAMBACERES, Jaan Jacques Rects pe (1753-1824), an eminent French statesman under the first republic and the first empire, was born at Montpellier the 18th October 1753, of an old and distinguished family. Being destined for the profession of law, he began his studies in that~~

~~department at an early age, and was soon recognized as one of the ablest jurists in France. And as his legal learning was one of the main sources of his fame, so it was his chief means of rendering service to his country. Cam- bacérés was a decided though moderate disciple of the new principles now everywhere diffused in France, and on the assembling of the States-general in 1789 was chosen as a second representative for the nobility of the district of Montpellier. The right of Montpellier to send a second noble deputy was disputed, and Cambacérés did not sit. But he was a member of the National Convention in 1792. Foreseeing the violent courses into which the Convention should be impelled, Cambacérés, from principle as well as necessity, held aloof, and sought to avoid the perils and excesses Of the time by confining himself to the neutral province of jurist and legislator. The trial of the king, however, compelled him to declare himself, In the first place, he maintained that the Convention was not competent to try the king ; and when the trial had been decided on, he insisted that all latitude of defence ought to be accorded to the royal counsel. As to the sentence, he found the king guilty, and worthy of the punishment due to one who had conspired against his country ; but moved for delay in the execution of it, till peace should be restored, or the French soilinvaded, This moderation made Cambacérés "suspect " in the eyes of the Mountain, and he confined himself more circunispectly than ever to his proper work of revising and codifying the new laws. On the downfall of Robespierre in 1794, he was a leading man in the restoration of a milder régime. He was sometime president of the Con- vention, and, subsequently, president of the Committee of Public Safety, in which capacity he helped to the conclusion of peace with Prussia and Spain. Under the Directory he again fell under the suspicion of the extreme party, and was obliged to retire from the presidency of the Five Hundred, to which he had been called. He took no part in the revolution of the 18th Brumaire (9th November 1799), which overturned the Directory and set up the con- sulate ; but Napoleon had such confidence in him that he made him second consul. This confidence Cambacérés continued to enjoy all through the consulate and the empire. On the establishment of the empire he became arch-chancellor, being life-president of the Senate, and the right-hand man of Napoleon in the civil administration generally. While loyal to his master, his influence was on the whole beneficial to France. He took an important part in the redaction of the Code Napoléon, tried to dis- suade Napoleon from the murder of the Duc~~

~~d'Enghien and from the disastrous campaigns of 1812 and 1813, and only gave in his adhesion to the act of abdication of 1814 when resistance was manifestly hopeless, while he resumed oflice with reluctance during the Hundred Days.~~

~~After the final restoration of Louis XVIII. in 1815, Cambacérés again became an object of persecution, this time as a regicide, and was obliged to retire into Belgium. A royal decree of 1818 restored him to all his civil and political rights, but he did not again emerge from private life. He died in 1824. Cambacérés was a great contrast to most of the leading men in the stormy days of the Revolution. He was moderate in his opinions and in~~

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~~his advocacy of them; he had a clear, penetrating and luminous understanding; and was a great master of seng torial eloquence. He had been created duke of Parma iy 1808, and by this name is sometimes known in history,~~

~~CAMBALUC is the name by which, under sundry modifications, the royal city of the Great Khan became known to Europe during the Middle Ages, that city being in fact the same that we now know as Peking. The word itself represents the Mongol Kaan-Baligh, " the city of the khan," or emperor, the title by which Peking continues, more or less, to be known to the Mongols and other northern Asiatics,~~

~~A city occupying approximately the same site had been the capital of one of the principalities into which Qhina was divided some centuries before the Christian era; and during the reigns of the two Tartar dynasties that immediately preceded the Mongols in Northern China, viz., that of the Khitans, and of the Kin or "Golden" khans, it had been one of their royal residences. Under the names of Yenking, which it received from the Khitan, and of Chungtu, which it had from the Kin, it holds a conspicuous place in the wars of Chirghiz Khan against the latter dynasty, He captured it in 1215, but~~

~~it was not till 1264 that it was adopted as the imperial residence in lieu of Kara Korum in the Mongol steppes, by his grandson Kublai. The latter selected a position a few hundred yards to the N.E, of the old city of Chungtu or Yenking, where he founded the new city of Z'a-tu ("great capital"), called by the Mon- gols Taidu or Daitu, but also Kaan-baligh ; and from this time dates the use of the latter name as applied to this site,~~

~~The new city formed a rectangle, enclosed by a colossal mud-rampart, the longer sides of which ran north and south. These were each about 54 English miles in length, the shorter sides 33, so that the circuit was upwards of 18 miles, The palace of the khan, with its gardens and lake, itself formed an inuer inclosure fronting the south. There were eleven city gates, viz., three on the south side, always the formal front with the Tartars, and two on each of the other sides; and the streets ran wide aud straight from gate to gate (except, of course, where interrupted by the palace-walls), forming an oblong chess-board plan.~~

~~Tatu continued to be the residence of the emperors till the fall of the Mongol power (1368). The native dynasty (Ming) which supplanted them established their residence at Nan-king ("South-Court"), but this proved so incon- venient that the second sovereign of the dynasty reoccupied Tatu, giving it then, for the first time, the name of Pe-hing (" North-Court"). This was the name in common use when the Jesuits entered China towards the end of the 16th century, and began to send home accurate information about China. But it is not sonow; the names in ordinary use being King-cheng or King-tu, both signifying " capital." The restoration of Cambaluc was commenced in 1409. The size of the city was diminished by the retrenchment of nearly one-third at the northern end, which brought the enceinte more uearly toasquare form. And this constitutes the modern (so-called) " Tartar city" of Peking, the south front of which is identical with the south front of the city of Kublai. The walls were completed in 1437. Population gathered about the southern front, probably using the material of the old city of Yenking, and the excrescence s0 formed was, in 1544, enclosed by a wall, and called the "outer city." It is the same that is usually called by Europeans " the Chinese city." The ruius of the retrenched northern portion of Kublai's great rampart are still pro minent along their whole extent, so that there is no room for question as to the position or true~~

~~dimensions of the Cambaluc of the Middle Ages; and it is most probable, indeed it is almost a necessity, that the present palace stands on the lines of Kublai's palace.~~

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~~The city, under the name of Cambaluc, was constituted into an archiepiscopal see by Pope Clement V. in 1307, in favour of the missionary Franciscan John of Montecorvino ; but though some successors were nominated it seems probable that no second metropolitan ever actually occupied the seat. .~~

~~Maps of the 16th and 17th centuries often show Cambaluc jn an imaginary region to the north of China, a part of the misconception that has prevailed regarding Cathay (see Cuiva). The name is often in popular literature written Cambalu, and is by Longfellow accented in verse Cambdli. But this spelling originates in an accidental error in Ramusio's Italian version, which, till lately, was the chief channel through which Marco Polo's book was popularly known. The original (French) MSS. all agree with the etymology in calling it Cambaluc, which should be accented Cimbdlue. H. Y.)~~

~~CAMBAY, or Kampay, a town of Western India, in Quzerat, or the northern division of tle province of Bombay, and forming the capital of the native state of the same name, which has an area of about 350 square miles, and a population of about 175,000. It is situated on the River Mahi, at the upper part of the Gulf of Cambay, 230 miles N. of Bombay, in 22° 18' N. lat. and 72° 39' E. long. It is supposed to be the Camanes of Ptolemy, and was formerly a very flourishing city, the seat of an extensive trade, and celebrated for its manufactures of silk, chintz, and gold stuffs; but owing principally to the gradually increasing difficulty of access by water, its commerce has long since fallen away, and the town has become poor and~~

~~dilapidated. The tides rise upwards of 30 feet, and at high water ships anchor near the town. The trade is chiefly confined to the export of cotton. The town is celebrated for its agates and carnelians, which are wrought into a variety of trinkets of reputation principally in China. The houses in many instances are built of stone (a circumstance which indicates the former wealth of the city, as the material had to be brought from a very considerable distance); and a brick wall, three miles in circumference, surrounds the town, enclosing four large reservoirs of good water and three bazaars. To the south-east there are very extensive ruins of subterranean temples and other buildings half-buried in the sand by which the ancient town was overwhelmed. These temples belong to the Jains, and contain two massive statues of their deities, the one black, the other white. The principal one, as the inscription intimates, is Pariswanath, or Parswanatha, carved in the reign of the Emperor Akbar ; the black one has the date of 1651 inscribed. It is Supposed that Cambay about the 5th century was the capital of the Hindu emperors of Western India. In 1780 it was taken possession of by the army of General Goddard, was restored to the Mahrattas in 1783, and was afterwards ceded to the British by the Peishwa under the treaty of 1808. The nawab, who is one of the 153 feudatory princes of British India by Sunnud or patent, pays £5876 of annual tribute to the viceroy of India from his revenue of £35,000. His military establishment consists of 800 horse and foot, who are employed indiscriminately in revenue, police, and miscellaneous duties; and a few pieces of ordnance complete his resources.~~

~~The GuLr or Campay, which is shallow and abounds in shoals and sand-banks, penetrates the coast of India for about 80 miles. It is supposed that the depth of water in this gulf has been decreasing for more than two cen turies past. The tides, which are very high, run into it with amazing velocity, but at low water the bottom is left nearly dry for some distance below the latitude of the town of Cambay. It is, however, an important inlet, being the channel by which the valuable produce of central Guzerat and the British districts of Ahmedabad and Broach is~~

~~exported ; but the railway from Bombay to Baroda and Ahmedabad, near Cambay, is gradually attracting the trade to itself. The gulf extends between~~

~~21° and 22° 10'N lat., and 71° 50° and 72° 40' E. long.~~

~~CAMBERT, Roserr (1628-1677), the earliest composer of French operas, was born at Paris in 1628. His master for the clavecin, and probably also for composition, was Chambonniéres. He was organist of the church of St Honoré, and also held the office of musical superintendent to Queen Anne of Austria, mother of Louis XIV. His earlier works, the words of which were furnished by the Abbé Perrin, continued to be performed before the court at Vincennes, till the death of his patron Cardinal Mazarin. Displeased at his subsequent neglect, and jealous of the favour shown to Lulli, who was musical superintendent to the king, he went, in 1673, to London, where he was appointed soon after his arrival master of the band to Charles II. One at least of his operas, Pomone, was performed in London under his direction, but it did not suit the popular taste. His principal operatic pieces were entitled Ariadne ou les Amours de Bacchus, Pomone, and Les Peines et les Plaisirs de' Amour. Cambert died in London about 1677.~~

~~CAMBODIA, more properly Camposa, or Kamposa, a very ancient kingdom of South-eastern Asia, still subsisting . in decay. As now limited the territory of Camboja forms a rough parallelogram, consisting in large part of alluvial plain, lying athwart the lower course of the Mekong or Great Camboja River, just above the Delta. The greatest length of the territory runs from W. to E., covering a little more than 34° of longitude, viz., from about 103° E. long. to 106° 40'. The mean breadth from S. to N. is a little over 2° of latitude, extending on the western coast from 10° 30' N. lat. to 11° 45', and on the little known eastern frontier from about 11° 35' to 13° 40'. On the N. it is bounded by provinces which the Siamese have wrested from Camboja; on the E. by Cochin-Chinese territory ; on the S. by the Delta Provinces first taken by Cochin-China from Camboja, and then by the French from Cochin-China; on the W. by the Gulf of Siam, along which it extends for 200 miles, now its only seaboard.~~

~~Both the ethnology and the early history of Camboja~~

~~'partake of the obscurity that hangs over Indo-China~~

~~generally. But traditions of the ancient grandeur of the kingdom are borne out by the recent exploration of numerous architectural remains of~~

~~extraordinary extent aud magnificence within its former limits. Some important notices are found in Chinese annals, and more information is to be expected when numerous existing inscriptions shall have been successfully interpreted.~~

~~The name given by the people of Camboja to their own race is Khmér, a name which was known and used by early Arab voyagers and geographers under the form Koémér, and noted by them as a country famous for aloes-wood; it has, however, been imbroiled in much confusion both by them and by their commentators. There is a persistent and apparently well-founded tradition among the Khmér, that before their own immigration, as they say from the north, the Tsiam or Champa race were in possession of the soil, whilst the Khmér themselves seem to have preceded the descent of the Thai race, to which the people of Siam and Laos belong.~~

~~Local written legends again appear to speak of two early immigrations from Gangetic India. We know that the Pali-Buddhistical annals of Ceylon record that at the conclusion of the third great synod of the Buddhist church, held at Palibothra, in the year 302 after Buddha (corresponding, according to ordinary Ceylonese reckoning, to 241 B.c., but as corrected by Professor Max Miiller to 175 B.c.), a mission was despatched to the region of~~

~~Stivarna-Bhumi—t.e,, Aurea-Regio or Chryse ; and this record may have been the real basis of the earlier Cambojan tradition. But it must not be forgotten that in Ptolemy's map of the Indo-Chinese coast are found many Sanskrit names, indicating the existence of Hindu settlements at least as early as the Ist century of our era. The name of Kamboja, though in later days we find it subjected to fantastic charade-making after the Chinese fashion of etymology,! appears to be simply the transfer of a name famous in old Indian literature as that of a race and region on the N.W. of the Panjab, in or near the present Chitral. Such transfers were common, and many survive in Indo- Chinese use or memory to this day.?~~

~~It is a singular circumstance that some of the Cambojan legends collected by Bastian—indications of which were also recorded by missionaries two~~

~~centuries ago—bring the second Indian immigration from a western region called ftom or Roma-viseit. This will be noticed again.~~

~~Like other Indo-Chinese states Camboja possesses written annals ; but these do not commence till 1346 a.p. Hence they only take up the history of the kingdom when its power, and perhaps its civilization. were already past their climax.~~

~~From the Chinese annals older information is obtained. These mention, under the name of F'u-nan, and as early as the 12th century 3.c., a kingdom embracing what afterwards became Camboja; and the Emperor Hiao-wuti of the Han dynasty is alleged to have made Funan tributary, along with adjoining countries, circa 125 B.c. Some two centuries later the same annals place an immigration under a foreign prince, who became the founder of a dynasty, and is perhaps to be identified with the Indian leader of the native legends. The fourth king of this dynasty—say in the latter part of the 2d century—makes extensive conquests over the adjoining kingdoms and coasts, and takes the name of Ta- wang ("great king"), probably a translation of the Indian title Mahd-rdja, which reappears some centuries later in Arab narratives as that of the King of the Isles. It is alleged, too, at this time, that the people of Za-tsin, 2.e., of the Roman empire, including Western Asia, frequented the ports of Funan for trade. This circumstance is highly probable when we consider that Ptolemy attests such voyages as having been made at least occaszonally, in the Ist or 2d century, whilst the Arab narratives show that they were habitual in the 9th.~~

~~Cambojan legend, like that of nearly all the Indo-Chinese countries, couples the introduction of Buddhism (perhaps rather its re-introduction) with the name of Buddhaghosha. However that may be, it is about the 1000th year of Buddha (z.e., according to the ordinary calculation 457 a.p.), and near the date usually assigned to Buddhaghosha, that the traditions place a great king, Phutamma Surwong, i.e., Padma Suryavansi; and it is at this epoch of the 5th and 6th centuries that Garnier is inclined to place the great kings, who were the founders of the older architectural monuments. Fergusson would place these several centuries later, but the whole subject of their chronology is as yet too obscure. From about this time the kingdom is known in Chinese records as Chinla, and to those days of splendour may be~~

~~referred an old Chinese proverbial saying, “ Rich as Chinla.” It appears long to have ruled over the valley of the Menam (since the 14th century the seat of Siamese~~

~~1 The syllables of Kamboja have been tortured by the later natives to mean “born of the waters,” “‘race of Kam (Khmér),” and what not. The modern Chinese have corrupted Kambgyja through Kan-phu-ché into Tung-po-chai, probably to meet some fancy of a similar kind.~~

~~? The occurrence of the name Camboja on one of the repliche of the inscriptions of Asoka, in connection with the names of regions in the extreme south of India, has lately raised a question whether the Indo-Chinese Camboja did not even then exist.~~

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~~monarchy), and perhaps at one time to the shores of the Bay of Bengal. In the reign of Prakrama Bahu of Ceylon (1155 a.p.) we hear, in the annals of that island, of his intercourse with Camboja (Jour. As. Soc. Bengal, vol, sai p. 198).~~

~~A very remarkable account of Chinla or Camboja, by an envoy sent from Peking shortly after the death of Kublaj Khan (viz., in 1295-1297), has been translated by Abel- Rémusat, and affords us a strange peep into the midst of a civilization now in the profoundest decay. The accuracy of his details regarding topography and surviving mont. ments of architecture attests the writer’s truthfulness, The court and capital are described as very splendid, whilst (as in all Indo-Chinese countries) some traits of the deepest barbarism in manners show themselves. The kingdom possessed many fortified cities ; but its power was already in decline, for it had not long before suffered from one of those invasions of the Thai which have ever since been wearing it away. Again and again such invasions and temporary occupation were repeated, especially after the foundation of the Siamese monarchy by another branch of the Thai in 1350.~~

~~The Portuguese found their way to Camboja not long after the conquest of Malacca, and the kingdom still retained a good deal of the shell of its old splendour. Yet its native force appears by this time to have been in reality almost burnt out; and towards the end of the 16th century the land swarmed with foreign adventurers, both European and Asiatic, among the latter of whom Japanese were prominent. At the instigation of some of these adventurers we find the Spanish authorities at Manilla (1594- 1598) engaging in " fillibustering " expeditions to Camboja, with little result. Somewhat later the Portuguese had factories in the country, and then the Dutch (1635). Notices of English trade with Camboja appear as early as 1616. In 1641 Gerard van Wusthoff of the Dutch factory conducted a remarkable expedition up the Great River to Vienchang, the capital of one of the Laos states, about 1000 miles from the sea,—a feat never repeated till the French mission of 1866-68. In 1643 Mynheer Regemortis, envoy from Batavia, with all the Europeans of the factory, on his way to court, were assassinated under Portuguese instigation, and this put a discreditable and too characteristic end to the official relations of Europeans with Camboja. The English established a factory at Pulo Condore, a group of islands off the coast of the Cambojan delta in 1702, but this also came to a speedy end in the massacre of its members by the Macassar sepoys of the garrison. The first missionary who entered Camboja was Gaspar da Cruz, a Dominican, in 1555. He has left some curious particulars which are given by Purchas.~~

~~Camboja continued to be ground between the two mill- stones of Siam and the now rising kingdom of Cochin- China. The former about 1690 annexed large tracts on the N.W., augmented a century later, and again in 1810-12, by seizures which embraced the districts adjoin- ing the Great Lake, at the very heart of the old monarchy ; the latter in the middle of the last century absorbed the whole of the Delta; and Camboja was thus reduced to its present narrow limits. In 1846 a king was enthroned under the joint investiture of Siam and Cochin-China. The French invasion of the Anamite provinces in the Delta took place in 1859, and these were formally ceded in 1862. Meantime Camboja seemed about to be finally swallowed up by Siam. It was manifest, however, that the prospects of the new French possession would be materially restricted if all above the Delta were Siamese ; and France began to claim the character of protector of Camboja.~~

~~In 1864 the king, Morodam, was solemnly crowned in the presence of a French and of a Siamese representative ; anda treaty was~~

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~~concluded, placing the kingdom formally under joint~~

~~protection of those two powers, but practically of France. The presence of a Siamese resident at the court ceased ; and thus a reprieve at least was given to this ancient monarchy.~~

~~Capitals and Seaports.—The ancient capital of Camboja in its splendour was Angkor, of which we shall speak below, abandoned in consequence of its exposure to Siamese aggression in 1388, but briefly reoccupied in 1437, In 1388 the court moved to Basan or Boribun, on the S.W. shore of the lake, and a few years later to P'nompenh, corruptly in some books called Calompé, at the confluence of the outlet of the Great Lake with the Mekong. This appears to be the place named by some of the old writers Chordamuco. About 1528 it was established at Lovek (called by Valentijn Hawwek), near the west side of the issue from the lake; then at Puntenang or Pontaipret opposite Lovek. Udong, a few miles north of the con- fluence, became the capital in 1739, and so continued down to 1866, when it was again trausferred to Pnompenh. The chief port of foreign trade in the 17th century was Potai- mat, called by foreigners Ponteamas, replaced afterwards by Kangkao or Atien on the same bay. But both were in the territory taken by the Cochin-Chinese, and now French. Since the annexations by Siam and Anam Camboja has only one port, Kdmpot. The trade is chiefly in Chinese Between this and the rich alluvial tract round the capitals a high range of hills has to be passed, but there is~~

~~_ acart road the whole way to Pnompenh.~~

~~Chief Geographical Features.—The great river Mekong, known also as the Camboja River, a name bestowed when its delta yet belonged to Camboja, flows through the existing territory for about 250 miles, fron N.E to S.W. This river as a whole will be better dealt with elsewhere (see~~

~~_Mrxone). The next main feature of the present limited territory is the “ Great Lake,” as it is called by the Cochin- Chinese (Bienhoa), or “ Freshwater Lake ” of the Cambojans (Lalé-Sab),—by the Malays styled the Lake of Sri Rama.~~

~~_ This lake is of the nature of those sheets of water which in~~

~~Bengal are called jhéls, viz., a shallow depression in an~~

~~alluvial plain, retaining a part of the annual overflow of the rivers throughout the year, and hence subject to great variations in depth and extent In the rains it is said to~~

~~have a length of about 100 miles (N.W. to S.E.) with a~~

~~breadth of one-third as much. Its average depth in the dry season is only 4 feet. The Udong River, communicat-~~

~~‘ing between the lake and the Mekong, fills a channel of~~

~~great breadth. Its waters change their direction half-yearly, from June to December filling the lake from the Mekong, and trom December to June draining the lake into the Mekong. | The lake is an object of superstitious regard to the people, and the fishery therein is the most important event in their saunual life. It is carried on in the dry season, during~~

~~Which time extensive pile-villages are erected in the lake, where the drying and salting of the fish is carried on. The dried fish is exported largely to Cochin-China, as well~~

~~as live fish in cages. Much also is converted into oil.~~

~~} Natural Productions and Lixports.—The elephant may be regarded as the characteristic animal of Camboja. Wild herds are Numerous, and frequent the shores of the lake~~

~~‘in the dry season. The tamed animals are by no means 80 well trained as in India, but they are the chief beasts~~

~~of burden, and a few years ago did not cost more than £10 or £12. The rhinoceros also abounds (the species we do not find stated) about the foot of the mountains north | of the lake. Strong and handsome ponies are bred, much in demand at Bangkok. Among wild animals there are Said to be three species of wild cattle. _ The Chinese envoy of 1295-97 mentions among Cam- bojan exports rhinoceros' horns, gamboge, cardamoms, and~~

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~~eagle-wood ; and these are still among the most characteristic. Though the gum called gamboge derives its name from Camboja, and is chiefly supplied by that country, the tree (Garcinia Morella) does not appear to have been seen in its native localities by any botanist. Dr Thorel, of the French expedition, indicates its habitat as in the N.W. of the old Cambojan territory, about Korat, now subject to Siam. The cardamoms (Amomum villosum, Louveiro) are produced in the mountains not far from the lake. Hagle- wood (or Aloes-wood) appears to be the result of disease, forming internal cavities in the soft white wood of Aqui- larva agallocha, and is obtained by splitting the tree, — its probable existence in any tree being recognized by indica- tions known to the collectors. It is now found chiefly near the coast of the Gulf of Siam, about Chantibun (now Sianiese), and is said to be common in the island of Kotran, or Phukok, off Kampot. The names eagle-wood, agua, &., are corruptions from the Sanskrit Ayuwru, and have nothing to do with eagles.~~

~~Other vegetable products are nutmeg, liquorice, caout- chouc and gutta-percha, tobacco, sapan-wood, pepper, rice, cotton, &c., with benzoin from the Upper Mekong. Addi- tional exports of sorts are hides and horns, tortoise-sheil, lac, ivory, and dried elephant flesh. Iron of excellent quality is smelted and wrought by some of the hill tribes,~~

~~People, Government, and Language.—Of the numerous wild, or we should rather say illiterate, tribes on the borders of the Cambojan plain, and still imperfectly known, we cannot speak in our limited space. The Cambojans proper, or Khmér, differ much from both Siamese and Cochin-Chinese. They are described as tall, well and strongly made, showing less of~~

~~Mongoloid feature than any of the better known nations of Indo-China ; good-natured but apathetic, and leaving all the trouble and gains of trade to Chinese, Auamites, and Malays. Their religion is Bud- dhism of the usual Indo-Chinese type. But like the other races of that region they call in the devil-dancing medicine- man in illness. They cut the hair short, leaving a top-tuft, and wear the langiti, or loin-cloth, tucked between the legs, using that Hindu name for it.~~

~~There are some 2000 Roman Catholic Christians in the country, and some considerable number of Malay and Tsiam Mahometans. The Malays are chiefly on the coast, and claim to be very ancient settlers.~~

~~The government is an absolute monarchy, after the usual Indo-Chinese kind, with a second king or cesar, the Yuva- raja of ancient India, known by a corruption of that title.~~

~~The language is placed by the late Mr Logan in his "Mon Anam " class. But it appears to differ materially from the Anamite, as well as from other purely monosyllabic languages of Indo-China. These, like the Chinese, employ a variety of so-called tones, or inflexions of voice, by which different meanings of the same monosyllable are discriminated,— the Anamite having six such tunes. The Cambojan is without these, being spoken, as a missionary expresses it, recto tono. The numeration is stated by Garnier to present traces of a quinary system, but the vocabulary which he gives hardly confirms this. The letters are an ornamental form of the Pali, which has been the foundation of all the Indo-Chinese alphabets. An older form, illegible to the modern priests, is used in the inscriptions.~~

~~Architectural Antiquities. As already indicated, these are of the highest importance and interest. They are found in some forty or more known localities, and some as far north as Suren in the Korat district, now Siamese (14° 47' N. lat.) Indeed the most important remains are all in what is now Siamese territory, north of the Great Lake. The remains embrace walled cities of large extent ; palaces and temples, stupendous in scale and rich in design, and often most elaborately decorated with long galleries of~~

~~storied bas-reliefs ; artificial lakes enclosed by walls of cut stone; stone bridges of extraordinary design and excellent execution ; elaborate embanked highways across the alluvial flats, &c. Were it possible to reconcile the geography, they would almost justify the extravagant fictions of Mendez Pinto regarding the palaces and temples of Timplan and Timagogo.~~

~~About fifteen miles north of the lake, buried in forest, is the ancient capital, commonly called Angkor or Nakhon (both corruptions of the Indian Magara) Thom, or " the Great City," the proper old name of which was Inthapata- buri, z.e., Indraprasthapuri, after the capital of the Pandus in the ancient India of the Mahabharat. Mouhot and Thomson have by some misapprehension greatly exaggerated its size; but its walls do in fact form a quadrangle of nearly 82 miles in circuit and 30 feet in height, surrounded by a very wide ditch. There are five gates (two on the east), of very grandiose though fantastic architecture. About five miles south of the city is the great temple called Nakhon Wat, z.e., 'the city monastery," one of the most extraordinary architectural relics in the world.~~

~~This also is enclosed by a quadrangular wall of 3860 yards in compass, outside of which is a wide ditch. We cannot attempt to describe this edifice with its corridors, sculptures, and towers rising to 180 feet and upwards. Much in the detail is Indian ; much that is but obscurely traced as yet in India connects itself with other remains in Indo-China and in Java; much again is unique. One remarkable point is the Roman-Dorie character of the enriched pilasters which form a feature frequently recurring ; this, too, has parallels, though not quite so striking, in Ceylon and in medizval Burmese remains.~~

~~Some remarkable features of the Camboja monuments are distinctly mentioned in the Chinese medizval narrative, but there is apparently no notice of the Nakhon Wat. If force is to be attached to this omission, it will indicate the date of that building as between 1296 and 1352, the date of the first great Siamese invasion. We are not yet ina position to say with certainty to what worship they were dedicated, though inclining to the view of Garnier, who regards them as belonging to Buddhism, the still existing worship of the nation ; and some of the temples are certainly Buddhist. Mr~~

~~Fergusson dissents, and regards the great temples as monuments of serpent-worship,—though admit- ting doubt.~~

~~Though the existence of these remarkable ruins had been quite forgotten till what may be called their redis- covery, of which the first distinct account was given by M. Mouhot in 1859, they had been known to some of the early Jesuit missionaries, who speak of their " discovery in 1570 ;" and a notice of them from such a source will be found in Zedler's Universal Lexicon under "' Cambodscha" (1733). Father Ribadeneyra (1601) says a legend ascribed the erection to Alexander the Great. This must have originated with the Malays, among whom Iskandar and the " Alexander Saga" were familiar and popular. And to the same communication may perhaps be due that strange introduction of Lome into the legendary history. This would then be Rome in its Mussulman sense,—Riim—.e., Greece or Turkey.~~

~~See Garnier, Voyage d' Exploration en Indo-Chine, Paris ; Cortam- bert et de Rosny, Tableau de la Cochin-Chinc, Paris 1862; Bastian, Reise, ii. and iv.; Mouhot's Travels, 1864; The Philippine Islands, &c., by Antonia de Morga, Hakluyt Soc. 1868 ; Cambodia and its Races, by G. Thomson ; Antiquities of Cambodia, by J. Thomson ; Fergusson's. Hist. of Architecture, vol. ii., and Tree and Scrpent Worship ; Crawfurd's Mission to Siam and Cochin-China; Abel-~~

~~Rémusat, Nouv. Melanges Asiat. vol. i. 100; Calendar of State-Papers, East Indies, 1862 ; Purchas, vol. lii., &c. (H. Y.)~~

~~CAMBORNE, a small town in the county of Cornwall, about 13 miles by rail S.W. of Truro. It is a neatly-built~~

~~place, and stands in the immediate neighbourhood of some of the most productive tin and copper mines in the county which afford employment to most of the inhabitants,]j has a handsome parish church, in the later Gothic style restored in 1862. Population in 1871, 7757. CAMBRAY, in German~~

~~Kamerik, or Kambryk, g fortified town of France, in the department of N. ord situated on the right bank of the Scheldt, 32 miles § of Lille, in 50° 10' N. lat. and 3° 14' E. long. It is wel] built, contains a large number of ancient gabled houses and is surrounded by strong walls flanked with round towers. The principal building is the Cathedral of § Sepulchre, occupying the site of an earlier structure, which was greatly damaged during the French Revolution, and suffered still more severely from a conflagration in 1859, It still contains a monument by David to the memory of Fénelon, but the tomb in which the archbishop was buried was broken open in 1793, and his coftin melted into bullets. Of the old archiepiscopal palace the only thing left is a Renaissance portal ; and the archbishop now has his residence in what was formerly the convent of the Benedictines. Besides these may be mentioned the church of St Gery, and the belfry of St Martin ; the town-house, dating from 1873; the citadel; and the public library, containing upwards of 35,000 volumes, in what was formerly the church of the hospital of St John. Cambray is the chief town of an arrondissement, and has judicial and commercial tribunals of the first instance. A college, two theological seminaries, a medical school, and a school of design are its chief educational establishments ; it has also various learned societies. The town has long been famous for its manufacture of fine muslin, to which it gave the name Cambric ; and it also contains manufactories of cotton cloth, lace, and thread, as well as sugar-factories, oil re- fineries, distilleries, breweries, and other industrial establish- ments. Its trade consists of grain, wine, hemp, hops, cattle, butter, and coal. The Scheldt begins to be navigable at the town, and communicates with St Quentin by means ofa canal. Population in 1872, 22,897. | Cambray is the ancient Nervian town of Camaracwm, which is first mentioned in the Antonine Itinerary. In the 5th century it was the capital of the Frankish king Ragnachar. Fortified by Charle- magne, it was captured and pillaged by the Normans in 870, and unsuccessfully besieged by the Hungariansin 953. During the 10th, | 11th, and 12th centuries it was the scene of frequent hostilities between tlic bishop and his supporters on the one hand and the citizens on the other ; but the latter ultimately cffected their inde- pendence. In 1478 Louis XI., who had obtained possession of the | town on the death of the last duke of Burgundy, handed it over to the emperor, and in the 16th century Charles the Fifth caused it to be fortified with a stroug citadel, for the erection of which the castles of Cavillers, Escaudceuvres,and many others were demolished. From that date to the~~

~~peace of Nimeguen, which assigned it to Franee, it frequently passed from hand to hand by capture or treaty. 1n 1793 it was besieged in vain by the Austrians. The League of Cambray is the name given to the alliance of Pope Julius I1., Louis Xi, Maximilian I., and Ferdinand the Catholic against the Venetians 1508 ; and the Peace of Cambray, or as it is also called, the Ladies Peace, was concluded in the town by Louise of Savoy, mother of Francis I., and Margaret of Austria, aunt of Charles V., in nameoi these monarchs. The bishopric of Cambray dates from the 5th cen- tury, and it was erected in 1559 into an archbishopric, which con- . tinued till the Revolution, and has since been restored. The bishops received the title of count from the Emperor Henry I., and in 1610 were raised to the dignity of dukes, their territory including, besides the town itself, the district called Cambresis.~~

~~CAMBRIDGE, County or, one of the smaller English counties, belonging to the South Midland division of England, is about 45 miles in length and 30 in breadth. It comprises 17 hundreds, and the boroughs of Cambridge and Wisbeach. There are in the county, which is embraced within the diocese of Ely, 172 parishes and townships, be sides parts of parishes. It contains, according to the census of 1871, 524,926 statute acres. It is divided by the old course of the River Ouse into Cambridge proper and the~~

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~~sult Professor Babington's Monograph.)~~

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~~Isle of Ely. Until the year 1857 the Isle of Ely was~~

~~ractically a county palatine, like the county palatine of Mhester and the bishopric of Durham, a distinct enclosure within the county. The liberty of the Isle of Ely has its court of quarter sessions, a separate commission of the peace, and its own county rate. The county, which is purely agri- cultural, and for the most part arable, presents a vast land expanse, with little that is picturesque and with no claims to fine scenery, but imposing to the summer tourist by the frequent pollarded watercourses, the heavy crops of grain, and the immense dome of sky.~~

~~Cambridgeshire evidently once formed part of the country of the Iceni. The Icenhilde, always a British way, and never a via strata, was most probably derived from the same root. 'The country is rich in Roman roads and other remains, and some of the Roman roads were doubtless formed on old British tracks. (For the ancient roads con- Cambridgeshire became a dependency of the kingdom of East Anglia. It was included in the Danelagh, though how far it was colonized by Northmen is uncertain. According to Henry of Huntingdon, in the war against the Danes, when the English fled the men of Cambridgeshire resisted most manfully. During the period of the Conquest, the siege and capture of the Isle of Ely is the most remarkable event; the sea country was the last that yielded to the Conqueror, and the half-legendary Hereward is the last English hero of the conflict. In the time of Stephen, in the time of John, and in the time of the Barons' War in the reign of Henry ITI., the Isle of Ely emerges repeatedly into notice. The splendid foundations of Htheldreda and her sister, with the rising colleges of the university of Cambridge, drew pilgrims to the district from all parts of the country. In the Civil War Cambridgeshire belonged to the associated counties, and had no actual share in the conflict. Cromwell possessed a considerable estate in the Isle of Ely, and lived in the rectory house of Ely till elected member for Cambridge. He became governor of Ely, and his son Henry died in the neighbour-~~

~~_ hood (Carlyle's Cromwell). King Charles, after his seizure~~

~~at Holdenby, was brought to Childerly near Cambridge, and was taken thence to Newmarket, near which the Parliamentary army was encamped under Fairfax and Cromwell.~~

~~The drainage of the Cambridgeshire fens forms one of the most remarkable chapters of the industrial history of the~~

~~country, All the northern portion of the county, at the junction of the counties of Lincoln, Huntingdon, Cam-~~

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~~bridge, and Norfolk, is part of the vast district known as the Great Level of the Fens. A large province of 680,000 acres of the richest land in England~~

~~has been reclaimed from the sea and preserved by continual watchfulness, as completely as is the case in the opposite kingdom of Holland. The great works which have reclaimed the land were mainly due to Cornclius Vermuyden, the Dutchman, knighted by Charles I., and the Dutch and Flemings he employed, and in more recent times to James Rennie, the eminent engineer. The chief promoters were five successive earls of Bedford, who have given their name to the great Bedford Level. From the carliest times, however, there had been conflicts between the encroaching waters and the inhabitants of the invaded shores. The Romans, who left few great works unattempted, reclaimed much of the rich silt and soil deposited on the shores of the Wash, and con- structed the immense drainage work known as the Carr (Fen) Dyke. They also carried causeways over the fen country. Much of the Roman work seems to have lapsed Into the " creat dismal swamp," caused by the silting up of the outfalls of rivers, and the mingling of the tides with the upland waters. The submerged territory seems~~

~~ae originally to have been rich meadow and forest land, and it receives the river deposits of soil from eight counties, the causes of the great and abiding fertility. All this region then formed an immense estuary, the Wash, or rather a large lake, communicating by shifting channels with the sea, The more elevated grounds were called islands, whose isolation sometimes invited the founders of religious edifices, and sometimes those withont the pale of the law. The whole country from Cambridge to Lincoln was a morass abounding with fish and fowl, and all the scattered habitations of the fenmen were Liabie to be swept away by sudden storms.~~

~~The monasteries and the bishops of Ely did good work in the reclamation of lands. Morton's Leam was a canal made by Bishop Morton of forty miles from Peterborough to the sea, which drained the North J,evel. After the dissolution of the monasteries the work fell into abeyance until renewed by Cornelius Vermuyden. The fenmen vehemently opposed his plans, and Oliver Cromwell, the member for Cambridge, put himself at their head and succeeded in stopping all the operations. When he became protector, however, he sanctioned Vermuyden's plans, and Scotch prisoners taken at Dunbar, and Dutch prisoners taken by Blake in his victory over Van Tromp,~~

~~were employed as the workers. Much valuable land was reclaimed, and the fen country altogether improved. There remained, however, very much to be done. Ver- muyden's system was exclusively Dutch; and while perfectly suited to Holland it did not meet all the necessities of East Anglia. He confined his attention almost exclusively to the inland draining and embank- ments, and did not provide sufficient out-let for the waters themselves into the sea. So late as 1810 there were districts in which people reaped their harvest, and gathered their orchard fruits, and went to church, in boats. Rennie pointed out the true scientific principle that a thorough drainage could only be effected by cutting down the outfalls to low water at spring tides, and so facilitating the escape of the waters. He projected a great system of drainage and provided a more effectual outfall of the Ouse into the Wash. His work was improved and extended by Telford.~~

~~Throughout the present century great improvements of all kinds have been carried on. The surplus waters were formerly pumped into the rivers and canals by windmills ; but this could not be counted on as an invariable force, and steam-mills are generally substituted. Dykes, cause- ways, sluices, and drains were now cut in every direction. All the rivers of Cambridgeshire which formerly found their outlet at Wisbeach, before the channel was choked up, now mainly by cuts and straightenings, have forsaken their old beds and are poured into the sea by artificial streams, like the Bedford rivers into the German Ocean.~~

~~It will be interesting to enumerate the original courses of the streams; it is not always easy to decipher the natural channels. The chief rivers are the Nene and the Ouse, with its tributary streams. The Nene on arriving at Peterborough turned to the right, and making a circuit of several meres passed by March to Wisbeach. It is now made to flow into three channels. One arm is the Cats- water or Shire Drain, which meets Morton Leam and flows into the Wash; the second arm is Whittlesey Dyke, or the old Nene river ; the third is Morton's Leam. The Great Ouse enters the Fens near Earith, where it formerly forked ; one branch ultimately joined the Nene; the other branch was called the West Water, and ultimately joined the main channel of the Nene. Both the channels are now nearly closed to the waters of the Ouse, and are carried by the Bedford rivers in a direct line to Denver, where they meet the channel of the Little Ouse, and so~~

~~reach the sea at King's Lynn. The Cam or Granta, formed by the junction of some small Essex streams, flows N.N.E. from Cambridge, changing its name to Ouse three miles from Ely, but instead of flowing into the sea at Wisbeach is carried on to Denver, and thence to the sea at Lynn. The Lark for seven miles separates Cambridgeshire from Suffolk, and the Linnet, a feeder of the Lark, also serves as a boundary stream for another stretch of seven miles.~~

~~All the northern part of Cambridgeshire, the fen country, is covered with alluvial deposits resting on a bed of clay of great but unknown thickness. These are called the Kimmeridge and Oxford clays, the Oxford clay lying below the Kimmeridge. There is no break of continuity between them ; they are only distinguished by the embodied fossils above the clay. 'There is a deposit of peat of variable thickness, but generally very deep. South and east the Fens are bordered by a narrow belt of Kimmeridge clay, beyond which is a strip of lower and then of upper green- sand; and beyond this, in the southern division of the country, we have the chalk. In the fen country there are great masses of gravel, sand, and drift-clay. '" We can trace the rise of the fen lands through the deposits of land- floods, and the growth of fuel-bogs " (Professor Sedgwick). Besides these regular formations and deposits Cambridge- shire contains much diluvial deposit, not to be accounted for by land-floods or tides and currents, but belonging to the glacial period. The uplands or so-called " highlands " of Cambridgeshire are level, but broken by low chalk hills in the neighbourhood of Essex and Suffolk. The chalk is in two divisions,—upper with flints, lower without flints. At the foot of the hills the lower bed of chalk has been extensively quarried, and much elaborate sculpture in Ely Cathedral has been formed of it. The thin upper greensand below the lower chalk rests on gault. This formation everywhere constitutes the northern border of the chalk, and in the western portion of the country forms rich, well-wooded soil. The gault is the blue brick earth of Cambridge, and has a thickness of 150 feet. Professor Sedgwick has given a careful account of the fossils found in these formations, and there is an ample collection of examples in the Woodwardian Museum. In deep diggings in the fen lands, and in excavations for buildings in Cambridge gravel, remains are discovered of~~

~~the wolf, bear, horse, and bos primigenius. Diluvial beds of loam mixed with fragments of chalk extend into the parts of Cambridgeshire adjacent to Essex and Suffolk. Along the irregular line separating Cambridgeshire from these counties the iron-sand which underlies the gault rises to the surface. It forms excellent garden ground, and is rich in fragments of mineralized wood (Conybeare and Phillip's Geology of England and Wales). Cambridgeshire is one of the chief corn-producing counties. A part of the county near the south-west border was formerly called the Dairies ; and large dairy farms are still found producing cheese very similar to the best Stilton. The census of 1871 returned 25 per cent. of the male population as agricultural labourers, farm- servants, and shepherds. Although the county is entirely agricultural, mainly arable, with some wheat and pasture crops, many busy trades are also carried on,—brewing and malting, brick-making, lime-burning. There is a great deal of boat-building, and there are many seamen employed on the navigable cuts. The climate of the county is generally healthy, but it would be premature to say that ague is altogether banished from the fen country.~~

~~Some reference has already been made to the British and Roman antiquities. There are some remains of Roman camps; afew only of Norman castles. In the southern part of the county are four great dykes. They once formed the boundary between East Anglia and Mercia; each extended~~

~~from fen land to wooded country, crossing the open intervening space. 'The chief of these fosses was the Devil's Ditch; another was the Fleam or Balsham Dyke ; the others were the ditches of Breat and Bran. All these were most probably of British origin. The county of Cambridge is rich in churches, especially in Ely and Cambridge and their neighbourhoods. We have abundant examples of Pre-Norman, Norman, Early English, Decorated, Perpen- dicular. At Ely there are some valuable monastic remains, The famous Abbey of Thorney is only represented by various foundations, and a fragment of the abbey church, which has been worked into the present parish church. Of domestic architecture there are very slight remains in one or two manor houses, and some remains of the Episcopal~~

~~palace at Downham. The modern architectural efforts may well compete with those of any former age.~~

~~Though Cambridge is the county town, Ely is the one city of Cambridgeshire. It derived its name from the abund- ance of the eels which were found there. It was situated on the largest of the islands that rose above the level of the Fens, which in winter were surrounded by water, and were only accessible by certain passes or gates. (See Eny,) The other Cambridgeshire towns are soon enumerated, Wisbeach (beach of the Ouse) is a large and prosperous town, next in size and population to Cambridge. The navigable River Nene intersects the town and makes ita port. The main export is grain; the main import is Baltic timber. The Wisbeach canal gives water communication in many directions. Newmarket has a somewhat peculiar reputation, and is called the metropolis of the turf. The race-course is four miles in length, of elastic turf; some hundred horses may be seen exercising on the Downs. There are seven race meetings in the year. This and the neighbouring town of Royston, on the borders of Hertford- shire, have been often frequented by royalty ; many houses are inhabited by patrons of the turf. Our literature abounds with references to Newmarket, which, truth to say, are as a rule of an unflattering description. Wimpole Park, Lord Hardwicke's place, is the principal seat in the county, and the fine park has some of the best timber in the country. Wimpole is celebrated for its pictures, and there is a good library. The principal other proprietors are the dukes of Bedford and Rutland and Mr Childers. Doddington was till recently the richest living in England, but the revenues are now spread over seven rectories. The village of Babra- han is celebrated as the first place in England where water irrigation was introduced, and also for the breed of South- down sheep which bears the name. Whittlesea Mere is the most remarkable of the modern reclamation ; there abund- ant crops are raised where boating and fishing were carried on within living memory. Whittlesea West is still covered with water many months in the year, when there is abund- ance of waterfowl. The ancient town of March should be noticed, also Chatteris, Thorney, Johan, formerly famous for their abbeys. The town of Thorney was greatly im- proved and beautified by a former duke of Bedford. In 1875 the county was under the ownership of 6497 pro prietors of one acre and upwards, and of 6677 proprietors of less than one acre. For parliamentary purposes the two divisions of the shire and isle form**

~~one district, returning three members to parliament. The population of the county in 1861, as compared with 1851, exhibited a de crease of 5 per cent., but in 1871 an improvement was manifested to the extent of 6 per cent. The rate of progress is slow, and it is hardly likely to be acceler: ated. By the census of 1871 the population consisted of 186,906 persons,—of whom 92,115 were males, and 94,791 females. (F. A.)~~

~~CAMBRIDGE, the chief town of the above county, aud the seat of a famous university, is situated on the Cam, m~~

~~Village near the town,~~

~~CAMBRIDGE~~

~~the midst of a healthy fertile country, which for the most The trade of the town is derived from its being the centre of an agricultural~~

~~part has been reclaimed from the fens.~~

~~district, and from the custom of the resident members of the~~

~~university. The Cam changes its name to the Ouse as the~~

~~{sis does to the Thames, and Cambridge is the head of navigation for barges from King's Lynn, which before the railways was connected with a very considerable business. Cambridge is now a chief station on the Great Eastern line, and is also connected with the Great Northern, the London and the North-Western, and the Midland lines. A large market is held on Saturdays. The town has returned two members since the time of Edward I. It is a very ancient corporation, and under the Municipal Reform Act is governed by a mayor, ten aldermen, and thirty common councilmen. The university, a corporation separate from~~

~~Plan of Cambridge.~~

~~the borough, also returns two members. The town has an excellent free grammar school, founded by Dr Perse, good public institutions, and endowed alms-houses. The town owes its existence mainly to the~~

~~university, which over- shadows it in importance. In this respect Cambridge and Oxford differ from all other universities, which are generally absorbed in the town in which they are situated. Cam- bridge, like Oxford, is of a singularly unique character, and affords examples of architecture from the dawnings of authentic history to the more modern structures designed fo meet the wants of ourown day. The original Cambridge was the ancient Roman Camboritum, a small settlement on the left or north bank of the Cam or Granta. A castle was built to overawe the fen country, of which some ruins may be traced, and Roman coins from the time of Ves- pasian downwards have been found. In Anglo-Saxon times the river was called Granta, and the Roman town Grantchester, a name which still survives in the present The modern name was derived from a great stone bridge, the only one in those parts that was thrown across the Cam, probably in old Roman days. Bede gives Cambridge or Grantchester the epithet of "desolate." It was exposed to the assaults of the Danes~~

~~and repeatedly plundered. In the days of Edward the Elder we find that Grantbridge, a derivation of Cambridge, is giving its name to a shire, in a new division of Mercia. In the 11th century the borough began to expand beyond the narrow Roman limits. A population grew up by degrees on the other side of the river. Religious foundations gradually took their place in the borough. We begin to have authentic annals in the 12th century. Learned men came hither anxious to teach, and scholars anxious to be taught. The students first lived in the houses of the townsfolk, as in German and Scottish universities; we afterwards find hostels, where students and teachers lodged together. It is probable that the great Benedictine monas- teries of the Fens may have had a part in the origin of the university. We find Henry IIL (1231) issuing writs for the regulation of Cambridge "clerks," and making mention of chancellor and masters. A few years later we find the king entrenching the town with two gates, which, however, were burnt by the barons, In Wat Tyler's insurrection the colleges were attacked and ransacked by the rabble, it was supposed with the connivance and assistance of the Cambridge townsfolk, but were repulsed by the young bishop of Norwich. The first two Stuart kings and the first two Hanoverian kings cultivated friendly personal relations with the university. In the Civil~~

~~War many of the colleges sent their plate to King Charles, but town and university without actual conflict came into the obedience of the Commonwealth. In other respects Cambridge has been so fortunate as hardly to possess any history.~~

~~_ We proceed to notice somewhat in detail the remarkable~~

~~structures which have now a European reputation. Although~~

~~there is no street to equal the glorious High Street of Oxford, yet the long street which begins with the Trump- ington Road, and then as a narrow lane fronts Sepulchre Church, is lined with the most important colleges. What is called "the backs of colleges," where the Cam wanders beneath frequent arches through groves and gardens, has a more unique beauty than Oxford or any other university town can display. Within recent years there have been con- stant changes at Cambridge, and the aspect of the place has been materially altered; there have been great demolitions and reconstructions, and some very fine edifices have been added. The Fitzwilliam Museum, as we first enter Trump- ington Street, is a very striking edifice, and as large funds from time to time are accumulated for its extension, it will become increasingly valuable. Recently it has at a great expense received a remarkable amount of colour and decoration. The columned facade, with its portico and colonnades, is considered by some the most striking piece of architecture in the kingdom. It was the foundation of Viscount Fitzwilliam, an Irish peer, who bequeathed to the university his picture gallery, including fine examples of the greatest masters, 120 folio volumes of engravings, a valuable library, and £100,000. Various other valuable collections have from time to time been gathered into the Fitzwilliam Museum. The sculpture gallery is peculiarly rich, There are also Colonel Leake's Greek vases, the Disney marbles, the Ellison collection of modern painters, the Mesmer collection. At a short distance from the Fitzwilliam, at the end of a water-course, is Hobson's Conduit, removed here from the market-place, where it stood from 1614 to 1856. Hobson was a great benefactor to Cam- bridge, and is commemorated by Milton. The Pitt Press is found in this line of street, with a very church-like appear- ance. It was erected in memory of William Pitt the states- man. Adderbrooke Hospital, the Botanic Garden (arranged after De Candolle's system), the Anatomical Museum, and the~~

~~Observatory, are very much worthy of examination, The renowned Senate-house, the centre of the university, is remarkable for its elaborate finish and perfect proportions. IV. — 92~~

~~Trinity College,~~

~~730 CAMBRIDGE~~

~~In this fine room the university examinations are held and degrees are bestowed. The scenes witnessed here when the mathematical honour list is issued, and on the degree day following, are a very interesting episode of university life. The seniof wrangler of the year receives a mighty ovation. Very near the Senate-house is the University Library ; the Georges were great benefactors to both. It is one of the few libraries entitled to copies of all new books. 'The number of hooks and MSS. is about half a million. The most remarkable :MS. is that known to scholars as D, the Codex Bez, the uncial MS. or vellum of the four Gospels and the Acts, presented by Theodore Beza. The front of the library is au Italian balustraded arcade ; the basement story of the quadrangle is called " the Schools," a much more limited expression than the same Oxford term. In the "school" were once carried on the lectures and disputations from which " wranglers " and " sophs" derived their names. One part of the schools is devoted to the Woodwardian or Geological Museum, enriched by the collec- tions of the late Professor Sedgwick. He taught geology to undergraduates in visiting the neighbourhood with them. Close to this is the Mineralogical Museum, enriched with diamonds presented by the late Lord Alford. The fine new buildings of the Union Society are noticeable. Various Cambridge churches are very interesting. The Round Church or Sepulchre Church is one of four similar churches in England (the Temple Church being one), modelled after the Church of the Holy Sepulchre at Jerusalem. It was restored in 1841 by the Camden Society. Great St Mary's, like St Mary's, Oxford, is the church of the university. St Benedict (or Benet) Church is very interesting. Its restoration in 1869 fully displayed the magnificent Roman- esque arch of great antiquity, and traces of Early English and Pre-Norman remains. St Mary's the Less, next to Peterhouse, is a very ancient church. The old church of All Saints, opposite St John's, has been removed, and is rebuilt in Jesus Lane, Thereare a large number of modern churches. There is a wide~~

~~market-place and several open spaces, such as Christ's Piece and Parker's Piece. The railway station, where different companies find a common home, is spacious and handsome. 'The so-called school of Pythagoras (the origin of the term is obscure) was doubtless the abode of a Thegn or Saxon gentleman, The mound of the Castle, a natural hill scarped and cut down, must have been of great importance in overlooking the fen country. It was probably within the lines of the Roman station, and a castle was built here by the Conqueror; many houses, according to Domesday Book, being removed to make way for it. Edward I. lodged here, but the castle was soon in ruins. The massive gateway was removed to make way for the county courts. The county gaol, at the rear of the county court, was arranged according to plans of John Howard the philanthropist.~~

~~Each college in Cambridge has its separate interest,— something remarkable in chapel, hall, or library, in garden or gallery. We shall rapidly indicate some distinctive features in each. The largest of the colleges is Trinity, the largest collegiate foundation in Europe. It is on both sides the street, for a new court, the Master's Court, was built at the expense of Dr Whewell, and his cipher, W.W., is on the capacious tower. The King's Gateway is the entrance to this famous college. The great canopied statue is that of Henry VIII, in whose time this vast portal was built by the scholars of Trinity. We pass into the great court with its velvet sward aud the lofty stone conduit, known as Nevill's Fountain. On one side is the Master's Lodge, with a fine collection of portraits, and a set of state rooms. On the same side is the lofty Gothic hall, with a high-peaked Flemish roof. In term time when the great hall, with its painted glass and armorial bearings, is crowded with~~

~~students, the sight is remarkable enough. On entering the chapel the ante-chapel should be carefully noted, with the statue of Newton in a sitting posture, the statue of Barrow, a statue of Macaulay, and soon there will be one of Whewell. A second great gateway, with the niched statue of Edward III., leads into the second court. On the south is a third gateway with four towers on the angles, called, from a statue of Queen Elizabeth in her robes, the Queen's Gateway. 'The library was begun by Barrow and designed by Wren. It is the most classic building in the university —in Wren's favourite style of the old Italian. It overlooks the river, aud below the library is a~~

~~colonnade opening on the bridge and the Lime Walk. In the value of its contents this library ranks next to the university library; it pos- sesses the mathematical MSS. of Newton and the poetical MSS. of Milton. It numbers nearly 100,000 volumes, The woodwork is by Gibbons; the series of marble busts by Roubillac. Recent additions have been made of the busts of Professor Sedgwick, Mr Tennyson, and Mr Ellis, At the end of the room is Thorwaldsen's statue of Lord Byron, which was refused admission into Westminster Abbey.~~

~~The next largest college is St John's, which is famous 3 J, for its series of splendid improvements. The college consists of four courts ; the plain brick edifices are carried to the brink of the river, but on the other side of the river is the magnificent New Court designed by Rickman, the finest modern structure of all the Cambridge quadrangles, The massive antique gateway of the first court has the armorial bearings of the foundress of this college and Christ's College, the Lady Margaret, countess of Richmond and motherof Henry VII. The chapel and hall are in the front court. The second court is still larger, and is one of the very few untouched by modern restoration. The third conrt has a cloister on the west; and the antique library, | unaltered for generations, takes up the whole upper part | of the north side. The Master's Lodge, finished in 1865 by Sir G. G. Scott, extends westward. A light Gothic bridge over the Cam conducts into the New Court, a stately quadrangle, with a vaulted cloister along the south side. The magnificent chapel, erected mainly by the society, and enriched with many gifts, at great expense, was openedin 1869. It was erected by Sir G. G. Scott, and has some | resemblance to the Sainte Chapelle at Paris, 'The roof | and painted glass are especially remarkable. Chantreys monument to Henry Kirke-White, erected at the expense of | an American gentleman, is to be transferred to this chapel~~

~~St Peter's College, or Peterhouse, is the oldest of the Sth colleges. It was founded in 1257 by Hugh de Balsham, who was one of the first to separate between the monkish and scholastic element in education. The university long gave special honour and celebration to De Balsham, St Peter's is remarkable for eminent men, and for lay fellow- ships at a time when they were hardly known elsewhere, The gardens are good, and there is a small deer park, |~~

~~King's College owns that magnificent chapel which widely King dominates over all the buildings in the town and university. | The college was originally commenced and endowed by — Henry VI., in connection with Eton. Henry VII. deserves the title of a second founder. The chapel is one vast long- drawn nave. It is the latest and most sumptuous example of the Perpendicular order of Gothic architecture. The fretted roof, unsustained by a single pillar, is vaulted into twelve divisions. The centre of each isa pendant keystone, terminating alternately in roses and portcullises, each key- stone weighing more than a ton. Over the stone roof is the timber roof. An organ separates between chapel and ante-chapel. The painted glass is the most remarkable that has been bequeathed to us by the age of Henry Vil. and Henry VIIL, and belongs to a time when the art of~~

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~~CARBBETD GE~~

~~painting had attained its highest excellence. There are fiveand-twenty windows, with more than a _ hundred subjects. The chantries are fine. The exterior of the chapel, though very fine, hardly corresponds with the interior. The immense design for the college, entertained by Henry VI, has never been carried out, and the new buildings, erected at a great expense, have not been subordinated to the general design. The best of these is the Master's Lodge ; the Fellows' Buildings are incongruous. King's College Chapel is certainly the architectural gem of the university.~~

~~Caius (pronounced Key's) College, in point of size, is the third college in the university. It has a some- what special character, being termed the Medical College. The founder was a physician high in favour with Philip and Mary. His tomb, with the inscription " Fui Caius," is the great ornament of the chapel. In the painted glass of the chapel is a series delineating the miracles of healing. No college has undergone greater alterations within recent years than Caius College, the larger part of the college having been taken down and rebuilt. It has now some of the most striking architectural effects in modern Cainbridge. The three famous gates—-the Gate of Humility, the Gate of Virtue, the Gate of Honour—are re- tained. Mr Fergusson says of the last "that it is one of the most pleasing as well as one of the most advanced specimens of the Early Renaissance in England." The~~

~~new hallis by Salvin (1864). The little college of Trinity Hall has also a special character, being the Legal College. To a great extent it has been rebuilt, after a destructive fire in 1851. The gardens are very fine.~~

~~Queen's College is the work of the two rival queens of the Red Rose and the White, Margaret of Anjou and Elizabeth Woodville, who are always regarded as co- foundresses. Erasmus took up his abode here and _ promoted the new learning. His study is supposed to have been in the south-west tower of the old court. The chapel has been beautifully restored in recent years. A quaint bridge, called the 'mathematical bridge," leads into the garden or wilderness on the other side of the Cam. On the south side of the Cloister Court is Erasmus's Court. It is said to be in contemplation to fill up the western side with a new river front. Corpus Christi College has an imposing frontage, not unlike that of Christ Church, Oxford, though on a smaller scale. This college has the credit of having begun the series of reconstructions which has been in progress for years past up to the present time. The college is in intimate relations with the town of Cambridge, in which it has much property, and from which it has derived various benefactions. On the north end of the great quadrangle is the Old Court, which is said to retain more of its original features than any other court in the university. Archbishop Parker lent his library to this college on condition that if twenty-five books should ever be missing the bequest should devolve to Caius College. Opposite Corpus Christi is the college long known as Catherine's Hall, the only hall in Cambridge, but in the fulfilled expectation of many private halls being established now termed a college. It is extremely picturesque, with a side of the principal quadrangle planted with elms and open to Trumpington Street. It might almost be called the Theological College, as it has produced an extraordinary number of ecclesiastical writers. Clare College consists of a single court, and is remarkable for its finished beauty, with "more purity and grace than any other example which can be named" (Fergusson). The bridge, avenue, and lawn are noticeable. This college is supposed to be Chaucer's "Soler Hall at Cantabrage." Once one of the largest, it is now one of the smallest colleges. Here "Ignoramus" was acted before the delighted James I.~~

~~Emmanuel College has a peculiar interest of its owr, Emmanuel.~~

~~Once its site was occupied by a house of Dominican friars, and it subsequently became the chosen college of the Puritans. The frontage of this college is long and imposing. Through an arcade we pass into the principal court, above an arcaded side of which is a picture gallery designed by Wren for the Master's Lodge. The. library here is very~~

~~good. Sidney Sussex College has a history very parallel sidney They were together styled Sussex.~~

~~to that of Emmanuel College. in the time of Charles I. " nurseries of Puritanism." Oliver Cromwell was a member of this college, and the best extant likeness of him is to be found here. There is also Bernini's bust from the plaster impression taken after death. This college was improved to the extent of entire obliteration by Wyatville, who has only left the old oriels of the Master's Lodge remaining. The lodge has a large pleasure~~

~~garden attached. Next to this college is Christ's, opposite Christ's.~~

~~to which a street runs westward that has some curious old houses and an old name, Petty Carey, the meaning of which has been much discussed ; it most probably means "little cookery." Christ's College was the foundation of the Lady Margaret, the saintly foundress of St John's. Her portrait is in chapel and hall, and her arms over the gateway. Like Sidney Sussex, Christ's was restored in the last century, and nearly all traces of antiquity extinguished. Christ's is famous for its associations with the Platonists, and especially with Milton. His rooms are pointed out, and his mulberry tree in the garden has drawn pilgrims from every. part of the world. The old tree is carefully propped up and mounded, and a, new tree has beén planted from an offshoot. Behind the college is an open space of park-like character leading down to the boats. Some of the latest restorations now in progress are in Pembroke. Queen Elizabeth saw this college she exclaimed, "Oh domus antiqua et religiosa!" but the peculiar features which give this college its picturesque appearance are being inexorably sacrificed to modern requirements. The chapel was designed by Sir Christopker Wren, and executed at the cost of his uncle, Bishop Wren, as a thank- offering for his liberation from a confinement of eighteen years in the Tower. The college~~

~~has been called “ Collegium Episcopale,” from the number of its prelates. It also boasts the great names of Edmund Spenser, Gray, and William~~

~~Pitt. Jesus College stands pleasantly’back from the public Jesus.~~

~~road, surrounded with gardens and meadows. The ivied walls have a very pleasant aspect. The college chapel is a very noble one, and may rank after King’s College chapel and the new chapel of St John’s, It is among the most magnificent of the recent restorations at Cambridge. It is © part of the old church of St Rhadegund; the ante-chapel, which is being decorated under the care of Mr Rossetti, being portion of the original nave. The New Court or Garden Court is shadowed with trees of many years’ growth. The college has recently laid out fresh grounds and _build- ings. The cock, the badge or rebus of Bishop Alcock, the founder, is discernible in many parts of. the college.~~

~~Magdalene College is the only college on the north side of Magdalene.~~

~~the Cam. It was founded bya lord of Audley End, whose representative always nominates the head of the college. It boasts three libraries,—the college library, the Peckard library, and the Pepysian library. The last contains the Pepy’s MS. and much old black-letter literature. The last of the Cambridge colleges is Downing College. only founded in the year 1800, with large bequests from a Cambridgeshire baronet. The first undergraduate was in 1821, but the college has in later years received a consider- able development. The well-wooded grounds are handsome and extensive, and are thrown freely open to the public. Some of the Cambridge localities should be mentioned. The suburb of Barnwell has the remains of an ancient~~

~~When Pembroke.~~

~~It was Downing.~~

~~132~~

~~priory. At Stourbridge is the disused chapel of an ancient hospital for lepers. The greatest fair in England was one held here. The little village of Trumpington is a favourite locality. Granchester has some remains which~~

~~make it a question whether it or Cambridge Castle was the site of the old Roman station. Byron's Pool is in the river here. Madingley is a fine old mansion, the residence of the Prince of Wales when at Cambridge, and possibly the scene of Gray's Elegy. Between this place and Cambridge is the Observatory. The central dome revolves on wheels, and can be moved bya single hand. The remarkable tele- scope was presented by the late duke of Northumberland in 1835. CAMBRIDGE, a city of the United States, in the county of Middlesex, Massachusetts, It lies on Charles River, three miles N.W. of Boston, with which it is connected by two bridges, with long causeways, and by horse railroads, or tramways. It is the seat of Harvard University, the oldest, richest, and most thoroughly equipped literary institution in the United States. Connected with the university is an observatory, in 42° 22' 48" N, lat. and 71° 8' W. long. Under the name of Newtown a settlement was made on its territory, then much more extended than at present, by some of the first company of English colonists on Massa- chusetts Bay in 1630. It was then proposed to make it the capital of the colony; but the neighbouring peninsula of Boston was found more convenient for commerce and defence against the Indians. The order of the colony court in 1636 having provided for planting a college at Newtown, its name was changed to Cambridge, in honour of the English university town, where some of the leading men of the colony had been educated. The first company of settlers, being Mr Hooker's church and congregation, moved to Connecticut in 1636, to find better farm-land. Their rights were purchased by another body of colonists just arrived from England. The present site of the college halls was originally "fortified" by palisades, within which the settlers found protection at night for themselves and their cattle against a possible inroad of the savages. Here was set up the first printing-press in the United States, and from it issued John Eliot's translation of the Bible, for the Indians, in their own language. Under the title of "Cambridge Farms," the present town of Lexington, incorporated as such in 1712, was a part of the original town. The town of Brighton, now annexed to the city of Boston, formerly South Cambridge, or Little Cambridge, was separated and received its present name in 1807; and the west part of the original settlement, known as Menotomy, was marked off in the same year, as West Cambridge, now known as Arlington. Between this place and Cambridge is North Cambridge ; and the districts of the city nearest to Boston, by the two bridges, are called Cambridge Port and East Cambridge. Cambridge was~~

~~incorporated as a city in 1846. It is for the most part level, with much marsh land near the river, portions of which are in process of being reclaimed. The cemetery of Mount Auburn is on the western border of the city. The population of Cambridge in 1874 was 50,337 ; the numbers of polls for voters, 11,983; of dwellings, 7383. The valuation was—of personal property, $17,532,971; of real, $49,043,700 ; total, $66, 576,671. The net debt of the city, incurred for water-works, streets, school-houses,~~

~~j and other improvements, is $3,792,135.~~

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~~The city appro- priation for 1874 was $2,771,508. Total cost of the water-works, $1,399,396. The police department, with 60 officers, cost $71,710; fire department, $97,355 ; filling up low lands, $650,000. The average number of paupery, 129; net cost of their maintenance, $38,000. Cost of street lighting, $20,157. The system of public schools is very complete and efficient, including a high school, 7 grammar schools, 18 primaries, and a training school,—with 183 teachers; cost of maintenance, $260,187°47. Cambridge was the site of the camp of the first American army, at the outbreak of the War of the Revolution with Great Britain, From it went the detachment which intrenched on Bunker's Hill; and here Washington took command of the army, July 3, 1775.~~

~~CAMBYSES, a Persian royal name, derived from the |~~

~~Greek KapBions, in which form it appears in Herodotus and in the Greek writers generally. In inscriptions from Egypt the name is given as KauBvoats (Letronne, Recueil d, inscrip. grecq., li. pp. 350, 356, f.), In the old-Persian of the Behistun inscription it stands in the form Kabujiya (Rawlinson) or Kambujiya (Oppert, Spiegel). In Zend the name takes the form Xavaus, and in Arabic and modern Persian it is worn down still further to Kavus and Kaus. In Egyptian the name occurs under three forms of transcription,—Kanbuza, Kembatet (Lepsius, K6énagsbuch, taf. xlix.), or rather Kambuzia, and Kambunsa (Lauth, Lin neuer Kambyses-text, p. 5). The etymology of the name is obscure, and the attempts to explain it by~~

~~Rawlin- son (Jour, As. Soc., xi. p. 97) and Benfey (Die persischen Keilinschriften, p. 77) cannot be regarded as successful It has been often remarked that the name, or one very similar, occurs more than once in the East as an ethnical and geographical designation, Thus we find Camboja a territory in India, Kamoj a tribe of the Kafirs in Cabul; and a territory named Cambysene, situated in the north on the Kur, is known to Greek geographers. In the same region there was a river called Cambyses, the modern Jom. Perhaps with Spiegel (Zranische Alterthumskunde, vol. ii. p. 294) we may regard the personal name Kambujiya as originally an adjective, meaning belonging to Kambuja. In Egypt, also, Cambysu occurs in the /é/nerariwm as the name of a place in the Delta, but this is probably derived from the Persian king about to be mentioned, by whom Egypt was conquered.~~

~~The persons known by the name of Cambyses belong to the Acheemenian line of Persian kings. It is thought that the great-grandfather of Cyrus the Great was thus called. The evidence, however, for the existence of this Cambyses, though strong, is constructive rather than direct (see Rawlinson's /ferodotus, vol. iv, p. 259). It is certain that the father of Cyrus was named Cambyses. He is called by Herodotus (i. 107) "a Persian of good family," but by Xenophon (Cyrop., i. 11, 1) he is denominated " king of the Persians." 'The justness of this title is proved by an inscription on a brick found at Senkereh, in which Cyrus calls himself "the son of Cambyses, the powerful king," as wellas by the statement of Darius Hystaspis, in the Behistun inscription (col. i. 4), that eight of his Ache-menian ancestors had been kings. During the reign of this Cambyses the Persian nation was included in the Median empire, and he is represented as the vassal of the Median king Astyages. At the same time he is said to have married Mandane, the daughter of Astyages, by whom he became the father of Cyrus. Such, at least, is the account of Herodotus, Xenophon, Diodorus, and Trogus Pompelus.~~

~~_Ctesias and-Nicolaus Damascenus give a different repre~~

~~sentation. It is stated by Loftus (Chaldwa and Susiana, p. 224) that he found at Warka "bricks inscribed in slightly~~

~~CAMBYSES~~

~~relieved cuneiform characters of Cambyses, the brother of Cyrus, a personage of whom we possess no historical notice whatsoever."~~

~~The only other, and the best known, king of this name is the elder son and successor of Cyrus, who reigned over the Persian empire, according to Herodotus, for seven years and five months—from 529 to 521 8.c. Of his proceed- ings before his famous invasion of Egypt little is known. To this period we must now, on the authority of the Behistun inscription (i. 10), in opposition to Herodotus (iii. 30), assign the secret murder of his brother, Bardiya (the Smerdis, Merdis, Mardus, or Mergis of the Greeks,— called Tanyoxarces by Ctesias, and Tanyoxares by Xeno- phon). Egypt at this time lay on the borders of the Persian empire; its subjugation had long been an object of ambition to the great Asiatic conquerors; it had recently provoked reprisals from Persia by sending help to Lydia against Cyrus; and in resolving to attack that country Cambyses was both carrying out the settled policy of his predecessors and accomplishing the purpose of his own father. If therefore, as is not unlikely, there was such an occasion given for the enterprise as that which Herodotus relates, it is not necessary to suppose that this was more than a pretext. A year or two were spent in collecting the forces of the empire, and the preparatory measures taken seem to have been marked by prudence and skill. A fleet of Phoenician and Greek ships was collected to operate against the vessels of the Egyptians; and the help of an Arabian chief was secured to provide water for the army in crossing the desert on the south and west of Palestine. The old king of Egypt, Amasis, under whom the country had enjoyed a long period of peace and prosperity, died a few months before the invasion, and was succeeded by his son Psammenitus, under whom the measures of defence proved unsuccessful. An obstinately contested but decisive victory was gained by the Persian arms near Pelusium, and this was speedily followed up by the siege and capture of the capital, Memphis, and by the subjugation of the whole country. The date of this conquest is commonly regarded as 525 B.c. (see Rawlinson, Anc. Mon., vol. i. p. 385), though some find cause to place it one or even two years earlier (cf. v. Gumpach, Zeitrechnung d. Ass. u. Bab., pp. —«:(165, f; Lauth, op. cit., pp. 13, 7; Brugsch, Hist.~~

~~@Hgypte, i. p. 267; Duncker, Gesch. d. Alterthums, vol. li, p. 792, n.; Lepsius, Kénigsbuch, p. 89),~~

~~Henceforward the life and activity of Cambyses centred in his new dominion. We know from an important hieroglyphic inscription proceeding from a priest of Neith at Sais, that he assumed the responsibilities and _ titles proper to a king of Egypt, taking as his throne-name that of Ramesut. Moreover, it is evident that fora time at least he cultivated the good-will of his new subjects. We learn that he took Egyptians who had been officers of Psam- menitus into his immediate service; that he sought in- struction in regard to the rites of their religion, and was initiated into certain of its mysteries; that he listened to complaints in regard to the profanation of the temples by Persian and other foreign soldiers, and gave orders for their removal from the sacred precincts; that he secured the priests in the receipt of the temple-revenues, and arranged for the due and continued celebration of the customary ceremonies and festivals, A monument is still extant on which he is represented adoring, on bended knee, the god Apis. (See De Rougé, Mémoire sur la statue naophore du Vatican, passim ; Brugsch, op. cit., vol. _ 1 pp. 266, 7. ; Lauth, op. cit., pp. 17, 7) One act, indeed, of a different complexion is reported by Herodotus (iii. 16), viz., his outraging and finally consuming by fire the embalmed body of Amasis,—an act, the historian assures us, which shocked the feelings alike of Egyptians and of~~

~~Persians, and which strongly attests the same jealons and resentful temper which prompted the murder of his brother. After having established himself in his new possession, Cambyses, Herodotus (iii, 17, 7.) informs us, planned three expeditions. One was against Carthage, in regard to which, however, he was thwarted by the refusal of his Pheenician mariners, who formed the principal portion of his sea-forces, to operate against their kindred. Another was directed against the Oasis and temple of Jupiter Ammon in the desert west of Egypt (see Heeren, D. afrikan. Volker, i. p. 416), the issue of which was that the whole of the force sent on this enterprise, numbering, it is said, 50,000 men, perished in the sand. The third was intended for the subjugation of the Ethiopians on the south of Egypt (regarding whose locality see Heeren, op. ct., 1. pp. 337, f.; Rawlinson, Herod., vol. ii. p. 421 ; Maspero, Histoire ancienne, pp. 533, f.), and of this Cambyses himself took the command. The army, how- ever, had marched less than a fifth of the distance when their provisions failed, and they were~~

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~~has been noticed, he had caused to be secretly murdered. Springing hastily upon his horse, his sword fell from the sheath and wounded him mortally in the thigh. According~~

~~priory. At Stourbridge is the disused chapel of an ancient hospital for lepers. The greatest fair in England was one held here. The little village of Trumpington is a favourite locality. Granchester has some remains which make it a question whether it or Cambridge Castle was the site of the old Roman station. Byron's Pool is in the river here. Madingley is a fine old mansion, the residence of the Prince of Wales when at Cambridge, and possibly the scene of Gray's Elegy. Between this place and Cambridge is the Observatory. The central dome revolves on wheels, and can be moved by asingle hand. The remarkable tele- scope was presented by the late duke of Northumberland in 1835. A favourite walk is to the very moderate elevation known as the Gogmagog Hills, an off-shoot of the chalk range, the summit of which has been a Roman camp and a lord-treasurer's abode. The Ladies' College at Girton may also be mentioned. Chesterton and Cherry Hinton are familiar resorts of Cambridge men, These are environs of Cambridge. The borough population of Cambridge in 1871 was 30,078, consisting of 13,742 males and 16,286 females. (F. A.) CAMBRIDGE, a city of the United States, in the county of Middlesex, Massachusetts, It lies on Charles River, three miles N.W. of Boston, with which it is connected by two bridges, with long causeways, and by horse railroads, or tramways. It is the seat of Harvard University, the oldest, richest, and most thoroughly equipped literary institution in the United States. Connected with the university is an observatory, in 42° 22' 48" N. lat. and 71° 8' W. long. Under the name of Newtown a settlement was made on its territory, then much more extended than at present, by some of the first company of English colonists on Massa- chusetts Bay in 1630. It was then proposed to make it the capital of the colony; but the neighbouring peninsula of Boston was found more convenient for commerce and defence against the Indians. The order of the colony court in 1636 having provided for planting a college at Newtown, its name was changed to Cambridge, in honour of the English university town, where some of the leading men of the colony had been educated. The first company of settlers, being Mr Hooker's church and~~

~~congregation, moved to Connecticut in 1636, to find better farm-land. Their rights were purchased by another body of colonists just arrived from England. The present site of the college halls was originally "fortified" by palisades, within which the settlers found protection at night for themselves and their cattle against a possible inraad of the savages. Here was set up the first printing-press in the United States, and from it issued John Eliot's translation of the Bible, for the Indians, in their own language. Under the title of "Cambridge Farms," the present town of Lexington, incorporated as such in 1712, was a part of the original town. The town of Brighton, now annexed to the city of Boston, formerly South Cambridge, or Little Cambridge, was separated and received its present name in 1807; and the west part of the original settlement, known as Menotomy, was marked off in the same year, as West Cambridge, now known as Arlington. Between this place and Cambridge is North Cambridge ; and the districts of the city nearest to Boston, by the two bridges, are called Cambridge Port and East Cambridge. Cambridge was incorporated as a city in 1846. It is for the most part level, with much marsh land near the river, portions of which are in process of being reclaimed. The cemetery of Mount Auburn is on the western border of the city. The population of Cambridge iu 1874 was 50,337 ; the numbers of polls for voters, 11,983; of dwellings, 7383. The valuation was—of personal property, $17,532,971; of real, $49,043,700 ; total, $66,576,671. The net debt of the city, incurred for water-works, streets, school-houses,~~

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~~| and other improvements, is $3,792,135.~~

~~The city appro- priation for 1874 was $2,771,508. Total cost of the water-works, $1,399,396. The police department, with 60 officers, cost $71,710; fire department, $97,355 ; filling up low lands, $650,000. The average number of paupers, 129; net cost of their maintenance, $38,000. Cost of street lighting, $20,157. The system of public schools jg very complete and efficient, including a high school, 7 grammar schools, 18 primaries, and a training school,—with 183 teachers; cost of maintenance, $260,187°47. Cambridge was the site of the camp of the first American army, at the~~

~~outbreak of the War of the Revolution with Great Britain, From it went the detachment which intrenched on Bunker's Hill; and here Washington took command of the army, Say "8, aH:~~

~~CAMBYSES, a Persian royal name, derived from the~~

~~Greek KapBvons, in which form it appears in Herodotus and in the Greek writers generally. In inscriptions from Egypt the name is given as Kay,Bicas (Letronne, Recueil d, inscrip. grecq., li. pp. 350, 356, f.), In the old-Persian of the Behistun inscription it stands in the form Kabyjiya (Rawlinson) or Kambujiya (Oppert, Spiegel). In Zend the name takes the form XKavaus, and in Arabic and modern Persian it is worn down still further to Kavus and Kaus. In Egyptian the name occurs under three forms of transcription, — Kanbuza, Kembatet (Lepsius, K6énigsbuch, taf. xlix.), or rather Kambuzia, and Kambunsa (Lauth, Ein neuer Kambyses-text, p. 5). The etymology of the name is obscure, and the attempts to explain it by Rawlin- son (Jour. As. Soc., xi. p. 97) and Benfey (Die persischen Keilinschriften, p. 77) cannot be regarded as successful, It has been often remarked that the name, or one very similar, occurs more than once in the East as an ethnical and geographical designation. Thus we find Camboja a territory in India, Kamoj a tribe of the Kafirs in Cabul; and a territory named Cambysene, situated in the north on the Kur, is known to Greek geographers. In the same region there was a river called Cambyses, the modern Jora, Perhaps with Spiegel (Hranische Alterthumskunde, vol. ti,~~

~~| p. 294) we may regard the personal name Kambujiya as~~

~~originally an adjective, meaning belonging to Kambuja. In Egypt, also, Cambysu occurs in the /tincrarium as the name of a place in the Delta, but this is probably derived from the Persian king about to be mentioned, by whom Egypt was conquered.~~

~~The persons known by the name of Cambyses belong to the Achzemenian line of Persian kings. It is thought that the great-grandfather of Cyrus the Great was thus called. The evidence, however, for the existence of this Cambyses, though strong, is constructive rather than direct (see Rawlinson's Herodotus, vol. iv, p, 259). It is certain that the father of Cyrus was named Cambyses. He is callled by Herodotus (i. 107) "a Persian of~~

~~good family," but by Xenophon (Cyrop., i. 11, 1) he is denominated " king of the Persians." The justness of this title is proved by an inscription on a brick found at Senkereh, in which Cyrus calls himself "the son of Cambyses, the powerful king," as well as by the statement of Darius Hystaspis, in the Behistun inscription (col. i. 4), that eight of his Ache menian ancestors had been kings. During the reign of this Cambyses the Persian nation was included in the Median empire, and he is represented as the vassal of the Median king Astyages. At the same time he is said to have married Mandane, the daughter of Astyages, by whom he became the father of Cyrus. Such, at least, is the account of Herodotus, Xenophon, Diodorus, and Trogus Pompelts.~~

~~_Ctesias and-Nicolaus Damascenus give a different repre~~

~~sentation. It is stated by Loftus (Chaldea and Susiana, p. 224) that he found at Warka "bricks inscribed in slightly~~

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~~Cal TPR VS bos~~

~~relieved cuneiform characters of Cambyses, the brother of Cyrus, a personage of whom we possess no historical notice whatsoever."~~

~~The only other, and the best known, king of this name is the elder son and successor of Cyrus, who reigned over the Persian empire, according to Herodotus, for seven years and five months—from 529 to 521 3.c. Of his proceed- ings before his famous invasion of Egypt little is known. To this period we must now, on the authority of the Behistun inscription (i. 10), in opposition to Herodotus (iii. 30), assign the secret murder of his brother, Bardiya (the Smerdis, Merdis, Mardus, or Mergis of the Greeks,— called Tanyoxarces by Ctesias, and Tanyoxares by Xeno- phon). Egypt at this time lay on the borders of the Persian empire ; its subjugation had long been an object of ambition to the great Asiatic conquerors; it had recently provoked reprisals from Persia by sending help to Lydia against Cyrus; and in resolving to attack that country Cambyses was both carrying out the settled policy of his predecessors and accomplishing the purpose of his own father. If therefore, as is not unlikely, there was such an occasion given for the~~

~~enterprise as that which Herodot#s relates, it is not necessary to suppose that this was more than a pretext. A year or two were spent in collecting the forces of the empire, and the preparatory measures – taken seem to have been marked by prudence and skill. A~~

~~fleet of Phoenician and Greek ships was collected to operate against the vessels of the Egyptians; and the help of an Arabian chief was secured to provide water for the army in crossing the desert on the south and west of Palestine. The old king of Egypt, Amasis, under whom the country had enjoyed a long period of peace and prosperity, died a few months before the invasion, and was succeeded by his son Psammenitus, under whom the measures of defence proved unsuccessful. An obstinately contested but decisive victory was gained by the Persian arms near Pelusium, and this was speedily followed up by the siege and capture of the capital, Memphis, and by the subjugation of the whole country. The date of this conquest is commonly regarded as 525 B.c. (see Rawlinson, Anc. Mon., vol. i. p. 385), though some find cause to place it one or even two years earlier (cf. v. Gumpach, Zeitrechnung d. Ass. u. Bab., pp. 165, f.; Lauth, op. cit, pp. 13, 3 Brugsch, Hist. @Hgypte, i. p. 267; Duncker, Gesch. d. Alterthums, vol. ii, p. 792, n.; Lepsius, Kénigsbuch, p. 89),~~

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to Ctesias (Hac. Pers., § 12) licdied at Babylon, of a wound accidentally inflicted while carving a piece of wood for his amusement. These accounts agree in representing his death as accidental. A somewhat different impression is conveyed by the statement of Darius on the point in the Behistun inscription (i. 11), who says that “ killing himself he died.” (Cf. Oppert, Les inscriptions des Achéménides, p- 54.) It may be, as Spiegel

~~believes (ran. Alterthum., ii. p. 302), that the phrase expresses nothing more than the Greek tradition reports. Rawlinson, however (Anc. Mon., iv. p. 394), and Duncker (op. cit., ii. p. 801) understand it as meaning that he committed suicide. The character of this king is sufficiently obvious. It is evident that he was an impulsive, self-willed, reckless, ambitious despot, of the peculiarly Oriental type, possessed of considerable ability as a general, but with passions so strong and uncontrolled as to render the powers he possessed worthless for good. {t was reported that from his childhood he was liable to epilepsy and also, what is probably more trustworthy, that he came to be much given to wine. By the Egyptians he made himself utterly abhorred. By the Persians also, while they acknowledged his success in enlarging their empire, his memory was held in evil repute. While they called Cyrus a father, they called his son a despot or master ; and while they said the one was " gentle, and procured them all manner of goods," they called the other "harsh and reckless " (see Herodotus, ili. 33, 34, 89). In the Hebrew Scriptures, Cambyses appears once under the name of Ahasuerus, in Ezra iv. 6 (see ARTAXERXEs). Some suppose that he is the "cruel lord" and " fierce king," to whose hands the Egyptians were to be given over, according to Isa. xix. 4. His name occurs in Rabylonian contract-tablets found at Warka, with the title '"Cambyses, king of Babylon." (See Loftus, op. czt., p. 222; Bosanquet, Trans. Bib. Archeology, i. pp. 210, f.) He is usually regarded as the Lohrasp of Persian traditional history (Malcom, Hist. of Persia, i. p. 334); but another of the heroes of that cycle of romance, Kaus, appears both from the name and from the exploits ascribed to him to be the true representative of Cambyses. (Cf. Spiegel, op. cit., vol.i. p. 594; Gobineau, Hist. des Perses, vol. i. p.523.) — (w. TU.)~~

~~CAMDEN (1), a city of the United States, capital of Camden county, New York, situated on the left bank of the Delaware River, directly opposite Philadelphia, with which it is connected by a regular steam-boat service, It lies 87 niles S.W. of New York, and is the terminus of several railway lines. Among its public buildings the chief place is held by the court-honse and the railway stations ; and its principal industrial establishments are iron-foundries, saw-mills, chemical works, glass-works, shipyards, and engineering factories. The city received its charter in 1831; and gas-light was first introduced in 1852. In 1840 the population was only 3371; in 1850 it amounted to 9479, and in 1870 to 20,045.~~

~~CAMDEN (2), the capital of Kershaw county in South Carolina, United States, 33 miles N.E. of Columbia on the Wateree River, which is navigable for steam-boats as far as the town. It contains an arsenal, an academy, and a library, and is altogether a flourishing little town. It is best known as the scene of two battles,—the first fought in 1780 between Gates and Cornwallis, and the second in 1781 between Greene and Rawdon. Population in 1870,~~

~~1007.~~

~~CAMDEN, Witttam (1551-1623), a celebrated anti- quary and historian, was born in London, May 2, 1551. His father, who was a native of Lichfield, settled in Lon- don, where he became a member of the company of paper- stainers. His mother was of the ancient family of Curwen of Workington in Cumberland. Young Camden received his early education at Christ's Hospital and St Paul's~~

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~~School ; and in 1566 he entered as a servitor of Magdalen College, Oxford ; but not succeeding in getting a demj's place, he removed to Bruadgate Hall, and, somewhat more than two years afterwards, to Christ Church, where he was supported by his friend and patron Dr Thornton. About this time he became a candidate for a fellowship at Aj] Souls College, which he lost through the adverse influence of the Roman Catholic party. In 1570 he supplicated the regents of the university to be admitted bachelor of arts but in this also he was disappointed. The following year Camden came to London, where he prosecuted his favourite study of antiquity, under the patronage of Dr Goodman deau of Westminster, by whose interest he was made, a 1575, second master of Westminster school. From the time of his leaving the university to this period, he had travelled through great part of England, with a view to make observations and collect materials for his Britannia on which he was now seriously engaged. In 1581 he became intimately acquainted with the learned President Brisson, who was then in England, and in 1586 he published the first edition of the Britannia, a survey of the British isles, written in elegant Latin. In 1593 he succeeded to the head mastership of Westminster school, on the resig- nation of Dr Grant. In this office he continued till 1597, when he was promoted to be~~

~~Clarencieux king-at-arms, In 1600 Camden made a tour to the north, as far as Carlisle, accompanied by his friend Mr (afterwards Sir Robert) Cotton. In 1606 he began his correspondence with the celebrated President de Thou, which continued to the death of that historian. In the following year he published his last edition of the Britanpia, from which the several Eng- lish translations have been made ; and in 1608 he began tu digest his materials for a history of the reign of Queen Elizabeth. In 1609, after recovering from a dangerous ill ness, he retired to Chiselhurst in Kent, where he continued to spend the summer montlis during the remainder of his life. The first part of his annals of the queen did not ap- pear till 1615, and he determiined that the second volume should not appear till after his death. The work was entirely finished in 1617; and from that time he was principally employed in ¢ollecting materials for the further improvement of his Britannia. In 1622, being now up- wards of seventy, he determined to lose no time in execut- ing his design of founding a history lecture in the university of Oxford. His deed of gift was accordingly transmitted by his friend Mr Heather to Mr Gregory Wheare, who was by himself appointed the first professor, Camden died at Chiselhurst, Nov. 9, 1623, in the seventy-third year of his age, and was buried with great solemnity in Westminster Abbey, where a monument was erected to his memory. He was a man of great modesty and integrity, profoundly learned in the history and antiquities of England, and a judicious and conscientious historian. The Camden Society, founded in 1838 for historical research, was so named in honour of him. Besides the works already mentioned, he was author of an excellent Greek grammar, and of several tracts in Hearne's collection. His greatest and most use ful work is the Britannia. It was first translated into English, and published in folio in London in 1611, by Dr Philemon Holland, who is thought to have consulted the author himself; and therefore great respect has been paid to his additions and explanations, on the supposition that they may belong to Camden. But in a later edition of the same translation, published in 1636, the doctor bas taken liberties which cannot be excused. A new translation, made with the utmost fidelity from the last edition, was published m 1695, by Edmund Gibson of Queen's College, Oxford, after- wards bishop of London ; in which, besides the addition of~~

~~‘notes, and of all that deserved to be taken notice of in Dr~~

~~Holland’s first edition, there are many other augmentations~~

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~~genuine work of the author.~~

~~Gibson’s edition was reprinted in 1722, and several times subse- quently. The latest and best editions are those by Gough, 1789-90, 3 vols. fol., and by Gough and Nichols, 1806, 4 vols. fol.~~

~~CAMDEN, CuHarLes Pratt, EArt, AND VISCOUNT Bayuam (1713-1794), chief-justice of the Common Pleas, lord chancellor of England, and president of the council, was born in 1713. He was a descendant of an old Devonshire family of high standing, the third son of Sir John Pratt, chief-justice of the King’s Bench in the reign of George I. He received his early education at Eton College, whence he passed, at the age of seventeen, to King’s College, Cambridge. In 1734 he became a fellow of his college, and in the following year obtained his degree of B.A. Having adopted his father’s profession, he had entered the Middle Temple in 1428, and ten years later he was called to the bar. He practised at first in the courts of Common Law, travelling also the western circuit. In 1740 he took his degree of M.A. For some years his practice was so limited, and he became so much discouraged, that he seriously thought of turning his back on the law and entering the church. He listened, however, to the advice of his friend Sir Robert Henley, a brother barrister, afterwards known as Lord Chancellor Northington, and persevered, working on and waiting for the success which in such case is usually slow to come. The first case which~~

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~~ance of ultimate success was the Government prosecution, iu 1752, of a bookseller, William Owen, for a libel on the House of Commons. Pratt was engaged as junior counsel for the defence, and he made his mark in an earnest and powerful speech, which contributed to the verdict for the defendant. In 1753 he undertook the defence of Murphy, who stood charged with the forgery of a will. Four years later, through the influence of William~~

~~Pitt (afterwards earl of Chatham), with whom he had formed an intimate friendship while at Eton, he received the appointment of attorney-general. The same year he entered the House of Commons as member for the small borough of Downton in Wiltshire, which was subsequently dis- franchised. He sat in parliament four years, but did not distinguish himself as a debater. His professional practice now largely increased. One of the most noticeable incidents of his tenure of office as attorney-general was the prosecution of Dr Shebbeare, a violent party writer of the day, for a libel against the Government contained in his notorious | Letters to the People of England, which were published in _ the years 1756-1758. As a proof of Pratt's moderation in _ a period of passionate party warfare and frequent 'State _ Trials," itis noted that this was the only official prosecution for libel which he set on foot. In January 1762 Pratt _ was raised to the bench as chief-justice of the Common Pleas, this post being vacant by the death of Chief-Justice Willes, He was at the same time knighted. Soon after his elevation the nation was thrown into great excitement about the prosecution of the "worthless profligate " John _ Wilkes, and the question involved in it of the legality of _ "general warrants." Chief-Justice Pratt pronounced, with~~

~~decisive and almost passionate energy, against their legality, thus giving voice to the strong feeling of the nation, and winning for himself an extraordinary degree of popularity _ 48 one of the " maintainers of English constitutional liberty." Honours fell thick upon him in the form of addresses from the city of London and many large towns, and of presenta- tions of freedom from various corporate bodies. In July | 1765 he was raised to the peerage as Baron Camden, of~~

~~Camden Place, in the county of Kent; and in the following year he was removed from the court of Common Pleas to take his seat as lord chancellor (July 30, 1766). This~~

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~~and improvemeuts, all properly distinguished from the | seat he retained less than four years; for although he~~

~~brought hin prominently into notice and gave him assur- |~~

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~~discharged its duties in so efficient a manner that, with one exception, his decisions were never reversed on appeal, he took up a position of such uncompromising hostility to the Governments of the day, the Grafton and North adminis- trations, on the greatest and most exciting matters, the treatment of the American colonies and the proceedings against John Wilkes, that the Government had no choice but to require of him the surrender of the great seal. He retired from the Court of Chancery in January 1770, but he continued to take a warm interest in the political affairs and discussions of the time. In his speeches in the House of Lords he sometimes showed a strong ill-feeling against his great opponent, Lord Mansfield, on the doctrine of libel. He continued steadfastly to oppose the taxation of the American colonists, and signed, in 1778, the protest of the Lords in favour of an address to the king on the subject of the manifesto of the American commissioners. In 1782 he was appointed president of the council under the Rocking- ham administration, but retired in the following year. Within a few months he was reinstated in this office under the Pitt administration, and held it till his death. Lord Camden was a strenucus opponent of Mr Fox's India Bill, took an animated part in the debates on important public matters till within two years of his death, introduced in 1786 the scheme of a regency on occasion of the king's insanity, and to the last zealously defended his early views on the functions of juries, especially of their right to decide on all questions of libel. He was raised to the dignity of an earl in May 1786, and was at the same time created Viscount Bayham. Earl Camden died in London, April 18, 1794. His remains were interred in Seale church in Kent.~~

~~CAMEL, the Djemal of the Arabs and Gamal of the Hebrews, a genus of Ruiminant Mammals, which, with the South American llamas, form the family Camelide, and which in their dentition, in the absence of horns and of hoofs completely enveloping tne toes, and in the separation of the navicular and cuboid bones of the tarsus, show an affinity with certain of~~

~~the Perissodactyle Ungulata. In common with the llamas, and unlike all other ruminants, the camel has two upper incisor teeth, conical and laterally com- pressed, and somewhat resembling canine teeth, of which in the upper jaw there are two, in addition to twelve molars. Beneath there are six incisors, two canines, and ten molar teeth, the whole forming a dentition admirably suited for the tearing asunder and mastication of the coarse dry shrubs on which the camel usually feeds. It possesses besides many other peculiarities in form and structure specially adapted to its mode of life. Its nostrils are in the form of oblique slits, which can be opened or shut at will, and thus the organ of smell, which in the camel is of extraordinary acuteness, is preserved from contact with the hot acrid sand that, like a 'pillar of cloud," frequently sweeps across the desert. The extremities only of the two toes which form the foot are free, and are each terminated by a short and somewhat curved nail, the rest of the toes being connected together by means of a broad elastic pad on which the foot rests, and which buoys the camel up as it moves on the soft and ever-shifting surface. The horny callosities on the breast and limb-joints, on which the camel rests when being loaded, may possibly have resulted from the long ages of servitude to which it has been subjected, but whether they existed in the wild camel or not, traces of thei are said to be now found on the new-born young. The hump or humps on the camel's back are mere masses of fat, without any corresponding curve on the vertebral column of the animal, and form a reserve of nourishment to be used when other supplies fail ; consequently during lengthened periods of pri- vation, and during the rutting season, when the males almost cease to eat, these masses greatly diminish in size, The camel~~

~~driver knows well the value of this natural storehouse, and takes care before starting on a lengthened-journey to have the humps of his beasts well distended. In its native deserts, however, the camel is more liable to suffer from lack of water than of food, and accordingly the stomach is so modified as te allow of a certain quantity of water being stored for future use. On the walls of the paunch or first stomach, little pouches with narrow mouths are developed ; these are the so called " water cells," the biggest of which in an adult camel measures when dilated about three inches in width and depth, and these serve to strain off a consider- able quantity of water from the contents of the paunch, re- taining it for future use by means of powerful sphincter muscles. The upper divided lip of the camel is slightly extensile, and is used as a feeler with which to touch and examine its food before turning the same into its mouth. The animal is further characterized externally by its long neck, the dusky colour of its fur, the shaggy masses of long woolly hair on certain parts of its body, and the dispro- portionate shortness of its legs. These, together with the peculiarities already mentioned, combine to make it one of the most ungainly of known animals, and almost justify the recent description given of it by Dr Russell, the Z7%mes corre- spondent, as 'an abominably ugly necessary animal." Never- theless, it is as indispensable where great deserts are to be traversed as is the ship on the ocean highway, and this fact seems to have completely blinded the Arab to its un- doubted deficiences in form, for in his poetry allusion is sometimes made to the motions of the camel as to a recog- nized standard of elegance.~~

~~The camel is one of the oldest mammals now living, and fossil remains have been found in the Mivcene of the Seva- lik Hills of a species (Camelus sivalensis) somewhat larger, but otherwise scarcely distinguishable from recent forms. "The difference is so slight," says Andrew Murray, " it pleases us to think that we may have here, in this most ancient animal, a species which saw the Miocene epoch, and which has survived all the chances and changes which have taken place since then." That it was one of the earli- est of domesticated animals is evident from the frequent allu- sions made to it in the oldest written records of the human race. Six thousand camels are said to have formed part of the wealth of the patriarch Job ; they also formed part of the present which Pharaoh gave to Abraham,~~

~~and it was to a company of Ishmaelites travelling from Gilead to Egypt on camels, laden with spices, much as their Arabian descend- ants do at the present day, that Joseph was sold by his brethren. Naturalists are able to indicate with more or less certainty the wild progenitors of most of the domestic animals, but they have hitherto failed to obtain any reliable evidence of the existence, at the present day, of the wild ancestor of the camel. In the eastern hemisphere it stands alone, sole representative of the family to which it belongs, its only allies, the llamas, being confined to the slopes of the Andes and the southern parts of South America, Pale- ontologists, however, by the discovery of several fossil forms, have been able to bridge over the geographical gap which at present separates the two branches of the Camelidz.~~

~~During the rutting season the male camel becomes exceed- ingly savage and dangerous, and engages in fierce contests with its fellows. The gravid female carries her young for fully eleven months, and produces oniy one calf at a time, which she suckles for a year. Hight days after birth the Arabian camel stands three feet high, but it does not reach its full growth till its sixteenth or seventeenth year. It lives from forty to fifty years. The flesh of the young camel resembles veal, and is a favourite food of the Arabs, while camel's milk forms an excellent and highly nutritious beverage, although, according to Layard, it does not furnish butter. The woolly hair, which grows to a great length on~~

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~~CAMEL~~

~~the under side of the neck, the upper part of the legs, and on the humps, is shorn every summer, and is woven into q variety of stuffs used by the Arab for clothing himself ang his family, and in covering his tent. It was in raiment of camel's hair that John the Baptist appeared as a preacher, The hair imported into this country is chiefly used in the manufacture of small brushes used by painters, while the thick hide is formed into a very durable leather. The dung ig used as fuel,and from the incinerated remains of this sal-ammioniac is extracted, which was at one time largely exported from Egypt.~~

~~But it is as “ the ship of the desert,” without which vast tracts of the earth’s surface would probably have remained for ever unexplored, that the camel is chiefly valuable, Ip its fourth year its training as a beast of burden begins, when it is taught to kneel down and to rise at a given signal, and is gradually accustomed to bear increasing loads, These vary in weight from 500 to 1000 ib, according to the variety of camel employed, for of the Arabian camel there are almost as many breeds as there are of the horse in more temperate regions. When crossing a desert the camels are expected to carry their load 25 miles a day for three days without drink, getting a supply of water, however, on the fourth ; but the fleeter varieties will carry their rider and a bag of water 50 miles a day for five days without drink- ing. When too heavily laden the camel refuses to rise, but on the march it is exceedingly patient under its burden, only yielding beneath it to die; relieved from its load it does not, like other animals, seek the shade, even when that is to be found, but prefers to kneel beside its burden in the broad glare of the sun, seeming to luxuriate in the burning sand. When overtaken by the deadly simoom it falls on its knees, and stretching its suake-like neck along the sand, closes its nostrils, and remains thus motionless till the at- mosphere clears ; and in this position it affords some shelter to its driver, who, wrapping his face in his mantle, crouches behind his beast. Of still greater service is it, when, the whole caravan being on the point of perishing for want of water, the acute sense of smell which the camel pos- sesses enables it to perceive the presence of water more than a mile off; then it will break its halter and make an unerring track for the well. The food of the camel consists chiefly of the leaves of trees, shrubs, and dry hard veget- ables, which it isenabled to tear down and masticate by means of its upper incisors and powerful canine teeth. It is, however, fond of luxurious living when such is to be had, and, according to Sir Samuel Baker, when it arrives in good pasture, after several days of sharp desert marching, it often dies in a few hours of inflammation caused by repletion; but when other animals are starving, the camel, according to the same authority, thrives “on the ends of barren leafless twigs, the dried sticks of certain shrubs, and the tough dry paper-like substance of the dome palm, about as succulent a breakfast as would be a green umbrella and a Tvmes newspaper.” The docility of the camel has become well- nigh proverbial throughout Europe, but recent travellers who have studied the animal in Arabia and Africa have said much to lessen, if not to extinguish, its~~

~~reputation in this particular. “If docile means stupid,” says Palgrave, who had ample opportunity of observing the camel during his romantic sojourn in Arabia, “well and good ; in sucha case the camel is the very model of docility. But if the epithet is intended to designate an animal that takes an interest in its rider so far as a beast can, that in some way understands his intentions, or shares them in a subordinate fashion, that obeys from a sort of submissive or half-fellow- feeling with his master, like the horse or elephant, then I say that the camel is by no means docile—very much the contrary. He takes no heed of his rider, pays no attention whether he be on his back or not, walks straight on when~~

~~once set agoing, merely because he is too stupid to turn aside, and then should some tempting thorn or green branch allure him out of the path, continues to walk on in the new direction simply because he is too dull to turn back into the right road. In a word, he is from first to Jast an undomesticated and savage animal rendered service- able by stupidity alone, without much skill on his master’s part, or any co—peration on his own, save that of an extreme passiveness. Neither attachmeut nor even habit impress him; never tame, though not wide-awake enough to be exactly wild.” So also Sir S. Baker, in his recent work The Albert Nyanza, bears testimony to its extreme dulness, for while other ruminants in feeding select wholesome herbs, the camel is stupid enough to eat indiscriminately every green vegetable; it is thus often poisoned through eating a plant known to the Arabs as “‘ camel poison,” and on this account it is customary to set watchers over them while grazing in districts where this plant is found. The camel, however, is revengeful, and in satisfying this passion is said to display a far-thoughted malice scarcely consistent with the extreme stupidity attributed to it by Palgrave. Of this vindictiveness the camel driver is well aware, and of the certainty that sooner or later it will seek revenge ; accordingly it is customary for the person who has reason to fear its malice to throw his clothes before the camel, meanwhile concealing himself until the infuriated animal has expended its rage in tossing and trampling upon them, when the injury, real or supposed, is immediately forgotten. The camel is probably a native of the desert countries of the south-west of Asia, whence it has spread into most of the arid regions of the castern~~

~~hemisphere, carrying with it wherever it goes a mark of its desert origin in the antipathy which it shows to cross a stream of water. It has lately been introduced into Australia, the great central desert of which was recently crossed by Warburton with a caravan of camels, It has now also obtained a footing in the New World, ten camels having been landed at New York some years ago, all of them, however, with the exception of a single male and female, dying soon after. The surviving pair were transferred to Nevada, where the soil was sandy and sterile, producing abundance of prickly shrubs which no other animal would touch, but on which the pair of camels flourished and bred. This female has already given birth to twenty-four young, all of which are still (1875) alive, and some of these having also bred, there are now ninety-six camels, all, with the exception of the original couple, born in Nevada. In Europe the camel is only reared in the neighbourhood of Pisa, having been introduced there by one of the dukes of Tuscany, and is employed as a beast of burden, but is said to be gradually deteriorating. There are two species of camel—the Arabian and the Bactrian. 'The former or single-humped_ species (Camelus dromedarius) is found in greatest perfection in Arabia, Whence it has spread eastwards to India, where it is now extensively used, although the stony nature of much of the ground it has to pass over does not give it in India that superiority over other beasts of burden, which it undoubt- edly possesses in desert countries. It seems to have spread westwards with the Koran along the North African shores, and to have been introduced by the Moors into Spain, Where, however, it did not succeed in establishing itself. It also accompanied the followers of Mahomet into Euro- pean Turkey. In Arabia several breeds, each possessing special qualities, are carefully cultivated. The chief of these are the thick-built, heavy-footed, and slow-paced variety, used for carrying heavy loads, and the dromedary— a name often applied to all the members of the single-humped species, but properly belonging ouly toa thin, comparatively elegant, and fine-haired breed, celebrated for its fleetness, carrying its rider when necessary 100 miles a day. The**

toe dromedary, says Palgrave, "is the race-horse of its species," and the difference between it and the heavy variety is exactly the same ''as between the race-horse and a hack." Another breed, belonging to a tribe of Arabs who dwell near the western shores of the Red Sea, is specially adapted for journeying with loads over mountainous districts,and Baker,

~~who made use of them, states that they accomplished feats in mountain climbing which would have been impossible to any other domestic animal so loaded. The Bactrian or two-humped camel (Camelus bactrianus) is a somewhat~~

~~larger and more robust species, and is much rarer than the~~

~~Arabian. It is found throughout the region lying to the~~

~~north and east of that inhabited by the dromedary, from~~

~~the Black Sea to China and northward to Lake Baikal,~~

~~where in winter it sustains severe cold, subsisting mean-~~

~~while upon the leaves and twigs of the willow and birch.~~

~~The pads-on its feet are harder than in the other species,~~

~~and are thus better fitted to bear the changes wrought on~~

~~the soil by the frequent alternations of rain and drought,~~

~~while its fur is also thicker and more plentiful. In Central~~

~~Asia both species occur, and hybrids are not uncommon,~~

~~the latter being, it is alleged, occasionally fertile among~~

~~themselves. (5. GI.)~~

~~CAMELLIA, the name of a genus of TVernstrimiacee, remarkable for its evergreen lanrel-like foliage, and its handsome rose-like flowers, whence the common species, C. japonica, is sometimes called the Japan rose. This is an evergreen shrub of remarkably hardy constitution, so that in our climate it flourishes perfectly in a cold green- house ; indeed, in the south and west of England, and in other favourable situations, the plant itself is hardy, and ouly suffers from frost in regard to the damage done to its flowers, which are naturally developed very early in the spring, and are~~

~~therefore liable to suffer injury from spring frosts. The plant had been cultivated by the Japanese and Chinese long previous to its introduction to our gardens from China in 1739, and, in consequence, numerous double-flowered varieties were at that time known, of which about two dozen sorts were introduced from China, chiefly be- tween 1806 and 1824, some two or three others having been obtained so early as 1792-4. This number of varieties has now been very considerably increased by the production of European seedlings, so that several hundreds are figured ina publication called Nouvelle Iconographie des Camellias, specially devoted to their illustration. The plant seeds freely in the climate of Italy and the south of Europe, and thence many first-rate sorts have been obtained.~~

~~The original type of C. japonica forms a dense bushy evergreen, abundantly clothed with ovate acuminate glossy leaves, and decorated with sessile single red flowers com- posed of from five to seven (nominally five) broadly obovate rosy carmine petals, which expand into a cup-shaped flower, and surround a circlet of numerous monadelphous stamens, within which a few free stamens, two to each petal, are produced. These stamens afford a fine contrast to the broad spreading petals. This form, or one but slightly removed from it, is still cultivated in gardens, as a stock on which to graft the double-flowered sorts, these only, in a general way, being now prized. There are, however, some few exceptions, as, for example, the single white, whose large flowers, with their conspicuous stamens, are extremely handsome when associated with the rich-looking dark green foliage.~~

~~The name Camellia was given to these plants by Linnzus in honour of George Joseph Camellus or Kamel, a Mor- avian Jesuit, who travelled in Asia, and wrote a history of the plants of the island of Luzon. In Japan, its native country, the Camellia attains to the size of a large tree, and it is held in high estimation by the Japanese, on account of the extreme beauty of its large, showy, and IV. — 93~~

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~~various-coloured flowers, which, however, have this draw- back, that they have no scent. It appears to have been cultivated by the Chinese from time immemorial, and all our earlier introductions were obtained from that~~

~~country. According to the Hortus Kewensis, it was introduced into England by Robert James, Lord Petre, before the year 1739; and the Waratah, or anemone-flowered variety, which has broad outer petals and a crowd of smaller central ones, is said to have been introduced at the same time. The double white, a variety as yet unsurpassed in beauty, its flowers being so pure in colour, and so full and symmetrically imbricated in form, was introduced in 1792; as also was the double striped, a free blooming hardy kind, with rosy red flowers irregularly blotched with white, which though surpassed in size and richness of colouring by more modern European varieties, is still too useful to be altogether dis- carded. The latest direct importations are probably the hexangular-flowered Camellia (hexangularis), introduced from China by Mr Fortune in 1846, a variety which, like that called Lady Hume's Blush (encarnata), has the pointed petals laid directly over each other, so that the face of the flower becomes six-angled; and the fish-tailed Camellia, introduced in 1861, a variety in which the leaves are sharply serrated at the margin and forked at the apex, so that they resemble in form the tail of a fish.~~

~~'1'o be seen in their full perfection Camellias should be planted out in borders of properly prepared soil under glass ; but these borders should be very effectually drained, aud of such a mechanical composition as never to become soddened, for the plants require to be almost deluged with water when making their growth, and when develop- ing their blossoms. The borders, moreover, when the plants have become well established, and the soil is full of roots, will require to be assisted by top-dressings, such as sheep or deer dung, and by applications of liquid manure. They by no means require a heated structure, nor too much sun- light, but when well established in a cool and somewhat shaded conservatory, may become a source of infinite delight to those who have a love for flowers. As instances of the great esteem in which the Camellia is held, it is only neces- sury to refer to the immense number of cut blooms sold during the season in Covent Garden market, and the high prices which they realize while yet comparatively scarce.~~

~~The genus Camellia is limited to some six or seven species, natives of India and Japan. Of these, besides C. japonica, another named C. retiewlata, a native of the island of Hong-Kong, is highly prized in gardens for its very~~

~~handsome blossoms. It differs from C. japonica in its downy branches, and reticulated, not glossy leaves, and also in its much larger flowers. The double-flowered variety of this plant has a most gorgeous appearance, specimens of the flowers having been measured which were as much as twenty inches in circumference.~~

~~Both C. Sasanqua (=oletfera), and C. drupifera (= Kissii), the former inhabiting Japan and China, the latter Cochin-China and the mountains of India, are oil-yielding plants. The oil of C. Sasan- qua (of which Sasankwa is the native Japanese name) has an agree- able odour, and is used for many domestic purposes ; it is obtained from the seeds by subjecting them to pressure sufficient to-reduce them to a coarse powder, and then boiling and again pressing the crushed material. The leaves are also used in the form of a decoc- tion by the Japancse women, for washing their hair ; and in a dried state they are inixed with tea on account of their pleasant flavour. The oil of C. drupifera, which is closely allied to C. Sasanqua, is used medicinally in Cochin-China, its flowers also are odoriferous, all the other known species, except the Indian C. lutescens, being in- odorous.~~

~~The genus Camellia is very closely allicd to that of the tea-plant (Thea) ; indced so close is the affinity that some botanists have pro- posed to unite them. Dr Seemann, however, in a memoir published in the Transactions of the Linnean Soetety (xxii. 337), points out their distinctions, from which it appears that while in Camellia the flowers are erect and sessile, the calyx many-leaved with deciduous sepals, the interior stamens (those within the monadelphous ring) twice the number of petals, and the styles five in number, the flowers of Thea are pedunculate and nodding, the calyx five-sepaled with persistent sepals, the interior stamens equalling the petals in~~

~~nuniber, and the styles three. So close, however, is the agreement between them that the red-flowered Camellia Sasangua, as it was for a long time called in gardens, has, as a result of more intimate acquaintance with its structure, to be referred to Thea, under the name of Thea maliflora. Bentham and Hooker, in their new Genera, Plantarum, have again united Thea with Camellia wnder the latter name, preferring to regard the teas as forming a section of the genus Camellia, which conclusion has been~~

~~adopted by Professor Dyer in the Flora of British India (i. 292), where the Thea assamiea of authors is referred to as the possible wild stock of the tea-plant, and the name of Camellia theifera adopted for the combined form called T. chinensis by Linneus and Seemann. (1. MO.)~~

~~CAMEO, a term of doubtful origin, applied to eugraved work executed in relief, ou hard or precious stones, on imitations of such stones in glass called " pastes," or on the shells of molluscous animals. A cameo is thus the converse of an intaglio, which consists of an incised or sunk engraving executed in the same class of materials, The word cameo is generally regarded as being derived from the Arabic camea, a charm or amulet ; but a number of other derivations have been suggested, among which a highly allegorical origin of the word from the Arabic camaut, the camel's hump, implying any object in relief, has been maintained by an eminent authority. Cameo- cutting is an art of much more recent introduction than the sister art of intaglio-engraving. 'The earliest known traces of any attempt at cutting gem-figures in relief are seen in certain Phcenician and Etruscan scarabei, in which the back of the beetle has been utilized for the faint delineation of another and quite different figure. One of the niost ancient known cameos, of which the date can be fixed with certainty, consists of a sardonyx of three layers with portrait heads of Demetrius Soter and his wife Laodice, which must have been engraved between the years 169 and 150 B.c.~~

~~The materials which ancient artists used for cutting into cameos were chiefly those siliceous minerals which, under a variety of names, present various strata or bands of two or more distinct colours, and properly the name cameo should be restricted to work executed in relief on such banded stones. The minerals, under different names, are essentially the chalcedonic variety of quartz, and the differences of colour they pressnt are due to the presence of variable proportions of iron and other foreign ingredients. These banded stones, when cut parallel to the layers of different colours,and when onlytwocoloured bands—white and black, or sometimes white and black and brown—are present, are known as ouyxes, but when they have with the onyx bands layers of carnelian or sard, they are termed sardonyxes. 'The sardonyx, which was the favourite stone of ancient cameo-engravers, and the material in which their masterpieces were cut, was procured from India, and the increased intercourse with the East by the way of Egypt after~~

~~the death of Alexander the Great hada marked influence on the development of the art. Cameo-cutting attained the zenith of its pristine perfection in Rome during the first two centuries of the Christian era, the chief works being portraits of the reigning families, and allegorical illustrations of their glories. Contemporaneously with the production of the finest works in Oriental precious stones, pastes or imitations in glass were made in I- credible numbers to meet the requirements of the classes who could not afford the other necessarily rare and costly luxuries. Both in perfection of material and in artistic merit these imitations were, in the best period, of extra- ordinary merit. The Barberini or Portland vase in the British Museum is a rare example of the skill of both the glass-worker and engraver on glass of ancient times.~~

~~The two most famous examples of this art which have come down to the present day are the Great Agate of the Sainte Chapelle in the Bibliotheque Nationale, Paris, and — the Augustus Cameo in the Vienna collection. The former~~

~~' was pledged among other valuables in 1244 by Baldwin IT. of Constantinople to Saint Louis. It is mentioned in 1344 as " Le Camahien," having been sent in that year to Rome for the inspection of Pope Clement VI. It is a – gardonyx of five layers of irregular shape, like all classical ems, measuring about 13 inches by 11 inches. During the Middle Ages the subject was supposed to be the triumph of Joseph in Egypt; but it is now known to represent on its upper part the apotheosis of Augustus, the centre being occupied with the reception of Germanicus on his return from his great German campaign by the Emperor Tiberius and his mother Livia. The lower division is filled with a group of captives in attitudes expressive of woe and deep dejection. The Vienna gem (Gemma augustea), an onyx of two layers measuring 9 inches by 8, is a work of still greater artistic interest. The upper portion is occupied – with an allegorical representation of the coronation of Augustus,—the emperor being represented as Jupiter with Livia as the goddess Roma at his side. In the composition _ Neptune and Cybele, with several members of the family of Augustus, are introduced, and on the exergue or lower portion are Roman soldiers preparing a trophy, barbarian – captives, and female figures. The history of this inestimable treasure has been traced from the time of the Crusades, and~~

~~it came into the possession of the Emperor Rudolph II. in the 16th century for the enormous sum of 12,000 gold ducats. : While these and other similar monuments of antiquity,~~

~~_ which have come down to us only mellowed and not injured ©~~

~~by time, have intrinsically a priceless value as the expres- sion of the most perfect artistic culture and feeling of the age to which they belong, they possess at the same time equally great significance to the student of the history, civilization, morals, and manners of the period. They supply the most authentic means of confirming the infer- ences to be drawn from classical sources as to beliefs, usages, dress, domestic and public habits, and pursuits of the people with whom they deal, and by means of such gems not only are the prevailing features of an ancient race accurately delineated, but the actual portraits of many of the most prominent personages in the world's history have been faithfully preserved, and can be identified beyond the shadow of a doubt.~~

~~The art of cameo-engraving waned in the early part 'of the 3d century, after the death of the Emperor Severus, but under the first Christian Emperor Constantine it enjoyed a~~

~~brief period of revival. Mauy very beautiful cameo , portraits of Constantine are extant; and it was during or shortly after his reign that Christian Scripture subjects began to appear on cameos. That class of subjects con- stituted the staple of such work—generally rude and | artistically debased—as continued to be cultivated under the Byzantine empire down to nearly the epoch of the Renaissance. From the Byzantine period downward one peculiarity of gem-engraving becomes noticeable. Cameo- work as compared with intaglios in classical times was rare and infrequent, but now and onwards the opposite is the case, intaglio-sinking having almost died out, and cameos " being chiefly produced. Commercial intercourse with the East still secured for the engravers a supply of magnificent \ sardonyxes, although blood-stone and other non-banded stones were very commonly used for works in relief. Cameos during the long dark ages were used chiefly for the decora- tion of reliquaries and other altar furniture, and as~~

such their designs were purely ecclesiastical or scriptural. To _ this period also belongs the class of complimentary or motto cameos, which, containing only inscriptions and an orna- mental border, executed in nicolo stones, were used as personal gifts and adornments. . in medixval times antique cameos were held in peenliar

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veneration on account of the belief, then universal, in their potency as medicinal charms. This power was supposed to be derived from their origin, of which two theories, equally satisfactory, were current. By the one they were held to be the work of the children of Israel during their sojourn in the wilderness (hence the name Prerres d'/srael), while the other theory held them to be direct products of nature, the engraved figures pointing to the peculiar virtue lodged in them.

The revival of the glyptic arts in Western Europe dates from the pontificate of the Venetian Paul II. (1464~71), himself an ardent lover and collector of gems, to which passion, indeed, it is gravely affirmed he was a martyr, having died of a cold caught by the multiplicity of gems exposed on his fingers. The cameos of the early part of the 16th century rival in beauty of execution the finest classical works, and, indeed, many of them pass in the cabinets of collectors for genuine antiques, which they closely imitated. The Oriental sardonyx was not available for the purposes of the Renaissance artists, who were consequently obliged to conteut themselves with the colder German agate onyx. The scarcity of worthy materials led them to use the backs of ancient cameos, or to improve on classical works of inferior value executed on good material, and probably to this cause must also be assigned the introduction of shell cameos, which are not supposed to have been made previous to this period.

~~Among the means of distinguishing antique cameos from cinquecento work, the kind of stone is one of the best tests, the classical artists having used only rich and warm- tinted Oriental stones, which further are frequently drilled through their diameter with a minute hole, from having been used by their original Oriental possessors in the form of beads. The cinquecento artists also, as a rule, worked their subjects in high relief, and resorted to undercutting, no case of which is found in the flat low work of classical times. The projecting portions of antique work exhibit a dull chalky appearance, which, however, fabricators learned to imitate in various ways, one of which was by cramming the gizzards of turkey fowls with the gems. Another index of antiquity is found in the different methods of working adopted in classical and Renaissance times. The tools employed by the Renaissance engraver were the drill and the wheel, both fed with oif and diamond or emery dust. The drill was simply the common instrument known by that name, and the wheel was a small metallic disc, which cut by its periphery being made to rotate in a vertical plane. Antique gems of the best period were cut or scratched (yAddew, scalpere) with the diamond point (splinters either of corundum or sapphire), with the aid of the drill, which the artists possessed in common with their modern successors.~~

~~In the early part of the 18th century great confusion was introduced into the study of this department of art, by the fraudulent insertion on a wholesale scalejof names in Greek, purporting to be those of the engravers of the gems bearing' them. In reality the insertion of his name by any artist, on cameos especially, was an exceedingly rare occurrence. An invariable and unfailing test of the authenticity of any signature on a cameo is "that it be always in relief, which is a sure evidence that it was cut at the same time with the rest of the composition." Another fraud practised in Italy during the revival consisted in engraving on unnamed portrait gems a name supposed to suit the aspect of the individual.~~

~~In our own day the engraving of cameos has ceased to be pursued as an art. Roman manufacturers cut stones in large quantities to be used as shirt-studs and for setting in finger-rings; and in Rome and Paris an extensive trade is carried on in the cutting of shell cameos, which are~~

~~largely imported into England and mounted as brooches by Birmingham jewellery manufacturers. 'I'he principal shell used is the large bull's-mouth shell (Cassis rufa), found in East Indian seas, which has a sard-like underlayer. The black helmet (Cassis twberosa) of the West Indian seas, the horned helmet (C. cornuta) of Madagascar, and the pinky queen's conch (Strombus gigas) of the West Indies are also employed. The famous potter Josiah Wedgwood introduced a method of making imitations of cameos in pottery by producing white figures on a coloured ground, this con- stituting the peculiarity of what is now known as Wedgwood ware. (J. PA.)~~

~~CAMERA LUCIDA, an instrument invented by Dr Wollaston for drawing in perspective.~~

~~If a piece of plane glass be fixed at an angle of 45° with the horizon, and if, at some distance beneath, a sheet of paper be laid horizontally on a table, a person looking downwards through the glass will see an image of the objects situated before him ; and as the glass which reflects the image is also transparent, the paper and pencil can be seen at the same time with the image, so that the outline of the image may be traced on the paper. The image is au mverted one. This is the simplest form of the instru- ment, and may be constructed extemporaneously by fixing on a stand a plane transparent glass, with its surfaces ground parallel, or a piece of Muscovy glass, at an angle of 45° with the horizon. A card with a small hole in it will serve as a sight for keeping the eye steady in one situation whilst the pencil is tracing the image.~~

~~Let a plane mirror, cb (Plate XXXIV. fig. 1), be inclined at an angle of 223° with the horizon, and let ba, a piece of plane transparent glass, be so placed as to make an angle of 224° with the vertical, then rays fg frum an object will be twice reflected before they reach the eye at e, and, con- sequently, on looking down through the transparent glass, an erect image is seen, and the pencil may be drawn over the outlines of this image, so as to leave a perspective representation on the paper.~~

~~As the image and pencil are at different distances, they cannot be both seen in the same state of the eye. To remedy this inconvenience, a convex glass is used, of such focus as to require no more effort than is necessary for seeing the distant objects distinctly. By means of this lens, the image will~~

~~appear as if it were placed on the surface of the paper. In fig. 1, bd is a convex glass of 12 inches focus. Instead of using a convex lens, short-sighted persons will require a concave glass to be placed at f, in the course of the rays from the object to the reflecting surface. In fig. 2, vk is a concave glass so placed that it may be turned at pleasure into its place, as the sight of the observer may require. Persons whose sight is nearly perfect may use either the concave glass placed before the reflecting surface, or the convex placed between the paper and the eye.~~

~~In the actual construction of the instrument, a prism is used instead of a mirror and plane glass. The rays from the object fall upon the surface be of the prism, fig. 3. This surface bc is inclined 224° to the horizon. The refractive power of the glass allows none of the rays in this situation to pass out; they are all reflected from the surface be to the surface ab, and from that to the eye. ab makes an angle of 135° with bc, and 223° with the vertical. The eye cannot see the pencil through the prism as it does through a plane glass; therefore, in order that the pencil may be seen, the eye must be so placed that only a part of the pupil may be above the edge of the prism, as at e, fig. 3; and then the reflected image will be seen at the same time with the paper and pencil. There is a small piece of brass perforated with a hole ¢ (fig. 2),and moving on a centre ; this serves to keep the eye in one position, as it must be that the image miay be steady, and also to regulate the~~

~~CAM—CAM~~

~~relative quantities of light to be received from the object and from the paper.~~

~~The instrument, being near the eye, does not require to be large. The smallest size which can be executed with accuracy is to be preferred, and is such that the lens jy only three-fourths of an inch in diameter. Fig. 4 shows the instrument on its stand, and clamped to a board, The joint by which the prism is attached to the stand ig double,~~

~~This instrument serves for drawing objects of all forms, and consequently also for copying lines already drawn on a plane surface. If it is required that the copy shall be of the same size as the original drawing, the distance of~~

~~the drawing from the prism should be the same as the distance of the paper from the eye-hole. No lens will be necessary in this case, because the image and the paper, being both at the same distance from the eye, coincide without the aid of a glass.~~

~~In order to have a reduced copy of a drawing, the drawing is to be placed at a distance from the prism greater than the distance of the paper from the eye-hole. Tf the distance is twice as great, a copy will be obtained in which the lines are of one-half the size of the lines in the original, and so in proportion for other distances. A lens is necessary, that the eye may be enabled to see at two different distances ; and, in order that one lens may serve, the distance between the eye-hole and the paper should be variable; to that effect the stand is susceptible of being lengthened or shortened at pleasure.~~

~~The length of the stem is adjusted upon optical principles. When'a distant object is to be delineated, the rays coming from it, and reflected by the instrument to the eye, are parallel, and it is required that the rays proceeding from the paper to the eye should also be parallel. This is accomplished by interposing a lens between the paper and the eye, with its principal focus on the paper. When the object to be delineated is so near that the rays which come from it to the eye are divergent, then it is required that the rays from the paper should likewise be divergent in the same degree, in order that the paper and the image may both be seen distinctly by the same eye; for this purpose the lens must be placed at a distance from the paper less than the distance of its principal focus.~~

~~The advantage of this instrument as compared with the camera obscura are, —Ist, That it is small and easily carried about ; 2dly, That no lines are distorted, not even those most remote from the centre; and 3dly, That in'the field of the camera lucida 70° or 80° may be included, whilst the distinct field of the camera obscura does not extend beyond 30° or 35° at most. See Repertory of Arts, vol, x., 1807, p. 162, and Nicholson's Journal, vol. xvii.~~

~~If the camera lucida be fixed at the eye-glass of 4 telescope, it will reflect to the eye the image of the objects in the field of the telescope, so that a drawing of the image may be made. See Brewster's Account of some Philosophical Instruments. A plane reflecting glass fixed at an angle of 45°~~

~~with the horizon, and placed so as to receive the rays from the eye-glass of a telescope, will also give an image of the objects in the field, so situated that the image may be traced with a pencil. Varley's patent graphic telescope 1s upon this principle. In order that the field may be large, the magnifying power of the telescope should be small.~~

~~The optigraph of Ramsden and Thomas Jones, described in the Philosophical Magazine, vol. xxviii., 1807, p. 67, 18 an instrument of a similar kind. The image of the object is seen ina telescope, There isa piece of plane glass near¢, in the focus of the eye-glass of the telescope F, Plate XXXIV. fig. 5. On the centre of this piece of glass isa dot; a18a plane mirror, inclined so as to reflect the image of the object into the telescope. This mirror remains fixed, whilst~~

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~~the telescope is movable on a universal joint at its object- glass 0. Near c is another plane mirror, which reflects the rays to the eye-glass. The eye being placed at the eye- _ giass at ¢, the telescope is to be moved by the handle 2 so that the dot in the focus of the eye-glass shall pass over the outlines of the image seen by the eye, and the pencil at L performing a similar motion to that of the dot, and sliding freely in its sheath,'presses with its weight on the paper ; a drawing of the object is the result. If the stand and slider H be lengthened, an enlarged drawing will be obtained.~~

~~CAMERA OBSCURA, an optical apparatus, consisting of a darkened chamber, at the top of which is placed a box or lantern, containing a convex lens and sloping mirror, or a prism combining the lens aud mirror. The rays of light from surrounding objects are received by the lens, and the mirror reflects images of the scenery downwards on a table placed underneath. This ingenious contrivance is said to have been invented by Baptista Porta in the end of the 16th century. Yor the camera obscura used by photographers see PHOTOGRAPHY.~~

~~CAMERARIUS, Joacuim (1500-1574), whose family name was Liebhard, one of the most learned classical scholars of his time, was born at Bamberg on the 12th April 1500, He studied at Leipsic, Erfurt, and Wittenberg, and in the last-mentioned town he enjoyed the friendship of Melanchthon.~~

~~Forsome years he was teacher of history and Greek at the Gymnasium, Nuremberg. In 1530 he was sent as deputy for Nuremberg to the Diet of Augsburg, where he rendered important assistance to Melanchthon. Five years later he was commissioned by Duke Ulrich of Wiirtemberg to recognize the university of Tiibingen ; and he subsequently rendered a similar service at Leipsic, where the remainder of his life was chiefly spent. He translated into Latin Herodotus, Demosthenes, Xenophon, Homer, Theocritus, Sophocles, Lucian, Theodoret, Nicephorus, and other Greek writers. He published upwards of 150 works, including a Catalogue of the Bishops of the principal Sees ; Greek Hpistles ; Accounts of his Journeys, in Latin verse ; a Commentary on Plautus; Hwclid, in Latin; and the Lives of Helius Eobanus Hessus and Philip Melanchthon. He died at Leipsic in 1574.~~

~~CAMERARIUS, Joacuim (1534-1598), a learned physician, son of the preceding, was born at Nuremberg, 6th November 1534. After having finished his studies in~~

~~Germany he visited Italy, where he graduated as doctor of |~~

~~medicine. On his return he was invited to reside at the courts of several princes ; but he was too much devoted to the study of chemistry and botany to accept their offers. He settled in his native town of Nuremberg, where he practised as a physician, and was the chief agent in fonnding a medical school. He wrote a Hortus Medicus, and several other works. He died on the 11th October 1598. CAMERINO, formerly the capital of a delegation of the same name in the States of the Church, and now the chief town of a district, in the province of Macerata, in Italy, is situated on a height at the foot of the Apennines, 41 miles W. of Ancona. It is the seat of an archbishop, and possesses a small university founded in 1727, a theological seminary, nineteen conventual buildings, and a bronze statue of Pope Sixtus V., dating from 1587. Its cathedral, Sansovino, is built on the site of an ancient temple to Jupiter, and contains a number of excellent paintings. The culture and manufacture of silk is by far the most important branch of industry ; to which may be added the preparation of leather. Camerino occupies the site of the ancient Camerinum, au Umbrian city, whose inhabitants, the Camertes, are mentioned as an important people at a very~~

~~early date. About the beginning of the Christian era its lands were bestowed on military colonists ; but it continued~~

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~~to enjoy considerable prosperity. In the Middle Ages it originally formed part of the duchy of Spoleto; but it passed in the 13th century to the Varani family, and in 1520 was made an independent duchy by Leo X. Abont seventy years afterwards it was incorporated by the Papal States. The painter Carlo Maratta, the last of the so-called Roman school, was a native of the city. Population, 11,880.~~

~~CAMERON, Jonn (1579-1623), a learned theologian, was born at Glasgow about 1579, and received his early education in his native city. After having taught Greek in the university for twelve months, he removed to Bordeaux, where he was soon appointed a regent in the College of Bergerac. He did not remain Jong at Bordcaux, but accepted the offer of a chair of philosophy at Sedan, where he passed two years. He then returned to Bordeaux, and in the beginning of 1604 he was nominated one of the students of divinity who were maintained at the: expense of the church, and who for the period of four years were at liberty to prosecute their studies in any Protestant seminary. During this period he acted as tutor to the two sons of Calignon, chancellor of Navarre. They spent one year at Paris, and two at Geneva, whence they removed to Heidel- berg, where they remained nearly twelve months. In this university, on the 4th of April 1608, he gave a public proof of his ability by maintaining a series of theses, De triplict Dei cum Homine Feedere, which were printed among his works. The same year he was recalled to Bordeaux, where he was appointed the colleague of Dr Primrose; and when Gomarus was removed to Leyden, Cameron, in 1618, was appointed professor of divinity at Saumur, the principal seminary of the French Protestants.~~

~~In 1620 the progress of the civil troubles in France obliged Cameron to seek refuge for himself and family in England. or a short time he read private lectures on divinity in London ; and in 1622 the king appointed him principal of the university of Glasgow in the room of Robert Boyd, who had been removed from his office in consequence of his adherence to Presbyterianism. His successor appears to have been more favourably~~

~~inclined to Episcopacy,—a circumstance that may have tended to diminish the cordiality of his reception in his native city. Here he also taught divinity with great reputation, but he resigned his office in less than a year. Calderwood says that ‘“‘ Cameron was so misliked by the people that he was forced to quit his place soon afterwards.”~~

~~He returned to France, and fixed his residence at Saumur; and after an interval of a year he was ‘appointed professor of divinity at Montauban. The country was still torn by civil and religious dissensions ; and as Cameron maintained the doctrine of passive obedience, he excited the indignation of the more strenuous adherents of his own party. He withdrew to the neighbouring town of Moissac; but he soon returned to Montauban, and a few days afterwards he died at the age of about forty-six. Cameron left by his first wife several children, whose maintenance was under- taken by the Protestant churches in France, All his works were published after his death,~~

~~His name has furnished a designation to a party of Calvinists in France, who asserted that the will of man is only determined by the practical judgment of the mind ; that the cause of men’s doing good or evil proceeds from the knowledge which God infuses into them; and that God does not move the will physically, but only morally, by virtue of its dependence on the judgment of the mind. This peculiar doctrine of grace and free-will was adopted by Amyraut, Cappel, Bochart, Daillé, and others of the more learned among the Reformed ministers, who judged Calvin’s doctrines on these points too harsh, The Cameronites are moderate Calvinists, and approach to the opinion of the Arminians. They are also called~~

~~Universalists, as holding the universal reference of Christ’s death, aud sometimes Amyraldists. The rigid adherents to the Synod of Dort accused them of Pelagianism, and even of Manicheism, and the controversy between the parties was carried on with great zeal ; yet the whole question between them was only, whether the will of man is determined by the immediate action of God upon it, or by the intervention of a knowledge which God impresses on the mind. The Synod of Dort had laid down the position that God not only illuminates the understanding, but gives motion~~

~~to the will by making an internal change therein; whereas Cameron admitted only the illumination by which the mind is morally moved, and attempted to explain the decision of the Synod of Dort so as to make the two opinions consisteut.~~

~~CAMERON, Ricuarp (% —1680), the founder of the Cameronians, was born at Falkland, in the county of Fife. The date of his birth is not known. His father, who was a shopkeeper in that town, gave him such an education as the village school afforded ; and his success was so great that, while still a youth he was appointed schoolmaster. In this situation he had opportunities of becoming acquainted with some of the more enthusiastic field preachers, who at this time wandered through the country disseminating their doctrines. Persuaded by them he resigned his situation, and shortly after entered the family of Sir Walter Scott of Harden as chaplain and tutor. He did not-remain there long, however, for, refusing to acknow- ledge the Indulgence, he joined the ranks of the noncon- forming ministers, and incited the inhabitants of the southern counties of Scotland to protest openly against the new edict. So formidable was the agitation that the Government thought fit to interfere, and pronounced illegal all armed assemblages for religious purposes. Cameron was obliged to take refuge in Holland, where he resided for some time; but in the spring of 1680 he returned to Scotland, and once more made himself for- inidable and obnoxious to the Government. Shortly after the defeat of the Covenanters at Bothwell Bridge in that year, Cameron was slain in a skirmish at the Aird's Moss, fighting bravely at the head of the few troops which he had been able to collect, and which formed the nucleus of the renowned regiment in the British army afterwards known by his name.~~

~~CAMEROONS, or perhaps preferably Camaroons, is the greatest mountain-mass on the western coast of Africa. It is situated at the angle of the Bight of Biafra, directly opposite the island of Fernando Po, with which it has evidently an intimate geological connection. Its European name is said to be derived from the Portuguese Camarios (shrimps or prawns), and to have been bestowed by the early diseoverers on the neighbouring coast from the abund- ance of its crustacea, The native designation of the highest peak is Mongo-ma-Loba, or the Mountain of the Sky, and the whole upper region is usually called Mongo-mo-Ndemi, or the Mountain of Greatness. The area~~

~~of the Cameroons proper is calculated at about 380 square miles; but off-shoots and underfalls seem to stretch beth north aud south for considerable distances. The pile is of distinctly volcanic formation, and the higher district contains numerous craters and lava-beds of comparatively recent date. On the principal summit, whose twin peaks of Mount Albert and Victoria rise to a height of about 13,120 feet above the sea-level, there are one small and two large craters, from which, if native report can be trusted, eruptions have taken place within the memory of man (1838). The lower portions of the mass are occupied by a luxuriant vegetation of palms, acacias, fig-trees, kokos, plantains, and a rich variety of tree and shrub; while at the height of about 7000 feet these give place to ferns, grasses,~~

~~and heaths. The climate of the middle zone would render it an excellent site for a sanatorinm for Euro- peans debilitated by the malaria of the neighbouring coasts ; and the fertility of the soil would soon raise the district to great commercial importance, if it were brought under cultivation. The native tribes which in- habit the mountain sides are comparatively few, and have a very small proportion of the surface in actual possession, To the south of the Cameroons lies the Bay of Ambas (Ambozes, or Amboize), with the two islands of Ndami and Mondori. It forms a well-sheltered harbour, and is capable of receiving the largest vessels, In 1837 the king of Bimbia on the mainland made over a large part of the. country round the bay to Colonel Nicolls, and in 1848 he agreed to abolish human sacrifices at the funerals of his great men. In 1858 a settlement was made on the coast. at the mouth of a small river, flowing into Morton Cove, now known as the Victoria River. The settlers were Mr Saker, a Baptist missionary, and his converts, who removed from Fernando Po, when the Spanish authorities published an edict forbidding public worship to be celebrated by any but the Roman Catholic clergy. To the south-east of the mountains flows the Cameroons River, where the. Baptist mission has had a station since 1850. The most important tribe is the Duallas, whose language has been reduced to writing within recent years. The ascent of the Cameroons Mountains was first attempted by Mr Merrick in 1847; but it was not till 1861 that the summit was actually gained by Captain Richard Burton and Mr Mann, a botanist. See Burton's Abeokuta~~

~~and the Cameroons Mountains, 1863 ; papers by Mr Mann in the Proceedings of the Linnean Society ; also Zeitschrift d. Gesellschaft fiir Lirdk, zu Berlin, 1874, and Petermann's JILittherl., 1863. CAMILLUS anp CAMILLA, in Roman Antiquity, the title applied to the boys and girls who were occupied in the ceremonies of sacrifice, whether temporarily or as a preparation for their entering the priesthood. In the latter case it was necessary that they should be the children of parents still alive (patrimi et matrimz) and freeborn, The name Camillus has been identified with the Cadmilus or. Casmilus of the Samothracian mysteries, _ ; CAMILLUS, Marcus Furtvus, one of the most illus- trious heroes of the Roman republic. He triumphed four times, was five times dictator, and was honoured with the appellation of Second Founder of Rome. When accused of having unfairly distributed the spoil taken at Veii, he~~

~~'anticipated judgment, and went voluntarily into exile at~~

~~Ardea. But during his exile, instead of rejoicing at the devastation of Rome by the Gauls, he exerted himself to repel the enemy, aud yet kept with the utmost strictness the sacred law of Rome, in refusing to accept the com- mand, which was offered him by several private persons. The Romans, when besieged in the Capitol by the Gauls, created him dictator ; and in this capacity he acted with so much bravery and conduct, that he entirely drove the enemy out of the territories of the commonwealth. He died of the plague in the eighty-first year of his age, 363 B.C. The famous story of Camillus and the schoolmaster belongs to the campaign against the Faliscans in 394, It is said that when Camillus appeared before Falerii, 4 schoolmaster attempted to betray the town by bringing into his camp the sons of some of the principal inhabitants of the place. Camillus, indignant at such baseness, ordered that the traitor should have his hands tied behind him, and be whipped into the town by his own scholars. It is said that the Faliscans were so affected by the. gene rosity of the Roman general that they immediately sut- rendered (Livy; Plutarch). For a critical estimate of the amount of historic truth that lies under the somewhat legendary history of Camillus see Roman History.~~

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~~| ; the national character. ||~~

~~CAMISARDS~~

~~CAMISARDS was the name given to the peasantry of the Cévennes who, from 1702 to 1705 and for some years afterwards, carried on an organized military resistance to the dragonnades, or conversion by torture, death, and con- fiscation of property, by which, in the Huguenot districts of France, the revocation of the Edict of Nantes was attempted to be enforced. Court de Gébelin derives the word from camisade, a night attack (Hist. des troubles des Cévennes, 3 vols. 1760). Louvreleuil, in his Le Fanatisme Renouvelé, 1704, suggests its connection with the camise, or linen shirt, at one time worn by the insurgents as a uniform, and with camzs, a road-runner. The Camisards were also called Barbets (or water-dogs, a term also applied to the Vaudois), Vagabonds, Assemblers (assemblée was the name given to the meeting or conventicle of Huguenots), Fanatics, and the Children of God. They belonged to that romance-speaking people of Gothic descent who took part in the earliest movements towards religious reform. It was in Languedoc that the Peace of God and the Truce of God were formed in the 11th century against the miseries of private war (Rudolph Glaber, iv. 5). There were preserved the forms of municipal freedom which nearly all Europe had lost ; and there commerce flourished without spoiling the thrift, the patience, the simplicity of Not even the voluptuous court of Arles, with its trouvéres, its courts of love, and its extravagant applications of the rules of chivalry, could corrupt the free and honest intelligence of these southern communities. Before the tragedy of the Albigenses began, it was a proverb in Languedoc against the stupid and sensual priesthood, " J'aimerais mieux étre prétre que davoir fait une telle chose." Although the rage of the Crasaders and the cold hate of the Dominicans were**

~~successful in blasting the commercial development of the _ district, they could not wholly eradicate those ideas which,~~

~~whether called Paulician, Catharist, Bulgarian, Hussite, or~~

~~le~~

~~Protestant, really represent religious sincerity and mental freedom. Calvin was warmly welcomed when he preached~~

~~_ at Nimes; Montpellier became the chief centre for the | instruction of the Huguenot youth. But it wasin the great~~

~~triangular plateau of mountain called the Cévennes that, among the small farmers, the cloth and silk weavers, and vine-dressers, Protestantisin was most intense and universal. These people were and still are very poor, but they are intelligent and pious, and they add to the deep fervour of the Provencal character a gravity which is probably the result of their recorded history. From the lists of Huguenots sent from Languedoc to the galleys (1684 to 1762), we gather that the common type of physique is "belle taille, cheveux bruns, visage ovale." The diocese of Meude consists of 173 parishes, and contains the Bas Gévaudan and the Haut Gévaudan. The Haut Gévaudan consists of the Mountains la Marguerite and Aulrac; the Bas Gévaudan embraces the Hautes Cévennes and the Lozére. In the midst of these mountains are three great plains or plateanx, called respectively L'Hépital, L'Hos- 'pitalet, and La Cause, and a forest named Le Faux des Armes, Barley and chestnuts are the chief products of _ Gévaudan. The Basses Cévennes are in the richer diocese of Alais, which has 93 parishes. The chief mountains are Aigoal and Esperon, the latter enclosing a beautiful plateau | named Hort-Dieu (God's Garden). The Vivarais lies in the diocese of Viviers, which has 314 parishes and 3 can- _ tous; Boutitres, Montagne, and Bas-Vivarais. Farther south are the well-cultivated dioceses of Uzes, Nimes (called Little Canaan), and Montpellier, the last of which is con-tected with La Serrafie, the southern branch of the Cévennes. The whole district of the war is thus contained In the modern departments of Lozére, Aveyron, Dréme, Ardéche, Gard, and Hérault. oe**

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~~_ To understand the war of these Camisards requires a glance at the preceding history of France. The system of toleration which was established under the Edict of N antes, 13th April 1598, and the Edict of Grace (Nimes), July 1629, was essentially a political compromise, and not a recognition of the principle of religious equality. The right of having a~~

~~priyate chapel was given to all seigneurs de fief haut justicier, but in the case of a seigneur sans haute justice only thirty persons might attend the service. New public churches were to be authorized at a certain rate in certain places. On the other hand, Calvinists were admitted to all public posts and to all professions ; they could publish books in towns where they had churches. The Chamber of the Edict was formed in the parliament of Paris for the impartial judgment of cases brought by Huguenots ; and the " mi-partie," half-Catholic half-Protes- tant constitution, was adopted in the town-consulates and the local parliaments of the south. After the short-lived struggle between Louis XIII. and the Duc de Rohan, the Huguenots settled down into contented industry; the army and navy of France were led by two Huguenots, Turenne and Duquesne, and Cardinal Bentivoglio wrote to Pope Paul IV. that he no longer found in France " quell' insano fervor di coscienza si radicato primo negli ugonotti." But the court in which Mme. de Maintenon had succeeded to Mme. de Montespan, where Louvois and the Jesuit Pére la Chaise were as supreme as Bossuet and Fléchier in the church, could not long be satisfied with tolerated heresy, which they chose to consider as veiled rebellion. On the death of Mazarin a commissioner had perazabu- lated the kingdom to inquire into the titles, or rather to suppress as many as possible, of the Huguenot churches, schools, and cemeteries. The extirpation of heresy had, in fact, been provided for bya clause in the marriage-contract between Louis and Maria Theresa (1660), aud in spite of the protection of Colbert, a policy was begun of destroying piece-meal the privileges of the dissenters. The chancellor Le Tellier, by a series of arbitrary council edicts, shut against them the public offices and the trade corporations, forbade them to marry with Catholics, and encouraged, almost enforced, the conversion of children who had reached the age of seven. The wholesale briberies of Pélisson, the destruction of churches by Foucault in Montauban, Béarn, and Poitiers, the billeting of soldiers on the unconverted in Languedoc by the intendant Baville, led up the Edict of Revocation (18th October 1685). This edict directed all the churches to be destroyed, forbade religious meetings under pain of imprisonment and confiscation of goods, ordered all ministers or pastors (who would not change their faith) to be banished within fifteen days, and to stop preaching at once under pain of the galleys, promised several exemptions from taxes and increased salaries to converted ministers, sup- pressed all Huguenot schools, and directed all children to be baptized and brought up in the Catholic faith, pro- hibited all~~

Huguenots, except ministers, from going abroad, and declared the property of those who had already gone to be forfeited unless they returned within four months. Such was the formal scheme. In carrying it into effect, Huguenot Bibles, Testaments, Psalters, and books of religious instruction were burned, and Huguenots were forbidden to hire themselves as. artisans or as domestic servants. Torture, hanging, insults worse than death to women, the galleys for life, imprisonment for life in the Tour de la Constance, near Aiguesmortes, were the ordinary occurrences of the next sixty years. Many escaped to Geneva, Lausanne, Amsterdam, and London. It is calculated that 600,000 French Protestants left their country in the twenty years following the revocation, and 400,000 in the twenty years preceding it (Smiles, The

-| Huguenots in France, p. 17). Many suffered a shameful

conversion, but in the Cévennes the inhabitants were too poor to escape, and all over Languedoc began the secret meetings of the Church of the Desert. At last Louvois proposed that this rebellious district should be turned into an actual desert. The intendant Baville and the Duc de Noailles raised an army 40,000 strong, and erected forts at Nimes, St Hippolyte, Alais, and Auduze. The peace of Ryswick (1697) facilitated these operations. The religious hysteria which now descended on the Cévennes has been traced (De U'Junspiration des Camisards, par Hippolyte Blanc, Paris, 1859) to Du Serre, an old Calvinist of Dieu-le-fit, who, in reading Jurieu's well-known book on the Fuljilment of the Prophecies, becaine suddenly inspired to preach and pray, and who about 1689 communi- cated his enthusiasm to the shepherdess La Belle Isabeau, and 500 or 600 other so-called prophets.

In 1700 this sacred fire again broke out in the person of a travelling dressmaker in Ardéche, and spread from the summits of the Lozére to the sea (Peyrat, M/istoire des Pasteurs du Désert, i. 261). A woman (Isabel Vincent) was again the most exalted of the prophets. The Abbé du Chaila, a veteran Catholic missionary from Siam, had been appointed inspector of missions in the Cévennes. There he introduced the " squeezers"" (which resembled the Scotch boot"), and his systematic and refined cruelty at last

~~broke the patience of his victims. His murder, on 23d July 1702, at Pont de Mont Vert, was the first blow in the war. It was planned by Esprit Séguier, the ‘‘ Danton of the Cévennes,” who at once began to carry out his idea of a general massacre of the Catholic priests. He soon fell, and was succeeded by Laporte, an old soldier, who, as his troop increased, assumed the title of the Colonel of the Children of God, and named his camp the “Camp of the Kternal.” He used to lead his followers to the fight, singing Clement Marot’s grand version of the 68th Psalm, ‘‘Q@ue Dieu se montre seulement,” to the music of Goudimal. Besides La Porte, the forest-ranger Castanet, the wool-carders Condere and Mazel, the soldiers Catinat, Joany, and Ravenel were selected as captains,—all men whom the théomanie or prophetic malady had visited. But the most important figures are those of Roland, who afterwards issued the following extraordinary despatch to the inhabitants of St André :—“ Nous, comte et seigneur Roland, généralissime des Protestants de France, nous ordonnons que vous ayez & congédier dans trois jours tous les prétres et missionaires qui sont chez vous, sous peine d’étre brilés tout vifs, vous et eux” (Court, i. p. 219); and Jean Cavalier, the baker’s boy, who, at the age of seven- teen, commanded the southern army of the Camisards, and who, after defeating successively Count de Broglie and three French marshals, Montrevel, Berwick, and Villars, made an honourable peace.)~~

~~Cavalier for nearly three years continued to direct the war. Regular taxes were raised, arsenals were formed in the great limestone caves of the district, ‘the Catholic churches and their decorations were burned, and the clergy driven away. Occasionally routed in regular engagements, the Camisards, through their desperate valour, and the rapidity of their movements in a country without good roads, were constantly successful in skirmishes, night attacks, and ambuscades. A force of 60,000 was now in the field against them; among others, the Irish Brigade which had just returned from the persecutions of the~~

~~1 Cavalier afterwards entered the British army, fought at the battle of Almanza, and died governor of Jersey in 1740. He told Voltaire that the discipline of his troops was maintained by a prophetess, La Grande Marie, who condemned to death all insubordinates. Stécle de Louis AIV., c. 36. See also Memoirs of the Wars of the Cévennes, by Jean Cavalier, London,~~

~~1726 ; and the documents in Jean Cavalier, ou les Fanatiques des Cévennes, Paris, 1840, 4 vols. ;~~

~~CAMISARDS~~

~~Vaudois. Montrevel adopted a policy of exterminatio and 466 villages were burned in the Upper Cévennes alone, the population being for the most part put to the sword, 'The Pope, Clement XI., assisted in this glorious work by issuing a Bull against the "'execrable race of the ancient Albigenses," and promising remission of sing tg the holy militia which was now formed among the Catholig population, and was called the Florentines, Cadets of the Cross, or White Camisards. Villars, the victor of Hochstadt and Friedlingen, saw that conciliation was necessary ; he took advantage of the feeling of horror with which the quiet Protestants of Nimes and other towns now regarded the war, and published an amnesty. In May 1704 a formal meeting between Cavalier and Villars took place at Nimes. 'The result of the interview was that a document entitled 7'rés humble requéte des réformés dy Languedoc au Rot was despatched to the court. The three leading requests for liberty of conscience and the right of assembly outside walled towns, for the liberation of those sentenced to prison or the galleys under the revocation, and for the restitution to the emigrants of their property and civil rights, were all granted,—the first on condition of no churches being built, and the third on condition of an oath of allegiance being taken. The greater part of the Camisard army under Roland, Ravenel, and Joany would not accept the terms which Cavalier had arranged. They insisted that the Edict of Nantes must be restored,—" point de parx, que nous n'ayons nos temples," They continued the war till January 1705, by which time all their leaders were either killed or dispersed.~~

~~In 1709 Mazel and Claris, with the aid of two preaching women, Marie Desubas and Elisabeth Catalon, made a serious effort to rekindle revolt in the Vivarais. In 1711 all opposition and all signs of the Reformed religion had dis- appeared, On 8th March 1715, by medals and a proclama- tion, Louis XIV. announced the entire extinction of heresy, Fourteen years afterwards, in spite of the strictest surveil- lance, aided by military occupation whenever the exigencies ef foreign war permitted, the heroic missionary Antoine Court had organized 126 churches in Languedoc, which~~

~~were attended by 200,000 Protestants, and governed secretly by the old discipline of “ pasteur, anciens, con- sistoire, synode ;” the Society of Help for the Afilicted Faithful (to which George I. subscribed 500 guineasa year) had established their training college at Lausanne ; and during the next thirty years Paul Rabaut, minister ab Nimes, fostered and developed this religion, the child of intolerance. Voltaire’s intervention in the affair of Calas stopped further religious persecution of an extreme kind? but it was not till 1775 that the last galley slaves from Languedoc were liberated, and not till 1789 that, on the motion of Rabaut St Etienne, the son of Paul Rabaut, the National Assembly repealed the penal Jaws against Protestants. The sufferings of the Cévénols on the galleys (‘ Forgats pour la Foi,” as they were called) have been described in the Afémoires de Marteilhe de Bergerac, Rotterdam, 1757 (translated into English by J. Willington, 1758, 2 vols.); in Bion’s Melation des tourments que Von fait soufrir aux Protestants sur les galéres de France, London, 1708; in the Discowrs sur la Providence, by Lows de Marolles, which is translated into English; and in the Histoire de ? Honnéte Criminel, the autobiography of Jean Fabre. M. Athanase Coquerel the younger published m 1866 an Historical Study on the subject.~~

~~2 Voltaire procured the release of several Huguenot galley slaves, among others Chaumont, the shoemakerg, After the treaty of Utrecht Queen Anne persuaded the French Government to free about 146; the total number was about 1500. ;~~

~~ie was an indecisive Edict of Toleration by Louis XVI. m~~

~~1787.~~

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~~What we know of the spiritual manifestations in the Qévennes (which much resembled those of the Swedish Raestars of Smaland in 1844) is chiefly derived from Le _ ‘T[hedtre Sacré des Cévennes, London, 1707, reprinted~~

~~at Paris in 1847; A Cry from the Desert, &c., by John Lacy, London, 1707; La clef des prophéties de M. Marion, London, 1707; Avertissements prophétiques d'Elie Marion, &c., London, 1707. About the date of these publications Marion, Durand Fage, and Cavalier werein London. They tried to propagate their "mystical phalanx" there, but the consistory of the French church in the Savoy pronounced the "ecstasy" to be an assumed and voluntary habit. Voltaire relates (Siecle de Louis XIV., c. 36) that Marion wished to prove his inspiration by attempting to raise a dead body from St Paul's churchyard. He was at last compelled to leave England. The inspiration (of which there were four degrees, avertissement, souffle, prophétie, dons) was sometimes communicated by a kiss at the assembly. 'The patient, who had gone through several fasts three days in length, became pale and fell insensible to the ground. 'Then came violent agitations of the limbs and head, as Voltaire remarks, ' quite according to the ancient custom of all nations, and the rules of madness transmitted from age to age." Finally the patient (who might be a little child, a woman, a half-witted person) began to speak in the good French of the Huguenot Bible words such as these : " Mes fre res, amendez-vous, faites pénitence, la fin du monde approche; le jugement général sera dans trois mois; répentez-vous du grand péché que vous avez commis d'aller 4 la messe; c'est le Saint-Esprit qui parle par ma bouche" (Ifstowre du fanatisme de notre temps, par Brueys, Utrecht, 1737, vol. i. p. 153). The discourse might go on for two hours ; after which the patient could only express himself in his native patois,—a Romance idiom,—and had no recollection of his "ecstasy." All kinds of miracles attended on the Camisards. Lights in the sky guided them to places of safety, voices sang encouragement to them, shots and wounds were often harmless. Those entranced fell from trees without hurting themselves ; they shed tears of blood; and they subsisted without food or speech for ninedays. The supernatural was part of their life. Much literature has been devoted to the discussion of these marvels, The Catholics Fléchier (in his Lettres Choisves) aud Brueys consider them the product of fasting and 'vanity, nourished on apocalyptic literature. The doctors Bertrand (in his Du Magnetisme Animal, Paris, 1826) and Calmeil (in his De la Folie, Paris, 1845) speak of mag- netism, hysteria, and epilepsy, a prophetic monomania based on belief in divine possession. The Protestants Peyrat and Court are content with the phrase " ecstasy," and do not invoke the supernatural. The Catholic Tories, such as M. Hippolyte Blanc, regard the~~

~~whole thing as the work of the devil. Since the publication of Fléchier's work on~~

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~~sider the subject in its true relations.~~

~~Although the Camisards were guilty of great cruelties in the prosecution of the war, there does not seem to be sufficient ground for the charge made by Marshal de Villars: " Le plupart de leurs chefs ont leurs demoiselles " (letter of 9th August 1704, in the War Archives, vol. 1797). There probably were many cases in which a vicious use "was made of the opportunities afforded by war and religious excitement ; but the charges of sexual immorality rest chiefly on the worthless statements of Louvreleuil. The | standard works relating to the Camisards are,—Elie Bénoit, | Historie de UV Edit de Nantes; C. Coquerel, Histoire des Lglises du Desert ; and the work of Court, already men- tioned.~~

~~Among the contemporary relics of this interesting period ought to be noticed Lettre sur (Etat present des Eglises reformées de~~

~~Epidemics of the Middle Ages, it has been possible to con- |.~~

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~~Franec, Au Descrt, Chez Pierre le Sincére. The author proves from the letter of Louis X1V. to the Elector of Brandenburg, 6th September 1666, that the king admitted that the Huguenots were loyal subjects, and had even given remarkable proofs of loyalty. He contrasts the passivity of his friends with the political intrigues of the Polish Socinians, and with the turbulence of the Swiss Ana- baptists. Claude, in his Plainte des Protestans cruellement opprimés dans le Royaume de France, Cologne, Chez Marteau, 1686, gives a vivid picture of the persecution from the beginning. He mentions the "Explications," or official glosses on the edicts, of which the Jesuit Meynier~~

~~was the most prolific author, one of which maintained that the Edict of Nantes (contrary to its express terms) was confined to Huguenots in life at its date ; another, that the phrase Petite Ecole did not include any school in which Latin was taught. He inveighs against the duplicity of the Conseil, who professed sometimes to blame, sometimes to encourage their intendants, and of the king, who in his circulars to the clergy declared (down to the moment of revocation) that he did not wish to interfere with the edicts. Soulier in his History of the Ediets of Pacification, and Nicole in his Protestants convieted of Schism, justified the royal policy from Scrip- ture, history, and reason. Maimbourg in his History of Pope Gregory, and Varillas in his History of Keligious Revolutions in Europe, praise Louis for using only the weapons of charity and per- suasion. Translations of the narratives of John Bion, and of the anonymous friend of the martyr Louis de Marolles, were published together at London in 1712. The latter is dedicated to Heinsius, Pensionary of Holland and West Friesland, who had assisted the refugee Cainisards ; it is preceded by a violent preface, in which the author, an English clergyman, points out how the position of France has altered since the Peace of Ryswick, and urges the English intervention to restore the Edict of Nantes. or the politics of the subject he refers to The Interest of Europe with respect to Peace or War, London, 1712. Bion's narrative contains all the details about the galleys. Zhe Complete History of the Cevennes by a Doetor of the Civil Law, London, 17038, consists of an account of the people and country by an Emglishman who had lately travelled there, and of a separate historical survey, descrip- tion of the edicts, and political argument. The doctor also prints the pretended Manifesto of the Cevennots to the Dauphin, and a form of prayer used in the Camisard Assembly. Zhe Memoirs of Jean Cavalier are written in a very simple and picturesque style. One object he had in writing was to contradict the state- ments of Pére Daniel.' The 7hédtre Sacré des Cevennes consists of the depositions of twelve witnesses (including Marion, Fage, Cavalier, Portales, Dubois) sworn on 6th March and Ist April 1707, before John Edisbury and Sir Richard Holford, both Masters in Chancery. The 7hédtre also contains important extracts from the {works of Bénoit, Brueys, Guiscard, and Boyer, and several original letters from Camisards. The same desire to protect the refugees from the attacks of the French Savoy Church in London, led to the publica- tion of the Mélange de literature historique et critique sur tout ce qui regarde Vétat extraordinaire des Cévennois, London,~~

~~1707 ; and of a full accountof the proceedings in the Consistory and Assembly against Jean Lions, one of the faithful ministers. The former contains excerpts from a Dissertatio de justitia armorum Cebennorum by Ernest Plane, Frankfort, 1704, which speculates about a supposed Camisard medal, turning out afterwards to be a Swedish dollar ; the letters CRS (which the German savant translated Christus Rex Solus) meaning only Carolus Rex Suecia. (W. ©. 8.)~~

~~CAMOENS (or, according to the Portuguese spelling, Camixs), Luiz pg (1524-1579), the son of Sim&o Vaz de Camoens and Ana de 84 e Miranda, was descended in the female line from the Gamas of Algarve, with which family Vasco de Gama claimed kinship ; on the male side also the Camoens were of gentle birth and high social position. Lisbon, Coimbra, Alemquer, and Santarem have claimed to be the cradle of this "prince of poets of his time ;" the balance of evidence, however, is now generally considered to be in favour of Lisbon. Manoel Correia, who was on terms of intimacy with the poet, in his Commentaries on the Lusiad, states: "The author of this book is Luiz de Camoens, Portuguese by nationality, born and bred in the city of Lisbon, of noble and accredited parentage." Correia states in his notes to canto 10 of the Lusiad, that Camoens was more than forty years of age when he wrote it; and, further on, that the canto was written in 1570. The evidence of Faria e Sousa, extracted in 1643 from the registers of the "India House at Lisbon," proves Camoens to have been twenty-five years of age in 1550; and 1524 is now generally accepted as approximately the year of his~~

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~~Alarmed by the shock of an earthquake as early as 1526, the court removed to Coimbra, where it remained until the pestilence, which devastated Lisbon and the border lands of the Tagus, had moderated ; the nobles and "fidalguia" followed the king and court. Simao Vaz de Camoens having house and possessions at Coimbra, would naturally follow the court there with his family ; the more so as his brother Bento had, prior to 1527, taken "the habit in the monastery of Santa Cruz," where he was often visited by the king. Evidently a man of culture, he was chosen, on the reforma- tion of~~

~~the university in 1529, "being then prior of his order," the first chancellor. The popularity of the training at the newly-reformed university drew within its walls most of the sons of the nobility and " fidalguia." Here Camoens was entered as one of "the honourable poor students" in 1537, remaining there until he had completed his eighteenth year. Of his manner of life during the period which inter- vened between his removal to Coimbra and the commence- ment of his university career, something may be gathered from his minor writings, from which it appears that he wandered by Mondego's banks, "careless and unfettered in the free licence of boyhood."~~

~~The position of the poet's uncle, Dom Bento de Camoens, as prior of Santa Cruz, in addition to his status as chan- cellor of the university, naturally suggested the church as a career for Camoens. This seems to have found no favour with him, as he writes, "I felt the pulse of many states of life. The clergy, I see, take stronger hold of life than of the salvation of souls; and the monks, although shrouded in hood and habit, expose some small tokens inconsistent with the profession that he who turns his back upon the world for God should desire nothing that the world can give." Freely and injudiciously expressed at an inoppor- tune moment in the ardour of youth, such home truths would tend to mar his advancement in church or state ; while his honesty, culture, wit, poetic genius, and comely appearance would induce much jealous enmity at a court where he was the idol of the women.~~

~~During his studentship, and possibly at a vacation revel, or when some degree was conferred, the students acted his Amphitrides in imitation of Plautus. The dramatic representations at the university had usually been of the tragedies of Seneca, or of original Latin compositions. This work of Camoens, in popular " redondilhos," and in the vernacular, was considered an attempt to popularize a poetic reaction which satirized the mode in which the grave doctors of the university desired that all instruction should be imparted. In a satire of Resende's, "to Luiz Camoens, reprehending those who, despising the learned, waste their own time with jesters," he indicates Camoens "as a pitiful poet, an unlucky monster, boasting to be a Latin bachelor."~~

~~With reference to the precise period when Camoens removed entirely from his alma mater and became again resident in Lisbon, some speculations~~

~~have been hazarded by his biographers. The one carrying the most weight is cited by the Visconde de Juromenha, who founds it upon the statement made by the poet in his first letter from India : " Because, when I reflect that without sin, which would sentence me to thirteen days of purgatory, I have passed thirteen thousand caused by evil tongues." Upon this Juromenha observes: "These thirteen thousand days are equal to eight years and eight days, and deducting the two years Camoens passed in Ceuta, and the one year of banishment on the upper Tagus, this leaves 1542 as the year of his departure from Coimbra." Thus we find Camoens quitting college to return to the court at Lisbon in his eighteenth year. A French biographer has assumed, with some force, that " Corte" simply means Lisbon, and not the court; for as Camoens was not of the titular nobility,~~

~~he would not be received at court. Contemporary evidence, on the other hand, rather favours the assump- tion that being of the " fidalguia," gentle born, and well cultured, he would be chosen as companion by many of the young nobles who were his fellow-students at Coimbra,~~

~~Gentleness of birth, classical attainments of no mean order, a cultivated intellect, and poetic genius, united to a pleasing personal appearance and witty manner, must have been good passports to the court of John IIL, in which resided at that time the Infante Dom Luiz, a man of considerable attainments and a fair poet ; also the Infanta Donna Maria, patroness of the Belles Lettres, surrounded by a bevy of fair damsels who could compose song, dirge, epigram, and roundelay, or jest with the quick wit of a Beatrice, and who, like her, knew many " merry tales " by heart. Statesmen, such as the Conde de Sortelha and the Conde de Vimioso, courtly poets, and fellow-students of Camoens at Coimbra, both in the full blaze of court favour, would gladly welcome to Lisbon so polished a youth as Camoens must at that time have been. Of this same court of John III. Gil Vicente writes, " It is a seq in which many fished, but found the pastime dangerous," $4 de Miranda also blamed " the economic error of herd- ing together all the young nobility in Lisbon."~~

~~Here, no doubt, Camoens formed acquaintanceships if not friendships, and became quickly initiated into the mysteries of court life and manners.~~

~~Precocious and bom a poet, his facility in every style of versification, a mind stored with romances of chivalry as well as popular fiction, and the poetic lore then available in his own, the Spanish, Italian, and classical idioms, would, added to his youth and sprightly manner, render him popular with the gentler, and unpopular with the sterner sex. Aban- doning in some degree the antiquated forms of composi- tion in vogue, he introduced eclogues, songs, and sonnets, full of tenderness and beauty, after the manner of the Italian school. Montemayor and S4 de Miranda, both Portuguese, residing in Italy, had already adopted and naturalized to some extent the Italian form of pastoral poetry.~~

~~Here we must speak of Camoens's romantic passion for a certain high-born lady of the court. "The sweet unwit ting cause" of so much detriment to his court advance- ment, and, if we are to credit his muse, of anguish to his heart, was a certain Donna Caterina de Ataide in attendance upon the queen of John III. The anagram of Natercia for Caterina clearly indicates the lady's name, in addition to which an acrostic coupling the names of Luiz with Caterina de Ataide, said to be by Camoens, puts the matter beyond all doubt. The tradition is that, ona certain Good Friday, Camoens for the first time en- countered the lady's eyes at her devotions in the Church of the Chagas, Lisbon. That the wound proved deep and permanent there is abundant evidence in his Rimas.~~

~~The lady's father, Dom Antonio de Lima, held the office of chamberlain in the royal household, a certain Pero de Andrade de Caminha serving in a similar capacity the Infante Dom Duarte. Caminha was a poet of fair ability, and was probably jealous of the success of Camoens; in addition to which tradition asserts that Caminha himself, favoured by her father, aspired to the hand, if not the heart, of the Donna Caterina. We may infer that the lady was not ignorant of the effect her eyes wrought upon the author of the ZLusiad; at any rate Caminha was jealous, and revenged himself in weak splenetic rather than satirical verse, while the lady's father employed his interest to mar the poet's prospects.~~

~~The precise cause which Jed to Camoens's banishment from Lisbon is not clear. The principal reason, no doubt, was his passion for the golden-tressed Caterina, but there~~

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~~CAMOENS~~

~~: may have been in addition to this some unintentional con- tempt of the rigid court etiquette which hedged the royalty of that day; for it was the custom that lyric offerings~~

~~_ intended for the ladies of the queen's court should first be submitted to the chamberlain, and then by him transferred to the chief Jady in waiting, who handed the effusion to the queen,—she, in her turn, after perusal, passing the "burning lines of passion" into the hands of the damsel to whom they were addressed. Camoens, doubtless, would essay some safer and more secret mode of conveying his offerings to the lovely Caterina. The dislike of De Lima, and the jealousy of Caminha, aided by the indiscretion and free-lance life of Camoens, may have led to this mark of the royal severity. Whether such or other causes inter- vened, the fact remains that he was banished from the court. The precise locality to which he retired, however, still remains conjectural only. Adding the year of his banishment to the two years he was absent with the army of Africa at Ceuta, where, in a naval engagement with the Moors, a chance splinter destroyed the sight of his right eye, we find him again in Lisbon in 1550.~~

~~During the three years which intervened between Camoens's return from Ceuta and his embarkation for India in 1553, he seems to have led a careless and discredit- able kind of life, consorting with the least reputable court gallants, and a certain dissolute ex-Franciscan friar, who had abandoned the cowl to adopt the réle of a low comedian. Since he inherited the traditions of " fidalguia,"—candid, brave, impetuous, and crossed in love,—much of the free and careless life credited by tradition at this period to~~

~~_Camoens is reasonably accounted for, if it may not be con-~~

~~doned. At this period occurred the fracas which led to his imprisonment and subsequent embarkation for India.~~

~~On the occasion of a grand procession at the festival of Corpus Christi, one of the king's equerries appears to~~

~~have had a dispute with two masquerading companions of~~

~~Camoens. The latter, unhappily intervening to defend~~

~~one of these friends hardly pressed, wounded the equerry~~

~~in the neck, his two friends escaping in the confusion.~~

~~For this Camoens lay some time in prison, and was only~~

~~pardoned upon the understanding that he should embark~~

~~forthwith for India. Juromenha gives the full text of this pardon.~~

~~_ With reference to the poet's departure for India in~~

~~March 1553, the indefatigable Faria e Sousa discovered~~

~~the following entry on the books of the registry of the~~

~~Lisbon India House :—" Fernando Casado, inhabitant of~~

~~| Lisbon, went in his stead Luiz de Camoens, son of Simon~~

~~and Ana de S4." His father did not offer himself as the~~

~~customary surety, while it is seen from a document, dated the 7th of March that year, that he was still alive, and an inhabitant of Lisbon.~~

~~Camoens, in his first letter from India, alludes to his departure from his native city; and as he sailed out of the "golden-sanded Tagus" in the twilight, exclaimed in the bitterness of his heart, using the words of; Scipio \Africanus,—" Ungrateful country, thou shalt not possess my bones !"~~

~~The ship in which he sailed, the "San Bento," parted company with her consorts during a storm, and reached her destination in the same year, while~~

her missing consorts did not anchor at Goa until the following spring. On landing at Goa, Camoens found the Viceroy Noronha pre- |paring an expedition to act against the king of Pimenta, who had invaded the territories of the allies of Portugal. With this expedition sailed Camoens ; and " after chastis- ing the enemy," he says, " with little trouble, we destroyed the people trained to the use of the curved bow, punishing them with death and fire." He returned to Goa early in the following year, 1554.

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The friendly terms upon which Camoens remained with the governor, and probably his disgust at the vice and venality rampant around him, induced him to join the expedition organized with a view to check the depredations of the Moorish rovers on the coast of Arabia. The com- mander, Menezes, received instructions to cruise on that coast where he expected to intercept the galleys sailing from Bassorah. The fleet cleared from Goa early in the year 1555 ; and, after seeking the Moorish galleys in vain, wintered at Ormuz, Returning in the following spring to Goa, Camoens, in cang&éo 10, describes his unpleasant impressions of this voyage: "Here fate's most cruel chances led me; here in this lonely, sterile, sun-scorched land did Fortune will that part of my brief life be passed, and thus in fragments scattered lie throughout the world." Some of Camoens's biographers allude to the governor Barreto as one of his relentless persecutors. Juromenha, however, demurs to this, alleging that two intimate friends of Camoens then at Goa, in the most frank and decided language, laud Barreto as "a liberal obliging comrade, and one ever ready to overlook offences received." That Camoens was unpopular with the venal many, his expression "This land is the mother of great villains and the step- mother of honourable men" leaves little doubt. He canie to uphold the honour of Portugal, and not to intrigue, brawl, and barter his soul for gold. His satirical exposure of the abuses so rife then in the Eastern dominions of Portugal will readily account for his numerous enemies, official and lay. Festivals, banquets, and dramatic representa- tions inaugurated the governorship of Barreto. Camoens's pen was not idle. He wrote a comedy for the occasion, entitled Filodemo. Correia, who describes himself as "companion in the state of India, and a great friend of Camoens,"

~~happily secured either the original MS. or a copy, which is, or was, in the national library at Lisbon. It is entitled, A Comedy made by Luis de Camoens, and represented in India during the governorship of Barreto, and in which the following characters figure, &c.~~

~~Camoens's unpropitious star still dominated his fate. The vices rampant in Goa, the drunkenness, dicing, brawl- ing, and cowardice, were notorious; and during these festivities, which lasted some weeks, were more pro- nounced than ever.~~

~~A certain satire, said to be from the pen of Camoens, passed from hand to hand, entitled A Jest which was made upon some men who did not think ill of wine, feigning that in Goa, at the feasts which were made on the governor's succession, these gallants went to sport with canes bearing devices on their banners, and verses conforming to their designs and inclinations. It is written chiefly in prose, having verses introduced. No names of the "gallants" appear. After introducing a few of these revellers, the author concludes by stating "that several other illustrious personages desired to be admitted to the feasts and sports, and to have an account of their qualifications chronicled ;" but, he observes, "the writing would be infinite, because all the men in India are so distinguished, and therefore let these suffice as examples." This jest, intended to satirize the corruption and immorality of the daily life of the Portuguese in India, caused intense amusement to those who did not recognize their own portraits on the canvas ; while, on the other hand, those who did, or imagined they did, were furious,—so much so, that 'the innocent author remained ready to hang himself."~~

~~The tradition is that this Jest was appended to Camoens's second letter from India, and that the author desired its source should remain unknown ; " because I do not wish that of my little so many should eat." Be that as it may, Camoens was banished from Goa, and this Jest is said to have been the cause. Some of those ridiculed~~

~~were powerful, malignant, and treacherous ; and it is surmised that Barreto was of the number, but it is difficult to imagine that if Barreto intended~~

~~punishment he should have made of this banishment a stepping-stone to a lucrative appointment, which must have been one of con- siderable importance, embracing as it did the custody of the property of absentees, aud of those Portuguese who had died in India. In a letter from Francisco de Souza to John III. the importance of this office is recognized, grave complaints of embezzlement aud misappropriation of the property of deceased merchants and others having reached Lisbon, so that, "early in 1556, a commission was despatched from the mother country to take charge of the effects of deceased subjects," and, in 1557, "full instruc- tions as to the management of this state department followed." Barreto, with a laudable desire to abate these scandals, may well have appointed a bold energetic man, upon whose integrity he could rely, and Camoens was selected.~~

~~During the absence of Camoens from Goa his friend Luiz Franco Correia collected the verses he had scattered amongst his friends, shrewdly observing, " that they who knew not the poetic art failed to estimate its value."~~

~~Apart from the vices and intrigues of Goa, and in the quietude of the Grotto still shown at Macao as the spot where much of the Zusiad was penned, we may imagine halcyon days for the persecuted poet. Here Antonio, the Javanese slave, is first introduced to history,—he who tended Camoens so affectionately and with such solicitude through those latter years of misery and neglect, which were the lot of this unhappy " prince of poets of his time." It is surmised that the first six cantos of the Lusiad were com- posed during Camoens's stay at Macao ; for in the seventh, allusion is made to the shipwreck he suffered on his return to Goa.~~

~~During his absence slanderous tongues were not silent, and we hear of his return to Goa by order of the governor, to make answer to charges brought against him in his capacity as commissary. Wrecked near the mouth of the River Mekong, Camoens and his faithful Javanese escaped only with their lives. Camoens, rescuing nothing but the manuscript of his epic, at length landed at Goa in the last days of Barreto's governorship, and was cast into prison. Here he received the only news which could aggravate his pain—the sad tidings of the death of Donna Caterina de Ataide, the Natercia of his~~

~~impassioned youth. We can estimate the depth and tenderness of his grief touchingly expressed in many of the Rumas.~~

~~The arrival in the autumn of the following year of Dom Constantinho de Braganga as governor to replace Barreto led to the liberation of Camoens, the charges against him having been proved to be unfounded. Under the protection of Dom Constantinho the poet enjoyed some respite from his persecutors. It was during this period of " cultured calm" that he invited several "'versifying friends" to a banquet, where each, on uncovering his plate, discovered, in place of the first course, an appropriate stanza. The surprise gave occasion to considerable mirth and amuse- ment. Three years later Dom Constantinho was replaced by the Conde de Redondo, an early friend and companion of the poet's. Towards the close of 1562 Camoens suffered a@ new reverse. Miguel Rodriguez Coutinho, a rich braggart, nick-named Fios Seccos (dry threads), detained him in custody for a trifling debt. On this occasion Camoens sent a request to the Conde to release him, in epi- grammatic verse, which well revenges Coutinho's meanness, commencing—'" What devil so completely damned but fears the edge of Fios Seccos' sword." Camoens was released, but does not appear to have accompanied the viceroy and his splendid retinue to Zamorin. Being desirous to return~~

~~CAMOENE~~

~~to his native land, a certain Captain Barreto, nephew of the old governor of Goa, charmed with the society of the poet, agreed to carry him to Sofala ; once there he hoped to detain him, and claimed a small sum he was unable to discharge, Here the expedition under Noronha, ex. governor of Goa, found him; and of Camoens's condition Diogo de Couto wrote: "Here we encountered that 'prince of poets of his time,' my fellow-sailor and frieng Luiz de Camoens, so poor that he lived upon his acquaint. ance, who found him necessary clothing and gladly gave him to eat. During that winter he prepared his Lusiag for the press, and wrote much in a book he called the Parnaso of Luiz de Camoens."~~

~~The fleet, including the 'Santa Clara," with Camoens on board, sailed from Sofala in November 1569, and on the 7th April 1570 the good ship cast anchor in the broad waters of the " golden-sanded Tagus."~~

~~After seventeen years of weary exile we may imagine the thrill of joy that warmed the heart of Camoens at the first sight of the headland which bares its base to the wash of the Atlantic, and marks the entrance to the Tagus, "From the round-top of the loftiest mast a sailor shouts, 'The land, the land!' This is my native land so fondly loved, which heaven grant, all perils past, my task accom. plished, these eyes behold once more before their light be dimmed for ever." While others from the far Indies brought rich merchandize and gold, he who had suffered banishments and imprisonments, had encountered tempests and shipwreck, came freighted only with a single manuv- script, on the pages of which were traced in immortal verse the glorious historic deeds of the Portuguese nation, and the touching episode of Ignez de Castro. Here Fortune still continued to persecute Camoens. He and his com- panions were not permitted to land, Lisbon having recently suffered from the effects of a pestilence which had destroyed 50,000 souls.?~~

~~Late in the month of April, the great plague having abated, a procession of our Lady of Health was decreed; and it is supposed that Camoens had already landed and embraced his mother, then "very old and very poor." The Lusiad, being now completed and ready for the press, after much delay and many impediments, was, through the influence of Dom Manoel, ambassador to Castile, presented in manuscript to the young king in the follow- ing year, 1571; the royal permission to print the work was accorded, the Alvard bearing date the 23d September of that year. Later the "censura" of the holy office was obtained, bearing date 12th March 1572. It carries the signature of Father Ferreira, a man of singular ability and evidently liberal views, and is as follows :—"I saw, by order of the Holy Inquisition, these ten cantos of the Lusiad of Luiz de Camoens, relating the valorous deeds in arms of the Portuguese in Asia and Europe, and I did not find in them a single offensive thing, nor aught~~

~~-contrary to the faith and good manners ; only it seemed to~~

~~me necessary to warn the reader that the author, in order to exaggerate the perils of the navigation and entrance into India of the Portuguese, makes use of a fiction of the heathen gods; and although San Agostinho in his Retractagoes corrects the having called the muses god- desses, nevertheless,~~

~~as this is poetry and fiction, and the author does not pretend more than to adorn his poetic style, I have not cousidered it inconvenient this fable of the gods in this work, knowing it for such, and while is always preserved the truth of our Holy Faith, that all the gods of the heathen are devils, and therefore i appeared to me that the book is worthy of being printed,~~

~~1No record has been discovered of the death of Sim%o Vaz, father~~

~~of the poet, but it is conjectured that he died of the plague during the autumn of 1569.~~

~~and the author displays in it much talent and erudition in the human sciences." The Lisbon upon which Camoens turned his back in 1553 had sadly changed ; the times were out of joint. A dreadful pestilence had decimated the population ; the intrigues inseparable from a regency, and a young king, the sport of youthful favourites, ruled by the Jesuits, brave and impetuous, already meditating the luckless expedition to Africa, overshadowed both court and kingdom. Remarking this, in his address to the young king Camoens wrote,—"'The humility of the anchorite should not be the only virtue of your ministers."~~

~~At length the epic, dreamed of at Coimbra, commenced in banishment, continued at Ceuta, resumed at Goa and Macao, revised at Mozambique and Sofala, and perfected in a humble room in the Rua de Santa Ana, Lisbon, was issued from the press of Antonio Go¢alvez.~~

~~The first edition of the LZusiad bears date Lisbon, 1572. Its success was immense, and the despair and malice of the mediocre poets of the court intense. A second edition was issued from the press of Gdgalvez in the same year.~~

~~Isolated amid this literary strife, Camoens lived retired, and was very poor. He lived in the knowledge of many, and in the companionship of few, inhabiting an apartment in a house adjoining the convent Santa Ana, at the bottom of asmall street which led to the-college of the Jesuits, where the sole consolation of his later years was his intimacy with some of the fathers. By the death of the Princess Donna Maria, who expired in 1578, Camoens~~

~~lost the last of his protectors, and was reduced to extreme poverty; then came the heaviest blow of all, the death of his faithful Javanese Antonio.~~

~~Early in the year 1578, after the grand ceremony of the Benediction of the Standards, Dom Sebastiao, the boy king, departed on his ill-starred expedition to Africa,— Bernardes, a court poet and a courtier, being selected in preference to Camoens to accompany the expedition and sing its triumphs. In August occurred the fatal rout of Aleazar-quivir, and the death of the young king, after which, according to the testimony of Bernardo Rodriguez, "Camoens went as one dreaming."~~

~~Three months prior to the poet's death, Benito Caldera's Castilian version of the Zusiad was printed at Alcalé de Henares, and we may reasonably infer that Camoens saw a copy."~~

~~The disaster of Alcazar-quivir shook Portuguese nation- ality to its base. In the last letter Camoens penned he alludes to this event. "I have so loved my country that not only do I deem myself happy to die in her bosom but happy to die with her.~~

~~The sad sickness unto death came at last, on the 18th of June, 1579. Ina small, cheerless room of a shabby house in the Rua de Santa Ana (No. 52 or 54) Luiz de Camoens died, and he was buried in the neighbouring convent of Santa Ana. On the fly-leaf of a copy of the first edition of the Zusiad (said to be in the library of Holland House), and in the handwriting of Fray José Indio, a Carmelite monk of Guadalajara, is found the following statement :—~~

~~"'What thing more grievous than to see so great genius lacking success! I saw him die in a hospitalin Lisbon, without a sheet to _ cover him, after having triumphed in the Indies, and having sailed five thousand five hundred leagues by sea. What warning so great~~

~~for those, who, by night and day, weary themselves in study without profit, like the spider weaving a web to catch small flies."~~

~~) Some picturesque and touching, but probably apocryphal~~

~~narratives are chronicled by Camoens's biographers. One tells of the faithful Javanese Antonio sallying forth at even- tide to beg from passers-by the means to procure a modest meal for himself and his master ; another, of Barbara, a mul- atto woman, who, from the scanty store upon her stall and the still seantier treasury of her pocket, spared a daily ration and~~

~~'right eye.~~

~~an occasional silver coin in pity for one she might have known prosperous at Macao ; anda third of a " fidalgo," named Ruy Diaz de Camara, who came to his poor dwelling to complain of the non-fulfilment of a promise of a translation of the penitential psalms, and to whom Camoens replied—' When I wrote verses I was young, had ample food, was a lover, and beloved by many friends and by the ladies ; therefore, I felt poetic ardour. Now I have no spirit, no peace of mind ; behold there my Javanese who usks me for two coins to purchase fuel, and I have none to give him." On his deathbed he is said to have exclaimed, '' Who ever heard that on so small a stage as a poor bed, Fortune should care to represent so great misfortune, and I, as if such were not sufficient, place myself on her side, because to dare to resist such ills would appear effrontery."~~

~~Camoens was spared the pain and humiliation of seeing a Castilian king upon the throne of Portugal. It is, however, related of Philip IT. that, soon after his occupa- tion of Lisbon, he inquired for Camoens, and finding him already dead, gave (as documentary evidence shows) instructions that a pension be granted to the poet's mother, still " very old and very poor." She survived the poet some years.~~

~~Of Camoens's personal appearance Manoel Severim de Faria, one of his biographers, writes thus: "He was of middle stature, his face full, and his countenance slightly lowering ; his nose long, raised in the middle, and large at the end. He was much disfigured by the loss of his Whilst young his hair (like Tasso's) was so yellow as to resemble saffron. Although his appearance was not perhaps prepossessing, his manners and conversa- tion~~

~~were pleasing and cheerful. He was afterwards a prey to melancholy, was never married, and left no child." Ona marble slab fixed in the wall of the church of Santa Ana, Dom Gongalo de Coutinho had an inscription placed; but as both church and inscription perished in the earthquake of 1755, there is some doubt as to its precise wording, and whether "he lived poor and neglected and so died" formed part of it or not.~~

~~Amid many tributes to Camoens's memory, those of Manoel de Sousa, Diogo Bernardes, Tasso, and Lope-de- Vega are well known. The last alludes to him as " the divine Camoens," and adds, "Strange fortune that to so much wit and learning gave a life of poverty and a rich sepulchre."~~

~~A Spanish biographer of Cervantes has shown " that the most remarkable coincidence of fortune may be traced in the events which marked the lives of Camoens and the author of Don Quixote."~~

~~Estimating the popularity of Camoens great epic Os Lusiadas by the number of editions printed in Portugal, it was without ques- tion considerable, no less than thirty-eight having been published at Lisbon prior to the year 1700, and in addition four in Spain, —three in Castilian and one in Portuguese. There exist translations in English, French, German, Italian, Dutch, Polish, Bohemian, Danish, Swedish, Russian, Latin, Greek, and even Hebrew. The earliest in English is by Sir Richard Fanshaw (London, 1655), and was com- posed during his banishment at Tankersley Park, Yorkshire, in 1652. Had he lived to prepare a second edition, many errors and imperfec- tions arising from an incomplete knowledge of the Portuguese idiom would, no doubt, have been rectified. He was appointed ambassador to Portugal in 1661, where he remained three years, being then transferred to Madrid, where he died in 1666. Mickle's Lusiad was first published in 1776, and hardly merits Southey's condemnation (he preferring that of Fanshaw) of ''most unfaithful." It is fairly close in places, but much of the force of the original is sacrificed for the sake of smooth versification. Another translation by Musgrave in blank verse appeared in 1826, the latter cantos of which are closer and more effective than the earlier. A version of the first five cantos by Quillinan followed in 1853, rendered with considerable grace and with greater accuracy than Mickle's. In 1854 appeared a version by Sir Thomas Mitchell.~~

~~In estimating the genius of Camoens, it must be remembered that ‘‘we build with ready materials, but he dug the quarry, rough-~~

~~hewing and polishing with his own hands the material for his edifice.” He strengthened and polished the Portuguese language, and his influence preserved it from destruction as an idiom during the Spanish occupation, when the language of the court was Cas- tilian. ‘The circumstances under which his great epic was penned~~

~~were peculiarly unfavourable to the production and elaboration of~~

~~such a work; still he triumphed over every difficulty, and produced the epic master-piece of hisage. Theophilo Braga, his latest Portu- guese biographer, observes, ‘‘In Camoens we find exemplified that tradition which insures moral unity to a people, and is the bond which constitutes their nationality, asin the Homeric poems are centered the Hellenic traditions. This same spirit animated Camoens, for in Os Lusiadas are gathered together many beautiful and excit- ing traditions of Portuguese history.” Extended and elaborate notices of the Lusiad will be found in Adamson, Mickle, and Bou- terwek.~~

~~Of Camoens’s minor works, or Rimas, a fulland exhaustive notice will be found in Memoirs of the Life and Writings of Luis de Camoens, by John Adamson, London, 1820; two exquisite trifles (the originals in Spanish) will be found in Ticknor’s History of Spanish Literature. Lord Strangford, Adamson, Hayley, and Southey have eachtranslated striking examples of the Rimas. (F. W. CO.)~~

~~CAMP, Roman. While the Greeks, depending more upon the advantages of situation, adapted the form of their encampment to the nature of the ground selected, the Romans laid out theirs according toa fixed and definite plan, modified only by the numbers for whom accommoda- tion had to be provided. Its form and arrangement in the~~

~~best days of the republic are minutely and clearly described by Polybius, the companion in many wars of the younger Scipio.~~

~~- Porta Pretoria B~~

~~Intervallum~~

~~Porta Principalis Dextra Porta Principalis Sinistra~~

~~Intervallum~~

~~Intervallum eT-FE~~

~~OT STSTsityy]~~

~~Intervallum~~

~~Porta Decumana~~

~~Plan of a Roman Camp.~~

~~A Roman camp of the Polybian type was intended primarily to accommodate a consular army, consisting of two legions, each of 4200 infantry and 300 cavalry, with the ordinary contingent of "socii," amounting in all to 16,800 foot and 1800 horse ; and for this purpose it was pitched in the form of a square, each side of which extended 2017 Roman feet in length. This square was divided into two unequal portions by a perfectly straight road called the " principia," 100 feet in breadth, running parallel with the front and rear of the camp, and forming at its ex- tremities in the sides AC and BD of the camp two gates, the "' porta principalis dextra" and the " porta principalis sinistra." In what may be called the upper and smaller portion, determining the arrangement of the rest of the camp, stood the " preetorium" (P), or general's tent, so situated as to have a commanding view in all directions. 100 feet of clear ground on every side left the " preetorium "~~

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~~in the centre of a square, whose sides, each 200 feet in length, were carefully traced parallel to the sides of the camp. To the right and left of the "pretorium," at F and @, were the "forum," or market-place, and the * questorium, " or paymaster's tent. Further to the right and left, at (p, ¢), (p',~~

~~7’), (7, 8), (7,’ 8’), were stationed the cavalry and infantry that formed the bodyguard of the consul and questor. Fifty feet in front of the “ praetorium,” along the line forming the upper boundary of the “ principia,” were the tents of the twelve tribunes of the legions, six to the right and six to the left of the “ pretorium,” opposite their respective legions. In the prolongation of the same line were probably stationed the “ preefecti sociorum.” Passing from the upper to the lower division, or to what was called the front of the camp, we cross the “ principia,” the great thoroughfare of the army, where the standards of the legion were placed round the altars of the gods. This part of the camp, 7.e., between the “¢ principia” and the side CD, was allotted to the main body of the army. It was intersected transversely in the middle by a street 50 feet broad, the “via quintana,” as well ag longitudinally by what were called the “vise” or streets of the camp. Each of the latter was also 50 feet in breadth, and the central “via” formed the boundary between the two legions, which were placed symmetrically to the right and left on each side. The “‘equites,” “ triarii,” “ principes,” and “hastati” of the legion were stationed in the spaces numbered (1, 1’), (2, 2’), (3, 3’), (4, 4’),—each of the spaces devoted to the cavalry containing, within an area of 10,000 square feet, one squadron of thirty men and horses, while in the same area there were quartered of the “ principes” and “hastati” two “maniples” or divisions of sixty men each. Each of the spaces where the “ triarii” were stationed was only half this area, and devoted to one “‘maniple” of sixty men. Spaces (5, 5’), (6, 6’) were assigned to the cavalry and infantry of the allies, of whom, however, a part was quartered in the upper camp. The “velites” (light-armed troops) were probably distributed proportionally among the three divisions of the infantry. Between the tents and outer wall of the camp there was an ‘“intervallum” all round, 200 feet broad, by which ample room was given for the passage of the legions in and out, and which also served as a receptacle for booty, as well as to increase the distance of the troops from the enemy. The camp was provided with four gates—(1) “porta principalis dextra,” and (2) “ porta principalis sinistra,” at the extremities of the “ principia ;” (3), “‘ porta preetoria,” on the side nearest the “ preetorium,” and in the very centre of that side ; (4), “ porta decumana,” in the centre of the side opposite. The fortifications con- sisted of a fosse or ditch (fossa), 9 feet deep and 12 feet wide, the earth from which, as it was dug out, being thrown to the inside, formed, with the~~

~~addition of turf and stone, a mound (agger), on the summit of which were fixed stout wooden stakes (szwdes).~~

~~Such was the general outline of the Polybian camp ; but when, under the emperors, changes were made in the con- stitution of the army, and organization by cohorts was introduced, the form and disposition of a Roman camp underwent modifications that resulted in what has been called the Hyginian camp, from Hyginus, a land surveyor who flourished under Trajan and Hadrian, and who has given an account of its arrangement in his day. The principal points of contrast with the Polybian camp were, that the form was now oblong and did not occupy half so much space, that the troops were stationed in cohorts round the rampart so as to enclose the whole body of foreigners and baggage, and that the fortification was much less substantial.~~

~~The ordinary entrenchments thrown up from day to day by a Roman army while on the march were but slight;~~

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~~put, where it was necessary or expedient to remain together for some time, or where it was likely they might reoccupy the same ground, a more permanent camp, with a propor- tionably stronger rampart, was formed. Such an encamp- ment was called " castra stativa," or a stationary camp. This, again, was distinguished as " castra estiva," a per- manent summer camp, and " castra hiberna," a permanent winter camp. Such were the camps that, in process of time, becoming surrounded by a numerous population, formed the nucleus of large towns, many of which may be recognized in England by the name-termination "chester" or " cester."~~

~~CAMPAGNA, a town of Italy, in the province of Principato Citeriore, 19 miles east of Salerno. It stands in the centre of a mountainous district, of which it is the capital. It is the see of a bishop, and contains a cathedral and college, besides several churches and convents. Popu- lation, 9813.~~

~~CAMPAGNA DI ROMA, is, in the wider application of the word, an extensive plain of central Italy, almost coinciding with the ancient Latium, and, in a more restricted signification, that portion of the larger area which lies immediately round the city of Rome between the Tiber and the Anio. The circumference of the latter "might be marked," says Gregorovius, "by a series of well-known points,—Civita Vecchia, Tolfa, Ronciglione, Soracte, Tivoli, Palestrina, Albano, and Ostia ;" while the former may be regarded as bounded on the N. by the Mountains of Viterbo (Sylva Ciminia), on the E. by the lower ranges of the Apennines, and on the S. and W. by the Tyrrhenian Sea. It extends about 84 miles in length from Civita Vecchia to Terracina, and has a breadth of 24 miles,—its area being nearly 1400 square miles. Of distinctly volcanic formation, the surface presents a very undulating appearance, broken by deep gullies and studded with extinct craters, that now form the basins of lakes, such as those of Bolsena, Vico, and Baccano. In ancient times it seems to have been a well-peopled region, and was the seat of numerous cities; but in the 3d and 4th centuries B.¢. the Roman aristocracy turned the most of the district into huge estates, and thus~~

~~led to the disappearance of the agricultural population. In the earlier period of the em- pire its condition grew worse and worse, and many parts of the plain became covered with pestilential marshes. The emperors Claudius, Nerva, and Trajan turned their atten- tion to the amelioration of the district, and under their example and exhortation the Roman aristocracy erected numerous villas within its boundaries, and used them at least for summer residence. With the ruin of the empire and the inroad of the barbarian hordes the desolation of the Campagna was complete; but, again, in the Middle Ages, it became dotted over with the baronial castles of the rival families of Kome—the Orsini, the Colonnas, the Savelli, the Conti, and the Caetani—who ruthlessly destroyed the remains of earlier edifices to obtain materials for their own. Several of the popes, as Boniface IX., Sixtus IV., and Julius III., made unsuccessful attempts to improve the sanitary condition of the Campagna; and equally fruitless in more recent times—as far, at least, as the general purpose is concerned—have been the efforts of Popes Pius VI. and VII., and of General Miollis, the French _ governor of Rome. The most healthy portions of the territory are in the north and east, embracing the slopes of the Apennines which are watered by the Teverone and Saccho ; and the most pestilential is the stretch between the Lepini Hills and the sea. The Pontine marshes, in- cluded in the latter division, were drained, according to the plan of Bolognini, by Pius VI.; but though they have been restored to cultivation, their insalubrity is still notorious. The soi] in many parts is very fertile ;~~

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~~and the atmosphere, which is so deadly to man, has no hurtful effect on the lower animals. In summer, indeed, the vast expanse is little better than an arid steppe; but in the winter it furnishes abundant pasture to flocks of sheep and herds of silver-grey oxen and shaggy black horses. The land is for the most part let by the pro- prietors to Mercanti di Campagna, who employ a sub- ordinate class of factors (fattor?) to manage their affairs on the spot. It is evident that the malaria which renders the Campagna almost uninhabitable, during the summer is owing to natural causes affecting a wide area with which it is very difficult to deal, and that no merely local improve- ments can have any effect. The regulation of the rivers is so defective that they annually overflow a great extent of surface; the character~~

~~of the soil allows the waters to gather in fetid masses, and the heat of summer turns them into noxious vapours. The attention of the Italian Govern- ment and of General Garibaldi has recently been turned towards the systematic sanitary improvement of the district, —with what results remains to be seen. The planting of the Hucalyptus globulus and the Helianthus annuus has been partially resorted to, especially in the district of Tre Fontani, and, it is reported, with some success.~~

~~Full details on the Campagna will be found in Westphal, Die Rémische Campagna, 1829 ; Didier, La Campagne de Rome, 1842 ; Adolph Stahr, Hin Winter in Rom, 1847-50; Paolo Mantovani, Descrizione geologica della Campagna Romana, Turin, 1875; Dr Pietro Balestra, L'Igiene nella Campagna e citta di Roma, 1875; Augustus Hare, Days near Rome, 1875. See also an article by Fr. Siebmann in Ausland for August 1875, and another by Fr. von Hellwald in the following number.~~

~~CAMPAN, Jeanne Lovise Henriette (1752-1822), née GENEST, was born at Paris in 1752. Carefully educated, and surrounded by the most cultivated society, at the age of fifteen she had gained so high a reputation for her accomplishments as to be appointed reader to the young princesses. At court she was a general favourite, and when she bestowed her hand upon M. Campan, son of the secretary of the royal cabinet, the king gave her an annuity of 5000 livres as dowry. She was soon after appointed first lady of the bedchamber by Marie Antoinette ; and she continued to be the faithful attendant of that princess till she was forcibly separated from her at the sacking of the Tuileries, on 20th June 1792. After this event Mme. Campan, almost penniless, and thrown on her own resources by the illness of her husband, bravely determined to support herself by establishing a school at Saint-Germain. The institution prospered, and was patronized by Mme. Beauharnais, whose influence led to the appointment of Mme. Campan as superintendent of the academy founded by Napoleon at Ecouen, for the educa- tion of the daughters and sisters of members of the Legion of Honour. This post she held till it was abolished at the restoration of the Bourbons, when she retired to Mantes, where she spent the rest of her life amid the kind attentions of affectionate friends, but saddened by the loss of her only son, and by the calumnies circulated on account of her con- nection with the Bonapartes. She died in 1822, leaving interesting~~

~~Alémoires sur la we privée de Marie Antoinette, suivis de souvenirs et anecdotes historiques sur les régnes de Louis XIV.XV. (Paris, 1823); a treatise De ’Hdu cation des Femmes ; and one or two small didactic works, written in a clear and natural style.~~

~~CAMPANELLA, Tomaso (1568-1639), one of the most brilliant and unfortunate of the Italian Renaissance philosophers, was born at Stilo in Calabria in 1568. At a very early age he showed remarkable mental power ; his memory was uncommonly tenacious, and before he was thirteen years of age he had mastered nearly all the Latin authors presented to him. In his fifteenth year he entered the order of the Dominicans, attracted partly by reading~~

~~To2 the lives of Albertus Magnus and Aquinas, partly by his intense love of learning. He was placed at first in the convent at Morgentia in Abruzzo, and after completing his course of philosophy was transferred to Cosenza, there to study theology. He soon became discontented with his teachers, for he earnestly desired to read, not only the works of Aristotle, but the book of nature, which was the language of God. An accident drew his attention to the work De Rerum Natura of Telesius, which he read with great eagerness. He was delighted with its freedom of speech and its appeal to nature rather than to authority. His first work in philosophy, for he was already the author of numerous poems, was a defence of Telesius against the attacks of Marta, an Aristotelian. It was styled Philo- sophia sensibus demonstrata, and appeared in 1591. freedom and boldness of his attacks upon established authority soon brought him into disfavour with the clergy. He left Naples, where he had been residing, and proceeded to Rome. For seven years he led an unsettled life, wandering through Padua, Bologna, Venice and other towns, everywhere attracting attention by the brilliancy of his talents and the boldness of his teaching. Yet Campanella was strictly orthodox, held the established faith, and was an uncompromising advocate of the Pope’s temporal power.~~

~~He returned to Stilo in 1598. In the following year he was arrested and committed to prison. What was the immediate cause of this is not clearly known. According to the most common report the motives for his imprison- ment were entirely political. He had joined himself to those who desired to~~

~~free Naples from Spanish tyranny, and had excited them by his fiery eloquence and independ- ence of spirit. His friend Naudée, however, declares that this was a complete mistake, and that the expressions used by Campanella, which were interpreted as revolu- tionary, had quite a different reference and signification. Whether froin error or not, the unfortunate philosopher was committed to prison, and remained there for twenty-seven years, suffering much torture and misery. Yet his spirit was unbroken ; he composed sonnets, and prepared a series of works, forming a complete system of philosophy, which were published at a later date. During the latter years of his long confinement he was kept in the castle of St Elmo, and was allowed considerable liberty. There seem, indeed, to have been great doubts even in the minds of those who imprisoned him whether he had done anything deserving such a punishment. Still he was looked upon as dangerous, and it was thought better to restrain his boldness. At last, in 1626, he was set at liberty. For some three years he was confined in the chambers of the Inquisition, but in 1629 he was fairly free. He was well treated at Rome by the Pope, but he made enemies; and, profiting by the lessons of experience, he thought it well to avoid future danger by taking flight from Rome. He came to Paris in 1634 under the protection of the French ambassador to Italy, and was received with marked favour by Cardinal Richelieu. The last few years of his life he spent in preparing a complete edition of his works; but only the tirst volume appears to have been published. He died on the 26th of May 1639.~~

~~The philosophy of Campanella is in many respects inte- resting and important, but it has much that is fantastic, and is wanting in unity and completeness. With Telesius he agreed in rejecting the Aristotelian method of inference.~~

~~According to him truth or certainty is only to be found in:~~

~~immediate intuition. The sciences are not to be con- structed from definitions by deduction, but proceed by induction to definition, which in the natural order comes last. The syllogism is only useful for expounding; the universal rule which it involves is always a result of~~

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~~induction, and the particular subsumed under it is itself part of the induction. Our knowledge begins in doubt, We know neither the past nor the future; even in the present we only know things as they appear to be, not as they are. The first proposition in a theory of cognition is that I myself think; the certainty of self-consciousness is the primary truth.~~

~~With all this freedom of philosophizing Campanella pre- served a completely orthodox respect for revealed religion ; he aimed indeed at a system which should embrace in one comprehensive scheme religious and philosophical prin. ciples. His view of God is not far removed from that of Bruno; he lays stress upon the divine unity and omnipre- sence, and as he is convinced that community of action is only possible where there is identity of being, he is driven to an apparently pantheistic conclusion. God is the ultimate unit; His three manifestations may be called power, wisdom, and love. He alone has pure being; all other things created by or emanating from Him are limited, i.e, have non-being. All things are of the same nature, otherwise there could be no mutual action; there is a universally diffused life and sensibility.~~

~~In his natural philosophy Campanella mainly follows Telesius, and lays duwn as fundamental forces heat and cold, in their concrete form, sun and earth. By these all thingsare formed. The soul of man is in nature corporeal, but is immortal, being endowed with a striving after happiness never attained in this life.~~

~~In practical philosophy Campanella was an extreme reformer. In his Czztas Solis he sketches an ideal state, in which principles of communism are fully carried out, He contends for a community of goods and wives, for state control of population, and for a universal military training. The king in his ideal state is called Hoh, z.e., Metaphysics; his ministers have names meaning respectively Power, Wisdom, and Might. The whole work is cold and abstract, utterly wanting in the rich practical detail of its prototype, the Utopia.~~

~~A long list of Campanella's works is given by Echard, App. to Cypriano, Vita Campanelle, who enumerates eighty-two, and by Campanella himself in the first vol. of his collected works. The niost important were De Sensu Rerum, 1620; Realis Philosophie Lpilogistice Partes IV. (containing Civitas Solis), 1623; Atheismus Triwmphatus, 1631; Philosophia Rationalis, 1637; Philosophia Universalis seu Metaphysica, 1638; De Monarchia Hispanica, 1640, translated into English.~~

~~See on his life Cypriano, Vita Campanellew, 1705, 1722; Bal- dacchini, Vita et Filosofia di Tomaso Campanella, 1840. On his philosophy, see Ritter, Ges. d. Phil. vol. ix., who gives a very full account ; Carriere, Phil. Weltanschawung der Reformationszeit, 522-608 ; Dareste, Th. Morus et Campanella, 1843. Some of the works have been translated into French, @uvres echoisies de Oam-~~

~~panella, par Mme. L. Collet, 1844; Cvté dw soleil, par Villegar- delle, 1840.~~

~~CAMPANTA, an ancient province of Italy, separated from Latium on the N. by the Massican Hills, and from Samnium on the E. by the Apennines, and bounded on the W. by the Tyrrhenian Sea, and on the S. by Lucania. It was distinguished by its fertility, beauty, and genial climate, and by the excellence of its harbours. It consists of a plain, broken only by a low volcanic range of hills, of which the chief is Mons Gaurus, and by Mount Vesuvius. The original inhabitants of Campania were Oscans oF Ausonians, The first settlers were the Greeks who founded Cume, and afterwards Dicearchia, Palzepolis, and Neapolis. It seems pretty certain that the next invaders were the Etruscans, and that they founded Capua and Nola. The Etruscans in turn had to give place to the Samnites. But both these invaders were few in number; and the Campanian people continued to be of essentially Oscan race. The remains of their language are, indeed, our best specimen of Oscan. In the 4th century 3.c. war broke out with the Romans, and in 340 3.c., by the battle of~~

~~Vesuvius, Campania fell into their hands. For subsequent history see Roman History. The Bay of Naples was one of the favourite situations for the villas of the ancient Romans; and, notwithstanding the eruption of Vesuvius in 79 A.D., which buried the cities of Herculaneum and Pompeii, Campania continued to flourish. The chief towns were Capua, Cumze, Neapolis, Nola, Pompeii, Herculaneum, Vulturnum, Puteoli, Liternum, Teanum, Salernum, Suessa, Misenum, Surrentum, Picentia. The province was tra- versed by several roads—the Via Appia, the Via Latina, part of the high road from Rome to Rhegium, and a road constructed by Domitian along the coast from Sinuessa to Neapolis. Under Augustus, Campania was joined to Latium to form the First Region of Italy. Its name then gradually superseded that of Latium; so that at present the district round Rome is known as the Campagna di Roma.~~

~~CAMPANI-ALIMEN'S, Marrero, an Italian mechanician and natural philosopher of the 17th century, was born at Spoleto. He held a curacy at Rome in 1661, but devoted himself principally to scientific pursuits. As an optician, he is chiefly celebrated for the manufacture of the large object-glasses with which Cassini discovered two of Saturn's satellites, and for an attempt to rectify chromatic aberration by using a triple eye-glass ; and in clock-making, for his~~

~~' invention of the illuminated dial-plate, and that of noiseless~~

~~clocks, as wellas for an attempt to correct the irregularities of the pendulum which arise from variations of temperature. Campani published in 1678 a work on horology, and on the manufacture of lenses for telescopes. His younger brother Giuseppe was also an ingenious optician (indeed the attempt to correct chromatic aberration has been ascribed to him instead of to Matteo), and is, besides, noteworthy as an astronomer, especially for his discovery, by the aid of a telescope of his own construction, of the spots in Jupiter, the credit of which was, however, also claimed by Divini. CAMPANILE, the bell tower attached to the churches and town-hall in Italy. Bells are supposed to have keen first used for announcing the sacred offices by Pope Sabinian (604), the immediate successor to St Gregory ; and their use by the municipalities came with the rights granted by kings and emperors to the citizens to enclose their towns with fortifications, and~~

~~assemble at the sound of a great bell. It is to the Lombard architects of the north of Italy that we are indebted for the introduction , and development of the campanile, which, when used in connection with a sacred building, is a feature peculiar. to~~

~~| Christian architecture,—Christians alone making use of~~

~~the bell to gather the multitude to public worship. The campanile of Italy serves the same purpose as the tower~~

~~_ or steeple of the churches in the north and west of Europe,~~

~~but differs from it in des'gn"and position with regard to the body of the church. In the north and west the tower forms an integral part of the building; it is frequently | placed at the west end or at the south or north side of the~~

~~| nave, in which case the ground story forms a porch to the church ; sometimes it is at the intersection of the nave and~~

~~transepts, in which case it rises as a grand central feature round which everything else groups, as seen at Salisbury, Lincoln, Norwich, &c. In Italy the campanile is almost always detached from the church, or at most connected with it by an arcaded passage. In Italy there are (with one or two exceptions, such as San Ambrosio, Milan, and at Novara) never more than one campanile to a church, whereas in the north and west the number varies from one to seven.~~

~~The design of the campanile differs entirely from its northern type. It never has buttresses, is very tall and thin in proportion to its height, and is square on plan, occasionally round, as at Ravenna and Pisa, and in one~~

~~or two cases, as at San Gottardo, Milan, octagonal. The campanile generally rises from base to summit without break; the faces are divided vertically by flat pilasters, and horizontally by string-courses, arcades, or windows. As a rule the openings increase in number with the height of the stage. Many, perhaps the finest examples, have openings at the top only.~~

~~The chief architectural defect of the square campanile is the covering. This is generally a short conical roof, either square, circular, or octagonal on plan; but its junction with the tower was never successfully managed. The campanili in the north of Italy and in Rome are nearly all built of brick. In Tuscany, as at Pisa and Siena, and further south, as at Viterbo, they are veneered with marble of various colours.~~

~~The tallest campanile is the one at Cremona; it rises to a height of 396 feet. Probably the grandest and richest is that designed by Giotto in 1334 for the cathedral at Florence. It measures 275 feet high and 45 feet square ; it is entirely veneered with black, red, and white marble, and is divided into five stages, the upper three only having windows. Giotto intended to have finished it with a spire 90 feet high, but Taddio Gaddi, who succeeded Giotto as architect, thinking that the tower would not be improved by it, left it as it now exists. Some of the best examples of church campanili are to be found in Venice, Verona, Modena, Cremona, Parma, and Pisa,~~

~~The campanili belonging to the municipalities have generally a distinct character from those attached to sacred edifices ; they have a smaller section on plan in proportion to the height. They want the conical roof, and are generally battlemented ; some have an upper and smaller stage, wherein the bells are hung, as at Florence, Siena, Volterra, and Montepulciano. Their faces are rarely divided by pilasters ; there are few windows, generally smal} openings only to light the staircase; and they are more frequently incorporated with the body of the build- ing than the church campanili, often rising from the wal] heads and not from the ground to great heights. The most remarkable campanili are those at Venice, Florence, Pisa, and Siena. The campanile of St Mark's at Venice stands in the great square in front of the cathedral. Its erection was commenced about the beginning of the 10th, and completed up to the belfry about the middle of the 12th century. The belfry was erected and finished by Bartolomeo Buono in 1517. From the level of the piazza to the belfry stage, it is constructed of brick; the belfry and surmounting pyramid are of marble. The total height is 323 feet, aud it is 42 feet square at the base. The gallery at top is reached by an inclined plane, and there are no windows other than small openings lighting the ascent.~~

~~The leaning' tower or campanile of Pisa, built by the citizens to rival that of Venice, was erected by Bonanno, and begun in the year 1174. It is circular on plan, and about 51 feet in diameter and 172 feet high. Not includ- ing the belfry it is divided vertically into seven stages, all of which, with the exception of the lowest, are decorated with an open arcade, The conical covering of the belfry was never constructed. This tower overhangs its base upwards of 13 feet, and for long it was supposed to have been built so. It is founded on wooden piles driven into boggy ground, When the tower had been carried up about 35 feet it began to settle to one side. That no such settlement was ever anticipated may be asserted from the fact that a gurgoyle or water-spout to throw off the water from the first arcade, may be observed on what is now the highest side. As the work was carried on, the levels were altered so as to keep the centre of gravity within the base. This tower was finished by an architect called William of Innspruck. The outside is entirely constructed~~

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~~of white marble, and the inside of stone from Verruca. There are many campanili, notably the Guarisendi and Asinelli towers at Bologna, that incline to one side,—all from the same cause as at Pisa.~~

~~The campanili of Florence and Siena are somewhat similar in design. The one at Florence is built of stone, and is about 20 feet square and about 300 feet high. That at Siena is built entirely of brick, and measures about 21 feet square and 282 feet high. Both are battlemented and have a smaller upper stage for the belfry. Several other important examples exist at Volterra, Monte- pulciano, Figline, Oppi, &c., &e. (R. AN.)~~

~~CAMPBELL, Srr Corttn. See Crypz, Lorn.~~

~~CAMPBELL, Gzorce (1719-1796), a theologian and Biblical critic, was born at Aberdeen on the 25th December 1719. His father, the Rev. Colin Campbell, one of the ministers of Aberdeen, was the son of George Campbell of Westhall, who claimed to belong to the Argyll branch of the family. Mr Colin Campbell died in 1728, leaving a widow and six children~~

~~in somewhat straitened circum- stances. George, the youngest son, was destined for the legal profession, and after attending the grammar school of Aberdeen and the arts classes at Marischial College, he was sent to Edinburgh to serve as an apprentice to a writer to the Signet. But he does not seem to have had any liking for law—at any rate he found in theology a study much more to his taste. While at Edinburgh he fell into the habit of attending the theological lectures, and this was followed, when the term of his apprenticeship expired, by his enrolment as a regular student in the Aberdeen divinity hall. After a distinguished career he was, in 1746, licensed to preach by the Presbytery of Aberdeen; but his first attempt to obtain a charge—that of Fordoun in Kincardine- shire—was unsuccessful. In 1748, however, he was ordained minister of Banchory Ternan, a parish on the Dee, some twenty miles from Aberdeen. Here he spent the next nine years, labouring with much success as a country minister, and planning two at least of the works by which he was afterwards to make himself known. In 1757 he left Banchory Ternan to become one of the ministers of Aberdeen. That city was at the time the centre of no inconsiderable intellectual activity. Reid was professor of philosophy at King's College; John Gregory, Reid's predecessor, held the chair of medicine ; Alexander Gerard was professor of divinity at Marischal College; and in 1760 Beattie became professor of moral philosophy in the same college. These men, with others of less note, formed themselves in 1758 into a society for the discus- sion of questions in philosophy. Reid was its first secretary, and Campbell one of its founders. It lasted till about 1773, and during this period not a few papers were~~

~~read, particularly those by Reid and Campbell, which |~~

~~were afterwards extended in the form of published treatises.~~

~~Meanwhile Campbell was, in 1759, made principal of Marischal College, an appointment due rather to the high estimation in which he was held by those who knew him, and perhaps also to his family influence with the duke of Argyll, than to any published evidence he had given of his fitness for the post. But this evidence, if it was required, was soon forthcoming. In 1763 he published his celebrated Dissertation on Miracles, a work that originated in a sermon preached two years previously before the Synod of Aberdeen.~~

~~In it he seeks to show, in opposition to Hume, that miracles are capable of proof by testimony, and that the miracles of Christianity are sufficiently attested. Hume derived our belief in testimony equally with our belief in the laws of nature from experience ; he held that where the laws of nature, being a uniform experience, contradict testimony, the latter must give way ; and he further held that in the case of miracles the laws of nature do actually~~

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~~contradict the testimony in favour of miracles, 7.¢., miracles are incapable of proof. In reply Campbell asserts—(1) that testimony is not derived from experience, but "has a natural and original influence on belief antecedent to experience." As, however, he admits that experience is, if not the source, at least the measure, of testiniony, he virtually grants all that Hume desires, and leaves the ques- tion where it was. But (2) he urges, and with more success, that testimony can prove a miracle. There is no contradiction, he argues, as Hume said there was, between what we know by testimony and the evidence upon which a law of nature is based ; they are of a different deserip- tion indeed, but we can without inconsistency believe that both are true. He also dwells at considerable length upon the ambiguity of the word "experience" as it is used by Hume, and devotes the rest of the work to a discussion of the actual evidence for the miracles of Christianity. The Dissertation is not a complete treatise upon miracles, and does not approach the subject from points of view it would be regarded from now, but with all deductions it was and still is a valuable contribution to theological literature.~~

~~In 1771 Campbell was elected professor of theology at Marischal College, and in consequence he resigned his city charge, although he still preached as minister of Grey- friars, a duty then attached to the chair. His next work was not a theological one. During his early ministerial life at Banchory Ternan he planned and began the com- position of a work on rhetoric. The results of his labours were partly communicated to the Aberdeen Philosophical Society, for most of the papers he read there were on ' Hloquence " and cognate subjects ; but it was not until 1776 that his~~

~~Philosophy of Rhetoric appeared,—a work that at once took a high place among books on the subject, which it can hardly be said even now to have lost. The most interesting portion is perhaps that which treats of evidence ; certainly the least satisfactory is that on the syllogism. In 1778 his last and in some respects his greatest work appeared, A New Translationlef the Gospels. The translation is a good one, but it is the critical and explanatory notes which accompany it that give the book its high value. Several of his sermons were published, notably one in 1777 On the Success of the first publishers of the Gospel, considered as a proof of its truth, It was preached before the Society for Propagating Christian Knowledge, and is one of the happiest specimens of his style and method of argument.~~

~~Campbell, who had never enjoyed robust health, was in 1795 compelled by increasing weakness to resign the offices he held in Marischal College, and on his retirement he received a pension of £300 from the king. He did not long enjoy the royal bounty, for he died on the 31st of March 1796 of a stroke of palsy. Principal Campbell had married Miss Grace Farquharson, daughter of Mr Farquhar- son of Whitehouse. They had no children. In church politics he belonged to the moderate side, but his independ- ence of judgment and strength of conviction were t00 great to permit him to be confined by the trammels of party. It is as a theologian and as a scholar, the acutest atid most cultivated that the Church of Scotland has pro- duced, that he will be best remembered.~~

~~His Lectures on Ecclesiastical History and some smaller writings were published after his death ; and there is a uniform edition of~~

~~his works in six vols. 8vo. A short account of his life, by the Rev. Mr Keith, is prefixed to his Lectures on Church History.~~

~~CAMPBELL, Joun, LL.D. (1708-1775), a miscel- laneous author, was born at Edinburgh, March 8, 1708. Being designed for the legal profession, he was sent to Windsor, and apprenticed to an attorney; but his tastes soon led him to abandon the study of law, and to devote himself entirely to literature. In 1736 he published~~

~~CAMPBELL~~

~~the Military History of Prince Eugene and the Duke of Marlborough, and soon after contributed several important articles to the Ancient Universal History. In 1742 and 1744 appeared the Lives of the British Admirals, in 4 vols., a popular work which has been continued by other authors. Besides contributing to the Biographia Britan- nica and Dodsley's Preceptor, he published a work on The Present State of Europe, consisting of a series of papers which had appeared in the Museum. He also wrote the histories of the Portuguese, Dutch, Spanish, French,Swedish, Danish, and Ostend settlements in the Hast Indies, and the histories of Spain, Portugal, Algarve, Navarre, and France, from the time of Clovis till 1656, for the Modern Universal History. At the request of Lord Bute, he published a vindication of the Peace of Paris concluded in 1763, embodying in it a descriptive and historical account of the New Sugar Islands in the West Indies. By the king he was appointed agent for the provinces of Georgia in 1755. His last and most elaborate work, Polztical Survey of Britain, 2 vols. 4to, was published in 1744, and greatly increased the author's reputation. Campbell died Decem- ber 28, 1775. He received the honorary degree of LL.D. from the University of Glasgow in 1745.~~

~~CAMPBELL, Tuomas (1777-1844). This distin- guished poet was a cadet of the respectable family of Campbell of Kirnan, in Argyllshire. Owing to the straitened circumstances of his father, who had settled in Glasgow and been unfortunate in business, young Canipbell was obliged, while attending college, to have recourse to private teaching as a tutor. Notwithstanding the amount of additional labour thus entailed, he made rapid progress in his studies, and attained considerable distinction at the university over which it was his fortune, in after years, to preside. He very early gave proofs of his aptitude for literary composition, especially in the department of poetry ; and so strong was his addiction to these pursuits, that he could not bring himself seriously to adopt the choice of a profession. From private tuition, which is at best an irksome drudgery, he recoiled after a short trial. Neither law, physic, nor divinity had any attractions for him ; nor is it probable that he ever would have risen to eminence in a regular profession, owing to a constitutional sensitiveness almost morbid, and a want of resolute energy. Weare told by his friend and biographer Dr Beattie that " the imagina- tive faculty had been so unremittingly cultivated that circumstances, trifling in themselves, had acquired undue influence over his mind, and been rendered~~

~~formidable by an exaggeration of which he was at the moment unconscious. Hence various difficulties, which industry might have over- come, assumed to his eye the appearance of insurmountable obstacles. Without resolution to persevere, or philosophy to submit to the force of necessity, he drew from everything around him, with morbid ingenuity, some melancholy presage of the future. He was dissatisfied with himself, chilled by the world's neglect, and greatly hurt by the apathy of friends who had extolled his merits, but left him to pine in obscurity." Campbell was not a man who could have successfully struggled with the world. Fortunately for him, his genius was such as to ensure an early recognition.~~

~~We find him at the age of twenty in Edinburgh, attending lectures at the university; soliciting employment from the booksellers, and not unknown to acircle of young men then resident in the Scottish metropolis, whose names have become historical. Among those were Walter Scott, Henry Brougham, Francis Jeffrey, Dr Thomas Brown, John Leyden, and James Grahame, the author of the Sabbath. He also became acquainted with Dr Robert Anderson, editor of a collection of the British poets, a man of extreme enthusiasm and kindliness of disposition, who early appreciated the remarkable powers of Campbell, and~~

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~~encouraged him to proceed in his literary career. In 1799 his poem, Zhe Pleasures of Hope, was published.~~

~~Probably there is no parallel instance of literary success so instantaneously achieved by a first effort ; nor was that owing to novelty of design on the part of the author, or the caprice of the public. For considerably more than half a century the poem has maintained, nay, increased its popularity. During that time the public has adopted and abandoned many favourites— names once famous and in every mouth have gradually become forgotten and unregarded—poetical works of greater pretension, which were once considered as masterpieces of genius and inspira- tion, have fallen into neglect ; but this poem by the boy Campbell remains a universal favourite. It is not much to say that it is, without any exception, the finest didactic poem in the English language. Even those who are not admirers of didactic poetry are forced to admit its charm ; and the uttermost objection that~~

criticism can make appears to be a certain vagueness, which, after all, is inseparable from the nature of the subject and the necessary plan of the composition. The delicacy of the thoughts, the beauty of the imagery, the occasional power of pathos, the extra- ordinary felicity of the language, and the wonderful harmony of the versification, distinguish the Pleasures of Hope from any poem which has been written before or since, and entitle it to a very high place as an original work of genius. It is as original and characteristic of its author as is the Deserted Village of Goldsmith, with which it has been frequently, but surely improperly compared. Gold-smith's poem affects us by its simplicity and truth. Campbell's, it must be owned, is much more florid and ornamented; but how exquisite is the taste of the ornament !

The literary and the private histories of an author are inseparable. In order to comprehend the one we must have recourse to the other. The first success of Campbell brought him fame, but not fortune. He had disposed of the copyright of the Pleasures of Hope, by his original bargain with the publishers, for a sum certainly noderate, which, however, probably exceeded his expectations at the time. He was, moreover, very kindly treated, for he received-a considerable unstipulated allowance for each new edition, which circumstance ought to have deterred him from uttering certain diatribes against "the trade," in which he was afterwards rather prone to indulge. The fact is that he did not know how to make use of his success. Instead of availing himself of the reputation which he had so worthily and decisively won, and applying himself to a new effort, he went abroad without any determinate aim; was perfectly wretched on the Continent, where he had no friends, and was sorely embarrassed for want of means ; and began to write fugitive poetry for the London journals. On his return to Britain he had ample opportunity of bettering his condition. With a name such as his, a moderate amount of exertion would have secured him not only a competence but comparative affluence ; but indolence, perhaps the result of timidity, had grown upon him. Campbell never could adapt himself even to the profession of literature, which, precarious though it be, is not without its prizes. In that profession, as in all others, the requisites for success are steadiness, punctuality, and perseverance ; but Campbell possessed none of them. The publishers were ready, and offered to give him lucrative employment, nor was he at all backward in accepting their offers ;

~~but when the period for performance arrived he. had literally done nothing. In extraordinary contrast to him stands Scott, who seemed simply to will in order to conceive and execute. Campbell had many bright conceptions, but he could not apply himself to the work. Of course he lost repute with the men who alone can intervene between an~~

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~~author and the public, and "the fathers of the Row" became chary of offering him engagements. Some idea of the extent of his habitual indolence may be formed from the fact, that the publication of his Specimens of the British Poets did not take place until thirteen years after the work was undertaken!~~

~~In the meantime Campbell married ; and his prospects were of the darkest, when, in 1805, he received a Govern- ment pension of £200. He was then in great distress, and even that aid, material as it was, failed to extricate him. It was probably fortunate for his fame that such was the case, for in 1809 he published his poem of Gertrude of Wyoming, to which were attached the most celebrated of his grand and powerful lyrics.~~

~~Among Campbell's lengthier poems Gertrude of Wyoming must hold the second place. He designed it fora poem of action, but he has failed to give it that interest and vivacity which a poem of action requires. There is in it too decided a predominance of the sentimental vein, and an extreme degree of elaboration, which, in poetry as in painting, is hurtful to the general effect. There is great truth in the following criticism, which occurs in a letter from Jeffrey to the author :—" Your timidity or fastidiousness, or some other knavish quality, will not let you give your conceptions glowing, and bold, and powerful, as they present themselves ; but you must chasten, and refine, and soften them, forsooth, till half their nature and grandeur is chiselled away from them. Believe me, the world will never know how truly you are a great and original poet till you venture to cast before it some of the rough pearls of your fancy." In spite of these defects, Gertrude was considered at the time as a work in every way worthy of the poet's previous reputation ; and it will ever be admired by that numerous class of readers who are more fascinated by the beauties of expression than by high inventive power and vigorous execution.~~

~~The soundness of the above criticism, proceeding from an eminent literary authority whose whole leanings were rather towards than against fastidiousness in composition, is demonstrated by the universal admiration accorded to Campbell's lyrical pieces. One or two of these, in particular Lochiel's Warning and Hohenlinden, are to be referred to an earlier period than the composition of Gertrude ; but there are others of a later date which show how much power remained in the man when he chose to exert it freely. There are few lyrics in the English language to be placed in comparison with the Mariners of England or The Battle of the Baltic ; and his exquisite poem of O'Connor's Child, which has not unaptly been termed the diamond of his casket of gems, is greatly superior in pathos and passion to his more elaborate compositions. All these, and others scarcely inferior to them, seem to have been struck off at a heat, and to have escaped that chiselling process to which Jeffrey so pointedly referred.~~

~~Campbell was now settled at Sydenham in England, and his circumstances were materially improved. His home was a happy one; the society in which he moved was of the most refined and intellectual character ; and he enjoyed the personal friendship of many of his distinguished con-temporaries. Ample leisure was afforded him to carry into effect any of the cherished schemes of his literary ambi- tion; but his indolence and inherent want of resolution again interfered. His most noteworthy exertion for years appears to have been the preparation of a short course of lectures on poetry, which he delivered with great éclat at the Royal Institution in London and elsewhere. It appears that at one time it was proposed by his friends, and especially by Sir Walter Scott, that he should become a candidate for the occupancy of a literary chair in the University of Edinburgh ; but he shrank from the idea of~~

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~~undertaking so serious a labour as is involved in the preparation of a thorough academical course. In 1820 he accepted the editorship of the New Monthly Magazine, and acted in that capacity for a considerable period, until he resigned it to take charge of the Metropolitan. Hig cop. uection with periodical literature may have been advan- tageous in a pecuniary point of view, but did not tend materially to enhance his reputation. His was not the~~

~~pen of the ready writer; and it must ever be regretted that he was induced to bestow so much attention upon merely ephemeral literature, to the sacrifice of the nobler aims which were expected froin his acknowledged genius, Jp 1824 he published his Theodric, a poem which, in spite of some fine passages, was generally considered as a failure, With Theodric his poetical career may be said to have closed. At times he put forth short poems of various degrees of merit, but none of them were equal to the grand lyrics already treasured in the memory of his countrymen, It seemed as if a large portion of the old virtue had departed from him; and his last published poem, the Pilgrim of Glencoe, showed hardly any marks of his former accomplish- ment and power.~~

~~In fact it appeared that the rich mine of poetry had been worked out. Without actually adopting that conclusion, we may observe that Campbell had latterly occupied him- self most zealously with matters which were apart from his earlier pursuits. In the first place, he took an active share in the Institution of the London University, and it was mainly through his exertions that it was saved from becoming a mere sectarian college. Shortly afterwards, in 1826, he was elected Lord Rector of the University of Glasgow, an event which he considered as the crowning honour of his life, and which certainly was a mark of dis- tinction of which any man might have been proud. He did not accept the office as a mere sinecure, but applied himself to discharge the actual duties (which, through the negligence of former rectors, had been allowed to fall into abeyance) with a zeal and energy which made entire con- quest of the hearts of his youthful constituents. In 183], the year in which the gallant struggle of the Poles for their independence was terminated by entire defeat, Campbell, who in his earliest poem had referred in such beautiful language to the shameful partition of Poland, more than revived his youthful enthusiasm for her cause. He had watched with an anxiety almost bordering on fanaticism the progress of the patriotic movement ; and the news of the capture of Warsaw by the Russians affected him as if it had been the deepest of personal calamities. '* His heart," says his biographer, 'was in the subject of Poland ; he could neither write nor speak upon any other with common patience ; and if a word was dropt in company that did not harmonize with his feelings, he was very apt to con- sider it as a personal offence." In one of his own letters he says, " I know that my zeal for Poland has put me half~~

~~mad." And again, " It is still all that I can do to support a tolerable cheerfulness before these kind hospit- able people, for Poland preys on my heart night and day. It is sometimes a relief to me to weep in secret, and I do weep long and bitterly." Nor did he show his sympathy by words alone, but by resolute and continued action. He was the founder of the association in London of the Friends of Poland, which not only served to maintain the strong interest felt by the British people for the Polish cause, but was the means of providing assistance and giving employment to large numbers of the unfortunate exiles who were driven to seek refuge in this country. Never, till his dying day, did he relax his exertions in their behalf ; and many an unhappy wanderer, who, but for un- expected aid, might have perished in the streets of a foreign city, had reason to bless the name of Thomas Campbell.~~

~~CAMPBELL~~

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~~SE ee —— eee~~

~~The remainder of his life presents few features of interest. Domestic calamity had overtaken him. His wife, whom he loved affectionately, had been taken from _him—of his two sons, one died in infancy, and the other was afflicted by an incurable malady. His own health became impaired. He gradually withdrew from public life, and died at Boulogne on 15th July 1844, at the age of sixty-seven. His last hours were soothed by the affec- tionate care of his relatives and friends ; nor did his countrymen forget the poet in his death, for his remains were solemnly interred.in Westminster Abbey, with the honours of a public funeral.~~

~~Few poets of reputation, whose span has been extended nearly to the threescore and ten allotted years, have written so little as Campbell: at the same time it must be con- fessed that there are fewer still whose works are likely to be prized by posterity in the like proportion with his. If we throw out of consideration altogether Z'heodric,—though some night demur to such an excision,—if we overlook the Pilgrim of Glencoe, and weed from his lyrical garden such plants as have little charm either from their colour or~~

~~their fragrance, there will still remain a mass of poetry familiar to the ear and the heart, such as hardly any other writer of this century has been able to produce. We may regret that Campbell was not more diligent in the cultiva- tion of his poetical genius, that he did not apply himself more sedulously in his earlier years to some serious effort, and that he allowed other pursuits and designs to interfere with his peculiar calling. But who can venture to say what success might have attended his efforts had he acted otherwise than he did? We blame the poet for apparent indolence, not reflecting that inspiration is not to be com manded at will. It is not only possible but easy for the man who is practised in versification to write a certain given number of lines within a certain specified time ; but genuine poetry never was and never will be the product of Egyptian taskwork. It cannot be produced to order—it must be spontaneous; and its quality must depend entirely upon the mood of mind under which it is com | posed. 'The greater part of the poetry or rather the verse _of Southey, a considerable portion of that of Scott, and a vast deal of that of Wordsworth, was not conceived or written under the poetic impulse. On such occasions these velebrated men were writing verse, as they might have written prose, without enthusiasin or anything like the feeling of passion; and although their ordinary thoughts were far higher, bolder, and more subtle than those of the million, they still were not attempting to rise beyond their ordinary intellectual level. One can see at a glance when they were inspired, and when they were merely _versifying. Of the poets who adorned the first half of the present century, Coleridge and Campbell were conspicuous for their abstinence in writing except under the influence of real emotion. Of the former it may be said that he has hardly penned a line of mere mechanical verse ; the latter did not do so until his inspiration seemed to have abandoned 'him. Undoubtedly, however,—to have recourse to a hackneyed, though by no means an unmeaning phrase,—it is the duty of the poet to woo the muse, not to wait for her courtship. He must seek for the waters of Castaly, not tarry till they are conveyed to him; and it is in this respect probably that Campbell principally erred. He did 'not sufficiently endeavour to awake his genius; he was too much a dreamer, and may at times have lost his "Opportunity from the sheer weight of indolence. And yet, considering the value of the legacy he has left, we have no reason to complain. Critics may dispute regarding the comparative merits of his~~

~~longer works; and, as they incline towards didactic or narrative poetry, may prefer the one composition to the other.~~

~~CAMPBELL L~~

~~Both are entitled to high .~~

~~praise and honour, but it is on his lyrics that the future reputation of Campbell must principally rest. They have taken their place, never to be disturbed, in the popular heart; and, until the language in which they are written perishes, they are certain to endure. (W. E. A.) CAMPBELL, Jouy, Baron (1779-1861), the second son of the Rev. George Campbell, D.D., by Magdalene, the only daughter of John Hallyburton, Esq. of Fodderance, was born at Cupar, Fife, on 17th September 1779. His father was for fifty years the parish minister of Cupar. For a few years young Campbell studied at the United College, St Andrews, where he met Thomas Chalmers. In 1800 he was entered as a student at Lincoln's Inn, and became a pupil of the well-known special pleader Mr Warren, the master of Lyndhurst, Denman, and Cottenham. A few days after his entrance, as he records in his Lives of the Chancellors, he saw and heard Lord Thurlow speak in the House of Lords. Aftera short connection with the Morning Chronicle he was called to the bar in 18%6, and at once began to report cases decided at Mist Prius (¢. ¢, on Jury Trial), in the courts of King's Bench and Common Pleas, and on the home circuit. Of these Reports he published altogether four volumes, with learned notes; they extend from Michaelmas 1807 to Hilary 1816. Campbell also devoted himself a good deal to criminal business, but in spite of his unceasing industry he failed to attract much attention behind the bar ; briefs came in slowly, and it was not ,till 1827 that he obtained a silk gown and found him- self in that "front rank" who are permitted to have political aspirations. When George IV. died (26th June 1830) and Parliament was dissolved (24th July), Campbell, like all the new Whig men of the day, resolved to enter Lord Grey's Parliament. With the help of his relative Major Scarlett he contested the borough of Stafford, which he represented in 1830 and 1831. In the House he showed an extraordinary, sometimes an excessive zeal for public business, speaking on all subjects with practical sense, but on none with eloquence or spirit. His main object, however, like that of Brougham, was the ameliora- tion of the law, more by the abolition~~

~~of cumbrous technicalities than by the assertion of new and striking principles. Thus his name is associated with the Fines and Recoveries Abolition Act (3 and 4 Will. IV. c. 74); the Law of Descent Act (3 and 4 Will. IV. c. 106); the Law of Dower Act (3 and 4 Will. TV. c. 105); the Statute of Limitations (3 and 4 Will. IV. c. 27); the Execution of Wills of Real or Personal Property Act (1 Vict. c. 26); one of the Copyhold Tenure Acts (4 and 5 Vict. c. 25); and the Imprisonment for Debt Act (1 and 2 Vict. c. 110). All these measures were important and were carefully drawn; but their merits cannot be explained in a bio- graphical notice. The second was called for by the prefer- ence which the common law gave to a distant collateral over the brother of the half-blood of the first purchaser ; the fourth conferred an indefeasible title on adverse possession for twenty years (a term shortened by Lord Cairns in 1875 to twelve years) ; the fifth reduced the number of witnesses required by law to attest wills, and removed the vexatious distinction which existed in this respect between freeholds and copyholds ; the last freed an innocent debtor from imprisonment only before final judgment (or on what was termed mesne process), but the principle stated by Campbell that only fraudulent debtors should be imprisoned was ultimately given effect to for England and Wales in 1869.! In one of his most cherished objects, however, which formed the theme of his maiden speech in Parliament, Campbell was doomed to disappoint-~~

~~1 Two of his later Acts, allowing the defendant in an action for libel to prove veritas, and giving a right of action to the representatives of persons killed through negligence, also deserve mention,~~

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~~ment, 'This was the establishment of a general Register of Deeds or Titles to Land for England aud Wales, which would diminish the number of unmarketable and unsafe titles, and thus simplify and cheapen the transfer of land. As head of the Real Property Commission of 1827, he had ample opportunity of observing the evils caused by tlie absurd system of outstanding terms,! and he was able to quote the example of most European countries, where com- pulsory publication had been found neither to hurt commercial credit nor to wound family pride. The measure of 1830 was defeated by the country attorneys, led by Sir Chas. Wetherell, but the principle has rapidly gained ground and has been partially embodied in the Land Transfer Bills of subsequent reformers. Campbell's most important appearance as member for Stafford was in defence of Lord John Russell's first Reform Bill (1831). In a temperate and learned speech, based on Fox's declaration against constitution-mongering, he supported both the enfranchising and the disfranchising clauses, and easily disposed of the cries of 'corporation robbery," " nabob representation," 'opening for young men of talent," &c. The following year (1832) found Campbell solicitor-general, a knight, and member for Dudley, which he represented till 1834. In that year he became attorney-general and was returned by Edinburgh, for which he sat till 1841.? His political creed declared upon the hustings there was that of a moderate Whig. He maintained the connection of church and state, opposed triennial parliaments and the ballot, and railed against the dictatorship of the great duke (see Speech at Edinburgh, 3d January 1835, 8vo, London, 1835). Although in his relations with his constituents in both England and Scotland there was traceable an unpleas- ant spirit of accommodation and cajolery, in Parliament his position, both political and religious, was always well defined and independent. There he continued to lend the most effective help to the Liberal party. His speech in 1835 in support of the motion for inquiry into the Irish Church Temporalities with a view to their partial appropriation for national purposes (for disestablishment was not then dreamed of as possible) contains much terse argument, and no doubt contrikuted to the fall of Peel and the formation of the Melbourne cabinet. The next year Campbell had a fierce encounter with Lord Stanley in the debate which followed the motion of Mr Spring Rice on the repair and maintenance of parochial churches and chapels. The legal point in the dispute (which Campbell afterwards made the subject of a separate pamphlet) was whether the churchwardens of the parish, in the~~

~~absence of the vestry, had any means of enforcing a rate except the antiquated interdict or ecclesiastical censure. It was not on legal technicalities, however, but on the broad principle of religious equality, that Campbell supported the abolition of Church Rates, in which he included the Edinburgh Annuity-Tax. In the same year he spoke for Lord Mel- bourne in the action (thought by some to be a political conspiracy®) which was brought by Mr Norton against the Whig premier for criminal conversation with the beautiful and accomplished grand-daughter of Sheridan. At this time also he exerted himself for the reform of justice in~~

~~1 A terminable estate in land, vested or continued in trustees, for convenience in giving security without exhibiting a title to the com- plete estate. .~~

~~21f we may trust the scandalous chronicle of Greville, Campbell got this post on condition that he should not expect the ordimary pro- motion to the bench, a condition which he immediately violated by claiming the vice-chancellorship on the death of Sir John Leach. Pepys (Lord Cottenham) and Bickersteth (Lord Langdale) were both pro- moted to the bench in preference to Campbell.~~

~~3 'There can be no doubt that old Wynton was at the bottom of it all, and persuaded Lord Grantley to urge it on for mere political purposes." — Greville, iii, 351.~~

~~the ecclesiastical courts, for the uniformity of the law of marriage (which he held should be a purely civil contract) and for giving prisoners charged with felony the benefit of counsel. His defence of the Zimes newspaper, which had accused Sir John Conroy, equerry to the duchess of Kent of misappropriation of money (1838), is chiefly remarkable for the confession —'I despair of any definition of libel which shall exclude no publications which ought to be suppressed, and include none which onght to be permitted," His own definition of blasphemous libel was enforced jp the prosecution which, as attorney-general, he raised against the bookseller Hetherington, aud which he justified on the singular ground that 'the vast bulk of the population — believe that morality depends entirely on revelation; and if a doubt could be raised among them that the Ten Commandments were given by God from Mount Sinaj men would think~~

~~they were at liberty to steal, and women would consider themselves absolved from the restraints of chastity." But his most distinguished effort at the bar was undoubtedly the speech for the House of Commons in the famous case of Stockdale v. Hansard. The Commons had ordered to be printed, among other papers, a Report of the Inspectors of Prisons on Newgate, which stated that an obscene book, published by Stockdale, was given to the prisoners to read. Stockdale sued the Commons' publisher, and was met by the plea of parliamentary privilege, to which, however, the judges did not give effect, on the ground that they were entitled to define the privileges of the Commons, and that publication of papers was not essential to the functions of Parliament. The . matter was settled by the Act 3 Vict. c. 9.~~

~~In 1840 Campbell conducted the prosecution against John Frost, one of the three Chartist leaders who attacked the town of Newport, all of whom were found guilty of high treason. We may also mention, as matter of his- torical interest, the case before the High Steward and the House of Lords which arose out of the duel fought on Wimbledon Common between the earl of Cardigan and Captain Harvey Tuckett. The law of course was clear that the '" punctilio which swordsmen falsely do call honour" was no exense for wilful murder. 'To the astonishment of everybody Lord Cardigan escaped from a capital charge of felony because the full uame of his antagonist (Harvey Garnett Phipps Tuckett) was not legally proved. It is difficult to suppose that such a blunder was not preconcerted. Campbell himself made the extraordinary declaration that to engage in a duel which could not be declined without infamy (ze., social disgrace) was "an act free from moral turpitude," although the law properly held it to be wilful murder. Next year, as the Melbourne administration was near its close, Plunkett, the venerable chancellor of Ireland, was forced by discreditable pressure to resign, and the Whig attorney-general, who had never practised in Hquity, became chancellor of Ireland, and was raised to the peerage with the title of Baron Campbell of St Andrews, in the county of Fife. His wife, Mary Elizabeth Campbell, the eldest daughter of the first Baron Abinger by one of the Campbells of Kilmorey, Argyllshire, whom he had mar- ried in 1821, had in 1836 been created Baroness Stratheden. The post of chancellor Campbell held for only sixteen days, and then resigned it to his successor Sir Edward Sugden (Lord St Leonards), It was during the period 1841-49, when he had~~

~~no legal duty, except the self-imposed one of occasionally hearing Scotch appeals in the House of Lords, that the unlucky dream of literary fame troubled Lord Campbell's leisure.t By two days' court work in Dublin~~

~~4In 1842 he published the Speeches of Lord Campbell at the Bar and in the House of Commons, with an Address to the Irish Bar 0s~~

~~« Lord Chancellor of Ireland, (Edin., Black.)~~

~~) he had received a pension of £4000 per annum from an ungrateful country, and he suddenly remembered what — Lords Coke and Bacon had said about the debt due from every successful lawyer. Following in the path struck out by Miss Strickland in her Lives of the Queens of Hngland, and by Lord Brougham's Lives of Hminent Statesmen, he at last pro- duced, in 1849, The Lives of the Lord Chancellors and Keepers of the Great Seal of England, from the earliest times till the reign of King George IV., 7 vols. 8vo. The conception of this work is magnificent; its execution wretched. Intended to evolve a history of jurisprudence from the truthful portraits of England's greatest lawyers, it merely exhibits the ill-digested results of desultory learning, without a trace of scientific symmetry or literary taste, without a spark of that divine imaginative sympathy which alone can give flesh and spirit to the dead bones of the past, and without which the present becomes an _ unintelligible maze of mean and selfish ideas. A charming style, a vivid fancy, exhaustive research, were not to be | expected from a hard-worked barrister; but he must certainly be held responsible for the frequent plagiarisms, the still more frequent inaccuracies of detail, the colossal | vanity which obtrudes on almost every page, the hasty | insinuations against the memory of the great departed who | were to him as giants, and the petty sneers which he con- descends to print against his own contemporaries, with whom he was living from day to day on terms of apparently sincere friendship. 'These faults are not so glaring in the lives of such men as Somers and Hardwicke, whom distance in time makes safe from personal jealousy ; they are painfully apparent in the lives of Eldon, Lyndhurst, and Brougham, and they have been pointed out by the biographers of Eldon and by Lord St Leonards.!. And yet the book is an invaluable repertory of facts, and must endure until it is superseded by something better. It was followed by the Lives of the Chief Justices of~~

~~England, from the Norman Conquest till the death of Lord Mansfield, . 8vo, 2 vols., a book of similar construction but inferior merit. It must not be supposed that during this period the _ literary lawyer was silent in the House of Lords. He spoke frequently. The 3d volume of the Protests of the Lords, lately edited by Mr Thorold Rogers, contains no less than ten protests by Campbell, entered in the years 1842-45, He protests against Peel's Income Tax Bill of 1842; against the Aberdeen Act (6 and 7 Vict. c. 61) as conferring un- | due power on church courts; against the perpetuation of diocesan courts for probate and administration; against Lord Stanley's absurd bill providing compensation for the destruction of fences to dispossessed Irish tenants; and against the Parliamentary Proceedings Bill, which proposed that all bills, except money bills, having reached a certain _ Stage, or having passed one House, should be continued to next. session, The last he opposed because the proper remedy lay in resolutions and orders of the House. He protests in favour of Lord Monteagle's (Mr Spring Rice) motion for inquiry into the sliding scale of corn duties under 5 Vict. c. 14; of Lord Normanby's motion on the Queen's speech in 1834, for inquiry into the state of Ireland (then wholly under military occupation); of Lord Radnor's bill to define the constitutional powers of the home secretary, when Sir James Graham opened Mazzini's letters. In 1844 he records a solitary protest against the _ judgment of the House of Lords in Reg. v. Millis, which~~

~~' 1It was of this book that Sir Charles Wetherell said, referring to its author, "and. then there is my noble and biographical friend who has added anew terror to death." See Misrepresentations in Campbell's " Lives of Lyndhurst and Brougham" corrected by St Leonards, Lon- don, 1869.~~

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~~affirmed that a man regularly married according to the rites of the Irish Presbyterian Church, and afterwards regularly married to another woman by an Episcopally ordained clergyman, could not be convicted of bigamy, because the English law required for the validity of a marriage that it should be performed by an ordained priest.~~

~~On the resignation of Lord Denman in 1850, Camp- bell was appointed Chief Justice of the Queen's Bench. For this post he was well fitted by his knowledge of com- mon law, his habitual attention to the pleadings in court, and his power of clear statement. On the other hand, at Nist Prius and on the criminal circuit, he was accused of frequently attempting unduly to influence juries in their estimate of the credibility of evidence. It is also certain that he liked to excite applause in the galleries by some platitude about the " glorious Revolution" or the " Protes- tant succession." He assisted in the reforms of special pleading at Westminster, and had a recognized place with Brougham and Lyndhurst in legal discussions in the House of Lords. Lut he had neither the generous temperament nor the breadth of view which is required in the com- position of even a mediocre statesman. In 1859 he was made Lord Chancellor of Great Britain, probably on the understanding that Bethell should succeed as soon as he could be spared from the House of Commons. His short tenure of this office calls forno remark. In the same year he published in the form of a letter to Mr Payne Collier an amusing and extremely inconclusive essay on Shake- speare's legal acquirements. One passage will show the conjectural process which runs through the book: "If Shakespeare was really articled to a Stratford attorney, in all probability, during the five years of his clerkship, he visited London several times on his master's business, and he may then have been introduced to the green-room at Blackfriars by one of his countrymen connected with that theatre." The only positive piece of evidence produced is the passage from Thomas Nash's " Epistle to the Gentle- nien of the Two Universities," prefixed to Greene's Arcadia, 1859, in which he upbraids somebody (not known to be Shakespeare) with having left the 'trade of Noverint" and busied himself with "whole Hamlets" and "handfuls of tragical speeches." The knowledge of law shown in the plays is very much what a universal observer must have picked up. Lawyers always underestimate the legal know- ledge of an intelligent layman. Campbell died on the 23d | June 1861. It has been well said of him in explanation of his success, that he lived eighty years and preserved his digestion unimpaired. He had a hard head, a splendid constitution, tireless industry, a generally judicious temper. He was a learned, though not a scientific lawyer, a faithful political adherent, thoroughly honest as a judge, dutiful and happy as a husband. But there was nothing admirable or heroic in his nature. On no great subject did his principles rise above the~~

~~commonplace of party, nor had he the magnanimity which excuses rather than aggra- vates the faults of others. ‘ His life is the triumph of steady determination unaided by a single brilliant or attractive quality. (w. ©. 8.)~~

~~CAMPBELTOWN, a royal burgh and seaport of Scotland, in Argyllshire, situated on an indentation of the coast, near the southern extremity of the peninsula of Kintyre, in 55° 25’ N. lat. and 5° 36’ W. long. Its principal buildings are the churches (one of which stands on the site of the castle of the Macdonalds), the town- house, the jail, and the athenzeeum. The staple industry is the manufacture of whisky. There are in the town, or in~~

~~2 This applies particularly to his conduct of the case of G. Achilli v.~~

~~Dr Newman for libel contained in the Lectures on the Difficulties of Protestantism. See special Report by W. F. Finlason, London, 1852:~~

~~its immediate vicinity, upwards of twenty distilleries, which produce a spirit that is in high estimation. Many of the inhabitants are also engaged in the fisheries and the coasting trade. A good supply of water is fur- nished, from a distance of a mile and a half, by the works opened in 1866. The harbour, which is formed by the inlet of the sea called Campbeltown Loch, has been im- proved by the extension of the pier to a distance of 250 feet. The whole bay measures about 2 miles in length by 1 in breadth, and has from 6 to 15 fathoms water. The registered vessels belonging to the port on the 31st of December 1874 were 41 sailing vessels of 2590 tons and 2 steamships of 284. During the same year there entered 8U6 British and 18 foreign vessels, with a tonnage of 61,838 and 2353 respectively. Campbeltown unites with Ayr, Inveraray, Irvine, and Oban in sending one member to parliament. The population of the parliamentary burgh in 1871 was 4593, while that of the parish amounted to 8580. Campbeltown is supposed to be a place of consider- able antiquity, though no memorial of this exists except a finely-sculptured stone cross, which now stands on a pedestal in the market-place, and is popularly assigned to the 12th century. Prior to 1700 the place was a mere fishing village, but it was then erected into a royal burgh through the interest of the Argyll family, from whom it derived its name.~~

~~CAMPE, Joacuim Hernricu (1746-1818), a German elucationist, was born at Deensen in Brunswick in 1746. He studied theology at the university of Halle, and after acting for some time as chaplain at Potsdam, he accepted a post as director of studies in the Philanthropin at Dessau. He soon after set up an educational establishment of his own at Trittow, near Hamburg, which he was obliged, to give up to one of his assistants within a few years, in con- sequence of feeble health. In 1787 he proceeded to Brunswick as counsellor of education, and purchased the Schulbuchhandlung, which under his direction became a most. prosperous business. He died in 1818. His numerous educational works were widely used throughout Germany. Among the most popular were the Aleine Kinderbibliothek, 12 vols., 11th ed., 1815; Robinson der Jiingere, 59th ed., 1861, translated into English and into nearly every European language ; and Sdémmtliche Kinder- und Jugendschriften, 37 vols.~~

~~CAMPEACHY, or CamMpeEcue, a fortified town of Mexico, formerly in the province of Yucatan, but now the capital of a new state to which it gives its name, is situated on the west side of the peninsula on the shore of the Bay of Campeachy, in 20° 5' N. lat. and 90° 16' W. long. The town is generally well built, though the houses, chiefly of limestone, are for the most part only one story in height. Its public edifices, several of which are substantial struc- tures, comprise a citadel, several churches and convents, a theatre, a museum, a college, a school of navigation, a hospital, and a custom-house. The port, though of con- siderable extent, and defended by a breakwater 160 feet long, is very shallow, and vessels drawing more than 10 feet have to anchor upwards of a mile from shore. During the Spanish domination Campeachy had a monopoly of the imports to Yucatan, and it still maintains a fair amount of commercial activity. There is a large trade in logwood (Palo de Campeche, or Campeachy wood), and con- siderable quantities of wax, cotton, hides, and cigars are 'also exported. Shipbuilding is carried on, and salt and marble are obtained in the neighbourhood. In 1872, 24 foreign vessels entered the port, and 317 engaged in the coasting trade; and in the previous year the customs amounted to £29,133,000.~~

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~~itself is said to be " built over extensive artificial galleries or catacombs, supposed to have been devoted by the ancient people [Mazas] to sepulchral uses." See Bancroft's Native Races of the Pacific States of North America, vol, iv. p. 265, The Spanish town, founded about 1540 near the older Indian settlement, which at the time of the cop. quest had about 3000 houses, was captured by the English in 1659, and several times in the same century fell into the hands of the Buccaneers, In the revolution of 1842 it was the scene of various engagements between the 'Mexicans and the people of Yucatan, in the last of which the latter were signally successful. The population, which numbered 15,500 in 1865, is now nearer 19,000.~~

~~CAMPEGGIO, or Camprccr1, Lorenzo (1479-1539) Cardinal, was born at Bologna in 1479. He was the P4 of an eminent lawyer, and for some years was himself engaged in the legal profession. But after the death of his wife he entered the church and quickly attained to high office. For his services to the Papal cause during the reduction of Bologna, Pope Julius II. raised him to the rank of bishop, and sent him as nuncio to Germany and Milan, In 1517 he became cardinal, and two years later he was sent to England to stir up a religious crusade against the Turks. He was unsuccessful in this mission, but received from Henry VIII, in 1524, the bishopric of Salisbury. Towards the close of 1528 he came over to England to assist Wolsey with regard to Henry's con- templated divorce from Katherine. He failed to accomplish anything, and left in the following year. The bishopric of Salisbury was withdrawn from him, and though at a later date (1536) it seemed possible that he might regain it, his expectations were disappointed. He died at Rome in 1539, just as he was about to set out on an embassy to Vicenza,~~

~~CAMPER, Perrer (1722-1789), a celebrated anatomist and naturalist, was born at Leyden, May 11, 1722. He was educated at the university of Leyden, and in 1746 graduated in philosophy and medicine. After the death of his father in 174.8 he spent more than a year in England, studying under the most famous medical teachers in London. He then visited Paris, Lyons, and Geneva, and returned to Franeker, where he had been appointed to the professorship of philosophy, medicine, and surgery. He visited England a second time in 1752, and in 1755 he was called to the chair of anatomy and surgery at the Atheneum in Amsterdam. He resigned this post after six~~

~~years, and retired to his country house near Franeker, in order uninterruptedly to carry on his studies, In 1763, however, he accepted the professorship of medicine, surgery, and anatomy at Groningen, and continued in the chair for ten years. He then returned to Franeker, and after the death of his wife in 1776 spent some time in travelling. He made the acquaintance of Diderot and Marmontel at Paris, and was received with great respect by Frederick the Great at Potsdam. In 1762 he had been returned as one of the deputies in the assembly of the province of Friesland, and the latter years of his life were much occupied with political affairs. In 1783 he was nominated ta a seat in the cauncil of state, and took up his residence at the Hague. His death (7th April 1789) was caused by a violent pleurisy, the effects of which were accelerated by political excitement. Camper's works, mainly memoirs and detached papers, are very numerous; the most impor- tant of those bearing on comparative anatomy were pub- lished in 3 vols. at Paris in 1803, under the title Guores de P. Camper qui ont pour objet Histoire Naturelle, la Physiologie, et Anatomie Comparée. ;~~

~~CAMPHOR is a colourless translucent body, having 4 tough waxy structure, with a specific gravity about. equal to that of water, melting at 347° Fahr. and boiling at 400°. It volatilizes readily at ordinary temperatures,~~

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~~CAM—CAM~~

~~giving off that peculiarly pungent aromatic odour which is characteristic of the substance. It is very slightly soluble in water, to which it communicates its warm cam- phoraceous taste ; but it dissolves with facility in alcohol, ether, fixed and volatile oils, naphtha, &c. In its chemi- eal constitution it is analogous to the solid stearoptines deposited by many essential oils, especially such as are derived from labiate plants. By submitting it to the action of oxidizing agents camphor, C,,H,,O, is trans- formed into camphoric acid, C,)H,,0,, and if the oxida- tion is continued it becomes camphretic acid, C,)H,,O,.~~

~~The greater part of the camphor of Western commerce is obtained by distillation from the wood of a tree, Camphora officnarum, belonging to the Natural Order Lauracee. tis produced most largely in the Island of Formosa, the area of production being a narrow belt of debateable land separating the Chinese settlement from the territory held of the aboriginal inhabitants of the island. The preparation of the product is consequently attended with considerable danger, owing to the mutual jealousies and encroachments of the natives and the Chinese. The crude and primitive process of distillation is thus described by Mr E. C. Taintor in his Zrade Report of Tamsut, 1869 : —" A long wooden trough, frequently hol- lowed out from the trunk of a tree, is fixed over a furnace and protected by a coating of clay. Water is poured into it, and a board perforated with numerous small holes is luted over it. Over these holes the chips [of the camphor- wood] are placed and covered with earthenware pots. Heat being applied in the furnace, the steam passes through the chips, carrying with it the camphor, which condenses in the form of minute white crystals in the upper part of the pots." It is collected and stored in vats to await exportation, during which time it gives out from 3 to 4 per cent. of uncrystallizable camphor oil of a yellowish colour, which has been suggested for use in medicine and the arts in the same way as spirits of turpentine. In addition to the supplies obtained from Formosa, a considerable quantity of camphor is now shipped from Japan. Japanese unrefined camphor is of a lighter colour than that obtained from Formosa, and commands a higher price in the market. Crude camphor is submitted to a process of refining by sublimation from a small quantity of sand, charcoal, iron- filings, or lime. The operation is conducted in glass vessels of peculiar form, to the upper part of which the sublimate adheres. It requires to be conducted with great care on account of the peculiarly inflammable nature of the product, and the heat must be carefully regulated to produce a solid compact cake.~~

~~Borneo camphor, or Barus camphor, is a variety differing entirely in its source, being the produce of Dryobalanops Camphora, and also somewhat removed in its chemical con- stitution and physical properties from the ordinary variety. It is obtained in its concrete form in fissures in old trees, which are cut down and split up in search of it. The tree is a native of the Malay peninsula, and is found chiefly in certain parts of Borneo and Sumatra, Borneo camphor is extravagantly prized by the Chinese, who~~

~~readily pay one hundred times more for this variety than for ordinary camphor.~~

~~A third variety of camphor, scarcely known beyond China, but there called Ngai camphor, has been ascertained by the late Mr D. Hanbury to be the product, in part at least, of Blumea balsamifera. In chemical composition it is the same as Borneo camphor, but differs from it in respect of odour, greater hardness, and higher volatility. In China it occupies in respect of value an intermediate place be- tween ordinary and Borneo camphor.~~

~~_ Camphor is extensively employed in medicine both Internally and externally as a stimulant, but its chief~~

~~medicinal use is in the preparation of liniments, into the composition of many of which it enters. It has a vulgar reputation as a prophylactic, on which account it is in great demand during serious epidemics. It possesses properties invaluable to naturalists and others for keeping furs, skins, and other animal substances free from moths ; and it simi- larly preserves cabinets of insects from attack. A very large quantity of camphor is consumed in India, and gene- rally throughout the Kast.~~

~~CAMPHUYSEN, Dirk Rarartsz (1586-1627), a Dutch painter, poet, and theologian, the son of a surgeon at Gorcum, was born in 1586. As he manifested great artistic talent, his brother, in whose charge he was left on the death of his parents, placed him under the painter Govitz. But at that time there was intense interest in theology; and Camphuysen, sharing in the prevailing enthusiasm, deserted the pursuit of art, to become first tutor of the sons of the lord of Nieuport, and then minister of Vleuten. As, however, he had embraced the doctrines of Arminius with fervour, he was driven from this post, and suffered much persecution. His chief solace was poetry ; and he has left a translation of the Psalms, and a number of short pieces, remarkable for their fresh- ness and depth of poetic feeling. He is also the author of several theological works of fair merit, among which is a Compendium Doctrine Sociniorum ; but his fame chiefly rests on his artistic power. His pictures, like his poems, are mostly small, but of great beauty; the colouring, though thin, is pure; the composition and pencilling~~

~~are exquisite, and the perspective above criticism. The best of his works are his sunset and moonlight scenes and his views of the Rhine and other rivers, The close of his life was spent at Dokkum, where he died in 1627.~~

~~CAMPI, Brernarpino, a pupil of Giulio Campi, who adopted a less ambitious style, but is equal and in some respects superior to his master. Bernardino was born at Cremona in 1525, and began life asa goldsmith. After an education under Giulio Campi and Ippolito Corta, he attained such skill that when he added another to the eleven Cesars of Titian, it was impossible to say which was the master's and which the imitator's. He was also much influenced by Correggio and Raffaelle.~~

~~CAMPI, Grutio, the founder of a school of Italian painters, was born at Cremona about 1502, and died in 1572. He was son of a painter, Galeazzo Campi, under whom he took his first lessons in art. He was then taught by Giulio Romano ; and he made a special study of Titian, Correggio, and Raffaelle. His works are remarkable for their correctness, vigour, and loftiness of style. They are very numerous, and the church of St Margaret in his native town owes all its paintings to his hand. Among the earliest of his school are his brothers, Vincenzo and Antonio, the latter of whom was also of some mark as a sculptor and as historian of Cremona.~~

~~CAMPIAN, Epmunp (1540-1581), a cclebrated English Jesuit, was born of humble parentage at London in 1540. From Christ's Hospital he removed to Oxford University, where he took a degree and became fellow of St John's. He was admitted to holy orders in the English Church, and in 1567 was ordained deacon. Being convinced that he could not assent to the Protestant formulary required by the Church of England, he left Oxford and went to Ireland, where he occupied himself in writing a history of the country. He then joined Allen and others at Douay, and passed his novitiate as member of the Society of Jesus. After residing for a short time at Briinn, Vienna, and Prague, where he taught philosophy and rhetoric, he was sent by Gregory XIII., along with Father Parsons, on a propagandist mission to England. He arrived in England in 1580, and entered on his duties by challenging the~~

~~universities and clergy to dispute with him. In July 1581 he was apprehended along with Parsons and two other agents at Lyford in Berks, and thrown into the Tower, on a charge of having excited the people to rebellion, and holding treasonable correspondence with foreign powers. Having been found guilty, he was condemned to death, and was executed at Tyburn, Dec. 1, 1581, with several others of his order. He is admitted to have been a man of great abilities, an eloquent orator, a subtle philosopher, and able diplomatist ; and he is praised by all writers, whether Pro- testant or Roman Catholic, not only for his talents and acquirements, but also for the amiability of his disposition. A full account of the Jesuit mission in which Campian took part will be found in Froude's History of England, vol. x1.~~

~~CAMPLI, a town of Italy, in the province of Abruzzo Ulteriore I., 5 miles north of Teramo. It has a cathedral, an abbey, and several churches and convents. Population,~~

~~7770.~~

~~CAMPOBASSO, a city of Italy, the capital of the pro- vince Molise, 53 miles N.N.E. of Naples. It is situated on the ascent of the mountain Monteverde, around which it forms a kind of amphitheatre. It is fortified, and con- tains a cathedral, the ruins of a castle, a small theatre, a hospital, and various other public buildings. "The most important industry is the making of steel and cutlery, and there is a considerable export trade in corn. Population,~~

~~14,090.~~

~~CAMPOBELLO, a town of Sicily, in the province of Trapani, 7 miles E.S.E. from Mazzara. In the neighbour- hood are the interesting quarries of Rocca di Cusa, from which the blocks were obtained for the buildings of the ancient Selinus. Population, 5575.~~

~~CAMPOBELLO DI LICATA, a town of Sicily, in the province of Girgenti, and 20 miles E.S.E. of the city of that name, on a tributary of the Salso. It possesses valuable sulphur mines. Population, 6301.~~

~~CAMPOMANES, Pepro Ropricunz, Conve pz (1710- 1802), a Spanish statesman and writer, was born in Asturias about 1710, or, according to other authorities, in 1723. From 1788 to 1793 he was president of the council of Castile ; but on the accession of Charles IV. he was removed from his office, and retired from public life, regretted by the true friends of his country. His first literary work was Antiquidad Maritima de la Republica.de Cartago, with an appendix containing a translation of the Voyage of Hanno the Carthaginian, with curious notes. This appeared in a quarto volume in 1756. His principal works are two admirable essays, Discurso sobre el Fomento de la Industria Popular, 1774, and Discurso sobre la Educacion Popular de los Artesanos y su Fomento, 1775. As a supplement to the last, he published four appendices, each considerably larger than the original essay. The first contains reflections on the origin of the decay of arts and manufactures in Spain during the last century. The second points out the steps necessary for improving or re-establish- ing the old manufactures, and contains a curious collection of royal ordinances and rescripts regarding the encourage- ment of arts and manufactures, and the introduction of foreign raw materials. The third treats of the guild laws of artisans, contrasted with the results of Spanish legislation and the municipal ordinances of towns. The fourth con- tains eight essays of Francisco Martinez de Mata on national commerce, with some observations adapted to present cir-~~

~~cumstances. These were all printed at Madrid in 1774 oe 1777, in five volumes. Count Campomanes died in~~

~~802.~~

~~CAMUCCINI, Vincenzo (1775-1844), the most famous of the modern historical painters of Italy, was born at Rome in 1775. He was educated by his brother Pietro, a picture-~~

~~restorer,and Bombelli, an engraver, and, up to the age of thirty, attempted nothing higher than copies of the great masters, his especial study being Raffaelle. As an original painter, Camuccini belongs to the school of David, His works are rather the fruits of great cleverness and patient care than of~~

~~fresh and original genius; and his style was essentially imitative. He enjoyed immense popularity, both personally and as an artist, and received many honour and preferments from the Papal and other Italian courts, He was appointed director of the Academy of San Lucg and of the Neapolitan Academy at Rome, and conservator of the pictures of the Vatican. He was also made chevalier of nearly all the orders in Italy, and member of the Legion of Honour. MHis chief works are the classical paintings of the Assassination of Cesar, the Death of Virginia, the Devotion of the Roman Women, Young Romulus and Remus, Horatius Cocles, the St Thomas, which was copied in mosaic for St Peter's, the Presentation of Christ in the Temple, and a number of excellent portraits. He died at Rome September 2, 1844.~~

~~CAMUS, Cuartes Errenne Lovts (1699-1768), a French mathematician and mechanician, was born at Crécy- en-Brie, near Meaux, on the 25th August 1699. At the age of twelve he was able to maintain himself by teaching at the Collége de Navarre in Paris, where he devoted himself to mathematics, civil and military architecture, and astronomy. He became Associate of the Académie des Sciences, professor of geometry, secretary to the Academy of Architecture, and member of the Royal Society of London. In 1736 he accompanied Maupertuis and Clairvaut in an expedition to Lapland for the measurement of a degree of the meridian, when he rendered essential service, not only as a geometrician and astronomer, but also by his remarkable skill in the mechanical arts. He died on the 2d February 1768. He was the author of a Cours de Mathématiques (Paris, 1766), and a number of essays on mathematical and mechanical subjects.~~

~~CANA, of Galilee, a village of Palestine, remarkable as the birthplace of Nathanael, and the scene of Christ's "beginning of miracles." Its exact site is unknown, but it is evident from the Biblical narrative that it was in the neighbourhood of Capernaum. By a tradition as old as the 8th century it is identified with Kefr Kenna, and by a more tnodern hypothesis with Kana-el-Jelil. The former lies about 44 miles N.W. of Nazareth, and contains the ruins of a church and a small Christian population ; the latter is an uninhabited village about 9 miles N. of Nazareth, with no remains of antiquity but a few cisterns.~~

~~CANAAN, a geographical name of archaic Hebrew origin, generally supposed to mean “ depression,” “lowland,” and hence fitly applied to various low-lying districts of Syria, viz., Phoenicia (Isa. xxiii. 11; Josh. v. 1, where the LXX. has ris Bowikys), Philistia (Zeph. ii. 5), and the valley of the Jordan (as implied in Num. xiii. 29, of. Josh. xi. 3). It is, however, also applied to the whole of the territory conquered by the Israelites on the west side of the Jordan (Gen. xi. 31, xii. 5; Num. xiii, 2, 17, &e), the boundaries of which are given in Gen. xv. 18 as “ the river of Egypt,” (i.e., the WAdy, or torrent-valley, el-Arish), and “the great river;’ the River Euphrates. Probably the Israelites found the name in use in the Jordan Valley, and,as a part of this was the first district they con- quered, extended it to their subsequent acquisitions. We have good parallels for this extension in the use of Argos for the whole of the Peloponnese, and of Hellas for the mainland of Greece. Of course this theory implies that the original signification of the word had been forgotten, as was so often the case with Hebrew proper names. The Phoenicians likewise accepted the name of Canaan. Heeatzus of Miletus (about 520 B.c.) knew Xva as~~

~~synonym for bowi«y, and the same identification is found in Philo’s Sanchoniathon (Miiller’s Pragmenta Hist. Grec.,~~

~~the remaining members of the Canaanitish group. AS Political described in the early books of the Old Testament, they state.~~

~~vol. i. p. 17, vol. iii. p. 369). St Augustine, too, says that _ the Punic peasants, when asked what they were, replied in Punic, Chanani (ed. Bened., vol. iii. col. 932), and on a coin of the date of Antiochus Epiphanes, Laodicea in the Lebanon district is called “a mother, or metropolis, in Canaan” (see inscription in Schréder, Die phénizische Sprache, p. 275). It is remarkable that there is a trace, and no more, of the extended use of the word Canaan in Egyptian. The town nearest to Canaan, in the territory of the Shasu or Bedawin (lit. Brigands, cf. Heb. shdsah), was called Pa-Kanana (Brugsch, Histoire d’ Egypte, p. 145). An instance of the confusion produced by the. different uses of the term Canaan is supplied by Gen. x.~~

~~15-18, where the list of Pheenician cities is interrupted by the five Palestinian nations, the Hittites, Jebusites, &c. As De Goeje has pointed out, the original writer of the Table of Nations understood Canaan in the sense of Pheenicia—he had probably used a Pheenician chart ; the interpola- tor, in that of Palestine (T'heologisch Tijdschrift, 1870, p. 241). Why Canaan is placed among the descendants of Ham could only be shown by a chart of the world as known to the Pheenicians. Clearly there was a misunderstanding as to the coasts of the Red ; = Movers, Die Phinizier, vol. ii. (1), pp. 4-6; Knobel, Die Vilkertafel der Genesis, pp. 307-810 ; De Goeje, Over de Namen Phoenicié in Kanadén, Amst. 1870. PEK)~~

~~CANAANITES. Only two of the possible senses of the word Canaanite need be here referred to; for the others, see Paa:niciaNns and Puruistines. And as one of these is included in the other, let us pass at once to the Canaanites in the larger sense, 7.¢., the whole group of nations conquered by the Israelites on the west side of the Jordan. The group is variously described. It is some- times said to consist of five—Clanaanites, Hittites, Amo- rites, Hivites, Jebusites (Exod. xiii. 5); sometimes of six, the Perizzites, 2.e., Pagani, being added (Exod. iii. 8, 17, | «xxiii, 23, xxxiii. 2, xxxiv. 11; Deut. xx. 17; Josh. ix. 1, xii. 8) ; sometimes of seven, by including the Girgashites (Deut. vii. 1; Josh. iii. 10, xxiv. 11); once of ten, omit- ting the Hittites, and including the aboriginal Rephaim and _ three Arab tribes, the Kenites, Kenizzites, and Kadmonites (Gen. xv. 19-21). The latter, however, are clearly inserted by mistake, as they only became inhabitants of Palestine, so far as they did become such, as the reward of assist- ance given to the Israelites. There are only two of these nations about whom we have any collateral information— the Hittites and the Aimorites. The former, however, _ Seem also to have been included among the Canaanites by mistake. Historical evidence, both Biblical and extra- "biblical, proves convincingly that they dwelt beyond the borders of Canaan ; and linguistic evidence tends on the whole to show that they did not even speak a Semitic language (see Hirrrres). The latter, too, were not en- tirely homogeneous with the other Canaanitish peoples, if the notices in Deut. iii. 11 ("Og . . . of the remnant of the Rephaim"), cbid. 13; Josh. xii. 4, xiii. 12, may be taken as historical. Perhaps, as Ewald suggests, they were mixed with the aborigines. A Semitic basis seems probable, but has only one linguistic fact in its favour—~~

~~have a general family likeness. They are described as living in a state of political disintegration, the combined result of the Semitic love of independence and of the varied conformation of the soil. Thirty-one of their petty kings are mentioned in Josh, xii. 9-24, including the king of Hazor (afterwards reckoned to Naphtali), whose realm, in Judg. xi. 10, is called "the chief of all those kingdoms." We find, indeed,'a king of Bezek claiming to have enslaved "seventy" of the surrounding reguli (Judg. i. 7), but this is an altogether exceptional event, for which the loosening of authority produced by the guerilla warfare of the Israelites sufficiently accounts. Yet the isolation of the Canaanites can never have been complete. Like the Pheenicians, they will have had their federations, as appears to be implied by the title Baal-berith, or " Baal of the Covenant " (Judg. viii. 33); and hieroglyphic inscrip- tions tell of their alliances with the Khita or Hittites against their Egyptian suzerains. Indeed, the rebellious tendencies of the Syrian states will partly explain the inaction of the Pharaohs during the Israelitish conquest. The only injury Joshua could do to the latter would consist in blocking up the military coast-road to the north of Syria, but this was well secured by Egyptian garrisons, which Joshua did not venture to attack; while to get the Canaanites humbled without any trouble was a clear gain, That the Israelites were not immediately and at all points successful is now universally recognized. The work of many years was con- centrated by tradition on a single great name; yet the Old Testament itself corrects by numberless indications the error of the more imaginative narrative. Thus the kingdom of Hazor, which had been utterly destroyed, according to Josh. xi. 10, 11, emerges again in the more accurate account of Judges (iv. 2, 3). And both Joshua and Judges (not to descend later—see AmorITES) supply evidence for the continued Canaanitish occupation of many parts of the country (Josh. xiii, 13, xv. 63, xvi. 10, xvii. 12, 13; Judg. i. 19-36). The immediate result of the invasion was, not the extinction of the old, but the addition of a new (and yet not wholly new) element, of stronger stuff but less advanced culture.~~

~~II. No doubt the Israelites at first put an end to much Results of of which they could not discern the value, or, to use their the con- own phrase, made it a khérem, a thing consecrated to God 4es*-~~

~~by destruction. The origin of Hebrew literature would not be such a blank if the sacred archives of Kiryath- sépher, or "the Book-city," otherwise called Kiryath- sannah, or "the Law-city (?)" (Josh. xv. 15, 49), had been preserved. Still the attractions of culture were superior in the long run to the dictates of religious zeal. Goodly houses, vineyards, and oliveyards (Deut. vi. 10, 11) were agents more powerful even than chariots of iron. The secrets of agriculture had to be learned from the Canaanites ; intercourse naturally led to intermarriage, and so a new strife arose in the field of religion, in which half the Jewish nation perished utterly, and the other half was only saved by its voluntary submission to a spiritual despotism.~~

~~III. The pages of the book of Judges are full of com- Religious plaints of Israelitish infidelity, which is rightly ascribed by aaiheess the compiler to mixture of blood (Judg. iii. 6). It is true istics an~~

~~Senir, the Amorite name of Hermon (Deut. iii. 9), men- tioned also in an inscription of Shalmaneser (Brit. Mus. | Coll, vol. iii. p. 5, No. 6, 1. 45); personal names like Og~~

~~influence.~~

~~and Sihon may easily have been Semiticized, and the 'name Amorite itseif, being probably descriptive (see AMoRITES), has no ethnological value. They are at all _ events un-Canaanitish in their political capacity, two con- | Siderable states having been founded by them on the east of the Jordan (Deut. iii. 8; Josh. xii. 2; Judg. x. 8, xi, 22). It will therefore be better to exclude Hittites and Aimorites from thie present notice.~~

~~I. It is extremely difficult to draw any distinction between~~

~~that expressions like this of infidelity have only a limited accuracy. As Ewald and Kuenen have pointed out, the final editor of Judges lived in the age of the Exile, when the religion of Yahveh (miscalled Jehovah) had attained its full development. From his point of view, religious approximation to the Canaanites was wilful apostasy, be- cause it involved the effacement of the distinction between physical and moral religion. But of this distinction the Israelites were hardly more conscious than the Canaanites.~~

~~The religions of both nations were based on a feeling for the powers of nature, whether regarded as destructive and awful, as by the one, or as favourable and lovely, as by the other. Thus the one religion was stern and in tendency moral; the other soft and in tendency immoral: there was indeed a difference, but not a clear-cut distinction between them. To come to particulars,—the chief object of Canaanitish worship was the dual-natured god of life and fruitfulness, viz., Baal, or rather the Baal, 7.¢., " the lord," and his consort Ashérah, 2.¢., "the happy," and so "'happy-making, favourable" (as in Assyrian, Salmanu- Asir, "' Salman is favourable"). The masculine form is also probably a divine title, and has given its name to the tribe of Asher, as Gad (" good fortune") to the Gadites. As Movers long ago pointed out, Ashérah is not identical with Ashtoreth or Astarte, whose name is philologically different, and who belongs to another type of Semitic religion. Her symbol was the stem of a tree (Deut. xvi. 21; Judg. vi. 25), though this may have been sometimes carved into an image; that of the Baal probably had the form of a cone, and represented the rays of the sun. It is these symbols which are referred to in the phrase, " the Baals and the Ashérahs" (Judg. iii. 7) ; the " groves" of the authorized version is an evident miistranslation (see in the Hebrew or some accurate modern version, Judg. vi. 25; 1 Kings xv. 13; 2 Kings xxiii. 6). The licensed harlotry which formed part of the worship of Ashérah was profoundly obnoxious to the later Hebrew writers (Num. xxv. ; Deut. xxiii. 18), though, indeed, even the folk-lore of the Israelites shows traces of aversion to its attendant immorality. An illustration of this is furnished in the narrative of Sodom (Gen. xviii, xix.), which can only refer to the later Canaanites. Similarly, another writer (Gen. xv. 16) describes 'the iniquity of the Amorites" as the divine justification of the Israelitish conquest. It is also the subject of a threatening passage in the Levitical legislation (Lev. xviii.), which if composed during the Babylonian exile, as is held by Graf and Kalisch, is a remarkable evidence of the tenacity of pre-Israelitish customs,~~

~~Another characteristic of Canaanitish religion, though far from peculiar to this, was soothsaying. After Israelite prophecy had broken its shell, and~~

~~taken its daring flight into a more spiritual region, its first anxiety was to destroy that rival phenomenon which enslaved the minds of men to gross superstition. Hence the earnest dehortations of Isaiah (ii. 6), and of the writer of Deuteronomy (xviii. 10-14): ae~~

~~There was only one relic of Canaanitish times which the disciples of prophetic religion could not or would not throw aside—the old traditions. For it can hardly be doubted by uncompromising historical critics that some, perhaps many, of the narratives of Genesis are but purified versions of Canaanitish myths and legends. The most obvious examples will naturally be those stories which are attached to localities in Canaan, e.g., Luzand Beersheba. Of course the story of Melchizedek, "the king of Salem," and " priest of the most high God" (Gen. xiv. 17-24), is not one of these, being out of harmony with all our other notices of the Canaanites. It is also easily separable from the rest of the narrative, and may possibly be as late as the Mac- cabean period, and written in honour of the temple and its priesthood, which are glorified by being, as it were, prefigured in the patriarchal age.~~

~~IV. The question has been asked of late, whethera remnant of theold population of Palestine may not stil! be in existence. M. Clermont-Ganneau, following Prof. E. H. Palmer (His- tory of the Jewish Nation, p. 64), answers it confidently in the affirmative. In the fellahin or peasants of the Holy Land he sees the descendants of the Canaanites, who, having~~

~~been reduced to a state of serfdom, were contemptuously over-~~

~~looked by the successive hordes of conquerors. Their strange superstitious customs have been remarked by every close observer, and are evidently survivals of some early form of religion. M. Ganneau also mentions some curious legendary parallels to Biblical narratives existing among them. Dr Thomson (Zhe Land and the Book, pp. 226-8) holds a similar theory about the sect of the Nusairieh in northern Syria, who are equally bad Moslems, but more probably represent the débris of the later Syrian paganism.~~

~~V. We have yet to speak of the ethnological relation of Ethnolo~~

~~the Canaanites and the Israelites. The linguistic evidence points to a kinship as close as that of both to the Pheni- cians. Not only are the personal names of the Canaanites (Melchizedek, Adonibezek, Adonizedek, Ornan or Aranyah, of which Araunah seems to be a corruption) pure Hebrew, but so too are the names of their cities, an evidence of still greater value, as given both in the Old Testament and in the lists of the places conquered by Thothmes III. The latter have been discovered by Mariette-Bey on a kind of triumphal arch at Karnak; they include 119 names belonging to Canaan, of which 75 have been identified with known Hebrew names of places (Mariette-Bey, in Comptes Rendus de VAcadémie des Inscriptions, 1874, p, 243, &c.). The same Hebraic character is apparent in the names given in the "Travels of a Mohar" (see the Records of the Past, vol. ii. pp. 107-116), which have been illustrated, we understand, by the recent explorations of Lieutenant Conder. How, it has been asked, is this conimunity of language to be accounted for? The problem is a real one to those who regard the Table of Nations (Gen. x.) as an ethnological authority, for in that docu- ment the Canaanites are classed separately from the Hebrews among the descendants of Ham. From this, as we believe, antiquated point of view, it becomes necessary to assume that the Canaanites borrowed their language from some of the genuine descendants of Shem. From the Israelites? But they spoke the language long be- fore the Israelite immigration. From an aboriginal Semitic speaking race? But there is no historical evidence for the existence of such a people. We are thus driven to accept the view that the Table of Nations is arranged not on an ethnological but on a geographical principle. The Canaanites will then be classed among the descendants of Ham as belonging, according to the compilers, to the southern terrestrial zone—not, however, the Canaanites, in our sense of the word, for these formed no part of the original Table (see CANAAN), but the Phoenicians. Apart from this mis- understood document there is no difficulty in admitting the affinity of the three nations, the Israelites, the Canaanites, and the Phoenicians, who all appear to have migrated successively from a Babylonian centre (see PH@NICIANS). The last to move westward were probably the Hebrews. They are generally supposed to have originally spoken an Aramaic dialect, but after entering Palestine to have adopted that of the more civilized Canaanites (see Introduc- teons of Bleek and De Wette-Schrader). The only evidence, however, offered in support of this view is Gen. xxxi. 47, where the " cairn of witness " receives a Hebrew~~

~~name from Jacob, an Aramaic from Laban. From this it is inferred that Laban's great-uncle Abraham must, according to tradi- tion, have spoken Aramaic, as if Aramaic were as early @ development as Hebrew, and as if the writer in Genesis had any thought of illustrating philological problems! Of any such event in the history of the Hebrews we have simply no evidence whatever.~~

~~Compare Ewald, History of the People of Israel, Eng. trans., Vol. i, pp. 232-242; Kuenen, Religion of Israel, Eng. trans., vol. 1 chap. 1 (with note) and 4; Movers, Die Phénizier, vol. ii. (1), PP: 61-82 ; Knobel, Die Volkertafel der Genesis, pp. 202, 321, 332-838;~~

~~Clermont-Gannean, 'The Arabs in Palestine," in Maemillan's Mag- azine, August 1875 (T. K.GH~~

~~ANADA, geographically and politically, differs widely from the British colony known by that name prior to~~

~~1867. Before that date the country embraced under the name of Canada included a region about 1400 miles in length and from 200 to 400 miles in breadth, extending from the watershed west of Lake Superior eastward to Labrador. Alongside of it lay the independent British provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland, and beyond it to the north and the west the vast regions abandoned to the Hudson's Bay Company But various causes combined to impress on Canadian statesmen the desirableness of uniting the colonies of British North America into one political confederation. On the cession of Canada to Great Britain in 1763, its French colonists were guaranteed the free exercise of the Roman Catholic religion, and equal civil and commercial privileges with British subjects. Further privileges were secured by "the Quebec Act" of 1774, whereby the old French laws, including the custom of Paris, the royal edicts, and those of the colonial intendants under the French regime, were declared binding in relation to all property and civil rights; while the criminal law was superseded by that of England with its~~

~~trial by jury. The seignories, with their feudal rights and immunities, were also perpetuated ; and thus, under the fostering protection of England, the colonial life of the France of Louis XV. and the regency survived in the "New France" of Canada, unaffected by the Revolution of 1792. But the whole French population at the date of the conquest did not exceed 65,000. From Great Britain, and still more from the older colonies, emigrants hastened to occupy the new territory to the north of the St Lawrence. On the declaration of independence by the revolted colonies in 1776, the loyalist refugees were welcomed by tlie Provincial Government, settled on land in Upper Canada, and aided with funds and farming implements; and these were followed by emigrants from Great Britain. But it was not till 1791 that the rule of a governor, aided solely by a council appointed by the Crown, was superseded by the _ grant of a constitution establishing the Government with an elective legislature. At the same time Upper Canada, with its purely British settlers, was made a separate province from the old French colony of Lower Canada. At this date the population of Lower Canada had increased to upwards of 130,000, and that of Upper Canada was about 50,000. According to the first strictly reliable census of 1811 it amounted to 77,000. Bnt the increase of popula- tion of Lower Canada was in part due to the immigration of British settlers. In 1793 a Protestant bishop of Quebec was appointed by the home Government; and in 1804 a cathedral was erected for him at Quebec, on the site of the old Recollet church. Dr Jacob Mountain, the Anglican bishop, exerted himself in the cause of education. Parlia- ment enacted the establishment of free schools throughout the parishes of Lower Canada, but to this the Roman~~

~~Catholic clergy gave resolute opposition; and in various'~~

~~other ways a spirit of antagonism began to manifest itself _ between the French inhabitants and the British population. The war of 1812 followed; and during the protracted~~

~~struggle on the Canadian frontier till the signing of the treaty of Ghent in 1814, the French and British colonists were united in loyalty to England ; but with the restoration of peace internal political difficulties revived. The legisla- tive and executive councils were at open variance with the popular~~

~~representative assemblies ; and a new element of strife created antagonism between Upper and Lower Canada.~~

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~~The position of Quebec and Montreal gave to Lower Canada a control over the exports and imports of the country; financial misunderstandings arose between the two provinces respecting their rightful share of import duties ; and a proposal, first made in 1822, for a legis lative union between Upper and Lower Canada, was at lertgth carried out in 1841, accompanied by important concessions designed to coufer on the majority of the representatives of the people that influence over the execu- tive Government which constituted the essential element of responsible government in England. But while the British colonists were divided by the old English party lines, the French Lower Canadians, united by local interests, race, and religion, were able to hold the balance of power when- ever the two British parties divided on points of sufficient importance to preclude a compromise. Thus while the advantages of soil and climate, the industry, and the con- sequent wealth of Upper Canada, enabled it to contribute an ever-increasing proportion of the revenue of the united provinces, it frequently received a very partial share in their distribution, and was liable to be outvoted on questions in which both local feeling and local interests were largely involved, 'This condition of things was turned to account in the party contests of the time with an ever-increasing irritation and sense of wrong on the part of the British colonists of Upper Canada, until a common feeling overrode party lines, and matters were bronght practically to a deadlock.~~

~~This it was which led to the idea of a legislative union among the various British American colonies, while reserv- ing to each the control of its own local government; and the common dangers to which they were exposed by results springing out of the great American civil war furnished additional motives to such a union. The leaders of dif- ferent parties representing the various interests of the provinces, after mature deliberation, agreed to the principles of the proposed confederation, and the Imperial Govern- ment responded by giving it the requisite force of parlia- mentary authority. 'The Imperial Act, known as "the British North American Act, 1867," provided~~

~~for the voluntary union of the whole of British North America into one legislative confederation, under the name of the Dominion of Canada. Thus the older provinces have pre- ceded, even by centuries, the Dominion within which they are now embraced, and have a separate history of their own. The Dominion thus constituted consists at present of the old provinces of Upper and Lower Canada, now designated respectively Ontario and Quebec, along with Nova Scotia, New Brunswick, Prince Edward Island, Manitoba, and British Columbia. To it also pertain the territories in the north-west still unsettled, with power to receive them into the confederacy when they acquire the requisite population and organization of provinces. Provision is also made in the Imperial Act for the admission of Newfoundland into the confederacy. It is further provided that the constitu- tion of the Dominion shall be "similar in principle to that of the United Kingdom;" that the executive authority shall be vested in the sovereign of Great Britain and Ireland, and carried on in his name by a governor-general and privy council; and that the legislative power shall be exercised by a parliament consisting of an Upper House, or " Senate," the members of which are nominated for life, by summons under the great seal of Canada, and a 'House of Commons," duly elected by the several consti- tuencies of the various provinces in proportion to the relative population of eacli.~~

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~~The Act of Confederation came into operation on the 1st of July 1867, at which date the provinces of Ontario and Quebec were united to the maritime provinces of Nova Scotia and New Brunswick. In 1870 the newly created province of Manitoba, in 1871 that of British Columbia, and in 1872 that of Prince Edward Island, were succes- sively admitted into the confederation. A lieutenant- governor and council are to be appointed to administer the affairs of the north-west territories, not yet settled or organized into provinces; and thus the whole of British North America has been organized into a united political confederacy under the name of the Dominion of Canada.~~

~~Previous to the confederation of the provinces, Labrador E. of a line drawn due N. of Anse au Sablon, was inde- pendent of Lower Canada, and it still remains politically attached to Newfoundland. The tract of country known~~

~~as Canada till 1867 extended from Labrador westward to the high land beyond Lake Superior, and from the St Lawrence Valley and the great lakes northward to the watershed between them and the Hudson Bay, and embraced an area of 331,220 square miles, lying between the parallels of 41° 71' and 50° N. lat., and the meridians of 57° 50' and 117° W. long. This extensive region, which constituted the most important colony of England, is now included in a Dominion which stretches across the North American continent from the Atlantic to the Pacific Ocean, and embraces an area of about 3,500,000 square iniles. The vast prairie lands of the great north-west, thus embraced within the Dominion, and out of which the province of Manitoba has been already formed, include the most fertile region of the whole continent. Already imunigration is setting steadily in that direction; nor can it be doubted that what has remained till recently a desert, traversed annually by migratory herds of buffalo, and only available as a hunting ground for wild Indians and the trappers of the Hudson's Bay Company, is destined to become the seat of populous provinces, and to constitute one of the chief granaries of the world.~~

~~By the addition of the maritime British provinces, included originally within the Acadie of the old French régime, Canada has acquired an extensive line of sea-coast, indented with bays and harbours, offering the most admirable facilities for every branch of maritime enterprise : and to these will, no doubt, be added ere long the island of Newfoundland, with the command of fisheries unequalled in value either in the Old World or the New. The peninsula of Nova Scotia and the island of Newfoundland form the eastern barriers of British North America, closing the Gulf of St Lawrence, and commanding the Atlantic coast, with its ocean trade and its inexhaustible fisheries ; while Vancouver Island, and the shores of the neighbour- ing mainland, stretch along the Pacific coast, with estuaries, inlets, and well-sheltered harbours, awaiting the develop- ment of the growing trade of the Pacific. There the rivers abound in salmon; the whale fisheries of the neigh- bouring ocean already yield valuable returns ; and the cod, haddock, and other deep-sea fish invite the enterprise of the young province, and guarantee an inexhaustible source of future wealth.~~

~~The people by whom the maritime advantages of the eastern provinces have thus far been enjoyed are peculiarly fitted by origin and training to turn~~

~~them to the best account. In the early years of the 16th century, when France was striving to outrival Spain in the occupation of the New World beyond the Atlantic, hardy adventurers of Basque, Breton, and Norman blood sailed from Dieppe, St Malo, Rochelle, and other French seaports, and divided among them the traffic in fish and furs of the Newfound- land banks and the Gulf and the River St Lawrence. The discovery of Canada, and, indeed. of the American continent,~~

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~~is justly assigned to John ana Sebastian Cabot, who set out from Bristol under the auspices of Henry VIL. of England in 1497, and landed on the coast of Labrador seventeen months before Columbus reached the American mainland, But England was siow to avail herself of the advantages of the discovery. In 1524 Verazzano, a Floren- tine navigator, sailing under the French flag, coasted the new found continent from Florida to Cape Breton, and the whole vaguely defined region was appropriated in thename of Francis I. as "La Nouvelle France." Ten years later Jacques Cartier sailed from St Maio, explored the coasts of Newfoundland, Nova Scotia, and New Brunswick > and for a time the Norman and Breton adventurers enjoyed a monopoly of fish, peltries, and whatever else could reward those pioneers of civilization for their adventurous daring and enterprise.~~

~~By such hardy adventurers the maritime provinces were originally settled, before Britain awoke to the importance of the fisheries and other valuable resources of the New World. But she in her turn contributed an energetic body of colonists, including many of Scottish origin; and the war of independence Jed to a considerable influx of loyalist immigrants from the revolted colonies. War, both then and in 1812, had its usual effect in depressing native industry. but with the return of peace the British pro- vinces entered on a prolonged course of prosperity, very partially affected by the political troubles of 1836-7, or even by the American civil war of 1862 and subsequent years. Half a century ago the population of the whole of British North America was less than 1,000,000; in 1872 that of the four provinces of Ontario, Quebec, New Bruns- wick, and Nova Scotia,~~

~~amounted to 3,485,761; and the population of the Dominion now exceeds 4,000,000 of souls,~~

~~So long as Canada was detached in government and all political relations from the maritime provinces, and embraced only Quebec and Ontario, with access to the ocean solely by the St Lawrence, which is closed for fully five months in the year, it constituted an inland province, sub- ject to many restrictions, and was to a considerable extent dependent on reciprocal relations with the United States for its foreign trade.~~

~~In a " Memorandum on the Commercial Relations, Past and Present, of the British North American Provinces with the United States," submitted to the Government at Wash- ington in April 1874, by Sir Edward Thornton and the Hon. George Brown, as joint plenipotentiaries of Her Britannic Majesty, it is shown that, in the interval from 1845, when a more liberal policy gave encouragement to intimate commercial relations between Canada and the United States, till 1853, the aggregate export and import trade between the two countries rose from $8,074,291 to $20,691,360 ; and at the same time a large amount of the import and export traffic between Great Britain and the provinces was carried in bond over the canals and railways of the United States. The Reciprocity Treaty was nego- tiated by the late Earl of Elgin, as governor-general of Canada, and signed on the 5th of June 1854; and it was abrogated in 1866. In the later years of its continuance the civil war in the United States gave a great advantage to Canada, so that in the last year of the treaty the exports to the States amounted to $54,714,383. Yet even then the balance of trade continued to be in favour of the United States ; and under the operation of the treaty, New York, Portland, Boston, and other American seaports, were so largely used for the trade of the British provinces, that the transportation traffic sent to and brought from foreign countries, in bond, over the railways and canals, and in the ocean ships and steamers, of the United States, became an important element of revenue to their chief lines of transport~~

~~CANADA~~

~~The effect of all this, at a time when jealousies and heart- burnings had arisen out of the American civil war, led American statesmen to over- estimate the value of such facilities to the British Provinces, and even to~~

~~conceive that the abrogation of the Reciprocity Treaty, and the restriction of such facilities, would suffice to create a desire for annexation. Happily, experience has led to very different results. In the '" Memorandum on Commercial Relations," already referred to, it is remarked :—~~

~~'The industry of Canada lad been largely directed to the supply of the American market with commodities for home consumption, as well as for foreign exportation, and the repeal in 1866 of the Reciprocity Treaty, under which so vast a trade had grown up, rendered imperatively necessary prompt measures to open new markets for the sale of Canadian produce. 'hese measures were at once taken. Under the influence of the formal notice given by the United States in 1865, of their intention to terminate the treaty, federation of the provinces, then under discussion, was hurried on, and became a fait accompli within fifteen months after its repeal. The Intercolonial Railway was at once undertaken, at a cost of over $20,000,000, at the national expense, to secure direct connection to and from the Atlantic ocean, at Halifax and St John, on Canadian soil, Commissioners were despatched to the British and other West India Islands, and to Sonth American States, to promote the exten- sion of direct trade between them and the Dominion. he enlarge- ment of the canals, the improvement of the navigation of the lakes and river St Lawrence, the construction of the Bay Verte canal, to connect the waters of the Bay of Fundy and the St Lawrence, the subsidizing of ocean and river steamship lines, and the promotion of the great shipbuilding and fishery interests, all received a new and vigorous impetus.~~

~~'These measures were attended with remarkable success. Only seven fiscal years have passed since the repeal of the treaty, but already the loss inflicted by it has been more than made up, and excellent outlets in new directions opened for Canadian commerce ; with an increasing annual proportion of the vast carrying trade formerly done for the provinces by the railways, canals, aud steam- ships of the Republic transferred to Canadian hands. 'The traffic between the United States and the Provinces at once fell, from an average during the three years before the repeal (according to American official statistics) of nearly $75,000,000 per annum, to an average of $57,000,000 ve annum during the first three years follow- ing repeal ;—the Act of Confedcration, too, removed from the cate- gory of foreign~~

~~commerce to that of home consumption the large interchanges of commodities between the several sections of the Dominion ; and the aggregate foreign commerce of the provinces consequently fell in the first year after the repeal of the treaty to $139, 202,615 from $160,409,455 in the previous ycar. As will be seen from the following statement, however, the trade of the Dominion speedily recovered from the blow, and the volume of its foreign commerce gradually increased until, in the seventh year from the repeal of the treaty, it reached the great sum (for a people of four millious) of $235,301,203,—being seventy-five millions higher than it had ever reached in any year of the treaty's existence :—~~

~~1867. Total exports and imports of Canada~~

~~and Newfoundland …….00 $139, 202,615 1868. oF se 139,595,615 1869, #s La om 142,240,897 1870. 7 arcane. 161,275,538 1871. r Meee | BLOstSo2006 1872. ™ ee. 205,339,943 1873, ie pe eevee. 09095/901, 208~~

~~Total Foreign Commerce in seven years… $1,207,807,817 "~~

~~Thus the immediate effect of the repeal of the Recipro- city Treaty was to draw the British provinces into closer union; while, as appears from official returns, the inter- change of traffic, which from 1820 to 1866 had been largely in favour of the States, underwent so great a change from 1866 to 1873 as to show a balance against the United States, and in favour of Canada, in value $51,875,008. Wheat, flour, provisions, and other articles, which were formerly sold to New York and Boston houses, are now sent through Canadian channels, direct to the Maritime provinces, to Newfoundland, the West Indies, South America, and to Great Britain ; and Canada thus enters into competition with the United States in its own foreign markets. Mr E. H. Derby, special commissioner of the United States Treasury, makes this admission as to the effect of the treaty on a single port:—"The commerce~~

~~of Boston affected by the Reciprocity Treaty exceeds $27,000,000 annually, namely,—imports from and exports to the maritime provinces, $6,000,000 ; outfits aud returns in deep-sea fisheries, $11,000,000 ; imports of wool,~~

~~grain, and animals across the frontier of Canada and entered there, with returns, at least $10,000,000." With the union of the maritime provinces to those on the St Lawrence, Canada has passed from the condition of an inland colony, dependent on the good will or the interested aims of a foreign rival, to the position of the fifth maritime nation of the world. The fisheries more than all else have laid the foundation of the industrial progress of the eastern provinces ; and in the men who now sail their fish- ing fleets Canada has acquired the elements of a powerful marine, which, in any national exigency, will be found to add no less to the defensive strength of the Dominion, than it now does to its commercial enterprise.~~

~~By right of seuiority the province of Quebec claims the first place among the sister provinces of the Dominion, though Nova Scotia may dispute with her the claim of earliest settlement. Among the cities of the Dominion it is probable also that Montreal will retain the pre-eminence by reason of the unparalleled advantages of her geogra- phical position for commercial purposes. In numbers, wealth, and productive industry, however, the foremost rank is at present due to the province of Ontario. Refer- ring to separate articles for a detailed description of each province, we confine ourselves here to what concerns the Dominion as a whole.~~

~~Hxtent.—The Dominion of Canada extends from 45° N, lat. northward to the Hudson Bay, and reaches from the Atlantic to the Pacific Ocean. In superficial extent it is nearly equal to the whole of Europe, and comprises an area of about 3,500,000 square miles. The larger moiety of this, including the territory formerly held by the Hudson's Bay Company, is the property of the Dominion Government. Of this about 120,000 square miles con- sist of prairie lands with occasional scattered groves and belts of trees along the rivers, admirably adapted for agri- culture. A larger tract, consisting chiefly of timbered land, but interspersed with prairies, and well fitted for settlement and farming operations, may be estimated to cover little short of 500,000 square miles. Beyond those two available regions of land, adapted, by soil and climate, for the growth of wheat and other grains, and the rearing of stock, there is a furtlier belt of land, which, though lying in a colder zone, is timbered, clothed with good natural grasses, and as fit for the growth of barley and oats as are many of the less genial regions of Northern Europe which support a considerable agricultural population. This~~

northern belt of timbered land is estimated at little less than 930,000 square miles. All this, as well as much more still uncleared within the various provinces, has to be settled and brought under cultivation ; and out of the great prairie and forest lands of the north-west have yet to be fashioned the future provinces of the Dominion of Canada.

Population.—The population of the whole Dominion in 1871, exclusive of Indians beyond the limits of the provinces, was 3,485,761, but to this has since been added the provinces of British Columbia, Manitoba, and Prince Edward Island ; thereby increasing the population to nearly 4,000,000. To this a large addition has since been made, both by natural increase and by immigration. The entire population of Canada in 1875 was estimated to amount to 4,000,000, exclusive of Indians, estimated at 85,000.

Indians.—In the older provinces of Canada the Indians have long since been gathered together into settlements, under the care of superintendents and other officers of the Indian department, and in some cases, with industrial schools and other organizations for accelerating their pro-

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gress to an equality in all respects with the white settlers. Missions under the care of different Christian churches have also undertaken the work of religious training, and the supervision of their schools. Of the bands of Indians thus settled on their own reserves, accurate statistics are furnished in the annual reports of the Indian Department. But only a vague estimate can be formed of the actual numbers even of the Crees, Blackfeet, Sioux, and other wild tribes which wander in the vicinity of the Red River settlements, or are brought into trading relations with the factors of the Hudson's Bay Company. The following estimate of the Indian tribes throughout the Dominion of Canada is based on the most recent information; and probably forms a fair approximation to their actual numbers :—

OIG Os wes hoes vc asteae coieecias casas cacana eect 14,184 OucbeC Mie dic ccse heater ere ee ooo tic svc esac aslceeee 10,843 Ji @ye) OO e aacegoeenee ace coer leeches aan eaeBee anata. 1,765 INOW

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~~85,301~~

~~Nationalities.—The nationalities of the population of Canada are in some respects peculiar. 'he first settlement made by Europeans, as has been already noted, was by the French navigator Jacques Quartier, or as he is now universally styled, Cartier, in 1535. He explored the coasts of Newfoundland, previously discovered by Cabot, and those of Nova Scotia and part of the Gulf of St Lawrence, and took possession of them in the name of Francis I. For two centuries and a quarter thereafter Acadie and Canada were provinces of France; and when, in 1759, they passed to English rule, a French population of 65,000 souls changed their allegiance. Everything was then done, consistent with British honour, to make the change as easy as possible. They were secured in the un- disturbed possession of their lands, and in the free exercise of their religion. All ecclesiastical property was respected, and the rights of the church so effectually guarded, that the only remnant of a state church in the Dominion is the Roman Catholic church in the province of Quebec, with its great wealth, its control of education, and its right to levy tithes and other church dues from its adherents. The French laws in like manner remaiued intact ; except in so far as the new subjects of England welcomed the substitu- tion of its criminal law, and trial by jury, for the arbitrary rule of intendants and other representatives of an absolute monarchy. By such means the language and customs of the French population of Canada have been perpetuated, and continue to exercise a marked influence on the character of the country as a whole ; though the results of confederation are already tending to diminish this, and to limit the French element to the old province of Quebec. The Canadian population of French descent now numbers 1,082,940; and in the fresh stimulus given in recent years to immigration, strong inducements have been held out to the expatriated inhabitants of the former French provinces of Alsace and Lorraine, to seek a home among the French Canadians of Quebec.~~

~~The other nationalities of the Dominion include in the returns of the last census 64,447 natives of the United States in the four provinces of Ontario, Quebec, New Bruns- wick, and Nova Scotia, who may be assumed to comprise immigrants of English, Scottish, and Irish descent, with an undetermined foreign element. Besides those the Irish population of Canada now amounts to about 850,000, the English to upwards of 700,000, the Scotch to 550,000, the Germans and Dutch to upwards of 230,000, the mixed race of African descent to nearly 22,000; the Welsh to 7800; Swiss, 2962; Norwegians, Swedes, Danes, and~~

~~Icelanders, 7000 ; Italians upwards of 1900 ; and Spaniards 900. The abrupt emigration of the Icelanders from then remote Arctic home, consequent on recent volcanic disturb- ances, along with other causes, has led a number of them to seek a home in Canada. The Mennonites, a Russian sect holding opinions closely allied to the Quakers jn reference to bearing arms, have left their homes in large bands, and many of them are settling in Manitoba, and other parts of Canada. Added to all those, have to be taken into account the miscellaneous elements of the new population of British Coluinbia,— Greek, Mexican, Spanish, French, German, Chinese, and Japanese ; in addition to~~

~~-which the native Indian population constitutes an impor-~~

~~tant elenent. The mixture of Indian and White blood has been considerable in the older provinces, and cannot fail to affect largely the population of Manitoba and the North West. Nevertheless in Canada, as in the United States, British race and British institutions alike predominate, and give a tone and character to the people, the influence of which increases after a few generations, as the foreign element is gradually absorbed into the prevailing stock, The peculiar geographical position of Canada, in imme- diate proximity to the United States, places it in very different circumstances from Australia, New Zealand, and other British colonies, in reference to immuigration, With thousands annually sailing to New York and other United States ports, yet destined for Canada, and many more selecting the route by Liverpool and Quebec to the Western States, it is only by the definite returns of the decennial census that the actual results of~~

~~immigration can bedetermined. The following tabular statements compiled from the official reports of the Minister of Agriculture for the Dominion, to whose department the charge of immigra- tion is assigned, and from the returns of emigrant agents and other sources, will suffice to convey some accurate idea of the rapid increase of the population from this source. The first table shows, in column I. the total number of emigrants from Europe who landed in the St Lawrence during a period of eight consecutive years, from 1866 to 1873. Column II. shows the number of immigrants entering Canada at all points, in so far as they came under the cognizance of immigrant agents, or other Government officials, who were reported to have settled in the Dominion. Column III. shows the numbers who gave a preference to the route by the St Lawrence, and, arriving at Canadian ports, proceeded from thence direct to the United States. The increase in the number of immigrant settlers in Canada within the above period, it will be seen has been five-fold. In reference to the third colunin there is a compensating element in the fact that, not only many of the better class of emigrants who seek a home in Canada choose the route by New York, and so enter the provinces overland, but the Minister of Agricul- ture draws special attention to a feature in the returns, showing a direct emigration from the United States to Canada. This is liable to be affected largely by the con- ditions of trade and industrial progress in either country. In 1873 the number of immigrants from the United States to Canada amounted to 8971 persons.~~

~~Year. IF 106~~

~~1866 28,648 10,091~~

~~1867 30,757 14,666 1868 34,300 12,765 1869 43,114 18,630 1870 44,475 24,706 1871 37,020 27,773~~

~~1872 34,7438 36,578 1873 36,901 50,050~~

~~Total | 289,958 195,259~~

~~388,720~~

~~The character of the above Canadian immigration as an addition to the industrial population of the Dominion may be partially tested by the following classification of the occupations or trades of the heads of families and other adult males who landed at Quebec during the last-named four years.~~

~~Occupations. 1870. 1871. | 1872. 1873. BPEOTOES os ops cneeseseesee aes 4,144 | 2,989 2,336 | 1,470 Labourers …. Rs | 12,248 | 11,465 6,189 6,202 Mechanics……. ceases yale 1,674 6,809 7,662 Clerks and Traders…..... 146 89 79 62 Professional Men…..... 10 4 14 |~~

~~(ee 18,265 | 16,221 | 15,427 | 15,403~~

~~In the year 1872 the total number of emigrants who sailed from British ports, both to the Colonies and to foreign states, amounted to 295,213; but 26 per cent. of the whole were foreigners, availing themselves of the route through Great Britain to their final destinations,~~

~~Climate.—The variations. of the Canadian climate are less than in many countries of much smaller extent. But throughout nearly its whole area, Canada is characterized by greater heat in summer and a much lower temperature in winter than in corresponding European latitudes. Its general character is level, though it includes the Rocky Mountains, with the picturesque and diversified region lying between them and the Pacific, and the Laurentian range, continued northward to the Arctic Ocean.~~

~~Besides the great lakes which find their outlet through the St Lawrence to the sea, there are thousands of lakes~~

~~throughout Canada, many of them of large dimensions. Foremost among those is Lake Winnipeg. 'The two great branches of the Saskatchewan take their rise in the Rocky Mountains, and after uniting their streams, flow into this lake, which also receives the Assiniboin, the Red River, and other smaller rivers. The St Lawrence and the great lakes, of which it is the outlet, are estimated to contain 12,000 cubic miles of water ; and the Niagara Falls, which constitute the main feature in the descent from Lake Erie to Lake Ontario, are on a scale commensurate with this vast fresh water system of rivers and lakes. The River Niagara issues from Lake Erie in a broad,~~

~~tranquil stream, varying in breadth from one to three miles, and continuing through a course of about 15 miles, with a fall of little more than a foot per mile. But on reaching the rapids, the descent is suddenly increased to about 80 feet in less 'than a mile, before the waters reach the grand leap of about 165 feet perpendicular over the great falls. The Horse-Shoe Fall, on the Canadian side is upwards of a third of a mile broad. Between this and the American Fall Goat Island intervenes; and then another volume of water, about 600 feet wide, plunges with like abruptness into the abyss below. The great breadth as compared with the height of the falls tends in some degree to mislead the eye in the first impression produced; and it is only by slow _ degrees that the mind is brought to an adequate estimate of _ the grandeur of the scene. Sir Charles Lyell thus describes the effect produced on his mind, at a first glance, and after prolonged study of all their remarkable features —"' We first came in sight of the Falls of Niagara when they were about three miles distant. The sun was shining full upon them—no building in view—nothing but the green wood, the falling waters, and the white foam. At that moment they appeared to me more beautiful than I expected, and less grand ; but after several days, when I had enjoyed a nearer view of the two cataracts, had listened to their thundering sound, and gazed on them for hours from above and below, and had watched the river foaming over the~~

~~rapids, then plunging headlong into the dark pool, and when I had explored the delightful island which divides the falls, where the solitude of the ancient forest is still unbroken, I at last learned by degrees to comprehend the wonders of the scene, and to feel its full magnificence." The river passes over the centre of the Horse-Shoe Fall in a solid column of water of 20 feet; and it is estimated that fifteen hundred millions of cubic feet pass over the falls every mirtute. This great water system of rivers and lakes affects the climate of the older provinces of Canada ; aud the other large rivers, with the numerous bodies of fresh water distributed over so large a portion of the whole surface of the Dominion, help to preserve an equable climate, and afford many facilities for local transport.~~

~~Reckoning Lake Erie and Lake Ontario with the Niagara River as parts of the St Lawrence, the river system trends in a N.E, direction throughout the whole course from Point Pelee, which is situated in 42° lat., to Tadousac, the earliest French trading port, at the mouth of the Saguenay, in 48° 2' lat. From this the coast still continues to trend north- ward till it merges in the inhospitable shores of Labrador, in a latitude. which is still as far south as London at the Strait of Belle Isle. The degrees of latitude indeed, are a very partial guide to the character of the Canadian climate as compared with that of the British Isles; and any state- ment of the mean temperatures of the two is deceptive. The severity of the winter, as tested by the thermometer, leads to a very exaggerated impression of Canadian experiences. Owing to the dry, clear, bracing atmosphere which generally prevails, the sense of discomfort produced by the raw easterly winds and damp fogs of an English spring suggests an idea of cold, such as is rarely thought of in a Canadian winter. There are indeed, every winter, a few days of intense cold, as in the summer there are brief periods of equally intense heat, when the thermometer ascends, or descends, through a scale unknown in the more equable English climate. But throughout the greater part of the winter season in Canada the sky is bright and clear, and the weather thoroughly enjoyable. Open sleighs are in use by all. Sleighing parties of pleasure are arranged for the period of full moon, that they may return home over the snow, after an evening's enjoyment at some appointed rendezvous; skating, snow-shoeing, and other outdoor exercises are in universal favour; and the sound of the sleigh-bellsin the open thoroughfares adds tothe exhilarating — sense produced by the pure bracing atmosphere. Snow accordingly brings with it no such ideas of discomfort as are associated with it in England ; while by the farmer it is hailed as altogether beneficial. In the province of Quebec the snow begins to lie early in November; in Ontario it is fullya month later; and it differs correspond- ingly at various localities throughout the Dominion. But everywhere the appearance of the snow is hailed as season- able and beneficial. It protects the wheat sown in autumn from the frost, affords facilities to-the farmer for bringing his produce to market, aids the lumberer in collecting the fruits of his labour in the forest at suitable points for transport by water with the spring freshets, and so con- tributes alike to business and pleasure.~~

~~The following tables, carefully prepared from official reports transmitted to Professor Kingston, director of the Magnetic Observatory, Toronto, from the chief stations throughout the Dominion, supply reliable data for determining the temperature and climatic changes at the most important points throughout Canada and Newfoundland. In the column of first frost at Montreal, as shown in the last of the tables, the dates for the years 1872, 1873, and 1874 indicate the first fall of the thermometer to 32°, while the earlier dates mark the first hoar frost of the autumn.~~

~~IV.—97~~

~~770 CANADA~~

~~Mean Temperature (in degrees Fahr.) for each Month and for the Year in the several Provinces, and for certain Stations in the Dominion of Canada. :~~

~~| Jan Feb. | March. fa April | May. | June. A July. } Aug. Sept. | Oct. | Nov. Dec. | Tala |~~

~~| ee — - ——— | ——— --- | . — - ——— - | — _--- ———] — we |---|] —~~

~~© ° ial 5) ° ° ° ° ° 3 | 5)) o an UEOY sas: a 19°3 | 20°2 | 26°7 42°6 | 54:4 | 65°6 | 69°8 | 68:1 | 58°6 47°4 | 33°0 | 20°5 |: 48°8 Quebec ,... soovewesceovee|t DORE | UbsO) Bbc8 |. AB S459) C620! | iO | 681 | e587 | B70) |) soe | 42°6 New Brunswick ..... 161 | 18:1 | 26°4 | 37°6 | 46-4 | 57°7 | 62°83] Gl:'4 | 542 | 45°1 | 32°3 | 19:8 hime ROVER CCGA ...0..-.2.0% os I 223} 2172 |}! Bey | 35°9 | 44:6 | 56°6 | 63°3 | 62°9 | 56°4 | 48:2 | 36°5 | 25°5 || 41-7 Prince Edward Island..... 20054 Lay | O76 |) BB | 46:2 | 54:0 | 64:3 | 62°7 | 57-2 | Bod || 32:7 | e809 40°5 Maniit@bae..2ss.. 29% . eR 2°9 3°0 9°0 | 80°2 | 51°2 | 68°6 | 65°9 | 64:8 | 51°38 | 40°0 | 14°6 0°6 ||| Sam British Columbia…,..... | 22°38 | 28°38 | 40°8.; 51:9 | 59°9 | 64:5 | 72°2 | 70°7 | 61-4 | 49°3 | 80°0 | 24:5 | agai Newfoundland ..... | 25°6 | 22°7 | 28:7 | 38°3 | 48°0 | 50°7 | 60°3 | 60°21 | 55:8 | 49:6 | 38°0 | 28:9 |) aie WROTONOL, <1 ccvs cose coecs cece | 22°9 | 22°9 |} 29°38 | 41°0 | 51-7 | 61°7 | 67°4 | 66:2 | 581 | 45-9 | 386'2 | 25°7 44°} Miombnealyea.. saeeen euceooee 16°38 | 18°6 | 26:9 | 43°5 | 57°2 | 66:4] 72:2] 69°8 | 60°8 | 47°5 | 33°6 | 18°9 44°3 St John, New Brunswick..|| 18:4 | 21°4 | 27°8 | 38:2 | 46°7 | 54°7 | 59°7 | 59°5 | 54°5 | 45°6 | 35°7 | 22°8 40°3 IB oil Beatie~~

~~caresses eaaiasns seagee | 22:8 39) 37 a 28°1 | Bo°]| af | 59"7 | 63%" | Gers) | 7e4 | 48°3 | 37°8 | 25°8 | 42°]~~

~~Averages of the [Highest Temperatures in each Month and Year for various places in the Dominion of Canada from three or more years.~~

~~|~~

~~t Jan. Feb. | March.| April. Oct. Noy. | Dee.~~

~~ONTARIO, * x * * “ bf ‘ z — . 4 WOOO! «6; <5 eeeasacsascleae 43°9 44-4} 51°9 | 67:2 | 76°21 86:1 |; 89°2 | 86:0 | 81:2 | 68°6 | 56:9 | 47°3 ott GodeHich,. ... gesc.cuessees 45°1 | 46:2 | 52°38 | 72°8 | 78°5 | 86°6 | 87°0 | 86°2 | 81:2 | 72°3 | 57-2 | 44°6 ff 89-1 WHnGSOR c.....c00.09->-00 ah 48’O |} SSH | 58°H | 78°6 | 83°6 | 92:0 | 98°6 | 92°6 | 89-1 | 78°6 | 61°8 } 48°4 # 967 Woodstock …..... OE ace 47°3 } 51°2 | 52:0 | 77°5 | 85°5 | 89:6 | 89°6 | 90°9 | 85°6 | 73:1} 50:9 | 41-2 92‘8 | Barrie sesvescscesveeel] 46°7 | 47°38 | 55°7 | 73°6 | 81°3 | 87-1 | 91-6 | 88°5 | 89°2 | 78-4 | 68:6) 46°41 Gane Peterborough ……. 43°3 | 45°8 | 50°5 | 72°3 | 83:2 | 90°5 | 92°2 | 91°3 | 86:8 | 73°6 | 56°8 | 43°9 || 94:9 P@m WROWG ..... 15… ese cee 40°9 } 44:9 | 55°8 | 68°9 | 87:4 | 93°9 | 98°8 | 88°7 | 84:2 | 75°41 57°3 | 40°7 Tt 95-1 QUEBEC. Mronitmeal 22… eves 40°7 | 43°83 | 52°8 | 73°8 | 87°1 | 89°9 | 92°3 | 90°1 | 84:1 | 79°9 | 58°83} 44:6 |} 961 GQireliec. seem. casunsnis 38‘2 | 37°6 | 48°7 | 61°4 | 81°9 | 90°2 | 89°6 | 82°5 | 78:9 | 69:2 | 46°4] 388-8 || 90°86 Nirw Brunswick. ac) |(5,)01 40°8 | 41°0 | 45°8 | 56°8 | 67:2 | 75°4 | 78:6 70°6 | 60°6 } 54:2 Beata Ri Vial © .c2iee .cttes 42°0 | 39°9 | 48:0 | 56°1 | 77°8 | 88:0} 87-1 78°5 | 69°4 | 56:9 Nova Scorta. 1S Tie ae eee ae Se oe “4 52 | G3°6ut 78-8 it 83:2 48°3 |} 88° Glace Bay, C. B… ..... wer 47°2 | 57°0 | 70°4 | 80°0 48°2 || 86°7 HONEY... 22Siae cee seas. : 49°2 | 57:2 | 75-4 | : 48‘1 || 85:6 PriIncE EDWARD ISLAND. ‘ Charlottetown ……. 491 | 52°6 | 74:7 | 786 45-0 | 87-0 MANITOBA. Winnipeg ……cc.c. veces 82°8 | 30°0 | 96-1 BRITISiZ CoLuMsia. | Spence’s Bridge,) ..... 87-4 | F | 45-3 || 96-7~~

~~Thompson River~~

~~Averages of the Lowest Temperature in each Month and Year for various places in the Dominion of Canada Srom three or more years.~~

~~t March. | April. | May. | June. July. | Aug. | Sept. |~~

~~ONTARIO.~~

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~~Goderich Windsor Woodstock Barrie Peterborough Pembroke QUEBEC. Montreal 0.288 inanates Que eCweran. os:...ceeneee New Brunswick.~~

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~~Bass River Nova Scoria. Halifax .. Glace Bay… Sydney Princr Epwarp IsLAnp. Charlottctown MANtETOBA. Winnipeg Bririsu CoruMBia. Spence's Bridge…....~~

~~ph Wi COCO ODP OOOO SW NO BAAUADEL © Go PP PA PRP RRR IO AWM RWANDA 2S AR KRNYANORA Sao RA SSHOESdOHO~~

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~~| 2°8 | 2-7 |~~

~~47°0 | 53-0~~

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~~CANADA 771 Monthly and Annual Rainfall in Inches for various places in the Dominion of Canada from three or more Years.~~
~~~~

~~| Jan Feb. | March.| April. | May. | June. | July. Aug. Sept Oct. Noy, Dec Year, Toronto "CQ ECORCODECEOU EOC 1:23 | 0°89 | 1°62 | 2°44 | 3°25 | 2°98 | 3°25 |) 8:02] 3:72 | 2:39 | 2°98 | 1°65 || 29-42 Goderich Meliss « ecisisia eens 0°66 | 0°55 | 1°39 |] 1°81 | 3°38 | 2°39 | 2°94] 2-78 | 3:28 | 2°46} 1°44] 0°84 |) 23-99 ans) re | 1°19 | 1°14 | 1°56 | 1°87 | 3°63 | 3°15 | 2°41 | 2°14] 1°69 |] 1°76 | 2°42 | 0°82 || 23-78 Woodstock etna 0°59 } 0°58 | 1°31 | 1°60 | 3°04 | 2°45 | 2°96 | 4°41} 2°93 | 2°64] 0:95 | 0°82 |] 24:28 ISSRICy HER. . cee. 228. vetls O°OL | O18 | 1°12 | 1°66 | 2°84 | 2:37 | 8°01 | 2:28 | 2°84 | 2:35 | 1°42 | 0°63 11 20-71 Peterborough ……. 0°64 | 0°36 | 1°01 ; 1°89 | 1°96 | 2°08 | 2°45 | 2°60} 3:22 | 2:98 | 1°81 | 0°65 || 20°55 IREMMOTOWKE .. s:i5 «ssiehaiiaiee on O15 | 0°15 | 0°56 | 1°33 | 3°06 | 2°28 | 2°51 | 2:36] 3:21 | 2:58 | 1:09 | 0-21 || 19°49 i oni err 0°64 | 0°42 |] 1°41 | 1°30 | 2°26 | 3:01 |] 2:26 | 3°62] 3:9 3°75 | 2°66 | 0°85 |) 27°26 (dad 8 i ae 0°25 | 0°00 | 0°42 |] 1:17 | 2°52 | 1:11 | 2°52) 4°27 | 2°81 | 2°89 | 0°95 | 0:00 | 19-26 St John Sik Misee seek 2°18 | 2°86 | 2°23 | 3°14 | 4°51 | 3:00 | 3°45 | 38°89 | 4°38 | 4°68 1 5:38 | 2°67 || 33-97 Bass TU Ci a ssreea acinar' 1°30 | 0°61 | 0°92 | 2°18 | 2°83 | 3°30 | 2°58 | 8:77 1 2°58} 4°88 | 3°78 | 1°15 |i 29°78 eitax ….. 1… hossosgadeer 3°66 | 3°39 | 2°91 | 3:10; 4:17 | 3°04 | 2°37 | 3°61 | 3:69 | 5:02 | 4°68 | 3°44 | 43°08 Giace Bay, C. Ts. ..c.0:.s 4°29 | 4°35 | 3°96 | 4:22 | 3°49 | 4°50 | 3:95 | 4:27 | 5°37 | 6:44 | 5°69 | 4:96 |] 55-49 "WiC Cena eee 3°49 | 3°16 | 2°20 | 4°03 | 3°46 | 3°16 |] 3°42 | 5:07] 5°48 | 5:04] 6°88 | 4:03 || 49°42 Charlottetown coe 2°27 | 0°68 | 1°12} 0°97 | 2°44 1 8°79 | 2:92 | 8:48 | 3°94 1 4:62 | 2°46 | 1:06 || 29°75 Winni oe elas Mis: oc 0°00 | 0°00 } 0°38 | 0°80 | 2°72 | 3°84 | 2°75 | 2°12 | 3°73 | 0°54 1 0:00 | 0°00 |] 16°88 Spence's Bridge ……. 0°08 | 0:19 | 0°00 | 0°21 | 0°78 | 0°81 | 0°25 | 0°47 | 0°32 | 0:20 | 0:37 | 0:20 || 3°88~~

~~Average Fall of Snow in the several Provinces of the Dominion of Canada, with the number of Days' Snow, and number of Days' Rain.~~

~~Depth of Snow in inches. Total~~

~~Snow | No. of | No. of~~

~~in Days' | Days~~

~~September! October. [November.|December.| January. | February. | March April May. {|Season.| Snow. | Rain.~~

~~BEALIOM cecesie sce… ace 29 13°5 20°1 25°1 14°9 19°9 2°2 Ss 95°9) 58 89 |~~

~~PURGE: His 044%, 840 0800s ee 2:0 13°9 23°2 31°8 16°4 175 | 68:8 1°4 115°0 60 94 New Brunswick ….. aise 1°3 HG 31°9 19°2 19°6 15°83 10°2 0°8 {1108:‘4) 58 | 107 Nova Scotia…..:..... me 0°8 4:0 21°9 17°6 18°9 11°8 13°3 il. O24) tbe) | aal7 Prince Edward Island Bes Pe 12°5 26°9 15°6 22°1 17°6 172 0°5 112°4) 78 | 129 BHEMICOWA! vy. sskdessseves 31 4°8 _ Wc 8°9 7°4 13°4 9°7 3°6 0°0 62‘5| 59 62 British Columbia ….. wits ® 6°0 87 10°0 i539) 3°3 8 0°0 83°5 | 27 66~~

~~As will be seen from the previous tables, January and February are the coldest months of the year. Throughout the whole of Canada steady sleighing is reckoned upon during those months. In Quebec and in Manitoba a longer period of sleighing can be relied upon. In Nova Scotia, New Brunswick, and Prince Edward Island, and also on the Pacific coasts, the temperature is modified both in summer and winter according to vicinity to the sea, Abrupt changes of temperature occur both in summer and in winter. A period of great cold early in the month of January is~~

~~TORONTO. MONTREAL,~~

~~First Snow. First Frost. | Last Snow. | Ice Icft Bay. First Snow. First Frost. Last Snow. {Ice left River: October 20 | September April 27 | March 29 |) November 27 | October 5 | April November 10 A » 20! April 8 35 iy rr 14 ee! October 25 ‘, May 8 | March 24 || October 25 00 2 * 8 November 11 — 13 4 20 | April 17 $5 17 | September 17 » 16 October 25 × 12 », 10 | March 31 0 24 — 12 sy «Oo~~

~~Be 16 > 19 | April 29 | April 8 AA 15 =f itil we 00 ap ily oS 28 | May 8 6 OG — 24 | August 9 Saul 3 80 ry 22 35 =~ C80 », 19 || November 1 a 26 | May 31 re 28 i 21 » 10] March380 || October 20 | September 7 | April 27 . 8 $ 18 | April 25 », 27 || November 4 | August 25 622 _ 19 49 6| June 41] June 27 || October 20 | October 7 9 wo September 25 ne 21 | April 25 | March 15 || September 29 | September 3 | May 20 October 24 — 22 | May 6 >», 29 || October 28 = 5 | April 17 <5 25 | August 30 | April 23 | Feb. 28 || November 10 | August 24 | May 7 November 8 5 26 | May 5 6 J 4 11 | October 24 9 2 October 8 | September 17 | April 18 | March 2 || October 8 | September 26 |~~

April 18 4 26 o iy Af BY Aol os 28 | October 21 sop ed es 31 * 15 > 28 a * 4) September 16 | May 3 Novemoer 4 9 11 | May 2] March 27 || November 5 3 23 5 2 October 16 De 17 | April 23 | April 1 || October 17 | October 24 {| April 23 = 18} August 31] May 1 . 1 || September 27 | September 28 | May 38 November 10 $3 27) April 6 Ke 1 || October 29 es 6 | April 5 October 17 | September 18 yy 2) (PMarch 13 33 18 rs 8 | March 27 3 a5 a 3 $+, we | Apml 9 11 | October 12 | April 24

2

so frequently followed by a complete change that its perio- dicity is reckoned upon under the name of the January thaw. Snow finally disappears in Quebec about the middle of April. In Ontario it is generally gone a month earlier. The table of average fall of snow given above shows its prevalence at various central points in each of the provinces of the Dominion, from October to the end of April. Ploughing usually commences in Ontario about the middle of April, and in favourable seasons is prolonged into the month of December. But throughout the Domi-

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nion, stretching as it does across the continent, and embracing an area nearly equal in size to Europe, the period varies with the locality, and is affected by the vicinity of the great lakes or other local influences. Cattle are turned out to graze in April, feeding in part upon the tender shoots of the spring forest growth, until the appear- ance of the young pasture with the disappearance of the snow. Before the end of July harvest begins; and with the rapidity of growth under the warm Canadian skies, the hay, grain, and root-crops follow in swift succession ; the cleared land is brought again under the plough, and the autumn sowing of wheat is carried on till another abrupt change brings the season to a close. In this way the Canadian climate is marked by the striking contrast of two seasons—summer and winter,—bringing with them alter- nations of fruitful labour and of repose intermingled with profitable industry and pleasure. This characteristic pre- vails with slight variations throughout the greater part of the Dominion. Manitoba presents in this respect no marked diversity from Quebec or Ontario. Spring opens nearly at the same time from Red River to the Athabasca. Early in April the alders and willows of the Saskatchewan

~~country are in bloom; the prairie anemone covers the southern exposures to the very verge of the retreating snow. May there brings with it more of the true summer heat than in the provinces on the St Lawrence. But the nights are cool, and throughout the period of greatest heats, the cool night breezes beget a welcome and refreshing change, accompanied with heavy dews. This protects the cereals from the effects of drought even in the driest seasons, and produces a rich growth of prairie grass, making the climate peculiarly favourable for the stock farmer. The Rev. Professor Bryce, of Winnipeg College, thus writes: "The juncture of the seasons is not very noticeable. Spring glides insensibly into summer, summer into fine autumn weather, which, during the equinox, breaks up in a series of heavy gales of wind accompanied by rain and snow. These are followed by that divine aftermath, the Indian summer, which attains its true glory only in the north-west. The haziness and dreamy fervour of this mysterious season have often been attributed to the prairie fires, which rage over half » continent in the fall, and evoke an eulormous amount of heat and smoke." His own observations incline him to accept this explanation. Winter begins with crisp clear weather, which grows increasingly cold and cloudy. The wind wheels to the north-east, and with it comes the snow, and the long steady winter of the Canadian year.~~

~~The character of the Manitoba winter is thus described by the same intelligent observer :—" The winters of the north-west, upon the whole, are agreeable, and singularly steady. The moccasin is dry and comfortable throughout, and no thaw, strictly speaking, takes place till spring, no matter how mild the weather may be. The snow, though shallow, wears well, and differs greatly from eastern snow. Its flake is dry and hard, and its gritty consistence re- sembles white slippery sand more than anything else. Generally speaking, the farther west the shallower the snow, and the rule obtains even into the heart of the Rocky Mountains. In south-western Ontario the winter is milder, no doubt, than at Red River; but the soil of the north-west beats the soil of Ontario out of comparison ; and after all, who would care to exchange the crisp, sparkling, exhilarating winter of Manitoba for the rawness of Essex in south Ontario."~~

~~But the frosts of spring and autumn, not those of winter, are what the Canadian farmer learns to regard with any dread; and this is still more true~~

~~in reference to the Canadian fruitgrower. But in this respect the north-west climate is exceptional in its character. Frosts are common~~

~~there in the nights of September ; but the fact has been noted by many independent observers, that frost which would injure grain in many other countries, appears to be innocuous on the Red River and the Saskatchewan, Various reasons have been assigned—such as the drynesg of the atmosphere, the heat-retaining character of the goj] and the sudden change of temperature that enables vigorous plants to bear an atmosphere at 20° better than at 35° when the latent heat of the earth and the plants has beep given off. But whatever be the true cause the fact appears to be well attested. The chief lesson which experience has taught the farmer is to sow his wheat early in the spring, so that the ear shall be past the milky stage before the frost comes.~~

~~The climate and other conditions to the west of the Rocky Mountains are necessarily marked by much greater local variations owing to the broken character of the country, with its ravines and deep narrow valleys, Stock raising has hitherto largely occupied the attention of the farmers on the Pacific slope, where the farms are called "ranches," after the fashion of the stock farmers of Cali- fornia and New Mexico. The ground produces both cereals and vegetables where irrigation is resorted to, as in the plains and valleys of those states. But the rich natural grass which abounds furnishes nearly all that ig needed for the profitable raising of stock; and until a large female immigration restores in some adequate degree the natural proportion of the sexes, the rough life of the "ranch," with its "corral," or cattle-pen, will be preferred to the more settled industry of the agriculturist.~~

~~The capacity of the different provinces for profitable industry, and the character of their native productions, will be found set forth in detail in the separate articles on each province. It is vain to attempt any detailed account of the soil and other local specialties of half a continent. The Geological Survey, carried out under the able direction of the late Sir W. E. Logan and his successor Mr A. R. C. Selwyn, has largely contributed to an accurate knowledge of the agricultural capabilities, as well as the mineral resources of the country. Vast areas consist chiefly of loam, with a substratum of~~

~~gravel, overlaid throughout extensive tracts of forest by a rich vegetable mould, the accumulation of ages. The prairie lands are not less available; and they are now being surveyed and explored, alike for the requirements of the settler and for economic and scientific results.~~

~~The Reports of the Geological Survey of Canada embody in this way a readily accessible guide to the resources of the country, and the suitability of its various districts and provinces for settlement. Entire districts of many square miles in extent prove to be composed of alluvial deposits from 30 to 40 feet deep, of soil in places so rich as to bear good crops of wheat for successive years without manure. Others of nearly equal value are found resting on red sandstone, trap, serpentine, limestone, and other strata most favourable for agriculture. There are also, as along some of the rivers, for miles in succession, soils too rich for wheat, others of a good sandy loam, suitable to and requiring the usual English rotations. In many parts, on the other hand, there exist considerable tracts of poor, thin, and stony soils. The Reports of the Geological Survey, in presenting an account of the geological distribution of the various strata, and their agricultural capabilities, will prove of great value to the immigrant, as well as to others interested in the lands of Canada.~~

~~The soil and climate of Canada are such that the country produces a much greater variety of grains and fruits than is usually grown in Great Britain or Ireland. Besides wheat, barley, oats, rye, pease, turnips, potatoes, hemp, flax, hops, and the other ordinary agricultural products of~~

~~England, which are all raised in abundance, Canada grows tobacco, rice, maize or Indian corn, and fruits of warmer climes than the British Islands. The full and steady heat of the summer matures with surprising rapidity the most valuable productions, while the long period of repose of the Canadian winter is not only amply atoned for by the rapid and luxuriant vegetation of the summer, but, no doubt, contributes to such results,~~

~~Fruits and Vegetables.—The fruits of Canada embrace all that are familiar to the English gardener, with others which the summer there is not warm enough to bring to maturity. The finest melons are grown in abundance in~~

~~the open ground. In favourable seasous peaches are plentiful in the Niagara peninsula, and in the south-western portions of Ontario, along the shores of Lake Erie and the Detroit River. The vine is cultivated largely in open gardens. The Isabella, the Delaware, Clinton, and other varieties of grapes attain to perfect size and excellent flavour in the open air; and the manufacture of native wines is now successfully prosecuted to a considerable extent.~~

~~Wild fruits abound in great variety throughout many Canadian districts. The wild vine (Vitis vulpina) is abundant everywhere, twining its tendrils around the trunks and over the branches of the forest trees, and yielding clusters of small grapes, inviting to cultivation. Among the other wild fruits may be mentioned plums, cherries, raspberries, brambles or blackberries, strawberries, whortle- berries, blueberries, gooseberries, black and red currants, juniper berries, cranberries, hickory and hazel nuts, and walnuts. The raspberries ripen in such abundance that euornious quantities are annually preserved and sold both in the Provinces and the United States. The blueberry is also extensively sold ; and the wild strawberry furnishes an agreeable dessert in many parts of the eastern provinces throughout the latter part of July and August.~~

~~Apples and pears are now largely cultivated. The island of Montreal has long been famous for its fruits; and the annual produce of the orchards of Ontario is exported to the States and to Europe. Vegetables for the table are also successfully cultivated in greater varieties than in England, and in such quantities that they are largely exported. The tomato flourishes and yields an abundant crop. Cauliflower, vegetable marrow, squash, French beans, pease, lettuce, spinach, celery, asparagus, rhubarb, and all the more common vegetables are grown in abundance in the older provinces. The climate of Manitoba, notwith- standing its exceptionally low temperature from December to March, gives promise of equally satisfactory results. Professor Bryce, after noting such examples of agricultural produce as that of one old settler who obtained 420 bushels of wheat from 11 acres, and another who by garden culture produced the enormous yield of 134 bushels per acre of oats, thus proceeds: 'These are given both as proof of the capabilities of the country, and of the advantage of careful culture. The ordinary table vegetables are surpris- ing in their growth, and reach a~~

~~prodigious size. The writer has seen nothing in his previous experience equal- ling the vegetable production of the province ; and the late lieutenant-governor, Hon. Mr Archibald, after testing the matter in his own garden, gave the same as his experience."~~

~~The exports of fruit and vegetables, the growth and pro- duce of the five eastern provinces of Canada, for the year 1874, included fruit to the value of $128,904, and vege- tables to the value of $332,068. But while this produce of the finer fruits and vegetables for the table shows exports to the value of $460,972 in a single year, and thus bears evidence to the character of the soil and climate, it conveys a very imperfect idea of the actual produce of Canadian orchards. Apples especially are in constant use at the table. Throughout the southern portion of Ontario~~

~~thousands of acres are planted with fruit-trees, yielding valuable crops of the finest quality, and forming an ever- increasing source of wealth to the farmer.~~

~~Flowers.—The flora of Canada naturally comes in order along with its agriculture and garden produce ; but to deal with the subject effectually would require a botanical – treatise on the whole flora of North America. There is the rich flora of the forest, which disappears with the clearing of the land for purposes of agriculture, and is even replaced in part by an immigrant flora, brought in with the hay and grass seeds of the European settler. Again, there is the brilliant flora of the prairies, which, in the full season of sumnier bloom, are resplendent with blue, scarlet, and yellow petals. The Rocky Mountains, and the rugged slopes of the Pacific province, have also their characteristic flora; while the shallows of the lakes and rivers abound with beautiful aquatic plants, foremost among which is the Nymphea odorata, the magnificent sweet-scented white water-lily, which converts many a broad lagoon into a beautiful floating garden.~~

~~It will better accord with the practical aim of this article, to note that the honey-bee flourishes in all the pro- vinces of Canada; and, as will be seen by the following table showing the produce of a single year, is cultivated with profitable success in the four older provinces :—~~

~~Hives of Bees.~~

~~Pounds of Honey,~~

~~3,038~~

~~5,854 41,295 94,604~~

~~21,374 90,004 648,310 1,239,612~~

~~144,791 1,999,300~~

~~orests.—The forests of Canada abound in fine timber, adapted to almost every variety of useful or ornamental work, and furnishing one main element of wealth to the province. Foremost in point of utility are the white and red pine, annually exported in large quantities to the United States and to Europe. Three-fourths of the square and flatted timber produced in the Ottawa region in 1873 was of white pine. Cedar, red pine, and railway-ties chiefly made of tamarac, were the others which were produced in largest quantities. Pine trees of 100 feet high are not un- common; and instances are not rare of trees greatly exceeding that height.~~

~~The pine prepared for exportation is made into squared timber, measuring from 60 to 70 feet in length; or into waney timber (as it is called when only partially squared or flatted), averaging generally the same lengths though sometimes running to 100, or even 120 feet. For the native market the unsquared log is cut into convenient lengths of from 12 to 15 feet for the saw-mill. The white oak, besides being made into squared timber not greatly inferior in dimensions to the white pine, serves also largely to supply staves both for the English and the West Indian markets. The number of pieces of squared and flatted timber produced in the Ottawa district alone in 1873 was 303,268, and the number of unsquared logs for the same year amounted to 2,024,980. The elm, beech, ash, maple, walnut, cedar, birch, and tamarac are all valuable products of the Canadian forests. The black walnut and the birds'-eye and curled maples are now in special demand in England for cabinet and fancy work. The sugar maple is also of value for the sap which it yields during early spring, from which excellent sugar is made in ever-increasing quantities. The yield of maple sugar~~

~~produced in the four older provinces in 1871 amounted to 17,276,000 Ib. A maple grove, as it is called, . accordingly regarded as a valuable feature on a Canadian arm,~~

~~774~~

~~The value of the immense forests of Canada is becom- ing more apparent every year. The year 1874 was one of reduced exports and imports, as compared with any pre- vious year since the confederation of the provinces. Never- theless the total produce of the forest exported during that year, apart from what was required for use within the Dominion, amounted in value to $26,817,715. Of this timber to the value of $14,928,403 was exported to Great Britain; the United States received to the value of $9,654,890 ; South America to the value of $920,309 ; the British West Indies to the value of $602,487; and the remainder went to the Spanish, French, and Dutch West Indies, to France, Portugal, Belgium, Germany, and Holland, and to regions and colonies beyond the Pacific. Australia took to the value of $60,081; China, $38,024; British and Dutch Guiana, $23,452; and Honolulu, the Azores, South Africa, and other countries, in lesser propor- tions. In addition to all this, the forest produce required for home consumption during the same period cannot be estimated at a less value than $3,000,000.~~

~~Canada is becoming every year more important as an agricultural country. It is exporting not only grain but also cattle to the English market; and when the rich prairie lands of the North West are brought under cultiva- tion its agricultural produce will probably rank foremost in value of that of any nation in the world. But at present the produce of the Canadian forests exceeds in value any other yield of the growth, produce, or manufac- ture of the Dominion. The total value of the exports of Canada for 1874 amounted to $73,926,748; and of this $26,817,715 was the produce of its forests. The import- ance of this branch of native industry cannot therefore be overlooked. The Governments of the different provinces grant licences to those engaged in the timber trade to cut timber over vast tracts of land, under the name of "timber limits." These are in most cases remote from the settlements ; and much ability and foresight are required to make adequate provision for the large bodies of men, horses, and oxen, to be employed in~~

~~cutting down and preparing the timber for the market, and transporting it to suitable points for rafting. Much capital is accordingly embarked in the trade. Hay and other requisites have to be accumulated at suitable stations. Large gangs of lum- berers follow at the proper season. Lumber shanties are constructed capable of accommodating from 25 to 50 men. The structure is made of logs hewn on the spot, and forms a square or oblong edifice surrounded on three sides with the baulks, or sleeping-berths, of the men, while the fourth side is occupied by the dresser or working-table and other requisites of the cook. The centre is open to the sky, and underneath this only opening for light or air a huge wood fire is kept constantly replenished. Over it stretches the crane on which the cook hangs his pot; and thus the fire answers the double purpose of warming and ventilating the dormitory and cooking the food of its in- mates. 'The shanty-cook is an important member of the little community. Salt pork and beef, pease-soup, wheaten bread and tea, with potatoes, white beans, and onions, are the staple of the lumber-shanty fare. As a rule, intoxicat- ing liquors are absolutely excluded; and thus provisioned the foreman selects the proper trees, and lumbering opera- tions proceed throughout the winter. Many thousands of men are busy through the whole winter felling the trees, cutting them into logs, or hewing them into squared timber, and transporting them over the snow to suitable points for floating them down the rivers to the mills, or directly to the place of export. As the rivers are in many places interrupted by falls of a character unfitted to the safe pas- sage of timber over them, large sums are expended in constructing timber-slides ; and on some of the main chan-~~

~~nels, as on the Ottawa, the construction and maintenance of the chief timber-slides are undertaken by the Government,~~

~~It is erroneously supposed by many, who are unfamiliay with the character of the Canadian forest, that the work of the lumberer results in the clearing of the land. Only the finest full-grown trees are selected for the lumberer's axe, and it is calculated that the same district may be gone over by the lumberer every twelve or fifteen years. Hence if the destructive fires which from time to time do such immense injury can be guarded against, and the operations of the lumberer are carried on with due care, under proper~~

~~oversight, there is no reason why the forests of Canada should not remain a permanent source of national wealth,~~

~~In the new clearings in the vicinity of lumbering dis. tricts, the farmer finds a ready demand for all his produce, and employment for himself, his horses, and his oxen during the leisure of winter. In this way the lumbering business helps to promote the settlement of new districts, and attracts a population to localities which otherwise might long remain a wilderness. In free-grant districts, as in the Muskoka region on the Georgian Bay, where new settlers are engaged in their first hard struggle to transform the wilderness into fruitful farms, the earliest savings of the farmer are frequently expended on a yoke of oxen; and thus provided, his services are welcomed by the lumberers, and he can find profitable employment throughout the winter. On the breaking up of the frost in spring the produce of the winter's lumbering is floated down the rivers. There, at suitable points on every available rapid or waterfall, large mills are erected for sawing up the logs, chiefly for the English and American markets. The squared timber for the foreign markets is put together in cribs and run down the rivers to suitable points, where they are formed into great rafts, and so floated down the lakes and rivers, as on the River St Lawrence to Quebec. There they are finally broken up, and shipped for their foreign destinations.~~

~~Few among the many sights which meet the eye of a voyager on the St Lawrence are more striking than one of those floating villages, consisting often of 150,000 cubic feet of timber, bound together into one great raft, with its shanties, its blazing fires, securely kindled on an earthen hearth, and its banners streaming in gala fashion, as it glides along. Much skill is required in piloting these rafts down the great rivers. The cribs floated from the far inland timber limits are collected into what are called drams; each dram has its own gang or division of the raft's crew, and so many drams form a raft. But at every con- siderable rapid the raft is again broken up into its com- ponent parts, and the cribs taken down separately, to be again put together on reaching smooth water. — Thus united, the raft moves onward with the current, aided at times by sail and oar, until it is safely secured within the booms of the great timber merchants in the coves above Quebec. ~ 4~~

~~Animals.—Looking to the native fauna of Canada in an economic point of view, it is abundantly evident that the~~

~~animal life of its seas and rivers is one of its great and Fisheri#~~

~~inexhaustible sources of wealth. Alike on the sea-coasts, in the estuaries, and throughout its great inland lakes and rivers, the most valuable fish abound ; and on the Labrador coasts and those of Newfoundland the seal fisheries are another annual source of wealth. The sturgeon is caught in Canadian waters, frequently weighing from 80 to 100i, the finest salmon abound both in the eastern rivers emptying into the Gulf of St Lawrence, and in those of British Columbia; lake trout is caught in large quantities weighing from 10 to 40 ib; and the smaller rivers and lakes teem with beautiful speckled trout, frequently weigh- ing from 4 to 6 fb. The white fish and maskinonge are~~

~~CAN~~

~~esteemed for their delicacy and richness of flavour ; and the | returns of the fisheries, as given in the separate accounts of _ the various provinces, show the relative abundance of cod, haddock, mackerel, herring, salmon, halibut, white fish, and other produce of the Canadian fisheries.~~

~~The returns of the last census show that in 1871 Canada produced 82,844 quintals of cod and haddock, and 685,272 barrels of fish of various sorts, besides 678,894 gallons of fish oil; and the total value of the produce of the fisheries exported during the fiscal year 1874 was $5,292,368. The quantities here stated are exclusive of the valuable fisheries of Newfoundland, which employ large fleets, and yield a corresponding return from cod, salmon, herring, mackerel, and other fish, from the oil of the whale and cod, and from seal-skins.~~

~~Neither British Columbia nor Manitoba has yet been brought within the provisions of the Fisheries Act; and the total yield of their fisheries can only be approximately estimated. Valuable oyster beds exist on the Pacific coasts of the Dominion. 'The salinon fishery promises, if rightly protected and regulated, to prove a valuable branch of industry. During the year 1873, 195 tons of salmon were canned for export; and 4000 barrels were salted. In the~~

~~great lakes and rivers of Manitoba the white fish are no less abundant; and they constitute an important source of supply of food in certain seasons of the year throughout the whole North West. 'The total value of the yield of the fisheries of the Dominion for the year 1874 was estimated at not less than $11,000,000.~~

~~Canada has been esteemed from its earliest discovery for its valuable fur-bearing animals, and was prized chiefly on this account so long as it remained a dependency ot France. In 1670 Charles II. granted the charter to the — Hudson's Bay Company, whereby they acquired the exclu- sive right of trading with the Indiaus in the vast regions vaguely recognized as surrounding the great inlet from which the company took its name. In 1783 a rival com- pany was established under the name of the North-West | Company, which claimed that, as the Royal Charter of their rivals had not been confirmed by Parliament, all British subjects were free to engage in the fur trade of the North- West The results of the jealousies and hostilities of the two companies played an important part in the early history of Canada, and in the first attempts at settlement on the Red River, which paved the way for the rise of the new province of Manitoba. After many bitter contentions, and after impeding each other's operations for years, the rival companies at length effected a junction in 1821; and the fur trade has since been successfully prosecuted under their joint action, till the acquisition by Canada of the north- west territory as a necessary step towards the prosecution of the plans of confederation, and the formation of new provinces throughout British America.~~

~~There still remains, however, not only a vast extent of unoccupied territory in which for many years to come the hunter and the trapper will find undisturbed sway, but the regions around the Hudson's Bay, and stretching west- ward to Alaska and northward to the pole, must ever remain a shelter for fur-bearing animals, and a resort of the hunter. All the furs collected for the great fur com- pany are shipped to London :—in part from their factories of York Fort and Moose River, on the Hudson's Bay, which are visited by a ship from England every year, and in part from Montreal and Columbia River.~~

~~In the vicinity of Canadian clearings deer are still found _ in abundance, and venison is plentiful during winter in all the markets of Canada. But wherever the deer abound wolves are sure to follow; and wherever they occur sheep-farming is impossible, and their depredations on the farmer's stock make them an object of special dislike. In~~

~~ADA 775~~

~~order to encourage their extermination a premium is paid by Government for the head or scalp of each wolf produced to a local magistrate, and it is not uncommon in new dis- tricts for the settler to pay his taxes in wolf scalps. By this means they rapidly disappear from the neighbourhood of the settlements. The bear is another mischievous native of the Canadian forests. The winter furs both of the bear and the wolf are prized for robes; and their value furnishes an additional stimulus to the extirpation of both wherever the country is settled. Beyond the settlements, in the remote recesses of the uncleared forest, the beaver still abounds. Foxes of diverse kinds (silver, grey, red, and black), racoons, otters, fitches, martins, aud minks are no less abundant. The musk rat is to be met with on all the Canadian rivers; and the red, black and grey squirrels sport everywhere in the forest, and at times even invade the clearings and make free with the farmers' crops. In the more remote regions, now also being invaded by settlers, vast herds of buffalo are met with; and beyond them are the moose, the wapiti, the reindeer, the white Arctic fox and the polar bear, whose haunts are safe from the invasion of the settler, however rapidly the Dominion may extend, and carve out new provinces in the great wilderness of the North-West.~~

~~The total value of the furs exported from Canada in 1871 was $1,633,501. This is distinct from hides and other products of the farm. In the abstract of the valuc of goods, the growth, produce, and manufacture of Canada, exported from the Dominion during the fiscal year 1874, animals and their products are classed under one head, showing a total value of $14,679,169. This includes a classification of farm and dairy produce along with the products of the chase, the chief items of which may be stated as follows, the same being exclusive of all home consumption :—~~

~~Animals and their Produce. Value RCHSOR Ein: ee number 5,899} $570,544 Hipmned Cattle te. sss: cathe aauiines », 939,628 951,269 Sheep~~

rs eneanen », 252,081! 702,504 REWVINTe Mee eeGries — vsrcejns vou vais «1 saueleaeeenes> * 6,983 56,894 AROUUGIAVAT «ccc meet mete es etka cicienaeten tre aasietele elena 79,224 | Pork, Beef, and other meats ……. ewt. 800,003] 2,172,581 BattemiCheese) and!) Hess went. at Bie. ete oes en. 6,731,105 Tardsand! Tallow? seus sscameeeeesavetins alle S92825 488 306, 860 dese belbsy Elanis) an CWE OORS. oper «ajarteornninemeeetans 394,069 Wool ……. oro ctecuctincce ner ee Oe eneee Tbh 2,764,796 983, 846 Furs, dressed and undressed) .....0. eeeseeeeeeeees 1,638,501

Cultivated Land and Agricultural Products,—Canada is pre-eminently a country of yeoman farmers. The land is held in possession and tilled by the settler on his own account ; and with every addition to the numbers of its industrious population fresh acres are recovered from the wilderness, and added to the productive resources and the wealth of the Dominion. The number of persons occupy- ing land within the four provinces of Nova Scotia, New- Brunswick, Quebec, and Ontario according to the census of 1871 was in all 367,862. Of these there were 324,160 owners, 39,583 tenants, and only 2119 farm labourers or servants. Those facts alone suffice to illustrate the striking contrast between the condition of Canada and most of the countries of Europe. By patient industry and frugality it is in the power of every Canadian to become owner of a house, and proprietor of whatever amount of land he can turn to profitable account; while the character of the population resulting from this condition of things checks the accumulation of extensive landed estates in the hands of single proprietors. The majority of the farms are small, tilled by the proprietor with his own hands, with the help of his sons and occasional hired labour in the busy season

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of harvesting. But capital is also successfully applied to farming, and beautiful large stock farms are now entering into rivalry with those of the United States and even of England. The following table shows the extent of holdings, and the subdivision of land :—

MORaeresramd Under…2.2..>cssncest meee meeeesseee 40,281 OME SCONOORACTER...,.. ocuccetesses oe cc eee ener 78,877 on, -eteNOO. 5,

~~..... WR ee 141,300 10O.tteeto. M00″ 5, ..ccptoeeeaee ee 82,176~~
~~FNDOVGR2 00 scestaseesceecte scone te ec ete eee 25,228~~

~~The greater number of occupiers and owners of hold- ings of ten acres and under are to be found in Quebec and the Acadian settlements of the maritime provinces, where a continual subdivision goes on among families under the influence of old custom and the operation of the French law of inheritance. In Quebec the old French seigniories established and perpetuated a large class of landed proprietors with their tenant farmers; and not- withstanding the abolition of the seigniorial tenures in 1854, their influence still survives, so that the number of holders of land above 200 acres is greater in Quebec than in any of the other provinces. The climate and other attrac- tions of Upper Canada tend to secure to it the largest share of immigration ; and the rapidly increasing quantity of cultivated land in the province of Ontario is at once an evidence and a guarantee of the substantial progress of the country. In 1842 the population of Upper Canada numbered 486,055, with 1,927,816 acres of land under cultivation. In 1852 the population had increased to 952,004, and the land under cultivation to 3,697,724 acres. According to the census of 1871 the total popula- tion of Ontario, as it is now called, numbered 1 620,851, with 16,161,676 acres of land in process of improvement.~~

~~Besides the grand staple of the cereal grains, the Cana- dian farmer derives large returns from his crops of hay, clover, and grass seeds, carrots, mangel wurzel, beans, hops, flax, hemp, and tobacco. In 1852 Upper Canada produced 764,476 tb of tobacco, the greater portion of which was grown along the western shores of Lake Erie, and on the peninsula between that and Lake St Clair, where the soil and climate specially favoured its growth. At the same date Lower Canada produced 488,652 ib; but in 1871 the returns for the province of Quebec alone amounted to 1,195,345 ib of tobacco. Hops are cultivated with still greater success ; and flax and hemp are additional sources of profit to the farmer. The value of the hops, flax, and flax seed exported during the year 1874 amounted to$161,908. The following tabular statement of the values of some of the chief agricultural products exported during the year 1874, apart from the amounts retained by Canada for home consumption, will suffice to illustrate the increas- ing value of this important branch of native industry :—~~

~~...- bushels 6,581,217 $8,886,077~~

~~Barley, Rye, and Oats ..... » 4,746,820 4,532,669 Indiant@orn,.....c0.20sceee a 235, 864 81,224 SANS Then so barrels 540,317 3,194,672 sntinaramnentanis,. Ream ie ¥ 53,162 230,820~~

~~ere RoMBEOODE ooo COREOSGL eee sense anne cewt. 782,054 113,256 Flax and other Seeds..... bushels 19,088 12,306 Peas and Beans ..... », 1,807,208 1,526,689 aise see es cloves satay ae eae tons 26,725 293,210~~

~~ssl lois Tale ate /ololaletatctelt atl otsioee ae no ib 169,726 40,177~~

~~ta eee aaa cwt. 13,898 27,992 gener eee tb 125,844 : 3,568~~

~~i ced .. | 460,993~~

~~$19,403,658~~

~~The total value of the grain and other agricultural pro- duce of Canada exported during the year 1874, apart from the produce for home consumption, was $19,590,142, of which Great Britain received to the amount of $9,867,047,~~

~~CANADA~~

~~the United States $8,680,997, and the remainder was~~

~~lig. tributed as shown here :~—~~

~~Great sitet. vis scs cesses. .<< «ce $9,867,047 Ue Sr 8,680,997 MUBBAIGOR © os:cisncah Ioseteaseoedscyee ee 189,600 MEE ODD 55 « cosneen esses cbsuatd dstteg tee $2,000 Miewieun aiid ys. ... .ccccessicesoccocseegunes 595,909 British West Indies..... 37,427 Spanish West Indies..... 000.000. cccecceeeee 29,343 French weet Indien'. .....<RUPEAISETO 2 cellt «hii, 0.0 ce eee 64,164 URGATOUTAN, « «oss vasina Seaviediene ne sso 15812 Brera @Giahias .i…c. cessceedevsdsc oe 15,617 SMD CMNEIIN, . occasssavvunvicesstee ecu 3,123~~

~~{tr eee $19,590,142~~

~~But a false estimate of the actual agricultural resources of Canada is apt to be produced by testing them by its exports. Canada is a country of yeoman farmers tilling their own lands and living in abundance on the produce, The requirements for the table of the farm labourer are ou a scale consistent with the resources of the country. The home consumption is accordingly great as compared with the number of the population; and it is therefore impos- sible to estimate, even approximately, the total annual value of all kinds of produce resulting from agricultural labour within the Dominion.~~

~~Minerals.—The mineral resources of Canada have as yet been very partially developed. Quebec and Ontario are devoid of coal, though both have access by convenient transport to rich coal-fields in adjoining provinces or states ; but the maritime provinces, Manitoba, the north- west territories, and British Columbia are all rich in coal, Other valuable mineral resources are still turned only to the most partial account ; but as the work of the Geological Survey proceeds, new fields are opening up for enterprise every year. The rich silver ores of Lake Superior have already yielded wonderfully valuable results to the miners : and the neighbouring districts are now being carefully sur- veyed. Extensive tracts of gold-bearing quartz are also reported, and Mr Bell, who took the charge of the Geologi- cal Survey on Lake Superior in 1872, states that within the basin of the Neepigon, which extends to about 170 miles in length by 80 in breadth, the upper copper-bearing series obtains the greatest development. Distinct. belts of rock extend from thence along the line of the lake coasts by Thunder Bay to Font du Lac; and in one of those, styled the Lake Shebandowan band, the gold-bearing rock is found. Gold-bearing veins are also reported to occur at Cross Lake on the Red River route; and far beyond the province of Manitoba, a rich copper region has long been kuown on the Mackenzie River.~~

~~As railways are extended, and the great project of a Canadian line from the St Lawrence to the Pacific is gradually made an accomplished fact, the resources of the regions traversed by it will be fully disclosed and turned toaccount. The vicinity of the great coal-fields of Pennsyl- vania and Michigan to Lake Erie and Lake Huron, must always give them an~~

~~advantage in any competition for the supply of Ontario with fuel. But the development of the railway system of the Dominion cannot fail to render its own mineral resources available to a much larger extent, not only for home consumption but for exportation. The Intercolonial Railway has opened up an extensive country to the coal miners of Nova Scotia; and the like results will follow both in the north-west and in British Columbia, when the great coal-fields of those regions are traversed by roads and railways, and their fertile prairies and rich alluvial valleys are settled by an industrious population. At present Canada both exports and imports coal, though~~

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~~the imports as yet greatly exceed the exports. The total produce of the mines of Canada, including coal, exported dur- ing the fiscal year 1874 amounted in value to $3,977,216. _ The following tabular statement shows the present resources of the Dominion, and its dependence on external sources for its supply of coal :—~~

~~Canadian Export and Import of Coal for 1874.~~

~~| Export in Tons. | Import in Tons. |~~

~~INOVANSCOLIE....0.0s000s6c 360,184 67,349 New Brunswick ……..... 6,627 142,503 Prince Edward Island … 219 696 MOE CIN soc cetesscosceveee 656 1,221,158 WEA Os es. 5.00 402s0000ceslee= ee 2,372,250 BVIILODE s.cecses0sseccee see ne 665 British Columbia …….. 50,671 696~~

~~ee 418,357 | 3,805,317~~

~~Trade of Canada.—The abstract of the value of the growth, produce, and manufactures of Canada, as shown by its exports, is classed in the official returns under six princi-~~

~~al heads, viz., the mines, the fisheries, the forest, animals and their produce, agricultural products, and manufactures. The results show, by a comparison with the earlier statistics of the country, the rapid progress it has made in a single generation.~~

~~The trade of Canada at a period not very distant was confined chiefly to the exportation of furs, seal-oil, and timber, little exceeding £100,000 annually. Prior to the year 1759, when the country, with its population of 65,000 inhabitants, was transferred from the Government of France to that of England, the amount of its annual exports was £115,415. The principal trade was furs, in pursuit of which the great forests were traversed by bands of resolute adventurers. A few ships were occasionally built. Agri- culture was neglected, if not actually despised.~~

~~Upon the acquisition of the country, however, by England, _ the cultivation of the soil attracted the attention of the settlers, and the germs of a trade sprung up which has now grown to be one of real magnitude and importance. In 1769 the exports in furs, oil, fish, &c., amounted to £355,000, and the imports in British manufactured goods and West India produce, reached £273,400. This trade employed seventy vessels; about twelve vessels were at the same period engaged in the fisheries of the St Lawrence, and about six were sent to the West Indies.~~

~~In 1799 and the three following years we find compara- tively large exportation of grain taking place. In 1802, 1,010,000 bushels of wheat, 38,000 barrels of flour, and 32,000 cwts. of biscuit were sent abroad. The number of vessels at this period engaged in the trade of the colony was 211, the aggregate burden of which amounted to 36,000 tons. In 1809 the first steamboat appeared in the , harbour of Quebec.~~

~~In 1809, 1810, and 1812, the trade of Canada, benefit- ing by increased duties levied upon Baltic timber imported into Britain, seems to have been comparatively active. In the first of these years 440 vessels, having an aggregate tonnage of 87,825 tons, arrived at Quebec. In 1810 as~~

~~The war which commenced in 1812 between the United States and Britain severely checked the commerce of the St Lawrence, which was greatly dependent upon the Americans. And, notwithstanding that Britain slightly~~

~~ma DA T77~~

~~relieved the import duties on wheat in favour of Canada in 1814, we find that the trade of the colony from 1810 to [820 remained almost stationary.~~

~~The aggregate tonnage which arrived at Quebec in 1820 (a more prosperous year, if shipping be taken as the criterion, than any of the pre- ceeding ten) amounted only to 9697 tons over that of 1810. In 1810, 26 vessels had been built in the colony, and only 7 were built in 1820.~~

~~According to the old system of colonial monopoly, the St Lawrence was rigidly closed against the entrance of foreign vessels, nor was any Canadian vessel allowed to enter a foreign port. The prosperity of the colony during this period of its infancy was believed not to have been materially checked by these restrictions, as the mother country at all times afforded an outlet for its surplus' pro- duce. After the United States had achieved their inde- pendence, their vessels were excluded from the ports of the British colonies; and Canada, as a reward for its loyalty, received the exclusive privilege of supplying the West India Islands with timber and provisions.~~

~~In this manner, as the trade of Canada had been confined and shackled for the supposed benefit of the mother country, so now she was rewarded with compensating privileges to the direct injury of the sister colonies of the West Indies. The United States ports were the natural resorts of the West Indies for timber and provisions, their distance from these being about one-half Jess than the ports of the St Lawrence. But the additional freight, which on such bulky articles constitutes a great proportion of the expense, was not only enhanced by this circuitous route, but the West Indies had to pay besides for transshipment upon what was supplied by the United States to Canada for the West Indian market. The West India planters were thus laid under contribution for the support of the Canadian shippers and farmers.~~

~~These regulations were, however, so far relaxed in favour of the West Indies in 1822, that the wheat and lumber of the United States were allowed to be imported directly on payment of certain duties; but at the same time duties were imposed upon agricultural produce entering the British American colonies as well as the West Indies.~~

~~The immediate result of this measure, so far as it affected Canada, was that one-half of the export trade of the St Lawrence was at once destroyed. The simultaneous abun- dance of the English harvest, together with the restrictions then in force upon the importation of grain into Britain, even from her own colonies, forbade any exports thither, and thus seriously~~

~~aggravated the depression of Canadian commerce, and afforded another illustration of the ruinous policy of bolstering up one class by privileges and exemp- tions, and shackling another by restrictions and duties,~~

~~In 1825 Britain admitted Canadian flour and wheat into her ports at a fixed duty of 5s. sterling per quarter. Mean- while a fresh trouble had already arisen to try the vexed fortunes of Canada. Previous to 1822, American exports had to a considerable extent sought the route of the St Lawrence, as if they had been of Canadian origin, contri- buting very materially, of course, to the benefit of the trade of the colony. But the opening of the Erie and Cham- plain canals in the United States, in 1825, drew off into a different channel those American exports which had formerly sought the Atlantic by way of Quebec, and the trade of the St Lawrence was thus seriously injured.~~

~~In 1826, however, the prospects again appeared to he brightening. The Americans were allowed, after four years of exclusion, to export timber and ashes for the British market into Canada free of duty. The duty upon Canadian flour for the West India market was also reduced.~~

~~The trade of the colony likewise profited by the disputes between Britain and the United States, which led to the~~

~~interdiction of the American export trade to the West Indies. This was reduced from £500,000 in 1826 to less than £500 in 1830. While the results were such to the United States, we find the trade of the St Lawrence in 1830 not only fairly recovered from the effects of the Imperial Acts of 1822, but far surpassing its position at any former period. The arrivals at Quebec in 1830 were 967 vessels, having a tonnage of 238,153 tons.~~

~~In 1831 the trade of the colony was still further favoured by the action of the Home Government. The forest and agricultural products of the United States were admitted into Canada free of duty, and could be exported by the St Lawrence, as Canadian produce, to all countries except the United~~

~~Kingdom. A differential duty was also at the same time imposed upon foreign timber entering the West Indian and South American possessions, greatly to the benefit of the colony, which also profited by the scarcity of food existing in Britain at this time. 'The arrivals at Quebec during this favoured and prosperous year, were 1016 vessels, with a tonnage of 261,218 tons; and the exports of flour and wheat by the St Lawrence were about 400,000 barrels, chiefly to Britain.~~

~~Between 1831 and 1836 we find a complete reversal of the order of trade between the colony and the mother country. The crops in England during that period being unusually abundant, and a scarcity of bread-stuffs existing in the United States, wheat was, in 1833, shipped from Britain to Quebec. A supply also came from Archangel. These imports from Europe to the St Lawrence amounted in 1835 and 1836 to about 800,000 bushels. The relaxation by the mother country of her protective policy in 1842 was viewed with alarm by the colonists as fraught with disas- trous consequences to their interests. Up to 1842 Baltic timber had paid an English import duty of 55s. per load, while Canadian timber entered England upon pay- ment of 10s. per load. The duty on foreign timber was now reduced to 30s. and Canadian to ls. per load. At the same time the free importation of United States flour~~

~~into the colony was stopped, and the West Indies were –~~

~~allowed, on the payment of a duty of 2s. per barrel, to import their flour direct from the Americans.~~

~~These serious blows to the trade of the St Lawrence fell upon the colony at the period of a commercial crisis, and were therefore felt more severely. The number of vessels that entered the St Lawrence4n 1842, from the sea, was 377 less than during the previous year.~~

~~In 1843, Canada was allowed to import American wheat under a comparatively nominal duty, and to export it through the St Lawrence as native produce to the British market. This measure, which may be viewed as having been the first indirect blow at the English corn-laws, amounted to a virtual premium of about 6s. sterling per quarter upon American exports to Britain through the St Lawrence. The British ports were thus at once in a~~

~~great measure thrown open to all the great wheat-growing coun- tries of North America. Canadian exports were rapidly swelled in consequence; and in 1846 half a million of barrels, and as many bushels of wheat and flour, were shipped by the St Lawrence. The timber trade of the colony, which was also seriously threatened in 1842 by the large reduction of the duty on Baltic timber imported into England, witnessed likewise in 1845 and 1846, not merely a revival, but a very material increase. The number of vessels that entered the St Lawrence rose to 1699 during each of these years, with an aggregate burden of over 620,000 tons,—this being a much larger amouut of ship- ping than had ever in any previous year entered the St Lawrence.~~

~~The history of Canadian trade enters upon a new stage from 1846, when the commercial policy of England at~~

~~leugth relaxed the old restrictive navigation laws in refer. ence to her colonial possessions. One of the most practical evidences of its beneficial influence on Canadian trade ig shown in the increase of its traffic with the United States at the very time that its trade relations with the mother country were being annually augmented in a correspondin ratio. From 1821 to 1832, the aggregate annual traffic between the United States and Canada averaged 10 more than $3,257,153. From 1833 to 1845 the average in. creased, with the growing population, industry, and wealth of both countries, to $6,313,780 per annum. But under the influence of the more liberal policy inaugurated by Great Britain in 1846, the traffic rose between that year and 1853 so rapidly that its annual average amounted to~~

~~$14,230,763.~~

~~But the concessions made by the mother country in favour of the timber and corn trade of Canada were stil] only partial. The exportation of colonial produce from the St Lawrence could only be carried on in British vessels ; and thus there grew up a class of vessels specially appro- priated to this trade, which made only two voyages in the year to Quebec or Montreal; and these having a monopoly of the whole exports of the St Lawrence at privileged rates, the colony was virtually subjected to a heavy tax both on~~

~~its exports and imports. Tea, coffee, sugar, and all the manufactured articles still required to be obtained from abroad were thus only obtainable through English ships; and hence the Canadian merchant was greatly restricted in the choice of the best and cheapest market. In retum, however, the colonists had certain privileges accorded to them, foremost amongst which were those already referred to in connection with the import of wheat from the United States, and its export from the St Lawrence as native produce,—the Canadian merchants having an advantage thereby over their competitors in New York and other American ports.~~

~~The abolition of the British corn laws deprived Canada of the privileges thus accorded to her in the export of bread-stuffs, and seemed to threaten the trade of the St Lawrence with grievous discouragement at the very time when the transactions of the colony with the United States were in a great measure interdicted by a hostile tariff. The changed and more enlightened views, however, which entered into imperial legislation materially assisted the growing energies and intelligence of the colonists. The Imperial Government formally abandoned in 1847 all control over the customs of the colony, which immediately set itself to the task of regulating its own trade. One of the first measures of the colonial legislature was to abolish in a great degree the differential and prohibitory duties on colonial imports along the United States frontier ; and the Americans upon the other side of the St Lawrence were by this measure placed, as regards matters of trade, upon an equal footing with England. The beneficial effects of this measure showed itself at once in increased commercial activity and prosperity over the whole of Canada.~~

~~On the Ist of January 1850, England completed her free trade measures by relieving the colonies from the injurious effects of the British navigation laws. The value of the more enlightened views which thus entered into both imperial and colonial legislation has since been most satisfactorily tested in the growing wealth and prosperity which have attended the progress of the colony. The same year is memorable for other events affecting Canadian pro- gress. It was in 1850 that gold was first discovered m British Columbia, and coal at Nanaimo, on Vancouver Island; and so the steps were accelerated which led to the organization of the first province of the~~

~~Dominion on the Pacific. The same year was marked by the organization of the opposition to ecclesiastical endowments, as well as to~~

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~~other exclusive rights and privileges, which resulted in 1854 in the final settlement of the vexed questions of the clergy reserves and seigniorial tenures in Upper and Lower Canada. The Grand Trunk Railway, which had been commenced in 1847, was now hastening to completion. Nova Scotia had already its first railway; the important local line connecting the Georgian Bay with Toronto, was developing the resources of Upper Canada; and in the same year, 1854, the Great Western Railway was com- menced, By this line Toronto is not only placed in direct communication with Detroit, Chicago, and the whole Western United States ; but by the extension of the line from Hamilton to the vicinity of the Niagara Falls, and the construction there of a suspension bridge, on a grand scale, for railway as well as ordinary traffic, the Great Western Railway of Canada has become an important link in the main lines of transit from Boston aud New York to the Western States. Since then the building of railways and the development of railway traffic have been energeti- cally prosecuted. The Intercolonial Railway has been completed, as a material bond of union between the older provinces of Canada and the maritime provinces, and a route through Canadian territory, at all seasons, to the seaboard. 'This has been followed by the more compre- hensive scheme of a Canadian Pacific Railway, the surveys for which have been already made ; and its first links are now in process of execution. 'he actual mileage of the railways within the Dominion completed, up to the close of 1874, extended to 4022 miles. The following tabular view of the railway traffic returns for the two previous years will suffice to illustrate their influence on the rapid growth of Canada in recent years :—~~

~~i ; Total Total Miles | Miles Railways. 1873. | 1872. | 1873. | 1872. g | ¢ Brockville and Ottawa (7 months)... 281,451 232,209 86, 86 Canada Central (6 months)..... 54,0123 49,509 28 28 Carillon and Grenville (no~~

~~return jos 193 BTIECMO MN so svers0oscccscacdYotesceseores 2 2 Cobourg, Peterboro' and Marmora e . (6 months… acne " madiaeccccameinasee 51,785 41,658 22 wa juropean an orth American a (no return for 1873). see 256,189 108 108 MGVOUED W CSUCITI w.veccaccccsscesssevescnesses 5,618,239 | 4,960,317 3512 3514 METI Kees. ec 0ssesessscccaseseceaeseve. 9,842,228 | 8,531,890 | 1,377 1,377 oe nial coGeLOCnE EOnCODICOO De UOUCODOE 821,424 241,464 269 2614 London and Port Stanley (no re- . 1 HMNTOT L873) sn.ccccosscsvesecessoes oe 39,808 243 244 Midland of Canada (7 months)..... 179,9482| 1261,737 89 89 — do (6 months)..... 401,950 2589,728 141 120 ew Brunswick and Canada . 3 ne 51,1802 15,909 1388 124 St Lawrence and Ottawa……..seseeee 183,278 158,148 54 54 St Lawrence and Industry (7 months) 12,7032 46,628 12 119} Toronto and Nipissing (3 months)... 53,3822 ae 88 A Toronto Grey, and Bruce (no re UIIEEOUTLO 13) s.sscccccesscrscosesscess oo ey shee Windsor and Annapolis (no return BUII) Eesetna, sels: vesiseeaGderes see ' BY Ns a BVVElOMG (9 TOS.) .ss..ssccccccseseeceseese 101,648 550,829 25 | 25 PHOEMLGeesachcceeacsrsesscosenss 17,139,876 | 15,436,018 | 2,6382 | 2,5082 18 months. 210 months. 31 month. 45 months. 5 § months.~~

~~During the same period telegraphic lines of communica- tion have been no less energetically prosecuted. At the end of 1874 the Montreal Telegraph Company had 23,267 miles of wire, and 1288 different offices; and to both additions are being rapidly made. The Dominion Telegraph Company, more recently organized, with its head-office in Toronto, had at the same date 6000 miles of wire, connect- ing 300 different offices; and the British Columbia Tele- graph, which was assumed by the Dominion Government, at the admission of British Columbia into the confederation, had already placed the head office at Victoria in communi- cation with twenty-one offices, the remotest of which was then distant 557 miles.~~

~~No less important is the banking system of the Dominion. From the banking returns published in the Canada Gazette it appears that the banking capital has more than doubled~~

~~since 1870, and this by a steadily progressive increase. The tables are imperfect, owing to some of the banks having omitted to make the requisite returns; so that, while the following tabular statement illustrates the progressive rate of increase, it falls short of the full amount :—~~

~~Banking Capital of Canada.~~

~~TO oss Sg $29,801,013 i re Pit en RE ee 36, 415,390 Tee ee ee 45,134,609 Be et ee es 55,102,959 Ung ee ne 60,448, 445~~

~~Besides the Post-Office Savings Banks, established on the same principle as those in Great Britain, there are local and other savings banks, building and other societies,— and the admission of every new province adds to the num- ber of such socicties,— in all of which large amounts are deposited at interest, without accessible returns. The building societies advance funds for the erection of churches, halls, and other public buildings, as well as for private dwelling-houses ; and the majority of the residents in cities and towns are proprietors of the houses which they occupy. The following tabular statement affords an illustrative view of the accumulating fruits of industry within the Dominion.~~

~~Bank Deposits. Post-Office Savings' Banks…….. $3,587,365~~

~~Government Savings' Banks ……. 3, 862,676 Montreal City and District Banks …… 4,303,509 Caisse d'Economie de Notre Dame…….. 2,782,055 Chantered banks metres ettess) ssece / Cy oURauy,~~

~~SPOR ctasa~~

~~Summary.—tThe evidence of the prosperity, and growing wealth of Canada may be completed in a tabular view of its exports and imports for two successive years, as derived from the latest official returns. 'The immediate result of confederation was a rapid progress in many ways. New railways were projected and brought into operation; new lines of steamships were established; fresh avenues of native and foreign trade were diligently sought out ; and a succession of prosperous years was marked by a steady commercial expansion which attained its maximum in 1873. Since that date various causes, and especially the difficulties created by an unredeemable~~

~~paper currency in the neighbouring United States, have tended to bring about a reaction; but it is a mere temporary ebb of the advancing tide, in which the commercial world at large has shared.~~

~~The following is a reproduction of a condensed compara- tive statement of the Commissioner of Customs, as given in the trade and navigation tables for 1874; to which are added from more recent unpublished returns, those of the year 1875, showing the influence of a period of reaction and great depression, alike on the exports and imports of the country.~~

~~Entered for Consump- tion.~~

~~Total Imports~~

~~Total Exports.~~

~~Fiseal Year.~~

~~Duty. ——— e #8,819,431°63 | 8,298,909-71 | 9,462,940°44 | 11,843,655°75 | 13,045,493°50 | 13,017,730°17 | 14,421,882°67 | 15,551 ,163°80~~

~~| $71,985,306~~

~~67,402,170 71,237,603 86,947,482 107,709,116 127,514,594 127 404,169 119,622,871~~

~~$78,459,644 70,415,165 74,814,339 96,092,971 111,430,527~~

~~| 128,011,281~~

~~128,213,582 123,068,093~~

~~vss.] 957,567,888~~

~~..| 60,474,781~~

~~73,578,490 74,173,618 82,629,663 89,789,922 89,351,928 78,048,870~~

~~ae eee eeeeeeeeeee~~

~~sceeeeeeeesoscres~~

~~at eeeeeeeeesoscs~~

~~Aggregate for Eight Yeares | &05,620,160~~

~~805,505,692 | 774,828,311~~

~~94,261,207°67~~

~~The apparent annual increase shown in the above table, is modified by the following elements, which must be taken into account. The first three years represent the business only of the first four provinces of the Dominion. Manitoba was received into the confederacy in 1871; and the~~

~~780 CAN~~

~~statistics of that year include six months' returns from the new province, amounting to $254,063 total imports, $286,357 entered for consumption, and $15,723-22 duty collected. In 1872 the exports of Manitoba were valuec at $85,541, the imports at $942,247, and entered for consumption, $1,020,172, on which $46,839°90 duty was collected. In the same year the returns for British Columbia appear as follows :—exports, $1,912,107 ; imports, $1,790,352 ; entered for consumption, $1,767,068 ; duty collected, $342,400°48. In 1874 the returns of Prince Edward Island give the following additional elements to swell the aggregate amount :—exports $722,129 ; imports, $1,908,522 ; entered for consumption, $1,913,696 ; duty collected $219,458°07. Deducting those sums and values from the years named, there remains abundant evidence of a steady and rapid increase in the commerce of the four older provinces up to the year 1874, when the depression prevailing in the United States, in part due to reaction resultiag from the effects of the southern war, began to be felt in Canada as well as in other countries. The great~~

~~ADA~~

~~expansion which has taken place in the commerce of Canada since 1867, and the influence of the reaction of 1874, are shown in the following~~

~~consecutive statement of the joint value of exports and imports for the years from 1868 to 1875 inclusive :—~~

~~Exports and Imports.~~

~~1 ea aaa." $181, 027,532 TE yas, colt a eee 130,889,946 TBO Oo civecesusccereccne eee 148, 387,829 Teme. .chgcakegeee eee 170,266,589 TSMETD, &, ocscua ta oko ee 194,070,190 WOE RS… ici eee 217,801,203 TSS pee. cue os oe 217,565,510 16," 1 ORE ri 201,116,968~~

~~The relative wealth and progress of the different pro- vinces of the Dominion will be illustrated by the following comparative table, showing the last year of nearly unchecked progress, and the first of reaction. It shows the value of the goods exported from, and entered for consumption in the Dominion, during the years ending the 30th June 1874 and 1875 :—~~

~~Year 1873-4. Year 1874-5.~~

~~2~~

~~Province. Expo ie, Entered for Consumption, 7 { es Entered for Consumption. | ' ee Value. Duty. Value. Value. Duty.~~

~~Nova Seotial ……0s0c00e00 $7,656,547 $10,875,140 $1,409,094 $6,968,139 310,688,218 $1, 490, 5438-77 New Brunswick…… 6,503,934 10,321, 492 1,399,930°75 6,542,329 9,855,533 1,370,611°42 Prince Edward Island …... 722,129 1,913,696 219,458°07 1,307,590 1,984,278 316,976°49 Quneeet ieacaser es sosaascerssexe 46,393,845 51,981,127 6,613,509°50 39,801,041 50,618,588 6,772, 808-90~~

~~OIUAIION.. 2502. cses.0s50sdes-ce- 25,157,087 48,375,522 4,361, 236°06 20,016,101 42,781,076 4,808,074 PWMATITEODAY, occ csiceeverecses 794,762 1,853,659 67,471°97 588,958 1,227,890 171, 430°86 British Columbia …….. 2,120,624 2,048, 336 336, 494°47 2,824,712 2, 487,293 413,991°50 PNG tA Se ones dcsvces $89,351,928 | $127,368,972 $14,407,194°82 $78,048,870 | $119,622,871 $15, 348, 931-94 Export Duty…. .. ae ope 14,564.90 date ee 7,231°86 $14, 421,759°72 $15,351, 163°80~~

~~Administration of Justice.. —So long as Canada consisted of the two provinces of Upper and Lower Canada, even when united for legislative purposes they retained their diverse laws and distinct judicial systems, while the Privy Council of Great Britain constituted the final court of appeal for both. In the province of Quebec the old French law, which was introduced under Louis XIV., is still the basis of the law of property. There the tenure of property re- mained strictly feudal, until the settlement of the claims of the seigniories by the Act of 1854 brought the old system to an end. But before that was effected new town- snips had been surveyed, and land disposed of to settlers to be held in free and common soccage. The commercial law is regulated partly by the old French code, but modified by the English customs, and by later Canadian legislation. The criminal laws of England, and the right of trial by jury, were introduced by 14th Geo. III c. 83. Since then all additions to the criminal law, or modifications of the statutes, have depended on the Acts uf the colonial legislature. The religion, laws, language, and customs of the French popu- lation were all guaranteed to them at the time of the cession of Canada to England ; and the rights and privileges per- taining to the Roman Catholic Church, among a population regarding its creed as their national religion, help tu per- petuate essential differences, by maintaining what is still practically an established if not a state-church.~~

~~By the constitution of the Dominion, as embodied in the British North American Act of 1867, the criminal law, with the establishment, maintenance, and management of penitentiaries ; all laws relating to bankruptcy and solvency, marriage and divorce, naturalization, aliens, Indians, and Indian reserves; and generally, all subjects not expressly assigned to the provincial legislatures, pertain to the Dominion parliament. The judges in all the provinces are~~

~~appointed by the general Government; and the pardoning power is vested in the governor-general per se, whilst his authority in all other respects is exercised under the advice of his privy council, or ministers for the time being. The powers entrusted to the local legislatures include generally all strictly local legislation not affecting in any way the rights of other provinces. The judges by whom the laws are administered must in the case of Quebec be selected from the bar of that province ; and the judges of the superior courts in all the provinces hold office during good behaviour, and are removable by the goveruor-general on address of~~

~~| both houses of Parliament.~~

~~The rights and privileges of each province being thus secured by its own parliament and courts of law, the pro- visions of the Act of Confederation have been completed by the establishment of a Supreme Court and Court of Ex- chequer at Ottawa, consisting of a chief justice and five other judges, two of whom, including the chief justice, have been selected from the bench of Ontario, two from the bench and bar of Quebec, and one each from the bench or bar of Nova Scotia and New Brunswick. The court thus constituted is the supreme and final court of appeal, from all the courts of law in the various provinces,—with this excep- tion that, while no appeal lies from the Supreme Court at Ottawa to the Privy Council, litigants have still the right of choice between the two as their final court of appeal.~~

~~Education.—Almost from the first organization of Upper Canada as a separate province, steps were taken for pro- viding means for the establishment of efficient schools and colleges. So early as 1797 a grant of 500,000 acres of the unoccupied lands of the province was set apart for the purpose of establishing and endowing a university and four royal foundation grammar schools. Of this one half was appropriated as a university endowment, and one-fourth~~

~~‘ of the remainder was granted to Upper Canada College, which assumed in Canada the functions of the great _ public schools of England, and still continues to hold its place at the head of the grammar or high schools of the _ province.~~

~~In the earlier years of Upper Canada, the "Clergy Reserves," set apart originally for the support of a " Pro- testant" clergy, were appropriated exclusively by the ministers of the Church of England. Upper Canada became an archdeaconry of the diocese of Quebec ; and the venerable Archdeacon Strachan, whose first labours in | Canada had been as master of the Cornwall Grammar School, became the leader both in ecclesiastical and educa- tional matters, and ultimately a privy councillor, member of the legislative council, and bishop of the diocese of Toronto. He was a man of great energy and decision of character; and under his guidance the lands set apart for the endowment of a provincial university were appropriated to the purpose, and a royal charter was granted by George IV. establishing at Toronto, or York, as it was then called, "one college, with the style and privileges of an university, for the education and instruction of youth and students in arts and faculties," under the name of King's College. The bishop of the diocese became, ex officio, visitor ; and when at length the college was organized, it had its divinity faculty, and its professor of divinity, along with its daily religious services according to the use of the Church of England. The special denominational character thus given to the provincial university excited opposition, and led to the establishment of Queen's College, at King- ston, under the control of the Church of Scotland, and of Victoria College, Cobourg, under the Wesleyan Methodist Church. 'To those have since been added Albert College, Belleville, under the management of the Episcopal Metho- dist Church ; and Ottawa College, and Regiopolis College, Kingston, in connection with the Church of Rome. All of those possess university powers, either by Royal Charter, or by Acts of the provincial legislature. By subsequent enactments the constitution of King's College has been greatly modified. Its divinity faculty has been abolished, ail denominational restrictions have been removed, and its functions divided between a university proper, modelled after the university of London, with a senate, on which devolves the fixing of the requirements for degrees, the appointment of examiners, and all other university work, as distinct from teaching. The latter is under the conduct and regulation of the professors, who constitute the council, of University College, and undertake all the duties of preparing the under-graduates for the university examina- tions in arts and science. Other colleges and schools, both in the faculty of arts and in those of law and medicine, are affiliated to the university, and part of the funds at the command of the senate is appropriated for~~

~~scholarships, to be competed for at the examinations in the different faculties. On the passing of the Act of 1853, by which the divinity faculty and professorship were abolished, a royal charter was obtained for the establishment of Trinity College, in connection with the Church of England, with all the powers of a university~~

~~The system of public instruction for Ontario has hitherto been carried out under the direction of a permanent officer, styled the Chief Superintendent of Education, with the advice of the Council of Public Instruction, originally nominated by the Crown, but latterly including repre- sentatives of the universities, of the school inspectors, and the masters of high and public schools. But by a recent Act of the Ontario Legislature, the functions of the Council of Public Instruction have been transferred to a committee of the executive council ; and the functions and duties of the chief superintendent are vested in one of its members,~~

~~| CANADA 7~~

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~~to be designated the Minister of Bdaneatwr. Wie intra- duction of the representative elemem ott "tte 'aunei af Public Instruction was immediately tollowet Sy = conflict between that body and the officers of 'iv ttmartment im reference to varions proposed modifteviamy. and the changes now introduced aim at bringme tite-atimnistration of the system of education mors directly unter: "Me control of the people through their representatives~~

~~There are two normal schools far the tramng Wf teacters, one at Toronto, and one at Ottawa; ant iB orepERedt ta establish others at Kingston and London Tne nigh sdiaais are divided into (1) collegiate imstitutes ml (2) Mngti schools for teaching classical and English 'sulypetts, and. (2) high schools, in which instruction may be hte eneity to English subjects. Of those there were 10S neal. meinding § collegiate institutes, in 1875, with av ctteentance af 8437 pupils.~~

~~The primary schools for junior punils ar Sweet antijic schools. The school population, inclidmg thos: ietreen 5 and 16 years of age, was returned 1: 1S) % ms anmiesnyg 504,869. At the same date there were 4772 stan om full operation, with an attendance of 460,PS8 oupia fh all the above schools every feature of & 'terwninaticnai character is excluded, The collegiate anstiture mea 'ngn schools are under the control of trustess anwonteel iv hie county municipalities, and their manttenaner tememsts on their share of the legislative grant and endowntend, snp). mented by the annual assessments of the city andl smnry municipalities. The public schools are m lise manner supported by legislative grants, and hy assessnen® evwert on the requisition of the school trustees i. meh etian) section. The essential feature of the whom syseem sr iat the people, directly or through their representatives, lave the entire control of the schools, including th: semeinn a the teachers, the fixing of their salaries, ant te nanage- ment of the school] funds.~~

~~The one exceptional feature is the Romav "Vavtinlic separate schools. Any Roman Catholic sai requin 'hs school-tax to be paid for the maintenaner 0: thr sajarntic schools of his own church ; and with this funt. swmpecnenteri from other sources, there were, in ISTA, L7t wqiarnte schools in Ontario, with an average attendant 0 pupils, or of 22,073 on the school rolls. Atezortime ww 'tis proportion of the Roman Catholic populaton. 'thir a ras than a third of their children of school age. A "ime grn- portion of the remainder attend the publioschoos Jussere of high schools are required to be graduates 0: umiversties,, and to have had previous experience in teaching 'Yeucier of public schools must hold a normal sclroo! 'or wtire: wee nized certificate of qualification.~~

~~The principal features of the system of edusdttien Thue brought into efficient operation have beer smutreleet. wi those of the states of New York and Massachusetts, aut an the normal schools of the Irish National Seard oO Benes tion. The systems of the other Canadian proviness. wit the exception of Quebec, have been franred 'on 'thas mtr. In the last-named province, where the greai mrass Wi Sie people are Roman Catholics, the education as in 'the bavte of the clergy, and is avowedly carried or in eonuecian with the Church of Rome. But dissentient oz Provestst schools are recognized as a part of the public schoo. sysien and the permanency of this state of things is~~

quaranie< by a clause in the Act of Confederation, which sexcimiss ti from the interference of the general legislature.

General Remarks.—-The position which Camace amr occupies as a Dominion formed by a confederation @: af governing provinces, united under a central Govermnsen, with its own governor-general, cabinet munisiers, semax parliament, and supreme courts of law,—yei neverthesaw remaining an integral part of the British Ropire, «ee

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Early his- tory.

Invention of locks.

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acknowledging the sovereignty of its Queen,—is unique in the history of nations, and strikingly illustrates the adap- tability of British institutions to the novel requirements of a free people. The peculiar circumstances resulting from the union of a colony formed under the fostering restraints of French ecclesiastical and civil rule with one of purely English origin, and settled in part by loyalist emigrants from the United States, begot difficulties which were more and more felt as the mother country removed from Canada one after another of the restrictions on self-government. It will form an interesting chapter in the history of Britain in relation to her colonies, to note the freedom with which, when those of British North America had, as it were, attained their majority, they were left to frame a scheme of confederation suited to their circumstances ; and when, after free deliberation, it had been matured to the satisfaction of those most directly interested in the results, the Imperial Government received it at their hands, and the British Parliament gave it the force of law. At the very period when this novel experiment in the history of colonization had been carried out to completion, and was open to the test of experience, the vice-regal duties were entrusted to the earl of Dufferin as governor-geueral of Canada. In the exercise of his duties he has visited many portions of the Dominion; and

~~towards the close of an extensive tour in the summer of 1874, he thus gave expres- sion to the results of his: observations :—" Everywhere I have learnt that the people are satisfied,—satisfied with their own individual prospects, and with the prospects of their country ; satisfied with their Government, and the institutions under which they prosper ; satisfied to be the subjects of the Queen; satisfied to be members of the British Empire. Indeed, I cannot help thinking that, quite apart from the advantage to myself, my early journeys through the provinces will have been of public benefit, as exemplifying with what spontaneous, unconcerted unani- nity of language, the entire Dominion has declared its faith in itself, in its destiny, in its connection with the mother~~

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~~couutry, and in the well-ordered freedom of a constitutiona} monarchy. It is this very combination of sentiments which appears to me so wholesome and satisfactory, Words cannot express what pride I feel as an Englishman in the loyalty of Canada to England. Nevertheless I should be the first to deplore this feeling, if it rendered Canada disloyal to herself,—if it either dwarfed or smothered Canadian patriotism, or generated a sickly spirit of depen. dence. Such, however, is far from being the case. he legislation of the Parliament of Canada, the attitude of its statesmen, the language of its press, sufficiently show how firmly and intelligently its people are prepared to accept and apply the almost unlimited legislative faculties with which it has been endowed; while the daily growing~~

~~disposition to extinguish sectional jealousies, and to ignore~~

~~an obsolete provincialism, proves how strongly the young heart of the confederated commonwealth has begun to throb with the consciousness of its national existence. At this moment not a shilling of British money finds its way to Canada; the interference of the Home Government with the domestic affairs of the Dominion has ceased ; while the imperial relations between the two countries are regulated by a spirit of such mutual deference, forbearance, and moderation, as reflects the greatest credit upon the states- men of both. Yet so far from this gift of autenomy having brought about any divergence of aim or aspiration on either side, every reader of our annals must be aware that the sentiments of Canada towards~~

~~Great Britain are infinitely more friendly now than in those early days when the political intercourse of the two countries was disturbed and complicated by an excessive and untoward tutelage; that never was Canada more united than at present in sympathy of purpose, and unity of interest with the mother country, more at one with her in social habits and tone of thought, more proud of her claim to share in the heritage of England's past, more ready to accept whatever obligations may be imposed upon her by her partnership in the future fortunes of the empire." (D. W.)~~

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~~AVIGABLE canals may perhaps be most conveniently~~

~~treated under two classes, Barge or Buat Canals,~~

~~now in many cases almost superseded by railways and~~

~~Ship Canals, which, judging from the stupendous works of~~

~~this class recently executed and now in contemplation, seem~~

~~as yet far from having exhausted the important aids they are destined to afford to navigation.~~

~~After giving a historical notice of early canals, the following article contains a brief notice of Barge Canals ; a digest of general engineering principles applicable to the construction of all canals; an account of Ship Canals recently constructed ; and a notice of Ship Canals which have been proposed and are ere long likely to be carried into execution for facilitating ocean navigation.~~

~~From the writings of Herodotus, Aristotle, Pliny, and other ancient historians, we learn that canals existed in Tigypt before the Christian era; and there is reason to believe that at the same early period artificial inland navigation also existed in China. Almost nothing, however, save their existence has been recorded with reference to these very early works ; but soon after the commencement of the Christian era canals were introduced~~

~~and gradually extended throughout Europe, particularly in Greece, Italy, Spain, Russia, Sweden, Holland, and France.~~

~~In speaking, however, of the earliest of these works, it is not to be supposed that they resembled the modern canals now constructed in our own and other countries. Early as inland navigation was introduced, it was not until the~~

~~invention of canal-locks, by which boats could be transferred from one level to another, that inland navigation became generally applicable and useful, and it has been truly remarked " that to us, living in anage of steam-engines and daguerreotypes, it might appear strange that an invention so simple in itself as the canal-lock, and founded on properties of fluids little recondite, should have escaped the acuteness of Egypt, Greece, and Rome."! Not only, however, had the invention escaped the notice of the ancients, but what is more striking, the several gradations made towards the attainment of that simple but valuable improvement appear to have been so gradual that, like many discoveries of importance, great doubts exist as to the person and even the nation that was the first to introduce canal-locks. One class of writers attributes the discovery to the Dutch, and Messrs Telford and Nimmo, who wrote the article "Inland Navigation" in Brewster's Edinburgh Encyclopedia, adopt the conclusion that locks were used m Holland nearly a century before their application in Italy; while, on the other hand, the invention has been strongly and not unreasonably claimed for engineers of the Italian school, and in particular for Leonardo da Vinei, the celebrated engineer and painter.2 Without, however, entering into a discussion of this question, which it is now perhaps impossible to solve, we may safely state that during OT C nc sk LU—= Eee 1 Quarterly Review, No. exlvi, p. 281 2 Frisi On Canals, p. 154.~~

~~CANAL~~

~~the 14th ceutury the introduction of locks, whether of Dutch or Italian origin, gave a new character to inland navigation, and laid the basis of its rapid and successful extension. And here it may be proper to remark, that the early canals of China and Egypt, although destitute of locks, do not appear to have been on that account formed on a uniformly level line, unadapted to varying heights. It is very doubtful, indeed, if the use of locks~~

~~has even yet been introduced into China, intersected as it is by many canals of great antiquity and extent, the imperial canal being about 1000 miles in length. “ This canal appears to have been completed in 1289, and is said to extend fora distance of forty days’ navigation, and is provided with many sluices, and when vessels arrive at these sluices they are hoisted by means of machinery, whatever be their size, and let down on the other side into the water.”! invention of locks was, as has been stated, a most important step in the history of canals ; and that mode of surmounting elevations may be said to be almost universally adopted throughout Europe and America. Inclined planes and perpendicular lifts have, it is true, been employed in those countries, as will be noticed hereafter ; but the instances of their application are undoubtedly rare.~~

~~But without tracing the gradual introduction of canals from country to country, we remark at once that we find the French at the end of the 17th century, in the reign of Louis XIV., forming the Languedoc Canal, designed by Riquet, between the Bay of Biscay and the Mediterranean, a gigantic work, which was finished in 1681. It is 148 Iniles im length, and the summit level is 600 feet above the sea, while the works on its line embrace upwards of one hundred locks and fifty aqueducts, an undertaking which is a lasting monument of the skill and enterprize of its projectors ; and with this work as a model it seems strange that Britain should not, till nearly a century after its execution, have been engaged in vigorously following so laudable an example. This seems the more extraordinary, as the Romans in early times had executed works in England, which, whatever might have been their original use, whether for the purposes of navigation or drainage, were ultimately, and that even at an early period, converted into navigable canals. Of these works we particularly specify the Caer Dyke and Foss Dyke cuts in Lincoln-~~

~~shire, which are. by general consent admitted to have | The former extends from Peter- borough to the River Witham near the city of Lincoln, a distance of about 40 miles; and the latter extends from |~~

~~been of Roman origin.~~

~~Lincoln to the River Trent, near Torksey, a distance of 11 miles.~~

~~Of the Caer Dyke the name only now remains; but the~~

~~Poss Dyke, though of Roman origin, still exists, and as it |~~

~~is the oldest British canal, the reader may be interested to~~

~~learn the following facts as to its history. Camden in his~~

~~Nevertheless the |~~

~~Britannia states that the Foss Dyke was a cut originally | made by the Romans, probably for water supply or. drainage, and that it was deepened and rendered in some.~~

~~measure navigable in the year 1121 by Henry I. In 1762 it was reported on by Smeaton and Grundy, who found the depth at that time to be about 2 feet 8 inches.2 They,~~

~~however, discouraged the idea of despening by excavation. |~~

~~They say they found "the bottom to be either a rotten peat earth, or else a running sand," and that though the~~

~~deepening of the navigation is in "nature possible," yet it |~~

~~"cannot be effected without removing one of the banks in order to widen the same," which would' not only turn out expensive, but would "occasion much loss of time and profit to the proprietor while the work is executing." Nothing~~

~~? Travels of Marco Polo, by Col. Yule, C.B. * Smeaton's Reports, vol. i. p. 55, London, 1812.~~

~~followed on this report; but in 1782 Smeaton was again called in, and deepened the navigation to 8 feet 6 inches, not, however, by widening the canal or dredging, but by raising the water-level 10 inches.2 From that period nothing more was done to enlarge the water-way, or adapt it to~~

~~increased traffic. Meantime the adjoining Witham navigation having been improved, the defects of old Foss became more apparent, and in 1838 Mr Vignoles was consulted, and made an elaborate report on alternative schemes for increasing the depth to 4 and 6 feet; nothing, however, was done till 1840, when "Messrs Stevenson were employed to design works for assimilating the Foss Dyke as far as practicable, both as regards width and depth, to the navigable channel of the Witham. The depth was found to be 3 feet 10 inches, and its breadth in many places was insufficient to admit of two boats passing each other, and for their convenience occasional passing places had been provided. It was resolved to increase the dimensions of the canal, and to repair the whole work. Accordingly it was widened to the minimum breadth of 45 feet, and deepened to the extent of 6 feet throughout. The entrance lock communicating with the River Trent at Torksey was renewed, and a pumping engine was erected for supplying water from the Trent during dry seasons, and thus that ancient canal, which is quoted by Telford and Nimmo as " the oldest artificial canalin Britain," was restored to a state of perfect efficiency, at a cost of £40,000, and now forms an important connecting link between the Trent and Witham navigations.~~

~~Notwithstanding the existence of this early work, how- ever, and of some others in the country, particularly the Sankey Brook navigation, opened in 1760, it cannot be doubted that the formation of the Bridgewater Canal in Lancashire, the Act for which was obtained in 1759, was the commencement of British Barge Canal Navigation, of which we propose first to treat, and that Francis, duke of Bridgewater, and Brindley the engineer, who were its projectors, were the first to give a practical impulse to a class of works which, under the guidance mainly of Smeaton, Watt, Jessop, Nimmo, Rennie, and Telford, has been very generally adopted throughout the country, and has un- doubtedly been of vast importance in promoting its com- mercial prosperity.*~~

~~According to Mr Smiles, the barge-canals laid out by Brindley, although not all executed by him, were :5—~~

~~Miles. The Duke's Canal, Longford Bridge to Runcorn…….. 24 WW OMG VeLO VMENICHOSLCD 0: ..0,cccencts erage tsscae secs pag lll~~

Grand Trunk, from Wilden Ferry to Preston Brook. .. 88

Weep 29a… 28 once cvsenen ed etag ics secsee nscale 46 COVERS 5 vada adtcresiensavavni += saddenseeweostean: Amie ens 36 Te lnvinisees MIEN: «2 55 PTO WAGH /9 caccsue ccistincn sameeren cece ear ee ee eee 5 BBO ae ica 08 valine rusian iors esnae Soar tenia ee wasee ete 82 MOU eh Le oon oe soc cdines siesveds Suexentsdeasso nee 46

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It is believed that the length of the inland boat naviga- tions constructed in Britain exceeds 4700 miles, and the system has been extensively carried out both in Europe and America. Many of them were made at great cost through hills and over valleys. The Harecastle tunnel on the Grand Trunk Canal, made by Brindley, and afterwards doubled by Telford, is nearly a mile and a half in length, and the Pont-y-Cyssylte aqueduct, on the Ellesmere Canal, over the Dee, constructed by Telford at a cost of £47,000, has nineteen openings 45 feet span, and is elevated 126

3 Smeaton's Reports, vol. i. p. 74, London, 1812.

4 History of Inland Navigation, particularly those of the Duke of Bridgewater, London, 1768 ; Hughes's Memoir of Brindley ; Weale's Quarterly Papers, London, 1848.

5 Smiles's Lives of the Engineers.

Bridge- water canals,

Water supply.

784

feet above the river, the canal being carried across in a cast-iron trough.!

It must be obvious, that to construct a navigable channel through a country varying in level, and affording, perhaps, no great facilities for obtaining a supply of water, infers high engineering skill. Vast reservoirs must in some cases be formed for storing the water necessary to supply, during dry

~~seasons, the loss by lockage, leakage, and evaporation. Feeders must be made to lead this water to the canal, hills must be pierced, by tunnels, valleys must be crossed on lofty embankments, or spanned by spacious aqueducts, and, above all, the whole must be conceived and laid out with scrupulous regard to the all-impcrtant object of securing the works against injury from an overflow of water during floods, and a consequent inundation of the surrounding country. Moreover, the necessity of laying out the canal in level stretches, and surmounting elevations by means of locks or inclined planes, occurring at intervals, often occa- sions much difficulty and greatly restricts the resources of the engineer. Taking, then, all these circumstances into consideration, and bearing in mind that canals were the pioneers of railways, we think it may safely be affirmed that the canal engineers of former days had more serious physical difficulties to contend with than are experienced in carrying out the railways of modern times, if we except such works as the Britannia Bridge, the high-level bridge of Newcastle, the Boxhill tunnel, and some other kindred works. But, indeed, their mechanical difficulties were also greater, for the introduction of steam, and its wide-spread application to all engineering operations, afford facilities to the engineers of the present day which Smeaton at the Eddystone, Stevenson at the Bell Rock, and Rennie and Telford in their early navigation works, did not enjoy. The distinguished merits of the engineers who practised in the former and at the commencement of the present century, cannot indeed be over-estimated, and had it been within the scope of this article it would have been profitable and~~

~~instructive to have described in detail some of the grand~~

~~aqueducts and other works on the lines of our canals. For this reference is made to the articles AQUEDUCT, BripGz, TUNNEL, and ResErvorr, all of which are more or less applicable to the formation of canals. We shall only therefore offer to the student the following sum- mary of engineering principles generally applicable to all cases.~~

~~A canal cannot be properly worked without a supply of water calculated to last over the driest season of the year, and in that respect, except as to the quality of the water, demands all the care requisite in investigating the~~

~~sources of water for supplying towns. in the district, available for supply and storage, the engineer must select situations suitable for artificial reservoirs, and the conditions to be attended to in selecting their positions are the same as those for water-works. They must com- mand a sufficient area of drainage to supply the loss by leakage, evaporation, and lockage, due to the length of canal, number and size of the locks, and probable amount of traffic. The capability of the district to afford this supply will depend on the area of the basin drained and the annual amount of rainfall. The offlets from the reservoirs must be at such an elevation as to convey water to the summit-level of the canal. The embankments for retaining the water must be erected on sites affording a favourable foundation, and, if possible, in situations where an embank- ment of small height and length may dam up a large amount of water. It is further necessary to consider whether the subsoil of the valley forming the reservoirs is throughout of so retentive a nature as to prevent leakage,~~

~~1 Life of Telford, London, 1888.~~

~~If there be no natural lake |~~

~~CANAL~~

~~and it is essential to provide, by means of waste weirs, for the discharge of floods. The Caledonian Canal, to he afterwards noticed, is in this respect very favourably situated, the whole supply being obtained from natural lochs. In other cases, such as the Union, Forth and Clyde Crinan, Birmingham, and other canals, it was necessary construct large reservoirs in which the water is stored in winter and led in feeders to points convenient for supplying the canal insummer. Where the canal communicates with the sea or a tidal river, and where the natural supply is small, as at the Foss Dyke already referred to, the water is raised by pumping engines. It will readily be seen, therefore, how important it is to reduce to a minimum the — loss of water due to leakage from deficient workmanship, as well as to lockage of the traffic through the canal, and (while on this subject) it may be stated that the wp con- sumes a greater amount of water than the down traffic, for an ascending boat on entering a lock displaces a volume of water equal to its submerged capacity ; the water go displaced flows into the lower reach of the canal and the lower gates are closed, the boat is then~~

~~raised, and on passing into the higher reach of the canal its displacement lost on entering is supplied by water withdrawn from the higher reach. A descending boat, on the other hand, on entering a lock likewise displaces a volume of water equal to its submerged capacity, but the water in this case flows — back into the higher reach of the canal, where it is retained when the gates are closed. Mr Fulton gives the consump- tion of 25-ton boats through locks of 8 feet lift as about 163 tons of water in ascending, and 103 in descending? Several proposals have been made for reducing the loss of water by side ponds to receive part of the water, but all such plans delay the traffic and have not come into general use.~~

~~The barge-canals constructed in this country are between Sectional 4 and 5 feet in depth. When the soil in which they were #0 made was retentive, they were formed as shown in the ,~~

~~cross-section, fig. 1. But when the soil was porous, clay~~

~~Fira. 1.—Section in retentive soil.~~

~~puddle was introduced, as shown in fig. 2. Professor Rankine says the depth of water and sectional area of water-way should -be such as not to cause any material~~

~~Fig. 2.—Section in porous soil.~~

~~| increase of the resistance to the motion of the boats beyond~~

~~what it would encounter in open water, and gives the following rules as fulfilling these conditions :— Least breadth at bottom = 2 x greatest breadth of boat.~~

~~Least depth of water = 14 foot + greatest draught of boat, Least area of water-way = 6 x greatest midship section of boat.~~

~~In laying out a line of canal the engineer is more restricted than in forming the route of a road or railway, where gradients can be introduced to suit the undulating surface of the country. A canal, on the contrary, must follow rigidly the bases of hills and windings of valleys, to preserve a uniform~~

~~level, accommodation being made for the road traffic by erecting suitable "fixed" and " movable" bridges. It is important, as already stated, to lay out the work in long level reaches, and to overcome~~

~~2 Fulton's Canal Navigation.~~

~~CANAL~~

~~' elevations iz cumulo by groups of locks at places where it can be most advantageously done. This leads to a saving of attendance and expense in working the canal, and causes fewer stoppages to the traffic. But to prevent waste of water the locks must be placed sufficiently far apart, say 100 yards, or an intervening pond or increased width of canal must be formed, so that a descending boat does not let off more water than the area below will receive without raising its surface so much as to lose the surplus water over the waste weirs. The mode of overcoming the difference of level between the various level reaches is, with few exceptions, by locks, which generally have a lift of 8 or 10 feet, though in some cases it is somewhat greater. The dimensions of the locks ought to be regulated by the trafic; but they should, in order to save water, be as nearly as possible the size of the craft to be passed through | them, allowing-from 6 inches to a foot of extra breadth and draught of water. The barge-canals in England have locks about 8 feet in breadth, and from 70 to 80 feet long, and their use in raising or lowering boats from the different reaches is so well known as not to require explanation ; and | for details as to the construction of the masonry of the chamber and walls, and the timber and iron work of the gates and sluices, reference is made to "Rankine's HngineeR- | ing." The water is generally admitted into and flows from each lock by sluices formed in the gates, and the passage of a boat occupies from three to six minutes, depending on the lift. Sir William Cubitt, on the Severn navigation, introduced the water through a culvert parallel to the side wall of the lock, and opening in the centre by means of a tunnel, which admits of 16,000 cubic feet of water flowing into or out of the lock in 1} minute; and in little more than that time loaded vessels can be passed through.} Inclined planes and perpendicular lifts, which have the advantage of saving water, were adopted so long ago as 1789 on the Ketling Canal in Shropshire, and afterwards on the duke of Bridgewater's canal. Mr Douglas of New York constructed the Morris**

~~Canal in the United States with 23 inclined planes, having gradients of about 1 in 10, with an average lift of 58 feet. The boats weighed, when loaded, 50 tons, and after being grounded on a carriage, were raised by water-power up the inclines with great ease and expedition. The length of the Morris Canal, between the rivers Hudson and Delaware, is 101 miles, and the whole rise and fall is 1557 feet, of which 223 were overcome by locks, and the remaining 1334 by inclined planes.? When first describing this work the author stated that the _ principal objection to the inclined planes for moving boats , was the injury they were apt to sustain in supporting great weights while resting on the cradle. A slimly-built canal boat, 80 feet long, and loaded with 30 tons, could not be grounded on a smooth surface without straining her timbers, but this objection has to some extent been overcome on an inclined plane constructed by Mr Leslie and Mr Bateman on the Monkland Canal, where the boats are not wholly grounded on the carriage, but are transported in a caisson of boiler-plate containing 2 feet of water, and are thus water-borne. This inclined plane is wrought by two high- pressure steam-engines of 25 horse-power each. The ‘ height is 96 feet, and the gradient 1 in 10. The maximum weight raised is 80 tons, and the transit takes about ten ‘ minutes. The average number of boats passing over the incline is about 7500 per annum. Mr Green introduced | on the Great Western Canal a perpendicular lift of 46 feet. Sir W. Cubitt also introduced three inclined planes, having gradients of 1 in 8, on the Chard Canal, Somersetshire.~~

~~} Minutes of Proceedings of Institution of Civil Engineers, vol. v.~~

~~340.~~

~~__ 3 Stevenson’s Sketch of Civil Engineering in North America, London, John Weale.~~

~~785~~

~~One of these inclines overcomes a rise of 86 feet; and they are said to act very satisfactorily.®~~

~~An essential adjunct to a canal is a sufficient number of Waste waste-weirs to discharge surplus water accumulating during We”~~

~~floods, which, if not provided with an exit, may overflow the tow-path, and cause a breach in the banks, stoppage of the traffic, and damage to adjoining lands. The number and positions of these waste-weirs must depend on the nature of the country through which the canal passes. Wherever the canal crosses a stream a waste-weir should be formed in the aqueduct; but independently of this the engineer must consider at what points large influxes of water may be apprehended, and must at such places not only form waste-weirs of sufficient size to carry off the surplus, but form artificial courses for its discharge into the nearest streams. These waste-weirs are placed at the top water-level of the canal, so that when a flood occurs the water flows over them and thus relieves the banks. The want of these has occasioned overflows of canal banks, attended with very serious injury to the works, and lengthened suspension of the traffic ; and attention to this particular part of canal construction is of essential importance.~~

~~Stop-gates are necessary at short intervals of a few miles Stop-gates.~~

~~for the purpose of dividing the canal into isolated reaches, so that in the event of a breach the gates may be shut, and the discharge of water confined to the small reach inter- cepted between two of them, instead of extending through- out the whole line of canal. In broad canals these stop- gates may be formed like the gates of locks, two pairs of gates being made to shut in opposite directions. In small works they may be made of thick planks slipped into grooves formed at the narrow points of the canal under road bridges, or at. contractions made at intermediate points to receive them. Self-acting stop-gates have been tried, but their success has not been such as to lead to their general introduction. When repairs have to be made stop-gates allow of the water being run off from a short reach, and afterwards restored with comparatively little interruption to the traffic. Their value in obviating serious accidents has been well exemplified in the author's own experience. The water during a flood flowed over the towing-path of the Union Canal connecting Edinburgh and Glasgow, and the uncontrolled current carried away the embankment and the soil on which it rested to the depth of 80 feet, as measured from the top water-level. The stop-gates were promptly applied, and the discharge confined to a short reach of a few miles, otherwise the injury (which was, even in its modified form, very~~

~~considerable) would have been enor- mous, not only to the canal works but to the adjoining lands.~~

~~For the purpose of draining off the water to admit of Offtets.~~

~~repairs after the stop-gates have been closed, it is proper to introduce, at convenient situations, a series of exits called “ offiets,” which are pipes placed at the level of the bottom of the canal, and fitted with valves which can be opened when required. These offlets are generally formed at aqueducts or bridges crossing rivers, where the contents of the canal can be run off into the bed of the stream, the stop-gates on both sides being closed so as to isolate the part of the canal from which the water is withdrawn.~~

~~In executing the work, provision must be made for the proper drainage of the tow-path, which should be made highest at the side next the canal, and sloped with a gentle inclination towards the outside. The drainage of the tow- path should be carried to a sky drain, and at intervals passed below it into the canal, as shown in fig 3.~~

~~3 Minutes of Proceedings of institution of Civil Engineers, vol. xiii.~~

~~IV. — 99~~

~~; P. 205~~

~~Drainage of~~

~~tow-path,~~

~~Pitching of banks.~~

~~786~~

~~The preservation of the banks at the water-line is also a matter of importance. “Pitching” with stones and “ facing” with brushwood are employed, and in the author’s experience the latter, if well executed, forms an economical and effectual protection,~~

~~Puddling,~~

~~Mode of~~

~~conducting'~~

~~traffic on canals.~~

~~Fic, 3.— Showing Drainage of Tow-path.~~

~~In forming the alvews or bed of the canal care must be taken, especially on embankments, and even in cuttings where the soil is porous, to provide against leakage by using puddle, as shown as fig 2. An all-important matter, as affecting the construction of the works, is the possibility of getting clay in the district, or such other soil as may be worked into puddle, on the good quality of which the sta- bility of the reservoir embankments and the imperviousness of the beds and banks of the canal mainly depend.~~

~~These are the only points of general application, in the construction of canals, to which reference can here be | made; and in applying them to each case the engineer | must be guided, jirst, by theoretical knowledge, to be acquired by a careful study of his profession ; and, secondly, | by that knowledge which can be gained only by expe-— rience.~~

~~Not a little has been written on the best mode of con- ducting traffic on canals, and the reader who wishes to study the subject fully is referred to the observations made | by Mr Walker and Mr George Rennie in the Transactions | of the Royal Society and of the Institution of Civil Engi- | neers, and especially to the valuable researches on hydro- dynamics by Mr J. Scott Russell in the Zransactions of the Royal Society of Edinburgh. Mr Russell while =:~~

~~i |~~

~~{~~

~~menting on propelling boats at high speeds found that the primary wave of displacement produced by the motion of a boat moves with a velocity due to the depth of water in the canal, being the velocity that is due to gravity acting through a height equal to the depth of the centre of gravity of the~~

~~cross-section of the channel below the surface of the fluid. The velocity is in no degree dependent on the form or velocity of the body which generates it, or on the breadth of the canal. A wave that had a velocity of 8 miles an hour was traced to a point where the channel became deeper, and its velocity was suddenly accelerated; the channel became alternately narrower and wider without producing any sensible effect, but when the wave once more reached that part of the channel which was of the original | depth it resumed its original velocity. A fact of great practical value was established, that a boat, if raised by a | sudden effort to the top of a primary wave, could be drawn along at 10 miles an hour with less fatigue to the horses than if drawn at the rate of 6 miles, while the waste was less severe on the banks of the canal, These investigations were made before the general establishmentof railways, when swift canal travelling seemed a desirable attainment. But though boats propelled at high speed on canals have given place to railway carriages, yet the canal traffic at slow speeds must be conducted, and the cheapest means of effecting the "haulage" with the least danger to the banks is still an important inquiry, and has within the last few years atiorded matter for some highly interesting papers and statements in the Proceedings of the Institution of Civil~~

~~matter of canal engineering it is necessary to notice it,~~

~~' particular part of the river where he carefully measured~~

~~| though smaller, are nevertheless a source of greater anxi , acting as they do in a narrow artificial channel, forme~~

~~CANAL "~~

~~q Engineers. These are communications on the employment of steam-power on the Gloucester and Berkeley Canal,~~

~~G. W. B. Clegram ;} on the Grand Canal, Ireland, by Mr. Healy ;? on the Forth and Clyde, by Mr J. Milne 3 and on the Aire and Calder, by Mr W. H. Bartholomew, to all _ which reference is made.~~

~~One great objection to high speeds on canals ig~~

~~wasting of the banks by the displacement produced propelling the vessel through the water. The wastin indeed, takes place even with very low speeds, and ag~~

~~give an instance of the effect on the large scale—Mr says that the river steamers on the Clyde, going at a s of 8 to 9 miles per hour, produce a swell which comme to rise when the vessel is " 2 or 3 miles off,"—a circums which was first noticed by Mr J. Scott Russell in 183; The swell gradually increases as the steamer approac and at last becoming a wave of translation, it breaks ¢ the river walls nearly abreast of the vessel, following on her course along the river, as a violent breaking w, measuring 8 or 10 feet from the hollow in the channe the crest on the wall. A coating of heavy whinstone rock, from 2 to 3 feet thick, extending from low to high water. mark is found necessary to enable the banks to withstand it. -Mr Urealso found that the action of passing steam though very destructive to the banks, was useful in sti up the mud from the bottom, which was carried off by the currents to an extent which he estimates to be from 20 to 25 per cent, of the whole quantity dredged from~~

~~It will at once be apparent, that however inconvenient wasting waves may be in a river, the waves in a ¢~~

~~some places on high embankments, the failure of whic would be attended with serious consequences. The wasting on canals where the traffic is conducted at a moderate speed is found to extend not more than 18 in to 2 feet, that is 1 foot above and below the water-lin Mr Clegram states that he has found on the Glouce Canal that a facing of stone filled into a recess cut in banks formed a complete protection. Brushwood, as alread noticed, is also an effectual remedy. What has recently led to the consideration of the bes means of protecting the banks of canals is the substitutio of steam for horse power in working the traffic, which ha been entirely successful. The first attempt at using steam- power on canals was made on the Forth and Clyde C with Symington's boat, in 1789. Various experiments made to introduce tugs, but these were ultimately abando in favour of steam-lighters, which now in great num navigate the canal, and make passages to Leith, Green and other trading ports on the Firths of Forth and Cly This system, however, would not suit the trade-of Gloucester Canal, which is~~

chiefly frequented by sea-b vessels, and steam-towing has been introduced on navigation. The following extracts from Mr Clegra paper® seem generally applicable to all navigations w. towing isto be adopted. He says the ship canal leadsfi the Severn at Gloucester to the Severn at Sharpness Po It is 16} miles in length, and has a depth varying from to 18 feet 6 inches, navigable by vessels of 700 tons regis Prior to the year 1860 all sea-going vessels passing thro were towed by horses, the number of horses being regu by a scale varying from 1 horse for a vessel of 40 tons t0 9 horses fora vessel of 420 tons. The cost of this amounted generally to about one farthing per ton per mile on the

1 Minutes of Proceedings of Institution of Civil Engineers, vol. xxvi. p. 1. 2 Ibid., p. 6. 3 Ibid., p. 10. ¥ * Tbid., p. 25. © Vd. Ps Ml:

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register tonnage of the vessel. The speed varied from one mile to three miles per hour, according to the size of the vessel and the state of the weather.

In 1860 steam-tugs were placed upon the canal to do this |

work. They are iron boats, 65 feet long, 12 feet beam, and draw 6 feet 3 inches of water, fitted with high-pressure engines ; tlie diameters of the cylinders are 20 inches, stroke of 18 inches, pressure of the steam 32 Ib on the inch, and the cost of each £3000. Nearly the whole of the sea-going craft are now towed by these tugs. The vessels range from 30 tons up to 700 tons register, with a draught of water from 6 to 16 feet. They are towed either singly or in a team, according to circumstances. Somctimes as many as thirteen loaded vessels of from 50 to 100 tons register have been towed by one tug at the rate of 3 to 35 miles an hour. The heaviest load drawn by any one tug has been 1690 tons of goods in three vessels. Their draught of water varied from 14 feet 6 inches to 15 feet 6 inches, and they were taken the whole length of the canal at the speed of 2 miles an hour. The smaller vessels are towed at a speed of 4 miles an hour, to which as a rule they are restricted.

~~The employment of steam for towing has been found very advantageous. The vessels rub less against the banks, the power being right ahead, and not on one side as with horses. The wear on the ropes used in tracking is reduced, the speed is increased, and vessels can be moved along the canal in weather which would have prevented horses doing the work. With a strong wind athwart the canal vessels cannot be tracked im train ; they must then be taken singly, or at most two ata time. When vessels are towed in train, as arule the largest and heaviest draughted are placed first, and the hawser leading from the first vessel to the tug is taken from each side of the bow. With this arrangement, and a skilful management of the tug, the vessels can be~~

~~did in days gone by when they had no competitors but the stage coach and the carrier's van.~~

~~These remarks, however, as to railway competition do Ship not apply to Ship-canals, which, undisturbed by competing canals.~~

~~schemes, retain all the monopoly they ever possessed ; and indeed, in the recent construction of the Suez and New Amsterdam canals, they have acquired an importance before unclaimed for works of that class—an importance which entitles them tothe highest consideration in any engineering treatise ; for, apart from their structural interest to the engineer, their usefulness in affording a short and sheltered passage for sea-borne vessels has long been acknowledged and can hardly be over-estimated.~~

~~The Languedoc Canal already mentioned, by a short passage of 148 miles, saves a sea voyage of upwards of 2000 miles through the Straits of Gibraltar. By the Forth and Clyde Canal sea-borne vessels, not exceeding 8 feet draught of water, can pass from opposite coasts of Scotland, through the heart of the country, by 35 miles of inland navigation and avoid the dangers of the Pentland Firth ; the Crinan Canal substitutes a short inland route of 9 miles for a sea voyage round the Mull of Kintyre of about 70 miles; and the last great canal between Suez and Alexandria saves vessels a tedious voyage of 3750 miles on their route to India.~~

~~To most of the early ship canals that have been executed, the principles of construction already stated are generally applicable—the depth of water and dimensions of the locks and all other works being increased to suit the larger size of craft which use them, and therefore further notice of such details is not required. But having still to illustrate the larger class of works, we proceed to describe some of the largest of the ship-canals already constructed and projected, and in doing so, we shall consider ship-~~

~~kept fazrly in the line of the canal. The only disadvantage of this system, on a canal the sides~~

~~canals under the following three classes :— First, Canals which on their route from sea to sea Three~~

~~of which are unprotected, is the additional wear caused by~~

~~the run of water between the sides of the large vessels and |~~

~~the banks. Such vessels occupy a large part of the sectional~~

~~area of the canal, and being taken along at a much greater |~~

~~speed than they were by horses the wash of water is more prejudicial, When the vessels or trains of vessels are heavy, and the tugs are working up to their full power and speed, the water thrown back by the action of the screw against the bow of the first vessel is thrown off by it to the banks on either side, and is the cause of considerable wash. This has been attempted to be remedied by placing the first vessel farther back from the tug; but in practice it is found that a distance of 40 to 50 feet is the farthest separation that can be allowed without sacrificing that hold between the two which prevents the vessel sheering from side to side. course, the others follow without much difficulty.~~

~~The employment of tugs has afforded an unexpected |~~

~~facility for cleansing the canal from deposit of mud. Formerly it was difficult to remove this deposit from the~~

~~slopes of the banks on which it collected, sometimes in- |~~

~~conveniently contracting the capacity of the canal. Since the vessels have been moved at greater speed and in trains this deposit has been entirely removed from the slopes to the bottom of the canal, whence it can readily be taken out by the dredger.~~

~~But though all efforts to improve barge-canals can never bring them to compete with railways in the quick con- veyance of passengers, it is surprising to find in how many~~

~~places they still command an enormous traffic in goods and |~~

~~The first vessel being kept steadily in her |~~

~~traverse high districts, surmounting the elevation by locks classes of~~

~~supplied by natural lakes or artificial reservoirs, such as the~~

~~Languedoc in France, or the Caledonian Canal in Scotland ; Second, Canals in low-lying districts, which are carried on~~

~~a uniform water-level from end to end, and are defended~~

~~_ against the inroad of the sea at high water by double acting~~

~~locks, which also retain the canal water at low tide, such as the canals of Holland and other low countries ;~~

~~Third, Canals, of which the Suez is the only example yet made, without locks at either end, and communicating freely with the sea, from which it derives its water supply.~~

~~The Caledonian Canal in Scotland is as good a specimen Caledonian~~

~~of works of the first class as can be selected.~~

~~In 1773 James Watt was employed to survey the country between the Beauly at Inverness and Loch Hil at the mouth of the river Lochy, a~~

~~distance of about 60 miles, with the view of forming a ship canal between the two seas, to save about 400 miles of coasting voyage by the North of Scotland through the stormy Pentland Firth. The district referred to, called the " Great Caledonian Glen," as will be seen from Plate XXXVI., embraces a chain of fresh-water lakes, which, in connection with the surrounding glens, have afforded an interesting field for the speculations of the geologist ; and no doubt the first conception of a canal through the district owed its origin to the apparent facilities for inland navigation which the lakes afforded… In 1801 Telford was employed by Government to report, and the ultimate~~

~~result of that report was the construction of the canal,~~

~~which was opened in 1823. The summit-level is at Laggan, between Loch Oich and~~

~~mimerals, and thus act as a valuable relief to overburdened | Loch Lochy, whence the drainage flows to the Eastern and railways. This is specially the case in the manufacturing , Western seas.~~

~~districts of England, where the Birmingham Grand Junction and other canals seem to carry on as brisk a trade as they~~

~~1 Life of Telford: Caledonian Canal~~

~~Canals of North Holland.~~

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~~The district which discharges into the eastern outlet comprehends an area of about 700 square miles, chiefly of high mountainous country, intersected by streams and lakes, which discharge themselves into Loch Oich, Loch Ness, and Loch Doughfour, and thence are conveyed into the Moray Firth by the River Ness. Loch Oich, the summit-level of the canal, has an area of about 2 square miles, and the present standard level of its surface is under- stood to be 102 feet above the level of mean high water of neap tides in Beauly Firth. It receives the drainage of Loch Quoich and Loch Garry. The waters of Loch Oich are discharged through the River Oich into Loch Ness, which~~

~~is about 24 miles in length, and has an area of about 30 square miles. Loch Ness receives the waters of the Tarff, the Foyers, and Glenmoriston, and the drainage of numerous other streams and lakes of less note. It discharges its waters through a comparatively narrow neck, called Bona Passage, into the small loch of Doughfour, whence they find an exit to the Beauly and Moray Firths by the River Ness, on which the town and harbour of Inverness are situated.~~

~~The drainage of the western district of the country, including Loch Arkegg, finds its way into Loch Lochy, which is about 10 miles long, and thence by the River Lochy to the Western Sea at Loch Eil.~~

~~The two locks in Loch Beauly at the northern entrance to the canal are each 170 feet long, 40 feet wide, and have a lift of about 8 feet. At Muirtown, a little further on, are four locks of 170 feet in length and 40 feet in width, having a rise of 32 feet, raising the canal to the level of Loch Ness, which it enters at Bona. The works westward of Loch Ness are an artificial canal with seven locks com- municating with Loch Oich. Between Lochs Oich and Lochy are two locks; at the south end of Loch Lochy is a regulating lock, and the canal is carried from this point on the level of Loch Lochy to Banavie, where it descends 64 feet by eight connected locks, forming what is called in the country " Neptune's Staircase ;" finally at Corpach the canal descends by two locks to the level of Loch Eil.~~

~~Of the whole distance, about 374 miles are natural lake navigation, and the remaining 23 are artificial or canal navigation. The canals were made 120 feet in width at top-water level, 50 feet at bottom, end 20 feet in depth. In the course of inquiries as to the state of the canal, under a remit from the Admiralty, the author found that the shallows at Loch Oich and the cutting at the summit level originally contemplated had not been carried to the full depth, and an additional depth had been gained at that place by raising the level of Loch Oich ; but still he was led to the conclusion that the standard depth of the canal cannot be regarded as more than 18 feet, giving access to vessels of 160 feet in length, 38 feet beam, and 17 feet draught of water.)~~

~~In carrying out this remarkable work Telford had to deal with difficulties of no ordinary kind, in rendering available rugged Highiand lakes, and~~

~~surmounting the summit-level of the glen. The work, which cost about one million sterling, is a noble monument of his engineering skill.~~

~~The canals of Holland are specimens of the second class of works to which reference has been made, and of these a very remarkable one is the North Holland Canal, completed in 1825. It was designed by M. Blanken, who, instead of the high rugged Highland glens of Scotland, had to deal with the proverbial lowness of the country, and to protect his works not from the assaults of mountain torrents but from encroachments of the waves, for there vessels are locked down from the sea into the canal. It extends from~~

~~1 Report on the Caledonian Canal to the Admiralty, 1849, by James Veitch, R.E., and David Stevenson, C.E.~~

~~Amsterdam to the Helder, is 50 miles in length, and ig formed of the cross-section shown in fig. 4. It enables vessels trading from Amsterdam to avoid the islands and sand-banks of the dangerous Zuider Zee, the passage through which in former times often occupied as many weeks as the transit through the canal now occupies hours.~~

~~Fia. 4.—Cross-section of North Holland Canal.~~

~~But the North Holland Canal, which has long proved go Anstey. useful to the commerce of the district, is destined goon to dam Can! be superseded by the new Amsterdam Canal, a work of great magnitude, which it is proposed to describe ag an illustration of ship-canals of the second class. from details furnished by Mr J. C. Hawkshaw, C.E.~~

~~The rapid increase in the trade of the ports to the south- ward and eastward of the Helder, effected by the construc. tion of railways throughout Europe, rendered it imperative for the merchants of Amsterdam to provide better com- munication with the North Sea than that afforded by the North Holland ship canal already noticed, or suffer its trade to pass to other ports more favourably situated for | over-sea traffic.)~~

~~In 1865 a company was formed for the purpose of con- structing a canal from Amsterdam, in nearly a direct line, to the North Sea, through Lake Y and Wyker Meer, a dis. tance of 16} miles. Sir John Hawkshaw and Mr~~

~~Dirks were appointed the engineers to carry out the work, a plan and section of which are given in Plate XXXVI.~~

~~The harbour in which the canal terminates in the North Sea is formed by two piers built of concrete blocks founded on a deposit of rough basalt. The piers are each 5069 feet in length, and enclose an area of about 260 acres, About 140 acres of this area are to be dredged to a depth of 26} feet, the remainder is to be left at the present depth for the accommodation of small craft and fishing-boats.~~

~~From its commencement at the harbour the canal passes ‘ by a deep cutting through a broad belt of sand-hills which protect the whole of this part of the coast of Holland from the inroads of the sea. ‘The cross-section of the canal at this place is shown in fig. 5. This cutting is about 3 miles~~

~~Fic. 5.—Cross-section of Amsterdam Canal.~~

~~in length ; the greatest depth cf cutting from the surface to the bottom of the canal is 78 feet, and the amount of earth- work excavated is 6,213,000 cubic yards. On emerging from the sand-hills the canal passes by the village of Velsen, in the neighbourhood of which it is crossed by the railway from Haarlem to the Helder, and there enters the Wyker Meer, a large tract of tide-covered land. After traversing the Wyker Meer it passes by a cutting of 327,000 cubic yards through the promontory called Buitenhuizen, which sepa- rates that Meer from Lake Y, another large tide-covered area. The rest of its course lies through Lake Y as far a Amsterdam.~~

~~There are two sets of locks, one set at each end. The North Sea locks are at a distance of about three-quarters of a mile from the North Sea harbour. These locks, as shown in fig. 6, have three passages. The central or main one 8 60 feet wide and 390 feet long, and will be furnished with two pairs of gates at each end, pointing in opposite direc~~

~~CANAL~~

~~tions, and one pair in the centre. The northernmost side passage for barges is 30 feet long and 34 feet wide, with three pairs of gates; that to the south is) 227 soak in length and 40 feet wide, with five pairs of gates.~~

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~~Fria. 6.—Plan of Locks on Amsterdam Canal.~~

~~In constructing the canal, which is (1876) now far advanced towards completion, the cuttings were first begun. The material proceeding from these cuttings was deposited so as to form two banks 443 feet apart, through the lakes on each side of the main canal, as shown by the hard lines on the plan, and also to form the banks of the branch canals on either side. The total length of these banks is 38} miles. The nucleus of the bank is formed of sand with a coating of clay, and protected during its progress with fascines ; and when the banks are far enough advanced, the deep channel for the canal is excavated by dredging. The cross-section of the canal and banks through these meers or lakes is shown in fig. 7.~~

~~The formation of the banks through the Wyker Meer and Lake Y will enable about 12,000 acres of the area, as _ shown on the plan, which is now occupied by these lakes, to be reclaimed. For the purpose of this reclamation, and also to provide for the drainage of the land on the margin _ of the lakes, including a large portion of what was formerly Haarlem Meer, pumps are provided by the company at | various points on the main and branch canals. The Canal | Company are bound to keep the surface-water of the canal about 1 foot 7 inches below average high-water level. In order to~~

~~insure this level being maintained, three large _ pumps have been erected in connection with the locks~~

~~hereafter to be described, on the dam between Amsterdam and the Zuider Zee. They consist of three Appold pumps, the largest of the kind yet made, the fans being 8 feet in diameter. Each pump is worked by a separate engine of 90 nominal horse-power. The maximum lift is 9 feet 9 inches, at which the three pumps are capable of discharging _ 1950 tons a minute; with the ordinary working lift of 34 | feet they will discharge 2700 tons a minute. | Lake Y extends about 43 miles to the eastward of Amsterdam ; and here it was necessary to form a dam with locks for the passage of vessels. The dam crosses Lake Y at a point about 2 miles to the eastward of Amsterdam, where it is contracted to 4265 feet in width. As it was necessary to construct these Jocks before completing the dam across Lake Y, a circular cofferdam 590 feet in diameter, consisting of two rows of piles 49 feet long, was constructed in the tideway, and within this dam the locks were built. These locks have three main passages, each~~

~~with five pairs of gates, and one smaller passage with three pairs of gates, arranged much in the same manner as the North Sea locks in fig. 6. The whole of the masonry and brickwork for these locks and sluiceways was founded on bearing-piles, upwards of 10,000 in number. The bottom where the cofferdam was placed consisted of mud, and some difficulty was experienced in maintaining it till the work was completed. The dam across Lake Y, as shown in section, fig. 8, consists of clay and sand, placed on and~~

~~nH ncn em evernnan permanent Fic. 8.—Section of Dam across Lake Y.~~

~~protected at the sides by large masses of wicker-work, which is afterwards covered with basalt in the manner usually adopted in Holland.~~

~~All the lock gates at both ends of the canal pointing seawards are of malleable iron; the gates pointing in- wards towards the canal are of wood. The necessity, for drainage purposes, of maintaining the surface water of the canal at the prescribed low level calls for a suffi- cient barrier being provided against thesea at both ends, as the sea-level will not unfrequently,~~

~~at high water, be several feet above the level of the canal. This necessity, as well as the difference of level and periods of high water in the Zuider Zee and the North Sea, required a totally different design from the Suez Canal, to be afterwards described. The contract sum for the execution of the Amsterdam Canal is £2,250,000, and it is expected that it will be ready for traffic in 1877.~~

~~Of the third class of works there is, as yet, only a single Suez Canal.~~

~~example in the Suez Canal, one of the most remarkable engineering works of modern times ; but though it is called a canal, it bears little resemblance to the works we have described under that name, for it has neither locks, gates, reservoirs, or pumping-engines, nor has it, indeed, anything in common with canals, except that it affords a short route for sea-borne ships. It is in fact, correctly speaking, an artificial strait or arm of the sea, connecting the Medi- terranean and the Red Sea, from both of which it derives its water-supply ; and the fact that the two seas are nearly on the same level, and the rise of tide very small, allowed this construction to be adopted.~~

~~The idea of forming this connecting link between sea and sea is of very ancient origin, and its author is unknown. It is understood, however, that a water communication for small vessels between the two seas was formed as early as 600 years before the Christian era, and existed for a period of about 1400 years, after which it was allowed to fall into disuse. Baron De Tott in his Memoirs of the Turks and Tartars,| written in 1785, after giving quotations from the historian Diodorus as to the existence of certain portions of the early work, and its having been abandoned in consequence of the supposed difference of level between the two seas, and threatened inundation of Egypt, says there still exist those early traces of work "qu'un léger travail rendrait navigable sans y employer d'écluses et sans menacer |'Egypte d'inondations." De Tott's opinion expressed in 1785 has certainly been carried out, but on a scale and at an expenditure of labour and money far beyond the conception of the French diplomatist.~~

~~The idea of restoring this ancient communication on a~~

~~1 Mémoires du Baron de Tott, sur les Tures et les Tartares, roster. dam, 1785, vol. ii. p. 271.~~

~~scale suited to modern times is understood to be due to Napoleon J. who, about the close of the last century, obtained a report from M. Lepére, a French engineer, which however was followed by no result, and it remained for M. de Lesseps, in the present day, to realize what were thought the dreams of commercial speculators, by carrying out the long-desired passage between the two seas. But the post- ponement of the scheme unquestionably favoured the chances of its commercial success, for had the canal been completed even a few years earlier, comparatively few vessels would:have been found to take advantage of it. Masters of sailing-vessels would not from choice have navi- gated the Mediterranean and encountered the passage through the canal and the tedious and difficult voyage of the Red Sea. They would undoubtedly have preferred to round the free seaway of the Cape of Good Hope, with all its ocean dangers and. excitements, to threading their way through such an inland passage, involving -risks of rocks and shoals, protracted calms and contrary winds. But the introduction of ocean-going screw-steamers was an entirely new feature in navigation. Being independent of wind for their propulsion, and being admirably fitted for navigating narrow straits and passages, their rapid and general adoption by all the leading shipping firms in the world afforded not only a plea, but a necessity for the short communication by the Mediterranean and Red Sea. It was indeed a great achievement to reduce the distance between Western Europe and India from 11,379 to 7628 miles, equal, according to Admiral Richards and Colonel Clarke, R.E., to a saving of thirty-six days on the voyage; and this is the great result effected by cutting the Suez Canal between the Mediterranean and the Red Sea.~~

~~Mr Bateman, C.E., who visited the canal as the repre- sentative of the Royal Society, communicated to that body a description of the works, in which he gives the following account of the early negotiations of M. Ferdinand Lesseps, who has the credit of having brought the work to a success- ful issue ; 1—~~

~~"The project" of M. Ferdinand Lesseps "was to cut a great canal on the level of the two seas, by the nearest and most practicable route, which lay along the valley or depression containing Lake Menzaleh, Lake Ballah, Lake Timsah, and the Bitter Lakes. The character of this route was described in 1830 by General Chesney, R.A., who examined and drew up a report on the country between the Mediterranean and the Red Sea. At that time a difference of 30 feet between the two seas was still assumed, and all proposals for canals were laid out on that assump- tion. General Chesney summed up his report by stating, —'As to the executive part there is but one opinion; there are no serious difficulties ; not a single mountain intervenes, scarcely what deserves to be called a hillock; and in a country where labour can be had without limit, and at a rate infinitely below that of any other part of the world, the expense would be a moderate one for a single nation, and scaicely worth dividing among the great kingdoms of Europe, who would all be benefited by the measure.'~~

~~""M. Lesseps was well advised therefore in the route he selected, and (assuming the possibility of keeping open the canal) in the character of the project he proposed.~~

~~"From 1849 to 1854 he was occupied in maturing his project. In the latter year Mahomet Said Pasha became Viceroy of Egpyt, and sent at once for M. Lesseps to consider with him the propriety of carrying out the work. The result of this interview was, that on the 30th of November a commission was signed at Cairo, charging M. Lesseps to constitute a company named 'The Universal Suez Canal Company.' In the following year, 1855, M. Se~~

- ~~Proceedings of the Royal Society, 1870, p. 132.~~

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~~Lesseps, acting for the Viceroy, invited a number of gentlemen, eminent as directors of public works, as engi- neers, and distinguished in other ways, to form an Ipter. national Commission for the purpose of considering and reporting on the practicability of the scheme.~~

~~"The Commission met in Egypt in December 1855 and January 1856, and made a careful examination of the harbours in the two seas, and of the~~

~~intervening desert, and arrived at the conclusion that a ship canal was practicable between the Gulf of Pelusium in the Mediterranean and the Red Sea near Suez. They differed, however, as to the mode in which such a canal should be constructed, The three English engineering members of the Commission were of opinion that a ship canal, having its surface raised 25 feet above the sea-level, and communicating with the Bay of Pelusium at one end and the Red Sea at the other, by means of locks, and supplied with water from the Nile, was the best mode of construction. The foreign members, on the contrary, held that a canal having its bottom 27 feet below sea-level, from sea to sea, without any Jock, and with harbours at each end, was the best system,—the harbours to be formed by piers and dredging out to deep water.~~

~~"The Commission met at Paris in June 1856, when the views of the English engineers were rejected, and the report to the Viceroy recommended the system which has since been carried out.~~

~~"Two years:from the date of this report were spent in conferences and preliminary steps before M. Lesseps obtained the necessary funds for carrying out the works, About half the capital was subscribed on the Continent, by far the larger portion being taken in France, and the other half was found by the Viceroy. necessarily lost in preparation, and it was not till near the close of 1860 that the work was actually commenced.~~

~~"The original concession granted extraordinary privileges to the Company. It included or contemplated the forma- tion of a 'sweet water' canal for the use of the workmen engaged, and the Company were to become proprietors of all the land which could be irrigated by means of this canal. One of the conditions of the concession also was that the Viceroy should procure forced labour for the execution of the work, and soon after the commencement of operations, and for some time, the number of workmen so engaged amounted to from 25,000 to 30,000. The work thus commenced steadily proceeded until 1862, when the late Viceroy, during his visit to this country at the time of the International Exhibition, requested Sir John Hawkshaw to visit the canal and report on the condition of the works and the practicability of its being successfully completed and maintained. His Highness's instructions were that Sir John Hawkshaw should make an~~

~~examination of the works quite independently of the French company and their engineers, and report the results at which he arrived."~~

~~We quote these results as given in Sir John Hawkshaw' report, because they show the nature of the difficulties that had been raised and the soundness of the advice which Sir John gave—advice which undoubtedly greatly contributed to the successful completion of the work.~~

~~The following are given by Sir John as the objections to the work :—~~

~~"*1, That the canal will become a stagnant ditch.~~

~~'*2. That the canal will silt up, or that the moving sands of the Desert will fill it up.~~

~~'*3. That the Bitter Lakes through which the canal is to pass will be filled up with salt. ¥~~

~~' 4. That the navigation of the Red Sea is dangerous and difli- cult.~~

~~'5, That shipping will not approach Port Said, because of the difficulties that will be met with, and the danger of that port om @~~

~~lee shore. "*6. That it will be difficult, if not impracticable, to keep opel~~

~~! the Mediterranean entrance to the canal."~~

~~Further time was .~~

~~CANAL~~

~~Having analysed cach of these objections, and fully weighed the arguments on which they were based, he came to the following con- clusions as to the practicability of construction and maintenance:—~~

~~'61st, As regards the engineering construction, there are no works on the canal presenting on their face any unusual difficulty of exe- cution, and there are no contingencies that I can conceive likely to arise that would introduce difficulties insurmountable by engineer- ing skill.~~

~~eo Qdly, As regards the maintenance of the canal, I am of opinion that no obstacles would be met with that would prevent the work, when completed, being maintained with ease and efficiency, and without the necessity of incurring any extraordinary or unusual yearly expenditure."~~

~~"Said Pasha died between the period of Sir John Hawkshaw's examination of the country and the date of his report. He was succeeded by his brother, Ismail, the present Viceroy or Khedive, who, alarmed at the largeness and uncertainty of the grants to the Canal Company, of the proprietorship of land which could be irrigated by the sweet water canal, and anxious to retire from the obligation of finding forced labour for the construction of the works, refused to ratify or agree to the concessions granted by his brother. The whole question was then referred to the arbitration of the late Emperor of the French, who kindly undertook the task, and awarded the sum of £3,800,000 to be paid by the Viceroy to the Canal Company as indemnification for the loss they would sustain by the withdrawal of forced or native labour, for the retrocession of large grants of land, and for the abandonment of other privileges attached to the original act of concession. This money was applied to the prosecution of the works.~~

~~"The withdrawal of native labour involved very important changes in the mode of conducting the works, and occasioned at the time considerable delay. Mechanical appliances for the removal of the material, and European skilled labour, had to be substituted ; these had to be recruited from different parts of Europe, and great difficulty was experienced in procuring them. 'The accessory canals had to be widened for the conveyance of larger dredging- machines, and additional dwellings had to be provided for the accommodation of European labourers. Ultimately all difficulties were overcome, and the work proceeded."~~

~~After the works had been nearly completed, the Lords of the Admiralty instructed Admiral Richards, the hydro- grapher, and Lieutenant-Colonel Clarke, R.E., to visit Egypt, and report as to the condition of the canal. These officers accordingly made a most minute survey of the canal and its terminal harbours, and issued a most interesting report,! from the information contained in which the plan of the canal, Plate XXXVI., has been mainly constructed. From this plan it will be seen that the canal~~

~~extends from Port Said on the Mediterranean to Suez on the Red Sea, and that, as shown by the section, it traverses a compara- tively flat country. This route has been selected so as to take advantage of certain valleys or depressions which are called lakes, but were in fact, previous to the construction of the canal, low-lying tracts of country, at some places below the level of the Mediterranean and Red Seas. These valleys were found to be coated with a deep deposit of salt, and are described as having had all the appearance of being covered with snow, bearing evidence of their having been at one period overflowed by the sea. As will be seen from the plan, Lake Menzaleh is next to the Mediterranean, Lake Timsah about half-way across the isthmus, and the Bitter Lakes next to the Red Sea. Lake Timsah, which is about 5 miles long, and the Bitter Lakes, about 23, were quite dry before the cutting of the canal, and the water which has converted them into large inland lakes was supplied from the Red Sea and Mediterranean. The water~~

~~1 Report on the Maritime Canal connecting the Mediterranean at Port Said with the Red Sea at Suez, February 1870.~~

~~began to flow from the Mediterranean in February 1869, and from the Red Sea in July, and by the beginning of October of the same year these vast tracts of country, which had formerly been parched and arid valleys, were converted into great lakes navigated by vessels of the largest class. It will be seen from the section that the surface of the ground is generally very low, the chief cuttings being at Serapeum and El] Guisr, where the sandy dunes attain an elevation of about 50 to 60 feet. The channel through the lakes was excavated partly by hand labour and partly by dredging, and for a considerable portion the level of the valleys was so low as to afford sufficient depth without excavation. The material excavated appears to have been almost entirely alluvial, and easily removed ; the only rock was met with at El Guisr, where soft gypsum occurred, removable to a considerable extent by dredging, so that the canal works presented no physical difficulty.~~

~~The whole length of the navigation is 88 geographical miles. Of this distance 66 miles are actual canal, formed by cuttings, 14 miles are made by dredging through the lakes, and 8 miles required no works, the natural~~

depth being equal to that of the canal. Throughout its whole length the canal was intended to have a navigable depth of 26 feet for a width of 72 feet at the bottom, and to have a width at the top varying according to the character of the cuttings. At those places where the cuttings are deep, the slopes were designed to be 2 to 1, with a surface width at the water-line of about 197 feet, as shown in fig. 9, which

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Fia. 9.—Cross-section of Suez Canal at El Guisr.

is a cross-section at El Guisr; in the less elevated por- tions of the land, where the stuff is softer, the slopes are increased, giving a surface width of 325 feet. It will be understood that in the lakes the canal consists of a navigable channel of sufficient depth and breadth to admit the traffic, the surface of the water extending on either side to the edge of the lake. Fig. 10 shows a cross-section at Lake

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Fia. 10.—Cross-section at Menzaleh.

Menzaleh. 'The deep channel through the lakes is marked by iron beacons on either side, 250 feet apart, and the Admiralty reporters state that "in practice it is found more difficult to keep in the centre while passing through these beacons, than it is when between the embankments." At every 5 or 6 miles there is a passing-place, to enable large vessels to moor for the night, or to bring-up in order to allow others to pass, all these movements being regulated by telegraph from Port Said, Ismailia, or Suez. Perhaps the most interesting question to the engineer is the action of the tide in the narrow channel between the two seas, and the observations made on this subject are given in the following quotation from the Admiralty report :—

'The tidal observations which we were able to make were neces- sarily somewhat imperfect from want of time, but they were made at that period of the moon's age when their effect would be greatest ; the results show that in the southern portion of the canal, between Suez and Great Bitter Lake, the tidal influence from the Red Sea is felt, there being a regular flow and

ebb,—the flood running in for about seven hours, and the ebb running out for five hours; at the Suez entrance, the rise at springs, unless effected by strong winds, is between 5 and 6 feet; about half way from Suez to the Small Bitter Lake, a distance of 6 miles, it is under 2 feet; at the south end of the Small Bitter Lake, a few inches only; while at the south end of the Great Lake there is scarcely any perceptible tidal influence. We were informed by the authorities at Ismailia, that since the Great Lake has been filled, the level of Lake Timsah, which was

filled from the Mediterranean in April 1867, has risen 12 centi- metres, or about 4 inches, and that its waters are continually run- ning at a slowrate into the Mediterranean ; certainly this statement agreed with what we ourselves remarked, for we always found a current running northward from Lake Timsah at the rate of from half a mile to a mile an hour. Limited, however, as these tidal ob- servations were, they were taken with great care, and appear suffi- cient to show that, except at the Suez end, the tides will not ma- terially affect the passage of vessels ; at that end, therefore, large vessels must regulate their time of passing ; indeed, the greatest difficulty which will be experienced will be not from the tides, but from the prevailing north-east wind in the canal, which will make close steerage difficult in going from north to south."

It thus appears that the tidal column of 5 feet range in the Red Sea is reduced to 2 feet at the distance of 6 miles, and is practically annihilated by the wide expanse of the Bitter Lakes. But it would be highly interesting to have this conclusion confirmed by further systematic tidal obser- vations.

In executing this strange work of the desert, and converting dry sands into navigable lakes, it is stated that there have been about eighty millions of cubic yards of material excavated, and at one time sixty dredging-machines and nearly 30,000 labourers were employed. For their use a supply of fresh water was conveyed from the Nile at Cairo, and distributed along the whole length of the canal, a work which of itself was one of no small magnitude.

The cost of the whole undertaking, including the harbours, is stated to have been about £20,000,000. The terminal harbours are important adjuncts of

~~this great work. That on the Mediterranean is Port Said, which is formed by two breakwaters constructed of concrete blocks, the western one 6940 feet in length and the eastern 6020 feet, enclosing an area of about 450 acres, with an average depth of only 13 or 14 feet, excepting in the channel leading to the canal, where the depth is 25 to 28 feet. The entrance to the canal at Suez is also protected by a breakwater, and in connection with the harbour at this place there are two large basins and a dry dock.~~

~~The canal may be regarded as a highway for steamers of 400 feet in length and 50 feet beam. A delay of three days is calculated on for the passage across from Port Said to Suez.~~

~~It is satisfactory to learn from the report of Commander Wharton, of H.M.S. "Shearwater," "that the canal retains its depth of water. That report states that "' comparing generally the depth of the canal in 1873 and 1875 it seems that itis in about the same condition, with perhaps a slight balance in favour of increased depth now ; while its average minimum may be stated at 26 feet, there are yet consider- able tracts where 25 feet and even as little as 24 feet will be passed over." The survey of Lieutenant Millard, also reported to the Admiralty in 1875, shows that at the entrance to Port Said harbour the 27, 30, and 33 feet contour lines were seaward of those obtained before, proving that some shallowing of the water at the entrance has taken place.~~

~~The use made of the canal may be judged of from the following table of the traffic passing through since its com- mencement! :—~~

~~Number of Gross~~

~~Year. Vessels. Tonnage. Receipts.~~

~~1870 486 654,915 £206,373~~

~~1871 765 1,142,200 359,748 1872 1082 1,744,481 656,303 18738 1178 2,085,072 915,892 1874 1264 2,423,672 994,375~~

~~The tonnage has thus been quadrupled in five years; and the best means of enlarging the canal to accommodate increas-~~

~~\ The History of the Suez Canal, by F. de Lesseps, translated by Sir H. D. Wolff, 1876.~~

~~CANAL~~

~~ing trade must soon become an important question for itg owners.~~

~~Such works as the ship canals we have been describing entirely revolutionize ocean navigation, and consequently demand the zealous attention of all nations whose interests they seem to affect. Of this zealous watchfulness the interest taken by the Powers of Europe in the distribution of the property in the Suez Canal may be cited ag ap example. But notwithstanding the difficulties, legal and political, which the execution of such works are almost sure to create by severing continents before united, and connecting seas before separated by thousands of miles of exposed navigation, we may safely conclude that wherever the perils and delays of ocean sailing can be lessened by forming canals these valuable helps to navigation will at all hazards be carried out. Viewing then the subject prospec- tiely, we offer no apology for noticing two important short sea passages which, though still unexecuted, will doubtless in some form be eventually carried out.~~

~~One of these canals is designed to obviate the navigation Proposed of the dangerous:strait between Ceylon and the mainland Paumba — of India, which is shallow and narrow, and in some states "idl. of the wind has a violent current, so that it can only be navigated by vessels of 'small draught. Ships of the larger class have to circumnavigate Ceylon in making their pas- sages to the eastern section of Hindustan. The importance of avoiding this detour round Ceylon of 350 miles of exposed navigation in the direct Suez route to Calcutta and Madras will be readily acknowledged, and the execution of the work cannot long be delayed.~~

~~The strait to which we allude is the Paumben passage leading from the Gulf of Manaar on the west to Palk Bay on the east,as shown in fig. 11,and many attempts have been made by blasting to clear away the rocky obstructions that at present render its navigation dangerous. But in order to provide a safe passage of the strait between Ceylon and India for the ships which now navigate the Suez Canal, nothing will suffice but a canal affording the same~~

~~depth and width, though very much shorter in length than its great pioneer in shortening ocean sailing ; and accordingly surveys have been made and schemes have been proposed to effect this important improvement. Mr George Robertson, } Civil Engineer, when inspecting the harbours of India, was | asked by the British Government to visit the locality and) report on these schemes ; and from his Report on Indian~~

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~~Harbours we find that the site he selected as most suit- able is through the island of Ramaseram, about a mile east from Paumben lighthouse. The distance across from sea to sea is about 2 miles, the ground being a flat sandy plain, raised on an average about 7 feet above high water, and from the borings that have been made it is not expected that much rock will be found in the course of the canal. In order to assimilate it to the Suez Canal the navigable depth should if possible be about 26 feet. On the north side the distance from high water mark to 30 feet at low water is, according to a chart by the Surveyor- General at Colombo, upwards of a mile; on the south side the distance to the same depth is still greater, so that very considerable works of dredging will be necessary in forming and afterwards maintaining the entrances to the canal. The south end of the canal is under shelter of a coral reef, but the north end may perhaps require to be protected by break-waters. The cost of cutting the canal has been named at £440,000. | The other scheme to which we referred has a far higher~~

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~~seas, to which has to be added the problem of making and maintaining a deep-water channel from the ocean to the entrances to the canal.~~

~~This bold scheme, first proposed in the 16th century has at various intervals been the subject of many deputa- tions and much correspondence between~~

the American and European powers ; and more recently, in 1845, when Louis Napoleon was confined as a state prisoner at Ham, he spent much of his exile in investigating its practicability, and in making arrangements for carrying out, under the name of the “ Napoleon Interoceanic Canal,” a passage between the two seas from Port San Juan to Port Realejo. But we have not space to record the various early attempts to

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realize this project, and must therefore confine our remarks to giving an idea of the present state of negotiations regard- ing it.

The recent enormous growth of Californian trade has led to the revived consideration of the scheme by the United States of America, who would be the greatest gainers by the work, and therefore are its most natural promoters ; and what we propose is to give asketch of the present state of the question, as afforded by reports and documents recently issued by the Government of the United States, from which alone authentic information can be derived.

It appears from these documents that two routes have recently been investigated : — First, that of the Isthmus of

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~~MALDIVE é» ISLANDS **~~

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~~Fra. 11.—Showing Suez Canal and Proposed Canal at Ceylon.~~

~~Darien, shown in fig. 12, under the direction of Commander | Selfridge, U.S.N.; and _ second, that of Nicaragua, also _ shown in fig. 12, under the direction of Commander Lull, — U.S.N. To both of these expeditions were attached a large~~

~~staff, including naval officers, civil engineers, surveyors, mineralogists, &c., and their surveys appear to have ex- tended over the years 1871, 1872, and 1873.~~

~~The results of these surveys are thus summarized in the report of the Secretary to the Navy, submitted to the~~

~~locks, twenty in number, are to be 427 feet long, 54 feet wide, with a lift of 10 feet. The water supply is to be derived from the Napipi river, and the gaugings and obser- vations made on evaporation lead to the conclusion that there is a great excess of water above the supply required for the canal. Commander Selfridge gives two alternative schemes, by which the tunneling is increased in length and the number of the locks diminished, at an estimated cost of from £17,000,000 to £18,000,000 respectively.~~

~~The exploration of the Nicaraguan route, under Com- proposed mander Lull, the position of which is also shown in fig 12, Nicaraguan is said to have proved the existence of a practicable route, Canal.~~

~~— Government of the United States in 1873, from which we take the following information. Of the Darien route, it is~~

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~~said that it includes 100 miles of navigation of the River Atrato, which has been carefully sounded, and found to be fully capable of being navigated by the largest class of ocean-steamers. Between Atrato and the Pacific a canal~~

~~- or artificial cut must be formed of 28 miles inlength. The~~

~~canal for 22 miles of this distance passes through a plain having a gradual rise of 90 feet. There will then remain 6 miles to the Pacific, three of which will be in moderate~~

~~| open cutting, and 3 miles will be tunneling. It is esti-~~

~~mated that the work will cost between £10,400,000 and~~

~~£12,600,000, and that it can be completed in ten years.~~

~~The tunnel, being for the passage of ships of the largest size, is proposed to be 112 feet high and 60 feet wide, and is to have 87 feet of clear headway above the surface of the water, The canal is to be 25 feet in depth, with a bottom width of 50 feet, and a surface width of 70 feet. The~~

~~having Lake Nicaragua as its summit-level, being 107 feet above mean tide. It is proposed by this route to connect the lake with the Pacific by a canal 163 miles «in length, beginning at the mouth of the Rio del Medio and terminat- ing at Brito. The first 75 miles will require an excavation averaging 54 feet in depth, and will be the most expensive part of the whole work. Ten locks and one tide-lock will be required between the lake and the sea. There will be 56 miles of lake navigation.~~

~~Slack-water navigation in the San Juan from its head to the mouth of San Carlos is considered perfectly feasible, and it is proposed to improve the river by four dams, at Castillo Rapids, Balas Rapids, Machuca Rapids, and at the mouth of the San Carlos River, at all of which places there are excellent sites for dams, A short section of canal with~~

one lock will be required to get around each of the upper three dams. From the fourth dam to Greytown in the Caribbean Sea an independent canal will be required 41°9 miles in length with seven locks, which apparently presents no difficulty. The total length of the proposed canal is 61°7 miles, and no tunnel is required. The harbour of Grey- town has been partially destroyed by a silt which comes from the San Carlos, and others of the lower tributaries of the San Juan, and the branch of the river leading to Grey- town has become so much filled up that it is now, at the lowest stage of the water, only 324 feet wide and 6 inches deep at the fork. It is proposed to shut off this branch | entirely and send all the silt-bearing water through the Colorado mouth, which empties into the sea 18 miles from

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Greytown, and to admit tothe harbour only the water of the canal, which, being drawn from the main river above the mouth of the San Carlos, will be perfectly clean, The harbour then cleared out, will leave nothing to deteriorate it again,

Short breakwaters will be required to protect the

entrances from the surf, both of which are included in the

~~estimate for the work. Careful gauging at the lowest stage shows that Lake Nicaragua, which has a surface area of 2700 square miles and a drainage area of 8000 square miles, will supply thirty. eight times the maximum possible demand of water. The depth of water is to be 26 feet, the width at bottom 72 feet, and at surface 150 feet,~~

~~CARIBBEAN SEA~~

~~SAN JUAN (Greytown.~~

~~AMERICA~~

~~Fia. 12.—Lines of proposed Darien and Nicaragua Canals. 4~~

~~number, with a lift of from 8 to 10 feet, are to be 400 feet long and 72 feet wide. The estimate is stated at £15,900,000.~~

~~M. Lesseps, in a lecture on the Suez Canal, delivered before the Société des Gens de Lettres at Paris, has given it as his opinion that unless the Atlantic and Pacific can be united by simply piercing the Isthmus from sea to sea without locks, as at the Suez Canal, the proposed scheme cannot possibly succeed as a commercial enterprise, because of the inadequacy of a canal with locks to pass the traffic that will frequent it, and also of the uncertainty of sufficient water to supply the lockage and evaporation. This latter objection, however, seems to be disproved by the researches of the American engineers who have investigated the sub- ject. A further difficulty arises in maintaining a sufficient: sea-water depth to the canal even after it has been formed. On this point the writer of this article, judging from documents prepared under the sanction of the Government of the United States and submitted to him by an authorized official of the Government, arrived at the conclusion that there are very formidable obstacles to the establishment and future maintenance of a deep-water entrance to the proposed Nicaraguan Canal at Greytown in the Caribbean sea. These obstacles involve the engineering problem of main-~~

~~taiping permanent deep water through an extensive shallow foreshore composed of soft materials and exposed to heavy seas. The reports state "that at Greytown there are now islands where twenty years ago there was~~

~~water enough to float a frigate." It remains to be seen whether the same difficulties apply to the entrance to the proposed Darien scheme ; and, to show that such fears may not be un- founded, we may remind the reader that the difticulties exist, as we have stated, at the Mediterranean entrance to the Suez Canal.~~

~~The question as to the best route for transit between the Atlantic and Pacific is, it will be seen, still far from being solved, but the necessity for free access from sea to sea remains an acknowledged fact. Its importance, especially to the United States, but in some degree to all the world, is such that, great as are the engineering difficulties, this long-cherished bold zdea may yet become a stupendous reality. (D. 8.)~~

~~Reference is made to the following works :—Chapman, On Canal Navigation ; Frisi, On Canals; Fulton, On Canal Navigation; Tatham's Economy of Inland Navigation; Vallancy's Treatise on Inland Navigation ; Principles and Practice of Canal and Liver Engineering, by David Stevenson, 2d edition, A. and C. Black,~~

~~Edinburgh ; Report of the Secretary of the United States Navy for~~

~~1873~~

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~~CANAL, or Canatetro, Antonio (1697-1768), a Venetian painter, born 18th October 1697, was bred with his father, a scene-painter at Venice, and for some time followed his father's line of art. In 1719 he went to Rome, where he employed himself chiefly in delineating ancient ruins, and particularly~~

~~studied effects of light and shade, in which he became an adept. He was the first painter who made practical use of the camera lucida. On returning home he devoted his powers to views in his native city, which he painted with a clear and firm touch and the most facile mastery of colour in a deep tone, intro- ducing groups of figures with much effect. In his latter days he resided some time in England. His pictures, in their particular range, still remain unrivalled. He died on 20th August 1768. Bellotto (commonly named Bernardo) Canaletto, 1724-1780, was his nephew and pupil, and painted with deceptive resemblance to the style of the more celebrated master. 2~~

~~CANANDAIGUA, a town in the United States, capital of the county of Ontario in New York, is situated at the northern end of a lake of the same name, 29 miles S.E. of Rochester by rail, in 42° 54' N. lat. and 77° 27' W. long. It is a railway junction of some importance, and has a court-house, an academy, and two printing-offices. Its incorporation dates from 1815. The lake is a beautiful sheet of water about 15 miles long, with a breadth varying from less than a mile to more than a mile and a half. It is about 437 feet above Lake Ontario. The population of the town is 4862, and of the township 7274,~~

~~CANANORE. See KANANORE.~~

~~CANARA. See Kanara.~~

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~~794~~

~~one lock will be required to get around each of the upper three dams. From the fourth dam to Greytown in the Caribbean Sea an independent canal will be required 41:9 miles in length with seven locks, which apparently presents no difficulty. The total length of the proposed canal is 61°7 miles, and no tunnel is required. The harbour of Grey- town has been partially destroyed by a silt which comes from the San Carlos, and others of the lower tributaries of the San Juan, and the branch of the river leading to Grey- town has become so much filled up that it is now, at the lowest stage of the water, only 324 feet wide and 6 inches deep at the fork. It is proposed to shut off this branch | entirely and send all the silt-bearing water through the Colorado mouth, which empties into the sea 18 miles from~~

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~~PACT ELC BEAR~~

~~AB. Line of Darien Canal CD. Line of Nicaragua Canal EF. Line of PanamaRailway~~

~~CANAL~~

~~Greytown, and to admit tothe harbour only the water of the canal, which, being drawn from the main river above the mouth of the San Carlos, will be perfectly clean, The harbour then cleared out, will leave nothing to deteriorate it again.~~

~~Short breakwaters will be required to protect the~~

~~entrances from the surf, both of which are included in the~~

~~estimate for the work.~~

~~Careful gauging at the lowest stage shows that Lake Nicaragua, which has a surface area of 2700 square miles and a drainage area of 8000 square miles, will supply thirty. eight times the maximum possible demand of water.~~

~~The depth of water is to be 26 feet, the width at bottom~~

~~72 feet, and at surface 150 feet. The locks, twenty-one in~~

~~gle 82° a 80° 7~~

~~CARS 8 BEANS EA~~

~~RDAN JUAN (Greytown. \~~

~~NAMERICA~~

~~Fia. 12.—Lines of proposed Darien and Nicaragua Canals. 4~~

~~number, with a lift of from 8 to 10 feet, are to be 400 feet long and 72 feet wide. The estimate is stated at £15,900,000.~~

~~M. Lesseps, in a lecture on the Suez Canal, delivered before the Société des Gens de Lettres at Paris, has given it as his opinion that unless the Atlantic~~

~~and Pacific can be united by simply piercing the Isthmus from sea to sea without locks, as at the Suez Canal, the proposed scheme cannot possibly succeed as a commercial enterprise, because of the inadequacy of a canal with locks to pass the traffic that will frequent it, and also of the uncertainty of sufficient water to supply the lockage and evaporation. 'This latter objection, however, seems to be disproved by the researches of the American engineers who have investigated the sub- ject. A further difficulty arises in maintaining a sufficient — sea-water depth to the canal even after it has been formed. On this point the writer of this article, judging from documents prepared under the sanction of the Government of the United States and submitted to him by an authorized official of the Government, arrived at the conclusion that there are very formidable obstacles to the establishment and future maintenance of a deep-water entrance to the proposed Nicaraguan Canal at Greytown in the Caribbean sea. These obstacles involve the engineering problem of main-~~

~~taining permanent deep water through an extensive shallow foreshore composed of soft materials and exposed to heavy seas. The reports state "that at Greytown there are now islands where twenty years ago there was water enough to float a frigate." It remains to be seen whether the same difficulties apply to the entrance to the proposed Darien scheme ; and, to show that such fears may not be un- founded, we may remind the reader that the difficulties exist, as we have stated, at the Mediterranean entrance to the Suez Canal.~~

~~The question as to the best route for transit between the Atlantic and Pacific is, it will be seen, still far from being solved, but the necessity for free access from sea to sea remains an acknowledged fact. Its importance, especially to the United States, but in some degree to all the world, is such that, great as are the engineering difficulties, this long-cherished bold idea may yet become @ stupendous reality. (D. 8.)~~

~~Reference is made to the following works:—Chapman, On Canal Navigation ; Frisi, On Canals; Fulton, On Canal Navigation; Tatham's Economy of Inland Navigation; Vallancy's Treatise on Inland Navigation; Principles and Practice of Canal and River Engineering, by David Stevenson, 2d edition, A. and C. Black,~~

~~Edinburgh ; Report of the Secretary of the United States Navy for~~

~~1873~~

~~CAN—CAN~~

~~CANAL, or Canatetto, Antonio (1697-1768), a Venetian painter, born 18th October 1697, was bred with his father, a scene-painter at Venice, and for some time followed his father's line of art. In 1719 he went to Rome, where he employed himself chiefly in delineating ancient ruins, and particularly studied effects of light and shade, in which he became an adept. He was the first painter who made practical use of the camera lucida. On returning home he devoted his powers to views in his native city, which he painted with a clear and firm touch and the most facile mastery of colour ina deep tone, intro- ducing groups of figures with much effect. In his latter days he resided some time in England. His pictures, in their particular range, still remain unrivalled. He died on 20th August 1768. Bellotto (commonly named Bernardo) Canaletto, 1724-1780, was his nephew and pupil, and painted with deceptive resemblance to the style of the more celebrated master. —~~

~~CANANDAIGUA, a town in the United States, capital of the county of Ontario in New York, is situated at the northern end of a lake of the same name, 29 miles §.E. of Rochester by rail, in 42° 54' N. lat. and 77° 27' W. long. It is a railway junction of some importance, and has a court-house, an academy, and two printing-offices. Its incorporation dates from 1815. The lake is a beautiful sheet of water about 15 miles long, with a breadth varying from less than a mile to more than a mile and a half. It is about 437 feet above Lake Ontario. The population of the town is 4862, and of the township 7274,~~

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~~king, he sailed in 1404 witha strong force, which mastered Lauzaroté, Fuerteventura, Gomera, and Hierro, without bloodshed. Being repulsed in his attempts on Palma and Canary, he returned to Europe in 1408 to obtain further assistance. He was well received at the Castilian court, where he was promised aid ; but he died shortly afterwards in France. Bethencourt's nephew had been left governor of the islands, and claimed to succeed to his uncle's rights. Being charged with many acts of misgovernment, he went to Spain to clear himself, and whilst there sold his rights to Don Enrique de Guzman, who, after expending large sums in fruitless endeavours to reduce the unconquered islands, sold them to another Spaniard named Paraza, His successors, about 1461, took nominal possession of Canary and Teneriffe, but the natives effectually resisted their occupation of them. Meantime it appeared that Jean de Bethencourt's nephew had fraudulently made a second sale of the islands to Portugal, and the difference thus arising between the crowns of Spain and Portugal was ended by the cession of the islands to the former. Grand Canary, Teneriffe, and Palma remaining unsubdued in 1476, Ferdinankand Isabella of Spain compelled Paraza's successors , to sell those islands to the crown; and the following year 1000~~

~~men were despatched to reduce them. After much bloodshed, and with reinforcements from the mother country, the Spaniards, under Pedro de Vera, became masters of Grand Canary in 1483. Palma was conquered in 1491, and Teneriffe in 1495, by Alonzo de Lugo, All the islands still continue in the possession of Spain,~~

~~Inhabitants—As to the derivation of their original inhabitants, the Guanches, nothing certain isknown. The most probable supposition is that they came from the adjoining coast of Africa, Pliny states that the islands were uninhabited at the time of which he wrote. If this were so, we might infer, from the absence of any trace of Mahometanism amongst the people found there by the Spaniards, that the migration took place between the time to which his account refers and the time of the conquest of Barbary by the Arabs. Many of the Guanches fell in opposing the Spanish invasion, many were sold by the conquerors as slaves, and many conformed to the Roman Catholic faith and intermarried with the Spaniards,—so that all trace of them as a distinct race is lost, They were said to be of tall stature, and Humboldt styles them the Patagonians of the Old World; but the skeletons of Guanches when measured have been found to be less than average skeletons of Europeans. The Guanches embalmed the bodies of their dead, and placed them in caves; and many mummies have been found at different times in a state of extreme desiccation, each weighing not more than 6 or 7 bb. Two inaccessible caves in a vertical rock by the shore, three miles from Santa Cruz (Teneriffe), are said still to contain bones. A few words of the languages spoken by the ancient inhabitants have been preserved, and a resemblance of some of them to words of North African dialects has been noticed. On the other hand, the Guanches had customs, such as that of preserving their dead, in which they differed from the Berbers. Councillor Von Loher, one of the most recent investigators of the question, finds that the names of places in the interior of the island are generally either of Berber or of Teutonic origin, and maintains that the Guanches were in all probability the descendants of Vandal and Gothic immigrants.~~

~~The present ithabitants are slightly darker than the people of Spain, but in other respects are scarcely dis- tinguishable. The men are of middle height, well-made, and strong; the women are not striking in respect of beauty, but they have good eyes and hair. Spanish is the only language in use, The~~

~~people have most of the traits of the people of the peninsula; they are sober, but given to~~

~~CANARY ISLANDS~~

~~gambling ; they are quick, but lazy, faithless, and superstj. tious, The lower orders are quite illiterate, and the better classes not very enlightened. A few booksellers' shops of a minor description exist at Santa Cruz and Las Palmas, The sustenance of the lower classes is chiefly composed of fish, potatoes, and gofio, which is merely Indian corn or wheat roasted and then, when ground, kneaded with water or milk.~~

~~Government, &c.—The Archipelago is politically con. sidered part of the province of Andalusia. he governor- general, who resides at Santa Cruz, has chief command both in civil and military affairs. The actual administration of affairs is in the hands of two lieutenant-governors, who reside at Santa Cruz and Las Palmas. On the other islands are deputy-governors, acting under the lieutenant-governor to whose district they belong. The military force is com. posed of a battalion of soldiers of the line, numbering about 1000 men; six regiments of mijlitia, anlounting to about 8000 men, distributed amongst the islands; and a few companies of artillery. There is a military commander on each island. The great court of appeal sits at Las Palmas, Courts of first instance sit at Santa Cruz, Orotava, and Las Palmas. The land in great part is strictly entailed. The islands form two bishoprics, Teneriffe and Grand Oanary, The whole ecclesiastical revenue is estimated at upwards of £36,000. The monkish establishments have been sup- pressed, and such of the monasteries and convents as are not kept up for secular purposes are falling to ruin. No form of religion except the Roman Catholic is tolerated,~~

~~Climate and Meteorology.—From April to October a north or north-east wind of more or less strength blows upon the islands, commencing at 10 a.m, and continuing until 5 or 6 ".M. In summer this wind produces a dense stratum of sea cloud (cumuloni), 1000 feet thick, whose lower surface is about 3500 feet above the sea at Teneriffe. This does not reach up to the mountains, which have on every side a stratum of their own, about 500 feet thick, the lower surface being about 2500 feet above the level of the sea, Between these two distinct strata there is a gap through which persons ona~~

~~vessel approaching or leaving the island may obtain a glimpse of the peak. Travellers who ascend the mountains look down on these stationary layers of cloud. The sea cloud conceals from view the other islands, except those whose mountains pierce through it. On the south-west coasts there is no regular sea or land breeze. In wiuter they are occasionally visited by a hot south-east wind, called Levante, from the African continent, producing various disagreeable consequences on the exposed parts of the person, besides injuring the vegetation, especially ou the higher grounds. Locusts have sometimes been brought by this wind. In 1812 it is said that locusts covered some fields in Fuerteventura to the depth of 4 feet. Hurricanes, accompanied by waterspouts, sometimes cause much devasta- tion; but, on the whole, these islands are singularly free from such visitations. The climate generally is mild, dry, and salubrious. On the lower grounds the temperature is equable, the daily range seldom exceeding 6° Fahr. The rainy season occurs at the same period as in southem Europe. The dry season is at the time of the trade-winds, which extend a few degrees farther north than this latitude. "In no part of the world is the barometer more susceptible of atmospheric changes than amongst the Canary Islands. A rapid rise is the sure precursor of an easterly wind, whilst the contrary as certainly indicates a change to west or south-west " (Lieut. Arlett).~~

~~Agriculture, Manufactures, and Commerce.—In ordinary years sufficient grain and potatoes are produced to supply the wants of the islands. The soil on the lower part of the islands, where water is plentiful, is productive; in some places two crops of Indian corn and one of potatoes~~

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~~tent, chiefly on Palma. is manufactured on the spot into stockings, ribands, &c. _ Some linen and woollen stuffs of a coarse kind are made~~

~~Cena Py ishbANDS~~

~~ean be obtained from the same piece of ground in a twelve:~~

~~month. Except at Fuerteventura, the vine is much culti-~~

~~vated, but chiefly at Teneriffe, the best wines being produced on the north-west coast. None, however, ig considered so good as the wine of Madeira. The most esteemed kind is sent to England under the name of Vidonia. The grape disease made its appearance at the Canaries in 1853, and destroyed nearly the whole crop. Previously the total annual produce was estimated at about 40,000 pipcs, of which 25,000 pipes were produced in Teneriffe. Between 8000 and 9000 pipes were exported. The price per pipe~~

~~on board ranged from £8 to £20. Some of the wine is — distilled into good brandy. Sumach, canary-seed, and a~~

~~little flax are grown. Sweet potatoes, maize, gourds, pump- kins, tara (Colocasia antiquorum), lentils, Cicer aretinwm,~~

~~| beans, kidney beans, and lupines are extensively cultivated for food. From bad management the fruits are generally _ inferior.~~

~~They include oranges, figs, bananas, dates, pine- apples, pomegranates, papaws, guavas, custard apples, and prickly pears. There are no cocoa-nut trees or bread-fruit A little oil is obtained from the olive in Grand Canary, The agave is abundant, and supplies a material~~

~~| for ropes, girths, &c. The leaves of the date palm are made into hats and baskets. | gathered for exportation; and the ice-plant is grown in~~

~~A good deal of orchil-lichen is~~

~~small quantity for barilla. The sugar manufacture, once largely carried on, has fallen before the American and West Indian trade; the only two existing mills are on Palma. tive, other products have received attention, the chief being cochineal. This insect, which feeds on a species of cactus, was introduced in 1825, and is now largely produced on~~

~~all the islands,—land formerly occupied by grain and vines~~

~~being devoted to its cultivation. In 1873 upwards of 5,728,000 ib, of the total value of 13,894,225 pesetas, or about £555,849, were exported, principally to France and England. The silkworm is reared to a small ex-Raw silk is exported, and some~~

~~for home consumption, but the great bulk of the clothing in use is of British manufacture. The island goats (a~~

~~_ peculiar and esteemed breed) furnish milk, from which~~

~~butter and cheese are made. Pigs and sheep of a small coarse-woolled breed are numerous, Horses and cattle are scarce; domestic fowls and rabbits are plentiful. Asses~~

~~, and mules are much used. A fishery on the African coast,~~

~~which gives employment to many persons, has existed from~~

~~an early period. The fish, principally bream, is salted and~~

~~largely consumed at the Canaries.~~

~~There is a good deal of intercourse by means of boats and small sailing vessels amongst the different islands. In this way wine, raw silk, cochineal, barilla, and dried fruits are taken to the places of export; and grain is conveyed from those islands where it is abundant to those where the supply is deficient. The principal foreign trade is with England, the chief articles of export being wine, cochineal, barilla, and orchil. The imports consist of iron, metal goods, glass, crockery, leather, and silk, cotton, and weollen manufaetures. There is also a considerable trade with the United States and~~

the countries bordering the Mediter- ranean, commodities takes place. commerce are foreign, chiefly British; but the islanders send a few vessels of their own with brandy, coarse earthen- ware, and silk goods to the Spanish West Indies, bringing back cigars, sugar, coffee, rum, cocoa (the material of chocolate), and a few other articles. Santa Cruz, Orotava, and Las Palmas are the only ports engaged in foreign trade ; nearly 300 vessels enter these ports in the course of

Wine having been for some time so little remunera- |

With Hamburg and France an exchange of | The ships employed in this |

797

a year. In 1852 the ports were practically made free— the small duty of 2s. per cent. only being now levied upon imported goods, with the exception of tobacco, which pays 5d. per 1b., and cigars which pay 10d. per tb. Spanish steamers ply between Cadiz and Santa Cruz. The Spanish Government packet on its outward voyage to Havana touches at Santa Cruz once a month; and the same port is visited by the English mail steamers in their voyages to and from the African coast.

Zoology.—The indigenous mammals and reptiles of the Canary Islands are very few in number. Of the former, only species of dog, of swine, of goat, and of sheep were found upon the island by the Spanish conquerors. The race of large dogs which is supposed to have given a name to Canary has been long extinct. A single skeleton has been found, which is deposited in one of the museums at Paris. The ferret, rabbit, cat, rat, mouse, and two kinds of bat have become naturalized. The ornithology is more inter- esting, on account at once of the birds native to the islands and the stragglers from the African coast. The latter are chiefly brought over in winter when the wind has blown for some time from the east. Among the former are some birds of prey, as the African vulture, the falcon, the buzzard, the sparrow-hawk, and the kite. There are also two species of owl, three species of sea-mew, the stockdove, quail, raven, magpie, chaffinch, goldfinch, blackcap, canary bird, titmouse, blackbird, house-swallow, &c. The bird with the sweetest song is a variety of the blackcap or Sylvia atricapilla. As to the insects, mention may be made of a species of gnat or mosquito which is

~~sometimes trouble- some, especially to strangers, and the cockroach. The list of reptiles is limited to three lizards anda frog. The only fresh-water fish is the eel. The marine fishes are not numerous, the reason perhaps being that the steepness of the coast does not allow seaweed to grow in sufficient quantity to support the lower forms of marine animal life. Whales and seals are occasionally seen. The cuttle-fish is abundant, and is sought for as an article of food.~~

~~Botany.—The position of mountainous islands like the Canaries, in the sub-tropical division of the temperate zone, is highly favourable to the development, within a small space, of plants characteristic of both warm and cold climates. Von Buch refers to five regions of vegetation in Teneriffe :—1. From the sea to the height of 1300 feet. This he styles the African region. The climate in the hottest parts is similar to that of Egypt and southern Barbary. Here grow, among the introduced plants, the coffee-tree, the date-palm, the sugar-cane, the banana, the orange tree, the American agave, and two species of cactus ; and among indigenous plants, the dragon tree on the north-west of Teneriffe. A leafless and fantastic euphorbia, E. canariensis, and a shrubby composite plant, Cacala Kleinia, give a character to the landscape about Santa Cruz. 2. Between 1300 feet and 2800 feet. This is the region of South European vegetation, the climate answering to that of southern France and central Italy. Here flourish the vine and the cereals. 3. The region of indigenous trees, including various species of laurel, an Ardisia, lea, Rhamnus, Olea, Myrica, and other trees found wild also at Madeira. The clouds rest on this region during the day, and by their humidity support a vegetation amongst the trees, partly of shrubs, and partly of ferns. It extends to the height of 4000 feet. 4. The region of the beautiful Penus canartensis, extending to the height of 6400 feet ; here the broad-leaved trees have ceased to grow, but arborescent heaths are found throughout its whole extent, and specimens of Juniperus oxycedrus may be met with. 5. The region of Retama (Cytisus nubigenus),a species of white-flowering and sweet-sceuted broom, which is found as high as 11,000 feet. At the upper edge of this region a lilac-coloured~~

~~violet clings to the soil, and above there is nothing but a little lichen. The number of wild flowering plants may be estimated at 900, upwards of 270 of which are peculiar to the Canaries. The forms of vegetation must in the main be considered North African, since the origin of many of those which they have in common with Southern Europe should be looked for in Africa. The character of the vegetation in Lanzarote and Fuerteventura islands, com- posed of extensive plains and low hills, with few springs, is different from that of the other islands, which are more elevated and have many springs. The wood is more abuudant, and the vegetation more luxuriant.~~

~~Geology.—Recent soundings have proved that the Canary Islands, like the other island groups of the North Atlantic, are the summits of mountains that are surrounded by an ocean of great depth. The lower and exterior portion of these islands consists for the most part of basalt, compact, vesicular, or scoriaceous, interstratified with beds of variously-coloured tufa. The compact variety of basalt frequently contains scattered grains and crystals of augite and olivine, In some cases the rock is chiefly trachyte. In Grand Canary the fossils contained in the tufas prove that movements of elevation began in the Upper Miocene period. They continued down to the Pleistucene period, for raised beaches containing shells of the recent period exist both in Teneriffe and Grand Canary. Simultaneously with the upheaval subaérial eruptions were taking place. Many of the superimposed streams of lava are divided from one another by red bands of laterite, probably ancient soils forraed by the decomposition of the surfaces of the lava, and showing that the building up of the islands was a slow process, In Teneriffe the basalt and tufa form an exterior mass, through which in the centre emerge the felspathic or trachytic rocks forming the nucleus of the volcanic cone, and over them fragments of pumice and streams of modern lava have been thrown. 'These trachytic rocks contain numerous disséminated crystals of glassy felspar. Obsidian is found in several parts of Teneriffe, and is usually spotted with white crystals of felspar. The few minerals that have been found in the Canary Islands are those characteristic of volcanic regions. A little iron exists, but is not turned to account. In no part of Teneriffe has there been dis- covered any sedimentary rock. The old lavas in Lanzarote are covered by a thin layer of white concretionary limestone, the origin of which is obscure, In Grand Canary and Fuerteventura there is also calcareous stone, but its nature does not appear to be known,~~

~~TENERIFFE, the largest island of the group, lies between Grand Canary and Gomera. It is of irregular shape, 60 miles in length, with an extreme breadth of 30 miles, Not more than one-seventh is cultivable. A chain of mountains~~

~~traverses the island in the direction of its greatest length, |~~

~~and in the middle of the broadest part rises the celebrated Peak, locally known as the Pico de Teyde, which, with its supports and spurs, occupies nearly two-thirds of the whole island. It has a double top ; the highest point, El Piton, is 12,200 feet above the sea; the other, Chahorra, con- nected with the first by a short narrow ridge, has a height of 9880 feet. They are both orifices in the same grand dome of trachyte. Neither reaches the line of perpetual snow. There is, however, a natural cavern, 11,050 feet above the sea, where snow is preserved all the year. Snow remains about four months on the upper part of the Peak.~~

~~For more than one-half of its circumference the base of the true peak rises from an elevated but comparatively level tract, called by the Spaniards Hl Llano de la Retama (retama being the name of the Cytisus nubigenus which abounds there), and by the English the Pumice-Stone Plains. On the south-east, south, and south-west there is~~

~~a high curved ridge overlooking the Pumice-Stone Plains, |~~

~~CANARY "1S Lene~~

~~and presenting a very steep face to the Peak. This is the analogue of the Somma ridge of Vesuvius, Between the ridge and the sea the slope is more gradual, and there are intervening table-lands. A path used by the country people in going from one side of the island to the other crosses this ridge at the height of 8000 feet. Peaks rise from the ridge, one of which (G@uajara) attains the height of 8900 feet. This ridge (the Llano) and the modern volcanic cone resemble in aspect a fortress with circular ramparts aud a fosse. The ramparts are about 8 miles in diameter, and tower in some places more than 1500 feet above the fosse. They consist, as shown in the sections, of beds of trachyte, greenstone, and tufa of various thick- nesses, and intersected by dykes and fanlts, On the north-west comparatively late~~

~~eruptions have filled up the fosse. 'The modern cone, then, is a pile of lava, pumice, and ashes, thrown up in an ancient crater which had become greatly enlarged either by a falling in of the upper part of the cone, or by a series of violent explosions. Both El Piton and Chahorra have craters on their summits, from which issue steani and a little sulphureous vapour, The crater on E] Piton is partly surrounded by a wallof lava, which has been made white by the action of sulphureous vapours, and every crevice contains small crystals of sulphur. The thermometer rises considerably when thrust into the ground, The crater is about 300 feet across, with a depth of, 70 feet, The average slope of the lower part of the cone is 28°; that of the sugar loaf at the top is 33°. The crater on Chahorra has a diameter of 4000 feet; its depth is scarcely 150 feet. The view from the highest point, when no clonds intervene, is very extensive. All the islands of the Archi-pelago are visible, and the horizon is 140 miles distant, Neither the coast of Africa nor the island of Madeira is within the range of vision.~~

~~The ascent of the Peak is usually made from Orotava, on the northern side of the island. After the cultivated grounds are left, the region of arborescent heaths is crossed. This zone extends over the zones of laurels and pines which have here disappeared. Above this is a belt covered with codeso (Adenocarpus frankenioides), and this extends to the region of retama, the first bushes of which are met with at the pass which admits the traveller into the Llano de la Retama. The scenery here is in striking contrast with what it has previously been. Instead of a steep and rugged ascent among black basaltic rocks, the traveller enters upon gently sloping ground, covered to a considerable depth with white puntice gravel, amongst which spring bushes of retama. The teuder shoots of this shrub serve the wild goats for food, and the flowers yield arich honey to the bees. The entrance to the Llano at a sort of portal (called Portillo) between two basaltic hills, is about 7000 feet above the sea. Between two and three hours are consumed in crossing the Llano to the base of the cone, the lower part of which (Monton de T'rigo) is ascended to a point 9750 feet above the sea, called Zstancia de los Ingleses, where the mules are usually left, and where travellers frequently pass the night. Then comes the Malpays, 1000 feet in altitude, consisting of rough black lava streams broken up into blocks and stones. These cease at the neck called Rambleta, the lip of an older crater over which the lava poured before the sugar-loaf cone of pumice and ashes was thrown up. 'The~~

~~pumice is in such quantity that at a distance it has the appearance of snow coating the Peak, From twenty to twenty-four hours are consumed in ascending the Peak and returning to Orotava,~~

~~To the north-west of the grand cone some thousands of feet below Chahorra, there are many small cones of erup- tion, showing that the intensity of volcanic action was greatest on this side. Eastward from the ridge bounding the Pumice-Stone Plains extends a chain of mountains to~~

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~~_ has never been known to fall here.~~

~~CANARY~~

~~the north-eastern extremity of the island. The highest peaks are Izana (7374 feet), Perejil (6027), and Cuchillo~~

~~5467).~~

~~\ Be ave no account in history of eruptions from either crater of the Peak. In 1795 a great quantity of lava was poured out from three vents on the eastern side; and in the same year lava streams issued from a crater near Guimar, half-way between Santa Cruz and the Peak. In the following year, a vent on the north-western side of the Peak discharged a copious stream, which flowed down to the sea, and nearly filled up the harbour of Garachico. For three months in 1798 much lava and other volcanic matter were ejected from orifices to the west of Chahorra.~~

~~Santa Cruz de Santiago, on the south coast, is the residence of the governor-general of the Canaries, the civil lieutenant-governor of the Teneriffe district, and the military governor of the island. Its position is 28° 28’ 30” N. lat. aud 16° 16’ W. long. It is a well-built and tolerably clean town of 10,830 inhabitants, lying on a small plain bounded by bare and rugged voleanic rocks, amongst which lie narrow valleys called barrancos. Scarcely any vegetation, except thorny cactuses and euphorbias, is to be seen in the neigh- bourhood. The streets are at right angles to each other, narrow, but provided with side walks. There are three public squares. The houses are generally low, with flat roofs ; those of the better class are large, with a court-yard in the middle, planted with shrubs in the Spanish fashion. The~~

~~market is well supplied with meat, fruits, and vegetables. Good water is brought from the fine forest of Mercedes, which is composed of laurels and other indigenous trees. A British consul resides in the town, and several English families. The accommodation for strangers is neither plentiful nor good. The Spanish cloak is much worn by the men, and the white mantilla by the women. Dromedaries brought from Lanzarote and Fuerteventura are in use for the conveyance of merchandise and in agricultural operations. A good animal costs from 30 to 40 dollars. A few wheel-carriages arein use. Much ground in the neighbourhood is planted with cactus (Opuntia Tuna) for the support of the cochineal insect. The town is defended by several batteries; and it was by a shot from one of these that Lord Nelson lost his arm, when he unsuccessfully attacked the place in 1797. Some English flags lost on that occasion are still hanging in one of the churches. The anchorage is good, and a mole facilitates landing. About 260 vessels annually visit the port. The climate is dry and moderately warm, the annual mean being 71° Fahr. The mean of the coldest month is 63°‘8 Fahr., and of the hottest 78°°8 Fahr. Rain falls on an average on thirty-six days in the year.~~

~~Laguna (population 4645) stands at the distance of four miles from Santa Cruz, in the centre of a plain where much grain is produced, elevated 1725 feet above the sea, and nearly surrounded by mountains, The situation is beautiful, but the town itself is gloomy. It contains seve- ral deserted convents and a cathedral. In summer the temperature is refreshingly cool, and for that reason Laguna is then resorted to by the rich of Santa Cruz. In~~

~~_ winter it is cold and damp, the plain being frequently laid _ under water by rain.~~

~~This is in consequence of three aerial currents meeting there, from the north, east, and south-west. The mean temperature of the year is 63°°2 Fahr. Snow The humidity of the atmosphere is shown by the quantities of sempervivum growing on the houses and walls.~~

~~A good road connects Santa Cruz and Orotava, a town on the north coast 25 miles distant. It passes through Laguna and Matanza,—a place deriving its name from the over- throw of the invading Spaniards by the Guanches in 1494. All travellers s»eak in terms of warm admiration of the~~

~~scenery in this part of the island. Humboldt says he " never beheld a prospect more varied, more attractive, more harmo- nious in the distribution of the masses of verdure and of rocks, than the western coast of Teneriffe." Date palms form a striking feature in the landscapes. The town of Orotava (population 3228) is 1040 feet above the sea, The houses are solidly built, but it has a deserted aspect.~~

~~Granp Canary (Gran Canaria), the most fertile island Grand of the group, is nearly circular in shape, with a diameter Canary.~~

~~of 24 miles and a circumference of 75 miles. The interior is a mass of mountain, reaching to the lieight of about 6000~~

~~feet above the sea, with ravines radiating to the shore. Its highest peak, Los Pexos, is 6400 feet above the sea. Large tracts are covered with native pine (P. canariensis). There~~

~~are several mineral springs on theisland. From the nature of the ground only a small part is under cultivation. Las Palmas (population 12,572), the seat of the local Govern- nient, is a well-built and clean town on a small bay on the north coast, deriving its name from the numerous palm trees, It contains a handsome: cathedral, a hospital, a college, several secularized convents, and an alameda or public walk. Its climate is more humid than that of Santa Cruz. Water is brought into the principal streets and squares by an aqueduct. The harbour, Puerto de la Luz, is defended by several forts, and affords good anchorage and shelter against all winds except the south-east. A British vice-consul resides here. In 1851 the cholera visited the island, and 9000 persons died, whilst not a single case occurred on any other island. Telde, the second place in the island, stands on a plain, surrounded by palm trees. At Atalaya, a short distance from Las Palmas, the making of earthenware vessels employ some hundreds of people, who inhabit holes made in the tufa. Pama (correctly, San Miguel dela Palma), 26 miles long, with an extreme breadth of 16 miles, lies 67 miles W.N.W. of Teneriffe. It is traversed in its longest direction (north to south) by a chain of mountains, the highest of which is 7900 feet above the sea. At the broadest part is a crater nine miles in diameter, known as the Caldera (i.e., cauldron), from~~

~~which, on its south-west side, runs a.ravine to the sea. The bottom of the crater has an elevation above the sea of 2300 feet, and 1t is overhung by peaks that rise more than 5000 feet above it. Some of these peaks are covered with snow for several months in the year. Extensive woods, principally composed of chestnut and pine, lie on their flanks. Palma contains several mineral springs, but there is great want of fresh water. The only stream which is never dried up is that which issues from the Caldera. In 1677 an eruption, preceded by an earthquake, took place from a volcano at the southern extremity of the island, and much damage~~

~~Palma.~~

~~Lanzarote.~~

~~Graciosa.~~

~~Fuerteven- tura.~~

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~~was done by the ejected ashes, stones, and lava. The sugar-caneis grown on an elevated plain called Los Llanos. Santa Cruz on the eastern coast is the principal town (population 4400). Ribands and stockings are manufactured there from silk produced on the island. The anchorage is good. The cultivated soil is fertile, but the labouring classes are in a wretched condition, notwithstanding their industrious habits.~~

~~LANZAROTE, the most easterly of the group, has a length of 31 miles and a breadth varying from 5 to 10 miles. It is naked and mountainous, bearing everywhere marks of its voleanic origin. Montafia Blanca, the highest point, attains a height of 2000 feet, and is cultivated to the summit. In 1730 the appearance of half the island was altered by a volcanic outburst. A violent earthquake preceded the catastrophe, by which nine villages were destroyed. In 1825 another volcanic eruption took place accompanied by earthquakes, and two hills were thrown up which still emit smoke. The port of Naos on the south- east of the island affords safe anchorage, It is protected by two forts. A short distance inland is the town of Arrecife (population 2700), where a British vice-consul resides, The climate is hot~~

~~and dry. There is ouly a single spring of fresh water on the island, and that is in a position difficult of access. From the total failure of water~~

~~the inhabitants were once compelled to abandon the island. —~~

~~Grain, wine (which is of superior quality), brandy, barilla, orchil, and raisins made from the muscatel grape are the principal articles of export. Dromedaries are used us beasts of burden. Teguise (population 1000), on the north-west coast, is the residence of the local authorities. A strait of about 6 miles in width separates Lanzarote fron Fuerteventura.~~

~~GRACIOSA, a small uninhabited island, is divided from the north-eastern extremity of Lanzarote by a channel a mile in width, which affords the most capacious and only safe harbour for large ships at the Canaries ; but basaltic cliffs, 1500 feet high, prevent intercourse with the inhabited part of Lanzarote. A few persons reside on the little island Allegranza, a mass of. lava and cinders ejected at various times from a now extinct volcano, the crater of which has still a well-defined edge.~~

~~FUERTEVENTURA lies between Lanzarote and Grand Canary. It has a length of 52 miles, and an average width of 12 miles. Though less mountainous than the other islands, its aspect is barren. The springs of fresh water are only two, and they are confined to one valley. Lava streams and other signs of volcanic action abound, but there has been no igneous activity since the Spaniards took posses- sion. At each of its extremities are high mountains, which send off branches along the coast so as to enclose a large arid plain. The highest peak reaches 2500 feet. In external appearance, climate, and productions this island greatly resembles Lanzarote. An interval of three years without rain has been known. The wine is bad. Barilla and orchil are largely exported. Oliva, with 970 inhabi- tants, is the largest town. A smaller place in the centre of the island named Betancuria is the residence of the authorities. Cabras, on the eastern coast (population 1000), is the chief port. Dromedaries are bred here.~~

~~Gomera lies 20 miles south-west of Teneriffe. Its greatest length is about 23 miles. The coast is precipitous and the interior mountainous, but it has the most wood and is the best watered of the group. The inhabitants are very poor. The palm trees produce excellent dates ; and wine, brandy, orchil, raw~~

~~silk, and dried fruits are sent to Tene- riffe. Dromedaries are bred on Gomera in large numbers. St Sebastian, the chief town and a port, has 2240 inhabi-~~

~~tants. Columbus resided here before sailing in search of the New World.~~

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~~HiErro, or Ferro, the most westerly and the smallest island of the group, is somewhat crescent-shaped. Its length is about 18 miles, its greatest breadth about 15 miles, and its circumference probably 50 miles. It lies 99 miles W.S.W. of Teneriffe. Its coast is bound by high steep rocks, which only admit of one harbour, but the interior is tolerably level. Its hill-tops in winter are some. times wrapped in snow, which, however, does not lie long, Better and more abundant grass grows, here than on any of the other islands. The island is exposed to wester] gales, which frequently commit great damage. Fountaing of fresh water are few, but there is a sulphurous spring, with a temperature of 102° Fahr. The once celebrated and almost sacred Til tree, which was reputed to be always distilling water in great abundance from its leaves, no longer exists. Only a small part of the cultivable land jg under tillage, the inhabitants being principally employed in pasturage. Wine, brandy, orchil, excellent dried figs, and Sheep are sent to Teneriffe. At Valverde, the principal town, with 4640 inhabitants, the local authorities reside, Geographers were formerly in the habit of measuring all longitudes from Ferro, the most westerly land known to them. The longitude assigned at first has, however, turned out to be erroneous; and the so-called "Longitude of Ferro" does not coincide with the actual longitude of the island,~~

~~See Bethencourt, The Canarian, published by the Hakluyt Society in 1872; Von Buch, Description des Iles Canaries, 1803 ; Bory de Saint Vincent, Les Iles Fortunées, 1825; Fritsch, Retse- bilder von den Canarischen Inscln, published as the 22d supple. mental part to Petermann's Mittheilungen ; C. Piazzi Smyth, Tene. rife, 1868. (J. ¥. dy~~

~~CANCALE, a seaport town of France, in the depart. ment of I]le-et-Vilaine, 10 miles EK. of St Malo, on the bay of St Michael, A considerable trade is carried on in oysters, which are found in the bay in great numbers and of~~

~~excellent quality. In 1758 the duke of Marlborough disembarked an army of 14,000 English here for the pur- pose of attacking St Malo, but retired without accomplish- ing anything. Population in 1872, 3814.~~

~~CANCAO, Canoar, or Kane-Kao, otherwise known as Ponthiamus or Potai-mat, or in Chinese, Ha Thian, the capital of a small state in Western Cambodia, on the eastern side of the Gulf of Siam, at the mouth of the River Cancao or Klong Chanda; in 10° 14' N. lat. and 104° 55' E. long. The town was once a great centre of Cambodian trade, its port having been declared free by a man of Chinese origin, who took advantage of the civil troubles of Siam to effect his purpose. In 1717, however, the Siamese expelled the merchants who had flocked to the place ; and though a considerable exportation of rice and salt is still maintained, the prosperity of the town has largely diminished, The harbour is shallow, though the river in general has a great depth of water. A canal gives communication with the Mekong River.~~

~~CANCER, or Carcinoma (from cancer, or kapkwos, an eating ulcer), is the name given to a class of morbid growths or tumours which occur in man, and also in certain of the lower animals, The term is apt to be somewhat loosely employed, partly owing to the fact that there are not a few forms of diseased growth respecting which it is still a matter of debate whether they are to be regarded as cancerous or not ; and in some measure also to the diffi- culty often experienced in recognizing true cancer particu- larly in its earlier stages.~~

~~The disease exists in various forms, which, although differing from each other in many points, have yet certain common characters to which they owe their special signifi- cance.~~

~~1. In structure such growths are composed of nucleated cells and free nuclei, together with a milky fluid called~~

~~Hier,~~

~~cancer juice, all contained within a more or less dense fibrous stroma or framework.~~

~~2. They have no well-defined limits, and they involve all textures in their vicinity, while they also tend to spread by the lymphatics and veins, aud to cause similar growths in distant parts or organs called 'secondary can-cerous growths."~~

~~3. They are undergoing constant increase, and their progress is usually rapid.~~

~~4, Pain is a frequent symptom. When present it is generally of a severe and agonizing character, and together with the local effects of the disease and the resulting condition of ill health or " cachexia," hastens the fatal termination to which all cancerous growths tend.~~

~~5. When such growths are removed by the surgeon they are apt to return either at the same or at some other part.~~

~~The chief varieties of cancer are Scirrhus or hard cancer, Encephalord or soft cancer, and ELpithelral cancer.~~

~~Scirrhus is remarkable for its hardness, which is due to the large amount of its fibrous, and relatively small propor- — tion of its cell elements. It is of comparatively slow growth, but it tends to spread and to ulcerate. Its most common seat by far is the female breast, though it sometimes affects internal organs.~~

~~Encephaloid is in structure the reverse of the last, its softness depending on the preponderance of its cell over its fibrous elements. Its appearance and consistence resemble brain substance (hence its name), and it is of such rapid growth as to have given rise to its being occasionally termed acute cancer. Its most frequent seats are internal organs or the limbs. Ulceration and hemorrhage are com- mon accompaniments of this form of cancer.~~

~~Epithelial cancer is largely composed of cells resembling the natural epithelium of the body. It occurs most frequently in those parts provided with epithelium, such as the skin and mucous membranes, or where those~~

~~adjoin, as in the lips. This form of cancer does not spread so rapidly nor pro- duce secondary growths in other organs to the same extent as the two other varieties, but it tends equally with them » to involve the neighbouring lymphatic glands, and to recur after removal.~~

~~Various views are entertained, and much discussion has taken place respecting the causation of cancer, but little has as yet been satisfactorily ascertained on the point. By some the disease is held to be from the first an entirely local affection, due to some alteration in the nutrition of the part, irrespective of any condition of the system gene- rally, but in course of time coming to assume a malignant form, and to infect the system secondarily. Others, on the contrary, maintain that a certain constitutional condition, either as regards the blood or some of the tissues of the body, must exist prior to the development of the disease to which it gives rise. A third view is that the concurrence of a constitutional and a local cause is necessary for the production of cancer. Without entering into an examina- tion of these opinions, it appears evident that a constitu- tional element cannot be excluded in view of such well- known facts as a hereditary liability to cancer, and also of its occasional appearance in several parts of the body at one time.~~

~~The hereditary tendency in some persons to this disease has long been recognized by medical men; but its extent was not accurately ascertained till Sir James Paget affirmed, as the result of his observations, that in one out of every three cases of cancer a family history of the malady could be traced, and further, that even this probably does not represent the whole extent of the hereditary predisposition to cancer,~~

~~Cancer is essentially a disease of degeneracy, all statistics going to show its relatively great frequency after middle~~

~~life; and the mortality, according to Dr Walshe, goes on increasing with each decade until the eightieth year. Cancer may, nevertheless, attack persons of any age, and instances of its occurrence are not unknown even among young children, It affects females to a much larger extent than males,—this, however, being fully explained by the greater liability of the~~

~~female breast and of the uterus to the disease than any other organs of the body ; for, apart from this, cancer is quite as common among men. It occurs equally among all ranks of life.~~

~~The commencement of a cancerous growth is frequently attributed to some local injury, as in the case of blows on the breast, or in the well-known instance of cancer of the lip following the irritation produced by smoking a short clay pipe. But it is only as exciting causes that the influence of such injuries can be admitted; and there must still remain, as necessary to account for the disease, some antecedent condition of the system which gives the par- ticular direction to the form of morbid action in the part.~~

~~Cancer tends to advance steadily to a fatal termination, but its duration varies in different cases according to the part affected, and according to the variety of the disease, Soft cancer affecting important organs of the body often proves fatal in a few months, while, on the other hand, cases of hard or epithelia] cancer may sometimes last for several years; but no precise limit can be assigned for any form of the disease. In some exceptionally rare instances cancerous growth may exist for a great length of time, and undergo a kind of spontaneous cure, or at Jeast prolonged arrestment.~~

~~With respect to the treatment of cancer the only hope of success lies in the entire removal of the disease. This can obviously be only accomplished where the growth affects parts which are within reach of the surgeon. When in such cases the tumour is of recent formation, is limited in its extent, does not largely affect the neighbouring lymphatic glands, and has not as yet produced any marked deterioration of the general health, the surgeon is warranted in operating. Although it must be admitted that the results are generally disappointing from the intense tendency of the disease to recur sooner or later, yet the relief to suffering and the prolongation of life obtained are alone sufficient to justify operative interference when other- wise admissible, not to mention the fact that in some rare instances a cure has thus been achieved. Nor is the view of the constitutional and hereditary nature of cancer necessarily inconsistent with the adoption of such remedial measures,—since, from the analogy of other hereditary diseases, it is probable that these influences are more potent at certain times of life, and that by prompt treatment the period of special liability may be tided over,~~

~~although the inherent tendency cannot be eradicated. When from the extent of the disease or its existence in internal organs no attempt at removal can be made, all that can be hoped for is the relief of suffering, and it is certain that even in such circumstances much may be done by appropriate medical treatment. It is painful to think how many of the unfor- tunate sufferers from this malady place themselves in the hands of ignorant persons who profess to be able to cure cancers, but whose violent remedies, if they do not actually destroy life, as has often been the case, only aggravate suffering and entail disappointment.~~

~~Cancer is known to occur in many of the lower animals, being probably most common among the domestic tribes, but it presents no special peculiarities as a disease beyond those already referred to. (J. 0. A.)~~

~~CANCRIN, Franz Lupwie von (1738-1796), a Ger- man mineralogist and metallurgist, was born in 1738 at Breitenbach. After acting as professor and holding municipal offices in Hesse and at Altkenirchen, he at-~~

~~tracted the notice of the Empress Catherine of Russia, who made him director of the salt-mines of Staraja-Russa, councillor of the Imperial College, and, three years before his death, councillor of state. He is the author of a large number of works in German on mineralogy and metallurgy, of which the most important, the Grundziige der Berg- und Salzwerkskunde, published at Frankfort in 13 vols., during the years 1773-1791, has been translated into several languages. He died in 1796.~~

~~CANDAHAR. See KANDAHAR,~~

~~CANDELABRUM, in Classical Antiquities, a stand for a lamp or lamps, usually of such a height as, when placed on the floor, to be serviceable to a person seated or reclining on a couch. The material varied according to the cir- cumstances of the owner; only those of bronze have survived; but they are many. Generally the form con- sists of a heavy base resting on three spreading claws. From the base rises a tall usually fluted stem, branching~~

~~out at the top into two or more arms from which the lamps were hung. On candelabra of this simple form the only place available for ornament was the top of the stem, on which a statuette or a group of figures could be placed ; and it appears that very many of the small bronze statuettes now existing in museunis had originally served this purpose. Or the lower part of the stem, immediately above the base, could be converted into a figure supporting the stem, as may be seen in several very beautiful examples in the British Museum. There was, however, no limit to the extent to which the origina] form night be departed from, as many of the candelabra from Pompeii show.~~

~~CANDESH, or KanpetsH. See KHANDESH.~~

~~CANDIA, the modern name of the island of Creve (¢.2.)~~

~~CANDIA, formerly the capital and still the most populous city of Crete, to which it has given its name (see CRETE), is situated on the northern shore somewhat nearer the eastern than the western end of the island, in 35° 20' N. lat. and 25°9' E. long. It is still surrounded by its extensive Venetian fortifications; but they have fallen into disrepair, and a good part of the town is in a dilapidated condition, mainly from the effects of earth- quakes. The principal buildings are the pasha's palace, the mosques, which are fourteen in number, the two Greek churches, the Armenian church, the Capuchin monastery, the bazaars, and the baths. The town is the seat of a Greek archbishop, and one of the churches ranks as a cathedral. The chief trade is in oil and soap, both of which are of excellent quality; 900 tuns of the former were exported in 1873, and of the latter 40,000 cwts. The coasting trade, which is of considerable importance, is mainly carried on in Turkish vessels. The manufacture of leather for home consumption is an extensive industry, and wine of good quality is produced in the neighbourhood. The harbour, which had grown almest inaccessible, was deepened by Mustapha Pasha between 1826 and 1840. It is formed for the most part by the ancient moles, and was never deep enough to admit the larger vessels even of the Venetians, which were accustomed to anchor in the port of the neigh- bouring island of Standia. A short distance from St George's Gate there is a small village exclusively inhabited by lepers, who number about seventy families. The popu- lation of the town is estimated at~~

~~from 15,000 to 18,000, about two-thirds being Turks. Candia, oras it is frequently called, Megalo Castro (the Great Fortress), occupies the site of the ancient Heracleion, the seaport of Gnossus, and is still known by that name to the Greek speaking population. The ruins of the mother city are situated at the distance of about two miles and a half to the S.E. at the village of Makri Teikos or Long Wall. Founded by the Saracens in the 9th century, Candia was fortified by the Genoese in the 12th, and was greatly extended and strengthened by the~~

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~~'Then they are distilled with the aid of superheated~~

~~Venetians in the 13th, 14th, and 15th centuries, Jt was besieged by the Turks under the Vizier Achmet in 1667. and, in spite of a most heroic defence, in which ule Venetians lost 30,000 in killed and wounded, it was forced to surrender in 1669. (Spratt's Z''ravels in Crete, 1865.)~~

~~CANDIAC, Jean Lovis Pierre ELIZaBern pp Montcatm DE, a child of astonishing precocity, born at the Chateau de Candiac, in the diocese of Nimes in France, in1719. At four years of age he read Latin, either printed or in manuscript ; and at six he understood Greek and Heb- rew, had an astonishing acquaintance with arithnietic, his- tory, geography, and heraldry, and had read many of the best authors. His extraordinary powers attracted the attention of the learned; and it was for his benefit that the typo- graphic board was contrived by M. Dumas, who superin- tended his instruction. He died at Paris in 1726.~~

~~CANDLE, a cylindrical rod of solid fatty or waxy matters, enclosing a central fibrous wick, and designed for giving light.~~

~~The raw materials mostly used for candles are tallow and palm oil; they are also made from wax, cocoa-nut oil, paraffin, spermaceti, the mineral wax called ozokerit, &e, For ordinary tallow candles, the mutton or ox tallow, taken as soon as possible after separation from the carcase, is sorted, cut into pieces, and melted in a pan; the mem- branous matters, which are known as graves or cracklings, collect at the surface; and the liquid tallow,~~

~~after being strained through a sieve and washed with boiling water, is ready for use. The candles are made either by dipping or by moulding.~~

~~The common tallow candles, however, are greatly inferior, both as regards illuminating power and absolute expense, to those now obtained from raw fats by processes based on the rescarches of some French chemists. The stearine or stearic acid industry, which is now of large proportions, originated in M. Chevreul's discovery that fats are composed of one or more inflammable fatty acids com- bined with a comparatively uninflammable base, glycerine. Thus, tallow or palm oil consists of palmitic, stearic, and oleic acids, with glycerine. An economical method of separating the acids and the glycerine was first discovered | in 1831 by De Milly, who used lime for the purpose, in | place of potash and soda, the substances adopted by Chevreul and Gay-Lussac in their patent of 1825. The factory established by De Milly and Motard near the Barriére de U Etoile, in Paris, gave the "star candles" their name.~~

~~In this saponification by means of lime, the melted fat is stirred some hours with a mixture of lime (about 14 per cent. of the weight of the fat) and water. The lime com- bines with the acids to form a soap, and the glycerine, dissolved in the water, is then run off. Next, the lime soap is decomposed, under heat, by means of sulphuric acid, which unites with the lime, the fatty acids being set free. 100 parts of the fatty acids, at this stage, give on an average 45°9 parts of a mixture of stearic and palmitic acids. The acids are washed with water, and allowed to cool and solidify. They are then pressed in press bags, both in the cold state and with application of heat, to expel oleic acid, which is liquid. After further purification, they are ready to be made into " stearine candles."~~

~~Various other methods of saponification have come into practice. Thus it was found that the amount of lime in the foregoing process might be greatly reduced if the mixture were heated to a higher temperature with superheated steam. In another method, sulphuric acid 1s added to the fat, and the mixture is heated. The black mass produced is washed with boiling water till all the fatty acids are completely freed from sulphuric acid.~~

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~~steam, cooled and pressed. This process offers advantages in treatment of impure and refuse fats, but it involves some waste of fat. Distillation has been dispensed with in the simpler process of De Milly (who found that fat could be saponified with sulphuric acid without formation of tarry matter), and more recently in that of Bock. Accord- ing to the latter, most neutral fats consist of small fat spherules, with thin albuminous skins,~~

~~The wicks of candles are generally of cotton-yarn, and, to secure good steady combustion, they should be of uni- form thickness, and free from knots or loose threads. The parallel threads of the wick are commonly twisted into a loose spiral. Plaited wicks were introduced by Cambacérés, his object being to do away with the necessity of snufting. Through twisting of the plaited wick as it burns, the pro- truding end is kept just outside the flame, and consumed to ash by the surrounding air. In stearine candles, the combustibility is often aided by impregnating the wicks with a solution of boracic acid ; a glass bead is formed at the top of the burning wick through the action of the acid on the constituents of the ash, and this by its weight turns the wick out of the flame. Another form of wick for stearine candles is prepared by first winding cotton-yarn round a wire. 'The covered rod is inserted in the mould, and after moulding is withdrawn from its covering, which remains as the wick. Machinery is now used in making various kinds of wick.~~

~~In the production of candles by dipping, the wicks are first arranged in pendant position on sticks on a frame corresponding in size to the dipping-trough, and each frame is suspended from one of a number of cross arms projecting from and jointed with an upright beam which turns on pivots. The workman turns these arms round, and as each frame comes over the dipping-trough, he presses the frame down, so that all the wicks are immersed in the tallow. This coats the wicks with one thin layer; the arms are then turned round, and each frame, as it successively arrives over the cistern, is treated the same way. The layer of tallow added in the dipping becomes consolidated before the turn comes for that set of candles to receive a second dip; and the arms are turned round and the candles dipped again and again, until all have acquired the requisite thickness and weight, which is known by a counterpoise fixed to the arm.~~

~~In the process of moulding, on the other hand, a number of slightly conical pewter moulds (ten to eighteen), finely- polished inside, are fixed by the larger extremity to a kind of trough, their taper ends projecting downwards. The wick is then fixed in the centre of the mould by being drawn through an aperture at the point of the mould which forms the upper end of the candle, and is retained in its place at the open extremity within the trough by means of a wire or other arrangement. The liquid material, being poured into the trough, fills all the moulds, and as soon as~~

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~~it is solidified, any redundance is removed and the candle drawn out of the mould by the end of the wick which has been held by the wire. Moulding-machines are in common use, in which as one set of candles is discharged from the moulds, the latter are, by the same movement, rewicked for the next process of filling.~~

~~The stearine candles are made by moulding. A difficulty arose from the tendency of stearic acid to crystallize in large foliated crystals, the candles produced being thus irregular in structure and brittle. The remedy at first adopted was the addition of a little arsenious acid, but this proved detrimental to health. The method now em- ployed is to mix 2 to 6 per cent. of white wax with the stearic acid when molten, or to add about 20 per cent. of paraffin.~~

~~Wax is a material not very suitable for moulding on account of its contraction in cooling and adhesion to the moulds. Several varieties of wax, besides that of bees, are used in candle-making. The wax is first submitted to a bleaching process ; and the candles are generally made by ladling molten wax upon the wicks from a large basin over which they are suspended from an iron ring. When the proper thickness has been acquired, the candles are taken down and rolled on a marble slab, or wooden table, and are then cut and trimmed. Where wax candles are made by the hand, the wax, being kept soft in hot water, is applied bit by bit to the suspended wick. Presses have been contrived for making wax candles ; they are of similar arrangement to those for making continuous lengths of lead and block- tin pipes. The wick is so directed that it is concentrically surrounded with soft wax when ejected from the spout of the cylinder of the press, thus~~

~~forming a continuous candle, which is afterwards cut up into lengths. Wax tapers of various thickness are produced by drawing the uncut wick through molten wax in a pan, then through a draw iron provided with somewhat conical apertures, arranged like those for wire-drawing, in the side of the vessel. The waxed wick is wound very slowly on a drum, the wax having time to solidify in its passage. The process may be repeated several times with drawing irons of increasing aperture.~~

~~Paraffin, now largely made into candles, is obtained from native petroleum (Rangoon oil), or from the products of dry distillation of peat, brown coal, Boghead mineral, lignite, bituminous schist, or ozokerit. The paraffin of candles is generally a mixture of several paraffins having different melting points. A little stearic acid (5 to 15 per cent.) is usually added, in order to make the candles more rigid, and in some instances to raise the temperature of fusion ; it also facilitates colouring. The candles are moulded much in the same way as stearine candles. The molten paraffin, however, is solidified suddenly by immersion of the warm moulds in cold water, the paraffin being thus pre- veuted from becoming crystalline and opaque. For black paraffin candles the paraffin is heated with anacardium shells, the resin of which is dissolved by it.~~

~~The mineral wax or paraftin known as ozokerit is found in the Carpathian Mountains, Galicia, Bohemia, and else- where. At the low temperature of 66° C. it becomes fluid, and other less fusible substances can then be added. Dr Letheby has observed that the light of 754 ozokerit candles equals that of 891 paraffin, or 1150 wax candles. Sperma- ceti is the solid matter obtained from the oil of the sperm whale by filtration. In further preparation for candles it is hardened and whitened by pressure, and refined by a weak~~

~~alkaline ley. A little wax or paraffin is added to prevent crystallization. Sperm candles have a high illuminating power, and notwithstanding their costliness, a considerable trade is done in them. The well-known composite candles~~

~~are made of a mixture of palm-acid and the stearine of cocoa- Belmont sperm is made of hot-pressed distilled palm-acid ; Belmont wax of the same~~

~~Night lights are short thick cylinders of fat, with a very thin wick, calculated usually In- making them, the melted fat is poured into shallow moulds having movable bottoms, with a projecting wire which moulds a narrow tube for the wick. By pressing up the bottom the cylinders of fat are ejected ; a wax-covered wick supported ona small piece of tin is afterwards inserted, and is cemented~~

~~nut oil in various proportions. mineral tinged with gamboge.~~

~~to burn from six to ten hours,~~

~~at the bottom part by pressing the night light on a warm~~

~~porcelain slab. Child's night lights are made in paper~~

~~cases of the nature of pill boxes, having a hole in the bottom~~

~~through which the tin-supported and waxed wick has been~~

~~inserted.~~

~~A candle is a simple but ingenious contrivance for sup- plying a flame with as much melted material as it can con-~~

~~sume without smoking. If the thickness of the candle be properly adapted to that of the wick, the fatty matter immediately below the flame is melted, so that a cup-like reservoir is produced, always properly filled for feeding the flame. The fibres of the wick act as a congeries of capillary tubes which convey the fluid fat into the flame, where, being exposed to a high temperature and sheltered from the air by the outer shell of flame, it becomes sub- jected to a dry distillation, The inflammable vapour thus produced rises, and by constant combustion diminishes in quantity and consequently in diameter, until at length it entirely disappears ina point. A current of air from below is produced by the heat of the flame; the oxygen of the air, aided by the high temperature, decomposes the inflam- mable vapour of the fat into hydrogen and carbon, and unites with these to form water and carbonic acid.~~

~~The interior dark part of a candle or other flame contains unignited inflammable vapour which will not of itself sup- port combustion; it may be drawn off with a glass tube and ignited at a distance. According to Frankland, the luminosity of an ordinary candle, lamp, or gas flame is due, not, as commonly supposed, to the separation of solid particles of carbon, but to that of very dense hydrocar- bons, which produce the same effect as the vapours of arsenic and phosphorus in their respective flames.~~

~~The excise duty of 4d. per Ib. on tallow candles, and 34d. per Ib. on wax and spermaceti candles, was repealed in 1832. (A. B. M.)~~

~~CANDLEMAS, a church festival, held on the 2d of February, which has in Scotland been chosen as one of the four term-days. The festival commemorates the purifica- tion of the Virgin; and the observances to which it owes its name, viz., the lighting of candles, and, in the Roman Catholic Church, the consecration of the candles which are to be used during the year for ecclesiastical purposes, are said to have an emblematical reference to the prophecy of Simeon that the child Jesus should become "a light to lighten the Gentiles." The institution of this feast dates probably from the reign of Justinian, and the year 542 is sometimes fixed upon as that of its first celebration. It is supposed to have grown out of the heathen festivals held in this month,—a view which is supported by the following considerations :—(1), The word February (con- nected with februare) denotes purification; (2), in this month the purification of the people took place ; (3), the rites of the Lupercalia, which were celebrated on the 15th, included the lighting of candles, in allusion to those used by Ceres in her search for Proserpine; and (4), the~~

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~~CANDLESTICK, in the earlier meaning of the word was the name applied to any form of support on which lights, whether candles or lamps, were fixed; and so it happens that what would now be called a candelabrum is stil] some- times spoken of from tradition as a candlestick, €.9., 88 When Moses was commanded to make a candlestick for the tabernacle, of hammered gold, a talent in weight, and con- sisting of a base with a shaft rising out of it and six arms, and with seven lamps supported on the sumraits of the six arms and central shaft. When Solomon built the temple,~~

~~he placed in it ten golden candlesticks, five on the north and five on the south side of the Holy Place ; but after the Babylonish captivity, the golden candlestick was again placed in the temple, as it had been before in the tabernagle by Moses. On the destruction of Jerusalem by Titus,tit was carried with other spoils to Rome. Representations of the seven-branched candlestick, as it is called, occur on the arch of Titus at Rome, and on antiquities found in the Catacombs at Rome. The primitive form of candle. stick was a torch made of slips of bark, vine tendrils, or wood, dipped in wax or tallow, tied together and held in the hand by the lower end, such as are frequently figured on ancient painted vases. The next step was to attach to them a cup (discus) to catch the dripping wax or tallow, See CANDELABRUM.~~

~~CANDLISH, Rosvert Smrra, D.D. (1806-1873), an eminent Scottish clergyman, was born at Edinburgh on the 23d March 1806. His father, who was a teacher of medicine, having died a few weeks after his birth, the widow and family removed to Glasgow, where young Candlish was brought up and educated. In 1818 he entered the University of Glasgow, and after a curriculum of five sessions, during which he carried off many honours, he duly graduated M.A. Entering immediately on his professional studies, he passed during the years 1823-26 through the prescribed course at the divinity hall, then presided over by Dr Stevenson MacGill. While carrying on his studies he had been largely occupied, according to the common Scotch practice, with private teaching, and on leaving the divinity hall he accompanied a pupil as private tutor to Eton. On the termination of this engage- ment in 1829, he entered upon his own proper work, having been licensed to preach during the summer vacation of the previous year. He was employed for two years as assistant to the minister of the parish of St Andrews, Glasgow, and he subsequently occupied a similar situation for about the same period in the parish of Bonhill, Dum- bartonshire. In each case the entire duties of the charge devolved upon him, and he fulfilled them with characteristic energy and zeal. It was not until 1834, after he had offered himself for service in Canada, in the belief that he was not to find a sphere of labour at home, that he obtained a settled charge as minister of the important parish of St George's, Edinburgh. Here he at once took the place he so long held as one of the ablest preachers in Scotland. Destitute of natural oratorical gifts, and somewhat ungainly in his manner, he attracted~~

~~and even rivetted the attention of his audience by a rare combination of intellectual keenness, emotional fervour, spiritual insight, and power of dramatic representation of character and life. His theology was that of the Scottish Calvinistic school, but he combined with the narrowness that springs from strong conviction the breadth that springs from tender sympathy. With such qualities it was natural that he should gather round him one of the largest and most intelligent congregations in the Scottish metropolis.~~

~~From the very commencement of his ministry in Edin- burgh, Candlish took the deepest interest in ecclesias-~~

~~origin of other Christian feasts appears to have been similar.~~

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~~: tical questions, and he soon became involved as one of the~~

~~chief actors in the struggle which was then agitating the church. His first Assembly speech, delivered in 1839, placed him at once among the leaders of the party that afterwards formed the Free Church, and his influence in bringing about what is known as the Disruption was inferior only to that of Chalmers. As a debater he had~~

~~powers of the highest order, which would have won for him a foremost place in any deliberative assembly. Great~~

~~as was his popularity as a preacher, it was in the ecclesias- tical arena that his ability chiefly showed itself, and probably no other single man had from first to last so large a share in shaping the constitution and guiding the policy of the Free Church. He was actively engaged at one time or other in nearly all the various schemes of the church, but special mention should be made of his services in the Education Committee, of which he was convener from 1846 to 1863, and in the unsuccessful negotiations for union~~

~~among the non-established Presbyterian denomi- nations of Scotland, which were carried on during the years 1863-73. In the Assembly of 1861 he filled the~~

~~-mnoderator's chair.~~

~~As a theologian the position of Candlish was perhaps inferior to that which he heldas a preacher and ecclesiastic, but it was not inconsiderable. So early as 1841 his~~

~~reputation in this department was sufficient to secure for~~

~~him the noniination to the newly-founded chair of Biblical Criticism in the University of Edinburgh. The appoint- ment was, however, not ratified by the Home Secretary in consequence of a representation made in the House of Lords, by the earl of Aberdeen, that Candlish had set himself in opposition to the law of the land by preach-~~

~~ing in the parish of Huntly in spite of an interdict from the Court of Session.~~

~~By a somewhat curious coincidence a second appointment to a professorship was also nullified, though in this case by his own act, and after a few months' tenure of the office. In 1847 Candlish, who had received the degree of D.D. from Princeton, New Jersey, in 1841, was chosen by the Assembly of the Free Church to succeed Chalmers in the chair of divinity in the New College, Edinburgh. After partially fulfilling the duties of the office for one session, he was led to resume the charge of St George's, the clergyman who had been chosen by the congregation as his successor having died before entering on his work. In 1862 he was again connected with the New College, being appointed principal in succes~~

~~sion to Cunningham, with the understanding that he~~

~~should still retain his position as minister of St George's. Some months before this he had obtained the assistance of a colleague in his pastoral work, but he continued to preach, with one or two intervals of somewhat protracted illness, until within a short time of his death, which occurred on~~

~~_ the 19th October 1873.~~

~~~ Though his greatest power was not displayed through~~

~~| the press, Candlish made a number of somewhat im- portant contributions to theological literature.~~

~~In 1842 he published the first volume of his Contributions towards~~

~~| the Exposition of the Book of Genesis, a work which was _ completed in three volumes several years later.~~

~~In 1854 he delivered, in Exeter Hall, London, a lecture on the Theological Essays of the Rev. F. D. Maurice, which he afterwards "published, along with a fuller examination of the doctrine of the essays. A treatise entitled Zhe Atone- ment ; tts Reality, Completeness, and Eatent (1861) was based upon a smaller work which first appeared in 1845, Tn 1864 he delivered the first series of Cunningham lectures, taking for his subject The Fatherhood of God. Published immediately afterwards, the lectures excited considerable~~

~~_ discussion on account of the peculiar views they represented. Further illustrations of these views were given in two works~~

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~~published about the same time as the lectures, one a treatise On the Sonship and Brotherhood of Believers, and the other an exposition of the first epistle of St John. Among his other works were Life in a Risen Saviour ; Seripture Characters; Reason and Revelation; and The Christian's Sacrifice and Service of Praise. A posthumous volume of sermons with a short prefatory biographical sketch appeared in 1874.~~

~~CANDOLLE, CANDOLLE.~~

~~CANE, a name applied to many plants which are possessed of long, slender, reed-like stalks or stems, as, for example, the sugar-cane, the bamboo-cane, or the reed-cane. From the use as walking-sticks to which many of these plants have been applied, the name cane is improperly given to sticks~~
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~~irrespective of the source from which they are derived, Properly it should be restricted to a peculiar class of palms, known as ratans, included under the two closely allied genera Calamus and Demonorops, of which there are a large number of species. The plants are found widely extended throughout the islands of the Indian Archipelago, the Malay Peninsula, China, India, and Ceylon ; and examples have also been found in Australia and Africa. They were described by the learned Rumphius, under the name of Palmijunci, as inhabitants of dense forests into which the rays of the sun scarce can penetrate, where they form spiny bushes, obstructing the passage through the jungle. 'hey rise to the top of the highest trees and fall again so as to resemble a great length of cable, adorned, however, with the most beautiful leaves, pinnated or terminating in graceful tendrils, The plants creep or trail along to an enormous length, sometimes, it is said,freaching 500 feet. In the Paris exhibition of 1855 two examples of Calamus verus, measuring respectively 270 and 230 feet, were exhibited. The stem in few cases exceeds 1 inch in diameter, and it is mostly of much smaller dimensions. When growing it is sheathed in a base of numerous leaves, which the natives, in preparing the canes for the market, strip off by pulling the cut plant through a notch made ina tree. The canes always present distinct rings at the junction of the sheathing leaves with the stem. They assume a yellow colour as they dry; and those imported from Calcutta have a glossy surface, while the produce of the Eastern Archipelago presents a dull exterior.~~

~~Canes, on account of their lightness, length, strength, and flexibility, are used for a great variety of purposes by the inhabitants of the countries in which they grow. Split into thin strips they are twisted to form ropes and ships' cables, an application mentioned by Captain Dampier in his Voyages. A more important application, however, is for basket-work, and for making chairs, couches, pillows, &c., as the great strength and durability of thin and easily-prepared strips admit of such articles being made at once airy, strong, and flexible. Much of the beautiful and elaborate basket-work of the Chinese and Japanese is made from thin strips of cane, which are besides used by the Chinese for larger works, such as door-mats, houses, and sheds. The use of cane as a material for constructing bridges in' Ceylon is mentioned by Sir James E, Tennent, and Dr J. D. Hooker instances a similar application of the material in his Himalayan Journal.~~

A very large trade with Western countries and the United States is carried on in canes and ratans, the prin- cipal centres of the trade being Batavia, Sarawak, Singapore, Penang, and Calcutta. In addition to the varieties used for walking-sticks, whip and umbrella handles, é&c., the common ratans are in extensive demand for basket- making, the seats and backs of chairs, the ribs of cheap umbrellas, saddles, and other harness-work ; and generally for purposes where their strength and flexibility make

them efficient substitutes for whalebone. The walking- stick " canes " of commerce include a great many varieties, some of which, however, are not the produce of trailing palms. The well-known Malacca canes are obtained from Calamus Scipionum, the stems of which are much stouter than is the case with the average species of Calamus.

CANEA, or Kianta, the principal seaport and since 1841 the capital of Crete, is finely situated on the northern coast of the island, about 25 miles from its western extrem- ity, on the isthmus of the Akrotiri peninsula, which lies between the Bay of Canea and the Bay of Suda, Its latitude is 35° 31' N., and its longitude 24° 1' E. Sur- rounded by a massive Venetian wall, it forms a closely- built, irregular, and overcrowded town, though of late years a few of its streets have been widened. The ordinary houses are of wood; but the more important buildings are of more solid materials. The Turks have a number of mosques ; there are Greek churches and a Jewish synagogue ; an old Venetian structure serves as a military hospital; and the prison is of substantial construction. The town is the seat of a Greek bishop, who is suffragan to the metropoli- tan at Candia; and it is the official residence of the European consuls. The harbour, formed by an ancient transverse mole nearly 1200 feet long, and protected by a lighthouse and a fort, would admit vessels vf cousiderable tonnage ; but it has been allowed to silt up until it shoals off from 24 feet to LO or even 8, so that large vessels have to anchor about four or five miles out. The principal articles of trade are oil and soap, of which there were exported, in 1874, 530 tuns and 50,000 cwts. respectively. A few small ships are built in the port, and there is a pretty extensive manufacture of leather. The fosse is laid out in vegetable gardens ; public gardens have been constructed outside the walls;

~~and artesian wells have been bored by the Government. To the east of the town a large Arab village has grown up, inhabited for the most part by natives of Egypt and Cyrenaica, who act as boatmen, porters, and servants, and number from 2000 to 3000; while about a mile off on the rising ground is the village of Khalepa, where the consuls and merchants reside. The population of the town is estimated at 12,000. Canea probably occupies the site of the ancient Cydonia, a city of very euly foundation and no small importance. During the Venetian rule it was one of the strongest cities in the island, but it fell into the hands of the Turks in 1646, several years before the capture of Candia. In 1856 it suffered from an earthquake. The neighbouring plain is famous for its fruitfulness, and the quince is said to derive its name Cydonia from the town.~~

~~CANEPHORI was the title given to the girls who at Athens were annually selected from noble families to walk in the procession at the Panathenaic and apparently also at other festivals, carrying on their heads baskets containing the implements and apparatus necessary for a sacrifice. The gracefulness of the attitude which may be seen in the figures of Canephori on the frieze of the Parthenon in the British Museum, is known to have suggested itselfas a subject for sculpture to Polycletus and Scopas. This type of statue also came to be used in archi- tecture to support light entablatures, in which case they are sometimes identified with Caryatides.~~

~~CANGA-ARGUELLES, Jost, Spanish statesman, was born in 1770, and died in 1843. He took an active part in the Spanish resistance to Napoleon, in a civil capacity, and was an energetic member of the Cortes of 1812. On the return of the Bourbon line in 1814, Canga-Arguelles was sent into exile in the province of Valencia. On the restora- tion in 1820 of the constitution of 1812, he was appointed minister of finance. He continued at this post till the spring of 1821, distinguishing himself by the zeal and~~

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~~ability with which he sought to reform the finances of Spain, It was high time; for the annual deficit was greater than the entire revenue itself, and landed and other property was, to an unheard-of extent, monopolized by the Priests, The measures he proposed had been only partially enforced when the action of the king with regard to the ministry of which he was a~~

~~member, obliged him to resign, There. after, as a member of the Moderate Liberal party, Canga- Arguelles advocated constitutional government and finaneja] reform, till the overthrow of the constitution in 1893 when he fled to England. He did not return to Spain till 1829, and did not again appear in public life, being appointed keeper of the archives at Simancas. He is the author of three works :—Hlementos de la Ciencia de Hacienda (Elements of the Science of Finance), London, 1825; Ducionario de Hacienda (Dictionary of Finance), London, 1827 ; and Observaciones sobre la guerra de la Peninsulg (Observations on the Peninsular War), in which he endeavoured to show that his countrymen had taken a far more effective part in the national struggle against the French than English historians were willing to admit, CANGIAGI, or Campraso, Lurer (1527-1585), a dis. tinguished painter, was born at Genoa in 1527, and died at the Escorial in 1585. He received his first lessons ijn the art of painting from his father, and completed his education at Rome, where he studied with particular care the masterpieces of Michelangelo. At a very early age he had gained a high reputation as an artist, and in 1583 he was invited to Spain by Philip IL, who desired his assistance in the decoration of the Escorial. He painted the ceiling of the choir, representing the Assemblage of the Blessed. Itis considered his best work. Among his other productions which were highly esteemed were the Rape of the Sabine Women, the Sleeping Cupid, and Judith, Most of his paintings are in Genoa and Spain; the Sleeping Cupid is in the royal collection at Paris. CANICATTI, a town of Sicily, in the province of Girgenti, which dates, it is believed, from the Saracenic occupation. It is well built and finely situated on the slope of ahill. The vine, orange, olive, and almond grow abundantly in the neighbourhood, and the inhabitants devote them- selves chiefly to agricultural pursuits. Population, 20,908. CANINA, Luter (1793-1856), an Italian archeologist and architect, was born at Casale in Piedmont. He became professor of architecture at Turin, and his most important works were the excavation of Tusculum in 1829, and of the Appian Way in 1848. He is the author of a great number of works on archeology and architecture, of which several were published in a most magnificent and costly form by his patroness, the queen of Sardinia. Of these may be mentioned L'Architettura Romana, 1830; L' Arehatettura Greca, 1833; Descrizicne storica del foro Romano e sue adjacenze, 1834; Descrizione dell' antico Tusculo, 1841; Sull Architettura pix propria dei tempi cristiani, 1843. CANINI, Giovanni~~

~~AcNnoto (1617-1666), a designer and engraver, born at Rome in 1617. He was a pupil of Domenichino, and afterwards of Barbalunga. He painted some altarpieces at Rome, including two admired pictures for the church of San Martino a' Monti, representing the Martyrdom of St Stephen and of St Bartholomew. His painting aimed at general effect, not at precision of detail. Having accompanied Cardinal Chigi to France, he was encouraged by the minister Colbert to carry into execution his project of designing, from medals, antique gems, and similar sources, a series of portraits of the most illustrious characters of antiquity, accompanied with memoirs; but shortly after the commencement of the undertaking Canim died at Rome,iin 1666. The work, however, was pr secuted by his brother Marcantonio, who, with the assist ance of Picard and Valet, completed and published itm~~

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~~| the River Aufidus, 6 miles from its mouth. \ for a terrible defeat which the Romans received there from~~

~~| valleys amidst groves of olive trees.~~

~~CAN—CAN 1699, under the title of Iconografia di Gio. Ag. Canint.~~

~~Tt contains 150 engravings. A reprint in Italian and French appeared at Amsterdam in 1731.~~

~~CANITZ, Frieprich RonotpH Lupwic, BARon von (1 654-1699), a German poet and politician of noble family, was born at Berlin in 1654. He attended the universities of Leyden and Leipsic, and travelled in England, France, and Italy. In 1680 he became councillor of legation, and Frederick I. made him councillor of state, privy councillor, baron of the empire, and plenipotentiary at the Hague, all which positions he appears to have filled with credit.~~

~~| His reputation is, however, founded upon his verse. | He believed that a great reform might be effected in | German literature by the introduction of the rules of | French taste ; and, consequently, he became an imitator of~~

~~Boileau, and through him of Horace,—the polished grace of whose verse he attained in some measure, though he~~

~~| does not always avoid turgidity and bombast.~~

~~CANN, in Ancient Geography, a town of Apulia, on It is famous~~

~~the Carthaginians under Hannibal, 216 B.c. A great~~

~~| diversity of opinion has prevailed as to the exact spot on~~

~~which the battle was fought, whether, as has been the general belief, on the south side of the river, or on the north bank, as is maintained by the best authorities, in- cluding Niebuhr, Swinburne, &c. The site of the town, which continued to exist at least till the 13th century, is~~

~~, still marked by ancient ruins, among which the most~~

~~important are those of an aqueduct, an amphitheatre, and a triumphal arch. In a neighbouring rock are several~~

~~large sepulchral excavations, in which vases and paintings have been discovered.~~

~~CANNES, a seaport of France, and the chief town of the department of Var on the Mediterranean, 15 miles 8. W. of Nice and 25 miles N.E. of Draguignan, in 43° 34’ N. lat. and 7° 0’ E. long. It enjoys a southern exposure on a seaward slope, and is defended from the northern winds by ranges of hills. Previous to 1831, when it first attracted the attention of Lord Brougham, it mainly consisted of the old quarter (named Sucquet), and had little to show except an ancient castle, and a church on the top of Mont Chevalier, dedicated in 1603 to Nétre Dame d’Espérance ; but since~~

~~) that period it has become a large and importaut town, and one of the most fashionable winter resorts in the south of |~~

~~France, much frequented by English visitors. The neigh-~~

~~_ bourhood is thickly studded with villas, which are solidly | built of a stone so soft that it is sawn and not hewn.~~

~~There is an excellent quay, and a beautiful promenade runs along the beach; and numerous sheltered roads stretch up the On the top of the hill behind the town are a Roman Catholic and a Protestant cemetery. In the most prominent part of the latter is the~~

~~‘ grave of Lord Brougham, distinguished by a massive stone~~

~~cross standing on a double basement, with the simple inscrip-~~

~~_ tion—“ Henricus Brougham, Natus mpccixxvut, De-~~

~~cessit MDCOCLXVIIL;” and in the immediate vicinity lies~~

~~| James, fourth duke of Montrose, who died December 1874.~~

~~The country around is very beautiful aud highly fertile ;~~

~~_ orange and lemon trees are cultivated like peach-trees in _ England, while olives, almonds, figs, peaches, grapes, aud | other fruits are grown in abundance, and, along with the~~

~~produce of the fisheries, form the chief exports of the town. Essences of various kinds are manufactured, and flowers are extensively cultivated for the perfumers. The climate of Cannes has been the subject of a considerable variety of opinion,—the preponderance being, however, in its favour. According to Dr De Valcourt, it is remarkable by reason of the elevation and regularity of the temperature during the height of the day, the clearness of the atmosphere and~~

~~abundance of light, the rarity of rain and the absence of~~

~~fogs. The following are a few of his numerous observa- tions of winter temperature, given in degrees Fahr. :—~~

~~1866-1867. 1872-1873.~~

~~Maxima. Minima. | Maxima. Minima. November. | 72 to 56 | 56 to 34 67 to 47 | 59 to 34 December. GL) 5 A || 8 5, 3! 60 ,, 47 44 ,, 28 January. OH on EYE Dns AY O25, G0 0) a, Sx February. 65 ,, 56 53 ,, 38 || 69 ,, 52 50 ,, 39 March. 71,,49 | 54,,38 || 69,,56 | 54,, 39 April. 76,,68 | 58,,39 || 75 ,, 57 | 58 ,, 35~~

~~Canues isa place of great antiquity, but its earlier history is very obscure. It was twice destroyed by the Saracens in the 8th and the 10th centuries; but it was afterwards repeopled by a colony from Genoa. In 1815 Napoleon landed in the vicinity after his escape from Elba; and opposite the town is the island of St Marguerite (one of the Lerins), in the citadel of which the Man with the Iron Mask was confined from 1686 to 1698, and which has acquired a recent notoriety as the prison whence Marshal Bazaine escaped in August 1874. Population of the town in 1872,~~

~~9618.~~

~~See De Valcourt's Cannes and its Climate, London, 1873, and Cli- matologie des Stations Hivernales du Midi de la France, Paris, 1865.~~

~~CANNIBALISM, the eating of human flesh by men. This practice has existed from the most ancient times, and has given rise to descriptive terms such as Gr. dvOpwroddyos (Lat. anthropophagus), Anglo-Sax. man-eta, Eng. man-eater. Since the discovery of the New World, the name of the Caribs of the West India Islands, recorded by Columbus under the Latinized forms Canzbales or Caribales, has come into popular use as a generic term for man-eaters, cannibals.~~

~~Man being by nature carnivorous as well as frugivor- ous, and human flesh being not unfit for human food, the question first arises why mankind generally have not only avoided it, but have looked with horror on exceptional individuals and races addicted to cannibalism. It is evident on consideration that both emotional and religious motives must have~~

~~contributed to bring about this prevailing state of mind. Simple association of thoughts causes the remains of a dead kinsman or friend to be treated with respect and tenderness, as may be seen from the conduct of some of the rudest races. Acting in another way, the same ideal association attaches the horror of death to anything con- nected with the dead, so that many tribes will avoid the mention of a dead man's name, and will even abandon his hut, and destroy the furniture he has used ; this sentiment must tend to preserve the corpse from violation. More- over, the religious doctrine that the soul outlives the body, continuing in ghostly shape to visit the living, and retain- ing a certain connection with the mortal remains it once inhabited, has evidently led the survivors to propitiate this honoured and dreaded spirit by respectful disposal of the corpse. Taking this combination of causes into con- sideration, it is readily understood why aversion to canni- balism must be taken as a rule established at a very early stage of culture, and we have only to consider what causes have from time to time led to its infraction. The principal of these have been the pressure of famine, the fury of hatred, and sometimes even a morbid kindness, with certain motives of magic and religion, to which must be added the strong tendency of cannibalism, once started in any of these ways, to develop a confirmed appetite which will afterwards be indulged for its own sake.~~

~~I. Famine.—The records of shipwrecks and sieges prove that famine will sometimes overcome the horror of canni- balism among men of the higher nations. Thus it is not surprising that savages, from their want of food adapted~~

~~for storing as well as from their reckless improvidence, should in severe climates be often driven to this extremity. For example, it is known that the miserable natives of Tierra del Fuego, when starving in winter, would throttle and devour the oldest woman of the party; when asked why they did not rather kill their dogs, they replied, "Dog catch otters!" (Fitzroy, Voy. of Adventure and Beagle, vol. ii. p. 183). For accounts of cannibalism and murder under stress of hunger in Australia see Salvado, Memorie dell' Australia, p. 240; Waitz, Anthropologie der Naturvolker, vol. vi. p. 749 ; amoung American tribes, Bancroft, WMative Races of Pacific States, vol. i.~~

~~p. 120; Back, Hap. to Great Fish Rwer, p. 227 ; Waitz, vol. iii. p. 89; in Polynesia, Ellis, Polynesian Researches, vol. i. p. 359; Martin, Mariner's Tonga Islands, vol. i. p. 116.~~

~~II. Fury or Bravado.—The North American Indian phrases as to eating the flesh and drinking the blood of their enemies are not to be taken as mere metaphor, but as referring to acts really done. There is even an Iroquois legend of a dialogue between the Manitu (Great Spirit) and a warrior who defends the eating of slain enemies as satisfying at once hunger and revenge (Crévecceur, Journey m Pennsylvania ; Klemm, Allgemeine Culturgeschichte, vol. ii, p. 28). For actual details of this ferocious custom see Schoolcraft, Indian Tribes, vol. iii. p. 242; Hennepin, vol. ii. p. 159; J. G. Miiller, Amerikanische Urreligionen, p. 145; Waitz, vol. iii. p. 159. Among the Polynesians, there is similar evidence of warriors devouring the flesh and drinking the blood of the slain enemy, where the purpose seems clearly that of inspiring terror and gratifying vengeance. (See Ellis, Polynesian Researches, vol. i. p. 309; Turner, Polynesia, p. 194; Waitz, vol. vi. p. 158.)~~

~~III. Morbid Affection.—Cases of the dead being devoured by relatives and friends (especially children by parents) from a sentiment of affection are recorded among low savage tribes, see Spix and Martius, Reise in Brasilien, vol. ii. p. 692; Angas, Savage Life in Australia, de., vol. i. p. 73; Howitt, Impressions of Australia, p. 134; Gerland, Aussterben der Naturvilker, p. 66. Such accounts are not, however, numerous, and sometimes, at least, may properly belong to other classes. The most remarkable is the often-quoted passage of Herodotus (iv. 26), describing the funeral feasts of the Issedones of Central Asia, where the relatives ate the body of the deceased with other meat, the skull being set in gold and preserved; these were sacred rites done in honour of the dead. As lately as the 13th century, William of Ruysbruck was told that the people of Tibet had till recently kept up this custom of eating their deceased parents, and still used their skulls as drinking-cups (Rubruquis in Pinkerton's Coll. of Voyages, vol. vii. p. 54).~~

~~IV. JMéagic.—Few notions belonging to primitive savage magic are more intelligible or more widely spread than the belief that the qualities of any animal eaten will pass into the eater. 'This motive naturally leads to~~

~~cannibalism (see Stanbridge, in Z'rans. Hthnological Soc., vol. i. p. 289), especially in war, where the conqueror eats part of the slain enemy with the avowed purpose of making himself brave. This idea is found among the natives of Australia (see Macgillivray, Voyage of Rattlesnake, vol. i. p. 152, vol. ii. p. 6), and not less distinctly in New Zealand (Ellis, vol. i. p. 358); among the North American Indians, when warriors would devour the flesh of a brave enemy, and particularly the heart as the seat of courage (Keating, Long's Hxpedition, vol. i. p. 102); also in Ashantee (J. L. Wilson, Western Africa, p. 168). An English merchant in Shanghai, during the Taeping siege, met his Chinese servant carrying the heart of a rebel, which he was taking home to eat to make him brave (Tylor, Harly History of Mankind, p. 133). The imagined value of human flesh~~

~~in giving magical powers to the eater is known to the' savage world both in Australia and America (Eyre, Central Australia, vol. ii. pp. 255, 329; Angas, vol. i. p, 193. Keating, vol. i. p. 103; Waitz, vol. iii. p. 159, vol. vi, p. 748). This idea even holds a place in the more cultured magical traditions of Asiatic and European nations (see Gerland, p. 66; Schaafhausen, in Archiv fiir Anthropologie, vol. iv. p. 247).~~

~~V. Lteligion.—One of the strongest reasous for consider. ing anthropophagy as having widely prevailed in pre-. historic ages is the fact of its being deeply ingrained jp savage and barbaric religions, whose gods are so often looked upon as delighting in human flesh and blood, The flesh of sacrificed human victims may even serve to provide cannibal feasts. The understood meaning of these rites may be either that the bodies of the victims are vicariously consumed by the worshippers, or that the gods themselves feed on the spirits of the slain men, their bodies being left to the priests and people. Thus in Fiji, "of the great offerings of food, native belief apportions merely the soul thereof to the gods, who are described as being enormous eaters; the substance is consumed by the wor shippers. Cannibalism is a part of the Fijian religion, and the gods are described as delighting in human flesh" (T. Williams, ijt and the Fijians, vol. i. p. 231). In Mexico, the anthropophagy which prevailed was distinctly religious in its origin and professed purpose. That the primary meaning of the human sacrifice was to present victims to their deities is shown by the manner in which the sacrificing priest, who tore out the heart, offered it to the sun, and~~

~~afterwards went through ceremonies of feeding the idol with the heart and b'ood. It was the Aztec worship of the war-god Huitzilopochtli which brought on the enormous prevalence of sacrifices of jprisoners ; to obtain supplies of such captives became a motive for frequent wars ; and it was the limbs of these victims which were eaten in the sacrificial feasts that formed part of the festivals. (For particulars and authorities see Prescott, Conquest of Memico ; Bancroft, vol. ii.; Waitz, vol. iv.) In Africa, also, camni- balism has in some cases evidently a sacrificial character (see Lander, Records, vol. ii. p. 250; T. J. Hutchinson, Ten Years among Ethiopians, p. 62, é&c.)~~

~~VI. Habit.—The extent to which anthropophagy has been carried among some nations is, no doubt, mainly due to the indulgence of the appetite once aroused. In such cases this reason is openly avowed, or some earlier motive remains rather in pretext than in reality, or the practice is justified on the ground of ancestral custom. It seems, for instance, that the cannibal feasts of old Mexico had become in themselves acceptable to the people, and that we must refer the sickening horrors of Fijian anthropophagy more to sensual gratification than to any religious motive. Among conspicuous cannibal races may be mentioned the semi-civilized Battas of Sumatra, whose original instiga- tion to eating their enemies may have been warlike ferocity, but who are described as treating human flesh as a delicacy, and devouring not only war-captives but criminals, slaves, and, according to one story, their aged kinsfolk (Junghuhn, Batta-linder ; Marsden, Hist. of Sumatra, p. 390; see also Wuttke, Geschichte des Heidenthums, vol. i. p. 172 ; Fried- niann in Zedtschrift fiir Ethnologie, 1871, p. 313). Cann balism assumes its most repulsive form where human flesh is made an ordinary article of food like other meat. This state of things is not only mentioned in past times in descriptions of West Africa, where human flesh was even sold in the market (see Pigafetta, Regwwm Congo, in De Bry; Wuttke, vol. i. p. 171), but still continues among the Monbuttu of Central Africa, whose wars with neighbouring tribes are carried on for the purpose of obtai- ing human flesh, the bodies of the slain being dried for~~

~~transport, while the living prisoners are driven off like cattle (Schweinfurth, /eart of Africa, and in Zeitschrift fiir Ethnologie, vol. v. p. 9). Where~~

~~cannibalism for its own sake becomes popular among a warlike people, its effect in thinning population, and even in exterminating weak tribes, becomes perceptible. This subject has been investigated by Gerland (Aussterben der Naturvolker, p. 61).~~

~~As to the history of anthropophagy, the most interesting question is whether at any early period it was ever a general habit of the human race. This has been debated on the evidence of prehistoric human remains (see Schaaf-hausen, ubi supra, p. 264; Proceedings of Congresses of Pre- historic Archeology, Paris and Copenhagen. It has been well argued that had the men of the quaternary period been cannibals, we should find the bones generally cracked for the marrow like those of beasts, which is not the case (Le Hon, L'Homme Fossile, p. 68); also that, as regards the ancient people of the shell-mounds, had they eaten their own species they would have thrown the human bones into the rubbish heaps with those of beasts and fishes (Lubbock, Prehistoric Times, p. 232). The discovery of some few ancient human remains, the state of which seems to indicate that the flesh had been eaten, may perhaps be taken to show that prehistoric savages were in this respect like those of modern times, neither free from cannibalism nor universally practising it, During later ages, it may have even increased rather than diminished with the growth of population,—its greatest excesses being found among high savage tribes or nations above the savage level. But with the rise of civilization to its middle and upper levels, it is more and more kept down by the growing sense of the dignity of man, and eventually disappears, as we may hope, irrevocably. (i, errs)~~

~~CANNING, Georcz (1770-1827), one of the greatest of English statesmen and orators, was born in London on the 11th April 1770. He was descended from an ancient family ; but his father, having incurred the displeasure of his parents, was cut off with a scanty allowance, and obliged to try his fortune in the metropolis. Here he studied for the bar, but literature proved too attractive for him, without yielding him even a tolerable livelihood. His affairs were not improved by a marriage with an Irish lady, of good connections and some beauty, but as poor as him- self. He died of a broken heart, a year after the birth of | his son. The widowed mother took to the stage without achieving any great success, and in this new way of life married twice,—neither time wisely.~~

~~It was thus, in the society of the stage, that the future premier of England passed his earliest years. It was well for him, therefore, when one of his paternal uncles, a wealthy banker in London, took upon himself the care of his education. Young Canning was then in his eighth year, and from that time had all the advantages of the best education and the most cultured society, for Burke, Fox, Sheridan, and other leading Whigs were guests at his uncle's house. After spending a few years ata London school he went in due time to Eton and Oxford. At both places he highly distinguished himself. He was a brilliant scholar, gave promise of the future orator in the debating societies, became known as a wit in a wide circle of admiring friends, and even at Eton, at the age of sixteen, gave decided evidence of literary talent, in a periodical got up amongst his schoolmates. From Oxford he returned to London with the reputation of a man able to perform ercat things. And now he had to choose between two careers, not easily to be combined by one who had his own way to make in the world. The generous enthusiasm of youth tempted him into a political career ; worldly prudence pointed him to the bar as the safer profession for a man without means.~~

~~Circumstances decided in favour |~~

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~~of the former. Pitt was new being drawn into the ter- rible crusade against the Freach Revolution, and greatly needed able associates to make head against the fiery elo- quence of Fox and Sheridan. To Canning, who soon became known in the clubs and other political circles of the metropolis as a young man of the most brilliant promise, he made the offer of the nomination borough of Newport. This was accepted, and Canning entered Parliament as an adherent of Pitt in 1793, being twenty-three years of age.~~

~~Canning is charged with having taken this step from interested motives. In the debating societies of Oxford and the metropolis he had been an enthusiastic Liberal, and had long been the friend of the Liberal leaders. Now, when the prospects of the Whig party were becoming gloomier every day, this crossing over to the ranks of Pitt had a suspicious appearance of convenience. But there is no real ground for such suspicion. With regard to the French Revolution, which was now the all-absorbing political question, Canning simply underwent the same change of opinion as the immense~~

~~majority of educated Englishmen, Pitt included, hailing it at first as the dawn of a new day for France and Europe, but turning away from it in dismay and indignation, and determined to oppose it, when he saw it was more likely to subvert than to reform society.~~

~~From his entrance into Parliament till the death of Pitt in 1806, Canning was an ardent and devoted supporter of all the measures of that statesman. In the House of Com- mons he soon took his place as one of the most brilliant and successful debaters of the time, though unhappily his efforts needed to be directed against his own friends, Fox and Sheridan ; and he gave proof of his business capacity in some of the less prominent departments of the adminis- tration. Out of Parliament he fought the Revolution almost as effectively by starting (in 1797) the Anti-Jacobin, a weekly paper, in which the principles of innovation in morals, in literature, and above all, in politics, were merci- lessly attacked, and their advocates covered with ridicule and abuse. Canning contributed many of the humorons articles, and in this way extended the reputation for caustic wit he had already acquired in Parliament.~~

~~In 1800 Canning married Miss Joan Scott. The marriage was in every way a happy and a fortunate one, based on mutual love and esteem, which continued unbroken to the end; while Miss Scott had a large fortune, and was con- nected with some of the highest of the aristocracy. _~~

~~Ou the death of Pitt in 1806, and the formation of a Whig ministry by Fox and the Grenvilles, Canning went into opposition, and showed that, even on a question of humanitarian interest, he was not above the pettiest feelings of party. He supported, but very coldly, the bill for the abolition of the slave-trade.~~

~~On the return of the Tories to power in 1807, Canning entered on his first great Government office, the secretary- ship for Foreign Affairs. It was one of the darkest periods in the history of England. The great European coalition had been overthrown at Austerlitz, Austria compelled to an ignominious peace, Prussia nearly annihilated, and Russia obliged, at the peace of Tilsit, to connive at the supremacy of Napoleon, or induced to share in the division of the Con- tinent. Canning performed the arduous duties of his office with extraordinary tactand energy. It was he that planned~~

~~the expedition to Copenhagen, for the seizure of the Danish fleet, with such secrecy and despatch as completely to antici- pate Napoleon, and excite in him the liveliest astonishment and wrath. The negotiations for peace opened with the English Government by Napoleon and Alexander, and the invasion of Spain, still further complicated the difficulties of his position, only to throw new lustre on his genius. He soon saw that the Peninsula was the battlefield on which England could bring her strength wi a td to bear~~

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~~810~~

~~against the armies of the French conqueror. He encouraged the spirit of resistance in the Spanish, nation, supported the Spanish armies, first with supplies of arms, and then with the active co-operation of the English forces, and was one of the first to recognize and employ the military capacity of-the future duke of Wellington. Unfortunately, an event soon occurred which deprived the country of his services, when the need was greatest, and when he was the only statesman in England whose talents were of the first order. In 1809, Lord Castlereagh, as Secretary-at-War, had organized the expedition to Walcheren, the worst conducted and the most disastrous of the whole war. In consequence of it a dispute arose between his lordship and Canning, which resulted in a duel, and in the resignation of both. From this unfortunate incident till 1822, Canning took no very prominent part in the Government of the country. This is particularly to be regretted, as the period in question includes the decisive years of the Napoleonic struggle, and the new settlement of Europe by the peace of Vienna, when Canning might have done good service by insisting, more than was done, on the claims of nationality and constitu- tional liberty. In this he was not free from blame, as he allowed his personal dislikes too much to interfere with his duty to his country. But the chief reason was his advocacy of Catholic Emancipation, which lost him favour at court. Men's motives must always remain to some extent doubtful; still it seems-clear that at one time his dislike of Castlereagh, at another his insistance on Catholic Emancipation, prevented him from resuming his place in the Foreign Office. He lived to regret this deeply, and to declare that two years of office at the termination of the European struggle would have been worth~~

~~ten years of life. Even now, however, he was not idle. In 1812 he made a powerful speech in favour of Emancipation, which was carried in the Commons by a large majority, but rejected by the Lords. From 1814 to 1816 he was ambassador at Lisbon, and from 1817 to 1820 President of the Board of Control for India. As a member of the Cabinet during the latter period he was very active in support of Government, strongly advocating the coercive measures employed at home during the years which immediately followed the Revolution. It is indeed a noteworthy fact in his political career that, though unable to act with Castlereagh in the most dangerous crisis of the French war, he found it right to join him and his associates in such severe measures of repression,—noteworthy, but quite explicable, as Canning never professed to be anything else than a disciple of Pitt.~~

~~At the head of the Board of Control, Canning gained the entire confidence of the directors of the East India Company. In consequence, they had appointed him to the governor-generalship of India, and he had proceeded to Liverpool to take leave of the constituents who had four times returned him to Parliament, when news came of the death of Castlereagh (then earl of Londonderry). The voice of the country had already named him successor in the Foreign Office, and, in this capacity, under the premier-ship of Lord Liverpool, Canning entered upon the last and most brilliant period of his career. The state of Europe had greatly changed since his resignation of the same office in 1809. The Holy Alliance now aspired to regulate the affairs of the world. Inaugurated by the emperor of Russia, under the inspiration of Madame Krudener, it was at first a sincere attempt of the rulers of Europe to govern on Christian principles. But even the Russian emperor was soon frightened from the path of benevolent reform by the revival of the revolutionary spirit and its appearance in his own army; while interested statesmen like Metternich so utilized the pious aspirations of kings to the profit of despotism, that the Holy Alliance soon became a byword in Europe. Castlereagh had yielded too far to this ten-~~

~~alike he aimed at holding a middle course.~~

~~dency. The country was getting weary of it. And now Canning came forward to assert the free action of England and the universal right of self-government. He was, how- ever, no revolutionist. In his home and foreign policy At home he advocated Catholic Emancipation, and believed in Free Trade, but strenuously opposed Parliamentary Reform, In his foreign policy his principle was that England shoulq hold the balance between the reactionary and the revolu- tionary parties, "that in order to prevent things going to extremities, she should keep a distinct middle ground, staying the plague both ways." Seeing that the reactionar~~

~~party predominated in 1822, he judged that England should throw the weight of her influence into the Liberal scales. In accordance with these views, he protested against the doctrine that free institutions should be held only as a spontaneous gift of the sovereign, and disapproved of the measures adopted at the Congress of Verona in 1822, especially of the French invasion of Spain for the restora. tion of absolutism in 1823,—a year, too, which was marked at home by the passing of the Reciprocity. Act, the first step in the direction of Free Trade. In order to render the protest against the invasion of Spain more effectual, it was determined in 1824 to recognize the independence of the South American colonies. On the threatened invasion of Portugal by reactionary Spain in 1826, Canning again interposed with the utmost decision, and the invasion was abandoned. The speeches he made on these occasions, and his general attitude of defiance to despotism, had a mar- vellous effect, not only in Parliament and in England, but in all civilized communities, He was everywhere hailed as the champion and spokesman of national and popular liberty. The party of progress recovered from the torpor consequent upon the Revolution, and returned to new life, The enthusiasm for his name was heightened when it became known that he had taken the initiative in another act of international justice, by proposing (1826) to France and Russia that combination of the three Powers which led to the battle of Navarino and the establishment of Greek independence,~~

~~But ere that result had been attained the great statesman was no more. Karly in 1827 Lord Liverpool, who had been the nominal head of the Government since 1812, was disabled. Canning, who now became premier, expected the co-operation of the members of the late administration, but was~~

~~disappointed, and had to struggle on under the greatest difficulties, and against the most virulent opposi- tion. His exciting labours and the alienation of so many friends were too severe for his sensitive temperament. He caught a severe cold, and died on the 8th of August 1827. He was buried in Westminster Abbey, in the Statesmen's Corner, by the grave of his master Pitt.~~

~~His death created a sensation commensurate with his world-wide fame and with the hopes still entertained of him. The splendour of his talents was only matched by their versatility. In his high and brilliant career he had proved himself equal to anything—from guiding the destinies of a great nation through the storms of the Napoleonic wars, down to the editing of a comic journal. He had all the natural endowments of a great orator,—a graceful and commanding form, a musical voice, a perfect mastery of the choicest language, and a ready wit that played with all the resources of his intellect. In private life he was even more admirable,—in his own family an almost perfect model of all the household charities, and towards his miother, whose imprudent marriages had endangered his infancy, full of the tenderest and most affectionate piety. T. K.)~~

~~CANNING, Cuartes Joun, Eart anv Viscount (1812- 1862), Governor-General of India, was the youngest child~~

~~of the subject of the preceding notice, and was born at Brompton, near London, on the 14th December 1812. He was educated at Christ Church, Oxford, where he graduated B.A. in 1833, as first class in classicsand second class in mathematics. In 1836 he entered Parliament, being returned for Warwickshire in the Conservative interest in opposition to Mr Hobhouse. He did not, however, sit long in the House of Commons ; for, ou the death of his mother in 1837, he succeeded to the peerage which had~~

~~been conferred on her with remainder to her only surviving |~~

~~son, and as Viscount Canning took his seat in the House of Lords. His first official appointment was that of Under-Secretary of State for Foreign Affairs, in the adminis- tration formed by Sir Robert Peel in 1841,—his~~

~~chief being the earl of Aberdeen. This post he held till January 1846; and from January to July of that year, when the Peel administration was broken up, Lord Canning filled the post of Commissioner of Woods and Forests. He declined to accept office under the earl of Derby ; but on the formation of the Coalition Ministry under the earl of Aberdeen in January 1853, he received the appointment of Postmaster-General. In this office he showed not only a large capacity for hard work, but also general administrative ability, and much zeal for the improvement of the service. He retained his post under Lord Palmerston's ministry until July 1855, when, in consequence of the death of Lord Dalhousie, and a vacancy in the governor-generalship of India, he was selected by Lord Palmerston to succeed to that great position. This appointment appears to have been made rather on the ground of his father's great ser- vices than from any proof as yet given of special personal fitness on the part of Lord Canning. The new governor sailed from England in December 1855, and entered upon the duties of his office in India at the close of February~~

~~1856,~~

~~judgment led him to adopt a policy of conciliation towards the native princes, and to promote measures tending to the betterment of the condition of the people.~~

~~In the year following his accession to office the deep- seated discontent of the people broke out in the mutiny which grew into the Sepoy War. Fears were entertained, and even the frieuds of the viceroy to some 'extent shared them, that he was not equal to the crisis.~ But the fears proved groundless. He had a clear eye for the gravity of the situation, a calm judgment, and a prompt, swift hand to do what was really necessary. By the union of great moral qualities with high, though not the highest, intellectual faculties, he carried the Indian empire safely through the stress of the storm, and, what was perhaps a harder task still, he dealt wisely with the enormous difficulties arising at the close of such a war, established a more liberal policy and a sounder financial system, and left the people more contented than they were before. While rebellion was raging in Oude, he issued a proclamation declaring the lands of the province forfeited ; and this step gave rise to much angry controversy. A "secret despatch," couched in~~

~~arrogant and offensive terms, was addressed to the viceroy by Lord Ellenborough, then a member of the Derby administration, which would have justified the viceroy in immediately resigning. But from a strong sense of duty he continued at his post; and ere long the general condemnation of the despatch was so strong that the writer felt it necessary to retire from office. Lord Canning replied to the despatch, calmly and in a statesman-like manner explaining and vindicating his censured policy. In April 1859 he received the thanks of both Houses of Parliament for his great services during the mutiny. He was also made an Extra Civil Grand Cross of _ the Order of the Bath; and in May of the same year he _ Was raised to the dignity of an earl. By the strain of~~

~~His strong common sense and sound practical~~

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~~anxiety and hard work his health and strength were seriously impaired ;. and in the hope that rest in his native land might restore him, he left India, reaching England in April 1862. But it was too late. He died in London on the 17th of June following. About a month before his death he was created K.G. As he died without issué the title became extinct. ;~~

~~CANNON. See Guns anp Gunnery and ARTILLERY.~~

~~CANO, Atonzo (1600-1667), one of the most vigorous of the Spanish painters, and also, like Michelangelo, with whom he is usually compared, an architect and sculptor of great merit. He has left in Spain a very great number of specimens of his genius, which display the boldness of his design, the facility of his pencil, the purity of his flesh- tints, and his knowledge of chiaroscuro. He was a native of Granada, and a contemporary of Velasquez and Pacheco, whom he rivalled without imitating. As a statuary, his most famous works are the Madonna and Child in the church of Nebrissa, and the colossal figures of San Pedro and San Pablo, As an architect, he indulged in too profuse ornamentation, and gave way too much to the fancies of his day. Philip IV. made him royal architect and king's painter, and gave him the church preferment of a canon. He was notorious for his ungovernable temper ; and it is said that once he risked his life by committing the then capital offence of dashing to pieces the statue of a~~

~~saint, when in a rage with the purchaser who grudged the price he;demanded. His known passionateness also (according to another story) caused him to be suspected, and even tortured, for the murder of his wife, though all other circumstances pointed to his servant as the culprit.~~

~~CANO, or Canus, MEtcutor (1523-1560), a learned Spanish bishop and theologian, who was pupil and successor of Vittoria as professor of theology at Salamanca. He had one, and only one, rival as to erudition in Spain, Bartolo- meo de Carranza, like himself a Dominican, and the university was divided between the partizans of the two professors. On account of his violent opposition to the establishment of the Jesuits in his native country, he was summoned by Pope Paul III. to the Council of Trent, and appointed to the distant see of the Canaries. But his influence with Philip II. procured his recall to Castile, where he became provincial of the Dominican order, His principal works are entitled Prelectiones de Poenitentia, De Sacramentis, and Locorum Theologicorum Libri XII.~~

~~CANOE, a species of boat. In several Eastern languages the word kan means something hollow, with a certain degree of strength. Pliny says some Indian reeds are long enough to form a boat for three men between the joints. The French canot, Spanish canoa, Italian canoe, are derived from the Latin canna; but a canoe is sometimes called in France bateau, bét, pirogue, caique, chaloupe, navire, nacelle, or périssour, and the paddle pagaye, and the canoeist pagayeur. The English word "canoe" may be defined as a boat propelled by one or more paddles used without a fixed fulcrum on the boat, and therefore in- variably with the sitter facing towards the bow. The Venetian gondola and the Maltese boats, and many others, are rowed by men who face the bows, but they always have a fixed rest for the rowlock. Canoes are made of various substances. Those of the Esquimaux are of seal- skin stretched over whalebone, and are propelled by the double-bladed paddle, 7 feet long and 6 inches broad, used by one man, whose dress is united with the deck covering, so as to be watertight.~~

~~The North American " dug-out" canoe is made from a tree hollowed by fire, while the bark canoes are formed by birch bark sewn together, according to the size required, until the craft will hold as many as seventy meu. Paper canoes have been used in the United States. Cork leather~~

~~would probably be a very good material. and of india-rubber have been used in England, but practi- cally all the best canoes now built in England, America, and France for general travelling are of oak, cedar, or pitch pine. The canoe was popular in England more than twenty years ago at Oxford and Cambridge, but only for short river practice, until in 1865 one was specially designed for a long journey by water in seas, lakes, and rivers, and by carriage on land in railways or carts or on horseback, or by being dragged over rough ground or borne on men's shoulders through woods and over hills.~~

~~The general type of this "Rob Roy" canoe is built of oak with a cedar deck. The length is from 12 to 15 feet, and the beam from 26 to 30 inches, the depth 10 to 16 inches. The paddle is 7 feet long with 6 inches of breadth in the blade, and is either double-bladed, or, if it is used with a single blade, a rudder is worked by the foot to counteract the lateral swerving. A backboard swinging with the paddler's motion enables the canoeist to sit in a comfortable position for many hours at a time, and a mast with some light sails completes his equipment, so that a favourable wind eases tlie muscular exertion, An ordinary travelling canoe when complete weighs about 70 tb. It will float with its paddle and 10 tb of luggage in 5 inches of water. In the Indian canoes of America the single paddle is usually employed, and the men kneel to the work. The canoeists in the Straits of Magellan paddle standing. The peculiar advantages of a canoe may be summed up thus :—~~

~~Canoes of tin |~~

~~1. The canoeist faces forwards in the direction of his progress, and therefore he can readily steer without turning his head round.~~

~~2. His centre of gravity is five or six inches below what would be necessary in a row boat, and therefore the canoe is more steady, and is very suitable for shooting from. When the action of the paddle stops the canoeist is at once in comfortable rest. In de- scending a rapid where rocks or snags are numerous, the canoeist has much power of seeing and avoiding danger, while he can also get out readily, and can sit on the deck in places where the feet, being in the water, arc of service in warding off collisions.~~

~~3. The knees of the canocist press outwards against the sides of the ‘‘well”’ or opening in the deck, so that in high seas there is ample ‘‘ purchase” for counteracting an upset, while the canoeist can use great power with his paddle at a critical moment for lifting the craft over a wave. The alternate action of the arms opens the chest, and the legs are continually exercised by pressure against the stretcher, while the sway of the whole body at each stroke of row- ing is dispensed with.~~

~~4. He can instantly hoist sail without leaving his place or shift- ing ballast, and he can fisli or shoot conveniently without changing his seat. He can sleep in the canoe when it is properly prepared.~~

~~5. The canoe being impelled without rowlocks, by pressure through the legs to the feet resting on the stretcher, and by only one imple- ment (the paddle), the joints of the planks and the nails and fast- enings, are not loosened, as in other boats, by the jerky leverage of~~

~~CANOE~~

~~rowlocks.~~

~~6. The deck covering (not feasible in a row-boat) protects the~~

~~‘ paddler and his luggage from wind, rain, and sea, and adds to the~~

- ~~stiffness” of his craft, so that it can be dragged on rough ground without injury. A canoe should have a very flat floor and small keel ; this secures stability, while it diminishes speed to a very small extent.~~

~~7. Ladies aud young children can conveniently use the canoe because of its safety and the simplicity of its mode of propulsion, Many double canoes are used in England, and some with four paddlers together.~~

~~For actual speed over a short and straight course the ordinary sculling skiff is superior to the canoe, but for long journeys of more tlian a week’s duration, and in strange rivers, or with frequent portage, rough usage, intricate navigation, or unexpected difficulties, the canoe is found to be much more convenient than the rowing boat. Forty miles a day in lakes can~~

~~be kept up for weeks together in a travelling canoe, unless against a contrary wind. Fast racing calloes are 20 feet long and 18 inches broad, and attain a speed of 8 miles an hour. Canoes for " upset races " (where the canoeist has to jump out, tow his boat while swimming, and then get in) and for the race " over land and water" are specially built for their purpose, Other canoes are built chiefly for sailing, and these carry "drop keels," " rockers," and heavy ballast.~~

~~In 1866 the Royal Canoe Club was formed in England, and the Prince of Wales became commodore, while about 500 members have been elected in various parts of the world. After the English canoes were seen in Paris at tlle Exhibition of 1867, others like them were built in France. Branches and clubs were formed also at the English universities, and in Liverpool, Hull, Edinburgh, Glasgow, and New York. A_ publication called The Canoeist records the more important cruises in canoes in almost every country on the globe. One member of the club crossed the English Channel from Dover to Boulogne in his canoe, another from Boulogne to Dover, and a third crossed the Irish Channel from Scotland to Ireland. Many old and new rivers have been explored for the first time in canoes, among which the most interesting were the hitherto inaccessible parts of the Jordan, the Kishon,' and the Abana and the Pharpar at Damascus, as well as the Lake Menzaleh in the Delta of the Nile, and the Lake of Galilee and Waters of Merom in Syria. So far as has been ascer- tained, not one of the members of the Royal Canoe Club has been drowned in any of the numerous long cruises performed.~~

~~See Macgregor's A Thousand Miles in the Rob Roy Canoe, The Rob Roy on the Baltie, and The Rob Roy on the Jordan, Red Sea, Nile, and Gennesareth, de.; Canoe Travelling, by W. Baden Powell ; Cruise in a Cockle Shell, by A. H. Reed ; The Canoeist (Royal Canoe Club). (J. M'G.)~~

~~END OF VOLUME FOURTH.~~

~~NEILL AND COMPANY, PRINTERS, EDINBURGH,~~

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~~When insertion throughout the text is desired, the Plates to be placed opposite the following~~

~~pages :— Plates I. to XVI. page 163 Plate XXIII. page 479 Plate XXX. page 597 Plate XVII ,, 221 * XXIV. ,, 480 nH seek. 4 69S Fe AVL , 330 ” XXV. ,, 482 » eeeIl , 885 . XIX. ,, 334 m XXVI. ,, 490 5 SAAT, ,, S32 “ cee ©6460 » maViIL , 592 i eV. 4, “740 fi SAL », 466 ~ 2eeVEL ,, 596 rae. >. ©. 9 Crm ¢ AXITL , 477 — XXIX.. ,, 596 » Meeve , Fol~~

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~~5. The canoe being impelled without rowlocks, by pressure through the legs to the feet resting on the stretcher, and by only one imple- ment (the paddle), the joints of the planks and the nails and fast- a Ae not loosened, as in other boats, by the jerky leverage of rowlocks.~~

~~END OF VOLUME FOURTH.~~

~~NEILL AND COMPANY, PRINTERS, EDINBURGH,~~

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~~BOTANY. PLATE TJ.~~

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~~BUILDING. PLATE XXT7I.~~

~~Fig.t. CARPENTRY~~

~~Forming a Beam by joggling,as 0, two timbers then? oe~~

~~Mast building. fBrenchs method)~~

~~Fig. 6.~~

~~long one: Fig. 8.22. yor po”~~

~~Side view~~

~~Plaw of the underside~~

~~“Ano ther good Orne.~~

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~~Another form of Scarfing~~

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~~BUILDING. / PLATE XXIII. CARPENTRY~~

~~‘Bolt or Post,~~

~~Fig. 5. IN ROOFING~~

~~JOINTS~~

~~Section of Beam and toot of Rafter showing the different Shoulders~~

~~Fig. 11.~~

~~To place Iron Strap~~

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BUILDING FLOORING AND PARTITIONS.

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~~*erture Elevation of a trussed partition . ora quartering partition*~~

~~*Ys Plan of Single Floor:*~~

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~~*Section of a tloor of singleJoists on ap*~~

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~~*BUILDING. PLATE XXVI.*~~

~~*WINDOWS & DOORS.*~~

~~*er wi 5 Inside elevation of awindow.*~~

~~*Traverse Section a Ww Le WwW,*~~

~~*i*~~

~~*Section pf arn 44H LOOT'.*~~

~~*Fig. 2.*~~

~~*Etlevalion of an Inner door.*~~

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~~*RL, 4*~~

~~Stone sill Y Yj Z Zi pa 2 J ZT g — A Vy Ni WY Yj i _ Plan of a doorway, = GF tj Vy Yi ZZ tj Zs, Z s —~~

~~Architrave~~

~~Dressings~~

~~(See Plate XXI Fig.7/~~

~~a Plan of awindow. ea Bi = (Sve hig. 4. : Dressings Ss SS N Boxings S "A wy : 83 : / Sas Pilaster . 3 x wS SSS SS 2 Bibtins . — Muntin or Vf Raised panel __ Stvle in 1 aA gE prang S . i S ZS \ "e 4 Bia oe eles Lae pap ee : y j . os Fig.3. y 8 Plan of doer Leg. 2 tealarger scale. 3 aN 8 9 ss . > Rs N ar Flat pee poulded , if se flat panel square — mouldings laid we. eee = \ yy Bead butt Muntin Bead flush. \ZZZZZZN SNG e Pilaster~~

~~wee mh : . Lea Kg * n a (of = fig. 6. (f ip ah Sig.7. Section of a leaded gutter. we of cage : ee aod oe rolls Z Tj « Lead or Zinc Fi) i se athe lea ned overthem. Dy \ ; Yj Gulter board. Boarding on joists for a flat. Ys Yj Gutter bearer. } det | Wi del? Yj ? , Eng? by 6. Aikman, Edin® Yj saa~~

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~~Parnassius Apollo.~~

~~(Apollo)~~

~~Papilio Machaon.~~

~~*Outline of 2.*~~

~~*(Swallow-tail)*~~

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~~*yellow Butterfly*~~

~~*(Pale- clouded Helwconius Langsdor?i.*~~

~~*Vanessa To.*~~

~~*Vanessa Lo.*~~

~~*Png? by G.Atkman, Edin”*~~

~~*{Peacock)*~~

~~*Danaida eunice.*~~

~~*(Peacock)*~~

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~~*ENCYCLOPADIA BRITANNICA,*~~

~~*| BUTTERFLIES. PLATE XXVIIW1. | .*~~

~~*Vanessa callithea .*~~

~~*Argynnis moneta. ”*~~

~~*| Silver-spotted Fritillary) Larva of hat Argynius paphia, Nymphalis ilia. (Silver-washed. F) ‘ttillaiy) ’*~~

~~*Chrysalis of Nymphals lia.*~~

~~*Nymphalis ethea.*~~

~~*Nymphatts Sasius.*~~

~~*\x*~~

~~*Morpho actorion.*~~

~~*favonia acadina*~~

~~*A.*~~

~~*Aymphalis Sasius. Veymphalis Sasius ng t bu C.Aikman. Edin”*~~

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~~*BUTTERFLIES & MOTHS. PLATE XXIX.*~~

~~*f wis’ Morpho phidippus.*~~

~~*Brassolis astyra.*~~

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~~7 Y~~

~~*Zephyrius amor.*~~

~~*Satyrus Balder.*~~

~~*Larva of Morpho phidippis.*~~

~~*a el Ys ‘ awa*~~

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~~*Chrysalis and larva of*~~

~~*Urania Boisduvali. Hesperia tages.*~~

~~*Flesperia sabadius . (Dingy Skipper) ENCYCLOPADIA BRITANNICA, NINTH EDITION.*~~

~~*Eng? by G. Aikman, Edin™*~~

~~*BUTTERFLIES & MOTHS. PLATE XXX.*~~

~~*Castnia Acreoiies.*~~

~~*R jasminearum. Sphinx)*~~

~~*hi*~~

~~*)*~~

~~*Smerinthus WT*~~

~~*Sesta asilipennis. (Gad-fly Hawk Moth)*~~

~~*Macmurtre., Goat Moth)*~~

~~*Atychia 4 pumila. Procris nebulosa*~~

~~*Larva of Cossus ligniperda (Goat Moth)*~~

~~*Uh Sericaria ‘*~~

~~*scalars.*~~

~~*Lastocampa proboscidea . (Proboscis Eggar’|*~~

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~~*hurnig urnia Luna. (Ghost Moth*~~

~~*Eng? by 6.Atkman Edin?*~~

~~*Saturnia PBauchinice*~~

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~~BUTTERFLIES & MOTHS PLATE XXAXT.~~

~~MOTHS.~~

~~_ Notodonta sez. (Lebble Prominent Moth)~~

~~Larva of Erebus (Omoptera) putrescens.~~

~~Botys dilucdatis. . . Mioned Pearl) Noctua (Oplhaderes) Imperator. Flydrocampe aquatilis. (Water Moth)~~

~~Aglossa dilucidalis. Crambus retusalis.~~

~~Tinea tapezana., (Clothes' Moth)~~

~~Orneodes hevadactylus. Pterophorus ptilodactylus. (24-plumed. Moth.) Eng? by G-Aikman, Edin®~~

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~~*Five-bowl Catender, side elevation.*~~

~~*front elevation*~~

~~*Catender, —*~~

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ENCYCLOPHDIA BRITANNICA

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DICTIONARY

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ARTS, SCIENCES, AND GENERAL LITERATURE

Nee. EDITION

VOLUME V

EDINBURGH: ADAM AND CHARLES BLACK

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ENCYCLOPA DIA

BRITANNICA.

CANON ;

ANON. The Greek word xavwvy means originally a straight rod or pole, and metaphorically what serves to keep a thing upright or straight, a rule. In

the New Testament it occurs in Gal. vi. 16 and 2 Cor. x. 13, 15, 16, signifying in the former passage a measure, in the latter, what is measured, a district. There are three opinions as to the origin of its application to the writings used by the church. According to Semler, Baur, and others, the word had originally the sense of list or catalogue—the books publicly read in Christian assemblies. Others, as Steiner, suppose that since the Alexandrian grammarians applied it to collections of old Greek authors as models of excellence or classics, it meant classical (canonical) writings. According to a third opinion, the term included from the first the idea of a regulating principle. This is the more probable, because the same idea lies in the New Testa- ment use of the noun, and pervades its applications in the language of the early Fathers down to the time of Con- stantine, as Credner has shown.) The "xavev of the church" in the Clementine homilies,? the " ecclesiastical xavov"> and "the xaviv of the truth" in Clement and Trenzeus,* the xavev of the faith in Polycrates,® the regula fidet of Tertullian, and the libri regulares of Origen' imply a normative principle. Credner's view of xavev as an abbreviation of ypadat xavévos, equivalent to Scriptura legis in Diocletian's Act,® is too artificial, and is unsanc- tioned by usage.

The two significations of the word are—a rule or funda- mental principle, and a collection or list of books that form or contain the rule.

The earliest example of its application to a catalogue of the Old or New Testament books occurs in the Latin trans- lation of Origen's homily on Joshua, where the original seems to have been xaviv. The word itself is certainly in

l Zur Geschichte des Kanons, pp. 3-68.

2 Clement. Hom., ap. Coteler., vol. i. p. 608.

3 Stromata, vi. 15, p. 803, ed. Potter.

4 Adv. Heres., i. 95.

5 Euseb, ZI. E., v. 24

8 De prescript. Horeticorum, chs. 12, 13.

7 Comment. in Mat. iii. p. 916; ed. Delarue.

8 Monumenta vetera ad Donatistarum historiam pertinentia, ed. Dupin, p. 168.

Amphilochius,® as well as in Jerome! and Rufinus.! As the Latin translation of Origen has canonicus and canont- zatus, we infer that he used xavovixds, opposed as it is to apocryphus or secretus. The first occurrence of kavovixds is in the 59th canon of the Council of Laodicea, where it is contrasted with iduorixds and déxavovictos. Kavovi€opeva, “canonized books,” is first used in Athanasius’s festal epistle.2 The kind of rule which the earliest fathers thought the Scriptures to be can only be conjectured; it is certain that they believed the Old Testament books to be a divine and infallible guide. But the New Testament was, uot so considered till towards the close of the 2d century, when the conception of a Catholic Church was realized, The collection of writings was not called Scrip- ture, or put on a par with the Old Testament as sacred and inspired, till the time of Theophilus of Antioch (about 180 a.p.) Hence Irenzeus applies the epithets divine and perfect to the Scriptures; and Clement of Alexandria calls them inspired.

When distinctions were made among the Biblical writ- ings other words were employed, synonymous with xavovi- Copeva or Kexavovicpéva, such as évditOynxa, opurpéva. The canon was thus a catalogue of writings, forming a rule of truth, sacred, divine, revealed by God for the instruction of men. The rule was perfect for its purpose.

The Old Testament Canon.

The individual who first gave public sanction to a por- tion of the national Jewish literature was Ezra, who laid the foundation of a canon. He was the leader in restoring the theocracy after the exile, “‘a ready scribe in the law of Moses, who had prepared his heart to seek the law of the Lord and to teach in Israel statutes and judgments.” The question how far Ezra was also the redactor of the Penta-

; teuch, or made additions to it, will be discussed in its

9 At the end of the Zambt ad Seleucum, on the books of the New Testament, he adds, otros devdéoratos xavav dp ely Tay CcomvevoTtwy ypapearv.

1 Prologus galeatus in ii. Reg.

Nl Hxpos. in Symb. Apost., 37, p. 874, ed. Migne.

12 After the word is added ral mapado@évra, morevOdvta Te Geta elvat. Opp., vol. i. p. 961, ed. Benedict.

Vv. — 1

proper place (see Penrateucn). Here it is sufficient to observe that the public authority he conferred on the Law is the first step in the formation of the canon.

After the first collection was made attention was directed to other national documents. Of these the prophetic books were the most conspicuous; and the order of men from whom they came, or whose names they bore, stood out in a favourable light, when looked back at from the restored theocracy, because many of their predictions had been fulfilled, Exhortations and warnings, which had often fallen upon listless ears, had been verified by experience. A desire to gather together the earlier prophetic writings would naturally accompany or follow the zeal displayed in bringing forth the Pentateuch to public view. Hence the historical books of the nation which described the divine guidance of the people, as well as the kings under whom the earliest prophets lived (Joshua—Kings), were first adopted.

This second canon originated with Nehemiah, of whom it is said in the second book of Maccabees, that, when found- ing a library, “he gathered together the acts of the kings, and the prophets, and the (Psalms) of David, and the epistles of the kings concerning the holy gifts.” These words, though somewhat ambiguous, and admitting different explanations, present

an historical statement which should not be sum- marily rejected, asit is by Graetz. “The Acts of the Kings 4 contained the two books of Kings (including those now called after Samuel), with Joshua and Judges, of which last Ruth was the concluding part ; for Joshua was now separate from the Mosaic books, with which it was closely connected at first. This historical portion was the proper continuation of Ezra’s canon. The “ Prophets” comprehended the four greater and twelve minor ones. Not all the latter, how- ever; for Jonah is of subsequent date. Lamentations were united to Jeremiah as one book. The “ Psalms of David” also belong to this canon, and may have been almost coex- tensive with the first three divisions of the present book. The epistles of the kings concerning the holy gifts are not extant. They appear to have been the documents of heathen (Persian for the most part) kings favourable to the rebuilding of Jerusalem and its temple. Nehemiah’s canon was identical to some extent with the second divi- sion of the Biblical books. It wanted Jonah, perhaps Malachi, but it had ‘the Epistles of the kings.” It was larger than the second Hebrew division of the Old Testa- ment, and had probably heen preceded by smaller collec- tions of prophetic productions before the captivity. We know that in the captivity itself, and immediately after, older prophecies were edited.

Whether Nehemiah himself collected the books, or whether he merely set the thing on foot and saw that it was carried out by the learned men of the time, can only be conjectured. As he was not a priest or a scribe like Ezra, but a statesman, the latter supposition is the more prob- able. This collection was highly esteemed; though it did not take equal rank with the first. It was not completed

before the close of the 4th century B.c., because the book of |

Jonah was probably not written till that time. The close of the prophetic canon could not have taken place till some period had elapsed after Malachi,—a period sufficient for the growth of a general consciousness that the prophetic function had ceased with the youngest of the prophets. Besides the historical books which preceded, there were in it four prophetic ones—Jeremiah, Ezekiel, Isaiah, the twelve minor prophets. Ruth belonged to the book of Judges, and Lamentations to Jeremiah; but they were

afterwards detached and put into the third division or canon. Definite allusions to this prophetic collection do

———

1 Chap, ii. 13.

not occur till the 2d century B.c. Daniel speaks of a passage in Jeremiah being in “the books” or “writings;”* and Sirach, both in the prologue and the 49th chapter, presupposes its completion. Such was the second or Nehemiah canon, partly gradual in its formation.

The third canon, in which the other books of the Old Testament were included, was not made at once. Its con- tents were multifarious, differing widely from one another in age and character—poetical, prophetic, didactic, his- torical. Such as seemed worthy of preservation, though they had not been included in the second canon, were gathered together during the space of a hundred and fifty years. The oldest part consisted of psalms supposed to belong to David, which were a supplement to those in Nehemiah’s collection,—perhaps the last two divisions, with some exceptions (books fourth and fifth). Next to the Psalms were Proverbs, Job, Canticles, which, though non- prophetic, and probably excluded on that account from the sacred canon, must have existed before the exile. En- riched with the latest additions, they survived the national disasters, and claimed a place next to the Psalms. They were but a portion of the literature current in and after the 5th century B.c., as may be inferred from the epilogue to Ecclesiastes and the Wisdom of Sirach. The historical work compiled by the chronicle-writer was separated, Ezra being put first as the most important part and referring also to the church of the 6th and 5th centuries, whose history had not been written, The Chronicles themselves were placed last, being considered of less value than the first part, as they contained the summary of a period already described, though with numerous adaptations to post-exile times. The youngest portion consisted of the book of Daniel, not written till the Maccabean period (between 170 and 160 B.c.); and probably of several psalms which were inserted in different places of the col- lection so as to make the whole number 150. The list continued open, and no stringent principle guided selection. The character of the collection was somewhat

indefinite. It was called c’tubim, i.e, writings,*—a general epithet suited to the contents.

The earliest attestation of this third canon is that of the prologue to Jesus Sirach, where not only the law and the prophets are specified, but “ the other books of the fathers,” or “the rest of the books.”* No information is given as to its extent, or the particular books included, They may have been for the most part the same as the present ones. The passage does not show that the third list was closed. The better writings of the fathers, such as tended to learn- ing and wisdom, are not excluded by the definite article. In like manner, neither Philo nor the New Testament gives exact information as to the contents of the division in ques- tion. Indeed, several books (Canticles, Esther, Ecclesi- astes), are unnoticed in the latter. The argument drawn from Matthew xxiii. 35, that the Chronicles were then the last book of the canon, is inconclusive, as the Zechariah there named was probably different from the Zechariah in 2 Chronicles xxiv. The third canon is not proved to be closed by any of these witnesses, much less by a passage of 2 Maccabees ii. 14, which is sometimes adduced for the purpose.

A more definite testimony respecting the canon is given by Josephus towards the end of the first century A.D. “ For we have not an innumerable multitude of books among us, ... but only twenty-two books, which contain the records of all the past times ; which are justly believed to be divine. And of them five belong to Moses. .... But

= The, B, : 3 DIN, translated by the Greek ayidé-ypada, hagiographa. 47 GAAG matpla BiBAla; Ta AOITA THY BiBAtwv.

as to the time from the death of Moses till the reign of Artaxerxes king of Persia, the prophets who were after Moses wrote down what was done in their times in thirteen books. ‘The remaining four books contain hymns to God and precepts for the conduct of human life. It is true our history has been written since Artaxerxes very particularly, but has not been esteemed of the like authority with the former by our forefathers, because there has not been an exact succession of prophets since that time: and how firmly we have given credit to these books of our own nation is evident by what we

do; for during so many ages as have already passed, no one has been so bold as either to add anything to them, to take anything from them, or to make any change in them; but it has become natural to all Jews immediately and from their very birth, to esteem these books to contain divine doctrines, and to persist in them, and, if occasion be, willingly to die for them.”! This list agrees with our present canon, showing that the Pales- tinian Jews were tolerably unanimous as to the extent of the collection, The thirteen prophets include Job; the four lyric and moral books are Psalms, Proverbs, Ecclesi- astes, and Canticles.

The canon, however, was not considered to be closed in the Ist century before and the Ist after Christ. There were doubts about some portions. The book of Ezekiel gave offence, because some of its statements seemed to contradict the law. Doubts about others were of a more serious nature,— about Ecclesiastes, the Canticles, Esther, and the Proverbs. ‘The first was impugned because it had contradictory passages and a heretical tendency; the second, because of its worldly and sensual tone; Esther for its want of religiousness ; and Proverbs on account of incon- sistencies. This scepticism went far to procure the exclu- sion of the suspected works from the canon, and their rele- gation to the class of the genuzim.? But it did not prevail. Hananiah, son of Hezekiah, son of Garon, about 32 z.c., is said to have reconciled the contradictions and allayed the doubts. But these traces of resistance to the fixity of the canon were not the last. ‘They reappeared about 65 A.D., as we learn from the Talmud,‘ when the contro- versy turned mainly upon the canonicity of Ecclesiastes, which the school of Shammai, who had the majority, op- posed ; so that the book was probably excluded.’ The question emerged again at a later synod at Jabneh or Jam- nia, when R. Eleaser ben Asaria was chosen patriarch, and Gamaliel the second deposed. Here it was decided, not unanimously, however, but by a majority of Hillelites, that Kcclesiastes and the Song of Songs “pollute the hands,” 2.¢., belong properly to the Hagiographa. his was about 90 a.p.° Thus the question of the canonicity of certain books was discussed at two synods. ‘The canon was vir- tually settled at Jamnia, where was confirmed what R. Akiba said of the Canticles in his usual extravagant way: “No day in the whole history of the world is of so much worth as the one in which the Song of Songs was given to Jsrael ; for all the Scriptures are holy; but the Song of Songs is most holy.”* As the Hagiographa were not read in public,

with the exception of Esther, opinions of the Jewish rab- bins might still differ about Canticles and Ecclesiastes, even after the synod at Jamnia.

Jewish literature began to degenerate after the captivity,

1 Contra Apion, i. 8,

cS D434 literally concealed, withdrawn from public use.

8 See Fiirst's Der Kanon des alten Testaments, u.s.w. pp. 147,

148.

- Tract. Sabbat., ch. i.

5 Adoyoth, v. 3.

6 See Graetz's Kohelet, pp. 162, 163.

7 One who said, " Whoever reads such writings as Sirach and the later books loses all part in everlasting life," can have no weight.

and it continued to do so. It leant upon the past more and more, having an external and formal character with little of the living soul. The independence of their reli- gious literature disappeared with the national independence of the Jews ; and the genius of the people was too exclu- sive to receive much expansion from the spirit of nations with whom they came in contact. In such circumstances, amid the general consciousness of present misfortune, which the hope of a brighter future could not dispel, and regretful retrospects of the past tinged with ideal splendour, the exact time of drawing a line between books that might be included in the third division of the canon must have been arbitrary. In the absence of a normal principle to deter- mine selection, the productions were arbitrarily separ- ated. Not that they were badly adjusted. On the con- trary, the canon as a whole was wisely settled. Yet the critical spirit of learned Jews in the future could not be extinguished by anticipation. The canon was uot really settled for all time by a synodical gathering at Jamnia ; for Sirach was added to the Hagiographa by some rabbins about the beginning of the 4th century ;8

while Baruch circulated long in Hebrew, and was publicly read on the day of atonement in the 3d century according to the apostolic constitutions.? These two books were in high re- pute for a considerable time, possessing a kind of canonical credit even among the learned Jews of Palestine. Rab, Jochanan, Elasar, Rabba bar Mare, occasionally refer to Sirach in the way in which the c'tubim were quoted; the writer of Daniel used Baruch; and the translator of Jere- miah put it into Greek.

With the formation of the canon we may now connect the labours of the Great Synagogue, so far as Jewish autho- rities present credible information regarding it. The Tal- mudic and other accounts are legendary in part, and also in- correct. Little as is known of its members or doings, some idea may be gathered from scattered notices about it as well as from analogy.

The oldest notice of the Great Synagogue is that in the Pirke Aboth, about 200 a.p., where it is said that " Moses received the law from Mount Sinai and delivered it to Joshua, Joshua to the elders, the elders to the prophets, and the prophets delivered it to the men of the Great Syna- gogue. 'These last spake three words: Be cautious in pro- nouncing judgment; make many disciples; put a hedge about the law."1° In Baba Bathra their Biblical labours are somewhat minutely described: 'Moses wrote his book, and the section of Balaam, and Job. Joshua wrote his book and eight verses in the law. Samuel wrote his book and Judges and Ruth. David wrote the psalms of the ten elders, &c., &c. Jeremiah wrote his book, Kings, and Lamentations. Hezekiah and his colleagues wrote Isaiah, Proverbs, Canticles, and Coheleth. The men of the Great Synagogue wrote Ezekiel, the twelve prophets, Daniel, and Ezra. Hzra wrote his book- and the genealogy in Chro- nicles down to himself," It is not clear what is méant by "writing" (ADD) in the latter part of the statement. It means composition in the first part, as the context un- doubtedly shows; and that is Rashi's explanation of the verb throughout.!® Perhaps, however, when used of the Great Synagogue it means no more than edit. That body put into their present form and received into the national library the works specified. Late writers, such as Abar- banel, Abraham ben David, ben Maimun, &c., record that Ezra was president, and that it consisted of 120 members, including Haggai, Zechariah, Malachi, &c.; but the names

8 Zunz’s Die gottesdienstlichen Vortrige, pp. 101, 102.

®v, 20, p. 124, ed. Ueltzen. 19 Chapter i. aed, 2 é

1? See Herzfeld’s Geschichte des Volkes Israel, vol. ii. p. 94.

and number are evidently conjectural and incorrect.’ These late notices deserve little credit.?

As Ezra is called “a ready scribe,” and his labours in connection with the law were important, he may have organized a body of scribes who should work in harmony, attending, among other concerns, to the preservation and correction of the national literature. It must be admitted, however, that the priests enumerated in N ehemiah x. 1, é&c., and the “company of scribes”* in 1 Maccabees vii. 12 (comp. ii. 42), afford no basis for such a college. Still, there is nothing improbable in the hypothesis. A succes- sion of scribes and priests, if not conjointly, at least in harmony, continued to labour till the corporation ceased to exist with Simon the Just, who is mentioned as the last belonging to it, ze, from 444 B.c, till about 200. What they did can only be inferred from the proceedings of Ezra himself, and from the prevailing views as well as wants of the times they lived in. Those who began with Ezra, see- ing what he did, would naturally follow his example, and would not scruple, if it seemed best, to revise the text in substance; but their chief work related to the form of the text. After the last canon was made, about a century or more anterior to the Christian era, the text was not con- sidered inviolate by the learned Jews; it received modi- fications and interpolations long after. The process of redaction had not ceased before the time of Christ. This was owing, among other causes, to the state of parties among the Jews, as well as the intrusion of Greek litera- ture and culture, whose influence the Palestinian Jews themselves were not able to withstand altogether.

The canon did not include all the national literature ; and if it be asked on what principle books were admitted, it is not easy to answer. The higher the value of the writ- ings, the more conducive to the religious life and advance- ment of the people, they were the more readily accepted. Real or

apparent importance determined their adoption. In judging of their value different considerations weighed. Some were regulative in the department of the legal and ethical ; the prophetic claimed a divine origin; the lyric or poetic touched and elevated the ideal faculty on which religion acts. ‘The nation, early imbued with the theo- cratic spirit, and believing itself the chosen of God, was favourably inclined toward documents in which that stand-point was assumed. The names of men renowned for their piety, wisdom, or knowledge of divine things, which some books bore, ensured their admission. A variety of considerations contributed to the gradual formation of the canon ; and the best part of the national literature was incorporated.

Of the three divisions, ‘The Law” or Pentateuch was most highly venerated by the Jews. It was the first trans- lated into Greek, and in Philo’s view was inspired in a way peculiar to itself. ‘The Prophets,” or second division, occu- pied a somewhat lower place. in their estimation, but were read in the public services as the law had been before. The “C”thubim,” or third division, was not looked upon as equal to the Prophets in importance; only the five Megiloth were publicly read. The three parts of the collection present the three gradations of sanctity which the books assumed successively in Israelite estimation. A certain reverence was attached to all as soon as they were made canonical ; but the reverence was not of equal height, and the supposed authority was proportionately varied.4 The consciousness of prophetism being extinct soon after the return from Babylon was a genuine instinct. With the extinction of

1 See Buxtorf’s Tiberias, chapter x. p. 88, &c. 2 Herzfeld’s Geschichte des Volkes Israel,vol.i. p. 880, &c. 8 Suvaywyh ypaupatéwv, without the article.

ey in the Jahrbiicher fiir deutsche Theologre, Bd. jii. p. ved Sale

the Jewish state the religious spirit almost evaporated. The idealism which the old prophets proclaimed in contrast with the symbolic religion of the state gave place to forms and an attachment to the written law. Religion came to be a thing of the understanding, the subject of learned treatment; and its essence was reduced to dogmas or pre- cepts. Thus it ceased to be spiritual, or a thing in which the heart had free scope for its highest aspirations. The narrow prophetism that appeared after the restoration was

little more than an echo of the past, falling in with an ex- ternal and written legalism. The literature of the people deteriorated in quality, and prophecy became apocalypse.

When the three divisions were united, the ecclesiastical respect which had gathered round the law and the prophets from ancient times began to be transferred to the c'thubim. A belief in their sanctity increased apace in the Ist century — before the Christian era, so that sacredness and canonicity were almost identical. The doubts of individuals, it is true, were still expressed respecting certain books of the cthusim, but they had no perceptible effect upon the cur- rent opinion, The sanctity attaching to the last division as well as the others did not permit the total displacement of any part.

The origin of the threefold division of the canon is not, as Oehler supposes,® a reflection of the different stages of religious development through which the nation passed, as if the foundation were the Law, the ulterior tendency in its objective aspect the Prophets, and its subjective aspect the Hagiographa. The books of Chronicles and others refute this arbitrary conception. The triplicity lies in the manner in which the books were collected. Men who be- longed to different periods and possessed different degrees of culture worked successively in the formation of the canon. It resulted out of the circumstances in which it was made, and the subjective ideas of those who made it.

The places of the separate books within the first divi- sion or Yorah were determined by the succession of the historical events narrated. The second division naturally begins with Moses's successor, Joshua. Judges, Samuel, and Kings follow according to the regular chronology. To the former prophets, as Joshua to Kings were called, the latter were attached, Isaiah, Jeremiah, and Ezekiel,—succeeded by the twelve minor prophets, arranged for the most part according to their times, though the length of individual prophecies also influenced their position, together with similarity of contents. The arrangement of books in. the third division depended on their age, character, and authors. The Psalms were put first, because David was supposed to be the author of many, and on account of their intrinsic value in promoting the religious life of the people. After the Psalms came the three

poetical works attributed to Solomon, with the book of Job among them,—Proverbs, Job, Canticles, Ecclesiastes. The book of Esther followed, since it was intended to further the observance of the Purin: feast ; with the late book of Daniel, which had some affinity to Esther in its relation to heathenism and to Greek life. To Ezra and Nehemiah, which were adopted before the other part of the chronicle-book and separated from it, were added the so-called Chronicles. Such was the original succession of the third division or cthubim ; but it did not remain unaltered. For the use of the syna- gogue the five Megiloth were put together, so that Ruth (originally the last part of Judges), and the Lamentations (appended at first to Jeremiah's prophecies) were taken out of the second and put into the third canon, This caused a separation of Canticles and Ecclesiastes.

The Samaritan canon consists of the Pentateuch alone.

5 Article " Kanon" in Herzog's Hncyklopedie, vol. vii. p. 253; and the same author's Prolegomena zur Theologie des alt. Test., pp. 91,

This restricted collection is owing to the fact that, when the Samaritans separated from the Jews and began their wor- ship on Gerizim, no more than the Mosaic writings had been invested by Ezra with canonical dignity. The hostile feeling between the rivals hindered the reception of books subsequently canonized. The idea of their having the oldest and most sacred part in its entirety satisfied their spiritual wants. Some have thought that the Sadducees, who already existed asa party before the Maccabean period, agreed with the Samaritans in rejecting all but the Penta- teuch ; yet this is doubtful. It is true that the Samaritans themselves say so ;1 and that some of the church fathers, Origen, Jerome, and others agree; but little reliance can be put on the statement. The latter, perhaps, confounded the Samaritans and Sadducees. It is also noteworthy that Christ, in refuting the Sadducees, appeals to the Penta- teuch alone; but the conclusion that he did so because of their admitting no more than that portion does not follow

The Alexandrian canon differed from the Palestinian. The Greek translation commonly called the Septuagint contains some later productions which the Palestinian Jews did not adopt, not only from their aversion to Greek litera-

ture generally, but also from the recent origin of the books, and perhaps their want of prophetic sanction. ‘The closing line of the third part in the Alexandrian canon was more or less fluctuating—capable of admitting receut writings ap- pearing under the garb of old names and histories, or em- bracing religious subjects ; while the Palestinian collection was pretty well determined, and all but finally settled. The judgment of the Alexandrians was freer than that of their brethren in the mother country. They had even separated in a measure from the latter, by erecting a temple at Leontopolis ; and their enlargement of the canon was another step of divergence. The influence of Greek learn- ing and philosophy led to a more liberal treatment of Jewish books. Nor had they the criterion of language for the separation of canonical and uncanonical ; both classes were before them in the same tongue. The enlarged canon was not formally sanctioned ; it had not the approval of the Sanhedrim ; yet it was to the Alexandrians what the Palestinian one was to the Palestinians. If Jews who were not well acquainted with Hebrew used the apocryphal and canonical books alike, it was a matter of feeling and cus- tom ; and if those who knew the old language better ad- hered to the canonical one more closely, it was a matter of tradition and language. The former set little value ou the prevalent consciousness of the race that the spirit of prophecy was extinct ; their view of the Spirit’s operation was larger. The latter clung to the past with all the more tenacity that the old life of the nation had degenerated. The identity of the Palestinian and Alexandrian canons must be abandoned. It is said, indeed, that Philo neither mentions nor quotes the Greek additions ; but neither does he quote several canonical books. According to Eichhorn, no fewer than eight of the latter are unnoticed by him.? Besides, he had peculiar views of inspiration, aud quoted loosely from memory. Believing as he did in the inspira- tion of the Greek version asa whole, it is difficult to think that he made a distinction between the different parts of it. The argument for the identity of the two canons deduced from 4 Esdras xiv. 44, &c., as if the twenty-four open books were distinguished from the other writings dictated to Ezra, is of no force, both because the reading is uncertain and, even if seventy be distinguished from twenty-four in the passage, verisimilitude required that an Egyptian Jew him- self must make Ezra conform to the old Palestinian canon. It is also alleged that the grandson of Jesus Sirach, who

translated his grandfather’s work during his abode in Egypt, —_____ {

ee a a ee 1 See Abulfath’s Anna. Samar., p. 102, 9, &c. 2 Hinleitung in das alte Testament, vol. i. p. 188.

knew no difference between the Hebrew and Greek canon, though he speaks of the Greek version; he speaks as a Palestinian, without having occasion to allude to the difference between the canonical books of the Palestinian and Egyptian Jews. The latter may have reckoned the apocryphal writings in the third division ; and therefore the translator of Jesus Sirach could recognize them in the ordinary classification. The mention of three classes is not opposed to their presence in the third. The general use of an enlarged canon in Egypt cannot be denied, though it was somewhat loose, was not regarded as a completed collection, and wanted express rabbinical sanction. The very way in which apocryphal are inserted among canonical books in the Alexandrian canon, shows the equal rank assigned to both. Esdras first and second succeed the Chrouicles ; Tobit and Judith are between Nehemiah and Esther ; the Wisdom of Solomon and Sirach follow Can- ticles ; Baruch succeeds Jeremiah ; Daniel is followed by Susanna and other productions of the same class ; and the whole closes with the three books of Maccabees. Such is the order in the Vatican MS.

The threefold division of the canon, indicating three stages in its formation, has continued. Josephus, indeed, gives another, based on the nature of the separate books, not on MSS. We learn nothing from him of its his- tory, which is somewhat remarkable, considering that he did not live two centuries after the last work had been added. The account of the canon’s final arrangement was unknown to him. The number of the books was variously estimated. Josephus gives twenty-two, which was the usual number among Christian writers in the 2d, 3d, and 4th cen- turies, having been derived from the letters of the Hebrew alphabet. Origen, Jerome, and others have it. It cou- tinued longest among the teachers of the Greek Church, and is even in Nicephorus’s stichometry.* The enumeration in question has Ruth with Judges, and Lamentations with Jeremiah. In Epiphanius‘ the number twenty-sevenis found, made by taking the alpbabet enlarged with the five final letters, and dividing Samuel, Kings, and

Chronicles into two books each. The Talmud has twenty-four,® which originated in the Greek alphabet, and probably proceeded from Alex- andria. After the Pentateuch and the former prophets, which are in the usual order, it gives Jeremiah as the first of the later, succeeded by Ezekiel and Isaiah with the twelve minor prophets. The Talmud kuows no other rea- son for such an order than that it was made according to the contents of the prophetic books, not according to the times of the writers. This solution is unsatisfactory. It is more probable that chronology had to do with the arrange- ment. The Talmudic order of the Hagiographa is Ruth, Psalms, Job, Proverbs, Ecclesiastes, Canticles, Lamenta- tions, Daniel, Esther, Ezra, Chronicles. Here Ruth pre- cedes the Psalter, coming as near the former prophets as possible ; for it properly belongs to them, the contents associating it with the Judges' time. The Talmudic order is that usually adopted in German MSS.

The Masoretic arrangement differs from the Talmudic in putting Isaiah before Jeremiah and Ezekiel. The Hagio- grapha are—Psalms, Proverbs, Job, Canticles, Ruth, Lamen- tations, Ecclesiastes, Esther, Daniel, Ezra (with Nehemiah), Chronicles.' MSS. often differ arbitrarily, because tran- scribers did not consider themselves bound to any one arrangement.' According to some, a very old testimony to

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3 See Credner's Zur Geschichte des Kanons, p. 124.

- De mens. et pond., chapters 22, 23, vol. ii. p. 180, ed. Petav.

5 Baba Bathra, fol. 14, 2.

5 See Fiirst, Der Kanon, u.s.w. p. 14, &e.

7 Hody, De Bibliorum textibus originalibus, p. 644.

8 Hody gives lists of the order in which the books stand in some early printed editions and in a few MSS., p. 645,

the commencing and concluding books of the third division is given by the New Testament (Luke xxiv. 44; Matthew xxiii. 35), agreeably to which the Psalms were first and the Chronicles last ; but this is inconclusive.

The Alexandrian translators, as we have seen already, placed the books differently from the Palestinian Jews. In their version Daniel comes after Ezekiel, so that it 1s put beside the greater prophets. Was this done by Jews or Christians? Perhaps by the latter, who put it between the greater and lesser prophets, or, in other words, out of the third into the second division, because of dogmatic grounds, and so effaced a trace of the correct chronology. Little importance, however, can be attached to the order of the books in the Septuagint, because the work was done at different times by different persons. But whatever may have been the arrangement of the parts when the whole was complete, we know that it was disturbed by Protestants separating the apocryphal writings and putting them all together.

The writings of the New Testament show their authors' acquaintance with the apocryphal books. They have ex- pressions and ideas derived from them. Stier collected 102 passages which bear some resemblance to others in the Apocrypha ;! but they needed sifting, and were cut down to amuch smaller number by Bleek. They are James i. 19, from Sirach v. 11 and iv. 29; 1 Peter i. 6, 7, from Wisdom iii. 3-7; Hebrews xi. 34, 35, from 2 Maccabees vi. 18-vii. 42; Hebrews i. 3, from Wisdom vii. 26, &c. ; Romans i. 20-32, from Wisdom xiii.-xv. ; Romans ix. 21, from Wisdom xv. 7; Eph. vi. 13-17, from Wisdom v. 18-20; 1 Cor. ii. 10, &e., from Judith viii. 14. Others are less probable.2 When Bishop Cosin says that "in all the New Testament we find not any one passage of the apocryphal books to have been alleged either by Christ or his apostles for the confirmation of their doctrine,"* the argument, though based on a fact, is scarcely conclusive ; else Esther, Canticles, Ecclesiastes, and other works might be equally discredited. Yet it is probable that the New Testament writers, though quoting the Septuagint much more than the original, were disinclined to the additional parts of the Alexandrian canon. They were Palestinian themselves, or had in view Judaizers of a narrow creed, The apostle Paul, at least, and probably the other writers of the New Testament, believed in the literal inspiration of the Biblical books, for he uses an argument in the Gala- tian epistle which turns upon the singular or plural of a noun. And as the

inspiration of the Septuagint trans- lators was commonly held by the Christians of the early centuries, it may be that the apostles and evangelists made no distinction between its parts. Jude quotes Enoch, an apocryphal work not in the Alexandrian canon; so that he at least had no rigid notions about the difference of canonical and uncanonical writings. Still we know that the compass of the Old Testament canon was somewhat unsettled to the Christians of the lst century, as it was to the Hellenist Jews themselves. It is true that the Law, the Prophets, and the Psalms were universally recognized as authoritative ; but the extent of the third division was indefinite, so that the non-citation of the three books re- specting which there was a difference of opinion among the Jews may not have been accidental. Inasmuch, however, as the Greek-speaking Jews received more books than their Palestinian brethren, the apostles and their immediate suc- cessors were not disinclined to the use of the apocryphal productions. The undefined boundary of the canon facili-

1 Die Apokryphen, u.s.w., p. 14, &e. 2 Studien und Kritiken for 1853, p. 267, &c. 3 A Scholastical History of the Canon, p. 22. n og Rothe, “Zur Dogmatik,” in Studien u, Kritiken, 1860, p. , &e.

tated the recognition of other sacred writings, such as the primitive records of the new revelation. |

The early fathers used the Greek Bible, as almost all of them were ignorant of Hebrew. Thus restricted, they naturally considered its parts alike, citing apocryphal and canonical in the same way. Accordingly, Irenzus (+ 202) quotes Baruch under the name of “Jeremiah the prophet ;”° and the additions to Daniel as “Daniel the prophet.”® Clement of Alexandria (t 220) uses the apo- cryphal books like the canonical ones, for explanation and proof indiscriminately. He is fond of referring to Baruch, which he cites upwards of twenty-four times in the second book of his Pedagogus, and in a manner to show that he esteemed it as highly as many other parts of the Old Tes- tament. A passage from Baruch is introduced by the phrase? “the divine Scripture says ;” and another from Tobit by® “ Scripture has briefly signified this, saying.” Tertullian (+ 220) quotes the Wisdom of Solomon ex- pressly as Solomon’s,? and introduces Sirach by “as it is written.”!0 He cites Baruch as Jeremiah.4! He also be- lieved in the authenticity of the

book of Enoch, and de- fends it at some length.!2 Cyprian often cites the Greek additions to the Palestinian canon. He introduces Tobit with the words "'as it is written,"! or ' divine Scripture teaches, saying ;"!4 and Wisdom with "the Holy Spirit shows by Solomon."15 The African fathers followed the Alexandrian canon without scruple.

Melito of Sardis (t after 171) made it his special business to inquire among the Palestinian Jews about the number and names of their canonical books; and the result was the following list:—the five books of Moses, Joshua, Judges, Ruth, four books of Kings, two of Chronicles, the Psalms of David, the Proverbs of Solomon, Ecclesiastes, the Song of Songs, Job, Isaiah, Jeremiah, the twelve in one book, Daniel, Ezekiel, Ezra. Here Ezra includes Nehemiah; and Esther is absent, because the Jews whom he consulted did not consider it canonical.

Origen's (t 254) list does not differ much from the Palestinian one. After the Pentateuch, Joshua, Judges, Ruth, Kings first and second, Samuel, Chronicles, come Ezra first and second, Psalms, Proverbs, Ecclesiastes, Can-— ticles, Isaiah, Jeremiah with Lamentations and the epistle, Daniel, Ezekiel, Job, Esther. Besides these there are the Maccabees, which are inscribed Sarbeth sarbane el." The twelve prophets are omitted in the Greek ; but the mistake is rectified in Rufinus's Latin version, where they follow Canticles, as in Hilary and Cyril of Jerusalem. It is re- markable that Baruch is given, and why? Because Origen took it from the MSS. of the Septuagint he had before him, in which the epistle is attributed to Jeremiah. But the catalogue had no influence upon his practice. He followed the prevailing view of the extended canon. Sirach is intro- duced by "for this also is written ;"15 the book of Wis- dom is cited as 'a divine word," !® Tobit as "Scripture." "° His view of the additions to the book of Daniel and Esther, as well as his opinion about Tobit, are sufficiently expressed in the epistle to Africanus, so that scattered quotations from these parts of Scripture can be properly estimated.

5 Advers. Heres., v. 85, referring to Baruch iv. 36, and v., p. 885, ed. Massuet.

8 Tbid., iv. 26, referring to Daniel xiii. 20 in the Septuagint.

7 Pedagog., ii. 3. 8 Stromata, ii. 23.

9 Advers. Valentinianos, ch. 2.

10 De Exhortatione Castitatis, ch. 2.

Ul Contra Gnosticos, ch. 8. 2 De Habitu Muhebra, vh. 38.

13 Hpist. 55, p. 110, ed. Fell. 14 De Orat. Domin., p. 153.

15 De Exhortat. Martyrit, ch. 12, p. 182.

16 Buseb. 27. E., lib. iv. ch. 26. ‘7 Euseb. HW. E., lib. vi. p. 25.

18 Comment. in Joann., tom. xxxii. ch. 14, ed. Huet. p. 409.

19 Contra Cels. iii. 72; vol. i. p. 494, ed. Delarue.

20 De Oratione, ii. p. 215.

by them began soon after the commencement of the 2d century, and continued till the end of it, —contemporane- ously with the development of a catholic church and its necessary adjunct a catholic canon.

No New Testament canon, except a partial and unautho- titative one, existed till the latter half of the 2d century, that is, till the idea of a catholic church began to be enter- tained. The Ebionites or Jewish Christians had their favourite gospels and Acts. The gospel of Matthew was highly prized by them, existing as it did in various recen- sions. Other documents, such as the Revelation of J ohn, and the Preaching of Peter, (a Jewish-Christian history sub- sequently re-written and employed in the Clementine Re- cognitions and Homilies) were also in esteem, Even so late as 170-175, Hegesippus, a Jewish Christian, uscd the gospel according to the Hebrews and despised Paul’s writings, in conformity with the leading principle of the party to which he belonged, viz., the identity of Jesus’s words with the Old Testament. The Clementine Homilies (161-180) used the four canonical gospels, even the fourth, which they assign to the apostle John. The gospel

according to the Egyptians was also employed. Paul's epistles were rejected, of course, as well as the Acts; since the apostle of the Gentiles was pointed at in Simon Magus, whom Peter refutes, It is, therefore, obvious that a collection of the New Testament writings could make little progress among the Ebionites of the 2d century. Their reverence for the Law and the Prophets hindered another canon. Among the Gentile Christians the formation of a canon took place more rapidly, though Judaic influences retarded it even there. After Paul's epistles were interchanged between churches a few of them would soon be put together. A collection of this kind is implied in 2 Peter iii. 16.

The apostolic fathers quote from the Old Testament, to them an inspired and sacred thing. They have scarcely any express cita- tions from the New Testament. "Allusions occur, especially to the epistles. The letter of Clement to the Corinthians (about 120) does not use written gospels, though it presupposes an acquaintance with the epistles to the Romans, Corinthians, and Hebrews. Where *' Scripture" is cited, or the expression ''it is written" occurs, the Old Testament is meant.

Hermas (about 130) seems to have used the epistles to the Ephesians and Hebrews, those of James and 1 Petcr, perhaps, too, the Acts; but there is great uncertainty about the matter, and he has no express quotation from any part of the New Testament. The writer often alludes to words of Jesus found in Matthew's gospel, so that he may have been acquainted with it.

Barnabas 'about 119) has but one quotation from the New Testament, if, indeed, it be such. Apparently, Matthew xx. 16 is introduced by ''it is written," showing that the gospel was con- sidered Scripture. This is the earliest trace of canonical authority being transferred from the Old Testament to Christian writings.

As far as we can judge from Eusebius's account of Papias > (+163), that writer knew nothing of a New Testament canon. He speaks of Matthew and Mark; but whether he had their present gospels is uncertain. According to Andreas of Cmsarea he was acquainted with the Apocalypse of J ohn, while Eusebius testifies to his knowledge of 1 Peter and1 John. But he seems to have had no conception of canonical authority attaching to any part of the New Testament.

Traces of later ideas about the canonicity of the New Testament appear in the shorter Greek recension of the seven Ignatian epistles (about 175). There ‘the Gospel” and ‘‘ the Epistles” are recog- nized as the constituents of the book.6 The writer also used the Gospel according to the Hebrews, for there is a quotation from it in the epistle to the Smyrnians.? The second part of the collection seems to have wanted the epistle to the Ephesians.®

Justin Martyr (150 — knew some of the® synoptic gospels— the first and third. The evidence of his acquaintance with Mark’s is but small. His knowledge of the fourth is denied by many, and zealously defended by others. Thoma finds proof that Justin used

Of the history of Susanna he ventures to say that the Jews withdrew it on purpose from the people.1 He seems to argue in favour of buoks used and read in the churches, though they may be put out of the canon by the Jews. As divine Providence had preserved the sacred Scriptures, no alteration should be made in the ecclesiastical tradition respecting books sanctioned by the churches though they be external to the Hebrew canon,

The New Testament Canon in the Jirst three Centuries,

The first Christians relied on the Old Testament as their chief religious book. To them it was of divine origin and authority The New Testament writings came into gra- dual use by the side of the older Jewish documents, accord- ing to the times in which they appeared and the reputed names of the authors,

When Marcion came from Pontus to Rome (144 a.p.), he brought with him a Scripture-collection consisting of ten Pauline epistles, Those addressed to Timothy and Titus, with the epistle to the Hebrews, were not init. The gospel of Marcion was Luke’s in an altered state. From this and other facts we conclude that external parties were the first who carried out the idea of collecting Christian writings, and of putting them either beside or over against the sacred books of the Old Testament, in support of their systems As to Basilides (125 a.p.), his supposed quota- tions from the New Testament in Hippolytus are too pre- carious to be trusted.? It is inferred from statements in Origen and Jerome that he had a gospel of his own some- what like Luke’s, but extra-canonical. His son Isidore and succeeding

disciples used Matthew's gospel. Jerome says that Marcion and Basilides denied the Pauline author- ship of the epistle to the Hebrews and the pastoral ones.3 It is also doubtful whether Valentinus's (140-166) alleged citations from the New Testament can be relied upon. The passages of this kind ascribed to him by the fathers belong in a great measure to his disciples ; and Henrici has not proved his position that he used John's gcespel. But his followers, including Ptolemy (180 A.D.) and Heracleon (185-200), quote the gospels and other portions of the New Testament. From Hippolytus's account of the Ophites, Perate, and Sethians, we infer that the Christian writings were much employed by them, An apocryphal work they rarely cite. More than 160 citations from the New Testament have been gathered out of their writings.4 We may admit that these Ophites and Peratze were of carly origin, the former being the oldest known of the Gnostic parties; but there is no proof that the acquaint- ance with the New Testament which Hippolytus attributes to them belongs to the first rather than the second half of the 2d century. The early existence of the sect does not show an early citation of the Christian books by it, especi- ally of John's gospel ; unless its primary were its last stage. Later and earlier Ophites are not distinguished "in the Philosophumena, Hence there is a presumption that the author had the former in view, which is favoured by no mention of them occurring in the " Adversus omnes THo- Teses" usually appended to Tertullian's Preescriptiones Hereticorum, and by Irenzeus's derivation of their heresy from that of Valentinus. The latter father does not even Speak of the Peratz. Clement of Alexandria is the first Who alludes to them. The early heretics were desirous of confirming their peculiar opinions by the writings current among catholic Christians, so that the formation of a canon

u Opp., ed. Delarue, vol. i. p. 12.

oe Introduction to the Study of the N. Testam., vol. ii. p. i 3 Explanatio in Epist. ad Titum, vol. iv. p- 407, ed. Benedict. "See the Indexes to Duncker and Schneidewin's edition,

® Hist. Eecles., iii. 39.

8 Epist. ad Philadelph., ch. 5. See Hefele's note on the passage, The other well-known passage in chapter viii. is too uncertain in read- ing and meaning to be adduced here.

7 Chapter iii. ® To the Ephesians, chapter xii,

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it freely as a text-book of gnosis, without recognizing it as the his- torical work of an apostle. It is pretty certain that he employed an extra-canonical gospel, perhaps the so-called gospel of the Hebrews. He had also the older Acts of Pilate. Paul's epistles are never mentioned, though he doubtless knew them. Having little sympathy with Paulinism he attached his belief to the primi- tive apostles. The Apocalypse, 1 Peter, and 1 John he esteemed highly ; the epistle to the Hebrews and the Acts he treated in the same way as the Pauline writings. J ustin's canon, as far as divine authority and inspiration are concerned, was the Old Testament. He was merely on the threshold of a divine canon made up of primitive Christian writings, attaching no exclusive sanctity to those he used, because they were not to him the only source of doc- trine. Even of the Apocalypse he says, ''A man among us named John, &c., wrote it."? In his time none of the gospels had been canonized, not even the synoptists, if, indeed, he knew them all. Oral tradition was the chief fountain of Christian knowledge, as it had been fora century. In his opinion this tradition was embodied in writing ; but the documents in which he looked for all that related to Christ were not the gospels alone. Others he used freely, not looking upon any as tspired. Though lessons out of the gospels (some of our present ones and others), as also out of the prophets, were read in assemblies on the first day of the week,® the act of converting the Christian writings into Scripture was posterior; for the mere reading of a gospel in churches on Sunday does not prove that it was considered divinely authoritative ; and the use of the epistles, which formed the second and less valued part of the collection, must still have been limited.

Justin's disciple, Tatian (160-180), who wrote an address to the Greeks, quotes the beginning of John's gospel; and his Diatessaron or Harmony probably included selections from the four canonical ones; but too little is known of it to enable us to. speak with certainty. Doubtless he was acquainted with Paul's writings, as he quotes statements contained in them. He seems, however, to have rejected several of his epistles, probably 1 and 2 Timothy.*

In Polycarp’s epistle (150-166) there are reminiscences of the synoptic gospels; and most of Paul’s epistles as well as 1 Peter were used by the writer. But the idea of canonical authority, or a peculiar inspiration belonging to these writings, is absent.

Athenagoras of Athens wrote an apology addressed to Marcus Aurelius (176). In it he uses written and unwritten tradition, testing all by the Old Testament, which was his only authorita- tive canon. He makes no reference to the Christian documents, but adduces words of Jesus with the verb ‘‘he says.” His treatise on the resurrection appeals to a passage in one of Paul’s epistles.®

The author of the epistle to Diognetus (about 200) shows his acquaintance with the gospels and Paul’s epistles; but he never cites the New Testament by way of proof. Words are introduced into his discourse in passing, and from memory.

Dionysius of Corinth (170) complains of the falsification of his writings, but consoles himself with the fact that the same is done to the ‘Scriptures of the Lord,” 7.e., the gospels containing the Lord’s words; or rather the two parts of the early collection, “the gospel” and ‘‘the apostle” together ; which agrees best with the age and tenor of his letters. If such be the meaning, the col- lection is put on a par with the Old Testament, and regarded as inspired. But Hegesippus still made a distinction between ‘‘the divine writings” (the Old Testament) and ‘“‘the words of the Lord ;”? showing that Holy Scripture was nothing else, in his opinion, than the Jewish books. He also used the gospel of the

ebrews and Jewish tradition.®

The letter of the churches at Vienne and Lyons (177) has quotations from the epistles to the Romans, Philippians, 1 Timothy, 1 Peter, Acts, the gospels of Luke and John, the Apocalypse. The last is expressly called ‘‘ Scripture.” ® This shows a fusion of the two original tendencies—the Petrine and Pauline, and the formation of a catholic church with a common canon of authority. Accord- ingly, the two apostles, Peter and Paul, are mentioned together.

Theophilus of Antioch (180) was familiar with the gospels and most of Paul's epistles, as also the Apocalypse. He puts the prophetic and apostolic Scriptures on the same level, because they proceeded from men who had the same spirit. Passages are cited from Paul as ''the divine word." 1°

The conception of a catholic canon was realized about the same time as that of a catholic church. One hundred and seventy years from the coming of Christ elapsed before the

1 See Zettschrift fir wissenschaftliche Theologie, 1875, p. 490, et seg. 2 Dialogus, part ii. p. 315, ed. Thirlby. Comp. on Justin, Tjeenk- Willink's Justinus Martyr in zijne Verhouding tot Paulus, 3 Apolog. i. p. 97, ed. Thirlby. 4 Hieronymi Proem. in Epist. ad Titum. ® Euseb, I H., iv. 23. 8 Photii Bibliotheca, cod. 232. 9 Kuseb. J2.#., v. 1, p. 144, ed. Bright. 10 Gefos Adyos. Ad Autolycum, iii. 14, p. 1141, ed. Migne.

5 Chapter xviii. 7 Tbid., iv. 22.

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collection assumed a form that carried with it the idea of holy and inspired. The way in which it was done was by raising the apostolic writings higher and higher till they were of equal authority with the Old Testament, so that the church might have a rule of appeal. The Old Testa- ment was not brought down to the New; the New was raised to the Old. It is clear that the earliest church fathers did not use the books of the New Testament as sacred documents clothed with divine authority, but fol- lowed for the most part, at least till the middle of the second century, apostolic tradition orally transmitted. They were not solicitous about a canon circumscribed within certain limits.

In the second half, then, of the second century there was a canon of the New Testament consisting of two parts called the gospel (v5 etayyéov) and the apostle (6 amdo- roXos). 'The first was complete, containing the four gospels alone; the second, which was incomplete, contained the Acts of the Apostles and epistles, z.e., thirteen letters of Paul, one of Peter, one of John, and the Revelation. How and where this canon originated is uncertain, Its birth- place may have been Asia Minor, like Marcion's; but it may have

grown about the same time in Asia Minor, Alex- andria, and Western Africa. At all events, Irenzus, Cle- ment of Alexandria, and Tertullian speak of its two parts ; and the three agree in recognizing its existence.

Ireneus had a canon which he adopted as apostolic. In his view it was of binding force and authoritative. This contained the four gospels, the Acts, thirteen epistles of Paul, the first epistle of John, and the Revelation. He had also a sort of appendix or deutcro- canon (which he highly esteemed, without putting it on a par with the received collection), consisting of John's second epistle, the first of Peter, and the Shepherd of Hemnas. The last he calls a ''Scrip- ture" because it was prophetic.1?_ The epistle to the Hebrews, that of Jude, James's, 2 Peter, aud 3 John he ignored.

Clement's collection was more extended than Irenus's. His appendix or deutero-canon included the epistle to the Hebrews, 2 John, Jude, the Apocalypse of Peter, the Shepherd of Hermas, the epistles of Clement and Barnabas. He recognizes uo distinc- tion between the New Testament writings except by the more fre- quent use of those generally received, and the degree of importance attached to them. Yet Barnabas is cited as an apostle.13 So is the Roman Clement.!+ The Shepherd of Hermas is spoken of as divine.'® Thus the line of the Homologoumena is not marked off even to the same extent as in Ireneus, and is seen but obscurely. :

Tertullian's canon consisted of the gospels, Acts, thirteen epistles of Paul, the Apocalypse, and 1 John, As an appendix he had the epistle to the Hebrews, that of Jude, the Shepherd of Hermas, 2John probably, and1 Peter. This deutero-canon was not regarded as authoritative. No trace occurs in his works of James's epistlc, 2 Peter, and 3 John. He used the Shepherd, but thought little of it, with the Montanists in general.1¢

These three fathers did not fix the canon absolutely. Its limits were still unsettled. But they sanctioned most of the books now accepted as divine, putting some extra-canonical productions almost on the same level with the rest, at least in practice.

The canon of Muratori is a fragmentary list which was made towards the end of the 2d century (170). Its birthplace is un- certain, though there are traces of Roman origin. Its translation from the Greek is assumed; but that

is nncertain. It begins with the four gospels in the usual order, and proceeds to the Acts, thirteen epistles of Paul, the epistles of John, that of Jude, and the Apocalypse. The epistle to the Hebrews, 1 and 2 Peter, and James are not named. The epistle ‘‘to the Laodiceans” is probably that to the Ephesians, which had this superscription in Murcion’s canon ; and that ‘‘to the Alexandrians” seems to be the epistle to the Hebrews. According to the usual punctuation, both are said to have been forged in Paul’s name, an opinion which may have been entertained among Roman Christians about 170 A.D. The epistle to the Hebrews was rejected in the West, and may have been thought a supposititious work in the interests of Paulism with sone reason, because of its internal character. The story about the origin of the fourth gospel, with its apostolic and episcopal attestation, evinces a desire to establish the authenticity of a work which had not obtaincd universal acceptance at the time. It is

11 See Davidson’s Introduction to the Study of the New Testament, vol. ii. p. 508, &c. 12 Advers. Hores., iv. 20, 2.

13 Stromata, ii. 6, p. 965, ed. Migne. LES Tlaeviln We Wis joe USNS

15 Tbid., i. 29, p. 928. 16 De Pudicitia, cap. 10.

difficult to make out the meaning in various places ; and there is considerable diversity of opinion among the expositors of the docu- ment. 1}

The stichometrical list of the Old and New Testament Scriptures in the Latin of the Clermont MS, (D) was that read in the African Chureh in the 8d century. It is peculiar. After the Pentateuch, Joshua, Judges, Ruth, and the historical books, follow Psalms, Proverbs, Ecclesiastes, Cauticles, Wisdom, Sirach, the twelve minor prophets, the four greater, three books of the Maccabees, Judith, Esdras, Esther, Job, and Tobit. In the New Testament, the four gospels, Matthew, John, Mark, Luke, are succeeded by ten epistles of Paul, two of Peter, the epistle of James, three of John, and that of Jude. ‘he epistle to the Hebrews (characterized as that of Barnabas), the Revelation of J olin, the Acts of the Apostles, the Shep- herd of Hermas,

the Acts of Paul, the Revelation of Peter, follow. There are thus three New Testament works, afterwards reckoned apocryphal. It is possible that the carelessness of a transcriber may have caused some of the singularities observable in this list, — such as the omission of the epistles to the Philippians and Thessa- lonians ; but the end shows a freer idea of books fitted for reading than what was usual even at that carly time in the African Chureh.? In Syria a version of the New Testament for the usc of the church was probably made early in the 3d century. This work, commonly called the Peshito, wants 2 Peter, 2 aud 3 John, Jude, and the Apocalypse. It has, however, all the other books, including the epistic of Jamcs and that to the Hebrews. The last two were re- ceived as apostolic.

Towards the middle of the 3d century Origen's testimony respect- ing the Canon (+ 254) is of great value. He seems to have dis- tinguished three classes of books—authentic ones, whose apostolic origin was generally admitted, those not authentic, and a middle class not generally recognized, or in regard to which his own opinion wavered. The first contained those already adopted at the beginning of the century both in the East and West, with the Apocalypse, and the epistle to the Hebrews so far as it contains Pauline ideas; to the second belongs the Shepherd of Hermas, though he hesitated a little about it, the epistle of Barnabas, the acts of Paul, the gospel according to the Hebrews, the gospel of the Egyptians, and the preaching of Peter ;4 to the third, the epistle of James, that of Jude, 2 Petcr, 2 and 3 John.> The separation of the various writ- ings is not formally made, nor does Origen give a list of them. His classification is gathered from his works ; aud though its application admitted of considerable latitude, he is cautious enough, appealing to the tradition of the church, and throwing in qualifying ex- pressions. ®

The Canon of Eusebius (+ 340) is given at length in his Ecclestast?- cal History.?' He divides the books into three classes, containing those writings generally received, those controverted,? and the heretical! (iii. 81). The first has the four gospels, the Acts, thirtcen epistles of Paul, 1 John, 1 Peter, the Apocalypse.!! The second class is subdivided into two, the first corresponding to Origen's mixed or intermediate writings,!? the second to his spurtous ones,}3 The former subdivision contains the epistles of James, 2 Peter, Jude, 2 and 3 John; the latter, the Acts of Paul, the Shepherd, the

Revelation of Peter, the epistle of Barnabas, the Doctrines of the Apostles, the Apocalypse of John, the gospel according to the Hebrews. The third class has the gospels of Peter and of Thomas, the traditions of Matthias, the Acts of Peter, Andrew, and John. The subdivisions of the second class are indefinite. The only distinction which Eusebius put betwcen them was that of ecclesiastical use. Though he classes as spurious the Acts of Paul, the Shepherd, the Revelation of Peter, the epistle of Barnabas, the doctrines of the Apostles, the Apocalypse of John, the gospel according to the Hebrews, and does not apply the epithet to the epistle of James, the 2 of Peter, 2 and 3 John, he uses of James's in one place the

1 It is printed and copiously con:mented on by Credner in his Geschichte des neutestamentlichen Kanon, edited by Volkmar, p. 141, &e., and by Westcott On the Canon, Appendix C, p. 466, 2d edition. Many others have explained it ; last of all Hilgenfeld.

- Tischendorf edited the Pauline epistles from this MS. 1852.

: co €v tH BiabhKy BiBrla, evdidOnka, bmoaroyotmeva.

voba.

> avriheydueva. Euseb., Hist. Liccles., vi. 25, iii, 25,

8 See Comment. in Matth., iii. p. 468 ; Lbid., p. 814; Comment. in ep. ad Roman., iv. p. 683 ; in Matth., iii. p. 644; Homil. viii. in Numb., ii. p. 294; Contra Cels., i. 63, p. 878; De Principiis preef., i. p. 49. Opp., ed. Delarue. See also Euseb., H. #., vi. 25.

" Hist. Eccles., iti. 25+ also 31, 39 ; vi. 18, 14.

& duoroyovpmeva, evdidOnka, avaudlrenra, avavrippnra.

avriheydueva, yrepiua 8¢ Tois mordols, ev wAclorais éxkAnotats dednuooteyyeva, vd6a.

0 kroma mdvrn Kal dvoceBh, wavreAas va.

11 This last with the qualification efye avetn. In another place he states that it was rejected by some, and therefore it is also along with the dvrireydueva or vd0q. 12 uinrd. 13 yd0a.

verb voevouat.!4 In like manner he speaks of the Apocalypse of Peter and the epistle of Barnabas as vontroverted.1 The mixed or spurious of Origen are vaguely separated by Eusebius; both come under the general head of the controverted ; for after specifying them separately he sums up, ‘‘all these will belong to the class of the controverted,” the very class already described as containing “books well known and recognized by most,” implying also that they were read in the churches.!® About 332 the Emperor Constantine entrusted Eusebius with the commission to make out a complete collection of the sacred Christian writings for the use of the Catholic Church. How this order was executed we are not told. But Credner is probably correct in saying that the code con- sisted of all that is now in the New Testament except the Revela- tion. The fifty copies which were made must have supplied Con- stantinople and the Greek Church for a considerable time with an authoritative canon.

Eusebius’s catalogue agrees in substance with that of Origen. The historian followed ecclesiastical tradition. He inquired dili- gently into the prevailing opinions of the Christian churches and writcrs, the views held by others before and contemporancously with himself, but could not attain to a decided result. His hesita- tion stood in the way of a clear, firm view of the question. The tradition respecting certain books was still wavering, and he was unable to fix it. Authority fettered his independent judgment. That he was inconsistent and confused does not need to be shown.

The exact principles that guided the formation of a canon in the earliest centuries cannot be discovered, Definite grounds for the neception or rejection of books were not very clearly apprehended. The choice was de- termined by various circumstances, of which apostolic origin was the chief, though this itself was insufficiently attested, for, if it be asked whether all the New Testament writings proceeded from the authors whose names they bear, criticism cannot reply in the affirmative. The example and influence of churches to which the writings had been first addressed niust have acted upon the reception of books, Above all, individual teachers here and there

saw the necessity of nieeting heretics with their own weapons, in their own way, with apostolic records instead of oral tradition, The circumstances in which the orthodox were placed led to this step, effecting a bond of union whose need must have been felt while each church was isolated under its own bishop and the collective body could not take measures in common. Writings of more recent origin would be received with greater facility than such as had been in circulation for many years, especially if they professed to come from a prominent apostle. A code of apostolic writings, divine and perfect like the Old Testament, had to be presented as_ soon as possible against Gnostic and Manichxan heretics, whose doctrines were injurious to objective Christianity; while the multiplication of apocryphal works threatened to overwhelm genuine tradition with a heap of superstition.

When it is asked, to whom do we owe the canon? the usual answer is, to the Church, which is hardly correct, The Church Catholic did not exist till after the middle of the second century. The preservation of the early Chris- tian writings was owing, in the first instance, to the con- gregations to whom they were sent, and the neighbouring ones with whom such congregations had friendly connec- tiou. The care of them devolved on the most influential teachers,—on those who occupied leading positions in the chief cities, or were most interested in apostolic writings as a source of instruction. The Christian books were mostly in the hands of the bishops, In process of time the canon was the care of assemblies or councils. But it had been made before the first general council by a few leading fathers towards the end of the second century in different countries. The formation of a Catholic Church and of a

4 Hist. Eccles., ii. 23. Christophorson, Schmid, and Hug think that Eusebius gave the opinion of others in this word; but it is more likely that he gave his own, as Valesius thinks. See the notc in Schmid's Historia antiqua et vindicatio Canonis, &c., p. 358.

15 Tbid., vi. 14,

18 See Weber's Beitriige zur Geschichte des neutestamentlichen Kanons, p. 142, &e.

canon was simultaneous. The circumstances in which the collection originated were unfavourable to the authenticity of its materials, for tradition had been busy over them and their authors, Instead of attributing the formation of the canon to the Church, it would be more correct to say that the important stage in it was due to three teachers, each working separately and in his own way, who were intent upon the creation of a Christian society which did not appear in the apostolic age,—a visible organisation united in faith,—where the discordant opinions of apostolic and sub-apostolic times should be finally merged. The canon was not the work of the Christian Church so much as of the men who were striving to form that Church, and could not get beyond the mould received by primitive Christian literature. The first mention of a “ Catholic Church” occurs in The Martyrdom of Polycarp, an epistle that cannot be dated earlier than 160 a.p., and may perhaps be teu years later. But though the idea be there and in the Ignatian epistles, its established use is due to Jrenzus, Tertullian, and Cyprian.

Origen was the first who took a somewhat scientific view of the relative value belonging to the different parts of the biblical collection, His examination of the canon was critical. Before him the leading books had been regarded as divine and sacred, the source of doctrinal and historic truth; and from this stand-point he did not depart. With him ecclesiastical tradition was a prevailing principle in the recognition of books belonging of right to the New Testament collection. He was also guided by the inspiration of the authors,—a criterion arbitrary in its application, as his own statements show. In his time, however, the collection was being gradually enlarged,—his third class, 7.e., the maxed, approaching reception into the first. But amid all the fluctuations of opinion to which certain portions of the New Testament were subject, and the unscientific procedure both of fathers and churches in the matter, though councils had not met to discuss it, and vague tradition had strengthened with time, a certain spiritual consciousness manifested itself throughout the East and West in the matter of the canon. Tolerable unanimity ensued. The result was a remarkable one, and calls for our gratitude. Though the development was pervaded by no

critical or definite principle, it ended in a canon which has maintained its validity for centuries.

It is sometimes said that the history of the canon should be sought from definite catalogues, not from isolated quotations. The latter are supposed to be of slight value, the former to be the result of deliberate judgment. This remark is more specious than solid. In relation to the Old Testament, the catalogues given by the fathers, as by Melito and Origen, rest solely on the tradition of the J ews, apart from which they have no independent authority. As none except Jerome and Origen knew Hebrew, their lists of the Old Testament books are simply a reflection of what they learned from others. If they deviate in practice from their masters by quoting as Scripture other than the canonical books, they show their judgment over-riding an external theory, The very men who give a list of the Jewish books evince an inclination to the Christian and enlarged canon. So Origen says, in his Epistle to Afri- canus, that “the churches use Tobit.” In explaining the prophet Isaiah, Jerome employs Sirach vi. 6, in proof of his view, remarking that the apocryphal work is in the Christian catalogue. In like manner Epiphanius, in a pas- sage against Aetius, after referring to the books of Scrip- ture, adds, “as well as the books of Wisdom, ze., the Wisdom of Solomon and of Jesus son of Sirach; finally, all the other books of Scripture.” In another place he gives the canon of the Jews historically, and excludes the apocryphal Greek books; but here he includes some of the

latter. We also learn from Jerome that Judith was in the number of the books reckoned up by the Nicene Council. Thus the fathers who give catalogues of the Old Testament

show the existence of a Jewish and a Christian canon in relation to the Old Testament ;—the latter wider than the former, their private opinion more favourable to the one, though the other was historically transmitted. In relation to the New Testament, the synods which drew up lists of the sacred books show the opinion of some leading father like Augustine, along with what custom had sanctioned. In this department no member of the synod exercised his critical faculty; a number together would decide such questions summarily. Bishops proceed in the track of tradition or authority.

The Canon from the Fourth Century.

It will now be convenient to treat of the two Testaments together, z.¢., the canon of the Bible. The canons of both have been considered separately to the end of the third century ; they may be henceforward discussed together. We proceed, therefore, to the Bible-canon of the fourth century, first in the Greek Church and then in the Latin.

The Council of Laodicea, at which there was a predominant semi-Arian influence, forbade the reading of all non-canonical books. The 59th canon enacts, that ‘‘ private psalms must not be read in the Church, nor uncanonized books; but only the canonical ones of the New and Old Testament.” The 60th canon proceeds to give a list of such. All the books of the Old Testament are enumerated, but in a peculiar order, somewhat like the Septuagint one. With Jeremiah is specified Baruch, then the Lamentations and Epistle. The prophets are last; first the minor, next the major and Daniel. In thie New Testament list are the usual seven catholic epistles, and fourteen of Paul, including that to the Hebrews. The Apocalypse alone is wanting. Credner has proved that this 60th canon is not original. It is of much later date. The Council was held in the year 363 A.D. The Apostolic Constitutions give a kind of canon like that in the 59th of Laodicca. After speaking of the books of Moses, Joshua, Judges, Kings, Chronicles, those belonging to the return from the captivity, those of Job, Solomon, the sixteen prophets, and the Psalms of David, our Acts, the epistles of Paul, and the four gospels are mentioned. It is remarkable that the catholic — are not inentioned. That they are indicated under Acts is altogether improbable. The Antiochian Church of that time doubted or denied the apostolicity of these letters, as is seen from Theodore, Cosmas, and others. Hence their absence from these Constitutions, which are a collection belonging to different times, the oldest portion not earlier perhaps than the third century.?

Cyril of Jerusalem, who took part in the Council of Laodicea, and died 386 A.D., gives a list of ‘the divine Scriptures.” The books of the Old Testament are twenty-two, and the arrangement is usually that which isin the English Bible. With Jeremiah are associated ‘“‘ Baruch and the Epistle.” All the New Testament books are given except the Apocalypse. The list agrces very

nearly with that of Eusebius, by taking the latter's ** controverted" writings into the class of the ‘‘ generally received."? The writer insists on the necessity of unity in the Church upon the subject, and forbids the reading of writings not generally received. Yet he refers to Baruch (iii. 836-38) as ‘‘ the prophet" ; and in adducing the tes- timonies of the prophets for the existence of the Holy Spirit, the last is Daniel xiii. 41, 45.

In Athanasius's festal epistle (365) the Alexandrian arch- bishop undertakes "to set forth in order the books that are cano- nical and handed down and believed to be divine." His list of the Old Testament nearly agrees with Cyril's, except that Esther is omitted, and Ruth counted separately, to make out the twenty-two books. He adds, ‘‘there are other books not canonical, designed by the fathers to be read by those just joining us, and wishing to be instructed in the doctrine of piety ;'' 4.¢., the Wisdom of Solo- mon and the Wisdom of Sirach, and Esther and Judith and Tobit, and the Doctrine of the Apostles (so-called), and the Shepherd ; ‘‘those being eanonical, and these being vead, let there be no men- tion of apocryphal writings," &c. The New Testament list is the same as Uyril's, with the addition of the Apocalypse.4 He quotes several of the apocryphal books in the sameway as he does the

1 Gesehichte des neutest. Kanon, p. 217, &c.

2 See Constit. Apostol., p. 67, ed. Ueltzen.

3 Catech., iv. 22, pp. 66, 67, ed. Milles.

4 Athanasii Opp. ed. Benedict. i. 2, pp. 962, 963.

canonical. Thus he cites Tobit xii. 7 with ‘‘ag it is written,'"! and Sirach xxx. 4 with ‘‘as sacred Scripture somewhere says."? Elsewhere he applies to the latter (ii. 33) ‘‘the divine Spirit says ;" 8 and Daniel xiii. 45 is cited under the name of ‘‘the Scripture." 4 Canonical and apocryphal are mentioned together, and similar language applied to them.

Gregory of Nazianzus (+ 389) puts his list into a poetical form. In the Old Testament it agrees with Athanasius's exactly, only he mentions none but the canonical books ; in the New, he leaves out the Apocalypse, and so deviates from Athanasius.®

Amphilochius of Iconium (+395) gives a long catalogue of the Biblical books in verse. The canon of the Old Testament is the usual one, except that he says of Esther at the end, "'Some judge that Esther should be added to the foregoing." He notices none of the apocryphal books. His New Testament canon agrees with the present, only he excludes the Apocalypse as spurious, which is given as the judgment of the majority. He alludes to the doubts that existed as to the epistle to the Hebrews, and to the number of the catholic epistles (seven or three).6 The concluding words show that no list was universally received at that time.

Epiphanius (+ 403) follows Athanasius in his canon. As to the number of the Old Testament books, he hesitates between twenty- two aud twenty-seven ; but the contents are the same. At the end of the twenty-seven books of the New Testament, Wisdom and Sirach are mentioned as ''divine writings;" elsewhere they are characterized as doubtful."" His practice shows his sentiments clearly enough, when he refers to the Book of Wisdom in such phrases as " Scripture," ''as Solomon the most blessed of the pro- phets says;"® and cites Sirach (vii. 1) as well as Baruch as " Scrip- ture." ® He mentions the fact that the epistles of Clemens Ro- manus were read in the churches.1°

Didymus of Alexandria (+ 392) speaks against 2 Peter that it is not in the canons.

Chrysostom (+ 407) does not speak of the canon; but in the New Testament he never quotes the four last catholic epistles or the Apocalypse. All the other parts he uses throughout his numerous works, 2

Theodore of Mopsuestia (+ 428) was much frecr than his con- temporaries in dealing with the books of Scripture. It seems that he rejected Job, Canticles, Chronicles, and the Psalm-inscrip- tions in the New Testament, the epistle of James, and others of the catholic ones. But Leontius's account of his opinions cannot be adopted without suspicion.

e catalogues of the Old Testament contained in the manu- scripts B, C, and & need not be given, as they are merely codices of the Septuagint, and have or had the books canonical and apocryphal belonging to that version. The list of the New Testa- ment books in B is like that of Athanasius. Imperfect at the end, it must have had at first the Epistles to Timothy, Titus, Philemou, and the Apocalypse. OC (cod. Ephremi rescriptus) has fragments of the New Testament, which show that it had origiually all the present books in the same order as Athanasius's. §& or the Sinaitic manuscript has in addition to the New Testament the Epistle of Barnabas and the Shepherd of Hermas. The progress made by the Greek Church of the fourth and former part of the fifth century, in its conception of the canon, seems to be that the idea of ecclesi- astical settlement, or public, legal, definitive establishment, was attached to the original one. A writing was considered canonical when a well-attested tradition put it among those composed by inspired men, apostles or others; and it had on that account a determining authority in matters of faith. Books which served as a rule of faith and were definitively set forth by the Church as divinely authoritative, were now termed canonical. "The canon con- sisted of writings settled or determined by ecclesiastical law.14 Such was the idea added to the original acceptation of canon. To canonical were opposed apocryphal writings, ¢.¢., heretical and fabri- cated ones ; while an intermediate class consisted of those read in the churches, which were useful, but not decisive in matters of belief. Another advance in the matter of the canon at this period was the general adoption of the Hebrew canon, with a relegation of the Greek additions in the Septuagint to the class ' publicly

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ei tg 205. 44,1, p.183, "Sip ea, 4% p. 9.

5 Gregorii Nazianzeni Opp. ed. Migne, vol. iii. pp. 4738, 474.

S$ Tambi ad Seleucum, in Greg. Naz. Opp. ii. p. 194.

" duirdéera, Adv. Heres. i. p. 19. See Hoeres., iii. tom. i. Be 941. De ponder. et mensur. 23.

8 Tom. i. pp. 578, 607, 713, ed. Petay.

10 Hoeres, xxx. 15.

» Enarrat. in Ep. S. Petri Secundam, p. 1774, ed. Migne.

12 See Montfaucon in his edition of Chrysostom’s Works, vol. vi. pp. 364, 365, ed. Paris, 1835.

13 See Leontius Byzantinus contra Nestorianos et Eutychianos, lib. fii, in Gallandi Bibliotheca, xii. p. 690. Comp. Fritzsche De Theodori Mopsuest. vita et scriptis, Hale, 1836.

14 BiBAla xavoviCsueva, kavovicd, Kekavoviopeva, apiopéva.

9 Pp, 481, 755.

11

read.”?© Yet doubts about the reception of Esther into the number of the canonical books were still entertained, though it was one of the Jewish canon. And the catholic epistles which had been doubted before—Jude, James, Second Peter—were now generally received. But there was a division of opinion about the Apocalypse.

We come to the period of the Latin corresponding to that of the Greck Church which has just been noticed. Augustine (+430) gave great attention to the subject, labouring to establish a com- plete canon, the necessity of which was generally felt. According to him the Scriptures which were received and acknowledged by all the churches of the day should be canonical. Of those not universally adopted, such as are received by the majority of the churches and the weightier should be preferred to those received by the fewer and less important churches.1® In his enumeration of the forty-four books of the Old Testament, he gives, after Chro- nicles, other histories ‘‘ which are neither connected with the order” specified in the preceding context ‘‘nor with one another,” 4.¢., Job, Tobit, Esther, Judith, the two books of the Maccabees, and Esdras. Wisdom and Ecclesiasticus, he thinks, should be numbered among the prophets, as deserving of authority and having a certain likeness to Solomon’s writings. He says of the Maccabees that this “Scripture has been received by the

Church not uselessly, if it be read or heard soberly.”1” The famous passage in the treatise on Christian. doctrine, where Augustine enumerates the whole canon, is qualified by no other; for though he knew the distinction be- tween the canonical books of the Palestinian Jews and the so-called apocryphal ones, as well as the fact of some New Testament writings not being received universally, he considered church reception a sufficient warrant for canonical authority. Hence he considered the books of the Maccabees canonical, because so received by the Church ; while he says of Wisdom and Sirach that they merited authoritative reception and numbering among the prophetic Scrip- tures. He raises, not lowers, the authority of the so-called apocryphal books which he mentions. He enumerates all the New — Testament books, specifying the Pauline epistles as fourteen, and so reckoning that to the Hebrews as the apostle’s ; but he speaks of it elsewhere as an epistle about which some were uncertain, professing that he was iufluenced to admit it as canonical by the authority of the Oricntal churches.!® He speaks hesitatingly in various placcs about its Pauline authorship.

In 398 the African bishops held a council at Hippo, where the canon was discussed. The list of the canonical Scriptures given includes, besides the Palestinian one, Wisdom, Ecclesiasticus, Tobit, Judith, and the two books of Maccabees. The New Testament canon seems to have agreed exactly with our present one.4® The Council of Carthage (397) repeated the statute of its predecessor, enumerating the same books of the Bible as canonical.2° Augustine was the animating spirit of both councils, so that they may be taken as expressing his views on the subject.

Jerome(t 420) gives a list of the twenty-two canonical books of the Old Testament, the same as that of the Palestinian Jews, remarking that some put Ruth and Lamentations among the Hagiographa, so making twenty-four books. All besides should be put among the Apocrypha. Wisdom, Sirach, Judith, Tobit, the Shepherd are not in the canou. The two books of Maccabees he regarded in the same light. But though Jerome’s words imply the apocryphal posi- tion of these extra-canonical books, he aliows of their being read in public for the edification of the people, not to confirm the authority of doctrines; ¢.¢., they belong to ‘‘the ecclesiastical books” of Athanasius. His idea of ‘‘apocryphal” is wider and milder than that of some

others in the Latin Church. It has been conjectured by Welte,2* that the conclusions of the African councils in 393 and 397 influenced Jerome's views of the canon, so that his later writiugs allude to the apocryphal works in a more favourable manner than that of the Prologus galeatus or the preface to Solomon's books. One thing is clear, that he quotes ditfereut passages from the Apocrypha along with others from the Hebrew canon. In his letter to Eustochius, Sirach iii. 383 comes between cita- tions from Matthew and Luke with the phrase "as it is written;" and xi. 30 has "holy Scripture" applied toit. Ruth, Esther, and Judith are spoken of as ''holy volumes." The practice of Jerome differed from his theory ; or rather he became less positive and altered his views somewhat with the progress of time aud knowledge. As to the New Testament, he gives a catalogue of all that now belong to it, remarking of the epistle to the Hebrews and of the Apocalypse that he adopts both on the authority of ancient writers, not of pre- sent custom. His opinion about them was not decided.?? In another work he gives the Epistle of Barnabas at the end of the canonical

10 BiBAla dvay.ivwxomeva. 16 De Doctrina Christiana, ii. 8. Contra Gaudent. i. 38; Opp. Paris, 1837, vol. ix. p. 1006.

18 De peccat. merit. i. 50; Opp. vol. x. p. 137, ed. Migne.

19 Mansi, tom. iii. p. 924. 20 Ibid. p. 891.

2! Prologus galeatus in Libros Regum ; Epist. ad Paulinum.

*2 In Herbst's Hinleit., erster Theil, p. 37.

*3 Ep. ud Dardan.; Opp. vol. i. p. 11038, ed. Migne.

list. He also states the doubts of many respecting the epistle to Philemon, and about 2 Peter, Jude, 2 and 3 John. According to him the first epistle of Clemens Romanus was publicly read in some churches.! —

Hilary of Poitiers (+ 368) seems to have followed Origen's cata- logue. He gives twenty-two books, specifying ''the epistle" of Jeremiah, and remarks

that some added Tobit and Judith, making twenty-four, after the letters of the Greek alphabet. Wisdom and Sirach he eites as "'prophets."2 In the New Testament he never quotes James, Jude, 2 and 3 John, nor 2 Peter.

Rufinus (+ 410) enumerates the books of the Old and New Testa- ments which ''are believed to be inspired by the Holy Spirit itself, according to the tradition of our ancestors, and have been handed down by the Churches of Christ.' All the books of the Hebrew canon and of the New Testament are specified. After the list he says, ''these are they which the fathers include in the | canon, by which they wished to establish the assertion of our faith." He adds that there are other books not canonical, but ccclcsiastical—the Wisdom of Solomon, Sirach, Tobit, Judith, and the books of the Maccabees. Besides the usual New Testament works, he speaks of the Shepherd of Hermas and ''the Judgment of Peter" as read in the churches, but not as authoritative in matters of faith.

Philastrius (+ about 887) gives some account of the Scriptures and their contents in his time. The canonical Scriptures, which alone should be read in the Catholic Church, are said to be the Law and the Prophets, the gospels, Acts, thirteen epistles of Paul, and seven others. He speaks of heretics who reject John's gospel and the Apocalypse,—remarking also that some do not read the epistle to the Hebrews, not thinking it to be Paul's.4 The influence of the East upon the West appears in the statements of this father upon the subject. He had several canonical lists before him ; one at least from an Oriental-Arian source, which explains some assertions in his book.

Innocent I. of Rome wrote to Exsuperius (405), bishop of Toulouse, giving a list of the canonical books. Besides the Hebrew canon, he has Wisdom and Sirach, Tobit, Judith, the 2 Maccabees. The New Testament list is identical with the present. He also refers to pseudepigiaphical writings which ought not only to be re- jected but coudemned.®

A canonical list appears in three different forms bearing the names of Damasus (366-384), Gelasius I. (492-496), and Hormisdas (514-528). According to the first, tle books of the Old Testament are arranged in three orders. In the first are the Pentateuch, Joshua, Judges, Ruth, four Kings, two Chronicles, Psalms, Pro- verbs, Ecclesiastes, Canticles, Wisdom, and Ecclesiasticus ; in the second, all the Prophets, including Baruch; in the

third, Job, Tobit, Judith, Esther, Esdras, two Maccabees. The New Testament books are the four gospels, fourteen epistles of Paul, the Apocalypse, and Acts, with seven eatholic epistles.

That which is called the Decree of Gelasius is almost identical with the preceding. It wants Baruch and Lamentations. It has also two Esdras instead of one. In the New Testament the epistle to the Hebrews is absent.

The Hormisdas-form has the Lamentations of J eremiah, and in the New Testament the epistle to the Hebrews.

The MSS. of these lists present some diversity ; and Credner supposes the Damasus-list a fiction. But Thiel has vindicated its authenticity. It is possible that some interpolations may exist in the last two ; but the first, which is the shortest, may well belong to the time of Damasus.®

In 419 A.D. another council at Carthage, at which Augustine was present, repeated the former list of books with a single alteration, viz., fourteen epistles of Paul (instead of thirteen).”

The preceding notices and catalogues show a general desire in the Western Church to settle the canon. The two most influential men of the period were Augustine and Jerome, who did not entirely agree. Both were unfitted for the critical examination of such a topic. The former was a gifted spiritual man, lacking learning and independence. Tradition dominated all his ideas about the difficult or disputed books,—a tradition arbitrarily assumed. He did not enter upon the question scientifically, on the basis of certain principles, but was content to take refuge in authority—the prevailing authority of leading churches.

ne See Onomastica Sacra; Comment. in ip. ad Philem. ; De Viris ulustr.

2 Prolog. im Psalm. ; Opp. ed. Migne, vol. i. p. 241.

3 Hapos. in Symbol. Apostol., pp. 373, 374, ed. Migne.

4 De Heeres. chs. 60 and 61, in Gallandi, vii. pp. 424, 425,

7 Mansi, iii. pp. 1040, 1041.

Credner’s Zur Geschichte des Kanons p. 151, &¢., and Thiel’

Epistole Romanorum Pontifiewn Genuine, toni, i. ‘ ens

7 Mansi, iv. p. 430,

His judgment was weak, his sagacity moderate, and the absence of many-sidedness hindered a critical result. Jerome, again, was learned but timid, lacking the courage to face the question fairly or fundamentally, and the independence necessary to its right investigation. Belong- ing as he did to both churches, he recommended the practice of the one to the other. “He, too, was chiefly influenced by tradition,—by Jewish teachers in respect to the Old Testament, and by general custom as to the New. Compared with the Eastern Church, the Western accepted a wider canon of the Old Testament, taking some books into the class of the canonical which the former put among those “‘ to be read.” In regard to the New Testament, all the Catholic epistles and even the Apocalypse were received, The African churches and councils generally adopted this larger canon, which resulted from the fact of the old Latin versions of the Bible current in Africa being daughters of the Septuagint. If the Latins apparently looked upon the Greek as the original itself, the apocryphal books would soon get rank with the canonical. Still the more learned fathers, Jerome, Rufinus, and others, favoured the Hebrew canon in distinguishing between canonical and ecclesiastical books. The influence of the Eastern upon the Western Church is still visible, though it could not extinguish the prevailing desize to include the disputed books. The Greek view was to receive nothing which had not apparently a good attestation of divine origin and apostolic authority ; the Latin was to exclude nothing hallowed by descent and proved by custom. The former Church looked more to the sources of doctrine ; the latter to those of edification. The one desired to contract those sources, so as not to be too rich; the other to enlarge the springs of edification, not to be too poor. Neither had the proper resources for the work, nor a right perception of the way in which it should be set about ; and therefore they were not fortunate in their conclusions, differing in regard to points which affect the foundation of a satisfactory solution.

Notwithstanding the numerous endeavours both in the East and West to settle the canon during the 4th and 5th centuries, it was not finally closed. The doubts of indi- viduals were still expressed, and succeeding ages testify to the want of universal agreement respecting several books. The question, however, was practically determined. No material change occurred again in the absolute rejection or admission of books. With some fluctuations, the canon remained very much as it was in the 4th and 5th centuries. Tradition had shaped and established its condition, General usage gave it a permanency which it was not easy to disturb. The history is mainly an objective one. Un- critical at its commencement, it was equally so in the two centuries which have just been considered.

The history of the canon in the Syrian church cannot be traced with much exactness. The Peshito version had enly the Hebrew canonical books at first; the apocry- phal were added afterwards. In the New Testament it wanted four of the catholic epistles and the Apocalypse. Ephrem (378) uses all the books in our canon, the apocry- phal as well as the canonical. The former are cited by him in the same way as the latter. The Syrian version made by Polycarp at the request of Philoxenus of Mabug, had the four catholic epistles wanting in the Peshito; and the Charklean recension of it probably had the Apocalypse also, if that which was published by De Dieu at Leyden belongs to it. Junilius, though an African bishop (about 550), says that he got his knowledge from a Persian of the name of Paulus, who received his education in the school of Nisibis. He may, therefore, be considered a witness of the opinions of the Syrian church at the beginning of the 6th century. Dividing the biblical books into those of

perfect, those of intermediate, and those of uo authority, he makes the first the canonical; the second, those added to them by many (plures); the third, all the rest. In the first list he puts Ecclesiasticus. Among the second he puts 1 and 2 Chronicles, Job, Ezra and N ehemiah, Judith, Ksther, 1 and 2 Maccabees; and in the New Testament, James, 2 Peter, Jude, 2 and 3 John. He also says that the Apocalypse of John is much doubted by the Orientals. In the third list, ¢.e., books of no authority added by soine (guidam) to the canonical, are put Wisdom and Canticles,! The catalogue is confused, and

erroneous at least in the one respect, that Jerome is referred to as sanctioning the division given of the Old Testament books ; for neither he nor the Jews agree with it.

The canon of the old Abyssinian church seems to have had all the books in the Septuagint, canonical and apocry- phal together, little distinction being made between them. The New Testament agrees with the present Greek one. At a later period a list was made and constituted the legal one for the use of ‘the church, having been derived frum the Jacobite canons of the apostles. This gives in the Old Testament the Pentateuch, Joshua, J udges, Ruth, Judith, Kings, Chronicles, Ezra and Nehemiah, Esther, Tobit, two books of Maccabees, Job, Psalms, five books of Solomon, iinor and greater prophets. External are the Wisdom of Sirach (for teaching children) and the book of J oseph ben Gorion, «.¢., that of the Maccabees. The New Testament has four gospels, Acts, seven apostolic epistles, fourteen of Paul, and the Revelation of John. Later catalogues vary much, and are often enlarged with the book of Enoch, 4 Esdras, the Apocalypse of Isaiah, &c. The canon of the Ethiopic church was fluctuating.?

The Armenian canon, if we may. judge from printed editions, follows the Septuagint ; but the books are put in a peculiar position. ‘The three books of Maccabees follow the historical ones. In the New Testament the epistle to the Hebrews precedes those to Timothy and Titus ; while Sirach, a second recension of Daniel, Manasseh, 3 Corin- thians, with the account of John’s death, are relegated to an appendix behind the. New Testament.

The Bible canon of the Eastern Church in the Middle Ages shows no material change. Endeavours were made to remove the uncertainty arising from the existence of nume- rous lists ; but former decisions and decrees of councils were repeated instead of a new, independent canon. Here belongs the catalogue in the Alexandrian MS, of the 5th century, which is peculiar. After the prophets come Esther, Tobit, Judith, Ezra and N ehemiah, 4 Maccabees, Psalms, Job, Proverbs, Ecclesiastes, Canticles, the all-virtu- ous Wisdom, the Wisdom of Jesus of Sirach. In the New Testament, the Apocalpyse is followed by two epistles of Clement. The list was probably made in Egypt. That of Anastasius Sinaita (+ 599) needs no remark. The apostolic canons (canon 76) give a list both of the Old and New Testament

books, in which the usual canonical ones are supplemented by Judith, 3 Maccabees, and in the New Testament, by two epistles of Clement, and the Clementines in eight books. The Apocalypse is wanting. But the whole is a patchwork, borrowed from the Apostolic Constitutions, Athanasius's festal epistle, and other sources. It cannot: be put earlier than the 5th century ; and it is pretty certain that Judith and Maccabees are later inser- tions.? We have also Nicephorus's Stichometry (806-815) ;4 Cosmas Indicopleustes (535), who never mentions the seven catholic epistles of the New Testament or the Apocalypse ; the Council of Constantinople commonly called the Trullan

? Gallandi, xii. p. 79, &e. ? See Dillmann in Ewald's Jahrbiicher, v. p. 144, &e.

3 See Credner, Geschichte des nevtest. Kanon, pp. 235, 236. 4 See Credner's Zur. Gesch. des Kanons, p. 97, &c.

(692), Johannes Damascenus (t+ 754), the second Nicene council (787), the Synopsis divinc Scripture Vet. et Novi Lest. (about 1000), Zonaras (about 1120), Alexius Aris- tenus (about 1160), and Nicephorus Callistus (1330).

In the Western church of the Middle Ages, diversity of opinion respecting certain books continued, Though the views of Augustine were generally followed, the stricter ones of Jerome found many adherents. The canon was fluctuating, and the practice of the churches in regard to it somewhat lax. Here belong Cassiodorus (about 550) ; the list in the Codex Amiatinus (about 550) ; and Isidore of Seville (+636), who, after enumerating three classes of Old Testament books gives a fourth, not in the Hebrew canon. Here he specifies Wisdom, Keclesiasticus, Tobit, Judith, 1 and 2 Maccabees, saying that the Church of Christ puts them among the divine books, honours and highly esteems them.' There are also the fourth council of Toledo (632), Gregory the Great (+604), Notker Labeo (t 912), Ivo (about 1092), Bede (735), Alcuin (t 804), Rabanus Maurus (t 856), Hugo de St Victor (+ 1141), Peter of Clugny (+1156), John of Salisbury (+1182), Thomas Aquinas (+1270), Hugo de St Caro (1263), Wycliffe (1384), Nicolaus of Lyra (+ 1340), &ce. Several of these, as Hugo de St Victor, John of Salisbury, Hugo de St Caro, and Nicolaus of Lyra, followed Jerome

in separat- ing the canonical and apocryphal books of the Old ‘Testa- ment,®

As to the arrangement of the New Testament books, the gospels stand thus in several MSS. of the old Latin version, in a, b, ¢, f, ff, g, cod. D (Latin),— Matthew, John, Luke, Mark. In the Acts of the council at Ephesus (431), Cyril of Alexandria, Theodoret, and several Latin translations, they are Matthew, John, Mark, Luke. The Curetonian Syriac has Matthew, Mark, John, Luke ; while a very old fragment of the gospels in Turin has Mark and Matthew.

The oldest order of the books, and that which lies at the basis of the current one given by Tertullian, is Gospels, Acts, Pauline epistles, Apecalypse, epistle of John. This was varied by putting the Catholic epistles before the Apocalypse, as in the Muratorian fragment, This order became the prevailing one in the West, with a few varia- tions here and there, such as the placing of the Acts after the Pauline epistles by the Peshito, Jerome, and Epiphanius; or after the Catholic epistles, immediately before the

Apocalypse, by Augustine and the Spanish church; while

in the Stichometry of the Clermont MS. they follow the Apocalypse as the last canonical book,

In the ancient Greek Church the order was different. There the usual one was Gospels, Acts, the Catholic epistles, the Pauline epistles, and the Apocalypse. This exists in Cyril of Jerusalem, Athanasius, and the MSS. B and A. But the Sinaitic has Gospels, Pauline epistles, Acts, Catholic epistles, Apocalypse.

The Pauline epistles seem to have been arranged accord- ing to their length ; the Catholic ones have that of J ames first, because the author was the bishop of the church at Jerusalem, then the epistles of Peter, the chief of the apostles.”

The Reformers generally returned to the Hebrew canon, dividing off the additional books of the Septuagint as well as those attached to the Vulgate. These they called apocryphal, after Jerome’s example. The latter, though

considered of no authority in matters of doctrine, were still pronounced useful and edifying. The principal reason that weighed with them was, that Christ and the apostles testified to none of the Septuagint additions,

Besides the canonical books of the Old Testament,

© Htymolog., vi. 1. 8 See Hody, p. 648, &e. 7 See Credner’s Geschichte, p. 398, et seq.

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Luther translated Judith, Wisdom, Tobit, Sirach, Baruch, 1 and 2 Maccabees, the Greek additions to Esther and Daniel, with the Prayer of Manasseh. His judgment respect- ing several of these is expressed in the prefaces to them. With regard to 1 Maccabees he thinks it almost equal to the other books of Holy Scripture, and not unworthy to be reckoned among them. Of Wisdom, he says, he was long in doubt whether it should be numbered among the canonl- cal books; and of Sirach, that it is a right good book pro- ceeding from a wise man. But he speaks unfavourably of several other apocryphal productions, as of Baruch and 2 Maccabees. It is evident, however, that he considered all he translated of some use to the Christian Church. He thought that the book of Esther should uot belong to the canon.

Luther’s judgment respecting some of the New Testa- ment books was freer than most Protestants now are dis- posed to approve. He thought the epistle to the Hebrews was neither Paul’s nor an apostle’s, but proceeded from an excellent and learned man who may have been the disciple of apostles. He did not put it on an equality with the epistles written by apostles themselves. The Apocalypse he considered neither apostolic nor prophetic, but put it almost on the same level with the 4th book of Esdras, which he spoke elsewhere of tossing into the Elbe. This judgment was afterwards modified, not retracted. James’s epistle he pronounced unapostolic. It was quite an epistle of straw. In like manner, he did not believe that Jude’s epistle proceeded from an apostle. Considering it to have been taken from 2 Peter, and not well extracted either, he put it lower than the supposed original. The Reformer, as also his successors, made a distinction between

the books of the New Testament similar to that of the Old,—the generally received (homologoumena) and controverted books (antilegomena); but the Calvinists afterwards obliterated it, as the Roman Catholics at the Council of Trent did with the Old Testament. The epistle to the Hebrews, those of Jude and James, with the Apocalypse, belong to the latter class. Luther assigned a greater or less value to the separate writings of the New Testament, and left every one to do the same. He relied on their internal value more than tradition,—taking the "Word of God" in a deeper and wider sense than its coincidence with the Bible.

Bodenstein of Carlstadt examined the question of canon- icity more thoroughly than any of his contemporaries, and followed out the principle of private judgment in regard to it. He divides the biblical books into three classes—. 1, Books of the highest dignity, viz., the Pentateuch and the Gospels; 2. Books of the second dignity, 7.e., tho works termed prophetic by the Jews, and the fifteen epistles universally received; 3. Books of the third and lowest authority, 2.¢., the Jewish Hagiographa and the seven antilegomena epistles of the New Testament. Among the Apocryphi he makes two classes—such as are out of the canon of the Hebrews yet hagiographical (Wisdom, Ecclesi- asticus, Judith, Tobit, the two Maccabees), and those that are clearly apocryphal and to be rejected (third and fourth Esdras, Baruch, Prayer of Manasseh, a good part of the third chapter of Daniel, and the last two chapters of Daniel).

4wingli asserts that the Apocalypse is not a biblical book.?

CGicolampadius says—" We do not despise J udith, Tobit, Keclesiasticus, Baruch, the last two Esdras, the three Maccabees, the last two chapters of Daniel, but we do not attribute to them divine authority with those others." 3

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1 Carlstadt's treatise is reprinted in Credner's Zur Geschichte des Kanons.

- Werke, edited by Schuler and Schulthess, vol. ii. p. 169.

3 "Ep. ad Valdenses" 1530, apud Scultet. Anna. evang. pp.

818, 314.

As to the books of the New Testament he would not com- pare the Apocalypse, James, Jude, 2 Peter, 2 and 3 John with the rest.4

Calvin did not think Paul to be the author of the epistle to the Hebrews, nor 2 Peter to have been written by Peter ; but both in his opinion are canonical.

The later Helvetic Confession speaks of the Apocryphal books as read in the churches, but not used as authorita- tive in matters of faith.®

The Gallic Confession makes a distinction between canoni- cal and other books, the former being the rule and norm of faith, not only by the consent of the Church, but much more by the testimony and intrinsic persuasion of the Spirit, by whose suggestions we are taught to distinguish them from other ecclesiastical books which, though use- ful, are not of the kind that any article of faith can be constituted by them.®

The Belgic Confession makes a distinction between the sacred and apocryphal books. The former may be read by the Church, but no doctrine can be derived from them. In the list of New Testament books given there are four- teen epistles of Paul.'

The Waldensian canon, in which the canonical are care- fully separated from the apocryphal books, is not of the date 1120, but is a later document derived from or made by a Protestant after 1532. It is not genuine.

The canon of the Anglican Church (1562), given in the sixth Article of Religion, defines holy Scripture to be "'those canonical books of the Old and New Testament, of whose authority was never any doubt in the Church." After giving the names and number of the canonical books, the article prefaces the apocryphal ones with, ' And the other books (as Hierome saith) the Church doth read for example of life and instruction of manners; but yet doth it not apply them to establish any doctrine. Such are these following," &c., &c. At the end it is stated that "all the books of the New Testament, as they are commonly re- ceived, we do receive aud account them canonical." The Article is ambiguous. If the canonical books enumerated are those meant in the phrase "of whose authority was never

any doubt in the Church," the statement is incorrect. If a distinction is implied between the canonical books and such canonical ones as have never been doubted in the Church, the meaning is obscure. In either case the language is not explicit.

The Westminster Confession of Faith gives a list of all the books of the Old and New Testaments as the Word of God written,—adding that those called the Apocrypha are not of divine inspiration, and no part of the canon, of no authority in the Church, nor to be approved or made use of otherwise than human writings.

The Roman Catholic canon was finally determined at the Council of Trent (1546), which adopted all the books in the Vulgate as sacred and canonical without distinction. But 3 and 4 Esdras, 3 Maccabees, and the Prayer of Manasseh were not included,—though the first and last appeared in the original Clementine edition of 1592, not however in the preceding one of Sixtus (1590). A council at Florence in 1441 had set the example, which was followed at Trent. But this stringent decree did not pre- vent individual Catholics from making a distinction be- tween the books, in assuming a first and second canon, or proto-canonical and deutero-canonical books,—as did Sixtus Senensis, B. Lamy, Anton a matre Dei, Jahn, and others,—though it is hardly consistent with orthodox catholicism or the view of those who passed the decree.

4 Ibid. 5 Niemeyer, Collectio Confessionum. p. 468. 8 Ibid., p. 830. 7 Ibid., pp. 361, 362.

When the writings are said to be of different authority —some more, others less—the intent of the council is violated. The Vatican council (1870) confirmed the Tri- deutine decree respecting the canon.

The Greek Church, after several ineffectual attempts to uphold the old distinction between the canonical and ecclesiastical books by Metrophanes Critopulus, patriarch of Alexandria in 1625, and Cyril Lucaris, patriarch of Constantinople (+ 1638),! came to the same decision with the Romish, and

canonized all the Apocrypha. This was done at a Jerusalem synod under Dositheus in 1672.

Semler (+1791) was the first scholar after the Re- formation who set himself to correct the prevailing ideas respecting the canon. He had no definite principles to guide him, but judged books chiefly by their Christian value and use to the Church. Though his views are some- times one-sided, and his essays ill-digested, he placed the subject in new lights, and his labours bore abundant fruit in after years.2 He was followed by his disciple Corrodi, by G. L, Oeder, Michaelis, Herder, Lessing, and Eichhorn,— most of whom recommended their views by a freshness of style which Semler did not command. In more recent times the whole question has been subjected to very thorough discussion.

We observe in conclusion that the canonical authority of Scripture does not depend on the church or its councils,

The primitive church may be cited as a witness for it; that is all. Canonical authority lies in the Scripture itself ; it is inherent in the books so far as they contain a revelatiop or declaration of the divine will. Hence there is truth in the statement of old theologians that the authority of Scripture is from God alone. The canonicity of the books is a distinct question from that of their authenticity. The latter is a thing of historic criticism, the former of doctrinal belief.

See De Wette’s Finleitung in das alte Testament, by Schrader, 8th edition ; Bleek’s Linleitung in das alt. Test., edited by Kamp- hausen ;, the same author’s Finleit. in das neue Testament, edited by Mangold ; Dillmann in the Jahrbiicher fiir deutsche Theologie, vol, iii. ; Oehler and Landerer in Herzog’s Encyklopedie, vol. vii. ; Steiner and Holtzmann in Schenkel’s Bibel -Lexicon, vol. iii.; Reuss’s Die Geschichte der heiligen Schriften neuen Testaments; Credner’s Geschichte des neutest. Kanon, by Volkmar; Ewald’s Geschichte des Volkes Israel, vol. vii. ; Diestel’s Geschichte des alten Testamentes in der Christliche Kirche ; Hilgenfeld’s Der Kunon und die Kritik des N. Test.; the same author’s LHistorisch-Kritische Hinleituny in das neue Testament; Holtzmann’s Kanon und Tradition » Herz- feld’s

Geschichte des Volkes Israel, vol. ii.; Griitz's Kohelet, Anhang i.; Fiirst's Der Kanon des alten Testaments, u.s.w.; Versuch einer Belcuchtung der Geschichte des judischen und christlichen Bibel- kanons (by Corrodi); Weber's Beitrage zwr Geschichte des neutesta- mentlichen Kanons; Jones's New and full method of settling the canonical authority of the New Testament ; Westcott, On the Canon of the New Testament ; Stuart's Critical History and Defence of the Old Testament, ed. Davidson. (S. D.)

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CANON, a person who possesses a prebend, or revenue allotted for the performance of divine service in a cathedral or collegiate church.

Canons are of no great antiquity. Gregory of Tours mentions a college of canons instituted by Baldwin, arch- bishop of that city, in the 6th century. The common opinion attributes the institution of this order to Chrode- gangus, bishop of Metz, about the middle of the 8th cen- tury. When the term Canonici is met with at an earlier date, it is employed in a more vague and generic sense, either as equivalent to the clerus or clergy at large, or as comprehending all who held any ecclesiastical office what- ever, even of the humblest character, as that of a chaunter, porter, d&e,

Originally canons were only priests, or inferior ecclesi- astics, who lived in community, residing by the cathedral church to assist the bishop, depending entirely on his will, Supported by the revenues of the bishopric, and living in the same house as his domestics or counsellors. They even inherited his movables till the year 817, when this was prohibited by the council of Aix-la-Chapelle, and a new rule substituted in the place of that which had been appointed by Chrodegangus, and which was observed for the most part in the West till the 12th century. By degrees these communities of priests, shaking off their dependence, formed separate bodies, of which the bishops, however, were still heads. In the 10th century there were communities or congregations of the same kind established even in cities were there were no bishops; and these were called collegiates, as they used the terms congregation and college indifferently,—the name chapter, now given to these bodies, being much more modern. Under the second race of the French kings, the canonical or collegiate life had spread itself all over the country, and each cathedral had its chapter distinct from the rest of the

clergy. They had the name canon from the Greek xavév, which signifies three different things—a rnle, a pension of fixed revenue to live

1 Kimmel's Monumenta Jidet eccles. orient. part i. p. 467. a ae von freier Untersuchung des Canon, 4 parts, Halle,

477.

on, and a catalogue or matricula, all which are applicable to them. .

In time, the canons freed themselves from their rules, the observance relaxed, and at length they ceased to live in community ; yet they still formed bodies, which through increase of wealth and the power naturally accruing to corporate societies claimed other functions besides the celebration of the common office in the church, assuming the rights of the rest of the clergy, making themselves necessary as a council of the bishop, taking upon them the administration of a see during a vacancy, and the election of a bishop to supply it. There are even some chapters exempt from the jurisdiction of the bishop, and owning no head but their dean. From the example of cathedral chapters, collegiate ones also continued to form bodies after they had abandoned living in community.

For details sce Du Cange, @lossarium Medic et Infimee Latini- tatis (ed. 1842, Paris, Didot), s. v. Canonicus, and the references there given to Mabillon, Muratori, &c.; Walcott, Sacred Archeo- logy (London, Reeve, 1868); Chéruel, Déetionnaire Historique (Paris, Hachette, 1855), art. Chanoine ; and Dictionary of Chris- tian Antiquities, by Smith and Cheetham (London, Murray, 1876), art. Canonict, where further references to Thomassini, Martigny, and others may be found.

CANON LAW. The law that is embodied in the Corpus Juris Canonici is termed the CANon Law. The rules enacted by the early church for its relations with the secular power, its own internal administration, or the con- duct of its members, were called canons (xavéves, regule), in contradistinction on the one hand to its articles of doctrine (Séypara), and on the other to the enactments of the civil lawgiver (vdqou, leges). Though at first applied only to the ordinances of an assembly of the church, the tern

canon came to be extended to include opinions of the fathers and decretals of the popes. Any collection of such laws was

Apostolic constitu- tions.

Apostolic canous,

fustern canons,

Nomo- canons.

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styled Jus Canonicum, a name which ultimately came to be confined to the collection kar’ égoynv, the Corpus Juris Canonict. Canon law must not be confounded with ecclesi- astical law (Jus LKcclesiasticum). The former has the church for its source; the latter has the church for its subject. During the growth of the canon law the church extended her influence into all departments of life. Churchmen filled high offices of state and performed the duties of practical lawyers, while prelates often exercised civil jurisdiction over a considerable tract of country. Hence the legislation of the church embraced many subjects which properly belonged to the domain of muni- cipal law. Ecclesiastical law on the other hand derives its binding authority solely from the state, and treats of the church as a religious institution. But its principles cannot be properly understood without a knowledge of the canon law, on which it is largely based.

J. Earzty History.—tThe earliest body known to us of purely church law is the spurious work called the Apostolic Constitutions (ddacxadia t&v drocrédwv, Constitutioncs Apostolorum), which originated in Syria. Its eight books, of which the first six date from the end of the 3d century, and the two remaining ones from the first quarter of the 4th century, contain a variety of moral and liturgical pre- cepts, and regulations on ecclesiastical discipline, bearing to proceed from the apostles themselves. As a supplement to the eighth book there appeared also in Syria, about the beginning of the 6th century, a collection of eighty-five disciplinary regulations under the name of the Apostolic Canons (kavoves t&v drooréAwy, Canones Apostolorum), The Council in Trullo (692) sanctioned

the Constitutions as law for the Greek Church, but rejected the Canons. The Latin Church adopted neither, but subsequently fifty of the Canons found their way into the Western collec- tions. Though not what they profess to be, these writ: ings are instructive on early ecclesiastical usages and dis- cipline,

Editions :—The

In the 4th and 5th centuries collections which have not come down to us were made of the canons of the Eastern councils of Antioch, Ancyra, Neoceesarea, Nicaea, Sardica, Gangra, Laodiceea, Ephesus, Constantinople, and Chalce- don. (See the Codex Canonum Eeclesie Universi of Justellus, Paris, 1610.) Joannes Schelasticus, patriarch of Constantinople in the reign of Justinian (564), reduced these and other canons into a systematic work divided into fifty books. A little later this was digested with corre- sponding fragments of the civil law relating to ecclesiastical affairs into a code called, from its combination of civil and ecclesiastical enactments, a Nomocanon. Of later compila- tions of the same description the most widely-known was the Nomocanon of the patriarch Photius (883). A most important consolidation of Greek canon law was effected in the year 692 by the labours of the Council in Trullo (Concilium Trullanum, from Trullus, the hall in the imperial palace at Constantinople in which they sat, also called Concilium Quinisextum, from its being considered supplementary to the 5th and 6th general councils). They drew up an authoritative list of the subsisting laws of the church, comprising the Apostolic Canons, the canons of the ten councils mentioned above, those of several synods held at Carthage, and one at Constantinople (394), and the decisions of twelve Eastern patriarchs and prelates from the 3d to the 5th century. They added 102 canons of their own, and this code, with the addition of 22 canons of

the Seventh CEcumenical Council held at Nicea in 787, was the leading authority in the Greek Church till the middle of the 9th century. (For the later ecclesiastical literature of the East see Zacharie, Histor Juris Greco-Ftomant Delineatio, Heidelberg, 1839; and Mortreuil, Histoire du Droit Byzantin, Paris, 1843-46),

Translations from the Greek collections gradually came Western into circulation among the Western clergy. The best church. known are two that date from the 5th century,—the Versio Isidoriana, originating in Spain, and the so-called – Prisca (sc. Canonum T'ranslatio), which carne from Italy. Prisca. The Latin Church was thus enabled to add to the canons of African, Italian, French, and Spanish provincial councils those of the cecumenical councils of Nice, Constantinople, and Chalcedon, and of numerous Oriental synods. About the same time a new source of church law rose into import- ance in the letters addressed by the popes to the bishops of the various dioceses in answer to requests for advice on points of ecclesiastical management. Such letters were called epistole decretales, or shortly decretales, sometimes Decretale constituta decretalia or decretalia. Being communicated by the bishops to whom they were addressed to the neighbour- ing dioceses they ruled similar cases occurring there. They were regarded as of equal authority with the canons of councils, and soon proved the most prolific source of canon law.

Both classes of material contributed to the collection formed (in two separate parts afterwards conjoined) about the beginning of the 6th century by a learned Scythian monk Dionysius, surnamed Fwiguus from the epithet he Dionysius modestly applies to himself in the preface. 'The first part Exiguus, contains a translation of the Apostolic Canons, and of the canons of the councils of Nice, Ancyra, Neocxsarea, Gangra, Antioch, Laodicza, and Constantinople, those of Chalcedon and Sardica in the original Latin, and the acts of the synod of Carthage (419) and other African synods. The second part is made up of papal decretals from Pope Siricius (385) to Anastasius IT. (498), arranged in chronological order. Though never formally authorized, this collection, from its clear arrangement, the fidelity of its translations from the Greek, and the general authenticity of its contents, obtained speedy acceptance, and long maintained its ground against later compilations.

It is printed in the Codex Canonum Vetus Ecclesie Romane of Franc. Pitheus, Paris, 1687, fol. A copy of it, containing some additional matter, and known as the Collectio Dionyso-Hadriana, Collectio was presented to Charlemagne during his first visit to Rome in 774 Bionyso- by Pope Hadrian I., and was sanctioned by the synod of Aix-la- Hadriana, Chapelle

(802) as the codex canonum for the Frankish empire. A collection of 232 African canons may also be mentioned, called the Breviatio Canonum, published by the Carthaginian deacon, Fulgen- Fulgentins tius Ferrandus, about the year 547. It formed the basis of the Con- Ferrandus cordia Canonum, a more complete work, by the African bishop Cres- conius (690). A similar collection had been made about 580 by the ara rtinus Spanish bishop Martin of Braga (Martinus Bracarensis). Bracarait

In Spain a large body of law had accumulated in the sis.

cauons of the numerous councils which followed that of Elvira (305), the earliest known to us. A collection of native and foreign canons was in circulation there in the 6th century, and after being added to at various times was generally received towards the close of the next century. It was called the Hispana (sc. Collectio) from the country Eispana, of its origin, and being erroneously attributed to Bishop Isidore of Seville, who died in 636, also acquired the name of Collectio Isidoriana. Like the Dionyso-Hadriana it is divided into two parts,—the first containing aclassified series of Greek, African, French, and Spanish canons, and the second the decretals from Pope Damasus (366) to Gregory the Great (604).

The Frankish clergy used, besides the Dionyso-Hadri- ana, the original work of Dionysius Exiguus, as well as a collection of Greek and African canons, Papal

Cresconius,

- decretals, imperial constitutions, &c., which was _pro-

duced in Gaul about the beginning of the 6th century, and is known to us as Quesnel’s Codex Canonum from the name of its first editor (Paris, 1675). The different ecclesiastical provinces possessed in addition the canons of their own particular synods, and Papal decretals addressed to the bishops within their bounds; and many Frankish prelates were in the habit of drawing up for their subordinate clergy short compendiums of canon law, in which they inserted any particular regulations the local circumstances

demanded. These so-called Capitula Episco- porum are printed in vols, xiil. —xv. of Mansi's Sacrorum Conciliorum Collectio.

The Hispana got into circulation among the Franks in a more or less corrupt form. One edition, which appeared about the middle of the 9th century, has become celebrated in church history as the Collectio Pseudo-Istdoriana or False Decretals. Everything connected with this collection, its date, its author, its subject-matter, its purpose, has formed the subject of controversy, giving rise to a con- siderable literature. We must here confine ourselves to the results of the latest criticism.

The following particulars seem to be settled. The work, which is divided into three parts, was compiled by a single author, a Frankish ecclesiastic, between the years 840 and 860. From his styling himself in the preface Isidorus Mercator, Bishop Isidore of Seville was mistakenly supposed to be the author, and hence the name Pseudo- Isidore. After the preface, and some minor apocryphal documents, the first part contains fifty of the Apostolic Canons extracted from the Hispana, and sixty spurious decretaJs of the popes from Clement I. (101) to Melchiades (314), chronologically arranged. The second part consists chiefly of canons taken from the Hispana. The author has also used the latter as the substratum of the third part, but has interpolated thirty-five fictitious decretals. A supple- lent is appended to some of the manuscripts containing, with a few unimportant pieces, a series of brief regulations regarding processes against bishops. These are the so-culled Capitula Angilramuni (a bishop of Metz), which are now thought to be older than the main collection.

No suspicion attached to the Psewdo-Isidore at the time of its appearance. On the contrary, it was everywhere accepted without question till Cardinal Nicolas of Cusa, in the 15th century, expressed doubts of the genuineness of some of its contents. During the next hundred years the untrustworthy nature of the book (printed by Merlin in his Concilia Generalia, Paris, 1523) was irrefragably demon- strated by the labours of Erasmus, the Magdeburg Centuriators, and especially the Calvinistic pastor, David Blondel. It was subjected to the fierce attacks of the Protestant Reformers, who approached the question less in a scientific spirit than with a desire to reveal the iniquities of the Church of Rome. They maintained with much acrimony

that the work was a deliberate forgery, under- taken by command, or at least with the connivance, of the Pope, to exalt his temporal and spiritual power. In modern times the controversy has been carried on chiefly by lawyers, and, the theological dust having subsided, it has become easier to define the limits within which lie the only probable views as to the sources and object of the work. It is to be regretted that some symptoms have recently appeared of a revival of the former bitter feeling in con nection with the Old Catholic movement in Germany. (The Pope and the Council, by Janus, 3d. ed., London,

1870).

The idea is exploded that the False Decretals were the invention of their author's brain, fabricated for purposes of Papal aggrandizement. Many of the apocryphal por- tions (the Apostolic Canons, &c.) had been for centuries in

circulation as genuine. Of the decretals a considerable number are authentic; though antedated and ascribed to early popes to give them the authority of antiquity, while others embody the traditional contents of actual but lost decretals. The sources from which the compiler prin- cipally borrowed his materials were the Bible, the fathers, genuine canons and decretals, Roman Jaw from the West Gothic Breviary of Alaric, the works of Rufinus and Cassiodorus on ecclesiastical history, and the biographies of popes in the Liber Pontificalis. It is now admitted by Protestant writers that the compilation was produced in the interest not of the Pope but of the bishops, in order, by protecting them from the oppression of temporal princes on the one hand and ecclesiastical councils on the other, to correct some abuses prevailing among the Franks. The tendency of the authorities collected was to support a right of appeal to the Pope in every causa major, 7.¢., proccss where a bishop was concerned, and to make the permission of the Pope a necessary preliminary to the assembling of a provincial council. This arrangement did not really secure the independence of the episcopate. It merely shifted the supreme contro] from a body of men to a single individual, in accordance with the constitutional ideas of the Middle Ages.

It is still a matter of controversy how far the course of ecclesiastical history has been influenced by the False Decretals, On the one hand it is

maintained, chiefly by Roman Catholic writers, that they effected no essential alteration on the previous constitution or discipline of the church, that they merely gave the form of enactment to the prevailing ideas of the time on church government, and that the latter would have developed in the same direction had no such compilation ever appeared. It is argued reasonably enough that if any great innovation had been introduced the genuineness of the work would not have remained so long unchallenged. Some Protestant writers on the other hand assert that the Papal claim to absolute supreniacy, over councils and hierarchy within the church and the laity without, was a pretension nnknown till the 9th century, and entirely based upon the False Decretals. The truth probably lies between the two views. The influence of the Pseudo-Lsidore has been greatly overrated. But it cannot be denied that the embodiment in a definite shape of the indistinct but yet perceptible tendency of church development in the 9th century was of considerable service to the popes during the struggle of the Hilde- brandine era. (The latest and best edition of the False Decretals is Decretales Pseudo-Isidoriane et Capitula Angilramni, by Hinschius, Leipsic, 1863.)

Other sources of church law prior to the Decretum of Gratian may be mentioned, Many laws on the rights and duties of the clergy were contained in the different com- pilations of Roman law (Theodosian and Justinian codes, Julian's Epitome of the Novels, and the Breviary of Alaric) and the Leges Barbarorum (especially the Les Ripuaria Bajuvariorum and Alamannorum). Of a similar character were some of the capitularies of the Frankish kings, a collection of which in four books was made by the Abbot Ansegisus of Fontanella in 827, and officially pro- mulgated. A more important collection from an eccle- siastical point of view was that of Benedict, a deacon of

Mainz (Benedictus Levita), who, by order of Bishop Otgar penedictus of Mainz compiled a supplement to Ansegisus in three Tevita.

books about the year 850. In addition to capitularies the work comprises extracts from the above-named Roman and German sources, from the Bible, penitential-books, the fathers, and other ecclesiastical writers, as well as canons copied apparently from the Hispana and Dienyso-Hadriana It

resembles the Psewdo-Isidore in containing much apo- crvvhal matter in the form of false capitularics directed to V. — 3

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the removal of certain grievances of the Frankish episcopate. Being circulated as a supplement to Ansegisus it gained a considerable reputation, but was never officially recog-

Libri peni- nized.1 The libri penitentiales, or manuals of penance, are

tentiales. of importance as the foundation of the criminal branch of the canon law. The earliest ones of any note in the Western Church originated in England and Ireland, as for instance the Liber Davidis (Irish) of the 4th century, the penitential of Theodore, archbishop of Canterbury, in the 7th century, and in the 8th those of the Venerable Bede and of Egbert, archbishop of York. The Irish church- discipline was introduced among the Franks, by whom the Poenitentiale Columbani and the Canones and Judicia Cummeani (two Irish missionaries) were extensively used." (Consult Jacobson in Herzog's Real – Encyclopddie, art. "Bussbiicher.") The development of church-law was further influenced by the Ordines Romani, or books of ritual, the Ordines Judiciorum, or rules of procedure in the ecclesiastical courts, and the collections of formule or precedents used in the preparation of formal or official documents, notably the Liber Diurnus, a pontifical collec- tion of the 8th century.

The Pseudo-Isidore continued to be the chief repertory of canon law till the time of Gratian; but many other collections more or less corrupt, differing from the earlier ones in their arrangement according to systematic instead of chronological order, were made during these three centuries. It will be sufficient to name the following, as they seem to have been used by Gratian in compiling his great work :—1. A collection of the 9th century, dedicated

Collectio to Archbishop Anselm (II.) of Milan (Collectio Anselino Anselmo Dedicata), based mostly on the Hispana, and interesting Dedicata. as the first work of authority containing extracts from the

Pseudo-Isidore ; 2. The Libri Duo de Synodalibus Causis Rage of et Disciplinis Ecclesiasticis of the 10th century, by Regino,

abbot of the monastery of Priim in the Eiffel, drawn from Frankish and German sources ;* 3. The Collectarium or Decretum Decretum of Bishop Burchard of Worms, in twenty books, eae compiled in the 11th century; 4. The Pannormia of . Bishop Ivo of Chartres, dating from the 12th century,® and another work by the same author known as the Algerus of Decretum ;° 5. The Liber de Misericordia et Justitia of Liége. Algerus of Liége, composed between 1120 and 1128.7 Il. The Corpus Juris Canontcr—The manuals of church law above referred to had not only become embarrassing by their number but laboured under defects that seriously impaired their practical utility. They con- tained much that was obsolete and much that was con- tradictory, many of them mixed up civil with church law, and their arrangement was unmethodical and cumbrous These faults were to some extent remedied in the great collection that was formed between the middle of the 12th and the end of the 16th centuries, and became the recognized canon law code. The Corpus Juris Canonic', aS it was called, consists of six portions, which may be classed under two heads, the Decretum and the Decretals.

Decretum. 1, The Decretum. Gratiant. Up to this time canon law

1 It is printed in vol. i, pp. 801-1232, of Baluze's Capitularia Regum Francorum, Paris, 1677. * These are all printed by Wasserschleben in Die Bussordnungen

der Abendlindischen Kirche mit einer Recht cht la inlet Sia. echtsgeschichtlichen Hinleitung,

J Balidjen by Wasserschleben, Leipsic, 1840. D. Burchardi Wormaciensis Decretorum, libri y 5 ah ee es Wor m, Hori xx., Cologne, 1543, 5 Edition by Melch. a Vosmcediano, Louvain, 1557. § Edited by Molineus, Louvain, 1661.

CANON LAW

was regarded as a branch of theology, and was studied only in the seminaries attached to cathedrals or monasteries, Gratian, a Camaldolensian monk of Bologna, first taught it Gratic as a separate science towards the middle of the 12th century. The school of Roman law founded in that city thirty or forty years before by Irnerius was then flourishing, and Gratian, living within the sphere of the new movement, became ambitious of introducing a similar scientific cultiva- tion of canon law. He selected the whole subsisting law of the church from among the mass of canons, decretals, writings of the fathers, and ecclesiastical historians, &c., and digested it into the systematic work since called after him the Decretum Gratiani, which soon superseded all preceding compilations. It was early known by the name of the Concordia Discordantium Canonum, from an expres- sion in one of the author's notes (" auctoritatum dissonantia ad concordiam revocari"); but whether Gratian himself made use of either name is uncertain. The work consists

The passages headed "Palea" (about fifty in number) are supposed to be Pales. additions made by Gratian's pupil Paucapalea, and are of equal credit with the rest of the work. 'The notes in the modern editions with the prefix "corr, Rom." are by the Correctores Romani, who published a revised text under the sanction of Pope Gregory XIIL Gratian had included in the Decretum the Papal decretals down to the year 1139, During the following century, owing to the struggles of the popes and emperors, and the general extension of ecclesiastical jurisdictions, the pontifical constitutions increased greatly in frequency. Innocent TIT. alone (pater Juris) is said to have published 4000 laws. ' These constitutions went by the name of decretales extrava- gantes (1.¢., extra decretumGratiant vagantes). Of the fifteen' known collections of them, five especially, which in contrast to that of Gregory IX. are called the Compulationes Antique, Compila attained a high reputation in the schools and the courts. tiones The Compilatio Prima, or oldest of them, is the Breviarium Antiqu® Hatravagantium of Bishop Bernard of Pavia,' which is noteworthy as the model of arrangement for all subsequent collections. It is divided into five books treating of—(1)

ee 8 Printed in Labbé, Antique Collectiones Decretatiwm, Paris, 1609,

scretals ' Gregory

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ecclesiastical officials and judges ; (2) procedure in ecclesi- astical courts; (3) rights, duties, and property of the clergy; (4) law of marriage; (5) criminal law and ecclesiastical discipline. This order is briefly summed up in the following hexameter :—

Judex, Judicium, Clerus, Connubia, Crimen.

The comp. tertia and comp. guinta are the only two that received the Papal sanction.

2. The second part of the Corpus Juris Canonici is made up of the following four collections of decretals :—

(a.) Decretals of Gregory IX.—The same causes that occasioned the compilation of the Decretum induced Pope GregoryIX. to commission his chaplain, Raymond of Penna- forte (near Barcelona), formerly a professor of canon law in Bologna university (and since canonized), to digest into a code the decretals since the time of Gratian. The usual arrangement in five books was observed, and these were subdivided into ¢ctuli, consisting of capita in chronological order. It was completed in four years, and officially promulgated in 1234, Its original name was Libri extra (sc. Decretum) which was abbreviated to X. for convenience in citation, eg., cap. 9, X. de eo qui cognovit (iv. 13), orc. 9, X. 4,13 refers to the 4th book, title 13, chap.

9. The laws are in the form of decisions pronounced in cases submitted to the Pope from all parts of Christendom. Among these are several cases from England and Scotland. (For a list of the latter see Heclesie Scoticane Statuta, il. 232). Raymond, in accordance with the Pope's instruc- tions, omitted such facts and other matter as he considered irrelevant to the case in hand. 'These so-called partes decisce (generally indicated in the text by the words "ct infra" or shortly "et j.") have been restored in modern editions, since without them the law is often to us uniutel- ligible.

(b.) The Lnber Sextus was published by Pope Boniface VIII. in 1298. It contains the decretals down to that date from the time of Gregory's collection, and acquired its name from being intended as a supplement to Gregory's five books. In one important respect it differs from the latter. Instead of a case being stated with the Papal decision thereon, abstract rules of law are laid down, extracted originally, no doubt, from actual judgments. A series of eighty-eight Regule Juris, chiefly borrowed from Roman law, are appended to the work, having been added, it is said, by the civilian Dinus to procure its accept- auce among the legste of Bologna. In citing from the Laber Sextus it is usual to give the number of the chapter, with the abbreviation "in vi" or "in 6," the number of the book, and the number and rubric of the title, ¢.g., ce. 1. in vi'° de const. I, 2, or c. 1. de const. in 6, L 2.

(c.) The Clementine.—By direction of Pope Clement V. the canons of the Council of Vienne in 1311 (at which he presided, the Papal court having been transferred to Avignon), and his own decretals before and after that date, were collected and published in 1313. They were almost

immediately withdrawn again for revision, and were pro-

mulgated in their present form by his successor Pope John

XXII. in 1317, under the name of Constitutiones Clementis —

Pape V. ot Clementine. The mode of citation is cither by the chapter, the title-rubric, the words "in Clementinis," and the number of book and title (e.g., c. 1. de summa trin. in Clem. I. 1.), or by calling the chapter itself the Cle- mentina, and adding its number, with the title-rubric, and 'acl of book and title (e.g., Clem. 1., de summa trin. ar

(d.) The Eatravagantes.—The Clementinze were the last of the collections formally promulgated by the popes. In the 15th century the term Corpus Juris Canonici was applied to the body of law composed of the Decretwm and

| to whom it was addressed, are, so far as we know, in their

the collections of Gregory, Boniface, and Clement, as

appears from the canons of the councils of Constance and

Basel. The more important of the decretals omitted from

the Clementinz or issued subsequently (distinguished from

those in the Corpus Juris Canonict by the name “ Extra-

vagantes”) were circulated or added in the manuscripts as

a supplement to the Corpus Juris, and studied along with

it at the universities. Two collections of them were printed

by Jean Chappuis in his edition of the Corpus Juris ,

Canonici, published at Paris in 1500. The first, which

was entitled Hxtravagantes Joannis XXIIJ., comprised Extrava-

twenty constitutions of that pope, arranged in fourtcen gantes of

titles, The second collection was called Hxtravagantes Ut i : ; : xtrava-

Communes, and consisted of 73 decretals issued in the pantes

period from Boniface VIIJ. to Sixtus V. (1298-1484), Communes.

systematically arranged according to the traditional scheme

of five books (“sed vacat liber quartus,” devoted in pre-
vious compilations to the law of marriage), divided into
titles and chapters. The following examples will explain
the method of citing the ‘first and second collections Mode of
respectively :—c. un. Xvag. Io. xxii. 12, or (mentioning “itation.
the rubric of the title) c. un. de poenis in Extrav. Io. xxii.
(12),and c. 2, Xvag. comm. III. 2, or (giving the title-rubric)
c. 2, de preb. et dig. in Extrav. comm. III. 2. Neither
collection was sanctioned as such; each decretal is inde-
pendent, and authoritative proprio vigore. The two sets of
Extravagantes being retained in subsequent editions have
beeome by use and wont part of the Corpus Juris Canonict.
They received a semi-official approval by being included in
the edition revised by the Correctores Romani (a learned Correctores
commission appointed by Pius IV. in 1653), and published Romani.
as the authorized text by Pope Gregory XIII. in 1582.

The different portions of the Corpus Juris Canonici Corpus stand to each other in the relation of lea prior and lea Juris Cano- posterior, so that in cases of contradiction the latest in date (aii. is preferred. The same rule is applied to the single capzta ; or laws of the private collections (the Decretum and the FExtravagantes), but not to those of the other books, which were published as official codes, and the different capita of which are all regarded as bearing the date of promulgation of the whole. .A distinction

is also made respecting the authority of the rubrics of the titles. Those found in Rubrics. the Decretum, irrespective of the fact that they are not the work of Gratian, have no sanction except that of usage ; while in the decretals of Gregory, Boniface, and Clement the rubric (rubrum) has as much authority as the text (nigrum), both having been issued together. The swzm- Summaria. maria, or summee, prefixed to the canons and chapters emanate from the glossators, and have no legislative authority. But they generally state the substance of the law correctly, and are useful for purposes of interpretation.

The Superscriptiones Capitulorum, giving the source and § perscrip-

date of a law, and in the case of each decretal, the person Fe

original state, but are not to be depended upon in all cases.

A few of Gregory's decretals, for instance, bear the dates 1235 and 1236, whereas we know they must have been

‘ pronounced prior to the promulgation of the collection in

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1234. No decretal anterior to 1298 is of authority unless found in the Decretum or the collections of Gregory or Boniface. The Clementine and Extravagantes, on the con- trary, are not exhaustive for the period they cover, and omission from them does not affect the credit of an other-

| Wise genuine constitution. André (Cours de Droit Canon,

3™° éd., 1860, vol. iii. p. 151) gives a list of the apo- cryphal laws in the Decretum and Gregory's Decretals. They are more numerous in the former, owing to Gratian's having selected his materials from the older compilations instead of the original sources, many of which were lost, and are of no authority except so far as adoptcd by sub-

Liber Sep- timus.

Tnstitu- tiones Lancelotti.

Editions,

Bologna University.

Glossators.

Apparatus,

Glossa Or- dinaria.

Summz2,

Repeti- tiones,

Cisus,

Quees- tiones, Dissen- siones Domi- norum.

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sequent church usage. But the few spurious decretals in Gregory's cellcction are of equal authority with the others, the whole having received the papal cmprimatur. The constitutions in the Liber Sextus, Clementine, and Extra- vagants are all genuine. –

The Liber Septimus Decretalium, which appears in a supplement to some editions of the Corpus Juris, is a mere private collection formed by Peter Matthzus, a lawyer of Lyons, in 1590. The Jnstztutiones Juris Canonici of J. P. Lancelottus of Perugia are of the same character, but they form a useful and trustworthy compendium and are of considerable authority. They were written, as the author tells us in his preface, to complete the parallel between the two Corpora Juris, civil and canon: The Decretum of the canonists corresponded to the Pandects of the civilians ; the Decretals of

Gregory to the Code; the Liber Sextus, Cle- mentinis, and Hxtravagants to the Novels. At the Pope's suggestion Lancelot undertook to supply a text-book cor- responding to the Institutes of Justinian. He completed and published it in 1563, but official confirmation never followed.

The latest and most correct edition of the Corpus Juris Canonict is by milius L. Richter (2 vols. 4to, Leipsic, 1839), of which a second edition is in the press. But it has not superseded that of J. H. Boehmer (2 vols. 4to, Halle, 1747), which is rendered valudble by his notes and copious indices, and contains much useful supple- mentary matter, including the Liber Septimus and Lancelot's Insti. tutions.

Til. Meprzvan History.—From the 12th century Bologna university possessed two faculties of law—a civil andacanon. The members of the latter were called doctores decretorum (a degree which required six years' previous study) corresponding to the doctores legum of the civil law. Those who graduated in both faculties were doctors utriusque Juris, The students were classed as canonistee or decretistce and civiliste or legiste. The system of tuition was oral (lecture) with minute study of the original authorities. Explanatory notes (gloss) were added by many of the professors (hence called glossatores) to their copies of the text, written either on the margin or between the lines, These were transcribed along with the text in the manu-scripts circulating among the students, 'Gradually the glosses took the shape of a consecutive commentary (appa- ratus) in which the author incorporated what was most valuable in the notes of his predecessors. One of these always came to be accepted as of more authority than the rest, and on that account was entitled in the manuscripts Glossa Ordinaria, or simply Glossa. Such are the gloss on the Decretum by Joannes Teutonicus (1212), revised and supplemented by Bartholomeus Brixensis (of Brescia) in 1258, and that on Gregory's Decretals by Bernardus Parmensis (1266). The ordinary gloss of the Liber Sextus and Clementines is by Joannes Andrew (1348), the author of the Arbor Consanguinitatis et Afinitatis since inserted in the Deeretum. (The last edition of the Corpus Juris Canonici, with the ed in 1671, 3 vols, fol., Lyons) 4

ere of Summe or Distinct

Collections were made of unsettled and controverted points (Dissensiones Dominorum) and of rules

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or maxims of law (Brocarda, Brocardica, Pareemi, or Broce) Regule Juris). In both faculties law was at this time cultivated in a thoroughly practical spirit, and their friendly rivalry and mutual influence were beneficial to both. The mode of study was similar in the other European schools, which were all modelled after those of Bologna or Paris.

The church was thus supplied by the universities with a well-educated class of lawyers ~~for administering the business of the ecclesiastical courts—those institutions which contributed so much to the growth and renown of the canon law. 'Their development was gradual but steady. The primitive Christians, in pursuance of apostolic Eccles precept (1 Cor. vi. 1~~-6), submitted their disputes to the Heald decision of their bishops, and it was enacted by several "MO! early councils that questions between churchmen should be settled by a spiritual tribunal. The episcopal jurisdiction was extended by Constantine to all matters which the con- tending parties agreed to submit to it. This so-called Audientia Episcopalis was confirmed by several later Audie | emperors, and the bishop's sentence was enforceable by the er civil' magistrate. By a law of J ustinian, actions against P*™* |] the clergy were directed to be brought before the bishop in the first instance. In course of time the church-courts absorbed many departments of civil jurisdiction. All matters connected in the most distant way with the church or religious duties were decmed proper subjects for disposal by her tribunals. The clergy dispensed the sacraments, and their assistance was required on the occasion of baptisms, marriages, and deaths. Hence the éurie christianitatis took cognizance of questions relating to legitimacy, marriage, and succession. They assumed juris- diction over not only the clergy, but all who were under the obligation of religious vows (e.g., Crusaders), as well as widows and orphans (persone miserabiles) and minors. In the department of criminal law they were particularly active, punishing both ecclesiastical and religious offences, such as heresy, simony, blasphemy, sacrilege, and violation of personal and social morality (adultery, bigamy, fraud, perjury). For the administration of this extended

judicial system the church had to enact her own rules of procedure, which were generally a great improvement on those prevailing in the civil courts. In fact it was by no means an evil at that period of European history that the administration of the law should fall into the hands of the clergy, who were the best educated men of their time, and had many of them been trained as lawyers in the schools of Bologna and Paris. The Teutonic and Gothic codes were very imperfect in most branches of the law, and the civil and criminal procedure of the native tribunals was far from settled. Their criminal law was little more than an elaborate system of fines, graduated according to the race or rank of the victim or the criminal. Evidence in our sense of the word was unknown, and innocence could only rely for protection on compurgation, ordeal, or judicial combat. Hence the people were, during several centuries, well content to resort to the church courts. The exemption of the clergy from civil jurisdiction was in accordance with the Teutonic principle that a man should be tried by his peers, And the laity were thankful to take shelter behind the church from the fines and exactions of the feudal courts, which were inflicted less in the interests of justice than for the profit of the overlord

In the domain of

public law the influence of the church was conspicuous. She may be said to have originated modern international law. The ancient Romans regarded Interna- all foreigners as hostes, Christianity inculcated the tional la principle of the brotherhood of nations. The popes acted as arbitrators between prince and prince, and between prince and people. They protected the weak against the strong, and right against might. The principle grew up

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that international questions should be decided according to law and Christian morality, and that war, when inevitable, should be conducted according to recognized rules laid down in the interests of humanity. The system of church administration served as a model for that of the state, which in medizeval times was frequently controlled by ecclesiastics. ‘The constitutional duties of a sovereign to his people were boldly asserted by the church. Kings were taught that there were obligations for discharging which they were responsible to God, and that if these were neglected their subjects might be absolved from their allegiance. In after times the enemies of the church borrowed some of their most effective weapons from her own armoury. ‘The writers on the law of nature and of nations, who headed the rebellion against the encroachments of ecclesiastical jurisdiction, adopted many priuciples which are to be found in the Corpus Juris Canonict, where we may also trace the germs of some leading doctrines of the French Revolution.

The canon law suited the civilization of the Middle Ages. It was natural that a system, claiming to regulate the most important concerns of practical life, administered by courts which, though belonging to different nations, were under the control of one central authority, and developed under the direction of a succession of able legislators, such as Hildebrand and Innocent IIL, should take the lead in forming the character and reconciling the conflicting interests of the rising nationalities. The canon law was not so much an independent system of law as a metliod of selecting what was best from the existing systenis, and transforming it, by the help of Christian morality and feeling, into one homogeneous, eclectic whole. Much of the Roman element in the common laws of Europe at the present day has descended indirectly through the canon law, though modern jurists are too apt to ignore this and express their obligations to the ancient sources alone.

The decline of the canon law kept pace with that of the church from which it sprang. The strife of popes and antipopes, the increased strength of national feeling prompt- ing the prelates to take their sovereign's part in his quarrels with the papacy, the arrogance of the ecclesiastical courts, the Reformation, the French Revolution, in short, all those causes that weakened the church's power and influence, were prejudicial to the authority of the canon law. And now that every country in Europe possesses, if not a code, at all events a matured system of national law, the Corpus Juris Canonict possesses little more than an historical and scientific interest.

IV. Present AUTHORITY.—Germany.—The Canon Law is still the common law of both sections of the Christian church of Germany, and in purely religious and eccle- siastical questions affecting their internal affairs it is applicable, so far as not altered by modern church standards. Such are, for the Roman Catholics, the canons of the Tridentine (1545-1563) and Vatican (1869) councils, and the various concordats with the temporal power; for the Protestants, the evangelical confessions (Augsburg, &c.) and the Conclusa Corporis Kvangelicorum (1653-1806). The relations of the different churches with the state are regulated exclusively by the law of the land. In a ques- tion of private law the canon law has no validity as an independent source. Till the end of last century both the civil and canon

laws were by custom received as authoritative in Germany. They were applied universally in the civil courts, and the canon law as the lex posterior was preferred in case of conflict. These two systems, along with the feudal customs, were the three constituent elements of the common law or Gemeines Recht. The jurisdiction of the latter is now confined by the provisions of the modern codes to about one-third cf Germany.

Within that |

area the Corpus Juris Canonict may be quoted to aid in interpreting a doubtful point of common law. In other words, it is of historical but not of legislative authority.

France.—The Constituent Assembly, after abolishing France.

tithes and religious orders and secularizing church property, superseded the canon and all other laws for the governinent of the church by the Constitution Civile du Clergé, enacted in 1790. Finally, in 1793 the Convention suppressed altogether the Christian religion and its institutions. Since the restoration of the Church in the beginning of this century, both its internal government and external relations have been regulated exclusively by civil enactment, based on the concordat between Napoleon I. and Pope Pius VII. (1801), and the Articles Organiques which followed in

1802.

England.—The Canon Law is of no intrinsic obligation Englanc.

in England. The English people have in all ages shown a firm determination that neither the national church nor the national law should be subject to the Papal legislation or jurisdiction. As early as 1138 Archbishop Theobald of Canterbury brought over Vacarius and other learned ecclesiastics from Italy to introduce the study of civil and canon law into England. The bishops and clergy vigor- ously supported the new system so favourable to their order ; but the nobility and laity generally adhered to the old common law with great pertinacity. The contest was practically decided when in the 13th

century the Oourt of Common Pleas was fixed at Westminster. This brought together the practitioners in municipal law who had been, while the court was ambulatory, dispersed throughout the kingdom, and shortly afterwards the victory of common law was made secure by the establishment of the Inns of Court and Chaucery for the education of youth in muni- cipal law.

The system administered in the spiritual courts is kuown as " the king's ecclesiastical law." It is based on the canon law, a knowledge of which is highly useful to the English ecclesiastical lawyer. But only such portions of the canon law have been adopted as have been sanc- tioned by the national legatine and provincial constitutions, the statutes of the realm, and immemorial church usage.

The canon law, though not binding proprio vigore, is one of the sources of the common law of England. The rules for the descent of land, for instance, are borrowed wholly from that system. But England assimilated less of it than other countries, or than might have been adopted by herself with advantage. It was not that the English people considered the provisions of the canon law inferior to their own customs; they were as a rule entirely ignorant of it. But their struggles against appeals to Rome and other claims of ecclesiastical jurisdiction roused the feeling of the nation. They stoutly stood up for their common law, cumbrous and even barbarous in some respects as it was, not because they thought it perfect, but because they were resolved to manage their own concerns after their own fashion. At the parliament of Merton (1236) when the bishops proposed that legitimation by subsequent marriage should be legalized, alleging that holy church (that is, the canon law) sanctioned such legitimation, all the earls and barons, we are told, with one voice answered, " Nolumus leges Angliz mutari." This incident shows that even at that early date canon law was of no authority unless sanctioned by the law of the land, for the decretal (c. 6, X. qui filii sint legitimi, iv. 17) alluded to by the bishops was addressed by Pope Alexander III. to the bishop of Exeter in 1172, and was incorporated in the Decretals of Gregory promulgated in 1234, two years before the parliament of Merton.

Scotland.—Several causes conduced to the provisions of Scotland.

the canon law being extensively adopted by the law of

Scotland. During the 16th and 17th centuries canon law was publicly taught in the Scottish universities ; and from a very early period it was the custom of the Scottish youth to resort for purposes of study to foreign countries, whence many of them returned doctors im utroque jure. A wide jurisdiction was exercised by the consistorial courts, from which for many centuries an appeal to Rome was competent, and at one time half of the senators of the College of Justice were necessarily clerical, while all were learned in both civil and canon law. Conveyancing, moreover, was in the hands of clerical notaries, who, till 1469, were, like those of Europe generally, appointed exclusively by the emperor and the Pope. But though one of the fontes juris Scotice, canon law never was of itself authoritative in Scotland. In the canons of her national provincial councils (at whose yearly meetings representatives attended on behalf of the king) that country possessed a canon law of her own, which was recognized by the parliament and the popes, and enforced in the courts of law. Much of it, no doubt, was borrowed from the Corpus Juris Canonicz, the Tridentine standards, and the English provincial canons. But the portions so adopted derived their authority from the Scottish Church. The general canon law, unless where it has been acknowledged by Act of Parliament, or a decision of the courts, or sanctioned by the canons of a provincial council, is only received in Scotland according to equity and expediency.

AppItIonAL AUTHORITIES.—HIsTtoRY AND LITERATURE :—Doujat, Histoire du Droit Canoniquc, Paris, 1677; Bickell, Geschichte des Kirchenrechts, vol. i. (never completed), Giessen, 1848 ; Rosshirt, Geschichte des Rechts tm Mittelalter, vol. i. Kanonisches Recht, Mainz, 1846. The best bibliographical history when com- pleted will be—Maassen, Geschichte der Quellen und der Literatur des Canonischen Rechts im Abcndlandc bis zum Ausgange des Mittelalters, vol. i. 1870. The Vienna Academy of Sciences have voted funds from the Savigny foundation to enable the author to visit foreign libraries for the purposes of his work, which contains in consequence the best account of the various MSS. The first volume comes down to, without including, the False Decretals. Four additional volumes are expected. The glossators and the mediawval universities are treated of in Savigny, Geschichte des Rimischen Rechts im

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1 The authority of this and most other French writers on canon law

is to be received with caution on matters havin any connection wi the Gallican Liberties, ol ae

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CANONICAL, as an adjective, is found associated with many substantives, and always implies dependence, real or supposed, upon the canons of the church. Thus we read of ‘‘ canonical obedience,” as signifying the obedience recog- nized as due to a superior officer of the church from an inferior, as that due to a bishop from a presbyter. Per- haps the best known and most widely spread use of the term occurs in the case of Canonical Hours, otherwise called Hours of Prayer, which are certain stated times of the day, consigned in the East, and in the West before the Reformation, more especially by the Church of Rome, to offices of prayer and devotion. These were at first three only, and were supposed to be inherited from the Jewish Church (see Psalm lv. 17, Dan. vi. 10, and Acts iii. 1),— namely, the third, sixth, and ninth hours, corresponding to 9 A.M., Hoon, and 3 p.M. with us. They were increased to five, and subsequently to seven (see Psalm exix. 164), and in time made obligatory on monastic and clerical bodies. The full list, recognized almost universally through- cut Europe before 700 a.., stands thus :—Matins (called also Matin Lauds, or simply Lauds), Prime, Terce, Sext, Nones, Evensong, Compline; in the Saxon canons of Ailfric, Uhtsang, Primsang, Undersang, Middaysang, Non- sung, difensang, Nihtsang. (See Du Cange, Glossarium, s. v. ‘‘ Horee Canonice ;” Durandus, De Of. Divin., lib. v.; Smith and Cheetham's Dictionary of Christian Antiquities, art. ‘‘ Hours of Prayer.”) Bishop Cosin, in the reign of Charles I., put forth an edition of the Hours (as books of devotion for the canonical hours are often called) for the use of such individuals or bodies of the English Church as might like to use them.

CANONIZATION, a ceremony in the Chureh of Rome, by which persons deceased are ranked in the catalogue of the saints. This act is preceded by beatification 3 and

after the merits of the individual have been duly tested and approved, the Pope decrees the canonization.

The term was not introduced till the 12th century. The first person who availed himself of it was Udalric, bishop of Constance, in his letter to Pope Calixtus IT. relative to the canonization of Bishop Conrad. The Act, however, dates from a much more remote antiquity. The ceremony was originally only a commemoration of the martyrs, whose assistance was invoked in the name of the church militant to which they had belonged. Originally bishops decided whether or not the candidate lad fairly vindicated his claim to the honour; but they only acted as the organ of public opinion. Orthodoxy was certainly considered of great importance, as may be seen from the fact of the ex- clusion of Origen and Tertullian, those great though erratic geniuses of the early church, from the title. As soon as the power of Rome was once more upon the ascendant in Europe, the popes naturally appropriated to themselves the important privilege of canonization. None but martyrs were at first admitted into the category of saints, but in course of time the privilege was extended to some of those pious men who, without having sealed their testimony with their blood, had evinced the sincerity of their belicf by the purity of their practice. In later times, however, the Pope assumed the right of admitting into the sacred catalogue potentates whose claim seems to have largely consisted in their support of his temporal interests, Not- able instances of this are the names of the emperor Henry L., caronized by Eugenius III., and Edward the Confessor of England, canonized by Alexander ITI.

So long as the right of according the honours of canoni- zation was vested in the bishops, there was no public guarantee that it had been exercised with rigour or discre- tion, But when it passed into the hands of the popes, meaus were taken to prevent any but really meritorious persons from being enrolled in the holy category. Even then, however, a very simple ordeal sufficed. A few miracles reported to have happened at a tomb were enough to give its inmate a claim to have his name inscribed in the canon of the mass among the number of the happy. A Roman Catholic writer, the editor of Butler’s Lives of the Saints (ed. 1866) states that “the proceedings of a beatification or canonization are long, rigorous, and ex- pensive.” It has been asserted that the discovery of the last-named feature of the process

prevented the somewhat parsimonious Henry VII. of England from carrying out his desire for the canonization of King Henry VI. ; Bacon, however (History of Henry VJI.), inclines rather to the belief that the obstacle here was the pope's fear it would 'diminish the estimation of that kind of honour" to give it to such "a simple man." At alater period, when the ceremony was only performed after a considerable lapse of time, reasons were always hard to be found why the saintly candidate should be rejected. In modern times the court of Rome has shown itself extremely averse to promiscuous canonization ; and since the days of Benedict XIV., the promoter of the faith, popularly known as the advocatus diabolt, or devil's advocate, has exercised extreme severity in sifting the claims of aspirants, It is further necessary that a period of a hundred years should elapse between the death of the saint and his admission into the calendar. But the more pious men of every country in Europe have of late evinced so little ambition to secure this posthumous compliment, that it may now be considered to have gone fairly out of fashion. It is also probable that the far more stringent rules of evidence and the growth of physical science have tended to render proof of the supernatural much more difficult than it seemed to be to our medizval forefathers. It may be observed that the Iutheran divimes of the century after the Reformer's

decease frequently refer to him as B. (ue., Beatus) Lutherus.

On the day of canonization the Pope and cardinals officiate in white ; while St Peter's church is illuminated and hung with rich tapestry, upon which the arms of the Pope, and of the prince or state requiring the canonization, are embroidered in gold and silver,

Beatification, which frequently precedes canonization, gives an inferior status to tlhe deceased person, and appears rather to recommend him as a fit object for the cultus of his co-religionists than to enjoin it,

See Du Cange Glossarium, s. v. " Canonizare," and the references there given to St Augustine on St John, the Bull of Pope John XY., and (for the ceremonies) to the Ceremoniale Romanum, lib. i. sect. 16. Compare Milman, Lat. Christianity, bk. xiv, chap ii., and preface to Forbes's Kalendar

of Scottish Saints, 1872. For the Roman Catholic statement of the case see Alban Butler's Lives of the Saints, preface to edition of 1866, and an Lssay on Beatzfication, Canonization, &c., by F, W. Faber (London, 1848). But the great authorities on the subject to which all Roman Catholics refer are the decrees of Pope Urban VIII., and a treatise on the entire subject by Pope Benedict XIV.

CANOPUS, or Canosus, in ancient geography, a town of Lower Egypt, on the Mediterranean, a hundred and twenty stadia, or fifteen miles, to the east of Alexandria. It contained a very popular shrine of the god Serapis ; and was the seat of the manufacture of henna, the scarlet dye with which women in the East colour their nails. The town was notorious for its dissoluteness; and as Alexandria rose into eminence, it gradually declined. All that remains is a heap of ruins. Canopus, the pilot of Menelaus, is said to have died in Egypt, aud to have given his name to the town.

CANOSA, or Canusium, a city of Italy, in the province of Terra di Bari, and district of Barletta, situated on the slope of an eminence on the right bauk of the Aufidus or Ofanto, about 15 miles from the sea, and 6 miles from the battlefield of Canne, Its most interesting buildings of modern date are a feudal castle on the top of the hill, and the church of St Sabinus the patron saint of the city, with its mosque-like cupolas and ancient pulpit. In the neighbourhood of the latter stands the tomb of Bohemond of Antioch, who died in 1102. The ruins of the old Roman city extend for a considerable distance beyond the modern town; large portions of its walls can still be traced; and there are extensive remains of an amphitheatre which was larger than that of Pompeii, and a gateway, frequently described as a triumphal arch, dedicated to 'Trajan. Various explorations have brought to light great numbers of vases, inscriptions, and miscellaneous antiquities, among which is a complete list of the members of the municipal senate. The vases, which have been principally derived from the sepulchres excavated in the tufa rock which were discovered about 1803, are large in size and somewhat coarse in workmanship. (See Millin, Description des tombeaux de Canosa, Paris, 1813.) Like several of the more important cities in this part of Italy, Canusium is said to have been founded by the Grecian hero Diomede ; the origin of the city, however, can be traced with tolerable certainty to the Pelasgi. Canusium is first mentioned in history as assisting the Samnites in

their wars against the Romans, by whom it was subdued for the first time 318 B.C. In the second Punic war the inhabitants gave shelter within their walls to the remnant of the Roman army, which retreated thither after the rout at Canne. In the second year of the social war, in which Canusium joined the revolted allies, it was besieged unsuccessfully by the Romans. In the civil wars it suffered severely, but always contrived to preserve its municipal privileges, and was never

colonized from Rome till the days of Marcus Aurelius. In the Iter ad Brundusium of Horace, its bread is described as gritty, and its water as extremely scanty. This last defect was remedied by Herodes Atticus, who constructed an aqueduct, of which the remains are still visible. In the tenth satire of the first book of Horace, the inhabitants are called bilingues, probably from their speaking Latin or Greek indifferently. ‘Till a late period in the Middle Ages Canusium continued an important and flourishing city; but it suffered severely at the hands of Lombards and Saracens, In 1694 it was laid in ruins by an earth- quake, and in 1851 it was considerably injured by a similar disturbance. The title of prince of Canosa was bestowed in 1712 on Tiberio Capece. Population, 14,900.

CANOVA, Antonio (1757-1822), one of the leading sculptors of modern times, was born on the 1st of N ovember 1757, at Passagno, an obscure village situated amid the recesses of the hills of Asolo, where these form the last undulations of the Venetian Alps, as they subside into the plains of Treviso. At three years of age Canova was deprived of both parents, his father dying and his mother remarrying. Their loss, however, was compensated by the tender solicitude and care of his paternal grandfather and grandmother, the latter of whom lived to experience in her turn the kindest personal attention from her grandson, who, when he had the means, gave her an asylum in his house at Rome. The father and grandfather of our artist followed the occupation of stone-cutters or minor statuaries ; and it is said that their family had for several ages supplied Passagno with members of that calling. As soon as Canova’s hand could hold a pencil, he was initiated into the principles of drawing by his affectionate grandfather Pasino. The latter possessed some knowledge both of drawing and of

architecture, designed well, and showed considerable taste in the execution of ornamental works, To his art he was greatly attached; and upon his young charge he looked as one who was to perpetuate, not only the family name, but also the family profession.

The early years of Canova were passed in study. The bias of his mind was to sculpture, and the facilities afforded for the gratification of this predilection in the workshop of his grandfather were eagerly improved. In his ninth year he executed two small shrines of Carrara marble, which are still extant. Soon after this period he appears to have been constantly employed under his grand- father. Amongst those who patronized the old man was the patrician family Falier of Venice, and by this means young Canova was first introduced to the senator of that name, who afterwards became his most zealous patron, Between the younger son, Giuseppe Falier, and the artist a friendship commenced which terminated only with life. From the interest which was excited in this family for Canova, the senator Falier was induced to receive him under his immediate protection. It has been related by an Italian writer, and since repeated by several biographers, that Canova was indebted to a trivial fortuitous circum- Stance,—the moulding of a lion in butter,—for the warm interest which Falier took in his welfare. The anecdote may or may not be true. By his kind patron Canova was placed under Bernardi, or, as he is generally called by filiation, Torretto, a sculptor of considerable eminence, who had taken np a temporary residence at Pagnano, a vil- lage in the vicinity of the senator’s mansion. This took place whilst Canova was in his thirteenth year ; and with Torretto he continued about two years, making in many respects considerable progress. This master returned to Venice, where he soon afterwards died 3 but by the high terms in which he spoke of his pupil to Falier, the latter was induced to bring the young artist to Venice, whither he accordingly went, and was placed under a nephew of

| masters of the art.

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Torretto, With this instructor he continued about a year, studying with the utmost assiduity. After the termina- tion of this engagement he began to work on his own account, and received from his patron an order for a group

on the subject of Orpheus and Eurydice. The first figure, which represents Eurydice in flames and smoke, in the act of leaving the infernal realms, was completed towards the close of his sixteenth year. It was highly esteemed by his patron and friends, and the artist was now considered qualified to appear before a public tribunal. The kindness of some monks supplied him with his first workshop, which was the vacant cell of a monastery. Here for nearly four years he laboured with the greatest perseverance and industry. He was also regular in his attendance at the academy, where he carried off several prizes. But he relicd far more on the study and imitation of nature. From his contemporaries he could learn nothing, for their style was vicious. From their works, therefore, he reverted to living models, as exhibited in every variety of situation. A large portion of his time was also devoted to anatomy, which Science was regarded by him as “the secret of the art.” He likewise frequented places of public amusement, where he carefully studied the expressions and attitudes of the performers. Not a day was allowed to pass without his making some visible advances in his profession. He formed a resolution, which was faithfully adhered to for several years, never to close his eyes at night without having pro- duced some design. Whatever was likely to forward his advancement in sculpture he studied with ardour. On archeological pursuits he bestowed considerable attention, With ancient and moder history he rendered himself well acquainted, and he also began to acquire some of: the Continental languages.

Three years had now elapsed without any production coming from his chisel. He began, however, to complete the group for his patron, and the Orpheus which followed evinced the great advance he had made. The work was universally applauded, and laid the foundation of his fame. Several groups succeeded this performance, amongst which was that of Deedalus and Icarus, the most celebrated work of his noviciate. The simplicity of style and the faithful imitation of nature which characterized them called forth the warmest admiration. His merits and reputation being now generally recognized, his thoughts began to turn from the shores of the Adriatic to the banks of the Tiber, for which he set out at the commencement of his twenty- fourth year.

Before his departure for Rome, his friends had applied to the Venetian senate for a pension, to enable him to pursue his studies without

embarrassment. The applica- tion was ultimately successful. The stipend amounted to three hundred ducats (about £60 per annum), and was limited to three years. Canova had obtained letters of introduction to the Venetian ambassador, the Cavaliere Zulian, an enlightened and generous protector of the arts, and was received in the most hospitable manner. His arrival in Rome, 28th December 1780, marks a new era in his life. It was here he was to perfect himself by a study of the most splendid relics of autiquity, and to put his talents to the severest test by a competition with the living The result was equal to the highest hopes cherished either by himself or by his friends. The work which first established his fame at Rome was Theseus vanquishing the Minotaur. ‘The figures are of the heroic size. The victorious Theseus is represented as seated on the lifeless body of the monster. The exhaustion which visibly pervades his whole frame proves the terrible nature of the conflict in which he has been engaged. Simplicity and natural expression had hitherto characterized Canova’s style ; with these were now united more exalted concep-

tions of grandeur and of truth. The Theseus was regarded with rapturous admiration,

Canova’s next undertaking was a monument in honour of Clement XIV.; but before he proceeded with it he deemed it necessary to request permission from the Venetian senate, whose servant he considered himself to be, in consideration of the pension. This he solicited in person, and it was granted, He returned immediately to Rome, and opened his celebrated studio in the Via del Babuino. He spent about two years of unremitting toil in arranging the design and composing the models for the tomb of the pontiff. After these were completed, other two years were employed in finishing the monument, and it was finally opened to public inspection in 1787. The work, in the opinion of enthusiastic dilettanti, stamped the author as the first artist of modern times. After five years of incessant labour, he completed another cenotaph to the inemory of Clement XIIL, which raised his fame still higher. Works now came rapidly from his chisel. Amongst those which belong to the period in question is Psyche, with a butterfly, which is placed on the left hand, and held by the wings with the right. This

figure, which is intended as a personification of man's immaterial part, is considered as in almost every respect the most faultless and classical of Canova's works. In two different groups, and with opposite expression, the sculptor has represented Cupid with his bride; in the one they are standing, in the other recumbent. These and other works raised his reputation so high that the most flattering offers were sent him from the Russian court to induce him to remove to St Petersburg, but these were declined. " Italy," says he, in writing of the occurrence to a friend, "Italy is my country —is the country and native soil of the arts. I cannot leave her; my infancy was nurtured here. If my poor talents can be useful in any other land, they must be of some utility to Italy; and ought not her claim to be preferred to all others 1"

Numerous works were produced in the years 1795-97, of which several were repetitions of previous produc- tions. It is only necessary to notice the celebrated group representing the Parting of Venus and Adonis. This famous production was sent to Naples. The French Revolution was now extending its shocks over Italy ; and Canova sought obscurity and repose in his native Passagno. 'Thither he retired in 1798, and there he con- tinued for about a year, principally employed in painting, of which art also he had some knowledge. He executed upwards of twenty paintings about this time. One of his productions is a picture representing the dead body of the Saviour just removed from the cross, surrounded by the three Marys, the beloved disciple, Joseph of Arimathea, and, somewhat in the background, Nicodemus. Above appears the Father, with the mystic dove in the centre of a glory, and surrounded by a circle of cherubs. This com- position, which was greatly applauded, he presented to the parochial church of his native place. Events in the political world having come to a temporary lull, he returned to Rome; but his health having been impaired from arduous application, he took a journey through a part of Germany, in company with his friend Prince Rezzonico. He returned from his travels much improved, and again commenced his labours with renewed vigour and enthusiasm.

Canova's sculptures have been distributed under three heads :—(1) Heroic compositions ; (2) Compositions of grace and elegance; and (3) Sepulchral monuments and rilievos. In noticing the works which fall under each of these divisions. it will be impossible to maintain a strict chronological

order, but perhaps a better idea of his productions may thus be: obtained. Their vast number, however, prevents their being all enumerated.

Soon after his return appeared his Perseus with the Head of Medusa. ‘The moment of representation is when the hero, flushed with conquest, displays the head of the “snaky Gorgon,” whilst the right hand grasps a sword of singular device. By a public decree, this work was placed in one of the stanze of the Vatican hitherto reserved for the most precious works of antiquity; but it would be a mistake to say that it sustains this comparison, or that it rivals the earlier realization of the same subject in Italian art, that by Cellini. In 1802, at the personal request of Napoleon, Canova repaired to Paris to model a bust of the First Consul. The artist was entertained with munificence, and various honours were conferred upon him. The statue, which is colossal, was not finished till six years after. On the fall of the great Napoleon, Louis XVIII. presented this statue to the British Government, by whom it was after- wards given to the duke of Wellington. Palamedes, Creugas and Damoxenus, the Combat of Theseus and the Centaur, and Hercules and Lichas may close the class of heroic compositions, although the catalogue might be swelled by the enumeration of various others, such as Hector and Ajax, and the statues of Washington, King Ferdinand of Naples, and others. ‘The group of Hercules and Lichas is considered as the most terrible conception of Canova’s inind, and in its peculiar style as scarcely to be excelled.

Under the second head, namely, compositions of grace and elegance, the statue of Hebe takes the first place in point of date. Four times has the artist embodied in stone the goddess of youth, and each time with some variation. The only material improvement, however, is the substitution of a support more suitable to the simplicity of the art. Each of the statues is, in all its details, in expression, attitude, and delicacy of finish, strikingly elegant. The Dancing Nymphs maintain a character similar to that of the Hebe. The Graces and the Venus are more elevated. The Awakened Nymph is another work of uncommon beauty. The Mother of Napoleon, his consort Maria Louisa (as Concord), to model whom the author made a further journey to Paris in 1810, the Prin- cess Esterhazy, and the muse Polymnia (Elisa Bonaparte) take their place in this class, as do the ideal heads, com- prising Corinna, Sappho, Laura, Beatrice, and Helen of Troy.

The cenotaphs and funeral monuments fall next to be noticed. Of these the most splendid is the monument to the Archduchess Maria Christina of Austria, consisting of nine figures. Besides the two for the Roman pontiffs already mentioned, there is one for Alfieri, another for Emo, a Venetian adntiral, and a small model of a cenotaph for Nelson. besides a great variety of monumental rilievos.

The events which marked the life of the artist, during the first fifteen years of the period in which he was engaged on the above-mentioned works, are of so little importance as scarcely to merit notice. His mind was entirely absorbed in the labours of his studio, and, with the exception of his journeys to Paris, one to Vienna, and a few short intervals of absence in Florence and other parts of Italy, he never quitted Rome. In his own words, “his statues were the sole proofs of his civil existence.” There was, however, another proof, which modesty forbade him to mention, an ever-active benevolence, especially towards artists. In 1815 he was commissioned by the Pope to superintend the trans- mission from Paris of those works of art which had formerly been conveyed thither under the direction of Napoleon. By his zeal and exertions, for there were many conflicting interests to reconcile, he adjusted the affair in a manner at once creditable to his judgment and fortunate for his country. In the autumn of this year he gratified a wish

‘ he had long entertained of visiting London, where he

received the highest tokens of esteem. The artist for whom he showed particular sympathy and regard in Lon- don was Haydon, who might at the time be counted the sole representative of historical painting there, and whom he especially honoured for his championship of the Elgin marbles, then recently transported to England, and ignorantly depreciated by polite connoisseurs. Canova returned to Rome in the beginning of 1816, with the ransomed spoils of his country’s genius. Immediately after, he received several marks of distinction, —by the hand of the Pope himself his name was inscribed in “ the Golden Volume of the Capitol,” and he received the

title of marquis of Ischia, with an annual pension of 3000 crowns, about £625.

He now contemplated a great work, a colossal statue of Religion. The model filled Italy with admiration ; the marble was procured, and the chisel of the sculptor ready to be applied to it, when the jealousy of churchmen as to the site, or some other cause, deprived the country of the projected work. The mind of Canova was inspired with the warmest sense of devotion, and though foiled in this instance he resolved to consecrate a shrine to the cause. In his native village he began to make preparations for erecting a temple which was to contain, not only the above statue, but other works of his own; within its precincts were to repose also the ashes of the founder. Accordingly, in prosecution of this design, he repaired to Passagno in 1819, Atasumptuous entertainment which he gave to his workmen, there occurred an incident which marks the kindliness of his character. When the festivities of the day had terminated, he requested the shepherdesses and peasant-girls of the adjacent hamlets to pass in review before him, and to each he made a present, expending on the occasion about £400. We need not therefore be surprised that a few years afterwards, when the remains of the donor came to be deposited in their last asylum, the grief which the surrounding peasantry evinced was in natural expression so intense aud irrepressible as to eclipse the studied solemnity of more pompous mourning.

After the foundation-stone of this edifice had been laid, Canova returned to Rome ; but every succeeding autumn he continued to visit Passagno, in order to direct the workmen, and encourage them with pecuniary rewards and medals. In the meantime the vast expenditure exhausted his resources, and compelled him to labour with unceasing assiduity when age and disease had set their seal upon his frame. During the period which intervened between commencing operations at Passagno and his decease, he executed or finished some of his most striking works, Amongst these were the group Mars and Venus, the colossal figure of Pius VI., the Pieta, the St John, the recumbent Magdalen. The last performauce which issued from his hand was a colossal bust of his friend the Count Cicognara. In May 1822 he paid a visit to Naples, to superintend the construction of wax moulds for an equestrian statue of the perjured Bourbon king Ferdinand. This journey materially injured his health, but he rallied again on his return to Rome.

Towards the latter end of the year he paid his annual visit to the place of his birth, when he experienced a relapse. He proceeded to Venice, and expired there on the 13th of October 1822, at the age of nearly sixty-five. His disease was one which had affected him from an early carving-tools, producing a depression of the ribs. most distinguished funeral honours were paid to his remains, which were deposited in the temple at Passagno on the 25th of the same month. Canova, in a certain Sense, renovated the art of sculpture in Italy, and brought it back to that standard from which it had declined when the sense both of classical beauty

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age, caused by the continual use of |

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and moderation, and of Titanic invention and human or superhuman energy as embodied by the unexampled genius of Michelangelo, had succumbed to the overloaded and flabby mannerisms of the 17th and 18th centuries. His finishing was refined, and he had a special method of giving a inellow and soft appearance to the marble. He formed his models of the same size as the work he designed was intended to be. The prominent defect of Canova's attrac- tive and highly trained art is that which may be summed up in the word artificiality,—that quality, so characteristic of the modern mind, which seizes upon certain properties of conception and execution in the art of the past, and upon certain types of beauty or emotion in life, and makes a compound of the two—regulating both by the standard of: taste prevalent in contemporary "high society," a standard which, referring to cultivation and refinement as its higher term, declines towards fashion as the lower. Of his moral character a generous and unwearied benevolence formed the most prominent feature. he greater part of the vast fortune realized by his works was distributed in acts of this description. He established prizes for artists 'and endowed all the academies of Rome. The aged and un- fortunate were also the objects of his peculiar solicitude. His titles were numerous. He was enrolled amongst the nobility of several states, decorated with various orders of knighthood, and associated in the highest professional honours. (See the Life of Canova by Memes, one vol. ; that by Missinini, four vols. ; the Biograyia, by the Count Cicognara; and Opere Scelte di Antonio

Canova, by Anzelmi, Naples, 1842.) (W. M. BR.) CANSTATT, Cannsrapt, or Kansrart, a town of Wiirtemberg, in the circle of the Neckar, about 24 miles N.E. of Stuttgart, in 48° 48’ 22” N. lat. and 9° 19’ 49” E. long. It is situated in the most fertile and populous part of the country, at a point where the high roads of the circle converge, and now forms one of the most flourish- ing towns in Germany. Its public buildings comprise a cathedral of the 15th century, dedicated to Uffo, a beautiful town-hall, the royal theatre, the market-house, and various educational institutions. The Wilhelma palace, built in 1842-51 as a summer residence for the late king William, is an elaborate example of the Saracenic style, and is surrounded by extensive and beauti- ful gardens. A very considerable industry is carried on in the town,—the most important branches being wool- spinning, dyeing, cotton-weaving, and the manufacture of steel and machines. The transit trade is still more im- portant and various. A large temporary population is attracted to the town by the fame of its mineral springs. These are about forty in number, for the most part of tepid water, which is used both for drinking and bathing, and is said to be highly beneficial in dyspepsia and weakness of the nervous system. Besides the usual bathing establish- ments, there are several medical institutions for the treatment of special diseases. Sielberg, a hill in the neighbourhood, upwards of 600 feet in height, is interest- ing for its caverns and the numerous fossils which it has preserved. Not far distant is the princely seat of Rosenstein (previously known as Kahlenstein), which was built in 1824-30; and on the neighbouring height of the Rothenberg was formerly the ancestral castle of the house of Wiirtemberg. Canstatt is mentioned as early as the 8th century, under the name of Condistat, as the seat of a great court held by Charlemagne for the trial of the rebellious dukes of Alemannia and Bavaria. From Louis the Bavarian it received the same imperial rights and privileges as were enjoyed by the town of Esslingen. Down to the middle of the 15th century it remained the capital of Wiirtemberg ; and as an important place of transport it has been frequently the object of military operations. In

1755, at the time of the great earthquake at Lisbon, part of the town-house subsided 3 feet. Population in 1871,

11,804.

CANSTEIN, Kart Hitpepranp, Count or (1667- 1719), was born at Lindenberg, in 1667. He studied law at Frankfort, travelled in Italy and England, and served in one campaign; but his health failing, he was obliged to retire into private life, At Berlin he became acquainted with Spener and Francke, whose influence determined him to devote his energies and time to further the circulation of the Bible. For this he obtained a large amount of money by subscription, and established at Halle the Bible Society which is named after him. In 1712, with the aid of Francke, he issued a stereotype edition of the New Testament at about fourpence a copy, and next year a similar edition of the whole Bible. In 1722 editions in Polish and Bohemian appeared. Canstein is the author of a Life of Spener, a Harmony of the Gospels, and several theological works. He is, besides, one of those to whom the introduction of stereotype printing has been ascribed.

CANTABRIA, a district of Hispania Tarraconensis, lying on the south coast of the Bay of Biscay. By the more ancient geographers the name was applied to the entire country now occupied by the provinces of Asturias, Santander, Biscay, and Guipuzcoa. After the conquest of Spain by the Romans, the name of Cantabria was restricted to what is now the province of Santander and the eastern portion of Asturias.

The Cantabri were not improbably the remains of an ancient Iberian population, and were, according to some, the ancestors of the modern Basques. They were the most warlike of all the native Spanish tribes that the Romans had to encounter, and were never completely subdued. Together with the Astures, they offered for many ages a successful resistance to the Roman arms, and were only at last compelled to acknowledge the supremacy of Rome by Augustus. They revolted a few years after, but were defeated with great slaughter by Agrippa, 19 8.c. When, however, their losses had been somewhat repaired, they again declared war; and they were only kept in check by the most vigorous exertions of the Emperor Tiberius. Their indomitable spirit is frequently alluded to in the ancient classics ; among others Horace alludes to the “ Cantabrum indoctum juga ferre nostra.” Cantabria under the Roman empire comprehended five principal tribes,—the Pleutauri, the Varduli, the

Autrigones, the Conisci or Concani (who fed on the blood of their horses, —“ letum equino sanguine Concanum”), and the Tuisi. ‘There were numerous towns and villages distributed throughout the country, of which the most important was Juliobriga.

CANTACUZENUS, Jonannes, emperor of the East, celebrated as a statesman, general, and historian, was born at Constantinople, of an ancient and opulent family, and under the reign of the elder Andronicus held the high office of Great Domestic. In the disputes that ensued between that emperor and his grandson, Cantacuzenus espoused the cause of the latter ; and when Andronicus IL., on the abdication of his grandfather, ascended the throne (1328) he was entrusted. with the supreme administra- tion of affairs, in which capacity he displayed considerable vigour and ability. On the death of the emperor in 1341, Cantacuzenus was left regent, and guardian of his son John Palzologus, who was but nine years of age. Whether he would have continued faithful to his trust is uncertain ; but being suspected by the empress, and the object of the hostility of a powerfui party at court, he rebelled, and got himself crowned emperor in one of the provincial towns, while his opponents, with the young emperor John, maintained themselves at Constantinople,

The civil war |

which ensued lasted six years; and as the rival parties were obliged to call in the aid of the Servians and Turks, and to engage mercenaries of every description, the empire was reduced toa state of incredible confusion, and nearly ruined. At the outset Cantacuzenus was so hard pressed that he was obliged to flee into Servia. alliance with Servia enabled him to make head against his enemies for some time; but his inconstant allies soon left him to join the other side, or to pursue their own private ends. brought the war to a termination. with Orchan, the Ottoman Sultan of Broussa, on the dis- graceful conditions of sending his daughter to the harem of the Turk, and of allowing his army to make slaves of the Greek subjects. triumph, and forced his opponents to an arrangement by which he became joint emperor with John Palxologus, retaining the administrative power in his own hands during the minority of his colleague. connected view of the government of Cantacuzenus. empire, already broken up into disconnected fragments, and

reduccd to the narrowest limits, was assailed on every side by open enemies or treacherous friends. wars with the Genoese, who had a colony at Galata and had money transactions with the court, and with the Servians, who were at that time establishing an extensive empire on the north-western frontiers, —carried on in every case without energy and without happy result; and there

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was a hazardous alliance with the Turks, who made their

first permanent settlement in Europe, at Callipolis, in Thrace, towards the end of the reign of Cantacuzenus

(1354). It would be wrong to blame him, however, for introducing those enemies of Christendom into Europe, as they had been in the habit of interposing in the unhappy struggles of the Greek empire. No individual energy could have saved a moribund state from destruction at the hands of its more vigorous neighbours. Yet Can- tacuzenus was far too ready to employ them in his European quarrels ; and as he had not money to pay them, this gave them a ready pretext for seizing upon a European town. The financial burdens imposed by Cantacuzenus had long been displeasing to his subjects, and there had always been a strong faction in favour of John Palsologus. Hence, when the latter entered Constantinople in the end of 1354, his success was easy. Cautacuzenus retired to a monastery, where he occupied himself in literary labours. He wrote a history of his own life and times, which has been incor- porated in the series of Byzantine historians. Cantacuzenus was not without ability, and had some literary merit and even

eloquence, but with a considerable share of the Byzantine vices,—timidity, duplicity, and falsity.

CANTAGALLO, a town of Brazil, in the province of Rio de Janeiro, about 80 miles N.E. of the city of that name, on a small tributary of the Parahyba, with a station on the railway from Rio de Janeiro to Campos. It was formerly the seat of important gold mines; but, since these were worked out, it has depended almost wholly ou agriculture. Population about 4200.

CANTAL, a department in central France, lying between 44° 87’ and 45° 26’ N. lat., and between 2° 3’ and 3° 18’ E. long., bounded N. by the department of Puy-de-Dome, and E. by Haute-Loire and Lozére, 8. by Aveyron and Lozére, and W. by Corréze and Lot. Its area is 2208 square miles ; and its population in 1872 was 231,867.

It is formed of the ancient province of Upper Auvergne, and received its name from the Plomb-du-Cantal, the central peak of a bare aud rugged chain which traverses the whole department. Near the Plomb, which attains a height of above 6090 feet, are the Col-de-Cabre and other peaks belonging to the same system, evidently of

voleanic origin. The slopes of the higher mountains are steep and bare. The more elevated valleys are thinly peopled, and in summer afford pasture for the flocks and herds which migrate thither from the low countries. _ Most of the streams of the department have their sources in this central ridge, and fall by a short and rapid course into the rivers which traverse the extensive valleys on either side. The principal rivers are the Alagnon, which is a tributary of the Allier ; the Celle and Truyére, which are tributaries of the Lot; and the Cére and Rue, which are tributaries of the Dordogne. The climate of the department varies con- siderably in the different localities. In the alluvial plain between Murat and Saint Flour, and in the 8.W., in the arrondissement of Aurillac, it is generally mild and dry ; but in the northern and central portions the winters are long and severe, and the hurricanes peculiarly violent. The internal resources of the department are considerable ; but the difficulty of land-carriage prevents them being sufficiently developed. ‘The hills and valleys abound with game, and the streams with

fish. Cantal produces a vast variety of aromatic and medicinal plants ; and its mineral products include coal, copper, lead, iron, antimony, granite, and slate.: Several mines of coal and one of antimony are worked, but generally these natural sources of wealth are neglected. The cold and damp of the climate, which are great obstacles to the cultivation of corn, favour the growth of the pastures. Cattle and horses are accordingly reared with profit, while butter and cheese (including the famous Roquefort cheese) are made in large quantities. The wool of the district also is of a superior quality. The inhabitants are rude and uncultivated, accustomed to live on the scantiest fare, and plying the meanest handicrafts for a considerable part of the year in their migrations to Paris and through the provinces. The principal articles of food are‘rye, buckwheat, and chestnuts. Cantal is divided into four arrondissements,—Aurillac, Mauriac, Murat, and Saint Flour. Its capital is Aurillac.

CANTARINI, Simone (1612-1 648), called Stmonz pa PESARO, a painter and etcher, was born at Oropezza near Pesaro in 1612. He was a disciple of Guido, and a fellow- student of Domenichino and Albano. The irritability of his temper and his vanity were extreme ; and it is said that his death, which took place at Verona in 1648, was occasioned by chagrin at his failure in a portrait of the duke of Mantua. Others relate that he was poisoned by a Mantuan painter whom he had injured. His pictures, though masterly and spirited, are deficient in originality. Some of his works have been mistaken for examples of Guido, to whom, indeed, he is considered superior in the extremities of the figures. Aniong his principal paintings are St Anthony, at Cagli; the Magdalene, at Pesaro; the Transfiguration, in the Brera Gallery, Milan ; the Portrait of Guido, in the Bologna Gallery ; and St Romuald in the Casa Paolucci. His most celebrated etching is Jupiter, Neptune, and Pluto, honouring the arms of Cardinal Borghese.

CANTEMIR, Antrocuus Russian poetry, was the youngest son of Demetrius Cante- niir, Peter the Great mathematics, physics, history, moral philosophy, and polite literature. When quite young he was elected a member of

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relation to the different revolutions which agitated Russia confidence and

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esteem of three successive princes. He died at Paris in 1744. Besides a Russian translation of Anacreon and the epistles of Horace, he wrote original satires, odes, and fables, and translated Fontenelle's Plurality of Worlds and Algarotti's Dialogues on Light and Colours. The Abbé Guasco wrote his life in French, and translated his satires into that language. . CANTEMIR, Demetrius, son of a prince of Moldavia, was born in 1673, and died in 1723. On his father's death, though not permitted to succeed to the throne of Moldavia, lie continued faithfully to serve the Turks, distinguishing himself in many campaigns, and acquiring the Oriental as well as the European languages, of which he became a great master. In 1710 he was at last appointed prince of Moldavia, in order to aid in resisting the threatened invasion of Peter the Great. Convinced of the approaching ruin of the Turks, Cantemir joined the Czar, and shared in the campaign of 1711 on the Pruth, which proved so humiliating to Russia, On the conclusion of peace, Peter, who had refused to give up his ally to the victorious Turks, took him with him to Russia, where he lived till — his death, assisting the Czar in his wars, and in great favour with him. He wrote several works, the most important being a history of the growth and decay of the Ottoman empire. CANTERBURY, a city and borough in the county of Kent, distant from London 55 miles E.S.E., and situated in 61% 17 W.dat,; 1°. Ps' E, long. London by the South-Eastern and the London-Chatham- and-Dover railways ; and a line, six miles in length, con- a small harbour on the north coast

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Plan of Canterbury.

of Kent, which is its port for trade purposes. he corpora- tion (from which the mayor is chosen) is elected from three wards, the Dane-John, Westgate, and Northgate wards, and consists of eighteen councillors and six aldermen. Here are held the quarter sessions for East Kent, the petty sessions for the Home Division of St Augustine, beside those of the city itself, and the county court of the surrounding district. The High Court of Justice has also

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district registries at Canterbury for the probate and bankruptcy divisions.

Canterbury contains a cathedral church, the seat of an archbishop, who is primate of all England and metro- politan, and provincial of the dioceses south of Trent,—his own diocese comprising the greater part of Kent anda small piece of Surrey. The cathedral staff consists of a dean, six canons, twenty-four honorary canons, an auditor, six preachers, four minor canons, and subordinate officers ; and attached to it is a school founded by Henry VIIL., and called the king’s school, comprising a foundation for two masters and fifty scholars, with a few exhibitions also. The cathedral library contains about 9000 volumes, and is rich in ancient charters and registers of the monastery. Besides the cathedral there are fifteen parish churches, and places of worship for Roman Catholics, Jews, Unitarians, Independents, Baptists, Wesleyans, Lady Huntingdon’s congregation, and the Society of Friends. In the crypt of the cathedral there is also a church founded by Queen Elizabeth for French Protestant refugees, and still used by a small French congregation. A college for the education of missionary clergy of the Church of England was founded by Royal Charter in 1848 on the ruins of St Augustine’s abbey ; and on St Thomas Hill in the suburbs is the boys’ school of the Clergy Orphan Corporation. The principal public buildings are the Guild Hall, the Corn Exchange with market-place below, the Museum, the Kent and Canterbury Hospital, an institution for upwards of 100 patients, and the gaol, which is for the eastern divi- sion of the county, with

the county court-hall adjoining. The city contains barracks for horse, foot, and artillery, — that for cavalry being used for depéts of regiments on foreign service, and that for infantry as the brigade depot of the 3rd regiment (Buffs) and the East Kent regiment, and as the headquarters of the East Kent militia, The trade of Canterbury comprises good markets for hops and corn, but has no other speciality. There are some pleasant public gardens known as the Dane-John Walks. The suburbs and neighbourhood are favourite spots for residence.

Canterbury returns two members to Parliament, the con- stituency being 2794 (revision 1875). The population in 1871 was 20,962, and the number of houses 4102.

Canterbury occupies the site of the Roman Durovernum, a city established upon that ford of the River Stour at which roads from the three Kentish harbour-fortresses, Rutupie, Dubre, and Lemane (now Richborough, Dover, and Lymne) became united into the one great military way through Britain, known in later days as Watling Street. From this ford the city apparently derived its name, the first syllable of which is the Celtic dwr, ‘‘ water.” The Romans do not seem, at least towards the end of their occupation, to have made it a military centre, or given it a permanent garrison; but, as a halting-place for troops on the march, and commercially, as lying in the direct path of all the Continental traffic of Britain, its importance at this date must have been considerable. The city re- appears, under its new name of Cantwarabyrig (since shortened to the present word), as the capital of Ethelbert, the fourth Saxon king of Kent, during the latter part of whose reign it became in a manner the metropolis of England,—the office of Bretwalda, or overlord, of the island to the Humber being held by Ethelbert. It was in this reign (in 596) and under these circumstances that Augustine and his fellow-missionaries arrived from Rome, and their settlement by Ethelbert in his capital became the origin of its position, held ever since, as the metropolis of the English Church. Its history from this time becomes chiefly ecclesiastical. Here lived and ruled Augustine and the succeeding archbishops, and here under their auspices, from the time of Ethelbert and Augustine downwards,

arose two of the principal monasteries of England, the abbey of St Augustine and the priory of Christ Church, —the latter ruled by a prior only, as acknowledging the archbishop for its abbot. These were long rivals in importance and wealth, in which the abbey held for several centuries the advantage, as possessing the shrines of the earlier archbishops, the chief saints of the English Church, till the pre-eminence of the priory in turn became decidedly established by the murder of Archbishop Becket (1170) in its cathedral church, his canonization as St Thomas of Canterbury, and the resort of the Christian world on pilgrimage to his shrine. Miracles were almost immediately said to be worked at his grave in the crypt, and at the well in which his garments had been washed; and from the time when Henry II. did his penance for the murder in the church, and the battle of Alnwick was gained over the Scots a few days afterwards—it was supposed as a result—- the fame of the martyr's power and the popularity of his worship became an established thing in England. On the rebuilding of the cathedral after a fire, in 1175, a mag- nificent shrine was erected for him in a new chapel built for the purpose, which became thronged for three centuries by pilgrims and worshippers of all classes, from kings and emperors downwards. Henceforward the interests of the city became bound up in these of the cathedral, and were shown in the large number of hostels for the accom- modation of the pilgrims, and of shops containing wares especially suited to their tastes. A pilgrimage to Canter- bury became uot only a pious exercise, but a fashionable summer excursion; and the poet Chaucer, writing in the 14th century, has given us an admirable picture of such pilgrimages, with the manners and behaviour of a party of pilgrims, leisurely enjoying the journey, and telling stories to each other on the road. Our very language still contains two words originating in these customs,—a "canterbury," or a " canterbury tale," a phrase used for a fiction,—and a " canter,' which is a short form for a '"canterbury gallop," an allusion to the easy pace at which these pilgrimages were performed. The largely ecclesi- astical character of the city may still be seen in the numerous remains of buildings connected with the church with which its strects abound to the present day. The shrine with its vast collected wealth was destroyed, and every reminiscence connected with it as far as possible effaced, by King Henry VIII.'s comniissioners in 1538.

In secular history Canterbury has been less remarkable. The castle was taken by Louis, son of Philip Augustus of France, during his incursion into England in 1215. Here, in the cathedral, Edward I. was married in 1299 to his second queen, Margaret of France, and Charles IL to Henrietta Mama in 1625. Hence started the Kentish rebels under Wat Tyler on their march to London in 1381, taking with them as prisoner Archbishop Sudbury, whom they beheaded later on Tower Hill,—in this point curiously repeating the action of the Danes during their invasion of 1011, who seized Archbishop Elphege from this cathedral, and shortly afterwards put him to death at Blackheath. The "Canterbury Christmas," that of 1647, is known for the resistance offered here to the attempt to carry out the decree of Parliament against the observance of the day. Out of the rising that ensued grew the " Kentish Petition " for the release of Charles I, supported, in the following summer, by an armed gathering of the gentry and yeomanry of the county, which was scattered by General Fairfax in the battle of Maidstone.

The cathedral stands on the site of a Roman church given by King Ethelbert, together with his own palace adjoining, to Augustine and his monks. This early church and its adjacent buildings were destroyed and entirely rebuilt by Archbishop Lanfranc in 1070, and the choir

was again rebuilt on a larger scale by his successor Arch-

bishop Anselm, whose work, in turn, on being restored after the fire of 1172, was then considcrably enlarged, especially by the addition of a chapel and corona, both dedicated to St Thomas, at its eastern end. In this state substantially the choir remains to the present day. Lanfrane's nave survived till the 14th century, when it was rebuilt, with the exception of one western tower, taken down in 1834. The central tower was not completed till about 1500. 'The most interesting parts remaining in the present church are—(1) the site of the murder of Becket in the north-west transept, which still shows the mark of the altar erected in its commemoration, though a prevalent story of a stone in the pavement from which his blood- stain has been cut out, is a modern fiction; (2) the site of the shrine itself, shown by the rough flooring in the centre of its chapel, King Henry's commissioners having destroyed the very pavement on which it stood; (3) a few remaining

windows of rich 12th century glass, unique in England and scarcely equalled on the Continent; (4) monuments of the Black Prince, of Henry IV. and his queen, and of several of the archbishops from Peckham to Pole ; (5) fine remains of Norman fresco-painting in the apse of St Gabriel in the crypt; and (6) the choir itself, built through the ten years succeeding 1174, an interest- ing specimen of the gradual transition from the Norman style progressing in England at the latter end of the 12th

century, and showing especially the first introduction of |

that Southern-French variety of detail which gained a place in the new style now known as Early English. Many of the monastic buildings still remain, as the cloisters, the chapter-house, the treasury, the two entrance gateways, and the lavatory tower now used as a baptistery ; and scattered in the precincts are relics of the infirmary, the dormitory, the prior's house, and three sets of buildings for hospitality to three different grades of pilgrims—all show- ing great beauty of architecture. The chapter buildings, added in the last few years, are not so praiseworthy.

Of St Augustine's Abbey the remains are fewer 3 buta beautiful gateway of the 14th century, the abbot's hall, and some remains of the great church, attest its former magnificence. Of the other religious foundations of the city, no remains exist of St Gregory's priory or St Sepul- chre's nunnery, but interesting parts are left of the Grey or Franciscan Friars, the White or Augustinian, and the Black or Dominican Friars (the latter the first friary of this order established in England); also of the hospitals of St John, Northgate; St Nicholas, Harbledown; St Thomas, Eastbridge; St Lawrence; and that of the Poor Priests,—of which the first three still remain in use as almshouses. Of the fifteen parish churches which exist the most remarkable is St Martin's, the church frequented by Bertha the queen of Ethelbert before Augustine's arrival, and thus the earliest seat of English Christianity. In this church Ethelbert must have been baptized, and the exist- ing font has been supposed of that age ; rude and archaic, however, as it is, it is not earlier than a Norman date, though Saxon masonry still exists in the church walls,

Among the secular remains there are large portions of the city walls, mostly of the 15th century, but connected in parts with an earthen bank of a very

much earlier date, and in one spot with a conical mound called the Dane-John or Donjon, probably of Celtic origin. The Norman keep of the castle, one of Bishop Gundulph's works, still exists, but in a very mutilated condition, as well as a fine gateway tower, the west gate of the city, built about the year 1380 by Archbishop Sudbury. The Guild Hall is of old work, but has been refaced with modern brick ; and part remains of the Chequers Inn for pilgrims, built by Prior Chillenden about the year 1400, and mentioned by

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Chaucer in his Canterbury Tales; but much of this was burnt down.in 1865. There are slight remains also of the archbishop's palace, built on the very ground originally given by King Ethel- bert before his conversion, and then known as Staplegate ; but the archbishops have ceased to reside in Canterbury since the 17th century. The following is a list of archbishops of Canterbury to the present day :—-

. John

. Augustine, 597 to 605. . Laurentius, 605 to 619. . Mellitus, 619 to 624.

. Justus, 624 to 630.

. Honorius, 631 to 653.

. Deusdedit, 655 to 664. . Theodore, 668 to 690.

. Berhtuald, 698 to 731. . Tetwine, 731 to 734.

. Nothelm, 735 to 741.

. Cuthbert, 741 to 758.

. Breogwine, 759 to 762. . denberht, 768 to 790.

. Aithelheard, 790 to 803. . Wulfred, 803 to 829.

. Fleogild, 829 to 830.

. Ceolnoth, 880 to 870.

. Aithelred, 870 to 889.

. Plegemund, 891 to 923. . Aithelm, 923 to 925.

. Wulfelm, 928 to 941,

. Odo, 941 to 958.

. Alsine, 958 to 959.

. Dunstan, 959 to 988.

. Aithelgar, 988 to 989.

. Sigeric, 990 to 995.

. Ailfric, 995 to 1006.

. Ailfeah, or Elphege, 1006 to

1012.

. Lyfing, 1013 to 1020.

thelnoth, 1020 to 1088.

. Eadsige, 1038 to 1050.

. Robert, 1050 to 1052.

. Stigand, 1052 to 1070.

. Lanfranc, 1070 to 1089.

. Anselm, 1098 to 1109.

3. Ralph de Turbine, 1114 to

1122.

. William de Curbellio, 1123

to 1136.

. Theobald, 1189 to 1161. . Thomas Becket,

1162 to

1170.

. Richard, 1174 to 1184. . Baldwin, 1185 to 1190. . Reginald Fitz-Joceline, 1191. . Hubert Walter, 1198 to 1205. . Stephen Langton, 1207 to

1228.

. Richard Wethershed, 1229

to 1231.

. Edmund de Abbendon, 1238

to 1240.

. Boniface of Savoy, 1245 to

1270.

. Robert Kilwarby, 1272 to

12/8.

Peckham,

1292.

1279 to

. Robert Winchelsey, 1298 to

1313.

. Walter Reynolds, 1313 to

1327.

. Simon de Meopham, 1327 to

1333.

. John Stratford, 1333 to

1348.

. Simon Sudbury,

. William Wake,

. John de Ufford, 1848 to 1849, . Thomas Bradwardin, 1349. . Simon Islip, 1349 to 1866. . Simon Langham, 1366 to

1368.

. William Wittlesey, 1868 to

1374,

1875 to

1381.

. William Courtenay, 1381 to

1396.

- Thomas Arundel, 1396 to

1414,

. Henry Chicheley, 1414 to

1448.

. John Stafford, 1448 to 1452. . John Kemp, 1452 to 1454. . Thomas Bourchier, 1454 to

1486.

. John Morton, 1486 to 1500. . Henry Dene, 1501 to 1503. . William Warham, 15038 to

1532.

. Thomas Cranmer, 1533 to

1556.

. Reginald Pole, 1556 to 1558, . Matthew Parker, 1559 to

1575.

. Edmund Grindal, 1575 to

1583.

. John Whitgift, 1583 to

1604.

. Richard Bancroft, 1604 to

1610.

. George Abbot, 1611 to 1633. . William Laud, 1633 to 1645. . William Juxon, 1660 to

16638.

. Gilbert Sheldon, 1663 to

1677.

. William Sancroft, 1677 to

1691.

. John Tillotson, 1691 to

16

: Thomas Tenison, 1694 to

alee 1715 to

1787.

. John Potter, 1787 to 1747. . Thomas Herring, 1747 to

leah

. Matthew Hutton, 1757 to

1758.

. Thomas Secker, 1758 to

1768.

. Frederick Cornwallis, 1768

to 1788.

. John Moore, 1783 to 1805. . Charles

Manners Sutton,

1805 to 1828.

. William Howley, 1828 to

1848.

. John Bird Sumner, 1848 to

1862.

. John Longley, 1862 to 1868. . Archibald Campbell Tait,

1868. (C1 G. #)

CANTERBURY, a province of New Zealand, occupying the central portion of the Middle Island on the eastern side

of the great dividing range of the Southern Alps. It is bounded on the E. by the sea, and on the N., W., and §. by the provinces of Nelson, Westland, and Otago respec- tively. The area of Canterbury is about 8,693,000 acres.

Physically, the province may be divided into two longi- tudinal sections, from north to south. Of these the more westerly, which is considerably the larger, is mountamous,

sloping eastward into downs, while the other consists of a.

plain, covering an area of 2,500,000 acres. To these two main divisions must be added Banks Peninsula, an isolated hilly district on the eastern edge of the plain, jutting into the sea, and with an area of 250,000 acres. Thus the surface of the province is of the most diversified character, varying from the snow-clad peaks of the Southern Alps, which culminate in Mount Cook (13,200 feet), the highest mountain in New Zealand, to the dead level of the plain on which Christchurch stands, only a few feet above the sea. In lakes Canterbury gives place to Otago and Auckland, though Lakes Ohau and Coleridge are large sheets of water, situated amid scenery of the most beautiful description. The rivers of Canterbury are short and rapid, running with a direct course to the sea, and quite useless for purposes of navigation. Apart from the Hurunui and Waitangi, which divide Canterbury on the north-east and south-east from Nelson and Otago respectively, and hence

belong equally to those provinces, the principal rivers of Canterbury are the Ashley, Waimakariri, Rakaia, Ash- burton, and Rangitata. They are all very liable to sudden and disastrous floods. The coast is poorly supplied with good harbours, that of Akaroa, in Banks Peninsula, being the only one safe in all kinds of weather. The harbour of Lyttelton is spacious, but exposed to easterly winds. The capital of Canterbury is Christchurch, and the other principal settlements are Lyttelton and Akaroa already mentioned, Kaiapoi a few miles north of Christchurch, and Timaru, 110 miles south of the latter place.

The downs and great plain of Canterbury are devoid of forests, but the mountain regions and Banks Peninsula yield abundance of excellent timber. The principal trees are the totara (Podocarpus Totara), rimu or red pine (Dacrydium cupressinum), and kahikatea or white pine (Podocarpus dacrydioides). Coal well adapted for house- hold and industrial purposes, though not of the first quality, is found in the Malvern Hills, to the west of Christchurch, and beds of clay ironstone exist in various localities, but are not yet worked. Gold is found in the south-western angle of the province, near the Otago border, though not in sufficient quantity to tempt many to search for it. The wealth of Canterbury consists in its flocks and its yield of agricultural produce. In 1874 the province contained 2,965,000 sheep and 79,000 cattle. The number of agricultural holdings was 3969, and the total area of land under crops of all kinds, including cultivated grass, was about 390,000 acres, of which 112,000 acres were under cereals. The imports of Canter- bury in 1874 amounted to £1,568,826, and the exports to £1,108,531,—by far the greater proportion of the latter consisting of wool, wheat, and oats. The export of phormium fibre (New Zealand flax), from which much was at one time expected, has greatly declined, but on the other hand the export of preserved meats is rapidly rising in importance. The population of the province on 31st December 1874 was 71,316. Besides possessing many good roads, Canterbury is fast being opened up by railways. The first of these, from Lyttelton to Christchurch, a dis- tance of eight miles, was tunnelled at great expense through the hills at the back of the former town. The line has since been continued on both sides of Christchurch—as far south as the River Rangitata, and as far north as the River Ashley, while branch lines have been, or are being, constructed to the settlements of Southbridge, Malvern, and Oxford. The first railway having

been of the 5-feet 3-inch gauge, the main line is for the most part of that width, while the branches are of the narrow gauge of 3

dl feet 6 inches, which is almost universally adopted in other parts of the colony.

The educational system of Canterbury is comprehensive and efficient. In addition to the New Zealand University (an examining institution, supported by the colony as a whole, but having its headquarters at Christchurch), there are in the capital several educational institutions of high standing. Spread over the province there are also, in addition to schools maintained by private enterprise, many Government schools. The number of these on 31st March 1875 was 93. They were conducted by 288 teachers and attended by 12,000 scholars.

Canterbury was founded in December 1850 by an asso- ciation headed by men of influential position in England, and connected with the national church. It was indeed sought for a time to prevent persons not members of the Church of England from settling in Canterbury, but the attempt was a failure. In 1867 the portion of the pro- vince west of the Southern Alps was formed into a separate province, under the name of Westland. Further particulars regarding the history of Canterbury will be found under the heading NEw ZEALAND.

CANTHARIDES, or Spanisu Fires, are the common blister-beetles (Cantharis vesicatoria or Lytta vestcatoria) of European pharmacy. They are bright iridescent golden- green or bluish-coloured insects, with the breast finely punctured and pubescent, head and thorax with a longi- tudinal channel, and elytra with two slightly elevated lines. The insect is from half-an-inch to an inch in length, and from one to two lines broad, the female being broader in the abdomen and altogether larger than the male. It is a native of the South of Europe, being found in Spain, France, Germany, Italy, Hungary, and the South of Russia, and it is also obtained in Siberia. The Spanish fly is also occasionally found in the South of England. The insects feed upon ash, lilac, privet, and jasmine leaves, and are found more rarely on elder, rose, apple, and poplar trees. Their presence is made known by a powerful disagreeable odour, which penetrates to a con- siderable distance; and people sitting under trees on which the insects were feeding

have been known to be injuriously affected by their presence. They are collected for use at late evening or early morning, while in a dull bedewed condition, by shaking them off the trees or shrubs into cloths spread on the ground; and they are killed by dipping them into hot water or vinegar, or by exposing them for some time over the vapour of vinegar. They are then dried and put up for preservation in glass-stoppered bottles; and they require to be very carefully guarded against mites and various other minute insects to the attacks of which they are peculiarly liable. Mr H. Pock- lington has discovered by means of spectroscopic observa- tions that the green colour of the elytra, &c., is due to the presence of chlorophyll; and he has demonstrated that the variations of the spectral bands are sufficient, after the lapse of many years, to indicate with some certainty the kind of leaves on which the insects were feeding shortly before they were killed. Cantharides owe their value to the presence of a peculiar chemical principle, to which the name cantharidin has been given. It is most abundant in large full-grown insects, while in very young specimens no cantharidin at aj] has been found. From about one-fourth to rather more than one- half per. cent. of cantharidin has been obtained from different samples; and it has been ascertained that the hard parts of the insect contain about six times more of the active principle than the soft parts. Cantharidin crystallizes in colourless four-sided prisms; in solution or prepared with lard it produces very powerful vesication, and taken internally it is a vivlent irritant poison.

Spanish flies are most largely used as an externa] applica- |

tion, being but rarely taken internally. They are applied as a topical stimulant for indolent ulcers, as rubefacients, and especially for blistering in inflammatory diseases. Taken internally in the form of tincture, they have been used in dropsy, in paralysis of the bladder, and for pro- ducing aphrodisiacal effects. They have also been employed in lepra and other skin diseases ; and they have had a re- putation in hydrophobia and other nervous disorders which they do not deserve. — ; d

A very large number of other insects belonging to the family Cantharide possess blistering properties owing to their containing cantharidin. Of these the most remark- able is the Telini fly of India (Afylabris cichorit), the rang

of which extends from Italy and Greece through Egypt and Central Asia as far as China. It is very rich in cantharidin, yielding fully twice as much as ordinary cantharides. Several green-coloured beetles are, on account of their colour, used as adulterants to cantharides, but they are very easily detected by examination with the eye, or, if powdered, with the microscope.

CANTICLES. The book of Canticles, or the Song of Solomon, is called in Hebrew Zhe Song of Songs (that is the choicest of songs), or, according to the full title which stands as the first verse of the book, Zhe choicest of the songs of Solomon. In the Western versions the book holds the third place among the so-called Solomonic writings, following Proverbs and Ecclesiastes. In Hebrew Bibles it stands among the Megillot, the five books of the Hagiographa which have a prominent place in the Syna- gogue service. In printed Bibles and in German MSS. it is the first of these because it is read at the Passover, which is the first great feast of the sacred year of the Jews. Spanish MSS., however, place it second among the Megillot, giving the precedence to Ruth.

No part of the Bible has called forth a greater diversity of opinions than the Song of Solomon, and that for two reasons. In the first place, the book holds so unique a position in the Old Testament, that the general analogy of Hebrew literature is a very inadequate key to the verbal difficulties, the artistic structure, and the general conception and purpose of the poem. In point of language it is most nearly akin to parts of the Bible which, like the song of Deborah, belong to Northern Israel, agreeing with these not only in individual traits but in the general characteristic that the departures from ordinary Hebrew are almost always in the direction of Aramaic. Many forms unique in Biblical Hebrew are at once explained by the Aramaic dialects, but not a few are still obscure. The philological difficulties of the book are, however, less fundamental than those which lie in the unique character of the Song of Solomon in point of artistic form, and in the whole atmosphere of thought and feeling in which it moves. ven in these respects it is not absolutely isolated. Parallels to the peculiar imagery may be found in’ the book of Hosea, in a few passages of the earlier chap- ters of Proverbs, and above all in the 45th Psalm 3 but such links of union to the genera] mass of the Old Testa: ment literature are too slight to be of material assistance in the solution of the literary problem of the book. Here,

again, as in the lexical difficulties already referred to, we are tempted or compelled to argue from the distant and insecure analogy of other Eastern literatures, or are thrown back upon traditions of uncertain origin and ambiguous authority.

The power of tradition has been the second great source of confusion of opinion about the Song of Solomon. To tradition we owe the title, which apparently indicates Solomon as the author and not merely as the subject of the book. The authority of titles in the Old Testament

(see BrsBue) is often questionable, and in the present case it is certain on linguistic grounds that the title is not from the hand that wrote the poem; while to admit that it gives a correct account of the authorship is to cut away at one stroke all the most certain threads of counection between the book and our historical knowledge of the Old Testament people and literature. We have already noted that, when judged by comparison with other parts of the Bible and by its Araniaic texture, the dialect points to a northern origin of the poem. It is to Northern Israel, moreover, that the whole loca] colouring and scenery belong ; so that even those commentators who stil] make Solomon the hero and author of the book are compelled to represent him as laying aside his kingly pomp to wander with a peasant girl through the gardens and forests of Galilee. The untenableness of this last attempt to rescue the authority of the title wil] appear as we proceed.

To tradition, again, we owe the still powerful prejudice in favour of an allegorical interpretation, that is, of the view that from verse to verse the Song sets forth the history of a Spiritual and not merely of an earthly love. To apply such an exegesis to Canticles is to violate one of the first principles of reasonable interpretation. True allegories are never without internal marks of their allegorical design. The language of symbol is not so perfect that a Jong chain of spiritual ideas can be developed without the use of a single spiritual word or phrase ; and even were this possible it would be false art in the allegorist to hide away his sacred thoughts behind a screen of sensuous and erotic imagery, so complete and beautiful in itself as to give no suggestion that it is only the vehicle of a deeper sense. Apart from

tradition no one, in the present state of exegesis, would dreain of allegorizing poetry which in its natural sense is so full of purpose and meauing, so apt in sentiment, and so perfect in imagery as the lyrics of Canticles. We are not at liberty to seek for allegory except where the natural sense Is incomplete. This is not the case in the Song of Solomon. On the contrary, every form of the allegorical interpretation which has been devised carries its own con- demnation in the fact that it takes away from the artistic unity of the poem and breaks natural sequences of thought.! The allegorical interpretation of the Song of Solomon had its rise in the very same conditions which forced a deeper sense, now universally discarded, upon so many other parts of scripture. Yet strangely enough there is no evidence that the Jews of Alexandria extended to the book their favourite methods of interpretation. The arguments which have been adduced to prove that the LXX. translation implies an allegorical exegesis are inadequate ; and Philo does not mention the book at all. Nor is there any allusion to Canticles in the New Testament. The first trace of an allegorical view identifying Israel with the spouse appears to be in the Fourth Book of Ezra, near the close of the Ist Christian century (v. 24, 26; vii. 26). Up to this time the canonicity of the Canticles was not unquestioned ; and the final decision as to the sanctity of the book, so energetically carried through by R. Akiba, when he declared that “ the whole world is not worth the day on which the Song of Songs was given to Israel; for all the scriptures (or Hagiographa) are holy, but the Canticles most holy,” must be understood as being at the same time a victory of the allegorical interpretation over the

- An argument for the allegorical interpretation has been often drawn from Mahometan mysticism,—from the poems of Hafiz, and the songs still sung by dervishes. See Jones, Poéseos Asiaticce Com., pt. iii, cap. 9; Rosenmiiller’s remarks on Lowth’s Prelectio xxxi., and Lane’s Modern ligyptians, ch, xxiv. But there is no true analogy between the Old Testament and the pantheistic mysticism of Islam, and there is every reason to believe that, where the allegory takes a form really analogous to Canticles, the original sense of these songs was purely erotic.

last remains of a view which regarded the poem as simply erotic.}

The form in which the allegorical theory became fixed in the synagogue is contained in the Midrash Chazita and in the Targum, which is a commentary rather than a translatiou. ‘The spouse is Israel, her royal lover the divine king, and the poem is explained as tracing the great events of the people’s history from the Exodus to the Messianic glory and final restoration.?

The authority of Origen, who, according to Jerome, surpassed himself in his commentary of ten volumes on this book, established the allegorical theory in the Christian church in the two main forms in which it has since prevailed. The bridegroom is Christ, the bride either the church or the believing soul. The latter con- ception is, of course, that which lends itself most readily to purposes of mystical edification, and which has made Canticles the manual in all ages of a wide-spread type of religious contemplation, But the other view, which identifies the bride with the church, must be regarded as the standard of orthodox exegesis. Of course the alle- gorical principle admitted of very various modifications, and readily adapted itself to new religious developments, such as the rise of Mariolatry. Within the limits of the orthodox traditions the allegory took various colours, accord- ing as its mystical or its prophetical aspect was insisted on. Among medieval commentators of the former class S. Bernard holds a pre-eminent place; while the second class is represented by Nicolaus de Lyra who, himself a converted Jew, modified the Jewish interpretation so as to find in the book an account of the processus ecclesvce under the Old and New Testaments. The prophetic exegesis reached its culminating point in the post-Refor- matiun period, when Cocceius found in the Canticles a complete conspectus of church history. But the relaxa- tion of traditional authority opened the door to still stranger vagaries of interpretation. Luther was tempted to understand the book of the political relations of Solomon and his people. Others detected the loves of Solomon and Wisdom—a view which found a supporter in Rosenmiiller even iu the present century; alchemists thought of Solomon’s researches in their art ; and Puffen- dorf, by the aid of Egyptian hieroglyphics, referred the whole to the grave of Christ.

The history of the literal interpretation begins with the great " commentator" of the Syrian Church, Theodorus of Mopsuestia (died 429), who condemned equally the attempt to find in the book a prophecy of the blessings given to the church, and the idea even at that time expressed in some quarters that the book is immoral. Theodorus regarded the Canticles as a poem written by Solomon in answer to the complaints of his people about his Egyptian marriage ; and this was one of the heresies charged upon him after his death, which led to his condemnation at the second council of Constantinople (553 a.p.) A literal interpretation was not again attempted till in 1544 Chateillon (Castellio or Castalion) lost his regency at Geneva for proposing to expel the book from the canon as impure, Grotius (Annot. in V. T., 1644) took up a more moderate position. Without denying the possibility of a secondary reference designed by Solomon to give his poem a more permanent value, he regards the Canticles as primarily an dapicris (conjugal

1 The chief passages of Jewish writings referring to this dispute are Mishna Jadaim iii. 5 and Tosifta Sanhedrin xii. For other passages see Gritz's Commentary, p. 115, and in control of his criticism the introduction to the commentary of Delitzsch.

? The text of the Targum in the Polyglotts and in Buxtorf's Rabbinic Bible is not complete. The complete text is given in the Venice clitions, and in Lagarde's Magiographa Chaldaice, Lipsie, 1873. The Polyglotts add a Latin version.

prattle) between Solomon and Pharaoh's daughter. The distinction of a primary and secondary sense gradually became current not only among the Remonstrants, but in England (Lightfoot, Lowth) and even in Catholic circles (Bossuet, 1693). In the actual understanding of the book in its literal sense no great progress was made. Solomon was still viewed as the author, and for the most part the idea that the poem is a dramatic epithalamium was borrowed from Origen and the allegorists, and applied to the marriage of Pharaoh's daughter. To reconcile this idea with the fact that the Song is full of peasant life, a most artificial style of composition had to be assumed. In Bossuet's once celebrated theory, to which Lowth also inclined, the

epithalamium is made to extend over seven days, and each morning the bridegroom, who is fictitiously represented as a shepherd, rises early to pursue his rustic toil, leaving his bride alone till the evening, The seventh day is the Sabbath, when the bride and bridegroom appear together (ch. viii.). From Grotius to Lowth the idea of a typical reference designed by Solomon himself appears as a mere excrescence on the natural interpretation, but as an excrescence which could not be removed without perilling the place of Canticles in the canon, which, indeed, was again assailed by Whiston in 1723. But in his notes on Lowth's lectures, J. D. Michaelis, who regarded the poem as a description of the enduring happiness of true wedded love long after marriage, proposed to drop the allegory altogether, and to rest the canonicity of the book, as of those parts of Proverbs which treat of conjugal affection, on the moral picture it presents (1758). The hints which Michaelis offered for the interpretation of the book on this principle showed a singular want of delicacy; but the moralizing rationalism of the period was not to be shocked by any impropriety which was atoned for by the "important moral tendency " of the book as a whole ; and the principle laid down by the critic of Gottingen was carried out in a variety of hypotheses, each, as Herder com- plained, more improper than the other. A real step, however, was made in 1771 by J. T. Jacobi, who distin- guished the husband of the Shulamite from Solomon, and representing the latter as a baffled tempter, prepared the way for the theory now most current among critics.

Then came Herder's exquisite little treatise on Solomon's Songs of Love, the Oldest and Sweetest of the East (1778). Herder possessed that delicacy of taste and sympathetic poetical genius which the school of Michaelis altogether lacked. Delighting in the Canticles as the transparently natural expression of innocent and tender love, he was indignant at an exegesis which, in a supposed apologetical interest, was content to establish a didactic object for the book by the aid of hypotheses which sullied the purity and profaned the sanctity of the utterances of genuine human affection. If the songs of Canticles were allowed to speak for themselves, they would need no theory to explain their meaning, no apology to justify their morality, no fiction of a typical or didactic purpose to commend them as pure, lovely, and worthy of a place in a holy book. Is not true love itself holy? for love is:the fountain of all man's bliss, and all love, like goodness

and truth, is at root one. Herder justifies these views in a sort of esthetical commentary, which triumphantly vindicates the naive innocence and genuine delicacy of the love which the book displays. But his sympathy with the sentiment of the Canticles was truer than his eye for details; and the idea that the poem is simply a sequence of independent songs without inner unity, grouped so as to display various phases and stages of love in a natural order, culminating in the placid joys of wedded life, was in some respects a retrograde Step.

Since Herder there has been no attempt of any intrinsic

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value to rehabilitate the allegorical theory, or the theory of a second sense consciously followed by the author. Even those commentators who, like Delitzsch (1851 and 1875) or his followers Zéckler (1868) and Kingsbury (in the Speaker's Commentary, 1873), assume that Canticles owes its place in the canon to the typical importance of Solomon in the history of salvation do not venture to make this idea an element in the exegesis.

In determining the literal sense recent scholars have followed three main courses. The theory of Herder, which refuses to acknowledge any continuity in the book, was accepted by Eichhorn on the part of scholars, and with some hesitation by Goethe on the part of the poets. Commentaries based on this view are those of Dopke (1829), Magnus (1842), Noyes (1846); and it has also enjoyed the critical authority of De Wette and Diestel. A second view which is at present dominant recognizes in the poem a more or less pronounced dramatic character, and following Jacobi distinguishes the shepherd, the truc love of the Shulamite, from King Solomon, who is made to play an ignominious part. Propounded in last century by Stéudlin (1792) and Ammon (1795), this view was energetically carried out by Umbreit (1820), and above all by Ewald, whose acuteness gave the theory a new develop- ment, while his commanding influence among Hebrew scholars acquired for it general recognition. Ewald assumed a.very simple dramatic structure, and did not in his first publication (1826) venture to suppose that the poem had ever been acted on a stage. His less cautious followers have

been generally tempted to dispose of difficulties by introducing more complicated action and additional inter- locutors (so, for example, Hitzig, 1855; Ginsburg, 1857 ; Renan, 1860); while Béttcher (1850) did his best to reduce the dramatic exposition to absurdity by introducing the complexities and stage effects of a modern operetta into a drama of the 10th century before Christ. The third view is that of Delitzsch and his followers, who also plead for a dramatic form—though without supposing that the piece was ever acted—but adhere to the traditional notion that Solomon is the author, who celebrates his love to a peasant maiden, whom he made his wife, and in whose company the proud monarch learned to appreciate the sweetness of a true affection and a simple rustic life.

In comparing thesc various views with what is found in the book itself, the unity of the poem has first to be con- sidered. A certain external unity, not merely in the general tone and colour of the language and in the repetition of similar sentences by way of refrain, but also in the order of the matter, is not denied by the followers of Herder, who, however, maintain that the constituent lyrics were originally distinct poems, and that they owe all appearance of continuity to the arrangement and interpolations of an editor. The correctness of this view would be positively demonstrated if its adherents were able, without arbitrary treatment of the text, to digest the Canticles into a series of lyrics, each complete in itself and independent of the rest. But no commentator has hitherto done this in a satisfactory way, and the most ingenious attempts—espe- cially that of Magnus—involve the assumption that the editor often displaced part of a song, sacrificing the unity of the original lyrics to an artificial composition of the whole. It is plain that, if assumptions of this kind are to be made at all, they may also be used in favour of a theory of original unity, marred by subsequent misconception.

Have, then, the supporters of the continuity of the poem come nearer to a positive proof of their position? Our starting-point, in looking at this question, is the fact that the composition takes for the most part the form of dialogue. Even if the book is to be broken up into dis- tinct lyrics, it must be granted that sevcral of these pieces

have an amoebean structure. Is it possible to show that throughout the book the same persons reappear in these lyrical dialogues? And, again, since the scene of the dialogue certainly varies in different parts of the book between the city of Jerusalem and the open country of Northern Israel, is it possible to find in the poem itself a thread of narrative sufficient to account for the change of place? The centre of attraction is throughout a female figure, and the unity of this figure is the chief test of the unity of the book. In the long canto, i. 1-1i. 7, the heroine appears in a royal palace (i. 4) among the daughters of Jerusalem, who are thus presumably ladies of the court of Zion. At i. 9, an additional interlocutor is introduced, who is plainly a- king, and apparently Solomon (i. 9,12). He has just risen from table, and praises the charms of the heroine with the air of a judge of beauty, but without warmth. He addresses her simply as “my friend” (not as Euglish version, “my love ”). The heroine on the contrary is passionately in love, but nothing can be plainer than that the object of her affection is not the king. She is not at home in the palace, for she explains (i. 6) that she has spent her life as a peasant girl in the care of vineyards. Her beloved, whom she knows not where to find (i. 7), but who lies constantly on her heart and is cherished in her bosom like a spray of the sweet henna flowers which Oriental ladies delight to wear (i. 13, 14), is like herself a peasant—a shepherd lad (i. 7) — with whom she was wont to sit in the fresh greenwood under the mighty boughs of the cedars (i. 16, 17). Even before the king’s entrance the ladies of the court are impatient at so silly an affection, and advise her, “if she is really so witless,” to begone and rejoin her plebeian lover (i. 8). The idea that from i. 12 onwards the heroine exchanges compliments with the king is inconsistent with what precedes, and psychologically impossible in view of ii. 5, 6, where her self-control, strung to the highest pitch as

she meets the compliments of the king with reminiscences

of her absent lover, breaks down in a fit of half delirious sickness. The only words directed to the king are those of i. 12, which, if past tenses are substituted for the pre- sents .of the English version, contain a pointed rebuff. Finally, ii. 7 is, on the plainest translation, a charge not to arouse love till it please. The moral of the scene is the spontaneity of true affection!

Nothing can be plainer than that the motive of this .

piece is dramatical and not lyrical. Itiis a complete scene, but not a complete poem, and if it is not a fragment, we must expect to find the denouement at the close of the book. Now, at viii. 5, a female figure advances leaning upon her beloved, with whom she claims inseparable union, —“‘for love is strong as death, its passion inflexible as the grave, its fire a divine flame which no waters can quench or floods drown. Yea, if a man would give all his wealth for love he would only be contemned.” This is obviously the sentiment of ii, 7, and the suitor, whose wealth is despised, must almost of necessity be identified with the king of chapter i, if, as seems reasonable, we place viii. 11, 12 in the mouth of the same speaker —“ King Solomon has vineyards which bring him a princely revenue, and enrich even the farmers. Let him and them keep their wealth ; my vineyard is before me” (i.¢, I possess it in present fruition). The last expression is plainly to be con nected with i.6. But this happiness has not been reached without a struggle. The speaker has proved herself an a

1 In comparing these remarks with the text, the English reader must remember that the authorized version is influenced in its renderings by a theory of the book. The translation of ii. 7 is quite false. The second half of i. 18 is simply “ which rests upon my heart ;” i, 4

should probably run, ‘‘ Draw me after thee, let us flee 771.9 to my horses.”

especially of the book of Job, leads us to expect.

CARTICLES

impregnable fortress (ver. 10), and, armed only with her own beauty and innocence, has been in his eyes as one that found peace. The English version is quite arbitrary in rendering favour for peace. The sense is that, like a virgin fortress, she has compelled her assailant to leave her in peace. To these marks of identity with the heroine of ch. i. are to be added that she appears here as dwelling in gardens, there as a keeper of vineyards (i. 6, and viii. 13), and that as there it was her brethren that prescribed her duties, so here she apparently quotes words in which her brothers, while she was still a child, speculated as to her future conduct and its reward (viii. 8, 9).

If this analysis of the commencement and close of the book is correct, it is certain that the poem is in a sense dramatic, that is, that it uses dialogue and monologue to develop a story. The heroine appears in the opening scene in a difficult and painful situation, from which in the last chapter she is happily extricated. But the dramatic progress which the poem exhibits scarcely involves a plot in the usual sense of that word. The words of viii. 9, 10 clearly indicate that the deliverance of the heroine is due to no combination of favouring circumstances, but to her own inflexible fidelity and virtue. In accordance with this her réle throughout the poem is simply a steadfast adherence to the position which she takes up in the opening scene, where she is represented as concentrating her thoughts on her absent lover with all that stubborn force of will which is characteristic of the Hebrews, and as frustrating the advances of the king by the mere naive intensity of pre-occupied affection. This conception of the principal part in the poem implies a very elementary amount of dramatic skill. But it is just the conception which the analogy of Hebrew poetry in general, and The characters of Job and his friends are carefully dis- criminated. But there is no action and reaction between the speakers. Each adheres to his own vein of thought almost untouched by what the others say, and the skill of the author appears only in the variety of poetical develop- ments in which the fundamental idea of each character expresses itself. The reader who, with this analogy to guide him, runs through the parts of Canticles which must be assigned to a female speaker, cannot fail to see that the réle indicated at the beginning and close of the book is carried out with perfect consistency.

The constant direction of the maiden’s mind to her true love is partly expressed in dialogue with the ladies of the court (the daughters of Jerusalem), who have no dramatic individuality, and whose only function in the economy of the piece is to give the heroine opportunity for a more varied expression of her feelings. Ini. 8 we found them contemptuous. In chapter ii. they appear to be still indifferent ; for when the heroine relates a dream in which the dull pain of separation and the uneasy consciousness of confinement and danger in the unsympathetic city disappear for a moment in imagined reunion with her lover, they are either altogether silent or reply only by taking up a festal part song describing the marriage pro- cession of King Solomon (iti. 6-11), which stands in jarring contrast to the feelings of the maiden.! A second dream (v. 2-8), more weird and melancholy, and con-

structed with that singular psychological felicity which characterizes the dreams of the Old Testament, gains more sympathy, and the heroine is encouraged to describe her beloved at large (v. 10-vi. 3). The structure of these

1 Ewald and others make this song a distinct scene in the action of the poem, supposing that the author here exhibits the honourable form of espousal by which Solomon thouglit to vanquish the scruples of the damsel. This view, however, seems to introduce a complication foreign to the plan of the book.

dialogues is so simple, and their purpose is so strictly limited to the exhibition of the character and affection of the maiden, that it is only natural to find them supple- mented by a free use of pure monologue, in which the heroine recalls the happiness of past days, or expresses her rising hope of reunion with her shepherd, and restora- tion to the simple joys of her rustic life. The vivid reminiscence of ii. 8-17 takes the form of a dialogue within the main dialogue of the poem, a picture within a picture—the picture of her beloved as he stood at her window in the early spring time, and of her own merry heart as she laughingly answered him in the song with which watchers of the vineyards frighten away the foxes. It is, of course, a fault of perspective that this reminiscence is as sharp in outline and as strong in colour as the main action, But no one can expect perspective in such early art, and recollection of the past is clearly enough separated from present reality by ii. 16, 17.2 The last monologue (vii. 10-viii. 3), in which the hope of immediate return with her lover is tempered by maidenly shame, and a maiden’s desire for her mother’s counsel, is of special value for a right appreciation of the psychology of the love which the poem celebrates, and completes a picture of this flower of the northern valleys,’ which is not only firm in outline but delicate in touch. The subordinate action which supports the portraiture of the maiden of Galilee is by no means easy to understand. It may be regarded as certain that, in iv. 1-7, the king is again introduced, and describes the personal charms of the heroine. His language is still that of cold admiration, suitable enough to the character of Solomon, and strongly contrasted with the beautiful and passionate outburst which follows

(iv. 8- v. 1), and which suits no lips but those of the true lover. The latter. passage offers great difficulties on any theory which finds a strict drama in Canticles. To sup- pose that the shepherd appears in Jerusalem at so early a point in the action is not plausible, and it seems equally violent to assume with Ewald that the whole passage is to be put in the mouth of the heroine rehearsing words of her beloved. Perhaps the plan of the poem did not forbid the author to place a song of the absent shepherd in juxtaposition with the words of Solomon so as to bring out the contrast between mere sensual admiration and genuine passion. But the passage presents on any theory diffi- culties of detail which no critic has satisfactorily removed.

We come next to chapter vi, which again sings the praises of the heroine, and takes occasion in this connection to introduce, with the same want of perspective as we observed in ch, ii, a dialogue descriptive of Solomon's first meeting with the maiden. We learn that she was an inhabitant of Shulem or Shunem in Issachar, whom the king and his train surprised in a garden on the occasion of a royal progress through the north. Her beauty drew from the ladies of the court a cry of admiration. The maiden shrinks back with the reply —"I was gone down into my garden to see its growth….. I know not how my soul hath brought me among the chariots of princes ;" but she is commanded to turn and let herself be seen in spite of her bashful protest,—' Why do ye gaze on the Shulamite as at a dance of Mahanaim (a spectacle)."* Now the person in whose mouth this relation is placed must be an eye-witness of the scene, and so none other than the king. But in spite of the verbal repetition of several of the figures of ch. iv., which,

2 "My beloved is mine, and I am his, who feedeth his flock among lilies. Before the day cool and the shadows fly, haste thee hither, my love, . . . over the mountains of separation."

8 The rose (narcissus) of Sharon (ii. 1) must be placed in the north- ern Sharon between Tabor and the Lake of Tiberias.—Onom. Sacra, ed. Lagarde, pp. 154, 296.

4 The purport of these verses was divined by Ewald.

if not due to corruption of the text, is probably a mere artifice to express the identity of the speaker in the two passages, the tone in which the king now addresses the Shulamite is quite changed. She is not only beautiful but terrible, her eyes trouble him, and he cannot endure their gaze. She is unique among women, the choice and only one of her mother. In this change of language Ewald and others recognize only a greater intensity of sensuous admiration, and accordingly assume that the king continues, in vii. 1-9, to describe the charms of the maiden, and to express his sensual desires in the shameless language of a voluptuary. But how can the king hold such language to a woman whose eyes he is afraid to face, and whom he addresses in chapter vi. with unmistakably respectful admiration ? Moreover, the figure described in chapter vii. appears to be displayed in the dance ; and, like the daughter of Herodias in the gospels, sheis a lady of princely lineage. Again, if the last words of the king are a fresh attack expressed in language which under the circumstances is positively brutal, the maiden's immediate outburst of joyful hope (vii. 10) is singularly out of place, and the turning- point of the story is left an absolute blank. The unity of action can only be maintained by ignoring vil, 1-9, and taking the words of Solomon in chapter vi. in their obvious sense as implying that the king at length recognizes in the maiden qualities of soul unknown in the harem, a character which compels respect, as well as a beauty that inflames desire. The change of feeling which was wrought in the daughters of Jerusalem in the previous scene now extends to Solomon himself, and thus the glad utterances of vii. 10, seg., have a suflicient motive, and the denouement is no longer violent and unprepared.

It is remarkable that the only passage which can hardly be freed from a charge of sensuality hangs so entirely loose from the proper action of the poem. Some critics (especially Hitzig) have seen similar phenomena in other parts of the book, and have thought themselves able to show that a sort of by-play exhibiting the sensual love of the harem runs through the whole action of the piece. The various hypotheses by which this idea has been carried out are all far too arbitrary to carry conviction, and an unprejudiced analysis justifies the persuasion that the dramatic structure of the book is of the very simplest kind, hardly rising above ameebean lyric, and affording no room for elaborate by-play or other complications. The nodus of the action is fully given in chapter i., the final issue in chapter viii.

The solution lies entirely in the character and constancy of the heroine, which prevail, in the simplest possible way, first over the ladies of the court and then over the king. There is nothing extravagant in the progress of the action ; for though the king has never before conceived the idea that any woman could refuse a place in his harem, his admiration does not reach the pitchof passion, and his sen- suousness nowhere degenerates into grossness, except in the imagination of commentators, who have been apt to detect a double entendre in every passage they did not understand.

A more legitimate explanation of difficulties seems, at least in some cases, to lie in the state of the text. When even Ewald finds a voluptuous idea in iy, 6, it ought to be observed that the words in question, which seriously inter- rupt the sense, were no part of the original LXX., or of the text of Theodotion, but were subsequently added from the version of Aquila, which substantially represents the Mas- soretic text. Yet the false reading has established itself so firmly in MSS. of the LXX. that our knowledge of the interpolation is almost accidental, and we have no certainty that other interpolations of the same kind have not been niade without our knowledge. In these circumstances the argument drawn from the versions for the purity of the Hebrew text has no great value. On the other hand the

a priort probability of interpolations and corruptions is very great in a poem like Canticles, passages froin which were used among the Jews as amatory songs. at least till the close of the lst Christian century.1 Of course the supremacy of the allegorical exegesis fixed the text, but naturally tended to fix it in its longest and presumably most interpolated form. Thus it is not inconceivable that the sensual passage in chapter vii., which, if genuine, can only be an interlude of some unexplained kind, is nothing more than the insertion of an early reader a propos of the mention of the dance of Mahanaim.

Whatever difficulties still remain in the Canticles, it is at least no arbitrary construction which has convinced the majority of critics that an internal dramatic unity runs through the book, and that Solomon is not the true love of the Shulamite. The assertion of Delitzsch that the shepherd is a mere imaginary Doppelganger of Solomon is even more violent than the opposite

attempt of Gritz to eliminate the king altogether and reduce the dramatic action to a narrative of idyllic love told by the Shulamite (Das Salomonische Hohelied, Vienna, 1871). And it is a special merit of the current theory that it at once places the authorship and purpose of the book in a strong his- torical light. A poem in the northern dialect, with a northern heroine and scenery, contrasting the pure sim- plicity of Galilee with the corrupt splendour of the court of Solomon, is clearly the embodiment of one phase of the feeling which separated the ten tribes from the house of David. The kingdom of Solomon was an innovation on old traditions partly for good and partly for evil. But novelties of progress and novelties of corruption were alike distasteful to the north, which had long been proud of its loyalty to the principles of the good old times.2 The conservative revolution of Jeroboam was in great measure the work of the prophets, and must therefore have carried with it the religious and moral convictions of the people. An important element in these convictious, which still claims our fullest sympathy, is powerfully set forth in the Canticles, and the deletion of the book from the cauon, providentially averted by the allegorical theory, would leave us without a most necessary complement to the Judean view of the conduct of the ten tribes which we get in the historical books. Written in a spirit of protest against the court of Zion, and probably based on recollection of an actual occurrence, the poem cannot be dated long after the death of Solomon. ‘The mention of Tirzah in vi. 4 points to the brief period when that city was the capital of the dynasty of Baasha, for Tirzah seems never to have recovered the siege and conflagration in which Yimri perished. Thus the book must have been written about the middle of the 10th century B.c. The attempt of Gratz to bring down the date to the Grecian period (about 230 B.c.) is ingenious but nothing more,

Literature. he leading commentators have been already men- tioned. A copious Elenchus interpretum is given in Rosenmiiller’s Seholia. More recent works are enumerated by Gritz and Zéckler, and Green’s translation of Zéckler adds a list of English and Ameri- can expositors. Specimens of the cxegesis of various periods are given in the elaborate introduction to Dr Ginsburg’s comnicntary. While the thoroughly perverse theory of Delitzsch and Ziéckler is represented in English by translations, and by Mr Kingsbury in the Speaker’s Commentary, the admirable exposition of Ewald in his

Diehter des Alten Bundes (2d ed. 1867) remains untranslated. This ig the more to be regretted, that Renan's French translation and Etude, and Dr Ginsburg's English commentary, represent extreme forms of the modern theory. Réville's sketch of the book, of which an English translation appcared in 1873, is slight, but less artificial, The student of the original cannot dispense with Ewald, Hitzig, Delitzsch, and Magnus. (W.B. 8S.)

1 The analogy of Arabic literature is instructive. Gf. Néldeke's Bettrige zur Kenntniss der Poesie der Araber (1864), pp. vi. 8qq.

- Cf. Wellhausen on 2 Sam. xx. 18,19, whcre the Hebrew text must be corrected by the LXX,

CANTON 37

CANTON, or more correctly Kwanc-cHow Foo, is a large and populous commercial city of China, in the pro- vince of Kwang-tung, situated on the eastern bank of the Pearl River, which at Canton is somewhat broader than the Thames at London Bridge, and is navigable 300 miles farther into the interior. The Pearl River has an addi- tional course of 80 miles to the sea, the first part of which lies through a rich alluvial plain. Beyond this rises a range of hills terminating in abrupt escarpments along the course of the river. The bold shore thus formed com- presses the stream at this point into a narrow pass, to which the Chinese have given the name of Hu-mun, or Tiger's mouth. This the Portuguese translated into Boca Tigre, whence the designation of "the Boque," by which it is commonly known among Europeans. When viewed from the hills on the north, Canton appears to be little

eure dp me dhos ||

1. Parade Ground. 9. Governor's Yamun,

2. Pagoda. 10. Temple of the Five Genii 8. British Consulate. 11. Confucian College.

4. Prefect's Yamun, 12. Rice Controller's Yamun. 5. Treasurer's Yamun. | 13. Examination Hall

6. City Temple. 14, Cathedral.

7. Confucian College. 15. Emperor’s Temple.

8. Mosque, A to R, Gates.

more than an expanse of reddish roofs relieved by a few large trees,—two pagodas shooting up within the walls, and a five-storied tower near the northern gate, being the most conspicuous objects. These hills rise 1200 feet above the river. Little or no vegetation is seen on them; and their acclivities, covered for miles with graves and tombs, serve as the necropolis of this vast city. Three or four forts are built on the points nearest the northern walls. Facing the city on the opposite side of the river is the suburb and island of Honan. The part of Canton enclosed by walls is about six miles in circumference, and has a partition wall, running east and west, and dividing the city into two unequal parts. The northern and larger division is called the old, and the southern the new city. Including the suburbs, the city has a circuit of nearly ten miles, The houses stretch along the river for four miles, and the banks are almost entirely concealed by boats and rafts. The walls of the city are of brick, on a foundation of sandstone and granite, are 20 feet thick, and rise to an average height of 25 feet. On the north side the wall rises to include a hill which it there meets with, and on the other three sides the city is surrounded by a ditch, which is filled by the rising tide, when, for a time, the revolting mass of filth that lies in its bed is concealed from view.

gates, through which boats pass from east to west across the new city. The gates are all shut at night, and in the day time a guard is stationed at them to preserve order. The streets, amounting in all to upwards of 600, are long, straight, and very narrow. They are mostly paved and are not as dirty as those of some of the other cities in the empire ; in fact, considering the habits of the people and the inattention of Government to these matters, Canton may be said to be a well-governed and comparatively cleanly city. The houses are in general small, seldom consisting of more than two stories, the ground floor serving as a shop in which goods are exhibited for sale, and the rest of the house, with the court behind, being used as a warehouse. Here are to be found the productions of every quarter of the globe; and the merchants are in general extremely attentive and civil. The Chinese are remarkably expert

‘inen of business, and are generally of the most assiduous

habits.

The temples and public buildings of Canton are numerous, but none of them present features worthy of special remark. There are two pagodas near the west gate of the old city, and 124: temples, pavilions, halls, and other religious edifices within the city. One of the pagodas called the Awangtah, or Plain Pagoda, is a Maho- metan mosque, which was erected by the Arabian voyagers who were in the habit of visiting Canton about ten centuries ago. It rises in an angular tapering tower to the height of 160 feet. The other is an octagonal pagoda of nine stories, 170 feet in height, and was first erected more than thirteen centuries ago. A Buddhist temple at Honan, opposite the foreign factories, and named in Chinese Hai-chwang-sze, or the Temple of the Ocean Banner, is one of the largest in Canton. Its grounds, which cover about seven acres, are surrounded by a wall, and are divided into courts, gardens, and a burial-ground, where are de- posited the ashes of priests, whose bodies are burned. There are about 175 priests connected with this establish- ment. Besides the Hat-chwang-sze the most noteworthy temples in and about the city are those of the Five Hundred Gods, and of Longevity, both in the western suburbs; the Tartar City Temple, and the Temple of the Five Genii. The number of priests and nuns i Canton is not exactly known, but they probably exceed 2000, nine-tenths of whom are Buddhists. The temples are gloomy-looking edifices. The areas in front of them are ustally occupied by hucksters, beggars, and idlers, who are occasionally driven off to make room for the mat- sheds, in which the theatrical performances got up by the wealthy inhabitants are acted. The principal hall, where the idol sits enshrined, is lighted only in front, and the inner apartments are inhabited by a class of men almost as senseless as the idols they serve.

The residences of the high officers of government are all within the walls of the old city. The residence of the governor-general used to be in the south-west corner of the new city, but it was utterly destroyed by the bombard- ment in 1856. The site remained desolate until 1860, when it was taken possession of by the French authorities, who have erected a Roman Catholic Cathedral upon it. The residence of the commander-in-chief is in

the old city, aud is said to be one of the best houses in Canton. There are four prisons in the city, all large edifices. For the space of four or five miles opposite Canton boats and vessels are ranged parallel to each other in such close order that it resembles a floating city; and these marine dwellings are occupied by numerous families, who reside almost constantly on the water. In the middle of the river lie the Chinese junks, some of them of from 600 to 1000 tons burden,

There are twelve outer gates— |! which trade to the north and to the Strait Settlements.

four of which are in the partition wall, and two water | The various guilds and associations among the people and

38

for its own particular use.

CAN

the merchants from other provinces have public halls each The number of these build- ings is not less than 150. Canton was long the only seat of British trade with China, and was no doubt fixed upon by the Chinese Government for the European trade, as

being the most distant from the capital Peking.

Formerly only a limited number of merchants, called the hong or security merchants, were allowed to trade with

foreigners. ‘They were commonly men of large property,

and were famed for integrity in their transactions.

foreign cargoes passed through the hands of these ee They

and by them also the return cargoes were furnished.

became security for the payment of customs duties, and it was criminal for any other merchant to engage in the

trade with foreigners.

Accounts are kept at Canton, in common with the rest of China, in taels, mace, candarines, and cash,—ten cash being one candarine, ten candarines one mace, ten mace one tael, which last is converted into English money at about 6s. 8d. The coin called cash is of base metal, cast, not coined, and very brittle. It is of small value, and varies in the market from 750 to 1000 cash for a tael. use is in making small payments among the lower classes. Spanish and other silver coins are current, and are esti- mated by their weight,—every merchant and weights with him. All the dollars that pass through the hands of the hong merchants bear their when they lose their weight in the course o they are cut in pieces for small change. The duties are paid to Government in sycee, or pure silver, which is In delivering a cargo, which are afterwards reduced to A pecul weighs

taken by weight. and scales are used, Chinese catties and peculs. avoirdupois, and a catty 14 1b. Gold and weighed by the tael and catty,

equal to 120 oz. 16 dwt. troy.

The foreign trade at Canton was materially damaged by the opening of Shanghai and the ports on the Yang- tsze, but it is yet of very considerable importance, as the subjoined table of the total value of the foreign trade with Canton between the years 1861 and 1874 inclusive 18

sufficient to show:—

Tutal Value of

Year. Imports.

Dollars.

1861 12,977,353 1862 10,580,928 1863 9,505,285 1864 8,192,795 1865 10,556,602 1866 14,171,101 1867 14,090,581 1868 12,991, 266 1869

11,487,679 1870 12,058,394 1871 15,661,889

1872 | 16,802,553 Shanghai Taels.

1873 9,843,819

1874 | 9,499,447

Although it is in the same Calcutta, the climate of Canton is sidered superier to that of m the tropics.

reached.

Total Value of

er 96°.

carrying scales

English weights

Exports, Total Value. Dollars. Dollars,

15,811,512 28,788, 865 17,742,590 28,328,518 16,083,062 25,588,347 18,659,177 21,851,972 18,054,557 28,611,159 18, 832,622 33,008,723 18, 403,154 32,498,735 18, 491,156 31,482,422 20,010,626 31, 498, 305 19,857,543 31,910,937 23,612,439 39, 274,328 25,691,712 42,494,265

Shanghai Taels. Shanghai Taels,

16,156,437 26,900, 256 16,640,525 26,139,972

Sera ee

parallel of latitude as much cooler, and is con- ost places situated between The extreme range of the thermometer is from 38° to 100° Fahr., though these extremes are rarely In ordinary years the wi 42°, and the maximuin in summ October the hot season is considered to last ; of the year the weather is cool. Sometimes forms at Canton; and

nter minimum is about From May to during the rest In shallow vessels ice so rarely is snow seen

Its chief

stamp ; and f circulation

1332 tb silver are also 100 taels being reckoned

TO &

that when in February 1835 a fall to the depth of two

inches occurred, the citizens hardly knew its proper name. Most of the rain falls during May and June, but the amount is nothing in comparison with that which falls during a rainy season in Calcutta.

July, August, and September are the regular monsoon months, the wind coming from the south- west with frequent showers, which allay the heat. In the

succeeding months the northerly winds commence, with some interruptions at first, but from October to J anuary

the temperature is agreeable, the sky clear, and the air invigorating. Few large cities are more generally healthy than Canton, and epidemics rarely prevail there.

Provisions and refreshments of all sorts are abundant, and in general are excellent in quality and moderate in price. It is a singular fact, that the Chinese make no use of milk, either in its natural state, or in the form of butter or cheese. Among the delicacies of a Chinese market are to be seen horse-flesh, dogs, cats, hawks, owls, and edible birds’-nests. The business between foreigners and natives at Canton is generally transacted in a jargon known as “ Pigeon English,” the Chinese being extremely ready in acquiring a sufficient smattering of English words to reuder themselves intelligible.

The intercourse between China and Europe by the way of the Cape of Good Hope began in‘1517, when Emmanuel, king of Portugal, sent an ambassador, accompanied by a fleet of eight ships, to Peking, on which occasion the sanc- tion of the emperor to establish a trade at Canton was ° obtained. It was in 1596, in the reign of Queen Elizabeth, that the English first attempted to open an intercourse with China, but ineffectually, for the two ships which were despatched on this mission were lost in the outward voyage, and it was not till about 1634 that English ships visited Canton. Unfortunately at this time a misunder- standing having occurred with the Chinese authorities owing to the treachery of the Portuguese, a rupture and a battle took place, and it was with difficulty that peace was again restored. In 1673 China was again visited by an English ship which was subsequently refused admission into Japan, and in 1677 a factory was established at Amoy. But during an irruption of the Tatars three years later this building was destroyed, and it was not till 1685 that the emperor permitted any trade with Europeans at that port. Upon the union of the two East India Companies in London, an imperial edict was issued, restricting the foreign commerce to the port of Canton.

Tea was first imported in England about the year 1667, and in 1689 a customs duty of 5s. per ib was for the first time imposed. From this date to 1834 the East India Company held a monopoly of the trade at Canton, and during this period the prosperity of the port increased and multiplied, notwithstanding the obstructions which were constantly thrown in the way of the “ Barbarians” by the Chinese Government. The termination of the Company’s monopoly brought no alteration in the conduct of the native authorities, whose oppressions became before long so unbear- able that in 1839 war was declared on the part of Great Britain. In 1841, while the forces under Sir Hugh (after- wards Lord) Gough were preparing to capture Canton, Capt. Elliott entered into negotiations with the Chinese, and consented to receive a pecuniary ransom in lieu of occupying the city. Meanwhile the war was carried on in central China, and finally resulted in the conclusion of the Nanking Treaty in August 1842, under the terms of which four additional ports, viz., Shanghai, Ningpo, Fuh-chow Foo, and Amoy, were thrown open to foreign trade, and foreigners were granted permission to enter the city of Canton, from which they had hitherto been

excluded. ‘This latter provision of the treaty, however, the Chinese refused to carry out; and after endless disputes about this and

other improper acts of the Chinese Government, war was again declared in 1856, the immediate cause of which was an insult offered to the British flag by the capture of certain Chinese on board the “ Arrow,” a small craft trading under English colours. The outbreak of hostilities was followed by the pillage and destruction of the foreign ‘‘factories,” in December 1856, by a Chinese mob, and twelve months later Canton was taken by assault by a force under Sir Charles Straubenzee, which had been sent out from England for the purpose. From this time until October 1861, the city was occupied by an English and French garrison, and the administration of affairs was entrusted to an allied comniission, consisting of two English officers and one French officer, acting under the English general. Since the withdrawal of this garrison, the city of Canton has been freely open to foreigners of all nationalities, and the English consul at the present time has his residence in the Yamun formerly occupied by the allied commissioners, within the city walls.

On the conclusion of peace it became necessary to provide a foreign settlement for the merchants whose “ factories ” had been destroyed, and after some consultation it was determined to fill in and appropiate as the British settlement an extensive mud flat lying to the westward of the old factory site, and known as Sha-mien, or ‘“ The Sand Flats.” This site having been leased, it was converted into an artificial island by building a massive embankment of granite in an irregular oval form. Between the northern face of the site and the Chinese suburb, a canal of 100 feet in width was constructed, thus forming an island of about 2850 feet in length and 950 feet in greatest breadth. The expense of making this settlement was 325,000 Mexican dollars, four-fifths of which were defrayed by the British Government, and one-fifth by the French Government. The British portion of the new settlement was laid out in eighty-two lots; and so bright appeared the prospect of trade at the time of their sale that 9000 dollars and upwards was paid in more than one instance for a lot, with a river frontage, measuring 12,645 square feet. ‘The depression in trade, however, which

soon followed acted as a bar to building, and it was not until the British consulate was erected in 1865 that the merchants began to occupy the settlement in any numbers. The British consulate occupies six lots, with an area of 75,870 square feet in the centre of the site, overlooking the river, and is enclosed with a substantial wall. A ground-rent of 15,000 cash (about £3) per mow (a third of an acre) is annually paid by the owners of lots to the Chinese Government.

The Sha-mien settlement possesses many advantages. It is close to the western suburb of Canton, where reside all the wholesale dealers as well as the principal merchants and brokers ; it faces the broad channel known as the Macao Passage, up which the cool breezes in summer are wafted almost uninterruptedly, and the river opposite to it affords a safe and commodious anchorage for steamers up to 1000 tons burden. Steamers only are allowed to come up to Canton, sailing vessels being restricted to the anchorage at Whampoa. See CHrna. (R. K. D.)

CANTON, a city of the United States, in Stark county, Ohio, about 118 miles north-east of Columbus, on the Nimishillen Creek. It forms the centre of a large agricul- tural district, aud carries on a thriving trade. Coal and limestone are abundant in the neighbourhood, and the creek affords a good supply of water-power. ‘There are several iron foundries and woollen factories in the town, as well as establishments for the manufacture of reaping-machines. Besides daily papers, two monthly periodicals are published. Population in 1870, 8660.

CANTON, Joun (1718-1772), an able natural philo- Sopher, was born at Stroud, Gloucestershire, in 1718. At

the age of nineteen, he was articled for five years as clerk to the master of an academy in Spital Square, London, with whom at the end of that time he entered into partnership. In 1746 the science of electricity, which seems early to have engaged Canton’s attention, gained a very im- portant addition by the discovery of the principle of the Leyden jar. This event turned the thoughts of most of the philosophers of Europe to that branch of natural philosophy ; and Canton, who was one of the first to repeat and pursue the

experiment by which the discovery had been made, found his labour rewarded by many valuable discoveries, In 1750 he read a paper before the Royal Society on a method of making artificial maguets, which procured him election as a member of the Society, and the award of its gold medal. The same year he was complimented with the degree of M.A. by the university of Aberdeen ; and in 1751 he was chosen one of the council of the Royal Society. Canton was the first in England to verify Franklin's hypothesis of the identity of lightning and electricity, having in 1752 succeeded in attracting the electric fire from the clouds during a thunderstorm. In consequence he prepared a paper, which was read the next year before the Royal Society, on Hlectrical Experiments, with an Attempt to Account for their several Phenomena, in which, among other things, he mentions that he had dis- covered that some clouds are in a positive and some in a negative state of electricity. About the same time Franklin made a similar discovery in America; and these circumstances gave rise to a lasting friendship between the two philosophers. In 1762 and 1764 he published experi- ments in refutation of the decision of the Florentine academy, at that time generally accepted, that water is incom- pressible. These and many other investigations were carried on without any intermission of his work as a schoolmaster, and his too sedentary life brought on dropsy, of which he died on March 22, 1772.

CANTU, or Canrurio, a town of Italy, in the province of Como, about five miles south of the city of that name, in 45° 44' 24" N. lat. and 9° 7' 49" E. long. It is sur- rounded with walls, and possesses a parish church with a very fine tower, a town hall, a hospital, and a theatre. In the neighbourhood are iron mines that were wrought in the 10th centnry. Population, 7429.

CANUSIUM. See Canosa.

CANUTE, or Cnut (about 995-1035), was the son of Sweyn or Swend, king of Denmark and England. Though only nineteen years of age at his father's death, he was elected by the Danish armament to the English throne (1014). But the English, only recently subdued by Sweyn, did not acquiesce in this disposal of the crown, recalled their old king Ethelred from Normandy, and obliged Canute to withdraw from the country. In the summer of 1015 Canute returned at the head of a vast Danish armament, and had compelled

the submission of most of England when Ethelred died, and his son Edmund Ironside became the representa- tive of the old English royal line. In the double election which ensued, Edmund was supported almost solely by London ; the Witan of the rest of England decided upon Canute, who had proved himself too formidable a candidate to be set aside. Nevertheless, in five pitched battles fought during the year 1016, Canute found in Edmund more than an equal rival,—a rival, too, that grew more dangerous, as he was recognized to be the champion of the pure English nationality. At length, in the sixth battle,at Assandun in the same year, the English army, weakened and disconcerted by the desertion of Edric, the traitorous earl of Mercia, was completely overthrown. A division of the kingdom was arranged between the two competitors, but Edmund dying soon after, not without suspicion of treachery, even on Canute's part, the latter became sole ruler of England.

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His first care on attaining to undivided power was to remove all who might disturb its tranquillity. The sons of Edmund Ironside were sent out of the kingdom, and Edwy his brother was put to death ; while Edric of Mercia soon met the fate he deserved, and many other leading men were banished or slain. The sternness of Canute's early measures was, however, more the effect of policy than of a cruel disposition, for in a little time he showed himself a After exacting a danegeld for the payment of his Danish host, he sent it home, with the exception of forty ships and of the household troops that attended on hiniself. Henceforward he put off the character of conqueror, and governed England like a native English-

just and beneficent ruler.

man, enforcing the old English laws or enacting wise new ones, repressing disorder, and in every way attending to the interests of his subjects. the church, though it had always beenone of the great centres

of resistance to Danish invasions, and was not afraid to raise

Englishmen, such as Earl Godwin, to the highest posts in his government. A letter written to his English subjects from Rome, to which he had made a

pilgrimage, is the best commentary on the motives which directed his reign; he is determined to make amends for the faults of his early years, to persevere in a just and pious government, to repress extortion, and in every way to promote the welfare of his subjects. The internal state of the kingdom was one of unprecedented peace and order, during which it recovered from the ravages and misgovernment of the generation preceding ; and he left a happy memory of him- self among the people. The well-known story of the rebuke he gave to his flattering courtiers, which rests on excellent authority, is a proof of this; and the well-known song he composed, when rowing near the monastery of Ely, is not only an example of his genial popular sympathies, but entitles him to a place among the creators of English poetry.

He was far more than king of England, however; he was the ruler of a vast northern empire, composed of five or six monarchies though the old historians differ in the enumeration of them. He succeeded to the usual over- lordship over Wales and Scotland, asserting it in the latter case by force of arms. Shortly after his secure installation on the English throne, he superseded his brother Harold on that of Denmark ; he repelled an attack of the Wends on his dominions there, and in those early times obtained a rectification of the Danish frontier from the emperor of

Germany, Though at first unsuccessful in an invasion of:

Norway, he added that kingdom to his empire in 1028. He was now one of the most powerful and respected rulers of Christendom. He died at Shaftesbury in 1035, in the fortieth year of his age, and the twentieth of his reign, The best proof of his energy and ability is that the hetero- geneous and geographically disconnected empire, which he governed so well, fell to pieces immediately after his death. (Freeman’s [fistory of the Norman Conquest, vol. i.; Palgrave’s History of the Anglo-Saxons ; Green’s Short History of the English People.)

CANVAS, a name applied to several kinds of stout cloth, made of hemp or linen fibres, and used for the sails of vessels, the ground of oil paintings, and various other purposes. Originally canvas was made solely from hemp, whence the name, which is corrupted from Cannabis, the classical and scientific name for the hemp plant. Being most extensively employed as

sail-cloth, the term came to designate the sails of a ship generally, for which, however, although hempen canvas is still used, linen or mixed fibres are now more generally preferred.

CAOUTCHOUC. See Inp14-Ruzzer.

CAPE BRETON, an island of British America, to the north-east of Nova Scotia, from which it is separated by a strait about fifteen miles long and a mile wide, known as the

He was careful of the interests of

CAN—CAP

Gut of Canceau or Canso. It lies between 45° 27’ and 47° 3’ N. lat., and between 59° 47’ and 61° 32’ W. long. ; its length from north to south is about 110 miles, its width about 87 miles, and its area 2,650,000 acres. Except on the north-west, the coast is much broken 3 and the island is nearly divided into two by the large irregular lakes of Bras d’Or, which communicate with the sea by two channels on the north-east. The most important bays are Aspee, St Anue’s, Sydney, Mira, Louisbourg, Gabarus, St Peter’s, and Mabou ; and the principal rivers are the Denys, the Margarie, the Baddeck, the Wagamatcook, the Mabou, and the Grand. There are several fresh-water lakes, of which Lake Ainslie in the west is the most extensive. The surface of the island is broken in several places by ranges of hills of moderate elevation, and the northern promontory consists of a plateau, which in some parts has a height above the sea of 1200 feet. The prevailing rocks belong to the carboniferous formations, interrupted here and there by igneous or metamorphic upheavals. About the half of the surface is said to be capable of cultivation; but in 186] there were only 198,550 acres cleared and under tillage, In winter the thermometer sometimes falls to 32° and generally to 20° below zero; while in summer it rises to 96° in the shade, and the mean temperature is about 60°. The commercial resources of the island consist chiefly in its timber, its agricultural productions, its minerals, and its fisheries. Nearly covered with forest at the time of its discovery, it still exports pine, oak, beech, maple, birch, and ash. Oats, wheat, turnips, and potatoes are extensively cultivated ; horses, cattle and sheep are reared in consider- able numbers ; and cheese

and butter form important items in its produce. Coal, limestone, and gypsum are worked, and excellent iron ore and slate are also to be found. Salt- springs of some value exist in different parts. The coal mines, which are chiefly situated towards the south-east, have been worked from an early period. The Bras d'Or Lakes and the neighbouring seas supply an abundance of salmon, cod, mackerel, herring, shad, and white-fish, and the fisheries employ about 3000 men. The number of schools in 1861 was 212; and in the same year there were 104 churches. The principal sects are the Roman Catholic Church, which had then 33,386 adherents, and the Presby- terians of the Lower Provinces with 19,982. The in- habitants are now mainly of Scottish descent, with a certain proportion of Acadiansand Irish. A few hundred Micmac Indians, who are principally employed in making fish- barrels and butter-firkins, are still to be found. By the census of 1871 the total population amounted to 75,483, of whom 5264 were inhabitants of Sydney. In 1861 and 1851 the numbers were respectively 63,083 and 27,580.

Cape Breton was probably discovered by Sebastian Cabot, and its name is understood to have been bestowed in remembrance of Cap Bréton, near Bayonne, by the Basque sailors who early began to frequent the coast. In 1629 James Stewart, fourth Lord Ochiltree, settled a small colony at Baleine, on the cast side of the island s but he was soon after taken prisoner with all his party by Captain Daniell of the French Company, who caused a fort to be erected at Great Cibou (now St Anne's Harbour). By the peace of St Germain in 1632, Cape Breton was formally assigned to France ; and in 1654 it formed part of the territory granted by patent to M. Denys, who made several small settlements on the island, which, however, had only a very temporary success. When by the treaty of Utrecht (1718) the French were deprived of Nova Scotia and Newfoundland, they were still left in possession of Cape Breton, and their right to erect fortifications for its defence was formally acknowledged. They accordingly transferred the inhabitants of Plaisance in Newfound- land to the settlement of Havre 4 l'Anglois, which soon after, under the name of Louisbourg, became not only the capital of Cape Breton (or Ie Royale, as it was then called), but also the most im- portant military post in that district of French America. When war broke out in 1744 between France and England, the New England colonists determined to attack the island ; and in the fol- lowing

year they succeeded in capturing Louisbourg. By the treaty of Aix-la-Chavelle. the town was restored to F rance ; but in the

Plate [.

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war that was declared in 1756, it again yielded to the assault of a | slate, which: runs out into the sea and protects the harbour

British force, this time commanded by Admiral Boscawen. On the conclusion of hostilities the island was ceded to England by the treaty of Paris; and on October 7, 1768, it was united by royal proclamation to the government of Nova Scotia All the troops were withdrawn from Louisbourg in 1768; and when the island was separated from Nova Scotia in 1784, a new capital was founded at the mouth of the Spanish River by Governor Desbarres, and received its name Sydney in honour of Lord Sydney (Sir Thoinas Townshend), then secretary of state for the colonies. There was immediately a considerable influx of settlers to the island, which received another important accession by the immigration of Scotch Highlanders from 1800 to 1828. In 1820, in spite of strong opposi- tion, it was again annexed to Nova Scotia. It now sends five members to the Canadian House of Commons.

See Denys, Description géogr. et hist. des Cétes de I’ Amérique septentrionale, 1672; Pichon, Lettres et Mémoires du Cap Breton, 1760; Richard Brown, A History of the Island of Cape Breton, 1869, and The Coal Fields of Cape Breton, 1878.

CAPE COAST CASTLE, or Cazo Corso, a town of Western Africa, the capital of the British settlements on the Gold Coast, is situated in Upper Guinea, about 70 miles to the W. of Acra, in 5° 5’ 24” N. lat. and 1° 13’ 38” W. long. ‘t occupies a low bank of gneiss and micaceous

CA BEC

er COLONY is a large tract of country which forms the most southern part of the continent of Africa, a colony of Great Britain since 1806, named from the Cape of Good Hope, a small promontory on its south-west coast, from the neighbourhood of which the Dutch settlers of 1652 spread out over the land. It lies for the most part between 28° and 34° 50’ S. lat., aud 16° 30’ and 29° 50’ E. long. West and south are the Atlantic and Indian Oceans; the Orange River forms the boundary of the colony proper on the north, separating it from Great Namaqua Land, the Kalahari desert, and the Orange River Free State; eastward its limit runs from the Tees River, a headstream of the Orange, along the Storm Berg and down the Kei River from its most easterly source-stream to its mouth, which line separates the colony from Free Kaffre Land, and includes within it the divisions of British Kaffraria added to the colony in 1865. Besides this chief area the colony includes various recently added irregular provinces ; these are—the agency of Basuto Land, annexed in 1871, consisting of the high valleys of the source-streams of the Orange River, sloping down inward from the Drakenberg mountains, which separate this territory from the colony of Natal; Herschel, a native district immediately south of Basuto Land ; the magistracy of Nomansland, including Griqua Land East, a native territory of northern Kaffraria on the seaward slope of the Drakenberg south-west of Natal; St John’s Territory, or the upper basin of the St John’s or Umzimvubo River on the slopes of the Drakenberg in central Kaffraria ; Mingo Land and the [dutywa Reserve, or the Transkeian territories of southern Kaffraria, bounded by the Bashee River; and Tambookve Land, between the Bashee and the Umtata. These latter districts were incorporated with the colony in 1875, Itis certain that in a few years the whole of what is now Free Kaffre Land will become British territory, when the Cape Colony will be couterminous throughout with Natal on the north-east ; and preliminary steps have already been taken for the extension of the western boundary of the colony to include the immense but thinly inhabited region of Great Namaqua Land, which stretches north of the lower Orange River to Walfisch Bay in 23° S.

The lieutenant-governorship of Griqua Land West, better known as the district of the South African diamond fields, which lies north of the Orange

River and west of the Free State, annexed to the British empire in 1871, is

from the violence of the surf. Besides the principal for- tress there are two outposts,—Fort Victoria on the west and Fort William on the east. With the exception of the European residences and the houses of the wealthier natives, which are built of brick, the whole of the town is composed of ‘‘swish” or mud huts, thatched with rushes, and having the walls white-washed. The population con- sists mainly of negroes of the Fanti tribe, but there are also a number of mulattoes and a colony of Kroomen. The earliest European settlement on the spot was that of the Portuguese in 1610. In 1652 the Swedes erected the fort of Karlsborg which was captured by the Danes in 1658, by the Dutch in 1659, and by the English in 1664. Since the last date the post has remained in English possession, in spite of the French attack in 1757 and various assaults by the native tribes. In 1827 the public establishments were withdrawn, and the forts were handed over to the mercantile companies; but in 1844 the Government re- sumed its possession. The population is estimated at about 10,000.

OLONY

strictly a separate dependency of the Crown, but is so intimately connected with the Cape Colony as to be neces- sarily described along with it.

The extreme breadth of the colony from north to south is about 500 miles, and its length from east to west about 800, its area comprising 230,000 square miles.

The country rises from the sea by a series of terraces, of Physical which the supporting walls are nearly parallel chains of features.

rugged mountains, intersected by deep ravines, rising to a central and highest range, which divides the drainage of the coastal streams from that of the inner tributaries of the Orange River in the north. This central range follows a curve almost identical with that of the coast, at a general distance of about 100 miles from the ocean; from the borders of Natal westward it is known in different portions as the Kahlamba or Drakenberg, the Storm Berg, Zuur Berg, Sueeuw Berg, Winter Berg, Nieuweveld, and Roggeveld. In height its summits appear to average nearly 6000 feet, the highest points

being Cathkin peak, 10,300 feet, in the extreme north-east corner of the colony ;

. Compass Berg, in the Sneeuw Berg, 8300 feet ; and Bulb-

houders Bank, in the Nieuweveld Range, which is 7300 feet above the sea. North of this dividing range the inner country slopes gradually to the Orange River, central Bushmanland being a plateau of from 3000 to 4000 feet above the sea. The numerous outer ranges, which form the margins of the terraces that fall towards the ocean, are separated from the central range throughout the greater part of the colony by the arid plateau known as the Great Karroo, nearly 300 miles in length and 60 miles in width north to south, and at an elevation of about

| 3000 feet above the sea; their general direction is always

that of the coast, and they are cut across at intervals by rugged gorges or “kloofs” through which the periodical torrents of the coastal watershed escape to the sea. Two chief ranges may be distinguished, an inner and an outer, —the former having the names of Zwarte Berg, Witte Berg, and Cedar Berg, along a great part of its length, the latter being most prominent in the Outeniqua, Zon- dereinde, Drakenstein, and Olifant Bergen, rising from the south and west coasts. Some points of the inner coast range exceed 7000 feet in altitude, and the outer line appears to average about 4000 feet. In Namaqua Land, in the north-west of the colony, the central and outer ranges, approaching one another and decreasing consider- V. =— 6

Soil.

Geology and minerals.

. them again to a barren and burnt-up aspect.

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ably in height, continue in an irregular series of chains to the lower Orange River. Within the central range, in Bushmanland, the most remarkable elevations are the chains of isolated flat-topped hills which rise directly

from the plains of the Fraserburg and Victoria west districts, known as the Karree and Praam Bergen. The Tafel Berg or Table Mountain, the well-known landmark of the coast, and the nucleus of the peninsula of the Cape of Good Hope, rises to 3582 feet. Though the mountains of the colony and the plateaus between them present bold and picturesque outlines of sharply-defined ranges and vast level plains, the landscape, excepting in the coastal districts, is bare and uninviting, and deficient in water and tree-growth. Nearly two-thirds of the surface of Cape Colony consists of vast arid plains, covered, however, with shallow beds of the richest soil, which only requires the fertilizing power of water to render it available for pasture or agriculture. After the periodical rains, the plateau of the " Karroo" and the great plains of Bushmanland present the appear- ance of vast fields of grass, but the summer sun reduces The pastoral lands or " velds," which extend chiefly around the outer slopes and in the east, are distinguished according to the nature of the grass or sedge which they produce as " sweet" or "sour." Shallow sheets of water termed " vleis " accumulate at many places in the flat lands of the interior after rains; and in the dry seasons these spots, where the soil is not excessively saline, are covered with rich grass and afford favourite grazing land for cattle. Only in the extreme southern coastland of the colony is there a soil and moisture supply suited to forest growth, and the first requisite of every settlement in the interior is the formation of a "dam" or reservoir for the collection and saving of a water supply. Out of an area of upwards of 40 millions of acres of occupied lands, according to the census returns of 1865, only 460,000 acres were then under cultivation. Geological knowledge of the vast territory of the colony is as yet imperfect, though sufficient data have been collected to enable the general features of the structure of the land to be mapped (A. G. Bain, Memoirs on the Geology of the Cape; Dunn's Geological Map of the Cape; Griesbach and Stow in the Quarterly Journal of the Geological Society, &c). The following are some of the more striking general features. The whole basis formation of the western province is considered to be granite, lower but more recent than the clay-slate which rests upon it. A remarkable band of porphyritic rock has been traced along the whole of the country between British Kaffraria and the Bokkeveld Mountains in the west, a distance of more than 600 miles. A series of sandstone rocks form the chains of the Zwarte and Lange Bergen. The " Karroo beds," the name given to formations which cover that plateau and the country northward to beyond

the Orange River, are believed from the abundance of fossil wood and fresh-water shells to be of lacustrine origin, and contain reptile remains of most remarkable character, unknown elsewhere. In the eastern province, one of the most interesting features of the geology is that of the beds of water-worn pebbles, many hundreds of feet above the present sea-level ; indeed there appears to be no doubt that a process of upheayal is still in progress along the whole South African coast, where modern raised beaches, coral reefs, and oyster banks may everywhere be seen. Slight shocks of earthquake have been experienced -at various times in the south-western region of the colony. There are records of these in 1739, 1766, 1809, 1811, and 1844. Namaqua Land, north as well as south of the Orange River, is a region composed of the older rocks, gneiss and schists, and is famous for its copper deposits. These appear to have been known as early as 1683, and

have attracted attention at various subsequent periods, but it was not till 1863 that any well-directed efforts were made for the extraction of the copper; at the present time the famous mine of Ookeip in the district of Springbokfontein yields an average of 7000 tons of ore each year. Copper is also known to exist in the Amapondo country of Kaffraria. Silver has also been discovered in Nameaqua Land, but has not yet been successfully worked. Coal seams are known both in the Storm Berg in the extreme east and in the central district of Beaufort, but not in easily workable situations.

The discovery of diamonds north of the Orange River, an event which gave great impetus to all affairs of the colony, was made in 1867, and in the following years people from all parts of the world flocked to the fields. These lie in the eastern portion of the territory known as Griqua Land West, which, as a consequence of the dis- covery, was annexed to the British empire in 1871. The mining has now become a settled industry, with its accom- paniment of a fixed population and rapidly-growing towns. The fields extend between the lower Vaal River and its tributary the Modder; in this region the diamond-producing rock is found in fragments mingled with the detritus of other rocks, occupying various depressions known as “pans,” or in the deep torrent beds of the rivers. The diggings are thus distinguished

as the wet, which lie chiefly along the lower Vaal river, and have been almost abandoned, and the dry mines, about Kimberley, Du Toits pan, and Bulfontein, farther south. One of the largest diamonds at first discovered in this region weighed 83 carats, and realized £11,000; several much larger ones have since been found, one of more than 200 carats. Iron ores, hematite, and magnetite abound also in this region, the deficiency of fuel alone prevents the working of mines of great richness.

We have seen that the great water-parting mountain Rivers,

chain of the colony passes through the centre of the country in a curve parallel to the coast line, from the inner border of Natal to near the western Atlantic coast, forming an outward watershed to the sea of about 100 miles in width, and an inner shed to the Orange River. The streams of the outer shed are constant only in the extreme east of the country ; towards the south-west and on the Atlantic coast land their supply is irregular. All partake of the character of mountain torrents,—having numerous falls. flowing in deeply-cut channels, and being low and feeble (in some cases dry) for the greater part of the year, but swollen and rapid in rainy weather. From east round to west the chief are the Kei, Great Fish, Zondag, Gamtoos, Gauritz, Breede, Berg, and Olifant ; of these only two are navigable for a short distance,—the Breede for small vessels for 30 or 40 miles from its mouth, and the Berg for a few miles from St Helena Bay, on the Atlantic coast. The Orange River, or Gariep, to which the inner shed of the colony drains, rises in the Drakenberg on the border of Natal in the extreme north-east of the colony, and flows westward for about 900 miles to the Atlantic. Its basin includes an area of upwards of 400,000 square miles, but the greater portion of this belongs to the arid deserts of the Kalahari and of Bushman- land. Below its confluence (in about 24° E. long.) with its chief affluent, the Vaal, from the north-east, it has no perma- nently flowing tributary, receiving only the occasional sup- plies of the torrent channels which are cut deep in the plateaus and filled only after thunder showers,—so that its volume decreases very much in its passage westward. Its upper valleys are very rugged and have been little explored ; the region about the confluence of the Vaal is low and alluvial; but from this to the sea the river is hemmed in by steep and precipitous cliffs, and broken by immense walls

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of rock which cause formidable cataracts : of these the fall named Aukurubies (in 20° 40’ E. long.), 150 feet in height, is the greatest. The Orange is not navigable excepting for boats for a few miles above its mouth, which is barred.

Lakes are unknown in Cape Colony. Springs are frequent, and in sandstoue districts afford excellent water, but in the Karroo country they are generally brackish. Hot or mineral springs occur in several districts.

The southern coastland of the colony is generally bold and rocky, the mountains often approaching the shore ; the Atlantic coast, on the other hand, is for the most part low and sandy. The great ocean currents—viz., the Mozambique current which sweeps down round the south of the Cape Colony, and is deflected there over the great bank of Agulhas, the submarine apex of the continent, and the South Atlantic current flowing northward past the Cape peninsula,—give rise to many local and minor currents in opposing directions close to the coast, fotming great obstacles to navigation.

The coast is indented by various bays and inlets; few of these, however, afford convenient harbours, and the only one which is naturally safe in all winds is that of Saldanha Bay on the Atlantic. From eastward round to west, the chief points at which commerce reaches the coast are—the port of East London, at the mouth of the Buffalo River in British Kaffraria, in which extensive harbour works are

‘being constructed; Port Alfred, or the Kowie mouth,

which estuary has also been rendered more commodious by engineering operations ; Port Elizabeth, in Algoa Bay, the second port of the colony in point of trade, but with many natural disadvantages ; Plettenberg Bay, of importance in coasting trade , the Knysna, a land-locked estuary in 23° E.; Mossel Bay; False Bay, a wide gulf formed by the peninsula of the Cape of Good Hope, and containing within it the well-sheltered naval station of Simon’s Bay ; Table Bay, the harbour of Cape Town, which has been rendered safe by the construction of a great breakwater and docks ; Saldanha Bay, little visited, but one of the finest natural harbours in the world ; and Port Nolloth, the copper port of Namaqua Land, and the terminus of a railway from the mines. Angra Pequefia Bay, in 26° 40’ S., a British pos- session on the barren Atlantic coast north of Cape Colony, was formerly visited in obtaining cattle, while the now nearly exhausted guano deposits of Ichaboe and Possession Islands, north and south of it, were being worked. Walfisch Bay, in 22° 50’ S., up to which point it is anticipated that the colonial territory will shortly be extended, is an inlet on a desolate waterless coast, affording secure anchorage, and for- merly much visited by American whaling ships. Lighthouses are maintained at various ports and headlands on the coast.

In general character the climate of the Cape Colony is dry, highly salubrious, and milder than that of England ; the atmosphere is clear and buoyant. So extensive, how- ever, is the country, and so diversified in aspect and eleva- tion, that there are naturally many varieties of climate within its limits. As far as moisture is concerned there is a gradual diminution from east to west across the country ; the prevailing winds in the interior are from eastward, and the moisture they draw from the Indian Ocean being expended in great part on the eastern slopes and mountain ranges, the western interior districts are left almost rainless. In the eastern divisions heavy rains and thunderstorms moderate the intense heat of summer, and keep the face of the country fresh and green. The winters are cold, but the air is then clear and agreeable. At Graham’s Town the average annual temperature is 63°, ranging from upwards of 100° to a minimum of 35°, and the annual rainfall is about 33 inches. The south-western margin of

the country outside the edge of the great Karroo plateau is for eight months of the year supplied with rain showers by westerly

ocean winds. In summer (December, January, February) the dry south-east trade winds blow with great violence. The mean temperature of the year at the Cape of Good Hope is about 62° attaining a maximum of 100° and a minimum of 34°, the average annual rainfall being 24 inches, At Worcester, on the inner border of this region, the yearly rainfall decreases to 12 inches.

The low coast region in the extreme west is subject to great droughts and extreme range of daily temperature ; though it seldom rains there, dense fogs arise at dawn. The climate of the great Karroo plateau, which is about 3000 feet above the sea, is also characterized by severe droughts, by excessive heats during the day in summer, by cold nights, and by sharp cold in winter. Within the water-parting mountains the plains stretching to the Orange River, though also subject to long periods of drought, have a salubrious climate, which is clear and bracing in winter; while in summer the violent thunderstorms, which occur on an average every three or four days along the mountain ranges, render the air cool and pleasant, filling the water-channels and “vleis,” and reviving vegetation. Hot, dry winds from the northern deserts sometimes prevail for two or three days at a time in the central and eastern districts of the interior. Snow seldom falls in the coast region, but in the higher mountain tracts it lies for three or four months in the year. The summit of Table Mountain is occasionally sprinkled with snow for a day or two. Hail-storms are rare, but are of great violence after long droughts. The phenomenon of the mirage is common, both on the coast and in the heated plains of the interior.

Ophthalmia and rheumatism are perhaps the only diseases of the colony which are at all prevalent; low fevers are common on the flat western coastlands.

Though much of the land of the colony is dry and Vegeta- barren, the flora of the more fertile portions is remarkable tion.

and varied. We have seen that the forests are confined to the outward slopes of the extreme margins of the colony,— the only patches of wood deserving the name being found in the Cedar Berg in the west, on two sides of Table Mountain, on the Outeniqua mountains facing the south coast, on the Olifants Hoek near Port Elizabeth, in the vicinity of King William's Town in British Kaffraria, and in the district of the Katberg or Stockenstroom farther inland. The inner slopes of Griqua Land East are also wooded. These patches of forest contain a great variety of useful woods, affording excellent timber; among the commonest trees are the yellow wood, which is also one of the largest, belonging to the yew species; black iron wood ; heavy, close-grained, and durable stinkhout ; melkhout, a white wood used for wheelwork ; nieshout ; and the assegai or Cape lancewood.

In no other country do bulbous plants and heaths exhibit so many beautiful varieties; of the latter several hundred varieties are described. Of pod-bearing plants there are upwards of eighty genera; Cape "everlasting" flowers (gene- rally species of Helichrysum) are in great numbers. Several species of aloe are indigenous to the Cape, and form a con- siderable article of export. The so-called American aloe has also been naturalized. The castor-oil plant and many other plants of great value in medicine are indigenous in great abundance. Among Cape plants which are remarkable in their appearance and structure may be noted the cactus- like Euphorbie or spurge plants, the Stapelia or carrion flower, and the elephant's foot or Hottentots' bread, a plant of the same order as the yam. Hooks, thorns, and prickles are characteristic of many South African plants. There are few indigenous fruits ; the kei apple is the fruit of a small tree or shrub found in Kaffraria and the eastern districts, where also the wild aud Kaffre plums are common ; hard pears, gourds, water melons, and species of almond, chestnut, and lemon are also native. Almost all the fruits

Animals,

of northern and southern Europe have been introduced, and grow inabundance. It is doubtful whether or not a species of vine is indigenous to the Cape, but the cuttings of French vines introduced by the Huguenots who emigrated to the colony on the revocation of the Edict of Nantes, between

1685 and 1688, have given rise to an extensive culture in the south-western divisions of the colony, the grapes being among the finest in the world. The Cape wines, the export of which has revived of late' years, are chiefly those known as Constantia, Pontac, Steen, and Hanepoot.

Of the cereals, wheat is grown throughout the colony, but chiefly in the low marginal division of the south-west and in the eastern midland districts; barley and oats are general. Rye gives its name to the Roggeveld in the west, and is chiefly grown there and in the lower hills of Namaqua Land; maize and millet are cultivated in all inoist situations of the north-east of the colony. Rice might be extensively cultivated, and flourishes on the inundated banks of the Olifants River in the west 3 the growth of potatoes has been much extended ; melons, cucumbers, beans, and pease are grown universally where there is water. Cotton has been introduced experimentally in some districts ; the cultivation of tobacco is wide spread, that of the division of George, grown in the valley of the eastern Olifants River, being most reputed.

The larger and more important of the wild animals which once gave the Cape Colony the character of the great hunting ground of the world have retreated before advancing civilization, and few are now found within the frontier. The lion is only to be met with now in the northern districts of Bushmanland and in the extreme north-eastern portion of the colony, and rarely in British Kaffraria. The elephant, which also abounded at the time of the first Dutch settlement, is now almost extinct in the

colony, a few only existing in the forests between Knysna and the Zondag River in the extreme south. The rhino- ceros and giraffe have been driven far outside the fron- are only found in the coast rivers of British Kaffraria and in the lower Orange River. The

tier. Hippopotami

buffalo remains only perhaps in the Knysna forests and in the thickets of Great Fish River.

hyena, the aard wolf or Proteles, keep their ground, and are still common in the colony. Quaggas and zebras are met with

the gnu, hartebeeste, and brindled gnu are also seen. the many varieties of South African antelope the larger kinds—the eland, koodoo, and sable are now banished from the colony, though the smaller varieties are found along the coast region, and migratory herds of springbok invade the plains of Bushmanland and Little Namaqua Land at certain seasons. Ostriches, once numerous, are still thinly scattered over the colony, though the supply of feathers is now mainly derived from regions north of the Orange River. Ostrich farming and artificial incubation, carried on in the northern, western, and eastern divisions, have, however, become of late years one of the most profitable industries of the Cape,—the feathers being worth from £30 to £60 per ib.

Birds of prey, including the bearded vulture, aasvogel, and several varieties of eagles, hawks, and falcons, are nume- Tous ; cranes, stocks, flamingoes, and pelicans are in large variety ; partridges and pheasants, guinea fowl, and quails abound. The bustard is found in several kinds, as well as ducks, wild geese, and plovers. ‘

Upwards of forty varieties of edible fishes are caught in the seas surrounding the Cape Colony, the waters of which also teem with whales, seals, and sharks. Reptiles are exceedingly numerous ; among the venomous snakes are the

The Cape leopard, the and the jackal alone

in large herds in the plains of the Vaal, and sometimes extend juto the colony as far as the divisions of Cradock and Graaf Reinet, where Of

and roan antelopes—

Comer 0 L Omen ay

cobra di capello and the puff adder ; large toads and frogs are also common, as are scorpions, tarantula spiders, hornets, and stinging ants.

Sheep, cattle, and dogs of an inferior breed were possessed by the natives on the discovery of the country. Horses, asses, goats, and cattle, introduced by the earlier colonists, were found to thrive well. The merino breed of

sheep is now rapidly taking the place of the big-tailed sheep of the Dutch settlers; and some of the central divisions have immense sheep farms, producing the wool which is the great staple of the country's export trade. The angora goat is now extensively farmed, the hair being largely exported. . Cows of the finest breeds have also been imported ; the introduction of the English horse does not, however, appear to have been successful, the older, heavier Spanish

breed being better adapted to the wants of the country.

The numbers of live stock in the Cape Colony and its native districts are estimated thus for 1875 :—

Sky UNC Oe Ea Laren eee Sey Sree cS DRA 11,500,000 BOGOR os coc coc cectcvecéces sees cases 500,000 Other homed Cattle ….....c0ecc0.— 0050.5 900,000 LE TOS 0S anes CoN cea 257,000 UVES S 0G 5 29,500 MOUG OPA ORGS esis csc; c: sar csosnscceacous cive oe * 1,000,000 WOMBMVON GORE oc coccec ccnsecsscesceesceeces ee, 2,300,000 ee ee 120,000 Meo ece acs ntie sce cicdsdsuesioaceveene. 22,250

The Cape of Good Hope was discovered by Bartholomew Histo:y,

Diaz, the Portuguese navigator, in 1486. He first landed at Algoa Bay, having, after exploring the west coast, been driven out to sea by a storm, Thus accidentally doubling the Cape, he saw it on his way back, and gave it the name of the Cape of Storms (Cabo Tormentoso),

The king of Portugal, however, gave it the more auspicious name it now bears, as its discovery afforded a hops of a new and easier way of reaching India, the great object of all the maritime expeditions of that age,

The great navigator Vasco de Gama doubled the Cape in 1497, and carried the Portuguese flag into the Indian seas. His countrymen, however, attracted by the riches of the East, made no permanent settlement at the Cape, although they frequently touched there on the voyage to India. But the Dutch, who, on the decline of the Portu- guese power, established themselves in the East, early saw the importance of the place as a station where their vessels might take in water and provisions. They did not, how-

ever, colonize it till 1652, when the Dutch East India Company directed Jan Van Riebeeck, with a small party of colouists, to form a settlement there. The country was at that time inhabited by a people called Queeque, but to whom the Dutch seem to have given the name of Hottentots. The Riebeeck settlers had at first great difficulties and hardships to endure, and their territory did not extend beyond a few miles round the site of the present Cape Town, where they first fixed their abode. They gradually, however, extended their limits, by driving the natives back or reducing them to serfdom. These colonists, although under Dutch authority, were not wholly of that nation, but consisted partly of persons of various nations, especially Germans and Flemings, with a few Poles and Portuguese, They were for the most part people of low station or indifferent character ; there was, however, a small number of a higher class, from whom was selected a council to assist the governor. About the year 1686 the European population was increased by a number of the French refugees who left their country on the revocation of the Edict of Nantes. Our limits forbid our attempting to trace the history of the Cape Colony during the lengthened period it remained under the Dutch Government, We may, however, mention some of its prominent incidents, the effects of which are visible in the colony to this hour.

CAPH COLON Y

1st, The Dutch, partly by so-called contracts, partly by force, gradually deprived the Hottentots of their country. 2d, They reduced to slavery a large part of that unfor- tunate people whom they did not destroy. 3d, They intro- duced a number of Malays and negroes as slaves. 4th, They established that narrow and tyrannical system of policy which they adopted in other colonies, prescrib- ing to the farmers the nature of the crops they were to grow, demanding from them a large part of their produce, and harassing them with other exactions tending to dis- courage industry and enterprize. There is no doubt that to this mischievous policy is due the origin of those un- settled habits, that dislike to orderly government, and that desire to escape from its control, which characterize a cousiderable part of the so- called Dutch boers of the present day,—qualities utterly at variance with the character of the Dutch in their native country, which were strongly manifested at the Cape, long before they came under British rule and under

those influences to which some exclusively attribute the insubordination of those men. of the boers to escape from the Dutch power, and so form an independent government beyond the borders of the colony, especially in the district since called Graaf-Reinet, are strikingly similar to their proceedings at a later date under the British Government. 5th, The Gamtoos River formed the boundary between the Hottentot and Kaffre races, and was early adopted by the Dutch as their eastern limit ; but about the year 1740 they began to pass this river, and came into collision with the Kaffres, and in 1780 they extended their frontier to the Great Fish River.

In 1795 the colonists, having imbibed the revolutionary principles then prevailing in Europe, attempted to throw off the yoke of the Dutch, upon which the British sent a fleet to support the authority of the Prince of Orange, and took possession of the country in his name As, however, it was evident that Holland would not be able to hold it, and that at a general peace it would be made over to England, it was ruled by British governors till the year 1802, when, at the peace of Amiens, it was again restored to Holland. In 1806, on the renewal of the war, it was again taken by the British under Sir David Baird, and has since remained in their possession, having been finally ceded by the king of the Netherlands at the peace of 1815. At this time the limit of the colony was formed by the Great Fish River and the line of the mountains south of Bush- manland to the Buffels River and the Atlantic, the area being about 120,000 square miles, and the population little over 60,000. A summary may be given of the chief events which have taken place since 1806

lst, The Kaffre Wars.—The first of these wars took place in 1811—

12, and the second in 1819, when the boundary of the colony was extended to the Keiskamma. The third occurred in 1835, under Sir Benjamin D’Urban, when the boundary was-advanced to the Kei; but on the recall of that officer the country between the Kei and

Keiskamma rivers was restored to the Kaffres. The fourth Kaffre war

took place in 1846, and after being conducted by governors Maitland and Pottinger, it was terminated by Sir Harry Smith in 1848, The fifth war broke out at the end of 1850, and after being for some time carried on by

Governor Sir H. Smith, it was conducted in 1852 by Governor Cathcart, and brought to a conclusion only in March 1852. During its progress an armed police had been organized for the pro- tection of the frontier, and British Kaffraria was subsequently formed into a Crown colony, reserved at first for occupation by Kaffres. A somewhat more detailed account of these wars will be found under the heading Karrraria.

2d, In 1820, British emigrants, to the number of 5000, arrived at Algoa Bay, and laid the foundation of the settlements on the eastern frontier which have since become the most thriving part of the colony, including the important towns of Graham’s Town and Port Elizabeth.

3d, In 1834 the great measure of slave emancipation took effect in the Cape Colony. It has been of immense service in raising the character and condition of the Hottentots and other races before held in bondage, though many of the vices begotten by the state of

The attempts –

slavery still adhere to them. This measure gave great offence to the Dutch boers of the colony, and completed their already existing dis- affection to the British rule.

In 1835—6 a large number of these people resolved to free them- selves from the British Government by removing with their fainilies beyond the limits of the colony. With this object they sold their farms, mostly at a great sacrifice, and crossed the Orange River into territories inhabited chiefly by tribes of the Kaffre race. After meeting with great hardships and varied success in their contests with the natives, a part of their number, under one Peter Retief, crossed the Drakenberg Mountains and took possession of the dis- trict of Natal, where they established a republican government, and maintained their ground against powerful nations of Zulu Kaffres till 1842, when they were forced to yield to the authority of the British Government, which took possession of Natal.

The boers beyond the Orange River and west of the Drakenberg still, however, retained a sort of independence till 1848, when, in consequence of the lawless state of the country, and the solicitation of part of the inhabitants, the governor, Sir Harry Smith, declared the supremacy of the Crown over the territory, which was thenceforth called the Orange River Sovereignty. Shortly after this, in conse- quence, it was alleged, of certain acts of the British Government in Natal, Andrew Pretorius, an intelligent boer of that district, crossed the Drakenberg Mountains with his followers, and after being joined on the western side by large numbers of disaffected boers, raised the standard of rebellion. pen this the governor, Sir H. Smith, crossed the Orange River at the head of a detachment of troops, and encountered and defeated the rebels in a short but brilliant skirmish at

Boem Plaats. After this Pretorius and the most disaffected part of the boers retreated to beyond the Vaal River (the northern limit of the sovereignty), where they established a government of their own. They were subsequently, in 1852, absolved from their allegi- ance to the British Crown by treaty with the governors and her Majesty's commissioners for settling frontier affairs.

In 1853-54, in consequence of the troubled state of the Orange River Sovereignty, and the difficulty of maintaining with becoming dignity the authority of her Majesty there, it was resolved to aban- don the country to the settlers, mostly Dutch boers. This was carried into effect by a special commissioner, Sir George Clerk, sent from England for the purpose; and the country, under the name of the Orange Free State, is constituted a republic, with a president at its head, assisted or controlled by an assembly called the Volksraad (people's council), elected by nearly universal suffrage.

4th, The Convict Agitation.—After the British Government had felt itself compelled to discontinue the sending of convicts to New South Wales and Van Diemen's Land, the subject of transportation became one of great difficulty, the more so that an unusually large number of prisoners was then on its hands in consequence of the pro- secutions arising out of the disturbed state of Ireland. Under these cir- cumstances an Order in Council was passed in 1848, under authority of the Act of 5 Geo. IV., authorizing the secretary of state to send certain convicts to such colonies as he might think proper. A cir- cular was sent by Earl Grey, then colonial secretary, to the governor of the Cape (among other colonial governors), requestiny him to ascertain the feelings of the colonists regarding the reception of: a certain class of convicts. Unfortunately, owing to some misunder- standing, a vessel, the ‘‘ Neptune," was despatched to the Cape hefore the opinion of the colonists had been received, having on board 289 convicts, among whom were John Mitchell, the Irish rebel, and his colleagues. When the news reached the Cape that this vessel was on her way, the people of the colony became violently excited ; and goaded to fury by the inflammatory articles in the local newspapers, and guided by a few demagogues, they established what was called the Anti-Convict Association, by which they bound themselves by a pledge to cease from all intercourse of every kind with persons in any Way connected "with the landing, supplying, or employing convicts." On the 19th of September 1849, the ‘‘Neptune"

arrived in Simon’s Bay; and when the intelligence reached Cape Town, the people assembled in masses, and their behaviour was violent and outrageous in the extreme. The governor, after adopting several resolutions, and again abandoning them under the pressure of popu- lar agitation, agreed not to land the convicts, but to keep them on board ship in Simon’s Bay till he received orders to send them else- where. Even this concession did not satisfy any but a small num- ber of more moderate men. The mass of the population, under the guidance or domination of a few agitators, continued to do all in their power to prevent the convicts and all the officers of the Govern- ment from obtaining supplies. When the Home Government be- came aware of the state of affairs it immediately sent orders direct- ing the ‘‘Neptune” to proceed to Van Diemen’s Land, and the agitation ceased. This agitation did not, however, pass away with- out important results, since it led to another movement, the object of which was to obtain a free representative government for the colony. This concession, which had been previously promised by Lord Grey, was granted by her Majesty’s Government, and, in 1853, a constitution was established of almost unexampled liberality.

5th, In 1857 an almost incredible delusion arose in the Amaxosa

Divisions and chief towns.

tribe of British Kaffraria. It was predicted among them that, on condition of a complete sacrifice of their lives and property, a re- surrecticn would take place on a certain day, in which all the dead warriors and great men of the nation would arise in new strength ; and acting upon this faith nearly a third of the tribe, or about 50,000, perished in a national suicide. The tracts thus depopulated were afterwards peopled by European settlers, among whom were many of the German legion which had served with the English army in the Crimea, and a body of upwards of 2000 industrious North Ger- man emigrants, who proved to be a valuable acquisition to the colony.

6th, Public works in the colony marked an era in the opening, in November 1863, of the railway from Cape Town to Wellington, begun in 1859, and, in 1860, of the great breakwater in Table Bay, long needed on that perilous

coast. In 1865 the province of British Kaftraria was incorporated with the colony, under the title of the Electoral Divisions of King William's Town and East London. In the same year several important modifications of the constitution were adopted. :

7th, The discovery of diamonds in the districts north of the Orange River in 1867 drew the attention of the whole world to the colony, and gave new life and impetus to every branch of industry, leading to the annexation of the large territory of Griqua Land West to the British Crown. The Basutos, a division of the Bechwana Kaffres, occupying the upper valleys of the Orange River, had sub- sisted under a semi-protectorate of the British Government from 1848 to 1854; but having been Jeft to their own resources on the abandonment of the Orange Sovereignty, they fell into a long exhaus- tive warfare with the boers of the Free State. On the urgent petition of their chief Moshesh, they were proclaimed British subjects in 1868, and their territory became part of the colony by Act of Government of 1871.

8th, More recently, in 1874 and 1875, large areas of southern and northern Kaffraria, the Transkei territories of the Fingo and Tam- bookie tribes, and the territory of Griqua Land East on the southern border of Natal, have also come under British rule by the free con- sent of their inhabitants. At the present moment attention is strongly directed towards the consolidation of the European states of South Africa, and the introduction of greater unity in their hitherto conflicting systems of government, with a view to the more complete development of their great natural resources.

A sum of five millions sterling voted by the Government is now (1876) being expended in the construction of four trunk lines of railway:—one extending the already cxisting line from Cape Town, two from Port Elizabeth, and one from East London. 'The tele- graphic wire now connects Cape Town with Port Elizabeth, Grahams- town, King William's Town, East London, Queenstown, Beaufort West, Graaf Reinet, Cradock, Colesberg, and Kimberley in the diamond fields. Five steamers now run between England and the Cape each month.

Until the year 1873, the colony was divided for the purposes of administration and election of members for the Legislative Council into two provinces, a western and an eastern ; but with the growth of the colony

these were found to be inconveniently large, and by an Act of Government, which became law in 1874, the country was portioned out into seven provinces; at about the same time some new divisions were formed within them by the reduction of those already existing. Space does not admit of a special description of each of these divisions; the following table, however, shows their approximate area and the increase of their population from the date of the first census in 1865 to that of 1875. The native districts recently added to the eastern side of the colony are governed by Government agents and resident magistrates, who are undcr the direction of the secretary for native affairs in Cape Town.

Population. Provinces, Divisions, and Arca! in Native Districts. square milcs. Census Census

1865. 1875.

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1 The areas of the divisions are adapted from those calculated at Gotha for Dr Behm’s Bevélkerung der Erde, which are nearer the truth than the approximation given by the Cape surveyor-general. The areas of the native districts have been specially ascertained from a map supplied by the secretary for native affairs in 1875.

GVHLPRL COLONY

H | Population. Provinces, Divisions, and Arca in Native Districts. square miles. Census Census

1865. 1875.

Brought forward …..... 5,423 95,1738 | 112,831 N.W. Provy., continued— Worcesterrecteneteerenc ces 5,975 7,704 9,801 Dullbaghe. .cescenecenseeeae ce 5,328 8,695 9,943 Clanwillitamiteeses.ceseeee sete 7,420 7,041 8,404 Gallivinna):.cs: 5 cee cee eros 20,017 8,521 7,452 Namaqua Land ….. Seeaaeen 18,200 10,071 12,351 SouTH- WESTERN PROVINCE: Caled Onis. ccucaa sass secece 2,150 9,900 11,303 Bredasdorpie.:.csc..-.0-4e80 1,485 4,169 4,285 TS wellendainy …...c.csese0s0 1,941 9,964 10,005 RObeRtSOnY fino. sc8bse sade ss 98 2,283 6,155 7,986 Riversdalete..<. ..:..+ ses 4,090 6,090 7,607 PR Bape LON Micccicsc.sc acces a ~ 25702 4,349 6,144 NU ENE SOULS 55 ccene rcs PSO eee ee 2,037 16,264 16,441 Pathurstaee.. cscaseassssscscets 419 4,867 5,803 ROrte Blige DOth co.csseseso« ss 236 11,633 14,450 LOT Res RIOT) een OSE eee 5,823 18,148 21,467 FRURMIAMOTP:.. oo… sccceeees 2,702 7,876 7,298 IMIERENATIO Gs 6 .ccsccccecnes 1,180 6,655 6,020 Wactonattaste, ...c…0..srees 419 8,292 7,970 Pedder rrtncgi ss. oes sscccdiee..- 572 18,796 16,538 NortTH-HASTERN PROVINCE: HortiBeatorts. ... s2.ss00.¢s 837 138,341 15,657 Stockenstroom ….....- 125 5,647 6,499 Somerset East…..... 3,253 10,593 10,858 Bedtord rcranscswcesecesence: 1,393 8,350 8,636 CRIME. oo csecscscestcsenes | 4,758 | 12,298 11,313 PAUIEYUR ee sere eeian oa etanene ens 3,045 9,802 Rae) Middelibuag: .....-5COMB sic. sakes. dstennens 6,850 8,115 10,187 EASTERN PROVINCE: Jd Loayelon aamenereseneecogs 1,707 3,040 15, 466 King William’s Town’..... 1,756 66,737 108,041 QUeenStEWih. ...s.cicsccccce.0s 3,882 44,555 50,711 Aliwal North…..... .. 8,107 WWIGGCHOUSC..ces-02 see sere: 5,024 22,200 26,5708 llenscltellscipatirecseiese serees 22,664

195, 883 566,158 721,435

ASUTOMGAN Dass. aunaarieign se 8,750 40,009(?)| 140,000 NoMANSLAND (including 4 Griqua Land East).... ” aabe0 O0s000 ae OHN’S TERRITORY— Pondomise, Lehana, &e., Kafites)c.cc.::- 25740 ip ene TRANSKEIAN TERRITORY— JdimaV{o el LAG ly penppecoadooooone: 1,050 43,971 Tambookie Country…..... 1,500 70,0785 Idutywa Reserve …..... 400 18,000

1,063, 482 50,000

The returns of population classified according to race Popula- Tn tion.

have not yet been received for the census of 1875. 1865 the Europeans of the colony numbered 187,400 or about 33 per cent. of the whole. The white or dominant population is composed of colonial Dutch, who are most numerous in the western divisions; of Anglo-Saxons, who

2 Formerly British Kaffraria.

5 Including 18,445 Tambookies of the ‘‘location” in Wodehouse and North-Eastern Queenstown.

- Griqua Land East (1875), pop. 31,901 ; country west of Griquas, pop. 8407.

> Including emigrant Tambookies now in colony.

CAPE COLON Y

are ina majority in the east; and, in smaller proportions, of . Germans, descendants of French emigrants, and Portuguese. English, which is the language of the legislation, is used in the seaports and eastern border towns, but Dutch is still commonly used in many parts of the western and midland provinces. Of thirty newspapers published in the colony twenty-five are English.

The major part of the population of the colony, how- ever, consists of Hottentots, Malays, Negroes, and Kaffres. The aborigines with whom the first settlers at the Cape came in contact had originally the generic name of Quzeque, and received the name of Hottentots from the Dutch. Owing to intermarriages with Malays, Negroes, and others, and illicit intercourse with the whites during the period of slavery, the race has lost much of its dis- tinctive character. In 1865 the number of people distin- guished as Hottentots was 82,000, nearly two-thirds of whom were found in the western division. The Malays were introduced by the Dutch as slaves; their descendants still retain the Mahometan religion, and most of the dis- tinctive habits and customs of their race. We have no means of ascertaining their number, but it cannot be large. They are found chiefly resident in the

seaports. The negroes are mostly from the eastern coasts of Africa. Griquas or Baastards are a mixed race sprung from the intercourse of the Dutch boers or farmers with their Hottentot slaves. A. great number of them migrated from the colony in the early part of this century with the boers, and settled between the Orange River and the Vaal under the chiefs Waterboer and Adam Kok, in part of the territory now known as Griqua Land West. In 1852 Kok's people (about 15,000 in number) separated from the others, and migrated to the district called Nomansland south of Natal, which had been depopulated by the strifes of the Amapondo and Amabaca Kaffres, forming there the settle- ment called Griqua Land East or New Griqua Land.

The line of division between the native Hottentot (or Bushman) and Kaffre races of South Africa passes south through the Cape Colony in about 26° E. long. The Kaffres now resident within the colony proper are chiefly of the tribe of the Amaxosa, with whom the colonists first came in contact at the line of the Great Fish River in 1778, and the Fingoes, who originally came from Natal and its vici- nity; driven thence early in the present century by Chaka, a warlike chief of the Zulu Kaffres, they took refuge with the tribes on the border of Cape Colony. There they were reduced to a state of serfdom, from which they were liberated by Sir Benjamin D'Urban after the third Kaffre war of 1835, when a body of 16,000 of them came into the colony and settled in what is now the division of Peddie. From this, again, the greater part of the Fingoes have moved to the district now called Fingo Land, east of the River Kei, recently joined to the colony. In 1865 the number of Kaffres within the limits of the colony was not less than 164,500. The Kaffres of the native districts which have come under British rule during the last three years are—

(1.) The Basutos, sometimes called Mountain Bechwanas, the frag- ments of several broken tribes of the Bechwana Kaffres which became united under the rule of Chief Moshesh. Besides the inhabited dis- tricts of Basuto Land, they now occupy the portion of Nomansland which lies between Griqua Land East and the range of the Draken- berg. (2.) The Ama-baca, who appear to be divided,—one portion of the tribe inhabiting the eastern third of Nomansland on the borders of Natal; the other, under Chief Makaula, the north-eastern portion of St John's Territory. (3.) The Ama-

xesibi, under Chief Jojo, in the country immediately south of Griqua Land East. (4) The Pondomisi, under the chiefs Umhlonhlo and Umditehwa, oceupy- ing the southern portion of St John's Territory. (5.) The Lehana, Zibi, and Lebenya, small mountain tribes along the north-west side of StJohn's Territory. (6.) The Tambookies, one of the most numer- ous and powerful of the Kaffre tribes located in part within the

colony proper, in the south-east of the division of Wodehouse and the north-east of Queenstown, and in part oceupying the adjoining basin of the Tsomo, a tributary of the Kei River, in the districts of their chiefs Gecelo, Stoekwe, Matanzima, and Darala. The Tam- bookies under Gangelizwe occupy the tract between the Bashce and the Umtata.

All these are now directly under British rule. The following tribes of Kaffraria, enclosed by British territory, still retain their indepen- dence. (1.) The Ama-pondo, the largest tribe between the Cape Colony and Natal. These were also formerly driven from a more northerly region by the Zulu Kaftfres, and now occupy the eountry on each side of the lower St John's River, under their paramount chief Umquikela Faku, his brother Damas ruling a smaller southern division of the tribe; their numbers are estimated by missionaries resident among them at not less than 160,000. (2.) The G'calecas and Bom-Vanas (Ama-bomvane), on the eoast-land between the Kei and the Umtata Rivers, of whom Kreli is paramount chief, Moni the chief of the Bom-Vanas acknowledging his supremacy.

Prior to 1827 there existed in the several districts of Govern- the colony an institution established by the Dutch called the ment.

Board of Landrost and Heemraaden. The landrost was the chief magistrate of the district, appointed and paid by the Government. The heemraaden was a council to assist him, composed of respectable inhabitants appointed by the governor, on the recommendation of the landrost. Thess boards not ouly had the administration of the local affairs usually entrusted to municipal bodies, but they also possessed extensive judicial authority. In consequence of abuses, more especially in the exercise of the latter func- tions, these institutions were abolished in 1827.

Prior to 1837 the whole authority of the general Govern- ment was vested in the governor, assisted by a small council of officials. In that year a legislative council was established, consisting of certain Government officials, and five persons nominated by the Crown. An executive council was also established to assist the governor in executive matters, consisting of certain high officers of Government. Such was the form of government till 1853, when the legislative council as thus established was abolished, and a new constitution introduced. Under this the legislature consists of the governor, appointed by the colonial office for a term of six years, and two chambers, called the legislative council and the house of assembly, both elected by the people. The former body was latterly composed of eleven members for the western and ten for the eastern province, chosen by the whole body of electors. But in 1873 a bill was introduced for dividing the country into seven electoral provinces, to give a more equable distri- bution of political influence, and to do away with the separa- tion of the colony into two parts; and by this arrangement each of the new divisions is to return three members to the upper chamber. This bill became law in 1874, but does not come into execution until the dissolution of the existing council by expiration of the time of its session. To qualify aman to be elected for this chamber, he must. possess property in land worth £2000, clear of charges, or £4000 in landed and personal property together; he must be thirty years of age, and must have been invited to become a candidate by written requisition, signed by not less than twenty-five electors. The voting in this election is cumu- lative,—that is, any elector may give all his votes (as many as there are members to be chosen) to one candidate, or he may distribute them among the candidates as he pleases. The council is elected for ten years, but so that half its number, as near as may be, go out every five years.

The legislative assembly is chosen by the electors of the towns and other electoral districts into which the colony is divided. The candidates have to be proposed and seconded at the hustings. There is no property qualification required of the candidates. The assembly consists of sixty-eight members, and is elected for five years.

The qualification of electors of both houses is the same, namely, the occupation of fixed property worth £25, or the

receipt of wages of not less than £50 a year. The ministry under the governor includes a colonial secretary or premier, a commissioner of crown lands and public works, an attorney-general, a treasurer-general, and a secretary for native affairs. Since 1872 the ministry holds office, like the English cabinet, at the pleasure of the Parliament.

The governor may dissolve both houses, or he may dissolve the house of assembly without dissolving the council. He may give or refuse his assent to bills in the Queen's name, or he may reserve them for the decision of her Majesty. The Queen may disallow any bill assented to by the governor at any time within two years of its receipt. It is further provided, that all bills appropriating any part of the revenues must be recommended to the house of assembly by the governor.

The administration of justice is presided over by a supreme court of five judges—a chief justice and four puisne judges. The chief justice with two judges holds the supreme court in Cape Town ; two other judges of the supreme court form the "court of the eastern districts" held at Graham's Town. 'The jurisdiction of the court of Cape Town extends over the whole colony; that of Graham's Town has a concurrent jurisdiction over the eastern divisions. Circuit courts are held throughout the colony twice yearly. Hach division has a salaried magistrate who is also civil commissioner, and the magisterial courts have a limited jurisdiction in civil and criminal cases. The civil commissioner presides over the "divisional council " of his district, an elected body charged with the super- intendence of roads, boundaries, and other interests of the division. The Roman or civil law, as received in Holland before the introduction of the Code Napoleon there in 1811, was in force in Cape Colony at the time of its cession to Britain, and remains authoritative, though a few modifica- tions have been sanctioned by Parliament.

The Cape Colony possesses important British military and naval stations, and the establishment maintained by the Home Government has always been very considerable. This was especially the case during the Kaffre

wars. In recent years, however, a gradual reduction of the number of imperial troops in the colony has taken place. Jn 1873 two British infantry regiments, with detachments of the Royal Artillery and Engineers, were quartered in the colony ; but these are kept at the Cape rather for the purposes of the Home Government than for the domestic defence of the colony. A force named the Frontier Armed and Mounted Police was organized for the latter purpose in 1853, and has been specially serviceable in quelling disturbances on the interior borders of the country. This force is divided into seven troops, and numbers 750 men. Small volunteer corps of rifles and cavalry have been organized at various points of the eastern and western divisions.

The greater number of the Protestant denominations of the United Kingdom, as well as the Roman Catholic Church, are represented in Cape Colony. The Dutch Reformed Church, as might be anticipated from the early history of the country, is by far the most nunterous com- munity. In form of government and in order of service it closely resembles the Church of Scotland, to which country a considerable number of its ministers belong. The Church of England has, perhaps, the next smaller

number of adherents. In 1847 a bishop of Cape Town

was appointed to preside over this church, whose diocese extended not only over Cape Colony and Natal, but also over the island of St Helena, Later, however, separate bishops were appointed for the eastern province (with the seat at Graham's Town) and for Natal. Wesleyan Metho- dists nearly equal the Anglicans in number, and have a larger proportion of coloured people in their body than any other sect. Tha Congregationalists, including Independents

and Baptists, are an important body. Lutherans, Presby- terians, and other Protestant communities, such as the. Moravians, are in smaller numbers. The Roman Catholics have bishops in Cape Town and Graham's Town, but are comparatively few. Government provides an annual grant for ecclesiastical purposes, which is distributed among the various religious bodies, the Congregationalists alone declin- ing to receive aid from the state. According, however, to the provisions of the "' Voluntary Act," recently passed, the grants in aid are to be continued only to present

incumbents. There are besides several foreign missions in the colony, the most important being the Moravian, London, and Rhenish missionary societies. The Moravians have been established there since 1732, and have labonred hard to convert the native races.

As early as 1839 a scheme of public schools, drawn up Edueati by Sir John Herschel, came into operation, which was well adapted to the condition and circumstances of the colony at that time. The Education Act of 1865, now in operation, is an advance on this system, and provides three orders of schools adapted to the wants of the main grades of the population, the Europeans, mixed races, and pure natives. These orders comprise — (1) Undenominational public schools in each division of the colony in three classes, subject to the inspection of a superintendent-general of education, and having teachers whose salaries are guaran- teed; (2) Schools established by missionary societies to which Government aid is granted under certain con- ditions for secular education; (3) Day schools and industrial institutions for the civilization of the aborigines on the frontiers of the colony. For ligher education there are several colleges, The South African college in Cape Town was founded in 1829, and in its higher classes prepares for the European universities and for colonial examinations ; the college has a grant of £400 annually from Government. Graaf Reinet College, on the same plan, has a similar subsidy. The Grey Institute, in Port Elizabeth ; Gill College, in Somerset East; the Diocesan College, under the bishop of Cape Town, the first of the institutions of a purely denominational character; the Theological Seminary of the Dutch Reformed Church at Stellenbosch ; and four educational institutions of the Roman Catholic Church, are the other schools of higher education which are chiefly worthy of note. A public university, founded on the plan of that of London, arose out of and superseded the Board of Public Examiners (which had been constituted in 1858),and stands at the head of the educational system of the colony ; it was established by Act of Parliament in 1872. Liberal bursaries and scholarships have since been attached to it, enabling students to continue their studies in Britain. The hospital of Cape Town is so far recognized as a medical school by the Colleges of Surgeons and Physicians, that students are allowed to spend two years of their course there in qualifying for their degrees.

The leading public institutions of the Cape Colony—- Public. the Royal Observatory, the South African Public Library sti? and Museum, and the Botanic Garden and Government Herbarium—are noticed under Cape Town below. The Albany or Graham's Town Museum, the chief of the provincial institutions of this kind, perhaps surpasses that of the capital in its collections and classification of the natural products of Southern Africa, A colonial medical committee, appointed by Government and presided over by a Government inspector of hospitals, is at the head of the curative institutions of the colony, the chief of which are the hospitals of Cape Town, the infirmary at Robben Island, and those of Port Elizabeth, Graham's Town, and King William's Town, with the numerous gaol hospitals throughout the countrv.

Press.

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The first newspaper of the colony, written in Dutch and English, was published in 1824, and its appearance marked an era not only in the literary but in the political history of the colony, since it drew to a crisis the disputes which had arisen between the colonists and the somewhat arrogant governor, Lord Charles Somerset, who had issued a tyrannical decree prohibiting all persons from convening or attending public meetings. Its criticisms on public affairs soon led to its suppression by the governor, and a memorial from the colonists to the king petitioning for a free press was the result. This boon was secured to the colony in 1828, and the press soon became a powerful agent, characterized in an especial manner by public spirit and literary ability. There are now about fifty newspapers and periodicals in English and Dutch, published in the Cape Colony and Natal.

The following table, giving the value of imports and exports and the tonnage of shipping in several years, taken at intervals, exhibits the progress of the commerce of the colony :—

Imports. Exports. Shipping.

Tons.

£541,038 | £362,280 134,875

732,494 775,060 184, 442 1,277,101 637,252 224,126

2,665,902 | 2,080,398 329,934 2,352,043 | 2,453,768 335,509 5,558,215 | 5,138,838 691,855

In the order of the amount and value of their commerce the ports of the Cape Colony rank thus :—Port Elizabeth, Cape Town, East London, Mossel Bay, Port Alfred (Kowie mouth), and Simon's Town,—the value of the trade of Port Elizabeth being more than double that of Cape Town.

The following table gives the quantities and values of the chief articles, the produce of the colony, exported during 1874 :—

Quantity Value. PAU ESM etre eccnete saciese ae 614,272 £5,526 Argol (crude tartar) ..... ah 75,598 2,268 oppenOre .. . cesses. tons 13,646 321, 434 Corn, Grain and Meal— Ian eVirseneees = ceiss eases Tb =: 148, 260 747 Beans and Pease…..... a 70,443 469 MEU Mseeaisrtc ieee seeess sie ares A 94,500 520 Bal Wie es cv caceeweavess y» 308,827 3,202 IETS, seepReperocer coonceene an 710,766 2,197 (Okt pagan eee sanencoee: 679,596 5,337 Wheat eC nner 35,411 496 (Choi cuty dhaheanvececceesn anbeseree a 15,117 257 Wiamondse. sce. eaastes No. 2,893 8,148 Feathers (Ostrich) ..... Tb 36,829 205,640 HSH CUNCCEE..s seucaceesciese », 4,872,814 34,339 tiie Cied., aeeseee eect a 382,762 5,078 Hair, An@Ora…... versse +51) L0Sb,a40 107,139 WIGS ss att cies esas se seers No. 68, 458 49,425 RE GeATRE «5. —cuceevasvernes "i 134,154 1,900 BELGUSES so, eat cc cea toe eee An 48 1,925 INO} Wocanne eesonden ete icooec 73,747 26,667 Skins, Goat… No. 1,478,761 194,323 De See senccess yy 1p 2yS07 144,538 Spirit, Brandy…..... Galls. 718 245 Wine, Constantia ….. fp 1,655 1 2 eee OKdinarye…..... Ag 77,802 15, 876 W/O)! shncnoonncaneeeaneneeneee Tbh 42,620,481 2,948,571 OthereArplelesnsmaeiyet oe acukvasesteeceses. 51,299 Add, for unregistered diamonds…..... 1,000,000 ARO GAME V AITO os csos eee cases hese £5,138, 838

The most important item of export is wool, and the following table shows the progress of the trade in this product, which is now almost monopolized

by the eastern ports :---

Exports. eee Port Elizabeth Cape Town ‘ (with Port Alfred and (with Port Beaufort and East London). Messel Bay) Tb ib

18338. 39,753 73,324 1840. 401,521 509,597

5), en 4,323,650 1,589,277 SG O Reece. 19, 438,566 8,734,219 S(O Rvs. tomece 33,809,934 3,473, 357

The number and value of the diamonds exported cannot be judged by the figures in the above table, since but few parcels of them are entered as freight. The whole declared value of the diamonds exported from the year of their discovery till 1874 was £743,000, but it is believed that diamonds to the value of upwards of £10,000,000 have been taken from the mines of Griqua Land West.

The copper ore of the Cape Colony is derived from the mines in Namaqua Land. Since 1863, when this branch of mining became a settled industry, and the Cape Copper Mining Company was formed, the exports of ore have risen steadily from an annual total of 2900 tons to upwards of 13,000 tons. Wine was at onc time the staple export, and was imported in large quantity by England ; falling into disrepute there, the industry remained in a depressed state for many years, but revived on the impulse given by the discovery of diamonds, and besides acquir- ing an increased consumption in the colony is again rising as an export.

The imports of the colony consist mainly of manufactured goods, cloths and hardwares, sugar and tobacco. The revenue of the colony is derived chiefly from an ad valorem tax on all goods impcried (with the exception of agricultural machinery, animals, bullion, books, and un- manufactured African products), and on land sales and rents, and from a tax called transfer-dues on the purchase money of all landed property sold, stamp-duties, and postages. The expenditure is for payment of salaries of officials and support of government. The colony incurs the expense of the regiments of Cape mounted riflemen and police, but the British troops in the colony

are maintained by the Imperial Government at an annual cost of about £200,000. The subjoined table shows the progress of the revenue and expenditure of the colony :—

Revenue. Expenditure. 1S 0 ee eee Eee £130, 808 £126,889 SA ORS seatncesccsacaes 171,205 181,653

1850. 245,785 245,655

ERG OE: i’s asic ne sisumetetetale (aril 729,689 TES AU Berar. coon eee 831,211 795,695 Moor canes sceacewss ea 2,078, 220 2,159,658 ISAs cea tecines salen 1,907,951 1,199,970

The revenue of 1873 was abnormally increased by the raising of a loan of £860,000, included in the statement, while the increased expenditure was caused by outlay on public works. The revenue of 1874 was increased by a loan of £369,400. The colony has a public debt, bearing interest at the rate of 6 per cent., dating from 1859. The debt had reached the amount of £1,723,000 in

1874.

Care Town, the capital and seat of government of Cape Colony, lies at the head of Table Bay, on the northern side of the peninsula formed by Table Mountain, and 30 miles north of the Cape of Good Hope. It was founded in 1652 by Van Riebeeck, and at first consisted of a few houses under the shelter of a fort, at the mouth of the Zoeta or “ Sweet Stream,” on the site of which the still existing castle was built. The chief streets of the increasing town were subsequently laid out at right angles, but the outer streets and suburbs extend irregularly upwards. The town is now paved, and lighted with gas, and bas a regular water supply. Its architccture generally

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retains the features given to it by the earlier settlers, the

houses being of brick faced with stucco, with flat roofs:

and cornices and raised platforms called “stoeps” in front ; but these are rapidly giving place to edifices. of more modern design. Be- : sides the castle, which is now useless in a military point of view, being com. manded by the sur- rounding heights, the public buildings in- clude the Govern- ment House (a mod- ernized Dutch build- ing), the supreme courts, the art gal- lery, the exchange, the post-office, and the public library (with upwards of 40,000 volumes) and museum, inaugur- ated in 1860, perhaps the finest edifice in the city. New par- liament houses are being built on a magnificent scale, the legislature having voted a large sum

for this purpose. |i Cape Town is the seat of bishops of the Anglican and Roman churches, | Among ‘its ecclesias- tical buildings the Roman Catholic cathedral, a Gothic structure, is the most conspicuous. A university has been erected, and there are several educational institutions, The botanical gardens, in the centre of the town, serve the purposes of a park,

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Cape of Good Hope.

and have been of great value in the introduction to the colony of many trees, flowering plants, and fruits.

The town is a municipality governed by a mayor and council. Its population, amounting in 1875 to nearly 33,000, is formed of many races; people of Dutch descent are still more numerous than British, but all

European nations are represented. The “coolie” or labouring popu- lation comprises the descendants of negro slaves, and half-

| bred Hottentots and Kaffres; the Malays form a numerous

class.

Cape Town is the starting-point of the Great Western Railway, which at present reaches Wellington, and is being extended towards Beaufort; and from the town communica- tions are maintained by post, cart, or waggon, with all chief points in the interior. Besides being a market for home produce, Cape Town imports manufactured articles for the greater part of the western provinces, and has a large export trade in copper, wool, wine, fish, and fruit ; the construction of a breakwater and docks in Table Bay having rendered shipping more secure and facilitated traffic. Several lines of steamers maintain regular com- munication with Cape Town both from Europe and from India, passing along the eastern and western sides of the continent.

The scenery round the head of Table Bay is very striking. Table Mountain, with its branches the Devil’s Peak and Lion’s Head, rises in a massive wall immediately at the back of Cape Town. During the prevalence of south-east winds it is covered by a dense whitish cloud, partially overlapping its side like a table-cloth. Along the base of this mountain, where lie the suburban villages of Ron- debosch, Claremont, Wynberg, and Constantia, the land is covered with luxuriant vegetation, including oaks and firs, with gardens of flowers and shrubs (especially of heaths) and vineyards, and is studded with villas.

The Royal Observatory of the Cape, established in 1820 —one of the most valuable of those supported by the British Government—-is three miles east of Cape Town.

See Cape of Good Hope Blue Books; H. Hall, South African Geography; J. Fleming, Southern Africa; Handbook for South Africa; Glanville, Guide to South Africa ; Noble, Descriptive Handbook of Cape Colony. Ee. dl).

CAPE HAYTIEN, or Cap Harmen, a town on the north coast of the island of San Domingo in the republic of Hayti, about 19° 46’ N. lat. and 72°14’ W. long. Its original Indian name was Guarico; and it has also been known at various times as Cabo Santo, Cap Frangais, and Cape Henry, while it is familiarly designated as simply Le Cap. It is situated at the foot of a fine range of mountains on a small bay, and possesses a secure and commodious harbour. Its trade is principally with the United States. It has declined considerably from the flourishing condition to which it attained during the French supremacy, when it was the seat of an archbishop, and possessed a university and academies of music and painting, but it is still one of the chief towns of the republic, and is the seat of a civil and criminal court and a tribunal of commerce. It was originally founded by Spaniards from the island of Tortuga, and possesses an eventful history. In 1695 it was burnt by the English ; and shortly after the revocation of edict of Nantes it received a French colony. In 1791 it was captured and burnt by Toussaint L’Ouverture ; and in almost all the revolutions of the island since that date it has suffered severely. In 1842 it was almost destroyed by an earth- quake. ‘The troops of Salnave, who were in possession in 1865, having insulted the British flag, Captain Wake

bombarded the town and blew up the arsenal. In 1869 the followers of Saget made themselves masters of the place. The population at present is estimated at 12,000 ; but in last century it is said to have exceeded 38,000. CAPE VERD ISLANDS. This group, situated in the Northern Atlantic Ocean, between the parallels of 14° 20’ and 17° 20’N. lat., and 22° 20’ and 25° 30’ W. long,, consists of ten islands, viz. :—Sant? Antao (commonly

miswritten St Antonio), Sa Vicente, Santa Luzia, Sido °

Nicolao, Sal, Béa Vista, Maio, San Thiago (the St Jago of the English), Fogo, and Brava, besides a few uninhabited islets. They form a sort of broken crescent, with the con- cavity towards the west. The last four constitute the leeward (Sotovento) group and the other six the windward (Barlavento). The distance between the coast of Africa and the nearest island (Béa Vista) is about 200 miles, Their total area is estimated at 1240 square geographical miles. They belong to Portugal, and derive their name (Z/has do Cabo Verde), frequently but erroneously written Cape de Verd

Islands, from the African promontory off which they lie, known as Cape Verd, or the Green Cape. The archipelago was partially discovered in 1441 by an expedi- tion fitted out by Dom Henrique of Portugal, under Antonio and Bartolomeo di Nolli; but no settlement was made on the islands till after the voyage of Cada Mosto in 1456,

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It is most probable that the islands were uninhabited at the period of the Portuguese discovery. The new settlers, however, imported negroes from the African coast. The population now amounts to upwards of 70,000, and would have been much greater if famine, caused by droughts and ‘epidemics, had not frequently diminished it. The blacks and mulattoes far outnumber the whites, whose constitution is less suited to the climate. Slavery existed in the islands in full force until the Portuguese Government set free the public slaves in 1854, and modified the condition of those who belonged to private individuals. At that time the number of persons subjected to “involuntary servitude ” amounted to about 6000, but at the census of 1860 they had been reduced to 3979. Criminals are transported thither from the mother country, and the punishment is much dreaded. All the towns are poor, dirty places ; even the best have few tolerable houses. The people are mild and hospitable, but indolent and uncleanly. In religion they are Roman Catholics. They are extremely ignorant and superstitious, and many heathen notions and practices pre- vail among them, brought from the African coast. All the inhabited islands have churches, except S. Luzia. The language is a bastard Portuguese, known to the people of the mother country as lingua creowla.

The archipelago forms one of the foreign provinces of Portugal, and is under the command of a governor-in-chief appointed by the Crown. There are two principal judges, one for the windward and another for the leeward group, the former with his residence at 8. Nicolao, and the latter at Praia; and each island has a military commandant, a few soldiers, and a number of salaried officials, such as police, magistrates, and custom-house directors. There is also an ecclesiastical establishment, with a bishop, dean, and canons. In every island there is a primary Govern- ment school conducted by the priests, but the attendance is very small, and the children of the

wealthier inhabitants are sent to Lisbon for their education. There are no roads in the islands, and ponies and donkeys are the beasts of burden.

Climate and Meteorology.—The atmosphere in the vicinity of these islands is generally hazy, especially in the direction of the continent. With occasional exceptions during summer and autumn, the north-east trade is the prevailing wind, blowing most strongly from November to May. The rainy season is during the months of August, September, and October, when there is thunder and a light variable wind from south-east or south-west, which is principally due to the close approach of the inner margin of the north- east trade winds, and the in-draught to the neighbouring continent, occasioned by the rarification of the air over the Sahara. The Harmattan, a very dry east wind from the African continent, occasionally makes itself felt. The heat of summer is high, the thermometer ranging from 80° to 90° Fahr. near the sea. The unhealthy season is the period during and following the rains, when vegetation springs up with surprising rapidity, and there is much stagnant water, poisoning the air on the lower grounds. Remittent fevers are then common. The people of all the islands are also subject in May to an endemic of a bilious nature called locally /evadias, but the cases rarely assume a dangerous form, and recovery is usually attained in three orfour days without medical aid. The droughts already spoken of are sometimes general, sometimes partial. On some of tho islands rain has occasionally not fallen for three years. The immediate consequence is a failure of the crops, and this is followed by the death of great numbers from sheer starvation. To add to these horrors, epidemics usually break out afterwards. These disastrous occurrences have greatly obstructed the progress of the colonies. In the general famine of 1730-3, about two-

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thirds of the population perished, and in that which began in 1831-3, 30,000 persons are supposed to have perished. The years 1855 and 1856 were also marked by great distress in several of the islands.

Productions, Agriculture, &c.—The chief occupation of the islanders is cattle-feeding. In some of the islands the making of salt from sea-water employs a considerable number of persons. Orchil is gathered, and the indigo and castor-oil plants, as well as the physic-nut plant (Cureas

purgans), are cultivated. The fruit of the last is exported in large quantities to Portugal, where the oil is expressed and consumed in lamps. Maize, sugar-cane, and the manioc plant are also much cultivated, as well as cotton and tobacco to a limited extent. Coffee was intro- duced in 1790, and grows well. Though the soil and climate are fitted to produce many tropical fruits, these receive little attention. Cocoa-nut trees, date-palms, tamarinds, and bananas are seen on most of the islands, Pumpkins, sweet potatoes, and the kalo are generally cultivated. Wood, except in the interior of 8. Antao, is entirely want- ing, and the people are often reduced to great straits for firing.

Quails are found in all the islands; rabbits in Béa Vista, and in' San Thiago and Fogo. Goats and asses are reared, and the skins of the former are exported. The neighbouring sea abounds with fish, and the coral animal is at work building up dangerous reefs on submerged rocks. 'Turtles come from the African coast to lay their eggs on the sandy shores.

The exports consist chiefly of coral, salt, physic-nuts, hides, coffee, maize, kidney-beans, sugar-cane spirit, and coarse sugar. The imports are cotton cloths, timber, hardware, crockery, glass, and wine. There is a con- siderable intercourse in the way of exchange between the islands one with another. There is a British consul stationed at Porto Grande in 8. Vicente, and a vice-consul at Porto Sal Rey in Boa Vista. On none of the islands have any lighthouses as yet been erected.

Botany.—The flora of these islands has been described by Mr P. Barker Webb in his Spicilegia Gorgonea, a catalogue of all the plants then discovered in the Cape Verd Islands, which forms part of Hooker's Viger Flora, London, 1849; also by Dr J. A. Schmidt in his Beetrdge zur Flora der Cap-Verdischen Inseln, Heidelberg, 1852. From these works it appears that the total number of wild flowering plants amounted to 424, of which 77 are monocotyledonous, and 347 dicotyledonous. Of the former an asparagus and 14 grasses are peculiar ; and of the latter, 50 are peculiar, There are besides 14 ferns, two of which are peculiar. The flora is closely related in the main to that of the neighbouring continent, and is strongly impressed with a tropical character. Doubtless a large proportion of the plants have been introduced.

Geology.—The whole archipelago is of volcanic origin, but little is known of its geological structure. Mr Darwin's examination of San Thiago (St Jago) appears to be the fullest that has been made of any of the islands, and that was only partial. Mariue shells are found embedded in tufa at Béa Vista (as we learn from Bowdich, who visited that island in 1823), showing an upheaval to some extent. In Fogo is a still active volcano several thousand feet high, which merits the investigation of geologists; and indeed all the islands would, doubtless, repay the student of volcanic phenomena for the time and labour bestowed on their examination For instance, an inquiry into the circumstances under which calcareous sand is thrown upon the island of Béa Vista, and heaped up by the winds into hills 30 feet high, would probably tend to explain the origin of the superficial layer of similar sand

'in part of Madeira and Porto Santo.

8. Antao, the most north-westerly of the group, has an area of 240 square geographical miles, and a population of about 29,000. Its surface is very rugged, and the interior lofty. The Sugar Loaf, its highest mountain, is thought to reach the altitude of 8000 feet. This island is reputed to be at once the most picturesque, the healthiest, the best watered, and the most fertile of the archipelago. On the other hand, the difficulty of passing from one part to another is very great. There are three indifferent landing-places, of which the most frequented is Ponta do Sol, where the custom-house stands, distant more than a Ieague from the chief town, Ribeira Grande, situated in the north-west of the island, a place of about 7000 inhabi- tants, Tarrafal Bay is spacious, and is sheltered from the prevalent winds. The island produces good coffce and sugar, and abundance of fruit; but the people are reputed to be indolent and inattentive to the advantages which soil and water afford them. Lead is said to be obtained, and there is a current opinion that other metals exist. Somewhere on the island is an extinct crater, from which the people declare that a wind occasionally issues so strong as to fling back any object that may be cast into the hollow.

S. Vicente (St Vincents) lies adjacent to S. Antao on the east. It has a superficies of 70 square miles, and a population of about 1700. At Porto Grande, on the north-west coast, is an extensive and excellent harbour, with

a coaling station for British steamers ; and barracks and municipal buildings are in course of erection. The island is so exposed to the fury of the north-east winds that not a tree will flourish. Its soil yiclds very little, and the inhabitants are supplied with grain and fruit from 8S. Antao. The distance from S. Vicente to 8. Antao is about 8 miles, to 8. Luzia about 4 miles.

Santa Luzia is a small island between S. Vicente and 8. Nicolao, with an area of about 18 square miles. ‘The inhabitants, who are wholly occupied in attending to their cattle, do not exeeed a dozen. Much orchil was formerly gathered. A little to the sonth are the two uninhabited islets of Branca and Rasa.

S. Nicolao is a long narrow island of a crescentic shape, with an area of about 115 square geographical miles, and a population of about 6000 persons. The climate is not very healthy. Maize, kidney-beans, manioc, sugar-cane, and vines are cultivated ; and in ordinary years grain is exported to the otherislands. The interior is mountainous, and has two remarkable hills which can be seen for many leagues ; one has the shape of a sugar-loaf, and is near the middle of the island; the other, Monte Gordo, is near the west end, and has a height of 4280 feet. All the other islands of the group can be seen from S. Nicolao in clear weather. Vessels fre- quently enter Freshwater Bay, near the south-east extremity of the island, for water and fresh provisions ; and the custom-house is here. The bishop of the archipelago has his headquarters in the island, and there is also a seminary for priests. The distance from 8. Nicolao to S. Vicente is over 20 miles, to Sal, nearly 60 miles.

Sal, a narrow island, through whose centre passes the meridian.of 23°, has a length of 20 miles, an area of 70 square geographical miles, and a population of about 750 persons, one-third of whom are em- ployed in the manufacture of salt, of which about 15,000 tons are manufactured in favourable years. The name is derived from a natural salt-spring, at which the trade commenced; but this has now been abandoned for artificial salinas more conveniently situated. A space of nearly 20 miles intervenes between Sal and Boa Vista.

Boa, Vista, the most easterly island of the group, lies in lat. 16°5’ N. and long. 22°55’ W. Its length from cast to west is about 17 miles, and its

breadth from north to south is about 16 miles. Its coast is indented by numerous shallow bays, the largest of which, situated on the western side, serves as a road for shi ping.

CAPE VEWD TSLaN DS

in the island, and carried off about a fourtccnth of the population. About the beginning of the century there resided on this island a certain Senhor Manocl Martins, who had great influence and power. He it was who constructed the salt-works in Sal, and laid down there the first iron railway that the Portuguese dominions pos- sessed, for the purpose of conveying the salt from the salinas to the shore.

Maio has a length of 15 miles, and its area is about 50 square geographical miles, The inhabitants, who number 773, derive their support chiefly from their cattle and from the exportation of salt. Fish is abundant, This island isa barren treeless wastc, surrounded by dangerous rocks. The best landing-place is at English Road, on the west side. Maio is 35 miles from Béa Vista, and is separated from San Thiago by a channel 7 miles wide.

San Thiago (St Jago), the largest but also the most unhealthy island of the archipelago, has a length of 37 miles, an area of 360 square geographical miles, and a population of 32,000 persons. Its geological structure is volcanic, and part of it has been minutely described by Mr Darwin in his Observations on Volcanic Islands, 1844. Its interior is very hilly, the highest point being a pointed conical mountain called Pico de Antonio, which attains the altitude of 4500 feet. here are numerous ravines which bring down per- cnnial streams, and in these ravines there is a good deal of cultivated ground, where crops of sugar-cane, maize, kidney-beans, rice, and manioc are raised. Some of the produce is exported to the other islands. Spirit is distilled from the juice of the sugar-cane, anda coarse sugar is alsomade. The purgerra or physic-nut tree is largely grown, and in 1869 the crop amounted to no Jess than 15,750 tons. Fine specimens of the baobab may also be seen. The chief port is at Villa da Praia, a town at the southern extremity of the island, with 2000 inhabitants. At this place, called Porta Praya by the English, the governor-general usually resides. Before the establish- ment of the coal depét for British steamers at S. Vicente, it was better known to voyagers than any other town in the group. It stands on a

basaltic plateau overhanging the bay, and presents a not unpleasing appearance, with its numerous cocoa-nut trees, and the lofty peak of Antonio rising from behind successive steps of table- land in the background. ‘The streets are wide and well laid out, and there is a large square in the heart of the town. The neighbourhood has a desolate aspect from its utter sterility. On the west coast an inlet penetrates several miles into the interior, but does not afford secure anchorage. In the ravine, at iis head, is the town of Ribeira Grande, the former capital of the island, which, with its ruined fort and cathedral, has a picturesque appearance.

Fogo.—This island is 30 miles distant from San Thiago, and lies between the parallels of 14° 42’ and 15° 1’ N. lat., and 24° 8’ and 24° 32’ W. long. It measures about 12 leagues from N. to S., and about 14 leagues from E. to W. Its area is estimated at 144 square geographical miles. Through the middle runs a mountain ridge of a semicircular form, the concavity being towards the east, and about the centre there rises a volcanic cone to the height of 9150 feet. This volcano produced fire uninterruptedly from 1680 to 1713. It as been active several times since then, the last eruptions havin g taken place in 1847, when a current of lava flowed to the sea ; the summit still emits vapour. In one part of the island there are a number of extinct craters where much sulphur could be collected. The only anchorage for vessels of burden is in Luz Bay, on the west side. Deep ravines add to the inequalities of the island, and carry off the rain as soon as it falls. The inhabitants, with great want of foresight, have been in the habit of felling trees, without replanting, so that very few trees are now to be found. The water is good but not abundant. The population amounts to about 8400. Sao Felippe, the largest town, and the only place with any commerce,has a popula- tion of about 1000. The chief articles of produce are sugar-cane, ground nuts, sweet potatoes, and cassava. There are few goats and swine, but horned cattle are abundant. This island is reputed to be one of the healthiest of the group; but in addition to the usual endemic, remittent and intermittent fevers manifest themselves in October and November, the intensity of which is in proportion to the abundance of the rains. In July 1855 there was an outbreak of cholera, which attacked upwards of a fourth of the entire population, and carried off nearly 650 persons.

Brava, the most southerly of the group, has an area of 36 square geographical miles, and its population amounts to nearly 7500, so that it is the most densely populated of all. Its distance from Fogo is about 12 miles. The interior is mountainous, but near the coast the soil is comparatively fertile ; its agricultural productions are numerous, and much maize is exported. Whalers resort to this island for supplies, and by their means the scanty resources of the population are eked out. This island is usually covered with dense clouds, otherwise its high land would be secn from a great distance.

C. de Chelmicki and T. A. de Varnhagen, Corograjia Cabo-Verdt- ana, Lisbon, 1841-2; Charles Darwin, Geological Observations on Volcanic Islands, London, 1844; J. J. Lima, Ensatos sobre a Estatistica da possessoes Portuguesas na Africa occidental e ortental, Lisbon, 1844,

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CAPEFIGUE, Baprists Honor&t Raymonp (1801- 1872), a French historian and biographer, was born at Marseilles in 1801. At the age of twenty he left his lative town in order to study law at Paris; but he soon deserted law for journalism. He became editor of the Quotidienne, and was afterwards connected, either as editor or leading contributor, with the Z'emps, the Messager des Chambres, the Revolution de 1848, and other papers. During the ascendency of the Bourbons he held a post in the Foreign Office, for which he was indebted to the royalism of some of his newspaper articles. Indeed all Capefigue's works receive their colour from his legitimist politics ; he preaches divine right and non-resistance, and finds polite words for even the profligacy of Louis XV. and the worthlessness of his mistresses. His style bears evident marks of haste, and although he had access to an exceptionally large number of sources of information, including the state papers, inaccuracies are not infrequent. This is not surprising when we consider the astonishing number of his biographies and histories. The former include the lives of Catherine and Maria de' Medici, Anne and Maria Theresa of Austria, Catherine II. of Russia, Elizabeth of England, Diana of Poitiers, and Agnes Sorel. The latter, besides histories of the Jews from the fall of the Maccabees to tle author's time, of the first four centuries of the Christian church, and of European diplomatists, extend over

the whole range of French history. As among the most important, and as illustrative of the extent of the field which he traversed, mention may be made of his histories of the Norman invasions, of the kings from Hugh Capet to Philip Augustus, of the constitution from Louis VIII. to Louis XI., of the Reforniation and the League, of Louis XIV. and XV., of the restoration of the Bourbons, of the consulate and the empire, and of Louis XVI. He died at Paris in December 1872.

CAPEL, Lorp Arruur (c. 1600-1649), was the son of | His birth year is not accurately known ; |

Sir Henry Capel. but it was about 1600. In 1640 he was chosen to represent the county of Hertford, and sat as a member of the Long Parliament, which was convened that year. He was elevated to the peerage by Charles I.; and on the break- ing out of the revolutionary war he raised and maintained a

troop in the royal interest, till the final triumph of the |

Parliamentarians compelled him to make peace with them. During the war he acted, together with Edward Hyde and Lord Colchester, as general in the west, and was concerned in important engagements at Bristol, Exeter, and Taunton. Having with noble devotion reassembled his troop in order

and comparing a vast number of szarce folio and quarto editions, he published his own edition in 10 vols. 8vo, with an introduction, written in a style of extraordinary quaint- ness, which was afterwards appended to the prolegomena of Johnson’s and Steevens’s editions. ‘The work was published at the expense of the principal booksellers of London, who gave him £300 for his labour. Three other volumes of Notes and Various Readings of Shakespeare, which he had announced in his introduction, under the title of Lhe School of Shakespeare, were published under the editorial superintendence of Mr Collins, in 1783, two years after Capell’s death. They contain the results of his unremitting labour for thirty years in collating the ancient MSS., and though utterly wanting in literary taste, throw considerable light on the history of the times of Shakespeare, as well as on the sources from which he derived his plots. Besides the works

already specified, he published a volume of ancient poems called Prolusions, and an edition of Antony and Cleopatra adapted for the stage.

CAPELLA, Marrianus Mingus Fetix, author of a curious encyclopedic work on the liberal arts, was born in the north of Africa, and flourished probably towards the beginning of the 5th century a.p., or at least during the 4th century. There is, however, no direct evidence as to the exact epoch at which he lived, and the few references to the author contained iu the work itself are not sufficiently definite to admit of any certain conclusion being drawu. He appears to have been a solicitor by profession and in easy circumstances. His work, eutitled Satyra de Nuptiis Philologice et Mercuri, is an elaborate allegory in nine books, written in a mixture of prose and verse. The style is heavy and involved, loaded with metaphor and bizarre expressions, and verbose to excess. The first two books contain the allegory proper,—the marriage of Mercury to a nymph named Philologia. It is wrought out in great detail, but the original conception is not a happy one, and the execution is tasteless. The remaining seven books contain expositions of the seven liberal arts, which then comprehended all human knowledge. Book iii. treats of grammar, iv. of dialectics, v. of rhetoric, vi. of geometry, vii. of arithmetic, viii. of astronomy, ix. of music. These abstract discussions are linked oun to the original allegory by the device of personifying each science as a courtier of Mercury and Philologia. The work was a complete encyc- lopeedia of the liberal culture of the time, and it was in high repute during the Middle Ages. There is much in-

| teresting matter in it, and much erudition is displayed by

to effect the rescue of Charles, he was forced by famine and |

sedition to surrender at Colchester to General Fairfax, and was condemned by the Commons to be banished ; but on the authority of some of the Parliamentary leaders he was immediately committed to the Tower. He contrived to effect his escape from prison, but was apprehended at Lambeth, and again committed to stand his trial at Westminster for treason. He was condemned to death, and was executed on the 9th of March 1649, exhibiting on the scaffold the greatest calmness and dignity. He was the author of Daily Observations or Meditations, a posthumous publication,

which was afterwards reprinted under a difer- ent title, with an account of his life.

CAPELL, Epwarp (1713-1781), a well-known critic and annotator of Shakespeare, was born at Troston in Suffolk in 1713, Through the influence of the duke of Grafton he was early appointed to the office of deputy-inspector of plays, with a salary of £200 per annum. Shocked at the inaccuracies which had crept into Sir Thomas Hanmer's edition of Shakespzare, he projected an entirely new edition, to be carefully collated with the original copies. After spending three years in collecting

the author, but the whole is executed in a clumsy, pedantic, and tasteless fashion.

A passage in book viii. has always attracted the attention of commentators, for it contains a very clear statement of the heliocentric system of astronomy. Many have supposed that Copernicus, who quotes Capella, may have received from this work some hints towards his own new system.

The editio princeps of Capella is that by Bodianus, 1449; the best of the older editions is that by Grotius, 1599; modern editions are those of Kopp, 1836, and Eyssenhardt, 1866. _Eyssenhardt, in vari- ous contributions to the Rheinisches Afusewm, has done much for the text and explanation of Capella.

CAPERCALLY, or CaeERKALLY,-—to use the spelling of the old law-books!, as given by Pennant, the zoologist, who, on something more than mere report, first included this bird among the British Fauna,—a word commonly derived from the Gaelic Capull, a horse (or, more properly, a mare), and Codle,a wood, but with greater likelihood, according to the opinion of Dr M'Lauchlan, from Cabher

1 The only one of the " Scots Acts," however, in which the writer has been able to ascertain that the bird is named is No. 30 of James VI. (1621), which was passed to protect '" powties, partrikes, moore foulles, blakcoks, gray hennis, termigantis, quailzies, capercatlztes," &c.

an old man (and, by metaphor, an old bird), and Coille, the name of Yetrao urogallus, the largest of the grouse family (Tetraonide), and a species which was formerly indigenous to Scotland and Ireland. The word is fre- quently spelt otherwise, as Capercalze, Capercailzie (the z, a letter unknown in Gaelic, being pronounced like y), and Capercaillie, and the English name of Wood-Grouse or Cock-of-the-wood has been often applied to the same bird. The earliest notice of itas an inhabitant of North Britain seems to be by Hector Boethius, whose works were published in 1526, and it can then be traced through various Scottish writers, to whom however it was evidently but little known, for about 200 years, or may be more, and by one of them only, Bishop Lesly in 1578, was a definite habitat assigned to it:—'In Rossia quoque Louguhabria [Lochaber], atque aliis montanis Jocis' (De Origine Moribus de rebus gestis Scotorum. Rome : ed. 1675, p. 24). Pennant, during one of his tours in Scotland, found that it was then (1769) still to be met with in Glen Moriston and in the Chisholm's country, whence he saw a cock-bird. We may infer that it became extinct about that time, since Mr Gray (Birds of the West of Scotland, p. 229) quotes the Rev. John Grant as writing in 1794 :— "The last seen in Scotland was in the woods of Strathglass about thirty-two years ago." Of its existence in Ireland we have scarcely more details. If we may credit the Pavones sylvestres of Giraldus Cambrensis with being of this species, it was once abundant there, and Willughby (1678) was told that it was known in that kingdom as the " Cock-of-the-wood." A few other writers mention it by the same name, and Rutty, in 1772, says (Nat. Hist. Dublin, i. p. 302) that "one was seen in the county of Leitrim about the year 1710, but they have cntirely disap- peared of late, by reason of the destruction of our woods." Pennant also states that about 1760 afew were to be found about Thomastown in Tipperary, but no later evidence is forthcoming, and thus it would seem that the species was exterminated at nearly the same period both in Ireland and Scotland.

When the practice of planting was introduced, the restoration of this fine bird to both countries was attempted. In Ireland the trial], of which some particulars are given by Thompson (Birds of Ireland, ii. p. 32), was made at Glengariff, but it seems to have utterly failed, whereas in Scotland, where it was begun at Taymouth, it finally succeeded, and the species is now not only firmly established, but is increasing in numbers and range. The late Mr Lloyd, author of several excellent works on the wild sports and natural

history of Scandinavia, supplied the stock from Sweden, but it must be always borne in mind that the original British race was wholly extinct, and no remains of it are known to exist in any museum.

This species is widely, though intermittently, distributed on the continent of Europe, from Lapland to the northern parts of Spain, Italy, and Greece, but is always restricted to pine-forests, which alone afford it food in winter. Its bones have been found in the kitchen-middens of Denmark, proving that country to have once been clothed with woods of that kind. More lately its remains have been recog- nized from the caves of Aquitaine. Its eastern or southern limits in Asia cannot be precisely given, but it certainly inhabits the forests of a great part of Siberia. On the Stannovoi Mountains, however, it is replaced by a distinct' though nearly allied species, the 7' urogalloides of Dr von Middendorff! which is smaller with a slenderer bill but longer tail

The Cock-of-the-wood is remarkable for his large size and

1 Not to be confounded with the bird so named previously by Prof, Nilsson, which is an hybrid.

glossy-black plumage. Hc is polygamous, and in spring mounts tosthe topmost bough of a tall tree, whence he challenges all comers by extraordinary sounds and gestures ; while the hens, which are much smaller and mottled in colour, timidly abide below the result of the frequent duels, patiently submitting themselves to the victor. While this is going on it is the practice in many countries, though generally in defiance of the law, for the so-called sportsman stealthily to draw nigh, and with well-aimed rifle to murder the principal performer in the scene. The hen makes an artless nest on the ground, and lays therein from seven to nine or even more eggs. The young are able to fly soon after they are hatched, and towards the end of summer and beginning of autumn, from feeding on the fruit and leaves of the bilberries and other similar plants, which form the undercovert of the forests, get into excellent condition and become good eating. With the first heavy falls of snow they betake themselves to the trees, and then, feeding on the pineleaves, their flesh speedily acquires so strong a flavour of turpentine as to be distaste- ful to most palates, The usual method of

pursuing this species on the Continent is by encouraging a trained dog to range the forest and spring the birds, which then perch on the trees; while he is baying at the foot their attention is so much attracted by him that they permit the near approach of his master, who thus obtains a more or less easy shot. A considerable number, however, are also snared. Hybrids are very frequently produced between the Capercally and the Black Grouse (7'. tetrix), and the offspring has been described by some authors under the name of 7'. medius, as though a distinct species, (A. N.) CAPERNAUM (Kazepvaovp, that is, probably, the village of Nachum), an ancient city of Palestine, on the western shore of the Lake of Gennesareth, on the borders of the tribes of Zebulun and Naphtali. It was, more than any other place, the residence of Jesus after He commenced His mission, and thus became the scene of many of His most important miracles; but the infidelity of the inhabi- tants brought down upon them the heavy denunciation :-— "And thou, Capernaum, which art exalted unto heaven, shalt be brought down to hell." The site of the city is a matter of much dispute,—one party, headed by Dr Robinson, maintaining an identification with Khan Minyeh, and another, represented by Wilson, Ritter, and Thomson, supporting the claims of Tell Hum. Khan Minyeh is situated in a "fertile plain formed by the retreat of the mountains about the middle of the western shore." The ruins, according to J. L. Porter, extend over a space of several acres ; and in the neighbourhood is a water-source, Ain et-Tin, "the fountain of the fig-tree," which may corre- spond with the fountain of Capernaum mentioned by Josephus, Tell Hum lies about three miles north of Khan Minyeh, and its ruins, covering an area of "halfa mile long by a quarter wide," prove it to have been the site of no smalltown. The satisfactory decision of the ques- tion can only be arrived at by more elaborate researches. CAPERS, the unexpanded flower-buds of Capparis spinosa, prepared with vinegar for use as a pickle, which is much esteemed. The caper plant is a trailing shrub, be- longing to the Mediterranean region, resembling in habit the common bramble, and having handsome flowers of a pinkish white, with four petals, and numerous long tassel- like stamens. The leaves are simple and ovate, with spiny stipules. The plant is cultivated in Sicily and the South of France ; and in commerce, capers are valued according to the period at which the buds are gathered and preserved. The finest are the young tender buds called " nonpareil," after which, gradually increasing in size and lessening

in value, come “superfine,” “ fine,” “capucin,” and “capot.” hey possess valuable stimulant, acrid, and anti-scorbutic

properties similar to the Crucifere. Other species of Capparis are similarly employed in various localities, and in some cases the fruit is pickled.

CAPET, the name of a family, to which, for nearly nine centuries, belonged the kings of France and many of the rulers of the most powerful fiefs in that country, and which mingled with several of the other royal races of Europe.

The first of the Capets known in history was Robert the Strong, a Saxon who received from Charles the Bald the county of Anjou, and, later, in 861, the duchy of the Ile de France, and who gained popularity by his repulse of the marauding Normans. The most distin- guished of his successors were Eudes, Robert, Rudolph, who succeeded to the dukedom of Burgundy in 888, 922, and 923 respectively, and Hugh the Great, count of Paris and Orleans, duke of France and Burgundy, who held vast domains from the Loire to the frontiers of Picardy. His son, Hugh Capet (987-996), being sup- ported by the Normans and by his brother, the duke of Burgundy, was, in 987, elected king by acclamation, and crowned at Rheims, in place of the Carlovingians, who were hated for their German manners and their desire to reconstruct the empire. The Capets, on the contrary, for some time avoided all such pretensiuns, and carefully maintained friendship with the church and the nobles, among whom they claimed to be no more than prim¢ dnter pares, and over whom they scarcely attempted to exert the slightest authority. By following this policy, they firmly established themselves on the throne, the influence of which they greatly extended by marriages, treaties, and conquests, and which the family continued to hold, after the failure of the direct royal line, at the death of Charles IV. in 1322, by the accession of the indirect lines of Valois, which reigned from 1322 to 1589, and of Bourbon, the last monarchical dynasty of France (see France).

The royal house of Valois was founded by Philip VLI., son of Charles de Valois, second son of Philip III. (see Vators); and the house of Bourbon (whose family name was Capet) was connected with the Capets by the

marriage, in 1272, of Robert, the sixth son of Louis IX., to Beatrice, the sole heiress of Agnes of Bourbon and the duke of Burgundy (see Bourzon).

Scarcely second in importance to the royal house is the branch to which belonged the dukes of Burgundy. In the 10th century Burgundy fell into the hands of Hugh the Great, father of Hugh Capet, who gave it, in 956, to his son Otho, and in 965 to his son Henry. In 1032 the second son of Robert the Pious, and grandson of Hugh Capet, founded the first ducal house, which ruled till 1361. For two years the duchy was in the hands of the Crown, but in 1363, the second ducal house, also Capetian, was founded by Philip the Bold, son of king John (see Burecunpy). This branch of the Capets is also distin- guished by its union with the royal house of Austria, through the marriage of Mary, daughter of Charles the Bold of Burgundy, to Maximilian, the archduke.

Of great importance also was the house of Anjou, which was founded by Charles, brother of Louis IX., Anjou having been ceded, with other provinces, by John of England to Philip Augustus, the grandfather of Charles. For an account of the counts and dukes of Anjou see Ansovu. Members of this family sat upon the thrones of three kingdoms. The counts of Anjou were also kings of Naples from 1226 to 1382; in 1309 Charles Robert of Anjou was elected king of Hungary, his claim being based upon the marriage of his ancestor with the daughter of Stephen IV. of Hungary; and, in 1445, Margaret, daughter of Duke René, married Henry VI. of England.

A third branch formed the house of Artois, which was founded, in 1226, by Robert the Illustrious, grandson

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of Philip Augustus, who gained possession of Artois by his marriage with Isabella of Hainault. This house merged in that of Valois, in 1383, by the marriage of Margaret of Artois with Philip the Hardy.

The throne of Navarre was also filled by the Capets. In 1284 its heiress, Jane, became the wife of Philip the Fair of France, and the two kingdoms were united till Philip of Valois ascended the French throne, when its queen, Jane, daughter of Louis X., married (1328) into the house of Evreux (see NAVARRE).

In the 13th century the throne of Constantinople was occupied by a branch of the Capets,—Pierre, eighth son of Louis VI, having obtained that dignity as brother-in- law of Baldwin count of Flanders (who was appointed emperor by the Crusaders in 1204) and of his successor Henry. Pierre was succeeded by his two sons, Robert and Baldwin de Courtenai, from the latter of whom Constan- tinople was recovered by the Greeks in 1261.

The counts of Dreux, for two centuries and a half (1132-1377), and the counts of Evreux, from 1307 to 1425, also belonged to the family of the Capets,—other members of which worthy of mention are the Dunois and the Longuevilles, illegitimate branches of the house of Valois, which produced many famous warriors and cour- tiers,

CAPGRAVE, Joun (1393-1464), an English historian, was born at Lynn in Norfolk, 21st April 1393. At an early age he was sent to one of the English universities,—most probably Cambridge,—and at a later period of his life he was connected with both. In his twenty-fourth year he entered the priesthood, and subsequently he prosecuted his studies in London, where he was residing at the time of the birth of King Henry VI. At Oxford he graduated D.D., taught theology publicly in the schools, and lectured on the Old and New Testaments. Having become an Augus- tinian friar he settled down in the house belonging to that order in his native town, where, to quote Leland’s expres- sion, he “stuck to his books like a limpet to its rock.” The friary at Lynn was then a flourishing establishment. It possessed a large and valuable library, and afforded a home to no fewer than thirty priests, besides subdeacous and novices to the number of sixteen. It is highly pro- bable that Capgrave became prior of this house, and it is certain that he was chosen provincial of his order in England. Most of his life was spent in the retirement of the cloister at Lynn, but he occasionally visited other Augustinian friaries, and once, at least, went to Rome. He died at Lynn 12th August 1464. Capgrave was justly regarded as one of the most

learned men of his age. His works are chiefly theological, consisting of commentaries, sermons, and biographies of saints. To the last class belongs the Nova Legenda Anglie, printed in London by Wynkyn de Worde in 1516. Of his historical works the most important is The Chronicle of England, published in 1858 under the editorial supervision of the Rev. F. C. Hingeston, and forming one of the series of Chronicles and Memorials of Great Britain and Ireland. This “Chronicle,” written in English, extends to the year 1417,—the accounts of the reigns of the later kings being very full and valu- able, and containing many original notices. Mr Hingeston also edited in the same year and for the same series Cap- grave’s Liber de Illustribus Henricis, in the original Latin, accompanying it with an English translation in a separate volume. ‘This curious work contains lives of King Henry VI. and other men of eminence who bore the name of Henry. Many other works by Capgrave are pre- served in MS., including a Life of St Katherine in quaint English verse ; but it is believed that his life of his patron and friend, Humphrey, duke of Gloucester, is irrecoverably lost.

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CEPILLARY ACTIOF

TUBE, the bore of which is so small that it will only admit a hair (capilla), is called a capillary tube. When such a tube of glass. open at both ends, is placed vertically with its lower end immersed in water, the water is observed to rise in the tube, and to stand within the tube at a higher level than the water outside. The action between the capillary tube and the water has been called Capillary Action, and the name has been extended to many other phenomena which have been found to depend on properties of liquids and solids similar to those which cause water to rise in capillary tubes.

The forces which are concerned in these phenomena are those which act between neighbouring parts of the same substance, and which are called forces of cohesion, and those which act between portions of matter of different kinds, which are cailed forces of adhesion. These forces are quite insensible between two portions of matter separated by any distance which we can directly measure. It is only when the distance becomes exceedingly small that these forces become perceptible. Quincke! has made experiments to determine the greatest distance at which the effect of these forces is

sensible, and he finds for various substances distances about the twenty-thousandth part of a milli- metre.

Poggendorff? tells us that Leonardo da Vinci? must be considered as the discoverer of capillary phenomena.

The first accurate observations of the capillary action of tubes and glass plates were made by Hauksbee* He ascribes the action to an attraction between the glass and the liquid. He observed that the effect was the same in thick tubes asin thin, and concluded that only those particles of the glass which are very near the surface have any influence on the phenomenon.

Dr Jurin ® showed that the height at which the liquid is suspended depends on the section of the tube at the surface of the liquid, and is independent of the form of the lower part of the tube. He considered that the suspen- sion of the liquid is due to “ the attraction of the periphery or section of the surface of the tube to which the upper surface of the water is contiguous and coheres.” From this he shows that the rise of the liquid in tubes of the same substance is inversely proportional to their radii.

Newton devotes the 3lst query in the last edition of his Opticks to molecular forces, and instances several examples of the cohesion of liquids, such as the suspension of mercury in a barometer tube at more than double the height at which it usually stands. This arises from its adhesion to the tube, and the upper part of the mercury sustains a considerable tension, or negative pressure, with- out the separation of its parts. He considers the capillary phenomena to be of the same kind, but his explanation is not sufficiently explicit with respect to the nature and the limits of the action of the attractive force.

It is to be observed that, while these early speculators ascribe the phenomena to attraction, they do not distinctly assert that this attraction is sensible only at insensible distances, and that for all distances which we can directly measure the force is altogether insensible. The idea of such forces, however, had been distinctly formed by Newton, who gave the first example of the calculation of the effect of such forces in his theorem on the alteration of

1 Pogg. Ann., cxxxvii. p. 402.

2 Pogg. Ann., ci. p. 551. 3 Died 1519.

4 Physico-Mechanical Experiments, London, 1709, pp. 139-169 ; and Phil. Trans., 1711 and 1712.

° Phil. Trans., 1718, No. 355, p. 739, and 1719, No. 363, p. 1083.

the path of a light-corpuscule when it enters or leaves a dense body.

Clairaut ° appears to have been the first to show the necessity of taking account of the attraction between the parts of the fluid itself in order to explain the phenomena. He does not, however, recognize the fact that the dis- tance at which the attraction is sensible is not only small but altogether insensible.

Segner' introduced the very important idea of the surface-tension of liquids, which he ascribed to attractive forces, the sphere of whose action is so small "ut nullo adhuc sensu percipi potuerit." In attempting to calculate the effect of this surface-tension in determining the form of a drop of the liquid, Segner tvok account of the curva- ture of a meridian section of the drop, but neglected the effect of the curvature in a plane at right angles to this section.

But the idea of surface-tension introduced by Segner had a most important effect on the subsequent development of the theory. We may regard it as a physical fact estab- lished by experiment in the same way as the laws of the elasticity of solid bodies. We may investigate the forces which act between finite portions of a liquid in the same way as we investigate the forces which act between finite portions of a solid. The experiments on solids lead to certain laws of elasticity expressed in terms of coefficients, the values of which can be determined only by experiments on each particular substance. Various attempts have also been made to deduce these laws from particular hypotheses as to the action between the molecules of the elastic substance. We may therefore regard the theory of elasticity as consisting of two parts. The first part estab- lishes the laws of the elasticity of a finite portion of the solid subjected to a homogeneous strain, and deduces from these laws the equations of the equilibrium and motion of a body subjected to any forces

and displacements. The second part endeavours to deduce the facts of the elasticity of a finite portion of the substance from hypotheses as to the motion of its constituent molecules and the forces acting between them.

In like manner we may by experiment ascertain the general fact that the surface of a liquid is in a state of tension similar to that of a membrane stretched equally in all directions, and prove that this tension depends only on the nature and temperature of the liquid and not on its form, and from this as a secondary physical principle we may deduce all the phenomena of capillary action. This is one step of the investigation. The next step is to deduce this surface-tension from an hypothesis as to the molecular constitution of the liquid and of the bodies that surround it. The scientific importance of this step is to be measured by the degree of insight which it affords or promises into the molecular constitution of real bodies by the suggestion of experiments by which we may discriminate between rival molecular theories.

In 1756 Leidenfrost® showed that a soap-bubble tends to contract, so that if the tube with which it was blown is left open the bubble will diminish in size and will expel through the tube the air which it contains. He attributed this force, however, not to any general property of the surfaces of liquids, but to the fatty part of the soap which he supposed to separate itself from the other constituents

6 Clairaut, Théorie de la Figure de la Terre, Paris, 1808, pp. 105,

7 Segner, Comment. Soc. Reg. Gétting., i. (1751), p. 301. 8 De aque communis nonnullis qualitatibus tractatus, Duisburg.

of the solution, and to form a thin skin on the outer face of the bubble.

In 1787 Monge‘ asserted that “by supposing the adher- ence of the particles of a fluid to have a sensible effect only at the surface itself and in the direction of the surface it would be easy to deterniine the curvature of the

surfaces of fluids in the neighbourhood of the solid boundaries which contain them ; that these surfaces would be lintearie of which the tension, constant in all directions, would be everywhere equal to the adherence of two particles, and the phenomena of capillary tubes would then present nothing which could not be determined by analysis." He applied this principle of surface-tension to the explanation of the apparent attractions and repulsions between bodies floating on a liquid.

In 1802 Leslie * gave the first correct explanation of the rise of a liquid in a tube by considering the effect of the attraction of the solid on the very thin stratum of the liquid in contact with it. He does not, like the earlier specu- lators, suppose this attraction to act in an upward direction so as to support the fluid directly. He shows that the attraction is everywhere normal to the surface of the solid. The direct effect of the attraction is to increase the pres- sure of the stratum of the fluid in contact with the solid, so as to make it greater than the pressure in the interior of the fluid. The result of this pressure if unopposed is to cause this stratum to spread itself over the surface of the solid as a drop of water is observed to do when placed on a clean horizontal glass plate, and this even when gravity opposes the action, as when the drop is placed on the under surface of the plate. Hence a glass tube plunged into water would become wet all over were it not that the ascending liquid film carries up a quantity of other liquid which coheres to it, so that when it has ascended to a cer- tain height the weight of the column balances the force by which the film spreads itself over the glass. This explana- tion of the action of the solid is equivalent to that by which Gauss afterwards supplied the defect of the theory of Laplace, except that, not being expressed in terms of mathematical symbols, it does not indicate the mathe- matical relation between the attraction of individual par- ticles and the final result. Leslie's theory was afterwards treated according to Laplace's mathematical methods by James Ivory in the article on capillary action, under the heading "Fluids, Elevation of," in the supplement to the fourth edition of the Hncyclopedia Britannica, published 1m 1819.

In 1804 Thomas Young? founded the theory of capillary phenomena on the principle of surface-tension. He also observed the constancy of the angle of contact of a liquid surface with a solid, and showed how from these two prin- ciples to deduce the phenomena of capillary action. His essay contains

the solution of a great number of cases, including most of those afterwards solved by Laplace, but his methods of demonstration, though always correct, and often extremely elegant, are sometimes rendered obscure by his scrupulous avoidance of mathematical symbols. Having applied the secondary principle of surface-tension to the various particular cases of capillary action. Young proceeds to deduce this surface-tension from ulterior prin- ciples. He supposes the particles to act on one another with-two different kinds of forces, one of which, the attrac- tive force of cohesion, extends to particles at a greater distance than those to which the repulsive force is confined. He further supposes that the attractive force is constant throughout the minute distance to which it extends, but

1 Mémoires de U Acad. des Sciences, 1787, p. 506.

2 Philosophical Maguzine, 1802, vol. xiv. p. 198.

3 Essay on the “Cohesion of Fluids,” Philosophical Transactions, 1805, p. 65.

that the repulsive force increases rapidly as the distance diminishes. He thus shows that at a curved part of the surface, a superficial particle would be urged towards the centre of curvature of the surface, and he gives reasons for concluding that this force is proportional to the sum of the curvatures of the surface in two normal planes at right angles to each other.

The subject was next taken up by Laplace.* His results are in.many respects identical with those of Young, but his methods of arriving at them are very different, being con- ducted entirely by mathematical calculations. The form into which he has thrown his investigation seems to have deterred many able physicists from the inquiry into the ulterior cause of capillary phenomena, and induced them to rest content with deriving them from the fact of surface- tension. But for those who wish to study the molecular constitution of bodies it is necessary to study the effect of forces which are sensible only at insensible distances ; and Laplace has furnished us with an example of the method of this study which has never been surpassed. Laplace investigates the force acting on the fluid contained in an infinitely

slender canal normal to the surface of the fluid arising from the attraction of the parts of the fluid outside the canal. He thus finds for the pressure at a point in the interior of the fluid an expression of the form

it a p=K+ sH(z+i)

where K is a constant pressure, probably very large, which, however, does not influence capillary phenomena, and therefore cannot be determined from observation of such phenomena ; H is another constant on which all capillary phenomena depend; and R and R’ are the radii of curvature of any two normal sections of the surface at right angles to each other.

In the first part of our own investigation we shall adhere to the symbols used by Laplace, as we shall find that an accurate knowledge of the physical interpretation of these symbols is necessary for the further investigation of the subject. In the Supplement to the Theory of Capillary Action, Laplace deduces the equation of the surface of the fluid from the condition that the resultant force on a particle at the surface must be normal to the surface. His explana- tion, however, of the rise of a liquid in a tube is based on the assumption of the constancy of the angle of contact for the same solid and fluid, and of this he has nowhere given a satisfactory proof. In this supplement Laplace gives many important applications of the theory, and compares the results with the experiments of Gay-Lussac.

The next great step in the treatment of the subject was made by Gauss.° The principle which he adopts is that of virtual velocities, a principle which under his hands was gradually transforming itself into what is now known as the principle of the conservation of energy. Instead of calculating the direction and magnitude of.the resultant force on each particle arising from the action of neighbour- ing particles, he forms a single expression which is the aggregate of all the potentials arising from the mutual action between pairs of particles. This expression has been called the force-function. Withits sign reversed it is now called the potential energy of the system. It consists of three parts, the first depending on the action of gravity, the second on the mutual action between the particles of the fluid, and the third on the action between the particles of the fluid and the particles of a solid or fluid in contact with it.

4 Mecanique Celeste, supplement to the tenth book, published in

1806. ,

5 Principia generalia Theorie Figure Fluidorum in statu .iquilibria (Gottingen, 1830), or Werke, v. 29 (Gottingen, 1867). V. =a 8

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The condition of equilibrium is that this expression (which weanay for the sake of distinctness call the potential energy) shall bea minimum. This condition when worked out gives not only the equation of the free surface in the form already established by Laplace, but the conditions of the angle of contact of this surface with the surface of a solid.

Gauss thus supplied the principal defect in the great work of Laplace. He also pointed out more distinctly the nature of the assumptions which we must make with respect to the law of action of the particles in order to be consistent with observed phenomena. He did not, however, enter into the explanation of particular phenomena, as this had been done already by Laplace. He points out, however, to physicists the advantages of the method of Segner and Gay-Lussac, afterwards carried out by Quincke, of measuring the dimensions of large drops of mercury on a horizontal or slightly concave surface, and those of large bubbles of air in transparent liquids resting against the under side of a horizontal plate of a substance wetted by the liquid.

In 1831 Poisson published his Nouvelle Theorie de PAction Capillaire. He maintains that there is a rapid variation of density near the surface of a liquid, and he gives very strong reasons, which have been only strengthened by subsequent discoveries, for believing that this is the case. He then proceeds to an investigation of the equilibrium of a fluid on the hypothesis of uniform density, and he arrives at the conclusion that on this hypothesis none of the observed capillary phenomena would take place, and that, therefore, Laplace’s theory, in which the density is supposed uniform, is not only insufficient but erroneous. In particular he maintains that the constant pressure K, which occurs in Laplace’s theory, and-which on that theory is very large, must be in point of fact very small, but the equation of

equilibrium from which he concludes this is itself defective. Laplace assumes that the liquid has uniform density, and that the attraction of its molecules extends to a finite though insensible distance. On these assumptions his results are certainly right, and are confirmed by the independent method of Gauss, so that the objections raised against them by Poisson fall to the ground. But whether the assumption of uniform density be physically correct is a very different question, and Poisson has done good service to science in showing how to carry on the investigation on the hypothesis that the density very near the surface is different from that in the interior of the fluid,

The result, however, of Poisson's investigation is practi- cally equivalent to that already obtained by Laplace. In both theories the equation of the liquid surface is the same, involving a constant-H, which can be determined only by experiment. The only difference is in the manner in which this quantity H depends on the law of the molecular forces and the law of density near the surface of the fluid, and as these laws are unknown to us we cannot obtain any test to discriminate between the two theories.

We have now described the principal forms of the theory of capillary action during its earlier development. In more recent times the method of Gauss has been modified so as to take account of the variation of density near the surface, and its language has been translated in terms of the modern doctrine of the conservation of energy.

M. Plateau,? who has: himself made the most elaborate study of the phenomena of surface-tension, has adopted the

1 See Prof. Betti, Teoria della Capillarita : Nuovo Cimento, 1867 ; a memoir by M. Stahl, " Ueber einige Punckte in der Theorie der Capillarerscheinungen,"' Pogg. Ann., cxxxix. p. 239 (1870) ; and M. Van der Waal's Over de Continuitett van den Gas- en Viloetstoftoe- stand. The student will find a good account of the subject from a mathematical point of view in Professor Challis's " Report on the Theory of Capillary Attraction, Brit. Ass. Report, iv. p. 2538 (1834.)

*M. Plateau, Statique experimentale et théorique des liquides,

following method of getting rid of the effects of gravity; He forms a mixture of alcohol and water of the same density as olive oil. He then introduces a quantity of oil into the mixture. It assumes the form of a sphere under the action of surface-tension alone. He then, by means of rings of iron-wire, disks, and other contrivances, alters the form of certain parts of the surface of the oil. The free portions of the surface then assume new forms depend- ing on the equilibrium of surface-tension. In this way he has produced a great many of the forms of equilibrium of a liquid under the action of surface-tension alone, and com- pared them with the results of mathematical investigation. He has also greatly facilitated the study of liquid. films by showing how to form a liquid, the films of which will last for twelve or even for twenty-four hours. The debt which science owes to M. Plateau is not diminished by the fact that, while investigating these beautiful phenomena, he has never himself seen them. He lost his sight long ago in the pursuit of science, and has ever since been obliged to depend on the eyes and the hands of others.

M. Van der Mensbrugghe' has also devised a great number of beautiful illustrations of the phenomena of surface- tension, and has shown their connection with the experi- ments of Mr Tomlinson on the figures formed by oils dropped on the clean surface of water.

M. Dupré in his 5th, 6th, and 7th Memoirs on the Mechanical Theory of Heat (Ann. de Chime et de Physique, 1866 to 1868) has done much towards applying the prin- ciples of thermodynamics to capillary phenomena, and the experiments of his son are exceedingly ingenious and well devised, tracing the influence of surface-tension in a great number of very different circumstances, and deducing from independent methods the numerical value of the sur- face-tension, The experimental evidence which M. Dupré has obtained bearing on the molecular structure of liquids must be very valuable, even if many of our present opinions on this subject should turn out to be erroneous.

M. Quincke* has made a most elaborate series of experi- ments on the tension of the surfaces separating one liquid from another and from air.

M. Liidtge® has experimented on liquid films, and has shown how a film of a liquid of high surface-tension is re- placed by a film of lower surface-tension. He has also ex- perimented on the effects of the thickness of the film, and has come to the conclusion that the thinner a film is, the greater is its tension. This result, however, has been tested by M. Van der Mensbrugghe, who finds that the tension is the same for the same liquid whatever be the thickness, as long as the film does not burst. The phenomena of very thin liquid films deserve the most careful study, for it is in this way that we are most likely to obtain evidence by which we may-test the theories of the molecular structure of liquids.

Sir W. Thomson ® has investigated the effect of the cur- vature of the surface of a liquid on the thermal equilibrium between the liquid and the vapour in contact with it. He has also calculated the effect of surface-tension on the pro- pagation of waves on the surface of a liquid, and has deter- mined the minimum velocity of a wave, and the velocity of the wind when it is just sufficient to disturb the surface of still water.'

THEORY oF CAPILLARY ACTION.

When two different fluids are placed in contact, they ay either diffuse into each other or remain separate. In

- Mém. de V Acad. Roy. de Belgique, xxxvii. (1878). * Pogg. Ann., cxxxix, (1870), p. 1.

> Pogg. Ann., cxxxix. (1870), p. 620.

5 Proceedings R. S., Edinburgh, February 7, 1870. " Philosophical Magazine, November, 1871.

CAPILLARY ACTION

some cases diffusion takes place to a limited extent, after which the resulting mixtures do not mix with each other. The same substance may be able to exist in two different states at the same temperature and pressure, as when water and its saturated vapour are contained in the same vessel. The conditions under which the thermal and mechanical equilibrium of two

fluids, two mixtures, or the same sub- stance in two physical states in.contact with each other, is possible belong to thermodynamics. All that we have to observe at present is that, in the cases in which the fluids do not mix of themselves, the potential energy of the system must be greater when the fluids are mixed than when they are separate.

It is found by experiment that it is only very close to the bounding surface of a liquid that the forces arising from the mutual action of its parts have any resultant effect on one of its particles, The experiments of Quincke and others seem to show that the extreme range of the forces which produce capillary action lies between a thousandth and a twenty thousandth part of a millimetre.

We shall use-the symbol « to denote this extreme range, beyond which the action of these forces may be regarded as insensible. If x denotes the potential energy of unit of mass of the substance, we may treat x as sensibly con- stant except within a distance « of the bounding surface of the fluid. In the interior of the fluid it has the uniform value x). In like manner the density, p, is sensibly equal to the constant quantity p), which is its value in the interior of the liquid, except within a distance « of the bounding surface. Hence if V is the volume of a mass M of liquid bounded by a surface whose area is 8, the integral

M = /]f pdadyde (1),

where the integration is to be extended throughout the volume V, may be divided into two parts by considering separately the thin shell or skin extending from the outer surface to a depth e, within which the density and other properties of the liquid vary with the depth, and the interior portion of the liquid within which its properties are constant.

Since ¢ is a line of insensible magnitude compared with the dimensions of the mass of liquid and the principal radii of curvature of its surface, the volume of the shell whose surface is § and thickness ¢ will be Se, and that of the interior space will be V — Se.

If we suppose a normal y less than e to be drawn from the sur- face § into the liquid, we may divide the shell into elementary shells whose thickness is

dv, in each of which the density and other pro- perties of the liquid will be constant.

The volume of one of these shells will be Sdv. Its mass will be Spdv. The mass of the whole shell will therefore be 8 th pdv, and

that of the interior part of the liquid (V—-Se)p). We thus find for the whole mass of the liquid

M=Vp,-S sf §(po— p)dv. (2). To find the potential energy we have to integrate E=/ffxpdadyda. (3).

Substituting xp for p in the process we have just gone through, we find

B=Vxopo-8/”(xopo- ee. TE Multiplying equation (2) by xo, and subtracting it from (4),

B- Myo=x08/(x- xo)p – (5).

In this expression M and x, are both constant, so that the varia- tions of the right hand side of the equation is the same as that of the energy E, and expresses that part of the energy which depends on the area of the bounding surface of the liquid. We may call this the surface energy.

The symbol x expresses the energy of unit of mass of the liquid at a depth y within the bounding surface. When the liquid is in contact with a rare medium, such as its own vapour or any other

gas, x is greater than x, and the surface energy is positive. By the principle of the conservation of energy, any displacement of the liquid by which its energy is diminished will tend to take place of itself. Hence if the energy is the greater, the greater the area of the exposed surface, the liquid will tend to move in such a way as to diminish the area of the exposed surface, or in other words, the exposed surface will tend to diminish if it can do so consistently with the other conditions. This tendency of the surface to contract itself is called the surface-tension of liquids.

M. Dupré has described an arrangement by which the surface- tension of a liquid film may be illustrated.

A piece of sheet metal is cut out in the form AA (fig. 1). A very fine slip of metal is laid on it in the position BB, and the whole is dipped into a solution of soap, or M. Plateau’s glycerine mix- ture. When it is taken out the rectangle AACC is filled up bya liquid film. This film, however, tends to contract on itself, and the loose strip of metal BB will, if it is let go, be drawn up towards AA, provided it is sufficiently light and smooth.

Let T be the surface energy per unit of area; then the energy of a surface of area $ will be ST. If, in the rectangle AACC, AA=a, and CC=8, its area is S=abd, and its energy Tab. Hence if F is the force by which the slip BB is pulled towards AA},

Fig. 1. °

d

Faq, Tab=Tao . « + + + (6), or the force arising from the surface-tension acting on a length a of the strip is Ta, so that T represents the surface-tension soting transversely on every unit of length of the periphery of the liqui surface. Hence if we write

T=f”(x-xopdv – ss + MO

we may define T either as the surface-energy per unit of afea, or as the surface-tension per unit of contour, for the numerical values of these two quantities are equal.

If the liquid is bounded by a dense substance, whether liquid or solid, the value of x may be different from its value when the liquid has a free surface. If the liquid is in contact with another liquid, let us distinguish quantities belonging to the two liquids by suffixes. We shall then have

E, – Mx =S if (xi – Xora, (8),

E,- M2xX.=S sf – (Xo- X02)Patve – (9).

Adding these expressions, and dividing the second member by S, we obtain for the tension of the surface of contact of the two liquids

Tye= fk (a= Xo) pdr +f “3 (X2- X02)P2tre » « (10).

If this quantity is positive, the surface of contact will tend to contract, and the liquids will remain distinct. If, however, it were negative, the displacement of the liquids which tends to enlarge the surface of contact would be aided ~s the molecular forces, so that the liquids, if not kept separate by gravity, would at length become thoroughly mixed. o instance, however, of a phenomenon of this kind has been discovered, for those liquids which mix of themselves do so by the process of diffusion, which is a molecular motion, and not by the spontaneous puckering and replication of the bounding surface as would be the case if T were negative.

It is probable, however, that there are many cases in which the integral belonging to the less dense fluid is negative. If the denser body be solid we can often demonstrate this ; for the liquid tends to spread itself over the surface of the solid, so as to increase the area of the surface of contact, even although in so doing it is obliged to increase the free surface in opposition to the surface-tension. Thus water spreads itself out on a clean surface of glass. This shows

that /’ © (x — x»)pdv must be negative for water in contact with glass.

On THE TENSION OF LiquiID FILMs.

The method already given for the investigation of the surface-tension of a liquid, all whose dimensions are sensible, fails in the case of a liquid film such as a soap- bubble. In such a film it is possible that no part of the liquid may be so far from the surface as to have the potential and density corresponding to what we have called the interior of a liquid mass, and measurements of the

tension of the film when drawn out to different degrees of thinness may possibly lead to an estimate of the range of the molecular forces, or at least

of the depth within a

between one particle and another. Let us suppose that the force between two particles m and m/ at the distance ¥ ds

liquid mass, at which its properties become sensibly uni- form. We shall therefore indicate a method of investigat-

ing the tension of such films.

Let S be the area of the film, M its mass, and E its energy ; o the

mass, and ¢ the energy of unit of area; then

M=Sco .

(11),

a E=Se

(12).

Let us now suppose that by some change in the form ae

its tension is T the work required to effect this increase of surface will be TdS, and the energy of the film will be increased by this amount.

boundary of the film its area is changed from S to S + dS.

Hence TdS=dE =Sde+edS (18).

But since M is constant,

aM =Sde+oedS=0 (14).

Eliminating dS from equations (18) and (14), and dividing by S,

we find

(15).

In this expression o denotes the mass of unit of area of the film,

and ¢ the energy of unit of area.

If we take the axis of z normal to either surface of the film, the radius of curvature of which we suppose to be very great compared with its thickness ¢, and if p is the density, and x the energy of unit

of mass at depth z, then € = es o A, pdz

e=/“xpda :

(16),

and

(lia):

Both p and x are functions of z, the value of which remains the If the thickness of the film is greater than 2e, there will be a stratum of thickness ¢—2e in the middle of the film, within which the values of pand x will be po and Xo, In the two strata on either side of this the law, according to which p and x depend on the depth, will be the same as in a liquid

same when z—e is substituted for z.

mass of large dimensions. Hence in this case

o=(C~2¢)pp+2/ “pd : (18), e=(C— 2¢)xopo + 2/° “xpdy . (19), dc de , de de P0 + Ge=XoPo » +. 7-=xo, f € P= 2/™ xpdv — 2×0 f “pay =2 i “(x-xo)pdv. (20).

Hence the tension of a thick film is equal to the sum of the ten- sions of its two surfaces as already calculated (equation 7). On the hypothesis of uniform density we shall find that this is true for films whose thickness exceeds e.

The symbol x is defined as the energy of unit of mass of the sub- stance. A knowledge of the absolute value of this energy is not required, since in every expression in which it occurs it is under the form x – x», that is to say, the difference between the energy in two different states. The only cases, however, in which we have experi- mental values of this quantity are when the substance is either liquid and surrounded by similar liquid, or gaseous and surrounded by similar gas. It is impossible to make direct Measurements of the properties of particles of the substance within the insensible distance e of the bounding surface.

When a liquid is in thermal and dynamical equilibrium with its vapour, then if p’ and x’ are the values of p and x for the vapour, and py and x, those for the liquid,

(21),

where J is the dynamical equivalent of heat, L is the latent heat of unit of mass of the vapour, and p is the pressure. At points in the liquid very near its surface it is probable that x is greater than Xo and at points in the gas very near the surface of the liquid it is probable that x is less than , but this has not as yet been as- certained experimentally. We shall therefore endeavour to apply to this subject the methods used in Thermodynamics, and where these fail us we shall have recourse to the hypotheses of molecular physics.

We have next to determine the value of x in terms of the action

| rs | ae (=-+ xX —Xo P p “s

F=mm/ (917) +7) (22),

being reckoned positive when the force is attractive. The actual force between the particles arises in part from their mutual gravita- tion, which is inversely as the square of the distance. This force is

expressed by m m’ =. It is easy to show that a force subject to

this law would not account for capillary action. We shall, therefore, in what follows, consider only that part of the force which depends on $(/), where @(f) is a function of J which is insensible for all sensible values of f, but which becomes sensible and even enormously great when fis exceedingly small.

If we next introduce a new function of J and write

Lo Aaf= m7) (23),

then m m/ M(f) will represent—1. The work donc by the attractive force on the particle m, while it is brought from an infinite distance from m/ to the distance J from m'; or 2. The attraction of a particle m 0n a narrow straight rod resolved in the direction of the length of the rod, onc extremity of the rod being at a distance / from m, and the other at an infinite distance, the mass of unit of length of the rod being m'. The function TI(f) is also insensible for sensible values of f, but for insensible values of J it may become sensible and even very great. If we next write

[70 f\df= We) (24),

then 2xmoy(z) will represent~—1. The work done by the attractive force while a particle m is brought from an infinite distance to a distance z from an infinitely thin stratum of the substance whose mass per unit of area is o ; 2. The attraction of a particle m placed at a distance 2 from the plane surface of an infinite solid whose density is o.

Let us examine the case in which 8 qQ the particle m is placed at a distance Z z from a curved stratum of the sub- Q?

stance, whose principal radii of cur- P

vature are R, and R,. Let P (fig. 2)

be the particle and PB a normal to

the surface. Let the plane of the paper be a normal section of the

surface of the stratum at the point

B, making an angle w with the sec-

tion whose radius of curvature is Ri.

Then if O is the centre of curvature 0 in the plane of the paper, and BO= Uy Fig. 2 1 cos.% sin.2w a= = = (25). Let POQ=0 , PO=r , PQ=f , BP=z, Si=u? +r? —Qur cos. 0. (26),

The element of the stratum at Q may be expressed by

ou? sin. 0 dédw , or expressing d@ in terms of df by (26),

o~ fife. Multiplying this by m and by If, we obtain for the work done

by the attraction of this element when m is brought from an infinite distance to P,,

ma — fT f)dfideo. Integrating with respect to J from f=z to f=a, where a is a line

very great compared with the extreme range of the molecular force,

but very small compared with either of the radii of curvature, we obtain for the work

Ima (¥(@)-W(a) de

and since (a) is an insensible quantity we may omit it.

f We may also write

Seale ‘ pet a + &C., since z is very small compared with u, and expressing ~ in terms of

w by (25), we find as cos.*w sin. 2w /, moy(z) hike R, TE) vs a 5 oe. = 2rino(z) lt+52 (+E) i

This then expresses the work done by the attractive forces when

a particle m is brought from an infinite distance to the point P ata

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distance z from a stratum whose surface-density is o, and whose principal radii of curvature are R, and Ry.

To find the work done when m is brought to the point P in the neighbourhood of a solid body, the density of which is a function of the depth v below the surface, we have only to write instead of o pdz, and to integrate

omnf pi(zidz + rm (E+ fo. pey(z)dz,

where, in general, we must suppose pa function of z. This expres- sion, when integrated, gives (1) the work done on a particle m while it is brought from an infinite distanee to the point P, or (2) the attraction on a long slender column normal to the surface and terminating at P, the mass of unit of length of the column being m. In the form of the theory given by Laplace, the density of the liquid was supposed to be uniform. Hence if we write

K=2nf yede ; Hat f- zy(z)dz ,

the pressure of a column of the fluid itself terminating at the sur-

face will be a ill 1 ail e{x+ou (Rte) |

and the work done by the attractive forces when a particle m is brought to the surface of the fluid from an infinite distance will be

2 1 1 1

me\K+5H (e+ 5):

S, Veyde=6(),

then 2mmp@(z) will express the work done by the attractive forces, while a particle m is brought from an infinite distance to a distance z from the plane

surface of a mass of the substance of density p and infinitely thick. The function 6(z) is insensible for all sensible values of z. For insensible valucs it may become sensible, but it must remain finite even when z=0, in which case 6(0)=K.

If x’ is the potential energy of unit of mass of the substance in vapour, then at a distance hon the plane surface of the liquid

X=x’ — 2rpA(z).

If we write

At the surface X=x’ — 2pe(0). At a distance z within the surface x =x! — 41p8(0) + Qrp6(z) . If the liquid forms a stratum of thickness c, then xX=x’ — 4rp0(0) + 2rpO(z) + 2rpO(z—c) .

The surface-density of this stratum is o=cp. unit of area is

e= f° xpi

=cop(x’ ~ 4xp6(0)) + 2mp% f° o(z)dz + 2mp? f° 0(c—z)dz.

Since the two sides of the stratum are similar the last two terms are equal, and

The cnergy per

e=cp(x’ — 4mp@(0)) + Anp? O(z)dz. Differentiating with respect to c, we find dc dene? de F F Ped 10 – 4rp6(0)) + Arp 6© . Hence the surface-tension de T=e-o 7 =4p*(/, ’ A(2)dz — c6©) : Integrating the first term within brackets by parts, it becomes dé c6© — 06(0) a tt. ade Remembering that 6(0) is a finite quantity, and that 7 = — y(2), we find T= dnp [* ay(z)dz.

When ¢ is greater than ¢ this is equivalent to 2H in the equation of Laplace. Hence the tension is the same for all films thicker than ¢, the range of the molecular forces. Yor thinner films

dT a = 4mp*ey© .

Henee if © is positive, the tension and the thickness will increase together. Now 2mmpy© represents the attraction between a particle m and the plane surface of an infinite mass of the liquid, when the distance of the particle outside the surface is c. Now, the foree between the particle and the liquid is certainly, on the whole, attractive ; but if between any two small values of c it should be repulsive, then for films whosc thickness lies between these values the tension will increase as the thickness diminishes, but for all other cases the tension will diminish as the thickness diminishes.

We have given several examples in which the density is assumed to be uniform, because Poisson has asserted that capillary pheno- mena would not take place unless the density varied rapidly near the surface. In this assertion we think he was mathematically wrong, though in his own hypothesis that the density does actually vary, he was probably right. In fact, the quantity 4mp?K, which we may call with Van der Waals the molecular pressure, is so great for most liquids (5000 atmospheres for water), that in the parts near the surface, where the molecular pressure varies rapidly, we may expect considerable variation of density, even when we take into account the smallness of the compressibility of liquids.

The pressure at any point of the liquid arises from two causes, the external pressure P to which the liquid is subjected, and the pressure arising from the mutual attraction of its molecules. If we suppose that the number of molecules within the range of the attrac- tion of a given molecule is very large, the part of the pressure aris- ing from attraction will be proportional to the square of the number of molecules inunit of volume, that is, to the square of the density. Hence we may write

p=P+Ap? (1), where A isa constant. But by the equations of equilibrium of the liquid

dp= — pax. (2).

Hence — pdx =2Apdp (3), and x’ -x=2Ap— 2B . (4).

where B is another constant. Near the plane surface of a liquid we may assume p a function of z We have then for the value of x at the point where z=c,

x= onl o@ye-ode (5),

where ¢ is the range beyond which the attraction of a mass of liquid bounded by a plane surface becomes insensible. The value of x depends, therefore, on those values only of p which correspond to strata for which z is nearly equal toc. We may, thereforc, expand pin terms of z-¢, or writing x for z—c,

dp hie (KO fae, (eo UR Gales Sa. (6), where the suffix © denotes that in the quantity to which it is

applied after differentiation, z is to be made equal toc. We may now write

, d xX -x= 2m [ES Wada + 2x (FZ Ye So E eV @)de+

a 1 Qn (3), 5 J Bww)dae + &e. The function (x) has equal values for + 2 and — x.

(7).

Hence

if ee x)(a)da vanishes if 2 is odd.

But if we write

1

Km a Ya)de , L=5 Wo xw(x)da ,

il ; M=rggat fo ty@lde, ke. dl? di x/-x=2Kp+2L 75 +2M 7h + ke.

This is the expression for x on the hypothesis that the value of p can be expanded in a series of powers of z—c within the limits z-eandz+e. Itis only

when the point P is within the distance e of the surface of the liquid that this ccases to be possible.

If we now substitute for x its value from equation 4, we obtain

dp d4p 2Ap —-2B=2Kp + 2L 75 +2M qi t &e., a lincar differential equation in p, the solution of which is B page te + Oye” + Ce + Ce”,

where 71, %9, 3, 2, are the roots of the equation Mn*+Ln?+K-A=0. The coefficient M is less than «*L, where ¢ is the range of the

attractive force, Hence we may consider M very small compared with L. If we neglect M altogether,

A~k A=-K barf $ N= ia .

If we assume a quantity a such that a®K =2L, we may call a the average range of the molecular forces. If we also take 3, so that bn=1, we may call b the modulus of the variation of the density near the surface. ,

Our calculation hitherto has been made on the hypothesis that a is small when compared with 4, and in that case we have found thatea® 20″ 3: A=K: K. ys

But it appears from experiments on liquids that A~K is in general large when compared with K, and sometimes very large. Hence we conclude, first, that the hypothesis of our calculation is incorrect, and, secondly, that the phenomena of capillary action do not in any very great degree depend on the variation of density near the surface, But that the principal part of the force depends on the finite range of the molecular action. : be

In the following table, Ap is half the cubical elasticity of the liquid, and Kp the molecular pressure, both expressed in atmo- spheres (the absolute value of an atmosphere being one million in centimetre-gramme-second measure, see below, p. 70). p is the density, T the surface-tension, and @ the average

range of the molecular action, as calculated by Von der Waals from the values of T and K.

The unit in which @ is expressed is 1 emx107*; a is therefore the twenty-millionth part of a centimetre for mercury, the thirty- millionth for water, and the forty-millionth part for alcohol. Quincke, however, found by direct experiment that certain molecu- lar actions were sensible at a distance of a two-hundred-thousandth

art of a centimetre, sothat we cannot regard any of these num- erg as accurate.

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ON SURFACE-TENSION,

Definition.—The tension of a liquid surface across any line drawn on the surface ts normal to the line, and is the same for all directions of the line, and is measured by the Jorce across an element of the line divided by the length of that element.

Eaperimental Laws of Surface-tension,

1. For any given liquid surface, as the surface which separates water from air, or oil from water, the surface- tension is the same at every point of the surface and in every direction. It is also practically independent of the curvature of the surface, although it appears from the mathematical theory that there is a slight increase of tension where the mean curvature of the surface is concave, and a slight diminution where it is convex. The amount of this increase and diminution is too small to be directly measured, though it has a certain theoretical importance in the explanation of the equilibrium of the superficial layer of the liquid where it is inclined to the horizon.

2. The surface-tension diminishes as the temperature rises, and when the temperature reaches that of the critical point at which the distinction between the liquid and its vapour ceases, it has been observed by Andrews that the capillary action also vanishes. The early writers on capillary action supposed that the diminution of capillary action was due simply to the

change of density corresponding to the rise of temperature, and, therefore, assuming the surface- tension to vary as the square of the density, they deduced its variations from the observed dilatation of the liquid by heat. This assumption, however, does not appear to be verified by the experiments of Brunner aud Wolff on the rise of water in tubes at different temperatures,

3. The tension of the surface separating two liquids which do not mix cannot be deduced by any known method from the tensions of the surfaces of the liquids when separately in contact with air.

When the surface is curved, the effect of the surface- tension is to make the pressure on the concave side exceed the pressure on the convex side by T atm) where T is the intensity of the surface-tension and R,, R, are the radii of curvature of any two sections normal to the surface and to each other.

If three fluids which do not mix are in contact with each other, the three surfaces of separation meet in a line, R straight orcurved. Let O (fig.

3) be a point in this line, and b let the plane of the paper be

supposed to be normal to the c

line at the point O. The three angles between the tan- gent planes to the three sur- c faces of separation at the point O are completely deter. ¢ mined by the tensions of the Q

three surfaces. For if in the Fig. 8.

triangle abc the side ab is taken so as to represent on a given scale the tension of the surface of contact of the fluids a and 8, and if the other sides bc and ca are taken so as to represent on the same scale the tensions of the surfaces between } and ¢ and between c and a respectively, then the condition of equilibrium at O for the corresponding tensions R, P, and Q is that the angle ROP shall be the supplement of abc, POQ of bea, and, there- fore, QOR of cab. Thus the angles at which the surfaces of separation meet are the same at all parts of the line of concourse of the three fluids. When three films of the same liquid meet, their tensions are equal, and, therefore,

they make angles of 120° with each other. The froth of soap-suds or beat-up eggs consists of a multitude of small films which meet each other at angles of 120°.

If four fluids, a, 6, c, d, meet in a point O, and if a tetrahedron ABCD is formed so that its edge AB repre- sents the tension of the surface of contact of the liquids a and 6, BC that of b ande, and so on; then if we place this tetrahedron so that the face ABC is normal to the tangent at O to the line of concourse of the fluids abc, and turn it so that the edge AB is normal to the tangent plane at O to the surface of contact of the fluids a and 8, then the other three faces of the tetrahedron will be normal to the tangents at O to the other three lines of concourse of the liquids, and the other five edges of the tetrahedron will be normal to the tangent planes at O to the other five surfaces of contact.

If six films of the same liquid meet in a point the corre- sponding tetrahedron is a regular tetrahedron, and each film, where it meets the others, has an angle whose cosine Hence if we take two nets of wire with hexagonal meshes, and place one on the other so that the point of concourse of three hexagons of one net coincides with the middle of a hexagon of the other, and if we then, after dipping them in Plateau’s liquid, place them horizontally, and gently raise the upper one, we shall develop a system of plane laminz arranged as the walls and floors of the cells are arranged in a honeycomb. We must not, how- ever, raise the upper net too much, or the system of films will become unstable.

When a drop of one liquid, B, is placed on the surface of another, A, the phenomena which take place depend on the relative magnitude of the three surface-tensions corre- sponding to the surface between A and air, between B

is —%.

t. ee ae a —

CAPILLARY ACTION

and air, and between A and B. If no one of these ten- sions is greater than the sum of the other two, the drop will assume the form of a lens, the angles which the upper and lower surfaces of the lens make with the free surface of A and with each other being equal to the external angles of the triangle of forces. Such lenses are often seen formed by drops of fat floating on the surface of hot water, soup, or gravy. But when the surface-tension of A exceeds the sum of the tensions of the surfaces of contact of B with air and with A, it is impossible to construct the triangle of forces, so that equilibrium becomes impossible. The edge of the drop is drawn out by the surface-tension of A with a force greater than the sum of the tensions of the two surfaces of the drop. The drop, therefore, spreads itself out, with great velocity, over the surface of A till it covers an enormous area, and is reduced to such extreme tenuity that it is not probable that it retains the same pro- perties of surface-tension which it has in a large mass. Thus a drop of train oil will spread itself over the surface of the sea till it shows the colours of thin plates. These rapidly descend in Newton's scale and at last disappear, showing that the thickness of the film is less than the tenth part of the length of a wave of light. But even when thus attenuated, the film may be proved to be present, since the surface-tension of the liquid is considerably less than that of pure water. This may be shown by placing another drop of oil on the surface. This drop will not spread out like the first drop, but will take the form of a flat lens with a distinct circular edge, showing that the surface-tension of what is still apparently pure water is now less than the sum of the tensions of the surfaces separating oil from air and water.

The spreading of drops on the surface of a liquid has formed the subject of a very extensive series of experiments by Mr Tomlinson. M. Van der Mensbrugghe has also written a very complete memoir on this subject.

When a solid body is in contact with two fluids, the surface of the solid cannot alter its form, but Pp the angle at which the surface of contact of the two fluids meets the surface of the solid depends on the values of the three surface- bo! tensions. If a and 6 are the two fluids and e the solid then the equilibrium of the ten- sions at the point O depends only on that of thin components parallel to the surface, be- cause the surface-tensions normal to the sur- Q face are balanced by the resistance of the solid. Fig. 4. Hence if

the angle ROQ (fig. 4) at which the surface of contact OP meets the solid is denoted by a,

Tye — Tea — Tap cos. a=0, whence

Tye – Tea

Tao 5 As an experiment on the angle of contact only gives us the difference of the surface-tensions at the solid surface, we cannot determine their actual value. It is theoretically

cos, a=

probable that they are often negative, and may be called

surface-pressures.

The constancy of the angle of contact between the surface of a fluid and a solid was first pointed out by Dr Young, who states that the angle of contact between mercury and glass is about 140°. Quincke makes it 128° 52’.

If the tension of the surface between the solid and one of the fluids exceeds the sum of the other two tensions, the point of contact will not be in equilibrium, but will be dragged towards the side on which the tension is greatest. If the quantity of the first fluid is small it will stand in a

1 Sur la Tension Superficielle des Liquides, Bruxelles, 1873.

drop on the surface of the solid without wetting it. If the quantity of the second fluid is small it will spread itself over thesurface and wet the solid. The angle of contact of the first fluid is 180° and that of the second is zero.

If a drop of alcohol be made to touch one side of a drop of oil on a glass plate, the alcohol will appear to chase the oil over the plate, and if a drop of water and a drop of bisulphide of carbon be placed in contact in a horizontal capillary tube, the bisulphide of carbon will chase the water along the tube.

In both cases the liquids move in the direction in which the surface-pressure at the solid is least.

ON THE RISE oF A LIQUID IN A TUBE.

Let a tube (fig. 5) whose internal radius is 7, made of a solid substance c, be dipped into a liquida. Let us suppose that the angle of contact for this liquid with the solid c is an acute angle. This im- plies that the ten- sion of the free surface of thesolid c is greater than that of the sur- face of contact of the solid with the liquid a. Now consider the ten- sion of the free surface of the liquid a. All round its edge there is a tension ‘T acting at an angle a with the vertical. The circumference of the edge is 277, so that the resultant of this tension is a force 2rrT cos. a acting vertically upwards on the liquid. Hence the liquid will rise in the tube till the weight of the vertical column between the free surface and the level of the liquid in the vessel balances the resultant of the surface- tension. The upper surface of this column is not level, so that the height of the column cannot be directly measured, but let us assume that A is the mean height of the column, that is to say, the height of a column of equal weight, but with a flat top. Then if 7 is the radius of the tube at the top of the column, the volume of the suspended column is arh, and its weight is wpgr*hk, when p is its density and g the intensity of gravity. Equating this force with the resultant of the tension

xpgrh=2nrrT cos. a,

Fig. 5.

or

_ 2T cos. a

se ele

Hence the mean height to which the fluid rises is inversely as the radius of the tube. For water in a clean glass tube the angle of contact is zero, and

h

_ For mercury in a glass tube the angle of contact is 128°

| 52’, the cosine of which is negative. Hence when a glass tube is dipped into a vessel of mercury, the mercury within the tube stands at a lower level than outside it.

RIsE oF A LIQUID BETWEEN Two PLATES.

When two parallel plates are placed vertically in a liquid the liquid rises between them. If we now suppose fig. 5 to represent a vertical section perpendicular to the plates, we may calculate the rise of the liquid. Let 7 be the breadth of the plates measured perpendicularly to the

plane of the paper, then the length of the line which bounds the wet and the dry parts of the plates inside is / for each surface, and on this the tension T acts at an angle a. to the vertical. Hence the resultant of the surface-tension is 27T cos. a. If the distance between the inner surfaces of the plates is a, and if the mean height of the film of fluid which rises between them is A, the weight of fluid raised is pghla. Equating the forces—

pghla=2IT cos. a, whence _ 2T cos. a ~ pga * This expression is the same as that for the rise of a liquid in a tube, except that instead of 7, the radius of the tube, we have a the distance of the plates.

h

ForM oF THE CAPILLARY SURFACE,

The form of the surface of a liquid acted on by gravity is easily determined if we assume that near the part con- sidered the line of contact of the surface of the liquid with that of the solid bounding it is straight and horizontal, as it is when the solids which constrain the liquid are bounded by surfaces formed by horizontal and parallel generating lines. This will be the case, for instance, near a flat plate dipped into the liquid. If we suppose these generating lines to be normal to the plane of the paper then all sections of the solids parallel to this plane will be equal and similar to each other, and

the section of the surface of the liquid will be of the same form for all such sections

Let us consider the portion of the liquid between two parallel sections distant one unit of length. Let P,, P, (fig. 6) be two points of the surface; 6,, 6,, the inclination of the surface tothe horizonat P,and P,; 4 Yq the heights of P,and P, above the level of the liquid at a distance from al] solid bodies. The pres- sure at any point of the liquid which is above this Jeve] is negative unless another fluid as, for instance, the air, presses on the upper surface, but it is only the difference of pressures with which we have to do, because two equal pressures on opposite sides of the surface produce no effect.

We may, therefore, write for the pressure at a height y

P=—pgYys where p is the density of the liquid, or if there are two fluids the excess of the density of the Jower fluid over that of the upper one.

The forces acting on the portion of Jiquid P,P,A,A, are— first, the horizontal pressures, — 4pgy? and 4pgy2 ; second, the surface-tension T acting at P, and P, in directions in-

clined 6, and @, to the horizon. Resolving horizontally we find—

Fig. 6.

1

T (cos. 0) — cos. 6,)+ 5 9P(ys*- 17)=0, whence

1 ik cos. 6, =cos. 6, — a9″ +9 ad Yo” > or if we suppose P, fixed and P, variable, we may write

2

cos. 0=5 oe + constant. This equation gives a relation between the inclination of the curve to the horizon and the height above the level of the liquid. , Resolving vertically we find that the weight of the liquid raised above the level must be equal to T (sin. 6, — sin. 6,),

and this is therefore equal to the area P,P,A,A, multi- plied by gp. The form of the capillary surface is identical with that of the “elastic curve,” or the curve formed by a uniform spring originally straight, when its ends are acted on by equal and opposite forces applied either to the ends themselves or to solid pieces attached to them. Drawings of the different forms of the curve may be found in Thomson and Tait’s Natural Philo- sophy, vol. i. p. 455.

We shall next con- sider the rise of a liquid between two plates of different materials for which the angles of contact are a, and a,, the distance between the plates being a, a small quantity. Since the plates are very near one another we may use the following equation of the surface as an approximation :—

y =h,Ax Bat hg=h, + Aat Ba?*,

Fig. 7.-

whence cot. aa=—A cot. a= A+2Ba

i il T (cos. ay + COS. ay) = pga (hy + 5 Aa +3 BA’) j whence we obtain

T a Toy = 9 (008: a + cos. da) + & (2 cot. a, — cot. ae)

y= (cos. a, + cos, a) +5 (2 cot. a— cot. a). Let X be the force which must be applied in a horizontal direction to either plate to keep it from approaching the other, then the forces acting on the first plate are T +X in the negative direction, and T sin. a,+4gph,? in the positive direction. Hence

X=) gply?-T(L—sin. a). For the second plate X=5 gph? — T(1— sin. a). Hence 1 2 2 i 1 1 X=7 gp(hy? + hg”) — T (1 -3 (sin. a, +sin. «:)) ; or, substituting the values of h, and A,,

2

i= Saat (cos. a, +C0S. a)?

~~T 1~~ 3 (sin. a, + sin. ay) — a (COS. @ + COS. ay) (cot. a, + Cot. ay) \ ;

the remaining terms being negligible when ais small. The force, therefore, with which the two plates are drawn together consists first of a positive part, or in other words an attrac- tion, varying inversely as the square of the distance, and second, of a negative part or repulsion independent of the distance. Hence in all cases except that in which the angles a, and a, are supplementary to each other, the force is attractive when a is small enough, but when cos. a, and cos. a, are of different signs, as when the liquid is raised by one plate, and depressed by the other, the first term may be so small that the repulsion indicated by the second term comes into play. The fact that a pair of plates which repel one another at a certain distance may attract one another at a smaller distance was deduced by Laplace from theory, and verified by the observations of the Abbé Haiiy.

A Drop BETWEEN Two PLATES.

If a small quantity of a liquid which wets glass be intro- duced between two glass plates slightly inclined to each

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other, it will run towards that part where the glass plates are nearest together. When the liquid is in equilibrium it forms a thin film, the outer edge of which is all of the same thickness. If d is the distance between the plates at the edge of the film and II the atmospheric pressure, the Presire of the liquid in the film is 1— =” ne A is the area of the film between the plates and B its cir- cumference, the plates will be pressed together with a force

2AT cos. aa BT sin. a,

and this, whether the atmosphere exerts any pressure or not. The force thus produced by the introduction of a drop of water between two plates is enormous, and is often sufficient to press certain parts of the plates together

so powerfully as to bruise them or break them. When two blocks of ice are placed lovsely together so that the superfluous water which melts from them may drain away, the remaining water draws the blocks together with a force sufficient to cause the blocks to adhere by the process called Regelation.

In many experiments bodies are floated on the surface of water in order that they may be free to move under the action of slight horizontal forces. Thus Newton placed a magnet in a floating vessel and a piece of iron in another in order to observe their mutual action, and Ampére floated a voltaic battery with a coil of wire in its circuit in order to observe the effects of the earth's magnetism on the electric circuit. When such floating bodies come near the edge of the vessel they are drawn up to it, and are apt to stick fast to it. There are two ways of avoiding this inconvenience. One is to grease the float round its water-line so that the water is depressed round it. This, however, often produces a worse disturbing effect, because a thin film of grease spreads over the water and increases its surface-viscosity. The other method is to fill the vessel with water till the level of the water stands a little higher than the rim of the vessel. The float will then be repelled from the edge of the vessel. Such floats, however, should always be made so that the section taken at the level of the water is as small as possible.

PHENOMENA ARISING FROM THE VARIATION OF THE SURFACE-TENSION.

Pure water has a higher surface-tension than that of any other substance liquid at ordinary temperatures except mercury. Hence any other liquid if mixed with water diminishes its surface-tension. or example, if a drop of alcohol be placed on the surface of water, the surface- tension will be diminished from 80, the value for pure water, to 25, the value for pure alcohol. The surface of the liquid will therefore no longer be in equilibrium, and a current will be formed at and near the surface from the alcohol to the surrounding water, and this current will go on as long as there is more alcohol at one part of tlie surface than at another. If the vessel is deep, these cur- rents will be balanced by counter currents below them, but if the depth of the water is only two or three millimetres, the surface-current will sweep away the whole of the water, leaving a dry spot where the alcohol was

dropped in, This phenomenon was first described and explained by Professor James Thomson, who also explained a pheno- menon, the converse of this, called the ‘‘ tears of strong wine.”

If a wine glass be half-filled with port wine the liquid rises a little up the side of the glass as other liquids do. The wine, however, contains alcohol and water, both of which evaporate, but the alcohol faster than the water, so that the superficial layer becomes more watery. In the middle of the vessel the superficial layer recovers its strength by diffusion from below, but the film adhering to

the side of the glass becomes more watery, and there- fore has a higher surface-tension than the surface of the stronger wine. It therefore creeps up the side of the glass dragging the strong wine after it, and this goes on till the quantity of fluid dragged up collects into a drop and runs down the side of the glass.

The motion of small pieces of camphor floating on water arises from the gradual solution of the camphor. If this takes place more rapidly on one side of the piece of camphor than ou the other side, the surface-tension becomes weaker where there is most camphor in solution, and the lump, being pulled unequally by the surface-tensions, moves off in the direction of the strongest tension, namely, towards the side on which least camphor is dissolved.

If a drop of ether is held near the surface of water the vapour of ether condenses on the surface of the water, and surface-currents are formed flowing in every direction away from under the drop of ether.

If we place a small floating body in a shallow vessel of water and wet one side of it with alcohol or ether, it will move off with great velocity and skim about on the surface of the water, the part wet with alcohol being always the stern.

The surface-tension of mercury is greatly altered by slight changes in the state of the surface. The surface-tension of pure mercury is so great that it is

very difficult to keep it clean, for every kind of oil or grease spreads over it at once.

But the most remarkable effects of change of surface- tension are those produced by what is called the electric polarization of the surface. The tension of the surface of contact of mercury and dilute sulphuric acid depends on the electromotive force acting' between the mercury and the acid. If the electromotive force is from the acid to the mercury the surface-tension increases ; if it is from the mercury to the acid, it diminishes. Faraday observed that a large drop of mercury, resting on the flat bottom of a vessel containing dilute acid, changes its form in a remarkable way when connected with one of the electrodes of a battery, the other electrode being placed in the acid. When the mercury is made positive it becomes dull and spreads itself out; when it is made negative it gathers itself together and becomes bright again. M. Lippmann, who has made a careful investigation of the subject, finds that exceedingly small variations of the electromotive force produce sensible changes in the surface- tension. 'The effect of one of a Daniell's cell is to increase the tension from 30°4 to 40°6. He has constructed a capil- lary electrometer by which differences of electric potential less than 0-01 of that of a Daniell's cell can be detected by the difference of the pressure required to force the mercury to a given point of a fine capillary tube. He has also constructed an apparatus in which this variation in the surface-tension is made to do work and drive a machine. He has also found that this action is reversible, for when the area of the surface of contact of the acid and mercury is made to increase, an electric current passes from the mercury to the acid, the amount of electricity which passes while the stirface increases by one square centimetre being sufficient to decompose '000013 grammes of water.

ON THE FORMS OF LiquiIp FILMS WHICH ARE FIGURES oF REVOLUTION.

A spherical Soap-bubble.

A soap-bubble is simply a small quantity of soap-suds spread out so as to expose a large surface to the air. The bubble, in fact, has two surfaces, an outer and an inner surface, both exposed to air. It has, therefore, a certain amount of surface-energy depending on the area of these

two surfaces. and inner surfaces are approximately equal, we shall consider the area of the film as representing either of them, and shall use the symbol T to denote the energy of unit of area of the film, both surfaces being taken together. If T’ is the energy of a single surface of the liquid, T the energy of the film is 2T’. When by means of a tube we blow air into the inside of the bubble we increase its volume and therefore its surface, and at the same time we do work in forcing air into it, and thus increase the energy of the bubble.

That the bubble has energy may be shown by leaving the end of the tube open. The bubble will contract, forcing the air out, and the current of air blown through the tube may be made to deflect the flame of a candle. If the bubble is in the form of a sphere of radius 7 this material surface will have an area

S=4ar. (1). If T be the energy corresponding to unit of area of the film the surface-energy of the whole bubble will be

STa4er’T. 2 2… (2)

The increment of this energy corresponding to an increase of the radius from 7 to 7 + dr is therefore

Tas=GerTdr. .°-. . « + (8).

Now this increase of energy was obtained by forcing in air at a pressure greater than the atmospheric pressure, and thus increasing the volume of the bubble.

Let I be the atmospheric pressure and +p the pressure of the air within the bubble. The volume of the sphere is

Vagerse (4),

©]

and the increment of volume is dV=4ur”dr. . 2 2… (8)

Now if we suppose a quantity of air already at the pressure IIT + p, the work done in forcing it into the bubble is pdV. Hence the equation of work and energy is

pay =Tads . (6), Iaprrdr = 8rrdrT (7),

OL

or pi

This, therefore, is the excess of the pressure of the air within the bubble over that of the external air, and it is due to the action of the inner and outer surfaces of the bubble. We may conceive this pressure to arise from the tendency which the bubble has to contract, or in other words from the surface-tension of the bubble.

If to increase the area of the surface requires the expenditure of work, the surface must resist extension, and if the bubble in contracting can do work, the surface must tend tocontract. The surface must therefore act like a sheet of india-rubber when extended both in length and breadth, that is, it must exert surface-tension. The tension of the sheet of india-rubber, however, depends on the extent to which it is stretched, and may be different in different directions, whereas the tension of the surface of a liquid remains the same however much the film is extended, and the tension at any point is the same in all directions.

The intensity of this surface-tension is measured by the Stress which it exerts across a line of unit length. Let us measure it in the case of the spherical soap-bubble by con- sidering the stress exerted by one hemisphere of the bubble on the other, across the circumference of a great circle. This stress is balanced by the pressure p acting over the area of the same great circle: it is therefore equal to wr2p,

Since in the case of thin films the outer |

»

CAPILLARY ACTION

To determine the intensity of the surface-tension we have to divide this quantity by the length of the line across which it acts, which is in this case the circumference of a great circle 2ar. Dividing arp by this length we obtain $pr as the value of the intensity of the surface- tension, and it is plain from equation 8 that this is equal to T. Hence the numerical value of the intensity of the surface-tension is equal to the numerical value of the surface-energy per unit of surface. We must remember that since the film has two surfaces the surface-tension of the film is double the tension of the surface of the liquid of which it is formed.

To determine the relation between the surface-tension and the pressure which balances it when the form of the surface is not spherical, let us consider the following case :-—

Let fig. 8. represent a section through the axis Ce of a soap-bubble in the form of a figure of revolution bounded by two circular disks AB and ab, and having the meridian section APa. Let PQ be an imaginary section normal to the axis. Let the radius of this section PR be y, and let PT, the tangent at P, make an angle a with the axis.

Let us consider the stresses which are exerted across this imaginary section by the lower part on the upper part. If the internal pressure exceeds the external pressure by p, there is in the first place a force zyp acting upwards arising fron the pressure p over the area of the sec- tion. In the next place, there is the sur- face-tension acting downwards, but at an angle a with the vertical, across the circular section of the bubble itself, whose circumference is 27y, and the downward force is therefore 2ayT cos. a.

Now these forces are balanced by the external force which acts on the disk ACB, which we may call F. Hence equating the forces which act on the portion included between ACB and PRQ

mry’*p-2ryTcowa=-F . .... (9).

If we make CR=z, and suppose z to vary, the shape of the bubble of course remaining the same, the values of y and of a will change, but the other

quantities will be con- stant. In studying these variations we may if we please take as our independent variable the length s of the meridian section AP reckoned from A. Differentiating equation 9 with respect to s we obtain, after dividing by 2m as a common factor

d a . d Dy Gy ~ Teos.a e+ Ty sin. aS =0. (10). Now

7 -_

qs 75. ao. (11). The radius of curvature of the meridian section is ds R=-< . (12).

The radius of curvature of a normal section of the surface at right angles to the meridian section is equal to the part of the normal cut off by the axis, which is

y

Ree P hea. (13). Hence dividing equation 10 by y sin. a, we find La oa fe *s) . (14).

This equation, which gives the pressure in terms of the

principal radii of curvature, though here proved only in the case of a surface of revolution, must be true of all surfaces. For the curvature of any surface at a given point may be completely defined in terms of the positions of its principal normal sections and their radii of curvature.

Before going further we may deduce from equation 9 the nature of all the figures of revolution which a liquid film can assume. Let us first determine the nature of a curve, such that if it is rolled on the axis its origin will trace out the meridian section of the bubble. Since at any instant the rolling curve is rotating about the point of contact with the axis, the line drawn from this point of contact to the tracing point must be normal to the direction of motion of the tracing point. Hence if N is the point of contact, NP must be normal to the traced curve. Also, since the axis is a tangent to the rolling

curve, the ordinate PR is the perpendicular from the tracing point P on the tangent. Hence the relation between the radius vector and the perpendicular on the tangent of the rolling curve must be identical with the relation between the normal PN and the ordinate PR of the traced curve. If we write 7 for PN, then y=, cos. a, and equation 9 becomes

hy F 2 ee a —— ¥ (25; 1) wp

This relation between y and 7 is identical with the relation between the perpendicular from. the focus of a conic section on the tangent at a given point and the focal distance of that point, provided the transverse and conjugate axes of the conic are 2a and 26 respectively, where az, and pak ; P up

Hence the meridian section of the film may be traced by the focus of such a conic, if the conic is made to roll on the axis .

ON THE DIFFERENT FoRMS OF THE MERIDIAN LINE.

(1.) When the conic is an ellipse the meridian line is in the form of a series of waves, and the film itself has a series of alternate swellings and contractions as represented in figs. 8 and 9, This form of the film is called the un- duloid.

(1a.) When the ellipse becomes a circle, the meridian line becomes a straight line parallel to the axis, and the film passes into the form of a cylinder of revolution.

(1b.) As the ellipse degenerates into the straight line joining its foci, the contracted parts of the unduloid become narrower, till at last the figure becomes a series of spheres in contact.

In all these cases the internal pressure exceeds the

2T ‘ : é external by r where a is the semitransverse axis of the

conic. The resultant of the internal pressure and the surface-tension is equivalent to a tension along the axis, and the numerical value of this

tension is equal to the force due to the action of this pressure on a circle whose diameter is equal to the conjugate axis of the ellipse.

(2.) When the conic is a parabola the meridian line is a catenary (fig. 10), the internal pressure is equal to the external pressure, and the tension along the axis is equal to 2rTm where m is the distance of the vertex from the focus.

(3.) When the conic is a hyperbola the meridian line is in the form of a looped curve (fig. 11). The corresponding figure of the film is called the nodoid. The resultant of the internal pressure and the surface-tension is equivalent to a pressure along the axis equal to that due to a pressure p acting on a circle whose diameter is the conjugate axis of the hyperbola.

When the conjugate axis of the hyperbola is made

smaller and smaller, the nodoid approximates more and more to the series of spheres touching each other along the axis. When the conjugate axis of the hyperbola increases without limit, the loops of the nodoid are crowded on one

| another, and each becomes more nearly a ring of. circular

section, without, however, ever reaching this form. The only closed surface belonging to the series is the sphere.

These figures of revolution have been studied mathe- matically by Poisson, Goldschmidt,? Lindeléf and Moigno,’ Delaunay,‘ Lamarle,® Beer,® and Mannheim,’ and have been produced experimentally by Plateau’ in the two different ways already described.

Sg eS:

Fig. 9.—Unduloid. Fic. 10.—Catenoid. Fic. 11.—Nodoid.

The limiting conditions of the stability of these figures have been studied both mathematically and experimentally. We shall notice only two of them, the cylinder and the catenoid.

STABILITY OF THE CYLINDER.

The cylinder is the limiting form of the unduloid when the rolling ellipse becomes a circle. When the ellipse differs infinitely little from a circle, the equation of the

meridian line becomes approximately y =a+c sin. – a

where c is small. This is a simple harmonic wave-line, whose mean distance from the axis is a, whose wave-length is 22a, and whose amplitude isc. The internal pressure

Now

consider a portion of a cylindric film of length x terminated by two equal disks of radius 7 and con- taining a certain volume of air. Let one of these disks be made to approach the other by a small quantity dx. The film will swell out into the convex part of an unduloid, having its largest section midway between the disks, and we have to determine whether the internal pressure will be greater or less than before. If A and C (fig. 12) are the disks, and if z the distance between the disks is equal to wr half the wave-length of the harmonic curve, the disks will be at the points where the curve is at its mean distance from the

corresponding to this unduloid is as before pes.

Fig. 12.

axis, and the pressure will therefore be . as before. If A,,

C, are the disks, so that the distance between them is less than wr, the curve must be produced beyond the disks before it is at its mean distance from the axis. Hence in this case the mean distance is less than 7, and

the pressure will be greater than a If, on the other hand,

the disks are at A, andC,, so that the distance between them is greater than 77, the curve will reach its mean dis-

1 Nouvelle théorie de Vaction capillaire (1831). 2 Determinatio superficiei minime rotatione curve data duo puncta jungentis circa datum axem orte: (Gottingen, 1831).

3 Lecons de calcul des variations (Paris, 1861).

4“ Sur la surface de revolution dont Ja courbure moyenne est constante,” Liouville’s Journal, vi.

5“ Théorie geometrique des rayons et centres de courbure,” Builet. de l Acad. de Belgique, 1857.

6 Tractatus de Theoria Mathematica Phanomenorum in Liquidis actioni gravitatis detractis observatorum (Bonn, 1857).

7 Journal U Institut, No. 1260.

8 Statique experimentale et théorique des liquides.

tance from the axis before it reaches the disks. The mean distance will therefore be greater than 7, and the

Hence if one of the disks be

made to approach the other, the internal pressure will be increased if the distance between the disks is less than half the circumference of either, and the pressure will be diminished if the distance is greater than this quantity. In the same way we may show that if the distance between the disks is increased, the pressure will be diminished or increased according as the distance is less or more than half the circumference of either.

Now let us consider a cylindric film contained between two equal fixed disks A and B, and let a third disk, C, be placed midway between. Let C be slightly displaced towards A. If AC and CB are each less than half the circumference of a disk the pressure on C will increase on the side of A and diminish on the side of B. The resultant force on C will therefore tend to oppose the dis- placement and to bring C back to its original position. The

equilibrium of C is therefore stable. It is easy to show that if C had been placed in any other position than the middle, its equilibrium would have been stable. Hence the film is stable as regards longitudinal displacements. It is also stable as regards displacements transverse to the axis, for the film is in a state of tension, and any lateral displacement of its middle parts would produce a resultant force tending to restore the film to its original position. Hence if the length of the cylindric film is less than its circumference, it is in stable equilibrium. But if the length of the cylindric film is greater than its circumference, and if we suppose the disk C to be placed midway between A and B, and to be moved towards A, the pressure on the side next A will diminish, and that on the side next B will increase, so that the resultant force will tend to increase the displacement, and the equilibrium of the disk C is therefore unstable. Hence the equilibrium of a cylindric film whose length is greater than its circumference is unstable. Such a film, if ever so little disturbed, will begin to contract at one section and to expand at another, till its form ceases to resemble a cylinder, if it does not break up into two parts which become ultimately portions of spheres.

pressure will be less than = :

INSTABILITY OF A JET oF LIQUID.

When a liquid flows out of a vessel through a circular opening in the bottom of the vessel, the form of the stream is at first nearly cylindrical though its diameter gradu- ally diminishes from the orifice downwards on account of the increasing velocity of the liquid. But the liquid after it leaves the vessel is subject to no forces except gravity, the pressure of the air, and its own surface-tension. Of these gravity has no effect on the form of the stream except in drawing asunder its parts in a vertical direction, because the lower parts are moving faster than the upper parts. The resistance of the air produces little disturbance until the velocity becomes very great. But the surface- tension, acting on a cylindric column of liquid whose length exceeds the limit of stability, begins to produce enlarge- ments and contractions in the stream as soon as the liquid has left the orifice, and these inequalities in the figure of the column go on increasing till it is broken up into elongated fragments. These fragments as they are fall- ing through the

air continue to be acted on by surface- tension. They therefore shorten themselves, and after a series of oscillations in which they become alternately elongated and flattened, settle down into the form of spherical drops.

This process, which we have followed as it takes place on

an individual portion of the falling liquid, goes through its | within and without.

GAPTLLARY ACE Pee

several phases at different distances from the orifice. so that if we examine different portions of the stream as it descends, we shall find next the orifice the unbroken column, then a series of contractions and enlargements, then elongated drops, then flattened drops, and so on till the drops become spherical.

STABILITY OF THE CATENOID.

When the internal pressure is equal to the external, the film forms a surface of which the mean curvature at every point is zero. ‘The only surface of revolution having this property is the catenoid formed by the revolution of a catenary about its directrix. This catenoid, however, is in stable equilibrium only when the portion considered is such that the tangents to the catenary at its extremities intersect before they reach the directrix.

To prove this, let us consider the catenary as the form of equilibrium of a chain suspended between two fixed points Aand B. Suppose the chain hanging between A and B to be of very great length, then the tension at A or B will be very great. Let the chain be hauled in over a peg at A. At first the tension will diminish, but if the process be continued the tension will reach a minimum value and will afterwards increase to infinity as the chain between A and B approaches to the form of a straight line. Hence for every tension greater than the minimum tension there are two catenaries passing through A and B. Since the tension is measured by the height above the directrix these two catenaries have the same directrix. Every catenary lying

between them has its directrix higher, and every catenary lying beyond them has its directrix lower than that of the two catenaries.

Now let us consider the surfaces of revolution formed by this system of catenaries revolving about the directrix of the two catenaries of equal tension. We know that the radius of curvature of a surface of revolution in the plane normal to the meridan plane is the portion of the normal intercepted by the axis of revolution.

The radius of curvature of a catenary is equal and oppo- site to the portion of the normal intercepted by the direc- trix of the catenary. Hence a catenoid whose directrix coincides with the axis of revolution has at every point its principal radii of curvature equal and opposite, so that the mean curvature of the surface is zero,

The catenaries which lie between the two whose direc- tion coincides with the axis of revolution generate sur- faces whose radius of curvature convex towards the axis in the meridian plane is less than the radius of concave curvature. The mean curvature of these surfaces is there- fore convex towards the axis. The catenaries which lie beyond the two generate surfaces whose radius of curvature convex towards the axis in the meridian plane is greater than the radius of concave curvature. The mean curvature of these surfaces is, therefore, concave towards the axis.

Now if the pressure is equal on both sides of a liquid film, if its mean curvature is zero, it will be in equilibrium. This is the case with the two eatenoids. If the mean curvature is convex towards the axis the film will move from the axis. Hence if a film in the form of the catenoid which is nearest the axis is ever so slightly displaced from the axis it will move further from the axis till it reaches the other catenoid.

If the mean curvature is concave towards the axis the film will tend to approach the axis. Hence if a film in the form of the catenoid which is nearest the axis be displaced towards the axis, it will tend to move further towards the axis and will collapse. Hence the film in the form of the catenoid which is nearest the axis is in unstable equilibrium under the condition that it is exposed to equal pressures If, however, the circular ends of the

catenoid are closed with solid disks, so that the volume of air contained between these disks and the film is deter- minate, the film will be in stable equilibrium however large a portion of the catenary it may consist of.

The criterion as to whether any given catenoid is stable or not may be obtained as follows.

Let PABQ and ApgB (fig. 13) be two catenaries having the same directrix and intersecting in AandB. Draw Pp and Qg touching both catenaries, Pp and Qg will intersect at 2 a point in the directrix; for since any catenary with its directrix is a similar figure to any other catenary with its directrix, if the directrix of the oue coincides with that of the other the centre of similitude must lie on the common directrix. Also, since the curves at P and p are equally inclined to the directrix, P and p are corresponding points and the line P » must pass through the centre of similitude. Similarly Qg must pass through the centre of similitude Hence T, the point of intersection of Pp and Qqg, must B be the centre of – similitude and must be on the common directrix. Hence the tan- gents at A and B / to the upper caten- ary must intersect above the direc- _ trix, and the tan- ; qT gents at A and B ny + to the lower catenary must intersect below the directrix. The condition of stability of a catenoid is therefore that the tangents at the extremities of its generating catenary must intersect before they reach the directrix.

STABILITY OF A PLANE SURFACE.

We shall next consider the limiting conditions of stability of the horizontal surface which separates a heavier fluid above from a lighter fluid below. Thus, in an experi- ment of M. Duprez,! a vessel containing olive oil is placed with its mouth downwards in a vessel containing a mixture of alcohol and water, the mixture being denser than the oil. The surface of separation is in this case horizoutal and stable, so that the equilibrium is established of itself. Alcohol is then added very gradually to the mixture till it becomes lighter than the oil. The equilibrium of the fluids would now be unstable if it were not for the tension of the surface which separates them, and which, when the orifice of the vessel is not too large, continues to preserve the stability of the equilibrium.

When the equilibrium at last becomes unstable, the destruction of equilibrium takes place by the lighter fluid ascending in one part of the orifice and the heavier descending in the other. Hence the displacement of the surface to which we must direct our attention is one which does not alter the volume of the liquid in the vessel, and which therefore is upward in one part of the surface and downward in another. The simplest case is that of a rectangular orifice in a horizontal plane, the sides being a and 0.

Let the surface of separation be originally in the plane of the orifice, and let the co-ordinates x and y be measured from one corner parallel to the sides a and 6 respectively, and let z be measured up- wards. Then if p be the density of the upper liquid, and o that of the lower liquid, and P the original pressure at the surface of separa- tion, then when the surface receives an upward displacement z, the

pressure above it will be P—pgz, and that below it will be P— «gz, so that the surface will be acted on by an upward pressure (p — «) 92.

1 “¢Sur un cas particulier de l’éqnilibre des liquides,”’ par F. Du- prez, Nouveaux Mém. del Acad. de Belgique, 1851 et 1854.

69

Now if the displacement z be everywhere very small, the curvature

2

y and if T is the surface-tension the whole upward force will be

2.

in the planes parallel to xz and yz will be aa and respectively :

ds a = (Gatga)te- o)92

If this quantity is of the same sign as 2, the displacement will be increased, and the equilibrium will be unstable. If it is of the opposite sign from z, the equilibrium will be stable. The limiting condition may be found by putting

it equal to zero. One form of the solution of the equation, and that which is applicable to the case of a rectangular orifice, is

z=C sin. pu sin. qy. Substituting in the equation we find the condition +e stable. (p? +9”) T-(p—a)g= 4 9 neutral. —vé unstable,

That the surface may coincide with the edge of the orifice, which

is a rectangle, whose sides are a and b, we must have

pa=mn , gob=nr, when m and n are integral numbers. Also, if m and nm are both unity, the displacement will be entirely positive, and the volume of the liquid will not be constant. That the volume may be constant, either or m must be an even number. We have, therefore, to consider the conditions under which

2 2

o(% +5) T-(@- 09

Under these conditions the equilibrium

cannot be made negative. The smallest

is stable for all small displacements of the surface. 2 ‘m3 1 : : admissible value of 4 +3 is Fat ja» where a is the longer side of

Hence the condition of stability is that

4 1

fd Ste) T-(p-o)9

is a positive quantity. When the breadth 0 is less than af

the rectangle.

gfe (p- o)g the length a may be unlimited.

When the orifice is circular of radius a, the limiting value of

a is af zs , where zis the least root of the equation gp

@ ta +t a gat 942-6 2°42-62°8 +&c.,=0. The least root of this equation is

2=3°83171.

If # is the height to which the liquid will rise in a capillary tube of unit radius, then the diameter of the largest orifice is

2a=3°8317 V 2h

=5°4188Vh.

M. Duprez found from his experiments 2a=5°485 Vi.

EFFrEct oF SURFACE-TENSION ON THE VELOCITY OF Wavus.”

When a series of waves are propagated on the surface of a liquid, the surface-tension has the effect of increasing the pressure at the crests of the waves and diminishing it in the troughs. If the wave-length is A, the equation of the surface is

: te y=b sin. 2m ;

The pressure due to the surface-tension T is dy An? p=- uh de Ty . This pressure must be added to the pressure due to gravity gpy. ence the waves will be propagated as if the intensity of gravity had been 47? ‘] FH943T G

instead of g. Now it is shown in hydrodynamics that the

2 See Sir W. Thomson, ‘ Hydrokinetic Solutions and Observations,” Phil. Mag., Nov. 1871.

velocity of propagation of waves in deep water is that | the body is w sec. 6, where w for water is about 23 centi- acquired by a heavy body falling

through half the radius | metres per second.

of the circle whose circumference is the wave-length, or

Ih Qa

S af Ay 2nT — ag oe 37 Ap This velocity is a minimum when

A= 29 ayn ’ 9p

and the minimum value is pee = AE,

For waves whose length from crest to .crest is greater than A, the principal force concerned in the motion is that of gravitation. For waves whose length is less than A the principal force concerned is that of surface-tension. Sir William Thomson proposes to distinguish the latter kind of waves by the name of ripples.

When a small body is partly immersed in a liquid origin- ally at rest, and moves horizontally with constant velocity V, waves are propagated through the liquid with various velocities according to their respective wave-lengths. In front of the body the relative velocity of the fluid and the body varies from V where the fluid is at rest, to zero at the cutwater on the front surface of the body. The waves produced by the body will travel forwards faster than the body till they reach a distance from it at which the relative velocity of the body and the fluid is equal to the velocity of propagation corresponding to the wave- length. The waves then travel along with the body at a constant distance in front of it. Hence at a certain distance in front of the body there is a series of waves which are stationary with respect to the body. Of these, the waves of minimum velocity form a stationary wave nearest to the front of the body. Between the body and this first wave the surface is comparatively smooth. Then comes the stationary wave of minimum velocity, which is the most marked of the series. In front of this is a double series of stationary waves, the gravitation waves forming a series increasing in wave length with their distance in front of the body, and the surface-tension waves or ripples diminishing in wave-length with their distance from the body, and both sets of waves rapidly diminishing in amplitude with their distance from the body.

If the current-function of the water referred to the body considered as origin is y, then the equation of the form of the crest of a wave of velocity w, the crest of which travels along with the body, is

dy=wds

where ds is an element of the length of the crest. To inte- grate this equation for a solid of given form is probably diffi- cult, but it is easy to see that at some distance on either side of the body, where the liquid is sensibly at rest, the crest of the wave will approximate to an asymptote inclined to the

path of the body at an angle whose sine is = , where w is the

velocity of the wave and V is that of the body.

The crests of the different kinds of waves will therefore appear to diverge as they get further from the body, and the waves themselves will be less and less perceptible. But those whose wave-length is near to that of the wave of miminum velocity will diverge less than any of the others, so that the most marked feature at a distance from ths body will be the two long lines of ripples of minimum velocity. If the angle between these is 20, the velocity of

TABLES OF SURFACE TENSION.

In the following tables the units of length, mass, and time are the centimetre, the gramme, and the second, and the unit of force is that which if it acted on one gramme fcr one second would communicate to it a velocity of one

, centimetre per second :—

Table of Surface-Tension at 20° C, (Quincke).

| Tension of surface | Angle of contact with

separating the liquid glass in presence of Liquid. Specific from. Gravity. r | Air. | Water. pode Air, | Water. |Mercur Water …..... il 81 | 408″ 125° Ba”. BaP IR? tee : yeer 13°5482′ 540 | 418 51° 8’ |26° 8 He

; –

Gateof | 12687) 821) 41-75] 872-5/30° 16/118° 9” Chloroform…..) 14878) 30:6} 29°5 | 399 sop Alcohol …... .. 0°7906) 25°5) ... 1899 1252197 … oe Olive Oil…..... 0°9186, 36°9| 20°56) 385 121° 50/172 ~=—-|47° 9” Turpentine . 0°8867! 29°7; 11°55) 250°5187° 44737° 44/ Ano oe ae Sines 0°7977|. 81°7| 27°8 | 284 186° 20‘142° 46/ ydrochloric : Acid…....¢, #2 | 701)... 377 Solution of | Hyposul ; : , , pint of ¢| 121248) 77° 449°5|23° 20 10° 42 Doda: «6…

| | l

Olive Oil and Alcohol, 12:2.

Olive oil and aqueous alcohol (sp. g. ‘9231, tension of free surface 25°5), 6°8, angle 87° 48’,

Quincke has determined the surface-tension of a great many substances near their point of fusion or solidification. His method was that of observing the form of a large drop standing on a plane surface. If K is the height of the flat surface of the drop, and & that of the point where its tangent plane is vertical, then

1

T=5 (K-k)%gp.

Surface-Tensions of Liquids at their Point of Solidification. From Quincke.

Temperature of

Substance. Solidification, Surface-Tensi sn, Platinum 2000° C. 1658 LC ICG Ld Sardine & 1200° 983 UK ee eee ee 860° 860 ME esos aaae lhe BUST GMsa se ..cleterter sas 265° 882 PotasSMIN cies vhserdes 58° 364 Sil a a 90° 258 BRIM 5.60.05 5350000 432° 244 | 3 a en ee ae 1000° ave Carbonate of Soda….. 1000° 206 Chloride of Sodium…. ae 114 SY SGI caketsiseor ones alas terete 0° 86:2 Selenium……..... 00… ON Wife 70°4

MOULD es vcs sawiycabsioone g 111° 41°3 Phosphorus…..... 43° 41°1 Wee Miri ee ae ae 68° 83°4

Quincke finds that for several series of substances the sur- face-tension is nearly proportional to the density, so that if we

call (K —&)? = aa the specific cohesion, we may state the

general results of his experiments as follows :—

The bromides and iodides have a specific cohesion about half that of mercury. The nitrates, chlorides, sugars, and fats, as also the metals, lead, bismuth, and antimony, have

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a specific cohesion nearly equal to that of mercury. Water, the carbonates and sulphates, and probably phosphates, and the metals, platinum, gold, silver, cadmium, tin, and copper have a specific cohesion double that of mercury. Zinc, iron, and palladium, three times that of mercury, and sodium, six times that of mercury.

RELATION oF SURFACE-TENSION TO TEMPERATURE,

It appears from the experiments of Brunner and of Wolff on the ascent of water in tubes that at the tempera- ture ¢° centigrade

T=75‘20 (1-0°00187¢) (Brunner) ;

= 76°08 (1 — 0°002¢ + 0°00000415¢”), for a tube *02346 cm. dia- meter (Wolff) ; =77°34 (1-0°001812), for a tube ‘03098 cm. diameter (Wolff).

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Sir W. Thomson has applied the principles of Thermody- namics to determine the thermal effects of increasing or diminishing the area of the free surface of a liquid, and has shown that in order to keep the temperature constant while the area of the surface increases by unity, an amount of heat must be supplied to the liquid which is dynamically equivalent to the

product of the absolute temperature into the decrement of the surface-tension per degree of tempera- ture. We may call this the latent heat of surface-exten- ston

It appears from the experiments of Brunner and Wolff that at ordinary temperatures the latent heat of extension of the surface of water is dynamically cquivalent to about half the mechanical work done in producing the surface- extension. (J. C. M.)

CAPIS, or Capiz, a town of the Philippine Islands, in a province of the same name, on the north coast of Panay, at the mouth of the rivers Panay, Panitan, and Ivisan, which are subject to inundations during the rainy season. It is the seat of a Spanish alcalde, and is defended by a small fort. Most of its buildings are light erections of nipa palm. Its exports are mainly rice, dyewood, gold-dust, and cattle. Population, 11,470. Lat, 11° 25’ N., long. 122° 45’ E.

CAPISTRANO, Giovanni D1 (1386-1456), was born at the little town of Capistrano in the Abruzzi. He was educated for the profession of law, and till about his thirtieth year was engaged in practice as an advocate. He then entered the Franciscan order, and became one of its most rigid and devoted adherents. At the same time he manifested very remarkable powers as a popular preacher, and was consequently employed on various missions by the popes. In 1450 he was sent by Nicholas V. to Germany to preach against the Hussite heresy, and at the same time to excite the Germans to a crusade against the Turks who, under their great leader, Mahomet II., were threatening to overrun Europe. Capistrano did much to repress the Hussite movement, and though he failed to excite a crusade against the Turks, his religious enthusiasm sustained the inhabitants of Belgrade when that town was besieged by the Turkish forces in 1456. He accompanied them with the cross in his hand in their successful sortie, a few months before his death, He was canonized in 1690.

CAPITAL, in social discussions sometimes treated as antithetical to Labour, is in reality the accumulated savings of labour and of the profits accruing from the savings of labour. It is that portion of the annual produce reserved from consumption to supply future wants, to extend the sphere of production, to improve industrial instruments and processes, to carry out

works of public utility, and, in short, to secure and enlarge the various means of progress necessary to an increasing community. Itis the increment of wealth or means of subsistence analogous to the increment of population and of the wants of civilized man. Hence Mr Mill and other economists, when seeking a graphic expres- sion of the service of capital, have called it “abstinence.” The labourer serves by giving physical and meutal effort in order to supply his means of consumption. The capitalist, or labourer-capitalist, serves by abstaining from consumption, by denying himself the present enjoyment of more or less of his means of consumption, in the prospect of a future profit. This quality, apparent enough in the beginnings of capital, applies equally to all its forms and stages; because whether a capitalist stocks his warehouse with goods and produce, improves land, lends on mortgage or other security, builds a factory, opens a mine, or orders the construction of machines or ships, there is the element of self-deprival for the present, with the risk of ultimate

loss of what is his own, and what, instead of saving and embodying in some productive form, he might choose to consume, On this ground rests the justification of the claims of capital to its industrial rewards, whether in the form of rent, interest, or profits of trade and investment.

To any advance in the arts of industry or the comforts of life, a rate of production exceeding the rate of consump- tion, with consequent accumulation of resources, or in other words, the formation of capital, is indispensable. The primitive cultivators of the soil, whether those of ancient times or the modern pioneers who have formed settlements in the forests of the New World, soon discovered that their labour would be rendered more effective by implements and auxiliary powers of various kinds, and that until the produce from existing means of cultivation exceeded what was necessary for their subsistence, there could be neither labour on their part to produce such implements and auxiliaries, nor means to purchase them. Every branch of industry has thus had a demand for capital within its own circles from the earliest times. The flint arrow-heads, the stone and bronze utensils of fossiliferous origin, and the rude implements of agriculture, war, and navigation, of which we read in Homer, were the forerunners of that rich. and wonderful display of tools, machines, engines, furnaces, and countless ingenious and costly appliances, which represent so large a

portion of the capital of civilized countries, and without the pre-existing capital could not have been developed. Nor in the cultivation of land, or the production simply of food, is the need of implements, and of other auxiliary power, whether animal or mechanical, the only need immediately experienced. The demands on the surplus of produce over consumption are various and incessant. Near the space of reclaimed ground, fron which the cultivator derives but a bare livelihood, are somc marshy acres that, if drained and enclosed, would add con- siderably in two or three years to the produce; the forest and other natural obstructions might also be driven farther back with the result, in a few more years, of profit; fences are necessary to allow of pasture and field crops, roads have to be made and farm buildings to be erected; as the work proceeds more artificial investments follow, and by these successive outlays of past savings in improvements, renewed and enhanced from generation to generation, the land, of little value in its natural state either to the owner and cultivator or the community, is at length brought into a highly productive condition. The history of capital in the soil is substantially the history of capital in all other spheres. No progress can be made in any sphere, small or large, without reserved funds possessed by few or more persons, in small or large amounts, and the progress in all cases is adventured under self-deprival in the meanwhile of acquired value, and more or less risk as to the final result.

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Capital is necessarily to be distinguished from money, with which in ordinary nomenclature it is almost identical. It is impossible to draw any line where capital may not operate actively without the intervention of money. A farmer, manufacturer, or artisan, who has saved from his consumption and expenses of the past year an amount of product-value, may in the following year either employ raore labour to direct production or divert a portion of the labour hitherto employed to an improvement of his process, which in either case would be an investment of capital. Money, strictly speaking, is the gold and silver coins in circulation and banking reserve, and its sum in the United Kingdom may amount to over 100 millions sterling. But when the bank deposits of the kingdom are taken into account, they are found to be fives of hundreds of millions sterling, all active as money, and forming what is called the “ floating capital ” of the

country. The explanation is that the farmer, manufacturer, and artisan already supposed, having a surplus produce to dispose of, sell it at what they deem the proper time for their advantage and put the pro- ceeds in bank; or the domestic servant or labouring man having a surplus from his wages, or the investor of speculator in stocks and shares having realized a profit, or the owner of a thousand acres, or the millionaire embarrassed with the returns of a capital so large that he can only add to it year after year, do the same thing—the rooney employed in these multiplied transactions being merely the vehicle of their notation in money-value, and after accomplishing one series of transactions being available for another series following. The deposits thus made to the banks may be recalled soon or late, in whole or in part, or may go on increasing under the same names for a generation ; but, in any case, they are the realized money- values of commodities, wages, rents, interest, and profits, of which the owners had no present need, and which they placed at the service of the public in this social form at some rate of interest until such time as they might choose or need to recall them. This is capital in its most vitalized form, because it is offered through the banks to all who want capital and can give the requisite securities of document or character for its repayment. In proportion as this fund increases a country may be safely deemed richer in resource for the extended employment of labour in all profitable branches of industry, and for coping with every exigency in its industrial and commercial condition. It is a necessary element of all great enterprises, such as raélways, telegraphs, lines of ocean steamers, and the like, as well as of operations in foreign commerce where there is a long train of outlays in materials, wages, and charges before there can be any return. Still the idea of capital cannot be confined to money and bank deposits of money. The indefinite extent to which, in the practical conduct of trades and industries, the capital is insensibly increased out of the resources of the business itself, without loans or contribu- tion of new capital shares, and the facility with which property and commodities command the energy of free and active capital, forbid any narrow definition. The capital of a country can scarce be said to be less than the whole sum of its investments in a productive form, and possessing a recognized productive value.

The distinction of “fixed” and “ circulating ” capital by the author of the Wealth of Nations (book ii. c. i.) cannot fail to be always useful in

exhibiting the various forms and conditions under which capital isemployed. Yet the principal phenomena of capital are found to be the same, whether the form of investment be more or less permanent or circulable. The machinery in which capital is “fixed,” and which yields a profit without apparently changing hands, is in reality passing away day by day, until it is worn out, and has to be replaced. So also of

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drainage and other land improvements. When the natural forests have been consumed and the landowners begin to plant trees on the bare places, the plantations while growing are a source of health, shelter, and embellish-ment—they are not without a material profit throughout their various stages to maturity—and when, at the lapse of twenty or more years, they are ready to be cut down, and the timber is sold for useful purposes, there is a harvest of the original capital expended as essentially as in the case of the more rapid yearly crops of wheat or oats. The chief distinction would appear to rest in the element of time elapsing between the outlay of capital and its return. Capital may be employed in short loans or bills of exchange at two or three months, in paying wages of labour for which there may be return in a day or not in less than a year or more, or in operations involving within themselves every form of capital expenditure, and requiring a few years or ninety-nine years for the promised fructification on which they proceed. But the common characteristic of capital is that of a fund yielding a return and reproducing itself whether the time to this end be long or short. The division of expenditure or labour (all expenditure having a destination to labour of one kind or another) into “ productive” and “ unproductive ” by the same distinguished authority (book ii, c. 3) is also apposite both for purposes of political economy and practical guidance, though economists have found it difficult to define where “ productive expenditure” ends and “unproductive expenditure” begins. Adam Smith includes in his enumeration of the “fixed capital” of a country “the acquired and useful abilities of all the inhabitants ;” and in this sense expenditure on education, arts, and sciences might be deemed expenditure of the most productive value, and yet be wanting in strict com- mercial account of the profit and loss. It must be admitted that there is a personal expenditure among all ranks of society, which, though not in any sense a capital expenditure, may

become capital and receive a productive application, always to be preferred to the grossly unpro- ductive form in the interest both of the possessors and of the community.

These remarks have probably indicated with sufficient clearness the origin, nature, and uses of capital. The subject in its details is full of controversies, on which it would be out of place here to enter. It may be enough to indicate simply some conclusions which appear to be fully established. 1. Capital is not a prerogative or monopoly of any class, but embraces both in its actual form and its future possibilities all classes of men from the humblest labourer to the millionaire. _ 2. In proportion as capital increases the rate of profit falls, the competition of capital with capital being fully more close and active than that of labour with labour (J. 8. Mill's Principles of Political Economy, book iv. c. 4). 3. The amount of the annual produce falling to capital is necessarily larger in proportion to the amount falling to labour in countries where the capital is large than in those where it is relatively small, in old than in new countries, though the rate of profit may be lower in the former than in the latter. The rate of profit may fall over the whole capital of a country, and yct from the increase of capital employed the aggregate profit be undiminished or even increased. M. Bastiat puts this conclusion in the following formula :—'"'In proportion to the increase of capital the absolute share of the total product falling to the capitalist is augmented and his relative share is diminished ; while, on the contrary, the labourer's share is increased both absolutely and relatively" (Harmonies of Political Economy, vii.) 4. Capital, so far from being the antagonist, is the ally of labour, the indispensable means of all extended cmployment and reward of labour, as well

as of all increase of population and civilized well-being (Some Leading Principles of Political Economy, by Professor Cairnes, part ii. c. 3).

CAPITANATA, or Foaera, a proviuce of Southern Italy, formerly belonging to the kingdom of Naples. It has an area of 2955 square miles, and is bounded on the N. and E. by the Adriatic Sea, on the S.E. by the province of Bari, on the 8. by Basilicata and Principato Ulteriore, on the W. by Benevento and Molise. The south-west of the province is occupied by the

slopes and underfalls of the Apennines, and on the north-east the mountain mass of Gargano covers an extent of more than 800 square miles. The central district, however, is very level, and is known as the Tavogliere di Puglie, or Chess-board of Apulia ; while the mountainous parts also enclose many fertile valleys. Except at the promontory of Gargano the coast is low, and is in many parts covered with lagoons, of which the principal are the Lago di Lesiua, the Lago di Verana, and the Lago di Salpi. The harbours are few and unimportant. The Fortore, the Candelaro, and the Cervajo are the chief rivers, to which must be added the Ofanto, which forms the boundary towards the south. The products are wheat, maize, pulse, fruits, hemp, flax, oil, and wine; the breeding of horses and cattle is pursued to a considerable extent, and vast herds of sheep are pastured throughout the province. The manufactures are few and of no great importance; and the commerce consists mainly in the coasting trade. The province is divided into the three districts of Foggia, San Severo, and Manfredonia ; its capital is Foggia, and the other principal towns, besides those which give name to the districts, are Lucera, Bovino, Cerignola, Ascoli di Satriano, and Vieste. Population in 1871, 322,758.

CAPITO, or Korpriin, Wonrcanc Fasrictus (1478- 1541), a Reformed divine, was born of humble parentage at Hagenau in Alsace. He was educated for the medical pro- fession, aud he also devoted some time to the study of law, in which he gained the degree of doctor. At the same time he applied himself so earnestly to theology that he received the doctorate in that faculty also, and taught for somie time at Freiburg. He acted for three years as pastor in Bruchsal, and was then called to the cathedral church of Basel. In 1520 he removed to Mainz, at the request of Albrecht, archbishop of that city. In 1523 he settled at Strasburg, where he remained till his death. He took a prominent part in the earlier ecclesiastical transactions of the 16th century, was present at the second conference of Zurich and at the conference of Marburg, and along with Bucer was appointed to present to the emperor the confession of Augsburg. From his endeavours to conciliate the Lutheran and Zwinglian parties in regard to the sacraments, he seems to have incurred the suspicions of his own friends ; while from his intimacy with several divines of the Socinian school he drew on himself the charge of Arianism. His principal works were,—Znstitutionwm Hebraicarum libri

duo ; Enarrationes in Habacuc et Hoseam Prophetas; and Explicatio doctissema m Hexaemeron.

CAPITOL, the great temple of Jupiter on the Tarpeian or Capitoline Hill at Rome. See Rome.

CAPITOLINUS, Juttus, one of a number of historical writers who lived about the end of the 3d century. See AuaustaNn History, vol. iii. p. 73.

CAPITULARIES are certain laws enacted under the auspices of kings of the Frankish race. They are called Capitularia, a name of no classical authority, but derived from capitulum, the diminutive of caput; and they are so described from the circumstance of their being enacted or digested capitulatum, by heads or chapters. The term is very frequently used in a general sense, but in other instances capitularies are distinguished from laws.

The laws of the Franks were enacted “ consensu populi

et constitutione regis.” Liberty was the chief inheritance of the ancient people of Germany; nor were they governed by laws which they had no share in enacting. It has been remarked by Dr Stuart, that “the short but comprehensive and sentimental work of Tacitus, on the manners of Jermany, is the key to the institutions, the Capitularies, and the code of the barbarians.” But the naticnal assemblies of those who were capable and worthy of bearing arms appear to have been gradually superseded by a select council, composed of the two orders of the clergy and nobility ; and if the great body of the people attended their deliberations, it seems to have been more in the capacity of spectators than of actual legislators. The initiative in promulgating any resolution was always taken by the king or emperor, and the final adoption seems also to have been very much in his hands, the assembled magnates merely giving their advice on the circumstances of the case. This was the form of the constitution in the time of Charlemagne, in whose name a great proportion of the Capitularies are promulgated, though some of them belong to a more recent, and others to a much more early period, the collection commencing with an enactment of

King Childebert, dated in the year554. The Capitularies are written in the Latin language, and were doubtless drawn up by the ecclesiastics. The Latin copies were de- posited amoung the national archives, but the laws were divulged to the people in their mother tongue.

Savigny gives the following summary of what is now known with regard to the Capitularies ~~—“ The imperial ordinances of the Franks (Capitularia), which, after the extension of their empire,were distinguished from the national laws (Leges), arose from the enlargement of the same principle. All royal enactments, particularly in later times, were called Capitularia, or Capitula. The king had a double character,— the one, as chief of each individual tribe, and the other as head of the whole nation. Hence the Capitularies also are of two classes,— those defining the law of a particular race, ¢.g., ‘ Capi~~ tula addita ad Legem Salicam,’ and those of general application over the whole Frank territory. In the kingdom of the Franks, with which so many different nations were incorporated, the Capitularies are so frequently general under the Carlovingian dynasty, that when their character is not specially fixed they may be understood as belonging to that class. In Lombardic Italy, on the contrary, where the Lombards and Romans were the only distinct peoples, most of the ordinances of Charles azd his successors must be understood as constituting exclusively Lombardic law. For this reason probably they have been inserted in a!l the early collections of that law, and were consequently never obligatory on the Romans. It is, however, of great, importauce to determine accurately the limits of the general Capitularies. The laws of the race of Charlemagne have been erroneously supposed to apply to all the subjects of their extensive empire. These princes reigned over three distinct kingdoms, the Frankish, the Lombardic, and that which under the name of Rome and the Exarchate had recently constituted part of the Greek empire. No Capitulary, however general, could overstep the boundaries of that state in which it had originated. The only excep- tions to this rule were some clerical laws; and their universal validity arose from the unity of the church, and from the common old ecclesiastical authorities, on which they were founded. No example of a similarly general application is found in any of the temporal ordinances.”

The first collection of the Capitularies was made in the 9th century by Angesise, abbot of Fontenelle, one of the councillors of Charle- magne. He collected the Capitula of Charlemagne and Louis le Debonnaire into four books. In 842 Benedict, deacon of Mainz, added three books, bringing up the number of Capitula to 1697. Supplements were afterwards added, which ans the number to

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2100. The history of the later editions will be found in the preface of Baluze, who has himself surpassed all preceding and all subsequent editors. His great collection appeared under the following title : Capitularia Regum Francorwm ; addite sunt Marculft monachi et aliorum fornvule veteres, et note doctissimorum virorum : Stephanus Baluzius Tutelensis in unum collegit, ad vetustissimos codices manu- scriptos emendavit, magnam partem nunc primum edidit, notis illus- travit, Paris, 1677, 2 tom. fol. This valuable work was long after- wards reprinted in Italy (Venetiis, 1771, 2 tom. fol.) Another edi- tion, for which Baluze had himself made preparations, 18 that of De Chiniac, which appeared at Paris, 1780, 2 tom. fol. This edition is splendidly printed, but is somewhat disfigured by a French trans- lation of the preface, exhibited column for column. The Capitu- laries are also to be found in Georgisch's Corpus Juris Germanict antiqui, Hale Magd. 1738, 4to ; in Canciani's Leges Barbarorum antique, Venetiis, 1781-91, 5 tom. fol. ; in Walter, Corpus Juris German. antig., 1823-4; and in Petz, Monumenta Germanica. An admirable analysis of the contents of the Capitularies will be found in Guizot, His. de la Civilization, Leg. xx1. and xxv. See also Michelet, Origines du Drow Francais.

CAPITULATION (the Pactum deditionis of Grotius) is an agreement in time of war for the surrender to a hostile armed force of a particular body of troops, a town, or a territory. It is an ordinary incident of war, and therefore no previous instructions from the captor's Government are required before finally settling the conditions of capitula- tion. The most usual of such conditions are freedom of religion, and security of private property on the one hand, and a promise not to bear arms within a certain period on the other. Such agreements may be rashly concluded with an inferior officer, on

whose authority the enemy are not in the actual position of the war entitled to place reliance. The Roman consuls sometimes introduced the condition — “ta ratum sit, si populus Romanus censuisset.” Saturninus surrendered the Capitol on the promise of Marius; but Cicero asks (pro C. Rab., c. x.), “Fides qui potuit sine senatusconsulto dari?” Czesar evidently thought that responsibility in such matters should rest in the com- mander-in-chief : “ Alter agere ad preescriptum alter, libere ad summam rerum consulere debet” (de B. C., iii. 51). In modern times the question has been raised whether a capitulation can ever amount to a conveyance of the sovereignty, or a perpetual cession of political allegiance. Such matters are fixed by the terms of peace; but before then questions may rise as to rights in the property passed by capitulation. Although private ransoms are theoretically allowed by English admiralty law in cases of necessity, the Prize Act (27 and 28 Vict. c. 25, § 45) con- fers a right only to ships and goods afloat. Hence part of the consideration of a capitulation may be condemned to the Crown. Again, as in the case of Thorshaven and its dependencies (Island of Stromoe), which capitulated to Captain Baugh in 1808, public property passed by the capitulation, if not taken possession of by the private enemy, may afterwards be seized by privateers and for- feited to the Crown. In two great capitulations of modern history, Great Britain has made a not very creditable appearance. That of Closter Seven, between the duke of Cumberland and Marshal Richelieu for a suspension of arms in N. Germany, King George, as elector of Hanover, refused to ratify, and ordered the Hanoverian troops, which ought to have been disbanded, to resume service as British troops. In the capitulation of El Arish (1800), which related to the evacuation of Egypt by the French, the British Government, so long as it seemed more ad- vantageous to fight, pleaded a defect in the authority of Sir Sidney Smith; but when Kleber’s brilliant movement to Heliopolis had changed matters, they clamoured for the faithful execution of the agreement. The most important case on the subject of capitulation is, however, that of the merchants of Genoa, particulars of which may be got in Hansard, vol, xxx., and 4 Robinson, 388.

Capitulation is also the name given to an arrangement

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by which a body of foreigners enjoy certain privileges within the state making the capitulation; eg., the Swiss Guards at the Tuileries, or the consular jurisdictions in the Levant. It is also applied by French writers to the oath which on his election the emperor of the Romans used to make to the college of electors ; this related chiefly to such matters as regalian rights, appeals from local juris- dictions, the rights of the Pope, &.

CAPMANY, Anvronto DE MontTpaLan ¥ (1743-1813), a Spanish historian and philosopher, was born at Barcelona. He spent the early part of his life in military service, and after his retirement in 1770 removed to Madrid, where he was elected secretary of the Royal Academy of History. His principal works are,—Memorias historicas sobre la Marina, Commercio, y Artes de Pantigua ciudad de Barcelona, 4to, Madrid, 1779-1792 ; Teatro historico-critico dela Eloquencia Espaitola, 4to, Madrid, 1786 ; Dictionario Frances-Espatiol, 4to, Madrid, 1805; Lilosofia de U'Elo-ewencia, 1776; and Questvones criticas sobre varios puntos de historia economica, politica, y militar, 8vo, 1807.

CAPO D'ISTRIA, a fortified seaport town of Austria, in the government of Trieste and circle of Istria. It stands on a small island in the Gulf of Trieste, 8 miles south of that city, in 45° 32' 20" N. lat. and 13° 42' 29" E. long., and is connected with the mainland by a causeway half a mile «in length. It is the seat of a bishopric, and has a cathedral and about thirty other churches, a citadel, a gymnasium, a prison, and a theatre. It manufactures salt, sugar, leather, and soap ; it also exports wine, oil, and fish, The harbour is large, but is little frequented except by fishing-boats. Populationin 1869, 9169. Capo d'Istria is usually identified with the town of Aigida, mentioned by Pliny, which appears by an inscription to have after- wards received the name of Justinopolis fromr Justin IT. At a later period it formed a free commonwealth, which was subjugated by the Venetians in the 10th century, fell into the hands of the Genoese in 1380, and was recaptured by the Venetians in 1487. As capital of Istria it passed into Austrian possession in 1797,

CAPO D'ISTRIA, Jonny, Count (1780-1831), was born at Corfu, where his father was a physician, in 1780. At first he devoted himself to the study of medicine in the academies of Padua and Venice, but joined the Russian

diplomatic service when at the treaty of Tilsit the Ionian Islands were ceded to the French. He held the office of secretary for foreign affairs under the Emperor Alexander, and was president of the Greek republic after the battle of Navarino. Having been suspected of treachery to the republican cause, he was assassinated when entering a church at Nauplia, October 9, 1831. See GREECE.

CAPPADOCIA, an extensive province of Asia Minor, that for a considerable period constituted an independent kingdom. It was originally a country of much greater extent; in the time of Herodotus, the Cappadocians occupied the whole region from the chain of Mount Taurus on the south to the shores of the Euxine. That author tells us that the name of Cappadocians was that applied to them by the Persians, while they were termed by the Greeks Syrians, or White Syrians (Leucosyri). The fact that they were a branch of the same race with the Syrians appears indeed to admit of no doubt. Under the Persian empire they were divided into two separate satrapies or governments, the one comprising the central and inland portion of the country, to which the name of Cappadocia continued to be applied, while the other was called Cap- padocia ad Pontum, and gradually came to be known simply as Pontus. As after the fall of the Persian government the two provinces continued to be subject to separate rulers, this distinction was perpetuated, and the name of Cappadocia came to be restricted to the inland province

(sometimes called Great Cappadocia); which alone will be |

considered in the present article. The history and geography of the region bordering on the Euxine will be found under Pontus.

Cappadocia, in this sense, was bounded on the S. by the chain of Mount Taurus, on the E. by the prolongation of that ridge and the Euphrates, on the N. by Pontus, and on the W. by Galatia and Lycaonia. But it had no natural boundaries except on the south and east, so that it is impossible to define its limits with accuracy on the other sides. Strabo is the only ancient author who gives any circumstantial account of the country, but he has greatly exaggerated its dimensions; it was in reality about 250 miles in length by

less than 150 in breadth. With the exception of a narrow strip of the district called Melitene, on the east, which forms part of the valley of the Euphrates, the whole of this extensive region is a high upland tract, attaining to the level of more than 3000 feet above the sea, and constituting the central and most elevated portion of the great table-land of Asia Minor. (See Asta Minor.) The western parts of the province, where it adjoins Lycaonia, and extending thence to the foot of Mount Taurus, are open treeless plains, affording pasture in modern as well as ancient times to numerous flocks of sheep, but almost wholly desolate and uncultivated. But out of the midst of this great upland level rise detached groups or masses of mountains, mostly of volcanic origin, of which the loftiest is Mount Argzeus (still called by the Turks Erdjish Dagh), which attains to a height of 13,000 feet above the sea, while that of Hassan Dagh to the south- west of it rises to about 8000 feet.

The eastern portion of the province is of a more varied and broken character, being traversed by the mountain- chain called by the Greeks Anti-Taurus, as well as by several subordinate ridges, some of them parallel with it, others extending eastwards from thence towards the Euphrates. Between these mountains and the southern chain of Taurus properly so called lies the region called in ancient times Cataonia, occupying an upland plain in a basin surrounded on all sides by mountains. This district in the time of Strabo formed a portion of Cappadocia, and though several ancient writers had regarded the Cataonians as a distinct people from the Cappadocians, Strabo, who had himself visited the country, could find no distinction between them either in language or manners.

The River Pyramus (now called the Jihun) rises in the

table-land of Cataonia, and forces its way through narrow and rocky defiles across the chain of Taurus to the plains of Cilicia. The Sarus, or Sihun, rises much farther north, in the Anti-Taurus, near the frontiers of Pontus, and flows through a deep and narrow valley between two parallel ridges of mountains, for a distance of more than 150 miles, till it in like manner forces its way through the main range of the Taurus, and emerges into the plains of Cilicia. The Halys, or Kizil Irmak, which has its sources within the confines of Pontus, traverses the northern part of Cappadocia throughout its

whole extent, passing within about 20 miles of the capital city of Kaisariyeh. The other rivers of. Cappadocia are of little importance.

The kingdom of Cappadocia, which was still in existence down to the time of Strabo, as a nominally independent state, was divided, according to that geographer, into ten districts, viz., Melitene, Cataonia, Cilicia, Tyanitis, and Garsauritis in the south, or adjoining Mount Taurus; and five others, Laviniasene, Sargarausene, Saravene, Cha- manene, and Morimene, on the side of Pontus. The posi- tion and limits of these northern subdivisions cannot be determined with any certainty, but the others are better known. Cataonia has been already described, and the adjoining district of Melitene, which did not originally

(ft) form part of Cappadocia at all, but was annexed to it by Ariarathes I., was a fertile tract adjoining the Euphrates, the chief town of which still retains the name of Malatiyeh. Cilicia was the name given to the district in which Caesarea, the capital of the whole country, was situated, and in which rose the lofty and conspicuous mass of Mount Argeus. Tyanitis, as its name shows, was the region of which Tyana was the capital,—a level tract in the extreme south of the province, extending quite to the foot of Mount Taurus. Garsauritis appears to have comprised the western or south-western districts adjoining Lycaonia; its chief town was Archelais, now Ak Serai.

The only two cities of Cappadocia in the days of Strabo which were considered by the geographer to deserve that appellation were—Mazaca, the capital of the kingdom under its native monarchs, but which, after it had passed under the Roman government, obtained the name of Ceesarea, which it has ever since retained under the scarcely altered form of Kaisariyeh ; and Tyana, not far from the foot of the Taurus, the site of which is marked by some ruins at a place called Kiz Hissar, about 12 miles south-west of Nigdeh. Archelais, founded by Archelaus, the last king of the country, subsequently became a Roman colony, and a place of some importance. At the present day the only considerable town in this part of Asia Minor is Kaisariyeh, which has a population of about 25,000 souls, and is an important centre of trade, and the resort of mer- chants from all parts of Asia Minor, as well as Syria and Armenia.

The ancient Cappadocians were much devoted to the

| practice of religious and superstitious rites, and several

localities in their eountry were the sites of temples that enjoyed a great reputation for sanctity. Among these the most celebrated was that of Comana, dedicated to the goddess Ma, whom the Greeks identified with Enyo, the Bellona of the Romans, and the same deity who was worshipped at the Pontic Comana. The high-priest enjoyed consideration second only to the king, and exercised rule over the greater part of Cataonia, of which Comana was the chief place. It was situated on the river Sarus, but the site has not been identified. Next to him ranked the high-priest of Zeus at Venasa, in Morimene, which had not less than 3000 slaves. The temple of Artemis Perasia at Castabala also enjoyed a great reputation of sanctity. Cappadocia was remarkable for the number of slaves, which constituted indeed the principal wealth of its monarchs. They were sent in large numbers to Rome, but did not enjoy a good reputation. The province was also celebrated for the number and excellence of its horses, as well as for its vast flocks of sheep; but from its eleva- tion above the sea, and the coldness of its climate, it could never have been a rich and fertile country.

History.—Nothing is known of the history of Cappadocia before it became subject to the Persian empire. It was included in the third satrapy of that empire in the division established by Darius, but continued to be governed by satraps or rulers of its own, who apparently retained the title of kings. These derived their descent from a Persian named Anaphus, who was one of the seven conspirators that slew the false Smerdis, The first ruler who succeeded in establishing himself in a position of virtual independence was Ariarathes (hence called Ariarathes 1.), who was a contemporary of Alexander the Great, and maintained himself on the throne of Cappadocia after the fall of the Persian monarchy.

After the death of Alexander, Perdiccas, marching into Cappadocia with a powerful and well-disciplined army, succeeded in taking Ariarathes prisoner, and crucified him and all those of the royal blood who fell into his hands. His son Ariarathes II., however, having escaped the general

slanghter, fled into Armenia, where he lay concealed till the civil dissensions which arose among the Macedonians after the death of Eumenes (to whom Perdiccas had surrendered the kingdom) gave him a favourable opportunity of recovering the throne. Haying defeated Amyntas in a pitched battle, he campelled the Macedonians to abandon all the strongholds, and after.a long and undisturbed reign, left his kingdom to his son Ariamnes II., under whose peaceful administration, as well as that of his successor Ariarathes III., Cappadocia made great progress.

He was succeeded by Ariarathes IV., who joined Antiochus the Great against the Romans, and after his defeat was obliged to atone for taking up arms against the people of Rome by paying a fine of two hundred talents. He afterwards assisted the republic with men and money against Perseus king of Macedon, and was honoured by the senate with the title of the friend and ally of the Roman people. He left the kingdom to his son Mithridates, who took the name of Ariarathes V.

During the reign of this prince, surnamed Phzlopator, the Cappadocians remained in close alliance with Rome. Notwithstanding this, he was for a time expelled from his kingdom by Orophernes, who had been set up against him by Demetrius Soter, king of Syria, as a rival claimant to the throne of Cappadocia; but Ariarathes succeeded in expelling Orophernes, and afterwards united his arms with those of Alexander Balas against Demetrius, who was defeated and killed in battle. Some years afterwards Ariarathes, having espoused the cause of the Romans in their contest with Aristonicus, a claimant of the throne of Pergamus, was slain in the same battle in which Crassus, pro-consul of Asia, was taken, and the Roman army cut to pieces (130 B.c.) He left six sons by his wife Laodice, on whom the Romans bestowed Lycaonia and Cilicia. But Laodice, fearing lest her children when they came of age should take the government out of her hands, poisoned five of them,— the youngest only having escaped her cruelty by being conveyed out ofthe kingdom. She was soon, however, put to death by her subjects, who rose in rebellion against her tyrannical government.

Laodice was succeeded by Ariarathes VI., who soon after his accession married Laodice, daughter of Mithridates the Great, wishing to gain the

alliance of that powerful prince in his contest with Nicomedes king of Bithynia, who laid claim to part of hiskingdom. Mithridates, however, instead of assisting, procured the death of Ariarathes by poison, aud under «pretence of maintaining the rights of the Cappadocians against Nicomedes, proclaimed himself regent till the children of Ariarathes should be competent to govern the kingdom. The Cappadocians at first acquiesced ; but finding him unwilling to resign the regency in favour of the lawful king, they rose in arms, expelled the foreign garrisons, and placed Ariarathes VII., eldest son of the late king, on the throne.

The new prince found himself immediately engaged in a war with Nicomedes ; but, being assisted by Mithridates, he not only drove him out of Cappadocia, but stripped him of a great part of his hereditary dominions. On the con- clusion of the peace, the refusal of Ariarathes to recall Gordius, the murderer of his father, led to a war with Mithridates. When the two armies met on the froutiers of Cappadocia, Mithridates invited Ariarathes to a confer-

ence, and openly stabbed him with a dagger which he had !

concealed in his dress. The terror-stricken Cappadocians immediately dispersed, and submitted to the yoke of Mithridates; but, unable to endure the tyranny of his prefects, they quickly rose in rebellion, and recalling the exiled brother of the late king they placed him on the throne. He had scarcely ascended the throne when Mithridates invaded the kingdom at the head of a numerous

| Ariarathes.

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army, defeated the army of the Cappadocians with great slaughter, and compelled Ariarathes VIII. to abandon the kingdom. The unhappy prince soon after died of grief, and Mithridates bestowed the kingdom on his own son, a youth only eight years old, giving him also the name of But Nicomedes Philopator, king of Bithynia, dreading the increase of power ina rival already so formid- able, claimed the throne for a youth who pretended to be the third son of Ariarathes, and whom he sent with Laodice to Rome

to advocate his cause. Having received the declaration of Laodice that the petitioner was one of three sons which she had borne to Ariarathes, and whom she had kept concealed lest he should share the fate of his brothers, the senate assured him that they would reinstate him in his kingdom. Mithridates, receiving notice of these transactions, despatched Gordius to Rome to advocate his cause, and to persuade the senate that the youth to whom he had resigned the kingdom of Cappadocia was the lawful son of the late king, and grandson to Ariarathes, who had lost his life in the service of the Romans against Aristonicus. On receiving this embassy, the senate inquired more narrowly into the matter, discovered the whole plot, and ordered Mithridates to resign Cappadocia. The Cappado- cians enjoyed their freedom for a short time, but soon sent ambassadors to Rome, requesting the senate to appoint a king. Leave was given them to elect a king of their own nation ; and as the old royal family was now extinct, they chose Ariobarzanes, who received the sanction of the senate, and continued steadily attached to the Roman interest 93 B.C.)

: Ariobarzanes had scarcely taken possession of his kingdon when he was driven out by Tigranes, king of Armenia, who resigned Cappadocia to the son of Mithridates, in terms of an alliance previously concluded between them. Ario- barzanes fled to Rome, and by tlie assistance of Sulla, who routed Gordius the general of Mithridates, he was quickly reinstated in his kingdom. On the return of Sulla, however, Ariobarzanes was again driven out by Ariarathes, the son of Mithridates, whom Tigranes had set up as king. By the intervention of Sulla, Ariobarzanes was again placed on the throne ; and immediately after Sulla’s death he was a third time forced to abandon his kingdom, when Pompey, after defeating Mithridates near Mount Stella, restored the unfortunate monarch, and rewarded him for his services during the war with the provinces of Sophene, Gordyene, and a great part of Cilicia. Wearied with such a succession of disasters, soon after his restoration he resigned the crown to his son Ariobarzanes (63 B.c.), and spent the rest of his life in retirement.

Ariobarzanes II. proved no less faithful to the Romans than his father had been. On the breaking out of the civil war between Csesar and Pompey he sided with the latter ; but after the death of Pompey he was received into favour by Cxsar, who bestowed upon him a great part of Armenia. While

the dictator was engaged in war with the Egyptians, Pharnaces, king of Pontus, invaded Cap- padocia and stripped Ariobarzanes of all his dominions; but Cesar, after defeating Pharnaces, restored the king of Cappadocia, and honoured him with new titles of friendship. After the murder of Cesar, Ariobarzanes, refusing to join Brutus and Cassius, was declared an enemy to the republic, and was soon afterwards taken prisoner and put to death (42 B.c.) His brother, Ariarathes IX. was then for a few years raised to the throne, but was in his turn put to death by Antony, and with him the royal family became extinct.

Archelaus, the grandson of the general of the same name who commanded against Sulla in the Mithridatic war, owed his elevation to the throne of Cappadocia solely to the intrigues of his mother Glaphyra with Mark Antony, to whom he remained faithful in the contests with Augustus.

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On the defeat of Antony, he was pardoned by the emperor at the intercession of the Cappadocians, and received Armenia Minor and Cilicia Trachea as a reward for having assisted the' Romans in clearing the seas of pirates who infested the coast of Asia. He contracted a strict friend- ship with Herod the Great, king of Judea, and married his daughter Glaphyra to Alexander, Herod's son. On the accession of Tiberius (who entertained a secret hostility to Archelaus on account of his previous neglect of his inerits during the lifetime of Caius Ceesar), he was decoyed to Rome by the fair promises of Livia, the emperor's mother ; but being accused before the senate, and loaded with reproaches at the court, he died of grief, after a reign of fifty years.

On the death of Archelaus (17 a.p.) the kingdom of Cappadocia was reduced to a Roman province, and governed by men of the equestrian order. It continued under the Roman empire to enjoy a high state of prosperity, and its capital, Ceesarea, became a great and flourishing city. But in the reign of Valerian, it was overrun by the Persian king Sapor, who took Cesarea after a long siege, and put most of the inhabitants to the sword. Cappadocia, however, continued to form part of the Byzantine empire, till it was conquered by the Seljukian Turks in 1074. It has ever since remained incorporated with the Turkish empire.

During the Roman period Cappadocia assumes rather a prominent part in ecclesiastical history. Its capital, Czsarea, was the birthplace of St Basil, who long occupied its episcopal see, while that of Nyssa was held by his brother Gregory ; and the small town of Nazianzus, in the south-west of the province, was at once the birthplace and the residence of the more celebrated Gregory, commonly known from thence as St Gregory Nazianzen. (E. H. B.)

CAPPEL, the name of a family of distinguished theo- logians, scholars, and jurisconsults, of whom the following are the most important. Guillaume Cappel, in 1491, as rector of the university of Paris, had the boldness to forbid the payment of the tithe demanded by Pope Innocent VIII. His son Jacques, jurisconsalt and councillor of state under Francis I., is famous for the speech which he delivered in 1537 before the king and nobility of France against Charles V. and the counts of Flanders, Artois, and Charolais. His son, Louis Cappel, sieur de Moniambert (1534-1586), who began life as professor of Greek at Bordeaux, and ended his days as professor of theology at: Sedan, is remarkable for his devotion to the cause of Protestantism, for the sake of which he risked his life on more than one occasion. It was he who, in 1560, pre- sented to Charles IX. the Confession of Faith which had been drawn up by the Parisian Protestants. Another son, Jacques Cappel (1570-1624), was a distinguished juris- consult. He was the father of Jacques Cappel, author of a number of works of considerable celebrity on theology, history, philology, and antiquities, and of Louis Cappel, noticed below.

CAPPEL, Louis, the most celebrated member of the above family, a learned Protestant theologian and scholar, was born at St Elien in 1585, and died at Saumur in 1658. He studied theology at Sedan, Oxford, and Saumur. At the age of twenty-eight he accepted the chair of Hebrew at Saumur, and twenty years after that of theology. Asa Hebrew scholar, his greatest achievement is his demonstra- tion, against the Buxtorfs, that the vowel points and accents are not an essential part of the Hebrew language, but were inserted by tlie Masorete Jews of Tiberias, not earlier than the 5th century 4.p., and that the primitive Hebrew characters are those now known as the Samaritan, while the square characters are Chaldean, substituted for the more ancient at the

time of the Captivity. Asa theologian, he | advocated liberal views with regard to the verbal inspira- ‘

tion of Scripture and the history of the Bible. These doctrines of Cappel were generally distasteful to his co- religionists. Their protest “against the Church of Rome being founded upon Scripture, to allow the possibility of the slightest inaccuracy in its text seemed to them to be striking at the very root of, their position. They, there- fore, made strenuous efforts to prevent the publication of his views. The Swiss clergy were compelled to sign a paper condemning them, and Cappel found great difficulty in printing some of his works. His Critica Sacra, a collec- tion of various readings in the Old Testament and of canons of textual criticism, lay in MS. for ten years, and he was only able to print it at Paris, in 1650, by aid of a son who had turned Catholic. Cappel is also the author of Annotationes et Commentarti in Vetus Testamentum, Chron- ologia Sacra, and other theological works, as well as of several treatises on Hebrew besides the Critica Sacra, among which are the Arcanum Punctuationis revelatum (1624), and the Diatriba de veris et antiquis Hbraworum literis (1645). His Commentarius de Capellorum gente, giving an account of the distinguished family to which he belonged, was published by his nephew James Cappel (1639-1722), who, at the age of nineteen, became professor of Hebrew at Sanmur, but, on the revocation of the edict of Nantes, fled to England, where he died in 1622.

CAPPERONIER, Ciaupe (1671-1744), a classivac scholar, was the son of a tanner at Montdidier. He studied at Amiens and Paris, and took orders in the Church of Rome, but devoted himself almost entirely to classical studies. He declined a professorship in the university of Basel, and was afterwards appointed to the Greek chair in the Collége de France. He published an edition of Quin- tilian, and left behind him at his death an edition of the ancient Latin Rhetoricians, which was published in 1756. His nephew, Jean Capperonier, was also a famous linguist.

CAPRERA, or CaBrera, a small island of Italy, in the Mediterranean, two miles off the north-east coast of Sar- dinia, in 41° 12’ 47” N. lat. and 9° 29’ 14” E. long. It forms one of the Buccinarian group, and belongs to the province of Sassari. The most of its surface of 6700 acres is rocky and

unfertile; and till the present century it was only occasionally visited. In 1854 Garibaldi acquired pos- session of a part of the island, and built himself a house, which has been his principal place of residence since that date. See Vecchj, Garibaldi at Caprera, 1862.

CAPRI, the ancient Caprew, a small island of Italy on the south side of the Bay of Naples, in 40° 32’ N. lat. and 14° 11’ E. long., and separated by a space of 34 miles from the promontory of Sorrento. It is a mass of limestone rock, with an area of about 20 square miles, rising into two distinct peaks or plateaus, with a little valley of great fertility between. The coast consists for the most part of precipitous cliffs, and there are only two landing-places in the whole circuit. The scenery throughout the island is of unusual beauty, and some of the sea-caves are un- rivalled for the splendid colours reflected on the rock. The two most famous are called respectively the Blue and the Green Grotto; the former, though it has only become a popular resort in the present century, seems to have been known in the 17th. The inhabitants still retain distinct traces of the Greek type of countenance and figure. They are industrious, religious, and siniple, and, in general, poor. Besides the cultivation of the narrow surface that can be reclaimed from the rock, they chiefly depend on the capture of the quails which visit the island in May and December; and about 200 of the young men take part annually in the coral fishery off the coast of Africa. The chief towns are Capri in the east, with 2332 inhabitants, and a beautiful cathedral and a semi- nary ; aud Anacapri in the west, situated on the summit of

Monte Solara, and accessible by a stair of 552 steps cut in the rock.

First inhabited, according to Virgil and Tacitus, by the Talaboes, Capri afterwards became a naval station of the Etruscans ; and in the 5th century B.c. passed under the power of the Greeks of Neapolis. From that city it was purchased by Augustus, who occasionally retired to its grateful seclusion in the latter part of his life. Itis chiefly celebrated, however, as the retreat of Tiberius, where he spent the last ten years of his reign. He erectcd twelve villas in different parts of the island, the most famous of which was the Villa Jovis, built on the summit of the eastern cliffs 1500 feet | above the sea. Large parts of the building, which combined the strength of:a fortress

with the luxury of a palace, still remain to bear witness to the power and wealth of the empire. The whole island, indeed, is full of Roman remains, and has yielded to the archeologist a rich harvest of mosaics, bas-reliefs, coins, and inserip- tions. Of the last one of the most remarkable is the strange lamentation of Hypatus, which was discovered in the Mithraic temple at Metromania. On the fall of the Roman empire, Capri passed to the see of Rome, and it formed part of the bishoprie of Sorrento till the 10th century, when it received a bishop of its own. Of its medieval history the principal remains are the castles of Castiglione and Anaeapri. In 1803 it was captured by Sir Sidney Smith, and defended by new fortifications ; but in 1808, while Sir Hudson Lowe was in command, it was recaptured by Murat.

See Hadrava, Lettere swll' isola di Capri, Dresden, 1794; Hans Andersen, Jmprovisatore ; and three articles (reprinted from the Saturday Review, 1878) in J. R. Green's Stray Studies, 1876.

CAPSICUM. See Cayenne Pepper.

CAPSTAN, an appliance used on board ship and else- where for heaving up the anchor or any heavy weight. Fig. 1 represents one of Harfield & Co.'s patent wrought-

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Fig, 1.— Vertical Section of Capstan.

lion capstans as used in the Royal Navy. It has a ver- tical spindle D, passing through sockets firmly secured in the deck, a drumhead E being keyed on to the spindle, and the capstan is turned round by means of bars inserted in holes made to receive them all round the edge of the drumhead. A capstan of the kind shown would have about twenty holes for bars, and each bar would be about 15 feet in length. The capstan bars are made of tough wood, such as American ash or rock elm. Three or four men can stand to each bar, so that when the capstan is fully manned at least sixty men are employed. When a hempen cable or a hawser is brought to the

capstan, three turns are taken round the barrel GG, and men are stationed to haul on the end of the rope to prevent it from slipping and to coil it up as it comes in. When a chain cable is brought to the capstan it is passed round the « whelps ” at H, and is kept upon them by the rollers a, a, a, a, aS shown in the plan (fig. 2), so that the cable assumes the position shown at ABC, A being towards its outer and QO towards its inner end.

Capstans in their primitive form were merely blocks of wood wrought to the required shape and made to traverse on an iron spindle, and improvements have been gradually |

effected in them, some important ones being introduced by Captain Phillips, R.N. In all these capstans the cable was brought in by means of a “ messenger” (see article

Fra, 2.—Plan of Capstan.

CaBLx); but in 1857 Mr Thomas Brown took out a patent for dispensing with the messenger, and working the cable itself on the capstan by fitting a grooved pulley with guide rollers for securing the requisite amount of turn of the chain, as before described, at ABC. Subsequently important improvements were introduced into the details of this invention, particularly in making the stops or whelps , 6 which hold the links movable, so that they may be adjusted to fit the links of the cable exactly, and also admitting of their renewal when worn.

The capstan shown in figs. 1, 2, and 3 is constructed of wrought iron, no cast-iron or wood being used. It is fitted with treble purchase gear, which is a simplification of Captain Phillips’s original power capstan, and has the 7 advantage of the toothed gearing remaining at rest with respect to the capstan, when the single purchase only is required. The treble power is obtained by withdrawing the connecting bolts c,c from the capstan barrel, and locking the plate d, which carries the intermediate pinions e, e toa fixed point in the deck, by sliding the horizontal paul / into one of the recesses g, g provided for the pur- pose. The action then is as follows:—The drumhead E, which is keyed to the spindle D, drives the centre pinion A; this drives

the intermediate pinions e, e, which rotate around their centres, as the pinion plate d is fixed to the deck by the paul f; these pinions in their turn drive the annular wheel /, which forms part of the capstan proper.

In large ships the spindle D is frequently continued down to the deck below, and another capstan is worked on it. In such cases the two capstans are so arranged that they may be worked either separately or together ; thus, if required, the power applied by the men on both capstans may be brought to bear on a chain or hawser attached to either. In large ships of the navy and in many merchant vessels steam power is employed to drive the forward capstan, which is the one most used. Small engines specially constructed for this purpose, and secured to the under side of the deck beams at K are generally used. All capstans are provided with pauls to prevent them ‘from running back.

Figs.1 and 4 show a new form of “cable-holder,” which has been recently introduced by Mr W. H. Harfield of Lon-

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Fre. 3, —Section showing Pinions,

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marked it out as a special object of attack to the Vandals,

den, and is in use in a few ships of British and foreign navies, The cable-holder is placed on the fore side of the deck pipe, and is fitted with a grooved pulley M for the cable to pass

Fia. 4.—Cahle-holder

over, similar to the whelps of the capstan shown in fig. I. It revolves on a horizontal spindle fixed to the deck by brackets. The interior is made hollow, and contains a double series of disks, which can be screwed together by means of a hand-lever L, thereby causing sufficient friction to let the cable run out slowly, or to stop it entirely, and also to hold the ship when riding at anchor. Means have been devised, and are now being fitted

in one of the ships of the British navy for connecting these “ cable-holders” with the capstan, so that the cable may be hove up by them without taking it to the capstan. (T. M.) CAPUA, a large and important city of ancient Italy, capital of Campania, was situated in the midst of a very fertile and valuable territory, two miles from the bank of the Vulturnus, and about half that distance from the mountain Tifata. Much diversity of opinion has prevailed as to the date of its foundation, and the people by whom it was originally inhabited. It is now generally agreed that Capua was one of the twelve cities which the Tuscans were said to have founded in the south of Italy at the beginning of the 9th century B.c. The city soon rose in importance, and its inhabitants became renowned through- out the whole peninsula for their wealth, and the luxurious magnificence of their lives. In course of time, as was natural, they degenerated so far that, from having been originally a brave and warlike people, they could no longer resist the encroachments of the Samnites, who in 424 B.o. made themselves masters of the city, and put the inhabi- tants to the sword. The material prosperity of the city remained undiminished under the rule of the Samnites, who in less than a century became as effeminate and Uegenerate as the Capuans had been. When they in turn were attacked by the mountaineers, they were compelled to apply to Rome for assistance, which was immediately granted. At the close of the Latin war, in which the Capuans had assisted the allies, they were deprived of the Campanus Ager, the most valuable district in Italy, but were admitted to take rank as citizensof Rome. They still continued, however, to select their own rulers. When the second Punic war broke out, the Capuans, elated with the prospect of retrieving their high position, opened their gates to Hannibal, who spent an entire winter with his army in the city. To the enervating contagion of Capuan effeminacy historians have always attributed the want of success which subsequently attended the Carthaginian commander in his Italian compaigns. When the Romans at length made themselves masters of the city, in the seventh year of the war, they took a terrible revenge, and only forbore to raze the city to the ground in consideration of the great natural advantages of its site. For its fidelity in the social war, the Romans restored to Capua all its municipal privileges, and the city recovered all its com- mercial, though it never regained its political importance. Under Julius Cesar, the Campanus Ager was distributed among 20,000 citizens of Rome, and Capua became a Roman colony. Under the emperors it continued to prosper commercially, aud it

seems to have been as rich and populous at the downfall of the Western empire as during the time of its political independence. Its wealth

who took and nearly destroyed it under Genseric 456 a.p, What was left undone by the Vandals was completed by the Saracens, who burnt the city to the ground in 840, The inhabitants, who had fled for shelter to the neighbour- ing mountains, returned on the departure of their eastern invaders, and established themselves at Casilinum, a stronghold on the Vulturnus two miles distant from their ancient home. Casilinum is the modern Capua, formerly one of the strongest forts in the kingdom of the Two Sicilies. The site of the ancient Capua is now occupied by Santa Maria, a thriving town of 16,000 inhabitants, the seat of the tribunals of the southern division of the province of Terra di Lavoro. Outside Santa Maria, on the north-west, are the extensive remains of the old Capuan amphitheatre, second ouly to the Flavian amphitheatre in size and magnificence, near which are the remains of a triumphal arch; and other ruins may still be traced within the town and in its immediate neighbourhood, but they are not of much interest.

Granata, Storia civile della fedelissima citta di Capua, 8 vols., Naples, 1752-56 ; Rinaldo, Memorte istor. della citta di Capua, 1755; Rucca, Capua Vetere, 1828; Daniele, Moncte antiche dt Capua, 1802.

CAPUCHINS. The Capuchin friars are one branch of the great Franciscan order, and their rule is in all essen tials the same as that of the other friars minor, or Minorites. It was in the first decade of the 13th century that St Franeis established his order; but it was not till 1528 that a bull of Clement VII. erected into a separate order the disciples of a certain minorite friar, who had conceived that he was inspired to reform the practices of his order in some respects. This man’s name was Mathew da Bassi, a Franciscan of the March of Ancona. The legend of the order states that, having seen a representation of St Francis wearing a square-cut pyramidal hood, he made a similar one for himself, sewed it on to his munastic habit and began to wear it. This was in 1525. This audacious innovation drew down on the author of it much blame, and some persecution on the part of his superiors ; but as usual in similar cases, that did not prevent others from following his

example. Specially two brothers Ludovico and Raffaelle of Fossombrone, the first a priest and the second a lay brother of the Franciscan order, joined them- selves to Mathew, and underwent punishment from their superiors for so doing, They, however, obtained the countenance and patronage of the Duchess Cibo, a connec- tion of the then reigning Pope Clement VII. (Giulio de' Medici), and the wife of Giorgio Varano, duke of Camerino. That lady gave her protegés a letter of recom- mendation to the pope, armed with which they went to Rome, and, despite the fact that they were disobedient to their superiors and therefore had broken their monastic vows, obtained from the pope the bull known as Religionis Zelus, by which they were permitted to impart their hooded habit to any disciples who might be willing to join them, to live as hermits in wild and desolate places, to go barefoot, to wear beards, and to call themselves "Hermit Friars Minor." The populace, however, gave them a nickname which has supplanted the more formal one. 'Cappnecio" is a hood in Italian; and the diminutive "Cappuccino," formed half affectionately, half contemptuously, as is the Italian wont, means " little hooded fellow." When this bull had been obtained, a place for the first congregation of the new order was soon found in an abandoned convent at Colmenzone, near Camerino, given to them by the duchess. Disciples thronged to the " new religion," and three other convents were shortly built. Mathew, the disobedient monk who had rebelled against his superiors and abandoned his con-

vent, had fully succeeded in the objects to which his ambition had prompted him. He had been made, of course, superior of the first convent, and, subsequently, when the "families" of his new congregation lad multiplied, he became vicar-general, subject only to the general of all the Franciscans.

In 1588, in a chapter of the new congregation convoked at Florence—so rapidly had the order of Capuchins spread itself—the celebrated Bernardino Ochino of Siena! was elected vicar general, and a second time in 1541. But having shortly afterwards fallen into heresy, and taken refuge in Switzerland, the society to which he had belonged, and on which his celebrity had thrown a lustre which has never since belonged to it, fell under grave suspicions of heterodoxy. The recently established

congregation ran great risk of being dissolved, and its leading members were cited by Paul III. to Rome to give anaccount of their opinions. The Capuchins were forbidden to preach, and would have been abolished, but fora warm and eloquent defence pronounced in Consistory by the Neapolitan Cardinal Autonio Sanseverino, which warned the Pope of the danger of ‘‘ plucking up tares and wheat together!” This privilege was restored to the society in 1545; and the congrega- tion multiplied itself largely in Italy. Paul III. had forbidden them to extend themselves beyond the Alps; but Gregory XIII., at the request of King Charles LX., revoked this decree, and permitted them to establish convents in any part of the world. Gregory XIV. in 1591 forbade the Capuchins by bull to hear confessions and grant absolution ; but these functions were restored to them by Clement VILI. in 1602. Paul V. in 1619 gave the congregation the rank and status of a distinct order, gave their vicar the title of Minister General, relieved him from the necessity (which heretofore had marked the quasi subjection of the society to that of the parent Fran- ciscan observantive or conventual friars) of asking the confirmation of his election from the general of the Conventuals, exempted the Capuchin convents from the right of visitation previously exercised by the superiors of the elder branch, and conferred on them the much- valued privilege of carrying a cross of their own in all processions, instead of being obliged to walk after that of the elder branch. It is stated that at this time the Capuchins numbered 15,000 members. Urban VIII. was a notable protector of the order, and created his brother, who was a member of it, cardinal. It was mainly by him that the convent in the Piazza Barberini,—which has been from that day to the recent one when the generals of all the orders were removed from their convents, the residence of the Capuchin generals, —was founded. Benedict XIV. gave the order the privilege that the preacher of the Sacred Apostolic Palace should always be a member of their society.

The Capuchius have from a very early period of their separate existence had the reputation of being great converters of heretics and infidels. It is related that they converted a thousand Calvinists in Poitou alone to the orthodox faith. From an early period they specially dedicated themselves to the work of missionaries. Up to the year 1641 the Capuchins, though sending missionavies to all parts of the world, had never had a missionary college. In that year thew general, Eugenio di Rumilly of Savoy, founded a college

in Rome for the express education of their members for the work of missions. In the first eighteen months after the foundation of this college thirty-six Italian Capuchins were sent to Hindustan and Brazil, and eighty Spaniards of the order to Venezuela.

The order at present maintains eighty-two missions, served (ac- vording to the latest accounts) by a few more than two hundred missionaries. They have twenty-three stations in Switzerland ; in the north of Italy, nine ; in the Levant, cleven. In Asia also they have stations at Beyrout, Gazir, Saida, Dainascus, Mount Lebanon, and Aleppo In Georgia there are five stations, and four in Mesopotamia Iu the East Indies they have fourteen missions, seven in Africa, and four in South America. It is a result which might be expected from such a field of labour, that the Capuchin Martyrology is a specially extensive one.

The saints and martyrs of the order have been recorded by Father Charles of Brussels in two volumes, under the title of Florcs Seraphiee. A Bibliotecu degli serittori Cappucint was printed in Venice in 1747. he history of the order has been written by Zachariah Boverius in Latin, Lyons, 1632-89, 2 vols. folio. A decree of the Congregation of the Index in 1651 ordered the sup- pression of this work on accouut of the absurd tales with which it abounds, A subsequent decree of the following year, however, per- mitted the publication of it on condition of certain emendations The work has been translated into French, Italian, and Spanish. A continuation of the History of Boverius, by Father Marco of Pisa, was published in folio at Lyons, 1676. The curious reader may also consult the work of Giuseppe Zarlino, On the Origin of the Con- gregation of the Capuchins, Venice, 1579 ;also the Annals of bee and Helyot’s History of the Monastie Orders, tom. vii. eh, 24,

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CAPYBARA. (Hydrocherus capybara), the largest of existing Rodents, measuring about 4 feet in length and 3 in girth, and weighing usually over 100 tb. It is also known as the water-hog from the resemblance which it bears when walking to a pig, although when sitting on its haunches it reassumes the characteristic appearance of the Cavy family, to which it

belongs. In the coarseness and scantiness of its fur, in the numerous enamel plates, embedded in cement, which stretch entirely across its molar teeth, like those of the elephant, and in the habit, when swimming, of carrying its young on its back like the hippopotamus, the capybara has been supposed to form a connecting link between the rodents aud pachyderms, and in the Linnweau system of classification it was placed among the Suidw. Its scanty fur is of a dark brown colour, its tail forms a small horny protuberance, and its feet are webbed, though not to the extremities of the toes. This pachydermatous rodent, as it has been called, is confined to South America, where it extends from Guiana soutliward to the Rio de la Plata, and westward to the eastern slopes of the Andes. It is a nocturnal animal, feeding on frnits and herbs, inhabiting the banks of rivers and fresh water lakes, and occasionally frequenting, according to Darwin, the mouths of such rivers as the Rio Plata where the water is entirely salt. Capybaras congregate in considerable numbers, browsing by night among aquatic plants, and in districts where they are not liabie to the attacks of the jagnar, are sufficiently tame to allow themselves to be approached within a few feet; while, under domestication, they are said to be capable of considerable attachment. When disturbed they utter a low abrupt grunt, “ resembling,” says Darwin, “the first hoarse bark of a large dog,” apparently produced by a sudden expulsiou of air; then, rushing at full speed into the water, they dive out of sight, remaining submerged for seven or eight minutes, and reappearing only to show the upper surface of their heads. They are readily killed, seldom attempting to defend themselves, although when driven to extremity they have been known to tear the flesh from the paw of a jaguar or the leg of a horse. ‘Their skin is of little value, and their flesh, which is made into hams, is of indifferent quality. The missionary monks of Brazil were wont to eat it during Lent, along with their turtle, in virtue of the capybara’s amphibious habits. On land it is a favourite food of the jaguar, as it is of the alligator in the water. Fossil re- mains of this and of another species of capybara have been found in the caves of Brazil.

CARACAL, Tue (felis caracal), belongs to a group of Lynxes characterized by comparative slenderness of body and length of tail and ears. It is somewhat larger than a fox, of a uniform reddish brown colour above, and whitish beneath, with two white spots above each of the eyes, and with a long black tuft of hair at the tip of the ears, the latter, according to Sir W.

Jardine, being only present in spring, or at the commencement of the breeding season. It is to the ear-tufts that it owes its name, which is derived from two Turkish words signifying “ black-ear.” The caracal is widely distributed, being found throughout Africa and South-western Asia. It feeds on the smaller quadrupeds and birds, hunting the former in packs after the manner of wolves, and climbing trees in pursnit of the latter. It is said also to resemble the jackal in following in the wake of the lion and other large carnivora, in order to feed on what those lords of the lower creation may leave, and on this account has received the name of the ‘‘lion’s provider.” Like the cheetah, it was formerly trained by Eastern princes to hunt the smaller quadrupeds, and such birds as the crane and pelican ; but from its fierceness, and the extreme irritability which it displays in confine- meut, it does not seem well-fitted for domestication.

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Frequent reference is made in Greek and Roman literature to the lynx, and from such descriptions as are given of it there is little doubt that the caracal, and not the more northerly species now known as the lynx, was referred to. In South Africa, where the caracal abounds, its hide is made by the Kaffres into skin-cloaks, known as karosses.

CARACALLA, Marcus Avretivus Antoninus (188- 219 a.p.), a Roman emperor, son of the Emperor Septimius Severus, was born at Lyons in 188. His original name, Bassianus, has been entirely dropped in favour, either of the nickname Caracalla (taken from the long hooded tunic which he wore, and introduced into the army), or of the imperial title of Marcus Aurelius Antoninus, which he recelved at the time when his father declared himself the adopted son of M. Aurelius. Dion Cassius regularly calls him Tarantus, from his resemblance to a certain coarse and bloodthirsty gladiator. The heartless cruelty of his dis- position was early displayed in an attempt to assassinate his father ; and when, on his father’s death, he mounted the throne (211) as colleague of his brother Geta, he did not shrink from murdering him in the presence of his mother, to seize the supreme power, nor from making himself secure by butchering 20,000 persons whom he suspected. It is said that he was, however, unable to rid himself of remorse, and that it was the torment of conscience which drove him to spend the rest

of his life in the maddest acts of destruc- tion and bloodshed. He visited Gaul, Germany, France, Egypt, and various parts of Asia, plundering everywhere, and committing the most atrocious crimes. In Alexan- dria he took vengeance for the sarcasms of the people by a general massacre ; and he laid Mesopotamia waste because Artabanus, the Parthian king, refused to give him his daughter in marriage. In 217 he was killed at the in- stigation of Macrinus, who succeeded him. See Roman HIsTory.

CARACAS, a large city of South America, capital of the United States of Venezuela, and of the federal district, is situated on the declivity of a mountain 2880 feet above the level of the sea, 16 miles south-south-east of La Guayra, its port on the Caribbean Sea, in 10° 30’ N. lat., 67° 4’ W. long. Population in 1873, 48,897. The city is finely-situated, and has a temperate and healthy though variable climate. The mean temperature of the year is about 72° Fahr., being in the hot season 75°, and in the cold season 66°. The thermometer, however, sometimes rises to 84° or 85°, and at other times descends as low as 51° or 52°. Rain is abundant during the months of April, May, and June, but not so incessant as in other tropical countries; the rest of the year is rather dry. The city is much subject to earth- quakes, from which it has frequently suffered; in that of 1812, 12,000 persons are said to have perished. Cardcas is separated from the sea-coast, and from its port of Guayra by the high ridge of the Cerro de Avila, and lies on the western skirt of the plain of Chacao, which has a steep slope from north-north-west to south-south-east. The Guayra, a tributary of the River Tuy, which falls into the ocean thirty-six miles east of Cape Codera, flows past the southern side of the city, and is joined by the streams called the Anauco, Catuche, and Caroata passing through the town from the north. Two miles east the great double-peaked mountain known as the Silla de Caracas rises to 8600 feet. The Calvario hill, west of the city, was the scene of a battle between the Spaniards and patriots in June 1821. The town is well and regularly built; the streets are wide and well paved, crossing each other at right angles. There are several squares, of which the Plaza Mayor, or great square, is the most worthy of notice. Its east side is principally occupied by the cathedral, the south by the college, and the west by the public prison. This square is a great market for provisions, fruit, and other articles, and contains a sort

of inner square in which are ranges of shops. A reservoir in the ravine of the Catuche to the north furnishes the city with water, which is supplied to the inhabitants by public fountains as well as in pipes. The chief public building is the cathedral, which is 250 feet in length by 75 in breadth, and is supported by twenty-four pillars, without beauty or proportion. It contains the tomb of Bolivar. The university of Caracas, which, with the House of Assembly, the National Library (of 10,000 volumes), and a church, forms one block of the town, was originally a convent of Carmelite friars, and has faculties of divinity, chemistry, and medicine. The Municipal Hall, close to the Grand Plaza, is a plain building, one of the oldest in Caracas. There are several parish churches, three monasteries for friars, two nunneries, three hospitals (one of which is for lepers alone), and a theatre. The city is very inacces- sible from the north, in which direction three rough mountain tracks unite it with La Guayra. A railroad is projected to unite Cardcas and its port. A railway to the eastward from the city was partly constructed at one time, but was not completed. Cardcas was founded by Diego Losada in 1567,

CARACCI, Lopovico, Acostrno, and ANNIBALE, three celebrated Italian painters, were born at Bologna in 1555, 1558, and 1560 respectively. Lodovico, the eldest, son of a butcher, was cousin to the two younger, Agostino and Annibale, sons of a tailor, and had nearly finished his professional studies before the others had begun their education. From being a reputed dunce while studying under Tintoretto in Venice, he gradually rose, by an attentive observation of nature and a careful examination of the works of the great masters preserved at Bologna, Venice, Florence, and Parma, to measure himself with the teachers of his day, and ultimately projected the opening of a rival school fin his native place. Finding himself unable to accomplish his design without assistance, he sent for his two cousins, and induced them to abandon their handierafts (Agostino being a goldsmith, and Annibale a tailor) for the profession of painting. Agostino he first placed under the care of Fontana, retaining Annibale in his own studio; but he afterwards sent both to Venice and Parma, to copy the works of Titian, Tintoretto, and Correggio, on which his owa taste had been formed. On their return, the three relatives, assisted by an eminent anatomist, Anthony de la Tour, opened, in 1589, an academy of painting under the name of the Incamminati (or, as we might paraphrase it,

the Right Road), provided with numerous casts, books, and bassi-rilievi, which Lodovico had collected in his travels. From the affability and kindness of the Caracci, and their zeal for the scientific edu- cation of the students, their academy rose rapidly in popular estimation, and soon every other school of art in Bologna was deserted and closed. They continued together till, at the invitation of Cardinal Farnese, Annibale and Agostino went to Rome in 1600 to paint the gallery of the cardinal's palace. The superior praises awarded to Agostino inflamed the jealousy of Annibale, already kindled by the brilliant reception given by the pupils of the Incamminati to Agostino's still highly celebrated picture of the Communion of St Jerome, and the latter was dis- missed to Parma to paint the great saloon of the Casino, Here he died in 1601, when on the eve of finishing his renowned painting of Celestial, Terrestrial, and Venal Love. Annibale continued to work alone at the Farnese gallery till the designs were completed; but, disappointed at the miserable remuneration offered by the cardinal, he retired to Naples, where an unsuccessful contest for a great work in the church of the Jesuits threw him into a fever, of which he died in 1609, Lodovico always remained at his academy in Bologna (excepting for a short visit to his

cousin at Rome), though invited to execute paintings in all parts of the country. He died in 1619, and was interred in the church of St Mary Magdalene. The works of Lodovico are numerous in the chapels of Bologna. The most famous are—The Madonna standing on the moon, with St Francis and St Jerome beside her, attended by a retinue of angels ; John the Baptist, St Jerome, St Benedict, and St Cecilia ; and the Limbo of the Fathers. He was by far the most amiable of the three cousins, rising superior to all feelings of jealousy towards his rivals; and though he received large sums for his productions, yet, from his almost un- paralleled liberality to the students of the academy, he died poor. With skill in painting Agostino combined the greatest proficiency in engraving (which he had studied under Cornelius de Cort) and high accomplishments as a scholar. He died not untroubled by remorse for the indecencies which, in accordance with the

corruption of the time, he had introduced into some of his engravings. The works of Annibale are more diversified in style than those of the others, and comprise specimens of painting after the manner of Correggio, Titian, Paolo Veronese, Raphael, and Michelangelo. The most distinguished are the Dead Christ in the lap of the Madonna; the Infant and St John ; St Catherine ; St Roch distributing alms (now in the Dresden Gallery) ; and the Saviour wailed over by the Maries, at present in possession of the earl of Carlisle. He frequently gave great importance to the landscape in his compositions. The reputation of Annibale is tarnished by his jealousy and vindictiveness towards his brother, and the licentiousness of his disposition, which contributed to bring him to a comparatively early grave.

The three Caracci were the founders of the so-called Eclectic School of painting,—the principle of which was to study in the works of the great masters the several excel- lencies for which they had been respectively pre-eminent, and to combine these in the productions of the school itself i for instance, there was to be the design of Raphael, the power of Michelangelo, the colour of Titian, and so on. ‘The dullest or mildest connoisseur will at once perceive that a picture uniting these various kinds of greatness would be a glorious and indeed an unparagoned work of art 3 but at does not follow that the attempt to transfer the several qualities, by study and practice, from the works of various mén to those of one man, is fruitful of good. It is, in fact, far the reverse ; and at the present day perhaps few axioms in art have won a wider acceptance than that which pronounces eclecticism to be at once a result and a symptom of decadence. Lclecticism indicates that the creative impulse, the vital energy and fertility, of art have departed : that the practitioners of the day can no longer do what their forerunners did—produce admirable works, because in themselves spontaneously capable of doing so. They have on the contrary to investigate what has been achieved, and labour not for a new achievement resembling those which preceded in so far as all are the product of some personal gift, special and unforestalled, but rather for an achievement recombining and re-applying old successes, and qualifying, or indeed neutralizing, the strength of one quality by that of another. This is, in effect, an attempt to produce works of art upon the principles which govern the criticism of those works,—an attempt predestined to sterility, for no two things are more antagonistic than the producing power and the criticizing power, They may,

no doubt, be united in the same person, but cannot work out their results the one through the medium of the other,

CARACTACUS, a chief of the Silures in ancient Britain See Britannia, vol. iv. p. 353.

CARAMAN, or Karamay, a town of Asiatic Turkey in the vilayet of Konia in Asia Minor, 61 miles south-east of the city of Konia (Tconium) on the border of an extensive

plain at the foot of Mount Taurus, in 37° 13’ N. Jat. and 33° 28’ E. long. It now contains about 1000 houses, three or four mosques, and an American church, and among other traces of its former importance are the ruins of 4 castle, the outer wall of which is of compass enough to contain about 100 houses. It trades with Smyrna and

the other towns of Asia Minor, and manufactures coarse

cloth from the wool of the neighbouring highlands. By the Greeks it is still called by its ancient name of Laranda, which was changed by the Turks for its present desig- nation in honour of Karaman, the founder of the Kara- manian kingdom. Little is known of its ancient history except that it was destroyed by Perdiccas about 322 B.ce and afterwards became a seat of Isaurian pirates. It was taken possession of by Frederick Barbarossa in 1190 ; in 1466 it was captured by Mahomet IL, and in 1486 by Bajazet IT.

CARAMANTA, or Karamanta, is a name that has been frequently given by modern geographers to the south coast of Asia Minor, including the whole of the districts between Mount Taurus and the Mediterranean, known in ancient times as Lycia, Pamphylia, and Cilicia. It is in this sense that the term is used by Captain Beaufort, who, by the publication of his work (Karamania: a Description of the South-Last Coast of Asia Minor, 8vo, 1816), which contained the first detailed account of the countries in question, did much to perpetuate the usage. But he him- self admits that there is no authority for the application of the term in this sense. The only foundation for it was the existence, after the break up of the monarchy of the Seljukian Turks, of an independent Turkish kingdom, comprising a portion of the interior, north of the Taurus, to which for a short time the

adjacent maritime provinces were annexed. ‘This state bore the name of Karaman-ili, derived from that of its founder, and after it was finally subdued by the Ottoman Turks in 1486 it still continued to exist as a pashalic or government, the seat of which was fixed at Karaman, a considerable town on the north side of the Taurus, occupying the site of the ancient Laranda. But the pashalic thus named was situated wholly in the interior, north of the great chain of Mount Taurus, and comprised no part of the maritime districts, to which the name of Karamania was applied by European geographers, This erroneous use of the term may be considered as now obsolete, and the name of Karaman is no longer found among the territorial divisions of Turkey. The regions comprised under this appellation as employed by Captain Beaufort and Colonel] Leake will be described under the headings Lycra, Pampuyzia, and Cirricta.

CARAVACA, a town of Spain, in the province of Murcia, near a stream of the same name, which is tributary to the Segura, in 38° 6’ N. lat., 2° 2’ W. long. It is commanded by the ancient castle of Santa Cruz, and has an old parish church, with several convents, hospitals, and schools, The hills in the neighbourhood yield various kinds of marble, and in a mountain on the west is the stalactite cavern of Barquilla. The miraculous cross of Caravaca is famous for its healing powers, and a great festival is held in its honour on the 3d of May. Population, 6840.

CARAVAGGIO, MicHELaNGELo AMERIGHI (or MeErIG1) DA (1569-1609), a celebrated painter, born in the village of Caravaggio, in Lombardy, from which he received his name. He was originally a mason’s labourer, but bis powerful genius directed him to painting, at which he worked with immitigable energy and amazingforce, He despised every sort of idealism whether noble or emasculate, became the head of the Naturalisti (unmodified imitators of ordinary nature) in painting, and adopted a style of potent contrasts of light and shadow, laid on with a sort of fury, emblematic of that fierce temper which led the artist to commit a

homicide in a gambling quarrel at Rome. To avoid the consequences of his crime he fled to Naples and to Malta, where he was imprisoned for another attempt to avenge a quarrel, Escaping to Sicily, he was attacked by a party

sent in pursuit of him, and severely wounded. Being pardoned, he set out for Rome ; but having been arrested by mistake before his arrival, and afterwards released, and left to shift for himself in excessive heat, and still suffering from wounds and hardships, he expired of fever on the beach at Pontercole in 1609. His best pictures are the Entomb- ment of Christ, now in the Vatican; St Sebastian, in the Roman Capitol; a magnificent whole-length portrait of a grand-master of the Knights of Malta, Alof de Vignacourt, and his page, in the Louvre; and the Supper at Emmaus, in the Borghese Palace.

CARAVAGGIO, Potrporo Catpara DA (1495-1543), a celebrated painter of frieze and other decorations in the Vatican, whose merits were such that, while a mere mortar- carrier to the artists engaged in that work, he attracted the admiration of Raphael, then employed on his great pictures in the Loggie of the palace. Polidoro's works, as well as those of his master, Maturino of Florence, have mostly perished, but are well known by the fine etchings of P. S. Bartoli, Alberti, &c. On the sack of Rome by the army of the Constable Bourbon in 1527, Polidoro fled to Naples. Thence he went to Messina, where he was much employed, and gained aconsiderable fortune, with which he was about to return to the mainland of Italy when he was robbed and murdered by an assistant, Tonno Calabrese, in 1543. Two of his principal paintings are a Crucifixion, painted in Messina, and Christ bearing the Cross, in the Naples gallery. |

CARAVAN, or, to write it more correctly, KARAWAN, is a Persian word, adopted into the later Arabic vocabulary, but rarely employed in speech and never in writing within the limits of Arabia proper, where other designations of strictly Arabic origin such as " Rikb" (assembled riders) or "' Kafileh" (wayfaring band) are in ordinary use.

In common acceptance, then, throughout Syria, Meso- potamia, and Asiatic Turkey generally, besides Persia, a caravan denotes a body of peaceable citizens, merchants, salesmen, and the like, travelling together on business for some considerable distance. The principal reasons which in the Asiatic region induce people of this class thus to unite for their journeys, and that in as large numbers as practicable, are, firstly, the greater security thus insured, or at least expected, against robbers, and in particular against

marauding parties of Bedouins, Kurds, Tartars, and the like, whose grazing-grounds the proposed route may traverse; and, secondly, mutual assistance in the matter of provisions, water, andsoforth. Bad government, or not rarely the absence of any government whatever, necessitates the first precaution; want of inns, baiting- places, and perhaps of habitations altogether, the second. It should also be remembered that no roads, in the European sense of the word, but merely tracks, and those difficult and often interrupted, exist throughout Asiatic Turkey and Persia generally,—a fact that speaks badly for the 'Public Works Department" in both empires. These conditions having existed more or less from time imme- morial in the major part of Western Asia, and still existing, caravans always have been in that part of the world, and still are the principal means for conveying merchandize from one commercial centre to another.

In these companies camels are most generally employed for the transport of heavy goods, especially where the track, like that between Damascus and Baghdad, for example, lies across level, sandy, and arid districts. The came!s are harnessed in strings of fifty and more at a time, a hair-rope connecting the rear of one beast with the

head of another ; the leader is gaily decorated with party- coloured trappings, tassels, and bells; an unladen ass precedes the file, for luck, say some, for guidance, say others—a not inappropriate allusion to human affairs in general, Where the route is rocky and steep, as that between Damascus and Aleppo, mules, or even asses, are used for burdens. The wealthier individuals of the party accompany it, where possible, on horseback. Every man carries arms ; but these are in truth more for show than for use, and are commonly flung away in the presence of any serious robber-attack; of wild beasts there is little danger, none of formidable size or disposition existing in the Levantine East. Should greater peril than ordinary be anticipated from Bedouins or the like, the protection of a company of soldiers is habitually pre-engaged,—an expen- sive, and ordinarily a useless adjunct. A leader or director, called " Karawan-Bashi" (headman), or, out of com- pliment, " Karawan-Seraskier" (general), both terms of Perso-Turkish composition, but most often simply desig- nated as

“Reis” (chief), is before starting appointed by common consent. His duties are those of general manager, spokesman, arbitrator, and so forth; his remuneration indefinite. But in the matter of sales or purchases, either on the way or at destination, each member of the caravan manages as best he can for himself.

The number of camels or mules in a single carayan varies from forty or so up to six hundred and more; sometimes, as on the reopening of a long-closed route, it reaches a thousand. ‘The movements of caravans are chiefly regulated by the seasons,—the summer and early autumn, when the heat is at its fiercest and water scarce, being, when possible, avoided, as also, though for opposite reasons, the brief but severe cold of a Levantine winter. Hence the ordinary caravan-seasons are the months of spring, early summer, and later autumn. Friday, in ac- cordance with a recommendation made in the Koran itself, is the favourite day for setting out, the most auspicious hour being that immediately following noonday prayer. The first day’s march never does more than just clear the starting-point by a couple of miles, or thereabouts. Sub- sequently each day’s route is divided into two stages,—the first being from 3 or 4 a.m. to about 10 in the forenoon ; a halt follows, then travelling is resumed between 2 and 3 p.M. and continued till 6, or even 8 in the evening. Thus the time passed daily on the road averages from ten to twelve hours, and, as the ordinary pace of a laden camel does not exceed 2 miles an hour, that of a mule being 23, it follows that a distance varying from 23 to 28 miles is gone over every marching day. But prolonged halts of two, three, four, and even more days are often interpolated, as business, fatigue, or fear of danger may suggest.

The hours of halt, start, and movement, the precise lines of route, and the selection or avoidance of particular localities are determined by common consent and the necessity of acting in concert, influences to which the “Reis” himself, apart from his personal recommendations, is indebted for whatever authority he may possess. But if, as sometimes happens, the services of a professional guide, or those of a military officer have been engaged, their will has to be deferred to in such matters. Indeed many a caravan has been plundered, or even totally destroyed, through the treachery of a hired guide. Part- nership may unite interests in the East, but paid hire more certainly disunites them,—a hint worth a traveller’s re-

membrance. While the caravan is on its way, the five stated daily prayers are, within certain limits, anticipated, deferred, or even curtailed, so as the better to coincide with the regular and necessary halts,—a practice authorized by the most orthodox Mahometan custom and tradition.

Two caravans, the one of Ishmeelites, probably “ Must’-

arebs,” or semi-Syro-Arabs of early times, to whom also Joseph was sold, the other of Midianites, or natives of the Hawran district, are mentioned in Genesis ch. xxxvil. ; the route on which they were passing seems to have coin- cided with that nowadays travelled by Syrian caravans on their way to Egypt. Other allusions to caravans may be found in the Hebrew records, e.g., in the book of J ob, in Isaiah, and in the Psalms. Eastern literature is, of course, full of mention of them.

The yearly pilgrim-bands, bound from various quarters of the Mahometan world to their common destination Mecca, are sometimes, but inaccurately, styled by European writers caravans; their proper designation is “ Hajj,” a collective word for pilgrimages and pilgrims. Some description of them may however not unsuitably find a place here. “

The two principal pilgrim-caravans, or “ Hajj,” start yearly, the one from Damascus, or, to speak more exactly, from Mozareeb, a village station three days’ journey to the south of the Syrian capital, the other from Cairo in Egypt. This latter is joined on its route, near Akabah of the Red Sea, by the Moghrebee, or North African “ Hajj,” collected from Tripoli, Marocco, and Tunis; the former gathers up bands from Anatolia, Kurdistan, Mesopotamia, and Syria. Besides these a third, but smaller “Hajj” of Persians, chiefly sets out from Sook-esh-Sheyoukh, in the neighbour- hood of Meshed Alee, on the lower Euphrates ; a fourth of Negroes, Nubians, Darfurees, &c., unites at Yembo on the Hejaz coast, whither they have crossed from Koseyr in Upper Egypt; a fifth of Indians and Malays, centres at Jiddah ; a sixth and seventh, of southern or eastern Arabs arrive, the former from Yemen, the latter from Nejd.

The Syrian “ Hajj” is headed by the Pasha of Damascus, either in person or by a vicarious official of high rank, and is further accompanied by the “ Sorrah Ameer,” or “Guardian of the Purse,” a Turkish officer from Constanti- nople, charged with the imperial contribution to the expense of the route, but chiefly with presents, or, to put it more truly, black mail, for the benefit of the independent Arab tribes, through whose lands the wayfarers must pass. The Egyptian company is commanded by an ‘ Ameer,” or ruler, appointed by the Cairene Government, and is accompanied by the famous “ Mahmal,” or sacred pavilion. The other bands above mentioned have each their own “Ameer,” besides their “ Mekowwams” or agents, whose business it is to see after provisions, water, and the like, aud are not seldom encumbered with a numerous retinue of servants and other attendants. Lastly, a considerable force of soldiery, one, two, or more regiments strong, accompanies both the Syrian and the Egyptian “ Hajj.”

No guides properly so called attend these pilgrim-caravans, the routes followed being invariably the same, and well known. But Bedouin bands generally offer themselves by way of escort, and not seldom designedly lead their clients into the identical dangers from which they bargained to keep them safe. This they are the readier to do that, in addition to the personal luxuries with which many of the pilgrims provide themselves for the journey, a large amount of wealth, both in merchandize and coins, is habitually to be found among the travellers, who, in accordance with Mahometan tradition, consider it not merely lawful but praiseworthy to unite mercautile speculation with religious duty. Nor has any one, the Pasha himself or the Ameer and the military, when present, excepted, any acknowledged authority or general control in the pilgrim-caravans ; nor 1s there any orderly subdivision of management of service. The pilgrims do, indeed, often coalesce in companies among themselves for mutual help, but necessity, circumstance, or caprice governs all details, and thus it happens that numbers, sometimes as many as a third of the entire

‘“‘Hajj,” yearly perish by their own negligence or by mis- fortune,—dying, some of thirst, others of fatigue and sick- ness, others by robbers on the

way. In fact the principal routes are in many places lined for miles together with the bones of camels and men.

The numbers which compose these pilgrim-caravans are much exaggerated by popular rumour ; yet it is certain that the Syrian and Egyptian sometimes amount to 5000 each, with twenty-five or thirty thousand camelsin train. Large supplies of food and water have to be carried, the more so at times that the pilgrim season, following as it does the Mahometan calendar, which is lunar, falls for years together in the very hottest season, though, indeed, the Hejaz portion of the route is always hot enough even in winter. Hence, too, the journey is usually accomplished by night marches, the hours being from 3 to 4 p.m. to 6 or 7 A.M. of the following day. Torches are lighted on the road; the pace is slower than that of an ordinary caravau, and does not exceed two miles an hour.

For the ceremonial and religious peculiarities of these pilgrim-caravans, or “Hajj,” see Burckhardt’s Travels in Arabia, and Lane’s Modern Egyptians, cc. xxiv. and xxv. In other respects the “Hajj” does not differ materially from an ordinary caravan, and it is from this point of view that it finds place in the present notice. (WwW. G. P.

CARAVANSERAI, a public building, for the shelter of caravans and of wayfarers generally. It is commonly constructed in the neighbourhood, but not within the walls, of some town or village, and bears the form of a quad-rangle, with a dead wall outside, only pierced below by a few narrow air-holes, but with small windows higher up. Within, a cloister-like arcade, surrounded by cellular store- rooms, forms the ground-floor; and a somewhat lighter arcade, giving access to little dwelling-rooms, runs round it above. Broad, open flights of stone steps connect the stories. The central court is open to the sky, and generally has in its centre a well with a fountain-basin beside ity but sometimes the well is outside the building, A spacious portal, high and wide enough to admit the passage of a loaded camel, forms the sole entrance, which is furnished with heavy iron-plated folding doors, and is further guarded within by massive iron chains, drawn across at night. Each side of the entry is also provided with stone seats, and the entry paved with flagstones, The court itself is most often paved also, and large enough to admit of three or four hundred crouching camels or

tethered mules ; the bales of merchandize are piled away under the lower arcade, or stored up in the cellars behind it ; the upstairs apartments are for human lodging ;_ but cooking is usually carried on in one or more corners of the quadrangle below. Should the caravanserai be a small one, the merchants and their goods alone find place within, the beasts of burden being left outside. A porter, appointed by the municipal authority of the place, is always present, lodged just within the gate, and sometimes one or more assistauts. These form a guard of the building and of the goods and persons in it, and have the right to maintain order and, within certain limits, decorum; but they have no further control over the temporary occupants of the place, which is always kept open from prayer-time at early dawn till late in the evening for all arrivals. A small gratuity is expected by, and is generally given by the guests to, the porter, but he has no legal claim for payment from travellers, his maintenance being provided for out of the funds of the institution. Neither food nor provender is supplied in a caravanserai, water and shelter only; the rest the caravan has to find for itself. Many caravanserais in Syria, Mesopotamia, and Anatolia are possessed of con- siderable architectural merit ; their style of construction is in general that known as Saracenic ; their walls are massive,

and of hewn stone ; their proportions apt and grand. The portals especially are often decorated with intricate carving ; so also is the prayer-niche within, that indicates the direction of the Meccan Kibleh. These buildings, with their belongings, are works of charity, and are supported, repaired, and so forth, out of funds derived from pious legacies, most often of land or rentals Sometimes a municipality takes on itself to construct and maintain a caravanserai; but in any case the institution is registered as tax-free, and its revenues as inalienable. When, as sometimes happens, those revenues have been dissipated by peculation, neglect, or change of times, the caravanserai passes through downward stages of dilapidation to total ruin (of which only too many examples may be seen by the Eastern traveller), unless some new charity intervene to repair and renew it. In the general decline of wealth, public spirit, and prosperity actually prevailing throughout the Mahometan Levant, such better fortune is, however, rare. ‘ Khans,” or places more analogous to our own town-inns and hotels, where not lodging only, but

often food and other necessaries or comforts may be had for payment, are sometimes by inaccurate writers confounded with caravanserais, though having really nothing in com- mon with them, except that they are also for the use of travellers. These “ Khans” are generally to be found within the town or village precincts, and are of mucli smaller dimensions than caravanserais. The “ Khan” called that of Asaad Pasha at Damascus is a model of con- structive skill and architectual beauty. (w. G. P.)

CARAVELLAS, a seaport town of Brazil, in the province of Espiritu Santo, on a river, and not far from a bay, to which it gives its name, in 17° 49’ S. lat. and 39° 26’ W. long. It is the principal port of the neighbouring country, and serves as the headquarters of the whale fishery of the Abrolhos Islands which lie off the coast. Population, about 5000.

CARAWAY, the fruit, or so-called seed, of Carum carut, an umbelliferous plant growing throughout the northern and central parts of Europe and Asia. The plant has finely-cut leaves and compound umbels, and fruits laterally compressed and ovate,—the mericarps being subcylindrical, slightly arched, and marked with five distinct pale ridges. Caraways evolve a pleasant aromatic odour when bruised, and they have an agreeable spicy taste. They yield from 3 to 6 per ceut. of a volatile oil, which is a compound of carvol (a mobile liquid isomeric with the menthol of spearmint) and carvene. The plant is cultivated in the northern parts of Norway, in Finland, Russia, Germany, Holland, and in Marocco, as well as in the south of England, the produce of more northerly latitudes being richer in essential oil than that grown in southern regions, ‘The essential oil is largely obtained by distillation for use in medicine as an aromatic stimulant and carminative, and as a flavouring material in cookery and in liqueurs for drinking. Caraways are, however, more extensively consumed entire in certain kinds of cheese, cakes, and bread, and they form the basis of a popular article of confectionery known as caraway comfits,

CARBOLIC ACID, or PueEnor (C,H,O), an acid sutstance forming one of the numerous constituents of coal-tar, was first described by Runge in 1834. Its con- stitution was investigated by Laurent in 1841, who, regard- ing it as a hydrated oxide of the compound radical phenyl, termed it the hydrate of phenyl. Among other names it has received are phenic acid, phenyl alcohol,

and creosote ; but though the latter is popularly applied to an impure mixture of carbolic acid and the allied cresylic acid, it properly belongs to an altogether distinct substance. In addition to being an abundant constituent of coal-tar, carbolic acid is formed by the action of heat upon salicylic

acid ; it can be obtained by the dry distillation of gum- benzoin and other resinous substances; traces of it are found in the urine of the horse, the ox, and man; and to it castoreum owes its peculiar odour.

Commercial carbolic acid is prepared solely from coal- tar by a method of which the following is an outline. When coal-tar is distilled the most volatile products—benzol, toluol, cumol, &c., first come away, after which when the temperature rises from 150° C. to 200° C. crude carbolic acid distils over. This distillate is mixed with a strong solution of caustic potash, and the resulting carbolate of potash is in its turn treated with sulphuric acid, which decomposes the carbolate, liberating carbolic acid, which

‘rises to the surface as an oily layer, and is removed by a

syphon. The product is purified by washing and repeated rectification, and finally cooled down to 10° C., when it forms whitish acicular crystals, from which the unsolidified acid is drained away. Crystallized carbolic acid of com- merce retains a strong naphthalic odour, from which it may be freed for medicinal or other purposes by a method recom- mended by Professor Church. Into 1 fb of the crystal- lized acid he pours 20 tb of cold distilled water, care being taken that the whole of the acid shall not be dissolved. The mixture is repeatedly shaken till from 2 to 3 ounces of the acid only remains undissolved, in which residue the whole of the impurities are retained. From this, the aqueous solution is syphoned off, and if necessary, filtered, and then pure powdered common salt is added to it till the salt will no longer dissolve. After standing some time the whole of the carbolic acid rises to the surface, and floats as a yellow oily layer, which as it contains 5 per cent. of water will not crystallize. It may be crystallized by distilling from a little lime, and the product collected up to 185° C. will possess only a faint pleasant aromatic odour. Pure carbolic acid crystallizes in long

colourless needles; it melts at 35° C., and boils about 187° C. It is soluble in all proportions in alcohol, ether, and strong acetic acid, but dissolves only sparingly in water. It does not redden litmus paper; it exerts a powerful corrosive action on the skin; its aqueous solution coagulates albumen ; and it unites with animal substauces, preserving them from decomposition, and removing the offensive odour from putrefying matter.

The extensive manufacture and employment of carbolic acid are, ina large degree, owing to the exertions of the late Professor Crace Calvert, who was the first to manufac- ture it in the crystalline form. The development of the aniline colour industry also communicated an impetus to the manufacture of carbolic acid, as the one is, in a sense, a secondary product of the other. A great many useful applications have opened up for the employment of the acid in addition to its extensive medicinal and antiseptic uses (see ANTISEPTICS). Jor domestic, sanitary, and medicinal use, carbolic acid is prepared in various states of purity and strength. ‘Toilet and medicated soaps, tooth powder, disinfecting powder, d&c., are all prepared containing definite proportions of the acid.

Carbolic acid is, however, most largely consumed in the preparation of several dyeing materials, which are second only in importance to the colours derived from aniline. Picric or carbazotic acid is a brilliant yellow dye-stuff, much used for wool and silk dyeing, prepared by very cautiously adding in sniall quantities nitric acid to crystallized carbolic acid, or to a mixture of carbolic acid with sulphuric acid. From picric acid in its turn two derivatives are obtained,

isopurpuric acid and picramic acid, but these have only a limited application in dyeing. Coralline, a dye in extensive use, yielding a variety of fine red shades, is obtained by heating together two parts of oxalic acid, three of carbolic acid, and four of sulphuric acid to a temperature of from 140° C. to 150° C. Peonine, or red coralline, is a product of coralline obtained by acting on it at a temperature of about 130° C. with a concentrated solution of ammonia. It yields on wool and silk a very rich durable Turkey-red- like shade. Aurine, or yellow coralline, is made by mixing together oxalic acid, carbolic acid and sulphuric acid, the same as

for ordinary coralline, but the mixture is submitted to a less elevated temperature. It dyes fine yellow and orange shades on animal fibres. Phenicienne, or rothine, is a dye producing shades varying from a deep garnet red to a chamois colour, made by adding to carbolic acid a mixture of nitric and sulphuric acids. Fol's yellow is manufactured by heating to 100° C. a mixture of five parts of carbolic acid and three of powdered arsenic acid. Besides these various other dyes having carbolic acid for their basis have been introduced and some of them are commercially established.

CARBON (symbol, C; atomic weight,12) is one of the most important of the chemical elements. It occurs pure in the diamond, and nearly pure as graphite or plumbago ; it isa constituent of all animal and vegetable tissues and of coal ; and it also enters into the composition of many minerals, such as chalk and dolomite.

Carbon is a solid substance, destitute of taste and odour ; but it occurs in several modifications which exhibit very diverse physical properties. Thus, it is met with in the form of the diamond in transparent crystals belonging to the regular or cubical system, which conduct electricity but slowly ; and in the form of graphite in opaque crystals belonging to the hexagonal system, which conduct electricity nearly as well as the metals, The diamond is the hardest substance known, and has a relatively high specific gravity (3°33 to 3:55), but graphite is comparatively soft, producing a black shining streak when rubbed upon paper, and has a much lower specific gravity (2°15 to 2°35). In addition to these two crystalline modifications of carbon there are a number of varieties of non-crystalline or amorphous carbon, which, however, exhibit the greatest differences in physical properties. ,

By heating to the high temperature afforded by a powerful galvanic battery, both the diamond and amorphous carbon are converted into graphite. In the electric arc carbon appears to be converted into vapour; but the temperature which is required to volatilize it is extremely high ; in fact, it has been calculated! that the boiling- point of carbon is not less than about 7000° on the centigrade scale.

Although the various allotropic modifications of carbon cannot always be satisfactorily distinguished by their physical properties, they may readily be distinguished, as Berthelot has shown, by their behaviour on treatment with

certain oxidizing agents. The diamond is not. affected thereby even after prolonged and reiterated treatment. The different varieties of amorphous carbon, however, are more or less readily entirely converted into humus-like substances, or “humic acids,” soluble in water, whereas the different varieties of graphite furnish “ graphitic oxides,” which aré msoluble in water, and especially characterized by the property of undergoing decomposition with deflagration when heated. The method of treatment adopted by Berthelot is as follows. The carbon in the form of an impalpable powder is mixed with the aid of a card with five times its weight of pulverized potassic chlorate, and paver cent ae eae ee see nie ieee NN alll

1 Dewar, Phil. Mag. (4), xliv. p. 461. 1872.

this mixture is then formed little by little intoa paste with fuming nitric acid. In performing these operations great care is necessary in order to avoid explosions, and at most five grams of carbon should be taken. The mixture, con- tained in a small open flask, is allowed to stand several hours, and is then heated for three or four days without interruption to a temperature not higher than 50° or 60°C. ; the mass is then diluted with water and washed by decanta- tion with tepid. water. It is necessary as a rule to repeat this series of operations several times in order entirely to dissolve the amorphous carbons, or to convert the graphites into graphitic oxides.

Berthelot has examined a very large number of varieties of carbon in this manner with the following results. The carbon of wood charcoal, animal charcoal, coke, the so-called metallic carbon obtained by decomposing hydrocarbons by passing their vapours through a red-hot tube, gas-retort carbon, and various specimens of anthracite from different sources, all dissolved entirely with more or less readiness when treated in the above manner; lamp black, however, furnished a small amount of graphitic oxide. The amorphous carbon of the meteorite of Cranbourne (Australia) furnished a graphitic oxide identical with that obtained by similarly treating graphite from cast-iron, but the carbon of the Orgueil meteorite was entirely soluble. The carbon of the Greenland meteoric rock discovered by Nordenskiold also dissolved entirely with the exception of a very in- significant residue.

Berthelot also examined the action of various agents on carbon, and finds that heat alone is without influence; that is to say, the graphites are not changed into amorphous carbon, or the amorphous carbons into graphite, when heated to whiteness in an atmosphere of hydrogen or of chlorine. When, however, a pencil of gas-retort carbon is inflamed in an atmosphere of oxygen, and then as soon as the point is fully incandescent plunged into water, the part which has been heated contains a small quantity of graphite. On examining the pencils of carbon employed in producing the electric light it was found that the spongy mass of carbon collected on the negative pole contained a large proportion of graphite, but that only traces were present in the pencil employed as positive pole, which appears to indicate that it is necessary for the carbon to undergo volatilization in order that it may be converted into graphite. The graphite thus produced is not identical with that contained in cast-iron, nor with natural plumbago ; the same variety of graphite is produced, however, when the diamond is heated in the electric arc. The carbon separated from the various hydrocarbons by heat alone consists entirely of amorphous carbon, but that obtained on decomposing marsh gas by the electric spark contains a small quantity of graphite, and the carbon resulting from the decomposition of perchloride of carbon and bisulphide of carbon at a red heat contains a considerable proportion of graphite; that resulting from the decomposition of cyanogen by the electric spark contains only traces of graphite.

The specific heats of the several modifications of carbon also differ considerably ; that is to say, the amounts of heat required to raise equal weights through the same number of degrees of temperature are different. The diamond has the lowest, and amorphous carbon the highest specific heat; or to raise the temperature of a given weight of the diamond from the temperature a to the temperature d will require less heat than to raise the temperature of the same weight of amorphous carbon from the temperature @ to 0.

Graphite-—Graphite is found native near Travancore in Ceylon, and near Moreton Bay in Australia, in several parts of the United States, in South Siberia, and in Germany, principally at Griessbach near Passau, always in rocks

belonging to the earliest formations, It occurs in two distinct modifications, one of which, like the Borrowdale graphite, is fine-grained and amorphous; the other, like the Ceylon variety, is composed of small flat plates. Native graphite contains from 95 to nearly 100 per cent. of carbon, the impurity being usually small quantities of silicates. Graphite, also called plumbago or black lead; is used for making so-called lead pencils, for polishing iron work, for lubricating machinery, for making crucibles, and in the electrotype process for coating the surfaces of wood, plaster- of-paris, gutta-percha, and other non-conducting materials, so as to render them conductive.

The behaviour of graphite on treatment with a mixture of potassic chlorate and nitric acid has been carefully studied by Brodie; but our knowledge of its oxidation products is still very incomplete. He has shown that it is converted into a body to which he attributes the composi- tion indicated by the formula C,,H,O,; graphitic acid, as this compound is termed, forms yellow silky plates, insoluble in water and acids. It does not form salts, and Berthelot therefore prefers to call it graphitic oxide. When this substance is heated it decomposes almost with explosive violence, leaving a residue which still contains hydrogen and oxygen, but which is not distinguishable from finely divided graphite. When the graphite which crystal- lizes from cast-iron and that obtained by heating amorphous carbon in the electric arc are similarly treated, graphitic oxides are produced which differ from each other, and from the oxide formed from native graphite; it is therefore supposed that these graphites are distinct substances (Berthelot, Ann. Ch. Phys, [4] xix. 399).

Amorphous Carbon.—Pure amorphous carbon is only obtained with great difficulty. ‘That produced by heating pure organic substances, such as sugar and starch, still contains traces of hydrogen and oxygen, from which it can only be freed by long-continued ignition at a white-heat in an atmosphere of chlorine.- The purest amorphous carbon ordinarily met with is amp black, which is prepared by the imperfect combustion of highly carbonized bodies, such as resin. An amorphous carbon of considerable purity, known as gas-retort carbon, is obtained in the manufacture of coal-gas. The parts of the

retort which are exposed to the highest temperature partially decompose the gas as it escapes, and by degrees a layer of very dense carbon is deposited in the upper parts of the retorts. It is a good conductor of heat and electricity, and burns with difficulty, and is therefore employed in producing the electric light, and to form the negative element in Bunsen's voltaic battery. Wood charcoal and coke are very impure forms of amorphous carbon, containing in addition to small quantities of hydrogen and oxygen a considerable proportion of mineral matters, which remain as ashes when the charcoal or coke is burnt. Animal charcoal is a still more impure form of amorphous carbon.

Oxides of Carbon.—When carbon is burnt in oxgyen carbonic dioxide or carbonic anhydride, or, as it is commonly termed, carbonic acid, CO,, is formed; if the supply of oxygen is deficient the lower oxide, carbonic oxide, CO, is also produced, and the latter may be obtained ina pure state by passing the dioxide over red-hot carbon. Both are colourless, odourless gases. The union of carbon with oxygen gives rise to the evolution of a very large amount of heat, but much less heat is produced by the union of the first half of the oxygen than by the union of the second half. Thus the combination of 12 grams of carbon with 16 grams of oxygen to form 28 grams of carbonic oxide gives rise to the evolution of about 25,000 units of heat, but no less than 69,000 units are produced by the addition of a second 16 grams of oxygen to form carbonic dioxide. It is supposed that in the first instance very much less heat

is evolved because energy, which otherwise would appear in the form of heat, is expended in converting the solid carbon into the state in which it exists in gaseous carbonic oxide and dioxide, since it is observed that in those cases in which two oxides are formed, both of which are solid, sensibly equal quantities of heat are evolved in the fixation of each successive 16 grams of oxygen.

In the conversion, however, of the different varieties of carbon into carbonic dioxide, CO,, by combustion in oxygen different amounts of heat are produced.- The following table represents the number of units of heat (the unit of heat being the amount required to raise the temperature of 1 gram of

water from 0° to 1° C) evolved in the conversion of 12 grams of each of the varieties of carbon into 44 grams of carbonic dioxide :—

Units. Diamond), ewes… ae saan. SE 93,240 TOnyOTAW NAC sw sccce.\ecensesos-ensceeecccetaeune | omhad Nipriitall GrApUUte. sc e.cscc cececcce aut cee Gare OOO Gas-retont Capbonmer….. cote ….0 Seeecen sek 96,564 Wood charcoal ….....0..0. 96,960

Carbonic oxide burns in the air or oxygen with a blue flame, forming carbonic dioxide. It is an extremely poisonous gas, being capable of displacing the oxygen in blood, owing to the formation of a compound with the hemoglobin with which the oxygen is ordinarily combined. It is very sparingly soluble in water, which dissolves only about jth of its bulk at 15°C. When a mixture of equal volumes of carbonic oxide and chlorine gas is exposed to sunlight, the two gases combine, forming chloro-carbonic oxide or phosgene gas, COCI,.

Carbonic dioxide will not burn, neither does it support combustion. Under the pressure of 36 atmospheres at 0° C. it is converted into a colourless mobile liquid. When the liquid is suddenly relieved from the pressure under which alone it can exist, part of it at once passes back into the state of gas, and heat is abstracted so rapidly that the remaining portion of the liquid solidifies. By allowing a jet of the liquid dioxide to pass into a cylindrical metal box, having within it an inclined metal tongue against which the jet of liquid impinges, a considerable quantity of the solid may be collected in the form of a white flocculent mass like snow. Like all flocculent substances, it conducts heat but slowly, and may be preserved for a considerable time. By mixing it with ether its heat-conducting power is greatly increased ; it therefore evaporates much more quickly, and a much lower témperature is obtained than with the solid alone, and by placing the mixture under the receiver of an air-pump and exhausting, a still greater degree of cold is produced. According to Faraday, an alcohol thermometer plunged into a bath of the solid carbonic dioxide and ether in air indicates a temperature of — 76° C., and in the same bath under a receiver exhausted to within 12 inches of the atmospheric pressure it fell to —110° C.; at the latter temperature alcohol assumes the consistence of a thick oil.

Recent experiments of Sir B. Brodie (Royal Society Pro- ceedings, xxi. p. 483, 1873) show that carbonic oxide and dioxide are not the only oxides of carbon which are capable of existing. When a current of pure and dry carbonic oxide is circulated through a Siemen's induction-tube, and there submitted to the action of electricity, a decomposi- tion of the gas occurs. Carbonic dioxide is formed, and simultaneously with its formation a solid deposit may be observed in the induction-tube; this deposit appears as a transparent film of a red-brown colour. It is entirely soluble in water, which is strongly coloured by it, and the solution has an intensely acid reaction. In the dry con- dition, before it has been in contact with water, it is an oxide of carbon. Samples, however, made in different experiments do not present precisely the same composition ;

but nevertheless they appear to belong to a certain limited number of forms, which repeatedly occur and may 1n- variably be referred to the same general order or system. This system is, or appears to be, what may be termed an homologous series of " oxycarbons," of which the unit of carbon with the weight 12 may be regarded as the first term, and of which the adjacent terms differ by an incre- ment of carbonic oxide, CO, weighing 28, precisely as homologous series of hydrocarbons differ by the increment CH,. Two at least of these substances have been identified by analysis, namely, the adjacent terms C,O, and C,0,.

Carbonic Acid.—Carbonic dioxide dissolves in about its own volume of water at ordinary temperatures, forming carbonic acid, H,CO,; the solution has a sharp and slightly acid taste, and turns the blue colour of litmus to wine-red. The volume of carbonic dioxide dissolved by water diminishes as the temperature rises, and at the boil- ing heat the whole is expelled from solution ; the volume dissolved by water at a given temperature is nearly the same, however, under all pressures, so that the weight of gas absorbed increases in nearly the same proportion as the pressure. On removing the pressure the gas is given off with effervescence. Ordinary soda-water consists merely of water impregnated with carbonic dioxide by mechanical pressure. When lime water is added to a solution of carbonic acid, or carbonic dioxide is passed into lime water, a white precipitate of calcic

carbonate or carbonate of lime, the chief constituent of ordinary chalk, is pro- duced :—

CaO,H, + H,CO, = CaCO, + 2H,0. Calcic hydrate. Carbonic acid. Calcic carbonate. Water.

On continuing to pass the gas the precipitate becomes dissolved owing to the formation of an acid carbonate or bicarbonate, which is fairly soluble in water, the carbonate being almost insoluble :—

CaCO, + H,CO, = H,Ca(CO,), Caleic carbonate. Carbonic acid. Calcic bicarbonate.

If the solution of the bicarbonate be heated, carbonic dioxide is given off and the calcic carbonate is precipitated, the bicarbonate being decomposed. The lime salt may also be removed from the solution, with the exception of the small amount of calcic carbonate which the water is capable of dissolving, by carefully adding lime water or a solution of ordinary washing soda as long as a precipitate is produced. The action of lime water in this case is to convert the soluble bicarbonate into the insoluble carbonate ; thus :—

H,Ca(CO,). + CaH,O, = 2CaCO, + 2H,0. Calcic bicarbonate. Calcic hydrate. Calcic carbonate.

These facts serve to explain the “hardness,” as it is termed, of many natural waters, and the methods employed to render such waters soft. A water which, like rain water, readily produces a lather with soap is said to be a soft water, whereas one which does not readily yield a lather, but forms a large amount of curd, is said to be a hard water. The hardness of most natural spring waters is chiefly due to dissolved calcic bicarbonate, which is formed by the action of the carbonic acid dissolved in rain upon the calcareous materials with which the water comes in contact during its passage through the earth. Ordinary soap consists of the sodic salts of certain fatty acids, and is soluble in water; but the lime salts of these acids are insoluble, so that when the soap is used with the hard water a double decomposition takes place, the calcic bicar- bonate being converted into sodic bicarbonate and the soda- soap into a lime soap orcurd. Such waters

may be rendered soft, that is to say, the calcic bicarbonate may be removed in a variety of ways, viz., by heating the water, which causes the decomposition of the bicarbonate and the precipi-

tation of the carbonate, and it is in this way that the fur is produced in our kettles and boilers ; by adding washing soda or sodic carbonate, a common practice in all households where hard water is used; and lastly, by adding lime water. (Ge EK. A.) CARBONARL, Tue (from theItalian carbonaro, charcoal maker), were certain secret societies of a liberal and even revolutionary tendency that took an active part in some events of Italian and French history during the first three decades of this century. Secret societies, calling themselves by this or a similar name, had indeed previously existed in various parts of Europe ; but it was in Italy, towards the close of the Napoleonic wars, that these first began to assume an historic importance. In 1808 many republi- cans, discontented alike with the Bourbon and the Bona- partist government in Naples, had retired to the mountain recesses of the Abruzzi and Calabria. At first engaged only in an isolated resistance to the authorities, they began to organize themselves. They took the name of Carbonari, name suggested by the trade of charocal-burning extensively pursued in those regions, in which many of them were engaged. From this trade, too, but especially from the Christian religion, and above all from the crucifixion of Christ, they adopted a system of mystic rites aud a symbolic phraseology, by which they concealed from the uninitiated, but all the more vividly expressed to the initiated, the real political aims of the society, while its apparently religious character served to attract many whom its revolutionary secrecy might have repelled. A lodge of Carbonari was baracca (a hut); an ordinary meeting, vendita (a sale) ; a meeting of importance, alta vendita ;—these terms being borrowed from the trade of charcoal-burning. But for words to express the inner purpose of the society they borrowed from religion. Christ, as the highest victim of tyranny, was the lamb that had been put to death by the wolf; they were sworn to avenge his death ; and so the destruction of the wolf to avenge the slaughter of the lamb became the symbolic watchword of the society. There were four grades in the society ; and the ceremonies of initiation were characterized by many mystic rites, through which the real

meaning began only gradually to appear. Many efforts were made to bring about a complete organ- ization of the Carbonari in Italy, by the institution of a central power which should. control the separate societies of the various provinces, but they failed. Politicians soon discovered how easily capital could be made of such societies, and negotiations were entered into by the Bourbons to unite the Carbonari in an effort to overthrow the French Government in Naples. Accordingly, for two years they carried on a desultory warfare with King Murat, who at last, taking the matter thoroughly in hand, drove them into the mountains, from which they had emerged, and sup- pressed them for a time. Capobianco, their leader, was treacherously arrested and put to death. Ere long, the Carbonari reappeared and helped towards the final over- throw of the French power in Naples. But Ferdinand, who hadcourted them during his misfortunes, proved false to them on his return to power, though they were moderate enough in their political aims, being ready to content themselves with the establishment-in Naples of the constitution that had been enjoyed in Sicily under English supremacy. Henceforward they began to conspire against the Bourbon Government, and indeed soon spread over the whole of Italy, being more and more regarded as the champions of the liberal and national cause. They were the principal authors of the Neapolitan revolution of 1820, of the disturbances in the Papal States of the same year, and of the Piedmontese revolution of 1821. Previously recruited chiefly from the lower classes, the Carbonari now counted in their ranks almost all the intelligent and patriotic population of Italy,

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especially the middle classes, the officers of the army, the students at the universities, the artists, and even the priests,—to the number, it is said, of nearly 700,000. Unable, however, to resist the military power of Austria, backed by a European congress, the revolution and the Carbonari along with it were crushed, and many, such as Silvio Pellico, implicated or supposed to be implicated in their conspiracies, perished or languished in Austrian dungeons. They never quite revived in Italy; though active again in 1830 and 1831, they were forthwith super- seded by the more energetic and more extreme “ young Italy ” of Mazzini.

It was about 1820 that Carbonarism began to take root in France. ‘There the organization was more perfect, as in addition to what had been attained in Italy, there was a supreme board, presided over by the veteran Lafayette, und a complete hierarchy of societies, by which the will of the chief was communicated, from higher to lower, to the smallest lodges in the extremities of France; these were ventes particuliéres, ventes centrales, hautes ventes, ventes suprémes. It made great progress in France, especially among the students and sub-officers of the army. The example of Spain and Italy having incited the French Carbonari to immediate action, attempts to raise an insur- rection were made in 1821 at Belfort, Thouars, La Rochelle, aud other towns. They were all immediately suppressed, but not without revealing to what extent the Carbonari had spread over France. It was at the trial of Boriés, one of those concerned in the rising at La Rochelle, that the nature and organization of the Carbonari in Frauce became publicly known, and attention was drawn to the mutual fide- lity prevalent among them, as none but those immediately concerned in the insurrection could be brought to trial. Though completely defeated in 1821, French Carbonarism did not die out, but continued to be an active centre of revolutionary discontent till 1830, when, after contributing to the July revolution, most of the members adhered to the government of Louis Philippe. For several years after, traces of it existed in some French towns, but these are of no importance.

Heckethorn’s Sccret Societies ; Botta’s History of Italy, vol. ii. ; Alison’s History of Europe, vol. ii. ; Annuatre Historique.

CARBONDALE, a city of the United States, in the county of Luzerne in Pennsylvania, near the source of the Lackawanna River, on the Delaware and Hudson Railway, about 110 miles N.N.W. of Philadelphia. Its incorpora- tion only dates from 1851, and (as its name implies) its principal importance consists in the fact that it is the centre of an extensive coal-field. About 900,000 tons are obtained annually from the neighbouring mines. Popula- tion in 1850, 4945; in 1870, 6393.

CARBUNCLE is a name applied in modern times to the various kinds of garnet employed by jewellers when cut ex cabochon, that is, with a smooth convex surface, and the back either flat or hollowed out. On account of the deep red colour of most garnets it is necessary to adopt this kind of cutting,

especially when the stones are of any considerable size, in order to exhibit their rich hues by the light passing through a comparatively thin stratum of the material. The carbuncle is frequently mentioned in the Bible, although it is impossible to define the precise stone referred to under that name in the Authorized Version of the Scriptures. The stone in the breast-plate of the High Priest, which is translated carbuncle (Exodus xxviii. 17), is in the original called Bareketh, literally meaning flashing, while again, in Isaiah liv. 12, the term Kadkod, equivalent to the glowing of fire, is also rendered by carbuncle. The carbunculus of Pliny appears to have included all the deep-red coloured stones which were suitable for jewellery and gems, such as the ruby and the

spinel, as wellas the various kinds of garnet. Itis remark- able that among the varieties distinguished by classical writers were the lychnis or lamp stone, and the dvOpaé or live coal, both in common with the scriptural names indicat- ing stones with a fiery glow. In the setting of carbuncles, a ruby-like glow is frequently communicated to the stones by a backing of coloured metallic foil which modifies their hue, a practice which is found to have prevailed in Roman times, tanta est in illis occasio artis, subditis per que translucere cogantur. The finest carbuncles come from Pegu and Ceylon, and they are sometimes found in masses of such dimensions that cups measuring as much as one and a half or two inches in height and diameter are cut out of them. See under GARNET.

CARBUNCLE, an acute local inflammation of the deeper layers of the skin, followed by sloughing. It is met with in those who are weakened by any cause, and in certain unhealthy constitutional states. It is accompanied by great constitutional disturbance ; in the early stages of the disease the pain is considerable. A hard flattened swelling of a deep red colour is noticed on the back, face, or extremities. This gradually extends until in some instances it may become as large as a dinner-plate. To- wards the centre of the mass numerous small openings form on the surface. From them blood and matter escape, and through these openings a yellow slough, of leathery con- sistence, can be seen. The treatment generally adopted is free incisions through the mass, relieving the tension and alleviating the pain. Poultices

are then applied to encourage the separation of the slough. After this coines away a healthy ulcer is left which heals rapidly, leaving an indelible scar. Opium is given in order to relieve the pain. The patient requires supporting diet, stimulants, good food, and the administration of iron. Occurring as it does in people of an unhealthy tendency, it may in severe cases occasion death. Some surgeons do not inter- fere with the knife, but give opium in large doses, and allow the slough to separate by natural processes.

CARCAJENTE, a town of Spain, in the province of Valencia, 24 miles from the right bank of the Jucar, in 39° 4'N lat. and 3 31' W. long., with a station on the railway between Valencia and Almansa. It is inhabited chiefly by an agricultural population, but has a consider- able manufacture of linen and woollen stuffs, and silk thread from the silk produced in the neighbourhood. The town-house (a modern building), the parish church, and the palace of the marquis of Calzada are its principal build- ings. Roman remains have been found in the vicinity. Population, 8850.

CARCASSONNE, the chief town of the department of Aude, in France, is situated on both sides of the River Aude, and in the immediate neighbourhood of the Canal du Sud, about 55 miles 8.E. of Toulouse, on the railway between that city and Narbonne, in 43° 12' 54" N. lat. and 2° 20'55 E. long. On an abrupt elevation on the right bank of the river stands the old city, enclosed by a double line of ramparts and towers, and retaining the aspect of a medizval fortress. A portion of the inner line is attributed to the Visigoths; the rest, including the castle, seems to belong to the 11th or 12th century, while the outer circuit has been referred mainly to the end of the 13th. The old cathedral of St Nazaire, which partly dates from the llth century, and contains magnificent stained-glass windows of the Renaissance period, has been restored under the superintendence of M. Viollet-le-Duc. On the left bank of the river, but connected with the city by a bridge of twelve arches, lies the new town, clean, well-built, and flourishing, with streets intersecting each other at right angles. It is surrounded by boulevards occupying the site of its ramparts, and has a large esplanade

for military manceuvres, as well as numerous fountains and planted walks. As chief town of a department, and the seat of a bishop, Carcassonne contains court-houses and various public offices, an episcopal palace, and a theological Seminary ; and among its other public buildings and institutions may be mentioned the new cathedral of St Michael, the town-hall, the library with upwards of 15,000 volumes, the exchange, the theatre, the barracks, the hospitals, the college, the school of design, the museum, the chamber of commerce, and the agricultural society. Of the various industrial establishments the most important are the woollen factories,—not less than 2000 people being engaged in the manufacture of cloth, which is chiefly exported to the Levant, Barbary, and South America. Wadding, paper,

leather, pottery, and iron wares are also produced; and |

there is a trade in wine, brandy, and fruit. A large fair is held in November and another on Whit-Tuesday. Population in 1872, 20,808 in the town. and 23,644 in the commune.

Carcassonne occupies the site of Carcaso, an ancient city of Gallia

Narbonensis, which belonged to the Volex Tectosages. It was a place of some importance at the time of Cxsar’s invasion, but makes almost no appearance in Roman history. On the disintegration of the empire, it fell into the hands of the Visigoths, who, in spite of

the attacks of the Franks, especially in 585, retained possession till 724, when they were expelled by the Saracens, destined in turn to yield before long to Charles Martel.) of the 13th century Carcassonne formed a separate countship, which was brought to ruin by the attachment of Count Raymond oger to the cause of the Albigenses. The city, in spite of a noble defence, was taken by the Crusaders of Simon de Montfort in 1209, and the unfortunate count perished in captivity. In 1224, his son, Ray- mond Trencavel II., recovered his estates, but in 1247 he was forced to yield all his rights to Philip Augustus. A revolt of the city against the royal authority was severely punished in 1262, by the expulsion of its principal inhabitants, who were, however, permitted to take up their quarters on the other side of the river. This was the origin of the new town, which was fortified in 1347,

During the religious wars Carcassonne several times changed hands, and it did not recognise Henry IV. till 1596.

CARDAMOM, the fruit of several plants of the genera Hletaria and Amomum, belonging to the natural order Zingiberacee, the principal of which is Elettaria Cardamo- mum, from which the true officinal or Malabar cardamom is derived. The Malabar cardamom plant has flag-like leaves, springing from an erect perennial stem, and rising to a height of from 6 to 12 feet. The fruit is an ovate- triangular three-celled three-valved capsule of a dirty yellow colour, enclosing numerous angular seeds, which form the valuable part of the plant. It is a native of the moun- tainous parts of the Malabar coast of India, and the fruits

are procured either from wild plants or by cultivation

throughout Travancore, Western Mysore, and along the Western Ghauts. A cardamom of much larger size found growing in Ceylon was formerly regarded as belonging to a distinct species, and described as under the name of Hlettaria major ; but it is now known to be only a variety of the Malabar cardamom. In commerce, several varieties

The a name given to half an inch long and about a quarter broad, Following these come “ short. longs” and “ long-longs,” also distinguished by their size, the largest reaching to about an inch in length. The Ceylon

native of Siam and Java 3 the bastard cardamom of Siam A. wxanthioides: the Bengal cardamom, which is the fruit of A. aromaticum ; the Java cardamom, produced by A. maximum ; the N epal cardamom, and the Korarima

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cardamom of East Africa, the last two not being yet botanically described. Cardamoms generally are possessed of pleasant aromatic odour, and an

agreeable Spicy taste, On account of their favour and stimulant properties they are much used with other medicines, and they forma prin- cipal ingredient in curries and compounded spices. In the North of Europe they are much used as a spice and flavour. ing material for cakes and liqueurs; and they are ve extensively employed in the East for chewing with betel, dc, CARDAN (or, in the Italian form of the name, CARDANO), GrrotamMo (1501-1576), famous as a mathematician, a physician, and an astrologer, born at Pavia, September 24, 1501, was the illegitimate son of Fazio Cardano, a learned jurist of Milan, himself distinguished by a taste for mathe- matics, After a sickly childhood and a stormy boyhood, during which he received a very irregular education, he was sent to the university of Pavia, and subsequently to that of Padua, where he graduated in medicine, He was, however, excluded from the College of Physicians at Milan on account of his illegitimate birth, and his first endeavours to establish himself in practice had so little success that he and hig young wife were at one time compelled to take refuge in the workhouse. It is not surprising that his first book should have been an exposure of the fallacies of the faculty. A fortunate cure of the child of the Milanese senator Sfon- drato now brought him into notice, and the interest of his patron procured him admission into the medical body, About this time (1539) he obtained additional celebrity by the publication of his Practice of Arithmetic, a work of great merit for the time, which indirectly led to his renown as a mathematician by engaging him in a correspondence with Nicolo Tartaglia, an ingenious calculator who had discovered an important improvement in the method of cubic equations. This discovery Tartaglia had kept to himself, but he was ultimately induced to communicate it to Cardan under a solemn promise that it should never be divulged. Cardan observed this promise in publishing his arithmetic, but when, several years afterwards, the isolated rule of Tartaglia had developed itself in his mind into a principle capable of transforming algebraical science, he thought himself justified in disclosing it as the ground- work of his own comprehensive treatise on algebra, which appeared at Nuremberg in 1545. This memorable volume marks an era in the history of mathematics, being the first in which the principle of cubic equations was fully ex- plained, and the first example of the application of alge- braical reasoning to geometrical problems. Its publication naturally involved Cardan in a violent controversy with Tartaglia, and it must be admitted that his conduct cannot be strictly justified, notwithstanding his

ample acknow- ledgment of his obligations to his original instructor. Two years previously he had published a wotk even more highly regarded by his contemporaries, his celebrated treatise on astrology. This will hardly be enumerated in our day among his titles to fame, but it would be exceedingly unjust to regard it as a proof of superstition or weakness of mind. As a believer in astrology Cardan was on a level with the best minds of his age; the distinc- tion consisted in the comparatively cautious spirit of his inquiries and his disposition to confirm hig assertions by an appeal to facts, or what he believed to be such, “A very considerable part of his treatise is based upon observations carefully collected by himself, and, it must in candour be owned, seemingly well calculated to support his theory so far as they extend. If the testimony is nevertheless quite inadequate to its purpose, it must in fairness be considered that the proposition of the influence of the heavenly bodies on human affairs appeared to Cardan’s contemporaries almost a truism. Trom this point of view it may be understood that the book should have been intended by

the author as a contribution to natural science, and should be almost entirely free from the superstitious whims and hallucinations which, while leaving his faculties as a thinker and a natural philosopher almost unaffected, fre- quently misled him in the affairs of practical life. Nume- rous instances of his belief in dreams and omens may be collected from his writings, and he especially valued him- self on being one of the five or six celebrated men to whom, as to Socrates, had been vouchsafed the assistance of a guardian demon.

Cardan’s authorship may have interferedwith his medical practice, and he himself ingenuously confesses that he and his family were mainly supported during a considerable part of this period by the complaisance of a Milanese patrician, who allowed him to win of him at play. The sudden loss of this resource reduced him fora time to penury, from which he was extricated by receiving the appointment of professor of medicine at Pavia. The publication of his works on algebra and astrology at this juncture gave him a European renown, and procured him flattering offers from Pope Paul III and the king of Denmark, both of which he declined. In 1551 his reputa-

tion was crowned by the publication of his great work De Subtilitate Rerum, which, crude and fanciful as it may now appear, in his own age embodied the soundest physical learning of the time and simultaneously represented its most advanced spirit of speculation. It was followed some years later by a similar treatise De Varietate Rerum, the two making in effect but one book. A great portion of this is occupied by endeavours, commonly futile, to explain ordinary natural phenomena, but its chief interest for us consists in the hints and glimpses it affords of principles beyond the full comprehension of the writer himself, and which the world was then by no means ready to entertain. The inorganic realm of Nature he asserts to be animated no less than the organic; all creation is progressive development; all animals were origin- ally worms; the inferior metals must be regardel as conatus nature towards the production of gold. The indefinite variability of species is implied in the remark that Nature is seldom content with a single variation from a

.customary type. The oviparous habits of birds are explained by their tendency to favour the perpetuation of the species, precisely in the manner of modern naturalists. Animals were not created for the use of man, but exist for their own sakes. The origin of life depends upon cosmic laws, which Cardan naturally connects with his favourite study of astrology. The physical divergencies of mankind arise from the effects of climate, and the variety of human circum- stances in general. Cardan's views on the dissimilarity of languages are much more philosophical than usual at his time ; and his treatise altogether, though weak in particular details, is strong in its pervading sense of the unity and omnipotence of natural law, which renders it in some degree an adumbration of the course of science since the author's day. It was attacked by J. C. Scaliger, whom Cardan refuted without difficulty. .

The celebrity which Cardan had acquired led in the same year (1551) to one of the most interesting episodes of his life, his journey to Scotland as the medical adviser of Archbishop Hamilton of St Andrews. The archbishop was supposed to be suffering from consumption, a complaint which Cardan, under a false impression, as he frankly admits, had represented himself as competent to cure. Failing to meet his patient at Lyons as had been arranged, he was induced to continue his journey to Scotland. He was of

great service to the archbishop, whose complaint proved to be asthmatical ; but the principal interest attaching to his expedition is derived from his account of the disputes of the medical faculty at Paris, and of the court of Edward

VI. of England, particulars which he had an opportunity of observing in going and returning. The Parisian doctors were disturbed by the heresies of Vesalius, who was beginning to introduce anatomical study from the human subject. Cardan's liberality of temper led him to sympathize with the innovator. His account of Edward VI.'s disposition and understanding is extremely favourable, and is entitled to credit as that of a competent observer without bias towards either side of the religious question. He cast the king's nativity, and indulged in a number of predictions which were effectually confuted by the royal youth's death in the following year. His impressions of England seem to have been very pleasant.

Cardan had now attained the summit of his prosperity, and the rest of his life was little but a series of disasters. His principal misfortunes arose from the crimes and calamities of his sons, one of whoni was an utter reprobate, while the tragic fate of the other overwhelmed the father with anguish. This son, Giovanni Battista, also a physi- cian, had contracted an imprudent marriage with a girl of indifferent character, Brandonia Seroni, who subsequently proved unfaithful to him. The injured husband revenged himself in the Italian fashion with poison; the deed was detected, and the exceptional severity of the punishment seems to justify Cardan in attributing it to the rancour of his medical rivals, with whom he had never at any time been on good terms. He exerted himself greatly as his son's advocate, but to no purpose. The blow all but crushed him; his reputation and his practice waned ; he addicted himself to gaming, a vice to which he had always been prone; his mind became unhinged, and filled with distempered imaginations. He was ultimately banished from Milan on some accusation not specified, and although the decree was ultimately rescinded, he found it advisable to accept a professorship at Bologna (1563), While resid- ing there in nioderate comfort, and mainly occupied with the composition of supplements to his former works, he was suddenly arrested

on a charge not stated, but in all pro- bability heresy. Though he had always been careful to keep on terms with the Church, the bent of his mind had been palpably towards free thought, and the circumstance had probably attracted the attention of Pius V., who then ruled the Church in the spirit, as he had formerly exercised the functions, of an inquisitor. Through the intercession, as would appear, of some influential cardinals, Cardan was released, but was deprived of his professorship, prohibited from teaching and publishing any further, and removed to Rome, where he spent his remaining years in receipt of a pension from the Pope. It seems to have been urged in his favour that his intellect had been disturbed by grief for the loss of his son,—an assertion to which his frequent hallucinations lent some countenance, though the existence of any serious derangement is disproved by the lucidity and coherence of his last writings. He occupied his time at Rome in the composition of his commentaries De Vita Propria, which, along with a companion treatise De Libris Proprius, is our principal authority for his biography. Though he had burned much, he left behind him more than a hundred MSS., not twenty of which have been printed. He died on September 20, 1576.

Alike intellectually and morally, Cardan is one of the most interesting personages connected with the revival of science in Europe. He had no especial bent towards any scientific pursuit, but appears as the man of versatile ability, delighting in research for its own sake, and capable of prosecuting it to great lengths by dint of perseverance and sagacity. He possessed the true scientific spirit in perfection ; nothing, he tells us, among the king of France’s treasures appeared to him so worthy of admira- tion as @ certain natural curiosity which he took for the

horn of a unicorn. It has been injurious to his fame to have been compelled to labour, partly in fields of research where no important discovery was then attainable, partly in those where his discoveries could only serve as the step- ping-stones to others, by which they were inevitably eclipsed. His medical career serves as an illustration of the former case, and his mathematical of the latter. His medical knowledge was wholly empirical ; restrained by the authority of Galen, and debarred from the practice of

auatomy, nothing more could be expected than that he should stumble on some fortunate nostrums. Asa mathe- matician, on the other hand, he eftected most important advances in science, but such as merely paved the way for discoveries which have obscured his own. From his astro- logy no results could be expected ; but even here the scien- tific character of his mind is displayed in his common sense treatment of what usually passed for a mystical and occult study. His prognostications are as strictly empirical as his prescriptions, and rest quite as much upon the observa- tions which he supposed himself to have made in his practice. As frequently is the case with men incapable of rightly ordering their own lives, he is full of wisdom and sound advice for others; his ethical precepts and practical rules are frequently excellent. To complete the catalogue of his accomplishments, he is no contemptible poet.

The work of Cardan's, however, which retains most interest for this generation is his autobiography, De Vita Propria. In its clearness and frankness of self-revelation this book stands almost alone among records of its class. It may be compared with the autobiography of another celebrated Italian of the age, Benvenuto Cellini, but is much more free from vanity and sclf-consciousness, unless the extreme candour with which Cardan reveals his own errors is to bé regarded as vanity in a more subtle form. The general impression is highly favourable to the writer, whose impetuosity and fits of reckless dissipation appear as mere exaggerations of the warmth of heart which imparted such strength to his domestic affections, and in the region of science imparted that passionate devotion to research which could alone have enabled him to persevere so reso- lutely, and effect such marked advances in such mnuulti- farious fields of inquiry.

Cardan's autobiography has been most ably condensed, and at the same time supplemented by information from the general body of his writings and other sources, by Professor Henry Morley (Jerome Cardan, 1854, 2 vols.). His capital treatises De Subtilitate and De Varietate Rerwm are combined and fully analyzed in vol. ii. of Rixner and Siber's Leben wnd Lehrmeinungen beriihmter Physiker am Ende des xvi. und am Anfange des xvii. Jahrhwnderts (Sulz- bach, 1820). Cardan's works were edited in ten volumes by Sponius (Lyons, 1663). A biography was prefixed by Gabriel

Naudé,whose unreasonable depreciation has unduly lowered Cardan's character with posterity. (R. G.)

CARDENAS, a maritime town of the island of Cuba, capital of a district in the western department, is situated 105 miles E. of Havana, on a bay of the northern coast, and has railway communication with Matanzas and Mont-alvo. There is good anchorage in the harbour, and a number of long wharves stretch out from the shore. The most important article of export is the sugar from the neighbouring district,—of which, in 1873, 13,096 tons were sent to Europe, and 69,364 to America. Though only founded in 1828, Cardenas had in 1861 12,910 inhabitants ; and at present, in spite of the troubled condition of the island, the number is calculated at about 11,000, of whoin 7700 are whites, 2800 slaves, and the rest free negroes. In 1850 the town was plundered by general Lopez.

CARDIFF (the "Caer," or castle on the Taff), a muni- cipal and parliamentary borough in the county of Qla- morgan, 170 miles from London by the Great Western Railway, in 51° 28'. lat. and 3°10' W. long. This town is

the chief emporium of the coal and iron trade of South Wales, and is remarkable for its rapid progress and development. The population of the parliamentary borough, by the census of 1871, was 56,911 and since that date it has largely increased. There is a striking contrast of dirty narrow thoroughfares and the wide streets of new houses now opening up in the modern quarter of the town. Historically, Cardiff is well known, but the castle reniains and the old church of St John and its noble pinnacled tower are almost the only remnants of antiquity, The ancient walls and gates, Blackfriars and Greyfriars, have been swept away, and the old church of St Mary, finer than any local churches that succeeded was washed

| | ___ Seale of Mile Soa ee

Plan of Cardiff.

away by the sea. The Arthurian legend of the Sparrow- hawk refers to Cardiff. Its position between the rivers Taff and Rhymney, and also between the mountains and the sea, marked it out, probably for the Romans, certainly for the Normans, as a fortified station, In the year 1108 Henry I. having taken prisoner his brother Robert duke of Normandy, imprisoned him in Cardiff Castle for twenty- six years until his death in 1134. Contrary to the pre- valent tradition he was most probably treated with kind- ness, and perinitted at times to change his abode.' In the time of the Civil War Charles I. came to Cardiff, and the castle was alternately occupied by Royalists and Parlia- mentarians. There was severe fighting at St Fagan's in the neighbourhood. In 1661 we find the Cardiff authorities complaining of being ruined by the competition of the neighbouring town of Caerphilly, but Caerphilly Castle is ruined and the town decayed, while Cardiff has greatly flourished. The local histories are full of the succession of different owners of the castle until the lordship of Glamorgan passed by marriage to the Butefamily. The castle occupies

a quadrangular space, and was probably once surrounded by earthworks, except towards the river. The area within the walls was 10 acres, within the counterscarp of the inoat 13 acres. The mound within the great enclosures has the remains of the keep, or the White Tower, On the town or south side of the court are the Black or Curthose tower, the scene of Duke Robert's imprisonment, and the gateway. The castle was once of enormous strength, and so constructed to resist the incursions of the Welsh. The Lodgings or habitable part are now undergoing extensive demolition and reconstruction. Under the advice of "Capability Brown" the whole structure was modernized, and many precious remaius swept away. A thorough re- storation is now in progress under the care of Mr Burgess. The new clock tower is a gorgeous example of most thorough ornamentation. On the side of the Taff, opposite to the castle grounds, are the Sophia Gardens, given to the town by the late marchioness of Bute.

There is a great deal of activity and public spirit in Cardiff. The gas, sanitary, and water arrangements arc excellent. There are both public library and infirmary, and plans for new and enlarged buildings for both institutions

are in progress. The exports of Cardiff are almost entirely coal and iron; the imports, insignificant in comparison, are inainly iron ore, esparto fibre for papér-making, timber, and corn.

At the commencement of the present ceutury Cardiff possessed a population which scarcely amounted to 1000, and was not even called a port. It was simply designated as a “creek” attached to the great port of Bristol. The peculiar resources of the district were not unknown or neglected, and it is interesting to notice the first rudimentary steps in their development. Coal was brought down from the hills and valleys on the backs of mules. The burdens were laid down at a primitive quay, where vessels of smal] tonnage awaited them to carry the cargo to Bristol or other ports, The iron was transported in waggons of 2 tons, and to avoid delays from frost, snow, and storms, the minerals, as much as possible, were brought down in the summer and stocked for the winter. Inthe American War guus made by contract were brought down to the primitive quay which long retained the name of Cannon Wharf. ‘The first stage in the progress of the town was marked by the construction of the Glamorganshire Caual from Merthyr Tydvil to the sea. It dropped from lock to lock some 500 feet in the course of its 25 mile journey to a certain seapond capable of holding vessels of 200 tons burden. The dock had only been formed a few ycars when the second marquis of Bute came into possession of his Welsh property. He held some 25,000 acres of the Glamorganshire hills, teeming with mineral treasures, and between Cardiff and the shore line he owned a tract of marshy wastc. It is to the Bute family that Cardiff is mainly indebted for its prosperity. Lord Bute contemplated the construction of large docks, and in the course of twenty years he made great progress with his plans, staking, it is said, the whole of his fortune on the result.

In 1830 the first bill was obtained for the construction of a dock, which has been truly termed the “ cradle” of Cardiff. The waters of the Taff were partially divarted as a “feeder” for an artificial stream. There was considerable difficulty in connecting the dock, which was considerably above low-water mark with the waters of the channel, but these were overcome by Sir William Cubitt. In 1839 the west dock was opened with great rejoicings. It became evident that additional accommodation would soon be required. The lucrative Taff Vale Railway had been fornied, incessantly pouring the

mineral treasures of the hills into the harbour of Cardiff, and the western side of the dock was ceded to their use. This company also

promoted a dock under the headland of Penarth. Later, the Rhymney Railway was constructed, and gave additional development to the coal trade. The great marquis, the second founder of Cardiff, who died somewhat suddenly in 1848, provided that the contingency of his death should not disturbhis schemes. He left his estatesin trust, nominally for fifteen hundred years, for carrying out his design for making Cardiff a great seaport. The trustees during the twenty years' minority of his successor achieved great works. It was resolved in 1851 that the east dock should be commenced. The demand for accommodation increased so rapidly that the plan of the dock was repeatedly enlarged. This second dock covers 45 acres; the width is partly 300, and partly 500 feet ; the total length is 4300 feet, the width of the sealock is 55 feet; the length between the gates is 220 feet. In 1864 further schemes of enlargement were brought forward. In 1868 a low-water pier was opened by Lord Bute on his coming of age. In 1874 a south basin was opened ; its area is twelve acres, and the iron-wrought gates have a larger superficial area than any similar works in existence. The new basin acts as a dock, and in some degree relieves the pressure for accommodation until the contemplated additional dock is' constructed. The scene on the wharves is very stirring. There is a network of railways about the docks, giving direct communication to every part of the kingdom. 'The railways bring the minerals from the mouths of the pits; there are enormous staiths, hydraulic lifts being often used for shipping the coals, and steam-cranes to discharge the enormous ballast of arriving ships. What Cardiff needs for its full development is an import trade, in the place of the ballast, but attempts in this way have not hitherto been very successful, and the New York line of steamers has been given up. Cardiff remains the greatest entrepdt for the smokeless coal which has been found the best for steamers in all the navies of the world, and in export ranks next to Newcastle. The docks owe all their importance to the minerals on the hills, and the means of transit that have been devised from the hills to the shore. The expenditnre on the docks, including the new works, will be from two to three millions ; the expen- diture on railways is about the same, and the capital invested in

the collierics is about twenty-five millions. The business of the port, though subject to fluctuations, steadily increases. In 1839 the amount of iron shipped at the port was 1200 tons, and of coal 4562. In 1848 the shipments of iron had advanced to 70,805 tons, and those of coal to 615,111 tons. In 1870, however, the weight of iron loaded at Cardiff amounted to 315,649 tons, and that of coal and patent fuel, which in the meantime had become an article of export, to 2,177,518 tons. The amount of coal exported in 1871 was 2,979,843 tons, and in 1872, 3,557,246 tons.

The villages in the neighbourhood of Cardiff,—Roath. Maindu, Canton, Llandaff,—are now its suburbs and nearly absorbed in the town. Of these the most interesting is Llandaff, a kind of minor Clifton to Cardiff. The remark- able cathedral, the seat of the earlicst English bishopric, gives the tiniest city in Britain its title. It is a little old-world village on the outskirts of Cardiff, with the Coplestone cross, the remains of the bishop's fortified palace, superseded by a modern country-house and a group of neat ecclesiastical buildings. For more than a hundred years the cathedral was left to neglect and decay. The aisles were roofless, grass grew in the nave, the ivy came through the windows, and storms were increasingly laying © waste the edifice. At the expense of many thousand pounds a satisfactory restoration was effected, and a re- opening took place in 1869. The cathedral is nobly situated near the Taff, where it is broad and wooded, and almost entirely screened by the ridges. (Fr. A.)

CARDIGAN, County or, or CARDIGANSHIRE, a mari- time county in South Wales, is bounded on the N. by Merioneth, on the E. by Montgomery, Radnor, and Brecon, on the 8. by Carmarthen and Pembroke, and on the W. by the Irish Sea. Its greatest length from south to north is about 30 miles, and its greatest breadth from east to west about 40 miles ; but these dimensions give a very imperfect idea of its size, as it almost exactly repre- sents in figure a "half-boot," the line of the sole being from east to west, with the toe at the extreme west. It possesses an area of 693 square miles, or 443,387 acres, and is, therefore, the fifth in size of the Welsh counties,

The whole area of this county is occupied by the lower Silurian geological formation. It does not, therefore, possess mines of coal, or iron, or

limestone ; but, as if to compensate for this want, it is the richest of all the Welsh counties in its metalliferous lodes. Its lead mines have long been famous ; and it was from the profits of his min- ing speculations, carried on chiefly in this county, that the celebrated Sir Hugh Myddelton was enabled to carry out his gigantic project for supplying London with water, by means of the New River. The Lisburne, Goginan, Cwm Ystwith, and other mines still yield largely, and have been sources of great profit to the adventurers. Some of the lead raised is very rich in silver ; and in the 17th century the quantity of silver obtained was so considerable, that, by virtue of letters-patent, a mint existed for coining it on the spot.

Cardiganshire is exceedingly wild and mountainous ; but the mountains generally have little of grandeur in their character, Plinlimmon itself, in spite of its height, being singularly deficient in boldness of outline. There is a considerable tract of flat land lying along the sea coast, especially towards the south-west, the general aspect. of which is so dreary and desolate, that it has been called, and with good reason, the desert of Wales. In that district it is almost possible to travel 30 miles in a straight line without seeing a house, or a road, or a human being. The principal mountains are Plinlimmon, just within the county boundary on the north-east, rising to the height of 2469 feet, and Tregaron mountain, near Tregaron, in the south-east, 1778 feet in height. Few of the others exceed 1000 feet in elevation. ,

The vale of Teifi presents views of great beauty and interest, especially as it approaches the sea. The valleys of the Aeron, the Ystwith, and the Rheidol, also present Scenes of great beauty, especially the last, in which is the famous Devil’s Bridge, with the falls of the Rheidol, one of the most celebrated pieces of Welsh scenery.

The county abounds in lakes and rivers. The chief of the latter is the Teifi, which rises in a lake of the same name (Llyn Teifi), about 8 miles north-east of Tregaron ; flowing through the centre of the county, in a south-west direction, till it reaches Lampeter, it becomes from that point the county boundary, separating it from Carmarthen and Pembroke, and, after a course of about 50 miles from its source, falls into the sea at Cardigan. The Aeron takes its rise in some lakes in a low range of hills called Myuydd Bach, and first flowing in a southerly direction and afterwards nearly west, falls into the sea at Aber. aeron. The Ystwith and Rheidol both rise in Plinlimmon, and flowing west, cross the county, falling into the sea at Aberystwith ; and the Towy forms the county boundary, separating it from Brecknockshire on the south-east,

_ Cardiganshire has been called the lake county of Wales an appellation which it well deserves. The most important are Llyn Teifi, Llyn Fyrddyn Fawr, Llyn Egnant, Llyn Gynon, and Llyn Eiddwen; but hardly any of. them exceeds three-quarters of a mile in length. They abound in trout, and are now a good deal resorted to by anglers,

Lisburne (Liberal).

CARDIGAN

The climate on the coast is mild and salubrious, but suffers from an excess of rain. The climate of the hill country is cold, wet, and bleak. The cultivated crops con- sist of wheat, oats, barley, turnips, and potatoes; and ip the lower districts on the coast, especially in the neighbour- hood of Aberaeron, Llanrhystyd, and Cardigan, good crops are raised ; and at the last-named, as well as at Lampeter, great improvements are now being effected, by means of the Government Drainage Bill, in draining and improving several large estates. In 1873 there were 2038 holdings of anacre and upwards, and 1278 of less size,—the average extent being 118 acres, while that of all Wales is 742 acres, seven holdings exceeded 5000 acres, and none extended to 50,000 acres. It is calculated that one-half of the lands are enclosed, The hill district is entirely occupied with wild heathy pastures, which are stocked with the small mountain sheep of the country, and with herds of ponies and cattle, which are annually drafted off by dealers to be

fattened in the more fertile districts of Wales or England, Cardiganshire has long been famous for its breed of horses, and for these high prices are obtained from English dealers, who now visit the farms in considerable numbers.

The following tables show the acreage of particular crops, and the numbers of live stock in the years 1872 and 1875 :—

Oats. Barley. Wheat. ce ab i UST 2.eae oleae 25,849 8430 14,739 40,505

1875…. 30,540 24,366 8459 13,653 37,991

Horses. Cattle, Sheep, Pigs. Si eneeenepe 11,762 56,565 203,619 23,739 TB(0.sc

Black cattle, sheep, pigs, butter, barley, oats, woollen manufactures, slates, and lead and lead ore form the prin- cipal articles of export.

The railways within the county are the Cambrian, by means of which access is given to Aberystwith from all parts of the kingdom, and a line through Tregaron and Lampeter, and by way of Pencader to Carmarthen. At present the county town is without any railway commu- nication.

The principal towns are—Cardigan, Aberaeron (at which, in consequence of its central situation, the county sessions are held), Aberystwith, Llanbadarn Fawr, Tregaron, Lam- peter, and Adpar,—which last is the name given to the portion of Newcastle Emlyn on the Cardigan side of the Teifi. The county, which contains 97 parishes, is in the diocese of St David's; and at Lampeter there is a college for the education'of the Welsh clergy. It returns one member to Parliament, and has done so since 1536, The political influence is divided between the families of Powell of Nant-Eos (Conservative) and Pryse of Gogerddan, Pryse of Peithyll, Lloyd of Coedmore, and the earl of Constituency in 1875, 4563. The annual value of real property paying income tax is £256,078.

The population of the county by the census of 1871 was 73,441, giving an average of 105-2 persons to a square mile, or 6°3 acres to each person. Of the total number 33,396 were males, and 40,045 females, showing an

unusual disproportion of the sexes, in the great excess of females. This may be perhaps accounted for by the emigration of men to the mining districts, especially Glamorganshire, where the excess of males would just balance the deficiency in Cardigan, Carmarthen, and Pembroke. The number of inhabited houses in 1871 was 16,420, uninhabited 741, aud building 76,—giving an average of 23-6 inhabited houses to a square mile, and 4‘4 persons to each house. The following table gives the census returns for the last

fifty years :— ISA cones 57,784 TSS ee cae 70,796 i Sy lea ecceenoce: 64,780 SOM Re sanincss od 72,245 ASA ineete 68,766 TSH Bees Seek 73,441

GO Aoi bY) G AN

The women may often be seen dressed in the picturesque costume of Wales, and having their heads surmounted by the high-crowned broad-brimmed hat. Many curious customs and superstitions still survive. On the occasion of a marriage, a “ bidder” goes from house to house inviting the inmates to the wedding. It is expected that all the guests are to bring presents of money and provisions. The inarriage always takes place on a Saturday ; but the guests assemble on Friday with their presents. All these are set down on paper, that tepayment may be made if demanded; but this seldom happens. The furnishing of the bride is also brought home on thisday. On Saturday ten or twenty of the man’s friends who are best mounted go to demand the bride. She is placed on a horse, behind her father, who rides off as fast as he can. He is soon, however, over- taken. Presents continue to be received on Saturday and Sunday, and on Monday they are sold, and sometimes with the money received realize £50 or £60.

There are numerous British and Roman antiquities in the county, consisting of cromlechs, tumuli, camps, and stations, and also the remains of a Roman road (the Sarn Helen) about four miles from Tregaron, and the Roman town Loventiwm at Llanio.

The castles of Aberystwith, Cardigan, and Newcastle Emlyn are interesting ruins, and the remains of Strata Florida Abbey are among the most beautiful of the eccle- siastical antiquities of South Wales. The church of Llan-

badarn Fawr (ouce the seat of a bishopric) is a fine example of a severe type of Early English architecture, and the collegiate church of Llanddewi Brefi marks the site of the synod in which, according to the legend, St David confuted the Pelagians.

The early history of the district is obscure, but at the time of the Roman invasion it was tenanted by the Demet, a Celtic tribe, within whose limits was comprised the greater portion of the south-west of Wales, Mingled with it, though living at perpetual variance, was a Gaelic popu- lation (drawn, probably, from Ireland), which in the 6th century had got the upper hand, and in turn was subdued by the sons of Cunedda, who came as liberators from North Britain. One of these sons was Caredig, who con- quered and gave the name to the province of Caredigion, which was nearly co-extensive with the present county of Cardigan. In the 8th century it formed part of the dominion of Sitsylt (from whom it received the name of Seissyltwg), and was hotly disputed by the descendants of his sons and daughter. Ultimately it fell to the latter, and at the close of the 11th century had been reduced to sub- mission to the Norman sway, from which, in spite of short- lived successes, it never escaped.

Cardigan was one of the counties involved in the singular disturbances known as the Rebecca riots.

CARDIGAN, a market town and municipal and _parlia- mentary borough of England, the capital of the county of the same name, is situated on the south-east of Cardigan Bay, about 36 miles by rail from Carmarthen, at the mouth of the Teifi, which there divides the county from Pembrokeshire. The houses are mostly constructed of slate rock, and the streets are narrow, steep, and irregular. The principal structures are the church of St Mary’s, a fine and spacious edifice of considerable antiquity, the county jail, erected in 1793, the national school dating from 1848, and a large block of buildings which includes a town hall, an exchange, a grammar school, a public library, and various markets. Besides being the commercial centre of a pretty extensive district, Cardigan engages in the coasting trade and the fisheries, and exports slates, oats, barley, and butter. Its harbour is unfortunately obstructed by a bar, so that the entrance is dangerous for vessels of more than 300 tons burden, except at high spring tides, when it is

passable for vessels drawing 15 to 18 feet of water. The imports in 1874 were valued at £3035, the exports at £52. The borough, in conjunction with Aberystwith, Lampeter, and Adpar, has returned one member to Parliament since 1836; and in 1874 the district had a constituency of 1981. The population in 1871 was 3461 in the municipal borough, and 4939 in the parliamentary, which is partly in Pembrokeshire.

Cardigan, called by the Welsh Aberteifi, from its position at the

‘mouth of the river, first rose into importance about the time of the

Norman conquest. In 1136 the English army, under Randolph, earl of Chester, suffered a severe defeat in the neighbourhood at the hands of the Welsh. The town was fortified by Rhys ap Gryffydd, prince of South Wales, to whom was also ascribed the foundation of the ‘castle, which is still represented by a few ruins near the bridge. His grandson Maelgwn razed the castle to the ground, and ravaged the town; but the effects of his vengeance were not long after repaired, and the castle continued to be a post of some import- ance down to the Parliamentary wars, when it was held for a while by the Royalist forces. In the neighbourhood there was, before the Reformation, a small priory of Benedictine monks, which, as a private dwelling in the 17th century, obtained some celebrity as the residence of Orinda (Catherine Philips), the friend of Jeremy Taylor. About a mile and a half distant was the more important priory of St Dogmael ; and about thrce miles up the river are the ruins of Cilgerran Castle.

CARDIGAN, James Tuomas BRUDENELL, SEVENTH EARL oF (1797-1868), and Baron Brudenell in the peerage of England, lieutenant-general, was the eldest surviving son of the sixth earl, and was born at Hambledon in Hamp- shire, October 16, 1797. He studied for several terms at Christ Church, Oxford; and in 1818 entered Parliament as member for the borough of Marlborough under the patronage of Lord Ailesbury. He entered the army in 1824 as cornet in the 8th Hussars, and was promoted in 1832 to be lieutenant-colonel in the 15th Hussars. With this regiment he made himself one of the most unpopular of commanding officers. He gave the reins to his natural overbearing and quarrelsome teniper, treating his men with

excessive rigour and indulging in unscrupulous licenti- ousness. Within two years he held 105 courts-martial, and made more than 700 arrests, although the actual strength of his regiment was only 350 men. In consequence of one of his numerous personal quarrels, he left the regiment in 1834; but two years later, at the urgent entreaty of his father, he was reinstated in the army, and appointed to the command of the 11th Hussars. He played the same part as before, and was censured for it; but he was allowed to retain his post, and the discipline and equipment of his regiment, in which he took great pride, received high commendation from the duke of Wellington. He suc- ceeded to the peerage on the death of his father in August 1837. In September 1840 Lord Cardigan fought a duel, on Wimbledon Common, with Captain ‘uckett, an officer of his regiment. The latter was wounded, and Lord Cardigan was tried before the House of Lords on a charge of feloniously shooting his adversary. But the trial was a mere sham, and on a trivial technical ground he was acquitted. In 1854, at the outbreak of the Crimean War, the earl of Cardigan was appointed to the command of the light cavalry brigade, with the rank of major-general, and he spent a very large sum in the purchase of horses and on the equipment of his regiment. He took a prominent part in the early actions of the campaign, and displayed throughout the greatest personal courage and the greatest recklessness in exposing his men. The feat which made his name famous was the charge of his brigade, numbering 600 men, on a body of Russian heavy cavalry 3600 in number at the battle of Balaclava (October 25, 1854). . He forced his way through the enemy, but half his men and horses were left dead on the field. The charge, celebrated by Tennyson in his well-known lyric, has been the subject of much controversy,—some critics having an eye

only to the splendid daring and unquestioning obedience to orders, and others seeing only a foolhardy and unjustifi- able throwing away of valuable lives. At the close of the war the earl was created K.O.B., and was appointed inspector-general of cavalry, and this post he held till 1860. In 1859 he was promoted colonel of the 5th Dragoon Guards, but was transferred in the following year to the command of his former regiment, the 11th Hussars. He attained the rank of lieutenant-general in 1861. He was twice married, in 1826 and in 1858, but had no children. On his death,

which took place at Deene Park, Northamptonshire, on the 28th of March 1868, the titles passed to his relative, the marquis of Ailes- bury.

CARDINAL, the name of the highest dignity in the Roman Catholic hierarchy. Very varying statements are found in the ecclesiastical historians respecting the origin of the name, the period at which it was first used, and the persons to whom it was applied in the earliest time of its use. This uncertainty is easily explained by the fact that both the thing and the name were at no time appointed aud created, but grew up by successive and mainly abusive encroachments legitimatized by usance, and from time to time more formally by Papal briefs and bulls. There can be little doubt that the word was originally applied to priests in the same sense in which it was and is applied to other things, as synonymous with " principal," that on which a thing hinges (cardo, a hinge).! The other ideas which have been put forward,—as that the priests so termed attended the pontiff when celebrating mass, standing at the corners (cardines) of the altar, that cardinal priests were those refugees from persecution who were received and " incardinated " into the clerical body of churches more happily cireumstanced, and some others—may be deemed the fanciful inventions of later writers in search of originality. What priests those were, who in fact or by privilege used this title in the earliest ages of the church, is a much larger and more debatable question, on which scores of volumes have been written. If, however, a guide is to be chosen, no safer can be found than Bingham,? who says, when pointing out that archpresbyters were by no means the same thing as cardinal presbyters, that the use of the term cardinal cannot be found in any genuine writer before the time of Gregory the Great (ft 604). For, says he, the Roman Council, on which alone Bellarmine relies to prove the word to have had a greater antiquity, is a mere figment. Tor the authorities for an earlier use of the term, such as they are, the reader may consult Gaetano Moroni's Dinonario at the word Cardinal. As regards the term "genuine" in Bingham's statement, it may be mentioned that both Baronius and Bellarmine regard the council said to have been held at Rome by Sylvester I. in 324 as genuine. Van Espen, on the other hand, considers it to be apocryphal. Further, in alluding to the origin of the name, Bingham notices the opinion of Bellarmine that the word was first applied to certain principal churches, and remarks that others have supposed that those among the priests in populous cities who were

chosen from among the rest to be a council for the bishop were first called cardinals. And Stillingfleet? says,—“When afterwards are ee ee

1 Pope Eugenius IV. writing in 1431, says. ‘* Ag the door of a house turns upon its hinges, so the See of the Universal Apostolical Church rests and is supported on this institution.” Cave, in his article on Anastasius, the Roman librarian (Scr, Eccl., vol. ii. p. 56, col. ii.) quotes the words of Pope Leo (about 848) respecting him—‘‘ Presbyter cardinis nostrs quem nos in titulo B. Marcelli Mart. atque Pont. ordinavimus ;” that is to say, continues Cave, that that Church was specially entrusted to him, that he might continually be busied in the care of it, tanguam janua in cardine suo,

2 Eccl. Antig., bk. ii. ch. 19, sec. 18.

3 Trenicon, pt. ii. ch. 6,

these titlest were much increased, those presbyters that were placed in the ancient titles, which were the chief among them, were called Cardinales Presbyteri, which were looked on as the chief of the clergy, and therefore were the chief members of the council of presbyters to the bishop.” Stillingfleet appears, however, to have been think- ing exclusively of Rome. Various other churches in France, Italy, Germany, and Spain—as Bourges, Metz, Ravenna, Fermo, Salerno, Naples, Cologne, Compostella, &c.,—claimed the title of cardinal for their canons as by privilege, in most cases probably usurped and _ not grauted. But the name appears gradually to have been understood to appertain only to those whom the pope specially created cardinals. And at last, in 1567, Pope Pius V. definitively decreed that none should assume the title of cardinal save those created such by the Roman pontiff, and the word from that time to this has been exclusively so applicd.

If the origin and early use of the term cardinal is obscure, Sacred cok the institution of a collegiate body consisting of cardinals lege.

and of none other is yet more so. There seem to be traces of such a conception in the life of Leo III. (t+ 816) written by Anastasius the librarian. And Moroni cites many passages from various authors and

documents between the above date and 1100, with a view of slowing that, at all events, by the end of that time the body of cardinals was recognized as a collegiate corporation. Put his citations seem to prove rather the reverse. Nor do we reach solid ground in this respect till we come to the bull " Postquam "> of Sixtus V. (3d December 1585) which finally regulates the composition of the Sagro Collegio. By this instrument seventy is fixed as the maximum number of the sacred college "after the example of the seventy elders appointed by God as counsellors of Moses." Nor has the number ever been exceeded since that tine, though it is expressly laid down by the authorities on the subject, that no canonical disability exists to prevent the pope from cxceeding that number should he see fit to do so, By the same bull '' Postquam," it is also provided that the seventy of the Sacred College should consist of six cardinal bishops, fifty cardinal priests, and fourteen cardinal deacons. 'The six cardinal bishops are the bishops of the sees lying immediately around Rome. The fifty cardinal priests take their '" titles" from the principal churches in Rome, but are many of them bishops or archbishops of distant sees, and four must be by regulation members (usually the " generals") of the monastic orders. The fourteen deacons take their titles from the ' deaconries" established in the earliest ages of the Church for the assist- ance and protection of the widows and orphans of the faithful. It may be added here that Sixtus V., by the above-mentioned bull, decrees that if any person created a cardinal be not in deacon's orders, he must receive them within the year. But "dispensations," by virtue of which the dignity has been held for many years by men not even in deacons' orders, have been common. If any cardinal should be in such a position at the time of the Pope's death, he cannot enter conclave or participate in the election, unless by immediately qualifying himself by taking orders.

As the institution of cardinals was entirely arbitrary and Number

an abuse, so, despite the shadow of an attempt to find or make a raison détre for their existence in the assignment of such dignities to certain special sees and churches in and

4 I.e., those principal incumbencies which from the earliest ages of the Church of Romie had been so called,—a use of the word of which a curious survival may be traced in the common phrase ''a title to holy orders."

5 See, however, Cave, Seript. Eccl. Mist. Itt., vol. ii. p. 124, who says that abcut the middle of the 11th century they were enrolled (asciti sunt), in an Apostolic College.

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around Rome, their connection with those churches very soon became purely nominal and formal ; and everything connected with the selection of them depended wholly on the will of the pontiff. Not so, as will be seen presently, their prerogatives when they had been created. And the limits, which might be supposed to have bounded the field from which the Pope could select the objects of his favour, became constantly enlarged. A few only of the many instances of creatious illustrating this fact which are on record can be here mentioned. Clement VI., in 1348, created his nephew Peter Roger cardinal when he was seventeen. Sixtns IV., in 1477, created John of Aragon cardinal at the age of fourteen, and at the same time his nephew Raffaelle Riario who was seventeen. Innocent VIII. (+ 1492) created Giovanni de' Medici, afterwards Leo X., cardinal at fourteen, his eminence having been Apostolic Protonotary ever since he was seven ! Ippolite d'Este had been an archbishop for the last nine years, when Alexander VI. created him cardinal in his seventeenth year. Alfred of Portugal was made cardinal by Leo X. when he was seven years old, on condition, however, that he should not assune the outward insignia of the dignity till he should be fourteen. 'The same pontiff made John of Lorraine cardinal at twenty, Alexander VI. having previously made him coadjutor of the bishop of Metz at four years old. Clement VII. made Odet di Coligny cardinal at twelve. Paul ILL Farnese (+ 1549), created his nephew Alexander Farnese cardinal at fourteen ; his grandson Guido Ascanio Sforza, the son of his daughter Costanza, at sixteen ; his cousin Niccolé Gaetani at twelve; his relative Giulio Feltre della Rovere, at eleven; and a second grandson, Ranuccio Farnese, at fifteen, having made him archbishop of Naples the year before. Paul also created Charles of Lorraine, brother of Mary Qneen of Scots, cardinal at twenty-two, although he had a brother in the Sacred College at the time, which is contrary to the constitutions and the decree of one of the Pope's predecessors. But this is only one out of a hundred facts which demonstrate the futility of the attempt to bind the hands of one infallible autocrat by the rules enacted by his predecessors.

Sixtus V. (+ 1590), a great reformer of abuses, made his nephew Alexander Peretti cardinal at fourteen. Paul V. (+ 1621) created Maurice of Savoy cardinal at fourteen, Carlo de' Medici at nineteen, and Ferdinand of Austria at ten. Clement XII. (t 1740) made Luigi di Borbone archbishop of Toledo and cardinal at the age of eight. And, lastly, Pius VII. (t+ 1823) created a second Luigi di Borbone, the son of the above-mentioned archbishop of Toledo, cardinal at twenty-three. The list of such creations might be much extended. Previously to the publication of the bull " Postquam " by Sixtus V. the number of the Sacred College was extremely variable. John XXII., requested in 1331 to make two French cardinals, replied that there were only twenty cardinals' hats, that seventeen of these were already French, and that he could, therefore, only make one more. At the death of Clement VI. (1352) the cardinals determined that their number should not exceed twenty. Urban VI. (t+ 1389) created a great number ; and we find the college making representations to Pius II. (+ 1464) to the effect that the dignity of the purple was diminished by such excess. Sixtus IV. (t 1484), how- ever, multiplied the number of his creations to an unexampled extent; and Alexander VI. (t 1503) exceeded him. Leo X. created thirty-one cardinals at one batch, leaving at his death sixty-five, a number unpre- cedented up to that time. Paul IIL, however, created seventy-one. But Paul IV. (+ 1559) issued the bull called ' Compactum," by which it was decreed that the number of cardinals should never exceed forty. His immediate successor, however, Pins IV. (t 1565) raised

the number to forty-six. In 1590 came the final settle- nent at seventy by Sixtus V., as has been said.

Many volumes have been written on the different forms used by the popes in the creation of cardinals in different ages, and many more still larger treatises ex professo on the strictly ecclesiastical, as well as what may be more properly called the social, portions of the accustomed ceremonial. But it must suffice here to characterize very generally the differences which have prevailed from age to age in the first respect, and to say but a few words on the second head.

The general tendency of the changes which have taken place in the methods used for the creation of cardinals may be very shortly stated. They have been such as indicate the steadily increasing absolutism of the pontiffs. A proclamation to the congregation including an invitation to any person to state any ground of objection known to him soon gave place to a real consultation of the college by the Pope, and a real assent on the part of the cardinals to the proposed new nominations, which in its turn dwindled off ata very early period to a mere form of asking and receiving consent. In the earlier centuries the crea- tions almost always took place on the first Wednesday of the Quattro T'empora,! and generally in the Basilica of Santa Maria Maggiore. There, after the Jntroit and collect of the Mass had been said, a reader ascended the pulpit and proclaimed the intended creation of such and such persons, ending with an invitation precisely similar to that used in our churches in the publication of banns of marriage, and a real inquiry followed the statement of any objector. At a later period the Pope asked of the cardinals assembled in secret consistory whether in their opinion there should be a creation of cardinals, and of how many? And a deputation was sent to the residence of any cardinals who might be ill to bring back their replies to the same questions. Then, satisfactory answers having been obtained from at least the majority, the Pope said " Portetur nuda cathedra." The chair was brought, and placed at his right hand. Thereupon all the cardinals rose, and stood ranged against the wall at a distance out of earshot of the Papal throne. The dean of the Sacred College placed himself in the empty chair, and the Pope told him in a low voice whom he purposed to create, add- ing "Quid vobis videtur?" One by one all present were similarly interrogated, and then the Pope said aloud, " Deo gratias habemus de personis creandis concordiam omniwm fratrum," or "quasi omnium," or " majoris partis," as the case might be. And then the pontiff at once pro- claimed the new dignitaries :—" Auctoritate Det Ommnipo- tentis, Sanctorum Apostolorum Petri et Pali, et nostru creamus Sanctce Romane Ecclesice Cardinales Presbyteros quidem. ..N.N…. Diaconos vero… N.N cum dispensationibus, derogationibus, et clausulrs Mecessarres et opportunis." He then thrice made the sign of the cross, saying as he did so, "J nomie Patris, de., Amen," and the consistory was at an end.

In later times the proclamation having been made in consistory by the simple announcement, “‘ Zabemus fratres ” so and so, the act of conferring the dignity with its insignia on the new recipients was performed at the Papal palace, and was accompanied by a mass of minutely ordered ceremonial which rendered it one of the most pompous and gorgeous scenic performances of the Roman Church and court. It would need many pages to describe the form and order of the ceremony, the intricacies of which no one was ever expected to remember or understand save the professional masters of the ceremonies, whose business it is to have mastered the science. And a description of it

1 The Quattro Tempora were the fasts with whieh each quarter of the year commenced. V.

-—— 13

Manner and cere- monial

of creation.

Cardinals in Petto.

Shutting and open- ing of the new Car- dinal’s mouth,

would serve no purpose, save that of causing amazement at the overgrown mass of frivolity which the constant tendency to extinguish significance under heaps of material forms and show, has led the old men who compose the Roman court to accumulate.

The social portion, as it may be called, of the ceremonial attendant on the creation of a cardinal, in which the city and all the inhabitants are concerned, is as pompous, and as much regulated by a whole code of traditional uses and customs, as the more purelyecclesiastical part of the business. The making of presents and payment of fees to persons of all sorts of conditions, from the high and reverend officials of the Curia to the cardinal’s Jackeys, makes a great part of it. And the amount of all these

payments is minutely regulated. Great illuminations! take place in the city, and especially on the fagade of the new dignitary's palace. Bands of music parade the city, and are specially stationed before the residences of the foreign ministers. The new cardinal opens his palace for a great full-dress reception, where all who have a decent coat, and specially all strangers, are welcomed. These are great and noted occasions for the display of the diamonds and toilettes of the Roman patrician ladies. *

Before quitting the subject of the method of creating cardinals, the custom of reserving cardinals ‘‘ a Pectore" must be briefly noticed. Various causes occasionally arose to lead a pontiff to deem it undesirable to declare to the world the person whom it was his purpose to create a cardinal. Martin V. (+ 1431) was the first who thus secretly created cardinals. But the practice then and subsequently differed essentially from that which the ever- increasing despotism of the popes brought it to under Paul ITI. and thenceforward. Martin and his successors, till Paul IIT. took the members of the college into their con- fidence, only strictly enjoining them not to divulge the fact that such and such persons were in fact cardinals. He died leaving four cardinals thus unpublished, having taken the oaths of the other cardinals that they would in case of his death recognize them. Notwithstanding their oaths, however, they refused when the Pope died to do so. And the popes have never been able to secure the admission to the college of those whose creation has been left by their deaths in this inchoate state. Sometimes the college has recognized them, and admitted them to the conclave; sometimes the succeeding Pope has re-created them out of respect for the wishes of his predecessor. Sometimes they have altogether lost the promotion intended for them. The change which Paul IIT. introduced consisted in confining the secret of the unpublished nominations to his own breast, keeping it "in pectore." His practice was, and that of his successors has been, to add to the form of proclamation in consistory, " Alios duos (or more or less) ¢ pectore reservamus arbitrio nostro quandocumque declarandos."

Before quitting the subject of ceremonial, a word or two may be said of the singular practice of closing and subse- quently opening the mouth of a newly created cardinal. Like almost everything else connected with the subject this form had once a real significance, but has become a mere meaningless formality. Some reasonable time was originally allowed to

elapse before the pontiff in one consistory formally pronounced the mouth to be opened which he had declared to be closed in a previous con- sistory. Now the form of opening is pronounced within a few minutes of the form of closing. As may be readily understood the cardinal whose mouth was closed could not speak or vote in any assembly of the cardinals, but only

1 It is to be understood that all this applies to the state of things before the Italian Government took possession of Rome. The Church now considers herself to be under eclipse, and all exterior pomp and magnificence are suppressed.

hear. When it has occurred that a cardinal has been left at the death of a Pope with closed mouth, the college have usually empowered one of their number to open the mouth of the cardinal so circumstanced. But it is a great mistake to suppose, as many have imagined, that a car- dinal, whose mouth remained closed, was ineligible to the Papal throne. For not only any such cardinal, but any person whatever, clerk or lay, not being an avowed heretig, and not labouring under any canonical impediment to holy orders, is perfectly eligible as pope.

The chief of the insignia of a cardinal’s dignity is the Insign, scarlet hat,—the original significance of which was, we are 2nd tit,

told, to remind the wearer that he was to be at all times ready to shed his blood in martyrdom for the faith. At an early period it became, and has since continued to be, a huge unwearable construction of silk and hanging tassels, such as may be seen suspended from the roofs of cathe- drals over the tombs of cardinals. So much is the hat the main mark of a cardinal’s dignity, that ‘‘ to receive the hat” is in common parlance equivalent to being made a cardinal. The canonical vestments of a cardinal are scarlet,? and in the city and in their homes the hems and such like of their coats, and also their stockings, are of the same colour,—in Italian parlance “purple.” Hence, “to aspire to the purple,” “to receive the purple,” is also equivalent to being a candi- date for or being made a cardinal. Their Eminences also wear a scarlet “beretta,” a four-cornered cap of the shape well known in pictures and engravings, and a scarlet “berettina,” or skull-cap. Until the

time of Urban VIII. the cardinals were styled “ Illustrissimi;” but that pope decreed that they should for the future be called “ Emi- nentissimi,” and addressed as “your Eminence.”

It remains to add a few words on the privilege of a Cardinals cardinal as an elector of the pontiff; and though the 28 Papal

subject is a large one, a very few words will suffice, because the treatment of it falls more properly and conveniently under other headings. In perfect consistency with every other portion of the history of the institution, the right and privilege of the cardinals to elect the Pope is an abuse, and has been attained by a long series of encroachments. which have gradually eliminated the originally democratic constitution of the Church. The popes were at first chosen by the whole body of the faithful; then by the whole body of the clergy ; then by the cardinals with the consent of the clergy, and, ultimately, absolutely and exclusively by the cardinals. That the mode of election has passed through these phases is certain; but the chro- nological details of the changes are extremely obscure. The methods pursued in the election belong to another place. And this article may be concluded by a statement of the fact, often misapprehended, that the right of a cardinal to enter conclave with his brethren and vote for the new Pope is indefeasible ; and he is not to be deprived of it by any declaration of the late Pope or deposition by him, or by any amount of unworthiness, however patent. Cases are on record in which popes have sought by every means in their power to prevent certain cardinals from taking part in the election that would follow their death, and some in which monstrous crimes have rendered such ex- clusion reasonable and right in every point of view. But in every such case the college has overruled the provisions of the deceased pontiff, and admitted theacknowledged member of their body to take part in the election. (fA. te CARDONA (perhaps the ancient Udura), a fortified town of Spain, in the province of Catalonia, about 55 miles N.W. of Barcelona, in 41° 57’ N. lat. and 1° 37’ E. long. It occupies the summit of a hill near the banks of the

2 Save in the case of members of the monastic orders, whose dress,

soley in form to the others, is in colour that enjoined by their special rule,

de plusieurs devises, pour porter devers le Seigneur Roi, pour son ébatement, cinquante-six sols parisis.” this entry it has hastily been concluded that Jacquemin

Cardonera, a branch of the Llobregat, and from the strength of its position has been able to bid defiance to repeated attacks. Besides its citadel and ramparts, it possesses the ruins of the palace of Ramon Folch, the church of San Vicente, and the church in which the famous Catalonian saint Ramon Nonato expired. It is still more celebrated, however, for the extensive deposit of rock salt in its vicinity, which forms a mountain mass about 500 feet high in the head of a valley, covered by a thick bed of a reddish brown clay, and apparently resting on a yellowish grey sandstone. ‘The salt is generally more or less translu- cent, but large masses of it are quite transparent ; and pieces cut from it are worked by artists in Cardona into images, crucifixes, and many articles of an ornamental kind. Population about 3000.

CARDS, Prayine (xdprys, paper, probably, as Chatto thinks, syuare paper), rectangular pieces of pasteboard, used atgames. The invention of playing cards has been attributed to various nations. In the Chinese dictionary, Ching-tsze- tung (1678), it is said that cards were invented in the reign of Séun-ho, 1120 a.p., for the amusement of his numerous concubines, ‘There is a tradition that cards have existed in India from time immemorial, and that they were invented by the Brahmans. A pack of cards, said to be a thousand years old, is preserved in the museum of the Royal Asiatic Society ; but modern critics are of opinion that these cards are of recent date. The invention of cards has also been assigned to the Egyptians, but apparently on no better authority than the belief that the representations on tarots may be so interpreted as to con- nect them with Egyptian philosophy. To the Arabs, Germans, Spaniards, and French have also been ascribed the invention of cards, but on grounds of varying feebleness.

There are numerous singular resemblances between the ancient game of chess (chatwranga, the four angas or members of an army) and cards (see “ Essay on the Indian Game of Chess,” by Sir William Jones, Aszatic Researches, vol. ii.), from which it has been conjectured, with some show

of reason, that cards were suggested by chess. The presumption, then, is in favour of the Asiatic origin of cards.

The time and mauner of the introduction of cards into Europe are also moot points. The 38th canon of the council of Worcester (1240) is often quoted as evidence of cards having been known in England in the middle of the 13th century; but the games “de rege et regina” there mentioned were a kind of mumming exhibition (Strutt says chess, No queen is found in the earliest European cards.

In the wardrobe accounts of Edward I. (1278), Walter Stourton is paid 8s, 5d. “ad opus regis ad ludendum ad quatuor reges.” This passage has been translated to mean cards; but as chess was known in the Hast by a term signifying the four kings (chaturajz), it 1s now believed that this entry relates to chess. If cards were known in Europe in 1278, it is very remarkable that Petrarch, in his dialogue which treats of gaming, never mentions them ; and that though Boccaccio and Chaucer and contemporary writers notice various games, there is not a single passage in any one of them that can be fairly construed to refer to cards. Passages are quoted from various works, of or relative to this period, but modern research leads to the belief that in every instance the word rendered “cards ” has either been mistranslated or interpolated.

The earliest unquestionable mention of a distinct series of playing cards is the well-known entry of Charles or Charbot Poupart, treasurer of the household of Charles VL of France, in his book of accounts for 1392 or 1393. It runs thus—“ Donné & Jacquemin Gringonneur, peintre, pour trois jeux de cartes, & or et & diverses couleurs, ornés

From

Gringonneur (it is not certain whether Gringonneur was

the painter’s surname, or only his designation as a maker of grangons) invented cards ; but the payment is clearly

for painting, not for inventing them.

The safe conclusion with regard to the introduction of cards is that, though they may possibly have been known to a few persons in Europe about the middle of the 14th century, they did not come into general use until the end of the century, and that whence they were brought has not yet been ascertained. But if the testi- mony of Covelluzzo can be relied on, cards were introduced into Italy from Arabia in the year 1379. Covelluzzo, who wrote in the 15th century, gives as his authority the chronicle of one of his ancestors. His words are—“ Anno 1379, fu recato in Viterbo el gioco delle carte, che venne de Seracinia, e chiamisi tra loro naib.” (In the year 1379 was brought into Viterbo the game of cards, which comes from the country of the Saracens, and is with them called naib. See “ Istoria della Crtta di Viterbo,” Feliciano Bussi, Roma, 1743.)

Soon after the date of Poupart’s entry, cards it would seem became common; for in an edict of the provost of Paris, 1397, working people are forbidden to play at tennis, bowls, dice, cards, or nine-pins on working days. From the omission of cards in an ordonnance of Charles V. (1369), forbidding certain games, it may reasonably be concluded that cards became popular in France between 1369 and the end of the century.

It does not follow that because the earliest positive mention of a series of cards is French, they were not previously known in other parts of Europe. It seems more likely, if their Eastern origin is accepted, that they travelled quickly through Europe to France. Early in the 15th century, card-making had become a regular trade in Germany, whence cards were sent in small casks to other countries. Cards were also manufactured in Italy at least as early as 1425, and in England before 1463 ; for by an Act of Parliament of 3 Edw. IV. the importation of playing cards is forbidden, in consequence, it is said, of the complaints of manufacturers that importation obstructed their business. No cards of undoubted English manufac- ture have been discovered of so early a date ; and there is reason to believe, notwithstanding the Act of Edward I. that our chief supplies came from France or the Nether- lands, In the reign of Elizabeth the importation of cards was a monopoly; but from the time of James I. most of the cards used

in this country were of home manufacture. In the reign of James I. a duty was first levied on cards ; since when they have always been taxed.

It has been much disputed whether the earliest cards were printed from wood blocks. Thisis a question of some importance, as, if answered in the affirmative, it would ap- pear that the art of wood engraving, which led to that of printing, may have been developed through the demand for the multiplication of implements of play. The belief that the early card-makers or card-painters of Ulm, Nurem- berg, and Augsburg, from about 1418-1450, were also wood-engravers, is founded on the assumption that the cards of that period were printed from wood-blocks. It is, however, clear that the earliest cards were executed by hand, like those designed for Charles VI. Many of the earliest woodcuts were coloured by means of a stencil, so it would seem that at the time wood-engrav- ing was first introduced, the art of depicting and colour- ing figures by means of stencil plates was well known. There are no playing cards engraved on wood to which s0 early a date as-1423 (that of the earliest dated wood-en-

graving generally accepted) can be fairly assigned; and as at this period there were professional card-makers estab- lished in Germany, it is probable that wood-engraving was employed to produce cuts for sacred subjects before it was applied to cards, and that there were hand-painted and stencilled cards before there were wood-engravings of saints. The German Briefmaler or card-painter probably progressed into the wood-engraver; but there is no proof that the earliest wood-engravers were the card-makers.

It is undecided whether the earliest cards were of the kind now common, called newmeral cards, or whether they were tarocchi or tarots, which are still used in some parts of France, Germany, and Italy, but the probability is that the tarots were the earlier. A pack of tarots consists of seventy-eight cards, four suits of numeral cards and twenty- two emblematic cards, called atutti or atouts. Each suit consists of fourteen cards, ten of which are the pip cards, and four court (or more properly coaé cards), viz., king, queen, chevalier, and valet. The atouts are numbered from 1 to 21; the unnumbered card, called the fou, has no positive value, but augments that of the other

atouts. (See Académie des Jeux, Corbet, Paris, 1814, for an account of the mode of playing tarocchino or tarots.)

The marks of the suits on the earliest cards (German) are hearts, bells, leaves, and acorns. No ace has been discovered corresponding to the earliest known pack, but other packs of about the same date have aces, and it seems unlikely that the suits commenced with the deuces.,

Next in antiquity to the marks mentioned are swords, batons, cups, and money. ‘These are the most common on Italian cards of the late 15th century, and are now used both in Italy and in Spain. French cards of the 16th century bear the marks now generally used in France and England, viz., coeur, trefle, pique, and carreau.

The French tréfle, though so named from its resem- blance to the trefoil leaf, was in all probability copied from the acorn; and the pique similarly from the leaf (grtin) of the German suits, while its name is derived from the sword of the Italian suits. It is not derived from its resemblance to a pike head, as commonly supposed. In England the French marks are used, and are named— hearts, clubs (corresponding to tréfle, the French symbol being joined to the Italian name, bastoni), spades (corre- sponding to the French pique, but having the Italian name, spade [dissyl.]), and diamonds. This confusion of names and symbols is accounted for by Chatto thus—“If cards were actually known in Italy and Spain in the latter part of the 14th century, it is not unlikely that the game was introduced into this country by some of the English soldiers who had served, under the banners of Hawkwood and other free captains, in the wars of Italy and Spain. However this may be, it seems certain that the earliest cards commonly used in this country were of the same kind, with respect to the marks of the suits, as those used in Italy and Spain.”

About the last quarter of the 15th century, packs with animals, flowers, and human figures, for marks of the suits, were engraved upon copper ; and later, numerous variations appeared, dictated by the caprice of individual card-makers ‘ but they never came into general use.

The court cards of the early packs were king, chevalier, aud knave. The Italians were probably the first to sub- stitute a queen for the chevalier, who

in French cards is altogether superseded by the queen. The court cards of French packs received fanciful names, which varied from time to time.

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CARDUCCI, Barrotommeo (1560-1610), better known as CarpucHo, the Spanish corruption of his Italian patronymic, was born in Florence, where he studied architecture and sculpture under Ammanati, and painting under Zucchero, The latter master he accompanied to Madrid, where he painted the ceiling of the Escorial Library, assisting also in the production of the frescos that adorn the cloisters of that famous palace. He was a great favourite with Philip JIL, and lived and died in Spain, where most of his works are to be found. The most celebrated of them is a Descent from the Cross, in the church of San Felipe el Real, in Madrid.

CARDUCCI, or Carpucuo, Vincenzo (1568-1638), was born in Florence, and was trained as a painter by his brother Bartolommeo, whom he followed to Madrid. He worked a great deal for Philip IIL. and Philip IV., and his best pictures are those he executed for the former monarch as

decorations in the Pardo Gallery. Examples of him are preserved at Toledo, at Valladolid, at Segovia, and at several other Spanish cities. For many years he laboured in Madrid as a teacher of his art, and from his atelier issued Giovanni Ricci, Pedro Obregon, Vela, Collantes, and other distinguished representatives of the Spanish school during the 17th century. He was also author of a treatise, or dialogue, De las Lxcelencias de la Pintura, which was published in 1633.

CARDWELL, Epwarp (1787-1861), a learned divine and ecclesiastical historian, was born at Blackburn in Lancashire in 1787. He was educated at Brasenose College, Oxford, where, in 1809, he took his degree of B.A. as first class in classics and second class in mathematics, and becaine a fellow of his college. He took his master's degree in 1812. After being for several years engaged as tutor and lecturer he was appointed, in 1814, one of the examiners to the university. In 1826 he was chosen Camden Professor of Ancient History; and during his five years' professorship he published an edition of the Hilacs of Aristotle with selected notes for the use of students, and a course of his lectures on The Coinage of the Greeks and Romans. In 1831 he took his decree of D.D., and was called to the post of principal of St Alban's Hall, which he held till his death. He published in 1837 a student's edition of the Greek Testament, with the text divided into paragraphs, and furnished with various readings and notes, and accompanied page for page by the English authorized version. In the same year appeared his edition of the Greek and Latin texts of the History of the Jewish War, by Josephus, with illustrative notes. But his most important labours were in the field of English Church History. He projected an extensive work, which was to embrace the entire synodical history of the church in England, and was to be founded on Wilkins's Concilia. Of this work he executed some portions only. The first published of these was Documentary Annals of the Reformed Church of England from 1546 to 1716, which appeared in 1839 and soon reached a second edition. It was followed by a History of Conferences, &c., connected with the Kevision of the Book of Common Prayer from 1550 to 1690 (1840), which reached a third edition within ten years. In 1848 appeared Synodalia, a Collection of Articles

of Religion, Canons, and Proceedings of Convocation from 1547 to 1717, completing the series for that period. Closely connected with these works in the Reformatio Legum Ecclesiasticarwum (1850), which treats of the changes proposed and attempted in the direction of reform during the reigns of Henry VIII., Edward VI., and Elizabeth. As a supplement to the foregoing, Dr Cardwell published in 1854 a new edition of Bishop Gibson's Synodus Anglicana. Dr Cardwell, as one of the best men of business in the university, held various important posts, among which were those of delegate of the press, curator of the university galleries, manager of the Bible department of the press, and private secretary to successive chancellors of the university. He died at Oxford, 23d May, 1861.

CAREW, Grores (died about 1613), second son of Sir Wymond Carew of Antony, was educated at Oxford, entered the Inns of Court, and passed some years in Continental travel. At the recommendation of Queen Elizabeth, who conferred on him the honour of knighthood, he was appointed secretary to Sir Christopher Hatton, and afterwards, having been promoted to a mastership in chancery, was sent as ambassador to the king of Poland. In the reign of James he was employed in negotiating the treaty of union with Scotland, and for several years was ambassador to the Court of France. On his return he wrote a Relateon of the State of France, with sketches of the leading persons at the court of Henry IV. It is written in the classical style of the Elizabethan age, and was appended by Dr Birch to his Historical View of the Negotiations between the Courts of England, France, and Brussels, from 1592 to 1617. Much of the information regarding Poland contained in De Thou's History of His Own Times was furnished by Carew.

CAREW, Gzorce (1557-1629), Earl of Totness, and Baron Carew of Clopton, Warwickshire, was born in 1557. After completing his studies at Oxford, he joined the army, and held an important command in the Irish wars against the Earl of Desmond and the rebels. He was successively appointed governor of Askeaton castle, lieutenant-general of artillery, and, after the successful expedition to Cadiz (1596), lord-president of Munster, treasurer to the army, and ultimately one of the lords judges of Ireland. When he entered on his duties, the whole country was in open rebellion ; but by a prudent and vigorous policy, backed by his own intrepidity in the field, he soon reduced the rebels to submission. His greatest exploit was the

capture of Dunboy castle, a success which disappointed the Spanish allies, and in reality pnt an end to the war. For his services in Ireland he was made governor of Guernsey, and was raised to the peerage. He was afterwards made privy- councillor to James I., and died at London in 1629. Carew wrote an account of the wars in Ireland in a book called Hibernia Pacata, published after his death; and made several collections for the history of Henry V., which were afterwards digested into Speed's History of Great Britain. Some of his letters have been printed by the Cam- den Society, 1860.

CAREW, Ricuarp (1555-1620), author of the Survey of Cornwall, was born in 1555. At an early age he became a distinguished student of Christ Church, Oxford, and when, only fourteen was chosen to dispute extemporaneously with Sir Philip Sidney, in presence of the earls of Leicester and Warwick and other noblemen. From Oxford he removed to the Middle Temple, where he spent three years, and then went abroad. On his return he was appointed sheriff of Cornwall, and published his Survey of the county, a work which enjoyed a high reputation, and has been several times reprinted. His other works are entitled—TZhe Hxamination of Men's Wits, a translation

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from the Italian, part of which is said to have been executed by his father; Zhe True and Ready Way to learn the Latin Tongue, a tract included in Hartlib's book on the same subject; and A Z'ranslation of the jirst Five Cantos of Tasso's Gerusalemme. He died in 1620.

CAREW, Taomas (1589-1639), an English poet, was born about the year 1589. He studied at Oxford, and on the completion of his course was made gentleman of the privy chamber to Charles I. At court he was highly esteemed for the vivacity of his wit and the elegance of his manners; and his poetical tastes gained him the friendship of Ben Jonson, Sir William Davenant, and other celebrated literary men. He wrote several sonnets,

amorous pieces, and masques, which were set to music by Henry Lawes and other eminent masters. Most of his smaller pieces are distinguished by pecnliar swect>“.» and gracefulness, by light gaiety, and by feticicons expression. They are generally occasional puems, vers de société, addressed to ladies, and ars sometimes exquisite of their kind. His longest and best known work is a masque called Calum Britannicum, performed by the king and several of the nobles at Whitehall on Shrove Tuesday, 1633. Parts in this masqve were taken by Lord Brackley and his brother, who acted in the following year in Milton’s Comus. The Calum is founded on the Spaccio della Bestia of BruNo (g.v.), and is a work of very considerable poetic merit. Some of the introductory verses remind strongly of Milton. Carew died in the prime of life about the year 1639. The best edition of his works is that of W. C. Hazlitt.

CAREY, Henry (died 1743), a humorous poet and musi- cal composer, was an illegitimate son of George Savile, Marquis of Halifax, and was born towards the end of the 17th century. He studied music under Lennert, Roseingrave, and Geminiani, but never attained to excel- lence in the higher departments of composition, His ballads and songs, however, were exceedingly popular at the time. He wrote several dramatic pieces for Covent Garden theatre, among which may be mentioned a burlesque tragedy called Chrononhotonthologos (1734); an operetta called the Honest Yorkshireman; two interludes, called Nancy and Thomas and Sally ; and two burlesque operas, called The Dragon of Wantley (1737) and Margery, or the Dragoness. His songs were collected and published by himself in a work called The Musical Century (1740); and one of them, Sally in our Alley, the most graceful and natural of English lyrics, is yet popular. His dramatic works were published in 1743. Carey died at an ad- vanced age the same year. It has often been said that he put an end to his own life, but the story had no good foundation.

CAREY, Wit11ay, D.D. (1761-1834), a Baptist mission- ary and Oriental scholar, was born at Paulerspury, North- amptonshire, in 1761. When a youth he worked with his father, who was a shoemaker; tut before he was twenty years of age he joined the Baptists, and devoted a large portion of his time to village preaching. In 1787 he became pastor of a Baptist congregation in Leicester, and five years after was chosen by a Baptist

missionary association to proceed to India as their missionary. On reaching Bengal, Carey and his companions lost all their property in the Hugli; but having received the charge of an indigo factory at Malda, he was soon able to pro- secute the work of translating the Bible into Bengali. In 1799 he quitted Malda for Serampore, where he established a church, a school, and a printing press for the publica- tion of the Scriptures and philological works. In 1801 Carey was appointed professor of Oriental languages in a college founded at Fort-William by the Marquis of Wellesley. From this time to his death he devoted himself to the preparation of numerous philological works,

consisting of grammars and dictionaries in the Mahratta, Sanskrit, Punjabi, Telinga, Bengali, and Bhotanta dialects. The Sanskrit dictionary was unfortunately destroyed by a fire which broke out in the printing establishment. rom the Serampore press there issued no fewer than twenty-four different translations of the Scriptures, all edited by Dr Carey. He died in 1834.

CARGILL, Doxatp (1610-1681), one of the leaders of the Covenanters, was born in 1610. He was educated at St Andrews, and afterwards attached himself to the Protesters. After his appointment to one of the churches in Glasgow, he made himself obnoxious to Government by his open resistance to their measures. Compelled to remain at a distance from his charge, he ventured back to celebrate the communion, and was arrested, but was liberated at the instance of some of his private friends. He was afterwards wounded at the battle of Bothwell Bridge, and fled to Holland, where he remained a few months. On his return he joined Richard Cameron in publishing the Sanquhar declaration, and boldly excom- municated the king and his officials. He was soon after- wards apprehended, and brought to Edinburgh, where he was beheaded on the 27th July 1681.

CARIA, a maritime province of Asia Minor, forming the south-western angle of the whole peninsula. It was bounded on the N. by Ionia and Lydia, on the W. and 8. by the Aigean Sea, and on the E. by Lycia and a small part of Phrygia. Its limit to the north was the river Meander, except near the mouth, where its cities of Mile- tus and Myus, with their territories, though on the south side of the Meander, were included in Ionia. Its precise eastern limit is not so clearly fixed, but may be considered as an arbitrary line drawn from the Meander a little east of Antiochia to the lofty mountain mass of Mount Cadmus (Baba-dagh), and thence along the great ridge of Salbacum (Boz-dagh) in a direction nearly south to the sea, where the promontory on the west of the Gulf of Macri constitutes the limit between it and Lycia. The coast-line of Caria is very peculiar, being wholly formed by a succession of great promontories advancing far out into the sea, and alternating with deep inlets or gulfs, running far up into the mainland. The largest and most important of these, known as the Ceramic Gulf or Gulf of Cos, extends inland for fully 70 miles, between the great mountain promontory terminating at Myndus on the north, and that which extends to Cnidus and the remarkable head- land of Cape Krio on the south. North of this is found the deep bay called in ancient times the Gulf of Jasus (now known as the Gulf of Mendeliyah), and beyond this again was the deeper inlet which formerly extended inland between Miletus and Priene, but of which the outer part has been entirely filled up by the alluvial deposits of the Meander, while the innermost arm, called in ancient times the Latmic Gulf, is thus converted into a lake. South of Cape Krio again is the gulf known as the Gulf of Doris, with several minor arms and subordinate inlets, bounded on the south by a mountainous and rugged promontory called by the ancients Cynossema (now Cape Alupo) and erroneously regarded by them as forming the §.W. angle of Asia Minor. Between this headland and the frontier of Lycia is the deep and sheltered bay of Marmarice, noted in modern times as one of the finest harbours in the Medi- terranean.

Almost the whole of Caria has more or less of a mountain character. The two great mountain masses of Cadmus (Baba-dagh) and Salbacum (Boz-dagh), which are in fact portions of the great chain of Taurus (see Asta Minor) form as it were the nucleus to which the whole physical framework of the country is attached. From these lofty ranges there extends a broad table-land in many parts

retaining a height of more than 3000 feet, while it sends down offshoots or arms of a rugged and mountainous character, on the north towards the valley of the Meander, and on the west towards the Aigean. None of these ranges, however, attain a height of more than 4000 feet, with the exception of Mount Latmus, of which the highest summit, now known as Besh Parmak, rises to about 4500 feet.

This deeply indented coast is accompanied, as in most simi- lar cases, by numerous islands, in some instances separated only by narrow straits from the mainland. Of these the most celebrated are the two great islands of Rhodes and Cos. But besides these there are Syme, Telos, Nisyros, Calymnos, Leros, and Patmos, all of which have been inhabited, both in ancient and modern times, and some of which contain excellent harbours. Of these Nisyros alone is of volcanic origin; the others belong to the same lime- stone formation with the rocky headlands of the coast, of which they are in fact mere detached portions.

Like most of the provinces of Asia Minor, Caria was not merely a territorial division, but an ethnographical dis- trict, and the Carians are spoken of by all ancient writers as a distinct nation from their neighbours, the Lydians, Phrygians, and Lycians. But their origin and early history is very uncertain. According to a tradition generally adopted by the Greeks, they were originally called Leleges, and inhabited the islands of the Aigean, where they were subject to Minos, king of Crete, and formed the strength of his navy ; and it was not till they were driven out of the islands by the Greeks that they settled on the mainland. It is much more probable that they were originally estab- lished on the continent, and from thence extended their power over the islands of the Aigean. That they were in very early times a powerful and warlikepeople, distinguished for their maritime skill and enterprise, may be considered as clearly proved, and was indeed a natural result of the peculiar configuration of their coasts. But at the period when we first obtain definite historical information concern- ing them, they had not only been expelled from the Cyclades and outlying islands of the Augean, but had been driven back into the interior, from the coasts and islands of their own country, which had been occupied by Greeks of Dorian

race, who had formed a Hexapolis or league of six cities, including three on the island of Rhodes, together with Cos, and Cnidus and Halicarnassus on the mainland. Besides these principal settlements the Greeks gradually colonized the whole of the coast region, which was hence sometimes designated by the name of Doris. But the Carians always maintained themselves in the interior of the country, and continued to be recognized as a distinct race, like the Lydians and Phrygians. Some writers indeed are inclined to believe that the people called Zeybeks or Xebeks, who occupy the inland mountain districts of Caria, and are distinguished from their neighbours by certain peculiarities, are lineal descendants of the ancient Carians.

Caria passed with little resistance under the Persian yoke, but afterwards joined in the Ionic revolt, and fought hard against the Persian generals before it again submitted. From this time till its conquest by Alexander, it continued to be subject to Persia, but under princes or rulers of its own, who resided at Halicarnassus, and were strongly im- bued with the principles of Greek civilization (see Hatt- CARNASSUS). The last of these native princes was named Pixodarus, and after his death the throne was usurped by a Persian named Orontobates, who offered a vigorous resist- ance to Alexander the Great. But after the capture of the capital, Halicarnassus, which sustained a long siege, the rest of Caria was quickly subdued. Alexander at first bestowed it npon Ada, a princess of the native dynasty, but it was soon incorporated with the Macedonian kingdom by his successors, and in common with the adjoining dis-

tricts of Asia Minor passed successively under the Syrian kings and those of Pergamus. It was united with the Roman empire after the extinction of the latter dynasty, and became a part of the Roman province of Asia. From this period it has no separate history of its own, and in common with the rest of Asia Minor became a part of the monarchy, first of the Seljukian and afterwards of the Ottoman Turks.

The principal cities of Caria in ancient times were Cnidus and Halicarnassus on the sea-coast, and Alabanda, Mylasa, and Stratonicea in the interior. At the present day, Budrum, which occupies the site of

Halicarnassus, is still a place of some importance ; while the two most considerable towns in the interior are Melassa (the ancient Mylasa) and Mughla,in the centre of the high inland plateau. The portions of the province adjoining the valley of the Meander are fertile, and produce excellent figs and raisins ; while the mountains near the sea-coast are for the most part clothed with forests, which render the scenery of the district among the most beautiful in Asia Minor. (£.4.B.)

CARIACO, or San Feuipe pE AUSTRIA, a town on the north coast of Venezuela, in the state of Cumana, situated at the east end of the gulf to which it gives its name, in 10° 27’ 45” N. lat. and 63° 13’ 21” W. long. The surrounding district produces cotton of the finest quality. Population about 7000.

CARIBBEAN SEA, that part of the Atlantic Ocean lying between the coasts of Central and South America and the islands of Cuba, Hayti, and Porto Rico, and the Leeward and Windward Islands.

CARIBBEE ISLANDS, in its more extended sense, is a name applied to the whole of the West Indies ; but strictly, it only comprehends that cluster of islands stretching from Porto Rico to the coast of South America, and known as the Leeward and Windward Islands, See Wust Inpuzs.

CARIBS (in German Karazben), a people of Red Indian race, which, at the time of the discovery of America by Columbus, was the most important along the northern coast of the southern continent, and in a number of the – islands of what is still known as the Caribbean Sea. They were a strongly built, warlike, and aggressive people, and offered a pertinacious resistance to the advances of the Europeans, before whose arrival they had rendered them- selves an object of terror to the other inhabitants of the region. They appear to have been addicted to canni- balism, and the very word cannibal is not improbably derived from a corruption of their name. From the islands they have for the most part disappeared, and their principal settlement is now in the republic of Honduras, where they form a very industrious and prosperous part of the population, while still retaining their original language and many of their peculiar customs, ‘They are to be found principally in the district between the Paitook river and the Belize. Their immigration into Honduras dates only from about 1796, when the English,

weary of the continual disturbances which they occasioned, transported them in a body from Dominica and St Vincent to the island of Ruotan. In these islands they divided into two great tribes, known as the Red and the Black Caribs, of whom the former were the pure descendants of the ancient stock, while the latter were largely inter- mingled with Negro blood. To the same race probably belong the Galibiin French Guiana, the Yaoi in Venezuela, the Cumanagotto, the Pariagotto, and various other tribes of the continent.

CARICATURE (Italian caricatura, t.e., “ritratto ridi- colo,” from caricare, to load, to charge ; French charge) may be defined as the art of applying the grotesque to the purposes of satire. The word “caricatura” was first used as English by Sir Thomas Browne (1605-1682), in his

Christian Morals, a posthumous work; it is next found, still in its Italian form, in No. 537 of the Spectator ; it was adopted by Johnson in his Dictionary (1757), and only assumed its modern guise toward the end of the 18th century, when its use and comprehension became general.

Little that is not conjectural can be written concerniug caricature among the ancients. Few traces of the comic are discoverable in Egyptian art,—three papyri only of a satirical tendency being known to exist, and these appear- ing to belong rather to the class of ithyphallic drolleries than to that of the ironical grotesque. Among the Greeks, though but fewand dubious dataare extant, itseems possible that caricature may not have been altogether unknown. Their taste for pictorial parody, indeed, has been suffi- ciently proved by plentiful discoveries of pottery painted with burlesque subjects. Aristotle, moreover, who dis- approved of the grotesque in art, condemns in strong terms the pictures of a certain Pauson, who, alluded to by Aristophanes, and the subject of one of Lucian’s anecdotes, is hailed by M. Champfleury as the doyen of caricaturists. That the grotesque in plastic art was practised by the Romans is evident from the curious frescoes unearthed at Pompeii and Herculaneum ; from the mention in Pliny of certain painters celebrated for burlesque pictures; from the curious fantasies graven in gems and called Grylli; and from the number of ithyphallic caprices that have descended to modern times. But in spite of these evidences of Greek and

Roman humour, in spite of the famous comic statuette of Caracalla, and of the more famous grafito of the Crucifixion, the caricaturists of the old world must be sought for, not among its painters and sculptors, but among its poets and dramatists. The comedies of Aristophanes and the epigrams of Martial were, to the Athens of Pericles and the Rome of Domitian, what the etchings of Gillray and the lithographs of Daumier were to the London of George III. and the Paris of the Citizen King.

During the long dusk of the Middle Ages a vast mass of material was accumulated for the study of the grotesque, but selection becomes even more difficult than with the scarce relics of antiquity. With the building of the cathedrals originated a new style of art ; astrange mixture of memories of paganism and Christian imaginings was called into being for the adornment of those great strongholds of urban Catholicism, and in this the coarse and brutal materialism of the popular humour found its largest and freest expression. On missal-marge and sign-board, on stall and entablature, in gurgoyle and initial, the grotesque displayed itself in an infinite variety of forms. Often obscene and horrible, often quaint and fantastic, it is difficult, if not absolutely impossible, to determine the import of this inextricable tangle of imagery. It has been pretended that it constituted an immense network of symbolism, in which the truths of the Church were set forth in forms intelligible to the popular mind. A second interpretation is that it is merely the result of the decor- ative artist’s caprice. A third school has sought to dis- cover in much of it the evidences of the struggle for supremacy between the secular clergy and the friars. Leaving all this on one side, however, until the appli- cation to archeology of the comparative method shall have made the matter somewhat clearer, it will be sufficient in this place to remark the prevalence of three great popular types, or figures, each of which may be credited with a satirical intention,—of Reynard the Fox, the hero of the famous medizeval romance; of the Devil, that peculiarly medizval antithesis of God; and of Death, the sarcastic and irreverent skeleton. The popularity of the last is evidenced by the fact that nv less than forty-three towns.

in England, France, and Germany are enumerated as possessing sets of the Dance of Death, that grandiose all-levelling series of caprices in the contemplation of which the Middle Ages found so much consolation. It was reserved for Holbein (1498-1554), seizing the idea and resuming all that his contemporaries thought and felt on the subject, to produce, in his fifty-three magnificent etchings of the Danse Macabre, the first, and perhaps the greatest, set of satirical inoralities known to the modern world, ;

It is in the tumult of the Renaissance, indeed, that carica- ture in its modern sense may be said to have been born. The great popular movements required some such vehicle of comment or censure; the perfection to which the arts of design were attaining supplied the means; the invention of printing ensured its dissemination. The earliest genuine piece of pictorial irony that has been discovered is a caricature (1499) relating to Louis XII. and his Italian War. But it was the Reformation that produced the first full crop of satirical ephemera, and the heads of Luther and Alexander VI. are therefore the direct ancestors of the masks that smirk and frown from the “cartoons” of Punch aud the Charivari. Fairly started by Lucas Cranach, a friend of Luther, in his Passtonale of Christ and Anti- christ (1521), caricature was naturalized in France under the League, but only to pass into the hands of the Dutch, who supplied the rest of Europe with more or less satirical prints during the whole of the next century. A curious reaction is visible in the work of Peter Breughel (1510- 1570) towards the grotesque (ablerie and macaberesque morality of medieval art, the last original and striking note of which is caught in the compositions of Jacques Callot (1593-1635), and, in a less degree, in those of his followers, Stefano della Bella(1610-1664)and Salvator Rosa (1615-1673). On the other hand, however, Callot, one of the greatest masters of the grotesque that ever lived, in certain of his Caprices, and in his two famous sets of prints, the Miséres de la guerre, may be said to anticipate certain pro- ductions of Hogarth and Goya, and so to have founded the school of ironical gene which now-a-days does duty for caricature,

In England, during the 1 6th century, caricature can hardly be said to have existed at all,—a grotesque of Mary Stuart as a mermaid, a pen and ink sketch of which is yet to be seen in the Rolls Office, being the only example of it known. The Great Rebellion, however, acted as the Reformation had

done in Germany, and Cavaliers and Roundheads caricatured each other freely. At this period satirical pictures usually did duty as the title pages of scurrilous pamphlets; but one instance is known of the employment during the war of a grotesque allegory as a banner, while the end of the commonwealth produced a satirical pack of playing cards, probably of Dutch origin. The Dutch, indeed, as already has been stated, were the great purveyors of pictorial satire at this time and during the early part of the next century. In England the wit of the victorious party was rather vocal thau pictorial; in France the spirit of caricature was sternly repressed ; and it was from Holland, bold in its republican freedom, and rich in painters and etchers, that issued the flood of prints and medals which illustrate, through cumbrous allegories and elaborate symbolization, the principal political passages of both the former countries, from the Restoration (1660) to the South Sea Bubble (1720). The most distinguished of the Dutch artists was Romain de Hooghe (1638-1720), a follower of Callot, who, without any of the weird power of his master, possessed a certain skill in grouping and faculty of grotesque suggestiveness that made his point a most useful weapon to William of Orange during the long struggle with Louis XIV.

CewIrCAT URE

The 18th century, however, may be called emphatically the Age of Caricature. The spirit is evident in letters as in art; in the fierce grotesques of Swift, in the coarser charges of Smollett, in the keen ironies of Henry Fielding, in the Aristophanic tendency of Foote’s farces, no less than in the masterly moralities of Hogarth and the truculent satires of Gillray. The first event that called forth caricatures in any number was the prosecution (1710) of Dr Sacheverell ; most of these, however, were importations from Holland, and only in the excitement attendant on the South Sea Bubble, some ten years later, can the English school be said to have begun. Starting into active being with the ministry of Walpole (1721), it flourished under that statesman for some twenty years,—the ‘“‘hieroglyphics,” as its prints were named, graphically enough, often circulat- ing on fans. It continued to increase in importance and audacity till the reign of Pitt (1757-1761), when its activity was somewhat abated. It rose, however, to a greater height than ever during the rule of Bute (1761- 1763), and since that time its influence has extended without a single check, The artists whose combinations

amused the public during this earlier period are, with few exceptions, but little known and not greatly esteemed. Among them were two amateurs, the countess of Bur- lington and General Townshend ; Goupy, Boitard, and Liotard were Frenchmen ; Vandergucht and Vanderbank were Dutchmen. But it must not be forgotten that this period witnessed also the rise of William Hogarth (1697-1764). As a political caricaturist this great man was not successful, save in a few isolated examples, as in the portraits of Wilkes and Churchill; but as a moralist and social satirist he has not yet been equalled. The publication, in 1732, of his Modern Midnight Conversation may be said to mark an epoch in the history of caricature. Mention must also be made of Paul Sandby (1725-1809), who was not a professional caricaturist, though he joined in the pictorial hue-and-cry against Hogarth and Lord Bute, and who is best remembered as the founder of the English school of water-colour; and of John Collet (1723-1788), said to have been a pupil of Hogarth, a kindly and indus- trious humourist, rarely venturing into the arena of politics. During the latter half of the century, however, political caricature began to be somewhat more skilfully handled than of old by James Sayer, a satirist in the pay of the younger Pitt, while social grotesques were pleasantly treated by Henry William Bunbury (1750-1811) and Woodward. ‘These personalities, however, interesting as they are, are dwarfed into insignificance by the great figure of James Gillray (1757-1815), in whose hands political caricature became almost epic for grandeur of conception and far-reaching suggestiveness. It is to the works of this man of genius, indeed, and (in a less degree) to those of his contemporary, Thomas Rowlandson (1756-1827), an artist of great and varied powers, that historians must turn for the popular reflection of all the political notabilia of the end of the 18th and the beginning of the 19th centuries. England may be said to have been the chosen home of caricature during this period. In France, timid and futile under the Monarchy, it had assumed an immense importance under the Revolution, and a cloud of hideous pictorial libels was the result; but even the Revolution left no such notes through its own artists, though Fragonard (1732-1806) himself was of the number, as came from the gravers of Gillray and Rowlandson. In Germany caricature did not exist. Only in Spain was there to be found an artist capable of entering into com- petition with the masters of the satirical grotesque of whom England could boast. The works of Francisco Goya y Lucientes (1746-1828) are

described by Théophile Gautier as "'a mixture of those of Rembrandt, Watteau, and the

comical dreams of Rabelais," and Champfleury discovers analogies between him and Honoré Daumier, the greatest caricaturist of modern [rance.

The satirical grotesque of the 18th century had been characterized by a sort of grandiose brutality, by a certain vigorous obscenity, by a violence of expression and intention, that appear monstrous in these days of reserve and restraint, but that doubtless sorted well enough with the strong party feelings and fierce political passions of the age. After the downfall of Napoleon (1815), however, when strife was over and men were weary and satisfied, a change in matter and manner came over the caricature of the period. In connection with this change, the name of George Cruikshank (1792), an artist who stretches hands on the one side towards Hogarth and Gillray, and on the other towards Leech and Tenniel, deserves honour- able mention. Cruikshank's political caricatures, some of which were designed for the squibs of William Hone (1779-1842), are, comparatively speaking, uninteresting ; his ambition was that of Hogarth—the production of "moral comedies." Much of his work, therefore, may be said to form a link inthe chain of development through which has passed that ironical genre to which refer- ence has already been made. In 1829, however, began to appear the famous series of lithographs, signed H.B., the work of John Doyle (1798-1868). These apt but feeble jocularities are interesting other than politically; thin and weakly as they are, they inaugurate the style of political caricature which obtains, with but few and slight variations, at the present date. In France, meanwhile, with the farcical designs of Pigal and the realistic sketches of Henri Monnier, the admirable portrait-busts of Dantan the younger, and the fine military and low-life drolleries of Charlet (1792-1845) were appearing, and in these modern social caricature may be said to be fairly embodied. Up to this date, though journalism and caricature had some- times joined hands (as in the case of the Craftsman and the Antijacobin, and particularly in Les Révolutions de France et de Brabant and Les Actes des Apétres), the alliance had been but brief; it was reserved

for Charles Philipon (1802-1862), who. may be called the father of comic journalism, to make it lasting. La Caricature, founded by Philipon in 1831, and suppressed in 1833 after a brief but glorious career, was followed by Ze Charwart, which is perhaps the most renowned of the innumerable enterprises of this extraordinary man. Among the artists he assembled round him, the highest place is held by Honoré Daumier, a draughtsman of great skill, and a caricaturist of immense vigour and audacity. Another of Philipon's band was Sulpice Paul Chevalier (1801-1866), better known as Gavarni, in whose hands modern social caricature, advanced by Cruikshank and Charlet, assumed its present guise, and became elegant. Mention must also be made of Grandville (1803-1847), the illustrator of La Fontaine, anda modern patron of the medizval skeleton ; of Traviés, the father of the famous hunchback " Mayeux ;" and of Amedée de Noé, or "Cham," the wittiest and most ephemeral of pictorial satirists. In 1840, the pieasantries of "H.B." having come to an end, there was founded, in imitation of this enterprise of Philipon, a comic journal which, under the title of Punch, or the London Charivari, has since become famous all over the world. Its earliest illustrators were John Leech (1817-1864) and Richard Doyle, whose drawings were full of the richest grotesque humour. It is in the pages of Punch that the growth of modern pictorial pleasantry may best be traced. Of late years all the "cartoons," or political caricatures, have been the work of John Tenniel; they exhibit few of the features of caricature as it was understood by Gillray and Daumier ; their object is not to excite hatred or contempt, but at

most to raisea smile. In social subjects, George Dumaurier, a fine draughtsman, though soniewhat mannered and fond of a single type of face and figure, has carried the ironical

genre, received by Leech from Gavarni and Charlet, to the

highest point of elegance it has attained.

Of caricature, in the primitive sense of the word, there is but little. The fall of the French Empire and the subsequent siege of Paris, together with the reign of the Commune—a popular movement, though confined to a single

city—produced a plentiful crop of genuine carica- tures, remarkable both for bitterness and for ability. Among the few caricatures that now find favour niay be mentioned the graceful and genial caprices of Sambourne, the clever portraits of “Gill,” a Parisian artist, and especially the remarkable series of portraits published in London since 1862, in Vanity Fair, the work of Pellegrini, which are cer- tainly the most remarkable of their kind that have appeared since the superb grotesques of Honoré Daumier.

See Grose, Rules for Drawing Caricature, with an Essay on Comic Painting, London, 1788, 8vo ; Malcolm, Historical Sketch of the Art of Caricaturing, London, 1813, 4to; Wright, History of Caricature and Grotesque in Literature and Art, London, 1865; Jaime, Musée de la Caricature ; Champfleury, Histoire de la Caricature Antique, Paris, 8v0 ; Histoire de la Caricature Moderne, Paris, 8vo; Histoire de la Caricature aw Moyen Age, 8vo;

Histoire de la Caricature sous la République, la Restauration, et V?Empire, Paris, 8vo.

CARIES, ulceration of bone, is the result of inflamma- tion, and resembles in its chief characteristics ulceration in soft tissues, as skin and muscle. Situated in a tissue

largely composed of inorganic material, it is chronic in its

course, and cured with difficulty. The exciting cause is generally an injury. It is frequently associated with scrofula, The cancellated tissue of bone is specially liable ; the short bones of the hand and foot, the articular extre- mities of the long bones, and the bones forming the vertebral column are its chief seats. It is preceded by the formation of matter, and when this escapes, either by natural processes or by the assistance of the surgeon, the diseased bone can be felt by the aid of a probe, passed through the sinus or channel which leads to the carious bone. This sinus does not heal until the disease heals or is removed. ‘The treatment generally adopted consists in removing the diseased bone by gouging or by excision. If the primary abscess is opened and dressed antiseptically for a lengthened period, the ulcerated bone often heals without further operation. This method of treatment is

most valuable in cases of caries of the vertebral column, in which it would be impossible to remove the disease by ouging or excision.

CARIGNANO, a town of northern Italy, in the province of Turin, and about 20 miles south of that city, is situated on the left bank of the Po, here crossed by a wooden bridge. It is surrounded by old walls, and has a handsome church, built in 1766, according to the design of Alfieri, a communal college, and several convents. The population, numbering about 8000, is chiefly engaged in the spinning of silk and the manufacture of confectionery, the principal depart- ment in the latter industry being the preparation of the citron rind.

Carignano, known in the early part of the Middle Ages as Car- nianum and Carganum, passed in 1418 into the hands of the counts of Savoy, who fortified it with rampart and ditch. In 1630 it was bestowed by Charles Emmanuel I. on his son Tommaso Francesco, who thus became known as prince of Carignano. The title con- tinued in the possession of his family, until they were called to the throne in the person of Charles Albert. It was bestowed in 1834

on Eugene Emmanuel Joseph, who now holds the rank of admiral and commander-in-chief of the Italian National Guards.

CARIMATA ISLANDS, a group in the East Indian Archipelago, lying to the West of Borneo, between that island and Billiton, in the channel to which they give their

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name. They are about sixty in number, but their united area is not more than 170 square miles. The most impor- tant are Great Carimata (with a peak rising to about 2000 feet), Panumbangan, the Pelapis Islands, Lissing, Bessi, Maledang, Surutu, and Pulu Lima. Their principal produc- tions are edible nests. honey, wax, gutta percha, turtles, trepang, and shellfish. At one time the cluster formed a small independent principality ; but’it afterwards became subject to Matan, and it is now attached to Pontianak. Several of the

islands are altogether uninhabited, and the whole population is very small. See Veth's Woordenboek van Nederl. Indié. '

CARINI, a town in Sicily, in the province of Palermo, on a rivulet of the same name, 12 miles W.N. .W. of Palermo. It is pleasantly situated on an elevation, and is a neat, clean town, with a Gothic castle. On the coast, about three miles distant, are ruins of the ancient Hyccara, which was chiefly famous as the birthplace of Lais. Population about 9500.

CARINOLA, a town of Italy, in the province of Terra di Lavoro, a district of Gaeta, in 41° 11' 16' N. lat. and 13° 58' 32" E. long. It was formerly the see of a bishop, and is believed to occupy the site of the Lombard city of Foro Claudio, which was founded in 1058. Its principal buildings are the cathedral, the convents, and the seminary. Population, 7640,

CARINTHIA (in German, Kdrnten or Kérnthen), a duchy, and since 1849 a crown-land of Austria, is bounded on the E. by Styria, on the N. by Styria and Salzburg, on the W. by Tyrol, and on the S. by Italy, Gortz, and Carniola. It has an area of 4006 English square miles, and the population in 1869 amounted to 336,400. The surface is for the most part mountainous, being occupied in the north by part of the Norian Alps, and in the south by those named the Carinthian Mountains, or the Kara- wanken, The principal river is the Drave, which flows from W. to E. through the length of the duchy, and re- ceives in its course the waters of all the other streams, except the Fella, which reaches the Adriatic by junction with the Tagliamento. In its eastern half, the valley opens out into a considerable plain, which contains the important lakes of the Worthersee and the Ossiachersee. According to official statistics, 337,246 acres of arable land were in cultivation in 1870; 280,581 acres were occupied by gardens and meadows, 593,040 by pasture, and 1,033,807 were under wood. In the same year there were in the duchy 22,979 horses, 232,791 head of cattle, 176,832 sheep, and 36,630 goats, while the bee-stocks' amounted to 62,615. The mineral produce consisted of 145,940 tous of iron ore, 5,047 of lead ore, 71,264 of coal, 4,220 of zine ore, and nearly 26 of graphite. The duchy is divided

into the seven districts of Hermagor, Klagenfurt, Spittal,

St Veit, Villach, Volkermarkt, and Wolfsberg,—the capital Klagenfurt forming an independent and eighth division. There are in all ten towns, twenty-eight market villages, and 2,911 hamlets,—the most populous places, besides the chief towns of the districts, being Bleiberg, Friesach, and Feldkirchen. With the excepfion of 19,000 Lutherans, the inhabitants are Roman Catholics; and more than two- thirds of them are of German race. The rest are of Slavonic origin, and for the most part occupy the districts conterminous with Carniola and Styria, though a consider- able Slavonic enclave is situated in the heart of the German area between Malborget and Tarvis. German is used in 255 of the village schools, and Slavonic in 24, while both are employed in 70. The Carinthian diet consists, accord- ing to the law of 1861, of thirty-seven members, including, besides the bishop of Gurk, ten appointed by the landed proprietors, seven by the towns, fourteen by the rural communes, and three by the commercial authorities at Klagenfurt. Five members are sent to the imperial diet.

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Carinthia is so called from the Carmi, a Celtic people who have perhaps also left their name to the neighbouring district of Carniola; and in the time of Augustus it formed part of Noricum. After the fall of the Roman empire, it was the nucleus of the kingdom of Carentania, which was founded by Samo, a Frankish adventurer, but soon fell to pieces after his death. Under Charlemagne it con. stituted a margravate, which in 843 passed into the hands of Louis the German, whose grandson Arnulf was the first to bear the title of Duke of Carinthia. The duchy was held by various families during the 11th, 12th, and 13th centuries, and at length in 1335 was bestowed by Louis the Bavarian’on the Dukes of Austria. It was divided into Upper or Western Carinthia and Lower or Eastern ; of these the former fell to France in 1809, but was reconquered in: 1813, and joined in 1814 to the kingdom of Illyria. See Ausrria, vol. iii.

CARIPE, or CariBe, a town of Venezuela, in the state of Cumana, and about 40 miles from the city of that name, in 10° 10’ 14” N. lat. and 28° 33’ 54” W. long. It is the chief station of the mission to the Chayma Indians, and is famous for the extensive system of caves in the limestone rock in the neighbourhood, which have been described by Humboldt. These extend

inwards a distance of 2800 feet, and have a heightof 70 or 80 feet. They are frequented by a species of night hawk, which builds in the recesses of the rocks. The young are killed in great numbers for the sake of their oil. The population of the town and valley is estimated at 5000.

CARISBROOKE, a village in the Isle of Wight, about a mile S. of Newport, at the base of a steep conical hill crowned by the castle, to which its celebrity is principally due. It was at one time a considerable market-town, and under the independent lords of Wight it ranked as the capital of the island. The original fortress is supposed to have been built by the Saxons as early as the 6th

century ; and, indeed, according to the annals, it was

besieged by Cerdic in 530. It was enlarged by William Fitzosborne, the first lord of Wight, in the 11th century, was captured by Stephen in 1136, and in the reign of Richard II. resisted an attack by the French. Further additions were made to it at different times, till, in the reign of Elizabeth, it reached its greatest dimensions, and comprised within its outer walls a space of 20 acres. The most interesting incident in its history is the captivity of Charles I., who took refuge with its governor, Colonel Hammond, in November 1647, but soon found his asylum converted into a prison, After his execution his two youngest children were confined in the castle, and the princess Elizabeth died there. The remains are still ex- tensive and imposing, but the king’s apartments are in ruins. Within the walls is a well 200 feet deep; and another in the centre of the keep is reputed to have been still deeper. Opposite the castle-hill are the remains of a Cistercian priory founded in the 11th century, and the parish church, which boasts of even greater antiquity. The population of the parish in 1871 was 8198.

CARISSIMI, Giacomo, one of the mostcelebrated masters of the Italian, or, more accurately, the Roman school of music, Of his life almost nothing is known, and Fétis, who has made his biography a subject of special study, has been able to do little more than correct inaccurate or fictitious statements of previous writers. The only authenticated facts are the following. Carissimi was born about 1604, at Marino, near Rome, and received his first musical educa- tion at home. At the age of 20 he became chapel-master at Assisi, and in 1628 he obtained the same position at the

church of St Apollinaris, belonging to the Collegium Germanicum in Rome, which he held till his death in 1674. He never seems to have left Italy, the rumour of his pro- longed stay in Paris, mentioned by De Fresneux, being entirely unfounded. By his education he belonged to the old Roman school of music, but his compositions show little of the severe grandeur of the earlier masters. He marks indeed the turning-point from the traditions of the

Renaissance period to the incipient aspirations of modern music, and for that reason his name is representative in the history of art. The two great achievements generally ascribed to him are the further development of the recitative, lately introduced by Monteverde, and of infinite importance in the history of dramatic music, and the invention of the cantata, a smaller form of the oratorio, by which Carissimi superseded the madrigals formerly in use. He also may claim the merit of having ‘given greater variety and interest to the instrumental accompaniments of vocal compositions. Carissimi’s numerous compositions consist of masses, cantatas, motets, and oratorios. The complete collection of his works, formerly said to have existed in the musical archives of the church of St Apollinaris, has entirely dis- appeared. Several English musical scholars deserve honour- able mention for having rescued Carissimi’s works from oblivion. Dr Burney and Hawkins have published speci- mens of his compositions in their works on the history of music; and Dr Aldrich collected an almost complete set. of his compositions, at present in the library of Christ Church, Oxford. The British Museum also possesses numerous valuable works by this great Italian master.

CARLETON, Sir Dupiey (1573-1651), an English statesman, was born in Oxfordshire in 1573, and educated at Christ Church College, Oxford. He went in a diplo- matic capacity to the Low Countries when King James resigned the cautionary towns to the States ; and he was afterwards employed for twenty-nine years as ambassador to Venice, Savoy, and the United Provinces. Charles I. created him Viscount Dorchester, and appointed him one of his principal secretaries of state, an office which he held till his death in 1651. He published several works, con- sisting chiefly of speeches, letters, and other productions on political subjects. The most

valuable appeared after his death, and consist of a selection of letters to and from Sir Dudley Carleton during his embassy to Holland, from January 1616 to December 1620, 4to, 1757.

CARLETON, Witt1am (1798-1869), a popular Irish novelist, was born at Prillisk, Clogher, in the county of Tyrone. His father was a peasant tenant, and young Carleton passed his early life among scenes precisely similar to those he afterwards delineated with so much power and truthfulness. His parents, though of humble rank, were highly endowed by nature. The father was remarkable for his extraordinary memory, which was well stored with anecdote and tale ; the mother was noted throughout the district for the rich sweetness of her voice. Both possessed in a high degree those domestic virtues so frequently found among the humbler classes of the Irish people. The beautiful character of Honor, the miser's wife, in Jar- darougha, is evidently sketched from the life by the loving hand of a son.

The education received by Carleton was of a very humble description. As his father removed from one small farm to another, he attended at various places the hedge-schools, which used to be a notable feature of Irish life. The admirable little picture of one of these schools in the Traits and Stories bears every mark of having been drawn from real experience. A smattering of some higher learning was picked up here and there as opportunity offered, and at the age of seventeen Carleton resolved to prosecute his education as a poor scholar. The resolution was not carried into effect; he remained at home, prepar- ing to enter upon the training for the priesthood, and receiving the unbounded veneration of the neighbouring peasantry for his supposed wonderful learning. An amusing account of this phase of his existence is given in the little sketch Denis O'Shaughnessy. When about the age of

most powerful of all his works; The

of Ahadarra. Squanders of Castle Squander, were not so successful as the earlier tales. the upper classes of Irish society, and overloaded his work

nineteen he undertook one of the religious pilgrimages then common in Ireland. His experiences as a pilgrim were such as at a later period made him resign for ever the

thought of entering the church. His vacillating ideas as to a mode of life were determined in a definite direction by the reading of Gil Blas, which chance had thrown in his

way. He resolved to cast himself boldly upon the world, aud try what fortune had in store for him. He went to Killanny, and for six months acted as tutor in a neigh- bouring farmer's family. Soon tiring of this occupation, he set out for Dublin, and arrived in the metropolis with 2s, 9d. in his pocket. He began to contribute to the

journals, and his paper " The Lough Derg Pilgrim," which

was published in the Christan Examiner, excited great attention. In 1830 appeared the first series of Traits and Stories of the Irish Peasantry, which at once placed the author in the first rank of Irish novelists. A second series appeared in 1832, and was received with equal favonr both in Ireland and in England. From that time till within a few years of his death Carleton's literary activity was incessant. The best of his many productions are Mar- darougha the Miser, perhaps on the whole the finest and Tithe Proctor ; Valentine M'Clutchy ; The Black Prophet ; The Emigrants Some of his later writings, such as Z'he

The author was not happy in describing

with political or semi-political matter.

Carleton is facile princeps among Irish novelists, and it is to his pages that one must look for an adequate picture of the peculiar Irish character. His style is clear, graphic, and pleasing; the plots of his stories are generally slight but well constructed. In his pictures of peasant life he is unsurpassed ; the lights and shades of Irish character, the buoyant humour and domestic virtues that under other conditions would lead their possessors to prosperity and happiness, and the fatal flaws that seem to render it impossible for Ireland ever to become capable of self- government, receive equal justice at

his hands. He in- variably writes from intimate acquaintance with the scenes described and from loving sympathy with the many good and noble elements in the Irish nature. He does not hesitate to point out the darker features of Trish life, nor to draw attention to the fatal system of education and priestly supremacy that did so much to produce them.

Carleton, after spending some years in America, settled in Dublin, where he died on the 30th January 1869. For many years before his death he had enjoyed a pension of £200 from the Crown.

CARLI, or Carti-Rupsi, Giovanni Rinawpo, Count oF, (1720-1795), a celebrated, Italian writer on antiquities and economics, was born at Capo d' Istria, in 1720. He was early distinguished for the extent and variety of his acquirements, and at the age of twenty-four was ap- pointed by the senate of Venice to the newly-established professorship of astronomy and navigation in the University of Padua, and intrusted with the superintendence of the Venetian marine. After filling these offices for seven years with great credit, he resigned them, in order to devote himself to the study of antiquities and political economy. His principal economic works are his Dedle Monete, e¢ della Instituzione delle Zecche d'Italia ; his Ragionamento sopra ¢ Bilanci economici delle Nazioni (1759), in which he main- tained that what is termed the balance of trade between two nations is no criterion of the prosperity of either, since both may be gainers by their reciprocal transactions ; and

his Sul libero Commercio dei Grani (1771), in which he argues that free trade in corn is not always advisable. Count Carli's merits were appreciated by Leopold of

Tuscany, afterwards emperor, who, in 1765, placed him at the head of the council of public economy, and of the board of public instruction. In 1769 he became privy councillor, in 1771 president of the new council of finances. The duties of these offices he continued to discharge with ability for several years ; but for some time before his death, which took place in February 1795, he was relieved from their toils,—retaining, however, their emoluments, as a reward for his important services, It was during the

leisure thus afforded that he completed and published his very valuable Antichita Italiche, in which the literature and arts of his country are ably discussed. Besides the above, he published many works on antiquarian, economic, and other subjects, including L'Uomo Libero, in confutation of Rousseau's Contract Social ; an attack upon the Abbé Tartarotti's assertion of the existence of magicians; Observazione sulla musica antica e moderna ; and several poems. CARLISLE, a parliamentary and municipal borough, the capital of Cumberland, 301 miles N.N.W. from London ; 54° 54' N. lat., 2° 55' W. long. It is situated on an eminence enclosed by the three streams —the Eden, the Caldew, and the Petteril. The Eden, which is the principal river, is joined by the Petteril on the east side of the city ; about a mile further west, as it flows through fertile holms, it is joined by the Caldew, and about six miles further on it falls into the Solway Firth. A handsome stone bridge, built in 1812-15, at a cost of £70,000, spans the Eden, midway between the mouths of the Petteril and the Caldew.

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Plan of Carlisle,

All the three streams are unnavigable. In the Eden there is good salmon fishing. Before the Romans invaded Great Britain a Celtic town was erected on the site of Carlisle ; and when the Romans came they occupied and improved it, Archeologists consider it doubtful whether the Romans made it a military station to aid in the defence of their

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newly-acquired colony against the incursions of the Picts } but Roman coins, pottery, inscribed tablets, and other re- mains have been found in such abundance that there can be no doubt Carlisle was, if not a military post, a town of considerable importance in those days. The great wall of

Severus, extending from the Solway Firth to the German Ocean, crossed the River Eden at Carlisle ; and remains of this great barrier may still be seen on the outskirts of the city. The Solway end of the wall, traces of which are still to be seen, was about twelve miles from Carlisle, at Bowness ; and there was an important Roman camp, the Amboglana of the Motitee, about fifteen miles eastward of the city, called Birdoswald, of which interesting remains are still in existence.

Carlisle was the Luguvallum of the Romans. This name was afterwards abbreviated to Lwell, and with the prefix Caer (a city), became Caer-Lwell, and afterwards by easy transition, Carliol and Carlisle. After the departure of the Romans in the 5th century the Picts laid the city in ruins ; but in the 7th century it was rebuilt by Egfrid, king of Northumberland. In 875 the town was attacked by the Danes, who burned the houses, pulled down the wall, and massacred the inhabitants. In this state of desolation it was left for 200 years, with no inhabitants but some few Celts who lodged themselves among the ruins, In 1092 William Rufus, impressed with the importance of Carlisle as a Border military station, ordered the town to be rebuilt and fortified, and left a garrison there. It was not, however, until after the capture of the town in the reign of Stephen, by David, king of Scots (who died within its walls in 1153), that the castle, the walls, and the citadel were completed.

After undergoing two sieges the town was surrendered to the English Crown in 1217. Edward I. held three parliaments in Carlisle. In 1298, after the battle of Falkirk, he marched to Carlisle; and nine years later it was while crossing Burgh Marsh, about four miles from that city, with his army, to quell the third revolt which had occurred in Scotland during his reign, that he sickened and died. A monument has been erected on the spot to commemorate the event. With his last breath he enjoined his son to prosecute the enterprise, and never desist until he had completed the subjugation of Scotland. The nobles hastened to Carlisle to pay homage to the new king, Edward II., to whom, however, the legacy of vengeance against the Scots proved but a “heritage of woe.” In 1315, after the independence of Scotland had been won by the decisive battle of Bannockburn, Robert Bruce, follow- ing up his success by ravaging the north of England, besieged Carlisle Castle. There he met with determined

resistance on the part of the garrison and the inhabitants, under Sir Andrew Harcla, governor. Bruce, who had his headquarters at the cathedral, made a general assault on all the gates of the town on the ninth day ; but the citizens defended their position with such valour that the besiegers soon beat a retreat, having only killed two of the besieged. Sir Andrew Harcla was created earl of Carlisle and Lord Warden of the Marches for this gallant defence of the city ; but he was afterwards found guilty of treason and executed at Harraby Hill. In 1345 the Scots burned Carlisle and Penrith. “They were very much annoyed,” says Lysons, “by small forces collected by Bishop Kirkby and Sir Thomas Lacy. The bishop and Sir Robert Ogle had a sharp skirmish with the enemy; the prelate was unhorsed during the encounter, but having recovered his saddle continued to fight valiantly, and contrived greatly to win the victory.” Nor was it only the “church militant” which did the state much service in those days. In one of the sieges the women of Carlisle helped in the defence of the city by pouring boiling water and rolling heavy stones from

the walls upon the heads of the beleaguering Scots below. In the 15th century Richard, duke of Gloucester, was governor of Carlisle Castle, and during his governorship extensive repairs were made in the old fortress, and in the course of time, during the reigns of Henry VIII. (who built the citadel) and Elizabeth, it was adapted to artillery. In 1568 Mary Queen of Scots, having fled from Lochleven, arrived in a fishing boat at Workington, a Cumberland seaport: 32 miles from Carlisle, and was there met by the deputy-governor of Carlisle, and conducted to Carlisle Castle, where she was lodged nominally as a guest but actually as a prisoner. She remained there for two months. A little later in the same year a daring exploit was per- formed by the duke of Buccleuch. William Armstrong, a redoubtable Borderer, better known as “ Kinmont Willie,” having been taken prisoner in disregard of a truce or understanding which facilitated his capture, the “ Bold Buccleuch,” with 200 followers, attacked Carlisle Castle, and rescued the prisoner, an achievement which gave dire offence to Queen Elizabeth.

During the civil wars Carlisle was harassed by frequent troubles; but the next event of importance occurred in 1644, when the city and castle were

besieged by the Parliamentary forces under General Leslie for eight months. Sir Thomas Glenham, the commander-in-chief of the royal troops, was in charge of the garrison, who were reduced to great extremities before they surrendered on 25th June 1645. heir valiant resistance was recognized by the besiegers, who allowed them to march out “ with their arms, flying colours, drums beating, matches lighted at both ends, bullets in their mouths, and twelve charges of powder a-piece.” The Parliamentary army pulled down some important portions of the cathedral buildings, and out of the materials erected a guard-house in the market-place. In 1648 Sir Philip Musgrave and Sir Thomas Glenham effected the capture of Carlisle by surprise ; but in October it was again surrendered to Cromwell, according to treaty. At this time great distress prevailed in the county, con- siderable families having barely the necessaries of life, while numbers of the poor died on the highways.

In the Scottish rebellion of 1745 Carlisle again figured in history. The Pretender, Priuce Charles Edward, laid siege to it, the three divisions of the army with which he marched from Edinburgh having converged at the city. The castle was at that time garrisoned by only two com- panies of invalids and some disaffected militia, and Colonel Durand, who was in command, found it necessary, with great reluctance, to surrender. ‘‘ Bonnie Prince Charlie ud rode into the town on a white charger, with a hundred Highland pipers playing a triumphal march in front, and made a house in English Street, which is still in existence, his headquarters. But in December of the same year the duke of Cumberland arrived and bombarded the castle, which his grace described as “an old hencoop, which he would speedily bring down about their ears,” and on the 30th the garrison surrendered. The duke quartered his soldiers in the cathedral, and thirty-one of the rebels were subsequently executed at Harraby Hill, The tower in which Mary Queen of Scots was imprisoned was pulled down in 1835; but a considerable portion of the ancient castle still remains, and it is used as a garrison for the 2d Brigade Depot. Only a small portion of the old city walls now exists, and the city gates have entirely disappeared.

Carlisle suffered in 1380 from a great fire, which destroyed 1500 houses in three of the principal streets ; and the plague in 1598 carried off 1076 persons, one-third of the inhabitants.

Carlisle is the see of a bishop. The cathedral was founded by William Rufus, and completed by Henry I. ‘The original proportions of the building have been very

much curtailed. A disastrous fire, in 1292, destroyed the nave, only a small part of which now remains. The most interesting architectural feature of the cathedral is the east window, which has been pronounced by archeologists to be one of the finest in the kingdom, the harmony of its parts and the easy flow of its lines being particalarly remarkable. The remains of Dr Paley are interred,in one of its aisles, aud a stone pulpit, richly carved in Caen-stone and ornamented with white alabaster, has been erected to his memory. ‘The window in the north transept has been filled with stained glass in memory of the five children of Dr Tait, archbishop of Canterbury, who died of scarlet fever while his grace was dean of Carlisle. The cathedral possesses many memorials of interest. A large portion of the adjacent priory, founded by William Rufus, was destroyed during the civil wars, but the remains may still, be traced on the south side of the cathedral. A convent of grey friars which existed in the city was destroyed by the fire in 1292. ‘There was also at one time a convent of black friars, and a hospital founded at St Nicholas for lepers; the latter was destroyed in the 17th century. According to Lyson’s History, the bowels of-Richard Coeur de Lion were buried in Carlisle cathedral.

In addition to the cathedral and the castle, the chief buildings in Carlisle are the court-houses-—two large round towers built upon the site of the old citadel; the county

jail, contiguous thereto; the news-room, the post-office,

the railway station, the infirmary, and two of the joint- stock banks. ‘There is a market-cross in the centre of the market-place, and two marble statues adorn the principal streets. One of these, between the two court-houses (by Musgrave L. Watson), is of William, earl of Lonsdale; the other, in the market-place (by Woodington), is of James Steel, editor and proprietor of the Carlisle Journal, a citizen who during his lifetime took a prominent part in local public affairs. In addition to the cathedral there are eight established

churches in Carlisle, and several places of worship for Independents, Methodists, Presbyterians, Baptists, and Roman Catholics. Its literary and scientific institutions include a mechanics' institution, a young men's Christian association, and several working men's reading rooms, managed entirely by working men themselves. Its charities consist of an infirmary with 100 beds, a dispensary, and a fever hospital; and in connection with the infirmary there is a convalescent institution at the seaside at Silloth, to which patients are admitted upon payment of a small weekly sum. 'here is a school-board, of nine members ; a school of art ; and a cathedral grammar school.

Carlisle is a great railway centre. The London and North-Western, the Midland, the Caledonian, the North British, and the Glasgow and South-Western Railways have each a terminus there; while the North-Eastern Company have access to the city by their Newcastle and Carlisle section. In 1876 more than sixty passenger trains left Carlisle Citadel station every week-day, and as many more entered the city.

The principal business of Carlisle is the manufacture of cotton goods, the finishing of silesias, the printing of calicoes, and the manufacture of biscuits. There are also within the city two or three large iron-works, and the manufacture of felt hats 1s carried on upon a large scale. A dock at and railway to Silloth, on the Solway Frith, 21 miles from Carlisle, were constructed in 1855 to facilitate the transit of the commerce of the district, and this gradually superseded Port Carlisle, which is no longer used as a harbour.

Carlisle returns two members of parliament. Its municipal government is vested in a mayor (unpaid), ten aldermen, and thirty councillors, who also constitute the Urban Sanitary Authority. 'To them belong the gas-works

and water-works, and by them a system of sewerage was carried out in 1854 at a cost of about £30,000. 'The city has a recorder and separate court of quarter sessions.

The market is held on Saturdays and Wednesdays, the former being the principal market. The grain is sold in the open street in bulk. Population in 1871, 31,074.

CARLISLE, a town of the United States, capital of Cumberland county in Pennsylvania, about 2$ miles south of the Conedogwinet Creek, and 18 miles west of Harris- burg by the Cumberland Valley Railway. The town is well built, has spacious streets, and contains thirteen churches. Of its public buildings the most interesting 1s Dickinson College, which was founded in 1783, and pos- sesses an extensive library. In the immediate neighbour- hood are barracks, which date from 1777, and are capable of containing 2000 men; and about four miles to the north, in a pleasant valley of the Blue Mountains, is the summer resort known as Carlisle Springs. Carlisle was founded in 1751, and in 1794 it was the headquarters of Washington during the Whisky Rebellion. On the night of Ist July 1863 it was bombarded by the Confederate troops. Population in 1870, 6650.

CARLISLE, Freperick Howaprb, Firra Earnor (1748— 1825), a statesman aud author, was born in 1748. During his youth he was chiefly known as a man of pleasure and fashion ; and after he had reached thirty years of age, his appointment on a commission sent out by Lord North to attempt a reconciliation with the American colonies was received with sneers by the Opposition. The failure of the embassy was not, however, due to any incapacity on the part of the earl, but to the unpopularity of the Govern- ment from which it received its authority. He was, in- deed, considered to have displayed so much ability that he was entrusted with the vice-royalty of Ireland in 1780. The time was one of the greatest difficulty ; for while the calm of the country was disturbed by the American rebel- lion, it was drained of regular troops, and large bands of volunteers not under the control of the Government had been formed. Nevertheless, the two years of Carlisle’s rule passed in quietness and prosperity, and the institution of a national bank and other measures which he effected left per- manently beneficial results upon the commerce of the island. In 1789, in the discussions as to the regency, Carlisle took a prominent part on the side of the Prince of Wales. In 1791 he opposed Pitt’s policy of resistance to the dismem- berment of Turkey by Russia; but, on the outbreak of the French Revolution he left the Opposition, and vigor- ously maintained the cause of

war. In 1815 he opposed the enactment of the Corn Laws; but from this time till his death, which occurred in 1825, he took no important part in public life. Carlisle was the author of some political tracts, a number of poems, and two tragedies, the Father's Revenge and the Stepmother, which received high praise from his contemporaries.

CARLISLE, Grorcze Wii11am FRepErick Howarp, SEVENTH Eart or (1802-1864), Lord-Lieutenantof Ireland, was born in London, 18th April 1802. He was the eldest son of the sixth earl by his wife Lady Georgiana Cavendish, eldest daughter of the duke of Devonshire, and bore at first the courtesy title of Lord Morpeth. He was edu- cated at Eton and Christ Church, Oxford, where he earned a reputation as a scholar and writer of graceful verse, obtaining in 1821 both the Chancellor's and the N ewdigate prizes for a Latin andan English poem. Two years later he graduated B.A. as first class in classics. In 1826 he accompanied his uncle, the duke of Devonshire, to Russia, to attend the coronation of the Emperor Nicholas, and became a great favourite in society at St Petersburg. At the general election of the same year he was returned to parliament as member for the family borough of Mor-

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peth. In one of his earliest speeches he undertook, at the risk of forfeiting the good opinion of the Liberal party, the defence of the Russian emperor against severe attacks made on him in reference to the suppression of the Polish insurrection of 1830, In the agitation for parliamentary reform he took the side of Earl Grey ; and after the dis- solution of parliament, which took place about that time, he was elected member for Yorkshire. This seat he held till after the passing of the Reform Bill in 1832. In the following year he was returned for the West Riding; and in 1835 he was appointed by Lord Melbourne Chief Secre- tary for Ireland, a position at that time of great difficulty, O'Connell being then at the height of his reputation. This post he held for about six years, winning great popularity by his amiable manners and kindly disposition. Losing his seat at the election of 1841, he availed himself of the leisure thus afforded him to visit the United States. He afterwards gave an account of this visit in a popular lecture, first

delivered at Leeds and subsequently repeated at other places. In 1846 he was again elected for the West Riding. Two years later, on the death of his father, he succeeded to the peerage and took his seat in the Upper House. He accepted office as Chief Commissioner of Woods and Forests, and afterwards as Chancellor of the Duchy of Lancaster, The great event of his life, however, was his appointment by Lord Palmerston to the Lord-Lieutenancy of Ireland in 1855. This high office he continued to hold till March 1858, and again from June 1859 till within a few months of his death. His retirement in August 1864 was neces- sitated by failing health. Lord Carlisle was not a man of great and original power, but he was above the average in knowledge, in acquirements, and in eloquence. As a debater he held his own in the midst of a large number of great orators, and in the stormy controversies of his Irish secretaryship he succeeded in carrying through the House of Commons several measures of great importance. His literary tastes and culture were displayed in various popular lectures and in several published works. Among these may be mentioned a lecture on The Life and Writings of Pope (1851); The Last of the Greeks, a tragedy (1828); a Diary in Turkish and Greek Waters (1854), the fruit of travels in the East in 1853 and 1854; and a volume of Poems, published after his death. He took warm interest in the reformation of juvenile criminals, and established on his own estate one of the best conducted reformatories in the country. Lord Carlisle died at Castle Howard on the Sth of December 1864. He was never married, and was succeeded in the peerage by his brother. In 1866 appeared his Viceregal Speeches, collected and edited by J. Gaskin.

CARLOW, an inland county of Ireland, in the province of Leinster, situated between 52° 26’ and 52° 54’N. lat., and 6° 30’ and 7° 12’ W. long., and comprising an area of 346 square miles, or 221,342 acres. It is bounded N. by Kil- dare and Wicklow, E. by Wicklow and Wexford, S. by Wexford, and W. by Queen’s County and Kilkenny. Excepting Louth it is the smallest county in Ireland.

The surface of the county is in general level or gently undulating, and of pleasing appearance, except the elevated tract of land known as the ridge of Old Leighlin, forming the commencement of the coal measures of Leinster, and the south-eastern portion of the county bordering on Wexford, where

the wild and barren granitic elevations of Knockroe (1746 feet) and Mount Leinster (2610 feet) present a bolder aspect.

There are no lakes or canals in the county, neither does it contain the source of any important river; but on its western side it is intersected from north to south by the Barrow, which is navigable throughout the whole extent of the county and affords means of communication with the

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port of Waterford ; while on the eastern border the Slaney, which is not navigable in any part of its course through the county, passes out of Carlow into Wexford at New- townbarry. Railway communication connects the county with Dublin, with Wexford, and with Kilkenny and Water- ford.

The geological formation of the county is mainly granitic, but the valley of the Barrow north, of Goresbridge presents the three formations of limestone observed in Ireland, and the great coal district of Leinster commences in the western edge of the county at Gallows Hill Bog (974 feet). The sandstone is frequently of such a nature as to split easily into layers, known in commerce as Carlow flags. Porcelain clay exists in the neighbourhood of Tullow ; but no attempt has. yet been made to turn this production to use.

The soil is of great natural richness. Agriculture is the chief occupation of the inhabitants, but is not so fully developed as the capabilities of the land would suggest. It will be observed from the following table that no pro- gress has. been made within the last twenty-two years in

the acreage under tillage :—

Barley, Under

Year. Meadow. Potatoes. Turnips. Oats. Bere, Rye. Wheat. Crops.

1853 24,887 10,608 6,306 27,707 6,700 6,687 84,422 1875 32,151 10,3854 5,189 22,165 6,755 2,748 81,638

The pasture land is of excellent quality, and generally occupied as dairy farms,—the butter made in this county maintaining a high reputation in the Dublin market. The farms are frequently large, and great attention is paid to the breeding of cattle. Within the last twenty-two years a large advance has been made in the stock of the county, which was in 1852 and 1875 respectively as follows :—

Horses,

Year. Mules, Asses. Cattle. Sheep. Pigs. Goats Poultry.

1852. 9,823 384,581 42,825 22,618 38,501 106,654 1875 10,254 48,672 77,225 28,684 3,364 164,492

The staple trade of the county is in corn, flour, meal, butter, and provisions, which are exported in large quan- tities. There are no manufactures.

The peasantry dwell chiefly in detached cottages, or in small villages, there being but three towns—Carlow, Bagenalstown, and Tullow—in which the inhabitants exceed 2000 persons.

The population has decreased within the twenty years ending 1871, at a slightly higher rate than that of the province of Leinster in general, owing probably to the want of manufacturing and mining industries. In 1851 the population was 68,078, and in 1871, 51,650 (males 25,464, females 26,186), showing an average decrease of 1°2 per cent. per annum.

In April 1871 there were 6 superior and 99 primary schools in operation, attended by 6454 children, and at the same date the following was ascertained to be the state of elementary instruction :—24,496 could read and write ; 9286 could read but could not write; and 17,868, or 34 per cent. of the population, could neither read nor write.

Of the whole inhabitants, 88 per cent. adhere to the Roman Catholic faith, the number professing that religion in 1871 being 45,621, while 5656 were Episcopalians, and 373 of various other denominations. As regards emigra- tion the county has contributed more than the average of Leinster. During the five years 1871 to 1875, there emigrated 3881 persons, a number equal to 7} per cent. of the population at the former date. ‘The poor law union, which does not include the whole county, relieved in 1874, 3030 persons or 64 per cent. of the inhabitants. The county belongs to the diocese of Leighlin and to the mili- tary district of Dublin. The assizes are held at Carlow, and quarter sessions at that town and also at Bagenalstown and Tullow. Carlow returns three members to parliament, two for the county and one for the borough of Carlow.

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Previous to the arrival of Strongbow, and for some time after- wards, what is now the county of Carlow was divided into the dis- tricts of Hy Cabanagh and Hy Drone, forming the northern portion of the principality of Hy Kinselagh. Its most ancient Irish families were the Kavanaghs (descended from the celebrated Macmurrough, king of Leinster), the O’Ryans, the O’Nolans, and the Q’Mores. After the English settlement, the families of St Aubin, De la Frayne, Bermingham, Carew, De la Landes, Grace, and Butler, held exten- sive possessions here. In the time of Queen Elizabeth appear the families of Bagnal, Eustace, Burton, O’Brien, Ponsonby, Hamilton, Coke, Bernard, Vigors, Burdett, Bunbury, Beresford, Bruen, Bagot, and Browne.

Under the name of Catherlogh, the present county was made shire- ground in the reign of King John. It is now divided into seven baronies,—Carlow, Forth, Idrone East and West, Rathvilly, and St Mullins Lower and Upper, and contains forty-seven parishes and parts of parishes. The relics of antiquity in the county comprise large cromlechs at Browne’s Hill near Carlow and at Hackets- town, and a rath near Leighlin Bridge, in which were found several urns of baked earth, containing only small quantities of dust. Some relics of ecclesiastical and monastic buildings exist, and also the re- mains of several castles built after the English settlement. The ruins of a round tower existed at the commencement of the present century near the church of Kellystown, but they are not now visible.

Cartow, a parliamentary borough, and the capital of the county of Carlow, situated on the River Barrow, which is navigable for small craft to its junction with the Grand Canal at Athy, is 45 miles (56 by rail) south-west of Dublin, It is a neat and in some parts a well-built town, of modern aspect. The principal buildings are—the Roman Catholic College of St Patrick, a plain but spacious building ; the parish church, an old building, with a handsome steeple of modern erection; the Roman Catholic chapel or cathedral, a large and elegant structure; the court-house where the assizes are held, an octagonal stone building with a handsome Ionic portico; the lunatic asylum for this and the adjoining counties; the county jail; the union workhouse ; and barracks for cavalry and infantry. The Wellington bridge over the River Barrow connects Carlow with the suburb of Graigue.

The industries of the place consist of brewing and flour- milling, and a considerable trade is carried on in the sale of butter and eggs.

Carlow was formerly of considerable importance. In the reign of Edward III. the king's exchequer was removed thither, and £500, a large sum at that period, applied towards surrounding the town with a strong wall. The castle (supposed to have been founded by Hugh de Lacy, but sometimes attributed to King John), situated on an eminence overlooking the River Barrow, is still a chief feature of attraction in the general view of the town, although there is not much of the original building left. It consisted of a hollow quadrangle, with a massive round tower at each angle. In the early part of the reign of Queen Elizabeth it was taken, and the town burned by the Irish chieftain Rory Oge O'More. When summoned to surrender by Ireton, the Commonwealth general, during the disastrous war of 1641, Carlow submitted without resistance. In the insurrection of 1798 the castle was attacked by an undisciplined body of insurgents, many of whom were intoxicated. They were speedily repulsed, and suffered severe loss, no quarter being given; and, in the confusion of their flight, many of the insurgents took refuge in houses, which the king's trocps immediately set on fire. After the slaughter, about 420 bodies were col- lected and buried.

The town obtained a charter of incorporation at an early period, and was re-incorporated, with enlarged privileges, by James I. The corporation, which was styled "The Sovereign, Free Burgesses, and Commonalty of the

Borough of Catherlogh," and was authorized to return two members to the Irish parliament, was extinguished by the Municipal Reform Act. 'The borough, which is under the Towns Improvement Act, sends one member to the imperial

parliament. Population in 1851, 9121, inhabiting 1375 houses, and in 1871, 7842, inhabiting 1367 houses.

CARLOWITZ, a town of Hungary, in the former Slavonian military frontier and circle of Peterwardein, is situated on the right bank of the Danube, eight miles south- east of Peterwardein. Population in 1873, 4419. It is the seat of the Greek archbishop in the Austrian dominions, and has, besides the cathedral, two Greek churches, a Roman Catholic church, Servian and German schools, seminaries for the Greek and Catholic clergy, a gymna- sium, a lyceum, and a hospital. There is important wine cultivation. The peace between Austria, Turkey, Poland, and Venice was concluded here in 1699.

CARLSBAD, or KAISERKARLSBAD, formerly Wary, a royal free towu of Bohemia, on the Tepel, near its junction with the Eger, 70 miles W.N.W. of Prague. It is situated in a beautiful narrow valley between steep granite moun- tains, and consists chiefly of lodging-houses and hotels for the accommodation of visitors, but has also some good shops and private houses, a theatre, hospitals, as well as schools, reading-rooms, &c, It is the seat of the district judge, custom-house, and excise. Carlsbad is the most aristocratic watering-place in Europe. It is most frequented from the middle of June to the middle of August, and the number of visitors averaging from 12,000 to 20,000. The permanent population is nearly 9000 (1873). The warm springs differ but little from each other in their component parts, the principal ingredients being sulphate of soda, car- bonate of soda, and common salt. Of the ten springs the Sprudel, Hygiea, Bernhardt, Neubrunnen, and Schloss- brunnen are the principal, having temperatures ranging from 165° to 122° Fahr. They are said to have been dis- covered in 1370, during a hunting excursion, by the Emperor Charles IV., to whom a statue has been erected in the market-place. The resident inhabitants make many curious articles in iron, steel, tin, and wood, for which they find a

ready market during the season. ‘The mountains in the neighbourhood have been made accessible, and here and there nice plots of ground have been laid out for visitors. The town has a post-office, railway, and telegraph stations, It lies in 50° 13’ N. lat. and 12° 53’ E. long.

CARLSBURG, a fortified town of Transylvania, capital of the county of Unter-Weissenburg, situated on the north bank of the Maros, 54 miles south of Clausenburg. It consists of the upper town, or citadel, and the lower town. It has a fine Roman Catholic cathedral (containing among other tombs that of John Hunniades), Lutheran and Re- formed churches, and a synagogue ; also an ecclesiastical seminary, gymnasium, observatory, public library, mint, &c, Population in 1874, 7955, Lat. 46° 4‘17” N., long. 23° 34’ E,

CARLSHAMN, or KarisHaven, a small seaport town _ of Sweden, in the laen of Carlskrona, on the Baltic, 27 miles west of Carlskrona. It has manufactures of sailcloth, leather, and tobacco. The harbour is small but secure, and by means of it a considerable trade is carried on in corn, ironware, timber, pitch, tar, and potash. Shipbuilding and fisheries are also prosecuted. Population in 1873, 5492.

CARLSKRONA, or Biexines, a laen or province of Sweden, bounded on the N, by Kronoberg, N.E. by Cal- mar, E. and 8. by the Baltic, and W. by Christianstadt. It has an area of 5398 square miles, and (1873) 127,877 inhabitants. Its principal towns are Carlskrona Carlshamn and Soelvesborg. The smallest and most fertile province of the kingdom, it has a mild climate and has been called the garden or park of Sweden. The inhabitants are lively and distinguished for beauty, and the principal industries are connected with agriculture and forestry, fishery, and shipping,

CaRLSKRONA, the capital of the above province, a seaport

on the Baltic, in 56° 10’ N. lat., 15° 33’ E. long., 55 miles east of Christianstadt. It is named from its founder Charleg XL, and is built upon five small islands connected with – each other and with the mainland by bridges. The town is well built, consisting partly of brick and stone, but

principally of wooden houses, and has broad streets. The harbour, which is fortified, is capacious and secure, with a sufficient depth of water for the largest vessels. It has three entrances ; the principal, and the only one practic. able for large vessels, is on the south side of the town, and is defended by two strong forts. The dry docks are of great extent, and have been cut out of the solid granite rock. The arsenal and other buildings connected with the docks are extensive, and are separated from the town by a wall. The manufactures are naval equipments, linen cloths, tobacco, and refined sugar; the exports, metals, potash, tar, pitch, &c. The town is very deficient in good water. Carlskrona is the principal station of the Swedish navy. It is the seat of the Government and Admiralty offices, has a handsome town-hall, navy-arsenal and hospital, naval and other schools, churches, and navy-yards. Popu- lation in 1873, 16,653.

CARLSRUHE, or Kartsrune (CHARLES’s Rust), a city of Western Germany, capital of the grand duchy of Baden.

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Plan of Carlsruhe.

1. Monument of Grand Duke Ludwig. 1]. Palace of Prince Wilhelm. 2. Palace of Markgrave Wilhelm. 12. Art Gallery. 3. Palace of Grand Duchess Sophie. 13. Theatre. 4. Obelisk. 14, Botanic Garden. 5. Town Church. 15. Winter Garden. 6. Town-Hall. 16. Castle, Library, and Cabinet of 7. Cathedral Church. Natural History. 4 8. Pyramid. 17. General Post-Office. 9. Polytechnic School. 18. Arsenal. 10. Finance Ministry. 19, Vereinigte Sammlungen.

It stands on an elevated plain of the Hardwald (which nearly surrounds it), 380 feet above the level of the sea, 8 miles from the Rhine, and 39 miles W.N.W. of Stuttgart. The Frankfort and Basel Railway passes the city. Carls- ruhe takes its name from Charles William, margrave of Baden, who, owing to disputes which he had with the citizens of Durlach, erected in 1715 a hunting-seat, around which the town has since been built. From the palace the principal streets, seventeen in number, radiate in the form of an expanded fan, in a S.E., S., and S.W. direction. The palace, erected in 1751 on the site of the previous erection of 1715, is a plain building in the old French style, composed of a centre and two wings, presenting nothing remarkable except the octagon tower (Bleithurm),

from the summit of which a splendid view of the city and surrounding country is obtained, and the marble saloon, in which the meridian of Cassini was fixed or drawn. In front of the palace is the Great Circle, a semi-circular line of buildings, containing the Government offices and the palace of the margraves of Baden. Carlsruh2 has several fine public squares, the principal of which are the Castle- place—with Schwanthaler’s statue of the late grand duke Charles Frederick in the centre—and the market-place. In the centre of the latter is a pyramid in honour of Charles William, the founder of the city, whose remains are interred there. Among the public buildings are the council-house, the palace of the margrave of Baden, hall of representatives, mint, post-office, barracks, arsenal, theatre, hall of fine arts, museum, the famed polytechnic school (with 800 students), cannon

foundry, a synagogue, and several Protestant and Catholic churches. There are also several hospitals, a deaf- mlute asylum, botanic gardens, and lyceum; military, medical, and veterinary schools, academies of architecture, painting, and music, and numerous literary and scientific associations. ‘The town is adorned with several public fountains, and is supplied with water by an aqueduct from Durlach. Carlsruhe carries on a considerable trade, and has engineering, carriage, chemical, silk, cotton, carpet, woollen, jewellery, tobacco, and snuff manufactories. The town is surrounded by beautiful parks and gardens. Population (1875), 43,000. Lat. 49° 1’ N., long. 8° 25° E.

CARLSTAD, a province or laen of Sweden, also called Wermland’s Laen. It is bounded W. and N.W. by Norway, N.E. by Falun, E. by Obevo, and 8. by Wenersborg and Lake Wener. The surface is mountainous and wooded, and is interspersed with numerous lakes and rivers. The pro- vince contains 300 iron mines, 80 foundries, and 300 forges. The neighbourhood of Fyrksdalen is called the Swedish Switzerland. The principal towns are Carlstad, Cristens- hamn, and Philipstad. Population in 18738, 263,037.

CarisTaD, the capital of the above province, stands on the island of Tingvalla, at the mouth of the Clara-Elf, on the north shore of Lake Wener. One of two bridges con- necting it with the mainland is the longest and most beautiful stone-bridge in Sweden. The town is the seat of a bishop, and has a handsome cathedral, a gymnasium, a theatre, a cabinet of natural history, and an agricultural society. The Gotha canal has considerably increased its commerce. Carlstad exports copper, iron, salt, timber, &c. It was founded by Charles IX., from whom it takes its name. Population in 1874, 7412.

CARLSTADT, a royal free city of Austrian Croatia, in the comitat of Agram, the capita] of the district of the same name, stands on the Kulpa, which here receives the Korana and the Dobra, 32 miles south-west of Agram. It consists of the fortress (which is surrounded by ramparts, trenches, and palisades), the inner town, and a suburb. Carlstadt is the seat of a Greek bishop, and five Catholic churches, a Catholic gymnasium, and many handsome public buildings. It has a considerable transit trade, and

manufactures the liqueur called rosoglio. It is situated in 45° 27’ N. lat. and 15°36’ E. long. Population (1871), 5515.

CARLSTADT (Karustapt), a district of Bavaria, in Lower Franconia, containing 29,014 inhabitants. The capital, of the same name, which is situated on the right bank of the River Main, has a population of 2240.

CARLSTADT, Karustapt, or Karonostapr (1480- 1541), whose real name was ANDREAS RUDOLF BoDENSTEIN, one of the boldest of the German Reformers, first the friend and afterwards the opponent of Martin Luther, was born at Carlstadt in Franconia, in 1480, thus being by three years Luther’s senior. In early life he was dis- tinguished by a thirst for knowledge, and a restless dis- position which led him to visit various countries and to

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pass from school to school. He went to Rome, and there plunged into the scholastic philosophy and theology; and having obtained the degree of bachelor of divinity, he arrived, in 1504, at Wittenberg. Here he was appointed professor at the university, first in the philosophical faculty, and ultimately (in 1513) in the theological. After obtain- ing his degree of doctor in theology in 1510, he held a canonry and was chosen archdeacon. In 1511 he was appointed dean or rector of the university; and in the following year it fell to his lot to confer the degree of doctor on Luther. At this time their friendship appears to have begun. Carlstadt had already attained a high reputation for learning, eloquence, and logical power. For the purpose of studying the canon law he went a second time to Rome in 1515, returning to Wittenberg in the following year. In the storm of persecution which raged against Reuchlin, Carlstadt took the part of the persecuted scholar. He also adopted about this time the views of Luther ; and in April 1517 he published a series of theses in which he asserted that the authority of Holy

| Scripture was above that of the fathers of the church,

and that in the absence of Scripture decision an.appeal must be made from the fathers to reason. It was at the end of October in the same year that

Luther affixed his theses to the church door at Wittenberg, and Carlstadt strenuously supported him. In 1519 he undertook to hold a disputation with Dr Eck, one of the greatest scholars of the age, on grace and free will. It took place at Leipsic in June, at the very time when the diet was sitting at Frankfort for the election of the emperor. Carlstadt as debater was not able to cope with Eck; and the discussions were tedious and almost fruitless. In the Papal bull against Luther, promulgated in 1520, Carlstadt was particularly named and condemned; and he was the first to appeal from the judgment of the Pope to a general council.

In 1521 he accepted an invitation from Christian II. of Denmark to teach the doctrines of the Reformation in that kingdom, but he made a very short stay there. Differences of opinion and petty jealousies were beginning to spring up between Luther and Carlstadt; and these ripened into bitter discussion and open hostility. Carlstadt's impetuous temper led him to become the advocate of violent measures for the attainment of those ends which Luther and the other Reformers hoped to compass by persuasiou. In con- sequence of the riotous agitation stirred up in Wittenberg by his speeches, writings, and manner of procedure during Luther's confinement in the Wartburg, Luther declared openly against him. For the next two years he remained quiet. But in 1523, being compelled to leave Wittenberg, he retired to Orlamiinde in Thuringia, and there got him- self elected pastor by the people. His violent proceedings favoured the suspicion that he was associated with the Anabaptists, and was implicated in the schemes of Miinzer, leader of the great peasant revolt. The elector of Saxony sent Luther to investigate the true state of things; and when Luther preached against Carlstadt at Jena they held a discussion on the " Real Presence," which Carlstadt was the first to deny, and an open quarrel broke ont between them. He was now ordered to leave the territories of the elector. For some time he wandered about from place to place, and at Rotenburg excited fresh tumults and instigated the people to destroy the images and pictures in the churches. Pursued as a promoter of the peasant insurrection, he was driven to strange shifts, and exposed to great hardships, his life even being in danger. In his extremity he wrote to Luther, offering to prove his innocence, and entreating him to intercede for him with the elector, and get permission for him to return to Saxony. Luther listened to him, printed

his defence, and succeeded in inducing the elector to comply with his request. For

several years Carlstadt led a quiet, retired life, engaged in farming and commerce. But he grew weary of this enforced suppression of his eager life and longings, and, allying himself with some of the fanatical teachers, he once more attacked Luther. The controversy, in which Zwingli took part in support of the views of Carlstadt on the Supper, grew fiercer than ever; and Carlstadt, the permission for his return to Saxony being now revoked, made his escape into Friesland. Thence he passed into Switzerland, where, through Zwingli's influence, he was named first a deacon in the church of Zurich and then pastor at Altstetten. He afterwards returned to Zurich as archdeacon, and preached there with much success. In 1534 he settled as pastor and professor of theology at Basel, and this post he occupied till his death. To his exemplary Christian character and life at Basel testimony is borne by Grynzus in a letter to Pitiscus, chaplain of the Elector Palatine. As Carlstadt was the first to assert several of the leading principles of Protestantism, so was he also the first to write against celibacy, and the first Protestant divine to take a wife. His writings, which were almost exclusively polemical, have fallen into oblivion. He died at Basel, December

24, 1541.

CARLUKE, a burgh of barony, in the county of Lanark, Scotland, situated near the right bank of the Clyde, 5 miles north-west of Lanark. Its inhabitants (3423) are principally engaged in cotton-spinning, and in the extensive coal, iron, and lime works in the vicinity.

CARLYLE, Joszpn Dacre (1759-1804), a celebrated Orientalist, was born in 1759 at Carlisle, where‘his father was a physician. Having completed his education at the grammar-school, he went in 1775 to Cambridge, was elected a fellow of Queen's College in 1779, and in 1783 took a master's degree. During his stay at college, with the assistance of a native of

Baghdad then resident at Cambridge, he had attained great proficiency in Arabic literature ; and after succeeding Dr Paley in the chancellor- ship of Carlisle, he was appointed, in 1794, professor of Arabic in the university of Cambridge. Two years before his appointment he published his translation of the History of Egypt written by Maured Allatafet Jemalledin, known in the East as the historiographer of Egypt ; and two years after his election to the professorship, a volume of Specimens of Arabic Poetry, from the earliest times to the extinction of the khalifs, with some account of the authors, Having been appointed chaplain by Lord Elgin to the embassy at Constantinople, he prosecuted his researches in Eastern literature, and made a lengthened tour through Asia Minor, Palestine, Greece, and Italy, collecting in his travels several valuable Greek and Syraic MSS. for a projected critical edition of the New Testament, collated with the Syraic and other versions—a work, however, which he did not live tocomplete. On his return he was presented by the bishop of Carlisle to the living of Newcastle-upon-Tyne, where he died in 1804. After his death there appeared a volume of poems, descriptive of the scenes of his travels, with prefaces extracted from his journal. Among other valuable works which he left unfinished was a half-corrected edition of the Bible in Arabic.

CARMAGNOLA, a town of Italy, near the right bank of the Po, in the province of Turin, and 16 miles by rail to the south of that city. It was formerly fortified, and the older portion is still surrounded with walls, while a fragment of its ancient castle is preserved in the form of a tower to the church of San Filippo. It contains five parish churches, several convents, and a hospital. A considerable trade is carried on, especially at the fair in June, in silk, flax, hemp, and cattle. Population in 1869, 12,799. Carmagnola, during the Middle Ages, belonged to the marquises of Saluzzo, and formed one of their frontier

towns. In the 16th century it was fortified by the French, but it fell into the hands of the Savoyards in 1588, and was assigned to them at the peace of 1601. On its capture in 1792 by the army of the Revolution, its name became famous as the title of a republican dancing-song which finished every verse with the refrain—Dansons lq Carmagnole, Vive le son du

canon. The word thus intro- duced to popularity was soon applied to a vest of common stuff and peculiar shape, which was recognized’as the sign of a true Republican ; and not long after it was jocularly used to designate the exaggerated reports that were pub- lished of the victories of the patriot army.

CARMAGNOLA, Francesco Bussonz, Count oF (1390-1432), one of the most celebrated Condottieri of the early part of the 15th century, was born at Carmagnola in 1390. He was first in the service of Filippo Maria Visconti, duke of Milan, who raised him to the rank of count and made him governor of Genoa. Having, however, lost Visconti’s favour, Carmagnola became general of the Venetian army, wrested Brescia from the hands of his old master, and inflicted a severe defeat upon him at Maclodio (1427), But in 1431, having failed to prevent the defeat of the Venetian fleet, and having been unsuccessful in an attempt to surprise Cremona, he incurred the suspicion of the senate, who, not daring to show their disapproval while he was surrounded by his soldiers, lured him to Venice, and there tortured and beheaded him (1432).

CARMARTHEN, County or, or CARMARTHENSHIRE

| (Welsh Caerfyrddin), a county in South Wales, bounded on

the N. by Cardigan, on the E. by Brecon and Glamorgan, on the 8. by Carmarthen Bay,an inlet of the Bristol Channel, and on the W. by Pembroke. Its greatest length is, from S8.W. to N.E., about 40 miles ; its greatest breadth, S.E. to N.W., about 24 miles. It possesses an area of 947 square miles, or 606,172 acres (of which about 95,600 are occupied by commons and waste land), and is thus the largest of all the Welsh counties. It contains 5 hundreds and 97 parishes, and is in the diocese of St David’s.

The whole of the northern, and by far the largest, portion of Carmarthenshire is chiefly occupied by ,the Silurian geological formation. To the south of this, and crossing the county ina direction from S.W. to N.E., there stretches a belt of the Old Red Sandstone, varying in width from 1} to 4 or 5 miles. This is succeeded on its southern edge by narrow belts of the carboniferous limestone, and the mill- stone grit ; south of which the

whole remaining portion of the county is occupied by the coal measures, forming part of the great South Wales coalfield.

In the south-east adjoining the border of Breconshire, there is a range of bleak and somewhat lofty mountains, called the Mynydd Da or Black Mountains, where the Carmarthenshire Van rears its lofty summit about 2600 feet high. The rest of the county is thickly studded with rounded green hills, few of which exceed 1000 feet in height, and is intersected by valleys and glens, many of them presenting scenes of great beauty and interest.

The principal river is the Towy, with its tributaries the Gwili and Cothi, which drains the central basin of the county, and enters the sea in Carmarthen Bay immediately to the east of the river Taf. The latter stream, with its numerous affluents, drains the western portion of the — county ; while in the north, the Teifi separates Cardigan from Carmarthenshire. The Llwchwr, springing from the Black Mountains, separates in its lower course Glamorgan from this county.

The climate is mild, except in the very elevated parts of the county ; but the annual fall of rain is very great, amounting at Carmarthen in 1875 to no less than 60°87 inches. Agriculture is generally not in a very forward

condition; but progress is being made in efficient drainage under the provisions of the Drainage Acts, and better modes of agricultural practice are coming into use. The soil varies very much ; but in the southern parts of the county, and in the larger valleys, it is exceedingly fertile.

In the south-east there are extensive and valuable coal and iron mines. There re also some important lead mines, and limestone is aLundant in the south.

Railways intersect the county; the through line from Bristol to Milford Haven, traversing the southern district, affords expeditious communication with London on the east and Ireland on the west. ;

The principal industry is that of agriculture, more particularly that of stock-raising. In 1873 the number of holdings in the county of less than one acre in extent amounted to 5168, and of an acre and upwards to 2898. There were only 11 above 5000 acres, and none exceeded 35,000. The average size of each holding at that date was 634 acres, that of all Wales amounting to 74}. The average rental of those containing one acre and upwards amounted to 14s. 9d. per acre.

The following tables will show the state of agriculture in the two years 1872 and 1875, and from them it will be observed, that while the acreage under crop has slightly decreased, an increase has taken place in the numbers of

live stock :— Grass under

Year. Oats. Barley. Wheat. Green crops ~ yotation.

NSTI) vases 41,920 wale 12,432 11,204 41,001

E76 …... 38,846 19,742 12,105 10,959 46,120 Year. Horses. Cattle. Sheep. Pigs. SA atte weiss 16,837 98,022 212,236 30,201 1\3)7/ aepeeraise 17,760 104,604 226,425 26,628

The other industries of any importance are coal-working, iron-founding, and the smelting of tin and copper, princi- pally of imported ores.

The population, which numbered 110,632 persons in 1851, increased in 1871 by 44 per cent., amounting to 115,710, of whom 54,921 were males, and 60,789 females. There are only two towns of any considerable size,— Car- marthen, population 10,488, and Llanelly, 13,958. Two members are returned to Parliament by the county and one by the group of Carmarthen boroughs. A court of quarter-sessions is held in the county.

Welsh is the language commonly spoken by the lower orders, and in the northern parts of the county the manners and customs of the people are as purely Welsh as in any part of the principality. Of the history of Carmarthet-shire it will be sufficient to say that it was occupied at the time of the Roman invasion by the Demete, a tribe which, after the expulsion of the conquerors, soon relapsed into semi-barbarism. Owing to its natural

advantages, it pre- served its independance long after the northern and eastern portions of Wales had become absorbed into the English states, and the fealty paid by Howel Dda, its most eminent prince, to the English sovereign was more nominal than real. But the tide of Norman conquest swept over it, and was scarcely interrupted until in the 12th and 13th centuries the two Llewelyns made a gallant resistance to it. It was, however, at Carmarthen that Edward I., checked for a moment in his course, raised a new army, before which Llewelyn fled, and the independence of the county ultimately fell. It was in this county that the remarkable “ Rebecca ” insurrection originated in 1843-4. The multi- plicity of toll-gates seemed to be the original cause of this singular conspiracy. Parties of five or six hundred men, mostly mounted, armed with pickaxes, sledges, hatchets, and guns, used nightly to traverse the counties of Car- marthen, Pembroke, Cardigan, and Brecon, headed by a tall man dressed in woman’s clothes, throwing down the toll-gates, and committing other excesses ; and so well did

the rioters keep counsel, and so secretly did they manage their forays, that despite the exertions of the magistrates, assisted by large bodies of military sent into the districts, no effectual check could be put upon their proceedings for many months.

Carmarthenshire is rich in antiquities, and possesses the traces of three important Roman roads, besides encamp- ments and several early British remains. The two most interesting medizval ruins are those of Carreg Cennin and Dynevor castles.

CARMARTHEN, the capital of Carmarthenshire, is a parliamentary and municipal borough, and forms a county of itself with an area of 4996 acres. It is beautifully situated on the right bank of the Towy, about 5 miles from the sea. The river is navigable for small vessels ; but, owing to the better access to the neighbouring borough of Llanelly, and to the increased facilities of railway com- munication, the Towy is not used so much for the transit of goods as formerly. The streets of the town are for the most part narrow and steep, although many of the houses are well built and of a

respectable class. Part of the town stands on elevated ground, and viewed from a distance it has an imposing appearance.

The principal church is that of St Peter's, a large plain building with a lofty square tower, containing some interest- ing monuments, among which is that of the celebrated Sir Rhys ap Thomas and his lady. Sir Richard Steele is buried here, but no monument marks his resting-place. There is another church belonging to the Establishment, and several dissenting chapels. There is a large and well- conducted training college here for Welsh teachers; and there are two grammar-schools on public foundations. There are also two infirmaries, and a literary and scientific institution, the lectures at which are well attended. The town also possesses a guild-hall,—a respectable stone edifice adorned with Tuscan columns, and having a covered market underneath. The county gaol is built on the site of the ancient castle. There is a granite obelisk erected to the memory of Sir Thomas Picton, and a bronze statue to General Nott, who were both natives of the town; and also a monument to the officers and men of the 23d Regi- ment (Welsh Fusiliers) who fell in the Crimean War.

A considerable trade is carried on by river and rail in slates, lead-ore, and tin plates, besides domestic produce. The salmon and sewin (bull-trout) fishing is also productive of some trade. 'The corporation consists of a mayor, 6 aldermen, and 18 councillors. It returned a member to Parliament from 1536 to the period of the Reform Act. Since that time it has been associated with Llanelly in returning onemember. There are markets on Wednesdays and Saturdays, and several fairs in the course of the year. The quarter sessions and assizes are held here. Population in 1851, 10,524, and in 1871, 10,488, (males 4820, females 5668), inhabited houses, 1984.

Carmarthen, as its name denotes, was a fortified place at an early period. It is generally believed to be the Mari- dunum of the Romans near which two branches of the great road, the Via Julia, diverged. Upon the erection of Wales into a principality, the chancery and exchequer of the southern division were fixed here. The last time when the castle was put to use was in the Parliamentary wars, when it was garrisoned and held for Charles I. After being re- duced by the Parliamentary forces it was dismantled, and

both it and the old walls were allowed to go to decay. The town gives the title of marquis to the duke of Leeds.

CARMEL, a mountain promontory of Palestine which runs out into the Mediterranean to the south of the bay of Acre, in 32° 50’ N. lat. and 35° E. long. Gradually retiring from the coast it stretches south-east for a distance of sixteen or eighteen miles, and then sinks abruptly to form a con-

nection with the mountains of Samaria, Composed almost entirely of oolitic formations, it is furrowed externally with nunierous ravines and other irregularities, while within it is eaten out into countless caves. Its greatest height 1s about 1750 feet. By the Biblical authors it is celebrated for its fertility; and its very name, which signifies the “vineyard of the Lord,” bears witness to its repute. At present there are only a few unimportant patches subjected to cultivation ; and most of the mountain is covered with a thick brushwood of evergreens which rises at some parts into forest. The tree which more than any other gives its character to the scenery is the Quercus Ilex, or prickly oak ; but the lentisk and myrtle are also abundant, and the profusion of lesser shrubs and aromatic herbs and flowers is altogether remarkable. ‘The vine is almost extinct except in the neighbourhood of the village of Esfia; but wine- presses hewn out of the rock show that its cultivation must at one time have been comnion. In the poetical books of the Scriptures allusions to Carmel are frequent ; and it is especially celebrated in Biblical story as the scene of the sacrifice by Elijah which decided the claims of Jehovah aud Baal. The exact site of the prophet’s altar is fixed by tradition at El Muhrakah at the eastern extremity of the ridge, where a rough structure of hewn stones is still visited as a place of sacrifice by the Druses. Various other places in the neighbourhord are connected with his name in one way or other, and the mountain itself, as well as the convent dedicated to the Virgin Mary, is familiarly known in the East as Mar Elyas. The origin of certain fruit-like fossils which occur in sonie of the rocks is explained by the legend that the keeper of a garden, having scornfully refused to let Elijah share in its produce, was punished by his melons and plums being instantly cursed into stone. Ata slightly later period the mountain afforded an asylum to the prophet Elisha ; and,

according to Jamblichus, Pythagoras sought the inspiration of its solitudes. In the time of Vespasian it was the seat of an oracle ; and Pliny speaks of its inhabitants as gens sola et toto in orbe preter ceeteras mira. The sanctity and seclusion of the place attracted a number of Christian hermits as early as the 4th century ; and here in the 12th century originated the order of the Carmelites. In 1209 the convent of St Brocardus was founded at the fountain of Elijah ; but the monks were massacred in 1238 and the building fell into decay. Another convent was erected in 1631; but it was destroyed in 1821 by Abd-ullah of St Jean d'Acre, who employed the ruins to build the walls of his city. A few years later the building was restored by command of the Porte, the expense being defrayed partly by Abd-ullah and partly by the contributions pro- cured by the monk John Baptist who wandered through a part of Europe, Asia, and Africa in pursuit of his mission. The building is large and commodious, and hospitable entertainment is freely rendered by the fraternity to travel- lers of any nation or religion whatever. The mountain was ut one time dotted with hanilets; but these have been almost all depopulated by the warlike Druses, An attempt to establish American colonists in some of the villages resulted in failure ; but in quite recent years considerable success has attended the efforts of a body of German Pro- testant dissenters, who call themselves Templars. Their principal settlement, founded in 1869, is at Haifa or Caipha, a town of from 2000 to 3000 inhabitants, at the northern end of the promontory, which is usually identified with the Roman Sycamina., (See the works of Irby and Mangles, Van de Velde, Thomson, Robinson, Tristram, and Stanley ; and for legendary details, Mislin, Zes Saints Lieux,

1851-57.)

CARMELITES, one of the four orders of Mendicant Friars. It is perhaps difficult to say whether upon the whole the Franciscans or the Carmelites

have invented and | la posterité ce quil y a de nlus curieua dans chaque Ordre,

propagated the more monstrous fictions respecting their own commencements and subsequent story. But as regards the very tender point

of their first foundation, the latter must be admitted to have distanced their competitors, For the history of the Franciscans at least commences with a basis of solid and indubitable historical fact, where- as in the case of the Carmelites ve plunge at once into the region of fable, and fable of the most monstrous kind, Mount Carmel is celebrated in Scripture as the abode of Elijah and Elisha, the former of whom the Carmelites claim as their founder. Elijah, or Elias, say the writers of the order, became a monk under the ministry of angels ; and his first disciples were Jonah, Micah, and Obadiah, They declare further that the wife of the latter, having bound herself by a vow of chastity, received the veil from the hands of Elias himself, and became the first abbess of the Carmelite female order. They tell us also that Pythagoras was a member of this order, and that he had on Mount Carmel several conversations with the Prophet Daniel on the subject of the Trinity. They further assert that the Virgin Mary and Christ himself assumed the habit and profession of Carmielites.! We first, however, reach the solid ground of something like history in the account left by Phocas, a Greek monk of the Isle of Patmos, who visited the Holy Land in 1185, and who concludes the narrative of his journeying by relating that the cave of Elias was then visible on Mount Carmel, and that there had existed there a large monastery, as might still be seen from the remains of the buildings ; that some years previously a monk in priest's orders, with white hair, had arrived there, coming from Calabria, and had established himself there in obedience to orders given him by Elias in a vision. He made, continues Phocas, a small enclosure among the ruins of the monastery, and built a bell tower and @ little church. He then collected about ten com- panions, with whom, concludes Phocas, he still continues to live there. To these recluses, Albert, bishop of Vercelli, who had become patriarch of Constantinople, gave a "rule" about the year 1209. And this must be considered to constitute the foundation of the Carmelite order.

This rule consists of only sixteen articles; and it appears from it that the monks on Mount Carmel were at that time eremitical, dwelling in separate little houses. The lodging of the prior was placed at the entrance into the enclosure, and the church was in the middle of the enclosed space. The rule contains the ordinary injunctions and prohibitions as regards masses and other services to be heard or said, and kinds of food to be avoided, with some unimportant specialities of dates and seasons. Albert further enjoined

on them to labour constantly with their hands, and to practise much silence. This rule was approved by Pope Honorius III. in 1226.

It is related that two English crusaders, John de Vesci and Richard de Grey, carried some of the recluses on Mount Carmel with them to England, and founded the first Carmelite monastery in England at Alnwick. Much about the same time—nearly the middle of the 13th century—Louis IX. of France, on his return from the Crusades, took with lim to Paris some of the Mount Carmel monks, and established them under the name of Carmelites in a monastery there. Others passed from Mount Carmel into Italy and Spain under the special protection of the popes. The number of their establishments was very rapidly and very largely increased; and they held their first European general chapter at Aylesford in England in 1245.

The Carmelites, however, can refer to papal briefs, bulls,

For a full account of all these absurdities, see a very curious work, printed at Paris in 1751, but with the date of Berlin, entitled Ordres Monastiques, Histoire extraite de tous les Auteurs qui ont conservé a

and rescripts of a much earlier time, in which their exist- ence is recognized John V. (ob 686), Stephen V. (ob. 817), Leo IV (ob, 855) Adrian IT. (ob, 872), Sergius Tiel, (ob, 911), Gregory VII. (ob. 1085), and Alexander ii.

(ob 1181) may be cited among the early popes who con- ferred privileges or special indulgences on the order. They further quote John XXII. (ob. 1334), Sixtus IV. (ob. 1484), Julius IIL. (ob. 1555), Pius V. (ob. 1572), Gregory XIIL (ob 1585), Sixtus V. (ob. 1590), and Clement VIII. (ob. 1605) as having all, in various documents, recognized the fact of their foundation by Elias. And, lastly, Bencdict XIII. in 1725. permitted the order to erect in St Peter’s, among the ste” Les of the founders of the religious orders, that of Elias as their founder, with the inscription,— Universus Ordo Carmelitarum fundatori suo Sancto Elie prophete erexit |

The term Universus in the above legend is intended to indicate that all the different branches of the order participated in the erec- tion of the statue,

although they have become entirely separate so- cieties The monks of that portion of the order which had adhered to the ancient rule, modified and mitigated, however, in some respects by Innocent IV. (ob. 1254), and more largely by Eugenius IV. (ob. 1447), are termed Carmelites of the Ancient Observanee. Shortly after the changes made in the rule by Pope Eugenius I'V., several local reformations were effected in the order in different countries,—one in Franee by the general Jean Soreth of Normandy in 1451, and another in the congregation at Mantua, which rapidly spread itself, and, much to the disgust of the general of that portion of the order which adhered to the old rule, obtained from the Pon- tiff the right to elect a vicar-general of their own, not subject to the jurisdiction or the approbation of the general. Various other partial reformations were effected, and the members of those congre-

ations which adopted them are styled ‘‘ Reformed Carmelites."

ut a more important, or at least a more marked and decided divi- sion into two branches was brought about by one of the most note- worthy personages in all the Catholic hagiology, Saint Tcresa. This extraordinary woman, a native of Avila, in old Castile, beeame a Carmelite nun in a nunnery of the order in that city in 1585. She at once determined on carrying out the rule in all its primitive strictness; but finding this insufficient to satisfy her abounding zeal and ambition, she obtained in 1562 a brief from Pope Pius IV. authorizing her to establish a separate branch of the order, the more austere observances of which should be modelled aecording to her own views. Very shortly several nunneries of ‘‘ Barefoot Carmelite Nuns" were established, mainly in Spain. Her success thus far soon led her to the more ambitious project of introducing a similar reform among the Carmelite body of the other sex. And this also she accom- plished by the assistance of two or three of the leading members of the Carmelite community. The members of the eommunities which reeeived this reformed rule, or which were founded for the obser- vance of it, were called Barefoot Carmelites (Carmes Déchaussés, or Carmelitani Scalzi), in distinction to those of the older bodies. For some time, however, the monasteries and nunneries of the Barefoot Carmelites remained subject to the gencral of the parent body ; till in 1580 Pope Gregory XIII. at the

instance of Philip II. of Spain, _ them to elect their own provincial generals, who were,

owever, still subject to the general of the entire order. But Sixtus V. having regard to the greatly increased and increasing number of their establishments, granted them, in 1587, the privilege of elect- ing a vicar-general of their own. Finally, Clement VIII., in 1598, separated them entirely from the other Carmelites, empowered them to elect a general of their body, and constituted them a separate Order of Friars Mendicant,—dispositions which were subsequently eonfirmed by Gregory XV.

The Carmelites originally wore white woollen dresses. But inas- much as the Orientals among whom they dwelt deemed this colour a mark of nobility, they adopted striped dresses, specimens of which may still be seen in aneient paintings, the colours of such stripes being sometimes white, grey, and black, and sometimes white and dark brown. After their establishment in Europe, however, these striped dresses were abandoned, and by the authority of Honorius IV., they began in 1287 to wear a white cape and scapulary, which was, however, shortly afterwards changed for dark brown. Over this dress they now wear a white cloak and hood when they quit their convent.

The device, both of the original body and of the Barefoot Camnel- ites, consists of a mountain, topped by three stars, and above this a crown, from the middle of which comes forth an arm grasping a sword. The mountain represents Mount Carmel; the stars sym- bolize the Virgin—Stella maris—to whom the order is more especially dedicated ; the crown figures forth her supremacy; the arm is the arm of Elias: and the sword it grasps is the token of his zeal. A

from cochineal.

line drawn across the top of the mountain differentiates the device as used by the Barefoot Carmelites. The order has been, and is

indecd still, a very wide-spread one, in all quarters of the globe.

CARMICHAEL, GersHom (1672-1729), a meta- physician of whom Sir William Hamilton has said that he “may be regarded, on good grounds, as the real founder of the Scottish school of philosophy.” He was born about the year 1672, probably in London, where his father, a Presbyterian minister who had been banished by the Scotch Privy Council for his religious opinions, was then living. Gershom was educated at Edinburgh Uni- versity. He graduated there in 1691, and soon after became a Regent at St Andrews. In 1694 he was elected a Master in the University of Glasgow,—an office that was converted into the profesorship of Moral Philosophy in 1727, when the system of Masters was abolished at Glas- gow. He was an eminently successful teacher, attracting students from England as well as Scotland, but his warm temper led him into various disputes with the principal and other college authorities, in consequence of which he was more than once suspended from his functions. His works are Breviuscula Introductio ad Logicam, a treatise on logic and the psychology of the intellectual powers, in which among other things he affirms that all knowledge may be resolved into immediate judgments known in their own light; Synopsis Theologie Naturalis ; and an edition of Puffendorff De Officio Hominis et Civis, with notes and supplements of high value. Carmichael died

in 1729.

CARMINE, a pigment of a bright red colour obtaincd It may be prepared by exhausting cochineal with boiling water, and then treating the clear

solution with alum, cream of tartar, or acid oxalate of potassium; the colouring and animal matters present in

the liquid are thus precipitated. Or an aqueous decoction of black cochineal is made, and treated with stannic chloride: a slow deposition of carmine then takes place ; the liquid is poured off, and the carmine dried. Another process is to add to 15 quarts of boiling river water 1 ib of cochineal, and a clear solution of 6 drachms of carbonate of soda in 1 tb of water, and boil for thirty minutcs. The liquid is then cooled, and 6 drachms of powdered alura are stirred in. After twenty minutes the resulting scarlet liquid is decanted, mixed well with the white of two eggs beaten up in } Ib of water, and again boilcd for a short time ; it is then left quiet for about half an hour, after which it is decanted, and the carminc which has becu deposited is

drained on a cloth, spread out on plates with an ivory or silver spatula, covered with white paper, and dried. By this process about 14 oz. of carmine is obtained from 1 tb of cochineal. Another method is to add 3 oz. of nitre and 4 oz. of acid oxalate of potassium to an in- fusion of 1 Ib of cochineal, and to boil for ten minutes. After four hours' standing, the liquid is poured into flat dishes, where it is left for three weeks. At the end of this time it is freed of the coating of mould formed upon it, and is drawn off, leaving a firm layer of carmine of fine colour. There are several other modes of preparing carmine, in some of which gelatine is used to assist its precipitation. The quality of carmine is affected by the temperature and the degree of illumination during its preparation,—sunlight being requisite for the production of a brilliant hue. It differs also according to the amount of alumina present in it. It is sometimes adulterated with cinuabar, starch, and other materials; from these the carmine can be separated by dissolving it in ammonia. Good carmine should crumble readily between the fingers when dry. Chemically, carmine is said to be a compound of colouring matter and a special animal principle with an acid from one of the agents employed to precipitate them.

Its discovery is attributed to a Franciscan monk of Pisa. Carmine is used in the manu facture of artificial flowers, water-colours, rouge, cosmetics, and crimson ink, and in the painting of miniatures. Carmine Lake is a pigment obtained by adding freshly precipitated alumina to decoc- tion of cochineal. ;

CARMONA, a town of Spain in the province of Seville, situated about 15 miles east of the city of that name, on a gentle elevation that overlooks an extensive plain. Its castle, now in ruins, was formerly the principal fortress of Peter the Cruel, and contained a spacious palace within its defences. The principal entrance to the town is an old Moorish gateway ; and the gate on the road to Cordova is partly of Roman construction. Part of the ancient college of San Teodomir is of Moorish architecture, and the tower of the church of San Pedro is an imitation of 'the Giralda at Seville. The principal trade is in oil, corn, and cattle. Carmona, the Roman Carmo, was the strongest city in Further Spain in the time of Julius Cesar ; and its strength

was greatly increased by the Moors, who surrounded it with a wall and ornamented it with fountains and palaces. In 1247 Ferdinand III. of Castile took the city, and bestowed on it the motto—Sicut Lucifer lucet in Aurora, sic ix Wandalia Carmona. The Carmona fair, which is held in April, affords an almost unequalled oppor-

tunity of observing the genuine costumes and customs of

southern Spain. Population, 20,704.

CARNAC, a village of France, in the department of

Morbihan and arrondissement of L'Orient, about 9 miles south-west of Auray, which .is the nearest railway station. It owes its celebrity to the rude stone monuments

in its vicinity, which are among the most extensive and interesting of their kind. The most remarkable consist of

long avenues of maenhirs or standing stones; but there is also a great profusion of other erections, such as dolmens and barrows, throughout the whole district. About half a mile to the north of the village is the Menec system, which consists of eleven lines, numbers 942 maenhirs, and extends a distance of 3376 feet. The terminal circle, whose longest diameter is 300 feet, is somewhat difficult to make out, as it is broken by the houses and gardens of a little hamlet. Further to the north-east there is another system at Kermario (Place of the Dead), which consists of 994 stones, many of them of great size—some, for example, 18 feet in height—arranged in ten lines and extending about 4000 feet in length. Still further in the same direction is a third system at Kerlescant (Place of Burning), com- posed of 266 stones, which are distributed into thirteen lines, terminated by an irregular circle, and altogether ex- tend over a distance of 1000 feet or more. A fourth system at Menec Vihan, due east of the village of Carnac, has 125 stones. The alignment of Kermario points to the dolmen of Kercado (Place of St Cado), where there is also a barrow, explored in 1863; and to the east of Menec Stands the great tumulus of Mont St Michel, which measures 317 feet in length and 192 feet in width at the base, and has at present a height of 33 feet. The tumulus, which is crowned with a chapel,

was excavated by René Galles in 1862; and the contents of the sepulchral chamber, which include several jade and fibrolite axes, are preserved in the museum at Vannes. About a mile east of the village 18 a small piece of moorland called the Boceno, from the boceniew or mounds with which it is covered ; and here, in 1874, the explorations of Cleuziou and Miln brought to light what they suppose to be the remains of a Gallo-Roman town, The tradition of Carnac is that there was once a convent of the Templars or Red K nights on the spot ; but this it seems is not supported by history. Similar traces were also discovered at Mané Bras, a height about three miles to the east. The rocks of which these various

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monuments are composed is the ordinary granite of the

district, and most of them present a strauge appearance from their coating of white lichens.

For further details the reader may consult the Prehistoric Times of Sir Johu Lubbock, who visited Carnac in 1867 along with Dr Hooker ; the Guide to the Principal Chambered Barrows and other Prehastoric Monuments in the Islands of the

Morbihan, &e. (1875), by W. C. Lukis, who spent consider.

able portions of seven years in the district ; the various pub- lications of René Galles, such as his Foudlles du Mont Saint Michel en Carnac, 1864, and Zumulus et dolmens de Ker- cado, 1864 ; Fouquet’s Des monuments celtiques et des rwines romaines dans le Morbihan, 1873; Journal of Anthrop, Soc. of London, 1869, p. cxxiii. ; Jephson’s Walking Tour im Brittany, 1866 ; and the Proceedings of the Soc. of Scot. Antig., 1875.

CARNARVON, County or, (Welsh Caer-yn-arfon), a maritime county of North Wales, is bounded on the N. by Beaumaris Bay, on the E. by Denbigh, on the S.E. by Merioneth ; on the S.W. by Cardigan Bay, and on the W. by the Irish Sea and the Menai Strait. There is a small detached

portion of the county on the N. coast of Denbighshire. The greatest length of this county is from north-east to south-west, and measures about 55 miles ; while its greatest breadth from south-east to north-west is about 23 miles. Nearly one-half of its whole length forms a spur-like peninsula, varying from five to nine miles in width, projecting in a south-west direction into the Irish Sea, aud forming Cardigan Bay on the south, and Car- narvon Bay on the north. The county possesses an area of 579 square miles, or 370,273 acres, and contains 10 hundreds and 76 parishes.

The Lower Silurian and Cambrian beds may be termed the basis of the geological features of this county; but they are so completely penetrated in every direction by intrusive igneous rocks that there is hardly a square mile of surface in the whole county free from their presence, These consist chiefly of compact felspar, felspathic traps, greenstone, quartz porphyries, and syenite. On the west, along the shore of the Menai Strait, there is a narrow belt of carboniferous limestone ; of this the Great Orme's Head is also composed ; and on the western side of the peninsular part of the county is a broad band of chlorite and mica schist with serpentine interspersed. Carnarvon is rich in mineral treasures ; for, besides lead and copper lodes and an appreciable amount of gold, its numerous slate quarries are amongst the most valuable mineral properties in the United Kingdom, and yield princely incomes to the fortunate possessors, besides furnishing employment to many thousands of workmen,

_ Carnarvon is the most mountainous of all the Welsh counties, and its mountains are the grandest of any in the British islands south of the Forth. The Snowdon range fills up the whole of the centre of the county ; and, with its lofty summits rising to the height of between 3000 and 4000 feet, throws an air of grandeur and sublimity over scenery which is of the most romantic and beautiful description. The summit of Snowdon itself is 3570 feet above the level of the sea, and it is surrounded by a phalanx of giants, many of them but little lower than itself. Among the more important of these, within the county, are the Carnedd Llewelyn, 3482 feet; the Carnedd Dafydd, 3430 feet; the Glyder Fawr, 3275 feet; the Elidyr- fawr, 3033 feet ; the Moel Siabod. 2863 feet ; Moel Hebog, 2578 feet ; and Drum, 2527 feet in height. The tocks of which the Snowdonian range is composed are for the

most part of a very bold and rugged description, which adds to the impressiveness of their immense masses.

Some of the valleys are characterized by the extreme of wild and rugged grandeur, being walled in by the naked

rocks, and traversed by foaming torrents ; while others are marked by soft and smiling beauty. Among the former

may be mentioned the gorge at Pont Aberglaslyn, while.

Nant Gwynant, with its placid lake and verdant meadows, will serve as an illustration of the latter. The vales of Beddgelert and Llanberis, the former at the southern, and the latter at the northern base of Snowdon, have a world-wide reputation for beauty ; and the vale of the Conway, from Llanrwst to Conway, is a noble piece of scenery, backed as it is on its southern border by the Snowdon range.

The only river of importance is the Conway, which rises in Llyn Conway, in the 8.E. corner of the county, and after separating Carnarvon from Denbigh in a nearly due north course of about 30 miles, falls into the sea at Conway. It is a tidal river, and is navigable for about 10 miles from Conway. ‘The Seoint, a small stream, rises in Snowdon, and falls into the sea at Carnarvon.

The lakes are very numerous, and some of them of con- siderable size. The more important are the lakes of Llanberis (Llyn Peris and Llyn Padarn), to the north of Snowdon; Llyn Ogwen, to the north of the Glyder Fawr , Llyn Owlyd and Llyn Eigiau, both to the north of Capel Curcg; Llyn Llydau on Snowdon; Llyn Cwellyn to the west, and Llyn Gwynant to the east of that mountain ; Llyniau Nant-y-Llef or Nantlle Pools, near Llanllyfni; and Llyn Conway, already referred to.

The climate is cold and severe during the winter, except in the peninsular part of the county and on the sea-coast, where it is very mild. The arable land occupies not more than a third part of the whole surface ; and this is

mostly in the vale of Conway, or in the neighbourhood of the sea. A small quantity of wheat is raised; but the principal cultivated crops are oats, barley, and potatoes. The alluvial deposit in some of the valleys forms a rich and fertile soil, which is chiefly employed as meadow land. Dairy and sheep-farming form the chief employment of the agricultural population ; and on the hills numbers of diminutive ponies are reared, which at two years old find a steady sale in the English market. Agriculture is not in a forward state, and has not been advanced by the success attending the mining industries of the county. In 1873 Carnarvon was divided among 6240 separate proprietors, 4610 of these owning holdings of less than an acre ; eleven holdings consisted of more than 5000 acres, and none ex- ceeded 42,000 acres. On an average each holding contained 48 acres, the average of all Wales being 744; and the aver- age rental of properties amounting to an acre and upwards was as high as 19s. 9d. per acre, owing to the presence of so many valuable mines.

The following tables will show the state of agriculture in the county in the years 1872 and 1875, and from these it will be observed that there is a general diminution of the acreage of crops but an increase in the numbers of

live stock :— Grass under rotation.

35,418 37,006

Wheat. Green crops.

2,038 9,134 1,626 9,101

Shee

Yoar

oe oe TLS (Danaege

Oats.

13,786 12,849

Horses, p

7,064 46,981 218,881 7,363 651,352 223,804

The county is as well served with railways as the mountainous character of the district will allow. The Chester and Holyhead line runs along the northern coast, and crosses to Anglesey by means of the Britannia Bridge over the Menai Strait. From this line branches diverge up the valley of the Conway, and across the peninsula by Carnarvon to Pwllheli, &c. The Cumbrian line enters from the south at Portmadoc _ These means of communication and the numerous ports

Barley.

9,101 8,459

Cattle. Pigs.

21,002 19,273

on its coasts, afford very great facilities for the transport of the important mineral products of the county.

Copper, lead, and slate are worked very largely, par. ticularly the last, which is of the most valuable quality. For roofing, paving, and ornamental purposes it is exported in large quantities. In 1871, 4370 men were employed in the slate quarries. The chief owners are Lord Penrhyn, Mr Duff Smith, and the Welsh Slate Company,

The inhabitants, who all speak Welsh more or less, num- bered in 1851 87,870; in 1871 they had increased 20} per cent., amounting to 106,121, of whom 51,874 were males and 54,247 females. Nearly the whole of Carnar- vonshire is in the diocese of Bangor. It has a court of quarter sessions. It is represented in Parliament by one member for the county and one for the Bangor group of boroughs.

The principal towns are Bangor, population (187 }) 9859; Carnarvon, 9449 ; Pwllheli, 3009 ; and Llandudno,

Carnarvonshire was occupied by the important tribe of the Segontiaci, who were with difficulty subdued by Ostorius Scapula and Suetonius Paulinus. During the Roman period it formed part of Britannia Secunda, and Conovium and Segontium have been identified as Caer Rhyn and Carnar- von (Caer Seoint). Later it was part of the kingdom of Gwynnedd until Edward I. in 1277 restricted that division to the land of Snowdon proper. ‘The early fortresses at Diganwy, Dinorwig, &c., as well as the later castles at Conway, Carnarvon, and other places, attest the warlike character of its inhabitants.

CARNARVON, the capital of the above county, a parlia- mentary and municipal borough, occupies an area of 1897 acres, and is pleasantly situated on the eastern shore of Carnarvon Bay, in the Irish Sea, at the mouth of the Seoint, 210 miles north-west of London. It stands very nearly upon the site of Caer Seoint, the ancient capital of the Segontiaci, and owes its origin to Hugh Lupus, earl of Chester, who in 1098 fortified the place. ‘The noble castle was commenced in 1284, and the common tradition that Edward II. was born in that year within its walls is now known to be unfounded, as they were at the date of his birth scarcely in existence. It occupies a large area on the west side of the town and is in the form of an irregular oblong, surrounded by walls and defended by thirteen polygonal towers. The Eagle Tower (Edward’s reputed birthplace) is at the extreme west, and is of con- spicuous beauty and dominant height. A considerable portion of the town-wall near the castle is still entire. The parish church is nearly half a mile from the town. In the town itself there is a chapel of ease, and several large and commodious dissenting chapels. There are also a town and county hall, a training college for teachers, and handsome schools. The town also possesses assembly rooms and a theatre, and is resorted to as a sea-bathing place in summer. ‘The port is used for the export of slates and copper ore from the quarries of Llanberis and Llanllyfni, but there is little manufacturing in the town itself. The borough has formed part of a district which has returned a member to Parliament since 1536. The Reform Bill added Bangor to the district, which now includes Carnarvon, Conway, Criccieth, Pwllheli, Bangor, and Nevin. The population of Carnarvon in 1851 was 8674, and in 1871, 9449 (males 4357, females 5092) ; the

inhabited houses numbered 1975. There is a weekly market on Saturdays, and four fairs are held in the course of the year. The quarter sessions and assizes are held in the town.

CARNATIC, a large district of Southern India, now included in the presidency of Madras. Though no longer recognized as a political or administrative division, it is of

take to support a sufficient civil and military force for the protection of the country and the collection of the revenue, On the death of the nabob in 1853 it was determined to put an end to the nominal sovereignty, a liberal establish- ment being provided for the family,

The Southern Carnatic, when it came into the Possession of the British, was occupied by military chieftains called polygars, who ruled over the country, and held lands by doubtful tenures. They were unquestionably a disorderly race; and the country, by their incessant feuds and plunderings, was one continued scene of strife and violence, Under British rule they have been reduced to order, and their forts and military establishments have been destroyed.

CARNEADES, a Greek philosopher, founder of the Third or New Academy, was born at Cyrene about 213 8.0, Little is known of his life. He learned dialectics under Diogenes the Stoic, and under Hegesinus, the third leader of the Academy in descent from Arcesilaus, The chief objects of his study, however, were the works of Chrysippus, Opposition to whose views is the mainspring of his philo- sophy. “Tf Chrysippus had not been, I had not been either,” he is reported to have said on one occasion, The nost notable incident in his life was the embassy to Rome in 156. His eloquence and powerful reasoning excited aimong the Roman youth an enthusiasm for philosophical speculations, and roused the ire of Cato, who insisted on Carneades, with his companions, being sent from the city. According to Diogenes Laertius, Carneades died in his eighty-fifth year, ze, in 129 Bo, ; according to Cicero he survived to the age of ninety.

Carneadcs is the most powerful of the ancient sceptics, Fundamentally he is at one with Arcesilaus (see ARCE- SILAUS) ; but he carried out his principles with such ful- ness and skill, both on the negative and on the positive side, that he is called with justice the founder of the New Academy. Negatively, the philosophy of Carneades is a polemic against the Stoic theory of knowledge in all its aspects. Experience, he thinks, clearly shows that there is no true impression. There is no notion that may not deceive us ; it is impossible .to distinguish between false and trne impressions ; ¢avrata KataAynmixy must be given up. There is no criterion of truth. Not content with attacking this fundamental position of the Stoic philosophy, Carneades also assailed their theology and physics, In answer to the Stoic doctrine of final cause, of design in nature, he points to those things which cause destruction and danger to man, to the evil committed by men endowed with reason, to the miserable condition of humanity, and to the misfortunes that assail the good man, There is, he con- cludes, no evidence for the doctrine of a divine superintend ing providence. Even if there were orderly connection of parts in the universe, this may have resulted quite naturally. No proof can be advanced to show that this world is any- thing but the product of natural forces. Carneades further attacked the very idea of God. He pomts out the contra- diction between the attributes of infinity and individuality. Like Aristotle, he insists that virtue, being relative, cannot be ascribed to God. Not even intelligence can be an attribute of the divine Being, Many of the arguments employed in this connection by Carneades have little value, but the general line of criticism is highly suggestive and anticipates much in modern thought.

The positive side of Carneades’s teaching resembled in all essentials that of Arcesilaus. Knowledge being impossible, a wise man should practise érox7, withholding of judgment. He will not even be sure that he can be sure of nothing. Ideas or notions are never true, but only probable ; nevertheless, there are degrees of probability, and hence degrees of belief, leading to action. This theory

great historic importance. It extended along the eastern coast about 600 miles in length, and from 50 to 100 miles in breadth. It was bounded on the N. by the Guntoor circar, the limit being the small River Gundezama, which falls into the sea at Muntapilly, and thence it stretched southward to Cape

Comorin. It was divided into the Southern, Central, and Northern Carnatic. The region south of the River Coleroon which passes the town of Trichinopoly, was called the Southern Carnatic. The principal towns of this division were Tanjore, Trichinopoly, Madura, Tranquebar, Negapatam, and Tinevelly. The Central Carnatic extended from the Coleroon River to the River Pennar; its chief towns were Madras, Pondicherry, Arcot, Vellore, Cuddalore, Pullicat, Nellore, &c. The Northern Carnatic extended from the River Pennar to the northern limit of the country; and the chief towns were Ongole, Carwaree, and Samgaum. The Carnatic, as above defined, comprehended within its limits the maritime provinces of Nellore, Chingleput, South Arcot, Tanjore, Madura, and Tinevelly, besides the inland districts of North Arcot and Trichinopoly. The population of this region consists chiefly of Brahmanical Hindus, the Maho- metans being but thinly scattered over the country. The Brahmans rent a great proportion of the land, and also fill different offices in the collection of the revenue and the administration of justice. Throughout the country they appropriate to themselves a particular quarter in every town, generally the strongest part of it. The country in former times was the scene of unremitting violence and strife between the numerous chieftains and petty potentates, among whom it was divided; and forts and fortresses accordingly crown almost all the elevated points. They are built of a square form ; from the long period of inter- nal tranquillity which the country has enjoyed, they are now rapidly falling into decay. Large temples and other public monuments of civilization abound. The temples are commonly built in the middle of a sqnare area, and en- closed by a wall 15 or 20 feet high, which conceals them completely from the public view, as they are never raised above it.

In the early centuries of the Christian era, the Carnatic or Carnata seems to have been formed part of the Panja or Pandion kingdom; but about the middle of the 11th century it passed under the power of the Belalas, a family of Rajput race, which at that time was making itself supreme in Southern India, Of the greatness of this dynasty the ruins of Bisnagar, their capital, still give striking witness ; but it succumbed before the mightier Mahometan poten- tates.

The Carnatic was first invaded by this new power in 1310 A.D., when they defeated the Hindu sovereign and conquered the country, which, after being

divided between the kingdoms of Bijapore and Golconda, became ultimately tributary to the sovereigns of the Deccan. In the 17th century it was overrun by the armies of Aurungzebe ;_ but it was again dismembered from the Mongol empire in 1717, when Nizam ul-Mulk obtained possession of the Deccan and the south of India. In 1743 he appointed Anwar ud-Deen nabob of the Carnatic, with his capital at Arcot; in 1754 a competition for the government arose ; and after a long and tedious war, in which the English aud the French took different sides, Mahomet Ali was left in possession of that portion of the Carnatic which was the fruit of the Successes achieved by the British. Central Carnatic was laid completely waste by Hyder Ali, but was again reconquered by the British in 1783. In 1801 all the possessions of the nabob of the Carnatic were transferred to the British by a treaty, the conditions of which were, that a revenue of several lacs of pagodas should be reserved to the nabob annually, and that the British should under-

of probability was worked out with some care, but little is known of its application to practice. The views of Carneades on the summum bonum were not clearly known even to his disciple and successor Clitomachus. He seems to have held that virtue consisted in the direction of activity towards the satisfaction of the natural impulses. Carneades left no written works ; his opinions seem to have been systematized by his follower Clitomachus. (See Diog. Laer. bk. iv., Cicero, and Sextus Empiricus. An admirable survey of Carneades is given by Zeller, Phil. d. Griechen, iii. pt. 1.)

CARNIOLA (in German, Xrain), a duchy and crown land of the Austrian empire, bounded on the N. by Carinthia, on the N.E by Styria, S.E. and 8. by Croatia, and W. by Trieste, Gortz, and Istria. It has an area of 3857 English square miles, and the civil population in 1869 amounted to 463,273, of whom 220,000 were males and 243,264 females. It is occupied in the N. by the southern slopes and offshoots of the Carinthian Alps, in the W. by the Julian Alps and the Karst or Carso Mountains, and on the 8.E. frontier by the Uskoken Mountains. The highest point is the Terglou, which rises to nearly 10,000 feet, and bears on its northern declivity the only glacier in the duchy. No part of Europe presents a greater number of caves,

subterranean streams, funnels, and similar phenomena ; and the grottoes of Adelsberg, especially, are among the most extensive and interesting in the world. The principal river of the duchy is the Save, which rises in the N.W. corner, and flows south-east ; its main source is in the Wochein Lake, and its more important tributaries are the Gurk, the Kanker, and the Leibnitz. The climate is rather severe, and the soil comparatively unproductive. In 1870, by official statistics, there were about 336,731 acres of arable land, 25,844 in vineyards, 406,325 in meadows and gardens, 504,879 in pasture, and 448,017 in woods. Millet is the grain principally grown, and furnishes the favourite national fare ; maize is not uncommon, but wheat and rye are rarely met with. The country is rich in mineral wealth; in 1870 it yielded 23,632 tons of quicksilver ore—most of it obtained from the mines of Idria —9401 of iron ore, 7630 of copper ore, 195 of zinc and a small quantity

of lead. The weaving of linen and lace is very common:

through the country, and distillation is carried on by a considerable number of the farmers on a small' scale. Carniola is divided into the eleven districts of Adelsberg, Gottschee, Gurkfeld, Krainburg, Laibach, Litaj, Loitsch, Radmannsdorf, Rudolfswerth, Stein, and Tchernembl ; and the capital Laibach ranks as a separate division. There are fourteen towns, twenty-three market villages, and 3231 hamlets,—the most populous places being Laibach, with 22,593 inhabitants, Upper Idria 3813, Krainburg 2668, and Rudolfswerth 2068. By far the greater part of the population is of Slavonic race,—the German element amounting to little more than a fifteenth of the whole. Nearly all are Roman Catholics, 956 being Protestants, and 315 adherents of the Greek Church. By the law of 1861 the Carniola diet consists of thirty-seven meinbers, including, besides the bishop, ten appointed by the landed proprietors, eight by the towns and centres of industry, sixteen by the rural communes, and two by the commercial chambers at Laibach ; six members are sent to the imperial diet. During the Roman empire Carniola forined part of Noricum and Pannonia. Conquered by Charlemagne, the most of the district was bestowed on the duke of Friuli ; but in the 10th century the title of margrave of Carniola began to be borne by a family resident in the castle of Kieselberg near Krainburg. Various parts of the present territory were, however, held by other lords, such as the

duke of Carinthia and the bishop of Friesing. Towards the close of the 14th century all the separate portions had

come by inheritance or bequest into the hands of Rudolph IV. of Austria, who took the title of duke of Carniola ; and since then the duchy has remained a part of the Aus- trian possessions, except during the short period from 1809 to 1813, when it was incorporated with the French Illyrian Provinces. In 1849 it became a crown land.

CARNIVAL. This word is probably most commonly written in English as it is here given ; but it is extremely difficult to say what is the most correct orthography. Of course for the solution of any doubt upon the subject we turn immediately to the Italian vocabularies and practice. But on doing so we find ourselves at the beginning not at the end of our difficulty. Fanfani, whose dictionary is constructed on the basis of the Della Crusca vocabulary, gives only “Carnevale.”! Moroni also in his ecclesiastical dictionary gives both “Carnevale” and “ Carnovale.” Boiste, following the “ Académie,” gives ‘“ Carnaval,” as the French form. Facciolati in his appendix of low Latin terms gives only Carnisprivium. Our mode of writing ‘“ Carneval” would seem, therefore, to be the only possible way of spelling the word which is unsupported by the authority of other languages ; yet, if that which seems to be the most obvious, and is the most generally accepted meaning and derivation of the word, be the correct one, “Carnival” is surely the most natural form of a word intended to express “ farewell to flesh-meat,’— Carni-vale. But there are sufficiently strong reasons for doubting whether such be really the etymology of the word. And the generally received notion seems to have naturally sug- gested itself to those who, understanding the term in its modern, popular, and specially non-Italian meaning, to signify the few last days of licence and feasting immediately preceding Lent, have supposed that this feasting was meant as a sort of valedictory consolation for the privations about to follow. But such is not the proper meaning of the term, and it is hardly yet popularly so understood in Italy. It is still very commonly taken there to signify the whole of the time from the first day of the year to Shrove Tuesday inclusive. But neither is this accurately correct. Carnival time properly begins with the day following the festival of the

Epiphany, that is the 7th of January, and lasts till midnight on Shrove Tuesday. Now, although it may be natural enough for those who consider ‘“ Carnival ” to mean the three or four days of revelry which inimediately precede Lent to imagine that such revelry celebrates their coming forty days of abstinence, it is har’!ly likely that a season of the year beginning between two and three months before such “ farewell to flesh” should be named from that circumstance. The Della Cruscans, with Du Cange and Muratori, suppose the word to be derived from Carn- avallare (avallare, Ital. to swallow), from the greater quantity of flesh-meat used at that time of the year. But the Spaniards, following the older low Latin phrase “Carnis-privium,” speak of Carnival as Carnes tollendas. And the

phrase met with in the older ecclesiastical writers, Carnis-

privium sacerdotum (applied to the period beginning with Sexagesima Sunday, from the fact of the regular clergy of most rules having practised a partial abstinence from that day till the beginning of Lent), would not seem to favour the supposition. It is to be observed also that there is another name for the period of carnival, once quite as common in Italy as that of which we are speaking, though now nearly obsolete, Carnasciale ; and Muratori says that he has nothing to oppose to those who think that Carnevale is merely another form of Carnasciale, the meaning of which is to abound in (or use unrestrictedly) flesh,—carne scvalare. Ferrario, on the other hand, maintains that the word was originally merely the same with “ Carnalia,” indicating an 1 But the Della Crusca vocadolaria itself, as well as Du Cange, Mura- tori, and other authorities, give either form, Carnevale or Carnovale,

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origin much earlier than any ecclesiastical observance, and used in the same way as “ Saturnalia,” “ Liberalia,” é&c.

And, in fact, whatever may have been the origin of the word, there can be little doubt that the origin of the thong dates from ante-Christian times. The Bacchanalian festivals of antiquity were celebrated by the Romans, who

adopted them from older nations, twice in the year, indicating the early connection of those rites with the phenomena of the solar system, in the winter and in the summer. And the primitive church, finding it, doubtless, impossible to sup- press, as it would fain have done, those popular revels, adopted its usual policy of at least fitting them in to its system, and assigning to them a meaning connected with its own practices and observances. The Lupercalian festi- val in honour of Pan and Ceres, observed in February (which Pope Gelasius I., who died in 496, strove to supersede by substituting for them the festival of the Purification of the Blessed Virgin, with special illumination of candles on the altar Candlemass)—also coincided with the period of carnival, as did also (at a little earlier period of the year) the medieval celebration of the Festival of Fools, equally a survival of the same old Pagan midwinter revelling. Specially the use of masks and torches can be traced as the continuation of ancient practices.

The spirit of compromise, which has so generally characterized the dealings of the church with ‘“ the world” is very notable in its attitude towards the popular observ- ances of carnival ; and more especially so, as needs must have been the case, in those cities in which the Pope was temporal ruler as well as spiritual pastor. For many generations past these carnival gala doings, especially at Rome, were recognized as an important element in the material prosperity of the city. They were good for trade. They induced large numbers of people, foreigners and provincials, to throng to Rome. The Government of the popes, accordingly, not only looked leniently on carnival excesses, but took active steps to promote and assist the revelry. But the Pope was at the same time the universal bishop of souls! And, as the writer of Moroni’s dissertation on the subject says, ‘‘ If the church tolerates the inveterate custom of carnivalesque diversions, especially the mas- querades, groaning all the while, it promotes exercises of piety at the same time, since the consequences of these travesties are dangerous, as affording opportunites for immoral conduct. And the Bacchanalian revelries of carnival, which are nothing else than an imitation of the abominable debauches of Pagans, when they abandon theniselves to their passious, have been constantly denounced by the voice of reason, by that of the gospel, by the sacred canons, by the councils, and by all the pontiffs and zealous pastors of the churches, from the earliest ages down to our own days. The

church from Septuagesima Sunday covers her altars, and her ministers assume vestments of penitence. She suspends the song of Hallelujah, and mingles tears and sighs of sadness with the joyous accents of the people. She assumes purple-coloured vestments and altar-cloths in sign of mourning, supresses her hymns, and proposes for our contemplation the fatal fall of our first parents, and the lamentable effects of that great sin." But at the same time the Cardinal Vicar, in whose hands was the police of Rome, was giving special permission for the wearing of masks in the streets, naming the days when people might pelt each other with sham comfits, regulating the exact size and nature of these, and planning the whole arrangement of the revels. Clement IX. (ob. 1669) meanwhile used to shut himself every year during carnival in the convent of St Sabina on the Aventine, that he might at least not see what he could not avoid tolerating. Clement XI, in 1719 and 1721, issued two apostolical briefs with the view of repressing the licence of carnival. Benedict XIII, (ob. 1730)

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always passed the carnival in the strictest retirement in the Dominican convent of St Sixtus. Benedict XIV (ob, 1758) strove, by an encyclical letter of the 1st of January 1748, to moderate some of the worst excesses of licentious- ness to which the carnival every year gave rise. But his efforts mainly restricted themselves to the merely forma] points of insisting that the revelry should not be prolonged beyond the midnight of Shrove Tuesday, and forbidding the appearance of masks in the streets on Sundays and Fridays ; adding a promise of plenary indulgence to all who would contribute to counterbalance the sins of carnival by the practice of certain extra devotional exercises during those days. Nevertheless, in the last years which preceded the destruction of the Pope's temporal power, when the inhabi- tants of Rome were bent on manifesting by every possible means their discontent at the ruling order of things, and their desire to associate themselves with the rest of liberated and united Italy, and for this reason were disposed to abstain from all carnival rejoicings, the priestly Government did everything in its power to promote the usual holiday doings, and excite the people to the accustomed revelry,

The Roman Carnival is recorded by several contemporary writers of records and diaries to have been especially splendid during the papacy of the great Farnese Pope Paul ITI., 1534-1549,—days when Rome was still over-flowing with wealth sent thither by all tributary Chris- tendom. And the year 1545 is mentioned by several chroniclers as having been marked by special magnificence, The carnival sports seem at that time to have consisted mainly of three divisions, the races in the Corso (which, formerly called the Via Lata, took its present name from them), and the spectacular pageants of the " Agona," now the Piazza Navona, and of the Testaccio. The races seem to have taken place on each of the eight days which were then held to constitute the period devoted to holiday- making. These races seem to have prevailed in one form or another from time immemorial ; and before they were run in the Corso, as at present, took place in the open space in the neighbourbood of the Porta St Sebastiano, not far from the present Protestant cemetery. It was in the time of Paul II. (ob. 1471) that they were moved to the Corso. The Piazza del Popolo, which now forms the starting-place, was not then in existence. The races started from the Arch of Domitian, in the immediate vicinity of the Palazzo Fiano, and terminated in the Piazza di Venezia, so named from the huge palace, now the property of Austria, which the Venetian Pope Paul II. (Barbd) had just built. "In these races," says the writer in Moroni's Dizionario, " ran, during the eight days of carnival, old and young, boys, Jews, horses, asses, and buffaloes, the prizes consisting in a certain flag or banner called palo." The institution of these races as they existed subsequently, and still exist to the present day, belongs to a subsequent period. The principal feature of the carnival, however, in the days we are speaking of, consisted in the so-called sports, " giuochi," of the Agona and the Monte Testaccio. The former seem to have consisted of little more than one of those colossal processions of which that age was so fond. A full account of those processions may be found in a MS. preserved in the Albani library, entitled The True Progression of the Festival of Agone and Testaccio, celebrated by the Gentlemen of Rome, on the Thursday and the Monday of Carnival in the year 1545, according to the practice of the Ancient Romans, together with a True Description of the Triumphal Cars.

The following account of the games at Monte Testaccio is abridged from Crescimbeni, who has preserved the de- scription left by a contemporary

writer. The Testaccio is an artificial mound of considerable size, composed of pot- sherds, the accumulation of many generations, long since well covered with turf, :

CA RSI VA L

«This place," says Crescimbeni, ‘‘is the finest and most conveni- ent for spectacles that can be imagined. To the west there is the Monte Testaccio ; to the east a little eminence on which the monas- tery of St Saba once stood ; on the north that part of the Aventine which Paul I1I. has fortified, and a few vine-dressers' cottages ; to the south are the walls of Rome, with a tower at every hundred feet. All these positions were crowded with people, and all could see con- veniently. Besides these commanding positions there were a great number of stands and scaffoldings. 1n the midst is the large open meadow, on the northern side of which was the dais raised for Madama (the beautiful Julia, sister of Paul I1I., whose recumbent statue may be seen on that Pontifi's tomb in St Peter's), which was entirely surrounded by infantry and cavalry." Then came a procession like that described in the work referred to above, and then ‘‘commenced the great hunting match, in which thirteen bulls were slain, and six cars were sent down from Monte Testaccio, on each of which was a red standard and a live pig, in scrambling for which no less efforts were made than in slaying the bulls. Among the many liveried companies seen that day was one of thirty-six mounte- banks clad in red, with iron-shod poles in their hands ; and these were the first to assail the bulls. But the most splendid thing seen was a company of six cavaliers, consisting of the Cardinal Farnese, the Cardinal Santa Fiori, the duke of Camerino, the duke of Melfi, the count of Santa Fiora, and the prince of Macedonia. These were dressed as knights of old, and their garments were of gold, and silver, and silk with embroidery and lace, and needlework upon needlework, —such an elegance that I (says the worthy canon) have neither the patience nor the courage to describe it! Their horses, too, were adorned with the same splendour, and they performed such feats of horsemanship (these cardinals!) that the people thought it a miracle! Then three races were run, the first for rider- less horses, with a banner of gold brocade for the prize ; the second for ridden horses, with a banner of crimson velvet for the prize; and the third, for mares, the prize being a banner of purple velvet. On the last day of carnival

there was a race of asses and buffaloes, and as usual there was revelling and tumult in abundance. At night there was a comedy in the Caffarelli palace. On the first day of Lent there was a procession to Santa Sabina, which was so grand that many disputed whether the Carnival or Lent was the finest at Rome!” Many other descriptions, some of them extending to great length, may be found in print amon the vast quantity of volumes concerning the Eternal City ; there is one especially relating to the doings of 1372. But there is evidence that these games were prac- tised from a much greater antiquity. They were somewhat mo ified from generation to generation ; but ostentation, magnificence in dress, and blood-thirsty cruelty to animals were the unchanging characteristics of them.

Church writers may represent the excesses of carnival as abhorrent to the church, and may point to the various ordinances of mortification and repentance which she has appointed as a means for atoning for the guilt then con- tracted by the city. But nothing is more certain than that many of the popes were great patrons and promoters of carnival keeping. Paul Il., the Venetian Barbd, was one of the most notable in this respect. In his time the Jews of Rome were compelled to pay yearly asum of 1130 golden florins (the thirty being added as a special memorial of Judas and the thirty pieces of silver), which was expended on the carnival. And we have a decree of Paul IT. minutely providing for, and arranging the diversions which were to take place in it. Among other things his Holiness orders that four rings of silver gilt should be provided, two in the Piazza Navona, and two at the Monte Testaccio,—one at each place for the burghers and the other for the retainers of the nobles to practise riding at the ring. The Pope also orders a great variety of races, the expense of which are to be paid from the Papal exchequer,—one to be run by the Jews, another for Christian children, another for Christian young men, another for sexagenarians, a fifth for asses, and a sixth for buffaloes. Under Julius III. we have long accounts of bull-hunts—bull-baits we should rather say—in the Forum, with gorgeous descriptions of the magnificence of the dresses, and enormous suppers in the palace of the Conservatori in the Capitol, where seven cardinals, together with the Duke Orazio Farnese, supped at one table, and all the ladies by themselves at another. After the supper the whole party went into the court-yard of the yalace, which was turned into the semblance of a theatre, ‘“‘te see a most charining comedy which was

admirably played, and lasted so long that it was not over till ten o'clock !" Even the austere and rigid Caraffa, Paul IV. (ob. 1559), used to keep carnival by inviting all the Sacred College to dine with him. The vigorous and terrible Sixtus V., who was elected in 1585, set himself to the keeping of carnival after a different fashion. Finding that the licence then customary and permitted gave rise to much abuse and no few crimes, he prepared for carnival, to the no small dismay and terror of the Romans, by setting up sundry gibbets in several conspicuous places of the town, as well as whipping posts,—the former as a hint to robbers and cut-throats, the latter in store for minor offenders. We find, further, from the provisions made at the time, that Sixtus reformed the evil custom of throwing dirt and dust and flour at passengers, permitting only flowers or sweetmeats to be thrown. The barbére (riderless horses) had by this time begun to run regularly every carnival in the Corso; and Sixtus caused a lane to be enclosed with palisades in the centre of the street, along which the horses might run without the danger of causing the accidents which, it seems then, as now, were frequently the result of this sport. He also compelled the people to desist from the old practice of using every kind of violence and trick to impede the barbéri in their course, for the purpose of favouring this or the other among the competi- tors.

It was formerly the custom, especially in the 16th and 17th centuries, to suspend ail carnival observances during the Anno Santo or jubilee year. Gregory XIII., when he celebrated the eleventh jubilee in 1575, forbade any of the usual carnival celebrations, and ordered that all the money usually expended for the purpose by the Apostolic Chamber should be used for the assistance of poor pilgrims, Clement X., just a hundred years later, on the occasion of the jubilee of 1675, prohibited all carnival celebration, and granted to the Archconfraternity of Pilgrims of the Holy Trinity the 6000 crowns which the Apostolic Chamber was at that period in the habit of spending on the carnival rejoicings, at the same time compelling the Jews to pay over to the same purpose the sums they annually furnished for the barbéri and the prizes of the races. The carnival celebra- tions have also been frequently suspended on account of the appointed day or days for them having fallen on the date of some church festival. When in the

pontificate of Innocent XII. the Wednesday in the last week of carnival chanced to fall on the festival of the Purification of the Virgin, the race of the barbéri which' ought to have taken place on the vigil of that festival, was changed to the previous Sunday. On many subsequent occasions the days of the sports have from similar causes been sometimes postponed, sometimes anticipated, and sometimes sup- pressed. In 1808 Pius VII. forbade all carnival manifesta- tions on account of the French invasion, nor would he permit any to take place in 1809, notwithstanding that the French in the occupation of the city had proclaimed the celebration of the carnival. Of course the Pope had no power to enforce his wish that no sort of carnival rejoicing should take place. But it is remarkable, as indicating the feeling of the population at the time, that the Corso remained entirely deserted and all the shops shut.

The later Popes for the most part restricted the public festivities of the carnival to the last six or seven days immediately preced- ing Ash Wednesday. The municipal authorities of the city, on whom the regulation of such matters now depend, allow ten days. The public are not, however, permitted to do all the things which are understood to constitute the celebration of carnival on all these days indifferently. Some days are appointed for a '* gala corso," 4.¢., @ processional driving up and down the Corso of all those who choose to take part in it, with the handsomest carriages and the finest liveries and horses, &c., they can compass ; and on these days con- secrated to finery and ostentation nothing save flowers is perinitted

to be thrown, either from the balconies and windows to the carriages, or vice versa. Other days are set apart for the throwing of ''corian- doli," as they are termed, little round pellets about the size of a pea made of plaster, and manufactured and sold in enormous quantities. These coriandoli are supposcd to represent comfits, which tradition declares to have been the only things thrown in the olden time be- fore the spirit of carnival was, as is supposed, spoiled and vulgar- ized by the influx of strangers from the north. But the reader has already seen that the flinging of dust, flour, and disagreeable things of all sorts had to be repressed at a very early time. At

the present day the principal fun seems to consist in flinging down bushels on bushels of these plaster cortandoli on the passers in the streets, mainly in the Corso, from the balconies, and in the return fire of these from the cars which pass up and down the Corso. These cars are huge machines, of which a large waggon forms the basis, built up sometimes in the form of a ship, or a castle, or other such device, and made gay-looking with garlands and abundant bright coloured calico. Some dozen or so of young men, generally in uni- form fancy dresses, stand on these machines, and work hard at returning, with such best vigour and activity as they may, the pelt- ing they endure from the balconies. The ladies are mainly the occupants of these. All are masked ; thuse who are prudent wear masks of wire gauze, for a handful of these cortandoli vigorously and dexterously thrown point blank into the face is not an attack to be despised. Meanwhile everybody shrieks at the top of luis voice, the masks affect a counterfeit and high falsetto note, with which they invariably address the unmasked and each other. Then ata given signal begins the running of the barberi, or riderless horses. Some ten of them are led to the starting place in the Piazza del Popolo, with loosely hanging little spiked machines, contrived to act as spurs, hanging to their sides, and crackers attached to them, which are fired at the moment of starting. A gun gives the signal for the compact crowd in the Corso to make a lane for the horses to run through. ; Pe ;

By the aid of the police and soldiers this is more or less satisfac- torily accomplished, and the horses dash through it, the crowd closing behind them as they run. Rarely, or perhaps it would be more accurate to say never, does a Carnival pass without two or three accidents, frequently fatal ones, in consequence of incautious persons getting knocked down by the rushing horses. The race is run in about two minutes. The winning “post” is a sheet hung across the street at the spot hence called Lipresa det Barberi, in the Piazza di Venezia. The prizes consist, as in olden time, of certain standards of velvet, gold lace, and the like, called ‘“palio,” which are after the race paraded through the Corso. In these days sums of money, 300 or 400 francs, are usually added by the municipality. The price of these prizes was formerly furnished by the Jews, as has tee seen. And popular tradition says that the Jews were permit- ted to furnish the horses and prizes as a concession to humanity, in lieu of running themselves in propria persona. It is undoubtedly true that they were so compelled to run. But it would seem

that they did not do so exclusively, other categories of persons, as the boys, the youths, the old men, having done thesame. These raccs of the barbéri were abolished in the year 1874, but were re-estab- lished in 1876, in accordance with the wishes of a large portion of the Romans. It remains to mention the peculiar diversion of the Moccoletti (tapers), which takes place immediately after sunset on Shrove Tuesday. Everybody in the streets, in the balconies and windows, and in the carriages, carries a taper, and everybody en- deavours to extinguish the tapers of his neighbours, principally by means of flapping with handkerchiefs, and keep his own alight. All the other features of a modern carnival are common to all the principal Italian cities, but the Moccoletti and the Barbéri are peculiar to Rome. The fun ends by burning at midnight on Shrove Tuesday a colossal figure supposed to represent the carnival. These are the public and out-door aspects of carnival. all the theatres have masked balls, called Vegliont (from Vigilare, watch or keep awake, Veglia, addition of the intensitive termination one gives the word the signi-

fication of ‘a great keeping awake,” 7.¢., a festival to last nearly all night).

to shew to what extent that licence was carricd.

CAR—CAR

CARNIVORA, or Flesh-eating Animals, is the name employed to designate the important order of Mammals which contains the dogs, cats, hyenas, weasels, bears, badgers, and others. By some zoologists the Carnivora are divided into the Pinnipedia, or aquatic carnivora, as the seals and walrus, and the F’ssipedia, which are mostly terrestrial, as the dogs, cats, &c. By others again the Pinnipedia are regarded as possessing characters suffi ciently distinctive to justify their being placed in a separate order of Mammals. See MAMMALIA.

CARNOT, Lazarz Nicotas Marguerite (1753-1823), was born at Nolay in Burgundy, May 13, 1753. After receiving a good mathematical education in his native province, he was admitted as an officer of the engineer corps under the patronage of the prince of Condé; and he was beginning to gain some reputation as an author by means of a prize eulogy on Vauban, two mathematical essays, and a number of verses of no great value, when the

Revolution drew him into political life. In 1791 he was returned to the National Assembly for the Pas de Calais, and it was not long before he became a member of the Committee of Public Safety under Robespierre. He took a leading part in the most revolutionary measures ; before his election he had addressed a paper to the Assembly proposing the seizure of the property of the church, and he ow proposed to arm 30,000 sans-culottes with pikes, and to destroy all the citadels in France, and voted for the overthrow of the nobility and the execution of the king. His genius, however, was more military than political ; he effected an important improvement in the discipline of the army, and his activity and spirit contributed materially to the successes of the Republic. One of his chief exploits was the victory of Wattignies, where he led in person, and headed a charge on foot. In 17 94, after the fall of Robespierre, Carnot had to defend his colleagues, Collot d'Herbois and Barére, from the charge of complicity with the crimes of their leader, and himself only escaped arrest through the glory of his military services. He based his defence on the argument that no member of the Committee was to be held responsible for the deeds of any of the others, since pressure of business made it necessary to sign orders without staying to learn their contents ; and, though the excuse is far from sufficient, it was probably true that Carnot, amid the unceasing toils of a minister of war, was not aware of many of the atrocities which were committed. In 1795 he became one of the five directors of the Republic, and it was now that he projected his famous Plan for the Invasion of England, by andi hg two armies simultaneously on the coasts of Sussex and Yorkshire. But not long after he was proscribed, and compelled to take refuge in Germany. Here, though under the protection of a monarch, he pub- lished his Mémotre Justificatif, in which he declares himself the "irreconcilable enemy of kings." On the downfall of the Directory he returned to France, and became minister of war, but he soon resigned this office, consistently refusing to consent to the election of Napoleon as consul for life ; and on the abolition of the tribunate in 1806 he retired into private life, became an active member of the Institute, and devoted himself to the pursuit of science. After the Russian campaign, believing that the independence of France depended upon the success of its emperor, he offered his services to Napoleon, and was made governor of Antwerp, which he defended till the abdication in 1814. He was still faithful to the Republic, and his revolutionary Mémoire au Roi did powerful service to the

anti-royalist cause. On Napoleon’s return from Elba, Carnot was made minister of war, but the time was past for carrying out the vigorous measures which he proposed. On the overthrow of the empire he retired first to Warsaw, and then to Madgeburg, where he died in 1823,

Besides the above-mentioned writings, Carnot was the author of several works on mathematical subjects, of which the best is his Réfeexions sur la Métaphysique du Calcul Infinitesimal, and several on political subjects, including Réponse de Carnot, Vun des fonda- teurs de la république, au rapport du Bailleul sur la conspiration du 18 fructidor (1798) ; Exploits des frangais depuis le 22 fructidor au 1° jusqw’au 15 pluviose an III. de la république ; Exposé de la situation de Empire (1815); Eaposé de la conduite du général Carnot depuis le 1¢” juillet 1814

CARNUNTUM, an ancient town in Upper Pannonia, on the right bank of the Danube —_It was of Celtic founda- tion, but became at a somewhat early period a Roman post, and was raised to the rank of a colony and a municipium. For three years during his wars with the Marcomanni and Quadi it was the residence of Marcus Aurelius, and here a part of his Meditations was composed, The town was taken and destroyed by the German invaders in the 4th century ; but it was afterwards rebuilt, and continued to be a place of some importance till its final destruction in the wars against the Magyars in the Middle Ages. Extensive ruins, supposed to be those of Carnuntum, still exist at Hainburg or Haimburg, a small town of Lower Austria, about 24 miles east of Vienna.

CARO, ANNIBALE (1507-1566), poet, was born at Civita Nuova, in 1507 He became tutor in the family of Ludovico Gaddi, a rich Florentine, and then secretary to his brother Giovanni, by whom he was presented to a valuable ecclesiastical preferment at Rome. At Gaddi’s death, he entered the service of the Farnese family, and became coufidential secretary in succession to Pietro Ludo- vico, duke of Parma, and to his sons, duke Ottavio and cardinals Ranuccio and Alexander Caro’s most important work was his translation of the ned (Venice, 1581, Paris, 1760). He is also the author of Hime, Canzoni, and sonnets, a comedy named Gli Straccioni, and two clever jeux desprit, one in praise of figs, La Ficheide, and another in

eulogy of the big nose of Leoni Ancona, president of the Academia della Vert. Caro's poetry is distinguished by very considerable ability, and particularly by the freedom and grace of its versification ; indeed he may be said to have brought the verso sciolto to the highest development it has reached in Italy His prose works consist of translations from Aristotle, Cyprian, and Gregory Nazianzen ; and of letters, written in his own name and in those of the cardinals Farnese, which are remarkable both for the baseness they display and for their euphemistic polish and elegance. His fame has been greatly damaged by the virulence with which he attacked Ludovico Castelvetro in one of his canzoni, and by his meanness in denouncing him to the holy office as translator of some of the writings of Melanchthon. He died at Rome about 1566.

CAROLAN, Turtocn, the most famous of the modern Irish bards, was the son of John Carolan or O'Carolan, a respectable descendant of an ancient tribe of East Breifny, a district now forming part of the counties of Meath and Westmeath. He was born at a place called Newtown, near Nobber, in the county of Meath about the year 1670. His father, being reduced to a state of poverty, quitted his native county and eventually settled at Alderford, co. Roscommon, on the invitation of the family of M'Dermott Roe It was here that the future bard received his education, which appears to have been very limited, as he never acquired more than a smattering of the English language. In his eighteenth year he was seized with small-pox, and totally deprived of sight. This misfortune led to his becoming a professional bard or itinerant minstrel; His benefactress having provided him with a harp, a horse, and attendant, he began his avocation in his twenty-second year by visiting the houses of the surround- ing gentry, his wanderings being chiefly confined to Con- naught. It is said, however, that he uever played for

hire, and that at the houses where he visited he was welcomed more as a friend than as an itinerant minstrel. To the family of M'Dermott Roe he was attached by the tenderest ties of gratitude and affection, and for them were composed some of his sweetest strains. The number of Carolan's musical pieces, to nearly all of which he composed verses, is said to exceed 200. He

died on the 25th March 1738, and was buried at Kilronan. His poetical Remazns in the original Irish, with English metrical translations by Thomas Furlong, are printed in Hardiman's /rish Minstrelsy (1831). Many of his songs are preserved among the Trish MSS. in the British Museum.

CAROLINA, NortH and SouTtH. LINA and SOUTH CAROLINA.

CAROLINE, Amet1a Aveusta (1768-1821), wife of

George IV. of Great Britain, second daughter of Charles William Ferdinand, duke of Brunswick-Wolfenbiittel, was born on the 17th May 1768. She was brought up with great strictness, and her education did not fit her well for her after station in life. In 1795 she was married to George, the Prince of Wales, who disliked her, and sepa- rated from her after the birth of a daughter in January 1796. The princess resided at Blackheath; and as she was thought to have been badly treated by her profligate husband, the sympathies of the people were strongly in her favour. About 1806 reports reflecting on her conduct were circulated so openly, that it was deemed necessary for a commission to inquire into the circumstances. The princess was acquitted of any serious fault, but various improprieties in her conduct were pointed out and censured. In 1814 she left England and travelled on the Continent, residing principally in Italy. On the accession of George in 1820, orders were given that the English ambassadors should prevent the recognition of the princess as queen at any foreign court. Her name also was formally omitted from the liturgy. These acts stirred up a strong feeling in favour of the princess among the English people generally ; and she at once made arrangements for returning to Eng- land and claiming her rights. She rejected a proposal that she should receive an annuity of £50,000 a year, on condition of renouncing her title and remaining abroad. Further efforts at cormpromise. proved unavailing; the princess arrived in England on the 6th June, and one month later a Bill to dissolve her marriage with the king on the ground of adultery was brought into the House of Lords. The trial began on the 17th August 1820, and on the 10th November the Bill, after passing the third reading, was abandoned. 'The public excitement had been intense ; the boldness of the queen's counsel, Brougham and Denman, unparalleled ; and the ministers felt that the smallness of their majority was virtual defeat. The queen was allowed to assume her title, but she was

refused admittance to Westminster Hall on the coronation day, July 19, 1821. Mortification at this event seems to have hastened her death, which took place on the 7th August of the same year. _ CAROLINE ISLANDS, a widely-scattered archipelago in the Pacific Ocean to the east of the Philippines and the north of New Guinea, between 3° and 11° N. lat., and 135° and 177° E. long. By the Spaniards, who lay claim to the whole, they are divided into the Western, the Central, and the Eastern Carolines.

The Western, better known as the Pelew, Pellew, or Palau Islands, have a total area of 346 square miles, and are nearly encircled by a coralreef. The principal members of the group are Babelthaup, with an area of 275 miles, Corére, Urucdzapel, Jaracong or Errakong, Kiangle, Eimelius, Pellelew, and Angour or Ngaur ; and the general title of Errekeltiu Islands is applied to all the archipelago to the south of Babelthaup. The surface is frequently well wooded and the soil fertile; and bread-fruit, cocoa-nuts,

See NortH Caro-

sugar-cane, arums, oranges, and bananas are grown in abundance. Cattle, sheep, and pigs have been introduced ; there is a great variety of birds, and the lagoons abound with turtle and fish. The inhabitants are a dark copper-coloured race, and bear evident traces of Malay and Papuan blood. Not only the separate islands, but even the villages fornl independent but co-operative republics. The most peculiar institution is the Clébbergoll, a kind of corpora- tion for purposes of mutual aid and defence. The women have clébbergolls of their own, and possess a considerable share of political influence. The Pelewese still used stone instruments and weapons at the close of last century, but produced a variety of artistic articles with their limited means. They have five kinds of recognized currency in the islands, consisting of pieces or beads of ancient glass and enamel, to which they ascribe a divine origin. The population seems to be rapidly decreasing; Dr Semper calculates that at present the whole group contains 10,000 inhabitants. The Pelews were brought prominently into notice by Captain Henry Wilson, whose ship— the “ Antelope ”—was wrecked, in August 1783, ou one of the islands. A narrative of his residence on the islands was published by George Keate, in 1788. Dr Semper gives a graphic account of

his intercourse with the natives in his Die Palau-Inseln im Stillen Ocean, 1873; and in the Journal des Museum Godefroy, Hamburg, 1873, Alfred ‘Tetens describes his visit during 1865-1868.

The Central Carolines, or those which are more usually known as the Carolines proper, consist of about 48 groups with 400 or 500 islands. Omitting Ualan, Puynipet, and Rug the area is hardly 20 square miles, but including them it amounts to 360. The Ngoli, Gulu, or Matelotas group lies to the north-east of the Pelews, and consists of three islands inhabited by afew people from Yap. Yap or Guap lies further to the north-east, is about 10 miles in length, and has an excellent harbour on the south-east. The natives are at a higher level of civilization than most of their neighbours ; théy cultivate the betel-nut with great care, build first-rate boats, lay out their villages regularly, pave their streets, and construct stone piers and wharves. A Spanish mission was established in the island in 1856. A map and description will be found in the Godefroy Journal for 1873, which also gives an account of the Ulithi, Elivi, or Mackenzie group, previously described by Captain Wilkes of the United States exploration. The Ulea, Swede, and Liitke Islands are of little importance; but the Hugoleu or Rug group, discovered in 1824 by Duperrey, is composed of five large and about forty smaller islands, and contains nearly 35,000 inhabitants, who are divided into two distinct races—a black and a red—which are often at war with each other. The Mortlock or Young William’s group, which received its former name from its discoverer in 1793, consists of three atolls called respectively Satoan, Etal, and Lukunor, The natives, who number about 3400, are of Samoan origin, and are the only worshippers of regular idols in the archipelago. To the north-east lies Ngatik, Nutik, or Raven Island, discovered in 1773, and inhabited by immigrants from Puynipet, greatly mingled with foreign blood. An account of a visit by the “Star” to the last three or four islands is given in the Geographical Magazine for 1874, Puynipet (Bornabi, Bonabe, Bonibet, Funopet, or Panapee), also called Ascension by the French, along with the two low atolls of Andema and Paphenemo (known to English sailors as Ant’s Islands and Pakeen respectively), constitute the group called by Admiral Liitke the Seniavine. The population at the time of the “ Novara’s” visit in 1858 was 2000, reduced by small-pox from 5000 in 1846. There is a small colony of whites

and the island has been the seat of an American mission since 1851 The island is the chief rendezvous for the

whalers in that part of the Pacific. There is a remarkable mass of ruins in the centre of the island, which seemg to have belonged to a fortification. (See Kubary, “Die Ruinen von Naumatie auf der Insel Ponape,” in the Godefroy Journal.) Ualan Kusai, or Strong’s Island, which occupies almost the centre of the Carolines proper, is a volcanic island with an area of about 30 square miles and a population from 700 to 1000, It was discovered in 1804 by the American Crozer, and is the seat of an American mission.

The Eastern Carolines are otherwise known as the Mulgrave Archipelago, and comprise the Radak, Ralik, or Marshall group and the Gilbert group. The total popula- tion is estimated at 100,000. ‘They were discovered by the two voyagers whose names they bear in 1788.

The Carolines were probably first visited by Alvaro de Saavedra in 1528 ; in 1579 Drake discovered the Pelews; and in 1686 another group was added to the list by Admiral Francesco Lazeano. To the last-mentioned navi- gator they owe the name they now bear, which was given in honour of Charles II. of Spain.

See besides the works mentioned above, the voyages of Freycinet,

Duperrey, D'Urville, Liitke, and Chamisso; Cheyne's Jslands in the Western Pacific Ocean, 1852; J. Van der Hoeven, Beschrijving van Schedels van Inboorlingen der Carolina-Hilanden, 1865 ; and articles by J. B. Davis and W. T. Pritchard in Anthropological Journal, 1866.

CARORA, a well-built town of Venezuela, in the pro- vince of Barquisimeto, 94 miles S.S.W. of the town of Coro, on the River Moreva or Tocuyo. It carries on a considerable trade in aromatic balsams, gums, cochineal, agricultural productions, cattle, and mules. Before the wars of independence it contained about 9000 or 10,000 inhabitants, and at present it numbers about 6000. Its foundation dates from 1752.

CAROUGE, a town of Switzerland, in the canton of Geneva, and about two miles south of that city, with which it is connected by a horse-railway. It is situated in the midst of fine orchards and meadows; and the neighbour-hood is thickly studded with villas. Cottou-spinning and the manufacturing of leather and pottery are the principal industries. About 1780 King Victor Amadeus of Savoy endeavoured to attract the workmen of Geneva to Carouge, and thus to render it the rival of the greater city ; but the occupation of his country by the Revolutionary forces in 1792 prevented the success of the undertaking. The popu- lation in 1870 was 5871.

CARPATHIAN MOUNTAINS, or Krapacks, the eastern wing of the great central mountain system of Europe. They lie between 44° 30' and 49° 40' N. lat., and 17° and 26° E. long., enclosing Transylvania and Hungary, and form a curve 800 miles long, the concavity of which is towards the south-west. The south-eastern extremity of the curve is at Orsova on the Turkish frontier, where the Danube separates it from the northern spurs of the Balkan or Hemus range. The western extremity is at Presburg in Hungary, on the same river. The breadth of the Carpathian Mountains is between 100 and 200 miles. They form the main water-shed between the northern seas and the Black Sea. The valley of the March divides them from the Silesian and Moravian chains; the valley of the Lower Danube, from the system of the Alps. They are almost entirely in Austrian territory. The chief divisions are the Little Carpathians on the west, between the Waag and the March ; to

the east of these, the Jablunka Mountains; then the Western Carpathians, or Carpathians proper; and lastly, the East Carpathians to the south-east of Transyl- vania. The Western Carpathians include the groups of the Tatra, Lomnitz, and Bisztra. Of these the highest is the Tatra, some of the peaks of which are free from snow only one month in the year. ‘The Gerlsdorfer Spitze, the loftiest

point, has an attitude of 8685 feet. On the northern side are some small glaciers, which, however, hardly deserve the name. Jt is here that the mountain lakes, or “eyes of the sea” are tound, in deep hollows between the steep and jagged granitic peaks. The main ridge of the Carpathians running east from the Tatra is called the Waldgebirge, the highest points of which are 2800 feet above sea-level. The Tatra and adjoining groups have a very important influence on the climate of the regions lying south of them, serving asa protection from the north wind. The Hast Carpathians, the southernmost member of the chain, occupy a quad- rangular tract of about 25,500 square miles. The highest point is Mount Butschetje, in South Transylvania ; it is 9528 feet in altitude. ‘The chief passes of the Carpathians are those of Tergova, leading from Orsova to Temesvar ; Vulean, in the valley of the Schyl, and Rothe Thurm, in the Aluta valley, at the foot of Mount Surul, bo:h on the south border of Transylvania; Tiirsburg, between Bucharest and Kronstadt; Ojitos and Gymos between Moldavia and Transylvania ; Borgo, leading from Bistritz to Bukowina ; Jablunka on the route from Presburg to Cracow. The Carpathians are rich in metallic ores ; lead and quicksilver, and also rock-salt, are obtained from them ; there are large copper-workings in Zips, gold and silver mines at Kremnitz and Schemnitz in Hungary, and rich gold ores at Nagyag in Transylvania. Besides these substances, the Carpathians furnish a variety of minerals. Granite is an important constituent of the range. In the Liptau Mountains it is overlain by limestone ; and in the Zipfer Mountains it is associated with limestone and gneiss. In the Waldgebirge the large deposits of sandstone afford a poor soil for culti- vation. Basalt and other igneous rocks, with the remains of ancient craters, are met with in some districts of the Transylvanian Alps. On the slopes of the Carpathians large quantities of wheat and maize are raised ; cattle and sheep are pastured in great numbers

; and vineyards and orchards flourish. The vegetation presents four zones; that of the beech extenas to 4000 feet above the sea, that of the Scotch fir’to 1000 feet higher; above this grows a species of pine, which becomes dwarfed and disappears at an altitude of about 6000 feet, beyond which height is a zone of lichen and moss covered or almost bare rock.

CARPATHUS, the ancient name of the island of Scarpanto, about 30 miles south-west of Rhodes, in that part of the Mediterranean which was called, after it, the Carpathium Mare, or Carpathian Sea.

CARPENTARIA, Guur or, an extensive arm of the sea deeply indenting the north coast of Australia, between 10° 40’ and 17° 30’S. lat., and 136° and 142° E. long. It averages 350 miles in length and breadth, and is bounded on the E. by York Peninsula, and on the W. by Arnhem Land. At its south-east corner is situated a group of islands of which the largest is Wellesley ; and towards the western side are the Sir Edward Pellew Islands and the Groote Eylandt. A large number of rivers find their way to the gulf, and some of them are of considerable size. On the eastern side there is the Mitchell River; at the south- east corner the Gilbert, the Flinders, the Leichhardt or Disaster, and the Gregory or Albert ; and on the west the Roper River. Jan Carstensz, who undertook a voyage of discovery in this part of the globe in 1623, gave the name of Carpentier to a small river near Cape Duifken in honour of Pieter Carpentier, at that time governor-general of the Dutch Indies ; and after the second voyage of Abel Tasman in 1644, the gulf, which he had successfully explored, began to appear on the charts under its present designation.

CARPENTRAS, the chief tuwn of an arrondissment in the department of Vaucluse in France, is situated on the left bank of the Auzon, 15 miles north-east of Avignon,

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with which it is connected by means of a branch railway leaving the main line at Sorgues. It is well built, but the streets are narrow. Part of its old walls and towers are still standing, and the Porte d’Orange is a fine specimen of an ancient gateway. Among its buildings the most interesting are the Cathedral of St Siffrein, rebuilt in 1405, a triumphal arch, which forms the

only important relic of the Roman period, the old Episcopal palace, and a hospital of the 18th century; and there are also a theatre, a public library of 12,000 volumes, and a museum of antiquities, as well as various municipal buildings. Water is brought to the town by an aqueduct of 48 arches, completed in 1734 ;

and a canal of quite recent construction communicates with

the Durance. Soap-works, distilleries, dye-works, and cotton factories are the chief industrial establishments ; and there is trade in silk, saffron, oil, honey, and fruits. Carpentras is identified with Carpentoracte, a town of Gallia Narbonensis mentioned by Pliny, which appears to have been of some importance during the Roman period. In the Middle Ages its history is full of vicissitudes ; it was captured and plundered by Vandal, Lombard, and Saracen. About 1313 it was for a time the residence of Pope Clement V.; and it continued, along with Avignon and the district of the Venaissin, of which it was regarded as the capital, to be administered by the Papal legate till the Revolution. The name of the ‘‘ Carpentras Inscription ” is specially appropriated by Semitic scholars to a few lines of Aramaic preserved on a stone in the Episcopal library, which are remarkable as probably the oldest specimen of rhythmic verse in the Semitic languages (see Journal Asiatique, 1868). Population in 1871, 7967.

CARPENTRY. See Buripine, vol. iv. pp. 476-485.

CARPET is the name applied in modern times to a woven or felted fabric, made generally of wool, which is used for covering the floors of chambers or for spread- ing on the ground. The term is probably connected with the Latin tapetes, whence also comes the word tapestry, which, though now distinctively applied to hang- ings, was in early times not clearly distinguished from carpeting. Carpets and rugs were originally employed by Oriental nations for sitting, reclining, or devotionally kneeling upon ; and when first introduced among Western communities they were also used as covers for tables and couches, or for laying before altats or chairs of state as pedalia or foot cloths. The processes for making tapestry hangings and carpets being the same, and the distinction of their application being vague, it was chiefly by the nature of the design that any line was, in medizval times, drawn between the two classes.

The mention of carpets dates from a very remote period of antiquity. In Egypt they were first applied to re- ligious purposes by the priests of Heliopolis, and were used to garnish the palaces of the Pharaohs. It was also a custom of antiquity to place them under the couches of guests at banquets. Regarding a carpet rug, which he considers to be of ancient Egyptian manufacture, Sir J. Gardner Wilkinson says,—“ This rug is made like many cloths of the present day, with woollen threads, on linen strings. In the centre is the figure of a boy in white, with a goose above, the hieroglyphic of ‘a child,’ upon a green ground, around which is a border composed of red and blue lines,” &c. (Manners and Customs of the Ancient Egyptians, vol. iii. pp. 141-2). The carpets of the Homeric age were generally white or plain cloths; but they were also sometimes produced with various colours and embroidered designs. At the supper of Iphicrates, purple carpets were spread on the floor; and at the magni- ficent banquet of Ptolemy Philadelphus (an account of

-which is given by Callixenus of Rhodes) we learn that

underneath 200 golden couches “ were strewed purple

carpets of the finest wool, with the carpet pattern on both sides ; and there were handsomely embroidered rugs, very beautifully elaborated with figures. Besides this,” he adds, “thin Persian cloths covered all the centre space where the guests walked, having most accurate representations of animals embroidered on them” (Athenzus, v. 26). The Babylonians, who were very skilful in weaving cloths of divers colours (Pliny, viii. 48), delineated upon their carpets entire groups of human figures, together with such fabulous animals as the dragon, the sphynx, and the griffin. These were numbered among the luxuries of Elagabalus. Babylonian carpet, and another covered the bed whereon his body was placed (Arrian, vi. 29). These carpets were exported in considerable quantities to Greece and Rome, where they were highly esteemed. The pre-eminence of the ancient Babylonian carpet weavers does not appear ever to have been lost by their successors, and at the present time the carpets of Persia are as much prized and as eagerly sought by European nations as they were when ancient Babylon was in its glory.

Oriental carpets were first introduced into Spain by the Moors; and at a later date the Venetians imported them into Italy, and supplied Western Europe with this luxurious manufacture. We have frequent mention of them during the Middle Ages, and their costliness and magnificence are celebrated in the illuminated pages of fabliaux and romances. They were spread in the presence-chambers of royalty, before the high altars of chapels and cathedrals, in the bowers of " ladyes faire," and on the summer grass, Many articles of furniture were also covered with them— beds, couches, tables, and regal faldistories; but here it becomes difficult to distinguish between carpet and tapestry, both being used promiscuously. Tapestry of Baldekine or Baldachine (from Baldak, an ancient name of Baghdad) was a carpet inwrought with gold and silver threads. Such carpets were carried on poles, and uplifted as a canopy over the host, and over great personages in procession. The troubadours had carpets of gold embroidery which they laid upon the grass beneath them. Hearth- rugs and throne carpets, gorgeously emblazoned with heraldic centre-pieces, were the handiwork of high-born dames during the romance period. To some of them were attached fringes, but these were more usually composed of the fag-ends of the warp, like those of Persia, India, and Turkey. A black velvet carpet, "fringed with silver and gold, and lined with taffeta," is enumerated in the inventory of Archbishop Parke's household furniture in 1577. Rushes were strewn on the floor of Queen Mary's presence-chamber, aud that of Elizabeth had the additional covering of a Turkey carpet. Long prior to this, however, Eastern carpets had been introduced. In the reign of Edward VI. we read that before communion-tables were placed—

'Carpets full gay, That wrought were in the Orient."

Chequered matting appears to have been very generally used about the 15th century. In Lydgate's metrical life of St Edmund (MS. Harl., No. 2278), is a representation of the room wherein that saint was born, the floor is covered with chequered matting, and a fringed hearth-rug of Gothic design is before the fire-place. Carpets composed entirely of leather strips interlaced together may be seen in our antiquarian museuins.

In the reign of Henry IV. the carpet manufacture appears to have been introduced from Persja into France. Colbert, the minister of Louis XIV.,

established the manu- factory at Beauvais in 1664, which is now in the hands of the French Government, and produces very artistic speci- mens, A variety of these, “in Turkish, Peruvian, and Chinese styles,” was exhibited at London in 1851. The

On the tomb of Cyrus was spread a purple

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national manufactory of Gobelins, which likewise sent its beautiful carpets and tapestry to the Great Exhibition, was established shortly after that of Beauvais. It was purchased in 1677 by Colbert from the Gobelin family, whose progenitors, two centuries earlier (Gilles and Jehan Gobelin), brought their art, as was supposed, from Flanders, An attempt was made, in the time of Henry VIIL, by William Sheldon, to start this manufacture in England ; and under the patronage of James I. it was more successfully established, with the superintendence of Sir Francis Crane, at Mortlake in Surrey, where both carpets and tapestry were produced. Toward this object the sum of £2676 sterling was contributed by its royal patron, and French weavers were brought over to assist. But it does not appear that anything considerable was effected, until after the revocation of the Edict of Nantes in 1685, when artizans of every trade fled to England, and among them tapestry and carpet weavers, who settled in various parts, About the year 1750, Mr Moore was awarded a premium by the Society of Arts for the best imitation Turkey carpets; and Parisot conducted an establishment for their manufac. ture at Paddington, under the patronage of the duke of Cumberland. Subsequently carpets were wrought on the same principle at Axminster, in Devonshire, whence the name ; and afterwards at Wilton, where the manufacture is still continued. The Board of Trustees for the Encourage- ment of Arts and Manufactures in Scotland offered prizes for the best Persian and Turkey carpets, which were carried off by Gregory, Thomsons, & Co. of Kilmarnock, and Whytock & Co, of Edinburgh. About ninety years pre- viously they had been made in the vicinity of Holyrood Palace.

Carpets, as manufactured at the present day, range themselves under two classes. The first and ancient class being such as are made by knotting into the warp, tuft after tuft, the materials of the pattern ; and the second con-

sisting of those in which the pattern is woven up in the loom. To the first class belong Oriental carpets generally, as well as such as are woven at many places throughout Europe under the name of Turkish carpets. Persia is now, as it has been from the most remote times, the recognized source of what is most truly artistic, durable, and valuable in this manufacture ; and after the products of that country, those of various parts of India and Turkey are most esteemed.

Persian Carpets.—The carpet weaving of Persia is similar in its process to the tapestry manufacture of Gobelins, Beauvais, or Aubusson. The tapestry, as is well known, consists of tufts of wool (French moquettes) or other fibre sewed on the strings of the warp, by means of small shuttle needles, The Persian carpet is formed by knotting into the warp tuft after tuft of woollen yarn, over each row of which a woof shot is passed, the fingers being here employed instead of the shuttle-needles, as the fabric is of a coarser description. In both methods the principle is the same. Both are formed in looms of very simple construction, the warp threads are arranged in parallel order, whether upright or horizontal, and the fabric and pattern are produced by coloured threads, hand-wrought upon the warp.

In Persia there are entire tribes and families whose only occupation is that of carpet-weaving. These dispose of their productions at the bazaars to native merchants, who remove them to Smyrna or Constantinople, where they meet with European purchasers. The finest carpets both as to design and texture come from Kerman, Feraghan, and Kurdistan. The Kerman products resemble in appearance the finest velvet pile carpets, but with the nap cut much shorter. The carpets of Feraghan are in external appedrance somewhat like Brussels carpets, while those of Kurdistan have theit pattern on both sides and are woven

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quite smooth. The trade in real Persian carpets was formerly limited, owing to their small size, as they were seldom larger than hearth-rngs, long and narrow in shape ; but with the extension of the European demand larger carpets are now niade, and they are woven in pieces with separate borders, so that they can be sewed together. The introduction of aniline dyes into Persian designs is likely, it is feared, to be detrimental to the mellow effect

of native colours. Very many of the imported carpets are considerably tarnished by exposure in bazaars, if they have not indeed been already used. To render these more saleable they are cleaned by cropping the surface, which in some cases is shaved quite close to the knot; hence a proportion of those brought to England have not their original richness and depth of pile. Carpets of silk were at one period extensively made in the country, but this manufacture has been entirely abandoned for more than a century. Felted carpets or nwrmuds are also very largely made in Persia, but do not constitute an export commodity. Very beautiful patterns are produced in this felt carpeting, by means of coloured tufts of worsted inlaid or inserted during the process of manufacture, pro- ducing a regular pattern when finished.

Turkey Carpets—The greater part of the real Turkey carpets imported into England are manufactured at Ushak or Ouchak, in the province of Aidin, about six days' journey from Smyrna, and rugs are principally made at Kulah, an adjacent village. In the provinces of Khodavendikiar, Adana, and Nish numerous households are employed in their production, as also in the districts of Bozrah, the city of Aleppo, and the villages of Trebizond. Here and there, throughout Caramania, such carpets are also made. The Turcomans of Tripoli, the women of Candia, and the peasantry of Tunis and Algiers are likewise engaged in the fabrication of a similar kind of carpet. In none of these places, however, does any large manufactory exist ; the carpets are the work of families and households. These carpets are woven in one piece, and there is this notable peculiarity in their manufacture, that the same pattern is never again exactly reproduced ; no two carpets are quite alike. The patterns are very remarkable, being rude and simple in design, and coming down from a very remote period. The coloursare rich and harmonious, red or green being the usual ground colours with blues, yellows, and black, but very rarely is any white permitted to appear. 'The design is usually made up of a large central more or less diamonded pattern with smaller diamonds filling up the corners and sides, the whole surrounded with a border of lines of the different colours, No representation of any living form, nearer than what might be taken as the rude outline of leaves, is introduced into the designs. The peculiarities of the patterns have been accounted for on the theory that the Turkey carpet represents inlaid

jewelled work, which accords with the Oriental delight in jewels and works in precious stones,

Indian Carpets—The manufacture of carpets, which have a very wide range of texture, quality, and material, is widely distributed throughout the East Indies. The weaving is carried on entirely by natives, who combine this as a domestic industry with agricultural labour accord- ing to the season. It has also been very widely adopted as a proper and profitable species of prison labour. The chief centres of the manufacture of woollen carpets, both for native use and export, are Mirzapore and Benares in the north-west provinces, and Masulipatam in the Madras Presidency, from which latter place the carpets most highly prized in Great Britain are imported.

At Benares and Moorshedabad are produccd velvet carpets with gold embroidery. A very elaborate carpet, sent from Kashmir to the Exhibition of 1851 by Maharajah Goolab Singh, was composed entirely of silk, with a pile

nearly an inch thick, in every square foot of which, we are informed, there were at least 10,000 ties or knots. Orna- mental hookah carpets and rugs with a silken pile are made in Mooltan, Amritsar, Peshawar, and Kashmir, those of Mooltan being the most famous. Woollen rugs are made very cheaply throughout Bengal and are in great demand ; but for texture, workmanship, and colouring the rugs of Ellore, Tanjore, and Mysore are unsurpassed. Cotton carpets or Suttringecs are a cheap substitute for woollen fabrics in almost universal use throughout India. They are woven in stripes of either blue and white or red and white,—the principal centres of the manufacture being Agra, Bareilly, Patna, Birbhum, and Bardwan. The price of these articles is generally determined by their weight, but those of Agra are accounted the best. There is considerable varicty in the designs of Indian carpets, but it is allowed they exhibit perfection of harmonious colour- ing. The prevailing colour is a full deep red, broken with leaves, &c., of an orange hue, and interspersed with soft- toned blues or greens. A creamy white is also introduced with excellent effect ; but of late years the introduction of bleached whites has robbed the patterns of that mellow subdued effect which constituted one of their leading charms,

Carpets made in this hand or needle-work style to which we have hitherto been alluding have long been made at various places throughout Europe, and the manufacture is still continued. The most celebrated and artistic textures of this class are the Aubusson, Savonnerie, and Beauvais carpets of France, and the similar products of Manufacture Royale de Tapis of Tournaiin Belgium. The manufacture of what are called Turkey carpets is also wide spread, and the common Axminster rugs of England are made on the same principle. But the characteristic carpet weaving of Europe is entirely the product of machine or loom work, aud of such there are several distinct varieties. Of these the first is the

Kidderminster, or Scotch Carpet.—This is called also the ingrain carpet, and is made in many parts of Scotland and the north of England, and in the United States of America. It consists of worsted warp traversed by woollen weft, and is woven in pieces about a yard wide. It is composed of two distinct webs interlaced together at one operation and is therefore a double or two-ply carpet, similar on its two sides. In this article only two colours can with propriety be introduced, as otherwise it has a striped or mixed appearance. A pure or plain colour can only be obtained where the weft traverses the warp of the same colour. Suppose a crimson figure on a maroon ground; the one web is maroon, the other is crimson, and the pattern is produced by these intersecting each other at fixed points ; what is crimson on one side being maroon on the other and vice versa. One beam contains the warp of both plies, ar- ranged in two tiers, which is passed through the mazls or metallic eyes of the harness—two threads through each eye— and thence through the reed. The harness draws up certain warp threads, to admit of the passage of the shuttle with the weft,the pattern depending upon the warp threads which are so drawn up. This was formerly effected by means of a revolving barrel, whose surface was studded with pins, which by rotation acted upon the warp threads. These studs being arranged so as to produce one pattern, a separate barrel or a new arrangement of the studs was requisite for every other pattern, But this machine is now superseded by the more efficient Jacquard apparatus, which produces the pattern by means of an endless chain of per- forated cards working against parallel rows of needles. The successful introduction of the power-loom for the use of the carpet weaver, which was accomplished by the ingenious perseverance of Mr William Wood, about a

quarter of a century ago, has had a marked influence in cheapening carpets and extending the limits of the industry. An improvement upon the Kidderminster carpet is the triple or three-ply fabric, the invention of Mr Thomas Morton of Kilmarnock. This is composed of three distinct webs, which, by interchanging their threads, produce the pattern on both sides, permitting at the same time much greater variety of colour, with a corresponding increase of thickness and durability in the texture ell

Figured Venetian carpeting is of similar description ; but in it the woof is completely covered by a heavy body of warp. Dutch carpeting is much inferior in quality, and was originally made of cow-hair, but now of the coarsest wool. Neither fabric has great capabilities of design ; simple diced patterns are wrought in the Venetian, stripes and chequers in the Dutch.

The Brussels Carpet is a very superior texture composed of worsted and linen, and has a rich corded appearance. The figures are raised entirely from the warp, by inserting a series of wires between the linen foundation and the superficial yarn, These wires are afterwards withdrawn, leaving a looped surface. In this manufacture there is a great waste of material, and the colours are usually limited to five, although in carpets of the best quality six colours are introduced, Each colour has its continuous layer of thread, running from end to end of the web, which rises to the surface at intervals indicated by the design, and then sinks into the body of the fabric. Thus, in a five-colour Brussels there are five layers or covers, only one of which is visible at any given point ; and owing to the irregularity of their ascent to the surface, the colours cannot be placed upon one beam, but each thread is wound on a separate bobbin, with a weight attached to give a proper tension. These bobbins are arranged in five frames jutting out behind the loom—260 bobbins in each frame for the ordinary width. Additional frames are requisite for additional colours introduced ; but where more than five are engaged the pattern is rather indistinct. The threads of all the bobbins are then drawn through the harness, heddles, and reed, to unite with the linen yarn in the compound fabric, the Jacquard machine being employed to produce the pattern. The manufacture of Brussels carpets was first

introduced into Wilton upwards of a century ago, from Tournai in Belgium. Kidderminster is now the chief seat of this manufacture ; but it is also extensively prosecuted in many other localities

Moquette or Wilton Carpets are woven in the same manner as Brussels carpets, differing only in this, that the loops are cut open into an elastic velvet pile. To effect this the wires are not circular as in the Brussels fabric but flat, and furnished with a knife edge at the upper extremity, the sharp point of which, drawn across the yarn, cuts the pile These carpets, which have a rich soft appearance, besides being manufactured in many parts of England and Scotland, are also made in France.

Tapestry Carpets are manufactured by a very ingenious process which was invented and patented by Mr Richard Whytock of Edinburgh in 1832. In Mr Whytock's in- vention, by a combination of printing and weaving, a pile similar to Brussels carpeting is produced, in which any desired range of colours is available to the designer, while only a single thread is used in the texture instead of the five or six which run through the Brussels texture. In tapestry carpet weaving the ordinary process of printing is reversed ; for instead of the fabric being first woven and afterwards printed, the threads are printed before even the warp is formed. One thread, or two treated as one, in some cases miles in length, are coloured, by steps of half an inch, faster than a swift runner would make the distance, When these threads have been all parti-coloured in this

manner, they form the elements, as it were, of the intended design or fabric. Singly, they exhibit no regular figure or pattern ; but when arranged in their proper order, ready for the weaver's beam, the figure comes into view, much elongated of course, inasmuch as 18 feet of the warp will sometimes be gathered into 4 feet of cloth, in order to secure the due proportions of the intended object. The two combined arts of printing and weaving are simplified by this contrivance. With regard to the weaving—lst, The loom occupies only one-third of the space in length that the Brussels loom requires ; 2d, The latter must have 1300 little beams or bobbins, from which the worsted pile has to be gathered, whereas this loom requires only one beam for the whole of the worsted threads; 3d, While the Brussels or

Wilton, on a web of 27 inches, requires for the best fabric 2860 threads, only 780 are here requisite—one layer instead of five—to produce as good or a_ better surface; and 4th, While the number of colours in suc. cession lengthwise,.on the Brussels principle, must not exceed six or seven, any desired number can be introduced in a tapestry carpet. Again, as regards the printing, whereas formerly a change of blocks was required for every change of pattern, in this new process the same blockg serve for all patterns —as the pen serves for every form‘of type. If an object, say a rosebud, recurs a thousand times in the length of a web, at intervals of 4 feet, the block printer must apply his block a thousand times to point the opening bud ; but here the buds are congregated, so that one stroke may dye them all. Tf it be desired to have a thousand buds in the length of the web, let a thread be wound round a hollow cylinder a thousand times, anda

traversing wheel charged with colour be passed across the coil. The thread, when uncoiled, will be found to be marked

in a thousand places, exactly where it is wanted to tip the opening bud with red from end toend of the web, Design-paper, whereon the pattern is indicated in small squares, serves as a guide to the printer—each square being one stroke of the colour-pulley. After the threads are thus streaked across with colour, they are removed from the cylinder or drum, and the dyes are fixed by the action of steam. The threads are then arranged in setting frames, according to the squares of the design-paper, to constitute the warp of the projected web. The Jacquard is thus superseded, and the loom restored to nearly the same simplicity as of old, when

“* Between two trees the web was hung.”

Not only can the pile of Brussels carpets be readily imitated by the process of Mr Whytock, but a velvet pile can also be produced by simply cutting the loops as practised for Wilton or Moquette carpets.

Like every other improvement, this invention on its first introduction met with considerable opposition, particularly on the part of manufacturers and dealers. During the first fourteen years, the number of looms employed gradually increased from one to fifty-six, the greatest number in operation at Lasswade in 1847. The great success which has attended the manufacture

of tapestry carpets was chiefly owing to the energetic manner in which Mr Whytock's brilliant idea was taken up and developed by the eminent firm of Messrs John Crossley & Sons of Halifax. The manufacture was entered on by many other carpet-weavers, and now, as tapestry and velvet pile carpeting, it is one of the most extensive and best estab- lished departments of the industry ; and the invention has been the means of bringing articles fit for the use of the most refined and fastidious within the reach of all classes of the community. Rugs, table-covers, velvets, and tapestry-hangings are printed and woven on the same principle.

Patent Aamumster Carpets owe their origin to Mr James

Templeton of Glasgow, who obtained a patent for his invention in 1839. With a loom as simple as that re- quired for Mr Whytock's patent tapestry, Mr Templeton succeeded in weaving patterns which embrace an unlimited

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Preparation of Chenille for Templeton's Carpets. c

variety of colours, and that with wool not printed, but dyed in the yarn. Further, these carpets are pile fabrics, and can be woven of a depth equal to any Oriental pro- duction; while for density, smoothness, and firmness of texture they cannot be surpassed. The manufacture in- volves two distinct weaving operations, ~~—lst, the prepara~~ tion of the chenille the strips of which form the weft, and 2d, the carpet-weaving proper. A design for the carpet to be woven is first prepared and accurately laid down in its proper colours on paper ruled into small squares. 'This design is then cut into small longitudinal strips and given to the chenille weaver to guide him as to the colours he is to use, and attaching these to the side of his web, he proceeds in regular order with length after length till the whole pattern is woven up (a, in wood-cut). The depth or thickness of the pile to be made is regulated by the spaces missed in passing warp threads through the reed. In the breadth of this web there may be ten, a dozen, or more separate chenilles,

and consequently there is that number of separate repeats of the pattern available for the weaving: which follows, This first web is cut into shreds or strips (0) along its whole length according to the number of separate chenilles it contains, and the loose edges fold together by a peculiarity in the weaving ©, so that a double pile projects upwards from a firmly woven centre or back. The chenille strips now form the weft thread for the second weaving, and being woven into a strong linen or hempen backing in the same order that the strips were cut off from the original pattern, the colours combine as in the pattern, and the elements of the complete design come out as the weaving proceeds. Each length of the chenille strips thus makes up a complete section of tbe design, and if twelve strips were woven in the breadth of the chenille web, they give the material necessary for twelve repeats. The diffi- culties which opposed the successful issue of his invention Mr Templeton set himself to combat and overcome with unusual perseverance and determination, and his exertions have been rewarded by his products attaining the highest place in public estimation, and by the establishment of a most extensive trade in his carpets. At a much earlier period than most other manufacturers he perceived the high importance of obtaining the co-operation of the best artists and designers to supply him with appropriate and artistic patterns. In 1851 Mr Templeton obtained designs from Mr E. T. Parris, and later he was fortunate enough to secure the aid of such eminent decorative artists as Mr Digby Wyatt and Mr Owen Jones.

Carpeting of felted-wool upon which coloured patterns are printed are in large demand for crumb-cloths, and as a

cheap covering for the floors of bed-rooms, &c. A very large trade, chiefly export, is now carried on in carpets made from jute fibre. The chief centre of this trade is Dundee, and there the goods are chiefly woven in plain strips or chequered patterns, imitations of Kidderminster or Scotch carpeting being rarely attempted in this inferior fibre. The printing of jute carpets has been accomplished in a manner very pleasing to the eye, but it is feared that such goods would not satisfactorily meet the rougher test of human feet. Matting of coir (from the husk of the cocoa- nut), Manilla hemp (Musa

teatalis), and Indian mat-grass (Cyperus textilis), are also in extensive use. Floor-cloths of various kinds come under a separate designation.

From the privately printed lectures of Mr Owen Jones on Lhe True and the False in the Decorative Arts we ex- tract the following on carpet-design :—

“ Carpets should be darker in tone and more broken in hue than any portion of a room, both because they present the largest mass of colour, and because they serve as a background to the furniture placed upon them.

“Ag a general rule, lighter carpets may be used in rooms thinly furnished than the contrary, as we should otherwise have too over- powering a mass of ‘shade. Turkey carpets are by universal consent adopted for dining-rooms, but not all Turkey carpets (and indeed very few) are fitted for such a purpose. The generality of Turkey carpets consist of a border with the whole middle of the carpet forming one large pattern converging to the centre. All-over pat- terns are much more rare. In the East, Turkey carpets are placed on a raised platform or dais at one end of a saloon, and all round the edge of it are cushions on which the Easterns recline, so that the whole middle of the carpet is perfectly free, and the complete pat- tern is seen at a glance. This is not the casc when they are trans- ferred to our dining-rooms, where the dining table alone cuts off the best half of it. . . – The principle of design in a Turkey carpet .is perfect, and our manufacturers would do well, instead of copying them in Axminster, as is their wont, to apply the principles to be learnt from them in producing carpets more in harmony with their requirements.

‘¢] will say no more on the floral style, but to express a regret that the more perfect the manufacturing process in carpets becomes the more do they (the carpets) appear to lend themselves to evil. The modest Kidderminster carpet rarely goes wrong, because it can- not ; it has to deal with but two colours, and consequently much mischief is beyond its reach. The Brussels carpet, which deals with five colours, is more mischievous. The tapestry carpets, where the

colours are still more numerous, are vicious in the extreme ; whilst the recent invention of printed carpets, with no bounds to its ambi- tion, has become positively criminal.” (A. WH.—J. PA.)

CARPI, a town of Italy in the province of Modena, 10 miles north of that city, on a canal supplied by the Secchia. It is the seat of a bishop, and has a cathedral, a theological seminary, a modern palace, an old castle, and considerable remains of its ancient fortifications. Silk- growing, and silk-weaving, the manufacture of straw hats, and the cultivation of grain, hemp, and flax are the principal occupations of the inhabitants, who number about 17,500. In the 14th and 15th and part of the 16th century, it belonged to the Pico family ; but it was taken possession of by Charles V. and bestowed on Alfonso d'Este.

CARPI, Grronamo pa (1501-1556), an historical and portrait painter, born at Ferrara, was one of Benvenuto Garofalo's best pupils. Becoming infatuated with the work of Antonio Leti, called Correggio, he quitted Ferrara, and spent several years in copying that master's paintings at Parma, Modena, and elsewhere, succeeding in aping his mannerisms so well as to be able to dispose of his own works as originals by Correggio. It is probable that not a few pictures yet attributed to the great painter are in reality the work of his parasite. Da Carpi's best paintings are a Descent of the Holy Spirit, in the church of St Francis at Rovigi; a Madonna, an Adoration of the Magi, and a St Catharine, at Bologna; and the St George arid the St Jerome, at Ferrara.

CARPI, Uco pa (died 1536), a painter, was long held the inventor of the art of painting in chiaroscuro, after- wards brought to such perfection by Parmegiano and by

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Baltasar Peruzzi of Siena. The researches of Huber and Breitkopf have proved, however, that this art was known and practised in Germany by Jan Ulrich Pilguin and Mair, at least as early as 1499, while the date of the oldest of Da Carpi's prints is 1518. Printing in chiaroscuro is performed by using several blocks. Da Carpi usually employed three,—one for the outline and darker shadows, another for the lighter shadows, and a third for the half- tint. By means of them he printed engravings after several pictures and after some of the cartoons of Raphael. Of these a Sybil, a Descent from the Cross, and a History of Simon the Sorcerer are the most remarkable.

CARPINI, Joannes DE Prano, author of a remarkable medieval work on Northern Asia. He appears to have been a native of Umbria, where a place formerly called Pian del Carpine, but now Piano della Magione, stands near Perugia, on the road to Cortona. He was one of the companions and disciples of his countryman St Francis of Assisi, and from sundry indications can hardly have been younger than the latter, born in 1182. John bore a high repute in the order, and took a foremost part in the pro- pagation of its teaching in Northern Europe, holding suc- cessively the offices of warden (custos) in Saxony, and of provincial (minister) of Germany, and afterwards of Spain, perhaps of Barbary, and of Cologne. He was in the last post at the time of the great Mongol invasion of Eastern Europe and of the disastrous battle of Liegnitz (April 12, 1241), which threatened to cast European Christendom beneath the feet of barbarous hordes. The dread of the Tartars was, however, still on men's mind four years later, when Pope Innocent IV. determined (1245) on sending a mission to the Tartar and other Asiatic princes, the real object of which apparently was to gain trustworthy informa- tion regarding the hordes and their purposes.

At the head of this mission the Pope placed Friar John, at this time certainly not far from 65 years of age, and to

his discretion nearly everything in the accomplishment of

the mission seems to have been left, The legate started from Lyons, where the Pope then resided, on Easter Day (16th April 1245), accompanied by another friar, who speedily broke down and was left behind, After seeking the counsel of an old friend, Wenceslaus, king of Bohemia, he was joined at Breslau by another minorite, F, Bennet the Pole, appointed to act as interpreter. The onward journey lay by Kiev; the Tartar posts were entered at Kaniev, and thence the route ran across the Dnieper (Veper) and the Don

to the Hthil or Volga, on which stood the Ordu or camp of

Batu, at this time the senior of the Chinghizid family. Here the envoys with their presents had to pass between two fires before being presented to the prince. Batu ordered them to proceed onward to the court of the supreme Kaan in Mongolia, and on Easter Day once more (April 8, 1246) they

started on the second and most formidable part of their journey —* go ill," writes the legate, "that we could

the Jaxartes (quidam fluvius magnus cujus nomen ignoramus), and the Mahometan cities which then stood on its banks ; then along the shores of the Dzungarian lakes and so forward, till, on the Feast of St Mary Magdalene (22d July), at last they reached the imperial camp called Sira Ordu (Yellow Pavilion), near the Orkhon River,—this stout-hearted old man having thus ridden something like 3000 miles in 106 days,

Since the death of Okkodai the imperial authority had been in interregnum. Kuyuk, his eldest son, had now been

designated to the throne; his formal election in a oreat Kurultai, or diet of the tribes, took place while the friars were at Sira Ordu, numbered among 3000 to 4000 envoys and deputies from all parts of Asia and Eastern Europe, bearing homage, tribute, and presents, They afterwards, on the 24th of August, witnessed the formal enthronement at another camp in the vicinity called the Golden Ordu, after which they were presented to the emperor,

It was not till November that they got their dismissal, bearing a letter to the Pope in Mongol, Arabic, and Latin, which was little else than a brief imperious assertion of the Kaan's office as the scourge of God, Then commenced their long winter journey homeward ; often they had to lie on the bare snow, or on the ground scraped bare of snow with the traveller's foot. They reached Kiev on the 9th of June 1247, There, and on their further journey, the Slavonic Christians welcomed them as risen from the dead, with festive hospitality. Crossing the Rhine at Cologne, they found the Pope still at Lyons, and there delivered their report and the Kaan's letter.

Not long afterwards Friar John was rewarded with the archbishopric of Antivari in Dalmatia, and was sent as legate to St Louis. We do not know the year of his death, but it would seem that his successor in the see died before April 1253; hence it is probable that John did not long survive the hardships of his journey.

He recorded the information that he had collected in a work, called in one MS. Liber Lortarorum, in another Historia Monga- lorum quos nos Tartaros appellamus. The work is divided into eight ample chapters on the country, climate, manners, religion, character, history, policy, and tactics of the Tartars, and on the best way of opposing them, followed by a single chapter on the regions passed through. The book thus answers to its title. Like some other famous medizval itinerarics it shows an entire absence of a traveller's or author's egotism, and contains, cven in the last chapter, scarcely any personal narrative. John of Pian del Carpine was not only an old man when he went cheerfully upon this mission, but was, as we know from accidental evidence in the annals of his order, a fat and heavy man (vir gravis et corpulentus), insomuch that during his preachings in Germany he was fain,contrary to Franciscan precedent, to ride a donkey. Yet nota word approaching more nearly to com- plaint than those which we have quoted above appears in his narra- tive. His book, both in its defect of personal detail and in literary quality, is inferior to that written a few years later by a younger brother of the order, aud envoy to the Mongol, William de Rubruck. Butit is an excellent work, and in our own day an educated Mongol, Galsang Gomboyey, has borne detailed and interesting testimony to the great accuracy of its statements (sce Mélanges Asiat. tirés du Bullet. Hist. Philol. dev Acad. Imp. de St Petersbourg, ii. p. 650,

1856).

The book must have been prepared immediately after the return of the traveller, for the Friar Salimbene, who met him in France in the very year of his return (1247), gives us these interesting par- ticulars :—‘‘ He was a clever and conversable man, well lettered, a great discourser, and full of a diversity of experience… . He wrote a big book about the Tattars (sic), and about other marvels that he had seen, and whenever he felt weary of telling about the Tattars, he would cause that book of his to be read, as I have often heard and seen” (Chron. Fr. Salimbeni Parmensis in Monum. Histor. ad Prov. et Placent. pertinentia, Parina, 1857).

For a long time the work was but partially known, and that chiefly through an abridgment in the vast compilation of Vincent of Beau- vais (Speculum Historiale) made in the generation following the traveller's own, and

printed first in 1473. Hakluyt (1598) and Bergeron (1634) published portions of the original work ; but the complete and genuine text was not printed till 1839, when it was put forth by the late M. D'Avezac in the 4th volume of the Récueil de Voyages et de Mémoires of the Geog. Society of Paris,—a work of that great geographer which forms such a model of editorial taste, learning, and sagacity, as will hardly be surpassed or equalled.

John's companion, Benedictus Polonus, also left a brief narrative taken down from his oral relation. This was first published by M. D'Avezac in the work just named. (HY)

CARPOCRATES, a Gnostic of the 2d century, about whose life and opinions comparatively little is known. He is said to have been a native of Alexandria and by birth a Jew. His family, however, seem to have been converted to Christianity. His Gnostic theory was for the most part

founded upon Platonism, and he made especial use of the doctrines of reminiscence and pre-existence of souls. He regarded the world as formed by inferior spirits who are out of harmony with the supreme unity, knowledge of which is the true Gnosis, The souls which remember their pre-exist- ing state can attain to this contemplation of unity, and thereby rise superior to all the ordinary doctrines of religion or life. Jesus is but a man in whom this reminiscence is unusually strong, and who has consequently attained to unusual spiritual excellence and power. To the Gnostic the things of the world are worthless ; they are to him matters of indifference. From this position it easily followed that actions, being merely external, were morally indifferent, and that the true Gnostic should abandon himself to every lust with perfect indifference. The express declaration of these Antinomian principles is said to have been given by Epiphanes, son of Carpocrates. The notorious licentiousness of the sect was the carrying out of their theory into practice.

CARPZOV (in Latin Carpzovius), the name of a family, many of whose members attained distinction in Saxony in the 17th and 18th centuries as jurists, theologians, and statesmen. They traced their origin to Simon

Carpzovy, who was burgomaster of Brandenburg in the middle of the 16th century, and who left two sons, Joachim and Benedict.

Benepict Carpzov (1565-1624), first of this name, second son of Simon, was an eminent jurist. He was born in Brandenburg in 1565, and was educated at the universities of Frankfort and Wittenberg and other German schools, He returned home in 1590, and was soon after nominated assessor in law. In 1595 he was appointed professor of law at Wittenberg, whence he removed in 1602 tothe court of Sophia, electress of Saxony, at Colditz, who named him her chancellor. After some years he returned to Wittenberg, and died there, November 26, 1624, leaving five sons. He published a collection of writings entitled Disputationes juridice.

Benepict Carpzov (1595-1666), second of the name, was the second son of the preceding, and like him was a great lawyer. He was born at Wittenberg in 1595, was at first a professor at Leipsic, obtained an honourable post at Dresden in 1639, became Ordinary of the Faculty of Jurists at Leipsic in 1645, and was named privy councillor at Dresden in 1653. Among his works, which had a very extensive influence on the administration of justice, even beyond the limits of Saxony, are,—Definitiones forenses (1638), Practica nova rerum criminalium (1635), Opus decisionum illustrium Sasxonice (1646), Processus juris Sanonici (1657), &c. His last years were spent at Leipsic, and his time was entirely devoted to sacred studies. He read the Bible through fifty-three times, studying also the comments of Osiander and Cramer, and making voluminous notes. These have been allowed to remain in manuscript. He died at Leipsic, August 30, 1666.

Auaust Carpzov (1612-1683), fourth son of the first Benedict, distinguished himself as a diplomatist. Born at Colditz in 1612, engaged first as advocate of the court at Wittenberg, he was appointed in 1657 chancellor and president of the Consistory at Coburg, and from 1675 till his death was privy councillor at Gotha. He took part in negotiating the treaties of Osnaburg and Nuremberg. Like his brother he was a man of earnest piety, and published several devotional works. He died at Coburg, November

19, 1683.

JoHANN Benepict Carpzov (1607-1657), fifth son of the first Benedict, was born at Rochlitz in 1607, became professor of theology at Leipsic, made himself known by a Systema Theologicum, in two volumes, and died at Leipsic, October 22, 1657, leaving five sons, all of whom attained some literary eminence.

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JoHann Gorttosp Carpzov (1679-1767), grandson of the preceding, was born at Dresden in 1679. He was educated at Wittenberg, Leipsic, and Altdorf, became a learned theologian, and in 1719 was called to the chair of Oriental languages at Leipsic. In 1730 he was appointed superintendent and first pastor at Liibeck. His most

important works were the Introductio in libros canonicos

bibliorum Veteris Testamenti, and Critica saera V.T. He died at Liibeck, April 7, 1767.

Joann Benepict Carpzov (1720-1803), grandson of the first Johann Benedict, was a distinguished classical scholar. He was born at Leipsic in 1720, became professor of philosophy there in 1747, and in the following year removed to Helmstiédt as professor of poetry and Greek. In 1749 he was named also professor of theology. He was author of various philological works, wrote a dissertation on Mencius, and published an edition of Museus. He died April 28, 1803.

CARRANZA, Barroremé pe (1503-1576), a Spanish primate and theologian, was born of noble family at Miranda in Navarre, in 1503. He studied at the university of Alcala, and entered the Dominican order. The only Spaniard who could pretend to rival him in learning was Melchior Canus, and as professor of theology at Valladolid

he gained so brilliant a reputation that students flocked thither from all parts of Spain to hear him. Charles V. selected him as envoy to the Council of Trent (1546). At this council he earnestly maintained that it was the duty of priests to reside in their benefices; and next year he

(1547) followed up this appeal by publishing at Venice De

necessaria residentia episcoporum et aliorum pastorum. He

was also chosen by Charles to accompany to England the prince who afterwards became Philip IJ., on the visit which he made for the purpose of marrying Mary. Carranza became that queen's confessor, and laboured very zealously for the re-establishment of Roman Catholicism. In 1557 Philip appointed him to the archbishopric of Toledo, a post he was very reluctant to accept, as he foresaw the jealousy which his promotion would arouse ; and indeed the bishop of Lérida the very next year denounced him to the Inquisi- tion as a heretic, taking as pretext his Commentarios sobre el catechismo Christiano, published that year at Antwerp, though that book was approved by a commission of the Council of Trent. It was placed in the Index Expurga- torius, and Carranza was imprisoned for eight years, after which, on appealing to Rome, he was taken thither and confined (1566-1576) in the castle of St Angelo. In 1576 he received final sentence, being made to abjure opinions which he had never held, suspended from his archbishopric for five years, and banished to the Dominican convent of Minerva. Seven days after this judgment he died. The people of Spain honoured him as a saint, and Gregory XIIL. placed a highly laudatory inscription on his tomb. His most famous work, Swmma Conciliorum, first published at Venice in 1546, is of considerable value, and has been frequently reprinted.

CARRARA, a town of Italy, in the province of Massa- Carrara, about 62 miles north-west of Florence, is situated not far from the coast of the Mediterranean, ina deep valley watered by the Avenza. The principal buildings are the collegiate church of St Andrea, the Madonna delle Grazie, and the ex-ducal palace. The town owes its whole importance, as well as its very name, to the quarries in the neighbouring mountains, which from a very early period have been one of the principal sources of statuary marble in the world. They are for the most part situated close to the village of Torano, about a mile distant from the town. Of the 450 quarries at present in full working order, the best are those known as Canal Grande, Poggio, Donzio, and Palvaccio. The excavation gives employment to about

6000 men; and nearly 4000 are engaged in the cutting and polishing shops, which number about 115. In 1873 the total value of the marble extracted was £360,000. Carrara is built not far from the site of the ancient Luna, an Etrurian city of considerable importance; and the marble was known to the Romans as Marmor Lunense. Napoleon I. founded in the town an academy of fine arts, which still exists and possesses a large collection of statues. The only native sculptors of note are Alberti Maffeoli in the 15th century and Danese Cattaneoin the 16th. The population of the town proper is about 8000, but the commune contains 23,827,

CARREL, Armanp, or more fully JEAN BAPTISTE Nrcoras ArManp (1800-1836), a distinguished French publicist, was born at Rouen, 8th May 1800. His father was a merchant in good circumstances, and he received a liberal education at the college of his native town, after- wards attending the military school at St Cyr. He had an intense admiration for the great generals of Napoleon, and his uncompromising spirit and bold uprightness soon marked him out as a man of independent views, and to be suspected. Entering the army as sub-lieutenant he took a secret but active part in the unsuccessful conspiracy of Belfort. On the outbreak of war with Spain in 1822, Carrel, whose sympathies were altogether with the Spanish cause, sent in his resignation, and succeeded in effecting his escape to Barcelona. He enrolled himself in the foreign legion and fought gallantly against his former comrades. Near Figuiéres the legion was compelled to surrender, and Carrel became the prisoner of his old general, Damas. There was considerable difficulty about the terms of capitulation, and one council of war condemned Carrel to death, or- tunately some informality prevented the sentence being executed, and he was soon afterwards acquitted and set at liberty.

His career as a soldier being then finally closed, Carrel resolved to devote himself to literature. He came to Paris and began as secretary to Augustin Thierry, the celebrated historian. His services were found to be of great value, and on his side he not only obtained admirable training in habits of composition, but was led to investigate for himself some of the most interesting portions of English history. His first work of importance (he had already written one or two historical abstracts) was the Mistory of the Counter- ftevolution in England, an exceedingly able political study of the

events which culminated in the Revolution of 1688, He gradually became known as a skilful writer in various periodicals ; but it was not till he formed his connection with the National that he became a power in Frauce. The National was at first conducted by Thiers, Mignet, and Carrel in conjunction; but after the revolution of J uly, Thiers and Mignet assumed office, and the whole manage- ment fell into the hands of Carrel. Under his direction the journal became the first political organ in Paris. His Judgment was unusually clear, his principles solid and well founded, his sincerity and honesty beyond question ; and to these qualities he united an admirable style, lucid, precise, and well balanced. As the defender of democracy he had frequently to face serious dangers. He was once in Ste Pelagie, and several times before the tribunal to answer for his journal. Nor was he in less danger from private enmities. Before his last fatal encounter he was twice engaged in duels with editors of rival] papers. The dispute which led to the duel with M. Emile de Girardin was one of small moment, and might have béen amicably arranged had 1t not been for some slight obstinacy on Carrel's part. The meeting took place on the morning of the 22d May 1836, De Girardin was wounded in the shoulder, Carrel in the abdomen. The wound was at once seen to be dangerous and Carrel was conveyed to the house of a friend, where

he died after two days' suffering. His works, with biogra. phical notice by Littré, have been published in five volumes (Paris, 1858). found in Mill's Dissertations, vol. i.

A fine estimate of his character will be

CARRIAGE, a term which in its widest signification

includes all structures employed for the purposes of transport of merchandize and movable goods and of human beings. Such vehicles are generally mounted on wheels, but the sledge and the litter are types of the exception to

this rule. Carriages, according to the definition above

given, includes in these days a vast variety of forms, ranging from the humble wheel-barrow and rude farm-cart up to the luxuriously appointed sleeping-cars of railways, and the state carriages of royal personages. application, however, limits the term to such vehicles as are used for the conveyance of persons, and it is in this restricted sense that the term is here used, Cars or

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carriages for use on railways or tramways are also excluded,

and will be dealt with in other connections.

Although, doubtless, the primitive means of transport

was by riding on the back of the horse, camel, elephant, or

other animal, there is evidence that the use of certain

kinds of carriages dates from a very remote antiquity, When Pharaoh advanced Joseph to the second place in Egypt “ he made him to ride in the second chariot which he had ;” and later, Joseph, by command of the king, sent

waggons out of the land of Egypt to convey Jacob and his whole family to the land of his adoption. Thus at this early period there were two distinct types of carriage in use among the civilized inhabitants of Egypt,—a country which from its level character presented facilities for the development of this species of conveyance. The use of chariots in Egypt and among early nations generally was reserved for rulers and warlike leaders.

It was among the Romans that the use of carriages asa private means of conveyance was first established, and with that people carriages attained great variety of form us well as richness of ornamentation. In all times the employment of carriages depended greatly on the condition of the roads over which they had to be driven, and the establishment of good roads, such as the Appian Way, constructed 33] B.C., and others, greatly facilitated the

development of carriage travelling among the Romans. In Rome itself, and probably also in other large towns, it was neces- sary to restrict travelling in carriages to a few persons of high rank, owing to the narrowness and crowded state of the streets. For the same reason the transport of goods along the streets was forbidden during the ten hours between sunrise and sunset. For long journeys and to convey large parties the veda and carruca appear to have been mostly used, but what their construction and arrange- ments were is not known. During the empire the carriage which appears in representations of public ceremonials is the carpentum. It is very slight, with two wheels, some- times covered, and generally drawn by two horses. If a carriage had four horses they were yoked abreast, among the Greeks and Romans, not in two pairs as now. From the carruca are traced the modern European names,—the English carriage, the French carrosse, and the Italian carrozea, The serpea was a very ancient form of vehicle, the body of which was of osier basket-work. It originated with the Gauls, by whom it was named benna, and by them it was employed for the conveyance of persons and goods in time of peace, and baggage during war. With its name are connected the modern French banne, banneton, vannerie, and panier,—all indicating basket-work. The essedum was a two-wheeled carriage, the form of which the Romans copied from the war cars of the Belge.

These various vehicles were sometimes very splendidly ornamented with gold and precious stones; and covered

carriages seem more and more to have become appendages of Roman pomp and magnificence. Sumptuary laws were enacted on account of the public extravagance, but they were little regarded, and weve altogether abrogated by the emperor Severus. Suetonius states that Nero took with him on his travels no less than a thousand carriages.

On the introduction of the feudal system the use of carriages was for some time prohibited, as tending to render the vassals less fit for military service. Men of all grades and professions rode on horses or mules, and sometimes the monks and women on she-asses. Horseback was the general mode of travelling ; and hence the members of the council, who at the diet and on

other occasions were employed as ambassadors, were called rittmeister. In this manner also great lords made their public entry into cities.

Covered carriages were known in the beginning of the 16th century, but their use was confined to ladies of the first rank ; and as it was accounted a reproach for men to ride in them, the electors and princes sometimes excused their non-attendance at meetings of the state by the plea that their health would not permit them to ride on horseback. Covered carriages were for a long time forbidden even to women ; but about the end of the 15th century they began to be employed by the emperor, kings, and princes, in journeys, and afterwards on state occasions, In 1474 the Emperor Frederick III. visited Frankfort in a close carriage, and again in the following year in a very magni- ficent covered carriage. Shortly afterwards carriages began to be splendidly decorated ; that, for instance, of the electress of Brandenburg at the tournament held at Ruppin in 1509 was gilded all over, and that of the duchess of Meck- lenburg was hung with red satin. When Cardinal Dietrich- stein made his entrance into Vienna in 1611, forty carriages went to mect him ; and in the same year the consort of the Emperor Matthias made her public entrance on her marriage in a carriage covered with perfumed leather. The wedding carriage of the first wife of the Emperor Leopold, who wasa Spanish princess, cost, together with the harness, 38,000 florins. ‘Those of the emperor are thus described : “Tn the imperial coaches no great magnificence was to be seen ; they were covered over with red cloth and black nails) The harness was black, and in the whole work there was no gold. ‘Tho panels were of glass, and on this account they were called the imperial glass coaches. On festivals the harness was ornamented with red silk fringes. The imperial coaches were distinguished only by their having leather traces ; but the ladies in the imperial suite were obliged to be contented with carriages the traces of which were made of ropes.” At the magnificent court of Duke Ernest Augustus at Hanover, in 1681, there were fifty gilt coaches with six horses each. The first time that ambassadors appeared in coaches on a public solemnity was at the imperial commission held at Erfurt in 1613. Soon after this time coaches became common all over Ger- many, notwithstanding various orders and admonitions to deter vassals from using them. These vehicles appear to have been of very rude construction. Beckmann describes a view he had seen of Bremen, painted by John Landwehr in 1661, in which was represented a long quadrangular

carriage, apparently not suspended by straps, and covered with a canopy supported by four pillars, but without cur- tains. Inthe side was a small door, and in front a low seat or box; the coachman sat upon the horses; and the dress of the persons within proved then to be burgomasters. At Paris in the 14th, 15th, and even 16th centuries, the French monarchs rode commonly on horses, the servants of the court on mules, and the princesses and principal ladies

sometimes on asses. Persons even of the highest rank some- +imes sat behind their equerry on the same horse. Carriages,

however, were used at a very early period in France ; for

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there is stil] extant an ordinance of Philip the Fair, issued in 1294, by which citizens' wives are prohibited from using them. It appears, however, that about 1550 there were only three carriages at Paris,—one belonging to the queen, another to Diana of Poitiers, and the third to René de Laval, a very corpulent nobleman who was unable to ride on horseback. 'The coaches used in the time of Henry IV. were not suspended by straps (an improvement referred to the time of Louis XIV.), though they were provided with a canopy supported by four ornamental pillars, and with curtains of stuff or leather.

Occasional allusion is made to the use of some kinds of vehicles in England during the Middle Ages. In The Squyr of Low Degree, a poem of a period anterior tv Chaucer, a description of a sumptuous carriage occurs :

'To-morrow ye shall on hunting fare And ride, my daughter, in a chare. It shall be cover'd with velvet red, And cloth of fine gold all about your head,

With damask white and azure blue Well diaper'd with lilies new."

Chaucer himself describes a chare as

'' With gold wrought and pierrie."

When Richard II. of England, towards the end of the 14th century, was obliged to fly before his rebellious subjects, he and all his followers were on horseback, while his mother alone used a carriage. The oldest carriages used in England were known as chares, cars, chariots, caroches, and whirlicotes; but these became less fashionable when Ann, the wife of Richard II., showed the English ladies how gracefully she could ride on the side-saddle, Stow, in his Survey of London, remarking, “so was riding in those whirlicotes and chariots forsaken except at coronations and such like spectacles.” The same writer states that in the year 1564 Guilliam Boonen, a Dutch- man, became the queen’s coachman, and was the first that brought the use of coaches into England. Although Stow is incorrect in thus attributing the introduction of coaches to the time of Elizabeth, there is no doubt that at the period he indicates, the use of wheeled vehicles began to be so common that it then became a prominent public fact. “Tittle by little,” he again states, “they became usual among the nobilitie and others of sort, and within twenty years became a great trade of coachmaking.” By the beginning of the 17th century the use of coaches had become so prevalent that in 1601 the attention of Parlia- ment was drawn to the subject, and a;Bill “ to restrain the excessive use of coaches ” was introduced, which, however, was rejected on the second reading. ‘Their use told severely on the occupation of the Thames watermen, and Taylor the poet and waterman complained bitterly both in prose and verse against the new-fangled practice :—

‘‘Qarroaches, coaches, jades, and Flanders mares Doe rob us of our shares, our wares, our fares. ee the ground we stand and knock our heels, Whilest all our profit runs away on wheeles.”

The sneers of wits and watermen notwithstanding, coaches became so common, that in the early part of the 17th century they were estimated to number more than 6000 in London and its surrounding country.

Vehicles plying for public convenience, we have seen, were in existence during the period of the Roman empire, and concurrently with the renewal of carriage locomotion in the 16th century, public carriages were again re-established. Hackney coaches were first introduced in France during the minority of Louis XIV. by one Nicolas Sauvage, who lived at the sign of

Saint Fiacre in the Rue St Martin, and hence hired carriages came to te called Jiacres, though eventually the name was restricted to such

as were stationed for hire in the streets. In 1650 Charles Villerme obtained the exclusive privilege of hiring out Jiacres in Paris for a payment of 5000 livres. The prototype of the modern omnibus first commenced plying in the streets of Paris on the 18th March 1662, going at fixed hours, at a stated fare of five sous. Soldiers, lackeys, pages, and livery servants were forbidden to enter such con-

veyances, which were announced to be pour la plus grand

commodité et liberté des personnes de merite. In the time of Charles X. the omnibus system in reality was established ; for no exclusion of any class or condition of person who tendered the proper fare was permitted in the vehicles then put on various routes, and the fact of the carriages being thus at the service of all gave rise to the present name.

Hackney coaches were first established in London in 1625. Writing in 1634 to Lord Stafford, MrGarrard says,— ‘Here is one Captain Bailey ; he hath been a sea captain, but now lives on the land, about this city, where he tries experiments. He hath erected, according to his ability, some four hackney-coaches, put his men in livery, and appointed them to stand at the May-pole in the Strand, giving them instructions at what rate to carry men into several parts of the town, where all day they may be had. Other hackney-men seeing this way, they flocked to the same place, and perform their journeys at the same rate, so that sometimes there is twenty of them together.”

In 1637 there were in London and Westminster no fewer than 50 such coaches ; in 1652 they had increased to 200, and in 1654 to 300, employing 600 horses. In 1694 the number of hackney coaches was limited to 700, and in 1715 to 800. Thus, notwithstanding the competi- tion of sedan chairs, the hackney-coach held its place and grew in importance till it was, about 1820, supplanted by the cabriolet de place, now shortened into “cab,” which had previously held a most important place in Paris, In that city the cabriolet came into great public favour about the middle of the 18th century, and in

the year 1813 there were 1150 such vehicles plying in the Parisian streets. The original cabriolet was a kind of hooded gig, inside which the driver sat, besides whom there was only room left for a single passenger. Mr Hansom, the inventor whose name attaches to the London two-wheeled vehicle to the present day, patented his cab first in the year 1834. It consisted originally of a square body hung in the centre of a square frame, the two wheels being about 7 feet 6 inches in diameter, the same height as the vehicle. On this very numerous improvelnents were quickly made, and in 1836, after a fresh patent had been obtained in name of Messrs Gillett and Chapman, a company was formed for establishing hansom cabs essentially the same as now in use,

Of coaches possessing a history the two best known in the United Kingdom are Her Majesty's state coach, and that of the Lord Mayor of London. The latter is the oldest, having been built, or at least first used, for the procession of Sir Charles Asgil, Lord Mayor elect, in November 1757. The body of this wonderful vehicle is hot supported by springs, but hung on leather straps ; and the whole structure is very richly loaded with ornamental carving, gilding, and paint-work. The different panels and the doors contain various allegorical groups of figures re- presenting suitable subjects and heraldic devices painted in aspirited manner. The royal state coach, which is described as "the most superb carriage ever built," was designed by Sir William Chambers, the paintings ou it were executed by Cipriani, and the work was completed in 1761. The following is an official description of it :-—

"The whole of the carriage and body is richly ornamented with

luurel and carved work, beautifully gilt. The length, 24 feet ; width, 8 feet 3 inches; height, 12 feet ; length of pole, 12 feet 4

CARRIAGE

inches; weight, 4 tons. posed as follows :—Of four large Tritons, who support the body by four braces, covered with red morocco leather, and ornamented with gilt buckles, the two figures placed in front the driver, and are represented in the action extending round their shoulders, and the cranes and soundin to announce the approach of the monarch of the Ocean ; an at

the back carry the imperial fasces, topped with tridents. driver’s foot-board is a large scallop shell, ornamented with bunches of reeds and other marine plants. lances ; the splinter bar is composed beneath a voluted shell, and each e dolphin ; and the wheels are imi triumphal chariot. palm-trees,

The carriage and body of the coach is com.

of the carriage bear of drawing by cables shells those

The

The pole represents a bundle of of a rich moulding, issuing from nd terminating in the head of a tated from those of the ancient The body of the coach is which, branching out at the top, four angular trees are loaded with obtained by Great Britain, by four lions’ heads.

composed of eight sustain the roof; and

trophies allusive to the victories during the late glorious war, On the centre of the roof stand three boys, representing the genii of England, Scotland, and Ireland, support- ing the imperial crown of Great Britain, the sccptre, sword of state, are adorned with festoons the four corners.

supported

and holding in their hands

and ensigns of knighthood ; their bodies of laurel, which fall from thence towards The panels and doors are ate emblematical devices, and the linin embossed with national emblems.”

painted with appropri-

gs are of scarlet velvet richly

Modern Carriages.—The forms of carriages as now built

Coach. Chariot. Barouche. Britzska. Droski. Cabriolet. Cab Phaeton. Mail Phaeton. Gig and Tilbury. Curricle. Landau. Fourgon. Dog-cart.

Omnibus.

Drag. Park Phacton.

Brougham.

Double Brougham.

Clarence.

Waggonette.

Sociable.

T-cart.

Sociable-landau.

Basket carriage.

Britzska-chariot.

Spider phaeton.

Rockaway.

Char-a-coté.

Tarantas.

Kibitka.

Telega.

Troika.

Outside car on two or four wheels.

Sledge. Carriole.

ee eee ees | ee In addition to this list there are numberless forms of fancy carriage, and the misdirected ingenuity of coach-builders is frequently exercised in the attempt to combine the features aud advantages of several vehicles in one structure,

are SO numerous as almost to defy altogether baftle detailed description. The climate, con- ditions of life, and various other circumstances of different countries have originated modified forms of carriage in each of them, some of which have come into general use, while others are seldom seen out of the land of their origin. Mr G. N. Hooper, of the firm of Hooper & Co. of London, who has given valuable assistance in the preparation of the present article, supplies the following table of modern carriages with the countries of their origin :—

Kotze, Berlin. Coupé. Caléche. Britzska. Droitzska, Cabriolet. Milord or Victoria. Mail phaeton. Tilbury. Curricle. Landau. Fourgon. To-car.

Omnibus.

Malle-Anglaise. Phaeton de pare.

Petit coupé.

Clarence.

Waggonette. Sociable. T-cart.

Panier-A-salade. Eilwagen.

Voiture de voyage.

|

classification, and they

| Hungary or Prussia. | France. |

. Austria, Germany and Russia. France. England. |

9

” Italy. Germany. Franee. England. France (by Shillbeer,

an Englishinaun). | England. |

a)

(Lord Broughain). England.

” rib) ”

Ee) Germany. America.

a? Switzerland. Russia.

9?

99

a?

Ireland. Russia, Norway, Ger-

many, Canada, &c. Norway.

generally with the result of rendering it unfit to be used with comfort or safety in any form.

In comparing the carriages of the present day with those of earlier periods it should be borne in mind that many circumstances apart from the skill and invention of the coach-builder have combined to modify, or to necessitate the modification, of such structures. The condition of streets and roads was such, at no very remote date, as to permit of only the most cautious traffic within limited areas in vehicles of great strength, solidity, and weight. The

paving of streets and macadamization of highways gave designers of carriages facilities for planning vehicles of a light, airy type on more elegant lines, of which oppor- tunities they were not slow to take advantage. Again, previous to the introduction of railways, not only public coaches but private carriages had to be built with a view to afford accommodation for undertaking long journeys, which are now entirely performed by railway, and that circumstance also now enables the coach-builder to give primary attention to the comfort, gracefulness, and elegance of the vehicles he constructs. But after allowance is made for all such circumstances, there remains to coach-builders, and especially to those of Great Britain, a very large share of credit, for the inventive skill and ingenuity which has brought the modern carriage to that perfection of workman- ship and artistic finish which it everywhere displays. To enumerate the improvements in coach-building, which have been effected chiefly in the present century, would demand a much greater space than can be devoted to this subject. It must suffice simply to point to the Collinge axle invented in 1792, now universally adopted, by means of which wheels require oiling only once in several months. The elliptic springs, upon which nearly all carriages are now mounted, were patented by Obadiah Elliott in 1804. A great many ingenious devices have also been adopted for facilitating the opening and closing of the head of landaus or such carriages as are made to be open or close at pleasure. And generally coach-building has enjoyed a full share of the advantages flowing from the improved mechanical devices and processes of modern times.

Coachmaking.—Coachmaking is a combination of crafts rarely united in one trade, embracing, as it does, work in such diverse materials as wood, iron, steel, brass, cloth, leather, ivory, hair, &c. A great division of labour and numerous highly skilled artizans are consequently employed in the various stages in the construction of a high-class carriage. The workmen include body-makers, who build up the part in which persons sit; carriage-makers, who make or fit together all the under parts of the vehicle on which the body rests; wheel-wrights, joiners, and fitters , trimmers, who fit up the inside of the carriage ; and several classes of smiths for special work connected with the iron framing, axles, springs, &c. Painting is an important part of the business, those professing it being divided into body, carriage, and heraldry or ornamental painters ; and after the painter comes

the polisher who gives the final brilliant polish to the outside of the whole structure.

A very great deal in the coach-making business depends on the selection of materials, Ash is the kind of wood commonly used in the framework both of body and carriage ; and the quality best suited for body-wood is that of a mild and free nature, while for the carriage the wood cannot be too strong or robust. Full-grown wood, of course, is best suited for both purposes, and the planks must be allowed to lie until they are properly seasoned, as is indeed most essential with all the wood used in the building of a carriage.

After the framework is made, the lower part of the body is panelled up with the softest bay mahogany, plain and The kinds of wood generally applied to coach-wheel making are elm or fustic for the naves, oak

free from grain.

body, and the second for finishing the carriage. paints of different qualities and varnish, a well-finished

private carriages.

for the spokes, and ash for the felloes ; but beech felloes are often used, and it has been found by experience that beech, when the felloes are cut from the log shortly after it is felled, and kept until they become dry before being put upon wheels, answers admirably for this purpose. American hickory is also one of the best available woods for spokes as well as carriage poles; and a large trade is now con- ducted between Great Britain and the United States in the importation of American machine-made hickory wheels. Canadian black walnut has also come into use as a sub- stitute for mahogany in panelling, and many other woods are available for special portions of carriages.

Formerly, in the making of coach-springs, nothing was used but German steel, which from its hardness was more apt to snap than the English steel now employed for that purpose. The latter combines with superior elasticity

a strength that enables the spring-maker to fabricate his springs at least one-third lighter, while they stand equal fatigue. The iron mounting of coach-work requires the skill of experienced smiths; for, besides solidity, some degree of taste is requisite to form the shapes and sets of the different parts. No branch of coach-making contributes more to the elegance of the vehicle than that of the painter. His colours must be of the best quality in order to stand exposure in all weathers. The varnish used is copal, of which there are two kinds,—the finest for finishing the Between

carriage gets from twenty to twenty-four separate coats

before it is finished. Between each coating of varnish colour and varnish the work is carefully rubbed smooth and flat with pumice or fine glass paper, and the final polish is attained by rubbing with the palm of the hand.

The growth and development of railway travelling, instead

of checking the use of horse-drawn vehicles, or injuring the art of the coach-builder, has had a very powerful influence in the opposite direction.

Railway travelling has caused an enormous increase in the use of cabs and other public vehicles, while increasing wealth has multiplied luxurious The revival of the driving of four-horse drags, in imitation of the old stage coaches, between London

and various suburban towns (one going to Brighton), which has taken place of late years, is deserving of note.

These coaches were put on the road by members of several aristo- cratic clubs, not with a view to profit ; their success, how- ever, has been very great.

As a coach-making and coaching country, England has long held the foremost place. ‘‘ The road,” its coaches, and their drivers figure largely in the popular literature of the country, and the perfection of coach equipment has besn an unfailing source of national pride. British coach- builders still continue to hold, almost without dispute, the highest position in their craft ; and that expensive luxury— a first-class London-built carriage—cannot, for

honest work- manship, handsome lines, and beautiful finish, be excelled by any product of industry. (5. PA.)

CARRICKFERGUS, a maritime county of a town, and a co-extensive parliamentary borough of the same name, in the province of Ulster, in Ireland. It is enclosed by the county of Antrim, except on the S. where it is skirted by the Bay of Carrickfergus (Belfast Lough). It comprises an area of 16,702 acres, of which 129 are occupied by the town. ‘The surface is in general hilly ; Lough Mourne, a lake of about 90 acres in extent, is 556 feet above the level of the sea, and the highest mountain, Slieve True, which commands a magnificent prospect, attains an elevation of 1100 feet. The land near the sea-shore is an alluvial plain. The farms are small, except in the hilly district, where grazing is carried on. The chief crops are oats and potatoes, for which sea-weed, with lime and vegetable

matter, forms the manure ; and the district has long been famous for the manufacture of cheese. The fisheries are valuable and extensive, and the oysters taken off the coast are highly prized for their size and flavour. At Duncrue, about a mile and a half from the town, on the property of the marquis of Downshire, rock-salt of remarkable purity and in large quantity is found in the Triassic sandstone.

According to ecclesiastical arrangement, this burgal county forms a single rectory in the diocese of Connor. The population numbered 8520 persons in 1851, and 9397 in 1871,—4280′ males and 5117 females. The borough returns one member to parliament.

The town of Carrickfergus, from which the county and adjoining bay take their name, is 94 miles north-east of Belfast by rail. It stretches along the shore of Belfast Lough, is about one mile in length, and consists of the old or walled town in the centre, the Irish quarter on the west, and the Scotch quarter on the east,—the last being chiefly inhabited by fishermen, descendants from a colony driven by religious persecution from Galloway and Ayr- shire about the year 1665. The town is irregularly built, and

deficient in neatness. ‘The principal building is the old castle, standing on a projecting rock, from which the town derives the name Carrick ; it was formerly a place of much strength, and is still maintained as an arsenal, and mounted with heavy guns. ‘The ancient donjon or keep, 90 feet in height, is still in good preservation. ‘The parish church, an antiquated cruciform structure, was originally a chapel or oratory dependent on a Franciscan monastery. The entrance to a subterranean passage between the two establishments is still visible under the communion-table of the church. The jail, built on the site of the above- mentioned monastery, was formerly the county of Antrim prison. The court-house, which adjoins the jail, is a neat modern building. When Carrickfergus was the county town of Antrim (which it ceased to be in 1850), the assizes were held there. The town has some trade in domestic produce and in linen manufactures, there being several

flax spinning-mills and a bleach-work in the immediate

neighbourhood. Distilling is carried on in the town. Vessels of 100 tons burden can discharge at the pier, and there is a patent slip on the shore. The population of the municipal town was 3543 in 1851, and 4212 in 1871, with an excess at the latter date of 528 females. In 1871 567 were Catholics and 3645 Protestants, and of the latter 2056 were Presbyterians.

In the reign of Queen Elizabeth and this was confirmed by James I., who added the privilege of sending two burgesses to the Irish parliament. The corporation, however, was superseded, under the provisions of the Municipal Reform Act of 1840, by a board of municipal commissioners. In 1182, John de Courcy, to whom Henry II. had granted all the parts of Ulster he could obtain possession of by the sword, fixed a colony in this district. De Courcy built the castle which afterwards came into possession of the De Lacy family, who, being ejected, in- vited Edward Bruce to besiege it (131 5). After a desperate resist- ance the garrison surrendered. In 1386, the town was burned by the Scots, and in 1400 was destroyed by the combined Scots and Irish. Subsequently, it suffered much by famine and the occa- sional assaults of the neighbouring Irish chieftains, whose favour the townsmen were at length necessitated to secure by the payment of an annual tribute. In the reign of Charles I. many Scotch Covenanters settled in the

neighbourhood to avoid the persecution directed against them. In the civil wars, from 1641, Carrickfergus was one of the chief places of refuge for the Protestants of the county of Antrim; and on July 10, 1642, the first Presbytery held in Ireland met there. In that year the garrison was commanded by General Munroe, who having afterwards relinquished the cause of the English Parliament, was, in 1648, surprised and taken prisoner by Sir Robert Adair. At a later period Saree was held b the partisans of James II., but surrendered in 1689 to the forces under King William's general Schomberg; and in 1690 it was visited by King William, who landed here on his expedition to Ireland. In 1760 it was surprised by a French squadron under Commodore Thourot, who landed with about 1000 men, and, after

the town obtained a charter,

holding the place for a few days, evacuated it on the approach of the English troops. Highteen years later Paul Jones, in his ship the "¢ Ranger," succeeded in. oun the 'é Drake, ay British sloop. of-war, in the neighbouring bay ; but he left without molesting the town.

CARRICK-ON-SUIR, a town of Ireland in the south riding of the county of Tipperary, province of Munster, is situated on the Suir, 14 miles east of Clonmel, with a station on the Waterford and Limerick railway. It was formerly a walled town, and contains some very ancient buildings, such as the parish church and the castle, erected in 1309, which belongs to the Butler family. On the other side of the river, but connected by a bridge of the 14th century, stands the suburb of Carrickbeg, with an abbey founded in 1336. The woollen manufactures for which the town was formerly famous still give employment to about 400 people ; and upwards of 1000 are at work in the linen and flax factories. A thriving export trade is carried on in agricultural produce, and slate is extensively quarried in the neighbourhood. Carrick-on-Suir became a place of importance soon after the English conquest of Ireland, and it still gives the title of earl to a branch of the Butler family. Population in 1871, 7792.

CARRIER, in its general acceptation, is a person who conveys the goods of another for hire. In its mere colloquial use it was applied to the class of men, now rendered comparatively obsolete by the railway system, who conveyed goods in carts or waggons on the public roads. In jurisprudence, however, the term is collectively applied to all conveyers of property, whether by land or water ; and in this sense the late changes and enlargements of the system of transit throughout the world have given additional importance to the subject. The law by which carriers, both by land and sea, are made responsible for the goods intrusted to them, is founded on the preetorian edict of the civil law, to which the ninth title of the fourth book of the Pandect is devoted. The edict itself is contained in these few words, “naute, caupones, stabularii, quod cujusque saluum fore receperint, nist restituent, in ¢os wudicium dabo.” The beautiful simplicity of the rule so announced has had a most beneficial influence on the commerce of the world. Throughout the great civilized region which took its law directly from the Roman fountain, and through the other less civilized countries which followed the same commercial code, it laid a foundation for the prin- ciple that the carrier’s engagement to the public is a con- tract of indemnity. It bound him, in the general case, to deliver what he had been entrusted with, or its value— thus sweeping away all secondary questions or discussions as to the conditions of more or less culpability on his part under which loss or damage may have occurred ; and it left any limitations of this general responsibility to be separately adjusted by special contract.

The law of England recognizes a distinction between a common and a private carrier. ‘The former is one who holds himself out to the public as ready to carry for hire from place to place the goods of such persons as choose to employ him. The owner of a stage coach, a railway company, the master of a general ship, a wharfinger carrying goods on his own lighters are common carriers; and it makes no difference that one of the termini of the journey is out of England. It has been held, however, that a person who carries only passengers is not a common carrier ; nor of course is a person who merely engages to carry the goods of particular individuals. If a man undertakes to carry goods safely, although he is not a common carrier, and is to have nothing for the carriage, he is responsible for damage sustained by his negligence. A common carrier is subject at law to peculiar liabilities.

He is bound to carry the goods of any person who offers to pay his hire, unless there is a good reason to the contrary,

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the death of Louis XV1., was one of the first to call for the arrest of the duke of Orleans, and took a prominent part in the Girondists). sent, early in October 1793, to Nantes, under orders from the Convention to suppress the revolt there, by the established a revolutionary tribunal, and formed a body of desperate men, called the Legion of Marat, for the purpose of destroying in the swiftest way the masses of prisoners heaped together in the jails. discontinued, and the victims were sent to the guillotine or shot or cut down in the prisons en large numbers of prisoners trap door in its bottom, and sunk in the Loire by night. This process, first of the noyades of Nantes, called by its inventor “republican baptism,” was twenty-five times re-peated, so that the river became polluted and a decree was issued, prohibiting the drinking of its water 5 women, and little children, there were special aggravations. Such was the terror inspired by these deeds that for some time no one dared to denounce the perpetrator, who, in his reports to the Committee of Public Safety, deliberately lied. At length the horrible truth became known, and Carrier was recalled. He was now the object of general execration ; and although, in consequence of the fall of Robespierre (9th Thermidor), he had a short respite, he was in November 1794 tried before the revolutionary tribunal. ings lasted nearly a month, and on the 16th December, having vainly pleaded the defence, he was condemned to death and executed.

as, for example, when his carriage is full, or the article is not such as he is in the habit of conveying. He ought to carry the goods in the usual course without unnecessary deviation or delay. To make him liable there must be a due delivery of the goods to him in the known course of his business. His charge must be reasonable ; and he must not give undue preference to any customer Or class of customers. ‘The latter principle, as enforced by statute, has come to be of great importance in the law of railway companies. In respect of goods entrusted to him, the carrier’s liability, unless limited by a special contract, 1s, as already stated, that of an insurer. There is no question of negligence as in the case of injury to passengers, for the

warranty is simply to carry safely and securely. The law, however, excepts losses or injuries occasioned immediately “by the act of God or the king’s enemies ”—words which have long had a strict technical signification. It would appear that concealmeant without fraud, on the part of the customer, will relieve the carrier from his liability for negligence, but not for actual misfeasance. Fraud or deceit by the customer (¢.g., in misrepresenting the real value of the goods) will relieve the carrier from his liability. The responsibility of the carrier ceases only with the delivery of the goods to the proper consignee. By the Carrier’s Act (11 Geo. IV. and 1 Will. IV. c. 68) the liability of carriers for gold, silver, dc. (in general “ articles of great value in small compass”) is determined. Should the article or parcel exceed £10 in value, the carrier is not to be liable for loss unless such value is declared by the customer, and the carrier’s increased charge paid. Where the value is thus declared, the carrier may, by public notice, demand an increased charge, for which he must, if required, sign a receipt. Failing such receipt or notice, the carrier must refund the increased charge and remain liable as at common law. Except as above uo mere notice or declaration shall affect a carrier’s liability ; but he may make special con- tracts with his customers. The carriage of goods by rail- wayor canal or by sea is subject to special regulations. (See Ratuways and CHarver Parry.) A carrier of passengers is responsible for personal injuries only when they have been occasioned by his negligence or want of skill. Where there has been contributory negligence on the part of the plaintiff,—7.¢., where he might, by the exercise of ordinary care have avoided the consequences of the defendant’s negligence—he is not entitled to recover. By 9 and 10 Vict. c. 93 (commonly called Lord Campbell’s Act), when a person’s death has been caused by such negligence as would have entitled him to an action had he survived, an action may now be maintained against the party responsible for the negligence on behalf of the wife, husband, parent, or child of the deceased. Previously such cases had been governed by the maxim actio personalis moritur cum ersond.

CARRIER, Juan Baptiste (1756-1794), French Revolu- tionist, one of the actors most infamous for cruelty in the “Reign of Terror,” was born at Yolai, a village near Aurillac in Upper Auvergne, in 1756. At the beginning of the Revolution (1789), he was merely an obscure attorney; and in 1792, with many others of the same class, he was chosen deputy to the National

Convention. He was already known as one of the influential members of the Cordeliers Club, which with the J acobins supported Robespierre. After the subjugation of Flanders he was one of the commissioners nominated in the close of 1792 by the Convention, and sent into that country to carry out a general spoliation of the inhabitants, which was called “ organizing the progress of liberty.” In the following year he took part in establishing the revolutionary tribunal, and said openly that for the prosperity of the republic at least half of its population must be “ suppressed.” He voted for

Stirling and parish of Larbert, on Carron River, about two miles north-east of Falkirk. It is of importance for its iron-works, which were started in 1760 by a chartered company, with a capital of £150,000. There are five blast-furnaces and thirty-five bloomary forges, and they give employment to upwards of 2000 individuals. The carronade, a short kind of cannon with a large chamber for the powder, is so called because it was first made in perfection at these works. Forth three miles one time the boundary of the Roman empire on the north- west. Camelon, and not far from the iron-works is the site of a now demolished monument of great antiquity known as

revolution of May 31 (overthrow of the After a mission into Normandy, Carrier was

which was raging

most severe measures. Nothing loath, he

The form of trial was soon

masse. He also had

put on board a vessel with a

with corpses,

and even in this wholesale slaughter of men,

The proceed- orders of the Convention in his

CARRON, a small village of Scotland, in the county of the right bank of the

The river, which falls into the E.N.E. of Falkirk, is interesting as at

In the neighbourhood, are the ruins of the ancient

Arthur’s Oven, or Oon. The population is about 2500. CARSTARES, Wiii1am (1649-1715), a Scottish clergy- man, born at Cathcart, near Glasgow, on the 11th February 1649, was the son of the Rev. J ohn Carstares, a member of the extreme Covenanting party of Protestors. He was educated at the university of Edinburgh, and then passed over to Utrecht, where he commenced his life-long friend- ship with the prince of Orange, and began to take an active part in the politics of his country. At this time the state of Scotland was restless and unhappy in the extreme; and it was natural, therefore, that the Govern- ment should desire to silence Carstares, whom it had several reasons to dislike. He was the intimate of William ; he had been the bearer of messages between the disaffected in Scotland and Holland; and he was believed to be con- cerned with the learned James Steuart in the authorship of a severe pamphlet—An Account of Scotland’s Grievances by reason of the D. of Lauderdale’s Ministrie, humbly ten- dered to his Sacred Majesty. Accordingly, on his return to England, at the close of 1674, he was committed to the Tower; the following year he was transferred to Edin- burgh Castle, and it was not till August 1679 that he was released, After this he visited Ireland, and then became

pastor to a Nonconformist congregation at Cheshunt. Dur- ing 1682 he was in Holland, but in the following year he was again in London, and was implicated in the Rye House Plot. On its discovery he was examined before the Scottish Council ; but, though the torture of the thumb-screw was applied, he refused to utter a word till he was assured that his admissions would not be used in evidence, and in the disclosures he then made he displayed great discretion. On his return to Holland he was rewarded by William’s

still warmer friendship, and the post of court chaplain ; and after the Revolution he continued to hold this office, under the title of royal chaplain for Scotland. He was the con-

fidential adviser of the king, especially with regard to the

affairs of his native country, and rendered important service

to Presbyterianism, in promoting the Revolution Settlement. At the accession of Anne, Carstares retained his post as royal chaplain, but resided in Edinburgh, having been

elected principal of the University. He was also minister of Greyfriars, and afterwards of St Giles, and was four

times chosen moderator of the General Assembly. He took an important part, too, in promoting the Union, and was consulted by Harley and other leading Englishmen

concerning it. During Anne's reign, the chief object of his policy was to frustrate the measures which were planned by Lord Oxford to strengthen the Episcopalian Jacobites, — especially a Bill for extending the privileges of the Episco- palians, and the Bill for replacing in the hands of the old

patrons the right of patronage, which by the Revolution Settlement had been vested in the elders and the Pro- testant heritors.

On the accession of George I. Carstares was appointed, with five others, to welcome the new dynasty in the name of the Scottish Church. He was received graciously and with hearty thanks for his services, and the office of royal chaplain was again conferred upon him. A few months

after he was struck with apoplexy, and died on the 28th of

December 1715,

See State-papers and Letters addressed to William Carstares, to

which is prefixed a Life by M'Oormick, 1774; and Story's Character

and Career of William Curstares, 1874.

CARTAGENA, or CARTHAGENA, a fortified seaport of

Spain on the Mediterranean Sea, in the province of Murcia, and 29 miles 8. by E. of the town of that name, in 37° 36’ N. lat. and 1° W. long. The town stands on a hill separated by a little plain from the harbour; towards the N. and E. it communicates with a fertile valley; on the S. and W. it is hemmed in by high mountains. The harbour, the finest on the eastern coast of Spain, is fringed by four hills; and the island called La Escombrera, the ancient Scombraria, 23 miles from the narrow entrance, shelters it from the violence of wind and waves, The harbour is heart-shaped and deep, except near its centre, where there is a ledge of rocks only 5 feet under water. On the eastern side is a breakwater 842 yards in length. A tramway leads from the port to the centre of the mining district, a distance of about two leagues. The streets of the town are spacious, but not imposing ; and the friability of the stone gives the houses a dilapidated look. The barracks, arsenal, wet and dry docks, marine school, parade, rope-walks, and the fortifications, are all in a neglected con- dition. The mines near the town are very productive, and thousands of men and beasts are employed in trans- porting ores of lead, iron, copper, zinc, and sulphur to the coast. In 1871 there were 150 blast-furnaces and 76 smelting furnaces at work, The profits vary according to the prices of English coal and coke. Among other mineral products of Cartagena may be mentioned gypsum, saltpetre amethysts, and rubies, Barley and wheat are grown in fair quantity, and there are some extensive vineyards and olive yards. Esparto grass (Stipa tenacissima), a Species of rush,

now much used in paper manufacture, is largely grown in the neighbourhood. It is the spartum, or Spanish broom, of the ancient Romans, —whence their name for Cartagena, Carthago Spartaria. It is still used locally for making shoes, ship’s cables, mats, and a kind of spun cloth. Barilla, earthenware, glass, and silk are also among the manu- factures of Cartagena. The. former prevalence of fever, the abandonment of the arsenal, and the prosperity of the neighbouring port of Alicante have much affected the trade of the town during this century ; the rail-road communica. tion

which now exists with Murcia promises, however, to bring about a revival of its commerce, The imports are chiefly coal and coke from Wales and the north of England, The principal exports are esparto grass and metallic ores : 195,000 tons of the latter were shipped in 1872, almost wholly to Great Britain. The British vessels cleared in 1872 were 244, tonnage 113,015. Of foreign vessels 413 were cleared, tonnage 184,933. ‘The sanitary condition of the town is now greatly improved, as the Almajar Marsh, which formerly caused much intermittent fever, has been drained, The drinking-water of Cartagena is not good : house-rent and food, with the exception of bread-stuffs, are dear; and there are many paupers and mendicants, to whom no public relief is afforded. The population in 1872 was estimated at 26,000, exclusive of the miners and the labourers in the works of the port,

Cartagena was founded about the year 243 B.c. by Hasdrubal,and was called Carthage Nova or New Carthage, to distinguish it from the African city of Carthage. It was conveniently situated opposite to the Carthaginian territory in Africa, and was early noted for its harbour, the best on the neighbouring coast of Spain. Its silver and gold mines were the source of great wealth both to the Carthaginians and to the Romans. In 210 3.0. this important place, the head- quarters and treasure city of the Punic army, was stormed and taken with great slaughter by P. Scipio. The city continued to flourish under the Romans, who made it a colony, with the name Colonia Victria Julia Nova Carthago. In 425 a.p. it was pillaged and nearly destroyed by the Goths. The modern Cartagena was a bishopric till the year 1219, when the see was removed to Murcia. It was re- built by Philip II. of Spain, for the sake of its harbour. In 1706, in the war of the Spanish Succession, it was occupied by Sir John Leake ; and in the next year it was retaken by the duke of Berwick. On the 5th November 1828 the town capitulated to the French. In Consequence of the insurrection in Spain, Cartagena was in 1844 again the scene of warfare. On the 23d August 1873 it was bombarded by the Spanish fleet under Admiral Lobos ; on the 11th October a battle took place off the town, between the ships of the Govern- ment and the Intransigentes, and on the 12th J anuary 1874 Carta- gena was occupied by the Government troops.

CARTAGENA, or CARTHAGENA, a seaport town on the northern coast of South America, in the United States of Colombia, in 10° 25’ 48” lat. and

75° 34’ W. long. It is situated on a low sandy island, which, with the island south of it, Tierra Bomba, forms the harbour of Cartagena, To the east of the town, and connected with it and the mainland by bridges, is the suburb of Xiximani, on another island. ‘The houses of Cartagena are of stone, with lattices and balconies of wood, and are regularly built, but mostly only one story high. ‘The streets are well-paved, but dark and narrow ; arrangements have lately been made for light- ing them by petroleum gas. ‘The principal buildings are the fortresses, some convents and churches, and the public hospitals. The town possesses a park and a theatre. The large cisterns in the walls contain a supply of excellent water. ‘The mean temperature of Cartagena is about 83° Fahr. In the summer the heat is excessive, and yellow fever often commits great ravages ; leprosy, also, is not unfrequent. ‘The harbour, which is second to none on the north coast of South America, covers 40,000 acres ; it affords complete security to ships in all weathers, and great facilities for loading and unloading. It is divided into three sections, Boca Grande and Pascaballos, and the Caldera, which have a depth of about 15 fathoms 3 and Boca Chica, which is deeper. The entrance to Boca Chica

is defended by the two forts—Angelo and San Fernando. Its narrowness, the shallows at its mouth, and the irregularity of the tides render a pilot necessary for ships passing through it. The roadstead for large vessels is about three miles from the city. A chain of salt-lakes, which open into the Bay of Cartagena to the 8.W., and extend towards the Magdalena, in a valley through which that river may at one time have flowed, was taken advantage of by the Spaniards in former times for the construction of a canal. Very little cutting seems to have been necessary, except at Calamar, the point of junction with the river. During the War of Independence the old channel became choked up; it was reopened, however, in 1846, after which the flooding of the valley rendered the channel once more unnavigable, except for barges of light draught. On account of the closing of the Digue, the rival port of Baranguilla has been created, and a great amount of commerce has been transferred to Santa Martha. ‘‘he rapidly-increasing re-quirements of trade in Colombia, and the great superiority of Cartagena as a shipping depét, cannot fail, however, of securing before long the reopening

of the route by the Digue. The imports of Cartagena from the United Kingdom are cotton goods, linen and woollen cloth, crockery- ware, glass, cutlery and hardware. ‘The exports are sugar, tobacco, coffee, cotton, dividivi and dye-woods, ivory-nuts, balsam of Tolu, caoutchouc, cocoa-nuts and fibre, and hides. Most of the cotton is obtained from wild plants, and the export is falling off year by year, as is also that of caoutchouc, from the wasteful cutting down of the india- rubber trees. The cultivation of sugar bids fair to succeed, for the climate and rich soil are adapted for the growth of the cane. The difficulty of obtaining labour has hitherto been a clog on agricultural enterprise in Cartagena. The value of bullion exported from Cartagena on British account in the year ending August 31, 1873, was £6237. The value of the imports was £153,160 ; the customs revenues, £41,400. There are no duties on exports. The number of vessels which entered the port in 1873 was 50, tonnage 30,637. The pupulation of Cartagena, formerly estimated at 28,000, is now about 9000 only; four-fifths of these are black or coloured people. The town of Cartagena is the chief naval arsenal of New Granada. It was founded in 1533 by Pedro de Heredia ; in 1544 it was seized by the French ; it was taken in 1585 by Sir Francis Drake, and in 1697 by the French, who obtained from it over a million of money. In 1741 Vernon unsuccessfully besieged the town. It was taken by Bolivar in 1815, and sur- rendered to the royalists in the same year. Finally, it was captured by the republicans, September 25, 1821.

CARTAGO, an inland town of Costa-Rica, Central America, on a river of the same name, 60 miles from the Gulf of Nicoya. The town suffered severely from an earth- quake in 1841, and has since then decreased in commercial importance, while the population has been reduced from about 9000 to 3000 inhabitants. The volcano Cartago, near the town, is 11,480 feet high.

CARTAGO, an inland city of the state of Cauca, in the United States of Colombia, South America, 130 miles north-west of Bogota, and situated on the Viega, an affluent of the Cauca. The inhabitants, numbering about 8000, carry on a considerable trade in horned cattle, fruits, coffee, cocoa, and tobacco. The climate is dry and salubrious, and the surrounding country well cultivated.

CARTE, Tomas (1686-1754), an English historian, was born at Dusmoon, near Clifton, in 1686. He was educated at Oxford, and was first brought into public notice by his controversy with Dr Chandler regarding the Irish massacre, in which he defended Charles I. His attachment:40 the Stuarts also caused him to remain a non- juror, and on the discovery of the plot of Atterbury, whose

secretary he was, he was forced to flee to France. During his residence in that country he collected materials for an English edition of De Thou and Rigault. These papers were purchased by Dr Mead, under whose direction the book was published in a very handsome form. Being recalled to England through the influence of Queen Caroline, he published, in 1738, A General Account of the Necessary Materials for a History of England. The task of collecting these materials he undertook, with the assistance of subscriptions from various sources. The first volume of his history, which is only of value for its vast and careful collection of facts,was published in 1744. By the insertion in it of the statement that the king's evil had been cured by the Pretender, Carte forfeited the favour of most of his patrons. He, however, continued to publish; and the 2d volume appeared in 1750, the 3d in 1752, the 4th in 1755. His papers became the property of the University of Ox- ford, and were deposited in the Bodleian Library.
CARTER, Exizaseta (1717-1806), a celebrated lady scholar, and translator of the works of Epictetus, was the daughter of the Rev. Dr Carter of Deal in Kent, and was born in that town, December 16, 1717. Mer mother, Margaret Swayne of Bere, in Dorset, lost her fortune by investing it in the South Sea Stocks, and died of a decline when Elizabeth was about ten years old. Dr Carter educated his children, boys and girls alike; but Elizabeth's slowness of apprehension tired out his patience, and it was only by great perseverance that she conquered her natural incapacity for learning. She studied late at night and early in the morning, taking snuff and chewing green tea to keep herself awake ; and she so injured her health by this that she suffered throughout her life from severe headaches. Miss Carter learned Greek and Latin from her father, and was specially proficient in Greek, so that Dr Johnson said concerning a celebrated scholar, that he " understood Greek better than any one whom he had ever known except Elizabeth

Carter.” She learned also Hebrew, French, German, Italian, Spanish, Portuguese, and lastly some Arabic. She studied astronomy, ancient geography, and ancient and modern history. In 1734 some of her verses appeared in the Gentleman’s Magazine under the signature ‘‘ Eliza,” Carr the editor being a friend of her father. In 1738 she published a small collection of poems, and next year she translated from the French an attack on Pope’s Essay on Man by M. Crousaz. In 1739 appeared her translation from the Italian of Algarotti’s Mewtonian- ismo per le Dame, calling it Sir Isaac Newton’s Philosophy explained for the use of the Ladies, in sia Dialogues on Light and Colours. Her translation of Epictetus was undertaken in 1749 to please her friends Dr Secker (afterwards arch- bishop of Canterbury) and Miss Talbot, to whom the translation was sent, sheet by sheet, as it was done. This work was published by guinea subscription in 1758. In 1762 Miss Carter printed a second collection of poems. Dr Carter, from 1762 to his death in 1774, lived with his daughter in a house at Deal, which she had purchased. Her literary earnings were auginented by an annuity settled on her in 1761 by Sir William Pulteney and his wife, who had inherited the fortune of her old friend Lord Bath; and she had another annuity from Mrs Montagu after that lady had become a widow. Among Miss Carter’s friends and correspondents may be mentioned—Johnson (whom she came to know through Cave the bookseller in 1737, and who printed one or two of her papers in the Rambler), Bishop Butler, Savage, Horace Walpole, Richardson, Reynolds, Burke, Mrs Montagu, Hannah More, and Mrs Vesey, the hostess of the Bas-Bleus. Miss Carter never married, and lived to the age of eighty-nine. She died in Clarges Street, Piccadilly, 1806 ; and her nephew, the Rev. Montagu Pennington, published her Jfemozs in 1808.

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CARTESIANISM

Y Cartesianism is here meant the philosophy developed principally in the works of Des Cartes, Malebranche, and Spinoza. It is impossible to exhibit the full meaning of these authors except in connection, for they are all ruled by one and the same thought in different stages of its evolution. It may be true that Malebranche and Spinoza were prepared, the former by the study

of Augustine, the latter by the study of Jewish philosophy, to draw from Cartesian principles consequences which Des Cartes never anticipated. But the foreign light did not alter the picture on which it was cast, but only let it be seen more clearly. The consequences were legitimately drawn. – It may be shown that they lay in the system from the first, and that they were evolved by nothing but its own immanent dialectic. At the same time it is not likely that they would ever have been brought into such clear consciousness, or expressed with such consistency, except by a philosopher whose circumstances and character had com- pletely detached him from all the convictions and pre- judices of the age. In Malebranche, Cartesianism found an interpreter whose meditative spirit was fostered by the cloister, but whose speculative boldness was' restrained by the traditions of the Catholic church. In Spinoza it found one who was in spirit and position more completely isolated than any monk, who was removed from the influence of the religious as well as the secular world of his time, and who in his solitude seemed scarcely ever to hear any voice but the voice of philosophy. It is because Cartesianism found such a pure organ of expression that its develop- ment is, in some sense, complete and typical. Its principles have been carried to their ultimate result, and we have before us all the data necessary to determine their value. Dus Cartes was, in the full sense of the word, a partaker of the modern spirit. He was equally moved by the tendencies that produced the Reformation, and the tendencies that produced the revival of letters and science. Like Erasmus and Bacon, he sought to escape from a transcendent and unreal philosophy of the other world, to the knowledge of man, and the world he lives in. But like Luther, he found within human experience, among the matters nearest to man, the consciousness of God, and therefore his renunciation of scholasticism did not end either in materialism, or in that absolute distinction between faith and reason which inevitably leads to the downfall of faith. What was peculiar to Des Cartes, however, was the speculative interest which made it impossible for him to rest in mere experience, whether of things spiritual or things secular, which made him search, both in our consciousness of God and our consciousness of the world, for the links by which they are bound to the consciousness of self. In both cases it is his aim to go back to the beginning, to retrace the unconscious process by which the world of experience was built up, to discover the hidden logic that connects the different parts of the structure of belief, to substitute a reasoned system, all

whose elements are inter- dependent, for an unreasoned congeries of opinions. Hence his first step involves reflection, doubt, and abstraction, Turning the eye of reason upon itself, he tries to measure the value of that collection of beliefs of which he finds himself possessed ; and the first thing that reflection seems to discover is its accidental and unconnected character. Itis a mass of incongruous materials, accumu- lated without system and untested. Its elements have been put together under all kinds of influences, without any conscious intellectual process, and therefore we can have no assurance of them. In order that we may have

such assurance we must unweave the web of experience and thought which we have woven in our sleep, that we may begin again at the beginning and weave it over again with “clear and distinct” consciousness of what we are doing. De omnibus dubitandum est. We must free our- selves by one decisive effort from the weight of custom, prejudice, and tradition with which our consciousness of the world has been overlaid, that in that consciousness in its simplest and most elementary form we may find the true beginning of knowledge. The method of doubt is at the same time a method of abstraction, by which Des Cartes rises above the thought of the particular objects of knowledge, in order that he may find the primary truth in which lies the very definition of knowledge, or the reason why anything can be said to be true. First disappears the whole mass of dogmas and opinions as to God and man which are confessedly received on mere authority. Then the supposed evidence of sense is rejected, for external reality is not immediately given in sensation. Itis acknow- ledged by all that the senses often mislead us as to the nature of things without us, and perhaps they may also mislead us as to there being anything without us at all, Nay, by a stretch of effort, we can even carry doubt beyond this point, we can doubt even mathematical truth, When, indeed, we have our thoughts directed to the geometrical demonstration, when the steps of the process are immediately before our minds, we cannot but assent to the proposition that the angles of a triangle are equal to two right angles; but when we forget or turn away our thoughts from such demonstration, we can imagine that God or some powerful spirit is playing upon our minds to deceive them, so that even our most certain judgments may be illusory. In this naive manner does Des Cartes express the idea that there are necessities of thought prior to, and presupposed in the truth of geometry. He is seeking to strip thought of

all the “lendings” that seem to come to it from anything but itself, of all relation to being that can be supposed to be given to it from without, that he may discover the primary unity of thought and being on which all knowledge depends. And this he finds in pure self-consciousness. Whatever I abstract from, I cannot abstract from self, from the “I think” that, as Kant puts it, accompanies a]] our ideas; for it was in fact the very independence of this universal element on the particulars that made all our previous abstraction possible. Even doubt rests on certitude; alone with self I cannot get rid of this self. By an effort of thought I separate my thinking self from all that I think, but the thinking self remains, and in thinking I am. Cogito ergo sum, The objective judgment of self-consciousness is bound up with or involved in the very faculty of judging, and therefore remains when we abstract from all other objective judg- ments It is an assertion involved in the very process by which we dismiss all other assertions. Have we not then a right to regard it as a primitive unity of thought and being, in which is contained, or out of which may be de- veloped, the very definition of truth ?

The sense in which Des Cartes understood his first principle becomes clearer when we look at his answers to the objections made against it. On the one hand it was challenged by those who asked, like Gassendi, why the argument should be based especially on thought, and why we might not say with as good a right ambulo ergo sum. Des Cartes explains that it is only as referred to conscious ness that walking is an evidence of my existence; but if I say “Iam conscious of walking, therefore I exist,” this is

equivalent to saying, “I think in one particular way, therefore I exist.” But it is not thinking in a particular way, but thinking in general that is co-extensive with my existence. I am not always conscious of walking, or of any other special state or object, but I am always con- scious, for except in consciousness there is no ego or self, and where there is consciousness there is always an ego. Do I then always think, even in sleep, asks the objector ; and Des Cartes exposes himself to the criticisms of Locke, by maintaining that it is impossible that there should ever be an interval in the activity of consciousness, and by insisting that as man is essentially a thinking substance, the child thinks, or is self-conscious, even in its mother’s womb.

‘The difficulty disappears when we observe that the question as to the conditions under which self-con- sciousness is developed in the individual human subject, does not affect the nature of self-consciousness in itself, or in its relation to knowledge. The force of Des Cartes’s argument really lies in this, that the world as an intellig- ible world exists only for a conscious self, and that there- fore the unity of thought and being in self-consciousness is presupposed in all knowledge. Of this self it is true to say that it exists only as it thinks, and that it thinks always. Clogito ergo sum is, as Des Cartes points out, not a syllogism, but the expression of an identity which is discerned by the simple intuition of the mind.’ If it were otherwise, the major “omne quod cogitat existit” would require to have been known before the minor “ cogito” ; whereas on the contrary it is from the immediate consciousness of being as contained in self-consciousness that that major can alone be derived. Again, when Hobbes and others argued that thinking is or may be a property of a material substance, Des Cartes answers that the question whether the material and the thinking substance are one does not meet us at the outset, but can only be solved after we have considered what is involved in the conception of these different substances yespectively.2 In other words, to begin by treating thinking as a quality of a material substance, is to go outside of the intelligible world for an explanation of the intelligible world. It is to ask for something prior to that which is first in thought. If it be true that the consciousness of self is that from which we cannot abstract, that which is involved in the knowledge of anything, then to go beyond it and seek for a reason or explanation of it in anything else is to go beyond the beginning of knowledge ; it is to ask for a knowledge before knowledge.

Des Cartes, however, is himself unfaithful to this point of view; for, strictly taken, it would involve the consequence, not only that there is nothing prior to the pure conscious- ness of self, but that there can be no object which is not in necessary relation to it. Hence there can be no absolute opposition between thought and anything else, no opposi- tion which thought itself does not transcend. But Des Cartes commits the error of making thought the property of a substance, a res cogitans, which as such can immediately or directly apprehend nothing but thoughts or ideas ; while, altogether outside of these thoughts and ideas, there is another substance characterized by the property of extension, and with which thought has nothing to do. Matter in

space is thus changed, in Kantian language, into a “thing in itself,” an object out of all relation to the subject; and on the other hand, mind seems to be shut up in the magic circle of its own ideas, without any capacity of breaking through the circle or apprehending any reality but itself, Between thought and being, in spite of their subjective unity in self-consciousness, a great gulf seems still to be fixed, which cannot be crossed unless thought should

> i SS 1 Resp. ad secundas objectiones, p. 74,—quoting from the Elzevir edition.

2 Resp. ad tertras obgect., p. 94.

become extended, or matter think. But to Des Cartes the dualism is absolute, because it is a presupposition with which he starts. Mind cannot go out of itself, cannot deal with anything but thought, without ceasing to be mind; and matter must cease to be matter ere it can lose its absolute externality, its nature as having partes extra partes, and acquire the unity of mind. They are opposed as the divisible and the indivisible, and there is no possible exist- ence of matter in thought except a representative existence. The ideal (or, as Des Cartes calls it, objective) existence of matter im thought and the real (or, as Des Cartes calls it,

formal) existence of matter out of thought are absolutely

different and independent things.

It was, however, impossible for Des Cartes to be content with a subjective idealism that confined all knowledge to the tautological expression of self-consciousness “I am I,” “What I perceive I perceive.” If the individual is to find

in his self-consciousness the principle of all knowledge,

there must be something in it which transcends the distine-

tion of self and not self, which carries him beyond the limit of his own individuality. What then is the point where the subjective consciousness passes out into the objective, from which it seemed at first absolutely excluded 4

Des Cartes answers that it is through the connection of the

consciousness of self with the consciousness of God. It is because we find God in our minds that we find anything else. The proof of God's existence is therefore the hinge

on which the whole Cartesian philosophy turns, and it is

necessary to examine the nature of it somewhat closely.

Des Cartes, in the first place, tries to extract a criterion

of truth out of the cogito ergo sum. Why am I assured of my own existence? Itis because the conception of existence is at once and immediately involved in the consciousness of self. I cannot separate them; whenever I clearly and distinctly conceive the one, I am forced to think the other along with it. But this gives me a rule for all judgments what-

I can logically distinguish the two elements, but

ever, a principle which is related to the cogito ergo sum as the formal to the material principle of knowledge.

Whatever we cannot separate from the clear and dis- tinct conception of anything, necessarily belongs to it in reality; and on the other hand, whatever we can

separate from the clear and distinct conception of any- thing, does not necessarily belong to it in reality. Let

us therefore set an object clearly before us, let us sever it in thought so far as is possible from all other objects,

and we shall at once be able to determine what pro- perties and relations are essential, and what are not essential to it. And if we find empirically that any object

manifests a property or relation not involved in the clear

and distinct conception of it, we can say with certainty that such property or relation does not belong to it except by arbitrary arrangement, or, in other words, by the external combination of things which in there own nature have no affinity or connection.

Now, by the application of this principle, we might at once assure ourselves of many mathematical truths; but, as has been already shown, there is a point of view from which we may doubt even these, so long as the idea of a God that deceives us is not excluded. If it is not certain that there is a God that cannot lie, it is not certain that there is an objective matter in space to which mathematical truth applies. But the existence of God may be proved in two ways. In the first place it may be proved through the principle of causality, which is a self-evident truth. We have in our mind many ideas, and according to the principle of causality, all these ideas must be derived from something that contains a “formal” reality which corresponds to their “objective ” reality, 7.e., which contains at least as much reality in its existence out of thought as they contain in

their existence in thought Now we might derive from ourselves not only the ideas of other minds like our- selves, but possibly also of material objects, since these are lower in the scale of existence than ourselves, and it is

conceivable that the idea of them might be got by omitting

some of the qualities which distinguish ourselves. But the idea of God, of a being who is eternal and immutable,

all powerful, all wise, and all good, cannot be derived The origin, therefore, must be sought in a being who contains actually in himself all that is contained in our idea of

from our own limited and imperfect existence.

him. To this argument it was objected by some of the critics

of Des Cartes that the idea of God as the infinite Being is

merely negative, and that it is derived from the finite simply by abstracting from its conditions, answers that the case is just the reverse—the infinite is

the positive idea, and the finite is the negative, and there-

fore the former is the presupposition of the latter. As Kant, at a later date, pointed out that space is not a

general conception, abstracted from the ideas of particular

spaces, and representing the common element in them, but that, on the contrary, the ideas of particular spaces are got by the limitation of the one infinite space that is prior to them, so Des Cartes maintains in general that the idea of the finite is had only by limitation of the infinite, and not the idea of the infinite by abstraction from the partic- ular determinations of the finite. It is a necessary con- sequence of this that the self-consciousness of a finite being is bound up with the consciousness of the infinite. Hence the idea of God is not merely one among other ideas which we have, but it is the one idea that is necessary to our very existence as thinking beings, the idea through which alone we can think ourselves, or anything else. “TI ought never to suppose,” says Des Cartes, “ that my conception of the infinite is a negative idea, got by negation of the finite, just as I conceive repose to be merely negation of movement, and darkness merely the negation of light.

On the contrary, I see manifestly that there is more reality in the infinite than in the finite substance, and that there-

fore I have in me the notion of the infinite, even in some sense prior to the notion of the Jinate, or, in other words, that the notion of myself in some sense presupposes the notion of God; for how could I doubt or desire, how could I be conscious of anything as a want, how could I know that I am not

altogether perfect, if I had not in me the idea of a being more perfect than myself, by comparison with whom I recognize the defects of my own existence?” 1 Des Cartes then goes on in various ways to illustrate the thesis that the consciousness of a defective and growing nature cannot give rise to the idea of infinite perfection, but on the contrary, presupposes it. We could not think of a series of approximations, unless there were somehow pre- sent to us the idea of the completed infinite as the goal we aim at. If we had not the consciousness of ourselves as finite in relation to the infinite, either we should not be conscious of ourselves at all, or we should be conscious of ourselves as infinite. The image of God is so impressed by Him upon us, that we “conceive that resemblance wherein the idea of God is contained by the same faculty whereby Wwe are conscious of ourselves.” In other words, our con- sciousness of ourselves is at the same time consciousness of our finitude, and hence of our relation to a being who is infinite,

The principle which underlies the reasoning of Des Cartes is, that to be conscious of a limit, is to transcend it. We could not feel the limits either upon our thought or upon our existence, we could not doubt or desire, if we did not

2 Meditatio tertia, p. 21.

already apprehend something beyond these limits, Nay, we could not be conscious of our existence ag individual selves, if we were not conscious of that which is not our- selves, and of a unity in which both self and not-self are included. Our individual life is therefore to us as self. conscious beings a part of a wider universal life. Doubt and aspiration are but the manifestation of this essential division and contradiction of a nature, which, as conscious of itself, is at the same time conscious of the whole in which it

is a part. And as the existence of a self and its consciousness are one, so we may say that a thinking being is not only an individual, but always in some sense identified with that universal unity of being to which it is essentially related.

If Des Cartes had followed out this line of thought, he would have been led at once to the pantheism of Spinoza, if not beyond it. As it is, he is on the verge of contra. diction with himself when he speaks of the consciousness of God as zn some sense prior to the consciousness of self, How can anything be prior to the first principles of know- ledge? It is no answer to say that the consciousness of God is the principium essendi while the consciousness of self is the principium cognoscendi. For, if the idea of God is prior to the idea of self, knowledge must begin where existence begins, with God. The words “in some sense,” with which Des Cartes qualifies his assertion of the priority of the idea of God, only betray his hesitation and his partial consciousness of the contradiction in which he ig involved. Some of Des Cartes’s critics presented this difficulty to him in another form, and accused him of reasoning in a circle when he said that it is because God cannot lie that we are certain that our clear and distinct ideas do not deceive us, The very existence of the con- scious self, the cogito ergo sum, which is the first of all truths and therefore prior in certitude to the existence of God, is believed only because of the clearness and distinct: ness with which we apprehend it. How then, they argued, could God’s truthfulness be our security for a principle which we must use in order to prove the being of God} The answer of Des Cartes is somewhat lame. We cannot doubt any self-evident principle, or even any truth based on a self-evident principle, when we are directly contem- plating it in all the necessity of its evidence ; It is only when we forget or turn away from this evidence, and begin – to think of the possibility of a deceitful God, that a doubt arises which cannot be removed except by the conviction that God is true? It can scarcely be said that this is a dignus vindice nodus, or that God can fitly appear as a kind of second-best resource to the forgetful spirit that has lost its direct hold on truth and its faith in itself. God, truth, and the human spirit are thus conceived as having merely external and accidental relations with each other. What Des Cartes, however, is really expressing in this exoteric way, is simply that beneath and beyond all par- ticular truths lies the great general truth of the unity of thought and existence. In contemplating

particular truth, we may not consciously relate it to this unity, but when we have to defend ourselves against scepticism, we are forced to realize this relation. The ultimate answer to any attack upon a special aspect or element of truth must be to show that the fate of truth itself, the possibility of knowledge is involved in the rejection of it, and that we cannot doubt it without doubting reason itself. But to doubt reason is, in the language of Des Cartes, to doubt the truthfulness of God, for, in his view, the idea of God is involved in the very constitution of reason. Taken in this way then, the import of Des Cartes's answer is, that the consciousness of self, like every other particular truth, is

® Resp. quarte, p. 234.

not at first seen to rest on the consciousness of Gud, but that when we realize what it means we see that it does so rest. But if this be so, then in making the consciousness of self his first principle of knowledge, Des Cartes has stopped short of the truth. It can only be the first principle if it is understood not as the consciousness of the individual self, but in a sense in which the consciousness of self is identical with the consciousness of God.

Des Cartes, however, is far from a clear apprehension of the ultimate unity of thought and being, which nevertheless he strives to find in God. Beginning with an absolute separation of the res cogitans from the res extensa, he is continually falling back into dualism just when he seemed to have escaped from it. Even in God the absolute unity, idea and reality fall asunder ; our idea of God is not God in us, it is only an idea of which God's existence is the cause. But the category of causality, if it forms a bridge between different things, as here between knowing and being, at the same time repels them from each other. It is a category of external relation which may be adequate to express the relation of the finite to the finite, but not the relation of the finite to the infinite. We cannot con- ceive God as the cause of our idea of him, without making Goda purely objective and therefore finite existence. Nor is the case better when we turn to the so-called onto-logical argument,—that existence is necessarily involved in the idea of God, just as the property of having its angles equal to two right angles is involved in the idea of a triangle. If indeed we understood this as meaning that

thought transcends the distinction between itself and existence, and that therefore existence cannot be a thing in itself out of thought, but must be an intelligible world that exists as such only for the thinking being, there is some force in the argument. But this meaning we cannot find in Des Cartes, or to find it we must make him inconsistent with himself. He was so far from having quelled the phantom “thing in itself,” that he treated matter in space as such a thing, and thus confused externality of space with externality to the mind. On this dualistic basis, the ontological argument becomes a mani- fest paralogism, and lies open to all the objections that Kant brought against it. That the idea of God involves existence proves only that God, if he exists at all, exists by the necessity of his being. But the link that shall bind thought to existence is still wanting, and, in consistency with the other presuppositions of Des Cartes, it cannot be supplied.

But again, even if we allow to Des Cartes that God is the unity of thought and being, we must still ask what kind of unity? Is it amere generic unity, reached by abstraction, and therefore leaving out all the distinguishing character- istics of the particulars under it? Oris ita concrete unity to which the particular elements are subordinated, but in Which they are nevertheless included? To answer this question, we need only look at the relation of the finite to the infinite, as it is expressed in the passage already quoted, and in many others. Des Cartes always speaks of the infinite as a purely affirmative or positive existence, and of the finite in so far as it is distinguished from the infinite, as purely negative, or in other words as a nonentity, ‘I am,” he says, “a mean between God and nothing, between the Supreme Being and not-being. In so far as I am created by God, there is nothing in me that can deceive me or lead me into error. But on the other hand, if I consider myself as participating in nothingness, or not-being, inas- much as I am not myself the Supreme Being, but in many ways defective, I find myself exposed to an infinity of errors. Thus error as such is not something real that depends on God, but simply a defect ; I do not need to explain it by means of any special faculty bestowed on me by God, but

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merely by the fact that the faculty for discerning truth from error with which he has endowed me, is not infinite." 1 But if we follow out this principle to its logical result, we must say not only that error is a consequence of finitude, but also that the very exzstence of the finite as such is an error or illusion. All finitude, all determination, according to the well-known Spinozistic aphorism, is negation, and negation cannot constitute reality. To know the reality of things, therefore, we have to abstract from their limits, or in other words, the only reality is the infinite. Jinite being, qua finite, has no existence, and finite self-consciousness, consciousness of a self in opposition to, or limited by, a not-self is an illusion. But Des Cartes does not thus reason, He does not see " anything in the nature of the infinite which should exclude the existence of finite things." '" What" he asks "would become of the power of that imaginary infinite if it could create nothing? Perceiving in ourselves the power of thinking, we can easily conceive that there should be a greater intelligence elsewhere. And even if we should suppose that intelligence increased ad infinitum, we need not fear that our own would be lessened. And the same is true of all other attributes which we ascribe to God, even of his power, provided only that we do not suppose that the power in us is not subjected to God's will. In all points, therefore, He is infinite without any exclusion of created things." The truth of this view we need not dispute ; the question is as to its consistency with Cartesian principles. It may be a higher idea of God to conceive him as revealing himself in and to finite creatures ; but it is a different idea from that which is implied in Des Cartes's explanations of error. It is an inconsistency that brings Des Cartes nearer to Christiantity, and nearer it may also be said, to a true metaphysic ; but it is not the less an inconsistency with his fundamental principles which necessarily disappears in their subsequent development. To conceive the finite as not constituted merely by the absence of some of the positive elements of the infinite, but as in necessary unity with the infinite ; to conceive the infinite as not merely that which has no limits, or determinations, but as that which is self-determined and self-manifesting, which through all finitude and manifestation returns upon itself, may not be erroneous. But it would not be difficult to show that the adoption of such a conception involves the rejection or modification of almost every doctrine of the Cartesian system.

In connection with this inconsistency we may notice the very different relations in which Des Cartes conceives mind on the one side and matter on the other, to stand towards God, who yet is the cause of both, and must therefore, by the principle of causality, contain in himself all that is in both. Matter and mind are to Des Cartes absolute opposites. Whatever can be asserted of mind can be denied of matter, whatever can be asserted of matter can be denied of mind. Matter is passive, mind is active; matter is extended, and therefore divisible ad infinitum ; mind is an indivisible unity. In fact, though of this Des Cartes is not conscious, the determination of the one is mediated by its opposition to the other ; the ideas of object and subject, the self and not-self, are terms of a relation distin- guishable but inseparable. But in the idea of God we must find a unity which transcends this difference in one way or another, whether by combining the two under a higher notion, or, as it would be more natural to expect on Cartesian principles, by abstracting equally from the particular characteristics of both. Des Cartes really does neither, or rather he acts partly on the one principle and partly on the other. In his idea of God he abstracts from the properties of matter but not from those of mind. ‘“ God,” he says, 1 Meditatio quarta, p. 26. 2 Resp. ad a object., p. 75.

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“ contains in himself formaliter all that is in mind, but only eminenter all that is in matter;”1 or, as he elsewhere expresses it more popularly, he zs mind, but he is only the creator of matter. And for this he gives as his reason, that matter as being divisible and passive is essentially imperfect. Ipsa natura corporis multas imperfectiones involuit, and, therefore, “there is more analogy between sounds and colours than there is between material things and God.” But the real imperfection here lies in the abstractness of the Cartesian conception of matter as merely extended, merely passive ; and this is balanced by the equal abstractness of the conception of mind or self-consciousness as an absolutely simple activity, a pure intelligence without any object but itself. If matter as absolutely opposed to mind is imperfect, mind as absolutely opposed to matter is equally imperfect. In fact they are the elements or factors of a unity, and lose all meaning when severed from

each other, and if we are to seek this unity by abstraction, we must equally abstract from both.

The result of this one-sidedness is seen in the fact that Des Cartes, who begins by separating mind from matter, ends by finding the essence of mind in pure will, z.c.,in pure formal self-determination, Hence God's will is conceived as absolutely arbitrary, not determined by any end or law, for all laws, even the necessary truths that constitute reason, spring from God's determination, and do not precede it. " He is the author of the essence of things no less than their existence," and his will has no reason but his will. In man there is an intelligence with eternal laws or truths involved in its structure, which so far limits his will. "He finds the nature of good and truth already determined by God, and his will cannot be moved by anything else." His highest freedom consists in having his will determined by a clear perception of the nature of good and truth, and "he is never indifferent except when he is ignorant of it, or at least does not see it so clearly as to be lifted above the possibility of doubt."? Indifference of will is to him "the lowest grade of liberty," yet, on the other hand, in nothing does the image of God in him show itself more clearly than in the fact that his will is not limited by his clear and distinct knowledge, but is " in a manner infinite." For "there is no object of any will, even the infinite will of God, to which our will does not extend." 3 Belief is a free act, for as we can yield our assent to the obscure conceptions presented by sense and the imagina- tion, and thus allow ourselves to be led into error, so on the other hand we. can refuse to give this assent, or allow ourselves to be determined by anything but the clear and distinct ideas of intelligence. That which makes it possible for us to err is that also in which the divine image in us is most clearly seen. We cannot have the freedom of God whose will creates the object of his knowledge ; but in reserving our assent for the clear and distinct perceptions of intelligence, we, as it were, re-enact for ourselves the divine law, and repeat, so far as is possible to finite beings, the transcendent act of will in which truth and good had their origin

The inherent defect of this view is the divorce it makes between the form and the matter of intelligence. It implies that reason or self-consciousness is one thing, and that truth is another and quite different thing, which has been united to it by the arbitrary will of God. The same external conception of

the relation of truth to the mind is involved in the doctrine of innate ideas. It is true that Des Cartes did not hold that doctrine in the coarse form in which it was attributed to him by Locke, but expressly declares that he has “never said or thought at any time ee

1 Resp. ad sec. object., p. 72-8, 2 Resp. Sexter, 160-163. 3 Principia, i. 35.

that the mind required innate ideas which were separated from the faculty of thinking. He had simply used the

determination of the will. is innate in certain families, and in certain others diseases, like the gout or the stone, we do not mean to imply that infants in their mother’s womb are affected with these complaints.” 4 hold that these truths are involved in the very nature of intelligence as such, so that we cannot conceive a self-con-

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word innate to distinguish those ideas which are derived from that faculty, and not from external objects or the Just as when we say Senerosity

Yet Des Cartes, as we have seen, does not

scious being without them. On the contrary we are to regard the divine intelligence as by arbitrary act determining that two and two should be four, or that envy should be a vice. We are “not to conceive eternal truth flowing from God as rays from the sun.”> In other words, we are not to conceive all particular truths as different aspects of one truth. It is part of the imperfection of man’s finite nature that he “ finds truth and good determined for him.” It is something given,—given, indeed, along with his very faculty

of thinking, but still given as an external limit to it, If

belongs not to his nature as spirit, but to his finitude as man. After what has been said, it is obvious that the transition

from God to matter must be somewhat arbitrary and external.

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God’s truthfulness is pledged for the reality of that of which we have clear and distinct ideas; and we have clear and distinct ideas of the external world so long as we conceive it simply as extended matter, infinitely divisible, and moved entirely from without,—so long, in short, as we conceive it as the direct opposite of mind, and do not attribute to it any one of the properties of mind, Omnes proprietates, quas in ea clare percipimus, ad hoe unum reducuntur, quod sit partibilis et mobilis, secundum We must, therefore, free ourselves from the obscure and confused modes of thought which arise whenever we attribute any of the secondary qualities, which exist merely in our sensations, to the objects that cause these sensations. The subjective character of such qualities is proved by the constant change which takes place in them, without any change of the object in which they are perceived. A piece of wax cannot lose its extension ; but its colour, its hard- ness, and all the other qualities whereby it is presented to Sense, may be easily altered. What is objective in all this is merely an extended substance, and the modes of motion or rest through which it is made to pass. In like manner we must separate from our notion of matter all ideas of actio in distans,—e.y., we must explain weight not as a tendency to the centre of the earth or an attraction of distant particles of matter, but as a consequence of the pressure of other bodies, immediately surrounding that which is felt to be heavy.® or the only conceivable actio im distans is that which is mediated by thought, and it is only in so far as we suppose matter to have in it a principle of activity like thought, that we can accept such explana- tions of its motion. Again, while we must thus keep our conception of matter clear of all elements that do not belong to it, we must also be careful not to take away from it those that do belong to it. It is a defect of distinctness in our ideas when we conceive an attribute as existing apart from its substance, or a substance without its attribute; for this is to treat elements that are only separated by a “distinction of reason,” as if they were dis- tinct things. The conception of the possibility of a vacuum or empty space arises

merely from our confusing the possible separation of any mode or form of matter from matter in general with the impossible separation of matter in general

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4 Note in Programma, p. 184.-

5 Epistole, i. 110, 5 Resp. Sexte, p. 165-6,

from its own essential attribute. Accordingly, in his physical philosophy, Des Cartes attempts to explain every- thing on mechanical principles, starting with the hypothesis that a certain quantity of motion has been impressed on the material universe by God at the first, a quantity which can never be lost or diminished, and that space is an absolute plenum in which motion propagates itself in circles. It is unnecessary to follow Des Cartes into the detail of the theory of vortices. It is more to the purpose to notice the nature of the reasons by which he is driven to regard such a mechanical explanation of the universe as necessary. A real or substantive existenee is, in his view, a res com- pleta, a thing that can be conceived as a whole in itself without relations to any other thing. Now matter and mind are, he thinks, such complete existences, so long as we conceive them, as pure intelligence must conceive them, as abstract opposites of each other; and do not permit ourselves to be confused by those mixed modes of thought which are due to sense or imagination. Des Cartes does not see that in this very abstract opposition there is a bond of union between mind and matter, that they are correlative opposites, and therefore in their separation res incomplete. In other words, they are merely elements of reality substantiated by abstract thought into independent realities. He indeed partly retracts his assertion that mind and matter severed from each other are ves complete, when he declares that neither can be conceived as existing apart from God, and that therefore, strictly speaking, God alone is a substance. But as we have seen, he avoids the necessary inference that in God the opposition between mind and matter is reconciled or transcended, by conceiving God as abstract self-consciousness or will, and the material world not as his necessary manifestation, but simply as his creation, —as

having its origin in an act of bare volition, and that only. His God is the God of monotheism and not of Christianity, and therefore the world is to God always a foreign matter which he brings into being, and acts on from without, but in which he is not revealed.

It is a natural consequence of this view that nature is essentially dead matter, that beyond the motion it has received from God at the beginning, and which it transmits from part to part without increase or diminution, it has no principle of activity in it. Every trace of vitality in it must be explained away as a mere false reflection upon it of the nature of mind. The world is thus “ cut in two with a hatchet,” and there is no attraction to overcome the mutual repulsion of its severed parts. Nothing can be admitted in the material half that savours of self-deter- mination, all its energy must be communicated, not self- originated ; there is no room for gravitation, still less for magnetism or chemical affinity, in this theory. A fortiort, animal life must be completely explained away. The machine may be very complicated, but it is still, and can be nothing but, a machine. If we once admitted that matter could be anything but mechanical, we should be on the way to admit that matter could become mind, When a modern physical philosopher declares that everything, even life and thought, is ultimately reducible to matter, we cannot always be certain that he means what he seems to say. Not seldom the materialist sot-disant when we hear his account of the properties of matter, turns out to be something like a spiritualist in disguise ; but when Des

Cartes asserted that everything but mind is material, and that the animals are automata, there is no such dubiety of interpretation. He said what he meant, and meant what he said, in the hardest sense his words can bear. His matter

was not even gravitating, much less living; it had no

property except that of retaining and transmitting the

motion received from without by pressure and impact.

And his animals were automata, not merely in the sense

of being governed by sensation and instinct, but precisely in the sense that a watch is an automaton. Henry More cries out against the ruthless consequence with which he develops his principles to this result. “In this,” he says, “JT do not so much admire the penetrative power of your genius as I tremble for the fate of the animals. What I recognize in you is not only subtlety of thought, but a hard and remorseless logic with which you arm yourself as with a sword of steel, to take away life and sensation with one blow, from almost the whole animal kingdom.” But Des Cartes was not the man to be turned from the legitimate result of his principles by a scream. ‘‘Nec moror astutias et sagacitates canum et vulpium, nec quecunque alia propter cibum, venerem, aut metum a brutis fiunt. Profiteor enim me posse perfacile illa omnia ut a sola membrorum conformatione profecta eaplicare,”*

The difficulty reaches its height when Des Cartes attempts to explain the union of the body and spirit in man. Between two substances which, when clearly and distinctly conceived, do not imply each other, there can be none but an artificial unity,—a unity of composition that still leaves them external to each other. Even God cannot make them one in any higher sense.? And as it is impossible in the nature of mind to see any reason why it should be embodied, or in the nature of matter to see any reason why it should become the organ of mind, the union of the two must be taken as a mere empirical fact. When we put on the one side all that belongs to intelligence, and on the other all that belongs to matter, there is a residuum in our ideas which we cannot reduce to either head. This residuum consists of our appetites, our passions, and our sensations, including not only the feelings of pain and. pleasure, but also the perceptions of colour, smell, taste, of hardness and softness, and all the other qualities appre- hended by touch, These must be referred to the union of mind with body. They are subjective in the sense that they give us no information either as to the nature of things or of mind. ‘Their function is only to indicate what things are useful or hurtful to our composite nature as such, or in other words what things tend to confirm or dissolve the unity of mind and body. They indicate that something is taking place in our body, or without it, and so stimulate us to some kind of action, but what it is that is taking place they do not tell us, There is no resem- blance in the sensation of pain produced by great heat to the rending of the fibres of our body that causes it. But we do not need to

know the real origin of our sensation to prevent us going too near the fire. Sensation leads us into error only when we are not conscious that its office is merely practical, and when we attempt to make objective judgments by means of its obscure and confused ideas, ¢.g., when we say that there is heat in our hands or in the fire. And the remedy for this error is to be found simply in the clear conviction of the subjectivity of sensation.

These views of the nature of sense, however, at once force us to ask how Des Cartes can consistently admit that a subjective result such as sensation, a result in mind, should be produced by matter, and on the other hand how an objective result, a result in matter, should be effected by mind. Des Cartes explains at great length, according to his modification of the physiology of the day, that the pineal gland, which is the immediate organ of the soul, is acted on by the nerves through the " animal spirits," and again by reaction upon these spirits produces motions in the body. It is an obvious remark that this explanation either materializes mind, or else puts for the solution the very problem to be solved. It was therefore in the spirit of Des Cartes, it was only making explicit what Se ee ee

1 Zpist., i. 66, 67. 2 Princ, i. 60.

is involved in many of his expressions when Geulincx, one of his earliest followers, formulated the theory of occasional causes. The general approval of the Cartesian school proved that this was a legitimate development of doctrine. Yet it tore away the last veil from the absolute dualism of the system, which had so far stretched the antagonism of mind and matter that no mediation remained possible, or what is the same thing, remained possible only through an inexplicable will of God. The intrusion of such a Deus ex machina into philosophy only showed that philosophy by its violent abstraction had destroyed the unity of the known and intelligible world, and was, there- fore, forced to seek that unity in the region of the unknown and unintelligible. If our light be darkness, then in our darkness we must seek for light ; if reason be contradictory in itself, truth must be found in unreason. The develop- ment of the Cartesian school was soon to show what is the necessary and inevitable end of such worship of the unknown.

To the ethical aspect of his philosophy, Des Cartes, unlike his great disciple, only devoted a subordinate atten. tion. In ashort treatise, however, he discussed the relation of reason to the passions. After we have got over the initial difficulty, that matter should give rise to effects in mind, and mind in matter, and have admitted that in man the unity of mind and body turns what in the animals is mere mechanical reception of stimulus from without and reaction upon it into an action and reaction mediated by sensation, emotion, and passion, another question presents itself. How can the mere natural move- ment of passion, the nature of which is fixed by the original constitution of our body, and of the things that act upon it, be altered or modified by pure reason? For while it is obvious that morality consists in the determination of reason by itself, it is not easy to conceive how the same being who is determined by passion from without should also be determined by reason from within. How, in other words, can a spiritual being maintain its character as self-deter- mined, or at least determined only by the clear and distinct ideas of the reason which are its innate forms, in the presence of this foreign element of passion that seems to make it the slave of external impressions? Is reason able to crush this intruder, or to turn it into a servant? Can the passions be annihilated, or can they be spiritualized 9 Des Cartes could not properly adopt either alternative; he could not adopt the ethics of asceticism, for the union of body and mind is, in his view, natural; and hence the passions which are the results of that union are in them- selves good. They are provisions of nature for the protec- tion of the unity of soul and body, and stimulate us to the acts necessary for that purpose. Yet, on the other hand, he could not admit that these passions are capable of being completely spiritualized ; for so long as the unity of body and soul is regarded as merely external and accidental, it is impossible to think that the passions which arise out of this unity can be transformed into the embodiment and expres- sion of reason. Deg Cartes, indeed, points out that every passion has a lower and a higher form, and while in its lower or primary form it is based on the obscure ideas produced by the motion of the animal spirits, in its higher form it is connected with the clear and distinct judgments of reason regarding good and evil. If, however, the unity of soul and body be a unity of composition, there is an element of obscurity in the judgments of passion which cannot be made clear, an element in desire that cannot be spiritualized. If the mind be external to the passions it can only impose upon them an external rule of

moderation. On such a theory no ¢deal morality is possible to man in his present state ; for, in order to the attainment of such an ideal morality, it would be necessary that the accidental

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element obtruded into his life as a spiritual being by his connection with the body should be expelled. be attained under present conditions is only to abstract so far as is possible from external things, and those relations to external things into which passion brings us. Hence the great importance which Des Cartes attaches to the dis- tinction between things in our power, and things not in our power. What is not in our power includes all outward things, and therefore it is our highest wisdom to regard them as determined by an absolute fate, or the eternal decree of God. We cease to wish for the impossible ; and

Yet the medium was, as we shall see, and hence the product was not quite pure. metaphor, Malebranche, by his previous habits of thought,

ject as such, but of a universal life in

[MALEBRANCHE,

What can

therefore to subdue our passions we only need to convince ourselves that no effort of ours can enable us to secure their objects. On the other hand that which is within our power, and which therefore we cannot desire too earnestly, is virtue, But virtue in this abstraction from all objects of desire is

simply the harmony of reason with itself, the drapagla of

the Stoic under a slight change of aspect. ‘Thus in ethics, as in metaphysics, Des Cartes ends not with a reconciliation of the opposed elements, but with a dualism, or at best, with a unity which is the result of abstraction.

MALEBRANCHE was prepared, by the ascetic training of the cloister and the teaching of Augustine, to bring to clear

consciousness and expression many of the tendencies that

were latent and undeveloped in the philosophy of Des Cartes. To use a chemical metaphor, the Christian Plato- nism of the church father was a medium in which Car- tesianism could precipitate the product of its elements. not a perfect one, Without

was well fitted to detect and develop the pantheistic and ascetic elements of his master's philosophy. But he was not well fitted to penetrate through the veil of popular language under which the discordance of that philosophy with orthodox Christianity was hidden. On the contrary, the whole training of the Catholic priest, and especially his practical spirit, with that tendency to compromise which a practical spirit always brings with it, enabled him to conceal from himself as well as from others the logical result of his principles. And we do not wonder even when we find him treating as a "' miserable " the philosopher who tore away the veil.

Malebranche saw " all things in God." In other words, he taught that knowledge is possible only in so far as thought is the expression, not of the nature of the individual sub- which he and all other rational beings partake. "No one can feel my individual pain ; every one can see the truth which I con- template—why is it so? The reason is that my pain is a modification of my substance, but truth is the common good of all spirits." This idea is ever present to Male- branche, and is repeated by him in an endless variety of forms of expression. Thus, like Des Cartes, but with more deci- sion, he tells us that the idea of the infinite is prior to the idea of the finite. '" We conceive of the infinite being by the very fact that we conceive of being without thinking whether it be finite or no. But in order that we may think of a finite being, we must necessarily cut off or deduct something from the general notion of being, which consequently we must previously possess. Thus the mind does not apprehend anything whatever, except in and through the idea that it has of the infinite 3; and so far is it from being the case that this idea is formed by the confused assemblage of all the ideas of particular things as the philo- sophers maintain, that, on the contrary, all these particular ideas are only participations in the general idea of the a get ee

1 Morale, i. 1, § 2.

infinite, just as God does not derive His being from the crea- tures, but all the creatures are imperfect participations of the divine Being.”! Agaiu, he tells us, in the same chapter, that “when we wish to think of any particular thing, we first cast our view upon all being, and then apply it to the consideration of the object in question. We could not desire to see any particular object unless we saw it already in a confused and general way, and as there is nothing which we cannot desire to see, so all objects must be in a manner present to our spirit.” Or, as he puts it in another place, “ our mind would not be capable of representing to itself the general ideas of genera and species if it did not see allthings as contained in one ; for every creature being an individual we cannot say that we are apprehending any created thing when we think the general idea of a triangle” The main idea that is expressed in all these different ways is simply this, that to determine any individual object as such, we must relate it to, and distin- guish it from, the whole of which it is a part; and that, therefore, thought could never apprehend anything if it did not bring with itself the idea of the intelligible world as a unity. Des Cartes had already expressed this truth in his Meditations, but he had deprived it of its full significance by making a distinction between the being and the idea of God, the former of which, in his view, was only the cause of the latter. Malebranche detects this error, and denies that there is any idea of the infinite, which is a somewhat crude way of saying that there is no division between the idea of the infinite and its reality. What Reid asserted of the external world, that it is not represented by an idea in our minds, but is actually present to them, Malebranche asserted of God. No individual thing, he tells us—and an idea is but an individual thing—could represent the infinite. On the contrary, all individual things are represented through the infinite Being, who contains them all in His substance trés efficace, et par conséquence trés intelligible. We know God by himself, material things only by their ideas in God, for they are “unintelligible in themselves, and we can see them only in the being who contains them in an intelligible manner.” And thus, unless we in some way “saw God, we should be able to see nothing else.” The vision of God or iz God, therefore, is an ‘‘intellectnal intuition” in which seer and seen, knower and known, are one. Our knowledge of things is our participation in God’s knowledge of them. When we have gone so far with

Malebranche, we are tempted to ask why he does not follow out his thought to its natural conclusion. If the idea of God is not separable from His existence, if it is through the idea of Him that all things are known, and through His existence that all things are, then it would seem necessarily to follow that our consciousness of God is but a part of God's conscicusness of Himself, that our con- sciousness of self and other things is but God's consciousness of them, and lastly, that there is no existence either of ourselves or other things except in this consciousness. To understand Malebranche is mainly to understand how he stopped short of results that seemed to lie so directly in the line of his thought.

To begin with the last point, it is easy to see that Malebranche only asserts unity of idea and reality in God, to deny it everywhere else, which with him is equivalent to asserting it in general and denying it in particular. To him, as to Des Cartes, the opposition between mind and matter is absolute. Material things cannot come into our minds nor can our minds go out of themselves pour se promener dans les cieux.2 Hence they are in themselves absolutely unknown; they are known only in God, in whom are their ideas, and as these ideas

2 Ibid. ch. 7. 3 Tbid., ch. 1.

again are quite distinct from the reality, they "might be presented to the mind without anything existing." That they exist owt of God in another manner than the intelligible manner of their existence zx God, is explained by a mere act of His will, that is, it is not explained at all, Though we see all things in God, therefore, there is no connection between His existence and theirs. The "world is not a necessary emanation of divinity; God is perfectly self- sufficient, and the idea of the infinitely perfect Being can be conceived quite apart from any other. The existence of the creatures is due to the free decrees of God.'4 Malebranche, therefore, still treats of external things as "things in themselves," which have an existence apart from thought, even the divine thought, though it is only in and through the divine thought they can be known by us. "To see the material world, or rather to judge that it

exists (since in itself it is invisible), it is necessary that God should reveal it to us, for we canuot see the result of His arbitrary will through necessary reason.” 5

But if we know external things only through their idea in God, how do we know ourselves? Is it also through the idea of usin God? Here we come upon a point in which Malebranche diverges very far from his master. We do not, he says, properly now ourselves at all, as we know God or even external objects. We are conscious of ourselves by inner sense (sentiment intérieur), and from this we know that we are, but we do not know what we are. “We know the existence of our soul more distinctly than of our body, but we have not so perfect a knowledge of our soul as of our body.” This is shown by the fact that from our idea of body as extended substance, we can at once see what are its possible modifications. In other words, we only need the idea of extended substance to see that there is an inexhaustible number of figures and motions of which it is capable. The whole of geometry is but a development of what is given already in the conception of extension. But it is not so with our consciousness of self, which does not enable us to say prior to actual experience what sensations or passions are possible to us. We only know what heat, cold, light, colour, hunger, anger, and desire are by feeling them. Our knowledge extends as far as our experience and no further. Nay, we have good reason to believe that many of these modifications exist in our soul only by reason of its accidental association with a body, and that if it were freed from that body it would be capable of far other and higher experiences. ‘We know by feeling that our soul is great, but perhaps we know almost nothing of what it is in itself.” The informations of sense have, as Des Cartes taught, only a practical but no theoretical value ; they tell us nothing of the external world, the real nature of which we know not through touch and taste and sight, but only through our idea of extended substances; while of the nature of the soul they do not tell us much more than that it exists and that it is not material. And in this latter case we have no idea, nothing better than sense to raise us above its illusions. Itisclear from these statements that by self-consciousness Male- branche means consciousness of desires and feelings, which belong to the individual as such, and not consciousness of self as thinking. He begins, in fact, where Des Cartes ended, and identifies the consciousness of self as thinking, and so transcending the limits of its own

particular being, with the consciousness or idea of God. And between the consciousness of the finite in sense, and the consciousness of the infinite in thought, or in other words, between the consciousness of the universal and the consciousness of the individual, he sees no connection. Malebranche is just one step from the pantheistic conclusion that the consciousness

4 Morale, i. 1, § 5. 5 Entretien, i. § 5.

of finite individuality as such is illusory, and that as all bodies are but modes of one infinite extension, so all souls are but modes of one infinite thought. But while he will- ingly accepts this result in regard to matter, his religious feelings prevent him from accepting it in relation to mind. He is driven, therefore, to ths inconsistency of holding that sense and feeling, through which in his view we apprehend the finite as such, give us true though imperfect knowledge of the soul, while the knowledge they give us of body is not only imperfect but false.1 Thus the finite spirit is still allowed to be a substance, distinct from the infinite, though

it holds its substantial existence on a precarious tenure. It

is left hanging, we may say, on the verge of the infinite, whose attraction must soon prove too strong for it. Ideas

are living things, and often remould the minds that admit

them in spite of the greatest resistance of dead custom and traditionary belief. In the grasp of a logic that overpowers him the more easily that he is unconscious of its tendency, Malebranche is brought within one step of the pantheistic conclusion, and all his Christian feeling and priestly train- ing can do, is just to save him from denial of the person- ality of man.

But even this denial is not the last word of pantheism. When the principle that the finite is known only in relation to the infinite, the individual only in relation to the uni- versal, is interpreted as meaning that the infinite and universal is complete in itself without the finite and individual, when the finite and individual is treated as a mere accidental existénce due to the

“arbitrary will of God,” it ceases to be possible to conceive even God as a spirit, Did Malebranche realize what he was saying when he declared that God was “ being in general,” but not any particular being? At any rate we can see that the same logic that leads him almost to deny the reality of finite beings, leads him also to seek the divine nature in some- thing more abstract and general even than thought. If we must abstract from all relation to the finite in order to know God as he is, is it not necessary for us also to abstract from self-consciousness, for self-consciousness has a nega- tive element in it that is something definite and therefore limited? We do not wonder, therefore, when we find Malebranche saying that reason does not tell us that God is a spirit, but only that He is an infinitely perfect being, and that he must be conceived rather as a spirit than as a body simply because spirit is more perfect than body. “When we call God a spirit, it is not so much to show positively what he is, as to signify that he is not material.” But as we ought not to give him a bodily form like man’s, so we ought not to think of his spirit as similar to our own spirits, although we can conceive nothing more perfect. “It is necessary rather to believe that as he contains in himself the properties of matter without being material, so he comprehends in himself the perfections of created spirits without being a spirit as we alone can conceive spirits, and that his true name is “He who is,” ae, Being without restriction, Being infinite and universal.” Thus the essentially self-revealing God of Christianity gives way to pure spirit, and pure spirit in its turn to the eternal and incomprehensible substance of which we can say nothing but that it is, The divine substance contains in it, indeed, everything that is in creation, but it contains them envinenter in some incomprehensible form that is reconcilable with its infinitude, But we have no adequate name by which to call it except Being. The curious metaphysic of theology by which, in his later writings, Malebranche tried to make room for the incarnation by supposing that the finite creation, which as finite is unworthy of God, was made worthy by union with Christ, the divine Word, shows that a eee

1 Recherche, iii. pt. ii. ch. 7,§4 ? Tbid., ch. 9.

Malebranche had some indistinct sense of the necessity of reconciling his philosophy with his theology ; but it shows also the necessarily artificial nature of the combination, The result of the union of such incongruous elements wag something which the theologians at once recognized ag heterodox and the philosophers as illogical.

There was another doctrine of Malebranche which brought him into trouble with the theologians, and which was the main subject of his long controversy with Arnauld, This was his denial of particular providence. As Leibnitz maintained that this is the best of all possible worlds, and that its evils are to be explained by the negative nature of the finite, so Malebranche, with a slight change of expression, derived evil from the nature of particular or individual existence. It is not conformable to the nature of God to act by any but universal laws, and these universal laws necessarily involve particular evil consequences, though their ultimate result is the highest possible good. The question why there should be any particular existence, any existence but God, seeing such existence necessarily involves evil, remains insoluble so long as the purely pantheistic view of God is maintained; and it is this view which is really at the bottom of the assertion that he can have no particular volitions. To the coarse and anthropomorphic conception of particular providence Malebranche may be right in objecting, but on the other hand, it cannot be doubted that any theory in which the universal is absolutely opposed to the particular, the infinite to the finite, is unchristian as well as unphilosophical. For under this dualistic presupposition, there seem to be only two possible alternatives open to thought; either the particular and finite must be treated as something independent of the universal and infinite, which involves an obvious contradie- tion, or else it must be regarded as absolute nonentity, We find Malebranche doing the one or the other as occasion requires. Thus he vindicates the freedom of man’s will on the ground that the universal will of God does not completely determine the particular volitions of man; and then becoming conscious of the difficulty involved in this conception, he tries, like Des Cartes, to explain the particular will as something merely negative, a defect, and not a positive existence.

But to understand fully Malebranche’s view of freedom and the ethical system connected with it, we must notice an important alteration which he

makes in the Cartesian theory of the relation of will and intelligence. To Des Cartes, as we have seen, the ultimate essence of mind lay in pure abstract self-determination or will, and hence he based even moral and intellectual truth on the arbitrary decrees of God. With Malebranche, on the other hand, abstraction goes a step further; and the absolute is sought not in the subject as opposed to the object, not in pure formal self-determination as opposed to that which is determined, but in a unity that transcends this difference. With him, therefore, will ceases to be regarded as the essence of intelligence, and sinks into a property or separable attribute of it. As we can conceive an extended substance without actual movement, so, he says, we can conceive a thinking substance without actual volition. But "matter or extension without motion would be entirely useless and incapable of that variety of forms for which it is made; and we cannot, therefore, suppose, that an all- wise Being would create it in this way. In like manner, if a spiritual or thinking substance were without will, it is clear that it would be quite useless, for it would not be attracted towards the objects of its perception, and would not love the good for which it is made. We cannot there- fore conceive an intelligent being so to fashion it."3 Now God need not be conceived as creating at all, for he is self-

8 Recherche, i, pt. i. ch. 1.

sufficient ; but if he be a creator of spirits, he must create them for himself. '" God cannot will that there should exist a spirit that does not love him, or that loves him less than any other good." The craving for good in general, for an absolute satisfaction, is a natwral love of God that jg common to all 'The just, the wicked, the blessed, and the damned all alike love God with this love" Out of this love of God arises the love we have to ourselves and to others, which are the natwral inclinateons that belong to all created spirits For these inclinations are but the elements of the love which is in God, and which therefore he inspires in all his creatures "JI s'aime, wl nous aime, i aime toutes ses créatures ; tl ne fait donc point @esprits quil ne les porte & Vaimer, & saimer, et a aimer toutes les créatures."* Stripping this thought of its theological vesture, what is expressed here is simply that as a spiritual

being each man is conscious of his own limited and individual existence, as well as of the limited and individual existence of other beings like himself, only in relation to the whole in which they are parts, so he can find his own good only in the good of the whole, and he is in contradiction with himself so long as he rests in any good short of that. His love of happiness, his natural inclinations both selfish and social, may be therefore regarded as an undeveloped form of the love of God; and the ideal state of his inclinations is that in which the love of self and of others are explicitly referred to that higher affection ; or in which his love does not proceed from a part to the whole, but from the whole to the parts.

The question of morals to Malebranche is the question how these natural inclinations are related to the particular passions, Sensation and passion arise out of the connec- tion of body and soul, and their use is only to urge us to attend to the wants of the former. We can scarcely hear without a smile the simple monastic legend which Male- branche weaves together about the original nature of the passions and their alteration by the Fall, “It is visibly a disorder that a spirit capable of knowing and loving God should be obliged to occupy itself with the needs of the body.” “A being altogether occupied with what passes in his body and with the infinity of objects that surround it, cannot be thinking on the things that are truly good.” Hence the necessity of an immediate and instinctive warn- ing from the senses in regard to the relations of things to our organism, and also of pains and pleasures which may induce us to attend to this warning. ‘‘ Sensible pleasure is the mark that nature has attached to the use of certain things in order that without having the trouble of examin- ing them by reason, we may employ them for the preserva- tion of the body, but not in order that we may love them.”* Till the Fall the mind was merely united to the body, not subjected to it, and the influence of these pleasures and pains was only such as to make men attend to their bodily wants, but not to occupy the mind, or fill it with sensuous joys and sorrows, or trouble its contemplation of that which is really good. Our moral aim should therefore be to restore this state of things, to weaken our union with the body and strengthen our union with God, And to encourage us in pursuing this aim we have to remember that union with God is natural to the spirit, and that, while even the condition of union with the body is artificial, the condition of subjection to the body is wholly unnatural to it. Our primary tendency is towards the Supreme good, and we

only love the objects of our passions in so far as we “determine towards particular, and there- fore false goods, the love that God gives us for himself.” The search for happiness is really the search for God in

) Recherche, i. pt. i. ch. 4.

2 Jeid., iv. ch. 1. 3 Entretien, iv.

4 Recherche, bk. v. ch. 4.

disguise, and even the levity and inconstancy with which men rush from one finite good to another, is a proof that they were made for the infinite. Furthermore, this natural love of God, or inclination for good in general, “gives us the power of suspending our consent in regard to those particular goods which do not satisfy it.”° If we refuse to be led by the obscure and confused voice of instinctive feeling, which arises from and always tends to confirm our union with the body, and wait for the light of reason which arises from and always tends to confirm our union with God, we have done all that is in our power, the rest is God’s work. “If we only judge precisely of that which we see clearly, we shall never be deceived. For then it will not be we that judge, but the universal reason that judges in us,”® And as our love, even of particular goods, is a confused love of the supreme good, so the clear vision of God inevitably brings with it the love of Him. “We needs must love the highest when we see it.” When it is the divine reason that speaks in us it is the divine love that moves us, “the same love wherewith God loves himself and the things he has made,””

The general result of the ethics of Malebranche is ascetic. The passions like the senses have no relation to the higher life of the soul ; their value is only in relation to the union of soul and body, a union which is purely accidental or due to the arbitrary will of God. As Pericles said of women that the less they were heard of in public for good or evil the better, so Malebranche would say of the sensa- tions and passions, that the more silently they discharge their provisional function, and the less they disturb or interfere

with the pure activity of spirit, the more nearly they approach to the only perfection that is possible for them. Their ideal state is to remain or become again simple instincts that act mechanically like the circulation of the blood. Universal light of reason casts no ray into the obscurity of sense ; its universal love cannot embrace any of the objects of particular passion. It is indeed recognized by Malebranche that sensation in man is mixed with thought, that the passions in him are forms of the love of good in general. But this union of the rational with the sensuous nature is regarded merely as a confusion which is to be cleared up, ot in a higher unity of the two _ elements, but simply by the withdrawal of the spirit from contact with that which darkens and defiles it. Of a trans- formation of sense into thought, of passion into duty,— an elevation of the life of sense till it becomes the embodi- ment and expression of the life of reason,— Malebranche has no conception. Hence the life of reason turns with him to mysticism in theory and to asceticism in practice. His universal is abstract and opposed to the particular ; instead of explaining it, it explains it away. A certain tender beauty as of twilight is spread over the world as we view it through the eyes of this cloistered philosopher, and we do not at first see that the softness and ideality of the picture is due to the gathering darkness. Abstraction seems only to be purifying, and not destroying, till it has done its perfect work. Malebranche conceived himself to be present- ing to the world only the purest and most refined expression of Christian ethics and theology. But if we obey his own continual advice to think clearly and distinctly, if we divest his system of all the sensuous and imaginative forms in which he has clothed it, and reduce it to the naked simplicity of its central thought, what we find is not a God that reveals Himself in the finite and to the finite, but the absolute substance which has no revelation, and whose existence is the negation of all but itself. Thus to tear away the veil, however, there was needed a stronger, simpler,

5 Recherche, iv. ch. 1. 7 Recherche, iv. ch. 5,

6 Morale, pt.i. ch. 1, § 9

and freer spirit,—a spirit less influenced by opinion, less

inclined to practical compromise, and gifted with a stronger “faith in the whispers of the lonely muse” of speculation than Malebranche.

It is a remark of Hegel’s that Spinoza, as a Jew, first brought into European thought the idea of an absolute unity in which the difference of finite and infinite is lost. Some later writers have gone further, and attempted to show that the main doctrines by which his philosophy is distinguished from that of Des Cartes were due to the direct influences of Jewish writers like Maimonides, Gersonides, and Chasdai Creskas, rather than to the necessary develop- ment of Cartesian ideas. And it is undoubtedly true that many points of similarity with such writers, reaching down even to verbal coincidence, may be detected in the works of Spinoza, although it is not so easy to determine how much he owed to their teaching. His own view of his obligations is sufficiently indicated by the fact, that while in his ethics he carries on a continual polemic against Des Cartes, and strives at every point to show that his own doctrines are legitimately derived from Cartesian principles, he only once refers to Jewish philosophy as containing an obscure and unreasoned anticipation of these doctrines.” “Quod quidam Hebraworum quasi per nebulam vidisse videntur qui scilicet statuunt Deum Dei intellectum resque ab ipso intellectas unum et idem esse.”1 It may be that the undeveloped pantheism and rationalisin of the Jewish philosophers had a deeper influence than he himself was aware of, in emancipating him from the traditions of the synagogue, and giving to his mind its first philosophical bias. In his earlier work there are Neo-Platonic ideas and expressions which in the Hthics are rejected or remoulded into a form more suitable to the spirit of Cartesianism. But the question, after all, has little more than a biographi- cal interest. In the Spinozistie philosophy there are few differences from Des Cartes which cannot be traced to the necessary development of Cartesian principles; and the comparison of Malebranche shows that the development might take place under the most diverse intellectual con- ditions. What is most remarkable in Spinoza is just the freedom and security with which these principles are followed out to their last result. His Jewish origin and his breach with Judaism completely isolated him from every influence but that of the thought that possesses him. And no scruple or hesitation, no respect for the institutions or feelings of his time interferes with his speculative con- sequence. He exhibits to us the almost perfect type of a mind without superstitions, which has freed

itself from all but reasoned and intelligent convictions, or, in the Cartesian phrase, “clear and distinct ideas ;” and when he fails, it is not by any inconsistency, or arbitrary stopping short of the necessary conclusions of his logic, but by the essential defect of his principles.

Spinoza takes his idea of method from mathematics, and after the manner of Euclid, places at the head of each book of his Hthics a certain number of definitions, axioms, and postulates which are supposed to be intuitively certain, and to form a sufficient basis for all that follows. Altogether there are twenty-seven definitions, twenty axioms, and eight postulates, If Spinoza is regarded as the most conse- quent of philosophers it cannot be because he has based his system upon so many fragmentary views of truth ; it must be because a deeper unity has been discerned in the system than is visible on the first aspect of it. We must, therefore, to a certain extent distinguish betwecn the form and the matter of his thought, though it is also trae that the defective form itself involves a defect in the matter.

1 Eth., ii. schol. 7.

What in the first instance recommends the geometrical method to Spinoza is, not only its apparent exactness and the necessity of its sequence, but, so to speak, its dis. interestedness. Confusion of thought arises from the fact that we put ourselves, our desires and feelings and interests, into our view of things; that we do not regard them as they are in themselves, in their essential nature, but look for some final cause, that is some relation to ourselves by which they may be explained. For this reason, he says, “the truth might for ever have remained hid from the human race, if mathematics, which looks not to the fina] cause of figures, but to their essential nature and the properties involved in it, had not set another type of knowledge before them.” To understand things is to see how all that is true of them flows from the clear and distinct idea expressed in their definition, and ultimately, it is to see how all truth flows from the essentia Dei as all geometrical truth flows from the idea of quantity. To take a mathematical view of the universe, therefore, is to raise ourselves above all consideration

of the end or tendency of things, above the fears and hopes of mortality into the region of truth and necessity. ‘When I turned my mind to this subject,” he says in the beginning of his treatise on politics, “Idid not propose to myself any novel or strange aim, but simply to demonstrate by certain and indubitable reason those things which agree best with practice. And in order that I might inquire into the matters of this science with the same freedom of mind with which we are wont to treat lines and surfaces in mathematics, I determined not to laugh or to weep over the actions of men, but simply to understand them ; and to contemplate their affections and passions, such as love, hate, anger, envy, arrogance, pity, and all other disturbances of soul not as vices of human nature, but as properties pertaining to it in the same way as heat, cold, storm,*thunder pertain to the nature of the atmosphere. For these, though troublesome, are yet necessary, and have certain causes through which we may come to understand them, and thus, by contemplating them in their truth, gain for our minds as much joy as by the knowledge of things that are pleasing to the senses.” All our errors as to the nature of things arise from our judging them from the point of view of the part and not of the whole, from a point of view determined by their relation to our own individual being, and not from a point of view determined by the nature of the things themselves 3 or, to put the same thing in another way, from the point of view of sense and imagination, and not from the point of view of intelligence. Mathematics shows us the inadequacy of such knowledge when it takes us out of ourselves into things, and when it presents these things to us as objects of universal intelligence apart from all special relation to our individual feelings. And Spinoza only wishes that the same universality and freedom of thought which belongs to mathematics, because its objects do not interest the passions, should be extended to those objects that do interest them. Purity from interest is the first condition of the philosopher’s being ; he must get beyond the illusion of sense and passion that makes our own lives so supremely important and interesting to us simply because they are our own, He must look at the present as it were through an inverted telescope of reason, that will reduce it to its due proportion and place in the sum of things. To the heat of passion and the higher heat of imagination, Spinoza has only one advice,—“ Acquaint yourself with God and be at peace.” Look not to the particular but to the universal, view things not under the form of the finite and temporal, but sub quadam specie ceternitatas.

The illusion of the finite,—the illusion of sense, imagi- nation, and passion, which, in Bacon's language, tends to make men judge of things ex analogia hominis and not ex

analogua universi, which raises the individual life, and even the present moment of the individual life, with its passing feelings, into the standard for measuring the universe, — this, in the eyes of Spinoza, is the source of all error and evil to man. On the other hand, his highest good is to live the universal life of reason, or what is the same thing, to view all things from their centre in God, and to be moved only by the passion for good in general, "the intellectual love of God." In the treatise De Hmendatione Intellectus, Spinoza takes up this contrast in the first instance from its moral side. 'All our felicity or infelicity is founded on the nature of the object to which we are joined by love." To love the things that perish is to be in continual trouble and disturbance of passion; it is to.be full of envy and hatred towards others who possess them ; it is to be ever striving after that which, when we attain it, does not satisfy us; or lamenting over the loss of that which inevitably passes away from us; only "love to an object that is infinite and eternal feeds the soul with a changeless and unmingled joy." But again our love rests upon our knowledge ; if we saw things as they really are we should love only the highest object. It is because sense and imagination give to the finite an independence and substantiality that do not belong to it, that we waste our love upon it as if it were infinite. And as the first step towards truth is to understand our error, so Spinoza proceeds to explain the defects of common sense, or in other words, of that first and unreflected view of the world, which he, like Plato, calls opinion. Opinion is a kind of knowledge derived partly from hearsay, and partly from eaperientia vaga. It consists of vague and general concep- tions of things, got either from the report of others or from an experience which has not received any special direction from intelligence. The mind that has not got beyond the stage of opinion takes things as they present themselves in its individual experience ; and its beliefs grow up by association of whatever happens to have been found to- gether in that experience. And as the combining principle of the elements of opinion is individual and not universal, so its conception of the world is at once fragmentary and

accidental, It does not see things in their connection with the unity of the whole, and hence it cannot see them in their true relation to each other. “I assert expressly,” says Spinoza, “that the mind has no adequate conception either of itself or of external things, but only a confused knowledge of them, so long as it perceives them only in the common order of nature, 2.e., so long as it is externally determined to contemplate this or that object by the accidental concourse of things, and so long as it is not internally determined by the unity of thought in which it considers a number of things to understand their agree- ments, differences, and contradictions.” !

There are two kinds of errors which are usually sup- posed to exclude each other, but which Spinoza finds to be united in opinion. Theseare the errors of abstraction and imagination ; the former explains its vice by defect, the latter its vice by excess. On the one hand, opinion is abstract and one-sided ; it is defective in knowledge and takes hold of things only at one point. On the other hand, and just because of this abstractness and one-sidedness, it is forced to give an artificial completeness and inde- pendence to that which is essentially fragmentary and dependent. The word abstract is misleading, in so far as we are wont to associate with abstraction the idea of a mental effort by which parts are separated from a given whole; but it may be applied without violence to any imperfect conception, iu which things that are really elements of a greater whole are treated as if they were res

1 Eih., i. schol. 29.

.to no other conditions but those of space and time.

complete, independent objects, complete in themselves. And in this sense the ordinary consciousness of man is often the victim of abstractions when it supposes itself most of all to be dealing with realities. ‘The essences and substances of the schoolman may delude him, but he cannot think these notions clearly without seeing that they are only abstract elements of reality, and that they have a meaning only in relation to the other elements of it. But common sense remains unconscious of its abstractness because imagination

gives a kind of substantiality to the fragmentary and limited, and so makes it possible to con- ceive it as an independent reality. Pure intelligence seeing the part as it is in itself could never see it but as a part. Thought, when it rises to clearness and distinctness in regard to any finite object, must at once discern its relation to other finite objects and to the whole,—must discern, in Spinozistic language, that it is ‘“‘ modal” and not “real.” But though it is not possible to think the part as a whole it is possible to picture it asa whole. The limited image that fills the mind’s eye seems to need nothing else for its reality. We cannot think a house clearly and distinctly in all the connection of its parts with each other, without seeing its necessary relation to the earth on which it stands, to the pressure of the atmosphere, &c. The very circum- stances by which the possibility of such an existence is explained make it impossible to conceive it apart from other things. But nothing hinders me to rest on a house as a complete picture by itself. Imagination represents things in the externality of space and time, and is subjected Hence it can begin anywhere, and stop anywhere. For the same cause it can mingle and confuse together all manner of inconsistent forms—can imagine a man with a horse’s head, a candle blazing in vacuo, a speaking tree, a man changed into an animal. ‘There may be elements in the nature of these things that would prevent such combinations; but these elements are not necessarily present to the ordinary consciousness, the abstractness of whose conceptions leaves it absolutely at the mercy of imagination or accidental association. ‘To thought in this stage anything is possible that can be pictured. On the other hand, as knowledge advances, this freedom of combination becomes limited, “ the less the mind understands and the more it perceives, the greater is its power of fiction, and the more it under- stands, the narrower is the limitation of that power. For just as in the moment of consciousness we cannot imagine that we do not think, so after we have apprehended the nature of body, we cannot conceive of a fly of infinite size, and after we know the nature of a soul we cannot think of it as a square, though we may use the words that express these ideas.”? Thus, according to Spinoza, the range of possibility narrows as knowledge widens, until to perfected knowledge possibility is lost in necessity.

From these considerations, it follows that all thought is imperfect that stops short of the absolute unity of all things. Our first imperfect notion of things as isolated from each other, or connected only by co-existence and succession, is a mere imagination of things. It is a fictitious substantiation of isolated moments in the eternal Being. Knowledge, so far as it deals with the finite, is engaged in a continual process of self-correction which can never be completed, for at every step there is an element of falsity, in so far as the mind rests in the contemplation of a certain number of the elements of the world, as if they constituted a complete whole by themselves, whereas they are only a part, the conception of which has to be modified at the next step of considering its relation to the other parts. Thus we rise from individuals of the first to individuals of

1 De Emend., viii. § 58. V. — 20

the second order, and we cannot stop short of the idea of “all nature as one individual whose parts vary through an infinite number of modes, without change of the whole individual.”1 At first we think of pieces of matter as independent individuals, either because we can picture them separately, or because they preserve a certain proportion or relation of parts through their changes. But on further consideration, these apparent substances sink into modes, each of which is dependent on all the others. All nature is bound together by necessary law, and not an atom could be other than it is without the change of the whole world. Hence it is only in the whole world that there is any true individuality or substance. And the same principle applies to the minds of men. ‘Their individuality is a mere semblance caused by our abstraction from their con- ditions. Isolate the individual man, and he will not display the character of a thinking being at all. His whole spiritual life is bound up with his relations to other minds, past and present. He has such a life, only in and through that universal life of which he is so infinitesimal a part that his own contribution to it is as good as nothing. “Vis qua homo in emstendo perseverat limitata est, et a@ potentia causarum externarum wfinite superatur.” 2 What can be called his own? His body is a link ina cyclical chain of movement which involves all the matter of the world, and which as a whole remains without change through all, His mind is a link in

a great movement of thought, which makes him the momentary organ and expression of one of its phases. His very consciousness of self is marred by a false abstraction, above which he must rise ere he can know himself as he really is.

"'Let us imagine," says Spinoza in his fifteenth letter, "a little worm living in blood which has vision enough to discern the particles of blood, lymph, &c., and reason enough to observe how one particle is repelled by another with which it comes into contact, or communicates a part of its motion to it. Such a worm would live in the blood as we do in this part of the universe, and would regard each particle of it, not as a part, but as a whole, nor could it know how all the parts are influenced by the universal nature of the blood, and are obliged to accommodate them- selves to each other as is required by that nature, so that they co-operate together according to a fixed law. For if we suppose that there are no causes outside of the blood which could communicate new motions to it, and no space beyond the blood, nor any other bodies to which its par- ticles could transfer their motion, it is certain that the blood as a whole would always maintain its present state, and its particles would suffer no other variations than those which may be inferred from the given relation of the motion of blood to lymph, chyle, &c. And thus in that case the blood would require to be considered always as a whole and not asa part. But since there are many other causes which influence the laws of the nature of blood, and are in turn influenced thereby, other motions and other variations must arise in the blood which are not due to the proportion of motion in its constituents but also to the relation between that motion and external causes. And therefore we cannot consider the blood as a whole, but only as a part of a greater whole."

"Now we can think, and indeed ought to think, of all natural bodies in the same manner in which we have thought of this blood, for alt bodies the surrounded by other bodies, and reciprocally determine and are deter- mined by them, to exist and operate in a fixed and definite way, So as to preserve the same ratio of motion and rest in the whole universe. Hence it follows that every body in so far as it exists under a certain definite modification,

1 Hth., ii, lemma, 7 schol. * Eth, iv. 8.

ought to be considered as merely a part of the whole uni. verse, which agrees with its whole, and thereby ig in intimate union with all the other parts; and since the nature of the universe is not limited like that of the blood, but absolutely infinite, it is clear that by this nature with its infinite powers, the parts are modified in an infinite number of ways, and compelled to pass through an infinity of variations. Moreover, when I think of the universe ag a substance, I conceive of a still closer union of each part with the whole; for, as I have elsewhere shown, it is the nature of substance to be infinite, and therefore every single part belongs to the nature of the corporeal substance, so that apart therefrom it neither can exist nor be conceived. And as to the human mind, I think of it also ag of part of nature, for I think of nature as having in it an infinite power of thinking, which, as infinite, contains in itself the idea of all nature, and whose thoughts run parallel with all existence."

From this point of view it is obvious that our knowledge of things cannot be real and adequate, except in so far as it is determined by the idea of the whole, and proceeds from the whole to the parts. A knowledge that proceeds from part to part must always be imperfect; it must remain external to its object, it must deal in abstractions or mere entra rationis, which it may easily be led to mistake for realities. Hence Spinoza, like Plato, distinguishes reason whose movement is regressive (from effect to cause, from variety to unity) from scientia intwitiva, whose movement is progressive, which "proceeds from the adequate idea of certain of God's attributes to an adequate knowledge of the nature of things."? The latter alone deserves to be called science in the highest sense of the term. For in order that our mind may correspond to the exemplar of nature, it must develop all its ideas from the idea that represents the origin and source of nature, so that that idea may appear as the source of all other ideas," 4 The regressive mode of knowledge has its highest value in preparing for the progressive. The knowledge of the finite, ere it can become perfectly adequate, must be absorbed and lost in the knowledge of the infinite. Ina remarkable passage in the Lthocs, Spinoza declares that the defect of the

common consciousness of men lies not so much in their ignorance, either of the infinite or of the finite, as in their incapacity for bringing the two thoughts together, so as to put the latter in its proper relation to the former. All are ready to confess that God is the cause both of the existence and of the nature of things created, but they do not realize what is involved in this confession—and hence they treat created things as if they were substances, that is, as if they were Gods. “Thus while they are contemplating finite things, they think of nothing less than of the divine nature; and again when they turn to consider the divine nature, they think of no- thing less than of their former fictions on which they have built up the knowledge of finite things, as if these things could contribute nothing to our understanding of the divine nature. Hence it is not wonderful that they are always contradicting themselves.”5 As Spinoza says else- where, it belongs to the very nature of the human mind to know God, for unless we know God, we could know nothing else. The idea of the absolute unity is involved in the idea of every particular thing, yet the generality of men, deluded by sense and imagination, are unable to bring this implication into clear consciousness, and hence their knowledge of God does not modify their view of the finite. It is the business of philosophy to correct this defect, to transform our conceptions of the finite by relating it to the infinite, to complement and complete the partial knowledge

3 Hth., ii, 40, schol. 2. 4 De Emend., vii. § 42. 5 Eth, ii. schol. 10,

produced by individual experience by bringing it into eon- nection with the idea of the whole. And the vital question which Spinoza himself prompts us to ask is how far and in what way this transformation is effected in the Spinozistic philosophy. ;

There are two great steps in the transformation of know- ledge by the idea of unity as that idea is conceived by Spinoza. The first step involves a change of the concep- tion of individual finite things by which they lose their individuality, their character as independent substances, and come to be regarded as modes of the infinite. But secondly, this negation of the finite as such is not conceived as implying the negation of the distinction between mind and matter. Mind and matter still retain that absolute

opposition which they had in the philosophy of Des Cartes, even after all limits have been removed. And therefore in order to reach the absolute unity, and transcend the Cartesian dualism, a second step is necessary, by which the independent substantiality of mind and matter is with- drawn, and they are reduced into attributes of the one in- finite substance. Let us examine these steps successively.

The method by which the finite is reduced into a mode of the infinite has already been partially explained. Spinoza follows to its legitimate result the metaphysical or logical principles of Des Cartes and Malebranche. According to the former, as we have seen, the finite presupposes the infi- nite, and, indeed, so far as it is real, it isidentical with the infi- nite. The infinite is absolute reality, because it is pure affir- mation, because it is that which negationem nullam involvit. The finite is distinguished from it simply by its limit, ze. by its wanting something which the infinite has. At this point Spinoza takes up the argument. If the infinite be the real, and the finite, so far as it is distinguished there- from, the unreal, then the supposed substantiality or individuality of finite beings is an illusion. In itself the finite is but an abstraction, to which imagination has given an apparent independence. All limitation or determina- tion is negative, and in order to apprehend positive reality, we must abstract from limits. By denying the negative, we reach the affirmative; by annihilating finitude in our thought, and so undoing the illusory work of the imagina- tion, we reach the indeterminate or unconditioned being which alone truly is. All division, distinction, and rela- tion are but entia rationis, Imagination and abstraction can give to them, as they can give to mere negation and nothingness, “a local habitation and a name,” but they have no objective meaning, and in the highest knowledge, in the scientéa intuitiva, which deals only with reality, they must entirely disappear. Hence to reach the truth as to matter, we must free ourselves from all such ideas as figure or number, measure or time, which imply the separation and relation of parts. Thus in his 50th letter, in answer to some question about figure, Spinoza says, ‘to prove that figure is negation, and not anything positive, we need only consider that the whole of matter conceived indefinitely, or in its infinity, can have no figure; but that figure has a place only in finite or determinate bodies, He who says that he perceives figure, says only that he has before his mind a limited thing and the manner in which it is limited. But this limitation does not per-

tain to a thing in its ‘esse,’ but contrariwise in its ‘non- esse,’ (i.¢., it signifies, not that some positive quality belongs to the thing, but that something is wanting to it). Since, then, figure is but limitation, and limitation is but negation, we cannot say that figure is anything.” The same kind of reasoning is elsewhere (Wpist. 29) applied to solve the difficulties connected with the divisibility of space or exten- sion. Really, according to Spinoza, extension is indivi- sible, though modally it is divisible. In other words, parts ad infinitum may be taken in space by the abstracting

mind, but these parts have no separate existence. You cannot rend space, or take one part of it out of its connec- tion with other parts. Hence arises the impossibility of asserting either that there is an infinite number of parts in space, or that there is not. The solution of the anti- nomy is that neither alternative is true. ‘There are many things que nullo numero explicart possunt, and to understand these things we must abstract altogether from the idea of number. The contradiction arises entirely from the application of that idea to the infinite. We cannot say that space has a finite number of parts, for every finite space must be conceived as itself included in infinite space. Yet, on the other hand, an infinite number is an ab- surdity; it is a number which is not a number. We escape the difficulty only when we see that number is a category in- applicable to the infinite, and this to Spinoza means that it is not applicable to reality, that it is merely an abstraction, or ens imaginationss.

The same method which solves the difficulties connected with the nature of matter is applied to mind. Here also we reach the reality, or thing in itself, by abstracting from all determination. All conceptions, therefore, that involve the independence of the finite, all conceptions of good, evil, freedom, and responsibility disappear. When Blyenburg accuses Spinoza of making God the author of evil, Spinoza answers that evil is an ens rationis that has no existence for God. “Evil is not something positive, but a state of privation, and that not in relation to the divine, but simply in relation to the human intelligence. It is a con- ception that arises from that generalizing tendency of our minds, which leads us to bring all beings that have the

external form of man under one and the same definition, and to suppose that they are all equally capable of the highest perfection we can deduce from such a definition. When, therefore, we find an individual whose works are not consistent with this perfection, straightway we judge that he is deprived of it, or that he is diverging from his own nature,—a judgment we should never make if we had not thus referred him to a general definition, and supposed him to be possessed of the nature it defines. But since God does not know things abstractly, or through such general definitions, and since there cannot be more reality in things than the divine intelligence and power bestows upon them, it manifestly follows that the defect which belongs to finite things, cannot be called a privation in relation to the intelligence of God, but only in relation to the intelligence of man.”! Thus evil and good vanish when we consider things sub specie ceternitatis, because they are categories that imply a certain independence in finite beings. For the idea of a moral standard implies a relation of man to the absolute good, a relation of the finite to the infinite, in which the finite is not simply lost and absorbed in the infinite. But Spinoza can admit no such relation. In the presence of the infinite the finite disappears, for it exists only by abstraction and negation ; or it seems to us to exist, not because of what is present to our thoughts, but because of what is not present to them. As we think ourselves free because we are conscious of our actions but not of their causes, so we think that we have an individual existence only because the infinite intelligence is not wholly but only partially realized in us. But as we cannot really divide space, though we can think of a part of it, so neither can we place any real division in the divine intelligence. In this way we can understand how Spinoza is able to speak of the human mind as part of the infinite thought of God, and of the human body as part of the infinite extension of God, while yet he asserts that the divine substance is simple, and not

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1 Epist., 32.

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bold identification of spirit and matter, God and nature, contains in it the germ of a higher idealism than can be found in any philosophy that asserts the claims of the former at the expense of the latter. A system that begins by making nature godless, will inevitably end, as Schelling once said, in making God unnatural. The expedients by which Des Cartes keeps matter at a distance from God, were intended to maintain his pure spirituality ; but their ultimate effect was seen in his reduction of the spiritual] nature to mere will. Ag Christianity has its superiority over other religions in this, that it does not end with the opposition of the human to the divine, the natural to the Spiritual, but ultimately reconciles them, so a true idealism must vindicate its claims by absorbing materialism into itself. It was therefore a true instinct of philosophy that led Spinoza to raise matter to the co-equal of spirit, and at the same time to protest against the Cartesian conception of matter as mere inert mass, moved only by impulse from without. ‘What were a God that only impelled the world from without?” says Goethe. “It becomes him to stir it by an inward energy, to involve nature in himself, himself in nature, so that that which lives and moves and has a being in him can never feel the want of his power or his spirit.”

While, however, Spinoza thus escapes some of the inconsequences of Des Cartes, the contradiction that was emplicit in the Cartesian system between the duality and the unity, the attributes and the substance, in his system becomes explicit. When so great emphasis is laid upon the unity of substance, it becomes more difficult to explain the difference of the attributes, The result is, that Spinoza is forced to account for it, not by the nature of substance itself, but by the nature of the intelligence to which it is revealed, « By substance,” he says, “T under- stand that which is in itself, and is conceived through itself, By attribute I understand the same thing, nist quod attributum dicatur respectu intellectus substantice certum talem naturam tribuentis,”2 Hence we are naturally led with Erdmann to think of the intelligence dividing the substance as a kind of prism that breaks the white light into different colours, through each of which the same world is seen, only with a different aspect. But if the intelligence in itself is but a mode of one of the attributes, how can it be itself the source of their distinction 4

The key to this difficulty is that Spinoza has really, and almost in spite of his logical principles, two Opposite concep- tions of substance, between which he alternates without ever bringing them to a unity. On the one hand, in accordance with the principle that determination is negation, substance must be taken as that which is utterly indeterminate, like the Absolute of the Buddhist, which we can characterize only by denying of it everything that we assert of the finite. In this view, no predicate can be applied univocally to God and to the creatures; he differs from them, not only in existence, but in essence.4 If we follow out this view to its legitimate result, God is withdrawn into his own absolute unity, and uo difference of attributes can be ascribed to him, except in respect of something else than himself. It is owing to the defects of our intelligence that he appears under different forms or expressions; in himself he is pure being, without form or expression at all. But, on the other hand, it is to be observed, that while Spinoza really proceeds by abstraction and negation, he does not mean to do so. The abstract 1s to him the unreal and imaginary, and what he means by substance is not simply Being in general, the conception that remains when we omit all that distinguishes the particulars, but the absolute totality of things conceived as a unity in which all particular existence is included and subordinated.

made up of parts. So far as they exist, they must be con- ceived as parts of the divine substance, but when we look directly at that divine substance, their separate existence altogether disappears. :

It has, however, been already mentioned that this ascending movement of abstraction, does not at once and directly bring Spinoza to the absolute unity of substance. The principle that “determination is negation,” and that therefore the absolute reality is to be found only in the indeterminate, would lead us to expect this conclusion ; but the Cartesian dualism prevents Spinoza from reaching it. Mind and nuatter are so absolutely opposed, that even when we take away all limit and determination from both, they still retain their distinctness. Raised to infinity, they still refuse to be identified. We are forced, indeed, to take from them their substantial or substantive existence, for there can be no other substance but God, who includes all reality in himself. But though reduced to attributes of a common substance, the difference of thought and ex- tension is insoluble. The independence of

individual finite things disappears whenever we substitute thought for imagination, but even to pure intelligence, extension re- mains extension, and thought remaing thought. Spinoza seems therefore reduced to a dilemma ; he cannot surrender either the unity or the duality of things, yet he cannot relate them to each other. The only course left open to him is to conceive each attribute in its turn as the whole substance, and to regard their difference as the difference of expression As the patriarch was called by the two names of Jacob and Israel, under different aspects, each of which included the whole reality of the man, so our minds appre- hend the absolute substance in two wa ,each of which expresses its whole nature.! In this way the extremes of absolute identity and absolute difference seem to be recon- ciled. There is a complete parallelism of thought and extension, ordo et connexio idearum idem est ac ordo et connexio rerum," yet there is also a complete independence and absence of relation between them, for each is the whole. A thing in one expression cannot be related to itself in another expression. Hence in so far as we look at the substance under the attribute of thought, we must take no account of extension, and in so far as we look at it under the attribute of extension, we must equally refuse to take any account of thought. This parallelism may be best illustrated by Spinoza's account of the relation of the human soul and body. The soul is the idea of the body, and the body is the object of the soul, whatever is inthe one really is in the other ideally ; yet this relation of object and subject does not imply any connexion The motions and changes of the body have to be accounted for partly by itself, partly by the influence of other bodies ; and the thoughts of the soul in like manner have to be accounted for partly by what God thinks as constituting the individual mind, and partly by what he thinks as constituting the minds of other individuals. But to account for thought by the motions of the body, or for the motions of the body by thought, is to attempt to bridge the impassable gulf between thought and extension. It involves the double ab- surdity of accounting for a thing by itself, and of accounting for it by that which has nothing in common with it.

In one point of View, this theory of Spinoza deserves the highest praise for that very characteristic which pro- bably excited most odium against it at the time it was first published, namely, its exaltation of matter, It is the mark of an imperfect spiritualism to hide its eyes from outward nature, and to

shrink from the material as impure and defiling. But its horror and fear are proofs of weak- hess ; it flies from an enemy it cannot overcome. Spinoza's

2 Epist., 27. Wh i], 3 Hpist., 27. 4 Eth., i. schol, 17.

Hence at a single stroke the indeterminate passes into the most determinate Being, the Being with no attributes at all into the Being constituted by an infinite number of attributes. And while, under the former conception, the defect of our intelligence seemed to be that it divided the substance, or saw a difference of attributes in its absolute unity, under the second conception its defect lies in its apprehending only two out of the infinite multitude of these attributes. To do justice to Spinoza, therefore, we must distinguish between the actual effect of his logic and its effect as he conceived it. The actual effect of his logic ig to dissolve all in the ultimate abstraction of Being, from which we can find no way back to the concrete. But his intent was simply to relate all the parts to that absolute unity which is the presupposition of all thought and being, and so to arrive at the most concrete and complete idea of the reality of things. He failed to see what is involved in his own principle that determination is negation ; for if affirmation is impossible without negation, then the attempt to divorce the two from each other, the attempt to find a purely affirmative being, must necessarily end in the barest of all abstractions being confused with the unity of all things. But even when the infinite substance is defined as the negative of the finite, the idea of the finite becomes an essential element in the conception of the infinite. Even the Pantheist, who says that God is what finite things are not, in spite of himself recognizes that God has a relation to finite things. Finite things may in his eyes have no positive relation to God, yet they have a negative relation ; it is through their evanescence and transitoriness, through their nothingness, that the, eternal, the infinite reality alone is revealedto him. Spinoza is quite conscious of this process, conscious that he reaches the affirmation of substance by a negation of what he conceives as the purely negative and unreal existence of finite things, but as he regards the assertion of the finite as merely an illusion due to owr imagination, so he regards the correction of this illusion, the negation of the finite as a movement of reflection which belongs merely to our intelligence,

and has nothing to do with the nature of substance in itself. We find the true affirmation by the negation of the negative, but in itself affirmation has no relation to negation. Hence his absolute being is the dead all-absorbing substance and not the self-revealing spirit. It is the being without determination, and not the being that determines itself. There is no reason in the nature of substance why it should have either attributes or modes; neither individual finite things nor the general distinction of mind and matter can be deduced from it. The descending movement of thought is not what Spinoza himself said it should be, an evolution, but simply an external and empirical process by which the elements dropped in the ascending movement of abstraction are taken up again with a merely nominal change. For the sole difference in the conception of mind and matter as well as in the conception of individual minds and bodies which is made by their reference to the idea of God, is that they lose their substantive character and become adjectives. Aristotle objected to Plato that his ideas were merely aicOyrd aida, that is, that his idealization of the world was merely superficial, and left the things idealized very much what they were before to the sensuous consciousness; and the same may be said of Spinoza's negation of finite things. It was an external and imperfect negation, which did not transform the idea of the finite, but merely substituted the names of attributes and modes for the names of general and individual substances.

The same defective logic, by which the movement of thought in determining the substance is regarded as altogether external to the substance itself, is seen again

in Spinoza's conceptions of the relations of the attributes to each other. Adopting the Cartesian opposition of mind and matter, he does not see, any more than Des Cartes, that in their opposition they are correlative. Or if he did see it (as seems possible from a passage in his earliest treatise),! he regarded the correlation as merely subjective, merely belonging to our thought. They are to him only the two attributes which we happen to know out of the infinite number belonging to God. There is no necessity that the substance should manifest itself im just these attributes and no others, for

abstract substance is equally receptive of all determinations, and equally indifferent to them all. Just because the unity is merely generic, the differences are accidental, and do not form by their union any complete whole. If Spinoza had seen that matter in itself is the correlative opposite of mind in itself, he need not have sought by abstracting from the difference of these elements to reach a unity which is manifested in that very difference, and his absolute would have been not substance but spirit. This idea he never reached, but we find him approxinating to it in two ways. On the one hand, he condemns the Cartesian conception of matter as passive and self-external, or infinitely divisible—as, in short, the mere opposite of thought.? And sometimes he insists on the parallelism of extension and thought at the expense of their opposition in a way that almost anticipates the assertion by Leibnitz of the essential identity of mind and inatter. On the other hand, he recognizes that this paral- lelism is not complete. Thought is not like a picture; it is conscious, and conscious not only of itself, but of extension. It transcends therefore the absolute distinction between itself and the other attributes. It is only because he cannot rid himself of the phantom of an extended matter as a thing in itself, which is entirely different from the idea of it, that Spinoza is prevented from recognizing in mind that unity that transcends all distinctions, even its own distinction from matter. As it is, his main reason for saying that intelligence is not anattribute of God, butmerely a mode, seems to be this, that the thought of God must be conceived as producing its own object, 2.e. as transcending the distinction of subject and object which is necessary to our intelligence. But this argument of itself points to a concrete quite as much as to an abstract unity. It is as consistent with the idea of absolute spirit as with that of absolute substance. Spinoza's deliberate and formal doctrine is undoubtedly the latter; but he constantly employs expressions which imply the former, as when he speaks of God as causa suz. The higher idea inspires him, though his consciousness only embraces the lower idea. The ethical philosophy of Spinoza is determined by the same principles and- embarrassed by the same difficulties as his metaphysics. In it also we find the same imperfect conception of the relation of the positive to the negative elements, and as a consequence, the same confusion of the highest unity of thought, the affirmation that subordinates and transcends all negation with mere abstract affirmation. Or, to put the same thing in ethical language, Spinoza teaches a morality which is in every point the opposite of asceticism, a morality of self-assertion or

self-seeking, and not of self-denial. The conatus sese conservandi is to him the supreme principle of virtue;+* yet this self-seeking is supposed, under the guidance of reason, to identify itself with the love of man and the love of God, and to find blessedness not in the reward of virtue, but in virtue itself. It is only confusion of thought and false mysticism that could object to this result on the ground of the element of self still preserved in the amor Det intellectualis. For

2 Epvst., 29, 70.

1 Tractatus de Deo et homine, ii. 19. 4 Hth., iv. schol. 22.

3 Eth., i. schol. 17.

it is just the power of identifying himself with that which is wider and higher than his individual being that makes morality possible to man. But the difficulty lies in this, that Spinoza will not admit the negative element, the ele- ment of mortification or sacrifice, into morality at all, even as a moment of transition. For him there is no dead self, by which we may rise to higher things, no losing of life that we may find it. For the negative is nothing; it is evil in the only sense in which evil exists, and cannot be the source of good. The higher affirmation of our own being, the higher seeking of ourselves which is identical with the love of God, must therefore be regarded as nothing distinct in kind from that first seeking of our natural self which in Spinoza's view belongs to us in common with the animals, and indeed in common with all beings whatever. Itemust be regarded merely as a direct development and extension of the same thing. The main interest of the Spinozistic ethics therefore lies in observing by what steps he accom- plishes this transition, while excluding altogether the idea of a real division of the higher and the lower life, the spirit and flesh, and of a conflict in which the former is developed throuwh the sacrifice of the latter.

Finite creatures exist only as modes of the divine sub- stance, only so far as they partake in the infinite, or what is the same thing with Spinoza, in the purely affirmative or self-affirming nature of God. They therefore must also be self-affirming. They can never limit themselves ; their limit lies in this,

that they are not identified with the in- finite substance which expresses itself also in other modes. In other words, the limit of any finite creature, that which makes it finite, lies without it, and its own existence, so far as it goes, must be pure self-assertion and self-seeking. Unaqueque res quantum in se est in suo esse perseverare conatur, and this conatus is its very essence or inmost nature! In the animals this conatus takes the form of appetite, in man of desire, which is “appetite with the consciousness of it.”? But this constitutes no essential difference between appetite and desire, for “whether a man be conscious of his appetite or no, the appetite remains one and the same thing.” Man therefore, like the animals, is purely self-asserting ‘and self-seeking. He can neither know nor will anything but his own being, or if he knows or wills anything else, it must be something involved in his own being. If he knows other beings, or seeks their good, it must be because their existence and their good are involved in hisown. If he loves and knows God it must be because he cannot know himself without knowing God, or find his supreme good anywhere but in God.

What at first makes the language difficult to us is the identification of will and intelligence. Both are represented as affirming their objects. Des Cartes had prepared the way for this when he treated the will as the faculty of judging or giving assent to certain combinations of ideas, and distinguished it from the purely intellectual faculties by which the ideas are apprehended. By this distinction he had, as he supposed, secured a place for human freedom. Admitting that intelligence is under a law of necessity, he claimed for the will a certain latitude or liberty of indiffer- ence, @ power of giving or withholding assent in all cases where the relations of ideas were not absolutely clear and distinct. Spinoza points out that there is no ground for such a distinction, that the acts of apprehension and judgment cannot be separated from each other. “In the mind there is no volition, é.¢., no affirmation or negation which is not immediately involved in the idea it appre- hends” and therefore “intellect and will are one and the same thing.”* If then there is no freedom except the

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1 Hahn, iii. 6,.7. 2 Eth, iii. 9.

8 Eth., iii, Def. Affect. 1. 4 Hth., ii. 49.

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liberty of indifference, freedom is impossible. Man, like all other beings and things, is under an absolute law of necessity. All the actions of his will, as well as of his intelligence, are but different forms of the self-assertiye tendency to which he cannot but yield, because it is one with his very being, or only ideally distinguishable there from. ‘There is, however, another idea of liberty. Liberty as the opposite of necessity is an absurdity —it is impossible for either God or man ; but liberty as the opposite of slavery is possible, and it is actually possessed by God. The divine liberty consists in this, that God acts from the necessity of his own nature alone, and is not in any way determined from without. And the great question of ethics is, How far can man partake in this liberty? At first it would seem impossible that he should partake init. Heisa finite being, whose power is infinitely surpassed by the power of other beings to which he is related. His body acts only as it ig acted on, and his mind cannot therefore apprehend his body, except as affected by other things. His self-assertion and self-seeking are therefore confused with the asserting and seeking of other things, and are never pure. Hig thought and activity cannot be understood except through the influence of other things which lie outside of his con- sciousness, and upon which his will has no influence. He cannot know clearly and distinctly either himself or any- thing else ; how then can he know his own good or deter- mine himself by the idea of it?

The answer is the answer of Des Cartes, that the apprehension of any finite thing involves the adequate idea of the infinite and eternal nature of God.5 This is the primary object of intelligence, in which alone is grounded the possibility of knowing either ourselves or anything else. In so far as our knowledge is determined by this idea, or by the ideas of other things, which are referred to this idea and seen in its light, in so far its action flows from an internal and not an external necessity. In go far, on the other hand, as we are determined by the affections of the body, ideas in which the nature of our own body and the nature of other things are confused together, in so far we are determined by an external necessity, Or to put the same thing in

what has been shown to be merely another way of expression, in so far as we are determined by pure intelligence we are free, but in so far as we are determined by opinion and imagination we are slaves.

From these premises it is easy to see what form the opposition of reason and passion must necessarily take with Spinoza. The passions belong to our nature as finite; they are grounded on, or rather are but another form of in-adequate ideas; but we are free only in so far as our ideas either immediately are, or can be made, adequate. Our idea of God is adequate ex wtermini; our ideas of the affections of our body are inadequate, but can be made adequate in so far as they are referred to the idea of God. And as the idea of God is purely affirmative, this reference to the idea of God implies the elimination of the negative element from the ideas of the affections of the body, “for nothing that is positive in a false idea is re moved by the presence of truth as such.”6 Brought into contact with the idea of God, all ideas become true and adequate, by the removal of the negative or false element in them. The idea of God is, as it were, the touch-stone which distinguished the gold from the dross. It enables us to detect the higher spiritual element in the natural passions, and to sever:the element belonging to that pure love of self which is identical with the love of perfection from the elements belonging to that impure love of our own finite individuality as such which is identical with the love of evil.

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° Hth., ii. 45. 6 Hth., iv. 1.

‘he imperfection in Spinoza’s development of this principle has already been indicated. It is in fact the same imperfection which runs through his whole system. Just as he supposed that the ideas of finite things were at once made consistent with the idea of the infinite when he had named them modes, so here his conception of the change through which selfish natural desire must pass in order to be- come spiritual is far too superficial and external. Hence he has no sympathy with asceticism, but treats it, like Bentham, as a torva et tristis superstitio. Joy is the “transition from less to greater perfection,” and cannot be but good; pain is the “transition from

greater to less perfection," and cannot be but evil. The revolt against the medizval opposition of the nature and spirit is visible in many of his sayings. '(No Deity who is not envious can delight in my weakness or hurts, or can regard as virtues those fears and sighs and tears which are the signs of the mind's weakness; but contrariwise, the greater is our joy, the greater is our progress to perfection, and our participation in the divine nature." ! "A free man thinks of nothing less than death, his wisdom is a meditation not of death but of life." 2 The same idea, combining with the idea of necessity, leads him to condemn repentance and pity, as well as pride and humility. Unconsciously, Spinoza reproduces the principle of asceticism, while in words he utterly rejects it. For though he tells us that pure self-complacency is the highest thing we can hope, yet from this self-complacency all regard to the finite individuality of the subject is eliminated. Qui Deum amat, conart non potest wt Deus ipsum contra amet. In like manner, he 'absolutely condemns all hatred, envy, rivalry, and ambition, as springing out of an over-estimate of those finite things which one only can possess, while the highest good is that which is enjoyed the more easily and fully the greater the number of participants. Yet Spinoza's exaltation of the social life, and of the love that binds it together, is too like the Buddhist's universal charity that embraces all creatures, and all creatures equally. Both are pased on an abstraction from all that is individual, only the Buddhist's abstraction goes a step further, and erases even the distinction between man and the animals. Spinoza felt the pressure of this all-levelling logic when he said, "I confess I cannot understand how spirits express God more than the other creatures, for I know that between the finite and the infinite there is no proportion, and that the distinc- tion between God and the most excellent of created things differs not a whit from the distinction between him and the lowest aud meanest of them."? As Pope said, God is "as full and perfect in a hair asa heart ;" in all finite things there is a ray of divinity, and in nothing more than a ray. Yet in another epistle, Spinoza contradicts this view, and declares that, while he does not consider it necessary to "know Christ after the flesh, he does think is it necessary to know the eternal Son of God, z.e., God's eternal wisdom, which is manifested in all things, but chiefly in the mind of man, and most of all in Christ Jesus."* In the Ethics the distinction of man and the animals is treated as an absolute distinction, and it is asserted with doubtful con-sistency that the human soul cannot all be destroyed along with the body,

for that there is something of it which is eter- nal. Yet from this eternity we must of course eliminate all notion of the consciousness of the finite self as such. At this point, in short, the two opposite streams of Spinoza's thought, the positive method he zntends to pursue, and the negative or abstracting method he really does pursue, meet in irreconcilable contradiction. The finite must be related to the infinite so as to preserve all that is in it of reality ; and therefore its limit or the negative element in it must

be abstracted from. But it turns out that with this ab- i | i a er

1 Bth., iv. schol. 45. % Hth., iv. 67. °% Epist., 57. * Hpist., 21.

straction from the existence of the finite, the positive also disappears, and God is all in all in a sense that absolutely excludes the existence of the finite. 'The mind's intel- lectual love of God," says Spinoza, '"'is the very love where- with God loves himself, not in so far as he is infinite, but in so far a8 he can be expressed by the essence of the human mind, considered under the form of eternity ; @e., the mind's intellectual love of God is part of the infinite love wherewith God loves himself." 'This double "in so far," which returns so frequently in Spinoza, just conceals for a moment the contradiction of two streams of thought, one of which must be swallowed up by the other, if they are once allowed to meet.

We have now reviewed the main points of the system, which was the ultimate result of the principles of Des Cartes. The importance of this first movement of modern philosophy lies in its assertion and exhibition of the unity of the intelligible world with itself and with the mind of man. In this point of view, it was the philosophical counterpart of Protestantism; but like Protestantism in its earliest phase, it passed rapidly from the doctrine that God is, without priest or authority, present to man's spirit, to the doctrine that man's spirit is as nothing before God. The object seemed too powerful for the subject, who effaced himself before God that he might be strong towards men. But in this natural movement of feeling and thought it was forgotten that the God that effaced the world and the finite spirit by his

presence could not be a living God. Spinoza gives the ultimate expression to this tendency, and at the same time marks its limit, when he says that whatever reality is in the finite is of the infinite. But he is unsuccessful in showing that, on the principles on which he starts, there can be any reality in the finite at all. Yet even if the finite be a delusion, still more if it be better than a delusion, it requires to be accounted for. Spinoza accounts for it neither as illusory nor as real. Itwas reserved for the following generation of philosophers to assert, in different ways, the reality of the finite, the value of expe- rience, and the futility of abstractions. Spinoza had declared that true knowledge consists in seeing things under the form of eternity, but it is impossible that things can be seen under the form of eternity unless they have been first seen under the form of time. The one-sided assertion of individuality and difference in the schools of Locke and Leibnitz, was the natural complement of the one-sided assertion of universality and unity in the Cartesian school. But when the individualistic tendency of the 18th century had exhausted itself, and produced its own refutation in the works of Kant, it was inevitable that the minds of men should again turn to the great philo- sopher, who, with almost perfect insight working through imperfect logic, first formulated the idea of a unity pre- supposed in and transcending the difference of matter and mind, subject and object.

See the Histories of Philosophy, especially those by Hegel, Feuerbach; Erdmann, and Fischer ; F. Bouillier, Histowre de la Philosophie Cartesicine, 1854; Ollé-Laprune, Philosophie de Male- branche ; E. Saisset, Précursewrs et Disciples de Deseartes, 1862. The German treatises on Spinoza are too numerous to mention. Jacobi’s Letters on Spinoza, which were the beginning of a true interpretation of his philosophy, are still worth reading. We may also mention C. Schaarschmidt, Descartes und Spinoza, 1850; C, Sigwart, Spinoza’s newentdeckter Tractat von Gott, dem Menschen, und dessen Gliickseligkeit, 1866. Both these writers have published German translations of the 7ractatus de Deo. See also Trendelen- burg, Historische Bettrdge zur Philosophie, 1867; R. Avenarius, Ueber die beiden ersten Phasen des Sptnozischen Pantheismus, 1868 ; M. Joél, Zur Genesis der Lehre Spinoza’s, 1871; R. Willis, Benedict de Spinoza: his Ethies, Life, and Influence on Modern ‘Religious Thought, 1870. For biographical particulars, see the articles Drs- CARTES, MALEBRANCHE, SPINOZA. (E. C,

5 Bth., v. 36.

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CARTHAGE was situated on the north coast of Africa, not far from the modern city of Tunis, just at that point where the coast approaches most nearly to the Island of Sicily. It lay in the heart of the Bay of Tunis, close to the mouth of the River Bagradas, and its site was so favourable to the natural development of a city that a hundred years after its entire destruction by the Romans it was chosen with Corinth as a place for colonization by Julius Cesar, and rose into distinction as the third town in the empire. It was a colony of the Phoenicians, and was founded about the middle of the 9th century B.c., a hundred years before the foundation of Rome. This isnot the place to discuss the position of Phcenicians in history, even if there existed sufficient material to do so with satisfactory results. The Phoenicians have generally been regarded as a purely com- mercial nation, forming a connecting link between the nations of antiquity, distributing the elements of culture, but producing little or no addition to the common stock. A fuller examination of Phoenician and Assyrian remains may serve to show us that this view needs correction. It is probable that a nation which gave its language to the Hebrews, and its alphabet to the Greeks, and which, after profoundly influencing both these factors of modern civiliza- tion, consolidated an empire which for four hundred years held its own against the preponderance of Greece and Rome, possessed a greater individuality of development than has been usually accorded to it. Phoenicians have had the mis- fortune of being for the most part described by their enemies. We must receive with caution the accounts given us by the Jews of Canaanitish cruelty, or by the Romans of Carthaginian dishonesty. The relations of native historians both of the mother-city and of her chief colony have come down to us in a garbled and fragmentary form. Our best hope of more perfect knowledge lies in the deciphering of contemporary inscriptions. | The name Cartago (the city was called Karthada by the Pheenicians, and Kapxjdwv by the Greeks) signifies New City. The inhabitants called themselves Canaanites, or inhabitants of the plain. The Romans used the name Peni or Punici, the Latin form of dotvxes, which

either signifies “red men,” or refers to the palms which were the chief products, and the principal emblem of the Syrian coast. We gather from this that the first knowledge of Pheenicians was gained by the Romans from the Greeks, but the name Sarranus given to Phoenician wares, and the name Carthago itself, shows us that their knowledge of the chief products of Syrian merchandize, and of the existence of their rival city, was gained independently. Carthage was the youngest Phoenician colony founded in the territory, which she after- wards subdued. Utica, Tunis, and Hadrumetum lay close to her in the district of Zeugitana, Hippo a short distance to the west, Leptis to the east. As these towns, with the exception of Utica, eventually became subject to her, she rose like Rome on the ruins of older towns, and she owed her success to the same cause,—the possession of a situation of superior commercial capabilities. We propose to give first a sketch of the history, next of the constitution, and lastly of the topography of the city.

‘ The history of ancient Carthage divides itself naturally into three periods : —the first extends from about 850 to 410 B.0., from the foundation of the city to the beginning of the wars with Syracuse; the second from 410 to 265 B.c., the beginning of the wars with Rome 3 the third from the commencement of the Roman (or Punic) wars till the destruction of the city, 146 Bc, Tt will then remain to remark the fortunes of the restored city until its destruction by the Arabs in 638 a.p. The first period of four centuries and a half contains the rise of the Carthaginian dominion and the culmination of its prosperity. Her empire was extended from the Straits of Gibraltar to the altars of the

territory of Cyrene.

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Philzni, near the Great Syrtis, where she touched on the She possessed as provinces Sardinia, the Balearic Islands, and Malta, and a few settlements in Spain and Gaul. She had subdued the neighbouring states founded from Pheenicia with the exception of Utica, and drew a large revenue from the corn lands of Byzacium and Emporia, situated on the coast south-east of the city. In Africa her subjects consisted of three classes—(1) Libyo-Phoenicians, (2) Libyans, and (3) Nomads. The first were of a mixed race,

the product of intermarriages be- tween the native Libyans and the Carthaginians or earlier settlers from Phcenicia. They cultivated the fields of Zeugitana, but were regarded with suspicion by the Carthaginians of pure blood. The Libyans, although completely subdued by Carthage, were of an entirely different race, and to a great extent did not understand the Punic language. At first they received a rent from the new settlers for the ground they occupied, but this was after- wards refused. They formed the staple of the Cartha- ginian army. Entire difference of race made it impossible for the new settlers to amalgamate with the original inhabitants, and the hard treatment they received led them to join the mercenaries in a revolt against their masters, Outside these limits the rest of the territory of Carthage was occupied by Nomads, who owed her a Joose allegiance, They supplied her with mercenary troops, especially cavalry ; but their fidelity could not be depended upon, and the Romans finally subdued Carthage by their assistance Among these Nomad tribes were situated various cities, colonized partly from Carthage and partly from the mother. country. Towards the south the dominion of Carthage extended as far as Lake Tritonis, connected by a canal with the Lesser Syrtis.

The foreign conquests of Carthage were undertaken with the object of securing her commerce. Justin tells us of a king, Malchus (the Latin form of the royal title), who after successes in Africa and Sicily was defeated in Sardinia, and turned his arms against his country. He must have lived between 600 and 550 Bc. A more historical personage is his successor Mago (between 550 and 500 B.c.), said to be the founder of the military power of the Carthaginians. His sons were Hasdrubal and Hamilcar, his grandsons Hannibal, Hasdrubal, and Sappho, sons of Hasdrubal, and Himilco, Hanno, and Gisco, sons of Hamilcar. By the energy of this family the Carthaginian empire was established over Sardinia, which was not lost till after the first Punic war, over the Balearic Islands and part of Sicily, and over portions of Liguria and Gaul, There are, however, few events of which the chronology is certain. ‘The first is the sea fight between the Etruscans and Carthaginians on the one hand and the Phoceans of Aleria in Corsica on the other, which occurred in 536 3.¢. The Phocwans, driven from Asia Minor by Harpagus in 564, had settled at Aleria or Alalia in Corsica, but engaged in piracy, which demanded the interference of the com- mercial naval powers. The Phocwans won the battle, but with such loss that they

abandoned Corsica, and settled at Velia in Italy. Polybius has preserved three treaties between Carthage and Rome, the first of which belongs to the year 509 B.c., the second probably to the period between 480 and 410 B.c. Their object is to restrict Roman commerce in Punic waters, and it is noticeable that the second treaty prescribes stricter limits than the first, and testifies to a considerable superiority of Carthage over Rome. To the period of about 500 3.0. belong the expedi- tions of Hanno and Himilco,—the one to found colonies on the west coast of Africa, which was probably explored as far as the mouths of the Senegal and Gambia, the other to obtain a knowledge of the Atlantic, which resulted in the discovery of Britain. But the most important event of the

first period was the battle of Himera, fought between Hamilcar and Gelo of Syracuse, about the year 480 B.c. Terillus, tyrant of Himera, on the north coast of Sicily, driven out by Thero of Agrigentum, implored and obtained help from the Carthaginians. Thero was assisted by Gelo of Syracuse. An account of this battle is given by Herodotus. The forces of Hamilcar consisted of 3000 ships and 300,000 men,—Pheenicians, Libyans, Iberians, Lignrians, Helyci (perhaps Volscians), Sardinians, and Corsicans. He was defeated with great loss, For seventy years the Carthaginians made uo further effort for the subjugation of Sicily This battle is one of the most important in ancient history. The expedition in which it terminated was undertaken in conjunction with that of the Persians against the Greeks of Attica. The nearly simulta- neous defeats of Himera and Salamis decided the question whether Semitic. or Aryan nations should hold the empire of the West. The only othcr events of any importance in this period, of which we have an account, arc the more complete subjugation of the African dependencies by the family of Mago, and the settlement of the disputed boundary between Carthage and Cyrene.

The second period of 140 years (410-269 B.c.) is occupied with the attempts of Carthage to reduce Sicily to the con- dition of a subject province. At this time her settlements were confined to the eastern corner of the island, while on the western coast Syracuse undertook the defence of Grecian nationality, and waged the battle of Aryans against Semites, until

both combatants fell before the supremacy of Rome. The repulse of the Athenians from Syracuse, and the same rivalry between Egesta and Selinus which had invited Athenian interfcrence in the affairs of the island, induced the Carthaginians to renew an enterprise which had been interrupted for seventy years. Hannibal, son of Gisco, stormed Selinus, and avenged at Himcra the death of his grandfather. Ovcrtures of peace were rejected, and preparations made for a more vigorous attack. In 406 Hannibal and Himilco destroyed the great city of Agri- gentum, overthrew the mighty columns of her temples, and covered a flourishing site with a mass of ruins, Hannibal died before Agrigentum; Himilco proceeded to attack Gela. Syracuse was now governed by Dionysius, who from an obscure position had raised himself to the rank of despot. In 405 a treaty made by Carthage secured to her the possession of her conquests, and to Dionysius a firmer position on the throne. But he no sooner felt himself secure than he hastened to drive the enemy from the island. War broke out in 398, all Sicily fell before the Punic arms, and Dionysius, driven by Himilco to take refuge within the walls of Syracuse was there besieged. Pestilence came to his assistance, and the Carthaginians were defeated; 150,000 Punic corpses lay unburied on Grecian soil; and Himilco, unable to bear the contempt of his fellow-citizens, starved himself to death. The Libyans rose in rebellion, and Carthage was threatened by an army of 200,000 men. The attempt of Mago between 396 and 392 to procure a more favourable result had little effect. Ten years afterwards he Jed another expedition. The defeat of Cabala nearly lost the possession of the whole of Sicily, but the brilliant victory of Corsica restored the balance, and the Halycus was accepted as the boundary between the two peoples Fourteen years of peace ensued. In 368 the misfortunes of Carthage encouraged Dionysius to a new but unsuccessful effort to complete the purpose of his life His death put an end to a renewal of the attempt, aud his son and successor made peace with the Cartha-ginians. The weak government of Dionysius II. was favourable to the extension of Carthaginian empire in Nicily ; but they found an antagonist of different mettle in the Corinthian Timoleon, who, after liberating Syracuse

from its tyrants, made war against Carthage for six years (345-340 3.c.). The defcat of the Crimissus (340 B.C.) was most crushing, The Holy

Legion, composed of 2500 of the best families of Carthage, was destroyed, and the host of mercenaries cut to pieces. Peace restrained the Cartha- ginians within their old boundary of the Halycus; the Greek cities were declared free; and Carthage promised never again to support a despot in Syracuse. The next thirty years contain little of note except trace of friendly intercourse between Carthage and Rome, and a record of assistance given to the Tyrians when besieged by Alexander the Great. She, however, sent ambassadors to Babylon to congratulate the conqueror on his return from Asia. Agathocles was the first to discover that the secular enenties of his countrymen were vulncrable in Africa. After becoming despot of Syracusc, and establishing his authority over the great towns in Sicily, he found that he had to reckon with the Carthaginians. Unsuccessful in the island, he transferred his forces to the mainland in 310, reduced Carthage to the last extremities, and would probably have obtaincd more signal success had not the revolt of Agrigentum called him home. Peace made in 306 continued till the death of Agathocles in 289. His loss encouraged the extension of Punic dominion, and at last obliged the Syracusans to call in the assistance of Pyrrhus, the chivalrous, king of Epirus. He left Italy in 277, and in a short time drove the Carthaginians from the west and besieged them in the distant fortress of Lilybeeum. But his allies were untrue to him—Carthage and Rome were leagued against him; he left Sicily in 276, and his departure from Italy in the following year left the Cartha- ginians to stand in sharp antagonism to the Latin branch of the Aryan stock,

The third period of Carthaginian history extends from 264 to 146 B.c.,—from the outbreak of the first war with Rome to the final annihilation of the city by the conquerors. This is not the placc for a detailed account of the Punic wars, which occupy a large space in every Roman history. We must content ourselves with a hasty summary. The first war, which lasted from 264 to 241 B.c., was a contest for the possession of Sicily. The Carthaginians in under- taking it felt secure of their mastery over the sca. Their ambassadors told the Romans that they could not even wash thcir hands in the sea without permission of the Carthaginians. Montesquieu considers it one of the chicf causes of the rise of Roman greatness that they were care- ful to borrow from their enemies whatever was calculated to improve their own efficiency. ‘The Romans not only built a fleet but developed a novelty of tactics which precisely secured the object which

they had in view. They were encouraged to further exertion by the victories of 260 B.c. and 256 B.c., and were schooled to caution by the defeat of the following year. The war was ended by the brilliant success of Catulus in 242 3.c., and Sicily was lost to the Carthaginians. The next three years and a half (241—237) were occupied by a civil war, which shows us ou what insecure foundations the power of Carthage was based. The large army of mercenarics which had becn employed against Rome was incautiously admitted into the city. Under pretence of demanding pay they rose against their employers, and were joined by the Libyans and Numidians, who cultivated the surrounding lands in unwilling subjection. The insurrection was quelled with difficulty, but a similar revolution in Sardinia was more successful ; 700 Carthaginians were barbarously murdered, and .the possession of the island passed to the Romans. All we know of the twenty years which elapsed before the beginning of the second war with Rome is confined to the successes of Hamilcar and his family in Spain. In 218 B.c. Hannibal, who had sworn as a boy eternal enmity to

the Romans, began the enterprize to which he devoted his life. His object was not so much to conquer Italian soil or Italian cities as to break up the confederacy on which the greatness of Rome depended, and to undo the fabric of its empire stone by stone. He sought, therefore, on the one hand to rouse Greeks and Orientals to a joint attack against the common foe, and on the other to sow dissension amongst the Latin, Sabellian, and Oscan tribes, and to urge them to reduce Rome to that position of comparative inferiority which she had occupied many centuries before. Both these plans failed. Hannibal was badly supported from home; he found that to combine in unity the shifting policy of the Kast was to weave a rope of sand ; and he dis- covered above all that Roman supremacy was established on a basis of complete security. How different was her position, seated among kindred peoples bound to her by affinities of blood and language as well as interest, governed by the wise policy of a patriotic senate, and restrained by the overpowering force of devoted legions, and that of the city of merchants, torn by factions, surrounded by alien and even hostile tribes, defended by

mercenaries, and swayed “by interest and passion, The defeat of Hasdrubal at the Metaurus in 207 B.c. crushed the last hope of the invader ; Spain was recovered by the genius of Scipio, and in 203 B.c. Hannibal, not unwillingly, obeyed the order to embark from Italy to retard the ruin of his country which it was too late to save. The battle of Zama in 202 put an end to the war in the following year. It was due to the magnaminity of Scipio and Hannibal that peace was con- cluded on such terms that, while Rome had no longer to fear Carthage as a rival, she was content to recognize her existence as a commercial community.

For the next six years Hannibal governed the city which he had not been able to preserve. He reformed the con- stitution in a democratical sense, and paid with surprising facility the enormous indemnity demanded by Rome. He was engaged in planning a combination against Rome with Antiochus of Syria, when he was driven from power, and forced to take refuge in the East. Shortly afterwards he fell a victim to Roman hatred.

The interval between 183 and 150 B.c. contains little besides the history of internal dissensions,— struggles between the Roman party, the democratical party, and the party of Masinissa, which tore the city in sunder by their quarrels, he so-called third Punic war (149-146 B.c.) is one of the saddest events in all history, and the greatest blot on the reputation of the Romans. Jealousy of their old antagonists had been shown by constant acts of injustice, and at last the sight of the prosperity and riches of the city impressed upon the narrow mind of Cato the conviction that Carthage must be blotted out. A pretext for war.was wantonly invented, The anxieties of the Carthaginians to secure peace at any sacrifice was made the instrument of their destruction. When they saw that their ruin was resolved upon, and that compromise was hopeless, they defended themselves with an energy which would have saved them at an earlier period. The sentence of the senate was ruthlessly carried out. The city burned for seventeen days, and concealcd its very site under a heap of ashes. The plough was passed over it, and the ground was cursed for ever. In the words of Mommsen, ‘“ where the industrious Pheenicians bustled and trafticked for five hundred years, Roman slaves henceforth pastured the herds of their distant masters.”

The history of Roman Carthage must be given in a few words. In 122 B.c. Caius Gracchus led 6000 colonists to Africa, and founded the city of Junonia. The colony did not prosper. In 29 B.c. a second colony was sent out by Augustus in fulfilment of a design of Julius Cesar. This bscame so prosperous that Herodian statcs that it disputed

with Alexandria the second place in the empire. In the middle of the 5th century it became, under Genseric, the capital of the Vandal kingdom, and in 533 a.p. it was stormed by Belisarius. In 706 A.D. it was entirely destroyed by the general of the caliph Abdulmelek. «3

The constitution of Carthage was essentially aristocratical. Constit,. The little we know of it is derived from a single chapter tion. in the Politics of Aristotle (ii, 8), a few scattered passages in the same treatise, and in Polybius, Livy, Nepos, and other authors. The official heads of the Government were the suffetes (Heb. Sophetim), who are compared to the Roman consuls and the Spartan kings; they may only have been two in number, and probably held office for a year, but were capable of re-election. Under them was the senate, which may or may not have been divided into two houses. These offices were filled by popular clcction, determined by the joint claims of wealth and merit, but bribery was largely practised, and Aristotle goes as far as to say that the chief offices were objects of sale and purchase. The people had a voice in the conduct of affairs, but they were not consulted if the suffetes and the senate were agreed on a course of action. There is no reason to suppose with Grote that the public banquets mentioned by Aristotle were part of the machinery of bribery. The history of England (which by some writers is spoken of as the modern Carthage) supplies us with ample examples of an aristrocratical government carried on under the forms of a democracy. By the side of the regular Government stood a controlling power which gradually absorbed into itself all the authority of the state, The pentarchies were probably bodies of commissioners chosen from the principal familics, self-elected, and so constituted that the outgoing members preserved their power for another year, and thus impressed a unity of policy on the institution. By these were elected the council of a hundred (or more strictly a hundred and four), who stood in the same relation to the suffetes as the ephors to the Spartan kings. By the gradual extension of judicial : functions, like the parliaments of

France, they usurped to themselves the authority of the state. To them is to be referred the cruel vengeance so often wreaked on unsuc- cessful generals. It was the work of Hannibal to diminish the authority of this body, and to secure a more real share of power to the people.

The Carthaginians were, like the Phcenicians, a deeply religious people. Religion entered into cvery important action of their lives, and their priests were held in the highest honour, yet there was no special order of priests, and we have no proof that the office was by law or custom confined to any particular family. Aristotle, writing more than half a century before the first Punic war, gives great praise to the Carthaginian constitution on the score of its stability, and its success in securing the happiness and con- tentment of the nation. It is, indeed, inconceivable that |

the Carthaginians should have attained such wealth and prosperity except under a good government; and the picture of faction, dissension, and disturbance, which we are accustomed to associate with it, belongs rather to the decline of the Punic empire, and is known to us only | through the representation of its enemies. | The general ontline of the topography of Carthage is Topo tolerably certain, but the details are involved in almost graphy. unavoidable obscurity. Two schools of topographers place the site of the city respectively on the north and south of i the peninsula, which the territory of Carthage undoubtedly : occupied. It seems now certain that the latter are in the right. The most important feature of the ancient city was the citadel Byrsa (Bozra), the hill now occupied by a church dedicated to St Louis, who died at Tunis. It was sur- | rounded by walls, and its summit was formerly crowned

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by a temple of JMsculapius, standing at the head of sixty steps. The name Byrsa was probably also given to the whole quarter of the city as well as to the citadel itself. The city was enclosed on the land side by a triple wall, with towers at short intervals and casemates, which afforded stabling for 300 elephants and 4000 horses. The harbours of Carthage were artificial, and consisted of two pasins,—one rectangular, for the merchant ships,

cpening into the lagoon of Tunis, and ending in a narrow passage, capable of being closed by a chain; the other circular, for ships of war, containing an island in the centre on which the admiral lived. ‘Their site can be easily identified, although their size is now considerably reduced. Between the lagoon of Tunis and the sea ran out a tongue of land, the Teenia of Appian, still recoguizable although altered in size and shape; on it stands the fort of the Goletta. Outside the walls lay the suburb of Megara or Magalia, now the districts of Mara, covercd then as now with villas and gardeus ; and still beyond this, towards the uorth of the peninsula, lay the vast necropolis marked by the modern village of Camart. The Carthaginians, like the Jews and other Semitic nations, combined a feeling of reverence for ancestors with a fear of contamination from the dead ; therefore, while thcir sepulchres were carefully and strongly built, they were situated far away from the habitations of the living, and in this case were not even visible either from Byrsa or Megara. We shall not be surprised that so little remains of this mighty city if we remember that for centuries it has been used as a quarry not only by its African neighbours but by the rapacious merchants of the West. The Cathedral of Pisa is said to have been built out of the ruins of Carthage ; and Genoese vessels, trading with Tunis in the Middle Ages, seldom returned without a ballast of Tunis marble. ‘The most impressive remains which strike the modern traveller arc the arches of the aqueduct, once fifty miles long, which cannot be referred with certainty to Carthaginian or Roman origin. Much more lies hidden under drifted sand and the silt of the Bagradas. Even lately the marble blocks of the ancient walls have been in part destroyed by the works of the Tunis railway.

The antiquarian may regret the want of evidence to assist him in reconstructing the aucient city. The historian and philosopher will feel still more deeply that the hostility of the Romans has left him so few traces of this vigorous scion of the Semitic stock. Phoenician culture still remains a tantalizing riddle to those who would unravel the course of human progress. The world has lost as well as gained by the cruel and arrogant self-assertion which culminated in tlle supremacy of Romine. In the history of civilization the survival of the fittest has frequently been nothing else but the survival of those who by force, obstinacy, and cunning were fittest to survive. In modern days we can give their full value to enterprize in commerce, activity in geographical discovery, and the taste which decorated the metropolis

with noble buildings and works of art, and collected a library which the ignorance of the conquerors dispersed amongst the barbaric princes of the desert. Virgil, standing in the light of a wiser and more tolerant age, did his best to soften the hatred of his countrymen against their hereditary foe, and to show that generous hospitality and refinement were not foreign to the court of Dido, and that the perfidy of Hannibal was a fitting retribution for the heartless treachery of Auneas.

Notices of Carthage in the classical writers are frequent, especially in Polybius, Diodorus, Livy, Appian, and Justin. The two works which have been the foundation of most that has been written on the subject in modern times are Béttger, Geschichte der Carthagen, Berlin, 1827, and Heeren, Jdcen, vol. ii. pt. 1. There is a brilliant

sketch of Carthage in Mommsen's History of Rome, vol. ii., and some sensible remarks in Grote's History of Grecee, Volos. "ire

articles on Carthage in Ersch and Gruber's Eneyelopédie, in Smith's Dietionary of Geography (by Philip Smith), and in Pauli's Real Lexieon, are admirable. Indispensable for the study of the consti- tution is Kluge, Aristoteles de Politia Carthaginiensium. Tllustra- tive of the topography may be mentioned Bealé, Fouilles @ Car- thage, and Davis, Carthage and her Remains. The standard work on the Pheenicians is still Movers, Die Phénizien, but it is probable that our knowledge of the subject may be much inereased when the researches now in progress have been completed and co-ordinated. E. de Sainte Marie published in 1875 a Bibliographie Carthaginoise (Jourdan, Paris), of which there is a severe but instructive review in the Literarisehes Centralblatt for May 20, 1876. (0. B.)

CARTHUSIANS, a religious order founded by St Bruno in the year 1084. (See Bruno.) This saint, disgusted with the world, and especially with the conduct of Manasses, archbishop of Rheims, determined to live, in some remote and retired spot, a life dedicated to contemplation and religion. With six companions he went to consult Hugh, bishop of Grenoble, who led them to a spot among the mountains, about ten or twelve miles from the town, called Chartreuse ; aud Bruno at once fixed upon this as the site of the

establishment which he was minded to found. Very many medieval writers have exhausted the resources of language in describing the awful and terrible nature and aspect of this spot, shut in among naked and precipitous rocks, surrounded by sterile mountains, and for a large portion of the year buricd in the snow ; and many modern writers have celebrated the romantic and picturesque fea- tures of the place. The obscure name was destined to become familiar in every country and language of Europe, and the monastery which Bruno founded there, soon after mankind had begun to recover from the alarm caused by the belief that the world would come to an end in the 1000th year after Christ, has been the parent of all the numerous “ Chartreux,” “ Certose,” and ‘ Charterhouses,” and “ Carthusian ” establishments throughout Europe.

Peter the Venerable, abbot of Cluny, writing about fifty years later, speaks thus of the mode of life of the earliest Carthusians :—

‘Warned by the negligence and Iukewarmness of many of the older monks, they adopted for themselves and for their followers greater precaution against the artifiees of the Evil One. As a remedy against pride and vain-glory they ehose a dress more poor and contemptible than that of any other religious body ; so that it is horrible to look on these garments, so short, scanty, coarse, and dirty are they. In order to cut up avariee by the roots, they en- closed around their cclls a eertain quantity of land, more or less, according to the fertility of the district ; and they would not aceept a foot of land beyond that limit if you were to offer them the whole world. For the same motive they limit the quantity of their cattle, oxen, asses, sheep, and goats. And in order that they might have no motive for augmenting their possessions, either of land or animals, they ordained that in every one of their monasteries there should be no more than twelve monks, with their prior the thirtcenth, eighteen lay brothers, and a few paid servants. To mortify the flesh they always wear hair shirts of the severest kind, and their fasting is well-nigh continuous. They always eat bread-of unbolted meal, and take so much water with their wine that it has hardly any flavour of wine left. They never eat meat, whether in health or ill. They never buy fish, but they aecept it if it is given to them for charity. ‘They may eat cheese and eggs only on Sundays and Thursdays. On Tuesdays and Saturdays they eat cooked vegetables. On Mondays, Wednesdays, and

Fridays, they take only bread and water. They eat once a day only, save on the days of the octaves of Christmas, Easter, Penteeost, Epiphany, and one or two other solemnities. They live in separate little houses like the ancient monks of Egypt, and they oceupy themselves continually with reading, prayer, and the labour of their hands, especially the writing of books. They reeite the prayers for minor eanonical hours in their own dwellings, when warned by the bell of the church, but they all assemble in church for matins and vespers. On feast days they eat twice, and sing all the offices in the church, and eat in the refec- tory. They do not say mass save on festivals and Sundays. They boil the vegetables served out to them in their own dwellings. and never drink wine save with their food.”

As might be supposed, the rigour of this rule has been much modified. The Carthnsian dress of very thick white cloth is no longer by any means the poorest or dirties? of

monastic costumes. It consists of a cassock or frock and cloak of ample and comfortable length. But the practice of each monk living in his own separate dwelling has always characterized the Carthusians. They have never been Ceenobites.

The Carthusians had no written rule till one was com- posed for them, about forty-five years after the foundation of the first house of the order at Chartreuse, by Guigo, their fifth prior. Some of the most special and character- istic points of it are as follows :—

It was not permitted to the members of the order to practise any

reater or additional austerities than those prescribed, without special i from the prior. They were rarely to use medicine, but to be bled five times a year, and shaved six times. They werc forbidden to receive any charity from usurers or cxcommunicated persons. They declined to bury any stranger (save a monastic person who might have happened to die within their walls) within their pre- cincts, and refused to charge themselves with the saying of any anniversary or other masses for the dead,—the reason assigned for the refusal being, that ‘‘ we have heard that the majority of priests are very

ready to say masses, and to make splendid banquets when- ever any one goes to pay them for praying for the dead—all which destroys abstinence, and renders prayer venal, making it depend on the will of whoso gives dinners." If, says Guigo's rule, our succcs- sors should find it impossible to maintain even this small number (thirteen) without being reduced to the odious necessity of begging, and wandering to beg, we advise them rather to reduce their numbcr to as many as can be supported, than to expose themselves to such dangers. Under the scventh general of the order, St Anthclm, the practice of holding general chapters was first introduced among the Carthusians; these have always been held at the '' Grande Chartreuse"' near Grenoble, the parent establishment.

The earliest formal approbation of the Carthusian Order is attributed to Urban IL. (ob. 1099). That pontiff, who had beeu a disciple of Bruno, when the latter was lectur- ing on theology at Rheims, had sent for Bruno to Rome a few years after his retirement to Chartreuse. The saint obeyed, taking all his monks with him. The latter shortly returned to Chartreuse, under Landuino, appointed by Bruno to be their second prior ; but Bruno himself refused to be made archbishop of Reggio, and finding the life of Rome insupportable to him, soon obtained the Pope's per- mission to accept a district of forest, in the diocese of Squillace in Calabria, given to him by Count Roger, where he founded the second house of his order. The rule and constitution of the order were frequently modified on subsequent occasions. The present rule is that which was fixed in 1578 and was corrected by a congregation of cardinals, published in 1581, and reconfirmed by Innocent XJ. in 1682. According to those new statutes, observes Moroni (or rather the learned writer of the article in his Dictionary), some of the practices as at present enjoined are more austere than in the ancient rule, since the choral service and the offica used by Carthusians are peculiar to them, and are of excessive length, following in many respects the ceremonies and rites of the ancient church. By these statutes the use of linen is wholly prohibited to them. They wear next the skin a shirt of horse-hair, bound by a cord girdle, and outside this a cossack and mantle of serge; and they sleep on a paillasse, with woollen sheets. The portrait of a Carthusian monk may be seen in Bonanni's Catalogo, at chapter 108, and a similar figure forms the 10th plate of Capparroni's Raccolta degli Ordini relegiost, published at Rome in 1826.

It isa very common error to suppose that the Carthusians are a branch or off-shoot from the great Benedictine order. It is true that the formula of their " office" or choral service is nearly the same as that used by the different orders which belong to the great Benedictine family ; but there is no relationship, of parentage or other, between the Carthuisans and Benedictines. The superiors of Carthusian convents are called priors, and not abbots as is the case with the Benedictine orders. Their general is the prior of the 'Grande Chartreuse" near Grenoble, and

resides always there, and not, as in the case of most other orders, at Rome. 'The order has a proctor-general (Pro- curatore Generale) who resides at Rome. Above all there is the radical difference in their mode of life,—the Bene. dictines being Ccoenobites, the Carthusians eremitical, living each in his own separate dwelling, erected within the wall, which forms the cloister (clawswra), but not even contigu. ous the one to the other.

St Bruno and his early successors made no pretension to any exemption from the jurisdiction of the ordinary, nor sought for any privilege of the kind. On the contrary they ina special manner recognized the bishop of Grenoble, in whose diocese their first and parent establishment wag situated, as the chief and abbot of their order. But the constant and unfailing tendency, which led all the regular bodies to aim at such exemptions, and to encroach in every manner ever more and more on the authority and proper domain of the bishops and secular clergy, induced the Carthusians within little more than an hundred years after their foundation to beg and to obtain from Pope Boniface IX. a bull, dated 6th of March 1391, granting them the exemption in question. It is remarkable, as indicating the strength of this tendency, that although the bull of Boniface is the first recognition whatever of any such exemption, the Pope says in the document in ques- tion, "A supplication has been presented in your name, setting forth, that although your order has been for a long time reputed exempt from the jurisdiction of the ordinary, and dependent immediately on the Holy See," c&ec. It had evidently come to be considered as a matter of course that monks, merely as such, were not subject to the autho- rity of the bishop, The motive assigned for granting the exeinption is that 'certain persons seek by citing you to

their tribunals to disturb you in the quietude and con- templation which are the object of your institute.”

The order of the Carthusians has always been one of the most respectable of the monastic bodies. It has maintained to a greater degree than most of them the spirit and qualities which presided at its foundation. Nor has it ever needed, as so many of its fellow communities, to be reformed, And although the services which it has rendered to litera- ture cannot vie with those of the Benedictines, it has by no means been valueless to the world in this respect.

The order at one time possessed 172 monasteries, of which 75 were in France. It had also numerous establish- ments in England (where, as is well known, the “ Charter House” near Smithfield, in London, was its principal house), Italy, Germany, and Spain. Hugh, bishop of Lin- coln, canonized in 1220, was a Carthusian. The order, however, has had fewer saints than almost any of the others ; so much so that the Carthusian Ferrari wrote a treatise of inquiry into the causes of this fact. To which query an answer may be found in the 97th of the Lcclesi- astical Letters of Father Sarnelli, who was vicar-general under Benedict XIII. (published in ten volumes at Venice in 1716), to the following effect :—

‘For canonization not only exalted virtues but the working of miracles is required. Now miracles are rarely performed by these solitary recluses, becausc the result of their doing so would be to call numbers of persons together, who would necessarily destroy or greatly impede the quietude of the contemplative life which it is the object of their rule to ensure. So true is this, continues the vicar-general, that Saint Antonine has recorded in his ecclesiastical history (bk. xv. ch. 22, sec, 2), that a certain Carthusian having performed a quantity of miracles at his tomb, became thereby, in consequence of the crowds who were attracted thither, so great a nuisance that the prior was obliged to go to the grave of the sainted deceased, and there command him on his obedience to do no more miracles, —an order which the dead saint thenceforward scrupulously obeyed.”

Father Petrejo published, in 1609, a Biblioteca degl Scrittort dell’ Ordine, which has been subsequently con-

tinued by other hands. A copious account of the order may be found in Dugdale's Monasticon, and oue yet more extended in the Chronicle of the Chartreuse by Dorlan ; gee also the Origines Carthustanorum, Cologne, 1609. A chronology of all the priors of the order was published at Rome in 1622. The device of the order consists of a globe surmounted by a cross, with the legend " Stat crux dum volvitur orbis." (T. A. T.)

CARTIER, JacquEs, a French navigator, was born at St Malo, in Brittany, in 1494. According to the custom of the place, even his early youth was passed upon the sea; and he was probably already acquainted with the coast of Newfoundland when he was appointed by Francis I, to the command of the two ships, which, on the 20th of April 1534, set sail from St Malo, for the purpose of exploring the district beyond the fishing grounds. Cartier first touched at Cape Buonavista, on the cast coast of Newfoundland, then passed northward along the coast, and, sailing south-west through the Straits of Belle Isle, dis- covered the mainland of Canada, which he claimed for France, by erecting a wooden cross with the inscription " Vive le Roy de France." Next year a second expedition was placed under his control to explore the estuary of the St Lawrence. He penetrated as far as Hochelaga, a large fortified village at the foot of a hill, to which he gave the name of Mont Royal, and which is the site of the modern Montreal, But he did nothing more, and returned on the 16th May 1536, disgusted with the climate and with his crew weakened by scurvy, a disease then unknown in Europe. The idea of colonizing Canada was abandoned after this, till in 1540 Jean Francis ~~de la Roche, Seigneur de Roberval, obtained permission to form a settlement. The project was carried out partly at Roberval's and partly at the king's expense; Cartier was sent out in command of five ships, in the spring of 1541; and in the autumn he arrived at the mouth of the St Lawrence. Near the present situation of Quebec he built a fort named Charlesbourg. But the Indians, whose king he had carried off with him on his last voyage, annoyed him so much with their attacks that he determined to return to France; and though Roberval arrived at Newfoundland in June 1542, with three ships and a colony of 200 men and women, and commanded him to turn back, he con~~ tinued his homeward voyage. Whether this was his last expedition is disputed, Some say that he returned

to the assistance of Roberval, in the autumn of 1543; but if this be so, we know nothing more. The rest of his life was spent in his native town or at the village of Limoilon, of which he was created seigneur by his patron Francis I, He was alive in 1552; but the date of his death is not known.

The interesting story of his discoveries and adventures is told in the Brief récit de la navigation faiete es isles de Canada, &e., Paris, 1545. ‘This work is extremely rare ; but the information it con- tained is to be found in the Voyage de Jacques Cartier . .. en 1534, a translation from the third volume of Ramusio’s Collection (Venice, 1565), which was published at Rouen in 1598, and was reprinted in 1865; in Lescarbot’s Histoire dela nouvelle Franee ; in Hakluyt’s Voyages (1600, republished by the Hakluyt Society in 1850) ; and in the Voyages de decouvertes au Canada, entre les années 1534 ef 1542, a collection of reprints published in 1843 by the Historieal and Literary Society of Quebec.

CARTOON (Italian, cartone, pasteboard), in paiuting, is a design drawn on thick paper or other material, which is used as a model for a large picture in fresco, oil, or tapestry. It was also formerly employed in glass and mosaic work. When cartoons are used in fresco-paint- ing, the back of the design is covered with black-lead or other colouring matter; and, this side of the picture being applied to the wall, the artist passes over the lines of the design with a point, and thus obtains an impression. According to another method the outlines of the figures are pricked with a needle, and the cartoon, being placed

against the wall, is “pounced,” «e¢, a bag of black colouring-matter is drawn over the perforations, and the outlines are thus transferred to the wall. In fresco-paint- ing, the portions of the cartoon containing figures were formerly cut out and fixed (generally in successive sections) upon the moist plaster. ‘Their contour was then traced with a pointed instrument, and the outlines appeared lightly incised upon the plaster after the cartoon was withdrawn. In the manufacture of tapestries upon which it is wished to give a representation of the figures of cartoons, these figures are sometimes cut out, and laid behind or under the woof, to guide the operations of the artist. In this case the cartoons are coloured. Cartoons have been cxecuted by

some of the most distinguished masters; the greatest extant performances in this line of art are those of Raphael, They are seven in number, coloured in distemper ; and at present they adorn the South Kensington Museum in London, having been removed thereto from their proper home, the palace of Hampton Court. With respect to their merits, they count among the best of Raphael's productions; Lanzi even pro- nounces them to be in beauty superior to anything else the world has ever seen. Not that they all present features of perfect loveliness, and limbs of faultless symmetry,—this is far from being the case; but in harmony of design, in the universal adaptation of means to one great end, and in the grasp of soul which they display, they stand araong the foremost works of the designing art. The history of these cartoons is curious. Leo X. employed Raphael in design- ing (in 1515-16) a series of Scriptural subjects, which were first to be finished in cartoons, and then to be imitated in tapestry by Flemish artists, and used for the decoration of the Sixtine Chapel. 'Two principal sets of tapestries were accordingly executed at Arras in Flanders ; but it is supposed that neither Lco nor Raphael lived to sce them. The sct which went to Rome was twice carried away by invaders, first in 1527, and afterwards in 1798. In the first instance they were restored in a perfect state ; but after their return in 1814 one was wanting—the cupidity of a Genoese Jew having induced him to destroy it for the sake of the precious mctal which it contained. Authoritics differ as to the original number of cartoons, but there appear to have been twenty-five,— some by Raphael himself, assisted by Francesco Penni, others by the surviving pupils of Raphael. The cartoons after which the tapestries were woven were not, it would secm, restored to Rome, but remained as lumber about the manufactory in Arras till after the revolution of the Low Countries, when seveu of them which had escaped destruction were purchased by Charles I., on the recommendation of Rubens. They were found much injured, " holes being pricked in them for the weavers to pounce the outlines, and in other parts they were almost cut through by tracing." Jt has never been ascertained what became of the other cartoons. Three tapes- tries, the cartoons of which by Raphael no longer exist, are in the Vatican,—representing the Stoning of St Stephen, the Conversion of St Paul, and St Paul in prison at Philippi. Besides the cartoons of Raphael, two, to which an extra- ordinary celebrity in art-history attaches, were those exe- cuted in competition by Leonardo da Vinci and by Michel- angelo,— the former named the Battle of the Standard, and the latter the Cartoon of

Pisa—Soldiers bathing, sur- prised by the approach of the enemy. Both these great works have perished, but the gencral design of them has been preserved, In recent times some of the most eminent designers of cartoons have been masters of the German School,—-Cornelius, Kaulbach, Steinle, Fuhrich, &c. ; indeed, as a general rule, these artists appear to greater advantage in their cartoons than in the completed paintings of the same compositions, In England cartoon-work took

some considerable development in 1843 and 1844, when a competition was going on for the decoration of the new Houses of Parliament. Dyce and Maclise have left ex- amples of uncommon mark in this line. (w. M. R.) CARTWRIGHT, Epmunp, D.D., F.R.S. (1743-1823), inventor of the power-loom, was born at Marnham, Not- tinghamshire, April 24, 1743, and educated at Wakefield grammar school. He began his academical studies at Oxford in University College, but in 1762 he was elected a demy of Magdalen College, where, in 1764, he succeeded to afellowship. In 1770 he published Armine and Elvira, a legendary tale in verse, which passed through seven editions in little more thana year. It was followed in 1779 by The Prince of Peace, the best of his poetical pro- ductions. In 1779 he was presented to the rectory of Goadby Marwood, Leicestershire, to which was added a prebend in the Cathedral of Lincoln. He would probably have passed an obscure life as a country clergyman had not his attention been accidentally turned in 1784 to the possibility of applying machinery to weaving. The result was that he invented the power-loom, for which he took out a patent in 1785. At this period he removed to Doncaster, where he established a weaving and spinning factory, which proved a failure; and in 1796 he settled in London. His first power-loom was a rude contrivance, but he afterwards greatly improved it, and made it an almost perfect machine. The first mill on his plan, that of Messrs Grimshaws of Manchester, was wilfully destroyed by fire in 1791, In spite, however, of the opposition of the hand-weavers, the use of power-looms had in 1807 greatly inereascd ; but as his patent was about to expire, this extraordinary mechanical genius would have derived no benefit from his invention, had not Parliament voted him a grant of £10,000 in consideration of his having contri- buted so largely to the commercial prosperity of the nation. Besides the power-loom

Cartwright invented machines for combing wool and making ropes, and he was also the author of many improvements in the arts, manufactures, and agriculture, He passed his latter ycars on a farm he had purchased near Sevenoaks, Kent, where he died October 30, 1823. He was the younger brother of Major John Cart- wright, the subject of the following notice.

CARTWRIGHT, Joun (1740-1824), known as Masor CARTWRIGHT, one of the earliest and most honourable of English parliamentary reformers, was born at Marnham in Nottinghamshire, September 28, 1740. He received his education at Newark grammar school, and at Teath Academy in Yorkshire, and at the age of eighteen entered the navy. He was present, in his first year of service, at the capture of Cherbourg, and served in the following year in the action between Sir Edward Hawke and Admiral Conflans. Engaged afterwards under Sir Hugh Palliser and Admiral Byron on the Newfoundland station, he was appointed to act as chief magistrate of the settle- ment ; and the duties of this post he discharged with singular uprightness and efficiency for five years. During this period he explored the intérior of the island and discovered Lieutenant's Lake. TI] health necessitated his retirement from active service fora time in 1771. When the disputes with the American colonies began, he saw clearly that the colonists had right on their side, and warmly supported their cause. At the beginning of the war he was offered the appointment of first lieutenant to the duke of Cumberland, which would have put him on the path of certain promotion. But he declined to fight against the cause which he felt to be just, and thus nobly renounced the prospects of advancement in his profession. In 1774 he published his first plea on behalf of the colonists, entitled American Independence the Glory and Interest of Great Britain. In the following year, when

the Nottinghamshire Militia was first raised, he was ap. pointed major, and in this capacity he served for seventeen years. He was at last illegally superseded, because of his political opinions. In 1776 appeared his first work on reform in Parliament, which, with the exception of Earl Stanhope's pamphlets (1774), appears to have been the earliest publication on the subject. It was entitled, Take your Chotce,—a second edition appearing under the new title of The Legislative Rights of the Commonalty

vindicated, The task of his life was thenceforth chiefly the attainment of universal suffrage and annual Parliaments. In 1778 he was an unsuccessful candidate for the representation of Nottinghamshire; and the same year he conceived the project of a political association, which took shape in 1780 as the “ Society for Constitutional Information,” and which included among its members some of the most distinguished men of the day. From this society sprang the more famous “Corresponding Society.” Major Cartwright, working unweariedly for the promotion of reform, published many pamphlets which it is needless to enumerate here, carried on a very extensive correspondence, and attended a great nuinber of public meetings. He was one of the witnesses on the trial of his friends, Horne Tooke, Thelwall, and Hardy, in 1794, and was himself indicted for conspiracy in 1819. He was found guilty in the following year, and was condemned to pay a fine of £100, He married in 1780, and his wife survived him. He had no children. He took up his abode in London in 1810, settled in Burton Crescent in 1819, and there spent his last years. He was warmly loved by all who knew him personally ; for, while the world looked chiefly at his inflexibility of political principle, his family and friends saw his unswerving integrity, his gentle-heartedness, his warm affections, his unvarying courtesy and rare simplicity of life. His health began to fail in 1823 ; and his spirits were greatly depressed at the same time both by public and private sorrows. The reverses in Spain and the execution of Riego touched him deeply, and more closely still the illness of a sister. and the death of his brother, noticed above. He died in London, on the 23d September 1824. In 1826 appeared, in two volumes, The Life and Cor- respondence of Major Cartwright, edited by his niece, F. D. Cartwright. A complete list of his writings is included in this work. In 1831 a monument was erected to him in Burton Crescent, from a design by Macdowell. CARTWRIGHT, Tomas (c. 1535-1603), a Puritan divine, was born in Hertfordshire about the year 1535. He studied divinity at St John’s College, Cambridge, but during the reign of Mary was compelled to adopt the legal profession. On the accession of Elizabeth, he resumed his theological studies, and was soon afterwards elected fellow of Trinity College. In 1570, he was appointed Margaret divinity professor ; but Dr Whitgift, on becoming chancellor in 1571, deprived him of the post. This was a natural consequence of the use which he made of his position. He inveighed bitterly against the hierarchy. He attacked the Elizabethan theory of a state-controlled church, advocating,

on the contrary, a church-controlled state, in which the presbyter was to enjoy a lofty authority, for his use of which he was to be responsible to God alone. He even taught that no opinions but his own were to be tolerated, and that heresy against them was a sin deserving of death. Immediately after this he removed to the Con- tinent, and officiated as clergyman to the English residents, first at Antwerp and then at Middleburg. On his return he became still further embroiled with Dr Whitgift and the Government, on account of his Admonition to Parliament, which was full of the most violent attacks on the existing condition of church and state. In 1590 he was summoned before the Star Chamber and imprisoned, and in 1591 he

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was once more committed to the Fleet by Aylmer, bishop of London. He was finally liberated in 1592 and allowed to preach, and the remaining eleven years of his life were undisturbed.

CARTWRIGHT, Witu1am (1611-1643), an English poet, born at Northway near Tewkesbury, in September 1611, was the son of a gentleman, who, having wasted his fortune, was reduced to the necessity of keeping an inn. William Cartwright finished his education at Oxford, entered the church, and became a popular preacher in that university. In 1642 he obtained the place of succentor in the church of Salisbury; and he was afterwards chosen junior proctor and metaphysical reader in his university. He dicd of camp fever at the age of thirty-two, in 1643. He was distinguished by a graceful person and attractive manner, and by extraordinary industry ; and, indeed, his fame rests on his personal popularity and the praise which he received from his fellow-poets, and especially from Ben Jonson, rather than on the merit of lis verses, which are, in fact, very ordinary productions. His poems and plays were published in 1651.

CARUPANO, a seaport town of Venezuela, South America, in the province of Cumana, 65 miles north-east of the town of that name. It is situated on the Caribbean Sea, at the opening of two valleys, and is defended by a fort. The chief trade is in horses and mules. Population

8600.

CARUS, Kart Gustav (1789-1869), a German physio- logist and psychologist, was born at Leipsic, on the 3d January 1789. He was educated at thc Thomas School and the university of his native city, ‘and devotcd his attention first to chemistry, intending to enter upon the business of his father, who had a large dyeing establish- ment, But a course of lectures on anatomy which he attended caused him to alter his views, and he began the systematic study of medicine. In 1811 he graduated, and began to teach as a privat-docent. The subject which he selected (comparative anatomy) had not previously been lectured on at Leipsic, and Carus soon established a repu- tation as a medical teacher. In 1813 he became director of the military hospital at Pfaffendorf, near Leipsic, and in the following year he was summoned as professor to the new medical college at Dresden. In this town he spent the remainder of his life, rising to the highest dignities of his profession. He was made royal physician in 1827, and became a privy councillor in 1862. The last ycars of his life were spent in drawing up an autobiography,—which was published under the title Lebenserinnerungen und Denkwiirdigkeiten, four volumes, 1865-6. He died on the 28th July 1869. In philosophy Carus belongs to the school of Schelling, and his works are thoroughly impreg- nated with the spirit of that system. He was also distin- guished as a landscape painter and as an art critic.

Carus’s literary activity was very great, and the list of his works is lengthy. The most important are—Grundaztige der vergleichende Anatomic und Physiologie, 1828 ; System der Physiologie, 2d ed., 1847-9; Psyche: zur Entwiekelungsgeschichte der Seele,1846; Physts: zur Geschichte des leiblichen Lebens ; Natur wnd Idec, 1861; Sym-

boli des menschlichen Gestalts, 1852; Atlas der Krantoskopiec, 2d ed., 1864; Vergleichende Psychologie, 1866.

CARVAHAL, Tomas Jos GonsaLez (1753-1834), a Spanish poet and statesman, was born at Seville in 1753. He studied at the University of Seville, and took the degree of LL.D. at Madrid. He obtained an office in the financial department of the Government ; and, in 1795 was made intendant of the colonies which had just been founded in Sierra Morena and Andalusia. During 1809- 1811, he held an intendancy in the patriot army.

He became, in 1812, director of the University of San Isidro ; but, having offended the Government by establishing a chair of international law he was imprisoned for five years

(1815-1820). The revolution of 1820 reinstated him, but the counter-revolution of three years later forced him into exile. After four years he was allowed to return, and he died, in 1834, a member of the Supreme Council of War. Carvahal enjoyed European fame as author of metrical trauslations of the poctical books of the Bible. To fit himself for this work he commenced the study of Hebrew at the age of fifty-four. He also wrote other works in verse and prose, avowedly taking Luis de Leon as his model.

CARVIN, a town of France, in the department of Pas- de-Calais, 144 miles E.S.E. of Béthune. It is a flourishing centre of industry, and carries on a large manufacture of beetroot sugar, alcohol, and starch. Population of the town in 1872, 5780, and of the commune, 7024.

CARVING. To carve (Anglo-Saxon, ceorfan) is to cut, whatever the material; in strict language carving is sculpture. The name of sculptor is commonly reserved for the great masters of the art, while that of carvers is given to the artists or workmen who execute subordinate decorations, ¢.g., of architecture in marble or stone. The word is also specially applied to sculpture in ivory and its substitutes, and in wood and other soft materials.

True ivory is the tusk of the elephant, but other inferior kinds are produced by the walrus, narwhal, and hippo- potamus. Long before the art of metallurgy was generally known, among the remotest pre-historic races, carvings on ivory aud on reindeer horn may be mentioned in evidence of the antiquity of this kind of art. A piece of mamioth ivory with a rude engraving of a mammoth is preserved in the Museum of the Jardin des Plantes in Paris, Tragments of ivory and horn, carved with excellent representations of animals, found in caves in the Dordogne in Franze, may be seen in the British Museum.

Coming to historic ages we find abundant evidence of the skill of the Egyptians in ivory carving. Two daggers inlaid and ornamented with ivory,

in the British Museum, are attributed to the age of Moses. In the same collection are chairs of the 16th century 8.c. inlaid with ivory ; two boxes in the shape of waterfowl and a small figure may perhaps be‘attributed to the 11th. A number of carvings in ivory and bone of these and later dates are preserved in the Egyptian galleries of the Louvre in Paris (Labarte, Arts Industriels, p. 186).

Ivory is mentioned among the imports of Solomon (1060 B.c.) His throne of ivory overlaid with the purest gold, and the ivory house of King Ahab, are specially recorded ; the words “ ivory palaces” in the 45th psalm are more exactly rendered “ wardrobes”—chests of wood ornamented with ivory. Horns, benches, aud beds of ivory are mentioned in the prophetical books. Amongst the Hebrews, as amongst other ancient nations, sceptres, thrones, and other insignia of royalty are often spoken of as made of ivory. These objects were frequently inlaid with precious stoncs.

Mr Layard discovered many fragments of carved ivory in Nineveh, so brittle from desiccation that they were boiled in gelatine to enable them to be safely handled. The most interesting (dated by Mr Layard about 950 B.c.) are two small tablets representing seated figures of Egyp- tian character with a cartouche bearing hicroglyphics. Parts of the decoration were “enamelled with a blue substance let into the ivory” (rather with slices of coloured vitreous pastes, not true enamel), and the whole ground of the tablet was originally gilded, remains of the gold leaf still{adher- ing to it (Wineveh and its Remains, ii. p. 9).

The Greeks made many precious objects in ivory even in the earliest times. Phidias and his successors (in the 5th century B.c.) made “chryselephantine” statues, %.<., of ivory and gold, and the practice was continued, probably, down to the Christian era. A great number of such statues

arc described by Pausanias. The most celebrated were the colossal statue of Athene at Athens, nearly 40 feet, and that of Jupiter at Olympia, about 58

fect high. They were the largest and most precious works ever executed in the material under discussion. It has been stated by writers of various dates, from Pliny downwards, that the ancients had methods of flattening and joining ivory so as to make it cover large surfaces, but modern experiments of the recipes given have not verified these statements.

A few remains of ivory carvings found in Etruscan tombs in Italy are preserved in the British Museum ; others have becn collected by Signor Castellani. Roman ivories earlier than the 4th century are very rare. ‘There are, however, in various collections in England and on the Continent carved ivory tablets, called consular diptychs, meant to fold up and to contain writing on the inside. They were used by the Roman consuls, and sometimes sent by them as presents to great personages. Half of one of the most beautiful of these works is preserved in the Kensington Museum (No. 212°65), the other half is in the Hotel de Cluny in Paris—this picce is of the 3d century. The chair of St Maximian, covered with ivory panels clabo- rately carved (6th century), is still in good preservation at Ravenna,

Ivory carving was carried on at Constantinople during the early Middle Ages. Charlemagne did much to en- courage and establish the arts in Northern Enrope. Ivory book-covers carved with Gospel subjects, pyxes, or small boxes for church use, caskets, horns, and other valuable objects were carved in ivory during his reign, and those of his immediate successors. They were set in gold or silver, and sometimes with precious stones. An example of Anglo-Saxon workmanship (10th century) is preserved in the Fitzwilliam Gallery in Cambridge. Combs both of ivory and bone of the Roman and Anglo-Saxon periods are not unfrequently found in tombs in England. Carved folding triptychs, shrines, and altar-pieces con- taining sacred subjects in bas-relief, or figures of saints, with rich and elaborate architectural details according to the style of the day, often decorated with gold and colour, were made in great numbers from the 10th to the 16th century, in most countrics of Europe. Crucifixes and images of the Virgin and the saints, madc during these ages, are often graceful and beautiful examples of small sculpture. To these should be added the pastoral staves carried by bishops and abbots, and numbers of objects for secular use, such as horns, combs, caskets, hilts of arms, and the like, carved in ivory for persons of wealth, through- out the Middle Ages. They reached their

highest perfec- tion during the 13th and 14th centuries. The religious subjects carved in ivory by Spanish artists were of great excellence before the 16th century.

The great sculptors of the Renaissance are credited, though often without sufficient authority, with many works in ivory still preserved in public galleries. The scholars of Cellini and Raphael certainly carved with great skill in this material. Examples attributed to the masters them- selves are shown in the galleries of Munich and Vienna. Gerniany, Flanders, Holland, and Spain were distinguished for ivory carvers during the 16th century. Augsburg and Nuremberg were especially renowned in this respect. The carved drums of vases and tankards, bas-relief plaques or panels ‘set in silver gilt and gold are to be seen in the galleries of Munich, Vienna, and Berlin. Dagger and knife hilts and sheaths, powder-flasks, and statucttes of admirable execution, continued to be made in ivory down to the middle of the 17th century. There are good examples in the Green Vaults in Dresden and in many other collections. Several German princes, as well as Peter the Great, carved and turned ivory in the lathe, and remark-

able specimens of their work may be seen in the Green Vaults.

Among the best Italian ivory carvers of the 16th century may be reckoned the pupils of Valerio Vicentino and Bernardo of Castel Bolognese. A fine bas-relief by Alessandro Algardi, of the 17th ceutury, is preserved in the Basilica of St Peter in Rome. Other well-known artists were Copé and Frangois Du Quesnoy, called the Fleming (1594-1644), the lattcr of great eminence ; Jacob Zeller, a Dutchman ; Leo Pronner of Nuremberg ; Van Obstal of Antwerp, settled in France; Leonard Kern and Angermann of Nuremberg (17th century); Barthel (died at Dresden 1694), who excelled in carving animals : Leonard Zick of Nuremberg (17th and 18thfcenturies), who carved puzzle balls, like those of the Chinese ; Stephan Zick, who carved eyes and ears, examples of which may be seen in the Green Vaults; Belthasar Perinoser, a Bava- rian scttled in Dresden (1650-1732); and Simon Troger (18th century), a carver of great skill in ivory who added fanciful details in brown wood; examples of his composi- tions are

preserved in the Kensington Museum, the Royal Museum of Turin, and the Green Vaults of Dresden.

Ivory carving has long been cultivated in the East. In many parts of India, Bombay especially, ivory is carved, pierced, and inlaid with great skill. The Bombay carvers berrowed this art from the Persians. ‘The Chinese carve slabs of ivory and entire tusks with elaborate compositions of figures and landscape. They carve and picrce puzzle balls, cut one inside another out of single pieccs of ivory, The skill of the apanese is still greater. Their groups of small figures, animals, shells, insects é&c., show a power of representing animal life, and a dexterity in inlaying ivory with metals and other substances probably never surpassed, If the art of both nations is somewhat grotesque, their power of hand has had but few equals in ancient or in modern times,

A modern school of ivory carving, that has become a small trade, is established at Dieppe in France, Many crucifixes and religious images are produced there of con- siderable merit.

Implements and furniture have been carved in wood Wood The perishable nature of the carvin

from very ancient times. material forbids the hope of finding remains of such remote antiquity as we have in ivory, bone, and horn. It cannot be doubted, however, that the weapons and utensils of the stone age were fitted to handles of wood and bound on with thongs of hide or animal sinews. Most ethnographical collections possess paddles and weapons made by more recent races in a primitive state of knowledge and cultiva- tion, Often these utensils are diapered over in patterns of much elegance,—those, for instance, of Mexico, New Zealand, and Polynesia. The figure-head of a New Zealand canoe of brown wood carved in graceful convolutions, resembling the designs of the Scandinavian artists, was exhibited amongst the collections of the duke of Edin- burgh.

Pausanias states that all the most ancient races carved statues out of wood, and mentions specially those of Egypt. According to Sir G. Wilkinson wooden statues continued to be erected in Egyptian temples till the times of the later Pharaohs. Sycamore was the wood in general use for furniture, and

cedar for mummy cases, which are carved into the shape of the mummy, painted and gilt. Timber was imported into Egypt, and rare woods were inlaid both in furniture and statues (see Birch, |Zrans. Roy. Soc., iii. p. 172). A bas-relief in hard wood, attributed to the 6th, 7th, or 8th dynasty (above 2000 years B.c.), is preserved in the Louvre.

The Hebrews of the age of Moses seem to have becn more skilful as metallurgists than as wood carvers, but

under Solomon, the sanctuary of the temple was lined with cedar, and the walls elaborately carved with figures of cherubims, palm trees, and open flowers all gilt. Two cherubims, 10 cubits high were carved in olive, a very durable wood. Solomon imported ebony and other rare woods for his musical instruments and furniture.

Wood was used by the Greek sculptors before the 5th century B.c., and Pausanias cnumerates many statues made of different woods, some of several kinds of wood extant in Greece in his time (bk. ii. and vii.)

The Romans, who used bronze and marble for their furniture in later times, were still curious in woods, which were carved or polished and reserved for many purposes, and when of fine grain were extravagantly valued. Tacitus speaks of the rude wooden idols of the Germans.

The fact that a great part of Europe was covered with oak, pine, and other forests made the use of timber universal during the Middle Ages; many memorials remain of the skill both of constructors and carvers in oak and other woods. Churches, houses, even entire cities were of timber; many of these remain in Northern Germany, e.g.,in Hanover, Hildesheim, and Brunswick, in towns of Brittany and Perigord, and in Blois, Coventry, Chester, and other cities of France and England. Beam ends, brackets, door heads and gables were often effectively carved. Two doors, remains of churches in Norway (of the 11th or 12th century), entirely constructed of timber, carved in a large-grained pine wood into a complicated but graceful composition of dragons and serpents, were exhibited at South Kensington in 1868. The most elaborate and artistic carved work of the Middle Ages is to

be found in the shrines or ‘‘retables” placed on altars, some of small chamber size, others 20 to 30 feet in height. They were made in countless numbers in Germany, Spain, France, Flanders, and England. The principal space of the shrine was filled by figures standing or seated under claborate carved tabernacle work,—sometimes with coniplete pictorial compositions representing well-known legends of the saints. Generally these figures were gilded and painted. Often the shutters on the sides were painted with illustrative subjects, frequently painted on both sides, so as to be seen whether the shrine was open or shut. Many Lutheran churches in Nuremberg retain these ornaments exactly as they stood in Catholic times. The 15th and 16th centuries were prolific in these rich structures. A famous triptych by Hans Bruggemann (1515) is preserved in the cathedral of Schleswig, an earlier one by Michel Pacher of Brauneck at Wolfgang-sur-le-Lac near Ichel. To the triptychs should be added the stall work of the 14th, 15th, 16th centuries, as in the cathedrals of Cologne, Amiens, and Ulm, and in many English churches, Another class of carvings may be studied in the vast roofs, such as that of Westminster Hall; the roofs of many churches in Norfolk, and many halls in the old colleges and Tudor mansions are decorated with carved figures and heraldry.

In the 16th century the great cities of Italy—Rome, Florence, Venice, Milan, Ferrara, Urbino, and others— abounded in richly carved gilt and inlaid furniture, chairs, wardrobes, chests——such as contained bridal trousseaux—nmirror frames, caskets, even’ bellows. They were of walnut, cypress, cedar, ebony, and other woods,— inlaid with ivory, agates, and ornaments of hammered silver. Rich and beautiful examples of such work are pre- served in the museum at South Kensington, the Hotel de Cluny, the Kunst Kammer of Berlin, and other collections. The 16th century stall-work of many Venetian churches, the panel-work of the old rooms in the Louvre in Paris, the fire-places seen in many old 16th century palaces, specially that of the Palace of Justice in Bruges, are examples of admirable decorative carving on a large scale.

The Spanish wood-carvers during this period had a just celebrity. Their religious imagery is admirably de- signed, true to nature, and devotional,

pathetic, and tender in expression. They coloured the figures up to nature, but nothing was lost in this process. ‘The great Renaissance painters and mastcrs of Germany practised wood-carving of great excellence. Wohlgemuth of Nuremberg, Albert Durer, Veit Stoss, Ludwig Krug, Peter Flotner, &c., carved classical subjects, portraits in medallions, delicate bas-reliefs on draught men made of box and other hard woods, which are to be seen in many collections. They carved as often in hone stone, and modelled medallions, statuettes, and minute busts in wax, sometimes coloured up to life.

A rilievo on hone stone by Albert Durer is preserved in the British Museum ; others on wood in the united collec- tions in Munich, on wood and hone stone by Lucas Kranach the painter in the Kunst Kammer, Berlin, on wood with the monogram of Hans Schauffin in the same collection, one attributed to Lucas Van Leyden the painter in the National Library, Paris. The Augsburg artists worked more generally in wood only. Rosary beads of box, $ to 3 of an inch in diameter, some made to open, carved with minute figure subjects of great excellence, may be seen in South Kensington and in other collections. During the same period minute Scripture subjects were carved in box on crosses and small triptychs by the monks of Mount Athos, the inheritors of the old Byzantine art.

In the 16th century curious minute works, entire compo- sitions, were carved by Properzia de’ Rossi in peach stones, One is preserved in the Museum of Turin. A cherry stone on which a “gloria” of saints is carved is preserved among the Florentine gems. Leo Pronner, already named, also carved microscopic work on cherry stones.

A carver of great skill, Grinling Gibbons (1650-1721), founded a school of decorative carving in England which survived till near the cnd of the last century. The facility of execution in carving soft woods for gilding, to make frames, carriages, and furniture was very great dur- ing the earlier years of the last century. The taste was best in Italy and most extravagant in France. A revival of classic taste began with the reign of Louis XVI, and at about the same time in England, influenced by the brothers Adam and by many excellent carvers of furniture and decorative wood-work.

The carvings of the mountain villagers in Switzerland and the Tyrol are spirited, and are well executed, with simple tools, generally in pine wood. What has been said of the Indians, Persians, Chinese, and Japanese regarding ivory-carving, applies equally to their skill in carving and inlaying wood.

In most countries of Europe the art has been much displaced in recent times by moulded work in various materials and by metal-casting.

See Maskell's Ivories at South Kensington ; Gori Thesaurus Dip- tychorum; Lebarte's Arts Industriels ; Du Sommerard, Arts Somp- tuatres; Voillet-le-Duc's Mobvilier ; Lubke's History of Art; Kugler's Hand-book ; Pollen's Ancient and Modern Furniture and Wood- work. @. HP.)

CARVING AND GILDING being two operations which formerly were the most prominent features in the important industry of frame-making, the craftsmen who pursued the occupation were known as carvers and gilders. The terms still continue to be the recognized trade name of frame-making, although very little of the ornamentation of frame-work is now accomplished by carving, and a great deal of the so-called gilt ornament is produced without the use of gold. The trade has to do primarily with the frames of pictures, engravings, and mirrors, but many of the light decorative fittings of houses, finished in " composition" and gilt work, are also entrusted to the carver and gilder.

Fashion in picture frames, like all fashions, fluctuates greatly. Mouldings of the prevailing sizes and patterns are generally manufactured in special factories, and sup- plied in lengths to carvers and gilders ready for use. A large proportion of such mouldings, especially those of a cheaper and inferior quality, are made in Germany. What is distinctively known as a "German" moulding is a cheap imitation of gilt work made by lacquering over the surface of a white metallic foil. German artisans are also very successful in the preparation of imitation of veneers of rosewood, mahogany, walnut, and other orna- mental woods. The more expensive

mouldings are either in wood (such as oak or mahogany), in veneers of any ex- pensive ornamental wood, or real gilt.

A brief outline of the method of making a gilt frame, enriched with composition ornaments, may be taken as a characteristic example of the operations of the frame-maker. The foundation of such a frame is soft pine wood, in which a moulding of the required size and section is roughly run. To prevent warping the moulding is, or ought to be, made from two pieces of wood glued together. The moulding is “whitened up,” or prepared for gilding by covering it with repeated coatings of a mixture of finely-powdered whiting and size. When a sufficient thickness of the whitening mixture has been applied, the whole sur- face is carefwly smoothed off with pumice-stone and glass- paper, care being taken to keep the angles and curves clear and sharp. Were a plain gilt moulding only desired, it would now be ready for gilding; but when the frame is to be enriched, it first receives the composition ornaments. Composition, or “ compo,” is a mixture of fine glue, white resin, and linseed oil well boiled together, with as much rolled and sifted whiting added as makes the whole into a doughy mass while hot, This composition is worked in a hot state into moulds of boxwood, and so pressed in as to take up every ornamental detail. On its removal from the mould all superfluous matter is trimmed away, and the ornament, while yet soft and plastic, is laid on the mould- ing, and fitting into all the curves, &c., is fixed with glue. The ornamental surface so prepared quickly sets and becomes very hard and brittle. When very large bold ornaments are wanted for frames of unusual size they are moulded in payrer maché. Two methods of laying on gold —oil gilding and water gilding—are practised, the former being used for frames broken up with enrichments. For oil-gilding the moulding is prepared with two coats of fine thin size, and afterwards it receives a coat of oil gold-size, which consists of a mixture of boiled linseed oil and ochre. When this gold-size is in a “tackey” or “sticky” con- dition, gold-leaf is laid on and carefully pressed over and into all parts of the surface ; and when covered with a coat of finish-size, the gilding is complete. Water gilding is applied to plain mouldings and all considerable unbroken surfaces, and is finished either “matt” or burnished. For these styles of work the mouldings are properly sized, and after the size is dry the gold is laid on with water. Matt- work is protected with one or two coats of finish-size ; but burnished gold is

finished only by polishing with an agate burnisher,—no size or water being allowed to touch such surfaces. The mitring up of frames, the mounting and fitting up of paintings, engravings, é&c., involve too many minor operations to be noticed here in detail ; but these, with the cutting and fitting of glass, cleaning and repair- ing pictures and prints, and similar operations, all occupy the attention of the carver and gilder.

CARY, Henry Franets (177 2-1844), translator of Dante, and miscellaneous writer, was born at Gibraltar, December 6, 1772. He was the son of a captain in the army, and was educated at Christ Church, Oxford, which he entered at the age of eighteen, having two years earlier

made his appearance as an author, in a volume of Sonnets and Odes. In 1796 he took his master's degree, and hay- ing entered the church was presented, in the following year, to the vicarage of Abbott's Bromley in Staffordshire. This benefice he held till his death. In 1800 he was also pre- sented to the vicarage of Kingsbury in Warwickshire, While still at Christ Church he had devoted much time to the study of modern literature, not only English but French and Italian; and the fruits of his studies in these fields appeared in the notcs to his translation of Dante, the work on which his reputation now chiefly rests. The version of the Jnferno was published in 1805, together with the original text. The version of the whole Diving Commedia did not‘ appear till 1814. It attracted little attention for some years. But when Coleridge, in hig lectures at the Royal Institution spoke of it in terms of high praise, the world was persuaded to acknowledge its merits. It gradually took its place among “ standard ” works, and passed through four editions in the translator's lifetime. It has the great merits of accuracy, idiomatic vigour, and readableness, and, although many rivals have since appeared in the field, still holds its honourable place. Its blank verse, however, cannot represent the close woven texture and the stately music of the terza rima of the original. In 1824 Cary published a translation of The Birds of Aristophanes. Two years later he was ap- pointed assistant-librarian in the British Museum, a post which he held for about eleven years. He resigned in consequence of being refused the appointment, in ordi- nary course on a vacancy, to the post of keeper of the printed books.

From this time he applied himself to literary work on his own account, for which his duties at the museum had left him little opportunity. For the old London Magazine he wrote a series of Lives of the early French Poets, and Lives of English Poets (from Johuson to Henry Kirke White), the latter intended as a continuation of Johnson's Lives of the Poets. These works were published in a collected form in 1846. He was also engaged in editing the works of Cowper, Milton, Pope, aud other poets. He published about 1834 a translation of the Odes of Pindar, and at the time of his death was preparing a body of illustrative notes for anew edition. A pension of £200 per annum was conferred on Cary by Lord Melbourne in 1841. He died in London, August 14, 1844, and his remains were interred in Westminster Abbey. A memoir of his life, with his literary journal and letters, was published in two volumes by his son, the Rev. Henry Cary, M.A., in 1847, :

CARY, Sir Lucius, second Viscount Falkland, was born at Burford, co. Oxon, in 1610 or 1611, and educated at Trinity College, Dublin, his father being at that time lord- deputy of Ireland. On leaving the university he served for a short time in the Low Countries, but failing to attain promotion returned to England, and found a refuge from domestic troubles in the study of ancient literature and the society of the most eminent men of learning. Among his intimate associates were Jonson, Suckling, and Cowley; and at his country seat, Great Tew in Oxfordshire, he subsequently gathered around him a small group of theologians whose liberal opinions were uot without influence in the religious rivalries of the day. In 1633 he succeeded to his father's title, and was appointed gentleman of the privy chamber to Charles I. In 1640 he entered the House of Commons as membcr for Newport, Isle of Wight, and quickly assumed there a prominent part upon the side of the king, while at the same time he supported Pym in his schemes of moderate reform in church and state, and hiniself introduced the Bill for the exclusion of bishops from the House of Peers. But having been chosen by Charles to be one of his secretaries of state,

Falkland found himself irretrievably committed to a cause whieh he eould not wholly approve, and to the service of a king whom in his heart he distrusted, though his ehivalry forbad him to abandon his cause. On the eve

of the Civil War he joined his royal master at York, and having raised a troop of horse, did good service at Edgehill, Oxford, and the siege of Gloucester. In the indecisive battle of Newbury (20th September 1643) he fell fighting in the front rank of Lord Byron's regiment, with the words "Peace, Peace" upon his lips. Had his life been spared it is possible that he might at least have sueceeded in mitigating the rancour of the contending parties. His poems and political writings, published after his death, do not increase a reputation which is based rather upon single- mindedness and patriotie self-devotion than upon his con- tributions to literature. :

CARYL, Josepu (1602-1673), a learned Noneonformist elergyman, was born in London in 1602. He was educated at Exeter College, Oxford, and after leaving the university became preacher at Lincoln's Inn. By order of the Parliament he attended Charles I. in Holmby House, and in 1650 he was sent with Owen to accompany Cromwell to Seotland. After the Restoration he continued to officiate in an Independent congregation in London till his death in 1673. Caryl is now remembered only for his learned but ponderous commentary on Job, originally published in twelve volumes 4to, afterwards in two huge volumes folio.

CASA, Giovanni DELLA (1503-1556), an Italian poet, was born at Mugillo, in Tuseany, in 1503. He studied at Bologna, Florenee, and Rome, and by his learning attraeted the patronage of Alexander Farnese, who, as Pope Paul III., made him nuncio to Florence, where he received the honour of being elected a member of the celebrated academy, and then to Naples, where his oratorical ability brought him considerable suecess. His reward was the archbishoprie of Benevento, and it was believed that it was only his openly licentious poem, Capitoli del foro, and the fact that the French court seemed to desire his elevation, which prevented him from being raised to a still higher dignity. He died in 1556. Casa is chiefly remarkable as the leader of a reaction in lyric poetry against the uni- versal imitation of Petrarch, and as the originator of a style, which, if less soft and elegant, was more nervous and majestic than that which it replaced. His prose writings gained great reputation in their own day, and long after- wards, but are disfigured by apparent straining after effect, and by frequent puerility and cireumlocution. The principal are—in Italian, the famous 7 Galateo, a treatise on manners, which has been translated into several languages, and,

in Latin, De Officiis, and translations from Thucydides, Plato, and Aristotle. A complete edition of his works was published at Florence in 1707, to which is prefixed a life by Casotti. The best edition is that of Venice, 1752.

CASA CALENDA, a town of Italy, in the province of Molise and district of Larino, about 18 miles north-east of Campobasso. It is situated in an agricultural distriet, and trades in silk, wine, and fruits, It is usually identified with the aneient Colela, where Fabius took up his station to watch Hannibal, when the latter established his quarters at Geruntwm, now Gerione. Population, 6248.

CASALE, a town of northern Italy, in the north of the province of Alessandria. It is situated in a plain on the right bank of the Po, 38 miles east from Turin, and at a height of 249 feet above sea-level. Its fortress, founded in 1590, was strengthened and improved in 1849 under the direction of General de la Marmara. The town has been frequently besieged. It was taken from the Spaniards in 1640, and forty-one years later was sold to France by the duke of Mantua. It was taken in 1695, but was reeovered from the allies by the French. Since then, it has been

twiee retaken by the latter. Casale is the see of a bishop; and its cathedral, a Lombard structure, is said to have been founded in 742. The chureh of San Domenieo, another fine edifice, consecrated in 1513, contains a monument of remarkably elegant design to the memory of the Palzo- logi, erected in 1835. Other objects of interest are the ehurches of §. Ambrosio and of S. Ilario (once a pagan temple), the town-house, the clock-tower, and the library. The town also contains aecollege, theatre, and several palaees of the nobility. Some trade is done in fruit, wine, hemp, and the so-called “syrup of Casale.” The principal manufacture is that of silk. Population, 27,514.
CASALMAGGIORE, a town of Italy in the provinee of Cremona, the capital of a eireondario. It is situated on the left bank of the Po, and is proteeted from inundation by excellent embankments. Its publie buildings comprise an abbey, a hospital, an orphan asylum, a eustom-house, and a theatre; and its most important industries are the manufaeture of glass, pottery, eream of tartar, and leather. It was the seene of a vietory of Francesco Sforza over the Venetians in 1448. Population about 4500.

CASALPUSTERLENGO, a town of Italy, in the province of Milan, about 30 miles south-east of that eity, on the River Brembiolo. It earries on the manufacture of silk, linen, and earthenware, and is one of the ehief seats of the trade in Parmesan eheese. Population, 6207. CASANOVA DE SEINGALT, Giovanni Jacopo (1725-1803), one of the most noted adventurers of the 18th century, was born at Venice in 1725. His father belonged to an ancient and even noble family, but alienated his friends by embraeing the dramatic profession early in life. He made a runaway marriage with Zanetta Farusi, the beautiful daughter of a Veuetian shoemaker ; and Giovanni was their eldest child. When he was but a year old, his parents, taking a journey to London, left him in eharge of his grandmother, who perceiving his precocious and lively intellect, had him educated far above her means. At sixteen he passed his examination and entered the seminary of St Cyprian in Venice, from which he was expelled a short time afterwards for some scandalous and immoral conduet, which would have cost him his liberty, had not his mother managed somehow to procure him a situation in the household of the Cardinal Acquaviva, He made but a short stay, however, in that prelate's establish- ment, all restraint being irksome to his wayward disposi- tion, and took to travelling. Then began that existence of adventure and intrigue which only ended with his death. He visited Rome, Naples, Corfu, Constantinople, and penetrated even so far as St Petersburg, where he was introduced to Catherine II. By turns journalist, preacher, abbé, diplomatist, he was nothing very long, except homme & bonnes fortunes, which profession he assiduously culti- vated till the end of his days. In 1755 having returned to Venice, he was denouneed to the Government as a politieal spy, and committed to prison. After several fruit- less attempts he sueceeded in establishing a eommunieation with another prisoner, in whose company he made his escape on the night of the 3lst of October 1756. This exploit, afterwards so graphically related by him in a separate volume, and also in his Afemoirs, gained him great cele- brity. From that day he became a man of fashion, and recommeneed his life of dissolute and profligate adventure. Exhibiting his effrontery and audacity at every court in Europe, he at last made his way through Germany, in whieh country he was presented to Frederick the Great, into Franee. Here he became acquainted with Rousseau, Voltaire, and many more notabilities, had interviews with Louis XV., and was almost tenderly intimate with Madame de Pompadour. Handsome, witty, and

eloquent, it is not to be wondered at that such a man should have been received

with open arms in the dissolute coteries of the 18th century. Consummate profligate and charlatan as he was, he was loaded with honours by the Italian princes, and even decorated by the Pope himself.

After eighteen years' absence from his native town, he endeavoured to reinstate himself in the esteem of the Venetians by a refutation of the work of Amelot de la Houssaye on the constitution of the republic ; and when at last serious matters took the place of his pleasures, he became, in 1782, librarian to a German prince without a library. This prince was Count Waldstein, whom he accompanied to his chateau at Dux in Bohemia, in which place he died in 1803, after having written his Aemoirs, a work not unlike the Confessions of Rousseau, but far more depraved in tone. They are the frank avowal of a godless life, notwithstanding the frequent professions of Chris- tianity in the preface. Much as they have been overrated, a certain literary merit cannot be denied to them. They are principally interesting for the faithful pictures they give us of the morals and manners of the times. The Mémoires were published at Leipsic, 10 vols., in 1828-38, and at Paris, 4 vols.,in 1843. He also wrote several works on history in Italian; Récit de ma Captivité, 1788; a translation in verse of the Zliad, 1778; and a Narrative of Liighty Years spent among the Inhabitants of the Interior of the Globe, 1788-1800.

CASAS GRANDES (zc, in Spanish, Great Houses), a town of Mexico, in the province of Chihuahua, situated on the Casas Grandes or San Miguel River, about 35 miles S. of Llanos and 150 miles N.W. of the city of Chihuahua. It is celebrated for the ruins of early Mexican buildings still extant, about half a mile from its present site. They are built of "sun-dried blocks of mud and gravel, about 22 inches thick, and of irregular length, generally about 3 feet, probably formed and dried in situ." The walls are in some places about 5 feet thick, and they seem to have been plastered both inside and outside. The principal edifice ex- tends 800 fect from N. to S. and 200 E. to W.; its general outline is rectangular, and it appears to have consisted of three separate piles united by galleries or lines of lower

buildings. The exact plan of the whole has not as yet been made out, but the apartments have evidently varied in size from mere closets to extensive courts. The walls still stand at many of the angles with a height of from 40 to 50 fcet, and indicate an original elevation of several stories, perhaps six or seven. Ata distance of about 450 feet from the main building are the substructions of a smaller edificc, consisting of a series of rooms ranged round & square court, so that there are seven to each side besides a larger apartment at’each corner. The whole district of Casas Grandes is further studded with artificial mounds, from which are excavated from time to time large numbers of stone axes, metates or corn-grinders, and earthen vessels of various kinds. These last have a white or reddish ground, with ornamentation in blue, red, brown or black, and are of much better manufacture than the modern pottery of the country. Similar ruins to those of Casas Grandes exist near the Gila, the Salinas, and the Colorado, and it is probable that they are all the erections of one people. Squier is disposed to assign them to the Moquis.

See vol. iv. of The Native Races of the Paetfic States of North America, by Squier, whose principal authorities are the Noticias del Listado de Chihuahua of Escudero, who visited the ruins in 1819; an article in the first voluine of the Album Mexicano, the author of

which was at Casas Grandes in 1842; and the Personal Narrative of Mr Bartlett, who explored the locality in 1851,

CASAUBON, Isaac (1559-1614), was born at Geneva, 18th February 1559, of French refugee parents. On the publication of the edict of January 1561, the family returned to France and settled at Crést in Dauphiné, where

Arnold Casaubon, Isaac’s father, became minister of 9 Huguenot congregation. Till he was nineteen, Isaac had no other instruction than what could be given him by his father amid the distractions of those troubled years, Arnold was away from home whole years together, in the Calvinist camp, or the family were flying to the hills to hide from the fanatical bands of armcd Catholics who patrolled the country. Thus it was in a cave in the

mountains of Dauphiné that Isaac received his first lesson in Greek, the text-book being Isocrates ad Demonicum,

At nineteen Isaac was sent to the Academy of Geneva, where he read Greek under Francis Portus, a native of Crete. Portus died in 1581, having recommended Casaubon, then only twenty-two, as his successor. At Geneva he remained as professor of Greek till 1596, Here he married twice, his second wife being Florence, daughter of the celebrated scholar-printer, Henri Estienne, Here, without the stimulus of example or encouragement, with few books and no assistance, in a city peopled with religious refugees, and struggling for life against the troops of the Catholic dukes of Savoy, Casaubon made himself the consummate Greek scholar, and master of ancicut learning, which he became. He gave himself up to a study of the classical remains with a zeal and persistency which were fed only by an innate love of acquisition, His great wants were books and the sympathy of learned associates, both of which were wanting at Geneva. He spent all he could save out of his small salary in buying books, and in having copies made of such classics as were not then in print. Henri Estienne, Beza, and Lect were, indeed, men of superior learning. But Henri, in those last years of his life, was no longer the Estienne of the Thesaurus ; was, besides, never at home, and would not suffer his son- in-law to enter his library. “He guards his books,” writes Casaubon, “as the griffins in India do their gold!” Beza was engrossed by the cares of administration, and retained, at most, an interest for theological reading. Lect, a lawyer, had left classics for the active business of the council. The sympathy and help which Casaubon’s native city could not afford him, he endeavoured to supply by cultivating the acquaintance of the learned of other coun- tries. Geneva, as the metropolis of Calvinism, received a constant succession of visitors. The Continental tour of the young Englishman of birth was not complete without a visit to Geneva. It was there that Casaubon made the acquaintance of young Henry Wotton, who lodged in his house, and borrowed his money, Of more consequence to Isaac Casaubon was the acquaintance of Richard Thomsou of Clare, for it was through Thomson that the attention of Scaliger, settled in 1593 at Leyden, was directed to Casaubon. Scaliger and Casaubon first exchanged letters in 1594, Their intercourse, which was wholly by letter, for they never met, passes through the stages of civility, admiration, esteem, regard, and culminates in a tone of the tenderest

affection and mutual confidence. Influential French men of letters, the Protestant Bongars, the Catholic De Thou, and the Catholic convert Canaye de Fresne, aided him by presents of books and encouragement, aud endeavoured to get him invited, in some capacity, to France.

This was effected in 1596, in which year Casaubon accepted an invitation to the university of Montpellier, with the title of “consciller du roi” and “ professeur stipendié aux langues et bonnes lettres.” In Montpellier he never took root. He held the professorship there only three years, with several prolonged absences. He was not, at any time, insensible to the attractions of teaching, and his lectures at Montpellier were followed not only by the students, but by men of mature age and position. But the love of knowledge was gradually growing upon hin,

and becoming a devouring passion which excluded all other ambition. He began to perceive that the editing Greek books was an employment more congenial to his peculiar powers than teaching. At Geneva he had first tried his hand in some notes on Diogenes Laertius and on Theocritus, of small account. His début as an editor had been a complete Strabo (1587), of which he was so ashamed afterwards that he apologized for its crudity to Scaliger, calling it “a miscarriage.” ‘This was followed by the text of Polyznus, an editio princeps, 1589 ; a text of Aristotle, 1590; and a few notes contributed to Estienne’s editions of Dionysius of Halicarnassus and Pliny’s Epistole. It is not till we come to his edition of Theophrastus’s Charac- teres, 1592, that we have a specimen of that peculiar style of illustrative commentary, at once apposite and profuse, which distinguishes Casaubon among annotators. At the time of his removal to Montpellier he was engaged upon what is the capital work of his life, his edition of, and commentary on, Athenzus.

In 1598 we find Casaubon at Lyons, superintending the passage of his Athenwus through the press. Here he lived in the house of De Vic, “ surintendant de la justice,” a Catholic, but a man of acquirements, whose connections were with the circle of liberal Catholics in Paris. In the suite of De Vic, Casaubon made a flying visit to Paris, and was presented to Henry

IV. The king was very gracious, and said something about employing Casaubon's services in the "restoration " of the fallen university of Paris.

With the hopes thus excited he returned to Montpellier. In January 1599 he received a summons to repair to Paris. But the terms of the letter missive were so vague, that, though it bore the sign manual, Casaubon hesitated to act upon it. However, he resigned his chair at Montpellier, but instead of hastening to Paris, he lingered more than a year at Lyons, in De Vic's house, waiting for the appoint- ment to a Paris professorship. None came, but instead there came a summons from De Vic, who was in Paris, to come to him in all haste on an affair of importance. The business proved to be the Fontainebleau Conference. Casaubon allowed himself to be persuaded to sit as one of the referees who were to adjudicate on the challenge sent to Du Plessis Mornay by Cardinal Duperron. By so doing he placed himself in a false position, as Scaliger said : "Non debebat Casaubon interesse colloquio Plessizano ; erat asinus inter simias, doctus inter imperitos" (Scalv- gerana 2%). The issue was so contrived that the Protestant party could not but be pronounced to be in the wrong. By concurring in the decision, which was unfavourable to Du Plessis Mornay, Casaubon lent the prestige of his name to a court whose verdict would without him have been worthless, and confirmed the suspicions already current among the Reformed churches that, ike his frend and patron Canaye de Fresne, he was meditating abjuration. From this time forward he became the object of the hopes and fears of the two religious partics; the Catholics lavishing promises, and plying him with arguments ; the Reformed ministers insinuating that he was preparing to forsake a losing cause, and only higgling about his price. We now know enough of Casaubon's mental history to know how erroneous were these computations of his motives. But, at the time, it was not possible for the immediate parties to the bitter controversy to understand the intermediate position between Genevan Calvinism and Ultramontanism to which Casaubon's reading of the fathers had conducted him.

Meantime the efforts of De Thou and the liberal Catholics to retain him in Paris were successful. The king repeated his: invitation to Causabon to settle in the capital, and assigned him a pension. No more was said about the university. The recent reform of the university

of Paris had closed its doors to all but Catholics; and though the chairs of the Collége de France were not governed by the statutes of the university, public opinion ran so violently against heresy, that Henry IV.-dared not appoint a Calvinist toa chair, even if he had desired to do so. But it was designed that Casaubon should succeed to the post of sub-librarian of the royal library when it should become vacant, and a patent of the reversion was made out in his favour. In November 1604, Jean Gosselin died in extreme old age; and Casaubon succeeded him as sub- librarian, with a salary of 400 livres in addition to his pension.

In Paris Casaubon remained till 1610. These ten years were the brightest period of his life. He had attained the reputation of being, after Scaliger, the most learned man of the age,—an age in which learning formed the sole standard of literary merit. He was placcd above penury, though not in easy circumstances. He had such facilities for religious worship as a Huguenot could have, though he had to go out of the city to Hablon, and afterwards to Charenton, for them. He enjoyed the society of men of learning, or who took an interest in learned publications. He had the best opportunities of seeing men of Jetters from foreign couutries as they passed through Paris, Above all, he had wealth of Greek books, both printed and in M6., the want of which he had felt painfully at Geneva and Montpellier, and which no other place but Paris could at that period have supplied.

In spite of all these advantages we find Casaubon restless, and ever framing schemes for leaving Paris, and settling elsewhere. It was known that he was open to offers, and offers came to him from various quarters,—from Nimes, from Heidelberg, from Sedan. His friends Lect and Diodati wished, rather than hoped, to get him back to Geneva. The causes of Casaubon’s discomfort in Paris were various, but the principal source of uneasiness lay in his religion. The life of any Huguenot in Paris was hardly secure in these years, for it was doubtful if the police of the city was strong enough to protect them against any sudden uprising of the fanatical mob, always ready to re- enact the St Bartholomew. But Casaubon was exposed to persecution of another sort. Ever since the Fontainebleau Conference an impression prevailed that he was wavering. It was known that he rejected the outré

anti-popery opinions current in the Reformed churches ; that he read the fathers, and wished for a church after the pattern of the primitive ages. He was given to understand that he could have a professorship only by recantation. When it was found that he could not be bought, he was plied by con- troversy. Henry IV., who liked Casaubon personally, made a point of getting him to follow his own example. By the king's orders Dupcrron was untiring in his efforts to convert him. Casaubon's knowledge of the fathers was that of a scholar; Duperron's that of an adroit polemist ; and the scholar was driven to admit that the polemist was often too hard for him. These encounters mostly took place in the king's library, over which the cardinal, in his capacity of aumonier, exercised some kind of authority ; and it was therefore impossible for Casaubon to avoid them. On the other hand the Huguenot theologians, and especially Du Moulin, chief pastor of the church of Paris, accused him of conceding too much, and of having departed already from the lines of strict Calvinistic orthodoxy.

When the assassination of Henry IV. gave full rein to the Ultramontane party at court, the obsessions of Duperron became more importunate, and even menacing. It was now that Casaubon began to listen to overtures which had been faintly made before, from the bishops and the court of England. In October 1610 he came to this country in the suite of the ambassador, Lord Wotton of Marley. He

had the most flattering reception from James I., who was perpetually sending for him, to have theological talk. The English bishops were equally delighted to find that the great French scholar was an Anglican ready made, and had arrived, by independent study of the fathers, at the very via media between Puritanism and Romanism, which was becoming the fashion in the English Church. Casaubon, though a layman, was collated to a prebendal stall in Canter- bury, and had a pension of £300 a year assigned him from the exchequer. Nor were these merely paper figures. When Sir Julius Ceesar made a difficulty about payment, James sent a note in his own hand: "Chanceler of my excheker, T will have Mr Casaubon paid before me, ny wife, and my barnes." He still retaincd his appointments in France, and his office as librarian. He had obtaincd leave of absence for a visit to England,

and his permanent settle- ment here was not contemplated. In order to retain their hold upon him, the Government of the queen regent refused to allow his library to be sent over. It required a special request from James himself to get leave for Madame Casaubon to bring hin a part of his most necessary books. Casaubon ,continued to speak of himself as the servant of the regent, and to declare his readiness to return when summoned to do so,

Meanwhile his situation in London gradually developed unforeseen sources of discomfort. Not that he had any reason to complain of his patrons, the king aud the bishops. James continued to the last to delight in his company, and to beas liberal as the state of his finances allowed. Overal had received him and his whole family into the deanery of St Paul's, and entertained him there for a year. Overal and Andrewes, then bishop of Ely, were the most learned men of a generation in which extensive reading was more general among the higher clergy than it has ever been since. These two were attracted to Casaubon by congenial studies and opinions. With the witty and learned bishop of Ely, in particular, Casaubon was always happy to spend such hours as he had to spare from the labours of the study. Andrewes took him to Cambridge, where he met the most gratifying reception from the notabilities of the university. They went on together to Downham, whcre Casaubon spent six wecks of the summer of 1611. In 1613 he was taken to Oxford by Sir H. Savile, where, amid the homage and feasting of which he was the object, his principal interest is for the MSS. treasures of the Bodleian. The honorary degree which was offered him he declined.

But these distinctions were far from compensating the 'serious inconveniences of his position. Having been taken up by the king and the bishops, he had to share in their rising unpopularity. The courtiers looked with a jealous eye on a pensioner who enjoyed frequent opportunities of taking James I. on his weak side—his love of book talk,—opportunities which they would have known how to use, Casaubon was especially mortified by Sir H. Wotton's persistent avoidance of him, so inconsistent with their former intimacy. His windows werc broken by the roughs at night, his children pelted in the streets by day. Ou one occasion he himself appeared at Theobald's with a black eye, having received a blow from some ruffian's fist in the street. Mr Hallam thinks that he had "become per- sonally unpopular ;" but these outrages from the vulgar seem to have arisen

solely from the Cockney's antipathy to the Frenchman. Casaubon, though he could make shift to read an English book, could not speak English, any more than Mme. Casaubon. This deficiency not only exposed him to insult and fraud, but restricted his social intercourse. It excluded him altogether from the circle of the "wits ;" either this or some other cause prevented him from being acceptable in the circle of the lay learned—the "antiquaries."

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Camden he saw but once or twice. Casaubon had been imprudent enough to correct Camdcn's Greek, and it igs possible that the ex-headmaster of Westminster kept him- self aloof in silent resentment of Casaubon's superior learning. With Cotton and Spelman he was slightly acquainted. Of Selden we find no mention. Though Sir Henry Savile ostensibly patronized him, yet Casaubon could not help suspecting that it was Savile who secretly prompted an attempt by Montagu to forestal Casaubon's book on Baronius. Besides the jealousy of the natives, Casaubon had now to suffer the open attacks of the Jesuit pamphleteers. They had spared him as long as there were hopes of getting him over. The prohibition was taken off, now that he was committed to Anglicanism. Not only Eudzemon-Joannes, Rosweyd, and Scioppius, but a respect- able writer, friendly to Casaubon, Schott of Antwerp, gavo currency to the insinuation that Casaubon had sold hig conscience for English gold.

But the most serious cause of discomfort in his English residence was that his time was no longer his own. He was perpetually being summoned out of town to one or other of James's hunting residences that the king might enjoy his talk, He had come over from Paris in search of leisure, aud found that a new claim on his time was established. The king and the bishops wanted to employ his pen in their literary warfare against Rome. They compelled him to write first one, then a second, pamphlet on the subject of the day,—the royal supremacy. At last, ashamed of thus misappropriating Casaubon's stores of learning, they set him upon a refutation of the Annals of Baronius, then in the full tide of its credit and success, Upon this task Casaubon spent his remaining strength and life. He died in great suffering, lst July 1614. His complaint was an organic and congenital malformation of the bladder; but his end was hastened by an unhealthy life of over-study,

and latterly by his anxiety to acquit himself creditably in his criticism on Baronius. He was buried in Westminster Abbey. ‘The monument, by which his name is there commemorated, was erected many years later by his friend Thomas Morton, then (1632) become bishop of Durham.

Besides the editions of ancient authors which have been mentioned, Casaubon published with commentaries Persius, Suetonius, the Scriptores Historic Auguste. Polybius, on which he had spent vast labour, he left unfinished. His most ambitious work was his revision of the text of Athenzeus, with commentary. The Theophrastus perhaps exhibits his most characteristic excellencies as a com- mentator. The Lzxercitationes 1» Baronium are but a fragment of the massive criticism which he contemplated, and failed in bringing before the reader the uncritical character of Baronius’s history. His correspondence (in Latin) was finally collected by D’ Almeloveen (Rotterdam, 1709), who prefixed to the letters a careful life of Isaac Casaubon.. But this learned Dutch editor was only acquainted with Casaubon’s diary in extract. This diary, Ephemerides, of which the MS. is preserved in the chapter library of Canterbury, was printed in 1850, by the Clarendon Press. It forms the most valuable record we possess of the daily life of a scholar, or man of letters, of the 16th century.

For a characteristic of Casaubon’s labours as a commentator and critic, a detailed account of his life, and a chronological list of his publications, the reader is referred to a work by the writer of the present article, Zswac Casaubon (1559-1614), 8vo, Lond., 1875. (M. P.)

CASBIN, Kasvin, Kazprn, a city of Persia, in the province of Irak, in 36° 12’ N. lat. and 49° 53’ E. long., and 108 miles W.N.W. of Teheran. It’is built in a fertile plain, south of Mount Elburz, and is square in form, and surrounded by a wall of brick, with towers. Its extent is

greater than that of Teheran ; but the place has been repeatedly shaken by earthquakes, and many of the streets are in ruins, as are most of the magnificent buildings seen here by Chardin in 1674. The most remarkable remains are the palace of the Sufi princes, and the mosque, with its large dome. The city is said to have been, founded in the 4th century. Inthe 16th

century Shah Tamasp made it the capital ; and it remained so till Shah Abbas the Great transferred the seat of government to Ispahan. The town still bears the name of Dar-el-Sultanet, or the “seat of royalty.” The dust and heat of the place are very oppressive ; it is furnished, however, with baths, and with cisterns fed by underground canals, The system of irrigation formerly carried on by these canals or kanauts rendered the Plain of Casbin one of the most productive regions of Persia. They are now mostly choked up, except in the immediate vicinity of the city. The manufactures of Casbin are velvet, brocades, carpets, a kind of coarse cotton-cloth termed kerbas, and sword-blades. The trade of the city is still considerable; great quantities of rice, and of silk for Baghdad and India, are brought to it from the Caspian provinces; and the bazaars are large. Casbin is also of some military importance, lying as it does at the entrance of the defile which leads into Ghilan. It is the birthplace of the poet Lokman, and of the geographer Ham el Oullah. Population in 1868 estimated at 25,000.

CASCIANO DEI BAGNI, a village of Italy in the province of Siena and district of Montepulciano, in the valley of the Paglia. It possesses warm mineral springs, and its bathing establishments attract a large number of visitors. Population, 3585. :

CASERTA, the capital of the district of Terra di Lavoro, in the province of Naples, and an episcopal see. It is situated on a rich alluvial plain, and has nearly 30,000 inhabitants. Caserta is mainly noticcable for its huge palace built by Vanvitelli for Charles III, which has a reputation that most architectural judges would probably deem to be superior to its merits. It is one of the stock sights for visitors to Naples, and has for many years served to but little other purpose. The length of the south front is stated to be 780 feet, the height 125 feet, and the number of windows in each floor 37; and such details as these best express the merits of a pile, which is in truth a monument of vulgar ostentation and wasted wealth. The harmony of the design is praised, and the building in truth possesses that easily-attained harmony which results from perfect symmetry. The travertine of which it is built was brought from the quarries of St Jorio, near Capua. The great staircase, gorgeously lined with lumachello marble from Trapani, has, however, some originality of conception and merit of design and execution. Besides all the usual appurtenances of a palace, including a chapel gorgeous

with lapis-lazuli and gilding, the building contains a theatre, with, as the visitor is told, forty boxes, besides that of the royal family. The palace is at present wholly useless, and serves only to lay an additional burden on the king of Italy's civil list, which is charged with the maintenance of 80 vast a number of now unneeded palaces, the heritage of all the sovereigns he has superseded. The gardens, adorned with numerous cascades and much decorative sculpture after the old Italian fashion, are perhaps better worthy of mention than the palace. They are extensive and command some fine points of view. The " English garden" was made by Queen Caroline in 1782. The property was bought by Charles III. from the dukes of Sermoneta, and the palace was begun in 1752. Caserta Vecchia—old Caserta—was situated on the hills behind the modern town. It was built by the Lombards, as is said, in the 8th century, and some remains of its old walls and bastions may still be seen,

CASHAN, or Kasuay, a city of Persia, in the province of Irak, 92 miles north of Ispahan, in a dry and stony plain, in 33° 52' N. lat. and 51° 20' E. long. The city is said to have been founded by Zobeide, wife of Haroun el Raschid. The manufactures are silk-brocades, carpets, cottons, gold and silver articles, and copper kettles. The city has a palace, many fine mosques, bazaars, and cara- vanseries. At the foot of the neighbouring hills, four niles away, are the villa and beautiful gardens of Feen, the scene of the official murder, 9th January 1852, of Amiru-'n- Nizam, one of the ablest ministers that Persia has had in modern times, The chief pavilion of the villa is in the form of a kiosk, with a projecting portico infront. The interior is decorated with fine arabesques. The vicinity of Cashan is famous for its scorpions. The city suffered from an earthquake in 1853. Population, 25,000.

CASHEL, an inland city of Ireland, in the county of Tipperary, 108 miles south-west from Dublin, and within 5 miles of the Great Southern and Western Railway. The town, which lies at the base of the Rock of Cashel, consists for the most part of a wide and well-built main street, and contains several public buildings, such as a court-house, a market-house, a fever hospital, barracks, and an infirmary. There are also the new cathedral, the

deanery house (once the bishop's palace), and a Roman Catholic church, while immediately outside the town there is the union workhouse. Formerly an archiepiscopal see, Cashel was reduced in 1833 to a bishopric, but the bishop does not now reside there. The town's revenue is derived from landed estates in the neighbourhood, the gift of Bishop Maurianus. It formerly returned one member to Parliament, but was disfranchised in 1870. Population in 1851, 4798, and in 1871, 4562.

The Rock of Cashel is the object of chief interest in the place. This elevation of limestone formation rises abruptly from the plain to a height of about 300 feet, and is a commanding object for many miles around. Its summit is occupied by the most interesting assemblage of ruins in Ireland, consisting of the remains of St Patrick's Cathedral, a round tower, Cormack's Chapel, and an ancient cross. The chapel, which is said to have been erected by King Cormack M'Carthy in the 12th century, is considered to be the oldest stone edilice in the country. Iu its style it combines the high stone roof with the richest Norman decoration. The cathedral is cruciform in its design, and contains many interesting sculptures and tombs. In the adjoining cemetery there stands, on a rude pedestal, the "Cross of Cashel," with an effigy of St Patrick sculptured on its side. The round tower, situated at the north-east angle of the cathedral, rises about 90 feet, with a circumference of 58 feet, and unlike the neighbouring ruins has been built not of the limestone of the "Rock" but of freestone.

The history of Cashel belongs to the early period of Irish chronology. A stronghold in the time of Brian Boroimhe it afterwards became noteworthy as the place where Henry II. received the homage of O'Brien, king of Limerick, and still later, where Edward Bruce held his Irish parlia- ment. The cathedral was burnt in 1495 by the earl of Kildare. Two other interesting ruins exist at the base of the Rock, viz., Horn Abbey, founded in the 13th century, and the Dominican Priory, belonging to the same period.

CASHEW NUT, the fruit of the Cashew, Cadju, or Acajou tree, Anacardium occidentale (Nat. Ord, Ana- cardiacece), a native of the West Indian Islands. The fruit is kidney-shaped, about an inch in length, and the kernel is enclosed in two coverings, the outer of which is smooth, grey, and leathery. Inside this external rind is a dark- coloured layer, containing an

excessively acrid juice. The kernels have a bland, oily, pleasant taste. They are much eaten, both raw and roasted, in the tropical regions in which the tree is cultivated, and they yield a light-coloured,

sweet-tasted oil, said to be equal to olive oil for culinary purposes. ‘he fruit-stalk, immediately under the fruit, is swollen and fleshy, and assumes a pear-like shape. This swollen portion of the stalk has a pleasant acid taste, and is eaten under the name of Cashew Apple. By fermenta- tion it yields an alcoholic beverage, from which a spirit for drinking is distilled in the West Indies and Brazil. The tree also yields a gum analogous to gum arabic.

CASHGAR. See Kasucar.

CASHMERE. See Kasumir.

CASINO. See Monte Casino.

CASIRI, Micuart (1710-1791), a learned Maronite, was born at Tripoli in 1710. He studied at Rome, where he afterwards for ten years taught Arabic, Syriac, and Chaldee, and gave leetures in philosophy and theology, In 1748 he went to Spain, and was employed in the royal library at Madrid. He was successively appointed a member of the Royal Academy of History, interpreter of Oriental languages to the king, and joint-librarian of the Escorial. In 1763 he became principal librarian, a situa- tion which he appears to have held till his death in 1791. Casiri published a work entitled Bibliotheca Arabico- Hispana LEscurialensis, 2 vols. fol., Madrid, 1760-1770. It is a catalogue of above 1800 Arabic MSS., which he found in the library of the Escorial ; and it also contains a number of quotations from Arabic works on history. The MSS. are classified according to the subjects of which they treat. The second volume, which is furnished with a copious index, gives an account of a large collection of geographical and historical MSS., which contain valuable information regarding the wars between the Moors and the Christians in Spain. A full view of the contents of the whole work, with some political comments, is given in the first appendix to Harris’s Philological Inquiries, and in the second appendix to Berington’s Literary History of the Middle Ages. ; :

CASORIA, a town of Italy, five miles north-east of Naples, in one of the most fertile districts of the Terra di Lavoro. . Itis the birthplace of the painter Pietro Martino. Population about 7000.

CASPE, a city of Spain, in the province of Aragon, about 55 miles south-east of Saragossa on the banks of the River Guadaloupe, which runs into the Ebro a short distance below the town. Its prosperity is due to the mines of iron and of coal which abound in its vicinity, and which have given rise to manufactories. It has a castle and several convents and hospitals, and is famous in history as the scene of the congress of the Aragonians, Catalonians, and Valencians in 1412, which elected Ferdinand of Castile to the throne. It was captured from the Moors by Alphonso II. in 1168, and bestowed on the knights of St John. Population in 1867, 9403.

CASPIAN SEA. ‘The Caspian Sea, which was known under that name to the Greeks and Romans (Herodotus having given a generally accurate account of it, stating that it is an inland sea having no connection with the ocean), is the largest of those salt lakes or closed inland seas which may be considered as “survivals” of former oceanic areas; and it is the one whose physical and biological conditions have been most fully studied! These conditions are in many respects extremely peculiar; and tolerably certain conclusions of great interest may be drawn from them, in regard to the past history of the large extent of low steppes that lie—chiefly in Asia, but partly in Europe also—to the east, north, and west of its present area. These will be most fitly considered after a general survey has been taken of the existing basin of the Caspian, and of its relations to the surrounding land.

} See especially the “ Kaspische Studien ” of Prof. Von Baer, in the Bt Petersburg Bull. Sci., and in.Erman’s Archiv. Russ., 1855, 1856.

The general form of the Caspian may be described as a broad band, with sides almost straight and parallel, except near its northern end, where it turns sharply round to the east. The general direction of its axis is about N.N.E and 8.8.W., ranging from lat. 47° 20’ to 36° 40’ N..—its most northerly point nearly coinciding with the mouth of the River Ural, and its most southerly being about half. way between the towns of Reshd and Astrabad. The distance in a straight line between these two points is about

740 miles in a straight line. The average breadth of its middle portion is about 210 miles, but the eastern extension of its northern portion into the Bay of Mertvy Kultuk increases the width of that part to 430 miles; and its southern portion also widens to nearly 300 miles. The total area is estimated at about 180,000 square miles,

The most important fact in the-physical geography of the existing Caspian is that its surface is 84 feet below that of the Black Sea, which may be considered as not differ. ing much from the general oceanic level.

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Sketch Map of Caspian Sea,

The basin of the Caspian may be considered as consist- ing of three distinct parts,—the northern, the middle, and the southern. The xorthern portion is extremely shallow,— its bottom, which is nowhere more than 50 feet below the surface, being a continuation of the almost imperceptible slope of the steppe, so that there is no definite shore-line. It is into this portion that the Volga, the Ural, and the Kuma discharge themselves ; and the deposit of alluvium which these rivers bring down is gradually raising its bottom, and

will in time convert it into a salt marsh. Along the north-western border of this basin, from the delta of the Volga to that of the Kuma, a space of 250 miles, the shore is gashed with thousands of narrow channels, termed dimans, from 12 to 30 miles in length, separated by chains of hillocks called bugors, which pass landwards into the level ground of the steppes. In the neighbourhood of the mouths of the Volga and Kuma, the excess of water which these riyers bring down at the time

of the melting of the snows passes into these channels, and tends to keep them open; so that when the inundation is over, the sea again flows into them. But along the inter- vening part of the coast, the channels, like the intervening hillocks, are not continuous, but form chains of little lakes, separated by sandy isthmuses. Although these channels run nearly parallel to each other, yet they have a some- what fan-like arrangement ; their centre of radiation being the higher part of the isthmus which separates the basin of the Caspian from the north-east portion of the Black Sea, —a fact, as will be seen hereafter, of no small significance. The coast-line of the Bay of Mertvy Kultuk, on the other hand, is formed by a chain of low calcareous hills, con- stituting the rampart of the plateau of Ust Urt or Turkoman Isthmus, which divides the Caspian from the Sea of Aral ; and it is between head-lands of this high plain that the long extension of this bay termed the Karasu (or Black Water) runs inland, the town of Novo Alexandrovsk being situated near its entrance.

The northern basin of the Caspian may be considered to terminate on the west side with the Bay of Kuma, and on the east with the hilly peninsula of Mangishlak, on which the town of Novo Petrovsk is situated. To the south of the line joining these points, in the parallel of 44° 10′ N. lat., the western shoreline is higher, and the water deepens considerably,—thus forming the mddle basin of the Caspian, which may be considered to extend as far south as Cape Apsheron, the south-eastern termina- tion of the great Caucasian range. This middle basin receives the large river Terek, which discharges itself by several mouths (some of them entering the Bay of Kuma) through an alluvial delta; and several smaller streams flow into it from the slopes of the Caucasian mountains through the low plain which intervenes between

their base and the border of the Caspian. Near the most consider- able of these, the Kabir Yalama, a rocky spur of the Caucasus comes down nearly to the sea; and a narrow pass is thus formed, which has been fortified from very ancient times, being formerly known as the Albazce or Caspice Pyle, and now as the Pass of Derbend, this being a small town built on the declivity in which the range terminates. The eastern shore of this portion of the Caspian is formed by the plateau of Ust Urt, or “high plain,” a very remarkable plateau from 550 to 727 feet above the level of the Caspian, which extends from its eastern shore to the sea of Aral, rising abruptly from oth seas, and ranging about 400 miles in the north and south direction; its north and south borders are formed by a precipitous face or cliff, which has much the appearance of an ancient sea-margin. As it is composed of later Tertiary strata, its elevation must have occurred at a time not geologically remote. The headlands of the Ust Urt form an abrupt coast-line along the northern part of the eastern border of the middle basin, with occasional bays into which several small streams from the plateau discharge themselves. Further south, however, the plateau recedes, and the land shelves off more gradually ; and here an extensive but shallow basin presents itself (of which more will presently be said) almost entirely cut off from that of the Caspian, termed the Karaboghaz, or Black Gulf. To the south of this the coast-line rises again ; and a peninsula is formed by an extension of the Balkan Mountains, which may be considered as forming the southern termination of the middle basin. Except along the shore-lines, the depth of this basin everywhere excedes that of the northern,—being greatest in its middle portion, where over a small area it reaches 400 fathoms, whilst it shallows again towards the south, where there is a sort of ridge between Cape Apsheron and the Balkan peninsula, at the average depth of 30 fathoms, that separates it from the southern basin.

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The southern basin ranges from the Balkan Peninsula on the east and Cape Apsheron on the west to the shore-line formed by the base of the great Elburz range of mountains, which curves round its low and swampy border, from the mouth of the Kur to Astrabad, at an average dis- tance of about 40 miles, rising in the peak of Sawalan near Tabreez to 15,800 feet, and in the snow-capped summit of Demavend, on whose southern slope Teheran is

situated, to 18,600 feet. These mountains are composed of granite and porphyry, and are covered with recent volcanic deposits. South of Cape Apsheron, this basin receives the large river Kur, which drains the southern slopes of the Caucasian range; and this is joined, at no great dis- tance from its mouth, by another large river, the Aras or Arax (the ancient Araxes), which forms the boundary between Russian Trans-Caucasia and Persia. The joint channel discharges its water by several mouths, part of them opening into the Gulf of Kizil-Agatch, which is the most considerable extension of the southern basin. From the mouths of the Kur to the Gulf of Enzeli, which resembles the Karaboghaz ona smaller scale, there is no considerable stream; but not far to theeast of the town of Reshd of which Enzeli is the port, the Scfid or White River discharges itself, this being formed by the confluence of the Kizil-Uzen with another considerable river, the two together draining a large portion of the slopes of the western division of the Elburz range, and of its extension towards the Caucasus. The southern border of the Caspian, between the mouth of the Sefid and Astrabad, receives numerous small streams from the northern slopes of the Elburz, but no considerable river ; the Bay of Astrabad, however, receives at its northern end the Attruk, a river of considerable importance, which drains an extensive valley enclosed by the mountain ranges that form the southern border of the desert plains of Khiva. On the eastern coast, opposite to the Gulf of Kizil-Agatch, are the Balkan Bay and the Adji-Bojur Bay, which lie between extensions of the Balkan Mountains. One or both of these bays, it may now be pretty confidently stated, formerly received the mouths of the ancient Oxus (now Amou-Daria), when it discharged itself into the Caspian, instead of into the Sea of Aral; and there is further reason to believe that a communication here at one time existed between the Caspian and the Sea of Aral, through a furrow which lies along the southern border of the Ust Urt, and which terminates in what was formerly known as the Gulf of Aboughir, a southern extension of Lake Aral now dried up. The depth of the southern basin of the Caspian is for the most part considerable, ranging in its central portion between 300 and 500 fathoms.

Drainage Area.—The drainage-area of the Caspian is much more extensive on the north and west than on the east and south. The Volga is estimated to drain an area of 527,500 square miles, and the Ural an area of 85,000 square miles,—these two rivers together probably bringing down more water than

the Danube and the Don pour into the Black Sea. When to these we add the Kuma, the Terek, the Arax and Kur, the Sefid, and the Attruk, it is obvious that the total amount of river water annually discharged into the basin of the Caspian must be almost, if not quite, the equal of that which is discharged into the basin of the Black Sea. Yet the whole amount of fresh water returned by rain and rivers to the basin of the Caspian is only sufficient to compensate for the loss by evaporation from its surface,—as is shown by the fact that its present level remains constant, or, if it changes at all, rather sinks than rises. Now thatthe level of the Caspian was formerly about the same as that of the Black Sea, although at present 84 feet below it, is shown by the erosion of the rocks that formed the original sea-shore of

the southern basin, which, at the height of from 65 to 80 feet above the present level, have been furrowed out into tooth-shaped points and needles ; and if the water were again to rise to that level, it would overflow many hundred thousand square miles of the southern steppes, extending the area of the basin as far as Saratov. Now supposing the Caspian to have been formerly in communication with the general oceanic area (which will be hereafter shown to be almost a certainty), a reduction of its level and a contraction of its area would follow as a necessary consequence, whenever that communication was cut off. For, as the evaporation-area would have then been much greater than it is at present, whilst the drainage-area would have been the same, there must have been a great excess of loss by evaporation over the water returned by rain and rivers; and this excess, producing a reduction of level, would have reduced the area of the northern shallow portion, until it contracted itself within its present limits. That this reduction was rapid, is indicated by two sets of facts ;—first, the absence of any erosion of rocks between the level of the old erosion and the present level ; and second, the fan-like arrangement of the dimans and intervening bugors on the north-west shore, which makes it difficult to suppose that these channels can have been formed except by the furrowing of the soft soil during the sinking of the water, corresponding to that which is seen on

a small scale on the muddy banks of a reservoir in which the water is being rapidly lowered by the opening of a sluice-gate.

Salinity of the Water of the Caspian.—It might have been anticipated that such a reduction in the volume of the Caspian water as must have taken place in this lower- ing of its level, would have shown itself (as in the Dead Sea) ip an increase of its salinity ; whereas the fact is that the proportion of salt in the water of the Caspian, though varying in different parts of the basin, and also at different seasons, is generally much less than the proportion in oceanic and even in Black Sea water.

In the northern portion, whose shallowness causes the enormous amount of fresh water brought down by the Volga, the Ural, and the Terek to exert the greatest diluting influence, the salinity is so slight (especially when the ordinary volume ~~of these rivers is augmented by the melt~~ ing of the snows) that the water is drinkable, its specific gravity not being higher than 1:0016. In the central and southern basins, on the other hand, which contain a body of salt water too large to be thus affected, the salinity is stated by Von Baer to be about one-third that of ordinary sea-water, the average sp. gr. being about 1°009. This re- duction from what may be presumed to have been its original amount seems fully explained by Von Baer, who traces it to the number of shallow lagoons with which the basin is surrounded, every one of them being a sort of natural salt-pan for the evaporation of the water and the deposit of its saline matter in the solid form. The process may be well studied in the neighbourhood of Novo Petrovsk, where what was formerly a bay is now divided into a large number of basins presenting every degree of saline con- centration. One of these still occasionally receives water from the sea, and has deposited on its banks only a thin layer of salt; a second, likewise full of water, has its bottom covered by a thick crust of rose-coloured crystals like a pavement of marble; a third exhibits a compact mass of salt, on which are pools of water whose surface is more than a yard below the level of the sea; and a fourth has lost all its water by evaporation, the stratum of salt left behind being now covered with sand. A. similar concentration is taking place in the Karasu; for notwith- standing the proximity of the mouths of the Ural and Volga, the proportion of salt there rises to such a degree (the sp.

gr. being 1:057) that animal life is almost, if not entirely, suppressed. In the Peninsula of Apsheron, again, there are ten salt lakes, from one of which 10,000 tons of salt are annually obtained.

This process of elimination goes on, however, upon its greatest scale in the Karaboghaz, whose nearly circular shallow basin, about 90 miles across, is almost entirely cut off from the Caspian by a long narrow spit of land, communicating with it by a channel which is not more than about 150 yards broad and 5 feet deep. Through this channel a current is stated by Von Baer to be continually running inwards (during the summer months, at least) at an average rate of three miles per hour; this rate being accelerated by westerly and retarded by easterly winds, but never flowing at less than a mile and a half per hour. The navigators of the Caspian, and the Turkoman nomads who wander on its shores, struck with the constant and unswerving course of this current, have supposed that its waters pass down into a subterranean abyss, through which they reach either the Persian Gulf or the Black Sea,— an hypothesis for which there is not the least foundation, and which is directly negatived by comparison of levels, The current is really due to the indraught produced by the excess of evaporation from the surface of the basin, which is exposed to every wind and to intense summer heat, and which receives very little return from streams, The small depth of the bar seems to prevent the return of a counter-current of highly saline water, such as, in the Strait of Gibraltar, keeps down the salinity of the Mediterranean (see MEDITERRANEAN), none such having been detected by the careful investigations of Von Baer. And thus there is a progressively increasing concentration of the contents of the basin of the Karaboghaz, so that seals which used to frequent it are no longer fonnd there, and its borders are entirely destitute of vegetation. Layers of salt are being deposited ou the mud at the bottom; and the sounding-line, when scarcely out of the water, is covered with saline crystals. Taking the lowest estimates of the salinity of the Caspian water, of the width and depth of the chaunel, and of the speed of the current, Von Baer has shown that the Karaboghaz daily withdraws from the Caspian the enormous quantity of 350,090 tons of salt.

Now, if such an elevation of the bar were to take place as should cut off the basin of the Karaboghaz from that of the Caspian, the former would quickly diminish in ex- tent, and the concentration of its waters would cause an increased deposit of salt to take place on its bottom. According to the proportion between the evaporation from the area so reduced and the return of fresh water by rain and streams, the Karaboghaz would either be converted into a shallow lake of extremely salt water, or into a salt marsh, or might altogether dry up and disappear, leaving behind it a thick bed of “rock-salt” resembling the deposits contained in the Saliferous strata of various geological periods. These several conditions all obtain at the present time in different parts of the great area of the steppes of Southern Russia. There are several small salt lakes which receive water enough from rain, snow, and streams to compensate for the loss they sustain by evapora- tion ; these especially occur in the Kirghiz steppes, which lie to the north-east of Astrakhan, between the Volga and the Mongodjar Hills that form the southern extremity of the Ural range; the most notable of them being Lake Elton, which lies about 200 miles to the north of the present border of the Caspian, and from which large quantities of salt are annually procured. There are large tracts of these steppes, again, which are alternately muddy and white with salt, according as they are moistened by rain or dried up by the heat of the sun; one of these, lying between Lake Elton and the River Ural, occupies a

depressed area about 79 feet below the present level of the Caspian, and more than 160 feet below that of the Black Sea, Everywhere the sand of these steppes contains an admixture of salt; and there are various local accumula- tions of salt, often associated with marl, having shells and fish-bones imbedded in them, and thus clearly marking the sites of lakes which survived for a time the reduction of level and recession of the northern border of the Caspian, but which are now entirely dried up.

Climate of the Caspran.—The temperature of the Caspian area is remarkable for its wide range, both geographical and seasonal,—the difference between the mean winter temperatures of its northern and southern extremities being very great, whilst over its whole extent a high

summer temperature prevails. The January isotherm of 15° skirts its northern border; that of 20° crosses it at the line of division betwecn its northern and middle basins; that of 30° crosses it between its middle and its southern portions ; and that of 40° skirts its southern border. Thus between the mean winter temperatures of the northern and southern extremities of the Caspian there is a geographical range of 95°, These means, however, do not indicate the extremely low temperatures which prevail over the whole region of the steppes during the prevalence of north-east winds ; the thermometer then sinking to — 20°, or even lower, on the level areas, whilst on the elevated plateau of Ust Urt a temperature of —30° is nothing remarkable.' The July isotherm of 75°, again, crosses the middle basin of the Caspian, nearly coinciding with the January isotherm of 25°; and that of 80° skirts the southern border of the sea, nearly coinciding with the January isotherm of 40°; so that the mean annual range is 50° over the northern portion of the basin, and 40° at its southern extremity. These sum- mer means give no truer indication than the winter means of the extremes of temperature occasionally reached ; thus Major Wood saw the thermometer mark 110° in the shade on the bank of the Oxus, recalling to his recollection the intense heat of Anncsly Bay in the Abyssinian expedition.

The shallow nortlicrn basin of the Caspian is frozen during the entire winter, and the ice sometimes extends to the middle basin ; the deep southern basin, on the other hand, is never frozen over.

The prevalent winds of the Caspian are the south-east, which usually blow between October and March, and the north or north-west, which are common between July and September. They sometimes continue with great violence for days together, rendering navigation dangerous, and inundating the shores, wherever these are low and flat, against which they blow. The same cause tends to disturb the general level of the water, which is raised or lowered by from 4 to 8 feet at the north or the south end of the basin, according to the direction of the wind; and when this changes suddenly, as it often does, strong currents are gencrated. There are no perceptible tides in the Caspian ; aud the changes of level occasionally observed without any wind to account for them seem attributable on the one hand to inequality between the evaporation and the return of water by rain and rivers, and on the other to differences in atmospheric pressure between one part of the area

and another, such as alter the level of the Baltic (see Baxric). It was stated by Colonel Monteith (Royal Geographical Journal, vol. iii.), that during his residence in that part of Asia from 1811 to 1828, the Caspian, “ as well as every other lake in Persia, had sensibly decreased in depth ;” but

according to the information given him by the inhabitants of Enzeli, there is a rise and fall of several feet in periods of thirty years; and Von Baer, by whom the question was

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1 Tt was here that the expedition of Peroffsky, in 1839-40, lost all

but 200 of its 12,800 camels.

carefully examined, could not obtain an evidence that any continuous reduction of level is at present in progress.. There is indecd reason to believe that the level of the Caspian was once much lower than it is at present ; for at Derbend, whose foundation is assigned to Alexander, masonry has been ascertained to exist at a depth of 50 feet below the present surface level; and as it is recorded that the Khorasmians made an offer to Alexander to conduct his army to Colchis, it would seem as if the ridge at the southern end of what is now the middle basin could then have been crossed dry-shod. This does not appear very improbable, if, as ancient geographers and historians ex- plicitly state, the Volga flowed in their time, not into thie Caspian, but into the Sea of Azoff,—a condition which seems to have persisted as late as the 5th century. The channel of its lower part would then have been that of the present River Don, which at one part approaches so closely to that of the Volga, that the two are united by a canal of less than 50 miles’ length.

Fauna of the Caspian.—The auimal life of this inland sea presents a remarkable admixture of marine and fresh- water types. The presence of scals and herrings secms an unmistakable indication of its former communication with the ocean,—and this rather northwards with the Polar Sea than westwards through the Black Sea and Mediterranean. Again, the

Caspian abounds in salmon, a fish that may be considered essentially marine, though resorting to rivers to breed, And among its most notable and valuable inhabi- tants are four species of Stwricnida—the sturgeon, the sterlet, the sevriouga, and the beluga—which are essentially estuary fish, ascending rivers from their mouths. The fisheries are extremely valuable,—a very large amount of fish being salted for transmission to distant parts, while the Sturionids afford the principal supply of caviare (prepared from their roe) and of isinglass (their swim- bladders cut into strips) for the whole world. The Molluscan fauna is not by any means proportionally numerous or varied. It principally consists of these wide- spread marine forms which are able to adapt themselves to a variety of conditions, and especially to a reduction in the salinity of the waters they inhabit, which (as in the parallel case of the Baltic) tends to dwarf the races of mollusks subjected to it.

Naphtha and Petroleum Springs.—Various parts of the shore of the Caspian abound in naphtha and petroleum. This is especially the case with the Peninsula of Apsheron, and with the Island of Tchilehon or Naphthalia, which lies near the opposite coast, off the Bay of Balkan. The whole

soil of Apsheron is said to be saturated with naphtha, which

rises wherever a hole is bored; and round the town of Baku there are nearly a hundred bituminous springs, from many of which considerable supplies of naphtha are drawn. Some of tliese are constantly burning; and one of them. termed the “burning field,” was formerly a celebrated “ shrine of grace ” to the Ghebers or Parsees, multitudes of pilgrims resorting to it, as Mahometans do to Mecca. Former Extent of the Caspian.—From what has been stated, there can be no reasonable doubt (1) that the area of the Caspian must have formerly been much more exteu- sive than at present, and (2) that it must at some time have had free communication with the ocean. It was long since pointed out by Pallas that the presence of salt lakes, dry saline deposits, and sea shells of the same spccies as those now inhabiting the Caspian, over a very large extent of the steppes to the east, north, and west of the present basin, can only be accounted for on such an hypothesis ; and he traced out what may probably be regarded as a northern

shore-line, along the base of the Mongodjar hills. Further, the fauna of the Caspian corresponds so remark-

ably with that of the Black Sea on the one side, and with

that of the Sea of Aral on the other, that it can scarcely be doubted they were formerly in free communication with one other; and the lincs of this communication can be pretty certainly traced out by the peculiar lowness of the levels. Thus bétween the Caspian and the Black Sea, or rather the Sea of Azoff, it would have lain across the low-lying portion of the steppe, which is at present a receptacle for the drainage of the surrounding area, forming the long and shallow Lake Manytsch. And between the Caspian and the Aral Sea it probably followed both the northern and the southern borders of the Ust Urt, which would have thus formed an insulated platform. If the elevation of level were sufficiently great to raise the water in Lake Aral to the height which it had in former times (as is shown by various clearly discernible landmarks), it would have overflowed a large area to the south also; and of this again, some parts of the coast-line are traceable. A very slight further elevation would bring it into com- munication with the Arctic Sea.

There is much to support this view, not only in the writings of ancient geographers and in the incidental notices which have been gleaned from the records of early travel, but also in the physical relations of the three basins now forming separate seas. For if the outlet of the Bosphorus were closed, the progressive accumulation of the excess of fresh water which at present escapes from the Black Sea by that channel (see Buack Sea), would in no long time cause an overflow into the basin of the Caspian ; since, although the Black Sea proper is separated from the southern portion of the Caspian by the mountainous region of the Caucasus, yet between the Sea of Azoff and the northern portion of the Caspian there is only the low steppe inhabited by the Don Cossacks and the Kalmucks ; and, according to Major Wood, au elevation of the Black Sea to no more than 23 fcet above its present level would cause it to overflow into the basin of the Caspian by the line of the Manytsch. The continuance of such an overflow would in time raise the Caspian to the same level, and would thus produce (as already

shown) an immense extension of its area. For although that area would be prevented by the interposition of the Ust Urt from directly spreading towards the Sea of Aral, yet a continued rise of the Caspian would enable its water to find its way along the north andsouth of that plateau, so as to extend itself over a large part of the Aralo-Caspian depression, including what is new the isolated Sea of Aral, and completely surrounding the Ust Urt, which would rise as an island in the midst of it. A rise of 158 feet above the sea would bring it up to the level of the Sea of Aral ; and it is considered by Major Wood that a further rise of about 62 feet, making 220 feet in all, of which there is distinct evidence in horizoutal water-marks, would cause this Asiatic Mediterranean to overflow its northern boundary into the watershed of the Tobol, one of the tributaries of the Obi, through which its water would be discharged into Polar Sea. And it isa fact of no little interest, that the existence of such a communication between the Aralo- Caspian basin and the Northern Ocean was most distinctly affirmed by Strabo and other ancient geographers.

Now, as there is strong reason to suspect, from the evidence of recent volcanic change in that locality, that the opening of the Bosphorus took place within a period which, geologically speaking, was very recent, it does not seem at all improbable that this event (which some writers identify with the deluge of Deucalion) was the commence- ment of a series of changes, by which the “Asiatic Mediter- ranean” came to be divided into the three separate basins which now constitute its “ survivals.” Supposing, then, the level and extent of this great inland sea to have been formerly such as just described, the effect of the

opening of the Bosphorus would of course be to lower its surface and to contract its area. So long as the Caspian retained its communication with the Black Sea, it would remain at the general oceanic level,—the excess of the river drainage into the western basin (including that of the Volga) supplying what was deficient in the eastern. But if, by a slight elevation of the intervening isthmus, this communication were cut off, the excess of evaporation over the Caspian area (which would have been previously separ- ated from the Aral Sea) would have reduced its level all the more

rapidly, when the Volga, which now furnishes its principal supply, was not one of its affluents; and we can thus account for that depression of its surface much below its present level, which seems to have existed in the time of Alexander. By the subsequent deflection of the lower part of the Volga from the Sea of Azoff into the basin of the Caspian, the level of the latter would have been raised again, and its area extended, until that equality came to be established between the evaporation-loss and the river-supply which obtains at the present time.

The changes produced in the eastern portion of the ‘Asiatic Mediterranean” by the opening of the Bosphorus would have been yet more considerable. In consequence of the greater elevation of the Aralian area, a comparatively slight reduction of level would have served to lay dry a large proportion of it, and to cut off all communication with the Caspian except by a narrow outlet; and the mainte- nance of the level in what thenceforth existed as an isolated basin would depend upon the relation betwcen its evapora. tion and its river-supply. This supply is mainly derived from two principal rivers :— the Syr Darya (the ancient Jaxartes), which takes its rise in the high valleys to the east of Kokand, flows through that khanate in a westerly direction, and now, after passing Khojend, turns suddenly northwards, and then to the north-west, and finally discharges itself into the Sea of Aral near its northern extremity; and the Amou Darya (the ancient Oxus), which rises in the plateau of Pamir and the high valleys of the Hindu Kush— its sources being in close proximity to those of the Indus,— and then, rapidly descending into the great Turcoman Plain, at present continues onwards in a north-west direction to Khiva, after passing which it flows into the southern end of the Aral Sea. A large proportion of the water of both these rivers, however, is withdrawn from them in the latter part of their course,—partly by percolation through the sandy soil (there being no defined river-beds), and partly through the extensive irrigation by which the dwellers along their course render productive the otherwise barren land. The supply which they bring to the existing Aral Sea does not suffice to keep it up to its present level, as is proved by recent exact observation ; and it is clear, there- fore, that even the whole body of water they bring down could not have maintained the level of the far larger area over which it must have originally spread, and that this must consequently have been rapidly reduced. Now there is very distinct evidence, both historical and physical, that the Oxus,

within a comparatively recent period, flowed westwards across the desert of Khwarezm, near the parallel of 39° N.,and discharged itself into the Caspian basin through the Balkan Bay. And there is also much reason to believe that the Syr Darya also, or a considerable part of it, once flowed westwards where it now takes its northerly bend, crossed the desert of Kizzel Koom, and finding its way into the Uzboy furrow which skirts the southern border of the Ust Urt, poured its water into the Caspian. Thus the area now occupied by the Aral Sea, deprived of its two main afiluents, must either have entirely dried up, or have been reduced toa salt marsh, until a change in their course filled its basin to somewhat above its present level.

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Thus it would appear that the condition of the Aralo- Caspian area must have undergone very considerable alterations within the historie period; and it is main- tained by Major Wood (Zhe Shores of Lake Aral, 1876) —who has recently investigated the whole subject both physically and historically, —that these alterations may have

taken place without any such geological disturbances as.

some physical geographers have supposed necessary. Some of these changes, he argues, may be fairly attributed to human agency, which can be shown to have exerted a con- siderable influence, not only on the amount of water carried along by the two great rivers of the Aralian area, but even, it is probable, on their course.

But the hypothesis of an Asiatic Mediterranean will not of itself account for the facts which indicate that its basin was formerly in free communication with the general oceanic area. For as the water of this great inland sea must have risen to 220 feet above its present level, to have escaped across the ridge that formed its northern boundary, into the watershed of the Obi, only an outward or overflow current could have passed that ridge, and no sea-water could have entered the basin from the outside. Hence the saltness, not only of the water of the Caspian and Aral seas, but of that of the numerous lakes still remaining in the most depressed spots formerly covered by the Asiatic Mediterranean, together with the large admixture of salt in the sand that covers what is now its dried-up bed, can only be accounted for on the

supposition that this Asiatic Mediterranean was itself a “ survival ” of an extension of the oceanic area properly so called,— retaining not only much of its salinity, but a portion of its characteristic fauna. And this conclusion derives confirma- tion from the fact (ascertained by the researches of the Russian naturalist, Bogdanoff) that the polar fauna may be traced through the succession of salt lakes lying to the north of the Aral Sea, and that its proportion increases as we approach the Polar Ocean. Now it is certain that the whole of this area was submerged during the Cretaceous period,—what is now the North Atlantic Ocean having then extended (with little interruption of its continuity) from the American continent to Siberia. The general rise of the Asiatic and European part of its sea-bed, which took place at the end of the Secondary period, may not improbably have cut off the Asiatic Mediterranean, enclos- ing it within the limits already pointed out, and at the same time elevating it above the general level of the sea. Under these conditions it would have for some time retained much of its original saltness ; and this seems the explana- tion of the fact that the marine shells which are now scattered over the ancient sea-bed, and are occasionally found accumulated in masses, are much larger than the shells of the same species now inhabiting the weakly-saline Caspian. If the river-drainage into this area were more than sufficient to equalize its loss by evaporation, it may have remained without any essential alteration of its con- ditions, until the opening of the Bosphorus initiated a new succession of changes, which in the case of the Aral Sea appear to bestillin progress. In this later succession, such alterations in the courses of the two great rivers of the Aralian area as are distinctly indicated by historical as well as physical evidence must have exerted a very impor- tant influeuce; and a due appreciation of the results of these alterations seems (as already shown) to afford the clue to the differences in the accounts that have been given of the Aral Sea within the historic period.

Bibliography.—In addition to the writings of Professor Von Baer and Major Wood, of which special mention has already been made, the student of the physical geography of the Aralo-Caspian area should refer to the discussion between Sir Roderick Murchison and Sir Henry Rawlinson

in the Journal of the R. Geog. Soc. for 1867 ; the paper of Professor Eichwald in the same journal ; the Aralseefrage of Roesler (Vienna, 1873) ; and the learned Das alte Bett des Oxus of Professor Goeje (Leyden, 1875). (iy. B..C:)

CASS, Lewis (1782-1866), an American general and statesman, was born at Exeter, New Hampshire, in the United States, on the 9th October 1782. He began life as a law-student, and was called to the bar at the age of twenty. Four years later he became a member of the Ohio Legislature. During the war with England (1812— 1814) he served in the army, and rose to the rank of general. In 1813 he was appointed governor of Michi- gan,—a position which gave him the chief control of Indian affairs, for the territory was then occupied almost entirely by natives, there being only 6000 white settlers. This post he held for eighteen years, during which he obtained large tracts of territory from the Indians, insti- tuted surveys, constructed roads, and explored the lakes and sources of the Mississippi. (For an account of these explorations see North American Review, 1, lv.) About this time also he amassed the greater part of his large fortune by judicious purchase of land. In 1831 he became secretary of war under General Jackson, and he fulfilled the duties of this office during the first two years of the Florida war. Five years later he was appointed minister plenipotentiary to France, where he became acquainted with Louis Philippe, to whom he gives the highest praise in his France: tts King, Court, and Government (1840). The cause of his resigning this appointment was that he disapproved of the concessions granted to England in the treaty concluded with Lord Ashburton by Daniel Webster, the American secretary of state, for the purpose of settling the dispute between England and the United States with regard to the north-eastern frontiers of the latter country. General Cass twice stood as candidate for the presidency, viz, in 1848 and 1852, but both times unsuccessfully. The last public office which he held was that of secretary of war under Buchanan; and, in the end of 1860, he retired into private life, upon the refusal of the president to send reinforcements to Fort Sumter. He died on the 17th June 1866. The chief points of the policy of General Cass were his defence of slavery, and his consequent attack upon the quintuple treaty which aimed at its sup- pression; his advocacy of a high protective tariff, and of extension of territory in the case of Texas; and his support of the cause of national unity, notwithstanding his expressed opinion that the

Union had no right to coerce the separate States. As an author, General Cass is known by the writ- ings already mentioned, and by his history of the Indians of the United States, which appeared in 1823. Accounts of his life have been published by H. R. Schoolcraft (1848), W. T. Young (1852), and W. L. G. Smith (1856).

CASSABA, or CasaBa, a town of Asia Minor, in the sanjak of Manisa, 63 miles east of Smyrna, with which it is connected by rail, An abundant supply of water is conveyed to the town from a distance of two or three miles by an ancient aqueduct of very solid construc- tion, which passes about 40 feet below the level of the soil, and is ventilated by air-shafts every 200 yards. Fountains are consequently numerous, and a stream of water flows down the middle of many of the streets; but thie lack of underground sewers keeps the channels in a very filthy condition. There is a large bazaar, and a very flourishing trade is carried on in the produce of the surrounding district. Cotton is the most important article, and there are four ginning factories in the town; the silk-worm is largely raised and exported ; and the “ melons of Cassaba ” are sent not only to Smyrna but to Constantinople. The influence of the connection with Smyrna is shown by the comparative neglect of several Eastern customs and the

very general use of the Greek language. Though no identification has been attempted, the town probably occupies the site of some ancient city; it is only 21 miles distant from the ruins of Sardis. Its population is estimated at 15,000, of whom about 10,000 are Turks and the rest Greeks and Armenians. In 1865 a large number of houses were destroyed by fire, and the inhabitants were decimated by cholera.

CASSANA, Niccotd (1659-1714), often called Nicox- ETTO an Italian painter, was born at Venice, and became a disciple of his father, Giovanni Francesco Cassana, a Genoesc, who had been taught the art of painting by Ber- nardino Strozzi (“il Prete Genovese”), Having painted portraits of the Florentine court, and also of some of the English nobility, Nicoletto was invited to England, and introduced to Queen Anne, who sat to him for her likeness, and conferred on him many marks of favour. [fe died in London in 1714, having given way to drinking in his later years. Cassana was a man of

the most vehement temper, and would wallow on the ground if provoked with his work. One of his principal paintings is the Conspiracy of Catiline, now in Florence.

CASSANDER (ce. 354-297 3.c.), king of Macedonia, was probably born about 354 B.c. He first appears in history at the court of Alexander, defending his father Antipater against the accusations of his enemies. Whether it be true or not that he brought himself into disfavour by mauifesting his contempt for the Eastern customs with which the king had surrounded himself, it is certain that he conceived a great hatred for Alexander, a hatred so well known that he was accused of having caused the king's death by poison. When his father became regent of Macedonia, Cassander was made chiliarch; but, when Polysperchon succeeded Antipater, he was not content with this position, but allied himself with Ptolemy Soter and Antigonus, and declared war against the regent. His success was such as to win over most of the Greek States ; and he also effected an alliance with Eurydice, the ambitious wife of King Arrhidzus. Both she and her husband, however, together with Cassandcr's brother Nicanor, and a number of others, were soon after slain by Queen Olympias. Cassander at once marched against Olympias, and, having forced her to surrender in Pydna, put her to death. Not long afterwards he also murdered Roxana and Alexander, the wife and son of Alexander the Great. He had already connected himself with the royal family by marriage with Thessalonica, Alexander's half-sister, and, having formed an alliance with Seleucus, Ptolemy, and Lysimachus, and defeated Antigonus and Demetrius near Ipsus, in 301, Cassander became undisputed sovereign of Macedonia and nonuual king of Greece. He died some threc years after, in 297 z.c. For the history of his campaigns (which is given in Diodorus, xviii.-xxi.) see MAcEDoNnrIA, Cassander is said to have been a man of cultivated literary taste, and we are told that his delight in Homer was such that he could repeat from memory every line of his poems.

CASSANDER, Grorcxr (1515-1566), a Flemish theo- logian, was born at Cadzand (whence his name), a village in Zeeland. He was for some time professor of classics and theology at Bruges and Ghent; but most of his life was spent in the endeavour to effect a reunion of the Roman Catholic and Protestant churches. In 1561 he published De Officio Pir Viri in hoc

Dissidio Religionis, in which he argues that no one has a right, on account of a few abuses, utterly to subvert the church ; but, on the other hand, he expresses his disagreement with those who regard the Pope as a deity. His standard is Scripture, explained by the tradition of the fathers, especial deference being paid to those who lived before Gregory I. Four years later, in

1565, he published his famous Consultatio de Articulis

Fidei inter Papistas et Protestantes controversis, in which he strives to put a Catholic interpretation into each of the articles of the Confession of Augsburg. Both these books were fiercely attacked by Calvin ; and they were also both condemned by the Councilof Trent. Cassander's complete works were published at Paris in 1616.

CASSANDRA, in Grecian story, daughter of Priam and Hecuba, was beloved of Apollo, who promised to bestow on her the spirit of prophecy if she would comply with his desires. Cassandra accepted the proposal; but no sooner had she obtained the gift than she laughed at the tempter, and refused to fulfil her promise, Apollo revenged himself by ordaining that her predictions should be discredited, and hence it was in vain that she ptophesied the ruin of Troy, On the capture of that city she was ravished by Ajax, the son of Oilecus, in the Temple of Minerva. In the distribution of the booty, Cassandra fell to the lot of Agamemnon, who loved her deeply; but again her fore- sight was useless, for he would not believe her prediction that he should perish in his own country. The prophecy was fulfilled, for both were slain through the intrigues of Clytemnestra.

CASSANO, a town and bishop's seat of Italy, in the province of Calabria Citra, seven miles E.8.E. of Castro- villari. It stands in a concave recess of a steep mountain, round an isolated rock, on which are the ruins of a grand feudal castle. It has hot sulphureous baths, of great local reputation, and is surrounded by beautiful scencry. Maca- roni, stamped Icather, table-linens, and cotton and silk stuffs are manufactured ; and corn, fruits, and oil are raised in the vicinity. Cassano is usually identified with the Castellum Carissanum of Pliny, and Cosa in Agro Thurino of Casar; and one of the

towers of its castle is still known as Zorre di Milo or Milo’s Tower, in memory of the death of Cicero’s famous client. Population, 9035.

CASSAVA is the name given to the farinaccous root stocks of two species of Euphorbiaceous plants, the Bitter Cassava, ‘Manihot utilissima, and the Sweet Cassava, A, Azpi, both highly important sources of food starches. The plants are natives of South America, but the Bitter Cassava, which is the most important of the two in an economic sense, has been introduced into most tropical regions, and is extensively cultivated in the East Indian Archipelago, from which, as well as from Brazil and other South American states, its starch in the form of tapioca isa staple article of export. The Bittcr Cassava root is fusiform, sometimes attaining a length of 3 feet and a weight of about 30 ib. Its sap contains hydrocyanic acid, and being thercfore highly poisonous, the root cannot be eaten in a fresh condition ; while on the other hand the Sweet Cassava is perfectly innocuous, and is employed as a table vege- table. Exposure to heat dissipates the poisonous principle, and the concentrated juice is in that state used as the basis of Cassareep and other sauces. From the Bitter Cassava roots many different food preparations are made in Brazil. The roots are preserved for use by being simply cleaned, sliced, and dried ; from such dried slices manioc or cassava meal used for cassava cakes, &c., is prepared by rasping. The starch also is separated and used for food under the name of Brazilian arrowroot; and this, when agglomerated into pellets on hot plates, forms the tapioca of commerce. Cassava starch has a stellate hilum, which readily distin- guishes it under the microscope from other starches. Its microscopic appearance is figured under ARRoWRooT, vol. ii. p. 631, fig. 6.

CASSEL, or Kasset, the capital of the former electorate of Hesse Cassel, in Western Germany, and, since its annexa- tion by Prussia in 1866, the capital of the province of Hesse Nassau, is pleasantly situated on both sides of the River Fulda, over which a stone bridge leads to the lower

new town. ‘The river is navigable, and railways connect the town with all parts of Germany. The streets of the old town are narrow and crooked, but those of the upper and lower new town, and the three suburbs, are not sur- passed by any in Germany. The principal streets are the Konigsstrasse

(5100 feet long and 60 broad), the Bellevue- Strasse, and the Friedrich Wilhelm Strasse (180 feet broad with four rows of linden trees). The Friedrich's Platz is the largest square in Germany, being 1000 by 450 feet. Tt contains a marble statue of Landgrave Frederick II, and commands a fine view from the openside. The former residence of the electors fronts this square, a3 well as the Museum, considered the finest building in the town. This museum contains various valuable collections of curiosities, interesting mosaics, a library of 100,000 volumes and valuable manuscripts. In the cabinet of curiosities there is a complete collection of clocks and watches (includ- ing the so-called Egg of Nuremberg), from the earliest to the present time. Among other public places and buildings worthy of notice are the Roman Catholic church, with a splendid interior ; the Military School ; the Konigs Platz, with a remarkable echo; the Karl's Platz, with the statue of Landgrave Charles; the Martin's Platz, with a large church containing the burial-vaults of the Hessian princes.

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Plan of Cassel.

1. Synagogue. 7. Catholic Church, 2.St Martin's Church 8. Bellevue Castle. 8. Post-Office. 9. Town Hall.

4, Palace. 10. Picture Gallery 5, Museum. 11. Theatre.

6. Military School.

The Gallery of Paintings in the Bellevue Castle has attracted of late many visitors to Cassel, as it contains numerous chefs d'cwvre, the most of which, before 1866, Were not accessible to the public. Among these are fine specimens of Holbein, Cranach, Diirer, Rembrandt, Van- dyck, Rubens, Mabuse, Teniers, Metzu, Wouvermann, P. Potter, Ruysdacl, Titian, Guido Reni, C. Dolce, the Caraccis, Veronese, Murillo, and many other eminent painters. The town contains numerous educational institu- tions, including a polytechnic school, an academy of the fine arts, a lyceum, and a military academy. The descend- ants of the French refugees who founded the upper

new town have a church of their own and a hospital, and the Jews, a very handsome synagogue. Music is much cultivated and there is a good opera with a first-rate

orchestra, of which Louis Spohr was at one time con- ductor. The opera house or theatre was built by Jerome Napoleon. ‘Trade has very much increased of late, and among the manufactures are steam engines and locomotives, articles in silver and gold, philosophical instruments, tobacco, sugar, cotton and linen cloths, hats, leather, car- riages, porcelain, soap, and chemicals. There are also several breweries; and two fairs are held annually. The celebrated chemists Bunsen and Kolbe are natives of Cassel. In the vicinity of the town are the Orangerie Chateau, and the Auegarten, a favourite promenade, with a marble bath.

On a slope of the Habichtswald Mountains, three miles from Cassel, and approached by an avenue, is the famous summer palace (with park and forest) of Wilhelmshohe, sometimes called the Versailles of Germany. Napoleon IIL resided here after the battle of Sedan. The surround- ing gardens are beautifully adorned with fountains, cascades, lakes, and grottoes, the principal fountain sending up a jet of water 180 feet high and 12 feet in diameter. Here also is an interesting building called the Loewenburg, erected a century ago in the style of a fortified castle, and containing among other things portraits of the Tudors and Stuarts. The principal curiosity is the Karlsburg cascade, which is placed in a sort of broad ravine, thickly wooded on both sides. A staircase of 900 steps leads to the top. On one of the landings is a huge rudely-carved stone figure of the giant Enceladus, and at the top is an octagon build- ing called the Riesenschloss, surmounted by a colossal copper figure of the Farnese Hercules, 31 feet high, whose club alone is sufficiently capacious to accommodate from eight to ten persons. In different parts of the park, and especially from the Octagon, charming views are obtained. The park was first formed by Landgrave Frederick big (whose consort was Mary, daughter of George II. of England), and was finished by his successor, after whom it was named, and who is said to have employed 2000 workmen for fourteen years in its construction.

Perhaps the carliest mention of Cassel occurs in a docu- ment of the year 913, when the name appears in the form of Chassala. The town was fortified by the Landgrave Philip the Magnanimous in the 16th century ; and in 1687 it was augmented by the formation of the Upper New Town by the Landgrave Charles, In 1762 it was captured by Frederick of Brunswick, after an obstinate siege, during which it had been defended by the French under Diesbach ; and not loug after its fortifications were dismantled. In 1807 it became the capital of the kingdom of Westphalia ; in 1813 it was bombarded and captured by the Russian general Chemicheff ; in 1830, 1831, and 1848 it was the scene of violent commotions; from 1850 to 1851 it was occupied by the Prussians, the Bavarians, and the Austrians ; and in 1866 it passed definitively into the possession of Prussia. Of late it has become a very thriving town, and is now a very favourite residence for strangers. Popula- tion (1875), 50,000.

CASSEL, a town of France, in the department of Nord, and arrondissement of Hazebrouck, is situated 28 miles N.W. of Lille, on an isolated hill, 800 feet high, which commands a most extensive view in all directions. Portions of the three kingdoms of France, Belgium, and England can be seen, with 32 towns and 100 villages, including St Omer, Dunkirk, Ypres, and Ostend. The public buildings comprise a castle, a communal college, and 4 museum; and the ancient mansion known as La Noble Cour de Cassel is classed among the historic monuments of France. The manufactures of the town arc lace, thread, stockings, pottery, leather, and oil; and it also trades in cattle. It is supposed to occupy the site of the Castellum Morinorum, and was certainly a Roman station, as the numerous

remains of the Gallo-Roman period sufficiently attest. It is frequently mentioned in the wars of the Middle Ages, and was the scene of important battles in 1071, 1328, and 1677. In1771 General Vandamme was born in the town. Population in 1872, 3250.

CASSIA BARK is the aromatic bark derived from various species of Cinnamomum other than C. zeylanicum, which is the source of the true cinnamon of commerce. The greater part of the supply coming from China, it is some- times termed Chinese cinnanion. The tree or trees which yield

the Chinese supplies are very extensively cultivated throughout the southern provinces of that empire, and grow with little call for attention in situations unsuited for other forms of cultivation. From various species of Cinnamomum, cassia is also obtained in Northern ‘India and Nepal, in Java, Borneo, Sumatra, and the Philippine Islands. ‘The bark is imported into England in bundles, which are from | foot to 18 inches in length, and weigh about 1 ib. The bundles consist of quills of bark from half an inch to an inch in diameter, generally single, rarely double. The bark is much thicker than that of true cinnamon; the taste is more pungent and the flavour less delicate, though somewhat similar to that of cinnamon, A large quantity of thick, woody bark, of inferior quality, is now imported under the name Cassia vera, or Wild Cassia. The properties of cassia bark depend on the presence of a volatile oil—the oil of cassia, which is imported in a pretty pure state as an article of commerce from Canton. Cassia bark is in much more extensive demand on the Continent of Europe than in Great Britain, being preferred to cinnamon by Southern nations. Both oil and bark are useful in medicine ; but their chief nse is for flavouring liqueurs and chocolate, and in cooking generally. When ground as a spice it is difficult to distin- guish cassia from cinnamon, and it is a common practice to substitute the cheap common spice for the more valuable article. The adulteration may be detected by the behaviour of a decoction in presence of iodine, which, in the case of cinnamon, produces little effect, but with cassia strikes a deep blue colour. Cassia Buds, which have a pleasing cinnamon flavour, are the immature fruits of the tree or trees which yield Chinese cassia. They are brought in considerable quantities from Canton, and used as a spice and in confectionery. Some confusion occasionally arises from the fact that Cassia is the generic name of an extensive genus of leguminous plants, which, in addition to various other medicinal products, is the source of the senna leaves which form a most important article of materia medica.

CASSIANUS, Joannes Eremira, or JoANNES Mas- SILIENSIS, a celebrated recluse, and one of the first founders of monastic institutions in Western Europe, was probably born about 360, and is supposed to have died about the year 448, The place of his nativity has been much disputed, but he spent the early part of his life in the monastery of Bethlehem, with his friend Germanus. In company with that monk he visited Egypt, and dwelt

for several years among the ascetics of the desert near the banks of the Nile. In 403 he repaired to Constantinople, where he received ordination as deacon from the hands of Chrysostom. At Marseilles he founded two religious societies—a convent for nuns, and the abbey of St Victor, which during his time is said to have contained 5000 inmates. In later times his regulations enjoyed a high repu- tation, and were adopted by the monks and nuns of Port Royal. He was eventually canonized ; and a festival in his honour long continued to be celebrated at Marseilles on the 25th of July. Cassianus was one of the first and most prominent of the Semi-Pelagians, a sect who rejected the Augustinian positions that man, since the fall of Adam, is

by nature wholly worthless and incapable of even right desire, and that everything holy in him is the Divine gift, bestowed without reference to any merit, or even wish, on his part ; but did not assert, with Pelagius, that man is born perfectly pure, and that the exercise of his free-will jg sufficient to secure salvation. Cassianus maintained that while man is by nature sinful, he yet has some good remaining in him, and that, while the immediate gift of God’s grace is necessary to salvation, conversion may also be commenced by thie exercise of man’s will. He further asserted that God is always willing to bestow his grace on all who seek it, though, at the same time, it is true that he sometimes bestows it without its being sought. These views have been held by a very large part of the church from his time, and embrace much of the essence of Arminianism, The style of Cassianus is careless and even slovenly, and displays no marks of literary polish, but its direct simplicity is far superior to the rhetorical conccits and affectations which disfigure most of the writings of that age. He has left Collationes Patrum, or conferences of the fathers of the desert; De Institutione Ceenobiorwm, in twelve books, of which the first part gives an account of the Eastern monasteries, and the second contains discourses on the eight worst sins ; and seven books upon the Incarnation, in confutation of the Nestorian heresy. The first edition of his collected works is that of Basel, 1559; the best are those of Frankfort, 1722, and of Leipsic, 1733, which contain commentaries by Gazct.

See G. F. Wiggers, De Joanne Cassiano Massiliensi, Rostock, 1824, 1825 ; and Geffken, Historia Semipelagianismd, Gottingen, 1826,

CASSINI, the name of a family of distinguished as- tronomers, who succeeded one another as directors of the Observatory at Paris for four gencrations,

Grovanni DomENtco Casstnt, the first and most famous, was born at Perinaldo, near Nice, on 8th June 1625, and died on 14th September 1712. He was educated by the Jesuits of Genoa, among whom he gained some reputation as a writer of Latin verse. His study of astronomy was introduced by a fancy for astrology ; but, notwithstanding the success of several of his predictions, he became convinced of the baseless character of the art, and thenceforth gave himself entirely to the pursuit of the science, in which, at the age of twenty-five, he had made so much progress that he was appointed professor of astronomy in the University of Bologna. Here he made the observations on the comet of 1652 which formed the subject of his first book ; in this he denied that comets are free from subjection to law, and explained them as the result of a mixture of exhala- tions from the earth and from the stars, About this time he gave a good deal of attention to experiments on the transfusion of blood, and on the habits and structure of insects. Five years later he had an opportunity of dis- playing his ability, as a man of business, on the occasion of a dispute between Bologna and Ferrara caused by the inundations of the Po; and his success was such that he was asked to continue to act as the representative of the Bolognese. He was also, soon after, appointed to take charge of the repairing of Fort Urban ; and already he had gained the patronage of the Pope, Alexander VII. Clement IX., too, valued him so highly that it was only on condition that he should return to Italy after two or three years that he would consent to his accepting Colbert’s offer of the directorship of the Observatory at Paris. Cassini, however, became attached to his new situation, was naturalized, and married a French lady. On 14th September 1671, he commenced his observations ; and his discoveries soon made him the best known astronomer in Europe, and gained him a reputation of an extravagant character. See ASTRONOMY, vol. ii. :

Jacques Cassrni (1677-1756), was the son of Domenica

Cassini. After his father's death he became director of the Observatory at Paris, and was also appointed to the post of maitre des comptes. His work, like his father's, was purely that of an observer, and he does not appear to have had any adequate knowledge of the state of philosophic thought in his own science. Though he had some personal acquaintance with Newton he does not seem to have under- stood his theories, and he was quite ignorant of the discoveries of nutation and the aberration of light. Nevertheless, largely on account of his father's fame, he enjoyed a high reputation throughout Europe.

Cfsar FRANCOIS CAssINI or CassINI DE Tuury (1714— 1784), was son of the preceding, whom he succeeded in both his appointments. Like his father and grandfather, he was a patient and accurate observer, but such work by itself no longer brought renown. He published Zlémens @Astronomie (1740); but his most important work was his topographical map of France, which was completed by his son.

Jacques Dominique Cassini, Count de Thury (1748- 1845), son of the preceding, completed the line of Cassinis, who for a hundred and twenty-two years filled the post of director of the Observatory at Paris. He appears to have held more philosophical views than his predecessors ;_ but his plans to improve the Observatory, by obtaining larger instruments, and by other means, were cut short in 1793. In that year the National Assembly decreed that three of his pupils should be united with lim in his office, an arrangement to which he refused to submit. Next year he was in consequence imprisoned for seven months; and after this he abandoned astronomy, and spent the rest of his life in retirement. The chief events of his life as an astronomer were the voyage which he undertook to test the chronometers of Le Roy (1769), and his association with Mechain and Legendre in the work of connecting the observatories of Paris and Greenwich by means of a chain of triangles (1779).

CASSIODORUS, Macnus Avretius, a Roman his- torian, statesman, and monk, was born at Scylaceum (Squillace), about 468. According to his own statement, he began public life under Odoacer as head of financial affairs, with the title of Comes sacrarum largitionum. By Theodoric he was raised

to the highest offices ; and, while the Ostro-Gothic power lasted, notwithstanding the in- trigues which surrounded the throne, he continued (with the exception of a short period of retirement at the tyrannous close of the reign of Theodoric), to regulate the affairs of the Western empire, and to support it by alliances with the Eastern. After the triumph of Belisarius, he retired, at seventy years of age, to the monastery of Viviers, which he had founded in his native province of Bruttium, where he spent about thirty years of far more importance to the world than the fifty during which he held the highest political authority. He deserves to be reckoned as one of the first and most influential of those who set the monks to literary work, and thus preserved the continuity of ancient and modern learning. He has also left a number of books, asthe De Artibus ac Disciplinis Liberalium Literarwm, the De Institutione Dwinarum Literarum, and the De Arte Grammatica, which were much valued and used in the Middle Ages. But the work which is most valuable to us is his Variarum Epistolarum Libri XIL., which contains the decrees of Theodoric, and of his successors, Amalasontha, Athalaric, Theodatus, and Vitiges, and is the best source

of our knowledge of the Ostro-Gothic empire in Italy.

The writings of Cassiodorus evince great erudition, in- genuity, and labour, but are disfigured by incorrectness and an affected artificiality, and his Latin partakes much of the corruptions of the age. His complete works were

lished by Garet, with an account of his life, at Rouen,

1679, and Venice, 1729. See also Sainte Marthe’s Vie de Cassiodore (Paris, 1694), and De Buat’s account in the Transactions of the Royal Academy of Munich, vol. i.

CASSIS, a small seaport-town of France, in the depart- ment of Pouches-du-Rhéne, stands in a narrow valley on the Mediterranean, 10 miles south-east of Marseilles. Its harbour is small, but it has some building yards, and a considerable trade in fruits and muscatel wine. The lighthouse is situated in 42° 12’ 50” N. lat. and 5° 31’ 54” kK. long. The town is supposed by D’Anville to occupy the site of the Roman Carsicis Portus. It was destroyed

by the Lombards in 573, but rebuilt in its present situation in the 13th century. The Abbé Barthélemy was born here in 1716. Population in 1872, 2976.

CASSIUS LONGINUS, Catus, is best known in history as one of the leaders in the assassination of Julius Cesar. Little is known of his early life. In 53 3B.c, he served in the Parthian campaign under Crassus, and displayed great courage and skill. He succeeded in bringing off a division of the army after the defeat of Carrhe, and in the following year, 52 3B.c., the government of the province having fallen into his hands, he was able, by cautious and skilful dispositions, to drive back the Par thians. In 61 B.c. he was compelled to retreat before a large force of the Parthians under Osaces and Pacorus, but managed to throw himself into Antioch, a strongly-fortified town, which the invaders found impregnable. They were compelled to retreat, and Cassius, pursuing them rapidly, gained a complete victory. He returned to Rome soon after, with a large fortune, and in 49 B.c. became tribune of the plebs. He at first united his fortunes with those of Pompey, but after Pharsalia he surrendered to Cesar, and was treated by him with great generosity. He was made one of the legates, and in 44 B.c. became praetor peregrinus with the promise of the Syrian province for the ensuing year. He does not seem, however, to have been at all conciliated by these favours. He was one of the busiest of the conspirators against his benefactor, and took an active part in the assassination on the Ides of March. Brutus and Cassius soon afterwards left Italy, and gathered together their forces in Macedonia and Syria. They succeeded in overcoming the slight opposition that was offered them in the provinces, and after taking Rhodes, united at Sardis to make a stand against the second triumvirate. They took up théir position at Philippi, where they were attacked by Antony and Octavianus. The division under Cassius was defeated, and Cassius himself, thinking all was lost, commanded his freedman to slay him. He was buried at Thasos.

CASSOWARY (Casuarius), a genus of Struthious Birds, only inferior in size to the ostrich, and, according to Professor Owen, approximating more closely than any other living birds to the extinct moas of New Zealand. Not wiany years ago only a single species of cassowary was known, but recent researches among the Australasian islands have led to the identification of

at least other four species. They are all characterized by short rudimentary wings, consisting of four or five barbless shafts, a few inches long, and apparently useless for purposes of flight, of running, or of defence ; and by loosely webbed feathers, short on the neck, but of great length on the rump and back, whence they descend over the body forming a thick hair- like covering. They possess stout limbs, with which they kick in front, and have the inner toe armed with a long powerful -claw. The Galeated Cassowary (Casuartus galeatus) stands 5 feet high, and has a horny, helmet-like protuberance on the crown of its head; the front of the neck is naked and provided with two brightly-coloured wattles; the tail is not apparent. It is a native of the Island of Ceram, where it is said to live i pairs, feeding

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on fruits and herbs, and occasionally on small animals. The Mooruk, or Bennett's Cassowary (Casuarius Bennettii), is a shorter and more robust bird, approaching in the thickness of its legs to the moas. It differs further from the preceding species in having its head crowned with a horny plate instead of a helmet. It has hitherto only been found in New Britain, where the natives are said to regard it with some degree of veneration. When captured by them shortly after being hatched, and reared by the hand, it soon becomes tame and familiar ; all the specimens which have reached Europe alive have been thus domesticated by the natives. The adult bird in the wild state is exceedingly shy and difficult of approach, and, owing to its great fleetness and strength, is rarely if ever caught. It eats voraciously, and, like the ostrich, will swallow whatever comes in its way. It has the curious habit, says Bennett (Gatherings of a Naturalist in Australasia), "of squatting down on its tarsi like a dog."

CASTAGNO, Anprea DEL (1390-1457), a painter of the Florentine School, was born in 1396, probably at Castagno, in the district of Mugello, and died in August 1457. He imitated Masaccio and the naturalists of his time in boldness of attitude, but was deficient in grace and colouring. His name has for about four centuries been burdened with the heinous charge of murder ; it was said that he treacherously assassinated his colleague, Domenico Veneziano, in order to monopolize the then recent secret of oil painting as

practised in Flanders by the Van Lycks. This charge is now at last a proved untruth; Domenico died four years after Andrea. The latter is commonly called ‘ Andrea (or Andreino) degl’ Impiccati” (of the Hanged Men) ; this was in consequence of his being com- missioned in 1435 to paint, in the Palazzo del Podesta in Florence, the fallen leaders of the Peruzzi and Albizzi —not (as curreutly said) the men of the Pazzi conspiracy, an event which did not occur until 1478, long after this painter’s death. One of his principal works now extant (most of them have perished) is the equestrian figure of Nicola di Tolentino, in the cathedral of Florence.

CASTALTA, or Fons Casranius, a celebrated fountain in Greece, now called the Fountain of St John, which rises at the foot of Mount Parnassus, in the neighbourhood of Delphi. It was sacred to Apollo and the Muses, and its water was used in the religious purifications of the “ Pythian Pilgrims.” From its connection with the Muses it is frequently referred to both by classical and by modern poets as a source of inspiration. For further details see DELPHI.

CASTANOS, Don Francisco Xavier DE (c. 1756- 1852), duke of Baylen, a Spanish general, who served in the Peninsular War, was born at Madrid. The exact year of his birth is not known, but it was probably about 1756. He was the son of a military officer; at the age of twelve he had received a commission as captain; and, while still very young, he was sent to study the art of war at the court of Frederick the Great. His first success was at Baylen, where, on the 22d of July 1808, 18,000 French under Dupont surrendered to him. It is, however, said that the chief credit in this engagement is due to the Swiss, Aloys Reding. In November of the same year, Castanos was defeated at Tudela; and during the rest of the war he occupied subordinate positions. He, however, distinguished himself at Vitoria, and was placed at the head of the army which was sent to assist the Allies in 1815; and till his death, which took place on the 24th September 1852, he held a high political position, being senator and guardian to Queen Isabella.

CASTE. There are not many forms of social organiza- tion on a large scale to which the name Caste has not been applied in a good or in a bad sense. Its Portuguese origin

simply suggests the idea of family; but before the word came to be extensively used in modern Kuropean languages, it had been for some time identified with the Brahmanic division of Hindu society into classes. ‘The corresponding Hindu word is varna, or colour, and the words gati, kula, gotra, pravara, and karana are also used with different shades of meaning. Wherever, therefore, a writer has seen something which reminds him of any part of the extremely indeterminate notion, Indian caste, he has used the word, without regard to any particular age, race, locality, or set of social institutions. Thus Palgrave! maintains that the colleges of operatives, which inscriptions prove to have existed in Britain during the Roman period, were practically castes, because by the Theodosian code the son was compelled to follow the father’s employment, and marriage into a family involved adoption of the family employment. But these collegia opificum seem to be just the forerunners of the voluntary associations for the regula- tion of industry and trade, the Frith-gilds, and Craft- gilds of later times, in which, no doubt, sons had great advantages as apprentices, but which admitted qualified strangers, and for which intermarriage was a matter of social feeling. The history of the formation of guilds shows, in fact, that they were really protests against the authoritative regulation of life from without and above, In the Saxon period, at any rate, there was nothing resembling caste in the strict sense. ‘‘ The ceorl who had thriven so well as to have five hides of land rose to the rank of a thegn ; his wergild became 1200 shillings; the value of his oath and the penalty of trespass against him increased in proportion ; his descendants in the third gene- ration became gesithcund. Nor was the character of the thriving defined ; it might, so far as the terms of the custom went, be either purchase, or inheritance, or the receipt of royal bounty. The successful merchant might also thrive to thegn-right. The thegn himself might also rise to the rank, the estimation, and status of an earl.”? It has been said that early German history is, as regards this matter, in contrast with English, and that true castes are to be found in the military associations (Genossenschaften) which arose from the older class of Dienstmannen, and in which every member—page, squire, or knight—must prove his knightly descent ; the Bauernstand, or rural non-military

population ; the Biirgerstand, or merchant-class. The ministry of the . Roman Catholic Church, was, however, never restricted by blood relation, There is no doubt that at some time or other professions were in most countries hereditary. Thus Prescott * tells us that in Peru, notwithstanding the general rule that every man should make himself acquainted with the various arts, ‘‘ there were certain individuals carefully trained to those occupations which minister to the wants of the more opulent classes. These occupations, like every other calling and office in Peru, always descended from father to son. Thedivision of castes was in this particular as precise as that which existed in Hindustan or Egypt.” Again, Zurita * says that in Mexico no one could carry on trade except by right of inhcritance, or by public permis- sion. The Fiji carpenters form a separate caste, and in the Tonga Islands all the trades, except tattoo-markers, barbers, and club-carvers are hereditary,—the separate. classes being named matabooles, mooas, and tooas, Nothing is more natural than that a father should teach his son his handi- craft, especially if there be no organized system of public instruction; it gives the father help at a cheap rate, it is

the easiest introduction to life for the son, and the custom

1 History of Rise and Progress of the English Constitution, i. 3382 2 Stubb’s Constitutional History of England, i. p. 162.

3 History of Peru, i. 148.

4 Rapport sur les différentes classes de chefs dans la nowvelle Espagwe, 1840, p. 223.

ra community of Javans, near Surabaya, on the Tengger

or reputation of the father as a craftsman is often the most important legacy he has to leave, The value of transmitted skill in the simple crafts was very great ; and what was once universal in communities, still survives in outlying portions of communities which have not been brought within the general market of exchange. But so long as this process remains natural, there can be no question of caste, which implies that the adoption of a new

profession is not merely unusual, but wrong and punishable. Then, the word caste has been applied to sacred corporations. A family or a tribe is consecrated to the service of a particular altar, or all the altars of a particular god. Or a semi-sacred class, such as the Brehons or the Bards, is formed, and these, and perhaps some speci- ally dignified professions, become hereditary, the others remaining free. Thus in Peru, the priests of the Sun at Cuzco transmitted thcir office to their sons; so did the Quipu-camayoc, cr public registrars, and the amantas and haravecs, the learned men and singers, Benjamin Con- stant! has ventured on the ambitious generalization that in the South, as in Judea and Mexico, such corporations were hereditary, but that in the North and West they were in general elective.? In many countries political considera- tions, or distinctions of race, have prevented intermarriage between classes. Take, for example, the patricians and the plebeians at Rome, or the Smapriarar, Adkwves, Or mepiorxot, and the EfAwres at Sparta. In Guatemala it was the law that if any noble married a plebeian woman he should be degraded to the caste of mazegual, or plebeian, and be subject to the duties and services imposed on that class, and that the bulk of his estate should be sequestered to the king.® In Malagasy marriage is strictly forbidden between the four classes of Nobles, Hovas, Zarahovas, and Andevos,— the lowest of whom, however, are apparently mere slaves. Allnations have at one time opposed themselves to marriage with foreigners, known chiefly as enemies ; and all nations have oppressed, industrially and politically, the races whom they have conquered. In one sense slavery might be called the lowest of castes, because in most of its actual forms it does permit some small customary rights to the slave. In another sense, the marriage of the queen’s daughter with a commoner might be described as an infraction of caste rule.

Besides the forms of caste we have mentioned, there are many isolated communities which resemble one another in the fact that their members constantly intermarry, and which generally devote themselves to some one particular trade or industry. This “endogamy” seems to be characteristic of early social arrangements, and therefore the existing specimens of endogamous societies in Europe and Asia do not exhibit any high form of civilization. Among others may be mentioned the descendants of the “Bounty” mutineers, who still occupy Pitcairn Island ; +

1 Dela Réligion, ii. 88.

2 Something like this is to be found in the Russian notion of tchine, or status according to official hierarchy of ranks, as modified by the custom of myestnttchestvo, by which no one entering the public service could be placed beneath a person who had been subject to his father's orders, Hereditary nobility at one time belonged to every servant, military or civil, above a certain rank, and a family remaining out of office for two generations lost its rights of nobility ; but in 1854 the privilege was confined to army colonels and state councillors of the 4th class. At one time, therefore, the razriadnyia knighi, or special registers, superscded by Peter the Great's barkhatnata kniga, or Velvet Book, contained a complete code of social privilege and pre- cedence. Peter's " tabel o rangakh'' contained fourteen classes. The subject is treated of in the 1600 articles of the ninth volume of the Russian Code Svod Zakonof. 'The Russian nobility, though de- prived of their exemptions from conscription, personal taxation, and corporal punishment, still retain many advantages in the public ser- vice. ('*I'Empire des Tsars," in Revue des deux Mondes, 1876.)

3 Juarros, Hist. of Guatemala, Tr., London, 1823,

- See Times, 21st November 1874.

Hills, numbering about 1200 persons, distributed in about forty villages, and still following the ancient Hindu religion ;® the inhabitants of various fishing villages in Great Britain, such as Itchinferry near Southampton, Portland Island, Bentham in Yorkshire, Mousehole and Newlyn in Mountsbay, Cornwall, Boulmer near Alnwick (where almost all the inhabitants are called Stephenson, Stanton, or Stewart), Burnmouth, Ross, and (to some extent) Eyemouth in Berwickshire, Boyndic in Banffshire, Rathen in Aberdeenshire, Buckhaven in Fifeshire, Port- mahomack and Balnabruach in Easter Ross. In France may be mentioned the commune of Batz, near Le Broisic in Loire-Inférieure; many of the central cantons of Brétagne ; the singular society called Foréatines supposed to be of Irish descent, and living between St Armand and Bourges ; the sailor population of Pauillac (Gironde), Granville, Arromanches, Portel (near Boulogne), and

other fishing villages ; the Republic of. Andorre in the Pyrenees ; the papermakers of Angoumois, Limousin, and Auvergne, whose trade seems to have doomed them to an hereditary weakness of constitution ; the Marans of Auvergne, a racc of Spanish converted Jews, accused of introducing syphilis

into France; the Hautponnais and Lyzelards of St Omer,

who have also a separate Flemish dialect ; the Burins and Sermoyers, chiefly cattle-breeders, scattered over the department of Ain and the arrondissement of Bourg en Bresse. The Vaquéros, shepherds in the Asturias Moun- tains; the Jewish Chuetas of Majorca ; the Petits-Créoles or Petits-Blancs, descendants of the original French settlers in Réunion, are also good examples of what biologists call ‘in-and-in breeding,” as opposed to “crossing.” On a larger scale the Icelanders, the ancient Samaritans (now almost extinguished, see Zimes, 4th April 1874), and the great and prosperous Jewish nation, may be called castes, so far as intermarriage is concerned. It must not be imagined, however, that this is a general charactcristic of a certain stage of social development. ‘Exogamy,” or the rule requiring either absolutely or in certain circum- stances marriage with a stranger, is recognized very widely even by modern tribes, especially in Asia ; and both these conditions of things seem to have been preceded by a primitive state, in which the relations of the sexes were promiscuous.® This is illustrated in the case of the Thlinkeets, or Kolosches, who inhabit the coasts and islands from Mt. St Elias to the River Nass. This singular tribe, which has an elective chicf and systematic slavery (chiefly supplied from the Flatheads of Oregon), is divided into two castes, the Wolf and the Raven, the symbols of which appear on their houses, boats, robes, and shields. The Wolf caste is subdivided into the bear, eagle, dolphin, shark, and aleca; the Raven, into frog, goose, sea lion, owl, and salmon. ‘The young Wolf warrior must seek his mate among the Ravens; and while celebrating his nuptials one day, he may on the next be called to fight his father- in-law over some hereditary feud.” Similarly, the Kutchin tribe of the Tinneh family, inhabiting the Yukon, Tananah, and Peel river-valleys, have a singular system of totems. There are three castes ; and persons of the same caste are not allowed to marry each other. The mother gives caste to the children, so that as the fathers die off the caste constantly changes. It

also happens that when a child is named, the father adopts that name and drops his own. The system prevents civil war.’

Caste in India is a question of more than historical interest. It is the great difficulty in the way of Govern- ment in framing laws and in governing the army, of native

5 Waitz, Anthropologie der Naturvilker, i. p. 482. 6 See Huth On the Marriage of Near Kin, London, 1875, 7 Bancroft, Races of the Pacific, vol. i.

religious reformers in attacking the Brahmanic supersti- tions, and of the Protestant missionaries, who are unable to offer in the British society of India a sympathizing and protecting caste in place of that which it costs the convert so much to leave. Probably owing to the extent of our Indian Empire, and the great varieties of caste custom which prevail, one hears very conflicting accounts and opinions of the institution. Writers such as Robertson and Dubois have regarded it as the great safeguard of social tranquillity, and therefore as the indispensable condition of the progress in certain arts and industries which the Hindus have undoubtedly made. Others, such as James Mill, denounee it as now at least a great political blunder, fatal to free competition, and opposed to individual happi- ness.. The latter view assumes a state of facts which is denied by Mr Colebrooke, one of the highest authorities on Indian matters. Writing in 1798 he says,! after point- ing out that any person unable to earn a subsistence by the exercise of his profession may follow the trade of a lower caste or even of a higher ; “ Daily observation shows even Brahmans exercising the menial profession of a Sudra. We are aware that every caste forms itself into clubs or lodges, consisting of the several individuals of that caste residing within a small distance, and that these clubs or

lodges govern themselves by particular rules or customs or

by-laws. But though some restrictions and limitations,

not founded on religious prejudices, are found amoug their by-laws, it may be received as a general maxim that the occupation appointed for each tribe is entitled merely to a

preference. Every profession, with few exceptions, is open to every description of persons ; and the discouragement

arising from religious prejudices is not greater than what exists in Great Britain from the effects of municipal aud

corporation laws. In Bengal the numbers of people actually willing to apply to any particular occupation are sufficient for the unlimited extension of any manufacture.”

This is corroborated by Elphinstone,? who states that, during a long experience of India, he never heard of a single case

of degradation from caste; and it is illustrated by the experience of the British army, in which men of all castes unite.

The popular notion of modern caste is that it involves certain restrictions on marriage, on profession, and on social intercourse, especially that implied in eating and drinking together. But how far intermarriage is permitted, what are the effects of a marriage permitted but looked on as irregular, what are the penalties of a marriage forbidden, whether the rules protecting trades and occupations are in effect more than a kind of unionism grown inveterate through custom, by what means caste is lost, and in what circumstances it may be regained,—these are questions oa which very little real or definite knowledge exists. It is very remarkable that the Vedas, on which the whole struc- ture of Brahmanic faith and morals professes to rest, give no countenance to the later regulations of caste. The only passage bearing on the subject is in the Purusha Sukta, the 90th Hymn of the 10th Book of the Rigveda Sanhita. “‘ When they divided man, how many did they make him ? What was his mouth? what his arms? what are called his thighs and feet? The Brahmana was his mouth, the Raganya was made his arms, the Vaisya became his thighs, the Sudra was born from his feet,” Haug finds in this a subtle allegory that the Brahmans were teachers, the Kshatriyas the warriors of mankind. But this is opposed to the simple and direct language of the

Vedic hymns, and to the fact that in the accounts of creation there the origin of many things besides classes of men is attributed in the

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1 Life and Essays of I. T. Colebrooke, i. p. 104, 2 Wistory of India,

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same fanciful manner to parts of the divine person. It

is in the Puranas and the Laws of Manu, neither of

which claims direct inspiration, where they differ from the

letter of the Veda, that the texts are to be found on which

all that is objectionable in caste has been based. Even in

the Vishnu Purana, however, the legend of caste speaks of the four classes as being at first “ perfectly inclined to conduct springing from religious faith.” Jt is not til] after the whole human race has fallen into sin that separate social duties are assigned to the classes. The same hymn speaks of the evolution of qualities of Brahma, Sattva, or goodness, sprang from the mouth of Brahma : Rajas, or passion, came from his breast; Tamas, or dark- ness, from his thighs ; others he created from his feet. For each one of these gunas, or primitive differences of quality, a thousand couples, male aud female, have been created, to which the distinct heavens, or places of perfec- tion of Prajapati, Indra, Maruts, and Gandharvas are assigned, ‘I’o the gunas are related the yugas, or ages ; Ist, the Krita, or glorious age of truth and piety, in which apparently no distinctions, at least no grades of excellence were known; 2d, the Treta, or period of know- ledge : 3d, the Dvapara, or period of sacrifice ; 4th, the Kali, or period of darkness. Bunsen supposes there may be an historical element in the legend that Pururava, a great conqueror of the Treta age founded caste. The

gas are hardly periods of historical chronology, but there is no doubt that the Vayu Purana assigns the definite origin of caste to the Treta period.

“The perfect beings of the first age, some tranquil, sonie fiery, some active, and some distressed, were again born in the Treta, as Brahmans, &e., governed by the good and bad actions performed in former births.” The same hymn proceeds to explain that the first arrangement did not work well, and that a second was made, by which force, criminal justice, and war were declared to be the business of the Kshatriyas; officiating at sacrifices, sacred study, and the receipt of presents to belong to the Brahmans ; traffic, cattle, and agriculture to the Vaisyas ; the mechanical arts and service to the Sudras. The Ramayana hymn suggests that in the four great periods the castes successively arrive at the state of dharma or righteousness. Thus, a Sudra cannot, even by the most rigorous self-mortification, become righteous in the period proper to the salvation of the Vaisyas. As the hymn speaks in the Dvapara age, it speaks of the salvation of Sudras as future, and not yet possible. Wholly in opposition to thie story of a fourfold birth from Brahma is the legend that the castes sprang from Manu himself, who is removed by several generations of gods and demi-gods from Brahma. Then, again, the Santiparvan alleges that the world, at first entirely Brahmanic, was separated into castes merely by the evil works of man. Castehood con- sists in the exercise of certain virtues or vices. Munis, or persons born indiscriminately, frequently rise to the caste of Brahmans, and the offspring of Brahmans sinks to a lower level. The serpent observes : “ If a man is regarded by you as being a Brahman only in consequence of his con- duct, then birth is vain, until action is shown.” But this change of caste takes place only through a second birth, and not during the life which is spent in virtue. Another poetical conception of caste birth is expressed in the Tarivansa, The Brahmans were formed from an imperish- able element (Akshara), the Kshatriyas from a perishable element (Kshara), the Vaisyas from alteration, and the Sudras from a modification of smoke. The general result of the foregoing texts is that there are several contradictory accounts of the origin of caste, and that these are for the most part unintelligible. Caste is described as a late episode in creation, and as born from different parts of diferent gods, from the mortal Manu, from abstract

principles, and from non-entity. It is also described as coeval with creation, as existing 11 perfection during the Krita period, and subsequently falling

into sin. It is also said that only Brahmans existed at first, the others only at later periods. Then the rationalistic theories of the Santiparvan upset the very foundation of caste; viz., hereditary trausmission of the caste character! It seems elear that when the Vedas were composed, many persons who were not Brahmans acted as priests, and saints, the “receptors of gods,” by their “ austere fervour,” rose from a lower rank to the dignity of Brahmanhood. Originally, indeed, access to the gods by prayer and sacrifice was open to all classes of the community. As the Brahmans grow in political importance, they make religion an exclusive and sacred business. We find them deciding questions of succession to the throne, and enforcing their decisions. While in the earlier literature there are several instances of Brahmans receiving instruction from the hands of Kshatriyas, in the Puranas and Manu death is made to overtake Kshatriyas who are not submissive to the Brahmans; and in one case Visvamitra, the son of Gadhi, actually obtains Brahmanhood as a reward for his submis- sion. It seems ccrtain that many of the ancient myths were expressly manufactured by the Brahmans to show their superiority in birth and in the favour of Heaven to the Kshatriyas,—a poetical effect which is somctimes spoiled by their claiming descent from their.rivals. This brings us to a consideration of the theories which have been started to account for the appearance of Brahmanic caste, as it is stereotyped in the Laws of Manu. James Mill, who invariably underestimated the influence ou history of “previous states of society,” has suggested that the original division must have been the work of some inspired individual, a legislator or a social reformer, who perceived the advantages which would result from a systematic division of labour. The subordination of castes he accounts for by the superstitious terror and the designing lust of power which have so frequently been invoked to explain the natural supremacy of the religious class. Because the ravages of war were dreaded inost after the calamities seut by heaven, he finds that the military class properly occupy the second placc. This arrangement he apparently con- templates as at no time either necessary or wholesome, and as finally destroyed by the selfish jealousies of caste, and by the degradations which the multiplication of trades made inevitable. Heeren? and Klaproth have coutended that the division into castes is founded on an original diversity of race, and that the higher castes are possessed of superior beauty. The clear complexion and regular features of the Brahmans are said to distinguish them as completely from the Sudras as the Spanish

Creoles were distinguished from the Peruvians. ‘The high forehead, the stout build, and the light copper colour of the Brahmins and other castes allied to them, appear in strong contrast with the somewhat low and wide heads, slight make, and dark bronze of the low castes” (Stevenson, quoted by Miller, Chips, ii. p. 327).3 This explanation is, however, generally conjoined with that founded on the tradition of conquest by the higher castes. There is no doubt that the three castes of lighter colour (traivarnika), the white 1 Muir’s Sanskrit Tea:ts, vol. i., 1868. 2 Tdeen, i. 610. 3 The idea of a conquering white race is strangely repeated in the later history of India. ‘The Rajputs and Bralimans are succeeded by the Mussulmans, the Turks, the Afghans. There was an aristocracy of colour under the Moghul dynasty. But under au Indiau climate it could not last many generations. The Brahmans of Southern India were as black as the lowest castes ; the Chandalas are said to be descended from Brahmans. According to Manu the Chandala must not dwell within town; his sole wealth must be dogs and asses ; his clothes must consist of the mantles of deceased persons; his dishes

must be broken pots. Surely this vituperative description must apply to an aboriginal race,

Brahmans, the red Kshatriyas, the yellow Vaisyas, are, at least in the early hymns and Brahmanas, spoken of as the Aryas, the Sanskrit-speaking conquerors, in contradistinc- tion to the dark cloud of the Turanian aborigines Dasyus. In fact Arya, which means noble, is derived from Arya, which means householder, and was the original name of the largest caste, now called Vaisyas. Jtoth, in his “ Brahma and the Brahmans,” 4 holds that the Vedic people advanced from their home in the Punjab, drove the aborigines into the hills, and took possession of the country lying between the Ganges, the Jumna, and the Vindhya range. “In this stage of complication and disturbance,” he says, ‘“ power naturally fell into the hands of those who did not possess any direct authority,” 7.¢., the domestic priests of the numerous tribal kings. ‘The Sudras he regards as a con- quered race, perhaps a branch of the Aryan stock, which iminigrated at an earlier period into India, perhaps an autochthonous Indian tribe. The latter

hypothesis is opposed to the fact that, while the Sudra is debarred from sharing threc important Vedic sacrifices, the Bhagasata Purana expressly permits him to sacrifice “without mantras,” and imposes on him duties with reference to Brahmans and cows which one would not expect in the case of a nation strauge in blood. But unless a previous subordination of castes among the conquering race be supposed, it seems difficult to see why the warrior-class, who having contributed most to the conquest must have been masters of the situa- tion, should have consented to degradation below the class of Brahmaus. The position of the Sudra certainly suggests conquest. But are there sound historical reasons for sup- posing that Bralmans and Sudras belonged to diffcrent nations, or that either class was confined to one nation ? The hypothesis is slightly modified by Meiuers,? who supposes that instead of one conquest there may have been two successive immigrations,—the first immigrants being subdued by the second, and then forming an intermediate class between their couquerers and the aborigines ; or, if there were no aborigines, the mixture of the two immigrant races would form au intermediate class. In the same way Mr Talboys Wheeler ® suggests that the Sudra may be the original conquerors of the race now represented by thie Pariahs. Most of these explanations seem rather to describe the mode in which the existing institutions of caste might | be transplanted from one land to another, from a mother- land to its colonies, and altered by its uew conditions. Military conquest, though it often introduces servitude, does not naturally lead to the elevation of the priesthood. It is unscientific to assume large historical events, or large ethnological facts, or the existence of some creator of social order.”

As Benjamin Constant *® points out, caste rests on the rcligious idea of an indelible stain resting on certain men, and the social idea of certain functions being committed to certain classes. The idea of physical purity was largely developed under the Mosaic legislation ; in fact the internal regulations of the Essenes (who were divided into four classes) resemble the frivolous prohibitions of Brahmanism. As the daily intercourse of men in trade and industry

4 Journal of the German Oriental Society, vol. i. (quoted by Muir, ubi supra).

5 De Origine Castarum, Gottingen. 6 History of India, vol. i.

7 For a characteristic appreciation of caste see Comte, Cours de Philosophie Positive, vi. c. 8. He regards the hereditary transmission of functions under the rule of a sacerdotal class as a necessary and universal stage of social progress, greatly modificd by war and coloni- zation. The morality of caste was, he contends, an improvement on what preceded ; but its permanence was impossible, because ** the political rule of intelligence is hostile to luman progress." The seclusion of women and the preservation of industrial inventions were features of caste ; and the highcr pricsts were also magistratcs, philo- sophers, artists, engineers, and physicians.

8 De la Réligion, ii. 8.

presents numberless occasions on which the stain of real or fancied impurity might be caught, the power of the religious elass who define the rules of purity and the penalties of their violation becomes very great. Macleod has also stated two important elements which enter into the conception of caste: "That our place in the world is assigned to us by divine sovereignty ; and that the co-operation and sympathy of a brotherhood ~~are essential to our usefulness and happi~~ ness in the world."! There is no doubt that the Hindu mind is deeply religious, and therefore naturally prepared for Purohiti, or priest-rule. 'They were also passionately attached to their national hymns, some of which had led them to victory, while others were associated with the benign influences of nature. Only the priest could chant or teach these hymns, and it was believed that the smallest mistake in pronunciation would draw down the anger of the gods. But however favourable the conditions of spiritual dominion might be, it seems to have been by no more natural process than hard fighting that the Brahmans finally asserted their supremacy. We are told that Parasurama, the great hero of the Brahmans, " cleared the earth thrice seven times of the Kshatriya caste, and filled with their blood the five large lakes of Samauta." Mr Wheeler thinks that the substitution of blood-sacrifices for offerings of

parched grain, clarified butter, and soma wine marks an adaptation by the Brahmans of the great military banquets to the purposes of political supremacy. It is not therefore till the Brahmanic period of Indian history, which ends with the coming of Sakya Mouni, in 600 z.c., that we find the caste-definitions of Manu realized as facts. These are ——‘To Brahmans he (¢.e., Brahma) assigned the duties of reading the Vedas, of teaching, of sacrificing, of assisting others to sacrifice, of giving alms if they be rich, and if indigent of receiving gifts.”? The duties of the Kshatriya are “to defend the people, to give alms, to sacrifice, to read the Veda, to shun the allurements of sensual gratifica- tion.” The duties of a Vaisya are “ to keep herds of cattle, to bestow largesses, to sacrifice, to read the scripture, to carry on trade, to lend at interest, and to cultivate land.” These three castes (the twice born) wear the sacred thread. The one duty of a Sudra is “to serve the before-mentioned classes without depreciating their worth.”? The Brahman is entitled by primogeniture to the whole universe; he may eat no flesh but that of victims; he has his peculiar clothes. He is bound tohelp military and commercial men in distress. He may seize the goods of a Sudra, and what-

1 Peeps at the Far East, p. 186.

2 The great mass of the Brahmans were in reality mendicauts, who lived on the festivals of birth, marriage, and death, and on the fines exacted for infractions of caste rule. Others had establishments called Mutlis, endowed with Jagecr villages. There were two distinct orders of officiating priests,—the Purohita, or family priest, who performed all the domestic rites, and probably gave advice in secular matters, and the Guru, who is the head of a religious sect, making tours of superin- tendence and exaction, and having the power to degrade from caste and to restore. In some cases the Guru is recognized as the Mehitra or officer of the caste-assembly, from whom he receives Huks, or salary, and an exemption from house and stamp taxes, and service as begarree (Steele’s Law and Customs of Hindoo Castes within the Dekhun Pro- vinces, 1826; new edition, 1868). Expulsion from caste follows on a number of moral offences (¢.g., assault, murder, &c.), as well as cere- monial offences (¢.g., eating prohibited food, eating with persons of lower caste, abstaining fromi funeral rites, having connection with a low-caste woman). Exclusion means that it is not allowed to eat with or enter the

houses of the members of the caste, the offender being in theory not degraded but dead. For some heinous offences, 7.¢.,against the express letter of the Shasters, no re-admission is possible. But generally this depends on the ability of the outcaste to pay a fine, and to supply the caste with an expiatory feast of sweetmeats. He hasalso to go through the Sashtanyam, or prostration of eight members, and to drink the Panchakaryam, 7.e., drink of the five products of the cow (Description of People of India, Abbé J. A. Dubois, Missionary in Mysore, Eng. Tr., London, 1817. There is a valuable new edition of this work by Mr Pope, Madras, 1862), . § Manu, x. 88-90,

ever the latter acquires by labour or succession beyond a certain amount. The Sudra is to serve the twice born ; and even when emancipated cannot be anything but a Sudra. He may not learn the Vedas, and in sacrifice he must omit the sacred texts. A Sudra in distress may turn to a handicraft ; and in the same circumstances a Vaisya may stoop to servicé. Whatever crime a Brahman might commit, his person and property were not to be injured ; but whoever struck a Brahman with a blade of grass would become an inferior quadruped during twenty-one trans. migrations. In the state the Brahman was above all the ministers ; he was the rajah's priest, exempt from taxation, the performer of public sacrifices, the expounder of Manu, and at one time the physician of bodies as well as of souls, He is more liable than less holy persons to pollution, and his ablutions are therefore more frequent. A Kshatriya who slandered a Brahman was to be fined 100 panas (a copper weight of 200 grains) ; a Vaisya was fined 200 panas; a Sudra was to be whipped. A Brahman slandering any of the lower castes pays 50, 25, or 12 panas. In ordinary salutations a Brahman is asked whether his devotion hag prospered ; a Kshatriya, whether he has suffered from hig wounds; a Vaisya whether his health is secure ; a Sudra whether he is in good health.' In administering oaths a Brahman is asked to swear by his veracity ; a Kshatriya by his weapons, house, or elephant ; a Vaisya by his kine, grain, or goods ; a Sudra by all the most frightful penalties of perjury. The Hindu mind is fertile in oaths; before the caste assembly the Dhurm, or caste custom, is some- times appealed to, or the feet of Brahma, or some cow or god or sacred river, or the bel (the sacred creeper), or the roots of the

turmeric plant. The castes are also distinguished by their modes of marriage. Those peculiar to Brahmans seem to be,—1st, Brahma, when a daughter, clothed only with a single robe is given to a man learned in the Veda whom her father has voluntarily invited and respectfully receives ; 2d, Devas or Daiva, when a daughter, in gay attire is given, when the sacrifice is already begun, to the officiating priest. The primitive marriage forms of Rashasas or Rachasa, when a maiden is seized by force from home, while she weeps and calls for help, is said to be appropriate to Kshatriyas. To the two lower castes the ceremony of Asura is open, in which the bridegroom, having given as much wealth as he can afford to the father and paternal kinsman and to the damsel herself, takes her voluntarily as his bride. A Kshatriya woman on her marriage with a Brahman must hold an arrow in her hand; a Vaisya woman marrying one of the sacredotal or military classes must hold a whip ; a Sudra woman marrying one of the upper castes must hold the skirt of a mantle.

How little the system described by Manu applies to the existing castes of India may be seen in these facts—(1) that there is no artisan caste mentioned by Manu; (2) that eating with another caste, or eating food prepared by another caste, is not said by him to involve loss of caste, though these are now among the most frequent sources of degradation. The system must have been profoundly modified by the teaching of Buddha : “ As the fourrivers which fall into the Ganges lose their names as soon as they mingle their waters with the holy river, so all who believe in Buddha cease to be Brahmans, Kshatriyas, Vaisyas, and Sudras.” After Buddha, Sudra dynasties ruled in many parts of India and under the Moghul dynasty the Cayets, a race of Sudras, had almost a monopoly of public offices. But Buddha did not wish to abolish caste. Thus it is related that a Brahman Pundit who had embraced the doctrines of Buddha never-

4 As to the rights of the castes to participate in domestic rites, see BRAHMANISM, vol. iv. p. 204. , ; 5 “Wheeler, fi. 583, ©

theless found it necessary, when his king touched him, to wash from head.to foot.1 Alexander the Great found no castes in the Punjab, but Megasthenes has left an account of the ryots and tradesmen, the military order and the

gymnosophists (including the Buddhist Germanes) whom ho found in the country of the Ganges.? From his use of the word gymnosophist it is probable that Megasthenes confounded the Brahmans with the hermits or fakeers ; and this explains his statement that any Hindu might become aBrahman. Megasthenes spent some time at the court of Sandracottus, a contemporary of Seleucus Nicator. All the later Greeks® follow his statement and concur in enumerating seven Indian castes,—sophists, agriculturists, herdsmen, artisans, warriors, inspectors, councillors. On

the revival of Brahmanism it was found that the second |

and third castes had disappeared, and that the field was now occupied by the Brahmans, the Sudras, and a host of mixed castes, sprung from the original twelve, Unooloom and Pruteeloom, left-hand and right-hand, which were formed by the crossing of the four original castes. Manu himself gives a list of these impure castes, and the Ayeen Akberi (1556-1605) makes the positive statement that there were then 500 tribes bearing the name of Kshatriya, while the real caste no longer existed. Most of these sub-divisions are really trade-organizations, many of them living in village-communities, which trace descent from a pure caste, Thus in Bengal there are the Vaidya or Baidya, the physicians, who, Manu says, originated in the marriage of a Brahman father and a Vaisya mother. In Mysore alone Major Puckle reports that there are 110 different castes ; and the varieties of custom in the Deccan are well brought out in the book of Mr Steele, to which we have already referred. As Colebrooke said, Brahmans and Sudras enter into all trades, but Brahmans (who are profoundly ignorant even of their own scriptures) have succeeded in maintaining their monopoly of Vedic learning, which really means a superficial acquaintance with the Puranas and Manu. Though they have succeeded in excluding others from sacred employment, only a portion of the caste are actually engaged in religious ceremonies, in sacred study, or even in religious begging. Many are privates in the army, many water-carriers, many domestic servants. And they have like other castes many sub-divisions which prevent intimate association and intermarriage. The ideal Brahman is gone. Instead of a priest “ with his hair and beard clipped, his passions subdued, his mantle white, his body pure, golden rings in his ear,” you have a mean, selfish, often extremely dirty, person, whose remaining power lies in extortion by

dishonesty. But the hold which caste has on the Hindu minds may, perhaps, be most clearly seen in the history of the Christian missions and in comparatively recent times. The Jesuits Xavier and Fra dei Nobili did everything but become Brahmans in order to convert the South of India,—they put on a dress of cavy or yellow colour, they made frequent ablutions, they lived on vegetables and milk, they put on their foreheads the sandal-wood paste used by the Brahmans,—and Gregory XV. published a bull sanctioning caste regulations in the Christian churches of India, The Danish mission of Trauquebar, the German mission of the heroic Schwarz, whose headquarters were Tanjore, also permitted caste to be retained by their followers. Even the priests of Buddha, whose life was a protest against caste, re-erected the system in the island of Ceylon, where the radis or radias were reduced to much the same state as the Pariahs.4 At the present day the progress of Protestant missions amounts almost to nothing. In Dr

1 Travels of Fah Hian, c. 27. 2 Strabo, Ind., sec. 59. , ne Indic, ec. 11, 12; Diod. Sic., ii. c. 40, 41; and Strabo, xy. 1.

“ Irving, Theory and Practice of Caste, London, 1859.

Mullen’s report down to 1871 the whole force of 579 English missionaries, 323 native ordained ministers, and 1993 other native preachers had produced a native Christian community of only 280,600. There was probably a much larger Roman Catholic population in the south of India about the middle of the 18th cen- tury.

It is still the general law that to constitute a good marriage the parties must belong to the same caste, but to unconnected families.© Undoubtedly, however, the three higher castes were always permitted to intermarry with the caste next below their own, the issue taking the lower caste or sometimes forming a new class. A Sudra need not marry a wife of the same caste or sect as himself. So recently as 1871 it was decided by the Judicial Committee of the Privy Council that a marriage between a Zemindar of the Malavar class, a sub-division of the Sudra caste, with a woman of the Vellala class of Sudras is lawful. Generally also a woman may not marry beneath her own caste, The feeling is not so strong against a man marry- ing

even in the lowest caste, for Manu permits the son of a Brahman and a Sudra mother to raise his family to the highest caste in the seventh generation. The illegitimacy resulting from an invalid marriage does not render incapable of caste; at least it does not so disqualify the lawful children of the bastard. On a forfeiture of caste by either spouse intercourse ceases between the spouses: if the out-caste be a sonless woman, she is accounted dead, and funeral rites are performed for her; if she have a son, he is bound to maintain her. It is remarkable that the professional concubinage of the dancing-girl does not involve degradation, if it be with a person of the same caste. This suggests that whatever may be the function of caste, it is not a safe guardian of public morality. The rules as to prohibited degrees in marriage used to be very strict, but they are now relaxed. An act of 1856 legalized. re-marriage by widows in all the castes, with a conditional forfeiture of the deceased husband's estate, unless the husband has expressly sanctioned the second marriage. The recent Marriage Act was directed against the iniquitous child marriages ; it requires a minimum age. In many ways the theoretical inferiority of the Sudra absolves him from the restraints which the letter of the law lays on the higher castes. Thus, a Sudra may adopt a daughter's or sister's son, though this is contrary to the general rule that the adopter should be able to marry the mother of the adopted person. The rule requiring the person adopted to be of the same caste and gotra or family as the adopter is also dispensed with in the case of Sudras. In fact, it is only a married person whom a Sudra may not adopt. As regards inheritance the Sudra does not come off so well in competi- tion with the other castes. 'The sons of a Brahamana in the several tribes have four shares or three or two or one; the children of a Kshatriya have three portions or two or ove; and those of a Vaisya take two parts or one." This refers to the case permitted by law, and not unknown in practice, of a Brahman having four wives of different castes, a Kshatriya three, and soon. But all sous of inferior caste are excluded from property coming by gift to the father ; and a Sudra son is also excluded from land acquired by purchase. It must be recollected, however, that under an Act of 1850, loss of caste no longer affects the capacity to inherit or to be adopted. In cases of succession ab intestato on failure of the preceptor, pupil, and fellow-student (heirs called by the Hindu law after relatives), a priest, or any Brahman, may succeed. Where a Sudra is the only son of a Brahman,

the Sapinda, or next of kin, would take two- thirds of the inheritance ; where he is the only son of any

5 See BRAUMANISM, vol. iv. p. 204.

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other twice-born father, the Sapinda would take one-half. Possibly, the rule of equal division among sons of equal caste did not at first apply to Brahmans, who, as the eldest sons of God, would perhaps observe the custom of primogenitnre among themselves. On the other hand it was laid down in the Judicial Committee in 1869, contrary to the collected opinions of the Pundits of the Sudder Court, that, in default of lawful children, the illegitimate children of the Sudra caste inherit their putative father's estate, and, even if there be lawful children, are entitled to maintenance out of the estate. It had previously been decided by Sir Edward Ryan in 1857 that the illegitimate children of a Rajput, or of any other member of a superior caste, have no right of inheritance even under will, but a mere right to maintenance, provided the children are docile. It seems then that the Kshatriya and Vaisya castes, though in one sense non-existent, still control Hindu succes- sion.}

With regard to Persia the Zend Avesta speaks of a fourfold division of the ancient inhabitants of Iran into priests, warriors, agriculturists and artificers ; and also of a sevenfold division corresponding to the seven amschespands, or servants of Ormuzd. This was no invention of Zoroaster, but a tradition from the golden age of Jemshid orDiemschid. The priestly caste of Magi was divided into Herbeds or disciples, Mobeds or masters, and Destur Mobeds or complete masters. The last-named were alone entitled to read the liturgies of Ormuzd; they alone predicted tlie future and carried the sacred cost?, or girdle, havan, or cup, and barsom, or bunch of twigs. The Zend word baresma is supposed to be connected with Brahma, or sacred element, of which the symbol was a bunch of kusa grass, generally called veda. The Persian and Hindu religions are further connected by the ceremony called Homa in the one and Soma in the other. Haug, in his Zract on the Origin of Brakmanism (quoted by Muir, ubi supra), maintains that

the division in the Zend Avesta of the followers of Ahura Mazda into Atharvas, Rathaesvas, and Vastrya was precisely equivalent to the three superior Indian castes. He also asserts that only the sons of priests (Atharvas) could become priests, a rule still in force among the Parsis. The Book of Daniel rather suggests that the Magi were an elective body ; and as regards the secular classes there does not seem to be a trace of hereditary employment or religious subordination. There is a legend in the Dabistan of a great conqueror, Mahabad, who divided the Abyssinians into the usual four castes ; and Strabo mentions a similar classification of the Iberians into kings, priests, soldiers, husbandmen, and menials,

At one time it was the universal opinion that in Egypt there were at least two great castes, priests and warriors, the functions of which were transmitted from father to son, the minor professions grouped under the great castes being also subject to hereditary transmission. This opinion was held by Otfried Miller,? Meiners of Gottingen, and others. Doubts were first suggested by Rossellini, and after Champollion had deciphered the hieroglyphic inscriptions, J. J. Ampére? boldly announced that there were in Egypt no castes strictly so called ; that in particular the professions of priest, soldier, judge, &c., were not hereditary ; and that the division of Egyptian society was merely that which is generally found in certain stages of social growth between the liberal professions and the mechanical arts and trades. No difference of colour, or indeed of any feature, has been eee

1 For an account of the actual condition of castes see the magnifi- cently illustrated Government publication The People of Indiu, edited ei Kaye and Watson, 6 vols. 4to, 1868-72 ; also Sherring's Castes of

Enares.

2 Manual of Archeology. 3 Revue des Deua Mondes, 15th September 1848,

observed in the monumental pictures of the different Egyptian castes. J'rom an inspection of numerous tombs, sarcophagi, aud funeral stones, which frequently enumerate the names and professions of several kinsfolk of the deceased, Ampere has concluded that sacerdotal and mili tary functions

were sometimes united in the same person, and might even be combined with civil functions ; that intermarriage might certainly take place between the sacred and military orders ; and that. the members of the same natural family did frequently adopt the different occupations which had been supposed to be the exclusive property of the castes. The tombs of Beni Hassan show in a striking manner the Egyptian tendency to accumulate, rather than to Separate, employments. Occasionally families were set apart for the worship of a particular divinity. An interesting “ see. tion” of Egyptian society is afforded by a granite monu- ment preserved in the Museum at Naples. Nine figures in bas-relief represent the deceased, his father, three brothers, a paternal uncle, and the father and two brother of his wife. Another side contains the mother, wife, wife’s mother, and maternal aunts. The deceased is described ag a military officer and superintendent of buildings ; his elder brother as a priest and architect ; his third brother as a provincial governor, and his father as a priest of Ammon, The family of the wife is exclusively sacerdotal. Egyptian caste, therefore, permitted two brothers to be of different castes, and one person to be of more castes than one, and of different castes from those to which his father or wife belonged. The lower employments, commerce, agriculture, even medicine, are nevér mentioned on the tombs. The ab- solute statements about caste in Egypt, circulated by sueh writers as Reynier and De Goguet, have, no doubt, been founded on passages in Herodotus (ii, 143, 164.), who men- tions seven classes, and makes war au hereditary profession ; in Diodorus Siculus (i. 2 —8), who mentions five classes and an hereditary priesthood; and in Plato, who, anxious to illustrate the principle of compulsory division of labour, on which his republic was based, speaks in the Zmeus of a total separation of the six classes,—priests, svldiers, husbandmen, artisans, hunters, and shepherds. Heeren (ii, 594) does not hesitate to ascribe the formation of Egyp- tian caste to the meeting of different races. According to the chronology constructed by Bunsen the division into castes began in the period 10,000-9000, and was completed along with the introduction of animal worship and the improvement of writing under the third dynasty in the 6th or 7th century of the Old Empire. The Scholiast of Apollonius Rhodius, on the authority of Diczarchus, in the Second Book of /ellas, mentions a king, Sesonchosis, who, about 3712 B.c., “enacted that no one should abandon his father’s trade, for this he considered as leading to avarice.” Bunsen conjectures that this may refer to Sesostoris, the lawgiver

of Manetho’s third or Memphite dynasty, the eighth from Menes, who introduced writing, building with hewn stone, and medicine ; possibly, also, to Sesostris, who, Aristotle says (Polzt., vii. 1), introduced caste to Crete. He further observes that in Egypt there was never a conquered indigenous race. There was one nation with one language and one religion; the publie panegyrics embraced the whole people ; every Egyptian was the child and friend of the gods. The kings were generally warriors, and latterly adopted into the sacredotal caste. Intermarriage was the rule, except between the swine- herds and all other classes. ‘ Every shepherd is an abomi- nation unto the Egyptians” (Gen. xlvi. 34). (w. ©. S.) CASTEL, Louis Berrrann (1688-1757), a learned mathematician, was born at Montpellier in 1688, and entered the order of the Jesuits in 1703. At first he was a student of literature, but he afterwards devoted himself entirely to mathematics and natural philosophy. He

wrote several scientific works, that which attracted most attention at the time being his Optique des Couleurs, or treatise on the melody of colours. He endeavoured to illustrate the subjeet by a clavecu oculaure, or ocular harp- sichord; but the treatise and the illustration were quickly forgotten. He also published a critical account of the system of Sir Isaac Newton in French.

CASTEL-A-MARE, or CAsTELLAMARE, a city and sea- port of Italy, on the Gulf of Naples, 15 miles by rail south- east of the city of that name. It is situated on the lower slopes of Montc Sant’ Angelo (the ancient Jfors Gaurus), and along a sheltered beach, commanding an extensive view of the Bay of Naples from Vesuvius to Misenum.. It stands near the site of the ancient Stabiw, which was destroyed by Sulla in the social war, but continued to exist as a small place till 79 AD., when it was overwhelmed along with Pompeii and Herculaneum by the great cruption of Vesuvius, and became for ever celebrated as the death-scene of the elder Pliny. The castle, from which the city takes its name, was erected by Frederick II., surrounded by walls and towers in the 13th century by Charles I. of Anjou, and strengthened by additional fortifications by Alphonso I. of Aragon. Castcl-a-mare is the seat of a bishopric, and has a royal palace, a cathedral,

several churches aud con- yents, a military hospital, barracks, a handsome quay, a royal arsenal, aud a dockyard, where the large ships of the Neapolitan navy were formerly built. In shipbuilding it still ranks second of the Italian towns; and there are manufaetures of linen, silk and cotton goods, and leather. The port is small, and divided by two forts. The hill immediately above the town is covered with villas and easinos. ‘The royal casino of Quisisana, originally built by Charles II. of Anjou, was restored by Ferdinand I. of Naples. It is more remarkable for its fine prospect than for its magnificence as a palace. Population about 26,000.

CASTEL-A-MARE, a seaport town of Sicily, on a bay to whieh it gives its name, in the province of Trapani, and about 30 miles west of Palermo. It oceupies the site of the port of the ancient Segesta, which lay about six miles distant, and it still carries on a considerable export tradc in wine, fruit, grain, and timber. Population 11,280.

CASTEL SARRASIN, a town of France, capital of an arrondissement, in the department of Tarn et Garonne, situated on the Songuine or Azine, near its influx into the Garonne, 12 miles west of Montauban. he walls which formerly surrounded the town have been couvertcd into promenades. It has manufactures of serges and other woollen stuffs, hats, and leather, and some trade in corn grown in the vicinity. The town is said by some investiga- tors to receive its name from the erection of its castle by the Saracens, but according to others the present form of the word is only a corruption of Castel sur Azine, The Parliament of Toulouse took refuge within the town in 1595. Population in 1872, 3064.

CASTEL VETRANO, a town of Sicily, near the south- east extremity of the island, 12 miles east of Mazzara, in the province of Trapani. It is well and regularly built, and has a population of about 20,000, many of whom are hereditary tenants of the dukes of Monteleone, who have a palaee in the town. Near it are the ruins of the ancient city Selinus, which was destroyed by the Carthaginians 409 B.c.

CASTELL, Epmunp (c. 1606-1685), a learned English Orientalist, was born about 1606, at Hatley, in Cambridge- shire. At the age of fifteen he entered Emmanuel College, Cambridge, but he afterwards changed his residence to St John’s, where he enjoyed the use of a valuable library. His great work

was the compiling of his Leaicon Heptaglotton Hebraicum, Chaldaicum, Syriacum, Samart- tanum, Aithiopicum, Arabicum, et Persicum (London, 1669).

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Over this book he spent eighteen years, working (if we may accept his own statement) from sixteen to eighteen hours a day ; he employed fourteen assistants, and by an expendi- ture of £12,000 brought himself to poverty, for his lexi- con, though full of the most unusual learning, did not find purchasers. His loss was partly compensated by a number of preferments, including a prebend at Canterbury, and the professorship of Arabic at Cambridge. Castell also lent the aid of hig erudition to the preparation of Dr Walton's well-known Polyglott Bible. His MSS. he bequeathed to the University of Cambridge.

CASTELLI, Icnaz Frrepricu (1781-1862), an Austrian dramatist, was born on 6th March 1781, at Vienna, He completed his education at the university in his native town, and entcred the profcssion of law. The leisure left him by his employment in a subordinate Government office he devoted to literary work, in particular to the composition and adaptation of dramatic pieccs, Some of his war-songs became exceedingly popular, and so excited the ill-feeling of the French that Castelli had to flee from Vienna and take refuge in Hungary. In 1811 he was made director of the court theatre by Prince Lobkowitz, but he resigned this post in 1814 in order to accompany Count Cavriani to France as secretary. He returned to Vienua with Count Miinch-Bellinghausen, and for many years occupied himself entirely with literary work. He died in 1862 at Lilienfeld. From 1840 he had enjoyed a pension from Government. His autobiography appeared in three volumes, 1861-2. His numerous dramas and minor pieces are distinguished only by their light gaiety and humour.

CASTELLO, Bzrnarpo (1557-1629), a Genoese portrait and historical painter, born at Albaro near Genoa, was the intimate fricnd of Tasso, and took upon himself the task of designing the figures of the Gerusalemme Liberata, published in 1590 ; some of these subjects were engraved by Agostino Caracci. Besides painting a number of works in Genoa, mostly in

a rapid and superficial style, Castcllo was employed in Rome, and in the court of the duke of Savoy.

CASTELLO, Giovannrt Barrista (1500-1569), an eminent Italian historical painter, was born in Bergato, aud is hence ordinarily termed I] Bergamasco. Hc belongs, however, to the school of Genoa, but' does not appear to have had any family relationship with the other two painters named Castello, also noticed here. He was employed to decorate the Nunziata di Portoria in Genoa, the saloon of the Lanzi Palace at Gorlago, and the Pardo Palace in Spain. His best-known works are the Martyrdom of St Sebastian, and the picture of our Saviour as Judge of the World on one of the vaultings of the Nunziata. He was an architect and sculptor as well as painter. In 1567 he was invited to Madrid by Philip IT., and there he died, holding the office of architect of the Royal Palaces.

CASTELLO, Vaterto (1625-1659), was the youngest son of Bernardo Castello, noticed above. He sur- passed his father, and particularly excelled in painting battle-scenes. . He painted the Rape of the Sabines, now in the Palazzo Brignole, Genoa, and decorated the cupola of the Church of the Anuunciation in the same city. Jn these works he is regarded by his admirers as combining the fire of Tintoretto with the gencral style of Paolo Vero- nese; his premature death cut short a carecr of high hopes.

CASTELLON DE LA PLANA, a town of Valencia, in Spain, the capital of a ncdern proviuce, is situated about 4 iniles from the sea, and 40 miles N.N.E, of Valencia, in 39°57' N. lat. and 0° 4' W. long. It derives its name from the extensive plain in which it is situated, and which is watered artificially by an aqueduct brought for the mest part through solid rock from the Mijares, a stream about

five miles distant, It is walled, and contains two nunneries, three monasteries, and two hospitals, as well as several churches, in which there are paintings by Ribalta, a native artist. There is a brisk local trade maintained in the weaving of sail-cloth and linen. In the time of the Moors

the city was situated on a height to the north of the present position, to which it was removed by Jayme I. in 1233. Population, 20,123.

CASTELNAU, Micuet pz, S1zur DE LA MAUVISSIERE (c.1520-1592),a French soldier and diplomatist, ambassador to Queen Elizabeth, was born in Touraine about 1520. He was one of a large family of children, and his grandfather, Pierre de Castelnau, was equerry to Louis XII. Endowed with a clear and penetrating intellect and remarkable strength of memory, he received a careful education, aud made rapid progress in his studies. To complete his education he travelled in Italy and made a long stay at Rome. He then spent some time in the Island of Malta, afterwards entered the army, and made his first acquaint- ance with the art of war in the chequered compaigns of the French in Italy. His abilitiesand his courage won for him the friendship and protection of the cardinal of Lorraine, who took him into his service. In 1557 a command in the navy was given to him, and the cardinal proposed to gethim knighted. This, however, he declined, and then rejoined the French army in Picardy. Various delicate missions requiring tact and discretion were en- trusted to him by the constable de Montmorency, and these he discharged so satisfactorily that he was sent by the king, Henry II., to Scotland, with despatches for Mary Stuart, then betrothed to the Dauphin (afterwards Francis II), From Scotland he passed into England, and treated with Queen Elizabeth respecting her claims on Calais (1559), a settlement of which was effected at the congress of Cambray. Castelnau was next sent, with the title of ambassador, to the princes of Germany, for the purpose of prevailing upon them to withdraw their favour from the Protestants. This embassy was followed by missions to Margaret of Parma, governess of the Netherlands, to Savoy, and then to Rome, to ascertain the views of Pope Paul IV. with regard to France. Paul having died just be- fore his arrival, Castelnau used his influence in favour of the election of Pius IV. Retuming to France he once more entered the navy, and served under his former patron. It was his good fortune, at Nantes, to discover the earliest symptoms of the conspiracy of Amboise, which he immediately reported to the Government, After the death of Francis II. (December 1560), he accompanied the queen, Mary Stuart, to Scotland, and remained with her a year, during which time he made several journeys into England, and attempted to bring about a reconciliation between Mary and Queen Elizabeth. The wise and moderate counsels which

he offered to the former were unheeded. In 1562, in consequence of the civil war in France, he returned there. He was employed against the Protestants in Brittany, was taken prisoner in an engage- ment with them and sent to Havre, but was soon after exchanged. In the midst of the excited passions of his countrymen, Castelnau, who was a sincere Catholic, main- tained a wise self-control and moderation, and by his counsels rendered valuable service tothe Government. He served at the siege of Rouen, distinguished himself at the battle of Dreux, took Tancarville, and contributed in 1563 to the recapture of Havre from the English. During the next ten years Castelnau was employed in various impor- tant missions ;— first to Queen Elizabeth, to negotiate a peace ; next to the duke of Alba, the new governor of the Netherlands. On this occasion he discovered the project formed by Condé and Coligny to seize and carry off the royal family at Monceaux (1567). After the battle of St

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Denis he was again sent to Germany to solicit aid against the Protestants ; and on his return he was rewarded for his services with the post of governor of Saint-Dizier, and a conpany of orderlies. At the head of his company he took part in the battles of Jarnac and Moncontour, In 1572 he was sent to England by Charles IX,, to allay the excitement created by the massacre of St Bartholomew; and the same year he was sent to Germany and Switzerland, Two years later he was reappointed by Henry III. ainbagga- dor to Queen Elizabeth, and he remained at her court for ten years. During this period he used his influence to promote the marriage of the queen with the duke of Alengon, with a view especially to strengthen and maintain the alliance of the two countries. But Elizabeth made so many promises only to break them that at last he refused to accept them or communicate them to lis Government. On his return to France he found that his chateau of La Mauvissiére had been destroyed in the civil war; and as he refused to recognize the authority of the League, the duke of Guise deprived him of the governorship of Saint-Dizier. He was thus brought almost to a state of destitution. But on the accession of Henry IV., the king, who knew his worth, and was confident that although he was a Catholic he might rely on

his fidelity, gave him a command in the army, and entrusted him with various confidential missions, Castelnau died at Joinville in 1592. The Mémozrres left by this great diplomatist rank very high among the original authorities for the period they cover, the eleven years between 1559 and 1570. They were written during his last embassy in England for the benefit of his son ; and they possess the merits of clearness, veracity, and impartiality. They were first printed in 1621; again, with additions by Le Laboureur, in 2 vols, folio, in 1659 ; and a third time, still further enlarged by Jean Godefroy, 3 vols. folio, in 1731. Castelnau translated into French the Latin work of Ramus On the Manners and Customs of the Ancient Gauls. Various letters of his are preserved in the Cottonian and Harleian collections in the British Museum.

CASTELNAUDARY, the chief town of an arrondisse- ment in the department of Aude, in France, 21 miles north- west of Carcassonne. It is finely situated on an elevation in the midst of a fertile and well-cultivated plain; and its commercial facilities are greatly increased by the Canal du Midi, which widens out, as it passes the town, into an extensive basin or reservoir, surrounded with wharves and warehouses, ‘The principal buildings are the courthouses, the church of St Michel, the exchange, and the communal college. There are large manufactures of woollen and cotton goods, linen, leather, bricks, tiles, and earthenware; an extensive trade is maintained in lime, gypsum, grain, fruits, and wine; and the building of canal boats forms an important industry. By some authorities Castelnaudary is supposed to represent the ancient Sostomagus, and to receive its present name, which they regard as a corruption of the Latin Castrum Novum Arianorum, from the fact that it was rebuilt by the Visigoths, who were adherents of the Arian party. It is distinctly mentioned in the 12th century, and in 1212 it was remarkable as the scene of a great conflict between the counts of Toulouse and Foix and Simon de Montfort, in which the former were defeated. In 1229 the town was deprived of its ramparts; and in 1355 it was captured and burned by the Black Prince. In 1632 the duke of Montmorency was defeated here by the’ royal troops under Schomberg. Population in 1872, 7946.

CASTELO BRANCO (z.¢., White Castle), a town and bishop’s seat of Portugal, in the province of Beira, on a hill near the Liria, 64 miles east by

south of Coimbra. It is surrounded by walls flanked by towers, and has a ruined castle on the summit of the hil]. Population about 5580.

CASTI, Giovanni Barrista (1721-1803), an Italian poet, was born of humble parents at Montefiascone, in the States of the Church, in 1721, He rose to the dignity of canon in the cathedral of his native place, but gave up his chance of church preferment to satisfy his gay and restless spirit by visiting most of the capitals of Europe, In 1782, on the death of Metastasio, he was appointed Poeta Cesario, or poet-laureate of Austria, in which capacity he applied himself with great success to the opera bouffe; but, in 1796, he resigned this post, in order that he might not be hampered by political relations ; and he spent the close of his life as a private gentleman at Paris, where he died in 1803. Castiis best known as the author of the Wovelle Gal-anti, and of Gli Animali Parlanti, a poetical allegory, over which he spent eight years (1794~-1802), and which, not- withstanding its tedious length, excited so much intcrest that it was translated into French, German, and Spanish, and (very freely and with additions) into English in W. S. Rose's Court and Parliament of Beasts (Lond. 1819). Written during the time of the Revolution in France, it was intended to exhibit the feelings and hopes of the people, and the defects and absurdities of various political systems. The Wovelle Galant is a series of poetical tales, in the ottava rima,—a metre largely used by Italian poets for that class of compositions. The sole merit of these poems con- sists in the harmony and purity of the style, and the liveli- ness and sarcastic power of many passages. They are, how- ever, characterised by the grossest licentiousness; and there is no originality of plot,—that, according to the custom of Italian novelists, being taken from classical mythology or other ancient legends. Among the other works of Casti is the Poema Tartaro, a mock-heroic satire on the court of Catherine II., with which he was personally acquainted.

CASTIGLIONE DELLE -STIVIERE, a town of Italy, in the province of Brescia, 20 miles north-west of Mantua. It has a castle, a theatre, and two fine churches, and was formerly the capital of a small principality dependent on the duchy of Mantua. In 1796 the Austrians, under Wurmser, were defeated there by Marshal Augereau, who was afterwards rewarded by

Napoleon with the title of duke of Castiglione. Population, 5237. This town must not be confounded with Castiglione Fioretino, a flourish- ing township, about 11 miles south of Arezzo by rail, which is chiefly engaged in the culture of the silk-worm.

CASTIGLIONE, BatpassaRE (1478-1529), diplomatist and man of letters, was born at Casatico near Mantua, and was educated at Milan under the famous professors Merula and Chalcondyles. In 1496 he entered the service of Lodovico Sforza, duke of Milan, returning to Mantua in 1500 when Lodovico was carried prisoner into France. In 1504 he was attached to the court of Guidobaldo Malatesta, duke of Urbino, and in 1506 he was sent by that prince on a mission to Henry. VII. of England, who had before conferred on Federigo Malatesta, “the Good Duke,” the most famous mercenary of his age, the order of the Garter. Guidobaldo dying childless in 1508, the duchy of Urbino was given to Francesco Maria della Rovere, for whom Castiglione, envoy at the court of Leo X. (Medici), obtained the office of generalissimo of the Papal troops. Charged with the arrangement of the dispute between Clement VII. (Medici) and Charles V., Castiglione crossed, in 1524, into Spain, where he was received with highest honours, being afterwards naturalized, and made bishop of Avila. In 1527, however, Rome was seized and sacked by the Imperialists under Bourbon, and in the July of the same year the surrender of the castle of Sant’ Angelo placed Clement in their hands. Castiglione had been iricked by the emperor, but there were not wanting accusa- tions of treachery against himself. He had, however, placcd fidelity highest among the virtues of his ideal ‘courtier ;”

and when he died at Toledo in 1529, it was said that he had died of grief and shame at the imputation. The emperor mourned him as “one of the world’s best cavaliers.” A portrait of him, now at the Louvre, was painted by Raphael, who disdained neither his opinion nor his advice.

Castiglione wrote little, but that little is of rare merit. His verses, in Latin and Italian, are elegant in the extreme ; his letters (Padua, 1769-1771) are full of grace and finesse. But the book by which he is best remembered is the famous treatise, Z/ Cortegiano, written in 1514, published at Venice by Aldus in 1528, and translated into English by a certain Thomas Hoby as

early as 1561. This book, called by the Italians Z7 Libro d'Oro, and remarkable for its easy force and undemonstrative elegance of style no less than for the nobility and manliness of its theories, describes the Italian gentleman of the Renaissance, under his brightest and fairest aspect, and gives a charming picture of the court of Guidobaldo da Montefeltre, duke of Urbino, " confessedly the purest and most elevated court in Italy." In the form of a discussion held in the duchess's drawing- room—with Elizabetta Gonzaga, Pietro Bembo, Bernardo Bibbiena, Giuliano de' Medici, Emilia Pia, and Ceretino the Unique among the speakers—the question, What constitutes a perfect courtier? is debated. With but few differences, the type determined on is the ideal gentleman of the present day. See Ginguené, LMistorre Litteraire de? Italie, vi., vii; and J. A. Symonds, Zhe Lenaissance in Italy, London, 1875.

CASTIGLIONE, Giovanni BeNEDETTO (1616—1670), currently named in Italy Il Grechetto, and in France Le Benédette, a painter of the Genoese School, was born in Genoa, and studied for some time under Vandyck. He painted portraits, historical pieces, and landscapes, but chiefly excelled in fairs, markets, and rural scenes with animals. His paintings are to be found at Rome, Venice, Naples, Florence, and more especially Genoa and Mantua. He also executed a great number of etchings, which are spirited, free, and full of taste; Diogenes searching for a Man is one of the principal of these. The etchings are remarkable for light and shade, and have even earned for Castiglione the name of "a second Rembrandt." The Presepio (Nativity of Jesus) in the church of San Luca, Genoa, ranks among his most celebrated paintings; the Louvre also contains eight characteristic examples. In his closing years he lived in Mantua, painting for the court ; here he received his name of " Grechetto," from the classic air of his pastorals, and here he died of gout in 1670. His brother Salvatore and his son Francesco excelled in the same subjects ; and it is thought that many paintings which are ascribed to Benedetto are only copies after him, or perhaps originals by his son or brother.

CASTIGLIONE, Carto Orravio, Count (1784-1849), an Italian philologist of considerable reputation, was born at Milan of an ancient family. His principal work was done in connection with the Arabic and other Oriental languages ; but he also performed good service in several other

departments. In 1819 he published Monete Cufiche del Museo di Milano, and assisted Cardinal Mai in his Ulphile partium ineditarum in Ambrosianis palimpsestis repertarum editio. A learned Mémoire geographique et numismatique sur la partie orientale de la Barbarie appelée Afrikia par les Arabes appeared in 1826, and established his reputation. In 1829 he published by himself the Gothic version of the second epistle of Paul to the Corin- thians ; and this was followed by the Gothic version of the epistle to the Romans, the~first epistle to the Corinthians, and the epistle to the Ephesians in 1834; by Galatians, Philippians, and 1 Thessalonians in 1835, and by 2 Thes- salonians in 1839. His life was written by Biondelli, and appeared at Milan in 1856.

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CASTILE (in Spanish, Castilla), an ancient kingdom of Spain occupying the central districts of the peninsula. For its history as a separate kingdom see the article Spain. The name Castile is derived from the existence of numerous forts (castillos) crected on the frontiers to afford protection from enemies. The northern part of the old ‘kingdom, which was first rescued from the Moors, 1s called Castilla la Vieja, or Old Castile; the southern, more recently acquired, is called Castilla la Nueva, or New Castile. The length of Castile from north to south is about 300 miles; the breadth, about 160 miles; and the total area about 45,000 square miles, or nearly one-fourth that of Spain.

Old Castile is bordered on the N. by the Bay of Biscay, on the E, and N.E. by Biscay, Alava, Navarre, and Aragon, on the §. by New Castile, and on the W. by Leon and Asturias. It is divided into the pro- vinces of Burgos, Logrofio, Santander, Soria, Segovia, Avila, Palencia, Valladolid, and has an area of 25,409 square miles, and a population estimated in 1870 at 1,689,864 inhabitants. The country consists of vast plains, which form, between the Cantabrian chain in the north and the chain of Sierras stretching south-west from Aragon to Estremadura, a great table-land, of a height between 2500 and 4000 fect above the sea. The principal rivers are the Douro and the Ebro. The plains ere barren and dry, with scarcely a tree, meadow, or spring of water ; but the hills bordering the mountain ranges are well clothed with oak-forests. The climate is healthy, but subject to great

extremes of cold and heat; frosts in the higher regions may last three months at atime. ‘The soil is productive, but poorly cultivated; the harvests of wheat, however, are abundant. Wine and oil of inferior quality, and madder, are produced in considerable quantity, but fruits are scarce except at Bureba. The export trade is chiefly in wool, cattle, sheep, and wheat. The bad state of the roads (which are often impassable for mules), the insufficiency of railway communication, and the neglected condition of the Port of Santander, are great obstacles to commerce.

New Castile is bounded on the N. by Old Castile, on the E. by Aragon and Valencia, on the 8. by La Mancha, on the W. by Estremadura. It forms the southern portion of the great central table-land of Spain, and comprises the pro- vinces of Madrid, Toledo, Guadalajara, and Cuenca, ‘The total area is 20,178 square miles, inhabited by a population estimated in 1870 at 1,277,123. The principal mountain ranges are the Sierra Guadarama in the north, and the Sierra Morena in the south. The chief rivers are the Tagus, Guadiana, Guadalquiver, Segura, and Xucar. The climate is more rigorous than that of Old Castile, and the mean temperature, on acconnt of the elevation of surface, is not more than 59°; but the heat in summer is extreme in the valleys. The rainfall is not more then 10 inches in a year; the windsare dry and violent. The whole country presents the aspect of a barren dusty steppe, with patches of olive-trees here and there, and wheat, pea, and saffron fields. During the rainy season the vegetation is very luxuriant ; but agriculture is in a backward state; the soil is fertile, but the rivers are not used for its irrigation. The total quantity of wheat raised is barely sufficient for the wants of the population. Hemp and flax and olive- trees are cultivated. Timber and fire-wood are becoming dearer, as the country is very little wooded, Honey is gathered in considerable quantities; and sheep, oxen, and mules are reared in great numbers. Iron, salt, and quick- silver are worked; the mineral resources are good, but ill developed. The manufactures are chiefly of woollen goods, plain and figured velvets, silks, satins, calicoes, stockings, earthenware, and cutlery.

The inhabitants of both Old and New Castile are a loyal

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and manly race, prescrving the primitive simplicity and pure Spanish, as well as the pride, of their forefathers, They are uneducated and inclined to bigotry, but naturally shrewd and intelligent. The tillage of the land and the pasturing of sheep are their chief employments.

CASTILLEJO, CuristoBat DE (1494-1556), was born, according to Moratin, in Ciudad-Rodrigo. Attached at an early age to the household of Ferdinand of Austria, after- wards king of Bohemia and Hungary, and eventually em- peror, Castillejo rose in the prince's service to the post of secretary, taking orders on the departure of his master from Spain, in which country he remained some time. A letter written during this period (1523) by Martin de Salinas to the treasurer Salamanca, in reply to one asking him to provide the treasurer with a secretary, bears flattering wit- ness to the ability and temper of Castillejo, who is warmly recommended to the vacancy. It is not known whether he obtained this post. Certain it is, however, that he soon afterwards folowed Ferdinand, and resumed his secretary- ship, with but little profit, if we may judge from many passages in his verse, in which he deplores his poverty and the forlorn position unaided merit held at court. He was several times in Venice, where certain of his opuscules were printed for smuggling into Spain,—Castillejo, like Terres Naharro, whose comedies and satires were also pub- lished in Italy, being on the Jndex of the Inquisition, on account of the strong anti-clerical bias of his satirical works. He died in a monastery near Vienna, two years before Fer- dinand's recognition as emperor.

Castillejo was a voluminous writer of verse. His poems are worthy of note, not only on account of their intrinsic merit, but also as being the last manifestation of import- ance of the older Spanish School of poetry against the younger section under the leadership of Garcilaso de la Vega. That fine melodist and brilliant rhetorician, the Ronsard of Spain, seconded by Boscan and Hurtado de Mendoza, had introduced into his own land the

rhythms and cadences employed in Italy; through him the sonnet, the canzone, the octaves of the comic epics, and even the terza ruma of the comedy itself had been transplanted into Spanish soil; and he and his followers had created a vocabulary of picked and exquisite terms which, passing through the hands of the magniloquent Herrera, was to end in the monstrous dialect of Gongora and his disciples. Against this revolution Castillejo set his face, fighting gallantly and unavailingly in defence of the antique metrical forms and structures. The use of these he never abandoned, save on one or two occasions when, for purposes of parody, he produced sonnets and octaves. In the poetry of Castillejo, which is written chiefly in " quintillas " and "'coplas de pié quebrado," are all the qualities that make the older verse of Spain such pleasant reading—the grace- ful simplicity, the artless elegance, the fluency and spontaneity (which sometimes, however, degeneratcs into garrulity), the keen and homely mother wit, often gross but seldom offensive or cruel. He has, however, other quali- tics which are peculiar to himself, and which give him a place apart even among the school that may be said to end in him ; his society verses are bright with a pleasant gossipy amiahility ; his satires are quick with a certain cynical sprightliness that makes them still amusing and attractive ; while one at least of his poems, the "' Dialogue between Himself and his Pen," overflows with a humorous tenderness that is extremely effective. Writing ou anything and everything—" On a Green and Yellow Costume," " On the Wood Guaiacum," " On a Friend's Horse called Tristram," ~-he of course produced a cloud of rhymes that are intolcrable and to be avoided. Some of his " Villancicos," " Letras," and " Motes," however, are charming in despite of years; a not infrequent note in them reminding the

reader somewhat of the quaint graces of Charles of Orleans, with whom in this fondness for elaborate trifies Castillejo may be said to have a certain affinity, though immeasurably his inferior in delicacy of touch and artistic restraint. His principal satires, "The Sermon against Love" and the "Dialogue of the Conditions of Women," are amusing and witty enough; while his " Galatea," an imitation of Ovid, must be regarded as one of the sweetest pieces of pastoral poetry in the whole range of Spanish letters, and,

with the excaption of the exquisite little anacreontic to Love, as the best of Castillejo’s many poems.

The strong anti-clerical feelings of Castillejo, himself an ecclesiastic, have been already remarked. His satires were treated exceedingly ill on this account by the officers of the Inquisition, who did not scruple to cxcise large portions of them, and to fill up the gaps thus caused with screeds of a contrary tendency, the work of their own hack-rhymesters, who had at this period a great deal of work to do of the samc sort. The poems themselves are divided into three books, the first devoted to ‘‘ Love,” and the second to “ Conversation and Pastime ;” while the third is composed of moral and religious verses, The best text is that given in the Biblioteca de Autores Hspaitoles, vol. xxxii., Madrid, 1832.

CASTING. See Founpine.

CASTLE (Saxon castel, Latin castellum, diminutive from castrwm, whence the French chdéteau and chatel, as in Neufchatel), an encampment, a fortress or place rendered defensible either by nature or art. The term is also often applied to the principal mansion of a prince or nobleman.

The frequent and protracted wars between neighbouring tribes and peoples which took place in carly times must soon have rendered evident the expediency of erccting forts. These at first consisted only of earthen ramparts or rows of palisades, situated mostly on commanding eminences. With improved methods of assault and the advance of con- structive art came erections of wood and stone, which by and by were flanked with towers and surrounded by a wall and ditch. Increased mechanical and architectural skill, while it made little alteration on the fundamental plan of such buildings, gradually introduced numerous contrivances for repelling assault, and rendering a great castle well-nigh impregnable.

Confining our narrative of the progress of castle-building to Britain, we notice first the hill-forts which are ascribed to the ancicnt Britons. Typical examples of them are the Herefordshire Beacon on the Malvern Hills, and the Barmekin of Echt in Aberdeenshire. The latter consists of the remains of two circular dry stone walls surrounded by three ditches. The inner wall seems to have been about 12 feet thick, and 300 yardsin circumference, and

contains five entrances all in an oblique direction. The outer wall, which is said to be more modern than the inner, is much more cntire, and has no entrances through it. The ditches are about 9 feet broad.

Of the castella which the Romans erected in this country during their long occupation of it, Richborough Castle near Sandwich in Kent is almost the only relic. It is, from the evidence of coins found there, supposed to have been built, or at any rate completed, in the time of the Emperor Severus. The ruins at present form nearly three sides— the southern, western, and northern—of a rectangle, and it 1s commonly supposed that the fourth side, the eastern, facing the River Stour, has been destroyed by the giving way of the terrace on which it stood. The length of the southern wall is 260, of the western 460, and of the northern 440 feet.

The height of the walls varies from 10 to 30 fect; and their thickness, from 11 to 12 feet at the base, diminishes slightly towards the top. In the western and northern

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walls are two openings which are usually denominated the decuman and postern gates. Round towers are said to have existed at the corners, and square ones at convenient dis- tances along the walls, but no traces of them are now to he found. The walls, which are enormously strong and faced with regular courses of squared stones, consist of rows of boulders alternating with courses of bonding tiles. Nearly in the centre of the castle is the base of a cruciform building resting on a substructure of masonry, which is conjectured

-to have been the azgurale, where the auguries were taken,

and where was situated the sacellum for the reception of the ensigns.

Regarding the castles built by our Saxon forefathers our knowledge is scanty. They were probably not very numerous, and some of them were built principally of wood. Alfred, who did so much for the defence of the country, constructed several strongholds which his successors do not seem to have kept up or improved. At all events they offered little resistance to

William the Norman, who, in order effectually to guard against invasions from with- out as well as to awe his newly-acquired subjects, imme- diately began to erect castles all over the kingdom, and likewise to repair and augment the old ones. Besides, as he had parcelled out the lands of the English amongst lis followers, they, to protect themselves from the resentment of the despoiled natives, built strongholds and castles on their estates, and these were multiplied so rapidly that towards the lattcr end of the reign of King Stephen they amounted to 1115.

As the feudal system gathered strength, the lords of castles began to arrogate to themselves a royal power, not only within their castles, but likewise in their environs, —exercising judicature both civil and criminal, coining money, and arbitrarily seizing forage and provisions for the subsistence of their garrisons, which they afterwards demanded as a right. Their insolence and oppression grew to such a pitch that, according to William of Newbury, “there were in England as many kings, or rather tyrants, as lords of castles ;” and Matthew Paris emphatically styles them “nests of devils and dens of thieves.” The licentious behaviour of the garrisons having at length become intolerable, it was agreed in the treaty between Stephen and Henry II, when the latter was duke of Normandy, that all the castles built within a certain period should be demolished; in consequence of which many were actually razed, but uot the number stipulated.

The style of castle erected in England after the Con- quest secmis to have been that of buildings of a similar kind in France, such as the castles of Chamboy, Domfront, Falaise, Nogent-le-Rotrou, Beaugency, Loches, Chauvigny, and many others. Like them, the Norman castle was commouly situated on an eminence, or on the bank of a river. The whole site of the castle, which was frequently of great extent and irregular figure, was surrounded by a deep and broad ditch, called the moat or fosse, which could be casily filled with water or left dry. In some of the later castles, before the principal entrances was placed an outwork called the barbacan, which was a high wall surmounted by battlements and occasionally turrets to defend the gate and the drawbridge, which communicated therewith. The drawbridge across the moat was con- structed of wood, and, by means of chains and weights, could be pulled up against the entrancc, thus cutting off all

communication with the outside. On the inside of the moat stood the outer bailey wall, about 8 or 10 feet thick, and from 20 to 30 feet high, surmounted by a parapet not less than 1 foot thick, with crencllated embattlements or embrasures. This parapet afforded protection to the defenders of the castle, who stood upon the wall, and through the crenelles discharged arrows,

darts, and stones at the besiegers. On the wall, and | was divided by a strong middle partition wall, in which projecting out from it were built at proper distances square | were openings for communication with the different apart- or round towers, sometimes called bastions, generally one | ments. In this wall was the well of the castle, often of story higher than the wall so as to command it. The | great depth, and with a shaft ascending through all the lower story of the walls and towers was often built with | stories to the top of the keep. The several floors were of a batter, or slope outwards to strengthen, and also to keep | stone or wood. The basement floor contained the store. the assailants farther from, the walls. Thus the defenders | rooms and the dungeon for prisoners, and had no lights from were not compelled to lean far over the parapet, and ex- | the outside. On the first floor were situated the soldiers' pose their bodies to the archers of the enemy who were } apartments, guard-room, dc., lighted only by small loop- placed at a distance to guard those engaged in undermining | holes. The second floor was taken up by the baronial hall the walls. In one of the towers and sometimes in the | in which the baron or governor and his retainers dined, wall near a tower was the postern gate at a considerable | The third floor contained, probably, the chapel and apart- distance from the ground. This gate was used for the | ments of the governor and his family. The two upper floors egress of messengers during a siege. The principal | were lighted by small round-headed Norman windows. entrance or main gate of the castle was of great strength, | Although there were unquestionably great variations in the and was usually flanked with strong towers having | structure of castles, yet the most perfect of them were built embattled parapets. It was made of wood, cased with | on the plan above described. As an illustration we give a iron, and was rendered doubly secure by an iron portcullis |

ground-plan of Dover Castle copied by permission from which slid downwards in grooves in the masonry. Within | The Architect.

the outer wall was a large open space or court called the outer bailey, bayle, or ballium, in which stood commonly a church or chapel. On the inside of the outer bailey and sur- rounded by a ditch stood another wall and parapet, with gate and towers similar to those on the outer wall. Round the inside of this inner wall were arranged the offices for the servants and retainers, the granaries, storehouses, and other necessary buildings. These constituted the inner bailey. Within all these was the keep, built sometimes on an artificial mound. It wasa large, high, square or rectangular tower more strongly fortified than any of the other parts of the castle, and was the last resort of the garrison when all the outworks were taken. Its walls, from 10 to about 20 feet in thickness at the base, and diminishing towards the top, on which was placed an embattled parapet, often

admitted of chambers and staircases being constructed in — :

them. On each side of the keep there was usually a flat FT Ate eae es ee Pe

Norman buttress, and at the corners were embattled turrets The towers along the outer bailey wall (such as Avranches carried one story higher than the parapet, as may be seen | tower, Marshall's tower, and the Constable's tower in Dover in the keeps of Rochester, Newcastle, cc. Castle) were, in the case of royal castles, each protected by

men of approved fidelity and valour, to whom estates were granted on condition of their performing castle-guard. Each had also to keep his particular tower in repair, and supply the requisite number of men to defend it during a siege. 'In process of time these services were commuted for annual rents, sometimes styled wardpenny and waytfee, but commonly castle-guard rents, payable on fixed days, under prodigious penalties called sursizes. At Rochester if a man failed in the payment of his rent of castle-guard on the feast of St Andrew, his debt was doubled every tide while the payment was delayed. These were afterwards restrained by an Act of Parliament made in the reign of Henry VIIL, and finally annihilated, with the tenures by knight's service, in the time of Charles II, Such castles as were private property were guarded either by mercenary soldiers, or by the

tenants of the lord or owner. Windsor, Warwick, Kenilworth, Conway, Carnarvon, and many others of the later Norman castles differ from the earlier ones chiefly in the structure of the keep, which contained in some instances an open quadrangular court, and had the chapel, the hall, and the state apartments arranged round the sides. The turrets at the corners and on the walls were of various shapes, round, square, and polygonal, and had embrasures and machicolations. The machicolations were corbelled projections, with apertures between, down which stones could be thrown, or Fra, 1,—Rochester Keep. molten lead poured, on the assailants. The principal entrances were defended by large circular towers, with The entrance was on the first floor, and was reached by | machicolations over the front of the gate, and sometimes an open flight of steps, which could be readily defended, or | more than one portcullis. by a staircase in a turret at one of the angles. The interior The Scotch castles were in general square or rectangular

keeps or peels, and depended for their security greatly upon their site. Some of them were situated on precipitous rocks on the sea- coast, such as Fast, Tantallon, Dunot- tar; others onislands in a lake or river, such as Lochleven and Threave. Edin- burgh and Stirling castles, like many others in England and on the Conti- nent, illustrate well one of the functions often discharged by fortresses, that of forming a nucleus for a village or city.

As civilization advanced and the country enjoyed more peace and security, buildings were erected with a greater regard to comfort and elegance, though still retaining many of the features of a fortress, such as the moat, the drawbridge, and the gatehouse. Examples of these eastellated mansions are seen in Caistor, Norfolk, and Herstmonceaux, Sussex, erected in the 15th century. But it should not be forgotten that many of the castles of older date were by subsequent repairs, improvements, and adaptations so transformed in course of time as to resemble

“more modern structures. Castles of recent date are merely imitations of these with some of their features preserved for ornament.

Parapet.

See Grose’s Antiquities, King’s Munimenta Antiqua, Britton’s Architectural Antiquitics, Brayley’s Ancient Castles of England and Wales, Beattie’s Castles and Abbeys of England, Billings’s Baro- nial and Ecclesiastical Antiquities of Scotland, M. Viollet-le-Duc’s Dictionnaire de? Architecture, M. de Caumont’s A bécédaire ou Rudi. ment d’Archeologie, and many notices in various architectural and archeological periodicals. (R. M‘K.)

CASTLEBAR, a town of Ireland, the capital of the county of Mayo, situated on the river of the same name, 159 miles west by north of Dublin. It consists chiefly of a main street upwards of half a mile in length and a square in which are the county courts and public offices. It also possesses a jail, an Episcopal church, a Roman Catholic chapel, a lunatic asylum, a county infirmary, a linen hall, artillery and infantry barracks, and a workhouse. ‘There are some breweries, and a considerable trade in linens and agricultural produce. ‘Two newspapers are published in the town, ‘The castle, which gives its name to the town, was a fortress of the De Burgh family; but the town itself is of more modern origin. In 1641 the castle was held for the Parliament by Sir Henry Bingham, but he was forced to surrender to Lord Mayo, and fell a victim, with all his garrison, to the fury and treachery of the besiegers. The massacre was afterwards avenged, in 1653, by the execution of Sir Theobald Burke (by that time Lord Mayo), who had been in command along with his father at the siege. Tn 1798 the town was occupied for some weeks by the French under General Humbert, who had defeated the English under Luke J. Hutchison in a conflict which is jocularly styled the “Castlebar Races.” Population in

1871, 3508.

CASTLEREAGH, Lorp. QUIS oF,

CASTLETOWN (in Manx, Butty Casuret), the capital of the Isle of Man, and seat of the Manx Government, Stands on the western side of Castletown Bay, 11 miles south-west of Douglas, on both banks of the Silverburn. Tt is neat and regularly built, and has a large square containing some handsome houses. In the centre of the town stands Castle Rushin, which owes its foundation to

See LonponDERRY, Mar-

the Danish chief, Guthred, in 960, and after serving for generations as the residence of the kings of Man, is now partly used as a prison and barracks, In its vicinity is the House of Keys, where the members of the Manx Parliament hold their sessions. The chief educational establishment is King William's College, situated about a mile and a half to the north of the town. It was originally erected about 1830-3; but a complete restoration was rendered necessary by fire in 1844, and it has since been enlarged, in 1862. Castletown also possésses a new town- house, a market-house dating from 1830, and several other public buildings; there are breweries, limekilns, and corn mills in the town and neighbourhood; and a small ship- ping-trade is maintained. Population in 1871, 2320. CASTOR AND POLLUX, in Greek and Roman mythology, were twin gods, also known under the name of Dioscuri (Aréoxovpor, from Zeds, Atos, Jupiter, and kodpot, children) for, according to one myth, they were children of Jupiter and Leda, whose love the god had won under the form of a swan. In some versions Leda is represented as having brought forth two eggs, from one of which were born the mortal babes Castor and Clyte- muestra, from the other the immortal Pollux or Polydeuces and Helen. According to others only the latter two were children of Zeus, and in Homer all are said to be children of Leda and Tyndareus, king of Sparta. We find also that the Dioscuri were specially reverenced among people of Dorian race, and that they were said to have reigned at Sparta. Miiller therefore suggests that the myth arose from the apotheosis of certain human Tyn- daride, round whom gradually collected fables which originally referred to some ancient Peloponnesian deities, The Dioscuri presided over public games, Castor being the god of equestrian exercise, Pollux the god of boxing ; but both are usually represented on fiery steeds with spears and egg-shaped helmets crowned with stars. They were, besides, the patrons of hospitality ; their willing and kindly aid was especially sought by travellers; they, Geol cwrpes, ever ready to befriend all who paid them due honour. Their most important exploits are their invasion of Attica, to rescue their sister Helen from Theseus; their share in the hunting of the Calydonian boar, and in the Argonautic expedition, during which they married the daughters of Leucippus; and, lastly, their battle with the sons of Aphareus, in which Castor, the mortal, fell by the hand of Idas. Pollux, finding him dead after the battle, implored Jupiter to be allowed to

die with him; but the father of the gods (says Homer) gave his brother life, on condition that both should, on alternate days, descend to Hades. According to another fable, the god marked his approval of their love by placing them together among the stars. Though their worship was perhaps most carefully cb- served among people of Dorian origin, they were held in no small venerationat Rome. It was the popular belief in that city from an early period that the battle of Lake Regillus had been decided by their interposition. They had fought, it was said, armed and mounted, at the head of the legions of the commonwealth, and had afterwards carried the news of the victory with incredible speed to the city. The well in the Forum at which they alighted was pointed out, and near it rose their ancienttemple. A great festival was kept in their honour on the Ides of Quintilis, believed to be the anniversary of the battle, and sumptuous sacrifices were offered to them at the public charge, It was further ordained that a grand muster and inspection of the equestrian body should be part of the ceremonial. All the knights, clad in purple and crowned with olive, were to meet at a temple of Mars in the suburbs. Thence they were to ride in state to the forum, where stood the temple of the twins, This pageant was during several

centuries one of the most splendid sights of Rome. In the time of Dionysius the cavalcade consisted of 5000 horsemen, all persons of fair repute and independent fortune.

CASTOR OIL, the fixed oil obtained from the Castor Oil Plant or Palma Christi, Ricinus communis, belonging to the Natural Order Euphorbiacee. The plant isa native of the East Indies, but it las been introduced, and is now cultivated in most tropical and in the warmer temperate countries. In size it varies from a shrubby plant to a tree of from 30 to 40 feet in height according to the climate in which it grows, being arborescent in tropical latitudes. On account of its very large beautiful palmate-peltate leaves, which measure as much as 2 feet in diameter, it is cultivated as anornamental plant. In the south of England, with the habit of an annual, it ripeus its sceds in favourable seasons; andit has been known to come to maturity as far north as Christiania in Norway. The fruit consists of a tricoccous capsule, covered externally with soft yielding prickles, and each

cell develops a single seed. The seeds of the different cultivated varieties, of which there are a great number, differ much in size and in external markings ; but average seeds are of an oval laterally compressed form, with their longest dianieter about four lines. They have a shining, marble grey and brown, thick, leathery epidermis, within which is a thin dark-coloured brittle coat. The cotyledons readily separate, and show a large distinct leafy embryo. The oil is obtained from the seeds by two principal methods—expression and decoction,—the latter process being largely used in India, where the oil, on account of its cheapness and abundance, is extensively employed for illuminating as well as for other domestic and medicinal purposes. The oil exported from Calcutta to Europe, which is said to be "cold drawn and nearly tasteless," is prepared by shelling and crushing the seeds between rollers, The crushed mass is then placed in hempen cloths and pressed in a screw or hydraulic press. The oil which exudes is mixed with water and heated till the water boils, and the mucilaginous matter in the oil separates asa scum. It is next strained, then bleached in the sunlight, and stored for exportation. A considerable quantity of castor oil of an excellent quality is also made in Italy ; and in California the manufacture is conducted on an extensive scale, The following is an outline of the process adopted in a Californian factory. The seeds are submitted to a dry heat in a furnace for an hour or thereby, by which they are softened and prepared to part easily with their oil. They are then pressed in a large powerful screw-press, and the oily matter which flows out is caught, mixed with an equal proportion of water, and boiled to purify it from mucilaginous and albuminous matter. After boiling about an hour, it is allowed to cool, the water is drawn off, and the oil is transferred to zinc tanks or clarifiers capable of holding from 60 to 100 gallons. In these it stands about eight hours, bleaching in the sun, after which it is ready for storing. By this method 100 ib of good seeds yield about 5 gallons of pure oil.

Castor oil is a viscid liquid, almost colourless when pure, possessing only a slight odour, and a mild yet highly nauseous and disagreeable taste. Its specific gravity is -96, a little less than that of water, and it dissolves freely in alcohol, ether, and glacial acetic acid. It contains palmitic and several other fatty acids, among which there is one— ricinoleic acid—peculiar to itself. In 1864 Tuson isolated from the oil a principle which he denominated an alkaloid under the name of ricinine, and that substance has since been

extracted from the leaves, which are used as galactagogues and emmenagogues. Castor oil forms a clean, light-coloured soap which dries and hardens well, having no tendency to deliquesence, and is free from smell. It has been recommended for medicinal use.

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Castor oil is one of the niost extensively useful of purgative medicines known; and the only one which, under certain circumstances, can with safety be admin. istered. Its purgative properties were supposed by Soubeiran to be due to the presence of an acrid oleo-regin and to ricinolein, but the constituents of tho oil have not yet beeu satisfactorily studied in their physiological relations, The seeds themselves, or the oil extracted by alcohol, owing to the larger proportion of the drastic principle they contain, act much more powerfully than the common oil. The nauseous taste of castor oil is the one great impediment to its use, and many methods have been suggested for overcom- ing its unpleasant flavour, The most common devices are—enclosing it in capsules, floating it in various palatable liquids, or preparing emulsions of the oi] with such sub- stances as dissolved gum-arabic and simple syrup.

CASTREN, Marruias ALEXANDER (1813-1853), one of the greatest authorities on the ethnology and languages of the Northern Asiatic nations, was born at Tervola, in the parish of Kemi in Finland, on 20th November (2d December) 1813. His father, Christian Castrén, parish minister at Rovaniemi, died in 1825; aud Matthias passed uuder the protection of his uncle, Mathias Castrén, the kindly and learned incumbent of Kemi. At the age of twelve he was sent to school at Uledborg, and there he helped to maintain himself by teaching the younger children. Onhis removal to the Alexander’s University at Helsingfors in 1830, he first devoted himself to Greek and Hebrew with the intention of entering the church ; but his interest was soon excited by the language of his native country, and he even began before his course was com- pleted to lay the foundations of a work on Finnish mythology. ‘The necessity of personal explorations among the still unwritten languages of cognate tribes soon made itself evident ; and in 1838 he was glad to join a medical fellow-student, Dr Ehrstrém, in a

journey through Lapland. In the following year he travelled in Russian Karelia at the expense of the Literary Society of Finland ; and in 1841 he undertook, in company with Dr Elias Lénnrot, the great Finnish philologist, a third journey, which ultimately extended beyond the Ural as far as Obdorsk, and occupied a period of three years. Before starting on this last expedition he had published a translation into Swedish of the Finnish epic of Kalevala ; and on his return he gave to the world his Llementa grammatices Syrjaence and Ele- menta grammatices T'scheremassee, 1844. No sooner had he recovered from the illness which his last journey had occasioned than he set out, under the auspices of the Academy of St Petersburg and the Helsingfors University, on an exploration of the whole government of Siberia, which resulted in a vast addition to previous knowledge, but seriously affected the health of the adventurous investi- gator. The first-fruits of his collections were published at St Petersburg in 1849 in the form of a Versuch einer Ostjakischen Sprachlehre. In 1850 he published a treatise De affixis personalibus linguarum Altaicarum, and was appointed professor at Helsingfors of the new chair of Finnish language and literature. The following year saw him raised to the rank of chancellor of the university ; and he was busily engaged in what he regarded as his principal work, a Samoyedic Grammar, when he died on 7th May 1853, Five volumes of his collected works appeared from 1852 to 1858, containing respectively— (1.) Reseminnen fran dren 1838-1844 ; (2.) Reseberditelser och bref dren 1845-1849 ; (3.)° Foreldsningar « Finsk mythologi; (4.) Hthnologiska féreldsningar ofver Altarska

folken ; and (5.) Smédrre afhandlingar och akademiska

dissertationer. A German translation has been published by Anton Schiefner, who was also intrusted by the St Petersburg Academy with the editing of his manuscripts

which had been left to the Helsingfors University. The Samoyedic Grammar (1854), a Samoyede Vocabulary (1855), a Tungusian Dictionary (1856), and studies on the Buriatic (1857), the Koibalic and Karagassic (1857), and the Yenisei Ostiak and Kottian dialects have been published.

CASTRENSIS, Pauuus, a distinguished professor of avil and canon law, who studied under Baldus at Perugia, and was a fellow pupil with Cardinal Zabarella. He was admitted to the degree of doctor of civil law in the university of Avignon. It is uncertain when he first undertook the duties of a professorial chair. A tradition, which has been handed down by Panzirolus, represents hin to have taught law during a period of fifty-seven years. Ife was professor at Vicnna in 1390, at Avignon in 1394, and at Padua in 1429; and he filled at different periods a professorial chair at Florence, at Bologna, and at Perugia, but at what precise periods is not known. He was for some time the vicar-general of Cardinal Zabarella at Florence, and his eminence as a teacher of canon law may be inferred from the language of one of his pupils, who styles him "'famosissimus juris utriusque monarca." His most complete treatise is his readings on the Digest, and it appears from a passage in his readings on the Digestum Vetus that he delivered them at a time when he had been actively engaged for forty-five years as a teacher of civil law. His death is generally assigned to 1436, but it appears from an entry in a MS. of the Digestum Vetus, which is extant at Munich, made by the hand of one of his pupils, who styles him '' preceptor meus," that he died on the 20th July 1441.

CASTRES, the chief town of an arrondissement in the department of Tarn, Frauce, 23 miles south-east of 'Alby, stands in a pleasant and fertile valley, on both sides of the Agout, here crossed by two bridges. The town is ill built, and the streets are narrow and crooked; but it has been much improved during the present century. The principal buildings are the town-hall, formerly the episcopal palace, which was built by Mansart, the churches of St Benoit (dating from the 17th century) and Notre Dame de la Platé, a modern courthouse, two hospitals, barracks, a theatre, and anexchange. It is the seat of tribunals of primary instance and commerce, and of a Protestant consistory. Castres is celebrated for its manufactures, among which are woollen, linen, silk, and cotton stuffs, soap, leather, paper, and iron and copper wares. It has also a considerable trade. Dacicr, Rapin, and Sabatier were natives of the town. Castres grew up round a Benedictine abbey, which is believed to have been founded in the 9th century. It was a place of considerable importance as early as the 12th century, and ranked as the second town of the Albigenses, During the Albigensian crusade it surrendered of its own accord to Simon de Montfort ; and in 1356 it was

raised to a countship by King John. On the confiscation of the possessions of the D'Armagnac family, to which it had passed, it was bestowed by Louis XI. on Boffilo del Giudice, but the appointment led to so much disagreement that the countship was united to the crown by Francis I. in 1519. In the wars of the latter part of the 16th century the inhabitants sided with the Protestant party, fortified the town, and established an independent republic. They were brought to terms, however, by Louis XIII, and forced to dismantle their fortifications ; and the town was made the seat of the chambre de V'édit, or chamber for the investiga- tion of the affairs of the Protestants, afterwards transferred to Castelnaudary (in 1679). 'he bishopric of Castres, which had been erected by John XXII. in 1317 was abolished at the Revolution. Population in 1872, Lei in the town, and 23,461 in the commune.

CASTRO, a seaport town of Italy, in the province of Otranto, and 10 miles south-west of the city of that name,

20%

It is the seat of a bishopric, and has an old castle and a cathedral. Some export trade is carried on in corn, wine, and fish ; but the harbour is accessible only to small vessels, The town is supposed to be the same with the Castrum Minerve of the Romans, which possessed an anciemt temple of the goddess whose name it bore, and was described by Virgil as the first place in Italy seen by his hero Aineas.

GASTRO DEL RIO EL REAL, a town of Spain in the province of Cordova. It is situated near the River Guadajocillo, about 16 miles south-east from Cordova, and contains several churches, schools, and hospitals, a hand- some town-house, and a prison. Its population is about 9000, and the great majority are employed in agricultural pursuits. Its commerce is confined to the exportation of grain and oil, and its industry to coarse manufactures for domestic purposes. '

CASTRO GIOVANNI, the ancient Hnna, a town of Sicily, in the province of Caltanisetta, about a quarter of a mile south of Caltascibetta, which is situated on the railway between Catania and Girgenti. It lies almost in the centre of the island, and occupies a well-nigh impreg- uable position on the

irregular but spacious summit of a hill which rises in precipitous cliffs to a height of 2790 fect. The town is in general in rather a dilapidated condition, but possesses a number of good ecclesiastical buildings. On the highest point of the hill-top stands the castle, built by Frederic II. of Aragon, probably on the site of the ancient temple of Ceres, which formed the boast of early Sicilians. The town issaid by Stcphanus of Byzantium to have been founded by Syracuse in the 7th century B.C. ; but it first appears in history as a Siculian city. It fell into the hands of Dionysius of Syracuse in 403 ; and it was afterwards subject to Agathocles. In 309 it was one of the first cities to join the Agrigentines in the war of liberation. During the first Punic war it was held for some time by the Carthaginians, and subsequently betrayed to the Romans ; and during the second it was delivered to massacre and plunder by the Roman governor Pinarius, who feared a revolt of the citizens. As headquarters of the insurrection of the slaves from 134 to 132 3.c., it defied the consul Rupilius till treachery came to his aid. From the spoliations of Verres it suffered severely, and its import- ance gradually diminished under' the empire. In 837 the Saracens made a vain attempt to take it by storm; but in 859 it was betrayed into the hands of Abbas ibn Fahdl. In 1080 the Normans entered into possession, and the proof of their occupation is still to be found not only in the remains of their buildings but also in the light hair and blue eyes of many of the present inhabitants. Of Roman architecture there are few remains, and the identification of the ancient site assigned to the myth of the Rape of Proserpine rests on very uncertain evidence. The present form of the name Castro Giovanni appears to have arisen simply from an erroneous interpretation of the Sicilian Castro Janni, which is really nothing more than Castrum Ennz, Population, about 14,000,

CASTRO NUOVO, a town of Sicily, in the province of Palermo, 25 miles north of Girgenti. In the vicinity there are extensive quarries of coloured marble, which have been worked since the time of the Romans, Population,

4300.

CASTRO REALE, a city of the province of Messina, in the Island of Sicily, situated on a triangular and rocky mountain about 11 miles south of

Milazzo. The climate is salubrious ; and excellent wine and oil are produced in the district. Population, about 7700.

CASTRO URDIALES, a seaport town of Spain, in the province of Santander, well known to sailors for the shelter which it affords from storms in the Bay of Biscay. It was destroyed by General Foy in 1813, but has been rebuilt,

:) y= 26

fortified, and greatly improved. The most remarkable buildings are the castle and the hermitage of Santa Ana. Its fisheries are considerable, and iron-ore and calamine are exported. Population, 3391. ; CASTRO, Guitten pe (1569-1631), a Spanish dra- matist of note, was a Valencian by birth, and early enjoyed a reputation as a man of letters. In 1591, with Aguilar and Artieda, he was a member of the Nocturnos, a brilliant Spanish imitation of the Italian Accademia. At one time a captain of horse,~~at another the protégé of the munificent Benevente, viceroy of Naples, of whom he received the governorship of a Neapolitan fortress, patronized and splendidly pensioned by the duke of Osufia and the count~~ duke Olivarez, Guillen de Castro would seem to have made friends with his pen as quickly and as easily as he unmade them by his sour humour and discontented obstinacy. Little is known of the literary part of his life. He lived at Madrid, and wrote for the stage, It is certain, too, that he long enjoyed the friendship of Lope de Vega, who dedicated a play to him in flattering terms, and whom he assisted at the famous festival of the Canonization of San Isidro, where he won a prize in the literary tourna- ment contested by Jauregui, Calderon, Juan de Montalvan, and others. He is said, moreover, to have died in such poverty as to have owed his funeral to charity. Guillen de Castro wrote some forty plays, in all of which he showed himself a follower of Lope de Vega, and a thorough Spaniard in instinct and idea, and in some of which great passions and stirring scenes are treated worthily and well, The best of them are perhaps—(1) Engatarse Engatando, (2) Pagar en propria Moneda, and (3) La Justicia en la Piedad. But the drama that has made Guillen de Castro’s reputation European is Las Mocedades del Cid, to the first part of which

Corneille was so largely indebted for the materials of his own renowned tragedy. The two parts of

this play, like all those of Castro, have the genuine ring

of the old songs of the Romanceros about them ; and, from

their intense nationality, no less than for their rough poetry

and sweet versification, were, doubtless, among the most popular pieces of their day.

See Schack, Geschichte der Dramatischen Literatur und Kunst in Spanien, ii. 428-449 ; Ticknor, History of Spanish LInterature, ii. 300-309 ; Comedias de Guillen de Castro, Valencia, 1621; Lord Holland's Lives of Lope de Vega and Guillen de Castro, London, 1817 ; Ribadaneyra, Biblioteca de Autores Espafioles, vol. xliii,

CASTRO, Inez DE (died 1355), called Oollo de Garza, a.e., " Heron's Neck," was born in Spanish Galicia, in the earlier years of the 14th century. Tradition asserts that her father, Don Pedro Fernandez de Castro, and her mother, Dofia Aldonga Soares de Villadares, a noble Portuguese lady, were unmarried, and that Inez and her two brothers were consequently of bastard birth. Educated at the semi-Oriental provincial court of Juan Manuel, duke of Peiiafiel, Inez grew up side by side with Costanga, the duke's daughter by a scion of the royal house of Aragon, and her own cousin. After refusing several crowned heads in marriage, Costanga was at last persuaded to accept the hand of the Infante Dom Pedro, son of Alphonso the Proud, king of Portugal. In 1341 the two girls left Pefiafiel ; Costanga's marriage was celebrated in the same year, and the young Infanta and her cousin went to reside at Lisbon, or at Coimbra, where Dom Pedro conceived that luck- — and furious passion for Inez which has immortalized them.

Morganatic marriages among the great were rather the rule than the exception in those times, The only person, therefore, who suffered in the contemplation of the lawless alliance between the Infante and Inez was Costanca. In 1345, however, the Infanta died in childbed, and the

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CASTRO

widower was left in undisturbed possession of his mistregs,

A wayward violent man, bold and irresolute, of terrible passions, but subject to strange lapses of will, Dom Pedro, doubtful, perhaps, of the illegitimacy of Inez, which debarred her from succession to the throne, took no steps to improve her position in the world's eye till 1354, nine years after Costanga's death, when he married her in

presence of the bishop of Guarda, and of several of the members of their household. No contract of marriage,

however, nor documentary proof of any kind was created

for this extraordinary occasion. In 1361 Dom Pedro, then king of Portugal, swore solemuly to Castauhede, that he had been lawfully wedded to Inez; but in 1385 Joio De Regras had no difficulty whatever, in the absence of written evidence, in setting aside the title of her descend. ants to the throne.

Alphonso the Proud feared for his grandchild and his kingdom's peace. The Castro family, as much dreaded in Spain as in Portugal, with Inez ready to mount the throne and her brother Pedro Fernandez de Castro rising daily higher in popularity and importance, had many enemics— among others, three gentlemen, Alvaro Goncalves, Pedro Coelho, and Diogo Lopes Pacheco. 'hese men, hateful to and fearful of Pedro Fernandez, are said to have used their influence with Alphonso to persuade him to strike down the family through Inez. The old king listened, refused, wavered, and ended by yielding. He went in secret to the palace at Coimbra, where Inez and the Infante resided, accompanied by his three familiars, and by others who agreed with them. The beauty and tears of Inez disarmed his resolution, and he turned to leave her ; but the gentle- men about him had gone too far to recede. Inez was stabbed to death, and was buried immediately in the Church of Santa Clara. :

The Infante raised at once the flag of revolt against. his father, and was only appeased by the concession of a large share in the government. ‘The three murderers of Inez were sent out of the kingdom by Alphonso, who knew his son too well not to be aware that the vengeance would be tremen- dous as the crime. They took refuge in Castile, In 1357, however, Alphonso died, and the Infante was crowned king of Portugal. Pedro the Cruel, his nephew, reigned over Castile; and the murderers were given up as soon as required, Diogo Lopes escaped through the gratitude of a beggar to whom he had formerly done a kindness ; but Coelho and Goncalves were executed, with horrible tortures, in the very presence of the king.

The story of the exhumation and coronation of the corpse of Inez has often been told. It is said that to the dead body, crowned and robed in royal raiment, and enthroned beside the king, the assembled nobility of Portugal paid homage as to its queen, swearing fealty on the withered hand of the corpse. The gravest doubts, however, exist as to the authenticity of this story ; Ferndo Lopes, the Portu- guese Froissart, who is the great authority for the details of the tragedy of the death of Inez, with some of the actors in which he was personally acquainted, says nothing of the ghastly and fantastic ceremony, though he tells at length the tale of the funeral honours that Pedro the king bestowed upon his wife. Inez was buried at Alcobaca with extraordinary magnificence, in a tomb of white narble, surmounted by her crowned statue ; and near her sepulehre Pedro caused his own to be placed. The monument, after repeatedly resisting the violence of curiosity, was broken into in 1810 by the French soldiery ; the statue was muti- lated, and the yellow hair was cut from the broken skeleton, to be preserved in reliquaries and blown away by the wind. The children of Inez shared her habit of mis- fortune. From her brother, however, Alvaro Perez de Castro, the house regnant of Portugal directly descends.

See Fernio Lopes, Chronica del Rey Dom Pedro, 1735 ; Camoens, Os Lusiadas ; Antonio Ferreira’s Ines de Castro,—the first regular tragedy of the Renaissance after the Sofonisba of Trissino; Luis Velez de Guevara, Reimar despues de morir, an admirable play ; and Ferdinand Denis, Chroniques Chevaleresqucs de l’ Espagne et du Portugal.

CASTRO, Jodo DE (1500-1548), called by Camoens Castro Forte, fourth viceroy of the Portuguese Indies, was the son of Alvaro de Castro, civil governor of Lisbon. A younger son, and destined therefore for the church, he became at an early age a brilliant humanist, discover- also a profound capacity for mathematics. The latter he studied under Pedro Nunez, in company with the In- fante Dom Luis, son of Emmanuel the Great, with whom he contracted a life-long friendship. At eighteen he went to Tangiers, where he was dubbed knight by Duarte de Menezes the governor, and where he remained several years. In 1535 he accompanied Dom Luis to the siege of Tunis, where he had the honour of refusing knighthood and reward at the hands of the great emperor Charles V. Returning to Lisbon, he received from the king the small commandership of S4o Pablo de Salvaterra in 1538. He was exceedingly poor, but his wife Lenor de Coutinho, a noble Portuguese lady, the exact date of whose marriage with him is not known, admired and appreciated her husband sufficiently to make light of their poverty. Soon after this he left for the Indies in company with his uncle Garcia de Noronha, and on his arrival at Goa enlisted among the aventuretros, ‘the bravest of the brave,” told off for the relief of Diu. In 1540 he served on an expedition under Estabio de Gama, by whom his son, Alvaro de Castro, a child of thirteen, was knighted, out of compliment to him. Returning to Portugal, Joio de Castro was named com- mander of a fleet, in 1543, to clear the European seas of pirates; and in 1545 he was sent, with six sail, to the Indies, in the room of Martin de Souza, who had been dismissed the viceroyalty. ‘The next three years were the hardest and most brilliant, as they were the last, of this great man’s life-—years of battle and struggle, of glory and sorrow, of suffering and triumph. Valiantly seconded by his sons (one of whom, Ferndo, was killed before Diu) and by Joéio Mascarenhas, Jo&io de Castro achieved such popu- larity by the overthrow of Mahmoud, king of Cambodia, by the relief of Diu, and by the defeat of the great army of Adhel Khan, that he could contract a very large loan with the Goa merchants on the simple security of his moustache. ‘These great deeds were followed by the cap- ture of Broach, by the complete subjugation of Malacca, and by the passage of Antonio Moniz into Ceylon; and in 1547 the great captain was appointed viceroy by Joao III., who had at last accepted him without mis- trust. He did not live long to fill this charge, expiring in the arms of his friend, St Francis Xavier, 6th June of the following year. He was buried at Goa, but his remains were

afterwards exhumed and conveyed to Portugal, to be reinterred under a splendid monument in the convent of Bemfica.

See Jacinto Freire de Andrade, Vida de D. Joad de Castro, Lisbon, 1651,—English translation, by Sir Peter Wyche, 1664; Joao de Barros, Decada secunda da Asia, bk. viii.; Roteiro de Dom Joam de Castro, Paris, 1833. The last is important as fixing the position of Joao de Castro among geographers.

CASTROVILLARI, a town of Italy, in the province of Calabria Citra, 7 miles W.N.W. of Cassano. It stands on an eminence surrounded by lofty mountains, and the modern portion contains several handsome streets. The massive castle is supposed to belong to the Norman period, The town carries on a considerable trade in cotton, wine, silk, and fruits, and has about 9400 inhabitants.

_CASTRUCCIO CASTRACANTI (1283-1328) was by birth a Lucchese, and by descent and training a Ghibelline.

He belonged to the family of Antelminelli; and being exiled at an early age with his parents and others of their faction by the Guelfs, then in the ascendant, and orphaned at nineteen, he served as a soldier in England, France, and Lombardy, till he returncd to Italy in 1313, and was chosen chief by the Ghibellines, who had again obtained the mastery. ‘To avenge himself on the vanquished fac- tion he called in Uguccione da Faggiuola, lord of Pisa, who treated him ill and perfidiously, putting him in irons and sacking the city of Lucca, in spite of strenuous support received from Castruccio in many arduous enterprises, particularly in that of Montecatini. An insurrection of the Lucchese leading to the explusion of Uguccione and his party, Castruccio regained his freedom and his position, and the Ghibelline triumph was presently assured. Elected governor of Lucca in 1316, he warred incessantly against the Florentines,—becoming the faithful adviser and staunch supporter of the Emperor Louis V., whom he accom- panied to Rome, and who made him duke of Lucca, count of the Lateran Palace, and senator of the empire. Cas- truccio was excommunicated with his master by the Papal Legate, in the interest of the Guelfs, and died soon

after- wards, leaving several young children, whose fortunes were wrecked in the Guelfic triumph consequent on their father's death.

Machiavelli's Life of Castruccio is a mere biographical romance ; it was translated into French, with notes, by Dreux de Radier in 1753 ; See Nicolas Negrini, Vita di Castruccio, Modena, 1496 ; Sismondi's and Leo's Histories of the Italian Republics ; and Wie- land, Disscrtatio de Castruccio, Leipsic, 1779.

CASUISTRY is the application of general moral rules to particular cases, but the word is specially limited to the consideration of cases of possible dubiety, since it is only where difficulty exists that formal treatment is neccssary. Any important development of casuistry can only take place under a government by laws expressed in definite precepts ; but the development may have its origin in either of two opposite causes, or in a combination of the two—in the desire, namely, to fulfil the laws, or in the desire to evade them, or in a conflict of these desires.

Of these principles a remarkable illustration is given by the Jews. Governed as they were by the written precepts of Moses, they were continually confronted by questions which did not clearly come under any one rule, but of which a solu- tion was required by their extreme reverence for the smallest dicta of theircode. This worship of every jot and tittle of the law, which was the most remarkable character- istic of their conscientiousness, determined the nature of their casuistry. It was exact, detailed, unbending, and, though often wise and noble, often useless and merely external. Thus it forbade the wearing of a girdle on the Sabbath, decided to a yard how far one might walk on that day, and declared the consequences of an oath by the gift on the altar to be most serious, while an oath by the altar itself was perfectly safe. Its loosest requirements were those which concerned marriage, for it was practically possible to divorce a wife at will. Of these rules some may be found in the Apocrypha, but their great repository is the encyclopedic Talmud, which entered into the minutiz of conduct with a detail which tended to prevent real obedience to great laws, and which was disastrous to individual freedom. It must, however, be remembered in considering the religious casuistry of the Jews that—as is also remarkably the case with the Mahometans—their religous code was intended to be at

the same time their civil law, and that, consequently, part of their casuistry is comprised in our law-books. In fact, the task of our judges is to solve questions of legal casuistry, and the precedents which they make are, so far, comparable to the traditions of the elders.

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The early Greeks and the early Romans, in the bright joyousness or the laborious activity of objective life, fully oceupied by the pleasures of art or the business of war and politics, with no minutely-detailed code or body of tradi- tions to guide them, troubled themselves little about such problems, When, however, the Greek philosophers and their Roman followers developed moral systems, attention began to be given to this department; at length, such questions as how far suicide is justifiable, or whether duty to the state is more important than duty to afriend, became favourite subjects of debate; and, during the first two centuries of the Christian era, elaborate treatises on the subject were produced by the famous Stoic philosophers Epictetus, Seneca, and M. Aurelius.

Christianity brought in a new method of settling casuis- tical questions—a method directly opposed to that of most of the Jewish scribes, in the midst of whom it had its origin, and consisting in an appeal to the true spirit of great principles. Naturally this method would have left particular cases to the decision of each man’s conscience; but the extreme recoil from reckless self-indulgence which gave birth to the monastic ascetic system produced a new kind of casuistical literature. It found its first great representative in Tertullian, a contemporary of M. Aurelius, with whom nearly all sin was mortal, one repentance at most being possible after baptism. The same type of casuistry was taught by others of the fathers, but with the greatest acuteness and power by Augustine, who laid special stress upon the subjective or spiritual side of Chris- tian ethics, insisting upon the principle that the moral worth of action depends upon the disposition of the agent as much as upon the objective nature of the act.

In the Roman Catholic Church, the practice of confession gave rise to a system of casuistry, expressed in the Libri Peoenatentiales, which were intended to guide the confessor as to the imposition of peuauce and the giving of advice. Among the most important of these are the Summe of

Raimund of Pennaforti, Angelus, Antonius Augustinus, Pacificus, and Prierias, the work of the last (who was a vigorous opponent of Luther) being an alphabetical com- pilation from those of his predecessors. Later examples are Amort's Dictionarium caswum conscientic (1784), and Sobiech's Compendium theologice mioralis pro utilitate confessartorum (1824), Indeed, throughout the Middle Ages, the doctrines of the church being universally accepted as the supreme rules of conduct, the casuistical was the departinent of moral science which was best developed. In Petrus Lombardus, in Alexander of Hales, and in Aquinas's famous treatise, the Secunda Secunde, we find the uncompromising strictness of the ancient fathers but slightly modified. Abelard, though earlier, took a more indulgent view, but his teaching was condemned by the church, in the synod of Sens (1140).

One of the most favourable conditions for the growth of a system of casuistry is that in which a people, having lost its reverence for the law it once held supreme, and ceased to find obedience tolerable, does not yct dare to deny its authority. Such was the condition in which, during the 16th century, there took place the worst development of casuistry which the world has seen. Men no longer were willing that their liberty should be repressed by the dead rules of a corrupt

church, and the Jesuits, animated by the single object of

adding to the power of their order, were always ready to make coticessions and to soften disagreeable requirements. The most remarkable doetrine which they promulgated—a doctrine which it is hard to believe that any one ever ventured to assert—is that of " Probabilism, " according to which any opinion which has been expressed by a " grave doctor" may be looked upon as possessing a fair amount of probability, and may, therefore, be safely followed, even

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though one's conscience may insist upon the opposite course. With principles so liberal it was hard if one could not find an authority to his mind among Escobar, Suarez, Sanchez, Velasquez, Molina, Bauny, Busenbaum, Toletus, Filiutius, Less, Ponce, and an inuumerable host of

other “ grave” and, as arule, obliging doctors. Such was the popularity of some of their works that Busenbaum’s Medulla casuum con- scientice (1645) ran through fifty-two cditions, and Escobar’s Theologia Moralis (1646) through forty. One of the most amusing of their ruses was that by which they avoided the condemnation of usury. That “ money should breed money ” was regarded universally in those days as unnatural; but borrowing was necessary, and no one could be expected to lend without being paid for his risk, and for the use of his capital, The remedy for the Jesuit was easy. There is no sin if you only call the payment not interest but “fair profit ;” or if you look upon it as a grateful return by the borrower for the favour done him ; or, thirdly, if you prefer it, you can avoid the least appearance of evil by making a “ Mohatra” bargain, that is, you sell to the person who wants money a quantity of goods, which he at once sells to you again at a lower rate. For these devices, however, the Jesuits are to be judged the less hardly, since almost all moralists found it necessary to evade the mis- taken law. It was mainly by their teaching on the fundamental question of the duty of veracity that they made themselves a by-word and a reproach among nien, To settle the limits of this duty is, indeed, one of the most difficult problems in practical ethics; but the Jesuits removed it entirely from the category of obligation. Thus Filiutius and others, from the principle that it is the intention which determines the quality of the action, argue that lying can be avoided by mental reservation, by equivocation, or by introducing words sotto voce, and that promises are not binding when the promiser in making them had no intention to bind himself. Equally notorious were their views on murder, which was authorized in revenge for a box on the ear, or to prevent the loss of a trifling sum; and with regard to some other questions, they entered into such prurient details that their bitterest enemies would not quote their words even for the purpose of con- demning them. In short, virtue, according to Father Le Moine’s Devotion made Easy, is not at all the “ cross- tempered dame” men represent her as being. ‘The rites and requirements of the church also were modified to suit the taste of the people. For example, if a whole mass be found wearisome, greater expedition can be obtained by having different parts performed simultancously ; and in his Paradise opened to Philagio in One Hundred Devotions to the Mother of God, easily practised, Father Bauny shows how easily the heart of the Virgin may be won; a prayer once a day, or even the wearing of an amulet, is enough ; nor is it- necessary, or, indeed, becoming,

that ths favoured worshipper should give his heart— that poor little slave "—to his benefactress as a token of his grati- tude. It was impossible that absurditics such as theso could fail to bring upon their authors the severest punish- iment. War was declared against them by the great Jansenist, Antoine Arauld ; and in 1656 and 1657 Pascal attacked them with an incisive wit, the edge of which none of their attempts could turn. The order became a jest ; the clergy were aroused to examine the ponderous folios which contained its casuistry, and to condemn them in a general assembly. The attack was afterwards followed up by the polished satire of Boileau, and by a second exposure of the Morale des Jesuites by Nicole Perrault (1667) ; and the influence of the Provincial Letters was at once spread far and wide by means of their immediate translation into Latin, Italian, German, Spanish, and English. It was in vain that the Pope condemned them (September 1657);

the attempts of Pirot and othcr Jesnits to justify the base maxims they exposed, only increased the disgrace of the order; and Father Daniel's endeavour to prove them inaccurate was a complete failure. The chief Roman Catholic casuists since that time arc St Ignatio (who produced a complete treatise in 1707, and an Lthica 'Amoris in 1709), Stattler (1782), Lambertini (1766-1794), and Amort and Sobiech, who have been already men- tioned. ;

The casuistry of the Reformers was similar, in origin, to that of the early fathers; and, with the marked exception of the question of cclibacy, the two systems greatly resemble one another in their severity. This strictness was most extreme in the Calvinistic Church, as is displayed in the stern rules of its founder, and in the works of the German Danzus (who, in fact, usually follows Augustine), of the English Perkins, and the Dutch Amesius. A more genial spirit prevailed in the Lutheran Church, which produced the Conszlia of Melanchthon, and the treatises of Baldwin of Wittenberg, Olearus, Osiander, and Spener. In the Pia Desideria of the last we find the commencement of a more ascetic but specially snbjective casuistry, founded upon the pietism of Thomas & Kempis. During the 17th century, several other Protestant works on casuistry appeared in England. Those of Bishops

Hall and Barlow are not marked by much power. Perkins's Cases of Conscience (1606), starting froma discussion of the authority of Scripture and the nature of the Godhead, of repentance and the sacraments, arrives at conclusions which often display vigorous sense, and always a straightforward and even stern honesty. 'Thus he declares that a promise, though extorted under compulsion or by mcans of deceit, is binding so long as the loss to be sustained is merely temporary and private ; and he condemns the striving for more riches than is necessary for the health of the body, the culture of the mind, and the satisfaction of one's obli- gations to one's family and to others. His most fanciful argument is that in which he founds the validity of an oath by a creature on the curious ground that "God is seen" (i.e, manifests himself) "in the creature." The still more famous Latin treatise De Obligatione conscientie (1660) —of which the best known section, the De Juramenti Obligatione appeared separately in 1647—by Sanderson, professor of theology at Oxford, is distinguished by an equal directness of moral aim, and by much learning and vigour. But the most renowncd of all, Jeremy Taylor's Ductoy Dubitantium (1660) has not the merit of similar clearness; as guides of conscience he mixes up the laws of revelation and nature, the laws ecclesiastical and civil of princes and governors, and "the fame or the public reputation of things, expressed. by proverbs, &c.," while the place of careful original thought is often taken by profuse quotations,

During the last two centuries, the study of morals has developed itself ina totally different direction. [Tree discussion being opened up as to the fundamental questions of religion and morality, modern writers on ethics more generally content themselves with the treatment of great principles, without laying down specific rules for their prac- tical application. T. M. W.)

CASWALL, Henry, D.D. (1810-1870), was born at Yateley, Hampshire, and educated chiefly at the grammar school of Chigwell, Essex. At the age of eighteen he went to the United States, and graduated in arts at Kenyon College, Ohio. After being engaged for several years as a parish minister and a professor of theology in America, he returned to England in 1842, obtaincd a private Act of Parliament recognizing the validity of his

ordination in the United States, was appointed to the vicarage of Figheldcan, Wiltshire, and became proctor in Convocation

for the diocese of Sarum, and prebendary of Salisbury Cathedral. He received the honorary degree of M.A. from the university of Oxford, and that of D.D. from Trinity College, Hartford, Connecticut. Caswall went back to the United States about two years before his death, which occurred at Franklin, Pennsylvania, December 17, 1870. The main object of his life was to promote the consolidation and to increase the power of the great religious organization connected with the English Re- formation. His principal work is America and the Ameri- can Church, 1839; 2d edition, 1851. He also wrote two works on Mormonism; Scotland and the Scottish Church; The Western World Revisited, 1854; and The Martyr of the Pongas, a memoir of the Rev. H. J. Seacock. ; CAT, a name applied in its widest sense to all feline animals, but generally restricted to a few of the smaller species which approximate more or less closely to the domestic form. Of undomesticated species the best known is the wild cat (elds catus), inhabiting the most inacces- sible mountain fastnesses, and the deepest recesses of the forests of Central and Northern Europe and Asia, It attains a length of 3 feet including the tail, is of a yellowish grey colour above and whitish beneath, with a dark streak extending along the back to the origin of tho tail, and with indistinct transverse bands on the sides. ts tail is bushy and of equal thickness throughout, annulated and tipped with black. The wild cat was formerly abundant throughout the wooded districts of Britain, but is now confined to Wales, the mountainous parts of the north-west of England, and the Highlands of Scotland, where, owing to the increased attention now paid to the preservation of game, it is being rapidly exterminated by trap and gun. It forms its nest in rocky crevices, or in the hollows of trees, and has been known to make use, for this purpose, of the nests of the larger birds, It is nocturnal in its habits, prowling by night in search of the mammals and birds which form its food, and thus doing immense damage in districts well stocked with game. The fierceness of its disposition, its strength, and its agility are well known ; and although it docs not seek to attack man, yet when disturbed in its lair, or when hemmed in, it will spring with tiger-like ferocity on its opponent, every hair on its body

bristling with rage. “I never saw an animal fight so desperately,” says Mr Charles St John (Wald Sports of the Highlands), “or one which was so difficult to kill.” In cotethiy districts specimens of the domestic cat run wild are by no means uncommon, for, having once tasted wild animal food, hares and rabbits are ever after- wards preferred to rats and mice, and when the house cat thus takes to hunting there are few animals more destructive to poultry and game. In some instances they have been known to hunt regularly in the woods and yet retain sufficient domesticity to carry home their prey before devouring it; and notwithstanding the Latin proverb— .

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‘“Catus amat pisces, sed aquas intrare recusat,”

they have been known to overcome their aversion to watcr in order to gratify their taste for fish. The offspring of such semi-wild forms gradually assume a uniform colouring not unlike that of the wild cat,—a similarity which led to the supposition that the house cat was but a domesticated form of Felis catus. The greater size, howcver, of the latter, the uniform thickness of its tail—a peculiarity which never reappears in any of the domestic varieties, nor in those which have returned to the wild state—along with the fact of the great scarcity of house cats and the high value set upon them throughout Europe during the Middle Ages, when the wild form was everywhere abundant, may be

from the wild form of our woods. Its origin, like that of many other domestic animals, is sufficiently obscure to have become a matter of more or less probable conjecture. Reference is made to it in Sanskrit writings 2000 years old, and still more ancient records of it arc to be found in the monumental figures and cat mummies of Egypt. The latter, according to De Blainville, belong to threc distinct species, two of which are said to be still found, both wild and domesticated, in parts of Egypt. The Gloved Cat of Nubia (felis maniculata), which also occurs as a mummy, approaches most nearly in size, and in the tapering form of the tail, to the domestic cat, but Professor Owen has shown that there are peculiarities in the dentition of this species, sufficient to invalidate its claim to be considered the ancestor

of the domestic form. The difficulty of recognizing this ancestor in any single wild species has led many naturalists, including Temminck, Pallas, and Blyth, to the conclusion that Melis domestica is the product of many species commingled ; and whatever weight may be attached to this view, there is sufficient evidence to show that domestic cats in different parts of the world have bcen greatly modified by frequent crossings with such wild species as occur in those parts. In the north of Scotland at the present day, the native species is believed occasionally to cross with the house cat, the product living in the houses. Such crosses would, no doubt, be much more frequent in ages when the wild cat was superabundant throughout Europe, and it is evidently owing to this, that, as Mr Blyth states, the affinity of the ordinary British cat to Felis catus, as compared with any Indian tame cat, is manifest. The latter, according to the same authority, has crossed with no fewer than four Indian wild species, and a tame specimen lately added to the British Museum, agreed, in Dr Gray's opinion, in almost every character with the Indian wild species Felis chaus. Similar instances of the crossing of native species with the domestic form have been noted in Algeria, South Africa, and Paraguay. Although the cat has probably been domesticated quite as long as the dog, the number of dis- tinct breeds inhabiting the same country, to which it has given rise, is strikingly small in comparison with those of the latter,—a fact owing, probably, to the nocturnal habits of the cat and the consequent. difficulty in preventing indiscriminate crossing. That it is not owing to any inherent want of variability is proved by the very distinct breeds that have been developed in insular and other isolated situations, such as the tailless cats of the Isle of

held to prove that the domestic cat is specifically distinct

Man, which differ in size of head and length of limbs, ag well as in absence of tail from the ordinary form, and the domestic cats of the Malayan Archipelago, in which the tail is short and truncated. The best known and most distinct varicties are the Tabby; the Tortoise-shell or Spanish, with its pleasing mixture of black, white, and yellow ; the Chartreuse, of a bluish-grey colour; and the Angora, with long silky hair of a dusky white, a

favourite drawing-room pet, and the gentlest of all the varieties, Among less known breeds are the Chinese, with pendulous ears, the red-coloured brecd of Tobolsk, and the twisted- tailed cats of Madagascar.

The disposition and habits of the domestic cat are familiar to all, and need not be dwelt upon here. It hag never evinced that devotion to man which characterizes the dog, though many individual cases of feline attachment might be quoted. It becomes, however, strongly attached to particular localities, and will find its way back from the most distant places although conveyed thither under cover, How it performs such feats has long puzzled naturalists, and no theory that has yet been advanced seems adequately to meet the case. It has been contended recently by Mr A, R. Wallace that a cat which is being conveyed to a distance blindfold will have its sense of smell in full exercise, and will by this means take note of the successive odours it encounters on the way ; that these will leave on its mind “a series of images as distinct as those we should receive by the sense of sight ;” and that “ the recurrence of these odours in their proper inverse order—every house, ditch, field, and village having its own well-marked indivi- duality would make it an easy matter for the animal in question to follow the identical route back, however many turnings and cross roads it may have followed” (Nature, February 20, 1873).

Among the ancient Egyptians the cat was sacred to Isis or the moon ; temples were raised, and sacrifices offered in its honour, and its body was embalmed at death. Nor is this feeling quite extinct among modern Egyptians, for in Cairo at the present time there is an endowment in operation for the lodging and feeding of homeless cats,

In the folk-lore of European nations the cat is regarded with suspicion as the favourite agent of witchcraft, and seems often to have shared in the cruelties inflicted on those who were supposed to practise the “ black art.” In Germany at the present day black cats are kept away from the cradles of children as omens of evil, while the appearance of a black cat on the bed of a sick person used to be taken as an announcement of approaching death.

CATACOMBS

ATACOMB, a subterranean excavation for the inter- ment of the dead, or burial-vault. In this sense the

word “Catacomb” has gained universal acceptance, and has found a place in most modern languages. he original term, catacumbe, however, had no connection with sepul- ture, but was simply the name of a particular locality in the environs of Rome. It was derived from the Greek xara and «vpn, “a hollow,” and had reference to the natural configuration of the ground, In the district that bore this designation, lying close to the Appian Way, the basilica of St Sebastian was erected, and the extensive burial-vaults beneath that church—in which, according to tradition, the bodies of the apostles St Peter and St Paul rested for a year and seven months previous to their removal to the basilicas which bear their nhames—were, in very early times, called from it camiterium ad catacumbas, or catacwmbas alone. From the celebrity of this cemetery as an object of pilgrimage its name became extensively

known, and in entire forgetfulness of the origin of the word, catacumbe caine to be regarded as a generic appella- tion for all burial-places of the same kind. This extension of the term to Christian burial-vaults generally dates from the 9th century, and obtained gradual currency through the Christian world. The original designation of these places of sepulture is crypta or coemitertum.

The earliest Christian catacombs known may be assigned to the 2d century. The largest number belong to the 3d and the early part of the 4th. The custom of subterranean inter- ment gradually died out, and entirely ceased with the sack of Rome by Alaric, 410 a.p. “ The end of the catacomb graves,” writes Mommsen (Cont, Rev., May 1871), “is intimately connected with the end of the powerful city itself. . . . Poverty took the place of wealth, ... the traditions of the Christian tomb-architects sank into utter insignificance, and the expanse of the wasted Campagna now offered room enough to bury the few bodies, without

CATACOMBS

having to descend as once far down below the surface of the earth.” The carliest account of the Catacombs, that of St Jerome narrating his visits to

them when a schoolboy at Rome, about 354 a.p. shows that interment in them was even then rare if it had not been altogether discon- tinued ; and the poet Prudentius's description of the tomb of the Christian martyr Hippolytus, and the ceme- tery in which it stood, leads us to the same conclusion. With the latter part of the 4th century a new epoch in the history of the Catacombs arose,—that of religious reverence. In the time of Pope Damasus, 366-384 a.D., the Catacombs had begun to be regarded with special devotion, and had become the resort of large bands of pilgrims, for whose guidance catalogues of the chief burial- places and the holy men buried in them were drawn up. Some of these lists are still extant. Pope Damasus him- self displayed great zeal in adapting the Catacombs to their new purpose, restoring the works of art on the walls, and renewing the epitaphs over the graves of the martyrs. In this latter work he employed an engraver named Furius Philocalus, the exquisite beauty of whose characters enables the smallest fragment of his work to be recognized at a glance, This, in Dean Milman's happy words, " irreverent reverence, which converted the Catacombs from hidden and secret chambers, where piety might steal down to show its respect or affection for the dead, to, as it were, a great religi- ous spectacle, the scene of devout pilgrimage to thousands " (Milman, Essays, p. 489), gave rise to extensive alterations in their construction and decoration, which has much lessened their value as authentic memorials of the religious art of the 2d and 3d centuries. Subsequent popes manifested equal ardour, with the same damaging results, in the repair and adornment of the Catacombs, and many of the paintings which cover their walls, which have been too unquestion- ingly assigned to the period of their original construction, are really the work of these later times. The Catacombs shared in the devastation of Rome by the Goths under Vitiges, in the 6th century and by the Lombards at a later period; and partly through the spoliation of these barbarian invaders, partly through the neglect of those who should have been their guardians, they sank into such a state of decay and pollution that, as the only means of preserving the holy re- mains they enshrined from further desecration, Pope Paul I, in the latter part of the 8th century, and Pope Paschal, at the commencement of the 9th, commenced the work of the translation of the relics, which was vigorously carried on by successive pontiffs until the crypts were almost entirely despoiled of their dead. The relics having been removed, the visits of pilgrims naturally ceased, and by degrees the very existence of those

wonderful subterranean cemeteries was forgotten. Six centuries elapsed before the accidental discovery of a sepulchral chamber, by some labourers dig- ging for pozzolana earth (May 31, 1578), revealed to the amazed inhabitants of Rome " the existence," to quote a contemporary record, "of other cities concealed beneath their own suburbs." Baronius, the ecclesiastical historian, was one of the first to visit the new discovery, and his "Annals" in more than one place evidence his just appreciation of its importance. The true 'Columbus of this subterranean world," as he has been aptly designated, was the indefatigable Bosiv, who devoted his life to the personal investigation of the Catacombs, the results of

1 The most important of these lists are the two Itineraries belonging to the first half of the 7th century, in the Salzburg library. One still earlier, but less complete, appears in the Wotitia Urbis Rome, under the title Index Coemeteriorum. Another Itinerary, preserved at Hinsiedeln, printed by Mabillon, dates from the latter half of the same century. That found in the works of William of Malmesbury (Hardy's ed. vol. li, pp. 539-544) appears to be ccpied from it, or both may be from the sume source. De' Rossi gives a comparative table of these Itincraries and other similar lists.

which were given to the world in 1632 in a huge folio, entitled oma Sotterranea, profusely illustrated with rude but faithful plans and engravings. This was republished in a Latin translation with considerable alterations and omissions by Aringhi in 1651; and a century after its first appearance, the plates were reproduced by Bottari in 1737, and illustrated with great care and learning. Some additional discoveries were described by Boldetti in his Osservazioni, published in 1720; but, writing in the interests of the Roman Church with an apologetic not a scieutific object, truth was made to bend to polemics, and little addition to our knowledge of the Catacombs is to be gained from his otherwise important work. The French historian of art, Seroux d'Agincourt, 1825, by his copious illustrations, greatly facilitated the study of the architecture of the Catacombs and the works of art contained in thein, The works of Raoul Rochette display a comprehensive knowledge of the whole subject, extensive reading, and a thorough acquaintance with early Christian art so far as it could be gathered

from books, but he was not an original investigator. The great pioneer in the path of independent research, which, with the intelligent use of documentary and historical evidence, has led in our own day to so vast an increase in our acquaintance with the Roman Catacombs, was the late Padre Marchi of the Society of Jesus, His work, Monument delle arti Christiane Primi- tive, so disastrously interrupted by the political vicissitudes of the times, is the first in which the strange misconception, received with unquestioning faith by earlier writers, that the Catacombs were exhausted sand-pits adapted by the Christians to the purpose of interment, was dispelled, and the true history of their formation demonstrated. Marchii's line of investigation was followed by the Commendatore De' Rossi, and his brother Michele, the former of whom was Marchi's fellow-labourer during the latter part of his explorations; and it is to them that we owe the most exhaustive scientific examination of the whole subject, in its geological, architectural, ritual, epigraphic, and artistic aspects, in the two volumes of Roma Solterranea, published in 1864 and 1867, as well as in the articles periodically published in the Bullettino di Archeologia Christiana. A very convenient abridgment of De' Rossi's work has been produced in English under the same title by Dr Northcote, President of Oscott, and the Rev. W. R. Brownlow. The Catacombs of Rome are the most extensive with which we are acquainted, gnd, as might be expected in the centre of the Christian world, are in many respects the most remark- able. No others have been so thoroughly examined and illustrated. These may, therefore, be most appropriately selected for description as typical examples.

Our description of the Roman Catacombs cannot be more appropriately introduced than by St Jerome's account of his visits to them in his youth, already refcrred to, which, after the lapse of above fifteen centuries, presents a most accurate picture of these wonderful subterranean labyrinths, "' When I was a boy," he writes, " receiving my education in Rome, I and my schoolfellows used, on Sundays, to make the circuit of the sepulchres of the apostles and martyrs. Many a time did we go down into the Catacombs. These are excavated deep in the earth, and contain, on either hand as you enter, the'bodies of the dead buried in the wall. It is all so dark there that the language of the prophet (Ps. lv. 15) seems to be fulfilled, ' Let them go down quick into hell.' Ouly occasionally is light let in to mitigate the horror of the gloom, and then not so much through a win- dow as through a hole.

You take each step with caution, as, surrounded by deep night, you recall the words of Virgil—

‘* Horror ubique animos, simul ipsa silentia terrent.” ?

- Hieron., Comment. in Lzech., lib, xx. c. 40, The translation iy Dean Burgon’s. ,

In complete agreement with Jerome’s vivid picture the visitor to the Roman Catacombs finds himself in a vast labyrinth of narrow galleries, usually from 3 to 4 feet in width, interspersed with small chambers, excavated at suc- cessive levels, in the strata of voleanic rock subjacent to the city and its environs,.constructed originally for the interment of the Christian dead. The galleries are not the way of access to the cemeteries, but are themselves the cemeteries,

the dead being buried in long low horizontal recesses, excavated in the vertical walls of the passages, rising tier above tier like the berths in a ship, from a few incheg above the floor to the springing of the arched ceiling, to the number of five, six, or even somotimes twelve ranges, These galleries are not arranged on any definite plan, but, as will be seen from the woodcut (fig. 1), they intersect one another at different angles, producing an intricate net

Fic, 1.—Plan

A, Entrance from the Basilica of St Agnes. 7. Ruined vault. 1, 2, Ancient staircases leading to the first story. 8. Blind ways. 8. Corridors from the stalrcasces. 9.

4. Two ruined staircases leading to the lower story. 5. Steps of the rock. 6 Air-shafts, or luminaria,

work which it isalmost impossible to reduce to any system. They generally run in straight lines, and as a rule preserve the same level, The different stories of galleries lie one below the other (fig. 2) to the number of four or five (in one part of the cemetery of St Callistus they reach seven stories), and communicate with oue another by stairs cut out of the living rock. Light and air are introduced by means of vertical shafts (/uwminaria) running up to the outer air, and often serving for several stories. The drawing (fig. 3) from Northcote gives a very correct idea of these gal- leries, with the tiers of graves pierced in the walls. The doorways which are seen interrupting the lines of graves are those of the family sepulchral chambers, or cubicula, of which we shall speak more particularly hereafter.

The graves, or loculi, as they are commonly designated, were, in the Christian cemeieries, with only a few excep- tions (Padre Marchi produces some from the cemetery of St Cyriaca,* Monum. Primitiv., tav. xiv. xliii. xliv.), parallel with the length of the gallery. In the pagan cemeteries, on the other hand, the sepulchral recess as a rule entered the rock like an oven at right angles to the corridor, the

of part of the Cemetery of St Agnes.

Passages built up or ruined.

. Passages obstructed by landslips. . Unfinished passage.

. Passages destitute of tombs.

From Martigny.

18. Narrow apertures between adjoining galleries, 14-17, Arcosolia. 18-32. Cubicula.

88, Chapel with vestibule and apse, and two chairs,

84. Double chapel with three chairs,

35. Large chapel in five divisions. body being introduced endways. ‘The plan adopted by the Christians saved labour, economized space, and

consulted reverence in the deposition of the corpse. ‘These locus were usually constructed for a single body only. Some, however, were formed to contain two, three, or four, or even more corpses. Such recesses were known respectively as bisomt, trisomi, guadrisomi, &c., terms which often appear in the sepulchral inscriptions. After the introduction of the body the loculi were closed with the greatest care, either with slabs of marble the whole length of the aperture, or with huge tiles, three being generally employed, cemented together with great exactness, so as to prevent the escape of the products of decomposition (fig. 4). Where any epitaph was set up—an immense number are destitute of any inscription at all—it is always painted or engraved on these slabs or tiles. In the earlier interments the epitaph is simply daubed on the slab in red or black paint. in later examples it is incised in the marbles, the letters being rendered clearer by being coloured with vermilion. The enclosing slab very often bears one or more Christian symbols, sucli as the dove, the anchor, the olive-branch, of

tne monograin of Christ (figs. 5, 6). The palm branch, which is also of frequent occurrence, has been solemnly decided by “the Congregation of Relics ” to be an indisputable mark of the last resting place of a martyr. But the decision of this

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Fra. 2.—Section of Galleries at different levels. Seroux d’ Agincourt.

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infallible authority has been proved fallacious by the stern logic of facts,—the emblem being found in connection with epitaphs of persons dying natural deaths, or those prepared

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Fia. 8.—View of a Gallery.

by persons in their lifetime, as well as in those of little chil- dren, and even of pagans. Another frequent concomitant of these Catacomb interments, a small glass vessel containing

Fig. 4.-Loculi. From De’ Rossi.

traces of the sediment of a red fluid, embedded in the cement of the /oculus, pronounced as confidently by the same author- ity to indicate a martyr’s grave (fig. 7), has also shown the

unwisdom of pronouncing dogmatically without sufficient evidence. The red matter proves to be the remains of wine not of blood; and the conclusion of the ablest archeologists of the Church of Rome itself is that the vessels were placed

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or Cee ce Fras. 5 and 6.—Loculi. * From De’ Rossi.

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where they are found, after the Eucharistic celebration or agape on the day of the funeral or its anniversary, and con- tained remains of the consecrated elements as a kind of

Fria. 7.—Glass Bottles. From Bosio.

religious charm. Instances of the pious theft, not alto- gether unknown in modern churches, which combines economy with becoming respect to the dead, appear in the Catacombs. Not a few of the slabs, it is discovered, have done double duty, bearing a pagan inscription on one side, and a Christian, one on the other. ‘These are known as opisthographs. The bodies were interred wrapt in linen cloths, or swathed in bands, and were frequently preserved by embalming, In the case of poorer interments the destruction of the body was, on the contrary, often ac- celerated by the use of quicklime.

Interment in the wall-recess or locwlus, though infinitely the most common, was not the only mode employed in the Catacombs. Other forms of very frequent recurrence are the table-tomb and arched tomb, or arcosolium. From the annexed woodcuts it will be seen that these only differ in the form of the surmounting recess. In each case the arched tomb was formed by an oblong chest, either hollowed out of the rock, or built of masonry, and

closed with a horizontal slab. But in the table-tomb (fig. 8) the recess above, essential for the introduction of the corpse, is square, while in the arcosolium (fig. 9), a form of later date, it is semi- circular. Sarcophagi are also found in the Catacombs, but are of rare occurrence. They chiefly occur in the earlier cemeteries, and the costliness of their construction confined their use to the wealthiest classes,—e.g., in the cemetery of St Domitilla, herself a member of the imperial house. Another unfrequent mode of interment was in graves like those of modern times, dug in the floor of the galleries (Marchi, w.s., tav. xxi, xxvi.), Table-tombs and arcosolia

are by no means rare in the corridors of the Catacombs,

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bones should be laid beside the bones of the man of God

but they belong more generally to the cwbicwla, or family | that came from Judah, is only the expression of an

vaults, of which we now procced to speak.

Fria 8.—Table-Tomb.

These cubicula are small apartments, seldom more than 12 feet square, usually rectangular, though sometimes circular or polygonal, opening out of the main corridors. They are not unfrequently ranged regularly along the sides of the galleries, the doors of entrance, as may be secn in a previous illustration (fig. 3), following one another in as orderly succession as the bedchamber doors in the passage of a modern house. The roof is sometimes flat, but is more usually coved, and sometimes rises into a cupola. Both the roof and the walls are almost universally coated with stucco and covered with fresco paintings,—in the carlier works merely decorative, in the later

always symbolical or historical. Each side of the cubiculum, except that of the entrance, usually contains a recessed tomb, either a table- tomb or arcosolium. That facing the entrance was the place of greatest honour, where in many instances the remains of a martyr were deposited, whose tomb, according to primitive usage, served as an altar for the celebration of the Eucharist, This was sometimes, as in the Papal crypt of St Callistus (fig. 10), protected from irreverence by lattice- work (transenne) of marble. The cubiculum was originally designed for the reception of a very limited number of dead, But the natural desire to be buried near one's rela-

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Fia. 9.—Arcosolia,

From Bosio.

tives caused new tombs to be cut in the walls, above and around and behind the original tombs, the walls being thus completely honey-combed with loculi, sometimes as many as seventy, utterly regardless of the paintings originally depicted on the walls. Another motive for multiplying the number of graves operated when the cubiculum contained the remains of any noted saint or martyr. The desire of the old prophet of Bethel that his

instinctive though unrcasoning fecling, connecting greater

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Fia, 10,—Restoration of the Papal Crypt, Cemetery of St Callistus. From De' Rossi.

personal safety with a resting-place close to the blessed dead, which awoke very carly and acted very powerfully in the Christian Church. The Christian antiquary has cause continually to lament the destruction of works of art due to this craving. One of the most perfect examples of early Christian

pictorial decoration, the so-called ‘* Dispute with the Doctors,” in the Catacomb of Callistus, the “antique style of beauty ” of which is noticed by Kugler, has thus suffered irreparable mutilation, the whole of the lower part of the picture having been destroyed by the excavation of a fresh grave-recess (Bottari, vol. ii. tav. 15).

| ‘ The plates of De’ Rossi, Perret, and, indeed, all illustrations

of the Catacombs, exhibit frequent examples of the same destructive superstition, The woodcuts (figs. 11 and 12), taken from De’ Rossi’s great work, representing two of the cubicula in the cemetery of St Callistus, show the general arrangement of the loculi and the character of the frescos which ornament the walls and roof. These paintings, it will be seen, are simply decorative, of the same style as ‘the wall-paintings of the baths, and those of Pompeii. Each cubiculum was usually the burying-place of some one family, all the members of which were interred in it, just as in the chantry-chapels connected with medisval ° churches. In them was celebrated the funeral-feast on the day of burial and on: ‘its anniversary, as well as the

Fucharist, which was the invariable accompaniment of funerals in the primitive church (Bingham, Orig. Ecel., bk. The funcral-banquet descended to the

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Fro, 11.—Cubiculum in Cemetery of St Callistus. From De’ Rossi.

Christian Church from pagan times, and was too often profaned by heathen licence. St Augustine, in several passages, inveighs against those who thus

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Fra. 12.—Cubiculum in the Cemetery of St Callistus. De’ Rossi.

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and insobriety buried themselves over the buried,” and “made themselves drunk in the chapels of the martyrs, placing their excesses to the score of religious reverence for the dead” (August., De Mor. Eccl. Cathol., c. 34; Contr. Faust., lib. xx. c. 21 ; Confess., lib. vi. c. 2). Some curious frescos representing these funeral feasts, found in the cubicula which were the scene of them, are reproduced by Bosio (pp. 355, 391) and others. A romantic air has been thrown over these burial chapels by the notion that they were the places of worship used by the Christians in times of persecution. Thistoa certain extent is doubtless true. Mr J. H. Parker, who has done more by his labori- ous and self-sacrificing investigations than any one living, not excepting De’ Rossi himself, for the elucidation of the true history and archeology of the Catacombs, writes “That during the time of persecution the bishops per- formed the divine offices in the Catacombs is not only recorded, but many of the chapels fitted up for that purpose remain, especially one in the chapel of St Priscilla, where

the altar or stone coffin of a martyr remains, with a small platform behind it for the priest or bishop to stand and officiate over it according to the practice of the early church ” (Archeology of Rome; The Catacombs, § 3, p. 25). Mommsen also speaks of them unhesitatingly as “places of devotion for the community,” adding, ‘this union of devotion with the interment, the development of the grave into the cemetery, of the cemetery into the church, is essentially Christian, one might perhaps say is Chris- tianity ” (w.s., p. 166). But that they can have been so used to any large extent is rendered impossible by the limited dimensions of these apartments, none of which could hold more than fifty or sixty persons. In some of the Catacombs, however, there are larger halls and connected suites of chapels, which may possibly have been constructed for the purpose of congregational worship

during the dark periods when the public exercise of their religion was made penal. The most remarkable of these is in the cemetery of St Agnes (see annexed plan, fig. 13). It consists of five

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Frag. 13.—Plan of a supposed Church, Catacombs of St Agnes. From Marchi.

rectangular compartments, three on one side of the cor- ridor and two on the other, connected by a passage in- tersecting the gallery at right angles, ‘Two of the five compartments are supposed to have been assigned to male, and two to female worshippers, the fifth, at the extremity of the whole, being reserved for the altar and its minis- ters. Inthe centre of the end-wall stands a stone chair (fig. 14), considered to have been the Episcopal cathedra, with

a bench for the clergy on each side. There is no trace of an altar, which may, Padre Marchi thinks, have been portable. The walls of the compartments arc occupied by arched sepulchral recesses, above and below which are tiers of ordi- nary graves or locul. The arrange- ments are certainly such as indi- cate a congregational purpose, but the extreme narrowness of the suite, and still more of the passage which connects the two divisions, must have rendered it difficult for any but a small number to take any intelligent part in the services at the same time. Although the idea of the use of the Catacombs for religious worship may have been pressed too far, there can be no doubt that the sacred rites of the church were celebrated within them. We have already spoken of the Eucharistic celebrations of which the cubicwla were the scene ; and still existing baptisteries prove that the other sacrament was also administered there. The most remarkable of these baptis- teries is that in the Catacomb of St Pontianus (fig. 15). Ten steps lead down to a basin of sufficient depth for immersion, supplied by a spring. The wall at the back exlubitsa fresco of a jewelled cross, beneath an arched recess, above which is a fresco of the Baptism of our Lord. Some of the subter-

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Fic. 14.—Bishop’s Chair. Catacomb of St Agnes.

ranean chambers contain armed seats and benches cut out of the tufa rock. These are supposed by Marchi and others to indicate school-rooms, where the catechumens were instructed by the bishop or presbyters. But this theory

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From Perret.

Fic. 15.—Baptistery of St Pontianus.

wants verification. It is impossible not to be struck with the remarkable analogy between these rock-hewn chairs and those discovered in the Etruscan tombs (vide infra), of the purpose of which no satisfactory explanation has been given.

Very exaggerated statements have been made as to the employment of the Catacombs as dwelling-places by the Christians in times of persecution. We have, however, sufficient evidence that they were used as places of refuge from the fury of the heathen, in which the believers—especi- ally the bishops and clergy, who would naturally be the first objects of attack—might secrete themselves until the storm had blown over. This was a purpose for which they were admirably adapted both by the intricacy of their labyrinthine passages, in which any one not possessing the clue would be inevitably lost, and the numerous small chambers and hiding places at different levels which might be passed unperceived in the dark by the pursuers. As a rule also the Catacombs had more than one entrance, and frequently communicated with an arenaria or sand-quarry; so that while one entrance was carefully watched, the pursued might escape in a totally different direction by another. But to quote again Mr J. H. Parker, “the Catacombs were never intended, nor fit for, dwelling-places, and the stories of persons living in them for months are probably fabulons. According to modern physicians it is impossible to live many days in the caves of pozzolana in which many of the Catacombs are excavated.” Equally exaggerated are the statements as to the linear and lateral extent of the Catacombs, and their intercommunication with one another. Without resorting to this exaggeration, Mommsen can speak with perfect truth of the “enormous space occupied by the burial vaults of Christian Rome, not

surpassed even by the cloacw or sewers of Republican Rome,” but the data are too vague to warrant any attempt to define their dimensions. Padre Marchi has estimated the united length of the galleries at from 800 to 900 miles, and the number of interments at between 6,000,000 and 7,000,000; Martigny’s estimate is 587 miles; and North. cote’s, lower still, at “not less than 350 miles.” The idea of general intercommunication is negatived by

the fact that the chief cemeteries are separated by low-ground or valleys, where any subterranean galleries would be at once filled with water.

It now remains for us to speak of the history of these subterranean burial places, together with the reasons for, and mode of, their construction. From the period of the rediscovery of the Catacombs, towards the end of the 16th century, almost to our own day, a gigantic fallacy prevailed, repeated by writer after writer, identifying the Christian burial-places with disused sand-pits. It was accepted as _ an unquestionable fact by every one who undertook to describe the Catacombs, that the Christians of Rome, finding in the labyrinthine mazes of the exhausted arenarie, which abounded in the environs of the city, whence the sand used in building had been extracted, a suitable place for the interment of their martyred brethren, where also the sacred rites accompanying the interment might be celebrated without fear of interruption, took possession of them and used them as cemeteries. It only needed a comparison of the theory with the visible facts to refute it at once. But the search after truth is trouble. some, and to controvert received doctrines is always unpopular, and it was found easier to accept the traditional view than to investigate for one's self, and so nearly three centuries elapsed before the independence of the arenarie and the Catacombs was established. The discovery of this independence is due to Padre Marchi, whose name has been already so often mentioned. Starting with the firmest belief in the old. traditional view, his own researches by degrees opened his eyes to its utter baselessness, and led him to the truth, now universally recognized by men of learning, that the Catacombs were exclusively the work of the Christians, and were constructed for the purpose with which their name is universally connected—the interment of the dead. It is true that a catacomb is often connected with the earlier sand-quarry, and starts from it as a com- mencement, but the two are excavated in different strata, suitable to their respective purposes, and their plan and construction are so completely unlike as to render any confusion between them impossible.

The igneous formation of which the greater part of the Roman Campagna is, in its superior portion, composed, contains three strata known under the common name of tufa,—the "stony," "granular," and "sandy" tufa,—the last being commonly known as pozzolana.1 The poz zolana is the material

required for building purposes, for admixture with mortar; and the sandpits are natur- ally excavated in the stratum which supplies it. The stony tufa (tufa litoide) is quarried as building-stone. The granular tufa is useless for either purpose, containing too much earth to be employed in making mortar, and being far too soft to be used as stone for building. Yet it is in this stratum, and in this alone, that the Catacombs are constructed ; their engineers avoiding with equal care the solid stone of the tufa ltoide and the friable pozzolana, and selecting the strata of medium hardness, which enabled them to form the vertical walls of their galleries, and to excavate the loculi and cubicula without severe labour and also without fear of their falling in.

1 In Rome the three strata are known to geologists as tufa litoidy tufa granolare, and pozzolana.

The annexed woodcut (fig. 16) from Marchi's work, when compared with that of the Catacomb of St Agnes already given, presents to the eye the contrast between the wide winding irregular passages of the sand-pit, calculated for

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the admission of a horse and cart, and the narrow rectili- near accurately-defined galleries of the Catacomb. The distinction between the two is also plainly exhibited when for some local or private reasons an ancient arenaria has been transformed into a cemetery. The modifications required to strengthen the crumbling walls to support the roof and to facilitate the excavation of loculi, involved so much labour that, as a rule, after a few attempts, the idea of utilizing an old quarry for burial purposes was aban- doned.

Another equally erroneous idea has only slowly retired be- fore the increased historical research and scientific investiga- tion which have been brought to bear on the construction of the Catacombs. This is, that these vast burial-places of the carly Christians remained entirely concealed from the eyes of their pagan neighbours, and were constructed not only without

the permission of the municipal authorities but without their cognizance. Nothing can be further from the truth. Such an idea is justly stigmatized by Mommsen as ridiculous, and reflecting a discredit as unfounded as it is unjust on the imperial police of the capital. That such vast excavations should have becn made without attracting attention, and that such an immense number of corpses could have been carried to burial in perfect secrecy is utterly impossible. Nor was there any reason why sccrecy should have been desired. The decent burial of the dead was a matter especially provided for by the Roman laws. No particular mode was prescribed. Interment was just as legal as cremation, and had, in fact, been universally practised by the Romans until the later days of the republic.1 The bodies of the Scipics and Nasos were buried in still existing catacombs ; and if motives of reverence for that which had been the temple of the Holy Ghost led the Christians to adopt that which Minucius Felix calls "the better, and more ancient cus- tom of inhumation" (Octavius, c. 2), there was absolutely nothing, to quote the words of Dr Northcote (Loma Sotterran., pp. 56, 61), " either in their social or religious position to interfere with their freedom of action. The law left them entire liberty, . . . and the faithful did but use their liberty in the way that suited them best, burying their dead according to a fashion to which many of them had been long accustomed, and which enabled them at the same time to follow in death the example of him who was also their model in life." | Interment in rock-hewn tombs, "as the manner of the Jews is to bury," had been practised in Rome by the Jewish settlers for a considerable period anterior to the rise of the Christian Church. A

1 Cicero is our authority for the burial of Marius, and for Sulla's being the first member of the Gens Cornelia whose dead body was burnt.—De. Legg, ii. 22.

Jewish catacomb, now lost, was discovered and described by Bosio (om. Sott., p. 141), and others are still accessible. They are only to be distinguished from Christian catacombs by the character of their decorations, the absence of Chris- tian symbols, and the language of their inscriptions. There would, therefore, be nothing extraordinary, or calling for

notice in the fact that a community, always identified in the popular heathen mind with the Jewish faith, should adopt the mode of interment belonging to that religion. Nor have we the slightest trace of any official interference with Christian burials, such as would render secrecy necessary or desirable. Their funerals were as much under the protection of the law, which not only invested the tomb itself with a sacred character, but included in its protection the area in which it stood, and the cella memorie or chapel connected with it, as those of their heathen fellow-citizens, while the same shicld would be thrown over the burial-clubs, which, as we learn from Tertullian (Apolog., c. 39), were common among the early Christians, as over those existing among the heathen population of Rome. We may then completely dismiss the notion of there being any studied secrecy in connce- tion with the early Christian cemeteries, and proceed to inquire into the mode of their formation. The investiga- tions of De' Rossi, confirmed by the independent researches of Mr J. H. Parker, show that, almost without exception, they had their origin in small burial areas, the property of private persons or of families, gradually spreading and ramifying and receiving additions of one subterranean story after another as each was required for interments. The first step would be the acquisition of a plot of ground cither by gift or purchase for the formation of a tomb. Chris- tians were not beyond the pale of the law, and their faith presented no hindrance to the property being secured to them in perpetuity. To adapt the ground for its purpose as a cemetery, a gallery was run all round the area in the tufa rock at a convenient depth below the surface, reaclicd by staircases at the corners. In the upright walls of these galleries loculi were cut as needed to receive the dead. When these first four galleries were full others were mined on the same level at right angles to them, thus gradually converting the whole area into a net-work of corridors. If a family vault was required, or a burial chapel for a martyr or person of distinction, a small square room was excavated by the side of the gallery and com- municating with it. When the original area had been mined in this way as far as was consistent with stability, a second story of galleries was begun at a lower level, reached by a new staircase. This was succeeded by a third, or a fourth, and sometimes even by a fifth. When adjacent burial areas belonged to members of the same Christian confraternity, or by gift or purchase fell into the same hands, communications were opened between the respective ecmeteries, which thus spread laterally, and gradually acquired that enormous extent which,

“even when their fabulous dimensions are reduced to their right measure, form an immense work.”? This could only be executed by a large and powerful Christian community unimpeded by legal enactments or police regulations, “a living witness of its immense development corresponding to the importance of the capital.” But although, as we have said, in ordinary times there was no necessity for secrecy, yet when the peace of the church was broken by the fierce and often protracted persecutions of the heathen emperors, it became cssential to

2 Mommsen’s chosen example of an ancient burial-chamber, extend- ing itself into a catacomb, or gathering subterranean additions round it till a catacomb was established, is that of the Cemetery of St Domitilla, traditionally identified with a granddaughter of Vespasian, and the catacomb of 8.8. Nereus and Achilleus on the Appian and Ardeatine way.

adopt precautions to conceal the entrance to the cemeteries, which became the temporary hiding-places of the Christian fugitives, and to baffle the search of their pursuers. To these stormy periods we’ inay safely assign the alterations which may be traced in the staircases, which are sometimes abruptly cut off, leaving a gap requiring a ladder, and the formation of secret passages communicating with the arenarve, and through them with the open country.

When the storms of persecution ceased and Christianity had become the imperial faith, the evil fruits of prosperity were not slow to appear. Cemetery interment became a regular trade in the hands of the fossores, or grave-diggers, who appzar to have established a kind of property in the Catacombs, and whose greed of gain led to that destruc- tion of the religious paintings with which the walls were decorated, for the quarrying of fresh locul?, to which we have already alluded. Monumental epitaphs record the purchase of a grave from the fossores, in many cases during the life time of the individual, not unfrequently stating the price. A very curious fresco, found in the cemetery of Callistus, preserved by the engravings of the earlier investigators (Bottari, tom. ii. p. 126, tav. 99), represents a “ fossor” with his lamp in his hand and his pick over his shoulder, and his

tools lying about him. Above is the inscription, “Diogenes Fossor in Pace depositus,”

Our space forbids us to enter on any detailed description of the frescos which cover the walls and ceilings of the burial-chapels in the richest abundance. It must suffice to say that the earliest examples are only to be distin- guished from the mural decorations employed by their pagan contemporaries (as seen at Pompeii and elsewhere) by the absence of all that was immoral or idolatrous, and that it was only very slowly and timidly that any distinctly religious representations were introduced. These were at first purely symbolical, meaningless to any but a Christian eye, such as the Vine, the Good Shepherd, the Sheep, the Fisherman, the Fish, &c. Even the personages of ancient mythology were pressed into the service of early

The subjects, beginning at the top and going to the right, are—(1.) The para- lytic earrying his bed; (2.) The Seven baskets full of iametalias 285 Raising a jt “ orn ie lions’ Royo (5.) Jonah swallowed by the fish;

-) Jonah vomited forth; (7. oses striking the rock: (8, . In the eentre, the Good Shepherd. : a aa

Christian art, and Orpheus, taming the wild beasts with his lyre, symbolized the peaceful sway of Christ; and Ulysses, deaf to the Siren’s song, represented the Believer

triumphing over the allurements of sensual pleasure, The person of Christ appeared but rarely, and then commonly simply as the chief personage in an historical picture, The events depicted from our Lord’s life are but few, and a conform rigidly to the same traditional type. frequent are the miracle at Cana, the multiplication of the loaves and fishes, the paralytic carrying his bed, the heali ng of the woman with the issue of blood, the raising of Lazarus, Zacchzeus, and the triumphal entry into J erusalem, The Crucifixon, and subjects from the Passion, are never represented. equally limited. The most common are the history of Jonah as a type of the Resurrection, the Fall, Noah receiving the dove with the olive branch, Abraham’s sacrifice of Isaac, Moses taking off his shoes, David with

always The most

The cycle of Old Testament subjects is

Fic. 18.—Fresco Ceiling. From Bosio.

beginning at the bottom and going to the right, are—(1.) Moses striking the rock; (2.) Noah and the dove; (3.) The three ehildren in the fur- nace; (4.) Abralam's sacrifice; (5.) The miracle of the loaves,

The subjects,

the sling, Daniel in the lions' den, and the Three Chil- dren in the fiery furnace. The mode of representation is always conventional, the treatment of the subject no less than its choice being dictated by an authority to which the artist was compelled to bow. Whatever be the date of the original pictures, a point on which considerable doubt exists, it is tolerably certain that the existing frescos are restorations of the 8th or even a later century, from which the character of the earlier work can only very imperfectly be discovered. All the more valuable of these paintings have been reproduced in Mr Parker's magnificent series of photographs taken in the Catacombs by the magnesium light. The contrast between these rude inartistic per- formances and the finished drawings, which profess to be accurate copies, in Perret's costly work, fully warrants the late Dean Milman's severe strictures on that " beautiful book,"—"so beautiful as to be utterly worthless to the arche- ologist and historian, which wants only two things,—truth and fidelity." Not the frescos alone, but also every point of interest in the plan, structure, and decoration of the Catacombs has been illustrated by Mr Parker in the same series of photographs, an examination of which is almost as instructive as a personal visit to the Catacombs themselves,1

1 Mr Parker's invaluable series of Roman photographs may be seen at the library of the South Kensington Museum, and at Mr Stanford's,

Charing Cross, as well as in the Ashmolean Museum, and the Bodleian Library, Oxford.

Beyond Rome and its suburbs the most remarkable Christian Catacombs are those in the vicinity of Naples, described by Pelliccia (De Christ. Eecl. Polit., vol. iv. Dissert. 5), and in a separate treatise by Bellerman. Plans of them are also given by Agincourt in his great work on Christian Art. These catacombs differ materi- ally from those of Rome. They were certainly originally stone-quarries, and the hardness of the rock has made the construction practicable of wide, lofty corridors, and spacious halls, very unlike the narrow galleries and con- tracted chambers in the Roman cemeterics. The mode of interment, however, isthe same as that practised in Rome, and the Joculi and arcosolia differ but little in the two. The walls and ceilings are covered with fresco

intings of different dates, in some cases lying one over the other. ‘This catacomb contains an unquestionable example of a church, divided into a nave and chancel, with a rude stone altar and bishop’s seat behindit, At Syracuse also there are very extensive catacombs known as “the Grottos of St John.” They are also figured by Agincourt, and described by Denon (Voyage en Sicile et Malte). Denon considers them of pagan origin, and to have passed to the Christians. He speaks of an entire underground city with several stories of larger and smaller streets, squares, and cross ways, cut out of the rock; at the intersec- tion of the crossways, are immense circular halls of a bottle shape, like a glass-house furnace, lighted by air shafts, The galleries are generally very narrow, furnished on each side with arched tombs, and communicating with family sepulchral-chambers closed originally by locked doors, the

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Fic. 19,—Plan of the Catacombs of St J ohn, Syracuse.

marks of the hinges and staples being still visible, The walls are in many places coated with stucco adorned with frescos, including palms, doves, labara, and other Christian symbols. A more complete ex- amination of this interesting

cemetery is much needed. The QS Wen ground-plans (figs. 19, 20), | 7% SS; CY

from Agincourt, of the cata- comb and of one of the circular halls, show how widely it dif- fers in arrangement from the Roman Catacombs. The fre- quency of blind passages and of / j j y Brenis> debate will be no- – +: — € eo 7 ticed, as well as the very large Fi 20.—Plan of Circular Ha 4 number of bodiesin the cruciform pee nee rer Fecesses, apparently amounting

One instance to nineteen. Agincourt remarks that this cemetery “gives an idea of a work exccuted with design

a sniall Christian cata-

ly discovered at Alex- andria, and described and figured by De’ Rossi.} here also are set end-

paintings, one of a

and Icisure, and with means very different from those at command in producing the Catacombs of Rome.”

Denon also describes catacombs at Malta near the ancient capital of the island, The passages were all cut in a close- grained stone, andare very narrow, with arched ceilings, running very irregularly, and ramifying in all directions, The greater part of the tombs stand on either side of the galleries in square recesses (like the table-tombs of the Roman Catacombs), and are rudely fashioned to imitate sarcophagi. The interments are not nearly so numerous as in other catacombs, nor are there any vestiges of painting, sculpture, or inscriptions, At Taormina in Sicily is a Saracenic catacomb, also figured by Agincourt. The main corridor is 12 fect wide, having three or more ranges of loculz on either side, running longitudinally into the rock, each originally closed by a stone, bearing an inscription.

Passing to Egypt, LE

comb has been recent-

The loculz

ways. to the passage. The walls are abun- dantly decorated with

liturgical character. But the most exten- sive catacombs at Alexandria are those of Aigypto-Greek ori- gin, from the largest of which, according to Strabo (lib. xvii. p. 795), the quarter where it is placed had the name of the Ne- cropolis. The plan, it will be seen, is remarkable for its regularity (figs. 21, 22). Here, too, the graves run endways into the rock. Other catacombs in the vici- nity of the same city

Fia. 21.—Plan of Catacomb at Alcx- andria. From Agincourt.

are described by

Pocock and other tra-

vellers, and are figured A by Agincourt. Cc i i

Subterranean ceme- © teries of the general character of those de- scribed are very frequent in all Southern and Eastern countries. A vast necropolis in the environs of Saida, tlic ancient Sidon, is described in Renan's Mission en Phenicie, and figured in Thobois's plates. It consists of a series of apartments approached by staircases, the sides pierced with sepulchral recesses running lengthwise into the rock.

The rock-hewn tombs of Etruria scarcely come under the category of catacombs, in the usual sense, being rather independent family burial-places, grouped together in a necropolis. They are, however, far too remarkable to be altogether passed over, These sepulchres are usually hollowed out of the face of low cliffs on the side of a hill. They sometimes rise tier above tier, and are sometimes all on the same level "facing each other as in streets, and branching off laterally into smaller lanes or alleys;" and occasionally forming "a spacious square or piazza sur-

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‘ * Bulletino di Archeologia Christiana, November 1864, August

865,

22.—Section of a Gallery in Catacomb _at Alexandria. From Agincourt.

rounded by tombs instead of houses’ (Dennis, Crtres and Cemeteries of Htruria, vol. il. p. 31). The construc- tion of the tombs commonly keeps up the same analog between the cities of the living and those of the dead. Their plan is for the most part that of a house, with a door of entrance and passage leading into a central chamber or a¢rwm, with others of smaller size opening from it, each having a stone-hewn bench or ¢ricliniwm on three of its sides, on which the dead, frequently a pair of corpses side by side, were laid as if at a banquet. These benches are often hewn in the form of couches with pillows at one end, and the legs carved in relief The ceilings have the representation of beams and rafters cut in the rock. In some instances arm-chairs, carved out of the living rock, stand between the doors of the chambers, and the walls above are decorated with the semblance of suspended shields The walls are often covered with paintings in a very simple archaic style, in red and black. As a typical example of the Etruscan tombs we give the plan and section (figs, 23, 2£) of the Grotta della Sedia at Cervetri from

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Fria, 23.—Plan of a Tomb at Cervetri. From Dennis.

Dennis (pp. 32, 35). The tombs in some instances form subterranean groups more analogous to the general idea of acatacomb, Of this nature is the very remarkable cemctery

Fra. 24.—Section of the Tomb of the Seats and Shields, Cervetri. From Dennis.

at Poggio Gajella, near Chiusi, the ancient Clusium, of a portion of the principal story of which the woodcut (fig. 25) isa plan. The most remarkable of these sepulchral cham- bers is a large circular hall about 25 feet in diameter,

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supported by a huge cylindrical pillar hewn from the rock, Opening out of this and the other chambers, and connecting them together, are a series of low winding passages or

#1c, 25.—Plan of a portion of the principal story in the Poggio

Gajella,

cuniculi, just Jarge enough for a man to creep through on all fours. No plausible suggestion has been offered as to the purpose of these mysterious burrows, which cannot fail to remind us of the labyrinth which, according to Varro’s description as quoted by Pliny (J/ist. Nat., lib, xxxvi. ¢ 19, § 4), was the distinguishing mark of Porsena’s tomb, and which have led some adventurous archeologists to identify this sepulchre with that of the great king of Etruria (Dennis, zs, p. 393, 7)

Avuruoririzs.—Aringhi, Roma Sotterranca; Boldetti, Osservaziont; Bosio, Roma Sotterranea,; Bottari, Sculture et pitture sagre; Garrueci, Cimetero degli Antichi Ebrei; Arte Cristiana ; Le Blant, Insertptions Chrétiennes; Fabretti, Inseriptionwin Antiquarwm Explicatio; Lupi, Dissertatio ;

Mabillon, Jéer Italiewm; De Cultu ignotorwm sanctorum; Wharton Marriott, Testimony of the Catacombs; Martigny, Diction- naire des Antiquités Chréticunes ; Mommsen, ‘‘The Roman Cata- combs,”” Contemp. Review, May 1871; Marehi, Afonwmenti delle art eristiane primitive ; Northeote and Brownlow, Jtoma Sotterranea ; Panvinius, De ritu sepeliendi mortuos; J. H. Parker, C.B., The Archeology of Rome, The Catacombs ; Perret, Les Catacombes de Rome ; Raoul Roehette, Tableau des Catacombes; Kichemont (Comte Desbossaynes de), Nowvelles études sur les catacombes Romaines; De’ Rossi, Inseriptiones Christiane; Roma Sotterranea; Seroux d’Agin- eourt, Histoire de Vart par les monuments ; Smith and Cheetham, Dictionary of Christian Antiquities, (E. V.) –

From Dennis.

CATALEPSY (from xardAnyus, a seizure) is a term applied to a nervous affection characterized by the sudden suspension of sensation and volition, accompanied with a peculiar rigidity of the whole or of certain muscles of the body. The subjects of catalepsy are in most instances females of highly nervous temperament. The exciting cause of an attack is usually mental emotion operating either suddenly, as in the case of a fright, or more gradually in the way of prolonged depression. The symp- toms presented vary in different cases, and even in the same individual in different attacks. Sometimes the typical features of the discase are exhibited in a state of complete insensibility, together with a statue-like appear-

ance of the body which will retain any attitude it may be made to assume during the continuance of the attack. In this condition the whole organic and vital functions appear to be reduced to the lowest possible limit consistent with life, and to such a degrce as to simulate actual death, At other times considerable mental excitement will accompany the cataleptic symptoms, and the patient will sing or utter passionate exclamations during the fit, being all the while quite unconscious. The attack may be of short duration, passing off within a few minutes. It may, however, last for many hours, and in some rare instances persist for several days; and it is conceivable that in such cases the appearances presented might be mistaken for real death,

as is alleged to have occasionally happened. Catalepsy belongs to the class of functional nervous disorders, of which the pathology is but little understood, owing to the manner in which morbid physical and psychical conditions are mixed up. Although it is said to occur in persons in perfect health, careful inquiry will usually reveal some departure from the normal state, as is shown by the greater number of the recorded cases. More particularly is this true of females, in whom some form of menstrual derange- ment will generally be found to have preceded the cata- leptic affection. Catalepsy is sometimes associated with epilepsy and with grave forms of mental disease. In ordinary cases, however, the mental phcnomena bear close resemblance to those witnessed in hysteria, with which disease catalepsy, though not identical, has very close alliance. In many of the subjects of catalepsy thcre appcars to be a remarkable weakness of the will, whercby the tendency to lapse into the cataleptic state is not resisted but rather in some measure encouraged, and attacks may thus be induced by the most trivial circum- stances. From what has been stated it follows that the succcssful treatment of such a disease as catalepsy must depend upon the due recognition of both its corporeal and mental relations. While the state of health will demand the attention of the physician, his skill and judgment will be no less urgently called for in dealing with the mental and moral characteristics manifested in each particular case, Dr Chambers has shown that efforts directed to obtain command of the patient's will, so as to compel her to resist to the utmost the inclination to fall into the cataleptic state, may succeed in curing even aggravated examples of this disease. See Ecstasy, Hysteria, SOMNAMBULISM.

CATALONTA (in Spanish, Cataluia), an old province of Spain and principality of the crown of Aragon, trian- gular in shape, and forming the north-east corner of the peninsula, lies between 40° 30' and 42°51' N. lat., and 0° 15' and 3° 21' E. long., and is bounded on the N. by the Pyrenees, W. by Aragon, S. by Valencia, E. by the Mediterranean. The greatcst breadth is 130 miles, the greatest length 185 miles; area, 12,483 square miles. The coast, which is partly sandy, partly rocky, extends about 240 miles; the harbours arc mostly unprotected from the wind, The surface is much broken by spurs of the Pyrenecs, the direction of which is generallysouth. Running south-west to north-east, and united on the north with one of the offsets of the Pyrenees, is the range of the Sierra Liena,

which bisects the province, and forms its central watershed. The principal rivers are the Ter, the Llobre- gat, and the Ebro, which all run into the Mediterranean. None of them is navigable. The climate, in spite of frequent mists and rains, sudden changes of temperature, and occasional great mid-day heat, is healthy and favourable to vegetation. The soil is light and loamy. Amongst the rocks of the province may be mentioned granite, chiastolite schists, porphyry and lava. Near Olot, towards the north- east, is a district containing extinct volcanoes. Oolitic limestone is found in the neighbourhood of Figueras ; and in other localities, nummulitic and Miocene deposits are represented. Mining is not much prosecuted ; but copper, zinc, manganese, marble, sulphur, and coal are worked, and rock salt in abundance is procured from Cardona, The vegetation of Catalonia varies according to the altitude and nature of different regions. The dwarf-palm, orange, lime, and olive grow in the warmer tracts; and on the higher grounds the thorn-apple, pomegranate, myrtle, esparto, and heaths flourish, There is much woodland; but meadows and pastures are rarc. Maize, millet, ryc, flax, liquorice, and fruits of all sorts—cspecially nuts, almonds, oranges, figs, walnuts, and chestnuts—are produced.

Wheat | shortly before, in 1679, been

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sufficient for one-fourth of the population is grown, and the vine is extensively cultivated. Few cattle, but numbers of sheep, goats, and swine are reared, Game is plentiful, and the fisheries on the coast are excellent. The exports are chiefly fruits, cork, and wines. The wines are for the most part rough and strong, though some are very good, especially when matured. ‘They are much used to adulterate those of Oporto, or, after undergoing the operation termed compage, are passed off as Bordeaux wines in France. The best of them, “ priorato,” is chiefly known in England under the disguise of second or third-rate port; it was much used in the military hospitals of America during the Civil War. The imports are chiefly textiles, coal, coke, machinery of all kinds, and salt-fish. The value of imports in 1870 was £5,996,143; of the exports, £2,884,306 ; the loss of the balance of £3,111,837 against Catalonia being partly borne by the other provinces of Spain, and to a great extent paid in wines, fruits, and corks.

The value of exports to the Spanish American colonies in 1873 excecdcd £2,220,000. The manufactures of Catalonia aro cotton, silk, woollen goods, brandy, paper, cordage, and firearms. The Catalonians are a frugal, sharp-witted, and industrious people, having much national pride, and a strong revolutionary spirit. They are distinct in origin from the other inhabitants of Spain, from whom they differ both in their dialect and costume and in their great energy and their love of enterprize. Irrigation, careful husbandry, and railroad communication have much developed the resources of their country, in themselves excellent ; and there aro many manufacturing towns and industrial establishments. Catalonia is divided into the provinces Gerona, Barcelona, Turragona, and Lerida. Its chief towns are the ports of Rosas, Mataro, Tarragona, and the capital Barcelona; and Tortosa, Gerona, Figueras, Lerida, and Manresa. The population, in 1867, was 1,744,520.

Catalonia was one of the first of the Roman possessions in Spain, aud formed the north-eastern portion of Hispania Tarraconensis. About 470 it was occupied by the Alans and Goths, and thus came to be called Gothalania, whence the modern name of the province. It was taken possession of by the Berbers in 712, who were in turn dispossessed by the Spaniards and the troops of Charlemagne in 788, and was after that ruled by French counts, who soon, however, made themselves independent of France. By the marriage of Count Ray- mond Berenger of Barcelona with Petronilla of Aragon, in 1137, Catalonia became annexed to the latter province ; but this union was frequently severed. In 1640, when Philip IV. attempted to deprive Catalonia of its rights and privileges, it gave itself up to Louis XIII. of France. It was restored to Spain in 1659, and was once more occupied by the Irench from 1694 to 1697. Under Philip V. Catalonia, in 1714, was deprived of its Cortes and liberties. From 1808 to 1813 it was held by France. It was the scene of civil war in 1823, and of important revolutionary operations in the Carlist war.

CATAMARCA, or, in its full form, San Fernanpo pE CaTamarca, the capital of the province of the same name in the Argentine Republic, is situated in 28° 20’S. lat. and 66° 25’ W. long. It is pretty regularly built, has a large square, with an obelisk in memory of the achievement of national independence, and numbers among its public buildings a small townhouse, a fort, a Franciscan monastery, and a Santa Teresa convent. The old

establish- ment of the Mercedarios, for some time possessed by the Jesuits, now serves as a high school. The import trade, even of European goods, is considerable, as the town is a centre of distribution for an extensive and flourishing dis- trict. Dried figs, wine, brandy, and cotton are the principal articles of export; the copper, for which the province is so well known, is from another district. ‘The present town of Catamarca only dates from 1685, when it replaced the old town of Chacra, the ruins of which are still to be seen a short distance to the north, at a spot which was found both unhealthy and exposed to inundation. Chacra had appointed capital instead

of San Juan de Londres, which had been founded in 1558, Population about 6000.

CATANIA, the ancient Catana, a city and seaport of Sicily and the chief town of a province, is situated on the east coast of the island, at the foot of the southern projections of Mount Etna, about 60 miles by rail from Messina, in 37° 28′ 20″ N. lat. and 15° 5’ 15” E. long. It is one of the most important and attractive cities in the island, and has a fine appearance from the sea, Its streets are wide, regular, and finely paved with blocks of lava; and not only its public buildings but a large number of its private mansions are spacious and handsome structures of lava and limestone ornamented with marble. Among its churches, which number upwards of a hundred, the first place is held by the cathedral, originally founded by Roger I. in 1091, but for the most part rebuilt since the earthquake of 1693; and, at the head of its monastic institutions stands the great Benedictine abbey of San Nicolo, which occupies an area of about 21 acres, and has hardly more than two or three buildings of the same kind in Europe to be compared with it. Its first foundation dates from 1518, when the Benedictines removed from the town of Nicolosi further up the slope of Mount Etna, where they had been settled since 1359; but the present buildings were erected in the beginning of the 18th century by Contini of Rome. The church is principally remarkable for a grand organ, with seventy-two stops and 2916 pipes, built by Donato del Piano in 1760. The chief educational institution is the university founded in 1445 by Alphonso of Aragon; it has five

faculties and thirty-eight professors, and was attended in 1873 by 233 students. The library is of considerable extent ; but its collections of antiquities are surpassed by those in the Biscari Museum, founded by Prince Ignazio Biscari in the end of the 18th century. The senate house, the theatre, and the hospitals are the most important of the other buildings ; and among the associations may be mentioned an academy of sciences and a college of the fine arts. Remains of the Roman period are numerous and extensive ; they include a theatre, an amphitheatre, an odeum, several baths known as the Bagni Achillei, a num- ber of tombs to the north-west of the town, and a few fragments of a so-called temple of Ceres. The theatre is for the most part buried under the débiis of volcanic dis- turbances ; and it has at different times served as a quarry for more modern buildings. Catania is the seat of a bishop, a prefect, and a court of appeal, as well as the residence of the grand prior of the Order of Malta. It is a place of great wealth, and is remarkable for the display of its festivals, of which the most important is held in August in honour of Santa Agata, the patroness of the city. Its industry and commerce are of considerable importance; silk and linen are largely manufactured, and there is a regular export of sulphur, grain, fruits, macaroni, olives, and articles in amber and lava. In 1873 the sulphur shipped amounted to 57,383 tons. In 1871 there entered the port 2297 sailing and 434 steam ships, with a respective tonnage of 97,442 and 162,387 tons. The value of the exports to Great Britain in 1874 was £160,000. The harbour is small, and accessible only to comparatively small craft, but another is in course of construction, which will be capable of receiving vessels of the largest size. Population in 1871, 84,379.

The ancient Catana was founded (730 n.c.) by a eolony from the neighbouring city of Naxos, which was itself founded by the Chal- eidians of Kubea. It maintained its independenee till 476 3.¢., when it was taken by Hiero I., who removed its inhabitants to Leontini, and repeopled the city with a new eolony of 5000 Syra- cusans and an equal number of Peloponnesians, at the same time ehanging its name to Aitna. Soon after the death of Hiero the former inhabitants obtained possession of the town, when it again took the name of Catana. In 403 B.c. it was taken by Dionysius of Syracuse, who, after plundering the city and selling the inhabi-

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tants for slaves, established there a body of Campanian mercenaries, In the first Punic war it was one of the earliest among the cities of Sicily to submit to the Romans, and it appears to have afterwards continued on friendly terms with them. In the time of Cieeto it was a flourishing and wealthy city ; but it suffered so severely from the ravages of Sextus Pompeius, that Augustus afterwards sent a eolony of veterans thither. In its more modern history the principal events are its oceupation by the Goths, its deliverance by Belisarius, its saek by the Saracens, its conquest by the Normans, its destruc. tion by earthquake in 1169, and its devastation by Henry VI., the erection of its fortress of Roeca Orsina by Frederick II., and several sieges in the eourse of the 14th century, the partial ruin of its har. bour in 1669 by the eruption of Mount Aitna, and its almost total overthrow by the earthquake of 1693.

CATANZARO, a city of Italy, capital of the province of Calabria Ulteriore JI., stands on the slope of a lofty and rocky hill near the Gulf of Squillace, 30 miles 8.S.E. of Cosénza. Itis the seat of a bishopric, and has a cathedral, several churches and convents, a castle, built by Robert Guiscard, a royal academy of sciences, a diocesan school, a college, a theatre, a fonndling and two other hospitals, and other charitable institutions. It has manufactures of silk, velvet, and woollen goods, and a considerable trade in corn and wine and walnut oil. The most important fact in its history is the successful defence it made in the 16th century against the French general Lautrec. In 1783 many of its principal buildings were destroyed by an earthquake. Population, 24,900.

CATAPULTA, a military engine, employed by the ancient Greeks and Romans. It was constructed of wood and ropes in such a way that a sudden and forcible recoil could be produced, sufficient to project’ arrows and spears to a considerable distance. It is usually mentioned in conjune- tion with the ballista, which was employed for projecting heavy stones; and, after the time of Julius Cesar, these two species of tormenta were often confounded.

CATARRH (from xaroppéw, to flow down) is a term employed to describe a state of irritation of the mucous membrane of the air passages, or what is

called in popular language a cold. This complaint, so prevalent in damp and cold weather, usually begins as a. nasal catarrh or coryza, with a feeling of weight about the forehead and some degree of difficulty in breathing through the nose, increased on lying down. Fits of sneezing accompanied with a profuse watery discharge from the nostrils and eyes soon follow, while the sense of smell and to some extent that of taste become considerably impaired. There is usually present some amount of sore throat and of bronchial irritation, causing hoarseness and cough. Sometimes the vocal apparatus becomes so much inflamed (laryngeal catarrh) that temporary loss of voice results. There is always more or less feverishness and discomfort, and frequently an extreme sensitiveness to cold. After two or three days the symptoms begin to abate, the discharge from the nostrils and chest becoming thicker and of purulent character, and producing when dislodged consider- able relief to the breathing. On the other hand the catarrh may assumc a more severe aspect and pass into some form of pulmonary inflammation (see BroncuTis).

A peculiar catarrhal affection occasionally occurs, in an epidemic form, to which the name Influenza is applie (see INFLUENZA).

Many remedies have been proposed with the view of cutting short a catarrh, but none of them are infallible, even where they can be safely employed. In some cases an opiate taken at the outset proves effectual for this end, but as often it will be found to fail. Entire abstinence from liquids of every kind for a period of forty-eight hours has been recommended as sufficient to cure any catarrh, but few will be found willing to submit to such a regimen. Many persons appear to think that they will get rid of a cold most quickly by continuing to go about, and, happily,

in the majority of such cases, no harm results, Nevertheless it is more than probable that by a brief confinement to a warm room and the cmployment of means to promote perspiration (such as Dover’s powder, along with a warm or vapour bath) speedier relief will be obtained ; and at all events the evil consequences attendant upon a “ neglected cold,” which are so familiar to the experience of every physician, will be obviated. Local applications, in the form of inhalation of the vapour of iodine, turpentine, or ammonia,

sometimes relieve the uncomfortable feelings in the head. Lately the use of a snuff composed of the trisnitrate of bismuth has been strongly recommended as affording marked relief in nasal catarrh. Where attacks of catarrh are of frequent occurrence no more useful prophy- lactic will be found than the habitual employment of the cold bath.

The term catarrh is now used in medical nomenclature in a still wider sense than that above mentioned, being employed to describe a state of irritation of any mucous surface in the body which is accompanied with an abnormal discharge of its natural secretion, hence the terms gastric catarrh, intestinal catarrh, &c.

CATAWBAS, an American Indian tribe in North and South Carolina, which has now become almost extinct, but was still able at the time of the War of Independence to furnish a valuable contingent to the South Carolina troops. They then occupied a number of small towns on the river which still preserves their name ; but they afterwards leased their land and removed to the territory ‘of the Chero- kees, with whom they had been formerly at war. There, however, they did not long remain, but returned to a reservation in their original district. Their affinities have not been very clearly made out, but by Gallatin they are grouped with the Cherokees, Choctaws, Muskogees, and Natchez. Their language is closely allied to that of the Waccoes and the Caroline tribe, and affords no support to the opinion that they came originally from Canada. A vocabulary of sixty of their words was published by Hale in volume ii. of the Zransactions of the American Lthno- logical Society in 1848; and a much fuller list—about 300—collected by Oscar M. Lieber, the geologist, in 1856, made its appearance in volume ii. of Collections of the South Carolina Historical Society, 1858. Peter Harris, the revolutionary soldier, was said to be the last survival of the full-blooded Catawbas, and the present representatives of the tribe are all half-castes. The pleasant sound of the Indian name is far more familiar in its application to the white American wine, whose praises have been sung so heartily by Longfellow. The grape from which the wine is obtained was first discovered about 1801, near the banks of the Catawba River, but it is now cultivated extensively in Illinois, Ohio, and New York, and especially on the shores of Lake Erie.

CATEAU CAMBRKESIS, or Le Cateav, a town of France, in the department of Nord, on the Selle, 15 miles E.S.E, of Cambray. It is well built, and was formerly fortified. Its importance has been greatly increased by the opening of coal-fields in the neighbourhood ; and it manu- factures shawls, merinos, calicoes, lace, leather, starch, sugar, and tobacco. Formed originally by the union of the two villages of Peronne and Vendelgies, under the protection of a castle built by the bishop of Cambray, Cateau became the seat of an abbey in the 11th century. In the 15th it was frequently taken and retaken; and in 1554 it was burned by the French, who in 1559 signed a celebrated treaty with Spain in the town. It was finally ceded to France by the peace of Nimeguen in 1678. In 1793 it was occupied for some time by the Austrians. Population in U572, 9332.

CATECHISM, a word which originally signified instruc-

tion by word of mouth, being derived from the Greek KaTnxéw. But, as it was necessarily by oral instruction that, in the early church, catechumens (or converts in preparation for baptism) were instructed in the essential doctrines of Christianity, and as the catechist usually sought to produce clear comprehension by means of questioning, several distinct uses of the word have sprung from its original employment, and it has come to signify —(1) in- struction by means of question and answer ; (2) elementary instruction, whether oral or written, in any branch of knowledge; and (3), in common language, a book of clementary-instruction by means of question and answer,— either secular, as, ¢.g., the science catechisms of the Middle Ages, or, as usually, religious.

Catechetical instruction was doubtless common among the ancient Jews, and the modern Jews possess several catechisms. The earliest with which we are acquainted are the Thirteen Articles of Belief of the famous Maimonides, which belongs to the 12th century, and Rabbi Levi’s Book of Hducation, which belongs to the 13th. Among those used at the present day in England may be mentioned Leser’s and Pixiotto’s. —

The most important and authoritative of the catechisms of the Roman Catholic Church is that of the Council of Trent, which was published in

1566. It was prepared under the superintendance of the archbishop of Milan, by Leonardo Marini, Francisco Fureiro, Aigidius Foscorari, and Mugio Calini; and the style was polished by Pogianus. It is not a catechism in the ordinary sense, for it is not. in the interrogative form, and it can scarcely be called elementary. It is, in fact, a very careful and complete system of Roman Catholic doctrine, extending over 500 8vo pages of closely-printed Latin. By command of the council, it was translated into French, German, Spanish, and Italian, and there is also an English version. The earliest of the catechisms of this church appear to be that of Kero, a monk of St Gall, who lived in the 8th century, and that which is ascribed to Otfried, a monk of Weissen- burg of the 9th century. Others worthy of mention are the Summa Doctrinarum of Peter Canisius, which was authorized in 1566; that of Bellarmine (1603), and that of Bossuet (1687). In 1870, the Gicumenical Council recommended the general use of the Schema de Parvo, a small catechism, which is little more than an abstract of Bellarmine's.

Catechisms were also very common among the Christian sects which, during the Middle Ages, opposed themselves to the dominant church, as the Albigenses and the Wickliffites.

The Greek Church has two principal catechisms, the earlier of which is that of Pcter Mogilas, patriarch of Kieff, which was published in 1542, and sanctioned by the church in 1572. The other is that of Plato, patriarch of Moscow, of which an abstract has been made for purposes of education. This work is divided into two parts, of which the first treats of natural religion, the second of revealed.

Of the larger Protestant sects, each has a separate catechism. 'The Lutherans are represented by the two smaller catechisms of their founder, published in 1520 and 1529, and by his larger catechism, published in the latter year. In Switzerland, France, the Low Countries, Hungary, and Scotland, the Geneva Catechism of Calvin (1536) was for some time the standard of the Reformed Church, The Heidelberg Catechism, which appeared in 1563, compiled by Caspar Olevian and Zacharias Ursinus, and revised by the Synod of Dort, became the standard of the Swiss Church ;

and upon it was founded the Zurich Catechism (1639). ASocinian catechism appeared at Rakov in 1574.

In the reign of Edward VI. (1549), the newly-established English Church published, along with the Forty-two Articles, what now forms the first part of its catechism,

It consists of no more than two or three pages, and contains only the Ten Commandments, the Creed, the Lord's Prayer, and an expression of the doctrine of baptism held by the English Church. In the reign of James I. an explanation of the Anglican doctrine of the sacraments was added by Bishop Overall.

The first catechism produced by the Scottish Presby- terians was that known as Craig's, which was laid before the General Assembly in 1592. It embodicd, in twelve chapters, the Calvinistic doctrine of the church with regard to original sin, redemption, the sacraments, and ecclesiastical discipline ; and after each chapter was a number of questions and answers. This catechism, together with some of those used on the Continent, served the British Presbyterians till 1647. In that year the Westminster Assembly of Divines appointed committees to draw up the famous Larger and Shorter Catechisms.

Besides these catechisms, which profess to be the symbols of various churches, a large number of private catechisms have been published. In the English Church the most important are Cranmer's and Noel's (1570). Among the English Protestant dissenters, who, of course, do not possess an authoritative catechism, there have been several, of which the most famous are those of Dr Watts. A con- siderable number have also been produced by German theologians; but many of the works which they have published under the name have no claim to it whatever.

CATECHU, or Curcu, is an extract obtained from several plants, its chief sources being the wood of two species of Acacia (A. Catechu and A. Suma), both natives of India. The extract obtained from these plants is also known as black catechu, Pegu cutch, and 7Z'erra japonica. A similar

extract, known in pharmacy as pale catechu (Catechu pallidum), and in general commerce as Gambir, is produced from the leaves of Uncaria Gambir and U. acida, Rubiaceous plants growing in the East Indian Archipelago, A third product to which the name catechu is also applied, is obtained from the fruits of the areca or betel palm, Areca Catechu; but this substance is not chemically the same as the other two, neither does it appear to enter to any extent into European commerce.

Ordinary black catechu is usually imported in three dif- ferent forms. The first and best quality, known as Pegu catechu, is obtained in blocks externally covered with the large leaves of a species of Dipterocarpus ; the second and less pure variety 1s Jn masses, which have been moulded in sand; and the third consists of large cubes packed in coarse bags. The wood of the two species of Acacia yielding catechu is taken for the manufacture when the trees have attained a diameter of about 1 foot, The bark is stripped off and used for tanning, and the trunk is split up into small fragments, which are packed into earthenware jars, covered with water, and boiled in the open air. As the liquor becomes thick it is passed into separate vessels in which the evaporation is continued till the proper degree of inspissation is reached. It is then cast into the forms in which it is found in commerce, and further hardened by exposure to the sun. Catechu so prepared is a dark brown, or, in mass, almost black substance, brittle, and having generally a shining lustre. It has a powerfully astringent taste, with a sweetish after-effect. In cold water it dis- integrates, and in boiling water, alcohol, acetic acid, and strong caustic alkali it is completely dissolved. Chemically it consists of a mixture of a peculiar variety of tannin termed catechu-tannic acid with catechin or catechuic acid, and a brown extractiform substance due to the alteration of both these principles. Catcchu-tannic acid is an amorphous body soluble in cold water, while catechin occurs in minute, white, silky, needle-shaped crystals, which do not dissolve in cold water, A very minute proportion of quercetin, a

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principle yielded by quercitron bark, las been obtained from catechu.

Gambir, which is similar in chemical composition to ordinary catechu, occurs in commerce in the form of cubes of about an inch in size, with a pale brown or yellow colour and an even earthy fracture. For the preparation of this extract the plants above mentioned are stripped of their leaves and young twigs, and these are boiled down in shallow pans. The juice is strained off, evaporated by boiling, and when sufficiently concentrated, poured into vessels for cooling in which it is stirred in a peculiar manner as it cools and thickens, The mass, when it has attained a syrupy consistence is cast into shallow boxes, where, as it hardens and dries, it is cut into small cubes,

Gambir and catechu are extensively employed in dye. ing and tanning, and to some extent as astringents in medicine. For dyeing they have been in use in India from the most remote period, but it is only during the present century that they have been placed on the list of European dyeing substances. Catecliu is fixed by oxidation of the colouring principle, catechin, on the cloth after dyeing or printing ; and treated thus it yields a great variety of most durable tints of drabs, browns, and olives with different mordants. In tanning, catechu is used only for a low class of leather, which, when made into boots, communicates to the stockings a yellowstain. The principal consumption of catechu occurs in the preparation of fibrous substances exposed to water, such as fishing-lines and nets, and for colouring stout canvas used for covering boxes and portman- teaus under the name of tanned canvas. The average annual imports into Great Britain amount to about 5000 tons of catechu, which comes chiefly from Bengal, and 20,000 tons of gambir, coming from the Straits Settlements.

CATECHUMEN. The Catechumeni in the earliest ages of the church were those who were desirous of and candidates for baptism. The literal signification of the term, according to its etymology (Greek) is one who is caused to hear something. In ecclesiastical language,—and the word is no otherwise used,—a catechumen is one who is being instructed in the doctrines of Christianity in preparation for baptism.

Catechumens were usually divided into four classes. The first class appears to have been those who were still in the condition of inquirers,—those who had been sufficiently impressed by that they had heard of Christianity to

wish for more complete instruction. It would seem that this first instruction was, from motives of prudence, given privately and not in the churches. The second class con- sisted of those who, having been thus instructed, were found worthy of being admitted to the churches, not, however, to take any part in the holy mysteries, or even, as it would seem, in the prayers of the faithful, but for the hearing of sermons and exhortations, and the reading of the Gospel. These were accordingly called audientes,—hearers. 'They left the church when the reading of the sacred Scriptures and the sermon had been concluded. The third class consisted of those who had formally demanded baptism, and placed their names in the list of catechumens. These were called prostrati or genuflectentes,—those who shared in the prayers of the congregation. The fourth class was the elect or competentes, or those who had completed the period of their probation, and were deemed ready to receive baptism, and only waited to do so on the first occasion, that is to say, at the following Easter or Pentecost. The most important body of catechumens was obviously those of the third class, the genuflectentes ; and it is of these that most of what we read in the early writers of the catechumens generally must be understood.

Of course the number of those who were in a state of preparation for baptism increased in proportion to the

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spread of the church. But it must not be supposed that there were no more catechumens when the totality of the population had become Christian, or that the catechumenate, ag it was called, denoted solely the period of conversion from heathendom to Christianity. The children of Chris- tian parents, who were not old enough, or not yet sufficiently instructed, to be admitted to the mystery of the Eucharist were catechumens, and subjected to the instruction of the church by a catechist appointed for the purpose. But throughout all the long period, during which pro- selytism from either Roman or barbarian heathenism was going on, the numbers of the catechumens were largely increased by a practice very curiously illustrative of the special superstition of the time. Large numbers of persons, who had become persuaded of the truth of Christianity, and who were fully minded to be baptized, put off the receiving of that sacrament, for a longer or

shorter period, often until they found themselves in the presence of death. The object of this was to avoid responsibility before God for that greater heinousness of guilt, which would have resulted from sin committed after baptism. They argued that since baptism washed out all previous sin, and could be had only once, it was clearly expedient that it should be received as late in life as possible. And thus many remained as catechumens during the greater part of their lives. And this practice prevailed not only among those who were quitting paganism for Christianity ; it was also common amoug those born of Christian parents. Tenderness of conscience, too, seems often to have produced the same result in prolonging the catechumenate as the superstitious notion nientioned above. St Ambrose, St Gregory Nazianzen, and St Augustine all remained catechumens till far on in life. The eniperors Theodoric, Valentinian, and Constantine the Great did the same. And the abuse became so great that towards the end of the 4th century (see Baronius, ad an, 877) the church tried to provide a remedy for it, and among other fathers of the church, Saints Ambrose and Gregory exerted themselves to prevent others from following (though probably from very different motives) their own exaimple.

The idea of the probable numbers of the members of a congregation likely to be in the condition of catechumens, which may be obtained from a consideration of the above circumstances, may serve to explain in some degree the architectural arrangements still to be seen in some churches of the early centuries. The-complete plan of a church of that time seems to have comprised a court in front of the principal western entrance, surrounded with colonnades, as may still be seen in the cases of the church of St Ambrose at Milan, and that of St Clement at Rome, and some others. Now, when the catechumens were dismissed previously to the commencement of that portion of the service which we should call the "' Communion Service," it was not understood that they should depart entirely, but they remained in these courts. It would seem, however, that those thus dismissed must have been the catechumens of the second class only—the audientes. And in the churches that have been mentioned, especially in that of St Clement at Rome, the body of the building is divided by permanent stone constructions into the presbytery or chancel for the clergy at the eastern end, an intermediate portion for the lay members of the congregation of the male sex (the females being in the galleries), and a

much larger part of the nave at the western extremity of the church, destined for the catechumens.

In the more important churches, persons called catechists were especially appointed for the instruction of the catechumens. In the epistle attributed to St Clement, catechists are spoken of as distinguished from cither bishops, priests, ordeacons. But there is not sufficient evidence that they were ever considered a separate order in the hierarchy. In the church of Alexandria there was a

celebrated school of catechumens, undcr the superintendence of some of the foremost men of their time, among whom St Clement of Alexandria and Origen may be mentioned. See Origen, Cont. Cel., lib. iii. It would scem that Origen was thus cmployed at eighteen years of age, when he was still a layman. There was also a cele- brated school of catechumens in the church of Carthage. It is somewhat remarkable, however, that no traces are found of any such catechists having existed at Rome. There can be no doubt, how- ever, that the catechnmens were there as elsewhere required to pass through a period of instruction and novitiate, the task of preparing them being doubtless entrusted to the priests aud deacons—more probably the lattcr—of each church.

Catechumens of the third category might be present, in the more distant and inferior part of the church assigned to them, during al] that part of the service of the mass which precedes the offertory. It was then that the ‘‘Jte, Catechumeni; nrissa est /” was pronounced; and that portion of the service was called a ‘‘Catechumens’ mass.” It was not permitted to them so much asto see the eucharist. But in order that there might be the bond of some kind of special com- munion between them and the body of the faithful, bread was blessed and given to them, and this bread was called Panis Catechu- menorum.

On the demand of any person to become a catechumen, a strict and searching examination was made into the previous conduct of the aspirant, and the general tenor of his life. Great caution was used also in ascertaining the nature and earnestness of his desire to become a Christian. If these

inquiries and examinations were satis- factory, the person's name was formally entered on the roll of cate- chumens. From a very ancient extant ritual, entitled Ordo ad factendum Christianum, it appears that the catcchumens were, by anticipation, as Moroni says, called Christians, while the title of '*the Faithful" was reserved for those who had received baptism. The duration of the catechumenate was originally fixed at three months (see the third epistle of St Clement), but was subse- quently shortened to forty days. The ceremonial with which the eatechnmen was at the termination of his novitiate admitted to baptism varied in some unimportant respects in different churches, But the following brief statement of the practice of the Roman church will suffice to indicate the nature of the function. In the first place a searching scrutiny into the miud and heart of the candi- date for baptism was made on seven different occasions during Lent or in the weeks preceding Pentecost. Previously to beginning the first scrutiny, which took place on the Wednesday of the third weck in Lent, the priest blessed ashes, which he sprinkled on the head of the catechumen. Healso touched his ears and his nostrils with saliva, saying '*Ephphatha, which is, be opened to the odour of sanctity. But thou, devil, flee hence, for the judgment of God is approaching." The days appointed for the other six scrutinies were the Saturday of the third week, the Wednesday and Saturday of the fourth week, the Wednesday of the fifth week, and the Wednesday and Saturday of the last week. 'The first scrutiny was closed by asking of the neophyte if he renounced the devil and believed all the doctrincs of the faith. Then the priest blew on his face, saying, ''Go out from him, thou unclean spirit, and give place to the Holy Spirit of the Paraclete ;"' and concluded by making the sign of the cross on his forehcad, accompanying the action by the words, ''In nomine Patris, et Filii, et Spiritus Sancti." At the third scrutiny the Creed and the Lord's Prayer were given to the catechumen that he might learn them by heart, for the discipline of the '' Arcamum " expressly forbade that he should be allowed any cognizance of these at an earlier period of his novitiate. This consigning of the Creed was not done without certain formalities. The catechumens were assembled in the church, the bells were rung, and the church doors closed. Then the bishop preached a sermon, and then recited the Creed twice, once in Latin, once in Greek, prefacing his reading by the words ''Signate vos; et audite Symbolum!" He then explained it passage by passage, and then gave to each Catechumen a written copy of it. Then a day was fixcd for the ceremony of baptism, and

the catechumens were dismissed by the archdeacon with the words ““Catechument recedant; omnes Catechument exeant foris /”’—** Let the catechumens retire! Let all the catechumens go out from the chureh!’’? And the deacon added ‘* Filtt curtssimi, revertimint ca loca vostra, expectantes horam qua possit eirea vos Dei gratia Baptis- mune operart,’’—‘* Well-beloved sons, return to your own home, and there await the hour when, by the graee of God, baptism may be per- formed on you.” And so ended the catechumens’ novitiate.

The number of writers who have specially treated of the institu- tion of catechumens, and of the practice of the Church, and in some respects of the different churches, in regard to them, is far too large for it to be possible to give alist of them here. Butsucha list may be found in the treatise of Cancellicri on the Holy Weck.

CATEGORY (Gr. xarzyopia), a term first introduced into the philosophical vocabulary by Aristotle, means etymologically an accusation. Even in the writings of Aristotle the word occurs once or twice in this its primary

acceptation, but generally it has there a definite and technical signification. So also in Aristotle the verb Karnyopety, to accuse, takes the specific logical sense, to pre- dicate ; 1d xaryyopovpevoy becomes the predicate; aid Karnyopix) mpdracis may be translated as affirmative pro- position. But though the word thus received a new signi- fication from Aristotle, it is not on that account certain that the thing it was taken to signify was equally a novelty in philosophy. We do find in the records of Oriental and early Greek thought something corresponding to the Aris- totelian classification.

Our knowledge of Hindu philosophy, and of the rela- tions in which it may have stood to Greek speculation, is not yet adequate to give decisive answers to various ques- tions that naturally arise on observation of their many resemblances ; and it might thcrefore appear irrelevant to introduce into an historical notice of a peculiarly Western doctrine any reference to its Eastern counterpart. Yet the similarity between the two is so striking that, if not historically connected, they must at least be regarded as expressions of similar philosophic wants. The Hindu classification to which we specially

refer is that of Kanada, who lays down six categories, or classes of existence, a seventh being gencrally added by the commentators, The term employed is Padartha, meaning “ signification of a word.” ‘This is in entire harmony with the Aristotelian doc- trine, the categories of which may with truth be described as significations of simple terms, 7a kata pydeptay cvprAoKyy Aeyducva. The six categories of Kanada are Substance, Quality, Action, Genus, Individuality, and Concretion or Co-inherence. To these is added Non-Existence, Priva- tion, or Negation. Substance is the permanent sub-strate in which Qualities exist. Action, belonging to or inher- ing in substances, is that which produces change. renus belongs to substance, qualities, aud actions; there are higher and lower genera. Individuality, found only in substance, is that by which a thing is self-existent and marked off from others. Concretion or Co-inherence denotes inseparable or neccessary connection, such as that between substanceand quality. Under these sixclasses, yév7n Tod dvros, Kanada then proceeds to range the facts of the universe.}

Within Greek philosophy itself there were foreshadow- ings of the Aristotelian doctrine, but nothing so important as to warrant the conclusion that Aristotle was directly influenced by it. Doubtless the One and Many, Being and Non-Being, of the Eleatic dialectic, with their sub- ordinate oppositions, may be called categories, but they are not so in the Aristotelian sense, and have little or nothing in common with the later system. Their starting-point and results are wholly diverse. Nor does it appear neces- sary to do more than mention the Pythagorean table of principles, the number of which is supposed to have given rise to the decuple arrangement adopted by Aristotle. The two classifications have nothing in common; no term in the one list appears in the other ; and there is absolutcly nothing in the Pythagorean principles which could have led to the theory of the categories.”

One naturally turns to Plato when endeavouring to dis- cover the genesis of any Aristotelian doctrine, and un- doubtedly there are in the Platonic writings many detached discussions in which the matter of the categories is touched upon. Special terms also are anticipated at various times,

1 For details of this and other Hindu systems see Colebrooke, Tissays ; H. H. Wilson, Essays ; Williams, Indian Wisdom ; Gough’s Vaiseshika-Sutras » M. Miiller, Sanskrit Literature, and particularly his Appendix to Thomson’s Laws of Thought.

- The supposed origin of that theory in the treatise wep) rod mavtdés, ascribed to ARCHYTAS (q.v.), has been proved to be an error. The treatise itself dates in all probability from the Neo-Pythagorean schools of the 2d century A.D,

‘that they are summa genera.

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e.g., muordrns in the T’hecetetus, wovety and méoyxe in the Gorgias, and wpés te in the Sophist.2 But there does not seem to be anything in Plato which one could say gaye occasion directly and of itself to the Aristotelian doctrine – and even when we take a more comprehensive view of the Platonic system and inquire what in it corresponds to the widest definition of categories, say as ultimate elements of thought and existence, we receive no very definite answer, The Platonic dialectic never worked out into system, and only in two dialogues do we get anything like a list of ultimate or root-notions. In the Sophast, Being, Rest, and Motion (7d dv GUTO Kal oTaCLS Kat Kivnots) are laid down as peytota Tov yevav.s To these are presently added the Same and the Other (rairdv Kai Oarepov), and out of the considcration of all five some light is cast upon the obscure notion of Non-Being (76 pi dv). In the same dialogue (262, sg.) is found the important distinction of dvoya and pjya, noun and verb. The Philebus presents us with a totally distinct classification into four elements—the In- finite, the Finite, the Mixture or Unity of both, and the Cause of this unity (rd daeipov, 76 épas, 7) ovpypudes, H aira). Itis at once apparent that, howcver these classifica- tions are related to one another and to the Platonic system, they lie in a different field from that occupied by the Aristotelian categories, and can hardly be said to have anything in common with them.

The Aristotelian doctrine is most distinctly formulated in the short treatise Karyyopiar, which generally occupies the first place among the books of the Organon. The authen- ticity of the treatise was doubted in early times by

some of the commentators, and the doubts have been revived by such scholars as Spengel and Prantl. On the other hand Brandis, Bonitz, and Zeller are of opinion that the tract is substantially Aristotle's. The mattcr is hardly one that can be decided either pro or con with anything like certainty ; but this is of little moment, for the doctrine of the categories, even of the ten categories, does not stand or fall with only one portion of Aristotle's works.

It is surprising that there should yet be so much uncer- tainty asto the real significance of the categories, and that we should be in nearly complete ignorance as to the process of thought by which Aristotle was led to the doctrine, On both points it is difficult to extract from the matter before us anything approaching a satisfactory solution. The terms employed to denote the categories have been scrutinized with the utmost care, but they give little help. The most important—x. rod dvros or tis obcias, yevy TOD dvtos OF Tay dvTwY, yévn Simply, Ta rpOTa OF Ta KoLva, TPOTO, ai wracets, OF at duarpécets—only indicate that the categories are general classes into which Being as such may be divided, The expressions yévy rév KaTyyopiwy and oxypata Tov K., Which are used frequently, seem to lead to another and somewhat different view. Karr- yopta being taken to mean that which is predicated, yéevy ray x. would signify the most general classes of predicates, the framework into the divisions of which all predicates must come. 'To this interpretation there are objections. The categories must be carefully distinguished from predicables ; in the scholastic phraseology the former refer to jirst inten- tions, the latter to second intentions, v.e., the one denote real, the other logical connection. Further, the categories can- not without careful explanation be defined as predicates ; they are this and something more. The most important category, odaéa, in one ofits aspects cannot be predicate atall.

In the Karyyopia Aristotle prefixes to his enumeration graminatico-logical disquisition on homonyms and syno- nyms, and on the clements of the proposition, «e., sub- i a

3 Prantl, Ges. d. Logik, i. 74-5; Trendelenburg, Kategorienlehre, 209, m, 4 Soph., 254, D.

ject and predicate. He draws attention to the fact that things are spoken of either in the connection known as the proposition, eg., “a man runs,” or apart from such con- nection, ¢g., “man” and “runs.” He then proceeds, “ Of things spoken of apart from their connection in a proposi- tion (rav Kara pndeuiav ovprAoKkiv heyouévov), each signi- fies either Substance (odcia), or Quantity (zocdv),or Quality rowv}, or Relation (pds rx), or Where (z.e. Place, wrod), or When (i.e. Time, roré), or Position (xeio Oa), or Possession (éxe), or Action (qroteiv), or Passion (zdéoxew). Odota, the first category, is subdivided into zpaérn obova or primary substance, which is defined to be 7é8e 71, the singular thing in which properties inhere, and to which predicates are at- tached, and dcvrepar otoiar, genera or species which can be predicated of primary substances, and are therefore otoia only in a secondary sense. Nevertheless, they too, after a certain fashion, signify the singular thing, rdde 7 (X,, p. 3b, 12,13). It is this doctrine of zpaéry otcéa that has raised doubts with regard to the authenticity of the Kary- yopiau. But the tenfold classification, which has also been captiously objected to, is given in an acknowledged writing of Aristotle’s (see Zopica, i. 9, p. 103b, 20),1 At the same time it is at least remarkable that in two places where the enumeration seems intended to be complete (Met., p. 1017a, 25; An. Pos, i, 22, p. 83a, 21), only eight are men- tioned, exew aud xeioOox being omitted. In other passages? six, five, four, and three are given, frequently with some addition, such as cal ai dAXa x. It is also to be observed that, despite of this wavering, distinct intimations are given by Aristotle that he regarded his list as complete, and he uses phrases which would seem to indicate that the divi- sion had been exhaustively carried out. He admits cer- tainly that some predicates which come under one category might be referred to another, but he declines to deduce all from one highest class, or to recognize any relation of sub- ordination among the several classes.

The full import of the categories will never be ade- quately reached from the point of view taken up in the Kampyopio, which bears all the marks of an early and pre- liminary study. For true understanding we must turn to the Metaphysics, where the doctrine is handled at large. The discussion of Being in that work starts with a distinc- tion that at once gives us aclue. To

dv is spoken of in many ways; of these four are classified—ré dv kara ovpBeByxés, 70 by ds GAnOEs, 7d dv Suvdper Kal evepyeia, and 7d by KaTd Ta oXNpMaTA Tov Karyyopiwy. It is evident from this that the categories can be regarded neither as purely logical nor as purely metaphysical elements. They indicate the general forms or ways in which Being can be predicated ; they are determinations of Being regarded as an object of thought, and consequently as matter of speech. It be- comes apparent also why the analysis of the categories starts from the singular thing, for it is the primary form under which all that is becomes object of knowledge, and the other categories modify or qualify this real individual. Tévra. d€ TA yuyvdueva tro TE Twos ylyverar Kal && Twos Ka ‘ti. To d€ ri Aéyw Kal Exdoryv Karyyopiav } yap 758 4 mooov i movdv 7 woo (Jfet., p. 1032a, 13-15). ... The categories, therefore, are not logical forms but real predi- cates ; they are the general modes in which Being may be expressed. The definite thing, that which comes for- ward in the process from potentiality to full actuality, can only appear and be spoken of under forms of individual- ity, quality, quantity, and soon. The nine later categories all denote entity in a certain imperfect fashion.

The categories then are not to be regarded as heads of predicates, the framework into which predicates can be

: Against this passage even the cross-grained Prantl can raise no objection of any moment ; see Ges. der Logik, i. 206, n. “See Bonitz, Index Aristotelicus, s.v., and Prantl, Ges. d. Log., i, 207.

thrown. They arc real determinations of Being—allgemeine Bestimmtheiten, as Hegel calls them. They are not summa genera of existences, still less are they to be explained as a classification of nameable things in general. The objections Mill has taken to the list are entirely irrelevant, and would only have significance if the categories were really—what they are not—an exhaustive division of concrete existences. Grote’s view (Aristotle, i. 108) that Aristotle drew up his list by examining various popular propositions, and throw- ing the different predicates into genera, “‘ according as they stood in different logical relation to the subject,” has no foundation. The relation of the predicate category to the subject is not

entirely a logical one; it is a relation of real existence, and wants the essential marks of the proposi- tional form. The logical relations of rd dv are provided for otherwise than by the categories.

Aristotle has given no intimation of the course of thought by which he was led to his tenfold arrangement, and it seems hopeless to discover it. Trendelenburg in various essays has worked out the idea that the root of the matter is to be found in grammatical considerations, that the categories originated from investigations into grammatical functions, and that a correspondence will be found to obtain between categories and parts of speech. Thus, Substance corre- sponds to noun substantive, Quantity and Quality to the adjective, Relation partly to the comparative degree and per- haps to the preposition, When and Where to the adverbs of time and place, Action to the active, Passion to the passive of the verb, Position (xeto6ar) to the intransitive verb, éxewv to the peculiar Greek perfect. That there should be a very close correspondence between the categories and granimatical elemeuts is by no means surprising; that the one were deduced from the other is both philosophically and historically improbable. Reference to the detailed criticisms of Trendelenburg by Ritter, Bonitz, and Zeller will be sufficient.

Aristotle has also left us in doubt on another point. Why should there be only ten categories? and why should these be the ten? Kant and Hegel, it is well known, signalize as the great defect in the Aristotelian categories the want of a principle, and yet some of Aristotle's expressions would warrant the inference that he had a principle, and that he thought his arrangement exhaustive. The leading idea of all later attempts at reduction to unity of principle, the division into substance and accident, was undoubtedly not overlooked by Aristotle, and Brentano* has collected with great diligence passages which indicate how the complete list might have been deduced from this primary distinction. His tabular arrangements (pp. 175, 177) are particularly deserving of attention. The results, however, are hardly beyond the reach of doubt.

There was no fundamental change in the doctrine of the categories from the time of Aristotle to that of Kant, and only two proposed re-classifications arc of such import- ance as to require notice. The Stoics adopted a fivefold

arrangement of highest classes, yevxdérara. Td dv or Ti, Being, or somewhat in general, was subdivided into tzroxed- peva or subjects, woud or qualitics in general, which give definiteness to the blank subject, mas dyovra, modes which further determine the subject, and mpds 7 mas éxovra, definite relative modes. These categorics are so related that each involves the existence of one higher than itself, thus there cannot be a mpéds te tas exov which does not rest upon or imply a was éyov, but ras éxov is impossible without zrouv, which only exists in trroxe/wevov, a form or phase of 76 év.4

3 Brentano, Bedeutung des Seienden nach A., pp. 148-178.

- For detailed examination of the Stoic categories, see Prantl, Ges. d. Logik, i. 428, sqq.3 Zeller, Ph. d. Gri., iii. 1, 82, sqg.; Trendelens burg, Kateg., p. 217.

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Plotinus, after a lengthy critique of Aristotle’s categorics sets ont a twofold list. Td &, kivyots, ordois, tadTérys, érepdtys are the primitive categories (apara yévn) of the intelligible sphere. Ovova, mpds tT, Towd, rocor, kivyots are the categories of the sensible world. The return to the Platonic classification will not escape notice.

Modern philosophy, neglecting altogether the dry and tasteless treatment of the Aristotelian doctrine by scholastic writers, gave a new, a wider, and deeper mean- ing to the categories. They now appear as ultimate or root notions, the metaphysical or thought elements, which give coherence and consistency to the material of know- ledge, the necessary and universal relations which obtain among the particulars of experience. There was thus to some extent a return to Platonism, but in reality, as might easily be shown, the new interpretation was, with due allow- ance for difference in point of view, in strict harmony with the true doctrine of Aristotle. The modern theory dates in particular from the time of Kant, who may be said to have re-introduced the term into philosophy. Na- turally there are some anticipations in earlier thinkers. The Substance, Attribute, and Mode of Cartesianism can hardly be classed among the categories ; nor does Leibnitz’s chance suggestion of a fivefold arrangement into Substance,

Quantity, Quality, Action and Passion,and Relations,demand any particular notice. Locke, too, has a classification into Substances, Modes, and Relations, but in it he has manifestly no intention of drawing up a table of categories. What in his system corresponds most nearly to the modern view of these elements is the division of kinds of real predica- tion. In all judgments of knowledge we predicate either (1) Identity or Diversity, (2) Relation, (3) Co-existence, or necessary connection, or (4) Real existence. From this the transition was easy to Hume's important classification of philosophical relations into those of Resemblance, Identity, Time and Place, Quantity or Number, Quality, Contrariety, Cause and Effect.

These attempts at an exhaustive distribution of the ne- cessary relations of all objects of knowledge indicate the direction taken by modern thought, before it received its complete expression from Kant.

The doctrine of the categories is the very kernel of the Kantian system, and, through it, of later German _philo- sophy. To explain it fully would be to write the history of that philosophy. The categories are called by Kant Noot- notions of the Understanding (Stammbegriffe des Verstandes), and are briefly the specific forms of the a priort or formal element in rational cognition. It is this distinction of matter.and form in knowledge that marks off the Kantian from the Aristotelian doctrine. To Kant knowledge was only possible as the synthesis of the mate- rial or @ posterior' with the formal or a priort. The ma- terial to which a prtort forms of the understanding were applied was the sensuous content of the pure intuitions, Time and Space. This content could not be known by sense, but only by intellectual function. But the under- standing in the process of knowledge makes use of the universal form of synthesis, the judgment; intellectual function is essentially of the nature of judgment or the reduction of a manifold to unity through a conception. The specific or type forms of such function will, therefore, be ex- pressed in judgments ; and a complete classification of the forms of judgments is the key by which one may hope to discover the system of categories. Such a list of judgments Kant thought he found in ordinary logic, and from it he drew up his well-known scheme of the twelve categories. These forms are the determinations of all objects of experience, for it is only through them that the manifold of sense can be reduced to the

unity of consciousness, and thereby con- stituted expericnce. They are « priori conditions, sub-

jective in one seuse, but objective as being universal, ne- cessary, and constitutive of experience.

The table of logical judgments with corresponding cate. gories is as follows :—

Judgments. : Categories. tei onciren ne _Singular…..... ga (Totality.

a ne 2

Infinite ,..... § OF Quality Y Timitation.

Categorical…] f Inherence and Subsistence ; Il. (Substance and Accident),

Hypothetical. OF Relation 4 ae aa moe

Disjunctive… [Community (Reciprocity),

Problematical Iv Possibility and Impossibility,

Assertoric….. OF Mo dalit Existence and Non-Existence,

Apodictic…... Y }/ Necessity and Contingency,

Kant, it is well-known, criticises Aristotle severely for having drawn up his categories without a principle, and claims to have disclosed the only possible method by which an exhaustive classification might be obtained. What he criticized in Aristotle is brought against his own procedure by the later German thinkers, particularly Fichte and Hegel, And in point of fact it cannot be denied that Kant has allowed too much completeness to the ordinary logical dis- tribution of propositions; he has given no proof that in these forms are contained all species of synthesis, and in consequence he

has failed to show that in the categories, or pure conceptions, are contained all the modes of a@ priors syuthesis. Further, his principle has so far the unity he claimed for it, the unity of a single function, but the specific forms in which such unity manifests itself are not themselves accounted for by this principle. Kant himself hints more than once at the possibility of a completely rational system of the categories, at an evolution from one single movement of thought, and in his Remarks on the Table of the Categories gave a pregnant hint as to the method to be employed. From any complete realization of this suggestion Kant, however, was precluded by one portion of his theory. The categories, although the neces- sary conditions under which alone an object of experience . can be thrown, arc merely forms of the mind's own activity; they apply only to sensuous and consequently subjective inatcrial. Outside of and beyond them lies the thing-in- itself, the blankest and emptiest of abstractions, which yet to Kant represented the ultimately real. This subjectivism was a distinct hiatus in the Kantian system, and against it principally Fichte and Hegel directed criticism. It was manifest that at the root of the whole system of categories there lay the synthetizing unity of self-consciousness, and it was upon this unity that Fichte fixed as giving the pos- sibility of a more complete and rigorous deduction of the pure notions of the understanding. Without the act of the Ego, whereby it is self-conscious, there could be no knowledge, and this primitive act or function must be, he saw, the positzon or affirmation of itself by the Ego. The first principle then must be that the Ego posits itself as the Ego, that the Ego = Ego, a principle which is uncondi- tioned both in form and matter, and therefore capable of standing absolutely first, of being the przws in a system. Metaphysically regarded this act of self-position yields the categories of Reality. But, so far as matter is concerned, there cannot be affirmation without negation, omnis deter minatio est negatto. The determination of the Ego pre- supposcs or involves the Non-Ego. The form of the pro- position in which this second act takes to itself expression, the Ego is not = Not-Ego, is unconditioned, not derivable from the first. It is the absolute antithesis to the primitive thesis. The category of Negation is the result of this second act. From these two propositions, involving absolutely op-

posed and mutually destructive elements,there results a third which reconciles both in a higher synthesis. The notion in this third is determination or limitation; the Ego and Non-Ego limit, and are opposed to one another. From these three positions Fichte proceeds to evolve the catego- ries by a series of thesis, antithesis, and synthesis.

In thus seizing upon the unity of self-consciousness as the origin for systematic development, Fichte has clearly taken a step in advance of, and yet in strict harmony with, the Kantian doctrine. For, after all that can be said as to the demonstrated character of formal logic, Kant's procedure was empirical, aud only after the list of categories had been drawn out, did he bring forward into prominence what gave them coherence and reality. The peculiar method of Fichte, also, was nothing but a con- sistent application of Kant's own Remark on the Table of the Categories. Fichte's doctrine, however, is open to some of the objections advanced against Kant. His method is too abstract and external, and wants the unity of a single principle. The first two of his fundamental propositions stand isolated from one another, not to be resolved into a primitive unity. With him, too, the whole stands yet on the plane of subjectivity. He speaks, indeed, of the universal Ego as distinct from the empirical self-consciousness ; but the universal does not rise with him to concrete spirit. Nevertheless the Wissenschafts- lehre contains the only real advance in the treatment of the categories from the time of Kant to that of Hegel. This, of course, does not imply that there were not certain elements in Schelling, particularly in the Transcendental Idealism, that are of value in the transition to the later system; but on the whole it is only in Hegel that the whole matter of the Kantian categories has been assimi- lated and carried to a higher stage. The Hegelian philo- sophy, in brief, is a system of the categories; and as it is not intended here to expound that philosophy, it is impos-

sible to give more than a few general and quite external |

observations as to the Hegelian mode of viewing these elements of thought. With Kant, as has been seen, the categories were still subjective, not as being forms of the individual subject, but as having over against them the world of nowmena to which they were inapplicable. Self- consciousness, which was, even with Kant, the nodus or kernel whence the categories

sprang, was nothing but a logical centre,—the reality was concealed. There was thus a dualism, to overcome which is the first step in the Hegelian system. ‘The principle, if there is to be one, must be universally applicable, all-comprehensive. Self- consciousness is precisely the principle wanted; it is a unity, an identity, containing in itself a multiplicity. The universal in absolute self-consciousness is just pure think- ing, which in systematic evolution is the catagories; the particular is the natural or multiform, the external as such; the concrete of both is spirit, or self-consciousness come to itself. The same law that obtains among the categories is found adequate to an explanation of the external thing which had so sadly troubled Kant. The categories themselves are moments of the universal of thought, type forms, or definite aspects which thought assumes ; determinations, Bestimmungen, as Hegel most frequently calls them. They evolve by the same law that

2 It does not seem necessary to do more than refer to the slight alterations made on Kant’s Table of Categories by Herder (in the

Metakritik), by Maimon (in the Propadeutik zu einer neuen Theorie des Denkens), by Fries (in the Neue Kritik der Vernunft), or by Schopen- hauer, who desired to reduce all the categories to one—that of Causa-

lity. We should require a new philosophical vocabulary even to

translate the extraordinary compounds in which Krause expounds his Las Notices of the changes introduced by Rosmini, and of Gioberti’s remarkable theory, will be found in Rag-

theory of the catcgories.

nisco’s work referred to below.

was found to be the essence of ultimate reality—zi.e., of self-consciousuess. The complete system is pure thought, the Universal par excellence. .

After the Hegelian there cau hardly be said to have been a philosophical treatment of the categories in Ger- many, which is not more or less a criticism of that system. It does not seem necessary to mention the unim- portant modifications introduced by Kuno Fischer, Erdmann, or others belonging to the school. In the strongly-opposed philosophy of Herbart, the categories can hardly be said to hold a prominent place. They are, with him, the most general notions which are psychologically formed, and he classifies them as follows:—(1) Thing, either as product of thought, or as given in experience ; (2) Property, either qualitative or quantitative; (3) Relation ; (4) The Negated. Along with these, he posits as categories of inner process— (1) Sensation, (2) Cognition, (3) Will, (4) Action. George,? who in the main follows Schleiermacher, draws out a table of categories which shows, in some points, traces of Her- bartiau influence. His arrangement by enneads, or series of nine, is fanciful, and wanting in inner principle.

The most imposing recent attempt at a reconstruction of the catagories is that of Trendelenburg. To him the first principle, or primitive reality, is Motion, which is both real as external movement, and ideal as inner construction. The necessary conditions of Motion are Time and Space, which are both subjective and objective. From this point onwards are developed the mathematical (point, line, &c.) and real (causality, substance, quantity, quality, &c.) cate- gories which appear as involved in the notion of motion. Matter cannot be regarded as a product of motion; it is

the condition of motion, we must think something nioved.

All these categories, “under the presupposition of motion

as the first energy of thought, are ideal and subjective

relations ; as also, under the presupposition of motion as

the first energy of Being, real and objective relations.”* A

serious difficulty presents itself in the next category, that of End (Zweck), which can easily be thought for inner activity, but can hardly be reconciled with real motion. Trendelenburg solves the difficulty only empirically, by

pointing to the insufficiency of the merely mechanital to

account for the organic. The consideration of Modality effects the transition to the forms of logical thought. On

the whole, Trendelenburg's unique fact of motion seems rather a blunder.

There is much more involved than he is willing to allow, and motion per se is by no means adequate to self-consciousness. His theory has found little favour.

Ulrici works out a system of the categories from a psy- chological or logical point of view. To him the funda- mental fact of philosophy is the distinguishing activity (unterscheidende Thiitigkeit) of thought. Thougl# is only possible by distinction, difference. The fixed points in the relations of objects upon which this activity turns are the categories, which may be called the forms or laws of thought. They are the aspects of things, notions under which things must be brought, in order to become objects of thought. They are thus the most general predicates or heads of predicates. The categories cannot be completely gathered from experience, nor can they be evolved @ priort; but, by attending to the general relations of thought and its purely indefinite matter, and examining what we must predicate in order to know Being, we may attain to a satis- factory list. Such list is given in great detail in the Sys- tem der Logik (1852), and in briefer, preciser form in the Compendium der Logik (2d ed., 1872); it is in many points well deserving of attention.

The definition of the categories by the able French logi-

2 Lehrbuch der Metaphysik, 1844. 3 Logische Untersuchungen, i. 376-7.

cian Renouvier, in some respects resembles that of Ulrici. To him the primitive fact is Relation, of which all the cate- gories are but forms. "The categories," he says, " are the primary and irreducible laws of knowledge, the fundamen- tal relations which determine its form and regulate its

movements.” His table and his criticism of the Kantian theory are both of interest. f ;

The criticism of Kant’s categories by Cousin and his own attempted classification are of no importance. Of more interest to us, though not of much more value, is the elaborate table drawn out by Sir W. Hamilton? The generalized category of the Conditioned has but little meaning, and the subordinate categories evolve them- selves by no principle, but,are arranged after a formal and quite arbitrary manner. They are never brought into connection with thought itself, nor could they be shown to spring from its nature and relations.

J. S. Mill has presented, ‘“as a substitute for the abortive classification of Existences, termed the categories of Aris- totle,” the following as an enumeration of all nameable things :—(1) Feelings, or states of consciousness ; (2) The minds which experience these feelings; (3) Bodies, or external objects which excite certain of those feelings ; (4) Successions and co-existences, likenesses and unlikenesses, between feelings or states of consciousness. This classi- fication proceeds on a quite peculiar view of the categories, and is only presented here for the sake of completeness.

Trendelenburg, Geschichte der Kategorienlehre, 1846 ; Ragnisco, Storia critica delle Categorie, 2 vols. 1871. For Aristotle’s doc- trine the most important, in addition to Brandis, Zeller, and the above, are Bonitz, Sttzwngsber. d. kin. Akad. d. Wissen., Wien, 1853, pp. 591-645; Prantl, Ges. d. Logik, i.; and Brentano, Bedeutung des Seienden nach Aristoteles, 1862. See also Schuppe, Die Kategorien des Aristoteles, 1866 ; Grote’s Aristotle, i. ; and the translations of the Categorie by Maimon, 1794, and Heydenreich, 1835. . – (R. AD.)

CATERPILLAR. See Burrerr.iss, vol. iv. p. 593.

CATGUT is the name applied to cord of great toughness and tenacity prepared from the intestines of sheep. It is used for the strings of harps and violins, as well as other stringed musical instruments, for hanging the weights of clocks, for bow-strings, and many other. purposes where toughness, flexibility, and durability are required. To prepare catgut the intestines are cleaned, freed from fat,

and steeped for some time in water, after which their.

external membrane is scraped off with the back of a knife or other blunt tool. They are then steeped for some time in an alkaline ley, smoothed and equalized by drawing out, bleached with sulphuric fumes, if necessary dyed, sorted into sizes, and twisted t-gether into cords of various numbers of strands acco ing to their uses. The best strings for musical instruments are imported from Naples ; and itis found that lean and ill-fed animals yield the toughest gut.

CATHAY. See Cuina.

CATHCART, Sir Grorcs (1794~1854), British general, was born in London, May 12, 1794. He was the third son of the first Earl Cathcart, a distinguished general and diplomatist, commander-in-chief of the. expedition to Copenhagen in 1807, and afterwards ambassador to Stockholm and St Petersburg. He received his early education at Eton College, and passed thence to the university of Edinburgh, In 1810 he entered the army, and two years later accompanied his father as aide-de-camp to Russia. With him he joined the Russian headquarters in March 1813; and he was present at all the great battles of the campaigns of that year in Germany, and of the

oe Eas de Critique Generale, 2d ed.; La Logique, i., pp. 184, 190, 2 Discussions, p. 577. 8 Logic, i. 83; of. Bain, Ded. Log., App. ©.

following year in France, and also at the taking of Paris, The fruits of his careful observation and critical study of these operations appeared in the Commentaries which he published in 1850, a volume of plain soldier-like history, prepared from notes made during the campaigns. After the peace of 1814 he accompanied his father to the Con. gress of Vienna; and while in that city he was appointed (March 1815) extra aide-de-camp to the duke of Wellington, He was present at Quatre-Bras and at Waterloo, was named full aide-de-camp to the duke, and remained in his staff till the army of occupation quitted Frauce. Re- appointed almost immediately, he

accompanied the duke to the Congresses of Aix-la-Chapelle and Verona, and in 1826 to Prussia. Promoted lieutenant-colonel in 1828, he served in Nova Scotia, Bermuda, and Jamaica,—retiring on half. pay in 1834. After three years he was recalled to active service, and was sent as commander of the King's Dragoon Guards to Canada, where he played an important part in suppressing the rebellion and pacifying the country. In 1844 he returned to England and again retired. Two years later he was appointed deputy-lieutenant of the Tower, and this post he held till 1852. In that year he was offered the governorship and command at the Cape, This he accepted, and had the merit of bringing to a close the Kaffre War. In December 1853 he was appointed adjutant-general of the army. In 1854 he was sent to take part as lieutenant-general in the Crimean War, and the highest hopes were fixed on him as a scientific and practically experienced soldier. But these hopes were not to be fulfilled ; for he fell at the battle of Inkermann, November 5, 1854. His remains, with those of other officers, were buried on Cathcart's Hill, Lord Raglan, the commander-in-chief, attending the ceremony. Sir George Cathcart married in 1824 Lady Georgiana Greville, who survived him, and by whom he had a family of one son and seven daughters. At the time of his death he wasa Knight Commander of the Bath.

CATHEDRAL, more properly CaTHeprat Catrcn (Ecclesia Cathedralis), the chief church of a diocese, in which the bishop has his official seat or throne, cathedra, The earliest example given of the use of the term Zeclesia Cathedralis is in the Acts of the Council of Tarragona, in 516. Another primitive designation was " Eeclesia mater " or "' matrix," indicating the cathedral as the mother- church of the diocese. As being the chief house of God, Domus Dei, of the district, it acquired in Germany the name of Domkirche, and in Italy of Duomo. The word " Keclesia " was gradually dropt, and by the 10th century the adjective "cathedralis" took rank as a substantive, which it has successfully maintained in most of the modern languages of Europe. The essential distinction between & cathedral and all other churches, viz., that it is the church of the bishop, containing his throne of office, or bishop's stool, a8 our Saxon forefathers termed it, is thus well expressed by Hooker (Zecl. Polit., vii. 8, 3), "To note & difference of that one church where the bishop hath his seat, and the rest which depend upon it, that one hath been usually termed cathedral, according to the same sense wherein Ignatius, speaking of the Church of Antioch, termeth it his throne;

and Cyprian, making mention of Evaristus, who had been bishop and was now deposed, termeth him cathedre extorrem, one that was thrust besides his chair. The church where the bishop is set with his college of presbyters about him we call a sce; the local compass of his authority we term a diocese." A bishop's see is, strictly speaking, a bishop's seat (sedes, siége), oF cathedra, and is only in a secondary sense applied to the church in which that scat is placed, and the city in which that church stands. From this it follows that a chutch may lose its cathedral rank by the transference of the

pishop's see to another church, which by that transference at once assumes the dignity lost by the other. Thus the Oxfordshiro Dorchester was the cathedral of the vast East Mercian diocese, until in 1072 Remigius removed the eathedra to Lincoln, while the West Mercian prelates at one time had their see at Chester before it was finally fixed in its earlier habitation at Lichfield. Thus also in 1088 the abbey church of Bath became the cathedral of Somerset- shire, which for nearly two centuries had been at Wells, where after a brief sojourn at Glastonbury the bishop's throne was again permanently set up in 1206. Towards the close of the 12th century the cathedral of Canterbury was in some danger of losing its rank, the contumacy of the monks having caused Archbishop Baldwin to conceive the idea of transferring his official seat to the church of Hackington, which would in that event have become the cathedral of the Kentish diocese, and the metropolitan church of England. Such a plan was actually carried out when, early in the 13th century (1220), Bishop Poore deserted the cathedral of Old Sarum, and founded the existing cathedral of Salisbury. The period of the Reformation saw the abbey churches of Bristol, Chester, Gloucester, Oxford, and Peterborough, and for a short space Westminster, elevated to cathedral rank by being made the seat of a bishop, a change which has been witnessed in the present century by the establishment of the sees of Ripon and Manchester. While we are writing, the church of Cumbrae has becomo the cathedral of the Scottish diocese of Argyll and the Isles, and the abbey church of St Albans is only waiting for the completion of preliminary necessary arrangements to be constituted the cathedral for the coun- ties of Hertfordshire and Essex.

By very early canons it was’ decreed that cathedrals should only be established in chief cities. The Council of Laodicea (361), following the legislation of the Council of Sardica (347), prohibited the appointment of bishops in villages or country places. Throughout the Roman empire, where the ecclesiastical coincided with the civil divisions, the seats of religious authority were fixed in the samc spots as the seats of temporal authority, the bishop placing his cathedra in the city where the temporal governor had planted his curule chair, In Britain, however, where, in the early days when the church first developed her power, cities were but few and insignificant, the case was different. The bishop was rather the bishop of a district or of a tribe than of a city. The position of his cathedral was dictated by motives of convenience and security rather than by the dignity and populousness of the site. Not unfrequently the cathedra was migratory. This state of things drew to an end with the conclusion of the 10th century, when the country became more settled, and the Roman system was finally ratified by the Council of London (1075), which ordered that episcopal sees should be removed from unwalled villages to walled cities. In obedience to this decree the cathedrals of Salisbury, Chichester, and Chester (the last only temporarily) were created,—succeeding to the episcopal dignity of those of Sherborne, Selsey, and Lichfield (Freeman, Hist, of Norman Conquest, vol. iv. pp. 414-420). Other transferences of only slightly later date were those already mentioned from Dorchester to Lincoln, and from Wells to Bath, as well as that of the Kast Anglian see from Elmham to Thetford and thence to Norwich.

Wherever established, the cathedral church was regarded as being, what it usually was in fact, the mother-church of the district dependent upon it. ‘This district was for the first three centuries designated the parochia (zapotxia) of the bishop. Gradually the term diocese (8:oéKyors), originally signifying a civil province of the lesser sort, came to be transferred to ecclesiastical divisions, to the

exclusion of the earlier name, which in its forms, parish, paroisse, parrocchia, &c., was restricted to the smaller ecclesiastical districts, each containing a single church. Cathedrals in their original idea possessed much of a mis- sionary character. The district of which they were the ecclesiastical centre in general received the light of reli- gious truth from them. They were the headquarters of the bishop and his clergy, from which

they went forth for the evangelization of the heathen inhabitants—pagani, t.e., dwellers in the pagi, or surrounding country villages. To this also they returned as their home for rest and refreshment, as well as for necessary conference. In the words of Dean Milman,—“ Christianity was first established in the towns and cities, and from each centre diffused itself with more or less success into the adjacent country. . . . The churches adjacent to the towns or cities either originally were or became the diocese of the city bishop” (Hist. of Christianity, bk. iv. c. 1. § 2). Thus, as Hooker says, “Towns and villages abroad receiving the faith of Christ from cities whereunto they were adjacent, did, as spiritual and heavenly colonies, by their subjection honour those ancient mother churches out of which they grew” (Keel. Polit., bk. vii. c. 8, § 2). In some cases, however, especially in Britain, the history of the cathedral was different. The missionary element was the same; but instead of starting with a bishop as the centre of organized action, establishments of missionary priests were formed, with a church as the focus of their religious life and a monastery as their home, which only tardily attained cathedral rank by the appointment of a bishop to preside over them. ‘The cathedral of Worcester is instanced by Professor Stubbs in this relation, as an example, “like Canterbury itself, of a successful missionary establishment, thus attaining its due development” (“Cathedral of Worcester in the 8th century,” Archeol. Jour., vol. xix. p. 244). The history of the missionary work of the Church of England during the early part of the present century reproduced this same system. The missionary clergy pre- ceded the bishop, and cathedral dignity was imposed on a church not originally erected with any such object. The last twenty years have seen a return to the other moro primitive plan of operations. In newly-constituted dioceses in Africa and elsewhere, the bishop takes the lead among his clergy in date of constitution as he does in official rank, and the cathedral church is one of the first require- ments to be provided for. The true character and object of a cathedral church and establishment are thus well set forth by Bishop Stillingfleet :—“ Every cathedral in its first institution was as a temple to the whole diocese, where the worship was to be performed in the most decent and con- stant manner; for which end it was necessary to havo such a number of ecclesiastical persons there attending as might still be ready to do all tho offices which did belong to the Christian church,—such as constant prayer and hymns and preaching and celebration of sacraments,— which were to be kept up in such a church, as

the daily sacrifice was in the Temple.” Though it was the church of the bishop, it was essential for its completeness that he should be surrounded by his college of presbyters, as the members of the body of which he was the head. The purpose of this collective body was threefold :—(1.) Con- sultative,—as the concilium episcopi, by whose advice he might be strengthened in all important matters concern- ing the diocese; (2.) Ministerial—for the maintenance and celebration of public worship in its most reverent and dignified form, cum cantu et jubilatione; and (3.) Diocesan,—as the bishop’s officials in the administration of his diocese, prepared also to go forth at his bidding to act as missionaries or evangelists in any part to which he might see fit to send them. Jn this way there sprang up

the body known as the “chapter” of the cathedral,—a body originally in the closest connection with the bishop, and having no corporate existence apart from him. This collective body sometimes consisted of “seculars, i.¢., of clergy not bound by monastic vows, living in the world, with separate homes of their own ; sometimes of regulars,

1.e., of clergy living according to @ monastic rule, residing in one religious community, and sharing in common buildings. Of both bodies the bishop was the head. When the cathedral was the church of a monastery and. was served by regulars, the bishop was regarded as the abbot ; and when the chapter consisted of a college of secular clergy, it owed allegiance to no one but the bishop himself, The “dean,” the present head of all English cathedral chapters, was a comparatively late addition, not appearing till the 10th or 11th century. He had been preceded by the prepositus, a “ provost, who occurs in the 8th and 9th centuries. [Earlier still we find the “ archpresbyter,” who was gradually supplanted by the archdeacon ” exercising chief authority among the cathedral clergy, but always in strict subordination to the bishop. Another chief officer of the church—one, with the two last, of the “ tria culmina ecclesis ”—was the “ custos ” or “ primicerius, ” a title he derived from his name being that first entered on the waxen tablet or list. The strange con- tradiction by which the bishop has less authority in the church of which he is the titular head, and which takes

its distinctive appellation from his throne, than in any other church in his diocese, ouly gradually came into existence, It was partly a result of the increase of his diocesan duties, partly of his transformation imto a great political officer of the state, and partly of the organization of the chapter as an independent corporation. When travelling over his wide- spread diocese, or attending upon the king as chancellor, or other high officer, the bishop had no leisure to attend to the internal administration of his cathedral, and the authority naturally tended to attach itself to the permanent chief of the chapter, while he gradually sank into a mere external visitor called in when needed to correct abuses, or as an arbiter to settle disputes.- Under the bishop as its nominal head the chapter of a fully organized cathedral, when it was formed of secular priests, consisted of the guatuor persone, or four chief “dignitaries” of the church, and a body of “ canons” or “ prebendaries.” The four high officers were—(1.) the “dean,” as the general head of the whole capitular body, charged with the internal discipline of the corporation; (2) the “ preecentor,” or “ chanter,” who was charged with the management of the choir, and the musical arrangements of the service ; (3) the “chancellor,” the literary-man of the chapter, who, as theological professor, superintended the education of its younger members, delivered lectures himself, and procured the delivery of sermons by others, had the care of the library, and wrote the letters of the body; and (4) the “ treasurer,” not in the modern fiscal sense of the word, but the officer to whose care were entrusted the treasures of the church, its sacred vessels and altar furniture, reli- quaries, and other ornaments. With these were usually united the ‘‘archdeacons,” varying in number with the size of the diocese, who were, however, more diocesan than cathedral officers. Next after these dignitaries the main body of a cathedral chapter consisted of “canons” or “ pre- bendaries.” The former name they received originally from being enrolled on the “canon” or list of ecclesiastical officers, though subsequently it was supposed to have reference to their being bound by canons, z.¢., rules. The additional title of prebendary was given to those canons who enjoyed a separate estate (preebenda), in virtue of their position, besides their share of the corporate funds, These names were, generally speaking, two different designations

for the same individual. A canon was usually, though not always, a prebendary ; but a prebendary, as a member of the capitular body, was always a canon. The life of the canons was separate, not coenobitic. Each had hig own house and his private establishment. The attempt of Chrodcgang, archbishop of Metz (who died in 766), to force a semi-monastic rule on canons, with a common refectory aud common dormitory, though eagerly adopted by the Emperor Charlemagne, was short-lived. By the middle of the 9th century the rule was indeed established in almost all the cathedrals of France, Germany, and Italy, and had also been adopted in England. But its strict- ness proved unpalatable to the canons, It was gradually rclaxed everywhere, and found no acceptance in Eng- land. ‘The distinction between ‘ residentiary ” and “ non- residentiary” canons had its origin in the attempt to combat the evils consequent on pluralities. The canons having other preferments were, by the end of the 12th century, generally non-resident. Their cathedral duties were performed by “vicars” recciving a small stipend, To attract them into residence the divisible part of the corporate revenue was ordered to be shared among those canons who had resided for a certain term.. This created a degree of confusion, as there was no certainty how many canons would reside during a given year. To obviate this irregularity the duty of residence was laid on a fixed number of canons only, who were to discharge the ordinary duties of the cathedral on behalf of the whole body (Freeman, Cathedral Essays, pp. 148-149), The establishment of “ vicars,” or, as they are now more usually but unstatutably called, ‘“ minor canons,” as a regular and permanent part of the cathedral bol, originally due to non-residence, was sanctioned through the inability of some of the canons to take their part in the choral service of the church. In most cathedrals each officer had his deputy. Thus we find the “ sub-dean,” the sub-chanter” or ‘“‘succentor,” the “ vice-chancellor,” as recognized members of the cathedral staff. Another officer is the “ preelector,” or lecturer in theology, who in some cathedrals executes the duties elsewhere performed by the chancellor.

We have been speaking hitherto of the cathedrals of secular canons. The monastic cathedrals differed little from ordinary monasteries, save in being governed, in the almost constant absence of their titular abbot, the bishop, by a prior as the real head of their society. Cathedrals of this class are peculiar to England and Germany, which received its religion mainly from

England. The monks or regular clergy who served them were, in England, every- where of the Benedictine order, except at Carlisle, where they were Austin canons,

The distinction between monastic and secular cathedrals in England was perpetuated at the Reformation under the new titles of “ Cathedrals of the Old Foundation” and “ Cathedrals of the New.” In the cathedrals of the former class the foundation remained substantially unchanged. But the monasteries attached to cathedrals having been suppressed by Henry VIII., together with the other religious houses, these cathedrals were founded afresh as chapters of secular canons presided over by a dean. ‘These new chapters were eight in number, viz, Canterbury, Durham, Winchester, Carlisle, Ely, Norwich, Rochester, and Worcester. The members of the chapter were designated, not canons, but prebendaries, an improper appellation, as none had any separate estate or “ praebenda” assigned to them. The highest number of these new prebendaries was twelve, at Canterbury, Durham, and Win- chester; the lowest was four, at Carlisle. With these monastic cathedrals may be classed the new sees formed by Henry VIII. from existing monasteries, viz. Bristol,

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Chester, Gloucester, Oxford, and Peterborough. The con- stitution of these cathedrals was similar to those of the other monastic cathedrals, and the codes of statutes almost identical. In all. the cathedrals of the New Foundation the precentor, instead of being a chief dignitary second only to the dean, is one of the minor canons.

The cathedrals of the Old Foundation, whose constitution hag not been materially changed since the 13th century, and which are in some instances still governed by pre- Reformation statutes, are those of York, London, Chichester, Exeter, Hereford, Lichfield, Lincoln, Salisbury, and Wells, together with those of the four Welsh bishoprics—Bangor, Llandaff, St Asaph’s, and St David’s. Monastic cathedrals being nearly peculiar to England and Germany, these Old Foundation cathedrals “ are those whose history and con- stitution has most in common with the churches of Scotland, Ireland, and Western Christendom generally” (Freeman, w.s., p. 139).

To these must be added the two recently-erected cathedrals of Manchester and Ripon. In each of these cases advantage was taken of an existing collegiate establishment on which to graft a cathedral. No provision is made in the Act for the founding of the see of St Alban's for the creation of a capitular body.

The legislation of 3 and 4 Victoria reduced all the cathedrals of England and Wales to a uniform constitution. The normal type is that of a dean and four canons. Canterbury, Durham, and Ely, however, have six canons a-piece, and Winchester and Exeter five. To remove still further the distinction between cathedrals of the Old and New Foundation, a body of honorary canons was called into being in the latter to correspond to the prebendaries of the former foundations, The prebendal estates having been alienated, the honour in each case is equally a barren one.

In not a few of the English cathedrals the due perfor- mance of the choral service is provided for by a corporation of "lay vicars," forming in some cases an independent body endowed with estates of their own. The chorister boys also in some cases are supported and educated from the proceeds of separate estates, The " priest vicars," or "minor canons," in several instances, also have their own estates and form a corporation by themselves.

It does not fall within the scope of the present article to enter upon the ritual and architectural history of cathedrals. In neither of these respects do they differ essentially from other important and dignified churches.

Essays on Cathedrals, edited by Dean Howson; Freeman, Cathe- dral Church of Wells; Walcott, Cathedralia; Robertson, History of the Christian Church ; Milman, History of Christianity. (. V.)

CATHERINE, Sarnt. The Roman hagiology contains the record of no less than six saints of this name, viz. :-— I. St Catherine, virgin and martyr, whose day of com. memoration recurs on the 25th of November; 2. St Catherine of Sweden, who died abbess of Watzen, on the 24th March 1381, and is commemorated on the 2lst of that month; 3. St Catherine of Siena, born in 1347, whose festal day is observed on the 30th of April; 4. St Catherine of Bologna, whose family name was Vigri, and who died abbess of the Convent of St Clairs in that city on the 9th March 1463; 5. St

Catherine of Genoa, who belonged to the noble family of Fieschi, was born about 1448, spent her life and her means in succouring and attending on the sick, especially in the time of the plague which ravaged Genoa in 1497 and 1501, died in that city in 1510, was canonized by Clement XII. in 1737, and had her name placed in the calendar on the 22d of July by Benedict XIV. ; and 6. St Catherine de' Ricci, of Florence, born of that noble family in 1522, who became

| present day called a Catherine wheel.

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a nun inthe convent of the Dominicans at Prato, died in 1589, and was canonized by Benedict XIV. in 1746, who fixed her festal day on the 13th February.

All these women are recorded by the chroniclers of the Roman Church to have worked miracles. Indeed without this essential qualification they could not have been canonized. The lives of all, save that of Catherine of Genoa, whose career was a more active one, having been spent mainly in the hospitals of her native city, were passed in the practice of the ordinary monastic virtues. St Catherine de' Ricci was subject to long trances and visions. And of St Catherine of Genoa it is recorded, that that miracle of levitation (or being raised from the ground), which is asserted with such curious frequency to have happened to various saints, frequently happened to her, when she was in the act of receiving the Holy Com- munion.

Of all these saints, however, it will only be necessary here to say a few words of the earliest of the name, who is the person intended when the Roman Church speaks of St Catherine without any additional designation, and then to give a somewhat more detailed account of the far most celebrated and historically important of them all, St Catherine of Siena,

History has exceedingly little to tell of this saint ; history, St Cathe-

more properly so called, indeed, has nothing at all. She is said to have been of royal parentage, and her life is referred to the early part of the 4th century. She was martyred at Alexandria. She was especially celebrated for

her learning and philosophical culture, and has always been considered the especial patron of philosophical schools, But in proportion to the scantiness of authenticated fact, legendary fable has been abundant in furnishing forth lives of the saint. And it is to one of these legends that tho well-known presentiment of the saint, which alone is likely to cause modern readers to feel any interest in her name, isdue. It is said that in revenge for the discomfiture of a company of heathen philosophers, with whom she had been compelled to dispute, the holy and learned lady was bound to a wheel armed with spikes, in such sort that every turn of the machine would cause the spikes to pierce her body. But the cords were miraculously broken, and the malice of her enemies foiled. Hence St Catherine, virgin and martyr, is always represented with a wheel, and the extreme popularity of this saint, and consequent common- ness of the pictures of her, is indicated by the fact that a wheel of a certain construction and appearance is to the The lover of medieval painting may be warned against mistaking the pictures, which he so constantly meets with, of St Catherine with her wheel, for representations of St Catherine of Siena, or of any of the other saints Catherine, who all of them lived a thousand years or moro later than the first and original saint of the name.

St Catherine of Siena, born in that city in the year St Cathe- said by the tine of

1347, was a daughter of Giacomo Benincasa, hagiographers to have been a descendant of the noble family of Borghese, also of Sienese origin,—a connection, however, which has been repudiated by the nobles of that subsequently Papal family. It seems certain, however, that the two families were sprung from the same stock, The researches of Signor Grottanelli, the present librarian of the municipal library at Siena, have enabled him to construct a pedigree of the saint, which may be considered as perfectly authentic, from which it appears that she was one of thirteen children ; and that her father Giacomo, who died when she was one-and-twenty, in 1368, had been one of ten. Her mother Lapa, who was the grand-daughter of a “ poeta volgare,”—that is to say, a poet who wrote in the then nascent Italian tongue,—lived to be eighty-nine.

To her and to one of her brothers, and to two of her nieces, sundry of the saint's letters are addressed. _ j

As is usual in the Roman hagiography, the first and con- temporary biographer of St Cathcrine, her confessor, the Dominican friar Raimondo (he was great-grandson of the celebrated Pietro delle Vigne, the chancellor of the Emperor Frederick II., and became the 24th general of the Domini- can order), insists largely on the tendency towards sanctity which marked Catherine in her earliest years. The austerities and self-inflictions by which she prepared herself for her career, and gave proof of her vocation to those around her, began at an incredibly early age, and went on increasing in intensity till they pass from the probable to the highly improbable, and thence to the manifestly miraculous. At five years old it was her practice in going up stairs to kneel at each step to the Virgin. She habitually flogged herself and induced other children to do the same, at six years of age. At seven she deprived her- self of a great portion of her food, secretly giving it to her brother, or throwing it to the cats. At the same age she would watch from the window to see when a Dominican monk passed, and as soon as he had moved on, would run down and kiss the spot of the pavement on which he had placed his feet. At twelve years old her mother begged her to comb her hair and wash her face oftener. But this she steadily refused to do, till her mother requested a married sister to use her influence with Catherine, to which for a time she yielded to a certain degree. This yielding, however, she often in after-life, as her confessor testified, bewailed with bitter tears of penitence, always mentioning it, when she made, as she was in the habit of doing frequently, a geueral confession of her sins.

About the same period of Catherine's life, her twelfth year, she wholly abandoned the use of animal food. At fifteen she left off wine. At twenty she gave up bread, living only on uncooked vegetables. She used to sleep but one quarter of an hour in the four and twenty. She always flogged herself till the blood streamed from her three times a day. She lived three years without speaking. She wore a chain of iron round her body, which gradually ate its way into her flesh, And, finally, she remained wholly without food for many years. Catherine began, we are told, to have visions at six years old. Returning home one day, about that time, through the streets of Siena, she saw in the sky, immediately over the Dominican

Church, a throne with Christ sitting on it, dressed in Papal robes, accompanied by St Paul, St Peter, and St John.

But these practices of her infancy, and these early visions were but preparatory to the wonders of a later period. Christ appeared to her daily as soon as she retired to her cell,:as she informed Father Raimondo, for the purpose of teaching her the doctrines of religion, which, as she said to her confessor, “no man or woman ever taught me, but only Our Lord Jesus Christ himself, sometimes by means of inspiration, and sometimes by means of a clear bodily appearance, manifest to the bodily senses, and talking with me, as I now talk with you.” A detailed account of these manifestations will be found in the pages of Father Raimondo.

It is necessary to give some account of one miraculous occurrence, which was deemed the great and culminating glory of the saint, and has occupied the most prominent position in her estimation by the church, and in the imaginations of her admirers. This is the supernatural impression on her hands and feet of the scars of wounds corresponding with those made in the hands and feet of the Saviour by the nails which fixed Hin to the cross. This is stated to have occurred at Pisa, and is asserted by Father Raimondo to have happened in his presence. Catherine had received the sacrament, and fell, as usual

with her at such times, into a trance. Her confessor and some others were awaiting her recovery from it, when they saw her suddenly rise with a start to a knecling posture, with her arms stretched out horizontally, and in a minute or two more fall prostrate. Soon afterwards she came out of her trance, and immediately calling aside her confessor said, ‘ Be it known to you, my father, that I now bear on my body the marks of the crucifixion of our Lord Jesus Christ.” ‘“ And I,” continues Father Raimondo, “ having told her that I had observed as much from the movements of her body, while she was in her trance, asked her in what manner the Lord had performed that miracle ? And she said, ‘I saw the crucified Lord descending towards me with a great light, which caused me, from the impetus of my

soul to meet its Creator, to raise up my body. Then I saw five bloody rays descending from the scars of his most holy wounds, and directing themselves to the hands and feet and heart of my body. Upon which, knowing what the mystery was, I exclaimed, O, Lord, my God, let not, I pray you, the scars appear externally on my body, it is enough for me to have them internally. Then, while I was yet speaking, the rays, before they reached me, turned from blood-colour to a pure and splendid light, and touched the five parts of my body—that is my hands, my feet, and my heart.' Lasked her further, Do you now feel in those spots any sensible pain? To which, with a deep sigh, she replied, 'So great is the pain I feel in all those five places, but especially in my heart, that it appears impossible to me to live many days, unless the Lord perform some further miracle.' "

In order to appreciate the importance and bearing of this celebrated miracle, the fierce and bitter rivalry which existed between the Dominicans and Franciscans must be borne in mind. St Francis had, some half century previously, received these five wounds in the same way. The marks are familiarly known among hagiographers and their readers as the Stigmata ; and the having received them was considered the crowning glory of St Francis, and was the exclusive boast of his Franciscans. But now the Dominicans were even with them. The Sienese Pope, who canonized his townswoman Catharine, Pius II., gave his approbation to a service, in which this reception of the stigmata was prominently asserted. And so severely was the blow felt by the indignant Franciscans that they obtained from the next Pope but one, Sixtus IV., himself a Franciscan, a decree to the effect that St Francis had an exclusive right to and monopoly of that especial miracle, and that it was accordingly forbidden to represent St Catherine receiving the stigmata under pain of ecclesias- tical censures, The tendency observable in many of the austerities and miracles said to have been suffered and done by St Catherine, to outdo the austerities and miracles of other saints, especially St Francis, is particularly remarkable in this of the stigmata. The degree in which it served the purpose of the Dominicans is the measure of the suspicion attaching to it. But there is nothing incredible in the supposition that Catherine may have imagined in, her trance all that she had related; and still less is it unlikely that such diseased dreamings may have been the natural product of a waking fancy, filled with, and dwelling on, this much envied manifestation. Perhaps the condition, so

providently introduced, as it would seem, tbat the scars were not to be visible, may be suggestive of a fraudulent intention. But on the other hand, it may be observed that if such a fraud had been planned, it would have been easy for one, who habitually subjected her body to so much suffering, to submit to the required wounds beforehand. It will, however, probably be felt by most readers of the above quoted narrative of Father Raimondo that it bears on the face of it many of the marks of untruth-

fulness. The monk's statement that he had known what was taking place from the movements of her body would seem to be very suggestive of a foregone purpose and plan. On the other hand it may be argued that this is so obvious, that the monk would never have committed himself to such a statement had not it becu the simple truth.

The celebrated and learned Tomasseo, whose literary reputation probably stands higher with his countrymen than that of any other living writer, and who is the latest writer on St Catherine, accepting her works and character in the spirit of an enthusiastic devotee, writes in the essay on St Catherine, which he has prefixed to the latest edition of her works (4 vols., Florence, 1860), as follows : "Tf by the mere play of the imagination a person, who has had a limb cut off, feels, nevertheless, pain in the part which has been removed; if the force of thought often creates bodily ills and cures them, it would be in contradic- tion to all philosophy and all the laws of criticism to deny that a woman rendered by love profoundly apprehensive of the sufferings of another, may feel pain in her own person, in that same spot of the body where the loved person feels or felt it, It would be to deny to Catherine that privilege of sympathizing piety and tender humanity, which we graut to the French mother, who exclaims, J'at mal & la poitrine de ma fille/ And for Catherine Jesus was alive, was present in her heart, in her eyes. All her being, as all the world, was full of him." The recognized phenomenon, however, to which the eloquent philologist refers is a purely physiological one; and it is for physiologists to determine what amount of analogy may be discoverable between that known fact and the sensation of bodily pain from which Catherine declared herself to be suffering, when she had recovered from her trance ;—or rather that respecting which Catherine

is said to have made such a declaration by the Dominican her confessor and biographer. For in weighing the extremely curious question of the amount of conscious imposture which may probably be supposed to have been mingled with other elements in the extraordinary narrative, it is very necessary to remember that we have the testimony and statements of Catherine only through the medium of the general of the order, to the fame and glory of which Catherine's saintly fame and glory was so all-important.

It is important to observe in this connection that various statements of her confessor will leave little doubt on the minds of those who have made that form of malady called catalepsy their study, or even of those who have witnessed the phenomena attending it, that Catherine was subject to constantly-recurring attacks of catalepsy. And physicians will probably deem the hint above thrown out, to the effect that the saint was in the habit of throwing herself into this state "as much as she could," not unimportant. It is unnecessary in this place to do more than call attention by a passing word to the very remark- able similarity betwcen some of the phenomena described by Father Raimondo and those attending many very well- known cases of animal magnetism,

But if doubts and difficulties crowd thickly about the whole of that portion of Saint Catherine's story which has obtained for her the pre-emiuence of saintship, it may be said that the public events of her life, which make part of the undoubted history of her time, are hardly less extra- ordinary and surprising. In the year 1376, the 29th of Catherine's life, Gregory XI. was living and holding the Papal court at Avignon. He was the last of seven French Popes in succession who had done so, and had perpetuated for seventy-three years what ecclesiastical writers are fond of terming "the Babylonian captivity of the church." To . an end to this absenteeism, and to bring back the

apacy to Italy was the cherished and anxious wish of all

good Italians, and especially of all Italian churchmen, Petrarch had urgently pressed Urban V., Gregory's imme- diate predecessor, to accomplish the desired change ; and Dante had at an earlier date laboured to bring about the same object. But both had failed in front of the great difficulties which attended the step. The French cardinals, who surrounded the Pope, were anxious, of course, to detain him in France. The king of France threw all his influence into the same scale. The French Pope's own prejudices and wishes were, of course, enlisted on the samc side. Rome itself and the dominions of the church, which tho violences and usurpations of the Roman barons kept in a chronic state of rebellion, made the Eternal City anything but an inviting residence. There was also considerable truth in the representations insisted on by several of the French Popes, that the rising importance of the northeru churches had in a great degree changed the central point of the ecclesiastical world, and that the church could more advantageously be governed from 4 French than from an Italian city. Thus all the influences which Italy had for many years past striven to bring to bear upon the popes, to induce them to return to their own city had failed. And it was under these circumstances that Catherine, the illiterate daughter of an obscure Sienese dyer, determined to try her powers of persuasion and argument for the accomplishment of that which tho princes of the church and the greatest men of Italy had in vain attempted. For this purpose Catherine proceeded to Avignon in the summer of 1376. And in the September of that year the Pope set out on his return to Rome. It is true that he did this, intending after a sojourn in the Eternal City to return to France, and he would almost certainly have done so, had he not been prevented by death. But the dyer's daughter did, as things fell out, succeed in her enterprise, and moved the centre of Europe back again once more to its old place in Rome! Of course it may be said that to attribute tho Pope's return to Rome to Catherine's intervention is a notable instance of a post hoc ergo propter hoc inference. But many proofs might be given from various writers to show that it was unquestionably believed in her own day that Catherine had been the real moving cause of the restoration of the Papacy to Rome. (See especially Ammirato, storie Fiorentine, vol. v. p. 130, ed. Flor., 1824,) After many other journeyings she arrived in Rome on the 28th of November 1378, in obedience to the commands of the Pope; and there she died on the 29th of April 1380, at the age of thirty-three. Father Raimondo was then at Genoa, and declares that in that city, at the hour of her death, he heard a

voice communicating to him a last message from Catherine, which he afterwards found she had uttered on her deathbed word for word as he heard it, “ and of this,” he adds solemnly, “let that Eternal Truth, which can neither deceive nor be deceived, be witness.”

Catherine’s works consist of a treatise oeeupying a closely-printed quarto volume, which Father Raimondo deseribes as ‘‘a dialogue between a soul, which asked four questions of the Lord, and the same Lord, who made answer and gave instruetion in many most useful truths,”—of her letters, 373 in number, and of 26 prayers. The dialogue is entitled, The Book of Divine Doctrine, given ir person by God the Father, speaking to the mind of the most glorious and holy virgin Catherine of Siena, and written down as she dictated it in the vulgar tongue, she being the while entranecd, and actually hearing what God spoke in her. The work is declared to have been dietated by the saint in her father’s house in Siena, a little before she went to Rome, and to have been completed on the 13th of October 1378. This dialogue has been divided into five parts, though no such division existed in it as it fell from her lips. The first four parts exist in manuseript, as taken down from the lips of the entraneed saint ; but the fifth treatise is not extant in the original, but only in the Latin version of Father Raimondo, from which the published Italian version has been re-translated. The French oratorian, Father Casimir Oudin, in his supplement of

ecclesiastical writers, omitted by Bellarminc, says very quietly, ‘‘She wrote, or Raimondo de Vincis wrote in her name, a work inscribed,” &c., &c. And it is very possible that the suspicion indicated may be a just one; but there is nothing in the matter of the work itself to belie the origin attributed toit. It may be re- marked, however, that the context, as it stands, does not even pretend to give the unbroken utterances of the saint. It is intermingled, without any advertisement to the reader, typographical or other, that he is about to enter on matter of a different authorship, with long passages descriptive of the saint’s mode of receiving the revelation, written in the person of the secretary. But the gaint’s own utterances aro exactly such as might have been ex- pected from such a patient. They resemble the worst and emptiest style of the pulpit eloquenco of her time and country, and

consist entirely of mere verbose and repetitive inanities and plati- tudes. It is impossible to read them without being strongly reminded of the productions, which have been giveu forth in

these latter days as spiritual communications made to persons in trance or otherwise constituting themselves ‘‘mediums,”’—a simi- larity which suggests sundry curious considerations. The most probable supposition seems to be that these ‘‘dialognes” were composed by Father Raimondo, from notes taken down from Catherine’s trance ramblings. The 26 prayers might have been expected to throw more light on the character and mental calibre of the saint, whose communings with the Infinite they represent. But nothing of the kind is to be gathered from them. The im- pression they are calculated to produce is either that the saint was a self-conscious actor and pretender, or that they are not her compositions,—the latter perhaps being the more probable hy- pothesis. Though addressed in form to the Deity, there is little in these effusions that can with accuracy be called prayer. The speaker, or rather writer, seems continually to forget his avowed object, and runs off into long statements of the nature and attributes of the Deity, and ecclesiastical positions based thereon, evidently prompted rather by didactic views as to mortal hearcrs, than by effort to hold communion with the Almighty. It is all dry, cold, repetitive, verbose theology, instead of the warm utterances of either a contrite or a thankful heart. It remains to say a few words of the saint’s letters, by far the most interesting and valuable of her reputed works. They are 873 in number, and form two stout quarto volumes of the Lucca edition. In the four octavo volumes of the recent cheap Milan reprint, only the first 198 are given, thongh no word appears to indicate that the collection is imperfect. On the contrary, the fourth volume is entitled ‘(4th and last.” Still more recently the letters havo been reprinted by Barbéra at Florence, 1860, in 4 vols. small octavo,with a prelimiuary notice of the saint prefixed by the cele- brated Niccold Tommaseo, consisting of 210 pages. The 378 letters of the entire collection have among them many addressed to kings, popes, cardinals, bishops, conventual bodies, and_ political corpora- tions, as well as a great number written to private individuals. And it seems very strange that among so many correspondents of classes whose papers are likely to be preserved, and many of whom, ae. the monastic communities, would assuredly have attached a high value to such documents, no one original of any of these

documents should have been preserved. Girolamo Gigli, the editor of the quarto edition of the saint's works, printed at Lucca and Siena, 1707-13, an enthusiastic investigator and collector of every description of information regarding her, gives, in his preface to the letters, a careful account of the manuscript collections from which they have at different times been printed, but has not a word to say of any scrap of original document. The epistles were first printed by Aldus in 1500, just 120 years after Cathcrine's death. The difficulties connected with the subject of the true authorship of these letters are much complicated by questions respecting Catherine's capability of writing, and her own statements of the miraculous manner in which she acquired that accomplishment. The discus- sion of these difficulties would require a larger space than can here be allotted to the subject. And the reader curious on the subject may be referred to a life of the saint by Mr Trollope, from which much of the presént notice has been taken. It is admitted on all hands, however, that a large portion of the letters were written by the hands of secretaries. 'The very high reputation, and that not wholly of a pietistic or ecclesiastical nature, which this large mass of writings has enjoyed for several centuries will probably appear to most English readers an extremely singular fact. A great deal of the praise bestowed on St Catherine's writings by Italian critics has reference to their style and diction. Written at a time when the language, fresh from the hands of Dante, of Petrarch, and of Boc- caccio, was. still in its infancy, and in a city at all times celebrated for the purity of its vernacular, they have by the common consent of Italian scholars taken rank as one of the acknowledged classics of the language,—as a testa di lingua, as the Tuscan purists say. The Della Cruscans have placed them on the jealously-watched list of their authorities, and an enthusiastic Sienese compatriot, the be- fore-mentioned Girolamo Gigli, has completed a vocabulario Caterini- ano, after the fashion of those consecrated to the study of the works of Homer and Ciccro. Of course no one from the " barbarous"

side of the Alps can permit himself any word of observation on this point, especially when the judgment is in the main confirmed by the authority of

the greatest of living Italian critics, Niccold Tommaseo, Had no such decisive opinion been extant to guide his ignorance, it might perhaps have seemed to a foreigner that the saint's style was loose in its syntax, intricate in its construction, and terribly overloaded with the merest verbosity. But the philological excel- lencies of her writings are, after all, the least part of the praise that has been lavished on Catherine as an author. Her admirers enlarge on the moving eloquence, the exalted piety, the noble sentiments, the sound argumentation of her compositions, especially the letters.

So large a uumber of devout writers have occupicd their pens on ''Iegends" and biographies of Saint Catherine that it would be far too lengthy a task to attempt to give even a list of them. The public library of Siena contains no less than 79 works of which the popular saint of the city is the subject. Almost all of them, however, seem to be based more or less directly and avowedly _ on the work of Father Raimondo. And enough has been said to give the reader a sufficient idea of the nature of that book. Of Giro. lamo Gigli's Vocabulario Cateriniano meution has also been made, Of course it will readily be understood that this work regards the saint's writings in a purely philological point of view. But the curious fate which attended this work may be noticed. It was burned by the hangman at Florence, not because it was supposed to contain any heterodoxy in matter of religion, but merely because the Della Crusca, which is occasionally somewhat slily satirized in it, was enraged at the position taken up by the author, to the effeet that the Sienese is a purer dialect of Italian than the Florentine! The notice of Saint Catherine by Niccold Tommaseo, prefixed to the most recent edition of St Catherine's works, has also been mentioned, It cannot be called ''a life" in any sense. For the author inakes no attempt to relate the story of her career, or to examine the evi- dence for any of the anecdotes which he does relate. It is written in a strain of enthusiastic pietistic admiration, which is certainly curious in the case of a highly-cultured 19th century layman ; and its principal value consists in the jndgment on the purely literary merits of the writer, by one who must be admitted to be the greatest living critic of Italy. (T. Aad

CATHERINE I., wife of Peter the Great of Russia, and after his death for two years (1725-27) empress of Russia, was the natural daughter of a country girl in Livonia. Being left utterly destitute when a mere child, she

was brought up by a Lutheran pastor of Marienburg, named Gliick. About 1702, at a pretty early age, she was married to a Swedish dragoon, from whom, however, she was almost immediately separated by the vicissitudes of war. She never saw him again; for she was carried off by the Russian forces, and was slave or mistress to more than one Russian general, last of all to Prince Menschikoff, in whose house she attracted the notice of the czar. The czar was struck by her beauty and good sense, and made her his mistress, and then his wife publicly in 1711. After that, in the same year, she performed a service to her husband for which she will always be remembered in history. In the campaign on the Pruth, Peter, with an excessive contempt of the generalship and other military qualities of the Turks, had rashly placed himself in a position in which he was completely surrounded and cut off from all supplies. From this peril he was relieved by Catherine, who was expert enough to collect the necessary sum for bribing the Turkish general, and in this way to bring about a tolerable peace. Next year she was solemnly crowned empress at St Petersburg. She continued to be the faithful companion and adviser of the czar, till his death in 1725. After that event she was herself raised to the Russian throne, chiefly through the address of her former lord, Prince Menschikoff, who put himself at the head of a powerful party, and gained over the guards at the capital. Her reign of two years was in no wise remarkable. Menschikoff was her minister, and directed affairs almost at his pleasure. Catherine was by no means free from the vices then prevalent at the Russian court. She spent whole days in dissipation, which hastened her end. She died in 1727, being somewhere about forty years of age. She was evidently a woman of considerable insight and expertness, able to manage the

eccentric czar in his violent and extravagant moods, and above all capable of sympathizing with him, and assisting him in his great schemes, though she could neither read nor write.

CATHERINE II., empress of Russia, was born at Stettin in 1729 ; by the dethronement of her husband Peter IIL, and the exclusion of her son, she ascended the Rus- sian throne in 1762, and occupied it till her death in 1796. Her father, who was prince of Anhalt-Zerbst in Upper Saxony, served

in the Prussian army. Her mother, a peevish, hard-tempered, and pedantic German of the oldschool, gave her a severe education, which, however, did not crush but strengthen the masculine temper of her daughter.

The Empress Elizabeth, having selected her nephew Peter, the duke of Holstein -Gottorp, as her successor on the throne, had requested a sister of Frederick of Prussia to be the wife of the future emperor. But aware of the extraordinary manners then prevalent at the Russian court, Frederick shrunk from the proposal and suggested the princess of Anhalt-Zerbst. Proposals being made in that quarter and thankfully accepted, the princess, whose original name was Sophia Augusta, was conducted to Russia by her mother in 1744; after some preliminary religious iustruction she received the name of Catherine, and was admitted into the Greek Church, and was at length in 1745 with due splendour married to Peter, who was only a year older than herself. The marriage proved an unhappy and ill-assorted one. While Catherine grew up to bea handsome, strong-minded, and ambitious lady, Peter passed his life apparently on the very borders of idiocy. Though not destitute of generous and even noble impulses, he was silly, wayward, and extravagant. Excluded from all serious employment, and indeed incapable of it, he spent his time in drilling a troop of dogs that he kept in a kennel adjoining his wife's sleeping apartments, executed martial law on the rats he used to train to the same military functions, and felt very angry when Catherine ventured to laugh at the extravagance of his proceedings. From early boyhood he had been habituated to strong drink, and, as he grew up, he was intoxicated every day. He insisted, too, on making his own wife his coufidante in the ceaseless love intrigues he carried on with the ladies of the court. Such was the husband to whom the poor girl of fifteen was married, and the man who was to have uncontrolled power over a vast empire. For a long time Catherine did her best to induce him to act in a reasonable way, but with little success. His wild and drunken habits continued, and, from mere caprice as much as anything else, he became more and more alienated from her.

Though Catherine was thus severely tried during those early years of her married life, the natural firmness of her character bore her through, and her great acute- ness and adroitness soon enabled her to gain firm footing in the court. She set herself resolutely to learn the Russian language, and soon

acquired a perfect mastery of it. She made herself thoroughly acquainted with the history, manners, and institutions of the country, and identified herself completely with the people around her, so that she became a thorough Russian in character and sympathies, and, when occasion required, knew how to move the Russian heart. The best foreign culture of her time, too, she made thoroughly her own, being an assiduous reader of French literature during the long inactive hours of her youth. Voltaire and the other philosophes of the 18th century were her favourite authors ; she professed to be a disciple of the new humanity they preached, expressed the highest reverence for them, and corresponded with some of them in after-life.

_in this way, while her husband wasted his life in every kind of grotesque extravagance, Catherine was engaged in cultivating her mind, and in learning to understand her

strange surroundings. Indeed the Russian court of that era was nearly as extraordinary as her husband. Since the death of Peter the Great (1725) the crown had been again and again a plaything in the hands of intriguing courtiers, mostly of German origin. To accomplish a revolution, to pull down one ruler and set up auother, and despatch the leaders of an opposing faction to Siberia, it was necessary only to gain over a few of the guards. In such a way had Elizabeth, youngest daughter of Peter the Great, won the crown in 1741. She had some natural capacity for com- mand, but lived in the utmost licence, in which she was only too perfectly imitated by the court. Placed in such a position as this, Catherine had a difficult part to play, and required for it all the deftness and insight of her nature. But she succeeded. She gradually acquired:a considerable influence over the mind of Elizabeth, who admired her cleverness and beauty. The courtiers of both sexes learned to respect her. Even Peter came to recognize the superiority of her understanding, and though he never liked her, used to ask her advice in his many perplexities. But she did not escape the contagion of the court. In accordance with the prevailing custom, she became involved in one love

intrigue after another. Consequently, when children were at length born of her (Paul, the eldest, in 1753), their paternity was matter of serious doubt,

In this way she lived till the beginning of 1762, when the death of Elizabeth opened the way to a very different career. The poor, half-imbecile Peter was now called on to leave his silly employments, and undertake the government of the most extensive empire in the world. All the schemes he embarked in were marked by a wild generosity and sense of justice; but, unhappily, in almost every one he managed to give deadly offence to the susceptible national spirit of Russia. Being a devoted admirer of the great Frederick, he gave back with impetuous haste all the advantages won in the Seven Years' War, sent home all the Prussian prisoners, restored the provinces torn from Prussia, and concluded peace and then an offensive and defensive alliance with his hero. Himself a Lutheran in his early years, he made little accofint of the religious etiquette of the Russian court, and still further alarmed the clergy by threatening to lay hands on the property of the church, while he grievously offended the soldiery by introducing the Prussian uniform and the severe Prussian drill. 'The ambition of Catherine would probably have been satisfied with the prospect of governing Russia through her husband, but he was too wayward a person to be an obedient instrument; and he soon publicly insulted her beyond forgiveness by compelling her to decorate his mistress, the Countess Woronzoff, with the order of St Catherine. This and other matters, and the growing alienation of a long and distasteful married life, brought on a crisis. It became clear that they could not live together; and Catherine began to adopt precautionary measures in self-defence. She had little difficulty in doing so most effectively. The Orloffs, influential persons in the Russian guards, were devoted to her ; the eldest, Gregory, was her lover. Those men, with the help of the Princess Dashkoff, Count Panin (the tutor of her son Paul), and others, planned the overthrow of Peter. Early on the morning of the 9th July (1762), Catherine was awakened at the palace of Peterhof by Alexis Orloff with the injunction to act immediately ; they had been betrayed. Accordingly, she set out for the capital, and finding Gregory Orloff on the spot, appealed to the guards, who were easily induced to raise the standard of revolt. In the church, the priests anointed her regent in the name of her son, while, outside, the Orloffs had her proclaimed empress in her own

right, After that, going in procession through the streets she was joyously sae empress of

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Russia, In the meantime, Peter, all unaware of what was going on, was busy drilling his favourite German guards at Oranienbaum. On proceeding to Peterhof he found that Catherine had vanished, and suspected the truth. He was urged to fight, but all his fortitude forsook him. Next day he abdicated, expecting freedom to retire to Holstein ; but he was compelled to proceed to Ropscha, where on the 17th, the Orloffs, after an unsuceessful attempt to poison him, strangled him with their own hands in the most revolting manner. Of this part of the proceedings Catherine seems to have had no knowledge. Thus easily, and apparently to the satisfaction of those concerned, was a revolution effected, by which a beau- tiful and ambitious woman, a foreigner, ascended the Russian throne, to the exclusion of the rightful occupants. For some time, however, Catherine did not feel quite secure, and had to trust to the influence of her admirers in suppressing diseontent. The soldiery at Moscow were disposed to resent the liberties taken by their compeers in the disposal of the crown, and even among the guards at St Petersburg doubtful symptoms appeared. But, eventually, they were all bribed or threatened into acquies- cence. A conspiracy formed to place on the throne Ivan (a descendant of a brother of Peter the Great), who had already been emperor a few months in 1740, also proved abortive, and cost that unfortunate prince his life. Ten years later (1773), a Cossack, Pugatcheff, who gave himself out for the dethroned Peter, raised an insurrection in the Volga region, which, being supported by many of the extreme orthodox party and by the peasantry, threatened to prove formidable. But the undisciplined bravery of his troops was of no avail against the forces of Catherine ; he was defeated, taken, and executed at Moscow. Her son Paul, whom she disliked and neglected, was placed under the strictest surveillance to the end of her reign.

As soon as she was securely seated upon the throne, Catherine began to attend to the foreign interests of her empire. Here she zealously observed the traditions of Russia. Debarred in so many ways from the free development of their resources, and surrounded in almost every direction by

weak and semi-barbarous neighbours, the Muscovites had been constantly aiming at the extension of their frontiers especially towards the sea. This policy Catherine took up, and no native Russian could have better carried it out in its calculating steadiness and wuserupulous- ness. One of her first steps (1763) was to expel the Saxon duke of Courland, and to put Biron, a ereature of her own, in his place; and by ceaseless intrigue she so managed things in Courland, that it was eventually glad to be in- corporated with the Russian empire (1795). Towards Frederick she took a threatening attitude at the beginning of her reign; but finding nothing offensive to herself in the correspondence of the king with her late husband, and seeing that great profit might be derived from the good-will of Prussia, she concluded with it an offensive and defen- sive alliance, which continued to the end of Frederick's reign.

It was chiefly with a view to Poland that this treaty of alliance was made. The first result of it was the advance ofa Russian army to the Vistula to compel the election of Poniatowski, an old lover of Catherine, to the throne of Poland (1763). But this was only the beginning of troubles. The old question of the toleration of dis- senters soon turned up; one confederation, that of Radom, was formed by a party of Polish nobles to enforce, and another, that of Bar, to resist toleration. Catherine supported the former. The confederation of Bar was defeated and broken up, and its members fled over the frontiers to Turkey and Austria (1768). The Turks, alarmed and incensed at the progress of Russia on Polish

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ground, fanatically rushed into a war (1768-1774) for

beaten both by land and sea.

[oF RUSSIA,

which they were not prepared, and were disgracefully The Russian arms marched vietoriously through Bessarabia, Moldavia, and Wallachia to the banks of the Danube ; while a fleet, led chiefly by English seamen, sailed from Cronstadt round the coasts of Western Europe into the Mediterranean,

and after sweeping the Levant burned the Turkish fleet in Tchesme Bay (1770).

After the Turks had been so thoroughly disabled,

Catherine had leisure ouce more to attend to the state of Poland. The libcrum veto, the freedom of confederation, the want of a middle class, the want of union and of a healthy publie spirit, the oppression and brutalizing of the peasantry, and many other causes, had reduced Poland to a state of incurable disease which it is impossible to describe. During the Seven Years' War the Russian armies had incessantly marched unchallenged over the Polish terri- tory ; that splendid opportunity for shaking off the northern incubus was allowed to passaway. Lately, famine and pesti- lence had so ravaged the country that pigs and dogs devoured the unburied bodies of men ; a loaf of bread could not be had for a hundred dueats. But it was from no bene- volent feelings towards Poland that Catherine wished to interfere with its territory ; instead of favouring the efforts made towards political improvement, her aim was simply to prolong the state of anarchy till she was ready to enter upon as large a share of it as possible. Frederick was the first to suggest a partial partition of Poland as the best way out of many existing difficulties. The project was dropped for a time, till Catherine took it up, and invited Prussia and Austria to join in it. An agreement was at last come to (1772) ; and a common fund was raised to bribe the Polish diet, which gave its consent the following year. Catherine, in this and the two ensuing partitions, seized the lion's share, in all about two-thirds of the Polish territory. By the peace of Kainardschi with the Turks (1774), who resigned all pretensions of supremacy over the Tartars in Southern Russia, Catherine was free to occupy all the northern shore of the Black Sea. One Tartar khan was expelled, aud another was induced to abdicate ; the Tartars were massa- ered, and a flourishing country reduced to a wilderness. The Crimea, Kuban, and Taman were finally annexed to the Russian empire (1783). Towards 1787 Catherine began to entertain still more magnificent sehemes of conquest. She made a progress as far as Kherson through the midst of flourishing towns, villages, and farms, by fine roads, amidst festivals and illuminations, all of which Potemkin had artificially extem- porized in the wilderness, in order to convince her how flourishing the recent conquests were. One of the gates of Kherson bore the inscription, '

This is the way to By- zantium," Catherine was going to fulfil the dreams of her French flatterers by chasing the Turk from Europe, and restoring the Byzantine empire. The Turks were aecord- ingly provoked into a new war (1787-92), and were again beaten everywhere. Important events in Poland, however, arrested the progress of Catherine on the Danube, and in- duced her to make a peace with Turkey (Jassy, 1792), by which the Dniester became the boundary between the two countries.

England and Prussia had been taking a hostile attitude to Russia. Under the furtherance of Hertzberg, the Prus- sian minister, many reforms had bcen introduced into Poland, and a constitutional hereditary monarehy estab- lished (1792). But a confederation of nobles, opposed. to these salutary changes, invoked the aid of Catherine, who was only too glad of an opportunity to interfere ; and as the progress of the French Revolution began to upset all existing political combinations, and to discredit everything

like constitutionalism in governing quarters; Prussia found it prudent to acquiesce in the arrangements of Catherine. She restored all the old abuses and seized upon whatever territory pleased her, allowing Prussia a small share of it (1793). The resulting attempt at a national rising of Poland under Kosciusko failed; the Russian armies entered the heart of Poland and stormed Warsaw (1794); and along with Austria and Prussia, Catherine effected the last partition in 1795.

Thus was an event consummated, which some historians denounce as the foulest deed in the history of the world, and others justify not only as necessary to the order and tranquillity of Europe, but as a vindication of Heaven's laws on those who have contemned them. In any case, Catherine must almost alone bear the responsibility of it, and in herit would be useless to seek for any other motive than an unscrupulous ambition. She had skilfully taken her measures for it, in securing the acquiescence or co-operation of Prussia and Austria, and in finally pushing it on while these and the other powers of Central and Western Europe were more and more involving themselves in the terrible struggles of the Revolution. She was a great hater of the Revolution; but while others were endeavouring to

suppress it, she profited by the oppor- tunity to accomplish the partition of Poland.

In the domestic government of Russia, Catherine professed to act on the principles she had learned from her French teachers. Most of her plans, however, proved illusory, in a country where all the elements and conditions of an ideal theory of government were wanting, even if Catherine had been perfectly resolute in her aims. The attempt to introduce a code of laws on the model of Montesquieu was a failure; but in the administration, especially the administration of justice, in the furtherance of education, of industry, and of commerce, real improve- ment seems to have been effected. All her schemes vitally suffered in two ways: from the absence of trustworthy public servants, and from the defects of her own character. In this, as in other reigns, bribery and corruption were prevalent to an extraordinary degree, and Catherine in- trusted the government to her favourites and to upstarts, to the exclusion of the nobility. In the capital, at her court, and in her own circle there reigned the most systematic immorality, which she encouraged by her example. French admirers used to call her the Semiramis of the North. Mr Carlyle calls her a female Louis Quatorze. She justified both comparisons by her beauty, her masculine ambition, and her summary disregard of virtuous restraint. One favourite was dismissed after another; but Potemkin eclipsed all others by the extra- ordinary union of qualities most requisite for success in Russia,—beauty, daring, extravagance, ambition,—and in the length of time his influence over Catherine continued. From 1775 till his death in 1791, that is, fora period of sixteen years, he was supreme; after Catherine's personal inclination for him had abated, he supplied her with new favourites and retained the power for himself, in all essential points directing Russian politics during that long period. To all her lovers she was munificent, not only during their season of favour, but after their dismissal, loading them with presents and pensions to such an extent, that altogether they are estimated to have cost Russia about £20,000,000. Towards the end of her reign discerning men began to fear that such extravagance, and the corrup- tion attendant upon such a state of things, might lead to the exhaustion of the empire. In fact, the magnificence of her court, the marvellous extent of her empire, her foreign conquests, and the imposing position she held

among the sovereigns of the world, only served to bring into more painful relief the moral corruption, the semi-

barbaric violence, the hard-hearted cruelty, and systematic unscrupulousness which characterized the Russian court and the Russian policy. Things grew worse towards the end of her reign. ‘The progress of the French Revolution damped all her sentimental enthusiasm for reform. The friend and correspondent of Voltaire and D’Alembert, and the patroness of Diderot, lived long enough to prohibit the publication of French works in Russia. She died of apoplexy in November 1796. The best account of Catherine’s early life is contained in the Memozrs written by herself in French, of which there is an English translation (1859). See also Hermann’s Geschichte Russ- lands ; Carlyle’s Friedrich the Second, vol. vi.; Rulhiére’s Histoire ou anecdotes sur la Révolution de Russie en Vannée 1762, and his Histoire de VAnarchie de Pologne. —(T. K.)

CATHERINE pe’ Menpicr (1519-1589), the wife of, one French king, and the mother of three, was born at Florence in 1519. She was a daughter of Lorenzo de’ Medici, that ruler of Florence for whom Machiavelli wrote the Prince. Having lost both her parents at an early age, Catherine was sent to a convent to be educated; and she was only fourteen when she was married (1533) to the duke of Orleans, afterwards Henry II. It was her uncle, Pope Clement VII., who arranged the marriage with Francis I. Francis, still engaged in his life-long task of making head against Charles V., was only too glad of the opportunity to strengthen his influence in the Italian Peninsula, while Clement, ever needful of help against his too powerful protector, was equally ready to hold out a bait. During the reign of Francis, Catherine exercised no influence in France. She was young, a foreigner, a member of a state that had almost no weight in the great world of politics, had not given any proof of great ability, and was thrown into the shade by more important persons. For ten years after her marriage she had no children. In con- sequence, a divorce began to be talked of at court ; and it seemed not impossible that Francis, alarmed at the possible extinction of the royal house, might listen to such a proposal. On hearing of it, Catherine, with her fine Ttalian tact, found her way into the presence of the king,

threw herself at his feet, and expressed her readiness to submit to the royal pleasure, either to remain the wife of his son, or in case another wife should be chosen, to be one of her humblest attendants. This appeal won the heart of Francis, the divorce was no more hard of, and Catherine had the happiness of bringing him grandchildren ere he died. During the reign of her husband, too (1549-1559), Catherine lived a quiet and passive, but observant life. Henry being completely under the influence of his mistress, Diana of Poitiers, she had little authority. This continued even after the accession of her son Francis II. Francis was under the spell of Mary Stuart, and she, little disposed to meddle with politics on her own account, was managed by her uncles, the cardinal of Lorraine and the duke of Guise.

On the death of Francis, Catherine became regent during the minority of her second son, Charles IX., and now found before her a career worthy of the most soaring ambition. ‘The new king was only ten years old. France was falling into a most critical condition. The opposition between the Reformation and the old religion was now beginning to assume a pronounced and openly hostile character, and the struggle was much intensified by the fact that most of the nobles who supported the Reformation represented also the old cause of feudal resistance to the centralizing tendencies of the court. The House of Guise were at the head of the Catholic party ; Coligny and the Prince of Condé were the leaders of the Huguenots. Michel ’Hopital, who, by the neutrality of his position and the disinterestedness of his character, was the fittest to

advise Catherine, recommended the national policy of taking no side in the contest,—by the enforcement of toleration, of civil reform, and of justice to all parties, to raise the Government above the region of controversy, and prevent civil war. Catherine took the advice in so far as to avoid siding decidedly with either party, but her character, and the habits of policy to which she had been accustomed, rendered her incapable of any noble aim. She had only one virtue, and that was her zeal for the interests of her children, especially of her favourite third son, the duke of Anjou. Like so many of the Italians of that time, who were almost destitute of a moral sense, she looked upon statesmanship in particular as a career in which

finesse, lying, and assassination were the most admirable, because the most effective weapons. By habit a Catholic, but above all things fond of power, she was determined to prevent the Protestants from getting the upper hand, and almost equally resolved not to allow them to be utterly crushed, in order to use them as a counterpoise to the Guises. Thus she is, more than any one else, responsible for the thirty years of civil war that was thenceforward to devastate France. For a time her plan succceded well enough. At the battle of Dreux (1562) the Huguenots were defeated by the duke of Guise; and at the siege of Orleans, the duke himself, now her most formidable rival, fell by the hands of an assassin. She had undoubtedly become the most important personage in France, but rage and suspicion so possessed men's minds, that she could no longer control the opposing parties, and one civil war followed another to the end of her life. But it is with the massacre of Bartholomew (24th August 1572) that her name will be especially associated in history. While the affection of the young king for Coligny inspired him with groundless confidence, Catherine decoyed the Protestant leaders to Paris by the prospect of a marriage between Henry of Navarre and her daughter Marguerite. Anxious for her own influence over Charles [X., and true to her favourite plan of perpetuating the feud between the Huguenot leaders and the House of Guise, she wrought upon the king's mind till he consented to the death of Coligny, while the unprincipled hate of the Guises and the fanaticism of the mob did the rest. In short, Catherine supplied all the preliminary conditions of the massacre, and then let loose the infuriated passions that were to con- summate it. After the death of Charles in 1574, and the succession of Anjou under the name of Henry IIL., Catheriue pursued her old policy; but as her influence is lost in that of her son, it is unnecessary to dwell upon it. She died in 1589, a short time before the assassination of Henry, and the consequent extinction of the House of Valois.

(See Martin's Histoire de France, vol. ix.; Michelet ; Ranke's Geschichte Frankreichs, vol. i.

CATHERINE or Aragon (1485-1536), the first queen of Henry VIIL, and the youngest child of Ferdinand and Isabella of Spain, was born the 15th December 1485, while her mother was on her way to Toledo from the Spanish army, then engaged in the conquest of Granada. The first four years

of her life were passed in the camp before Granada ; after the taking of the city it became the capital and the residence of the court. Here, then, Catherine spent her youth, carefully educated by her mother, herself a woman of no common learning and ability, during a period of marvellous prosperity for Spain, while the Moors were being finally conquered, America was discovered, and the Spanish chivalry was in its very bloom. In 1501, being requested in marriage by Henry VII. for his eldest son Arthur, Cathcrine embarked at Corufia, landed at Ply- mouth the 2d October, aud, with the usual pageantry, was united to Arthur the month following. Their marriage was of no long duration ; in the April of next year Arthur

died. His widow, however, continucd to reside in England, as proposals were made and accepted for her betrothal to Henry, second son of Henry VII., now heir-presumptive tothe throne. Catherine, already eightcen, was disinclined to an engagement with a boy of thirteen; nevertheless the ceremony of betrothal took place in 1503. The mar- riage did not take place till 1509, after the accession of Henry to the throue, a dispensation from the Pope having been procured, The carly years of the marriage were happy enough. Henry was a handsome, affable, and jovial king, fond of magnificent display, covetous of distinction in the tilting ground, and ambitious of popularity. His wife had the good sense to humour him in his favourite diversions, while she herself lived a dignified self-denying life of almost conventual strictness, conscientious in the perform- ance of her religious duties, devoted to her husband, kind to her friends, charitable to her cnemies, and careful of the interests of her adopted country. In the year of Flodden (1513) she was regent of the kingdom during the absence of Henry in France, and performed the dutics of that office with great courage and ability. But the repeatcd loss of children cast a gloom over those years. Three sons died almost as soon as they were born; Mary, a sickly child, born in 1516, was the only survivor.

It was not till 1527 that Henry’s scruples as to the vali- dity of his marriage with Catherine became public, though there can be no doubt his affections had been alienated from her long before. It was anticipated by Henry and Clement that the conventual habits of Catherine would have rendered it easy for her to retire from the throne, and spend the rest of her life in a monastery. But they were mistaken; however submissive she might be to

her husband in everything else, and however ready to act charitably towards the minor irregularities of his conduct, she was resolved not to allow any doubt to be cast upon the legality of their marriage or the title to the thronc of her daugliter Mary, nor to surrender any of her rights as qucen. This the Papal legate, Campeggio, soon found out on his arrival in England in 1528. Aftcr Jong hesitation, and much tortuous diplomatic manceuvring on the side of the Pope, a court, consisting of the legates Campeggio and Wolsey, was at last constituted, 28th May 1529, at Black- friars, to hear the case of the royal parties. Catherine appeared only to protest agaiust the legality of the court; and then after a solemn address to the king for justice, appealed to the Pope, and withdrew. Notwithstanding the proceedings for the divorce, and the fact that Henry had brought Anne Boleyn to live in the palace, Catherine and he were not quite separated til] the beginning of 1531, when, finding he could not prevail upon her to withdraw her appeal to the Pope, or in any way to give up her passive resistance, he commanded her to retire from Windsor. After that she never saw him again, nor her daughter Mary. Her residence was often changed; but it was principally at Ampthill. At length an open declara- tion of the Pope against Henry obliged the monarch to solve the difficulty by the assertion of the royal supremacy (1531). Ina court held at Dunstable, Cranmer, recently appointed archbishop of Canterbury, pronounced the mnarriage of Henry and Catherine null and void (1553). Naturally, Cathcrine, though still as cliaritably disposed as ever towards Henry, treated this and all other attempts to deprive her of her rights with resolute contempt. Her health, which had begun to fail long before the divorce was agitated, now completely gave way. After writing a letter of forgiveness and of gentle admonition to her husband, and taking all the care she could of her faithful attendants, she died at Kimbolton Castle the 7th January 1536. (Sec Miss Strickland’s Queens of England, vol. iv.; Froude, vol, 1.; Lingard, vol. v.)

CAT—CAT

CATHERINE or Bracanza (1638-1705), queen of Charles IJ. of England, was born at Villa Vicosa in Portugal, 25th November 1638. Her father, John, duke of Braganza, who was rightful heir to the crown of Portugal, then under Spanish sway, headed the revolt of 1640, which after many years’ fighting succceded, and became king of Portugal. Her mother was a

woman of great ability, and governed Portugal after the death of her husband. She was penetrating enough to foresee the Restoration in England, and, some years before, proposed the marriage of Charles with her daughter Catherine, in order to secure an ally in the prolonged struggle against Spain. After the Restoration the marriage was agreed upon, not without much diplomatic manceuvring, especially on the side of Spain, which was naturally averse to it, The marriage treaty was very advantageous to England, as the Portuguese promised a dowry in money of £500,000, the towns of Tangier and Bombay (the first English possession in the East), and many privileges of trade with their colonial dependencies. On his marriage at Plymouth, 13th May 1663, Charles expressed himself highly pleased with his Portuguese bride. But the union did not prove ahappy one. Catherine had been brought up ina convent, and therefore had not the tact and the manners suited to one of the most fashionable and profligate courts of Europe. But the principal fault lay in the heartless and inconstant nature of Charles. He insistcd on bringing to court his abandoned mistress, Lady Castlemaine, and, when the queen expressed her indignation at the insult, made Clarendon himself lecture her on the duty of submission. Gradually Charles's neglect of her grew into a feeling of settled aliena- tion, and after repeated humiliations her spirit was broken. Being a Roman Catholic, too, she was an object of suspicion and calumny during the Popery panics. Perhaps the only satisfaction she enjoyed from her connection with England was the decisive aid rendered by the country to her native land in its struggle against Spain. After a life of great retirement during the reign of James II. and the early part of that of William, she returned to Portugal in 1692. Some little time before her death (at the close of 1705), she actcd with great ability in the capacity of regeut to her brother, Don Pedro, She had no children.

CATHERINE oF Vatois (1401-1437), consort of Henry V. of England, was born at Paris in 1401. She was most unfortunate in her early years; for her father, Charles VI., king of France, was subject to prolonged fits of insanity, and her mother, one of the most abandoned women of her time, neglected her children to such an extent that they were often without suitable food and clothes. At last, in one of his lucid intervals, Charles had her children separated from their mother, and Catherine, the youngest of them, was sent to a convent to be educated. On his accession to the English throne in 1413,

Henry V. asked Catherine in marriage ; but as the proposal was coupled with the demand of a large dowry in Imoney, and especially the restitution to England of the provinces once held in France, it was unceremoniously rejected. In the invasion of France which ensued, Henry proved himself so able to assert his claims, and the country had been thrown into such a state of distress and disorder, that the court of Charles, then under the control of Philip of Burgundy, was fain to comply with all the demands of the English king. Accordingly Henry, who had already seen and loved Catherine, received her in marriage at Troyes in 1420, and, along with her, the immediate possession of the provinces claimed, the regency of France during the life of his father-in-law, and the Teversion of the sovereignty of France. Early next year Catherine was solemnly crowned at Loudon. In December 1421, Henry VI. was born at Windsor. Catherine was

again in France, when her royal husband died (1422). She returned to London with the funeral cortege ; but, after taking some part in the arrangements connected with the regency during her son's minority, she almost dis- appears from the history of the country. The only remarkable circumstance of her subsequent life is her secret marriage. Her second husband, Owen Tudor, was sprung from a princely house of Wales, had followed Henry to his French wars, and had been made a squire of his body for bravery displayed at Agincourt.' Subsequently, he became au officer in the queen's household, and in this capacity gained her affections. He seems to have been aman of high character; but as his position in England was of the lowest, the marriage was for many years kept a profound secret. The vexations the queen had to endure in consequence of its ultimate disclosure probably hastened her death, which took place in 1437. As is well known, her eldest son to Owen Tudor was created earl of Richmond, and, marrying Margaret Beaufort, the heiress of the house of Scmerset and representative of the junior branch of John of Gaunt, became the father of Henry VIL, and the ancestor of the Tudor line of kings.

CATHOLIC (Gr. xafoArkds, general, universal), a desig- nation adopted at a very early period by the Christian church to indicate its world-wide universality in contrast with the national particularism of Judaism. It has

also been used by ecclesiastical writers, from Ignatius down- wards, to denote the church as the depository of uni- versally-received doctrine (quod semper, quod ubique, et quod ab omnibus) in contrast with heretical sects. In the latter or exclusive sense it is still claimed on the ground of historic continuity by the Roman Catholic Church ; but the claim, in so far as it is exclusive, is, of course, not recognized by other Christian denominations, See Roman CaTHOLIC CHURCH.

CATHOLIC APOSTOLIC CHURCH, a religious com- munity often called " Irvingites," but uot itself acknow- ledging any other name than that of " the Catholic Apostolic Church," which, the members say, belongs to them in commou with the whole of baptized Christendom. The relation of the celebrated preacher Edward Irving to this community was, as they state it, somewhat similar to that of John Baptist to the early Christian church, 7.e., he was the forerunner and prophet of the coming dispensation, not the founder of a new sect; and indeed the only connection which Irving seems to have had with the existing organization of the Catholic Apostolic body was in " fostering spiritual persons who lad been driven out of other congregations for the exercise of their spiritual gifts." Shortly after Irving's trial and deposition, certain persons were at some meetings held for prayer designated as "called to be apostles of the Lord" by certain others claiming prophetic gifts. In the year 1835, six months after Irving's death, six others were similarly designated as " called" to complete the number of the " twelve," who were then formally "separated" by the pastors of the local congregations to which they belonged to their higher office in the universal church on the 14th July 1835. This separation is understood by the com- munity not as "in any sense being a schism or separation froni the one Catholic Church, but a separation to a special work of blessing and intercession on behalf of it." The twelve were afterwards guided to ordain others,—twelve prophets, twelve evangelists, and twelve pastors, " sharing equally with them the one Catholic Episcopate," and also seven deacons for administering the temporal affairs of the Church Catholic. The central episcopacy of eight-and- forty was regarded as "' indicated by prophecy," being fore- shown in the forty-eight boards of the Mosaic Tabernacle. For ecclesiastical purposes the church universal is under their charge in twelve tribes; for Christendom is considered

to be divided into twelve portions or tribes, each tribe being under the special charge of an apostle and his co- ministers, and the seat of the Apostolic College being at Albury in England.

For the service of the church a comprehensive book of liturgies and offices was provided by the “apostles ;” and lights, incense, vestments, holy oil, water, chrism, and other adjuncts of worship have been appointed by their authority. The ceremonial in its completeness may be seen in the church in Gordon Square, London, and elsewhere. The daily worship consists of ‘‘ matins” with “ proposition” (or exposition) of the sacrament at 6 A.M., prayers at 9 A.M. and 3 p.M., and “vespers” with “proposition” at 5 P.M. On all Sundays and holy days there is a “solemn celebra- tion of the Eucharist” at the high altar; on Sundays this is at 10 a.w. On other days “‘low celebrations” are held in the side-chapels, which with the chancel in all churches correctly built after apostolic directions are separated or marked off from the nave by open screens with gates.

Each congregation is presided over by its “angel” or bishop (who ranks as pastor in the Universal Church) ; under him are four-and-twenty priests, divided into the four ministries of ‘elders, prophets, evangelists, and pastors,” and with these are the deacons, seven of whom regulate the temporal affairs of the church—besides whom there are also ‘“‘sub-deacons, acolytes, singers, and door- keepers.” The understanding is that each elder, with his co-presbyters and deacons, shall have charge of 500 adult communicants in his district; but this has been but par- tially carried into practice. This is the full constitution of cach particular church or congregation as founded by the “restored apostles,” each local church thus “reflecting in its government the government of the Church Catholic by the angel or high priest Jesus Christ, and His forty-eight presbyters in their fourfold ministry (in which apostles and elders always rank first), and under these the deacons of the Church Catholic.” The priesthood is supported by tithes ; it being deemed a duty on the part of all members of the church who receive yearly incomes to offer a tithe of their increase cvery week, besides the free-will offering for the support of the place of worship, and for the relief of distress. Hach local church sends “a tithe of its tithes” to the

“Temple,” by which the ministers of the Universal Church are supported ; by these offerings, too, the needs of poorer churches are supplied, and other expenses connected with the administration of the Church Catholic. From recent statements made by members of this com- munity it appears to be making steady progress. It claims to have among its clergy many of the Roman, Anglican, and other churches, the orders of those ordained by Greek, Roman, and Anglican bishops being recognized by it with the simple confirmation of an “ apostolic act.”

For further details of doctrines, ritual, &c., see Restoration of Apostles and Prophets, by R. N. Bosworth; also his Readings on the Liturgy, and The Chureh and Tabernacle.

CATILINA, Lucrus Sercius, a member of an ancient patrician family of Rome, first appears in history during the proscription of Sulla, conspicuous among the ruthless band of murderers, slaying his inoffensive brother-in-law with his own hand, and torturing and mutilating the much- loved Gratidianus. His foul vices were unconcealed; he was believed to have made away with his wife and his son to win the profligate and wealthy Aurelia Orestilla; it was even suspected that he had been guilty of an intrigue with the Vestal Fabia. Nevertheless, in 66 3B.c., he found himself qualified for the consulship, and ‘only incapacitated by the impeachment brought against him by P, Clodius Pulcher for extortion during his government in Africa, Catiline would not brook even delay in his

advance to power, and accordingly he formed a conspiracy, in which Autronius, Piso, and even, according to rumour, Crassus and Ceasar were concerned. The new consuls were to be murdered while offering up their vows on the 1st of January; andthe fasces were to be seized by Catiline and Autronius, The plot failed, but only be- cause the signal was given too hastily; and the discovery brought no punishment upon those implicated, for the intervention of a tribune was readily obtained. Soon after, Catiline, having bribed both judges and accuser, was acquitted in the trial for extortion. His scheme was forthwith immensely widened. The city was to be fired, and those who opposed the revolution were to be slain; all debts were to be cancelled; and there was to be a proscription of all the wealthy

citizens. Among the conspirators were many men of the first rank and influence. Arms and money were collected, soldiers were enlisted, and the assistance of the slaves was sought. But Catiline's hopes were again disappointed; once more he failed to obtain the consulship; and, moreover, it soon became apparent that one of the new consuls, Cicero, was mysteriously able to thwart all the schemes of the con- spirators, He was, in fact, informed of every detail, through Fulvia, the mistress of Curius, one of the plotters, who was himself soon persuaded to turn informer. Before the next comitia consularia assembled, the orator had given so impressive a warning of the danger which was impending, that Catiline was once more rejected and the consuls were invested with absolute authority, The other consul, C. Autronius, being absent in Macedonia, Cicero had every- thing in his own hands. On the 8th of November, he again rose in the senate to make so vigorous an attack upon Catiline that he rushed from the temple, amid the curses of the senators, and fled to the army. Next day Cicero awoke the terror of the people by a second declaration which he delivered in the Forum. Still not one of the rebels deserted, though a free pardon and great rewards were offered to informers,—a remarkable proof, it has been said, of the wretchedncss and discontent of the lower orders at that time. It has also, however, been suggested that there existed uo conspiracy of a kind concerning which any member of the lower orders could give information. Legal evidence of the plot was, nevertheless, obtained by the means of the Allobrogian ambassadors, implicating Lentu- lus, Cethegus, and Statilius, who, on the noues of De- cember, were condemned to be strangled by the common executioner in the vile dungeon of the Capitol. This act of speedy vengeance, which was opposed as illegal by Julius Czesar, was strenuously advocated by Cato and, indirectly, by Cicero. Thus a heavy blow was dealt to the cause of Catiline, who, in the beginning of 62 B.c., saw his legions, partially armed and diminished by desertion, shut in between those of Metellus Celer and Antony. Near Frsule he hazarded battle with the forces of the latter, commanded by M. Petreius, for the proconsul was or pretended to be ill, So terrible an engagement ensued that the bravest of the victors were slain, and of the con- quered not one was taken alive. Catiline's body was found far in advance of his own ranks, amidst a heap of the enemy whom he had slain.

Such is the account of the conspiracy of Catiline, and such is the character of its author, as we find them in the speeches of Cicero, and the histories of Sallust and Dion Cassius. Though there is nothing incredible in either, it must not be forgotten that our sole authorities for these statements were all members of one political party, and that the aristocratical. Some of the incidents given as facts by Dion Cassius are manifest absurdities ; and Cicero shared the common habit of ancient orators, and paid more regard to the effect than the truthfulness of an accusation,

We find him at one time admitting that Catiline had almost persuaded him of his honesty and merit, nay, even seeking a political union with him; at another, when his alliance had been rejected and an election was at hand, declaiming against him as a murderer, and as a profligate horribly conspicuous among profligates. And, lastly, though Sallust's vivid narrative is consistent throughout, it is not hard to see that he cherished very bitter feelings against the democratical party. Nevertheless, we have certainly no ground for accepting the view which makes Catiline a worthy successor of the Gracchi, an honest enemy of the hateful oligarchy, and a disinterested champion of the pro- vincials. 'The following is probably as accurate a statement of the case as can now be given. There was at the time on the part of many of thc Roman nobles a determination to raisc themselves to power, despite the opposition of the senate, while the bolder amoung them were quite prepared to resort to force, if that appeared likely to be for their advantage. When, therefore, the senatorial party successfully assumed the aggressive, and its leader, Cicero, ventured on the bold course which we have described, they at once took up arms. Among them Catiline stands out conspicuous, and receives all the attacks of their enemies. Whether he was morally worse than the rest we cannot say with confidence ; it was enough that he was far the foremost in force of body and of mind.

CATLIN, Gzorce (1796-1872), a writer on the North American Indians, was born at Wilkesbarrc, Luzerne Co., Pennsylvania, in 1796. He was brought up to the law, and practised that profession in Philadelphia for two years ; but art was his favourite pursuit, and forsaking the law he established himself at New York as a portrait painter. In 1832, his attention having been

called to the fact that the pure American race was disappearing before the march of civilization, he resolved to rescue from oblivion the types and customs of this singular people. With this object in view he spent many years among the Indians in North and South America. He lived with them, acquired their languages, and studied very thoroughly their habits, customs, and mode of life, making copious notes and many studies for paintings. In 1840 he came to Europe with his collection of paintings ; and in the following year he published at London a work on the Manners, Customs, and Condition of the North American Indians in two volumes, illustrated with 300 engravings. In 1844 he published Zhe North American Portfolio, containing 25 plates of hunting scenes and amusements in the Rocky Mountains and the prairies of America, This was followed in 1848 by Hight Years' Travels and Residence in Europe, in which Catlin narrates the adventures of three different parties of American Indians, whom he had introduced to the courts of England, France, and Belgium. In 1861 he published a curious little volume, in " manugraph," entitled Zhe Breath of Life, on the advantage of keeping one's mouth habitually closed, especially during sleep ; and in 1868 appeared his Last Rambles amongst the Indians of the Rocky Mountains and the Andes. He died in Jersey City, New Jersey, December 22, 1872.

CATMANDOO, the capital of Nepal, in India. KHATMANDU.

CATO, M. Porctus, surnamed Sapiens, Priscus, Cen- sorius, or Major, was born at Tusculum in the year 234 B.c. of an ancient plebeian family, noted for some military services, but not ennobled by the discharge of the higher civil offices. This man may be taken as a type of the genuine Roman character at the critical moment when the free state was in its fullest vigour, but was threatened with sudden and rapid decline. His early youth fell in with the period of Hannibal's invasion of Italy. Before he had teached middle age Rome had escaped from imminent

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danger of destruction, and had centered upon its career of universal conquest beyond the limits of the Italian peninsula, He was bred, after the

manner of his Latin forefathers, to agriculture, to which he devoted himself assiduously when not engaged in military service. But having attracted the notice of L. Valerius Flaccus, a magnate of the city, he was brought to Rome, and became successively questor (204), edile (199), praetor (198), and consul (195). Meanwhile he served in Africa under Scipio, and took part in the crowning campaign of Zama (202). He had a command in Sardinia, where he first showed his strict public morality, and again in Spain, which he reduced to subjection, and gained thereby the honour of a triumph (194). In the year 191 he acted as military tribune in the war against Antiochus, and con- tributed to the great revolution by which Greece was finally delivered from the encroachments of the East, and sub- jected to the dominion of the West. From this period the morals and principles of the Romans became fatally affected by their contact with the advanced and corrupt civilization of the Hellenic world. Cato was among the first of his countrymen to perceive the danger, and to denounce it. His character as an able soldier was now well established ; and henceforth he preferred to serve the state in the Forum at home. For scveral years he occupied himself in scrutinizing the conduct of the candidates for public honours, and whenever he seemed to detect in them a decline from the stainless virtue of the olden time, he persistently opposed their claims. He questioned the “ pretended battles” of Minucius Thermus, and baffled his demand for a triumph (190); he denounced the “ pecula- tion” of Acilius Glabrio, the conqueror of Antiochus (189) ; he declaimed against Fulvius Nobilior for meanly flattering his soldiers, and for carrying about with lim in his campaigns a “frivolous verse-writer,” such as Ennius. If he was not personally engaged in the prosecution of the Scipios (Africanus and Asiaticus) for corruption, it was by his spirit that the attack upon them was animated. Africanus, indeed, refused to reply to the charge, saying only, ‘Romans, this is the day on which I conquered Hannibal,” and the citizens absolved him by acclamation ; nevertheless, so marked was the blot which Cato had hit in the character of the self-seeking commanders of the time, that Africanus himself found it necessary to retire sclf- banished to his villa at Liternum.

But Cato was engaged in making head against corruptions more deeply-scated and more widely-prevalent than these. The pride of conquest, the infection of foreign manners, and the dissolution of national ideas and

prejudices had made formidable inroads upon the narrow simplicity of the ancient Romans. Both the Etruscans and the Greeks were imbued with a more refined and artificial culture ; and with their higher education and enhanced power of persuasion, both these peoples were now exerting a powerful influence upon the minds of their conquerors. Cato conceived it to be his special mission to resist this invasion. It was in the discharge of the censorship that his character as a maintainer of primitive discipline was most strongly exhibited, and hence that he derived the title by which he is most geuerally distinguished. He revised with unsparing severity the lists of senators and knights, ejecting from either order the men Whom he judged unworthy of it, either from their want of the prescribed means, or from notorious crimes or vices. The expulsion of the great imperator L. Quinctius Flamininus was a splendid example of his rigid justice. He regulated with pedantic strictness the expenses of the table, and also of dress and personal ornament, especially of the women. He contended gallantly, but even more ineffectually, against bribery at the public elections; and though he gained little success in the crusades to which

he thus religiously devoted himself, it may be allowed that the example of the great censor did actually raise and maintain a higher spirit of public morality among his con- temporaries, and gave encouragement and strength to many struggling consciences even in later generations.

From the date of his censorship (184) to his death iu

149, Cato held no public office at home or abroad; but continued to the last to distinguish himself in the senate as the persistent opponent of the new ideas and the men who supported them. He was struck with horror, along with many other Romans of the graver stamp, at the licence of the Bacchanalian mysteries (181), which he attributed to the fatal influence of Grecian manners ; and he vehemently urged the dismissal of the sophists who came as ambassadors from Athens. It was not till his eightieth year that he consented to learn even the rudiments of the Greek language. His speeches, of which as many as 150 were collected, were principally directed against the young free-thinking and loose-principled nobles of the day. It is hard to say, was the remark of Livy, whether he attacked them most or they

him ; for they too did not fail to retaliate, and when he was required to defend himself in his eighty-first year against a capital charge, he was heard to complain of having to plead his cause before men of other minds and of another generation. Almost his last public act was to urge his countrymen to the third Punic war and the destruction of Carthage. Rome, he constantly declared, could never be safe while so great a city lay so near her ; and he plucked, on one occasion, from under his robe the fresh figs which, he said, had been gathered but three days before on the coast which fronted the mouth of the Tiber, exclaiming again and again, * Delenda est Carthago !”

The great principle of Cato’s life was to do everything by rule. With him the individual life was a continual disci- pline, and public life was the discipline of the many. He regarded the individual householder as the germ of the family, the family as the germ of the state. All his actions were measured, and every one assigned to its proper place and hour; he was a great economist of his time, and thereby enabled himself to get through a great variety of work, though it all lay within narrow limits. He exacted similar application from his dependents, and proved himself a hard husband, a strict father, a severe and cruel master. There was little difference, apparently, in the esteem in which he held his wife and his slaves; his pride alone induced him to take a deeper interest and indulge a warmer feeling in regard to his sons. It may be remarked, however, that among the Romans themselves there was little in this behaviour which seemed worthy of censure ; it was respected rather as a traditional example of the old Roman manners. In the remarkable passage in which Livy describes the character of Cato (Hist., xxxix. 40), there is no word of blame for the rigid discipline of his household.

During the course of his long and industrious life, Cato contributed to the formation of the Latin language by at least two important works, the treatise De Ke Rustica, which is supposed to be at least substantially his own, and the Origines, of which last only fragments remain. The one is a miscellaneous collection of rules of good husbandry, conveying much curious information on the domestic habits of the Romans of his age, the other seems to have been a more methodical compilation of Roman history from the foundation of the city to his own time. The fragments which remain of it furnish us with information which is often interesting, but

sometimes perplexing, and it is observed that Livy seems to have made no use of the work of which he could not have been ignorant. Of the numerous speeches of Cato but few passages have been pre- served. His collection of Apophtheymeta—he was himself

curt, caustic, and sententious in conversation—is wholly lost.

We possess the life of Cato as written by Cornelius Nepos, Plutarch, and Aurelius Victor. Many particulars of his career and character are to be gathered from Livy and Cicero, (Cc. M.)

CATO, M. Porctus (commonly distinguished from his great-grandfather, Cato the Censor, by the title of Uticensis, from the place of his death and the renown attending upou it), furnishes a remarkable specimen of the effect of Hellenic training upon the hard and narrow but determined spirit of the old Latin race. While he inherited from his illustrious ancestor, and from the general discipline of his family through many generations, a sour and severe temper, a pedantic adherence to form and usage, and an utter lack of sympathy with any temper or habits alien from his own, his feelings had been deepened, if not expanded, by the study of the Greek philosophy. As a devoted follower of the Stoic teaching he had attained to very lofty principles, and made them, with almost undeviating consistency, the rule of his life and conduct. He became a fanatic in the pursuit of holiness and pureness of living, in the highest sense in which such graces could be acquired by a pagan, with a view to himself and his own perfection only, but with no love of man and no faith in Providence. He waged a brave but hopeless war against the evil tendencies of his age; but he attached to himself no party, gave strength to no cause, effected no good in his generation, aud at the last critical moment betrayed his trust to humanity by fleeing from immediate evil by an unreflecting suicide. But his aims were, for the times in which he lived, generous and noble, and his career well deserves to be studied by succeeding generations, It is only in a very slight outline that it can be here presented.

Cato was born in the ycar 95 B.c., and on the death of his parents was brought up in the house of his uncle, Livius Drusus, who was just then

beginning to incite the Italians to claim a share in the Roman franchise and its privileges. This was the commencement of the intestine troubles of the Republic, and the whole of Cato's after-life was passed amidst domestic dissensions and civil wars. In his early years he expressed with striking boldness his dis- gust at the cruelties of Sulla. The priesthood of Apollo, to which he early consecrated himself, commended him to a life of rigid observances, and gave a great impulse to his fervid imagination. He learned the principles of the Stoics under a Greek teacher named Antipater, but his oratory in the Forum represented only the harsh, vehement, and caustic type of his Roman countrymen. After fighting in the ranks against Spartacus he became a military tribune, 67 B.c., and served a campaign in Macedonia. On his return he obtained the questorship, and distinguished Limself for his zeal and integrity in the management of the public accounts, which recommended him for a provincial appointment in Asia. Again he acquitted hin- self with marked disinterestedness, and conceived a disgust equal to that of his great ancestor at the corruption of the public men with whom he came in contact. He saw, however, much to admire in the discipline which Lucullus had enforced in his own Eastern command, and he supported his claims to a triumph, while he opposed the inordinate pretensions of Pompeius. When the favour of the nobles gained him the tribuneship he cxerted himself to convict Murena, one of their chief men, of bribery. Cicero, more pliant than himself, defended the culprit and obtained his acquittal ; but Cicero was glad to avail himself of the firmness and stern justice of his recent adversary, when he urged the execution of Catilina's associates. By this time Cato had become a great power in the state. Though possessed of little wealth and no family influence, his

character for unflinching resolution in the cause of the ancient free state rendered him a valuable instrument in the hands of the nobles, perplexed as they were by the open hostility of Caesar and the oppressive patronage of Pompeius aud Crassus. They were the better disposed, perhaps, to make use of him from the oddity of his unpractical temper, which made it the easier for them occasionally to dis- claim and repudiate his assistance. They did not, in- deed, find him so complacent a dupe as Cicero, nor did they treat him more faithfully. They thrust him into the snare prepared for him by the

triumvirs, and Jet him be sent ona mission of gross injustice towards the king of Cyprus, which his pedantic loyalty to the state forbade him to refuse. He continued to struggle against the combined powers of the triumvirs in the city, and became involved in scenes of violence and riot, while desperately resisting the superior force of their turbulent adherents. He suc- ceeded, however, in obtaining the pretorship in 54, in which office he strenuously exerted himself in the hope- Jess aud thankless task of suppressing bribery, in which all parties were equally interested. Resolved not to stoop to such practices himself, he failed to attain the con- sulship ; and he had made up his mind to retire from the arena of civic ambition when the civil war broke out in 49.

Cato had now persuaded himself that the sole chance for the free state Jay in conceding an actual] supremacy to Pompeius. Accordingly he did not scruple to support the unjust measures of the nobles against Cwsar, which gave too fair a colour to the invasion of Italy. Cato was, indeed, little prepared for his commander's flight across the Adriatic, and the surrender of the city, the government, and therewith the ostensible right, to the victorious rebel, Though he followed Pompeius to Epirus he found little satisfaction in his camp, where the fugitives were loudly threatening a bloody vengeance on their enemies, He excused himself from accompanying the forces of the Senate into Thessaly, by which he escaped being present at the battle of Pharsalia, After that great disaster, when his chief had abandoned his party and provided only for him- self, he too felt at Jiberty to separate himself from the main body of the republicans, and conducted a small remnant of their forces into Africa. His march through the deserts of Libya gained him immortal glory. The struggle between the senate and Cesar was renewed in the African province. Cato shut himself up in Utica, and prepared to defend it as the most important post for communication with Italy. The battle of Thapsus, and the tota] rout of the senatorial forces, now threw upon him the whole weight of maintaining a cause which had become evidently desperate. The people of the place were anxious to make terms with the victor ; but he would not trust the Roman citizens and soldiers to the clemency of the heir of Marius. Hitherto the civi] wars of Rome had been con- tinually marked by bloody retaliation; even if Czsar himself were disposed to mercy he might not be able to restrain the violence of his allies; and it was rumoured that terrible

execution had been inflicted upon the captives of the Jast battle. Accordingly Cato determined to keep the gates closed till he had sent his adherents off by sea. While the embarkation was in progress his own demeanour continued calm and dignified. He supped familiarly with his friends, discoursing with them, as was his wont, on philosophical topics. On being informed that the last of the transports had left the port he cheerfully dismissed his attendants, and soon afterwards stabbed himself on his couch. Assistance was promptly offered, but he refused to avail himself of it, and so perished, much, it may be said, to his own fame, but with little advantage to his country (46 B.c.) :

Cato had been reading, we are told, in his last moments

Plato’s dialogue on The Jnumortality of the Soul, but it is not likely that the Stoic, with his keen and rigid logic, put much faith in the vague aspirations of the idealist of Academus. His own philosophy had taught him to act upon a narrow sense of immediate duty without regard to future con- tingencies. He conceived that he was placed in the world to play an active part, marked out by circumstances, and when disabled from carrying out his principles, to retire gravely from it. He had lived for the free state, and it now seemed his duty to perish with it. Czesar had slain the commonwealth ; it never occurred to him that Cesar himself was mortal, and that the commonwealth might live again. Had he condescended to ask his life, the conquerors would have been proud to grant it; in two years more he might have been the survivor, for he was hardly yet fifty years of age, and might have formed a rallying point for the few devoted spirits, though few indeed they were, who really cared for freedom. Cato has left perhaps, from the cir- cumstances of his life and of his death, the most marked name in the history of Roman philosophy, but he was a student, possibly a dreamer only, composed no works, and bequeathed to posterity no other instruction than that of his example. The memory of his career proved indeed fruitful. The school of the Stoics, which took a leading part in the history of Rome under the earlier emperors, looked to him as its saiut and patron. It continued to wage war against the empire, hardly less openly than Cato himself, for two

centuries, till at last it became actually seated onthe im- perial throne in the person of Marcus Aurelius. (c. m.)

CATO, Dionysius, a name concerning which it is doubtful whether it be the name of the author, or merely part of the title, of the Dionystt Catonis Disticha de Moribus ad Filium, a small work, consisting of moral apophthegms, chiefly in hexameters. The name usually given is simply Cato, but Dionysius is added on the authority of a MS. declared by Scaliger to be of great antiquity. Other titles by which the book is known are Cato Moralissimus and Cato, Carmen de Moribus. The latter is also the title of a work by the famous M. Cato the elder ; but extracts given from this by Aulus Gellius prove that it was inprose. The authorship of the Disticha has been ascribed to a large number of persous, including Seneca and Boetius, but in truth we know nothing of the writer, or of the exact time when it was written. The style is generally pure, and the existence of occasional corruptions argues little against its antiquity, since interpo- lations have certainly been made, and not improbably emen- dations attempted. The first mention of the work which we find is in a letter addressed to Valentinian; it is also referred to by Isidorus and Alcuin, and frequently by Chaucer. It appears to have had considerable reputation in the Middle Ages; and at the revival of learning it was studied and highly praised by such men as Scaliger and Erasmus. There have been numerous editions, in MS. and print, of which the best is that of Arntzenius, Amsterdam, 1754. In 1483 a translation was issued from Caxton’s press at Westminster.

CATS, Jacos (1577-1660), one of the oldest, and long the most popular, of Dutch poets and humourists, was born at Brouwershaven in Zeeland. Deprived of his mother at an early age, and adopted with his three brothers by an uncle, Cats was sent to school at Zierikzee. At school he was an idle boy, and learned but little; removed, however, to the young and thriving university of Leyden, he seems to have read hard, and to have acquired a respectable knowledge of Greek and jurispru- dence. After a visit to France to learn the language, and a turn in Italy with the same object, he returned to Holland, and settled at the Hague, where he began to practise as an advocate. His pleading in defence of a

wretched creature accused of witchcraft got him many clients and some reputation. As Cats so far anticipated the common sense line of argument afterwards adopted in cases of the sort as to be often referred to later as an authority, his success was by no means undeserved. A serious love affair occurred about this time, which was broken off on the very eve of marriage by a tertian fever in the bridegroom. The fever defied all attempts at cure for some two years. Jor medical advice and change of air Cats betook himself to England, where he consulted the highest authorities, and exhausted their pharmacopoeia 1n vain. He resigned himself to his fate, returned to Zeeland to die, and was cured mysteriously by a strolling quack. He then went to Middleburgh, where (1602) he married a lady named Valkenburg, who bore him five children. At Middleburgh he devoted himself to farming and poetry, retiring gradually from the exercise of his profession, and producing his first great works—the Emblems of Fancy and Love, the Galatea (a pastoral romance), the Mirror of Past and Present, the Murriage, and others. In 1621, on the expiration of the twelve years' truce with Spain, the breaking of the dykes drove him from his farm. He was made pensionary (stipendiary magistrate) of Middleburgh ; and two years afterwards he received the same distinction from the larger city of Dort. His Nuptial Ring was the result of his leisure during this part of his carecr. In 1627 Cats came to England on a mission to Charles L ; that prince made him a knight, but otherwise the poet's success as an ambassador was not indicated by any result. In 1635 he was made grand pensionary of Holland; and in 1652, a year after his resignation of this office, the second in the commonwealth, he again figured in England as an unsuccessful envoy. His long Latin oration left Cromwell absolutely unmoved ; and Cats returned to Holland altogether to relinquish the practice of state affairs. In the seclusion of his villa of Sorgvliet (Fly-from-Care), near the Hague, he resided till his death, occupied in the composition of his autobiography (Highty-two Years of My Life) and of many poems (Old Age and Country Life, Coffins for the Living, &e.) He was buried by torchlight, and with great ceremony, in the Klooster-Kerk at the Hague, and is still spoken of as "Father Cats" by his countrymen.

Cats, who lived and reigned with Hooft and Vondel in the golden age of Flemish literature, was an exceetlingly prolific writer. His versification is smooth and regular ; although somewhat monotonous ; his style is homely and familiar ; and the naiveté and simplicity of most of that he says, aud of his manner of saying it, are peculiarly attractive. He never soared, or tried to soar; he was content to plod on, scattering round him as he went the blunt straight maxims, the shrewd little moralities, the excellent pieces of advice, which his countrymen—of whose practical and prosaic genius he is the highest literary representative— have found so pleasant and so full of profit. Hardly known outside of Holland, among his own people for nearly two centuries he enjoyed an enormous popularity, — his Book of Emblems, a great favourite with Sir Joshua Reynolds in his childhood, being often styled “The House- hold Bible.” Of late years, however, his diffuseness and the antiquated character of his matter and diction have come to be regarded as difficulties in the way of study, and he is perhaps rather more renowned than read. A statue to him was erected at Ghent in 1829.

See Jacob Cats, Complete Works, 1790-1800, 19 vols. ; Pigott, Moral Emblems, with Aphorisms, &c., from Jacob Cats, 1860; and Octave Delepierre, Sketch of the History of Flemish LInterature, 1860. Southey has a very compli- mentary reference to Cats in his “ Epistle to Allan Cun- ningham,”

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CATSKILL or KAATSKIL MOUNTAINS, a group of moderate elevation belonging to the great Appalachian system of North America. They are situated for the most part in Greene County, New York, and are mainly remarkable for the beauty of their scenery and the inagni- ficence of the outlook over the neighbouring country. The priucipal summits are Round Top, High Peak, and Over- look, which attain a height of nearly 4000 feet. To the north of High Peak is situated the celebrated gorge or “clove” of Catterskill, with its waterfall. The cascades are three in number, and the total height is about 300 feet ; but the supply of water is often deficient, and has even to be managed by the hotel proprietors. The place can easily be reached from Mountain House, an hotel which is built at an elevation of 2500 feet, on the front of Pine Orchard Mountain, about 12 miles from the

town of Catskill. Another hotel has more recently been erected on the summit of Overlook, at a height of 3800 feet.

CATTACK [Currack], a district of British India, in the province of Orissa, under the jurisdiction of the Lieutenant- Governor of Bengal, in 20° N. lat., and 85° to 87° E. long. Tt is bounded on the N. by the district of Balasor, from which it is separated by the Baitaranf and Dhamra rivers ; on the E. by the Bay of Bengal, on the 8, by the district of Puri, and on the W. by the Orissa Tributary States. The district comprises the nucleus or middle portion of the great delta formed by the Mahdnadi River, and consists of three distinct tracts ;—first, a marshy woodland strip along the coast, from 3 to 30 miles in breadth ; second, an intermediate stretch of rice plains; third, a broken hilly region, which forms the western boundary of the district. The marshy strip along the coast, like the Bengal Sundarbans, is covered with swamps and malaria- breeding jungles, but lacks their forest scenery. As one approaches the sea the solid land gives place to a vast network of streams and creeks, whose sluggish waters are constantly depositing silt, and forming morasses or quicksands. Cultivation does not begin till the limits of this dismal region are passed, The intermediate rico plains stretch inland for about 40 miles, and occupy the older part of the delta between the sea-coast strip and the hilly frontier. They are intersected by four large rivers, which dash down from the western mountains, and then split into innumerable branches on the level delta. Their distributaries, after tortuous interlacings, frequently rejoin the parent stream as it approaches the sea. This inter- mediate tract is a region of rich cultivation, dotted with great banyan trees, thickets of bamboos, exquisite palm foliage, and mango groves. The hilly frontier separates the delta of British Orissa from the semi-independent Tributary States. It consists of a series of ranges, 10 to 15 miles in length, running nearly due east and west, with densely-wooded slopes and lovely valleys between. The timber, however, is small, and is of little value except as fuel. The political character of these three tracts is as distinct as are their natural features. The first and third are still occupied by feudal chiefs, and have never been subjected to a regular land-settlement, by either the Musalmaén or the British Government. They pay alight tribute, now permanently fixed. The intermediate rice plains, known as the Mughulbandi, from their having been regularly settled by the Muhammadans, have yi elded to the successive dynasties and conquerors of

Orissa almost the whole of the revenues derived from the province. The deltaic portions are of course a dead level ; and the highest hills within the district in the western or frontier tract do not exceed 2500 feet. They are steep, and covered with jungle, but can be climbed by men. The most interesting of them are the Assa range, with its sandal trees and

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Buddhist remains; Udayagir{ (Sunrise-hill), with its colossal image of Buddha, sacred reservoir, and ruins ; and Assagiri, with its mosque of 1719. The Mahdavi- nayaka Peak, visible from Cattack, has been consecrated for ages to Siva-worship by ascetics and pilgrims.

Cattack district takes its character from its rivers. These issue in magnificent streams through three gorges in the hilly frontier. On the south, the Mahdnadzi, literally the Great River, rushes down upon the delta from a narrow gully at Nardj, about seven miles west of the town of Cattack. On the extreme north of the district, the sacred Paitaranf, the Styx of the Hindus, emerges from a more open country, and forms the boundary line between Cattack aud Balasor. The Brahmani enters the district about half way between the two. The Cattack delta is thus divided into two great valleys, one of them lying between the Baitarani and the Brahmani, the other between the Brdhmani and the Mahanadi. The rivers having, by the silt of ages, gradually raised their beds, now run along high levels. During floods they pour over their banks upon the surrounding valleys, by a thousand channels which interlace and establish communication between the main streams. As the rivers enter the district by three great gorges in the hills, so, after numerous bifurcations they find their way into the sea by three principal mouths. On the north, the Baitarani and Brdhmani debouch into the Bay of Bengal, under the name of the Dhamrda, at Point Palmyras ; while the Mahdnad{, after a variety of inter- lacings, forms two great estuaries,—one, bearing the name of the Mahanadi, at False Point, and the other, called the Devi, in the south-eastern corner of the district. Silt- banks and surf-washed bars render the entrance to these rivers perilous. The best harbour in Cattack district is at False Point, on the north of the Mahdnadi{ estuary. It consists of an anchorage, land-locked by islands or sand- banks, and with two fair channels navigable towards the land. The Famine

Commissioners in 1867 reported it to be the best harbour on the coast of India from the Hugli to Bombay. The dearth of the preceding year (1866) had led to the discovery of its value as a port for throwing supplies into the starving province. The harbour is safe and roomy, and the channel properly buoyed. The Dhamra harbour, further up the coast, although not so well protected, is more resorted to by native ships. Four canals have been made through Cattack since 1862 for regulating and distributing the water supply by means of irrigation, and for navigation. They are—the High Level Canal, the Kendrapaéra Canal, the Taldand& Canal, and the Mach- hgaon Canal, with their respective distributaries. The High Level Canal is designed to provide a great trade- route between Cattack and Calcutta, and to irrigate the country through which it passes. The other three are intended for irrigation and as navigable channels within the district. The canals were undertaken by the East India Irrigation Company in 1862; but the company proving unable to continue the works, Government purchased them on the 31st December 1869 for £941,368. Cattack district is subject to destructive floods, and from time immemorial embankments have been maintained along the sides of the tivers. In 1870 their aggregate length was 680 miles.

The district has an area of 3178 square miles, with a total population of 1,494,784, 95 per cent. of whom, or _ 1,430,040, are Hindus. The rest consist of Muhammadans, £0,013; Christians, 2314; and persons of unspccified religion, 22,398. The last comprise the aboriginal tribes, who here, as elsewhere, cling to their mountains and jungles. They chiefly consist of the Bhumij, T4l4, Kol, and Savar peoples, the Savars being by far the most numerous, numbering 16,589 souls. They are regarded by the orthodox Hindus as little better than the beasts of the

wildernesses which they inhabit. Miserably poor, they subsist for the most part by selling firewood or other products of their jungle; but a few of them have patches of cultivated Jand, and many earn wages as day labourers to the Hindus. They occupy, in fact, an. intermediate stage of degradation between the comparatively well-off tribes in the Tributary States (the stronghold and home of the race), and the Pans, Bauris, Kandrds, and other semi-aboriginal peoples on the lowlands, who rank as the basest castes of

the Hindu community. The great bulk of the Indo-Aryan or Hindu population consists of Uriyas, with a residue of immigrant Bengalis, Lal4 Kayets from Behar and Northern India, Telingds from the Madras coast, Marhattas from Central and Western India, a few Sikhs from the Punjab, and Marwaris from Rajputand. The Muhammadans are chicfly the descendants of the Pathans who took refuge in Orissa after the subversion of their king- dom in Bengal by the Mughuls in the 16th century.

Only three towns in Cattack district contained in 1872 upwards of 5000 inhabitants, viz., Cattack, the capital, 50,878 ; Jajpur, 10,753; Kendraparé, 10,682. Jajpur was the capital of Orissa under its Hindu kings ; it is still considered a sacred town, and thousands of pilgrims annually flock to it.

Rice forms the staple product of the district ; its three chief varieties are bed/é or early rice, sérad or winter rice, and ddlua or spring rice. The other cereal crops consist of mdndud (a grass-like plant producing a coarse grain resembling rice), wheat, barley, and chind, a rice-like cereal. Sudn, another rice-like cercal, not cultivated, grows spon- taneously in the paddy ficlds. Pulses of different sorts, oilseeds, fibres, sugar-cane, tobacco, spices, and vegetables also form crops of the district, The cultivators consist of two classes—the resident husbandmen (7hdni), and the non-resident or migratory husbandmen (Pdéhé). At the time of the last settlement of land revenue in 1837, the rights of the resident cultivators were formally recognized by Government, and secured to them by palm-leaf leases. They hold their homestead lands rent frec, and are not liable to be ousted so long as they continue to pay the rents assessed on their cultivable lands. Nor can such rents be enhanced until the expiration of their leases, which run con- currently with the land-settlement to 1897, The non-resi- dent cultivators were formerly tenants-at-will, but since 1859 a large proportion of them have acquired rights of occupancy under the Acts of the Indian Legislature.

Weekly steamers ply between Calcutta and Dhamra. The High Level Canal, when completed, will afford ample means of communication inland towards Beugal. The revenues of the Cattack district have steadily increased under the British rule. The total revenue in 1829-30 was £139,642, the expenditure on civil administration £114,438 ; in 1870-71 the revenue was £243,958, the civil expenditure £223,659. In the latter year the land revenue

amounted to £77,629. Excluding the indigenous village schools maintained by the people themselves, the schools inspected by the Educational Department in 1872-73 numbered 53, attended by 2435 pupils, and maintained at an outlay of £4081, to which Government contributed £2699. The hot season commences in March and lasts till about the middle of June; the rains con- tinue from the middle of June till the end of October, when the cold weather sets in. The average rainfall for five years previous to 1870 was 63°18 inches, the average temperature 84° Fahr. Intermittent fever, elephanti- asis, smallpox, and bowel complaints form the prevalent diseases. Cholera is always present among the natives, and occasionally assumes the epidemic type. The district of Cattack, with the rest of Orissa, passed into the hands of the English from the Marhattds in 1803. (W, W. H.)

CaTTack, the most important town in the above district, and the capital of the province, is situated in 20° 28’ N. lat. and 85° 55’ E. long, on the tongue of land where the Mahanadi first bifurcates, throwing off the Katjuri on its southern and the Birip4 on its northern bank. Cattack city formed one of the five royal strongholds of ancient Orissa, and was founded by a warlike prince who reigned from 953 to 961. Its native kings protected it from the rivers by a masonry embankment several milcs long, built of enormous blocks of hewn stone, and in some places 25 feet high. A fortress defended the north-west corner of the town, and was captured by the English from the Mar- hattas in October 1803. It is now abandoned as a place of defence. The city has long been the commercial and administrative headquarters of Orissa; it is connected with False Point harbour by the Kendrdpdré Canal. The High Level Canal, at present in course of construction, will open out inland communication between it and Cal- cutta. In 1825 the town contained 6512 houses, and a population of about 40,000. Population in 1872, 50,878, viz., Hindus, 40,849 ; Muhammadans, 7436 ; Christians, 1968; others, 625. (w. w. H.)

CATTARO, the chief town of a circle in the Austrian kingdom of Dalmatia, situated on a narrow ledge between the mountains of Montenegro and the Bocca di Cattaro, a winding and beautiful inlet of the Adriatic. It is strongly fortified towards both the sea and land,—towards the sea by the fortress of

Castelnuovo, at the mouth of the gulf, and towards land more especially by the Castle of San Giovanni on the heights; the long lines of wall from this castle to the town form a striking feature in the landscape. The town is the seat of a Catholic bishop, and contains a small cathedral, a Catholic collegiate church, and several convents ; but the population is largely Slavonic, and the Greek Church is almost on a level with the Latin. The trade is comparatively restricted, and but little advantage is taken of the gulf except for thefisheries. The principalarticle of export is dried flesh or castradina. Population, 3600,

Cattaro is probably to be identified with the Roman Aseriviwm (or Askrourion); but it does not appear under anything like its present name till the 10th century, when it is deseribed by Coustantinus Porphyrogenitus as Dekatera. In the reign of Basil the Macedo- nian (867-886) it was captured by the Saraeens; but it afterwards maintained itself as a more or less independent republic till 1419, when from fear of the Turks it aeeepted the protection and dominion of Veniee. In the following centuries it was several times besieged by the enemies of Venice; and in 1563 and 1667 it was nearly destroyed by earthquakes. By the peaee of Campo-Formio it passed to Austria; but in 1805, by the peaee of Presburg, it was assigned to Italy, and in 1810 it united with the Freneh empire. Its restora- tion to Austria did not take place till 1814. See Tozer, Highlands of Turkey, 1869; Saturday Review, Mareh 1876.

CATTERMOLE, Grorce (1800-1868), an English painter, chiefly in water-colours, was born at Dickleburgh, near Diss, Norfolk, in August 1800. At the age of sixteen he began working as an architectural and topographical draughtsman; afterwards he contmbuted designs to be engraved in the annuals then so fashionable and popular ; thence he progressed into water-colour painting, becoming an associate of the Water-Colour Society in 1822, and a full member in 1833. In 1851 he withdrew from active con-nection with this society, and with the practice of water- colour painting, and took to oil-colouring. His most fertile period was between 1833 and 1851. In 1855, as an exhibitor in the British Fine Art section of the Great Exhibition in Paris (water-colour branch), he received one of the five first-class gold medals awarded to British painters, He also enjoyed professional honours in Amsterdam and in Belgium. He died on the 24th July 1868,

Among his leading works arc The Murder of the Bishop of Liége (15th century), The Armourer relating the Story of the Sword, The Assassination of the Regent Murray by Hamilton of

Bothwellhaugh, and (in oil) A Terrible Secret. He was largely employed by publishers, illustrating the Waverley Novels and the Historical Annual of his brother the Rev, Richard Cattermole (his scenes from the wars of Cavaliers and Roundheads in this series are among his best engraved works), and many other volumes besides. He is stated to have been ‘unsettled in his habits, and uncertain in engagements.” Cattermole was a painter of no inconsider- able gifts, and of great facility in picturesque resource; he was defective in solidity of form and texture, and in realism or richness of colour. He excelled in rendering scenes of chivalry, of medizvalism, and generally of thse romantic aspects of the past. Indeed, his faculty in this way might almost be compared—though on a considerably lower level, and with less of the spell of originality—to that of Walter Scott. Just as Scott was fading from the region of mediaval romanticism in letters, Cattermole entered upon it in fine art. CATTI, or Cuatti, a powerful and warlike German nation, who, though defeated by Drusus, Germanicus, and other Roman generals, were never wholly subjugated, till in the 4th century they disappeared among the Franks, They inhabited a district extending from the Wescr on the E. to the Rhine on the W., and bounded on the 8. by the Agri Decumates, They thus occupied about the same position as the modern Hesse—though their territory was more ex- tensive, and included also part of North-Western Bavaria, —and the name Hesse is probably the same as Chatte, They lived in a communistic society, but possessed several towns, of which the chief was Mattewm, now Maden. CATTLE, a term applied to the various races of domesticated animals belonging to the genus Jos, known also as Oxen. They have been divided into two primary groups, the humped cattle or zebus (Bos indicus) of India and Africa, and the straight-backed cattle (Bos taurus), which are common everywhere. By many naturalists these groups have been regarded as mere races of the same species, and it is a well-ascertained fact that the offspring arising from the crossing of the humped and unhumped cattle are completely fertile ; but the differences in their osteology, configuration, voice, and habits are such as to

leave little doubt of their specific distinctness. Oxen appear to have been among the earliest of domesticated animals, as they undoubtedly were among the most important agents in the growth of early civilization. They are mentioned in the oldest written records of the Hebrew and Hindu peoples, and are figured on Egyptian monuments raiscd 2000 years before the Christian era; while the remains of domesticated specimens have been found in the Swiss lake-dwellings along with the stone implements and other records of Neolithic man. In infant communities an individual's wealth was measured by the number and size of his herds—Abram, it is said, was rich in cattle ;—and oxen for a long period formed, as they still do among many Central African tribes, the favourite medium of exchange between nations. After the introduction of a metal coinage into ancient Greece, the former method of exchange was commemorated by stamping the image of an ox on the new money ; while the same custom has left its mark on the languages of Europe, as is seen in the Latin word "'pecunia" and the English " pecuniary," derived from " pecus," cattle. The value attached to cattle in ancient times is further shown by the Bull figuring among the signs of the zodiac; in its worship by the ancient Egyptians under the title of Apis; in the veneration which has always been paid to it by the Hindus, according to whose sacred legends it was the first animal created by the three divinities who were directed by the supreme Deity to furnish the earth with animated beings; and in the important part it was made to play in Greek and Roman mythology. The Hindus were not allowed to shed the blood of the ox, and the

Egyptians could only do so in sacrificing to their gods. Both Hindus and Jews were forbidden, in their sacred writings, to muzzle it when treading out the corn; and to destroy it wantonly was considered a public crime among the Romans, punishable with exile.

The domestic cattle of Europe, of which there are at least fifteen British,and a considerably larger number of Continental breeds, have been, according to Professors Nilsson and Riitimeyer, who have specially studied this subject, derived from at least three distinct species or races—Bos primigenius, Bos longifrons, and Bos frontosus. The first of these, the Urus, would seem,

from its remains, to have been domesticated among the Swiss lake-dwellers,— abounding then, and down to historic times, in the wild state, throughout the forests of Europe. Cesar describes it as existing, in his time, in the Hercynian Forest, in size almost as large as an elephant, but with the form and colour of a bull; and it is mentioned by Hebcrstein so late as the 16th century as still a favourite beast of chase. The naine Urus, applied to it by the Romans, is derived from Ur, a root common to the Indo-European languages, and signify- ing original, primitive ; and may be traced in the Thur of Poland, Stier of the Germans, and the Latin Taurus, as also in various names of places, as the Canton of Uri, Thuringian Forest, Turin, and Tours. The Urus was characterized by its flat or slightly concave forehead, its straight occipital ridge, and the peculiar curvature of its horns. Its immense size may be gathered from the fact that a skull in the British Museum, found near Atholl in Perthshire, measures 1 yard in length, while the span of the horn cores is 3 feet 6 inches, Several breeds of cattle, as the Friesland of the Continent, and the Pembroke of England, are supposed to have sprung from this source : while the so-called wild cattle of Britain (Bos taurus, var. Scoticus) make the nearest approach, according to Riitimeyer, of living forms to the Urus. This breed is of a white colour, except the tips of the horns, which are dark, and the ears and muzzle, which are either black or brownish red. Unformity in colour, however, is secured by the slaughter of all calves which differ from the pure type. British wild cattle now exist only in Cadzow Forest, Chillingham Park, Lyme Park, and Chartley, in all of which they are strictly preserved. The purest bred are those of Chillingham—a park which was in existence in the 13th century. ‘These have red ears with brownish muzzle, and show all the characteristics of wild animals. According to Mr Hindmarsh, who obtained his information from the proprictor, ‘they hide their young, feed in the night, basking or sleeping during the day ; they are fierce when pressed, but, generally speaking, very timorous, moving off on the appearance of any one even at a great distance,” The bulls engage in fierce contest for the leadership of the herd, and the wounded are set upon by the others and killed; thus few bulls attain a great age, and even those, when they grow feeble, are gored to death by their fellows The white cattle of Cadzow are very similar to those of Chillingham in their habits, but being confined to a narrow area are less wild. They still form a considerable herd, but of late years, it has been stated, they have all become polled It is probable, as Sir Walter Scott used

to maintain, that Cadzow and Chillingham are but the extremities of what, in ruder times, was a continuous forest, and that the white cattle are the remnants of those herds of “ tauri sylvestres ” described by early Scottish writers as abounding in the forests of Caledonia, and to which Scott evidently refers in the following lines ;—

“* Mightiest of all the beasts of chase That roam in woody Caledon, Crashing the forest in his race, The mountain bull comes thundering on.”

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It is still a matter of controversy whether these wild cattle are the unsubdued, although degenerate, descendants of the mighty Urus, or merely the offspring of a domestic breed run wild, which have reverted somewhat to the ancient type. Their comparatively small size, and their evident tendency to vary in colour, seem to point out the latter as the more probable view. A breed similar to the Chillingham cattle existed in Wales in the 10th century, being white, with red ears; and Welsh chroniclers relate how on one occasion a Prince of Wales demanded, as com- pensation for certain injuries, 100 white or 150 black cattle, and how also the anger of King John was at one time appeased by a gift of 1400 of the white variety,— showing that the latter were numerous, and sufficiently under control to be collected and conveyed from one part of the country to another, also that they were more highly valued than the black cattle,—in short, that they existed at that time as a domesticated breed. According to Professor Low (Domesticated Animals of the British Islands), this Welsh breed existed under domestication, in a com- paratively pure state, in Pembrokeshire at the beginning of the present century. As the wild cattle of Britain are prevented, by rigorous selection, from deviating from their present colour, it is impossible to assert that the ancient Urus was mainly white, although Darwin (Animals and Plants under Domestication) has brought forward some facts to show that domestic cattle run wild seem to have a slight tendency to revert in that direction. Immense herds of wild oxen in the Ladrone Islands are described in Anson’s Voyages as “ being milk-white, except the ears, which are generally black;” and in the southern districts of the Falkland Islands, where cattle, introduced from La Plata, have run wild

for at least a century, they are “ white, with their feet, or whole head, or only their ears, black.”

Bos longifrons, according to Nilsson, existed in the wild state in Sweden ; but Riitimeyer holds that there is not sufficient evidence to prove that it ever existed otherwise than domesticated in Central Europe. Tt seems to have been the most common race of domestic cattle among the ancient lake-dwellers, and several of the existing Swiss breeds are believed to be derived from it. Remains of the same race are found in Britain associated with those of the elephant and rhinoceros, and there is little doubt that Ceesar found large domestic herds of this kind on his arrival in Britain, and that these supplied food to the Roman legions. Professor Owen regards it as the original of our Welsh and Highland cattle. Bos longifrons was smaller than the ordinary breeds now existing, and had short horns. Whether it is to be regarded as originally a wild European species, which Neolithic man succecded in domesticating, or merely as a domestic race introduced by settlers from the East, as many on philological grounds suppose, if has undoubtedly had a very considerable influence in the formation of our existing breeds.

Bos frontosus was somewhat larger than B. longifrons, with which it coexisted in ccrtain districts of Scandinavia, Its remains are found chiefly in the lake-dwellings of the Bronze period, although occurring sparingly in those of earlier date. They have also been found in Irish cran- noges ; and Nilsson regards it as the progenitor of the present mountain cattle of Norway.

The breeds and sub-breeds produced from those ancient races are exceedingly numerous. “In Britain,” says Youatt, “they are almost as various as the soil of the different districts, or the fancies of the breeders.” This variety may in some degree be attributable to their being the descend- ants, in all probability, of more than one species, to slight differences in the climate and pasturage of different districts, or to the sudden appearance of what Darwin has

termed “spontaneous variations ;” but it is beyond doubt mainly due to the long-continued and careful selection of the breeder. The British forms, a detailed account of whieh will be found under the article AGRICULTURE, vol, i. p. 387, may be eonveniently arranged in three classes :— (1.) Polled Cattle, an artificial variety which may be produced in any breed by selection; thus the polled cattle of Galloway had small horns so late as the middle of the last century, but by only breeding with bulls of the shortest horns, the grandfather of the present earl of Selkirk succeeded in entirely removing those appendages ; (2.) Short-horned Cattle, the descendants of Bos longifrons, represented in greatest purity by the Welsh and Highland cattle, and probably differing little from the cattle found ‘n Britain from the Polished Stone age to the end of the Roman period; these were afterwards driven with their masters from the open country to the hilly districts, before the Saxon invaders, who probably brought with them (3.) the Long-horned Cattle, larger than the preceding, and of a red and white eolour, which have given rise to those breeds of cattle that now oceupy the less elevated and more fertile tracts of England. Those Saxon eattle may be regarded as representing the primigenius type. The long and short horned varieties, however, interbreed freely, so that in many of our breeds the two types are inextricably mixed. é

Of Continental forms the Hungarian is conspicuous from its great size, and the extent of its horns, which often measure 5 feet from tip to tip. The cattle of Friesland, Jutland, and Holstein form another large breed, and these, it is said, were introduced by the Goths into Spain, thus becoming the progenitors of the enormous herds of wild cattle which now roam over the Pampas of South America, The latter, it is alleged by Spanish writers, have all sprung from seven cows and a bull brought from Andalusia to the city of Assuncion in Paraguay, about the year 1556. They are widely spread over the plains of that continent, but are most numerous in the temperate districts of Paraguay and La Plata—a fact whieh bears out the view taken by Darwin, that our oxen are the descendants of speeies originally inhabiting a temperate climate. Exeept in greater uniformity of colour, whieh is dark-reddish brown, the Pampas eattle have deviated but little from the Andalusian type. They roam in great herds in search of pasture, under the leadership of the strongest bulls, and avoid man, who hunts them ehiefly for the value of their hides, of which enormous numbers are exported annually

from Buenos Ayres. They are, however, readily reclaimed ; the wildest herds, aeeording to Professor Low, being often domesticated in a month, ‘These eattle have hitherto been chiefly valued for their hides, and as supplying animal food to the inhabitants, who only use the ehoieest parts ; but lately attempts have been made, and with considerable success, to export the beef in a preserved state to Europe. Although the South American cattle have thus sprung from a single European breed—that continent possessing no indigenous species of taurine Bovide, they have already given rise to many well-marked varieties, as the polled cattle of Paraguay, the hairless breed of Colombia, and that most monstrous of existing breeds, the Natas, two herds of which Darwin saw on the banks of the Plata, and whieh he deseribes as “ bearing the same relation to other cattle as bull or pug dogs do to other dogs.” Cattle have been introduced by the eolonists into Australia and New Zealand, where they are now found in immense herds, leading a semi-wild existence on the extensive “runs” of the settlers. The Hottentots and Kaffres possess several valuable breeds, as the Namaqua and Bechwana cattle, the latter with horns whieli sometimes measure over 13 feet from tip to tip along the curvature, The cattle of those

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semi-barbarous South Africans appear to be among the most intelligent of their kind,—certain of them, known as backleys, having been trained to watch the flocks, preventing them from straying beyond fixed limits, and protecting

them from the attaeks of wild beasts and from robbers,

They are also trained to fight, and are said to rush into

battle with the spirit of a war-horse.

Oxen, especially in Britain, have eome to be regarded as dull and stupid animals, but this is only true of such breeds as are reared solely for fattening and killing. The wild cattle of Chillingham, and the semi-wild herds that abound on the plains of South Ameriea, show no lack of sagacity in

avoiding threatened danger, or in combining to mcet a eommon foe; while the backley of the Kaffres shows how susceptible they are of education. Wherever, indeed, the ox is employed as a beast of burden or of draught, and it is so in most eountries, its intelligenee is scareely inferior to that of the horse, while it surpasses the latter in docility and in the patient endurance of toil. In the south-west of England the Devonshire eattle are largely employed in husbandry, and the greater attention whieh has consequently been bestowed upon them has been amply rewarded in the superior docility and intelli- gence of the breed. Among the Swiss mountains there are herds of cows, whose leaders are adorned with bells, the ringing of which keeps the eattle together, and guides the herdsman to their pasture grounds. The wearing of the bells has eome to be regarded as an honourable distinction by the cows, and no punishment is felt so keenly as the loss of them, the culprit giving expression to her sense of degradation by the most piteous lowings.

The period of gestation in the cow is nine months, when she usually produces a single calf; oceasionally, however, two are born, and when these are of different sexes, the female is almost invariably barren, and is known as a “ free-martin,” that is, a cow free for fattening, from the Seotch word “ mart,” signifying a fattened oz.

It is impossible to over-estimate the services rendered by the ox to the human race. Living, it ploughs its owner’s land and reaps his harvest, carries his goods or himself, guards his property, and, as has been seen, even fights his battles, while its udders, which under domestication have been enormously enlarged, yield him at all seasons a copious supply of milk, When dead, its flesh forms a chief source of animal food ; its bones are ground into manure or turned into numerous articles of use or ornament; its skin is made into leather, its ears and hoofs inte glue; its hair is mixed with mortar; and its horns are eut and moulded into spoons and other useful articles. : Humped cattle are found in greatest perfection in India, but they extend eastward to Japan and westward to the Afriean Niger. They differ from the European forms not only in the fleshy protuberance on the shoulders, but in the number of saeral vertebrae, in the eharacter of their voice, which has been deseribed as “‘grunt-like,” and also in their habits; “they seldom,” says Mr Blyth, “seek the shade, and never go into the water

and there stand knee-deep like the cattle of Europe.” They now exist only in the domesticated state, and appear to have been brought under the dominion of man at a very remote period, all the representations of the ox on such ancient sculptures as those in the eaves of Elephanta being of the humped or zebu form. ‘There are several breeds of the zebu, the finest oecurring in the northern provinces of India, where they are used for riding,—carrying, it is said, a man at the rate of six miles an hour for fifteen hours. White bulls are held peculiarly sacred by the Hindus, and when they have been dedicated to Siva, by the branding of his image upon them, they are theneeforth relicved from all labour.

They go without molestation wherever they choose, and

may be seen about Eastern bazaars helping themselves to whatever dainties they prefer from the stalls of the faithful. See AGRicuLTURE, vol. i. p. 387. (5. GI.)

CATTOLICA, a town of Sicily, in the provinee of Girgenti, and 15 miles north-west of the town of that name. In the vicinity there are extensive deposits of sulphur and rock salt. Population, 6380.

CATULLUS, ‘C. Vatertus, one of the most brilliant and original among Latin authors, belongs to the Ciceronian age, and is one of the two poets whose works adorn and illustrate the last years of the Roman republic. Our knowledge of his life is almost entirely derived from his own writings. The few statements eoneerning him which hhave been reeeived on external evidence require to be eonfirmed or correeted by referenee to allusions contained in these writings. The most important of these external evidences are the statements of Jerome, in the continuation of the Etisebian Chronicle, under the year 87 z.c.: ‘Gaius Valerius Catullus, seribtor lyrieus Veronze naseitur,” and, under 57 B.c.: ‘“ Catullus xxx. statis anno Rome moritur.” Questions have been raised, and variously answered, in regard to the eorreetness both of the names assigned to the poet, and of the dates of his birth and death given in these passages. Although he appears to speak of himself in his poems only by the name of Catullus, there is no controversy as to the Gentile name, Valerius. Suetonius, in his Life of Julius Cesar (ch.

73), mentions the poet by the names “ Valerium Catullum.” Other persons who had the cognomen Catullus belonged to the Valerian gens. Among these, the best known is M. Valerius Catullus Messalinus, one of the Delatores in the reign of Domitian, and one of the personages introdueed in the famous scene at the Alban Villa of the emperor, deseribed in the fourth satire of Juvenal :—

“Et cum mortifero prudens Veiento Catullo.”

The testimony of inseriptions shows, further, that this name was common in the native provinee of Catullus, and belonged to other inhabitants of Verona, besides the poet and his family (Schwabe, Questiones Catulliane, p. 27). Scholars are still divided in opinion as to whether his preenomen was Gaius or Quintus. In the best MSS. the volume is ealled simply Catulli Veronensis liber, and this is the title whieh his English editor, Prof. Robinson Ellis, adopts. For the name Gaius we have the undoubted testimony, not ouly of Jerome, which rests on the much earlier authority of. Suetonius, but also that of Apuleius. In support of the seeond, a passage is quoted from the Natural History of Pliny (xxxvii. 6, 81), where in some editions the praenomen Q, is prefixed to the name. The Q. is, however, omitted in the best MSS., and in other passages of the same author the poet is spoken of as “Catullus Veronensis.” The mistake is supposed to have arisen from a eonfusion with Q. Catulus, the eolleague of Marius in the Cimbrie War, himself also the author of lyrical poems. The only other ground in favour of adopting the latter name is a conjectural emendation of Scaliger in the 67th poem (line 12), where he changes the qui te of the MSS. into “Quinte.” Though a question on which such eminent scholars as Mommsen, Haupt, L. Miiller, and apparently Mr Ellis, take one side, while Schwabe, W. S. Teuffel, and Mr Munro (Journal of Philology, iii.) take the other, can scarcely be considered absolutely settled, yet the arguments adduced by Schwabe and Mr Munro for aceepting the authority of Jerome and Apuleius seem difficult to answer. A more important question is raised Coneerning the dates of the poet’s birth and death. It 18 quite certain, from allusions contained in the poems, that the date of his death given by Jerome (57 B.c.) is wrong, and that Catullus survived the seeond consulship of Pompey (55 3.c.) (cf. lv. 6, cxiii. 2), and was present in

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August of the following year at the proseeution of Vatinius, by Licinius Calvus (cf liti.) From the allusion in lii, 3.— ‘*Per consulatum perierat Vatinius,” it was assumed, till the appearance in 1862 of Schwabe’s Queestiones Catulliance, that Catullus must have lived to witness the consulship bestowed on Vatinius in the end of 47 B.c. This consideration indueed Lachmann to fix on 77 B.c. instead of 87 B.c. as the date of the poet’s birth. It has, however, been shown by Schwabe, and is now generally admitted, that the line ‘‘ Per consulatum,” &c., refers to the faet that Vatinius, after being preetor in 55 B.C., was in the habit of boasting of the certainty of his attaining the consulship, as Cleopatra was in the habit of confirming her most solemn deelarations by appealing to her hope of one day administering justice in the Capitol (cf. Haupt. ‘ Questiones Catullianz,” contained in vol. i. of his Opuscula, 1875). We have thus certain evidenee that Catullus lived till the month of August 54 3B.c., but there is no allusion in his poems to any event of a later date than the proseeution of Vatinius. Some of the poems (as xxxvii. and lii.) may very probably have been written during his last illness, He seems to, have lived just long enough to eollect his;works together, to dedicate them to Cornelius Nepos, and to see his ‘‘Jepidum novum libellum Arido modo pumice expolitum.”

If he died in 54 Buc. or early in 53 3B,c. there must be a further error either in the first or the seeond of Jeromie’s statements. Catullus must either have been born later than 87 3.c. or have lived to a greater age than thirty. The diffieulty in regard to the first supposition is that it inereasés the disproportion between the ages of the poet and his niistress Clodia, who must have been born about 94 B.c. But as he was supplanted in her affections by a still younger man, M. Celius Rufus, who appears for a time to have been equally infatuated by her, and as Cicero in his defence of Celius deseribes her as one “ que etiam aleret adolescentes et parsimoniam patrum suis sumptibus sustentaret” (Pro IM. Celio, ch. xvi. 1), this difficulty is not a serious objection to the date. Catullus is deseribed by Ovid, in true keeping with all the eharacteristies of his poetry, as “hedera juvenalia

cinctus Tempora ” (Amor., iii. 9, 61); and this description seems more applicable to a man who dies in his thirtieth year than to one who dies three or four years later. Further, the age at which a man dies is more likely to be aecurately remembered than the partieular date either of his death or of his birth. The common praetice of recording the ages of the deceased in sepulchral inseriptions must have rendered a mistake less likely to occur in that respect, than in respect of the consulship in which he was born. Other instanees can be given of the carelessness of Jerome in respeet to dates, and Mr Munro gives a probable explana- tion of the mistake in the confusion between the first and the last of the four consulships of Cinna! It seems, there- fore, on the whole most likely that the words “xxx. atatis anno” are eorrect, and that Catullus was born in 94 B.c., in the consulship of Cn. Papirius Carbo II. and L. Cornelius Cinna IV.

The statement that he was born at Verona is confirmed by passages in Ovid and Martial. Pliny the elder, who was born at Como, speaks of Catullus in the preface to his Natural History, as his “countryman” (conterraneus), and the poet speaks of Verona as his home, or at least his temporary residenee, in more than one place (lxvii. 34, Ixviii. 27, xxxv. 3); and in mentioning the Transpadani

1 This is also suggested as possible by Schwabe, who, however, pres fers adhering to the date 87 B.c. ;

among the other inhabitants of Italy, he adds the words “ut meos quoque attingam ” (xxxviil. 13).

His occasional residence in his native place is further attested by the statement of Suetonius (Julius Caesar, 73), that “Julius Cxsar accepted the poet’s apology for his scurrilous verses upon him, invited him to dine with him on the same day, and continued his intimacy with his father as before.” As this incident could only have happened during the time that Julius Cesar was Pro- consul, the scene of it must have been in the Cisalpine province, and at the house of the poet’s father, in or near Verona. ‘The verses apologized for were those contained in poems xxix. aud lvii., the former of which must have been written after Casar’s invasion of Britain, so that this

interview probably took place in the winter of 55-54 B.c. The fact that his father was the host of the great pro- consul, and lived on terms of intimacy with him, justifies the inference, that he was, in wealth and rank, one of the principal men of the province, an inference confirmed by the social position which Catullus himself assumed in Rome, and by his enjoyment of property independent of his father (¢f. poems xxxi. and xliv.) during his father's lifetime. The only other important statement concerning the poet's life which rests on external authority is that of Apuleius, that the real name of the Lesbia of the poems was Clodia. One other statement, not concerning the poet's life, but concerning the reputation which he enjoyed after his death, is given in the Life of Atticus by Cornelius Nepos (12, 4). It is to the effect that he regarded Lucretius and Catullus as the two greatest poets of his own time.

The volume of poems which Catullus collected and published before his death consists of 116 pieces, varying in length from 2 to 408 lines, the great mass of them being, however, short pieces, written in some lyric or iambic, or in elegiac metre. These poems are not arranged either in chronological order or in accordance with the character of the topics with which they deal. The only principle which seems to have guided the author in his arrangement was that of placing the longer poems, of a less personal and fugitive character, in the middle of the volume, while the first part contained those written in lyric or iambic metres, and the latter part consisted entirely of verses written in the elegiac metre. Many of the last treat of the same topics and refer to the same persons as those forming the subject of the short poems at the beginning of the volume. 'The elegiac, as well as the phalecian and jambic metres, were employed by him as the vehicle both of his tenderest and his bitterest feelings. Though no chronological order is observed, yet internal evidence enables us to determine the occasions on which many of the poems were written, aud the order in which they followed one another. They give a very vivid image of various phases of the poet's life, and of the strong feelings with which persons and things affected him. They throw much light also on the social life of Rome and of the provincial towns of Italy in the years preceding the outbreak of the second civil war. Apart from their poetic charm, they thus possess the interest of bringing vividly before us some aspects of one of the most critical epochs in the history of the ancient world. In this respect they

may be compared with the letters of Cicero, which record the impression produced by the same time on a man of similar susceptibility of feeling and keenness of apprehension, but of character and pursuits as far removed as possible from those of the provincial poet, who modestly contrasts the greatness of the “ most eloquent of the descendants of Romulus” with his own humble pretensions.

The poems extend over a period of seven or eight years, from 61 or 62 till 54 B.c. Among the earliest are those

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which record the various stages of the author’s passion for Lesbia. It is in connection with this passion that he is generally mentioned, or alluded to, by the later Roman poets, such as Propertius, Ovid, J uvenal, and Martial. The real name of Lesbia, as we learn from Apuleius, was Clodia. The admiration which Catullus felt for the great Lesbian poetess, which is clearly indicated by the imitation of her language in his 51st and 62d poems, affords an obvious explanation of the Greek name which he gave to his Roman mistress. After the exhaustive examination of the subject by Schwabe, it may be regarded as certain that she was the notorious sister of Publius Clodius Pulcher, the Boas who plays an important part in the drama of Cicero’s fortunes, brought before us in the first three books of the Letters to Atticus,—the “ Palatina Medea,” whose character stands out so prominently in the speech Pro Colio,—the “ quadrantaria Clytemnestra,” as she was called by her lover Czlius (Quintilian, viii. 6, 23), in reference to the suspicion she incurred of having poisoned her husband, Q. Metellus Celer (consul, 60 B.c.) in 59 B.c. (cf Munro, Journal of Philology, iii.) In the year 56 she charged M. Celius Rufus, after tiring of him, as she had of Catullus, with an attempt to poison her. It was in defence of him that Cicero described the spell she exercised over young men, in language which might have been applied to her previous relations with the youthful poet, as well as those with the youthful orator and politician.

It may probably have been on hearing of this defence, that Catullus, whose feelings had by that time changed from passionate devotion to scornful animosity, wrote the short poem (xlviii.) Disertissime Romuli nepotum, which _asso- ciates his name with the great orator of the age. Yoems

concerning Lesbia occur both among the earliest and the latest of those contained in the series. They record the various stages of passion through which Catullus passed, from absolute devotion and a secure sense of returned affection, through the various conditions of distrust and jealousy, attempts at renunciation, and short-lived ‘“‘amoris integrationes,” through the “odi et amo” state, and the later state of savage indignation against both Lesbia and his rivals, and especially against Czlius Rufus, till he finally attains, not without much suffering and loss, the last state of scornful indifference. Among the earliest of the poems connected with Lesbia, and among those written in the happiest vein, are ii. and iii, (Passer, delicie mee puelle and Lugete, O Veneres Cupidinesque), and v. and vii. The 8th, Mfiser Catulle, desinas ineptire, perhaps the most beautiful of them all, expresses the first awakening of the poet to a sense of her unworthiness, before the gentler have given place to the fiercer feelings of his nature. His final renunciation issent in a poem written after his return from the East, with a union of imaginative and scornful power, to his two butts, Furius and Aurelius (xi, Put e Aurelt, comites Catulli), who, to judge by the way Catullus writes of them, appear to have been hangers on upon lim, who repaid the pecuniary and other favours they recaived by giving him grounds for jealousy, and making imputa- tions on his character (cf. xv., XVi., Xvili., xxiii.)

The intrigue of Celius Rufus with Lesbia began in 59 or 58 Bc. (cf. Schwabe, Quest. Catulli, p. 66). It was probably in the earlier stages of this liaison that the 68th poem was written, from which it appears that Catullus, at the time living at Verona, and grieving for the recent death of his brother in the Troad, had heard of Lesbia’s infidelity, and, in consideration of her previous faitlless- ness in his favour, was not inclined to resent it very warmly—

‘‘Rara verecunde furta feremus ere,” Two other poems in the series express the grief which

| Catullus felt for the death of his brother—one, the 65th,

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composed at the same time as the 68th, and addressed to the orator Hortensius, who is there, as in some of Cicero's letters, called Hortalus or Ortalus, and sent to him along with the Coma Berenaces (Ixvi.), a translation of a famous elegy of Callimachus. 'The other poem referring to this event (ci.) must have been composed some years later, probably in 56 z. ¢., when Catullus visited his brother's tomb in the Troad, on his return from Bithynia. Between 59 and 57 Bc. most of the lampoons on Lesbia and her numerous lovers must have becn written (e.g., xxxvil., xxxix., lxix., lxxiL., Ixxvii., lxxix., xc., &c.) Some, too, of the poems expres- sive of his more tender feelings to her, such as viii, and Ixxv1, '¢ Miser Catulle, desinas ineptire,"

and.

'* Siqua recordanti benefacta priora voluptas,"' belong also to these years; and among the poems written either during this period or perhaps in the early and happier years of his liaison, some of the most charming of his shorter pieces, expressing the affection for his young friends Verannius and Fabullus (ix., xii., xili.), may be included.

In the year 57 the routine of his life was for a short time broken, by his accompanying the Propretor, C. Memmius, the friend to whom Lucretius dedicates his great poem, as one of his staff, to the province of Bithynia. The desire of seeing foreign lands, which was as strong a passion among cultivated Romans as among cultivated Englishmen of the present day, was probably the chief inducement to this temporary change of life, especially as Catullus had the prospect of gratifying this passion in congenial society ; for the testimony of Cicero as well as of Lucretius shows that Memmius, whatever else he was, was a man of some accomplishment in literature and poetry; and among his younger companions, in the pretor's train, was his friend and brother-poet Helvius Cinna (cf. x.) Some expressions in x., written shortly after his return, imply that he had some hopes of bettering his fortunes by this absence from Rome, as humorous complaints of poverty and debt (xiii, xxvi.) show that his ordinary means were insufficient for his mode of life. He frankly acknowledges the disappointment of these hopes, and still more frankly his disgust with his chief (x., xxviii.) Some of the most charming and perfect among the shorter poems express the delight

with which the poet changed the dulness and sultry climate of the province for the freedom and keen enjoyment of his voyage home in his yacht, built for him at Amastris on the Euxine, and for the beauty and peace of his villa on the shores of Lake Benacus, which welcomed him home “ wearied with foreign travel.” ‘To this period and to his first return to Rome after his visit to his native district belong the poems xlvi., ci., iv., xxxi., and x., all showing by their freshness of feeling and vivid truth of expression the gain which the poet’s nature derived from his temporary escape from the passions, distractions, and animosities of Roman society. This happier vein is not to be traced in many of the poems which can be assigned to the years intervening between this time and the poet’s death. ‘Two poems, written ina very genial and joyous spirit, and addressed to his younger friend Licinius Calvus (xiv. and 1.), who is ranked as second only to himself among the lyrical poets of the age, and whose youthful promise pointed him out as likely to become one of the greatest of Roman orators, may, indeed, with most probability be assigned to these latcr years (xiv.) From the expression “ Odissem te odio Vatiniano,” in the third line of xiv., it may be inferred almost with certainty that the poem was written not earlier than December (the “Saturnalia ”) of the year 56 B.c., as it was early in that year, as we learn from a letter of Cicero to his brother

Quintus (ii. 4, 1), that Calvus first announced his intention of prosecuting Vatinius. The short poem nunibered liii, records an incident in connection with the actual prosecu- tion which occurred in August 54 B.c. The poems which have left the greatest stain on the fame of Catullus—thosc ‘ referta contumeliis Cvzesarzs,” the licentious abuse of Mamurra, and probably some of those personal scurrilities addressed to women as well as men, or too frank con- fessions, which posterity would willingly have let die— were written in the last years of his life, under the influence of the bitterness and recklessness induced by his experience. The complaint expressed in poem XXXVlil,—

‘¢Male est, Comifici, tuo Catullo,”

and one or two other short poems such as lii,— “‘Quid est, Catulle ? quid moraris emori?”

appear to be expressive of his state of mind in his last illness. In the first of them we recognize the tender trust- fulness, in the last the “ seeva indignatio” of his tempera- ment. ‘here is a return of the old graciousness and playfulness of his nature in the dedication to Cornelius Nepos (i.)— ‘¢Quoi dono lepidum novum libellum,”

which must have been written immediately before the publication of his volume.

Of several of the more interesting among the minor poems, as, for instance, xvii., xxxiv., and xlv., we have no means of determining the date. Nor can it be deter- mined with certainty whether the longer and more artistic

‘pieces, which occupy the middle of the volume—the

Epithalamium in celebration of the marriage of Manlius Torquaius; the 62d poem, written in imitation of the Epithalamia of Sappho “Vesper adest: iuvenes, con- surgite ;” the Aitis, and the Epic Idyll representing the marriage festival of Peleus and Thetis—belong to the earlier or the later period of the poet’s career. If the conjecture of Schwabe and other commentators is correct, that the person addressed in the first part of the 68th is the Manlius of the Hpithalamiwm, and that the lines from 3 to 8—

‘* Naufragum ut eiectum

refer to the death of Junia, it would follow that the first Epithalamium was written some time before that poem, and thus belongs to the earlier time. We should be inclined to attach as much weight to the consideration that the ringing, cheerful notes of the poem proclaimed it to be the utterance of the unclouded dawn of his genius, before his nature was saddened and embittered by the two great griefs of his life —the faithlessness of his mistress and the death of his brother. ‘The fact that the translation of Sappho,—

‘* Ile mi par esse deo videtur,”

and the translation from Callimachus (1xvi.),— ‘‘Omnia qui magni dispexit lumina mundi,”

belong to the earlier period might afford grounds for con- jecturing that the other poeins not relating to personal topics, and written after the manner of Sappho or the Alexandrine poets, belonged to the same period. But the Attis and the Peleus and Thetis, although perhaps suggested by the treatment of the same or similar subjects in Greek authors, are executed with such power and originality as declare them to be products of the most vigorous stage in the development of the poet's genius. That his genius came soon to maturity and did not need the ripening process of time and experience through which Horace attained to the perfection of his art, is a reason for hesitation in assigning any particular time between 62 and 54 B.c. for the composition of the AZtis and of that part of the Epithalamium ('" Peliaco quondam prognate vertice V. — 32

pervigilat,"

pinus") which deals with the main subject of the poem. But the criticism of Mr Munro in his edition of Lucretius, which shows similarities of expression, which cannot be mere casual coincidences, between the Ariadne-episode in the Lpithalamium of Catullus (from line 52 to 266) and the poem of Lucretius, leaves little doubt that that portion at least of the poem was written after the publication of the De rerum natura, in the winter of 55-54 B.c. There is no reason for supposing that Catullus could have had any access to that poem in the lifetime of Lucretius, and even if he were personally known to him and had been acquainted with his poem before its publication, the liberty which ancient poets assumed of using the thoughts and language of previous or contemporary writers could not have included the right of appropriating them before they saw the light.

No ancient author has left a more vivid impression of himself on his writings than Catullus. Neither the Letters to Atticus of Cicero nor the Satires and Lpistles of Horace afford more trustworthy indications of feeling and character. The interests which occupied his life and inspired his poetry were limited to the passions and the purer pleasures of youth, such as friendly intercourse with men of con- genial and cultivated tastes, the enjoyment of outward nature and foreign travel, the cultivation of his art, and the study of the early Greek lyric and the later Alexandrine poets.

Coming to Rome in early youth from a distant province, not at that time included within the limits of Italy, he lived as an equal with the men of his time of most intellectual activity and refinement, as well as of highest social and political eminence. Among those to whom his poems are addressed we find the names of Hortensins, Cicero, and Cornelius Nepos, attesting the fact that his society was valued by older men of established reputation and graver pursuits. With Memmius he was at least on sufficiently intimate relations to form one of the members of his staff during the time of his provincial government. He lived on terms of affectionate friendship with Licinius Calvus, with Helvius Cinna, whose distinc- tion (whatever his real merits as a poet may have been) is attested in Virgil's line—

'*Nam neque adhuc Vario videor, nec dicere Cinna Digna,"

with Varus, in all probability the Quintilius Varus whose death Horace laments to Virgil in the 24th ode of the first book, and other poets and men of letters contemporary with him. It is interesting to notice among those men- tioned as belonging to the circle of his younger friends, one who lived to become one of the most eminent men as statesman, orator, and man of letters in the following generation, Asinius Pollio, characterized by Catullus as—

- leporum ‘Disertus puer et facetiarum.”—xii. 8.

Catullus brought into this circle the genius of a great poet, the social vivacity of a vigorous nature, the simplicity and sincerity of an unambitious, and the warmth of an affec- tionate disposition. He betrays all the sensitiveness of the poetic temperament, but it is never the sensitiveness of vanity, for he is characterized by the modesty rather than the self-confidence which accompanies genius, but the sensitiveness of a heart which gives and expects more sympathy and loyalty in friendship than the world either wants or cares to give in return. He shows also in some of luis lighter pieces the fastidiousness of a refined taste, intolerant of all boorishness, pedantry, affectation, and sordid ways of life. The passionate intensity of his temperament displays itself with similar strength in the outpourings of his animosity as of his love aud affection, It was, unfortunately, the fashion of the time to employ in

the expression of these animosities a liccuce of speech and of imputation which it is difficult for men living under different social conditions to understand, still more difticult to tolerate. Cicero, in reference to such imputations says, in his defence of Cvelius (ch. iii.)—“ Sunt ista maledicta pervulgata in omnes, quorum in adolescentia forma ct species fuit liberalis ;” and a few sentences later he says of this kind of malediectio, “ si petulantius iactatur, convicium, si facetius, urbanitas nominatur.” It is not easy to realize what the style of those scurrilities must have been, which were “more petulant” and “less urbane” than those of Catullus. But the language of Cicero implies that they were taken, and meant to be taken, merely as a facon de parler, and would not be regarded either by the objects

of them or by those who read them as conveying the serious belief of the writer. Mr Munro (Journal of Philology, iii.) has examined the 29th poem—

‘*Quis hoe potest videre, quis potest pati,”

the longest and most important of the lampoons on Cesar and Mamurra, and has shown with much learning and acuteness the motives and intention of Catullus in writing them. Had Julius Ceesar really believed, as Suetonius writing two hundred years afterwards says he did, that “an eternal stigma had been cast upon him by the verses concerning Mamurra,” we should scarcely apply the word magnanimity to his condonation of the offence. But these verses survive as a memorial not of any scandal affecting Julius Cxsar which could possibly have been believed by his contemporaries, but of the licence of speech which was one of the symptoms of the social and political disorganiza- tion of the age, of the jealousy with which the younger members of the Roman aristocracy, who a little later fought on the side of Pompey, et that time regarded the ascendency both of the “father-in-law and the son-in-law,” and the social elevation of some of their instruments, and also, to a certain extent, of the deterioration which the frank and generous nature of Catullus underwent from the passions which wasted and the faithlessness which marred his life. The great age of Latin poetry extends from about the year 60 B.c. till the death of Ovid in 17 a.p. There are three marked divisions in this period, each with a distinct character of its own: the first represented by Lucretius and Catullus, the second by Virgil and Horace, the last by Ovid. Force and sincerity are the great characteristics of the first period, maturity of art of the second, facility of the last. The educating influence of Greek art ou the Roman mind was first fully experienced in the Ciceronian age, and none of his contemporaries was so susceptible of that influence as Catullus. With the susceptibility to art he combined a large share of the vigorous and genial qualities of the Italian race. Like most of his younger contemporaries, the vedrepor of whom Cicero speaks (Zpist. ad Atticum, vii. 2), he studied in the school of the Alexandrine poets, with whom the favourite subjects of art were the passion of love, and stories from the Greek mythology, which admitted of being treated in a spirit similar to that in which they celebrated their own experi- ences. It was under this influence that Catullus wrote the Coma Berenices, the 68th poem, which, after the manner of the Alexandrines, interweaves

the old tale of Protesilaus and Laodamia with the personal experiences of the poet himself, and the Zpithalamium of Peleus and Thetis, which combines two pictures from the Greek mythology, one of the secure happiness of marriage, the other of the passionate despair of love betrayed. In this last poem Catullus exercises a power of creative pictorial imagination far trauscending that displayed in any of the extant poctry of Alexandria. We have no means of deter- mining what suggested the subject of the Adts to Catullus,

 marian, though they are not included in the MSS. of his eolleeted works. The text, as it has reached us, is in many places corrupt, and its restoration still exereises the acuteness of Knglish and Ger- man scholars. There appears to have been one MS. of Catullus ex- tant in Franee in the 9th eentury, from which the 62d poem, Vesper adest, iuvenes, consurgite, &e., was eopied at that time into an anthology of Latin poems. Another MS. is known to have existed in Verona in the middle of the following eentury. This MS. is not again heard of till the beginning of the 14th eentury, when it was again discovered and read by Petrarch. It was soon after lost again. The two oldest extant MSS. are immediate eopies of it. One of these, dated 1375, now belongs to the Paris Library, the other to the Bodleian (¢f. Bahrens, Prolegomena). The editio prineeps appeared in 1472, and other editions appeared a few years later at Parmaand Venice. ‘‘1n the 16th century Catullus, like most of the chief Latin elassics, was corrected and illustrated with signal zeal and suecess. The editions of Avancius, Guarinus, Muretus, Statius, and Sealiger do honour to the learning of Italy and France, even in that age of erudition” (Munro, Journal of Philology, iii.) Nothing more was done of any importance, in the way of emendation or commentary, till Lachmann published his edition of the text in 1829. Since that date editions have appeared by Haupt, Rossbach, Sehwabe, Miiller, Bihrens (1876), and other German editors, and by Professor Robinson Ellis—the last aeeompanied by an elaborate apparatus eritieus, prolegomena, &e. Most important eontributions to the interpretation of the matter and meaning of Catullus have been made by Haupt, Schwabe, and Mr Munro in the Journal of Philology. Among recent English translations may be mentioned those of Mr Theodore Martin, Dr Cranstoun, and Mr R. Ellis—the last being written in the metres of the original poems. = (W. Y. 8.)

CAUCASIA, a governor-generalship of the Russian empire, which extends from about 38° 40’ to 46° 40’ N. lat., and includes the whole range of the Caucasus, the vast steppes that lie to the north of the mountains between the Sea of Azoff and the Caspian, and all the Russian territory to the south, On the south side it is bounded by the Turkish empire and Persia, while on the north it is con- terminous with Astrakhan and the province of the Don army. ‘The principal division is into Cis-Caucasia or the European portion, and Trans-Caucasia or the Asiatic,—the watershed of the Caucasus having recently been adopted as the line of partition. Cis-Caucasia thus includes the government of Stavropol, the Kuban district, the Terek district, and Daghestan; while Trans-Caucasia comprises the governments of Tiflis, Baku, Elisabethpol, Erivan, and Kutai, and the circles of Sukhum, Zakatal, and the Black Sea or Chernomorsk. ‘The total area is 172,837 square miles, and the population is estimated at 4,893,332.

whether the previous treatment of the subject by some Greek writer, some survival of the myth which he found still existing during his residence among the “Phrygii Campi,” or the growth of various forms of Eastern superstition aud fanaticism, at Rome, in the last age of the Republic. Whatever may have been its origin, it is the finest speci- men we possess, in either Greek or Latin literature, of that kind of short poem more common in modern than ancient times, in which some situation or passion entirely alien to the writer, and to his own age, is realized with dramatic intensity. But the genius of Catullus is, perhaps, even happier in the direct expression of personal feeling than in artistic creation, or the reproduction of tales and situations from mythology. The warmth, intensity, and sincerity of his own nature are the sources of the inspira- tion in these poems. The most elaborate and one of the finest of them is the Lpithalamium in honour of the marriage of a member of the old house of Manlius Torquatus with Junia (or, according to another reading, Vinia) Aurunculeia, written in the glyconic in combination with the pherecratean metre. To this metre Catullus imparts a peculiar lightness and grace by making the trochee, instead of the spondee as in Horace’s glyconics and pherecrateans, the first foot in the line. His elegiac metre is constructed with less smooth- ness and regularity than that of Ovid and Tibullus or even of Propertius, but as employed by him it gives a true echo to the serious and plaintive feelings of some of his poems, @.9.) IXXVi.— “Si qua recordanti benefacta priora voluptas,”

xcvi.,

“Si quiequam mutis gratum aceeptumque sepulchris,” and ci.,

‘¢ Multas per gentes et multa per equora vectus,” while it adapts itself, as it did later in the hands of Martial, to the epigrammatic terseness of his invective. But the perfection of the art of Catullus is seen in his employment of those metres which he adapted to the Latin tongue from the earlier poets of Greece, the pure iambic trimeter, as in iv.— «« Phaselus ille quem videtis hospites,”

the Scazon iambic, employed in viii. and xxxi.—

“ Peninsularum, Sirmio, insularuamque,”

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and the phalecian hendecasyllabic, a slight modification of the Sapphic line, which is his favourite metre for the expres- sion of his more joyful moods, and of his lighter satiric yein. The Latin language never flowed with such ease, freshness, and purity as in these poems. Their perfection consists in the entire absence of all appearance of effort or reflexion, and in the fulness of life and feeling, which gives a lasting interest and charm to the most trivial incident of the passing hour. In reference to these poems Mr Munro has said with truth and force: ‘A generation had yet to pass before the heroic attained to its perfection; while he (Catullus) had already produced glyconics, phalecians, and iambics, each ‘one entire and perfect chrysolite,’ ‘cun- ningest patterns’ of excellence, such as Latium never saw before or after,—Alczeus, Sappho, and the rest then and only then having met their match ” (Journal of Philology, No. iii.)

From expressions in some of the poems (xvi. 12, liv. 7) itis clear that several of them had been published or cireulated separately before they were finally collected in the edition which has eome down tous. Lines are quoted from Catullus by ancient writers whieh are not found in any of the poems which we possess. If these passages are eorreetly attributed to

Catullus it follows that he must have omitted some of his earlier poems from the eollection which he made before his death. In some of the older editions (as for instance that of Doring, 1834) two poems addressed ‘ad Hortorum Deum,” and num- bered 19 and 20, have been ineluded, of whieh there is no ground to believe Catullus to have been the author. The lines numbered in Doring’s edition 18 are attributed to him by an aneient gram-

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Map of Caucasus and Lieutenaney of Caucasis (750 miles by 650).

CAUCASUS, a great chain of mountains, extending from the Black Sea to the Caspian. It has a general direction from W.N.W. to E.S.E., which it preserves with great uniformity for so extensive a chain, having a range of nearly 700 English miles in length, from its commencement

near Anapa on the Black Sea, till it sinks into a range of low hills, as it approaches Baku on the Caspian. Its width on the other hand is comparatively small, not exceeding in general about 70 or 80 miles, and even where widest not attaining more than 120 miles.

Few great mountain chains have their boundaries so clearly marked by nature. On the N. it is bounded by the vast plains and steppes of Russia, which extend completely across from the Sea of Azoff to the Caspian, and are carried up to the very foot of the mountain slopes ; on the S. it is bounded at first by the Black Sea, for a distance of nearly 240 miles, and afterwards by the broad and level valley of the Rion as far us Kutais, about 70 miles inland. Farther east- ward the valley of the Kur may be eonsidered as forming its southern limit from the neighbourhood of Tiflis to the Caspian, a distance of more than 250 miles. But between the towns of Kutais and Tiflis the country is more broken, the underfalls and minor ramifications of the Caucasus extending to the south so as to meet those of

the mountain chain which forms the southern boundary of the valley of the Rion. The two ranges are, indeed, united at this point by a transverse range of very moderate elevation, which forms the watershed between the streams that flow into the Blaek Sea, and the Kur and its tributaries, which flow eastward towards the Caspian. This dividing range (commonly known as the mountains of Suram from the town of that name) may therefore be regarded as con- stituting a conneeting link between the Caucasus and the southern range, whieh extends from the Black Sea in the neighbourhood of Poti to that of Tiflis, and itself attains to a very considerable elevation, several of its summits having an altitude of from 9000 to 10,000 feet. But these ranges belong to the great mountain group of Armenia, and are inseparably eonnected with the mountains of Lazistan, and with those which extend inland to join the northern branches of the Taurus; and they cannot with any propriety be regarded as forming part of the system of the Caucasus. The transverse range above deseribed, though forming the watershed between the two basins of the Rion and the Kur, is in itself but an ineonsiderable ridge of hills, and the point where it is traversed by the high road between Kutais and Tiflis has an elevation of only about 3000 feet above the sea. Hence the Caucasus may properly be eonsidered as forming an isolated chain, uneonnected with any other of the great mountain systems of Asia ; while those to the south of it belong in reality to the wide-spread ramifications of the range known to the ancients as Mount Taurus, which extends from Asia Minor through Armenia into Persia.

It is unfortunate that some modern geographers, especially Germans, have introdueed into their systematie treatises the praetice—first adopted by the Russian residents in the provinces south of the Caueasus—of designating these southern ranges by the appellation of the Little Caueasus, a term tending to produee confusion, and to encourage the notion of their being connected with the great northern range in a manner which is certainly not the case in any true orographical sense. In the present article the name of the Caucasus will be employed only as applied to the great mountain range which, as has been already stated, forms a continuous barrier from the shores of the Black Sea to those of the Caspian, and to which alone the appellation has been applied from the time of the Greeks to our own day

The origin of the name is unknown. It was employed by the Greeks in very early times, and has continued in use among geographers ever since. But no general name for the whole chain is known to the tribes that inhabit it, or to those that immediately adjoin it. Nor does it appear that any of the loeal or native designations of portions of

the mountains known by this name are sueh as may reasonably be supposed to liave given rise to the term.

At the present day the line of the Caucasus is generally regarded as constituting the boundary between Europe and Asia; and though it is only in quite modern times that this line of demarcation has been established among geographers, it is so much the most convenient natural limit that it can hardly fail to eontinue to be received ag such. The scientific eouclusion has, moreover, been con- firmed of late years by the official sanction of the Russian Government, which has adopted the watershed or central ridge of the Caucasus as the line of separation between its European and Asiatic provinees.

In its general cliaraeter and conformation the range of the Caucasus may be considered as presenting more analogy with the Pyrenees than with the Alps. Its general uniformity of direction, its comparatively small width, and its well-defined limits towards both the south and the orth, are strong features of resemblance to the former, rather than to the latter, of these well-known ranges. ‘To these it may be added that, like the Pyrenees, the ridge of the Caucasus generally preserves for long distances together a high average elevation, and is not broken by those deep depressions, constituting natural passes across the chain, which are of such frequent oeeurrence in the Alps. Another point of resemblance between the Pyrenees and the Caucasus is to be found in the fact that in both cases two of the highest summits are in some measure detached from the main range ; aud just as the Mont Perdu and the Maladetta both lie south of the central ridge of the Pyrenees, and are consequently distinctly included in Spain, so Mount Elbruz aud Kazbek—the two best known summits of the Caucasus—are situated decidedly north of that chain, and must therefore be geographically assigned to Europe, if the line of demareation be drawn along the watershed of the range. Both

these mountains are, in faet, of recent volcanic origin, and, geologically speaking, unconnected with the granitie masses which constitute the central axis of the chain.

It had long been known that the highest summits of the Caucasus exceeded the most lofty of the Alps in positive elevation; but until very reeently no aceurate measure- ments of them existed, and little or nothing was known of any of the individual peaks except the two already mentioned. Of these Mount Elbruz owes its celebrity not merely to the fact that it is in reality much the most lofty summit of the whole range, attaining an elevation of not less than 18,526 feet, but to the circumstance that from its partly isolated position, it is eonspieuously seen, both from the Black Sea and, on the other side, from the plains and steppes of Russia, where it is said to be distinctly visible from a distanee of more than 200 miles. Kazbek, on the contrary, attracted attention from an early period, on aceount of its proximity to the Pass of Dariel, in all ages the only frequented pass across the range of the Caueasus. Hence it was long supposed to be the second in height of the whole range, which is now found not to be the case, though it attains an elevation of 16,546 feet, or nearly 800 feet higher than Mont Blanc. But between these two giant peaks rise those of Kosehtan Tau and Dych Tau (both of the names until very recently quite unknown), of which the former rises to nearly 17,100 feet, while the latter attains to 16,925 feet; these are therefore entitled to rank as the second and third summits of the Caucasus, while Kazbek can claim only the fourth plaee. It is, indeed, doubtful whether some of the other peaks on the great snowy range do not also exceed it in height.

For the purpose of description it may be eonvenient to divide the great range into three portions.

1. The first of these, comprising the western portion of

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the mountain chain, begins in the neighbourhood of Anapa on the Black Sea, where it rises at first merely as a chain of hills of moderate height, but gradually assumes more and more of a mountain character, until the highest summits attain to an elevation of 9000 to 10,000 feet. It is not, however, till they approach the neighbourhood of Elbruz that they pass the limit of perpetual snow; but the central chain, from the 41st degree of longitude eastwards, is almost constantly' covered with snow, and throughout the greater part of the year exhibits a lofty range of snow-clad peaks, that can find no parallel in Europe, except in the Alps. Throughout this western portion of the Caucasus, the central chain forms a very distinct line of watershed, at no great distance from the Black Sea, but gradually receding from it, and thus leaving a wider interval between its shores and the main ridge. Even at Sukhum Kaleh, however, in longitude 41°, the central chain of the mountains is not more than 30 miles inland in a direct line as measured on the map. The whole of the intermediate space is filled up by the underfalls and subordinate ranges of mountains thrown out from the great chain, extending for the most part quite down to the sea, so as to constitute a coast line of a singularly rugged and inaccessible character. For a distance of nearly 200 miles from Novo Rossisk to Sukhum Kaleh there is nothing like a harbour, while the dense forests with which the mountains arc still covered contribute to render the interior impassable.

From the proximity of the central ridge to the sea, in this western portion of the Caucasus, it naturally follows that no rivers of any importance are to be found on the southern slope of the mountains, though it is furrowed by numerous mountain torrents, which add to the impracticable character of this part of the country. On the northern side, on the contrary, the mountains slope more gradually towards the plains of Russia, and here several considerable streams are found, all of which pour their waters into the Kuban, which itself takes its rise in the glaciers of Elbruz. Among the most considerable of these streams may be mentioned the Urup, the Laba, and the Bjelaia.

2. The great central mass of the Caucasus, extending from the neighbourhood of Elbruz to that of Kazbek, or from the source of the

Kuban to the pass of Dariel, a distance of about 130 miles in a direct line, is at once the most important and interesting part of the whole chain, and is that which has of late years been the most fully explored. It is here that are found all the most lofty summits of the whole range. Besides the four above mentioned, there are at least five other peaks in this part of the chain that attain to not less than 15,000 feet, viz., Gumaran Khokh and Adai Khokh, which, according to the Russian survey, measure respectively 15,672 and 15,244 feet in height, while three others, not found in the survey, are estimated by the practised English mountaineers as follows :— Tungzorun, 15,000 fect ; Tau Tétdnal or Tetnuld, 15,500 ; and Uschba (one of the most remarkable mountains in the whole of the Caucasus), not less than 16,500 feet. But it is not mercly that isolated summits attain to these great altitudes, but the whole line of the watershed or central ridge, from a point south of Elbruz to the group of Adai Khokh, on the west of the Ardon valley, is an uninterrupted line, which nowhere sinks below 10,000 feet, and is traversed only by glacier passes, some of them extremely rugged and difficult, others comparatively easy, but still presenting an extent of snow and ice equal to that of the well-known pass of St Theodule in the Alps. There is here, therefore, an unbroken mass of glacier and perpetual snow of nearly 100 miles in length, or as far as from Mont Blanc to the St Gotthard. It nowhere, however, attains to any great width, nor do any of the glaciers that descend its flanks equal in extent the largest of those in the Alps. Eastward

of the Adai Khokh group the ridge is intersected by the upper valley of the Ardon, but the range of snowy peaks is continued after this interruption by the lofty summits of Tau Tepli and Gumaran Khokh on to Kazbek, where the whole chain is deeply cut through by the gorge of Dariel, and the corresponding depression of the pass between Kobi and Mleti. But while the series of peaks just referred to may be considered as the continuation of the truc axis of the chain, the watershed, which has for so long a space run nearly from W.N.W. to E.S.E., bends suddenly due south, and sinks to the comparatively low gap of the Mamisson Pass, which is about 9400 feet in height, and entirely free from glacier. After a few miles it resumes its former direction, but without recovering its elevation or grandeur, the peaks of this part of the chain rising only to 11,000 and 12,000 feet, while the

passes which traverse it range from about 9000 feet to less than 8000 feet, the elevation of the Krestowaja Gora, where the watershed is traversed by the high road from Vladikafkaz to Tiflis. In this part of the chain, therefore, we have a watershed of com- paratively small altitude, with a parallel range to the north of it of much more lofty mountains. The central mass, on the contrary, from Elbruz to Adai Khokh, presents a lofty medial range of granitic structure, on both sides of which, but especially on the south, rise secondary chains of limc- stone mountains, preserving in a general way parallel courses with that of the main chain. Hence the upper valleys are troughs, bounded on both sides by lofty mountains, through which the upper waters of the streams that take their rise in the glaciers of the central chain are compelled to flow, until they make their cscape by deep gorges cut through the lateral ranges. The most important of these parallel trough-like valleys is the upper valley of the Ingur, forming the district known as Suanetia, which is between 40 and 50 miles in length, and will thus bear comparison with the two great valleys of similar structure in the Alps, the Valais and the Valteline.

It may naturally be expected that so great a mass of glaciers and perpetual snow should send forth a number of considerable streams, and in fact all the principal rivers of the Caucasus have their sources in the district now under consideration. Commencing with those on the south side of the chain, which flow towards the Black Sea, we find —(1.) the Kodor, a considerable stream, which enters the sea about 12 miles south of Sukhum Kaleh ; (2.) the Ingur, a much more important river, which rises in the great glaciers of the Central Caucasus, near a place called Jibiani, and, after flowing for nearly 50 miles in a course parallel to the great chain (as already described) and receiving in its course the outflows of numerous other glaciers, turns abruptly to the south-west, and after pursuing that direction for above 60 miles, discharges its waters into the Black Sea at the little town of Anaklia; (3.) the Zenesquali, which rises in the mountains almost immediately east of the sources of the Ingur, and in like manner flows at first nearly due west, then turns towards the south-west and south, and joins the Rion about 30 miles above its mouth at Poti; and (4.) the Rion itself, the most important of all the Caucasian rivers that flow into the Black Sea. The Rion has a very circuitous course, having its source at the foot of the mountain called Pasi Mta, very near the sources of the Zenesquali, and flowing at first in a south-

easterly direction, past the little town of Gebi, about 8 miles below which it receives an affluent from the Mamisson Pass towards the north-east ; it then turns about south-west till it has passed the village of Oni, after which it flows for a considerable distance (above 30 miles) nearly due west, through one of the parallel valleys above described, and then again turns due south until it has passed under the walls of Kutais, the capital of Imeritia, A few miles

below that town it emerges from the hills into the broad and level valley that separates the underfalls of the Caucasus from the ranges to the south. It here receives a tributary called the Quirilha, which brings down the waters from the Suram range (the transverse ridge that unites the Caucasus with the mountains of Armenia), and then again turning to the west, pursues a winding course, but retaining the same general direction, till it enters the Black Sea at Poti, about 50 miles in a dircct line from its junction with the Quirilha. The Rion is in the lower part of its course a deep and rapid stream, and is navigable for steamers as high as Orpiri, where it receives the Zenesquali, but unfortunately a shallow bar at its mouth prevents the entrance of large steamers from the sea. It is the river so well known in ancient times under the name of Phasis, and connected by Greek legends with Medca and the voyage of the Argonauts.

All the streams that take their rise on the southern side of the Central Caucasus, east of the Mamisson Pass, are tributaries of the Kur, and discharge their waters into that river, which itself, however, does not derive its origin from the Caucasus, but flows from the mountains of Armenia, and receives its first Caucasian affluent, the Lachwa, at the town of Gori. The most important of these tributaries is the Aragwa, which has a course almost due north and south, from its source above Mleti to its junction with the Kur at. Mscheti. It is up the valley of this river that is carried the highroad from Tiflis to Vladikafkaz, which turns off at Mleti to cross the pass of the Krestowaja Gora, and from the natural facilities afforded by this line of route, it has been from the earliest ages frequented for the same purpose.

The rivers that flow from the Central Caucasus north- wards have much longer courses than those on the south side, both from the more gentle slope of the mountains in that direction, and from the extent of the steppes beyond, through which they have afterwards to find their way to the sea. By far the most important of these rivers are the Kuban and the Terek, which receive as tributaries all the minor streams. Of these the Kuban takes its rise in a glacier at the foot of Mount Elbruz, immediately below the watershed of the main chain. It flows at first in a northerly direction, and preserves this course till it has altogether quitted the mountains, and entered the steppe of the Nogai Tartars, when it trends first towards the north-west and then abruptly towards the west, which general direction it pursues till it enters the Sea of Azoff by one mouth and the Black Sea by another. Its whole course is estimated at above 400 miles. During the latter part of its course, from east to west, it receives the waters of all the smaller streams that descend the northern slopes of the Western Caucasus. The Terek has its source in the central chain, where it issues from a small glacier at the foot of Zilga Khokh, its head waters being separated from those of the Ardon only by a pass of moderate elevation. Its upper valley, like so many others, has a direction parallel to the main range, so that it is compelled to flow towards the south-east as far as the village of Kobi, where it turns to the north-east, which direction it holds to the village of Kazbek, and from thence pursues a course almost due north, traversing the famous ravine or gorge of Dariel, until it finally issues from the mountains at Vladikafkaz. From thence it takes a north-westerly direction, which it follows for a distance of more than 70 miles, receiving on its way numerous affluents, the last of which is the Malka, after its junction with which, near the town of Jekaterinograd, it turns abruptly to the east and pursues its course in that direction through a tract of steppes and marshes for 200 miles to its mouth in the Caspian Sea. All the mountain streams that flow northwards from the great glaciers of the

central chain, between the Kuban and the Terek, discharge their waters into the latter river. The most important of these are (proceeding from west to east) the Malka, the Baksan, the Tchegen, the Tcherek, the Uruch, and the Ardon,—all of them large and rapid streams, which flow through deep

valleys in a generally northerly direction, until they emerge from the mountains, and successively unite their waters with those of the Terek. The Kuma alone pursues an independent course through the steppes to the north of the Terek, but this stream does not rise in the central chain of the Caucasus, but has its sources in the detached and outlying group of mountains near Pjaitigorsk—the highest summit of which, the Beschtau, does not attain to a height of more than 4600 feet. Hence its waters, not being fed by perennial snows, are absorbed in the sands of the steppe before they reach the Caspian,

3. The Eastern Caucasus may be considered as com- Easter

prising the whole of the main chain from the Pass of Dariel to the Caspian, together with its various ramifications, which are considerably more extensive than in the other portions of the range. It is at once the most complicated and the least known part of the whole, the highest portions not having yet been explored by any of those adventurous travellers who have added so much to our knowledge of the Central Caucasus. But itis certain that, while none of the summits in this part of the range equal those further west— the highest of them not attaining to 15,000 feet—there is nevertheless a long succession of snowy peaks, rising to a height of from 10,000 to 14,000 feet, which extends from the Pass of Dariel as far as Baba Dagh, in 48° E. long, the last of these lofty summits proceeding eastwards towards the Caspian. At the same time there is no great connected mass of glacier similar to that found in the Central Caucasus ; indeed no considerable glaciers exist in this part of the range at all. The watershed is, however, continued at a high elevation (after passing the depression traversed by the pass of the Krestowaja Gora) as far as Mount Schebulos, from whence it sends out a considerable branch towards the north-east, known as the Andi Moun- tains, from the village and valley of that name, which forms the northern boundary of Daghestan, and separates it from Tschechnia, or the country of the Tchetchens. The main range retains its general direction with little variation, from about north-west to south-east, and still presents many peaks of considerable elevation, the highest summits being Sari Dagh at the head of the River Samur, which attains to 12,000 fect, and Schach ‘Dagh (called. also Bazardjusi) which rises to 13,950 feet. The last of these lofty peaks is Baba Dagh (11,934 feet), from which the

main chain descends gradually as it approaches the Caspian, and sinks into hills of moderate elevation before reaching the shores of that sea at Baku. The Peninsula of Apsheron, which here forms a promontory projecting into the Caspian, may be considered as forming the last faint prolongation of the Caucasian chain.

But while the axis forming the main watershed of the range thus preserves a pretty regular course, it throws off towards the north and north-east a number of offshoots, filing up the greater part of the space between the main range and the Caspian. It is here that is formed the remarkable country known as Daghestan, which is in fact a great mountain plateau, sloping gently towards the Caspian at an elevation of not less than 7000 to 8000 feet, furrowed by decp valleys or ravines, cut by the streams that descend from the central range. It was this peculiar conformation of the tract in question that so long enabled the mountain tribes of this part of the Caucasus to defy the arms of Russia. Gunib, the last stronghold of Schamyl, is a mountain that rises to 7742 feet, with precipitous sides ;

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other summits in the same region attain to a still greater elevation,—Intscharo to 9469 feet, Schumi Dagh to 9733 feet, and Dschufa Dagh to 9900 feet. At the point where this fan-shaped plateau joins on to the main range is found a cluster of peaks, all of them rising above the level of perpetual snow; while Alachun Dagh, an offshoot of the main range, between Sari Dagh and Dschufa Dagh is said to attain to 12,100.

Of the streams that traverse the elevated plateau of Daghestan, four are known by the common name of Koissu, but are distinguished as the Andi Koissu, the Avari Koissu, the Kara Koissu, and the Kazikumi Koissu. After

flowing through extremely deep and narrow valleys, in many places mere gorges, they all unite their waters before they quit the mountains, and under the name of Sulak flow into the Caspian Sea about 90 miles north of Derbend. The only other river of Daghestan that deserves notice is the Samur, which takes its rise at the foot of Sari Dagh, and after sweeping round almost in a semicircle enters the Caspian a few miles south of Derbend. The most important of the streams that rise in the main chain east of the valley of the Terek, and flow northwards into that river, is the Argun. Those which traverse the country of the Tchetchens are of little consequence.

The secondary ranges on the south side of the Eastern Caucasus are of comparatively little interest or importance, and none of them attain to any considerable elevation. Two of these subordinate ranges, however, which branch off from the main chain but a little east of the Terek, constitute the limits which separate the valley of the Aragwa from that of the Jora, and the latter again from that of the Alazun. Both these rivers are among the most con- siderable of the affluents of the Kur, and the valleys through which they flow are two of the most fertile districts of Georgia. The valley of the Alazun especially, constitut- ing the region known as Kakhetia, is celebrated for the abundance and excellence of its wines.

The preceding account of the physical structure of the Caucasus is derived from the latest works on the subject, but it must be admitted that our knowledge of this important chain is still far from possessing the complete- ness and accuracy which the geographer would desire. The Russian survey has been found by recent travellers to be often defective and erroneous in regard to the most interesting part of the chain—the range of glaciers and snow-clad peaks in the Central Caucasus—and will require much correction before it can compare with the maps that we now possess of the Alps and Pyrenees. Much confusion still exists with regard to the nomenclature of the different peaks, and this is aggravated by the different names given to them by the different races which inhabit the surrounding valleys. Thus Elbruz, as it is called by the Russians, is known to the neighbouring mountaineers only as Minghi Tau, and the mountain called by the Russians Kazbek, from the village of that name, is known to the Georgians, from whose plains it is a conspicuous object, as Mkinwari.

The scarcity of passes across the great chain of the Caucasus has been already adverted to. There exists in fact but one such natural pass, sufficiently practicable to afford direct communication between the countries to the north and south of the range, and this has in consequence been frequented in all ages. ‘This is the line followed by the present highroad constructed by the Russians since their Occupation of the country, from Vladikafkaz at the northern foot of the chain to Tiflis on the south. This Toute ascends the valley of the Terek from Vladikafkaz as far as Kobi (a distance of about 40 miles), where it quits the valley, which turns abruptly to the west, and is carried over the lofty crest or ridge known as the Krestowaja Gora (Mountain of the Cross), an elevation of nearly 8000

feet, from whence it descends to Mleti in the valley of the Aragwa, and follows the course of that stream nearly to Tiflis. The proper designation of this pass would undoubtedly be that of the actual passage over the sum- mit level of the range, the Krestowaja Gora, but it is commonly known as the Pass of Dariel, from the re- markable gorge of that name through which it is carried between Larsand Kazbek,—a defile of the grandest and most impressive character, which is considered by recent travellers to be equal, if not superior, in point of scencry, to the finest defiles of the Alps, Previous to the formation of the present road, this deep and narrow gorge—affording only just passage for the torrent, while the mountains rise on each side abruptly to a height of at least 5000 feet above the level of the Terek—must have presented alinost insuperable difficulties to the passage of traffic along this route. ence it was known and celebrated from the earliest times, and is mentioned under the name of the Caucasian Gates (Porte Caucasiw) by Pliny (Hist. Nat., vi. 2, § 30), who describes the pass as actually closed by a fortified gate, a measure which might have been easily adopted.

The only other line of communication in general use between the northern and southern regions bordering on the Caucasus, is that which skirts the eastern extremity of the range, where its offshoots descend to the shores of the Caspian. This passage presents almost no natural difli- culties, the mountains for the most part not descending nearly to the sea, the shores of which are everywhere flat andlow. In one place only doesa range of hills,

branching off from the more lofty masses of the chain, descend to Within a short distance of the Caspian, so as to admit of the interval being closed by a fortified wall, which was in former times carried up the heights to the west for a con- siderable distance, ‘The site is still guarded by a small fort and the town of Derbend, but the adjoining hills are not of a precipitous or impracticable character, so that the obstacles presented by this pass are merely of a military kind, aud there is no difficulty in the construction of a road or railroad along this line, which has been, indeed, in all ages the natural highway by which nations north of the Caucasus have entered Georgia and Persia. Thus we are told by Herodotus (i. 104) that it was by this route ~ that the Scythians penetrated into Media in the 7th century B,C. :

On the other hand the western portion of the Caucasus, where it abuts upon the Black Sea, affords no natural passage along the coast, the underfalls of the chain descend- ing so steeply to the sea, and being so rugged and broken, as well as densely covered with forest, as to preclude the existence of any practicable route on this side. It is certain, indeed, that Mithridates the Great, when hard pressed by Pompey, succeeded in forcing his way with an army from Colchis (Mingrelia) to the Cimmerian Bosporus, along this line of coast, but the same Greek writers who recorded this wonderful march, dwelt largely upon the difficulties that he encountered. In modern times the Russians, during their long contest with the Circassians, established a continuous system of forts or small fortified posts along the whole of this line of coast, from Anapa to Sukhum Kaleh; but these have now been almost all abandoned, and the communications are maiutained ex- clusively by sea,

Climate and Natural Productions.—The chain of the Climate.

Caucasus is situated between 45° and 40° 30’ N, lat. It therefore corresponds in general position rather with the Apennines and the Pyrenees than with the Alps. But from its character as a great barrier extending across from sea to sea, it constitutes the limit between two climates which differ very widely from one another, The great

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steppes and plains of Russia on the north side of the chain are open to the cold winds of the north, and partake to a great extent of the severity of a Russian winter ; while the valleys of Imeritia and Georgia on the southern side are sheltered by the vast mountain wall to the north of them, and thence enjoy a climate more in accordance with their southerly latitude. Thus Tiflis, though situated at a height of about 1500 feet above the sea, has a mean temperature of 55°, and Kutais of more than 58°. The average winter temperature of Tiflis does not fall below 36°, and that of Kutais is not less than 42°5°.

Bat a still more remarkable contrast is that presented by the varying amount of rainfall in the different portions of the chain, according to their distance from the Black Sea. While the rainfall at Tiflis does not exceed 20 inches, it amounts to more than 57 inches at Kutais, and not less than 63 inches at Redut Kaleh on the sea shore near Poti.

The effects of these great variations in the meteorological conditions of the countries adjoining the Caucasus are naturally striking and strongly marked. Whatever be the coutrasts presented by the two sides of the Alps, they are far more remarkable in the Caucasus, This is especially the case with the south-western valleys and slopes, where a great amount of rain is combined with a warm tempera- ture. Hence all this part of the mountain country is characterized by a luxuriance of vegetation to which no parallel can be found in Europe. Magnificent forests clothe the mountain sides and extend down quite to the sea; while the rich valley, or rather basin, of the Rion equals any part of Italy in fertility, and is capable of producing all kinds of crops that flourish in the Italian plains. But as the traveller passes inland towards Tiflis, he is struck by the change that takes place after crossing the comparatively trifling range of the Suram Mountains. Arid upland plains and parched hill-sides take the place of the rich verdure and luxuriant forests of Imeritia and Mingrelia. A similar change is observed in the higher regions of the mountains on crossing the Mamisson Pass, which separates the head waters of the Ardon from those of the Rion. While the valleys west of this—especially that of the upper Ingur, or Suanetia—are covered with the richest vegetation, those on the other side, the valleys of the Ardon and

Terek, are almost wholly bare of trees,and present only mountain slopes covered with grass, where they are not sheets of bare rock. The extensive pine forests, which constitute so important a feature in the scenery of the Alps, are almost wholly wanting in the Caucasus, or at least of ouly partial and occasional occurrence ; and the description given by Mr Freshfield of the scenery of the Terek above Kazbek, that it presents ‘treeless valleys, bold rocks, slopes of forbidding steepness (even to eyes accustomed to those of the Alps), and stone-built villages, scarcely distinguishable from the neighbouring crags,” will apply with little varia- tion tv all the valleys that run northward from the central chain, But if the general scenery of these valleys be dull and uninteresting, there is a marked exception in the deep gorges by which in most cases their waters make their escape through the northern lateral ridge. These defiles are pronounced by competent judges to be far superior in grandeur to anything of the kind to be found in the Alps; that of Dariel has been already described, but the less known gorges of the Tcherek and the Uruch are considered by recent travellers to be still more striking and marvellous. At the same time the snowy ridges and peaks of the central chain are said to surpass those of the highest portions of the Alps in boldness and picturesqueness of outline, as well as in steepness and apparent inaccessibility, as much as they do in absolute elevation. On the whole it may be safely asserted that the Caucasus presents attractions to the traveller and the tourist beyond those of any other mountain

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chain within such comparatively easy reach, and that it will year by year become better known and more frequently visited. The vegetation of the Caucasus is in general not materially different from that of the mountain chains of Central Europe. The extensive forests that clothe its flanks are composed entirely of the ordinary European trees, among which the oak, the beech, the eli, and the alder are the most prevalent, but a peculiar character is imparted to them by the dense undergrowth of rhododen- drons, azaleas, box-trees, and laurels, as well as by the huge climbing masses of ivy, clematis, and wild vine, which attain to a height and size wholly unlike anything to be seen in Western Europe. Fruit trees of various kinds abound on the lower slopes of the hills, where the plum, the peach, the apple, and

the pear are found wild, as well as the walnut, which is extensively grown in the cultivated regions, where it combines with the plane and the lime tree to form one of the chief ornaments of the

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landscape. ‘The wild animals found in the Caucasus are Zoology

for the most part the same with those of the mountainous regions of Central Europe, while others point to a transi- tion toward the zoological character of Asia. Thus while it has the bear, the wolf, the wild boar, the lynx, in common with the Alps, the jackal is not unfrequent on its southern side, the hyzena is also found, and leopards are occasionally killed. Tigers do not appear to be ever found in the Caucasus proper, though they are killed from time to tine in the districts of Lenkoran on the Caspian, south of the mouth of the Kur. The ibex or bouquetin, as well as the chamois, abounds among the higher summits of the range, and with them is found the wild goat (Capra Agagrus), and aspecies of moufflon or wild sheep. These vast forests of the western ranges still afford shelter to the aurochs or European bison, which now exists here alone in a truly wild state. It may be mentioned also that the southern slopes of the Caucasus are the native country of the pheasant, which derives its name, as well as its origin, from the River Phasis.

Geology.—The geology of the Caucasus is still but Geolog:

imperfectly known, though the long-continued labours of Dr Abich have thrown much light on the subject, and enabled us to trace at all events its general outlines. Throughout the most lofty part of the chain, from beyond Elbruz on the west to Kazbek on the east, the central ridge is composed of rocks of a granitic character; in great part indeed of pure granite. Immediately adjoining this granitic axis are found metamorphic rocks of the usual character,—mica-schists, talc-schists, &c.,—and beyond these, again, clay-slates and schists of uncertain age. The great limestone masses that form the secondary chains on each side of the central range (which rise to a height of 10,000 to 12,000 feet) are considered by Dr Abich to belong to the Jurassic formation, while the flanks and underfalls of the mountains on both sides are composed of Cretaceous strata, and these are again succeeded by

Tertiary marls and sandstones, extending around the base of the chains, and forming its lowest declivities. This succession of the strata may be observed with great regu- larity and distinctness on the north side of the range, and is found on the southern side also, though more disturbed and irregular,

The principal disturbance on the north side is caused by the protrusion of the two great masses of Elbruz and Kazbek,—both of them of decidedly volcanic origin, and (geologically speaking) of comparatively recent date. They are composed principally of trachyte, but send down also vast streams of basaltic lavas, which form a striking feature in the scenery of the valleys beneath them.

The regularity of structure which may be considered as pervading the whale of this ceutral mass of the Caucasus

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disappears almost entirely as one passes eastward of the Kazbek. Though the axis of elevation still preserves very much the same general direction from north-west to south- east, the fundamental granitic ridge is altogether wanting ; and even the highest summits of the range are composed of calcareous slates and sandstones, which were supposed by carlier geologists to belong to the Paleozoic period, but are assigned by Dr Abich to a much later age. Even the lofty summits of Schach Dagh (the giant of the Eastern Caucasus) are composed of a dolomitic limestone, which appears to belong to the Neocomian era. ‘To the same period may probably be referred the greater part of the limestones and shales which constitute the singular platcaux of Daghestan already described. But from the great scarcity of organic remains the determination of their age is a question of much difficulty.

The mineral riches of the Caucasus are still in great measure unexplored. Iron and copper ores are known to exist in abundance ; and coal is found in the valley of the Kuban, as well as in the upper valley of the Rion. But as it belongs to the Jurassic and not to the true Car- boniferous age, it is doubtful to what extent it may prove productive. The remarkable springs of naphtha near Baku, which have long been known as an object of interest and a sanctuary of the fire worshippers, are now turned to account for the manufacture of petroleum on a large scale,

It has already been observed that glaciers exist on a great scale in the Caucasus, but they are confined to a higher elevation than in the Alps. Notwithstanding the vast mass of glacier and perpetual snow which exists in the Central Caucasus, none of the lateral glaciers descend below 7000 feet on the southern side of the range; while the lowest point reached by any of those on the northern side is not below 5700 feet. But, as in the case of all the principal mountain chains of Europe, there is abundant evidence of the glaciers having once been much more ex- tensive and having descended to a much lower level in the valleys than they at present occupy. At the same time it may be observed that there is a total absence in the Caucasus of those lakes which form so conspicuous a feature in the country on both sides of the Alps, and which are supposed by many geologists to be connected with glacial action.

Ethnology.—The ethnology of the Caucasus is still far from thoroughly known. From the earliest times it has been noted as the region where the greatest diversity of tribes and languages existed within the smallest space (Herodot., i. 203). Pliny tells us that no less than 130 different interpreters were required by the Greek traders at Dio- scurias, the port where all the tribes of the neighbouring mountains, as well as the more remote nations of the interior used to congregate, while others raised the number to 300 (Plin., ZH. W., vi. 5, § 15). This is of course a great exaggeration, but it proves the fact that there existed then, as at the present day, an extraordinary number of races speaking different and in many cases wholly dissimilar dialects. The researches of modern scholars have thrown considerable light upon the subject, and cnabled us at least to classify these different tribes in certain groups or families.

I. The Grorcray, or, as they are sometimes termed by modern writers, the Kartalinian tribes, from their speaking a language ealled by themselves Kartli. These are in all probability the descendants of the people called by Greek writers Iberians, who were in possession of the country south of the Caucasus at the earliest period of which we have any historical account, The name of Georgian is comparatively modern, but its origin is unknown. To this family belong :— ‘

1. The Grusians or Georgians proper, who inhabit the whole country cast of the Suram mountains down to the lowland steppes of the River Kur. They extend also up the valley of the Aragwa to

the very foot of the main range, and occupy the extensive valleys of Kakhetia and the slopes still further east.

2. The Jmeritians, who extend from the watershed of the Suram mountains westward, including the valleys of the Rion or Phasis, and its tributary the Quirilha. Their western limit is the Zenes- quali, which separates them from the Mingrelians.

8. The Mfingrelians, who extend from the Zenesquali on the cast to the Ingur and the Black Sea on the west, while the lower course of the Rion may be considered as constituting their limit on the south. Both these nations, though long politically independent of the Georgians, are undoubtedly of cognate race, and speak kindred dialeets.

4, The Gurians, a small people occupying the strip of land be- tween the Rion and the mountains on the south, which form the frontier between Russia and Turkey. Their language shows them to be of Georgian race, but they are closely connected with the Laz or Lazi, a tribe that inhabits the adjoining mountains within the Turkish territory, where they were already settled under the name of Lazi in the time of Strabo.

5. The Suanians or Suanetians, who occupy the upper valley of the Ingur, above the confines of Mingrelia. They are a wild and semi-barbarous mountain tribe, who have only lately been brought under subjection to the

Russians, and are still left in a condition of semi-independence. But from the natural beauty of their country, and its proxiniity to the highest ranges of the Caucasus, they have attracted much attention from recent travellers. They are considered to belong to the same race with their neighbours the Georgians and Mingrelians ; though they have existed from a very remote period as a separate tribe, being already mentioned under the name of Suances or Suani by Strabo and Pliny, in whose time they were one of the most powerful nations in the Caucasus. Their language is a cognate dialect with the Georgian and Min- grelian, but presents very material differences.

II. The second principal group of the Caucasian mountaineers, and that whieh has of late years attracted the most attention of any, is that of the Tcherkesses or CrncassIANns (a name of Russian origin), who until within a few years past constituted the whole population of the Western Caucasus on both sides of the mountain chain. They were subdivided into numerous tribes, but may be considered as belonging to three principal divisions.

1. The Circassians proper, who designate themselves by the name of Adighé, and who formerly oceupied the whole coast of the Black Sea from the neighbourhood of Anapa to Pitzunta, as well as the northern slopes of the mountains towards the Kuban. It was this people who so long fixed the attention of all Europe by their long continued struggles against the Russian power, whieh, however, ended in their complete subjugation in 1864. But that event was followed by a wholesale emigration of the Circassians, who quitted their country to the number of 400,000 (or, according to other accounts, nearly 500,000) souls, and settled in the different provinces of the Turkish empire. The effect of this emigration, without a precedent in modern history, has been to leave the whole country between the Caucasus and the Black Sea, for a distance of nearly 200 miles, almost absolutely without inhabitants, except the small settle- ments of the Russians at Novo Rossisk, Tuapse, and Sukhum Kaleh.

2. The Abkhasians, a tribe occupying the coast eastward from Pitzunta to the confines of Mingrelia. They are undoubtedly a kin- dred race with the Circassians, though described as in all respects inferior to them. Their numbers have also been thinned to a great extent by emigration, since their

last abortive attempt at insurrec- tion in 1864, so that the interior of the country formerly oceupied by them is now almost uninhabited.

3. The Kabardans, who hold the country north of the main chain of the Caueasus, from the valley of the Kuban to that of the Terek, and extending quite down to the steppes on the north. Though resembling the other Circassians in language and manners, and like them professing the Mahometan religion, they never offered any very serious opposition to the Russian arms, and have long been peaceful subjects of the Russian empire.

III. Adjoming the Cireassian races on the east, and occupying the very centre of the Caucasian range, are the OssETEs, an isolated race, differing both in language and in customs from their neighbours on allsides. Their country is traversed by the great highroad across the Caucasus, which has brought them especially under the observa- tion of travellers, and many conjectures have been formed with re- gard to their original and ethnic affinities. It is, however, conclu- sively proved that they are an Aryan race, and their language has considerable affinity with the Medo-Persian branch of that family. Many resemblances have been traced in their manners and customs with those of the Germans, and some writers have supposed them to be a remnant of the Goths, while others regard them as the representatives of the Alani, who played so conspicuous a part to- wards the close of the Roman empire ; but there is no real founda- tion for either theory, and the evidence of their language seems decisive, that, though belonging to the great Aryan family, they have no special affinity with the Germanie or Teutonic branch of it,

They call themselves Iron, the name Ossetes being that applied to them by the Georgians. Some of them are Mahometans, while the greater part profess Christianity, but retain many of their pagan rites and customs, aud are in fact still more than half pagans. They hold the upper valley of the

Terek, down to the pass of Dariel, as well as the mountain tract to the west of it, as far as the head- waters of the Ardon and the Mamisson Pass.

IV. The Touurcuens, a people who inhabit the northern slopes of the Eastern Caucasus, extending down to the valley of the Terek. They adjoin the Kabardans and Ossetes on the west, and the Lesghians towards the south, but do not extend up to the highest recesses of the range. They profess the Mahometan religion, and speak a language distinct from all others, of which it is said that there are more than twenty dialects, Leal their whole population is not estimated at more than 150,000 souls. .

V. The LescHrans, a name under which are generally comprised all the inhabitants of the Eastern Caucasus, though consisting of many petty tribes, speaking dialects more or less different, and in gome eases, it is said, radically distinct languages. Their chief scat

is in the high mountain region extending eastwards from Kazbek, .

and including all the highest summits of the range as far as Baba Dagh ; but they occupy also the southern declivities of the moun- tains towards the valleys of the Alazun and the Kur, as well as the rugged mountain tract of Daghestan towards the north-east between the central range and the Caspian. It was these wild mountain tribes that so long offered an unavailing resistance to the Russian arms ; but it is said that the only real bond of union among thein was their devoted attachment to Islamism, and that no connection of race unites them together. Their ethnic relations are certainly still very obscure and imperfectly known, and it is supposed by some ethnologists that among them may be found remnants of a number of different nations and races. But it is more probable that when they come to be better known, they will be found to have for the most part a common origin, notwithstanding the remarkable diver- sity of dialects spoken among them. A few very small tribes, such as the Udi and the Kubatschi, seem, however, to form an exception, and to belong to essentially distinct races. The most cultivated, as well as the most powerful of the tribes of the Daghestan, is that of the Avares or Avari, who adjoin the Tchetchens on the north, and extend from thence to the central chain. They are the only Lesghian tribe who profess a written language, for which they make use of the Arabic characters.

It is unnecessary here to speak of the numerous Turco-Tartar tribes that inhabit the borders of Daghestan, between the mountains and the Caspian, as well as of the Cossacks of the Kuban and the Terek,—all these tribes, whether nomad or settled, being confined almost wholly to the plains and steppes that surround the moun- tains, and not forming any considerable ingredient in the popula- tion of the Caucasus itself.

The estimates of the numbers of these mountain tribes are very various, and the Russian official reports do not distinguish the population of the mountains from that of the adjoining districts in- cluded in the same governments. But it seems probable that, since the great emigration of the Circassian tribes, the whole population of the Caucasus does not exceed a million of souls.

History.—The Caucasus was known to the Greeks from a very early period. Without referring to the fable of the Argonauts, it is certain that Greek navigators penetrated in very early times into the remotest parts of the Euxine, and carried on trade with the native population of Colchis, the name which they gave to the rich country at the mouth of the Phasis or Rion. Here, at a somewhat later date, they founded the flourishing settlement of Dioscurias, the name of which is still retained in Cape Iskuria, a few miles south of Sukhum Kaleh. Hence their attention could not fail to be attracted by the vast snowy range of the Caucasus, and we find its name already familiar to Mschylus, who speaks of its ‘‘star-neigh- bouring summits,” and terms it the most lofty of mountains (Prom. Vinct., 720). The same statement is repeated by Herodotus, who had a clear conception of its geographical position, as extending from the Caspian to the Euxine, and forming in this direction the limit of the Persian empire (i. 203, iv. 12), The mountain tribes still retained their independence under the successors of Alexander, and it does not appear that any considerable advance was made in the knowledge of these countries till the time of the great Mithri- dates, who subdued all the nations up to the very foot of the moun- tains, and even suceeeded in making his way with an army along the coast of the Black Sea from Colchis to the Cimmerian Bosporus. His wars in these regions were described by several Greek historians, and Strabo, writing from these materials, shows an acquaintance both with the Caucasus and the adjoining countries, remarkable for its clearness and accuracy. Pompey had declined

to pursue Mithri- dates on his adventurous march, and no Roman general ever passed the Caucasus. Under the Roman Empire, however, the frequent relations maintained with the Armenians made the Romans familiar with the names of the Iberians and Albanians on the south side of the chain, while their connection with the tributary kings of Bosporus opened out to them communications with the steppe country to the

north. Neither Pliny nor Ptolemy, however, add much that is material to the knowledge already possessed by Strabo.

In modern times the chief interest in these regions has arisen from the long-continned struggle of these mountain tribes against Russia, and the energy with whieh the Circassians and Lesghians especially maintained the contest for independence against ail the power of that mighty empire. From the tine of the annexation of Georgia, at the commencement of the present century, it became a great object with the Russians to obtain possession of the intermediate mountain country ; but it was not till the treaty of Adrianople in 1829, by which the Turks ceded to the Russian Empire their nomi- nal sovereignty over the Caucasian tribes, that their efforts assumed a systematic form. From that period till the year 1859, the contest was maintained almost without interruption, and with many alter- nations of success. The Russians had to encounter immense diffi- culties, to traverse dangerous passes, to burn down forests, and to sacrifice immense numbers of lives, in order to gain small portions of territory. The war was for a long time chiefly maintained by the Circassians under their native chiefs ; and no sooner did their exer. tions relax in consequence of the exhaustion caused by a long con- tinued contest, than a new enemy to Russia arose on the shores of the Caspian. Schamyl, the most devoted follower of the heroic Kasi Mullah, placed himself, on the death of that chief, at the head of the Lesghians. At once the prophet and the warrior of his race, by his enthusiasm and bravery he soon gained the confidence of the tribes, and prevailed upon them to follow a united and deter- mined plan of action under his authority. His influence was daily increased, not only by the victories which he gained, but by the successful manner in which he frequently delivered himself and his followers from the most imminent

dangers. His own escape from the rocky fortress of Achulko, where he was completely invested by the forces of General Grabbe, appeared both to his own countrymen and the enemy almost miraculous. The great exertions which were made by the Russians in the following years to reduce the tribes yet unsubdued, and those which had risen against their authority, were completely defeated by his indefatigable activity and bravery. In the year 1842, when the mountain tribes were filled with the great- est alarm in consequence of the advance of General Grabbe, that formidable enemy was completely defeated by Schamyl in the woods of Itchkeri. The Circassians, after again renewing their attacks upon the Russians in the neighbourhood of the Black Sea, were ultimately driven back to their fastnesses ; but Schamyl still con- tinued to maintain his position on the Caspian, and inflicted severe losses upon the armies of the enemy. The Russians were evidently at a loss how to proceed against a chief who had baffled all their schemes, who had been a prisoner in their hands, whose rocky home had been frequently in their possession, who had incurred the most imminent dangers and been driven to the greatest emergencies, and who was still opposing them with unconquerable resolution, watch- ing the progress of their troops, cutting off their supplies, and har- assing them by constant attacks. Various Russian generals were sent in succession to the Caucasus, new plans of action, defensive and offensive, were tried, but without effecting any permanent con- quest.

The Crimean War (1854-1856) produced a temporary suspension of the efforts of the Russians in the Caucasus ; but after its termina- tion hostilities were resumed with increased vigour, both on the side of Circassia and in Daghestan. In the western districts, indeed, the contest never assumed any important character, and was carried on by a series of petty expeditions against the Circassian and Abkhasian tribes, who never acted in concert, and were compelled to submission one after the other. But it was not till the year 1864 that the last of these wild tribes was finally subdued, and the com- plete subjugation of the Circassians was secured by the emigration of the whole people in the manner already noticed. The contest in Daghestan, though it had assumed for a time more formidable di- mensions, had been already brought to a close. All the efforts of Schamyl could not prevent the Russians from gaining ground. Step by step they advanced steadily, though slowly, into the in- terior of the mountain country, and at last in the winter

of 1858- 59 made themselves masters of Weden, Schamyl's principal strong- hold, which was taken by storm, and he himself was obliged to flee. This event was followed by the submission of many tribes, and thongh Schamyl threw himself into the apparently impregnable mountain fastness of Mount Gunib, even this was surprised by the Russian general Prince Bariatinski, and Schamyl himself made prisoner (Sept. 6, 1859). From this time the war in the Caucasus was virtually at an end; the mountain tribes submitted one after the other, and notwithstanding some occasional petty outbreaks, appear to have passed quietly into the condition of Russian sub- jects.

CAUCASUS

It is only of late years that we have begun to obtain accurate Biblio. information concerning the mountain chain of the Caucasus and the graphy.

tribes that inhabit it. 'The works of the earlier travellers in this region—Pallas, Klaproth, &c.—treat principally of the countries that adjoin the Caucasus, rather than of the mountain ranges them- selves, and even the elaborate work of Dubois de Montpéreux

(Voyage autour du Caucase, 5 vols, 8vo, Paris, 1839-43) labours under the same defect. It was not, indeed, till after the complete subjugation or pacification of the mountain tribes by Russia that it was possible to carry on any systematic examination of the interior recesses of the great chain, and the foundation of a scientific know- ledge of the Caucasus was first laid by the construction of the trigo- nometrical survey under General Chodzko from 1847 to 1863, and the publication of the map resulting from their labours on the scale of 5 versts to an inch. Recent travellers have indeed found that the portions of this work relating to the highest ranges of the Cen- tral Caucasus are often imperfect or crroneous; but the same was the case with the best maps of the Alps until very lately, and if our knowledge of the great Caucasian chain is still far inferior to that whieh we now possess of the principal European ranges, it is immeasurably in advance of that which we have attained concerning any other Asiatic mountains, except those parts of the Himalaya which have been surveyed by English

engineers. Among recent writers the one who has contributed the most valuable information is A. Petzholdt, whose work (Der Kaukasus, 2 vols. 8vo, Leipsic, 1866) is the most useful book on the subject as yet published. The works of Dr Radde also supply valuable materials of a more special and detailed character. The more recent work of Baron Thielmann (Travels in the Caucasus, Persia, and Turkey in Asia, translated into English and published by Murray in 2 vols. 8vo, 1875) also contains much useful matter in a compendious and convenient form. Mr Freshfield's Journey in the Central Caucasus and Bashan (8vo, Lond., 1869) is not merely a record of his personal experiences, but an important contribution to our knowledge of the highest regions of the central chain, which he was the first to explore. His example has been already followed by Mr Grove, who has described some portions of the mountains not visited by Mr Freshfield (The Frosty Caucasus, 8vo, Lond., 1875), and there can be little doubt that suc- cessive explorers of a similar stamp will soon make us acquainted with the inmost recesses of the Central Caucasus. (# Hf. B..)

CAUDETE, a town of Spain, in the province of Albacete, about 80 miles north of Cartagena, It was for- merly fortified, and contains a town-house, a prison, a school of primary instruction, a Carmelite convent, and several other religious institutions. The inhabitants are engaged almost exclusively in agriculture and the manufacture of coarse fabrics for home consumption. Population, 6500.

CAUDINE FORKS (Furcule Caudine), the name of an Italian valley, famous in Roman history on account of the disaster which there befell the Roman army during the second Samnite war, in 321 3.c, Livy describes the pass as an open space, grassy, and well-watcred, completely surrounded by lofty and thickly-wooded mountains, except where a passage is afforded by two uarrow gorges, situated opposite to one another (bk, ix. c. 2). It has been usually identified with the Val d'Arpaja, which is on the high road between Beneventum and Capua; and confirmation is found in the facts that this valley was known as the Caudine, and that close by there existed a village called Fureulz (now Forchia), But there is the almost conclusive objection that this valley does not answer to the above description (which is the only sufficient one which we possess), being surrounded by no mountains of any eleva- tion, and having many outlets. A much more

probable theory is that which declares it to be the little valley between Sta Agata and Moirano, through which flows the small stream of the Isclero; and which, as it meets the Val d'Arpaja near Caudium, would have an equal right to the name of Caudine Forks.

CAVA, or La Cava, a town of Italy in the province of Principato Citreriore, 28 miles by rail south-east of Naples, with a communal population of 19,500. It is the seat of a bishopric, has a cathedral and a diocesan seminary, and carries on the manufacture of silk, cotton, and woollen stuffs. In the vicinity is the famous Benedictine abbey of La Trinita della Cava, which was founded in the 11th century, and almost rivals Monte Casino in the number and value of its literary treasures. Its archives contain about 40,000 Separate documents of parchment, and morc than 60,000 manuscripts on paper,—of which a complete inventory is being published by Don Michele Morcaldi under the title of Codex Diplomaticus Cavensis. The library, in spite of

losses sustained within the last two centuries, still preserves a number of rich and valuable manuscripts, and a collection of early specimens of typography. Among these may be mentioned the Codeaw Legum Longobardorum, which dates from the beginning of the 11th century ; a MS. copy of the Vulgate of the 8th, an Isidorus of the 9th, and a prayer-book illustrated with miniatures ascribed to Fra Angelico da Fiesole. (See Dantier's Monast. Benedict. d Italia, and two articles in Academy, vol. viii. pp. 262 and 364, 1875.)

CAVAIGNAC, Louis Evckne (1802-1857), dictator at Paris during the insurrection of June 1848, was born there in 1802. His father was a member of the National Convention, and the family was marked by republican proclivities. After going through the usual course of study for the military profession, he entered the army in 1824, and served in the Morea in 1828. When the revolution of 1830 broke out, he was stationed at Arras, and was the first officer of his regiment to declare for the new order of things. In 1831 he incurred the displeasure of the Government of Louis Philippe by joining in a protest against its reactionary tendencies; but in 1832 he was recalled to the service, and sent to Algeria. This con- tinued to be the main

sphere of his activity for sixteen years, till the revolution of 1848; and he took an active part, though in a subordinate capacity, in the different sieges and campaigus by which Algeria was gradually reduced under French rule. After passing through almost all the successive grades in the army, he was, in 1844, raised to the rank of general of brigade, as a reward for his skill and courage. When the revolution of February (1848) took place, the Provisional Government appointed him governor-general of Algeria; and they shortly after offercd him the post of minister at war, which he declined. On his election to the National Assembly, however, Cavaignac returned to Paris. When he arrived on the 17th May, he found the capital in an extremely critical state. The social ists of Paris, incited and organized by skilful leaders, were in a state of bitter hostility to the National Assembly, and a formidable insurrection was gradually maturing. The National Assembly had proved a bitter disappointnient to them ; for the peasant proprietors, terrified by the vast increase of taxation, and the general uncertainty of revolu- tion, had returned a decidedly conservative majority. Several collisions had already taken place. The crisis was at last brought about by the threatened abolition of the national workshops (ateliers nationaua), which the reason- able majority of the Assembly was especially anxious for, as the finances were being ruined by the maintenance in utter idleness of 120,000 men. By the 22d of June a formidable insurrection had been organized, and it remained only for the National Assembly to assert its authority by force of arms. Cavaignac, first as minister at war, and then as dictator, was called to the task of suppressing the revolt. It was no light task, as the national guard was doubtful, recular troops were not at hand in sufficient numbers, and the insurgents had abundant time to prepare them- selves. Variously estimated at from 30,000 to 60,000 men, well armed and well organized, they occupied the north-eastern part of the city, their front line stretching from the Pantheon on the south of the Seine by the Pont St Michel to the Portes St Martin and St Denis. Resting on the Faubourg St Antoine as central point, and threaten- ing the Hotel de Ville, they had entrenched themselves at every step behind formidable barricades, and were ready to avail themselves of every advantage that ferocity and despair could suggest to them. Cavaignac, knowing the work he had before him, remained inactive, notwithstand- ing the urgent representations of the civil members of Government, till a sufficient regular force had been collected. At last, by a strong combined movement on the two flanks

and against the centre of the insurgent forces, he attempted to drive them from their barricades,—with doubtful success for some time, as every inch of ground was disputed, and the Government troops were frcquenily repulsed, till, fresh regiments arriving, he forced his way to the Place de la Bastille, and crushed the insurrection in its headquarters. The contest, which raged from the 23d to the morning of the 26th of June, was, without doubt, the bloodiest and most resolute the streets of Paris have ever seen. It is calculated that more Frenchmen fell in it than in the bloodiest battles of the first empire. , Cavaignac was severely censured by some for having, by his delay, allowed the insurrection to gather head; but he was declared by an immense majority to have deserved well of his country, and continued to be president of the I'xecutive Committee till the election of a regular president of the republic. It was expected that the suffrages of France would raise Cavaignac to that position. But the mass of the people, and especially the rural population, sick of revolution, and weary even of the moderate republicanism of Cavaignac, were anxious for a stable government. Against the five and a half million votes recorded for Louis Napoleon, Cavaignac received only a million and a half. Not without chagrin at his defeat, he withdrew into the ranks of the opposition. At the coup d'état of the 2d December 1851, he was arrested along with the other mem- bers of the opposition ; but after a short imprisonment at Ham he was released, and, with his newly-married wife, lived in retirement till his death in 1857. Cavaignac was no statcsman, but was a loyal, skilful, and courageous soldier, a zealous republican, and in every way an honourable man.
CAVAILLON, a town of France and important railway junction in the department of Vaucluse, on the right bank of the Durance, about 13 miles south-east of Avignon. The town is ill-built and dirty, and carries on a considerable trade in dried fruits, madder, and other productions of the fertile district in which it is situated. It has a fine town- house, an old church of the 12th century, dedicated to the Virgin and St Veran, and the mutilated remains of a triumphal arch which probably belongs to the time of Constantine. Numerous minor relics of the Roman period have been found to the south of the present town, on the site of the ancient Cabellio, a place of some note in the territory of the Cavares. In medieval and modern history the town has for the most part followed the fortunes of the Comtat

Venaissin, in which it was included; and down to the Revolution it was the see of a bishop, and had a large number of monastic establishments. Population in 1872, 3906 in the town, and 8034 in the commune. CAVALCANTI, Gurpo, an Italian poet and philosopher of the 13th century, who died in 1300. He was the son of a philosopher whom Dante, in the Znferno, condemns to torment among the Epicureans and Atheists ; but he himself was a friend of the great poet. By marriage with the daughter of Farinata Uberti, he became head of the Ghibellines; and when the people, weary of continual brawls, aroused themselves, and sought peace by banishing the leaders of the rival parties, he was sent to Sarzana, where he caught a fever, of which he died, Cavalcanti has left a number of love sonncts and canzoni, which were honoured by the praise of Dante. Some are simple and graceful, but many are spoiled by a mixture of metaphysics borrowed from Plato, Aristotle, and the Christian Fathers, They are mostly in honour of a French lady, whom he calls Mandetta. His Canzone d'Amore was extremely popular, and was frequently published ; and his complete poetical works are contained in Giunti's collection, Florence, 1527, Venice, 1531-2, He also wrote in prose on philosophy and oratory. CAVALIER, Jan (c. 1680-1740), the famous chief

of the Camisards, was born at Ribaute, near Anduse, in Lower Languedoc. 'The date of his birth is variously given between 1679 and 1685. It could hardly be so late as the last-named year, and may probably be assigned to the period between 1679 and 1681. He was the son of a peasant, and in boyhood was employed first in keeping sheep, and afterwards as a baker's apprentice. A pious mother trained him in the Reformed faith. The persecution of Protestants, which began after the revocation of the Edict of Nantes, and which was carried on with pitiless cruelty in the Cevennes, drove him from his native land in 1701, and he took refuge at Geneva. By the dragonnades of Louis XIV. the Protestants of the Cevennes were at last driven to revolt ; and Cavalier, inspired with the hope of being their deliverer, a hope which was raised to the pitch of enthusiasm, it is said, by certain prophecies, returned to his own country in 1702. The insurrection broke out in July of that year, and Cavalier was one of the chosen leaders. Roland was named generalissimo, but Cavalier soon rose to share the chief

command with him. Untrained in arms, he displayed not only a fiery courage, but extra- ordinary military skill. This must have been owing to some extent to the eager attention which he had paid, while keeping his sheep, to the manceuvres of the troops which were stationed in his native district. Although the enfants de Dieu, as the insurgents were called, numbered at the most only 3000 men in arms, they coped successfully again and again with the much more numerous forces of the king, and were never entirely conquered, After several affairs Cavalier changed the theatre of war to the Vivarais ; and on the 10th of February 1703 be defeated the royalist troops on the Ardéche. A few days later he was completely defeated on the same ground and was supposed to have fallen. But he reappeared, was again defeated at Tour-de-Bellot (April 30), and again recovered himself, recruits flocking to him to fill up the places of the slain. By a long series of successes he raised his reputation to the highest pitch, and gained the full confidence of the people. It was in vain that more and more rigorous measures were adopted against the Camisards ; in vain that their mountain district was ravaged, sacked, and burned by the Catholics. Cavalier boldly carried the war into the plain, made terrible reprisals, and threatened even Nimes itself. On April 16, 1704, he encountered Mar- shal Montrevel himself at the bridge of Nages, with 1000 men against 5000; and though defeated after a desperate conflict, he made a successful retreat with two thirds of his men. Marshal Villars was next sent against him, and instead of fighting proposed negotiation. Roland reso- lutely turned a deaf ear to him ; but Cavalier agreed to treat. A conference was held at Nimes, hostages being given to Cavalier; and he appeared with an armed and mounted escort, which was drawn up facing the guard of the marshal. The terms proposed were deferred to the decision of the king, Cavalier in the meanwhile retiring to Calvisson. In this place for some days the Camisards held their meetings openly, and thousands eagerly flocked to them. The result of the negotiation was that Cavalier received for himself a commission with a pension of 1200 livres, and for his brother a captain’s commission. He was authorized to form a regiment of Camisards to be sent to Spain ; and liberty was restored to his father and other Protestant prisoners. The treaty, which did not include any provision for general liberty of conscience, excited great indignation among the companions of Cavalier. They called him traitor and coward, and deserted him. Dis- heartened, and with little confidence in the promises of the court, Cavalier

afterwards visited Paris for the purpose of an interview with Louis XIV. He was presented privately to the king at Versailles, but was ill received. His dis-

appointment and the reports which were current of intended attempts on his life or liberty induced him to leave France. He weut to Switzerland, and afterwards to Holland ; and there he married a daughter of Madame Dunoyer, the latter a lady of Nimes, who had once been sought in marriage by Voltaire. He then passed into England for the purpose of recruiting his regiment of Camisards. He had an interview with Queen Anne, of which conflicting accounts are given. But so highly was his military genius valued that he was sent with his regiment to take part in the famous expedition to Spain, under the earl of Peter- borough and Sir Cloudesley Shovel (May 1705). At the battle of Almanza his Camisards encountered a French regi- ment which they had met in the Cevenncs, and, without firing, the foes rushed to a hand to hand fight and made a fearful slaughter. Cavalier was severely wounded, and was saved from death by an English officer. On his return to England a small pension was given him, and after long wait- ing he was made a major-general and named governor of Jersey. This post was afterwards exchanged for the gover- norship of the Isle of Wight. Cavalier died at Chelsea, in the first half of May 1740, and there his remains were in- terred. Malesherbes, the courageous friend and defender of Louis XVI., bears the following eloquent testimony to this young hero of the Cevennes : —“T confess,” he says, “ that this warrior, who, without ever having served, found himself by the mere gift of nature a great general,—this Camisard who was bold to punish a crime in the presence of a fierce troop which maintained itself by like crimes,—this coarse peasant who, when admitted at twenty years of age into the society of cultivated people, caught their manners and won their love and esteem,—this man who, though accustomed toa stormy life, and having just cause to be proud of his success, had yet enough philosophy in him by nature to enjoy for thirty-five years a tranquil private life,—appears to me to be one of the rarest characters to be found in history.” There is a work, little esteemed, entitled JZemoirs of the War in the Cevennes, under Colonel Cavalier, which appears to have been written not by Cavalier himself but by a French

refugee named Galli. Fora more dctailed account see Mrs Bray's Revolt of the Protestants of the Cevennes, published in 1870. ,

CAVALLINI, Prerro (c. 1259-1344), born in Rome towards 1259, was an artist of the earliest epoch of the modern Roman School, and was taught painting and mosaic by Giotto while employed at Rome; and it is believed that he assisted his master in the mosaic of the Navicella, or ship of St Peter, in the porch of the church of that saint. Lanzi describes him as an adept in both arts, and mentions with approbation his grand fresco of a Crucifixion at Assisi, still in tolerable preservation; he Was, moreover, versed in architecture and in sculpture. According to George Vertue, it is highly probable that Cavallini executed, in 1279, the mosaics and other ornaments of the tomb of Edward the Confessor in West- minster Abbey. He would thus be the " Petrus Civis Romanus " whose namc is inscribed on the shrine ; but his extreme youth at this date tends to discredit the supposi- tion. The work, if really his, must have been executed in Rome, where he appears to have constantly resided. He died in 1344, at the age of eighty-five, in the odour of sanctity, having in his later years been a man of eminent piety. He is said to lave carved for the Basilica of San Paolo fuori le Mura, close to Rome, a crucifix which spoke in 1370 toa female saint.

CAVALLO, Trperius (1749-1809), an electrician and natural philosopher, son of a physician established at Naples, Was born in that city, March 30,1749. His father died when he was only eleven years old, but he received a libera education through the kindness of his friends, and com

pleted his studies at the university of Naples. He was originally destined for commerce, and came to England in 1771, in order to obtain more complete information respecting the various objects of mercantile pursuit. But he soon abandoned his intention of adopting that mode of lifc, and determined to devote his time to science. His mind, however, was rather imitative than original; and he is said to have found it easier to learn Euclid by heart than in the ordinary way, which indeed he found im- possible. He became a member of the Royal Academy of Sciences of Naples, and a fellow of the Royal Society of London. He died at London in 1809. The splendid improvements which had been lately made in electricity directed his attention to that department of natural philosophy ; and his chief works are

—A Complete Treatise of Electricity (1777), Essay on Medical Electricity (1780), and Zhe Elements of Natural and Euperimental Philo- sophy (1803).

CAVALRY. From the earliest dates, at which there is any record of armed men being systematically trained and organized, cavalry has always formed an integral part of every army, although the relative size and importance of the arm has varied, according to the nature of the country and the peculiarities of its inhabitants. Hgypt probably affords the earliest historical records of any distinct attempt at military organization. In that country cavalry and horsemanship werc held in high reputc, according to the prophet Isaiah. Diodorus of Sicily tells us that Osyman- dias led 20,000 cavalry against the rebels in Bactriana, and that twenty-five generations elapsed between Osyman- dias and Sesostris, who seems to have been the chief founder of Egyptian greatness, aud to have lived at a period indis- tinctly laid down in history, but certainly long prior to the Trojan war. In early times chariots appear to have been associated with the horsemen of an army, although perfectly distinct from them, Frequent references are made in the Bible to “chariots and horsemen ;” and Joscphus states that the army of Israelites that escaped from Egypt numbered 50,000 horsemen and 600 chariots of war. Herodotus frequently speaks of the cavalry arm, and men- tions the existence of a corps of young women whose breasts Hippocrates used to sear to enable them to use the bow and javelin. Plato likewise speaks somewhat vaguely of a corps of young ladies about 500 B.c. ‘The existence of Amazons as a race has never been supported by even moderately authentic testimony, although by some they were believed to live on the River Thermodon in the north. of Asia Minor.

The first authentic account that we have of cavalry being regularly organized is given by Xcnophon, who states that in the first Messenian war, 743 B.c., Lycurgus formed his cavalry in divisions. Some hundred ycars later, in 371 B.C., Epaminondas raised a corps of 5000 cavalry, and from this date it may be said the arm was much cultivated throughout Greece, until Philip and Alexander of Macedon raised it to a great pitch of excellence. Both these monarchs were indebted for several of their greatest successes to the prowess of their cavalry ; and the exploits of Alexandcr’s 7000 horsemen at the battle of Arbela, 331 B.c., in which he signally

defeated Darius, may well serve as an example for future gencrations. The Greek cavalry were divided into heavy, or “ cataphracti,” and light, or “me cataphracti.” To these Alexander added a third class, termed “ dimachez,” who were trained to fight on foot or on horseback, After the death of Alexander the Great cavalry appears to have fallen into comparative disuse until the days of Hannibal and the Carthaginians. Dire experience, more especially the defeats of the Ticinus and the Trebia, taught the Romans the value of cavalry ; and in the latter days of the republic it became the most popular and highly favoured service of

the Roman armies, According to Vegetius, the Roman cavalry was organized into ten troops or squadrons, forming a regiment of 726 horses, either intended to act in- dependently or, more usually, attached to some special legion. Asthe Roman empire increased and brought many tributaries under its flag, the cavalry began to be drawn from those countrics whose inhabitants were specially devoted to equestrian pursuits. The Gauls for many years furnished the principal part of the cavalry both in the Carthaginian and in the Roman armies, and appear to have rivalled the Numidians in efficiency. Strange to say, saddles were never used until the time of Constantine, and stirrups were introduced by the Franks about the middle of the 5th century. ;

In the Middle Ages the unwillingness to intrust any military power to the serfs rendered the upper classes the only soldiers, and as these did not deign to fight on foot cavalry became the basis of European armies. The knights and esquires were the nucleus, mounted attendant bowmen and pikemen being the secondary portion of the fighting power.

The invention of gunpowder aud the decline of the feudal system wrought a change in military tactics, and from the organization of a standing army by Charles II. of France, in 1445, cavalry as it now exists may be said to date. As in early days, each country produced a species of cavalry in accordance with the characteristics of its inhabitants and the nature of its institutions. From Hungary came the Hussars, whose name is derived from the Hungarian word “ Husz,” twenty, and “ar,” pay. Marshal Luxembourg appears to have been the first person who disciplined and organized these

hussars, and in 1692 they were attached to his army as light troops and recon- noitrers. Carabineers were of a somewhat earlier date, and seem to have come originally from Basque and Germany. ‘The word carbine has been traced to an Arab word ‘“karab,” but this derivation is somewhat doubtful. Originally it was the custom for carabineers or horsemen armed with firearms to mount infantry behind them, and in 1543 King Louis of Nassau made use of this hybrid force in his operations against Bergen.

A few years later, in 1554, Marshal De Brissac formed a corps of mounted infantry and called them Dragoons, thus justifying Dr Johnson’s definition of the word as “a man who serves indifferently either on foot or on horse-back.” The actual origin of the term dragoon has been ascribed to the dragon’s head which, as a rule, adorned the muzzle of the firearm with which these horsemen were armed,—although this derivation again cannot be regarded as very certain, As firearms became more generally used, so the tactics and organization of cavalry underwent modifications. In the time of Francis I. the gens-d’armes of France were reckoned the best cavalry in Europe, and were formed in single rank. Somewhat later the Spaniards, and afterwards the Germans, carried off the palm; -they went to the other extreme as regards formation, being formed in six and eight ranks, and were composed of a mixed force of arquebusiers and lancers. At this time military leaders failed to appreciate the true mission of cavalry, and assigned too great importance to the effect of firearms, too little to that of ‘cold steel.” Maurice of Nassau was the first to train cavalry with a view to their mobility, and teach them to act by separate bodies, and in distinct lines. Now for the first time cavalry was organized by regiments, each regiment being composed of four

squadrons, formed in five ranks, and numbering about

1000 horses. During the Thirty Years’ War, from 1618 to 1648, the lance as a cavalry weapon gradually dis- appeared, partly on account of the amount of training which is necessary to insure its efficient use, and partly on

account of the exaggerated value attached to firearms ag cavalry weapons. After Maurice of Nassau, Gustavus Adolphus appears as the next great

cavalry leader, and was so successful in the employment of his cuirassiers and dragoons—into which two divisions his horsemen were classed—that all other European nations began to imitate lim, and adopted his formation in three ranks. After the death of Gustavus Adolphus, until the wars with the Turks, the French appear to have been the most instrueted and efficient in the employment of cavalry. The wars of Louis XIII. and Louis XIV. soon developed military art, and such great leaders as Turenne, Condé, Montecuculi, and Marlborough made their name. At this period defensive armour for cavalry was abolished, and lances were unknown except among irregular horsemen, who came from the plains of Poland and Russia. Excellent, however, as the French cavalry at this period undoubtedly was, it could not vie with that of the Turks either as regards its own efficiency or tle results that it achieved. So formid- able and so much feared were the Turkish horsemen that the Russian infantry when opposed to them invariably carried chevaux-de-frise in light carts for their protection, It has been very justly remarked that no other cavalry has ever obtained such an ascendency as this over in- fantry.

Hitherto but little attention had been paid to the employ- ment of cavalry off the field of battle for purposes of recon- noitring, although it had long exercised an important influence in action. Marshal Saxe, however, may be said to have introduced a new and more enlightened era in the history of the arm, he not only was the first to recognize the true mission and use of light cavalry, but also the necessity for celerity in movement and manceuvre on all occasions. Although he cannot be said to have introduced horse artillery, which did not appear on the field of battle till 1762, still, by his timely use of guns in conjunction with cavalry at the battle of Fontenoy, he first showed how the two arms might be combined.

It cannot, however, be said that cavalry has cver before or since played the important part in war that it did in the days of Frederick the Great. This monarch recognized that the “ arme blanche,” and not the firearm, was the proper weapon for a mounted soldier. He discontinued firing in line, and the pitch of excellence at which his horse- men arrived under the leadership of Seidlitz, and the results they obtained, have never been equalled by the cavalry of any other nation. The battles of Zorndorf, Rosbach, Striegau, Kesselsdorf, and Leuthen still remain the most signal examples of what

may be attained if to long previous training and preparation are joined brilliancy and rapidity of execution in the field. It required, however, long experience and the occasional disasters which befell him in the first and second Silesian wars before Frederick the Great appreciated the true principles: of mounted warfare or put them into execution,

The next period in the history of cavalry may be said to date from the rise of Napoleon I. until the battle of Water- loo. The Republican armies of France were but ill provided with mounted troops, and the disaster of Wurzburg in 1796 nearly annihilated the comparatively few squadrons that France then possessed. The genius of Napoleon evinced itself as remarkably in the organization as in the leading of his armies, and his first care was to create a force of cavalry such as would enable him to reap the fruits of his victories. To his cavalry he was mainly indebted for some of his most signal triumphs, notably Marengo and Austerlitz, and to the manner in which he employed his mounted scouts and reeonnoitrers he owed the facility with which he so often out-mianceuvred and anticipated his

enemies, The Russian campaign of 1812 annihilated the

French cavalry, and there was not time to reorganize it before it was necessary again to take the field. Hence some of Napoleon’s most decided successes in 1813 proved fruitless; as he himself remarked, had he possessed cavalry at the battles of Liitzen and Bautzen the war would then have been brought to an end. It would here appear worthy of remark that defensive armour for cavalry, which had fallen into disuse, was re-introduced by Napoleon. He increased the French cuirassiers from one regiment to twelve, and they performed excellent service ever aftcr- wards, Similarly in Napoleon’s time the lance began to be again used in Europe; in 1807 it was found that a Polish regiment of lancers was so useful that twelve lancer regiments were afterwards formed, anda certain proportion of this arm has ever since been maintained in all European armies. Auy remarks, however, on cavalry in the time of Napoleon would be incomplete were no reference made to the Cossacks, who so much contributed to render the retreats from Russia and after Leipsic peculiarly disastrous to the French. These irregular horsemen, mounted on small horses and armed with

lances, hung on the flanks aud rear of the retreating enemy, and, although seldom standing to meet an attack, appeared to be ubiquitous, alike affording a screen for their own army and obtaining the fullest information regarding the movements of that opposed to them

In the forty years' peace cavalry deteriorated like every- thing else connected with military science. In the Crimea, asthe entire war may be said to have consisted of one siege, there was but little occasion for the use of cavalry, and the few opportunities afforded were ccrtainly not turned to the best account. In the 1859 campaign between the French and Italians on the one side and the Austrians on the other, the nature of the country was unsuited to the action of cavalry, and except in some isolated instances, as on the field of Solferino, cavalry played a very unimportant part in the war. For many years the value of cavalry was only exemplified on the plains of India, where both the British and the native horsemen performed many deeds of valour and did excellent service. In 1866 there occurred the first great European war since Waterloo in which cavalry could be turned to full account. From long disuse and want of practice neither Austrians nor Prussians made sufficient use of the large force of horsemen which was at their disposal, and neither on the field of battle nor off it did they achieve any great distinction, although, un- doubtedly, of the two the Austrians carried off the palm. They performed reconnoitring duties far more efficiently than their antagonists, and the manner in which they covered the retreat of their army after Kéniggratz was a model of devotion and bravery.

Four years later the experience gained by the Prussians

in 1866 on the plains of Bohemia was in the fullest degree

utilized, whereas their opponents the French only showed how splendid material may be sacrificed and how brilliant courage may be thrown away. Incessant practice during the four preceding years of peace had rendered the Prussian cavalry most proficient in all the duties of reconnoitring and outposts. The information they obtained and the manner in which they concealed the movements of the army in their rear mainly contributed to enable the leaders of the German army to carry out successfully their strategic plans, and their prowess on the field of battle when turned to account as at Mars-la-Tour was exerted to the best effect. The French

cavalry, on the other hand, were remarkable more for bravery than efficiency. In place of being Scattered in small parties some days in advance of an army they marched in masses frequently in its rear. Off the field of battle they were of no service, and on it they were needlessly sacrificed through the incapacity of their leaders.

History has few examples of bravery more devoted than that of the French cavalry at the battles of Worth and Sedan, and none in which bravery was more entirely thrown away. After the fall of the empire it may be said that the French cavalry ceased to exist, and as it is an arm that cannot be improvised the republic had no time to replace what had been destroyed.

On the whole it cannot be said that the last two European wars have added much to the art of handling cavalry. The practice of spreading light troops two days' march in advance of an army was not new, although of late years it had fallen into disuse, and as regards the employ- ment of mounted troops on the battle-field, it is still an unsettled question whether the recent improvements in firearms have or have not rendered it impossible for them ever to turn the tide of victory.

For the organization, equipment, and strength of the cavalry of the various armies of the present day see ARMY, vol. ii. (F. 8. RB.)

CAVAN, an inland county in the province of Ulster, in Treland, situated between 53° 43' and 54° 7' N. lat., and 6° 45' and 7° 47' W. long., is bounded N. by Fermanagh and Monaghan, E. by Monaghan and Meath, S. by Meath, Westmeath, and Longford, and W. by Longford and Leitrim. It has an area of 746 square miles, or 477,394 acres.

The surface of the country is uneven, consisting of hill and dale, without any great extent of level ground, but only in its northern extremity attaining a mountainous elevation. The barony of Tullyhaw, bordering on Fer- managh, a wild dreary mountain district, known as the kingdom of Glan or Glengavlin, contains the highest land in the county, called Slieve Russell. In the same barony is Quilca Mountain, the place of inauguration for the Macquires, chieftains of Fermanagh, held in veneration by the peasantry, in

connection with legends and ancient superstitions. The remainder of the county is not deficient in wood, and contains numerous lakes, generally of small dimensions, but of much interest for their picturesque beauty, more espécially Lough Oughter, which lies between the towns of Cavan and Killashandra, The chief river in the county is the Erne, which originates in the Lake of Scrabby, one of the minor sheets of water communicating with Lough Gowna on the borders of Longford. The river takes a northerly direction by Killeshandra and Belturbet, being enlarged during its course by the Annalec aud other smaller streams, and finally enters Lough Erne near the northern limit of the county. The other waters, consisting of numerous lakes and their connecting streams, are mostly tributary to the Erne. A copious spring called the Shannon Pot, at the foot of the Cuilagh Mountain, in the barony of Tullyhaw, is regarded as the source of the River Shannon. The Blackwater, a tributary of the Boyne, also rises in this county, near Bailieborough.

Branch lines of the Midland, Great Western, and Great Northern railways traverse the county.

The climate is not very genial owing to the dampness arising from its numerous lakes and the nature of the soil, and to the boisterous winds which frequently prevail, more especially in the higher districts.

The south-eastern portion of Cavan rests upon clay-slate, and the remainder of the county upon the Carboniferous limestone formation. A rich iron ore was formerly raiscd from Quilea Mountain. Indications of lead, silver, and sulphur have been observed ; and fullers' earth, pipe-clay, potters' clay, and brick clay are frequently met with in Tullyhaw barony, in which there are also indications of coal. Several mineral springs exist in this county, the chief of which is near the once-frequented village of Swanlinbar. Tn the neighbourhood of Belturbet, near the

small lake of Annagh, is a carbonated chalybeate. There are several other springs of less importance; and the small Longh Leighs, or Lough-an-Leighaghs, which signifies the healing lake, on the summit of a mountain between Bailie- borough and Kingscourt, is celebrated for its antiscorbutic

properties. The level of this lake never varies. It has no visible supply nor vent for its discharge; neither is it ever frozen during the severest winters.

The soil is generally a stiff clay, cold and watery, but capable of much improvement by drainage, for which its undulating surface affords facilities. Agriculture has made little progress within the last twenty years; the extent of the farms being generally small. In the mountainous parts, however, where the land is chiefly under grazing, the farms are larger, and in stock raising the county has made considerable progress.

From the Owners of Land Return (1876) it appears that in 1875 Cavan was divided among 1044 proprietors, 328 of whom owned less than 1 acre, and 716 one acre and upwards. The largest holdings were those of Lord Farnham (29,455 acres), Earl Aunesley (24,221), and E. J. Saunderson (12,362). The average rateable value of the land was 11s. 102d. per acre, while that of all Ulster was 15s, 84d.; and the average extent of the holdings was 435 acres per owner, or nearly double the avcrage size for Ulster, which was 239.

The following tables give comparative statements of the agriculture acreage in the years in 1853 and 1875, and of the live stock in 1852 and 1875 respectively :—

Wheat, Turnips

Oats. Barley, Flax. Potatoes. “Green Meadow. ae . rops.

1853…89,929 2,883 12,106 27,734 8,368 34,921 176,591 1875…52,826 665 5,298 28,823 6,754 61,946 156,312

hee ty) a Cattle. Sheep. Pigs. Goats. Poultry. S52 LOnool 92,690 16,167 24,715 14,024 328,241 ES WID wee er 19,439 120,899 27,822 42,263 15,800 422,501

The number of goats raised here greatly exceeds that in the other eounties, with the exception of Kerry and Cork.

Cavan is not a manufacturing county. The bleaching of linen and the distillation of whisky are both carried on to a small extent; but the people are ehiefly em- ployed in agricultural pursuits and in the sale of home produce. The soil in those districts not well adapted for tillage is peculiarly favourable for trees. The woods were formerly very considerable, and the timber found in the bogs is of large dimensions; but plantations are now chiefly found in demesnes, where they are extensive.

The population is less mixed in race than most parts of Ulster, being generally of Celtic extraction. The dwellings of the peasantry are poor in accommodation. There are in the county only four towns with upwards of 1000 inhabitants, viz., Cavan, Cootehill, Belturbet, and Bailie- borough. The population in 1851 amounted to 174,064, aud in 1871 to 140,735 (with an excess of 223 males), showing a decrease in twenty years of 33,329 persons, being an average of 1666 per annum, or 19 per cent., on the population of 1851. This is considerably above the average decrease of Ulster. At the census of 1871 there were 113,174 Catholics, 21,223 Episcopalians, 15,004 Presby- terians, and 1334 of other denominations, showing that 80 per eent. of the inhabitants professed the Catholic faith.

With regard to emigration, it appears that 11,129 persons left the county within the five years ending 1875, being at the rate of 2226 per annum, which is about the average of the rest of the province. The poor law is administered by a subdivision of the eounty and parts of the adjacent district into four unions, and these relieved 5126 paupers in 1874. Education is disp2nsed by means of 8 superior

CA Vag

and 340 primary schools. In 1871] the number of persons of five and upwards who could read and write was 55,773; 31,438 could read hut eould not write, and 48,104 could neither read nor write.

The county is divided into eight baronies—Castlerahan, Clanmahon, Clankee, Loughtee Lower and Upper, Tully- garvey, Tullyhaw, and Tullyhunco, and eontains thirty-six parishes and parts of parishes. It is almost entirely within the diocese of Kilmore. In military arrangements it is in the Belfast district ; and there are barracks for cavalry at Belturbet, and

for infantry at Cavan, where also the staff of the county militia is stationed. The assizes are held at Cavan, where the county prison and the county infirmary are situated. Prior to the Union it returned six members to the Irish parliament, two for the eounty at large, and two for each of the boroughs of Cavan and Belturbet ; but since that period it has been represented in the imperial parliament by two county members only.

The most ancient geographers describe this and the adjacent eounties of Leitrim and Fermanagh as occupied by the tribe of the Erdini, At the period of the English settlement, and for some eenturies afterwards, it was known by the name of the Brenny, or O'Reilly's country ; and its inhabitants, protected by the nature of the country, long maintained their independence. In 1584 Cavan was formed into a county of Ulster by Sir John Perrott, lord-deputy of Ireland, and subdivided into seven baronies, two of which were assigned to Sir Jolin O'Reilly, free of all eontributions, and three to other members of the family; while the two remaining baronies, possessed by the septs of Mackernon and Macgauran, and situated in the moun- tains bordering on O'Rourke's eountry, were left subject to their ancient tenures and the exactions of their Irish lord, the Crown reserving 200 beeves upon the whole county for the lord-deputy's provision. There was also an ancient subdivision, peculiar to this county, into polls, each of which contained about 25 acres. Early in the reign of James J, a commission of inquiry was issued concerning all lands in several counties of Ulster, escheated to the Crown by attainder, outlawry, or actual death in rebellion, by which the greater portion of this county was deemed to be vested in the Crown, and its exact state thereupon investigated. Under the eonsequent project for the new plantation of Ulster, the county was distributed among the undertakers, British planters, servitors, natives, ecclesi- astics, &c. The principal English and Scotch families settled in Cavan were the Auchmuties, Bailies, Butlers, Tfamiltons, Lamberts, Parsons, and Ridgeways. Some few remains of antiquity remain in the shape of cairns, raths, and the ruins of small castles.

CAVAN, the capital of the above county, and, previous to the Union, a parliamentary borough, but now placed under the Towns Improvement Act, is situated near the centre of the county. It is 68 miles N.W. from Dublin (85} by rail), on one of the tributary streams of the Annalee River, in a large valley surrounded on every side by elevated ground, with picturesque

environs, adorned by the mansions and demesnes of Lord Farnham and the bishop of Kilmore. The town, which in 1871 contained 3380 inhabitants, is of unpretending and rather humble appear ance. The court-house, erected at an expense of £11,000, is elegant in its proportions and convenient in its internal arrangements. The parish church, built on an elevated site, is also a graceful structure. The most conspicuous building is the grammar-school, founded by Charles J. It was rebuilt in 1819, atan expense of £9000, on an emincnee overlooking one of the main entrances into the town, und is capable of accommodating one hundred resident pupils. The other public buildings are the Roman Catholic chapel and Dissenters' meeting-houses, the connty gaol and 1n-

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firmary, barracks, and the union workhouse. Cavan has still some linen trade, and a considerable retail business is transacted in the town. It is the seat of a presbytery of the Presbyterian church, but the great majority of the inhabitants are Roman Catholics. A monastery of Dominican friars, founded by O'Reilly, chieftain of the Brenny, formerly existed here, and became the burial-place of the celebrated Irish general, Owen O'N eal, who died as is supposed by poison, in 1649, at Cloughoughter. This monastery, and all the other antiquities of the town, have been swept away during the violent and continuous feuds to which the country has been subjected. Even so late as the year 1690 the chief portion of the town was burned by the Enniskilleners under General Wolsey.

CAVANILLES, Antonto Jose (1745-1804), a Spanish ecclesiastic who devoted himself to botany, was born at Valencia in 1745. He was educated by the Jesuits at the university of that town, and became tntor of the sons of the Duke of Infantado, whom he accompanied to Paris. There he resided twelve years, enjoying the friendship of the famous Jussieu, whose views he adopted. He after- wards became director of the royal garden at Madrid. In 1789 and the following years, he published Dissertations upon Monadelphous Plants, and in 1790 he commenced to issue his work on the plants of Spain, and those discovered by Spanish navigators in Mexico, Peru, Chili, New Holland, and the Philippine Islands,

CAVE (Latin cavea), a hollow extending beneath the surface of the earth. Caves have excited the awe and wonder of mankind in all ages, and have been the centres round which have clustered many legends and superstitions. They were the abode of the sibyls and the nymphs in Roman mythology, and in Greece they were the temples of Pan, Bacchus, Pluto, and the Moon, as well as the places where the oracles were delivered at Delphi, Corinth, and Mount Cithzeron. In Persia they were connected with the obscure worship of Mithras. Their names frequently are survivals of the superstitious ideas of antiquity, as for example, the Fairy, Dragon's, or Devil's Caves of France and Germany. Long after the Fairies and Little Men had forsaken the forests and glens of Germany, they dwelt in their palaces deep in the Hartz Mountains, in the Dwarfholes, &c., whence they came from time to time into the upper air.

The Seven Sleepers of Ephesus slept their long sleep in a cave. The hills of Granada are still believed by the Moorish children to contain the great Boabdil, and his sleeping host, who will awake, when an adventurous mortal invades their repose, to restore the glory of the Moors in Spain.

Caves have been used in all ages by mankind for habita- tion, refuge,'and burial, In the Old Testament we read that when Lot went up out of Zoar he dwelt in a cave with his two daughters. The five kings of the Canaanites took refuge from Joshua, and David from Saul, in the caves of Palestine, just as the Aquitani fled from Cxsar to those of Auvergne, and the Arabs of Algeria to those of Dahra, where they were suffocated by Marshal Pelissier in 18495. In Central Africa Dr Livingstone tells us that there are vast caves in which whole tribes find security with their cattle and household stuff.

The cave of Machpelah may be quoted as an example of their use as sepulchres, and the rock-hewn tombs of Palestine and of Egypt, and the Catacombs of Rome probably owe their existence to the ancient practice of burial in natural hollows in the rock. We might therefore expect to find in them most important evidence as to the ancient history of mankind, which would reach long beyond written record ; and since they have always been used by wild beasts as lairs we might reasonably believe also that

| their exploration would throw light upon the animals which

| have in many cases disappeared from the countries which they formerly inhabited. The labours of Buckland, Pen- gelly, Falconer, Lartet, and Christy, and Dawkins, carried on during the last fifty years in the caves, have added an entirely new chapter to the history of man in Europe, as well as established the changes that have taken place in the European fauna, The physical history of caves will be taken first, and we shall then pass on to the discoveries relating to man and the lower animals which have been made in them of late years.

Physical History.—The most obvious agent in hollowing out caves is the sea. The set of the currents, the force of the breakers, the grinding of the shingle inevitably discover the weak places in the cliff, and leave caves as one of the results of their work, modified in each case by the local conditions of the rock. Those formed in this manner are easily recognized from their floors being rarely much out of the horizontal; their entrances are all in the same plane, or in a succession of horizontal and parallel planes, if the land has been elevated at successive times. J'rom their inaccessible position they have been rarely occupied by man. Among them Fingal's Cave, on the island of Staffa, off the south-west coast of Scotland, hollowed out cf columnar basalt, is perhaps the most remarkable in Europe. In volcanic regions also there are caves formed by the passage of lava to the surface of the ground, or by the expansion of steam and gases in the lava while it was in a molten state. They have been observed in the regions round Vesuvius and Etna, in Iceland and Teneriffe. We may take as an example the Grotto del Cane (cave of the dog), near Pozzuoli, a few miles to the south-west of Naples, remarkable for the flow of carbonic acid from crevices in the floor, which fills the lower part of the cave and suffo- cates any small animal, such as a dog, immersed long enough in it.

The most important class of caves, however, and that which immediately demands our notice, is that composed of those which have been cut out of calcareous rocks by the action of carbonic acid in the rain-water, combined with the mechanical friction of the sand and stones set in motion by the streams which have, at one time or another, flowed through them. They occur at various levels, and are to be met with wherever the strata are

sufficiently compact to support a roof. Those of Brixham and Torquay, and of the Eifel are in the Devonian limestone; those of Wales, Somerset, the central and northern counties of Belgium, Saxony,and Westphalia, of Maine and Anjou, of Virginia and Kentucky, are in that of the Carboniferous age. The cave of Kirkdale in Yorkshire, and most of those in Franconia and Bavaria, penetrate Jurassic limestones. ‘The compact Neocomian and cretaceous limestones of Central France contain most of the caverns of Perigord, rendered famous by the discovery of the remains of the Eskimos along with the animals which they hunted ; as well as those of Northern Italy, Sicily, Greece, Dalmatia, Carniola, and Palestine. The cave of Lunelvicl near Montpellier is the most important of those which have been hollowed in limestones of the Tertiary age. They are also met with in rocks composed of gypsum ; in Thuringia, for example, they occur in the saliferous and gypseous strata of the Zechstein, and in the gypseous Tertiary rocks of the neighbourhood of Paris, as for example at Montmorency.

Caves formed by the action of carbonic acid, and the action of water are distinguished from others by the following characters. They open on the abrupt sides of valleys and ravines at various levels, and are arranged round the main axes of erosion, just as the branches are arranged round the trunk of a tree. In a great many cases the relation of the valley to the ravine, ee of the ravine to

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the cave, is so intimate that it is impossible to deny that all three have been produced by the same causes. The caves themselves ramify in the same irregular fashion as the valleys, and are to be viewed merely as the capillaries in the general valley system through which the rain passes to join the main channels. Sometimes, as in the famous eaves of Adelsberg, Kentucky, Wookey Hole in Somerset- shire, the Peak in Derbyshire, and in many in the Jura, they are still the passages of subterranean streams ; but very frequently the drainage has found an outlet at a lower level, and the ancient watercourses have been deserted. These in every case present unmistakable proof that they have been traversed by water in the sand, gravel, and clay which they contain, as well as in the worn surfaces of the

sides and bottom. In all districts where there are caves there are funnel-shaped depressions of various sizes called pot-holes or swallow-holes, or bétoires, ‘“‘chaldrons du diable,” ‘‘marmites des géants,” or “ kata- vathra,” in which the rain is collected before it disappears into the subterranean passages. ‘They are to be seen in all stages, some being mere hollows which only contain water after excessive rain, while others are profound vertical shafts into which the water is continually falling. That known as Helln Pot in Yorkshire, 300 feet deep, is an ex- ample of the latter class. The cirques described by M. Desnoyers belong to the same class as the swallow-holes.

The history of swallow-holes, caves, ravines, and valleys in calcareous. strata may be summed up as follows. The calcareous rocks are invariably traversed by joints or lines of shrinkage, which are lines of weakness by which the direction of the drainage is determined ; and they are composed to a large extent of carbonate of lime, which is readily exchanged into soluble bicarbonate by the addition of carbonic acid. Theo rain in its passage through the air takes up carbonic acid, and it is still further charged with it in percolating through the surface soil in which there is decomposing vegetable matter. As the rain drops converge towards some one point, determined by some local accident on the surface, and always in a line of joint, the carbonic acid attacks the carbonate of lime with which it comes into contact, and thus a funnel is gradually formed ending in the vertical joint below. Both funnel and vertical joint below are being continually enlarged by this process. This chemical action goes on until the free carbonic acid is used up. The subterranean passages are enlarged in this manner, and what was originally an in- significant net-work of fissures is developed into a series of halls, sometimes as much as from 80 to 100 feet high, These results are considerably furthered by the mechanical friction of the pebbles and sand hurried along by the current, and by falls of rock from the roof produced by the removal of the underlying strata. In many cases the results of this action have produced a regular subterranean river system. The thick limestones of Kentucky, for example, are traversed by subterranean waters which collect in large rivers, and ultimately appear at the surface in full power. The River Axe, near Wells, the stream flowing out of the Peak Cavern at Castleton, Derbyshire, that at Adelsberg (see ADELSBERG, vol. i. p. 151) in Carniola, flow out of caverns in full

volume. The River Styx and the waters of Acheron disappear in a series of caverns which were supposed to lead down to the infernal regions.

If the direction of the drainage in the rock has been altered, either by elevations such as those with which the geologist is familiar, or by the opening out of new passages at a lower level, these watercourses become dry, and present us with the caves which have afforded shelter to man and the wild animals from the remotest ages, sometimes high up on the side of a ravine, at other times close to the level of the stream at the bottom,

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Caves, as a general rule, are as little effected by dis- turbances of the rock as the ravines and valleys, which have been formed, in the main, irrespective of the lines of fault or dislocation.

We must now examine what happens to the bicarbonate of lime which has been formed by the action of the acid on the limestone. Ifa current of air play upon the surface of the water, the carbonic acid, which floats up the lime, so to speak, is given off and the insoluble carbonate is deposited, and as a result of this action we havé the elaborate and fantastic stony incrustations termed stalactites and stalagmites. The water percolating through the rock covers the sides of the cavern with a stalactitic drapery, and if a line of drops persistently falls from the same point to the floor, the calcareous deposit gradually descends from the roof, forming in some cases stony tassels, and in others long columns which are ultimately united to the calcareous boss, formed by the plash of the water on the floor, The surface also of the pools is sometimes covered over with an ice-like sheet of stalagmite, which shoots from the sides, and sometimes forms a solid and firm floor when the water on which it was supported has disappeared. Sometimes the drops form a little calcareous basin, beautifully polished inside, which contains small pearl-like particles of carbonate of lime, polished by friction one against the other. The most beautiful stalactitic caves in Great Britain are those of Cheddar in Somerset, Caldy Island, and Poole’s Cavern at Buxton.

The intimate relation which exists between caves and ravines renders it extremely probable that many of the latter have been originally

subterranean watercourses, which have been unroofed by the degradation of the rock. Inall limestone districts ravines are to be found continued in the same direction as the caves, and the process of atmospheric erosion may be seen in the fallen blocks of stone which generally are to be met with at the mouths of the caverns. In illustration of this the valley and caves of Weather- cote, in Yorkshire, may be quoted, or the source of the Axe at Wookey ; and the ravine formed in this way has very frequently been widened out into a valley by the action of subaerial waste, or by the grinding of glaciers through it during the glacial stage of the Pleistocene period.

Pleistocene Caves in Europe.—The caves which have offered shelter to man and the wild animals are classified according to their contents. Ist, Those containing the extinct animals, such as the mammoth, woolly rhinoceros, or Paleolithic man (see ARcH#OLOGY), are termed

Pleistocene. These are sometimes called Quaternary, under the mistaken idea that they belong to an age succeeding the Tertiary period. 2d, Those which contain the remains of the domestic animals in association with the remains of man either in the Neolithic, Bronze, or Iron stages of civilization are termed Prehistoric. 3d, The third group consists of those which can be brought into relation with the historic period, and are therefore termed Historic.

The search after ebur fossele or unicorns’ horn, or in other words the fossil bones which ranked high in the materia medica of the 16th and 17th centuries, led to the discovery of the ossiferous caverns of the Hartz Mountains, and of Hungary and Franconia. The famous cave of Gailenreuth in the last of these districts was explored by Dr Goldfuss in 1810. The bones of the hyzena, lion, wolf, fox, and stag, which it contained, were identified by Baron Cuvier, and some of the skulls have been recently proved by Professor Busk to belong to the grizzly bear. They were associated with the bones of the reindeer, horse, and bison, as well as with those of the great cave bear. These dis- coveries were of very great interest, because they established the fact that the above animals had lived in Germany in ancient times. ‘The first bone cave systematically explored in

England was one at Orreston near Plymouth in the year 1816, which proved that an extinct species of rhinoceros (R, Megarhinus) lived in that district. Four years later the famous hyena den at Kirkdale in Yorkshire was explored by Dr Buckland. He brought forward proof that it had been inhabited by hyzenas, and that the broken and gnawed bones of the mammoth, rhinoceros, stag, bison, and horse belonged to animals which had been dragged in for food. He pointed out that all these animals had lived in Yorkshire in ancient times, and that it was impossible for the carcases of the rhinoceros, hyzena, and mammoth to have been floated from tropical regions into the places where he found their bones. He subsequently investigated bone caves in Derbyshire, South Wales, and Somerset, as well as in Germany, and published his Reliquic Deluvianee in 1822, a work which laid the foundations of the new science of cave-hunting in this country. The well-known cave of Kent's Hole near Torquay, furnished the Rev. J. McEnery, between the years 1825 and 1841, with the first flint implements discovered in intimate association with the bones of extinct animals. He recognized the fact that they proved the existence of man in Devonshire while those animals were alive, but the idea was too novel to be accepted by his contemporaries. His discoveries have since been verified by the subsequent investigations carried on by Mr Godwin Austen, and ultimately by the committee of the British Association, which has been at work for several years under the guidance of Mr Pengelly. There are four distinct strata in the cave. 1st, The surface is composed of dark earth, and contains medieval remains, Roman pottery, and articles which prove that it was in use during the Iron, Bronze, and Neolithic ages. 2d, Below this is a stalagmite floor, varying in thickness from 1 to 3 feet, and covering (3d) the red earth, which contained bones of the hyzena, lion, mammoth, rhinoceros, and other animals, in association with flint implements and an engraved antler, which proved man to have been an inhabitant of the cavern during the time of its deposition. 4th, Filling the bottom of the cave is a hard breccia, with the remains of bears and flint implements, in the main ruder than those found above; in some places it was no less than 12 feet thick. The most remarkable animal found in Kent's Hole is the sabre-toothed carnivore, Machatrodus latidens of Owen. While the value of Mr McEnery's discoveries was in dis- pute the exploration of the cave of Brixham near Torquay in 1858 proved that man was coeval with the extinct mammalia, and in the following year additional proof was

offered by the implements ;that were found in Wookey Hole. Similar remains have been met with in the caves of Wales, and in England as far north as Derbyshire (Cres- well), proving that over the whole of southern and middle England men, in precisely the same stage of rude civiliza- tion, hunted the mammoth and rhinoceros and other extinct animals.

Cave-dwellers allied to Eskimos. —The caves and rock shelters of Perigord, explorcd by the late M. Lartet and our countryman Mr Christy, in 1863-4, have not only afforded accumulative proof of the co-existence of man with the extinct mammalia, but have given us a clue as to the race that so existed. They penetrate the sides of the valleys of the Dordogne and Vezére, and offer as vivid a picture of the life of the period as that revealed of Italian manners in the lst century by the buried cities of Herculaneum and Pompeii. The old floors of human occupation consist of broken bones of animals killed in the chase, mingled with rude implements and weapons of bone and unpolished stone, and with charcoal and burnt stones, which indicate the position of the hearths. Flakes without number, awls, lance-heads, hammers, and saws made of flint rest péle-méle with bone needles, sculptured reindeer antlers, arrowheads, and harpoons, and bones of the reindeer, bison, horse, ibex, Saiga antelope, and musk sheep. These singular accumulations of débris mark the places where the ancient hunters lived, and are merely the refuse cast aside. ‘The reindeer formed by far the greater portion of the food, and must have lived in enormous herds at that time in the centre of France. From this, as well as from the presence of the most arctic of the herbivores, the musk sheep, we may infer the severe climate of that portion of France at that time. Besides these animals the cave bear and lion have becn met with in one, and the mammoth in five localities, and their remains bear marks of cutting or scraping which showed they fell a prey to the hunters. The most remarkable remains left behind in these refuse heaps are the sculptured reindeer antlers and figures engraved on fragments of schist and onivory. A well-defined outline of an ox stands out boldly from one piece of antler; a second represents a reindeer kneeling down in an casy attitude with his head thrown up in the air so that the antlers rest on the shoulders, and the back forms an even surface for a handle, which is too small to be grasped by an ordinary European hand; in a third a man stands

close to a horse’s head, and on the other side of the same cylinder are two heads of bisons drawn with sufficient clearness to ensure recognition by any one who has seen that animal. On a fourth the natural curvature of one of the tines has been taken advantage of by the artist to engrave the head and the characteristic recurved horns of the ibex; and on a fifth horses are represented with large heads, upright dishevelled manes, and shaggy ungroomed tails. The most striking figure is that of the mammoth engraved on a fragment of its own tusk; the peculiar spiral curvature of the tusk and the long mane, which are now not to be found in any living elephant, prove that the original was familiar to the eye of the artist. These drawings probably employed the idle hours of the hunter, and hand down to us the scenes which he witnessed in the chase. They are full of artistic feeling and are evidently drawn from life. The mammoth is engraved in its own ivory, and the reindecr and the stag on their respective antlers, The general idea which we are justified in forming of these ancient dwellers in Aquitaine is that they lived by hunting and fishing, and that they were clad with skins sewn together with sincws or strips of intestines. They possessed no domestic animals, nor were they acquainted with spinning or with the pottcr’s art. We have no evidence that they

buried their dead,—the interments, such as those of Aurignac, Les Eyzies, Mentone, as well as of Belgium and Germany, most probably belonging to a later age. Caves containing their implements occur throughout these regions as well as in Switzerland.

These traces of the most ancient men as yet discovered in Europe, may with a high degree of probability be referred to the Eskimos. The bone needles, and many of the harpoons, as well as the flint spearheads, arrowheads, aud scrapers, are of precisely the same form as those now in use amongst the Eskimos. The artistic-designs from the caves of France, Belgium, and Switzerland, are identical in plan and workmanship with those of the Eskimos, with this difference only, that the huuting scenes familiar to the Paleolithic cave-dwellers were not the same as those familiar to the inhabitants of the shores of the Arctic Ocean. Each represented the animals which he knew, and the whale, walrus, and seal were unknown to the inland

dwellers of Aquitaine, just as the mammoth, bison, and wild horse are unknown to the Eskimos. The reindeer, which they both knew, is representcd in the samc way by both. The practice of accumulating large quantities of the bones of animals round their dwelling-places, and the habit of splitting the bones for the sake of the marrow, are the same in both. The hides were prepared with the same sort of instruments, and the needles with which they were sewn together are of the same pattern. In both there was the same disregard of sepulture. All these facts can hardly be mere coincidences caused by both peoples leading a savage life under similar conditions. ‘The conclusion, thcrefore, seems inevitable that, so far as we have any evidence of the race to which the cave-dwellers belong, that evidence points only in the dircction of the Eskimos. It is to a considerable extent confirmed by a considcration of the animals found in the caves. The reindeer and musk sheep afford food to the Eskimos now in the Arctic Circle, just as they afforded it to the Paleolithic hunters in Europe; and both these animals have been traced by their remains from the Pyrenees to the north-east, through Europe and Asia as far as the very regions in which they now live. The mammoth and bison also have been tracked by their remains in the frozen river gravels and morasses through Siberia as far as the American sidc of the Straits of Behring. Paleolithic man appeared in Europe with the arctic mammalia, lived in Europe with them, and in all human

probability retreated to the north-east along with them.

- Ancient Geography of Hurope.—The remains of man and the animals described in the preceding paragraphs have been introduced into the caves either by man or the wild beasts, or by streams of water, which may or may not now occupy their ancient courses ; and the fact that the same species are to be met with in the caves of France, Switzerland and Britain implies that our island formed part of the Continent, and that there werc no physical barriers to prevent their migration from the Alps as far to the north- west as Ireland.

The same conclusion may be gathered from the explora- tion of caves in the south of Europe, which has resulted in the discovery of African species, in Gibraltar, Sicily, and Malta. In the first of these the spotted hyzena, the serval, and Kaffre cat lie side by side with the horse, grizzly bear,and

slender rhinoceros (2. Hemitoechus),—see Falconer's Pale- ontographical Memoirs. To these African animals inhabit- ing the Iberian peninsula in the Pleistocene age, M. Lartet has added the African elephant and striped hyzena, found in a stratum of gravel near Madrid, along with flint implements. The hippopotamus, spotted hyzena, and African elephant occur in the caves of Sicily, and imply that in ancient times there was a continuity of land between that spot and Africa, just as the presence of the Elephas antiquus proves the

non-existence of the Straits of Messina during a portion, to say the least, of the Pleistocene age. A small spccies of hippopotamus (Z/. Pentlandi) occurs in inercdible abundance in the Sicilian caves. It has also been found in those of Malta along with an extinct pigmy elephant species (Z. Melitensis). It has also been discovered in Candia and in the Peloponnese. For these animals to have found their way to these regions, a continuity of land is necessary. The view advanced by Dr Falconer and Admiral Spratt, that Europe was formerly connected with Africa by a bridge of land extending southwards from Sicily, is fully borne out by these considerations. The present physical geography of the Mediterranean has been pro- duced by a depression of land to the amount of about 400 fathoms, by which the Sicilo-African and Ibero-African bar- riers have been submerged, and Crete and Malta separated froni the South-European continent. It is extremely pro- bable that this submergence took place at the same time that the adjoining sea bottom was elevated to about the samc amount to constitute that region now known as the Sahara.

Pleistocene Caves of the Americas and Australia.—The Pleistocene caverns of the Euro-Asiatic continent contain the progenitors of the animals now to be found in some parts of the Old World, the extinct forms being closely allied to those now living in the same geographical provinces. 'Those of Brazil and of Pennsylvania present us with animals whose nearest analogues are to be found in North and South America, such as sloths, armadillos, and agoutis. Those, again, of Australia present us with mar- supials only, allied to, or identical with, those of that singular continent.

The extinct forms in each case are mainly those of the larger animals, which, from their large size, and the fact of their only bearing one at a birth, would be specially liable to be beaten in the battle for life by their smaller and more fertile contemporaries, and less likely to survive those changes in their environment which have undoubtedly taken place in the long lapse of ages. It is, therefore, certain that the mammalian life in the Old, New, and Australian worlds was as well marked out into geographical provinces in the Pleistocene age as at the present time, and that it has been continuous in these areas from that remote time tv the present day.

For caves of America see Lund, Chron. des Sc. Nat., 2d ser., xill. p. 313; American Journ. of Science and Art, i. 1871. For those of Australia—Owen, Brit. Ass. Rep., 1844; Mitchell, Three Hxpeditions into Interior of Australia, 1838, vol. ii; Wood's Geological Observations in South Australia, 1862,

The fact that no caves contain remains more ancient than the Pleistocene age may be explained by the view that the caverns in which the animals of former periods took shelter have been removed by the process of subaerial denudation operating through long periods of time.

Prehistoric Caves of Neolithic Age in Europe.—The prehistoric caves are distinguished from Pleistocene by their containing the remains of domestic animals, and by the wild animals to which they have afforded shelter belonging to living species. They are divisible into three groups according to the traces of man which occur in them, —ainto the Neolithic, Bronze, and Iron ages.

The Neolithic caves are widely spread throughout Europe, and have been used as the habitations and tombs of the early races who invaded Europe from the East with their flocks and herds. The first of these sys- tematically explored was at Perthi Chwareu, near the village of Llandegla, Denbighshire, in 1869. In the follow- ing years five others were discovered close by, as well as a second group in the neighbourhood of Cefn ou the banks of the Elwy. They contained polished celts, flint flakes,

rude pottery, aud human skeletons, aloug with the broken bones of the pig, dog, horse, Celtic shorthorn, and goat. The remains of the wild animals belong tv the wolf, fox, badger, bear, wild boar, stag, roe, hare, and rabbit. Most of the bones were broken or cut, and. the whole group was obviously an accumulation whieh resulted from these caves having been used as dwellings. They had subsequently been used for burial. The human skeletons in them were of all ages, from infancy to old age; and the interments had becn suceessive until eaeh became filled. The bodies were buried in the eontracted posture which is so character- istic of Neolithic interments generally. The men to whom these skeletons belonged were a short race, the tallest being about 5 feet 6 inches, and the shortest 4 feet 10 inches ; their skulls are orthognathic, or not presenting jaws advancing beyond a vertical line dropped from the forehead, in shape long or oval, and of fair average capacity. The face was oval, and the cheek bones were not prominent. Some of the individuals were characterized by a peculiar flattening of the shinbone (platycnemism), which probably stood in relation to the free action of the foot that was not hampered by the use of a rigid sole or sandal, ‘This, however, cannot be looked upon asa race character, or as a teudency towards a simian type of leg. These Neolithic eave-dwellers have been proved to be identical in physique with the builders of the eairns and tumuli which lie scattered over the face of Great Britain and Ireland, (See Thurnam, Crania Britannica.) They have also been met with abundantly in France. In the Caverne de ’Homme Mort, for example, in the department of Lozére, explored in 1871, the association of remains was of precisely the same nature as those mentioned above, and the human skeletous were of the same small type. The same elass of remiaius has also been discovered in Gibraltar, in the caves of Windmill Hill, and some others. The human remains examined by Professor Busk are of precisely the same type as those of Denbighshire. In the work of Don Manuel Gongora J. Martinez (Antiguedades Prehis- toricas de Andalusia, 1868), several interments are deseribed in the eave of Mureielagos, which penetrates the limestone out of which the grand scenery of the southern Sierra Nevada has been toa great extent carved. In one place a group of three skeletons was met with, one of which was adorned with a plain coronet of gold, and elad ina tunie made of esparto grass finely-plaited, so as to form a pattern like that on some of the gold ornaments in Etruscan tombs. In a seeond spot further within, twelve skeletons formed a semieirele round one eovered with a tunic of skin, and

weariug a neeklaee of esparto grass, earrings of blaek stone, and ornaments of shell and wild boar tusk. There were other artieles of plaited esparto grass, such as baskets aud sandals. There were also flint flakes, polished-stone axes, implements of bone and wood, together with pottery of the same type as that from Gibraltar. The same class of remains have been diseovered in the Woman's Cave, near Alhama in Granada. From the physical identity of the human remains in all these cases it may be inferred that in the Neolithic age a long-headed, small race inhabited the Iberian peninsula, extending through Franee, as far north as Britain, and to the north- west as far as Ireland,—a raee considered by Professor Busk "to be at the present day represented by at any rate a part of the population now inhabiting the Basque provinces." This identification of the ancient Neolithic cave-dwellers with the modern Basque-spealing inhabitant of the Western Pyrenees is corroborated by the elaborate researches of M. Brocas, Professor Virchow, and Dr Thuram into modern Basque skulls. It may therefore be concluded that in the Neolithic age au Iberian population occupied the whole of the area mentioned above, inhabiting

eaves aud burying their dead in caves and chambered tombs, and possessed of the same habits of life. The remains of the same small, oval-featured, long-headed race have been found in Belgium in the cave of Chauvaux.

There is no evidenee that any other race except the Iberic buried their dead in the caves of Britain. In Belgium, however, the exploration of the eave of Sclaig- neaux by M. Soreil proves that broad-headed men of the type defined by Professor Huxley and Dr Thurnam as brachyeephalic, and eharacterized by high eheek bones, projeeting muzzles, and large stature, the average height being 5°84 inehes (Thurnam), inhabited and buried their dead in the eaves of that region. In France they oeeur in the sepulchral cave of Orrouy (Oise) in assoeiation with those of the Iberic type. They have also been met with in Gibraltar. This type is undistinguishable from the Celtic or Gaulish, found so abundantly in the ehambered tombs of the Neolithic age in France. Both these aneient races are represented at the present day by the Basques and Aquit- anians of Franee and Spain, and by tlic Celts or Gauls of France,' Britain, and the Mediterranean border of Spain, their relative

antiquity being proved by an appeal to their history and geographical distribution. For just as the earliest records show that the Iberie power extended as far north as the Loire, and as far cast as the Rhone, so we have proof of the gradual retrocession of the Iberie frontier southwards, under the attacks of the sueeessive Celtic hordes, until ultimately we find the latter in possession of a considerable part of Southern Spain, forming by their union with the conquered the powerful nation of Celt- Iberi. The Iberians were in possession of the Continent before they were dispossessed by the Celts; they are reeognized by Tacitus in Britain in the Gilures of Wales ; and they are still to be scen in the small, dark, lithe inhabitants of North Wales (see Dawkins, Vortnightly Review, Oetober 1874). From the present distribution of this non-Aryan race it is obvious that they were gradually pushed back westward by the advance of tribes eoming from the East, and following those routes which were subsequently taken by the Low and High Germans.

The exploration of the Grotta dei Colombi, in the island of Palmaria overlooking the Gulf of Spezzia, in 1873, proves that the stories scattered through the classical writers, that the caves on the Mediterranean shores were inhabited by eannibals, are not altogether without founda- tion. In it broken and cut bones of children and young adults were found along with those of the goat, hog, fox, wolf, wild eat, flint flakes, bone implements, and shells perforated for suspension.

Prehistoric Caves of Bronze and Iron Ages.—The extreme rarity of artieles of bronze in the European caves implies that they were rarely used by the Bronze folk for habitation or burial. Bronze weapons mingled with gold ornaments have, however, been discovered in the Heatheryburn Cave near Stanhope, Durham, as well as in those of Kirkhead in Cartmell, in Thor's Cave in Staffordshire, and the Cat Hole in Gower in Glamorganshire. In the Iberian penin- sula the Cave of Cesareda, explored by Signor Delgado, in the valley of the Tagus, contained bronze articles, associated with broken and eut human bones, as well as those of domestic animals, rendering it probable that eannibalisin was praetised in early times in that region. Professor Busk believes, however, that the facts are insuffieient to support the charge of cannibalism against the aneient Portuguese.

Caves eontaining articles of irou, and therefore belong- ing to that division of the prehistorie age, are so unimport- ant that they do not deserve notice in this plaee. As man inereased in eivilization he preferred to live in houses of his own building, and he no longer buried his dead in the natural sepulehres provided for him in the rock.

Prehistorie eaves have been rarely explored in extra- European areas. Among those which abound in Palestine, one in Mount Lebanon, examined by the Rev. Canon Tristram, contained flint implements along with charcoal and broken bones and teeth, some of which may be referred to a small ox, undistinguishable from the small short-horn, Bos longifrons. In North America the remains found by Mr. F. W. Putnam in the caves of Kentucky, consisting of moccasins, rudely plaited cloth, and other articles, may be referred to the same division.

Historic Caves in Britain.—-The historic eaves have only attracted notiee during the last few years, and in Britain alone, principally through the labours of the Settle Cave Committee from the year 1869 to the present day. To them is due the exploration of the Vietoria Cave, which had been discovered and partially investigated as early as the year 1838. It consists of three large ill- defined chambers opening on the face of the cliff 1450 feet above the sea, and filled with débrs very nearly up to the roof, It presented

three distinct eras of occupation,—one by hyeenas, which dragged into it rhinoceroses, bisons, mam- moths, horses, reindeer, and bears. This was defined from the next oecupation, which is probably of the Neolithic age, by alayer of grey elay, on the surface of which rested a bone harpoon and a few flint flakes and bones. Then after an interval of débris at the entrance was a layer of charcoal, broken bones, fragments of old hearths, and numerous instruments of savage life associated with broken pottery, Roman coins, and the rude British imitations of them, various articles of iron, and elaborate personal ornaments, which implied a considerable development of the arts. ‘The evidence of the coins stamps the date of the occupation of the cave to be between the first half of the 5th century and the English invasion. Some of the brooches present a peculiar flamboyant and spiral pattern in relief, of the same character as the art of some of the illuminated manuseripts, as for example one of the Anglo- Saxon gospels at Stockholm, and of the gospels of St Columban in Trinity College, Dublin. It is mostly allied to that work which is termed by Mr Franks late Celtic. From its localization in Britain and Ireland, it seems to be probable that it is of Celtic derivation; and if this view be accepted, there is nothing at all extraordinary in its being recognized in the illuminated Irish gospels. Ireland, in the 6th and 7th centuries, was the great centre of art, civilization, and literature ; and it. is only reasonable to suppose that there would be intercourse between the Irish Christians and those of the west of Britain, during the time that the Romano-Celts, or Brit-Welsh, were being slowly pushed westwards by the heathen English invader. Proof of such an intereourse we find in the brief notice of the Annales Cambriv, in whieh Gildas, the Brit-Welsh historian, is stated to have sailed over to Ireland in the year 565 a.p. It is by no means improbable that about this time there was a Brit-Welsh migration into Ireland, as well as into Brittany. Objects with these designs found in Germany are probably direetly or indireetly due to the Irish missionaries, who spread Christianity through those regions. The early Christian art in Ireland grew out of the late Celtic, and is to a great extent free from the influence of Rome, which is stamped on the Brit- Welsh art of the same age in this country.

Several other ornaments with enamel deserve especial notice. ‘The enamel composed of red, blue and yellow has been inserted into the hollows in the bronze, and then heated so as to form a close union with it. They are of the

same design as those which have been met with in late Koman tumuli in this country, and in places which are mainly in the north. They all belong to a elass named late Celtie by Mr Franks, and are considered by him to be

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of British manufaeture. This view is supported by the only reference to the art of enamelling furnished by the classieal writers. Philostratus, a Greek sophist in the court of Julia Domna, the wife of the Emperor Severus, writes, “It ig said that the barbarians living in the ocean pour these colours (those of horse-trappings) on heated bronze, and that these adhere, grow as hard as stone, and preserve the designs that are made in them.” Itis worthy of remark that, since the Emperor Severus built the wall which bears his name, marched in person against the Caledonians, and died at York, the aeeount of the enamels may have reached Philostratus from the very district in which the Vietoria Cave is situated.

Associated with these were bronze ornaments inlaid with silver, and miseelianeous iron articles, among whieh was a Roman key. Remains of this kind have been met with in the Albert and Kelko eaves in the neighbourhood, in that of Dowkerbottom near Arncliffe, in that of Kirkhead on the northern shore of Moreeombe Bay, in Poole’s Cavern near Buxton, and in Thor’s Cave near Ashbourne,

List of Principal Animals and Objects found in Brit- Welsh strata in Caves.

ae ‘ E & |S8lag|2 & Animals, = oe Pes leis Se S| HRS R= as DomrEstic— Cams famvilieris. Dog ……..... x | X |x | Xe I PEORO NE MN OY oe. eq tes’e stitiees Samal eee eS al Se LEquis caballus. Horse……..... x wt |X alll Gc Be Bos longifrons. Celtic short-horn.) x | x | x | x | x Capra hires, Gort……...21-<+- me ese lease IN x Witp— Congas vulpes: WORE. ~~2…..0662 scl) X a || 33 |t 2 Meles taxus. Badger……..... x x Cervus claphus, Stag……. 0.0 x ee oo |) 3 Cervus capreolis. Woe……..~~ x x | Roman coins, or imitations……. | oe es. || eu Enamelled ornaments, in bronze.} x | x | xX | X Bronze ornaments, inlaid with é xl Re x BONG Lysates nas sien ca nsceesec yaad TMOMPAGGNGSY. ...SAMMVANE WLC! « occccne eer cawecnecearicee Xess ies x Black iwatenin….ce..0.-.

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It is obvious in all these eases that men aceustomed to luxury and refinement were compelled, by the pressure of some great calamity, to flee for refuge to caves with what- ever they eould transport thither of their property. The number of spindle-whorls and personal ornaments imply that they were aeeompanied by their families. We may also infer that they were eut off from the eivilization to whieh they had been accustomed, beeause in some eases they extemporized spindle-whorls out of fragments of Samian ware, instead of using those which were expressly manufactured for the purpose. Why the eaves were inhabited is satisfactorily explained by an appeal to contemporary history. In the pages of Gildas, in the Anglo-Saxon Chronicle, and in the Annales Cambrie, we have a graphic picture of that long war of invasion by which the inhabit- ants of the old Roman province of Britannia were driven back by the Jutes, Angles, and Saxons, who erossed over with their families and household stuff. Slowly, and in the ehances of a war which extended through three centuries, they were gradually pushed back into Cumber- land, Wales, and West Somerset, Devon, and Cornwall While this war was going on the coinage became debased, and Roman coins afforded the patterns for the small bronze minimi, which are to be met with equally in these caves

and in the ruins of Roman cities. As the tide of war rolled to the west, the English tongue and, until towards the close of the struggle, the worship of Thor and Odin supplanted the British tongue and the Christian faith, and a rude barbarism replaced what was left of the Roman civilization inthe island. Itis to this period that relics of this kind in the caves must be assigned. They are traces of the anarchy of those times, and complete the picture of the desolation of Britain, revealed by the ashes of the cities and villas that were burnt by the invader. They prove that the vivid account given by Gildas of the straits to which his countrymen were reduced were literally true. The historic caves of the Continent have not as yet been explored.

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Ossemens Fossiles découverts dans les Caverns de Liége ; Merk, Excavations at Kesserloch, transl. J. &. Lee, 1876. (W. B. D.)

CAVE, Epwarp (1691-1754), an English printer, was born at Newton in Warwickshire, in 1691. He was placed by his father, who was a shoemaker at Rugby, at the famous school of that town, but being accused of robbing the hen-roost, he was forced to leave. He became clerk to a collector of the excise; but the drudgery and insolence to which he was subjected by his master's wife caused him to try his fortunes in London, and after having been engaged for some time by a timber-merehant, he was finally bound apprentice in the printing-oflice of Mr Collins, In two years he attained so much skill in his art, that he was sent to conduct a printing-house at Norwich, and publish a weekly paper. In this undertaking he met with some opposition, which produced a public controversy, and procured young Cave the reputation of a writer. The only work of any size, however, which he left was An Account of the Criminals. He held for a short time the office of clerk of the franks, but his rigour in checking abuses soon caused his dismissal. He now embarked the capital which he had acquired in the publication of the Gentleman's Magazine, a periodical which procured a fortune for the projector, and survived almost all its competitors. It is as the founder of this magazine, and as the first to give literary employment to Samuel Johnson, that Cave's name has been remembered. He died on the 10th January 1754. Dr Samuel Johnson wrote a short biography of Cave.

CAVE, Dr Wittt1am (1637-1713), an English divine, was born at Pickwell in Leicestershire. He was educated at St John's College, Cambridge, and became successively minister of Hasely in Oxfordshire, of All-Hallows the

Great of Islington in London, and of Isleworth in Middlesex. He was chaplain to Charles IL, and in 1684 was installed as a canon of Windsor. The two works on which his reputation principally rests are the Apostolici, or History of Apostles and Fathers in the three first centuries of the church (1677), and Scriptorum Ecclesiasticorum Historia Literaria (1688). The best edition of the latter is the Clarendon Press, 1740-3, which contains additions by the author and others. In both works he was drawn Into controversy with Leclerc, who was then writing his Bibliotheque Universelle, and who accused him of partiality.

Besides these, he wrote Primitive Christianity, or Religion of the Ancient Christians, de.; Tabule Ecelesiastice; Antiquitates Apos- toliee; A Dissertation concerning the Government of the Ancient Church, &e.; Ecelesiastici, or History of the Fathers of the 4th cen-

tury ; and a work entitled Chartophylax Eeclesiasticus, which is an abridgment of the Zistoria Literaria.

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CAVEDONE, Jacopo (1577-1660), an Italian painter, born at Sassuolo in the Modenese, was educated in the school of the Caracci, and under them painted in the churches of Bologna. His principal works are the Adora- tion of the Magi, the Four Doctors, and the Last Supper ; and more especially the Virgin and Child in Glory, with San Petronio and other saints, painted in 1614, and now in the Bolognese Academy. Cavedone became an assistant to Guido in Rome; his art was generally of a subdued undemonstrative character, with rich Titianesque colouring. In his declining years his energies broke down after the death of a cherished son ; and he died in extreme poverty, in a stable in Bologna.

CAVENDISH, Henry (1731-1810), a chemist and natural philosopher, was the son of Lord Charles Cavendish, brother of the third duke of Devonshire, and of Lady Anne Grey, daughter of the duke of Kent. He was born at Nice on the 10th October 1731. Little is known about his early education. He was for some time at New- combe’s school at Hackney, and afterwards went to Cambridge. Probably his taste for experimental research was mainly acquired from his father, who gave some atten- tion to meteorological

observations, and whose very accurate determination of the depression of mercury in barometrical tubes has formed the basis of some of the most refined investigations of modern times. The morbid sensibility of his nature, which led him to shrink from society, would also have an influence in determining his choice of a scientific life; and he was free to follow his bent, ag his allowance from his father was amply sufficient for his wants, and a large inheritance left him by one of his uncles put him in possession of abundant means for prosecuting his scientific investigations. In the latter part of his life, indeed, he was not less famed in his country for the great accumulation of his property than for his intellectual and scientific treasures. His merits in science were more generally understood on the Continent ; and he was made, though not till he had passed the age of seventy, one of the eight foreign associates of the Institute of France. He resided principally at Clapham Common, but his library was latterly at his house in Bedford Square; and after the death of his librarian, he appointed a day on which he attended in person to lend any work to such men of letters as were either personally known to him or recommended by his friends. So methodical was he that he never took down a book for his own use without entering it in the loan book. In 1760 he became a member of the Royal Society. He was constantly present at the meetings of the society, as well as at the conversations held at the house of the president ; and he dined every Thursday with the club composed of its members. Otherwise he had little intercourse with society, even with his own family. He saw only once a year the person whom he had made his principal heir. His dinner was ordered daily by a note placed on the hall table, and his female domestics had orders to keep out of his sight on pain of dismissal. His person was tall and rather thin; his dress was singularly uniform, although sometimes a little neglected. He had a slight hesitation in his speech, and an air of timidity and reserve that was almost ludicrous. He died unmarried on the 24th of February 1810, leaving a property in the funds of about £700,000, and a landed estate of £6000 a year. Some of his warmest admirers have expressed regret that no portion of that vast wealth was appropriated to scientific objects.

For almost fifty years after Cavendish became a member of the Royal Society, he continued to contribute to the Plalosophical Transactions some

of the most interesting and important papers that have appeared in that collection ; in which the precision of experimental demonstration, no

less than the important scientific facts communicated, has been thonght to have aided the further progress of chemical discovery. He may almost be called the founder of pneumatic chemistry, which had barcly an existenec when he began his researches. In a series of ‘‘ Three papers, containing Experiments on Factitious Air,” Dhil. Zrans., 1766, p. 141, he describes the apparatus used in processes of this kind, which he had improved by the occasional employment of mercury. By weighing a bladder filled with a known bulk of inflamraable air (hydrogen), and then in a state of collapse, and by examining the loss of weight during the solution of zinc in an acid, he found the specific gravity of inflammable air to be about ;’;th of that of common air, a discovery which led to balloon experiments and projects for cerial navigation. He also observed that the gas obtained during the solution of copper in muriatic acid was rapidly absorbed by water, but did not inquire further into its nature. The second paper refers to fixed air (carbonic acid), which was found to undergo no alteration in its elasticity when kept a year over mercury, to be absorbed by an equal bulk of water or of olive oil, and by less than half its bulk of spirit of wine, to exceed the atmospheric air in specific gravity by more than one-half, and to render it unfit for supporting combustion even when added toit in the proportion of only 1to9. Inthe third part, the air produced by fermentation and putrefaction is examined, and is shown io be identical with the fixed air obtained from marble. It is also shown that the inflammable air emitted during putrefaction resembles that which is procured from zinc, although it appears to be a little heavier.

A paper on “ Experiments on Air,” Phil. Trans., 1784, p. 119, contains an account of two of the greatest dis- coveries that have ever been made in chemistry,—the composition of water, and that of nitric acid. Cavendish first establishes the radical difference of hydrogen from nitrogen, and then’ relates his experiments on the combus- tion of hydrogen with oxygen, which had partly been suggested by an observation of Mr Waltire, a lecturer on uaturgl philosophy, and which prove that pure water is the result of the

process, provided that no nitrogen be present. The second series of experiments shows that when phio- gisticated air (nitrogen) is present in the process, some nitric acid is produced, and that this acid may be obtained from atmospheric air, by the repeated operation of the electrical spark. In another paper on ‘ Expcriments on Air,” Phil. Trans., 1785, p. 372, the composition of nitric acid is further established, and it is shown that nearly the whole of the irrespirable part of the atmosphere is con- vertible into this acid, when it is mixed with oxygen and an electric spark is passed through the mixture,—the fixed air sometimes obtained being due to the presence of organic substances,

Besides the above, Cavendish contributed a number of other papers to the Philosophical Transactions. In an “ Account of a New Eudiometer,” PAil. Trans., 1783, p. 106, he attributes the great difference in the results of eudiomcetrical experiments with nitrous gas, or nitric oxide, to the different degrees of oxygenization of the acid that is formed. But he found that when the method employed was the same, there was no sensible difference in the con- stituent parts of the atmosphere under circumstances the most dissimilar,—the air of London, with all its fires burn- ing in the winter, appearing as pure as the freshest breezes of the country. In “An Attempt to explain some of the principal Phenomena of Electricity by means of an Elastic Fluid,” Phil. Trans., 1771, p. 584, his theory of electricity agrees with that which had been published a few years before by A%pinus, but he has entered more minutely into the details of calculation, The law of electric attraction

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and repulsion had not at that time been fully ascertained, but Cavendish inclines to the true supposition, of forces varying inversely as the square of the distance. In hig ‘Observations on Mr Hutchin’s Experiments for deter- mining the degree of cold at which quicksilver freezes,” Phil. Trans., 1783, p. 303, he denicd to heat the character of a substance, and thought “Sir Isaac Newton’s opinion, that heat consists in the internal motion of the particles of bodies, much the most probable,’”—a view which it was one of the first of Sir Humphrey Davy’s objects to confirm, The apparatus which Cavendish employed in his “ Experi- ments to determine the density of the

Earth," Phil. T'rans., 1798, p. 469, had been invented and constructed many years before by the Rev. John Michell, who did not live to perform the experiments for which he intended it. The method employed was to suspend by a vertical wire a horizontal bar, having a leaden weight at each end; to determine the magnitude of the force of torsion by the time occupied in the lateral vibrations of the bar; and to measure the extent of the change produced in its situation by the attraction of two large masses of lead placed on opposite sides of the case containing the apparatus, so that this attraction might be compared with the weight of the balls, or, in other words, with the attraction of the earth, In this manner the mean density of the earth was found to be five and a half times as great as that of water.

There has been some difference of opinion as to thie attitude of Cavendish towards the antiphlogistic theory of Lavoisier. Cavendish by no means dissented from the whole of that theory. In the " Experiments on Air," DPhil. Trans., 1784, he quotes Lavoisier and Scheele with appro- bation, as having suggested the opinion " that dephlogisti- cated air and phlogisticated air are quite distinct substances, and that common air is a mixture of the two." Afterwards he says that "not only the foregoing experiments, but most other phenomena of nature, scem explicable as well, or nearly as well, upon this as upon the commonly believed principle of phlogiston." M. Cuvier has even asserted that the autiphlogistic theory derived its first grigin from one great discovery of Cavendish, that of the nature of hydro- gen, and owed its complete establishment to another, that of the composition of water.

Cavendish possessed a clearness of comprehension, and au acuteness of reasoning, which had been the lot of very few of his predecessors from the days of Newton. The splendid career of chemical investigation, which has since been pursued with a degree of success unprecedented in history, may be said to have been first laid open to man- kind by his labours.

CAVENDISH, Marcaret. OF.

CAVENDISH, Tuomas (1560-1592), the third circum- navigator of the globe, was born at Trimley St Mary, in Suffolk, in 1560. Fora short time he studied at Corpus Christi College, Cambridge, but quitting the university without a degree, he followed the court, and in a few years squandered

away nearly all his inheritance. Turning his attention to maritime adventure with a view to repairing his fortune, he fitted out a ship in which he accompanied the expedition sent to Virginia in 1585 under the command of Sir Richard Grenville. On his return he resolved upon a predatory expedition against the Spaniards in the New World. Accordingly, on July 21, 1586, he sailed from Plymouth with three small vessels, passed through the Straits of Magellan, cruised along the coasts of Chil, Peru, and Mexico, and burnt and sunk nineteen ships, including the “ Santa Anna,” a vessel belonging to the king of Spain, with a cargo of immense value, which he captured off the coast of California. Returning home with his plunder by the Cape of Good Hope he reached Plymouth,

See NEWCASTLE, DUCHESS

September 9, 1588, having circumnavigated the globe in two years and fifty days. It is said that his sailors were clothed in silk, his sails were damask, and his topmast covered with cloth of gold. His hastily-acquired riches did not last long, forin 1591 he had reduced himself to the necessity of undertaking another expedition with five vessels. This voyage was a most disastrous one. His crews were mutinous, and after leaving the Straits of Magellan they obliged him to steer for England. At this he became dispirited, and died of grief on the home- ward voyage in 1592. The only geographical discovery of any importance which can be attributed to Cavendish is that of the harbour named by him Port Desire, on the east coast of Patagonia.

CAVENDISH, Sir Witty, the second son of Thomas Cavendish of Cavendish in Suffolk, clerk of the pipe in the reign of Henry VIII., was born about the year 1505. Having received a liberal education, he was taken into the family of Cardinal Wolsey, whom he served in the capacity of gentleman-usher of the chamber. Cavendish was with Wolsey when he died, and delayed going to court till he had seen his remains decently interred. The king was so far from disapproving of his conduct that he immediately took him into his household, made him treasurer of his chamber and a privy-councillor, and after- wards conferred on him the order of knighthood. He was also appointed one of the commissioners for receiving

the surrender of religious houses. In 1540 he was nominated one of the auditors of the court of augmentations, and soon afterwards obtained a grant of several considerable lordships in Hertfordshire. In the reign of Edward VI. his estates were much increased by royal grants in seven different counties ; and he appears to have continued in high favour at court during the reign of Queen Mary. He died in 1557. Sir William was the founder of Chatsworth, and of the vast fortunes of his descendants, the dukes of Devon- shire. He wrote Zhe Life and Death of Cardinal Wolsey, of which a mutilated copy appeared in 1641. It was first correctly printed in Dr Wordsworth's Lcelesiastical Biography.

CAVENDISH, Wittt1am, first duke of Devonshire. See DEVonsHIRE, DUKE oF.

CAVITE, a fortified seaport town of the Philippines, capital of a province of the same name in the Island of Luzon, nine miles south of the city of Manilla, on a tongue of land in the bay. It was formerly the head naval dept of the Spanish possessions in the East, and has an arsenal, a hospital, two churches, and three convents,

CAVORE, or Cavour, a town of Italy in the province of Turin, 25 miles south-west of the city of that name. It carries on silk-spinning and linen-weaving, as well as a trade in grain. In 1433 it was bestowed by Amadeus VIII. of Savoy on the lords of Raconis, and in the 16th and 17th centuries it appears from time to time in the various wars and revolutions. In more recent days it has given its name to the great statesman of Italy whose family Were raised to the marquisate of Cavour in the middle of the last century. An earthquake did considerable damage to the town in 1808. Population, 7380.

CAVOUR, Count (1810-1861). Camillo Benso di Cavour, the regenerator of Italy, and one of the greatest of modern statesmen, was born at Turin on the Ist of August 1810. The family of the Bensi was a very ancient one. The founder of it, a Saxon warrior named Hubert, after following Barbarossa in his Italian wars, and making a pilgrimage to the Holy Land, married a Piedmontese heiress about the middle of the 12th century, and settled on the very estate of Santena where the remains of his great descendant were lately

laid. In the early part of their history, the Bensi seem to have been connected with the

small neighbouring republic of Chieri, later with the House of Savoy, which gradually gained the upper hand in those parts of Northern Italy. Their life, like that of other feudal barons, was stirring, rough-handed, and adventurous. Members of the family are frequently to be met with in history, but none of them eminent enough to deserve mention here. In the middle of last century the head of the Bensi was raised to the dignity of marquis, under the name of Cavour. Accordingly, at the beginning of this century we find the father of the great statesman in possession of the title of marquis. He had married a Genevese lady of rank, and both held offices in the house- hold of the Prince Borghese, husband of the Princess Pauline, the beautiful sister of Napoleon, who was governor of Piedmont in those days when Europe lay at the feet of the French conqueror. Under these circumstances was the future deliverer of Italy born, the second son of this Piedmontese nobleman and of his Genevese wife. The Princess Pauline, the sister of one Napoleon, and aunt of another, who have so powerfully influenced the destinies of Italy, presented the infant Camillo at the font.

Cavour spent the first ten years of his life in his father’s house at Turin, enjoying all the advantages which favour the full and genial development of both mind and body. The old marquis, who became a decided conservative after the Revolution, was a wise and benevolent father, and an upright man. He enjoyed the care, too, of an accomplished mother, of a grandmother still more accomplished, and of two aunts, who, having no children of their own, naturally bestowed all their affection on him and his elder brother. For some time he had no love for his lessons ; in fact, he had a perfect horror of them. ‘The probability is that the buoyancy and energy of his nature made him averse to such restraint. He was an active, energetic boy, full of animal spirits and never tired of play, strong of will, yet genial and good-natured. In a little time he became a voracious reader, but as full of frolic as ever. At ten years of age Camillo, being intended for the army, left home to enter the military academy. There he studied hard, especially mathematics. As he afterwards regretted, the literary side of his education had been neglected,

—perhaps because he had never been attracted to literature by any of those circumstances which call forth a dormant power, perhaps because the original bent of his mind was too strong towards the clear and the utilitarian. Mathematics satisfied his love for definite statement and clear demonstrative argument. He had no inclination towards metaphysics, had little imagination, and was never tempted to run after vague ideals. ‘The only speculations he indulged in were social, political, or industrial, those, in fact, which are closely connected with tangible and positive interests. But his after career as plainly shows that he was capable of a deep and absorbing enthusiasm, which was all the more powerful and effective, because disciplined by a sure judgment and a wise patience.

Anyhow, he was a very successful student in the subjects taught at the military academy. This is proved by the fact, that he was appointed to a commission in the engineers at the age of sixteen, though by the rules of the service it was not under twenty such a post could be granted.

At the military academy an incident occurred which is a clear indication of his character, and helped greatly to determine his future career. Being the son of a noble family, he was honoured with the dignity of page in the royal household, An ordinary boy would have been highly delighted with this introduction to court life ; but to Cavour its restraints, its etiquette, and its livery were a galling load, and, as he was by no means ready to learn the lessons of what is called a wise reticence, he was soon

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relieved of the honour, and marked as a dangerous fellow. During his brief military career he Seems to have been stationed mostly at Genoa. This was a more independent life than he had hitherto led ; and at Genoa, where the liberal element was naturally stronger than at the court and capital, young Cavour felt himself more at his ease than ever he had been at Turin. But when the shock of the French Revolution of the year 1830 began to be felt in Italy, and when men thought themselves at liberty once more to express their opinions on the state of their native country, Cavour was soon caught offending by the same excessive freedom of speech. He was sent, therefore,

in a kind of honourable banishment to Fort Bard in the Val d'Aosta, nominally to superintend some mason-work there, but:really as a chastisement for his imprudence, and in the hope of a course of solitary reflection leading him at last to acquiesce in the existing state of things. Here Cavour was reduced to great straits for want of society, being obliged to while

away his time at a certain game of tarots with the con—

tractors. After six months he grew weary of it, and sent in his resignation (1831).

He had now reached a most important turning-point in his career. Set adrift from the profession for which he had been educated, and suspected at court, there were three courses open to him,—to retire into private life in Piedmont, or to go abroad and quietly await a favourable opportunity for taking part in the deliverance of his country, or to join in the frequent conspiracies of the Carbonari and others for its immediate emancipation. The state of Italy was such as to justify the most extreme methods. He was now arrived at a time of life at which he could realize the full measure of the sufferings and huiniliations his country had undergone. Endowed with the all too fatal gift of beauty, and covered with a population, which has excelled in every department of human activity, in arts and literature, in commerce and navigation, but was too disunited and far too demoralized to defend her, Italy had for centuries been the prey of every spoiler, of the Saracen and the German, the Frenchman and the Spaniard. Her national life had been repressed, her commerce ruined, her intellectual growth stifled, and the very soul of her people debased and per- verted by priestcraft and foreign despotism. To most other nations their native land was an object of pride and affection, to the Italians Italy was the theme of shame and burning tears. The entrance of the armies of Republican Trance into Italy had been greeted as the dawn of deliverance, but in a little time their deliverers proved themselves to be only new masters. Yet the French occupa- tion had the good effect of diffusing the liberal ideas of the French thinkers, and of accustoming the Italians to a comparatively just and well-ordered government, so that the desire for national regeneration became more ardent than ever. Then came the Peace of Vienna, which gave Austria direct or

indirect rule over the whole of Italy, and in 1820 the rising in Naples and Piedmont, which furnished that power with the pretext of armed intervention, and the excuse for rivetting still faster the chains of the enslaved. At this period, then, the prospects of Italian liberty seemed darker than ever. Even Sardinia, though preserved from the worst reactionary extreme by the hatred of Austria, had been compelled to yield to the prevailing current. Charles Albert himself, the leader of the rising in Piedmont in 1821, was fain to atone for his liberal courses by joining in the worst measures of the reaction, and, when he ascended the throne in 1831, was instructed that he held his place only on his good behaviour. In fact, from the beginning of his reign to 1847, when the revolution re-commenced, he was only the nominal ruler of Sardinia ; his ministers were the creatures of Austria, and received their instructions from Metternich. It is necessary to

remember these circumstances if we are to appretiate rightly the services of Cavour. We must compare the Italy he has made not with countries which have for centuries had a free development of their national life, but with Italy of 1820 or 1830, with Italy oppressed, demoralized, and disunited, while the noblest of her sons languished in Austrian prisons, or fretted their lives away in exile or in vain conspiracy. In these circumstances, Cavour, a youth of twenty, might have been led to join the secret societies which, under the direction chiefly of Mazzini, waged ceaseless war against the oppressors of Italy. From this his good sense happily saved him, Though prophetically aware of the near advent of democracy as the ruling power in the world, he saw that conspiracies could not deliver Italy; that fitful plots backed by irregular bands were useless against a regular Government supported by veteran armies, and that fretful outbreaks would only irritate Austria: and excuse further oppression without doing her any real injury. Being, therefore, unable to tolerate the policy of the clerical and aristocratic party of the time, and entirely disapproving of the methods of the Carbonari and “ Young Italy,” he saw that the best course in politics was a watchful inactivity. For sixteen years he was obliged to wait in private life, a keen and patient observer, acquiring that ripe and com- prehensive wisdom which should fit him to be an effective servant of his country. During these

long years we find him active in three special ways,—as the skilful promoter of the material interests of his country, especially in agriculture, as a keen student and observer of foreign countries, especially France and England, and as the

. author of papers in which he embodied some of the results

of his observations.

Though, at first, it is said, he could scarcely distinguish between a cabbage and a turnip, he soon made himself complete master of the theory and practice of agriculture, introduced vast improvements on the family estates, and was one of the founders of the Agricultural Society of Piedmont in 1841. So in the application of stea:n to material and social improvement, in establishing steamers on the Lake Maggiore, in the erection of steam-mills and chemical works, and in the furtherance of railways, as well as in founding the Bank of Turin, he took a leading part. These were good in themselves, but Cavour had a patriotic end in view; he knew that they were the sure basis of national and social improvement, aud the best possible introduction to it. In his study of foreign countries, though he had an open, penetrating eye for all phases of their national life, it was with the same continual reference to the good of Italy that he observed and meditated. He was several times at Paris, and at least twice in England, and was perfectly familiar with the language and economic and political condition both of England and of France. Such French statesmen as Guizot and the Duc de Broglie he highly esteemed ; and he was always an ardent, though by no means unqualified, admirer of England. In the early part of his public career, when his opposition to the revolu- tionary fanaticism made him unpopular, the charge of Anglomania was frequently brought against him. During these years, too, he wrote various reviews, all of which give the results of studies bearing on the economic or political questions of the time, and bear, all of them, the impress of that practical moderation and penetration which were such essential elements in his character. These sixteen years were in every sense the training time of Cavour. Under the combined influence of practical experience in the conduct of business, and of philosophic insight – into the principles of free government, as exhibited

especially in England, he grew into that capable man who should guide Italy through the troubles of a very

trying struggle to the honourable place she now occupies among the free nations of the earth. The years of waiting at length came to an end. Towards the end of 1847 all the provinces of Italy were in a highly-wrought state of revolutionary excitement. Pius IX., the new Pope, had put himself at the head of the movement, and, the clerical and liberal parties being thus united, the most extravagant hopes were entertained. The revolution carried everything before it, threatening only by its growing violence to defeat its own ends. Cavour saw the time for action was come, and, along with his friends Balbo and Santa Rosa, insti- tuted at Turin a newspaper called the 2isorgimento, as the organ of their common opinions, while, on the promulgation of the new constitution for Sardinia, which he was the first to suggest, he took his seat in the Chamber as one of the members for the capital. Having long meditated on the political situation of Italy, and being perfectly at home on all political questions, he took a decided attitude from the beginning. As a conscientious adherent of the principles of the juste milieu, he opposed in the firmest way the irregular fervour of the revolution; and as a practical man, he was ready so far to yield to its fury, in order, by thus yielding, to command it and utilize its strength. In the same way he desired to restrain the violence of the war party; but after the example of Paris had encouraged the people of Milan and Venice to rise against Austria, he saw that the time for politic hesitation had gone by, and with all ardour sounded the call taarms. Again, when the reaction had regained the upper hand at Naples, and Radetzki had defeated the Sardinian forces at Custozza, he was convinced that there was no more hope of success, and counselled peace. Still more so after Novara. In the Sardinian Chamber parties rose and fell without changing the attitude of Cavour ; resolyed on advocating the measures which were for the time most conducive to the good of Piedmont and of Italy, he supported the party that he deemed most likely to carry them out, without regard to its colours. For some time he was one of the most unpopular men in Turin ; the advanced party hated him for his moderation, and the conservatives for his liberalism; as a moderate liberal he often stood almost alone. But gradually the real

greatness of his character began to appear above the contending elements which surrounded and obscured it. Passing on from those years of excitement and despair, when the hopes of Italy seemed again indefinitely deferred, to the beginning of 1853, when the elections after his first elevation to the premiership took place, we find the extreme left almost annihilated, and the extreme right greatly reduced in members. How had this change taken place? Five years of hard, adverse experience had taught his countrymen that he was right. Opposed to the excesses of the revolution, when the revolution was at its height, and to the pretensions of clericalism, when the revolution was for a time discredited, he was thc real fixed point in the ever-shifting chaos, and the elements of confusion gradually gathered round him. Time, that tests all opinion and all character, had proved the soundness of his.

From 1850 to 1852 Cavour was an active member of Azeglio's administration ; from 1852 to his death in 1861, he was, except for a short intcrval, the prime minister and virtual ruler of his country. From 1850 to 1855, when Sardinia began to take part in tle Crimean War, the most conspicuous feature in his career was his relation to the church. With his usual penetration he soon perceived that the pretensions of the party now dominant at Rome were utterly incompatible with the rights of a free modern society, and that the only solution of the difficulty was, that the state, while recognizing the right of the church to perfect freedom within the spiritual sphere, should assert

for itself the same frecdom within the civil sphere; in his own words, he desired a free church in a free state. While an extreme party counselled the confiscation of the church property, Cavour merely asserted the right of the state to sccure a more equitable distribution of it among the clergy. On the question of civil marriage, and of the immunity of the clergy from the civil jurisdiction, he asserted the principle that the state should be absolute master within its own domain; with the spiritual rights of the church he never interfered. Those years were marked, too, by many energetic measures for the material improve- ment of Sardinia. The principles of free trade were introduced as far as possible, and a morc judicious taxation.

Cayour’s proposal to join the alliance of the Western powers against Russia met with the most violent opposition from both the extreme parties in the Sardinian Chamber, and even some of the most influential members of his own cabinet threatened to resign. But the king supported him ; the country, as a whole, trusted him ; and in the spring of 1855 the Sardinian army was on its way to the East. This audacious step of the Sardinian minister, which engaged one of the smallest kingdoms of Europe in a con- flict among the greatest empires, caused some doubtful reflections at the various courts, It was understood by all as a bold assertion of Italy; and an Austrian minister declared it a pistol-shot fired at the head of Austria, At first, too, the Sardinian army experienced a hard fortune. It was attacked by cholera, and, for a long time, no opportunity occurred for distinguishing itself on the field of battle. The worst auguries of the opposition seemed destined to be fulfilled, and their fiercest denunciations of an expensive and Quixotic expedition justificd, when tidings came of the battle of the Tchernaya. The enthusiasm was universal, the opposition was silenced, and Cavour rose higher than ever in the national estimation,

Then came the peace, considerably to the disappointment of Cavour, who had expected a prolonged war, and perhaps a general state of confusion, in which an adventurous state like Piedmont, that had everything to gain and little to lose, might greatly profit. It was not without great hesitation that he resolved to be present at the Congress of Paris. Yet, when there, he maintained the cause of Italy not less effectively than the Sardinian army had done in the Crimea, In all the questions that turned up he bore himself with such tact, knowing well how far the modesty of his position imposed upon him the duty of silence, and so skilfully brought forward the astonishing resources of a mind deeply versed in European questions, that he was immediately recognized as one of the ablest living diplomatists, and took a place altogether out of proportion to the strength of the kingdom he represented. His most ardent wish was to see the grievances of Italy brought before the Congress. Accordingly, near the end of its sittings, Count Walewski, as president, introduced the subject, pointing out the danger to the European peace of the existing state of things, and suggested that a note should be addressed to the sovereigns of Italy counselling reform. This step took the members by surprise, and as Count Buol, the representative of Austria, protested against the discus- sion of the question, the matter ended,

but not before Cavour had time to plead the cause of Italy. Aftcrwards, he followed up the advantage he had gained by a memorandum to the same effect addressed to the cabinets of London and Paris. Thus the gains of the war were not slight. The morale of the Piedmontese army had been restored, and the name of Italy, not as a geographical idea, but as a nationality, brought before assembled Europe. Above all, cnlightencd Italians now felt that they had found a man; no sentimental dreamer of liberty, nor a fanatical

conspirator, but a wise statesman, deeply read in the secrets of European politics, capable of commanding at once the confidence of Italy and the respect of Europe.

What was scarcely less important was, that Napoleon and France had become interested in Italy. Certainly, if Cavour had been free to choose, he would have preferred to inaugurate the regeneration of his country under the auspices of England. Her moral weight was greater, and she was less likely to exact painful sacrifices as the price of her support. His participation in the Crimean struggle had been above all advantageous to England; her liberal traditions and her feelings of gratitude alike led him to hope for her support. But to his chagrin, he found at the Congress that the state of European politics had made England the friend of Austria; and that bis advocacy of the union of the Danubian Principalities in opposition to her views had alienated her, he soon found out in the cold- ness of the English ministers. Still he did not allow him- self to be discouraged. He could count on Napoleon ; Russia was estranged from Austria, Prussia was her rival in Germany, Hungary was discontented. To isolate Austria, to make friends of her enemies and rivals, to regain the good- will of England, —this was now the policy of Cavour. The hostility of Sardinia to Austria became every day more apparent and more provoking. The armaments of Sardinia, far too great for the resources or the ordinary requirements of the country, pointed to war as the only solution of standing difficulties. Accordingly, at Plom- biéres, in the autumn of 1858, the programme of the war of 1859 was made out by the French Emperor and Cavour.

These were times of almost preternatural activity for Cavour, At one period or other he had filled almost every office in the administration ; but in a crisis like the present, the constitution was suspended, and the prime minister became a kind of dictator, taking upon himself the entire government of the country, home and foreign affairs, and the ministry at war, as well as finance. The crisis was worthy of such a supreme. effort, for bitterly disappointed as Cavour and the Italians were at the peace of Villafranca, the power of Austria in the peninsula had been broken, and Italy thenceforward had her destiny in her own hands.

On the conclusion of peace Cavour had resigned, but he returned to his post in January 1860, to resume under different conditions the work interrupted at Villafranca. The task was a tortuous and delicate one, and required skilful managing. The possession of Lombardy and the overthrow of Austria were the tangible results of the late campaign. With regard to the rest of Italy, and in the further development of events, four influences had to be considered : —France, which was bound by the treaty of Villafranca to the restoration of the old rulers of Central Italy ; Austria, which insisted on the fulfilment of this and other conditions of the treaty ; England, where in obedience to public opinion, which now began to under- stand the real issues at stake in Italy, the Government inclined to Jet the people have their own way; and the people of Italy itself, decidedly anxious for Italian unity, but in danger of falling into the ruinous excesses of 1848. It was now the business of Cavour so to manage the course of diplomacy, as to prevent a collision with France or Austria, to gain time for the public opinion of Central and Southern Italy to declare itself, and to avoid every- thing like disunion or uproar in bringing the various provinces under the government of Victor Emmanuel. First, then, in early spring, the population of Tuscany and Emilia all but unanimously declared in favour of annexation, though this result was embittered by the consequent cession of Nice and Savoy to France, which

claimed these districts as compensation and security, Cavour was severely reproached by many, and above all by Garibaldi, for this concession. But there are three con- siderations, which seem entirely to clear him from any

appearance of want of patriotism,—the necessities of his position as regarded France, and the facts that the Savoyards are far more French than Italian, and from a geographi- cal and military point of view belong more naturally to France than to Italy. In the south, where the Pope and the king of Naples still maintained a settled govern- ment, the unification of Italy seemed to meet with greater difficulties, when Garibaldi stepped forward to cut the knot, It was certainly not against the will of Cavour that the hero set out on his adventurous enterprise. He could evidently do nothing else than carefully watch the progress of the expedition, ready to own or disown it, according to the event. Accordingly, on Garibaldi's triumphant arrival at Naples, the Piedmontese army occupied the Marches and Umbria, crossed the Apennines, and on the plains of Campania shook hands with the volunteers of Garibaldi, The hero saluted Victor Emmanuel king of Italy. Next spring the first Italian Parliament met at Turin; and Cavour saw the dream of his youth realized. He had seen a new Italy spring from the ashes of the old, an Italy of representative government and of enlightened progress, the mistress of her own destinies, and a worthy member of the commonwealth of nations. Still much remained to be done, the sores caused by centuries of misgovernment required to be healed, the finances arranged, a navy created, the relations with the church regulated, and a thousand other matters attended to, ere the new Italy could answer to the ideal in the mind of Cavour. And now he was to be taken away in the very midst of his task. For many years, and especially during the slippery and delicate events of the last year, and during the harassing debates with the Garibaldian party as to the cession of Savoy and Nice, and the treatment of the volunteers, he had been doing an amount of work which no human strength could bear. There were premonitory symptoms enough; but the keen sense of the responsibilities weighing upon him seemed to increase as his strength declined. Medical men differed as to the precise form his disease took; but that overwork was the cause of it, no one doubted. After some days' illness, during which his feverish talk ran ever on Italy, he died on the 6th of June 1861.

It is needless to describe the sensation caused by his death, and the passionate grief of every Italian patriot. It was felt by every enlightened man that a great and beneficent worker had passed away from the earth. The worthy countryman of Dante and Michelangelo, he had been privileged

to achieve a mightier task than they; the one had written a great poem, and the other had executed certain noble works of art; Cavour recalled to life the nation they all loved so well.

Victor Emmanuel and Garibaldi did their part in the consummation of the great work, while without the help of France it clearly would have been impossible ; but it must be admitted that Cavour was the indispensable person who brought all the other agencies into wise and effective action. To him it is chiefly due that Italy anticipated Germany in the recovery of her national rights, and led the way in two of the most salutary revolutions that have taken place in the history of the world. He, therefore, deserves to be gratefully remembered not only as a true patriot, but as one of the benefactors of mankind.

Cavour was not eloquent in the ordinary acceptation of the word ; but if the force of words is to be measured by their influence on the will of men, he was one of the most powerful speakers that ever lived; for he achieved what he did, not only as the adviser of the king, but as the

leader in the Sardinian Chambers. In private life he was upright, genial, and forgiving. In public life, as we have seen, his one passion was the regeneration of Italy. In fact, few statesmen have left a more stainless name behind them. He was never married, and left his property to the children of his elder brother, who, it may be added, was a stanch adherent of the reactionary party.

See De la Rive, Le Comte de Cavour : récits et Souvenirs, 1862 (translated into English, same datc); and a memoir by E. Dicey, 1861. (T. K.)

CAVY, a name common to several species of Rodents belonging to the family Cavide, all of which, at least in the wild state, are confined to the South American con- tinent. They are small creatures, seldom exceeding a foot in length, burrowing in the ground, and feeding entirely on fruits and herbs. There are several species. (1.) The Patagonian Cavy (Dolichotis patagonica), larger than a hare, but somewhat resembling that rodent in external appear- ance, inhabits the dry sterile districts of Patagonia and La

Plata, disappearing wherever the country becomes more humid. It is a shy creature, forming burrows in the earth, although in districts where the bizcacha is found, it is said to avail itself of the subterranean works of the latter. It feeds by day, roaming in search of foodin small companies, “‘ hopping,” says Darwin, “ one after the other ina straight line over the gravelly plain.” Unlike other cavies, its eyes, like those of the kangaroo, are protected from the glare of the sun by prominent eyelashes. It is covered with a long dense fur of a rusty colour, and has a short tail. It produces two young at a birth. (2.) The Restless Cavy (Cava aperea), found throughout Uruguay and Brazil, is supposed to be the wild form of the Guinea- pig of Europe, It is about 10 inches long, is destitute of a tail, and weighs a little over 1 tb; its fur is long and of a nearly uniform greyish-brown colour. The aperea is rarely found in dry sandy localities, preferring marshes covered with aquatic plants, among which it lies concealed, feeding in the early morning and after sunset in the evening, but when the soil is dry it forms burrows like the other cavies. It is said to live in societies of from six to eighteen individuals, to breed but once a year, and to have one or at most only two young ata birth. The Guinea-pig (Cavia cobaya of some authors) was, according to the zoologists of the 16th century, unknown in Europe previous to thie dis- covery of America, and there is little doubt that it was introduced from the southern division of that continent, the name of Guinea-pig being probably given by mistake for Guiana-pig. It differs, however, in many important respects from the wild aperea. It is somewhat larger, as might be expected in a cultivated form ; the colour of its fur is white, variegated with irregular patches of red and black. It perishes on the marshy soil which the other prefers; it produces a numerous progeny three times a year; and what is more important still, the two forms do not couple together, a difference which among wild species is usually held as indicating generic distinctness. It appears, from the drawing of Aldrovandus, that the Guinea- pig had already attained its present variegated colouring fifty years after the discovery of America, a fact which has led to the supposition that it had been previously domesti- cated by the natives of South America. Mr Waterhouse, however, thinks it more probable “that some pretty variety had attracted the attention of the earliest European settlers in the New World, and given rise to its capture and domestication, more especially as the harmless disposition and pretty colouring of the common Guinea-pig appear to be the only claims of

interest which are attached to it” (Natural History of the Mammalia, vol. ii.) It is a singularly inoffensive and defenceless creature, of a restless disposition, and greatly wanting in that intelligence which

usually characterizes domestic pets, although it is said to show some discrimination. It is of no particular service to man, neither its flesh nor its fur being put to use, while the statement that its presence is sufficient to drive off rats and mice appears to be without foundation. It is exceed- ingly prolific, beginning to breed at the age of two months; the number of young varies, according to the age of the parent, from four to twelve. It has been calculated that a single pair of Guinea-pigs may prove the parent stock of a thousand individuals in a single year. (3.) The Bolivian Cavy (Cavia bolivensis), found throughout the higher regions of Bolivia, usually at an elevation of 10,000 or 12,000 feet, is exceedingly shy, and lives in burrows, these in some districts being so numerous as to have completely undermined the soil. (4.) The Rock Cavy (Cavia rupestris), distinguished by its short, blunt nails, is found in rocky situations throughout Brazil, and is much sought after for its flesh, which is considered a dainty by the Indians. (5.) The Southern Cavy (Cavia australis), common along the coast of Patagonia, forms deep burrows, with several outlets, in sandy declivities, and is said to climb trees in search of the fruit ou which it feeds.

CAWNPUR [Cawnpore], a district of British India within the jurisdiction of the Lieutenant-Governor of the North-Western Provinces, lies in 25°and 26° N. lat., and 79° and 80° E, long. It is bounded on the N. by the province of Oudh, the Ganges River forming the boundary line; on the E. by Fathipur district, on the 8. by the Jamnd, separating it from Hamirpur and Jalaun districts, and on the W. by Etawah and Farrakhabdd districts. The district is situated between the Ganges and Jamné rivers, and is a portion of the well-watered and fertile tract known as the Dudb. The general inclination of the country is from north to south. Besides the two great rivers, the principal streams are the Arand or Rhind, the Karan or Singar, tlie Isan, and the Pandu. An extension of the great Ganges Canal also passes through the district. The total area is 2336°53 square miles. The census of 1872 returned the total population of Cawnpur district at 1,156,055, made up as follows :

—Hindus, 1,065,786, or 92°20 per cent. of the total population; Muhammadans, 89,215, or 7°72 per cent. ; Christians (i.e, Europeans, Eurasians, and native Chris- tians), 1054, or ‘08 per cent. Total number of villages and townships, 1985; total number of houses, 272,232. Only two towns in the district contain a population of upwards of 5000 souls, namely Cawnpur town and can- tonments, population 122,778, and Bilhaur, population 5954. Of the total area of the district, viz, 2336°53 square miles, 1351°42 square miles are cultivated, and 236°15 cultivable, the remainder being uncultivable waste. The staple crop is wheat, but cotton of an excellent quality has of late years been much cultivated. The principal industry is leather work, which is very extensively carried on throughout the district,—Cawnpur saddlery and harness being exported to all partsof India. The trading towns of importance besides Cawnpur are,—Bilhaur, population 5954 ; Akbarpur, population 4911; and Kashi- pur, population 4663. Most of the towns and large villages have markets once or twice a week for the sale of local produce and cattle. The only regularly-constituted municipality in the district is Cawnpur, but ten small towns have a municipal committee, and carry out con- servancy and sanitary arrangements, &c., by means of taxes assessed on the householders, The last settlement of the land revenue of the district expired in 1872, and a new one is in progress.

The district revenue in 1872-73 was £576,587, of which £212,276 was derived from land, £12,163 from opium, and £15,882 from stamps. The district police force in 1873 numbered 555, costing

£9165, 8s.; the village watchmen, or rural police (maintained by the villagers), 2985, estimated cost £10,746 ; municipal police, for

eleyen towns, 414 officers and men, costing £3183, 12s, At the charitable dispensaries 2634 patients received treatment during 1873, at a cost of £1131, 5d., of which Government contributed two- thirds. The Government and aided schools in the district in 1873 numbered 391, attended by 10,731 pupils.

Cawnpur Curry, the administrative headquarters of the district of the same name, and a large military canton- ment, situated on the right or south bank of the Ganges, in 26° 29’ N. lat. and 80° 25’ E. long. The river here is about 500 yards wide in summer, but when swollen by the rains increases to about a mile in breadth, with a strong and rapid current. It is navigable southwards to the sea, a distance of 1000 miles; and upwards as far as Sukertal, 300 miles to the north-west. A bridge of boats crosses the Ganges at Cawnpur, and the ghdts, or landing- places, on the bank present a busy scene of commerce. The city is built on a sandy plain; and, together with the cantonments, contained in 1872 a total population of 122,710 souls, classified as follows :—Hindus, 90,582 ; Muhammadans, 31,888; Christians, 300. This classification apparently excludes the European soldiers. The canton- ment forms one of the large military stations of Northern India, and has accommodation for 7000 fighting men. Excluding the cantonment, the population within the limits of the Cawupur municipality amounted to 98,476 in 1872. The municipal income in 1871-72 amounted to £19,323, and the expenditure to £15,639. Cawnpur is a station on the East India Railway, and also a terminus of the Oudh and Rohilkhand Railway. The principal thoroughfare in the native town is the Chandni Chauk, or “street of silver,” upwards of 100 feet in width. Cawnpur is noted for the excellence and cheapness of its leather manufactures, such as saddlery, harness, boots and shoes, &c.

History.—The importance of Cawnpur city dates from its selection as a military post, when the Ceded Provinces were acquired by the East India Company in 1801. The one great event in its history is the siege of the British position by the rebel Sepoys during the mutiny of 1857, and the treacherous massacre which followed on the surrender of the garrison. The story of the mutiny and massacre of Cawnpur has been fully chronicled by Sir J. W. Kaye, Colonel Mowbray Thomson, and Mr G. O. Trevelyan. On the deposition of Mahdér4j4 Baji Rao, the last Marhatté Peshwa, or sovereign of Puna, by the East India Company, he received an annuity of £80,000 a year, and had a princely residence assigned to him at Bithur, a short distance from Cawnpur. Here he lived in great state until his death in 1851. His heir was an adopted son, named Sirfk Dandhu Fanth, more commonly known as the Nand Sahib, who succeeded to the late Peshwa’s estate at Bithur, and to the great accumulations of wealth which he had left

behind him. An application of Naénd Sahib for a continuance of the annuity or pension granted to his adop- tive father was, however, disallowed by the Indian Govern- ment; and on appeal, this decision was upheld by the Board of Control and by the Privy Council in England. For this refusal to grant what he looked upon as his right, Nand Sahib cherished a bitter grudge against the English, which, however, he carefully concealed until the outbreak of the mutiny afforded him his opportunity for revenge.

In May 1857 the European force in the Cawnpur cantonment consisted of a handful of artillery and infantry, making about 300 fighting men, including the English officers of the Sepoy regiments. The native force comprised the Ist, 53d, and 65th regiments of native infantry, and the 2d regiment of Bengal cavalry, about 3000 men in all. The division was commanded by General Sir Hugh Wheeler. The native troops began to manifest, early in 1857, the same symptoms of disquiet as other native regiments stationed in Bengal and Upper India. When the news of the outbreak at Meerut and Delhi reached Cawnpur, the excitement among the native soldiery, camp followers, and city population increased to such a degree that General Whecler deemed it expedient to throw

up defensive works, within whieh the whole Christian population might gather in event of arising. Unfortunately, the site chosen for the entrenchment proved unsuitable in almost every respect. ‘‘The fortifications,” writes Sir John W. Kaye, ‘‘ were go paltry, that an English subaltern could have ridden over them on a cast horse from the company’s stud. The earthworks were little more than 4 feet high, and were not even bullet-proof at the crest. The apertures for the artillery exposed both our guns and our gun- ners, Whilst an enemy in adjacent buildings might find cover on all sides.” Towards the end of May it became evident that the rising of the Scpoys was only a question of time, and accordingly all women, children, and non-combatants were gathered within the improvised entrenchments, On the night of the 4th June the crisis arrived, The 2d cavalry set the example of open rebcllion, and were immediately followed by the Ist regiment of foot. The treasury was robbed, and the magazine, with its enormous supplies of am- munition and artillery, was taken

possession of by the mutineers, The following morning the 53d and 56th native regiments joined their comrades.

The Nana's opportunity hadnowcome. He placed himself at the head of the rebels, and was proclaimed Peshwa of the Marhattas, in feudatory allegiance to the Delhiemperor. On the 6th June he sent notice to General Wheeler that he was about to attack the position. Within this slight fortification upwards of a thousand souls had taken refuge, of whom 465 were men of all ages and professions, Every one able to bear arms was told off to the defence. At noon be- gan the siege, '' the miseries of which to the besieged," says Sir J. W. Kaye, ''have never been exceeded in the history of the world. All the wonted terrors of a multitudinons encmy without, of a feeble garrison and scant shelter within, of the burden of women and children and sick people, with little to appease their wants or to allay their sufferings, were aggravated by the burning heat of the climate, The June sky was little less than a great canopy of fire; the sum- mer breeze was as the blast of a furnace; to touch the barrel of a gun was to recoil as from red-hot iron. It was the season when European strength and cnergy are ever at their lowest point of depression ; when military duty in its mildest form taxcs the powers of Englishmen to the utmost, and English women can do little more than sustain life in a state of languid repose, in shaded apartments, with all appliances at command to moderate the temperature and mitigate the suffering. But now, even under the fierce meridian sun, this little band of English fighting men were ever straining to sustain the strenuous activity of constant battle against fearful odds, whilst delicate women and fragile children were suddenly called to endure discomforts and privations which it wonld have been hard to battle with in strong health under their native skies."

The deficiencies of the position asa place of defeuce soon became apparent. Itwas exposed to a continuous cannonade from heavy siege guns, taken from the magazine, and to a ceaseless hail-storm of mnsketry fire from a range of buildings just outside the entrench- ments. All attempts of the mutineers to push forward were fiereely driven back, and a general attack upon the British position was defeated with heavy Joss to the assailants. But the contest was too er to last long. By the end of the first week our fifty-nine artillerymen were all wounded or killed at their posts. On the eighth

day of the siege a great calamity befel the garrison. The building assigned as a shelter for the women and children was burned down, and the sick and wounded had henceforth neither roof over head to shelter them by day, nor any bedding between them and the bare earth at night. The miseries of hunger and thirst and disease were now added to the fire of the enemy and the exposure to the bum- ing sun. During the three weeks which the siege lasted, 250 of the little garrison were interred in the well within the entrenchment.

Fearfully reduced in numbers, with their guns almost unservice- able, their ammunition nearly expended, and starvation staring them in the face, they found it impossible to hold out much longer. When thus almost at the last extremity of despair, a written mes- sage came from the Nana, offering to provide a safe passage to Allahabad to all who laid down their arms, The question of capitu- lation was long and anxiously discussed before the measure was decided on; bnt the consideratien of the women and children, and of the sick and wounded, led to the acceptance of the Nana's terms on the 26th June, and it was arranged to evacuate the entrench- ment next morning, the Nana engaging to provide safe conduct for the garrison to the river side, and sufficient boats to convey them to Allahabad.

Accordingly, on the following morning, the remnant of the little garrison left the entrenchment and feebly dragged themselves to the river-stairs appointed as the place of embarkation. Here ensued the act of treachery which was destined for long years to embitter the feelings between the English nation and the Indian races. The boats were in waiting as arranged, and the embarkation was accom- plished. No sooner, however, were all on board than on a signal the native boatmen deserted their vessels and clambered to shore. A murderous fire was opened on the boats from both sides of the river, and presently the thatched roofs of the vessels burst into

flames, having becn ignited by hot cinders. The boats were aground

at the time of their abandoument by their crews. On the opening of the fire every attempt was made to get them afloat in mid- channel, but most of them remained immovable. ‘‘ The sick and wounded," says Sir J. W. Kaye,

‘‘ were burnt to death or more mercifully suffocated by the smoke; whilst the stronger women with children in their arms took to the river, to be shot down in the watcr, to be sabred in the stream by mounted troopers wlio rode in after them, to be bayoneted on reaching land, or to be made captives and reserved for a later and more cruel immolation.” The male prisoners were immediately killed, but of women and ehildren it is computed that 200 were spared for the time by order of the Nana, and conveyed back to Cawnpur. Of the boats which got afloat only one succecded in forcing its way through the swarms of enemies on both banks of the river, and of its occupants only four men, two officers and two privates, survived to relate the story of Cawnpur. The rest of the tale is soon told.. English troops were being hurried forward by forced marches to the relief of Cawnpur under Major Renaud and General Havelock. On the 12th July they came up with the rebel army at Fathipur, and after a short encounter —it could not be called a fight—utterly routed it. Another engage- ment with a like result took place at Aoung on the 15th July, 22 miles from Cawnpnr. On thisday, the 15th, the Nana heard of the defeat at Fathipur, and learned that Havelock’s little army was in full march upon Cawnpur. Furious at the news, he resolved upon a great final act of butchery. Orders went forth for the massacre of the women and children, the survivors of the dreadful day at the river side. Four or five men who were among the prisoners were first shot in the presence of the Nana, and then the women and children were slashed to death in their prison by Muhammadan butchers from the bazaar, and one or two of the Nanda’s followers. Their bodies (some, it is said, with life not qnite extinct) were thrown into the well which had served as an improvised cemetery during the siege. After this crowning act of infamy Nana Sahib resolved upon making one last stand for Cawnpur, and gave battle to Havelock a few miles south of the city on the 16th July. The fight was more hotly contested than those which had preceded it, but ended in the same result. During the night Nana Sahib fled with the remnant of his army, and tlie next morning Havelock entered Cawnpur, but too late to save the captives whom he had hoped to rescue. A marble shrine with a statue of the Angel of Peace by Marochetti now covers the well, and the sad scene has been surrounded by a lovely garden. The spot is one of the niost pathetic in India, and, to quote the words of the legend round the shrine, will for ever be ‘‘ Sacred to the per- petual memory of a great company of Christian people, chiefly women

and children ” who lie beneath. A memorial church has also been built in commemoration of the events of thesiege. (W. W. H.)

CAXAMAROA, or Cazamanrca, a city of Peru, eapital of a provinee of the same name, in the department of Truxillo, in 7° 7’ S. lat. and 78° 31’ W. long. It is situated on the east side of the Western Andes, in a fertile valley on the Eriznejas, at an elevation of about 9060 feet above sea-level, 72 miles N.N.E. of Truxillo. ~~The streets are regular and wide; but the houses are mostly built of clay. The principal buildings are the fine parish church, erected at the expense of Charles IJ. of Spain, the church of San Antonio, the Francisean monastery, a nunnery, and the remains of the palace of Atahualpa, the last of the Ineas of Peru, who was put to death there by the Spaniards in 1533. Ata shortdistance to the east of the town are the deep sulphur springs of Pultamarea, ealled the Baiios del Inca, or Inca’s Baths, which have a temperature of 156° Fahr., and are still much frequented. The manufaetures of Caxamarea are woollen and linen goods, and steel and silver articles; also biscuits, which are much esteemed. Much trade is earried on with Truxillo; and a railway conneets the town with the port of Pacasmayo. Popula~~ tion, about 12,000.

CAXATAMBO, a town of North Peru, 120 miles N.N.E of Lima, on the western declivity of the Andes, in 9° 53’ &. and lat. 76° 57’ W. long. The inhabitants, num- bering 6000, are oecupied in rearing sheep and cattle, in the eultivation of eorn and coehineal and the manufacture of woollen yarn, and in working the silver mines near the town.

CAXTON, Witr1aMm (1422-c. 1491), the introdueer of printing into England, was born, as he tells us himself, in “Kent in the Welde.” The date of his birth is uncer- tain; Oldys places it in 1412, while his most recent

biographer, Mr Blades, shows that it eould not have been much later than 1423. The latter, however, fixes upon 1422-3 as the approximate date; and this appears to be as near eorrectness as we are likely to attain. 1412 seems too early ; for, by the reeords of the Mercers’ Com- pany we find that in 1438 William Caxton was apprenticed to Robert Large; and it is far more likely that he was apprenticed at sixteen than at twenty-six. Robert Large

was a man of great wealth and of high position ; in 1430 he was sheriff, and in 1439 he celebrated his election to the office of Lord Mayor with extraordinary splendour ; and the fact that Caxton was apprentieed to a merchant of such distinetion makes it nearly eertain that he belonged to a family of considerable influence. In 1449 his master died; and it became the duty of his exeeutors to place Caxton where he could fulfil the term of his apprenticeship. They sent him to Bruges; at least, we know that he was there soon after. In this town he entered into business on his own aecount, and prospered so well that before 1450 he was considered substantial seeurity for £110, which would be equivalent to £1000 at the present time; and eight years later he had become governor of the Company of Merchant Adventurers, Caxton appears to have been a man of considerable polish, and to have hada high repu- tation for sagacity; for in 1465, the treaty with the duke of Burgundy concerning the wool trade being about to expire, he was appointed by the king, along with Sir Richard Whitehill, to negotiate its renewal; and this attempt having failed, he was again sent on a similar mission three years later by the Mereers' Company, after the marriage of the duke to the sister of King Edward IV. In the next year, which is worthy of note as that in which he eom- menced his Mecuyell des Histoires de Toye, he was con- sidered worthy to share in the gift of the " vin d'honneur," which was presented by the authorities of Bruges only to the most important men in the eity. In the autumn of 1470 Caxton obtained, and availed himself of, an exeellent opportunity for aequiring favour and influenee in the English court; for Edward IV. had, with his sup- porters, been driven into exile, and had taken refuge in Bruges, at the eourt of his brother-in-law, the duke of Bur- gundy.

In 1471 Caxton, perhaps because he was beginning to find the duties of the offiee which he held too severe for his declining strength, or it may be because the interrup- tion in the wool trade to which we have referred had diminished his fortune, entered the serviee of the duehess of Burgundy, from whom he reeeived a yearly pension. At her command he eontinued the Jtecuyell, whieh was finished in September of that year. '

About this time Caxton learned the art of printing. Wynkyn de Worde, his disciple, says that he was taught at Cologne by Ulric Zell ; but Worde is often inaceurate, and he seems rather to have had Colard Mansion as his

master. That printer was at Bruges; what need then for Caxton to go to Cologne? Besides Caxton's types are more like Mansion's than Zell's; and, indeed, it was long before he adopted the improvements which the latter introduced.

At what date Caxton brought his press to England and set it up at Westminster is quite uneertain. It was pro- bably between 1471 and 1477. 1474 is the date of the Game and Playe of Chesse; but the tradition that this work was printed in England may not be eorrect. He received valuable patronage, being employed by Edward IV., Riehard III., and Henry VII., by the duchess of Somerset, the earl of Arundel, Sir John Fastolf, and other nobles; aud he appears to have been busy writing and printing up to his death, which oceurred about 1492.

Of Caxton's private life and charaeter we know very

little. His temper seems to have been strongly conserva- tive ; he delighted in the glories of chivalry, and declared that he would rejoice in a new crusade which should pre- vent its decay, This disposition was also displayed in his great slowness to adopt reforms in typography. He appears to have been a shrewd and courtly man of business, and a scholar of considerable attainments, for he was acquainted with French, Latin, and Dutch, and was master of an English style which is both pleasant and vigorous, ;

For an account of his typography, see Printinc. His life has been written by Oldys in the Sirographia Britannica, by Lewis (1738), by Charles Knight, and by Mr Blades.

CAYENNE, an island of South America. See GUIANA.

CAYENNE, a seaport town, and the capital of French Guiana, on the north-west extremity of the island of Cayenne, and near the mouth of the river of that name, in 4° 56' 5" N. lat. and 52° 20' W. long. The town forms an almost perfect square, and has clean and well-macada- mized streets. The houses, mostly of two stories, are of wood, strengthened on the first and

ground floors by brick- work. In the old town, which contains the Government- house and Jesuits' College, the streets are not so regularly and well built as in the new. The Place d'Armes, a fine quadrangular space, lies between them. The streets are lighted with oil lamps, which burn for nearly twelve hours. Cayenne has a parish church, three Roman Catholic chapels, a nunnery, and two schools; also a bank and savings bank under Government supervision, military and civil hospitals, and a hospital for leprosy; but it has no hotel, theatre, club, reading-room, or any place of amuse- ment. To the right of the governor's house is Mount Cépéron, on which stand Fort St Michell, the marine barracks, the signal station, and the light-house. Here, too, are the capacious reservoirs for the water-supply of the town, the source of which is a lake to the south of the island. The harbour is shallow at its entrance, but sufficiently deep within to float vessels of 800 tons' burthen ; craft drawing much water are obliged to load and unload at a distance of seven or eight miles from the town. There is no dock for the repair of vessels; and the quay is small, though of sufficient size to meet requirements, The principal exports of Cayenne are native gold, raw sugar, arnotto, cocoa, coffee, limes (in brine), rum, molasses, isinglass, cotton, hides, woods, and spices. In 1873 the gold which paid export duty weighed 2206 bb troy. The imports are French wines, spirits, and liqueurs ; vinegar, silk and cotton stuffs, tobacco, hardware, glass, earthen- ware, clothing, preserved meat, fish, and vegetables, maize, flour, hay, bran, oils, and cattle. The value of the total

exports in 1873 was £120,014, of the imports £282,808, .

—the import trade having increased and the export trade sensibly diminished during the preceding thirty-five years. In 1872 the vessels cleared were 90, tonnage 19,688 ; the vessels entered, 87, tonnage 18,530. There is a regular mail service between Cayenne, the West Indies, and Europe, once a month. The ports trading with Cayenne are Mar- tinique, Nantes, Bordeaux, and Marseilles, and Salem in the United States. Cayenne is the seat of the Government of French Guiana, and a penal settlement for political offenders. It is provided with an efficient police force, and is well governed. Food as well as clothing is exorbitantly dear, the only cheap articles of consumption being bread and French wines. The temperature of Cayenne is between 76° and 88° Fahr. throughout the year; but the heat is

tem- pered by easterly winds. Between December and March a north wind blows, unfavourable to weak constitutions. Yellow and other fevers often attack the inhabitants of the town, which, owing apparently to the vast swamp that flanks one side of it is far from healthy. The death-rate

amongst the coolies is especially high. Population, about

7000.

CAYENNE PEPPER, Guryea Pepper, Spanisy PEPPER, CHILLY, a preparation from the dried fruit of varioug species of Capsicum, a genus of the Natural Order Solq- nace, to which belong also the potato, tomato, and bittersweet. The true peppers are members of a totally distinct order, the Piperacee. The fruits of plants of the genus Capsicum have alla strong pungent flavour, The capsicums bear a greenish-white or violaceous flower, with a wheel-shaped corolla, five anthers (connivent and dehiscing lengthwise), and an obtuse stigma. The ovary becomes a pod, consisting of an envelope at first fleshy and afterwards leathery, within which are the spongy pulp and several seeds. The leaves are entire, and alternate, or in pairs near one another; the peduncles are extra-axillary, ‘here are many kinds of capsicums, ranked by botanists either as distinct species or as varieties. Don, in his General System of Gardening and Botany, gives a list of thirty- three species. They are chiefly natives of Brazil, the West and East Indies,and China. They are now grown in various parts of the world, both for the sake of the fruit and for ornament. In England the annual sorts are sown from March to the middle of April, under a frame. They can be planted out when 2 or 3 inches high, and in June may be transferred to a light rich soil in the open garden. They flower in July or August, and produce pods from August till the end of September. The perennial and shrubby kinds may be wintered in a conservatory. Several species or varieties are used to make Cayenne pepper. The annual or common capsicum (C. annuum), the Guinea Pepper plant, was brought to Europe by the Spaniards, and was grown in England in 1548. It is indigenous to South America, but is now cultivated in India, Hungary, Italy, Spain, and Turkey,

with the other species of capsicum. It isa hardy herbaceous plant, which attains a height of 2 or 3 feet, and bears a pod usually of an ovate shape, and yellow, red, or black in colour. The Spur or Goat Pepper (C. frutescens) has been an inmate of English gardens since 1656, It is a dwarf shrub, a native of the East Indies, which produces a small pod, having very pun- gent properties. C. tetragonum, or Bonnet Pepper, is a species much esteemed in Jamaica; it bears very fleshy fruits, Other well-known kinds of capsicum are the Cherry Pepper (C. cerasiforme) ; Bell Pepper (C. grossum), which has thick and pulpy fruit, well adapted for pickling ; and Berry or Bird Pepper (C. baccatum). The last men- tioned has been grown in England since 1731; its fruit is globular, and about the size ofa cherry. The West Indian stomachic Man-dram is prepared by mashing a few pods of bird pepper and mixing them with sliced cucumber and shallots, to which have been added a little lime-juice and Madeira wine. Chillies, the dried ripe or unripe fruit of capsicuins, are used to make chilly-vinegar, as well as for pickles. Cayenne pepper is manufactured from the ripe fruits, which are dried, ground, mixed with wheat flour, and made into cakes with yeast; the cakes are baked

‘till hard like biscuit, and then ground and sifted. The

pepper is sometimes prepared by simply drying the pods and pounding them fine in a mortar. Cayenne pepper is occasionally adulterated with red lead, vermilion, ochre, salt, ground-rice, and turmeric. The taste of the pepper is impaired by exposure to damp and the heat of the sun. Chillies have been in use from time immemorial ; they are eaten in great quantity by the people of Guiana and other warm countries, and in Europe are largely consumed both as a spice and as medicine. Their hot and biting taste is due to the presence of the alkaloid Capsicine, a reddish body, having a balsamic and extremely acrid and irritating odour. The Cayenne pepper plants, with the rest of the

Solanacee, have not the narcotic properties of the genera of the miost nearly allied order Atropacez, unless, as has been affirmed, these are resident in the pulp of certain species of capsicums. Medicinally, Cayenne pepper is used with cinchona in lethargic affections, also in atonic gout accompanied

by flatulence, and in tympanites and paralysis. It is employed as a stimulant in those forms of dyspepsia which are due to faulty chymification and defec- tive secretion of gastric juice. In malignant scarlatina it is used either in the form of a tincture or as a gargle. To make the tincture, a pint of vinegar is boiled with two tablespoonfuls of powdered chillies and a teaspoonful of salt, and then strained. Cayenne pepper taken in large quantities acts as an irritant poison. A dose of powdered capsicum is from | to 9 grs., and of the tincture from 5 to 15 drops.

CAYLUS, Anne CiaupE Puinipre pE Tusrbrss, Comrz DE, Marquis d'Esternay, Baron de Bransac (1692- 1765), was born at Paris in October 1692. He was the eldest son of Lieutenant-General Count de Caylus, and while a young man he distinguished himself in the cam- paigns of the French army, from 1709 to1714. After the peace of Rastadt, he spent some time in travelling in Italy, Greece, the East, England, and Germany, and devoted much attention to the study and collection of antiquities, publishing several works on the subject, among which are the Recueil des Antiquités égyptiennes, étrusques, grecques, romaines, et gauloises (Paris, 1752-5), Numismata Aurea Imperatorum Romanorum, and a description of the method of encaustic painting with wax mentioned by Pliny, which he had rediscovered. He was also an admirable engraver, and he copied many of the paintings of the great masters He did his best to assist the cause of art, by writing the lives of the most celebrated painters, by causing engravings to be made, at his own expense, of Bartoli's copies from ancient pictures, and by publishing his Vowveausx sujets de peimture et de sculpture (1755) and T'ableausx tirés del' Iliade, de l Odysse, et de ! Hnéide (1757). Caylus is besides known as the author of a number of romances, humorous pieces, and fairy tales. He was a man of singular simplicity, generosity, and kindliness.

CAZALLA bE La Sierra, a town of Spain, in the pro- vince of Seville, 36 miles north of the city of that name, on the Sierra Morena. The town is well laid out, and contains numerous churches, and there are Roman and Moorish antiquities in its suburbs. The neighbouring mountains are well wooded, and yield ores of iron, copper, silver, and antimony, pyrites, and variegated marble. Tan- ning, weaving, the making of oil, brandy, and wine,

and the smelting and working of metals, are the chief employ- ments of the inhabitants. Population, 6850.

CAZEMBE is properly the hereditary name of an African chief, whose territory is situated to the south of Lake Moero and the north of Bangweolo, between 11° and 9° S. lat. In the end of the last century the authority of the Cazembe was recognized over a very extensive district,

but the prestige of the dynasty has greatly diminished, and |

the present representative does not even rank first among the tributaries of the Muatiyanvo of the Rua or Moluwa kingdom. The country, which has no more distinctive title than the land of the Cazembe, is estimated to have an area of 120,000 square miles and a population of 500,000. It forms a kind of hollow plain, and is richly watered by numerous rivers. Of these the most important is the Luapula, which flows from Bangweolo to Moero, and forms, according to the conjecture of Cameron, one of the head waters of the Congo. The population consists mainly of two races, the Messiras and the Campoldélas,—of whom the former are native and subjugated, and the latter intrusive and dominant, The Campoldlas alone are

eligible to public offices, and their language is that spoken at court. Considerable attention is paid throughout the country to agriculture; and millet, maize, manioc, sugar- cane, yams, gourds, and bananas are grown. The ass and horse are both totally unknown ; sheep are very scarce, but cattle are fairly abundant. Salt is obtained in various places, and forms an important source of wealth. Coarse cotton cloth, earthenware, and iron goods are the chief manufactures ; and slaves, ivory, and copper-ore are almost the only exports. The Cazembe has despotic power, and uses it in a most barbarous fashion. He has 600 wives, and his nobles imitate his example according to their means. – On his accession every new Cazembe chooses a new site for his residence, and thus the country cannot be said to have a permanent capital. The residence at the time of Dr Livingstone’s journey in 1868 was situated about a mile to the north of the small lake of Mofwe; and the town occupied, with its cassava grounds and cotton fields, about an English square mile, and had a population of about 1000. It is

sometimes called Usemba or Lunda, and Magyar heard it mentioned as Tambalameba; but none of these seems to be its native name. In 1796 the Cazembe was visited by Manoel Caetano Pereira, a Portuguese merchant ; and in 1798 a more important journey was undertaken by Dr Francesco Jose Maria de Lacerda, a native of Sao Paulo in Brazil. He died at Tschungu on the 18th of October, but left behind him a valuable journal. In 1802 Honorato da Costa, superin- tendent of the Cassange factory, sent two native traders or pombeiros, Pedro Joao Baptista and Anastacio José, on a visit to the Cazembe; and in 1831 a more extensive mis- sion was despatched by the Portuguese governor of Rios de Sena. It consisted of Major José Monteiro and Antonio Gamitto, with an escort of 20 soldiers and 120 negro slaves as porters; but its reception by the Cazembe was not altogether satisfactory. Another expedition is said to have been undertaken in 1853 by a Mr Freitas; and a few notes of a Moorish traveller are given in the Geographical Journal for 1854, Livingstone's visit in 1868 has already been mentioned,

See the account of Pereira's journey in Annaes Maritimos e Coloniaes, 1844, and the Consideracées politicas sobre os descobri- mentos dos Portuguezes na Africa, by José Accursio das Neves, 1830; of Lacerda's in Annaes for 1844, 1845, and 1846 ; of Baptista's in 1843; Monteiro and Gamitto, O Muata Cazembe, Lisbon, 1854 ; The Lands of the Cazembe, published by the Royal Geographica. Society in 1873, containing Lacerda and Baptista's Journals, and a résumé of Monteiro and Gamitto ; '' Livingstone's Reisen in Inner Afrika," 1866-1878, in Petermann's Mittherlungen, 1875 ; and Liv- ingstone's Last Journals, 1874.

CAZORLA, a town of Spain, in the province of Jaen, on the Vega. It is generally well built, and contains two ancient castles (one of them Arabic), several hospitals, a spacious theatre, a very ancient church, and several con- vents. It was an important military station under the Moors, and has suffered frequently during the civil wars in Spain. In 1811 it was captured and partly burned by the French, and in 1837 it was distinguished in the Carlist contest. Population, 4980.

CAZOTTE, Jacques (1720-1792), a French author, was born at Dijon in 1720. He was educated by the Jesuits, and at twenty-seven he obtained a

public office at Martinique, but it was not till some years after, on his return to Paris, that he appeared as an author. His first attempts, a mock romance and a coarse song, gained so mucli popularity, both in the court and among the people, that he was encouraged to essay something more ambitious. He accordingly produced his Roman d'Olivier. He also wrote a number of sportive effusions, such as Duiable Amoureux, among which was a continuation of Voltaire's Guerre Civile de Genéve, the verisimilitude of which was

such that no one had the lcast suspicion of the deception. From all this gaiety and licence Cazotte rushed into the opposite extreme, embracing the views of the Tiluminati, and declaring himself possessed of the power of prophecy. It was upon this fact that La Harpe based his famous Jeu Wesprit, in which he represents Cazotte prophesying the most minute events of the revolution. Cazotte was attached to the royal cause, and, on the discovery of some of his letters in August 1792, was arrested ; and, though he escaped for a time, through the love and courage of his daughter, he was executed on the 25th of the following month. A complete edition of his works was published in 1817.

CEARA, or Forranza, or VILLA Do Forts, a town of Brazil, in a province of the same name, situated at the mouth of the River Ceardé, on an open bay between the promontory of Mararanguape and Cape Mocoripe, in 3° 42' S. lat. and 38° 30' W. long. It consists of a new and old town, and has regular and well-paved streets. Opened to general trade in the present century, it exports a consider- able quantity of coffee, cotton, and sugar; but it has recently suffered somewhat by the formation of the new port of Aracaty, about ninety miles distant. In 1871 the number of British vessels engaged in the trade was 43, with a tonnage of 28,784. Population about 20,000.

CEBES of Thebes, a disciple of Socrates, mentioned by Plato in the Phedo, and by Xenophon as distinguished both for his virtue and for his love of truth, was the author of a once popular didactic dialogue, the Ilwag or

Tabula Cebctis. This work, which professes to be an explanation of an allegorical picture, commences with the Platonic doc- trine that men enter the earth from a pre-existent state. There they have been taught how to guide their course in this world; but the draught of oblivion of which all must drink—though not all in equal degree—causes them to forget the instruction, Many allurements entice them to vice, but by patience and endurance they may attain virtue and happiness. The sciences—grammar, geography, arithmetic, geometry, and music—are declared not to be the true discipline, but yet to be useful, especially as a kind of restraining bridle for the young. [rom certain passages, which are probably interpolations, some have supposed the work to be the production of a Stoic of the same name, who lived under M. Aurelius. The ZYabula Cebetis has been translated into all the European languages. An Arabic version, with the Greek text, and a Latin translation, was published by Salmasius in 1640. It is usually printed together with Epictetus, as at Strasburg, 1806, and Paris, 1826. Cebes was also, according to Suidas and Laertius, the author of the “EGdduy and the @pvvixos, which have been entirely lost.

CEBU, a city of the Philippine Islands, on the eastern side of an island of the same name, about 400 miles S.E. of Manilla. It is the oldest provincial town in the archipelago, and still ranks as one of the best built ; while its position renders it the chief commercial centre for the Southern Philippines. It is the residence of a military governor and an alcalde, as well as of the governor-general of the Vissagas; and its public buildings comprise a cathedral, an episcopal palace, and a lazaretto. It exports sugar, hemp, tobacco, and sapan-wood, the quantity of the first two in 1870 being 114,806 and 40,756 piculs respec- tively. Its foreign goods are obtained via Manilla, There is an old fort built of coral, and in the island of Matan opposite the town is situated the grave of Magellan. The population, inclusive of the suburb of St Nicholas, is reckoned at 34,000.

CECCO D’ASCOLI (1257-1327) is the popular name of Francesco DEGLI Srasrir, a famous medixval ency- clopedist and poet,—Cecco being the diminutive of Francesco, and Ascoli, in the marshes of Ancona, the place

of the philosopher’s birth. He devoted himself to the study of mathematics and astrology, and in 1322 was made pro. fessor of the latter science at the university of Bologna, It is alleged that he entered the service of Pope Johr XXIL at Avignon, and that he cultivated the acquaint. ance of Dante Alighieri, only to quarrel with the gteat poet afterwards; but of this thete is no evidence. It ig certain, however, that, having published a commentary on the sphere of John de Sacrobosco, in which he propounded audacious theories concerning the employment and agency of demons, he got into difficulties with the clerical patty, and was condemned in 1324 to certain fasts and prayers, and to the payment of a fine of seventy crowns. ‘l’‘o elude this sentence he betook himself to Florence, where he was attached to the household of Carlo di Calabria. But his freethinking and plain-speaking had got him many enemies; he had attacked the Commedia of Dante, and the Canzone ad’ Amore of Guido Cavalcanti; and his fate was sealed. Dino di Garbo, the physician, was indefatigable in pursuit of him ; and the old accusation of impiety being renewed, Cecco was again tried and sentenced, this time to the stake. He was burned at Florence the day after sentence, in the seventieth year of his age.

Cecco d’Ascoli left many works in manuscript, most of which have never been given to the world. The book by which he achieved his renown and which led to his death was the Acerba (from acervus), an encyclopsedic poem, of which in 1546, the date of the last reprint, more than twenty editions had been issucd. It is unfinished, and consists of four books in sesta rima. The first book treats of astronomy and meteorology ; the second of stellar influences, of physiog- nomy, and of the vices and virtues; the third of minerals and of the love of animals; while the fourth propounds and solves anumber of moral and physical problems. Of a fifth book, on theology, the initial chapter alone was com- pleted. A man of immense erudition and of great and varied abilities, Cecco, whose knowledge was based on experiment and observation (a fact that of itself is enough to distinguish him from the crowd of savants of that age), had outstripped his contemporaries in many things. He knew of metallic aerolites and shooting-stars ; the mystery of the dew was plain to him; fossil plants were accounted for by him through terrene revolutions which had resulted in the formation of mountains; he is even said to have divined the circulation of the blood. Altogether a remark- able man, he may be described as one of the many

Cassandras of the Middle Ages—one of the many prophets who spoke of coming light, and were listened to but to have their words cast back at them in accusations of impiety and sentences of death. .

The least faulty of the many editions of the Acerba is that of Venice, dated 1510. The earliest known, which has become exces- sively rare, is that of Brescia, which has no date, but is ascribed to 1473 or thereabouts.

CECIL, Rosert, Eart or Sarispury (1550-1612), was the son of Lord Burghley, whose character and ability he inherited, and by whom he was carefully educated for political life. After residing at Cambridge and represent- ing Westminster in parliament, he received a post in thie French embassy, and was next made Secretary of State under Walsingham. He was also appointed Chancellor of the Duchy of Lancaster, and Lord Privy Seal, and he succeeded his father as Master of the Court of Wards and Walsingham as chief Secretary of State. It is noteworthy that, though his health was delicate and his person deformed, he served as a volunteer against the Armada. His career was simply a continuation of his father's. He toiled as laboriously and as carefully, and carried out the same system of espionage with equal success. The interest which he took in the domestic affairs of the country and in the state of

CECIL

Jreland was as great; and the object log his foreign diplomacy was the same,—to prevent Spain from gajning a mastery which would be fatal to England. But he followed the wisdom of his father too well ; his policy was wanting in originality and depth of insight; and he has left no mark upon history. ,

During the reign of the queen he had entered into correspondence with James, upon whose accession he was reappointed to the post of Secretary of State and was raised, in successive years, to the dignities of baron of Issenden, Viscount Cranborne, and earl of Salisbury. In 1608, on the death of the earl of Dorset, he added the office of Lord High Treasurer to that of Secretary. Thus he was now at once chief adviser of the king as to home and foreign affairs, mediator between him and the parlia- ment, and also the responsible manager of the finances of the kingdom. In the last capacity his

work was by no means casy. It was vain to hope to moderate the royal extravagance ; his attempt to obtain from the Commons an increase of £200,000 to the royal income was unsuccessful ; and the chief financial measure which he carried out was an addition to the duties on imports. As Secretary, Cecil followed his father's example with regard to the Catholics, and wrote a Treatise against the Papists. His opposition to the growth of Spanish power was consistent, though he accepted a pension from the Spanish king, and refused to unite with France and the United Provinces. to effect its utter overthrow.

Cecil has been much blamed for his conduct towards three of the greatest of his contemporaries. Of his cousin, Francis Bacon, he appears to have been jealous; in the noble qualities of the earl of Essex he saw nothing but a dangerous hotheadedness ; and probably his opinion was similar about Raleigh, who, though more of a politician, was usually as little inclined to be cautious or conciliatory. But all this argues no extraordinary baseness; he was merely wanting, by nature and through education, in breadth of sympathy. The assertion that he was the sole cause of all Raleigh's troubles is unfounded, and is, indeed, contra- dicted by two facts :—first, that on his trial Cecil more than once insisted that he should meet with all consideration, and should be allowed to urge all he could in his own defence; and, secondly, that it was after Cecil's death that the bitterest feeling against him was displayed, and that he was offered as a sacrifice to Spain. Besides his Treatise against the Papists, Cecil published an interesting work on The State and Dignity of a Secretary of State. His corre- spondence with James I. was published by Lord Hailes in

1766,

CECIL, Witt1am, Lorp Burcutey or Burteicu (1520- 1598), an English statesman, born in 1520, was the son of Richard Cecil, Master of the Robes to Henry VIII. After distinguishing himself at Cambridge, he entered Gray's Inn at twenty-one, and soon after obtained the rever- sion of the office of custos brevium at the Court of Common Pleas. He increased his political inflnence by marriage, first with the sister of Sir John Cheke, and then with the daughter of Sir Anthony Cook; and, at length, through friendship with the protector, Somerset, lie became Secretary of State in 1548. After sharing

the imprisonment of Somerset, his prudence and sagacity enabled him to regain his office under Northumberland. Yet, when Edward died, he contrived to escape the danger which threatened him on every side. He signed the instrument making over the crown to Lady Jane Grey, but only as a witness; and he kept clear of religious difficulties by displaying no dislike to Catholicism. Indeed it is probable that he really felt little or none. He confessed, attended mass, took a priest lato his house; he escorted Cardinal Pole from Brussels, and cultivated his friendship. And, though he opposed

the court party in parliament, and thus kept up his connection with his old friends, his opposition was go moderate as to be perfectly safe. He maintained a constant correspondence with the Princess Elizabeth, and on the death of her sister at once prepared a proclamation declaring her queen. He was immediately appointed Secretary of State, and member of the Privy Council; and from this time he was the foremost minister of the Crown. Foreign ambassadors often regarded him as the possessor of unbounded power, and as practically head of the Govern- ment and ruler of the queen, but, in fact, his inflnence was not so supreme, nor his favour with Elizabeth so uniform. No man, indeed, could always guide that strong-willed monarch; and Cecil had no ambition to be a mere favourite and tool. Though not an enthusiast, and though he never fought for a hopeless cause, he had far nobler aims than personal advancement. Though his statesmanship lay not so much in a power of deep and rapid insight as in the possession of a mind patient to take account of the minutest points, and able to weigh all considerations impartially, he was capable of independent thought and firm decision, and his plans often conflicted with the incon- stant intrigues of the queen, On such occasions he did not shrink from telling her that she was wrong; he rebuked her stinginess and treachery, and he several times braved her passionate resentment. From her accessicn he was Secretary of State, and from 1572 he was Lord High Treasurer ; but his services brought him pecuniary logs, and he received no honours but the Mastership of the Court of Wards, the order of the Garter, and the barony con- ferred upon him in 1571, after thirteen years of service. He was absolutely incorruptible. He refused to use or to sell the office of Royal

Exchanger, though it would have brought him several hundred thousand pounds. Mendoza in vain tried to bribe him; to Catherine of Medici's splendid offers he replied that he served none but his God, his mistress, and his country ; and he refused to share in the gold of which Drake had robbed the Spaniards. Into the deeper passions of his time he did not enter. It is true that as his life advanced he grew more and more attached to the Protestant cause. He saw that his country had identified herself with that cause, and he was, Lesides, firmly opposed on political grounds to the pretensions of the Papacy. He appears, however, to haye had no spccial devotion to any form of doctrine ; and he opposed the persecution of loyal Puritans and of loyal Catholics. When, indeed, cither Catholic or Puritan became disloyal or other- wise dangerous he lost all compunction. He hated and persecuted the Jesuits because they placed the Pope above the laws, but he twice took the trouble to explain to the world that this was the sole reason. Te was affected with no inconvenient weakness of sympathy ; he could ruthlessly crush any one who seemed dangerous to the state. Essentially honest as he was, he scrupled at nua espionage or treachery to gain the secrets of his enemies. His emissaries were everywhere. He kept Herle in the Marshalsea, examined him before the council, and threatened him with torture that the Catholic prisoners might believe him to be a martyr to their cause, and might intrust him with their plans; and he made Bishop Parker appear in the guise of the Cathalie Dr Story to take the confessions of a prisoner whom torture could not move. When his policy was opposed to Spain he did not scruple to get up demonstrations against the Spanish ambassador, and to cast into prison all the Spanish merchants in London. Plots against his own life never deprived him of his calm- ness ; he watched De Quadra's conspirators quietly, day after day, though every day he knew they might attempt to murder him, and Jet them alone till he had gained all the information to be got. Day after day Norfolk and

Arundel came to the council intending to arrest him; and day after day his cool sagacity defeated them. Yet when occasion required he knew how to act with prompt and vigorous decision. He was always struggling against the queen's variability. Being eager that she should marry, he urged her again and again to decide at once; and a paper is extant which he presented

to the queen when the last marriage proposal was finally cast aside. In it he sketches a great and able policy. Preparations were to be made for war by land and sea; honours and wealth were to be applied to attach the hearts of the foremost men of the nation, and no longer wasted on useless favourites ; Ireland was to be ruled with attentive care and in a conciliatory spirit ; and, lastly, there was to be a grand alliance of all Protestants—of England, Sweden, Denmark, Scotland, and the Protestants in Germany, France, and Flanders. With regard to the Queen of Scots he pressed for the most vigorous action. Undeterred by the anger which Elizabeth showed in striking his name from the list of lords- lieutenant, he appeared at Mary's trial to meet her denial of the charges made against her with a stern contradiction. When, at last, Elizabeth signed the warrant, he ventured to oppose her express wish by calling the council to his own house to discuss the matter ; and he dared to inter- cede for Davison when, in a torrent of passion, she sent him to the Tower. The result was that he was fiercely ordered out of her presence, and for two months the queen refused to see him.

In the industry of the country Cecil took the greatest interest. He entertained the serious apprehensions which were commonly felt on account of the increase of importa- tion, the exportation of gold, and the falling off of agricul- ture ; and he protested against the growing use of wine, silk, and other foreign commodities. To make up for the loss to the shipping which the downfall of Catholicism had caused by diminishing the demand for fish, he obtained the passing of a curious law which made the eating of flesh on Friday and Saturday, and on Wednesday unless fish dishes were also placed on the table, a misdemeanour. In short, Cecil devoted himself to the service of his country with the most painstaking and disinterested laboriousness. From the peculiarity of his method of working we have more com- plete information concerning the details of his career than is usually the case with statesmen; for it was his practice not only to draw up papers of advice to the queen, but also before deciding on any question to set out on paper all the considerations on both sides ; and many of these documents, together with many of the letters which he either received or wrote, can still be consulted (see Scrinia Ceciliana, 1663, the state papers published in 1740 and 1759, and Tytler's Ancient Letters, 1839). Cecil died in office in August 1598.

Among his writings are characteristic Precepts for the well-order- tng of a man's life (1637), and The Execution of Justice in England Sor the Maintenance of Public and Christian Peace (1581 and 1583 , Latin version, 1584). The latter is a defence of the queen's commis- sioners appointed to examine Papists, with special reference to the use of torturc, and a declaration that purely religious belief was never the cause of punishment. An interesting paper of advice to the Queen (1583) is to be found in the Somers Tracts. A volumi- nous life by Nares appeared in 1828-31. See Froude's History.

CECILIA, Sarnr. A passing word in the very apoc- ryphal legend of this saint has caused her name to be one of the best known in the calendar, and oftenest in the mouths of men. It is related, among other circum- stances purely legendary, that Cecilia often united instru- mental music to that of her voice in singing the praises of the Lord. On this all her fame has been founded, and she has become the special patroness of music and musicians all the world over. Half the musical societies in Europe are named after her, and her supposed musical acquire-

ments have led the votaries of a sister art to find subjects for their works in episodes of her life. The grand painting by Domenichino, at Bologna, in which the saint is repre- sented wrapped in an ecstasy of devotion, with a small "organ," as it was called,—an instrument resembling a large kind of Pandean pipes,—in her hand, is well known, as is also Dryden's beautiful ode.

Her legend relates that, about the year 230, which would be in the time of the Emperor Alexander Severus, Cecilia, a Roman lady, born of a noble and rich family, who in her early youth had been converted to Christianity, and had made a vow of perpetual virginity, was constrained by her parents to marry a certain Valerian, a pagan, whom she succeeded in converting to Christianity without infring. ing the vow she had made. She also converted her brother- in-law Tiburtius, and a friend called Maximus, all of whom were martyred in consequence of their faith. This is stated to have happened at Rome when one Almacus was prefect; but no such name is known to history. It is unfortunate also for Cecilia's claim to a footing on the solid

soil of history, that the earliest writer who makes mention of her, Fortunatus, bishop of Poitiers, represents her to have died in Sicily between the years 176 and 180, It is absurdly stated in the Biographie Universelle that Cecilia's name is found in the most ancient martyrologies; whereas, as may be seen from Baronius, the earliest of these documents was compiled by Pope Clement I. who died in the year 100. The French writer maintains that her body must have been transported from Sicily to Rome subsequently to the 4th century, because the saint's name is not found in the Roman calendar compiled in the time of Pope Liberius (ob. 363), from which fact no such con- clusion can be drawn. The Roman tradition is that the church dedicated to St Cecilia was built on the site of the house inhabited by her, at her request, by Urban I. about the year 230. We do not reach any ground of certainty, till we come to the councils celebrated by Pope Symmachus in the year 499 (of which, however, some doubt the authenticity), in whose records this church is mentioned, two priests qualifying themselves in their subscription as priests of the church of St Cecilia.

This church was in a ruinous condition in the 9th century ; and Pope Paschal I. (ob, 824) built it anew with much splendour. In the course of the work he was, we are told, visited by the saint in a vision, who informed him where her body was to be found in the cemetery of Callistus. Following her indications he found not only her body but those of her husband Valerian, her brother-in-law Tiburtius, their friend Maximus, the Popes Urban L. and Lucius I, and 900 other martyrs! All these Paschal transported with much solemnity and ceremonial to the new church of St Cecilia, which he dedicated to God, to the Virgin, to Saints Peter and Paul, and to Saints Cecilia and Agatha. Cardinal Sfondrati, nephew of Gregory XIV. (ob. 1591), who had his ¢2¢/e as cardinal from this church, almost entirely rebuilt it; in the course of which operation the bodies of the saints were found, and were on the 22d of November, the day dedicated to St Cecilia, in the year 1599, deposited in a silver reliquary, and placed by Clement VIIL., assisted by twenty-two cardinals, in a small crypt under the high altar. The silver urn was stolen by the French, as their custom was, at the period of their first occu- pation. One of the best known and most admired-modern statues in Rome is that executed by Stefano Maderno in the 17th century, which represents the saint recumbent in her grave-clothes, and in the attitude in which she is described to have been found when her tomb was

opened. The church was subsequently “redecorated,”—that is to say destroyed as regards architectural beauty,—in 1725 by Cardinal Doria, who built heavy piers around the columns

of the nave, and enclosed with gratings an upper gallery, which must have been beautiful, in order to make accom- modation for the nuns of the adjoining Benedictine monastery to hear, unseen, the services. Still, especially in the tribune at the east end of the church, some interesting relics of the old 9th century church may yet be seen there. The curious mosaics representing St Cecilia, and the other saints to whom Pope Paschal dedicated the church, belong to that period.

The church of St Cecilia is situated at the further end of that part of the city called Trastevere, near the quay of the Ripa Grande, a region which tradition declares to have been the earlier “Foro degli Ebrei,” or quarters assigned to the Jews,—a “ ghetto,” as the part of the city so destined was subsequently called. Here it is said that St Peter, as a Hebrew, was lodged on his first arrival in Rome, and hence began to preach the gospel.

This church has from its first foundation given his “title” to a cardinal priest. For many generations it was the custom for the popes, accompanied by all their cardinals, to celebrate a ‘‘ Capella papale ” here on certain days in the year. And down to the present time, on the 92d of November in each year, the best church music still to be met with in Rome (which is not, however, saying much) may be heard in the church of St Cecilia.

CECROPS, probably a Pelasgian hero, was, according to Athenian tradition, the first king of Attica, and the founder of its political life. He was said to have divided Attica into twelve parts, to have instituted marriage, and introduced a new form of worship. Some late Greek writers held that he came from Egypt. He is represented as human as regards the upper part of his body, while the lower is shaped like a dragon.

CEDAR, a name applied to several members of the Natural Order Conzfere. The word Cedar (the Greek xedpos) is probably derived from the Arabic

Kedr, worth or value, or from Kedrat, strong. ‘The name has been supposed by soie to have taken its origin from the brook Cedron, in Judea.

The Abies Cedrus or Cedrus Libani, the far-famed Cedar of Lebanon, is a tree which, on account of its beauty, stateliness, and strength, has always been a favourite with poets and painters ; and which, in the figurative language of prophecy, is frequently employed in the Scriptures as a symbol of power, prosperity, and longevity. It grows to a vertical height of from 50 to 80 feet—“ exalted above all trees of the field,” aud at an elevation of about 6000 feet above sea-level. In the young tree, the bole is straight and upright, and one or two leading branches rise above the rest. As the tree increases in size, however, the upper branches become mingled together, and the tree is then clump-headed. Numerous lateral ramifying branches spread out from the main trunk in a horizontal direc- tion, tier upon tier, covering a compass of ground the diameter of which is often greater than the height of the tree. Gilpin, in his Forest Scenery, describes a cedar which, at an age of about 118 years, had attained to a height of 53 feet, and had a horizontal expanse of 96 feet. The branchlets of the cedar take the same direction as the branches, and the foliage is very dense and close-woven. The tree, as with the rest of the fir-tribe, except the larch, is evergreen; the leaves are renewed every spring, but their fallis gradual. In shape the leaves are straight, taper- ing, cylindrical, and pointed; they are about an inch long, and of a dark green colour, and grow in alternate tufts of about thirty in number. The male and female flowers grow on the same tree, but are separate. The cones, which are on the upper side of the branches, are flattened at the ends, and are 4 or 5 inches in length, and 2 inches wide; they take two years to come to perfection, and while growing exude

much resin. The scales are close pressed to one another’ and are reddish in colour, The seeds are provided with a long membranous wing. The root of the tree is very strong, and ramifying, The cedar flourishes best on sandy loamy soils. It still grows on Lebanon, eleven groves having been described by the American missionary Jessup; and pro- bably is to be found over the whole group of mountains lying between Damascus and Tripoli in Syria, which com- prehends, besides Lebanon, the Mounts Taurus and Amanus of

the ancients. Lamartine tells us that the Arabs regard the trees as endowed with the principles of continual existence, and with reasoning and prescient powers, which enable them to prepare for the changes of the seasons. The best known group in the Lebanon range consists of twelve very ancient trees amidst a grove of about 400 younger ones—apparently the yellow cedars spoken of by Lamartine. They occupy little knolls in the Jebel-el-Arz, a recess or hollow near the highest point of the mountains, about 15 miles from the sea. One tree on the southern side has a circumference of 42 feet at its base. Lord Lindsay mentions two other cedars on the northern edge of the grove, one 63, and another 49 feet in girth. The number of the trees has been slowly decreasing since 1550, when Belon counted twenty-eight of them; nearly 200 years later, when Dr Pococke visited Syria, only 15 were to be seen. The wood of the cedar of Lebanon is fragrant, though not so strongly scented as that of the juniper or red-cedar of America. It appears that the wood may be hard in portions, and sufficiently close-grained and compact to be carved,—the fibre in mountain-cedars being finer than in those growu on plains. The wood is, however, generally described as a reddish-white light material, of a coarse grain and spongy texture, easy to work, but liable to shrink and warp. Dr Pococke affirms that it does not differ in appear- ance from white deal, nor does it seem to be harder. As a firewood, it is said to be inferior, burning quickly and evolving but little heat.

The cedar of Lebanon is cultivated in Europe for orna- ment only. It can be grown in parks and gardens, and thrives well; but the young plants are unable to bear great variations of temperature. According to Gilpin, the English cedar in its maturer age becomes shrivelled and deformed, the body increasing, whilst the limbs shrink. In the Botanic Gardens at Chelsea are two cedars, planted there in 1683, which have probably lived upwards of 200 years. At Caen Wood, Hampshire, are four trees which have been growing since 1756, and are as much as 100 feet in height. The first cedars in Scotland were planted at Hopetoun House in 1740 ; and the first one said to have been introduced into France was brought from England by Bernard de Jussieu in 1734, aud placed in the Jardin des Plantes. Cedar-wood is earliest noticed in Leviticus xiv. 4, 6, where it is prescribed among the materials to be used for the cleansing of leprosy ; but the wood there spoken of was probably that of the juniper. The term Eres (cedar) of Scripture does

not apply strictly to one kind of plant, but was used indefinitely in ancient times, as is the word cedar at present. The term arz is ap- plied by the Arabs to the cedar of Lebanon, to the com- mon pine-tree, and to the juniper; and certainly the “cedars” for masts, mentioned in Ezek. xxvii. 5, must have been pine-trees, It seems very probable that the fourscore thousand hewers employed by Solomon for cut- ting timber did not confine their operations simply to what would now be termed cedars and fir-trees. Dr Lindley considers that some of the cedar-trees sent by Hiram, king of Tyre, to Jerusalem may have been procured from Mount Atlas, and have been identical with the Callitris qguadri- valvis, or arar-tree, the wood of which is hard and durable, and was much in request in former times for the building

of temples. The timber-work of the roof of Cordova Cathedral, built eleven centuries ago, is composed of it. In the time of Vitruvius “cedars” were growing in Crete, Africa, and Syria. Pliny says that their wood was ever- lasting, and therefore images of the gods were made of it; he makes mention also of the oil of cedar, or cedraum, distilled from the wood, and used by the ancients for preserving their books from moths and damp: papyrl anointed or rubbed with cedrium were on this account called cedrati libri. Drawers of cedar or chips of the wood are now employed to protect furs and woollen stuffs from injury by moths. Cedar-wood, however, 1s said by Dr Fleming to be injurious to natural history objects and to instruments placed in cabinets made of it, as the resinous matter of the wood becomes deposited upon them. Cedria, or cedar resin, is a substance similar to mastic, that flows from incisions in the tree; and cedar manna is a sweet exudation from its branches.

There are two sub-specics or varieties of Abies Cedrus —A. Deodara, the deodar, or “god tree” of the Hima- layas, and A. atlantica, of the Atlas range, North Africa. The deodar flourishes in all the higher mountains from Nepal up to Kashmir, ab an elevation of from 5500 to 12,000 feet ; on the peaks to the northern side of the Boorung Pass, it grows to a height of 60 to 70 fect before branching. ‘The wood is close-grained, long-fibred, per- fumed, and higlily resinous, and resists the action of water. The foliage is of a grey-green, the leaves are slender, and the twigs are thinner than those of

A. Cedrus. The tree is employed for a variety of useful purposes, especially in building. It is now much cultivated in England as an ornamental plant. A. atlantica has shorter and denser leaves than A. Cedrus; its wood also is hard, and more rapid in growth than is that of the ordinary cedar. It is found at an altitude above the sea of from 7000 to 9000 feet.

The name cedar is applied to a variety of trees, The Bermuda cedar (Juniperus bermudiana) and the red or American cedar (J. virginiana) are both much used in joinery and in the manufacture of pencils; though other woods are now superscding them for pencil-making. The Japanese cedar (Cryptomeria japonica) is a kind of cypress, the wood of which is very durable. Another species of cypress (Cupressus thyoides), found in swamps in the south of Ohio and Massachusetts, is known as the American white ccdar. Jt has small leaves and fibrous bark, and is much used for making fences and coopers' staves, The Spanish cedar is a name applied to the Juniperus thurifera, and also to another species, J. oxycedrus, The latter was much used by the Greeks for making images; and its empyreumatic oil, Huile de Cade, is used medicinally for skin-diseases. A species of cypress which has been naturalized in the neighbourhood of Cintra is known as the cedar of Goa. The order Cedrelacee (which is en- tirely distinct from the Conifers) includes, along with the mahoganies and other valuable timber-trees, the Jamaica and the Australian red cedars. The cedar-wood of Guiana, used for making canoes, is a species of the Natural Order Amyridacee, Icica altissima. :

The importation of woods classed as cedars into Great Britain has been free from duty since 1866, when the im- ports were 5647 tons, valued at £59,224,

See Gordon's Pinetwm; Loiseleur-Deslongchamps, Histoire du cadre dw Liban, Paris, 1838 ; Loudon, Arboretum Britannicum, vol. iv. pp. 2404-2432, London, 1839; Marquis de Chambray, Traité pratique des arbres résineux coniféres, Paris, 1845; Dr J. D. Hunter, Nat. Hist. Review, Jan. 1862, pp. 11-18; Brandis, Forest Flora of N.W,. and Central India, pp. 516-525, Lond., 1874.

CEFALU, a seaport town on the north coast of Sicily, in the province of Palermo, and 39 miles E.S.E. of the

town of that name, in 38° 0’ N. lat. and 14° 4’ E. long, The new town, founded by Roger I. of Sicily in 113], is situated at the base of a steep promontory 1191 feet in height, which overlooks the magnificent Bay of Cefalu, The houses are tolerably well built; and the cathedral, commenced in 1132, is distinguished for the beauty of its fagade, with antique pillars and mosaics. Near it are the bishop’s palace and the seminary. The harbour is good, but small; and the trade, which is chiefly in oil, manna, and sardines, is inconsiderable. The inhabitants, who number about 10,200, are actively engaged in sea-fishery. The old town derived its name of Cephaleedium or Cephaleedis from the projecting headland mentioned above, on which it stood. On the original site are to be seen a fine Saracenioc castle and an ancient temple. The latter is constructed of massive stones, and part of its walls is formed by the side of the hill. At first Cephaleedium was possibly only a fortress of the Himerzans, In 396 B.c. it entered into friendly relations with Himilco; and after the defeat of the Carthaginian fleet, it was betrayed into the hands of Dionysius of Syracuse. In 307 B.c. it was taken by Agatho- cles, and in 254, in the first Punic war, by the Romans, In 858 a.p. the town was captured by the Saracens.

CEHEGIN, perhaps the ancient Segisa, a town of Murcia in Spain, four miles east from Caravaca. Its houses are generally built of marble from the neighbouring quarries, Its civil, religious, and educational cstablish- ments are in a comparatively prosperous condition. It possesses a considerable trade in agricultural produce, especially wine, hemp, and oil, and has several manufac- tories of paper and coarse linen, Population, 6200.

CELANO, a town of Italy, in the province of Abruzzo Ulteriore and district of Avezzano, about seven miles east of the town of that name. It is finely situated on a hill about four miles from the former bed of Lake Celano, and has an interesting medizeval castle of the 15th century, celebrated for its connection with the unfortunate Countess Covella. Though the town neyer recovered from the ven- geance inflicted on it in 1223 by Frederick IT., it continued to be the centre of a countship which was bestowed in 1463 on Antonio Piccolomini, The chapel of this family, in the Convent of Valle

Verde, not far from the town, is worthy of notice for the paintings of Giulio Romano; and the town itself has the honour of being the birthplace of Beato Tommaso the probable author of the Dies Ira. The population of the commune is 6673.

The neighbouring lake, known to the ancients as Zacus Fucinus, had till the beginning of this century an area of 37,990 acres, and was remarkable for its frequent changes of level. As early as the 1st century, the Emperor Claudius constructed a subterranean passage by which the sur- plus waters found an outlet to the Liris or Garigliano. No fewer than 30,000 workmen were employed for a space of eleven years; and the undertaking seems to have been as successful as it was bold. But in the following reign the passage was allowed to fall into disrepair; and it has been reserved to the present generation to see the old Roman works not only restored but surpassed. From 1793 to 1810 the lake had been gradually rising till it was 30 feet above its former level; and the attention of the Neapolitan Government was directed to the danger. Little, however, was effected till 1852, when the necessary works were undertaken by a company, under the dircction of Mr C. Hutton Gregory, who proceeded to widen the emissarium and support the walls with arched work. The shares of the company were gradually bought up by Prince Giulio Torlonia of Rome, who successfully carried on the operations at his own expense till his death in 187]. About 36,000 acres of rich arable land have been reclaimed, and the corn-crops yield a profit of from 30 to 34 per cent.

The new tunnel is about four miles long, and has a cross section of 21 square yards. The honour of the engineer- ing has been shared by Montricher, who died in 1858, Bermont, and Brisse. See Kramer, Der Fuciner See, Berlin,

1839.

CELEBES, an island of the East Indian Archipelago, separated from Borneo on the W. by the Strait of Macassar aud bounded on the E. by the Strait of Molucca. It stretches from 118° 30’ to 125° 40’ E. long., and from 5° 45’ §. to 1° 45’ N. lat., and its area is approximately estimated at about

70,000 square miles. Its general out- line is extremely irregular, and has been compared to that of a starfish with the rays torn off from the west side. It consists of four great peninsulas, extending from a com- paratively small nucleus towards the N.E., E., S.E. and§., and separated by the three large bays of Gorontalo orTomini, Tolo or Tomaiki, and Boni. Of these bays the first is by

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Map of Celebes (580 miles by 530).

far the largest, the other two having much wider entrances and not extending so farinwards. Most important among the smaller inlets are the bays of Amurang, Kwansang, and Toutoli on the north coast, Palos and Parre-Parre on the west, and Kendari or Vosmaer on the east. A large part of the island is but partially explored, but the general character of the whole

seems to be more or less mountain- ous. Well-dcfined ranges prolong themselves through each of the peninsulas, rising in many places to a considerable elevation, Naturally there are no great river basins or extensive plains, but one of the features of the island is the frequent occurrence, not only along the coasts, but at various heights inland, of beautiful stretches of level ground often covered with the richest pastures. The substruc- tural rocks are mainly of igncous origin, the most frequent being basalt in a state of decomposition; but in many districts the Carboniferous strata are well developed, and give a character to the landscape. The northern peninsula differs from the others in being still highly volcanic and subject to not unfrequent earthquakes. Within the pro- vince of Minahassa alone as many as eleven distinct volcanoes have been counted; and hot springs, mud fountains, and similar phenomena occur in several other districts, Few of the rivers are navigable for any distance, and the entrance to almost all of them is obstructed by

bars. Lakes, on the other hand, are both numerous and extensive. Of thesé the most important is the Tamp- arang-Labaya or Tempe, situated in the south-eastern peuinsula in 3° 37’ 8. lat. It has a depth of about 30 feet, and is richly stocked with wild-fowl and fish. The scencry throughout the island is of the most varied and picturesque description. ‘“‘ Nowhere in the archipelago,” says Mr Wallace, “‘have I seen such gorges, chasms, and precipices as abound in the district of Maros; in many parts there are vertical or even overhanging precipices five or six hundred feet high, yet completely clothed with a tapestry of vegetation.” Much of the country, especially round the Bay of Tolo, is still covered with primeval forest and thickets, traversed here and there by scarcely percep- tible paths, or broken with a few clearings and villages.

In spite of its situation in the centre of the arcltipelago, Celebes possesses a fauna of a very distinctive kind. The number of species is small; but in many cases they dre peculiar to the island. Of the birds, for example, about 200 species are known ; and of these no fewer than 80 are peculiar. The mammalian species number only 14, and of these 11 belong almost entirely to the Celebesian area. Most remarkable are the Mfacacus niger, an ape found nowhere else but in Batchian; the Anoa depressicornis, a small ox-like quadruped, which inhabits the mountainous districts ; aud the babirusa

or pig-deer of the. Malays. There are no large beasts of prey, and neither the elephant, the rhinoceros, nor the tapir is represented. Wild- buffaloes, swine, and goats are pretty common; and most of the usual domestic animals are kept in greater or smaller numbers. Though they receive but little attention, the cattle are good. The horses are in high repute in the archipelago; formerly about 700 were yearly exported to Java, but the supply has considerably diminished.

The same peculiarity of species holds in regard to the insects of Celebes as to the mammals and birds. Out of 118 species of butterflies, belonging to four important classes, no fewer than 86 are peculiar; while among the rose-chafers or Cetoniade the same is the case in 19 out of 30. Equally remarkable with this presence of peculiar species is the absence of many kinds that are common in the rest of the archipelago ; and the fact that similarities are often to be traced with species belonging to Africa and other remote regions is highly suggestive.

Vegetation is, it need hardly be said, extremely rich ; but there are fewer large trees than in the other islands of the archipelago. Of plants that furnish food for man the most important are rice, maize, and millet, coffee, the cocoa- nut tree, the sago-palm, the obi or native potato, the bread- fruit, and the tamarind; with lemons, oranges, mangosteens, wild-plums, Spanish pepper, beans, melons, and sugar-cane. The shaddock is to be found only in the lower plains. Indigo, cotton, and tobacco are grown; the bamboo and the ratan-palm are common in the woods ; and among the larger trees are saudal-wood, ebony, sapan, and teak. The gemuti palm furnishes fibres for ropes; the juice of the Arenga saccharifera is manufactured into sugar and a beverage called sagueir; and intoxicating drinks are prepared from several other palms.

Except where Dutch influence has made itself felt, very little attention has been paid by the native races to any agricultural pursuit; and their manufacturing industries are few and limited. The weaving of cotton cloth is principally carried on by women; and the process, at least for the finer description, is tedious in the extreme. The cheap introduction of European goods is gradually lessening the amount of native stuffs. The houses are built of wood and bamboo; and as the use of diagonal struts has not been

introduced, the walls soon lean over from the force of the winds. The most important of the mineral pro-

ducts of the island are gold and salt ; excellent iron is also found, which is utilized by the natives ; and coal of rather poor quality has been met with in various places, as in the district of Maros. The gold-mines are mainly in the northern peninsula; but even there the amount actually obtained is not so great as it was formerly. The various chiefs, bound by contract to bring yearly a fixed quantity of the metal to the Dutch authorities, frequently fail in their engagements, and many of them have been of necessity exempted. The gold is usually found at a depth of from 12 to 75 feet; but there are some mines in Bwool and Tontoli that reach 90 feet. In many, such as those of Ankahulu, Pagiama, and Popasatu, it is very cold, and the miners have to sit all day in nitrous water.

The whole island is practically in the hands of the Dutch Government, though a comparatively small. portion is under their direct administration, and a large number of petty princes are still permitted to do very much as they please in the internal management of their territories. For administrative purposes it is distributed among the residencies of Celebes, Manado, and Ternate, of which the two former belong solely to the island, while the third includes a large part of the Moluccas.

The residency of Celebes, formerly known as the Govern- ment of Macassar, comprises all the various states that surround the Gulf of Boni, and is divided into the following departments :—(1) Macassar, (2) the Northern Districts, (3) the Southern Districts, (4) Bulecomba and Bonthain, and (5) Saleyer aud the subordinate islands, Buton, Sum- bawa, and Bima.

The department of Macassar, or Mangkasara as it is called in the native language, is one of the oldest parts of the Dutch possessions. It contains Macassar, the capital of the residency, which is situated on the west coast of the southern peninsula in 5° 7’ 45” S. lat., forms one of the principal ports in the archipelago, and has a population of from 15,000 to 20,000. ‘The

inhabitants of the depart- ment consist mainly of Macassars and Malays proper, Endinese from the Island of Flores, and immigrants from the neighbouring kingdom of Wadjo. The foreign colonies are each under the management of a separate captain, and the Malays are also under the care of a head priest. The Macassars proper are one of the most important peoples in the island. ‘They belong to the Malay race, are well built and muscular, and have in general a “dark-brown com- plexion, a broad and expressive face, black and sparkling eyes, a high forehead, a flattish nose with large ale, a large mouth, and black soft hair, which they let fall over their shoulders.” The women are sprightly, clever, and amiable, and in former times were bought for large prices. The men are brave and not treacherous, but ambitious, jealous, and extremely revengeful. Drunkenness is rare, but to gambling and cock-fighting they are passionately addicted ; and so frequent among them is the running amuck that the Dutch authorities had to dismiss the Macassar soldiers from their service. In all sorts of bodily exercises, as swinging, wrestling, dancing, riding, and hunting, they take great pleasure. Though they call themselves Mahometans, their religion is largely mingled with pagan superstitions; they worship animals, and a certain divinity called Karaeng Lové, who has power over their fortune and health. Their language, whicli belongs to the Malayo-Javanese group, is spoken by about 300,000 persons, in Macassar proper, Goa, Tello, Sanraboni, Turateya, Bulecomba, Tanralili, and a great many parts of the southern peninsula; but it has a much smaller area than the Buginese, which is the language of Boni. It is very deficient in generalizations; thus, for example, it has words for the idea of carrying in the hand, carrying on the head, carrying on the shoulder, and so on, but has no word for the notion of simply carrying. It has

adopted a certain number of vocables from Sanskrit, Malay Javanese, and Portuguese, but on the whole is remarkably pure, and has undergone comparatively few changes in the course of the last two or three centuries. It is written in a peculiar character, which has displaced, and probably been corrupted from, an old form employed as late as the 17th century. Neither bears any trace of derivation from the Sanskrit alphabet. ‘The priests affect the use of the Arabic letters. The literature is very poor, and consists largely

of romantic stories from the Malay, and religious treatises from the Arabic. Of the few original pieces the most important are the early histories of Goa, Tello, and some other states of Celebes, and the Rapang, or collection of the decrees and maxims of the old princes and sages. The more modern productions are letters, laws, and poems, many of the last having very considerable beauty. For his know- ledge of the Macassar the European scholar is mainly indebted to the labours of B. F. Malthes of the Dutch Bible Society, who was sent out in 1846, and has published Makassaarsche Spraakkunst (1858), Makassaarsch-Hol- landsch Woordenboek (1859), Ethnographische Atlas (1859), Makassaarsche Chrestomathie (1860), and various com- munications to the Zeitsch. der morgenl. Gesellsch.

The department of the Northern Districts, called also Maros (properly Marusa), from the chief town, lies to the north of Macassar, and is divided into twenty-six districts. It is watered by the River Maros, which has a channel of great picturesqueness broken by waterfalls and bordered by eaves, ‘The mineral products comprise gold, marble, porcelain-clay, and anthracite; but the extensive rice-fields are the principal source of wealth. The river is commanded by the fort of Valkenburg; and a great road, constructed in 1859, leads through the department. About five miles from the town are the warm mineral springs of Amarang and Magemba. The population is estimated at 120,000. The prevailing language is Buginese, but Macassar is also spoken by a considerable number.

The department of the Southern Districts, or Takalla, lies to the south-west of Macassar, and is divided into two parts by the interposition of the little independent state of Sanraboni. The population is estimated at 70,000, and the language is Macassar. The people of the district of Glissong or Galesong are remarkable for their attachment to a sea- faring life. In 1863 the department was increased by the annexation of Turateya, which included the three small states of Bintamo, Bangkala, and Laikan, previously troublesome by their piracies and raids. The Turateyans speak a mixture of Macassar and Buginese.

Separated from Turateya by the River Tino is the depart- ment of Bonthain and Bulecomba, a thinly-peopled and mountainous country, chiefly remarkable for the lofty summit of Lompobattang or Dikbuik, more

familiarly known as the Peak of Bonthain, which has a height of about 11,000 feet. The soil is specially adapted for the culture of coffee. The inhabitants are peaceful and well- behaved, but in education and civilization they are less advanced than those of the departments already described. They were formerly subordinate to the Macassar kingdom.

To the north of these two states lies the important kingdom of Boni, of which an account will be found ina separate article (vol. iv. p. 32), and to the north of Boni, and separated from it by the River Chinrana, is the rival kingdom of Wajo or Wadjo, with a coast line of about 50 miles along the Gulf of Boni. It is governed by about forty chiefs or nobles, who are almost independent in their respective districts and maintain their individual bands of followers, but at the same time recognize the overlordship of the prince. The different offices of the state are not unfrequently held by women ; and the greatest importance is attached to purity of descent. The inhabitants rather

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CELEBES

neglect the culture of the soil ; and large numbers of them The capital was formerly Tesora or Tossora, a large straggling city near the River Chinrana, embracing within its fortifications a

resort to the neighbouring states as traders,

space of several miles in circuit. For numerous details

on this district the reader may consult Mundy’s Narrative

of Hvents im Borneo and Celebes, vol. i.

To the south-west of Wadjo is the kingdom of Sopeng,

which was long connected by intermarriages with Boni.

The ground is very fruitful, and large quantities of rice are exported. The capital was formerly a place of the same name on the coast; but the rajah removed his residence Sopeng recognized the

to Sengkang on Lake Tempe. Dutch supremacy in 1825. at 18,000.

The population is estimated

To the north of Sopeng lies the territory of Adja Tam-

karang, under the government of the prince of Lidenring, who takes lis title from a small principality of that name. It is traversed by the Sadang River, one of the most important of those that flow into the Strait of Macassar.

Round the head of the Bay of Boni stretches the kingdom of Luvu (Loewoe), a well-peopled district, productive of gold and excellent iron, but greatly depressed by an unsatis- factory government. To the south-west of Luvu lie the districts of Ussu and Lellevau, and south of these the state of Baikonka or Minkoko, with its capital Pansulai on the Gulf of Boni; but the whole of this region is comparatively unexplored. The Minkokos have a considerable resemblance to the Dyaks of Borneo, and maintain a similar custom of head-hunting. Their language is akin to Buginese.

At the very end of the eastern peninsula is situated the district of Polean Rumbia, conterminous on its north-east boundary with the more important territory of Lavui, which stretches along the coast of the Bay of Tolo, and is tribu- tary to the king of Boni. The latter district possesses in Kendari or Vosmaer’s Bay one of the finest harbours in the archipelago, and it carries on a certain amount of traffic. The coast is frequented by numbers of the Bajows.

The rest of the lands that lie round the Bay of Tolo belong to the residency of Ternate. Conterminous with Lavui is the principality of Tombuku, a densely-wooded, and partially-explored territory, governed by an hereditary chief under the sultan of Ternate. The population is mainly settled in the interior, and their numbers were estimated in 1852 at 15,000. They have no regular coin, and strips of cotton cloth are used in exchange. Their language seems to have almost no connection with any other in the archipelago.

Among the people along the coast excellent workers in metal are found, and earthenware is also manufactured. The capital was formerly Lanona ; but since 1856 this honour belongs to Sabita. At the very head of the bay is the district of Tomore or Tomaiki, with a river of the same name; while along the northern side ate situated the territories of Bangay and Balante. From the latter iron and timber are exported.

The country that lies round the Gulf of Gorontalo belongs to the residency of Manado, and is divided into the Minahassa or Confederation of Manado, the department of Gorontalo, and various states, such as Parigi, Bwool, and others that will be mentioned in the course of the article.

Of these the most important is the Minahassa, or properly Ni-mahassa, of Manado, which derives its name from the union of thirty-six states under the Dutch Supremacy to resist the claims of the king of Bolang, who had made himself at one time master of the district. It occupies the most eastern part of the northern peninsula, and is divided into the five departments of Manado, Kema,

ondano, Amurang, and Bolang. Of the whole island it is the most distinctly volcanic portion, and contains several mountains that have been in active eruption within modern

times. The most important summits are those of Klabat (6560 feet high), Saputan (5960), Engerong (4050), Lokon (5240), Prumangan or Mahabu (4300), Kimavang, and Papelampungan. In 1806 the Mountain Toukoko threw forth a quantity of ashes and pumice-stone that darkened the air for two days and covered the ground for many miles with a layer an inch thick. There are numerous boiling springs and geysers, the most interesting being Lahendang, where the Count Charles de Vidua de Conzano met with his death in 1830. An interesting account of a visit to several of these volcanic phenomena is given by Mr Bickmore in his Hast Indian Archipelago. Perhaps in no part of their possessions have greater and happier transformations been effected by the Dutch than in this district. In the beginning of this century the inhabitants were still savages, broken up into numerous tribes that were almost never at peace with each other, and speaking such a variety of dialects that hardly any village was quite intelligible to its neighbours. About 1822 it was discovered that the soil of the mountain sides was fitted for the growth of coffee; the cultivation was introduced and a system established which stimulated the native chiefs to undertake the management of the plantations. The result has beey not only to make the Minahassa one of the best coffee districts in the archipelago, but to advance the civilization of the inhabitants in a wonderful manner. Missions have been established by the Dutch Missionary Society, and have met with the most encouraging success. In 1859 the mission schools numbered 102, and were attended by 8996 pupils ; while at the same time 12 Government schools had 1049 pupils and 28 village schools had 1610. The various local

dialects are rapidly being replaced by Malay, which is the language adopted for educational purposes. The villages, which have grown up in considerable numbers, are neat and tidy, and most of the houses are well built ; the country is traversed by good roads, finely-shaded with trees and in many cases fit for carriages; and bridges have been erected over the rivers. The trade of the district is in a flourishing condition and promises to become more important. The principal articles are the coffee, cocoa, rice, and trepang. In 1858 the number of households employed in the coffee-culture was 12,909; the number of trees in regular gardens was 3,449,518 ; and their produce for the year amounted to 22,866 piculs, Since that date the plantations both of the Government and private speculators have very largely increased. The plant succeeds admirably at a height of from 1500 up to 4000 feet above the sea, and produces a fine kernel of a trans- lucent greenish blue colour, which is known in the market as Manado coffee, and brings a much higher price than the Java growth. Cocoa was probably introduced by the early Spanish navigators, but it received little attention till about 1822, when some Dutch and Chinese settlers undertook its cultivation. Since that time it has become a pretty important article, and has been introduced into Gorontalo and the Sangir Islands ; but the crop is unfor- tunately a somewhat precarious one. The koffo or Manilla- hemp (Musa textilis) is largely grown, more especially in the neighbourhood of Amurang, where the Government has established a rope factory. The nutmeg, though only introduced in 1853, is now cultivated pretty extensively, Tobacco is also grown, but mainly for home consumption. The best is obtained from the district of Bantek, The population of the Minahassa was, in 1868, 105,514.

The department of Gorontalo comprises the various districts of Gorontalo, Limbotto, Bone, Bintauna, Suvava, Bolango, Attingola, Bualemo, Muton, Parigi, Saussu, Posso, Tongko, Todjo, and the Togian Islands. Goron- talo proper lies on the north of the Tomini Bay. The in- habitants are mainly Mahometan Malays, and they ‘possess

about 200 Mahometan priests, most of whom can neither read nor write. The capital is a large and flourish- ing town with considerable trade ; it has a Dutch garrison and fort, and a Christian school. ‘The rivers and lake furnish abundance of fish, and almost every house has a pond attached for keeping those captured alive. Limbotto, a small state of about 6000 inhabitants, since 1865 under Dutch direction, is chiefly noticeable for the Bay of Kwandang and the gold-mines of Limbotto, Bulatu, and Sulametta. Muton possesses several gold-mines, The village of that name lies in 0° 23’ N. lat. and 121° 30’ 18” . long. Along the northern coast to the north of Muton lie the states of Palele, Bwool, and Tontoli, of which the second is the most important, being traversed by one of the largest rivers in the island, and possessing valuable gold-mines and great numbers of sago-palms. The composition of its population in 1870 was (according to J. G. F. Riedel in the Zyjdschrift voor Indische Taal-, Land-, en Volkenkunde, 1874) 4229 natives, 726 from Gorontalo and Limbotto, 466 from Kayeli, 230 Buginese, 84 Tontoli, 38 Mandharese, and 22 Arabs. Tontoli was formerly the resort of pirates, but in 1822 it was cleared by Captain De Man.

Along the south side of the Bay of Gorontalo stretches the country of Parigi from Amphibabu to the River Dulagu. It has a very fertile territory, and a considerable trade is carried on with Palos and Dongala, the districts on Tomini Bay, and Singapore. The exports are gold, horses, cocoa- nuts, bananas, and a kind of resin called damar. Parigi recognized the Dutch supremacy in 1850, but has pre- served its autonomy, and is governed by a prince and several chiefs. The principal village is Parigi di Atas.

On the west coast of the island, and forming as it were the nucleus from which the peninsulas spring, lie the districts of Dongala, Palos, and Kayeli. Dongala is situated on the Bay of Palos, and is governed by a rajah who recognized Dutch supremacy in 1824. Palos is governed by an independent chief, and is in a flourishing condition. The town is situated in 0° 57’ 8. lat. and 119° 34’ E. long., and is connected by road with Parigi and Boni. Its inhabitants carry on an active trade both by sea and land. The kingdom of Kayeli was at one time under the sultan of Ternate, passed by conquest to the people of Macassar, was restored to the sultan by the treaty of Bonga, and was by him presented to the Dutch, whose authority was only recognized in 1854, The soil is well fitted for cultivation, and yields coffee

and cocoa-nuts for export. The kingdom of Mandhar lies further south, and is governed by seven chiefs, who take their titles from the seven principal rivers, and till 1854 recognized the supremacy of Boni. The in- habitants speak a distinct language. Those on the coast are nominal Mahomctans, those inland are still pagan. They are active traders, and take voyages to Java, Bencoolen, Malacca, Singapore, and Manilla. Toradja, which lies further inland, is possessed by a wild pagan race, who keep themselves apart from all intercourse, and are gener- ally regarded as the original inhabitants of the island.

Celebes was first discovered by the Portuguese in the early part of the 16th century, the exact date assigned by some authorities being 1512. The name does not appear to be of native origin, and the plural form is probably due to the belief that the different peninsulas were so Inany separate islands. At the time of the Portuguese discovery, the Macassars were the most powerful people in the island, having successfully defended them- selves against the king of the Moluccas and the sultan of Ternate. In 1609 the JUnglish attempted to gain a footing. At what time the Dutch first arrived is not certainly known, but it was very probably in the end of the 16th or beginning of the 17th century, since in 1607

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they formed a connection with Macassar. In the year 1611 the Dutch East Indian Company obtained the monopoly of trade on the Island of Buton; and in 1618 an insurrection in Macassar gave them an opportunity of obtaining a definite establishment there. In 1660 the kingdom was finally subjugated by Van Dam and Truit- man, with a fleet of 33 ships and a force of 2700 men, In 1666 the war broke out anew; but it was brought to an end by Speelman in the following year, and the treaty of Bonga or Banga was signed, by which the Dutch were recognized as the protectors and mediators of the different states who were parties to the treaty. In 1683 the north-eastern part of the island was conquered by Robert Paddenburg, and placed under the command of the governor of the Moluccas. In 1703 a fort was erected at Manado. ‘The kingdom of Boni was successfully attacked by Van Geen in 1824, and in August of that ycar the Bonga treaty was renewed in a

greatly modified form, Since then the principal military event is the Boni insur- rection, which was quelled in 1859. With the exception of Manado, the Dutch settlements in Celebes have not been financially successful; but as the resources of the country are developed it will, doubtless, become a very valuable possession.

InVeth's Woordenbock van Nederlandsch Indié there will be found an extensive bibliography of Celebes drawn up by H. C. Millies. Besides the well-known works of Valentyn, Stavorinus, Raffles, and Crawfurd, it will be sufficient to mention Van den Bosch, Nederland- sche Bexittingen in Azia, &c., 1818; Vincent, '' Notice sur l'isle de Celebes," in Journ. des Voyages, 1826; Olivicr's Reizen, 1884; Reinwardt's Reis naar het Oostelijk gedeclte van den Ned. Archipel. in 1821, 1858 ; Van der Hart, Reize rondom het Hiland Celebes, 1858 ; Samuel Whitc, Aceouwnt of the last rebellion at Macassar, 1687 ; Stubenvoll's Translation of History of the Island of Celebes, by Mr R. Blok, Gov. of Maeassar, 1817 ; Capt. R. Mundy, Narrative of Events in Borneo and Celebes, 1848; Ed. Dulaurier, Code Maritime des Royaumes Mangkassar et Bougui, 1845; Wallace, Malay Archi. pelago, 1869; Bickmore, Hast Indian Archipelago, 1868; Veth's Een Nederlandseh reiziger op Zuid Celebes, 1875; Riedel's ZHet landsehap Bocool, Noord Sclebes, 1872; the same writer's '' Die landsehaften Holontalo, Limoeto," &c. in the Zedtschr: fiir Eth- nologic, 1871; Beccari's '* Viaggio" in Guido Cora's Cosmos for 1874-6. (H. A. W.)

CELERY (Apiwm graveolens), a biennial plant bclong- ing to the Natural Order Umbellifere, which, in its native condition, is known in England as smallage. In its wild state it is common by the sides of ditches and in marshy places, especially near the sea, producing a furrowed stalk and wedge-shaped leaves, the whole plant having a coarse, rank taste, and a peculiar smell. By cultivation and blanching the stalks lose their acrid qualities and assume the mild sweetish aromatic taste peculiar to celery asa salad plant. The plants are raised from seed, sewn either in a hot bed or in the open garden, according to the season of the ycar, and after one or two thinnings out and transplantings, they arc, on attaining a height of 6 or 8 inches, planted out in deep trenches for convenience of blanching, which is effected by earthing up and so excluding the stems from the influence of light. A large number of varietics are cultivated by gardeners, which are

ranged under two classes, white and red,—the white varieties being generally the best flavoured, and most crisp and tender. As a salad plant, celery, especially if at all “stringy,” is difficult of digestion, but it possesses valuable diuretic properties. Both blanched and green it is stewed and used in soups, the seeds also being used as a flavouring ingredient. In the south of Europe celery is seldom blanched, but is much used in its natural condition.

Celeriac is a variety of celery cultivated more on account of its roots than for the stalks, although both are edible and are used for salads and in soups. It is chiefly grown in the north of Europe, and is not in much request in Great Britain.

CEHEL—CEL

CELESTINE, the name of five popes.

CeLesTINeE I. was a Roman, and is supposed to have been a near relative of the Emperor Valentinian. Various portions of the liturgy are attributed to him, but without any certainty on the subject: He held the Council of Ephesus in which the Nestorians were condeimned, in 431. Four letters written by him on that occasion, dated all of them 15th March 431, together with a few others, to the African bishops, to those of Illyria, of Thessalonica, and of Narbonne, are extant in retranslations from the Greek, the Latin originals having been lost. He actively persecuted the Pelagians, and was zealous for Roman orthodoxy. He sent Palladius, a Greek, to Scotland, and Patricius (St Patrick) to Ireland. He raged against the Novatians in Rome, imprisoning their bishop, and forbid- ding their worship. He was zealous in refusing to tolerate the smallest innovation on the constitutions of his pre- decessors, and is recognized by the church as a saint. He occupied the scat of St Peter eight years five months and three days, and died on the 6th April 432. He was buried in the cemetery of St Priscilla in the Via Salaria, but his body, subsequently moved, lics now in the Church of St Prasside.

CeLEsTINE IT. was elected in 1143, governed the church only five months and thirteen days, died 9th March 1144, and was buried at the Lateran. His name had been Guido di Castello, from the small town of which he was a

native. He had studied under Peter Abelard. The principal act of his Papacy was the absolution of Louis VIL' of France at the request of that penitent monarch, and the removal of the interdict under which that country had lain for three years.

CeLEstine III, Giacinto Bobone Orsini, of that noble race, was elected Pope 30th March 1191, being then only a deacon, received priest's orders on the 13th of April, ruled the church six years, nine months, and nine days (though belizved to have been ninety when elected), died 8th January 1198, and was buried at the Lateran. He crowned the Emperor Henry VI. on the day after his election with a ceremonial symbolizing his absolute supremacy, as described by Roger Hoveden, who is believed (more reasonably as it would seem) by Baronius, but discredited by Natale Alexander. He subsequently excommunicated thesame Henry for wrongfully keeping Richard of England in prison, In 1192 he confirmed the statutes of the Teutonic Order of Knights. He would have resigned the Papacy, and recommended a successor shortly before his death, but was not suffered to do so by the cardinals.

Curxstine IV., Godfrey Castiglioni of Milan, a nephew of Urban III., became a monk at Hauteeombe in Savoy, there wrote a history of Scotland, and was elected Pope by seven cardinals only, in the midst of troubles caused by the vicinity and violence of the Emperor Frederick II., on the 22d September 1241. He occupied the throne only seven- teen days, died, before consecration, on the 8th October 1241, and was buried at the Vatican.

Ceestine V. was known before his election as Peter di Morone. Born in 1215, the son of a peasant in the Neapolitan district, named Angelario, he became a Benedictine monk at Faifoli in the diocese of Benevento when he was seventeen. He showed from the first an extraordinary disposition to asceticism and solitude, and in 1239 retired to a solitary cavern on the mountain Morone, whence his name. Five years later he left this Tetreat, and betook himself, with two companions, to a similar cave on the Mountain of Majella in the Abruzzi, where he lived as strictly as was possible according to the example of St John the Baptist. Terrible accounts are given of the severity of his penitential practices. While living in this manner he founded, in 1244, the order sub.

sequently called after him Celestines. (See Crnrstinus.) The cardinals assembled at Perugia after the death of Nicholas IV., and after long dissensions and difficulties agreed asa means of escaping from them to clect the hermit Pietro di Morone. When sent for he obstinately refused to accept the Papacy, and even, as Petrarch says,! attempted flight, till he was at length persuaded by a deputation of cardinals accompanied by the kings of Naples and Hungary. Elected 7th July 1294, he was crowned in the city of Aquila in the Abruzzi, 29th August. He issued two decrees,—one confirming that of Gregory X., which orders the shutting of the cardinals in conclave; the second declaring the right of any Pope to abdicate the Papacy, —a right he, at the end of five months and cight days, proceeded himself to exercise at Naples on the 13th December 1294. He did one other thing which may be noted, because it seems to be the only instance known to the church in which such a thing occurred, He empowered one Francis of Apt, a Franciscan friar, to confer priest's orders on Lodovico, son of Charles, king of Sicily,—a fact which seems to have escaped the notice of Bingham, who says that such a thing was never done.* In the formal instrument of his renunciation he recites as the causes moving him to the step, "the desire for humility, for a purer life, for a stainless conscience, the deficiencies of his own physical strength, his ignorance, the perverseness of the people, his longing for the tranquillity of his former life ;" and having divested himself of every outward symbol of dignity, he retired to his old solitude. He was not allowed to remain there, however. His successor, Boniface VIII., sent for him, and finally, despite desperate attempts of the late Pope to escape, got him into his hands, and imprisoned him in the castle of Fumone near Ferentino in Campagna, where, after languishing for ten months in that infected air, he died on the 19th May 1296. He was buried at Ferentino, but his body was subsequently removed to Aquila. Many Dantescan commentators and scholars have thought that the poet stigmatized Celestine V. in the enigmatical verse which speaks of him "Che fece per viltd lo gran rifinto."3 Recent opinion on the point more reasonably rejects this interpretation. Celestine V., like the first of the name, is recog- nized by the church as a saint.

CELESTINES, a branch of the great Benedictine monastie order. At the foundation of the new rule, they were called Hermits of St Damiano, or Moronites (or Murronites), and did not assume the appellation of Celestines till after the election of their founder to the Papacy as Celestine V. The fame of the holy life and thie austerities practised by that saintly hermit (as noticed above) in his solitude on the Mountain of Majella, near Sulmona, attracted many visitors, several of whom were moved to remain and share his mode of life. They built, therefore, a small convent on the spot inhabited by the holy hermit, which very shortly became too small for the accommodation of thosc who thronged thither to share their lifé of privations. Peter of Morone, their founder, therefore built a number of other small oratories in that neighbourhood. This happened about the year 1254. A new religious community was thus formed, and Peter of Morone gave them a rule formed in accordance with his own practices. In 1264 the new institution was approved by Urban IV. But the founder, having heard that it was probable that Pope Gregory X., then holding a council at Lyons, would suppress all such new orders as had been founded since the Lateran Council, having commanded that such institutions should not be further multiplied, betook himself to Lyons,

1 De Vit. Solit.; lib. ii. sec. 3, ch. 18.

2 Orig. Eccl., lity ii. cap. 8, sec. 5.

3 ““Who made from cowardice the great refusal,” Inferno, canto iii, line 60,

and there succeeded in persuading Gregory to approve his new order, constituting it a branch of the Benedictines, with a rule based on that of St Benedict, but adding to it many additional severities and privations. Gregory further took it under the Papal protection, assured to it the possession of all property it might acquire, and endowed it with that great and constant, but most pernicious and fatal, object of the ambition of all monastic orders, exemption from the authority of the ordinary. Nothing more was needed to eusure the rapid spread of the new association ; and Peter the hermit of Morone lived to see himself “ Superior-General” of thirty-six monasteries and morethan ‘six hundred monks. Peter, however,

cannot be accused of ambition or the lust of power when a monastic superior, any more than when he insisted on divesting himself of the Papacy, to which he was subsequently raised. As soon as he had seen his new order thus consolidated he gave up the government of it to a certain Robert, and retired once again to a still more remote solitude to give himself up more entirely to solitary penance and prayer. Shortly afterwards, in a chapter of the order held in 1293, the original monastery of Majella being judged to be too desolate and exposed to too rigorous a climate, it was decided that the monastery which had been founded in Sulmona should be the headquarters of the order and the residence of the General-Superior, as it has continued to be to the present day. The next year Peter the hermit of Morone, having been, despite his reluctance, elected Pope by the name of Celestine V., the order he had founded took the name of Celestines. The hermit Pope found time in the few short months of his Papacy to confirm the rule of the order, which he had himself composed, and to confer on the society a variety of special graces and privileges. In the only creation of cardinals promoted by him, among the twelve raised to the purple, there were two monks of his order. He found time also to visit personally the great Benedictine monastery on Monte Casino, where he suc- ceeded in persuading the monks to accept his more rigorous rule. He sent fifty monks of his order to introduce it, who remained, however, for only a few months.

After the death of the founder the order was favoured and privileged by Benedict XI., and rapidly spread through Italy, Germany, Flanders, and France, where they were received by Philip the Fair in 1300. Subsequently the French Celestines, with the consent of the Italian superiors of the order, and of Pope Martin V. in 1427, obtained the privilege of making new constitutions for themselves, which they did in the 17th century in a series of regula- tions accepted by the provincial chapter in 1667. At that time the French congregation of the order was composed of twenty-one monasteries, the head of which was that of Paris, and was governed by a Provincial with the authority of General. Paul V. was a notable benefactor of the order. But in consequence of later political changes and events the order has been dissolved.

According to their special constitutions the Celestines were bound to say matins in the choir at two o’clock in the morning, and always to abstain

from eating meat, save in illness. The specialities of their rule with regard to fasting would be long and tedious to recount. It cannot be said that they are more severe than those of sundry other con- gregations, though much more so than is required by the old Benedictine rule. But in reading their minute directions for divers degrees of abstinence on various days, it is impossible to avoid being struck by the conviction that the great object of the framers of these rules, beyond the general purpose of ensuring an ascetic mode of life, was to create a speciality, to make a distinguishing difference between what “ our ” order does and what others do.

The Celestines wore a white woollen cassock bound with

a linen band, anda leathern girdle of the same colour, with a scapulary unattached to the body of the dress, and a black hood. It was not permitted to them to wear any shirt save of serge. Their dress in short was very like that of the Cistercians. But it is a tradition in the order that in the time of the founder they wore a coarse brown cloth. The church and monastery of St Pietro in Montorio originally belonged to the Celestines in Rome; but they were turned out of it by Sixtus IV. to make way for Franciscans, receiving from the Pope in exchange the Church of St Eusebius with the adjacent mansion for a monastery.

The order of Celestines has had its special historians, as Becquet, author of a history of the Celestines of France (Paris, 1719), and in the great collection of the Bollandists, vol. iii., under the month of May. But the order does not seem to have becn fruitful of men of much mark ; nor has it ever attained in the annals of Europe, or even of the church, a position of such importance as most of its rival societies have reached.

CELIBACY is the condition of those who are living a single life. The word is derived from celebs, which means, not necessarily, as is very commonly supposed, a bachelor, but one who has no existing wife, whether he be a bachelor or a widower. (For authorities on this point, see Facciolati, Totius Latinitatis Lexicon.) Scaliger and Voss derive the word from xoiry, a bed, and Ae«izw, to leave. Some more fanciful etymologists, imagining that celebs leads a celestial life, have suggested a derivation from calum. The

word is sometimes written celebs, but the better authorities are in favour of the diphthong «.

From the remotest times, those who have given their attention to the study of the conditions of human life in this world have deemed the married state to be a better thing both for the individual and the society to which he belongs than celibacy ; while from an equally early period those who have professed to understand man's destinies in a future world, and the most proper means of preparing for them, have, though in no wise condemning marriage, con- ceived that celibacy is the better, purer, nobler, and higher condition of life. Lawgivers, sociologists, statesmen, philosophers, and physiologists have held the former view; devotees, ascetics, priests, the latter.

The lawgivers of various countries and ages have striven to discourage celibacy, as far as it was in the power of law to doso. The mention by Dionysius of Halicarnassus of an ancient law by which all persons of mature age were obliged to marry, may be cited. More authentic is the Roman law of the time of Augustus known as the Lex Julia de maritandis Ordinibus. It was afterwards called Papia Poppeea, or Julia Papia, from some new sanctions and amendments under the consuls Papius and Poppeus. Modern legislation has with increased wisdom shrunk from such direct attempts to coerce those subjected to it. But various provisions have in many European countries been enacted or proposed with the view of' favouring the preval- ence of marriage.

Any endeavour to give a satisfactory account of the investigations of physiologists, as bearing on this subject would lead us too far afield into the discussion of topics which fall more conveniently and appropriately under other headings. But it appears from recent statistics that married persons,—women in a considerable but men in a much greater degree,—have at all periods of life a greater probability of living than the single.

The ideas which, in the absence of or in opposition to the deductions of social philosophers and legislators, have found expression in the religious or ecclesiastical observ- ances and theories of various ages and creeds, require and are fitted to be treated, though with the utmost brevity, in a

somewhat more historical manner. Beausobre, in his Histoire Critique du Manichéisme, lib, vii. cap. 3, shows

that it was a prevalent opinion among the earliest Christians that if Adam had not fallen by disobedience, he would have lived for ever in a state of virgin purity, and that a race of sinless beings would have peopled Paradise, produced by some less objectionable means than the union of the first pair of mortals. Marriage was considered by them as a consequence of the Fall, the brand of the imper- fection it had entailed, and a tolerated admission of an impure and sinful nature. To abstain from it, therefore, was the triumph of sanctity and at the same time the proof and the means of spiritual perfection. The earliest aspirants to this perfection among the Christians were not ecclesiastics as such, but hermits and anchorites, who adopted this among other means of attaining to recognizedly exceptional sanctity. Itis not true, as is often stated, that the official expositors of Romanist theology and ecclesiastical law maintain that a vow of perpetual celibacy was required as a condition of ordination in the earliest ages of the church. It is fully admitted by them that, “although celibacy is preferable to matrimony, the divine law does not make it necessary for the reception of holy orders, or forbid cither the ordination of married men or the marriage of those already in orders.” In fact it would be impossible to maintain the reverse without denying the truth of many portions of ecclesiastical history, which the church cannot afford to spare, as to the conduct and lives of many of the early bishops, confessors, and martyrs, and without running very serious risk of damaging the favourite claim of the church to uninterrupted apostolical succession.

It was proposed in the second Council of Carthage (251) that celibacy should be required in candidates for the priesthood; but it cannot be pretended that even from that time it was always considered necessary. Moroni (Dict. Storico Hccles., vol. ii. p. 58) makes a very much modified statement :—‘“‘As regards the usage and laws of the church,” he says, “it has never been permitted to priests or to bishops to take wives, when they had declared at the time of their ordination that they would persevere in celibacy.” It must be observed, however, with regard to the citations of the

cases of bishops and priests of the early Greek Church, that Romanist ecclesiastical writers have never pretended that the practice of the Greek Church was not much more lax in this respect than that of the Latin or Western Church. ‘The difference between the discipline of the one and the other was this. In the Greek Church no objection was made to the ordination of married men purposing to continue living with their wives, if these wives were their first wives, and had not before their marriage been widows ; whereas, as is claimed by Romanist writers, in the Latin Church neither priests’ nor bishops’ orders were ever conferred on married men without re- quiring from them and from their wives reciprocal consent, and a solemn promise, that they would live separately during the remainder of their lives. As regards bishops, however, the practice in the Greek Church was the same as in the Latin. The decrees of various councils, how- ever, show that the practice of the Greek Church in this respect was by no means settled and uniform. That of Ancyra in 313 permitted marriage only to such deacons as had protested against accepting the obligation of celibacy at the time of their ordination. The Council of Nice thought that the ancient tradition of the church should be re-established in conformity with the 26th apostolical canon, which permitted marriage only to those who held the office of readers or chanters in the churches.

The principal Papal decrees which have been issued by the popes on the subject of sacerdotal celibacy are the following. It is said that Calixtus I., who was elected in 221, renewed a constitution forbidding the marriage of priests, It is said, too, that Lucius I, elected in 255, re-

enacted the same prohibition. We do not, however, reach any certainty on the subject till we come to the Council of Elvira, the first of those on matters of discipline the decrees of which are extant. It is doubtful whether this council was held in the year 300 or 313. The thirty-third and thirty-sixth canons of this council command bishops, priests, deacons, and subdeacons to live apart from their wives. The council further prohibited ecclesiastics from having any female in their houses save a sister or a daughter, and those only when virgins, who had consecrated their virginity to God. The ecclesiastical writers maintain that these constitutions were but

the confirmation by authoritative sanction of the practice which had been immemorially observed, rather as an apostolic tradition than a positive command. From that time to the time of Gregory VII. (the great Hildebrand, elected 1073), a series of popes issued decrees commanding bishops, priests, and deacons to observe celibacy. But all of them are couched in terms, and put forth under circumstances, which indicate that the regulation was by no means universally, perhaps even it may be said generally, observed. Gregory VII., in the council held at Rome in the year 1074, determined more decisively and vigorously that, according to the sacred canons and the decrees of his predecessors, no ecclesiastic could be a married man, that the sacrament of ordination should be conferred on none except those who professed perpetual celibacy, and that no wived priest should celebrate or even assist at the Mass.

Upon the whole it is clear that the pretension advanced by the Church of Rome to insist on the celibacy of its clergy was at first put forward tentatively and gradually, as a thing desirable and tending to higher perfection, rather than as a thing absolutely necessary ; that, like so much else in that church, it was an encroachment on Christian liberty, originating in a mystic idea of the greater purity of a state of celibacy, which was a natural product of the working of the human intellect in the earliest centuries of Christianity, and became fixed and consolidated into a rigid law, as the rulers of the church, and especially Gregory VII., came to perceive that it wasa potent engine of ecclesiastical power. It is probable that Hildebrand, the nature of whose intellect and temper was such as eminently to qualify him for perceiving, appreciating at its true value, and utilizing the doctrine of the universal celibacy of the clergy, was the first ruler of the church who clearly saw the incalculably enormous power which this rule placed in the hands of the hierarchy as a body, yet more notably than it tended to increase that of each individual priest. To this and to this alone it has been and is due that a Catholic priest is the citizen of no country, and acknowledges or at least feels no allegiance, unless perhaps a subordinate and secondary one, save to his church, and that to him his order is in the place of family and country; and the greatness, the power, the glory, and the supremacy of the church constitutes that for which the best minds among the priesthood labour and live. But while churchmen were becoming more and more alive to the vast importance of celibacy as a sine

qua non of the priesthood, minds which were fitted to estimate that institution with a larger view to its ultimate results and consequences became at an early period aware of its verit- able conseyuences. Erasmus, in his 19th Epistle (lib. 29) gives us at once his own and Augustine's views of the subject in the following remarkable passage :—" Mirum vero si procus amans laudat nuptias, dicitque castum con- jugium non multum abesse a laude virginitatis, quum Augustinus patriarcharum polygamiam anteponat nostro ceelibatui."

But when the church stood at the diverging of the ways, fabled in the apologue, and at the Council of Trent decided

once and for ever which of the two paths open before her she should follow, whether that of progressive reformation and amelioration, or that of a sint-wt-sunt-aut-non-sint persistence in her old ways and policies, the abolition of the celibacy of the clergy was discussed among other proposed measures of reform, and more peremptorily rejected than almost any other suggestion brought forward. The church understood too well what was around her, and too little what was ahead of her; was too clear-sighted, yet too shortsighted; and determined to retain the terrible engine of her power, which makes of her a caste, with a gulf between her ministers and the rest of humanity.

CELLINI, Benvenuto (1500-1569), was born at Florence, where his family, originally landowners in the Val d'Ambra, had for three generations been settled. His father, Giovanni Cellini, was a musician, and artificer of musical instruments ; he married Maria Lisabetta Granacci, and eighteen years elapsed before they had any progeny. The father designed Benvenuto for the same profession with himself, and endeavoured to thwart his inclination for design and metal work. When he had reached the age of fifteen, his youthful predilection had become too strong to be resisted, and his father reluctantly gave consent to his becoming apprenticed to a goldsmith, Antonio di Sandro, named Marcone. He had already attracted some notice in his native place, when, being implicated in a fray with some of his companions, he was banished for six months to Siena. After visiting Bologna and Pisa, and after twice resettling for a while in Florence, he decamped to Rome. On his next return to Florence, his violent temper again

embroiled him in a quarrel, which again com- pelled him to retreat in disguise to Rome. Here he pro- duced a vase for the bishop of Salamanca, which introduced him to the favourable notice of Pope Clement VII.,—like- wise at a later date one of his celebrated works, the medallion of Leda and the Swan ; he also reverted to music, practised flute-playing, and was appointed one of the Pope's court- musicians. In the attack upon Rome by the Constable de Bourbon, which occurred immediately after, in 1527, the bravery and address of Cellini proved of signal service to the pontiff; if we may belicve his own accounts, his was the very hand which shot the Bourbon dead, and he after- wards wounded the Prince of Orange. His exploits paved the way for areconciliation with the Florentine magistrates, and his return shortly after to his native place. Here he assiduously devoted himself to the execution of medals, the most famous of which (executed a short while later) are Hercules and the Nemean Lion, and Atlas supporting the Sphere. From Florence he went to the court of the duke of Mantua, and thence again to Florence and to Rome. Here he avenged a brother's death by slaying the slayer ; and shortly afterwards he had to flee to Naples to shelter himsclf from the consequences of an affray with a notary, Ser Bencdetto, whom he wounded. Through the influence of several of the cardinals he obtained a pardon; and on the elevation of Paul III. to the pontifical throne he was reinstated in his former position of favour, notwithstanding a fresh homicide of a goldsmith which he had committed in the interregnum. Once more the plots of Pier Luigi, a natural son of Paul IIL. led to his retreat from Rome to Florence and Venice, and once more he was restored with greater honour than before. On returning from a visit to the court of Francis I., being now aged thirty-seven, he was imprisoned on a charge (apparently false) of having embezzled during the war the gems of the pontifical tiara ; he remained some while confined in the castle of Sant' Angelo, escaped, was recaptured, and was in daily expecta- tion of death on the scaffold. At last, however, he was released at the intercession of Pier Luigi's wife, and of the cardinal of Ferrara, to whom he presented a splendid cup.

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For a while ‘after this he wrought at the court of Francig I. at Fontainebleau and in Paris; but the intrigues of the king’s favourites, whom he would not stoop to conciliate and could not venture to silence by the sword, as he had silenced his enemies at Rome, led him, after about five years of laborious and sumptuous work, and of continually- recurring jealousies and violenccs, to retire in disgust to Florence, where he employed his time in works of art, aud exasperated his temper in rivalries with the uncasy- natured sculptor Baccio Bandinelli. Here, as well ag in a previous instance in Paris, he was accused of gross immor- ality; in his autobiography he rather repels than denies the charge, but he certainly repels it with demonstrative and grotesque vivacity. During the war with Siena, Cellini was appointed to strengthen the defences of his native city, and he continued to gain the admiration of his fellow-citizens by the magnificent works which he pro- duced. He died in Florence on 13th December 1569, and was buried with great pomp in the church of the Annun- ziata. Besides the works in gold and silver which have been alluded to, Cellini executed several pieces of sculpture on a grander scale. The most distinguished of these is the bronze group of Perseus holding the head of Medusa placed in front of the old Ducal Palace at Florence, a work full of the fire of genius and the grandeur of a terrible beauty, one of the most typical and unforgettable monuments of the Italian Renaissance, The casting of this great work gave Cellini the utmost trouble and anxiety; its completion was hailed with rapturous homage from all parts of Italy. Not less characteristic of its splendidly gifted and bar- barically untameable author are the autobiographical memoirs which he composed, beginning them in Florence in 1558,—a production of the utmost energy, directness, and racy animation, sctting forth one of the most singular careers in all the annals of fine art. His amours and hatreds, his passions and delights, his love of the sumptuous and the exquisite in art, his self-applause and self-assertion, running now and again into extravagances which it is impossible to credit, and difficult to set down as strictly: conscious falsehoods, make this one of the most singular and fascinating books in existence. Here we read, not only of the strange and varied adventures of which we have pre- sented a hasty sketch, but of the devout complacency with which Cellini could contemplate a satisfactorily achieved homicide ; of the legion of devils which he and a conjuror evoked in the Colosscum, after one of his not innumerous mistresses had been spirited away from him by her mother; of the marvellous halo of light

which he found surrounding his head at dawn and twilight after his Roman imprison- ment, and his supernatural visions and angelic protection during that adversity; and of his being poisoned on two several occasions. The autobiography has been translated into English by Thomas Roscoe. Cellini also wrote treatises on the goldsmith's art, on sculpture, and on design, Among his works of art not already mentioned, and many of which have perished, are a colossal Mars for a fountain at Fontainebleau and the bronzes of the doorway, coins for the Papal and Florentine states, a marble Christ in the Escorial palace, a magnificent button for the pontifical cope of Clement VII., a Jupiter in silver of life size, and a bronze bust of Bindo Altoviti. (Ww. M. RB.) CELSIUS, Anpers (1701-1744), a Swedish astronomer, was born at Upsala in 1701. After, travelling in Germany, England, Italy, and France, he took part in the famous expedition which was undertaken in 1736 by Maupertuis, Clairaut, Camus, and others, for the purpose of measuring a degree of the meridian in Lapland. He became member of the academies of Stockholm and Berlin, and of the Royal Society of London, and was appointed secretary of the Royal Society of Upsala, He died in his native town

in 1744, leaving several works on astronomical subjects, including Observations on the Measurement of the Earth (1738), A new method of Measuring the Distance of the Sun from the Harth (1730), and a paper in which he tried to show that the waters of the ocean are decreasing in volume.

CELSUS is the first writer against Christianity of whose objections we have any record. His history is juvolved in complete uncertainty. Our knowledge of his treatise is derived from Origen's work written against it. We should have expected some information from the Alexandrian in regard to the writer whose book he refutes. But when we examine Origen's statements carefully, we are led to the conclusion that Origen knew nothing about him. Celsus's treatise had been sent to him by Ambrosius with the request that he should grapple with its arguments. Origen had not heard before of the work or of the author. He thought that Christianity did not require a defence, but to please his friend, and with the hopc of benefiting those who were not

Christians, he sct about the task assigued. In the performance of this task he could not help making conjectures in regard to the author. He speaks of him in the preface “as long ago dead” (c. iv.). “We have heard,” he says in another passage (i. 8), “that there were two Epicurean Celsi, one in the time of Nero and this one [the author] in the time of Hadrian and after- wards.” But he could not make up his mind definitely that the Celsus, the author of the treatise, was an Epicurean. He says that he is proved to be an Epicurean from other writings (i, 8), He again and again calls him an Epicurean (i. 10, 21 ; ii. 60). He allows that Cclsus did not state in the treatise that he was an Epicurean (v. 3). He lays before his readers three suppositions in regard to him, either that he concealed his Epicurean opinions, or that he had changed to a better state of mind, or that he had merely the same name as the Epicurean (iv. 54). And he expresses his doubt quite distinctly,—The Epicurean Celsus, if indeed he is the person that composed the other two books against the Christians” (iv. 36), The “ other two books” here mentioned are in all probability, as Neander and Baur have shown, two parts of the book which Origen tries to refute, or that book and another which is mentioned as having been promised by Celsus, Origen expresses a similar doubt as to the authorship of a work ascribed to the Epicurean Celsus. ‘‘ You see how in these expressions he as it were accepts the reality of magic. I do not know if he is the same as the person who wrote several books against magic” (i. 68),

From these passages the inference may be drawn that Origen was very much in the dark as to who Celsus was and when he lived. The indications in the work itself are not much more satisfactory. But there is at least a clear indication of a period before which it could not have been written. Celsus makes mention of Marcellina (v. 62), who, according to Trenzus (i, 20, 4), came to Rome In the time of Anicetus (154 or 155 to 166 A.D.) In the same passage he mentions Marcion and his followers, and whatever may be the date of Marcion’s first arrival in Rome, we may again accept the statement of Irencus (iii. 4, 3) that he flourished in the time of Anicetus, As the followers of Marcellina and Marcion are spoken of, we may infer that both Marcellina and Marcion had had con- siderable success in propagating their opinions at the time Celsus wrote. A third clue to the date might be found in the mention of Dionysius, an Egyptian musician with whom Celsus had associated (vi. 41). In all probability this Dionysius was the younger

Dionysius of Halicarnassus who was termed povouxds, and who discussed in his books Just such points as those to which Celsus alludes. If this were the case, Celsus must have lived in the time of

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Hadrian, the period in which Suidas says that Dionysius flourished. But there is no conclusive evidence that this Dionysius lived in Egypt, though the. epithet " of Halicarnassus " proves nothing to the contrary, as it merely denotes that he was descended from the rhetorician and historian Dionysius of Halicarnassus. Some have found an indication of a date in the circumstance that oftener than once Celsus speaks of "the king " (viii. 68, 73), while in one passage (viii. 71) he speaks of " those who now rule." They infer from this that there were two emperors associated together in the government, but that one of them was far more prominent than the other, in fact that they were Marcus Aurelius and his son Commodus (Keim, p. 265). But the inference is not warranted. The last expression is a general expression, not applicable to the emperors only but to all rulers of the period, and if the other statements were to be pressed they would rather point to a time when only one emperor was on the throne.

In this deficiency of evidence it is not wonderful that critics have varied widely as to the date of Celsus, but most have assigned a date somewhere between 150 and 180. Peter Faidit maintained that he flourished in the time of Nero, and in recent times Volkmar has argued for the opinion that Celsus was a contemporary of Origen (see Supernatural Religion, vol. ii. p. 228, -).

Outside of Origen's work we find no clue to the history of Celsus. The name was very common. Upwards of twenty persons of the name are mentioned within the first three centuries of the Christian era (see Keim for the list, p. 276). But there is only one for whom any one has claimed identity with the Celsus of Origen. This is the Celsus to whom Lucian sent his treatise Pseudomantis, giving an account of the imposture of Alexander of Abonoteichos. We think that this identification is a mistake, The Celsus of Origen is unquestionably not an Epicurean, The Celsus of Lucian could scarcely be anything else. The tractate of the satirist is full of extravagant praises of Epicurus. The defence of Epicurus as "aman truly holy and divine in his nature, and who alone with truth ascertained what was beautiful," is

said to be specially agreeable to Celsus. The followers of Plato and Chrysippus and Pythagoras are alluded to con- temptuously,—an allusion which would have applied pointedly to the Celsus of Origen. If an identity could have been proved, the date of Celsus would have been ascertained ; for Lucian mentions the war of Marcus Aurelius with the Quadi and Marcomanni as a con- temporaneous event. It is very likely that the Epicurean Celsus mentioned by Origen as living in the time of Hadrian is the same as the Celsus of Lucian.

Happily we are uot left in the same doubt in regard to the treatise of Celsus as we are in regard to his life. In refuting it Origen adopted the plan of going through it in regular sequence, taking one passage after another in the order in which he found them in the book. He has not adhered to this rule with absolute fidelity, but his devia- tions from it are few, and as he generally quotes the exact words, a large portion of the treatise has thus come down to us. The remains of it are so numerous that we can form an accurate notion of the whole work. The treatise was called a “true discourse” (Adyos dn Oys). Origen states at the end of his work against it (viii. 76) that Celsus intended to write a sequel to it, in which he was to supply rules of practical life for those who wished to embrace his opinions. Whether he ever carried out his intention history does not state.

In the Zrue Discourse, Celsus shows great philosophical and critical powers. He takes note of almost every objec- tion which has been brought against Christianity, and his position is substantially that which is assumed by the

scientific opponents of Christianity inthe present day. The True Discourse is divided into two parts. In the first he does not speak in his own person, but introduces a Jew who discusses from the Jewish point of view the credibility of the statements made by Christians in reference to the life of Jesus. There was considerable advantage in this mode of procedure. Celsus himself did not believe in the supernatural. The only possibility of the existence of such a person as the Christian Jesus that he could conceive depended upon his being demonic, but Jesus showed nothing of that majesty, that grandeur, that energy of will in worldly affairs which he

deemed essential tothe demon. He therefore rejected his pretensions entirely as inconsistent with his philosophy; but he believed that even on the basis of a philosophy which permitted the supernatural the claims of Jesus must be rejected. And so his arguments are made to come from a Jew. The Jew rejects the miraculous birth of Jesus. Mary was divorced from her husband, and wandering about fellin with a Roman soldier, Panthera, who was the father of Jesus. Jesus being needy went down to Egypt and there learned all the tricks by which he could work apparent miracles, and on the strength of this knowledge he claimed to be God when he returned to Judea. But who could believe the statements made in regard to him,—who heard the voice at his baptism? None but himself and a companion who shared his dream or rather his imposture. The miracles ascribed to him are absurd. Any one could see such miracles by paying a few obols to an Egyptian juggler. IfJesus was God, would he have chosen such wicked and worthless men as his apostles ? If he knew that Judas would betray him, why did he make him his companion? But the story of the resurrection especially seemed absurd. He was condemned publicly before the eyes of all. No one could doubt this. If he rose again, why did he not make his justification as public 4 Would he not have confronted his judge, his accusers, the general public, and given indubitable evidence that he was not a malefactor? And who saw him after he rose again ? A half insane woman and one or two followers who were in the very humour to trust to dreams or to an excited fancy. In this way the Jew discusses many of the statements made in the gospels, and comes to the conclusion that Jesus was an ordinary man.

In the second part Celsus tests the beliefs of the Christians by his philosphical principles. He then shows that the Greeks had all that was true in Christianity, but in a nobler and better form, and he ends with a practical application, urging Christians to give up their separatist tendency, to worship the demons, and to join in all civil and military duties imposed on citizens by the state. Before dealing with the principles of the Christians he draws attention to the false position which they occupy. They are, he thinks, essentially rebellious. They wish to separate themselves from the rest of mankind. The Jews show this tendency, but they are so far to be excused in that they adhere to their national beliefs. These beliefs indeed are often silly and puerile, and perversions of what is wiser and better in Greek poets and philosophers. But

the Christians belong to no nationality, and separate –

themselves from the ordinary beliefs without any good cause. They object to the divinity of the Dioscuri, Hercules, and others, in regard to whom the Greeks believe that they became gods from being men. And yet they worship a man who was a prisoner and died. This worship is on a level with that of Zamolxis by the Geta, of Mopsus by the Cilicians, and of others whom he names. It is unreasonable. Accordingly the Christians do not invite the wise or the good. It is ignorant slaves, women, and children whom they try to influence, not publicly but in corners and private places. And their divisive tend-

encies are shown in the number of the sects which exist among them.

After this introduction Celsus proceeds with his philoso- plical argument. God is good and beautiful and blessed. He therefore cannot change. For if he were to change, it could only be for the worse. Therefore God cannot come down to men. He cannot assume a mortal body, He cannot do it in reality, for that would be contrary to his nature ; he cannot do it in appearance, for that would be to deceive, and God cannot deceive. Indeed the idea is absurd. What advantage could be gained by lug coming? Does he not know all things? Has he not power to do all things without assuming a body? Is he not able as God to do everything that he could do ag incarnated God? And no real advantage is got for men : for they do not know God better by seeing him in hodily form. God must be seen by the soul, and men are deceived if they imagine they know Him better by seeing Him in a corruptible body than when they see Him with the pure eye of the soul. Indeed Christianity is in this respect marked by a gross anthropomorphism. Nor can the purpose which Christians assign for this incarnation be regarded as true. The nature of the whole is always one aud the same. There is always the same amount of evil in the world. There is nothing evil in God. The evil is in matter. But God is continually making the evil serve for the good of the whole. If this is the case, then, it is absurd to suppose tliat God would be especially interested in afew of the human race. He works always for the whole. And the Christian notion is peculiarly absurd, Did God at that particular time waken from sleep and resolve to rescue a few

from sin? Was He indifferent to all mankind before, to all the nations of the earth? And is He to continue to show the same special favour only for a select number? Not only are the Christians wrong in this, but they are wrong in supposing that the world was made for man. Again it is the whole that is cared for. And we can see signs in nature that animals are equal if not superior to man in many points. If he hunts the deer, the lion hunts him and feeds on him. Bees have cities and rulers. Some animals speak to each other. Some can foretell the future. Some are religious. In fact neither for animals nor man was the universe made, but that the world as God's work might be perfect in every part. In these arguments we have a remarkable anticipa- tion of many of the points which come out in our present Darwinian discussions (see Zeleologie und Naturalismus in der altchristlichen Zeit: Der Kampf des Origenes gegen Celsus um die Stellung des Menschen in der Natur dargestellt von Dr Phil. Aug. Kind: Jena, 1875).

In exhibiting the superiority of the Greek doctrines over the Christian, Celsus points to the circumstance that the Greeks appeal to reason, the Christians cry out, " Believe, believe." The doctrine of the Son of God,-he thinks, was borrowed from Plato. The Devil owed his origin to a distortion of a Greek opinion. He compares the prophecies of the Greeks with those of the Christians, and he contrasts Greek and Christian doctrines of .a future state, and speaks of the resurrection as a ridiculous belief.

In the practical application he maintains that the deemons are subordinate ministers of God, and that there- fore any worship paid to them is worship also of the Supreme God himself. Especially the Christians have no good reason for objecting to such worship since they already worship a dead man.

Our abstract of this work is necessarily very imperfect, and many important points we have been compelled to omit entirely. From what has been given, it will be seen that Celsus was a Platonist. He believed in a Supreme God, the Supreme Good, higher than all existence. This

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God was everywhere and in everything. Alongside of this God was original uncreated matter, the source of all evil. These two made up the universe, which remained a constant quantity. There could, therefore, be no real redemption from sin. There could be nothing super- natural. There was merely the apparent evolution and involution of the same reason and matter. This mode of thought is fatal to final causes, fatal to a special aim on Cod's part, fatal to a special interest in man, and therefore fatal to Christianity.

The writers who have discussed Celsus and his opinions are numerous, Most of them are mentioned in the most recent work on the subject, Celsus' WV ahres Wort: dlteste Strettschrift antiker Weltanschauung gegen das Christenthum vom Jahr 178 n. Chr., von Dr Theodor Keim, Ziirich, 1873. This is a translation of the True Discourse, with dissertations on the life, date, arguments, &c. of Cel- sus. The best expositions of the opinions of Celsus are given in Redepenning's Origenes (Bonn, 1841); in Baur's Die: Christliche Kirche der Drei Ersten Jahrhunderte (Tiib., 1860); and in Kellner's Hellenismus und Christenthum (Cologne, 1866). The fragments of Celsus in Greek were collected by Jachmann (1836). (J. D.)

CELTIBERIA, the country of the Celtiberi, was an extensive inland division of Spain, lying between the basin of the Iberus or Ebro and the sources of the Tagus, Douro,

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HE Greeks gave the collective name Keltal to a |' Western people, and the name Keltike to the land which they inhabited. The region to which the latter term was applied varied according to the more or less accurate knowledge of each writer who used the term. The use of the word Keltat was equally vague and variable ; and this was due as much to the great movements of peoples which took place some centuries before the Christian era as to the want of knowledge of the early Greek writers. One of the displacements of tribes due to those movements has immediate connection with our present subject, the migra- tion of some of the Keltai by the valley of the Danube and Northern Greece into Asia Minor; for in the names Galatai given to the people, and Galatia given to the land wherein they

settled, we have forms which connect the Greek Keltai and Keltike with the Roman Galli and Gall, and both, perhaps, with Goidil, Gaerdil, or Gaedhil, the name of one brauch of the descendants of the Keltat, or, to use the modern form of the word, Celts. If Goidil, or, in the modern Scottish form, Gael, be radically connected with Keltai, Galatai, and Galli, these names would repre- sent that by which the original nation, or one of its principal tribes, called itself. We do not know the collective name by which the Germans designated their neighbours. Dieffenbach suggests that it may exist in Halidgastes, a man's name, which, as frequently happened, from a tribe name became an appellative, and exists now in the modern German word Held.

When the Romans became first acquainted with the Celts there were two Gauls,—Cisalpine Gaul or Northern Italy, and Transalpine or Greater Gaul, which included not only France but also Belgium, all that part of Germany West of the Rhine, and Western Switzerland. Whether any Celtic tribes lived east of the Rhine since the attack of the Gauls on Rome, and whether the frontier of the Germans and Celts was a fixed one within historic times or a constantly advancing one, are questions which we have not space to discuss, nor, if we had, would it be profitable to do so in the absence of any real facts to work upon. To the Continental Celtic ground above defined we have to add the British Islands.

The determination of the limits of the Celtic ground is based chiefly on linguistic evidence. Unfortunately, as tegards the Continental part, our materials are scant, and

and Guadiana, and comprehending the greater portion of the modern provinces of Cuenca and Soria, the south-west half of Aragon, and part of Burgos. By the Romans the name was employed almost as synonymous with Hispania Citerior. It was a hilly and barren region, intersected with valleys of great fertility. Of the chief cities the most famous were Segobriga, the capital ; Bilbilis, the birth- place of the poet Martial; and Numantia, besieged ten years by the Romans, and taken and destroyed by Scipio Africanus, 133 B.c. The Celtiberians, as their name imports, were considered to have arisen from the inter- marriage of Iberians with the Celts

that, having crossed the Pyrenees from Gaul, subdued and settled amongst then. The new race thus formed were a brave and powerful people, whose warlike qualities, improved by conflicts with their neighbours and the Carthaginians, rendered them formidable opponents of the Romans, whom they not un- frequently defeated, After their overthrow by Scipio, and their consequent alliance with their conquerors, they fre- quently revolted ; but, on the assassination of their leader Ser- torius in 72 B.c., they were subdued by Pompey, and from that time Celtiberia submitted quietly to Roman influence.

PERATURE

hence a good deal of room is left for the imagination. Thus it has been much discussed whether the language spoken in every part of ancient Gaul was the same. Some have asserted that the Belgians were Germans, and there- fore spoke a Teutonic tongue, and that even the Celtic dialect spoken north of the Loire differed considerably from that spoken south of that riverin Aquitaine. This opinion was based upon a well-known passage in Cesar's History of the Gallic War, in which he states that Gaul was divided into three parts which differed among themselves in language, institutions, and laws. This may mean either that three distinct languages were spoken, or if but one language, that there were three well-marked dialects, M. Roget de Belloguet has shown from a careful investiga- tion of all ancient authorities, and an analysis of nearly 400 Gaulish words gathered from ancient authors and inscriptions, that the differences in question were dialectic, and that, save, perhaps, in those parts occupied by a Ligurian or Basque people, the same language was spoken in all Gaul.

Community of language does not, however, necessarily Celtic

imply community of race. speak the same language, while others nearly akin may speak widely different languages. This has been found to have been the case in Gaul as elsewhere. One language was spoken by two races which gradually fused into one people—a northern, fair-haired, blue-eyed race, of tall sta- ture, lymphatic temperament, and elongated heads, and a

southern race, shorter in stature and dry and nervous in

temperament, having brown or black hair aud eyes and round heads. The free or dominant class of Gauls belonged to the former race, which was evidently an intrusive one. The inhabitants of the British Islands seem to have been composed of the same two races, and to have spoken the same language as those of Gaul.

People having no kinship may ethnology.

Causes of phonetic change like those which produced Branches

the parallel branches of the Teutonic stem (the Germanic ee

and Scandinavian tongues) and of the Windic stem (tho Slavonic and Lithuanic tongues) must have existed at an early period in the Celtic language, for the original stem has produced two branches in the British Islands which are wider apart than those of the Teutonic stem, and, according to Zeugs, less widely separated than the two branches of the Windic stem, These branches we — call, in Sees

age,

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Zeuss, the Irish and British branches. Tach of these branches has again produced three dialects. The Irish or Goidelic dialects are—the Irish proper, the Scottish Gaelic, and the Manx, or dialect of the Irish spoken in the Isle of Man, The British dialectsare—the K ymraeg or Welsh, the Cornish, and the Armoric, or language of Brittany.

. The Cornish is now extinct, having died out about the

Distinction between branches of Celtic language.

middle of the last century. We have included Armoric among British dialects on the ground that whatever may be its relation to old Gaulish it was intimately connected during the Middle Ages with the Cornish, if it be not a direct descendant of the language spoken by the southern Britons who emigrated to Brittany during the early Saxon wars.

It would be impossible within the limits of such an article as this to point out even the principal distinctions between the two branches of the Celtic, but the following examples will perhaps enable the reader to realize their general character. The Irish has preserved the hard or & sound of c, while in British it is represented by p;—-e.g., Irish cethir, four, cland, posterity, crann tree, with initial guttural, are equal to the Welsh petguar, plant, pren ; Trish nach, nech, person, macc, son, with final guttural, and cach, each, with initial and final c, corrospond respectively with Welsh nep, map, and paup This change from a guttural to a labial, and even in some cases to a dental, is what Professor Curtius calls “ labialismus,” and is very marked in Greek as compared with Latin; so that as respects this phonetic law Welsh stands to Irish in the same relation as Greek does to Latin. The tendency to labialism is, how- ever, less in Irish than in Latin, ¢.g., Latin septem, seven, Irish secht ; and perhaps even than in Sanskrit, for Irish drops initial p, e.g., casg, fish, Welsh pysy, or changes it into 6, e.g., Welsh pen, Irish ben. The reverse process to labialism even sometimes takes place in the case of borrowed words, e.g., Pascha, Easter, Welsh Pasg, Irish Casg; Latin purpura, Irish coreur. So great is the contrast in this respect between Irish and Welsh, that the latter labializes borrowed names, as in the case of the Irish Saint Ciaran, who became Piaran in Wales. If Dr Windisch, Mr J. Rhys, and some other philologists are right in thinking that the primitive or truc p sound when not combined with other consonants has disappeared everywhere from all the Celtic languages, and that when p does appear in them, especially in Welsh, it is only the representative of a former qu, mb, or of a provected 0, that is a 0 carried for- ward from the end of one word to the beginning of the next, then the distinction just dwelt upon, though very marked when we compare modern Welsh and Irish, did not exist in ancient times. But whether this be so or not the Irish articulation maintains a good deal of hardness and strength, in illustration of which we may mention that en and sr occur as initial sounds—-the latter, which is also found in Sanskrit, does not exist perhaps in any other European language. Again, Irish, like Sanskrit, Latin, German, and Slavonian has preserved the sibilant s, while in British, as in Zend, Persian, and Greek, it has been generally changed into h, eg., Irish sen, old, Welsh hen, Irish salann, salt, Welsh halen ; or the s when combined with other consonants has a prefixed y, as in Irish scarad, separation, Welsh yscar. As regards this change of s into kh British also stands to Irish in the same position as Greek does to Latin, eg., Latin

sal, Greek dds. Like the labialism above pointed out, this change did not, however, constitute an ancient distinction. Irish words can also end ins and 7, and in » probably derived from m, Of these, final s disappears first, but we have an example of the preservation of a final * in so common a word as athir, father, when it has lost the initial labial. British has often v or w for an m in Irish, eg., lowan, a rope,

Trish loman ; huvel, low, Irish humal. All the dialects of the British do not do this equally ; thus Irish amail, amal, like, is awel in Cornish, and ewel in Armoric, but mal in Welsh. And again the Irish preserves letters where tho British loses them; this is especially the case with gutturals, e.g., Irish tech, house, Welsh t ; Irish nocht, night, Welsh os; Irish teglech, houschold, Welsh teudw, And, lastly, Irish has preserved the declension of its noun even to this day; and forms closely allied to old Indo- European declensions are found in Old Irish, but with the exception of the genitive in Cornish scarcely a trace of declension is to be found in British. Irish verbal forms are also much better preserved than the British ones, though the latter are in a better state than the nouns.

As regards the dialects of each branch, the Irish ones frig, differ less from each other than do the British dialects, dialect;

Irish proper and Scottish Gaelic are practically the same language, and do not differ greatly more than the dialect of English spoken in the Scotch Lowlands does from common English. Such differences as do exist indicate the modern origin of the Scottish Gaelic. Among those differences the following will bear out this opinion. In the genitive plural the initial consonant is not modified, or, as Irish grammarians say, does not suffer eclipsis in Gaelic as it does in Irish. Thus a Highlander says nan cos, of the feet, where an Irishman would say na g-cos ; the former would, however, use zam before a labial, as e.g., nam fear, of the men, Again the possessive pronouns ar, our, bhur, your, do not causc ellipsis in Gaelic as in Irish, e9., ar buachall, our boy, Irish ar m-buachaill ; bhur cosa, of your feet, Irish bhar g-cosa. Again there is the frequent ending of the nomi- native plural in Gaelic in az, as in slatan, rods, a pecu- liarity which it shares with Manx and Welsh, and probably derives from British; writing the personal ending -

azre, or -otr as ~~air in Gaelic, ¢.g., sealgacr, a huntsman, for seal~~ gatre, and the personal ending -aidh as -acche or -tche, ¢.9., coistche for coistdhe, a footman ; writing the Irish termina tion -wgadh in progressive active nouns as ~~uchadh, eg, gradhachadh for gradhughadh ; writing the passive parti~~ ciple always hard instead of softening it under certain circumstances, as in Irish, eg., ta, tha; te, the. Among the less marked differences we may point out the use of the negative cha in Gaelic for the modern Irish m¢ and old nocha, the more frequent use of the auxiliary verb ¢é in conjugation, and the absence of f in the future indicative and in subjunctive in Gaelic. Manx differs from Irish much more than Gaelic ; but the dissimilarity is not nearly so great as at first sight it appears to be, owing to a kind of phonetic spelling having been adopted in Manx through which the radical letters have often been lost. Manx has been much corrupted, too, in consequence of the connection between Ireland and the Isle of Man having becn cut off by the Norse conquest, and also by its having been under the dominion of Wales for some time ; add to which that it never received literary cultivation. The chief differences are in orthography ,—the ending of the nominative plural in n already alluded to, the dropping of a final vowel, tho substitution of d for g, and of ¢ or ¢ for g in the middle or end of words, &c.

Of the British dialects Cornish and Armoric resemble Britis each other more than either of them does Welsh. ‘This dislec

resemblance is, however, not as great as that of the Irish and Scottish Gaelic, but perhaps as close as that between Spanish and Portuguese, especially if the later borrowings from English and French be excluded. As to the words borrowed by the Cornish from French, which are much more numerous than those taken from English, it is inter- esting in connection with the history of romance to note that many are borrowed directly from Provengal. The difference between Welsh and Cornish and Armoric is con-

lish rage.

siderable; Mr Edwin Norris thought it to be as great as that between French and Spanish. Besides the difference in their vocabularies, which is, of course, largely due to the great number of words borrowed by the southern

British dialects, especially by Cornish, we may mention the following points in which Cornish differs from Welsh, and these will serve to indicate the general character of the difference between the latter and the southern dialects as a whole :—the retention in Cornish of an initial s combined with other consonants without prefixing y, e.g., scol, scod, spyryt, which in Welsh are weakened to ysgol, ysgwydd, and ysprydd ; the diphthongation of vowels in Welsh in cases where Oornish preserves the strong vowel, eg., Cornish tron, tom, scouth, which are in Welsh trwyn, twym, and ysgwyd ; the better preservation of consonants in the middle of words in Cornish than in Welsh, ¢.., Cornish hanter, steren, valtovat, cantewil, which have been reduced in Welsh to hanner, seren, gwallawiad, canyll ; and lastly the preservation in Cornish of a genitive case in complete con- formity with the Irish. ;

The “question naturally suggests itself here, when did the original Celtic stem divide into the two branches described ? and again, when did cach of those branches produce their dialects? The late Mr Edwin Norris was of opinion that the separation took place after the arrival of the primitive stock in the British Islands. This opinion appears to be in entire conformity with all the facts of the case, ethnological, linguistic, and historical. We have already indicated that the Scottish Gaelic is an essentially modern dialect, which has an existence of only a few centurics. It is probable that pure Irish was spoken in the Isle of Man in the 6th and 7th centuries, that is, Irish exhibiting no greater dialectic variety than existed at the same period between any two provinces of Ireland itself, so that the Manx dialect must have grown up since then. Of the two branches the Irish is the most archaic, that is it has preserved more of the characteristics of the original stem. Among the British dialects the most archaic, that is, the one which best represents the British branch, is Cornish, which is the descendant of the speech of the un- Romanized Britons of England. This was also the opinion of Mr Norris, who held that the older the Welsh the more closely would it approximate to Cornish. It is indeed probable that the Welsh dialect originated in the 5th and Oth centuries, when the conquests of the Saxons began to isolate Wales from the other British-speaking people. Thc separation of Cornish and .Armoric is still more recent, a fact which supports the story of the emigration of Britons to Armorica, and. of long-continued intercourse during the early Middle Ages.

If the preceding view of the origin of the two branches of Celtic and their respective dialects be correct, it disposes once for all of a very vexed question, namely, did old Gaulish belong to the Irish or to the British type, or, to put it more correctly, to which of those types would the dialects belong which would have grown up in France if Gaulish had not been suppressed by Latin? The usual view has been that the Gaulish belonged to the same type a8 the British. Grimm's attempt to prove that the medical incantations contained in the book of Marcellus of Bor- deaux, a physician of the 4th century, were Celtic of the Irish type led to a modification of this view. Amédéc Thierry assumed that the Gauls proper spoke a dialect of the Irish type, while the Belgx and the Gauls or Galatians of Asia Minor spoke Cymric or British. Such a view implies that Irish and British had already grown out of the original stem before the advent of the Celtic people im the British fslands and Gaul; and further that two distinct waves of Celts had come into Western Europe, the first or oldest being the Goidelic or Irish, and the

second the Cymric or British. Edward Lhuyd, the father of Celtic philology, long ago suggested an hypothesis of thig kind as an explanation of the occurrence of geographical names in Britain which appeared to him to be Goidclic rather than Cymric. Zeuss threw the weight of his great authority into the scale in favour of the kinship of the old Gaulish and Cymric. The grounds on which he based his opinion have since, however, been altogether explained away, or their force much weakened, especially since the investiga- tions of Gluck and Roget de Belloguet on the Gaulish voca- bulary which has been collected from classic authors and in- scriptions, and the inercased knowledge of the Celtic dialects, the study of which Zeuss himself so powerfully promoted.

Medizval Irish and Welsh manuscripts contain an trish ethnic extensive body of legendary ethnology, which in the case of traditions.

the Irish legends has been even fitted with a complete chronology. Sctting aside the more fabulous parts of the Irish legends which refer to colonists who arrived a short time before and after the deluge, we find four successive colonies mentioned in the following order :-—Nemedians,

Firbolgs, Tuatha Dé Danann, and Milesians. The Nemedians are said to have occupied the country during only two hundred years, when the greater part of them went away in three separate bodies, owing to the harassing attacks made upon them, and their final overthrow, by a people who appear in Irish legends as sea-rovers, called Fomorians. One body took refuge in Britain, another went to Thrace, and the third into the north of Europe. The Thracian party became the ancestors of the second colonizing race, the Firbolys. The Nemedians who went to the north of Europe appear afterwards as the Z'watha Dé Danann; those who went into Britain became the Britons, According to this legend three of the early tribes which peopled Ireland were of the same race with the Britons. The fourth and latest of the Irish races, the Milesians, or followers of J/tled, are also connected with the others in the genealogies to be found in Irish manuscripts, but the rcla-tionship is much more distant than that which is represented to have existed between the other races. All Irish accounts of the carly races inhabiting Ireland agree in bringing Miled from the north of Spain; but in the early times when the Irish ethnic stories received their present shape, the majority of people, uot alone in Ireland, but everywhere, had very imperfect notions of geography, and often applied the few geographical names which had reached their cars by pure hazard, and generally without having more than the vaguest notions of the places they referred to. A perusal of Irish and, we may add, of Welsh poems and tales will bear out what is here stated. Spain in the Milesian story probably means n0 more than that the Milesians, whoever they were, came from a distance, and not from neighbouring countries with which the early Irish had intercourse. Ethnic tradi- tions as a rule do not add much to our knowledge, but it is always dangerous to ignore them altogether because they must necessanly contain some truth. Of all the Irish traditions of this class those only seem to possess real importance which relate to the mysterious pcople called the Tuatha Dé Danann. This name appears to mean the tribes of Dé and Ana; and as Dé is God, and Ana is called the mother of the Irish gods, these supposed invading tribes are only the deities in a system of mythology which has yet to be unravelled.

All these deities descend from a common ancestor, the Irish Alldat, or All-God, and appear to form two lines—the Aes mythology.

Trebair and the Aes Side, probably analogous to the Teutonic Vanir and disir, The close resemblance between the Irish and Norse words Aes and “sir can hardly be accidental. The former signifies a people; the latter is connected with the Norse ans and the Anglo-Saxon és, God, which occurs in many men’s names. The Sid wags

the heavenly fort of the Aes Side, as Asgard was of the Aisir, The Mna Sidhe, women of the Sidh, or in the singular Bean Sidhe (pronounced Banshee) of modern fairy mythology, represent the goddesses of the Aes Side. As in other mythologies, the same deity was endowed with different attributes and received different appellatives. The medieval genealogists who looked upon the T’uatha Dé Danann as a real human race, thought it necessary to provide a place in the genealogies which they invented for every different name, and so added confusion to what was before obscure enough.

As some of those deities oceupy a place in Celtic romanee, we shall venture to say a few words about some of them, though at the risk of making one out of several distinet deities, and of making several out of one. In a subject of inquiry whieh has been hitherto almost entirely uncultivated, and all but unknown, this is nearly inevitable ; but afew mistakes, should we make them, will not sen- ously interfere with the objeet we have in view. One of the ehief deities of the Irish pantheon was Ogma, surnamed Griainainech, “of the sun-like faee,” son of Eladan, or Elathan, that is, of knowledge. Ogma had other appellatives, the most important being Dagda, Delbaith Dana or Tuirenn Bicrenn, and Cermait ‘‘ of the honey-mouth,” though the last sometimes appears as the son of the Dagda. Under the last appellative his wife is dna, the mother of the gods, orthe Mér Rigu, or Mér Riganalso known by the appella- tives of Badb and Jlacha. As the latter, she was the mother of Acd (fire), who is probably the Aed Mawr of Welsh legends, father of Prydain, the first legendary king of Britain, whence the name Ynys Prydain, or the Island of Prydain, and the real origin of the mythi- cal Hw of the medieval bards. The Dagda had another son, whose name was Aengus, or the Mac Og, a eelebrated personage of early Irish legend, and an equally eelebrated daughter, Brigit, the god- dess of wisdom and judgment. Under

the appellative of Delbaith Dana or Tuirenn Bicrenn (who is represented as the son of Ogma, and not that personage himself), Ogma has two wives, Ana, under that name, and of her other two appellatives, and Hrxmas, who is represented as the mother of the first-named wife ; Ana, under her various names, is therefore at onee the daughter and wife of Del- baith. Ana's sons by Delbaith are Brian, Iuchair, and Lucharba, who are ealled the gods of Ana, and henee she is ealled the mother of the gods. They are the sameas the sons of Cermait ‘‘ of the honey- mouth," already mentioned as being an appellative of Ogma himself, or his son under that of the Dagda. These sous are Seithotr or Mac Cuill, a sea-god, Tetthoir or Mac Cecht, the ruler of the sky and heavenly bodies, to whom the plough was saered, and Ceithoir or Mac Greine (son of the earth), the god of the earth. Their mother was the Htain of Irish legend; and as she was the wife of Ogma under that name, it proves that Cermazt ‘‘of the honey- mouth" was only an appellative for the latter, and not his son, under his appellative the Dagda. The wivesof the three gods above mentioned were Banba, Kotla, and ZHirc, names under whieh Ire- land was personified. Hlcmair was either a son of Ogma as Delbaith, or more probably his brother, and was the same as Z'ade Mor, Orbsen, and Lér (the sea). Under the last-named appellative he was god of the sea, and is espeeially interesting, for in him we have the original of Shakespeare's King Lear, and the father of Manandan of Irish and Welsh romanee. It is probable that Zér was the samme as Jac Cuill, the sea-god above mentioned. There was also a god of war, Neit (battle), whose son Lserg (slaughter) was the father of Diancécht Dia na-cécht), the god of the powers (of healing), of Goibniu, the smith, and of other impersonations of the Arts. The god of heal- ing had a son Cian or Conn (valour), who is also known under other appellatives, suet as Scalbalb, and is sometimes eonfounded with his wife Ethienn or Ethne (skill). His daughters were Airmed, the goddess of physie, and Htain, the wife of Ogma, above mentioned. thicnn's son Lug is a prominent figure in Celtie romanee, and was known also by the names of Lug Ldmfada, or Lug ‘‘the long- armed," Hn, and the Sab Lidanach, or pillar of many arts. Abhean, the grandson of Ethlenn and Conn, was god of musie. Conn, under his appellative of Scalbald, is also made one of the sons of Echaid Garb, son of Breas (power), personages who fill prominent parts in Irish story. Among the other sons of Hchaid we must mention Badb Derg, the chief of the Side of Munster, and Uillind Faebar Derg, who kills Manandan Mac Lir inalegend.

The deities related to Conn or Cian, husband of Ethlenn, and his son Lug are ealled the Aes Trebuir, while those related to the Dagda or Ogma are the Aes Side of story. The two tribes appear in eontention or warfare, but, nevertheless, occasionally associated and intermarry, like the Teutonie Vanir and dsir ; thus Etain, the daughter of the god of healing, was the wife of the Dagda, and Cermait ‘of the honey- mouth ;” aud Fea and Nemand, the goddess of war, the wives of Neit or Neid, the god of war, were the daughters of Elemair (great evil), known also as Lér.

Before leaving the subject of the early races of Ireland The _ we shall say a few words upon a people incidentally men- Fomori:, tioned above, the Fomorians. In Irish legends they appear | as sea-rovers who only occasionally visited the coasts, i pillaged and oppressed the people by levying tribute, or rather holding the inhabitants to ransom. One of the principal battles of Irish legendary history is supposed to have been fought between the Z’uatha Dé Danann and the Fomorians. Evendid we not know, as in this instance we do, that one of the contending races was mythical, we should naturally be inclined to regard such ethnic quarrels as imaginary, unless where we had unquestionable physical evidence of the occurrence of the struggle. On the other hand, in the case of mythologies which reach us, not as the recorded living belief of a people, but as the traditions | of a prehistoric time, clothing real personages, who lived just at the close of that period, in what we might call the |

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twilight of the historic period, and around whom as lay figures gather and assume definite shape fragments of old beliefs, we should always expect to find some nucleus of fact in legends relating to such ethnic wars. That the Fomorian and Z’watha Dé Danann contests are mythological . there can be no doubt, but the kernel of fact around which the myths have gathered is the contests of the Irish | and the Romans; in other words we believe the Fomorians

to have been the Romans. The latter never made any settlements in Ireland, but there can be no doubt that they | kept a few galleys in the western ports of Britain to pro-

tect the country from the hostile incursions of the Irish

or Scots, and that they often chased these into Irish ports,

and forced them to pay ransom. The accounts of the Fomorians in Irish story are just in accordance with this view, which can be supported by other evidence, into which, however, we cannot enter here.

The Welsh or Cymric ethnic traditions are not so ela- Welsh | borate as the Irish, nor do they in their present form bear the ethnic ‘ same appearance of antiquity about them. According to ‘taditic the Triads, a peculiar kind of literature to which we shall | return hereafter, four classes of tribes entered Britain—the social, the refuge-seeking, the invading, and the treacherous tribes. The social tribes, of which there must have been three to make a triad, were the Cymry, the Lloegrwys, and the Brython, who were all of the same race and closely related. The Cymry like the Irish Firbolgs came from the summer land called Defrobant or Greece, or to speak as precisely as the Triads, from “ where is now Constanti- nople, by way of the Hazy Sea,” or German Ocean. The |

Lloegrwys, or Loegrians, came from the land of Gwasgwyn,

not Gascony, however, but the country of the Veneti, ‘ about the mouth of the Loire, between whom and the] Britons there appears to have been much intercourse in the | time of Cesar. The Brython or Britons came from | Llydaw, that is Armorica, or rather that part of France

which lies between the Seine and the English Channel, and

which, therefore, included Normandy as well as Brittany. , The refuge-seeking tribes were the Celyddon in y Gogled, the Gwyddel in Alba, and the men of Galedin. Y Gogled was apparently a general term among early Welsh writers for all the country between the Ribble and the Clyde ! inhabited by Britons; but it probably had a more | restricted meaning, of which we shall speak presently. The Celyddon can hardly be other, at least in name, than the Caledonians, and were probably a Pictish tribe which had settled in the great forest district amidst the British i people of the Scotch

Lowlands, The Gwyddel of Albu | were the Picts, and as the name Gwyddel implies, they were Gaelic. Gwyddel is the Welsh form of the old Irish

Goidil, or in its modified later form Gaeidhil, or phoneti-

cally Gael. The men of Galedin, the present Galloway

(Wigtown and Kirkcudbright), were part of the tribe |

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known in Ireland as Crruitne, that is Picts, and only differed from the Gwyddel or Picts of Alba, in having come into Galloway from Ireland. The three invading tribes were the Coranaid, the Gwyddel Ffichti, and the Saeson or Saxons. The Coruniaid are said to have come from “ the Jand of Pwyl, and they could not be driven out,” but dwelt about the River Humber and the shore of the North Sea. If these be the same as the people known to the Romans as the Coritanz, they were probably Picts of the same tribe as the Irish Picts, for there can be no doubt that Cruitne and Coritani are the same word. The Gwyddel Ffichtt or Irish Picts who came to Alba by the Sea of Llychlyn (Norway), that is the North Sea, were doubtless a branch of the same Picts who settled about the Humber, in Galloway, and in Ireland. The three treacherous tribes were the Gwyddel Coch or Red Gordil, or Gael

from Ireland, the men of Llychlyn or Norsemen, and the Saeson or Saxons. The Triads expressly tell us that the Cymry, the Lloegrwys, and the Brython were of the same stock. The different tribes of the Gwyddel or Gael, including the Coraniaid, were simply part of the same people who inhabited Ireland. We therefore assume with Mr W. F. Skene that the Picts and Gael were the same eople. : tt thus appears that all the Celtic inhabitants of the British Islands consisted of two branches, which though originally the same people had branched off from each other in language and in other ways, producing the two classes of Celtic dialects, the Goidelic or Irish and the British, as we have above pointed out. But while we agree with M. de Belloguet that the Gauls were one in race aud language, and, moreover, believe that the people who inhabited the British Islands were the same as those of Gaul, and that the divergence which we now observe between the Goidelic and British dialects first took place after their arrival, there seems no reason to doubt that the Celtic population flowed into these islands in two streams, one from the neighbouring Gaul, and one from some country east of Gaul by way of the North Sea,—the Coretani, the Gwyddel Ffichti from about the Forth, the Irish Cruitne, and the Scots forming part of the latter stream, and, if our conjecture be correct, the latest comers, a view in harmony with ethnic traditions, but differing from the ordinary opinion that the so-called Cymry came long after the Goidi, and drove them westward, they themselves being in turn pushed in the same direction by the incoming Saxons.

It would be interesting to pursue the subject of the ethnology of the early races of the British Islands through the conflicts and displacements of races which took place between the landing of Cysar and the final retirement of the Romans in the 5th century. But as this is not absolutely necessary for the illustration of a literature which only dates from the latter event, we shall content ourselves with giving a sketch of the ethnic distribution of the people of Britain resulting from the conflicts and displacements referred to as it existed in the beginning of the 6th century, when we are on sure ground in the history and literature of Ireland at least. Without such a preliminary sketch much that we shall have to say of great importance in the history of Celtic literature would be unintelligible.

In the end of the 5th and beginning of the 6th centuries external invasions had ceased, and the different races had gathered into separate states, and commenced a struggle for Mastery, In England the Saxons (using that term as a collective name for Saxons proper, Frisians, Angles, and Jutes) held possession of the southern and eastern coast from Dorsetshire to the Humber—the Angles chiefly occupy- Ing what is now Suffolk, Norfolk, and Lincoln—and were gradually making themselves masters of Central England towards the Severn, and were even penetrating northwards

between the vale of the Ouso and the Pennine Chain, into what is now the West Riding of Yorkshire. With the exception, perhaps, of the immediate neighbourhood of the south-eastern coast, where the continuous arrival of fresh bands of Saxons had driven away the British inhabitants, and of the district about the Humber where in like manner the fresh bands of Angles continually coming must have done the same, we are not to assume, as is usually done,

that the former British inhabitants, called by the Welsh

Lloegrwys or Loegrians, had all been exterminated, or

driven away. On the contrary as the Saxons advanced inwards and the external invasion practically ceased, an

increasing proportion of Britons must have been left. The new comers merely dispossessed the British ruling families, as the Norsemen did in Normandy, and as happened afterwards in Ireland, and left the bulk of the peasants. This was unquestionably the case in Central and Western England, and in Deira and Bernicia, the present counties of York, Northumberland, Durham, and the eastern Lowlands of Scotland. Cornwall aud Devon were independent British kingdoms. What the Saxons had done on the southern and eastern coast the Irish did on the west. We cannot enter here into the question of when the Irish occupation of Western England commenced, or how long it lasted ; there is no doubt, however, now that in the 5th century they occupied a considerable part of Gwynned, or that part of North Wales now forming Anglesea, Carnarvon, Merioneth, Denbigh, and Flintshire ;

and Demetia, or that part of South Wales now forming Cardigan, Pembroke, and Carmarthen, or in other words, the north and west coast of Wales. But while the Saxons were gradually displacing the British rule in the east, the Britons were gradually dispossessing the Irish in the west. The leaders of these Britous were the descendants of a certain Cwnedda, reputed to have been a G'wyddel or Pict of the east of Scotland. Another Gwyddel, but probably one from Ireland, who like Cunedda was said to have married a British wife, Brychan, has given his name to Brecon or Brecknockshire. Brychan may, however, have been only the eponymous ancestor of the Goidelic families of Brecon.

The west of Britain from the Dee to the Clyde, with the exception of Galloway, was occupied by independent British tribes, apparently confederated for purposes of war. On the eastern side between the Humber and the Tyne was Dyfer or Deira, also British at this period; and north of Deira, was Bryneich or Bernicia, which extended to the Forth. These two states probably formed in the beginning of the 6th century part of a confederation of Cumbrian states. But in the course of that century they seem to have been gradually converted into Anglian states without any serious displacement of population, or even of ruling families. On the shore of the Firth of Forth was a district called in Welsh Guotodin, the eastern part of which about the Pentland Hills was called Manau Guotodin, and was occupied by a tribe of Goidelic or Irish Picts, who, there is reason to believe, had also settlements in other parts of Bryneich along the east coast. It was from this tribe that Cunedda, if, as is probable, he was not an eponymous ancestor, had sprung. The remainder of Guotodin, between the Lammermoor Hills and the sea, seems to have been also at least partially occupied by another foreign people, most probably Frisians. On the western side, in what is now Argyllshire, north of the Clyde, a settlement of Scots, who had gradually leaked in there from the opposite coast of Ireland, had been formed, and had become organized into a distinct state which was ultimately destined to absorb the whole of Scotland, and give it its present name. The remainder of the country north of the Forth and Clyde was occupied by the Picts,

The Druids.

properly so called, a Goidelic people closely akin to, indeed almost identical with, the Irish. In Galloway was another branch of Picts, called Gwyddel Ffichtt by the Welsh, that is, Goidelic or Irish Picts, part of the Craitne who leaked over from Ireland like the Scots.

In the beginning of the 6th century the Romanized Britons were giving way everywhere before the Teutonic tribes, and the only independent territory which they appear to have held comprised—-(1) The Damnonian kingdom of Devon and Cornwall ; (2) the part of Hastern Wales now forming Montgomeryshire and Radnorshire, which later formed the principality or lordship of Powys, and perhaps even yet all the land to the Severn, that is, Herefordshire and Shropshire ; (3) Cumbria, that is, all the land from the Ribble to the Solway west of the Pennine chain, and all the Lowlands of Scotland to the Roman Wall, save Galloway, and G'wotodin, or Linlithgow (includ- ing part of Stirlingshire), Edinburgh, and Haddingtonshire ; (4) Bryneich, Bernicia, that is, Berwickshire, Durham, and Northumberland ; (5) Dyfr, or Deira, that is, Yorkshire. The ancient dioceses of Scotland, even as they existed in the 13th century, seem to mark out very well the ethnic condition of the Lowlands in the early part of the 6th century. The diocese of Galloway included the territory of the Irish Picts; the diocese of Lothian, which had three rural dcaneries—(1) Linlithgow, or Manau Guotodin (comprising the shire of that name, part of Stirlinghshire, and the most of Edinburgh), occupied by the Brithwyr, a mixed race of Picts and Britons, according to Mr Skene ; (2) Haddington and the remainder of Edinburgh, that is, Guotodin, in which, as we have said, there was an early settlement of Frisians, or Angles ; and (3) Merse, that is, Berwick. The continued existence of a Goidelic or Pictish population on the south side of the Firth of Forth, even in Berwickshire, down to as late as the 8th century at least, seems to be shown by the existence there of churches belonging to the ancient diocese of Dunkeld. In the 13th century they formed a separate deanery of that diocese, which appears to have corresponded with the Goidelic population of Guotodin. Prydain, the Cymric or true British country of the Lowlands, was consequently conterminous with the diocese of Glasgow, comprising the five rural deaneries of Glasgow proper—Rutherglen, Len- nox, Lanark, Kyle and Cunninghame, and Carrick ; and

the four deaneries of the archdeaconry of Teviotsdale,— Teviotsdale, Peebles, Nithsdale, and Annandale, This was the region called y Gogled, though it is probable that this term was applied to the whole of the independent British territory, that is, Cumbria as well as Prydaim proper ; but whatever was its extent, y Gogled was the cradle of the language and literature of Wales. It was the country of its prehistoric poets Aneurin and Llywarch Hén, and of the seer Merlin, whose fame was so great in the Middle Ages, and who is also reckoned among the early poets of the Welsh.

To complete this ethnic picture of Britain at the dawn of Celtic literature it would be necessary to give a sketch of the political and social state of the various Celtic tribes, so far as we could directly or by induction ascertain it. But as the articles Bkrnon Law and Cuans give perhaps enough of this kind of information for the purpose we have in view, we refer the readers to those articles.

In the carlier stages of tribal organization among the Aryans and other races, the chief was priest as well as king. But the Celts appear to have already passed into a higher political stage before they came within the light of history, and to have established a distinct pricsthood known to us as that of the Druids. Greek and Roman writers give us very little information on this subject, and the early Welsh records and poetry none at all. Modern

Welsh writers have, however, made up for this want in their genuine literature by inventing an elaborate Druidical] system of religion and philosophy, which, they pretend, survived the introduction of Christianity, and was secretly upheld by the Welsh bardsin the Middle Ages. This neo-Druidic imposture has found numerous adherents, and hag been supported with a good deal of misspent learning by several persons of considerable talent. It would be a waste of time to say anything further on the subject here. In Irish poems and tales Druids, and other organized learned classes, are frequently mentioned. From an analysis of these, and aided by whatever light the classical writers throw on the Druidism of Gaul and Britain, we may make the following induction ag to their position and organization in Ireland, where they cannot have been very different from what they were in other Celtic countries. There are no definite accounts of the religious rites

practised by the pagan Irish, but there are several allusions, which, though vague, plainly show that such rites existed, and that it was one of the functions of the Druids to performthem. The Druids also invoked the divinities in favour of their friends and against their enemies, and for this purpose they made incantations upon a mound or elevated ground near the field of battle. They determined, by auguries from the heavenly bodies, clouds, wind, smoke, the flight of birds, and other phenomena, the propitious and unpropitious times for fight- ing a battle, or doing any other important action, They announced the G'aesa or things which it would be unlucky for a chief or a tribe to do, foretold future events, practised incantations of various kinds, kept events in remembrance, and were, in a word, the depositaries of such knowledge as was possessed in Ireland at the time. Many of these functions belong equally to the persons usually called poets, and among the qualifications of the higher grade of the latter was a knowledge of certain kinds of incantation, some o which involved many pagan rites, the practice of which we find distinctly ascribed to Druids. That the latter were therefore only a higher degree of the order of poets seems certain. Assuch they naturally performed or superintended all the higher pagan rites, and hence the whole order, of which they were the highest representatives, were called Druids. After the introduction of Christianity the hieratic functions of the Druids ceased, and the term Druid, which had been the special appellative of the poets who performed those functions, gradually fell into desuetude. But the order of which they were the highest exponents did not disappear as it did in Gaul; there its lay functions were swept away by Roman law, whereas in Ireland they acquired new vigour. In pagan times the poets enjoyed great power and many privileges, both of which they are said to have abused to such an extent that it was proposed to banish them altogether out of Ireland. Through the intercession of the mythical king of Ulster, Conchobar Mac Nessa, this, we are told, was not done ; their number was, however, diminished, and their power and privileges curtailed. Among other changes said to have been then effected was that of depriving the poets of the functions of judge, which they had hitherto performed. This legend indicates the existence at some period immediately preced- ing the introduction of Christianity of a struggle between the lay and the spiritual power, in which the former were to some extent successful. The struggle continued even into Christian times, for in the 6th century it was again proposed to banish them, but on this occasion

they were protected by St Columeillé, not, however, without a further diminution of their number and loss of power. :

The organization of the learned classes, as we find it pein Cla he

Trelanc.

described in Irish manuscripts, is no doubt to be referred to the Dal or parliament holden at Druimceta about the. year 575, at which were present the king of the Dalriadic

or Seotie kingdom, the paramount king of Ireland, and many sub-reguli, and prominent above all St Columeillé. According to this organization there were three grades or orders,—the Gradh Lena, the Gradh Fene, and the Gradh Fit. Hena, wisdom, meant general as distinguished from special professional knowledge. A graduate of Kena was called a Saz, sage, but there appear to have been several degrees of the title, the highest of which was the Ollamh Sai, sometimes called also the Rosaz, or very sage, or Sud leitre, lettered sage. Ollamh (pron. Ollave), we may remark, was the title of the highest degree in any profession. An Ollamh Sat had the rank and was entitled to the retinue of a Rig Tuatha, or tribe king. All questions between the different tribes, the interpretation of the laws, the succession to chieftainships, and similar questions were decided by them. They were the genealogists or historians of the chiefs or kings, In pagan times the Gradh Zena, which was only a branch of the order, call it which we will, of Druids or poets, was probably the highest, judging by the dignity and privilege of its Ollamh, and consequently the one whose members were specially called Druids. If this view be correct, it was to this braneh that the functions of judge originally belonged. When the right of judgment passed from the Druids into the hands of the fig, or chief, the Jatter no doubt acted as judge himself, or appointed some one to fill his place. This judge was called a Breitheam, or as he is ealled from the pronuneiation of the modern form of the word, a Brehon, and was always in early times a Sat, for Fenechas, or law, formed part of the knowledge eomprised under the term Hena, a fact

which strongly supports the view above expressed, that the Sad was the suceessor of the Druid, In time the practice of law grew into a distinet profession, and every Breitheam of the higher elass, that is every one who was a Sai, kept a kind of law school. Thus arose the Gradh Fene, or lawyers. One of the causes which no doubt helped to separate the study of Henechas, or law, from the general study of Zena, or wisdom, was the rise of sehools in connection with religious establishments,

The class of persons whom we have above designated as poets were ealled File in Irish, and their art Fulidecht. The latter is usually translated poetry, but it was rather vaticination in which they used verse. The J%li truly represents the Ovdreis, or vates, who formed onc of the orders of Druids, mentioned by Strabo. Some of the forms of incantation practised by the Fili are deseribed in Irish manuscripts, and, as we have stated above, are attri- buted to the Druid as well as to the Ji. Those which in- volved pagan rites, and which were consequently forbidden by St Patrick, fell into desuetude with the name Druid; but simple incantations by rhymes continued to be practised in Christian times. One of these, the Glam Dichinn, or an ineantation of satirical verses aceompanied by certain eeremonies, which was believed to be capable of rais- ing blisters on the face, was much used, and supplies, perhaps, one reason of the great sensitivencss of Celts to satire. The J%d¢ appears to have been distinguished in early times by some kind of tonsure, the exaet nature of which we do not understand. Perhaps it was the same as that afterwards used by the Christian priests, which was one of the causes of differenee between the early Irish Church and the Roman Church. It is at all events worthy of remark that tho Irish priests were reproached with having the tonsure of Simon Magus, who in those times was the representative of all magicians or others who practised necromancy or yatieination. ‘There were several degrees of the order of /ili, the highest being the Ollamh Fili, as we have already pointed out. A Weli of this rank was entitled to keep, that is, to have supported for him, a grey- hound, a beagle, four stallions, two mares, and their foals

—the maintenance of the horses, being we are told, at the expense of the church. The king fostered the Ollamh’s sons as if they were his own; and

the queen was bound to give dowries to his daughters. In return for all these emoluments and privileges the /7%lz, or poet, was bound to furnish a panegyrie of the prinee annually. In fact the ehief function of the Jd when he became a mere poet was to eulogize the chief, and the chief's family and ancestors. The designation, given to the Gaulish bards, of parasites who attended the Gaulish warriors on military expeditions to celebrate their praise, by Posidonius the Rhodian Stoic, who visited Gaul about 100 3.¢., applies with equal truth to the Irish 4. The flattery was not given without hope of reward, however. In the glossary attributed to Cormac, who was at the same time king and bishop at Cashel in the 9th century, which is at least as old as the 10th eentury, we are told that the reason why the second degree of Fil was ealled an Anruth was because of "the rich stream (Sruth) of beautiful praise which flows from him, and the stream of treasures which flows to him in return." This was exactly the sentiment of the Gaulish bard who in eulogizing the magnificence of Bituitus the Avernian chief said, "From the track of his chariot- wheels sprang gold and blessings to mortals." An Ollamh, oras we might call him a doctor, in Wilidecht was entitled to have a certain number of scholars who formed his retinuc when he went abroad. One of his privileges was to make a circuit at certain times, the extent of which depended upon his rank. When, for instanee, an Ollamh Fuli became chicf poet, and was invested with the Zwgen, or cloak trimmed with white feathers, the symbol of his offiee, he might make a eircuit of Ireland, During his circuit the Ollamh Fili was entitled to maintenance and protection for a certain time, not only for himself but for his legal retinue, and their horses and dogs also. They could not, however, remain beyond the fixed legal time without special invitation,

The bards who recited poems and storics formed at first a distinct branch from the /%li. According as the true Filidecht fell into desuetude, and the 7%li became simply a poet, the two orders practieally coalesced, and the nanics Lili and bard became synonymous. 'There were several degrees of bards, aceording to the number of poems and stories which the graduate should be able to recite. In pagan times, and during the Middle Ages, the Irish bards, hke the Gaulish ones, aceompanicd their recitation of poems on a stringed instrument called a Cut, believed to have been a harp. The bard was therefore to the Fuld, or poct, what the Jogler was to the Troubadour, and the Jongleur to the Trouvére. The Cruitire, or harper, who likewise

played upon a kind of Rote called a Zimpan, and who belonged to the privileged classes, while the players on other instruments did not, was probably the representative of the true bard.

One of the most interesting points in the history of Celtic Thelearned literature is the relation of the transformed Druidie hicrarehy classes and

just described to the Christian church. Independent of its own intrinsic interest some knowledge of this is necessary in order to understand the system of schools in Ireland in the early Middle Ages, and the position whieh the native literature occupied in them. Before stating what we have to say on the latter subjects we must therefore bricfly describe the character of the early Irish Cliureh.

The presence of British bishops at several couneils, and the production of so distinguished a heresiarch as Pelagius, prove that there must have been an organized church in Britain in the 4th century. At that period there were many populous towns there, and much of the culture of

a rich Roman province. The British Church must, therefore, have been organized upon the municipal type as in the rest of the Roman empire ; that is, the jurisdiction of the bishops must have coincided with the civil government of the Romans, out of which the later diocesan system grew. The intercourse, partly commercial, partly hostile, which took place between Britain and Ireland in the 3d and 4th centuries could scarcely have failed to introduce Christianity into the latter country. Medizeval writers state that Christianity existed in Ireland before St Patrick; and Celestius, the chief disciple of Pelagius, and, according to St Augustine, the real leader of the Pelagians, was an Irishman. Indeed, if we can trust the statement of Genadius, who flourished at the end of the 6th century, the parents of Celestius must not only have been Christians in Ireland in the year 369, but must have known the use of letters, for, according to the writer quoted, Celestius wrote three letters, in the form of little books, on the things necessary for all desirous of serving God. This primitive Irish Church appears to have been principally, if not altogether, confined to the south of Ireland, the province of Munster forming an independent kingdom at this

period, or at least one having but little political connection with the other provinces. In after times, when the fame of St Patrick had become established, and he came to be regarded as the sole apostle of Ireland, the saints of the primitive church, many of whose names have come down to us, were assumed to have belonged to the Patrician period, or were confounded with persons of the same name. In this way St Brendan, the voyager, born on the shore of the Atlantic Ocean in the county of Kerry, has been confounded with a later St Brendan who lived in the centre of Ireland. ‘The church which grew up in the south of Ireland, though the offspring of the British Church, must necessarily have adapted itself to the political and social organization of the country, which was altogether tribal, and being without walled towns had none of the elements of municipal government which had moulded the church organization elsewhere. Some of the Trish legendary lives of saints of the early church, though, in the form in which we have them, not older than from the 12th to the 14th century, give us amidst a luxuriant growth of prodigies an insight into this highly interesting church, which the subsequent conversion of the rest of Ireland by St Patrick merely extended, but did not change. When a missionary had converted a chief and his Occa, or principal men, he became an adopted member of the tribe, and was considered to be a Sad; in other words, he was given the same rank and privileges as the pagan priests had. Beyond building a round wicker oratory for the priest, no change whatever was made in the organization of the tribe. The course of study for the different grades of Lena, Filidecht, and Fenechas went on as before, except that in the course of Lena, or wisdom, the Christian doctrine was added. The practice of the different kinds of verbal incantation which did not involve distinct pagan rites some centuries later by the poets shows this. Fasting, prayer, and vigils were practised, and those who wished to embrace the ecclesiastical state, that is, to join the new learned class called later the Gradh Helasa, or grade of the church, tonsured themselves, as did the students of Filidecht also, as we have before said. The Dun, or fortified residence, of the chief, around which lay always a village of the different classes of people who constituted the retainers of an Irish chief, becaine a kind of Cenobinm of a novel type. Some members of the Fine, or “ House,” desirous of practising a higher degree of asceticism, went into the march-land, or waste land of the territory, and built a wicker hut and oratory. Others followed, and built their huts all ground, and a new Conobium, consisting of a village

of huts and a circular oratory gradually grew up, which differed from the original one only by the absence of the rainparts and ditch forming the Dun. Afterwards the round tower, which was a mere extension of the circular stone Caisel, itself an imitation in stone of a circular wicker-house—afforded a refuge and place of safety for preserving from fire and theft the sacred vessels and books belonging to those religious establishments, which were directly established for religious purposes.

Whether a single Fine or the collection of “Houses” forming a Tuath, or tribe, became Christian, they were all of the same blood, and the right of succession to the property and government of the church remained with the Fine or “ House” of the donor. The church within each Tuath, or tribe, which constituted the unit state of tho Irish political system, was simply a spiritual Fine, or “‘ House,” and could receive and hold land only in the same way as any other Fine. Hence the Comorb (coheir), or successor of the founder of a Cenobium, might be, and frequently was, a layman. ‘This explains, too, the aristo- cratic character of the saints of the early Irish Church, who all necessarily belonged to the families of the chiefs, as the unfree classes could not form Fines, or “ Houses,” or enter those in existence, except by adoption according to legal forms. When a person of low birth appears among the saints we are sure to have some legend showing how he came to be adopted by somebody. As a consequence of this system all the Cenobia which grew out of the first, and the chapels which were established in connection with Cenobia to supply the religious wants of districts remote from the latter, remained under the government of the parent establishment. Nay more, the Cenobia founded in neighbouring countries by missionaries often continued to acknowledge the headship of the parent establishment. They formed, in fact, a religious clan, in which the abbot of the parent establishment exercised the same kind of authority as the head of the ordinary clan, In this way it often happened that bishops, notwithstand- ing the higher order of their functions, were under the jurisdiction of priests, and even of women, as in the case of St Brigit. This peculiar organization of the church continued to exist unaltered in Ireland during several centuries, indeed with few changes, chiefly relating to the position of bishops, down to the Norman Conquest. The Irish carried this

organization with them into Wales, Scotland, England, Gaul, Germany, and Switzerland, where it was finally supplanted by the Benedictine order.

When a Dun, and its surrounding village, in which Early Ini lived the various classes who formed the household and schools.

retainers of a chief, became a kind of Cenobium, in which were associated together those who had formally adopted a religious life and those who had not, we can understand how a school could grow up in which Lena, Filidecht, and Fenechas should be taught along with Latin and Christian knowledge. But even in the case of Cenobia which had a direct religious origin the same thing took place, because many persons of those professions embraced a religious life, and came there with their pupils, either with the object of increasing their own knowledge, or to partake of the literary life of the place. In the 6th century some of those schools had already acquired considerable reputation ; while in the 7th and 8th centuries some had grown into small towns, and were much frequented by strangers. Bede tells us that in 664 many of the nobility and lower ranks of the English nation were in Ireland leading a monastic life, or attending the schools, “ going about from one master’s cell (hut) to another.” Incidentally we learn that one of those schools, namely, Cill Belaigh, had seven streets of huts occupied by foreigners in the first half of the 8th century. From all this it will be seen that

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GEETiOCt LASER RATURE

the teachers in the Irish schools, even when connected with Cenobia, or later with monasteries, were not necessarily ecclesiastics. Indeed some of the most distin- guished men who taught in them were laymen, such as Mac Coise, Colman O’Cluasaigh, &c. ; and even Flann, surnamed of the monastery, who was head-master of the school of St Buite, now Monasterboyce, in the first half of the 11th century, was a layman and married. This explains the circumstance, so unusual in other countries in the Middle Ages, of so distinguished a scholar as Johannes Scotus Erigena being a layman.

The course of instruction included under the term Filz- decht, which an Ollamh Jili passed through, as laid down in a special tract called the Leabhar Ollamhan, or Book of Ollaves, occupied twelve years, eight of which were devoted to learning to read and write the grammar of the Irish language, the laws of the privileged classes, Filidecht proper, which besides vaticination, &c., included whatever knowledge was then possessed of the phenomena of nature. the elements of philosophy, Diznsenchas or historical topography, and learning by heart about 270 tales and a number of poems, and the secret language of the poets, &c. The ninth and tenth years were devoted to the composition of various kinds of poetry ; the eleventh year was employed in composing fifty major and fifty minor specimens of verse requiring the use of four kinds of metre. The studies of the twelfth year consisted in the composition of six orations, and the study of the art of poetry according to the precepts of four different authors, whose treatises are unfortunately either lost or unknown. The last two years of the course were for those who proposed to become Ollamhs. Whatever may have been the character of the teaching or the value of the outcome, it is the earliest example of the cultivation of any vulgar language in Europe. As an example of the inrportance attached to the native literaturc, it may be mentioned that the head-master of a school was obliged to go through the course just indicated, as well as to know Latin, “and from the Ten Commandments to the whole of the Scriptures.” The school here iniplied would be one of those connected with a Cenobium, or monastery, and had usually six teachers, The lowest of these taught the students to recite the psalms ; the second taught the course of native litera- ture just described up to the end of the 10th year. The fourth master taught Latin, arithmetic, and the elements of astronomy and geography; the fifth master was professor of divinity; and the sixth was the head-master, who was sup- posed to know the whole course, both profane and sacred.

In discussing the outcome of this system of education we can here of course take cognizance only of what has been written in Irish, and must consequently leave out of consideration the Latin hymns of the early church, the writings of Columbanus, Sidil or Sedulius, Johannes Scotus, Adamnan, and others who wrote in Latin. For the same reason we must in speaking of existing Irish manuscripts leave out of consideration the Latin ones, among which are some of the most remarkable illuminated books in

Europe, such as the Book of Kells. In the Ambrosian Library in Milan, the libraries of the convent of St Gall and of Bern in Switzerland, of the University of Wiirzburg, and of Carlsruhe, there are several Latin manuscripts glossed more or less copiously with explanatory Irish words. There is also in the town library of Cambray a manuscript containing the canons of an Irish council held in 684, in the middle of which is preserved a fragment of an Irish sermon on self- denial. These manuscripts, some of which belong to the 8th century and the others to the 9th, furnished materials to Zeuss for his Grammatica Celtica, a work which created an epoch in Celtic philology. With the exception of the last-mentioned none of these manuscripts contain a con-

tinuous Old Irish text. But according to Mone there is in the convent of St Paul, somewhere in Carinthia, a manu- script altogethcr in Irish, containing among other pieces pocms, copies of which are to be found in manuscripts of the 14th century in Ireland. In the Royal Library at Copenhagen there is one manuscript, partly vellum and partly paper, containing Irish poems, which formerly belonged to Professor Thorkelin, but we do not know its age, The manuscripts formerly belonging to the Irish College at Louvain were dispersed, the better portion being taken to the Franciscan convent of St Isidore at Rome, where they remained until within the last five or six years, when they were brought to the convent of the same order in Dublin. The remainder of the Louvain manuscripts, consisting chiefly of copies of Irish lives of the saints madc for Colgan when preparing his Acta Sanctorwm, are now in the Royal Library at Brussels. These are all the Irish manuscripts now known to exist on the Continent. The Irish manuscripts in the United Kingdom are very numer- ous, and by good fortune the majority of them, and these the most valuable, are in public libraries, and are thus at once more accessible to scholars and safer from fire, the danger by which Welsh literature has already suffered much loss. The number of Irish manuscripts which formerly existed must have been considerable if the file were as industrious as they were numerous and well rewarded. More than thirty books are mentioned by special names as sources from which some of the most important existing manuscripts were compiled, which are now lost, although some of them existed as late as the 17th century. Nearly all

the most valuable existing books are to be found in four public libraries, namely, those of the Royal Irish Academy and Trinity College, Dublin, the Bodleian Library at Oxford, and the British Museum. The collection of Irish manuscripts belonging to the Royal Irish Academy is the largest of all, and comprises, besides a large number of paper manuscripts containing many things not found elsewhere, the valuable vellum manuscripts, Leabhar na h-Uidhri or Book of the Dun Cow, the Book of Ballymote, the Book of Lecan, tho Leabhar Breac or Speckled Book, the Book of Fermoy. Next in importance stands the collection of Trinity College, Dublin, which contains the Book of Leinster (the most valuable from a literary point of view of all existing manuscripts), the yellow Book of Lecan, and a number of other manuscripts full of poems and prose tales, besides the most valuable of the existing law manuscripts. The collection in the Bodleian Library, though consisting we believe of only sixteen volumes, is very valuable. Besides a rare law manuscript it includes a manuscript compiled perhaps as early as the year 1100, and certainly not later than the first half of the 12th century, and containing some important poems not known to exist elsewhere. Theo British Museum Library has now a considerable number of Irish manuscripts, chiefly, however, written on papcr. But besides some law manuscripts of valuc, there is one vellum manuscript, a small folio of 68 leaves beautifully written about the year 1460, formerly belonging to Sir Henry Spelman, which contains the best extant copies of several of the most cclebrated historic tales. Of the vellum manuscripts in private hands the most important are the Book of Lismore, belonging to the duke of Devonshire, and kept at Lismore Castle in Ireland ; a manuscript in the possession of the O'Connor Don, containing a large number of poeins of the 15th and 16th centuries; the Liber Flavus, a small folio manuscript of about the beginning of the 15th century ; the manuscripts formerly belonging to the duke of Buckingham, and now in the possession of the earl of Ashburnham. The most important manuscript in this collection, which is inaccessible to Ys — 39

scholars, is the larger fragment of the Book of O'Duvegan, Ollamh of Ui Maine, the O'Kelly's country, who died in the year 1372, The other part of this manuscript is in the British Museum,

Contents of The contents of these manuscripts are of the most

Trish MSS.

Use of letters by the Pagan Trish.

Ogam in: scriptions,

miscellaneous character, in fact many of them are merc scrap-books. The following classification will enable the reader to form some general notion of the nature of existing Trish literature :—(1) grammar and glossaries ; (2) annals, genealogies, and pedigrees ; (3) history, legendary and real, including a large number of narrative poems, some of which might be considered to be ballads, and prose his- torical tales; (4) mythological and other imaginative tales ; (5) lyric poetry ; (6) satire ; (7) religious litera- ture, including lives of saints; (8) law; (9) science, inclusive of medicine ; and (10) miscellaneous translations from other languages. The manuscripts containing this varied literature were written after the 11th century ; only three of the principal ones above mentioned are as old as the 12th, the remainder being written chiefly in the 13th and 14th centuries. The contents of a manuscript are at least as old as itself and may be much older. Sometimes the manuscript itself informs us that a particular picce was copied from another manuscript which is named. Again poems are attributed to authors who lived long before the manuscript containing them was written, even as far back as pagan times. Can we look upon those poems as the genuine work of the period they are referred to, in the same way as we accept the works of Greek and Latin writers, although we do not possess any manuscripts of them written within even centuries of the author’s time ? andif not, howare we to determine the true age of the eontents of an Irish or of a Welsh manuscript ? ‘The answer to this question necessarily affects everything that could be said on the character and growth of Irish and Welsh literature. We must, therefore, say a few words on the subject, especially with a view of pointing out some of the considerations which might help us to arrive at a true solution of the problem.

The first point which naturally suggests itself for inquiry is whether the Irish knew the use of letters before the introduction of Christianity, This

question has been much discussed, but as there is not much evidence one way or the other, the discussion has not been profitable. Czesar says that the Gauls knew writing and used the Greek alphabet, showing that their knowledge of letters probably came from the Greek colony of Massilia; and the Gauls of North Italy used the Etruscan alphabet long before the time of Cesar. But these facts do not necessarily imply that their brethren in the British Islands had also a knowledge of letters before the arrival of the Romans, nor have we any evidence oven after that event that the British language was written. The Celtic names on British coins prove nothing one way or the other. As regards Ireland the only picce of evidence of the existence of a knowledge of writing before St Patrick's time is the statement of Gennadius respecting the letters of Celestius. This, it must be admitted, would be very slender evidence to found a conclusion upon unless supported by more definite facts.

Jn certain parts of Ireland, and in those parts of Wales once occupied by the Irish, are found rude stone monu- ments, upon the edges of which are cut inscriptions eonsisting of a number of long and short lines. This method of writing, which is called Ogam, was practised in Christian times even as late as the 9th and 10th centuries, for marginal entries written in Ogam eharacters are found in some of the manuscripts of St Gall; and in the vellum manuscript in the library of the Royal Irish Academy, called the Book of Ballymote, compiled near the close of the 14th century the different styles of Ogamic writing

and the value of the letters are explained in a special tract on the subject. The character of many inscribed monuments, and the circumstances under which they are usually found, seem to favour their pre-Christian use algo, On this point, however, there is still much uncertainty, and the utmost that we could venture to say is that the archaic character of the grammatical forms of Ogamic words, and especially the case of one bilingual inscription, places their relative antiquity beyond question. The geographical dis- tribution of Ogam-inscribed stones is worthy of attention ; they are almost exclusively confined in Ireland to Munster, and chiefly to the south-western counties. In the provinces of Leinster and Connaught only a few have been

found at one or two spots, and but one has been found in Ulster; they are, in fact, most abundant in the district where, according to tradition, the Milesians or Scots first landed in Ireland. In Wales they seem also to be chiefly confined to the districts formerly occupied by the Gwyddel, or Gael, Notwithstanding the use of Ogam by Irish scribes in the 9th century, and the existence of the key in the Book of Ballymote, the deciphering of the inscriptions has not been hitherto very easy, perhaps, as some think, because many are cryptic. Those that have been deciphered with certainty are very simple, and evidently marked the grave in some instances, perhaps in every ease, of a Sai or Yili, that is, if used in pagan times, of one of the Druidic order. If we can trust to the authority of some of the oldest of the romantic tales, Ogam was used in the north of Ireland as well as in the south ; there, however, it was cut on sticks or twigs, as Venantius Fortunatus tells us the barbarians cut their runes. In some Irish poems mention is made of Duile Feda, which has been interpreted to mean “ Books of Wood,” and may have been Ogam-inscribed tablets. But as no specimen of this literature has come down to us, and as they must, if they were evcr used at all, have been an inconvenient and imperfect mode of recording the pro- duct of thought, we may leave them out of consideration. Whatever opinion then may be held as to the existence in Jreland of a knowledge of letters in prehistoric times, we may safely assume that literature in the true sense of the

word began there with Christianity. In saying this, how- Oral tr

ever, we are not to be understood as denying that a record missioy poems, ».

of events, accounts of battles, panegyrics of warriors, may not be orally transmitted in verse. Metre, alliteration, rhyme, and assonance are powerful aids to the memory, and a bar to the introduction of new matter, and conse: quently prevent two different streams of traditions from mingling. But in time, and especially among a highly imaginative people possessing the power of improvising in verse, the streams of verse did mingle, enlarge, and modify themselves. Nevertheless it is marvellous how perfectly long poems of the most complex metrical structure may be transmitted by oral tradition for centuries. Poems transmitted in this way follow of course all the phonetic ehanges of the language, and, when at length they are written

down from memory, look as if they had been com- posed at first in the living language. In this way an essen- tially pagan literature may come as it were into existence long after paganism itself had passed away. The Kalevala, or heroic epopee of the Finns, and the Kalevi Poeg of the Esthonians, are examples of this. In order that this should take place, the manners, customs, and general state of culture should undergo but little change. When any serious change in these respects occurs, the stream either ceases altogether, or becomes so modified and admixed with foreign elements that a new literature may be said to begin. One of the most marked changes which takes place under such circum- stances is the substitution of vague descriptions of dress and arms, and a vague toponomy, for the full and definite descriptions and precise toponomy of the primitive poems.

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CELTIC LITERATURE

The knowledge of writing does not necessarily involve the entire supplanting of tradition by written narrative. Many Asiatic nations who possess alphabets from olden time nevertheless still transmit their history by oral tradition. The account which we have given of the organization and method of instruction of the poets clearly shows that in early times genealogies, laws, history, tales, &c., were trans- mitted orally, or, as was said, ‘from mouth and tongue.” This should always be borne in mind when discussing the antiquity or genuineness of poems, prose tales, or histories. Here it may be well to remark that verse is a better vehicle for the oral transmission of knowledge than prose. Besides

for being more difficult to remember than verse, prose offers ~ greater facility, not to say inducements, to introduce new

matter by way of explanation or commentary, or to fuse legends of different kinds. Hence laws were transmitted in verse, and wherever we have a legend embodied in verse, it will be found to be. both more archaic and purer than when in prose. The use of prose seems to indicate the passage from oral to written tradition. Another point which should be kept in view in judging of such literatures ag those of Ireland and of Wales, is that after the traditions of a country have been committed to writing the different kinds of knowledge will not be transmitted in equal purity or preserve their original form and language equally. Every fresh copy of an account of a battle, a legend, or a life of a saint, or of a narrative or description, would follow the change in the spoken language, and to some extent in the accessories of the picture, such as dress, arms, &c. ; in other words it would be a new and popular edition made intelligible to all. On the other hand, the exact words of a law or decision are important and would be sure to be copied without other changes than what the carelessness or ignorance of the scribe would produce. As vellum was dear and not easily pro- cured everywhere the words were written close together and contractions were used, especially for the terminations ; here was a fertile source of error and of the corruption of grammatical forms by ignorant and careless scribes. The most cursory examination of Irish manuscripts will illustrate the preceding remarks. In the same manuscript may be found pieces which differ in language by centuries. If the manuscript contain law-tracts, or pieces on subjects not of common or popular interest, they will be found written iu obsolete language, and generally noted with explanatory glosses or commentaries. The language of the tales and popular poems on the other hand will represent exactly the period of the compilation of the manuscript ;. and yet they may have been originally composed long before the law.

We need not dwell on the first category of Irish literature further than to observe that Irish scribes seem to have had a special liking for glossing, and that if all the existing glossaries, old and new, were added together we should have at least 30,000 words besides those in printed dictionaries, a richness of vocabulary unequalled perhaps by any living language. Among the old glossaries we may mention that attributed to Cormac Mac Cuilenndin, king and bishop of Cashel, who was killed in 903, as an early attempt at com- parative etymology, the author referring to Latin, Greek, Hebrew, Norse, and British. Many of these derivations are no doubt wrong,

but as an early attempt it is curious. The earliest copy of this glossary is to be found in the Book of Leinster, compiled in the first half of the 12th century, but though some articles may have been added, there is no reason to doubt that it was the work of Cormac. As grammar formed an important subject of the course of Filidecht we might expect to find many treatises on it in Irish manuscripts. Several are mentioned, but they appear to be lost. There is, however, one deserving of much attention, written perhaps in the 9th or 10th century ;

the oldest copies now known, however, are those in the Books of Ballymote and of Lecan, manuscripts compiled towards the end of the 13th century.

Annals form a notable element in Irish literature, but we can do little more than mention a few of the more important compilations. During the 11th century attempts were made to synchronize Irish events with those of other countries. Of these may be mentioned the synchronisms of Jann of Monasterboyce, already mentioned. But the most notable attempt to synchronize events is that made by Zighernach O'Braoin, abbot of Clonmacnoise, who died in 1088. Zighernach in his Annals displays considerable scholarship, and for the time fair critical power. He was probably the first to intro- duce the common era into Irish annals. The oldest copy, and unfortunately only a fragment, is in a manuscript of the 12th century in the Bodleian Library at Oxford, nor can a perfect copy be made out of the six or seven other copies which are known. The Annals called by most writers since the times of Usher and Ware the Annals of Ulster, but more correctly the Annals of Senat Mic Maghnusa, or Mac Manus, compiled or copied by Cathal Maguire in 1498, in an island'in Upper Lough Erne called Senat Mic Maghnusa, and continued in some copies to 1604, are of special importance, because the book contains notices of comets, eclipses, and other natural phenomena, which appear to have been recorded by eye- witnesses, as is proved by the day and hour of the eclipse of the sun on Ist May 664 being correctly recorded, while Bede, who records the same eclipse post-dates it, as the result of calculation, by two days, as does the Saxon Chroniclealso. Zighernach, like the Annals of Ulster, gives the right date. This fact shows that both Zrghernach and the

compiler of the Annals of Ulster must have had access to contemporary documents, at least as old as the middle of the 7th century. But the most extensive though the latest-compiled Annals is the collection called by Father John Colgan, editor of the Acta Sanctorum Hibernia, the Annals of the Four Masters, the chief of whom was Michael O'Clery, 2 Franciscan friar, who, after collecting materials from the then existing Irish manuscripts, com- menced in 1632, amidst the ruins of the convent of his order in Donegal, the compilation of this very remarkable monument, and in four years completed it. The Annals of the Four Masters extend from fabulous antiquity to 1616. Down to the 4th century the entries are little more than lists of kings, but thenceforward they become fuller and more trustworthy.

The political and social organization of Ireland, and Pedigrees.

especially the custom of gavel-kind, made pedigrees and genealogies matters of great importance. The Irish gene- alogies are usually carried up to Noah, and include on the way many eponyms and even divinities. The Biblical portion may be easily removed without detriment to the Irish part; but it is not so easy to say where the legendary and the true touch. Within the historical period the pedigrees and genealogies afford great help in historical inquiry, though it should not be forgotten that a Sac was quite as capable of inventing a pedigree as any modern

herald. Topography may be said to be the complement Topo- of pedigrees, and like the latter was of great use to Irish graphy.

families, and was accordingly, as we have already pointed out, well attended to. Of this kind of literature the most curious and valuable example is the tract called the Dinnsenchas, said to have been compiled at Tara by a Sav, named Amergin Mac Amalgaidh, or Macauley, about the year 550. This work, the oldest copy of which is in the Book of Leinster, gives an account of the legendary origin of several places of note, and thus preserves invalu- able mythological materials.

Historical poems.

Every successive race which peopled Ireland had, we are told, its historian, whose names are given, and in some cases particular verses and even long poems are attributed to them, These are, of course, mythological personages, but this fact is in itself a proof of the antiquity of the system of recording in verse the history of the country. Without going back to Coirbre, the son of the goddess Liam, wie of Ogma " of the sun-like face," a long list of poets beginning with Adel Olam, a king of Munster in the 2d century, the supposed progenitor of the chief Celtic families of the south of Ireland, may be made out. There are three poems in the Book of Leinster attributed to the Ailill just named. It is needless to say that in their present form these poems could not be the work of a poet who lived a thousand years before the Book of Leinster was written, even if the poet were not, as is probable, only an eponymous ancestor of Munster clans. 'T'o the same or a somewhat later period belong several other mythological personages to whom poems still extant are attributed, and of whom we shall have something to say presently,—namely, Finn son of Cumall, contemporary of Cormac son of Art, "the lone man," and a reputed author himself, Oisin the son of Jin (the Ossian of later romance), and his brother fergus, and his cousin Cailte. In Niall of the Nine Hostages, who was killed on an excursion into Britain in 405, we have probably an undoubted historic personage, and in Torna Eigeas or "' the learned," his /%li, a real poet, There are many poems attributed to him still extant, but in their present form they belong to a period not perhaps earlier than the 11th century. His contemporary Laidcenn was the author of an Art of Poetry which has not reached us, After the conversion of the whole country in the 5th century there cannot be any doubt that the poets whose names occur in the Annals, and to whom poems are attributed in manuscripts, were real personages. Some of the poems attributed to the earlicr ones have come down in such an archaic dress that it is probable we have the genuine work of the poct. The works of the poets of the 9th, 10th, and 11th centuries are either their genuine pro- ductions or at most slightly modernized versions. Between the first of those centuries and the 14th the change in the language was not very great. Among the names of authors of historical poems who lived between the 5th and the 11th century the following deserve special mention :—Bishop Lace, author of a metrical life of St Patrick which survives nearly, if not quite, in its original form; and Dallan Forgaill, a contemporary of St Columcillé, and author of an elegy on that saint, which is to be found in the oldest

manuscript written wholly in Irish now in Ireland, the Leabhar na h-Urdhri, or Book of the Dun Cow, which was compiled before 1106. The poem in question is glossed and accompanicd by a kind of commentary on the difficult words, so that the language was already so obsolete in the end of the 11th century as to be practically unintelligible, In the 7th century the most prominent names are the following. Senchdn Torpeist, the successor of the Dallan just mentioned as chief poet of Ireland, flourished about the year 600. Senchan is one of those to whom the authorship of the existing form of the principal Irish tale, the Téin Bé Cuailnge, is attributed. Finntann, poet of Kaghallach, king of Connaught, killed in 648, has attributed to him the authorship of a very spirited ballad on the deeds and death of his patron. The language of this poem, admitting it to have been written by Linntann, has been modificd to some extent in the way above suggested, St Moling was the author of several poems of considerable merit, some of which only come under the present category. Two of St Moling's poems have been found by Mone in the manuscript in the convent of St Paul in Cariuthia above mentioned, and scarcely differ in

orthography from the copies which exist in manuscripts in Ireland compiled six hundred years later than the St Paul codex, assuming the latter to be, as Mone suggested, of the 8th century. Cennfaeladh "the Learncd," the reputed author of the grammar of the Irish language above men- tioned, died in 678. During the 8th century the num- ber of writers appears to have becn smaller than in the preceding and succeeding centuries. This was no doubt due to the great number who went abroad, for during that century, and the early part of the 9th, Irishmen were to be found in every part of Europe. In the latter century Lothadh, Flanagan, and Flann Mac Londin occupied a prominent position as writers of historical poems. Laitheog, the mother of Plann Mac Lonain, deserves mention also ag a poetess, and as showing that women shared in the literary cultivation of the period. In the 10th century the most prominent poets were Cormac "the Learned," Ctnacdh O'Hartagan, and Echaid O'Flinn ; and in the 11th cen- tury, Lchaid O'Ceirin, surmmamed " the Learned," author of a curious historical poem

descriptive of one of the great fairs or Oenechs, held in Ireland; Mac Liag, Mac Coise, Cuan OLothcain, and Flann of the Monastery. The historical poems attributed to the writers of the 10th and 11th centuries are, as might be expected, much more numerous than those of preceding ones, Indeed we might make an epitome of the whole history of the country, especially of the legendary part, from the poems of the writers just mentioned, the poets of one period deriving the materials of their own poems from those of their predecessors,

In the 11th and 12th century prose came largely into Prose use, as is shown by the large number of prose historic history. tales and romances which were written at this time. It is difficult to draw a line between real history and his- torical fiction In an early literature, but in Irish it is especially so, for we find many of the so-called historical tales so free from the miraculous, and go sober in the narrative, that at first sight we could scarcely refuse to accept them as history; and yet one of them to which this description applies is undoubtedly an account of a war between deities. In general, however, we can follow all the stages from a simple historical narrative up to a full- blown romance. The circumstances under which this kind of literature was produced show why this should be so. The business of the Fil, or poet, was to praise his chief, celebrate the achievements of his ancestors, and find him amusement when he regaled his Sabaid, or props, as the chief men of the tribe were called, in his alehouse. Tor this purpose a simple narrative of a foray or a skirmish required to be embroidered with a little romance ; hence the number of accounts of battles, deaths, feasts, é&c., which though in the main founded on real events belong by their treatment to fiction, There are, however, some produc- tions which though not free from invention may yet be classed as attempts at writing prose historical narrative. Perhaps the earliest of this class of compositions is the History of the Borromean Tribute, or great tribute of cows levied in the province of Leinster by Zuathal, surnamed Leachtmar, or “the Legitimate,” whose death is variously stated to have occurred at from 106 to 160, and who consequently belongs to the dawn of the historic period. This tribute was abolished by the paramount king of Ireland Finnachta, surnamed “ the Festive,” at the instance of the St JMoling above mentioned, but imposed again in the beginning of the 11th century by Brian, surnamed from this circumstance Boroimhé, or “ Brian of the Cow Tribute,” as a punishment of

Leinster for supporting the Danes. This interesting work is found in the Book of Leinster, and was therefore probably written at the time of the re-imposition of the tribute. Another work of the same period is the Wars of the Gacdhil with the Gaill, or the

history of the invasions of Ireland by the Danes and Norsemen. The only perfeet eopy of this work known is one in the handwriting of Michael O'Clery, chief of the Four Masters, in the National] Library at Brussels, but there is a fragment of it in the Book of Leinster, the remainder being lost. The existence of this fragment shows that it was written at latest within a eentury of the battle of Clontarf ; but from curious ineideutal evidence it must have been. written by an eye-witness of the battle, or by some ore who received his information from one who had been there. It is mentioned in the history that the tide in Dublin Bay coineided with sunrise on the 23d of April 1014, the day the battle of Clontarf was fought, and that the returning tide in the evening aided in the defeat of the Danes; astronomical caleulations have shown that the first part of this statement is quite correet. The style of this work is poor, the descriptions are wanting in precision and aceuraey of detail, owing to the redundaney of nearly synonymous adjectives, and it was evidently written by a partizan of Brian. But with all its faults it is a work of some interest even from a literary point of view. The Wars of Turloch, written by John Mae Grath, historian of the Clans of Thomond, now the eounty of Clare, about the year 1459, isa third example of historic prose, and one whieh gives us an insight into the nature of the feuds and struggles for power between rival elaimants for a ehieftancy, and the part which the Norman adventurers played in these intestinal contests, which ultimately allowed them to beeome masters of the country. The immediate subjeet of the history in question was the war between Turloch O'Brian and his uncle Brian Ruadh O'Brien, and the sons of the latter, aided by the De Clares ; but it may be said to be a history of Thomond for more than two hundred years, from the Anglo-Norman invasion to the death of Robert de Clare and his son. Like the work last mentioned the style of this history is very redundant, the deseriptions being overloaded with adjectives 'almost identical in meaning, and often incorreetly applied; it is not, how- ever, devoid of skill in the narrative, and many of the incidents

are deseribed with vigour aud force. Perhaps if we had the original texts of this aud the Wars of the Gaedhil with the Gail, we should find the style purer. One of the ways in which scribes corrupted the texts of the works they eopied was by adding meaningless adjectives to give as they thought dignity and ornament to the deseriptions.

The Book of Munster, though of uncertain date, and not known to exist in any old manuseript, is a work whieh illustrates very well the peculiarities of Trish historical com- pilations. It begins with an aecount of the Creation taken from Genesis, whieh serves as an exeuse for tacking on the Biblieal genealogies to the Irish ones; then follows the history of the Milesians from ber, son of filed, the epopymous ancestor of the Munster tribes, to Brian Lorowmhé. The legendary part of the work is to be found in most of the principal Irish manuscripts; but the part relating to the period from the 7th to the 10th eentury is of great interest, and contains much not found elsewhere. The ethnic legends just referred to, whieh form so pro- minent a feature in Irish historieal compilations, have been all brought together in what is ealled the Book of Invasions. This work is a link between genealogies and historical narrative proper, and consists of the legendary histories of the successive tribes supposed to have peopled Treland, and of their eponymous leaders, into which are introduced many curious so-called historieal poems, the matter of which, if not the language, is of considerable antiquity. ‘The oldest eopy of the Book of Invasions, the author of which is not known, is that in the Book of Leinster; the one which existed in the Book of the Dun

Cow in 1631 has been unfortunately sinee lost, with much of that valuable manuseript. Michael O’Clery, chief of the Four Masters, eompiled from the eopy just referred to and others, a condensed version, the original of which is now in the possession of Lord Ashburnham. In speaiing of the Book of Invasions we are reminded of the first attempt made to write a general history of Ireland, by Geoffrey Keating, a parish priest in the eounty of Tip- perary, in the beginning of the 17th century. His work, whieh is written in the spoken Irish of the period, and compiled under very unfavourable circumstances, is an epitome of the copious mixture of legend and faet

which is found in Irish manuscripts, and among other things con- tains much borrowed from the Book of Invasions. He appears to have had aeeess to many manuseripts since lost, and though he makes no attempt to examine his materials critically, the work has eonsiderable value, and. bears eom- parison with similar attempts made under analogous conditions in other languages.

The learning of stories formed, as we have seen, an Different An Ollamh classes of Fili, for example, was bound to know two hundred and !<*

important feature in the course of ilidecht.

fifty prime stories, and one hundred secondary ones. In the 11th and 12th centuries the number of stories eurrent must have been very eonsiderable. There is a list of one hundred and eighty-one tales in the Book of Leinster classified under the heads—Destruetions, Cow Spoils, Wooings, Battles, Adventures in Caves, Wanderings and Voyages, Deaths or Tragedies, Feasts, Sieges, Adventures, Abduetions, Slaughters, Irruptions of Lakes, &c., Visions, Loves, Expeditions, Marches or Progressions. More than one hundred of these are still extant, and of these nearly one half are to be found in manuseripts as old as the 12th century, into whieh they were copied, as in many instanees we are distinetly told, from older books. The existing tales belong to six categories :—(1) ethnie, or those relating to the peopling of the eountry, and the subsequent struggles of the different races; (2) voyages, expeditions to Scotland, the Isle of Man, or Britain, and the sieges, battles, adventures, deaths, and abduetions whieh took plaee there ; (3) mythological stories connected with the Side ; (4) tales forming the heroie cyele of Queen Jedb and Crichul- aind ; (5) the tales of the Fennian or Oisianie period ; and (6) miscellaneous tales belonging to pagan and Christian times, but chiefly to the periods of the 3d and 7th eenturies.

The Book of Invasions is simply an attempt to put Ethnic the prineipal stories of the first category into a me- legends.

thodieal order. The staple of the stories of this elass is unquestionably of considerable antiquity, though in the present form they are not much older than the 12th century. Of the existing ones the most important are the aeeounts of the battle of Mag Zutred Conga, supposed to have been fought between the /irbolgs and the intrusive Tuatha Dé Danann, and the battle of Mag Tuired of the Fomorians, supposed to have been fonght between the latter and the Tuatha Dé Danann. The first of these tales has the terseness and simplicity of a Norse Saga, and depicts a rude and early state of society wholly unlike that in the later stories. The supernatural is so little developed in them that, notwithstanding the ehief personages are the gods of the Irish pantheon, they must represent real ethnie struggles.

The stories we would propose to place in the second Legends of

eategory have little in common save that they refer to what ely inter- ith course with

we nlight call the prehistoric relations of Ireland w Britain. Some relate to personages of the heroie or mythological cyeles ; others to Scotie invasions of Britain ; and others again to the Christian Dalriadie kingdom. Of the tales of this second category two are of great value in the history of romance—namely, the Abduetion of Dlathnad

Mytholo- gical tales.

daughter of Pavll by Cuichulaind, and the Voyage or Exile of Brecedn. The Paill of the first story appears to be the Pawl of the Welsh Mabinogion, which we shall mention further on ; and in her second husband we have the Corrou mab Dayry of a Welsh poem, which gave rise to much dis- cussion. The Brecedén of the second story was, according to Cormac's glossary, the son of Vall of the Nine Hostages, one of the Scotic invaders of Britain, who traded with a {icet of fifty boats between Ireland and Alba, but was wrecked, and he and his whole fleet lost, in a whirlpool formed by the meeting of the tidal currents in the channel between the two countries, which on this account was called Coire Breccdin or Breccén's cauldron. Dr Reeves thinks this was between the mainland of Antrim and the Island of Rathlin ; but it has since migrated with the legend to the channel between Jura and '¢ Searba's Isle, whose tortured shore Still rings to Corrievrekan's roar."

Breccén has also left footprints of himself not only in Welsh legend but also in Welsh hagiology, and as we have already mentioned in Welsh toponomy, for he is the Lrychan, the founder of one of three families of saints, who has given his name to Brecknock,

The mythological tales all relate to the inhabitants of the Side or Celtic Elysium, whose chiefs were the mythical Tuatha Dé Danann leaders, and who form, as we have pointed out above, an extensive pantheon. Among those who figure in the tales are Htain, Lér, Manandan his son, the Dagda, Tuirenn Bicrenn or Delbaith aud his three sons, and Lug Mac Eithlenn.

These tales may be divided into three classes. Tu the first of these the actors are all Z'uatha Dé Danann, or these associated only with personages of remote antiquity, and in the sccond the same divin- ities are associated with personages of the heroic period, especially with Medb and Cvichulaind, and those in which historic or semi-historic personages are asso- ciated with the deities of the Side. The Wooing of Etain, the Exile of Bri Leith, the Death of the Sons of ZTwirenn, are examples of the first class. The Seirglige Conchulaind, or Bed of Decline of Crichulaind, one of the most remarkable of all the Celtic mythological tales, is an excellent example of the second. The third class embraces such tales as the Wooing of Becuma by Conn " of the Hun- dred Battles," and the Adventures of Condla the Beautiful, son of the Conn just mentioned. -In the third class might also be placed a number of curious tales in which pagan myths are transformed into Christian ones. We may observe this transformation of the pagan into the Christian myth in every stage of the process; thus in the tale called Tomaidm Locha Hachach, or the Irruption of Loch Neagh, or, as it is called in the Leabhar na h-Uidhri, Aided Hichach Mac Maireda, the Death of Echaid son of Mazred, we have a legend more than half of which is pagan, but which in the latter part is changed into a Christian myth without affecting the general pagan character of the whole. 'The Fate of the Children of Zéz, or Lear, is a legend of the same kind ; indeed the same pagan myth serves as the basis of the Christian part of the myth in both tales. In the Birth of Aed Slane, king of Jreland, who died in 600, we have an Aryan myth completely transformed into a Christian one. Diarmait, son of Cerbeoil Aed's father, had two wives, Ifurend and MMurgdn, the former of whoni was bald, and was provided with flowing hair by the aid of St Ciaran, or Kyran; the latter was barren, but becomes fruitful through the aid of St Finden and of a bishop named Aed (fire, spark), who gives her a drink of blessed watcr which renders her pregnant of a lamb os second drink causes her to bring forth a silver salmon ; but the third drink gives her a son called Aed.

There is a special class of legends, the Znmrums or

Wanderings by sea, which we have not included in any of Inmrany. theforegoing categories, but which, as examples of the fusion °F wander. of pagan and Christian elements in a legend, may be dis- 8 posed of here. 'he origin of the Christian Jmmram igs

to be found in several pagan tales such as the Visit of

Conn “of the Hundred Battles” to the Land of Promise,

which forms part of the Wooing of Decuma, already men- tioncd. The principal Immrams are—the Voyage of St Brendan (the most celebrated of all), the Wandering of the

sons of Ua Corra, and the Wandcring of Afaeldun. In these

the transformation of the pagan myth is so complete that

we should not have been able to trace their origin but for

the existence of the pagan tales just mentioned.

There is another class of compositions—the isa, or Fésa, or Visions, which, though strictly belonging to the category visions. of religious literature, offer so many analogies to the Immrams or Wanderings, in some of the incidents, that it is better to say a few words on them in this place. In several pagan tales we have examples of visions, some brought about by pagan rites, which are the prototypes of the later Christian visions, such as those of St Adamndén, and St Fursey. The Christian visions of Hell and Heaven owe | something to Virgil, but the extent of the obligation is | much smaller than might at first sight be supposed, for we can trace the growth of the ideas under which the J%s or vision was evolved and developed to the fusion of pagan, Celtic, and Christian notions. Several of the adventures of Brendan, Maeldun, and the sons of Ua Corr@ contain scenes which have the same origin as many of those . depicted in the visions,

The tales which we propose to include under the head of Heroic | heroic tales form a large and well-marked cpic cycle. Thee — central tale of the scrics is the Zdéin B6é Cuailnge or Cattle Spoil of Cwalnge, now Cooly, in the county of Louth, | which relates the history of the war waged by JMedb, queen of Connaught, the Queen Mab of fairy mythology, and her husband Azdill, with Conchobar Jac Nessa, king of Ulster, for the possession of the mystic brown bull of Cualnge, in which the hero Cichulaind defends Ulster single-handed, while the king and his champions are in a peculiar state of

debility inflicted upon them for a savage act of the former. The existing tales of the series amount to about thirty, exclusive of the tale of the Zdin itself and of the prologues and fore-tales narrating the pre- parations for the great cow-prey. In these tales as a whole we have one of the most complete epic cycles in any literature. We have a narrative of the life of the great hero of the series from his conception to his death, of AMedb, the chief heroine, and of all the chief personages on both sides, male and female—Conchobor Mac Nessa, Fergus Mac Roigh, Arlill, husband of Medb, Conall Cernach and Léi- gutre or Leghaire Buadach, companions of Crichulaind, the sons of Uisnech, and Ferdiad ; Deirdriu, Emer, and the other women who take part in the action. In some of the stories Curoi Mac Daire, the Munster king, Conaire Mor, the paramount king of Ireland, Manandan Mac Inv and his wife Fand, and many other personages of Celtic mythology come in. The principal tales of this remarkable series exist in manuscripts written in or before the early part of the 12th century, and the others in vellum manuscripts of good authority. ‘The stories are mixed prose and verse, the latter being generally more abundant in the oldest copies ; the finest episode of the Zdin itself, descriptive of the single combats between Cichulaind and Ferdiad, consists of about equal parts of both. Prose, as we have said above, marks a transition period, and it is therefore likely that the whole series originally consisted of poems- which the bard in reciting introduced by brief prologues which served to connect the subjects of the several poems into a kind of connected narrative. This may be regarded as the first

stage in the composition of national epics, that is, when the isolated poems fashioned by different rhyme-smiths are first welded into some kind of connected whole. A second stage would be the linking together of the separate episodes by a permanent setting of prose which would connect, continue, and expand the stories of the separate poems into a continuous coherent narrative. A third stage would be the forging of the whole material, poems and prose settings, into one continuous epic poem. ‘The elder Edda, which consists of thirty-eight poems collected from the mouths of the Skalds, perhaps in part composed by Saemund Sigfusson, towards the end of the 11th century, gives us the first or embryonic stage of growth. Snorro-Sturleson’s prose Edda, made in the beginning of the 13th century out of the

poetic Edda and other materials, gives us a second stage; and after a long interval a third stage was reached in Oehlenschliger's Vordens G'uder, or " Gods of the North." In this case the original materials under- went complete fusion in each stage. The /lcad and Odyssey of Homer are cxamples of epics iu a third stage, but we do not know their previous stages. The Finnish Epic, Xalevala, made in the present century shows us that an epic may be fashioned directly from the popular poems without passing through a prose stage at all. The Zdin Bé Cuailnge is clearly in the second stage, a fact which should not be for- gotten in comparing it with other national epics, as for instance with the Nibelungen Lay, which is an epic in the third stage. But the Irish epic not only belongs to a different stage of poetic workmanship, but, owing to the comparatively isolated position of Ireland, to a relatively much earlier and more archaic type of society than that of the German epic, which moreover was recast, or at all events reached its third stage in the 12th century in the times of the brilliant Hohenstaufen.

Who the author of the 7déin Bé Cuarlnge or of any of the tales of the heroic period was is not known. A curious legend points to Senchdén Torpeist, a poet who flourished about 600, as the person who gave the 7'din its present form ; another tradition assigns the work to St Ciaran of Clonmacnoise. The language of the portion of the Téun in the Book of the Dun Cow is not older at most than the beginning of the 10th century; the text of the Book of Leinster, which contains the whole story, is more modern, although the two manuscripts do not differ in age perhaps fifty years, the language of each copy evidently following, as we have before pointed out, the current of the spoken language. The tales of the heroic cycle, whenever originally written, are essentially pagan, and represent an early state of scciety still unaffected by Christianity or by Roman influence. That real persons may become the heroes of legends, and very simple everyday acts the roots of myths, is too well known to require proof. Indeed, it may be doubted whether a real personage may not always be necessary as a lay figure for the myths to gather round in the first instance. Be this as it may, Cvichulaind, Medb, and the rest of tho personages of the heroic period, not- withstanding their complete anthropomorphism, are a phase of Irish mythology. The connection of the Tuatha Dé Danann pantheon and the actors in the heroic tales is direct and explicit. Thus the rival bulls, which are the direct cause of the war, are but metamorphoses of two hostile personages among the

inhabitants of the Side, the representatives perhaps of the Teutonic AMsir and Vanir. Fedelm, the Ben Fath, prophetess, from the Sid of Cruachan, appears to Medb and describes to her Cuichulaind ; Badb, the Mér Rigu, forewarns Crichulaind of his death ; the latter in the tale of the Bed of Decline, which we have re- ferred to in speaking of the mythological tales, is bewitched by the woman of the Sid; Fand, wife of Manandan Mac Lir, falls in love with him; he visits Zu Tatrngire, or

the Land of Promise, and assists the people of the Side in a battle against their enemies, edb, too, has power over the Geinete Glind:, or Spirits of the Glen, and in many ways shows her divine nature.

The poems and tales which we have called Fennian, or Oisianic, form a cycle entirely distinct from the heroic one. Their history, too, is curious. of Cumall, the chief hero of the tales, is supposed to have flourished in the second half of the 3d century and to have acted as commander of a body of mercenaries. He thcre- fore lived at a time which may be considered, if not actually within the historic period, at least upon its threshold. The struggle of the various races for mastery was ended, and this militia or standing army was evidently intended to keep the subject races in check. That the idea of such a force was suggested by the Roman army in Britain there can be little doubt. Perhaps to the existence of this body is due the considerable scale upon which the sub- sequent invasions of Britain by the Scots took place. As finn appears in the accounts of the battles which he is supposed to have fought, he has all the air of an historical character, and is almost entirely devoid of legendary accessories. The same may be said of his son Oisin, the poet, and of his grandson Oscar. In the Book of Leinster are two poems ascribed to Ousin, and only two or three tales belonging to the Fennian cyclc—one of which has reached the present time—are mentioned. Indced in the older manuscripts there are few references to Finn, or to any of the personages of the Fennian romances. Inthe 12th century it would appear, therefore, that Finn and the other Fennians had only just begun to become the heroes of romance. But between the end of the 12th and the middle of the 15th century a rich body of poems and tales came into existence. This new Fennian epos possessed considerable vitality, for it

continued to grow even down to the present century, and at least one entirely new tale belongs to the 18th century, and many received considerable expansion during the same time. The cause of this very remarkable growth of legend is obscure, and would be well worth investigating in connec- tion with the history of romance. The two streams of romance are perfectly distinct and never mingle; at least we never find any of the heroes of the heroic period mentioned as actors in genuine Fennian tales. No better proof of the spurious character of a legend could be given than the co-existence in the same poem or story of actors belonging to the two romantic cycles.

The Fennian or Oisianic legends are very numerous and very romantic, and there is a distinct Fennian toponomy, whicli has not obscured or invaded that of the heroic period. Finn is stilla popular hero, while Caichulaind has become a shadow. In the current Fennian literature, as distinguished from the mere corrupt popular plastic legend on the onc hand, and the Fennian poems and tales con- tained in good manuscripts of the 15th century on the other, there is an increasing disregard of relative chron- ology, and of consistent toponomy. There is not the same terseness and clearness of expression in the new as in the old stories ; they are evidently the work of a people who are no longer in the same stage of culture. The descrip- tions of the dress and arms of the actors are vague, the number of those slain in battle is greater. The romanccs of the 14th and 15th centuries are full of magic and wild prodigies, but nevertleless they have the aroma of the forest and the mountain heather; one hears the echo of tho huntsman’s horn, and sees the rude life of the Dun, and the deep drinking of the chief’s ale-house. The prose tales lack the refinement of the Welsh JAfabinogion, and the poems the polish of the Welsh ones, but they are truer products of the national culture of the period.

Finn, or Find, the son *

Fennian or

Oisianic ales,

Miscella- neous legends.

The sixth or miscellancous class of legends do not require special notice, the more so as we have alrcady included among the mythological tales some that might come under this head. Nor do the limits of this article permit us to say anything on the subject of lyric poetry. We have spoken of the incantations in verse of the Jie, and of the satirical poetry which originated in them, and which for a long time was endowed by the popular mind with baneful powers. This belief was the source of the Fils's influence in Christian times, and encouraged him to indulge in satirical compositions. Some of these possess considcrable merit, and two of them deserve to be specially mentioned as early examples of a form of satire which was uscd by the French writers of fabliaux, and which in the hands of Rabelais and Swift gave rise to great works. The first is the Aislénge or Phantasy of a certain Aner, the son of Conglinn, who lived at the end of the 8th century. He was at first a theological student, but soon relinquished divinity for satire and the free life of a Mi. He betook himself to Cork, to Cathal, king of Munster, who happened to suffer at the time from the disease of a voracious appetite, for which he sought everywhere a cure. Azer undertakes it and succeeds. . The piece opens with a kind of prelude in which a northern hag boasts that Jaeldun, king of Avlech in Ulster, Cathal's rival for the paramount sovereignty of Ireland, is about to go to the south and carry off its spoils; a southern hag defies him, and says he will stop on the way. The poet, as if to raise his own importance, gives in a short poem the nanies, tribes, and places of eight scholars of repute, among whom is of course the poet himself, who had studied together at the school of Armagh. Having thus given himself the necessary importance, he describes his preparation for his journey to Cork, and the journey itself. On his arrival there he goes to the gucst-house of the Cenobium, but uot finding it an agreeable place, and the food being not to his liking, he writes a severe satire on the place, for which he is treated badly by the abbot. Anier revenges himself by writing a singular genealogy of Jfanchan, the abbot, whose ancestors up to Adam he represents to be various forms of luxurious viands. He then acquaints the abbot with his object in visiting Cork, and relates a vision which he had of an island of wheaten bread in the midst of a lake of new milk, on which was a house of butter and other articles of food. He fancies himself ferried over to this island in a boat of beef, and finds at

the house a singular doorkeeper dressed in clothes of beef, curds, fish, butter, &c., and ornamented with garlands of sausages. Here he learns how to cure his voracious appetite, which he feigns to be the object of his search. The result of this account of his vision is that dZanchan sends him to the house of a certain Pichun, where he has an interview with king Cathal, and rclates to him another vision of a mansion made of the most delicious viands, with the object of enticing the Lonchraes, or voracious demon, with which the king was sup- posed to be possessed, to come forth. By such stratagems he ultimately succeeds in enticing the demon out, and curing the king. The personification of viands in this curious piece forcibly reminds us of the French fabliau of the Bataille de Karesme et de Charnage,| in which the combatants on one side are fish and the various dishes permitted in Lent per- sonified, and on the other the various kinds of flesh meats.

The Dream or Phantasy of Anier Mac Conglinne is in a manuscript, of about the year 1400, called Leabhar Breac, the Speckled Book, but the language of the piece even in its present state proves that itis much older. There seems, indeed, no reason to doubt that it really was written in the 8th or 9th century, and that the orthography has been

ai ie ee eae meen | Fabliaux et contes des Poétes Frangots des XI de, Siécles, publie par Barbazan, Paris, 1808, vol. iv. p. 80.

only a little changed by the scribes who copied it. The contrast between the dishes, the mere recital of which it was hoped would entice the demon from Cathal’s stomach, and those mentioned in the French fabliau are very instrue- tive as regards the kinds of food in use, and the relative degree of skill in the culinary art, and the general culture of Ireland and France at the periods when the Aislinge and the fableaw were respectively written,

The second piece referred to above is the Plunder of the Cathair of AMael Milscothach, or Mael “of the honcyed words,” written by Hrard Mac Coise, who died about the year 1023. The poet had a Cathazr, or residence, at Clartha, now Clara in Westmeath, which was plundered and demolished in his absence by some of the O’Neills, and his furniture, ornaments, and cattle carricd off. fac Coise not being in a position to demand redress

directly, had recourse to his art. Going to the Dun of Domnal O'Neill at Azlech, near Derry, the king, as was customary, asked him what tales he could recite; the poet names those he knows, all of which the king has heard before save one called the Plunder of Afael Milscothach's Cathair, which he desires to hear. Jfac Corse then describes the attack and destruction of his house, using allegorical names for all the actors in the outrage. He first gives the pedigree of Mael "of the honeyed words," from the god Dagda. As the hostile party approach the Cathair the nymph of poetry asccnds to the top, and asks who they are, and what they seek. The spokesman of the enemy gives a number of allegorical names, which when interpreted mcan the O'Ncills themselves. The nymph asks would they not prefer the jewels of poetic eloquence and eulogy to the torturing lash of satire, for she possessed abundance of both, from the panegyrics of Jfac Londin, the satires of Mordn, the eloquence of Laidech, the stories of Leach Liathmhuim, the proverbs of Jthal, the wisdom of the Ferceirtnés, the intellect of the poetess Ltain, the brilliancy of Nera, the clear truths of the priucess Af67 Mumhan. The marauders heed not the question, but burst into the house and plunder it. On going to the cellar they are met by the guardian Dathghel, who enumerates the male and female defenders of the place; these are no other than the various household articles personified, such as " Bellows, son of constant Fire-place ;" ' Blanket, son of Women's Work ;" " Broom, daughter of Tidiness," and so on, The result of this clever piece of satire was the restoration of the poet's property, and compensation for his loss,

The subject of law and its literature will be found fully Law.

treated under the heading Brenon Law, vol. iv. p. 252.

Among the gods of the Irish pantheon mentioned above Medicin

was Diancécht, that is, Dia na Cécht, the god of the powers (of healing). In the 7déin D6 Cuatlnge, a Fath-Liag, or prophet-leech, heals the wounds of Cichulaind after his fight with Ferdiad. It is probable, therefore, that in pagan times the Ziag, leech, belonged to the order which may be conventionally called Druidic, and that charms and incantations formed part of the means of cure, like those of the Gallo-Roman physician Marcellus Burdi- gallensis. The position assigned to the leech by the laws in the

Middle Ages was a very high one. He ranked with the smith and the Cerd, or artist in gold and silver ; and the Ollamh, or doctor in leechcraft, ranked with an Aire Ard, that is, one of the highest grades of lord, who had ten frec- stock tenants and ten base-stock tenants. He had also a distinguished place at assemblies, and at thc table of the king. lLeech-craft became hereditary in certain families, sonie of whose names indicate their profession, as O'Lee, that is O'Liaigh, the descendant of the leech; and O'Hickey, O'Hiceadha, the descendant of the healer. The heads of these families kept schools of leechcraft, as the Breitheams kept schools of law, many of which were in existence in the

' vived. The cause of this is not far to seek,

16th century, for Campiou, who wrote in 1571, says of both classes of schools, " They speake Latine like a vulgar lan- guage, learned in their common schooles of Leacheraft and Law, whereat they begin children, and hold on sixteene or twentie yeares conning by roate the Aphorismes of Hypocrates, and the Civill Institutions, and a few other parings of those two faculties." Many of the books of these families still exist in the libraries of the Royal Irish Academy, the King's Inns, &c., in Dublin. These books show that the Irish leeches were well acquainted with the works of Hippocrates, Dioscorides, Galen, Avicenna, Rhazes, and most of the medical writers of the Continent of their time. They also contain early translations into Trish of several medical works of repute.

With the cxception of the hymn of St Colman O'Cluasatyhe, published in the Liber Hymnorum of the early Irish Church, some fragments of poems attributed to St Bec Mac Dé, and some others, everything ecclesiastical which could with certainty be referred to an early period is in Latin, and therefore outside the scope of this article. The Leabhar Breac, or Speckled Book, now in the library of the Royal Irish Academy, contains chiefly religious writings, which give us the means of estimating what may be called the popular religious literature in the 13th and 14th centuries. It contains homilies on moral, scriptural, doctrinal, and ritualistic subjects, eg., on the duties of kings and subjects, on charity, almsgiving, the ten com- mandments, the commandments of the church, the different festivals,

prayer, fasting, and abstinence, baptism, the cere- monies of the mass, &c.; an epitome of Bible history from the Creation to the Ascension, which often so closely follows the text of the Scriptures, that we may regard it almost as a translation; the legends of the Finding and Exaltation of the Holy Cross, embodying much of the Gospel of Nicodemus, which was popularized in every country in Europe in the Middle Ages ; the acts of several saints, which are found in Early English, French, and German literature; the lives of the three principal Irish saints, Patrick, Brigit, and Columeillé, and of some others ; the elegies of St Colum Cullé, and St Sendn, &e. There are also many legendary lives of the saints of the early Irish Church in some of the principal vellum manuscripts. It will thus be seen that the popular religious literature in Ireland did not differ from that of neighbouring countries, and on the whole bears favourable comparison with it.

We have no dircct evidence that the Pictish language was ever written, but inductive reasoning is rather against the supposition, for no trace of a poem or legend has sur- The Pictish language, as we have already pointed out, was a Goidelic dialect, which at the period of the principal Dalriadic settlement in the west of Scotland did not perhaps differ from Irish more than Low German or Alemanian does from High German, if even somuch. There was just difference enough to make intercourse between the Scots and the Picts at first somewhat difficult. This close relationship of language is no doubt the explanation of the readiness with which Scots and Picts allied against the Britons. In the 5th and 6th centuries, when the Irish kingdom established in Alba began to become an impor- tant factor in the affairs of that country, the Irish were a lettered people. ‘The Irish Fili, or poet, followed in the track of the Irish missionary, and carried the poems and historic tales of Ireland among a kindred people, having the same eponymous ancestors, and nearly identical mythological traditions. For several centuries after the conversion of the Picts, Alba, as Scotland was then called, was a second home to the Irish Ceilé Dé, or monk, and the Irish poet and harper. Even in the 12th and 13th centuries the Irish poets and musicians included Scotland in

their circuit, and took refuge, or sought their fortune there. We shall mention one instance as it happens to be instruc- tive in another way, that of Afuwiredkach O'Daly, better known, on account of his long residence in Scotland, as Muiredhach Albanach, or Muireach the Albanian, or as we should now say, the Scotchman. Did we not know the whole history of this man, who is believed by the Rev. Dr T. M'Lauchlan to be the ancestor of the great race of Mac Vurrichs, bards to MacDonald of Clanranald, we should never have suspected him to have been an Irish Fil. It is easy to understand how under these circum- stances the literary and cultivated language came to be Irish. But beneath this literary language there was tlio under-current of the original Pictish, which was gradually modified under the influence of the Irish, in the same way that a literary language always influences the spoken language. Nor should we forget that in this case the action was more potent because it was directly exerted on the people through the preachers, and by the bards reciting their poems and telling their stories. Towards the middle of the 15th century Irish literature began to decline and the Irish language to recede. Irish poets and musicians still continued, however, to include Scotland in their visitations, but the connection between the two countries began to be weakened, and the Scottish dialect accordingly gradually rose into literary importance. Poems and tales began to be written in it; and those originally written in Irish were recast in the local dialect. There can be no doubt, too, that the legends and _ historical traditions brought over from Ireland, which had becu transformed by, or had absorbed into them, the primitive Pictish traditions of the same kind which grew from the same original stem, began to be recast and modified, and a new growth of legends to spring up indigenous to Scot- land. In this way a Gaelic literature arose, of which some examples are to be found in the Dean of Lismore's Book. Its development was, however, arrested by the Reforma- tion. This would have been only a temporary check, but for the political changes which followed, and which by gradually bringing the most remote part of the Highlands into the current of a wider aud more active political life, and by drawing to the capital and within the direct influence of modern European culture the Scottish nobility, gave au additional stimulus to the spread of English, and reduced the Gaelic to a peasants' patois. Under other and more favourable circumstances the translation of the Bible into Gaelic, and the composition of a Gaelic liturgy,

together with the change in the whole current of religious ideas, might have given rise to a new type of Celtic literature.

The success which attended some translations made by MacPher- James MacPherson led him to make a tour in the High- son's lands, and to gather as many poems and other specimens Ossian.

of Gaclic literature as he could find. It was no doubt during this tour that he matured his idea of using the legends preserved in the popular memory, written down in Scottish Gaelic, and existing in the Irish MSS., which he came across in his travels, as materials out of which to compose the poems which have since become so celebrated under the name of the poems of Ossian. We mean of course the English poems, for in the usual sense of that word no Gaelic originals existed. The so-called originals are a very curious kind of mosaic, constructed evidently with great labour afterwards, in which sentences, or parts of sentences of genuine poems are cemented together in a very inferior word-paste of MacPherson's own. We have pointed out that the personages of the two cycles of romance, the heroic and the Fennian, are never mingled as actors in genuine national poetry or tales. his is, however, done commonly by MacPherson. Thus in Dar-thula, which Vv. — 40

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is based upon a tale of the heroic age called the Exile of the Sons of Uisnech, we have Deirdriu (Dar-thula), Novis (Nathos), Ardan, and Cathbad (Cathba) the Druid, actors of the original tale, associated with Ozse and Cormac who belong to a different time and another phase of Irish legend. In Temora we have Find son of Cumall (Fingal), his son Ovséx (Ossian) and grandson Oscar, and Cormac Mae Airt, associated with Cathaeir Mér, Nois (Nathos), Cachulaind (Cuthulin), and the antediluvian Carill. Again, in Fingal, which has manifestly been written under the

influence of the Zdéin Bé Cuailnge, we have Carill, Ovichulaind, Cathbad, Conlaech (Conloch) son of

- Otichulaind, Ferdiad son of Daman (Ferdia), associated

with Finn (Fingal), Oisin (Ossian), Oscar, Goll Mac Morna (Gaul, son of Morna), and other heroes of the Ossianic period. This mingling of the heroes of two different cycles of romance would be sufficient to prove, did we possess no other test, that MacPherson had no original, The old Celtic tales are especially characterized on the one hand by the detailed descriptions they give of the personal appearance, dress, and arms of the chief actors in a tale, and of the internal arrangements of the houses, &c,; and on the other by the absence of descriptions of scenery, except when 7% Tairngu'e, the Land of Promise, is in question. The aspects of nature were familiar to those who listened to those tales, what they wanted to realize was the actors and their deeds. MacPherson's poems on the contrary are full of word-pictures of nature, sometimes no doubt bombastic, but generally giving beautiful, and often grandly poetic, descriptions of the most characteristic features of the scenery of the Highlands. But the actors in his epic are like figures seen through a mist, barely sketched in outline, whose dress, ornaments, and arms are so generally and vaguely described as to lose all peculiar and distinctive character. The Poems of Ossian are thoroughly modern, more so even than the current legends of the west of Scotland which retain many things—talking ravens, soothsaying, &e., which savour of old times. An examination of the poems and prose tales of the Irish Oisianic cycle is very instructive in this connection; the older they are the more detailed are the descriptions of the actors and of their dress and arms ; the newer the vaguer and more general—the more like MacPherson's heroes do they become. In this respect MacPherson did no more than what he was entitled to do, and what has been done by others who have used similar materials for the construction of poems. The author of the Nibelungen Lay fused in the 12th century legends of the Horny Siegfried with those of a different and newer cycle concerning Attila, Dietrich von Bern, Brunhild, &c. So the romances of Arthur and the St Graal, though of a totally different origin have mingled together. So, too, the medizval German poets took many liberties with the French romances, which served them as materials. What he had no right to do was to call his poem a

translation. It is unfortunate for his fame that he should have supported this comparatively trivial error by the grave one of producing his pretended original. Let us add that the publication of a selection of the poems in the manuscript known as the Dean of Lismore's Book by Mr W. F. Skene and the Rev. T. M'Lauchlan, and Mr J. F. Campbell's collection of Popular Tales of the West Highlands, have done more to settle the Ossianic controversy than all that had been written by the combatants on both sides.

The number of Welsh manuscripts is considerable, but with the exception of those in the British Museum, the library of Jesus College, Oxford, and that of the university of Cambridge, they are all in private collections. Of these the most important is the Hengwrt collection, con- sisting of the manuscripts collected by Mr Jones of Gelly

Lyvdy, between the years 1590 and 1630, and by the antiquary Mr Robert Vaughan of Hengwrt, who died in 1666. The two collectors arranged that their manuscripts should be united on the death of one of them, the survivor to become the possessor of the whole. According to this arrangement they became the property of Mr Vaughan, and hence got the name of the Hengwrt collection. Some years ago Sir Robert Vaughan bequeathed the collection, comprising, we believe, about four hundred volumes, to Mr W. W. E. Wynne of Peniarth, in whose possession it now is, But although Welsh manuscripts are numerous there are very few of any considerable antiquity, the others being comparatively modern compilations, often the work of ignorant scribes, the contents of which seem for the most part to have been in the first instance taken from the old books just spoken of. Of such old books there are, ex- clusive of law manuscripts, only five of such antiquity or importance as to deserve special mention here, The first is a copy of the hexametrical paraphrase of the Gospels of Juvencus in the University Library of Cambridge, as old at least as the 9tl century. The only Welsh it con- tains are some glosses and two short poems written in Irish characters; but as the oldest specimens of Welsh known they are invaluable as a standard wherewith to compare the language of other manuscripts. The second is the Black Book of Carmarthen, a small quarto vellum manuscript of 54 leaves, written in Gothic letters by various hands in the reign of Henry

II. (1154-1189), This manuscript originally belonged to the Priory of Black Canons at Carmarthen, and was given by the treasurer of the Church of St David to one of the commissioners appointed by Henry VIII. for the suppressed monasteries, Sir John Price. It is now in the Hengwrt collection at Peniarth. The third is the Book of Taliessin, also in the Hengwrt collection, a small quarto manuscript consisting of 38 leaves of vellum written in Gothic letters through- out in one hand, some time in the early part of the 14th century. Its history before it came into the possession of Robert Vaughan, the antiquary, is not known, The fourth is the Book of Aneurin, a small quarto manuscript, of 19 leaves of vellum, written probably in the end of the 13th century. It was purchased by the late Sir Thomas Phillips of Middlehill, and may have been formerly in the Hengwrt collection. ‘The fifth is the Red Book of Hergest, so called from Hergest Court, one of the seats of the Vanghans, for whom it was probably compiled. ‘This important manuscript, the chief repository of Welsh litera- ture, is a folio volume of 360 leaves of vellum, written in double columns at different times, from the early part of the 14th to the middle of the 15th century, and is now in the library of Jesus College, Oxford.

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The text of a large number of the poems and other Myvytt compositions contained in Welsh manuscripts has been Arch:

published in a work in three volumes, called the Ifyvyrian Archaiology of Wales. ‘The first volume, containing poems, and the second, chronicles and historical documents of various kinds, were published in 1801; and the third, moral, didactic, legal, and miscellaneous pieces, in 1803. This publication is due to the noble patriotism of three men,—Owen Jones, a furrier in London, and the son of a Welshman, with whom the idea originated while still a young man, and who devoted no inconsiderable portion of his fortune to its realization ; Edward Williams, a stone- mason, better known by his assumed name of Lolo dfor- ganwg, the chief contributor to the collection; and William Owen, who afterwards assumed the name of Pughe, the author of the principal dictionary of the Welsh. Had the critical judgment and knowledge of the editors equalled their patriotism, the work would be of great value.

Welsh manuscript literature may be classed for our

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CELTIC LITERATURE

nssifica- purpose under the following heads :—(1.) Glossaries and grammars; (2.) The Bruts, or annals, genealogies, and (4.) Mabinogion, and other prose There are very few Welsh glossaries, because there exist in fact few examples of obsolete or old Welsh. The oldest Welsh laws are attributed to Howel Dda, who died in 950, and

histories ; (3.) Poems ; tales ; (5.) Laws; (6.)“Medicine and science.

the oldest codex containing them is belicved to have been written in the 12th century.

very much in the interval between the framing of the laws aud the writing of the manuscripts. But like all Welsh manuscripts, even the oldest copy of the laws gives us an edition in the language of the time, A grammar of the Welsh, said to have been made by Bdeyrn Dafod Aur, by the order and at the desire of three Welsh priuces, in the second half of the 13th century, has been published by the Rev. J. Williams ab Ithel, from a copy made in 1832 from another copy made in 182] from a manuscript of Edward Williams, or olo Morganwg. Whatever may be the intrinsic scientific value of the treatise itself, this is a very doubtful source to derive historical value from. Mr Williams has also published in the same volume a work on the rules of Welsh poetry, originally compiled by Davydd Ddu Athraw in the 14th century, and subsequently enlarged by Simwnt Vychan in the 16th century. We have no evidence as to how much belonged to the former and how

much to the latter, but it all appears to belong to the 17th century. Mr Williams has also added a great deal of matter of his own, which is distinguished from the text by being printed in smaller type. His object was to combine in one volume as complete a body of information on the subject as possible. It wouid be outside the scope of this article to criticise this laborious work.

If we might judge by names alone, the British, between the departure of the Romans and the conversion of the Anglo-Saxons, possessed many historians. Welsh anti- quaries give a long list, and some find a place even in the works of English and forcign writers; but with the exception of Gildas aud Nennius, the titles only of their writings are known, nor are these above suspicion. Bede quotes Gildas, and so far we have proof that as early as his time there was a belief in the existence of such an author. The works now known as those of Gildas and Nennius are written in Latin, and are properly outside our scope, but they are so inseparably connected with the Bruts or Annals, and with the history of romance, that we must say a few words concerning cach. Gildas was the son of a British king of Addclyd, the present Dumbarton, and was therefore from that part of Britain referred to in Welsh works as y Gogled. Several dates have been assigned for his birth and death, but we prefer for the former 516, and for the latter 570, and his book De Ex- culio Britannic, if genuine, seems to have been written about 560. According to his legendary lives, he went to Ireland on the invitation of St Brigit, founded monas- teries there, and taught at the school of Armagh. His work above named is written in an inflated style, and is a mere sketch of British history under the Romans, and in the period immediately succeeding their withdrawal from the country, and so includes the period of the wars of the Britons with the Picts, Scots, and Saxons; it is full of blunders and anachronisms. Mr Skene suggests, very reasonably, that the well-known letter of the Britons to Aetius, asking for Roman aid, is misplaced, and that if put In its proper place the discrepancy between Gildas’s account of the departure of the Romans from Britain and that of Greek and Roman writers will disappear.

Nothing is known of the person called Nennius, to whom

the 1 at If this codex contained the laws in their original form they would probably require no gloss to explain them, because the language did not change

the short History of the Britons known by his name is attributed. In the earliest known manuscript of it, written about the middle of the 10th century, and now in the Vatican Library, it is ascribed to a certain Marc, who is be- lieved to be the Mare who with his nephew, Moengal, better known as Marcellus (little Marc), came to the monastery of St Gall about the middle of the 9th century, having with him many books and a considerable retinue. Bestowing his wealth on his followers, and reserving for himself only the books, he and his nephew remained at St Gall, where the latter became celebrated ag the teacher of Notker, Ratpert, and Tutilo. Mr Skene thinks it was originally written in British in Cumbria, or y Gogled, and was afterwards translated into Latin. To this nucleus was added the genealogies of the Saxon kings, down to 738 3 the above-mentioned Mare appended, probably about 823, the life of St Germanus, and the legends of St Patrick, which were subsequently incorporated with the history. Some South Welshman added to the oldest manuscript of the history in these countries, about 977, a chronicle of events from 444 to 954, in which there are genc- alogies beginning with Owain, son of Lowel Dda king of South Wales. This chronicle, which is not found in other manuscripts, has been made the basis of two later chronicles brought down to 1286 and 1288 respectively. It is consequently not the work of one author. A Sad and ih, named Gilla Caomhan, who died 1072, translated

‘it into Irish, and added many things concerning the Irish

and the Picts.

The Mistoria Britonum is more valuable for the legendary matter which it contains than for what may be accepted as history, for it gives us, at least as early as the 10th century, the British legends of the colonization of Great Britain and Ireland, the exploits of King Arthur, and the wonderful birth and prophecies of Merlin, which are not found elsewhere before the 12th century. The date of the book is of the greatest importance to the history of

medizeval romance, and there can now be no doubt, especially since the publication of the Irish Nennius, that it is earlier than the Norman Conquest, and that the legends themselves are of British origin. The books attributed to Gildas and Nennius contain the germs of the fables which expanded into Geoffrey of Monmouth's History of Britain, Geoffrey of which was written in Latin sometime before 1147, the Monmouth. date of the epistle dedicatory to Robert, earl of Gloucester, the son of Henry I. by Mest, only daughter of Rhys ab Tewdwr, and was a manifestation of the great advance which took place in Welsh literature consequent on the restoration of the Welsh prince just named, and of Gruffyd ab Cynan, and of which we shall have more to say hereafter. In the epistle just referred to Geoffrey states that Walter, archdeacon of Oxford, had given him a very ancient book in the British tongue, giving an account of the kings of Britain from Brutus to Cadwaladyr, and that he had translated it into Latin at the archdeacon's request. But in the Welsh version of Geoffrey's chronicle in the Afyuyrian Archaiology, the Brut Geoffrey ap Arthur, there is this postscript : "I, Walter, archdeacon of Oxford, did turn this book out of Welsh into Latin; and in my old age I turned it a secoud time out of Latin into Welsh." That Geoffrey drew his materials from British sources, and did not coin any of them, seems to us the legitimate conclusion to be drawn from a eareful study of the whole subject. His book is, however, a compilation and not a translation , at all events no book now exists which can be regarded as his original, while all the Bruts or chronicles are posterior The Bruis. to Geoffrey's book aud based upon it. Of these there are the Brut Tysiho and the Brut Geoffrey ap Arthur, both of which are also called Brut y Brenhinoedd, or Chronicle of the Kings, The copy of the latter in the Red Book is

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followed by a chronicle in continuation which, according to an entry in a later hand, was called Brut Zwysogion, ot Chronicle of the Princes. In some menuscripts there 1s also added a chronicle of Welsh events interspersed with Saxon ones, which is from this called the Brut y Saeson, or Chronicle of the Saxons ; in one manuscript this is attributed to Caradoc of Llancarvan. The chronicle of eveuts from 444 to 954, which is contained in the British Museum manuscript of the History of Nenntus, and two other

chronicles, already mentioned, bringing events down to 1286 and 1288, have been printed together as the Annales Cambric. These later chronicles ought not,

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are nearly all to be found in Mr Skene’s book, are uot in their present form older than the 11th century. But while the form may be new the substance may be old, as we have already pointed out in the case of many Irish poems. It is probable that many of the poems attributed to Aneurin, and several of the mythological and religions poems, are only popular editions of much older poems, and further that the change effected in some of them may be so small that we have substantially the original poems. Others again have been so deeply modified that they may be regarded as new poems on an old theme.

The following classification of those poems shows their Classifica

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origin, and will help to render the few observations we tionof |

as Mr Skene properly remarks, to have been incorporated

i | : : yee reputed with the older one, which alone possesses the special valuc | can offer here more intelligible. — . oldertVel of having been written before the Norman Conquest, and 1. Poems referring to events in Romanized Britain, or poens,

The Triads,

Welsh poetry.

a century and a half before the Druts. —

Besides the chronicles or Pruts there are no historical works properly so called in Welsh, unless we include the Triads, a curious kind of literature peculiar to Wales ; for although there are some Irish Triads they are imitations of the Welsh ones, an imitation which fortunately did not extend

very far. The Triads are an arrangcment of similar subjects, similar events, or things which might be associated in the mind, or be worthy of remembrance, &c., in series of three, e.g., “Three ornaments of a hamlet—a book, a teacher versed in song, and a smith in his smithy ;” or “Three punishments for theft in hand—the first is imprisonment, the second is cutting off a limb, the third is hanging.” This kind of composition appears to have come into use injthe 12th century, the earliest specimen being the Triads of the Horses, which are in the Black Book. The Triads of Arthur and his warriors are perhaps as old as the 13th century. The Red Book contains the Triads of the Island of Britain, which include those last men- tioned, an enlarged editiou of the Triads of the Horses, and many others. The Triads of Dyfnwal Moelmud, a supposed ancient king of Britain, are perhaps as old as the beginning of the 16th century.

The poetic literature of the Welsh, which is very exten- sive, may be conveniently divided into—(1.) Poems attributed to poets who lived before the 12th century, and anonymous poems in the Black Book; and (2.) Poems written by or attributed to posts who lived in the 12th and succeed- ing centuries. The claims of the Welsh to possess au ancient literature rests altogether on the poems of the first category, hence they have been the subject of much dis- cussion; The grounds upon which such discussions have hitherto rested have altered considerably within the last few years. The labours of Zeuss and others who have worked at Celtic philology, and the discovery of specimens of Old Welsh in the Cambridge Codex of Juvencus, furnish us with much safer canons of criticism than existed in 1849, when even a learned Welshman, the late Mr Thomas Stephens, who did more than any one else to establish the claims of his country to a real literature, doubted the authenticity of a large number of the poems said to have been written by Taliessin, Aneurin, Merlin, and Llywarch Hén, who are supposed to have lived in the 5th century. Mr W. F. Skene has done a very great service to Welsh literature by the publication of the texts of those poems from the four principal manuscripts now known, the Black Book, the Book of Taliessin, the Book of Aneurin, and the Red Buok. In addition to the texts Mr Skene has given translations of the poems specially made for him by the Rev. D. Silvan Evans and the Rev. Robert Williams, so that next to the Welsh Laws, and Stephens’s Literatare of the Kymry, his Four Ancient

Books of Wales is the most important contribution to Welsh literature yet made.

If we judge by the test of language alone, the poems which we have included in our first category, and which

to the east frontier of Wales.

2. Poems referring to events on the Mercian frontier and in South Cumbria.

3. Poems referring to personages and events connected with the Gwyddel or Goidelic occupation of Wales and Cornwall.

4, Poems referring to the Gwyr y Gogled, or Men of the North.

5. Poems relating to or attributcd to Zaliessin of a general character.

6, Proverbial poetry attributed to Llywarch LHén.

7. Poems attributed to poets between the 7th and 11th centuries.

8. Anonymous religious poems in the Black Book.

9. Poems referring to personages and events of Welsh history in the 12th and subsequent centuries.

The first class is represented by one poem in the Book of Zaliessin, The Reconciliation of Zlud the Less, which would be unintelligible but for a ALabinogi to which we shall refer later. The poem has no mark of antiquity about it, and belongs to the 13th century. To the second class belong the Death Song of Z7rof, and other pieces in which that warrior is inentioned, and the Death Song of Uthyr Pendragon, all of which are in the Book of Zaliessin, and in form and substance are not older than the 12th century. The poems of the third class are of considerable

importance, but here we shall merely give the names of a

few as examples, reserving what we have to say concerning them until we come to the Jfabinogion. The follow- ing are good examiples of the class—

The Death Song of Corrot, The Battle of Godeu, and The Chair of Ceridwen, from the Book of Taliessin; the Preiddcu Annwn ; Daronwy, and the poems relating to Gwydyon ap Don, from the Black Book, the Book of Valiessin, and the Red Book. The poems which belong to the fourth class are the most numerous and important. Among them may be mentioned first of all the Gododin poems, those relating to Ureen Itheged, the war between the sons of Llywarch Hén and Mug Mawr Drefydd, poems relating to the battle of Adderyd, as for instance the Avallenau, or Apple Trees, and poems relating to Cadwallawn and Cadwaladyr.

Hadrian and Antoninus, and had been erected into the Ro- man province of Valentia. As it was a loose term, it may have included all the independent British country north of the Ribble. This country, and especially that part of it forming the ancient diocese of Glasgow, was the cradle of the Welsh language and literature. It was the only part that could have been this. Here the question naturally suggests itself, to what extent was Britain Romanized ? That it was not so to the extent usually supposed may be shown in many ways. It is obvious that, if the southern Britons were as thoroughly Romanized as Gaul or Spain, the language of Cornwall should have been a

We have already explained that y Gogled Extent t was that portion of Britain which lay between the Walls of which

Romanee dialect, and that of Brittany an allied one. Again, if the Welsh were a remnant of the Romanized Britons driven westward by the conquering Saxons, the Welsh language also should be a Romance dialect, or its voeabulary should contain a large intermixture of words borrowed from the Latin, and especially of words connected with law, trades, &c. But this is not so. The fact is the population of Britain was not Romanized to any extent. In the towns the prineipal citizens no doubt spoke Latin, as they speak English in Calcutta and other large towns in India. A large British population in part bilingual gathered ronnd the cities and towns, as the Irish did about the Anglo- Norman towns of the Pale, and as the Letts, Esthonians, and Russians do about the German towns of the Russian Baltic

provinces. We should also not forget that the legionarics in the 2d and 3d eenturies were only Roman in name, being recruited from every part of the empire, and consequently could not eontributc to Romanizing the inhabitants among whom they were located. The peasantry continued British, but the nobility, no doubt, learned to speak Latin, but not forhome use. When afterwards the Saxons on the east and the Irish on the west of what is now Wales displaeed the rnling families, the Romanized part of the independent British population, hemmed in between the two hostile peoples, and with an ever- encroaching Saxon frontier on one side, gradually merged into the Celtie-speaking peasantry, and lost the use of the Latin tongue. This was not a state of things favourable for the development of a literature. In the north especially, between the Walls of Hadrian and Antoninus, in the province of Valentia, which never had Roman towns, only camps oecu- pied by legionaries, who for the most part probably spoke no Latin, the whole population must have remained essentially British after the withdrawal of Roman power. Here if

became Welshmen, and the sites of the battles they fought were identified with places of similar name in Wales and England. When /Towel Dda became king ofall Wales, the legends of the north passed into South Wales, and like the legends of Oise in Scotland, became so thoroughly identified with their new home, that they seem to have first originated there.

Of all the poems attributed to the four ancient Welsh The y_ bards, the one which has most elaim to be considered @2¢in

genuine, and the only one we ean speeially allude to here, is that known as y Gododin. As published by Mr Skene from the Book of Aneurin, it eonsists of 94 stanzas, and is both obscure and fragmentary. ‘The latter character Mr Skene explains, and we think successfully, by supposing that it consists in reality of two distinct poems, referring to two events separated by a Jong interval of time. The first event is the battle of Cattraeth, the Bellum Miathorum of Adamnan, fought between the Britons and Scots under Aedan, king of Dalriada, and the pagan Saxons and their British subjects in Devyr and Bryneich or Deira and Bernicia, and the half-pagan Picts of Gwotodin, a district corresponding to the northern part of the

Lothians along the Firth of Forth. Cattraeth was the adjoining district on the Forth where the great Roman wall terminates at Carriden, the Fort of Zidinn. If this view be correct, and it is the best that has yet been proposed, the Afynydawy of the poem was Aedan Aflac Gabran, and the battle the one fought in 596, of which Columcillé prophesied that Aedan would be unfortunate but victorious,—the misfortune being doubtless the loss of his four sons in the battle, one of whom was named Artur (Art). Tho second and later portion of the pocm, Mr Skene thinks, refers to the battle of Strathcavrinn, now Strathcarron, in which Domnal Brec, king of the Dalriadic Scots of Alba,

tise of ae : : : :

Velsh anywhere the first germs of a British literature should show | was slain, 642. In the brevity of the narrative, the care- oetty in theinselves, and accordingly tradition makes Taliessin, | less boldness of the actors as they present themselves, _ Gogled. § Anewrin, Llywarch Hén, and Myrdin or Merlin, to whom | the condensed energy of the action, and the fierce exulta-

most of the supposed ancient Welsh poems are attributed, natives of this region. Here also the actors in the events referred to in the poems lived, and the places where those events are supposed to have taken place are to be found. The greater part of this region, too, enjoyed substantial independence down to the end of the 9th century, with the exeeption of the interval from 655, when they were subjected to the kingdom of Northumbria by Oswy, after the defeat of Cadwallawn and Penda, to the battle of

tion of the slaughter, together with the recurring elegiac note, this poem (or poems if it be the work of two authors) has some of. the highest epic qualities. The ideas and manners are in harmony with the age and country to which it is referred. ‘The poems called the Gorchans, which are also found in the Book of Aneurin, and refer to the personages and events of the Gododin, possess many of the characteristics of that poem, and are probably the work of the saine time, if not of the same poet.

poems.

Dunnichen in 686, when Ecfrid, king of Northumbria, was defeated. From the 7th to the 9th century Cumbria, including under that name all the British territory from

Still more celebrated than Aneurin, the reputcd author Poems of y Gododin, was Taliessin, a name which has becn inter- ascribed to preted as “Splendid Forehcad,” and has consequently been 7#/i¢sst”.

the Ribble to the Clyde, was the prineipal theatre of British and Saxon cvunflict. The rise of the dynasty of Maileun, who according to Welsh tradition was a de- scendant of Cunedda, one of the Gwyddel or Goidelic Picts of the distriet called Guotodin, brought Wales into close connection with the Cumbrian kingdom, and prepared both North and Sonth Wales for the reception of the northern traditions and the rise of a true Welsh literature.

Whether the poets of Cumbria really wrote any of the poems which in a modified form have eome down to us or not, there ean be no doubt that a number of lays attributed to them lived in popular tradition, and that under the sudden burst of glory which the deeds of Cadwallawn called forth, and which ended in the disastrous defeat of 655, a British literature began to spring up, and was nourished by the hopes of a future resurrection under his son Cadwaladyr, whose death was disbelieved in for so long a time. These floating lays and traditions gradually gathered into North Wales, aceording as the nobility and bards sought refuge there from the advaneing conquests of the Saxon kings in the north. The heroes of Cumbria

the subject of a good decal of mysticism. The number

of poems in the Book of Zaliessin supposed to have —

been written by him is considerable ; in language they are not older than the 12th century, thongh many of them may be what we have called in other cases popular editions of older poems. Several belong to the fourth class which we have been just considering; the poems whieh we would include in a special fifth class are those which have bcen imade the subject of bardic speculation in con- sequence of their generality and vagueness, such as the Fold of the Bards, Hostile Confederacy, Song to the Wind, Mead Song,

Songs to Great and Little Worlds, Elegy of the Thousand Sons, Pleasant things of Zaltessin. Many of these poems possess considerable merit, and even as thie work of the 12th and 13th eenturies might bear eomparison with similar eompositions in other Furopean literatures of the period.

The poems of the sixth class attributed to Llywarch Poems at- Hén are in the Red Book, and are the work of some tributed to d Liywarch Hen,

Tupper of the 14th century, too disinterestedly prou of his work to put his own name to it. They are curiong

Vocts from the 7th to the 11th century.

Religious poems in Black Book.

Poems at- tributed to Myrdin.

and interesting examples of a sort of proverbial philosophy in which each proverb or wise saw is accompanied by a reference to some natural feature, such as “ Bright the tops of the broom,” which serves as a kind of mnemonic catch- word. This catchword is sometimes the same in every verse, as in the poem Liry mnyd, mountain snow.

Welsh tradition has preserved few poems of the period between the end of the 6th century and the end of the llth, a period of 500 years, nor for the matter of that even the names of poets, a circumstance which 1s in- telligible enough if we consider that Welsh literature really began with the 11th century, but inexplicable according to the ordinary views of . Welshmen. In the Black Book are five poems attributed to three poets who lived in the early part of the barren interval,—dAfecgant, whosc name also occurs in Irish litcrature; Hlaeth, to whom are attributed two out of the five poems, which are of a religious character; and Cuhelyn, a bard of the 9th century. The two poems attributed to the last are of very great importance, because in them occurs the earliest mention of the goddess Ceridwen, who

plays so conspicuous a part in the modern bardic system of Neo-Druidism. The anony- mous religious poems of the Black Book, apart from the Janguage, may belong to any time from the 6th to the 12th centuries; they probably belong in great part to the 11th and 12th centuries, and were most Jikely the work of the monks in whose monastery the Black Book was compiled. The ninth and last division of the early Welsh poems are those which covertly allude to passing cvents in Wales, and can therefore be no older than those events. Two of them refer to Powys in Norman times, the Satire of Cynan Garwyn, son of Brochwael, in the Book of Z'aliessin, and the clegy on Cyndylan in the Red Book. The others are the poems which Mr Skene groups together under the head '" Poems which mention Henry or the son of Henry;" the most im- portant of them are those attributed to Afyrdin or Merlin, such as the Dialogue between Afyrdin and his sister Gwendydd, a Fugitive Poem of Afyrdin in his Grave, containing a number of predictions, and the Songs of the Little Pigs, each stanza of which begins with " Ovan a par- chellan," "isten, O Little Pig." The structurc of the last poem being like that of the poem called the Avellenau, each stanza of which commences with that word " Sweet Apple-tree," both are classed together, and in the Myvyrian Archaiology are attributed to Merlin. The Avellenau is, however, found in the Black Book, and is every way an older poem; but it is needless to add that none of the poems of Merlin are genuine, and that with the exception perhaps of the Apple-trec poem, they all refer to times later than the 12th century, and to the present Wales.

Before discussing the second division of Welsh poetic literature, or poems written by or attributed to poets who lived in Wales in the 12th and succeeding centuries, we must say a few words ou the Welsh bards. The organiza- tion of the classes of Jearned men in Wales was far Jess developed than in Ireland. According to the Jaws each king or prince had a household bard, who appears to have performed the functions of the Irish Saz and Jil, and also that of harper. His position was honourable, and on in- vestiture he was presented by the king with a harp, and by the queen with a gold ring. Beside the Bardd Teuleu, or household bard just spoken of, a Pencerdd, chief of song, is mentioned in the laws, who in North Wales was an officer of the household, but in South Wales was not,—his posi- tion there being apparently that of a privileged personage entitled to make a circuit and so spend his time where he pleased. The chief of song was also

called a chaired bard, becduse he was one of the fourteen entitled to a chair at court. The installation of a bard to a chair appears to have been attended with some ceremony, for the judge of

the king's court was entitled as a perquisite of his office to the bugle-horn, the gold ring, and the cushion which was under the bard on the occasion. The Pencerdd represented the Irish Ollamh Fili, and like him appears to have kept a school of poetry, for he was entitled to receive 24 pence from each minstrel who completed his course of instruction, to their services 'asa man placed in authority over them," and to the Gobyr or Amobyr of their daughters, that is to the fee payable to the lord on the marriage of a maiden. Among his emoluments was a fee of 24 pence from every maiden on her marriage. In the court his seat was on the side of the judge of the court, and he lodged with the LEdling, that is the heir-apparent of the king or prince, corresponding to the Irish Yanaiste. A villain or serf could not become a bard, nor a smith without the permis- sion of his lord; nor could a bard practise his art after he had taken holy orders. Should a serf or a stranger happen to become a bard he became personally a free Cymro or Welshman, but his children were not free, though the time in which his descendants might rise to the privileges of a free Cymro was shortened. A minor bard was forbidden to solicit a gift without the permission of the Pencerdd, but the latter might ask a gift though all others should be forbidden to do so. The duty of the chief of song was to commence the singing or recitation of poetry by singing two songs on entering the hall, one concerning God and the other about kings; the household bard then repeated the third song below the entrance of the hall. This is nearly all that the laws contain about bards.

sky-blue dress of the former, the emblem of peace and truth, nor of the white robe of the Druid, nor of the green robe of the Ovydd, the colour of natnre, nor of the robe of the Awenydd or bardic student striped with the three colours, nor of the Gorsedd or assembly of bards. If any of these things existed in the 12th ccntury, the most brilliant period of Welsh poetry, we should expect to find them in tho Welsh laws. But so far from any relics of the ancient Druidic organization having survived at that period, it is

probable that even the organization above given from the laws was in part at least the work of Gruffyd ab Cynan. They are, in fact, the inventions of later times when Wales had lost its political liberty. We have the first stage of the invention in the Triads, and it seems to have been com- pleted by that extraordinary man Edward Williams, whom we have already mentioned as one of the editors and the principal contributor of the ALyvyrian Archatology, who pre- tended to be the head of the bardic order of South Wales, and accordingly assumed the bardic title of Jolo Morganwy from his native county of Glamorgan. the source whencc the Rev. Edward Davies derived the chief part of the material for his marvellous system of Neo-Druidic philosophy. According to the supporters of this system, the religion of the Druids, a medley of sun- worship and Jewish Noachian traditions, the emblems of which were the bull, the horse, and fire, survived the intro- duction of Christianity, and continued to be believed by the bards, and its rites practised in secret by them. The principal source whence evidence was derived in support of this assumption was the early poems which we have been discussing. Davies gave what he called transla- tions of some of those poems, in which the simplest and plainest phrases are made to express mysterious and abstruse doctrines. In the religious poems which contain such expressions as “ Christ the Son,” “ Merciful Trinity,” Mr Davies omits the latter, or treats them as mere phrases introduced to deceive the uninitiated, and make them be- lieve the pagan bards were Christians. Among the doctrines attributed to the Neo-Druids was that of metempsychosis. The chief source from whence evidence was derived in

There is not Neo-Druid, a word about the Ovydd, or the Druid-bard, nor about the ism.

He is probably |

support of this assumption outside a pretended work called Barddas, or treatise on the whole system of the bards, which Iolo Morganwg possessed, was the Romance. called Hanes Yaliessin, or history of Laliessin, which though partly prose, aud therefore coming under the head of the prose romances, of which we shall speak later, may be more conveniently referred to here. A fragment of the Welsh text of this ~ history was given in the

Myoyrian Archaiology; the whole tale was afterwards published by Dr Owen Pughe; and Lady Charlotte Guest published it again in the third volume of her Mabinogion from two fragients, one dated about

bards may have been the institution of bardic Gorsedds or ineetings, of which the imodern Misteddfod is au imitation. In Ireland the poets did not, so far as we know, hold separate meetings of this kind, but they took a prominent part in the great periodic gatherings called Aonechs or fairs held fora threefold purpose,—for promulgating laws, for public games, and as a market. At these gatherings poems were sung, stories narrated, and prizes awarded.

One of the earliest poets whose productions we can be Poets of certain of is Meilyr, bard of Zrahaearn, whom Gruffyd ab the 12tb Cynan defeated at the battle of Carno, and afterwards of °°@t™y:

1758, and the other belonging to Lolo Morganwg. The romance of the Lanes Taliessin in its existing form belongs to the beginning of the 17th century. Of the thirteen pocnis contained in Lady Charlotte Guest's book, only two are fonnd in the Book of Zalessin, the Ode to the Wind and the Mead Song. It is evident that a number of poems attributed to Z'alvessen were floating about in popnlar tradi- tion, and were strung together in the 16th century into a romance, Although of these so taken up only the two just mentioned find a placein the special manuscript of Z'aliessin's poems in the 14th century, we are not therefore entitled to assuine that the other poems did not therefore exist at that period. It is singular that the compiler of the Z/anes Paliessin did not include such poems as the Canu y Meirch, or the Song of the Horses, which would find its place after the account of the contest of Llphin against the 24 horses of Maileun, the Ale Song, which is the counterpart of the Mead Song, the Chair of Zaliessin, and the Chair of the Sovereign (Kade T'eyrnon). In all these there is no mythology, nor indeed anything indicative of a secret, But when the Elegy of the Thousand Sons, a religious poem on the saints before and after Christ, which is in the Book of Zaliessin, is believed to contain the doctrine of nietempsychosis, any doctrine whatever may be drawn from the Welsh poetry. But while the whole of the Nco- Druidic speculations must be looked upon as fables, it

does not follow that there areno mythological allusions in Welsh poems as old as from the 12th to the 14th century. We have already alluded to the occurrence of the name of the goddess Ceridwen in two poems in the Black Book attributed to Cuhelyn, a bard of the 9th century. The following poems in the Book of Taliesin also contain traces of mythology :—Song concerning the Sons of Llyr ab Broch- wel, the Chair of Ceridwen, the Spoils of Annwn, Daronwy, and the dngar Cyfindawd. But as the mythology of the poems is intimately connected with that of the prose tales we shall reserve our observations on the subject until we are considering the AMabinogion.

going the same changes as the spoken language, they must be considered from a merely literary point of view as the products of the period from the 11th to the 13th century inclusive, But apart from those poems there is another anda perfectly legitimate Welsh literature which may be said to have commenced with the restoration of the old royal families of North and South Wales. Rhys ab Teewduwr, the reputed legitimate hcir to the throne of South Wales, returned from Brittany in 1077 bringing with him no doubt the Armoric legends of the Round Table; and Gruffyd ah Cynan came in 1080 from Ireland, where he was born and had been educated, and where he must have become familiar with its poetry and music. Indeed, we know on the authority of Welsh writers that @rufyd reorganized the bards and improved the music, and in other ways gave a great and beneficial impulse to Welsh literature. Among

the changes which ho effected in the organization of the

eulogies havea kind of religious prelude.

the conqueror Grufyd himself. His best piece is the Death-bed of the Bard, a semi-religious poem, which is distinguished by the structure of the verse, poetic feeling, and religions thought. Aeilyr was the head of a family of bards; his son was Gwalchmat, one of the best Welsh poets; and the latter had two sons, inion and Meilyr, some of whose poetry has reached us. Gwalchmai was a true poet, and not a mere professional bard. In hig Gorhofedd Gwalchmai, Gwalchmai’s Delighis, there is an

appreciation of the charms of nature, the murmuring of

brooks, and the songs of birds not unworthy of one of the modern Lake poets, His Arwyrain 7 Owain is an ode of considerable beauty, and full of vigour in praise of Owain Groynedd, king of North Wales, on account of his

victory of J'al y Moelvre, part of which has been translated by Gray under the name of "The Triumphs of Owen."

This translation, though not very literal, preserves the

terseness and boldness of action of the original. Kynddelw,

who lived in the second half of the 12th ceutury, was a contemporary of Gwalchmai, and wrote on a great number of subjects including religious ones; indecd, some of his He had command of words and much skill in versification, but he is pleonastic and fond of complicated metres and of ending his lines with the same syllable. 'There is a certain obseurity about some of his poems which has given him an importance

among the disciples of the Neo-Druidic or bardic philosophy.

Among the other poets of the second half of the 12th century may be mentioned Owain Kyveclwg and Howel ab Owain Gwynedd. The first-named was prince of Powys, and Was distinguished also as a soldier. The Hirlas, or Drinking Torn, isa rather long pocm marked alike by originality and poetic merit. The prince represents himself as carousing in his hall after a fight; bidding his cup-bearer fill his great drinking-horn, he orders him to present it in turn to each of the assembled warriors. As the horn passes from hand to hand he eulogizes each in a verse beginning Diwallaw dv venestr, " Fill, cup-bearer." Having thus praised the

afluenceof Whether the poems we have been hitherto considering | deeds of two warriors, Zudyr and Moreiddig, he turns tlys ab were really first written after the 10th century, or, as seems | round to challenge them, but suddenly recollecting that mh much more probable, were composed at an earlier period they had fallen in the fray, and listening as it were to their 'rufya ab 02d transmitted by popular tradition, their language nnder- | dying groans, he bursts into a broken lamentation for their

loss. The second was also a prince; he was the eldest of the many sons of Owain Gwynnedd, and ruled for two years after his father until he fell ina battle between himself and his step-brother David. He was a young man of con- spicuous merit, and one of the most charming pocts of Wales,—his poems being especially free from the conceits, trivial common-places, and complicated metres of the pro- fessional bards, while full of gay humour, a love of nature, and a delicate appreciation of woman. Some of his love sougs especially are charming. There are two other pocts, who, though they lived into the 13th century, belonged perhaps more to the 12th, namely, Llywarch ab Llewelyn and Gwynvardd Brycheiniog. Mr Stephens attributes the Songs of the Pigs to the former, and believes that the poet covertly alludes to the events which occurred in the reign of Llewelyn ab Iorwerth, grandson of Owain Gwynedd ; but as this poem occurs in the Black Book it can hardly.

be the work cf L/ywarch. The poems which are distinctly referred to him are marked by much power of delineation and poetic feeling, of which his address to Llewe Jorwerth affords a good instance. The Welsh poets, as we have said, went circuit like their Irish brethren, staying 10 cach place according as hospitality was extended to them. When departing, a bard was expected to leave a sample of his versification behind him. In this way many Imanu- scripts came to be written, as we find them, in diffcrent hands, The Irish manuscript known as the Book of Fermoy is just such a book kept in the house of David Roche of Fermoy in the 15th century. Llywarch has left us one of those departing eulogies addressed to Ithys Gryg, prince of South Wales, which affords a favourable specimen of his style. Gwynvardd Brycheiniog’s poem on St David, in which he enumerates all the churches dedicated to the saint, is a typical example of a kind of topographical poein abounding in Irish. There is an early anonymous example of this kind of poem in the Black Book, the Luglynnionn y Bedeu, The Verses of the Graves, which is the exact counterpart of the Irish Lay of the Zeachts, and some other poems of the same kind.

The following are a few of the poets of the 13th century whose pocms are still extant. Davydd Benvras was the author of a poem in praise of Llewelyn ab Iorwerth ; his works, though not so verbose or trite as bardic poems of this class usually are, do not rise much above the bardic level, and are full of alliteration. Zlidyr Sais was, as his naine implies, of Saxon origin, and wrote chiefly religious poetry. Liniawn ab Gwgawn is the author of an extant address to Llewelyn ab Iorwerth of considerable merit. Phylip Brydydd, or Philip the poet, was household bard to Rhys Gryg (Rhys the hoarse), lord of South Wales ; one of his picces, An Apology to Phys Gryg, is a striking example of the fulsome epithets a household bard was expected to bestow upon his patron, and of the privileged domesticity in which the bards lived, which as in Ireland must have been fatal to genius, Prydydd Bychan, the Little Poet, was a South Wales bard, whose extant works consist of short poems al] addressed to his own princes. The chief feature of his Hnglynnionn is the use of a kind of assonance in which in some cases the final vowels agreed alternatcly in each quatrain, aud in others each line ended in a different vowel,—in both cases with alliteration and consonance of final consonants, or full rhyme. Llygad Gwr is known by an ode in five parts to Llewelyn ab Gruffyd written about the year 1270, which is a good type of the conven- tional flattery of a family bard. Howel Voel, who was of Irish extraction, possessed some poetical merit; his remonstrance to Llewelyn against the imprisonment of his brother Owain is a pleasing variety upon the conventional culogy. It has many lines commencing with the same word, ¢.g., gwr, man, The poems of Bleddyn Vardd, or Bleddyn the Bard, which have come down to us are all short eulogies and elegies. One of the latter on Llewelyn ab Gruffyd is a good example of the elaborate and artificial nature of the Welsh versification. There are seven quatrains, the first, seccud, and fourth of which all end in -af. With the exception of the first and last stanza the first threc lincs of each stanza begin with gwr, man, or a compound of it, “manly.” The second, third, and fourth lines of the first stanza also begin in the same way; the fourth line is a kind of refrain, which in the first two stanzas begins like the other lines with gwr or a compound of it; in the third and last it begins with yn, and in the fourth, fifth, and sixth with hyd. The best of all the poets of the century was Gruffyd ab yr Ynad Coch, whose elegy, notwithstanding its alliteration and conventional use of the same initial word, or of words having the same fore-sound, has the ring of true poetry. His religious poems, too,

possess considerable merit. But of all the religious poems in early Welsh we have seeu, that which best deserves the

lyn ab ; name is one written by Madawe ab Gwallter. The death of Llewelyn and the subjugation of all Wales, Poets of and especially the social and other internal changes which the Mth

took piace in the Principality, necessarily checked literary efforts. A general revival took place, however, in the time of Owain Glyndwr and the Wars of the Roses, with which the Welsh had much to do, In the meantime a considerable improvement had taken place in the esthetic feeling of the people. The bardic system, which had helped to raise the Celtic people in their tribal stage above other barbarous peoples, but which at a later period had fettered their intellectual and political development, was, at least so far as regards exclusive privileges, at an end ; inter-tribal wars had ceased, and great unprovements in the houses, churches, dress, and food of the people had taken place. Love supplanted war as the theme of song, and much attention was paid to language and versification, Nature, too, was made a theme of poetry by several poets. We have already had occasion to notice some examples of this love of nature; but at the period we are now considering, one cannot help being struck with the power of observation of natural phenomena, and the keen sense of objective natural beauty, which many Welsh poets exhibit; nor is there wanting the higher poetic feeling of subjective beauty. These high qualities are, it is true, often marred by artificial systems of versification, Among the poets who flourished in the 14th century, the following may be mentioned. Gwilym Ddu is the author of two odes to the unfortunate Sir Grufyd Llwyd, one of which, the Odes of the Months, written in 1322, was composed while the subject of it was im prison, Yorty-three out of sixty-three begin with the word newd ; it is moreover strongly alliterated, and many of the lines end in-ed, He is also the author of an elegy on the poet Trahaearn, son of Gronwy,a contemporary poet. This poem, which is a panegyric on Welsh poets past and present, is skilfully constructed. A considerable number of writers of love Englynnzonns flourished at this time, among whom may be specially mentioned Jorwerth Vychan, Casnodyn, who is believed to be the same as

the foregoing Trahaearn, and Gronwy ab Davydd, who was probably the father of the latter. But the representative poets of this period are Rhys Goch ab Rhicert aud Davydd ab Gwilym. ‘The verses of the former to a Maiden’s Hair, though strongly alliterated and rhymed, are smooth and less intricate and conventional than most poems of the period, and possess a good deal of the character of the love romants of the time, in Southern Europe, with which he undoubtedly was acquainted. Both Rhys Goch and Davydd ab Gwilym, the Cambrian Petrarch, as he has been called, were great lovers of nature, and no modern poets sing more sweetly of the woodland, wild- flowers, the voice of birds, and other charms of the country. It is amidst such scenes they place their lovers, who are real swains and maids, and not the mock oncs of the pastoral poetry of the 18th ceutury. Two hundred and sixty two poems, chiefly pastoral of Davydd ab Gunlym are said to exist, some of which, as for instance his exquisite Ode to Summer, would be worthy of any literature.

century,

The most distinguished poet of the 15th century was Paes | the 15th |

Lewis Glynn Cothi, more than one hundred and fifty of whose poems are known. The period of the civil wars in the 17th century had its poets, the best known of whom, Huw Morus, was on the Royalist side. Since then a new literature has grown up which, however, lies outside the scope of this article.

century.

We have already alluded to the probability of the tales Prose tale,

in verse, whether historical or romantic, being earlier than those in prose, Most of the heroes of the earlier poems,

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whatever may be their real age, are also the subjects of prose tales. In the poems, as a rule, if there be any definite picture of the actors, they appear as men, and there is very little necromancy surrounding them ; the prose tales, on the other hand, are full of marvels and magical trans- formations. In the older prose tales there is a certain unity in the personages and events ; gradually two or more streams of romance mingle, as in MacPherson's Ossian. The Welsh prose tales all belong to South Wales; the poems, on the other hand, belong to a large extent to North Wales, The prose tales which still exist are few in number, and are evidently ouly a small part of those which were once current. The reason of the small number of prose tales preserved, as compared with the very large number of poems, is doubtless to be explained by the fact that the poets were a privileged class, who formed 'part of the households of the lords; while the prose tales were chiefly told by the strolling minstrels, against whom, and not against the bards properly so called, so many severe enactments were made. 'The privileged bards despised the tales of the story-teller, and hence, unfortunately for the history of romance and of comparative mythology, so few have been preserved.

In the Red Book there are eleven prose tales, which have been published by Lady Charlotte Guest, together with the Hanes Taliesin, of which we have spoken above, under the name of Afabinogion, though that name is applied in the Red Book to four only. We may classify them thus according to their origin. J. Roman-British—(1) The Contention of Liudd and Llevelys; (2) The Dream of Maxen Wledic. II. Irish Romances—(3) The Tale of Pwyll, Prince of Dyved; (4) Branwen, daughter of Llyr ; (5) Manawyddan, the son

of Llyr ; (6) Math, son of Mathonwy. It, Arthurian Romances—(7) The Lady of the Fountain ; (8) Peredur, son of Evrawe ; (9) Geraint, son of Erbin. IV. Mixed Romances—(10) The Story of Kilhwch and Olwen ; (11) The Dream of Lhonabwy. To the category of mixed romances may also be added, as a third kind, the story of the St Graal contained in a Hengwrt manuscript.

The first story relates to Zluwdd, son of Beli the great, son of AManogan, who became king after his father's death, while his brother Llevelys becomes king of France, and shows his brother how to get rid of the three plagues which devastated Britain :—first a strange race, the Coranians, whose knowledge was so great that they heard everything, no matter how low soever it might be spoken ; second, a shriek which came into every house on May eve, caused by the fighting of two dragons; and third, a great giant, who earried off all the provisions in the king's palace every day. The second relates how J/axen or Maximus, emperor of Rome, has a dream while hunting, in which he imagines that he visits Britain, and sees a beautiful damsel, Helen, whom he ultimately succeeds in finding and marrying. The personages of this tale are mentioned in the earliest form of the Brut Gruffyd ab Arthur, but the account is different. Both tales seem to be British, and to be trace- able to Roman times.

We have called the second group Irish romances, not only because the action in some of them is placed occa- sionally in Jreland, and some of the actors are distinctly stated to have been Irishmen, but because they are un- mistakably relics of the period of the occupation of the coast of Wales by the Gevyddel or Irish. The group of four romances forma, cycle of legends, and are the onlyones called Mabinogion in the manuscript from which they have been taken. In the first tale the principal characters are Pwyll, prince of Dyfed, and Arawn, king of Annwn or Annwyvn ; in the second Bran and Aanawyddan the sons, and Bran- wen the daughter, of Llyr, and Matholwch, king of Ireland ; in the third Manawyddan, son of Llyr, and Pryderi, son

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of Pwyll ; and in the fourth, Jfath, son of Mathonwy, king of Arvon and Alona, Gwydyon ap Don and Arianrod his sister, and Llew Liaw Gyfes and

Dylan eil Ton, the sons of Arianrod. These personages are mentioned in several of the poems attributed to Talzessin, in whose reputed works curiously enough the relics of the ancient mythology are chiefly found. Among these poems we may mention the following, some of which are in the Book of Z'aliessin, while others arenot :—Kadetr Kerrituen, orthe Chair of Cerzdwen ; the Spoils of Annwn; the Kat Godeu, the Battle of Godeu; Murwnat cil Ton, the Death Song of Dylan, son of the wave ; Daronwy; Angar Cyfindawd; the story of Llyr ab Brochwel Powys ;—in other words, all the so-called mythological poems. In these talesand poems we have undoubtedly the relics of the ancient Irish mythology of the Tuatha Dé Danann, sometimes mixed with later Arthurian myths. The Caer Sidi is the Sid of Irish mythology, the residence of the gods of the Aes Side. The seven other Caers or resid- ences mentioned in the poem on the Spoils of Annwn are the various Séde of the immortals. lyr is the Irish sea- god Lér, and was called Llyr Llediatth, or the half-tongued, implying that-he spoke a language only partially intelligible to the people of the country. Bran, the son of Llyr, is the Irish Bran Mac Allait, Allat being one of the names of Lér. This Gran is probably the same as Brian, son of Tuirenn, though according to the Irish genealogies, Brian would be the nephew of Lér. Mfanawyddan ap Llyr is clearly the Manandan or Manannan Mac Lir of Irish mythology. In one derivation of his name, if correct, we have a most im- portant link in these romances. Accordingto this etymology, Manannan comes from Aan, lord, and Annan, of the foamy sea, Lér, his father's name, meaning also the sea. In Annan we would have the Azwn of the poems, and of the story of Pwyll, and commonly identified with hell, but really corre- sponding to the Zi Zairngire or Elysium of the Irish. 2hz- annon, the wife of Pwyll, who possessed marvellous birds which held warriors spell-bound for eighty years by their singing, comes from Aznwn, and her son Pryderi gives her, on the death of Pwyll, as a wife to Manawyddan. With Ain or Annwvyn we naturally connect the Irish Ana, the mother of the gods, or Mér Rigu, and wife of the Dagda. She was the mother of Aed, the Welsh Aed Afawr, and was probably the same as Ceridwen. Ina previous part of this article we have made the Dagda the same as Delbaith Dana or ZLucrenn, the father of Lér; if we are right in our conjecture, Ana would be the mother of Zér, the sea, as well as of Aed, fire. Jthiannon, daughter of Heveydd Lén, and wife of Pwyll, and afterwards of Janawyddan, is perhaps also to be connected with Ana and Annwn, Again, the Caer Sidi above

mentioned, where neither disease nor old age affects any one, is called the prison of Gwew in one of the poems. This Gweir, we have no doubt, represents Gaiar, son of Afanandan Mac Lir, the Atropos who cut the thread of life of Irish mythology. In one legend Gaiar is made the son of Uisle and of Deirdriu, celebrated in the story of the sons of Uisnech, and the foster son of Manandan, who aids him in banjshing Conchobar Mac Nessa to Alba on account of his killing the sons of Uisnech, and becoming king of Ulster in his place. Afterwards, Gaiar relinquishes the kingship by the advice of Jfan- andan, who takes him to Lmhain Abhlach, or Eman of the Apple-trees, where he dies. Gazar's sister Adeb-greine, the Sunlike, married Ann, son of Lehaid Iwil of Tir Tairngire, or the Land of Promise. This Linn takes part in the contests between the swincherds of Ochull Ochne and Badb, chiefs of the rival Side, who after a series of metamorphoses become the Finnuenduch, or bull of Con- naught, and the Donn Cualngiu, the celebrated bull of the Tdéin Bé Cuailuge. Math, son of Alathonwy, may be connected with Mat, the great Druid of the Tuatha Dé Vo — a

Danann, The necromancer Mathene or Londn, the com- panion of Art, of whom we shall have something to say presently, may be a relic of the older mythology. Nor should we forget to mention in connection with this name that the mother of Queen Medd or Mab was Mata Murrisc. The Llew Llaw Gyffes of the tale of Math, son of Mathonwy, is Lug Lém Fada, king of the Tuatha Dé Danann, whose mother was Ethlenn or Cethlenn, daughter of Balor of the Evil Eye, a Fomorian chief, This Zug was known by several names, among which was that of the Sab Llda- nach, or Skilful Pillar, because he knew or supported all arts, a name which connects him with J. Uanach or Iidanach (Skilful),son of Manandan. Lug,accordingto Irish legends, was the first who introduced fighting on horseback into Ireland, and who established funeral games. Gwydyon, son of Don, who fills so important a part in the early Welsh poems and talcs, was the brother of Arzanrod, the mother of Llew Llaw Gyffes and of Dylan, Son of the Wave, and the grandson of Daronwy, the son of Brynach or Urnach Wyddel by Corth, daughter of Brychan, by which another line of legend, originating

also in Ireland, is brought into connection. Gwydyonis an enchanter of wonderful power, his master being Math. He produces a woman from blossoms, and the forms of horses from springing plants, The tale of Math,son of Mathonwy, is full of such transformations as those of the swine-herds in the preface to the Z'din Bo Cuailnge. Thereare alsosimilar transformations in the poem of the Kat Godeu, or Battle of Godeu. The Milky Way is called Caer Gwydyon; the constellation Cassiopeia is Llys Don, the court of Dow; and the Corona Borealis is Caer Arianrod, the residence of Artanrod, daughter of Don, and mother of Llew Thus Avianrod is the same as Hthlenn. There are several Dons or Donns in Irish romance :—the chief of the Munster fairies, or people of the Side, was Donn Firinne of Cnoc Firinne, now Knockfierna, in the west of the county of Limerick; Donn Dumhach, or Donn of the sandbank at the mouth of the Lidhneach near Ennistymon, in the county of Clare, and Donn Chnwic na n-Oss, now Knockanoss, in the county of Cork, were also chiefs of Side. These examples show that Don, thefather of Gwydyon, may be connected with the Aes Side. Manandan Mac Lir had a son who was 'ch-Don Mor, or the great Lch-Don, who is probably the Dorn mentioned in the Fennian Agallamh na Senorach, or Dialogue of the Sages, as having been slain by a certain Derg Dianscothach in a war between Ilbhreach of the Sid of Has Ruadh and Lér of Sid Finnachaidh. It may be remarked here that whenever the Acs Side are brought into the Fennian romances there is generally some confusion, Thus in the romance just mentioned Lér is re- presented as at war with J/bhreach, who in the genealogies is made the son of Manandan. Before leaving those curious tales, it will be better to discuss one of the mixed romances, The Story of Kilhwch and Olwen. By mixed romance we meau one in which two distinct streams of legends have mingled, The one just mentioned belonged originally to the same class of legends as the four Mabinogion we have been discussing, but it got mixed up with the Arthurian romance. i/hweh asks for wife Olwen, the daughter of Yspaddaden Penkawr, who imposes upon him a number of tasks before he would give him his daughter, the final one being to fetch the comb and scissors which were between the ears of the Twrch Trwyth. All these he effects through the aid of his cousin Arthur. Among the personages men- tioned are—Am«aethon, son of Don, who is represented as a great husbandman, and Govannon, son of Don, a smith. Among the actors are Gwyther, the son of Greidawl, who is betrothed to Creiddylad, daughter of Lludd Liaw Ereint,

that is Cordelia, daughter of Lear, Gwen Ap Nudd however, carries off Cretddylad, but Arthur makes peace between them, the condition being that the maiden should

be restored to her father’s house, and Gwen and Gwyther should fight for the yellow-haired maiden on the first of May each year. This very curious tale is altogether based on Irish mythology. Govannonis Goibu, the Irish Vulcan, the brother of Diancécht or Dia na-cécht, the god of the powers (of healing). Creiddylad is the Irish Cretde of Tiv Tairngire. The ZLwreh Trwyth is the Irish Tore Triath, the King Boar. Indeed the story puts him in Ireland, and says that he cannot be hunted without Garselit the Gwyddelian, the chief huntsman of Ireland. This king boar belonged to Brigit, the poetess daughter of the Dagda, the Minerva of the Irish, Mudd, the father of Gwen, is apparently Veit (battle), the god of war, and Kilhweh himself seems to represent Coin Ceallach—son of Delbaith, son of Weit, the god of war—who received the name Hladan (art, skill) in consequence of the skill he displayed in pre- paring ropes for capturing Jasau, king of Britain.

By an Arthurian romance we mean a tale in which Arthuric Arthur is a chief hero, and the scene of which is laid in T0mance

Wales or South England. The legends of Arthur in this sense belong chiefly to South Wales, and must have origi- nated there in great part, though they were afterwards much modified by uew elements introduced from Armorica by Rhys ab Tewdwr and his followers at the end of the 11th

century. At this period South Wales was more civilized Conditic than North Wales, because less mountainous and more fer- of S. Wa

tile, and also because it had considerable intercourse with *! 4° , ; : 11th cen France. These very circumstances led to its conquest by imy,

the Normans earlier than North Wales, which maintained its independence nearly a century longer. Before the advent of the Normans in South Wales, stone-built castles and churches existed, but they erected much stronger and more splendid castles, and the clergy whom they introduced built fine

churches and great abbeys. The Norman castles and walled towns and trained men at arms, always ready for war, must have afforded more protection to commerce and agriculture than it could enjoy under the Welsh tribal system. The wants of the new nobility, too, were greater, their courts were more splendid, their dresses and arms more costly than those of Welsh princes; and corresponding splendour was introduced into the ceremonies of the church, The Norman baron was not prouder, but he was graver and more courtly than the Welsh lord. All these things acted on the popular storics and gradually transformed them, as manners improved, into elegant ro- manees of chivalry. The abundant materials of romance which cxisted in Wales were the property, so to say, of the strolling minstrels and peasantry, and were despised by the lettered bard with whose poems the popular tales competed. Carried into Armorica, they became, as it werc, ennobled, and assunied a more polished and courtly form; and when brought back by Rhys ab Tewdwr, almost. entirely dis- placed the conventional poems of the bards, which were chiefly eulogies of the living, and clegies of their dead patrons. This is the reason why South Wales produced so few poems from the 12th to the 15th century. These romances were soon translated, or rather new ones con- structed upon the same themes, by the Norman Jongleurs, who soon spread them among the Norman nobility every- where. The heroes of y Gogled were well adapted to serve as actors in the courtly romances. They appear in the poems which we have discussed above as so many lay figures upon which to put the rich dresses and armour of the Normans, and who might be put into a fine castle anywhere without incongruity. The necromancy seems to have been largely borrowed from the Irish legends, a great many of which, of the same character as the Mabinogion, must have still existed in the 12th and 13th centuries.

The position assigned to Arthur in romance is duc t0 the ar

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position in the north as to give him of right the place occupied by Arthur in those productions. Some tale or ballad, in which a hero called Artur was the chief actor, might have had perchance the necessary elements for popular success ; and around this as a nucleus gathered the legends of other Arturs. One of the sons of Aedan Mac Gabran, killed at the battle of Cattraeth, was named Artur; and there were doubtless many others of the name, both Scots and Britons, The name Art has a place in Irish romance also. Thus Art, “the lone man,” son of Conn of the Hundred Battles, was beloved on account of his great fame by Becuma of the fair skin, wife of Labrad of the quick-hand-at-sword, and probably the same as Hiain, a goddess already so often mentioned, and who had been unfaithful with Gaiar, son of Manandan Mac Inv, Becuma, driven out of Zir Tairngire or Elysium on account of her offence, is sent adrift in a boat, and lands onthe Hill of Howth in Ireland, where, under the name of Delbh Caemh, daughter of Morgan, she presents herself to Conn and marries him. She next insists on the banishment of Art from Tara. Evil, however, comes on the country on account of Conn’s marriage, and the Druids announce that it could only be averted by sprinkling the blood of the son of an undefiled couple on the door posts. Conn sails away in search of such a youth, finds him in Zir Zairn- give, Elysium, and brings him to Ireland. Then we have a scene of exactly the same character as that told of Gorti- gern, but the boy is ultimately saved from immolation by the appearance of his mother, who tells them they must banish Lecwma. The latter then plays a game of chess with Art the son of Conn, and he wins, and imposes upon her the obligation of getting the

champion’s wand which was in the hand of C’urot Mac Daire when making the conquest of Eri, and of the whole world. She visits the Side, and at length finds it, and brings it to Art. They play again, and this time Becuma wins, and sends him in search of Delbh Caemh, daughter of Jforgan, z.¢., herself, whom he would find in an island in the middle of the sea. He sails away, and arrives at a beautiful island full of apple-trees, flowers, birds, and spotted horses ; in which too there were joyous ever-blooming women, and Crede, the ever beautiful. Again Art was named Oenfhir, “the lone man,” because his brother Condla, “the beautiful,” being invited by a Ben Stde to rule over Magh Mell, “the plain of honey in the Land of Promise,” went thither and left him without a brother. Art is also credited with having anticipated Christian belief; and consequently it is supposed that neither he nor his son Cormac was buried in the pagan cemetery on the River Boyne.

It should be remembered that this Art lived either at the beginning of the Scotic invasions of Roman Britain, or immediately before that period, for his son Cormac, according to Irish legends, was expelled from Ireland, and, going over the sea, obtained the sovereignty of Alba, and his fame must have been carried into Wales, where he must have been the subject of many legends. These legends were the nucleus around which gathered all the floating traditions which came down from the north into North Wales, and thence into South Wales. Some obscure Arthur of the north, perchance Aedan’s son, was clothed in the legendary glory of Art, and was made a Gluledig or generalissimo, and paramount king of Britain. From South Wales these legends passed into Cornwall and Armorica, where it is probable the Round Table was invented or borrowed in the same way that at a later period the legend of the St Graal, which there is reason to believe originally came from Provenge, was carried by the Jongleurs into Brittany, and thence into Wales. If the preceding view be correct, the Arthurian legends attained considerable development in Wales before the Round Table was

developed, and were carried by itinerant story-tellers and musicians among the Normans before Geoffrey of Mon- mouth wrote his history. That book

gave a value to the popular tales which they otherwise could never have attained, and afforded a key by which to correct them. To the Norman clerics the romances owe their polish, and to a large extent their chivalry. But the germs of medisval chivalry, and even of knight-errantry were already in the original legends, associated, no doubt, with much barbarism.

Besides the Bruts, poems, Mabinogion, genealogies, and Other some miscellanous pieces including a few legendary lives Welsh of saints and the grammatical works alluded to in a pre- literature. ceding part, the only other early works in the Welsh language which have been printed, are two medicine books, and a music book. The two medicine books belonged to Medicine. a family of leeches of Mydvac in Carmarthen, descended from Lthiwalion, family leech to Rhys Gryg or Rhys the Hoarse, prince of South Wales, in the 13th century. The oldest of the two books is in the Red Book, and may possibly have been copied from the Book of Ricwallon himself, or of his sons; the second is the Book of Howel Veddyg, or Howel the Leech, a descendant of Hinton, son of Lhiwallon, and was written probably towards the end of the 17th century. Both books are mere dispensatories, and contain very little which would enable us to judge of the theoretical knowledge of disease possessed by the Welsh leeches, and cannot represent the real state of leech- craft in Wales in the 16th and 17th centuries, In Wales the practice of leechcraft was, as in Ireland, hereditary in certain families, who held land by the tenure of medical service. The rank and privileges of the family lecch to the king are givenin the Welsh laws; and in Wales he was obliged, as in Ircland, to take a guarantce from the kindred of his patient equal to the sum which should be paid for the homicide of a man of his rank, in case he might happen to die from his treatment, otherwise he should answer for his death, The music book, published Music. in the Myvyrian Archaiology, which is believed to contain some of the ancient music of Wales, and a peculiar system of musical notation, contains merely the music of the lute or some stringed instrument, pcrhaps the Welsh Crwth or Crowd, with the notation in common use for such instru- ments in every part of Europe, and there is no evidence that it contains any of the ancient music of Wales.

The literature of the Cornish dialect of the British, Corwisu which was once the spoken language of the centre and LITERa- south of England, is very

limited indeed. There is first TU?” the Pascon Agan Arluth, The Passion of our Lord, con- sisting of 259 stanzas, each of which is a quatrain of four double lines, in rhyme, or eight single heptasyllabic lines with alternate rhymes, the final vowel and consonant in the rhymes being almost always the same in each stanza,

This important monument of the Cornish language has been printed with a translation by Mr Whitley Stokes. Secondly, there is the Ordinalia, a MS. of which is in the Bodleian Library, Oxford. It forms a dramatic trilogy, consisting of three miracle plays—the Beginning of the World, the Passion, and the Resurrection of our Lord. The latter piece is divided into the Resurrection and the Ascension, with a curious interlude of the putting of Pilate to death. These dramas are founded on the Gospels, the Acts of the Apostles, the apocryphal Gospel of Nicodemus or Acts of Pilate, and several legends which were current all over Europe in the Middle Ages. They arc probably translations or adaptations of French miracle plays of the end of the 14th century. The metre is syllabic, with few exceptions, each line having seven syllables, like the lines of the poem of the Passion. A great many of those lines are arranged in stanzas of eight or of four lines, with alternate rhymes, as in the poem just

mentioned ; others in stanzas of six, in whieh the third rhymes with the sixth, and the others together or in pairs. Occasionally there are eight-lined stanzas, 1n whieh the first, second, and third lines, and the fifth, sixth, and seventh lines form triplets rhyming together or separately, and the fourth and eighth lines rhyming together. In lyric and declamatory passages, the lines are oceasionally only tetrasyllabic. There are many other varieties of metre, but those here described make up more than three- fourths of the whole. The late Mr Edwin Norris published the Ordinalia with a translation under the title of the “ Aneient Cornish Drama.” The third relic of the Cornish language is a miraele play founded upon the life of St Meriasck, son of a duke of Brittany, and. called in Breton St Meriadee. This pieee, which was written in 1504, was found a few years ago by Mr Whitley Stokes among the Hengwrt manuseripts at Peniarth. The language is newer

than that of the Ordinalia, the admixture of English being also greater ; the metre employed is, however, much the same, The fourth work is alsoa miracle play, The Creation of the World, with Noah's Flood, written in 1611 by one William Jordan, It is written in a more corrupt language than those above mentioned, is full of English words, and imitates, in some instanecs almost copying, passages in the Ordinalia. The remaining literature consists of two versions of the Lord's Prayer, the Commandments, and the Crecd, and two indifferent versions of the first chapter of Genesis, a few songs, a short tale, and a few proverbs, and lastly a Cornish Glossary, explanatory of Latin words. The oldest copies of the poem on the Passion is a vellum manuscript in the British Museum of the 15th century ; the age of the principal manuscript of the dramatic trilogy is about the same. The Glossary is the most ancient monument of the Cornish language, for the manuscript which contains it belongs probably to the end of the 12th or beginning of the 13th century; and it was copied into this from a more ancient MS. The miracle plays, as we learn form Carew's Survey of Cornwall, printed in 1602, were played down to the beginning of the 17th eentury, in earthen amphitheatres in the open fields as in France and Germany, which in the 18th century, when Borlase wrote, were popularly known as " Rounds." Armoric like Welsh is a living language, but no monu- ment of the old form of the language exists, and the relics of Middle-Breton literature consist of two miracle plays, a prayer-book or " Hours," a dictionary, and the chartularies of two monasteries. Of this small list only one of the plays and the dictionary arc known to exist in early manuscript originals or copies. The play, which is founded on the life of St Nonna or Nonita, is in a paper manuscript, which has been purchased by the National Library at Paris, and is believed by Zeuss to belong to the 14th century. This piece which, with the chartu- laries of Rhedon and Landevin, was the principal source whence Zeuss drew the materials for the Armoric part of the Grammatica Celtica, was published together with a translation in 1837, under the title of Buhez Santez Nonn. The second play, the Burzud braz Jezuz, the Great Mystery or Miraele of Jesus, is also referred to the 14th cen- tury, but no manuseript of it is known to exist. M. Hersart de la Villemarqué has reprinted it from copies, probably unique, of two editions printed in Paris in the years 1530 and 1622. It consists of two parts —the Passion and the Resurrection, and is treated somewhat differently from the corresponding parts of the Cornish trilogy. It possesses some literary merit, which the ele- gant translation of

the editor does ample justice to. Only two copies of the “ Hours,” printed apparently in 1524 are known. From these Mr Whitley Stokes has recently reprinted it, adding extracts from a missal printed in 1526,

and a catechism printed in 1576. Onc of the most valu- able of the Middle-Breton doeuments is the Breton-French and Latin Dictionary of Jean Lagadcuc or Lagadec, curé of Ploegonen, a manuscript of which, extending to the middle of the letter P, dated 1464, is in the National Lib- rary of Paris. Under the title of Le Catholicon it has been printed several times, the earliest edition being that of 1499.

Miracle-plays died out in France and England in the 16th century, but in Cornwall, as we have seen, they continued to be played down to the beginning of the 17th century, and in Brittany almost down to our own time. The Great Mystcry of Jesus, modernized and otherwise altered, was in great repute in the 18th century. One of the widest known and most popular mysteries which have come down to modern times is that of St Tryphine and King Arthur, which M. Luzel has pub- lished. The language is more modern than in the two plays above mentioned, and is largcly mixed with French expressions, hence we did not include it among Middle- Breton documents. The Breton miracle-plays, as well as the Cornish ones, are free to a great extent from thie dis- gusting realism, coarse expressions, and indecent buffoon- eries of the English and French plays of the 15th century.

Although modern Breton literature, like modern Welsh literature, is outside the scope of this articlc, we should except from this category popular poems and tales, for, though modern in form, they contain materials for com- parative mythology and linguistic studics, and exhibit the whole intellectual life, belief, and customs of the people, and the impressions which the events of thcir history have left on the popular mind. Of such collections the mest important is M. de la Villemarqué’s Barzaz Breiz, the fruit of many years’ labour in every part of Lower Brittany. This collection consists of gwers, or short heroie, historical, or mythological ballads; sons, or love and festive songs ; and religions poems. ‘The language is, of course, modern, but is full of archaisms, showing very well how old poetie material becomes modified in the current of popular tradi- tion. The Breton text is accompanied by an

elegant trans- lation into French, an introduction and notes, and in the sixth edition all the pieces have the original airs noted. Mr Tom Taylor published in 1865 a translation of the Barzaz Breiz, M. M. ¥. Luzel, already well known as the author of a volume of cxcellent Breton poetry (Bepred Breizad, Morlaix, 1865), and by his edition of Saznte Tryphine et le rot Arthur, published in 1868 a volume of gwers or popular ballads collected in a part of the aneient diocese of Tréguier, under the name of Gweraton Breiz- zel, Similar collections have been made in other parts of Brittany, especially by MM. Penguern, G. Milin, Goulven- Denis, &c., which have not, so far as we know, been yet published. M. Luzel has also published some popular tales in the Tréguier dialect, and Colonel A. Troude and G. Milin an interesting collection of seven in the Léon dialect.

In concluding what we have had to say on the litera- ture of the respective dialects, it may be well to add a few words on a subject which belongs to all alike, upon which M. de la Villemarqué has given a short essay by way of introduction to his edition of Le Grand Mystére de Jesus, and upon which M. Luzel has also some remarks in his Sainte Tryphine et le roi Arthur, namely, the theatre of the Celts. M. de Ja Villemarqué assumes that there is no evidence of a drama among the Goidelic branch of the Celts, but he thinks that it existed among the British branch, at least in an embryonic state, and refers to the Welsh poems in dialogue as evidence. Mr Stephens had already! drawn attention to these poctic dialogues,

1 Literature of the Kymry, p. 82.

e.g., those between Arthur and Gwenhwyvar, Gwalchmat and T’rystan, Talessin and Myrtin (Myrdin or Merlin), &c,, and given it as his opinion that written dialogue seems to indicate the existence of drama of some sort, and that dialogues such as those referred to are inexplicable on any other hypothesis. If this argument were admissible, we cannot see how the existence of the dramatic form should be denied to the Irish, inasmuch as dialogue is very fre- quent in Irish poems and tales. Indeed, the “ Fight of Ferdiad and Cvchulaind,” and other episodes of the Tain Bo Cuailnge, the

Bridthar chath ban Ulad, or “ Wordy War of the Women of Ulster,” the Siabur charpat Conculaind, or “ Phantom Chariot of Ciichulaind,” possess as much of the character of incipient drama as any poetic or prose dialogues in Welsh literature. The truth is, however, neither the Welsh nor the Irish had the drama in the proper sense of the word, for the sufficient reason that though, like other Aryan peoples, they may have pos- sessed the germ, it could not be developcd among a people who had no civic life. The miracle-plays of the Cornish and Bretons are of foreign and ecclesiastical origin, and merely prove that there existcd a closer contact between their churches and the great body of the church in Europe than between the latter and the Irish and Welsh churches. No Welsh miracle-play is known, if there ever was one; nevertheless, it is possible that the words hud a lledrith, which are explained “illusion,” ‘“phantasm,” may have really referred to some exhibition of the kind, though the explanation of those words given in the Zolo MSS., upon the authority of a certain Zewan Vawr ap y Diwliths, who, according to Mr Edward Williams (Zolo Morganwg), wrote his treatise on Welsh metres about the year 1180, looks very suspicious. M. de la Villemarqué also alludes to a rustic féte, known as le jew de printemps et de la jeunesse, in which three characters, two young men and one maiden, acted, while the spectators formed the chorus, and repeated the dialogued chants of the principal actors while dancing. Although this féte seems to be a survival of pagan times, and to possess to some extent the elements of an incipient drama, yet in the absence of written monuments or ancient evidence, no argument as to the existence of a native drama among the Celts can be legitimately drawn from it.

Celtic literature, although it has no great masterpiece of its own to point to, has exercised a considerable amount of influence on the creations of modern European literature. This influence was exerted by several distinct currents of legends. The first is that of the legends of the Aes Side and those of Queen Mebd or Mab and the heroic period; of these the existing Irish legends, and the modified form of them in the Welsh Mabinogion, give us one type. In Britain this first current, modified and mixed with foreign and especially Teutonic elements, has gone on altering, growing, and decaying until the traccs of its origin are almost unrecognizable. It is from this source that much of our fairy mythology is derived, and that Chaucer and Spenser obtained materials. To it also may be traced the legends which formed the groundwork of Shakespeare's immediate sources for King Lear and Midsummer Night's Dream. The legends of the second stream were in reality but modifications of those of the first—all secondary streams of legend must be necessarily but branches of the primitive Stream. These legends were translated into Latin at an carly period, and thus, while they spread far and wide, and passed into every language of Europe, we are better able to follow the current up to its first sources. These legends are the Irish Jmmrams or Wanderings and the isa or Visions which we described above. The idea of a land without winter, of never-ending day, in which the flowers of spring and summer should coexist with the fruits of autumn, and in which bodily ills and old age should be

unknown, is common to all lands and to all times. The belief in perpetual youth and especially of abundance of fruit at all times was spread over all Western Europe, and found expression in the popular legends of Schlauer-afenlande, Pays de Cocaigne, &c. The Irish idea of this kingdom of the dead, an idea common to all the branches of the Celtic race, and to the Teutonic races also, is given us in the descriptions of Zr Tairngire, The Land of Pro- mise ; Afagh Mell, The Plain of Honey; and the Country of the Side. Thither went several of the heroes of romance —Cichulaind, Find, Conn, and his son Art.

In some legends the land of the Aes Side was reached through caves, as in Virgil's Cave of the Sibyl; in others, and more usually, by water,—it being

conceived in such cases as an island, In the legends of Conn and Art this island lay to the eastward, that being the direction in which all the expeditions of the Irish went, the direction in which lay the wealth of the Roman towns of Britain and the metals for bronze of Cornwall. In early Christian times asceticism carried many to the headlands and islands along the west and south-west coast, and the Land of Promise followed the setting sun. A comparison between the Irish pagan and Christian legends of Zir Tairngire, the terra repro- missionis of the Latin medieval writers, and those of the Teutonic Glasberg, or heaven, shows very clearly the com- mon origin of the two streams. The individual features of the Celtic and Teutonic notions of the kingdom of the dead are the same, though their combinations may differ according to age and other circumstances. ‘The great sca cat and the island of cats in St Brendan’s voyage—the island being also met with in other Jmmrams—are connected with the sacred animal of Freyja or Holda; the island of black faced dwarfs of the Irish legends reminds us of the dwarfs dwelling in Glasberg. Like Jolda’s soul-kingdom, Tir Tawngire was an island hidden in a cloud-mantle, en- joying never-ending day and perpetual fogless summer, full of fine mansions surrounded by grassy, flower-bedecked lawns, whose flowers never wither, abounding in apple trees, bearing at the same time flowers and fruit—a land rich in milk, ale, and pork, whose air was ever filled with sweet music, and whose inhabitants enjoying perpetual youth were of spotless innocence, free from blemish, disease, or death. Of all the qualities of Zr Tairngire abundance of apples, the only important fruit known to the northern nations, seems to have been the one which conveyed the highest notion of enjoyment. Hence the soul-kingdom was called by the Welsh the island of apples, Ynys yr Avallon, and sometimes Ynysvitrin or Ynysgutrin, Glass Island, a name which identifies it with the Teutonic Glasberg. When these names passed into other languages untranslated, so that their meaning became obscured or forgotten, the kingdom of the dead was localized at Glas- tonbury, the Anglo-Saxon Glestinga burh. There, accord- ing to legend, Arthur lies buried, but another popular tradition has it that he was carried away to the island of Avallon by his sister the fairy Morgana, the Morgue la Fac of French romance. This Jforgana is the Becuma, “ the fair skinned” daughter of Morgan, in search of whom Art, “ the lone man,” visits Z%r Z’airngirc, as already mentioned, When Art reaches the Land of Promise, the lady he finds is Crede, “the ever beautiful.” In the romance of Oger le Danois, when

Ogier, who Morgue la Fae deter- mines shall be her lover, arrives at the palace of Avadlon, he finds there besides Aforgana, her brother King Arthur, and her brother Awberon, the Oberon of fairy romance, and Mallabron, a sprite of the sea. A curious legend in the vellum manuscript called the Book of Lismore connects – Brendan with Crede. According to this legend a certain tribe king named Doburchu, whose wife's name was Crede, was transformed through the curse of St Brendan into an

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otter. Another link in the chain which connects all these legends with Celtic mythology is the introduction of Brendan into the curious legend of the irruption of Loch Neagh, beneath which lived in her sun-house Liban, probably the same as Becuma, and therefore as Mor- gana, whose lapdog was transformed into an otter when she herself became a salmon. In the Christian Jmmrams or Wanderings the pagan soul-kingdom was simply changed into a place where souls were to await the final resurrec- tion. It is probable, however, that a tradition of real wanderings among the rocky and inaccessible islands along the western coasts of Ireland and Scotland, and on the ocean itself, served as a nucleus around which gathered and fused together the pagan and Christian notions of the kingdom of the dead. 'The islands of birds, and the whale serving as an island (in the Latin St Brendan Jasconius, 1.¢, Irish tasc-tnis, fish-island), support this view.

The F%sa, or prophetic Visions, are merely a different type from the Zmmrams or Wanderings of the same fundamental legends; although perfectly pagan in their origin the better known ones belong to Christian times when the Celtic Soul-Kingdom, and the Christian story of the Day of Judgment, and the Elysium and Tartarus of the Romans, as depicted by Virgil in the sixth book of the Aneid, which became known to the Irish as early at least as the 6th century, were fused togéther. The visions when translated into Latin passed into European languages. The original Irish of some of them is not now known; perhaps some of them were first written in Latin; their thoroughly Irish character, however, and the existence in Irish only of one of the most perfect of them, the Vision of Adamndn, lead to the opposite conclusion. The Wandering of St Brendan, the Purgatory of St

Patrick, and the Vision of Tundale represent three distinct types of the second stream of legends. The first is the way of getting at the soul-kingdom by water, the second by a cave, and the third by a fis or vision, which in pagan times would have formed part of the &lidecht of the poet. These three legends, which are to be found in every European language in the Middle Ages, constitute three out of the five main sources of the plot of Dante's great poem! The effect of St Brendan's Voyage upon geographical discovery does not come within our scope, and we shall therefore only add that his island, which was simply the Celtic soul-kingdom, is to be found on maps of the 17th century, and was the subject of an article ina treaty between Spain and Portugal in the 18th.

The third current we have already touched upon. It was formed by the fusion of the legends of Aré, son of Conn, the necromancy of the Aes Side, and the legendary history of the struggles of the Britons and Saxons in the North of England and the South of Scotland, which latter legends supplied heroes, a toponomy, and events. To this stream flowed afterwards, as we have pointed out, the Armorican tributary stream of the Round Table, and the Provencal stream of the St Graal. The effects of this stream of legend, which in its early course belongs to South Wales, on the literatures of Europe is too well known to require discus- sion here further than to point to its threefold action :— (1) much of the romantic literature of Europe may be traced back directly or indirectly to those legends ; (2) they helped as the vehicle of that element we call chivalry, which the church infused into them, to fashion and mould the rude soldiers of feudal times into Christian knights; and (3) they expanded the imagination, and incited the minds of men to inquiry beyond the conventional notions of things, and thus materially assisted in creating modern society.

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1 See Villari, Antiche legende e tradiziont che illust Let Commedia, Pisa, 1865. oe

CELTIC LITERATURE

BrsirocRapny.—In the following list we have included Biblio. only the more important works bearing more or lesg &taphy.

directly upon the subjects treated of in the foregoing article. We have been consequently obliged to exclude many valuable works on the history of Celtic peoples, and especially the numerous and interesting books on Celtic antiquities. Although the Neo-Druidic heresy may be considered to be now fully exploded, we have, nevertheless, deemed it necessary to include a few of the principal works of the upholders of that singular delusion, because of the historic interest which they possess,

CreLTic LANGUAGES, ETHNoLoGy, &c,., IN GENERAL.—~Zeuss, J. G.. Gram- matica Celtica, 2 vols., Lipsize, 1853; second and greatly improved edition, Berlin, 1871, ed. by Prof. H. Ebel, embodying all the emendations of Celtic scholars to the time of its publication. Gliick, C. W.: Die bei Caius Julius Casar vorkommen- den Keltischen Namen, Miinchen, 1857. Stark, Dr Franz: Keltische Forschungen, Keltische Personennamen nachgewiesen in den Ortsbenennungen dcs Codex Traditionum Ecclesis: Ravennatensis aus dem V1L-X. Jahrhundert, Wien, 1869, Flechia, Prof.: Di alcune forme de' nomi locali dell' Italia Superiore, Torino, 1871. Roget, Baron de Belloguet: Ethnogénie Gauloise, Paris, 1858-1861. Dief- enbach, Lorenz: Origines Europes, Die Alten Vilker Europas, Frankfurt, 1861; Dr Diefenbach was the first who systematically included the Celtic languages in comparisons with the Germanic languages in his Vergleichendes Worterbuch der Germanischen Sprachen, 2 vols., Frankfurt, 1851. Beitriige zur vergleichen- den Sprachforschung auf dem Gebiete der Arischen, Celtischen, und Slawisclen Sprachen, herausgegeben von A. Kuhn und A. Schleicher, vols. 1-8, This periodical contains the most important contributions made to Celtic philology since the publication of the first edition of Zeuss's Grammatica Celtica, such as those of Ebel, Stokes, Schleicher, Cuno, Becker, Aufrecht, Lottner, Pictet, &c. Prof. Ebel's valuable contributions, 'Celtische Studien," have, with the excep- tion of those on the verb, been translated into English (‘' Celtic Studies from the German of Dr Hermann Ebel," &c., by William K. Sullivan, London & Edin- burgh, I863). The Beitriige has been fused with the Zeitschrift fiir ver- gleichende Sprachforschung, herausgegeben von Dr Adalbert Kuhn. The volume for 1876 contains a remarkable article on the Perfect tense in Irish by Professor Ernest Windisch, who has also done good service by contributing comparisons from the Celtic languages, especially Ivish, to the 4th edition of Curtius's Grundziige der Gricchischen Etymologie (Leipzig,

1873), and to Pro- fessor Figk's work on Greek Proper Names. The Revue Celtiqne, commenced in 1870 by Prof. 11. Gaidoz, is the only periodical in Europe exclusively devoted to the scientific study of Celtic, and contains papers by most of the scholars of Europe who devote themselves to the subject—Ad. Pictet, Dr Stokes, Mr J. Rhys, M. M. Perrot, d'Arbois de Jubainville, Le Men, Sauvé, Luzel, &c.

Cettic Epricrarny—Gaulish Inscriptions.—Professor J. Becker's paper, " Die Inschriftlichen Ucberreste der Keltischen Sprache," published in the 3d and 4th yolumes of the Beitriige zur vergleichenden Sprachforschung (1863-1865), is an exhaustive summary of what was known about Gaulish Inscriptions up to that time; sce also papers in the Beitriige (by Pictet and Stokes) and in the Revue Celtique. Ogam Inscriptions.—The Proceedings of the Royal Irish Academy contain the papers of Bishop Graves, Dr Samuel Ferguson, the late Mr R. R. Brash, who are those who have occupied themselves with the subject in Ireland. Dr Ferguson has also contributed a paper on the subject to the journal of the Royal Ilistorical and Archeological Society of Ireland, The Archxologia Cam- brensis may be consulted on the Welsh inscriptions, and in connection with them we may specially mention the name of Mr J. Rhys.

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CEMENTS, substances employed to unite together by their solidification from a soft or liquid state, and without mechanical rivets, things of the same or of different kinds. Stony cements may be natural, as the lime employed for mortar, and the so-called Roman cements ; or they may be artificial, as Portland cement, made by calcining mixtures of chalk with clay or river-mud (see Burnprne, vol. iv. p. 459). Roman contains more clay than Portland cement, and sets more rapidly. A good artificial water cement 1s obtaincd by heating for some hours to redness a mixture of 3 parts of clay and 1 part of slaked lime by measure. Another hydraulic cement may be madc by mixing powdered clay and oxide of iron with watcr. A very hard stone cement is prepared from 20 parts of clcan river sand, 2 of litharge, 1 of quicklime, worked into a paste with linseed- oil, Paper-pulp, mixed with size and plaster of Paris 1s used for moulded ornaments. Keene's marble cement is plaster of Paris which has becn steeped in strong solution of alum or sulphate of potash, and calcined and ground. It is slaked with alum solution when used. In Jfartin's cement, pearl-ash is employed as well as alum. Parian cement contains borax. Selenitic cement is a mixture of calcined gypsum, sand, and hydrauliclime. A cement used for cracks in boilers is a mixture of clay 6 parts and iron filings 1 part with linseed-oil. For steam-joints, ox-blood thickened with quicklime is employed. The dron-rust cement consists of 100 parts of iron turnings, with 1 part of sal-ammoniac; this is an excellent cement for iron- work. For water-tight joints, equal parts of white and red lead are worked into a paste with linseed-oil. A serviccable packing for connecting pipes, making joints, filling cracks in retorts, &c., may be made by adding to asbestos powder enough of liquid silicate of soda to form a thick paste; the composition hardens rapidly, stands great heat, and prevents the escape of acid vapours. Cracks in glass vessels required to resist heat and moisture may be stopped by covering them with strips of hog's or bullock's bladder, which are affixed by means of a paste of caseine dissolved in cold saturated solution of borax ; after drying, the repaired portions are made capable of withstanding heat by an outside coating of a mixture of concentrated solution of silicate of soda with plaster of Paris or quicklime.

A strong cement for alabaster and marble, which sets in a day, may be prepared by mixing 12 parts of Portland ecment, 8 of fine sand, and 1 of infusorial carth, and making them into a thick paste with silicate of soda;

the object to be cementcd need not be heated. For stone, marble, and earthenware a strong cement, insoluble in water, can be made as follows: skimmed-milk cheese is boiled in water till of a gluey consistency, washed, kneaded well in cold water, and incorporated with quicklime; the composition is warmed for use. A similar cement is a mixture of dried fresh curd with th of its weight of quicklime, and a little camphor ; it is made into a paste with water when employed. A cement for Derbyshire spar and china, &c., is composed of 7 parts of resin and 1 of wax, with a little plaster of Paris; a small quantity only should be applied to the surfaces to be united, for, as a general rule, the thinner the stratum of a cement, the more powerful its action. Quicklime mixed with white of egg, hardened

Canada balsam, and thick copal or mastic varnish are also uscful for cementing broken china, which should be warmed before their application. For small articles, shell- lac dissolved in spirits of winc is a very convenient cement, Cements such as marine glue are mixtures of shcell-lac and India-rubber, or of their solutions.

There are various cements for wood. For wooden cisterns a mixture is made of 4 parts of linseed-oil boiled with litharge, and 8 parts of melted glue; other strong cements for the same purpose are prepared by softening gelatine in cold water and dissolving it by heat in linsecd- oil, or by mixing glue with 4 of its weight of Venice turpentine. Solution of shell-lac in ammonia has been proposed by Mons. C. Meéne for the attachment of caoutchouc to wood and metals. Jfahogany cement, for filling up cracks in wood, consists of 4 parts of beeswax, 1 of Indian red, and yellow-ochre to give colour. C’utlers’ cement is made of equal parts of brick-dust and melted resin, and is used for fixing knife-blades in their hafts. A cement used in electrical apparatus is composed of 4 parts by weight each of red ochre and beeswax, 20 parts of resin, and 1 part of plaster of Paris; these are melted together till smooth. For covering bottle-corks a mixture of pitch, brick-dust, and resin is employed. A cheap cement, sometimes employed to fix iron rails in stone-work, is melted brimstone, or brimstone and brick-dust. Jap: anese cement, for uniting surfaces of paper, is made by mixing rice-flour with water and boiling it. Jewellers cement contains 3 parts of isinglass made soft in water, and 1 part of gum ammoniacum; these are heated together till a drop of the mixture stiffens immediately on cooling.

Gold and silver chasers keep their work firm by means of a cement of pitch and resin, a little tallow, and brick-dust to thicken. Zemporary cement for lathe-work, such as the polishing and grinding of jewellery and optical glasses, is compounded thus :—resin, 4 0z.; whitening previously made red-hot, 4 oz.; wax, }0z. Masticalone is much employed for cementing and mending gems. In Turkey, jewellery for the ornamentation of weapons and trinkets is secured by a composition thus made :—two small bits of gum galbanum or gum ammoniacum are dissolved by trituration in 2 oz. of a glue prepared by digesting softencd isinglass in spirits, and the mixture is incorporated at a gentle heat with a thick alcoholic solution of a little gum mastic. This cement is kept in closely-stoppered phials, which must be immersed in warm water wlen the cement is to be liquefied for use.

The following works may be consulted :—‘‘ On Hydraulic Lime and Cement Stones,” in Knapp’s Chemistry applied to the Arts and Manufaetures, vol. ii., p. 400, et seg. (1847); Burnell’s Rudimentary Treatise on Limes, Cements, &e., Weale’s series (1866) ; Reid’s Prac- tical Treatise on the Manufacture of Portland Cement (1868); Cooley’s Cyclopedia of Practical Recetpts, edited by Tuson, pp. 305 ~311 (1872) ; Gwilt’s Encyclopedia of Architecture, edited by Pap- worth, §§ 1868 ef seg., 2281i, 2251a et seg. (1876).

CEMETERY (xownrjprov, from xoupdw, to sleep), lite- rally a sleeping-place, was the name applicd by the early Christians to the places set apart for the burial of their dead. These were generally extra-mural and unconnected with churches, the practice of interment in churches or churechyards being unknown in the first centuries of the Christian era. The term cometery has, therefore, been

appropriately applied in modern times to the burial grounds, generally extra-mural, which have been substituted for the overcrowded churchyards of populous parishes both urban and rural.

From 1840 to 1855, attention was repeatedly called to the condition of the London churchyards by correspondence in the press and by the reports of Parliamentary committees, the first of which, that of Mr Chadwick,

appeared in 1843. The vaults under the pavement of the churches, and the small spaces of open ground surrounding them, were literally craminced with coffins, In many of the buildings the air was so tainted with the products of corruption as to be a direct and palpable source of disease and death to those who frequented them. In the churchyards coffins were placed tier above tier in the graves until they were within a few feet (or sometimes even a few inches) of the surface, and the level of the ground was often raised to that of the lower windows of the church. To make room for fresh interments the sextons had recourse to the surreptitious removal of bones and partially-decayed remains, and in some cases the contents of the graves were systematically transferred to pits adjacent to the site, the grave-diggers appropriating the coffin-plates, handles, and nails to be sold as waste metal. The daily papers of thirty years ago contain numerous records of scandals of this kind ; while from the official reports it appears that the neigh- bourhood of the churchyards was always unhealthy, the air being vitiated by the gaseous emanations from the graves, and the watcr, wherever it was obtained from wells, con- taining organic matter, the source of which could not be mistaken. The vaults of many of the London churches are still crowded with coffins deposited in them during this period of intra-mural interments. In the vault of Bow Church, Cheapside, the leaden coffins form a huge mass 30 feet high, covered with fungi and cobwebs. In all the other large towns the evil prevailed in a greater or less degree, but in London, on account of the immense popula- tion and the consequent mortality, it forced itself more readily upon public attention, and after more than one partial measure of relief had been passed the churchyards were, with a few exceptions, finally closed by the Act of 1855, and the cemeteries which now occupy a large extent of ground to the north, south, east, and west, became henceforth the burial places of the metropolis. Several of them had been already established by private enterprize before the passing of the Burial Act of 1855 (Kensal Green Cemetery dates from 1832), but that enactment forms the epoch from which the general development of cemeteries in xreat Britain and Ireland began. Burial within the limits of cities and towns is now almost everywhere abolished, aud where it is still in use it is surrounded by such safeguards as make it practically innocuous. Ata large expenditure of money London and most of our chief provincial cities and towns have been provided with spacious and well-situated cemeteries, which are under the supervi- sion of the Local Burial Boards

and of the inspectors appointed by Government, and anything like a recurrence to the scandalous statc of things which existed as late as twenty-five years ago is now impossible.

But though there need be no fear of retrogression there may be a change in another direction. Our present system of burial has been made the subject of very severe strictures on the part of Sir Henry Thompson and others, and it has been proposed that we should abandon inhuma- tion altogether and return to the ancient practice of cremation. We shall not discuss this proposal here, as the importance of the subject requires a separate treatment, but we must briefly refer to the criticisms upon our cemeteries to which it gave rise. The practice of burial has been very ably defended by Mr Holland, M.R.C.S.,

subject of immediate investigation and reform,

who as Medical Inspector of Burials for England and Wales has perhaps a greater practical knowledge of the subject than any other man living, and on the same side were found Dr Richardson and Mr Seymour Haden, who proposed, however, some important modifications of the system with a view to its improvement. Amongst the objec- tions urged against the present practice, it is alleged that in three ways our cemeteries are a source of danger to the health of the living, viz. :—(1) by the gases rising from the surface of the soil causing air-pollution ; (2) by their drainage introducing noxious matter into wells used for drinking purposes ; (3) by the possibility that the re- opening of ground in which persons who have died of an infectious disease are interred might sometimes be the means of reproducing an epidemic. Now there is really no evidence in support of these scrious allegations ; on the contrary there is much concurrent testimony which tends to completely discredit them. Of course it is not fora moment contended that cemeteries may not be mismanaged so as to become a source of danger. But this is beside and beyond the question, for ina matter of this kind we cannot argue from individual cascs of abuse against the general use, and under the existing system of inspection and superintendence, with local authorities in every district specially cliarged with the care of the public health, it is difficult to see how any dangerous

case of mismanagement could be allowed to develop itself without becoming the Only very ordinary precautions are required to render a cemetery perfectly safe. “If,” says Mr Holland, “no more dead be buried in the soil than the free oxygen contained in rain and dew carried through it will decompose, and if such soil be left undisturbed until the process of deca is completed, and if, as is almost certain to be the case, the use of such ground for burial be discontinued at latest when it becomes full of the remains that do not decay, and probably long before, such places will be neither harmful while they are used for burial, nor any- thing but beneficial when such use of them is discontinued, as then they will become large decorative gardens or small parks—reservoirs of fresh air.” With regard to the alleged peril from air-pollution, it may be replied that there can be no danger so long as the dead are laid in a sufficient space of properly planted ground, and at a modcrate distance from any considerable number of houses, and for this purpose a mile is quite sufficient. The gases evolved are to a great extent absorbed by the vegetable produce of the soil, and what little does filter upwards and escape from the surface of the ground cannot accumu- late to any pernicious extent, and must necessarily be dispersed and diluted in the air. Who ever perceives any unpleasant odour in a well-kept cemetcry? Yet if danger were present the sense of smell would give unmistakable warning of it. As to the question of water-pollution, especial care is always taken to study the drainage of our cemeteries with reference to the neighbouring sources of water supply. Shallow surface wells near a cemetery are open to suspicion, as the water may be tainted by organic matter filtering through the soil, but suspected wells can Le closed by the authorities, and it must be remembered that shallow wells are nearly always dangerous whether they are near cemeteries or not. Deep wells are almost invariably safe even near a cemetery, and in most places the water is brought from a distance in mains in such a way that pollution from cemeteries is impossible. As to the danger of infection, if it existed anywhere, assuredly we should have some practical evidence of it from the great cemeteries of the metropolis, Yet there is not a particle of such evidence forthcoming. On the contrary, it is now very, generally conceded that there need be little if any V. — 42

fear of infection from a dead body. Undertakers and their assistants who are continually at work among the dead are notoriously free from contagious disease, and, a fortiori, there can be no danger once the body is laid in the earth. It is only in very exceptional cases that it can be disturbed until many years have elapsed, and then all cause for apprehension is gone. Many of the plague-pits in the London churchyards have been reopened in places where the plague-stricken dead once lay piled in layers, and scarcely any human remains have been found, and these in such a condition that it would be impossible to imagine any infection or contagion from them.

The changes in our cemetery system which have been suggested by Mr Seymour Haden and others have all the one common object of increasing the security of safety to the public health, by facilitating and rendering perfect the decay of the buried dead, and it is proposed to accomplish this less by the use of any direct agency for accelerating the natural process, than by removing the obstacles that are at present placed in its way. Mr Seymour Haden tells us that a well-made wooden coffin is practically indestructible, and though it cannot prevent decomposition, yet it arrests it, and keeps the process Jong incomplete, thus considerably increasing the aggregate of decaying matter at any one time present in a cemetery, and prevent- ing the return of “earth to earth.” As a remedy he pro- poses that we should use wicker coffins, of the present shape, made of white or stained (but unvarnished) osiers, with large open meshes. The contents of such a receptacle could be concealed during the funeral by a graceful covering of ferns and flowers, and in cases of infectious disease, or where decomposition might commence immediately after death, the coffin could be made double with a space of two or three inches beween the inner and outer basket to ba filled with charcoal or some other disinfectant. Models of such coffins were exhibited by Mr Seymour Haden at Stafford House, London, the town residence of the duke of Sutherland in June 1875, and there is no doubt that if they were generally employed, the natural process of decay in our cemeteries would take place in a way that would leave even less room than at present for any evil resulting from carelessness or mismanagement on the part of the authorities charged with their superintendence, and the number of bodies actually decaying in any given cemetery would be comparatively few, so surely and effectually would the process be completed ina great majority of cases. The abandonment of the

practice of burial in vaults, brick graves, and catacombs, such as those which are to be segn in many of the London cemeteries, is of course a corollary of this proposal; and whether Mr Seymour Haden's plan is adopted or not, it is quite certain that our cemeteries would be greatly improved by no more brick graves being made in them, and by the open catacombs being closed wherever they exist. Such places are very difficult to ventilate, and must frequently be the source of malarious exhalations.

Amongst other proposals which have been made it has been suggested, that when a good natural soil containing carbon does not exist the site of the proposed cemetery should be excavated to the depth of about 12 feet, and then filled up with an artificial soil composed of carbon, lime, and sand. 'The existence of carbon in the soil would remove any danger of water pollution through filtration froni the cemetery, while the lime would tend to accelerate the resolution of the decaying matter into its original elements. Thisis Dr Richardson's proposal, and he further adds that the cemetery should be planted with quick-grow- ing shrubs and ornamental grasses, the trees being confined to an encircling belt of wood, and a series of memorial tablets in an adjacent edifice being substituted for tomb-

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stones and mouuments. He further points out that with such a method the cemetery might be renovated after a certain number of years by substituting freshly-prepared soil for the old. But there does not seem to be any advantage in this, There must always be open spaces in and around our cities for the sake of fresh air, and a cemetery in which interments have ceased for some years, and in which the ornamental plantations were kept in good order, would form a useful park or garden. In the disposal of our dead feeling must always be allowed to be a considerable factor in the arguments for the adoption of any given plan, and it appears that in Great Britain and Ireland there would be an amount of dislike to any method which did not assign to our dead something like a lasting place of interment. This feeling does not by any means exist in some of the countries of the Continent. In one of the cemeteries of Naples numerous burials take place in a series of 865 pits. One pit is opened each day, the dead are laid in it, and it is filled

with an earth containing a large quantity of lime. A year after the pit is reopened, the earth with its contents, now almost entirely decayed, is removed, fresh earth is placed in its stead, and the pit is again ready for new interments.

The chief cemeteries of London are. Kensal Green Cemetery on the Harrow Road, about 24 miles from Paddington, which has an arca of 18 acres and already contains the remains of 70,000 dead; Highgate Cemetery, which occupies a considerable portion of the slope of High- gate Hill, and commands onc of the best views of London ; the cemetery at Abney Park (once the residence of Dr Watts), which is adorned with very fine plantations of old growth ; the Norwood and Nunhead cemeteries to the south of London ; the West London Cemetery at Brompton ; the cemeteries at Ilford and Leytonstone in Essex ; the Victoria Cemetery and the Tower Hamlets Cemetery in East London ; and at a still greater distance, and generally accessible only by railway, the great cemetery at Woking near Guild- ford in Surrey, and the cemetery at Colney Hatch. The general plan of all these cemeteries is the same, a park with broad paths either laid out in curved lines as at Kensal Green and Highgate, or crossing each at right angles as in the case of the West London Cemetery. The ground on each side of these paths is marked off into grave

Fra. 1.—West London Cemetery, Brompton.

spaces, and trees and shrubs are planted in the intervals between them. The buildings consist of a curator’s residence and one or more chapels, and usually there is also a range of catacombs, massive structures containing in their corridors recesses for the reception of coffins, generally closed only by an iron grating. The provincial cemeteries in the main features of their arrangements resemble those of the metropolis, One of the most remarkable is St James’s Cemetery at Liverpool, which occupies a deserted quarry, The face of the eastern side of the quarry is traversed by ascending gradients off which open catacombs

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_ the cities of America possess very fine cemeteries.

formed in the living rock,—a soft sandstone; the ground below is planted with trees, amongst which stand hundreds of gravestones. ‘The main approach on the north side is through a tunnel, above which, on a projecting rock, stands the cemetery chapel, built in the form of a small Doric temple with tetrastyle porticoes. Its situation, though very picturesque, is an objectionable one, for no cemetery should ever be constructed in a deep hollow. Many of One of the largest is that of Mount Auburn near Boston, which occupies upwards of 110 acres of undulating ground on the bank of the Charles River. It is formed out of an old and well-wooded estate, and consequently, unlike most modern cemeteries, its plantations consist of large well- grown trees,

The chief cemetery of Paris is that of Pére la Chaise, the prototype of the garden cemeteries of Western Europe. It takes its name from the celebrated confessor of Louis XIV., to whom as rector of the Jesuits of Paris it once belonged. It was laid out as a cemetery in 1804. It has an area of about 200 acres, and contains 16,000 monuments, including those of all the great men of France of the present century—marshals, generals, ministers, poets, painters, men of science and letters, actors, and musicians. Twice the cemetery and the adjacent heights have been the scene of a desperate struggle; in 1814 they were stormed by a Russian column during the attack on Paris by the allies, and in 1871 the Communists made their last stand among the tombs of Pére la Chaise; 900 of them fell in the defence of the cemetery or were shot there after its capture, and 200 of them were buried in quicklime in one huge grave, and 700 in another. ‘There are other cemeteries at Mont Parnasse and Montmartre, besides the minor burying-grounds at Auteuil, Batignolles, Passy, La Villette, &c. In consequence of all these cemeteries being more or less crowded, a great cemetery was laid ont in 1874 on the plateau of Méry sur Oise, 16 miles to the north of Paris, with which it is connected by a railway line. It includes within its circuit fully two square miles of ground. The French cemetery system differs in many respects from the English. Every city and town is required by law to provide a burial-ground beyond its barriers, properly laid out and planted, and situated if possible on a rising ground. Each interment must take place in a separate grave. This, however, does not apply to Paris, where the dead

are buried, forty or fifty at a time, in the fosses communes, the poor being interred gratuitously, and a charge of 20 francs being made in all other cases. The fosse is filled and left undisturbed for five years, then all crosses and other memorials are removed, the level of the ground is raised 4 or 5 feet by fresh earth and interments begin again. For a fee of 50 francs a concession temporaire for ten years can be obtained, but where it is desired to erect a permanent monument the ground must be bought by the executors of the deceased. In Paris the undertakers' trade is the mono- poly of a company, the Socrété des pompes funebres, which in return for its privileges is required to give a free burial to the poor.

The Lewchenhatiser, or dead-houses, of Frankfort and Munich form a remarkable feature of the cemeteries of these cities. The object of their founders was twofold,—(1) to ob- viate even the remotest danger of premature interment, and (2) to offer a respectable place for the reception of the dead, in order to remove the corpse from the confined dwellings of the survivors. At Frankfort the dead-house (fig. 2) occu- pies one of the wings of the propylaeum, which forms the inain entrance to the cemetery. It consists of the warder's room B, where an attendant is always on duty, on each side

-of which there are five rooms A, A, well ventilated, kept at

an even temperature, and each provided with a bier on which

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a corpse can be laid. On one of the fingers is placed a ring connected by a light cord with a bell which hangs outside

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Fig. 2.—Deadhouse, Frankfort Cemetery.

in the warder’s room. The use of the dead-house is voluntary. The bodies deposited there are inspected at regular intervals by a medical officer, and the warder is always on the watch for the ringing of the warning bell. One revival, that of a child, has taken place at Frankfort. The Leichenhaus of Munich is situated in the southern cemetery outside the Sendling Gate. At one end of the cemetery there is a semi-circular building with an open colonnade in front and a projection behind, which contains three large rooms for the reception of the dead. At both Frankfort,and Munich great care is taken that the attend- ants receive the dead confided to them with respect, and no interment is permitted until the first signs of decom-position appear ; the relatives then assemble in one of the halls adjoining the Leichenhaus, and the funeral takes place. In any case there is, with ordinary care, little fear of premature interment, but in another way such places of deposit for the dead are of great use in large towns, as they prevent the evil effects which result from the prolonged retention of the dead among the living. Mortuarics for this purpose are now established in many places in England.

Of the cemeteries still in use in Southern Europe the catacombs of Sicily are the most curious. There is one of these under the old Capuchin monastery of Ziza near Palermo, where in four large airy subterranean corridors 2000 corpses are ranged in niches in the wall, many of them shrunk up into the most grotesque attitudes, or hanging with pendent limbs and head from their places. As a preparation for the niche, the body is desiccated in a kind of oven, and then dressed as in life and raised into its place in the wall. At the end of the principal corridor at Ziza there is an altar strangely ornamented with a kind of mosaic of human skulls and bones.

Cemeteries have been in use among many Eastern nations from time immemorial. – In China, the high grounds near Canton and Macao are crowded with tombs, many of them being in the form of small tumuli, with a low encircling wall, forcibly recalling the ringed barrows of Western Europe. But the most picturesque cemeteries in the world are those of the Turks. From them it was, perhaps, that the first idea of the modern cemetery, with its ornamental plantations, was derived. Around Constantinople the cemeteries form vast tracts of cypress woods, under whose branches stand thousands of tombstones. A grave is

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never reopened; a new resting-place is formed for every one, and so the dead now occupy a wider territory than that which is covered by the homes of the living. The Turks believe that till the body is buried the soul is in a state of discomfort, and the funeral, therefore, takes place as soon as possible after death. No coffin is used, the body is laid in the grave, a few boards are arranged round it, and then the earth is shovelled in, care being taken to leave a small opening extending from the head of the corpse to the surface of the ground, an opening not unfrequently enlarged by dogs and other beasts which plunder the grave. A tombstone of white marble is then erected, surmounted by a carved turban in the case of a man, and ornamented by a palm branch in low relief if the grave is that of a woman. The turban by its varying form indicates not only the rank of the sleeper below, but also the period of his death, for the fashion of the Turkish head-dress is always changing. A cypress is usually planted beside the grave, its odour being supposed to neutralize any noxious exhala- tions from the ground, and thus every ceimetery is a forest, where by day hundreds of turtle doves are on the wing or perching on the trees, and where bats and owls swarm undisturbed at night. Especially for the Turkish women the cemeteries are a favourite resort, and some of them are always to be seen praying beside the narrow openings that lead down into a parent's, a husband's, or a brother's grave. Some of the other cemeteries of Constantinople contrast rather unfavourably with the simple dignity of those which belong to the Turks. That of the Armenians abounds with bas-reliefs which show the manner of the death of whoever is buried below, and on these singular tombstones there are frequent representations of men being decapitated or hanging on the gallows.

See on this subjeet various parliamentary papers issued since 18438, Loudon on Cemetery Interment, the reports of the chief eemetery eompanies, and the discussions on our cemetery system in reference to eremation in the Contemporary Review and other periodicals

(1874-1875). Books of travel contain numerous deseriptions of remarkable foreign eemeteries. (Aca, Be)

CENCI, Bearrice (1583-1599), called “The Fair Parricide,” was the daughter of Francesco Cenci (1527- 1598), a Roman gentleman, no less notorious for his wealth and talents than for the shameless depravity of his life and character. Born during the sack of Rome by the troops of the Constable Bourbon, Francesco Cenci began early to be talked of as a man who cared little for law and less for public opinion, and whom it were better to serve than to offend. He was the son of a Cardinal Cenci, who, as financial minister under Pius V., had contrived in that capacity to amass an immense fortune. This enabled his heir to defy the law; condemned on several occasions for murders and unnatural crimes, Francesco Cenci had always managed to escape sentence by the timely administration of enormous bribes. He was, therefore, a very profitable criminal, and one with whom several popes in succession found it to their interest to deal gently. A man of great force of character and at the same time of boundless passions, in the service of which his fine intellect and indomitable courage were wholly employed, he was one of those personalities, interesting by sheer weight of depravity, in which the Italy of the Renaissance abounded. He is distinguishable, however, from his rivals in villainy by an entire absence of ambition except of a sensual kind.

The pampering of his every appetite would seem to have induced in him its natural result,—the infinite per- versity known to psychologists as a common consequence of the weariness that follows satiety. Francesco Cenci was twice married; by his first wife he had had seven children, one of whom had died in infancy ; his second wife, Lucrezia Petroni, was childless. One of the strangest

sides of his horrible character was the intensity of hatred with which he regarded his surviving children. The three eldest, Giacomo, Cristoforo, and Rocco, he had sent to a Spanish university, where he kept them penniless and starv- ing, till they could bear no more, and returned. His con- duct towards them remained unchanged. Shortly before the commencement of that episode of his life with which the name of his daughter Beatrice is inseparably connected, he was imprisoned for the third and last time, and his three sons presented a petition to the Pope regnant, Clement VIII.,

imploring him, for the sake of the honour of their house, to make an end of their father. Clement, however, wanted money, and Francesco Cenci was released. His hate for his children was by no means lessened by this circumstance. Of his sons he never spoke but with curses; his two daughters he was in the habit of beating violently. The elder sister, however, found means to get a petition presented to Clement, in which she prayed to be removed to a convent. The Pope took pity on her, and gave her in marriage to a gentleman of Gubbio, obliging her father to dower her largely. Cenci was furious. He shut his daughter Beatrice, then aged fourteen, in a lonely room, where he visited her to bring her food, to beat her, and to revile her with her sister's flight. It is said that it was in this place and under these circumstances that Francesco Cenci conceived the monstrous passion that resulted in his death.

Meanwhile Rocco Cenci had been assassinated, and a year afterwards his brother Cristoforo met with a like fate. Thereafter Fraucesco Cenci, whose joy at the news of his sons' death is recorded to have been awful, ceasetl not to torture his unhappy wife and unhappier daughter to the utmost. The ordeal must indeed have been a terrible one that could have transformed the gay light-hearted girl- humorist into the grand woman who was afterwards to play such a notable part in crime and expiation. The accounts of Cenci's conduct with her are not to be repeated. Meanwhile, however, a certain cardinal, Monsignor Guerra, one of the handsomest men in Rome, had fallen in love with her, and was in the habit of visiting the Palazzo Cenci whenever Francesco left it. Maddened by the failure of a petition for the redress of their wrongs, which they had addressed te Clement, and which had miscarried, Lucrezia and Beatrice turned for aid to the cardinal, and com- municated to him their design of ending their troubles by the murder of the author of them. The cardinal allowed himself to be persuaded; he lost no time in sounding Giacomo Cenci, the elder brother, and, after Francesco, head of the house, without whose consent nothing could be attempted. Meetings were held in a room in the cardinal's palace, and the advice of Lucrezia and Beatrice was taken on all points. For the execution of the design determined on, choice was made of two of Cenci's vassals, Olimpio and Marzio, both of whom were violently incensed against their master,—Marzio out of pity for his mistresses, and Olimpio for his own wrong's sake. It was at first proposed to cloak the murder in an attack and robbery

by banditti. A dozen men were to be held in readiness to stop Francesco Cenci on his way to Petrella, a fief within the Neapolitan frontier, whether he was wont to betake himself in the summer. An enormous ransom was to be asked, with the alternative of death; the mother and daughter were to return to Rome to obtain the sum; and the assassins were to carry their threat into execution. But the scheme miscarried ; Francesco reached Petrella in safety, and the conspirators were forced to arrange other combina- tions.

The old man’s treatment of his wife and daughter grew worse daily. He issaid to have pretended that he believed them pleased and happy in his gray hairs and declining

years, and to have tormented them with an incomparable ingenuity and ferocity. Beatrice at last found means to communicate with Monsignor Guerra, and it was agreed that, for the sum of a thousand piastres, one-third to be paid by the cardinal and the rest by Beatrice and Lucrezia, Olimpio and Marzio should enter the castle and kill Francesco in his bed. On September 9, 1588, accordingly, a strong opiate having been dexterously administered to the tyrant, the assassins were introduced into his chamber by Beatrice herself. Here they were overtaken with remorse ; the spectacle of the old man sleeping was too much for them; and they retreated without accomplishing their intent. Beatrice, however, whose magnificent personality had risen to the occasion, received them with such indigna- tion, that they returned and slew the sleeper, much as Jael had slain Sisera, by driving a long nail through the eye into the brain, making assurance doubly sure by driving another through the throat. When this was done Beatrice presented them witha purse of money, and clothed Marzio in a mantle laced with gold, which had belonged to her father. She and Luerczia then withdrew the nails from the corpse, which they folded in a sheet, and dragged through several rooms to a gallery looking into an unused garden, whence they flung it into the branches of a great elder tree that grew thereby. This gallery was used for such a purpose as would lend reality to the story they intended to tell, of Cenci’s leaving his bed to repair thither, and of lis slipping aud falling accidentally into the branches below.

Everything occurred as Beatrice and her mother had foreseen. The alarm was great, but Francesco's death was accounted for naturally enough; his remains received an honourable burial, and the two women returned to Rome, and lived tranquilly there for several months. Suspicion, however, had been excited in Naples by the circumstances of the event, and a magistrate was sent to Petrella, who arrested all the people employed about the castle. Among them was a washerwoman to whom Beatrice had given the soiled linen from Cenci's bed, with a story accounting in quite a natural way for the presence of so much blood. The woman, interrogated as to the credibility of the story, threw doubts upon it, basing her opinion on the unusual brightness of colour of the marks. Details of the interrogatory were sent to Rome, but no notice was taken, and Lucrezia and her children remained undisturbed. Meanwhile, however, Monsignor Guerra, as soon as he was informed of what was passing at Naples, had sent out emissaries charged with the murder of Francesco Cenci's assassins. Olimpio alone had been dispatched. Marzio, arrested by the Neapolitan Government several wonths after the murder, was taken to Naples; he confessed everything.

On information being conveyed to Rome, Lucrezia and her three step-children, Giacomo, Bernardo, and Beatrice Cenci, were arrested. Lucrezia, Giacomo, and Bernardo were taken to the Corte Savella prison, while Beatrice was confined to the Cenci Palace, and guarded strictly by a troop of sbirri. Marzio, meanwhile, was brought from Naples, and confronted in the Corte Savella with Lucrezia and her daughter The majesty and strength of Beatrice in this interview were such that the old vassal withdrew his confession, and chose rather to expire under torture than to incriminate his mistresses further. In the absence of any other proof, the whole of the Cenci family were relegated to Sant' Angelo, where they remained for several months. At the end of that time Olimpio's assassin was arrested, and confessed as much as he knew. Monsignor Guerra fled from Rome, disguised as a charcoal- burner, and Lucrezia and her children were taken back again to the Corte Savella,

Put to the torture, Giacono and Bernardo at once con- fessed the crime and their share in it. Lucrezia, too, who was of a luxurious habit of body, was

not able to endure the torture of the cord, and acknowledged her complicity also. But Beatrice was not made of such penetrable stuff. ‘I’he cord made no impression on her whatever, and her genius and force of will so confounded Moscati, the judge charged with her interrogatory, that he made her the subject of a special report to the Pope. The examination was committed to a second of sterner reputa- tion, and Beatrice was questioned by suspension by the hair. While in this posture her brothers aud Luerczia were introduced into the apartment. All of them urged her to confess. She reproached them with their little care for the honour of the family, but at last consented. She then answered the judge’s questions, denying the false and explaining the true. On the release of Beatrice from the torture and the examination, the four dined and spent the evening cheerfully together, Next day the two brothers were taken to the Tor di Nono, the women remaining in the Corte Savella; the Pope, having read the papers, had sentenced them to immediate death.

Immense efforts were made to obtain a commutation of the sentence, but a respite of twenty-five days was all that could be got. On the twenty-fifth day a body of advocates, among whom was the celebrated jurist Farinacci, presented themselves before Clement, to plead the cause of the accused; the Pope, however, refused to listen to them, and Farinacci alone was allowed to speak. They left their bricfs, which Clement spent tle night in rcad- ing. The next day all four prisoners were ordered to be confined aw secret, and great hopes were entertained of pardon. Buta scandalous case of matricide intervened ; the assassin fled, and the Cenci were immolated in his stead, Farinacci succeeding after great efforts in saving the life of Bernardo, the youngest boy.

On the 11th of September 1599, the four prisoners were conveyed to the scaffold. Lucrezia and Beatrice were on foot ; Giacomo was drawn in a cart, and was subjected the whole way to the torture of the pincers, which he bore with great fortitude. Bernardo, who was young and long- haired, was extremely agitated, and was several times mis- taken for Beatrice, who indeed was far from sharing her brother’s weakness. ‘Tlic heat was intense, the excitement unparalleled, the crowd enormous ; several deaths from fever and sunstroke are said to have occurred curing the day. Lucrezia and Beatrice were beheaded, and were afterwards buried, the one in the church

of San Giorgio, the other in that of San Pietroin Montario. Giacomo was mazzolato— killed with a mace. Bernardo, who fainted several times, was removed to a convent,—“ Oriental precautions ” being taken, it is said, to prevent his disturbing the new owners in their possession of the confiscated estates of his house.

Part of these estates, conveyed to a cardinal nephew of Clement, became the Villa Borghese. Therein are still preserved the portraits of Lucrezia Petroni and of Beatrice Cenci, the latter of which is said to be by Guido Reni. Shelley’s fine tragedy is well known; the poet has dealt freely with much of his material, but the result is of unapproachable excellence. See also the Chroniques et Nouvelles of H. Beyle, whose account of the Cenci forms a remarkable page in a remarkable book.

CENEDA, a district in the province of Treviso, Northern Italy, so called from the city of the same name. Its popu- lation has varied as follows:— 1807, 22,718; 1844, 18,986; 1855, 37,510; 1862, 38,443. It is a highly picturesque region at the foot of tle Alps, fertile in corn and wine, the white kind of which bas considerable local celebrity. The olives which formerly abounded have

| almost disappeared, There are saline springs near the

town, which are among the richest in iodine of any known, the ~~proportion being 0°4032 of iodine in 10,000 parts of water. They are much used by the inhabitants of the neighbouring districts. The little city of Ceneda is charmingly situated on the last slope of the hills inclined from west to east, and has the reputation of being especially healthy. The Emperor Berengarius held a court of justice here, when he gave by diploma to the bishop of Ceneda, which had its own body of statutes com~~ piled in 1339 and published in 1609, the jurisdiction of the whole territory lying between the rivers Piave and Livenza from the Alps to the sea. In the cathedral, a building of the middle of the last century on the site of an older one, there are some not very remarkable paintings of Palma Giovine, Bonifacio, and Tintoretto. ‘The town hall has some good frescoes of Pomponio Amalteo in its ‘“loggia,” and a curious series of portraits within of the bishops of

Ceneda, and another of the Podestds, with the arms of each, The origin of the city, which very numerous finds of urns, inscriptions, coins, lachrymatories, and other objects prove to have existed under the Romans, is uncertain. At the period of the Gothic and Lombard invasions it was a place of some military importance. Alaric fortified it strongly. The Emperor Honorius subse- quently gave it with the title of county to one Marcellus. Attila devastated it in 450, The sovereignty of the district was the subject of long contests between the neighbouring counts of Camino and the bishops, with the gradual result of subjecting the city and its district to the republic of Venice, which, however, permitted the bishops and the ancient council of notables to exercise some rights of sovereignty even down to 1776.

It should be added that Ceneda has recently changed its name to Vittorio, This absurd abnegation of its past history has had some little show of reason to excuse it. Ceneda and the neighbouring commuue of Serravalle were for many generations hereditary enemies. When the province of Venice was restored to Italy it was determined, among other festive and fraternizing doings, that these two communes should henceforth form but one, to be known as Vittorio,—an appellation which seems to have succeeded in supplanting the old historical name more entirely than usually occurs in similar cases,

CENSOR (from censere, to estimate), the title of two magistrates of the highest importance in the Roman republic. It was their duty to take a census of the citizens, to estimate their property and impose taxes in proportion to what each possessed, and to punish offences not only against morality, but against the conventional requirements of Roman custom. They took cognizance of bad cultiva- tion of the land, of the carrying on of any occupation which was considered disgraceful, of luxuriousness, of celibacy, and of many other matters of a similar kind. If the offender was a senator, they might remove him from the senate; if eques, they might take from him his horse, they might expel him from his tribe, and they might lower him to erarian rank. There was, however, an appeal from their decisions to an assembly of the people; and they could only punish a citizen for some definite fault, which they were bound to declare in their list. The censors also appointed the princeps senatus, and filled up all vacancies in the senate. At first this was done at their own discretion, but afterwards they

were controlled by the lex Ovinia, which bound them to choose ex-magistrates in the order of their rank. The censors also let out the taxes to farm; and they took charge of all public buildings, roads, and aqueducts, and undertook the construction of new public works.

At first the duration of the censorship was five years, but in 433 3.c, the dictator Mamercinus made a law

restricting it to a year and a half. Upon the death of either censor the other resigned, and a new election was held. Originally patricians alone were eligible; but in 351 B.c. the plebeians were admitted. The censorship was instituted in 443 B.c.; and the office continued to the time of the emperors. Vespasian and his son took the title ; and the last who bore it was the brother of Constantine. The emperor generally assumed censorial power under the title of morum preefectt.

CENSUS is now almost solely used to denote that enumeration of the people made at intervals in most European countries, and in the United Kingdom and the British Colonies decennially. The term had its origin in Rome, where a group of the many functions performed by the high officer called censor received the name of census. An enumeration of the people was only one of them, but they were chiefly of a statistical character. They were especially directed to fiscal objects ; and it does not appear that the enumeration of the people was then deemed of value as a source of statistical knowledge which might influeuce morals and legislation. It was connected with the Servian constitution, which apportioned the rights and duties of citizens to the amount of property, dividing them into six classes, which were subdivided into centuries by a mixed ratio of wealth and numbers. Had the enumeration been deemed of value for any such other purposes, besides the adjustment of rights and obligations, as those for which statistical knowledge is now deemed so valuable, the notices preserved of the vast collection of statistical facts thus made would have been less scanty and meagre, and we should not have found it so impracticable to come to any conclusion about the population and extent of the city of Rome itself. The Roman census must have been minute and full. It indicated not only the number and respective classes of all free persons,

but their domestic position as husbands and wives, fathers and mothers, and sons and daughters. The slaves and freedmen were indicated in connection with the possessions of the head of the house, and landed property was analyzed into several classes according to its character and produce, The important practical effect of the census caused it to be conducted at intervals generally so frequent as every fifth year. It was followed by a sacrifice of purification or lustration, whence the term of five years came to be designated alustrum., There were highly penal consequences to the citizen who neglected his registration for the census, to whom as an unregistered person the name of incensus was given. From the mixed functions to which it was applied we have the word used among the Romans to siguify the patrimony or property qualification of a parti- cular grade—as census senatorius and census equester; and we have it employed in later times to indicate taxation. Hence census domnicatus, implying a feudal tax to the superior, and census duplicatus, a double tax or feudal casualty ; and the word cense, used by old English writers, was abbreviated in modern use into cess.

While the word census was thus applied to the taxation of the Middle Ages, it will readily be understood that in its modern sense it received no practical application, since neither taxation nor the adjustment of social rank required a numbering of the people; and the statistic or economic ends of such a process were as little known as they had been to the Romans. Under the despotic Governments of the Continent, however, the tendency to central organiza- tion for purposes of administration and police prepared the way for statistical inquiries into the numbers of the inhabitants of particular areas whenever there should occur an occasion for enumerating them. It was in Britain, with its abstinent Government and unrestrained people, that the want of population statistics became most flagrantly

conspicuous. It is difficult at present to realize the idea that, long after Adam Smith’s time, the number of the inhabitants of the British empire could only be guessed at as the populousness of China is at the present day; and, as in all matters of statistics, which have their own simple solution through specific inquiry, the guesses about the population of the empire

were not only vague but extrava- gantly contradictory. During the 18th century, the most trustworthy geographers were generally those who did not venture on an estimate of the population eveu in those European states which had the best means of enumeration at their command.

The first effort to take a census of the population of Great Britain was made in 1801; it did not then extend to Ireland. The success which attended this and the two succeeding efforts was mainly owing to the zeal and ability of Mr Rickman, the assistant-clerk of the House of Commons. Where there is an organization like that of many in the European states for preserving a constant official record of all the fluctuations of the population, not only in their absolute numbers throughout a whole territory, but in the relative numbers in its respective parts as they may be affected by fluctuations, systematic arrangements are thus prepared not only for obtaining a general census at any one moment, but for checking its accuracy and classifying its elements. But to deal at once with the raw material in the self-governed British empire required great ingenuity and sagacity. A census, to be accurate, must be taken on a uniform system, and must be taken simultaneously. Any enumeration going over a tract of time, were it but two days, must be more or less inaccurate, and destitute of the means of correcting its own inaccuracies. Besides the mere abstract numbers of the people, there is much collateral information to be recorded. This, besides its Own intrinsic value, is necessary as a check on the numbers ; since a distribution into elements according to scx, age, social condition, occupation, and the like, affords a self-acting control on the accuracy of mere figures. In a census, indeed, it is a simple rule, that the information returned should be extended as far beyond the main facts as with safety to these it can be carried. The tendency towards complexity in the nature of the returns must always be checked by the liability of the people at large to make blunders and create confusion where they are required to attest facts not of the most obvious nature, and by the difficulty of getting a number of subordinate officers to understand and carry out a complex classification. Hence there was great difficulty in obtaining a classification according to occupation, from its complex intermixture with the classification according to families. Thus, in the first census, there was an attempt to classify the people under three divisions—(1) persons chiefly employed in agriculture, (2) persons chiefly employed in trade, manu- factures, or handicraft, and (3)

all other persons not com- prised in the two preceding classes. But Mr Rickman found the returns unsatisfactory, from the difficulty of deciding “ whether the females of the family, children, and servants were to be classed as of no occupation, or of the occupation of the adult males of the family.” In the two subsequent enumerations, the rule adopted was to record the occupation of the head of the family ; but here comes a new element of confusion, in the difficulty of defining the head of a family. Experience, and an anxious desire to combine simplicity and comprehensiveness in the returns, were the only means by which such difficulties could be mitigated. :

The enumerations of 1841 and 1851 in England were much facilitated by the uniform system of registration of births, marriages, and deaths which came into operation on Ist July 1837, and which not only afforded the means of

of a totally different kind.

checking the accuracy of the returns, but provided a prompt and skilled machinery accustomed to statistical work. Far more dependence could now be placed on the discretion and skill of the officers to whom the local duties were committed ; and the returns were made more minute and complete. In Scotland it was necessary to adopt the method of employing the parish schoolmasters to perform the local duty of enumerating the population in the country districts. In Ireland the first attempt at a general census was made in 1811, but it was decidedly unsuccess- ful. It was repeated in 1821, but went no further than a bare enumeration of doubtful accuracy. The census taken there in 1831 was subject to correction in 1834, to make it the basis of the new system of national education. In the two subsequent enumerations the aid of the admirable constabulary force, and the use of an ordnance survey, nearly complete in 1841, went far to supply the want of permanent local statistical machinery.

The census of 1851 was taken on the 31st day of March, the previously distributed schedules being then collected, They embraced a return of the local and other conditions of the population during the preceding night.

‘* At the present census,” say the commissioners, ‘it was resolved to exhibit, not merely the statistics, as before, of parishes, and more completely of parliamentary and municipal boroughs, but also of such other large towns in England and Scotland as appeared sufficiently important for separate mention, and of all the ecelcsias- tical districts and new ecclesiastical parishes which, under the pro- vision of various Acts of Parliament, have, during the last forty years, been created in England and Wales. In addition also to the Inquiry concerning the occupation, age, and birthplace of the population, it was determined to ascertain the various relationships (such as husband, wife, son, daughter), the civil condition (as mairied, unmarried, widower, or widow), and the number of persons blind, deaf, and dumb.”

Another novel feature in the census of 1851 was an attempt to supply the statistics of the ecclesiastical and educational condition of the country. It stated the amount of church accommodation at the command of each religious denomination ; while a return was procured of those in attendance in the several churches on Sunday, 30th March, The attendance throughout thirty-five religious communities in England on that forenoon was returned as 4,428,338, of which the proportion assigned to the Church of England was 2,371,732. The returns for Scotland, admittedly very imperfect, give a total of 943,951, of which 351,454 belonged to the Established Church. The English report was accompanied by an ela- borate history of the several religious communities.

The enumerations in Ireland exhibit statistical noveltics In 1841 it was resolved, as that country so totally depended on the amount of its agricultural produce, to obtain the statistics of its rural economy. The surface of the country was divided under five heads—arable, plantations, uncultivated, towns, and water ; and, with a view to these divisions, a return was made of the character of each farm or other agri- cultural allotment, with the quantity of live stock and other relevant facts. The attempt was found so successful, that it was renewed with more full effect in 1851, pro- ducing 727 tabular folio pages of very valuable information.

Census of 1861.

The enumeration in 1861 was the seventh census of England, and was taken under the superintendence of the Registrar-General, under the powers conferred by three Acts of Parliament, applicable respectively to England, Scotland, and Ireland. By this census it was found that the popula- tion of the United Kingdom was 29,321,288, and that of each of the four divisions of the kingdom was as follows :— England and Wales, 20,228,497 ; Scotland, 3,096,808 ; Ireland 5,850,309 ; islands in the British seas, 145,674,

The population of England and Wales, excluding the por- tion of the army, navy, and merchant seamen abroad, was 20,066,224. The annual rate of increase per cent. of the population in the United Kingdom, in the ten years 1851-61 was 0°55, viz. :—England and Wales, 1:14; Scot- land, 0°58; Ireland, (decrease), 1:23; and islands in the British scas, 0°02.

The local machinery by means of which the census of England was taken in 1861 differed in no material respect from that employed in 1851. In subdividing the country the registrars were to see that the enumeration districts were not too extensive or too populous; they were not to contain more than 200 houses in towns, so that they could be enumerated by an active man within the compass of a singleday. An important feature eonsisted of the publi- cation of the uumber of houses and population in “ civil counties” and in lieutenancy subdivisions. The number of blind and of deaf and dumb from birth, the number of foreigners, and the number of naturalized British subjects, were shown in 1861 for the first time. In the ease of Scot- land, the enumeration was for the first time required to be made apart from that of England, under the superintendenee of the Registrar-General of Scotland. From 1855 Scotland had the advantage of a national systen: of registration, and the eensus of 1861 was therefore no longer taken through the agency of the sheriffs in counties, and of the provosts or chief magistrates in the royal and parliamentary burghs, but through the agency of 1001 local registrars of births, deaths, and marriages, assisted by 8075 enumerators. The forms and instructions issued were all based on, and in most cases virtually the same as, those used in England in the censusof 1851. “ Flats” were not reckoned as houses in Scotland in

1861. All the details as to population, &c., in 1851, were for civil parishes and eivil counties only. In 1861 the returns were for registration districts and registration counties, The novel features in 1861 for Scotland, which merit special notice, were the number of families in every parish and eounty, the number of houses having windows, and the number of ehildren between the ages of five and fifteen years in attendance at sehool. In 1861 it was ascertained that the islands in Scotland amounted to 787 in number, and of these 186 were inhabited by one or more persons on the eensus day.

The tables in 1861 relating to the ages, conjugal con- ditions, birthplaces, blind, deaf and dumb, and to the occupations eombined with ages, were published uniformly with those in 1851. A comparison can be madc of the occu- pations at the different ages with the death registers, and the comparative mortality prevailing among the different classes and ranks of society can now be ascertained as well as the compirative healthiness of each occupation or trade.

Ireland, 1861.—The enumeration of the people of Ireland in 1861 was effected for the first time altogether (excepting the metropolis) by the officers and men of the constabulary force. The returns show—for provinces, counties, baronies, parishes, towns, and parliamentary boroughs —the area, population, and number of houses, the number of families with their pursuits and the means upon which they were dependent, also the religious profes- sions and education of the inhabitants, the number of families living in each house, and the amount of their accommodation by counties in rural and civic districts, the birthplaces of the people, their condition as to marriage, and their occupations for each eounty, also tabular summaries relating to vital statistics.

The ages of the pcople in Ireland were ineorreetly returned in 1861, and in the tables of the occupations of the people a large number are left unclassified,

Iu the Channel Islands and the Isle of Man, the census was taken in conformity with instructions from the Home

CENSUS

Office, by the respective Lieutenant-Governors acting in conjunction with the English central offiee.

First Imperial Census, 1871,

In 1871 the first Jmperzal ecnsus of the British empire was taken, and the population was found to amount to 234,762,593, living upon 7,769,449 square miles of territory ; comprising England and Wales, with a population of 22,856,164; Scotland, 3,392,559 ; Ireland, 5,449,186: islands in the British seas, 147,470; and British Colonies and Possessions (exclusive of the army, navy, and mer- chant seamen abroad, as they are included in the popula- tions just quoted), 202,917,214. The population of England and Wales, excluding the portion of the army, navy, and merchant seamen abroad, was 22,712,266. The annual rate of increase per cent. of the population in the United Kingdom in the ten years 1861-71 was 0°83, viz. : — in England and Wales, 1°23; Scotland, 0°92; Ireland (decrease), 0°71; islands in the British seas, 0°12.

In this great undertaking the work was subdivided for eonvenience of execution. In conformity with the Act of Parliament the census of England and Wales was taken by the Registrar-General, assisted by Dr Farr and J. T. Ham- mick, The population was enumerated en one day (3d April 1871) by 32,543 enumerators, employed under 2195 regis- trars and 626 superintendent registrars.

Instructions were issued to the superintendent registrars, and to the registrars of births and deaths, for their guid- ance in taking the census, and one of the duties requiring their earliest attention was the division of the country into enumeration districts, and just here the registrar had an important duty to fulfil, for he was directed to sea that the boundaries of parishes, townships, ccclesiastical dis- tricts, municipal and parliamentary cities and boroughs, urban sanitary districts, and all other of the various eon- flicting and confusing territorial subdivisions of the country, were duly indicated. Most of the registrars laid down the boundaries of their enumeration districts on maps, so as to ensure that uo part of their districts was omitted.

Thesc plans of division were first submitted to the various superintendent registrars, and finally to the Registrar-General, for approval. The 32,543 enumerators were required to be intelligent, trustworthy, and active, to write well, and to have some knowledge of arithmetic. They were not to be infirm or of weak health, uot younger than 18 years, nor older than 65 ; and they were required to be persons likely to eonduct themselves with strict propriety and civility. 627 of the publie or charitable institutions were enumerated by the masters or chief resident officers.

In order to facilitate the proper designation of all roads, streets, and houses, a circular was addressed to the mayor of each municipal eity and borough, and to the chairman of every local board, suggesting that previous to the census all unnamed roads and streets should be named, and all houses numbered. Cireulars were also addressed to the press explaining the objects and uses of the eensus, so as to aid in securing complete and eorrect returns,

The enumeration of 1871 was a “ nominal” census.

The householders’ schedules were delivered by the enumerators prior to 3d April. Every separate occupier received a schedule, and this schedule was so prepared in accordance with the 4th section of the Census Act, that, as shown in the annexed example, the name, sex, age, rank, profession or occupation, eonjugal condition, relation to head of family, and birthplace of every person who abode in any house, on the night of Sunday, 2d April 1871, might be returned ; the blind, deaf and dumb, imbccile, or lunatic were distinguished. At the census of 1871 the numbers of lunatics out of asylums and of imbcciles or idiots were ascertained for the first time.

CENSUS

| Age Relation to cox (last

| Head of Family.

Name and Surname. Condition.

The despatch of forms and instructions began as soon as the office in Craig’s Court was opened, and included 6,500,000 householders’ schedules,

weighing about 41 tons, The enumeration books and forms sent out weighed in the aggregate about 54 tons. But in addition to these there were sent out from the central office no less than 115 different descriptions of printed instructions, forms, and circulars, including a calendar, so that certain opera- tions might be summarized,

The metropolitan, the municipal, and the county police afforded help in enumerating the houseless population. The strength of the navy, in forms prepared for the purpose, was returned by the Admiralty ; the merchant seamen, in port or out at sea, by Her Majesty's Customs, and by the Registrar-General of merchant seamen ; and His Royal Highness the Field-Marsha] Commanding-in-chief supplied full returns of the various particulars respecting the army. The numbers of British subjects in foreign states and in India and the population of the Colonies were obtained through Her Majesty's Secretaries of State for Foreign Affairs, India, and the Colonies.

Welsh schedules were issued for the use of a certain number of the Welsh people, and it was found that in 17,276 of these the particulars were inserted in the Welsh language, and had to be translated.

The enumerators were instructed to consider a house as comprising all the space within the external and party walls of a building, whether occupied by only one family, or by several families living in distinct stories or apartments ; and they were also instructed, when delivering their schedules, to make a record, in a "memorandum book" supplied for the purpose, of the road or strect in which every house was situated, and of the name or number of each house, and to state the number of schedules left at each honse. Unin- habited houses, houses building, churches, chapels, and all other public buildings were likewise noticed in this book. With the assistance of the police, the enumerator had to make or procure returns of all persons not dwelling in houses, but sleeping in barns, sheds, caravans, or tents, or in the open air.

Special schedules were printed for the enumeration of persons in public institutions, on board vessels, or in charge of boats and barges employed in inland navigation.

Persons travelling during the night of Sunday, 2d April, were to be included in the schedule of the proprietor or manager of the hotel or inn, or in the schedule of the occupier of the house, at which they arrived on the morning of Monday, 3d April. Persons engaged in work away from home during the night of Sunday, 2d April, were to be included in schedules left at their houses.

The cause of an unusual number of persons being temporarily absent or present was to be noted.

When the enumerators had collected and arranged their schedules, they were copied into enumeration books pro- vided for this purpose, and a summary was made of the popu- lation of each civil parish, township, or place, and these books were delivered to the registrar on or before 10th April, by whom they were examined and corrected, and forwarded on or before 24th April to the superintendent registrar.

The enumeration books were then revised by the

Birth-| Rank, Profession, or Oeeupation.

day). (4) Lunatic. Farmer (of 817 aeres, employ-

1! George Wood….. Head of Family Married Boel, wi 48 { ing 8 labourers and 8 boys) Surrey, Godstone …..+++..

2] Maria Wood …... Will Chrsecrcessccses Married ….. 0, 4 IPDNMAVEN ST VWilLe ls ssessscescusesssovecees an COU MC terssseieressssssrtasss

CUMIN MENY OOdlsceeoese|| SOM ccevvesccecessrose Unmarried | M. 20 | Farmer’s Son…... ngnoRemAnAAnAN Surrey, Godstone…...00..

4 | Flora Jane Wood; Daughter…..... ac 105 2S PSehOMreccrsesesccnrsss se see] Kent, R&MSPAte.cescceseeee oe

5 | Ellen Wood …....) Mother…....es00 Widow …... 185 TU CATINUICAD Gissceterccccsccscuscssssescesee ee (GE 0.210 | anon édinonodcnocoocncerDoo * — Lunatie. 6 | Eliza Edwards…|

Servant…....0. Unmarried | F. 24 | General Servant (domestie).....| Middlesex, Paddington .. 008

7 | Ann Young…..... DeMVANticvssscscese Unmarried | F. 22) | Dainyyoaldarerecsnessescerrtisreercatey Surrey, Croydon o….eeee.

8 | Thomas J ones….| DETVAlltisercsessecs Unmarried | M. ZU) | Pau SOnvaliteessrecerereceresecessesees Essex, Epping …ccccsceeee

Bot

| If (1) Deaf-and-Dumb. (2) Blind.

Where born. (3) Imbeetle or Idiot.

superintendent registrar, who was at this stage required to fill up a printed form, showing a summary of the houses and population in each sub-district, municipal or parlia- mentary city or borough, &c., and transmit the whole to the Census Office in Craig's Court.

On receipt of the books and summaries by the Registrar- General, the abstract required by the 9th section of the Census Act was prepared and laid before Parliament on 20th June 1871.

As soon as the preliminary report, consisting of 137 pages, was published, the work commenced at the central office of revising the enumeration books so as to ascertain the correct number of houses and population in each of the various subdivisions of the country, and in order to ensure accuracy in the preparation of this work, statements of the houses and population of ecclesiastical districts and other local subdivisions were submitted to the clergy and to the various local authorities for approval. The registrars were required to state the cause of any remarkable increase or decrease of population, and a proof of the tables relating to each county was submitted to the clerk of the peace for correction and approval.

The abstracts relating tu the occupations and ages of the people were a great work. It was considered desirable not only to take out the number of persons of each sex in each cecupation, but the number at each

quinquennial period of age ; for without this information the relative salubrity of the professions, and a great variety of other important ques- tions could not be determined.

In this arrangement of the people according to occupa- tions and ages, they had not only to be classified in different orders, but it was necessary to find a place for every one of the 23 millions of population, so as to be enabled to pass them rapidly and distinctly in review.

The classification of the living according to their pro- fessions and occupations in combination with age has opened up a new field of inquiry, and the question can now be determined for sanitary purposes, and for life insurance, what effects the different professions and occupations have on health at different ages. Formerly, the mean age at death was taken to show the healthiness or insalubrity of certain occupations. But the mean age at death depends upon many circumstances besides health, and among others, upon the ages of the living, which vary in propor- tions in almost every profession, according as it is a pro- fession that people enter early or later in life, Insurance offices and friendly societies will find the results of the third volume of the Census of England in 1871—in conjunction with the 14th Annual Report, and the two Supplements to the 25th and 35th Annual Reports of the Registrar-General, recording the mortality of persons at different occupations—of great use to them in their trans- actions, for it is evident that the lives of farmers, for example, may be safely insured at much lower rates than the lives of licensed victuallers.

Many important results for ‘ civil counties” were pub- lished in 1871 that will not be found in the census returns of 1861, such as a description of the territorial, executive, and ecclesiastical divisions in each county, more exact arcas from the ordnance survey, additional columns showing

the houses under three headings, and distinguishing the sexes of the population, additional columns showing area, number of electors, and of members within the parlia- mentary limits, including and excluding

represented boroughs, petty sessional divisions, wards of municipal boroughs, comparative tables of houses and population in 1861 and 1871, tables showing the number of families in each civil parish and township, and results showing the residue of area and population in mother parishes. _

Also under “registration counties” many new particulars were published in 1871, such as maps of counties and districts, showing the population of large towns, and the particulars as to reformatory and industrial schools, and as to Her Majesty’s ships.

The census of Ireland in 1871 was taken by the Registrar-General of Ireland, assisted by two other com- missioners, W. R. Wilde and G. W. Abraham. The enumeration (except in the metropolis, in which 178 of the Dublin Metropolitan Police discharged that duty) was effected by 4536 members of the Royal Irish Constabu- lary, whose local knowledge and previous experience as enumerators on three former occasions rendered them peculiarly well suited for this undertaking. The country was divided into 248 districts, each under the charge of a sub-inspector. Printed instructions were furnished, and, when necessary, the enumerators were supplied with maps, conveyances, boats, and in the Irish-speaking districts with interpreters also. In conformity with the Census Act an abstract of the census of Ireland was i eet on 14th June 1871, showing the number of iouses, families, and population in each county and city, and in certain corporate towns in Ireland. The numbers in the different religious professions were also returned as directed by the Act. The revised and final numbers for Treland record the population in 1871 at 5,412,377, showing a decrease since 1861 of 386,590 or 6°67 per cent. In the previous decenniad, 1851-61, the population had decreased by 753,418, or 11°50 per cent. The decrease in the population of 1871 is stated to be chiefly attributable to emigration. From Ist May 1851 to 31st March 1871 the loss by emigration amounted to 2,024,609. Results relating to the ages, civil conditions, occupations, birth- places, religion and education of the people are published in the census returns for Ireland; and instructions were issued by the Government, directing that the results of the census of 1871 for each of the three divisions of the kingdom should be published, with a view to uniformity. Some of the principal results have thus been assimilated in 1871, but there is still a considerable want of uniformity, especially as

regards the ages of children in Ireland. A volume devoted entirely to vital statistics is not the least interesting of the results of the census of Ireland in 1871.

As regards Scotland, the results of the census of 1871 are nearly uniform with those of England. In addition to the ordinary particulars, inquiries were made as to the number of children from five to thirteen years of age receiving education, and the number of rooms with windows. This census was taken by the Registrar-General of Scotland and Dr Stark, through the agency of 1016 local registrars, assisted by 8342 enumerators, whose appointments were approved by the sheriffs in counties, and by the chief magistrates in boroughs. The returns for Scotland in 1871 contain some new features, such as the ecclesiastical sub- divisions of civil counties, grouping the population of each civil county into three great divisions, according as they inhabited towns, villages, or rural parts ; the particulars as to houses, families, and population relative to parlia- mentary constituencies of counties are also new. As there were no registration districts in 1851, no attempt was made in 1861 to show the relative increase or decrease of the

population from 1851. But in the census of 1871, this want was supplied by giving the number of the population in each district for 1861, for comparison with that of 1871. The number of children from five to thirteen years of age in the receipt of education also appears for the first time in the returns for 1871.

The census of the Island of Man and of the Channel Islands was taken by the lieutenant-governors according to directions issued by the Secretary of State for the Home Department, but the forms and instructions were issued by the Registrar-General of England. The population of these islands on the aggregate in 1871 was 144,638, viz.:—Isle of Man 54,042, Jersey 56,627, and Guernsey and adjacent islands 33,969. No census of the Isle of Man was taken earlier than that of 1821, when 40,081 persons were enume- rated. Enumerations of the inhabitants of Jersey were made in 1806 and in 1815, in which years the population was respectively returned as 22,855 and 22,763. ‘The first census of Guernsey, &c., was taken in 1821, and was

20,302. The population of these islands has remained nearly stationary at the last three censuses.

The cost of the census, incurred at the central office, and in payment of local officers in each of the three countries in 1871, was £5, 5s. 72d. per 1000 of the population for England and Wales, £8, 1s. 4d. for Scotland, and £7, 2s. 7d. for Ireland.

The results of the census of 1871 are multitudinous, and it is impossible here to enumerate all the facts of interest which the returns disclose. Those relating to parliamentary constituencies show that of 95 counties, or divisions of counties, the population had increased since 1861 in 82, while in 13 the population had decreased. Out of 198 boroughs which returned members to Parliament the popu- lation had increased in 156, while in 31 the population had decreased. In the year 1868 the boundaries of 68 boroughs were altered, and in some of these the increase of population may be due to enlarged area. Eleven boroughs had been formed since 1861. Some of the elaborate results afford the means of solving important questions relating to the industrial organization of the country, and show to what extent there has been a diminution in the numbers employed in the cultivation of the soil, and to what extent there has been a consolidation of farms, affecting the average size of the holdings. Other results show the ages of the married and unmarried population, and these, combined with the returns of the ages at marriage, furnish the means of determining very important questions, such as the probable duration of the joint lives of husband and wife, the annual rate of marriage at different ages, and so on. ‘Tables showing the number of foreigners resident in England and Wales, and the number of British residents abroad, throw much light on many points relating to the social condition of the people. Not the least useful of the results is an interpolated table of the population at each year of age, furnishing school-boards with the means of ascertaining the proportional number of children at the school ages, and enabling life insurance offices and scientific and other authorities to solve many important problems. (w. F.)

Census of the United States.

The census in the United States is a political necessity. To this, and not to the general appreciation of the claims of statistical science is due the fact that the systematic periodical enumeration of inhabitants was there undertaken earlier even than in England.

Had the government set up in 1787 been a pure con- federation, like that which preceded it, into which the States entered as equal bodies, the census would not have been a condition of its existence; while rude estimates

founded on the number of the natural militia, the arms- bearing population, or on the number of horses, or on the records of births and deaths, might long have answered all administrative purposes. On the other hand, had the Constitution of 1787 erected a single, self-sufficient government, a simple sovereignty, the census need not have been provided for in that instrument. Representa- tive power might have been apportioned approximately according to common fame, or numbers might have been rejected as the measure of political power, as in England, and even as in Connecticut, alone of all the States of the American Union, to-day.

But the mixed form of government established by that constitution, the only form of government which was then possible, by which the pre-existing States maintained their right to exist and to act for themselves in all strictly internal affairs, while for all national purposes political power was to be exercised by a double rule, partly through the States acting as equal bodies, and partly according to population irrespective of State lines, positively required, not as a means of administrative efficiency, but as an essential condition of its own existence, that the inhabi- tants of the United States should be periodically enumer- ated. Accordingly, we find in the Constitution of 1787 a provision for a census to be taken every ten years, the first enumeration to be made “within three years after the first meeting of the Congress of the United States.”

It would appear from this brief review that the eulogium of Moreau de Jonnés was scarcely merited, when he declared that the United States present a phenomenon without parallel in history,—“that of a people who instituted the statistics of their country on the very day when they founded

their government, and who regulated by the same instrument the census of inhabitants, their civil and political rights, and the destinies of the nation." As a matter of undoubted history, the provision for a national census was incorporated in the constitution solely from political, not at all from philosophical, considerations. Pending the actual accomplishment of the first enumera- tion, an estimate of the population of the several States was adopted as a provisional basis of representation in Congress.

The first census was taken in 1790, the returns all being referred to the lst of August of that year, although the work of canvassing was extended over a considerable period. As was the case with the first British census eleven years later, and as is likely to be the case with the first census of any community, great disappointment was felt at the result, and dissatisfaction at the methods of cnumeration was loudly expressed. Mr Jefferson, then Secretary of State, was careful in sending abroad copies of the published tables, to impress it on the minds: of his correspondents that the returns fell far short of the truth, and even went so far as to supply the omissions which he assumed to exist. The results of later censuses, however, have established the substantial accuracy of the first enumeration, and shown that the dissatisfaction felt at the time was but the inevitable disappoiutment of over-strained anticipations. 'To count," says Dr Johnson, "is a modern practice; the ancient method was to guess; and wherc numbers are guessed, they are always magnified." General censuses were taken in 1800, 1810, and 1820, with exact intervals of ten years. In 1830 the date of enumeration was fixed on the lst of June. This change made the interval between the fourth and fifth censuses nine years and ten months only, reducing the nominal ratio of increase between 1820 and 1830, by about two-thirds of 1 per cent. The succession of census was then resumed with exact intervals of ten years. The ninth census was taken as of date June 1, 1870.

Bis)

Peculiarities of the Constitution of the United States have been spoken of which rendered the census a political necessity, and secured its adoption there earlier than in countries far more advanced in statistical science and in the arts of administration. To the same peculiarities are at- tributable the features by which the census of the United States has come to differ from

the census of other countries, The reservation by the States of all rights not granted to the general Government makes it fairly a matter of question whether purely statistical inquiries, other than for the single purpose of apportioning representation, could be initiated by any other authority than that of the States themselves. That large party which advocates a strict and jealous construction of the constitution would certainly oppose any independent legislation by the national Con- gress for providing a registration of births, marriages, and deaths, or for obtaining social and industrial statistics, whether for the satisfaction of the publicist, or for the guidance of the legislature. Even though the supreme court should decide such legislation to be within tho grant of powers to the general Government, the distrust and opposition, on constitutional grounds, of so large a portion of the people, could not but go far to defeat the object sought.

In this political difficulty, the unquestionable provision of the constitution for a decennial census has been taken advantage of by all parties to secure much statistical information, which is not usually, and perhaps is not properly, connected with a census. Nor can there be any doubt that the introduction of new schedules of inquirics has, since 1850, somewhat impaired the efficiency of the census in its original constitutional function of making a count of the inhabitants of the several parts of the country for the purpose of distributing representation in Congress. As the census has widened, it has weakened. More has been put upon the enumerator than he could well carry. His attention. has been distracted by the multiplicity of objects presented ; the great number of inquiries has also perplexed and irritated the body of citizens; while the result of protracting the canvass to obtain additional information has, in the incessant changes of population, especially in cities and in manufacturing villages, allowed not a few to escape enumeration altogether.

The first enlargement of the scope of the census was in 1810, when the agents of the census were by law required to take an account of the several manufacturing establish- ments and manufactories within their several districts. Tho same requirement was contained in the Act for the census of 1820 ; but the results proved of so little value that the attempt was altogether abandoned in 1830, In 1840 a manufacturers’ schedule was used, and inquirics respecting schools were incorporated. It was at the seventh

census, 1850, however, that the main enlargement was effected. By the Act of May 23 of that year, the census was extended to cover the several subjects of mortality, agriculture, productive industry, schools, churches, newspapers, d&c., &e.

The agencies and methods of enumeration in the census of the United States have been but little changed from the first, and are to-day antiquated and ineffective in a high degree. By the Act of 1790, it was made the duty of the marshals of the United States courts in the several judicial districts to take the enumeration, appointing therefor as many assistants as they should gecm necessary. The enumeration was to commence August 1, and to close within nine calendar months thereafter ; the returns were to be filed with the cierks of the several courts, while the marshals were to forward to the president " the aggregate amount of each description of persons within their respective districts." In 1800 the supervision of the census was placed with the Secretary of State. The

machinery of enumeration remained until 1850 the same as in 1790.

In 1810 the agents of the census were placed under the direction of the Secretary of the Treasury as to the enumera- tion of manufactures required; but in 1820 the entire charge reniained with the Secretary of State. In 1850, the supervision of the census was committed to the newly created Department of the Interior, and the period allowed. for enumeration was restricted to five months. As a matter of fact, no enumeration has been completed within that time. The United States marshals and their assistants remained the agents of the census office; andasuperintendent of census was appointed. In preparation for the census of 1870, a committee of the House of Representatives, under the chairmanship of General James A. Garfield of Ohio, presented a bill which sought to bring the census as nearly up to the demands of modern statistical science as the peculiar conditions of settlement and occupation in the United States would allow. The report of the committee dwelt strongly on the essential viciousness of a protracted enumeration, and on the general unfitness of the marshals of the courts to perform the duty. The bill, liowever, did not propose a single-day enumeration, but allowed a month for its completion. The schedules of

inquiries were largely increased in recognition of the impossibility of obtaining statistical information under authority of the United States Government, except under cover of the constitutional provision for a decennial census. The rank and power of the superintendent of census were increased.

The bill of the committee was carried through the House of Representatives by large majorities, but failed in the Senate. The census of 1870 was consequently taken under the Act of 1850 with two or three inconsiderable amendments.

The cost of each census has been as follows :—

Dollars. Dollars.

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In the census of 1870 the work of enumeration was performed by 6572 assistant marshals, supervised by 61 marshals of United States courts.

Prior schedules so called, that is, schedules to be left at the residence in advance of the enumeration, to be filled up by the head of the family, have never been used in a census of the United Statcs, though adopted in nearly every European country. (F. A. W.)

CENTAURS (Ké&ravpo.), in Greek mythology, were beings part horse part man, 2¢. a horse had its neck and head replaced by the head and body of a man down to the waist. The oldest form was that of a man alto- gether in front with the body and hind legs of a horse attached to his back. In peopling solitary and wild places with imaginary beings it was usual to assign to these beings a bodily form in some obvious way consistent with the features of the locality; thus, Pan, the spirit of rocky hills, was imagined ag having goat’s legs, and Scylla, the spirit of sea-storms, as having the body and tail of a fish. In most cases the animal adjunct was made to

supersede the human legs, as if the first considcration had been that the spirit should have a non-human means of locomotion. In the case of the Centaurs whose home was in mountainous and wooded regions with wild torrents, chiefly in Thessaly and Arcadia, the horse may have been chosen either as symbolic of the impetuosity of streams and winds, or from the circumstance of such districts being favourable for horse rearing. One of the Centaurs, Chiron, who lived in a cave on Mount Pelion, was a friend of gods and heroes, skilled in medicine and music, and as an instructor of

youth; but as a race they were best known for their battle with the Lapithe, which arose at the marriage of Peiri- thous and Deidamia, when the Centaurs, excited with wine, attempted to carry off the bride, but were over-powered by the help of Theseus, who was present ; hence this subject, generally suitable for sculpture, was a favourite with Athenian artists. The Centaurs formed part of the retinue of Bacchus. No satisfactory derivation of the name has yet been given.

CENTIPEDES anp MILLEPEDES, the popular names of the two orders of Articulate animals which until lately formed the entire class Myriapoda. They were formerly classed with insects, which they resemble in their jointed limbs and antennz, and in their respiratory system, but they have also points of contact with annelid worms, with crustaceans, and with spiders, by which they are marked as a transition group, intermediate between the lower and higher Articulata. Myriapods (uvpids, ten thousand, and rovs, a foot) are elongated worm-like creatures, cylindrical or flattened, and composed of numerous segments, each bearing one or two pairs of jointed legs,—those on the anterior segments being modified, as in the Crustacea, so as to form the organs of the mouth. The fang-like, prehensile jaws of the centipede, perforated at their extremities to allow of the passage of the liquid venom into the wound they have inflicted, are thus simply modifications of a pair of legs. The eyes consist of a number of ocel/z, congregated together on the head, and, with a single exception, are never compound, as in insects. Like the latter, they breathe by means of tracheal tubes, opening by stigmata placed on both sides, behind the insertion of the legs, and kept permanently open by a spiral chitinous fibre. They are

unisexual, the organs of generation being, however, dif- ferently placed in the two groups, occurring anteriorly in millepedes, and posteriorly in centipedes. The young of many species closely resemble their pareuts from the time they leave the egg, only with fewer limbs and segments ; these, however, increase with each successive moulting until the normal number of the adult is reached. Other species, as those of the family Judidw, undergo, during their period of growth, modifications closely resembling the metamorphoses of insects. Their larve at first either are destitute of legs, or have only three pairs situated anteriorly ; and it is only after a long series of moultings, extending in some cases over two years, that their maturity is signalized by the appearance of sexual organs.

Myriapods have been usually divided into the two orders Chilognatha or Millepedes and Chilopoda or Centipedes ; but recently a small myriapod, ;4,th of an inch in length, was discovered by Sir J. Lubbock, among decomposing vegetable matter, differing from the other members of the class in the absence of traches, apparently absorbing air through its semi-transparent skin, in the smaller number of its legs (nine pairs), and in the bifid character of its antenns; and this has been made the type of a third order— Pauropide. Pauropus Husxleyt Lubbock describes as an active, cleanly little creature, with a look of cheerful intelligence, in marked contrast to the dull stupidity of the Julide, or the melancholy ferocity of the centipede. Millepedes, or ‘‘ Thousand-Legs,” are readily distinguished from the other group by their antennz, which are always six or seven jointed, by the generally cylindrical shape of the body, and by the possession of two pairs of legs on each segment—the last posterior segments and a few anterior excepted. Each segment also bears a pair of stigmata or tracheal openings, instead of every alternate one, as in centipedes ; and this fact, taken in connection with the double quantity of legs, has led to the belief that each segment in the millepede has been formed by the union of two, a view further strengthened by the presence of a

distinct transverse groove down the centre of each. The

legs of millepedes though numerous are exceedingly weak, and in moving they appear to glide along like footless worms. They are most frequently

found among damp moss, and beneath masses of decaying vegetable matter on which they feed ; and when in danger they roll themselves into a ball. The British species are few, and the largest of these does not exceed 2 inches in length ; but there is an American form which attains a length of 8 inches, All are equally harmless, the prehensile jaws being rudiimen- tary, while the other parts of the mouth are modified to suit their purely vegetable diet.

Centipedes, or " Hundred-Legs," have their segments flattened, and covered with a leathery skin, and have one pair of legs on each segment, the posterior pair being directed backwards and elongated so as to resemble a couple of jointed tails. Their antennz have not less than fourteen and rarely more than forty joints, while the body segments do not usually exceed twenty. The organs of the mouth are masticatory, and are admirably adapted to the carnivorous habits of the centipede. It feeds principally on insects, seizing them with its powerful prehensile organs, and injecting at the same time its venom into the wound. The bite of the larger forms, as Scolopendra morsitans, occurring in tropical countries, is exceedingly painful, and is described by those who have suffered from it "as similar to what might be produced by contact with a red-hot iron," giving rise to swelling, throbbing pains, and febrile symptoms (Dr Collingwood's Maturalist's Rambles in the China Seas). These, however, yield readily to an application of ammonia. Centipedes seldom exceed a foot in length. They are exceedingly active in pursuit of their prey, insinuating their many-jointed and flattened bodies under stones, beneath the bark of trees, and wherever insects usually lurk. JLithobius forcipatus, the commonest British species, is 2 inches long, and quite harmless, although when seized it attempts to fix its jaws into the skin of its captor. The species belonging to the genus Geophilus are said to be luminous in the dark. Upwards of twenty species of fossil Myriapoda are known,— the oldest from the Coal Measures of North America, and belonging to the millepede or vegetable-eating division. One of these, Xylobius sigillaria, was found in the hollow trunks of the fossil Sigdlaria.

CENTLIVRE, Susanna (1667-1723), a dramatic writer, was born in 1667, or perhaps a year or two later, probably in Ireland, whither her father, Mr Freeman, a Lincolnshire gentleman, had been forced to flee at the Restoration on account of his Parliamentarian principles. Being left an

orphan about the age of eleven she came to London, where, at the age of sixteen she married a nephew of Sir Stephen Fox. About twelve months afterwards her husband died ; and she then married a military officer named Carrol. Carrol was killed in a duel about a year and a half after their marriage, and his widow was left to support herself by her pen and by acting. Her first attempt was a tragedy called the Perjured Iusband ; but almost all ker subsequent pieces were comedies, several of which, through theirliveliness, enjoyed very considerable popularity, as for example the well-known Busibody (which has been represented within the last few years), A Bold Stroke for a Wife, The Basset-table, The Wonder—a Woman keeps a Secret, Love at a Venture. Her wit and personal attrac- tions also gained her the support of Steele, Farquhar, Rowe, and many others of high position in literature and society. In 1706 she married Mr Joseph Cent- livre, principal cook to Queen Anne, with whom she lived till her death in 1723. Her dramatic works were published, with a biography, in 3 vol 12mo, 176), reprinted 1872.

CENTO, a town of Italy, in the province of Ferrara, 16 miles north by west of Bologna, situated in a fertile plain near the Reno. It is the seat of a bishop, has a cathedral and several fine buildings, and carries on a trade in grain and hemp; but it is chiefly remarkable as the birthplace of the painter Guercino, several of whose works are to be seen in the churches of St Biagio and the Madonna del Rosario. His house is still preserved, and a statue has been erected to his memory in the middle of the town. Population about 19,000.

CENTO (Greek xévrpwv, Latin cento, patchwork), a com- position made up of passages from other works. The Byzantine Greeks manufactured several out of the poems of Homer, among which may be mentioned the life of Christ by the famous Empress Eudoxia, and a version of the Biblical history of Eden and the Fall. The Romans of the later empire and the monks of the Middle Ages were fond of constructing poems out of the verse of Virgil. Such were the ancient Cento Nuptialis of Ausonius, the

sketch of Biblical history which was compiled in the

4th century by Proba Falconia, wife of a Roman pro- consul, and the hymns in honour of St Quirinus taken

from Virgil and Horace by Metellus, a monk of Tegernsee, in the latter half of the 12th century. Specimens may be found in the work of Aldus Manutius (Venice, 1504 ; Frankfort, 1541, 1544). duced from Virgil an attack upon the dissolute lives of the monks; in 1536 there appeared at Venice a Petrarca Spirituale ; and in 1634 Alexander Ross (a Scotchman, and one of the chaplains of Charles I.) published a Virgilius Evangelizans, sew Historia Domini nostri Jesu Christe

In 1535 Lelius Capitulus pro-

Virgilianis verbis et versibus descripta.

CENTORBI, or Centurire, the ancient Centuripa, a town of Sicily, on a rugged mountain, in the province of Catania, and 20 miles W.N.W. of the city of that name. At a very early period Centuripa was an important town of the Siculi ; and through various vicissitudes it succeeded in maintaining its independence until the first Punic war, when it was besieged by the consuls Otacilius and Valerius Messala. In the time of Cicero it was one of the most flourishing places in the island, and had a population of about 10,000. In 1233 it was destroyed by Frederick II. Extensive remains of the ancient city still exist. The new town has a population of upwards of 7000.

CENTRAL AMERICA, as a geographical division, would naturally include the whole stretch of territory from the Isthmus of Tehuantepec to the Isthmus of Darien, which forms the nexus between the two great masses of North and South America ; but political arrangements have so affected the use of the name that it only includes the portion corresponding to the five independent North American republics of Costa Rica, Nicaragua, Honduras, San Salvador, and Guatemala, while the Isthmus of Panama is assigned to South America as a part of New Granada, and the Isthmus of Tehuantepec and the Penin- sula of Yucatan are incorporated with North America as parts of Mexico. Central America thus lies between 7° and 18° of N. lat., extends about 800 or 900 miles in length, and has a varying breadth of from 30 to 300 miles. For details the reader is referred to separate articles on the five republics mentioned above, which formed a federal republic from 1823

to 1839, and have frequently en- deavoured since then to effect a restoration of their union.

CENTRAL INDIA POLITICAL AGENCY, the official name for a group of feudatory states in the middle of India. Roughly speaking, they are bounded on the N. by Rajputand, the North-Western Provinces, and Oudh ; on the E. by the Chhot4 Nagpur division of Bengal, on the S. by the Central Provinces, and on the W. by Boinbay. The total area of these states is not accurately known,

but is probably not less than 90,000 square miles, and the population is computed at over 8,000,000 souls. The individual states which make the group have nothing in common with one another, apart from the diplomatic link which connects them all with the British power through the person of the agent to the Governor-General. The principal of the feudatories are Gwaliar (Scindiah), Indor (Holkar), Rewah, and Bhopdl. Each of these states will be found noticed in its respective place in alphabetical order. The total number of states, great and small, com- prising the Central India Political Agency is 71.

CENTRAL PROVINCES, a Chief-Conmissionership of British India, situated between 17° 50’ and 24° 30’N. lat., and between 76° and 85° E, long., comprising an area of 84,078 square miles, and a population returned by the census of 1872 at 8,201,519. The Chief-Commissioner- ship was constituted in 1861, when the territories previ- ously known as the Nagpur Province and the Sagar and Nerbudda Territories were united under the name of the Central Provinces. This large tract, comprising almost every variety of soil and of physical aspect, and in- habited by races of very diverse origin, is bounded on the N. by the feudatory state of Rewah, by the small native states of Bundclkhand, and by the district of Lalatpur in the North-Western Provinces ; on the N, and E. by the Chhota Nagpur division, the Orissa tributary states, and the northern districts of Madras; on the S. by the Godavari district; and on the 8.W., W., and N.W. by the Nizdm’s dominions, the Berar districts, and the states comprising the Central India Agency. The Central Provinces are divided into four divisions or commissionerships,— Nagpur, Jabalpur, Nerbudda,and Chhat{sgarh,

comprising 19 British districts, ‘Two districts, SAgar and Damoh, lie parallel to each other upon the Vindhyan table-land. To the south of them, in the valley of the Nerbudda and its tributaries, are the districts of Mandl, Jabalpur, Narsinhpur, Hoshangabad, and a part of Nimér, the rest of it being in the valley of the Tapti. The next range of districts continuing south-wards includes Betul, Chhindward, Seoni, and Balaghat, occupying the Sdtpurd table-land, and attaining a height of about 2000 feet. Still further to the south is the great Nagpur plain, formed by the valleys of the Wardh4 and Waingangé, and comprising the districts of Nagpur, Wardha, Bhanddr4, and Chand& To the east is the Chhatisgarh plain, a low plateau of red soil, coutaining the districts of Raipur, Bilaspur, and Sambalpur. Last of all, in the extreme south, and almost cut off by forests and wild semi-independent states, is a long strip of territory lining the left bank of the Godavari, aud known as the Upper Godavari district.

Physical Geography and Scenery.—The official compiler of the statistical account of the Central Provinces thus describes the physical aspects of the country :—“ Within comparatively narrow limits, a plateau and a plain follow each other, and again, in similar sequence, a larger plateau and a larger plain, ending in a mass of hill and forest, which is probably the wildest part of the whole Indian peninsula. Even the continuously level portions of this area are broken by isolated peaks and straggling hill ranges ; while its rugged formation and rapid slopes give to the greatest rivers which rise in it, such as the Nerbudda and Tapti, something of the character of mountain torrents. Though the scenery is on too small a scale to compare in sublimity with that of the Himdlayas, it is on the other hand as far removed from the monotony of the plains of Hindustan. Not only is it characterized by a constant variety of form and level, but it possesses a diversity of colour peculiar to itself. In no other part of India are the changes of soil and vegetation more rapid and marked than in the Nerbudda country. In the pleasant winter months, the eye may

range over miles of green corn lands, only broken by low, black, boundary ridges or dark twisting footpaths. The herizon is bounded here and there by hill ranges, which secm to rise abruptly from the plains, but on coming

nearer to them, the heavy green of their slopes is found to be divided from the softer hues of the young wheat by broad belts of gravelly soil studded with fine trees. On the Satpurd plateau the alternations of scenery are even more frequent than in the low country. The hills are higher and more abrupt, the black soil deposits are deeper, and the water supply more abundant. Hence in the midst of the grim rolling plateaus of basalt, there may often be found little valleys cultivated like gardens,—oases of sugar-cane and opium, which, but for their inaccessibility, would tempt away the best cultivators of the plains, It is thought that in some of these upland basins, tea, coffee, and other delicate plants might be raised with success, but the obstacles which have so long retarded the settlement of these plateaus, though partially smoothed away, still exist, and can only be surmounted by patient and continued energy. Much has been done to open out the country of late years. Railways from both coasts now connect the plateau with the eastern and western seaboards, and form the central link of communication between Calcutta and Bombay.”

The principal rivers of the Central Provinces are the Nerbudda, Tapti, Wardha, and Waingang4, but, owing to falls and rocky rapids, they are navigable only at certain times of the year and for short distances, As a means of communication they are practically useless. The chief lines of road are the following :—

(1) From Jabalpur to Sagar via Damoh, 116 miles; (2) from Jabalpur to Raipur via Mand1a, 208 miles ; (3) from Sagar to Kareli on the Great Indian Peninsular Railway, 76 miles; (4) from Nar- sinhpur to Chhindwara, 91 miles ; (5) from Hoshangabad to Betul, 68} miles ; (6) from Nagpur to Réipur, 174 miles; (7) from Nag- pur to Chhindwara, 78 miles; (8) from Nagpur to Betul, 104} miles ; (9) from Nagpur to Chanda, 96 miles ; (10) from Rdipur to Sam- balpur, 167 miles; (11) from Chanda to Sironchda, 121 miles.

The country is intersected by the Great Indian Peninsular and East Indian Railways. The Great Indian Peninsular Railway from Bombay enters the Central Provinces near Barhanpur, and runs north-east to Jabalpur, where it joins the Kast India line from Allahdbéd and Calcutta. A branch of the Great Indian Peninsular Railway, which leaves the main line at Bhasdwal in

Kandesh, enters the Central Provinces at Wardha, and runs to Négpur. A state line is in course of construction to connect this railway with the newly-opened coal-fields of Chanda.

The population of the 19 districts of the Ceutral Provinces was returned by the census of 1872 at 8,201,519, made up as follows :—Hindus 5,879,950, or 71°69 per cent. of the total population ; Muhammadans, 233,247, or 2°84 per cent.; Buddhists and Jains, 36,569, or 0°45 per cent. ; Christians, 10,477, or 0°13 per cent.; and “ others” (consisting chiefly of Gonds and the original inhabitants of the country before they were driven back by their Hindu conquerors), 2,041,276, or 24°89 per cent. The census report of 1872 returns 39 towns containing upwards of 5000 inhabitants. Of these 26 have less than 10,000 inhabitants; 5 between 10,000 and 15,000; 3 between 15,000 and 20,000; 3 (Burhanpur, Sagar, and Kamth{) between 20,000 and 50,000; and only 2 (Nagpur and Jabalpur) over 50,000, the former having a population of 84,441, and the latter of 55,188,

Of the total surveyed and assessed area of the British territory 12,352,473 acres were returned in 1873-74 as actually under cultivation, 12,220,845 acres as cultivable but not under tillage, 1,365,071 acres as grazing lands, and 10,885,296 as uncultivable waste, Wheat, rice, and cotton are the principal agricultural staples. The recently- discovered coal-fields and iron-beds in the Wardha Valley

and the Chanda district promise to open a new era of prosperity for the country.

The improved means of communication afforded by the railways and roads have rapidly developed the trade of the Central Provinees. In 1863-64 the imports and exports were valued at about four millions sterling. In 1868-69 their value had risen to six and three-quarter millions sterling. In 1873-74 the ascertained imports of the Central Provinces amounted to 117,761 tons, value £4,399,134, and the exports to 209,157 tons, value £3,148,598 ; total of imports and exports 326,918 tons, value £7,547,732.

Administration.—The executive authority at Nagpur vests in the chief-commissioner aud agent to the Governor- General. He is assisted by a secretary and staff, a judicial commissioner, a settlement commissioner, a sanitary com- missioner, a commissioner of customs, four commissioners of revenue and circuit, an inspector-general of police, an in- spector-general of public instruction, an inspector-general of jails and dispensaries, a conservator of forests,and a registrar- general of assurances, who is also commissioner of excise and superintendent of stamps. A commissioner presides over each of the four divisions, with a deputy-commissioner and assistants in each of the nineteen districts, all sub- ordinate to the chief-commissioner at Nagpur. The total revenue of the Central Provinces in 1873-74 amounted to £1,260,977, of which £1,057,021 was derived from im- perial, and £203,956 from provincial taxation. The civil expenditure in the same year amounted to £904,670, of which £440,232 was on imperial, and £464,433 on provincial account. Of the total revenue £603,056, or just one-half, was derived from the land. There were 196 criminal and 119 civil courts at work in 1873-74, The regular police consisted of a force of 7539 officers and men, besides a municipal police of 988. The total cost of the regular and municipal police in 1873-74 amounted to £130,674, The troops quartered in the Central Pro- vinces are as follows :—Europeans—3 batteries of artillery (with 18 guns), and 2 regiments and 1 company of in- fantry ; natives—2 regiments of cavalry and 63 regiments of infantry. The European troops numbered 2462, and the native troops 5475, giving a total of 7937 officers and men, kept up at a cost of £277,781. For the education of the people Government maintains, or subsidizes under its grant-in-aid system, 1532 schools, attended in 1873-74 by 76,781 pupils, and maintained at a total cost of £55,734, to which the state contributed

£31,628, or over one-half. These schools are exclusive of private institutions not receiving support from the state.

Besides the 19 British districts of the Central Provinces described in the foregoing ii and to which alone the above statistics refer, there are also 15 small feudatory states, comprising a total area of 28,834 square miles, with a population of 1,049,710 souls, made up as follows :—Hindus, 638,187 ; Muhammadans, 7718 ; Buddhists and Jains, 14; Christians, 5; and ‘others” (consisting of abori- ginal tribes), 403,786. The following are the details of arca popula- tion, revenue, &c., of each of these states as officially returned in 1874-5 :—(1.) Bastar: area, 13,062 squaremiles ; population, 78,856 ; supposed gross revenue, £9213, 10s.; annual tribute to the British Government, £305, 12s. (2.) Karond: area, 3745 square miles ; population, 133,483 ; estimated revenue, £2000; tribute, £355. (8.) Raigarh-Bargarh : area, 1486 square miles ; population, 63,304 ; esti- mated revenue, £750; tribute, £40. (4.) Sarangarh: area, 540 square miles ; population, 37,091; estimated revenue, £800; tribute, £135, (5.) Patna (under British management): area, 2399 square miles ; population, 98,636; estimated revenue, £2500 ; tribute, £60. (6.) Sonpur: area, 906 square miles; population, 130,713; estimated revenue, £1800; tribute, £500. (7.) Raird Khol: area, 838 square miles; population, 12,660; estimated revenue, £600; tribute, £58. (8.) Bdmré: area, 1988 square miles; population, 53,613; estimated revenue, £600; tribute, £35. (9.) Sakti: area, 115 square miles; Peet, 8394; estimated revenue, £813; tribute, £35. (10.)

Kawardo: area, 887 square miles; Dee 75,462: estimated Tevenue, £5356; tribute, £1600, (11.) Konda or Chhuikhadan: area,

174 square miles; population, 29,590; estimated revenue, £2203; tribute, #1100. (12.) Kanker: area, 1000 square miles; population, 43,552; estimated revenue, £1500; pays no tribute. (18.) Khaira- garh (under British management): area, 940 square miles; popula- tion, 122,264 ; estimated revenue, £11,768 ; tribute, £4700. (14.) Nandgaon: area, 884 square miles; population, 148,454; estimated revenue, £8595; tribute, £4600. (15.) Makrai: area, 215 square miles; population, 13,648; estimated revenue, £2200; pays no tri- bute.

Including the 19 British districts and the 15 small feudatory states, the Central Provinces comprise a total area of 113,797 square miles, and have a population of 9,251,229 souls, made up as follows :—Hindus, 6,518,137, or 70°46 per cent. ; Muhammadans, 240,965, or 2°60 per cent. ; Buddhists and Jains, 36,583, or 0°40 per cent. ; Christians, 10,482, or 0-11 per cent.; and " others," 2,445,062, or 26°43 per cent. (w. w. H.)

CENTUMVIRI, among the Romans, were judges appointed to decide common causes among the people, of whom three were chosen out of each tribe. The extent of their powers has not been exactly ascertained. It is not unlikely that they were originally intended to deal with questions concerning quiritian ownership, which determined the status of the citizens. Hollweg asserted that their jurisdiction was confined to civil cases; but this is doubtful. (See Hollweg, Ueber die Competenz des Centum- viralgerichts ; Tigerstrém, De Judicibus apud Romanos).

CENTURION, among the Romans, an officer in the infantry who commanded originally a hundred men (whence the name), but afterwards an indefinite number—the sixtieth part of a legion. Centurions were of two grades, and were chosen by the tribunes. Their duties were to drill the soldiers and appoint their tasks, and they had power to punish minor offences.

CEOS (Kéos), the modern Zea or Tzia, an island in the Aigean Sea, belonging to the group of the Cyclades and the eparchy of Syra, 14 miles off the coast of Attica. Its greatest length is about 13 miles, and its breadth about 8. It gradually rises towards the centre, where it culminates in Mount Elias, 1860 feet high. Among its natural pro- ductions are lemons, citrons, olives, wine, and honey ; and it also exports a considerable quantity of valonia. There were formerly four towns of some importance in the island : —Iulis, about three miles from the north-west shore ; Coressia, the harbour of Iulis, with a temple of Apollo Smintheus in the neighbourhood ; Carthzxa in the south-east ; and Poieéssa in the south-west. Of these Iulis is represented by the town of Zea, and Carthwa by the village of 'S tais Polais; and traces of the other two can still be made out. In ancient times Iulis was the birthplace of the lyric poets Simonides and Bacchylides, the philosophers Prodicus and Ariston, and the physician Erasistratus ; and the

excellence of its laws was so geuerally recognized that the title of Cean Laws passed into a proverb. One of them, which forbade a citizen to protract his life beyond sixty years, affords a curious instance of the application of utilitarian principles. The present population of the island is about &000, cf which the capital has about 4300.

CEPHALONIA, or CeraLonta, the ancient Cephalleniu, an island belonging to the kingdom of Greece, and the largest of those known as the Jonian Islands, is situated on the west side of the mainland, almost directly opposite the Gulf of Corinth. Its extreme length is 31 miles, and its breadth varies from about 20 miles in the southern portion to three or less in the projecting part, which runs parallel with the island of Ithaca, at a distance of about four miles across the strait of Guiscardo or Viscaro. The whole island, with its area of 348 English square miles, is covered with rocky hills of varying clevation, the main range running from north-west to south-east. The ancient

mount Ainos, now Elato, Monte Negro, or the Black Mountain, hasa height of 5300 feet, and frequently retains the snow for several months. It is not only the loftiest part of the sierra, but also the highest land in the whole Ionian group. The name Black" was given from the darkness of the pine woods which still constitute the most striking feature in Cephalonian scenery, although their extent has been greatly curtailed by fire. On the summit there is still to be seen an ancient altar, surrounded by the bones of former sacrifice. The island is ill supplied with fresh water; there are few permanent streams except the Rakli, and springs are apt to fail in dry summers. In the western part of the island a gulf runs up from the south a distance of about seven miles ; on its east side stands the chief town Argostoli, with about 9000 inhabitants, and on its west side the rival city of Lixuri, with 6000. About five miles from Argostoli is the Castle of St George, a building of Venetian origin, and the strongest fortifica- tion in the island ; and between St George and the village of Mataxata, where Byron at one time resided, are several large catacombs. On an eminence east-south-east of Argostoli are the ruins of the ancient Cranii, and Lixuri is close to or upon those of Pale; while on the other side of the island are the remains of

Samos on the bay of the same name, of Proni or Pronni, further south above the vale of Rakli and its blossoming oleanders, and of an unknown city near the village of Scala, The ruins of this city in- clude Roman baths, a brick-built temple, rock-cut tombs, and tesselated pavements ; and Cranii, Proni, and Samos are remarkable for stretches of Cyclopean and Hellenic walls, partly of the most irregular construction, and partly preserving almost unimpaired the results of the most perfect skill. ‘The inhabitants of Cephalonia have all along been extremely active ; and no slight amount of toil has been expended in the construction of terraces on the steep sides of the hills. Owing to the thinness of the population, however, but a small proportion of the soil is under cul- tivation, and the quantity of grain grown in the island is comparatively meagre. The staple is the currant, in the production of which the island surpasses Zante. The fruit is smaller than that of the Morea, and has a peculiar flavour ; it finds a market mainly in Holland, Belgium, and Germany. The grape vine is also grown, and the manu- facture of wine is a rising industry. The olive crop is of considerable importance, and within recent years the culture of cotton in the low grounds has been successfully attempted. Manufactures are few and undeveloped, but lace from the aloe fibre, Turkey carpets, and basket-work are produced by the villagers, and boats are built at both the principal towns. Among recent improvements may be mentioned the erection of two steam-mills and the intro- duction of steam-boat communication between Argostoli and Lixuri. In 1873 there were exported from the island 19,603,933 tb of native currants, of the value of £123,176; and in the same year the re-exportation of Morea currants was 4,567,192 tb, valued at £25,728. The total imports, which consist mainly of wheat, maize, barley, and rye, amounted to £287,493. Of all the seven islands Ccphalonia and Zante are most purely Greek ; and the inhabitants display great mental activity. Of several contributors to the national literature may be mentioned Bishop Maniati, author of a treatise on the schism of the Eastern and Western churches, and Andrea Lascarato, a vigorous political writer and keen defender of the British protectorate, who brought himself into great

trouble by the freedom of his attacks in his Mysteries of

Cephalonia,

In the Homeric poems, Cephalonia is mentioned under the name of Same, and its inhabitants, among the subjects of Ulysses, are designated Cephallenes. In the Persian war they took but little

timber trees are the iron-wood and the makila.

part ; in the Peloponnesian they sided with the Athenians. The town of Pale was vainly besieged by Philip of Macedon in 218 B.c., because it had supported the Atolian cause. In 189 B.c. all the cities surrendered to the Romans, but Same afterwards revolted, and was only reduced after a siege of four months. The island was presented by Hadrian to Athens, but it appears again at a later date as ‘free and autonomous.” After the division of the Roman cmpire, it continued attached to Byzantium till 1082, when it was eaptured by Robert Guiscard, who died, however, before he could repress the revolt of 1085. In 1204 it was assigned to Gaius, prince of Tarentum, who accepted the protection of Venice in 1215 ; and after 1225 it was held along with Santa Maria and Zante by a succession of five counts of the T’occo family at Naples. Formally made over to Venice in 1850 by the prince of Tarentum, it was afterwards eaptured by the Turks in 1479; but the Hispanico-Venetian fleet under Benedetto Pcssaro and Gonsalvo of Cordova effected their expulsion in 1500, and the island continued in Venetian possession till the fall of the republic. For some time it was administered for the French Government, but in 1809 it was taken by the English under Collingwood, ‘Till 1813 it was in the hands of Major de Bosset, a Swiss in the British service, who displayed an industry and energy in the repression of injustice and development of civili- zation only outdone by the despotic vigour of Sir Charles Napier, who held the same office for the nine years from 1818-1827. Dur- ing the British protectorate the island made undoubted advances in material prosperity, but was several times the scene of political disturbances. lt retained longer than the sister islands traces of feudal influence exertcd by the landed proprietors, but has been gradually becoming more democratic. Under the Venetians it was divided into eight districts, and an elaborate system of police was in force; since its annexation to Greece it has been broken up into twenty demarchias, each

with its separate jurisdiction and revenues, and the police system has been abolished.

A special treatise on the antiquities of Cephalonia was written by Petrus Maurocenus. See also Holland's Z'ravels, 1815 ; Ansted's Ionian Islands, 1863; Viscount Kirkwall's Four Years in Ionian Islands, 1864; Wiebel's Die Insel Kephalonia ; and Parliamentary papers.

CERAM, or Srrane, an island of the East Indian Archipelago, situated to the west of New Guinea, and belonging to the Dutch Government of the Moluccas. It lies between 2° 45' 30" and 3° 30' 30" S. lat., and extends from 128° to 131° 10' E, long.; its greatest length is about 200 miles, its greatest breadth about 50, and its area, upwards of 6000 square miles, It is divided into two parts, Great Ceram and Little Ceram or Huvamohel, united by the isthmus of Taruno; and, for administrative pur- poses, the eastern portion is assigned to the residency of Banda, while the western belongs to that of Amboyna, A chain of mountains traverses the island from east to west, and attains in various parts a height of upwards of 8000 feet. The loftiest summit—Nusa Keli—has an elevation of 9500 feet ; and others of mark are Salagor, Trier, and Tomaehe. The coast is for the most part rocky and precipitous; but it is broken in several places by con- siderable bays, of which the most important are Hatuvi and Savaai on the north, and Huvamohel, Amahay, Nusa Laut, and Selan on the south. The country is well watered with streams, which are of very little use, however, for navigation or systematic irrigation. Several hot springs have been discovered, and earthquakes are not unfrequent. A large part of the interior is covered with dense and gloomy forests, and except along the coasts the population is very scant, For the naturalist Ceram is a comparatively uninteresting island, without any characteristic species or abundance of specimens. The Bandanese pay occasional visits to shoot bears and deer ; there are numbers of wild goats and cattle; and among the birds are mentioned cassowaries, cockatoos, birds of paradise, and the swallows that furnish the edible nests. A large number of fish are to be found in the various rivers ; and as early as 1860 no fewer than 213 species were described by Dr Bleeker in the Natwurkundig Tijdschrift v. N. I. The most valuable Rice, maize, cocoa-nuts, sugar-cane, and a variety of fruits are

grown ; but by far the most important production is the sago palm, which grows abundantly in the swampy districts,

especially of Eastern Ceram, and furnishes a vast supply of food, not only to Ceram itself, but to other islands to the east. The Dutch settlers at Amboyna have recently established cocoa plantations at various points, and the Government encourages their formation. The inhabitants are mostly gathered in villages along the coast; they are partly native Alfuroes and partly immigrant Malays, with a considerable intermixture of Buginese, Macassars, Bali- nesc, and other races of the archipelago. Christianity has been introduced in various districts, especially along the southern coast, but as yet with but little practical benefit. A baneful influence has been exerted by a secret society called the Kakian Union, to which pagans, Mahbometans, and Christians indiscriminately attached themselves; and it has several times cost the Dutch authorities considerable efforts to frustrate their machina- tions. A full account of the union will be found in the fifth year of the Tijdschrift van Ned. Ind. The total population is estimated at 195,000, of whom the lands on the south coast contain 65,000, the lands on the north coast 40,000, and the south-western peninsula a large portion of the remainder. There was a Dutch fort at Kambello, on the west side of Little Ceram, as early as 1646. See Wallace's Malay Archipelago, and Bickmore's Eastern Archipelago.

CERBERUS (KepGepos), in Greek mythology, the dog which guarded the entrance to Hades, not against incomers, but against whoever might seek to escape. In Hesiod (Lheog. 310), he is a many-headed monster with a fearful bark, but usually he was represented with three heads and the body of a dog such: as haunted battlefields,— sometimes also with the tail of a snake. The same number of heads occurs in other beings connected with the lower world, as in Hecate " triformis" and Hermes " trikephalos." The most difficult of the labours imposed on Hercules was to bring Cerberus to the upper world, and in this he was forbidden by Pluto to use any weapons. Of the various suggested derivations of the name perhaps the most satisfactory is that which connects it with épeBos, the darkness of Hades.

CERDONIANS, a Gnostic sect, founded by Cerdo, a Syrian, who came to Rome about 140, but concerning whose history little is known. They held that there are two first causes—the perfectly good and the perfectly evil. The latter is also the creator of the world, the god of the Jews, and the author of the Old Testament. Jesus Christ is the son of the good deity ; he was sent into the world to oppose the evil; but his incarnation, and therefore his sufferings were a mere appearance. Regarding the body as the work of the evil deity, the Cerdonians formed a moral system of great severity, prohibiting marriage, wine, and the eating of flesh, and advocating fasting and other austerities. Origen attributes to Cerdo the opinion,— which was certainly held by the more famous Marcion, his contemporary and, in some respects at least, his follower, — that there are three first causes—the perfectly good, the perfectly evil, and the imperfect, whom Marcion calls " the just" (76 dixovov), and who is the creator of the world and the god of the Jews. Besides the Old Testament, Cerdo rejected also the New, except part of Luke's Gospel and of St Paul's Epistles. See Marcton and Gnostics.

CERES, in Mythology, was the Roman goddess of seed and harvest, worshipped jointly with Liber (Bacchus) and Libera (Proserpine). No special myth or personal history is known to have been attached to her. But early in the times of the Republic, when Greek deities were introduced into Rome on the advice of the Sibylline books, Demeter, the Greek goddess of seed and harvest, whose worship was largely spread in Sicily and Lower Italy, usurped in Rome the divine position which Ceres held before ; or rather to Ceres were added the religious rites

which the Greeks paid to Demeter, and the mythological incidents which originated with her. These rites were Greek in their language and forms, the priestesses were Greeks, and the temple was Greek in its architecture. Her principal festivals were (1) the Cerealia (April 12-19), corresponding in the main idea with the Eleusinia, and (2) the Jejunium Cereris (October 4), corresponding to the Thesmophoria of Demeter. The Cerealia included the spectacle of hunting a fox with a torch attached to his tail. Her temple in Rome had been destroyed by fire, and was rebuilt by Augustus, Claudius

attempted to introduce the mysteries of Eleusis into Rome in connection with her worship.

As regards the Greek goddess, the chief interest of her worshippers was concentrated on the myth which told how her only daughter Persephone (Proserpine) had been carried off in a chariot by Pluto, the god of the lower world, from the fields of Enna in Sicily, where she was gathering flowers ; other districts also were assigned for this incident, but the Romaus naturally preferred Enna as being the nearest. Demeter wandered over the earth searching for her daughter in vain, in her anguish refusing food or drink, and threatening a famine for mankind, till Zeus agreed to allow Persephone in future to live half the year with her mother on the earth. The othcr half she must remain with Pluto in the lower world. From the myth so far it was an obvious step to think of Demeter as a mother always anxious for her child, yearning through half the year to see her again, and sad through the other half at the prospect of her leaving again. But a deeper meaning appears to have been found in the myth by those who were initiated into the mysteries of Eleusis, in which seems to have been taught the principle of a new life after death, founded on the return of Persephone to the upper world, or rather on' the process of nature by which seed sown in the ground must first die and rot before it can yield new life, a process which the annual going and coming of Persephone was designed to illustrate. To make more explicit this connection of Demeter with seed-sowing, the myth tells how, in searching for her daughter, she was hospitably received among other places at Eleusis in Attica, and how, when leaving Eleusis, she gave to Triptolemus, the king's son, her chariot drawn by winged snakes, with the injunction to travel over the world teaching men to cultivate grain as she had then begun to teach them. At the Thesmophoria, a festival in which only married women took part, Demeter was regarded as having instituted certain laws (@ecpot) for regulating life, in particular the married life of women. In the Cretan myth of Demeter she was connected with a hero Jasion, said to have been the first to sow grain, to whom she bore a son, Plutos. Poseidon, the god of the sea, appears as repugnant to her in the myth, according to which she took the form of a horse to eseape him, but was overtaken, and finally bore to him the winged horse Arion. It may have been with reference to this that she was figured in an ancient image at Phigaleia as having a horse's in place of a human head. Her attributes were

a veil and diadem on her head, ears of corn or poppies in her hand. Her principal sacrifice consisted of pigs. Demeter was a daughter of Kronos and Rhea. Zeus was the father of Persephone.

CERIGNOLA, a town of Italy, in the south of the Neapolitan province of Capitanata, 24 miles 8.I. of Foggia, pleasantly situated on an eminence which commands an extensive view. The surrounding plain is well cultivated, and produces large quantities of almonds and cotton. Linen is manufactured by the inhabitants. Cerignola is divided into an old and new town, and contains a hospital, a college, and several convents. Here, on the 28th April 1508, the Spaniards, under Gonsalvo de Cordova, defeated

the French, when the leader of the latter, the Duc de Nemours, was slain. In the neighbourhood, to the west of the Lago di Salpi, are the ruins of the ancient Apulian town Salapia. Population about 17,500. |

CERIGO, the ancient Cythera (KvOypa), one of the Ionian islands, situated at a distance of not less than 150 miles from Zante, but only about 8 miles from Cape Malea on the southern coast of Greece. Its length from N. to S. is nearly 20 miles, and its greatest breadth about 12; its area is 114 square miles. The general character of the surface is rocky and broken; but streams abound, and there are various parts of considerable fertility. Two caves, of imposing dimensions, and adorned with stalactites of great beauty, are the most notable among its natural peculiarities ; one is situated at the seaward end of the glen of the Mylopotamus, and the other, named Santa Sophia, about two hours ride from Capsali. Less of the ground is cultivated and more of it is in pasture land than in any other of the seven islands. Some wine and corn are produced, and the quality of the olive oil is good. The honey is still highly prized, as it was in remote antiquity ; and a considerable quantity of cheese is manufactured from the milk of the goat. Salt, flax, cotton, and currants are also mentioned among the produce. The people are industrious, and many of them go to seek employment as labourers in the Morea and Asia Minor. Unfortunately the island has hardly a regular harbour on any part of the coast ; and from its situation at the

meeting as it were of seas, the currents in the neighbourhood are strong, and storms are very frequent. The best anchorage is at San Nicolo, at the middle of the eastern side of the island. The principal village is Capsali, a place of about 1500 inhabitants, at the southern extremity, with a bishop, and several convents and churches; the lesser hamlets are Modari, Potamo, and San Nicolo. There are compara- tively few traces of antiquity, and the identification of the ancient cities has not been satisfactorily accomplished. The capital bore the same name as the island, and con- sisted of a maritime and au inland portion, distant from each other about 10 stadia. The site of the upper city is probably at Paleopoli, about three miles from the present port of Avlemona; but no trace can be discovered of the famous shrine of the Venus of Cythera, whose worship had been introduced from Syria, and ultimately spread over Greece. The present inhabitants of the island are very badly educated, The number of priests is out of all pro- portion to the population, and no fewer than 260 churches or chapels have been counted. Spiridion Vlandi, author of an Italian and Romaic lexicon, published at Venice in 1806, is one of the few Cerigotes who have made appear- ance in literature. In 1857 the total population was 13,256, the excess of females being 1028; it appears now to number about 10,000. Ata very early date Cythera was the seat of a Pheenician settlement, established in connection with the purple fishery of the neighbouring coast. For a time dependent on Argos, it became afterwards an im- portant possession of the Spartans, who annually despatched a governor named the Cytherodices. In the Peloponnesian War, Nicias occupied the island, and in 393 it was captured by Conon the Athenian. By Augustus it was bestowed on Eurycles. Its modern history has been very much the same as that: of the other Ionian Islands; but it was subject to Venice for a much shorter period—from 1717 to 1797. See the works referred to under CEPHALONIA.

CERIGOTTO, an island of Greece, belonging to the Ionian group, and situated between Cerigo and Crete in 35° 50’ N. lat. and 23° 20’ E. long. It was anciently known as gilia, and is now called by its inhabitants Lius. With an area of about 10 square miles it supports a population of about 300, who are mainly Cretan refugees,

and in favourable seasons exports a quantity of good wheat. It was long a favourite resort of Greek pirates,

CERINTHUS was the founder of one of the earliest heretical sects of the Christians. He was brought up in Egypt (Theod. Her, Fab. ii. 3), but removed to Asia Minor, where he propagated his doctrines. He flourished, according to Eusebius (27st. £ccl. iii. 28) in the time of Trajan (98-117). Irenzeus relates a story which repre- sents him as a contemporary of the apostle John (Contra Her, iii. 3, 4). He says that John, the disciple of the Lord, when in Ephesus went to bathe, and when he saw Cerinthus inside, he leapt from the bath without bathing, erying out, " Let us flee, lest the bath fall, for Cerinthus the enemy of the truth is within." TIrensus heard this story from some people who heard it from Polycarp, who may have heard it directly, or more likely at second-hand, from some of the friends of St John. The same story is told in regard to Ebion, but not on so good authority. We know nothing of the death of Cerinthus.

We possess three different authorities for the opinions of Cerinthus, to some extent inconsistent with each other,— Irenzeus, Caius the Roman presbyter, and the third unknown. Lipsius has tried to prove that the third was Hippolytus,

According to Irenzus (Contra Her. i. 26), Cerinthus taught 'that the world was not made by the supreme God, but by a certain power which was separated and distant from the supreme authority, which is over all, and which was ignorant of the God over all." He also maintained "that Jesus was not born of a virgin, but was the offspring of Joseph and Mary, born like all other human beings, and that he was juster and wiser and more prudent than all." He affirmed also " that after his baptism the Christ came down into him in the form of a dove from the Lord, who is above all, and that then he proclaimed the unknown Father and performed miracles, but towards the end the Christ flew away from Jesus, and that Jesus suffered and was raised up, but that the Christ remained impassible, being spiritual." The same information is given in the treatise Zhe Refutation of Heresies, first ascribed to Origen, and now to Hippolytus (lib. vii. c. 33), in the very words of Irenzous, and the writer repeats it in his summary (x. 21), with the addition that it was by an angelic power that the world was made. Irenzus

(iii, xi. 7, see also Jerome, De Viris JU. c. 9) also informs us that the gospel of St John contained statements which were specially intended to remove the error of Cerinthus, and of the Nicolaitanes who held the opinion before him, that the maker of the world and the supreme God were different.

From Caius the Roman presbyter our information is as follows. '"Cerinthus, by means of revelations which pretend to be written by a great apostle, speaking falsely, introduces wonders which he speaks of as if they had been shown to him by angels, saying that after the resurrection the kingdom of Christ was to be on earth, and that again men in bodily form would live in Jerusalem and be subject to lusts and pleasures. And being an enemy to the Scriptures, and wishing to lead astray, he affirms that a thousand years will be spent in marriage feasting" (Eus. Hist. Hecl. iii, 28). It is plain from this passage that Caius derived his opinion of the character of the millennium in which Cerinthus believed from the revelations which Cerinthus wrote in the name of a great apostle. Dionysius, bishop of Alexandria, affirms that some maintained that the Apocalypse was not the production of the apostle John, not even of a saint, but of Cerinthus, who established the sect called Cerinthian from him, and who wished to give a respectable name to his own fiction (Eus. Hist. Eccl. vii. 25). The context proves conclusively that Dionysius refers specially to Caius, whose words he partly quote

and partly paraphrases. The paraphrase shows how easy it is to invent a discreditable character and doctrine for a heretic. He says that Cerinthus believed 'that the kingdom of Christ would be on earth, and that being fond of the body and altogether carnal, he dreamt that he would revel in these delights for which he longed—the satisfaction of the stomach and the parts below it, that is, in foods, and drinks, and marriages, and the means by which he thought that he could more decently procure these, namely, feasts and sacrifices and the slaying of victims." It is barely possible that Dionysius may have had access to other sources of information than the state- ment of Caius, but the probability is all on the other side. He was a determined antagonist of millenarianism, and was prepared to see gross sensuality in the adherents of the doctrine ; but there is no good evidence that Cerinthus was sensual. We cannot even affirm that he was a

millenarian, for Caius evidently formed his opinion on this matter in consequence of his belief that Cerinthus wrote the Revelation ascribed to St John—a belief which others seem to have shared with him (Epiph. Heer. li., 3).

Our third source is not extant in its original form, but is to be traced in Epiphanius (//fer. xxviii.), and in almost all the Latin writers on heresy contained in Oebler's first volume of his Corpus Heresiologicum, but most markedly in Philastrius (c. 36) and Pseudo-Augustinus (c. 8). According to Irenzeus, Cerinthus carefully distinguished between the historical man Jesus and the xon Christ. This source evidently represented Jesus and Christ as the same, and it was the descent of the Holy Ghost after his baptism that rendered Jesus Christ capable of performing miracles, Jesus Christ was the son of Joseph and Mary, and was for the short time of his ministry miraculously eudowed through the descent of the Holy Ghost, but the Holy Ghost left him before he suffered, and he died and did not rise again, but will rise again when the general resurrection takes place. _

Cerinthus, according to these authorities, affirmed that the world was made by angels, and that the law and the prophets were given by one of the angels who made the world. Philastrius thus sums up the other features of the heresy. " He taught circumcision and the observance of the Sabbath … He does not receive the apostle Paul, he honours Judas the traitor, he receives the gospel accord- ing to Matthew, he despises three gospels, he rejects the Acts of the Apostles, he blasphemes the blessed martyrs." Epiphanius makes him accept only a portion of the gospel of St Matthew. He thinks that he was one of those Judaic Christians referred to in Acts xv. 24, that he also found fault with the apostle Peter for going to Cornelius (Acts xi. 3) and created a commotion against Paul in connection with Titus (Acts xxi. 28), and that St Paul alludes to a practice of Cerinthians in noticing baptism for the dead.

Most of these statements are probably incorrect, and some of them are to be rejected without hesitation for chronological reasons. Some of the writers mention a Merinthus, who was either the same as Cerinthus or was confounded with him. It is likely that this is not the only confusion in these accounts, and we may well doubt whether either Justin or Hippolytus could

be the source from which they were drawn, or that the account contained in it was more accurate than that of Irenzeus.

Cerinthus is mentioned in nearly all the historians of early Chris- tianity, but special reference may be made to Lardner's works, vol. viii. (Kippis's edition) ; Mansel's Gnostic Heresies (London, 1875) ; Lipsius's ''Gnosticismus," in Ersch and Gruber, p. 257 ; his Zur Quellenkritik des Epiphanios (Vienna, 1865), p. 115, and his Die Quellen der dltesten Ketzergeschichte (Leipsic, 1875), p. 89; and Adolf Harnack's Zur Quellenkritik der Geschichte des Gnosticismus (Leipsic, 1878), p. 46. (J, D.)

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CERRETO, a town of Italy, in the Neapolitan pro- vince of Benevento, on the Cusano. It is well-built, is agreeably situated on the slope of Monte Matese, and has a fine cathedral, collegiate church, and seminary. With Telese it forms the see of a bishop. There are several cloth manufactories, and excellent wine is produced in tho neighbourhood. The town suffered greatly from the plague in 1656, and from an earthquake in 1688. Popu- lation, 7000.

CERRO DE PASCO, a town of Peru, in the department of Junin, on the table-land of Bombon, 14,280 feet above sea-level. The houses are ill-built, and there are no public buildings of importance. Living is dear, the neighbourhood is unfertile, and the climate iscoldandstormy. The silver mines, discovered in 1630, are numerous, but not so pro- ductive as in past times. Population, consisting chiefly of Indians and a mongrel race, about 13,000.

CERTALDO, a market-town of Tuscany, on the right bank of the Elsa, in the province of Florence, and 15 miles south-west of that city. It was the birthplace of Boccaccio, whose house, repaired in 1823 by the Marchesa Lenzoni Medici, is still to be seen. One of the rooms contains, besides some of the ancient furniture, the remnants of the poet's tomb, his autograph, and his picture. Not far from the house stands the Church of St Michael and St James, from which Boccaccio's remains were removed in 1783. In December 1875 a monument to his memory was erected by the authorities

of the town. The older part of Certaldo is on the summit of a steep and conical hill, and contains the building which was once the strong- hold of the Counts Alberti, the lords of the place before it became subject to Florence. There also dwelt the vicars of Certaldo, who ruled the town and district for Florence, ti]l the reign of the reformer Peter Leopold. The new burgh is situated along the course of a road that skirts the foot of the hill. Population about 2000.

CERVANTES-SAAVEDRA, Micuet pe (1547-1616), the author of Don Quixote, was born at Alcala de Henares, the ancient Complutum, a small town in the province of New Castile, in 1547. The day of his birth is not known, but as he was baptized on the 9th of October it is conjectured from his Christian name that he was born on St Michaelmas day preceding. The place of his nativity also remained in doubt until the year 1748, when Don Juan de Yriarte found in the Royal Library of Madrid a manuscript entitled La Verdadera Patria de Miguel de Cervantes, written by the learned Benedictine Martin Sarmiento. Till then seven cities, Madrid, Seville, Lucena, Toledo, Esquivias, Alcazar de San Juan, and Consuegra, had contended for the honour of being his birthplace, although in the Topography of Algiers, by Father Heedo, published in 1612, mention was made of

Cervantes as a native of Alcal4é de Henares, and the Birth at genealogist Mendez de Silva, in his tract on Nuiio Alfonso, Alcala de published in 1648, had also spoken of him as a noble ie

Castilian gentleman of the same town. All doubts on the : subject, their long ignorance as to which is one of the many proofs of the carelessness with which the Spaniards have treasured what belongs to the memory of their illustrious countryman, were finally resolved by the discovery of the petition for an inquiry into his conduct at Algiers addressed by Cervantes to the Government in 1580. The family of Cervantes, which had for some generations attached to their patronymic the name of Saavedra, was of respectable if not noble origin. The patriotic zeal of some later biographers has even claimed for it affinity to the royal blood of Castile. The cradle of the race was Galicia, from which province the ancestors of Cervantes emigrated at an early date. Members of the family accompanied Ferdinand

III. on his expedition against the Moorish kingdom of Seville and obtained a share of the conquered territory. The grand-

Karly works.

Journey to Rome.

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father of Miguel was Juan de Cervantes, a knight of some distinction, who held the office of corregidor of Ossuna at the beginning of the 16th century, His son Rodrigo married in 1540 Leonora de Cortinas, a lady of Esquivias, of birth equal to his own but, it is presumed, of no greater fortune. There were four children of the marriage, two sons, Rodrigo and Miguel, and two daughters. Although ranking themselves with the Aidalgos, the parents must have been, at the birth of their younger son, in humble circumstances. The biographers have been able to glean but few details of the early life of our hero, and for these they are indebted almost entirely to the chance allusions in Cervantes's own writings. He studied grammar and the humanities under a master of some repute, Lopez de Hoyos, aud, according to a doubtful tradition, spent two years at the university of Salamanca, residing in the Calle de Moros. That he received a fair education according to the standard of the age, and had an extensive though not exact knowledge of classical and general literature, his works bear witness. When a boy he describes himself as having attended the representations of the first regular company of Spanish actors under Lope de Rueda, the founder of the dramatic art in Spain. Upon the occasion of the magnificent obsequies held in honour of Isabel de Valois, the wife of Philip IL, in 1568, the most advanced scholars of Lopez de Hoyos competed in the literary exercises, in Latin and in Spanish, which formed part of the funeral ceremony; and chief among the victors was Miguel de Cervantes, who is mentioned by his master in the most affectionate and laudatory terms as his "dear and beloved pupil." These compositions, among which were sonnets, letrillas, and edondillas, have perished, together with many of the early poetical essays of their author, probably with no loss to the world or to his reputation. In his Journey to Parnassus Cervantes speaks of these effusions of his youthful muse with characteristic modesty and candour, averring that "from his tenderest years he had loved the sweet art of poesy,' and had composcd

endless ballads and sonnets, good and bad, but confessing with a touching humility that Heaven had not granted him the poet's grace. Among the last works belonging to this period, of which their author speaks with more complacency, was Jilena, a pastoral poem, esteemed sufficiently good by his contemporarics to earn for the author a place among the multitude of those who wrote themselves poets in that fruitful harvest-time of Spanish literature,

In 1568 there came to Madrid—charged with a message of condolence from the Pope to Philip IL, on the death of his son Don Carlos, and with sundry complaints respecting default of allegiance to Rome—the Cardinal Acquaviva, who, though only in his twenty-fifth year, had already earned a name for culture and a good disposition to letters. With him Cervantes took service as a camarero or page,— an employment held to be no humiliation in that age even to young men of noble birth,—returning in the suite of his patron to Rome by way of Valencia, Barcelona, and the south of France. Apparently the post was not to the taste of one in whom the sight of Italy—then for the greater part a fief of Spain—awakened more of warlike than of poctic ambition. In the beginning of 1570 the cardinal's page exchanged his livery for the soldier's uniform, enlisting in the company of the famous Captain Don Diego de Urbina of the regiment of Don Miguel de Moncada. It was the period when the military glory of Spain was at the highest, and the profession of arms the surest road to advancement. The first campaign of Cervantes was made at sea, his regiment being engaged in the expedition which, in the summer of 1570, under the orders of the Papal general, Marco Antonio Colonna, made an ineffectual attempt to relieve the Island of Cyprus, then

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hotly besieged by the Turks. The capture of Nicosia by the Mahometans, and the fall of the island, which spread consternation throughout Christendom, gave rise to the memorable Holy League against Selim II. Through the exhortations of the Pope, Pius V., Spain and Venice were induced to lay aside for a time their old dissensions and to unite with Rome in an attempt to bridle the Ottomans, then in the flush and vigour of their genius. The pact between these Christian powers was formally ratified on

the 25th of May 1571, the confederates binding them- selves to “make perpetual war” not only against the Turks but against the Moors of Algiers, Tunis, and Tripoli.

The armament provided—the expenses of which were distributed among the three states in the proportion of three-sixths to Spain, two-sixths to Venice, and one-sixth to Rome—was to consist of 200 galleys of war, with 100 store-ships, 50,000 infantry, 4500 light horse, and a suffi- cientsupply of artillery and ammunition. The generalissimo whom the unanimous voice of the allies called to the command of this fleet-—the most formidable which had ever been assembled in the Mediterranean—was Don John of Austria, the natural son of Charles V., then in his twenty-fourth year,—a youth not more recommended by his near connection with the Spanish king than by his brilliant talents, amiable character, and great popularity. The mutual jealousies and fears of the allied princes, and the hesitation of Philip II. to entrust so important a com- mand to his half-brother, the object of his secret envy and distrust, caused many delays in the assembling of the Christian forces, and gave the Turks ample time for prepara- tion. The armada, after rendezvousing at Messina, put to sea finally in quest of the enemy on the 15th of September. The company in which Cervantes still served as a private soldier was embarked in the galley ‘‘ La Marquesa,” com- manded by Francisco San Pietro. After relieving and provisioning Corfu, Don John came up with the Turkish

fleet on the 7th of October, drawn up in order of battle in Battle of The Christians advanced in three Lepanto,

the Gulf of Lepanto. divisions, their right commanded by the Genoese admiral, Juan Andrea Doria, the centre under Don John himself, and the left under Agostino Barbarigo, the Venetian Proveditore ; the Marques de Santa Cruz, with his squadron, being in reserve. The “ Marquesa” was on the left wing, having on board Miguel de Cervantes, who lay in his cabin ill of a fever. On coming into action, his ship being in the van of the squadron, Cervantes’s captain and comrades besought him to remain quietly in his bed, but he, according to the sworn testimony of ear-witnesses, asked them what would they think of him if he did not do his duty, and declared his resolve to die fighting for God and his king, rather than remain under

shelter and take care of his health. Huis entreaties to be allowed to share in the fighting having been granted, Cervantes was stationed with twelve soldiers under his command in what was reckoned the post of greatest danger, namely, in the boat which hung by the galley side, most exposed to the enemy's fire. Hero he performed his part in that glorious day's work so valiantly as to attract the notice of his commanders, even of Don John himself. The vessel immediatcly opposed to the '" Marquesa" was the galley of the Capitan Pasha of Alexandria, who commanded on the Turkish right, bearing the royal standard of Egypt. After a stubborn resistance, and the slaughter of 500 of her crew, she was compelled to surrender, her fate involving the flight or capture of the entire squadron, and contributing materially to the final defeat of the Turks. On their right wing the Christians were less successful,—Marco Antonio Colonna having to encounter the celebrated renegade, Uluch Ali, a sea-captain of great skill and experience, to whose good conduct and abilities Cervantes himself, with characteristic generosity,

bears witness. The issue was highly honourable to the allied arms. The victory at Lepanto, though barren of results, and spoilt by the contentions among the Christian leaders, broke the spell of Turkish invincibility at sca, and is to be reckoned among the most glorious feats of arms ever performed by Spain when at the zenith of her greatness. In this battle, to the remembrance of which he ever fondly clung, which he loved to speak of as the proudest event of his life, Cervantes was severely wounded—receiving two gun-shot wounds in the chest and one in the left hand, which was maimed and rendered useless "for the greater glory of the right," as its owner said, holding this defect ever after to be his greatest ornament. Lepanto was to Spain what Salamis was to Athens. All Europe rang with the fame of "the man sent from God whose name was John," accord- ing to the fervent exclamation of the grateful Pope when he heard the news of the victory; and the exploits of Doria, Colonna, and Santa Cruz were on all men's tongues. But while generals and admirals are now forgotten, it is a striking evidence of the power of genius to override even the traditions of patriotism and of warlike glory that of all the memories which survive of this once renowned day, that which remains green and flourishing is of the

private soldier who fought in the “ Marquesa,” of him whom his countrymen love to designate as Hl Manco de Lepanto. It would be absurd to attribute to the single arm of Miguel de Cervantes any appreciable share in the event of that day, but making all allowances for the partiality of his biographers, there can be no reason to doubt that Cervantes did earn a very extraordinary amount of renown for his behaviour in the battle. As a private soldier he was not debarred, according to the fashion of the times, from receiving from his superiors those marks of consideration due to men of good birth and breeding; yet the extra- ordinary favours bestowed on him by Don John and the other leaders, the letters of credit which they gave him on his return to Spain, the numerous references to him by his contemporaries, and the influence he afterwards exercised among his fellow-captives at Algiers, are sufficient to prove that at this early period of his life Cervantes had attained to much distinction over and above what he had won as a man of letters.

After the battle of Lepanto the lateness of the season compelled Don John to return to Sicily, leaving the Turks leisure to recover from their losses and to recruit their strength. The wounded were tended at Messina, among whom Cervantes was visited in the hospital by Don John in person, receiving upon his recovery a special increase of pay to the amount of three crowns a month. From the company of Moncada our soldier was now transferred to that of Don Ponce de Leon, in the Zercvo de Figueroa, the most distinguished of all the Spanish regiments of that period—of that famous infantry which sustained the Spanish dominion over half Europe, making, in the words of the chronicler, “ the earth tremble with their mus- kets.” The further enterprizes of the League at sca were checked by the growing dissensions between Spain and Venice, and also by the quarrel now on foot between the former nation and its old rival France. The jealousies between the confederate princes extended to their com- manders, and it was in vain that Don John urged upon his allies the necessity of striking another blow at the Turk ‘Service = before he had time to repair his shattered forces. It was

against the not until the 9th of August 1572, that the Christian fleet Turks, again set sail for the scene of its great exploit of the year previous. In this second campaign, through the supine-

ness of the leaders, perhaps from some incapacity of the generalissimo, scarcely fitted by age or force of character to

. control so vast and incongruous a host, but chiefly from the superior skill and vigilance of the Turkish commander-

in-chief, a post now held by Uluch Ali, the armada did nothing more than make a feeble demonstration against the enemy's fleet, which was found at anchor in Navarino Bay. Cervantes, who has given a minute account of this inglorious affair in his story of the captive in Don Quixote, served in this expedition in the squadron commanded by AntonioColonna. Returning to Messina to winter, thearmada was next year dispersed in consequence of the dissolution of the Holy League, the Venetians having concluded a separate peace with the Turks. In 1573 Cervantes took part im the expedition of Don John against Tunis and in the capture of the Goleta—his wounds being still unhealed, as we learn from his letter to Mateo Vasquez. That winter he was in garrison in Sardinia, and in the next spring in Lombardy, being ordered to Messina in August 1574, and thence to Naples. On the 15th of June 1575 he obtained leave of the viceroy, the Duke de Sesa, to visit Spain, and thus ended the first portion of his military career, with small profit but with much honour. During his five years' active service by land and sea, however, Cervantes had acquired that knowledge of men and life which was so useful to him in after years. He had visited the most famous cities of Italy, and had stored his mind with impressions of her art and literary culture, traces of which are to be found in all his writings, even to the extent of making him liable to the charge of introducing Italian idioms into his style. Of his intercourse with Italian men of letters there is no evidence, though his works furnish abundant testimony of his familiarity with the best models of Italian literature. That he had won the respect and esteem of his commanders as a good soldier is proved by the highly flattering letters which he received from Don John, re- commending him to the king for promotion as a man of singular merit and of great services ; also from the viceroy of Naples, speaking of him as a worthy but unfortunate soldier who, "by his noble virtue and temper, had secured the good will of his comrades and officers." Furnished with these letters, which in the event were to prove

to him so fatal a possession, Cervantes, with his brother Rodrigo, embarked at Naples in the galley “ El Sol.” On the 26th of September, when off the-coast of Minorca, his vessel fell in with a squadron of Algerine cruizers under the command of the dreaded pirate captain, Arnaut Mami, Attacked by three of the enemy’s ships, the Spanish galley, after an obstinate resistance, in which Cervantes bore a conspicuous part, was forced to surrender Capture to overwhelming odds, and was brought in a prize to by the Algiers. On the division of the prisoners Cervantes fell to 4!serines. the lot of Déli Mami, a Greek renegade, noted for his ferocity and greed among the Algerines. The lctters of Don John and the viceroy of Naples found on this Spanish soldier served but to mislead his captors as to his true rank, and therefore to stimulate their cupidity and to aggravate his sufferings. Being supposed to be able to purchase his liberty at a high price, Cervantes was guarded with special care, and that he might be induced the more quickly to ransom himself, he was loaded with chains and treated with extraordinary rigour. According to the testimony of Father Heedo, in whose curious and impor- tant work onthe Yopography of Algiers, published in 1612, we have the most valuable authority for this period of Cervantes’s life, and who was an eye-witness of the cruelties practised in this pirates’ den upon the Christian slaves, the captivity of Cervantes was one of the hardest ever known in Algiers. It was borne with a courage and constancy which, had there .been nothing else to make his name memorable, must have sufficed to rank Cervantes among the heroes of his age and country. No episode more romantic is contained in the books of chivalry, No adventures more strange were encountered by any knight-_

errant. Not Amadis nor Esplandian, nor any of those whose fabled deeds had kindled his youthful imagina- tion displayed a loftier spirit of honour or more worthily discharged his knightly devoir than did Miguel de Cer-vantes when in duresse at Algicrs. A slave in the power of the bitter enemy of his creed and nation, cut off in the hey-day of his fame from the path of ambition which fortune seemed to have opened to him, no lot could be more cruel than that which in the prime of his manhood and genius fell to

our hero. Nor is there any chapter of his life more honourable than the record of the singular daring, fortitude, patience, and cheerfulness with which he bore his fate during this miserable period of five years, With no other support than his own indomitable spirit, forgotten by those whom he had served, unable to receive any help from his friends, subjected to every kind of hardship which the tyranny or caprice of his masters might order, pursued by an unrelenting evil destiny which seemed in this, as in every other passage of his career, to mock at his efforts to live that high heroic life which he had conceived to him- self, this poor maimed soldier was looked up to by that wretched colony of Christian captives, including among them many men of higher birth and rank, as their chief counseller, comforter, and guide. In the formal informa- tion laid before the commissary of the Spanish Govern- ment at Algiers, Father Juan Gil, of the order of the Redemptorists, very particular testimony is borne by Cervantes's fellow-captives to his character and conduct, as one who bore himself always as a faithful Christian, who cheered those who were despondent, who shared with the poor the little which he possessed, who helped the sick in their necessities, who risked every danger in the cause of the faith, behaving himself always like a true soldier of the king anda noble gentleman,—all which good record is confirmed by the honest father himself of his own per-sonal knowledge.

The captivity of Cervantes in Algiers lasted five years, during which period he never ceased to plot schemes of deliverance, which, however daringly conceived and skil- fully planned, were doomed to be always foiled by accident or by treachery. On such occasions he was invariably the first to come forward to shield his associates and to take the whole blame upon himself, rendering himself liable to the barbarous punishments then inflicted by the Algerines upon such of their slaves as sought to escape from their chains. 'Twice was Cervantes brought into the king's presence, with a rope round his neck, to be hanged. Once he was ordered two thousand blows with a stick, the penalty being remitted at the last moment only through the prayers of the other captives. 'The king or viceroy of Algiers at this time was Hassan Pasha, a Venetian renegade, whose name was a terror throughout Christendom. Cervantes himself in Don Quixote calls him " the worst of the apostate race," and "the homicide of human kind." Heedo pronounces him "the most cruel tyrant of all those who have been kings in

Algiers.” Over this monster, who had purchased Cervantes from Déli Mami for 1500 crowns, our hero seems to have exercised an extraordinary influeuce. Though repeatedly menaced with death in the most horrible forms, and condemned to witness the torture and mutilation of his companions, Cervantes never actually suffered any ill-treatment in person, beyond being fettered, nor was ever abused by an ill-word, as he himself has borne testimony in Don Quixote. For this exceptional immunity it is not easy to account, even on the theory that his master took him fora person of greater conse- quence than he really was, and we must attribute it to the extraordinary influence acquired by Cervantes over the other captives, and to the respect engendered by his magnanimity and daring. Hassan Pasha, accordi ng to Heedo,

was wont to say that “could he keep hold of that maimed Spaniard he would regard as secure his Christians, his ships, and his whole city.” Hassan Pasha’s fears were not wholly unwarranted, although the object of them was but a simple soldier, for Cervantes had conceived the design of a general rising of the captives in Algiers and the seizure of the city. “And assuredly,” says Hedo, “the plan would have succeeded, and Algiers would have been Chris- tian, if his fortune had corresponded to his courage, his zeal, or the greatness of the undertaking.” From the dun- geons of Hassan Pasha Cervantes wrote to Mateo Vasquez, the secretary of Philip II., suggesting the enterprise as one befitting the arms of his royal master; nor was it so des- perate as might appear, seeing that the number of Chris- tian captives in that day was nearly 25,000. Philip, how- ever, was then too much occupied in the conquest of the Christian kingdom of Portugal to bestow any attention on the daring project of Cervantes.

In the meantime, while the captive was wasting his heart away in chains and in fruitless struggles for liberty, his friends in Spain were not neglectful of his condition. His family were too poor to be able of their own re- sources to raisc the sum demanded by Hassan Pasha for his ransom. At the prayer of his brother Rodrigo an official investigation was held upon the conduct of Cer- vantes and the circumstances of his captivity, and at the solicitation of the father and mother, the Duke de Sesa wrote a strong letter

to King Philip on behalf of the soldier of Lepanto, recounting his services and entreating his majesty's assistance. No other response, however, was vouchsafed to this and other petitions which were ad- dressed to the Court by Cervantes's mother (his father being now dead), save a gracious permission to Dofia Leonora, dated the 17th of January 1581, to export licensed goods from Valencia to Algiers, to the value of 2000 ducats. The profit in this venture was only 60 ducats, The widow and her daughters having raised 300 more, a sum of 500 ducats was made up with the assistance of friends, and entrusted to the hands of Father Juan Gil, the Redemptorist, who embarked for Algiers in May 1580. Hassan Pasha, however, would abate nothing of his demand, which was 1000 ducats, and threatened to take Cervantes with him to Constantinople, whither he was now recalled on the expiration of his term of govern- ment, Cervantes was actually embarked and chained to his place at the oar, when, finally, through the pious zeal of the good friar Juan Gil, aided by the liberality of some Christian merchants of Algiers, the sum required was made up. After a little delay in Algiers rendered neces- sary to clear himself of some false accusations made against him by his old enemy, Blanco de Paz, Cervantes had at last the joy of arriving, after a long captivity, safe and sound in his native country, landing in Spain towards the close of the year 1580.

The captivity in Algiers is worthy of more study than it has received from Cervantes's biographers. Not only did it turn the whole current of his life and influence all his subsequent career, but in it, as the period of his darkest adversity, may be discovered no little of the material on which his character, and even his literary work, was founded. In the hard school of an Algerine bagnio, amidst chains and misery and the constant sight of death in its most appalling forms, were learnt those lessons of humanity which, controlling his heroic spirit and temper- ing his romantic fancy, were turned to so memorable a use in Don Quixote. Like him of La Mancha our knight had started in his life's adventure with a mind nursed in the glowing visions of chivalry, impatient of wrong-doing, eager for the good, full of faith in manhood, and quick to believe in the ideals of honour which his imagination had

Ransom and return to Spain.

Battle of Terceira.

CERVANTES

conceived. He found himself amidst a generation which cared for none of these things, confronted by the stern realities of a commonplace age, tossed about and buffeted in a world in which chivalry had become already an anachronism. There is no need for us to search for the key to the parable of Don Quixote, knowing the life of the author ‘The experience was a bitter one, suchas no man of letters ever had to endure; but from the long ordeal, which ended only with his life, Cervantes emerged sweet- ened and strengthened. The gay courage which was the essential attribute of his nature, the dauntless good humour—

‘* That ever with a frolic welcome took The thunder and the sunshine,”

had to survive even greater trials than the five years’ slavery in Algiers. On his return to Spain Cervantes was destined to taste of miseries compared to which even the cruelty of Hassan Pasha was kindness. His services, his works, his sufferings, were all forgotten. His absence of five years from the scene had been long enough to erase from the memories of the king and the Court the gallant soldier who had fought and bled at Lepanto. In 1580 Philip II. was marching his army into Portugal, and Cervantes rejoined his old regiment of Figueroa, in which his brother Rodrigo was also serving. The next year we find him engaged in the expedition against the Azores, where the partizans of Dom Antonio, known to history as the Prior of Ocrato, the rival claimant to the Portuguese throne, were holding out with the assistance of England and France. On the miscarriage of this enterprize through the dissensions between the military and naval cominanders, the fleet returned to Lisbon, The next year it took the sea again under the command of Don Alvaro de Bazan, Marqués de Santa Cruz, celebrated by Cervantes in Don Quixote as ‘that thunderbolt of war, that father of his soldiers, that fortunate and invincible captain.” In the victory gained by Santa Cruz over.the allied squadrons off Terceira, on the 25th of July 1582 —one of the most brilliant achievements in the annals of the Spanish navy — Cervantes took a part, being on board the admiral’s galleon, the “San Mateo,” which bore the brunt of the fighting. It was not until the year following, however, that the Azores were finally reduced, Rodrigo

Cervantes distinguishing himself greatly in the storm of Terceira. During his service and residence in Portugal, of which country and its people he ever spoke with a kindliness rare among Spaniards, Cervantes had some passages of love with a noble Portu- guese lady, who bore him a daughter, Isabel, his only child, the object of her father's tenderest affection and a sharer in all his troubles till his death.

Of the next few years the record is a brief one. To- wards the last months of 1583 we hear of Cervantes being at Mostagan, a Spanish post on the Algerine coast, pro- bably still with his regiment, whence he was sent with despatches to the king, by whom he was ordered to return toOran. He does not seem to have been employed again in any official capacity, and perhaps from this time he began to despair of that military preferment to which his services had given him so just a claim. Even if it were possible for one in his station to attract the personal notice of the king, we could not expect that such a man as Philip should recognize the merit of the future author of Don Quzxote, nor could the morose tyrant who grudged the glory of Lepanto to his brother be particularly well disposed to one whose chief title to remembrance was his share in that victory. By the end of 1583 Cervantes appears to have quitted the profession of arms and returned to litera-

Publication ture, being now in his thirty-sixth year. About this time of Galatea. he wrote Galatea, a prose pastoral interspersed with lyrics,

inspired, according to the tradition, by love of the lady he

ool was then courting, and who became his wife. Dedicated to Ascanio Colonna, son of Marco Antonio of that name, Cervantes's old commander, it appears to have been favour- ably received, and is not more unreadable than the books of that class so happily ridiculed by Cervantes himself in the 73d chapter of the second part of Don Quixote. As the author himself frankly informs his readers, his "' shepherds and shepherdesses are many of them only such in their dress." Their names of Lauso, Tirsi, and Damon are but the grotesque disguises of celebrated poets of the time and friends of Cervantes—in Galatea being pictured his future wife and in Elisio himself. They talk high- flown sentiment and make stilted love after the manner of the school of Gil Polo in his Diana Enamorada, nor is their talk more insipid than is usual to the pastoral profession in fable. There is no better criticism

of the book than that which Cervantes himself has given through the mouth of the priest in the scrutiny of Don Quixote's library. "What book is that?" "The Galatea of Miguel de Cer- vantes," said the barber. 'Tis many years since he has been a great friend of mine that Cervantes, and I know that he is rather versed in sorrow than in poetry. This book has some invention ; it proposes something, and it concludes nothing ; it behoves us to wait for the second part which he promises. Perhaps with his amendment he will obtain that entire pardon which is now denied to him ; in the meantime, gossip, keep him a recluse in your cham- ber," This second part never appeared, perhaps with no loss to the author's reputation. «Poor as the verse is in Galatea, it secured for Cervantes a place among the chief poets of the age, and there is evidence to show that it was held in esteem, even out of Spain, before and after the appearance of Don Quixote.

On the 12th of December 1584 Cervantes added to his Marriage.

happiness if not to his fortune by a marriage with Dofia Catalina de Palacios Salazar y Vozmediano, a lady of good family of Hsquivias. The settlement on his wife of a hundred ducats, supposed to be one-tenth of his estate, and the inventory of his effects taken at this time, among which are included '45 hens, some chickens, and a cock," prove that the bridegroom was in but indifferent circuni- stances, even for a poor hidalgo of the time. Of the lady the records give us scarcely a glimpse, and indeed for some years after his marriage the life of Cervantes is wrapt in obscurity. All that is known is that he wrote poetry, and won many friends among the poets by his good nature and genial humour.

comedies, of which only two survive, Za Mumancia and Lil Trato de Argel. here seems to be no reason to doubt Cervantes's own statement that asa playwright he gained considerable applause, and it has been proved that the payment he received was quite as high as that given to Lope de Vega. August Schlegel has assigned high rank to La Numancia as one of the most striking and original of modern tragedies, and La C'onfusa, a comedy now lost, is spoken of with much complacency by its author. The gifts of Cervantes, however, were not those of the dramatist, and such fame as he had begun to win paled before the rising star of that "monster of nature," Lope de Vega. Once more disappointed in his hopes of a livelihood, and

having now to support his wife, his widowed sister, and his natural daughter, Cervantes was forced to seek for bread by other means than literature. For twenty years— the darkest period of his life—he ceased to write, or at least to publish. The poor crippled soldier had to drink of a cup even more bitter than loss of liberty among the Moors. A veil hangs over this portion of his career, which his countrymen, for their own sake no less than for his, are not too eager to lift, hiding, as it is only too certain

He wrote for the stage also for a Dramatic living, producing between twenty and thirty plays, chiefly ¥°T*-

Commis- sary at Seville.

O07

that it does, penury, rags, almost beggary, misery of every kind except shame. ‘Throughout all these trials what is known of Cervantes proves him at least to have re- tained undimmed his cheerfulness of spirit, his rare sweet- ness of disposition and faith in humanity, “as one in suffering all that suffers nothing.” In 1588 he is found at Seville filling the humble place of a commissary under Don Antonio de Guevara, the Proveédor-General of the Indian fleets. In this capacity he had to assist in the victualling of the Invincible Arinada, and documents pre- served in the archives of Seville prove his activity in the purchase of grain, oil, and wine among the villages of Andalusia,—gleaning, besides naval stores, much of that knowledge of life and character of which he afterwards made such admirable use. In 1590 he petitioned the king for employment in the Indies, minutely recapitulating his past services, and naming four offices then vacant as those he was qualified to fill—the accountantship of New Gra- nada, that of the galleys of Carthagena, the government of the province of Socomusco, in Guatemala, and the corre- gidorship of the city of La Paz, The petition was coldly received and bore no fruit, for which perhaps the ingrati- tude of the Government was not wholly to blame. The habits of unthrift and restlessness which he had acquired as a soldier, together with such weaknesses as were the natural defects of his virtues of extreme good nature and easiness of disposition, must have unfitted him to some extent for the sober pursuits of civil life ; and Cervantes himself seems to hint, in a passage in Don Quixote, as well as in his Journey to Parnassus, at some

imprudence which contributed to spoil his advancement. He continued for some years to hold his poor place of commissary, residing chiefly at Seville. At a' poetical competition held at Sara- gossa in honour of the canonization of San Jacinto, in 1595, he was adjudged the first prize—three silver spoons. The next year, on the occasion of the sacking of Seville by the English under Essex, he wrote a sonnet, ridiculing with fine irony the behaviour of the Duke of Medina-Celi, who, having a large force at his command for the defence of the city, only appeared on the scene when the English had departed. Owing to the treachery and failure of an agent, through whom he had remitted to Madrid a sum of money, collected on account of the Government, Cervantes about this time became involved in a pecuniary difficulty, which continued to be a source of annoyance to him for some years, in addition to his other troubles. Being unable to repay the money at the king's mandate, he was cast into prison, but having succeeded in scraping together enough to reduce his debt to a few hundred reals, he was released after a few days' detention. Neither on this occasicn, nor on two subsequent ones when he fell under the cognizance of the law, was there left any stain upon his honour, nor any fault alleged beyond that of carelessness or undue trustful- ness. On the death of Philip IL, in 1598, his obsequies were celebrated at Seville with such extravagant pomp and grandeur of decoration as to awake the ridicule of Cervantes, who, never a lover of the defunct monarch, gave vent to his feelings in a sonnet which is one of the happiest of his lighter effusions in this which was his true vein in poetry. At this period the author, in spite of his poverty and mean condition, seems to have enjoyed the society and friend- ship of his countrymen most famous in literature and art, among others of the celebrated poet Fernando de Herrera and the artists Pacheco and Jaureguy, by both of whom his portrait was painted. He wrote and circulated in manu- script some of those novels which many years later he completed and published ; but like the poor poet whom he has described, half of his divine thoughts and imagina- tions were taken up in the study of the means of daily bread for himself and his family.

CHRVANTEE

The four years succeeding 1598 are wholly a blank in the life of Cervantes. Tradition assigns to this period the visit to a Mancha where occurred that

new trouble of which Don Quixote is supposed to be the vengeance. The story is, that Cervantes had a commission from the prior of St John to collect his tithes in the district of Arga- masilla, and that while he was employed in this ungrateful function the villagers set upon him, and after maltreating him threw him into prison, his place of imprisonment being a house still standing called La Casa de Medrano. Here, according to a general consensus of opinion, was conceived, if not written, the first part of Don Quixote, conformably to what the author says in the prologue of this " child of his wit" being 'born in a gaol."

In 1603 Cervantes is found living at Valladolid, among At Valla- the herd of starving soldiers and needy writers expectant of dolid,

preferment which' then filled the Court. The favours of Philip IIL, good natured and well-disposed to literature, were dispensed by the Duke de Lerma, then at the height of his power, whose haughty, cold, and selfish nature was little likely to see merit in Cervantes. Once more disappointed in his hopes of preferment, Cervantes was reduced to the utmost straits of poverty, eking out a living by business agencies and humble literary employment, such as writing petitions and correcting manuscripts, aided by such small gains as the ladies of his household were able to earn by the labours of the needle. By the beginning of 1604 he had completed the work which was destined to give him, if not bread, immortality. The First Part of Don Quixote, begun, ac- cording to internal evidence, before the death of Philip IT., was now ready for the press. The date is the same which the majority of Shakespearian critics have assigned to the first appearance of the second and perfect Hamlet; nor is this the only coincidence between the lives of these two great contemporaries. A patron being in that age as ne- cessary to an author as a publisher, Cervantes with some difficulty found one in the Duke de Bejar, a nobleman of high rank and honour, ambitious of the name of a Mecenas. The tradition which tells how the duke's scruples at con- necting his name with a book of so novel a character and equivocal a purpose were surmounted is probably well founded. Instigated, it is said, by his confessor, who scented heresy, or at least a dangerous humour, in this book with a strange name, the Duke de Bejar withdrew the promise of patronage he had given and would not accept Cervantes's dedication. The

author, however, begged hard for permission to read a chapter of his story before the duke, and pleased him so well that his objections were overcome.

next year the first part of Don Quixote was printed a Madrid by Juan de la Cuesta, and published by Francisco de Robles, to whom Cervantes had sold the copyright for ten years. The theory that the book was received coldly at first, so that Cervantes was induced to write a tract called Hl Buscapie, in order to attract the attention of the public to Don Quixote and to stimulate their curiosity by hinting that the characters and incidents were not wholly imaginary, must be rejected as unsupported by a tittle of evidence and wholly opposed to the facts. ‘There is no proof that any such tract as Zl Buscapie ever existed until Don Adolfo de Castro published in 1848 what all compe- tent Spanish critics have pronounced to be a clumsy and impudent forgery. There could be no reason for such a publication by Cervantes, seeing that Don Quixote was received by the great mass of the public with marked and singular applause. Although certain great literary per- sonages, and some of Cervantes’s own friends, from suspicion that they were included in the satire or from jealousy of his success, professed to sneer at the book because of its vulgar

The licence for publication was obtaincd on Publication

the 26th September 1604, and in the beginning of the of the first ¢, partof Don

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style, its unbecoming subject, and its bizarre title, there can be no doubt of the extraordinary popularity achieved by Don Quixote on its first appearance. No fewer than six impressions of the first edition of 1605 are extant, of which two were issued at Madrid, two at Valencia, and two at Lisbon. There had appeared up to that date no book since the invention of printing which had so many readers. ‘To that artificial age, reared in the insipid ex- travagances of the successors of Amadis, Don Quixote was as the dawn of a new revelation. The humour, equally simple and deep, the easy, careless grace of the narrative, the fine wisdom and tenderness, the true charity, of this book which professed to be a burlesque of the romances of chivalry, were qualities as rare as they were delightful in Spanish

literature. Even those who missed the allegory and were insensible to the satire could not but enjoy the story with its fresh and lively pictures of national life and character. That which has become, to use the phrase of Sainte-Beuve, “the book of humanity,” was no less successful in its age as a book of popular recreation. The author himself was probably amazed at his. own success. Like his great contemporary Shakespeare, while careful of his lesser works he seems to have abandoned his master- piece to the printers with scarcely a thought of his literary reputation. All the first editions of Don Quiwote swarm with blunders of the most extraordinary kind, proving that Cervantes could never have revised the printing, even if he had looked through his manuscript before committing it to the press. He is made to forget in one chapter what he had written in another. He confounds even the names of his characters, calling Sancho’s wife Theresa in one place and Maria in another—the very blunders of which he afterwards accused his enemy Avellafieda, He makes Sancho ride his ass immediately after it had been stolen by Gines de Passamonte, and bewail its loss when it had been recovered. He confounds time, place, and persons, and abounds in inaccuracies and anachronisms, to the distrac- tion of his readers, the perturbation of his critics, and the serious grief of his admirers. The style of this first part of Don Quixote, in spite of occasional passages of beauty which are among the modcls of the Castilian tongue, is loose, slovenly, and inartistic. Even in the second edition, published in 1608 and revised by the author, a great many patent blunders were suffered to stand, over which Cervantes himself makes merry in the second part. All this is unfavourable to the theory which some critics have formed that there was a purpose in the book other than what appears on the surface. There is no reason to doubt Cervantes’s own declaration, several times repeated, that in writing Don Quixote he had no other design than to destroy the credit of those romances of chivalry whose reading was so pernicious to the taste and morals of the age, and to furnish “a pastime for melancholy and gloomy spirits.” The idea of Byron that Cervantes ‘‘laughed Spain’s chivalry away” is not more absurd than some recent conjectures that Don Quxote was intended ag a satire upon certain leading personages of the Spanish court, especially upon the Duke de Lerma. The chivalry of Spain was already gone before Cervantes wrote. Had it not been gone Don Quixote would not have been written, nor would it have fallen to Cervantes, the most chivalrous of men, to deliver its death stroke. Not chivalry, but the foolish and extravagant

romances of chivalry it was which Cervantes undertook to destroy ; and so completely was his work done that none of them ap- peared after 1604. There wasno man of that age more deeply imbued, as his life bears witness, with the true chivalrous spirit, nor was there any better affected, as his book shows, to all the literature of chivalry. Don Quimote itself is a romance of chivalry, certainly not less inspired with the

purest sentiment of honour, or furnishing a less exalted model of knighthood than Amadis of Gaul or Palmerin of England. Every passage of it proves how carefully and sympathetically Cervantes had studied his originals. For the romance of Amadis itself, as contained in the four first books of Garci-Ordoiiez, Cervantes always professed a high respect. What he intended to ridicule was the continuation of Amadis in all the endless series of his descendants, each surpassing its predecessor in extravagance and folly. The theory that Cervantes wrote Don Quixote in order to revenge himself on the Duke de Lerma and his satellites, which has been revived in these latter days, scarcely deserves serious refutation. To those who are able to believe that in the character of the knight of La Mancha the author intended to portray his mortal enemy the more material improbabilities which surround this hypo- thesis will present no difficulty. In one sense Don Quixote is indeed a satire; but the follies it ridicules are those com- mon to all humanity and to every age, and the satire is of that rare kind which moves not to depreciation but to love and pity of the object—to sympathy rather than to contempt, and to tears as well as laughter. Don Quixote and Sancho Panza are permanent types individualized. They are as true for all time as for the sixteenth century—for all the world as for Spain. The antithesis of the pure imagina- tion without understanding and the commonplace good sense without imagination which these two represent is the eternal conflict which possesses the world. The secret of the marvellous success of Don Quixote, of the extraor- dinary popularity which makes it not only the great book of Spain but a book for all mankind, has been aptly de- scribed by Coleridge to lie in the rare combination of the permanent with the individual which the genius of the author has been enabled to achieve. Don Quixote is not only the perfect man of imagination, less the understand- ing, but he is a living picture of the Spanish Azdalgo of the

time of Philip II. Sancho is the ideal commonplace man of sense, less the imagination, and also the pure Man- chegan peasant. In the carrying out of his happy con- ception Cervantes was doubtless careless of his own main purpose, so that this burlesque of romance has become a real picture of life —this caricature of chivalry the truest chivalric model—this life of a fool the wisest of books. The fame acquired by the publication of the first part of Don Quixote does not appear to have contributed mate- rially to the improvement of the author's fortunes. In 1605 he was still living at Valladolid, where, with his usual ill- luck, he was involved in a painful incident which brought him once more, though perfectly innocent, into collision with the authorities. A young nobleman of the court, being wounded in a street brawl, was carried into the house where Cervantes lodged to be tended, and died there of his hurts. Cervantes and his family, with the other inmates of the house, were cast into prison, according to the rough process of Spanish law, until they could be examined before the alcalde. From the depositions of the witnesses, which are extant, we learn that at this time Cervantes's household consisted of his wife, his natural daughter Isabel, over 20 years old, his widowed sister Andrea, with her daughter Constanza, and another sister, Magdalena, with one female servant; and that he nade his living by writing and general agency. In May of this year there arrived at Madrid the earl of Huntingdon with a retinue of 600 persons from England, bearing a message of congratulation to the king on the birth of his heir, after- wards Philip IV., on which occasion were given a series of magnificent entertainments. On the strength of an allu- sion in a satirical sonnet by Gongara, a narrative of the festivities, published in 1605 and still extant, has been attri- buted to Cervantes, but it bears no marks oa his style, and it aD

Second part 1608 was published the second edition of the first part of

of Don Quixote.

Novelas

Lixemplares

ob4 CERVANTES

Lepanto—has been founded that ideal portrait, first de- signed by the English engraver Kent for Lord Carteret's edition of 1753, and since then ignorantly copied and re- peated in Spain and everywhere as the true image of Miguel de Cervantes.

is not probable that he would be employed on such a purpose. There is better evidence of his hand ina letter to Don Diego de Astudillo Carillo, discovered in the Bibliotheca Colombina at Seville in 1845, giving an account of a bur- lesque tourney or poetical joust held in the suburb of San Juan de Alfarache on the feast of St Laurence. From this it would appear that Cervantes was on a visit to Seville in 1606, and on terms of familiar intercourse with many dis- tinguished poets; also that allusions to Don Quéxote and quotations from the book were familiar in the mouths of the wits of the time. Thenceforward to his death, Cer- vantes seems to have resided at Madrid, whither he had followed the court from Valladolid, with but little improve- ment in his worldly circumstances, supported chiefly by a pension from the archbishop of Toledo, and casual gratui- ties from his other patron the Count de Lemos, In

our author's essays in verse. It isa burlesque poem, pro- fessedly in imitation of one with the same title by the Italian, Cesare Caporali, but having little but the name in common with its predecessor. The half serious half jest- ing vein in which Cervantes here indulges was unquestion- ably that which was most natural to his genius, and in spite of the cumbrousness of the allegorical machinery, and the excessive laudation which, as usual, he heaps on the small writers his contemporaries, the poem abounds in fancy, humour, and invention. The seventh book, in which is described the encounter between the armies of the good and bad poets, may compare with the Battle of the Books and the fifth canto of the Lutrin, Cervantes's fancy of making the combatants wound one another with odes and sonnets is surely happicr than either Swift's, where the authors use the ordinary weapons of Homeric war, or Boileau's, where the monks discharge material volumes. Not the least interesting portion of this poem is the fourth book, wherein the author speaks of himself, his labours, and his misfortunes, with a charactcristic mix- ture of modesty, gaiety, and simple self-confidence. Iu the prose appendix is a spirited and humorous dia- logue with a messenger from Apollo concerning Cer- vantes's relations to the theatre, and the

reason of his ill success as a dramatist. After thirty years' retirement from the stage, during which interval the great Lope de Vega had arisen in all his glory, and he and his imitators had, by their fertility and their submissive devotion to the vulgar taste no less than by their genius, obtained the complete mastery of the national drama, Cervantes could hardly hope to recover for himself that position as a play- wright to the memory of which he seems to have always clung with tenacity. Encouraged, however, by the renewal of Returms to his popularity as a writer, or stimulated perhaps by the drama. his necessities, he made in his old age another experi- ment in the drama, in which it is sad to find that he abandoned all those admirable principles which he had advocated through the mouth of the Canon in Don Quixote, surrendering himself to the vicious models he had himself so eloquently condemned. The result was unfortunate for his reputation. A collection of eight comedies and as many interludes was published in 1614, with a preface in which the author reports naively of his ill-success in the negotiation for a sale of their copyright. He would buy them, the bookseller said, were it not that he had been told by a certain person of distinction that "of the prose of Miguel de Cervantes much could be expected, but of his poetry nothing." This opinion was probably confirmed by these plays, which are so unworthy of their author that when reproduced in 1749 by Blas de N asarre, that editor maintained the ingenious paradox that Cervantes had made them purposely bad in order to ridicule the plays of the day, just as he had written Don Quixote to ridicule the books of chivalry. There is no need of any such theory to account for the failure of Cervantes in the drama. His genius was unsuited to thestage. 'The qualities in which he inost excelled were essentially undramatic, nor can his per- sistent efforts to recover his position as a playwright, even after the success of Don Qudxote had been assured, be explained otherwise than by the fact that the stage was then almost the only road to literary fortune. The first part of Don Quixote had brought him fame, but nothing more. Before the appearance of the second part, the plan

Don Quixote, with some corrections and additions by the author. The next year, following the fashion of the times, he entered as a lay brother into the Oratory of Cafiizares, together with Lope de Vega, Quevedo, Espinel, and many other of his contemporaries and friends. In 1610, the Count de Lemos was appointed viceroy of Naples, and Cervantes seems to have been

indulged with some promises of being made his secretary, but his advanced age and his dependent family were made the pretext for his being passed over in favour of his rival and pretended friend, Leonardo Argensola. In 1613, he gave to the world his Movelas Lxemplares, some of which had been written many years before—a collection of tales of very various character, in a style till then unknown in Spain, owing little beyond their form to the Italian models These stories, undeservedly neglected out of their native country, must be reckoned as second in merit among Cervantes's writings, and even superior to Don Quixote in elegance of style. They are indeed the true originals in the modern literature of Europe of the novel, or story of real life, with plot, character, and scenery, and display in a very remarkable degree not only the versatility of their author's genius but his extreme familiarity with every type of Spanish society, especially of the lower orders of the people. In the charming story of La Gatanella, among some of the best of Cervantes's lyrics, is to be found the germ of all the gipsy romances, poems, and operas, Which have since delighted the world, and in Rinconete y Cortadillo we have a picture of a Spanish Alsatia as vivid and real as anything by Defoe or Dickens. Indeed, these stories, rich in incident, character, and invention, have been a mine in which the novelists and dramatists of all countries have delved,—Scott himself, according to Lock- hart, confessing that he first drew from them his idea of writing the Waverley Novels. In his dedication of the Novelas to the Count de Lemos, Cervantes speaks of being engaged on several other works, among them the second part of Don Quixote; and in the prologue, which contains some interesting details of his biography, he gives this portrait of himself in his 65th year:—" Of aquiline features, chesnut hair, a smooth and open forehead, with cheerful eyes, a nose curved though well proportioned, long inustaches, the beard of silver (which twenty years ago was of gold), the mouth small, the teeth not much, for he has but six, and those in bad condition and worse placed for they have uo concert one with another; the body between two extremes, neither large nor small, the complexion lively, rather white than brown, somewhat crooked in the shoulders, and not very light of feet—this, I say, 1s the effigy of the author of Galatea and of Don Quixote de la Mancha." Upon this description of his person—to which it may be added that he stammered in his speech and had lost the use of his left hand by the wound received at

In 1614 was published the Viage al Parnaso, which Voyage to | with all its faults may be said to be the most successful of Parnassus,

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The false Quixote.

CERVANTES

of which had been freely announced to his friends for some time previously, Cervantes was destined to encounter per- haps the strangest of the many crosses with which his pitiless evil star teased him to the end of his troubled and painful life. He had seen, while in the flush of manhood, his dream of soldiership dispelled by a cruel captivity. He had experienced the overthrow of all his hopes of civil preferment. He had been subject to every kind of mor- tification in his literary ambition. He had been jostled out of the arena by his rivals in poetry and in the drama, When old, infirm, and destitute, his genius had at last found in Don Quixote its proper field of employment and something like a fitting recognition. But even here he was not to be left undisturbed. The ill-fortune which never ceased to make him its mark was able to send a shaft through this his strongest side, which poisoned all his hardly-earned triumph and vexed him to the grave. The story of the false second part of Don Quixote, published under the name of Avellaiieda, is one of the strangest in literary history, the mystery of which, though it has occupied many volumes, is not yet wholly unravelled. It is sufficient here to say that after it was well known that Cervantes was employed upon and had nearly completed his second part of Don Quixote, there appeared at Tarragona in 1614 a book pretending to be a continuation of the knight's adventures, by Alonso Fernandez de Avellaiieda, a native of Tordesillas. The manifest object of this impudent fabri- cation was to malign the character of Cervantes, to destroy the credit of his book, and to deprive him of the fame and profit which he expected to derive from its completion. In a preface, full of a curious malignity, evidently arising from some cause deeper than literary envy, Cervantes was reproached in the grossest terms with his infirmities and misfortunes, even with his wounds,—sneered at as one "with more tongue than hands,"-—reviled as old, poor, and without

friends,—branded as envious and discontented, a calumniator of great men, and an evil-speaker even of the Church and the Holy Office. In the body of the book, under pretence of carrying on the story, every opportunity is taken to spoil it, by degrading the characters and giving a coarse turn to the incidents. Don Quixote is debased into a wild lunatic, who ends his days in a mad-house ; Sancho is turned into a dull buffoon and his humour into brutal gluttony. In place of the witty and beautiful Doro- thea we have the gross wench Barbara; and the graceful episodes of the original are represented by a string of dreary and vulgar adventures, without life, colour, or probability. Apart from the spirit of malice, the book, in the words of Ticknor, is "so completely without dignity or consistency that it is clear the writer did not. possess the power of comprehending the genius he at once basely libelled and meanly attempted to supplant." Nothing in viler taste has ever disfigured the literature of any nation, and it is greatly to the scandal of Cervantes's countrymen, nor the least of the injuries they have done him, alive and dead, that they have suffered such a book to be reprinted and to retain a place in their national collections. The false Don Quixote, in which Le Sage, and even some later critics, both French and Spanish, have pretended to see merits equal if not superior to those of the true, is now remembered only by Cervantes's perhaps too frequent refer- ences to it in the later chapters of his own book, and has little interest except in connection with the mystery of his life. The identity of Avellafieda is a problem which has greatly exercised the Spanish critics. The weight of opinion is in favour of its being the disguise of the notorious Fray Luis de Aliaga, the low-born confessor and minion of the Duke de Lerma, who was high in power during the reign of Philip ITI. Of all whose names have been suggested as the probable author of the spurious Quixote Aliaga is

the only one who fulfils the required conditions. He was a Dominican, a preacher, and an Aragonese. He was an

intimate friend of Lope de Vega, whose cause he openly espoused. He was in the confidence of the Holy Office, and may be suspected of not being well-disposed to Cer- vantes's patron the archbishop of Toledo, whom he

suc- ceeded as Inquisitor-General. He was known to be of a rancorous and envious spirit, who had written more than one pseudonymous libel, and was himself the mark of frequent caricatures and lampoons. Lastly, it has been proved that, before the appearance of Don Quixote, Aliaga's well-known nickname was Sancho. There was much in the book of Cervantes to give such a man offence, even whether such offence was intended or not,—in his person, his character, his office, and his religion. That as Avellafieda he found assistance among some of the writers of the period, rivals of Cervantes and jealous of his fame, is very probable ; and there is only too much reason for suspecting that the great Lope de Vega himself was one of Aliaga's allies. Although Spanish writers are slow to admit that the rela- tions between the two illustrious contemporaries were other- wise than friendly, and although on the side of Cervantes there never was any other than the spirit of perfect cour- tesy, loyalty, and magnanimity which became his own noble nature, recent researches have proved that by Lope de Vega these feelings were not honestly reciprocated. He who was called by his own familiar friend Alarcon "the universal envier of other men's meeds" is known to have regarded with jealous eyes the sudden popularity achieved by his despised competitor in Don Quixote. In addition to other proofs of an indirect kind tending to show that about the time of the appearance of Don Quixote Lope de Vega was ill-disposed towards his once intimate friend, we have the direct evidence of the letter discovered by Schack among the manuseripts of Count Altamira, dated August 4, 1604, wherein occurs this passage:—"Of poets I speak not; many are budding for the year to come; but none is so bad as Cervantes, or so stupid as to praise Don Quixote." With Don Quixote it could scarcely be expected that Lope would be pleased; and there was much in the book, especially in the Canon's strictures on the popular drama, to give him offence. If he stooped so low for his revenge as to inspire or to aid his friend Aliaga to write the false Don Quixote, his triumph was but brief. At the close of 1615 Cervantes published his own second part, and from that moment the other was for ever blotted from the world's memory. 'This second part, though bearing marks of haste in the concluding chapters, belies, according to the judgment of the best critics, the Opinion of the author himself as expressed through the mouth of the Priest, that second parts are never good. Although written in old age it contains at least as much of the glow and warmth of imagination as the first, while it is even superior in invention. There is more harmony in

the construction, more correctness if not more vigour in the style, with fewer distractions and digressions. The author has more confidence in himself and more love of: his work. His hero is more consistent in his mad- ness, Sancho more pleasant in his sanity. Both master and man, especially the latter, while still true to their character, have developed into an ampler and richer nature. They have evidently advanced in their creator's favour, and have more pains taken with their behaviour. The knight is more lovable, the squire more humorous; and the whole treatment of the story, with its vivacity and variety, its easy flow of narrative, and its masterly and pathetic close, is worthy of the happy genius of which it is the crown and full development.

By this time the fame of Cervantes had spread through many lands. Numerous editions of his Don Quixote had

Death.

been printed, either in the original or in translation, thus realizing the author's prediction that there would be no nation or language to which his book would not be carried. According to the interesting story told by the archbishop of Toledo's secretary, in his approbation appended to the second part, dated February 1615, foreigners of distine- tion, when they visited Madrid, made it their first business to enquire after the author of Don Quixote. To a party of French gentlemen, members of the suite of the ambas- sador, the Duc de Mayenne, who were anxious to learn of the condition and mode of life of the celebrated writer, the secretary of the archbishop was obliged to respond that "he who had made all the world rich was poor and infirm, though a soldier and a gentleman." The man who was the delight of his age and destined to be the chief glory of his country was indeed still in great misery, depending on alms for his subsistence, and now in his sixty-ninth year stricken by a mortal disease. In the dedication of his second part of Don Quixote to the Count de Lemos, Cervantes speaks of his broken health and approaching end, still with unabated courage and cheerfulness. His last work, not published till after his death, was Pericles and Sigismunda, a romance of love and adventure after the model of Heliodorus, on which he bestowed great pains and singular affection,

declaring that it would be either the best or the worst of his books. The dedication to the Count de Lemos is written with an astonishing gaiety and spirit, though it announces that the author had yesterday received extreme unction, and had “one foot in the stir- rups,” waiting fora summons. About this time must have occurred that adventure, which is so pleasantly told in the prologue, of the meeting with the student near Toledo, When our author, in a grievous state from dropsy, was re- turning from a visit to his wife’s family at Esquivias, at the close of which he wrote:—‘ And so farewell, humours : farewell, my gay friends, for I feel myself dying, and have no desire but soon to see you happy in the other world,” On the 4th of April he entered the order of the Franciscan Friars, whose habit, following the fashion of the period, he had assumed three years before, and on the 23d of that month he ended, in all serenity and cheerfulness, his life of many troubles. In the same year, and nominally on the same day, though really ten days later, allowance being made for the difference of calendars, died William Shakespeare in England. Cervantes’s body was buried humbly at the expense of his religious order in the convent of the Trinitarian Nuns in the Calle de Humilladero, of which community his daughter Isabel was a professed member. Jn 1633 the nuns moved to a new site in the Calle de Cantarrenas, and having exhumed and brought away their dead with them, the bones of Cervantes were mingled with others in a common ossuary, so that Spain, who had shown herself so careless of him jn life, has lost all trace of him in death. So closes a record as glorious and as calamitous as any in literary history, of one of the world’s greatest benefactors, whom the world knew not— of the best of all Spaniards, the very type and perfect embodiment of the highest Castilian nature, whom his country starved and who has made her immortal.

The language of eulogy has been exhausted over that work of Miguel de Cervantes which for two hundred and fifty years has been the delight of mankind in a degree such as no other book has ever approached. There is nothing to add to the tribute which the critics of all countries have joined in paying to the wisest, tenderest, and deepest of humourists,

The popularity of Don Quixote is best attested by the extraordi- nary number of editions and translations which have appeared in all languages. According to a computation made by Don Lope de Fabra, in his appendix to

the Barcelona fae-simile of the first edition, there were published, up to 1874, 278 editions of Don Quixote, of

which 87 appeared in Spain, and 191 in other countries. Of these, 136 are in the original. Translations have appeared in English, French, German, Dutch, Italian, Danish, and indeed in every European tongue, including Turkish. England, who of all foreign nations has ever been foremost in recognizing the genius of Cer- vantes, is entitled to the honour of having produced the first critical edition of the Spanish text, which is that of Dr John Bowle, pub- lished at Salisbury in 1781. This has served as the basis of all the subsequent Spanish editions; for although the Royal Academy anticipated Bowle by a year in its magnificent edition printed by Ibarra, it was a knowledge of the Englishman's design, and to some extent of his labours, which prompted that undertaking. The other most important critical cditions in Spanish are that of Pel- licer, published in 1797, who has borrowed largely, and not with duc acknowledgment, from Bowle; that of Clemencin, in 1833-39, with a very elaborate commentary, displaying much industry and learning but little taste or sympathy, and sadly lacking in reverence for the author ; and that in the complete edition of Cervantes's works printed at Argamasilla in 1864, under the editorship of Don Eugenio de Hartzenbusch and Don Cayetano Alberto de Rosell,—superb in type and paper, but otherwise of little value, with a text distigured by wanton emendations. The principal English translations are— the first, by Thomas Shelton, which is also the earlicst version of Don Quixote in any foreign language, published in 1612-20, vigor- ous, and of a spirit akin to the original, but rude and incorrect ; that of Motteux, absurdly over-praised by Lockhart, which is nothing more than a loose paraphrase of Cervantes's text, in a style con- sciously comic and therefore of all the most unhappy for Don Quixote ; that of Jarvis, which, with some trifling revisions, is the current accepted version—correct and careful, but dull, commonplace, and destitute of humour; and that of Smollett, which is the worst of all, being a piece of hack-work done for the booksellers, without knowledge of Spanish, or even such an insight into his author's meaning as his kindred genius should have suggested. By far the best life of Cervantes is that by Don Martin Fernandez de Navarrete, published in Madrid in 1819. (Hi i. WY.)

CERVIA, an episcopal town of Italy, with a port on the Adriatic, in the district of Ravenna, and 12 miles S.E. of the city of that name. In the vicinity are the extensive salt-works of Valle di Cervia. Population about 5700.

CESARI, Grusrpps, called I] Cavaliere d'Arpino (being born in or about 1568 at Arpino, and created a " Cava- liere di Cristo" by Pope Clement VIII.), also named I] Giuseppino, an Italian painter, much encouraged at Rome and munificently rewarded. Cesari is stigmatized by Lanzi as not less the corrupter of taste in painting than Marino was in poetry ; indeed, another of the nicknames of Cesari is " I] Marino de' Pittori" (the pictorial Marino), There was spirit in Cesari's heads of men and horses, and his frescoes in the Capitol (story of Romulus and Remus, &c.), which occupied him at intervals during forty years, are well coloured ; but he drew the human form ill. His perspective is faulty, his extremities monotonous, and his chiaroscuro defective. He diedin 1640, at the age of seventy- two, or perhaps of eighty, at Rome. Cesari ranks as the head of the "' Idealists" of his period, as opposed to the " Natural- ists," of whom Michaelangelo'da Caravagio was the leading champion,—the so-called " idealism" consisting more in reckless facility, and disregard of the common facts and common-sense of nature, than in anything to which so lofty a name could be properly accorded. He was a man of touchy and irascible character, and rose from penury to the height of opulence.

CESAROTTI, Metcutorr (1730-1808), an Italian poet, born at Padua in 1730, of a noble but impoverished family. At the university of his native place his literary progress procured for him at a very early age the chair of rhetoric, and in 1768 the professorship of Greek and Hebrew. On the invasion of Italy by the French, he gave his pen to their cause, received a pension, and was made knight of the iron crown by Napoleon I., to whom, in consequence, he addressed a bombastic and extrava- gantly flattering poem called Pronea. Cesarotti is best known as the translator of Homer and Ossian. Much praise cannot be given to his version of the Zliad, for he has not scrupled to add, omit, and modernize. Ossian, which he held to be the finest of poems, he has, on the

other hand, considerably improved in translation; and the appearance of his version attracted much attention in Italy and France, and raised up many imitators of the Ossianic style. Cesarotti also produced a number of works in prose, including a Course of Greek Interature, and essays On the Origin and Progress of the Poetic Art, On the sources of the Pleasure derwed from Tragedy, On the Philosophy of Lan- guage, and On the Philosophy of Taste, the last being a defence of his own great eccentricities in criticism. His style is forcible but full of Gallicisms, and he is too fond of novelty both in expression and matter. A complete edition of his works, in 42 vols, 8vo, began to appear at Pisa in 1800, and was completed in 1813 after his death. See Aemoirs by Barbieri (Padua, 1810).

CESENA (Lat. Casena, or Cesenia), an episcopal city of Emilia, in the province of Forli, a station on the railroad between Bologna and Ancona, gives its name toa “ cir- condario” and to two subdivisions or “ mandamenti” of the same. Population of circondario in 1862, 77,489.

CESPEDES (in Italian Cepaspr), Pasto pe (1538- 1608), was born at Cordova, and was educated at Alcala de Henares, where he studied theology and Oriental languages, On leaving the university, he went to Rome, where he became the pupil and friend of Federigo Zucchero, under whose direction he studied particularly the works of Raphael and of Michelangelo. In 1560, while yet in Rome, proceedings were taken against him by the Inquisition at Valladolid on account of a letter which, found among the papers of the archbishop of Toledo, had been written by Cespedes during the preceding year, and in which he had spoken with great freedom against the holy office and the inquisitor-general, Fernando de Valdés. Cespedes remained in Rome at this critical moment, and from which city he appears rightly to have treated this matter of the prose- cution with derision. It is not known how he contrived to bring the proceedings to an end; he returned, however, to Spain a little before 1577, and in that year was installed

in a prebend of the cathedral at Cordova, he resided till his death.

A distinguished poet, a remarkable painter, eminent alsc as an architect and sculptor, Pablo de Cespedes has been called the most savant of Spanish artists. According to his friend Francisco Pacheco, to whom posterity is indebted for the preservation of all of Cespedes's verse that is extant, the school of Seville owes to him its introduction to the practice of chiaroscuro. He wasa bold and correct draughts- man, a skilful anatomist, a master of colour and composition ; and the influence he exerted to the advantage of early Spanish art was considerable. Cristobal de Vera, Juan de Pefialosa, and Zambrano were among his pupils. His best picture is a Last Supper at Cordova; but there are good examples of his work at Seville and at Madrid.

Cespcdes was author of several opuscules in prose on subjects connected with his profession. Of his poem on The Art of Painting enough was preserved by Pacheco to enable us to form an opinion of the whole. It is esteemed the best didactic verse in Spanish; Marchena and Castro compare it, not disadvantageously, with the Georgics. It is written in strong and sonorous octaves, in the majestic dcclamatory vein of Fernando Herrera, and is not altogether so dull and lifeless as is most didactic verse. It contains a glowing eulogy of Michelangelo, and some excellent advice to young painters, insisting particularly on hard work and on the study of nature, The few fragments yet remaining, amounting in all to some six hundred lines, were first printed by Pacheco in his treatise Del Arte de la Pintura, in 1649.

CETACEA (from the Greek word xjros, a whale) is the name employed by zoologists to characterize the important order of Mammals which contains the whales and dolphins, These mammals are aquatic in their habits, and possess a fish-like form. They differ from fishes in breathing by lungs and not by gills, in being viviparous aud not oviparous, and in suckling their young with a pair of milk-secreting glands or mamme. This order was formerly divided: into two groups, the herbivorous cetacea and the carnivorous cetacea. By modern zoologists the herbivorous cetacea, which include the animals called dugong, manatee, and rytina, are not regarded aa whales, but are referred to a distinct order named Sirenta. The order Cetacea, there- fore, in its present acceptation is limited to the toothed whales or Odontoceti and the whalebone whales or Afystacocett. For the organization, classification, and dis- tribution of these animals, see MAMMALIA.

CETINA, GuTIERRE Dz, soldier and poet, was born at Seville during the earlier years of the 16th century. Choosing the career of arms as a means of obtaining tlie preferment he needed, he served several campaigns in Italy, fought at the leaguer of Tunis (1535) against Barbarossa, and continued in the practice of his profession for some years in Flanders, under Ferdinand of Austria. The death of the prince of Ascoli, his patron and protector, whom he mourned in a fine elegiac sonnet, and his own continued poverty, would seem to have disgusted him with the trade of war. He returned to Seville, departing thence soon afterwards for Mexico, where he had a brother high in office. No more is known of him, saving that he came back again to the city of his birth, and that he died there, it is supposed about 1560. An euthusiast in art, the friend of Boscan and Garcilaso, of Hurtado de Mendoza and Jeronimo de Urrea, Gutierre de Cetina, as may naturally be inferred, followed in the wake of these poets, renouncing the old Castilian creed, aud preaching the new evangel of Petrarch. His poems, which were not published till long after his death, consist of sonnets, canzoni, epistles in terza rund, and madrigals, and are remarkable for elegance and simplicity of form, and for grace and tenderness of thought

and feeling. Their author has been often confounded with Doctor Gutierre de Cetina, who was vicar of Madrid. See Rivadaneyra's Biblioteca, vol. xxxii.

CETTE, a fortified seaport in the department of Hérault, in 43° 23′ 48" N, lat. and 3°42' 15" E. long., and 15 miles S.W. of Montpellier. After Marseilles it is the principal commercial port on the south coast of France. It occupies the foot and slope of a hill, the ancient Ifons Setius, situated on a tongue of land that lies between the Medi- terranean and the Lagoon of Thau. The town is well built, and has numerous factories, glass-works, shipbuilding yards, a custom-house, a school of navigation, a communal college, a botanic garden, museums, a library, and a theatre. It is much resorted to for sea-bathing. The harbour is capable of accommodating 400 sea-going vessels, and is safe in all weathers. The left of the two moles which form it runs E.N.E. for a distance of about 630 yards into the sea, and is then continued in a breakwater, which extends across the entrance. At the

end of this mole are the fort of St Louis and the lighthouse. Opposite to them, on the other side of the harbour, is the fort of St Pierre, which, with the citadel, completes the defences of Cette. The town is connected with Lyons by the Canals des Etangs and de Beaucaire and the Rhone, and with Bordeaux by the Canal du Midi; railways communicate with Toulousc and Montpellier, and steamers with the Mediterranean ports. The shipping trade of Cette is very considerable. Its imports are colonial produce, wool and cotton, hides, cork, brandy and wine for manufacture, iron and lead ores, staves from the Adriatic, asphalt, fruits, sulphur, wheat, oats, maize, barley, timber, and coal. In 1873 the port was visited by 63 British ships, of total tonnage 17,409, mostly laden with pitch for manufacture into patent fuel at the coal mines N. of Nimes. The greater number of these ships left Cette in ballast. The exports are wines, brandy, liqueurs, argol, verdigris, corks, salt, oil, dried fruits and fish, meal, cloth, and woollen stuffs. Thé sum total of imports and exports in 1870 was about 460,000 tons. In the same year 2075 ships entered, and 2108 left the port. There are upwards of 40 sailing-vessels belonging to the port, of from 60 to 300 tons burden. A large number of small craft are employed in the sardine, cod, and oyster fisheries on the coast. ‘There are factories for the manufacture of syrups, grape-sugar, corks, soaps, and chemicals, which with the docks, the extensive salt-works in the neighbourhood, and the establishments for the making, from French and Spanish wine and brandy, of claret, sherry, port, champagne, &c., give employment to thousands. The town was founded in 1666 by Louis XIV. Population in 1872, 25,181.

CETTINJE, Cerinsz, Zevinsx, Cerrigno, or Crrrin, the capital of the principality of Montenegro, is situated on the left of a small river in a narrow plain deeply sunk in the heart of the mountains, at a height of 2470 feet above the sea. It consists of two streets of whitewashed stone houses, and, according to Mr Tozer, has very much the appearance of a Dartmoor village. The principal buildings are the monastery and the palace. The former was founded in 1478, but has been frequently burned and restored. It is surrounded with walls, and now contains a prison, a school, a library, a printing establishment, and the residences of the archimandrite and the bishop. The chapel is held in great veneration ag the burial-place of the sainted Peter I. and Danilo, The palace is a comparatively simple building of two stories, composing two sides of a court, which is completed by high

walls. The town owes its origin to Ivan the Black, who was obliged, in the end of the 15th century, to withdraw from Jabliak, the former capital, situated to the north of Lake Scodra. The town has frequently been taken and ravaged by the Turks,

but has seldom continued for any length of time in their possession. Population about 700.

CEUTA, or (in the local Moorish form) Sesra, a town and fortress belonging to Spain on the coast of Marocco, on a peninsula opposite Gibraltar, in 35° 54’ N. lat., 5° 18’ W. long. It derives its name from its seven hills, the most important of which, the Monte del Hacho (the ancient Abyla, one of the pillars of Hercules), has a considerable elevation. The town is well built, and is chiefly important as a military and convict station. It contains a cathedral, the bishop of which is suffragan to the archbishop of Seville, several religious houses, and a hospital. It has a small harbour, and imports provisions and military stores from Spain. Ceuta occupies the site of the Roman colony of Ad Septem Fratres. In 618 the town, which had been refortified by Justinian, fell into the hands of the West Goths; and in the 8th century it was the seat of that Count Julian whose name is inseparably connected with the Saracenic conquest of Spain. Under the Arabic govern- ment it was an industrial city, and it is said to have been the first place in Western Europe where a paper manufactory was established, It was taken from the Moors by John I, king of Portugal, in 1415, and passed into the hands of the Spaniards on the subjugation of Portugal by Philip UI. in 1580. It has been several times unsuccess- fully besieged by the Moors—from 1694 to 1727 by Mulai Ismail, and in 1732 by Ripperda. In 1810 it was held by the English under Fraser. In 1860 the Spanish territory around the town was extended by force of arms. Popula- tion about 7000.

CEVA, the ancient Ceba, a town of Italy, in the province of Cuneo and 11 miles east of Mondovi, at the confluence of the Cevetta with the-Tanaro. It was formerly fortified ; and the rock, at the foot of which the town lies, was surmounted by a citadel. It has iron-works and _silk- factories, and carries on a considerable trade in its cheese, which was famous even in the time of the Romans. In the Middle Ages it was the centre of a separate marquisate,

and during the 16th and 17th centuries it was several times captured by the French and the Spaniards. In 1796 it was taken by Augereau, and in 1800, after having with- stood the siege of the previous year, it again fell into the hands of the French. The conquerors destroyed the castle, which had served as a state prison. Population, 4730.

CEVENNES, a mountain ‘chain in the south of France, dividing the valleys of the Lower Sadne and Rhone from those of the Loire and the Garonne. On the N. the Cévennes are a continuation of the Lyonnais mountains ; and they end on the 8. at the Canal du Midi, which separates them from the Pyrenees, They are divided into two parts,—the south consisting of the Montagnes Noires (in Aude and Hérault), the Espinouses (in Tarn, Aveyron, and Hérault), the Garrigues (in Aveyron and Gard), and the Cévennes proper or Lozére or Gévaudan (in Lozére); and the north consisting of the Vivarais (in Ardéche). Some- times there are also included in the name the Lyonnais (in Rhone) and the Charolais (in Saéne-et-Loire). The average height is 3000 to 4000 feet; and the highest peaks are Mount Mezenc (in Ardéche), 5788 feet, and Mount Lozére, 4880, The principal rivers which take their rise in these mountains are the Loire, the Allier, the Lot, and the Tarn, The mountains consist of limestone, greywacke, and granite; and beds of trachyte and lava give evidence of former volcanic action. In the Cévennes are found iron, coal, lead, silver, copper, antimony, marble, and porphyry. ‘The lower slopes are well cultivated; higher up good pasturage is found; while the summits arc generally covered with forests of chestnut and pine. The Cévennes are famous as the retreats of the Albigenses, Waldenses, and Camisards,

aie , an island in the Indian Ocean, separated on the N.W. from continental India by the Gulf of Manaar. It lies between 5° 55’ and 9° 51’ N, lat., and between 79° 41’40” and 81°54’ 50” E. long. Its extreme length from north to south is 271 miles; its greatest width

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Sketch Map of Ceylon (embracing 299 miles by 233).

is 137 miles; and its area, including that of its dependent islands, amounts to 25,742 miles, or about one-sixth smaller than Ireland. In its general outline the island resembles a cone, the apex of which points towards the north,

The Coast.—The coast is beset on the N.W. with number- less sandbanks, rocks, and shoals, and may be said to be almost connected with India by the island of Ramisseram and Adam’s Bridge, a succession of bold rocks reaching almost across the gulf at its narrowest point. Between the. island and the opposite coast there exist two open channels of varying depth and width, beset by rocks and shoals. One of these, the Mannar Passage, is only navigable by very small craft. The other, called the Paumben Passage, lying between Ramisseram and the mainland, has been deepened at considerable outlay, and is now used by vessels drawing ten feet of water, in passing from the Malabar to the Coromandel coast, which were formerly compelled in doing so to make the circuit of the island. The west and south coasts, which are uniformly low, are fringed. their entire length by cocoa-nut trees, which grow to the water’s edge in great luxuriance, and give to the island a most picturesque appearance. Along these shores there are numerous inlets and backwaters of the sea, some of which are available as harbours for small native craft. The east coast from Point de Galle to Trincomalee is of an entirely opposite character, wanting the ample vegetation of the other,

and being at the.same time of a bold precipitous character. The largest ships may freely approach this

side of the island, provided they take care to avoid a few dangerous rocks, whose localities are, however, well known to navigators.

Seen from a distance at sea, this “utmost Indian isle” of the old geographers wears a truly beautiful appearance. The remarkable elevation known as “Adam’s Peak,” the most prominent, though not the loftiest, of the hilly ranges of the interior, towers like a mountain monarch amongst an assemblage of picturesque hills, and is a sure landmark for the weary navigator, when as yet the Colombo light- house is hidden from sight amidst the green groves of palms that seem to be springing from the waters of the ocean.

The low coast-line of country encircles the mountain- zone of the interior on the east, south, and west, form- ing a belt which extends inland to a varying distance of from 30 to 80 miles; but on the north the whole breadth of the island from Kalpitiya to Batticaloa is an almost unbroken plain, containing magnificent forests of great extent.

Mountains.—The mountain zone is towards the south of the island, and covers an area of about 4212 miles, The up- lifting force seems to have been exerted from south-west to north-east, and although there is much confusion in many of the intersecting: ridges, and spurs of great size and extent are sent off in many directions, the lower ranges mani- fest a remarkable tendency to run in parallel ridges in a direction from south-east to north-west. Towards the north the off-sets of the mountain system radiate to short distances and speedily sink to the level of the plain. Detached hills are rare; the most celebrated of these are Mihintale, which overlooks the sacred city of Anuradha- pura, and Sigiri. The latter is the only example in Ceylon of those solitary acclivities which form so remark- able a feature in the table-land of the Deccan,—which, starting abruptly from the plain, with scarped and perpen- dicular sides, are frequently converted into strongholds accessible only by precipitous pathways or by steps hewn in the solid rock.

For a long period Adam’s Peak was supposed to be the highest mountain in Ceylon, but actual survey makes it only 7352 feet above the sea-level. This

elevation is chiefly remarkable as the resort of pilgrims from all parts of the Hast. The hollow in the lofty rock that crowns the summit is said by the Brahmans to be the footstep of Siva, by the Buddhists of Buddha, by the Mahometans of Adam, whilst the Portuguese Christians were divided between the conflicting claims of St Thomas and the eunuch of Candace queen of Ethiopia. The footstep is covered by a handsome roof, and is guarded by the priests of a rich monastery half way up the mountain, who main- tain a shrine on the summit of the peak. The highest mountains in Ceylon are Piduru Talagala, 8295 feet in altitude ; Kirigalpota, 7836 feet ; and Totapelakanda, 7746 feet. The summits of the highest ridges are clothed with ver- dure, and along their base, in the beautiful valleys which intersect them in every direction, the slopes were till within the last few years covered with forests of gigantic and valuable trees, which have now disappeared under the axe of the planter, who has felled and burnt the timber on all the finest slopes at an elevation of 2000 to 4500 feet, and converted the hill sides into highly-cultivated coffee estates. The plain of Nuwara Eliya, the sanatorium of the island, is at an elevation of 6200 feet, and possesses many of the attributes of an alpine country. The climate

of the Horton plains, at an elevation of 7000 feet, is still finer than that of Nuwara Eliya, but they are difficult of access, and are but little known to Europeans. The town of Kandy, in the Central Province, formerly the capital of the native sovereigns of the interior, is situated 1727 feet above sea-level.

Rivers.—The island, though completely within the influ- enceof oceanic evaporation, and possessing an elevated table- land of considerable extent, doesnot boast of any rivers of great volume. ‘The rains which usher in each monsoon or change of season are indeed heavy, and during their fall swell the streams to torrents and impetuous rivers. But when these cease the water-courses fall back to their original state, aud there are but few of the rivers which cannot be passed on horseback. ‘‘In the plains there are comparatively few rivulets or running streams; the rivers there flow in almost solitary lines to the sea; and the beds of their minor afiluents serve only to conduct to them the torrents which descend at the change of each

monsoon, their channels at other times being exhausted and dry. But in their course through the hills and the broken ground at their base they are supplied by numerous feeders, which convey to them the frequent showers that fall in these high altitudes. Hence their tracks are through some of the noblest scenery in the world; rushing through ravines and glens, and falling over precipitous rocks in the depths of wooded valleys, they exhibit a succession of rapids, cataracts, and torrents, unsurpassed in magnificence and beauty. On reaching the plains, the boldness of their march and the graceful outline of their sweep are indicative of the little obstruction opposed by the sandy and porous soil through which they flow. Throughout their entire course dense forests shade their banks." The most important of the Ceylon rivers is the Mahaveli-ganga, which has its source in the Pidurutalagala mountain, whence it takes a tor- tuous course through the Kotmale valley to Pasbage, where it is joined by a smaller branch issuing from the base of Adam's Peak; it then passes through the village of Peradeniya, where it is crossed by the railway bridge, and by a beautiful bridge, of a single span of 205 feet, constructed of satin wood, on the American or wedge principle. Thence it winds to the west and north of Kandy, and after an easterly descent of nearly 1000 feet between Kandy and Bintenne, sweeps suddenly to the north, and takes its course through the wild and open country, separating into two branches,—the smaller of which, the Vcrukal, enters the sea about 25 miles south of Trincomalee, while the larger, retaining its original name, falls into the great bay of Kottiar, near the noble harbour of Trincomalee, after a course of nearly 200 miles. In flood- time it rises 25 or 30 feet, but for the greater part of the year it is fordable in many places. It is seldom wider than the Thames at Richmond, and is generally of much less width. Surveys have shown that, at some outlay, this river might be made navigable for a distance of 80 or 90 miles from the sea. The upper half of its course is through a rocky and precipitous country, but the lower half is through a fine open region, well watered throughout the whole of the year, and only requiring capital and labour to convert it into the garden of Ceylon, which it once doubt- less was. 'The remains of stupendous dams and canals bear witness to the importance which the ancient rulers of Ceylon attached to this portion of their possessions. The Kelani-ganga rises at the base of Adam's Peak, whence, running first north and then almost due west to Ruwanwella, it takes its way more southerly to Colombo, on the northern outskirt of which

it falls into the sea across a wide sand- bank. It is navigable for about 40 miles by flat-bottomed boats. The Kalu-ganga and the Walawe-ganga (or Wal- oya) flow from the eastern base of Adam's Peak through

the district of Sabaragamuwa to the sea, the former south- westerly, the latter south-easterly. Both are navigable by country boats for some distance, —the Kalu-ganga for up- wards of 50 miles, from above Ratnapura to the sea at Kalutara, whence a canal connects it with Colombo. The Walawe ganga falls into the sea 8 miles to the west of Hambantota. The Mahaoya falls into the sea, aftcr a westerly course of about 70 miles, to the north of Negombo, The other rivers, except during the heavy rains, are of no great size, and none of them are navigable.

Lakes and Canals,—There are in Ceylon some lakes of cousiderable extent and of great beauty. Those of Colombo, Bolgoda, and Negombo are of natural formation; those which have been formed by human labour will be noticed below in connection with irrigation. The rivers, as already explained, descend rapidly from the hills, and sweep along in their rapid course large quantities of earthy matter ; at their junction with the ocean they are met " transversely by the gulf-streams, and the sand and soil with which they are laden, instead of being carried out to sea, are heaped up in bars along the shores, and then, augmented by similar deposits held in suspension by the currents, soon extend to north and south, and force the rivers to flow behind them in search of a new outlet." At the mouths of the rivers, the bars thus created generally follow the direction of the current, and long embankments are gradually raised, behind which the rivers flow for considerable distances before enter- ing the sea. Occasionally the embouchures become closed by the accumulations without, and the rivers, swollen by the rains, force new openings for themselves, and leave their ancient channels couverted into lakes. Thus have been formed the lakes of Colombo and Negombo on the west coast, the harbour of Batticaloa on the east, and the long low embankments of sand on both coasts. These embankments, known by the local name of ''Gobbs," and often from one to three miles in breadth, are covered with thriving cocoa-nut plantations.

The Dutch whilst in possession of Ceylon did much to improve its water communication, and connected the natural channels formed by these embankments by con- structing artificial canals, so as to provide unbroken water communication between Kalpitiya, on the N.W. coast, and Negombo ; this line has been extended from Negombo to Colombo, and on to the south as far as Kalutara.

Harbours.—The magnificent basin of Trincomalee, sit- uated on the east coast of Ceylon, is perhaps unsurpassed in extent, security, and beauty by any haven in the world. The Admiralty has a dockyard here, and it is the principal naval station in the Indian Seas; but it is far removed from the productive districts, the population is small and scattered, and vessels have to resort to the rocky and dangerous harbour of Point de Galle at the south, or to the open roadstead of Colombo on the west. Something has been done by blasting to improve Galle harbour, but it is small, and its entrance is narrow and difficult ; it is also somewhat remote from the most productive districts, and the Colonial Government has decided on making a break-water at Colomboin preference to improving Galle har- bour. The anchorage at Colombo is good, and it is antici pated that the new works will render it a secure harbour at all times of the year.

Seasons, Climate, d:c.—The seasons in Ceylon differ very slightly from those prevailing along the coasts of the Indian peninsula. The two distinctive monsoons of the year are called, from the winds which accompany them, the south- west and the north-east. ‘The former is very regular in its approach, and may be looked for along the 8.W. coast be- tween the 10th and 20th of May; the latter reaches the N.E. coast between the end of October and the middle of November, There is q striking contrast in the influence

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which the south-west monsoon exerts on the one side of the island and on the other. The clouds are driven against the lofty mountains that overhang the western and southern coasts, and their condensed vapours descend there i copious showers. But the rains do uot reach the op-

posite side of the island: whilst the south-west is deluged, the east and north are sometimes exhausted with dryness ; and it not unfrequently happens that different sides of the same mountain present at the same moment the opposite extremes of drought and moisture.

The influence of the

Colombo, 42 feet.

Galle,

Ratnapura, 40 feet.

Jaffn 114 feet. :

Puttalam, 9 feet.

11 feet. Months.

eee ceeee

Wee eeene

year on the average of tive years,

75-70)148 | 75-31/195 |146-26/328 | 48.56] 79 | 38.32

87

O61

north-east monsoon is more general. The mountains which face the north-east are lower and more remote from the sea than those on the south-west ; the clouds are carried further inland, and it rains simultaneously on both sides of the island. Owing to the efforts of Lieut.-Col. Fyers, R.E., the surveyor-general of Ceylon, very accurate meteorological observations have been recorded throughout Ceylon for the last few years, and the following table has been compiled from the official return of rainfall in Ceylon during the years 1870-1874 inclusive :—

Anuradha- pura, 812 ft,

Trineomalee, 175 feet.

Kandy, 1718 feet.

Badulla, |NuwaraEliya, 2220 feet.

Kotmale,

6240 feet. 4000 feet.

8-01] 13 | 5-65! 12 8 | 512! 8

5 | 2311 6

7| 7-39] 16

5 | 5-13] 14

-48| 2] 9-73] 24

88] 5 | 7-65) 23

-68| 8] 4:24] 21

‘74 8 | 7-92) 21

7-82) 15 | 9-63] 22 13-27] 21 | 10-51] 21

9.42) 19 16

48.22) 94 | 60-25/116 | 81-62/204 | 58.02) 57 | 96-66/208 |164-22182

- 2 days in 1872 and 1 in 1873,

This table shows that throughout Ceylon the greatest quantity of rain falls in the last three months of the year, though at high elevations and within the immediate influence of the highest mountains the rainfall in June is very great. At Colombo, on the west coast, the rainfall is 75°70 inches, and the number of rainy days is 148 ; at Galle, at the south-west corner, the rainfall is nearly the same, viz., 75°31, but the number of rainy days is 195. At Ratna- pura, about 65 miles S.E. of Colombo, and lying immediately under Adam's Peak, the rainfall is 146-26, and the rainy days 228, Jaffna is at the extreme north of the island ; Puttalam lies on a salt lake, behind a gobb, close to the west coast. Anuradhapura lies to the north-east of Puttalam, about 40 miles from the low hills at the north of the mountain zone. Trincomalee is on the east coast, almost due east of Anuradhapura. Badulla lies to the far east of the mountain zone, and, though at a higher elevation than Kandy, has a very small rainfall. The hill-station of Nuwara Eliya has a rainfall of 96°66, and the coffee district of Kotmale, lying below the highest hills, has a rainfall of 164-22, and 182 rainy days. The returns for 1874 show that at four stations the rainfall in 24 hours excecded five inches. The following table, compiled from the surveyor-general's returns, shows the temperature:—

Temperature of the Air in 1874.

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rg a3 Sa he a |S Colombo … ..... 42] 85-3] 76-2; 80-7| 91-5] 69-3} 22.2] 165-0] 55-1 Ratnapura …... 114) 84-1; 75-9) 80-0) 89-2) 72-4] 16-8) 167-8) 56-6 Pittalani…..... 11] 87-0) 75-3) 81-1) 95-5} 68-8) 31-7) 161-0) ... Anuradhapura…| 312) 87-8) 73-8, 80-5] 95-0) 60-6] 34-4] 159-0} 35-0 UATAMIAT 6s 00s0 08 -| oss 85-8] 77-4| 81-6} 91-8) 70-2) 21-6) ... | 54-8 AMIE). cos. ces cee ees 9] 86-2) 77-4 81-8} 92-8) 65-5] 27-3] 160-4] 63-0 Trincomalee…... 175) 88-1 75-6; 81-8] 98-8) 69-5] 29-3] 175-0) 52-3

Batticaloa…..... 21) 86-5) 76-4, 81-4) 94-8) 68-6) 26-2) 169-0] .. Hambantota.. 40] 86-2} 74-4) 80-3] 98-0) 65-1] 32-9) 155.0) 55.2 (Cis paaeee meee 40} 82-9] 76-6] 79-7| 88-0) 71-0| 17-0} 160.0) 57-0 WSGMOY oc. ....00000 1650) 79-5] 72-8! 76-1] 84-9] 66-5) 18-4) 162-4) 40.4 Nuwara Eliya …/6150) 65-2) 51-7) 58-4] 73-0) 38-0) 35-1) 154-0] 7-2 Badly ces… 2220; 81-7 65-7! 73:7) 88-0) 54-0} 34-0) 160-0} 58-0

The length of the day, owing to the proximity of the island to the equator, does not vary more than an hour at any season. The mean time of the rising of the sun’s centre at Colombo on February Ist is 64 23™ a.m., and of its setting 62 5™ p.m. On August 15th its rising is at 52 45™ a.m, and its setting at 62 7™ p.m, It is mid-day in Colombo when it is morning in England. Colombo is situated in 79° 50’ 45” KE. long., and the day is further advanced there than at Greenwich by 54 19™ 235,

Geology and Minerals—Ceylon may be said to have been for ages slowly rising from the sea, as appears from the terraces abounding in marine shells, which occur in situations far above high-water mark, and at some miles distance from the sea. A great portion of the north of the island may be regarded as the joint production of the coral polypi and the currents, which for the greater part of the year set impetuously towards the south ; coming laden with alluvial matter collected along the coast of Coro- mandel, and meeting with obstacles south of Point Cali- mere, they have deposited their burdens on the coral reefs round Point Pedro; and these, raised above the sea-level, and covered deeply by sand drifts, have formed the penin- sula of Jaffna, and the plains that trend westward till they unite with the narrow causeway of Adam’s Bridge. The Tertiary rocks are almost unknown. The great geological feature of the island is the profusion of gneiss, overlaid in many places in the interior by extensive beds of dolo- mitic limestone. This

formation appears to be of great thickness ; and when, as is not often the case, the under-sur- face of the gueiss series is exposed, it is invariably found resting on granite. Veins of pure quartz and felspar of considerable extent have been frequently met with in the gneiss ; whilst in the elevated lands of the interior in the Galle districts may be seen copious deposits of disinte- grated felspar, or kaolin, commonly known as porcelain clay. At various elevations the gneiss may be found intersected by veins of trap rocks, upheaved whilst in a state of fusion subsequent to the consolidation of the

former. In some localities on the sea-shore these veins assume the character of pitch-stone porphyry highly im- pregnated with iron. Hornblende and primitive green- stone are found in the vicinity of Adam’s Peak and in the Pussellava district. he

Laterite, known in Ceylon as cabook, a product of disin- tegrated gneiss, exists in vast quantities in many parts, and is quarried for building purposes.

As yet no traces of coal have been found, with the exception of a little anthracite ; but looking to the position of the carboniferous deposits of northern India, lying as they do on the gneiss formation, it is not impossible that similar deposits may be here met with in like positions,

Specimens of tin, platina, copper, and black oxide of manganese from the southern province have been placed in the museum of the Ceylon Asiatic Society. Quicksilver mines existed at one time in the vicinity of Colombo, and the Dutch are said to have exported the article to Europe. Plumbago is quarried to a great extent, and has fora series of years formed a considerable item in the exports of the island. In 1850 the shipments of this article amounted to 23,823 cwts., in 1860 to 75,000 ewts., and in 1874 to 150,000 ewts, Iron exists in vast quantities in the western, southern, and central provinces, of excellent quality, in many places cropping out at the surface in a state of great purity. The Sinhalese have been accus- tomed to work the

ore into tools and implements from the most remote times; and although the means they

employ are rude, imperfect, and wasteful in the extreme,

they nevertheless manufacture articles which are esteemed by them far above those imported from Europe, and the rudely worked Sinhalese iron is equal in temper to the finest Swedish metal.

Nitre and nitrate of lime are to be met with in many caves of the low country, whilst alum and sulphate of magnesia are known to exist, though in limited quautities. Natural deposits of eommon ‘salt are found in many parts of the maritime provinces. It is also produced by arti- ficial means in large quantities under the supervision of Government, in whose hands its manufacture and sale form a monopoly which yields an annual revenue of eon- siderable amount. In 1873 the sale of this article yielded £80,000,

In the Sabaragamuwa district precious stones are met with in great abundance ; also, though less eommonly, in the Badulla, Nuwara Eliya, and Matara districts, The most valuable are the ruby, the sapphire, the amethyst, the eat’s-eye, and the carbuncle. Emeralds are rarely met with in any purity ; but the moon-stone, cinnamon stones, and garnets are found in great abundance and variety.

Soil.—The natural soils of Ceylon are composed of quartzose gravel, felspathic clay, and sand often of a pure white, blended with or overlaid by brown and red loams, re- sulting from the decay of vegetable matter, or the disintegra- tion of the gneiss and hornblende formations. The whole of the great northern extremity of the island consists of a sandy and calcareous admixture, made to yield productive crops of grain, tobaceo, cotton, and vegetables by the eare- ful industry of the Tamil population, who spare no pains in irrigating and manuring their lands. Between the northern districts and the elevated mountain ranges which overlook the Bintenne and Uva countries are extensive plains of alluvial soil washed down from the table- lands above, where once a tceming population produced large quantities of grain. The remains of ancient works of irrigation bear testimony to the bygone agriculture of these extensive regions now covered by swamps or dense jungle.

The general character of the soil in the maritime pro- vinces to the east, south, and west is sandy. Large tracts

of quartzose sand spread along the whole line of sea-eoast, some of which, of a pure white, and very deficient in vegetable matter, is admirably adapted to the growth of the einnamon plant. In the light sandy districts, where the soil is perfectly free, and eontains a portion of veget- able and nuineral loam, the eocoa-nut palm flourishes in great luxuriance. This is the ease along the entire coast line from Kalpitiya to Point de Galle, and further east- ward and northward to Matara, stretching to a distance inland varying from 100 yards to 3 miles. From this light sandy belt as far as the mountain-zone of the Kandyan country the land is mainly composed of low hilly undula- tions of sandstone and ferruginous elay, incapable of almost any eultivation, but intersected in every direction with extensive valleys and wide plains of a more generous soil, not highly fertile, but still eapable, with a little industry, of yielding ample crops of riee.

The soil of the eentral province, although frequently containing great quantities of quartzose sand and ferrugi- nous clay, is in many of the more elevated districts of a fine loamy character. Sand sufficiently vegetable and light for rice eulture may be seen at all elevations in the hill districts; but the fine chocolate and brown loams overlying gneiss or limestone formations, so admirably adapted for eoffee eultivation, are only to be found on the steep sides or along the base of mountain ranges at an elevation varying from 2000 to 4000 feet. Such Jand well-timbered contains in its elements the decomposed particles of the rocks above, blended with the decayed vegetable matter of forests that have for centuries scattered beneath them the germs of fertility. The quantity of really rich coffee land in these districts is but small as compared with the extent of country,—vast tracts of open valleys eonsisting of an indifferent yellow tenacious soil interspersed with many low ranges of quartz rock.

Botany.—The eharacteristics of the low-growing plants of Ceylon approach nearly to those of the eoasts of southern India. The Lhzzophoree are numerous along the low muddy shores of salt lakes and stagnant pools; and the acacias are equally abundant. The list comprises Zyiceras fra- grans,

Lpithina malayana, Thespesia populnea, Feronia elephantum, Salvadora persica (the true mustard tree of Scripture), Hugenia bracteata, Elaodendron Romburghit, Cassia Fistula, Cassia Roxburghii, &c. The herbaceous plants of the low country belong mostly to the natural orders Composite, Leguminose, Rubiacece, Scrophulariacec, and Luphorbiacee.

Leaving the plains of the maritime country and ascend- ing a height of 4000 feet in the central distriets, we find both herbage and trees assume an altered character. The foliage of the latter is larger and deeper coloured, and they attain a height unknown in the hot low country. ‘The herbaceous vegetation is there made up of ferns, Cyr- tandrece, Composite, Scitaminee, and Urticacee. The dense masses of lofty forest at that altitude are interspersed with large open tracts of coarse wiry grass, called by the natives patanas, and of value to them as affording pas- turage for their cattle.

Between the altitudes of 4000 and 8000 feet, many plants are to be met with partaking of European forms, yet blended with tropical characteristics. The guelder rose, St John’s wort, the Vepenthes distillatoria or pitcher plant, violets, gcraniums, buttercups, sun-dews, ladies’ mantles, and campanulas thrive by the side of Magno- liacee, Ranunculacece, Eleocarpee, &c. The most beauti- ful flowering shrub of this truly alpine region is the rhodo- dendron, which in many instances grows to the height of 70 feet. It is met with in great abundance in the moist plains of the elevated land above Nuwara Eliya, flowering abundantly in June and July. There are two distinct

varieties, one similar to the Nilgiri plant, having its leaves broad and cordate, and of a rusty colour on the under side ; the other, peculiar to Ceylon, is found only in forests at the loftiest elevations; it has narrow rounded leaves, silvery on the under side, and grows to enormous heights, frequently measuring three feet round the stem. At these altitudes English flowers, herbs, and vegetables have been cultivated with perfect success, as also wheat, oats, and barley. English fruit-trees grow, but rarely bear. Grapes are grown successfully in the north of the island. The vines were introduced by the Dutch, who overcame the difficulty of perpetual summer by exposing the roots, and thus giving the plants an artificial winter.

Timber.—The timber trees indigenous to Ceylon are met with at every altitude from the sea-beach to the loftiest moun- tain peak. They vary much in their hardincss and dura- bility, from the common cashew-nut tree, which when felled decays in a month, to the ebony and satinwood, which for many years resist the attacks of insects and climate. The known woods amount to 416 varieties, of which 33 are valuable for furniture, and house and shipbuilding, and are capable of standing long exposure to weather. The most beautiful woods adapted to furniture work are the cala- mander, ebony, flowered-satinwood, tamarind, nedun, dell, kadomberiya, kitul, cocoa-nut, &c.; the sack-yielding tree (Antiaris saccidora), for a long time confounded with the far-famed upas tree of Java (Antiaris tomicaria), grows in the Kurunegala district of the island.

Palms.—The Cocos nucifera, or cocoa-nut palm, is a native of the island, and may justly be considered the most valuable of its trees. It grows in vast abundance along the entire sea-coast of the west and south sides of the island, and furnishes almost all that a Sinhalese villager requires. Its fruit, when green, supplies food and drink ; when ripe, it yields oil. The juice of the unopened flower gives him toddy and arrack. The fibrous casing of the fruit when woven makes him ropes, nets, matting. The nut-shells form drinking-vessels, spoons, &c. The plaited leaves serve as plates and dishes, and as thatch for his cottage. The dried leaves are used as torches, the large leaf-stalks as garden fences. The trunk of the tree sawn up is employed for every possible purpose, from knife-handles to door- posts; hollowed out it forms alike a canoe or coffin. There are four kinds of this palm,—-the common, the king, the dwarf, and the Maldive.

The Palmyra and Arcca palms grow luxuriantly and abundantly, the former in the northern, the latter in the western and central districts: The one is valuable chiefly for its timber, of which large quantities are exported to the Indian coasts; the other supplies the betel-nut in common use amongst natives of the eastern tropics as a masticatory. The export trade in the latter to India and eastern ports is very considerable, amounting to £70,000 a year in value.

Cinnamon.—Next in importance to the cocoa-nut palm amongst the indigenous products of Ceylon is the cinna- mon plant, yielding the well-

known spice of that name.

Animals.— Foremost among the animals of Ceylon is the elephant, which, though far inferior to those of Africa and the Indian continent, is nevertheless of considerable value when tamed, on account of its strength, sagacity, and docility. They are to be met with in greater or less numbers throughout most unfrequented parts of the interior. Occasionally they make inroads in herds upon the culti- vated grounds and plantations, committing great damage. In order to protect these lands, and at the same time keep up the Government stud of draught elephants, “kraals” or traps on a large scale are erected in the forests, into which the wild herds are driven ; and once secured, they are soon tamed and fit for service. The oxen are of

small size, but hardy, and capable of drawing heavy loads. Buffaloes exist in great numbers throughout the interior, where they are employed in a half-tame state for plough- ing rice-fields and treading out the corn. They feed upon any coarse grass, and can therefore be maintained on the village pasture lands where oxen would not find support. Of deer, Ceylon possesses the spotted kind (Axis maculata), the muntjac (Stylocerus muntjac), a red deer (the Sambur of India), popularly called the Ceylon elk (Musa Aristvtelis), and the small musk (Moschus meminna). There are five species of monkeys, one the small rilawa (A/acacus pileatus), and four known in Ceylon by the name of ‘ wandaru” (Presbytes ursinus, P. Thersites, P. cephalopterus, P. Pria- mus), and the small quadrumanous animal, the loris (Loris gracilis), known as the ‘‘Ceylon sloth.” Of the Cheiroptera sixteen species have been identified; amongst them is the rousette or flying fox (Pteropus Edwardsii). Of the Carni- vora the only one dangerous to man is the small black bear (Prochilus labiatus). The tiger is not known in Ceylon, but the true panther (felis pardus) is common, as is the jackal (Canis aureus) and the mongoos or ichneumon (Herpestes vitticollis), Rats are numerous, as are the squirrel and the porcupine, and the pig-rat or bandicoot (Jfus bandicota), while the scaly ant-eater (Janis pentedactyla), locally known by the Malay name of pengolin, is occasionally found. The dugong (Halicore dugong) is frequently seen

on various points of the coast. .

Birds.—Upwards of 320 species of birds have becn found in Ceylon, and many of them have splendid plumage, but in this respect they are surpassed by the birds of South America and Northern India. The eagles are small and rare, but hawks and owls are numerous ; among the latter is a remarkable brown species, the cry of which has earned for it the name of the “ devil-bird.” The esculent swift, which furnishes in its edible nest the celebrated Chinese dainty, builds in caves in Ceylon. Crows of various species are numerous, and in the wilder parts pea-fowl are abundant. ‘There are also to be men- tioned king-fishers, sun-birds, several beautiful fly-catchers and snatchers, the golden oriole, parroquets, and numerous pigeons, of which there are at least a dozen species. The Cey- Jon jungle-fowl (Gallus Lafayetti) is distinct from the Indian species. Ceylon is singularly rich in wading and water birds,—ibises, storks, egrets, spoonbills, and herons being frequently seen on the wet sands, while flamingoes line the beach in long files, and on the deeper waters inland are found teal and a countless variety of ducks and smaller fowl. Of the birds familiar to European sportsmen there are partridge, quail, and snipe in abundance, and the wood-cock has been seen.

Reptiles. —The poisonous snakes of Ceylon are not nume- rous. Four specics have been enumerated,— the ticpolonga (Daboia elegans), the cobra di capello (Naja tripudians), the carawilla (Z’rigonocephalus hypnale), and the Lrigono- cephalus nigromarginatus, which is so rare that it has no popular name. The largest snake in Ceylon is the “boa,” or “anaconda” of Eastern story (Python reticulatus); it is from 20 to 30 feet in length, and preys on hog-deer and other smaller animals. Crocodiles infest the rivers and estuaries, and the large fresh-water reservoirs which supply the rice-fields; there are two species (C. biporcatus and C’. palus- tris). Of lizards the most note-worthy are the iguana, several bloodsuckers, the chameleon, and the familiar geckoes, which are furnished with pads to each toe, by which they are enabled to ascend perpendicular walls and adhere to glass and ceilings. .

Insects.—Insects exist in great numbers. The leaf and stick insects are of great variety and beauty. Ceylon has four species of the ant-lion, renowned for the predaceous ingenuity of its larvee ; and the white ants or termites, tho

CEYLON

Of the first colonization of Ceylon but little is known. In the great Hindu epic, the Ramayana, we have the fable of the conquest of a part of Ceylon by the hero Rama and his followers, who, as the poem tells, besieged and took the capital of its king Rawana, No permanent occupation of the country took place at this time, nor until the advent, in 543 B.c., of Vijaya an Indian prince, who, arriving from the mainland with a small band of followers, succeeded in establishing himself as sole ruler of the country. ‘To this king is attributed the introduction of caste into Ceylon, an institution which, although far less rigorously observed

ravages of which are most destructive, are at once ubiquitous and innumerable in every place where the climate is not too chilly, or the soil too sandy for them to construct their domed dwellings They make their way through walls and floors, and in a few hours destroy every vegetable substance within their reach Of all the insect pests that beset an unseasoned European the most annoying are the mosquitoes Ticks are also an intolerable nuisance ; they are exceedingly minute, and burrow under the skin. In the lower ranges of the hill country land leeches arc

found in tormenting profusion

fishes, —Of the fish in ordinary use for the table the finest is the seir, a species of scomber (Cybium guttatum), Mackerel, dories, carp, whitings, mullet (red and striped), soles, and sardines are abundant. Sharks appear on all parts of the coast, and the huge saw fish (Pristes antuguorum) infests the eastern coast of the island, where it attains a length of from 12 to 15 feet There are also several fishes remarkable for the brilliancy of their colouring; e.g., the Red sea perch (Lolocentrum rubrum), of the deepest scarlet, and the great fire fish (Scorpana miles), of a brilliant red. Some are purple, others yellow, and numbers with scales of a lustrous green are called “parrots” by the natives ; of these one (Sparus Lardwickit) is called the “ flower parrot,” from its exquisite colouring—irregular bands of blue, crimson, and purple, green, yellow and grey, crossed by perpendicular stripes of black.

Pearl Fishery.—Pearl oysters are found in the Tambala- gam bay, near Trincomalee, but the great banks on which these oysters are usually found lie neat Arippu, off the northern part of the west coast of Ceylon, at a distance of from 16 to 20 miles from the shore. They extend for many miles north and south, varying considerably in their size and productiveness, A naturalist was recently employed by the Government for five years to study the habits of the pearl oysters, but no information of any value has been obtained. It is, however, generally believed that the oyster arrives at maturity in its seventh year, that the pearl is then of full size and perfect lustre, and that if the oyster be not then secured it will shortly die, and the pearl be lost. It is certain that from some unexplained cause the oysters disappear from their known beds for years together, The Dutch had no fishery from 1732 to 1746, and it failed them again for 27 years from 1768 to 1796. The fishery was again interrupted between 1820 and 1828, also from 1833 to 1854, and from 1864 to 1873 In1797 and 1798 the Government sold the privilege of fishing the oyster-beds for £123,982 and £142,780 respectively. Since that time the fishery has been conducted by the Government itself, which sells the oysters in heaps of 1000 as they are landed from the boats. Under this system, however, reccipts have not exceeded £87,000 in any year, and have fallen as low as £7200, which was the net revenue from the fishery of 1874, The fishery immediately preceding (that of 1863) yielded a net revenue of £46,000. The small oyster found at Tambalagam is the Placuna placenta ; the pearl- oyster of the Arippu banks is the Meleagrina margaritifera,

Lfistory.—The island of Ueylon was known to the Greeks and Romans under the name of Zaprobane, and in later times Serendib, Sirinduil, and Zeylan have been employed to designate it by writers of the Western and Eastern Worlds. Serendib is a corruption of the Sanskrit Sinhaladvipa. Like most Oriental countries, Ceylon possesses a great mass of antiquarian records, in which the real is so intimately and largely blended with the ideal that the student finds it difficult to determine the respective limits of history and fable. The labours of Turnour have, however, helped to dissipate much of what was before confused and con- tradictory, and in his admirable translation of the “ Maha- wanso” we may trace the true current of Sinhalese history.

than on the continent, is still maintained,

Under him and his successors Ceylon attained a degree

of civilization scarcely to be looked for in that remote age of Oriental despotism. The purity of the religious and moral code, the strict administration of justice, and the well-defined and carefully protected rights of the king and his many classes of subjects excite our admiration not less than our astonishment. follow the subsequent current of Sinhalese history through its many intricate windings. the descendants of Vijaya the conqueror continued to hold the reins of government with varied ability and unequal success. Some of them were distinguished for their learning, their military prowess, their benevolence, and the length of their reigns. and foreign invasions, which not unfrequently cost them their lives. territories were not less frequent and fatal than those

It is impossible, however, to

It must suffice to say that

Others lived amidst civil dissensions The incursions of the Malabars upon their

of the Danes in Britain. During a period of four or

five centuries, these marauders continued to pour their bands of armed men into the island; and so far had the

country fallen off from its ancient prosperity and strength

that when, in the year 1505, the Portuguese adventurer

Almeida landed at Colombo, he found the island divided into seven separate kingdoms.

The first settlement of the Portuguese was effected in 1517, when Albergaria succeeded in obtaining permission from the king of Kotta, whose territories closely adjoined Colombo, to erect a small factory on the latter spot for purposes of trade. Once established, the new-comers lost no

opportunity of strengthening their position and extend- ing their intercourse with the natives. Stone walls quickly took the place of palisades ; the factory became a fort; whilst bristling cannon commanded ° alike the approaches by land and the entrance by sea. Alarmed at these unequivocal signs of military possession, the Sin- halese kings attempted to expel their new friends from the island, in which they were joined by the Moorish and other traders opposed to the progress of the Portuguese. But their efforts were too late, and proved ineffectual 3 and after a series of unequal and sanguinary conflicts, the Europeans found themselves in secure possession of the west coast of Ceylon.

The fanatical zeal and remorscless cruclty of the Portuguese were a constant source of dissension with the natives; and when, in the year 1602, the Dutch, under Admiral Spilberg, landed on the east coast and sought the alliance of the king of Kandy in the interior of the island, every encouragement was held out to them with the view of inducing them to aid in expelling the Portuguese. Nothing seems to have come of this until 1638-9, when a Dutch expedition attacked and razed the Portuguese forts on the east coast. In the following year they landed at Negombo, without, however, establishing themselves in any strong post. In 1644 Negombo was captured and fortified by the Dutch, while in 1656 they took Colombo, and in 1658 they drove the Portuguese from Jaffna, their last stronghold in Ceylon.

Pursuing a wiser policy than their predecessors, the

Duteh lost no opportunity of improving that portion of the country whieh owned their supremacy, and of opening a trade with the interior. More tolerant and less ambitious of military renown than the Portuguese, they so far sueeecded in their objeet as to render their commeree between this island and Holland a souree of great profit. Many new branches of industry were developed. Public works were undertaken on a large scale, and education, if not universally placed within the reach of the inhabitants of the maritime provinces, was at least well cared for on a broad plan of Government supervision.

That which they had so mueh improved by poliey they were, however, unable to defend by foree when the British turned their arms against them. A eentury and a half had wrought great ehanges in the physical and mental status of the Dutch colonists. The territory which in 1658 they had slowly gained by undaunted and obstinate bravery, they as rapidly lost in 1796 by imbeeility and cowardice. .

The first intercourse of the English with Ceylon took place as far back as 1763, when an embassy was despatehed from Madras to the king of Kandy, without, however, leading to any result. On the rupturo between Great Britain and Holland in 1795, a foree was sent against the Duteh possessions in Ceylon, where the opposition offered was so slight that by the following year the whole of their forts were in the hands of the English eom- mander.

At first the island was placed under the earo of the East India Company, but in 1802 the whole seaboard of Ceylon became, by the treaty of Amiens, a possession of the British Crown. The central traet of hilly country, hedged in by impenetrable forests and precipitous moun- tain ranges, remained in possession of Wikrama Sinha, the last of the Malabar dynasty of kings, who showed no signs of encouraging communication with his European neighbours.

Minor differences led in 1803 to an invasion of the Kandyan territory ; but siekness, desertion, and fatigue proved more formidable adversaries to the British forces than the troops of the Sinhalese monareh, and peaec was eventually eoneluded upon terms by no means favourable to the English. The eruelty and oppression of the king now became so intolerable to his subjeets that disaffeetion spread rapidly amongst them. Executions of the most horrible kinds were perpetrated. The utmost stretch of despotism failed to repress the popular indignation ; and in 1815 the British, at the urgent request of many of the Adigars and other native chiefs, proeecded against the tyrant, who was eaptured near Kandy, and subsequently ended his days in exile. With him ended a long line of sovereigus, whose pedigree may be traced through upwards of two thousand years,

By a convention entered into with the Kandyan chiefs on the 2d of Mareh 1815, the entire sovereignty of the island passed into the hands of the British, who in return guaranteed to the inhabitants eivil and religious

liberty. The religion of Buddha was deelared inviolable, and its rights, ministers, and plaees of worship were to be main- tained and protected; the laws of the eountry were to be preserved and administered aeeording to established forms ; and the royal dues and revenues were to be levied as before for the support of Government.

With the exception of a serious outbreak in some parts of the interior in 1817, whieh lasted for upwards of a year, and of two minor attempts at rebellion easily put down, in 1843 and 1848, the politieal atmosphere of Ceylon has remained undisturbed since the deportation of the last king of Kandy.

Population.—The total population of Ceylon, as ascer-

tained by the census of Mareh 1871, is given as 2,406,262: Its distribution aeeording to Provinces is as follows :—

Population to

rovined: ; Province square mile,

Population.

775,285 269,084 899,755 113,290

Northern 281,788 Central 495,340

70,720

Western North-Western Southern

2,406,262

The principal towns with these populations are— Colombo 95,843, Galle 47,059, and Jaffua 34,864. The distribution aceording to raee is as follows :

ST DUIS EC Rane Ratan paarcniaaeonacepcannonnngeddatic 1,670,207 Hlkananillls)- Ser gcsns creas duieestacmueeeeevor seesean 540,685 Arab deseemdanits) ...cvetiereosecessstsve oe 168,516 MIAN SS

anasconssaseeeaiaa Ma = aan 7,952 Other Asiaties, Kafirs, &e. .....0.000e 8,835 European descendants and half-castes… 14,181 IBILUAOVCEEDNS copeadpRGAcad® Lossdebdscdeenggnon: 5,886

Motallnene 2,406,262

Government.—Ceylon is a Crown colony, that is, a possession of the British Crown aequired by conquest or cession, the affairs of which are administered by a governor, who reeeives his appointment from the Crown, generally for a term of six years. He is assisted by an executive and a' legislative council. The executive council aets as the cabinet of the governor, and consists of the Queen's advoeate, the three principal officers of the colony (namely, the colonial secretary, the treasurer, and the auditor-general), and the general in command of the forees. The legislative council, in addition to the members of the executive, ineludes the two principal civil officers of the western and central provinces, the surveyor-general, the collector of customs, and six unofficial members nominated by the governor, who generally selects three to represent the planting and mereantile community, and three to represent the Sinhalese, Tamil, and Eurasian inhabitants ; the governor presides and has a casting vote, if the numbers are equal, in addition to his original vote. There are thus nine official members and six unofficial. The powers of the governor constitute a 'paternal despotism," controlled only by the distant authority of the Crown, as exercised through the sccretary of state for the eolonies. The functions of his councils are consultative; the adop- tion or rejection of their recommendations rests exclusively with himself. The executive council is the body by whose advice all Government measures are originally framed preparatory to their submission to the legislative council, by whom they are finally diseussed with all the forms of parliamentary debate ; still the paramount authority of the governor ean overrule their delibera- tions, and their labours may be nullified by his withholding his assent, which is necessary to give an enactment the force of law pending its allowance or disallowanee by the Crown. All legisla- tive enactments must be published in the local gazette for three weeks before they can be finally adopted by the legislature. A eertain portion of the colonial expenditure is covered by permancut ordinances, which provide for the fixed establishments of the colony, the contribution towards the military defence of the colony, and the

payment of interest and sinking fund on account of loans. All other expenditure has to be covered by an annual vote of the legislative council. The administration is carried on by a eivil service, organized on the model of the great institution by which our Indian empire has been formed. It is reeruited by members selected by competition from a limited number of candidates nomi- nated by the sceretary of state and the governor of Ceylon. The selected candidates are carefully trained in the colonial office at Whitehall and in the public offices in Ceylon, and are also required to pass an examination in the native languages before being em- ployed in any responsible office. For this highly-trained body the more important eivil appointments in Ceylon, including many of the judicial appointments, are reserved. The old routine system of rising by seniority was abolished by the order of the earl of Derby in 1845, and merit instead of seniority is professedly now the basis of promotion. The island is divided into seven provinecs, each having its chief and assistant agents, who carry on the affairs of the provinee under the direct authority of the Government. The agents of Government are the sole means of communication between the Government and the native inhabitants of the island ;

it is their duty to ascertain the real feelings of the people in refer- ence to any Government measure the expediency of which may be doubtful, and to keep them thoroughly acquainted with any change in the law, and also to bring before the Government the wants of the people, and to obtain early information of any disaffection or fear of a rising of the people. They have consequently very delicate and important duties to perform in relation to the native chiefs and nobles. They have also to collect, through their subordinates, al} the revenue not derived from customs duties, to see that the public buildings and highways arc kept in proper order, and generally to see to the welfarc of the province. ‘The provinces are divided into districts under an assistant agent, and the districts are parcelled out into smaller divisions under native chiefs and headmen of various ranks,—called in the Kandyan country Ratemahatmayas, Koralas, and Arachchies ; in the maritime Sinhalese provinces Mudaliyas, Muhandirams, and Vidanas; in the Tamil provinces Vanniyas, Udaiyars, and Vidanas. The Kandyan provinces are the central, north-central, and parts of the western and north-

western; the maritime or low-country Sinhalese provinces are the southern and parts of the western and north-western ; the Tamil provinces are the northern and eastern.

Justice.—The administration of justice is conducted by a Supreme Court, consisting of a chief justice and two puisne judges ; by dis- trict judges, police magistrates, justices of the peace, and commis- sioners of Courts of Request. There arc a Queen's advocate and a deputy Queen's advocate for the island. These officers correspond to the attorney-gencral and solieitor-general in England, They are the law officers of the Government, and are bound to give their advice on any case submitted for their opinion, and to appear for the Crown in all civil suits. The Queen's advocate also has to discharge the duties of public prosecutor, to supervise the proceed- ings of the justices of the peace, and to conduct the prosecution in all cases before the Supreme Court and in all serious cases. before the District Courts. The Queen's advocate is assisted by provincial deputies, who are the legal advisers of the agents of Government in charge of the provinces.

The Supreme Court has original criminal jurisdiction in all cases. It usually tries only cases ordinarily punished with more than one year's imprisonment ; in all criminal cases it has the assistance of a jury. It goes on circuit twice a year for criminal cases, It has appellate jurisdiction, civil and criminal, over all the subordinate courts in the island, and the power to issue writs of mandamus and habeas corpus. The District Courts have criminal jurisdiction in cases ordinarily punishable by twelve months' imprisonment with or without hard labour, by a fine of £100 or, more strictly, 1000 rupecs, or by 50 lashes, or by imprisonment and fine, or by imprison- ment and lashes within the specified limits. They have original civil jurisdiction in all cases, whether affecting land or not, in lunacy, in testamentary and matrimonial cases, and in administer- ing the estates of minors and intestates,

Law which have been only recently conferred by the Judicature Acts on the Supreme Court of Judicature in England. The District Courts have no jury, but they have the power, which, however, is rarely exercised, of summoning assessors to their assistance. The police courts have jurisdiction in cases ordinarily punishable by imprison- ment with or without hard labour for

three months, by a fine of £5 or 50 rupecs, or by twenty lashes, or by imprisonment and fine, or by imprisonment and lashes within the specified limits, The Courts of Requests have jurisdiction in civil cases where the matter in dispute is not of greater value than £10. The pleadings in all the courts are in English, but the proceedings are conducted in the language of the district unless both parties are English. The evi- dence is interpreted and recorded in English.

Village Tribunals.—In ancient times all petty disputes were settled by the village clders, who formed the village council or gamsabawa. When the island fell under European control these native customs were rudely swept away, and courts were established which were to administer justice equally to all. In course of time it was found that these courts were in reality highly oppressive to the people, who are of a litigious disposition, by bringing partics and witnesses away from their homes for the scttlement of every petty case and involving them in costs for stamps and legal assistance, the costs often being tenfold the value of the matter in dispute. It was also found that the ancient customs by which each shareholder in arable land was compelled to take his proper share in the common work, such as fencing, repairing the dams of the reservoirs for irrigation, and the like, had gradually fallen into disuse under British rule. It was consequently determined by Sir Hercules Robinson, then governor of Ceylon, to revive the ancient system, and by the "* Village Communities Ordinance, 1871," power was given to every village or group of villages to frame rules, having the force of law, for the management of village affairs, and to form village tribunals on the ancient model for the settlement of all petty cases, such as petty assaults and the'like, punishable by a small fine, and all civil cases of £2 and under. These tribunals are presided over by a native of rank and experience. The experiment has proved 4 suc-

They have long exercised , the combined powers of the Court of Chancery and the Courts of

cess beyond the expectation of its original advocates. The relief to the people in getting their small disputes settled on the spot by their own elders is very great, and the revival of the ancient village customs is leading to the

general restoration of the village tanks and other irrigation works, which were rapidly falling into decay from the failure of the Government to enforce the ancient rules for their preservation.

Laws.—In the maritime provinces ceded to Great Britain by the peace of Amiens the Roman-Dutch law prevails; in the Kandyan provinces the Kandyan law is administered under the convention of 1815. The Mahometans have their own laws of marriage and succession. The English law of evidence, trial by jury in the more serious criminal cases, and the English mercantile law have been introduced by local enactments. The Roman-Dutch law applies where no other system of law specially applies. Cases frequently occur in which it is a matter of the utmost difficulty to determine by which systen1 of law they are to be decided, and it is a matter for surprise that no attempt has been made to codify the Ceylon laws, or at least to adapt to the not very different circumstances of Ceylon the admirable civil and criminal codes, and the regulations of procedure, which have been given to India by the able men who have followed Lord Macaulay in the great task of regulating the administration of justice in India,

Language.—The language of nearly 70 per cent, of the population is Sinhalese ; of the remaining 30 per cent., with the exception of about 6000 Europeans and about 14,000 of European descent, the language is Tamil. Sinhalese is an Aryan language, nearly allied to Pali, which is the sacred language of Buddhism. Tamil is a Dravidian language spoken by those of Arab descent and by the Tamils, who are natives of the northern and eastern provinces, as well as by the Tamil immigrants from Southern India. A corrupt form of Portuguese is spoken by some natives of European descent. The Vaddas, 2 small forest tribe, speak a distinct language, and. the Rodiyas, an outcast tribe, possess a large vocabulary of their own. Pali is one of the Prakrits of ancient India, “which was spoken in the sixth century before Christ, and has been a dead language for upwards of two thousand years.” It was the dialect of Magadha, or Southern Behar, and was the language in which Gautama Buddha preached. “ Originally a mere provincial dialect, it was raised by the genius of the great reformer to the dignity of a classic language. It stands to Sanskrit in the relation of a younger sister ; Pali and Sanskrit, though intimately con- nected, being

independent corruptions of the lost Aryan speech which is their common parent.”

Lnterature.—The Sinhalese possess several original poeins of some merit, and an extensive and. most interest- ing series of native chronicles, but their most valuable literature is written in Pali, though the greater portion of it has been translated into Sinhalese, and is best known to the people through these Sinhalese translations, The Pali literature is of great extent; it comprises—(1,) The Buddhist Scriptures, called the Tripitaka, estimated in extent at eleven times that of our own Bible, and dating from 309 3.c.; (2.) The commentaries of Buddhaghosha, which date from the 5th century a.p,; and (3.) Historical, grammatical, and other works, of various dates from the 2d or 3d century to the present day, of which the most important are the two histories Dipavamsa and M ahavamsa, the discovery of which made the name of George Turnour illustrious, for in them we find the only authentic sources for the history of India previous to the Christian era. The treasures of the Pali literature are gradually being opened up to European scholars ; foremost amongst those who have sought to raise Pali scholarship to a science are a Frenchman and a Dane. Burnouf has left behind him the important works—Jntroduction & l‘HHistowre du Bouddhisme and Le Lotus de la Bonne Loi 3 and Fausbdoll is now editing the text of the entire Jataka, or IZistory of the Births of Buddha. This work is being translated by an Englishman, Professor Childers, whose valuable diction- ary is an immense boon to the Pali student.

CEYLON

Religuons.—The census of 1871 gives the following figures :—

Buddhists…..1,520,575 Mahometans…... 171,542 Hindus…..... 465,944 Chinistiang…....- 240,042

Of the Christians, about 186,000 are Roman Catholics, and 54,000 are Protestants of various denominations ; and it is estimated that about 150,000 of them are Sinhalese, 72,000 Tamils, and 18,000 Europeans and Eurasians. The Mahometans are the descendants of Arabs (locally termed Moormen) and the Malays. The Tamils, both the inhabitants of the island and the immigrants from India, are Hindus, with the exception of the 72,000

Christians. The Sinhalese, numbering 70 per cent. of the whole population, are, with the exception of 150,000 Christians, Buddhists. Ceylon may properly be called a Buddhist country, and it is here that Buddhism is found almost in its pristine purity. Ceylon was converted to Buddhism about 300 years B.c. by the great Augustine of Buddhism, Mahinda, son of the Indian king Dhammasoka ; and the extensive ruins throughout Ceylon, especially in the ancient cities of Anuradhapura and Polonnaruwa, bear witness to the sacrifices which kings and people joined in making to create lasting monuments of their faith. Under European rule royal support is no longer given to it, but its pure and simple doctrines live in the hearts of the people, and are the noblest monument to the memory of its founder Gautama Buddha. The taking of the meanest life is strictly forbidden, and falsehood, intem- perance, dishonesty, anger, pride, and covetousness are denounced as incompatible with Buddhism, which enjoins the practice of chastity, gratitude, contentment, modera- tion, forgiveness of injuries, patience, and cheerfulness, The Buddhist priests are sworn to celibacy, and are regu-

larly ordained. They are required to meet at convenient |

places every fourteen days for mutual confession. The Buddhist Temples in the Kandyan country possess valu- able lands, the greater portion of which is held by here- ditary tenants on:the tenure of service. These lands were given out with much care to provide for all that was necessary to maintain the temple and its connected monastery. Some tenants had to do the blacksmiths' work, others the carpenters', while another set of tenants had to cultivate the land reserved for supplying the mon- astery; others again had to attend at the festivals, and prepare decorations, and carry lamps and banners. In course of time difficulties arose; the English courts were averse to a system under which the rent of lands was paid by hereditary service, and a commission was issued by the governor, Sir Hercules Robinson, to deal with the whole question, to define the services and to enable the tenants to commute these for a money payment. The result of the inquiry was to show that the services, except in a few instances, were not onerous, and that almost without an exception the tenants were willing to continue the system. The Government maintains an ecclesiastical estab- lishment consisting, for the Church of England, of a bishop, whose see is Colombo, an archdeacon, four principal chap- lains, and several junior chaplains ; and,

for the Church of Scotland, of four principal chaplains. The total cost of this establishment is about £14,000 a year. Various missionary bodies have established themselves in Ceylon.

Caste.—Caste exists among the Sinhalese as a conven- tional and social, not as a sacred institution. All castes, however low, are eligible to the priesthood, which com- mands the homage of the highest. Buddha teaches that—

- A man does not become low caste by birth, Nor by birth does one become high caste ; High caste is the result of high actions—

And by actions does a man degrade himself to caste that is low.”

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Nevertheless, caste was tolerated under the Sinhalese kings as a social institution, and in the account given in the JMJanavansa of the planting of the great Bo tree, it is said that “the sovereign, the lord of chariots, directed that it should be lifted by the four high caste tribes and by eight persons of each of the other castes.” The highest caste among the Sinhalese is the goi-vansa, or tillers of the soil; there are, besides, fishers, smiths, washers, baggage- carriers, weavers, potters, scavengers, and many others. Every trade is a caste. The castes do not intermarry, and neither wealth nor Kuropean influence has had any effect in breaking down caste distinctions. At present the wealthiest native of Ceylon is a fisher by caste, but his wealth cannot gain him admittance to the houses of the native aristocracy, who are all of necessity of the highest caste. The Tamils have the same caste distinctions as their fellows on the mainland. The Mahometans have no caste distinctions.

iducation.—The Ceylon Government maintains a large number of public schools, chiefly of the village class ; and there are throughout the island several schools under the management of the Roman Catholics and other missionary bodies, which receive large grants from Government in the form of payments for results in subjects of secular instruc- tion. The education department is under a Director of Public Instruction. The following is an abstract of the school returns for 1874 :—

Number of Scholars.

Male, Female. | Total. 253 Public Schools,..... 10,376 1,348 | 11,719 4 Regimental Schools,... 331 27 358 882 Free Schools,..... 88,554 | 10,825 | 44,379

329 Private Schools, ... 8,569 1,360

The annual expenditure by the Government on education is upwards of £30,000 ; of which from £17,000 to £18,000 is expended on general administration and salaries of masters of public schools, and £13,000 on grants in aid and other contingent charges.

Crime.—The criminal statistics for the year 1874 give the following figures, having reference to a popula- tion of upwards of 2,400,000. The justices: of the peace made 10,171 preliminary inquiries, of which 2750 related to offences against the person, 2452 to cattle stealing, 3706 to offences against property, and 1263 to other offences ; 1807 persons were committed for trial in the superior courts, of whom 528 were sent up for offences against the person, 552 for cattle stealing, 452 for offences against property, and 275 for other offences. There were 11,794 summary convictions in the magistrates' courts, of which 2568 were for assaults, &c.; 178 malicious injuries; 1678 other offences against property; 5779 offences against Revenue

Acts, Highway Acts, Health Acts,and the like; 437 under

Masters and Servants Acts; and 1154 other offences. A comparison of the statistics for 1872, 1873, and 1874 shows a slight increase, under almost every head in 1874, as compared with the two previous years.

Diseases.— Ceylon is reputed to be more healthy than most parts of the adjoining continent of India. It is doubt- ful, however, how far this is true. It is a point which it is difficult to bring to the test of statistics. Experience proves that with ordinary care Europeans may pass many years in the island as free from disease as in any part of Europe, but a lengthened residence almost invariably induces a reduced vigour in the whole muscular

apparatus, The diseases to which Europeans are most subject are dysentery and hepatic attacks. The returns from the

native hospitals for 1874 show that chronic dysentery, diarrhoea, anasarca, and asthenia are the most fatal. In the principal hospital in Ceylon, namely, the Maradana hospital, near Colombo, out of 292 deaths 34 were from chronic dysentery, 99 from diarrhcea, 33 from anasarca, and 18 from asthenia; in the Kandy hospital, out of 304 deaths, 14 were from chronic dysentery, 99 from diarrhea, 94 from anasarca, and 42 from asthenia; in the Galle hospital, out of 89 deaths, 4 were from chronic dysentery, 14 from diarrhoea, 11 from anasarca, and 1 from debility.

Roads.—The policy of the Sinhalese rulers of the interior was to exclude strangers from the hill country. Prior to the British occupation of the Kandyan territory in 1815, the only means of access from one district to another was by footpaths through the forests. The Portuguese do not appear to have attempted to open up the country below the hills, and the Dutch confined them- selves to the improvement of the inland water-communi- cations. necessity of making roads into the interior for military purposes, and, more recently, for developing the resources of the country. The credit of opening up the country is due mainly to the governor, Sir Edward Barnes, by whose direction the great military road from Colombo to Kandy was made. Gradually all the military stations were con- nected by broad tracks, which by degrees were bridged and converted into good carriage roads. The governors Sir Henry Ward and Sir Hercules Robinson recognized the importance of giving the coffee planters every assistance in opening up the country, and the result of their policy is that the whole of the hill country is now intersected by a vast number of splendid roads, made at a cost of upwards of £2000 per mile. In 1848 an ordinance was passed to levy from every adult male in the colony (except Buddhist priests and British soldiers) six days’ labour on the roads, or an equivalent in money. The labour and money obtained by this wise measure have enabled the local authorities to connect the Government highways by minor roads, which bring every village of importance into communication with the principal towns. The expenditure in 1874 out of the revenues of the colony on roads,

streets, bridges, and canals was, in round numbers, £175,000, of which sum £113,500 was expended in the ordinary maintenance of existing roads. The expenditure by the local authorities under the road ordinance amounted in the same year to £65,000, and by the municipalities of Colombo, Kandy, and Galle to £23,000.

Railways.—After repeated vain attempts by successive governors to connect Colombo with the interior by railways, Sir Charles MacCarthy successfully set on foot the present railway of 75 miles in length from Colombo to Kandy, which is probably the most prosperous in the world. It was constructed at a cost of £1,738,483. The gross receipts in 1872 were £226,000, and the working expenses £89,000, or about 38 per cent. of the gross earnings, A branch rail- way from Peradeniya (four miles from Kandy) to Navala- pitiya, 17 miles in length, has just been completed, and a line from Colombo to Moratuwa, 11 miles in length, has been commenced ; the latter line will probably be extended to Kalutara, distant 26 niles from Colombo. The line from Colombo to Kandy is remarkable for its beauty, and for the engineering skill shown in its construction. The ruling gradient for the first 50 miles is 1 in 100; the line then rises for 12 miles with a gradient of 1 in 45 throughout and curves of 10 chains radius, to the Pera- deniya station, which is 1562 feet above the sea-level. The Navalapitiya railway station is 1913 feet above the sea-level.

Agriculture.—The Sinhalese are more attached to the

The British Government saw from the first the

pursuit of agriculture than any other occupation, and although their implements are of the rudest kind, and their processes the most simple, they succeed in obtain- ing successive crops of grain of good quality wherever they can secure sufficient water. The chief culture in every part of the island is that of rice, the staple food of all the native races in Ceylon.

Fice.—In a few places, where the rain-fall is abundant, rice cultivation is allowed to depend on the natural supply of water, but in most parts the cultivation is not attempted unless there is secured beforehand a certain and

sufficient supply, by means of canals or reservoirs. In the hill country every valley and open plain capable of tillage is made to yield its crops of grain, and the steep sides of the hills are cut into terraces, on which are seen waving patches of green rice watered by mountain streams, which are conducted by means of channels ingeniously carried round the spurs of the hills and along the face of acclivities, by earthen water-courses and bamboo aqueducts, so as to fertilize the fields below. These works bear witness to the patience, industry, and skill of the Kandyan villagers, In the low country to the north and east and north-west of the hills, irrigation works of a more expensive kind are necessary.

Lrrigation.—The native rulers covered the whole face of the country with a network of irrigation reservoirs, by which Ceylon was enabled in- ancient times to be the great granary of Southern'Asia. Wars, and the want of a strong hand to guide the agriculture of the country, have led to the decay of these ancient works, and large tracts of land, which were formerly highly productive, have become swampy wastes or dense forests. The remains of some of the larger irriga- tion works are amongst the most interesting of the memorials of Ceylon's former greatness. Some of tho artificial lakes were of great size. Mineriya, formed by damming across the valleys between the low hills which surround it with an embankment 60 feet wide at the top, is at this day twenty miles in circumference. Another with an embankment several miles in length, the Kala- wewa, was formed by damming back the waters of the Kalaoya, but they have forced their way through the em- bankment, and in the ancient bed of the lake, or tank, are now many small villages. In connection with these large tanks were numerous canals and channels for supplying smaller tanks, or for irrigating large tracts of fields. Throughout the district of Nuwarakalawiya every village has its tank, The embankments have been formed with great skill, and advantage has been taken to the utmost of the slightest fall in the land; but they in common with the larger works had been allowed to fall into decay, and were being brought to destruction by the evil practice of cutting them every year to irrigate the fields. The work of restoring these embankments has at last been undertaken by the Government. Proper sluices will gradually be supplied to all the village tanks, and the em- bankments will be raised and strengthened by the united labour of the villagers in proportion to their shares in the fields under the gamsabawa system.

Dry Grains.—Several dry grains (so called as distin- guished from rice, which is grown in water) are grown in Ceylon. These are chiefly kollu, millet, kurakkan, gingele, and pulse of various kinds.

Tobacco.—Tobacco is extensively cultivated in various parts of the island, and the growth of particular places, such as Durabara and Uva, is much prized for local con- sumption. The tobacco of export is grown in the penin- sula of Jaffna, where the rajah of Travancore has an agent who purchases for him direct from the growers. The exports of this article in 1850 were 22,176 cwts., valued at £20,698, and in 1873, 36,676 cwts., valued at £99,174.

CHEYLON

Cinnamon.—Ceylon has been celebrated since the middle of the 14th century for its cinnamon, and during the period of the Dutch occupation this spice was the principal article of commerce ; under their rule and up to 1832 its cultivation was a Government monopoly. With the aboli- tion of the monopoly the quantity exported increased, but the value declined. European consumers contented them- selves with the cheaper and coarser cassia, and the Ceylon producers then peeled the coarser and less valuable shoots of cinnamon to compete with the cassia, till the average price in London, which was 5s. 1d. per tb in 1841, was reduced in 1857 to 1s. 6d. per Ib. Cassia during this period varied from 1s. 14d. to 64d. per Ib. The customs returns give the exports for 1850 at 664,857 ib, valued at £64,486, and for 1873 at 1,160,754 ib, valued at only £58,037.

Cofee.—The most important cultivation is that of coffee, a branch of industry which since the year 1841 has assumed a position of great and ever-increasing prominence. Coffee was an article of growth and export from Ceylon so far back as the time of the Portuguese, but like the cinnamon it grew wild without any attempt at cultivation. Patches of it were to be seen around the Kandyan villages in wild luxuriance ; and the berry, gathered before it was ripe, and imperfectly cured, seldom possessed much flavour, and was lightly esteemed as an article of European com- merce. Coffee cultivation on the West Indian plan was first commenced in 1824 by Sir E. Barnes, then gover- nor of Ceylon, who hoped by his example to introduce coffee-planting by Europeans into the island. Until 1834,

however, public attention does not seem to have been occupied with the subject; but in that year the falling off in the supplies from other quarters brought capitalists into the field ; and when in 1836 the home duty on East India coffee was reduced to 6d. per Ib, a great impulse was given to coffee planting in Ceylon. During that and the following year about 7000 acres of forest land were purchased for this object ; and when at the end of a few years it became matter of notoriety that the soil and climate of Ceylon were capable of yielding a coffee equal in value to most kinds, the influx of capital from England for investment in this new branch of Ceylon industry became very great.

The commercial crisis of 1847 gave a check to coffee- planting in the island, and caused the abandonment of several estates. But enforced economy induced more careful cultivation, and the coffee enterprise soon recovered. There are now 1,215 coffee plantations, of which 800 are owned by individual proprietors, 250 of whom reside on their own estates, and 400 more are resident in the island. The area is estimated at 250,000 acres, of which 195,000 are in bearing. The exports from these planta- tions for the coffee season ending 10th Oct. 1874 were 850,000 cwts., giving an average yield from old and new estates together of a little over 4 cwts. peracre. Estates from 5 to 10 years old probably yield about four and half cwts. per acre, and older estates about three and a half cwts. per acre. The price for plantation coffee in the London markets in 1845 was 74s. per cwt.; it has fluctuated considerably, and went down to 50s. in 1851, but it did not rise much above the price of 1845 till 1872, when it steadily rose till it reached 139s. on Feb. 7th, 1873. Land suitable for coffee is purchased from the Government in forest. It was formerly sold in large blocks at an upset price of 5s, an acre; it is now sold in convenient blocks of 200 acres or less at an upset price of £1 an acre; no land, however, which is really well suited for coffee can be obtained at less than £9 or £10 an acre, and in 1873 a lot of 306 acres of forest land sold for £18 per acre. Including the lands sold in small lots to natives, the Government granted from 1833 to 1844

267,373 acres, and between 1844 and 1874 693,886 acres; the average price per acre has risen from 10s. 8d. to £2, 12s. 4d. per acre. The exports of

coffee in 1850 were 278,473 cwts., valued at £609,262, and in 1873, 951,591 cwts., valued at £4,220,750.

T’ea.—The cultivation of tea has recently been intro- duced. A small quantity of pure good tea is produced annually, and finds a ready market in the island. It has not yet become an article of export.

Cinchonu.—Cinchona was introduced into the hill districts of Ceylon and India from South America in 1860, It was brought direct from the forests, where it maintained an incessant struggle with other trees for existence. After patient and intelligent experiment its cultivation has been assured, and the object of its introduction secured. There is now provided an abundant supply of the bark at a price which will secure to the population at large the valuable febrifuge yielded by the alkaloids of cinchona.

Sugar.—The cultivation of sugar was commenced in 1836 near Kandy, and subsequently in several other parts of the island, but without any permanent success : the sugar grown inthe island forms a very small portion of the annual consumption. The sugar imported in 1873 amounted to 28,956 cwts., valued at £46,953.

Cocoa-nuts.—As an investment for English capital cocoa- nut planting has not proved remunerative. ‘To the native cultivator a small cocoa-nut plantation adjoining his home- stead is of the utmost value, as has been already explained under the head “palms.” It is estimated that the extent of land, held by Europeans and natives, bearing cocoa-nuts is 250,000 acres.

Manufactures.—The native manufactures are of the most primitive description. Coarse cotton cloth of a strong and serviceable kind is woven in rude looms, but the looms are rapidly disappearing with the introduction of the cheaper but inferior productions of Manchester. The fibre of the cocoa-nut is worked up in large quantities into coir yarn and cordage, which is admirably adapted for use in salt water. The country trading vessels employ no other cordage or rope than this, and indeed the planks of their small vessels are held together solely by coir yarn, without the aid of a single nail. Cocoa-nut oil is expressed from the dried kernel of the cocoa-nut in native mills, which are simply a rough mortar of wood or stone in which a heavy pestle of hard wood is made to revolve by means of a pair of

oxen at the end of a long pole, secured by a bamboo to the upper end of the pestle, the whole machine forming a simple kind of lever, by the action of which the oil is extracted. Steam-power is now used by European merchants in manufacturing this oil and in preparing and pressing coir fibre, and oil and coir have become important articles of export. In 1850 the exports of coir rope, yarn, &c.,were 39,886 cwts., valued at £20,435, and in 1873, 65,048 cwts., valued at £45,363. Of cocoa-nut oil the exports in 1850 were 32,785 cwts., valued at £35,035, and in 1873, 113,872 cwts., of the value of £141,818.

Trade and Commerce.—The trade of Ceylon shows a steady im- provement. ‘The earliest returns of imports and exports are those for 1825, which give the following figures :—Imports, £296,301 ; exports, £224,388; total, £510,689. The latest returns show that

in 1874 the imports and exports together were valued at nearly ten millions, as against half a million in 1825, that is half a century

ago. The figures are as follows :— Year, Imports. Exports, Total. 1835 | £352,076 | £199,268 | £551,344 1845 | 1,495,127] 583,100 | 2,078,227 1855 | 2,388,191 | 1,974,777 | 4,862,968 1865 | 5,022,179 | 3,565,157 | 8,587,336 1874 | 5,336,119 | 4,394,427 | 9,780,546

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There has been a corresponding increase in the tonnage of ship- ping entered and cleared during the same period. The figures are as follows :—

DSO ok Meee rycen senenee: 91,685 tons. GBI” Aeenee secs sacs goat 145,182 , MSAD) aces ten sc: ates 423,370 ,, TSI) Pescara sonieiee sisaisuss 634,482 ,, WSC oy germane + 1,150,840 ,, MIS cosctts saictasuissiied OMS He

With the exception of a duty of one shilling per cwt. on plum- bago, which is in lieu of the royalty to which the Crown was entitled on all plumbago as it came from the pits, there are no export dutics; the duty on imports is five per cent. on the declared value, with some few exceptions, such as arms, wincs, spirits, and grain, which are liable to special rates ; paddy, or rice in husk, which pays 3d. a bushel ; rice and other grain, 7d. a bushel; and machinery, paper, aud a few other articles, which are free.

Banks.—Two English banking companies and one Indian bank have branches in Ceylon—the Oriental Bank Corporation, the Chartered Mercantile Bank of India, London, and China, and the Bank of Madras. The two chartered banks, the Oriental and the Chartered Mercantile Bank, have the privilege of issuing notes of five rupees and upwards in value. The Government in 1856 gave up this privilege, and left the paper currency of the island entirely in the hands of the banks, who pay to the Government, in lieu of stamp duty, one percent. per annum on the average amount of notes in circulation, and are required to keep in reserve bullion equal to one-third of their issues. The bank notes are received at all the Government treasurics throughout the island, but the banks are bound to redeem them with specie after a notice of 60 days; this rule is only enforced when the Government requires a remit- tance of specie at some distant treasury. The note circulation has increased with the general improvement in the financial position of Ceylon. In 1854 it amounted to £131,000, of which £70,000 was represcnted by Government notes ; in 1859 it amounted to £93,334, in 1864 to £259,631, in 1869 to £270,979, and in 1874 to £386,089. Since 1st January 1872 the rupee has been the sole standard of value in Ceylon, with decimal subdivisions, represented by bronze token pieces, which are taken as cquivalent to x>th part of a rupee or 5 eents, z$5th part of a rupee or one cent, z}oth part of a rupee or half a cent, g§sth part of a rupee or a quarter of a cent. All accounts are kept in rupeesand cents. The Indian silver subsidiary coins are current,—the half rupee as 50 cents, the quarter rupce as 25 cents, and the two anna piece (jth of a rupee)‘as 124 cents. The rupee is the Company’s silver rupee of India, of 180 grains weight and 44ths fineness.

Revenue and Expenditure. —The total revenue for 1874 was £1,241,558, the total expenditure £1,110,180. The principal heads of revenue are

customs, £268,203; land. sales, £67,795; land revenue, £80,822; tolls on roads and canals, £41,247 ; licences (under which head is derived the revenue from the Government nonopoly of the arrack trade), £173,305 ; stamps (including both general and postage), £105,239, of which about £20,000 is postal revenue ; fines and forfeitures, £8440; sale of Government property, £133,323, of which about £70,000 is derived from the monopoly on salt; reim- bursements, £30,000; interest on suitors' deposits invested inIndian Government securities and on balances in England, £13,600 ; miscel- laneous, £44,633 ; pearl fishery, £9524 ; railway receipts, £221,168. Of the customs duties about £150,000 is derived from the import duty on grain, and of the land revenue about £70,000 is derived from the tithe on grain; it thus appcars that about one-fifth of the total revenuc of the island is derived from a tax on the daily food of the people. In defence of these burdens on.food, it is urged that the importation of ricc is rendered necessary, to a large extent, by the employment on the coffee estates of immigrant labourers from the south of India, who come over for the coffee season and return to India with their earnings, out of which they would contribute nothing to the révenue of Ceylon, if it were not for the tax on their imported food; and as regards the tithe on grain, that

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CHABLIS, a town of France, on the Seray or Serein, in the department of Yonne, 10 miles east of Auxerre. It has a church, St Martin, of the 13th century, which is classed among the historical monuments of France; and it gives its name to a celebrated white wine produced in the neighbouring vineyards, of which the most esteemed are Clos, Valmur, Vaudesir, Bougereau, and Mont de Milieu. Population in 1872, 2270.

CHABRIAS, a celebrated Athenian gencral, who first assumed the command about the year 3923.c. He defeated the Spartans at Adgina (388), and again at Naxos (376). With Iphicrates and Callistratus he commanded at Corcyra,

this is the reserved rent of the Crown as supreme landlord. The monopoly of the arrack trade yields about £170,000. 'The very name of monopoly has

an odious sound, but in the instances in which it exists in Ceylon it is difficult to see what modc of taxation would be less oppressive, and, as regards the arrack monopoly, there can be no doubt that its possession by the Government renders possible the exercise of an effectual check on the abuse of this intoxi- cant. The Government restricts distillation to certain licensed stills, which are left free to sell the spirit wholesale in open market, but the right to retail is granted only to certain persons and certain taverns. This right is sold by auction from year to year to taverns or groups of taverns, which are bound to retail pure arrack at not more than a certain price named in the conditions, and are subjected to stringent regulations for the prevention of drunkenness and the maintenance of order. In the management of this mono- poly, revenue is a secondary consideration, and taverns are only allowed where they are absolutely required, that is, where their place, if they were not allowed, would be supplied by the illicit sale of arrack. The proper management of this monopoly has received much attention from the present governor, Sir W. H. Gregory, and he has been careful to enforce the observance of the principles which have always been supposed to govern this question. The monopoly of salt has been from time immemorial in the hands of the sovereign, and, as it prevails in Ceylon, is common to every country in the East ; it seems to be the only cxpedicnt by which to obtain a minimum of taxation from classes incapable of bearing in any other shape an equitable share of the public burdens. Salt is produced at about 10d. per cwt. and sold at 4s. 8d. per cwt.

The principal heads of expenditure are as follows :—Salaries and office charges, £354,761; pensions, £41,000; revenue services, £24,000 ; hospitals, £16,000; education, £14,600; police and jails, £30,700; works and buildings, £24,000; roads, streets, bridges, and canals, £185,300 ; military expenditure, £124,687. The returns of revenue and expenditure of the Government, as given above, do not represent the whole of the public revenue and expenditure of the island ; there have to be added the returns from the municipalities and the local boards by which the road tax is collected. These figures are as follows for the year 1874 :—

Revenue. Expenditure. Colombo Municipality …..... £38,961 £38,708 Galle ee ene 7,057 6,100 Kand RO as SBI 11,766 14,548 Provincial Road Committees— Western Province…..... 35,087 28,468 North-Western

Province… 9,213 6,180 Southern ae 9,554 8,046 Eastern 15 5,192 4,350 Northern a slaty 6,976 Central eee «© MORON, 9,319 North-Central i ee | ABBE 1,838 Ga ic scattetsnias £148,519 £124,478

The returns of revenue from 1856 to the present time show a steady and rapid increase, and are a fair indication of the great advance which Ceylon is making. The revenue in 1856 was £504,174; it rose, year by year, till it reached £767,100 in 1860, and in 1865 it amounted to £978,462; it then fell somewhat owing to the cession by the Government to the municipalities of certain sources of revenue, butit rose in 1870 to £1,091,606, in 1871 to £1,121,679, in 1872 to £1,174,698, and in 1873 to £1,290,918. The revenue for 1874 in reality excecded that of 1878, though it is only given as £1,241,558, which is the equivalent of rupees 1,32,48,288 at 1s. 10$d., at which the rupee is rated in the accounts for 1874, whereas in the previous year it was rated at 2s,

Tennent's Ceylon, 2 vols. 2d ed. 1859; Reports to Ceylon Govern- ment by Service Tenures Commissioner, 1870-1873 ; Ceylon Govern- ment Blue Book, 1874, and Gazette, 1875 ; Childers's Palt Dictionary 1875 ; Ferguson's Ceylon Directory, 1875. a. He DB.)

and repulsed Epaminondas before the walls of Corinth. In 366, together with Callistratus, he was accused of treachery in advising the surrender of Oropus to the The- bans, and was then, it is said, defended by Plato. His unpopularity on account of this charge, and also on ac- count of his ostentation and luxuriousness, led him to accept a foreign command under Tachos, king of Egypt, who had revoltcd from the Persians. On the breaking out of the Social War (357), he, however, joined Chares in the command of the Athenian fleet. At the siege of Chios, his ship was disabled, but he refused to flee, and fell fighting bravely. He was famous for the invention of a maneeuvre,

which consisted in receiving a charge on the left knee, with the spears of the front ranks pointed against the enemy and the shields resting on the ground.

CHADERTON, Laurence (1536-1640), a Puritan divine, was born at Lees Hall, in the parish of Oldham, Lancashire, September 14, 1536, being the second son of Edmund Chaderton, « gentleman of an ancient family, and a zealous Catholic. Under the tuition of Laurence Vaux, a priest, he became an admirable scholar. In 1562 he entered Christ's College, Cambridge, where, after a short time, he formally joined the Established Church, and was, in consequence, disinherited by his father. In 1567 he was clected a fellow of his college, and subsequently he was chosen lecturer of St Clement's Church, Cambridge, where he preached to admiring audiences for many years. So great was his reputation that when Sir Walter Mildmay refounded Emmanuel College in 1584, he chose Chaderton for the first master, and on his expressing some reluctance, declared that if he would not accept the office, the founda- tion should not go on. In the beginning of the reign of James I. Chaderton was appointed one of the five divines for managing the cause of the Puritans at the Hampton Court conference ; and he was also one of the translators of the Bible. In 1613 he was created D.D. At this period he made provision for twelve fellows and above forty scholars, in Emmanuel College. Fearing that he might have a successor who held Arminian doctrines, he resigned the mastership in favour of Dr Preston, but survived him, and lived also to see the college presided over successively by Dr Sancroft and Dr Holdsworth. He died November 1540 in the second month of his 105th year, according to his biographer Dr Dillingham. Dr Chaderton published a sermon preached at St Paul's Cross in 1578, and a treatise of his On Justification was printed by Anthony Thysius, professor of divinity at Leyden. Some other works by him on theological subjects remain in manuscript.

CH/AERONEIA, a Beeotian town situated on the Ther- modon, a tributary of the Cephissus, on a plain which was on tlie borders of Phocis, and was on the natural route for an army invading Beeotia on that side. It is celebrated in history as the scene of three great battles. In the first (447 B,c.) the Athenians were defeated by the Beeotians ; in the second (388 B.c.) Philip defeated the confederate forces of the Athenians and Beeotians ; and in the third (86 3.c.) Sulla defeated the generals of Mithri- dates. A colossal lion lately excavated near the site of the modern Kapurna marks the grave of the Bceotians who fell in the second of these engagements, aud in the village itself are some remains of the ancient citadel, the Petrachus,

and a theatre excavated out of the rock on which the citadel was built. Cheroneia was the birthplace of Plutarch.

CHAFFINCH (fringilla celebs), a Conirostral Bird, belonging to the family Mringillide or Finches, and distin- guished, in the male sex, by the deep greyish blue of its crown feathers, the sulphur yellow of its rump, the white of the wing coverts, so disposed as to form two conspic- uous bars, and the reddish brown passing into vinous red of the throat and breast. The female. is less conspicuous in its colouring than the male, and the young males resemble the females until after the first autumn moult, when they gradually assume the plumage of their sex. The chaffinch breeds early in the season, and its song may often be heard in February. Its nest, which is a model of neatness and symmetry, it builds on trees and bushes, preferring such as are overgrown with moss and lichens. It is chiefly composed of moss and wool, lined internally with grass, wool, fcathers, and whatever soft material the locality affords. The outside consists of moss and lichens, and

according to Selby, “is always accordant ‘with the par-

ticular colour of its situation.” When built in the neigh- bourhood of towns the nest is somewhat slovenly and untidy, being often composed of bits of dirty straw, pieces of paper and blackened moss; in one instance, near Glasgow, the author of the Birds of the West of Scotland found several postage-stamps thus employed. It lays four or five eggs of a pale purplish buff, streaked and spotted with purplish red. In spring the chaffinch is destructive to early flowers, and to young radishes and turnips just as they appear above the surface ; in summer, however, it feeds principally on insects and their larvae, while in autumn and wiuter its food consists of grain and other seeds. On the Continent of Europe the chaffinch is a favourite songbird, especially in Germany, where a cow has been known to be given in exchange for one of these birds, and where great attention is paid to its training. Its notes are clear and powerful, and, according to Bechstein, ‘seem almost to approach to words.” ‘he chaftinch is found throughout Europe and Western Asia, and has been observed as far west as the Azores. It is resident all the year in the warmer parts of this area, but migrates south- ward from Northern Europe on the approach of winter. It was at one time supposed that the females only migrated, and Linneus

named the species Celebs, or “ bachelor,” in allusion to this alleged desertion of the males by their mates, which, however, does not appear to take place.

CHAGRES, a seaport of Colombia, in the state of Panama, situated on the northern side of the Isthmus of Panama, about 12 miles W.S.W. of Colon or Aspinwall, at the mouth of a river of itsown name. Before the opening of the railway between Panama and Aspinwall in 1855 it was a place of very considerable importance; but it has now sunk into a very decadent and dilapidated condition, and the inhabitants, who are mainly negroes or half-castes, only amount to about 1000. The period of its greatest prosperity coincides with the great emigration from the United States to the Californian gold-fields, and the dis- trict on the left side of the river is still known as the American town. The chief facts in its history are its destruction by the buccaneers in 1671 and its capture by the English under Admiral Vernon in 1740.

CHALCEDON, or rather CaLcHEDON, an ancient maritime town of Bithynia, in Asia Minor, called also Procerastis and Colpusa, almost directly opposite Byzan- tium, to the south of the present town of Scutari It was founded by a colony from Megara, on a site so obviously inferior to that which was within their view on the opposite shore, that it received from the oracle the namo of “The City of the Blind.” In its early history it shared the fortunes of Byzantium, was taken by the satrap Otancs, vacillated long between the Lacedzemonian and the Athcnian interest, and at last fell into the hands of the kings of Bithynia, by the last of whom it was bequeathed to the Romans. It was taken and partly destroyed by Mithridates, but it recovered during the empire, and in 451 a.p. was the seat of the Fourth General Council, which condemned the Monophysites. It fell under the repeated attacks of the | barbarian hordes, who crossed over after having ravaged Byzantium, and it furnished an encampment to the Persians under Chosroes for about ten years after 616. Its ruin was completed by the Turks, who used it as a quarry from which to draw the building materials for Constantinople. The site is now occupied by the village of Kadi Keui, or “ Village of the Judge,” which contains a number of fine villas and a large Roman Catholic cathedral. At a short distance to the south are tho ruins of Panteichon, or, as it is now called, Pandik, where Belisarius is said tu have

lived in retirement, A plain in the neighbourhood affords camping ground for the caravans after they leave Scutari.

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CHALCIS, See Evsaa.

CHALDEA. See Basytonra, vol. iii. p. 183.

CHALK (Ang.-Sax. ceale; Lat. calxz, lime), an earthy limestone of the Upper Cretaceous group of rocks. It has a specific gravity of from 2°4 to 2°6, is rough to the touch, is friable, and presents an uneven fracture; it has an insipid taste, and adheres slightly to the tongue ; it is usually white, and imparts its colour to surfaces over which it is rubbed. On microscopical examination, chalk is found to consist in the main of the minute shells of Foraminifera. In addition to calcium carbonate, chalk usually contains about 5 per cent. of water, with some free silica and ferric oxide, besides minor impurities. The red varieties of chalk may contain as much as 9°28 per cent. of silica, 9°6 per cent. of ferric oxide, and 1°42 per cent. of alumina (Clapham, Chem. News, 1862, vol. vi. p. 313.) Some of the red chalk of Norfolk gives, when treated with acids, an argillaceous residue, which when air-dried has a weight equal to 9°3 per cent. that of the chalk taken, and has been found on analysis to consist of water, ferric oxide, and alumina, with a small proportion of magnesia and potash (Church, Chem. News, 1875, vol. Xxe1.p. 199%)

The flooding of streams that flow through chalky ground is almost unknown, since chalk is very porous, and will when dry take up nearly one-third of its bulk of water (Ansted and Miller) ; and in some districts where chalk is the surface-rock, the heaviest showers are absorbed as soon as they fall. During the summer months, however, most of the rainfall penetrates only a few feet downwards, and is consequently imbibed by vegetation or evaporated ; for though chalk is highly absorbent, its fine and close texture does not allow of the freoa permeation of water. Occasionally, lower-lying beds of chalk have been drained, whilst higher levels have remained charged with moisture. The circulation of water in chalk strata is due, in fact, not so much to general percolation in the mass, as to its flow either through fissures or, asin the case of deep-seated and but little disturbed and

creviced beds, along planes of stratification. As a storehouse of water the chalk formation is of great importance, the artesian wells of London and many other places being supplied directly or indirectly from it. Where chalk forms the surface of the land, the yield of water may be very large, as at the Tring cutting of the North-Western Railway, where it amounted to upwards of a million gallons a day. Chalk is much used a3 a dressing for land deficient in lime, and is of special value where the soil consists of a stiff wet clay. The effect of the addition of chalk is to render the soil better able to retain moisture, and to improve its texture. It is generally most efficacious when used in moderate quantity every six or seven years. The renewal of the supply of chalk is necessary owing to its removal from the surface by solution and by the undermining action of earthworms. The chalk is not ploughed into the land till it has been exposed to frost, which breaks it up into small squarish fragments. In the Lincolnshire wolds, the process of chalking, in conjunction-with boning and manuring, has brought about a great improvement in the soil. In Dorsetshire the land is usually chalked once in twenty years. The chalk is spread on the ground in large lumps, which crumble down under the influence of the weather F or it may be burnt and applied as lime. For sandy soils, on which it acts as a cement, chalk is best adapted when marly in character. On poor chalky ground, the sain- foin (Onobrychis sativa),a plant which flourishes in calcareous soils and is an excellent fodder for cattle, has been culti- vated with great success; and the herbage of the chalk downs of Sussex, Wilts, and other counties of England, affords good pasture for sheep,

Chalk is employed medicinally as an antacid and mild astringent, either alone, or together with other astringents, or combined with mercury as hydrargyrum cum creta, but never in the crude state. As none of the salts it forms is purgative, it is a valuable remedy in diarrheea. Externally, prepared chalk is used as a dessicant, and as a protective application for ulcers and burns, and in inter- trigo and other affections of the skin. When taken for a prolonged period, chalk is apt to form concretions in the stomach, for want of acid sufficient to dissolve it.

Chalk is rarely hard enough to be used in any kind of building. When burnt to lime it serves the same purposes as stone lime, but on account of its more rapid absorption of carbonic acid gas, it is not so fit for general use as the latter, except when fresh from the kiln. Chalk is employed in the manufacture of cements and of carbonate of soda, in the preparation of carbonic acid gas, and in many other chemical processes ; also for making paints, crayons, and tooth-powder. Whiting or Spanish white, used to polish glass and metal, is purified chalk prepared by triturating common chalk with a large quantity of water, which is then decanted and allowed to deposit the finely- divided particles it holds in suspension.

Black chalk or drawing slate is a soft carbonaceous schist, which gives a black streak, so that it can be used for drawing or writing. Brown chalk is a kind of umber. fed chalk or reddle is an impure earthy variety of hzematite. French chalk isa soft variety of steatite, a hydrated silicate of magnesium.

See J. Prestwich, The Water-bearing Strata of London, p. 57, sqq. (London, 1851); J. A. Clarke in Journ. Roy. Agric. Soc., vol.

xi. p. 831 (1851) ; Caird, English Agriculture in 1850 and 1851, p. 61 (London, 1852).

CHALLONER, Ricwarp (1691-1781), an eminent Roman Catholic prelate, born at Lewes, Sussex, 29th September 1691. After the death of his father, who was arigid Dissenter, his mother sought refuge with some Roman Catholic families, the consequence being that the son was brought up in their religion, chiefly at the seat of Mr Holman at Warkworth, Northamptonshire, where the Rev. John Gother, a celebrated controversialist, officiated as chaplain. In 1704 he was sent to the English College at Douay, where he was ordained a priest, took his degrees in divinity, and was appointed professor in that faculty. In 1730 he was sent on the English mission and stationed in London. ‘The controversial treatises that he now published in rapid succession attracted much attention, particularly his Catholic Christian Instructed, which was prefaced by a witty reply to Dr Conyers Middleton’s Letter from Rome, showing an exact conformity between Popery and Paganism. Middleton is said to have been so irritated that he endeavoured to put the penal laws in force against his antagonist, who prudently withdrew from London until the commotion

subsided. On 29th January 1741, Challoner was raised to the episcopal dignity at Hammersmith, by the title of bishop of Debra, im partibus infidelium, and nominated coadjutor, cum jure successionis, to Bishop Petre, Vicar-Apostolic of the London district. Accordingly, on the decease of that prelate in 1758, Challoner succeeded to the Vicariate-Apostolic. Ho resided principally in London, but was obliged to retire into the country during the “No Popery ” riots of 1780. Soon afterwards he died, on January 12, 1781, and was buried at Milton, Berkshire. Bishop Challoner was the author of numerous controversial aud devotional works, which have been frequently reprinted and translated into various languages. He compiled the Garden of the Soul, which continues to this day to be the most popular manual of devotion among English-speaking Roman Catholics; and he revised an edition of the Douay version of the Scriptures

(1749-50), correcting the language and orthography, which in many places had become obsolete, Of his historical works the most valuable is one which was intended to be a Roman Catholic antidote to Foxe’s well-known martyr- ology. It is entitled Memoirs of Missionary Priests and other Catholicks of both Sexes who suffered Death or Imprisonment in England on account of their Religion, from the year 1577 till the end of the reign of Charles EH., 2 vols. 1741; reprinted in 1803. Bishop Challoner also published anonymously, in 1745, the lives of English, Scotch, and Irish saints, under the title of Britannia Sancta.

CHALMERS, AtexanpeR (1759-1834), was born in Aberdeen. He was educated as a doctor, but gave up this profession for literature. His first productions were con- tributions to London periodicals, and he was for some time editor of the Morning Herald. Besides editions of the works of Shakespeare, Beattie, Fielding, Johnson, Warton, Pope, Gibbon, Bolingbroke, and others, he published A General Biographical Dictionary in 32 vols. (1812-1817) ; a Glossary to Shakspeare ; an edition of Shakspeare ; and the British Hssayists, commencing with the Tatler and ending with the Observer, with biographical and historical prefaces and a general index.

CHALMERS, Grorce (1742-1825), an antiquarian and political writer of considerable eminence, was born at Fochabers, a village in the county cf Moray, in the year 1742. His father, James Chalmers, was a grandson of George Chalmers of Pittensear, a small estate in the parish of Lhanbryde, now St Andrews-Lhanbryde, in tle same county, possessed by the main line of the family from about the begiuning of the 17th to the middle of the 18th century. After completing the usual course at King's College, Aberdeen, young Chalmers studied law in Edin- burgh for several years. Two uncles on the father's side having settled in America, he visited Maryland in 1763, with the view, it is said, of assisting to recover a tract of Jand of some extent about which a dispute had arisen, and was in this way induced to commence practice as a lawyer at Baltimore, where for a time he met with much success, Royalist party on the breaking out of the American war of Independence, he found it expedient to abandon his professional prospects in the New World, and return to his native country. For the losses he had sustained as a colonist he received no compensation, and several years elapsed before he obtained an appointment that placed him in a state of comfort and independence.

In the meantime Chalmers applied himself with great diligence and assiduity to the investigation of the history and establishment of the English colonies in North America; and enjoying free access to the state papers and other documents preserved among what were then termed the plantation records, he became possessed of much important information. His work entitled Political Annals of the present United Colonies from their Settlement to the Peace of 1763, 4to, London, 1780, was to have formed two volumes ; but the second, which should have contained the period between 1688 and 1763, never appeared. The first volume, however, is complete in itself, and traces the original settlement of the different Ameriean colonies, and the progressive changes in their constitutions aud forms of government as affected by the state of public affairs in the parent kingdom. Independently of its value as being compiled from original doeuments, it bears evidence of great research, and has been of essential benefit to later writers. Continuing his researches, he next gave to the world An Hstiumate of the Comparative Strength of Britain during the Present and Four Preceding Reigns, Lond. 1782, which passed through several editions. At length, in August 1786, Chalmers, whose sufferings as a Royalist

Having, however, espoused the cause of the.

must have strongly recommended him to the Government of the day, was appointed chief elerk to the committee of Privy Council on matters relating to trade, a situation which he retained till his death in 1825, a period of nearly forty years. As his official duties made no great demands on his time, he had abundant leisure to devote to his favourite studies,—the antiquities and topography of Scotland having thenceforth special attractions for his busy pen.

Besides biographical sketches of De Foe, Sir John Davies, Allan Ramsay, Sir David Lyndsay, Churchyard, and others, prefixed to editions of their respective works, Chalmers wrote a life of Paine, the author of the Lights of Man, which he published under the assumed name of Francis Oldys, A.M., of the University of Pennsylvania; and a life of Ruddiman, in which considerable light is thrown on the state of literature in Scotland during the earlier part of the last century. His life of Queen Mary, in two quarto volumes, was first published in 1818, It is founded on a MS. left by Whitakcr the historian of Manchester ; but Chalmers informs us that he fouud it necessary to rewrite the whole. The history of that ill-fated queen occupied much of his attention, and his last work, A Detection of the Love-Letters lately attributed in Hugh Campbell’s work to Mary Queen of Scots, is an exposure of an attempt to represent as genuine some fictitious letters said to have passed between Mary and Bothwell, which had fallen into deserved oblivion. In 1797 appeared his Apology for the Believers in the Shakespeare Papers which were exhibited im Norfolk Street, followed by other tracts on the same subject. These contributions to the literature of Shakespeare are full of curious matter, but on the whole display a great waste of erudition, in seeking to show that papers which had been proved forgeries might neverthcless have becu genuine, Chalmers also took part in the Junius controversy, andin The Author of Junius Ascertained, from a Concatena- tion of Circumstances amounting to Moral Demonstration, Lond. 1817, 8vo, sought to fix the authorship of the cele- brated letters on Hugh Boyd, In 1824 he published 7’he Poetical Remains of some of the Scottish Kings, now first collected , and the same year he edited and

presented as a contribution to the Bannatyne Club Robene and Makyne and the Testament of Cresseid, by Robert Henryson. His political writings are equally numerous. Among them may be mentioned Collection of Treaties between Great Britain and other Powers, Lond. 1790, 2 vols. 8vo; Vindication of the Privileges of the People in respect to the Constitutional Light of Free Discussion, &c., Lond. 1796, 8vo, published anonymously; A Chronological account of Commerce and Coinage in Great Britain from the Restoration till 1810, Lond. 1810, 8vo; Opinions of Eminent Lawyers on various points of Hnglish Jurisprudence, chiefly concerning the Colonies, Fisheries, and Commerce of Great Britain, Lond. 1814, 2 vols. 8vo; Comparative Views of the State of Great Britain before and since the War, Lond. 1817, 8vo.

But Chalmers's greatest work is his Caledonia, whieli, however, he did not live to complete. The first volume appeared in 1807, and is introductory to the others. It is divided into four books, treating successively of the Roman, the Pictish, the Scottish, and the Scoto-Saxon periods, from 80 to 1306 a.p. In these we are preseuted, in a condensed form, with an account of the people, the language, and the civil and ecclesiastical history, as well as the agricultural and commercial state of Scotland during the first thirteen centuries of our era. Unfortunately the chapters on the Roman period are entirely marred by the author's having accepted as genuine Bertram's forgery De Situ Britannie ; but otherwise his opinions on contro- verted topics are worthy of much respect, being founded on a laborious investigation of all the original authorities that were accessible to him. The style both of this and

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of the succeeding volumes is redundant, the scholarship is often defective, and hastily-drawn conclusions are asserted with the utmost confidence in their accuracy ; yet, notwith- standing all these drawbacks, such were the industry and perseverance of Chalmers that his Caledonia contains a mass of information on all subjects connected with early Scottish history and topography that has been of the highest value to subsequent writers. The second volume, published in 1810, gives an account of the seven south-eastern counties of Scotland—Roxburgh, Berwick, Had- dington,

Edinburgh, Linlithgow, Peebles, and Selkirk, each of them being treated of as regards name, situa- tion and extent, natural objects, antiquities, establish- ment as shires, civil history, agriculture, manufactures and trade, and ecclesiastical history. In 1824, after an interval of fourteen years, the third volume appeared, giving, under the same headings, a description of the seven south- western counties— Dumfries, Kirkcudbright, Wigtown, Ayr, Lanark, Renfrew, and Dumbarton. In the preface to this volume the author states that the materials for the history of the central and northern counties were collected, and that he expected the work would be completed in two years. This expectation, however, was not destined to be realized. It is much to be regretted that, instead of all but wasting his time on profitless and acrimonious controversies about Shakespearian forgeries and the character of Queen Mary, Chalmers did not direct his whole energies to his magnum opus, and give to the world the matured fruits of all the labour he had bestowed on it; for it is on Caledonia that his fame must chiefly rest.

While thus fully occupied, Chalmers had for many years been engaged in Jaying the foundation for other works of a not less important and laborious nature. One of these is said to have been a history of Scottish poetry, another, a history of printing in Scotland. Each of them he thought likely to extend to two large quarto volumes, and on both he expended an unusual amount of enthusiasm and energy. He had also prepared for the press an elaborate history of the life and reign of David I. In his later researches he was assisted by his nephew James, son of Alexander Chalmers, writer in Elgin.

George Chalmers died at his house, James Street, Buckingham Gate, London, May 31, 1825, after a few days' illness, in the eighty-third year of his age. His valuable and extensive library he bequeathed to his nephew, at whose death in 1841 it was sold and dispersed. Chalmers was a member of the Royal and Antiquarian Societies of London, an honorary member of the Antiquarian Society of Scotland, and a member of other learned societies, In private life he was undoubtedly an amiable man, although the dogmatic tone that disfigures portions of his writings procured him many opponents. He is besides chargeable with a want of taste, which appears too prominently in his keen attempts to silence, at all hazards, those whom he considered the detractors of Mary. Among his avowed antagonists in

literary warfare the most distin- guished were Malone and Steevens, the Shakspeare editors ; Mathias, the anthor of the’ Pursuits of Literature; Dr Jamie- son,the Scottish lexicographer ; Pinkerton, the historian ; Dr Trving, the biographer of the Scottish poets; and Dr Currie of Liverpool But with all his failings in judgment, Chal- mers was a valuable writer. He uniformly had recourse to original sources of information; and he is entitled to great praise for his patriotic and self-sacrificing endeavours to illustrate the history, literature, and antiquities of his native country. (3. MD.)

CHALMERS, Dr Txomas (1780-1847), a distinguished Scottish divine, was born at Anstruther in Fifeshire, on the 17th March 1780. He was early destined to the church, and while only eleven years old was enrolled as a student

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in the university of St Andrews. Having completed his collegiate course, in which he devoted himself almost exclusively to the study of mathematics, in January 1799 he was licensed as a preacher of tle gospel by the presbytery of St Andrews. Instead of entering at once on the duties of his profession, he spent the two following winters in Edinburgh, attending the lectures of Professors Stewart, Playfair, Robison, and Hope. In May 1803 he was ordained as minister of Kilmany, a small parish in Fife- shire, about nine miles from St Andrews. During the preceding winter he had acted as assistant to Mr Vilant, professor of mathematics in the university of that city, who for many years had been laid aside by ill health. ‘The novelty, however, of his method, and the singular enthusiasm that he exhibited and excited were distasteful to those attached to the old routine of university education ; and at the close of the session he was informed that his further services would not be required. Indignant at the fancied injustice thus done him, he adopted the singular expedient of opening mathematical classes of his own during the succeeding winter, which, though discountenanced in every way by the university authorities, many of the students were attracted to attend. The winter of 1803-4 was a very busy and exciting one. During the week he taught three classes in St Andrews, and prepared and delivered there a course of lectures on chemistry, largely illustrated by experiments,—appearing at the same time in the pulpit of Kilmany every Sunday. Having

sufficiently redeemed his reputation by the great success which attended them, his mathematical classes were uot resumed. ‘The lectures on chemistry were frequently redelivered in his own and in many adjoining parishes, to the surprise and delight of many rural audiences. In 1805 the chair of mathematics in Edinburgh became vacant, and he appeared, but unsuccessfully, as a candidate. In 1808 he published an Inquiry into the Extent and Stability of National Resources, a treatise originated by the alarm which Bonaparte’s com- mercial policy had created in Britain, and intended to elucidate some of those questions in political economy which the existing state of affairs had raised. He was preparing a new edition of this work when a series of domestic bereavements, and a severe illness that brought him to the brink of the grave, and laid him aside from all duty for upwards of a year, turned his thoughts and life into a new channel, Dr Brewster had invited him to become a contributor to the Ldinburgh Encyclopedia ; at his own request the article Christianity had been assigned to him, and he was now engaged in preparing it. In studying the credentials of Christianity, he received a new impression of its contents. A sustained but abortive effort to attain that pure and heavenly morality which the Gospel of Christ requires led on to that great spiritual revolution the nature and progress of which his journal and letters enable us to trace with such distinctness. When he resumed his duties, an entire change in the character of his ministry was visible to all. The report of discourses so earnest and eloquent as those now delivered, and of house- hold visitations conducted with such ardent zeal, soon spread beyond the limits of his own neighbourhood. His reputation as an author received at the same time a large accession by the publication in a separate form of his article on Christianity, as well as by several valuable con- tributions to the Ldinburgh Christian Instructor and the Eclectic Renew. So strong, however, at that time was the public bias against those evangelical doctrines which he had embraced, that when a vacancy occurred in Glasgow, and his friends brought him forward as a candidate, it was only after extraordinary efforts, and by a narrow majority, that his election was carried in the town-council.

In July 1815 he was formally admitted as minister of

the Tron church and parish. A blaze of unparalleled popularity at once broke around him as a preacher. A series of discourses which he had preached on the connec- tion between the discoveries of astronomy aud the Christian revelation were published in January 1817. Never either before or since has the same reception been given to any volume of sermons in our language. Within a year, nine editions and 20,000 copies of the volume were in circula- tion. Soon after its appearance he visited London, and occupied for the first time one or two of the pulpits of the metropolis. The crowds were enormous, the applause loud and universal, ‘ All the world,” writes Mr Wilberforce, “wild about Dr Chalmers.” His extraordinary popularity remained undiminished during the eight years that he remained in Glasgow.

His preparation for the pulpit, however, formed but a small part of his labours. In visiting his parish, which contained a population of about 11,600 souls, he speedily discovered that nearly a third of them had relinquished all connection with any Christian church, and that their children were growing up in ignorance and vice, The appalling magnitude of the evil, and the certainty of its speedy and frightful growth, at once arrested and engrossed him. To devise and execute the means of checking and subduing it became henceforth one of the ruling passions of his life. Attributing the evil to the absence of those parochial influences, educational and ministerial, which wrought so effectually for good in the smaller rural parishes, but which had not been brought to bear upon the overgrown parishes of our great citics, from all spiritual oversight of which the members of the Establishment had retired in despair, his grand panacea was to revivify, remodel, and extend the old parochial economy of Scotland. Taking his own parish asa specimen, and gauging by it the spiritual necessities of the city, he did not hesitate to publish it as his conviction that not less than twenty new churches and parishes should immediately be erected in Glasgow. All, however, that he could persuade the town- council to attempt was to erect a single additional one, to which a parish containing no fewer than 10,000 souls was at- tached. This church, built at his suggestion, was offered to him and accepted, in order that he might have free and unim- peded room for carrying out his different parochial plans.

In September 1819 he was admitted as minister of the church and. parish of St John's. The population of the parish was made up principally of weavers, labourers, fac- tory workers, and other operatives. Of its 2000 families, more than 800 had no connection with any Christian church, The number of its uneducated children was count-

less. In this, as in his former parish, Dr Chalmers's first

care and efforts were bestowed upon the young. For their week-day instruction, two commodious school-houses were built, four well-qualified teachers were provided, each with an endowment of £25 per annum; and at the moderate school-fees of 2s, and 3s. per quarter, 700 children had a first-rate education supplied. For the poorer and more neglected, between forty and fifty local sabbath schools were opened, in which more than 1000 children were taught. The parish was divided into 25 districts, embracing from 60 to 100 families, over each of which an elder and a deacon were placed—the former taking the oversight of their spiritual, the latter of their temporal interests. Over the whole of this complicated parochial apparatus Dr Chalmers presided, watching, impelling, controlling every movemsnt. Nor was his work that of mere superintendence. He visited personally all the families, completing his round of them in about two years, and holding evening meetings, in which he addressed those whom he had visited during the week. Many families were thus reclaimed to the habit of church-going,

and many individuals deeply and enduringly impressed by the sacred truths of Christianity.

The chief reason why Dr Chalmers removed from the Trou parish to that of St John's was that he might have an opportunity of fairly testing the efficacy of the old Scottish method of providing for the poor. At this period there were not more than 20 parishes north of the Forth and Clyde in which there was a compulsory assessment for the poor. The English method of assessment, however, was rapidly spreading over the southern districts of Scotland, and already threatened to cover the whole country. Dr Chalmers dreadcd this as a great national catastrophe. Having studied in its principles, as well as in its results, the operation of a compulsory tax for the support of the poor, he was convinced that it operated prejudicially and swelled the evil it meant to mitigate. It was said, however, that though the old Scotch

method of voluntary contributions at the church door administered by the kirk-session was applicable to small rural parishes, it was inapplicable to the large and already half-pauperized parishes of our great cities. Dr Chalmers asked the magistrates of Glasgow to commit the entire management of the poor of the parish of St John's into his own hands, and he undertook to refute that allegation. He was allowed to try the experiment. At the commencement of his operations, the poor of this parish cost the city £1400 per annum. He committed the investigation of all new applications for relief to the deacon of the district, who had' so small a number of families in charge, that by spending an hour among them every week, he became minutely acquainted with their character and condition. By careful scrutiny of every case in which public relief was asked for, by a summary rejection of the idle, the drunken, and the worthless, by stimulating every effort that the poor could make to help themselves, and when necessary, aiding them in their efforts, a great proportion of these new cases were provided for without drawing upon the church-door collections ; and such was the effect of the whole system of Christian oversight and influence, prudently and vigorously administered, that in four years the pauper expenditure was reduced from £1400 to £280 per annum.

At the commencement of his ministry in St John's, Dr Chalmers began a series of quarterly publications oa J'he Christian and Civic Economy of Large Towns, devoted to the theoretic illustration of the various schemes of Christian usefulness which he was carrying on,—presenting himself thus to us as at once their skilful deviser, their vigorous conductor, their eloquent expounder and advocate. But the fatigues of so toilsome a ministry began to exhaust his strength ; and he was already longing to exchange the personal for the literary labours of his profession, when the vacant chair of moral philosophy in the university of St Andrews was offered to him. This offer, the seventh of the same kind that had been made to him during his eight years' residence in Glasgow, he accepted, entering on his new duties in November 1823, and devoting the next four years of his life to their fulfilment. Hitherto meta- physics and ethics had been taught conjunctly by the professors of moral science in the Scotch colleges, while, in teaching the latter, allusions to the peculiar doctrines of Christianity had generally and often carefully been avoided. Looking upon mental philosophy as belonging properly to another chair, Dr Chalmers confined his prelections

to the philosophy of morals, entering at large upon the duties man owes to God as well as those he owes to his fellow-men, endeavouring throughout to demonstrate the insufficiency of natural religion to serve any other purpose than that of a precursor of Christianity. Many of his lectures, as remodelled afterwards and transferred to the theological chair, are to be found now in the first and second volumes

of his works. In the purely ethical department, the dis- cussions in which he made important and _ original contributions to the science are those occupied with the place and functions of volition and attention, the separate and underived character of the moral sentiments, and the distinction between the virtues of perfect and imperfect obligation. It was not so much, however, for their scientific speculations that his lectures in the moral philosophy class-room were distinguished, as for that fervour of pro- fessional enthusiasm with which they were delivered, and which proved so healthfully contagious. Beyond the intel- lectual impulse thus communicated, his frequent references to the great doctrines of Christianity, and still more the force of his inviting example, kindled to a very remarkable degree the religious spirit among the students of St Andrews; and not a few of them—including many men who have since highly distinguished themselves—were led thereby to consecrate their lives to missionary labour. In November 1828, Dr Chalmers was_ transferred from the chair of moral philosophy in St Andrews to that of theology in Edinburgh. In this wider theatre he was enabled to realize all his favourite ideas as to the best methods of acadeniical instruction. To the old practice of reading to his students a set of carefully prepared lectures he added that of regular wva voce examination on what was thus delivered, and introduced besides the use of text- books, communicating through them a large amount of in- formation ; and coming into the closest and most stinulat- ing contact with his pupils, he attempted to combine the different systems pursued in the English and the Scottish universities. In the professorial chair there have been many who, with larger stores of learning, have conducted their students to greater scientific proficiency ; but none have ever gone beyond him in the glowing impulse, intellectual, moral, and religious, that he conveyed into the hearts of the ardent youths who flocked around his chair;

and to that spirit with which he so largely impregnated the young ministerial mind of Scotland, may, to a large extent, be traced the Disruption of the Scottish Established Church, The leisure for literary labour which professorial life afforded was diligently improved. At St Andrews he resumed the work which his departure from Glasgow had suspended, and in 1826 published a third volume of the Christian and Cwre Economy of Large Towns. This was followed in 1827 by his treatise on the Use and Abuse of Interary and Ecclesiastical Endowments, the ablest defence of endowments in our language, a work which itself would have won celebrity for its author. For many years his chief ambition had been to complete a treatise on political economy, a science which had been a favourite one from youth, In St Andrews, besides his ordinary course on ethics, he had opened a class for instruction in this science, and had been delighted to find how attractive it had proved. As soon as he had got through his first course of

theological lectures in Edinburgh, he resumed this subject,.

and embodied the reflections and preparations of many years in a work on Polttical Economy, published in 1832. Many of the particular doctrines of this work have not met with general acceptanée. The public mind, however, has been gradually coming round to a belief in that great truth which this volunie was mainly intended to enforce,—that a right moral is essential to a right economic condition of the masses,—that character is the parent of comfort. His work on Political Economy was scarcely through the press, when, on invitation from the trustees of the earl of Bridgewater, Dr Chalmers was engaged on a treatise On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man, which appeared in 1833. Literary honours, such as were never united previously in the person of any Scottish ecclesiastic, crowned these labours. In

1834 he was elected fellow of the Royal Society of Edin- burgh, and was soon after made one of its vice-presidents.. In the same year he was elected corresponding member of the Royal Institute of France, and in 1835 the university of Oxford conferred on him the degree of D.C.L.

Hitherto Dr Chalmers had taken but little part in the public business of the church. He had given some effective help in the prosecution of two measures—the one for the abolition of pluralities, and the other for the improvement of theological education. The death of Dr Andrew Thomson, who had long been the able leader of tlic Evangelical party, and the obtaining by that party of the ascendency, called him to lead the counsels and doings of the church. One of the earliest acts of the General Assembly of 1834, the first in which the Evangelical party had the majority, was to place Dr Chalmers at the head of a committee appointed to promote the extension of the church. In this office he had a double duty to discharge—to solicit the Government to make a grant out of the public revenue, and to stimulate the friends of the church by their own voluntary efforts to meet the spiritual necessities of the country. In both departments extraordinary efforts were made, but with very different results. The Whig Government, insecure in its hold of power, and dependent to some extent on the political assistance of the Scottish Dissenters, could be induced to do nothing beyond appoint- ing a committee of inquiry, which led to no _ practical result. It was otherwise when Dr Chalmers appealed to the country. That appeal was made with singular ardour and eloquence. When circulars, pamphlets, and reports had done their uttermost, he made a tour through a large part of Scotland, addressing the various presbyteries and hold- ing public meetings in the most populous districts, Year after year swelled the fund that these efforts created, till at last in 1841, when he resigned his office as convener of the Church Extension Committee, he had to announce that in seven years upwards of £300,000 had been contributed to this object, and 220 new churches had been built.

This great movement on behalf of church extension was finally checked by another in which Dr Chalmers was destined to play a still more conspicuous part. In 1834, the General Assembly, after declaring it to be a fundamental principle of the church that "' no minister shall be intruded into any parish contrary to the will of the congregation," had enacted that in every instance the dissent of the majority of the male heads of families, being communicants, should be a bar to the settlement of a minister. This Act, commonly called the Veto Law, was based upon the old constitutional practice of the "call," in which the people invited the minister to undertake the pastoral office, on which invitation alone the spiritual act of ordination

was grounded, The church believed herself to possess the power of determining what kind and amount of popular concurrence was necessary before the pastoral tie was formed by ordination. She had often exercised that power to the effect of setting aside the nominee of the patron. When invited in such instances to interfere, the civil courts had refused, on the ground that the church was acting within the limits of her acknowledged authority. In other instances the civil courts had often reviewed decisions of the church courts, but only with a view of regulating the title to the benefice. But now the power of the church to pass such a law as that of the Veto was challenged, and the civil courts claimed a right not only to regulate the destination of the benefice, but to control and overrule the decisions of the church. In the parish of Auchterarder, containing a population of 3000 souls, only two individuals signed the call, while 287 out of 300 dissented ; but in an action raised at the instance of the presentee, the Court of Session decided that his rejection by

the church was illegal. This decision the House of Lords, on appeal to it, confirmed,—Lords Brougham and Cotten- ham, in delivering judgment, stating it expressly to be their opinion that in settling a minister the church had no legal right to look beyond his qualification as to “ life, literature, and morals.” In this decision, as involving a forfeiture of the benefice, the church acquiesced, declaring at the same time her intention, for her own spiritual objects, to interpret for herself the statutes which established her, and aunouncing her unaltered purpose to protect her congregations from the intrusion of unacceptable ministers. It speedily appeared that she was not to be permitted to carry out these resolutions if the Court of Session could prevent. ‘The presbytery of Dunkeld rejected a licentiate presented by the Crown to the parish of Lethendy on the ground of his having been vetoed by the people. The Crown acquiesced and issued a new presentation. At the instance of the first presentee the Court of Session inter- dicted the presbytery from ordaining the second. The church ordered the presbytery to proceed with the ordina- tion. It did so, and was summoned in consequence to the bar of the civil court, solemnly rebuked, and informed that in the next instance of such disregard by the church of the interdict of the civil court imprisonment would be the punishment, In the parish of Marnoch, with a

population of 2800 souls, only one individual signed the call; an overwhelming majority dissented ; but in defiance of the law of the church, and in obedience to the Court of Session, the presbytery of Strathbogie, by a majority of i too, resolved to proceed to the ordination, To prevent this ordination the church suspended the seven ministers who formed the majority. The Court of Session not only annulled that suspension and prohibited the church from intimating or executing it, but interdicted all ministers from preaching or administering any of the sacraments within any of the parishes of the seven suspended clergymen. he church held such interference as a violation of her spiritual independence, and proceeded as if no such sentence of the civil court had been passed,—many of the most distinguished ministers, Dr Chalmers and Dr Gordon among the rest, preaching in those parishes in the face of interdicts served on them personally. The seven suspended clergymen treated in the same way the supreme ecclesiastical authority, and on the 21st January 1841, in opposition to an express order of the General Assembly, consummated the ordination. By the following General Assembly these clergymen were deposed from the office of the ministry. The Court of Session immediately thereafter pronounced the deposition null and void. Other like instances occurred, The collisions between the two supreme courts became frequent and most unseemly. Matters were running into inextricable confusion. The church appealed to the Government to interfere. At first the Whigs were in power, but they declined to interfere. In 1841, Sir Robert Peel was placed at the head of a Government strong enough to have applied the remedy, and the hopes of the church were excited. Still no measure was intro- duced. Under the guidance of Dr Chalmers the church pursued her course with steady unfaltering step; but she was not prepared to prolong the controversy indefinitely. Denying the right of the Court of Session to act as it had done, she freely conceded to the legislature the right of determining on what terms she held her temporalities ; and if, fairly appealed to, the legislature declared that she held them on condition of rendering such obedience to the civil courts as they now required, she felt that she had no alternative but either to renounce her own principles or relinquish the temporalities. Ata solemn convocation held in November 1842 a large number of ministers signed and published a declaration that if no measure of relief were

granted they would resign their livings. Up to the last, however, it was not believed that any very extensive secession would take place. In January 1843, the Government not only refused to grant the protection the church required, but put a final and peremptory negative on her claims of spiritual independence. And in March the House of Commons did the same by a large majority,— the Scotch members, however, voting in the proportion of more than two to one in her favour. The controversy was now closed, and it remained only for those clergymen who felt that they could not with a good conscience submit to the civil restraint imposed upon the church to adopt the only expedient now left to them and retire from the Establishment. On the 18th May 18438, 470 clergymen withdrew from the General Assembly and constituted themselves into the Free Church of Scotland, electing Dr Chalmers as their first moderator.

For two years previous to this final step, Dr Chalmers had foreseen the issue, and in preparation for it had drawn up a scheme for the support of the outgoing ministers. For a year or two afterwards the establishment and exten- sion of that fund, to which the Free Church owes so much of her stability, engaged a large share of hisattention. He then gradually withdrew from the public service of the church, occupying himself with his duties as principal of the Free Church College, and in perfecting his Jnstitutes of Theology. In May 1847, he was summoned before a committee of the House of Commons to give evidence regarding that refusal of sites for churches in which a few of the landed proprietors of Scotland who were hostile to the Free Church were still persisting. He returned from London in his usual health, and after a peaceful Sabbath (May 30) in the bosom of his family at Morningside, he bade them all good night. Next morning, when his room was entered and the curtains of his bed withdrawn, he was found half erect, his head leaning gently back upon the pillow, no token of pain or struggle, the brow and hand when touched so cold as to indicate that some hours had already elapsed since the spirit had peacefully departed.

During a life of the most varied and incessant activity, spent much too in society, Dr Chalmers scarcely ever allowed a day to pass without its modicum of composition. He had his faculty of writing so completely at command that at the most unseasonable times, and in the most unlikely places, he snatched his hour or two for carrying on his literary work. He

was methodical indeed in all his habits, and no saying passed more frequently from his lips than that punctuality is a cardinal virtue. His writings now occupy more than 30 volumes. He would permanently perhaps have stood higher as an author had he written less, or had he indulged less in that practice of reiteration into which he was so constantly betrayed by his anxiety to impress his ideas upon others. It would be pre- mature to attempt to estimate the place which his writings will hold in the literature of our country. We may briefly indicate, however, some of the original contributions for which we are 1n- debted to him. As a political economist he was the first to unfold the connection that subsists between the degree of the fertility of the soil and the social condition of a community, the rapid manner in which capital is reproduced (see Mill's Political Economy, vol. i. p. 94), and the general doctrine of a limit to all the modes by which national wealth may accumulate. He was the first also to advance that argument in favour of religious establishinents which meets upon its own ground the doctrine of Adam Smith, that religion like other things should be left to the operation of the natural law of supply and demand. In the department of natural theology and the Christian evidences, he ably advocated that method of reconcil- ing the Mosaic narrative with the indefinite antiquity of the globe which Dr Buckland has advanced in his Bridgewater Treatise, and which Dr Chalmers had previously communicated to that author. His refutation of Hume's objection to the truth of iniracles is perhaps his intellectual chef d'ewvre, and is as original as it is com- plete. The distinction between the laws and dispositions of matter, as between the ethics and objects of theology, he was the first to indicate and enforce. And itis in his pages that the fullest and most masterly exhibition is to be met with of the superior authority as witnesses for the truth of Revelation of the Scriptural as com- pared with the ex-Scriptural writers, and of the Christian as com- pared with the heathen testimonies. In his Institutes of Theology,

no material modification is cither made or attempted on the doctrines of Calvinism, which he received with all simplicity of faith, as he believed

them to be revealed in the Divine word, and which he defended as in harmony with the most profound philosophy of human nature and of the Divine providence. 2

The character of Dr Chalmers's intellect was eminently practical. The dearest object of his earthly existence was the elevation of the common people. Poor-laws appeared to him as calculated to retard this elevation ; he therefore strenuously resisted their introduction. The Church of Scotland appeared to him as peculiarly fitted to ad- vance it ; he spoke, he wrote, he laboured in its defence and exten- sion. ''I have no veneration," he said to the. royal commissioners in St Andrews, before either the Voluntary or the Non-intrusion eontroversies had arisen, ''I have no veneration for the Chureh of Scotland quasi an establishment, but I have the utmost veneration for it guast an instrument of Christian good." Forcing that church to intrude unacceptable ministers, and placing her in spiritual sub- jection to the eivil power, in his regard stripped her as such an in- strument of her strength, and he resolutely but reluctantly gave her up.

It id as a mover of his fellow men, as the reviver of cvangelistic feeling in Scotland, and as a leader in the great movement which terminated in the erection of the Free Church, that Dr Chalmers will fill the largest place in the eye of posterity, and occupy a niche in the history of Scotland and of the church. Various elements combined to clothe him with public influence—a childlike, guile- less, transparent simplicity, the utter absence of everything facti- tious in matter or manner—a kindliness of nature that made him flexible to every human sympathy—a chivalry of sentiment that raised him above all the petty jealousies of publie life—a firmness of purpose that made vacillation almost a thing impossible, a force of will and general momentum that bore all that was movable before it—a vehement utterance and overwhelming cloquence that gave him the command of the multitude, a scientific reputation that won for him the respect and attention of the more educated— the legislative faculty that framed measures upon the broadest prin- ciples, the Lae sagacity that adapted them to the ends they were intended to realize—the genius that in new and difficult cir- cumstances could devise, coupled with the love of ealculation, the capacity for business details, and the administrative talent that fitted him to execute—a purity of

motive that put him above all suspicion of selfishness, and a piety unobtrusive but most profound, simple yet intensely ardent. “ (W. HA.)

CHALONER, Sir Tromas (1515-1565), a statesman and poet, of a noble Welsh family, was born in 1515. Under Henry VIII. he was sent as ambassador to Charles V., whom he accompanied on his unfortunate expedition against Algiers in 1541. On his return he was appointed to the office of first clerk of the council. He gained the friendship of the duke of Somerset; but after his fall he was obliged to live in retirement, and during the reign of Mary his Protestantism still kept him from the court. On the accession of Elizabeth he was received into high favour, and appointed ambassador, first to the Emperor Ferdinand I., and then to the court of Spain, where, however, he found himself so uncomfortable that after three years’ stay he obtained permission to return home in 1564. He died the following year. Chaloner enjoyed considerable reputa- tion as a poet, and left Poetical Works, De Republica Anglorum Instauranda, the Praise of Folie (from the Latin of Erasmus), Jn Laudem Henrict Octave Carmen Panegyricum, the Office of Servants (from the Latin of Cognatus), and some other small pieces,

CHALON-SUR-SAONE, a town of France, capital of an arrondissement in the department of Sadne-et-Loire, 81 miles by rail north of Lyons. It is a neat and well- built town, situated in an extensive plain on the right bank of the Sadne, at the junction of the Canal du Centre, and connected by a fine stone bridge with the suburb of St Laurent on an island in the river. Its principal buildings aré the cathedral of St Vincent, a Gothic edifice of the latter part of the 14th century, on the site of a church founded about 532; the church of St Pierre, with two lofty steeples; the hospitals of St Laurent and St Louis ; the town hall, the market, and the courthouse. An obelisk was erected in the 18th century to commemorate the opening of the canal. There are tribunals of primary instance and commerce, an exchange, a communal college, a school

of design, a public library, and socie ies for agriculture, history, archzology, and arts. The industrial establish- ments are extensive and various, comprising docks, flour- inills, sugar factories, glass-works, distillcries,

breweries, and tile-works ; and the transit trade, both with the north and south of France, is of the greatest importance. There is also manufactured in the town the essence d'orient, a preparation from the scales of the bleak (Cyprinus alburnus), employed in the fabrication of mock pearls. Chalon-sur-Saéne is identified with the ancient Cabdillonwm, ori- ginally a town of the Aidui. 1t was chosen in the 6th century by Goutraim, king of Burgundy, as his capital ; and it continued till the 10th to pay for its importance by being frequently sacked. The bishop, first appointed in the 4th century, obtained the title of count in the 12th, and retained it tothe Revolution. In its modern history, the most important fact is the service the town rendered in the defence of the French territory in 1814, by keeping in check a division of the Austrian army. Population in 1872, 20,055.

CHALONS-SUR-MARNE, a town of France, capital of the department of Marne, is situated mainly on the right bank of the river, here crossed by a fine stone bridge, 107 miles EK. of Paris on the railway to Strasburg, and 25 S. of Rheims by another line, in 48°57' 21" N. lat. and 4° 21' 27" E. long. It occupies a considerable area for its population, and is rather irregularly laid out; many of its streets are broad, and it has fine public walks. Among its principal buildings may be mentioned the cathedral of St Etienne, originally founded in the 12th century on the site of an earlier church, but in several portions dating only from the 17th; the churches of Nétre Dame, St Alpin, St Jean, and St Louis, belonging respectively to the 12th, 13th, 14th, and 15th centuries; the town-house, which was erected in 1771; the prefecture, formerly the palace of the count of Artois; the barracks of St Pierre, on the site of the Benedictine abbey; the public library; and the industrial school. The town is the seat of a bishopric, and has tribunals of primary instance and commerce, a com- munal college, two theological seminaries, a normal school, a theatre, a museum, a botanical garden, and societies of agriculture, commerce, arts, and sciences. To the east of the town lies a large public park of 19 acres, known as the Jard, which was stripped of its trees during the war of 1870-1; and beyond the river is the Church of St Prudentienne, annually in the month of May the rendezvous of about 50,000 pilgrims. Chélons has long been an important industrial centre. As early as the 14th century, it was famous for its woollen cloth, which was known by the name of the town, afterwards corrupted into "shalloon ;" and in the 18th it maintained an extensive manufacture of linen

goods of various kinds. Besides these industries, it now carries on tanning and shoemaking, and the manufac- ture of cotton cloth and hosiery, while at the same time it is one of the principal seats of the champagne wine trade. The annual export amounts on an average to 1,000,000 bottles, and the cellars of Jacquesson et Fils have storage room for 3,000,000. About six miles cast of the town is the beautiful church of Notre Dame de l'Epine, which was built in the 15th century, and restored in 1860. Population in 1872, 16,436.

Chalons-sur-Marne occupies the site of the chief town of the Catalauni, which became signalized by the defeat of Attila in the terrible conflict of 451. In 648 it was laid waste by Herbert of Vermandois, in 931 by Ralph of Burgundy, and in 947 by Robert of Vermandois ; but in the four following centuries it attained great prosperity as a kind of independent state undcr the supremacy of its bishops, who held a most influential position in the kingdom, and obtained the title of grand-vassals of the crown. In 1214 the men of Chalons appeared in the first rank in the battle of Bouvines; and in the 15th century their descendants maintained their honour by twice (in 1430 and 1484) repulsing the English from their walls. In the 16th century the town sided with Henry IV., who in 1589 transferred thither the parliament of Paris, which shortly after- ward was bold enough to burn the bulls of Gregory XIV. and Clement VIII. In 1814 the Prussians took possession of the town

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after the expulsion of Macdonald, and in 1815 it was captured by Chernicheff. In 1856 Napolcon established a large camp, known as the Camp of Chalons, about 16 miles north of the town by the railway to Rhcims. It was situated in the immediate neighbourhood of Grand Mourmelon and Petit Mourmelon, and occupied an area of 12,000 hectares or 29,650 acres. The troops were principally accommodated in tents, but also partly in wooden barracks. At the outbreak of the Franco-German war, the camp was occupied by the sixth army corps, under Canrobert, and it was afterwards held by MacMahon. On 22d August 1870, the town of Chalons was occupied by the Prussians, and in the course of the war it formed an important point of communication.

CHALOTAIS. See La Cuazorais.

CHALYBAUS, Hxrwricn Mortrz (1796-1862), a dis- tinguished German writer on philosophy, was born on the 3d July 1796. The facts of his life are few and unim- portant. For some years after completing his university education he acted as lecturer in the Kreuz-Schule at Dresden, and while there his lectures on the history of philosophy in Germany, delivered before large audiences, drew attention to his rare merits as a thinker and writer. In 1839 he was called to a Professorship in Kiel University, where, with the exception of one brief interval, he remained till his death on 2d September 1862. His first published work, Historische Entwickelung der spekulativen Philosophie von Kant bis Hegel, 1837, was extremely popular, and still retains its place as one of the best and most attractive expositions of modern German thought. It has been twice translated into English, by Tulkin 1854, and by Edersheim in 1860. His other writings are Phdnomenologische Blatter, 1841; Die moderne Sophistrik, 1843 ; Hntwurf eines Systems der Wissenschaftslehre, 1846 ; System der spekulativen Ethik, 2 vols, 1850; Philosophie und Christenthum, 1853; Fundamental – Philosophie, 1861. Of these the most important are the JWessenschaftslehre and the JLthek. Chalybiius’s general principle may be named Ideal-Realism. He opposes both the extreme realism of Herbart and what he calls the one-sided idealism of Hegel, and endeavours to find a mean between them, to discover the ideal or formal principle which unfolds itself in the real or material world presented toit. His Wissenschaftslehre, accordingly, divides

itself into three parts,—Principlehre, or theory of the one principle; Vermittelungslehre, or theory of the means by which this principle realizes itself; and Yeleologie. The most noticeable point is the position assigned by Chalybiius to the “ World Ether,” which is defined as the infinite in time and space, and which, he thinks, must be posited as necessarily coexisting with the Infinite Spirit or God. The System der thik is perhaps the richest and most thorough-going modern work on moral philosophy. The fundamental principle is carried out with great strength of thought, and with an unusually complete command of ethical material. A brief but satisfactory account of Chalybius will be found in Erdmann, Grundriss der Geschichte der Philosophie, ii. 781-786.

CHAMBA, a feudatory state of Northern India, sub- ordinate to the Punjab Government, situated between 32° 10’ and 33° 9’ N. lat., and between 75° 54’ and 76° 30’ E. long. ChdAmbé is bounded on the N. by a range of mountains, separating it from the province of Zaskar in Kashmir; on the E. by the outlying British pargands

of Bangéhal and Lahaul, belonging to Kangra district ; on

the S. by mountain ranges which separate it from the Kangra valley; and on the W. by the provinces of Jammu and Kistwar in Kashmir. In shape the state is an oblong, its eastern and western sides being about 65 miles in length, and its mean width about 50 miles. It is traversed from east to west by a lofty range which divides it into two distinct valleys. The northcrn of these valleys is drained by the Chindb, which, rising in Lahaul, passes through Chamba into Kashmir territory, having a general direction from south-east to north-west. The southern

valley is drained by the Ravi, of which one head is in Chamba territory, and the other in Bangéhal. The two branches unite a short distance below Barmur in Chamba. The river then flows eastwards till close to Dalhousie it turns southwards, and after forming the boundary of the state for some distance, enters the plains of the Punjab. The estimated population of the state is 140,000 souls, and the estimated gross revenue, £18,937. The annual tribute payable to the British Government is £500. Owing to the abdication of the late raja and the succession of his son, a lad of seven years of age, the administration of the state passed under the direct control of the

British Government in 1872-73, an arrangement which will con- tinue during the minority of the young chief. The only towns in the state are Chamba and Barmur situated on the Ravi, and Kilar on the Chinab. The British sanitarium of Dalhousie is within the limits of the state, situated upon ground purchased from the chiefs. The principal agri- cultural products are wheat and millet; among the other products are timber, wax, nuts, honey, lime, and slate from quarries near Dalhousie, The extensive forests are leased by the British Government, and are under the management of the Punjab Forest Department.

CHAMBERLAIN (Latin camerarius, from camera, a chamber; French chambellan), etymologically, and also his- torically to a large extent, an officer who superintends the arrangement of domestic affairs. Such were the chamber- lains of monasteries, and the chamberlains of cathedrals, who had charge of the finances, gave notice of chapter meetings, and provided the materials required for various services. A royal chamberlain is an officer whose function is in general to attend on the person of the sovereign, and regulate the etiquette of the palace. The Roman emperors appointed this officer under the title of cubicularius. Dur- ing the Middle Ages, the royal chamberlain usually en- joyed the important privilege of keeping the king's signet ring; andit seems that the mayoralty of the palace, which gradually acquired such an authority as to overthrow the Merovingian dynasty in France, grew out of an office corre- sponding to that of the chamberlain. The chamberlain of the Pope enjoys very extensive powers, having the revenues of the church under his charge. In France, the office existed from very early times till the reign of Louis XIV., and was revived by Napoleon.

The Lord Great Chamberlain of England originally took rank after the Lord Privy Seal. The office is hereditary, and belonged at one time to the De Veres, from whom it descended by the female line into the family of Bertie. On the death of the fourth duke of Ancaster in 1777, it passed to the houses of Cholmondeley and Willoughby d'Eresby. From these families alternately a Lord Great Chamberlain is appointed on the death of the reigning monarch. 'The principal duties of this office are to take charge of the houses of parliament, and to attend on tho sovereign at his coronation.

The Lord Chamberlain is an officer distinct from the Lord Great Chamberlain, and of greater importance, though his functions are less responsible than they were formerly. He is regarded as chief officer of the royal household; he has charge of a large number of appointments, such as those of the royal physicians, tradesmen, and private attendants of the sovereign; he is licenser of plays; and he examines the claims of those who desire to be presented atcourt. He is a member of the privy council, and holds office during the ascendency of the political party to which he belongs.

Many corporations appoint a chamberlain. The most important in England is the chamberlain of the corpora- tion of the city of London, who is treasurer of the corpora- tion, admits persons entitled to the freedom of the city,

and determines disputes between masters and apprentices. He is elected annually by the liverymen.

CHAMBERS, Eruraim, an English author, was born at Kendal, Westmoreland, in the latter part of the 17th century. He was apprenticed toa globe-maker, but having conceived the plan of his Cyclopedia, he left this business, and devoted himself entirely to writing. The first edition of the Cyclopedia, which was the result of many years' intense application, appeared by subscription in 1728, in two vols. fol. It was dedicated to the king, and procured for Mr Chambers the honour of being elected fellow of the Royal Society. In less than ten years a second edition was printed, with corrections and additions (in 1738) ; and this was followed by a third a year later. In addition to the Cyclopedia, Mr Chambers wrote for the Literary Magazine, and translated the History and Memoirs of the Royal Academy of Sciences at Paris (1742), and the Jesuits' Perspective. He died in 1740.

CHAMBERS, Grorcx (1803-1840), a marine paiuter, born at Whitby, Yorkshire, was the son of a seaman, and for several years he pursued his father's calling. While at sea he was in the habit of sketching the different classes of vessels. His master, observing this, gratified him by cancelling his indentures, and thus set him free to follow his natural bent. Chambers

then apprenticed himself to an old woman who kept a painter's shop in Whitby, and began by house-painting. He also took lessons of a drawing-master, and found a ready sale for small and cheap pictures of shipping. Coming after- wards to London, he was employed by Thomas Horner to assist in painting the great panorama of London for the Colosseum (the exhibition building in the Regent's Park, recently demolished), and he next became scene- painter at the Pavilion Theatre. In 1834 he was elected an associate, and in 1836 a full member, of the Water- colour Society. His best works represent naval battles. Two of these—the Bombardment of Algiers in 1836, and the Capture of Porto Bello—are in Greenwich Hospital. Not long before his death he was introduced to William IV., and his professional prospects brightened; but his constitution, always frail, gave way, and brought him to an early grave. He died on the 28th October 1840. A Life of him, by John Watkins, was published in 1841.

CHAMBERS, Roperr (1802-1871), author and pub- lisher, distinguished especially for his services to popular literature, was born at Peebles on the 10th July 1802. His parents were of the middle class, but owing to the father's misfortunes in business the family were reduced to poverty, and had to leave Peebles for Edinburgh while Robert was still young. He had before that received such an education as the parish and grammar schools of his native place afforded, and had shown himself possessed of unusual literary taste and ability. A small circulating library in the town, and a copy of the first edition of the Encyclopedia Britannica which his father had purchased, furnished him with stores of reading of which he eagerly availed himself. Long afterwards he wrote of his early years— Books, net playthings, filled my hands in child- hood. At twelve I was deep, not only in poetry and fiction, but in encyclopedias."

In Edinburgh the family had a somewhat hard struggle with their straitened circumstances. Robert had been destined by a sort of tacit understanding for the church, and was placed for a time at a classical school with a view to his being sent to the university. This design had, however, to be abandoned. After enduring many hard- ships, and making two unsuccessful attempts to fill situa- tions in mercantile houses in Leith, he commenced business on his own account as a bookstall-keeper in Leith Walk, on the advice of his elder brother and future partner,

William. He was then only sixteen, and his whole stock consisted of a few old books belonging to his father. By slow degrees the stock was increased and the business extended. A similar but distinct concern was carried on during the same period with like success by William, and after a number of years the two brothers were united as partners in the now well-known publishing firm of W. and R. Chambers.

From the commencement of his residence in Edinburgh, Robert Chambers had shown an enthusiastic interest in the history and antiquities of the city. Infrequent rambles every feature of its ancient buildings grew familiar to him, and his mind became a storehouse for all sorts of informa- tion connected with its famous persons and places. He thus found a most congenial task in the publication of the Traditions of Edinburgh (1823-4), which, though not his first work, was the first which brought him into general notice. It secured for him the approval, and what he doubtless valued even more highly, the personal friendship of Sir Walter Scott, then in the zenith of his fame. Other works on kindred subjects followed in rapid succession, the most popular and important being a History of the Iebellion of 1745. He also wrote from time to time a number of short poetical pieces of very considerable merit, which were afterwards collected and printed for private circulation (1835). For a year or two he acted as editor of the Edinburgh Advertiser, a Tory newspaper of old standing, which has now ceased to appear. With commendable and characteristic prudence the bookselling business was diligently prosecuted in the midst of these numerous literary engagements, so that his life at this period was oue of ceaseless activity.

In the beginning of 1832 his brother William, after con- sultation with him, started a weekly publication under the title of Chambers's Journal, which speedily attained an immense circulation, and still holds a leading place in the cheap popular periodical litcrature of which it was the pioneer. Robert's connection with it was at first only that of a contributor. After fourteen numbers had appeared, however, he became associated with his brother as joint- editor, and from that period he wrote for it nearly all the leading articles, which took the form of essays—moral, familiar, and humorous. Written in an easy, graceful style, entirely free from any affectation of condescension, always interesting, and carefully avoiding the debateable

ground of religion and politics, they contributed more perhaps than anything else to the remarkable success of the Journal. Anumber of them were republished in 1847 in the author's Select Writings, and are thought to be on the whole the best specimens of his original work. Of the same character as his work for the Journal were his numerous contributions to the Information for the People and the Miscellany of Useful and Kntertaining T'racts published by his firm.

Among the other works of which he was in whole or in part the author, the Cyclopedia of English Interature, the Life and Writings of Burns, Ancient Sea Margins, the Domestic Annals of Scotland, and the Book of Days were the most important. The Cyclopedia of English [nterature contained a series of admirably selected extracts from the best authors of every period, "set in a biographical and critical history of the literature itself." The biographies were gracefully written, and the critical estimates, though brief, were just and comprehensive. For the Life of Burns he made diligent and laborious original investigations, gathering many hitherto unrecorded facts from the surviv- ing acquaintances of the poet, and especially from his sister, Mrs Begg, to whose benefit the whole profits of the work were generously devoted. The poemsare interwoven into the narrative in their proper chronological order, and

with all the information that could be obtained as to the circumstances of their composition. In connection with the work on Ancient Sea Margins, it may be mentioned that its author ranked high as a scientific geologist, and that he had availed himself of tours in Scandinavia and Canada for the purpose of geological exploration. His knowledge of geology was one of the principal grounds on which the authorship of the celebrated anonymous work, The Vestiges of the Creation, was very generally attributed to him. As, however, neither he himself nor any one entitled to speak for him ever acknowledged the work, its authorship remains amystery. The Book of Days was his last publication, and perhaps his most elaborate. Help on which he had de- pended having failed him, he was left to do the work almost alone, and it is supposed that his excessive Jabour in connec- tion with it hastened hisend. He died at St Andrews, where he had built a

pleasant residence for himself several years previously, on the 17th March 1871. Two years before his death the university of St Andrews had conferred upon him the degree of Doctor of Laws, in consideration of his dis- tinguished literary merit, and he was a fellow of several learned societies. As a writer Chambers possessed in

very harmonious combination most of the qualities which

form the basis of a sound and lasting popularity. Few even of popular authors ever possessed in a higher degree the faculty of interesting without resorting to sensation, of amusing without stooping to frivolity, and of instructing without assuming superiority. Few have done more than he for the illustration of Scottish life and character, and for the preservation of what was curious in Scottish tradition and antiquities. But it will always be his highest claim to distinction that he did as much as, if uot more than, any other single man to give a healthy tone and a pure moral influence to the cheap popular litera- ture which has become so important a factor in modern civilization. An interesting account of the life of Robert Chambers by his brother appeared in 1872, under the title, Memoir of Robert Chambers: With Autobiographic Reminiscences of William Chambers. (w. B. 8.) CHAMBERSBURG, a town of the United States, the capital of Franklin county, Pennsylvania, is situated about 135 miles west of Philadelphia, in a populous district in the great limestone valley that extends along the east side of the Blue Mountains. It has a court-house, a national bank, ten churches, and a Presbyterian college for young ladies ; and it manufactures cotton, wool, paper, and iron. In 1864 a large part of the town was burned by the Confederates under Early, Population in 1870, 6308. CHAMBERY (in Italian CramBert), a city of France, capital of the department of Savoy, pleasantly situated in a fertile district, between two hills, on the rivers Laisse and Albana, 46 miles 8.S.W. of Geneva. The town, how- ever, is irregularly and ill built, and has only two good streets—the Place Saint-Léger and the Rue de Boigne, of which the latter is named after a General Boigne who left a fortune of 3,400,000 francs to the town. The principal

- edifices are the cathedral, dating from the 14th aud 15th

centuries ; the Hotel-Dieu, founded in 1647; the castle, a modern building serving as a prefecture, and preserving only a great square tower belonging to the original-struc- ture; the palace of justice, the theatre, the barracks, and the covered market, which dates from 1863. Several of the squares are adorned with fountains ; the old ramparts of the city, destroyed during the French Revolution, have been converted into public walks ; and various promenades and gardens have been constructed. Chambéry is the seat of au archbishop, aud of a superior tribunal ; and has also a Jesuit college, a royal academical society, a society of agriculture and commerce, a public library, with 20,000 vols. % museum, a botanic garden, end many charitable

institutions. It manufactures silk-gauze, lace, leather, and hats, and has a considerable trade in liqueurs, wine, lead, copper, and other articles. Overlooking the town is the Rock of Lemenc, which derives its name from tlie Lemincum of the Romans; and in the vicinity is Char- mettes, for some time the residence of Rousseau.

The origin of Chambéry is unknown, but its lords are mentioned for the first time in 1029. In 1282 it was sold to the count of Savoy, Thomas I., who bestowed several important privileges on the inhabitants. As capital of the duchy of Savoy, it has passed through numerous political vicissitudes. From the middle of the 16th century to 1713 it was in the hands of the French ; in 1742 it was captured by a Franco-Spanish army; and in 1792 it was occupied by the Republican forces. Restored to the house of Savoy by the treaties of Vienna and Paris, it was again surrendered to France in 1860. Among the famous men whom it has given to France, the most important are Vaugelas, Saint-Réal, and the brothers Joseph and Xavier de Maistre. Population of the town in 1872, 17,331, and of the commune, 19,144.

CHAMBORD, a maguificent Gothic chateau of France, in the department of Loire-et-Cher, 10 miles east of Blois, on the left bank of the Cosson. It was commenced by Francis I. in 1582, carried on by Henry IL., and at length finished by Louis XIV. It is built of black stone, with a profusion of towers, turrets, and minarets, and the inte- rior is fitted up with great magnificence. The park is enclosed by walls seven leagues in circumference. The castle is famous as the residence of Diana of Poitiers, and of Stanislaus, king of Poland, whose son-in-law, Louis XV., bestowed it

upon Marshal Saxe. It was given by Napoleon to Marshal Berthier, from. whose widow it was purchased by subscription in 1821, and presented to the duke of Bordeaux, the representative of the older branch of the Bourbons, who has assumed from it the title of Count de Chambord.

CHAMELEON, the common name of a well-defined family of Lizards, forming the tribe Dendrosaura, and con- taining the single genus Chamcelo, which includes about twenty known species, bearing a close family resemblance to each other, and differing very widely from all other lizards. They are small creatures, not usually exceeding 7 inches in length exclusive of the tail, which in general is as long as the body. The body is greatly compressed, often with a crest—toothed or otherwise—along the back and belly, and the skin is covered with granular specks, giving it the appearance of shagreen. The large pyramidal head is sup- ported by a short neck composed of five vertebra, instead of eight, as in the majority of saurians; and there is no true sternum, although the anterior ribs are joined to the mesial line, which thus takes the place of a breast-bone, while the ribs which follow are so connected together as to form a bony circle for the protection of the abdominal region. Unlike other lizards, the chameleon has the body raised high on its legs, and the toes, which are five in number on both posterior and anterior limbs, are divided into two opposable groups or bundles, closely resembling those of a parrot, and equally serving the purpose of pre- hension. ‘The tail, by the greater thickness of which at the base the male is distinguishable from the female, is also prehensile, and is of the greatest service in giving support and security to the climbing chameleon. The lungs are large, and are connected with air-vessels distributed through- out the body, by the inflation of which a certain trans- parency is given to the body, as well as a plumpness which at once disappears on their collapse, and this, together with the fact that the chameleon can live apparently in a thriving condition for weeks without food, seems to have given rise to the ancient belief that this singular creature lived ou air. The eyes of the chameleon are large, globular, and covered with a circular disk formed by the junction cf the two lids and having a central aperture which acts as an external pupil, being capable of dilatation or contraction

at will, In moving, the eyes act independently of cach other, so that while the one stares upwards the other may be eagerly following the motions of an insect beneath, or the one may cven be directed backwards while the other watches in front, This extraordinary range of vision amply compensates for the small degree of mobility in the neck

aud the general slowness of motion characteristic of the , chameleon. The tongue is equally remarkable, being , sub-cylindrical, worm-like, and extremely cxtensile, with | the end somewhat enlarged and hollow, and supplied with , a glutinous secretion. It is by means of this organ, which

is capable of being protruded to a length of six or seven inches, that chamelcons obtain their food. They are arbo-

real in their habits, supporting themselves on the branches ;

of trees by their grasping hand-like feet and prehensile tails. In their movements they are slow and deliberate, and when watching for the insects which form their sole food, they remain motionless for hours, partly concealed by the foliage, and still more by the exercise of the faculty which they possess above all other creatures of changing their colour so as to resemble surrounding objects. Their power in this direction has, however, been greatly ex- aggerated. They cannot, as was at one time supposed, assume in succession all the colours of the rainbow; but under certain conditions, by no means well ascertained, their normal bluish ash colour may give place to a green or yellowish hue, with irregular spots of a dull red, or it may become considerably paler so as to approach to white- ness. Thus an observer reports recently that he saw a chameleon making its way along the top of an old wall near Ephesus, the stones of which were of a dark colour,

occasionally varied by a block of white marble, and he

noticed that no sooner did the creature rest on one of the latter than it gradually became less visible, owing evidently to its assumption of a colour somewhat harmonizing with the marble on which it rested. This curious phenomenon was observed by the earliest writers on natural history, and gave rise to much speculation. Aristotle held that the change of colour only

took place when the chameleon was inflated with air, to which therefore it was owing ; Pliny that its varying colours were borrowed from sur-rounding objects ; while Wormius was the first to attribute

those variations to the play of the emotions and passions ;

but Milne Edwards, in a paper published in the Annales des Sciences, showed that, whatever the exciting cause of these changes in colour, whether due to the emotions, the inflation of the lungs, or exposure to the sun's rays, they were rendered possible only by the presence in the skin of the chameleon of two layers of differently-coloured pig- ment, placed onc over the other, and so arranged that both may appear simultaneously on the surface, or the one may be displaced to a greater or less extent by the other, the colour varying with the amount of such displacement. Thus protected by its colouring, the chameleon awaits the coming of its prey, and no sooner does an insect place itself within reach of its worm-like tongue than that organ, leaping forth from its sheath with lightning speed, fixes its victim on the glutinous tip, which is forthwith engulphed with equally astonishing rapidity. The eggs of the chame- leon are deposited under leaves on the ground. They are numerous, round, and covered with an exceedingly porous shell formed of calcarcous matter. The species composing the family are inhabitants chiefly of Africa and the islands adjacent, notably of Madagascar, to which about a third of all the known species are confined. The latter include such curious forms as the Rhinoceros Chameleon, the male of which has a horn-like tubercle at the end of the muzzle ; also a form recently described by Giinther, in which the tail is so short as to be almost useless for prehension, a defect. which seems compensated for by the presence of an

additional denticle at the inner base of each claw, and of a spine projecting from the side of each finger and toe, which must add greatly to the creature's prehensile power. Owing to this peculiarity Giinther proposes to make it the type of a new genus (Proceedings of the Zoological Society,

| 1874). Fernando Po is the home of the Three-Horncd

Chameleon (Chameleo Oweni), which has a long conical horn over each eye, and another at the extremity of the muzzle ; but the best known and

most widely distributed species is the Common Chameleon (C. vulgaris), found in Southern Asia and the north of Africa, and naturalized in the southern countries of Europe. It is often brought to England, but owing to the coldness of the climate it exists there in a more or less torpid condition, and soon dies.

CHAMFORT, Niconas (1741-1794), one of the most famous talkers of a century rich in conversational excellence, was born at a little village near Clermont in Auvergne. The illegitimate child of a dame de compagnie, he never knew his father, and started in life as plain Nicolas, that being the name bestowed on him by his mother. A journey to Paris resulted, through some now unknown influence, in the boy's obtaining a bursary at the Collége des Grassins. He worked hard, and won nine prizes out of ten in two years. It is significant of his cynical and original turn of mind that he should have been the only critic disposed to be severe on the Latin hexameters that crowned his college reputation, and that in after years he should have regarded as wasted the time bestowed on the acquisition of academical knowledge, his opinion of which is expressed in one of his most contemptuous cpigrams—' Ce que far appris je ne le sais plus ; le peu que je sais je Vat diwiné." After this success the future king of the salons ran away from college, iu company with two class-mates, on a voyage round the world. The three rovers reached Cherbourg, and there reflected. They returned, and Chamfort became an abbé. "C'est un costume, ef non point un état," he said; and to the principal of his college who promised him a benefice, he replied that he would never be a priest, inasmuch as he preferred honour to honours— "Paime Chonneur et non les honneurs."

About this time he assumed that name of Chamfort:he was afterwards.to render famous, and plunged hap-hazard into the press for literary work and renown. He met with scant.suc- cess. Repulsed by editors and booksellers alike, he took to making sermons at a louis each for an incompetent brother ; and in this way, scribbling now and then for the journals, he contrived to exist for a whole ycar. A successful con- petition for one of the Academy's prizes opened to him the drawing-rooms of theupper world, and he became fashionable. His health and constitution were exceedingly vigorous; but his passions were violent, he lived hard, and he prescntly had to seek rest and recovery at Spa and elsewhere. In a second competition he was

unsuccessful; but a comedy of little merit, Za Jeune Indienne, made some noise, and con- soled him for his failure. He was always poor. Though his was already a well known name, he lived on elee- mosynary dinners and suppers, repaying countenance and sustenance with his bons mots. Madame Helvétius entertained him at Sevres for some years. Chabanon, however, gave up to the destitute wit his pension of 1200 livres on the Mercure de France, and about the same time Chamfort took two more Academy prizes for his culogies on Moliére and on La Fontaine, by which he also won a hundred louis from Necker, and obtained an enormous reputation. And as he wrote little and talked a great deal, his reputation increased, till, under protection of the Duchesse de Grammont, he went to court. His poor tragedy, Mustapha et Zeangir, was played at Fontainebleau before Louis XVI. and Marie Antoinette; the king added 1200 livres to the gift of Chabanon, and the Prince de Condé made Chamfort his

secretary. The man was then some forty years of age; he |

was fast growing misanthropical; he was “gat mais ombrageux ;” he was a Bohemian naturally and by habit. He resigned his post in the prince’s household, and retired into solitude at Auteuil. There, comparing the authors of old with the men of his own time, he uttered the famous mot that proclaims the superiority of the dead over the living as companions; and there too he presently fell in love. The lady, attached to the household of the Duchesse de Maine, was forty-eight years old, but clever, amusing, a woman of the world; and Chamfort married her. They left Auteuil, and went to Vaudouleurs, near Etampes, where in six nionths Madame Chamfort died. The widowed epicurean travelled, lived in Holland for a space with M. de Narbonne, and returning to Paris received the Academy arm-chair left vacant by the death of Sainte-Pelaye in 1781. He haunted the court, and made himself loved in spite of the reach and tendency of his unalterable ironiy ; but he quitted it for ever after an unfortunate and mysterious love affair, and was received into the house of M. de Vaudreuil. Among the many men of mark assem- bled round him there by his fine faculty of pregnant speech, le made the acquaintance and gained the friendship of

Mirabeau, whom he assisted with orations, and whom he followed heart arid soul into the storm and tumult of tlie young Revolution.

He forgot his old friends (‘‘ ceuw qui passent la fleuve des revolutions ont passé la fleuve de ’oubli”); he frequented the clubs, and for a time was secretary of that of the Jacobins ; he became a street-orator; he eutered the Bastille among the first of the storming party ; he worked for the Mercure de France, a royalist print in which he depreciated kingship. With the reign of Marat and Robespierre, however, his uncompromising Jacobinism grew critical, and with the fall of the Girondins his political life came to an end. But he could not restrain the tongue that had made him famous ; he no more spared the Convention than he had spared the Court. His notorious republicanism failed to excuse the sarcasms he lavished on the new order of things; and denounced by an assistant in the Brbliothéque Nutionale, to a share in the direction of which he had been appointed by Roland, he was taken to the Madelonnettes. Released for a moment, he was threatened again with arrest; but to this brilliant free-lance of thought captivity had been intolerable, and he had determined to prefer death to a repetition of the moral and physical restraint to which he had been subjected. He attempted suicide, with pistol and with poniard; and, horribly hacked and shattered, dictated to those who came to arrest him the well-known declaration—“ Moi, Sebastien- Roch-Nicolas Chamfort, declare avoir voulu mourir en homme libre plutét que détre conduit en esclave dans une prison”—which he signed in a firm hand and in his own blood. He did not die at once, but lingered on a while in charge of a gendarme, for whose wardship he paida crown a day. To the Abbé Sieyes Chamfort had given fortune in the title of a pamphlet (‘“ Quw’est-ce que le Tiers-Ltat ? Tout, Qu’a-t-l ? Rien”), and to Sieyés did Chamfort retail his supreme sarcasm, the famous “Je m’en vais enfin de.ce monde ot il faut que le coeur se brise ow se bronze.” The maker of constitutions followed the dead wit to the grave.

The writings of Chamfort, which include comedies, politi- cal articles, literary criticisms, portraits, letters, and verses, are colourless and uninteresting in the extreme. As a talker, however, he was of extraordinary force. His Maximes et Pensées, highly praised by John Stuart Mill, are, after those of La Rochcfoucauld, the most brilliaut and suggestive sayings that have been given to the modern world. The aphorisins of Chamfort, less

systematic and pschologically less important than those of the ducal moralist, are as significant in their violence and iconoclastic spirit of the

| brusquement et sufflent encore.”

period of storm and preparation that gave them birth as the Léflewtons in their exquisite restraint and elaborate subtlety are characteristic of the tranquil elegance of their epoch ; and they have the advantage in richness of colour, in picturesqueness of phrase, in passion, in audacity. Sainte-Beuve compares them to “ well-minted coins that retain their value,” and to keen arrows that “ arrivent An edition of his works— Quvres completes de Nicolas Chamfort, 5 volumes—was published at Paris in 1824-25. A selection— Giuvres de Chamfort—in one volume, appeared in 1852, with a biographical and critical preface by Arséne Houssaye, reprinted from the Hevuwe des Deux Mondes. See also Sainte-Beuve, Causeries de Lundt, W. E. 8.)

CHAMISSO, Apatpert von (1781-1838), poet, botanist, and voyager, was by family, birth, and the educa- tion of childhood, a Frenchman, by his after-life, his marriage, and his literary activity,a German. He was born in 1781 at the castle of Boncourt in Champagne, and traced his descent from a respectable line of French knights, who derived their title from the ancient town of Chamesson or Cambisonum, near ChAtillon-sur-Seine. The quiet home-life at Boncourt was broken up by the Revolu- tion in 1790, and the Chamissos, parents and children, were forced, like so many of their rank, to leave their country, and find such footing as might chance in a foreign land. And though in after years the main part of the family was permitted to settle again on their native soil, several of the younger members were left behind, whera they had begun to take root. Of these was Adalbert, who had in 1796 obtained a situation as page to the queen of Prussia, and in 1798 entered the military service with the rank of ensign. To his professional studies he devoted himself with ardour, and he attracted the royal attention by some of his writings; but in the society of his comrades lic was made bitterly to feel that he was not regarded as one of themselves, and it was not altogether with regret that he found himself in 1806 set free from the army. Meanwhile he had formed a friendship with several con- genial spirits, such as Hitzig,

Varnhagen von Ense and Neumann ; and with the last two he joined in the publica- tion of the Jlusenalmanach, which first appeared in 1803. A visit to Madame de Stael at Coppet was a pleasing interruption to his ordinary course of life, and has afforded the reader of his letters some amusing description of that eccentric wonian, who alternately flattered Chamisso for his ability and scolded him soundly for his inattention to etiquette. The study of botany, which he began at Coppet, was prosecuted with so much persistence and success that it became his professional subject. In 1815 he was chosen botanist of the expedition for the circumnavigation of the world, which was originated by Romanzoff, and conducted by Kotzebue ; and on his return in 1818 he was appointed custodian of the botanical gardens at Berlin. Much to his own advantage and comfort, he obtained the hand of Antonie Piaste, a young lady of eighteen years; and the rest of his life was spent in steady professional labour, relieved by kindly intercourse with an increasing circle of friends. Among those with whom he became acquainted were August Neander, Freiligrath, and Andersen.

It cannot be said of Chamisso, as he himself affirmed of Heine, that he was a poet to the very tips of his fingers ; but the poctic element in his nature was genuine and strong, and, in spite of the unfavourable circumstances of his life, his tendency towards literary expression was very early displayed. In estimating his success as a writer, it should not be forgotten that he was cut off from his native speecli and from his natural current of thought and feeling. None of his works perhaps can be called great ; but he has none the less enriched his adopted language with several poems

of undisputed and enduring value. He often deals with gloomy and sometimes with ghastly and repulsive subjects ; and even in his lighter and gayer productions there is too frequently an undertone of sadness or of satire. In the lyrical expression of the domestic emotions he displays a fine felicity, and he knows how to pour true pathos into a tale of love or vengeance. The “ Lion’s Bride”—Dvze Léwenbraut—may be taken as a sample of his weird and powerful simplicity; and “ Retribution,”—Vergeltung—is remarkable for a pitiless precision of treatment. The “Song of Women’s Devotion ”—Hin Lied von der Weibertrewe—might find a

place in the Ingoldsby Legends ; and “Cousin Anselmo”— Vetter Anselmo —is worthy to rank with the ballads of Southey. Of more celebrity perhaps than any of his poems is the little prose narrative of Peter Schlemihl, the man who lost his shadow, which first appeared in 1814, and was soon afterwards translated into several European languages. It was written partly to divert his own attention from gloomier thoughts, and partly to afford amusement to the children of his friend Hitzig ; and the plot was suggested by a casual question of Fouqué’s. First and prominently a genuine story such as children love, with full allowance of incident and fun, it is also to the older and sympathetic reader an allegory only too accurate of the poet’s own life. For full details see the Leben und Briefe, by Hitzig, in the fifth and sixth volumes of Chamisso’s Werke.

Works.—Ucbersieht der niitzbarsten und schiidlichsten Gewwéehse in Norddeutschland, 1827 ; Reise wm die Welt ; Bemerkungen und

Ansichten auf einer Entdeckungsreise wnter Kotzebue, 1827 ; Ueber die Hawatische Sprache, 1837.

CHAMOIS (Rupicapra tragus), the Gemse of the Germans, is the only Antelope found in Western Europe, and forms the type of the Rupicaprine or goat-like group of that family. It resembles the roebuck in size, being about 3 feet long and 2 fect high at the shoulders, and is specially characterized by the form of its horns, These are from 6 to 8 inches long, of a black colour, slender, round, and slightly striated, rising perpendicularly from the forehead, and suddenly hooked backwards at their extremities. They are common to both sexes, although in the female they are less uncinated. The body is covered with long hair of a chestnut brown colour in winter, when it is also longest, that of the head being paler, with a dark brown streak on each side. At other seasons the colour is some- what lighter, in spring approaching to grey. Underneath the external.covering the body is further protected from the cold by a coat of short thick wool of a greyish colour. The tail is short and black, the ears pointed and erect ; the hoofs are solid, with the outer edges higher than the soles, and are thus admirably adapted for laying hold of the slightest projection or roughness on the face of the rocky precipices it frequents, The chamois is gregarious, living in herds of 15 or 20, and feeding generally in the morning or evening.

The old males, however, live alone except in the rutting season, which occurs in October, when they join the herds, driving off the young males, and engaging in fierce contests with each other, that often end fatally for one at least of the combatants. The period of gestation is twenty weeks, when the female, beneath the shelter generally of a projecting rock, produces one and sometimes two young. They are said to attain the age of thirty years. The chamois inhabits the Alpine regions of Central Europe from the Pyrenees to the Caucasus, and extends eastwards as far as Persia, frequenting the wildest and most inaccessible peaks and ravines of these mountain ranges. In summer it ascends to the limits of perpetual snow, being only outstripped in the loftiness of its haunts by the ibex ; and during that season it shows its intolerance of heat by choos- ing such browsing grounds as have a northern exposure. In

winter it descends to the wooded districts that immediately succeed the region of glaciers, and it is there only that it can be successfully hunted, Chamois are exceedingly shy ; and their senses, especially those of sight and smell, are exceedingly acute. ‘The herd never feeds without having a sentinel posted on some suitable prominence to give timely notice of the approach of danger; this is done by stamping on the ground with the fore feet, and uttering a shrill whistling note, which puts the entire herd on the alert. No sooner is the object of alarm scented or seen than éach one seeks safety in the most inaccessible situa- tions, which are often reached by a series of astounding leaps over crevasses, up the faces of seemingly perpendicular rocks, or down the sides of equally precipitous chasms. The chamois will not hesitate, it is said, thus to leap down 20 or even 30 feet, and this it effects with apparent ease by throwing itself forward diagonally and striking its feet several times in its descent against the face of the rock.

Chamois-shooting is most successfully pursued when a

number of hunters form a circle round a favourite feeding ground, which they gradually narrow ; the animals, scent- ing the hunters to windward, fly in the opposite direction, only to encounter those coming from leeward. Chamois- hunting, in spite of, or perhaps owing to, the great danger attending it, has always been a favourite pursuit among the hardy

mountaineers of Switzerland and Tyrol, as well as of the amateur sportsmen of all countries, with the result that the animal is now much rarer than formerly. In certain parts of Switzerland it now enjoys a close season; thus in the Canton of Grisons it can only be hunted during September, and there in 1874 no fewer than 918 were killed during that period, the largest number shot by one sportsman being 16. The chamois feeds in summer on mountain herbs and flowers, and in winter chiefly on the young shoots and buds of the fir and pine trees. It is particularly fond of salt, and in the Alps sandstone rocks containing a saline impreg- nation are often met with hollowed by the constant licking of these creatures. The skin of the chamois is very soft ; made into leather it was the original shammy, which is now made, however, from the skins of many other animals. The flesh is prized as venison. The chamois can be at least partially tamed, and in that state, according to Major Smith, it evinces all the mixture of impudence, timidity, and curiosity observed in goats.

CHAMOMILE or Camomite Fiowers, the flores anthemidis of the Pharmacopeia, are the capitula or flower- heads of Anthemis nobilis (Nat. Ord. Composite), a plant indigenous to England and Southern Europe. It is ex- tensively cultivated for medicinal purposes in Surrey, at several places in Saxony, and in I’rance and Belgium,—that grown in England being much more valuable than any of the foreign chamomiles brought into the market. In the wild plant the florets of the ray are ligulate and white, and contain pistils only, those of the disc being tubular and yellow ; but under cultivation the whole of the florets tend to become ligulate and white, in which state the flower- leads are said to be double. The flower-heads are desti- tute of pappus; they have a warm aromatic odour, whicli is characteristic of the entire plant, and a very bitter taste. In addition to a bitter extractive principle, tlicy yield about 2 per cent. of a volatile liquid, which on its first extraction is of a pale blue colour, but becomes a yellowish brown on exposure to light. It has the charac- teristic odour of the flowers, and consists of a mixture of butylic and amylic angelate and valerate. Angelate of potassium has been obtained by treatment of the oil with caustic potash, and angelic acid may be isolated from this by treatment with dilute sulphuric acid. Chamomile is used in medicine in the form of an infusion, made

with 4 oz, of the flowers to 10 oz. of boiling distilled water. An extract is also prepared by evaporating the infusion, and subsequently adding 15 minims of the esseutial oil for each pound of flowers used. It isan aromatic tonic and stomachic, and the infusion, if given warm and in large doses, acts as an emetic. The oil is stimulant and carminative, and forms a useful adjunct to purgative medicines.

CHAMOUNI, or Cuamonrx, a celebrated valley and village of the French Alps, in the department of Upper Savoy, and the arrondissement of Bonneville. The village, which is the great centre for tourists in the Mont Blanc district, is situated 22 miles S. of Martigny, and 50 miles E.S.E. of Geneva, at a height of about 3400 feet above the level of the sea. A great part of it was destroyed by fire in 1855, and it has thus undergone a striking change in its appearance. It now possesses numerous hotels, a museum, and baths; and an English chapel was opened in 1860. Upwards of 15,000 tourists are accommodated in the course of a year, the greater pro- portion being from England, America, and France. The busiest months are August and September. Excellent butter and cheese are prepared by the peasants, and flax and honey are exported. The valley, which is bounded on the S. and E. by Mont Blanc and others of the Pennine Alps, and on the W. and N. by Brévent and the Aiguilles Rouges, is about 12 miles in length from north-east to south-west, with an average breadth of two miles; it forms the upper part of the basin of the Arve, which traverses its entire length. It is the most celebrated in the Alps for the picturesque grandeur of its glaciers, which are only rivalled by those of the Zermatt in the Bernese Oberland. The view from the village up to the top of Mont Blanc is remarkable for its simple and massive sublimity.

The name of Chamouni is a corruption of the words Campus Munitus, or Champ Muni, the Defenced Field, applied by the Benedictine monks to the site of the monas- tery here, probably with allusion to the protection afforded by the “strength of the hills.” This establishment was founded some time before 1099, on the spot that is now occupied by the village church; and it has left but little trace of its existence save the name of Le Prieuré, some- times used instead of Chamouni. In 1530 the right of holding

fairs at the priory was granted by Philip of Savoy, and the place thus became a rendezvous for the surround- ing population. The reputation of the valley, however, for the savagery of its inhabitants was so great that the nick- name of The Cursed Mountains—Les Montagnes Maudites —was given to the district; and in the 17th century it was regarded as a proof of remarkable heroism on the part of Francis de Sales that he ventured to visit that part of his-diocese. General interest was excited by the explora- tions of Pococke and Wyndham, who published an account of their adventures in the 7ransactions of the Royal Society for 1741. They were followed by Saussure (1760), De Luc (1774), Bourrit (1775) and others ; and the number of visitors gradually increased, until the valley became the place of resort it now is.

CHAMPAGNE, a former province of the kingdom of France, with an area of about 10,500 square miles, bounded on the N. by Liége and Luxembourg, on the E. by Lor- raine, on the §. by Burgundy, and W. by Isle de France and Picardy. It now forms the departments of Ardennes, Marne, Aube, and Haute Marne, with part} of Seine-et- Marne, Meuse, Aisne, and Yonne. The details in regard to its physical features will be found under these separate headings. It was divided into three principal parts, Lower Champagne, Upper Champagne, and Brie. Of these the first comprised Champagne Proper, Sénonais, Vallage, and Bas-

signy, Champagne Proper being the central district, which included the towns of Troyes, Chalons-sur-Marne, Vertus, La Fere, Pleurs, Planci, Arcis-sur-Aube, Pont-sur-Seine, Nogent, Villemaure, and Aumont, That portion of the district which extended from near Rheims in tha N. to near Troyes in the §., was further distinguished as Cham- pagne Pouilleuse, on account of the poverty of its soil. Upper Champagne comprised the districts of Rethelois, Rémois, and Pertois, of which the chief towns were respectively Rethel and Méziéres, Rheims and Rocroy, Vitry and .Saint-Dizier; while Brie included Meaux, Chateau-Thierry, Coulommiers, Sézanne, Provins, and Bray-sur-Seine. Physically the province belonged for the

most part to what is known as the great basin of Paris, The

only a small part being drained by the Meuse.

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Sketch-Map of Champagne.

eastern portion has consequently the greatest elevation, and the whole surface has a general slope to the west. The principal heights are the mountains of the Meuse, the Forest of Argonne, and the Western Ardennes, which reach an altitude of 1000 or 1500 feet, but have a very irregular formation. The greater part of the province consists of undulating plains, broken here and there by small clusters of gently swelling hills. Its wines have made its name known over the world. The most valuable grape-districts are the arrondissements of Rheims and Epernay in the department of Marne; and the wine trade is principally centred in Rheims, Epernay, Avise, and Chalons-sur-Marne. Champagne, which in the time of the Romans was inhabited by the Lingones, the Sinones, the Remi, the Tricasses, and the Cata- launi, began to be known by its modern name of Campania, or the Plain-Country, in the 6th century, when it formed a duchy of the kingdom of Austrasia. During the 9th century it was part of the oe of Vermandois, and on the disintegration of that omain about 943, it took the rank of an independent countship. In 1030 the title passed to the house of Blois in the person of Odo II.

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who was succeeded by Stephen II., Theobald I., Hugh I., Theobald II., surnamed the Great, Henry I., Henry II., Theobald III., Theo- bald IV., Theobald V., and Henry III. Of these the most import- ant was Theobald IV., famous for his romantic passion for Blanche of Castile, his political versatility, and his poetic skill. By the dcath of Henry III., who was also king of Navarre, Champagne passed into the hands of his daughter Jeannc, who afterwards married Philip the Fair of France. Assigned to her son Louis

(Hutin), it was united to the royal domain on his accession to the throne of France in 1314. By Philip VI. it was incorporated with the kingdom, and it has ever since been one of the most important and truly national districts of France. Its frontier position and its physical configuration have made it the scene of military operations in. almost all the French invasions, and more especially in the Austrian war of the 16th century, the campaign of 1814, and the Prussian war of 1870. During the wars of religion it was governed by the Guises, and sided with the Catholic party; and on the accession of Henry IV. it was one of the last provinces to recognize his legitimacy. Up to the Revolution it formed one of the twelve governments of France, and was within the jurisdiction of the parliament of Paris. Its various bailliages were governed by separate ‘‘ Coutumes,” those of Troyes, Meaux, and Chaumont, being remarkable for the trans- mission of nobility by the female side.

See Baugier, Mémoires historiques de la province de Champagne, 1721; Pithou, dfém. des comtes héréditaires de Champagne et de Bric, 1572; Debercy, Recherches sur Champagne; Beraud, Hist. dcs comtcs de Champagne ct de Brie, 1839; Arbois de Jubainville, Hist. des ducs et des comtes de Champagne, 1859-63.

CHAMPAGNE, Puiiprr pz (1602-1674), a celebrated painter, was born at Brussels of a poor family. He was a pupil of Fouquier; and, going to Paris in 1621, was employed by Du Chesne to paint along with Nicholas Poussin in the palace of the Luxembourg. His best works are to be found at Vincennes, and in the church of the Carmelites at Paris, where is his celebrated Crucifix, a signal perspective success, on one of the vaultings. After the death of Du Chesne, Philippe became first painter to the queen of France, and ultimately rector of the Academy of Paris. As his age advanced and his health failed, he retired to Port Royal, where he had a daughter cloistered as a nun, of whom he painted a celebrated picture, highly remarkable for its solid unaffected truth. This, indeed, is the general character of his work,—grave reality, without special elevation or depth of character, or charm of warm or stately colour. He painted an immense number of paintings, dispersed over various parts of France, and now over the galleries of Europe. Philippe was a good man, indefatigable, earnest, and scrupulously religious. He died on the 12th August 1674.

CHAMPARAN, a British district in the Behar Province, under the jurisdiction of the Lieutenant-Governor of Bengal, lies between 26° and 28° N. lat., and between 84° and 86° E. long. It is bounded on the N. by the inde- pendent state of Nepal; on the E. by the River Baghmati, which separates it from the district of Tirhut; on the S. by the district of Séran and the Bar4 Gandak River ; and on the W. by the Oudh district of Gorakhpur. A broad grass-covered road or embankment defines the Nepal frontier, except where rivers or streams form a natural boundary. The district is a vast level except in the north and north-west, where it undulates, and gradually assumes a rugged appearance as it approaches the mountains and forests of Nep&l. Wide uncultivated tracts cover its north-western corner ; the southern and western parts are carefully cultivated, and teem with an active agricultural population. The principal rivers are the Bard or Great Gan- dak, navigable all the year round, the Chhotd or Little

Gandak, Panch Nadi, Lalb4gi4, Koj4, and Teur. Old

beds of rivers intersect Champdran in every direction, and one of these forms a chain of lakes which occupy an area of 139 square miles in the centre of the district. Of the total area of Champdran, viz., 3531 Square miles, 2350 square miles are cultivated, 433 are grazing lands, and the rest uncultivable waste. The population in 1872 amounted to 1,440,815 persons, living in 2299 villages and

242,228 houses. Of these the Hindus numbered 1,240,264, or 86:1 per cent.; Muhammadans, 199,237, or 13°8 per cent. ; Christians, 1307 or 1 per cent.; and persons of unspecified religion, 7. Only two towns, contain upwards of 6000 inhabitants :—-(1) Motihari, the headquarters of the district, population 8266; and (2) Bettiah, population 19,708. The principal crops are rice, Indian corn, barley, sugar-cane, opium, indigo; the mineral products,—gold, copper, and limestone. Gold is washed, generally in minute particles, but sometimes in nuggets of the size of a pea, in the sandy beds of the rivers flowimg from the hills, Indigo, saltpetre, and rope form the only manufactures of the district, the first being chiefly conducted with European capital. The revenue of the district in 1870 was £82,159, of which the land revenue yielded £52,030, or 63 per cent.; the civil expenditure was

£20,613. In 1872, Champaran had 78 schools under Government inspection, attended by 1222 pupils, costing £293, to which the state contributed £153, Champaran, with the rest of Bengal and Behar, was acquired by the British in 1765. Up to 1866 it re- mained a subdivision of Saran. In that year it was sepa- rated and formed into a separate district.

CHAMPEAUX, Witxu1aM of, or Gulielmus Campellensis, a scholastic philosopher and theologian, so called from his birthplace, the village of Champeaux, near Melun, was born about 1070, and died in 1121. After studying under the realist Anselm of Laon, and the nominalist Roscellin, le commenced to teach in the scliool of the cathedral of Nétre Dame, of which he was made canon in 1103, Many scholars gathered round him, and among them was Abelard, who was to prove his great and victorious adver- sary. In 1108 William, whose attempts to silence his rival had been all in vain, retired into the abbey of St Victor, where he soon resumed his lectures. He afterwards became bishop of Chalons-sur-Marne, and took part in the dispute concerning investitures, on the side of Calixtus II. whom he represented at the conference of Mousson. Of William of Champeaux's works one on the Eucharist has been printed by Mabillon, and the Jforalia Abbreviata and the De Origine Anime by Marténe. In the last of these there is an interesting discussion concerning the fate of children who die unbaptized. He holds that they must be lost, the pure soul being defiled by the grossness of the body; and he silences all objections as to the justice of their condemnation by declaring that God's will is not to be questioned. Ravaisson has discovered a number of fragments by him, among which the most important is the De Essentia Der et de Substantia Dei et.de tribus ejus Personis ; and a Laber Sententiarum, consisting of discus- sions as to points of ethics and Scriptural interpretation, is also ascribed to him. William of Champeaux is, how- ever, most important as a representative of realism. We possess no works of his own on philosophical subjects, and his views are only to be discovered in the writings of his pupil and rival Abelard. At first he taught that the essence of all the individuals of a genus is the universal (which, as a realist, he held to be an existence independent of the individuals), while the differences between the individuals are not in their essence, but in their accidents. Abelard afterwards—-he tells us himself—brought him to admit that there are differences in the essences of different individuals of the same genus, and that the universal is not the whole

essence, but only that which is common to the essences of all the individuals—that which exists in them all “indiferenter.” This admission, though not neces- sarily involving a surrender of realism, gave rise to suspicions that William was deserting that theory, and it is said that in consequence his popularity greatly diminished.

See Hauréau, De la Philosophie Scolastique; Prantl, Geschichte der Logik; Stick], Geschichte der Philosophie

des Mittelalters ; Cousin, Abélard ; Histoire Littéraire dela France (vol. vii. p. 90, and vol. x. p. 307).

CHAMPLAIN, a considerable lake of North America, lying between the States of New York and Vermont, and penetrating for a few miles into Canada. It is 126 miles in length, and from 1 to 15 in breadth, lying nearly north and south, and contains a great number of small islands, most of which belong to Vermont, The Champlain canal, 63 miles in length, connects it with the Hudson ; the Sorel, Richelieu, or St John’s River forms a natural outlet towards the St Lawrence, and the Chambly canal communicates with the ocean. The lake owes its name to Samuel Champlain the French explorer, by whom it was dis- covered about 1608 ; and during the War of Independence it was rendered famous by the defeat of the English fleet in the engagement of September 11, 1814. Large steam-boats and vessels of considerable tonnage navigate Lake Champlain from end toend. The:scenery along its shores is highly picturesque, and its waters abound in salmon, salmon-trout, sturgeon, and other fish,

CHAMPLAIN, Samvuet pr (1567-1635), the governor of the first French settlers in Lower Canada, was born at Brouage, in 1567. His father was a sea-captain, and probably he was already skilled in navigation when, while still young, he entered the army of Henry IV. On the conclusion of the war he accompanied a Spanish fleet to Mexico and the West Indies, and on his return wrote an account of the expedition. In 1603, he made his first voyage to Canada, being sent out by De Chastes, on whom the king had bestowed some territory in that country. During 1604-1607 he was engaged, together with De Monts, to whom De Chastes’s privileges had been trans- ferred, in

exploring the Canadian coast, in seeking a site for a new settlement, and in making surveys and maps. In 1608 he made his third voyage; and in this year he commenced the formation of a settlement at Quebec. But De Monts's influence was now waning; he had been deprived of some of his privileges; and the merchants who had ventured in the affair were losing heart. Under these circumstances Champlain prevailed upon the Duc de Soissons to interest himself in the matter, and to seek the post of Governor and Lieutenant-General of New France. Under him, and under his successor the duke of Condé, Champlain held the office of lieutenant, which made him in reality governor of the colony. Owing, however, to quarrels with the Indians, the settlement seemed likely to fail ; but, under the viceroyalty of the Duc de Montmorenci, and still more under that of the Duc de Ventadour, it began to flourish. In 1629 it met with a reverse, Champlain being forced to surrender to an English fleet commanded by three brothers named Kirk. He was carried to England, but was restored to liberty in 1632, He returned to Canada in the next year, and died there two years afterwards (1635).

Champlain published several volumes containing accounts of his life work. In 1603 appeared his Des Sauvages ; in 1618 and 1619 Voyages, with valuable maps; and in 1682 an abridgment of the first two voyages, with a continuation bringing down his stay to 1629, and appendices containing a treatise on seamanship, and specimens of the Huron and Montagnais languages. In 1870 the whole series of his works was published, with the exception of the very interest- ing account of his visit to Mexico and the West Indies, which was

translated by Alice Wilmere from the MS. keptin the public library at Dieppe, and published by the Hakluyt Society in 1859.

CHAMPOLLION, Jean Francois (1790-1831), one of the earliest and most distinguished of Egyptologists, called de Jeune to distinguish him from Champollion- Figeac, his elder brother, was born at Figeac, in the department of Lot, in 1790. He was educated by his brother Champollion-Figeag, professor of Greek at Gre- noble, and was then appointed government pupil at the

Lyceum, which had recently been founded. His first work was an attempt to show by means of their names that the giants of the Bible were

personifications of natural phenomena. At the age of sixteen (1807) he read before the academy of Grenoble a paper in which he maintained that the Coptic was the ancient language of Egypt. He soon after removed to Paris, where he enjoyed the friend- ship of Langlés, De Sacy, and Millin. Champollion's wonderful acuteness is best displayed by his interpretation of the Rosetta stone, in regard to which there was keen discussion as to the share Dr Young and he respectively had in the discoveries. In 1809 he was made pro- fessor of history in the Lyceum of Grenoble, and there published his earlier works. He was sent by Charles X., in 1824, to visit the collections of Egyptian antiquities in the museums of Turin, Leghorn, Rome, and Naples ; and on his return he was appointed director of the Egyptian museum at the Louvre. In 1828 he was commissioned to undertake the conduct of a scientific expedition to Egypt in company with Rosellini, who had received a similar appointment from Leopold II., Grand Duke of Tuscany. He remained there about a year. In March 1831, he received the chair of Egyptian Antiquities, which had been created specially for himself, in the Collége de France. He was engaged with Rosellini in publishing the results of Egyptian researches at the expense of the Tuscan and French Governments, when he was seized with a paralytic disorder, and died at Paris in 1832.

He wrote L' Egypte sous Ics Pharaons, 2 vols. 8vo, 1814; Sur Vécriture hiératique, 1821; Sur Vécriturc démotique ; Précis du sys- teme hiéroglyphique, &c., 1824; Panthéon égyptien, ou collection des personnages mythologiques de Vancienne Egypte (incomplete) ; Aonu- mens del Egypte et de la Nubie considérés par rapport a Vhistoire, la religion, &c.; Granumaire égyptienne, 1836, edited by his brother ; Dictionnaire hiéroglyphique; Grammaire copte and Dictionnatre copte (not printed) ; Analyse méthodique du texte démotique de Rosette; Apergu du résultats historiques de la découverte de Valphabet hiéro- glyphique (1827); Mémoires sur les signes employés par les Egyptiens dans lewrs trois systemes graphiques & la notation des principales divi- sions du temps; Lettres écrites d'Egypte et de Nubie (1888); and also several lctters on Egyptian subjects, addressed at different periods to the Duke de Blacas and others.

CHAMPOLLION-FIGEAC, Jean Jacques (1778- 1867), elder brother of Jean Francois Champollion, was born at Figeac, in 1778. He became professor of Greek and librarian at Grenoble, then librarian of the imperial library at Paris, and, when he lost this post in 1828, librarian to Louis Napoleon at Fontainebleau. He edited several of his brother's works, and was also author of a number of original works on philological and historical subjects, among which may be mentioned—Wouvelles recherches sur les patois owidiomes vulgarres de la France (1809), Annales des Lagides (1819), Paléographie ancrenne et moderne (1839-41), Louis et Charles d' Orleans (1843).

CHANCELLOR. Various origins have been attributed to this word, so important in its modern use over the greater part of the civilized world; but all of them are of a trivial nature, bearing little reference to the subsequent application of the term. The word chancel is connected with the most ordinary and apt of these origins. It supposes the chancellor to have been so called because he sat within a lattice or screen partitioned from the court of justice or hall of audience. There was no such office in the early civil law, and even under the later Western emperors the cancellarius appears to have been a mere subordinate person, a sort of clerk of the chamber, or scribe, who saw the petitioners, and arranged about their business. Gradually he appears to have risen to the rank of an adviser or conscience-keeper, on whose decision the fate of suitors in a great measure depended. In the Eastern empire the chief cancellarius had become a powerful and important officer. As it was the principle of the popedom to be the

spiritual counterpart of the empire, and possess a corre- sponding hierarchy, the office was imitated at the ecclesi- astical court of Rome, and a chancery at the Vatican was repeated throughout the several bishoprics, where each diocese had its chanceJlor. The great monastic houses too had frequently a chancellor. In the universities an officer of the same name was the connecting-link between those republican institutions and the Romish hierarchy. While the rector was elected by the proctors of the nation or some other corporate constituency, the bishop of the diocese, or in some

cases the head of the monastic house to which the university was subordinated, was ex officio the chancellor.

It was the ambition of the kings who rose on the fall of the Roman empire, even of those who reigned in Saxon England, to gather round them as many as they could obtain of the attributes of the emperor or basileus, and hence each generally had his cancellarius. In Central Europe the office would naturally descend from the imperial court of Charlemagne; and in France the chancellor became the head of the law and the minister of justice. The office was abolished at the first Revolution. At the Restoration the ministry of justice was made a separate office, and the chief function of the chancellor was to preside in the House of Peers.

It is perhaps in England that we have the most remarkable illustration of the struggle between the influence of the imperial usages and the constitutional spirit of the Northern nations. The existence of common law courts enforcing in its strictness what was deemed the old law of the land, and the chancery with its regal equity interfering to give redress, presents to us the English people with their common lawyers standing up for their rights and privileges, and the monarch, with his clerical advisers, endeavouring to acquire the imperial prerogatives. The chancellor was generally a churchman, who took his ideas of law from the canonists and the civilians, whose principles were intensely disliked by the common lawyers. Hence the two systems called law and equity grew up in antagonism, neither throughout a long contest being able to conquer the other ; and hence it is that England has been burdened with the inconvenience of having two systems of jurisprudence, the one called common law, the other equity. The spirit of the former, indeed, may be said to have been so far triumphant in compelling equity to depart from her digressional vagueness, and become a fixed system as securely bound to statute and precedent as the common law itself. But even in Selden’s day we find the laxity of the chancellor’s equity so much suspected, that he says in his Lable Talk,—“ Equity is a roguish thing. For law we have a measure—know what to trust to: equity is according to the conscience of him that is chancellor, and as that is larger or narrower, so is equity. It is all one as if they should make the standard for the measure we call a foot a chancellor’s foot. What an uncertain measure would this be! One chancellor has a long foot, another a short foot, another

an indifferent foot; it is the same thing in the chancellor's conscience." How little, indeed, the chancery practice had been at that time moulded into a strict system, we may infer from the seals being held by a churchman, the celebrated Archbishop Williams, and this at the time when the common law had accumulated that amazing mass of intricate precedents which it tasked all the diligence and genius of Coke to reduce into order. Clarendon, when he became chancellor, had been twenty years out of practice, and his successor Shaftesbury had no pretensions to be acquainted with law. Lord Nottingham appears to have been the first who wished to apply strict rules in the court of chancery, but it does not seem to have been in a fit condition for their application. Roger North

CHANCELLOR

says, " He was a formalist ; and took pleasure in hearing and deciding, and gave way to all kinds of motions the counsel would offer; supposing that if he split the hair, and with his gold scales determined reasonably on one side of the motion, justice was nicely done—not imagining what torment the people endured who were drawn from the law, and there tost in a blanket." (Life of Lord Keeper Guildford, 423), Guildford himself, who, in the words of Lord Campbell, ''had as much Jaw as he could contain," made light of the mere judicial business of his office, which ere then, however, had begun to show its characteristic defects, for, according to his biographer, "the greatest pain he endured ensued from a sense he had of the torments the suitors underwent by the excessive charges and delays of the court."

The Lord High Chancellor of Great Britain is a great state officer, with varied and disconnected functions, He is in official rank the highest civil subject in the land out of the royal family, and when raised to the peerage, as he invariably is, he takes precedence immediately after the archbishop of Canterbury. His functions have sometimes been exercised by a "Jord keeper of the great seal ;' but there appears to be no essential difference between the two offices, save that the keeper is appointed by mere delivery of the seal, which is of itself sufficient to confer all the powers appertaining to the office, while a chancellor receives letters patent along with it. As a great officer of state, the chancellor acts for both England and Scotland, and in some respects for the United Kingdom, including Ireland. As an

administrative officer, as a judge, and as head of the law, he acts merely for England. In the first class of functions he acts as prolocutor, speaker, or chair- man of the House of Lords, and in this capacity it some- times falls to him to adjudicate in Scottish law, since he often leads the judgment of the house on appeals. (See APPEAL.) By the Treaty of Union, one great seal was appointed to be kept for all public acts. Hence, in this department, the chancellor's authority extends to the whole of Britain, and thus the commissions of the peace for Scotland as well as England issue from him. His English ministerial functions are thus briefly described by Blackstone : —"' He became keeper of the king's conscience, visitor, in right of the king, of all hospitals and colleges of the king's foundation, and patron of all the king's livings under the value of twenty marks per annum in the king's books. He is the general guardian of all infants, idiots, and Junatics, and has the general superintendence of all charitable uses in the kingdom." 'There is much convenience in the repetition of such vague definitions, from the difficulty of more specifically defining the chancellor's functions in these matters. His indistinct and unsatis- factory authority as to charitable foundations has been virtually superseded by the Charity Commissioners' Act of 1853 (17 Vict. cap. 137). The Lord Chancellor is by office a privy-councillor, and it has long been the practice to make him a cabinet minister. Hence he belongs toa political party, and is affected by its fluctuations. This has often been denounced as destructive of the independence and calm deliberativeness essential to the purity and efficiency of the bench. In defence, however, of the ministerial connection of the chancellor, it has been said that, while the other judges should be permanent, the head of the law should stand or fall with the ministry, as the best means of securing his effective responsibility to parlia- ment for the proper use of his extensive powers. The addition of permanent judges to the Chancery Court has removed many of the objections to the fluctuating character of the office.

Under the Judicature Act, 1873, the Lord Chancellor is president of the Court of Appeal, and, although the Act is

singularly indefinite on the subject, of the High Court of Justice also. He is named as president of the Chancery Division of the latter court. By the

Amendment Act of 1875, he is not to be deemed a “ permanent member of the High Court of Justice” within the meaning of the section of the original Act, limiting the number of permanent judges to twenty-one. His judicial patronage is very extensive, and Lord Campbell says that he is by usage the adviser of the Crown in the appointment of judges in the superior courts. His proper title is “Lord High Chancellor of Great Britain and ireland.” His salary is £10,000 per annum, and he is entitled to a pension of £5000 per annum.

In Ireland there is a lord chancellor at the head of the equity system, which arose in minute imitation of the English.

In Scotland a chancellor appears at a pretty early period in history, as the person who, being the adviser and con- science-keeper of the king, issued his writs or letters for the remedy of injustice done by judges or other persons in power. A comparison between the English and the Scottish chancellors of the 13th century would probably show them to have then been much alike. Subsequently, however, the civil law predominating in Scotland, the chancellor was its chief administrator, instead of leading on a system antagonistic to the common law. Hence he became the leading judge of the Court of Session on its establishment in 1533. While Episcopacy predominated he was generally an ecclesiastic, never a working lawyer; and after the Revolution he became an officer of state, who was not expected to be a working lawyer. Hence, when by the Treaty of Union the great seal for public transactions was appointed to be kept in England, the Lord Chancellor of Scotland dropped out of existence. A keeper of the great seal continued to be appointed for sealing writs as to private matters, and the office of director of chancery remained for the transaction of routine business connected with the department. When the method of certifying hereditary successions was simplified and placed on a uniform system in 1848, it was put under the direction of an officer called the Sheriff of Chancery. ;

The Chancellor of a Diocese is an officer who holds the courts of the bishop, and acts as his assessor or adviser in matters of ecclesiastical law. A bishop may be compelled to appoint a chancellor; and there is no appeal from the chancellor to the bishop.

The. Chancellor of the Duchy of Lancaster is an officer appointed of old chiefly to determine controversies between the king and his tenants of the duchy land, and otherwise to direct all the king's affairs belonging to that court. By late practice, the office, nominally one of high dignity, but demanding little exertion, has been given to statesmen who have grown old in other and more laborious offices, but whose services are still desired in the ministry.

The Chancellor of the Huchequer is an officer who, ac- cording to the old definitions of his functions, presides in the Exchequer Court, and takes care of the interest of the Crown. He is always in commission with the lord treasurer for the letting of Crown lands, &c., and has power, with others, to compound for forfeitures of lands upon penal statutes. While the treasury is understood to have the custody and distribution of the collected revenue, it is the function of the exchequer to realize it. Chancellor of the Exchequer, as the head of that depart- ment which proposes to parliament the plans for the annual revenue, and sees to its realization, is always an important member of the cabinet. Sometimes he is prime minister. His annual statement of the method by which he proposes to meet the exigencies of the exchequer is called "The Budget." The salary attached to the office is £5000 a year,

Hence the |

CHANCERY, the court of the Lord Chancellor, now consolidated along with the other superior courts in the Supreme Court of Judicature by the Act of 1873. Its origin has been briefly noticed under the head of CHANCELLOR. :

It has been customary to say that the Court of Chancery consists of two distinct. tribunals—one a court of common law, the other a court of equity. From the former have issued all the original writs passing under the great seal, all commissions of sewers, lunacy, and the like—some of these writs being originally kept in a hanaper or hamper (whence the " hanaper office"), and others in a little sack or bag (whence the " petty-bag office"). The court had likewise power to hold pleas upon scire facias for repeal of

letters patent, &c. ‘So little,” says Blackstone, “is commonly done on the common law side of the court that I have met with no traccs of any writ of error being actu- ae brought since the fourteenth yearof Queen Eliza-

eth.”

The equitable jurisdiction of the Court of Chancery was founded on the supposed superiority of conscience and equity over the strict law. The appcarance of equity in England is in harmony with the general course of legal history in progressive societies. What is remarkable is that, instead of being incorporated with or superseding the common law, it gave rise to a wholly independent set of tribunals. The English dislike of the civil law, and the tendency to follow precedent which has never ceased to characterize English lawyers, account for this unfortunate separation. The claims of equity in its earlier stages are well expressed in the little treatise called Doctor and Student, published in the reign of Henry VIII. :—“ Conscience never resisteth the law nor addeth to it, but only when the law is directly in itself against the daw of God, or law of reason.” So also King James, speaking in the Star Chamber, says, “Where the rigour of the law in many cases will undo a subject, then the chancery tempers the law with equity, and so mixes mercy with justice, as it preserves a man from destruction.” This theory of the essential opposition between law and equity, and of the natural superiority of the latter, remained long after equity had ceased to found itself on natural justice, and had become as fixed and rigid as the common law itself. The jealousy of the common lawyers came to a head in the time of Lord Ellesmere, when Coke disputed the right of the Chancery to give relief against a judgment of the Court of Queen’s Bench obtained by gross fraud and imposition. James I.,after consultation, decided in favour of the Court of Equity. Thesubstitution of lay for clerical chancellors is regarded by Mr Spence (Lquitable Jurisdiction of the Court of Chancery) as having at first been unfortunate, inasmuch as the laymen were ignorant of the principles on which their predecessors had acted. Lord Nottingham is usually credited with the first attempt to reduce the decisions of the court to order, and his work was continued by Lord Hardwicke. By the time of Lord Eldon, equity had become fixed, and the judges, like their brethren in the common law courts, strictly followed the precedents. Henceforward chanceryand common law courts have exhibited the anomaly

of two co-ordinate sets of tribunals, empowered to deal with the same matters, and compelled to proceed in many cases on wholly different principles. The Court of Chancery could in most cascs prevent a person from taking advantage of a common law right, not approved of by its own system. But if a suitor chose to go to a court of common law, he might claim such unjust rights, and it required the special intervention of the Court of Equity to prevent his enforcing them. In many cases also a special application had to be made to chancery for facilities which were absolutely necessary to the successful conduct of a case at common law. Another

source of difficulty and annoyance was the uncertainty in many cases whether the chancery or common law courts were the proper tribunal, so that a suitor often found at the close of an expensive and protracted suit that he had mistaken his court and must go elsewhere for relief. Attempts more or less successful were made to lessen those evils by giving the powers to both sets of courts ; but down to the consolidation effected by the Judicature Act, our judicial system justified the sarcasm of Lord Westbury, that we set up one tribunal to do injustice and another to stop it. In one of the last cases, the custody of an infant, which had been granted by the Queen’s Bench to one claimant, was transferred by the Court of Chancery to another. ‘The payment of a sum of money into court for the benefit of the child made her a ward of court, and enabled the judge in chancery to apply the principles of equity to the case.

The equitable jurisdiction of chancery was commonly divided into exclusive, concurrent, and auxiliary. Chancery had exclusive jurisdiction when there were no forms of action by which relief could be obtained at law, in respect of rights, which ought to be enforced. ‘Trusts are the most conspicuous example of this class, and are, in fact, the main staple of the business of the court. It also includes the rights of married women, infants, and lunatics. Chancery had concurrent jurisdiction when the common law did not give adequate relief, ¢.g., in cases of fraud, accident, mistake, specific performance of contracts, &c. It had auxiliary jurisdiction when the administrative machinery of the law courts was unable to procure the necessary evidence.

The Judicature Act, 1873, enacts ($24) that in every civil cause or matter commenced in the High Court of Justice, law and equity shall be administered by the High Court of Justice and the Court of Appeal respectively, according to the rules therein contained, which provide for giving effect in all cases to “equitable rights and other matters of equity.” ‘The 25th section declares the law hereafter to be administered in England on certain points, and ordains that “ generally in all matters not hereinbefore particularly mentioned in which there is any conflict or variance between the rules of equity and the rules of the common law with reference to the same matter, the rules of equity shall prevail.”

Previous to being merged in the New Supreme Court of Judicature, the Court of Chancery consisted of the Lord Chancellor, the Master of the Rolls, two Lords Justices of Appeal, and three Vice-Chancellors, The Vice-Chancellors and Lords Justices of Appeal are comparatively recent creations.

Notwithstanding the fusion of the courts the great division between common law courts and chancery is not obliterated. The chancery judges form a division by them- selves, to which all the pending business of the old court has been transferred, and to which all causes and matters which, but for the Act, would have been within the exclusive jurisdiction of that court are assigned. The Chancery Division still is, and probably will for a long time be, distinguished from the others by the peculiar nature of its business, by the peculiar nature of its administrative arrangements, and by having a separate bar. Another distinction is making itself apparent, and will assume great importance if finally established. The Chancery Division seems to be unwilling to try cases by jury ; and in a recent case there has been a direct collision of opinion on this subject between the Chancery and the Common Law Judges.

CHANDA, a district of British India, in the Nagpur division of the Central Provinces, situated between 19° 7’ and 20° 51’ N, lat., and 78° 51’ and 80° 51’ E. long. It is

bounded on the N. by the districts of Rdéipur, Bhandara, and Wardha, on the E. by Bastér and Raipur, on the 8. by Sironché, and on the W. by the Wardha and Pranhita rivers, which divide it from Berar and the Hyderabad territory. Excepting in the extreme west, hills are thickly dotted over the country, sometimes in detached ranges, occasionally in isolated peaks rising sheer out from the plain. ‘Towards the east they increase in height, and form a broad table-land, at places 2000 feet above sea-level, The Waingangé River flows through the district from north to south, meeting the Wardha River at Seon{f, where their streams unite to form the Pranhitaé. The census of 1872 returns the total area of the district at 9700 square miles, and the population at 534,431 souls, residing in 2392 villages and townships, and dwelling in 108,258 houses. Of the total population, 397,540, or 74°39 per cent., are Hindus ; 8176, or 1°52 per cent., Muhammadans ; 648 or ‘12 per cent., Buddhists and Jains; 89, or ‘02 per cent., Christians ; and 127,978, or 23:95 per cent., aboriginal tribes and people returned in the census report under the heading of “others.” ‘Two towns in the district are returned as containing a population of upwards of 5000 souls ; viz., Chanda, population 16,233, and Armort, popu- lation 5271. Of the total area of the district, 9700 square miles, only 988 were actually under cultivation in 1873-74, 5200 square miles being returned as cultivable, and 3509 as uncultivable waste. The principal crops are rice, wheat, oil-seeds, sugar-cane, and cotton. Within the Jast few years extensive coal and iron beds have been discovered, and 20 mines were in operation in 1873-74, A branch line of railway will shortly connect the Chand4 coal-measures with the Bombay railway system. Dense woods cover the country. Teak grows everywhere; and in the Government forests, in the eastern part of the district, it attains a large size. ‘The chief manufacture of the district is cotton cloths, both of coarse and fine quality, which are largely exported to Western India. Silkworm breeding is largely carried on, and silk or silk and cotton fabrics are woven. Iron smelting is an important branch of industry. The district trade is conducted at annual fairs, which are held at the towns of Chand4, Bhandak, Chimur, Markandi, and Warhd, and are numerously attended by visitors from all parts of India. ‘The sales effected at these fairs in 1868-69 amounted to £152,224.

Chanda is thickly studded with fine tanks, or rather artificial lakes, formed by closing the outlets of small valleys, or by throwing a dam across tracts

intersected by streams. ‘The broad clear sheets of water thus created are often very picturesque in their surroundings of wood and rock. ‘The chief architectural objects of interest are the cave temples at Bhandak, Winjbdsani, Dewdald, and Ghugus; a rock temple in the bed of the Wardha River below Ballalpur; the ancient temples at Markandi, Ambgdon, and elsewhere ; the forts of Wairdgarh and Ballélpur ; and the old walls of the city of Chanda, its system of water-works, and the tombs of the aboriginal Gond kings.

The total revenue of the district in 1873-74 amounted to £38,922,10s., of which £24,402 or 62°7 per cent., was derived fromthe land. For the education of the people, 67 schools, attended by 3347 pupils, were either entirely supported by the state, or were subsidized under the grant-in-aid rules. For the relief of the sick, 4 charitable dispensaries were maintained, at which 24,448 persons were treated, at a total cost of £660, of which £439 was contributed by Government. The annual rainfall at Chandé town averages 44°67 inches, but in the hilly wooded region to the east it is considerably higher. The rainy season lasts from the middle of June to the end of September. From the middle of September to the close of

November fever of a malarious type pervails all over the district. Cholera and smallpox are also common.

CuAnpA, the principal town in the district of the same naine, is situated in 19° 57’ N. lat. and 79° 29’ E. long., at the junction of the Virdi and Jharpat rivers. The town is surrounded by a wail of cut stone five and a

- half miles in circuit, and crowned with battlements still in perfect preservation. The town contains a total population of 16,233 souls, classified as follows :—Hindus, 14,350 ; Muhammadans, 1294; Buddhists and Jains, 53 ; Christians, 76; and “ others,” 460. The municipal revenue in 1871 was £1120. The population of the town is chiefly Marhatté and ‘Teling4; the traders, shopkeepers, and craftsmen be- long to the latter. The principal manufactures are coarse and fine cottou cloths, silk fabrics, brass utensils, leather slippers, and bamboo work. The town is the seat of con- siderable external trade, the value of the imports in 1868-69 being returned

at £178,044, and the exports at £114,342. The civil station lies a little to the north of the city, having the military cantonments to the west, with the civil lines in the centre aud east.

. CHANDARNAGAR (popularly Chundernagore),aFrench settlement, with a small adjoining territory, situated on the right bank of the River Hugli, 20 miles above Calcutta, in 22° 51’ 40” N. lat. and 88° 24’ 50” E. long. Chandarnagar has played an important part in the European history of Bengal. It became a French settlement towards the close of the 17th century, but did not rise to any importance till the time of Dupleix, during whose administration more than two thousand brick-houses were erected in the town, and a considerable maritime trade was carried on. In 1757, Chandarnagar was bombarded by an English flect and captured; the fortifications and houses were after- wards demolished. On peace being established, the town was restored to the French in 1763. When hostilities afterwards broke out in 1794, it was again taken possession of by the English, and was held by them till 1816, when it was a second time given up to the French; it has ever since remained in their possession. All the former commercial grandeur of Chandarnagar has now passed away, and at present it is little more than a quiet suburb of Calcutta, without any external trade. The European town is situated at the bottom of a beautiful reach of the Huglt, with clean wide thoroughfares, and many elegant residences along the river bank. The total area of the territory is only 2330 acres, including a few villages outside the town. The authorities of Chandarnagar are subject to the general jurisdiction of the Governor-General of Pondicherrf, to whom is confided the general government of all the French possessions in India.

CHANDLER, Ricuarp, D.D. (1738-1810), a British antiquary, was born in 1738, at Elson in Hampshire, and was educated at Winchester school, and Queen’s College, Oxford. His first work consisted of fragments from the minor Greek poets, with notes (1759); and in 1763 he published a fine edition of the Arundelian marbles, Marmora Oxoniensia, with a Latin translation, and a number of suggestions for supplying the lacune. In 1763 Chandler, together with Revett, the architect, and Pars, a painter, was sent by the Dulettanti Society to explore the antiquities of Ionia and Greece. After spending above a year in Asia Minor the travellers passed another

year in Greece, examining Attica and the Peloponnesus, and returned to England in the end of 1766. The result of their joint investigations was the two magnificent folios of Ionian antiquities published in 1769. Chandler also published a very valuable collection of inscriptions, entitled Inscriptiones Antique plereque nondum edite, in Asia Minore et Grecia, proesertim Athenis, collecte (Oxford, 1774). In 1775 he published his Zravels in Asia Minor ;

in 1776 his Travels in Greece ; and in 1800 his History of Ihwm, in which he asserted the accuracy of Homer's geography. His Life of Dishop Waynflete, Lord High Chancellor to Henry VI., did not appear till after his death, in 1811. After his return from Greece, Chandler obtained several church preferments, including the rectory of Tylehurst, in Berkshire; and after marrying and travelling for some time in Switzerland and Italy, he settled down in England, where he died in 1810.

CHANDLER, Samuet, D.D. (1693-1766), a learned Dissenting minister, was born at Hungerford, in Berkshire, where his father was an eminent Nonconformist minister. He was sent to school at Gloucester, where he commenced a life-long friendship with Bishop Butler and Archbishop Secker ; and he afterwards studied at Leyden. His talents and learning were such that he was elected fellow of the Royal and Antiquarian Societies, and was made D.D. of Edinburgh and Aberdeen. He also reccived offers of high preferment in the Established church. These he decidedly refuscd, remaining to the end of his life in the position of a Presbyterian minister. For some time ho preached at Peckham, and for forty years he was pastor of the meeting- house in the Old Jewry. During two or three years, having fallen into pecuniary distress through the failure of the South Sea Scheme, he kept a book-shop in the Poultry. On the death of George II. Chandler published a sermon in which he compared that king to King David. This view was attacked in a pamphlet entitled The Listory of the Man after God's own Heart, in which the author complained of the parallel as an insult to the late king, and, following Bayle, exhibited king David as an example of perfidy, lust, and cruelty. Chandler condescended to reply in A Critical History of the Life of David, which is perhaps the best of his

productions. This work was just completed when he died, on May 8, 1766. He left 4 vols. of sermons (1768), and commentaries on St Paul's Epistles to the Galatians, Ephesians, and Thessalonians (1777), several works on the evidences of Christianity, and a work on subscription to articles of faith (1748).

CHANG-CHOW, a town of China, in the province of Fuh-keen, on a branch of the River Lung Keang, 35 miles west of Amoy. It is well built, and surrounded with a wall 44 miles in circumference, which, however, includes a good deal of open ground. The streets are paved with granite, but are very dirty. The river is crossed by a curious bridge, 800 feet long, constructed of wooden planks supported on 25 piles of stones about 30 feet apart. The city is a centre of the silk-trade, and carries on an extensive commerce in different directions. Brick-works and sugar- factories are among its chief industrial establishinents. Its population is estimated at about 1,000,000.

CHANNEL ISLANDS, a number of islands politically attached to Great Britain, but connected with France by geographical position, being situated in the great bay of St Michael, which is bounded by the coasts of the departments of Manche, Ille-et-Vilaine, and Cotes du Nord. They are naturally divided into four priucipal groups—the northern, which includes Alderney, Burhou, and the Casquets, lying off the Cape de la Hogue; the north-central, com- prising Guernsey, Herm, and Sark, about eighteen miles to the south-west; the south-central, or Jersey and its adjacencies, more towards the centre of the bay; and the

'southern, or the Muinquiers and Chausseys, with their

multitudinous islets. The total area is about 75 squarc miles, or 48,000 acres.

The geological character of all the groups is in their principal features the same, for the islands consist almost exclusively of igneous rocks in various stages of decomposi- tion. They have been denuded of nearly all the fossiliferous

and stratified rocks with which at an earlier period they

would seem to have been covered. The process which has thus stript the islands is still going on around the coasts, wearing the cliffs into caves and gullies, and grinding the rocks into shingle and sand. The tide in St Michael’s bay is of very considerable ;

force, and rises to a height of about forty feet at Jersey, and to about thirty at Guernsey, while the difference of high water at spring and neap tides is seventeen feet at the former island and eleven at the latter.

The minerals belong- ing to granitic rocks are very abundant, such as crystals of felspar and hornblende, and many kinds of quartz and felspar, Asbestos is found, and chlorite is everywhere abundant.

The flora of the islands is remarkably rich considering their extent nearly 2000 different species of plants having been counted throughout the group. Of timber properly speaking there is hardly any, but the evergreen oak, the elm, and the beech grow well and are abundant. Wheat is the principal grain in cultivation; but far more ground is taken up with turnips and potatoes, mangold, parsnip, and carrot. The tomato ripens asin France, and the Chinese yam has been successfully grown. There is a curious cabbage, chiefly cultivated in Jersey, which shoots up into a long woody stalk from 10 to 15 feet in height, fit for walking-sticks or palisades. Grapes and peaches come to perfection in green-houses without artificial heat ; and not only apples and pears but oranges and figs can be reared in the open air. ‘The arbutus ripens its fruit, and the camellia clothes itself with blossom, as in more southern climates; the fuchsia reaches a height of 15 or 20 feet, and the magnolia attains the dimensions of a tree. Of the flowers, both indigenous and exotic, that abound throughout the islands, it is sufficient to mention the Guernsey lily with its rich red petals, which is supposed to have been brought from Japan.

The number of the species of the mammalia is little over twenty, and several of these have been introduced by man. There is a special breed of horned cattle, and each island has its own variety, which is carefully kept from all inter- mixture. The animals are small and delicate, and marked by a peculiar yellow colour round the eyes and within the ears. ‘The red deer

was once indigenous, and the black rat is still common in Alderney and Herm. Nearly 300 species of birds have been found, or more than half the whole British list. There are few localities in the northern seas which are visited by a greater variety of fish, and the coasts abound in crustacea, shell-fish, and zoophytes.

Owing to the Norman system of land-tenure being still in force, the lard is parcelled out among a great number of small proprietors, and in Alderney, for example, five or eight acres of arable land is accounted a fair estate. The results of this arrangement seem to be favourable in the extreme. Every corer of ground is carefully and intelli- gently cultivated, and a considerable proportion is allotted to market-gardening. The cottages are neat and comfort- able, the hedges well trimmed, and the roads kept in excellent repair. Wealth is for the most part pretty equally distributed, and poverty or pauperism is comparatively unknown. There is avery considerable export and import trade, the value of the produce and manufactures of the islands dispatched to England in 1874 amounting to £459,639, or between £9 and £10 for every acre of land ;

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Channel Islands.

reached the sum of £982,656.

islands are not so great as they were a few years ago,

CHANNEL ISLANDS

while the total importation of British and foreign articles The population of the whole group has largely increased during the present century, though, on account of exceptional causes, the numbers in Alderney, Sark, and a few of the smaller In 1821 Jersey had 28,600 inhabitants, as compared with 56,627 in 1871; and Guernsey and the dependent islands, inclusive of Alderney, Sark, &c., had 20,827, as compared with 33,699. For further details on the economical con- dition of the islands the reader may consult the separate articles ALDERNEY, JERSEY, &c.

The language spoken in ordinary life by the inhabitants of the islands is in great measure the same as the Old Norman French, though modern French is used in the law courts, and English is taught in all the parochial schools, and is familiar to a gradually increasing proportion of the population, especially in Jersey and Alderney, The several islands have each its own dialect, differing from that of the others at once in vocabulary and idiom ; and a very marked difference is observable between the pronunciation inthe north and the south of Guernsey. It has even been asserted that every parish in that island has some recognizable peculiarity of speech; but if this is the case, it is probably only in

the same way in which it could be asserted of neighbouring parishes throughout the country. None of the dialects have received much literary cultivation, though Jersey is proud of being the birthplace of one of the principal

Norman poets, R. Wace, and has given a number of writers to English literature. The Guernsey patois is rendered pretty well known to the philologist by the Rimes Guerné- siaises of George Métivier, who has since published a Dictionnaire Franco-Normand, ou Recueil des mots particuliers au dialecte de Guernesey, 1870 ; and a fair idea of that of Jersey is obtainable from the Mumes et Poésies Jersiaises de divers auteurs, by A. Mourant, 1865.

The original ethnology and pre-Christian history of the Channel Islands are largely matters of conjecture and debate. Of carly inhabitants abundant proof is afforded by the numerous megalithic monuments—cromlechs, kistvaens, and maenhirs—still extant in various quarters, and it is well known that the number of these memorials was much greater in recent centuries. One of the most important, indeed—a cromlech near St Helier's —was only removed in 1788. But little trace has been left of Roman occupation, and such remains as have been discovered are mainly of the portable description that affords little proof of actual settlement. According to tradition St Marcou or Marculfus visited the islands as a Christian missionary in 540, and in 568 he was followed by St Magloire (a friend and fellow-evangelist of St Samson of Dol), who founded monasteries at Sark and at Jersey. In 988 the islands were made over by Rodolph of Brittany to

William of Normandy, the son of Rollo; and after the Norman conquest of England, their allegiance shifted between the English crown and the Norman coronet according' to the vicissitudes of war and policy. During the purely Norman period, they had been aitchot with numerous ecclesiastical buildings, some of which are still extant, in a more or less perfect condition. In the reign of John of Eng- land, the future of the islands was decided by their attachment to the English crown, in spite of the separation of the duchy of Nor- mandy. To John it has been usual to ascribe a document, at one time regarded by the islanders as their Magna Charta ; but modern criticism leaves little doubt that it is not genuine. An unauthen- ticated 'copy " of uncertain origin alone has been discovered, and there is little proof of there ever having been an original ; while it is plain that the islands were in possession of several of the privi- leges which it professes to accord previous to the supposed date. The reign of Edward I. was full of disturbance and trouble ; and in 1279 Jersey and Guernsey received from the king, by letters patent, a public seal as a remedy for the dangers and losses which they had incurred by lack of such a certificate. Edward II. found it necessary to instruct his collectors not to treat the islanders as foreigners ; his successor, Edward IL, fully confirmed their privi- leges, immunities, and_customs in 1341; and his charter was re- cognized by Richard Il. in 1378. In 1348 there was a descent of the French in Guernsey ; the governor was beaten, and Castle Cornet besieged. In 1380 Pius IV. issued a bull of anathema against all who molested the islands ; it was formally registered in Brittany in 1384, and in France in 1386; and in this way they

acquired the right of neutrality, which they retained till 1689. Henry V. confiscated the alien priories which had kept up the same connection with Normandy as before the Conquest, and conferred them along with the regalities of the islands on the duke of Bedford. During the Wars of the Roses, Queen Margaret, the consort of Henry VI. made an agreement with Maulevrier, the seneschal of Normandy, that if he afforded assistance to the king he should hold the islands independently of the Crown. A force was accordingly sent to take possession of Jcrsey Castle. Orgueil was captured and a small part of the island subjugated, but the rest held out under Philip

de Carteret, and in 1467 the vice-admiral of England, Sir Richard Horbiston, recaptured the castle and brought the foreign occupation to an end. By a charter of 1494, the dutics of the governors of Jersey were defined and their power restricted ; and the educational interests of the island were furthcred in the same reign, by the foundation of two grammar schools by John Neal. ‘The Reformation was heartily welcomed in the islands ; and under the influence of French pastors, the form of worship adopted was the Presbyterian. The greatest severity was exercised in the maintenance of the new ecclesiastical discipline. In 1554 one Richard Girard was flogged through the town of St Helier’s for defending the doctrine of the mass; in 1576 several persons were thrown into prison by the royal court for not having taken the communion, and they were not to be liberated till they could repeat the commandments and the Lord’s prayer; and in 1592 it was enacted that all persons should attend divine service morning and evening under the penalty of a fine.

The Presbyterian form of church government was formally sanc- tioned in Jersey and Guernscy hy Queen Elizabeth ; and in 1603 King James enacted that ‘‘they should quietly enjoy their said liberty.” During the governorship of Sir John Poyton, however, disputes arose between him and the Presbyterian ‘‘colloquy” or synod about nomination to benefices, and both parties appcaled to the king. A commission was appointed in 1609, but peace was not established. An Episcopal party had been formed in Jersey, and in 1619 David Bandinal was declared Dean of the island.

Heylin, Relation of two Journeys, 1656 ; Philip Falle, Caesarea, or an Account of Jersey, London, 1694, revised edition, 1734 ; Dicey, An Hist. Account of Guernsey, 1750; E. Allen, Argument to His Majesty’s Royal Commissioners in the Island of Jersey, 1812 ; Berry, Hist. of Island of Guernscy, 1815; Plees, Account of Jersey, 1817; Inglis, Channel Islands, 1835; Duncan, Hist. of Guernsey, 1842; F. B. Tupper, Chronicles of Castle Cornet, Guernsey, 1851 ; Hoskins, Charles II. in Channel Islands, 1854 ; Le Quesne, Constit. Hist. of Jersey, 1856; Girardin and Moritre, Rapport d@’wne Ex- cursion Agricole ad Jersey en 1856, 1857 ; De la Croix, Jersey, ses antiquités, ses institutions, dc.,1859; D. T. Ansted and R. G. Latham, The Channel Islands, 1865. The last work is an interesting com- pilation, and treats of the islands in their geographical, botanical,

zoological, and historical relations. See also a paper in the Fort- nightly Review (1876) by the Rev. F. Barham Zincke.

CHANNING, Wiuitam Ettery (1780-1842), was the son of William Channing and Lucy Ellery, and was born at Newport, Rhode Island, U.S., on the 7th of April 1780. The place of his birth is situated amidst scenery of great and varied beauty, the influence of which upon his mind may be traced in many allusions in his writings, and in the vivid admiration which he ever expressed for it in after-

life. To the society of the town of Newport he owed but little ; it was a bustling, crowded seaport, where a certain Puritanic strictness, inherited by tradition from the founders of the State, was kept up, not only in connection with, but too much as a salvo for, a considerable amount of laxity both of speech and practice. As a bathing-place it was a resort for strangers from other parts, and the interfusion of French and British officers tended to modify the peculiarities which the unmixed influence of retired sea captains, West Indian traders, and keen New England lawyers might have rendered too strong.

As a child, Channing was remarkable for a refined delicacy of feature and temperament, which made him an object of admiration and affection in the household. From his father he inherited a fine person, simple and elegant tastes, sweetness of temper, and warmth of affection ; froin his mother (who appears to have been a remarkable woman) he derived the higher benefits of that strong moral discern- ment and straightforward rectitude of purpose and action which formed so striking a feature of his character. By both parents he was carefully instructed in those strict religious principles which were characteristic of the people of New England; and by both, but especially by his mother, was his moral training most sedulously cared for. Other influences, however, were in the meantime operating upon him. The excitement of the revolutionary war was inspiring him with a profound and ardent love of freedom. The sick chamber of an aunt of his father, who was a woman of much piety and sweetness, was the source of many serious and hallowed lessons of gentleness and good- ness. An amateur Baptist preacher, who was by trade a cooper, by refusing, though very poor, to

manufacture any of the articles of his trade used for containing ardent spirits, gave him an impulse which he never lost in favour of temperance. A female servant, whose religious views were of a more cheerful cast than those prevalent in his circle, used to talk to him in a way that greatly engaged him, and probably sowed the germ of not a few of the ideas which afterwards regulated his modes of religious sentiment. Able and free-minded men, like Dr Stiles and Dr Hopkins, frequented his father's house, and the quiet and thoughtful boy listened to their conversations, and laid many suggestive words that fell from them to heart. While but a child he had begun to draw inferences from what he heard from the pulpit and elsewhere that were not quite such as his guardians would have wished him to draw; and he "was even then quite a theo- logian, and would chop logic with his elders according to the fashion of that controversial time," as he himself tells us.

Whilst very young, he was sent to a dame's school, who exacted from the incipient republicans the title of Madam, and enforced her authority and her lessons by means of "a long round stick." From this he passed under the care of two excellent women, by whose instructions he profited greatly. His next step was to the school of a Mr Rogers, considered the best at that time in the town ; and in his twelfth year he was sent to New London to prepare for college, under the care of his uncle the Rev. Henry Channing. His career at school does not appear to have been marked by any remarkable aptitude for letters; on the contrary, his progress was at first somewhat slow, though after the few initiatory difficulties were overcome, he advanced rapidly, both in a knowledge of the classics and an appreciation of their excellencies. His disposition was thoughtful and retiring, though among his companions he showed no absence of relish for lively conversation or hearty amusement. A certain mingled dignity and sweet- ness gave him a commanding influence in the school, where he went by the name of " the memainak on: and " Little

King Pipin," and where he was obeyed, though "small and delicate,' with more readiness than mere physical strength could ever have commanded.

Shortly after he went to reside with his uncle, his father died. This event, however, though it produced a great change in the circumstances of the family, was not allowed to interrupt the course of his studies. After the funeral he returned to the house of his uncle, where he remained till he had reached his fifteenth year, when he was removed to Cambridge, Massachusetts, and entered at Harvard College as freshman in1794, Before leaving New London he came under the influence of a religious revival which took place there, a circumstance to which he was accustomed to trace the commencement of a decidedly religious life.

The four years he remained at college seem to have been most profitably spent. Besides acquiring an extensive acquaintance with classical and general literature, he read largely and thought earnestly in the department of psychology and ethics. The books which appear to have exerted most influence upon his mind and opinions were Price's Dissertations, Hutcheson on Beauty and Virtue, and Ferguson on Civil Society. To the study of Shakespeare also (the interest in whose works was then newly awakencd in that quarter) he owed much; and so deep was the impression made on him by the genius of the poet, that to the close of his life one of the greatest of his intellectual treats was furnished by recitations from his writings. By patient and well-directed assiduity he trained himself to the mastery of that copious and vigorous style of composi- tion to which his subsequent position in the world of letters is in no small measure due, and at the same time also laid the basis of his success as a public speaker, by the formal study of rhetoric, and by frequent practice in addressing assemblies of his fellow-students.

For a year and a half after leaving college in 1798, Channing was resident at Richmond, in Virginia, as tutor in the family of Mr David Meade Randolph. Here he had time for study, which he employed chiefly on theo- logical subjects. In regard to many points, touching both the evidences of Christianity and its doctrines, his mind was burdened with doubt and anxiety; and so earnestly did he labour to attain satisfaction, that 'his constitution sank under the incessant toil. When, in 1800, he returned to Newport, his friends were shocked to find him changed to "a thin and 'pallid invalid ;' and unhappily, at this time were sown the seeds of that depressed condition of health which continued through life his severest

trial. He remained in the bosom of his family for another year and a half, engaged in the pursuit of his studies, and in preparing himself, by physical and moral as well as intellec- tual training, for the work to which he was looking forward —that of the ministry. In 1802 he returned to Cambridge, having been elected to the office of regent in Harvard University, a situation which, without exacting from him any large amount of service, secured to him the advantage of independence, and an opportunity of prosecuting his studies within reach of a valuable library, and under influ- ences favourable to success. In the autumn of 1802 he began to preach, having received approbation to do so from the Cambridge Association ; and in the beginning of the following year he accepted the invitation of the Congrega- tional Church, Federa] Street, Boston, to be their pastor. To this office he was ordained in June 1803.

Channing entered on his ministry with a deep and almost painful sense of the responsibility of the office he had assumed, and with an earnest desire to acquit himself faithfully of its obligations. His theological views were at this time probably not definitely fixed. We have his own assurance that he was not a Trinitarian, but he had not at this time severed himself from those holding orthodox views.

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In 1808 he took part in the ordination of the Rev. J. Codman, a well-known minister of the Congregational order, when he delivered a sermon which was afterwards published. In this sermon, though the language and sentiments are such as any evangelical divine might use, there is nothing that certainly indicates that the author held any of the views peculiarly distinctive of evangelical orthodoxy unless it be the application of the title "‘ Divine Master" to Jesus Christ, and the use of such expressions as that the blood of Christ was "shed for souls," and that for man's salvation " the Son of God himself left the abodes of glory and expired a victim on the cross." It is not thus that Unitarians, in England at least, are wont to speak of Christ and his death. But Channing never identified himself with any theological party. He called himself a Unitarian, and so in a sense he was, but his views were Arian rather than what are commonly known as

Unitarian. He reverenced in Jesus Christ not only a sublimely perfect character, but a nature higher than that of man. He believed in His pre-existence in heaven, and that He came down from heaven for man's salvation ; and he taught that "the Scriptures ascribe the remission of sins to Christ's death with an emphasis so peculiar that we ought to con- sider this event as having a special influence in removing

-punishment, as a condition or method of pardon, without

which repentance would not avail us, at least to that extent which is now promised by the gospel" (Sermon at the ordination of Rev, Jared Sparks). The truth is, that Channing was too much a lover of free thought, and_ too desirous to hold only what he saw to be true, to allow himself to be bound by any party ties. "I wish," he says, "to regard myself as belonging not to a sect but to the community of free minds, of lovers of truth, and followers of Christ, both on earth and in heaven. I desire to escape the narrow walls of a particular church, and to stand under the open sky in the broad light, looking far and wide, seeing with my own eyes, hearing with my own ears, and following Truth meekly but resolutely, however arduous or solitary be the path in which she leads" (Sermon at Installation of Rev. M. J. Motte). Thus refusing to be enclosed within the limits of party, and acting freely as respected religious association, he may be claimed as one whom men of all parties honour for his abilities, his integrity, and his work.

In 1814 Channing married his cousin, Ruth Gibbs, a union which brought him an increase of worldly substance, as well as a rich addition to his personal happiness. " TInwardly and outwardly," his biographer tells us, " his lot henceforward was singularly serene." He was now fast rising in reputation, both as a preacher and as a public man. Interested in all that concerned his country and the cause of humanity, his voice was heard on most of the questions that came before the American public, and always with marked and growing effect. He had begun also to command attention as a writer for the press. His Address on War, some of his sermons, and especially his able tract on The Evidences of Christianity, had given him a position of eminence among the writers of his country. In 1821 he received the title of D.D. from Harvard University. In 1822 he undertook a journey to Europe, in the course of which he visited Great Britain and some parts of

the Continent. When in England he made the acquaintance of some distinguished men of letters, espe- cially Wordsworth and Coleridge, on both of whom he appears to have left a most favourable impression. Coleridge wrote of him, "‘ He has the love of wisdom and the wisdom of love." On his return Dr Channing resumed his duties as a minister, but with a more decided attention than before to literature and public affairs. In 1824 he received as colleague the Rev. Ezra Stiles Gannett, at

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whose ordination he preached one of his published dis- courses, From this time forward his energies were devoted, in addition to his pulpit labours, chiefly to the furtherance of great schemes of social reform. Of the anti-slavery cause he was throughout the firm, eloquent, and uncom- promising advocate ; and in every question that bore upon the happiness of the people he took a lively interest. Of his publications, the most extensively read are his Remarks on the Life and Character of Napoleon Bonaparte, his Remarks on the Character and Writings of John Milton, his Hssay on the Character and Writings of Fénelon, his Essay on Self-Culture, and his Hssay on the Importance and Means of a National Literature. He died in the sixty-third year of his age, on Sunday, the 2d of October 1842, whilst on a journey, at Bennington, Vermont, and was buried at Boston, on the 7th of that month. An extended memoir of him by his nephew, William Henry Channing, appeared in 1848 (republished in 1870). His Complete Works were published in 2 vols., London, 1865. (W. L. A.) CHANTIBAN, a large town of Siam, the capital of a province of the same name, on the south bank of a small river near its mouth in the Gulf of Siam, 150 miles 8.E. of Bangkok, in 12° 45’ N. lat. and 102° 18’ E. long. It is the seat of one of the Siamese arsenals, and has a con-

siderable export trade in pepper, cardamoms, rosewood,

dyewoods, ship-timber, hides, horns, and ivory. In the Vicinity there are mines. of precious. stones. The population, which is estimated at 30,000, contains a large proportion of Chinese traders.

CHANTILLY, a small town of France, in the department of Oise, 25 miles north of Paris by the main line of the great northern railway. It is finely situated near the River Nonette, and is one of the favourite Parisian resorts. Its name has long been associated with the manufacture of lace and blonde, and it is still more celebrated for its chateaux and pleasure grounds, and as the scene of the great annual races of the French Jockey Club. The old castle must have been in existence in the 13th century, and in the reign of Charles VI. the lordship belonged to Pierre d'Orgemont, Chancellor of France. In 1484 it was trans- ferred by his grandson to the house of Montmorency, and in 1632 it passed from that family to the house of Condé. The Prince de Condé, surnamed the Great, was specially attached to the spot, and did a great deal to enhance its beauty and splendour. Here he enjoyed the society of La Bruyére, Racine, Moliére, La Fontaine, Boileau, and other great men of his time; and here his steward Vatel killed himself in despair, because something had gone wrong with the preparations for the reception of his majesty Louis XIV. Of the two splendid mansions that then existed, and were known as the Grand Chateau and the Petit Chateau, the former was destroyed about the time of the Revolution, but the latter still remains as one of the finest specimens of the Renaissance architecture in France. On the death of the duke of Bourbon, the last representative of the house of Condé, the estate passed into the hands of the Duc d'Aumale, fourth son of Louis Philippe. In 1853 the house of Orleans was declared incapable of possessing property in France, and Chantilly was accordingly sold by auction. Purchased by the English bankers Coutts & Co. for the sum of 11,000,000 francs, it has since passed back into the hands of the duke. There is a hospital in the town, built and endowed by the last Prince de Condé, and the parish church contains the grave of the Admiral Coligny, who perished in the massacre of St Bartholomew. Among the modern buildings is an Episcopalian church, erected for the English residents, who are mainly jockeys or grooms. Population in 1872, 3461. See Du Cerceau-Perelle ; Mérigot, Promenade des Jardins de Chantilly, 1791; and Fauquemprez, Histoire de Chantilly, 1840.

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CHANTREY, Siz Francis (1782-1841), a sculptor of repute, was born on 7th April 1782, at Norton, near Sheffield, where his father cultivated a

small property of his own. His father died when he was eight years of age ; and, his mother having married again, his profession was left to be chosen by his friends. In his sixteenth year he was on the point of being apprenticed to a lawyer in Sheffield, when, having seen some wood-carving in a shop-window, he requested to be made a carver instead of a solicitor, and was accordingly placed with a Mr Ramsay, wood-carver in Sheffield. When in this situation, he became acquainted with Mr Raphael Smith, a distinguished draftsman in crayon, who gave him lessons in painting ; and Chantrey, eager to commence his course as an artist, procured the cancelling of his indentures, and went to try his fortune in Dublin and Edinburgh, and finally in Lon. don. Here he first obtained employment as an assistant wood-carver, but at the same time devoted himself to portrait-painting, bust-sculpture, and modelling in clay. The sculptor Nollekens showed particular zeal in recognizing his merits. His first imaginative work was the model of the head of Satan, which was exhibited at the Royal Academy in 1808. He afterwards executed for Greenwich Hospital four colossal busts of the admirals Duncan, Howe, Vincent, and Nelson ; and so rapidly did his reputation spread that the next bust which he executed, that of Horne Tooke, procured him commissions to the extent of £12,000. From this period he was almost uninterruptedly engaged in professional labour. In 1819 he visited Italy, and became acquainted with the most distinguished sculptors of Florence and Rome. He was chosen an associate, and afterwards a member, of the Royal Academy (1816 and 1818), received the degree of M.A. from Cam- bridge, and that of D.C.L. from Oxford, and in 1837 was knighted. He died after ~~an illness of only two hours' duration, on the 25th November 1841, having for some years suffered from disease of the heart, and was buried in a tomb constructed by himself in the church of his native village. The works of Chantrey are extremely numerous. The principal are the statues of Washington in the State~~ house of Boston, of George III. in London, of George IV. at Brighton, of Pitt in Hanover Square, London, of Watt in Westminster Abbey and at Glasgow, of Roscoe and Canning at Liverpool, of Dalton at Manchester, of Lord-President Blair and Lord Melville in Edinburgh, &ec. Of his equestrian statues the most famous are those of Sir Thomas Munro at Calcutta, and the Duke of Wellington in front of tle London Exchange. But the finest of Chantrey's works are his busts, and his delineations of children. The figures of two children asleep in each other's arms, which form a monumental design in Lichfield Cathedral,

have always been lauded for beauty, simplicity, and grace. Sois also the statue of the girlish Lady Louisa Russell, represented as standing on tiptoe and fondling a dove in her bosom. Both these works, it should, however, be explained, were executed from designs by Stothard ; for Chantrey knew his own scantiness of ideal invention or composition, and on system sought aid from others for such attempts. ‘In busts, his leading excellence is facility — a ready unconstrained air of life, a prompt vivacity of ordinary expression. Allan Cunningham and Weekes were his chief assistants, and were indeed the active executants of many works that pass under Chantrey’s name. Chantrey was a man of warm and genial temperament, and is said to have borne a noticeable though commonplace resem- blance to the usual portraits of Shakespeare. He bequeathed his valuable collection, and his whole fortune, after the death of Lady Chantrey, to the Royal Academy, for the encouragement of British sculpture and painting. It is but very recently that this bequest has taken actual

effect ; and the precise form in which the Academy mean to administer the trust still (1876) remains indefinite. CHAPELAIN, Jean (1595-1674), a French poet and man of letters, was the son of a notary, and was born in Paris. His father destined him for his own profession ; but his mother, who had known Ronsard (she was the daughter of a certain Michel Corbiére, an intimate friend of the great poet), had determined otherwise. At an early age Chapelain began to qualify himself for literature, acquiring by his own unaided efforts, not only Greek and Latin, but also Italian and Spanish, and even applying himself to medicine. Having finished his studies, he was engaged for a while in teaching Spanish to a young nobleman. He was then appointed tutor to the two sons of a M. de la Trousse, grand provost of France. Attached for the next seventeen years to the family of this gentleman, the administrations of whose fortune was wholly in his hands, he seems to have published nothing during this period, yet to have acquired a great reputation as a probability. His first work given to the public was a preface for the Adone of Marini, who printed and published that notorious poem at Paris. This was followed by an excellent translation of Mateo Aleman’s novel, Guzman de Alfarache, and by four extremely indifferent odes, one of them addressed to the great Richelieu, whom Chapelain had

the honour of grounding in the dramatic unities. Rewarded with a pension of a thousand crowns, and appointed from the first a member of the newly-constituted Academy, Chapelain drew up the plan of the grammar and dictionary, .the compilation of which was to be a principal function of the young institution, and at Richelieu's com- mand prepared a criticism of the Cid. In 1756 he published, in a magnificent form, the first twelve cantos of his celebrated epic Za Pucelle, on which he had been engaged during twenty years. His reputation at this time was so great that six editions of the poem were disposed of in eighteen months. But this was the end of Chapelain, "the legist of Parnassus," The epigrams of Montdor and Furetitre, the slashing satire of Boileau (in this case fairly inaster of his subject), had done their work, and Chapelain ('le plus grand poéte+Frangais qu'ait jamais été et du plus solide jugement," ashe is called in Colbert's list) had taken his place among the failures of modern art. The last twelve cantos of La Pucelle were never published. A complete manuscript of it exists, with corrections and a preface in the author's autograph, in the Brbliothéque Nationale ; but its readers, it may be presumed, are few. In 1662 Chapelain wasemployed by Colbert to draw up an account of contemporary men of letters, destined to guide the king in his distribution of pensions. In this pamphlet, as in the extracts from his letters published by Camusat in 1726 (Mélanges de Littérature tirés des Lettres manuscrites de Chapelain), he shows to far greater advantage than in his unfortunate epic. His prose is said to be incomparably better than his verse ; his criticisms are remarkable for their justice and generosity ; his erudition and kindliness of heart are everywhere apparent ; the royal attention is, directed alike towards the author's firmest friends and bitterest enemies. The man, indeed, appears to have been as excellent as the poet was worthless. He does not seem to have known jealousy ; Corneille was the object of his warmest praises; and to him the young

Racine was indebted not only for kindly and seasonable.

counsel, but also for that pension of six hundred livres which was so useful to him. Moving in the best society, polite and literary, and loaded with honours and pensions, in his old age Chapelain is reported to have become a miser of the most sordid type, the clothes le wore being so patched and

clouted as to procure for him the nickname of the Chevalier de lAraignée; while Ménage relates that,

calling upon the old man after a long estrangement, he found on the hearth the same cinders that he had remarked thereon twelve years before. His avarice, moreover, is said to have been indirectly the cause of his death, which happened in his seventy-ninth year. Some 50,000 crowns, a large fortune for those days, were found in his apartments.

As a poet, Chapelain seems to occupy on the French side of Parnassus a place analogous to that one filled on the English side by Sir Richard Blackmore. Ja Pucelle is an enormous allegorical nightmare, towards a correct apprecia- tion of which the satire of Boileau is said to be the best guide. As a prose-writer and critic, Chapelain seems to have had real merit; in a passage of his, concerning the legendary epic of the Middle Ages, quoted by Sainte-Beuve (who calls him “homme instruit, sinon poéte ”), he would appear to have anticipated much of what modern criticism has had to say on the subject.

CHAPEL-HILL, a village of the United States, in Orange County, North Carolina, 27 miles north-west of Raleigh. It is the seat of the North Carolina university, founded in 1789, and has about 2800 permanent in- habitants, a

CHAPMAN, Grores, translator of Homer, dramatist, and gnomic poet, was born in 1559, and died in 1634. At fifteen, ‘according to Anthony Wood, “he being well grounded in school learning, was sent to the university” of Oxford; at thirty-five he published his first poem, 7’he Shadow of Night. Between these dates, though no fact has been unearthed concerning his career, it is not improbable that he may have travelled in Germany. At thirty-nine he was reckoned ‘among the best of our tragic writers for the stage;” but his only play published at that age was a crude and formless attempt at romantic comedy, which had been acted three years before it passed from the stage to the press; and his first tragedy now extant in print, without name of author, did not solicit the suffrage of a reader till the poet was forty-eight. At thirty-nine he had also pub- lished the first instalment of his celebrated translation of the liad, in a form afterwards much remodelled

; at sixty- five he crowned the lofty structure of his labour by the issue of an English version of the Aymns and other minor Homeric poems. The former he dedicated to Robert Devereux, Earl of Essex, the hapless favourite of Eliza- beth ; the latter to Robert Carr, Earl of Somerset, the in- famous minion of James. Six years earlier he had in- scribed to Bacon, then Lord Chancellor, a translation of Hesiod's Works and Days. His only other versions of classic poems are from the fifth satire of Juvenal and the Hero and Leander which goes under the name of Muszeus, the latter dedicated to Inigo Jones. His revised and completed version of the J/iad had been inscribed in a noble and memorable poem of dedication to Henry Prince of Wales, after whose death he and his Odyssey fell under the patronage of Carr. Of the manner of his death at seventy-five we know nothing more than may be gathered from the note appended to a manuscript frag- ment, which intimates that the remainder of the poem, a lame and awkward piece of satire on his old friend Jonson, had been "lost in his sickness."

Chapman, his first biographer is careful te let us know, "was a person of most reverend aspect, religious and teni- perate, qualities rarely meeting in a poet ;" he had also certain other merits at least as necessary to the exercise of that profession. He had a singular force and solidity of thought, an admirable ardour of ambitious devotion to the service of poetry, a deep and burning sense at once of the duty implied and of the dignity inherent in his office; a vigour, opulence, and loftiness of phrase, remarkable even in that age of spiritual strength, wealth, and exaltation of thought and style; a robust eloquence, touched not un-

frequently with flashes of fancy, and kindled at times into heat of imagination. The main fault of his style is one more commonly found in the prose than in the verse of his time,—a quaint and florid obscurity, rigid with elabor- ate rhetoric and tortuous with labyrinthine illustration ; not dark only to the rapid reader through closeness and subtlety of thought, like Donne, whose miscalled obscurity is so often "all glorious within," but thick and slab as a witch's gruel with forced and barbarous eccentricities of articulation. As his language in the higher forms of comedy is always pure and clear, and sometimes exquisite in the simplicity of its earnest and

natural grace, the stiff- ness and density of his more ambitious style may perhaps be attributed to some pernicious theory or conceit of the dignity proper to a moral and philosophic poet. Never- theless, many of the gnomic passages in his tragedies and allegoric poems are of singular weight and beauty; the best ofthese, indeed, would not discredit the fame of the very greatest poets for sublimity of equal thought and ex- pression : witness the lines chosen by Shelley as the motto for a poem, and fit to have been chosen as the motto for his life.

The romantic and sometimes barbaric grandeur of Chap- man's Homer remains attested by the praise of Keats, of Coleridge, and of Lamb; it is written at a pitch-of strenu- ous and laborious exaltation, which never flags or breaks down, but never flies with the ease and smoothness of an cagle native to Homeric air, From his occasicual poems an expert and careful hand might easily gather a noble anthology of excerpts, chiefly gnomic or meditative, alle- goric or descriptive. The most notable examples of his tragic work are comprised in the series of plays taken, and adapted sometimes with singular licence, from the records of such part of French history as lies between the reign of Francis I. and the reign of Henry IV., ranging in date of subject from the trial and death of Admiral Chabot to the treason and execution of Marshal Biron." The two plays bearing as epigraph the name of that famous soldier and conspirator are a storehouse of lofty thought and splendid verse, with scarcely a flash or sparkle of dramatic action. The one play of Chapman's whose popularity on the stage survived the Restoration is Bussy d'Ambois (d'Amboise),— a tragedy not lacking in violence of action or emotion, and abounding even more in.sweet and sublime interludes than in crabbed and bombastic passages. His rarest jewels of thought and verse detachable from the context lie em- bedded in the tragedy of Caesar and Pompey, whence the finest of them were first extracted by the unerring and un- equalled critical genius of Charles Lamb. In most of his tragedies the lofty and labouring spirit of Chapman may be said rather to shine fitfully through parts than steadily to pervade the whole; they show nobly altogether as they stand, but even better by help of excerpts and selections. But the excellence of his best comedies can only be appre- ciated by a student who reads them fairly and fearlessly through, and, having made some small deductions on the score of occasional pedantry and occasional indecency, finds in All Fools, Monsieur d' Olive,

The Gentleman Usher, aud The Widow's Tears a wealth and vigour of humorous invention, a tender and earnest grace of romantic poetry, which may atone alike for these passing blemishes and for the lack of such clear-cut perfection of character and such dramatic progression of interest as we find only in the yet higher poets of our heroic age.

So much it may here suffice to say of Chapman as an original poet, one who held of no man and acknowledged no master, but throughout the whole generation of our greatest men, from the birth of Marlowe well-nigh to the death of Jonson, held on his own hard and haughty way of austere and sublime ambition, not without kindly and

graceful inclination of his high grey head to salute such younger and still nobler compeers as Jonson and Fletcher. With Shakespeare we should never have guessed that he had come at all in contact, had not the keen intelligence of a living critic, Mr Minto, divined or rather discerned him to be the rival poet referred to in Shakespeare's son- nets with a grave note of passionate satire, hitherto as enigmatic as almost al] questions connected with those divine and dangerous poems. This conjecture the critic has fortified by such apt collocation and confrontation of passages that we may now reasonably accept it as an ascertained and memorable fact.

The objections which a just and adequate judgment may bring against Chapman's master-work, his translation of Homer, may be summed up in three epithets: it is romantic, laborious, Elizabethan. The qualities implied by these epithets are the reverse of those which should dis- tinguish a translator of Homer; but setting this apart, and considering the poems as in the main original works, the superstructure of a romantic poet on the submerged foundations of Greek verse, no praise can be too warm or high for the power, the freshness, the indefatigable strength and inextinguishable fire which animate this exalted work, and secure for all time that shall take cognizance of English poetry an honoured place in its highest annals for the memory of Chapman. (A. ©. 8.)

CHAPPE, Ciaups (1763-1805), a French engineer, and the inventor of the simple French telegraph, was born in Normandy in 1763. His invention consisted of an upright post, on the top of which was fastened a transverse bar, while at the ends of the latter two smaller arms moved on pivots. The

positions of these four bars represented words or letters; and by means of machines placed at intervals such that each was distinctly visible from the next, messages could be conveyed through 50 leagues in a quarter of an hour. It was said that Chappe borrowed the design from Hooke and Amontons, and the charge so deeply affected him that, notwithstanding the success of his machine, which had been adoptcd by the Legislative Assembly in 1792, he was seized with deep melancholia, under which he committed suicide in 1805.

CHAPTAL, Jean Antoine (1756-1832), count of Chanteloup, an eminent French chemist aud statesman, born at Nogaret, Lozere, 4th June 1756. At Montpellier, where he first studied chemistry, he obtained his doctor's diploma in 1777, when he repaired to Paris. In 1781, the States of Languedoc founded a chair of chemistry for him at the school of medicine in Montpellier, where he taught with success the doctrines of Lavoisier, in opposition to those of Stahl. The capital he acquired by the death of a wealthy uncle he employed in the establishment of chemical works for the manufacture of mineral acids, alum, white-lead, soda, and other substances. His labours in the cause of applied science were at length recognized by the French Government, which presented him with letters of nobility, and the cordon of the order of Saint Michel. A publication by Chaptal, entitled Dialogue entre un Montagnard et un Girondin, caused him to be arrested ; but being speedily set at liberty through the intermission of his friends, he undertook, in 1793, the management of the saltpetre works at Grenelle. In the following year he went to Montpellier, where he remained till 1797, when he returned to Paris. After the revolution of the 18th of Brumaire (9th November 1799) he was made a councillor of state by the first consul, and succeeded Lucien Bonaparte as minister of the interior, in which capacity he established a chemical manufactory near Paris, a school of arts, and a society of industries ; he also reorganized the hospitals, in- troduced the metrical system of weights and measures, and otherwise greatly encouraged the arts and scieuces. A

misunderstanding between him and Napoleon occasioned Chaptal's retirement from office in 1804; but before the end of that year he was again

received into favour by the emperor, who bestowed on him the grand cross of the legion of honour, and made him treasurer to the conserva- tive senate. On Napoleon's return from Elba, Chaptal was made director-general of commerce and manufactures and a minister of state. He was obliged after the downfall of the emperor to withdraw into private life; and his name was for a time removed from the list of the peers of France. In 1816, however, he was nominated a member of the Academy of Sciences by Louis XVIII. Notwith- standing the many vicissitudes of fortune which he under- went, Chaptal continued to promote the interests of science until his death, which took place at Paris, 30th July

1832.

His literary works exhibit both vigour and perspicuity of style ; he wrote, in addition to various articles for chemical journals, Elémens de Chimie, 3 vols. 8vo, 1790; Traité sur le Salpétre, 8vo, 1796; Essai sur le Perfectionnement des Arts Chimiques en France, 8vo, 1800; Art de faire, de gouverner, et de perfectionner les Vins, 1 vol. 8vo, 1801; Traité Théorique et Pratique sur la Culture de la Vigne, &c., 2 vols. 8vo, 1801; Essai sur le Blanchiment, 1801 ; Chimie appliquée aux Arts, 4 vols. 8vo, 1807 ; Art de la Teintwre du Coton en rouge, 8v0, 1807; Art du Teinturier et du Dégraisseur, 8vo, 1800; De ? Industrie Frangaise, 2 vols. 8vo, 1819 ; Alémoire sur le Sucre de Betteraves, 8vo; Chimie appliquée a 1 Agriculture, 2 vols. 8vo, 1823.

CHAPTER, the. community of clergymen connected with a cathedral or collegiate church, See CATHEDRAL.

CHAPU, an important maritime town of China, in the province of Che-keang, 50 miles N.W. of Chinhai, situated in one of the richest and best cultivated districts in the country. It is the port of Hang-chow, with which it has good canal communication, and it was formerly the only Chinese port trading with Japan. The town has a circuit of about five miles, exclusive of the suburbs that lie along the beach ; and the Tatar quarter is separated from the rest by a wall. It was attacked and much injured by the British force in 1842, but was abandoned immediately after the engagement.

CHARADE, a trifling species of composition, or quasi- literary form of amusement, which may perhaps be best defined as a punning enigma propounded in a series of descriptions. A word is taken of two or more syllables, each forming a distinct word ; each of these is described in verse or prose, as aptly and enigmatically as possible ; and the same process is applied to the whole word. The neater and briefer the descriptive parts of the problem, the better the charade will be. In selecting words for charades, special attention should be paid to the absolute quality of the syllables composing them, inaccuracy in trifles of this sort depriving them of what little claim to merit they may possess. The brilliant rhythmic trifles of W. Mackworth Praed are well known. Of representative prose charades, the following specimens are perhaps as good as could be selected :—“ My jirst, with the most rooted antipathy to a Frenchman, prides himself, whenever they meet, upon sticking close to his jacket ; my second has many Virtues, nor is its least that it gives its name to my first; my whole may I never catch!” “ My /jirst is company ; my second shuns company; my third collects company; and my whole amuses company.” The solutions are Tar-tar and Co-nun-drum. “ Acting charades” are simply punning enigmas described dramatically. A bril- liant description of this variety of the species will be found in Thackeray’s Vanity Fair. .

CHARCAS. See Sucre.

CHARCOAL, the more or less impure form of carbon obtained from various vegetable and animal materials by their ignition out of contact with air.

i

CHA—CHA

Wood Charcoal is a hard and brittle black substance, that retains the form and external structure of the wood from which itis made. It rings when struck, and has a conchoidal fracture ; it is infusible, and is not dissolved by water or acids; at ordinary temperatures it is a bad con- ductor of heat and electricity. Charcoal varies much in degree of compactness, box-wood giving a very solid, and willow a porous variety. Exclusive of its pores, it has a specific gravity of 1:5, or, if made at a high temperature, of 2:0.

Charcoal from Scotch fir weighs from 10°3 to 10°9 tb per cubic foot ; that made from oak is heavier. Very light charcoal is prepared from dogwood, alderwood, and willow. Charcoal contains, besides carbon, varying (but small) quantities of hydrogen, oxygen, and nitrogen ; and when consumed, it yields from 1 to 5 per cent. of ash, or the greater part of the mineral matter contained in the original wood. Charcoal burns without flame, and has in air a calorific intensity of about 2700° C. ; its specific heat, according to Regnault, is 0°2411. The higher the temper- ature to which it has been exposed, the higher is the igniting point of charcoal; and that made at the melting point of platinum requires a temperature of 1250° C. to kindle it.

Fresh-burnt charcoal rapidly absorbs from 9°6 to 18 per cent. of.its weight of atmospheric moisture, of which the commercial article usually contains about 12 percent, It has also a remarkable absorptive action on gases, condensing them within its pores. To the heat thus developed has been attributed the occasional spontaneous ignition of char- coal that has been stacked too soon after manufacture. Recently-made box-wood charcoal absorbs, at 12° C. and 28°5 in. pressure, 90 volumes of ammonia, 85 of hydro- chloric acid, 65 of sulphurous anhydride, 55 of sulphuretted hydrogen, 35 of carbonic anhydride, 94 of oxygen, and 6} of nitrogen ; only 1} vols., however, of hydrogen (Saussure), The absorptive power for gases is nearly in the ratio of the pressures to which the charcoal is exposed, the temperature being constant.

Charcoal can be made at a temperature as low ag 300° C. It is produced in greatest quantity at a heat just sufficient thoroughly to char the wood. The charcoal so made con- tains a larger percentage of hydrogen, oxygen, and nitrogen than that formed at higher temperatures, and, being readily inflammable, is adapted for the manufacture of gunpowder. The quantity of charcoal obtainable from wood varies according to the nature of the wood employed and the method of manufacture. By distillation 25 to 27 per cent. of the weight of the wood can be obtained. Ordi- narily, beech yields about 15 per cent. of its weight, box 204 per cent. Mr Mushet obtained in his experiments the following percentage composition of various kinds of wood, the amount of each kind taken being 1 tb avoirdupois :—

ba a Charcoal. Ashes.

StiOCC AA Can hoo NOH REOOATOONTIIS 22682 0°423 Ee ea aie e aa cecacie tee 17972 0°768 NCR IE : 17°491 1°792 INGHAM EN? LADIG) pesanpontineapoode 80°441 19°204 0°355 (3 s@ysir1i0\/go5nno aooeos GnooBDOG. 73°528 25 °492 0°980 SWMERRAIKOT Gs onoapooaoton cobonSAoK 79°20 19°734 1:066 HOMILY ean. cos ss Ae Ne es 78°92 19°918 1°162 ScOtely WRINGM 30. senses se oon 83°095 16°456 0°449 Ree COUR An epee naS nv TG : 19°941 0°955

ae ene earmere nce non 19°574 0°761 Bent Sea etainee : 20°663 0°816 American Maple…..... 79°331 19-901 0°768 American Black Beech…..) 77°512 21°445 1°033 IDinleibbsentb0t).oq capnnondesousnaoe 74°234 24°586 1°180 Loitemmbten WE=; coop counonocao0: 72°643 26°857 0°500 Sa llOweasucaeeee ar eesinesas 18°497 1°132

23°280 0°416

CHA—CHA

Rumford, who employed a long-continued moderate heat, obtained a much larger quantity of charcoal from wood. During the charring of the wood, pyroligneous or acetic acid, creosote, pyroxylic spirit, and empyreumatic oils are produced, and much carbonic oxide, carbonic anhydride, hydrogen, and water are evolved.

Charcoal can be prepared in a variety of ways. In its purest form it is obtained by the ignition of organic sub- stances such as starch and sugar. That made for powder-

‘mills, as also that produced in acetic acid factories, is the

product of the distillation of wood in iron cylinders. In China charcoal is prepared in pits, preferably in a clayey soil. In some parts of Sweden it is made from rectangular piles of wood, the process being regulated by the careful admission of air through holes in the covering of the wood. In Foucauld’s process, a portable shroud or abri of wood coated with a mixture of loam and grass is used to cover the heap to be charred. In most countries where wood is abundant, charcoal-burning is carried on by firing conical piles of billets of wood, about 12 feet in height, and 10 to 40 feet in

diameter, from the top of a central hole or chimney. The wood is felled in winter, and must be tolerably dry ; it is built up with the bark outermost, the largest billets being placed in the interior of the pile ; over the whole is laid a covering of turf, or of charcoal-dust (‘breeze ”) and soil, The combustion of the wood is con- ducted from above downwards, and from the exterior towards the centre; so that the charcoal in a half-burnt heap forms an inverted cone. At the sides of the heap are holes for the admission of air, the number and size of which are a matter of importance. The first or “sweating” process lasts three or four days, during which the cover becomes moist with condensed water. The openings round about the base of the pile are then covered, and a series of holes is made about half-way from the top of the heap; as the smoke ceases to issue from these they are closed, and other series of holes are made below, as required. The tarry products which collect towards the close of the operation are removed from the heap by means of gutters or pipes,

Sometimes the base of the heap is made in the shape of a flat funnel, from which proceeds a channel for the tar and acid. When the air-holes of the burning heap no longer emit smoke and flame, they are carefully stopped, and the pile is allowed to cool for two or three days, The charcoal is then drawn, and any pieces which may still be glowing are quenched by plunging them into water or sand. By the above-described method, 128 cubic feet (one cord) of wood yield about 30 bushels of charcoal.

Besides being employed as a fuel, and as a reducing agent in metallurgy, wood-charcoal is applied to a variety of purposes. It is much used in the manufacture of filters, and as a medicine it may be administered in some cases of dyspepsia. On account of the resistance of charcoal to the action of water, stakes for wet soils and the insides of casks are charred previous to use. Charcoal is valuable as an absorbent of noxious effluvia, which it decomposes by bringing them into contact with condensed oxygen within its pores. Its absorbent power is greater than that of spongy platinum, but its efficacy as a promotor of chemical union is not so great. Dr Stenhouse has been able to unite the properties of charcoal and spongy platinum in what he calls “ platinized charcoal,” which is made by boiling charcoal in a solution of platinic chloride, and then heating it to redness in a closed vessel. This preparation may be employed in ventilators and respirators,

and, on account of its oxidizing properties, has been proposed for use as a mild caustic.

Coal-Gas Charcoal, or Gas-Carbon, is a dense and pure variety of charcoal, of a greyish black colour, which is

deposited in the inside of gas-retorts. It is used for making the negative poles of Bunsen's batteries.

Lamp Black is a finely-divided form of charcoal, obtained by condensing the smoke of burning resinous and oily substances in cylindrical chambers hung with sacking or sheep-skins. The crude lamp black is purified by heating to redness in closed vessels.

Peat Charcoal.—This variety of charcoal is produced by the carbonization of peat in kilns or circular shafts of brick and stone-work, The ignition is made to proceed from above downwards. Peat may also be economically charred by means of tlie waste-gas of smelting-furnaces, or of heated gases produced by the combustion of wood. In Bohemia a muftle-like chamber, heated at the sides and end by peat-fires, has been successfully employed,—8 to 9 cubic metres of charcoal being produced from 20 cubic metres of peat, by the consumption of 10 cubic metres of the same, and at a cost of 5s, 24d. per cubic metre of charcoal. According to Stéckhardt, 100 tb of wood-charcoal will by their combustion evaporate as much water as 113 ib of peat-charcoal. The use of charred peat in some metallurgical operations must depend upon the cost of its preparation. Its friability renders it unfit for the blast- furnace; but it may be advantageously used on black- smiths' hearths. Hitherto, it has not been employed on an extensive scale, the large amount of ash it produces (45 per cent.) being one objection to its consumption.

Animal Charcoal, or Bone-Black, is prepared by igniting fresh and coarsely comminuted bones, which have been previously boiled to remove fat, in closed vessels of iron or earthenware. The bone-black so produced, which weighs about half as much as the bones employed, is hermetically sealed, as soon as made, in iron canisters. Animal charcoal contains of carbon about 14 per cent. in a state of fine division, of calcic phosphate 80 per cent., of calcic carbonate 5 per cent., with nitrogen and minor impurities. It is largely

employed as a decolorizing, deodorizing, and filtering agent. It removes many organic substances from their solutions ; thus it has been found that whilst the colour of ale can be made paler by its means, the bitterness is at the same time wholly removed. This action of animal charcoal is due to the separation of the particles of carbon by the earthy matter present in it. The precipitant action of bone-black on matters in solution is much greater than that of wood-charcoal. Its decolorizing properties are found to be greatly enhanced by washing with hydrochloric acid and subsequent calcination with potash. A good decolorizing charcoal is made by igniting nitrogenous animal matter, such as horn and clippings of hides, in contact with pearl-ash, and washing the product with water. Animal charcoal can be re-purified after use by treating it with acids; or by putrefying and dissolving out organic impurities, washing, and finally igniting it. Animal charcoal is used as a pigment, more especially in the form of ivory black, and also as a manure for vegetable soils; and it has been recommended by Drs Eulenberg and Wohl as an antidote in cases of phosphorus poisoning.

See Wurtz, Dictionnaire de Chimie, vol. ii., 1868, pp. 843-847 ; Hunter, ‘‘On the effects of Pressure on the Absorption of Gases by Charcoal,” Journ. Chem. Soc., 1871, p. 76; Percy, Metallurgy, Lond. 1875; Wanklyn, ‘‘On the Process of Combustion which

takes place in the Interior of certain Porous Filters,” Chem. News, vol, xxxiii. p. 248, and vol. xxxiv.

CHARD, a municipal borough and market-town of England, in Somersetshire, with a railway junction, 18 miles south of Bridgewater, and 139 miles from London. It was allowed to return two members to parliament by Edward I., but was deprived of that privilege in the reign of Edward III. The town stands upon an eminence on the south border of the county, is well built, and has a town-

house and market-hall of recent erection. lace and woollen goods, and iron and brass wares, lation in 1871, 2400,

CHARDIN, Sir Joun (1643-1713), a celebrated traveller, was born at Paris in 1643. His father, a wealthy jeweller, gave him an excellent education and trained him in his own art; but instead of settling down in the ordinary routine of the craft, he set out in company with a Lyons merchant named Raisin in 1665 for Persia and India, partly on business and partly to gratify his own inclination. After a highly successful journey, during which he had received the patronage of Shah Abbas IJ. of Persia, he returned to France in 1670, and there published in the following year Récit du Couronnement du Rot de Perse Soliman III, Finding, however, that his Protestant profession cut him off from all hope of honours or advance- ment in his native country, he set out again for Persia in August 1671. This second journey was much more adventurous than the first, as instead of going directly to his destination, he passed by Smyrna, Constantinople, the Crimea, Caucasia, Mingrelia, and Georgia, and did not reach Ispahan till June 1673. After four years speut in researches throughout Persia, he again visited India, and returned to Europe by the Cape of Good Hope in 1677. The persecution going on in France led him, in 1681, to settle in London, where he was appointed jeweller to the Court, and received from Charles II. the honour of knight- hood. In 1683 he was sent to Holland as representative of the English East India Company; and in 1686 he published the first part of his great narrative—The T'ravels of Sir John Chardin into Persia and the Eust Indies, &e. (London). It was not till 1711, however, that the com- plete account of his travels appeared, under the title of Journal du Voyage du Chevalier Chardin, at Amsterdam. The Persian portion is to be found in vol. ii. of Harris's Collection, and extracts are reprinted by Pinkerton in vol. ix. The best complete reprint is by Langlés, Paris, 1811. Sir John Chardin's narrative has received the highest praise from the most competent authorities for its fulness, comprehensiveness, and fidelity; and it furnished Montes- quieu, Rousseau, Gibbon, and Helvétius with most import- ant material. Sir John died in London in 1713 and was buried in Westminster Abbey, where his monument bears the inscription Vomen szbi fecit eundo.

CHARENTE, an inland department in the south-west of France, comprehending the ancient division of Angou- inois, and inconsiderable portions of Saintonge, Poitou, and Limousin. It is bounded N. by the departments of Deux-Sévres and Haute-Vienne, E. by those of Vienne and Dordogne, and 8. and W. by Dordogne and Charente-Inférieure. The greater

part of its area of 2295 square miles consists of the valley of the River Charente, which rises in Haute-Vienne, and after a circuitous course passes into the department of Charente-Inférieure, where it falls into the sea opposite Isle-Madame, having received in its progress the waters of the Tardoire, Touvres, Né, Antoine, and Boutonne. The Charente, though rapid, has been aftificially rendered navigable, and steamers ply between Angouléme and Saintes, although the tide ascends no higher than the latter town. Thesurface of the depart- ment is comparatively level, and subject to frequent inunda- tious; and in the arrondissement of Confolens alone there are upwards of sixty small lakes. The hills, which belong to the Limousin range, are generally uniform in height, and abound in marine deposits ; some of them are covered with chestnut forests, which supply the district with a large amount of fruit. The climate is temperate, and the pre- vailing winds are the west and south-west. The principal productions are wine, corn, hemp, flax, and potatoes, the wine being largely distilled into brandy, for which the

It manufactures Popu-

town of Cognac is famous. Pigs, sheep, and poultry are extensively reared for the consumption of the capital ; and the value of the truffles annually brought to market is estimated at several million francs. The mineral produc- tions consist chiefly of iron, lead, antimony, and gypsum, of which iron and gypsum only are worked to any extent. Among the manufactures paper occupies the foremost place ; but canvas, linen cloth, hats, cordage, hoops, and pottery are also made. Charente is divided into five arrondisse- ments, which derive their names from the five principal towns of Angouléme, Cognac, Ruffec, Barbézieux, and Confolens. Angouléme is the chief town. The popula- tion in 1872 amounted to 367,520.

CHARENTE-INFERIEURE, or Lower CHARENTE, a maritime department of France, comprehending the old pro- vinces of Saintonge and Aunis, and including the islands of Ré, Oléron, Aix, and Madame. It has an area of 2636 square miles, and is bounded N. by Vendée and Deux-Sévres, E. by Charente, 8. by Gironde, and W. by the Bay of Biscay. The surface is exceedingly flat throughout the whole department, and along the coast-line

it is so far de- pressed as to require in many places the erection of sea-dikes and extensive artificial draining. The facilities of the de- partment for internal communication are greatly increased by the number of navigable streams, the formation of two canals (from La Rochelle to the Sevre-Niortaise, and from Brouage to Rochefort), and the development of an extensive railway system in the hands of a company known as the Company of the Charentes. The productions very nearly coincide with those of Charente, with this difference—that its wines and brandy are greatly inferior, but its fruits and vegetables greatly superior to those of the upper province. It has also more extensive pasturage; and considerable revenue accruing from the pilchard and oyster fisheries on the coast, but its mineral wealth aud manufactures are neither so various nor so productive. The former is confined to iron pyrites and the salt supplied by the marshes along the coast; the latter includes coarse woollen stuffs, leather, soap, earthenware, staves, timber, and chemicals. It has several sheltered bays on the coast, and several good harbours, such as Rochefort, Tonnay-Charente, Royan, and Marans, at which a brisk coasting trade is carried on. There is considerable trade in colonial produce, and ship- building is prosecuted to some extent. The climate is salubrious except along the coast, where fevers and ague prevail. There are six arrondissements, cognominal with the towns of La Rochelle, Rochefort, Marennes, Saintes, Jonzac, and St Jean d'Angely,—La Rochelle being the chief town of the department. The total population in 1872 was 465,653.

CHARENTON-LE-PONT, a town of France in the department of Seine, situated on the right bank of the Maine, near its confluence with the Seine, a short distance south-east of Paris, of which it may almost be regarded as a suburb. It derives the distinctive part of its name from the stone bridge of ten arches which crosses the Marne and unites the town with the village of Alfort, famous for its veterinary school. It has always been regarded as a point of great importance for the defence of the capital, aud has frequently been the scene of sanguinary conflicts. Of its fortifications the most important is the Fort de Charenton, which lies on the left bank of the river near Alfort. In the 16th and 17th centuries Charenton was the scenc of the ecclesiastical councils of the Protestant party, which had its principal church in the town. At present its most remarkable institution is the lunatic asylum, or Maison de Santé, which was originally founded by Le Blanc in 1664 as a

general hospital, and only received its present appropriation by a decree of the tenth year of the Republic. In 1814 the bridge was gallantly defended by

the pupils of the veterinary school against the Austrians and Wiirtembergers. Population in 1872, 7141.

CHARIOT, in antiquity, was a conveyance used in battle, for the chase, in public processions, and in games. It had two wheels, and was made to be drawn by two horses ; if a third or, more commonly, two reserve horses were added, they were attached on each side of the main pair by a single trace fastened to the front of the chariot, as may be seen on two prize vases in the British Museum from the Panathenaic games at Athens, on which quadrige are represented. On the monuments there is no other sign of traces, from the want of which wheeling round must have been difficult. Immediately on the axle, without springs of any kind, rested the basket or body of the chariot, which consisted of a floor to stand on, and a semicircular guard round the front about half the height of the driver. It was entirely open at the back, so that the combatant might readily leap to the ground and up again as was necessary. There was no seat, and generally only room for the combatant and his charioteer to standin. ‘The pole was probably attached to the middle of the axle, though it appears to spring from the front of the basket; at the end of the pole was the yoke, which consisted of two small saddles fitting the necks of the horses, and fastened by broad bands round the chest. Besides this the harness of each horse consisted of a bridle and a pair of reins, mostly the same asin use now, made of leather and ornamented with studs of ivory or metal. ‘The reins were passed through rings attached to the collar bands or yoke, and were long enough to be tied round the waist of the charioteer in case of his having to defend himself. The wheels and body of the chariot were usually of wood, strengthened in places with bronze or iron; the wheels had from four to eight spokes and tires of bronze or iron. This description applies generally to the chariots of all the uations of antiquity ; the differences consisted chiefly in the mountings. The chariots of the Egyptians and Assyrians, with whom the bow was the principal arm of attack, were richly mounted with quivers full of arrows, while those of the Greeks, whose characteristic

weapon was the spear, were plain except as regards mere decoration. Among the Persians, again, and more remarkably among the ancient Britons, there was a class of chariot having the wheels mounted with sharp sickle-shaped blades, which cut to pieces whatever came in their way. ‘This was probably an invention of the Persians ; Cyrus the younger employed these chariots in large numbers. Among the Greeks and Romans, on the other hand, the chariot had passed out of use in war before historical times, and was retained only for races in the public games, or for processions, without undergoing any alteration apparently, its form continuing to correspond with the descriptions of Homer, though it was lighter in build, having to carry only the charioteer. On two Panathenaic prize vases in the British Museum are figures of racing b¢g@, in which, contrary to the description given above, the driver is seated with his feet resting on a board hanging down in front close to the legs of his horses. The biga itself consists of a seat resting on the axle, with a rail at each side to protect the driver from the wheels. The chariot was unsuited to the uneven soil of Greece and Italy, and it is not improbable that these nations had brought it with them as part of their original habits from their former seats in the East. In the remains of Egyptian and Assyrian art there are numerous representations of chariots, from which it may be seen with what richness they were sometimes ornamented. The “ iron” chariots in use among the Jews appear to have been chariots strengthened or plated with metal, and no doubt were of the form above described, which prevailed generally among the other ancient nations.

CHARITIES. There are few features of English society more remarkable than the strength of its charitable organization. It is not merely that the voluntary contribu- tions of individuals to the purposes usually described as charitable are on the largest scale, but that endowments in aid of every variety of public use abound in all parts of the country. These endowments are mostly of private founda- tion, and but for comparatively recent legislation, would be almost entirely beyond the cognizance or control of the state. So far, indeed, as real property is concerned, the state has for various reasons discouraged its application to such purposes, During the feudal period of English law, the rights of the lords of the soil were continually being invaded by the alienation of land to ecclesiastical corpora- tions. These societies had perpetual succession, whereby the rights

of the superior incidental to the tenancy of individuals were destroyed. It wasto prevent such aliena- tions that the Mortmain Acts were passed. ‘The statute De Religiosis, 7 Edward I. st. 2, c. 1, and the statute of Westminster 2d enacted that if any body politic, ecclesiasti- cal or lay, sole or aggregate, should buy or sell lands or by any engine or craft appropriate lands in such a way that they should in anywise come into mortmain, the lord of the fee might enter within a year of the alienation, and in default of the mesne lord, the land should go to the king. The 15 Ric. II. c. 5 extended this statute to all lands, &e., purchased to the use of guilds and fraternities, &c. When testamentary power over freehold lands was established in the reign of Henry VIII, bodies politic and corporate were expressly excepted from the benefit of the statute. Aliena- tions in mortmain, as they were called, were not absolutely void, but voidable only at the option of the intermediate lords or the king, and the licence of the lords and the king confirmed the alienation. A devise of realty to a corpora- tion was ineffectual, and the land descended to the heir, either for his own use or charged with the trust imposed on it by the intended devise. The preamble to the im- portant statute 43 Eliz. c. 4 gives us an idea of the number and variety of the public objects on which testators and other donors were in the habit of expending their wealth :— ‘Whereas land, tenements, rents, annuities, profits, heredita- ments, goods, chattels, monéy, and stocks of money have been heretofore given, limited, appointed, and assigned, as well by the Queen and her progenitors as by sundry other well-disposed persons; some for relief of aged, impotent, and poor people ; some for maintenance of sick and maimed soldiers and mariners, schools for learning, for schools and scholars in universities ; some for repair of bridges, ports, havens, causeways, churches, sea-banks, and highways ; some for education and preferment of orphans ; some for or towards relief, stock, or maintenance of houses of correction ; some for marriages of poor maids ; some for supportation, aid, and help for young tradesmen, handicraftsmen, and persons decayed ; and others for relief or redemption of prisoners or captives, and for aid or ease of any poor inhabitants, concerning payments of fifteens, setting out of soldiers, and other taxes, which lands, tenements, &c., have not been employed according to the charitable intent of the givers and founders thereof, by reason of frauds, breaches of trust, &c.” The statute gives the Lord Chancellor power to appoint commissioners to inquire into such cases. A charity under the statute has been defined to bea

gift to a general public use, which extends to the rich as well as to the poor. By a series of judicial inter- pretations, the power of devising lands to corporations for charitable uses was established, and the subject of the Mortmain Acts was to a certain extent frustrated.

The Act 9 Geo. II. c. 36 takes notice of the public mischief caused by alienations or dispositions made by languishing or dying persons to uses called charitable uses,

to the disherison of their lawful heirs. It is accordingly enacted that no real property, or money to be laid out in the purchase of real property, shall be transferred in any way in trust for the benefit of any charitable use whatso- ever, unless such gift be executed by deed at least twelve months before the donor's death, and enrolled in the Court of Chancery within six months of its execution. Gifts to the universities and colleges are excepted under the Act. Gifts to uses which are superstitious within the Acts of Henry VIII. and Edward VI. are still held to be void. Many Acts have been passed within the present century for the better regulation of charities. The Lord Chan- cellor was always understood to have a prerogative juris- diction, as representing the king, who is parens patric, over these public trusts. The Act of Elizabeth, as we have seen, gave him authority to appoint commissioners of inquiry, and under that Act the Court of Chancery developed some very important doctrines regarding charities, The chancellor's commissions fell into disuse, and it was found more convenient to proceed by way of information on the part of the Attorney-General. It will be easily understood that great abuses must have sprung up under a system of control which was by its very nature casual, litigious, and intermittent. In the case of charitable cor- porations with visitors of their own, the power of the court to interfere was to a certain extent restricted by the visitatorial jurisdiction. In 1818 began arseries of public investigations into charitable funds, which has by no means yet come to an end, At the instance of Lord Brougham, a commission was appointed to inquire into the educational charities, but the universities and large schools were exempted from its operation. A second commission with further powers was appointed under the 59 Geo. ITI. ec.

81, and continued until 1830. Charities under special visitors were still exempted, but this exemption was discon- tinued when the third commission, under 1 and 2 Will. IV. c. 34, was appointed. In the reports of the commis- sion it is stated that the worst cases of abuse and malad- ministration were found in charities having special visitors. Grammar schools in that position are described as being especially deplorable. A fourth commission was appointed in 1835. ‘The reports of these various commissions, and of a House of Commons committee on the same subject, called public attention to the abuses of charity administra- tion, After many efforts the Charitable Trusts Act of 1853 was passed. By this and the amending Acts, perma- nent commissioners were appointed with extensive powers, It is their duty to inquire into the management of charities, and to insist on accounts being laid before them, and they are now enabled to undertake the administrative business in respect of charities which belonged to the Court of Chancery. Contentious business is still remitted into court, but the rest is carried through in the office of the commissioners, In cases requiring such intervention, they send a certificate to the Attorney-General, who takes such proceedings thereon as he may think proper. The universities and their colleges, cathedrals, and generally all charities connected with religious worship, or supported solely by’ voluntary contributions, are exempted from the jurisdiction of the commissioners. Endowed schools were, by the Endowed Schools Act 1869, handed over to a Separate commission, and the powers of the Court of Chancery and Charity Commissioners were restricted with respect to them. More recently the Endowed Schools Commission has been allowed to expire, and its duties have been assigned to the Charity Commission, There are still many charities in England which the powers of the Charity Commissioners do not seem to be able to reach. CHARITON, of Aphrodisias in Caria, probably one of the last of the Greek erotic writers, lived about the 5th

century A.D., and was the author of a romance eutitled Zhe Loves of Chereas and Callirrhoe. Tt has been translated into German and French. The best edition is that by D’Orville, reprinted by Beck, Lips., 1783, CHARLEMAGNE, or Cartes tue Great, was born in 742, succeeded his father Pepin as king of the Franks iu 768, was crowned emperor of the

Romans in 800, and died in 814 after an eventful and beneficent reign of forty-six years. His father had divided the Frankish kingdom between him and his younger brother Carloman, but the latter dying in 771, Charlemagne was proclaimed sole ruler. The monarchy he thus inherited was a very extensive one ; for, in addition to the Frankish territory, stretching from the Loire to the east of the Rhine, there were Burgundy and Allemania, which had been incorporated by his ancestors, while almost all round the direct empire of the Franks stretched a group of vassal nations. Aquitaine, Brittany, Frisia, Thuringia, and Bavaria were in more or less close subjection to them. They were, moreover, the pro- tectors of the popes against the Greeks and Lombards, and the champions of Christianity against the Saracens on the south-west and the heathen Saxons of the north-east. In fact, before the accession of Charlemagne the Franks had attained to a real supremacy over most of the Germanic nations, and were the bulwark of the Christianity of the West. This many-sided and lofty position imposed a corresponding complexity of duty on the new king, which he fulfilled with an energy and success almost unexampled in the history of the world, maintaining and extending on all hands the influence of Christian culture, aud taking the first steps towards converting the military monarchy of the Franks into an organized polity. His first task was to suppress a rising in Aquitaine. In 772 commenced the great mission of his life, the conquest and conversion of the Saxons, a work which could be effected only after thirty-two years of the fiercest and most passionate warfare. With the doubtful exception of the Frisians, the Saxons were the last remnant of the old Germanic resistance to the military supremacy of the Franks, and the last Germanic champions of the religion of Odin against the onward progress of Christianity. Charlemagne never had much difficulty in vanquishing the badly-organized Saxon forces, and in com- pelling a temporary or partial submission ; but with a loose confederation like the Saxons, which had no definite organization and no properly recognized representative, it was difficult to make a fixed and universally accepted arrangement. Hence the incessant renewal of an apparently decided conflict, and the outcry of the Franks against the treachery of their enemies, The encroachments of the Saxons on his eastern frontier was the occasion of his first expedi- tion, which was directed into the ancient forest of Teutoberg, famous as the scene of the old Germanic resistance to the Romans. Here he stormed the fortress of Ehresburg, overthrew the Irminsul, a mysterious column-shaped idol

much revered among the Saxons, destroyed the sanctuary of Odin, and compelled the Westphalian Saxons to submit. Events in Italy now summoned Charlemagne to the other sidé of the Alps, in order to chastise the Lombards who were invading the possessions of the Pope. The Frankish king was victorious, dethroned Desiderius the Lombard king, and placed the Lombard crown on his own head (774). Meanwhile, the Saxons had profited by his absence to expel the Frankish garrisons, and even to renew their old ravages. Charlemagne immediately set out against them, and in two campaigns enforced the submission of the entire Saxon confederation. In a great Champ-de-Mai at Paderborn the Frankish king, surrounded by his chiefs and by ambassadors from distant nations, received the homage of the Saxon warriors, many thousands of whom submitted to be baptized (777). The Saxons apparently

subdued, Charles crossed the Pyrenees, and received the | men who associated the ideas of imperial order and con-

submission of the country as far as the Ebro. On his return, however, the rear-guard was assailed and cut off by the mountaineers in the pass of Roncesvalles ; Roland their leader was slain, and the overthrow of the Franks, trans- formed and wrought up in every possible way, became one of the great themes of song and romance (778). His march home from Spain had been unseasonably hastened by a general revolt of the Saxons, this time assisted by the Danes. Charles was again easily victorious, but no sooner had he left the country than the Saxons, mad with revenge, and animated by the fiercest national and religious hate, resumed the struggle. Even the massacre of Verden (782), in which 4500 Saxon prisoners were slain in cold blood, served only to intensify the spirit of resistance ; but their rude courage was no match for the large and well-dis- ciplined armies of the Frankish king. They were again completely defeated ; even Wittikind, the hero of the whole war, was compelled to confess the superiority of the God of Charlemagne, and at Attigny received the rite of baptism (785). His example was generally followed; and the Frankish organization, political and ecclesiastical, was systematically introduced. Germany had become Christian ; it was now the Northmen, among whom thousands of Saxons

had found refuge, that took up the task of support- ing a gradually declining cause. But though this may be looked upon as the deciding act in the draina of old Ger- manic resistance, there were still many bloody and almost general revolts of the Saxons. To punish these Charles adopted even a more effective method than the planting of Frankish garrisons ; thousands of Saxon families were de- ported into other provinces of the empire, and more loyal subjects introduced to fill the vacant space. It was not till 804 that the last sparks of resistance were quenched.

In the year 788, Bavaria was incorporated with the Frankish empire. Its duke, Thassilo, had more than once incurred the displeasure of Charles by too pronounced measures towards the recovery of his independence, and had even alienated his subjects by schemes of alliance with the heathen Avars and the heretic Greeks. Consequently Charles had no difficulty in dethroning him, This was followed in 791 by a vast and well-organized expedition against the Avars, a savage robber nation of Mongols inhabit- ing the modern Hungary. The Franks were again victorious everywhere ; but other work of a more pressing kind prevented Charles from completing their reduction, which was afterwards effected chiefly by his lieutenants. Their immense circular encampments, or rings, from which they had issued to carry havoc into all the surrounding countries, were forced, and their treasures became the spoil of the Christian armies (798). They submitted; and German colonists were introduced into many of those regions. In this way Pannonia was added to the empire of Charles. Other campaigns carried on at various times by Charlemagne or his lieutenants, on the Elbe and even in Bohemia, against the Danes, the Wends, and the Czechs, still further increased the prestige of the Frankish armies, and enlarged the empire of their great monarch against Slavish and Scandinavian heathendom, while his troops maintained the Spanish march against his south-western enemies, Moslem and Christian, and the duke of Bene: ventum in Southern Italy was obliged to become his vassal. Thus from the Eider to Sicily, and from the Ebro to the Theiss, the will of Charles was supreme; while over the Slavonic tribes, as far as the Oder or even the Vistula, his influence was felt in no feeble way. The genius and energy of one man had succeeded in arresting the progress of political disintegration, and, in the interest of culture and constructive order, in welding into one great monarchy all the races of continental Germany. It was no wonder that

structive civilization with the name of Rome should have recognized in the monarchy of Charles the restoration of the power of the Czesars. When, therefore, at Rome, on Christmas eve of the year 800, he was crowned emperor of the Romans, it seemed the natural consummation of his whole career. And when in 801 an embassy arrived with curious presents from Harun-al-Rashid, the great caliph who held in the East the same place as Charles in the West, men recognized it as a becoming testimony to the world-wide reputation of the Frankish emperor.

Charles was far more than an ordinary conqueror. He displayed not less energy in the internal organization and administration of his kingdom than in foreign affairs. The whole empire was divided into districts, presided over by counts, who were responsible for their good government; while in the exposed frontiers or marches, other counts (MJarkgrafen) were stationed with forces capable of defending them. In order to superintend these provincial authorities, to give effect to the royal will, to preserve the due subordination of the outlying portions of the empire to the central power, and in this way to complete and secure the organization of the empire, the misst dominict, experienced men both of the laity and clergy, were despatched in all directions. Two great assemblies were held every year,—the Champ-de-Mai, which was a kind of national muster, essentially military, and an- other in autumn, of the high officials, of a deliberative and advisory nature. In the capitularies (edicts issued as the necessities of the empire required), in his endeavours to promote education, in his organization of the church and the definitive institution of tithes, in the unsuccessful attempt to join the Danube and the Rhine by a canal, he gave proof of the noblest desire to conserve and propagate the culture of former times, Learned men—Eginhard, Paul Warnefried, and, above all, Alcuin—were his intimate friends and teachers; Guizot calls Alcuin his intellectual prime minister.

Charlemagne died on 28th January 814, at Aix- la-Chapelle, and was buried there. The empire created and organized by his genius gradually fell to pieces after his death. His endeavour to resuscitate an old civilization, to engraft the Christian Roman culture on the vigorous stem of the Teutonic races, and to unite all the Germanic tribes in one empire, before the long action of historic influences had stamped upon them a distinct national

character—this was to a great cxtent a failure, because one life-time was too short for its accomplishment. His greatness lies in the nobility of his aim, in the energy and wisdom with which he carried it out during his life, and also in the enduring traces of valuable work which remained notwithstanding the general wreck of his empire ; for, though the central organization was swept away, the provincial authorities remained, to be transformed into the new feudal organization of Western Europe, whilst the idea of the revival of the Christian Roman Empire was to be taken up by other sections of the Germanic race. Though the circumstances of his time prevented him from being the founder of a new epoch in history, like Cesar or Alexander, yet, in the greatness of his character, in his marvellous many-sided activity, and in the magic influence of his name on subsequent generations, he was equal to either.

The works of Charlemagne are—1. His Capitularies, first col- lected by Ansegise, abbot of St Wandrille, the best edition of which is that of Etienne Baluze, Paris, 1677, 2 vols. folio; 2. Letters, contained in the collection of D. Bouquet ; 3. A Grammar, of which fragments are to be found in the Polygraphia of Trithe- mius; 4. His Zestament, contained in Bouchcl's Bibliotheque du Droit Frangais, tom. iii., printed at Paris, 1667, folio; 5. Some Latin poems, ¢.g., the Epitaph of Pope Adrian and the Song of Roland ; 6. The Caroline Books. The great contemporary authority for the

life of Charlemagne is the Vita Caroli Magni, by Eginhard, who also writes Annales. There is a good Life, in English, by G. P. R. James. Sketches of Charlemagne in histories of a more general kind are innumerable ; probably the best recent one is to be found in Martin's Histoire de France. (HUE 1S)

CHARLEMAGNE, Jean Armanp (1759-1838), a French dramatic author, was born at Bourget in 1759. He was intended for the church, but only remained a few months at the theological seminary. He first became a solicitor's clerk, and then entered the army, and served in the American war of independence. At the age of twenty- four he returned to France, and commenced publishing tracts on social subjects, but it was ten years later before he began to write for the stage. He is the author of a large number of comedies and poems and romances, and of an essay, published in 1794, and

entitled Observations de quelques patriotes sur la nécessité de conserver les monuments de la littérature et des arts.

CHARLEMONT, a great fortress on the Franco-Belgian frontier, on a rock above the town of Givet. See Grvzt.

CHARLEROI, a town of Belgium, in the province of Hainault, about 33 miles south of Brussels, on the Sambre, a navigable tributary of the Meuse. It is the seat of a court of primary instance, and possesses a gymnasium, an academy of painting, a hospital, a parish church dating from the time of Louis XIV., and a prison erected in 1852 in the style of a feudal castle. Situated in the midst of an extensive mining district, it has developed into one of the most important industrial centres in the country, carry- ing on a large manufacture of glass, iron, cutlery, cotton cloth, and woollen yarn. Several thousand persons are engaged in the nail trade alone; and the forges of Couillet. about two miles from the town, supply a third of the whole quantity of cast-iron produced in the kingdom. In 1870 upwards of 24,000 people were employed in the coal mines

of the district ; and 3,832,850 tons of coal were brought-

to the surface. Abundant means of transit are afforded by the railways, which form a junction at the town, and by the Brussels and Charleroi canal, which was opened in 1832, and forms a connection at the capital with the Wille- broek canal to Antwerp. In 1866 the population of the town was 12,150.

Charleroi was founded in 1666 by Charles II. of Spain, on the site of the village of Charnoy, which changed its name to the present form in honour of the king. The fortifications, however, which the Spaniards had commenced, were interrupted by the approach of the French, and their completion was duc to the genius of Vauban. During the rest of the century it passed more than once from French to Spanish, and from Spanish to French posses- sion ; in 1746 it was captured by the prince of Conti, but in 1749 it was restored to the house of Austria. During the Revolutionary War in 1794 it was four times besieged by the French, to whom it was ultimately compelled to surrender on the 25th of June. The following year saw the destruction of the fortifications, but they were restored in 1815.

CHARLES I. (1600-1649), king of England, born at Dunfermline on the 19th November 1600, was the second and favourite son of James [. By the death of his brother Henry, he became Prince of Wales in 1612, but the first public matter of importance in which he was concerned was the Spanish marriage. At first he was quite indifferent to the affair, and in 1622 he was full of a dream that he would lead an army into the Palatinate, and set his dear sister upon her throne. But, by the beginning of the next year, Buckingham had filled him with the romantic notion of setting off, in defiance of all policy, on a private visit to Spain. His conduct while at Madrid displays the weakest side of his character. He took a violent fancy for the Infanta, whom he seriously alarmed by leaping over the wall of the garden in which she was walking, in order that he might enjoy the private conversation which Spanish etiquette refused to permit. With a mixture of infatuation and duplicity, he bore with repeated insults; he allowed his

chaplains to be excluded from the palace, and his retinue to be sent back to England, and gave way to each of the ever-growing demands of the Spanish favourite Olivarez. He promised what he knew he had no power to fulfil, the abrogation of the penal laws against the Catholics within three years ; he listened respectfully to the arguments of the Spanish theologians, and promised to listen whenever the pringess should require it; he addressed to the Pope a disgraceful letter, which, while binding him to nothing, gave rise to the greatest expectations; and thus he held out hopes of a conversion which, according to his own subsequent declaration, he believed would never take place. At last the Spaniards made up their minds to the match ; but, though immediately before leaving Spain Charles swore to carry out tle marriage, his ardour had cooled, and Buckingham was throwing cold water on the dying embers. James was persuaded to demand the restoration of the Palatinate to the elector Frederick as an _ essential preliminary ; the match was broken off; and in 1624 Buckingham had arranged a marriage with Henrietta Maria of France. Not the least dishonourable part of Charles’s conduct in connection with this affair was his treatment of the earl of Bristol, the English ambassador toSpain. This only too faithful servant of the Crown he was mean enough to subject, at the instigation of his favourite, to a persistent and illegal persecution. On the summons of the

second parliament of his reign he commanded that Bristol's writ should be withheld ; he sought to punish him in an under- hand way by forbidding his attendance ; and when the earl continued to insist on his rights, and, after two years of confinement to his house, laid the king's letter before the Lords with a request for leave to impeach the duke, he even accused him of high treason, and employed his personal influence against him. The reason of all this was that Bristol had offended Buckingham; and the faults which were laid against him were really chargeable to his accusers, In the first place, he had been too well deceived by Charles's acting, had imagined that he was really inclined to Catholicism, and had offered, if this were so, to keep the matter secret ; and, secondly, he had sought to preserve his country's honour by striving to prevent the capricious rupture of the treaty which had heen completed with Spain.

In March 1625 Charles came tothethrone. The excited joy with which he had been welcomed home from Spain had given way to suspicion as fuller reports of his conduct spread abroad, and there was now prevalent an anxious dread of the growth of Catholicism. The first. Parliament sent Montagu to the Tower for preaching the doctrines of divine right and the real presence; and, as difficulties arose concerning the old method of levying tonnage and poundage, it refused to grant the impost for more than ayear. From a paper of Sir John Eliot's,! it would seem that this was in-tended merely as a temporary measure ; but to please the duke of Buckingham, Charles dissolved the Parliament, and took a pitiful revenge by making Montagu royal chaplain.

The king was now at the disposal of his favourite, who was full of great and warlike schemes. All were, however, doomed to failure. The English sailors refused to fight against the Huguenots of Rochelle ; the expedition against Cadiz was mismanaged from first to last ; and, worst of all, the pawning of the crown jewels brought in but a very small sum, It was necessary to summon another Parliament.

But this Parliament was not less determined than the first. The House of Lords vindicated its independence by acquitting the earl of Bristol. The Commons, led by the ardent and eloquent Sir John Eliot, ventured on the bold step of exhibiting eight articles of impeachment

1 See Forster’s Sir John Eliot, vol. i. p. 214.

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against the duke of Buckingham. His majesty replied with a haughty message that the duke had acted only at his direction, threw Eliot and Sir Dudley Digges into prison, and finally dissolved the Parliament again, without any improvement of his finances. Forced loans were resorted to; the common people who refused to pay were pressed for the navy; the gentlemen were summoned before the council, or committed to prison per speciale mandatum regis. At this inopportune moment Buckingham provoked a war with France, and led an expedition against Rhé, which proved an utter failure. In 1628 Charles was com- pelled to call a third Parliament.

The House of Commons which now assembled was remarkable alike for the social standing of its members and for their wealth, which was three times that of the House of Lords. But equally with the other two which had met in this reign, it was determined to obtain redress of grievances. Its first act was to draw up the Petition of Right, which declares the illegality of forced loans, of martial law in time of peace, and of the billeting of soldiers on private houses. Characteristically, Charles at first attempted an evasive reply—“ The king willeth that right be done according to the laws and customs of the realm.” When, however, the Commons proceeded to censure Buckingham, he gave the regular formal assent. Yet such was his insincerity that he caused 1500 copies of the Petition to be distributed with the first answer attached. The Commons now made known their readiness to vote tonnage and poundage, provided that the king would admit that his arbitrary levy had been illegal; and Hollis and Valentine held the speaker in the chair while Eliot read a protest against Arminians and Papists, and against the irregular levy of tonnage and poundage. A few weeks before, Buckingham had fallen by the dagger of a disap- pointed officer. But the king’s policy was unchanged. The usual plan of dissolution was resorted to ; and Eliot, Hollis, and Valentine were heavily fined, and so strictly imprisoned that, though Eliot’s health gave way, his petitions for a temporary release were repeatedly refused by Charles, and he was allowed to die in the Tower.

From this time there was no Parliament for eleven years (March 1629 to April 1640). Every year made the people better acquainted with the character of their king, who showed an unhappy ignorance both of the history and the temper of the nation; and taught thein to feel more and more deeply that stronger safeguards were needed to withstand the arbitrary power of the sovereign. ‘The Lon- don merchant who compared the rule of Charles to that of the sultan of Turkey was not altogether unjust. A paternal government was his beau-ideal ; and Parliament was to be summoned only to give advice to the king, and to acquaint him with the needs of the people. The Petition of Right, to which he had recently given his assent, he utterly disregarded. He descended toa puerile exercise of authority. His proclamations forbade the country people to come up to the metropolis, commanded all the shops in Cheapside, except those of the goldsmiths, to be shut, and prohibited the building of more houses in London, unless special leave (to be well paid for) were first obtaincd. But the great necessity was to procure money. The Council of the North was directed to compound with recusants. Monopolies were granted to companies in defiance of the spirit of the law. Neglect of the knight- hood which was no longer an honour was punished by a fine, which was often extremely severe. Pretensions to forest-lands, which prescription had long made unjust, were revived. And, lastly, the famous ship-money was levied. Besides, Charles must also be held personally responsible for other tyranny than that which was executed at his direct command. During these years Strafford was

maturing his policy of “ Thorough,” by which England was to be made subject to a standing army ; and if Charles did not carry out this scheme as far as might have been possible, it was not because it was too bad, but only because it was too great for him. Though he had no love for its inventor he showed his respect for his absolute policy by making him president of the Council of the North, and sending him to govern Ireland with an iron sternness, which, though it certainly added to tlie prosperity of some parts of the island, as certainly helped to arouse in others the feeling which

resulted in the horrors of the Irish massacre. He allowed the Star Chamber to sentence a clergyman to perpetual imprisonment, mutilation, and whipping for a libel against the bishops, and to reduce a gentleman to poverty for merely sneering at the badge of a nobleman. He sanctioned the inquisitorial Court of High Commission. He supported Laud's oppression of the Puritans, his inculcation of celibacy among the clergy, of auricular confession, of prayers for the dead, and of the doctrine of purgatory, and he advanced men like Montagu, whom he knew to be desirous of a reunion of the English Church with Rome, confirming by all this the suspicions which the disclosures of Bristol had awakened.

At length, on his own sole authority, he commanded Scotland to receive a liturgy and a book of canons. The fatal results of this act belong to the history of Scotland. Unable to meet the Scottish army with a sufficient force, Charles summoned the Short Parliament ; but as it refused to vote supplies till it made inquiry into the causes of the imprisonment of Eliot and his two com- panions, into ship-money, and other matters of that kind, it was speedily dissolved. A great council of the peers would not act alone; and in November 1640 he was compelled to summon the Long Parliament. The Commons were now happy in a leader magnificently fitted for the times. His fiery energy was repressed, not quenched, by the ripeness of his age ; his courage and determination were too firm to be shaken ; his respect for law and order was deep and strong; but deeper still and stronger were his love of liberty, and his resolve that nothing should serve as a bulwark against despotism. With the sagacity of the true statesman, Pym struck the first blow at the strongest pillar of the hateful structure. He exhibited articles of impeachment against the earl of Strafford. The impeach- ment was allowed to drop (against his wish), but it was only in favour of a bill of attainder. The preachers preached and the mob yelled against the great delinquent. The king went in person to the House of Lords, and tried to buy him off by promising never to employ him again ; and then listened to a scheme, hatched by certain hot-headed officers and some of the fierier of the courtiers, to bring up the army of the north and overawe the Parliament. But his entreaty was voted irregular ; the plot was discovered, and the earl was condemned to death. Charles's weakness was now fatal to himself. A few months later the splendid ability of Strafford would have been invaluable to him. But he had no affection for the stern, haughty '" dark

earl,” and, when the Lords refused his humiliating request that they would suggest to the Commons some milder punish- ment, he sacrificed his greatest servant. At the same time, Charles, who never knew the true place for firmness, yielded on another fatal point by confirming a bill, accord- ing to which the Parliament then sitting was not to be dissolved without its own consent. Before the triumphant course of the Commons everything had now to give way. The Triennial Bill was passed, ship-money, the Star Chamber, the High Commission, the Council of the North, the Council of Wales, the Council of Lancaster and Cheshire, the whole system of illegal exaction and injustice, were swept away. ‘The religious passion of the

Houses manifested itself in an impeachment of Laud, and a proposal to abolish Episcopacy.

Charles once more resorted to the crooked policy which he usually employed in extremity. He visited Edinburgh, attended the Presbyterian worship, and loaded Argyll, Hamilton, and the other Presbyterian leaders with marks of favour, while all the time he was intriguing with the earl of Montrose, Argyll’s open enemy. There was a darker suspicion at the time that an attempt, known as the ‘‘Incident,” had been made by Montrose, with the king’s knowledge, to assassinate Argyll; but this worse treachery is by no means proved. At this moment, while men’s minds were full of excitement and apprehension, a massacre of thousands of Protestants took place in Ireland. It was known that O’Neale, the leader of the butchery, professed to have the king’s written warrant and the ardent support of the queen; and many believed the hideous charge. They would have been more strongly convinced had they seen the letter in which his majesty coldly remarked that he trusted this trouble in Ireland would help to cure the folly at home. Other plots were also being discovered, of which men more naturally ascribed some knowledge to the king. Pym’s life was in constant danger. An attempt was made to convey plague infection to him in a letter, and a gentleman was stabbed by mistake for him in Westminster Hall.

But Pym and the Parliament yielded not one step. On the Ist December 1641 the Grand Remonstrance was pre- sented to the king, who received the committee which pre- sented it in the highest spirits. He had returned from

Scotland but a few days before, had been entertained at a great banquet by the Lord Mayor, and had made up his inind to show the Parliament that he was not to be trifled with. He had already appointed Colonel Lunsford, a dis- reputable scapegrace, to the command of the Tower. He now replaced the guard, which had protected Parliament since the news of the Army Plot, by a company under the earl of Dorset, who did not pass his first day of duty without firing on the people. Mobs far from orderly began to assemble round Westminster Hall, and a petition against the bishops was presented to the Commons. ‘The bishops themselves were mobbed on their way to the House, and when they protested against the legality of what should be done in their absence, were summarily silenced by an impeachment. The excitement in the city grew dangerously intense, and Charles fanned the flame by accepting a com- pany of armed soldier-adventurers as guard, and allowing them to quarrel with the unarmed crowd.

It was on the 3d of January 1642 that the final breach was made. Pym was not to be gained over, for only a few days before he had refused office. The king now practically declared war against the Parliament. How far he acted alone is disputed ; but Clarendon is very likely right in saying that he was goaded on by the queen, who had retained from the political theory in which she had been educated some very lofty notions about the rights of kings and the duties of parliaments. On the morning of the 3d, he commanded Attorney-General Herbert to impeach Lord Kimbolton (against whom, however, the matter was not pressed), Pym, Hampden, Haslerig, Hollis, and Strode on a charge of high treason, founded upon their parliamentary conduct. The rooms, drawers, and trunks of the five members were illegally sealed at the king’s command, and the king’s sergeant-at-arms was illegally sent to demand their persons. The Commons behaved with the greatest dignity. The sergeant was commanded to show his respect for the House by laying aside his mace, and four members, of whom two were privy-councillors, were sent with a message to the king that the House would give him an answer as speedily as the greatness of the business would

allow, and that the members should meet any legal charge against them. But Charles had determined to crush the Parliament by force, and to make it for ever subservient to the Crown. He sent orders to the lord mayor that the guard sought by the Parliament should be employed to disperse all crowds, and to “shoot with bullets” all who resisted. On the morning of the 4th, at the head of his attendants, his pensioners, and the Whitehall guard, armed with partisans, swords, and pistols, to the number of three or four hundred men, he entered the House of Commons, and demanded the persons of the five members, declaring that treason has no privilege. But, with the formal consent of the House, they had taken refuge in the city; to the king’s demands the sole reply was that given by the speaker, bravely, though tremblingly, and on his knees, that he could speak only as he was commanded by the House; and Charles was obliged to retire with undignified threats upon his lips. The consequence of this act was the most ter- rible excitement. Some members of the Commons cried ‘‘ Privilege” in the very presence of his majesty. In Lon- don the shops were shut; there was a report that the cavaliers, with the king at their head, were about to fire the city, and it became known that a seizure of the arms of the citizens was contemplated. When the king visited the city next day, in the streets and in the court-room of the common council, he was met by cries of “ Privilege of Parliament!” The panic still grew; the streets were thronged with almost frenzied crowds; the train bands were collected. Other crowds poured in from the country, one with a petition signed by thousands for the protection of Pym, another, from Buckinghamshire, eager to live and die with Hampden, to serve the Commons, respectfully to petition the king. The very sailors in the river caught the enthusiasm, and offered their assistance. And the House of Commons, declaring itself no longer safe at Westminster, adjourned first to Guildhall and then to Grocers’ Hall. On the 10th Charles, seeing that the true magnitude of his attempt had been understood, and that he was met with his own weapons, retired in alarm to Hampton Court. On the following morning the five members returned to their seats in triumph, amid salutes from the river, the shouts of the crowd, and a parade of the train bands,

The Parliament retaliated the king’s attack by passing a bill assuming the command of the militia, and appointing the lieutenants of counties. But the king on his journey from Dover, where the queen had embarked with the

crown jewels, had met with so many expressions of loyalty that he refused his consent. He requested, however, that all requirements should be drawn up in one document, and submitted to him. Accordingly, in June 1642, Parliament — presented “The Nineteen Propositions.”» They were such as would have entirely altered the constitution, | Constitu- tional concessions could no longer avail the king ; fifteen years of unconstitutional rule had made that impossible. He had striven to obtain the tyranny ; he had appealed to force ; and the Civil War had already begun with the Westminster tumults. On the 22d August 1642, it was formally commenced by the erection of the royal standard at Nottingham. At first success was on the side of the king, and the Parliament suffered so severely in the west that they began to discussterms of peace, while several defections to the royalist party took place. But Charles was too highly elated ; having summoned a parliament of his own at Oxford, he declared that which met at Westminster to be none; and when the earls of Holland, Bristol, and Clare came over to his party, he treated them with so much neglect and insult that after three months they turned back, and no others risked the treatment they had received. But as the troops of the Parliament became accustomed to the use of arms, and its officers to the tactics of war, the inferiority of the royalists

became apparent. In the beginning of 1645. the Parlia- ment was in a position to demand, in the treaty of Uxbridge, that Presbyterianism should be established, and that it should have the command of the army and navy and the direction of the war with Ireland.

In the same year, after the decisive victory at Naseby, the king’s cabinet, containing a number of letters which proved that he was promising toleration to the Catholics and seeking aid from several foreign powers, fell into the hands of the Parliament, and the letters were published. Soon after a still more important discovery was made,— that of a treaty entered into, by means of the earl of Glamorgan, with the Trish Catholics, whose aid was to be bought at the price of great religious concessions. Charles denied all knowledge of the affair, and Glamorgan was imprisoned for a short time ; but subsequent evidence gives strong reason for believing that he was deeply implicated in the matter. Owing to the anti-popish bigotry which

they offended, and the insincerity which they manifested, these disclosures were extremely damaging to the king.

In May of the next year Charles had fled to the Scots at Newark ; and in January 1647 he was delivered by them into the hands of the English Parliament, who placed him in Holmby House, six miles from Northampton Terms similar to those offered at Uxbridge were again tendered at Newcastle; but Charles, being sincerely attached tc Kpiscopacy, was most unwilling to yield concerning church affairs, and, holding himself necessary to any settlement, believed that he had only to insist upon more favourable offers. In June the army took possession of his person, and finally brought him to his palace at Hampton Court. He was treated with respect and kindness; Cromwell and Treton sought to bring about a secure peace ; and the latter, on behalf of the Agitators or Adjutators, who formed the parliament of the army, drew up most favourable terms. But unable to see that the army was now supreme, and hoping, contrary to his whole experience, to obtain some- thing more from the Parliament or the Scots, with whom he was treating, Charles haughtily broke with the officers, and scornfully refused their offers. To many it was now apparent that it was vain to hope for a settlement by means of compromise.

From this moment the ascendency was taken by a party of enthusiasts, who held that a crown should not excuse the crime of treason against the country, and sternly called for justice on the grand delinquent. Fearing assassiiiation, Charles fled to the Isle of Wight, where, however, he was captured. But trusting in the Scots, who now prepared to protect him by force, he still rejected the offers of the Parliament, which were again tendered to him at Carisbrook and at Newport. At length the army impatiently seized him once more, removed him to Hurst Castle, and thence to Windsor and St James’s, purged the Parliament by excluding some hundred and forty members, and resolved to bring him to trial. On the Ist of January 1649, though the Peers adjourned refusing to consider the question, the Commons voted the appointment of a High Court of Justice “to the end no chief officer or magistrate might presume for the future to contrive the enslaving and destruction of the nation with impunity.” One hundred and thirty-two commissioners were elected, of whom about half took part in the trial. Bradshaw was elected Lord President, and Cook solicitor against the

king. On the 20th, the 22d, and the 23d, Charles was brought before this court ; but with a calm and admirable dignity, due to a sincere belief in his own pretension, he proudly refused to acknowledge the court, declaring that obedience to kings is commanded by Scripture, that by the law the king can do no wrong, that the Commons have no authority of themselves to erect a court of judicature, and that they had

not received such authority from the people, whose power to confer it he, besides, declined to admit. On the 26th the court went through the form of listening to evidence that he had appeared in arms against the Parliament, which was declared to represent the nation. On the 27th Bradshaw pronounced sentence of death against Charles Stuart, as a tyrant, a murderer, and a traitor to his country ; and on the afternoon of the 30th of Jannary 1649, Charles was beheaded in front of the Banqueting House at Whitehall. His body was conveyed to Windsor, and on the 8th of February was buried in St George’s Chapel without any service.

In person and in demeanour Charles presented a most favourable contrast to his ungainly, babbling father. A somewhat painful stammer was his only physical defect. His manner, also, was grave and reserved ; his scrupulous observance of the ordinances of religion was accompanied by strict decorum of conduct; and he possessed consider- able taste for literature and art. Yet of almost all the essential kingly qualities he was utterly destitute. He had, indeed, a strong sense of personal and royal dignity, but this very feeling was fatal to him. It rendered intoler- able the least limitation of the prerogative which he be- lieved to be his divinely-appointed birthright ; and thus it placed him in obstinate opposition to the strongest ten- dency of his time,—that tendency which had already re- sulted in the Reformation, and which now manifested itself in the development of Puritanism and the growth of the English constitution. Nor did he possess the qualities which might have given him a chance of success in the contest. Affectionate toward his intimate friends to a degree of weakness which often arouses contempt, he had no magnanimity for an enemy, nor even fidelity to a servant, however great, who did not awaken his fondness. In political

sagacity he was utterly wanting ; and so com- pletely did he identify political skill with duplicity that, in public matters, he could never be trusted, and compromise with him was impossible.

About the time of Charles's death several works appeared purport- ing to be by his hand. Of these the chief is the Hikon Basilike : The Portraiture of his Sacred Majesty in his solitude and sufferings. After the Restoration Bishop Gauden declared himself its author, and his claim was not disputed cither by Clarendon or by Charles II., who, on the contrary, gave him ecclesiastical preferments. The controversy as to its authorship haslcft little doubt that it isa forgery. A collection of the works was published at the Hague in 1651, under the title of Reliquic Sacree Caroline: The works of that Great Monarch and glorious Martyr, King Charles I.

The chief contemporary authorities for the history of this reign are :— Rushworth, a barrister, and a member of the Long Parliament, who gives an account of the proceedings of the Parliament fron 1615 to 1640, and also relates the trial of Strafford ; Whitelocke, a modcrate Parliamentarian, whose M/cmortals extend from the acces- sion of Charles to the Restoration; Sir Ralph Verney and Sir Symonds D'Ewes, members of the Long Parliament; and May, author of the History of the Long Parliament. The Hardwicke and Clarendon State Papers; the recently published Calendars of State Papers ; Carte's History, Irish Massacre set in a clear light, and Life of Ormond; Laud's Diary; Clarendon's History of the Great Rebellion, the work of a royalist partisan, whose great talents did not include political insight; and The Letters and Specchcs of Oliver Cromwell, by Thomas Carlyle, also contain original information. As it deserves, this period has been more frequently treated by modern historians than any other in English history. In 1822 appeared Brodie's careful History of the British empire from the Accession of Charles I. to the Restoration; in 1824-28 Godwin's repub- lican History of the Commonwealth ; in 18380 Isaac Disraeli's Commentaries on the Reign of Charles I. See also Hallam's Constitu- tional History ; Forster's Sir John Eliot, The Grand Remonstrance, The Impeachment of the Five Members, and Statesmen of the Com- monwealth ; 8. R. Gardiner's Prince Charles and the Spanish Mar- riage; Sanford's Illustrations of the Great Rebellion ; Burton's History of Scotland. Especially on account of th analogy of this portion of English

history with the French Revolution, it has been carefully studied by several French historians, among whom the most important is Guizot, who has published a Histoire de la Re- volution d’ Angicterre, and a Htstotrc d’ Oliver Cromwell. It has also been treated in German hy Dahlmann. See ENGLAND. (T.M. W.)

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CHARLES II. (1630-1685), king of England, born in 1630, though the second son of Charles I., was Prince of Wales from his birth. In the earlier and more important campaigns of the Civil War he held a nominal command in the west, but he was too young to take any real part in the conflict. After the battle of Naseby he passed by way of Scilly and Jersey to join his mother at St Germain Till 1649 he spent his time either at Paris or at the Hague, with- out interfering in public affairs, except when he attempted to save his father’s life by forwarding a signed carte blanche to the Parliament to be filled up with any terms which they would accept as the price of his safety. On the execution of Charles I, he immediately assumed the title of king. The Scotch Government offered to place him on the throne by force, and sent a deputation to the Hague. For a time Charles protracted the negociations, meanwhile urging Montrose to make him independent of the Presbyterians. But when the rising was crushed, and Montrose himself executed, he accepted their invitation. In June 1650 he landed in Scotland; and he was crowned at Scone on the 1st January 1651. Butas he had been obliged to sign the Covenant, and conform to tle austere manners of the Covenanters, he soon began to feel the price of their assist- ance intolerably heavy. The secret efforts which, during the whole time hé was treating with the Presbyterians, he had been making to bring together a sufficient force of Highlanders proved unsuccessful; and, on the defeat of Leslie at Dunbar, he was glad to march south, with the hope of arousing the loyalty of the English. The appeal failed ; and the royalist forces were again routed by Cromwell at Worcester (1651), Thanks to his own great coolness and address, and the fidelity of those in whom he confided, Charles contrived tv reach France. Here he remained till 1654, when, having received a pension from the French king, he retired to Cologne. Thence he removed to Bruges, where he principally resided till the death of Cromwell. For the most part, notwithstanding the small- ness of his means and the

wretchedness of his circumstances, he passed his time in careless dissipation, surrounded by a little court in which the few old cavaliers, like Clarendon, who maintained the dignified manners which had adorned the court of Charles I., were lost in a crowd of gay young libertines and sprightly women of disreputable character. His applications for assistance to France and Rome were all unheeded ; and he was equally unsuccessful in his attempts to contract an advantageous marriage. At length, through the contrivance of General Monk, but still more through the open and enthusiastic wish of a large portion of the people, he was recalled to England; his conciliatory declaration from Breda was well received; and he entered London amid sincere public rejoicings on his thirtieth birthday, May 29, 1660.

Charles's course was at first attended by no difficulty. The loyalty of the Convention summoned by Monk was sufficient for the time. It sympathized in the one desire for vengeance in which he was earnest ; it was resolved on the punishment of the regicides. Thirteen were executed, some in direct opposition to the apparent intention of the king's declaration of oblivion ; the bodies of Cromwell and Ireton were hung in chains ; and even the coffin which con- tained the ashes of Blake was cast out of Westminster Abbey, and thrown into a common churchyard. And, finally, though some of the measures of the Convention prove that it had not lost all the spirit of the Long Parlia- ment which preceded it, it showed its enthusiastic loyalty in a manner very agreeable to Charles, viz., by granting him the dangerous gift of £1,200,000 a year for life. But if the Convention was sufficiently loyal, the royalism of the first regular Parliament of the reign was extravagant. It insisted on the prerogative of the sovereign, and abased itself before

At his express recuest it repealed the Triennial Act ; and it allowed him to declare that he would not be forced by that Act tosummon frequent parliaments, if he believed that they would be disadvantageous to the Crown. It showed much reluctance to confirm the Act of Indemnity. It

assisted him to complete his revenge by the sacrifice of Vane and Lambert, whom he had pledged his word to spare. But its royalism was equalled by its attachment to the Church of England; and thus commenced its opposition to the sovereign it professed to worship. Charles desired to tolerate the Catholics, and accordingly issued a General Declaration of Indulgence. Its illegality, however, raised so much opposition, even among the Protestant dissenters whom it benefited, that he prudently recalled it, and even published a proclamation banishing all Roman Catholic priests,

It was, indeed, the Protestant temper of the nation which was the most powerful influence against which Charles's policy had to contend. Fortunately for himself he was able to estimate its strength. Himself a Roman Catholic, lie made several attempts to grant toleration to his co-religionists ; but he always gave way when the anti-popish passion seized the people. Twice he yielded to a degree which more than any other of his acts displays the utter selfishness of his character. In order to blind the people, and prepare the way for the trial of Shaftesbury, he sacrificed the Catholic Archbishop Plunkett, the accusation against whom was supported only by the most worthless witnesses. But the basest compliance of which he was guilty was in the case of the pretended Popish plot, He did nothing to allay the popular frenzy ; he allowed Oates to be handsomely pensioned, and located at Whitehall; the only case in which he is reported to have interfered was that of his wife, who was not, indeed, seriously threatened ; and he calmly signed the death-warrants of men whom he must have regarded as martyrs.

Jt is remarkable that the matter in regard to which Charles most firmly withstood opposition was one in which he was not personally concerned—the exclusion of his brother, the duke of York, from the succession. This is the more remarkable as there is good reason to believe that his affection was much stronger for the duke of Monmouth, his own son by Lucy Walters. He treated him like a legitimate prince, and permitted him to wear the royal arms without the bar sinister, and to make progresses through the kingdom, on which he was received as if he had been heir to the throne. Towards the end of his life (in 1682), however, he twas so seriously displeased with one of these progresses as to banish the duke to Holland; pos- sibly the licence which Monmouth assumed was only per- mitted by

the king ; and we may, perhaps, give him credit for having all along unselfishly desired that his brother and a Catholic king should succeed him.

Concerning the character of Charles historians are in general agreement. His selfishness, which was of the sensual, indolent, good-humoured type, was such that he was incapable of understanding motives different from his own. His chief aim was to support, without trouble or censure, his own gay and dissipated life, and his troop of mistresses. This was no easy matter; his mistresses were numerous, and he was fond of indulging them to the utmost of his power. One was raised to the rank of duchess of Portsmouth, another to that of duchess of Cleveland; six of the sons they brought him were created dukes ;! and means were supplied to maintain their lofty dignity. They occupied a recognized position at court; and the queen was obliged to humiliate herself, and to treat them without

1 The dukes of Monmouth (by Lucy Walters), St Albans (by Nell Gwynn), Richmond (by Louise de Querouaille), and Cleveland, Grafton, and Northumberland (by Barbara Villiers).

scorn, and even with familiarity In short, the court of Charles was the most scandalous which England has seen. Yet, being affable and witty, and free from all vindictive- ness, Charles enjoyed a good deal of popularity, if nothing of respect.

In 1662 Charles married Catherine, princess of Portugal, who brought him half a million of money, Bombay, and the fortress of Tangiers. He died, probably of apoplexy, without legitimate issue—for there is no evidence to sup- port the popular belief in the legitimacy of Monmouth— on the 6th February 1685, after receiving extreme unction from a Roman Catholic priest named Huddlestone.

Throughout his whole reign, and especially by his secret negociations with Louis XIV. of France, whose pensioner he was not ashamed to be, Charles

exerted a powerful and harmful influence on English politics; but his political action is matter of history, and is treated elsewhere.

See the Diaries of Pepys and Evelyn; The Mfémotres de Gramont ; the English histories of Burnet, Hallam, and Macaulay ; Kennet's Register ; and The Calendar of State Papers of the Reign of Charles JT,, edited by Mary Anne Everett Green (1860-66).

CHARLES I., the Bald (823-877), king of France and emperor of the Romans, was son of Louis le Debonnaire, by his second wife Judith. To furnish him with a king- dom, his father deprived his elder brothers of some of the territory he had previously assigned to them, and war ensued, at the end of which, after many failures and successes, Charles was left in possession of a great kingdom in the west of the empire. On the death of his father in 840, Charles sought to succeed as emperor, and allied himself with his brother, Louis the German. In 841, in a battle at Fontenai, remarkable for the number of the slain and the fierceness with which it was contested, Charles's rival and eldest brother Lothaire was defeated ; but such had been the loss even of the victor that it was impossible to follow up the victory. The alliance between Louis and Charles was renewed, the former taking his oath in words which form one of the earliest specimens of the Romance language; and in 843 the treaty of Verdun confirmed to Charles the possession of his kingdom, which comprised France to the west of the Meuse, Sadne, and Rhone, and Spain from the Ebro to the Pyrenees. The weakness of Charles's government was, however, extreme. The Normans, sailing up the rivers in small companies of a few hundreds, pillaged the country almost without resistance ; at length in 858 the people in despair, calling in the aid of his brother Louis, drove the king from the country for a time. Charles was entirely under the control of the bishops, and his submission did not go without reward; in 875 he was crowned emperor by the Pope. But Louis attacked him with great success ; and his power was far from stable when, having been summoned into Italy by the Pope against the Saracens, he died in 877 near Mont Cenis. The last and perhaps niost important act of his reign was the decree of Chiersi, by which the tenure of the counties was made hereditary.

CHARLES IL, the Fat (832-888), king of France and emperor of the Romans, was the third son of Louis the German. Swabia he inherited from his father ; the death of his brother Carloman of Bavaria made him king of Italy in 880; in 881 he was crowned emperor; the death of another brother, Louis of Saxony, gave him possession of all Germany in 882; and that of Carloman the French king in 885 left him the kingdom of France. Thus, by no effort of his own, he became sovereign of all the dominions of Charlemagne. But he was soon found to be utterly incapable of ruling. He was, in fact, given up to pleasure, especially to the pleasures of the table. When the Northmen besieged Paris, he made not the least attempt to renulsc them by means of the vast army which

he led against them, but bought them off with disgraceful presents. He was, therefore, justly rejected by the people ; in 887 he was deposed at Tribur; and he died in the cloister during the following year.

CHARLES IIL, the Simple (879-929), king of France, was a posthumous son of Louis the Stammerer. On the deposition of Charles the Fat in 887, he was excluded from the throne by his youth; but during the reign of Eudes, who had succeeded Charles, he obtained the alliance of the emperor, and forced the former to cede Neustria. In 898, by the death of his rival he obtained possession of the whole kingdom. His most important act was the treaty which he made with the Normans in 911. They were baptized ; the territory which was afterwards known as the duchy of Normandy was ceded to them ; and their chief, Rollo, married the sister of the king, and was created duke. In 922 the barons, jealous of the growth of the royal authority, rebelled and elected Robert, brother of the late king, in place of Charles. Robert was killed in the battle of Soissons by Charles’s own hand, but the victory remained with his party, who elected Raoul, duke of Burgundy, king. In his extremity Charles trusted him- self to Herbert, count of Vermandois, who deceived him, aud threw him into confinement. Released by his old enemy, Raoul, he died at Peronne in 929.

CHARLES IV., the Fair (1294-1328), king of France and Navarre, was the third son of Philip the Fair. In 1322 he succeeded his brother Philip V. on the throne of France and Navarre. The chief aim of his domestic policy was to free the country from the Lombards and from the exactions of the barons and the judges ; and he did something to improve the condition of the Jews. He assisted his sister Isabella in her contest with her husband, Edward II. of England. In 1325, being supported by the Pope, Charles sought the imperial crown, but without the least success.

CHARLES V. (1337-1380), king of France, born in 1337, was the son of John II. His physical weakness, precluding him from the usual ambitions of his rank, led him to cultivate the taste for literature and the political ability which gained for him the title of '" the Wise." From the age of nineteen to that of twenty-three, during the exile of his father, a period of great disturbance and difficulty, he ruled as lieutenant of the kingdom. The first States-General which he summoned, led by Stephen Marcel, president of the tiers-état, and Robert le Coq, president of the clergy, refused to raise levies or subsidies, and demanded, first, the trial before judges nominated by themselves of the ministers of justice and of finance, whom they accused of corruption ; secondly, the establishment of a council chosen from the three chambers to be consulted in all cases by the dauphin; and lastly, the release of the king of Navarre. Next year (1357) they were equally determiaed ; they forced the dauphin to give his assent to an ordinance which greatlyextended the authority of the States, and the commission appointed to carry it out ruled for some time with dictatorial power. The authority of Marcel also was such that he was bold enough to enter the palace of the dauphin, and slay two of his chief officers,—the marshals of Clampagne and Normandy. At the same time another enemy, Charles, the king of Navarre, was enjoying unbounded popularity among the people of Paris, aud maintaining their cause. France, indeed, seemed ripe for revolution, for its condition was wretched in the extreme. 'The heartless ravages of the English, of the free companies, and of the French nobles themselves had laid waste the country, and maddened the peasantry till, under the name of La Jacquerie, they burst into hideous revolts, in which they committed the most brutal outrages against the hated nobility. But after a few months, by the assas-

sination of Marcel, andthe support of the nobles and of the provincial States, Charles regained the supremacy. When he again appealed to the States-General, in order to obtain the rejection of the ruinous treaty of London, which John had signed in his eagerness to procure his own release, he also received from them troops and money to carry on the war in Picardy. But he never again convoked them, ex- cept on one occasion (in 1369), when they are said to have proved extremely submissive. Ever after he had recourse to assemblies of notables, or to the provincial States, which never ventured to offer him serious opposition.

From 1360 to 1364 John, ransomed by the treaty of Bretigny, ruled in person; but in the latter ycar, to save his honour, he returned to London, and in April he died there, leaving the crown to Charles,

Charles at once set himself vigorously to the task of binding up the wounds of the kingdom, and preparing to expel the English, He employed Duguesclin, an able soldier of Brittany, to lead 30,000 men of the free com- panics into Spain, and to set Henry of Transtamare upon the throne. Thus he not only freed the country from a grievous scourge, but also obtained the friend- ship of the Spanish king. He had already made alliances with the king of Castile, with the count of Flanders, with Scotland, and even with Charles of Navarre; and after having carefully fortified the principal towns, he provoked a renewal of the war with England. The wise policy on which he had resolved was carried out with great firmness. Pitched battles were avoided, and the enemy, being repulsed by the towns, had nothing left but to ravage the country, with the result of deepening the hatred of the people. The Bretons were gained over, and soon all the land to the north of the Garonne ceased to belong to the English (1373). In 1380 the conquest of Guienne by the French left them only Bayonne, Bordeaux, Brest, and Calais. as

At the same time Charles crushed his other great enemy, the king of Navarre. After accusing him of various plots against himself and other members of the royal family, he took his two sons as hostages, executed

two of his ministers, and raised up enemies against him who seized great part of his territory, and forced him to give up twenty places as security for peace.

But Charles's last aggressive attempt was not equally successful, He summoned the duke of Brittany before him, and when he failed to appear, declared his dukedom confiscated tothe crown. The result, however, was that the people reealled the duke, who had previously been banished, and formed an alliance with England. While affairs were in this condition Charles died at Vincennes, on the 16th September 1380.

His reign had left many important results. The country had been freed for a time—though, unfortunately, only for a time—from its two great scourges, the free companies and the English. The residence of a pope at Avignon under the influence of the king tended to make the Gallican Church more independent. The privileges of the nobility were somewhat invaded by Charles's favour to the burgesses of Paris. Something was done to increase the

purity of the administration of justice, and the parliament |

of Paris was allowed to become self-elective,—a reform which, however, was only temporary, a retrogressive change being made under Charles VII. On the other hand, the States-General were silenced ; the personal power of the king was increased ; and the weight of taxes, often from their nature peculiarly oppressive, was greatly multiplied, for, notwithstanding the grievous war expenses, Charles set no limit to the free indulgence of his tastes. He left several costly specimens of the expensive art of architecture, including the splendid palace of Saint Paul and the

strong walls of the Bastille; and he distinguished him- self still more honourably by founding the royal library at Paris.

See Froissart, Roy's Histoire de Charles V. (1849), and The Chronicle of St Dents.

CHARLES VI. (1368-1422), king of France, was the son of Charles V., whom he succeeded in 1380, at the age of twelve. The treasure left him by his father was at once seized by his four uncles, the dukes of Berry, Burgundy, Anjou, and Bourbon, whose tyranny and rapa- city aroused a general rebellion throughout France. It gained the supremacy in Paris (where the insurgents, from the weapon with which they armed themselves, took the name of Mazllotins), in Rouen, and in many other French towns, and also in the Flemish cities, of which the foremost was Ghent, now led by Philip van Artevelde. At first the union of the popular parties in the various towns was successful against the nobility, but in 1382 the latter won a great victory at Roosebeke, in which Artevelde was killed, and after which many of the rebels were punished by death or by heavy fines. In 1385 immense and costly preparations were made for an in- vasion of England, in which the king was to take part in person, but on account of various obstacles,' over which he had not sufficient resolution to triumph, nothing was done. In 1388, with the advice and support of the cardinal of Laon, Charles, who had six years before reached the age fixed for his majority by his father, threw off the control of his uncles, the dukes of Berry and Burgundy. But in 1392, on his march against the duke of Brittany, who had seized and then attempted to assas- sinate the constable, De Clisson, the appearance of a rough- looking man, who declared that the king was betrayed, so affected him that, in a fit of madness, he killed four of his attendants, and was for some time after insane. During the next year another accident, by which he was nearly burnt to death, brought on a second fit, from which he never completely recovered. By these unfortunate events a field was opened for the ambition of the dukes of Burgundy and Orleans. The latter first obtained the government ; but the former, Jthn Sans Peur, as champion of the people of Paris, gradually became so powerful that, in 1407, he ventured to assassinate his rival and allow the mob to massacre his adherents. But a confederacy was formed against him, the duke of Orleans who succeeded his victim being joined by the dukes of Berry, Bourbon, and Brittany, and the powerful and able count of Armag- nac. The Parisians opened their gates to the Armagnacs (as the party was now called), but they in turn treated Paris as if it had been a hostile city conquered by force. In 1415

Henry V. of England, the fulfilment of the treaty of Bretigny being refused, landed in France, and gained the victory of Agincourt. In 1418 the gates of Paris were opened to the duke of Burgundy, and another massacre of the Armagnacs took place. Famine and plague carried off thousands of others. Charles died, deprived of almost every sign of royal dignity, in 1422.

See The Chronicle of St Denis, Monstrelet, Juvénal des Ursins, Le Laboureur, De Choisy, Saint-Remy.

CHARLES VII. (1403-1461), king of France, the son of Charles VI., was betrothed at ten to Mary of Anjou, daughter of Louis, king of Sicily, whom he marricd nine years after. He became dauphin at the age of thirtcen ; and while only fourteen, on account of the insanity of his father, he held the position of Jord-lieutenant of the king- dom. At, -first the strong hand of Bernard of Armagnac, the constable, guided the government ; but the triumph of the Armagnacs, crowned by the murder of John of Burgundy in the very presence of the dauphin, brought the most serious trouble upon France. Aided by the Burgundians,

the English soon gained a mastery so complete that in 1420 the treaty of Troyes conferred the succession upon their king, Henry V., who had married Catherine, the daughter of Charles VI. In August 1422, however, Henry died, and Charles V1. a few weeks after. Bedford became English regent of France; and the ability of his administration resisted all hostile attempts. The defeats of the French at Crevant (1423) and Verneuil (1424) were disastrous, and their successes were few and unimportant. It was plain that Charles, intent upon nothing but a round of frivolous dissipation, would never effect the independence of the country. Though he was capable of being roused to energy, the weakness of his character was conspicuous. He was

dependent upon a succession of advisers, which included

both the worst and the greatest men and women of his day. No king was ever cursed by more worthless favourites than Charles during his youth, and no French court was ever in a state of more miserable anarchy than that of

the first years of his reign; but yet to none could the title of “ Well-Served ” have been more fitly applied, for none has borrowed more undeserved glory from the great men who surrounded him. Favourite at first rapidly followed favourite,—Tannegui Dichatel, the lawyer Louvet, Pierre de Giac, the haughty Lecamus de Beaulieu, and La Tré- mouille.

But France was not entirely lcft to these selfish courtiers. A national spirit was rising, and she possessed many bold soldiers who were willing to fight her battles. The con- stable Richemont, though violent, and though he unfor- tunately Jaboured under a superstitious terror of heresy and sorcery, was honest and capable. Under him fought Dunois the bastard of Orleans, La Hire, Xaintrailles, Brézé, Jean and Gaspard Bureau, and the three brothers Chabannes. But the greatest impulse was given to the French arms by the noble country maiden, Joan of Are, who, after placing the king firmly on the throne, received from him as reward nothing but jealousy and the most heartless desertion (see Joan or Arc). ‘The benefit which she wrought for France did not end with her life. The English were still forced to give way. In 1435, by the treaty of Arras, Philip the Good of Burgundy broke with them, and joined the French ; the death of Bedford in the same year left them no chance of rallying, and soon Paris received its rightful sovereign.

In the meantime a great change had come over the court and the king. Charles had fallen into better hands. A most beneficial influence has been ascribed to Yolande of Aragon, his mother-in-law, Isabel of Lorraine, his sister-in- law, and Agnes Sorel, his mistress. And, more important still, a great revolution had taken place in the royal council, a large part of which now consisted, not of nobles, but of commoners. ‘he greatest of these was Jacques Coeur, who, having amassed a vast fortune by financial speculations and commerce, had become the argentier of the king, and gradu- ally acquired power in all the branches of administration. Surrounded by men of energy and patriotism, Charles’s facile nature reflected both these virtues, and he appeared in the battle-field among his troops. Normandy was re- covered by Dunois and Richemont (1449); the English were driven out of Guienne; and in 1453 there remained to them nothing but the single fortress of Calais. Among the other important events that had meanwhile taken place may be mentioned the ratification in 1438

of the “Pragmatic Sanction,” and extensive army reforms whereby both privates and officers became immediately dependent upon the sovereign. ;

In 1450 Agnes Sorel died Soon after, and in connec- tion with her death, occurred Charles’s second great act of ingratitude. Jacques Coeur, by aid of whose abilities and taoney much of the success of the reign had been achieved,

wag accused of intrigues with the dauphin, and charged with poisoning Agnes at his instigation. He cleared him- self of these charges, but others were immediately substi- tuted, which, so far as they were true, afford no excuse for Charles. He was condemned to death; and though his life was spared, his property was confiscated, and himself banished from the country (1453).

Towards the close of Charles’s life his condition became even more scandalous and wretched than it had been in the troublous times of his youth. With the death of Agnes all show of dignity and decency was cast aside, and the king at length died, the miserable victim of his own faults. Bitter ill feeling had arisen between him and the dauphin ; the latter had fled; his father’s repeated entreaties could not induce him to return; and Charles, insane through his fear that his son would seek to get rid of him by means of poison, refused to eat, and on the 22d July 1461 died at Mehun of starvation.

During this reign there had taken place three events of the first importance to France,—the expulsion of the English and of the free companies, the establishment of a standing army, supported by a large permanent tax, and the enactment of the Pragmatic Sanction. Besides these, the university of Paris has been brought under the jurisdiction of the Parliament, and other reforms, such as the shortening of the legal processes, and the strict prohibi- tion of all presents to members of the court, had been effected. In case of vacancies it was decreed that the Parliament should nominate two or three persons, from whom the king should select one. The Court of Aids was also instituted, to decide all cases connected with the levying of taxes ; but its

constitution was extremely faulty, as it gave to the same persons, viz., the treasurers, tho power of extortion and of trying for extortion.

See Vallet de Viriville, Charles VII. ct son époque (1862-5), and Clément, Jacques Ceur et Charles VII. (1878). –

CHARLES VIII. (1470-1498), king of France, born in 1470, succeeded in 1483 to the power acquired by the astute policy of his father Louis XI. His sister, Anne of Beaujeu, though only twenty-two, by the firmness and eraft which she inherited from her father, gained the supreme authority as regent. She was opposed by the duke of Orleans and Count Dunois, who were supported by the duke of Brittany and the cmperor Maximilian; but Dunois was defeated in Guienne; and in the battle cf St Aubin the duke of Orleans was routed and taken prisoner. One important internal reform took place 1nder the government of Annc,—a change was made in the mode of election of the States-General. In the first place, members were no longer called as fcudatories of the king, even barons and bishops appearing not by right of title but as representatives of the gentry and the clergy; and secondly, the right of voting for members of the tiers-état was given even to the peasantry. In 1490 Anne's authority came to an end, for the king released Orleans, and entered into the most familiar friendship with him, and also took Dunois as his chief adviser. Under his influence he broke off the contract of marriage with the daughter of Maxi- milian, and took as his wife Anne of Brittany, to whom Maximilian had been betrothed, In consequence a war broke ont, in which England and Spain took part against France; but Henry VII. was bought off by a gift of money, and in the treaty of Senlis, Spain was persuaded to make peace by the surrender of Roussillon and Cerdagne, and Maximilian by the restoration of Franche-Comté and Artois, .

Charles was now at liberty to attempt the realization of his dream of founding an Eastern empire. His father had purchased the claim of the House of Anjou to the throne of Naples, and he himself bought the title' of Andrew

Palzologus, the nephew of the emperor of Constantinople. Having madc a treaty with the Pope, Charles in 1495 entered Naples unresisted. But he showed no favour to the Neapolitan nobility, and gave all offices to his own soldiers. In consequence much discontent arose, and a Icague was formed against him by the Pope, the emperor, Spain, and Venice. With 5000 men he defeated at Fornova an army greatly outnumbering his own; but the victory increly enabled him to reach France. Naples soon fell into the hands of Ferdinand of Spain; and Charles died at Amboise, through an accident, at the age of twenty-eight, before he could carry out his intention of returning to Italy

1498

CHARLES IX. (1550-1574), king of France, was the secoud son of Henry II. and Catherine de' Medici. At the age of ten he succeeded his brother Francis II. His mother became regent, aud Anthony of Navarre lieutenant of the kingdom. During Charles's youth there was fierce and continual war between the Huguenots, under Condé and Coligny, and the duke of Guise and his adherents. In the second period of the coutest Catherine opposcd the former party ; but in 1570 Charles, declaring himself convinced that conformity in religion is impossible, and avowedly acting on his own judgment and in opposition to his mother, brought about a reconciliation with the Huguenots. His sister was marricd to the young Huguenot king of Navarre, Charles protesting that their union should not be prevented even by the Pope, Admiral Coligny was received into familiar friendship, made one of the council, and treated as the chief adviser of the king, while on the attempt to assassinate him Charles expressed deep regret and an earnest intention to punish the crime. His sincerity in this course of conduct has been questioned; we are reminded that he was neither scrupulous nor merciful, and it is said that his restless and apparently open manner concealed a long- conceived and terrible treachery. According to another and more probable account, he was not acquainted with the plots of his other till their fulfilment was almost at hand, and it was on the ground that the Huguenots were conspir- ing against the throne that he was prevailed upon not to interfere in preventing the massacre of St Bartholomew's day 1572. His consent was wrung from him, it is said, im an agony of passion, and the memory of the event tortured him till his death, which occurred at

Vincennes only two years later. But there is no doubt that his con- sent was given, for next day he avowed the act, declaring that it had proved necessary in order to check a dangerous rebellion. Charles left a work on hunting, entitled La Chasse Royale, an edition of which, published in 1857, contains also several poems by him.

Contemporary accounts of this reign were published by Des Portes, Sainte-Foy, and Favicr in 1574, the year of Charles's death, and by Varillas in 1584,

CHARLES X, (1757-1836), king of France, a younger brother of Louis XVI., known before his accession as Charles Philippe, Count of Artois, was born in 1757 At the age of sixtecn he married Maria Theresa of Savoy. His youth was passed in a course of scandalous dissipa- tion; but for a short time he joined the French army at Gibraltar, and during the disturbances immediately prior to the Revolution he took a minor part in politics. In July 1789 he left France, and visited scveral of the European courts, in order to procure assistance for the royalist cause On the execution of Louis XVI., he assumed the title of Monsieur, and in the campaign of 1792 he commanded a regiment of French geutlemen ; but in February 1793 he retired to Russia, where he was warmly welcomed by Catherine. In August 1795 he led an expedition, fitted out by the English, to assist the revolt in La Vendée but he displayed no energy, and

effected nothing. Retiring after this to England, he re-

sided for a time at Holyrood Palace, and aftcrwards with

his brother Louis at Hartwell. In April 1814 he was cordially welcomed back to Paris by the Provisional Government. During the reign of his brother, Louis XVIII, he was the leader of the extreme royalist party, who aimed at bringing back the state of affairs which had existed before the Revolution; and on succeeding to the throne in September 1824 he continued to follow the saine policy. His frequent appearances in public,

and the dignity of his address, at first awoke considerable enthusiasmn ; but his popularity was brief. M. Villéle, who had already directed the government for some time, continued to be chief minister. A bill was passcd by which a thousand millions of francs were devoted to recompense the losses of the emigrés (March 1825), The Jesuits wer, it was believed, encouraged to return to France. Severe laws were made against sacrilege, death being assigned as the penalty for theft from consecrated ground, and profanation of the consecrated elements being regarded as a crime equal to parricide; aud the censorship of the press, which he had abolished at his accession, was re-imposed. At length, in January 1828, Charles made a compromise by replacing the unpopular ministry of Villéle by a ministry headed by the Marquis of Martignac. But the change was temporary ; soou after he called to the head of affairs Prince Polignac, a personal friend, whose views exactly coincided with his own, and the choice of whom conse- quently aroused the deepest dissatisfaction. But Charles refused to give way, and the address of the Chambers requesting the dismissal of the prince was answered with a dissolution. His foreign policy, meanwhile, was popular, for his troops gave assistance to Greece and conqucred Algiers. But this could not save a king who so little understood the temper of his people. On the 25th June 1830 he issucd ordinances, of which one forbade the publication of any periodical without Government permission, another dissolved the new House of Deputies which had not yet met, and a third placed the elections under the power of the prefects. This excited a spirit of resistance which spread rapidly through Paris; barricades were thrown up; the troops were repulsed; and in three days the revolution was completed, Charles meantime doing absolutely nothing. At length he recalled his cdicts; and he afterwards resigned in favour of his grandson, the duke of Bordeaux. But all was now in vain. Louis Philippe was elected king ; and Charles retreated from St Cloud to Trianon, from Trianon to Rambouillet, and finally returned to Holy- rood, where he lived four years. He died at Gértz in 1836: The close of his life was spent in religious austerities, which were intended to atone for his former dissoluteness. CHARLES I., emperor. See CHARLEMAGNE. CHARLES IT, emperor. See Cuartrs I. of France. CHARLES ITT, emperor. See Cuares II. of France. CHARLES IV. (1316-1378), emperor of the Romans, was the son of John of Luxembourg, king of Bohemia. As a child he spent five years at Paris, but at the age of twelve he returned to his father’s court. While only sixtccn he was appointed viceroy

of Italy,—a post of the greatest difficulty, from which it was not long before he was obliged to retire. He next took part in the Carinthian war against the Emperor Louis of Bavaria, the grcat euemy of the Pope. In 1346, on the death of his father at Crécy, he became king of Bohemia; and in the same year he was elected emperor in place of Louis, through the influence of Pope Clement VI. But Charles only gained this dignity at the cost of many humiliating concessions, which made him appear the mere tool of the Pope and robbed him of the respect of the electors. – On the death of Louis in the next year, they refused to recognize him, and chose first

Edward IT. of England, then the Marquis of Meissen, and lastly, when both of these refused the honour, Count Giinther of Schwarzburg. On the death of the last, how- ever (an event which he was accused of having accelerated by poison), Charles, who had married Anne, daughter of the Elector Palatine, and given his own daughter, with Tyrol as dowry, to the duke of Austria, was unanimously elected. He devoted all his care to the aggrandizement of himself and his family ; and the government of the empire was very negligently administered. In 1354 he visited Italy, and was crowned at Milan, Rome, and Ostia ; but he received many indignities, being, for example, refused entrance to several cities, and only allowed to remain at Rome a single day. He was obliged to confirm the Viscontis in their usurpation ; and he left the country, after amassing a large sum of money,—a mockery to both Guelf and Ghibelline. As third wife Charles took the daughter of the duke of Jauer, to whose dukedom he. hoped thus to obtain the succession. He also added Brandenburg, Silesia, and Lower Lusatia to the possessions of the House of Luxembourg ; and he obtained from the electors, by means of large bribes, the recognition of Wenceslas as his suc- cessor, He allowed the empire meanwhile to be overrun by banditti, and he only once took up arms. ‘This was at the call of the Pope, to whom he was always submissive ; but eveu on this occasion he allowed himself to be bought off by his adversaries, the tyrannous Viscontis The only important measure which he effected was the publication of the Golden Bull (1356), which determined the method of clection for the dignity of emperor. It decreed that the number of the electors should be seven :—threc ecclesiasti- cal, viz., those of Mayence, Cologne, and Tréves; and four

secular, viz., the king of Bohemia, the Count Palatine, the duke of Saxony, and the margrave of Brandenburg. The king of the Romans, and future emperor, was to be elected by the majority ina meeting to be held at Frankfort, The Pope thus lost all influence over elections; and to escape his anger Charles granted him a tithe of all ecclesiastical incomes, together with some other concessions. Charles died at Prague in 1378, having immensely enriched the honse of Luxembourg, but leaving the empire greatly the worse for his reign.

See Greschien, De Constitutionibus Caroli IV. (1617) ; Dénniges, Geschichte des Deutschen Kaiserthums im 14 Jahrhundert (1841) ; and Pelzel, Geschichte Kaiser Karls IV. (1780),

CHARLES V. (1500-1558), emperor, the ablest and most powerful monarch of the 16th century, was born at Ghent, February 24, 1500. He was the converging point and heir of four great royal lines, which had become united by a series of fortunate matrimonial alliances. father was Philip of Austria, who being the son of the Emperor Maximilian and of Mary, only daughter and heiress of Charles the Bold, transmitted to him the possession of the Netherlands, and of the hereditary dominious of Austria, as well as a solid claim to the imperial crown of Germany at the next election. His mother was Joanna, second daughter, and finally heiress, of Ferdinand of Aragon and Isabella of Castile, joint rulers of Spain, who handed down to their grandson the united monarchy, increased by the conquest of Granada in 1492, by the addition of the two Sicilies in 1504, by the annexation of the southern part of Navarre in 1512, and by the discovery of the New World. Seldom, if ever, in the history of the world has any one been born to such vast possessions and to such weighty responsibilities. He fell heir to the Netherlands on the death of his father in 1506, to the crown of Spain and Naples on the death of his grandfather Ferdinand in 1516, and to the archdukedom of Austria on the death of his grandfather Maximilian in 1519, Before the future emperor was born, Columbus had been discover-

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ing for him territories of unlimited extent and fabulous wealth beyond the pillars of Hercules. When he was ouly fifteen years of age the first European saw the Pacific Ocean; and while the crown of Charlemagne and Bar- barossa was being placed on his head at Aix-la-Chapelle, Magellan was prosecuting the great voyage which was to result in the circumnavigation of the globe, and Cortes was engaged in the arduous conquest of Mexico. Ere he had been twenty years on the throne of Spain, Pizarro had completed the conquest of Peru. This was not all. It must be remembered that two at least of the countrics he was destined to rule were approaching the very highest point of their intellectual, moral, and material development. The ingenious and energetic population of the Netherlands Were carrying industry to a pitch till that time unexampled in the history of the world, whilc the vast wealth they accumulated could in the hands of a politic ruler become an almost exhaustless source of revenue. It was the heroic period in the history of Spain, the period of final victory over the Moors, and of the romantic conquest of a new world, when religious and military cnthusiasm elevated the national character in such an extraordinary manner ; in war, diplomacy, and government the pre-eminence of the Spaniards was acknowledged and dreaded. In fact, the material wealth of great countries and the genius necessary to form it and to guide it were available to an extent which has seldom been surpassed.

On to 1517, when he went to enter upon the government of Spain, Charles lived in the Netherlands. He was carefully educated, though his tastes attracted him more to the active exercises of the chase and of the tilting ground than to the dry and pedantic learning of the time. William of Croy, Lord of Chiévres, was appointed to superintend his education, while under him Adrian of Utrecht, afterwards Pope by the name of Adrian VI., was the teacher of the young prince. The latter was not able to inspire him with any love for the scholastic learning in which he excelled, while the former did not attempt to lay any constraint upon his natural bent. He took care, how- ever, to instruct him in the knowledge more directly useful to a prince, in the study of history and the science of government, and especially sought to intcrest him in the practical direction of affairs. If we may judge from the result he was perfectly successful, as his pupil grew up to be a great adept in the arts of government, and to be the active and direct moving power in everything that tran- spired during his reign. Yet his character was late in

developing. His excessive deference to his teachers and the undue place he gave them in the government rendered him very unpopular during his first visit to Spain

(1517-19).

In 1519 the news arrived of the death of his grandfather Maximilian, and then of his own election to the imperial crown. The contest between him and Francis I. had excited universal attention in Europe. The crown had been first offered to Frederick the Wise, elector of Saxony, but that prince recommendcd Charles on the plea that the critical state of the empire, especially on account of the alarming progress of the Turks, required for it a powerful protector. And, indeed, now that Charles had attained to the highest position in Christendom, he found that the vast extent of an empire, consisting of nations geographically disconnected and brought under the same head, not through any real affinity, but by the accident of matrimonial alliances, had only increased the number of his rivals and the many-sided complexity of his duties. Between Charles's dominions in Spain and the Netherlands, holding the duchy of Burgundy, which Charles claimed by hereditary right, ard the duchy of Milan, over which he was bound to assert the old imperial claims, angry because of the

Spanish conquest of Navarre, and chagrined by his defeat in the contest for the imperial crown, Francis ruled a com- pact and united kingdom, not capable certainly of matching the vast empire of Charles, yet not easily accessible to attack, and formidable on the battlefield. About the same time that Charles was crowned at Aix-la-Chapelle, the throne of Turkey was ascended by Soliman the Magnificent, who himself the heir of mighty conquests and of well-dis- ciplined armies, carried the Ottoman empire to the very pinnacle of its power (1520-66); his progress through Hungary up to the walls of Vienna was marked by an ever-advancing line of fire and blood; his fleets conmanded the Mediterranean, and threatened the coasts of Italy and Spain, while the corsairs of Tunis and Algiers, under the renowned Barbarossa, who was soon to acknowledge his allegiance, infested the seas, and, spreading terror all along the northern shores of the Mediterranean, carried thousands of Christians into slavery. The Pope was a doubtful and

suspicious ally or an open enemy, as the interests or passions of the Holy See seemed to dictate, and Henry of England, aspiring to be the arbiter of Europe, pursued an equally capricious course of vacillation. In Spain itself the discontent of the commons broke into open revolt, while the haughty nobles required to be skilfully managed. Above all, on the very year of the coronation, Martin Luther had burned the papal bull which condemned him at the gate of Wittenberg. No one could yet foresee the extent of the chasm opened up in the Christian world by the heroic defiance thus hurled at its spiritual chief; but it soon became clear that the heart of Germany was with the Augustinian monk, and that many powerful influences, in the empire and out of it, religious, social, and national,— science, culture, patriotism, morality, and piety—were work- ing towards the overthrow of priestly domination. On all sides, then, Charles had difficult work to do. In Italy and Navarre, and on the Flemish frontier, he had to make head against the armies of Francis; in Hungary and in the Mediterranean he had to arrest the progress of the Turks ; lie required to watch the wayward king of England and the crafty popes, to manage the haughty susceptibility of Spanish grandees and the boisterous independent spirit of the Flemish cities, to compose the religious troubles, and to stay the growing spirit of revolt against the old state of things.

From his coronation at Aix-la-Chapelle, Charles pro- ceeded to the Diet of Worms, which opened on the 28th of January 1521. After a council of regency had been appointed, which under the presidency of his brother Ferdinand was to govern during the emperor’s absence, and other business had been disposed of, the religious difficulty was taken np. Though political considerations always prevailed with Charles during his active career, he was a Catholic by conviction, and was by no means disposed to encourage the hopes entertained of him by the liberal party in Germany. Besides, the old traditions of the empire, in which he firmly believed, required that he should support the church. At the same time, the Reformation was too strongly’ supported to admit of the summary measures most congenial to his character and most suitable to his political position, Luther was therefore heard, and his safe-conduct respected ; but at the close of the diet Charles had the ban of the empire pronounced upon him and his adherents. This edict, however, which had been obtained by unfair means, remaincd inoperative. The war with Francis which now broke out, and occupied the

emperor for eight years, prevented him from obstructing the. Refor- mation. In the meantime, disturbances had been going on in another part of his dominions (1519-21), The discon- tent of the commons of Castile at the summary proceedings of Ximenes, at the excessive preference given to Flemish

officials in the government of Spain, and at the other uncon- stitutional measures of the new Government, broke into open revolt. Toledo was the first to rise, and the insurgent cause soon became powerful in Castille. Even many of the nobles sympathized with the movement; one of their number, Dou John de Padilla, placed himself at. the head of it; but divisions among the commons, and their aliena- tion from the nobility, weakened their strength. An army was brought up against them, which defeated Padilla, and took Toledo after a hard siege. Like disturbances took place in Valencia. On his return from Germany, Charles treated the insurgents with great clemency, and wisely attached the nobility to his person; but the old liberties of Castile became little more than a dead letter.

After his return from the Diet of Worms, Charles remained in Spain till 1529, directing the war against Francis. The emperor was upon the whole decidedly victorious. The French were foiled in Navarre, and expelled from Milan and from the whole of Italy. The failure of the imperialists in an invasion of Provence and the siege of Marseilles was compensated by the splendid victory of Pavia, in which the French sustained enormous losses, and Francis himself was made prisoner (1525). The triumph was, indeed, too decisive, as it made Charles oblivious of every chivalrous principle in his treatment of the captive king, and alarmed his allies, Henry of England and Clement VII., into espousing the French cause. Francis nominally accepted, but immediately after his liberation repudiated the humiliating peace of Madrid, and with his allies recommenced the war. Thus Charles lost the fruits of his victory; but he was again successful. The mercenary army of Bourbon plundered Rome, and kept the Pope a prisoner in the

castle of St Angelo, while the efforts of Francis to maintain himself in Italy proved a failure. At length the rival monarchs composed their differences for a time at the peace of Cambray 1529, by which Francis renounced his pretensions to Milan, and retained the duchy of Burgundy. The superior generalship of the Spaniards, the deeper and more persevering policy of Charles, and the defection of Bourbon (who, grievously injured at the French court, carried over to the enemies of his country his military skill and a thirst. for revenge) had given him the foremost place in Christendom, in reality as well as in name, while the peace left him free for other labours. Leaving Spain under the regency of his beloved queen, Isabella of Portugal, whom he had wedded in 1526, he proceeded to Italy. At Bologna, where he had an interview with the Pope, he was crowned emperor and king of Italy; and Florence, which had expelled the Medici, was taken after a long siege, deprived of its republican constitution, and placed under a member of that celebrated family. After having arranged the affairs of Italy, the emperor crossed the Tridentine Alps into Germany to attend the diet which had been summoned to meet at Augsburg (1530). Notwithstanding the Peasants' War, the fanaticism of the Anabaptists, aud the strenuous, often threatening, opposition of the powers temporal and spiritual, especially of Southern Germany, the Reformation had made marvellous progress during the nine years which had elapsed since the Edict of Worms, and was rapidly overspreading the whole empire. It was clear that if the influence of the church beyond the Alps was not altogether to be lost, the emperor must interpose with the whole weight of his authority. Accordingly, at Augsburg, Charles made every effort to bring about a peaceful arrangement of the religious differences ; but he soon found that he had quite mistaken the strength and firmness of the new movement. The Protestants held resolutely by the confession they had presented; and when Charles proceeded to issue a hostile edict against them, they formed

themselves into a league for mutual defence under the leadership of Saxony and Hesse. This was the famous Smalkald League, which from the end of 1530 continued to be the political bulwark of German Protestantism. The league entered into communication with both France and England ; but it wasfrom a much stranger quarter deliver- ance was to come. As at the Diet

of Worms it was Francis, so now it was Soliman that averted an armed collision between the young Protestantism and the impcrial power, Foiled in his attack on Vienna in 1529, the sultan was again threatening the south-castern frontiers of Germany with a terrible army. Charles felt it necessary to unite the empire against him, and so at Nuremberg effected a compromise with the Protestants, by which freedom of worship was secured till the calling of a general council, With all enthusiasm they then armed against the Turk. At the head of one of the most splendid armies ever equipped by Christendom, Charles for the first time took the field in person. Great deeds were expected at this hostile meeting of the Eastern and the Westcrn worlds ; but the sultan, reckoning on the religious quarrels of Germany, did not anticipate that he would have to confront the united forces of the empire, and therefore soon with- drew within his own fronticr (1532). Not being able to follow the enemy through the wasted kingdom of Hungary, the emperor returned through Italy to Spain. His next expedition was against Tunis, now the stronghold of the great pirate Barbarossa. The emperor defeated Barbarossa, took the city, aud released thousands of Christian slaves, who, returning to Europe, spread abroad the fame of their generous deliverer (1535). The same year war was resumed with Francis, who formed an alliance with the Turks, and invaded the territory of the duke of Savoy. Charles failed completely in an invasion of Provence, and the war ended without any important result by the truce of Nicc (1538). Next ycar the emperor lost his wife Isabella, to whom he was decply attached. Towards the end of the year (1539), when a revolt of the city of Ghent required his presence in Flanders, Charles passed through Paris on the special invitation of the French king, giving to Europe, as was thought, a noble example of chivalrous confidence and forgetfulness of past enmities. The emperor was too much occupied with present emergencies to introduce a systematic despotism into the Netherlands ; but when the privileges of the cities came into conflict with his imperial plans they were little respected. The most cruel edicts had been issued against Lutheranism and a_ bloody persecution carried on. But to Charles the Netherlands were above all things an inexhaustible source of revenue, from which he drew the supplies for his many wars. They paid annually twice as much as Spain and the Indies put together, and were continually called upon for extraordinary contributions. The great city of Ghent, his own birthplace, had lately refused to contribute, and even entered into communication with Francis,

who betrayed it to Charles. The emperor entered the city with a numerous army and an imposing retinue, caused the ringleaders to be executed, annulled the constitution of the city, and placed it entirely under the government of persons nominated by himself (1540). In the autumn of next year Charles made another expedition against the corsairs of North Africa, who had now made Algiers their great stronghold and the centre of their nefarious power. But he was unsuccessful ; a tremendous tempest so disabled the army and injured the fleet that he was obliged to return before he had in the least accomplished the object of the expedition. He had unwisely persisted in it during a highly unfavourable season ; but the bravery with which he exposed himself to danger and hardship of every kind to some extent atoned for his rashness. ‘The reverses sustained by the emperor

at Algiers encouraged the most persevering of his enemies, Francis, to renew the war in alliance with the Turks. Consequently, Charles was once more obliged on every side to make head against his old foes, against the French armies in Piedmont and on the Spanish and Flemish frontiers, against the Turkish armics in Hungary, and against a junction of the French and Turkish fleets in the Mediter- ranean. At length a fresh compromise with the Protestant princes enabled him to invade Champagne with a powerful German army, which so alarmed the French capital that Francis found it expedient to conclude the peace of Crespy (1544). This was the last war of Charles with his French rival. The emperor had all along maintained his superiority over the king, but cxcept that the French had been expelled from Italy, they remained, territorially, as they had been at the beginning,

This peace with Francis, and a truce subsequently con- cluded with Soliman, now left Charles free to grapple with his last and most difficult labour, the suppression of the Reformation. The religious question always lay very near to the heart of the emperor. But during the first twenty-five years of his reign, it had only been at short and broken intervals, left him by his wars and othcr multi- form relations with Francis, Henry, the Pope, and the Turk, that he had been able to take it in hand. Scarcely had he been able to enter on some deliberate method of dealing with it when one or other of

those rivals or suspicious friends crossed his path, and called his attention elsewhere. And now, when he could devote seven years of almost uninterrupted leisure to the work, and could concentrate the entire strength of his empire on the execution of it, he was destined to discover that the Refor- mation had grown too strong to be arrested even by his imperial will. Its progress, great as it had been from the Diet of Worms to that of Augsburg, had been far greater from the. Diet of Augsburg to the period at which we have arrived. At Augsburg the elector of Saxony and Philip of Hesse were the only considerable princes that supported the Reformation. By this time Wiirtem- berg, Brandenburg, the dukedom of Saxony, and the Palatinate of the Rhine had declared for it. Northern Germany was almost entirely Protestant, whilst in Southern Germany the imperial cities, and cven to some extent the nobility of the Austrian hereditary states, were in favour of it. Bohemia was strongly inclined in the same direction ; and towards the West the orthodoxy of the Nethcrlands was threatened by the duke of Cleves, who was going to enter the Smalkald League, when his plans were cut short by the emperor, and still more so by Hermann, archbishop of Cologne, who was engaged in inaugurating a moderate reformation of his province under the advice of Bucer and Melanchthon. Thus had the new movement profited by the distractions of an emperor who wished to arrest it. Now it was clearly time for the most strenuous and com- prehensive effort. It was to be expected of the politic nature of Charles that he would not have recourse to extreme measures till all means of accommodation had been exhausted. Accordingly, in 1541, at Ratisbon, a great religious conference had been held by some of the most moderate theologians on either side. No little harmony of opinion had been arrived at, but they differed as to tran- substantiation and the powers of the church, the more decided heads of both parties were afraid that compromise was being carried too far, and the result was that they separated without any common platform being secured. Towards the end of 1545 another of the methods all along proposed for the arrangement of the religious difficulty, and constantly urged on the popes by the emperor, was at length to be tried. But the Protestants were resolved to have nothing to do with a so-called gencral council which wag

composed almost entirely of Italians and Spaniards, where the Pope and the old party were absolutely predominant, and where, consequently, the Church of Germany had no chance of a fair representation or even of a fair hearing. The calling of the Council of Trent, therefore, had the sole effect of widening the chasm between the old and the new ; and the course its deliberations were to take had the same result in signalizing the contradiction between the Catholic and the Protestant point of view. Perceiving that milder methods were of no avail, Charles now made preparations to compel the submission of the Frotestant princes. The dissensions among them greatly facilitated his plans. Maurice, duke of Saxony, always at feud with his kinsman the elector, was ready, with reasonable prospect of self- aggrandizement, to take the imperial side, and the elector of Brandenburg took no active part in the struggle, so that Lilectoral Saxony, Hesse, Wiirtemberg, and the imperial cities alone were to be reckoned with. The counsel of the great general Schirtlin, who commanded the troops of the cities, to fall upon Charles at Ratisbon before his forces were assembled, and then to seize the passes of Tyrol, so as to break the communication between Italy and the imperial camp, was set aside by the hesitating and over- scrupulous leaders of the Protestant party. Accordingly, Charles was allowed to concentrate his troops and take the offensive. Maurice thereupon declared himself, and, in- vading the territories of Electoral Saxony, compelled the clector to withdraw from the Protestant camp, which con- sequently soon broke up, leaving the emperor to have his own way in South Germany, and to suppress the Reforma- tion in the province of Cologne. Thus, disastrously for the Protestants, ended the campaign of 1546, the result of their own indecision, as their forces were superior to those of the emperor.

In the meantime, the Saxon elector had been chastising Maurice for his treacherous invasion of the electorate. In the spring of 1547 the emperor, hastening to assist his ally, concentrated his forces at Eger on the Bohemian frontier, overtook the electoral forces at Miihlberg on the Elbe, defeated them easily, and took the elector prisoner. He was obliged to submit to a humiliating arrangement, by which he resigned his territory and the electoral hat to his enemy Maurice. Shortly after, Philip of Hesse was like- wise compelled to yield, and was detained a prisoner by the emperor, whose dishonourable conduct on_ this occasion excited the indignation of his

Protestant allies, especially of Maurice, who was son-in law to the landgrave. In a little time Protestantism seemed to be at the fect of the emperor. The city of Magdeburg was the only important seat of resistance remaining. But while the emperor had been beating down the cnemies of the church on the field of battle, her representatives at Trent were proceeding in such a way as to render a permanent settle- ment of the question impossible. The politic Charles was anxious to concede certain points to the Protestants, so as to secure peace while still maintaining the rights of the church. The conclusions arrived at by the council did not admit of, compromise ; and to make matters worse, the Pope, alarmed at the victorious attitude of Charles, removed it from Trent to Bologna. Elated by his victories to an extent that was not to be expected of an old and experienced statesman, the emperor now adopted some very doubtful measures. Under his auspices, the Augsburg Interim was framed—an attempt to supply a common religious platform for all parties in the empire, and thus by his own imperial authority put an end to the schism. But it pleased neither party, for the Catholics rejected it, and the Protestants accorded it only a limited and enforced obedience. Another plan of the emperor, to induce the German electors to cancel the clection of his brother Ferdinand as king of the Romans

CH ARLE sem

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and to choose his own son Philip instead, also failed. Thus the ambitious dream of Charles to transmit all his own power to his son, and if possible make it hereditary in his family, could not be realized. Meanwhile, all unknown to himself, a plot was maturing by which he was to be hurled from a position of splendid triumph into the bitterest reverses of his life. ‘The profound and skilful Maurice of Saxony, finding that he had got from the emperor all that was to be expected, and perceiving how deeply he had outraged the national and religious senti- ment of Germany, resolved to seize the advantage given him by the high-handed and oppressive measures of his ally in order to retrieve his own lost credit. Accordingly a combination of princes was formed with the greatest secrecy, and an alliance concluded with Henry II. of France. While the French king,

marching eastward as the “Protector of the Liberties of Germany,” seized Toul, Verdun, and Metz, and threatened Strasburg, and the Turks renewed the war on the Austrian frontiers, Maurice and his confederates advanced suddenly into South Germany, and surprised the emperor at Innsbruck, whence, saved from capture by a mutiny among the German lands- knechts, he fled, sick of gout, over the Tyrolese Alps into Carinthia. Weary of the religious divisions of Germany, Charles left to his brother Ferdinand the task of arranging a peace, first at Passau (1552), and finally at Augsburg (1555). But he was doomed ere long to sustain another severe reverse. While renouncing the task of arranging the internal affairs of Germany, he had chosen for himself the duty of chastising her foreign enemies, and winning back an important possession. At the head of a splendid army of 60,000 men, he besieged Metz from the end of October 1552 to the beginning of January; but all his efforts to retake the city availed nothing against the skill of Guise, and the bravery of the French nobles, who had thrown themselves into the city in great numbers. After suffering great losses he was obliged to retreat, and Metz was for three centuries lost to the German empire. Soon after, in a very different quarter, the policy of Charles gained a great triumph, which likewise proved illusory. ‘The frequent changes in the direction of English politics had always been a subject of deep interest to him, and had to some extent affected his own course, though only in a secondary way. Now, however, on the accession of Mary, there was real ground for the hope that England might be drawn into the closest connection with his policy, and most intimately interested in the great struggle against the new movement, which had gradually become the supreme ques- tion in European politics. Mary had already been betrothed to Charles, and expressed her willingness to become his second empress; but he trausferred the state duty of marrying Mary to his son Philip, who accordingly did so in 1554. The presence of Philip in England con- tributed greatly to the restoration of Catholicism in the country, and Mary was very glad to fall in with the general policy of Charles. An heir only was wanting to the stability of the union, an heir, too, who was destined by the marriage-treaty to rule over England and the posses- sions of the house of Burgundy, and his birth was expected with many prayers in the Catholic world, and with great anxiety on the part of Charles. Happily for England, the hopes of Mary were not realized. The English alliance continued, but its insecurity was only too apparent.

Long before the period at which we have arrived, Charles had entertained the idea of relinquishing the throne in order to devote the remainder of his life to quiet retirement and preparation for another world. With a feeling of this kind it had been purposed by him and his wife Isabella, who died in 1539, to withdraw, he into a monastery, she into some neighbouring nunnery, and there spend the

evening of their days in religious exercises. On his return from the unhappy expedition against Algiers his suite remarked the impression made on him by the quiet simplicity of the monastic life. In 1542, the secret had been confided to Francisco Borja, afterwards famous in the Society of Jesus. Now when he had been thwarted in his dearest schemes, obliged to renounce all pretension to control the religious movement in Germany, and foiled in a great attempt to recover an imperial city treacherously seized by his bitterest foes, and when the last great effort of his statesmanship depended on the life of a sickly woman, it is no wonder that he proceeded to carry his plan into execu- tion. But beyond a doubt the great reason for finally adopting the resolution to abdicate was his feeble health. The vigour which in his younger days had fitted him so well for the chase, the tournament, and the battle-field, was already corapletely undermined by incessant labour and anxiety, by repeated attacks of gout, and, it must be added, by the most extraordinary excess at table. In 1554 he transferred the crown of Naples to his sou Philip, in order that Philip might marry Mary of England on equal terms. Next year, on the 25th of October, the States of the Nether- lands were assembled at Brussels to receive a formal abdication of those provinces. Supported by a crutch on the right hand, the left leaning on the shoulder of the young prince of Orange, afterwards renowned as the liberator of Holland, Charles recounted the many journeys he had made and the long and arduous labours he had undergone in the service of his people; he intimated that the state of his health now required that he should transfer the cares of government to his young son, whom he introduced to the assembly ; and, exhorting them to adhere stedfastly to the Catholic faith, requested their forgiveness of all the errors committed during his reign. The assembly, full of the ancient spirit of reverent loyalty, and struck by the marvellous spectacle of the highest earthly power voluntarily divesting

itself of its majesty and descending into obscurity before the natural time, burst into tears and sobs. The emperor himself, as he sunk exhausted in his chair, wept like a child. The same year Charles intimated to his brother Ferdinand his determination to resign the imperial dignity; but owing to the tedious formalities of the empire, and the objections of Ferdinand, it was not till 1558 that the process of abdication was completed. In the beginning of 1556 he formally laid down the crown of Spain.

After he had thus relieved himself of the responsibilities of government, Charles sailed from Flushing on the 17th September for a climate better suited to his broken health. He landed at Laredo in Spain on the 28th, and in the beginning of February of next year finally settled at Yuste, a Hieronymite monastery in the north of Estremadura., It stood in a pleasant and genial valley, protected from the north wind by a range of mountains. He had selected the spot some time before, and had caused a house to be built for his reception adjoining the monastery. Here he stayed till his death, a period of one year and eight months nearly. His life in retirement, so erroneously painted by Robertson, has been described with great minuteness by many recent historians of great ability. The romance in which it has been euveloped has been done away, and his character appears in unborrowed and somewhat prosaic reality. It is true that he devoted much of his time to religious exercises; for it was not to be expected that a prince, who had not allowed a single day to pass since the age of twenty-one without spending a portion of it in inward prayer, would intermit the practice in his declining years, and during a retreat chosen for the purpose. He spent much of his leisure in gratifying his mechanical tastes, but so far was he from learning the principle of toleration from

the impossibility of making two watches go exactly alike, that he exhorted his children, in the most urgent manner, to destroy heresy with fire and sword. He still delighted in the converse of learned and experienced men, but instead of entertaining them familiarly at table he maintained the stately Castilian etiquette of dining alone, only once deigning to partake of the meal of the friars, whom he con- tinued to respect as much as ever. ‘The

simplicity of his table especially is a mere imagination. So long as he was tolerably well he kept his dependents in continual anxiety to have it well furnished with: those pernicious dainties which had contributed to ruin his health, and this was only equalled by the anxiety of his medical and other advisers, when excess had brought about its natural consequences. His retirement certainly delivered him from the necessity of moving in a prescribed line of anxious duty and responsibility, bwt his own sympathy with public affairs, and the emergencies in which Philip found himself in con- sequence of a new combination of the French, the Turks, and the Pope, obliged him to come forward with his advice, which was always attended to with the utmost deference, and in financial matters, with his active help, The couriers despatched to Yuste found him keenly alive to all the vicissitudes of good and evil fortune which his empire was still destined to experience. The brilliant, but somewhat barren victories of St Quentin and Gravelines, the extra- ordinary peace concluded by Philip with the Pope, the loss of Calais and Thionville, the advance of the Turkish fleet to the coast of Spain, and the much-desired but never ~~to~~ be-fulfilled hope of Mary of England, that God might give her a child for the good of the church—all these matters interested him as much as when he was the moving spirit of Kuropean politics. The soft air of Yuste and the easy way of life he led had for some time a most beneficial effect on his health. He became stronger than he had been. But his gout, and above all his injudicious diet, still rendered him an invalid, He could not ride, nor could he walk much, but was usually carried about in a chair, and delighted to enjoy the warm air under the shade of the trees of the monastery. At length, during the month of August 1558, serious symptoms began to show themselves, and it was remarked that his mind dwelt more than ever on the religious ceremonies prescribed by the church for the souls of the dead. The Hieronymite chroniclers relate that he even caused his own obsequies to be performed before his death. There are a good many difficulties in the way of accepting their narrative ; but Sir W. Stirling Maxwell and Prescott are both disposed to believe that his funeral service was in some form celebrated during his life. The same day, the 30th August, he felt considerably worse. In a little time his ailment took the form of fever, of which he expired at two o’clock in the morning of the 21st September (1558). He died the death of a good Catholic, earnestly commending his soul to God according to all the forms observed by the church. He was interred in the monastery ; but after the

completion of the Escorial by Philip, his remains were removed thither, where they were again laid to rest by the side of his dearly beloved and much regretted Isabella.

An important point in the codicil to his will, executed some days before his decease, must be mentioned for the light it throws on the character of Charles and on the subsequent history of Europe. In the very year of his death the most conclusive proof had been given of the influence of Luther's teaching even at the court and round the throne of Spain. At the time of this alarming dis- closure Charles had urged the severest measures for the extinction of heresy, and now in this codicil he enjoined his son in the solemnest manner to root it out. Thus the last energies of the emperor were spent in consecrating that

terrible system of religious policy which led the different branches of his house into the fatal crusade against the Reformation, set one-half of Christendom in arms against the other, and permanently arrested the development of Southern Europe. As to Luther and the Diet of Worms he regretted that respect for human engagements had led him to forget his duty to God in permitting the arch-heretic to escape, but congratulated himself that he had never exposed his soul to coutamination by hearing the new doctrines defended in his presence, as if ignorance were the only sure safeguard of truth. At the same time, those who would see in this proof of a blood-thirsty disposition entirely mistake the character of Charles or the state of the Spanish conscience. Charles was neither cruel nor cold by nature; he was popular among all classes and nationalities of his subjects, clement to rebels, revered by his immediate attendants, loved by the members of his own family, and deeply attached to his wife. Conscious that he was by divine right the political head of Christendom, he did not evade or depreciate the duties such a position imposed, but exerted himself to the utmost and in a religious spirit to fulfil them, though by no means unwilling to employ all the arts permitted by the statesmanship of the time. In fact he fulfilled better than most men the mission which his experience and position imposed and his education enabled him to comprehend, and of this

he considered the suppression of opinion destructive of the church the most indispensable part, quite as obligatory as the defence of Christendom against the Turks and the corsairs, more so than the assertion of his imperial dignity against the Pope, or of the rights of the house of Austria against the French. But his conscientious conviction of the necessity of sup- pressing heresy neutralized all the excellencies of his character. It was not so much in what he did, as in what he was not permitted to do, that his reign was helpful to the civilization of modern Europe.

The memoirs of Charles, dictated by him in lcisure hours while sailing up the Rhine in 1550, were discovered in 1861 by Baron Kervyn de Lettenhove, while making some searches in the Imperial Library at Paris. The manuscript was in Portuguesc, and professed to be a translation made from the original at Madrid in 1620. That such memoirs had existed was well known from the testimony of Van Male, literary sccretary.to Charles, and from other contemporary notices; and their existence was affirmed in 1623 by Gonzalez d'Avila, historiographer of Philip III. They were written in French in a concise and dignified style, and give a brief summary of his life from 1515 to 1548, —very brief at first, somewhat in detail from 1545 to 1548. English translation by L. I'. Simpson (Long- mans, 1862).

Other authorities :—Robertson's Charles V.; Ranke's Deutsche Geschichte im Zettalter der. Reformation, which is almost cocxten- sive with Charles's life. For life during his retirement consult Sir W. Stirling Maxwell's Cloister Life of Charles V.; Prescott's Appendix to Robertson; Pichot's Chronique de Charles-Quint ; Gachard's Retraite et mort de Charles-Quint, and Mignet's Charles Quint, all which works are based on researches into the archives of Simaneas, especially on those of Gonzalez. Or a}

CHARLES VI. (1685-1740), emperor, was the second sonjof Leopold I. As the only male representative of the house of Hapsburg, he claimed the throne of Spain, which was left by Charles II. to Philip, duke of Anjou, grandson of Louis XIV.; and in order to prevent the predominance of the house of Bourbon, England, Holland, Prussia, Germany, and Portugal gave him their support. In 1703 he was proclaimed'at Vienna; and having, after a visit to England, invaded Spain, with the assistance of an English fleet under Peterborough and an English land-force under the earl of Galway, he

was proclaimed king in Madrid in 17 06. He himself remained at Barcelona ; and the war continued with varying success, till the death of his brother, the Emperor Joseph I., in 1711, produced the most im- portant changes in the policy of the allied European powers, They became as much afraid of the supremacy of the house

of Hapsburg as they had formerly been of that of Bourbon; and in 1713, by the treaty of Utrecht, they made peace with France. In the next year Charles was obliged to follow their example, and by the treaty of Rastadt he gave up all to Philip except the Spanish possessions in the Netherlands and Italy. In 1715 Charles undertook the defence of Venice against the Turks; his general, Prince Eugene, gained some considerable successes, including the victory of Belgrade ; and, at the conclusion of peace in 1718, he added Belgrade, and parts of Servia, Slavonia, Bosnia, and Wallachia to the empire. He was next engaged in meeting an attack on his Italian territory made by Spain, whose policy was then directed by Alberoni; and, with the assistance of England, France, and Holland, he was speedily successful. After this for several years all his efforts were spent in endeavouring to obtain the recognition by the European powers of his Pragmatic Sanction of 1713, which settled the succession on his daughter, Maria Theresa, and her heirs. By ceding Parma and Piacenza, Charles purchased the favour of Spain, and he afterwards in a similar manner acquired the alliance of Russia and Prussia. But England, France, Denmark, and Holland united to oppose him ; and it was only at the cost of considerable sacrifices that he at length, in a conference held at Vienna in 1731, obtained their recognition of his scheme. One of the promises which he then made was to secure the succession to the crown of Puland to the son of the reigning king; and on the death of the latter he was consequently involved in a war with France, Spain, and Sardinia, which supported a rival claimant. In this struggle he lost Milan, Lorraine, and most of Lombardy, which were seized by the French, together with the two Sicilies, which were conquered by the Spaniards. His last war, against the Turks, was equally unfortunate. He died in 1740, leaving the empire considerably weakened by his reign.

CHARLES VIL (1697-1745), emperor, also known by the name of Charles Albert, was the son of Maximilian Emmanuel, elector of Bavaria. He was taken from home while a child by the Emperor Joseph I., who had outlawed his father, and seized Bavaria; and he was not liberated till the conclusion of the treaty of Rastadt in 1714. He commanded against the Turks in the war which the Emperor Charles VI. undertook in order to protect the Venetians. In 1722 he obtained in marriage the second daughter of the late Emperor Joseph, after renouncing all claims to the imperial crown. But when he succeeded to he electorate of Bavaria (1726), he refused to recognize the Pragmatic Sanction ; and on the death of Charles VI. he gained the alliance of France and Spain, proclaimed himself king of Bohemia, and, having obtained his own unanimous election, was crowned as emperor at Frankfort in 1742. The Hungarians, however, having espoused the cause of Maria Theresa, she was enabled to occupy Upper Austria and Bohemia, and Charles was forced to retire. In the next year his general, Seckendorf, met with some success, and in 1744 Frederick of Prussia invaded Bohemia in his interest. Charles died at Munich in 1745.

CHARLES L. of Spain. See Cuartus V., emperor.

CHARLES IL (1661-1700), king of Spain, son of Philip IV., was only four years old at the death of his father. ‘The regency was left in the hands of the queen, Anna Maria of Austria. She appointed a council, at the head of which she placed Neidhard, her confessor, whom she also made grand inquisitor. But Don John, the illegitimate son of the late king, having gained great popularity by his military successes, marched on Madrid, and forced her to dismiss Neidhard, and give to himself the vice-royalty of Aragon. An unsuccessful war with France, and the loss of Sicily further weakened her power; and in 1675

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Charles assumed the government, and took Don John as his chief adviser. Still Spain continued to suffer in the great European contest; and in 1678 she was forced, in the treaty of Nimegucn, to cede Franche-Comté and several considerable towns in the Low Couutries to France. In the next year she sustained another serious loss in the death of her ablest minister, Don John. Immediately after the treaty of Nimeguen, Charles espoused Louisa

of Orleans, a niece of Louis XIV., who for the next eleven years maintained harmony between Spain and France. The queen-mother now left the retirement of the convent in which she had been placed, and once more, amid the empty folly of the king and the court, assumed considerable authority. After the death of Louisa, Charles married Anne, a sister of the Emperor Leopold I.; and in 1694 he joined the country of his wife and of his mother in declaring war against France. But he effected nothing, and the French troops had reached Barcelona, when Spain was saved by the treaty of Ryswick (1697). As the king was childless, negotiations concerning the succession occu- pied the last years of his life, and after leaning for a long time to the side of Austria, at last, a month before his death in 1700, greatly through the influence of the Pope, he left the crown to Philip Bourbon, grandson of Louis XIV., who succeeded as Philip V.

See Spain wnder Charles II. ; extracts from the correspondence of Alexander Stanhope, British ambassador at Afadrid from 1690 to

1700, edited by Mahon (Lond. 1840), and Mignet's Wégociations relatives & la succession d' Espagne.

CHARLES ITI. (1716-1788), king of Spain, was the second son of Philip V. Parma, Piacenza, and Tuscany, having fallen into the hands of Spain, were bestowed upon Charles, who at the age of fifteen was furnished with an army, and sent to take possession of his principality. At eighteen he conquered the two Sicilies, and the emperor was obliged to recognize him as king. In 1759, by the death of his brother, Charles succeeded to the throne of his native country. His reign was a useful one; for he was aman of ability and of liberal temper, and he was served by such ministers as Aranda, Grimaldi, and Florida Blanca. The administration of the finances was reformed, and a bank was instituted at the capital. The Jesuits were banished, and an attempt, which was not, however, suc- cessful, was made to bring the Inquisition under the power of the civil government. Something was done to abolish brigandage ; and on two occasions Charles endeavoured to repress the piracy of the Algerines; he interested himself greatly in the development of commerce, science, and art ; and, lastly, he did much to strengthen the army and navy. The wars, however, which he carried on with England, in alliance with the French, brought him little

success. In 1763 he ceded Florida to the English in exchange for Cuba. He joined France in sending assistance to the United States during the War of Independence; and in the peace which was concluded after that war, he recovered Florida, and also gained Minorca. But his attack on Gibraltar was unsuccessful, and the English refused to treat for its restoration. Charles died at Madrid in 1788, after a reign of twenty-nine years. See the Logo of Cabarrus, and the accounts of the reign by Beccatini and Roy.

CHARLES IV. (1748-1819), king of Spain, was the son of Charles IIJ., whom he succeeded in 1788. He was married while very young to his cousin, Maria Louisa of Parma, who soon acquired the greatest influence over him. His most remarkable minister was Manuel Godoy, a good looking guardsman, who gained the friendship of both the queen and her husband, rose from the ranks to the position of lieutenant-general, and was made duke of Alcudia, and minister of foreign affairs. In 1795 Godoy concluded a treaty of peace with the French Republic at Basel, after

an unsuccessful attempt by the king to aid his relative, Louis XVI. Soon after the peace an offensive and defen- sive alliance was entered into with France ; and Spain was thus involved in a short war with Portugal and a longer struggle with England, during which Nelson shattered the Spanish fleet at the battle of Trafalgar (1805). In 1807

| Charles made a secret treaty with Napoleon, according to

which Portugal was to be seized by the French and Spaniards, and the greater part divided between Godoy and the queen of Etruria, and Charles was to assume the title of emperor of America. At the same time 16,000 Spanish troops were sent to assist the French in Denmark. Meanwhile Napoleon also carried on intrigues with Don Frederick, the heir to the throne, who was soon after discovered in a plot to assassinate his father. Though pardoned, Frederick continued to do all that he could to arouse ill feeling against the court ; and in 1808 Charles was so alarmed by disturbances in Madrid, that he abdicated in his favour. He declared almost

immediately that the act was not voluntary , but the matter was decided by a meeting with Napoleon at Bayonne. Urged by Godoy, who was moved by his fear of Frederick, and also by the queen, Charles surrendered the crown to Napoleon, who gave him a pension of 6,000,000 francs with the castle and grounds of Chambord; and from that time he lived in retirement with his wife and the favourite, refusing to return to the throne, even when he might have done so with safety on account of the great unpopularity of his son. He died at Rome, soon after the decease of his wife, in L602.

CHARLES IX. (1550-1611), king of Sweden, was the fourth son of Gustavus Vasa. His nephew, Sigismund, king of Poland, who inherited the crown in 1592, being a Roman Catholic, Charles was appointed to direct the govern ment, till Sigismund signed a decree establishing Luther- anism as the religion of Sweden. There was alsoa general feeling against the occupation of the throne of Sweden by a Polish king, and, after several fruitless attempts at accom- modation, Sigismund was deposed and Charles elected king in 1604. He carried on a vigorous war with Poland, Russia, and Denmark with varying success; and at the age of sixty he challenged (though without result) Christian IV., the king of the last-named country, to single combat. Many of his domestic measures were very beneficial. He founded the university of Gothenburg, and otherwise furthered the spread of education; and he drew up a new code of laws. He left a rhymed chronicle, and a number of letters addressed to Henry IV. of France and others, on the subject of the war with Poland, which were printed in German at Amsterdam in 1608. He died in 1611.

CHARLES GUSTAVUS X. (1622-1660), king of Sweden, was the son of John Casimir, Elector Palatine of the Rhine, and of Catherine, daughter of Charles IX. of Sweden. He studied at Upsala, and travelled in France and Germany, took part in the Thirty Years' War, and fought at Leipsic and elsewhere. On his return to Sweden he sought the hand of his eccentric cousin, Queen Christina, whom he professed to love sincerely. He was rejected ; but in 1654 she voluntarily abdicated the throne, and was succeeded by him. He had now an opportunity of gratifying his passion for war. In 1655 he overran Poland, on the pretext that the king had protested against his accession and desired to supplant him. The kingdom of Poland, and after that the dukedom of Prussia, were com- pelled to swear allegiance

to him, and Charles next seized the continental territory of Denmark. He proposed to Holland and England a plan for dividing Denmark among the three nations, but Cromwell scornfully refused to share in therobbery. Charles was still fighting against Denmark when he died at Gothenburg (1660) in his 38th year.

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CHARLES XI. (1655-1697), king of Sweden, was five years old at the death of his father, Charles X., and was left under the regency of his mother and of a council. Brought up without care, he arrived at manhood unable even to read. In 1672 he assumed the government, and, under the influence of France, was speedily engaged in the invasion of the electorate of Brandenburg. ‘The elector was assisted by Denmark and Holland; and Charles’s army at first mct with serious reverses; but afterwards, taking the command in person, he won several battles, including those of Lund and Landskrona ; and in 1679 peace was signed. Charles now devoted his energy to establish the absolute independence of the kingly authority. He diminished the number of senators, and made them mere royal councillors; he reunited to the Crown all the lands which had been divorced from it since 1609; and in December 1682 the States were induced to declare that the king was responsible for the use of his authority to none but God, that he was not bound by forms of government, and that he nced only seek the consent of the senate at his own pleasure. The power thus gained was creditably used for purposes of government. Charles paid the public debts, published annual accounts of the finances, travelled through the country that he might be personally acquainted with the needs and circumstances of the people, defended them from the tyranny of the nobles, established a strong and just legal administration, and commenced the drawing up of a general code. He also added largely to the territory of the kingdom. Under his reign no religion was tolerated but Lutheranism; and the king often showed liimself stern and rough. He died at Stockholm in 1697,

CHARLES XII, king of Sweden, was born at Stockholm on June 27, 1682. He received an excellent education, and was able to speak German, French, and Latin fluently. In the spring of 1697 his father, Charles XI., died, and the prince, then only in his fifteenth year, was declared of age by the States-

General and invested with the royal authority. As might have been expected, the boy-king showed himself but little disposed for state affairs. His time was divided between study and amusement ; now he was poring over the exploits of Alexander in the pages of Quintus Curtius, now spending whole hours in gymnastic exercises, or joining a hunting party in the pursuit of the bear ; and thus he was rapidly developing the iron strength of constitution which he displayed in his subsequent campaigns. At this juncture Frederick IV., king of Denmark, conceived the idea of wresting the crown from the young king, and adding Sweden to his possessions in the Scandinavian peninsula, and Augustus IL, king of Poland and elector of Saxony, and the czar, Peter the Great, agreed to second his enterprize by seizing the con- tinental provinces of Sweden. ‘The Danes struck the first blow by invading the territories of Holstein Gottorp, and the duke, who had married the sister of Charles, fled to Stockholm and begged for assistance to recover his states. Charles proposed immediate operations against Denmark, confident in his own prowess and in promises of substantial aid received from the court of St James’s, for William of Orange saw in Sweden a valuable ally for his Continental policy, and was resolved not to allow the balance of power in the north to be destroyed by the triple alliance. Sir George Rooke, with an Anglo-Dutch squadron, formed a Junction with the Swedish fleet, and at the head of fifty-four sail of the line swept the Baltic, drove the Danish fleet into Copenhagen, and bombarded the city, doing, however, little damage. Meanwhile Charles had landed in Zealand with a Swedish army, leading his troops to the shore in person, and wading through the water up to his chin in his eagerness toland. The Danes, inferior in numbers, retired before him, and Frederick seeing his capital threatened

with a siege by land and sea, abandoned the triple alliance, and sued for peace, leaving Charles free to turn his arms against Russia and Poland.

From this campaign we may date Charles’s assumption of those Spartan manners which distinguished him for the rest of his life. He gave up the use of wine ; at night he slept upon his cloak spread upon the floor of his room

or on the ground in the open air. His dress was of the plainest, his whole wardrobe consisting of a suit of blue cloth with copper buttons. He seemed to care for no pleasure or amusement; he had an amount of endurance which defied fatigue, and he was alike insensible to the heat of summer and the almost arctic cold of a northern winter. Hardy, brave to the extent of recklessness, capable of inspiring in his followers personal devotion to himself, and with all that astute and sagacious in council, he was the very model of a soldier king, Yet in the end Sweden reaped no advantage even from his victories. He had left Stockholm to defend the country from a pressing danger, but once he had tasted the pleasures of military success, he allowed himself to be allured onward to a career of conquest, and he never saw his capital again,

When Frederick sued for peace, Peter the Great was threatening Narva and the Swedish province of Livonia on the Gulf of Finland, while Augustus II., elector of Saxony and king of Poland, was besieging Riga, then a Swedish town. Charles disembarked in Livonia with 20,000 men. The Russian army, said to have been 50,000 strong, lay before Narva in an entrenched camp. With 10,000 of the splendidly disciplined infantry of Sweden, Charles attacked them there on November 30, 1700. In a quarter of an hour the camp was stormed, and the Russian army, which must have been largely composed of raw troops, was completely routed and dispersed. Turning southward, Charles marched against the Saxons and Poles, defeated them on the banks of the Dwina, and raised the

| siege of Riga. He might now have dictated a peace which

would have given Sweden an undisputed pre-eminence in Northern Europe. But his ambition was aroused ; Augustus was by no means a popular king, and while continuing the war against him, Charles intrigued with the party adverse to him in Poland. The Saxon army of Augustus was defeated in the battle of Clissow (1703), and Poland was occupied by the victorious Swedes, Radziejowski, the cardinal primate, declared the throne vacant, and under the influence of Charles, the diet conferred the crown upon his friend Stanislas Leszczynski, the young palatine of Posnania. But even now Charles would not sheath the sword. He carricd the war into Saxony, over-ran the hereditary states of Augustus, and in 1706 dic- tated to him the

peace of Altranstadt, by which Augustus resigned all claim to the throne of Poland, and further agreed to give up to the conqueror John Reginald Patkul, the ambassador of the czar at Dresden. Patkul was by birth a Livonian, and therefore a subject of Sweden, but he had transferred his allegiance to Russia, and it was said that he was the real author of the league between Russia, Poland, and Denmark. It was very doubtful if he could have been adjudged guilty of treason, and in any casc his position as ambassador ought to have protected him; but Charles thought only of vengeance, and after the form of a trial had been gone through, Patkul was condemned to be broken on the wheel, and the cruel sentence was executed, the king refusing to mitigate it in the least degree. The whole affair has left an indelible blot upon his memory, and it shows how much of vindictive passion was con- cealed under a perfectly impassive exterior. Even had Charles been willing now to bring the war to a close, the execution of his ambassador would not have allowed the czar to accept a peace. Twice he invaded Poland, but each

time he had to retire before the Swedes. By the autumn of 1707 Charles had collected 43,000 men in Saxony; a reserve of 20,000 under General Levenhaupt was in Poland, and a third army, 15,000 strong, was upon the frontier of Finland. In the following January, in the midst of the ice and snow, he suddenly broke up his camp, marched against the Russians, surprised and almost captured the ezar at Grodno, and then eontinued his advance, driving the Russians before him, and defeating them in numerous encounters. He had forced the Beresina and won a battle near Smolensko, and the way to Moscow lay almost open before him, when, to the surprise of his army, he turned southward to the district of the Ukraine, The fact was that he had a secret treaty of alliance with the hetmann of the Oossaeks of the Ukraine, Mazeppa, whose romantic story has been made so famous by the verse of Byron. The hetmann had promised to join the Swedes with 30,000 Cossaeks and abundant supplics. But when, after a difficult march, Charles reached the Ukraine, he found that the Russians had diseovered and frustrated Mazeppa’s design, and the hetmann brought him only a handful of followers, Nor was this his only disappointment. A reinforcement of 15,000 men under Levenhaupt was inter- cepted and cut to pieces by the

ezar, and after wasting the summer in a desultory warfare, the Swedes found them- selves overtaken by the severe winter of 1708-1709 in the midst of an enemy's country. Still Charles would not abandon the idea of reaching Moseow. Though his army was reduced by cold and privations to 23,000 men, he maintained himself till spring, and then besieged the fortress of Pultowa The place held out until July, when the ezar approached at the head of a large army. On the 7th Charles was wounded in reconnoitring the enemy. In the famous battle which took place next day he had to be carried in a litter amongst his staff. The battle ended in the complete defeat of the Swedes. Charles, leaving most of his officers prisoners in the hands of the enemy, fled with a few attendants aeross the Bug into the Turkish territories, and was hospitably received by the Turks at Bender on the Dniester.

Charles resided three years in Turkey, during all which time ns expenses, and those of his numerous household, were paid by the Turkish Government, in aceordance with a very liberal interpretation of the Eastern law of hospi- tality. Irom the day of his arrival at Bender his constant aim was to involve Russia and Turkey in war. He sueceeded

in producing an outbreak of hostilities; the Turks out- |

manceuvred and surrounded Peter and his army on the banks of the Pruth, and the ezar would have been either killed or taken had not his wife Catherine, by her energy and courage, obtained an armistice for him on favourable terms from the grand vizier. Removing his residenec to Vranitza, where his followers formed a little eamp around the strongly-built house in which he lived, Charles con- tinued his intrigues to produee another war with Russia, and though onee on the point of sueeess, he eventually failed, and the counter-intrigues of the czar began to pro- duce an effeet at Constantinople At this time Charles oceupied a very humiliating position, short of money, afraid to leave Turkey for fear of falling into an enemy's hands, dreading at any moment to be betrayed by the Turks, and knowing that all his conquests had been useless, and that the Swedish provinees were being invaded by Danes, Saxons, Poles, and Russians. The Porte displayed a singu- lar amount of patience in treating with him, but at length it became

evident that so long as Charles felt himself safe among his Polish and Swedish guards at Vranitza he would not leave Turkey. A fetva of the Sheikh-ul-Islam declared that the rights of hospitality would not now be violated by his forcible removal, and Ismaél Paclia, the governor of the district, received orders to seize him dead or alive.

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Charles having persistently refused to come to terms, Ismael, with several thousand janissaries and Tartars, sur- prised the little camp and took his 200 guards prisoners ; he then attacked the house held by Charles and forty of his suite. The king defended himself desperately ; the house was set on fire over his head, and he was retiring, driven out by the flames, when his spurs became entangled, and he fell and was secured and disarmed by the janissaries. His eyebrows were singed and his clothes torn and stained with blood. For a while he was kept in honourable imprisonment, then he was allowed to reside with a few attendants at Demotica, where he still spoke of departing escorted by a Turkish army, and feigned illness in order to gain time for negotiations, which in the end led to nothing. The king of Prussia was desirous of forming a league with him against the czar, and would have sceured for him an honourable return to his states, the one con- dition being that Stanislas should abdicate and Augustus Il. be recognized as king of Poland. Stanislas was quite willing to abandon his doubtful claim to the throne, but Charles with charactcristic obstinacy refused to listen to the proposal. “If,” he said, “my friend Stanislas will not be king, I ean find some one else to take his place.” At length he saw that there was no chance of the Porte granting his demands, and sending his respectful adieux to Constantinople, he set out suddenly with only two attendants, and travelling unceasingly, riding by day and sleeping in a carriage or cart at night, he passed through the Austrian territories, Bavaria, Westphalia, and Mecklen- burg, and thus avoiding the districts held by his enemics, reached his own town of Stralsund, in Swedish Pomerania, late at night, on November 21, 1714, after a journey of sixteen days. He announced himself as a Swedish officer eharged with important despatches from Bender. The governor received him at once in his bedroom, and asking for news of the king,

recognized Charles by the sound of his voiee when he replied, and the tidings of his arrival soon spread through the city, which was illuminated for the rest of the night. The return of Charles only drew more elosely the allianee between the powers which had been plotting in his absence the dismemberment of Sweden, Stralsund was besieged by a combined arnry of Saxons, Danes, Prussians, and Russians. Charles made a protraeted defence, but on Deeember 23, 1715, the place was forced to capitulate, the king embarking immediately before the surrender, and taking up his residence at Lund in Scania, ee:

Arrived in Sweden, he took measures to protect the coasts of the kingdom against a descent of his enemies, and with a small army invaded Norway in March 1716 ; he overran a large part of the country, but was forced to retire for want of supplies. About this time the Baron von Gértz, a German officer, who had during his stay in Turkey become his principal adviser, proposed to him a complete change of policy, and Charles immediately accepted the scheme which Gértz had claborated, and of which he had already executed some of the preliminaries. He proposed that Charles should make peace with the ezar, ecde to him the Baltic provinces of Sweden, and gain his allianee. The allies were to replace Stanislas on the throne of Poland and restore the duke of Holstein to his states which had been seized by Denmark. Charles was to invade and conquer Norway, and then land a small army in Scotland, and with the help of the Jaeobites, restore the house of Stuart in England, Cardinal Alberoni, then all-powerful in Spain, promising to assist in the accomplishment of this part of the projeet. The other allics had lately been showing a marked jealousy of the growing power of the czar, and it was no difficult matter for Gortz to detach Lim frem the allianee and negotiate a

peace on the part of Sweden. This first step being successfully accomplished, Charles burst into Norway, speedily occupied several provinces, and in the early winter of 1718 besieged Fredrikshall, a strong fortress, which was regarded as the key of Norway. On Sunday, November 30, accompanied by his staff, and by Siguicr and Maigret, two French officers in his service, he visited the trenches in the afternoon, Arrived in

the foremost trench he found fault with the progress of the work, sent for some more sappers, and leaning on the gabions in front of the trench, himself directed their operations. Night came on rapidly, but stil] he remained there exposed to the shot of the fortress, for the Danes threw up light-balls, and kept up a continual fire from their batteries. His officers in vain endeavonred to persuade him to retire from his dangerous post, he obstinately refused even to shelter himself behind the gabions, though several of those around him had been struck, and about nine o'clock, when the moon had risen and shining on the snow made the night alinost as bright as day, a well-aimed shot struck him on the temple, his head fell forward, his hand instinc- tively grasped his sword hilt, and his officers running up found him leaning over the gabions dead. A musket ball had passed through his head, destroying his Icft eye and driving the right out of its orbit. The shot put an end at once to the invasion of Norway, the projects of Gortz, and the power of Sweden in the north of Europe.

Before the end of the following year it began to be whispered that the shot which killed Charles came not from the ramparts of Fredrikshall, but from the Swedish trenches. The two French officers were in turn pointed out as the probable assassins, and Siguier in the ravings of fever actually charged himself with the murder. On his recovery he denied it, but his involuntary self-accusation was generally believed in preference to his denial. Others laid the alleged crime upon the Swedish generals Cronstadt and Stiernross, and it was said that they had been bribed to break up the project of Gortz by a successful pistol-shot before Fredrikshall. In 1746 the tomb of Charles XII. was opened and the remains were examined in order to see if in this way the question could be settled. The officials charged with the examination secm to have known very little about surgery. They at first suggested that the hole through the skull was made by a dagger ; then apparently misled by their ignorance of the well-known fact that the wound at the point of exit is almost invariably larger than that at the poiut where the bullet enters, they alleged that the ball had struck the right side of the king's head, which was turned away from the fortress, This naturally con- firmed the belief that he had been assassinated, although a

great mass of concurrent testimony tended to exculpate |

every one who had been charged with the crime. ‘To solve the mystery of his death, the body was again ex- humed by Charles XV., so recently as 1859, when a care- ful examination of the skull by three eminent medical professors led to the conclusion that the fatal shot had been fired from a distance on the king’s left, and from a higher level than that on which he stood. Thus it was finally proved that Charles fell, not by the hand of a traitor, but from his recklessly exposing himself to the fire of the fortress,

The character of Charles was a strange mixture of good and evil. In him almost everything was vitiated by a kind of exaggeration. Thus his courage at times degenerated into rashness, his determination into mere obstinacy. While we praise his temperate and simple habits, we cannot be sure that, in despising the ostentation and luxury of his brother kings, he was not actuated by a subtle vanity that made him more proud of the blue coat with copper buttons than another would have been of a richly

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‘the Russians.

[oF SWEDEN.

embroidered uniform. His victories and conquests arc all the more wonderful when we consider how young he was at the time of his greatest achievements. He was only eighteen when he extorted a peace from Frederick of Denmark and defeated the Russians at Narva, and he was only twenty-one when the victory of Clissow madc him master of the destinies of Poland. War had not in those days the lightning rapidity of modern times, or Charles might have more than rivalled the victories of the first Napoleon. But he was really little more than a soldier ; as a statesman he must be placed below the second rank, and the only result of his reign was the weakening and impoverishment of his kingdom. He found Sweden one of the first powers of Europe, he left her fallen to a secondary place, and she has never recovered her former position.

See the histories written by his chaplain Norberg and by Alder- field, one of his officers. Voltaire's well-known memoir is useful, but contains several inaccuracies. There are also very full bio- graphies by Fryxell and Lundblad. Among contemporary publica- tions there is a curious account of his wars ‘‘ by a Scots gentleman in the Swedish service," the first edition of which appcarcd in London in 1715, before the death of Charles, the second in 1718. The real author was Danicl Defoc. (A. H, A.)

CHARLES XIII. (1748-1818), king of Sweden, was the second son of Adolphus Frederick and of Louisa Ulrica, sister of Fredcrick the Great. He was educated for the office of high-admiral, and commanded with credit against On the accession of his brother Gustavus ITI., in support of whom he exerted all his influence, he was appointed governor of Stockholm and created duke of Sudermania; and he became regent when Gustavus was assassinated in 1792. In 1796 Gustavus IV. camc to his majority, and Charles retired from political life. But when Sweden was threatened by the arms of Napoleon, Gustavus directed his forces with an incapacity so remark- able that the people refused any longer to bear his govern- ment. In March 1809 he was obliged to abdicate ; and in May the crown was offered to Charles. A year after, Prince Christian, the heir appointed by the States, having died, Charles, yielding to the wish of the nation, nomi- nated Charles Bernadotte prince royal, and gave the government into his hands,

though still retaining the title and some of the dignity of king. After occupying this position for eight years, Charles died in February 1818.

CHARLES XIV., king of Sweden. See BERNADOTTE.

CHARLES XV. (1825-1872), king of Sweden and Norway, succeeded to the throne in 1859, on the death of his father, Oscar I, son of Charles XIV. His rule was popular and liberal. The most important event in his reign was the change which was effected in 1866 in the consti- tution of the Storthing, or parliament, which, from that time has consisted not of four but of two chambers—the first being elected by the provincial representatives, the second by the people. In character Charles was generous and kindly, and his disposition is shown in his refusal to sanction capital punishment. He possessed considerable taste for literature and art, and published a volume of poems, which were translated into German by A. Van Winderfeld (Berlin, 1866). In 1850 he married Louisa, daughter of the king of the Netherlands, by whom he had one daughter, Louisa, who became the wife of Prince Frederick of Denmark. His relations with Denmark were of the most intimate kind, owing to his personal friendship with the king; but during the struggle of that country against the aggressions of Prussia he was obliged to remain neutral, since neither Sweden nor Norway would take up arms. Charles died September 18, 1872.

CHARLES, count of Anjou and Provence, king of Naples and Sicily, born between the years 1220 and 1226, was the ninth son of. Louis VIII, of France,

He married Beatrice, heiress of Provence, after scattering his rivals by the aid of an army furnished by his brother, Louis IX. Soon after he accompanied the king on a crusade, during which he fought with bravery, but achieved no permanent success, and he was at last taken prisoner with his brother. During his absence most of the towns of Provence formed themselves into republics; but on his return they were quickly subdued, and, among others, Marseilles lost the independence she had before enjoyed.

Charles’s power was now very considerable; but his ambition was far from being satisfied. He therefore un- scrupulously lent his arms to Margaret of Flanders, who offered him the province of Hainault in return for his assistance in setting aside her husband’s children by a former wife in favour of her own; but this scheme was erushed by Louis, who caused him to give up Hainault for a sum of money. Charles had now, besides, conceived a loftier ambition, He had been requested to assume the crown of the two Sicilics by Pope Urban IV., who desired to overthrow the bastard Manfred, the Ghibelline king ; and in 1265 he was crowned at Rome. A crusade

oD) was preached against Manfred, who was defeated and slain.

The legitimate heir, Conradin, was also routed (1268), and –

being betrayed, was meanly tried and executed; a similar fate befell a large number of Italian nobles; many fiefs were confiscated to reward the French followers of the new king; and the rule of the Provengals was often arbitrary and brutal. Charles’s ambition continued to widen. He now designed to make himself the head of tho Eastern empire. With this end in view, he again accompanied his brother on a crusade; but the accomplishment of his ultimate design was prevented by a terrible storm, and by the outbreak of the plague. He also incurred the cnmity of the Pope, Nicholas III., by haughtily refusing to accept the hand of his nicce for his own grandson. Nicholas joined the Ghibellines, and took from Charles, who offered no resistance, his titles of senator of Rome and vicar-gencral of Italy. But in 1280 Nicholas died, and Charles, by meaus of many intrigues, and after imprisoning two of thie cardinals, effected the election of a Frenchman, Martin IV. In return, he was made senator of Rome, and his rival, the Emperor Michael Palzeologus, was excommunicated. An- other expedition was already fitted out against the Hast, when news was brought of the rebellion known as the Sicilian Vespers. Aroused by the rough rule of the French, the people were also stirred by the burning exhortations of John of Procida, a Calabrian doctor, formerly friend of Frederick and of Manfred, who had been travelling in disguise through Italy, Greece, and Spain, seeking assistance against the usurpation of Charles. On Easter Monday, 1282, he collected a large assembly of the Sicilian nobles at Palermo. An opportune pretext for a rising soon occurred. ‘The viceroy had forbidden

the bearing of arms ; and, on the pretext that weapons were concealed under her dress, a Frenchman insulted a girl of noble family on her very passage to the church where she was about to be married. He was killed on the spot, and every Frenchman in the city soon shared his fate. Some of the other Sicilian towns followed this example; others expelled the French laore mildly. Charles at once directed his fleet against Messina. He refuscd all offers of capitulation, and Messina held out till aid was brought it by Don Pedro of Aragon, and Charles's fleet was burned by the famous sailor, Roger de Loria, Charles, despairing of other means of success, now challenged Pedro to single combat Pedro accepted the challenge, but Charles alone entered the lists. It is said that the former was dissatisfied with the arrangements, though others regard his acceptance as a mere ruse. Soon after Charles's son was defeated and taken prisoner, and in

1285 Charles himself fell ill, and died at Foggia,

CHARLES II. (1332-1387), king of Navarre and count of Evreux, was a grandson of Louis Hutin, and possessed a title to the French throne inferior to that of John IT. only on account of the Salic law, and superior to that of Edward Ill. of England. Handsome, clever, cloquent, and bold, he yet thoroughly deserved the title of "the Bad" with which he mounted the throne in 1849, at the age of six- teen. The commencement of his notorious career was the assassination of Le Cerda, the favourite of John, who had been appointed to the duchy of Angouléme, which the king had bought from Charles's mother, but of which the price was not yet paid. Tor this deed,—which Charles openly avowed, declaring it to be a punishment richly deserved,— John was at first unable to retaliate, being indeed obliged to make good his debts ; but not long after (1356) Charles was seized and thrown into prison, During the king's exile in England, Charles, aided by the States-General, obtained his release, and by his eloquence and the suavity of his man- ners gained the hearts of the Parisians, who made him their captain-general. Suspecting him, however, of too great favour for the aristocracy, they deprived him of the office ; but he maintained his alliance with Stephen Marcel, and, at the head of companies of banditti he con- tinued to lay waste the country till 1360, when he made peace with the king. This peace was not final, for Charles V. was resolved to crush him. He was accused of various unscrupulous plots, and extravagant stories were

circulated against him, as, for example, that the king's weakness was duc to poison administered by his contrivance, On the – charge of being concerned in these intrigues, two of his ministers were executcd, and his two sons were seized as hostages. The duke of Anjou was persuaded to attack Montpellier, the king of Castile to invade Navarre, and Duguesclin was sent to seize his fiefs in N ormandy, and Charles was obliged to yield twenty placcs as security before he regained his territory. According to the popular story, he expired by a divine judgment, through the burning of the clothes stecped in sulphur and spirits in which he had been wrapped as a cure for a loathsome disease caused by his debauchery; but the bishop who attended him affirms that he died placidly and in the odour of sanctity (1387). See Sccousse, Histoire de Charles le-Mauvais.

CHARLES IV. (1421-1461), king of Navarre, was the son of John of Aragon, and of Blanche, daughter and heiress of Charles IIT, king of Navarre. On her death the throne belonged to Charles, but his father retained it, and took as second wife the ambitious and unscrupulous Jeanne of Castile. Charles did not press his claim, but devoted himself to literature, until his step-mother roused him by repeated indignities. He succeeded in having himself crowned, but soon after was defeated and imprisoned (1652). Next year he was released ; the struggle recom- menced, and he gained possession of a considerable part of Navarre. He was reconciled to his father, and recog- nized as king of Barcelona; but Jeanne caused him to be arrested and poisoned, He was a man of gentle disposition, and of considerable learning. He left a Spanish transla- tion of the Lthics of Aristotle, a chronicle of the kings of Navarre, and several poems.

CHARLES, or Cuarxes Lours (1771-1847), archduke of Austria, was the third son of the Emperor Leopold II. He commenced active service against the French at the age of twenty-two, and so distinguished himself that at twenty-five he was intrusted with the supreme command of the army of the Rhine. He defeated Jourdan at Teiningen, Amberg, and Wiirzburg, and Moreau at Rastadt ; and the year after (1797) he was honoured with the command against Napoleon in Italy. In a month, however, peace was concluded; but the war soon re- commenced, and in 1799 Charles defeated Jourdan onca

more in Swabia, and then checked Masséna in Switzerland. After this he was forced by ill-health to retire from service. He was appointed governor of Bohemia; but it was not long before he had again to oppose his old enemy Morcau, with whom he made terms which were afterwards taken as the basis of the peace of Lunéville. His popu- larity was now such that the Diet of Ratisbon, which met in 1802, resolved to erect a statue in his honour, and to give him the title of Saviour of his Country; but Charles refused both distinctions. He was for some time president of the council of war, but in 1805 he was once morc in Italy, where he won the victory of Caldiero over Masséna. On his return to Austria he became commander-in-chief and again president of the aulic council of war. He employed his time in organizing the army and establish- ing a strong reserve force, till in 1809 he took the field against the French army commanded by Napoleon in person. He carried on the conflict for five days, and fought with great gallantry ; but at last, being wounded and overpowered, he retreated in good order. At the end of the campaign he gave up all his military offices, and spent the rest of his life in retirement, with the exception of a short time, when on the return of Napoleon from Elba, he became governor of Mayence, He published Grundsditze der Strategve (1814), and Geschichte des Feldzugs von 1799 in Deutschland und der Schweiz (1819).

CHARLES, the Bold (1433-1477), duke of Bur- gundy, born in 1433, was the son of Philip the Good of Burgundy and Isabella of Portugal. Remarkable both for his personal qualities and also for his position as the leader of the last great struggle of the feudal lords against royalty in France, and as the life-long enemy of crafty Louis XL, Charles was the last great figure of the Middle Ages. His physical strength and energy were extraor- dinary. He was full of the most lofty ambition, and capable of the most obstinate determination, He never forgot an injury. His passion was terrible and frequent. His boldness amounted to the rashness of fury. He was careless of luxury, though, in imitation of the ancicnt con- querors about whom he loved to read, he delighted to surround himself with magnificent display ; and he pre- sented an example of conjugal fidelity most remarkable in the society in which he lived.

As Charles rose to manhood, he found his father under the .control of the Croys, whose usurpation of what he regarded as his own rightful function he deeply resented ; and he allowed himself to be banished rather than take one of the family into his household. Soon after—he was at this time count of Charolais—he joined the duke of Brittany in forming a great confederation of the French nobles against King Louis. The confederates, calling themselves the League of the Public Weal, declared that their object was to get rid of bad ministers, to abolish taxes, and relieve the people from oppression. They maintained good discipline, paid for al] they consumed, and consequently were opposed neither by the townsmen nor by the country-folk, while the gentry with their dependants flocked to their standard. In 1465 Charles met the royal army in the battle of Montlhéry, which was decided by the retreat of the latter during the following night. Paris was besieged; and Louis was forced to surreuder Normandy to the duke of Berry, tle towns on the Somme and the counties of Boulogne aud Guienne to the count of Charolais, and other territory to other of the nobles, Charles's next exploit was the conquest of Liége, which, hitherto ruled democratically under the constitu- tional control of its bishop, was now struggling against the encroachments of Burgundy. The town of Dinant alone he excepted from the peace which he granted to the rest of the principality; and a year later he returned to take ven-

geance upon it. Its crime was that some of its apprentices lad insulted himself and his mother by burning him in efligy as a bastard, and its punishment was an extravagant revenge. It was burned to the ground; of its men numbers were butchered, and the rest remained the unfortunate prisoners of the rude soldiery. The women were spared to be exposed to the extremes of cold and hunger, but were saved from worse treatment by the stern regard for female honour, which was Charles's most admir- able characteristic.

At the age of thirty-four (1467) Charles became duke of Burgundy. Immense changes were at once effectcd. He permitted none of the gay festivity and wasteful pro- fusion which had been common in his father's timc, but the court was directed with a stately and splendid cere- mony, in

which the duke took his full share. Everything was arranged, though liberally, yet with strict order and economy ; the state of the fiuances was carefully examined, and the amount in the treasury was largely increased by unusual demands from the Estates, Every petitioncr, how- ever humble, was heard ; the duke shirked no details of business, was present at every council, and sharply rebuked or punished with a fine any absence or inattention on the part of the courtiers. A strict system of administering justice was instituted, and the law was carried out impartially even in the case of the most popular of the nobles.

Soon after his accession Charles increased his political influence by taking as his second wife Margaret the sister of Edward IV, of England. It was not long before he required all his power; for soon Louis egain took possession of Normandy, and contrived to detach the duke of Brittany from his alliance with Burgundy. But Charles at once made ready for war, and the king in alarm took the daring step of requesting a meeting, and placing himself in the duke's hands at Peronne. Unfortunately for Louis, he had been for some time inciting the people of Liége to rebellion, and they chose this moment for an outbreak. Charles was mad with indignation, and with great difficulty restrained himself from taking vengeance upon the person of the king. After three days of irrepressible passion his wrath was so far spent that he contented himself with requiring Louis to undergo the ignominy of witnessing the punishment of the revolt which he had himself instigated, and with extracting from him a treaty, which, among other most important concessions, confirmed to the duke the possession of the territory which he then held, sanctioned the alliance with England, and took away the right of appeal from the courts of Flanders to the Parliament of Paris. In case of violation of this compact, the hing invoked upon himself the curse of excommunication and the loss of the fealty of Burgundy ; and a letter, signed by Louis, was despatched to cach of the princes of the blood, requiring them in that event to jtake up arms against him.

Soon after this Liége was burned, like Dinant, and its inhabitants nearly exterminated, the fighting-mcn being mostly butchered, and the aged, the women, and the children exposed to the terrible cold; and the powerful city of Ghent, whose mob had forced from the duke the abolition of the hated cueillote and certain other concessions during his passage through the city

before his coronation, was fain to avert his auger by giving up all, and allowing its charter to be annulled.

Charles had now reached the height of his power, but his greatness was unsubstantial. His subjects were becoming much estranged from him, The placid trade-loving Nethcrlanders found it hard to bear his arbitrary and haughty passion, The courtiers became weary of the stiff ceremonial] of the court and the constant toil they wero

obliged to undergo. Comines (seeing, as he tells 1g; that his master was madly rushing to destruction, but, as we can perceive, also affected by the promises of Louis) went over to the court of France. The king was now bold enough to reverse his hypocritical policy, and deny the validity of the treaty which he had signed under constraint at Peronne; and the towns on the Somme, never loyal to Burgundy, were reattached to France. The consequent war was, however, carried on by Charles with his usual success and his usual extravagance of severity.

His ambition and his policy were now changed, He cared no longer to make the lords independent of the king, but aimed at erecting a kingdom with himself as indepen- dent sovereign. Circumstances enabled him to obtain the reversion of Gueldres; and he entered into negotiations with the Emperor Frederick, to whose son he agreed to marry his daughter on condition that he should himself be elected king of the Romans. The emperor proposed instead to crown him king of Burgundy. A meeting, enlivened by a protracted round of gorgeous jousts and feasts, was held at Tréves (1473), in order to carry out the latter proposal; but the electors made a protest to Frederick, who was not remarkable for decision, and persuaded him to flee secretly by night,

In 1469 Sigismund, duke of Austria, being in great financial difficulty, had sold Alsace to Charles. The governor appointed by the latter was Peter von Hagenbach. His boldness as a soldier, his rough shrewdness, and his capacity for strong government had recommended him ; but horrible stories were told of his brutality, his licence, and his blasphemies, He did indeed terrify the country into order, but his severity at length excited people and

nobles alike against him, and he was tortured and condemned to death by a court of deputies, repre- senting the Alsatian towns, with Bern, and one or two others. Charles did not fail to take signal ven- geance, and the country was given up to indiscriminate slaughter and devastation. But he was now surrounded by powerful and determined enemies. He had himself refused to renew the treaty with Louis, who had on his part purchased the alliance of the Swiss. Sigismund of Austria, now desirous of redeeming Alsace, but having no objection to save his money, had been concerned in the rebellion of that province, and afterwards openly joined the French. But, notwithstanding all this, aud in spite of the prohibitions and threats of the emperor, Charles pre- pared for the invasion of Cologne, in support of its bishop- ruler, by whose means he expected to bring the city under his own control. Asa preliminary he attacked the strong town of Neuss. For eleven months it appeared that nothing could tear him from the siege. The Swiss routed his army, and ravaged Franche-Comté ; the French army laid waste his territory and pillaged his towns; the emperor opposed him with a large force; the Pope commanded him to desist. At length he came to an undersianding with the emperor. Neuss was put under a papal legate, and the fate of Cologne was left in the hands of the Holy Father (June 1475).

Immediately after this the English landed at Calais, but only to sign a treaty of peace with Louis at Picquigny. Yet Charles did not give up heart; and an important acquisition was made in the conquest of Lorraine. Again the Swiss took the aggressive, and possessed them- selves of the Pays de Vaud. Notwithstanding his capture of Grandson, Charles was plainly overmatched; and, in 1476, he was utterly routed by them at Morat with immense slaughter. Still with no thought of yielding, he devoted himself with all his energy to raise and organize afresh army. In a few months he was once more ready for war. René had raeauwhile recovered Nancy; but

soon, through the cowardice of the Alsatians, he was deserted, and his capital was invested by Charles. But René’s triumph was at hand. The assistance of the Swiss was gained, and the Burgundians were attacked by an enemy they could not resist. On the 5th of January 1477 the battle took placa. The Burgundians were scattered, and next day the massive body of Charles the Bold was found in a ditch, mutilated by several deadly wounds.

It was buried at Nancy, but in 1550 his remains were removed to Bruges by Charles V.

See Comines, Mémotres; De Barante, Histoire des ducs de Bour- gogne; J. Foster Kirk, Charles the Bold. (T. M. W.)

CHARLES ALBERI1′ (1798-1849), king of Sardinia, was the son of Charles Emmanuel of Savoy Carignano. In his youth Charles became attached to the national party in Italy, and even formed a connection with the Carbonari. In 1821 Victor Emmanuel, on his abdication, appointed him regent; and he now availed himself of the oppor- tunity for carrying out a liberal policy. He confirmed the constitution which had lately been established on the model of the new Spanish constitution, and which con- sisted of an assembly of one chamber, with a king de- prived of the right of veto and of almost all real power. The approach of the Austrians, however, and the declaration of the new king, Charles Felix, refusing to recognize his acts, caused him to flee secretly from Turin after holding the regency little more than a week, and he was afterwards forbidden to;enter the Sardinian court. In 1823 he served as a volunteer in the French army which invaded Spain in order to overthrow its new constitution; and by thus de- serting his principles he obtained permission to return to Turin. He was fora few months, in 1829, viceroy of Sardinia ; and in 1831 he succeeded Charles Felix on the throne. He felt obliged to resort to severe measures in order to secure his throne against the secret societies, of which the chief at that time was the society of “ Young Italy,” which had been founded by Mazzini. In 1847 risings took place in Sicily, Rome, Tuscany, aud Naples ; the Austrians were expelled from Milan, and the people of Piedmont gained the re-establishment of the constitution which Charles liad advocated in his youth. At the same time Charles greatly increased the freedom of the press. During the next year he marched against the Austrians, who had already been broken by defeat, and who at once retreated. On the last day of April 1848 he won the victory of Pastrengo, and in the end of May, that of Goito. But two months after he was defeated at Custozza by Marshal Radetsky, and forced to retire to Milan, where he made an armistice with the Austrians, and, contrary to his promise, surrendered the city. On the expiration of the truce Charles again took up arms. A battle ensued with Radetsky at Noyara, in which the Piedmoutese army was rapidly and

completely routed, though the king risked his life bravely, and some thought cven desperately. An armistice was again sought, but the terms offered by Austria were such that Charles abdicated in favour of his son Victor Emmanuel II. He died four months later, on 28th July 1849. Charles did what he could to further commerce and to popularize art and science, and appears, notwithstanding apparent inconsistencies, to have sincerely desired the good of his people.

CHARLES AUGUSTUS (1757-1828), grand-duke of Saxe-Weimar, having been early deprived of his father, was educated under ‘the governorship of Count Gortz, and among his tutors were Wieland, Knebel, Seidler, and Hermann. At seventeen he commenced his friendship with Goethe, who afterwards joined Schiller, Wieland, and Herder in forming the company of men of genius that dis- tinguished his court. Charles assumed the direction of the government at the age of eighteen; and “ the next year

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entered the Prussian army, in which he remained till after the defeat at Jena (1806), when he became a member of the Rhenish confederacy, and furnished aid to the French. In 1813, he joined the coalition against Napoleon, and took the command of an army of Saxons, Hessians, and Russians. He fought among the Allies in 1815; and at the Congress of Vienna he received as reward for his services the enlarge- ment of his principality, and its erection into a grand- duchy. Charles died in 1828, His correspondence with Goethe was published in 1863 at Leipsic.

CHARLES EDWARD, or, in full, Cuartus EDwarpb Louis Pamir Castmir (1720-1788), was born on the 3Ist December 1720. He was the elder son of James, known as the Pretender and the Chevalier St George. Grandson of James II. and nephew of Anne, he was heir of line of ’ both these sovereigns ; but the hereditary rights of his father and himself had been declared null under the Proclamation of Rights and other parliamentary enactments which fol- lowed and completed the Revolution of 1688.

The young prince was educated at Rome, his mother, by blood a Sobieski, superintending his studies for some years. On the whole his education was good ; he became conversant with the French, Italian, and Latin languages, and his religious training was watched with interest by the Pope. His father's miniature court was frequented by English and Scottish noblemen of Jacobite sympathies, by foreign enemies of the house of Hanover, and by bigoted supporters of the Romish faith ; and the influence of this society is distinctly evident upon his after life. In 1734, the duke of Livia, afterwards duke of Berwick, who was proceeding to join Don Carlos in his struggle for the crown of Naples, passed through Rome. He offered to the Pretender to take charge of his son, should Charles be willing to accompany him in his expedition. This offer was accepted, and the youth of fourteen, having been appointed general of artillery by Don Carlos, shared with credit the dangers of the successful siege of Gaeta.

The handsome and accomplished youth, whose doings were eagerly reported by the English ambassador, was now introduced by his father and the Pope to the highest Italian society, which he fascinated by the frankness of his manner and the grace and dignity of his bearing. To these, more than to any power of his mind or heroism of his career, are to be attributed the successes of his early life. James despatched his son on a tour through the chief Italian cities, that his education as a prince and man of the world might be completed. The distinction with which he was received on his journey, the royal honours paid to him in Venice, and the jealous interference of the English ambassador in regard to his reception by the Grand Duke of Tuscany, show how great was the respect in which the exiled house was held by forcign Catholic powers, as well as the watchful policy of England in regard to its fortunes.

The Pretender himself calculated upon foreign aid in his attempts to restore the monarchy of the Stuarts; and the idea of rebellion unassisted by invasion or by support of any kind from abroad was one which it was left for Charles Edward to endeavour to realize. Of all the European nations France was the one on which Jacobite hopes mainly rested, and the keen sympathy which Cardinal Tenein, who had succeeded Fleury as French minister of war, felt for the Pretender resulted in a definite arrange- ment for an invasion of England to be timed simul- taneously with a pre-arranged

Scottish rebellion. Charles was secretly despatched to Paris. A squadron under Admiral Roquefeuille sailed from the coast of France. Transports containing 7000 troops, to be led by Marshal Saxe, accompanied by the young prince, set sail for England. The sight of the English fleet and a severe storm effected, however, a complete disaster without any actual engagement

having taken place. The loss in ships of the line, in transports, and in lives was a crushing blow to the hopes of Charles, who remained in France in a retirement which he keenly felt, and which he resolved to quit by a personal visit to Scotland.

He had at Rome made the acquaintance of Lord Elcho and of Murray of Broughton; at Paris he had seen many supporters of the Stuart cause ; he was aware that in every European court the Jacobites were represented in earnest intrigue ; and he had now taken a considerable share in correspondence and other actual work connected with the promotion of his own and his father's interests. Although dissuaded by every friend he had, he, on 13th July 1745, sailed for Scotland on board the small brig ‘“‘ La Doutelle," which was accompanied by a French man-of-war, " The Elizabeth," laden with arms and ammunition. "The Elizabeth" fell in with an English man-of-war and had to return to France, while Charles escaped during the engagement, and at length arrived on the 2d of August off Erisca, a little island of the Hebrides. Receiving, however, but a cool reception from Macdonald of Boisdale, he set sail again and arrived at the bay of Lochnahuagh, on the west coast of Inverness-shire.

The Macdonalds of Clanranald and Kinloch Moidart, along with other chieftains, again attempted to dissuade him from the rashness of an unaided rising, but they yiclded at last to the enthusiasm of his manncr, and Charles landed on Scottish soil in the company of the "Seven Men of Moidart," who had come with him from France. LEvery- where, however, he mct with discouragement among the chiefs, whose adherence he wished to secure; but at last, by enlisting the support of Cameron of Lochiel, he gained a footing for more than a miniature rebellion. With secrecy and speed communications were entered into with the known leaders of the Highland

tribes, and on the 19th of August, in the valley of Glenfinnan, the standard of James ITI. and VIII. was raised in the midst of a motley but: increasing crowd.

On the same day Sir John Cope, at the head of 1500 men, left Edinburgh in search of Charles ; but, fearing an attack in the Pass of the Corryarrick, he changed his proposed route to Inverness, and Charles thus had the undefended south country before him. In the beginning of September he entered Perth, having gained numerous accessions to his forces on his march. Passing through Dunblane, Stirling, Falkirk,-and Linlithgow he arrived within a few miles of the astonished metropolis, and on the 16th of September a body of his skirmishers defeated the dragoons of Colonel Gardiner in what was known as the “Canter of Coltbrig.” His success was still further augmented by his being enabled to enter the city, a few of Cameron’s Highlanders having on the following morning, by a happy ruse, secured the Netherbow Port. On the 18th he occupied Holyrood.

Cope had by this time brought his disappointed forces by sea to Dunbar. On the 20th Charles met and defeated him at Prestonpans, and rcturned to prosecute the siege of Edinburgh Castle, which, however, he raised on General Guest’s threatening to lay the city in ruins. In the beginning of November Charles left Edinburgh never to return. He was at the head of at least 6000 men; but the ranks were speedily thinned by the desertion of High- landers, whose experience had led them to consider war merely asa raid and an immediate return with plunder. Having passed through Kelso, he, on the 9th November, laid siege to Carlisle, which capitulated in a week. On the 4th of December he had reached Derby and was within two days’ march of London, whosc inhabitants were terror- struck, and where a cominercial panic immediately ensued. Two armies under English leadership were now in the ficld

against him,~-the one under Marshal Wade, whom he had evaded by entering England from the west, and the other under the duke of Cumberland, who had returned from the Continent. London was not to be supposed helpless in such an emergency ; Manchester, Glasgow, and Dumfries, rid of his presence, had riscn against him, and Charles paused,

There was division among his advisers and desertion among his men, and on the 6th of December he commenced his retreat.

Closely pursued by Cumberland, he marched across the border, and at last stopped to lay siege to Stirling. At Falkirk, on the 17th of January 1746, he defeated General Hawley, who had marched from Edinburgh to intercept his retreat. A fortnight later, however, Charles raised the siege of Stirling, and after a weary though successful march, rested his troops at Inverness. Having taken Forts George and Augustus, and had varying success against the supporters of the Government in the north, he at last pre- pared to face the duke of Cumberland, who had passed the early spring at Aberdeen. On the 8th of April the duke marched thence to meet Charles, whose little army, ex- hausted with a futile night march, half-starving, and broken by desertion, he engaged at Culloden on 16th April 1746. The decisive and cruel defeat sealed the fate of Charles Edward and the house of Stuart.

Charles fled. Accompanied by the faithful Ned Burke, and a few other followers, he gained the western coast. Hunted hither and thither, the prince wandered on foot or cruised restlessly in open boats among the many islands of the west. The barren Benbecula sheltered him fora month. In lack of food, unsightly in appearance, having a strange contentment under his misfortunes, and already betraying his weakness for liquor, Charles, upon whose head a price of £30,000 had a year before been set, was relentlessly pursued by the spies of the Government. Disguised in women’s clothes, and aided by a passport obtained by the devoted Flora MacDonald, he passed through Skye, and parted from his conductress at Portree. Shortly afterwards he was again on the mainland, and in the end of July he took refuge with the “ Seven men of Glenmoriston,” a body of outlawed Jacobite freebooters, with whom for a time he was safe. Having joined Lochiel and Cluny Macpherson, he at last heard that two French ships were in waiting for him at the place of his first arrival in Scotland—Loch- nahuagh.

He embarked with speed, and sailed for France. Lre- long he was again intriguing in Paris, and even in Madrid. So far as political assistance went his efforts were in vain ; and he plunged eagerly into the gaieties of Parisian society, of which he was the hero for some years.

The enmity of the English Government to Charles Edward made peace with France an impossibility, so long as she continued to harbour the young prince. A condition of the treaty of Aix-la-Chapelle, concluded in October 1748, was that every member of the house of Stuart should be expelled the French dominions. Charles had forestalled the proclamation of the treaty by an indignant protest against its injustice, and a declaration that he would not be bound by its provisions, But his indignation and persistent refusal to comply with the request that he should voluntarily leave France had to be met at last with force ; he was apprehended, imprisoned for a week at Vincennes, and on the 17th December conducted to the French border. He lingered at Avignon; but the French, com- pelled to hard measures by the English, refused to be satisfied; and the Pope, under threat of a bombardment of Civita Vecchia, advised the prince to withdraw. Charles simply and quietly disappeared ; and for years Europe watched for him in vain. It is now established, almost

with certainty, that he returned to the neighbourhood of |

Paris; and it is supposed that his residence was known to the French ministers, who, however, firmly proclaimed their ignorance. In 1750, in 1752, and again, itis thought, in 1754, he was even in London, hatching futile plots and risking his safety for his hopeless cause.

During the next ten years of his life Charles Edward lad become a confirmed profligate. His illicit connection with a Miss Walkenshaw, whom he had first met at Bannockburn House while conducting the siege of Stirling, his imperious fretful temper, his drunken habits and debauched life, could no longer be concealed. He wandered over Europe in disguise, alienating the friends and crushing the hopes of his party; and in 1766, on the death of his father, he was treated even by the Pope with contempt, and his title as heir to the British throne was openly repudiated by the great powers.

It was in 1772 that France, still intriguing against England, arranged that Louise, Princess of Stolberg, should marry the besotted prince (now passing under the title of Count Albany) who twelve years before had so cruelly maltreated his paramour that she had left him for ever. Six years afterwards, however, the countess had to take refuge in a convent. Her husband’s

conduct was brutal, and her own life was in danger at his hands. Her suspected attachment to Alfieri the poet and the persistent complaints of the prince at last brought about a formal separation, and Charles Edward, lonely, ill, and evidently near death, remained at Florence. In remorse he wrote for his daughter, the child of Miss Walkenshaw, and she remained with him, under the name of duchess of Albany, during the last two years of his life. He died at Rome on the 31st of January 1788, and was buried in the Grotte Vaticane of St Peter's.

See Earl Stanhope's The Forty-Five, Chambers's History of the Rebellion of 1745-6, Burton's History of Scotland, Hayward's Essays, vol. ii., Hale's Full of the Stuarts, Ewald's Life and Times of Charles Stuart, The Autobiography of Flora Macdonald, &e.

CHARLES EMMANUEL L, The Great (1562-1630), duke of Savoy, succeeded his father Philibert Emmanuel in 1580. After having fought in alliance with Spain, France, and Germany, he laid claim to the throne of France on the death of Henry III. He became involved in war with Henry IV. and also with the Swiss, and was defeated at St Joire in 1589. But the peace to which his defeat com- pelled him was soon broken, and he joined the Catholic league. He gained several successes, and obtained posses- sion of Saluzzo, for which he had fought both with Henry III. and Henry IV. He next attacked Geneva, but without success ; and his alliance with France against Spain was equally unfortunate, for Henry IV. dying, the regent made peace with Spain, and Charles was compelled to follow her example. After this he conquered Montferrat, which, however, he was unable to retain; and in 1619 he laid claim to the imperial crown without success. New leagues against Spain and against the Genoese followed, But finally the French conquered Savoy and part of Piedmont, and Charles died overwhelmed with misfortune.

CHARLES MARTEL (about 689-741), was an illegitimate son of Pepin d'Heristal, duke of Austrasia and mayor of the palace of the Merovingian kings of France. The wildness of Charles's youth, and most of all the suspicion that he was concerned in the murder of his brother, totally estranged the affection of his father, who left the mayoralty to one of his grandsons, and the regency to his wife. The Austrasians, however,

unwilling to be ruled by an infant and a woman, made Charles their duke. His life was from that time one continual battle, of which the result was to lay the foundation of the modern, French kingdom. He subdued the Neustrians, and made himself mayor of the palace ; he forced the duke of Aquitaine to do

homage to the French crown; he drove back the Saxons, Bavarians, and other German tribes, who ravaged the fron- tier ; and he compelled the Frisians to embrace Christianity. But by far his most important achievement was the victory which he won between Tours and Poitiers in 732, when he finally stayed the northward advance of the Saracens, and thus inaterially affected the subsequent course of Kiuropean history. It is a commonly accepted tradition that it was his valour in this battle which gained him the title of Martel, or “the Hammer.”

appointing another nominal king, though he never altered his own title. He divided his territory between his two sons, Pepin and Carloman, the former receiving Neustria,

the latter Austrasia ; and on the death of Carloman, Pepin

gained possession of the whole kingdom, and assumed the title of king. Of the favour of the church Charles Martel was careless; he seized her lands to reward his warriors ; and though he more than once defended the Pope, his name was execrated by the clergy, who were fond of painting him amid the torments of hell.

CHARLESTON, a city, a seaport, and the capital of Charleston county, South Carolina, United States, is situated in 32° 45’ N, lat. and 79° 57’ W. long. It stands upon a flat tongue of land pointing south-eastward between the Ashley and Cooper rivers, which here de- bouche into a spacious harbour extending about 7 miles south-east to the Atlantic, with an average width of two miles. The harbour is surrounded by land on all sides except the entrance, which is about one mile wide and 18 feet deep. The water in the harbour, however, is very much deeper, and the work of increasing the depth of the entrance is in progress. Fronting the Atlantic, and extending

northwards, is Sullivan’s Island, about six miles long; and on the other side of the eutrance is Morris Island which stretches to the southward. Both islands are penetrated by channels. The harbour is well defended, —at its entrance by Forts Sumter and Moultrie, and in- side by Castle Pinckney and Fort Ripley.

Owing to the lowness of the ground on which it is built, Charleston presents a peculiarly picturesque appearance from the harbour. Its spires and public buildings seem to rise out of the sea, while the richness of the surrounding foliage gives the place a particularly engaging aspect. Its proximity to the ocean tends materially to the equalization of the climate. In June 1874 the mean temperature in January was 52° 1’, in June 81°, in July 79° 3’, and in August 79° 1’. The maximum temperature (96°) occurred in June, and the minimum (27°) in January. The city covers an area of about five square miles, and has a water front of about nine miles. The streets are regularly laid out, and are generally well paved and lighted with gas. King Street and Meeting Street, the two chief avenues of the city, extend in nearly parallel lines, and are intersected by the shorter cross streets, which run between Ashley and Cooper rivers. There is little uniformity in the buildings, and there is a waut of public squares and places; but many of the residences are surrounded with spacious orna- mental Srounds, which, with the numerous shade trees of all kinds, give the city a picturesque appearance. The most noted public buildings are the city orphan house, which has extensive grounds, the city hall, the custom-house, the arsenal, the court-house, and the Academy of Music, a theatre, which is esteemed one of the best in the southern States. The population of Charleston has increased from 18,711 in 1800 to 42,985 in 1850, to 40,519 in 1860, to 48,956 in 1870 (of whom 22,749 were coloured and 4892 foreigners), and to 56,540 in 1875 (of whom 32,012 were coloured),

Charleston is one of the leading commercial cities of the

In 737, on the death of Thierry IV., Charles did not go through the form of

South, being the outlet for a very rich rice and cotton pro- ducing country, and a point of supply for an extensive territory embracing South Carolina

and parts of North Carolina, Georgia, Alabama, Florida, Tennessee, and Mis- sissippi. The commerce consists chiefly of exports. Dur- ing the year ending June 30, 1875, the foreign commerce comprised exports to the value of $19,655,966, and imports valued at $680,343. Included in the exports there were 265,410 bales of cotton, valued at $18,709,949. Besides this foreign commerce there is au extensive trade in cotton, rice, naval stores, phosphate, and lumber, which are shipped in. large quantities to ports of the United States. The extent of the commerce in these articles will be indicated by the following statement of the quantities received in Charleston from the interior for shipment for a series of years ending August 31 :—

1873. 1874. 1875.

Cotton, Upland……... bales] 368,710 425,394 409,724 »» Sea Island…... A 17,418 11,362 10,223 leew petures coaunaeuettes ticrces 48,943 43,667 46,796 Naval stores, spirits….casks 40,000 41,000 50, 265 é rosin…….....1b] 185,683| 180,000| 295,957 Phosphate, raw…….....6 tons 49,838 56,413 51,546 53 manufactured ,, 56,298 46,302 49,500 EAD eI, eeeaenesdtasea sues: feet|21, 000,000 [21,000,000 | 5,242,238

Of the total shipments of cotton during the year ending August 31, 1875, 264,305 bales were sent to foreign, and 154,869 to home ports. The large quantities of bonc phosphate annually shipped are obtained in the vicinity of the city, where the richest deposits of this material in the United States have been discovered. A valuable fertilizer is manufactured from the phosphate. During the year ending June 30, 1875, 236 vessels, of 102,023 tons, entered in the foreign trade, and 268, of 119,274 tons, cleared ; 504 vessels, of 382,018 tons, entered, and 461, of 328,266 tons, cleared in the coastwise trade. The number of vessels registered, enrolled, and licensed was 185, of 12,051 tons. The manufactures of Charleston are of inferior importance compared with its commerce. Among the most important industries are the manufacture of fertilizers from phosphate, in which more than $2,000,000 is invested, and the preparation of rice for market by removing the husk, cleaning, &c. There are three rice mills in the city, where a large part of the rice crop of South Carolina and Georgia is cleaned. The manufacture of sulphuric acid is extensively carried on in connection with the phosphate industry. Charleston has an extensive wholesale trade in

dry goods, boots and shoes, clothing, hats and caps, drugs and medicines, &c. The city has three national, four State, and five savings banks. Three rail- roads have their termini here,—the North-Eastern, extending to Florence ; the South Carolina, to Augusta, Ga.; and the Savannah and Charleston. The Santee canal, 22 miles long, connects Charleston with the Santee River. The city is divided into eight wards, and is governed by a mayor and eighteen aldermen. It has an excellent fire depart- ment and an efficient police system. Among the public charitable institutions are the city orphan house, the catholic orphan asylum, the almshouse, the asylum for the aged and infirm, the city hospital, and the asylum for coloured orphans. In 1874 the school population was 12,727 of whom 3291 white and 2221 coloured children were attending the public schools. There were 75 teachers employcd, of whom all were white, and all, except four, were females. The public schools are graded as primary, grammar, and high, There is also a normal school for girls, The higher institutions of learning are the College of Charleston, founded in 1785, which has a faculty of five and an excellent museum ; and the Medical College of the

State of South Carolina, opened in 1832, which has a faculty of eight-and a valuable pathological and anatomical museum. ‘he Charleston library was founded in 1748, and has about 15,000 volumes. There are published in the city fifteen newspapers and periodicals—four daily, two thrice a week, four weekly, two fortnightly, two monthly, and one quarterly. The city contains 39 churches, the most noted edifices being St Michael’s, built in 1752, and St Philip’s, both Episcopal.

Charleston was founded about 1680 by English colonists who had come over with William Sayle. As early as 1670 they had settled a few miles distant from the site of the present city at a place which they named Charleston. The new village soon began to flourish, while the original settlement dwindled away and disappeared. During the revolutionary war two unsuccessful attempts were made by the British forces to take Charleston,—the first by Sir Peter Parker and Sir Henry Clinton in 1776, and the second by General Prevost in 1779. After a siege of several weeks, the city was taken in May 1780 by a force under Sir Henry Clinton, but it

was evacuated by the British in December 1782. In the recent civil war between the Northern and the Southern States Charleston was the scene of the first hostilities, which commenced April 12, 1861, with the bombardment of Fort Sumter by the Confederate General Beauregard. After the surrender of the Fort the Confederates took possession of the city, and held it until February 1865. In April 1863 a naval attack was made upon the fortifications in the harbour by a Federal fleet of nine iron-clads commanded by Admiral Du Pont. This effort, however, proved unsuccessful, as was also a land attack made by General Gillmore in July ensuing. The advance of General Sherman's army through South Carolina, aud the fall of Columbia, the capital of the State, led to the evacuation of Charleston by the Confederates on the 17th of February 1865. The public buildings, cotton warehouses, stores, shipping, &c., had previously been fired by order of the general in command. From this and other causes the city suffered much injury during the war ; but since its close many new buildings have been erected, and there has been marked commercial and industrial progress, (H. 8. D.)

CHARLESTOWN, formerly a separate city of the United States, in Middlesex county, Massachusetts, but since 1874 incorporated with the city of Boston, with which it had long before been in many respects practically one. It was founded in 1628 or 1629, and soon rose into im- portance. The most remarkable event in its history is its almost complete destruction in 1775 during the revolu- tionary war. Its population in 1800 was 2751, which at the time of its incorporation with Boston had increased to 32,040. See Boston.

CHARLET, Nicotas Tovussarnt, a designer and painter, more especially of military subjects, was born in Paris on 20th December 1792, and died there on 30th October 1845, He was the son of a dragoon in the Re- publican army, whose death in the ranks left the widow and orphan in very poor circumstances. Madame Chavlet, however, a woman of determined spirit and an extreme Napoleonist, managed to give her boy a moderate education at the Lycée Napoléon, and was repaid by his lifelong affection. His first employment was in a Parisian mairie, where he had to register recruits: he served in the National Guard in 1814, fought bravely at the Barriére de Clichy, and, being thus unacceptable to the Bourbon party, was dismissed

from the mairie in 1816. He then, having from a very carly age had a propensity for drawing, entered the atelier of the distinguished painter Baron Gros, and soon began issuing the first of those lithographed designs which eventually brought him renown, His Grenadier de

Waterloo, with the motto ‘“‘ La Garde meurt et ne se rend pas” (a famous phrase which has got attributed to Cam- bronne, but which he never uttered, and which cannot, perhaps, be traced farther than to this lithograph by Charlet), was particularly popular. It was only towards 1822, however, that he began to be successful in a pro- fessional sense. Lithographs (about 2000 altogether), water-colours, sepia-drawings, numerous oil sketches, and a few etchings followed one another rapidly; there were also three exhibited oil pictures, the first of which. was especially admired—LEpisode in the Campaign of Russia (1836), the Passage of the Rhine by Moreau (1837), Wounded Soldiers Halting in a Ravine (1843). Besides the military subjects in which he peculiarly delighted, and which found an energetic response in the popular heart, and kept alive a feeling of regret for the recent past of the French nation aud discontent with the present— a feeling which incrcased upon the artist himself towards the close of his career,—Charlet designed many subjects of town life and peasant life, the ways of children, &e., with much wit and whim in the descriptive mottoes. One of the most famous sets is the Vie Civile, Politique, et Militaire du Caporal Valentin, 50 lithographs, dating from 1838 to 1842. In 1838 his health began to fail, owing to an affection of the chest. Charlet was an uncom- monly tall man, with an expressive face, bantering and good natured; his character corresponded, full of boyish fun and high spirits, with manly independence, and a vein of religious feeling, and he was a hearty favourite among his intimates, one of whom was the celebrated painter Géricault, Charlet married in 1824, and two sons survived him. A life of him was published in 1856 by a military friend, De la Combe.

CHARLEVILLE, a handsome and well-built town of France, on the left bank of the Meuse, in the department of Ardennes, about one mile north of Méziéres, with which it is connected by a suspension bridge. Since the end of the 17th century it has become a thriving place, with manufactures of nails, hardware, and firearms, and an active export trade in wine, spirits, coal, iron, and slates. It has tribunals of primary instance and commerce, a

coni- modious port, a theatre, a large public library, and a cabinet of natural history. The royal manufactory of arms formerly established here was transferred to Tulle and Chatellerault. Charleville was founded by Charles of Gonzagua, eighth duke of Mantua, in 1606, and continued in the possession of his family till1708. Its fortifications were dismantled in 1687 ; and in 1815 it was plundered by the Prussians, Louis Dufour, the abbé of Longuerue, was born in the town. Population in 1872, 12,059.

CHARLEVOIX, Pierre Frangois Xavier DE (1682- 1761), a French Jesuit traveller and historian, was born at St Quentin in 1682. At the age of sixteen he entered the society of the Jesuits; and, at the age of twenty-three, was sent to Canada, where he remained for four years. He afterwards became professor of belles lettres at home ; and travelled on the errands of his society in various countries. In 1720 he visited America for two ycars, in order to collect materials for his L/istowre de la Nouvelle- France, which appeared in 1744. He also wrote Histoire de Paraguay (1756), Historie de Saint Domingue (1730), Histoire du Japon, a compilation chiefly from Kéampfer (Rouen, 1715); and he was one of the directors of the Journal de Trévoux.

CHARLOTTENBURG, a town of Prussia, in the pro- vince of Brandenburg, district of Potsdam, and circle of Teltow, situated on the Spree, four miles west of Berlin, with which a fine promenade connects it. The town has well- built straight streets, two churches, and a free park ; it has several spinning mills, oil and vitriol factories, a beer brewery,

and distilleries, It is much frequented in summer by visitors from Berlin. The castle, built in 1696 for the queen of Frederick I., the electress Sophia Charlotte, after whom the town was named, contains a collection of antiquities and paintings. In the castle grounds there is an extensive orangery, as also a granite mausoleum, the work of Schen- kel, with monuments of Frederick William IIT. and Queen Louise by Rauch. The population in 1871 was 19,518.

CHARLOTTESVILLE, a town of the United States, the capital of Albemarle county, Virginia, situated about 65 miles north-west of

Richmond on Moore's Creek, a tributary of Rivanna river. Itis a railway junction of some import- ance; but its celebrity is due to the university of Virginia and the residence of Thomas Jefferson, which are both in the neighbourhood. The university was founded by Jefferson in 1819, and over $200,000 was spent on the buildings ; it is endowed and controlled by the state, and was attended in 1875 by 330 students. Monticello, the founder's residence, is still standing, though in a somewhat dilapidated state, and his tomb is to be seen in the family burying-ground. 'The population of the town in 1870 was 2838, of whom 1473 were coloured.

CHARLOTTE TOWN, a town of British America, in the Dominion of Canada, the capital of Prince Edward Island, is situated on gently rising ground on the north bank of Hillsborough River, at its junction with York River, not far from the south coast, in 14° 15' N. lat. and 63° 7' W. long. It has a good harbour in Hillsborough Bay, and the river is navigable by the largest vessels for several miles. Besides the Government buildings and the court-house, the town possesses an Episcopal, a Roman Catholic, and a Scotch church, a fort and barracks, a con- vent, a lunatic asylum, an exchange, a jail, three banks, and an almshouse; its educational institutions include the Prince of Wales College, supported by the province, the Roman Catholic College of St Dunstan's, the Wesleyan Methodist Academy, founded in 1871, and a normal school ; and among its industrial establishments are an iron foundry, a woollen factory, and shipbuilding yards. Large quantities of grain are exported, as well as potatoes, fish, and pork, A steamer plies between the town and Southport every hour, and there is regular communication with several of the other continental ports. A railway, with a total length of 200 miles, runs east to Georgetown and Souris, and west to Somerside, Alberton, and Tignish. Population in 1871, 8807.

CHAROLLES, a town of France, the capital of an arrondissement in the department of Sadne-et-Loire, 3 miles by rail W.N.W. of Macon. It has tribunals of primary instance and commerce, an agricultural society, a communal college, a public library, manufactories of potteryware, iron forges, and a considerable trade in corn, wine, cattle, and timber. It was the capital of Charolais, an old division of France, which from the 13th century gave the title of count to its possessors. In 1327 the countship passed by

marriage to the house of Armagnac ; aud in 1390 it was sold to Philip of Burgundy. After the death of Charles the Bold, who in his youth had borne the title of count of Charolais, it was seized by Louis XI. of France; but in 1493 it was ceded by Charles VIII. to Maximilian of Austria, the representative of the Burgundian family. Ultimately passing to the Spanish kings, it became for a considerable period an object of dispute between France and Spain, until at length it was assigned to Condé the Great, in reward for the services he hed rendered to the Spanish monarch. ‘The ruins of the count’s castle occupy the summit of a hill in the immediate vicinity of the town. Population in 1872, 3064,

CHARON, in Grecian mythology, the son of Erebus and Nox, whose office it was to ferry the souls of the deceased

who had received the rite of sepulture over the waters of Acheron. For this service each soul was required to pay an obolus or danace, one of which coins was accordingly placed in the mouth of every corpse previous to burial.

CHARONDAS, a celebrated lawgiver, who legislated not only for his native Catana, but likewise for various cities of Magna Greecia. By some he is said to have been a disciple of Pythagoras, who flourished 540-510 B.o, ; and according to the common account (as given by Diodorus, xir.), he also drew up a code for the use of the Thurians ; but this statement is scarcely admissible, since Thurii was not founded till the year 443, and it is known that the laws of Charondas were in use among the Rhegians till they were abolished by Anaxilaus, who reigned from 494-476 Bc. It is traditionally related that Charondas fell a sacrifice to one of his own laws, by which it was made a capital offence to appear armed in a public assembly. Hastening to quell a tumult on his return from a military expedition, his sword still hanging by his side, he was reminded by a citizen of his violation of the law, upon which Charondas exclaimed—“ Then will I seal it with my blood!” and immediately plunged the weapon into his breast. Fragments of his laws are given in Heyne’s Opuscula, vol. ii.

CHARPENTIER, Frangors (1620-1702), archeologist and man of letters, was born at Paris, Intended for the bar, he quitted law for literature at an early agc, and was employed by the great minister Colbert, who had determined on the foundation of a French East India Company, to draw up an explanatory account of the project for the perusal of Louis XIV. ; to the memoir he thus prepared he | afterwards added a second part. Charpentier, who was an ardent admirer of his own tongue, was one of the first to demonstrate the absurdity of the use of Latin in monu- mental inscriptions, and to him was entrusted the task of supplying the paintings of Lebrun in the Versailles Gallery with appropriate legends. He acquitted himself so indifferently of the commission that his verses had to be replaced by others, the work of Racine and Boileau. With these poets Charpentier had already quarrelled, having espoused the cause of Perrault in the famous academical dispute (1687) concerning the relative merit of the ancients and moderns, and their notices of him are by no means calculated to place his abilities in the most favourable light. He is credited with an important share in the production of the magnificent series of medals that coim- memorate the principal events of the age of Louis Quatorze. Charpentier, who was long in receipt of a pension of 1200 livres from Colbert, was erudite and often ingenious, but he was always heavy and commonplace. His principal works are a Vie de Socrate (1650), a translation of the Cyropedia of Xenophon (1659), the Zraité de la Peinture Parlante (1684), and the Défense de ? Excellence de la Langue Francaise (1695). ane

CHARRON Prerre (1541-1603), a French philosopher, born in Paris in 1541, was one of the twenty-five children of a bookseller of that city. After studying law at Orleans and Bourges, and obtaining the degree of doctor from the latter university, he settled at Paris to practise as an advocate. But, having met with no great success during five or six years, he entered the church, and soon gained the highest popularity as a preacher, rising to the dignity of canon, and being appointed preacher in ordinary to Queen Margaret. At length, when about forty-seven years of age, he determined to fulfil a vow which he had once made to enter the cloister; but, being rejected by the Carthusians and by the Celestines, and having taken the advice of some professed casuists, he held himself absolved, and continued to follow his old profession. He delivered a course of sermons at Angers, and in the next year passed

to Bordeaux, where he formed his short but famous and important friendship with Montaigne. Its intimacy is shown by the fact that at the death of Montaigne, in 1592, Charron was requested in his will to bear the arms of his family.

In 1594 Charron published (at first anonymously, after- wards under the name of “ Benedict Vaillant, Advocate of the Holy Faith,” and also, in 1594, in his own name) Les Trois Vérités, in which, by methodical and orthodox argu- went, he seeks to prove that there is a God and a true re- ligion, that the true religion is the Christian, and that the true church is the Roman Catholic. The last book (which is three-fourths of the whole work) is ehiefly an answer to the famous Protestant work entitled Le Traité de I Lglise by Du Plessis Mornay ; and in the second edition (1595) there is an elaborate reply to an attack on the third Vériéé, which had been published anonymously by a Protestant writer. Les Trois Vérités gained considerable popularity, ran through several editions, and obtained for its author the favour of the bishop of Cahors, who appointed him grand vicar and theological canon. It also led to his being chosen deputy to the general assembly of the clergy, of which body he became chief secretary. It was followed in 1600 by Discours Chrestiens, a book of sermons, similar in tone, half of which treat of the Eucharist.

In the following year (1601) Charron published at Bordeaux his third and most remarkable work—the famous De la Sagesse, a complete popular system of moral philosophy, Usually, and so far correctly, it is coupled with the Essays of Montaigne, to which the author is under very extensive obligations ; but though it is avowedly com- posed in great part of the thoughts and even the words of others, there is distinct individuality in the book. It is specially interesting from the time when it appeared, and the man by whom it was written. Conspicuous as a champion of orthodoxy against atheists, Jews, and Protest- ants—without resigning this position, and still upholding practical orthodoxy—Charron suddenly stood forth as the representative of the most complete intellectual scepticism.

His psychology is sensationalist. With sense all our knowledge commences, and into sense all may be resolved. The soul, located. in the ventricles of the

brain, is affected by the temperament of the individual; the dry tempera- ment produces acute intelligence ; the moist, memory; the hot, imagination. Dividing the intelligent soul into these three faculties, he shows—after the manner which Bacon subsequently adopted—what branches of science correspond with each. With regard to the nature of the soul he merely quotes opinions. The belief in its immortality, he says, is the most universal of beliefs, but the most feebly supported by reason. As to man's power of attaining truth his scepticism is decided ; and he plainly declares that none of our faculties enable us to distinguish truth from error. In comparing man with the lower animals, Charron insists that there are no breaks in nature. ‘“‘ Those parts which approach and touch one another are more or less similar. So between man and the other animals there is much near- ness and kindred." The latter have reason; nay, they have virtue ; and, though inferior in some respects, in others they are superior. The estimate formed of man is not, indeed, flattering. His five most essential qualities are vanity, weakness, inconstancy, misery, presumption. Upon this view of human nature and the human lot Charron founds his moral system. Equally sceptical with Mon- taigne, and decidedly more cynical, he is distinguished by a deeper and sterner tone. Man comes into the world to endure; let him endure then, and that in silence. To be grieved by others' sorrows is a weakness ; our compas- sion should be like that of God, who succours the suffer- ing without sharing in their pain. Avoid vulgar errors ;

cherish universal sympathy. Let no passion or attachment become too powerful for restraint. Follow the customs and laws which surround you. Such are the maxims he lays down.

Special interest attaches to Charron's treatment of reli- gion. He has been lauded for his piety, and condemned for his infidelity ; but he is justly to be regarded as a sceptic of the school of Montaigne. He insists on the diversities in religions ; he dwells also on what would indicate a com- mon origin. All grow from small beginnings and increase by a sort of popular contagion ; all teach that God is to be appeased by prayers, presents, vows, but especially, and most irrationally, by human suffering. Hach is said by its devotees to have been given by inspiration. In fact, however, a man is a Christian, Jew, or Mahometan, before he knows he is a man. One religion is built upon another ; the Jewish, for instance, on the Egyptian and other

Gen- tile religions, the Christian on the Jewish, the Mahometan on the Jewish and Christian combined. But while he openly declares religion to be “strange to common sense,” the practical result at which Charron arrives is that one is not to sit in judgment on his faith, but to be “simple and obedient,” and to allow himself to be led by public autho- rity. This is one rule of wisdom with regard to religion ; and another equally important is to avoid superstition. What superstition is he boldly ventures to define. It is the belief that God is like a hard judge who, eager to find fault, narrowly examines our slightest act, that He is revengeful and hard to appease, and that therefore He must be flattered and importuned, and won over by pain and sacrifice. True piety, which is the first of duties, is, on the other hand, the knowledge of God and of one’s self, the latter knowledge being necessary to the former. It is the abasing of man, the exalting of God,—the belief that what He sends is all good, and that all the bad is from ourselves. It leads to spiritual worship; for external ceremony is merely for our advantage, not for His glory.

Charron’s political views are neither original nor inde- pendent. He pours much hackneyed scorn on the common herd, declares the sovereign to be the source of law, and asserts that popular freedom is dangerous.

At once the De la Sagesse brought upon its author the most violent attacks, the chief being by the Jesuit Garasse, A second edition was nevertheless soon called for, In 1603, notwithstanding much opposition, it began to appear , but only a few pages had been printed when Charron died suddenly in the street. A summary and defence of the Sagesse, written shortly before his death, appeared in 1606. In 1604 his friend Michel de la Rochemaillet prefixed to an edition of the Sagesse a Life, which depicts Charron as a man of the most amiable disposition and purest character. His complete works, with this Life, were published in 1635, An excellent abridgment of the Sagesse is given in Tenne- mann’s Philosophie, vol. ix.

CHARTER. The word charter, from ydprys, thick paper or parchment, came to be applied, from the substance on which it was written, to a document granted by a prince conferring or acknowledging privileges to be enjoyed by either the whole or a portion of the people under his rule. In England, from the Conquest downwards, there was a struggle between those who

sought to enforce the feudal exactions which the Normans had learned in France and those who attempted to resist the innovation and hold to the old Saxon customs. Ifat first it was a contest between the monarch with his Norman followers on the one side and the Saxon population on the other, the conditions had changed during the lapse of nearly a century and a half preceding the reign of John, and the barons were so frequently incensed by the oppressions and exactions of the ambitious kings, to whose power they had contributed

so much, that they joined in the general demand for “the good old laws of Edward the Confessor.” Even so early as the reign of the Conqueror himself, there was a royal acknowledgment of francliises or liberties, and the charters, renewals, or confirmations granted by subsequent kings are inextricably numerous. Coke, without exhausting them, counts thirty-two. The Great Charter of King John (1215) has so conspicuous a place in history, not only from its comparative eomplctencss, but because it was exacted by men with arms in their hands from a resisting king, and was thus an enforced stipulation likely to be rigidly interpreted, instead of a concession carelessly conceded and readily forgotten. A great many of the stipulations of the Great Charter refer to feudal exactions now so long obsolete that the restraints on them cease to be intelligible; and those who have looked at the “ palladium of our liberties,” expecting to find in it high-sounding definitions of freedom like those in modern Continental declarations of right, have beeu much disappointed. Even in the comparatively popular language of Blackstone there is not much to eonvey a distinct expression to unprofessional modern readers.

“It fixed,” he says, ‘‘the forfeiture of lands for felony in the same manner as it still remains, and prohibited for the future the grants of exclusive fisheries, and the erection of uew bridges so as to oppress the neighbourhood. With respect to private rights, it established the testamentary power of the subject over part of his personal estate, the rest being distributed among his wife and chil- dren ; it laid down the law of dower as it has continued ever since ; and it prohibited the appeals of women, unless for the death of their husbands. In matters of publie police

and national concern, it enjoined a uniformity of weights and measures, gave new en- couragements to eommeree by the protection of merchant strangers, and forbade the alienation of lands in mortmain. With regard to the administration of justice, besides prohibiting all denials or delays of it, it fixed the court of eommon pleas at Westminster, that the suitors might no longer be harassed with following the king's person in all his progresses ; and at the same time brought the trial of issues home to the very doors of the freeholders, by directing assizes to be taken in the proper counties, and establish- ing annual eireuits. It also correeted some abuses then incident to the trials by wager of law and of battle, directed the regular awarding of inquests for life or member, prohibited the king's inferior ministers from holding pleas of the Crown, or trying any eriminal charge, whereby many forfeitures might otherwise have unjustly acerued to the exchequer, and regulated the time and place of holding the inferior tribunals of justiec, the county court, sheriff's turn, and ecourt-lect. It confirmed and established the liberties of the eity of London, and all other cities, boroughs, towns, and ports of the kingdom. And, lastly, it protected every indi- vidual of the nation in the free enjoyment of his life, his liberty, and his property, unless deelared to be forfeited by the judgment of his peers or the law of the land."

The material feature of the doeument is that, so slightly referred to in the above extract, whieh says, "No freeman shall be taken or imprisoned, or be disseised of his frechold or liberties, or free customs, or be outlawed or exiled, or any otherwise damaged, nor will we pass upon him, nor send upon him, but by lawful judgment of his peers, or by the law of the land." In this stipulation there is inferred that supremacy of the fixed principles of the Jaw over the will and power of the monarch, which has rendered the fanatical devotion of the English lawyers to their common law so justifiable ; and as a farther security, the right of trial by peers or juryimen appointed a perpetual popular tribunal to eheek the official judges, should they be tempted to sell the liberties and privileges of the subject. Hallam, a very eompetent judge, says, "The institutions of positive law, the far more important changes which time has wrought in the order of society during 600 years subsequent to the Great Charter, have undoubtedly lessened its direet application to our present eircumstanees. But it is still the keystone of English liberty. All that has since been obtained is little more than a

confirmation or com- mentary ; and if every subsequent law were to be swept way, there would still remain the bold features that dis-

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tinguish a free from a despotic monarehy.”— (Afiddle Ages, chap. viii.)

Exemplars of the Great Charter were preserved among the muniments of cathedrals, and in other places calculated to preserve public archives. The Record Commission, when they published their edition of the statutes of the realm, were desirous to print the best authenticated version of the charter of King John; and they state, that “in Lineoln Cathedral, an original of the Great Charter of Liberties, granted by King John in the seventh year of his reigu, is preserved in a perfect state. This charter appears to be of superior authority to either of the two charters of the same date preserved in the British Museum. From the contemporary indorsement of the word Lincolina on two folds of the eharter, this may be presumed to be the charter transmitted by the hauds of Hugh, the then bishop of Lineoln, who is one of the bishops named in the introductory clause.” —(Introduction, xxix.)

Among the other concessions of a less comprehensive nature, the Charter of the Forest was deemed next in importanee to Magna Charta. In nothing was the selfish rapaeity of the Norman monarchs more conspicuous than in their relentless clearings of great districts of country for the establishment of forests or chases, where the sanctity of their field-sports was protected with a strict legal severity not conceded to the protection of ordinary property and personal freedom. The Charter of the Forest imposed wholesome limits on such inroads, and hence, along with the Great Charter, it has been printed at the commencement of the English statutes. The position of these documents in a series of Acts of Parliament is not so anomalous as it might seem ; for it would be very difficult to distinguish the charters from the earliest statutes, which were con- cessions or admissions granted by the monarch on the requisition of the principal persons of the realm assembled together. Our statutes, indeed, still bear in their phraseology a testimony to this origin.

The early use of the word “ charter,” as a foundation of constitutional liberties, led to its being applied on various oceasions to fundamental constitutional codes or rules of government adopted by various nations. The most memorable instance is the French Charte, containing the constitution of the French Government, as adjusted at the restoration in 1815, and amended at the revolution of 1830, which had its origin in an attempt of Charles X. to stretch one of its dubious clauses.

From such public acts as Magna Charta, the coneession of privileges by charter from the Crown descended through various grades. Both in England and Scotland the privileges of municipal corporations either were conferred of old by charter, or were presumed to have been so con- ferred. The power of the Crown has in this form long virtually departed, but it is still competent to ineor- porate collective bodies with certain limited powers by royal charter ; though, in general, it is deemed necessary when the powers might affeet personal or public interests to secure them by Aet of Parliament. Insidious privileges were sometimes granted by charter, and were among the objects of the attacks on the Crown’s power to grant monopolies in the 17th eentury.

By the practice of mimicking the usages of the sovereign through all grades of feudality, it became the custom for every feudal lord or superior, high or low, when conceding any privilege as to his fief or landed property, to do so by a charter. Thus, throughout the British empire, and in Scotland especially, one of the most ordinary deeds con- nected with the ecommerce in land assumes to this day the shape of a coneession of privileges by a sovereign or other high feudal lord to his vassal. One of the essential features which the student of Seottish law has to master in the

practice of conveyancing is the constitution of the charter. Although modern practice has ingrafted on it other classes of deeds, to suit the exigencies of the commerce in land, such as the disposition, the assignation, &c., yet “the char- ter ” is the original source from which the spirit and tenor of the whole system of conveyancing are to be acquired.

CHARTER-PARTY, a written or partly written and

partly printed contract, by which a ship is let or hired for the conveyance of goods on a specified voyage, or for a definite period. By the terms of this contract the owners declare the ship to be “tight, stanch, strong, and every way fitted for the voyage ;” and they are accordingly liable in damages to the merchant or charterer, if the ship be unseaworthy, or if they fail to provide her with any necessary equipment or clearances. ‘The shipowners are further bound to have the vessel ready to receive her cargo at the stipulated time; and they are responsible for the proper stowage of the goods received on board. On the loading being completed, the vessel must proceed without delay to her appointed destination; and should she un-necessarily deviate from the regular course of the voyage (a proceeding which might vitiate the merchant’s insurances), the owners are liable in damages to the merchant. On arrival at the port of destination the goods are to be delivered ‘agreeably to bills of lading,” the responsibility of the shipowners in this particular being limited by the usual exception against loss or damage by “the act of God, the queen’s enemies, fire, and all and every other dangers and accidents of the seas, rivers, and navigation of whatever nature and kind soever.” ‘The freight payable to the ship- owners is the amount specified in the charter-party, which may in certain cases be either more or less than the rates mentioned in the bills of lading,—the charterer having usually the right of sub-letting the ship in part or in whole to other shippers, on terms agreed upon between themselves, which it is customary to specify in their separate bills of lading, without prejudice to the original agreement. In such cases, however, the shipowners’ lien on the goods for freight extends only to the amount specified in the bills of lading ; and they must look to the charterer personally for any further sum which may be due to them.

The charterer, on his ‘part, is bound to furnish the cargo at the port of loading, and to take delivery of the same at the port of discharge within specified periods, which are usually called “‘laydays.” He may detain the vessel for a certain fixed time beyond the stipulated laydays on payment of a specified sum as “ demurrage ” for each day the ship is so detained. The laydays commence on the ship being ready to load or to discharge, even although it may happen from the port being crowded, or from similar causes, that she cannot at the time be placed in a berth where it would be convenient or practicable for the merchant to begin these operations.

The vessel is not bound to proceed nearer to her port of loading and discharging than "'she may safely get;" and this generally means that she is not bound to go nearer to a loading port than to the point from which she can safely get away again with her cargo on board. The charterer, therefore, must pay the expense of necessary lighterage in loading or discharging, unless there be a specific agreement to the contrary. ;

It is usual to insert in charter-parties a clause by which the parties bind themselves to fulfil their contract under a specified sum as penalty for non-performance ; but the amount of this penalty is not the absolute limit of the damages which either party may be entitled to recover under any of the other conditions which may have been violated. See Carrier.

CHARTIER, Axatn, the most distinguished French man of letters during the 15th century, was born at Bayeux.

The date of his birth is not known, but M. Vallet de Viriville places it between 1380 and 1390. After a complete course of study at the university of Paris, he is supposed to have entered the service of Charles V1., who is said to have charged him with important missions, After this, however, he is known to have followed the fortunes of Charles the Dauphin, afterwards Charles VIL., and to have been employed by that prince, about 1420, in the triple capacity of clerk, notary, and financial secretary. He is also said to have held a prebend in the cathedral church of Nétre-Dame de Paris, of which he was likewise arch-deacon, and to have been sent as envoy to the Scottish court. A Latin epitaph, discovered in the 18th century, and pronounced authentic by the biographer already cited, credits him with the enjoyment of other dignities than those referred to, and declares that he " s'endormit enfin dans le Seigneur," in the city of Avignon, "Van de ? Incarnation, 1449."

There is some analogy between the fate of Alain Chartier and that of Ronsard. Both enjoyed an extraordinary reputation during their lives, and after death both were neglected and forgotten. Alain Chartier's lot was cast in troublous times—he felt the agony of Agincourt, and Witnessed the rise of the Maid—but this would seem to have increased his renown, 'The story of the famous kiss bestowed by Margaret of Scotland, wife of that Louis the Dauphin who was afterwards to be known as Louis XI., on "la précieuse

bouche de laquelle sont issus et sortis tant de bons mots et vertueuses sentences," authentic or not, is interesting, if only as a proof of the high degrce of estimation in which the ugliest man of his day was held. Jean de Masles, who annotated a portion of his verse, has recorded how the pages and young gentlemen of that epoch were required daily to learn by heart passages of his Lréviaire des Nobles; Lydgate, the English rhymester, studied him ardently and affectionately ; and Clément Marot and Octavien de Saint-Gélais, writing fifty years after his death, find many fair words for the old poet, their master and predecessor. For the last three centuries, how- ever, Alain Chartier has been remembered rather on account of the kiss aforesaid than for the sake of any of the ons mots and vertueuses sentences that induced it. The Renais- sance of 1830, even, that has made so many glories to blossom anew, has uot justified again his old renown in the eyes of men. As a poet his fame has yielded to that of his contemporary, Charles of Orleans; and even his eloquent prose, which is said to be the best part of his work, has awakened no interest whatever. In spite of this, however, Alain Chartier deserves notice as one of the most remarkable aud influential men of his time. His writings, both in prose and verse, breathe an ardent spirit of patriotism, and are notable, in some instances, for a boldness of thought and freedom of idea that seem to foreshadow the great utterances of the 16th century.

Alain Chartier, who is credited with the invention of the 7on- deau déelinatif, used all the forms of verse eurrent at that period— roundel, lay, ballad, and complaint. His best books are said to be Le livre des Quatre Dames, which was called forth by the battle of Agincourt, and Le Quadriloguc-Inveetif, a fine patriotic dialogue, bearing date.1422. See Mancel, Alain Chartier, étude bibliographique et littératre, 8vo., Paris, 1849.

CHARTISM was a movement for radical reform in Eng- lish politics, which originated in 1838, reached its culminat- ing point in 1848, and collapsed the same year; it took its name from the " People's Charter" or " National Charter," the document in which the scheme of reform was embodied. The Reform Bill of 1832 left a large class of the popula- tion, especially the working-men, dissatisfied. Accordingly, in 1838, after an unsuccessful attempt to initiate a scheme of more radical reform in the House of

Commons, six of the most advanced members of the House had a consultation

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with the deputies of the “ Working-men’s Association,” the result being the appearance of the People’s Charter, which embodied in the six following points the programme of their party :—(1) annual parliaments; (2) universal suffrage ; (3) vote by ballot ; (4) abolition of the property qualification for membership of the House of Commons ; (5) payment of members ; (6) equal electoral districts. The most influ- ential of the six members of the House who took part in the drawing up of the charter was O’Connell, and the methods adopted for the propagation of their views were those practised by the great agitator with such success. Monster meetings were held, at which seditious language was occasionally spoken, and slight collisions with the military took place. Fetitions of enormous size, signed in great part with fictitious names, were presented to Parlia- ment; and a great many newspapers were started, of which the Northern Star, conducted by Feargus O’Connor, the active leader of the movement, had a circulation of 50,000. In 1840 the Chartist movement was still further organized by the inauguration at Manchester of the National Charter Association, which rapidly became powerful, being the head of about 400 sister societies, which are said to have numbered 40,000 members. Some time after, efforts were made towards a coalition with themore moderateradicals, but these failed ; and a land scheme was started by O’Connor, which prospered for a few years. In 1844 the fanatical spirit of some of the leaders was only too well illustrated by their attitude towards the Anti-Corn-Law League. O’Connor, especially, entered into a public controversy with Cobden and Bright, in which he was worsted; and he even endeavoured to defeat the purpose of the League. But it was not till 1848, during a season of great suffering among the working classes, and under the influence of the revolution at Paris, that the real strength of the Chartist movement was discovered, and the prevalent discontent became known. Early in March disturbances occurred in Glasgow which required the intervention of the military, while in the manufacturing districts all over the West of Scotland

the operatives were ready to rise, in the cvent of the main movement succeeding. Some agitation, too, took place in, Edinburgh and in Manchester, but of a milder nature ; in fact, while there was a real and wide-spread discontent, men were indisposed to resort to decided measures. The principal scene of intended Chartist demonstration was London. An enormous gathering of half a million was announced for the 10th April on Kennington Common, from which they were to march on the Houses of Parliament to present a petition signed by nearly six million names, in order by this imposing display of numbers to secure the enactment of the six points. Probably some of the more violent members of the party thought to imitate the Parisian mob by taking power entirely into their own hands. The announcement of the procession excited great alarm, and the most decided measures were taken by the authorities to prevent a rising. The procession was for- bidden. The military was called out under the command of the Duke of Wellington, and by him concealed near the bridges and other points where the procession might attempt to force its way, Even the Bank and other public buildings were put in a state of defence, and special con-stables, to the number, it is said, of 170,060, were enrolled, one of whom was destined shortly after to be the emperor of the French. After all these gigantic preparations on both sides the Chartist demonstration proved to be a very insignificant affair. Instead of half a million, only about 50,000 assembled on Kennington Common, and _ their leaders, Feargus O'Connor and Ernest Jones, shrank from the responsibility of braving the authorities by conducting the procession to the Houses of Parliament. The monster petition was duly presented, and scrutinized, with the result

that the number of signatures was found to have been grossly exaggerated, and that the most unheard of falsifica- tion of names had been resorted to. Thereafter the movement specially called Chartism soon died out. The return of national prosperity relieved the working classes of their most pressing grievances ; and subseqent legislative changes have in great measure removed the causes that existed for discontent among the classes which mainly sup- ported the charter.

CHARTRES, the chief town of the department of Enre- et-Loir, 55 miles south-west from Paris by railway, stands on a slope skirted by the River Eure, which flows partly within and partly beyond the ramparts. Its houses are antique and straggling; but there are four fine squares, in one of

which, used as the herb-market, is an obelisk in memory of

General Marceau, a native of the town. Chartres is theseat of a tribunal of the first instance, a tribunal of commerce, a com- munal college, and a diocesan seminary ; and it has a weekly corn-market, which is one of the largest in France and is well managed bya corporation of women, Its chief manu- factures are woollens and leather. Its cathedral of Ndtre Dame, a vast Gothic edifice, with two spires of different construction, is reckoned one of the finest cathedrals in France. It was founded in the 11th century by Bishop Fulbert on the site of au earlier church destroyed by fire in 1020. In 1194 another conflagration laid waste the new building then hardly completed ; but clergy and people set zealously to work, and the main part of the present structure was finished by 1240, Though there have Leen numerous minor additions and alterations since that time, the general character of the cathedral is unimpaired. The upper woodwork was consumed by fire in 1830, as well as the beautiful belfry of the old tower, but the rest of the building was saved; and it still preserves some of its magnificent stained-glass windows of the 13th century. (See Bulteau, Descript. de la cathédr. de Chartres, 1850.) The churches of St Pierre and St André may also be noticed.

Chartres was one of the principal towns of the Carnutes, and by the Romans was called Autricum, from the river Autura (Eure). From the Romans it passed into the hands of the Frankish kings, and was successively taken by Thierry II., king of Orleans and Burgundy, and by the Normans, who burnt it in 852 and 872. It afterwards fell into the hands of the English, from whom it was recovered in 14382. It was attacked unsuccessfully by the Pro-testants in 1568, and was taken in 1591 by Henry IV., who was con-secrated there three years afterwards. In the Franco-Prussian War it was seized by the Germans on 2Ist Oct. 1870, and continued during the rest of the campaign an important centre of operations. During the Middle Ages it was the chief town of the district of Beauce, and gave its name to the counts

of Chartres ; and since the time of Louis XIII. the title of duke of Chartres has been hereditary in the family of Orleans. Population of the town in 1872, 19,322; and of the commune, 19,580.

CHARTREUSE, or more usually, to distinguish it from other establishments of the order, LA Granpr CHARTREUSE, a famous Carthusian monastery of France, in the depart- ment of Istre, situated about 14 miles north of Grenoble, at a height of 4268 feet above the level of the sea, in one of the upper valleys of a group of calcarcous mountains, near the sources of the Guiers Mort and the Guiers Vif, two tributaries of the Rhone. The settlement was originally founded in 1084, and derived its name from a small village a short distance to the south-east, which was formerly known simply as Chartreuse or Curtusia, but is now distinguished as Saint Pierre de Chartreuse. The first convent ou the present site was not erected till 1137, and most of the present edifice is of a later date than 1676. It stands in a large meadow, which slopes to the south-west, and is watered by a tiny tributary of the Guiers Mort ; on the north a fine forest rises up to the Col of La Ruchére, while on the west the valley is shut in by well-wouded heights, and ou the cast is overshadowed by

the white ridges of Grandsom, which rise upwards of 2500 feet above the convent roof. All access to the spot was formerly by difficult and defensible pathways ; and before the construction of the modern roads, it was very seldom that’ alien visitors disturbed the monks in their retreat. One of the principal approaches is by the valley of the Guiers Mort, which the traveller enters at St-Laurent-du- Pont, a village of about 1800 inhabitants, with a deaf-mute institution supported by the Carthusians. Passing up the left bank of the stream he next reaches the picturesque hamlet of Fourvoirie (Latin forata via), so named from the road which was driven up the pass at the suggestion of Le Roux, the thirty-tlurd general of the order, in the 16th century. It is the seat of iron forges, a saw-mill, a farm, and laboratories belonging to the monks; and it was formerly the site of the first gateway that guarded the entrance to their domain. ‘The river is there spanned by a noble three- storied bridge of a single arck ; and about three miles higher up is the bridge of St Bruno, which has replaced the older Pérant bridge still

hanging in romantic dilapida- tion over the torrent. A short distance higher up begins the new part of the road constructed by M. Eugéne Viaud in 1853-4 ; it soon leads through the narrow passage of the Ciillette or Aiguillette, formerly guarded by a second gateway, beyond which no female footstep was permitted ; and after having passed through four separate tunnels, it brings the traveller in sight of the convent in about three hours from St-Laurent-du-Pont. Other routes of less interest are by the villages of Sappey and La Charmette. There is nothing very striking or beautiful about the architecture of the Chartreuse,—its principal features being the high roofs of dark slate and the cross-surmounted turrets. Within the buildings there are four halls for the reception of monks from the Carthusian provinces of France, Italy, Burgundy, and Germany, about sixty cells for the resident brethren, a church of the 15th and 16th centuries, several chapels, and a library, which before the Revolution contained a valuable collection both of books and manuscripts. A short distance from the main building is the infirmary, now set apart under the direction of the sisters of charity for the entertainment of female visitors. Since the revolutionary confiscation of 1793 the domain of Chartreuse has belonged to the state, and the monks, who were permitted to return to the monastery in 1816, pay a nominal rent for the use of the buildings and the right of pasturage, and have no longer any property in the neighbouring forests, which are in great measure due to their predecessors. Their revenue is augmented by the sale of various pharmaceutical preparations known as the Elixir, the Boule d'Acier (a mineral paste or salve), and the Chartreuse. In the manufacture of the last—a famous aromatic liqueur—carnations, absinthium, and the young buds of the pine tree are employed ; there are three kinds —a green, a yellow, and a white—differing in degree of strength. The monks are distinguished by an active benevolence, the effects of which are visible in all the surrounding villages, where churches, schools, hospitals, and similar institutions have been erected and maintained at their expense. See Bruno and CarrHusians ; also Adolphe Joanne's Dauphiné et Savoie, 1870, and Jules Taulier's Guide du Voyageur a la Grande Chartreuse, 1860.

CHARYBDIS. See Scyrua AND CHARYBDIS.

CHASE, Satmow Portianp (1808-1873), an American statesman, was born in Cornish, New Hampshire, on the 13th of January 1808, After graduating with distinction at Dartmouth College, at the age of eighteen he opened a classical school at Washington, and commenced the study of law under William Wirt. In 1830 he was admitted to the bar; and he soon after gained for himself considerable reputation by a compilation of the statutes of Ohio.

Throughout his whole career he was a consistent and vigorous opponent of slavery. From the first he was willing to risk his hopes of professional success by under- taking the defence of runaway slaves or of those who assisted their escape; and he boldly argued that slavery was merely an institution of the individual States, to which the national Government could not extend its sanction. He took a prominent part in the anti-slavery convention which met at Columbus in 1841, in the first ‘‘ National Liberty Convention” of 1843, in the ‘Southern and Western Liberty Convention” of 1845, and in the second “ National Liberty Convention” of 1847. He also presided over the “ National Convention” of 1848, which nominated Van Buren for president and Adams for vice-president. In 1849 he became member of the senate; and in 1855 he was elected governor of Ohio, in which position he was so popular that he was re-elected, two years after, by an extraordinarily large number of votes. He was also three times nominated for the presidency, though he never attained that dignity.

On the accession of Lincoln to the presidency, in March 1861, Chase became secretary of the treasury; andhe fulfilled the duties of this most important and difficult post with the greatest energy till June 1864. Still, notwithstanding his ability and zeal, it cannot be said that the measures he adopted were the best even in the extremely difficult cir- cunistances in which he was placed. Though he appears to have apprehended some of the evil consequences likely to arise from the creation of inconvertible notes, he argues that their issue was necessary on the ground that it would increase the loanable capital of the country, while, in fact, employed as it was by Government in defraying expenses, it could have no such effect. At first Chase contemplated raising a large sum by direct taxation ; but this course Congress refused to pursue. He was forced, thercfore, to resort to a

considerable increase of the taxes on imports, to issues of an inconvertible paper currency, and to enormous loans, which were contracted upon un- necessarily expensive terms. The interest was, in reality, about double its nominal amount, owing to the fact that it was paid in gold ; and, beside this, a considerable loss was sustained through the arrangement by which the debt'con- tracted in depreciated paper was discharged in coin.

It was under his management that Congress passed the Banking Law of February 1863, which, as amended in June 1864, is still in force (see BANKING, vol. iii. p. 340). It was at that time useful in two ways; for it procured for the Government, in its necessity, a considerable loan from the banks, and it replaced the notes of the banks, which had lost their credit through frequent failures, by notes which pos- sessed the Government guarantee. Its great recommenda- tion at present is that it secures the trustworthiness of the note currency.

In December of the year in which he resigned the secretaryship of the treasury, Chase was appointed Chief Justice of the Supreme Court of the United States, and in this capacity he had to undertake the responsibility of superintending the trial of President Johnson. But his healtli was now broken, and his old activity was no longer possible. In June 1870 he suffered a shock of apoplexy, and on May 7, 1873, he died at New York.

CHASTELAIN, Grorcss (1403-1475), called L'Adven- twreux, the celebrated Burgundian chronicler, was born at Alost in Flanders. When only seven years old be began the study of letters. This, however, he abandoned to become a soldier, serving first of all as a squire. Particu- larly favoured by Philip the Good, duke of Burgundy, he quitted the career of arms towards.1443, and devoted him- self to the service of that prince, who made him successively pantler, orator, and finally grand chronicler of the house of

Burgundy. In addition to such duties as these offices entailed upon their holder, Chastelain was often em- ployed diplomatically, and was also accustomed to direct the dramatic entertainments designed for the amusement of the ducal court. A heavy but insolent opuscule in verse, published by him in 1455, had nearly compromised his safety, as it was held

to contain reflections injurious to the honour of the king and nobility of France; Chastelain, however, extricated himself from the difficulty by issuing a sort of reply (in prose) to his own libel. About this time, too, at the request of Philip, he began his most important work, the Grande Chronique. Philip's son, Charles the Bold, continued to confide in and favour Chastelain as his father had done, and conferred on him the order of the Golden Fleece, with the title of Indictaire—a designation intended as descriptive of one who "démonstroit par escripture authentique les admirables gestes des chevaliers et confréres de Dordre." At the beginning of the new reign, however, Chastelain retired to Valenciennes, where he busied himself till his death in the production of his Chronique (in which he was assisted by Jean Molinet, his disciple and continuator) and of other works, imaginative and his- torical,

Among his contemporaries, Georges Chastelain acquired by his verses the style and title of a second Homer 3 but posterity, in relegating his poetry to eternal oblivion, has been careful of his memory. As an historian, Chastelain is deserving of more attention. He was a soldier and traveller, who had yet been trained to letters, the favourite of a splendid prince, and personally acquainted with most of the actors in the great scenes which his position enabled him to study on the very theatre of their action. His method of writing history, to judge by a declaration of his own yet extant, was nut such as would have occurred to the mere compiler or writer from dictation, The vast mass of material collected during his long and busy life was intended to be fused and shaped as his own conclusions, his own great experience of men and years, should determine, and not altogether according to the requirements of party and feudal feeling. Impartiality, however, must not be considered one of his virtues. A brilliant satirist, and at the same time, a master of eulogy, it was his interest to use all his gift in his master's service, and he did so use it.

Only three fragments of the Chronique, which was to have filled six volumes, in folio are known to exist—the first ex- tending from 1419 to 1422, and the sccond, with large breaks in the text, from 1461 to 1474, A third mutilated frag- ment is understood to refer to the period uncovered by the larger chapters, but it neither tells a connected story nor fills the great gap between the otlier two.

See Buehon, Chroniques nationales and Panthéon littéraire ; Quieherat, Dibliothéeque de U Hcole des Chartes ; Reiffenberg, Dues de Bourgogne, 8vo, 1836. ,

CHASTELARD, Pierre Bosconen DE (1540-1563), a French poet whose name is inseparably connected with that of Mary Queen of Scots, was born in Dauphiné, and was a scion of the house of Bayard. From the service of the Constable Montmorency, Chastclard, then a page, passed “to the houschold of Marshal Dainville, whom he accompanied in his journcy to Scotland in escort of Mary (1561). He returned to Paris in the marshal’s train, but Icft for Scotland again shortly afterward, bearing letters of recommendation to Mary from his old protector, Montmorency, and the Régrets addressed to the ex-queen of France by Pierre Ronsard, his master in the art of song. He is also understood to have undertaken the charge, for transmission to the poct, of the service of plate with which Mary rewarded him. But he had fallen in love with the qucen, who is said to have encouraged his passion, Copies of verse passed between them ; she lost no occasion of showing

herself partial to his person and conversation. The young man hid himself under her bed, where he was discovered by her maids of honour. Mary pardoned the offence, and the old familiar terms between them were resumed. Chastelard was so rash as again to violate her. privacy. He was discovered a second time, seizcd, sentenced, and hanged the next morning. He met his fate valiantly and consistently, reading, on his way to the scaffold, his mas- ter’s noble Mymne de la Mort—“Trés-bien fait et propre pour ne point faire abhorer la mort”—and turning at the instant of doom towards the palace of Holyrood, to address to his unseen mistress the famous farewell— Adieu, toi si belle et si cruelle, qui me tues et que je ne puis cesser (aimer.” This at least is the version of Brantéme, who is, however, as notoriously untrustworthy as an authority as he is charming as a writer. Another account is that the plaint was a reproach, contained in the exclamation “Cruelle reine!” and emphasized by a threatening gesture addressed to Mary’s apartments.

Sworder and amorist, audacious and irreligious, with a strong sense of the nobility of art and some taste for its practice, Chastelard is a favourable specimen of the golden youth of the French Renaissance. As a poct lie is not remarkable—merely one of “the mob of gentle- men who wrote with ease,” in spite of the notes of truth and passion occasionally to be distinguished through the clink and fall of his verse. But for his maduess of love, indeed, it is possible that he would have left no shadow or shred of himself behind. As it is, however, his life and death are of interest as illustrating the wild days in which his lot was cast.

See Chalmers, Life of Mary Queen of Scots ; Knox, JZistory of the Reformation ; Mignet, Iistotre de Marie Stuart ; Dargaud, Histoire de Marie Stuart ; Le Laboureur, Mémoires de Castelnau ;

Brantéme, Mémoires. Myr Swinburne’s tragedy of Chastelard is too well known to need more than passing reference.

CHATEAUBRIAND, Francois Ren, Viscount pr (1768-1848), the most brilliant representative of the reaction against the ideas of the French Revolution, and the most conspicuous figure in French literature during the First Empire, was born at St Malo, September 4, 1768. Here, as beautifully narrated by himself, his naturally poetical temperament was fostered by picturesque influences, the mysterious reserve of his morose father, the ardent piety of his mother, the traditions of his ancicnt family, the legends and antiquated customs of the sequestered Breton district, above all, the vagueness and solemnity of the neighbouring ocean. He received his education at Dol and Rennes, and after declining to enter the church from an absence of vocation, obtained a commission in the army when on the point of proceeding to try his fortune in India

(1788).

His thirst for distinction, further excited by the political convulsions of the following year, found vent in a romantic scheme for the discovery of the North West Passage, in pursuance of which he departed for Americain 1790, The passage was not found or even attempted, but the adventurer returned enriched with the to him more important discover y of his own powers and vocation, conscious of his marvellous faculty for the delineation

of nature, and stored with ideas and imagery, the matcrial of much of his future work, His return coincided with the execution of Louis XVI. Chateau- briand, a Breton and a soldier, could not do otherwise than throw himself into the ranks of the emigrants. After the failure of the duke of Brunswick's invasion he retired to England, where he lived obscurely for several years, gaining an intimate acquaintance with English literature, and elaborating The Natchez, a prose epic designed to portray the life of the Red Indian tribes, and inspired by reminis- cences of his American travels. Two brilliant episodes of

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this work, Atala and fené, have acquired universal } also inspired his prose epic of Zhe Martyrs, published two

renown; but the work as a whole, to say nothing of the unreality of its pictures of savage life, belongs to that unfortunate compromise between the forms of prose and poetry in a manncr imposed upon the French language by the penury of its poetic diction, but incapable of the perfection of either poetry or prose. Chateaubriand's first publication, however, was the Hssay on Revolutions (1797). In this remarkable work, which the author subsequently retracted, but took care not to suppress, he appears as a mediator between royalist and revolutionary ideas, a free- thinker in religion, and in philosophy imbued with the spirit of Rousseau. A great change in his views was, however, at hand, induced, as he would have us believe, by the death of his mother in the samc year. It is certain that upon his restoration to his country three years subse- quently, the Genius of Christianity was already in an advanced state. Before publishing it, however, he determined to make an essay with an episode of his romance. Atala, or The Loves of Two Savages, appeared in 1801, and immediately raised the author to the summit of literary distinction, Exquisite style, impassioned eloquence, and glowing descriptions of nature, gained indulgence for the incongruity between the rudeness of the personages and the refinement of the sentiments, and for the distasteful blending of prudery with sensuousness ; the latter was indeed conformable to the example of the author's raodels and predecessors. Alike in its merits and defects, the piece

is a more emphatic and highly-coloured “ Paul and. Virginia ;” it has been justly said that Bernardin Saint Pierre models in marble and Chateaubriand in bronze. Kucouraged by his success, the author resumed his Gendus of Christianity, which appeared in the following ycar, just upon the cve of Napoleon’s re-establishment of the Catholic religion, for which it thus almost seemed to have prepared the way. No coincidence could have been more opportune, and Chateaubriand might almost be pardoned for esteeming himself the counterpart of Napoleon in the intellectual order, as he certainly did. In composing his work he had borne in mind the admonition of his friend Joubert, that the public would care very little for his erudition and very much for his eloquence. It is consequently an inefficient production from the point of view of serious argument. The considerations derived from natural theology are but commonplaces rendered dazzling by the magic of style; and the parallels between Christianity and antiquity, especially in arts and letters, are at best ingenious sophis- tries. The less polemical passages, however, where the author depicts the glories of the Catholic liturgy and its accessories, or expounds its symbolical significance, arc splendid instances of the effect produced by the accumula- tion and judicious distribution of particulars gorgeous in the mass, and individually treated with the utmost refine- ment of detail Taken altogether, the work is a master- piece of literary art, and its immediate effect was very considerable. It admirably subserved the statecraft of Napoleon, who appointed the writer attaché at Rome, and when his insubordinate and intriguing spirit compelled his recall, transferred him as envoy to the canton of the Valais. The murder of the duke of Enghien took place during his absence on this mission. Chateaubriand, to his honour, immediately resigned his post, and subsequently taanifested great courage in his indirect censures of Napoleon in a journal of which he had become proprietor, and which was ultimately suppressed. rc this he had departed on a pilgrimage to Jerusalem, undertaken, as he subsequently acknowledged, less in a devotional spirit than in quest of new imagery, and in deference to the wishes of a lady friend. The journey produced (1811) a record of travel distinguished by his habitual picturesqueness, and

years previously. ‘This work may be regarded as the argument of the Genius of Christianity thrown into an objective form. Moore’s Hpicurean, and the more ambitious passages of Bulwer’s earlier romances, may convey

an adequate notion of it to the merely English reader. As in the Lpicurean, the professed design is the contrast between Paganism and Christianity, which fails of its purpose partly from the absence of real insight into the gemus of antiquity, and partly because the heathen are the most interesting characters after all. Two years previously had appeared J?ené, another detached episode of The Natchez, and perhaps Chateaubriand's most characteristic production. The connecting linkg in European literature between IWer- ther and Childe Harold, it paints with wonderful mastery the misery of a morbid and dissatisfied soul, the type of a character blighted by over-sensitiveness on the one hand, and an egotism thinly disguised by poetical sentiment on the other. The representation is mainly from the life, and Chateaubriand must certainly be acquitted of the unreality and affectation which so frequently characterize similar delineations of the poetic temperament. René's morbid de- spondency is but the too faithful protrait of the desolation begotten in his own mind by the unnatural alliance between opulence of imagination and poverty of heart. His sister Lucile is the Amélie of the story. The Natchez, of which Itené was to have formed an episcde, was not published until 1826, at which time also appeared the beautiful tale of Zhe Last of the Abencerrages, written about 1809, and, as the author asserts, withheld from publication on account of the Peninsular War. With this composition Chateau- briand's career as an imaginative writer is closed; and we have henceforth chiefly to consider him as a politician. His character in this point of view may be comprised in a sentence; he was equally formidable to his antagonists when in opposition and to his friends when in office. His poetical receptivity and impressionableness rendered him honestly inconsistent with himself, while his vanity and ambition, too morbidly acute to be restrained by the ties of party allegiance, made him dangerous and untrustworthy as a political associate. His pamphlet, Donaparte and the Bourbons, published in 1814, while the fate of Napoleon yet trembled in the balance, was as opportune in the monient of its appearance as the Genius of Christianity, and produced a hardly less signal effect. Louis XVIII. declared that it had been worth a hundred thousand men to him, Chateaubriand was called to his councils, accompanied him to Ghent during the Hundred Days, and for a time asso- ciated himself with the excesses of the royalist reaction. Political bigotry, however, was not among his faults ; he gradually drifted into liberalism and opposition, and upon a change of ministry, obtained the London embassy,

from which he was transferred to represent lis country at the Congress of Verona. He here made himself mainly responsible for the iniquitous invasion of Spain,—an expedition undertaken, as he himself admits, with the puerile idea of restoring French prestige by a military parade. He next received the portfolio of foreign affairs, which he soon lost by his desertion of his colleagues on the question of a reduction of the interest on the national debt. After another interlude of effective pamphlcteering in opposition, he accepted the embassy to Rome under the Martignac administration, resigned it at Prince Polignac's accession to office, and on the downfall of the elder brancl of the Bourbons, made one last extremely brilliant but inevitably fruitless protest from the tribune in defence of the principle of legitimacy. During the first half of Louis Philippe's reign he was still active with his pen, and was regarded as the most efficient champion of the exiled dynasty, but as years increased upon him, and the prospect

of his again performing a conspicuous part diminished, he relapsed into an attitude of complete discouragement, and contributed to chill the ardour of his own party. His narrative of his share in the Congress of Verona, the Life of Rancé, and his translation of Milton, belong to the writings of these later days. He expired on July 4, 1848, wholly exhausted and thoroughly discontented with himself and the world, but affectionately tended by his old friend Madame Récamier, herself deprived of sight. His remains were interred in Grand Bey, a lonely islet off the coast of Brittany. Shortly after his death his memory was power- fully revived, and at the same time cxposed to much adverse criticism, by the publication, with sundry mutilations as has been suspected, of his celebrated dfémotres a' Outre-Tombe, the composition of which had occupied him at intervals during the greater part of his life. These memoirs undoubtedly reveal his vanity, his egotism, the frequent hollowness of his professed convictions, and his incapacity for sincere attachment, except, perhaps, in the case of Madame Récamier. They abound, on the other hand, with beauties of the first order, and much of the rough treatment they have experienced is attributable to the animosity of party. Their principal literary defect is the frequent encroachment of the historical element upon the autobiographical, the writer's exaggerated

estimate of his own consequence leading him to allow a disproportionate space to transactions in which he had in fact but little sliare.

Chateaubriand ranks rather as a great rhetorician than as a great poet, rather as a great writer than a great man. Something of affectation or unreality commouly interferes with the enjoyment of his finest works. The Genius of Christianity is a brilliant piece of special pleading ; Atala is marred by its unfaithfulness to the truth of uncivilized luman nature, Mené by the perversion of sentiment which solicits sympathy for a character rather deserving of con- tempt. Chateaubriand's fame owes much to the timeliness of his appearances in print, and even more to the genuine conviction of his countrymen that French literature and European literature are practically convertible terms. They have hence made his position in the former the standard of his influence over the latter,;which, for an author so widely read and so generally admired, has in reality been but small, ven in France he is chiefly significant as marking the transition from the old classical to the modern romantie school. He belongs to the latter by:the idiosyncrasy of his genius, to the former by the comparative severity of his taste. The fertility of ideas, vehemence of expression, and luxury of natural description, which he shares with the romanticists, arc controlled by a discipline imbibed in the school of their predecessors. His palette, always brilliant, is never gaudy; he is not merely a painter but an artist. He is a master of epigrammatic and incisive sayings, and has contributed as much as any great French writer to foster the disastrous national partiality for la phrase. Perhaps, however, the most truly characteristic feature of his genius is the peculiar magical touch which Mr Arnold has indicated as a note of Celtic extraction, which reveals some occult quality in a familiar object, or tinges it, one knows not how, with " the light that never was on sea or land." This incommunicable gift is of necessity genuine, and supplies an element of sincerity to Chateaubriand's writings which goes far to redeem the artificial effect of lis calculated sophistry and set declamation. It is also fortunate for his fame that so large a part of his writings should directly or indirectly refer to himself, for on this theme he always writes well. Egotism was his master-passion, and beyond his intrepidity and the loftiness of his intellectual carriage his character presents little to admire. Ife is a signal instance of the compatibility of genuine

poetic emotion, and sympathy with the grander aspects both of man and nature, end even munificence in pecuniary matters, with absorption in self and general sterility of heart.

The principal authority for Chateaubriand's biography is his own Mémoires d'Outre-Tombe. The Souvenirs et Correspondance of Madame Récamier may also be consulted. The best general review of his character and writings is Sainte Beuve's Chateaubriand et sa Groupe Littéraire, Paris, 1872; sce also the Count de Marcellus's Chateaubriand et son Temps, and for his diplomatic career the latter's Souventrs Diplomatiques. The best edition of his works is Sainte Betve's, Paris, 1859-60. (RB. G.)

CHATEAUBRIANT, a town of France, at the head of an arrondissement in the department of Loire Inférieure, on the left bank of the Chére, a tributary of the Vilaine, 35 miles N.N.E. of Nantes. It takes its name from a castle founded in 1015 by Briant, count of Penthiévre; and its principal ornament is another castle, built in 1524 by Jean de Laval, and famous in history as the scene of the assassina- tion of Francoise de Foix. There is also an interesting Romanesque church dedicated to St Jean de Bere. The manufactures are mainly woollen stuffs and confectionery ; and the trade is in iron, coal, and wood. Population in

1872, 4134.

CHATEAUDUN, a town of France, capital formerly of the countship of Dunois, and now of an arrondissement in the department of Eure-et-Loir, 28 miles S.S.W. of Chartres. It stands on an eminence near the left bank of the Loir, and has remains of an old castle, several ancient churches, a town-hall, a communal college, a public library, and manufactures of woollens and leather. It was almost entirely destroyed by fire in 1723, and in 1870 it was captured by the Germans. Population in 1872, 5923.

CHATEAU-GONTIER, a town of France, at the head of an arrondissement in thedepartment of Mayenne, onthe right bank of the Mayenne river, here crossed by a stone bridge, 17 miles S.S.E. of Laval. It has a fine Gothic church, a communal college, three hospitals, an agricultural society, public

baths, extensive bleach fields, and manufactures of linen and woollen stuffs. It is also the entrepdt of a great part of the trade of the department in wine, slate, iron, and coal, Chateau-Gontier owes its origin and its name to a castle erected in 1037 by Gunther, the steward of Fulques Nerra of Anjou, on the site of a farm belonging to the monks of St Aubin d'Angers. On the extinction of the family, the lordship was assigned by Louis XT. to Philippe de Comines. The town suffered severely during the wars of the League, and in the Vendean struggle it was the scene of sanguinary proceedings. Population in 1872,

7048.

CHATEAUROUX, a town of France, capital of the department of Indre, is situated in a fine plain on the left bank of the Indrc, 90 miles by rail S.W. of Orleans. It is the seat of a court of assize, and tribunals of primary instance and commerce; and it has a castle, now used as the town-hall, a cathedral, erected about 1873, a society of arts and agriculture, a communal college, a theatre, and a public library. It is ill built, with narrow filthy streets. The principal manufacture is woolleng, in which a great part of its inhabitants are employed; it has an active trade in woollen yarn, leathcr, iron, grain, and cattle, and there are quarries of lithographic stone in the neighbourhood. The castle from which it takes its name was founded about the middle of the 10th century by Raoul, prince of Déols, and passed into the possession of several noble families. In 1215 one of the earliest of the Franciscan monasteries was founded in the town by William of Chauvigny. Raised to the rank of a conntship in 1497, and to that of duchy in 1616, it finally passed into the possession of Louis II. of Bourbon, prince of Condé, and the castle served for the incarceration of his wife for twenty-three years. General Bertrand was born in the castle in 1773, and his statug

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adorns the Place Sainte Héléne. Population of the town in 1872, 16,858 ; of the commune, 18,670, CHATEAU-THIERRY, a town of France, at the head of an arrondissement in the department of Aisne, on the right bank of the Marne, and connected with an extensive suburb on the opposite bank by a fine stone bridge of three arches. It is the seat of a tribunal of primary instance, and has a communal college, a public library, and manu- factures

of linen, cotton, leather, and earthenware. [It contains a marble statue erected to the memory of La Fontaine, who was born in the town; and his housé is still preserved in the street that was formerly called after the Cordeliers, but now bears the uanie of the poet. On the top of the hill are the rpins of a castle, which is said to have been built by Charles Martel for Thierry IV., and is plainly the origin of the name of the town, Chateau-Thierry was formerly the capital of the district of -Brie Pouilleuse, and received the title of a duchy from Charles IX. in 1566. Its position has brought upon it numerous disasters from time to time. It was captured by the English in 1421, by Charles V, in 1545, and by the Spanish in 1591, During the wars of the Fronde it was pillaged in 1652; and in the campaign of 1814 it suffered severely. On February 12 of the latter year the Russo-Prussian forces were beaten by Napoleon in the neighbourhood. Population of the town in 1872, 5347; of the commune, 6623,
CHATELLERAULT, a town of France, at the head of an arrondissement in the department of Vienne, on the right bank of the Vienne, here crossed by a handsome stone bridge, which connects it with the suburb of Chateauneuf on the opposite side of the river, 24 miles N.N.E. of Poitiers. It stands in a fertile valley, and has several fine promenades, but is irregularly built. It has tribunals of primary instance and commerce, a fine Gothic church, a public fsuutain, a communal college, an exchange, a hospital, a society of agriculture, and a theatre. It is one of the chief seats of the manufacture of cutlery in France; and has a Government manufactory of swords and bayonets, established

in 1820, There is a large trade in wines, dried fruits, ’

slates, iron, corn, hemp, and timber. Population in 1872,

13,363.

Chitellerault, or Castrwm Heraldi, derives its name from a castle built in the 11th century. In 1514 it was made a duchy in favour of Gilbert of Bourbon, count of Montpensier, but not long after it was reunited to the Crown. In 1548 it was bestowed on James Hamil- ton, second earl of Arran; but it was forfeited by failure of male issue. The title, however, continued to be claimed by the dukes of Hamil- ton and the earls of Abercorn, who were both descended by the female side from the original possessor, A decree of

the French Council of State decided against the earl, and the title was rebestowed on the duke of Hamilton by Napolcon III.

CHATHAM, a town of England, in the county of Kent, on the south side of the Medway about 15 miles from its junction with the estuary of the Thames, and 27 miles east of London. Though still nominally distinct, it is practically united with Rochester on the west, and is in close proximity to Brompton and Gillingham on the east. In Chatham proper the streets are for the most part narrow, and with the exception of the docks and fortifica- tions, there are but few objects of interest. St Mary's church is a brick building erected about 1788, but occupying the site of an earlier structure of the 14th century ; it con- tains @ monumental brass to the memory of Stephen Borough, the discoverer of the northern passage to Russia. There are a few remains of the hospital for lepers founded by Bishop Gundulf in 1078; but the funds for its main- tenance were appropriated by decision of the court of chancery to the new hospital of St Bartholomew erected in 1863 within the boundaries of Rochester. 'The almshouse, established in 1592 by Sir John Hawkins for poor decayed seamen and shipwrights, is still in existence, the building

CHA 439 having been re-erected in the present century ; but the fund called the Chatham Chest, originated by Hawkins and Drake in 1588, was incorporated with Greenwich Hospital in 1802, The town possesses numerous churches and chapels of various denominations, a ragged school, a nautical school, a mechanics' institnte, and a lecture hall. The Medway union workhouse is situated a short distance to the south-east. The water supply is obtained from springs at the village of Lupton, about half a mile further off in the same direction; and extensive reservoirs were con- structed in 1862 at Star Hill in the neighbourhood of the village, Numerous brickyards, lime-kilns, and flour-mills are in the surrounding district, and the town carries on a large retail trade, partly from the presence of the garrison.

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Plan of Chatham.

The fortifications are among the most elaborate in the kingdom. ‘The so-called Chatham Lines eught rather to bear the name of the village of Brompton which they enclose, They were commenced in 1758 and eompleted in 1807 ; but various alterations and additions have since been effected. They are strengthened by several detached forts and redoubts, and consist of a very intricate system of trenches, batteries, and subterranean passages. Fort Pitt, which rises above the town to the west, was built in 1779, and is now used asa general military hospital 3 it was regarded as the principal establishment of the kind in the country till the foundation of Netley in Hampshire,

The lines include the Chatham, the Royal Marine, the Brompton, the Hut, and St Mary’s barracks; the garrison hospital and Melville hospital ; the arsenal with its large park of artillery ; the gymnasium, established in 1864 for gymnastic exercise ; the military school for the practical instruction of sappers and engineers, opened in 1812; a military institute for the men in garrison; the convict prison; and, finally, the cxtensive system of dockyards which has made the town so famous.

Numerous Roman remains, both architectural and domestic, have been discovered at Chatham and Brompton ; but they appear to have belonged to the Roman city of Rochester. ‘Till the reign of Elizabeth the place was a mere insignificant village; but before 1588 the queen established the first dockyard on the site of what is now called the Ordnance Wharf, and erected Castle Upnor on the opposite bank of the river for its defence. The situa-tion was changed in the following reign, and under the Charleses extensive additions were made. The history of the town since the attack of the Dutch in 1667 has been mainly the history of the naval and military establishments. The parliamentary boroagh, which returns one member, includes the towns of Chatham and Brompton, and the villages of Gillingham, Chatham Hill, and New Brompton, and covers an area of 2707 acres. The population of the borough in 1871 numbered 45,792 persons, of whom 24,873 were males and 20,919 females.

CHATHAM, Wiwiam Pirz, First Earu or (1708- 1778), one of the greatest of English statesmen and parlia- mentary orators, was born at Westminster

on the 15th November 1708. He was the younger son of Robert Pitt of Boconnock, in Cornwall, and grandson of Thomas Pitt, governor of Madras, who was known as Diamond Pitt, from the fact of his having sold a diamond of extra- ordinary size to the Regent Orleans for £135,000. It was mainly by this fortunate transaction that the governor was enabled to raise his family, which was one of old standing, to a position of wealth and political influence. The latter he acquired by means of the former in the direct open method, then so common, purchasing the burgage tenures of Old Sarum, which was thus destined to become famous as represented by William Pitt a hundred years before it became notorious as the typical “rotten borough” in the debates on the first reform bill.

Of the early life of William Pitt comparatively little is known. He was educated at Eton, and in January 1726 was entered as a gentleman commoner at Trinity College, Oxford. There is evidence that he was an extensively read, if not a minutely accurate classical scholar ; and it is interesting to know that Demosthenes was his favourite author, and that he diligently cultivated the faculty of expression by the practice of translation and re-translation. An hereditary gout, from which he had suffered even during his school-days, compelled him to leave the university without taking his degree, in order to travel abroad. He spent some time in France and Italy; but the disease proved intractable, and he continued subject to attacks of growing intensity at frequent intervals till the close of his life. In 1727 his father had died, and on his return home it was necessary for him, as the younger son, to choose a profession. Having chosen the army, he obtained through the interest of his friends a cornet’s commission in the dragoons. But his military career was destined to be short. His elder brother Thomas having been returned at. the general election of 1734 both for Oakhampton and for Old Sarum, and having preferred to sit for the former, the family borough fell to the younger brother by the sort of natural right usually recognized in such cases. Accord- ingly, in January 1735, William Pitt entered Parliament as member for Old Sarum. Attaching himself at once to

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the formidable band of discontented Whigs known as the Patriots, whom Walpole's love of exclusive power had forced into opposition, he became in a very short time one of its most prominent members. His maiden speech was delivered in April 1736, in the debate on the congratulatory address to the king on the marriage of the prince of Wales. The occasion was one of compliment, and there is nothing striking in the speech as reported; but it served to gain for him the attention of the house when he presented himself, as he soon afterwards did, in debates of a party character. So obnoxious did he become as a critic of the Government, that Walpole thought fit to punish him by procuring his dismission from the army. Some years later he had occasion vigorously to denounce the system of cashiering officers for political differences, but with charac- teristic loftiness of spirit he disdained to make any reference to his own case. The loss of his commission was soon made up to him. The heir to the throne, as has usually been the case in the house of Hanover, if not in reigning families generally, was the patron of the opposition, and the ex-cornet became groom of the bed-chamber to the prince of Wales. In this new position his hostility to the Govern- ment did not, as may be supposed, in any degree relax. He had all the natural gifts an orator could desire,— a commanding presence, a graceful though somewhat theatrical bearing, an eye of piercing brightness, and a voice of the utmost flexibility. His style, if occasionally somewhat turgid, was elevated and passionate, and it always bore the impress of that intensity of conviction which is the most powerful instrument a speaker can have to sway the convictions of an audience. It was natural, therefore, that in the series of stormy debates, protracted through several years, that ended in the downfall of Walpole, his eloquence should have been one of the strongest of the forecs that combined to bring about the final result. Specially effective, according to contemporary testimony, were his speeches against the Hanoverian subsidies, against the Spanish convention in 1739, and in favour of the motion in 1742 for an investigation into the last ten years of Walpole's administration. It must be borne in mind that the reports of these speeches which have come down to us were made from hearsay, or at best from recollection, and are necessarily therefore most imperfect. The best known specimen of Pitt's eloquence, his reply to the sneers of Horatio Walpole at his youth and declamatory manner, which has found a place in all handbooks of elocution published during the last hundred years, is evidently, in form at least, the work, not of Pitt. but of Dr Johnson, who

furnished the report to the Gentleman's Magazine. Probably Pitt did say something of the kind attributed to him, though even this is by no means certain in view of Johnson's repentant admission that he had often invented not merely the form but the substance of entire debates.

In 1742 Walpole was at last forced to succumb to the long continued attacks of the opposition, and was succeeded as prime minister by the earl of Wilmington, though the real power in the new Government was divided between Carteret and the Pelhams. Pitt's conduct on the change of administration was open to grave censure. The relentless vindictiveness with which he insisted on the prosecution of Walpole, and supported the bill of indemnity to witnesses against the fallen minister, was in itself not magnanimous; but it appears positively unworthy when it is known that a short time before Pitt had offered, on certain conditions, to use all his influence in the other direction. Possibly he was embittered at the time by the fact that, owing to the strong personal dislike of the king, caused chiefly by the contemptuous tone in which he had spoken of Hanover, he did not by obtaining a place in the

new ministry reap the fruits of the victory to which he had so largely contributed. The so-called " broad-bottom " administration formed by the Pelhams in 1744, after the dismissal of Carteret, though it included several of those with whom he had been accustomed to act, did not at first Before the obstacle to his admission was overcome, he had received a remarkable accession to his private fortune. The eccentric duchess of Marlborough, dying in 1744, at the age of ninety, left him a legacy of £10,000 as an " acknowledg- ment of the noble defence he had made for the support of the laws of England and to prevent the ruin of his country."

include Pitt himself even in a subordinate office.

As her hatred was known to be at least as strong as her love, the legacy was probably as much a mark of her detestation of Walpole as of her admiration of Pitt. It may be mentioned here, though it does not come in chronological order, that Pitt was a second time the object of a form of acknowledgment of public virtue which few statesmen have had the fortune to receive even

once. About twenty years after the Marlborough legacy, Sir William Pynsent, a Somer- setshire baronet to whom he was personally quite unknown, left him his entire estate, worth about three thousand a year, in testimony of approval of his political career.

It was with no very good grace that the king at length consented to give Pitt a place in the Government, although the latter did all he could to ingratiate himself at court, by changing his tone on the questions on which he had made himself offensive. To force the matter, the Pelhams had to resign expressly on the question whether he should be admitted or not, and it was only after all other arrange- ments had proved impracticable, that they were re-instated with the obnoxious politician as vice-treasurer of Ireland. This was in February 1746. In June of the same year he was promoted to the more important and lucrative office of paymaster-general, which gave him a place in the Privy Council, though not in the Cabinet. Here he had an opportunity of. displaying his public spirit and integrity in a way that deeply impressed both the king and the country. Ip had been the usual practice of previous paymasters to appropriate to themselves the interest of all money lying in their hands by way of advance, and also to accept a com- mission of one-half per cent. on all foreign subsidies, Although there was no strong public sentiment against the practice, Pitt altogether refused to profit by it. All advances were lodged by him in the Bank of England until required, and all subsidies were paid over without deduc- tion, even though it was pressed npon him, so that he did hot draw a shilling from his office beyond the salary legally attaching to it. Conduct like this, though obviously dis- interested, did not: go without immediate and arnple reward, in the public confidence which it created, and which formed the mainspring of Pitt's power as a statesman,

The administration formed in 1746 lasted without material change till 1754. It wonld appear from his published correspondence that Pitt had a greater influence in shaping its policy than his comparatively subordinate position would in itself have entitled him to. His conduct in supporting measures, such as the Spanish treaty and the Continental subsidies, which he had violently denounced When in opposition, had been much criticized. One of his biographers, Mr Thackeray, takes the trouble to offer an elaborate defence of it; but the vindication is in part unnecessary, and in part

unsatisfactory. Within certain limits, not indeed very well defined, inconsistency has never been counted a vice in an English statesman, ‘The times change, and he is not blamed for changing with the times. Pitt in office, looking back on the commencement of his public life, might have used the plea “A good deal has happened since then,” at least as justly as some others have done, Allowance must always be made for the restraints

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and responsibilities of office. In Pitt’s case, too, it is to be borne in mind that the opposition with which he had acted gradually dwindled away, and that it ceased to have any organized existence after the death of the prince of Wales in 1751. Then in regard to the important question with Spain as to the right of search, Pitt has disarmed criticism by acknowledging that the course he followed during Walpole’s administration was indefensible. All due weight being given to these various considerations, it must be admitted, nevertheless, that Pitt did overstep the limits within which inconsistency is usually regarded as venial. His one great object was first to gain office, and then to make his tenure of office secure by conciliating the favour of the king. The entire revolution which much of his policy underwent in order to effect this object bears too close a resemblance to the sudden and inexplicable changes of front habitual to placemen of the Tadpole stamp to be altogether pleasant to contemplate in a politician of pure aims and lofty ambition. Humiliating is not too strong a term to apply to a letter in which he expresses his desire to “efface the past by every action of his life,” in order that he may stand well with the king.

In 1754 Henry Pelham died, and was succeeded at the head of affairs by his brother, the duke of Newcastle. To Pitt the change brought no advancement, and he had thus an opportunity of testing the truth of the description of his chief given by Sir Robert Walpole, “His name is treason.” But there was for a time no open breach. Pitt continued at his post; and at the general election which took place during the year he even accepted a nomination for the duke’s pocket borough of Aldborough. He had satfor Seaford since 1747, When Parliament met, however, he was not long in showing the state of his feelings. Ignoring Sir Thomas Robinson, the political nobody to whom Newcastle had entrusted the management of the Commons, he made

frequent and vehement attacks on Newcastle himself, though still continuing to serve under him. In this strange state matters continued for about a year. At length, just after the meeting of Parliament in November 1751, Pitt was dismissed from office, having on the debate on the address spoken at great length against a new system of Continental subsidies, proposed by the Government of which he was a member. Fox, who had just before been appointed Secretary of State, retained his place, and though the two men continued to be of the same party, and afterwards served again in the same Government, there was henceforward a rivalry between them, which makes the celebrated opposition of their illus- trious sons seem like an inherited quarrel.

Another year had scarcely passed when Pitt was again in power. The inherent weakness of the Government, the vigour and eloquence of his opposition, and a series of military disasters abroad combined to rouse a public feeling of indignation which could not be withstood, and in December 1756 Pitt, who now sat for Oakhampton, became Secretary of State, and leader of the Commons under the premiership of the duke of Devonshire. He had made it a condition of his joining any administration that Newcastle should be excluded from it, thus showing a resentment which, though natural enough, proved fatal tothelengthened existence of his Government. With the king unfriendly, and Newcastle, whose corrupt influence was still dominant in the Commons, estranged, it was impossible to carry on a Government by the aid of public opinion alone, however emphatically that might have declared itself on his side. In April 1757, accordingly, he found himself again dismissed from office on account of his opposition to the king’s favourite Continental policy. But the power that was in-

sufficient to keep him in office was strong enough to make any arrangement that excluded him Ue The ee

public voice spoke in a way that was not to be mistaken. Probably no English minister ever received in so short a time so many proofs of the confidence and admiration of the public, the capital and all the chief towns voting him addresses and the freedom of their corporations. From the

political deadlock that ensued relief could only be had by an arrangement between Newcastle and Pitt. After some weeks' negociation, in the course of which the firmness and moderation of "the Great Commoner, " as he had come to be called, contrasted favourably with the characteristic tortuosities of the crafty peer, matters were settled on such a basis that, while Newcastle was the nominal, Pitt was the virtual head of the Government. On his acceptance of office he was chosen member for Bath.

This celebrated administration was formed in June 1757, and continued in power till 1761. During the four years of its existence it has been usual to say that the biography of Pitt is the history of England, so thoroughly was he identified with the great events which make this period, in so far as the external relations of the country are concerned, one of the most glorious in her annals. A detailed account of these events belongs to history; all that is needed in a biography is to point out the extent to which Pitt's personal influence may really be traced in them. It is scarcely too much to say that, in the general opinion of his contemporaries, the whole glory of these years was due to his single genius ; his alone was the mind that planned, and his the spirit that animated the brilliant achievements of the British arms in all the four quarters of the globe. Pos- terity, however, has taken the liberty of revising this eu- thusiastic verdict, and has placed his renown on what seems a truer and therefore a firmer basis. It has recognized more fully than his contemporaries the independent genius of those who, as subordinates or allies, carried out his pur- poses. The heroism of Wolfe would have been irrepres- sible, Clive would have proved himself "a heaven-born general," and Frederick the Great would have written his name in history as one of the most skilful strategists the world has known, whoever had held the seals of office in England. But Pitt's relation to all three was such as to erititle him to a large share in the credit of their deeds. It was his discernment that selected Wolfe to lead the attack on Quebec, and gave him the opportunity of dying a victor on the heights of Abraham, He had personally less to do with the successes in India than with the other great enterprises that shed an undying lustre on his adminis- tration; but his generous praise in Parliament stimulated the genius of Clive, and the forces that acted at the close of the struggle were animated by his indomitable spirit. Frederick the Great's Seven Years' War might well have been another Thirty Years' War, if Pitt

had not furnished him with an annual subsidy of £700,000, and in addition relieved him of the task of defending Western Germany against France.

Contemporary opinion was, of course, incompetent to estimate the permanent results gained for the country by the brilliant foreign policy of Pitt. It has long been genérally agreed that by several of his most costly expe- ditions nothing was won but empty glory. It has even been said that the only permanent acquisition that England owes directly to him is her Canadian dominion; and, strictly speaking, this is true, it being admitted that the campaign by which the Indiau empire was virtually won was not planned by him, though brought to a successful issué during his ministry. But material aggrandizement, though the only tangible, is not the only real or lasting effect of a war policy. More may be gained by crushing a formidable rival than by conquering a province. The loss of her Canadian possessions was only onc of a series of disasters suffered by France, which radically affected the

future of Europe and the world. Deprived of her most valuable colonies both in the East and in the West, and thoroughly defeated on the Continent, her humiliation was the beginning of a new epoch in history. The victorious policy of Pitt destroyed the military prestige which repeated experience has shown to be in France as in no other country the very life of monarchy, and thus was not the least considerable of the many influences that slowly brought about the French Revolution. It effectually de- prived her of the lead in the councils of Europe which she had hitherto arrogated to herself, and so has affected the whole course of Continental politics to the present time. It is such far-reaching results as these, and not the mere acquisition of a single colony, however valuable, that constitute Pitt’s claim to be considered as on the whole the most powerful minister that ever guided the foreign policy of England.

The first and most important of a series of changes which ultimately led to the dissolution of the ministry was the death of George II. on the 25th October 1760, and the accession of his grandson, George III. The new king had, as was natural, new counsellors of his own, the chief of whom, Lord Bute, was at once admitted to the cabinet as a secretary of state. Between

Bute and Pitt there speedily arose an occasion of serious difference. The existence of the so-called family compact by which the Bourbons of France and Spain bound themselves in an offensive alliance against England having been brought to light, Pitt urged that it should be met by an immediate declaration of war with Spain. To this course Bute would not consent, and as his refusal was endorsed by all his colleagues save Temple, Pitt had no choice but to leave a cabinet in which his advice on a vital question had been rejected. On his resignation, which took place in October 1761, the king urged him to accept some signal mark of royal favour in the form most agreeable to himself. Accordingly he obtained a pension of £3000 a year for three lives, and his wife, Lady Hester Grenville, whom he had married in 1754, was created Baroness Chatham in her own right. In con- nection with the latter gracefully bestowed honour it may be mentioned that Pitt's domestic life was a. singularly happy one. ©. –

Pitt's spirit was too lofty to admit of his entering on any merely factious opposition to the Government he had quit- ted. On the contrary, his conduct after his retirement was distinguished by a moderation and disinterestcedness which, as Burke has remarked, " set a seal upon his char- acter." The war with Spain, in which he had urged the Cabinet to take the initiative, proved inevitable; but he scorned to use the occasion for " altercation and recrimina- tion," and spoke in support of the Government measures for carrying on the war. To the preliminaries of the peace concluded in February 1763 he offered an indignant resist- ance, considering the terms quite inadequate to the suc- cesses that had been gained by the country. When the treaty was discussed in Parliament in December of the pre- ceding year, though suffering from a severe attack of gout, he was carried down to the house, and in a speech of three hours' duration, interrupted more than once by paroxysms of pain, he strongly protested against its various conditions. The physical cause which rendered this effort so painful probably accounts for the infrequency of his appearances in Parliament, as well as for much that is otherwise inex- plicable in his subsequent conduct. In 1763 he spoke against the obnoxious taxon cider, imposed by his brother- in-law, George Grenville, and his opposition, though un- successful in the house, helped to keep alive his popularity with the country, which cordially hated the excise and all

connected with it. When next year the question of general warrants was raised in connection with the case of

Wilkes, Pitt vigorously maintained their illegality, thus defending at once the privileges of Parliament and the free- dom of the press. During 1765 he seems to have been totally incapacitated for public business. In the follow- ing year he supported with great power the proposal of the Rockingham administration for the repeal of the American Stamp Act, arguing that it was unconstitutional to impose taxes upon the colonies. He thus endorsed the contention of the colonists on the ground of principle, while the ma- jority of those who acted with him contented themselves with resisting the disastrous taxation scheme on the ground of expediency. The Repeal Act, indeed, was only passed part passe with another censuring the American Assembly, and declaring the authority of the British Parliament over the colonies ‘fin all cases whatever;” so that the House of Commons repudiated in the most formal manner the prin- ciple Pitt laid down. His language in approval of the resist- ance of the colonists was unusually bold, and perhaps no one but himself could have employed it with impunity at a time when the freedom of debate was only imperfectly conceded.

Pitt had not been long out of office when he was solicited to return to it, and the solicitations were more than once

renewed, Unsuccessful overtures were made to him in 1763, and twice in 1765, in May and June,—the negotiator in May being the king's uncle, the duke of Cumberland, who went down in person to Hayes, Pitt's seat in Kent. It is known that he had the opportunity of joining the marquis of Rockingham's short-lived administration at any time on his own terms, and his conduct in declining an arrangement with that minister has been more generally condemned than any other step in his public life. ven Thackeray, his admiring biographer, has admitted that in this matter he was ‘‘ neither kind as a man nor wise as a politician.” In the autumn of 1766 Rockingham was dismissed, and Pitt was entrusted by the king with the task of forming a Government entirely on his own condi- tions, The result was a cabinet, strong much beyond the average in its individual members, but weak to powerless- ness in the diversity of its composition, Burke, in a memorable passage of a memorable speech, has described this “‘ chequered and speckled ” administration with great humour, speaking of it as “indeed a very curious show, but utterly unsafe to touch and unsure to stand on.” Pitt chose for himself the office of Lord Privy Seal, which necessitated his removal to the House of Lords; and he became Viscount Pitt and Harl of Chatham.

By the acceptance of a peerage the great commoner lost at least as much and as suddenly in popularity as he gained in dignity. One significant indication of this may be mentioned. In view of his probable accession to power, preparations were made in the city of London for a banquet and a general illumination to celebrate the event. But the celebration was at once countermanded when it was known that he had become earl of Chatham. The instantaneous revulsion of public feeling was somewhat unreasonable, for Pitt's health seems now to have been beyond doubt so shattered by his hereditary malady, that he was already in old age though only fifty-eight. It was natural, therefore, that he should choose a sinecure office and the ease of the Lords. But a popular idol nearly always suffers by re- moval from immediate contact with the popular sympathy, be the motives for removal what they may.

One of the earliest acts of the new ministry was to lay an embargo upon corn, which was thought necessary in order to prevent a dearth resulting from the unprece- dentedly bad harvest of 1766. The measure was strongly opposed, and Lord Chatham delivered his first speech in the House of Lords in support of it. It proved to be almost the only measure introduced by his Government in which he personally interested himself. His attention

had been directed to the growing importance of the affairs of India, and there is evidence in his correspondence that he was meditating a comprehensive scheme for transferring much of the power of the company to the Crown, when he was withdrawn from public business in a manner that has always been regarded as somewhat mysterious. It may be questioned, indeed, whether even had his powers been unimpaired he could have carried out any decided policy on any question with a cabinet representing interests so various and conflicting; but, as it happened, he was incapacitated physically and mentally during nearly the whole period of his tenure of office. He scarcely ever saw any of his colleagues though they repeatedly and urgently pressed for interviews with him, and even an offer from the king to visit him in person was declined, though in the language of profound and almost abject respect which always marked his communications with the court. It has been insinuated both by contemporary and by later critics that being disappointed at his loss of popularity, and con vinced of the impossibilty of co-operating with his colleagues, he exaggerated his malady as a pretext for the inaction that was forced upon him by circumstances. But there is no sufficient reason to doubt that he was really, as his friends represented, in a state that utterly unfitted him for business. He seems to have been freed for a time from the pangs of gout only to be afflicted with a species of mental alienation bordering on insanity. This is the most satisfactory, as it is the most obvious, explanation of his utter indifference in presence of one of the most momentous problems that ever pressed for solution on an English statesman. Those who are able to read the history in the light of what occurred later may perhaps be con- vinced that no policy whatever initiated after 1766 could have prevented or even materially delayed the declaration of American independence; but to the politicians of that time the coming event had not yet cast so dark a shadow before as to paralyze all action, and if any man could have allayed the growing discontent of the colonists and

prevented the ultimate dismemberment of the empire, it would have been Lord Chatham. The fact that he not only did nothing to remove existing difficulties, but remained passive while his colleagues took the fatal step which led directly to separation, is in itself clear proof of his entire incapacity. The imposition of the import duty ou tea and other commodities was the project of Charles Townshend, and was carried into effect in 1767 without consultation with Lord Chatham, if not in opposition to his wishes. It is probably the most singular thing in connection with this singular administration, that its most pregnant measure should thus have been one directly opposed to the well-known principles of its head.

For many months things remained in the curious posi- tion that he who was understood to be the head of the cabinet had as little share in the government of the country as an unenfranchised peasant. As the chief could not or would not lead, the subordinates naturally chose their own paths and not his. ‘The lines of Chatham’s policy were abandoned in other cases besides the imposition of the import duty ; his opponents were taken into confidence ; and friends, such as Amherst aud Shelburne, were dismissed from their posts, When at length in October 1768 he tendered his resignation on the ground of shattered health, he did not failto mention the dismissal of Amherst and Shelburne as a personal grievance.

Soon after his resignation a renewed attack of gout freed Chatham from the mental disease under which he had so long suffered. He had been nearly two years and a half in seclusion when, in July 1769, he again appeared in public at a royal levee. It was not, however, until 1770 that he resumed his seat in the House of Lords. He had

now almost no personal following, mainly owing to the grave mistake he had made in not forming an alliance with the Rockingham party. But his eloquence was as powerful as ever, and all its power was directed against the Govern- ment policy in the contest with America, which had become the question of all absorbing interest. His last appearance in the House of Lords was on the 2d April 1778, on the occasion of the duke of Richmond’s motion for an address praying the king to conclude peace with America on any terms. In view of the hostile demonstrations of France the various

parties had come generally to see the necessity of such a measure. But Chatham could not brook the thought of a step which implied submission to the ‘natural enemy” whom it had been the main object of his life to humble, and he declaimed for a considerable time, though with sadly diminished vigour, against the motion. After the duke of Richmond had replied, he rose again excitedly as if to speak, pressed his hand upon his breast, and fell down in a fit. He was removed to his seat at Hayes, where he died on the 11th May. With graceful unanimity all parties combined to show their sense of the national loss; The Commons presented an address to the king praying that the deceased statesman might be buried with the honours of a public funeral, and voted a sum for a public monument which was erected over his grave in Westminster Abbey. Soon after the funeral a bill was passed bestowing a pension of £4000 a year on his succes- sors in the earldom. He had a family of three sons and two daughters, of whom the second son, William, was destined to add fresh lustre to a name which is one of the greatest in the history of England.

Dr Johnson is reported to have said that “ Walpole was a minister given by the king to the people, but Pitt was a minister given by the people to the king,” and the remark correctly indicates Chatham’s distinctive place among English statesmen. He was the first minister whose main strength lay in the support of the nation at large as distinct from its representatives in the Commons, where his personal following was always small. He was the first to discern that public opinion, though generally slow to form and slow to act, is in the end the paramount power in the state : and he was the first to use it not in an emergency merely, but throughout a whole political career. He marks the commencement of that vast change in the movement of English politics by which it has come about that the senti- ment of the great mass of the people now tells effectively on the action of the Government from day to day,—almost from hour to hour He was well fitted to secure the sympathy and admiration of his countrymen, for his virtues and his failings were alike English. He was often incon- sistent, he was generally intractable and overbearing, and he was always pompous and affected to a degree which, Macaulay has remarked, seems scarcely compatible with true greatness. Of the last quality evidence is furnished in the stilted style of his letters, and in the fact recorded by Seward that he never permitted his under-secretaries to sit in his presence. Burke speaks of “some significant,

pompous, creeping, explanatory, ambiguous matter, in the true Chathamic style” But these defects were known only to the inner circle of his associates To the outside public he was endeared as a statesman who could do or suffer “ nothing base,” and who had the rare power of transfusing his own indomitable energy and courage into all who served under him. “A spirited foreign policy ” has always been popular in England, and Pitt was the most popular of English ministers, because he was the most successful exponent of such a policy. In domestic affairs his influence was small and almost entirely indirect. He himself confessed his unfitness for dealing with questions of finance. The commercial prosperity that was produced

by his war policy was in a great part delusive, as prosperity so produced must always be, though it had permanent effects of the highest moment in the rise of such centres of industry as Glasgow. This, however, was a remote result which he could have neither intended nor foreseen. More directly attributable to him was the policy which led to the pacification of the Highlands of Scotland. With the happy instinct of a chivalrous mind he advised the formation of the Highland regiments, and so succeeded in transforming high-spirited though mistaken rebels into the bravest and most loyal soldiers of the British crown.

See A Lfistory of the Right Hon. William Pitt, Earl of Chatham, (2 vols. 4to, 1827) by the Rev. Francis Thackeray ; Correspondence of William Pitt, Karl of Chatham (4 vols. 8vo. 1838-40) ; and Almon’s Ancedotes of Chatham, with his Specches in Parliament (2 vols. 4to, 1792). A volume of Pitt’s letters to his nephew, Thomas Pitt, Lord Camelford, was published in 1804. (W. B. 8.)

CHATHAM ISLANDS, a group in the Pacific, 560 miles east of New Zealand, lying between 43° 40’ and 45° 20’ S. lat., and between 176° 10’ and 177° 20’ W. long. It consists of three islands, a large one called Wari-Kauri, or Chatham Island, a smaller one, Rangi-Haute, or Pitt’s Island, and a third, Rangatira, or South-east Island. There are also several small rocky islets. Chatham Island, according to Dieffenbach, contains an area of 305,280 acres; of which, however, 57,600 acres are lakes and lagoons. In the centre is a large brackish lake called Tewanga, about 25 miles long and

6 or 7 broad, which at the southern end is separated from the sea by a sandbank only 150 yards wide, which it occasionally bursts through. The southern part of the island has an undulating surface, and is covered either with an open forest or with high ferns. In general the soil is extremely fertile, and where it is naturally drained, a rich vegetation of fern and flax (Phormium tenaz) has sprung up, giving firmness to the soil and yielding a rich harvest to the planter. On the north-west are three or four conical hills of basalt, which are surrounded by oases of fertile soil. On the western side is Petre Bay, 40 miles across, on which, at the mouth of the River Mangatu, is Waitangi, the principal settlement. The country to the east of the great lagoon is quite flat, and is scarcely 50 feet above the sea-level. The climate is very mild, in winter varying only from 45° to 60°. The changes of temperature are less sudden than in New Zealand. The inhabitants cultivate potatoes, turnips, cabbages, taro (escu- lent arum), tobacco, and pumpkins. The trees and shrubs resemble those of New Zealand, but the former are of very small size. Horses and cattle are bred in considerable numbers for the New Zealand market. Birds of many kinds, chiefly ducks, snipes, plovers, curlews, rcdbills, sandlarks, and parroquets, abound. Fish are plentiful on the coast, and whaling is actively prosecuted all round the group. Pitt's Island is about 12 miles long and 8 broad ; it has no harbour. These islands were discovered in 1791 by Lieutenant Broughton, who gave them the name of Chatham from the brig which he commanded. The natives, who are known as Morioris or Maiorioris, Were conquered in 1832-33 by the Maoris of New Zealand, who killed great numbers of them, and in 1839 half of those left died of an epidemic of influenza. Their num- bers have becn reduced from 1500 to 140, and they are now a feeble and degenerate race. The geology and the flora and fauna of the islands indicate their physical connection with New Zealand, to which politically they belong,

CHATILLON-SUR-SEINE, a town of France, formerly the capital of the Pays de la Montagne or Country of the Mountain, in Burgundy, and now at the head of an arrondissement in the department of Céte d'Or, is situated about 40 miles south-west of Troyes on the Upper Seine. It is built on both sides of the river, and formerly consisted

of two distinct portions known as Chaumont and Bourg, each with its own fortifications, It is the seat of a court of primary instance, and possesses the ruins of a magnificent castle, a hospital, a town-house, a communal college, a public library, and some fine promenades, The church of St Vorle dates from the 12th century, and contains a number of frescoes included among the historic monuments of France. Marshal Marmont, duke of Ragusa, who was born in the town in 1774, has left a memento in the shape of ahandsome chateau. A.considerable trade is maintained by Chatillon in timber, wool, leather, and lithographic stones ; and it has cloth-factories, paper-mills, foundries, flour-mills, and various other industrial establishments. The origin of the town probably dates from the 5th century. For several centuries it was a favourite residence of the dukes of Burgundy. In modern times it is mainly remarkable for the conference held, in February 1814, between Napoleon and the Allics, in which the former rejected the proposal that he should rule over the France of pre-Revolutionary limits. Population in 1872, 4691. CHATSWORTH, the seat of the duke of Devonshire, one of the most splendid private residences in England, is situated in Derbyshire, on the River Derwent, 34 miles north-east of the village of Bakewell, and 8 miles west of the town of Chesterfield. It stands on the left bank of the river, opposite the hamlet of Edensor, and as seen from the west presents a magnificent fagade in fine relief against the wooded ridge of Bunker’s Hill, The building is in the Ionic style, and the principal part is composed of four nearly equal sides, surrounding an open quadrangular court with a fountain in the centre. A wing and other somewhat extensive additions have been made since 1820. Chatsworth contains some beautiful wood carvings by Gibbons and Watson, several pieces of sculpture by Canova, Thorwaldsen, Chantrey, and Wyatt, and a unique collection of original drawings by Titian, Rubens, Salvator Rosa, Raphael, Claude Lorraine, and others of the older masters. The park is upwards of 11 miles in circuit; the gardens are among the most celebrated in the kingdom, and cover an area of twelve acres. The grand conservatory, an acre in extent, erected by Sir Joseph Paxton, is un- equalled by any in Europe; and the waterworks, which include one fountain with a jet 260 feet high, are only surpassed by those of Versailles. The domain of Chatsworth is mentioned in Domesday Book as Chetesvorde. In the 16th century it was purchased by Sir William Caven- dish. The mansion which he erected afterwards served as a place of confinement for Mary Queen of Scots from

1570 to 1581. It has entirely disappeared ; and the present building was commenced in 1688 by the first duke of Devonshire and was completed in 1840 by the seventh. CHATTANOOGA, a city of the United States, in the county of Hamilton, Tennessee, about 250 miles by water from Knoxville, at the foot of Lookout Mountain, on the left bank of the Tennessee river, which is navigable for steamers during eight months of the year. It has free communica- tion by four railway lines, and carries ou a pretty extensive trade in the produce of the surrounding district, which is well supplied with timber, iron-ore, and coal. Among its industrial establishments are saw-mills and wood-work factories. In 1862 and 1863 the Confederates were defeated here by the Federal forces under General Grant. Population in 1870, 6093, of whom 2221 were coloured. CHATTERTON, Tuomas (1752-1770). Among the poets of the 18th century, Thomas Chatterton occupies a place altogether unique. He indeed claims scarcely less the interest of the psychologist as a marvellous example of matured intellectual precocity, than that of the student of English literature as a poet remarkable in an age of varied literary excellence. Fully to estimate the characteristics

in which Chatterton stands out with such exceptional prominence, it has to be kept constantly in view that he was a posthumous child, the son of a poor widow, self- taught in all but the merest rudiments of education acquired at a charity school; that, so far from receiving encourage- ment, he was thwarted at every step in his strange, brief career; and that he was buried by strangers, in a pauper’s grave, when only seventeen years of age.

Born though Chatterton was in a humble rank of life, his pedigree has a curious significance. The oflice of sexton of St Mary Redcliffe, at Bristol, one of the most beautiful specimens of parochial church architecture in England, had been transmitted for nearly two centuries in the Chatterton family ; and throughout the brief life of the poet it was held by his uncle, Richard Phillips. The poet’s father— the first of the Chattcrtons who aspired to a position requiring education and natural ability—was a musical genius, somewhat of a poet, an antiquary, and a dabbler in occult arts. He was one of the subchanters of Bristol Cathedral, and master of the Pyle Street Free School in the vicinity of Redcliffe church, But whatever

hereditary tendencies may have been transmitted from the father, the sole training of the boy necessarily devolved on his mother, who wasin the fourth month of her widowhood at the time of his birth (20th November 1752).

The young widow established a girl's school, took in sewing and. ornamental needlework, and so brought up her two children, a girl and boy, till the latter attained his eighth year, when he was admitted to Colston's Charity. But the Bristol blue-coat school had little share in the education of its marvellous pupil. The hereditary race of sextons had come to regard the church of St Mary Redcliffe as their own peculiar domain ; and, under the guidance of his uncle, the orphan child found there his favourite haunt. The knights, ecclesiastics, and civic dignitaries, recumbent on its altar tombs, became his familiar associates ; and by and by, when he was able to spell his way through the inscriptions graven on their monuments, he found a fresh interest in certain quaint oaken chests in the muniment room over the porch on the north side of the nave, where parchment deeds, old as the Wars of the Roses, long lay unheeded and forgotten. His futher, the schoolmaster, had already made free with them for wrappers to his copy books; his mother turned them to account for thread papers and patterns; and they formed the child's playthings almost from his cradle. He learned his first letters from the illuminated capitals of an old musical folio, and turned to account deeds and charters of the Henrys and Edwards as his primers. Wayward, as it seems, almost from his earliest years, and manifesting no sympathy with the ordinary pastimes of children, he was regarded for a time as deficient in intellect. But he was even then ambitious of distinction. One of his sister's earliest recollections of him was his thirst for pre-eminence. He was confident in his own resources, and while still little more than a child was wont to say that a man might do anything he chose. But from his earliest years he was liable to fits of abstrac- tion, sitting for hours in sceming stupor, or yielding after a time to tears, for which he would assign no reason. Tie had no one near him to sympathize in the strange world of fancy which his imagination had already called into being, or to feel any intcrest in the wonderful productions of his pen, which ere long were the fruits of such musings.

The influence of this lack of appreciative sympathy, along with the suspicions which his incomprehensible love of solitude excited, helped to foster his natural reserve, and beget that love of mystery which exercised so great an influence on the development of his genius. When the strange child had attained his sixth year his mother began to recognize his capacity; at eight he was so eager for

books that when unrestrained he would read from an early hour till bed-time; and by the time he reached his eleventh year he had become a contributor to Felix Farley's Bristol Journal.

On the 3d of August 1760, when in his eighth year, Chatterton was admitted to all the privileges of Colston's Hospital. This charity is popularly styled the Blue-coat School of Bristol, and as such has been referred to as an in-stitution of a similar character to that of Christ's Hospital, London, But except in the quaint, half-monkish garb of its inmates, Colston's Hospital bore little resemblance to the foundation where Barnes and Markland acquired their scholarship, and Lamb and Coleridge found culture for their genius. 'The " great house on St Augustine's Back," which had been converted to the use of Colston's Charity, was a fine civic mansion erected in Tudor times on the site of a dissolved house of Friars Carmelites. Queen Elizabeth had held court there in 1581; and when the Stuarts succeeded to the Tudors, its hospitalities had been exercised by Sire Ferdinand Gorges, one of the merchant princes of the old seaport. But though Edward Colston, as the representa- tive of a line of merchant adventurers who had flourished in Bristol in the reign of Edward III, no less deserved that title, the civic mansion when transferred to his care rather resembled the dwelling of the older friars, except in its lack of their redeeming feature of monkish learning. Bristol had its grammar' school, with liberal endowments and university exhibitions, for the sons of its more favoured citizens. But the rules of Colston's Hospital provided for the training of its inmates in "the principles of the Christian religion, as laid down in the church catechism," and in fitting them to be apprenticed in due course to some trade. But Chatterton was too young, as yet, to comprehend the difference between the two schools. He was thirsting for knowledge, and was greatly elated at his

election on the foundation, “thinking,” as his foster- mother said, “that he should there get all the learning he wanted.” But he speedily discovered that its meagre cur- riculum was inadequate to his cravings, and he indignantly complained that he could not learn so much as at home.

Chatterton remained an inmate of Colston’s Hospital for upwards of six years, learning little more than the most ordinary elements of a common school education 3 and its chief value was that it lightened to his poor mother the burden of his maintenance. Some influences, however, of a more congenial character are traceable to the friendly sympathy of one of its ushers. Thomas Phillips, himself a writer of verse, strove to excite a spirit of emulation among the older of his pupils and found in Chatterton a response to his appeal. Three of his companions are named along with him, as youths whom Phillips’s taste for poetry stimulated to rivalry, and ere long enlisted among the

contributors to Feliz Lurleys Journal, But Chatterton had already conceived more daring literary adventures ; and it was while still an inmate of Colston’s Charity that he essayed on Phillips his first serious attempt to pass off verses of his own as the production of a poet of the 15th century. Except, indeed, in the immaturity and inexperi- ence inseparable from his years, Chatterton was the superior of those to whose society he was limited, and was in all essential respects his own teacher. His little pocket-money was spent in borrowing books from a circulating library ; and he early ingratiated himself with book collectors, by whose aid he found access to Weever, Dugdale, and Collins, as well as to Chaucer, Spenser, and other writers strangely out of the line of reading of a charity boy, or indeed of any boy of his age. His holidays were mostly spent at his mother’s house ; and much of them in the favourite retreat of his attic study there. He had already conceived the romance of an imaginary monk of the 15th century, and lived for the most part in an ideal world of his own, relegated to that elder time when Edward IV. was Jingland’s king, and Master William Canynge— familiar to him among the recumbent effigies in Redcliffe church— still ruled in Bristol’s civic chair. “The Storie of William Canynge,” a poem of great beauty which constitutes one of the shorter picces of his ingenious

romance, represents the bard endowed by Truth, a heavenly maid, with divine insight, and so translated to those elder times, and that more real poetic life, in which Chatterton had revelled from his own childhood :— ‘Straight was I carried back to timcs of yore, Whilst Canynge swathed yet in fleshly bed, And saw all actions which had been before, And all the scroll of Fate unravclled ; And when the fate-marked babe acome to sight, I saw him eager gasping after light. In all his simple gambols and child’s play, In every merry-making, fair, or wake, I kenn’d a perpled light of wisdom’s ray ; He ate down learning with the wastcl-cake ; As wise as any of the aldermen, He’d wit enow to make a mayor at ten.”

This beautiful picture of the childhood of the ideal patron of Rowley is in reality that of the poet himself,— “the fate-marked babe,” with his wondrous child-genius, and all his romantic dreams realized. ‘he first lines are, indeed, referred to by Mr Skeat, in his annotated edition of the poems, as “clearly an oversight,” in which the poet writes in his own person and modern character, and so introduces ‘‘an unconscious admission of forgery.” The literary masquerade which thus constituted the life-dream of the boy was wrought out by him with marvellous consistency into a toherent romance, until the credulous scholars and antiquaries of his day were persuaded into the belief that there had lain in the parish chest of Redcliffe church for upwards of thrce centuries, a collection of poems of rare merit, the work of Thomas Rowley, an unknown priest of Bristol in the days of Henry VI. and his poet laureate, John Lydgate. .

Among the Bristol patrons of Chatterton, Mr George Catcott and Henry Burgum, his partner in their trade as pewterers, occupy a prominent place. ‘The former was one of the most zealous accreditors of Rowley, the imaginary priest and poet of the times of the Roses, and continued to collect his reputed writings long after the death of their real author. The credulity of the other was subjected to a more severe test. He had come from Gloucestershire to Bristol, a poor friendless boy, and himself owed to one of Colston’s charities his first start in life. He had risen, mainly by his own exertions, to the position of a success- ful tradesman, and gave full licence to the vanity with which he asserted the claims of his new position. On him, accordingly, the blue-coat boy palmed off the De

Bergham pedigree, and other equally apocryphal evidenees of the pewterer’s deseent from an ancestry old as the Norman Conquest. The De Bergham quarterings, blazoned on a piece of parchment doubtless recovered from the Redcliffe muniment ehest, was itself supposed to have lain for centuries in that ancient depository. The pedigree was professedly collected by Chatterton from original records, including “The Rowley MSS,” Into this he introdueed an ingenious romance of one of the pewterer’s ancestors, who was also a metallurgist, though after a more dignified fashion. According to this the De Bergham of that elder time obtained from Henry VI. a royal patent to play the alchemist, and so to transmute pewter and other base metals into gold. He left issue four sons, one of whom figures as ‘‘ Edward Asheton of Chatterton, in Com. Lane. in the right of his wife, the daughter and heiress of Radcliffe de Chatterton of Chatterton, the heir general of many families.” The pedigree still exists in Chatterton’s own handwriting, copied into a book in which he had previously transcribed portions of antique verse, under the title of ‘‘ Poems by Thomas Rowley, priest of St John’s, in the city of Bristol ;” and in one of these, “ ‘The Tourna- ment,” Syrr Johan de Berghamme plays a conspicuous part. The ennobled pewterer rewarded Chatterton with five shillings, and was satirized for this valuation of a noble pedigree in some of his latest verse. The pedigree and all its accessories are crude enough; but as the production of a boy not fourteen years of age, whose whole edueation had been aequired in a charity school, it is a remarkable evidence of preeocity.

On the Ist of July 1767, before he had eompleted the seventh year of his residence in Colston’s Hospital, Chatterton was transferred to the office of Mr John Lambert, attorney, to whom he was bound apprentice as a clerk. There he was left much alone; and after fulfilling the routine duties devolving on him, he found leisure for lis own favourite pursuits. An aneient stone bridge on the Avon, built in the reign of Henry II., and altered by many later additions into a singularly picturesque but inconvenient thoroughfare, had been displaced by a structure better adapted to modern requirements. In the month of September 1768, when Chatterton was in the second year of his apprenticeship, the new bridge was partially opened for

traffic. Shortly afterwards the editor of Lelia Farley's Journal reeeived from a correspondent, signing himself Dunelmus Bristoliensis, a ' deseription of the mayor's first passing over the old bridge," professedly derived from an ancient MS. Mr William Barrett, F.S.A., surgeon ald antiquary, who was then accumulating materials for a history of Bristol, secured the original manuscript, whieh is now preserved in the British Museum, along with other Chatterton MSS., most of which were ultimately ineorporated by the credulous antiquary into a learned quarto volume, entitled the History and Antiquities of the City of Bristol, published nearly twenty years after the poet's death.

The publication of the deseription of the ancient opening of the bridge naturally exeited inquiry ; for the picturesque narrative acquired a suitable flavour of antiquity, without being too much obseured for the general reader, by its archaie language and spelling ; and so a desire was manifested to traee it to its source. Chatterton was ere long recognized as its contributor, on presenting himself at the office of the Bristol Journal with another of his productions ; and then it was that the definite story made its appear- anee—over which eritics and antiquaries wrangled for nearly a century—of numerous ancient poems and other MSS. taken by the elder Chatterton from a coffer in the muniment room of Redcliffe church, and transeribed, and so rescued from oblivion, by his son.

The dream of the boy-poet was of an age devoid of all the sordid meanness of his own, and of a patron of the muses generous 4s the ideal Canynge of his romance. Living in this imaginary world, he continued to invent, and ascribe to the authorship of the good priest Thomas Rowley, dramatic, lyrical, and descriptive poems, along with letters, fragments of local or general history, and other miscellaneous productions in prosc,—nearly all of them pertaining to the romance of Rowlcy and Master Canynge, the old citizen and mayor of Bristol. With a persistent coherence to this ideal, which he had formed in his own mind while still a mere child, Chatterton produced nearly all the marvellous literary creations on whieh his fame depends. In the interval between his first-known antique ballad, the ''Elinoure and Juga," written while still an inmate of Colston's Hospital,

and his leaving Bristol at the age of seventeen, his pieces includo the ‘‘Bristowe Tragedy,” another and longer ballad ; his ‘‘ Alla, a Tragycal Interlude,” as he styles it, but in reality a dramatic poem of sustained power and curious originality of structure; his ‘‘Goddwyn,” another dramatic poem; his ‘‘Tout- nament,” “Battle of Hastings,” ‘“‘The Parliament of Sprites,” with numerous smaller pieces of autique verse—forming altogether a goodly volume of poetry, the rare merit of which is indisputable, wholly apart from the fact that it was the production of a mere boy.

Yct this only partially illustrates the fertility of his genius. During the same period he had thrown off numerous lyrics, and had given vent to hil satirical humour in several lengthened poems, which, though for the most part inferior in merit to his antique verse, would excite wonder as the sole productions of any boy of hisage. But the authorship even of those modern poems was rarely avowed. The habit of secretiveness grew ere long into a love of mystcry, which ultimately proved prejudicial to the boy. Unfortunately for him, his ingenious romance had either to be acknowledged as his own creation, and so |in all probability be treated with contempt, or it had to be sustained by the manufacture of spurious antiques. To this accordingly Chatterton resorted, and found no difficulty in gulling the most learned of his credulous dupes with his parchments.

The literary labours of the boy, though diligently pursued at his desk, were not allowed to interfere with the duties of Mr Lambert’s office. Nevertheless such a mode of employing any portion of his time was peculiarly distasteful to the Bristol attorney. He was wont to search his apprentice’s drawer, and to tear up any poems or other manuscripts that he could lay his hands upon ; so that it was only during the absences of Mr Lambert from Bristol that he was able to expend his unemployed time in his favourite pursuits. But repeated allusions, both by Chatterton and others, scem to indicate that such intervals of freedom were of frequent occurrence. Then he could finish his average two hours of legitiniate office work, attend to whatever other duties devolved upon him, and thereafter betake himself to song or satire, or abandon himself to the romance of that antique world in which his pleasantest hours were passed.

But such intervals of freedom only tended to increase his dislike for the restraints of office-life under his master's cye. In every changing mood of mind he was prone to seek relief in his pen ;— yielding at times to earnest thought, and giving lyrical form to his religious feelings and convictions ; at other times giving freest scope to his satirical humour, and subjecting all who came within its range to ridicule or scornful invective; or again, lapsing into ro- mantic reveric, and revelling in the creations of his antique muse. Some of his modern poems, such as the piece entitled ‘‘ Resignation," are of great beauty ; and these, with the satires, in which he took his revenge on all the local celebrities whose vanity or meanness had excited his ire, are alone sufficient to filla volume. The Catcotts, Burgum, Barrett, and others of his patrons, figure in these satires, in imprudent yet discriminating caricature, along with mayor, aldermen, bishop, dean, and other notabilities of Bristol. But such satirical sallies were the mere sportive effusions of the boy, in which he thoughtlessly exposed even the foibles of his friends, Towards Lambert his feelings were of too keen a nature to find relief in such sarcasm. When he does give utterance to them, it is with a bitter sense of one deeply wronged. Doubtless the abilities of the attorney's clerk were widely different from what he had bargained for ; but it is obvious that the boy whom he had received into his house was regarded by him with no more sympathy than any transient menial who drudged for hire. At length, in 1770, Chat- terton's connexion with Lambert was brought to an abrupt close. Thus far the muse had rewarded him only by the pleasure of secret hours spent in her service. The very appreciation of his antique poems by the few to whom they had been communicated was accom- panied by'an utter ignoring of any capacity on the part of their real author ; and every attempt to win recognition of lis merits only sub- jected him to fresh slights. The ambition to be able to hold his place among his companions, in dress, and in the pastimes suited to their age, made him increasingly sensitive to his menial position, and tempted him to look to his pen for other returns than the pleasure derived from his romantic dream. Mr Cottle gives an extract from a letter written about this time, in which he curses the Muses, exclaiming, ‘‘I abominate them and their works, They are the nurses of poverty and insanity."

As the boy began to realize the practica necessities of life, and indulge in dreams of fame and fortune consequent on the recognition of his merits, he resolved to attempt the introduction of Rowley to the world, Accordingly in December 1768, while still only entering on his seventeenth year, he wrote to Dodsley, the London publisher, stating his ability to procure for him ‘‘copies of several ancient poems, and an interlude, perhaps the oldest dramatie piece extant, wrote by one Rowley, a priest in Bristol, who lived in the reigns of Henry VI. and Edward IV.” To this letter he appended the initials of his favourite pseudonym, Dunelinus Bristoliensis, but directed the answer to be sent to the care of Thomas Chatterton, Redcliffe Hill, Bristol. To this, as well as to another letter enelosing an extract from the tragedy of ‘‘ /illa,” no answer appears to have been returned. The diplomacy of the romancer was only too characteristic of his inexperienee ; though we have a hint in the second letter of another and perhaps more praetical idea for the publication of his antique drama. ‘‘Ifit should not suit you, I should be obliged to you if you would ealculate the expense of printing it, as I will endeavour to publish it by subscription on my own aecount.

In the Rowley romanec, Chatterton pictures the old poet as the chaplain and eonfidential friend of Master Canynge, mayor of Bristol, builder of the church of St. Mary on Redeliffe Hill, and patron of all liberal arts,—who rejoiced in gathering round him a group of poets, and making them the sharers of his bounty. Rowley sends to him his verses from time to time, ever sure of some

liberal acknowledgment in return; and Master Canynge supplies

him with funds that he may expend them in travelling and eollect- ing manuscripts for his library. Dean Milles, President of the Society of Antiquaries, and one of the most zealous maintainers of the genuineness of the imaginary Rowley, describes the old mayor and his literary associates as a parallel to Mecenas with his three friends, Virgil, Horace, and Varus. No wonder, therefore, that Chatterton, conceiving the idea of finding sympathy and aid at the hand of some modern Canynge, bethought him of Horace Walpole, subsequently fourth carl of Orford. This patrician virtuoso loved to dally with the muses, and had made art and letters the business of his life. He professed extreme social liberalism, and not only indulged in a medixval

renaissance of his own, but was the reputed author of the Castle of Otranto, a spurious antique of times akin to those in which Chatterton had in like fashion delighted to revel. From the point of view of the inexperienced youth, the idea of finding in Walpolo the oe of whom he dreamt was by no means an extravagant one. He accordingly addressed a lettcr to him, giving him au account of the Rowley poems and other MSS. as genuine antiques of the fifteenth century, and cnelosing, as a specimen, a brief poem on Richard I.—probably his Eclogue styled “‘ Nygelle,” which extends to eight stanzas. To this Walpole replied with eourteous acknowledgments. He characterized the verses as ‘‘ wonderful for their harmony and spirit,” and added, ‘‘Give me leave to ask you where Rowley’s poems are to be had? I should not be sorry to print them ; or at least a specimen of them, if they have never been printed.” The courtesy of his correspondent tempted the poor boy to a more unreserved communieation. He replied, enclosing additional specimens of antique verse, and telling Walpole that he was the son of a poor widow, and clerk to an attorney, but had a taste for more refined studies, and hinted a wish that he might help him to some more congenial occupation. Walpole’s manner underwent an abrupt change. The specimeus of verse had been submitted to his friends Gray and Mason, the poets, and pronounced modern. They did not thereby forfeit the wonder- ful harmony and spirit which Walpole had already professed to recognize in them. But he now coldly replied, advising the boy to stiek to the attorney’s offiee ; and ‘‘when he should have made a fortune,” he might betake himself to more favourite studies.

Walpole has been loaded with more than his just share of re- sponsibility for the fate of the unhappy poet. That he shut his eyes to the merits of the wonderful poems sent to him by a boy of sixteen, and dwelling alone on the mystification with which they were palmed on him as genuine antiques, returned them to their author and thought no more about them, is what hundreds would do in like circumstanees. Yet the literary fraud was no more than he himself had practised in his Custle of Otranto; and all the fame which he so greedily coveted was as nothing, compared with what he might have made his own, had he befriended the boy, of whoin he admitted when too late ‘I do not believe there ever existed so masterly a genius,”

Chatterton now abandoned the antique muse, turned his attention to periodical literature and the politics of the day, and exchanged Felix Farley's Bristol Journal for the Town and County Magazine and other London periodieals. Assuming the vein of Junius— then in the full blaze of his triumph—he turned lig pen against the duke of Grafton, the earl of Bute, and the princess of Wales. It was while thus busied with politics and modern satire, that another and very different production was penned, which, whether written in jest or earnest, brought his Bristol eareer abruptly to a close. He had just despatched one of his politieal diatribes to the Middlesex Journal, when he sat down on Easter Eve 17th April

1770, and penned his ''Last Will and Testament," a strange satirical compound of jest and earnest, in which he intimated his intention of putting an end to his life the following evening. Among his satirical bequests, such as his "humility" to the Rev. Mr Camplin, his ''religion" to Dean Barton, and his ' modesty "" along with his '' prosody and grammar" to Mr Burgum, he leaves 'to Bristol all his spirit and disinterestedness, pareels of goods unknown on its quay since the days of Canynge and Rowley." In more genuine earnestness he recalls the name of Mr Clayfield, a friend to whom he owed intelligent sympathy, and leaves to him ''the sincerest thanks my gratitude can give," —adding, with grave humour, the bequest of a full valuation to be paid to Mr Clayfield, as his exeeutor, of '' whatever any person may think the pleasure of reading my works worth." 'According to his foster-mother's account, the will was purposely prepared in order to frighten his master into letting him go. If so, it had the desired effect. Lambert cancelled his indentures ; his friends and acquaintance made him up a purse ; and so, with light heart, anda bundle of manu- scripts of rare worth by which he still fondly hoped that his fortune was to be achieved, he set forth, at the age of seventeen, to play his brief part as a man of letters in the great metropolis. Chatterton was already known to the readers of the Middlesex Journal as a rival of Junius, under the nom de plume of Decimus. He had also been a contributor to Hamilton's Town and Country Magazine, and speedily found access to the Frecholder's Afagazine, another political miseellany strong for Wilkes and liberty. His contributions were freely aceepted ; and the sanguine youth Hattered himself that his position was

already established, and lis fortune sure. He wrote accordingly in the most hopeful terms to his mother and sister, and spent the first money received by him in purchasing acceptable gifts for both. His pride and ambition were amply gratified by the promises and interested flattery of editors and political adventurers ; Wilkes himself had noted his trenchant style, "'and expressed a desire to know the author;" and Lord Mayor Beckford graciously acknowledged a political address of his, and greeted him ''as politely as a citizen could." But of actual money he reeeived but little. He was not only frugal, but abstemious, while he flattered himself with dreams of eoming triumphs and ample recompense. His diligence was great, and his versatility wonderful. He could assume the style of Junius or Smollett, reproduce the satiric bitterness of Churchill, parody Maepherson's Ossian, or in graver mood ape the rythmieal niceti¢s of Pope, or the polished ee of Gray and Collins. He wrote political letters, eclogues, lyrics, operas, and satires, both in prose and verse. He played in all ways the versatile mocking-bird, while still planning the resumption of his antique romance, with the hope of winning thereby not only fortune but enduring fanie. In the month of June 1770—after Chatterton had been some nine weeks in London—le removed from Shoreditch, where he had hitherto lodged with a relative, to an attic in Brook Street, Holborn. His busy pen had dashed off songs, pasquinades, a burletta, an oratorio, satirical sketches, and politieal articles enough to fill more than one month's magazine. But for most of those the payment was delayed ; and now state prosceutions of the press rendered Ictters in the Junius vein no longer admissible, and threw him back on the lighter resources of his pen. In Shoreditch, as in his lodging at the Bristol attorncy's, he had only shared a room ; but now, for the first time, in his new lodging, he enjoyed the delights of uninter- rupted solitude. His bed-fellow at Mr Walinsley's, Shorediteh, noted that much of the night was spent by him in writing ; and now that all restraint was removed the dawn frequently found him still at work, Fancy ence more had free play; the romance of his earlier years revived, and he transcribed from an imaginary parch- ment of the old priest Rowley his '' Excelente Balade of Charitie." This fine poem, perversely disguised in archaic language, hie sent to the editor of the Town and County Magazine, and had it rejected. The high hopes of the sanguine boy had begun to fade. He had not yet completed his second month in London, and already failure and starvation stared him in the face. Mr Cross, a neighbouring apothecary whose acquaintance he had

made, and who had been faseinated by his fine conversational powers, discerned ere long the evidence of the privations to which he was reduced, and repeatedly invited him to join him at dinner or supper ; but he repelled the proffered hospitality. His landlady also, suspecting his necessity, pressed him to share her dinner, but in vain. ‘She knew,” as she afterwards said, ‘‘that he had not eaten anything for two or three days.” But he was offended at her urgency, and assured her that he was not hungry. Only a month before, he had written to his sister in the highest spirits, with talk of china, silver fans, and fine silks in store for them, and had actually sent them valued presents bought with his first earnings. But the needy political adventurers in whose service he had enlisted changed their tone when he began to press for payment for his contributions; and the note of his aetual receipts, found in his pocket-book after his death, shows that Hamilton, fell, and other editors who had been so liberal in flattery, had paid the inexperienced youth at the rate of a shilling for an article, and somewhat less than eightpence cach for his songs ; while

much which had been aecepted was held in reserve, and still unpaid for. The beginning of a new month revealed to him the indefinite postponement of their publication, and with it of the prospeet either of payment or of further demand for his labours. He had wished, aecording to his foster-mother, to study medicine with Barrett ; and one of his companions specially refers to the charm which the praetiee of physie had for him. In his desperation he now reverted to this, and wrote to Barrett for sucha letter as might help him to an opening as a surgeon’s assistant on board an African trader. He appealed also to Mr Cateott to forward his plan, but in vain. The letters were written before the middle of the month, and he continued to hope against hope, as he awaited their replies. What these were we ean only surmise. On the 24th of August 1770, he retired for the last time to his attie in Brook Street, earry- ing with him the poison which he there drank, after tearing into fragments whatever literary remains were at hand. In the morning he was found, with limbs and features distorted by his last eon- yulsions, a ghastly eorpse.

Thus perished by his own hand, in an obseure lodging in London, among strangers and in absolute want, a youth assuredly without his equal in that eighteenth eentury. He was only seventeen years and nine months old ; yet he had already written poems whieh fill two ample volumes, and which now, upwards of a century after his death, command our admiring wonder for the rare evidence of genius and sustained power whieh they display. The intelligent labours of the Rev. W. W. Skeat have at length presented them in a form worthy of their unique merit, not only as evidence of fine poetic genius, but as an unparalleled example of youthful precocity displayed in spite of every disadvantage that poverty and adverse fate could interpose to prevent its display. Yet even now com-

aratively few know what a rich vein of romance and true poetry ies concealed under the antique guise of the Rowley poems, or how singular is the study which they involve. The best of his numerous productions, both in prose and verse, require no allowanee to be made for the immature years of their author, when comparing him with the ablest of his contemporaries. Yet he was writing spirited eatires at ten, and he produced some of the finest of his antique verse before he was sixteen years of age. He pictures Lydgate, the monk of Bury St Edmunds, challenging Rowley to a trial at versemaking, and under cover of this fietion, produces his “Songe of Zilla,” a piece of rare lyrical beauty, worthy of comparison with any antique or modern production ofitselass. Again, inhis ‘‘Tragedy of Goddwyn,” of which only a fragment has been preserved, the ‘‘Ode to Liberty,” with whieh it abruptly closes, is a wonderful speeimen of bold imagery which may claim a place among the finest martial lyries in the language.

The eolleetion of poems in which such specimens oceur furnishes by far the most remarkable example of intellectual precocity in the whole history of letters; nor is it the least among all the notable features which distinguish the boy’s writings, hat from first to last, le consistently maintained his romance of Canynge and Rowley through all the diverse seenes of verse and prose in which those imaginary eharaeters are made to figure. The age at which he died, before he had even reached manhood, adds to the tender pity which his fate awakens even now, upwards of a century after 1ig death. Collins, Burns, Keats, Shelley, and Byron all awaken sorrow over the premature arrestment of their genius; but the youngest of them survived to

his twenty-fifth year, while Chatterton was only seventeen when he perished despairingly in his miserable

arret.

- The death of Chatterton attracted little notiee at the time; for the few who then entertained any appreciative estimate of the Rowley poems regarded him as their mere transeriber. He was interred in a burying ground attaehed to Shoe Lane Workhouse, in the parish of St Andrew's, Holborn, which has since been con- verted into a site for Farringdon Market. But a story has been eurrent from an early date, and credited by some trustworthy in- vestigators, that the body of the poet was recovered through the intervention of one of his London relatives, and secretly interred by his uncle, Richard Phillips, in Redcliffe Churchyard. There a monument has sinee been ereeted to his memory, with the appro- priate inseription, borrowed from his ‘‘ Will," and so supplied by the poet's own pen—‘‘T'o the memory of Thomas Chatterton. Reader! judge not. If thou art a Christian, believe that he shall be judged by a Superior Power. To that Power only is he now answerable." (D. W.)

CHAUCER, Gzorrrey (c. 1340-1400). There are few fields of research in which antiquarians, from Speght to Furni- vall, have laboured su zealously and successfully as the life of Chaucer. The secret of their success has been that Chaucer was more actively engaged in public affairs than any poet of celebrity since his time, and has consequently left many traces in official records. The chief biographical fact known to Speght was that Chaucer gave evidence in

a case tried at Westminster in 1386 touching the right of Lord Scrope to bear certain arms, and then deposed that he was "forty years old and upward," and had borne arms for twenty-seven years. III. a pension of twenty marks was more suggestive. This clue was first energetically followed up by Godwin, the author of Caleb Walliams aud Political Justice, who searched diligently through several records, chiefly the Patent, Close, and French Rolls, for other notices of Chaucer's name, and succeeded in enriching his bio- graphy of Chaucer, published in 1804, with various im-

portant particulars. He was followed by Sir Harris Nicolas, who made an exhaustive examination of the Issue Rolls of the Exchequer, and published the results in 1843, Another determined search through records which Godwin and Nicolas had shrunk from was made in 1873 by Mr Furnivall, and this also resulted in several important finds.

It is to Mr Furnivall that we are indebted for finally settling the parentage of Chaucer. Speght in the course of his researches had hit upon the name of one Richard Chaucer, a vintner, who died in 1348, and made a bequest to the church of St Mary Aldermary. Merely on the ground of the name, Speght supposed this to be the father of Chaucer; but Urry and Tyrwhitt, in the 18th century, disputed this, and wished to give the poet a higher lineage, because in the grant of a pension made to him in 41 Edward ITI. he was described as " valettus noster." Mr Furnivall settled the question by bringing to light a deed dated 1380, in which Chaucer, relinquishing his right in a house belonging to his father, described himself as "the son of John Chaucer, vintner." By other documents this John Chauccr is shown to be the son of Speght's Richard. It is thus established that both the poet's father and his grandfather were London vintners. The precise date of his birth has not been ascertained, The accepted date till lately was 1328. The difficulty with this date was his being described as "forty years and upwards" in 1386, and of late opinion has inclined to 1340 as a more probable year. This is favoured by the discovery that the poet was Richard Chaucer's grandson and not his son, and fits in better with the facts than 1328.

How Chaucer was educated, whether like " Philogenet," the name which he assumes in the Court of Love, he was 'of Cambridge clerk," and how he was introduced to the notice of the court, is left toconjecture. His name occurs in the household book of the wife of Prince Lionel, second son of Edward III., in 1857, probably, Mr Furnivall con- jectures, as a page. He bore arms in Edward III.'s invasion of France in 1359, John Chaucer being also in the expedition, probably in connection with the commis- sariat. There was little fighting in that expedition, the ravages of the English for several years before having left little to fight for ; but in the course of a disastrous retreat, compelled rather by hunger than by martial force, Chaucer was taken prisoner. In 1360 the king paid £16 for his ransom. From

1360 to 1366 there is a gap in the record of his life ; but in the latter year his name occurs in a list of the members of the royal household as one of thirty-seven ‘esquires” of the king, who were to receive a gift of clothes at Christmas. By this time also he would seem to have been married, if the Philippa Chaucer, one of the demoiselles of Queen Philippa, who in 1366 was granted a yearly pension of ten marks, was, as is most probable, his wife (see the discussion of the question in Sir H. Nicolas’s memoir). In 1367 Chaucer himself received a pension of twenty marks from the king, being described as “‘dilectus valettus noster.” To show that in being courtier and scholar he had not ceased to be soldier, he took part in another inglorious expedition against France in 1369, in

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which from the Fabian tactics pursued by the French king there was little opportunity for distinction. He was back in London towards the end of 1370, and henceforward devoted himself to more peaceful pursuits. His talents for diplomacy and his acquaintance with commerce were recognized by the crown. In 1372 he was despatched to Genoa as a commissioner to arrange a commercial treaty with the Genoese. About this embassy much has been written, on the supposition that he may have made the acquaintance of Petrarch in the course of his visit to Italy. Whether in recognition of his services or on other grounds, he received on his return, in 1374, the grant of a pitcher of wine daily ; and soon after, in further evidence of the royal favour, he was appointed comptroller of the customs and subsidy of wools, skins, and tanned hides in the port of London. In 1376 he was associated with Sir John Burley on some secret service, the nature and place of which are not known, and in 1377 he was sent on the secret wission to Flanders. And it was not merely in commercial matters that the poet was considered serviceable; in 1378, after the accession of Richard IT., he was attached to a mission sent into France to negotiate a marriage for the young king. His fortunes continued steadily to improve ; with his pension of twenty marks from the king, £10 from the duke of Lancaster, his allowance for robes as one of the king’s esquires, his salary as comptroller, his payments for occasional services, his pitcher of wine

(commuted in 1378 into an annuity of twenty marks), and his wife's pension, he had no reason to complain that his genius was neglected. The wonder was that his genius was not smothered. His employment as comptroller was not a sinecure; he was bound to write the rolls of his office with his own hand, and he had to be continually present at his office, not having the option of appointing a deputy. Apparently as he rose in the world he was allowed to make an easier arrangement ; in 1382 he was appointed comptroller of the petty customs of the port of London, with the privilege of appointing a deputy, and in 1385 he was allowed to appoint a deputy for the other comptrollership. In 1386 he touched the summit of his fortune, being returned to Parliament as a knight of the shire of Kent. But that was an unfortunate year for him ; his patron, John of Gaunt, lost his ascendency at court, and a commission which sat to inquire into the abuses of the preceding administration superseded Chaucer in his two comptroller- ships. In the course of two years he was obliged to transfer his annuities to another man, probably selling them for a sum of ready money. 'he return of Lancaster to power in 1389 again brightened his prospects; he was appointed clerk of the king's works, and four years after- wards obtained a grant of an annnity of £20. How much he wanted this assistance appears from the fact that he was several times obliged to apply for small portions of it in advance. When Bolingbroke came to the throne in 1399 he gave the old poet an additional annuity of forty marks, which came in time to comfort the last year of his life. The minutes of his pension cease in 1400, and, according to the inscription on his tomb, he died on the 25th of October of that year

_ These are the main facts of Chaucer's life as brought to light by successive investigators, and they form a tolerably complete outline biography, more complete than Spenser's or Shakespeare's. They are significant facts, throwing light on the singularly varied circumstances, aptitudes, and occupations of the man, supplementing in a really sub- stantial way what may be gathered from his works. They show that Chaucer was not merely a poet and a scholar, deeply read in what then passed for science and philosophy, as well as in the rich literature of his poetical predecessors, but a soldier, a courtier, a man of business, familiar from

the circumstances of his birth and subsequent rise in posi- tion with all sides of the life of his time, ready to under take any kind of employment that his powerful patrons chose to obtain for him,—comptrollership of customs, secre- taryship of an embassy, diplomatic commissionership, guardianship of a minor. Mr Furnivall has also discovered that, rather late in life, he was charged with being concerned in the “raptus” (abduction, probably) of a girl, which would show that he was willing to undertake more questionable services, unless the “raptus ” was for his own benefit. Great caution must be observed in trying to fill up from hints in his poems the gaps in the documentary facts of his biography,—great caution, that is, if we wish to get at the truth and not merely to speculate for the sake of speculating. Antiquarian speculators are usually more distinguished for fancy than imagination. They catch at hints and push them to conclusions without having imagination enough to take account of qualifying considera- tions. Thus it has often been taken for granted that in the description of the poet of the Canterbury Tales, we have an authentic portrait of Chaucer himself. The poct ig a very quiet unobtrusive man, and the Host, master of the ceremonies, suddenly casts his eye on him, and addresses him in his bullying way :— What man art thou? quod he.

Thou lookest as thou wouldst find an hare,

For ever upon the ground I see thee stare.

Approaché near, and looké merrily.

Now ware you, sirs, and let this man have space.

He in the waist is shapen as well as I ;

This were a puppet in an arm to embrace

For any woman, simall, and fair of face.

He seemeth elvish by his countenance,

For unto no wight doth he dalliance. There is no reason to suppose that this quaint, shy little figure was any more like Chaucer than the Spectator was

like Addison or Steele. The allusion to his waist, coming from the burly host, is evidently jocular, and the whole picture is in all likelihood a humorous description of the opposite of Chaucer's own appearance. We must be particularly careful in accepting literally the statements of a writer one of whose favourite veins of humour, appcar- ing in every one of his works, is self-depreciation; We should remember that Chaucer wrote fora limited audience, all of whom knew him personally, and for whose amusement he was in the habit of making comical allusions to himself. His jokes were more of the nature of family jokes than we are now accustomed to in writings intended for wide and promiscuous circulation. When he made the eagle in the Louse of Fame complain of his being heavy to carry, or promise to make him the butler of the gods, or append to the statement that he lived like a hermit, the qualification —''although thine abstinence is little," or remind him that he had had no personal experience of love, he knew that these little jests at his own expense would be fully appreci-

ated by his few readers, The extreme of frivolous conjecture

is reached when it is supposed that his wife was a termagant because he " chaffs" women frequently. His graceful and chivalrous compliments to women are quite as frequent as his chaff. There is, indeed, one passage in the House of Fame which is pretty clearly intended for his wife, that where the eagle cries " awake" to him—

Right in the samé voice and steven (sound)

That useth one J couldé neven (name). But if it had been anything more serious than common- place conjugal banter, he would hardly have dared to circulate it. A conjecture of an equally frivolous kind is that he was unmarried in 1369, because in that year he spoke of having suffered for eight years pangs which none but one couldheal. 'The pangs may have been matrimonial pangs, or pangs of poverty, or purely imagitlary pangs,

officially becoming in the poet-narrator ; but Mr Furnivall is so convinced that the poet's sickness was a real love- sickness, and that he was not then

married to the queen’s demoiselle Philippa Chaucer, that he accounts for this lady’s name by supposing her to have been Chaucer’s cousin.

A similar inelasticity of conjecture appears in the grounds on which certain of the works commonly attributed to Chaucer are rejected as spurious. The Z’estament of Love, the Assembly of Ladies, and the Lamentation of Mary Magdalene bear no internal marks of being Chaucer’s, and are now universally rejected ; but of late some commentators have adopted a test of genuineness which would deprive us of several works which are in no respect unworthy of Chaucer’s genius. It is known from Chaucer’s own state- ment in the undisputed Legend of Good Women that he translated the Roman de ba Rose, but Mr Bradshaw refuses to believe that the extant translation, of which we have only one 15th century manuscript, can be his, because its rhymes do not conform to a rhyme-test which Chaucer observed in works which are undoubtedly his. The extant Romance of the Rose admits the adverbial Jy to rhyme with the adjectival or infinitival ye, and it cannot be Chaucer’s because y is never allowed to rhyme with ye in the House of Fame and the Canterbury Tales. For the same reason—no other of any shadow of validity has yet been adduced—the Court of Love, which Mr Swinburne calls “ that most beautiful of young poems,” and the Flower and the Leaf, which Dryden and Hazlitt have praised and quoted as a choice example of the poet’s genius, have also been pronounced to bespurious. We cannot give up such poems unless more urgent reasons are advanced for their confiscation. They cannot be set aside as spurious so long as their variation from the rhyming rule, which the com- mentators have shown much ingenuity in detecting, can be explained in any reasonable way. There is no getting over the plain question which every one asks when first told that they are not Chaucer’s, If they are not his, who else could have written them ? Is it conceivable that the name of the writer of such works could have been utterly un- known in his own generation, or if known could have been by accident or design so completely suppressed? If he deliberately tried to palm them off as Chaucer’s upon the transcribers, would not this rule of rhyme have been precisely the sort of mechanical likeness which he would have tried to preserve? The Court of Love we have special reasons for declining to give up. It might be argued that, though the Flower and the Leaf bears internal marks of being Chaucer’s, although its picturesque richness, its tender atmosphere, and the soft fall of its words are like his, yet

it is easy to grow the plant once you have the seed, and it may be the work of an imitator. The (lower and the Leaf professes to be written by a lady, and there may have been at the court some wonderful lady capable of it, although it passed in the monkish scriptorium as Chaucer's. But there is some external evidence for the authenticity of the Court of Love, which also contains traces of Chaucer's most inimitable quality, his humour. Mr Minto has put forward some minor considerations for believing this to be Chaucer's (Characteristics of Hnglish Poets, p. 22), but the strongest fact in its favour is that the Court of Love was imitated by James I. of Scotland in the King's Quhair, and that in paying the customary compliment to his poetical masters, he mentions no names but Lydgate and Gower, who were clearly incapable of writing the poem, and Chaucer. James's captivity in England began five years after Chaucer's death, and it is simply inconceivable that he could have attributed the Court of Love to Chaucer in ignorance, and without having heard a whisper of its real authorship. If, indeed, this rhyme-test were

absolute, we should have to treat these other considerations as inexplicable difficulties and submit. But when we remark that all the poems in which y ye rhymes occur are earlier works of Chaucer's, if they arc his at all, bearing the touch of his hand but wanting the sustained strength of his mature workmanship, and when we remember that the y ye rhyme was the common practice of his predeces- sors, @ very simple explanation of the rhyme difficulty becomes apparent. Chaucer adhered to the practice of his predecessors till he felt strong enough to impose upon himself a restriction of his own devising.

At what periods of his life Chaucer wrote his poetry, we have no means of ascertaining. There are no manuscripts of any of his works that can be referred to his own time ; the earliest of them in existence are not supposed to have been written till several years after his death. The only one of his works of which the date is fixed by an external circumstance is the Book of the Duchess; if, as is taken for granted, this was written to commemorate the death of the wife of his patron John of Gaunt, its date is 1369. Chaucer, if born in 1340, would then have been twenty- nine, and there is none of his

extant works, except the translation of the Romance of the Rose, and the Dream (which we hold to be Chaucer's, though its authenticity is not worth contending for), which can be confidently assigned to an earlier period. Philogenet, in the Court of Love, professes to be eighteen, but this is not the slightest reason for concluding that Chaucer was that age when he wrote it. The Book of the Duchess is certainly not very mature work for a poet of twenty-nine, and it is probable that Chaucer did not cultivate the art, as he certainly did not develop the faculty, till comparatively late in life. The trauslation of the Romance of the Rose is to all appearance the earliest of his surviving compositions, If we may judge from his evident acquaintance with dry studies, and his capacity for hard business work, the vintner's son received a scholastic training in the triviwm and quadriwium which then formed the higher education. If he had been nurtured on troubadour love from his youth up, it is exceedingly unlikely that he would afterwards have been able to apply himself to less fascinating labours. His study of mathematics and astronomy in his old age for the benefit of "little Lewis, his son," looks like a return such as we often see in age to the studies of youth. But, indeed, he can hardly be said ever to have lost his interest in such studies, for in his theory of sound in the House of Fame and his description of alchemical processes in the Canou's Yeoman's Prologue he shows a genuine scholar's interest in the dry details of learning, His knowledge of the Trouvére and Troubadour poetry, from which his genius received its impulse, probably began with his introduc- tion, however that was brought about, to court society. He was about seventeen at the date of the first mention of his name as attached to the household of Prince Lionel. It is permissible to conjecture that he had French poets to beguile his captivity in France a few years afterwards.

Professor Ten Brink divides Chaucer's work into three periods :—a period of French influence, lasting up to 1372-3, the date of his visit to Italy; after that a period of Italian influence, lasting up to 1387, the supposed date of his House of Fame ; finally, a period of mature strength and originality, in which he pursued. the bent of his own genius. Not much is gained by this division into strict periods. It is obvious enough that, in the /Touse of Fame, the Legend of Good Women, and the general plan of the Canterbury Tales, Chaucer strikes out more uumistakably a path for himself, and exhibits a raaturer power, & more masterly freedom of movement than in his earlier

works, but there profitable division ends, To erect a period of Italian influence, implying that at any time the stimulus

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that Chaucer received from Italian sourees was at all com- parable to the stimulus he received from French sources, 18 most inisleading. The difference betwecn the Book of the Duchess and the House of Fame, or between the Court of Love and Troilus and Cresside is not to be explained by an influx of Italian influence ; itis part of the self-governed development, the spontaneous expansion of his own mind. As he went on writing, his powers continued to expand, and to take in materials and suggestions from all quarters open to him, French, Italian, or Latin. Comparing the 7'roilus, the raw material of which is taken from Boccaccio's Filostrato, with his Lomance of the Lose, we can trace no change in method or in spirit fairly attributable to Italian influence. In both.translations he shows a bold independence of his originals; they are not so much translations as adaptations. He does not imbibe the spirit of Guillaume de Lorris or Jean de Meun in the one and the spirit of Boccaccio in the other; he boldly modifies all three to bring them into harmony with his own conceptions of love's laws, and in both his so-called translations there is the same high spirit of chivalry and the same tender worship and kindly mockery of woman. Where he chiefly shows advance of strength, apart from the mere technical workmanship, is in his grasp of character; and that is a clear development on the lines of his earlier conceptions and not a new acquisition. His Cresside and his Pandarus were not the Cresside and Pandarus of Boccaccio; they are regenerated by him and developed till they become figures that might have moved in his own Court of Love. He held the knightly and " gentle" character too high to adopt Boccaccio's conceptions. In the method also, Zyoilus has a close affinity with Chaucer's earlier work and his first models. 'Troilus' pursuit of Cresside is the pursuit of the Rose over again in the conercte. The greater subtilty of the stages is due to the increased strength of the narrator's faculty.

M. Sandras is in the main right as to the extent of Chaucer's obligations to French sources, although he fails to recognize the forceful individuality of

the man. Chaucer was really an English ¢rouvére, thoroughly national, English in the whole texture of his being, but a trouvére. We must not allow our conviction of his loyalty to his own English nature to blind us to the fact that he was a poet in the school of Guiilaume de Lorris; nor on the other hand must we allow the peculiar extent of his obliga- tions to his predecessors in the school to obscure the fact that he was an original poet. M. Sandras is a special pleadcr for one side of the cass, and naturally presses unfairly against the other. Chaucer, writing in a different language from his masters, was at liberty to borrow from them more literally than he could have done if he had written in their language; but though M. Sandras proves With superfluous completeness that he freely appropriated from them not merely stories and hints of stories, but natrative methods, phrases, images, maxims, reflections, — not only treated their works as quarries of raw material, but adopted their architectural plans, and even made no scrupke of seizing for his own purposes the stones which they had polished, still he so transmuted the borrowed plans and materials that his works are original wholes unmis- takably stamped with his own individuality. Whatever he appropriated, whcther ore or wrought metal, all passed through his own alembic, and his moulds were his own, though shaped according to the fashion of the school. The very affluence of Chaucer's pages, their wealth of colour, of tender and humorous incident, of worldly wisdom, is due to his peculiar relations to his predecessors, to the cireum- stance which enabled him to lay them go royally under tribute. He was not the architect of his own fortune, but the son and heir of a family which for generations had been

accumulating wealth. Edward III.'s spoliation of the

French was nothing to Chaucer's, and the poet had this

advantage, that his appropriations neither left the spoiled

country desolate nor corrupted the spoiler.

"The ground-work of literary genius," Mr Matthew Arnold says, 'is a work of synthesis and exposition, not of analysis and discovery ; its gift lies in the

faculty of being happily inspired by a certain intellectual and spiritual atmosphere, by a certain order of ideas, when it finds itself in them, of dealing divinely with these ideas, presenting them in the most effective and attractive combinations— making beautiful works with them, in short." The poet's constructive power must have materials, and. ideas round which materials accumulate. The secret of the richness and enduring character of Chaucer's work is that he had a fruitful idea ready to his hand, an idea which had been flowering and bearing fruit in the minds of two centuries, which had inspired some later songs and tales, which had been illustrated, expounded, formulated by every variety of native invention and critical ingenuity. Chivalrous love had been the presiding genius, the inspiring spirit of several generations of poets and critics when Chaucer began to write. Open any of his works, from the Court of Love down to the Canterbury Tales, and you find that the central idea of it is to expound this chivalrons sentiment, either directly by tracing its operation or formulating its laws, or indirectly by setting it off dramatically against its counterpart, the sentiment of the villain or churl, Gradually as years grew upon him, and his mind assumed more and more its natural attitude of descriptive impartiality, he became less a partizan of the sentiment, more inclined to view it as one among the varieties of human manifestation, but never to the last does he become wholly impartial. Not even in the Canterbury Tales does he set the churl on a level with "the gentles." Thoroughly as he enjoyed the humour of the churl, freely as his mind unbent itself to sympathize with his unrestrained animal delights, he always remembers, when he comes forward in his own person, to apologize for this departure from the restraints of chivalry.

The very opposite of this is so often asserted about the Canterbury Tales that it almost has a paradoxical air, although nothing can be more plain to any one who takes the trouble to read the tales observantly. It has been said to be the crowning merit of Chaucer that he ignores distinctions of caste, and that his pilgrims associate on equal terms. It should be noticed, however, in the first place, that in the Prologue, he finds it necessary to apologize for not " setting folk in their degree," "as that they shouldé stand ;" and, in the second place, that although he does not separate the pilgrims according to their degrees in the procession, yet he draws a very clear line of separation betwecn them in the spirit of their behaviour. At the outset of

the pilgrimage the gentles are distinctly so mentioned as taking a sort of corporate action, though in vain, to give a more decorous aspect to the pilgrimage. When the Knight tells his tale, it is loudly applauded by the whole company, but the poet does not record their verdict indiscriminately ; he is careful to add, particularly by ‘the gentles every one.” And though all applauded. the tale, the more vulgar and uproarious spirits were some- what restive under its gravity, the host called for a merry tale, and the Pardoner eagerly stepped forward to comply with’ his request. But “the gentles” interposed, and began to cry that they must have no ribaldry ; “ tell us,” they said, “ some moral tale that we may learn.” And the gentles would have carried their point if the Miller, as the poet is most careful to make clear, had not been so drunk that he insisted upon telling a noble tale that he knew, and would forbear for no man. Chaucer is profuse in his apologies for introducing such a tale; it was a churlish

tale, he admits, told in a churlish manner, and he does not wish to be responsible for it. **Kvery gentle wight I pra For Goddés love, deemeth not thet I es : Of evil intent ; but for I must rehearse

Their tales all, be they better or worse, Or ellés falsen some of my matter.”

Tf gentle readers do not like it, they may turn over thic leaf, and choose another tale; there is plenty “of storial thing that toucheth gentillesse.” They must not blame him for repeating this churlish tale; “the Miller is a churl, ye know well this,” and such tales are in his way. Gentle readers must not take it too seriously ; “men should not make earnest of game ;” it is, after all, only for their amusement that he thus exhibits to them the humours of the lower orders.

Such is the claborate apology that Chaucer makes for introdncing into his verse anything inconsistent with the sentiments of chivalry. It may be said that it is all a humorous pretence ; and so no doubt it is, still it is characteristic that the pretence should be of so courtly a tone. All through the Canterbury Tales Chaucer is very careful to remember that he was writing for a courtly audieuce, studious to guard against giving offence to the chivalrous mind. He contrives that the gentles shall mix with the churls

without sustaining any loss of dignity; they give the churls their company, and with polite compliance

let them have their own gross will, but they never lay’

aside the restraints of their own order. Every here and there is some trace of deference to them, to show that their ribald companions have not wholly forgotten themselves, and are only receiving a saturnalian licence for the time. Nothing is done to throw any disrespect on the gentle order; its members—the Knight, the Squire, the Monk, the Prioress, the Second Nun; and the professional men-—the Lawyer, the Doctor, the Clerk—admit no ribaldry into their tales, and no ribald tales are told about them. The ribaldry is confined to the meaner members of the company, —the Reeve, the Miller, the Friar, the Summoner, the Wife of Bath ; the narrators as well as the subjects of the ribald tales are of churlish and not of gentle position.

The Canterbury Tales are really in their underlying design an exposition of chivalrous sentiment, thrown into telief by contrast with its opposite. The spirit of chivalry is the vital air of all Chaucer’s creations, the rain, the wind, and the sun which have quickened their germ and fostered their growth. We to whom the chivalrous spirit, at least in the fantastic developments of its vigorous medieval youth, is an historical thing are apt to overlook this. There is so much on the surface of Chaucer’s poems, such vivacity of movement, such tender play of feeling, such humour, such delight in nature, in green leaves and sweet air, snn- shine and bird singing, that few of us care to look beneath. The open air, on the breezy hillside or by the murmuring brook, seems the only proper atmosphere for such a poet. There, no doubt, with sun and wind contending playfully to divert us from the printed pages, there perhaps more than anywhere else, Chaucer is a delightful companion ; but it is the duty of the dry-as-dust critic to remind us that Chaucer’s sweet verses were first read under wholly different conditions, in tapestried chambers, to the gracious ear of embroidered lords and ladies. It was from such an audience that Chaucer received ina vapour what he poured back in a flood. This is the secret of his exquisite courtliness of phrase, his unfailing tone of graceful defer- ence, his protestations of ignorance and lack of cunning, his tender handling of woeful love-cases, the gentle play- fulness of his satire, the apologetic skill

with which he introduces a broader and more robust humanity into his verse. If you place yourself within the circle for which

the poet wrote, you see the smile play on sweet lips as he proceeds ; you see the tear gather in the cye; you see the needle laid aside, as the mind of the fair listener is trans- ported to the poct's flowery mead, or plied more briskly as she bends over her work to conceal her laughter at his more vulgar adventures. It was because Chaucer wrote for such au audience that his picture of the life of the time, various and moving as it is, is so incomplete on one side.

There was more than romancing in green fields and Canterbury pilgriming in the travelled times in which Chaucer lived; there were wars, plagues, insurrections, much misery and discontent. But for the disagreeable side of the 14th century we must go to the writer of Piers the Plowman; we find little trace of it in Chaucer. The outside of the walls of the Garden of Mirth is painted with horrible and squalid figures,—Ire, Envy, Covetice, Avarice, Felony, Villany, Sorrow, Eld, and Poverty; but no such figures are admitted within the gates; the concierge is Idleness ; the chief inmates are Love, Sweetlooking, Beauty, Richesse, Largesse, Franchise, and Courtesy ; and Mirth and Gladness are the master and mistress of the ceremonies.

All Chaucer's works are steeped in the nectar of the court; the perfume of chivalrous sentiment breathes from them all. It is-impossible, as we have said, to determine strictly the order of their composition, though it is very casy to distinguish his earlier from his later work. There is a passage in the Prologue to the Legend of Good Women which settles the position of that poem. 'The poet there pretends to have an interview with the king and quecn of love, as he is out on a May morning to worship the daisy. The king challenges his worthiness to do homage to this his own flower, and upbraids him with having translated the Lomance of the Rose, which (in its second part at least) is a hercsy against love's law, and also with having told the story of Cresside, and thrown discredit on women. But the queen of love, Alcestis, speaks up for the poet ; perhaps, she pleads, he was ordered to do these translations and durst not refuse ; and he had done good service by extending the praise of love among the unlearned folk, for—

‘*He made the book that hight the house of Fame, And eke the death of Blanché the Duchess, And the Parliament of Fowlés as I guess, And all the love of Palamon and Areite, Of Thebes, though the story is knowen lite ; And many a hymneé for your holy days That highten Ballads, Roundels, Virclays.”

The translation of the Romance of the Tose was probably the first of these works. It may have been written soon after or during his captivity in France, when he was a youth of twenty, but there is no appreciable difference of style between it and the Book of the Duchess, which if it commemorates, as there is every reason to believe, the death of the first wife of John of Gaunt, must have been written after 1369, when Chaucer was twenty-nine. The idea of writing in the vulgar tongue may have been suggested to him by the cxampleof Dante. The Mouse of Fame is probably later than the Look of the Duchess. The Court of Love is not mentioned by name in the above list, but it may be referred to in the following lines of the prologue :—

- Tast thou not in a book lyeth in thy chest The greaté goodness of the Queen Alceste That turned was into a dayéseye ¢”

Alcestis is, under Venus, the lady and queen of the Court of Love. It is easy to conceive why Chaucer should have kept the Court of Love in his chest. The tide of Puritanic religious sentiment which was destined to sweep into temporary oblivion the airy structures of the chivalric imagination had already in the middle of Chaucer’s life begun to rise. In the Court of Love he fully accepted the troubadour notion of love and marriage,

making the husband the natural enemy of the lover; and he may have had to accommodate himself to the taste of the Fair Maid of Kent, the widow of the Black Prince, the Alcestis of the time, and put his poem out of sight, only pleading that even in it he had paid homage to “the greate goodness of the Queen Alceste.”

There is no good edition of Chaueer, not even a good text. The only text or rather eolleetion of texts that the Chaneerian scholar would think of using is the valuable parallcl six-text edition, published by the Chaucer Society. For

the general reader one text is abont as good as another; there is little to ehoose between Tyrwhitt's, Bell's, and Dr Morris's text in the Aldine edition. (W. M.)

CHAUDES-AIGUES, an old town of Upper Auvergne in France, in the department of Cantal, 17 miles 8.8. W. of St Flour. It is celebrated for its hot mineral springs, which vary in temperature from 135° to 177° Fahr., and at their maximum rank as the hottest in France. The water, which is very slightly alkaline, is employed not only for medical purposes, but also in the washing of fleeces, the incubation of eggs, and various other economic applications ; and it furnishes a ready means of heating the houses of the town during winter. In the immediate neighbourhood is the cold chalybeate spring of Condamine. The warm springs were known to the Romans, and are mentioned by Sidonius Apollinaris, The population of the town is about

2000,

CHAUMONT, a town of France, the capital of the depart- ment of Haute Marne, on an eminence betwecn the Marne and the Suize, 145 miles 8.H. of Paris by the railway, which here crosses a fine viaduct. It is the seat of tribunals of primary instance and commerce, is tolerably well built, and has an elegant town-hall, a court-house, a communal college, a hospital, a theatre, a public library, and a botanical garden. A single towcr remains of the Castle of Haute Feuille, which belonged to the counts of Champagne ; and there is a triumphal arch erected by Napoleon I. and finished by Louis XVIII. The church of Saint Jean- Baptiste, a building of the 13th century, and the chapel of the old college of the Jesuits, arc classed among the historic monuments of France. Coarse woollens, hosiery, and gloves are mannfactured in the town; and there is a con- siderable trade in the iron and iron-wares of the depart- ment. The rise of Chaumont into importance dates from 1190, when it received a charter from the counts of Champagne. In the 13th century it became the seat of a provost ; and in the 16th it was surrounded with forti- fications. It was here that the treaty of 1814 was con- cluded by which England, Austria, Russia, and Prussia formed an alliance against Napoleon. Population in 1872,

8474,

CHAUNY, a town of France, in the department of Aisne, 20 miles W.N.W. of Laon, situated partly on the right bank of the Oise and partly on an island at the commencement of the canal of St Quentin. It has some trade in cider, linen cloth, and hosiery, and is a depdt for coals from Flanders and glass mirrors from St Gobain. Population in 1872, 8831.

CHAUVIN, Errenns (1640-1725), a celebrated minister of the Reformed religion, was born at Nimes, At the revocation of the Edict of Nantes he retired to Rotterdam ; and in 1695 the elector of Brandenburg appointed hin professor of philosophy at Berlin, where he enjoyed con- siderable reputation as a representative of Cartesianism, and ag a student of physics. His principal work is a laborions Lewicon Rationale, sive Thesaurus Philosophicus, which he published at Rotterdam in 1692, and of which a new and enlarged edition was printed at Leeuwarden in 1703. He also wrote Theses de Cognitione Dei, and started the Nowveau Journal des Savants (1694-98).. Chanvin died in 1725, .

CHA—-CHE

CHAUX DE FONDS, a town of Switzerland, in the canton of Nenchitel, and ten miles N.W. of the city of that name, at a height of 3200 feet above the level of the sea, in the rngged and narrow valley of the Jura. Tebuilt after the conflagration of 1794, the town has a handsome and pleasant appearance, and its public buildings include a church with vaulted roof, extensive schools, and a theatre. There are also some peculiar subterranean mills turned by a stream before it sinks into the ground. The principal trade is the manufacture of watches, which are turned ont at the rate of 150,000 annnally; but gilding, enamelling, and carving arc also carried on, as well as the manufacture of scientific and musical instruments. The watch trade was introduced in 1679, and is conducted on the principle of the division of labour. Population in

1872, 19,930.

CHAVES, a town of Portugal, not far from the frontier, in the province of Tras-os-Montes, on a plain near the right bank of the Tamega, which is here crossed by a fine old Roman bridge of eighteen arches. It was fornierly one of the principal fortifications in the country, and in fact derives its present

name from its forming the “keys” or ‘‘chaves” of the north. It has hot saline springs which were known in ancient times as the Aque Flaviw. In one of its churches is the tomb of Alphonso L.; and it gave the title of marquis to Pino de Fonseca, the gallant supporter of Dom Miguel. Population formerly about 20,000, now

4870,

CHAZELLES, Juan Maruiev pr (1657-1710), a French mathematician and engineer, was born at Lyons in 1657. He was employed for some time by Cassini in measuring the meridian, and afterwards taught mathematics to the duke of Mortemar, who procurcd him the preferment of hydrographic professor for the galleys of Marseilles. In 1686 Chazelles went on board the galleys in their campaigns, and kept his school at sea. He was sent to the west coast in July 1689 to examine the practicability of so contriving galleys that they might live upon the ocean, and be employed to tug the men-of-war when becalmed ; and having set sail with fifteen galleys from Rochefort, he cruiscd as far as Torbay, in Devonshire, and took part in the descent upon Teignmonth. On his return he published his observations, with maps of the coasts and harbours he had visited, These maps were inserted in the Neptune Francais, published in 1692. In 1693, Monsieur de Pont-chartrain, secretary of state for the marine, engaged Chazelles to publish a second volume of the Meptune frangais, which was to include the hydrography of the Mediterranean, For this purpose he passed through Greece, Turkey, and Egypt. When in Egypt he measured the pyramids, and finding that the angles formed by the sides of the largest were in the direction of the four cardinal points, he concluded that this position must have been intended, and also that the poles of the earth and meridians had not deviated since the crection of these colossal strne- tures. Chazelles likewise made a report of his voyage in the Levant, and another concerning the position of Alexandria. He was made a member of the Academy in 1695, and died in 1710.

CHEDUBA, an island in the Bay of Bengal, situated ten miles from the coast of Aracan, between 18° 40’ and 18° 56’ N. lat., and between 93° 31’ and 93° 50’ E. long. It extends about 20 miles in length from north to south, and 17 miles from east to west, and its area of 250 square miles snpports a

population of 10,000. The channel between the island and the mainland is navigable for boats, but not for large vessels. The surface of the interior is richly diversified by hill and dale, and in the southern portion some of the heights exceed a thousand feet in elevation. There are varions indications of former

voleanic activity, and along the coast are carthy cones covered with grecn-sward, from which issue springs of muddy water emitting bubbles of gas. Copper, iron, and silver ore lave been discovered; but the island is chiefly noted for its petroleum wells, the oil derived from which is of excellent quality, and is extensively used in the com- position of paint, as it preserves wood from the ravages of insects. Timber is not abundant, but the gamboge tree and the wood-oil tree are found of a good size. Tobacco, cotton, sugar-cane, hemp, and indigo are grown, and the staple article is rice, which is of superior quality, and the chief article of cxport. The inhabitants of the island are mainly Mughs. Cheduba fell to the Burmese in the latter part of the last century. From them it was captured in 1824 by the British, whose possession of it was confirmed in 1826 by the treaty concluded with the Burmese at Yan- daboo.

CHE-FOO, or YEN-rar, as it is called by the natives, a seaport town of Northern China, on the southern coast of the Gulf of Pih-chih-li, in the province of Shan-tung near the mouth of the Yi-ho, and about 30 miles east of the city of Tang-chow-foo. Tillrecently it was quitea small place, and had only the rank of an unwalled village ; but it was chosen as the port of Tang-chow opened to foreign trade in 1858 by the treaty of Tien-tsin, and it is now the resi- dence of a Tau-tai, or intendant of a circuit, the centre of a gradually-increasing commerce, and the seat of a British consulate, a Chinese custom-house, and a considerable foreign settlement. The native town is yearly extending, and though most of the inhabitants are small shop-keepers and coolies of the lowest class, the houses are for the most part well and solidly built of stone. The foreign scttlement occupies a position between the native town and the sea, which neither affords a convenient access for shipping nor allows space for any great extension of area. Its growth, however, has hitherto been steady and rapid. Various

streets have been laid ont, a large hotel erected for the reception of the visitors who resort to the place as a sanitarium in summer, and the religious wants of the community supplied bya Roman Catholic and a Protestant church. Though the harbour is deep and extensive, and possessed of excellent anchorage, large vessels have to be moored at a considerable distance from the shore. The foreign trade is mainly in the hands of the English and Americans, the Germans and the Siamese ranking next in importance. In 1872 there entered the port 233 British vessels, with a tonnage of 97,239 tous and cargoes valued at £144,887 ; while in the same year the ships of all other nationalities numbered 348, with a tonnage of 149,197 tons and a value of £177,168. The imports are mainly woollen and cotton goods, iron, and opium ; and the exports include bean-cake, bean-oil, and peas, raw silk, and straw-braid mauufaetured by the peasants of Lai-chow-foo, walnuts from Tsing-chow-foo, a coarse kind of vermicelli, vegetables, and dried fruit. A certain amount of trade is carried on with the Russian settlements of Manchuria, in which the edible sea-weed gathered in the shallows of the coast are exchanged for piece goods, liqueurs, and sundries from China.

CHEESE, a solidified preparation from milk, the essential constituent of which is the proteinous or nitro- genous substance caseix. All cheese contains in addition some proportion of fatty matter or butter, and in the more valuable varieties, the butter present is often greater in amount than the casein. Cheese being thus a compound substance of no definite chemical composition is found in commerce of many different varieties and qualities; and such qualities are generally recognized by the names of the localities in which they are manufactured. The principal distinctions arise from differences in the composition and

condition of the milk operated upon, from variations in the method of preparation and curing, and from the use of the milk of other animals besides the cow, as, for example, the goat and the ewe, from the milk of both of which cheese is manufactured on a commercial scale.

The quality and the composition of the milk operated on are of prime importance in cheese-making. Not only does this substance vary widely in

richness and flavour owing to the breed, the nature of the food, and the state of the health of the animal yielding it, and many other circumstances; but in cheese-making the differences are still further increased, in some cases by adding cream to it, and in others by using it as skim-milk or milk deprived of a portion of its fat." Taking as a standard the ordinary sweet milk of cows, the following analyses (No. 1 given on the authority of Dr Parkes, and No. 2 by Dr Voelckcr) may be taken to represent its average composition :—

Composition Non! No. 2, ACG tag terete ne crecrmnmc etme cuneate 86°7 86°65 TUT bes Tipeatepe rsa teat ava er Retr ter ce 3°7 38°99 MP AS ater… sdehicivatatisciassiacAce warns 4°0 3°47 BRS REGED 0.0, cocssseossseversenns 5°0 5-11 Minéral mattOrs…c.ccessesseats oe 06 '78

The object of the cheese-maker is to obtain in a solid form as large a proportion as possible of the casein and butter contained in the milk dealt with. The poverty in these constituents of the whey or liquid matter separated in the process of making cheese is therefore, to some extent, a measure of the success of the operation. The average composition of the whey drained off may be thus stated :—

AWE NEI? cogtianeacesmeeeeccorenncennrace Bo caceater sce: Sealer 92°95 1 Eric ey aR Reyy Meme tra aA oc a oe a Ae 24 (Oieontine vane 5 eee Necaian:, MU icotereticdic 4 Oeste cece: 81 Dill Sugar Gnd liaetio Aad tse ees… severe 5°27 Miaiveral WvauleR Oss: gees eels cases oie eee sc ten "TS

Milk, as is well known, if allowed to stand for some time, becomes thick, and is then separable intotwo portions— a solid white curd, and a greenish liquid whey. Such a coagulation and separation is essential in the making of cheese; but only to a small extent, in Holland and some other localities, is the natural acid coagulation taken advantage of. It has been assumed that the solid con- stituents of milk are held in solution by an alkalinc substance, and that coagulation is the result of the neutra- lization of the alkali by tle development within the fluid of lactic acid, as in the case of sour milk, or by the addition of an acid substance as is sometimes the practice; but this theory does not satisfactorily account for all the phenomena of coagulation. Acid snbstances, however, do readily curdle cheese, and hydrochloric acid,

tartaric acid, vinegar, and cream of tartar have all been employed to produce coagula- tion for cheese-making. The curding is also, in practice, produced by the action of such substances as the juice of figs, and decoctions of thistle tops, artichoke flowers, the butter-wort, and other plants, But the substance atsed. uniformly in Great Britain, and in all great cheese-producing districts, is rennet, a preparation of the fourth or digesting stomach of the suckling calf. Rennet is prepared by cutting up the membrane in strips, salting, smoking, and sometimes treating it with spices and aromatics. The influence of rennet is due to the fact of its exciting a kind of fermentative action;: but that it thereby changes the sugar of milk (lactin) into lactic acid, and so coagulates the casein, has been denied by Dr Voelcker, who holds its action to be “sue generis, and as yet only known by its effects.”

In the practice of cheese-making it is found necessary, in order to hasten the coagulating action of rennet, and to produce a curd of sufficient hardness, to heat the milk to a temperature which varies from 72° to 85° or 90° Fahr. The lower temperature, it is found, yields a soft cheese, retaining

much whey and ripening soon; while the increased heat produces a firm curd and a solid slow-ripening cheese. After due coagulation the curd is broken, and by a variety of manipulative processes as much as possible of the whey 1s drained away, and the curd is reduced to comparatively dry crumbly fragments. At this stage, sometimes, but not frequently, the curd is salted; it is then collected into a clean cheese-cloth, placed in a cheese vat of tlie form and size of the cheese to be made, and submitted to pressure 1n the cheese press. While in the press it is frequently turned, a good deal of whey meantime continuing to exude ; and it is found that the amount of pressure has much influence on the solidity and rate of ripening of the cheese. As soon as a sufficient skin has formed on the cheese to preserve its shape, it is removed from the press aud salted by repeated rubbings of salt over its surface. The cheese is then put aside in a clean, cool, airy situation for ripening, a process which takes a variable period according to the quality of the checse, its method of preparation, and other circumstances.

The ripening of cheese is the result of a slow process of decay caused by a spontaneous fermentative action. In hard, solid, poor cheeses it acts very slowly, while in thosc which contain butter in large proportions its action is very energetic, and they cannot be preserved for any considerable period. Chcese when newly made has an acid reaction, but by degrces from without inwards the acid reaction becomes less apparent, and the cheese ripens, A portion of the casein suffers decomposition, evolving ammonia and ammoniacal bases which neutralize “the acid of the cheese. In a similar way the fat is partly decomposed, and the resulting fatty acids ulso combine with the ammonia evolved by the casein. When this action is allowed to proceed too far the cheese becomes alkaline, putrefactive decay ensues, free ammonia is evolved, an offensive odour is produced, and sometimes even poisonous compounds are formed, A satisfactory indication of ripening found iu Stilton and other rich cheeses is the appearance of a green mould, streaked throughout the mass, produced by the fungus Aspergillus glaucus. A red mould also develops from Sporendonema Casei, and when the ripening becomes advanced the cheese-mite, Acarus domesticus, is produced with great rapidity in inconceivable numbers.

In England the milk of cows only is used in the manu- facture of cheese. Excluding the so-called cream cheeses— a preparation of a soft buttery consistence made from cream gently pressed, which must be used new and fresh, —British cheese may be divided into three classes :—-Ist, that made with whole milk plus cream ; 2d, that made with whole milk ; and 3d, that made with milk minus cream, or skim-milk. Stilton and double Gloucester belong to the first class, being made of morning milk to which the cream of the previous evening’s milking is added. Whole milk cheeses are xepresented by single Gloucester, Cheshire, Cheddar, and Dunlop ; and the ordinary country checse used by the labouring classes represents the third class. It must, how- ever, be understood that all gradations in richness are met with in cheese, as seen by the table below, and that quality depends on other circumstances besides proportion of butter. Of foreign cheese imported into Great Britain, the most important in point of quantity and value is American ; and since the introduction of the factory system of cheese- making in the United States, this has greatly improved in guality and become an important and extensive article of commerce, A large quantity of cheese, both fat and poor, is also made and exported from

Holland. Parmesan cheese and Gruyére cheese, which are highly relished on account of their flavour, are skim-milk products, the former being coloured and artificially flavoured with saffron. The celebrated French Roquefort cheese is made from ewe’s

milk, and matured in the caves of Roqucfort, where a uniform low temperature is found throughout-the year. The accompanying table, compiled from various sources, gives the average composition of the principal kinds of cheese at present known in commerce : ~-

Water. Fat.

Stilton QO 43°98

(CERNE conane cosuataauemnencon: 82°59 82°51 | 4°53 Cheddaniiem.. cc ccsasusceeoee 80°32 | 28°18 | 35°53} 1:66] 4:31 Caanasee: 33°41 : 82°69 | 2°23] 3°92 Single Gloucester …..... 36°50 : 28°75 | 4°68] 4°32 AWallitslitin@semeners. cos aceite: 89°22 U9‘26) 2289) 5×02 ID ruallloh se snanonconbegecso node 38°46 Bul | bac 8°81 Ordinary Skim-milk …..... 39°48 27°08 | 0:22) Bog ENMMVOM GAUMeae ses ., cores smuteeieneee 27°29 Soraley 6r21″ | o.22 Dutehy(Gouda) TEI IV aoa ameduponsuntodons: 27°56 15°95 | 6°69] 5°72 GUUyeTON vacant ener 40°00 24°0 15 3°00 Bile reee s ncdsesancer ees comeee 45°25 25°73 | 4°94) 5°61 deularesuietineeetienies 84°55 80°14) 3°72] 5:67 Neufchatel (Cream Cheese) | 36°58 40°71] 15°80| 0°51

As an article of food cheese is used in a double capacity. Rich cheese in an advanced stage of ripeness is eaten in small quantities partly on account of its piquancy, and partly also as a digestive stimulant. Skim-milk cheese, and all the varieties poor in fat, again, are valuable articles of food on account of their high percentage of nitrogenous matter, and the cheaper qualities are, on this account, extensively consumed among the classes by whom other animal food is not usually obtainable. As an article of ordinary dict, cheese labours under the disadvantage of being hard of digestion ; and especially when it is toasted, as is frequently the practice, it really is, as has been observed, “about as digestible as leather.” According to Dr Frankland’s

experiments, the maximum amount of force produced by the complete oxidation of 1 1b of Cheshire cheese within the human body is 2704 foot-tons.

The imports of cheese into Great Britain during the year 1875 amounted to 1,626,413 ewt., of an estimated value of £4,705,229 ; of this quantity about one-half was imported from the United States and one-fourth came from Holland. Of course the imports only represent a small proportion of the total quantity consumed.

CHEETAH, or Huntine Leoparn (Gueparda jubata), a Carnivorous Mammal belonging to the family Pelidw, but exhibiting in form and habits such a mixture of feline and canine characteristics as have lcd naturalists to regard it as a transition form between the cat and dog groups. Unlike the typical Felide, its head is short and round, its legs clongate and slender, and the flesh tooth of the upper jaw thin and longitudinally compressed. Its claws, being only partially retractile, get blunted by exposure to the surface of the ground, and so are less adapted to the purely felinc mode of capturing prey. The cheetah attains a length of 3 to 4 feet, is of a pale fulvous colour, marked with numerous spots of a deep black on the upper surface and sides, and is nearly white beneath, The fur is some- what crisp, altogether lacking the sleekness which charac- terizes the fur of the typical cats. Its tail is long and some- what bushyat the extremity. In confinement it soon becomes fond of those who are kind to it, and gives evidence of its attachment in an open, dog-like manner. According to Mr Bennet (ower Menageries) “the character of the cheetah seems to be entircly free from that sly and suspicious feeling of mistrust which is so strikingly visible in the manner and actions of all the cats, and which renders them so little susceptible of real or lasting attachment;” and it is the opinion of the same writer that the cheetah

might be thoroughly domesticated and “rendered nearly as familiar and faithful as the dog himself.” The cheetah is found throughout Africa and Southern Asia, and has been employed for centuries in India and Persia in

hunting antelopes and other ruminant game. According to Sir W. Jones, this mode of hunting originated with Hushing, king of Persia, 865 B.c., and afterwards became so popular that certain of the Mongol emperors were in the habit of being accompanied in their sporting expeditions by a thousand hunting leopards. In prosecuting this sport at the present day the cheetah is conveyed to the field in a low car with- out sides, hooded and chained like hunting-birds in Europe in the days of falconry. When a herd of deer or antelopes is seen, the car, which bears a close resemblance to the ordinary vehicles used by the peasants, is usually brought within 200 yards of the game before the latter takes alarm ; the cheetah is then let loose and the hood removed from its eyes. No sooner does it see the herd, than dropping from the car on the side remote from its prey, it approaches stealthily, making use of whatever means of concealment the nature of the ground permits, until observed, when taaking a few gigantic bounds, it generally arrives in the midst of the herd and brings down its victim with a stroke of its paw. The sportsraan then approaches, draws off a bowl of the ruminant's blood, and puts it before the cheetah, which is again hooded and led back to the car. Should it not succeed in reaching the herd in the first few bounds, it makes no further effort to pursue, but retires seemingly dispirited to the car. In Africa tlie cheetah is only valued for its skin, which is worn by chiefs and other people of rank. It forms an article of export from Senegal.

CHEKE, Sir Jown (1514-1557), was born of good family at Cambridge, and was educated at St John's College. His learning gained him the position of king's scholar, and in 1540 he was chosen to fill the chair of dreek then instituted by Henry VIII. Together with Sir Thomas Smith he has the honour of being one of the first who revived the knowledge of that language in England. He specially interested himself in its pronunciation ; and he finally carried his point, throngh his popularity with the students, notwithstanding the strennous opposition of the chancellor, Bishop Gardiner. Among those whom he taught were William Cecil and Roger Ascham, the latter of whom, in his Schoolmaster, gave him the highest praise both for scholarship and character. About 1544 he was appointed tutor to Prince Edward, and on the accession of lis pupil to the throne he received several cousiderable grants, and, among other honours, rose to the position of secretary of state. Unfortunately for himself he followed the duke of Northumberland, and acted as secretary to Lady Jane Grey during

her nine days' nominal reign, In consequence Mary threw him into the Tower, and confiscated his wealth. In September 1554 he obtained his liberty, with leave to travelabroad. He visited Italy, gave lectures on Greek at Padua, and afterwards was forced to support himself by teaching that language at Strasburg. In 1556 he was lured to Brussels by a message that his wife was in that town, and, on his way thither, was seized by order of Philip of Spain, and again brought to the Tower. He was immediately visited by two Catholic priests, who failed to convert him till he was informed that he must recant or be burned. Upon this he yielded, and made two public recantations. He did not long survive his disgrace, and in September 1557 he died in London. Perhaps the most interesting of Cheke's works is the Hurt of Sedation (1549), which gives advice to the people who had risen in rebellion uuder Ket. 'To seek equality, he argues, is to make all poor; and, besides, "riches and inheritance be God's providence, and given to whom of His wisdom He thinketh

good." He also wrote Latin translations of some of St Chrysostom's homilies ; De Obitu Martini Bucert (1551) ; De Pronunciatione Greece Lingue, 1555); De Super- stitione, presented to King Henry VIII, ; translation of Leo de Apparatu Bellico; Carmen Heroicum, aut Epitaphium in Antonium Denevum, See Life by Strype.

CHELMSFORD, the county-town of Essex, in England, 29 miles N.N.E. of London, with which it is connected by the Great Eastern Railway. It is situated in a valley on the Chelmer, near the confluence of the Cann, and has conimunication by the river with Maldon and the sea, 11 miles to the east. The Cann is crossed by two bridges, one of stone and the other of cast-iron; and there is also a bridge over each of the two branches into which the Chelmer is divided at this part of its course. In the neighbourhood of the island enclosed by this bifurcation are the works of the gas company, and the wharves for the barges on the river, Besides the parish church of St Mary, an ancient and elegant edifice, rebuilt in 1428 and again in 1800, the town has seven churches and chapels belonging to different denominations, a grammar school founded by Edward VI., an endowed charity school, a mechanics' institute, a museum, and a library. It is the seat of the county

assizes and quarter sessjons, and has an elegant and commodious shire hall. Its corn and cattle markets are among the largest in the county ; for the former a fine exchange was provided in 1856 at a cost of £10,000, and a similar sum is being expended on an enclosure for the latter. In the centre of the square in which the corn-exchange is situated there stands a bronze statue, by Bailey, of Lord Chief-Justice Tindal, who was a native of the parish. There are corn mills, tanneries, and a brewery in the town; but most of the inhabitants are engaged in agriculture or the trades im- mediately connected with it. About a mile to the north is situated the county jail at Springfield Hill, and at a distance of two miles to the south is the racecourse, with a grand stand erected in 1863. The town, not being a corporation, is under the government of a local board, and within the limits of that jurisdiction it had 9318 inhabi- tants in 1872.

Chelmsford lies but a short distance from the site of the Roman colony of Ceesaromagus, usually identified with Writtle. At the time of the Conquest the manor was held by the bishops of London ; and in the reign of Henry I. the town was indebted for its bridge over the Cann to Bishop Maurice. After this improvement it rapidly increased in prosperity, and in the reign of Edward Jil. it sent four representatives to the council at Westminster. Of the Dominican convent founded in the town at an early period there are no remains ; but a chronicle composed by friar Langford is still extant.

CHELSEA, formerly a village about two miles west of London, on the left bank of the Thames, but now an integral part of the great metropolis. It gives its uame toa parish and a parliamentary borough, the former with 71,089 inhabitants, and the latter, which includes Fulham, Hammersmith, Kensington, and part of Willesden, with 258,050, at the census of 1871. It is connected with the district of Battersea on the other side of the river by three bridges, known respectively as Battersea, Albert, and Chelsea suspension bridges. Like many of the suburban villages of London, it has an interesting history of its own. In 785 it is mentioned by the name of Cealscythe as the seat of an ecclesiastical synod; and in Domesday Book it appears as Cercehede or Chelched. The name was still written Chelchith in the time of Sir Thomas More, who had a house in the village, but it began to assume the form of Chelsey in the 16th century. The manor was bestowed by Henry VIII. on Catharine Parr,

and it afterwards passed successively into the possession of the duke of Northumberland, Lord Cheyne, and Sir Hans Sloane. It was at Chelsea that Sir John Danvers in- troduced the Italian style of gardening, which was so greatly admired by Bacon and soon after became prevalent in England; and here in our own day were the gardens of the English botanist William Curtis, arranged according to the Linnean system. During the 18th century the village was the residence of many of the most famous men of the period, Atterbury, Swift, and Arbuthnot lived in Church- lane ; Guy, Smollett, and Steele were for a time inmates of Monmouth House; and Count Zinzendort established a Moravian society at Lindsay House. Sir Robert Walpole's residence was extant till 1810; and till 1824 the bishops of Winchester had a palace at the end of Cheyne Walk, a fine promenade extending along the river and now fronted by part of the Thames embankment, which has greatly im- proved its appearance. The house and grounds of the earl of Ranelagh were a favourite resort from 1742 till 1808 ; and Cremorne, which was built by the earl of Huntingdon, father of Steele's ‘‘ Aspasia," is still a place of popular amusement. 'The old church and churchyard contain the tombs of Sir Thomas More, Sir Hans Sloane, George Herbert's mother, Thomas Shadwell, Woodfall the printer of Junius, and other persons of celebrity, Of greater importance than any of the buildings already mentioned is the great Chelsea Hospital for invalid soldiers, built by Sir Christopher Wren (1682-1690), on the site of King James's College ; and to the north of the hospital is the

Royal Military Asylum, founded by Frederick Duke of

York, for the education of children connected with the army. For further details see the article Lonpon, CHELSEA, a city of the United States, in Suffolk county, Massachusetts, forming part of the suburbs of Boston. It is situated on the north bank of the Mystic River, which separates it from Charlestown, while Chelsea creek lies between it and East Boston. It communicates both with Charlestown and with East Boston by bridges. (See plan, vol. iv. p. 731). Its public buildings comprise the city hall, Winnisimmet hall, the naval hospital, the marine hospital, an academy of

music, a free public library opened in 1870, a high school, a national bank, and about a dozen churches; aud among its industrial establishments are several foundries, brick-works, worsted factories, soapworks, and oilworks, a manufactory of washing machines, a brewery, and a salt-refinery. It is supplied with water from the works in Charlestown, which are fed by the Mystic River. In 1871 there were 3092 houses in the city, and in 1874 the population amounted to 20,695, showing an increase since 1830 of 19,925. The first settlement dates from 1630, and in the following year Winnisimmet ferry was established. Till 1738 the place itself was known as Winnisimmet, and was regarded as part of Boston, but in that year it was organized as a separate town, for the convenience of its inhabitants, who found it difficult to attend the municipal meetings of the city, In 1857 it obtained a city-charter of its own. CHELTENHAM,a parliamentary and municipal borough of England, in Gloucestershire, situated about 88 miles N,W. from London, in a valley watered by the Chelt, and sheltered on the E. and N.E. by the Cotswold Hills. Its streets and buildings are spacious and elegant, and its spas and promenades are reckoned among the finest in England. The ‘‘ Promenade ” par excellence, indeed, which extends for more than a quarter of a mile, and is lined with trees, will bear comparison with any in Europe. Besides the parish church of St Mary’s, which probably dates from the 14th century, there are ten Episcopalian churches and numerous other places of worship; several of them are beautiful specimens of modern architecture, and the Roman Catholic

church of Saint Gregory is especially admired. Among the educational institutions the most important are the well known Cheltenham College, which dates from 1842, and numbers upwards of 600 pupils; a foundation grammar school, originally established in 1574 by Richard Pates of Gloucester ; a Church of England college for the training

Cheltenham (Central part),

of teachers for national and parochial schools; and the Ladies’ College at Cambray House opened in 1854, Of the charitable institutions may be mentioned the General Hospital and Dispensary, which is supported by donations and subscriptions, and the Female Orphan Asylum, which owes its existence to Queen Charlotte. There are no manufacturing

establishments of any importance ; and the prosperity of the town, which has the reputation of being one of the healthiest, cleanest, cheapest, and best regulated places in the kingdom, is mainly due to its being a fashionable and educational resort. The mineral springs are four in number—the Old Wells, Montpellier, Cambray, and Pittville; and with the exception of Cambray, which is chalybeate, they all furnish a saline water. The Pittville spring is the mildest and most attractive, and it also possesses the best pump-room in the town,—a handsome building, surrounded by an Ionic colonnade, which was erected in 1825 by Joseph Pitt, at a cost of £20,000.

Cheltenham probably existed at a very early period, and Roman remains have been discovered on its site. The manor is described in Domesday-Book as terra regis, or king's land, and it possessed important privileges granted by several charters. In the reign of Queen Elizabeth the town was relieved from the burden of sending two members to Parliament. It rose rapidly into importance at the commencement of the eighteenth century through the discovery of its mineral waters, which were visited in 1788 by George III., and soon after attracted general attention. In 1804 it consisted of only one street, and contained 710 houses and 8076 inhabitants ; whereas at the census of 1871 the parish, which has an area of 4203 statute acres, contained 7825 inhabited houses, and had a population of 41,924. The Parliamentary borough, which was extended by an Act of 31 and 82 Vict. to an area of 4451 acres, and contains part of the parish of Leckhampton, had in the same year 8321 in- habited houscs and a population of 44,519 persons, of whom 18,370 were males, and 26,149 females. It returns one member to Par- liament, and is the seat of a County Court, a centre under the Bankruptcy and Judicature Acts, and the depdt of the county police. ' '

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CHEMISTRY

ISTORICAL INTRODUCTION.—The acquaintance of the ancients with the modes of extracting several of the metals from their ores, and also with the arts of dyeing, tanning, and glassmaking, and their recognition of various kinds of salts, earths, and inflammable sub- stances show that they

must have been possessed of a knowledge of a considerable number of chemical facts ; but that this knowledge was to any extent gained by experimental research rather than by mere accident, or that when acquired it was applied to the classification of chemical phenomena, or to the establishment of any theory explan- atory of them, there is no evidence to show. Until com- paratively recent times the principles of metaphysical philosophy were not recognized as distinct from those of chemistry ; men of learning gave themselves up to specu- lation upon the obvious physical characteristics of matter, whilst they neglected the indirect observation of their intrinsic and specific properties ; analogies were a sufficient basis for the classification of bodies, and a consideration of their external peculiarities—“ a decomposition of bodies,” to use the words of Whewell, “into adjectives, not into substantives ”—stood in the place ofanalysis. Thus we find that the qualities of the “ elements” of the school of Aristotle are all physical, they are dry or humid, warm or cold, light or heavy ; the idea of substances distinguished by special chemical properties was as yet no less foreign to men’s minds than a knowledge of their ultimate com- position.

Ideas similar to those of Aristotle concerning the elemen- tary constitution of the universe were early prevalent in the East, whence they appear to have found their way into Europe. The elements, according to the Hindus, were earth, air, fire, water, and ether ; and in the fourth book of “ Chow, ” forming part of the Chinese historical records known as the Shoo King, there is a document supposed to date from 2000 B.c., in which is given an account of the five elements, namely, earth, fire, water, metal, and wood. Of what precisely was meant by an “element” in the language of the ancient philosophers and early chemists it is difficult to get any definite idea; the term could hardly, in fact, be used otherwise than in a vague sense before the exact processes of chemical analysis had shown that the properties of matter vary according to the presence or absence within it of definite quantities of certain sub- stances, distinct in properties from one another, and un- resolvable into other substances,

To the doctrine of a plurality of elements, as opposed to the systems of Thales and Heraclitus, may be ascribed the origin of the conception that by the analysis and synthesis of bodies the various kinds of matter with all their diversity of physical features might be produced, a conception that

took practical shape in the processes of alchemy, which, as Liebig has remarked, “ was never at any time different from chemistry.” During the alchemistical period a knowledge of the properties of bodies was acquired ; afterwards chemistry showed the relations, connections, and limits of these properties. The first mention of chemistry (xnpela)

is found in the dictionary of Suidas, who flourished in the |

11th century ; he defines it as “the preparation of silver and gold,” and relates that Diocletian, lest the Egyptians should become rich aud capable of resisting the Roman power, caused their books on chemistry to be burnt. He further asserts that the art was known as carly as the period of the ,Argonautic expedition, the golden fleece being a treatise written on skins (Sépyacr) concerning the making of gold. The belief in the art of making gold and

silver, held by the Greeks from the 5th to the 15th century, was by them communicated to the Arabs, possibly not long after the conquest of Egypt in 640; and from the lith tothe 15th century alchemy was diligently studied by the philosophers of Italy, France, Germany, and England.

That the claims of alchemy, notwithstanding repeated demonstrations of their futility, so long received the serious attention of mankind, is attributable to various causes. Not only did impostors find free scope in the credulity of an age of ignorance for the exercise of their arts; but men of talent and culture, relying on tradition, were led honestly to support the doctrine of the transmutation of metals. The existence of the philosopher’s stone having once been accepted as an ascertained fact, it is not extra-ordinary that Isaacus Hollandus is able to indicate the method of its preparation from ‘‘adamic” or “virgin” earth, and its action when medicinally employed; that Roger Bacon, Raymond Lully, Basil Valentin, and John Price know the exact quantities of it to be used in trans- mutation; and that George Rippel, in the 15th century, has grounds for regarding its action as similar to that of a ferment. In the view of some alchemists, the ultimate prin- ciples of matter were Aristotle’s fd elements, the proxi- mate constituents were sulphur and mercury, the father and mother of the metals ; gold was supposed to have attained to the perfection of its nature by passing in succession through the forms of lead, brass, and silver; gold and silver

were held to contain very pure red sulphur and white quicksilver, whereas in the other metals these materials were coarser and of a different colour. Geber, judging from an analogy instituted between the healthy human being and gold, the most perfect of the metals, regarded silver, mercury, copper, iron, lead, and tin in the light of lepers that required to be healed.

To the evidence of their imaginations the alchemists were able to add that of actual observation ; the fact that many ores resembling metals were changed and decom- posed by heat could not but offer support to thcories formed at a time when the nature of chemical combination was not understood; and the apparent transition of many bodies into one another, as, for example, that of clouds into water, was not less wonderful to them than the transmutation of the lighter metals into gold.

It was in the 16th century that a new race of alchemists, or spagyrists, as they were termed, arose, who, abandoning the search for the philosopher's stone, began to direct their energies to the discovery of chemical remedies for the various diseases of the body. "'The true use of chemistry," says Paracelsus (1493-1541) "is not to make. gold, but to prepare medicines." Rejecting the teaching of Galen, he admitted three or four elements, the star, the root, the element, and the sperm or true seed, which were originally confounded together in the chaos or yliados ; these cle- ments he asserted were composed of the three principles siderite salt and sulphur and mercury, the cause respectively of the qualities of fixity, combustibility, and fluidity and volatility. The theories of Paracelsus found many advo- cates, amongst whom may be mentioned Thurneysser (1531-1596), Bodenstein, Taxites, Dorn, Sennert, and Du- chesne ; and with some modifications they were main- tained in the 17th century by Dr Willis (1621-1675), the celebrated English anatomist and iatro-chemist, and by Lefebvre and Lémery in France, according to whose system matter consisted of the active principles mercury or spordt, sulphur or oil, and salt, and the passive principles water or phlegm and earth.

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Among the contemporaries but not the followers of Paracelsus, the German metallurgist Agricola (149 4-1555) deserves mention ; his great work, De Re Metallica, is the most valuable contribution to practical chemistry that

appeared in the 16th century. Libavius also, who died in 1616, did much to forward chemical science at this period. From his writings, however, in which he puts forward the views both of Paracelsus and of Aristotle concerning the constitution of bodies, it does not appear that his notions of chemical combination were more definite than those of his preclecessors. ;

J. B. Van Helmont (1577-1644), who, like Paracelsus, repudiated the doctrines of the Galenists, held opinions that in many respects were no advance upon those of the former. He looked upon water as the true principle of all existing things, inclusive of the three principles salt, sul- phur, and mercury, which therefore were not elements; to air, however, he granted the rank of a true element. The archeeus—something without form, and independent of the elements—he imagined to draw all bodies from water, to which its generating spirit was attracted by the odour of a ferment or aura vitalis. The vapour produced by the fermentation of water was, according to Van Helmont, a gas, and the same term was by him for the first time applied to carbon dioxide, which he termed gas sylvestre, and to other bodies resembling air.

To Francis de la Bep Sylvius (1614-1672), who studied with care the works of Van Helmont and of Descartes, is due the foundation of the iatro- chemical sect among phy- sicians. In his view the health of the human frame depends upon the relation of its fluids, which were acid and alkaline (acidwm aud lixivum), and these by union produced a neutral and milder substance ; two kinds of diseases were clistinguished, the result either of alkaline or of acid acridity. The new doctrine served to explain many chemical facts, and led to the establishment by Lémery and Macquer of a distinction between acid and alkaline or, as they were afterwards called, basic compounds, This recognition of this chemical difference in bodies and their consequent disposition to unite prepared the way for the conception of chemical attraction or affinity.

In the works of Glauber (1604-1668), alchemy, the preparation of chemical medicines, and the processes em- ployed by him for that end are treated of. His Afiraculum Mundi has for its subject the virtues of the sal mirabile, sulphate of sodium, or Glauber’s salt, of which he was the discoverer ; and in other of his works he describes various chlorides of the metals, the

sulphates of iron and copper, and sulphuric, nitric, and hydrochloric acids, but with respect to their ultimate constitution he advances no theory ; he variously states in his different works that mercury and salt are the principles of all metals, that salt is the origin of all things, and again that water and earth have pro- duced all the minerals and metals.

The first to attempt to overthrow the doctrines of the iatro-chemists was Robert Boyle (1627-1691), who in 1661 published the first edition of Zhe Sceptical Chemist, or Chymico-Physical Doubts and Paradoxes touching the Luperiments whereby vulgar Spagyrists are wont toendeavour to evince their Salt, Sulphur, and Mercury to be the true Principles of Things, a treatise in which. he shows the doubtful character of the doctrine of the threefold con- stitution of matter, and lays stress upon the influence of heat in the formation of new bodies, not necessarily pre- existent as such in the substances from which they are pro- duced. If, as he tells us, he is somewhat too indulgent of suspicion against the hypotheses or arguments of other chemists, he is only acting in compliance with the advice of Aristotle, and bending a crooked stick the contrary way, to reduce it at length to straightness. Into the mouth of

“‘ Themistius” he puts tlhe complaint that “ Aristotle’s hypo- thesis had not been called in question till in the last cen- tury Paracelsus and some few other sooty empiricks,.... . having their eyes darkened and their brains troubled with the smoke of their furnaces, began to rail at the Peripatetick doctrine, which they were too illiterate to understand, and to tell the credulous world that they could see the three ingredients in mixed bodies, which, to gain themselves tlle repute of inventors, they endeavoured to disguise by calling them—instead of earth, and fire, and vapour—salt, sulphur, and mercury, to which they gave thie canting title of hypostatical principles.” Boyle inclines to a belief in “but one universal matter of things, as it is kuown that the Aristotelians themselves acknowledge, who called it MACHU PUNO»... . the portions of this matter seem to

j differ from one another in certain qualities or accidents,

fewer or more.” He thinks that elementary corpuscles are of various sizes, and of more sorts than three or four or five; and that the combination of two of these corpuscles may give rise to a new body as really one as either of the cor- puscles before they were mingled or confounded, this con- cretion being endowed with distinct qualities, and no more by fire or any known way of analysis divisible into the corpuscles that liad first concurred to make it, than cither of them could by the same means be subdivided into other particles. He furthermore deduces from his arguments the corollary, ‘“‘That it may as yet be doubted whether or no there be any determinate number of elements ; or, if you please, whether or no all compound bodies do consist of the same number of elementary ingredients or material prin- ciples.” Inanother work, The Imperfections of the Chemical Doctrine of Qualities, Boyle points out the arbitrary nature of Sylvius’s classification of all substances as acids and alkalies, and the needlessness and unsatisfactory character of his hypotheses. JIatro-chemistry was opposed also by Conring (1606-1681), Sydenham (1624-1689), Pitcairne (1652-1713), and his pupil Boerhaave (1668-1738), the author of the excellent Hlementa Chemie; and though vig- orously supported by De Blegny, Borrichius, Viridct, Vieussens, and others, it gradually lost repute, and was finally overthrown by F. Hoffmann (1660-1742).

Of the labours of Kunckel (1630-1703) in the cause of chemistry it is impossible to give an account within the com- pass of the present sketch ; but whilst the science was en- riched by means of his numerous researches, amongst which may be mentioned those on phosphorus, it received no assistance from his theoretical views concerning the consti- tution of bodies ; thus, for instance, he rejected the belief in the three principles of Paracelsus, yet maintained that all metals contained common quicksilver ; and though their increase in weight by calcination was not, according to him, due to the absorption of ponderable fiery material, the explanation he offered of this phenomenon was even less satisfactory.

To Becher (1635-1682) and to Stahl (1660-1734) chemistry owes the introduction of the first consistent theory of the constitution of compounds and of chemical action. Becher held that the primary ingredients of matter were water and earth, and that from these were produced three earths—the fusible or stony, the fatty, and the fluid earths,—improperly called salt,

sulphur, and mer- cury. Stahl, who developed the doctrines of Becher, enumerated fourelements—water, acid, earth, and phlogiston. Becher bad explained the calcination of metals on the supposition that they consisted of an earth anda some- thing of which they became deprived on ignition ; the burning of brimstone was, in like manner, thought to be its resolution into an acid and true sulphur, or that combus- tible part which was dispelled by heat: It was this supposed combustible body to which the name phlogiston

(pdoyiorov, combustible) was applied by Stahl — the materra aut principium ignis non ipse ignis. The pllogiston of Stahl answers in some measure to the souls and spirits assigned to metals and salts by the alchemists, or to what Geber called the “humidity,” and Cardan the “ celestial heat” of metals. When by means of charcoal a metallic calx was reduced, or a compound containing sulphur was obtained from fused sodium sulphate, phlogiston was supposed to be absorbed from the charcoal, which with lamp black and other reducing agents came in time to be regarded as nearly pure phlogiston. Bodies that would not burn were thought to have already parted with their phlogiston. From a consideration of the insolubility of most combustible substances arose the idea that phlogiston was a dry and earthy body, capable of receiving a motion of great vclocity—the motus verticellaris—manifested when ignition or flame was produced. John Rey had in 1630 remarked that metals grow heavier when calcined by the absorption of “ thickened air,” but had given no general theory of combustion, or explanation why many substances become lighter or are lost sight of when heated. Boyle, too, had noticed the increase of weight caused by the calcination of metals, and had attributed it to the combina- tion of the latter with heat particles ; and Stabel and others were not slow to object that this fact negatived the supposition that calcination consisted in a subtraction of phlogiston ; the Stahlians, however, met the difficulty by declaring that substance to be the principle of levity or negative weight.

F, Hoffmann, who contributed greatly to the progress of analytical chemistry in Germany, held with Stahl that sul- phur consisted of acid and phlogiston, and that combustible bodies contained something which might

be described as phlogiston, but thought it possible that the calces of metals were formed, not by the subtraction of phlogiston, but by the combination of the metals with an acid material. Boerhaave, without directly attacking the phlogistic theory, casts doubts upon the assumption of the existence of a combustible principle and of earthy substances in the metals. The view of Homberg (1652-1715) was that the principle of combustibility in inflammable minerals and in vegetable substances was sulphur ; and E. F. Geoffroy (1672-1731) regarded phlogiston as a sulphurous or oily principle. Amongst the most active supporters of the doctrincs of Stahl were Neumann (1683-1737); J. H. Pott (1692-1777), distinguished for his researches on the behaviour of mineral substances at high temperatures ; Marggraf (1709-1782); and Macquer (1718-1784), the discoverer of arsenic acid. Other celebrated chemists who flourished during the phlogistic period were Réaumur (1683- 1757), Hellot (1685-1766), and Duhamel du Monceau (1700-1782), who first proved the nature of the base of common salt.

The phlogistic theory of Stahl, though incorrect, was of no small assistance towards a true understanding of chemical phenomena. It was based upon experimental data, the interpretation of which served for the correlation of facts of which but vague and enigmatic explanations had formerly been given. The supposed subtraction of phlogiston in the calcination of metals, though equivalent in reality to the addition of oxygen, was yet a loss of potential energy, by virtue of the combination of the metal with the gas; and the gain of phlogiston was an increase of potential energy, attendant on the removal of oxygen.

It was only in the latter part of the 18th century that the influence of the presence of air upon the formation of many chemical compounds was generally perceived, and that through the use of the balance the nature of gascs began to be comprehended and sucli airy nothingness

became commonly regarded as an intimate and necessary constituent of various solid and fluid bodies. The phlogistic theory gave to its adherents so

plausible and moreover so circumstantial an account of the modes ctf chemical action, that facts and observations which caused ata later time a complete revolution in the theory of chemistry, such, for instance, as regarded the existence and properties of oxygen, remained without explanation, and almost unheeded. Robert Hooke, so early as 1665, in his AMicrographia, foreshadowed the discoveries of Priestley and his contemporaries, when he advanced the opinion that in common air there existed a substance like, if not the same as, that fixed in saltpetre, and which at an elevated temperature dissolved combustikles such as sulphurous bodies with a rapidity sufficient to occasion the motion of fire, and to create light; this solvent he considered to be far less for a given bulk of air than of saltpetre. The investigations of Mayow (1645-1679) are particularly interesting. In treatises published at Oxford in 1668 and 1674 oxygen is actually described by him under the name of fire-air, aérial spirit, and nitre-air ; all acids are said to contain it, and it is necessary for combustion and respira- tion, processes which are therefore analogous; it is thie nitre-air of the atmosphere that causes fermentation and the souring of wines, that produces sulphuric acid from sulphur, and effects the calcination of metals.

Early in the 18th century Newton in his Opticks indi- cated the nature and the modes of formation of gascs, "'Deuse bodies," he tells us, "' by fermentation rarefy into several sorts of air; and this air by fermentation, and sometimes without it, returns into dense bodies;" and further on he remarks that the particles shaken off frora bodies by heat or fermentation, so soon as they are beyond the reach of the attraction of the body, recede from it, and also from one another with great strength, so as sometimes to take up above a million of times more space than they did before in the form of a dense body. 'This vast con- traction and expansion seem to him unintelligible by feigning the particles of air to be springy and ramous, cr rolled up like hoops, or by any other means than a repulsive power; the particles of fluids which do not cohere strongly are most easily rarefied into vapour; but those which are grosser, or cohere by a stronger attraction, are not separated without a stronger heat, or perhaps not without fermentation ; being rarefied by fermentation they become true permanent air, those particles receding frora one anvther with the greatest force, and being most difficultly brought together, which upon contact adhere most firmly. — (Opticks, bk. iii., qu. 30 and 31, 1730.)

In 1727 Dr Stephen Hales (1677-1761), who had for some years been engaged in investigations similar to those of Mayow, gave to the world in his Statical Hssays the collective results of his observations. The atmosphere he describes in this work as a fine elastic fluid, with particles of very different natures floating in it, whereby it is fitted to be the breath of life of vegetables as well as of animals. The effect of respiration and of the burning of sulphur in air is to deprive it of its elasticity; and country air is cleaner and more elastic than that of towns. Elasticity, we read, is not an essential immutable property of air particles ; “they are easily changed from an elastic to a fixed state by the strong attraction of the acid, sulphureous, and saline particles, which abound in the air. Whence it is reasonable to conclude that our atmosphere is a chaos, consisting not only of elastic, but also of unelastic air particles, which in great plenty float in it.”’—(Stat, Ess., vol. i, 4th ed., 1769.) Hales did not, however, attempt to determine the distinctive properties of the various gaseous constituents of the atmosphere, and of the substances on which he experimented; all are indiscriminately designated

“air.” It is air that is generated by fermentation, and that contributes to the briskness of Pyrmont and other mineral waters; 108 cubic inches of air are procured from a cubic inch of iron filings and the same quantity of oil of vitriol; and 33 cubic inches of air are the result of distilling a cubic inch of dog’s blood. Hales determined also the volume of air to be obtained by distilling certain quantities of amber, chalk, coal, grey pyrites, aqua-fortis, antimony, tobacco, and other materials, but apparently with no other end in view than the establishment of the fact that air is contained in a great number of substances. He had learned to interrogate, but not to cross-examine nature, The first important step towards a knowledge of the specific properties of the various gaseous bodies was that made in the middle of the 18th century by Dr Black, who experimentally proved that the causticity acquired on ignition by mild magnesia and lime was attributable not to the entrance into them of ponderable caloric, but to the expulsion of a peculiar kind of air, which occurred fixed, or in a state of combination, in the unburnt or mild earths, and caused them to be heavier before than after exposure to heat. He found it possible, in fact, to impart to these substances

a large amount of heat, which became latent, whilst at the same time their weight was lessened by the loss of ‘ fixed air” (carbon dioxide). It was discovered by Black that alkalies in contact with quicklime became caustic by giving up their fixed air to the lime, which was thereby increased in weight and rendered mild. It was thus, by employing the balance as an experimental test of the composition of bodies, that Black laid the foundation of quantitative chemistry, and in so doing gave the first occasion to the strife that twenty years later began to rage between the followers of Stahl and the antiphlogistians. Foremost in the number of those who after Black dis- tinguished themselves as pneumatic chemists, was Dr J. Priestley (1733-1504), His first discovery, made in 1772, was nitric oxide gas, which he soon employed in the analysis of air. Boyle, more than a century before Priestley’began his experiments, had stated in Zhe Sceptecal Chemist, that “‘ without the addition of any extraneous body, quicksilver may. by fire alone, and that in glass vessels, be deprived of its silver-like colour, and be turned into a red body; from this red body, without addition, likewise may be obtained a mercury bright and specular as it was before.” —(Boyle’s Works, ed. Birch, p. 852, Lond, 1744.) On the 1st of August, 1774, Priestley discovered that the red oxide of mercury evolved a gas when heated. This gas (oxgyen) being superior even to the air as a supporter of combustion was regarded by him as dephlogisticated aw; the incom- bustible part of the atmosphere he supposed to be saturated with phlogiston, on the assumption that a gas was so much the better adapted for supporting combustion as it contained within itself a smaller quantity of that body. Common air, by drawing phlogiston from burning substances, became, as he thought, phlogisticated air, and on that account had no longer any attraction for phlogiston, or, in other words, any power of supporting combustion, The phlogiston evolved in the burning of combustibles and in the calcina- tion of metals was supposed to unite with the atmosphere or the dephlogisticated air contained therein, and that which was produced by the action on the atmosphere of the phlogiston lost by the metals was the cause of the increased weight of their calces. The opinion that the air given off during the solution of metals in acid was their combustible constituent had been advanced in 1700 by Lémery; and Priestley, guided apparently by the notion suggested by Cavendish’s experiments, that to unite with acids metals must part with their phlogiston, considered inflammable air

(hydrogen) either as identical with or at least very rich in that principle. In 1788, in order to explain the formation

of water from a mixture of inflammable and dephlogisticated air, he put forward the hypothesis that watcr entered into the composition of these and of fixed and other airs ; inflam- mable air, he thought, might be the principle of alkalinity, dephlogisticated air, as Lavoisier had shown, being the principle of acidity. To the last Priestley was an advocate of the phlogistic philosophy, and though unquestionably one of the fathers of modern chemistry was always, to quote the words of Cuvier, ‘un pére qui ne voulut jamais reconnoitre sa fille.” Besides nitric oxide and nitrogen, Priestley first made known sulphurous acid gas, gascots ammonia and hydrochloric acid, and carbon monoxide ; and he it was who, by showing that the condition of ammoniacal gas and of common air is altered by the transmission of electric sparks, led to Berthollet’s analysis of ammonia, and Cavendish’s discovery of the composition of nitric acid.

Henry Cavendish (1731-1810), who, like Priestley, was of the phlogistic school, contributed by his discoveries and care- fully conducted investigations, especially as regards gases, scarcely less than that experimenter to the advance in chemi- cal knowledge which before the beginning of the 19th cen- tury effected the subversion of the Stahlian philosophy. To him chemists are indebted for the invention of the pneumatic trough, and to him is due the first recognition of the importance of determining the specific gravities of the various gases. He established the radical difference between hydrogen and nitrogen, and discovered in 1781 that hydrogen and dephlogisticated air (oxygen), when ex- ploded in a close vessel in proportions sufficient almost entirely to phlogisticate the burnt air, produced pure water ; and that water was also formed when a mixture of common air and inflammable air was exploded, a reduction of one- fifth of the bulk of the former air being then observable. According to Cavendish, water consisted of phlogiston and dephlogisticated air; inflammable air, of phlogiston and water; the action of dephlogisticated upon inflammable air when exploded with it was to unite with its phlogiston to form water, and

consequently to set free the water of tlie inflammable air; thus both airs became water.—(7Z'rans. Roy. Soc, 1784 and 1785.) Lavoisier had shown in 1770 the incorrectness of the notion prevalent among chemists that water by continued boiling and redistillation could be transformed into an earth. Cavendish's discovery deprived it of the rank of an element, to which, according to the vague Aristotelian doctrines of the time, it was en- titled, and thus prepared the way for the acceptation of correct and definite views concerning the elementary bodies. Lavoisier, availing himself of the facts ascertained by Cavendish, taught that oxygen, the so-called dephlogisticated air, was an element, and that combined with it was impon- derable caloric ; inflammable air, or hydrogen, as he termed it, was another element, which had the power of disengaging from caloric'a weight equal to its own of oxygen, with which it united toform water, 'The new doctrine did not, however, meet with very ready acceptance from tlic phlogistians. 'It is inconceivable," writes one of them, "how water, which is absolutely incombustible, should have so combustible a body as inflammable gas is for one of its component parts ; whereas, by admitting pure air in its whole substance to be one of the component parts of water, and the other to consist of the base only of inflam- mable gas, which being burnt by the passage of the electric spark through it, its phlogiston is converted into light and heat, the whole doctrine of the generation of water becomes plain and easy."—(Hopson, Chemistry, 1789.)

Among the most eminent of thc contemporaries of Priestley and Cavendish that cherished a belief in the existence of phlogiston was the Swedish chemist Scheele (1742-1786). In experiments made to ascertain the

nature of heat and fire, he found that measured quantities of common air, when kept in contact with certain sub- stances, ¢.g., solution of potassium sulphide or moist iron-filings, contracted in volume, and became incapable of supporting combustion, As the specific gravity of the air had not augmented, the decrease of bulk, Scheele con- cluded, could not be due, as he had at first conjectured, to the absorption of phlogiston ; the atmosphere must, there- fore, consist of two distinct bodies. One of these, the residual

air, he assumed to be incapable of combining with phlogiston ; the other, having a strong attraction for that substance, had united with it, forming heat, which had penetrated through the walls of the vessel containing it hence the diminution of the original volume of air. Heat, Scheele considercd, was decomposed by means of bodies which had a strong attraction for its phlogiston, such as the calces of gold, silver, and mercury, and oil of vitriol mixed with black manganese ore, and consequently the other constituent of heat, empyreal or fire-air (oxygen), became isolated. Heat could be synthesized, for it was produced by the union of the phlogiston of coals with fire- air. Light, like heat, was a compound of fire-air and phlogiston, but was richer in the latter constituent, to the varying proportions of which it owed its differences of colour. Subsequently, when it became impossible for Scheele to ignore the consideration of the increase observ- able in many substances after burning or calcination, he so far modified his views as to regard fire-air as a compound containing, with a very little phlogiston, a saline principle (principium salinum) and water, which last gave to fire-air the greater part of its weight. When fire-air formed heat by combining with phlogiston, it gave up its water to the materials it dephlogisticated, and thus it was that they were rendered heavier by ignition. Such, in brief, were the theoretical conceptious of Scheele ; it is upon his work as a practical chemist that his fame must rest. ‘Tartaric acid was isolated by him in 1769, and he made the dis- covery in 1774 of baryta and of dephlogisticated muriatic acid (chlorine), and in 1779 of glycerine, the properties of which he pointed out in 1784 ; in 1781 he demonstrated the nature of hydrofluoric acid, first obtained by him in 1771, and prepared tungstic acid, before unknown; and between the years 1776 and 1786 he discovered benzoic, molybdic, lactic, mucic, oxalic, malic, and gallic acids, and made important observations on the compounds of arsenious acid. |

The advance made during the last part of the 18th century in analytical chemistry is attributable in great measure to the labours of Torbern Bergman of Upsala (1735.-1784), who devised systematic methods of examining compounds by the wet way, and by means of the blow-pipe, and first rendered it possible to analyze minerals insoluble in acids by fusing them with an alkali or alkaline carbonate. In 1718 E. F. Geoffroy had published tables in which he exhibited the reciprocal chemical affinities of

various sub- Stances, and these tables had been improved upon by Gellert in his Metallurgic Chemistry, 1751, and by Limbourg, 1761. Bergman, in 1775, gave in a disserta- tion on elective attractions, as he named affinity, an arrangement in 59 columns of all the chemical substances known at the time, in which was shown the order of their decomposition when in solution, and when exposed toa strong heat, The nature of the compounds formed by the mixture of reagents depended, in Bergman's estimation, on the sum of their attractions. Bergman contributed also in some measure to the determination of the constitution of neutral salts—a subject treated of by Homberg in 1699, and, after Bergman and Kirwan, investigated by Wenzel in his Vorlesungun tiber die chemische Verwandtschaft der Kérper, published in 1777, From Weuzel's observations

the idea of equivalency took its rise. He showed that the products of the mutual decomposition of two neutral salts were themselves neutral, or, in other words, that the same weight of base satisfies definite quantities of two diffcrent acids, Thus, according to his experiments, 123 parts of lime and 222 of potash must be considered cquivalent to each other, being both competent to neutralize 181°5 parts of sulphuric, or 240 parts of nitric acid.

In England, ten years previously to the publication of Wenzel's treatise, Cavendish described certain quantitics of fixed alkali and marble as " equivalent ;" and in 1788 he stated that a quantity of oil of vitriol sufficient to produce 100 parts of plumbum ponderosum with sugar of lead would dissolve 33 of marble, since he found by experiment that so much oil of vitriol would saturate as much fixed alkali as a quantity of nitrous acid sufficient to dissolve 33 of marble.—(Phil. Trans, 1767, p. 102; 1788, p: 178.)

In 1792, J. B. Richter (1762-1807) published a work on Stichiometrie, or the Art of Measuring Chemical Elements, in which he gave in two series of tables the weights of different bodies which neutralized 1000 parts of various acids, and the weights of acids that similarly cor- responded to 1000 parts in the case of the bases, and pointed out the proportionality that

existed between the weights of the bases, as also of the acids, in cach series, There was, he remarked, a constant ratio betwecn the quantity of an acid and the quantity of oxygen in the weights of the bases nceded for its complete saturation,—a fact afterwards restated by Berzelius, who showed thata simple and uniform relation was observable between the amounts of oxygen in the acid and basic portions of salts of the same class.

Although neither the science of chemistry nor yct a change in its objects can be said to have originated with Lavoisier (1743-1794), the means he introduccd of attain- ing those objects, the ideas he put forth concerning the constitution of bodies, and the explanations he gave of various phenomena were new, and gave to the science in the twenty years preceding his death a completely altcred aspect. The mine of chemistry had yielded rich returns long before Lavoisier came to labour in it; he availed himself of the old workings and, extending them, opened the main lode. ‘““He discovered,” says Licbig, ‘‘no new body, no new property, no natural phenomenon prcviously unknown ; but all the facts established by him were the necessary consequences of the labours of those who preceded him. His merit, his immortal glory consisted in this—that he infused into the body of the science a new spirit ;_ but all the members of that body werc already in existence, and rightly joined together.”—(Letters on Chemistry, ii.) In the first of his papers, in 1765, Lavoisier indicates no doubt of the existence of phlogiston. In 1775 he still spoke of it, but in the following year he expressed his conviction that, for the elucidation of certain phenomena, one must ascribe to phlogiston other qualities than those assigned to it by Stahl. It was in 1755 that he presented to the French Academy a memoir On the Nature of the Principle which combines with the Metals during thetr Calcination, and which augments their Weight, in which he describes the formation of fixed air from charcoal in the reduction of calces, and the preparation and properties of oxygen; but he makes no allusion to the fact that Priestley had in November of the foregoing year made him acquainted with that gas, or to the observations of Bayen in the Journal de Physique, February and April 1774, to the effect that the change of a metal into a calx is attributable to the fixation of an aerial fluid, and that the red oxide of mercury is reduced by heat without the addition of anything, and loses in weigiit by reduction, |

In 1776 Lavoisier, by experiments with phosphorus and sulphur, confirmed results already arrived at by him— that the atmosphere contained two gases,‘azote or nitrogen, and a highly respirable air, the absorption of which by burning substances accounts for their increase in weight. In 1777 he combated the assertion of Priestley that air is rendered irrespirable by becoming loaded with phlogiston, and showed that air in which candles were burnt furnished about two-fifths of its volume of fixed air, and that pure or dephlogisticated air under the same conditions became almost completely transformed into that gas. Iu a paper received by the Academy in 1778 Lavoisier broached his theory that the dephlogisticated air of Priestley was the universal acidifying or oxygenizing principle, which by combination with charcoal, sulphur, uitrogen, and phosphorus formed carbonic, vitriolic, nitric, and phosphoric acids, and with metals, calces ; all the phenomena of com- bustion, Lavoisier contended, were explicable without the supposition of the existence of phlogiston, of which there was no evidence. In 1783, when he had determined to discover by carefully conducted experiments the nature of the product of the combustion of hydrogen, Lavoisier learned that Cavendish had ascertained that body to be water. He therefore repeated Cavendish’s cxperiments, and with the aid of Meusnier proved that water con- tains hydrogen, by passing steam through a_ red-hot porcelain tube containing iron wire. Lavoisier had long been unable to hold the doctrine that hydrogen was the phlogiston of metals, seeing that the calces were actually heavier than the metals supposed to contain them, and that the hydrogen supposed to be evolved by the inetals, though light, certainly had weight. Lavoisier now explained the production of hydrogen during the solution of metals ir acids on the assuniption that water was decomposed, its oxygen uniting with the metals, whilst its liydrogen escaped. In the case, however, of nitric acid, oxygen was supposed to be supplied by the acid, The effect of Lavoisicr’s reasonings upon his contemporaries is illustrated by Priestley’s remark (Phil. Trans., 1788, p- 155) that, “the doctrine of the decomposition of water being set aside, that of phlogiston (which in consequence of the late experiments on water has becn alinost universally abandoned) will much better stand its ground.” But the fate of the Stahlian philosophy was sealed ; and in 1792 Klaproth and the Berlin Academy gave in their adhesion to the new

doctrines. Gren and Wiegleb in Germany, Delametherie in France, and Kirwan in England endea- voured but in vain, to support the phlogistic theory; and ere long Lavoisier's innovations could be regarded not siniply as the anti-phlogistic, but as the universally accepted system of chemistry. 'It was the glory of Lavoisier," wrote Davy in 1814, ''to lay the foundation of a sound logic in chemistry by showing that the existence of thuis principle (phlogiston), or of other principles, should not be assumed where they could not be detected." In 1789 was published Lavoisier's Trazté élémentatre de Chimze, in which the new chemical doctrines were set forth with remarkable clearness and ability. A list of 33 "simple substances" is given in the 2d part of the Ist vol. of this work, whierein light and caloric are included with oxygen, azote, and hydrogen as elements of bodies; but as to whether light was a modification of caloric, or caloric a modification of light, it was impossible, Lavoisier considered, to decide (Traité élément., tom. 1. part ii, chap. 1). Under the head of "oxidable or acidifiable substances" le placed sulphur, phosphorus, carbon, and the muriatic, fluoric, and boracic radicals; the ' oxidable and acidifiable metals " are antimony, silver, arsenic, bismuth, cobalt, copper, tin, iron, manganese, mercury, molybdenum, nickel, gold, platinum, lead, tungsten, and zinc; and the "simple

earthy and salifiable substances" are lime, magnesia, baryta, alumina, and silica. Of metallic oxides, he says (Traité élément., tom. 1. part i. chap. vii.), "they ought not to be considered as completely saturated with oxygen, because their action on that principle is balanced by the force of attraction exercised upon it by caloric. Oxygen, then, in the calcination of metals, obeys really two forces —that exercised by the caloric and that exercised by the metal." Davy, who by his experiments on the effects of friction on ice did much to dispel the belief in the materiality of heat, but who regarded light as a body in a peculiar state of existence, and consisting of minute particles, held the view that light in phosoxygen (oxygen gas) was ee combined with oxygen.—(Works, vol. ii. pp.

11-32.

The following table will serve to show the progress that has been made in the knowledge of the elementary bodies from the time of the publication of Lavoisier’s Zraité élémentavre ; the second and third columns give the authori- tics by whom and the dates when these bodies were either first isolated, or were recognized as simple substances :—

Uranium Klaproth 1789 || Strontium Davy Titanium Klaproth 1795 || Chlorine Davy Chromium Vanquelin 1797 || Fluorine Ampere Tellurium Klaprotli , a Todine Courtois |Hatchett &) | 180 Lithium Arfvedson Tantalum Ekeburg f | 1802 || Selenium Berzelius 4 (Del Rio and) | 1801 9 Termann & Vanadium (Sefstrim 1830 Cadmium aes \ Berzclius,) Silicon Berzelius Cerium 1 sng & >} 1808 || Zireonium Berzclius Klaproth j Bromine Balard Palladium Wollaston 1803 |, Aluminium Wwonl Tridium Tennant 1804 }} Glueinum eee Osmium Tennant 1804 || Thorium Berzelins Rhodium ‘ Wollaston 1804 || Yttrium Wohler Potassium ; Didyminum Sodium j pow 1807 |) Lanthanums | Mosander Davy, and Erbium Mosander Barium Berzclius & > | 1808 || Niobium Rose Pontin Ruthenium Claus (Davy, and Cesium Kirehhoff & Boron 1 ei eee 1808 || Rubidium =f | (Bunsen & Thénard : Crookes fs (D avy, and = Thallium { an d Lamy in alcium ~ Berzelius 8 Py ¢ich an (Pontin Indium Richter Magnesium Davy 1808 || Gallium Boisbaudran

Lavoisier was assisted in the establishment of his system by Foureroy (1755-1809), Monge (1746-1818), Guyton de Morveau (1737-1815), and Berthollet (1748-1822) ; Lavoisier’s theory that oxygen was the principle of acidity was not, however, accepted by Berthollet. In 1803 appeared Berthollet’s Chemical Statics, in which Bergman’s conclusions with respect to the laws of the combination of acids and bases were disputed. Affinity, it was argued, could not be simply an attraction, for then no decomposition, but only an addition of constituents would take place whien solutions of different compounds were mixed together; affinity might be regarded as an attraction between combining substances probably like that existing between the planetary bodies—an attraction dependent on mass, not on elective force, so that com- bination between the various kinds of matter could take place in all sorts of proportions. ‘The complete removal of a constituent of a compound by means of a decomposing agent was attributed by Berthollet to its elasticity or insolubility in the free state. Thus, he

considered that barium sulphate was precipitated by solution of potassium sulphate because it was insoluble in water, but that a triple compound was formed when solutions of the sulphates of sodium and potassium were mingled. The decomposition of ammonium carbonate by sulphuric acid he asserted to be due to the elasticity of the carbonic acid gas that escaped. Berthollet's hypotheses found an opponent in Proust (1755-1826), who had already written on the constancy of the relations by weight of the component parts of bodics, and had shown that tin and antimony unite with oxygen,

and iron with sulphur, in two definite proportions respec- tively. In a controversy with Berthollet that extended over some years he successfully demonstrated that all com- pounds are definite, and contain only certain determinate proportions of their constituents.

In August 1804, Dalton (1766-1844) communicated to Dr Thomson his theory of the atomic composition of bodies. Dalton's ideas had been vaguely foreshadowed by W. Higgins of Pembroke College, Oxford, in a publication entitled A Comparative View of the Phlogistic and Antiphlogistic Theortes, where we read that—

'In volatile vitriolic acid a single ultimate particle of sulphur is intimately united only to a single particle of dephlogisticated air ; and in perfect vitriolic acid every single particle of sulphur is united to two of dephlogisticated air, being the quantity necessary to saturation. As two cubic inches of light inflammable air require but one of dephlogisticated air to condense them, we must suppose that they contain equal number of divisions, and that the difference of their specific gravity depends chiefly on the size of their ulti- mate particles; or we must suppose that the ultimate particles of light inflammable air require two or three or more of dephlo- gisticated air to saturate them. If this latter were the case, we might produce water in an intermediate state, as well as the vitriolic or the nitrous acid, which appears to be impossible ; for in whatever proportion we mix our acids, or under whatever circum- stance we combine them, the result is invariably the same."—(2d ed,, 1791.)

The atomic theory first suggested itself to Dalton during his investigations on marsh-gas, or light carburetted hydro- gen, and olefiant gas. He calculated that if the weight of carbon in each of these compounds were reckoned to be the same, then marsh-gas contained exactly twice the weight of hydrogen present in olefiant gas. He further observed that the quantity of oxygen in carbonic acid gas was twice as much as in carbonic oxide gas. These and similar facts he conceived might be explained by assuming thie ultimate particles of matter to be incapable of further division, or, in other words, atoms, possessing definite weights, the ratios of which could be denoted by numbers, the weight of an atom of hydrogen. being taken as unity. The combination of these atoms with one another would account then for the definite proportions in which the elements united. For clearness the atoms were represented

by symbols, thus :— Relative Weights.

OO ce or aR On Cn nent mesons 6°5 @ Eedvemen: wccacccameccs eves voneaeoe. i MOY CaO) 35: 55n. iaetee aeaae cs eeeeeame 5 Mb Aare. aee es eles, cares weer are 5

Binary compounds with their weights were denoted thus :—

GONO Mele alte. ot aeuonuamna une ie 75 OD ©) Olas. os cores snereracene. 6 GO AMMONIA ies eee ices evs erases 6 Or@ Combomies0xide 2… ccarieeies coe 115 and ternary compounds in a similar manner :— Ow © Carbottic veid! gas…....00.665 18 i eo oes iiicsenrinte einai nese 11 © @ © Carburetted hydrogen gas…... 7

The weight of the smallest particle of a compound was therefore, according to Dalton's theory, to be obtained by adding together the weights of its constituent atoms; the laws discovered by Wenzel and Richter were thus in-cluded within the law of atomic weights. The new theory was promulgated in Dr Thomson's System of Chemistry, 3d edit., 1807. In the same year Thomson showed that the amount of oxalic acid required to form strontium binoxalate was twice as great as that in the case of the oxalate, supposing the weight of strontium in each salt to be the same ; and Dr Wollaston proved that three potassium oxalates were obtainable, to form which

C}HSH.M mS BB Y

fore 6:24, its equivalent, 12°48.

465

a definite amount of potash needed weights of oxalic acid in the proportion of 1: 2: 4.

In 1808, the year of the publication of Dalton's New System of Chemical Philosophy, Gay-Lussac made known to the world the laws of the combinations of gases by volume— to which his attention had been directed by the discovery which he and A. Von Humboldt had made, that a definite volume of oxygen combined with exactly twice its bulk of hydrogen. He pointed out that there is a simple relation between the

volumes of two gases which unite together, and also between their collective volume in the uncombined and in the combined condition. Thus, three volumes of hydrogen combine with one of nitrogen to form two volumes of ammonia; one volume of chlorine with one of hydrogen produces two volumes of hydrochloric acid gas ; and two volumes of nitrogen and one of oxygen give two volumes of protoxide of nitrogen. The law of definite proportions was shown to hold good with respect to the volumes as well as to the weights of combining bodies,

In 1811 Avogadro, remarking that equal variations of temperature and pressure produce in all gases and vapours the same changes of volume, enunciated the hypothesis that equal volumes of any gas or vapour contain the same number of atoms, and the same doctrine was brought forward in 1814 by Ampére. On this hypothesis the density of equal volumes of gases was shown to represent the relative weights of their atoms ; and thus, as it had been discovered that gases frequently do not unite volume for volume, a distinction came to be drawn between atomic weights and equivalents. Ifwe say atom for volume, wrote Berzelius, we find in Gay-Lussac's discovery one of the most direct arguments in favour of Dalton's hypothesis.

Berzelius (1779-1848), from considerations based on the law of combination by volume, accounted the atoms of elements distinct from their equivalents. Thus two volumes of hydrogen were recognized as the equivalents of one volume of oxygen, the relative weights of equal volumes of the two gases being those of their atoms. Berzelius adopted 100 parts of oxygen as his standard of atomic weight, the atomic weight of hydrogen was there- He considered that the atoms of aluminium, arsenic, antimony, bromine, chlorine, fluorine, hydrogen, iodine, nitrogen, and some other elements had a weight equal to only half that of their equivalents, which latter were double and inseparable atoms. In place of the symbols used by Dalton to denote the proportions in which the elements combine by weight, he employed a notation in which letters were used to indicate the names of the elements. He introduced also an abridged notation, in which the equivalents or double atoms were represented by drawing a bar through the symbol of the element. A dot being used to signify an atom of oxygen, the formula of water was written H,; and HCl denoted hydrochloric acid, which

was viewed as consisting of a double atom of hydrogen united toa double atom of chlorine,—an hypothesis which left unexplained the fact that the combination of the so-called double atoms of hydrogen and chlorine resulted always in the formation of two molecules, instead of one, of hydrochloric acid gas. Berzelius constructed a ~~table of atomic weights and equivalents, which the discovery by Dulong and Petit in 1819 of the connection between the specific heats and the atomic weights of the elements, and that of the law of iso~~ morphisin by Mitscherlich in 1820, enabled him to modify and improve. ‘The equivalent notation of Berzelius was adopted by Gay-Lussac, and displaced in time that founded upon the atomic weights ; but it was not generally applied with strictness to all compounds, molecular and not equivalent formulz being employed in some cases. It had this objection, that it masked the relative atom-fixing

powers of the various acids; thus the formula AgO.4PO, did not express the tribasic character of a molecule of phosphoric acid, and its relations to the molecules of acids of less basicity. Observing the ratio between the oxygen of bases and acids, Berzelius was led to the conception of the dualistic theory, according to which all compounds consist of paired constituents or groups of constituents. This theory was applied to both organic and inorganic substances, and received considerable support from the development of the doctrine of compound radicles, of which Berzelius was the chief supporter.

De Morveau, in a memoir On the Development of the Principles of Methodical Nomenclature, had in 1787 given the name of radicles to the “acidifiable bases ” of acids, and Lavoisier in his 7’raité élémentaire had spoken of the “hydrocarbon radicles” in oils, starch, sugar, and gum. In 1817 Berzelius, following Lavoisier, held the opinion that all inorganic oxides contained simple radicles, and organic oxides compound radicles. In 1832 Liebig and Wohler discovered the composition of bitter-almond oil, which they showed, on the assumption of the existence of a radicle C,H,O, might be compared with the compounds of potassium and other metals. Berzelius at first accepted their explanation of the constitution of benzoyl-

compounds, but afterwards rejected it, as his electro-chemiical theory did not support the view that oxygen could be a constituent of aradicle. Benzoic acid was represented by him as a com- pound containing the radicle C,,H,, thus:—C,,H,.O, + HO, and alcohol as an oxide of the radicle CH,, or 2(CHs).0.

In 1834 Dumas made known his observations on the substitution of hydrogen by other elements; and Laurent subsequently concluded from numerous experiments that, when hydrogen is substituted by an equivalent of chlorine or bromine, these elements take the place occupied by the hydrogen, performing toa certain extent the functions of the latter in the new compound, which is therefore analogous to that from which it has been produced. Thus was given the first blow to the dualistic theory. The discovery of trichloracetic acid by Dumas gave considerable aid in the establishment of the new doctrine; but Berzelius and others, who were unable to reconcile with the electro- chemical theory the substitution of an.electro-positive by an electro-negative element, sought to explain the facts of substitution in accordance with dualistic notions. Berzelius considered that a compound in which oxygen was a fourth element was at once an oxide and a chloride ; trichloracetic acid was, in his opinion, a copulated compound of sesquichluride of carbon with sesquioxide of carbon (oxalic acid) C,Cl,+C,0,+HO; acetic acid, on the other hand, was a trioxide of acetyl (C,H,) with the formula C,H,.0,+HO. The substitution-compounds discovered by Malaguti and Regnault were in like manner represented dualistically ; dichloroformic ether, for example, was written 2C,H.O, + C,H.Cl, + 2C,H,.0,+C,H,.Cl, ; such complex formula, however, which implied in most cases a widely different constitution for bodies obviously related in properties, were received with but little favour by chemists. At length Melsens, by converting trichloracetic acid into acetic acid, gave decisive evidence as to the truth of the principle of the substitution theory.

Gerhardt, who regarded all compounds as simple molecules, certain atoms of which were displaceable by double decomposition, discarded entirely the conception of radicles. He classified organic substances according to the number of carbon atoms contained in their molecules ; hence the recognition of homologous series of organic com- pounds, What he termed

residuwes—molecules deprived of certain of their constituents—were in many instances identical with the radicles employed by Berzelius, but were not held necessarily to pre-exist in compounds. Gerhardt

was the means of re-introducing, in a modified form, the atomic notation of Berzelius. Observing that the smallest quantities by weight of carbonic acid gas and water pro- duced in reactions were expressed by the formule C,O, and H,O,, he concluded that these must represent tle molecules of the two bodies, which might be more con- veniently written CO, and H,O, the atomic weights of hydrogen, oxygen, and carbon being taken as 1, 16, and 12 respectively. He made the atomic weights of bromine, chlorine, fluorine, hydrogen, iodine, nitrogen, and other of the elements equal to those given by Berzelius, thus enabl- ing the formule of water and most volatile compounds to be expressed in agreement with the law of Gay-Lussac ; but he halved the old atomic weights of most of. the metals, supposing that all metallic oxides were similar in constitu- tion to water, or contained two atoms of metal to one of oxygen. Regnault afterwards proved that, according to the law of Dulong and Petit, this alteration ought to be made in the case only of the atomic weights of the metals lithium, potassium, sodium, and silver; many metals were accordingly to be regarded as having oxides of the general formula RO. Such metals, being compared with the diatomic radicles of organic chemistry, were called diatomic by Cannizzaro in 1858, Thus originated the idea of the polyatomicity of the metals.

The theory of types dates from the time of the discovery of trichloracetic acid by Dumas, who observed that this body and others similarly obtained must be of the same chemical type with the hydrogenated substances from which they are derived. The discovery by Wurtz of the com- | pound ainmonias, and by Hofmann of diethylamine and triethylaniine, led to the creation of the ammonia type ; and Williamson, by the discovery in 1850 of the mixed ethers, was enabled to refer ether, alcohol, and acids to the water type, and to predict the existence of acetic anhydride, which, as well as benzoic anhydride, was discovered in 1852 by Gerhardt. To these types Gerhardt added two others, those of hydrogen and hydrochloric acid, and

with the former associated the aldehydes, ketones, and many hydro-carbons, ¢.g., the radicles discovered by Frankland and Kolbe. The theory of types was still further extended by Williamson, to whom the conception of condensed types is due; by Odling, who first suggested the idea of represent- ing the relations of compounds by the use of mixed types ; and by Kekulé and numerous other investigators.

The foundation of electro-chemical science may be said to have been laid by Nicholson and Carlisle, who in 1800 discovered the decomposition of water by the agency of the voltaic pile; but the earliest electro-chemical experi- ments were those made by Priestley in 1775 upon am- monia gas, and by Deiman and Van Troostwijk in 1789 upon water, by means of frictional electricity. Cruickshank by experiments with the chlorides of magnesium, sodium, and ammonium demonstrated that when those salts are decomposed by the electric current, alkali always appears at the negative, and acid at the positive pole,

In 1803 Berzelius and Hisinger published their observa- tions on the electrical decomposition of salts and some of their bases; oxygen, acids, and oxidized bases, they said, appear at the positive pole; combustible bodies, alkalies, and earths at the negative. Later experimenters, however, showed that it is the metal, not the oxide, that appears at the negative pole when salts are electrolyzed, and that oxides cannot be supposed to exist ready formed in salts, Davy, whose electrical experiments were commenced in 1800, undertook in 1806 a course of investigations which led him to the discovery of the metals of the alkalies and alkaline earths, In 1807 he-expressed the opinion that bodies having an affinity for one another are in different states of electricity, and “that chemical and electrical

attractions depend upon the same cause, acting in the one case on particles and in the other on masses of matter.”

In 1834 Faraday discovered that the decompositions effected by the voltaic current indicate the quantity by weight in which the elements combine, or the weights of the atoms of the atomic theory, thus adding to the probability of the correctness of the supposition that the operations of the same agent

are exhibited in both chemical and electrical phenomena. Latterly, the discovery of the action of the copper-zine couple by Gladstone and Tribe has opened out a new field of electro-chemical research, already productive of important results. To mention, however, the numerous advances that have been made in recent times, whether in chemical physics or in chemistry proper—especially as regards the constitution and synthesis of the compounds of carbon—would be to exceed the scope of the present introductory notice. The reader must, there- fore, be referred to the treatises and original memoirs of those whose labours have cffected the modern development of chemistry, and have raised it to the high position which it occupies as a science at the present time. rua. B.)

THE ELEMENTS.

The examination of all the various substances met with in nature has led to the discovery of sixty-four different bodies, from which it is impossible by any means now at our disposal to separate simpler substances; they are consequently termed ‘‘elementary or simple bodies,” or “elements.” It is not asserted that such substances are absolutely simple, or that they may not be found hereafter to yield more than one kind of matter, but merely that so far as our knowledge extends it is so ; indeed, recent spec- troscopic researches favour the impression that some at least of the elements are, perhaps, compounds of simpler bodies.

It is the study of the laws which regulate the combina- tion of the elements with one another, and to which their compounds are subject in their mutual actions, and of the properties of the elements and of the compounds formed by their union, which constitutes the science of chemistry.

The majority of the elements are of comparatively rare occurrence, whilst many of them are extremely rare, being met with only in certain localities. Gold and a few others almost always occur as such, and our atmosphere, we know, consists chiefly of the two elements, oxygen and nitrogen, in the free state; also some others, such as carbon, copper, silver, and sulphur, are occasionally met with in the uncom- bined state, but in general two or more elements are found united, The number of elements of which the materials are made up which principally compose the earth and the plants and animals living upon it is, however, exceedingly small. Thus, plants consist

chiefly of carbon, hydrogen, and oxygen, and animals chiefly of these three elements together with nitrogen ; water consists entirely of oxygen and hydrogen. The solid earth is mainly composed of substances such as quartz or silica, chalk or limestone, and various silicates like felspar and clay,—the elements which are the chief constituents of these substances being oxygen, silicon, carbon, calcium, magnesium, aluminium, iron, and potassium. The only elements which appear to be absolutely essential to vegetable or animal life are carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorus, calcium, iron, potas- sium, sodium, magnesium, silicon, and chlorine; and the remainder are to us, so to speak, merely of artificial value.

Four of the elements—chlorine, hydrogen, nitrogen, and oxygen—are gases ; and fluorine, which is not known with certainty in the free state, is probably also a gas; two are liquid at ordinary atmospheric temperatures, viz., mercury and bromine ; and the element gallium, recently discovered in certain zinc ores, but as yet obtained in only very small

quantities, is also said to be a liquid. The remaining elements are solids.

The following is a list of the elements now known, arranged in alphabetical order. ‘The most important ele- ments are distinguished in the table by capitals; whilst those which at present are of slight importance, on account of their rare occurrence, or of our insufficient knowledge of their properties, are printed in italics.

Name of Element. Symbol. ‘| Atomic Weight. ALUMINIUM Al iio Antimony Sb (Stibium) 122 Arsenic As 74°9 Barium Ba 136°8 Bismuth Bi 207°5 ! Boron B iat BRroMINE Br 79°75 Cadmium Cd 111°6 Casium Cs G4 CALCIUM ‘Ca 89°9 CARBON C 11°97 Cerium Ce 141 CHLORINE Cl 35°36 Chromium Cr 52-4 Cobalt Co 58°6 COPPER Cu 63‘3 Didymiwm Di 147 Erbium Ir (2)170°5 Fluorine ¥ ; 19°] Gallium ae ; Glucinum G 9°3 Gold Au (Aurum) 196°2 HYDROGEN H il Indium In BYE IODINE I 126°53 Iridium Ir 196°7 Tron Fe (Ferrum) 55°9 Lanthanum La 139 Lrap Pb (Plumbum) 206°4 Lithium Li 701 Magnesium Mg 23°94 Manganese Mn 54°8 MrERcuRY Hg (Hydrargyrum) 199°8 Molybdenum Mo 95°8 Nickel Ni 58°6 Niobium Nb 94 NITROGEN N 14:01 Osmium Os 198°6

OXYGEN O 15°96 Palladium Pd 106°2 PHOSPHORUS P 80°96 Platinum Wei 196°7 Porass1uM K (Kalium) 39°04 Rhodium Ro 104°] Rubidium Rb 85:2 Ruthenium Ru 103°5 Selentum Se 79 SILICON Si 28 SILVER Ag (Argentum) 107°66 SopIUuM Na (Natrium) 23 Strontium a 87°2 SULPHUR S 31°98 Tantalum Ta 182 Tellurium Te 128 Thallium Ae 203°64 Thorium Th (2)178°5 Tin Sn (Stannum) 117°8 Titanium Ti 48 Tungsten W (Wolfram) 184 Uranium U (?)180 Vanadium Vv Bil 2 Vitriwm XN (2) 89°5 ZINC Zn 64°9 Zirconium Zr 90

Laws of Combination by Weight and Volume—Ther ex- planation by the Atomic Theory—Determination of the relatwe Weights of Atoms.

The proportions in which elements unite together are definite and constant, a given compound always consisting of the same elements united in the same proportions.

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Chloride of silver, for examp.e, in whatever manner it may be prepared, invariably consists of chlorine and silver in the proportions by weight of 35°36 parts of the former and 107°66 of the latter.

But it is often the case that elements combine together in several proportions ; whenever this occurs the several proportions in which the one element unites with the other invariably bear a simple relation to one another. Thus, 1 part by weight of hydrogen unites with 8 parts by weight of oxygen, forming water, and with 16 or 8 × 2 parts of oxygen, forming peroxide of hydrogen. Again, in nitrous oxide we have a compound of 8 parts by weight of oxygen and 14 of nitrogen ; in nitric oxide a compound of 16 or 8×2 parts of oxygen and 14 of nitrogen ; in nitrous anhydride a compound of 24 or 8 × 3 parts of oxygen and 14 of nitrogen ; in nitric peroxide a compound of 32 or 8×4 parts of oxygen and 14 of nitrogen; and lastly, in nitric anhydride a compound of 40 or 8 × 5 parts of oxygen and 14 of nitrogen, This law is known as the law of combination in multiple proportions.

The proportions in which two elements combine with a third also represent the proportions in which, or in some simple multiple of which, they will

themselves combine. For instance, 35°36 parts of chlorine and 79°75 parts of bromine combine with 107°66 parts of silver; and when chlorine and bromine unite it is in the proportion of 35°36 parts of the former to 79°75 parts of the latter. Todine unites with silver in the proportion of 126°53 parts to 107°66 parts of the latter, but it combines with chlorine in two pruportions, viz.,in the proportion of 126°53 parts either to 35°36 or to three times 35°36 parts of chlorine. This is known as the law of combination in reciprocal proportions.

In explanation of these three laws deduced entirely from experimental observations, chemists have adopted the atomic or molecular theory which was first introduced into the science by Dalton at the commencement of this century. According to this theory the exceedingly small masses or molecules of which it is supposed matter consists are com- posite, being made up of indivisible particles or atoms (see the article Arom, vol. iil. p. 36). ‘The molecules of the elements are assumed to consist of similar atoms, whereas those of compounds are congeries of dissimilar atoms; and the molecules which constitute a given kind of matter, it is supposed, are alike in weight and general properties, but differ from those of which all other kinds of matter are composed, so that every molecule belongs to one of a definite number of species. The study of the alterations which take place in the composition of molecules under the influence of various forces, and which result from their action upon one another, is the work of the chemist; whilst it is the province of the physicist to study the influences of those forces upon matter which affect entire molecules without in any way altering their composition.

The chemist has no means of ascertaining, nor does he attempt to ascertain, the absolute weights of the atoms or of the molecules of the various elements and their coni- pounds; he concerns himself merely with their relative weights, hydrogen being adopted as the standard of refer- ence since it is the lightest of all known elements. The relative weight of the atoms of the various elements referred to that of hydrogen regarded as 1 are given in the third column of the table on page 467. The determina- tion of the exact atomic weight of an element is an opera- tion of extreme difficulty, and one requiring the greatest analytical skill, so that as yet the atomic weights of only a limited number of elements have been ascertained

with more than approximate accuracy. The most accurately determined atomic weights are those of hydrogen, oxygen, nitrogen, chlorine, bromine, iodine, lithium, potassium,

sodium, silver, and thallium. Apparently the numbers obtained for these elements are practically perfect.

The manner in which the relative weights of the atoms of the elements are determined will be evident from the following considerations.

If, instead of comparing together the relative weights of the elements which enter into combination, the volumes which they occupy in the state of gas (at the same tempera- ture and under the same pressure) before and after com- bination are compared, it is found that gases always unite together in very simple proportions, viz., either in equal volumes, or in volumes which bear some simple relation such as 1:2, 1:3, 1:4, 2:38, &. Moreover, whatever the number of volumes before combination, it always is reduced to two on combination. Thus, equal volumes of hydrogen and chlorine gases unite without condensation to form hydrochloric acid gas ; in the production of water 2 volumes of hydrogen and 1 of oxygen combine, but form only 2 volumes of water-gas or steam ; and if ammonia gas be decomposed by heat or a series of electric sparks, 2 volumes of the gas yield 3 volumes of hydrogen and 1 of nitrogen.

Now, according to the law of Boyle and Mariotte, the volume of a given mass of any gas varies inversely as the pressure, provided that the temperature remains the same ; for instance, the quantity of air which is contained ina vessel of the capacity of 1 pint under the pressure of 1 atmosphere, or 15 tb upon the square inch, may be con- tained in a vessel of half a pint capacity if the pressure be doubled.

According to the law of Charles and Gay-Lussac, on the other hand, all gases expand equally by heat, provided the pressure remains constant,—the rate of expansion being +, of the volume at 0° C. for each rise of 1° C. in

temperature ; or in other words, the volume of a gas varies directly as the absolute temperature.

A gas which strictly conforms to these two laws is said to be a perfect gas, but none of the gases with which we are acquainted are perfect in this sense, Thus, Andrews's experiments show that carbonic anhydride, which under a pressure of 36 atmospheres at 0° C. is reduced to the liquid state, condenses more than it should according to Boyle's law. Again, the density of chlorine gas referred to air, according to Stas's determination of the atomic weight of this element, should be 2°4501. The following table exhibits its density at various temperatures from 20° to 200° C.,1 and it is evident that it is higher than it should be at all temperatures below 200° C. :-—

Temperature. Density. Temperature. Density. 20° 2°4807 m 2°4609 50° 2°4783 200° 2°4502

100° 2°4685

From the few accurate observations which have been made on this subject it appears that, in general, the departure from the laws of Boyle and Charles is greater the more the temperature of the gas approaches to that at which it becomes liquid; and chlorine affords an instructive illustra- tion of this, since it is readily condensed to a liquid under the pressure of 4 atmospheres at 15°°5 C., or by cooling in a bath of solid carbonic anhydride aud ether.

The general resemblance in the behaviour of gases under the influence of pressure and heat is very great, however, although not in absolute accordance with the laws of Boyle and Charles; by this we are led to the assumption that their physical constitution must be similar, and, therefore, to the acceptance of the proposition, originally stated by Avogadro in 1811, that equal volumes of different gases contain equal numbers of molecules. Obviously, therefore, if the relative weights of equal volumes of different gases are determined under the same conditions as to tempera-

1 Ludwig, Berichte der deutschen chemischen Gesellschaft, 1868, 232.

ture and pressure, the temperature and pressure chosen being that at which the gases most closely approximate to the requirements of the laws above stated, an estimate of the relative weights of their molecules is obtained. For example, the density of nitrogen referred to hydrogen is 14, since a given volume of nitrogen is found to weigh 14 times as much as an equal volume of hydrogen at the same temperature and under the same pressure; hence, according to Avogadro's hypothesis, the molecules of nitrogen are fourteen times as heavy as the hydrogen molecules.

In the formation of hydrochloric acid gas equal volumes of chlorine and hydrogen unite without condensation. The density of chlorine gas referred to hydrogen is 35°36, and the simplest possible hypothesis of the composition of hydrochloric acid is that it consists of an atom of hydrogen weighing 1, and an atom of chlorine weighing 35°36, so that its molecule, therefore, must weigh 36°36. But since the density of hydrochloric acid gas is ascertained by experiment to be only 18°18 as compared with that of hydrogen, and, according to Avogadro's hypothesis, equal volumes of hydrogen and hydrochloric acid gas contain equal numbers of molecules, it follows that the weight of the hydrogen molecule as compared with that of hydro- chloric acid must be 2, or in other words, that the hydrogen molecule consists of two atoms, The chlorine molecule in like manner must consist of two atoms, each weighing 35°36, and in the formation of hydrochloric acid from hydrogen and chlorine two molecules of hydrochloric acid are produced from a molecule of hydrogen and a molecule of chlorine: in the one molecule half the hydrogen is displaced by chlorine, in the other half the chlorine is dis- placed by hydrogen. It may be proved that the assumption is correct that the molecule of hydrochloric acid contains only a single atom of chlorine, weighing 35°36, and that it does not consist, for example, of two atoms of chlorine each weighing 17° 68, by comparing the various volatile com- pounds containing chlorine. In the first place their densities in the state of gas are determined, and a knowledge is thus obtained of the relative weights of their molecules as compared with that of the hydrogen molecule; the percentage of chlorine they contain is then ascertained by careful analysis. The density referred to hydrogen as unity multiplied by 2 gives the molecular weight of the com- pound; and the percentage of chlorine being known, the amount contained in the quantity expressed by the molecular weight is ascertained by a simple calculation.

For example, the density of sulphur chloride is found to be 57°36, and its molecular weight is therefore 57°36 × 2 or 114: 72 ; it contains 61°64 per cent. of chlorine, so that in 114-72 parts there are 70°72 of chlorine. When the numbers thus deduced are compared it is seen that the lowest amongst them, is 35°36, and that all the higher numbers are simple multiples of this ; 35°36 is accordingly adopted as the number which expresses the weight of the atom of chlorine relatively to that of the hydrogen atom. A number of volatile chlorine compounds are thus compared in the following table :—

Weight of Chlorine.

!

Name of Compound. Molecular Weight.

Hydrochloric acid

nee 86°36 35°36

Methyl chloride .. 50°33 35°36 Carbon oxychloride… caer 98°65 35°36 × 2 Mercurie chloride…..... 270°52 35°86 × 2 Boron chloride.. : 117°08 35°36 × 3 Phosphorus trichloride… 137°04 | 35°36 × 3 Carbon tetrachloride….. 153°41 85°36 × 4 Silicon tetrachloride….. 169‘44 | 35°36 × 4 Aluminium chloride …. 266°76 85°36 × 6 0°72 35°30 × 2

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In like manner, on comparing the various volatile com- pounds which contain oxygen, it is found that the number 16 represents the least weight of oxygen contained in the inolecular weight of any of its compounds ; 16 is therefore taken as the atomic weight of oxygen.

In all cases in which it is possible to obtain volatile compounds, the atomic weights of elements may be deduced in this manner ; unfortunately, however, many of the elements do not furnish stable volatile compounds, so

that hitherto the atomic weights of the following elements only have been ascertained by the application of Avogadro's hypothesis :—

Antimony. Todine. | Silicon. Arsenic. Lead. Sulphur. Bisinuth. Mercury. | Tantalum. Boron. Molybdenum. | Tellurium. Bromine. Niobiuin. | ine Carbon. Nitrogen. | Titanium. Chlorine. Osmium. Tungsten. Chromium Oxygen. Vanadium. Fluorine. Phosphorus. Zine. Hydrogen. | Selenium. | Zirconium.

The determination of the density of bodies in the state of gas is thus an operation of fundamental importance. The precise manner in which the determination is effected is described in most of the text-books on chemistry. The methods ordinarily employed in the case of liquids and solids which by the application of heat can be converted into vapour or gas without undergoing decomposition are known respectivelyas Dumas's and Gay-Lussac's , a modifica- tion of the latter method of great value has recently been introduced by Hofmann. By Dumas's method the weight of substance is ascertained which will furnish a certain volume of gas at a certain temperature and pressure ; by Gay-Lussac's method, however, and by Hofniann's modifica- tion of it, the volume of gas is measured which is furnished by a given weight of the substance at a certain temperature and pressure. By either method we arrive finally at a knowledge of the weight (w) of a certain volume (v) of the gas at a temperature ¢ and pressure p; and its density (D) referred to hydrogen is then found by dividing the weight w by the weight (w') of an equal volume of hydrogen at the same temperature ¢ and pressure p—

Or the density referred to air may be calcu.ated in a similar manner, and then converted into the density referred to hydrogen by multiplication by 14°43,—the number which expresses the density of air referred to hydrogen. Both methods require that the substance be heated to the tem- perature at which its vapour most closely approximates to the laws of Boyle and Charles, which is readily ascertained by experiment ; this temperature, however, is often very considerably above the boiling point of the substance, and acetic acid may be cited as an illustration of this. Thus, although this acid boils at 119° C., its vapour does not exhibit the required density until it is heated to 250° C., as will be evident from the following

table—the theoretical vapour density of acetic acid vapour referred to hydrogen

190° 250° 300° 33°1 30°01 30°01

Temperature…....125° 130° 140° 160° Vapour Density…46°1 45°0 41°8 35°7

Owing to unavoidable experimental errors, and, in many cases, probably to the circumstance that the vapours of solid and liquid bodies are very imperfect gases at temperatures not much above their boiling points, the determination of the vapour density of a substance does not, as a rule, furnish a result of more than approximate accuracy,—the result being the more accurate, however, the more raretied the vapour and the higher the temperature at which the

density is determined, provided always that the teniperature be not so high as to cause decomposition. But the rela- tive proportions in which the elements combine, and the composition of compounds may usually be ascertained with very great—in many cases with almost absolute—accuracy by chemical analysis; and the determination of the density in the state of gas simply serves to prove which of the several multiple proportions, in which it is found that the elements combine together, is the true atomic weight. For instance, analysis shows that marsh gas is a compound of carbon and hydrogen exactly in the proportions of 1 part of the latter with 3 of the former ; that carbonic anhydride consists of carbon and oxygen iu the proportion of 16 parts or an atom of the latter and 6 or 3×2 parts of carbon ; and carbonic oxide of the same elements, in the proportion, however, of 16 of oxygen and 12 or 3×4 of carbon. The question, therefore, is, Which of the numbers, 3, 6, or 12, represents the relative weight of the carbon atom; that is to say, is marsh gas a compound of an atom of hydrogen and an atom of carbon weighing 3, of two atoms of hydrogen and an atom of carbon weighing 6, or of four atoms of hydrogen and an atom of carbon weighing 12? The molecular weights of three such compounds would be respec- tively 3+1 or 4, 6+2 or 8, and 12+4 or 16; and the corresponding theoretical densities referred to hydrogen 2, 4, and 8. Finding, however, by experiment

that the density of marsh gas is, say, 7°5, we at once conclude that the atomic weight of carbon is 12 and not 6 or 3, because the observed density of marsh gas most closely accords with that required on this assumption. The difference between theory and experiment is practically seldom, if ever, so large as in this case, which is merely given as an illustration of the principle involved.

The equivalent of an element—that is to*say, the amount of it which is capable of combining with or displacing one part by weight, or one atom, of hydrogen—being known, its atomic weight is not absolutely fixed by the determina- tion of the density in the state of gas of its compounds with other elements; we are at most enabled to say from this that the atomic weight cannot exceed a certain value, —for instance, that the atomic weight of chlorine cannot exceed 35°36, because all its compounds contain either this amount or some simple multiple of it in their molecules. It is nevertheless possible that 35°36 is not the weight of one but of several atoms of chlorine ; the probability that 35°36 is the true atomic weight is enormously increased, however, as compound after compound is examined and found to contain 35°36 or some simple multiple of 35-36 parts of chlorine in its molecule.

In the case of those elements of which stable volatile compounds have not been obtained, the study of their specific heats is of great importance, and moreover furnishes most important confirmation of the atomic weights deduced by the aid of Avogadro’s hypothesis, To raise the temperature of equal weights of different sub- stances the same number of degrees, from 0° to 1° QC. for instance, very different amounts of heat are required ; and on the other hand very different amounts of heat are given out when equal weights of different substances are cooled from the initial temperature ¢° to a lower temperature ¢’°, Of all bodies except hydrogen water has the greatest capacity for heat, and is, therefore, adopted as the standard of reference,—the number which expresses the amount of heat necessary to raise the temperature of a given weight of a body a certain number of degrees, or which is given out by it in cooling through a certain number of degrees, as compared with that required to raise the temperature of an equal weight of water the same number of degrees, being termed its specific heat.

Thus, the specific heat of lithiuin is ‘9408; that is to say, to raise the temperature of a given

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weight of lithium—1 gramme, for example—from 0° to 1° C. only requires “9408 of the heat necessary to raise the temperature of | gramme of water from 0° to 1° C. The specific heats in the solid state of the various elements of which the atomic weights have been determined by Avogadro’s hypothesis are given in the second column of the following table :— —

Specific Heat Name of Element. Specific Heat. | Atomic Welght. | Multiplied by Atomic Weight.

AMtIMONY… 2 Rees. 0508 122 6:19 ATSeNIChAe ¥ gece 0814 74°9 6°10 IBIS ANUAN copeAgpaees oe | 0308 207°5 6°39 JOXONRON ieaanencnona coe par 3) 11 5°5

IBTOMMME es… -s ete 0848 79°75 6°72 amWOnNi se sso. .eccene *4589 11°97 5°49 MOciMe Ws. .ccs sooner "0541 126°538 6°84 J&R rae eeee eee 0314 206°4 6°48 WOT GMILY. wuts snseones 0317 199°8 6°33 Molybdenum ..... "0722 95°8 6°92 Osmiium’...:....-.0c0 0311 198°6 6°17 Phogphorud ..... 174 30°96 5°39 SStellevairiiinngy 4 ageenaeaeen 0745 79 5°86 MSUIM OU syrecss vin ceen e «on 2029 28 5°68 MUM MUT scceessc2 SZ il 31°98 5°47 4Nalllieel esr ipepesersoece 0474 128 6°07 HIMITIORR EE a cinaticneeseue 0562 117°8 6°62 JOE Sc a 0334 184 6°14 JADNG 5 sateecce pee ee “0955 64°9 – 6°19

On comparing the numbers in the fourth column of this table it will be seen that they vary within comparatively narrow limits; and if certain of the elements are excepted, viz., boron, carbon, phosphorus, sulphur, silicon, and selenium, the agreement becomes much closer, the average product obtained by multiplying specific heat into atomic weight being about 6°3. From this it would appear that the specific heats of these elements are, at least approximately, inversély proportional to their atomic weights. From

the observation of this relation in the case of only a small number of elements Dulong and Petit, in 1811, were led to infer that the atoms of all simple bodies have the same capacity for heat. The specific heat of a body varies, however, with the temperature; an extreme instance of this is afforded by the elements carbon, boron, and silicon, as will be evident on inspecting the following table of the specific heat of carbon in the form of diamond at various temperatures :—

Temperature…….++ 0° 50° 100° 150° 200° 606° 806° 985° Specific Heat……. 095 144 +191 *286 :279 -440 :448 °458

iohd Spesihe Heat. {112 172 228 2°81 833 5-26 5:36 5-48

Hence, owing to the circumstance that the determina- tions of specific heat have not been made at temperatures which are comparable for the different elements, there is no doubt that many of the results which have been obtained are defective ; but from Weber's recent researches it appears that in the case of the solid elements there is a point for each element, after which the increase in specific heat with increase of temperature is insignificant, and when this point is reached the product of specific heat into atomic weight—the so-called atomic heat—varies within compara- tively narrow limits. These limits, according to Weber, are from 5°5 to 6°5, but it appears probable that the superior limit is slightly greater than this, and as a matter of fact the atomic heats of nearly all the elements are nearer 6°5 than 5°5,—the latter number being characteristic of the so-called non-metallic elements, the atomic weights of which can be determined by the aid of Avogadro's hypothesis.

In consequence of this relation between the specific heat of an element and its atomic weight, we can readily deter-

mine the atomic weights of elements which do not furnish volatile compounds, it being merely necessary to ascertain the equivalent of the element by analyzing its compounds, and to multiply the equivalent by such a number that the product when multiplied by the specific heat of the element will furnish a number not less than 5-5, and not much greater than

6°5. As an instance of the application of the method, the metal indium, one of the most recently discovered elements, may be cited. Analysis showed that the equivalent of indium was 37-8, but this number was doubled on account of the many points in which indium resembles zinc,—the latter metal having the equivalent 32°45, but the atomic weight 64°9. For some time, until Bunsen determined its specific heat, 75°6 was accepted as the atomic weight of indium, but he found that it was necessary to multiply the equivalent by 3 in order that the product of specific heat into atomic weight should corre- spond to that ordinarily observed, thus raising the atomic weight to 113°4.

The following table is a list: of the elements whose atomic weights have been determined from the observation of their specific heats alone :—~

Name of Element. Specific Heat.

Atomic Weight.

Atomic Heat,

Aluminium .. .. ‘214 278 5:8 Cadmium…....:.... 0567 111°6 6°3 @alciumy…....ecc0.0: “170 39‘9 6°8 WETTUNT.... seesccnsenone 0447 141 6°2 Chromium…..... 100 52:4 5-21 WOMANG «cscs esas caeens ‘107 58‘6 6°3 C0) 2 ere 0952 63°3 6:0 Didymium…..... 0456 147 6°7 Gliweimumy…. cceerenes 64 9°3 5°9 (Colle li saison noua: 0324 196°2 6:4 Ihavsbttietyceaqnees copeos 0570 ligt 6°5 iba liyeoany pe pgeaneases 0326 196°7 6°4 RGN enisareen ee eceecee “114 55°9 6°4 Lanthanun…..... 0448 139 6.2 IOUT soicececemceae “9408 7°01 6°6 Magnesium…..... °250 23°94 6°0 Manganese…..... 122 54:8 6°7 ING CIC) i scicsceseccexcee 109 58°6 6‘4 Palladium…..... 0593 106°2 6°3 PVaGiMUIM,..... 0% 00.0 ‘0324 196°7 6°4 Potassium…..... 166 39°04 6‘5 OCT .. soc eee oce0 “0588 104°1 6‘1 mithenium …..... ‘0611 103°5 6°3 MUUVIET. .....cceceacenes 0570 107°66 6°1 Sodium …..... 293 23 6°7 SAMMI .....saece °0335 203‘64 6°8

The only elements of which at present the atomic weights have not been ascertained, either by the vapour- density or specific heat method, are

erbium, thorium, uranium, and yttrium. Even the equivalent of gallium is not yet known.

Often, also, information which is of service in determining the atomic weights of elements may be obtained by observ- ing the manner in which their compounds crystallize, for it is found that in many instances a given element in a com- pound may be displaced by another without altering the crystalline form ; for example, in ordinary alum, which is a double sulphate of potassium and aluminium, the potas- sium may readily be displaced by sodium, or the aluminium by chromium, and yet the resulting compounds crystallize in precisely the same manner as the alum. Substances which thus agree in crystalline form are said to be iso- morphous. A great number of isomorphous substances have been examined by chemists; and they have been led to infer that, as a rule, when two compounds containing similar elements agree in crystalline form they contain the Same number of atoms; and hence the quantity of an element which is capable of displacing an atom of another

1 This number is known to be too low.

element in a compound without altering its crystalline form is regarded as its atomic weight. This is by no means always the case, however, and the occurrence of isomorphism cannot alone be taken as a proof of the atomic weight of an element; it is of service rather as a check on the determinations made in other ways, and as a stimulus to investigation in the case of elements which have not been sufficiently examined. For instance, certain phosphorous and arsenic minerals of similar composition were known to be isomorphous with a vanadium mineral, vanadinite, the composition of which, according to the received atomic weight of vanadium, exhibited no analogy with them. Roscoe was led by this to investigate anew the compounds of vanadium and to determine its atomic weight, and he found that what had hitherto been regarded as vanadium was really an oxide of the element, and that when the composition of the mineral vanadinite was

calculated from the true atomic weight of vanadium, it was precisely similar to that of the minerals with which it was known to be isomorphous.

Molecular Weights.

We have pointed out (p. 469) that it is to be supposed that the molecule of hydrogen consists of two atoms; hence, if the atomic weight of hydrogen be taken as 1 its molecular weight is 2. In order to ascertain the molecular weights of other elements—that is to say, the relative weights of their molecules referred to that of hydrogen— it is merely necessary to determine their densities referred to hydrogen as unity, aud then to multiply the densities by 2. Unfortunately, owing to the high temperature at which most of the elements are converted into vapour, the densities of only very few of them are as yet known.

When, however, the molecular weights of the elements are compared with their atomic weights it is found that they are not always, asin the case of hydrogen, double their atomic weights ; hence it is inferred that the molecules of elements do not all contain twoatoms. In a few cases the atomic weight and molecular weight agree, which necessitates the conclusion that the molecules are monatomic or con- sist of a single atom; in a few other cases the molecular weight is either 4 or 6 times the atomic weight, and the molecules are therefore regarded as tetratomic or hexatomic.

The following table includes all the elements of which the molecular weights have been determined :—

No. of Atoms

| Name Atomic Weight. | Molecular Weight.| “;, Moleouie,

Hydrogen ……..... a 2 | 2 @hlorineny…...00… 35°36 70°74 2 Bromine 79°75 159°50 2 Wigs biviv, gantancpassonar 126°53 253°06 2 Nitrogen Rosenoannee 14°01 28°02 2 ORE. ccc evenes 15:96 31°92 2 Selenium…..... 79 158 2 Telimruamiies. <2… 128 256 2 NNGRORIAY Ganececondae gos 199°8 il Cadmium …..... 111°6 111°6 il Phosphorus…..... 30°94 123°76 4 PASE TI Clay istriaces cca 74:9 299°6 f

cobeneneeens 6

It will be seen that two numbers are given for sulphur. This is because at temperatures above 800° C. the density of sulphur vapour is such as to indicate that the sulphur molecule consists of 2 atoms, whereas its density at about 500° C. is three times as great, and, consequently, it is to be supposed that the molecules are hexatomic. Selenium, which is closely allied to sulphur, exhibits a very similar be- haviour, its vapour at about 1400° C. containing only diatomic molecules, but as the temperature sinks its density

rapidly increases. These two elements, in fact, afford striking examples of the resolution of complex molecules into simpler molecules by heat; and it is by no means iniprobable that the tetratomic phosphorus and arsenic molecules will be found to behave similarly if sufficiently heated.

No method is known by which it is possible to determine the molecular weights of elements or compounds in any other state than that of gas, and the behaviour of sulphur is alone sufficient to prove that we are not justified in assuming that the molecular weiglits of liquid or solid elements or compounds are identical with their molecular weights as gases. Indeed it is in the highest degree probable that the molecules of solid and liquid bodies are very frequently far more complex than the molecules of the sume bodies in the state of gas.

Chemical Notation—Valency of Llements—Rational Formule.

Opposite the name of each element in the second column of the table on p. 467, the symbol is given which is always employed to represent it. This symbol, however, not only represents the particular element, but a certain definite quantity of it. Thus, the letter H always stands for 1 atom or 1 part by weight of hydrogen, the letter N for 1 atom or 14 parts of nitrogen, and the symbol Cl for 1 atom or 35°36 parts of chlorine. Compounds are in like manner represented by writing the symbols of their constituent elements side by side, and if more than one atom of each element be present, the number is indicated by a numeral placed on the right of the symbol of the element either below or above the line. ‘Thus, hydrochloric acid is

represented by the formula HCl, that is to say, it is a compound of an atom of hydrogen with an atom of chlorine, or of 1 part by weight of hydrogen with 35°36 parts by weight of chlorine ; again, sulphuric acid is represented by the formula H,SO,, which is a statement that it con- sists of 2 atoms of hydrogen, 1 of sulphur, and 4 of oxygen, and consequently of certain relative weights of these elements. A figure placed on the right of a symbol only affects the symbol to which it is attached, but when figures are placed in front of several symbols all are affected by it, thus 2H,SO, means H,SO, taken twice.

The distribution of weight in chemical change is readily expressed in the form of equations by the aid of these symbols ; the equation

2HCl+ Zn = ZnCi, + H,,

for example, is to be read as meaning that from certain definite weights of hydrochloric acid and zine certain definite weights of two different bodies, zinc chloride and hydrogen, are produced. The + sign is invariably employed in this way either to express combination or action upon, the meaning usually attached to the use of the sign= being that from such and such bodies such and such other bodies are formed.

Usually, when the symbols of the elements are written or printed with a figure to the right, it is understood that this indicates a molecule of the element, the symbol alone representing an atom. Thus, the symbols H, and P, indicate that the molecules of hydrogen and phosphorus respectively contain 2 and 4atoms. Since, according to the molecular theory, in all cases of chemical change the action is between molecules, such symbols as these ought always to be employed. Thus, the formation of hydrochloric acid from hydrogen and chlorine is correctly represented by tlie equatiou

H,+Cl,=2HCl; that is to say, a molecule of hydrogen and a molecule of chlorine give rise to two molecules of hydrochloric acid ; whilst the following equation merely represents the relative

weights of the elements which enter into reaction, and is not a complete expression of what is supposed to take place :—

H+Cl=HCl

As the molecular weights of comparatively few of the elements have been determined, however, it is possible only in a limited number of cases to employ such symbols. The molecular weights of the larger number of compounds are also unknown, but in all cases it is usual to represent them by formule which to the best of our know- ledge express their molecular composition in the state of gas, and not merely the relative number of atoms which they contain; thus, acetic acid consists of carbon, hydrogen, and oxygen in the proportion of one atom of carbon, two of hydrogen, and one of oxygen, but the determination of its vapour density shows that it has a molecular weight corresponding to the formula ©,H,O,, which therefore is always employed to represent acetic acid. When chemical change is expressed with -the aid of molecular formule, not only is the distribution of weight represented, but from mere inspection of the symbols it is possible to deduce the relative volumes which the agents and resultants occupy in the state of gas if measured at the same temperature and under the same pressure. Thus, the equation

2H, + O,= 2H,0

not only represents that certain definite weights of hydrogen and oxygen furnish a certain definite weight of the compound which we term water, but that if the water in the state of gas, the hydrogen, and the oxygen are all measured at the same temperature and pressure, the volume occupied by the oxygen is only half that occupied by the hydrogen, whilst the resulting water-gas will only occupy the same volume as the hydrogen. In other words, 2 volumes of oxygen and 4 volumes of hydrogen furnish 4 volumes of water gas. A simple equation like this, there- fore, when properly interpreted, affords a large amount of in- formation. One other instance may be given; the equation 2NH,=N,+3H,, represents the decomposition of ammonia gas into nitrogen and hydrogen gases by the electric spark, and it not only conveys the information that a certain relative weight of ainmonia consisting of certain relative weights of hydrogen and nitrogen is broken up into certain relative weights of hydrogen and nitrogen, but also that the

nitrogen will be contained in half the space which contained the ammonia, and that the volume of the hydrogen will be one and a half times as great as that of the original ammonia, so that in the decomposition of ammonia the volume becomes doubled.

Formule which merely express the relative number of atoms of the different elements present in a compound are termed empirical formule, and the formule of all com- pounds whose molecular weights are undetermined are necessarily empirical. The molecular formula of a com- pound, however, is always a simple multiple of the empi- rical formula, if not identical with it; thus, the empirical formula of acetic acid is CH,O, and its molecular formula is C,H,O,, or twice CH,O. If the vapour density of a compound cannot be ascertained, its molecular formula can only be ascertained, with more or less approximation tv truth, by considering its properties, and especially its rela- tions to allied compounds of known molecular weight. For example, chromic anhydride is represented as CrO,, and, although it cannot be vaporized, this is held to be its molecular formula chiefly on account of the formation from chromic anhydride of a volatile chromium oxychloride, the molecular weight of which is found to accord with the formula CrO,Cl,.

But in addition to empirical and molecular formule,

he

chemists are in the habit of employing various kinds of rational formule, called constitutional formule, graphic for- mule, &c., which not only express the molecular composition of the compounds to which they apply, but also embody cer- tain assumptions as to the manner in which the constituent atoms are arranged, and convey more or less information with regard to the nature of the compound itself, viz., the class to which it belongs, the manner in which it is formed, and the behaviour it will exhibit under various circum- stances. Before explaining these formule it will be neces- sary, however, to consider the differences in combining power exhibited by the various elements.

It is found that the number of atoms of a given element, of chlurine, for example, which unite with an atom of each of the other elements is very variable. Thus, hydrogen unites with but a single atom of chlorine, zinc with two, boron with three, silicon with four, and phosphorus with five. Those elements which are equivalent in combining or displacing power to a single atom of hydrogen are said to be wnivalent or monad elements; whilst those which are equivalent to two atoms of hydrogen are termed bivalent or dyad elements ; and those equivalent to three, four, five, or six atoms of hydrogen triad, tetrad, pentad, or hexad elements, But not only isthe combining power or valency (atomicity) of the elements different, it is also observed that one element may combine with another in several pro- portions, or that its valency may vary ; for example, phos- phorus forms two chlorides represented by the formule PCL, and PCl,, and nitrogen the series of oxides repre- sented by the formule

N,O, NO, N,0,,N,0,, N,0,.

In explanation of these facts it is supposed that each element has a certain number of " units of affinity," which may be entirely, or only in part, engaged when it enters into combination with other elements; and in those cases in which the entire number of units of affinity are not engaged by other elements, it is supposed that those which are thus disengaged neutralize each other, as it were. For example, in pentachloride of phosphorus the five units of affinity possessed by the phosphorus atom are satisfied by the five monad atoms of chlorine, but in the trichloride two are disengaged, and, it may be supposed, satisfy each other. Compounds in which all the units of affinity of the con- tained elements are engaged are said to be saturated, whilst those in which the affinities of the contained elements are not all engaged by other elements are said to be wnsatu- rated, According to this view, it is necessary to assume that, in all unsaturated compounds, two, or some even number of affinities are disengaged; and also that all elements which combine with an even number of monad atoms cannot combine with an odd number, and vice versa, —in other words, that the number of units of affinity active in the case of any given element must be always either an even or an odd number, and that it cannot be at one time an even and at another an odd number. There are, how- ever, a few remarkable exceptions to this "law." Thus, it must be supposed that in nitric

oxide, NO, an odd number of affinities are disengaged, since a single atom of dyad oxygen is united with a single atom of nitrogen, which in all its compounds with other elements acts either as a triad or pentad. When nitric peroxide, N,0,, is converted into gas, it decomposes, and at about 180° C. its vapour entirely consists of molecules of the composition NO,; while at temperatures between this and 0° C. it consists of a mixture in different proportions of the two kinds of molecules, N,O, and NO,. The oxide NO, must be regarded as another inistance of a compound in which an odd number of affinities of one of the contained elements are disengaged, since it contains two atoms of dyad oxygen united with a single

atom of triad or pentad nitrogen. Again, when hexa- chloride of tungsten is converted into vapour it is decom- posed into chlorine and a pentachloride, having a normal vapour density, but as in the majority of its compounds tungsten acts as a hexad, we apparently must regard its pentachloride as a compound in which an odd number of free affinities are disengaged. Hitherto no explanation has been given of these exceptions to what appears to be a law of almost universal application, viz., that the sum of the units of affinity of all the atoms in a compound is an even number.

The number of units of affinity active in the case of any particular element is largely dependent, however, upon the nature of the element or elements with which it is asso- ciated. Thus, an atom of iodine only combines with one of hydrogen, but may unite with three of chlorine, which never combines with more than a single atom of hydrogen ; an atom of phosphorus unites with only three atoms of hydrogen, but with five of chlorine, or with four of hydrogen and one of iodine; and the chlorides corresponding to the higher oxides of lead, nickel, manganese, and arsenic, PbO,, Ni,O,, MnO,, and As,O, do not exist as stable compounds, but only the lower chlorides, PbCl,, NiCl,, MnCl,, and AsCl,, are known.

It is difficult, therefore, to classify the elements according to their valencies; indeed, an absolute classification is scarcely possible. In the following table

a number of the elements are arranged mostly according to their apparent maximum valencies :—

Monads. Dyads. Triads. Hydrogen. Oxygen. Boron. Fluorine. Barium. Gold. Chlorine. Strontium.

Bromine. Calcium. Todine. Magnesium.

Zine. Potassium. Cadinium. Sodium. Copper. Lithium. Mercury. Silver.

Tetrads, Pentads, ITexads. Carbon. Nitrogen. Sulphur. Silicon. Phosphorus, Selenium. Tin. Arsenic. Tellurium. Lead.

Aluminium. Antimony. Tungsten. Indium. Bismuth. Molybdenum. Thallium.

Tron.

Chromium.

Manganese.

Cobalt.

Nickel.

Platinum.

Palladium.

The valency of an element is usually expressed by dashes or Roman numerals placed on the right of its symbol, thus: H’, O”, B”, Ci’, P’, Mo”; but in constructing graphic formule the symbols of the elements are written with as many lines attached to each symbol as the element which it represents has units of affinity.

Graphic formule are employed to express the manner in which it is assumed that the constituent atoms of com- pounds are associated together ; for example, the trioxide of sulphur is usually regarded as a compound of an

atom of hexad sulphur with three atoms of dyad oxygen, and this hypothesis is illustrated by the graphic formula

o=5—O I O

When this oxide is brought into contact with water it com- bines with it forming sulphuric acid, H,SO,, and it is VY — 60

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supposed that in this compound only two of the oxygen atoms are wholly associated with the sulphur atom, each of the remaining oxygen atoms being united by one of its affinities to the sulphur atom, and by the remaining affinity to an atom of hydrogen; thus—

| H—O—S—O—H

I

O Again, the reactions of acetic acid, C,H,O, , show that the four atoms of hydrogen which it contains have not all the same function, and also that the two atoms of oxygen have different functions ; the graphic formula which we are led to assign to acetic acid, viz.,—

H | ie ae | 0=0—O—H

serves in a measure to express this, three of the atoms of hydrogen being represented as associated with one of the atoms of carbon, whilst the fourth atom is associated with an atom of oxygen which is united by a single affinity to the second atom of carbon, to which, however, the second atom of oxygen is united by both of its affinities. It is not to be supposed that there are any actual bonds of union be- tween the atoms; graphic formule such as these merely express the hypothesis that certain of the atoms in a com- pound come dircctly within the sphere of attraction of certain other atoms, and only indirectly within the sphere of attraction of others,—an hypothesis to which chemists are led by observing that it is often possible to separate a group of elements from a compound, and to displace it by other elements or groups of elements.

Rational forniule of a much simpler descriptionthan these graphic formule are generally employed. For instance, sulphuric acid is usually represented by the formula SO,(OH),, which indicates that it may be regarded as a com- pound of the group SO, with twice the group OH. Each of these OH groups is equivalent in combining or displac- ing power to a monad element, since it consists of an atom of dyad oxygen associated with a single atom of monad hydrogen, so that in this case the SO, group is equivalent to an atom of a dyad element. This formula for sulphuric acid, however, merely represents such facts as that it is possible to displace an atom of hydrogen and an atom of oxygen in sulphuric acid by a single atom of chlorine, thus forming the compound SO,HCl; and that by the action of water on the compound SO,Cl, twice the group OH, or water minus an atom of hydrogen, is introduced in place of the two monad atoms of chlorine—

S0,Cl, + 2HOH =80,(OH), + 2HCl.

Water. Sulphuric acid. Constitutional formule like these, in fact, are nothing more than symbolic expressions of the character of the com- pounds which they represent, the arrangement of symbols in a certain definite manner being understood to convey certain information with regard to the compounds repre- sented.

Groups of two or more atoms like SO, and OH, which are capable of playing the part of elementary atoms (that is to say, which can be transferred from compound to com- pound), are termed compound radicles, the elementary atoms being simple radicles. Thus, the atom of hydrogen is a monad simple radicle, the atom of oxygen a dyad

simple radicle, whilst the group OH is a monad compound radicle,

[FORMULA.

It is often convenient to regard compounds as formed upon certain types; alcohol, for example, may be said to be a compound formed upon the water type, that is to say, a compound formed from watcr by displacing one of

the atoms of hydrogen by the group of elements C,H,,

thus H C,H, O H O H Water Alcohol.

Chemical Action.

Chemical change or chemical action may be said to take place whenever changes occur which involve an alteration in the composition of. molecules, and may be the result of the action of agents such as heat, electricity, or light, or of two or more elements or compounds upon each other.

Three kinds of changes are to be distinguished, viz., changes which involve combination, changes which in- volve decomposition or separation, and changes which in- volve at the same time both decomposition and combination. Changes of the first and second kind, according to our present views of the constitution of molecules, are probably of very rare occurrence ; in fact, chemical action appears almost always to involve the occurrence of both these kinds of change, for, as already pointed out, we must assume that the molecules of hydrogen, oxygen, and several other elements are diatomic, or that they consist of two atoms, Indeed, it appears probable that with few exceptions the elements are all compounds of similar atoms united together by one or more units of affinity, ac- cording to their valencies. If this be the case, however, it is evident that there is no real distinction between the reactions which take place when two elements combine together and when an element in a compound is displaced by another. The combination, as it is ordinarily termed, of chlorine with hydrogen, and the displacement of iodine in potassium iodide by the action of chlorine, may be cited as examples ; if these reactions are represented, as such re- actions very commonly are, by equations which merely express the relative weights of the bodies which euter into reaction, and of the products, thus—

ni + Cl ee el Hydrogen. Chlorine. Hydrochloric acid. KI + Cl = KCl + I

Potassium iodide. Chlorine. Potassium chloride. Iodine. they appear to differ in character ; but if they are correctly represented by molecular equations, or equations which express the relative number of molecules which enter into reaction and which result from the reaction, it will be ob- vious that the character of the reaction is substantially the same in both

cases, and that both are instances of the occurrence of what is ordinarily termed double decom-

positiou—

Hydrogen. Chlorine. Hydrochloric acid. 2KI + Cl = 2KCl +. I,.

Todine,

For chemical action to take place between two bodies it ig necessary that they should be in contact, and, therefore, gencrally speaking, that one of them should be in the state of liquid or gas.

In all cases of cliemical change energy in the form of heat is either developed or absorbed, and the amount of heat developed or absorbed in a given reaction is as defi- nite as are the weights of the substance engaged in the reaction. Thus, in the production of hydrochloric acid from hydrogen and chlorine 22,000 units of heat! are

Potassic iodide. Chlorine. Potassic chloride.

1 A unit of heat is the quantity of heat necessary to raise the tem- perature of 1 gramme of water 1°C., and whenever in this article itis

developed; in the production of hydrobromic acid from hydrogen aud bromine, however, only 8440 units of heat are developed ; and in the formation of hydriodic acid from hydrogen and iodine 6040 units of heat are absorbed.

This difference in behaviour of the three elements, chlorine, bromine, and iodine, which in many respects ex- hibit considerable resemblance, may be explained in the following manner. We may suppose that in the forma- tion of gaseous hydrochloric acid from gaseous chlorine and hydrogen, according to the equation

H, +Cl,=HOl+HCl,

a certain amount of energy is expended in separating the atoms of hydrogen in the hydrogen molecule, and the atoms of chlorine in the chlorine molecule, from each other ; but that heat is developed by the combination of the hydrogen atoms with the chlorine atoms, and that, as more energy is developed by the union of the atoms of hydrogen and chlorine than is expended in separating the hydrogen atoms from each other and the chlorine atoms from one another, the result of the action of the two ele-

ments upon each other is the. development of heat,—the .

amount finally developed in the reaction being the differ- ence between that absorbed in decomposing the elementary molecules and that developed by the combination of the atoms of chlorine and hydrogen. In the formation of gaseous hydrobromic acid from liquid bromine and gaseous

hydrogen— H,+ Br, = HBr+HBr,

in addition to the energy expended in decomposing the hydrogen and bromine molecules, energy is also expended in converting the liquid bromine into the gaseous condi- tion, and probably less heat is developed by the combina- tion of bromine aud hydrogen than by the combination of chlorine and hydrogen, so that the amount of heat finally developed is much less than is developed in the formation of hydrochloric acid. Lastly, in the production of gaseous hydriodic acid from hydrogen and solid iodine—

H, #l,=HI+H1,

so much energy is expended in the decomposition of the hydrogen and iodine molecules and in the conversion of the iodine into the gaseous condition, that the heat which it may be supposed is developed by the combination of the hydrogen and iodine atoms is insufficient to balance the expenditure, and the final result is therefore negative ; hence it is necessary in forming hydriodic acid from its elements to apply heat continuously,

These compounds also afford examples of the fact that, generally speaking, those compounds are most readily formed, and are most stable, in the formation of which the most heat is developed. Thus, chlorine enters into re- action with hydrogen, and removes hydrogen from hydro- genized

bodies, far more readily than bromine ; and hydro- chloric acid is a far more stable substance than hydrobromic

cid, hydriodic acid being greatly inferior even to hydro- bromic acid in stability.

When two substances which by their action upon each other develop much heat enter into reaction, the reaction is usually complete without the employment of an excess of either; for example, when a mixture of hydrogen and oxygen, in the proportions to form water—

2H, + O0,=20H,, is exploded, it is entirely converted into water. This is

i a Se stated that a certain amount of heat is developed in the production of a certain body, the production of a quantity of it equal to its mole- cular weight in grammes is to be understood. Thus, in the above case, the production of hydrochloric, hydrobromic, and hydriodic acids means the production respectively of 36°36, 81°75, and 127°53 grammes of these bodies.

also the case if two substances are brought together in solution, by the action of which upon each other a third body is formed which is insoluble in the solvent employed, and which also does not tend to react upon any of the sub- stances present; for instance, when a solution of a chlo- ride is added toa solution of a silver salt, insoluble silver chloride is precipitated, and almost the whole of the silver is removed from solution, even if the amount of the chloride employed be not in excess of that theoretically re- quired.

But if there be no tendency to form an insoluble com- pound, or one which is not lable to react upon any of the other substances present, this is no longer the case. For example, when a solution of a per-salt of iron is added to a solution of potassium thiocyanate, a deep red coloration is produced, owing to the formation of thiocyanate of iron. Theoretically the reaction

takes place in the case of the per- nitrate of iron in the manner represented by the equation Fe,(NO,), + 6KCNS =_ Fe,(CNS), + 6KNO, ; Ferric nitrate. Potassiun thiocyanate, Ferric thiocyanate. Potassium nitrate. but it is found that even when more than sixty times the amount of potassium thiocyanate required by this equation is added, a portion of the ferric nitrate still remains uncon- verted, doubtless owing to the occurrence of the reverse change—

Fe,(CNS), + 6K NO, = Fe,(NO3)5 + 6KCNS.

In this, as in most other cases in which substances act upon one another under such circumstances that the resulting compounds are free to react, the extent to which the dif- ferent kinds of action which may occur take place is de- pendent upon the mass of the substances present in the mixture. As another instance of this kind, the decomposi- tion of bismuth chloride by water may be cited. If a very large quantity of water be added, the chloride is entirely decomposed in the manner represented by the equation— BiCl + OH, = BiOCl + 2HCl, Bismuth chloride. Bismuth oxychloride.

the oxychloride being precipitated ; but if smaller quanti- ties of water be added the decomposition is incomplete, and it is found that the extent to which decomposition takes place is proportional to the quantity of water em- ployed, the decomposition being incomplete, except in pre- sence of large quantities of water, because of the occur- rence of the reverse action—

BiOC] +2HCl = BiCl, + OH).

Chemical change which merely involves simple decom- position is also influenced by the presence of the products of decomposition. Thus when calcium carbonate is strongly heated in an open vessel, it is entirely decomposed into carbon dioxide gas and calcium oxide—

@acOo, = CO, + CaO. Calcium carbonate. Carbon dioxide. Calcium oxide. When it is heated in a confined space, the decomposition only goes on until the liberated gas has attained a certain tension, and as long as the temperature does not vary, the tension remains the same, and is independent of the pro- portion of the compound decomposed, that is to say, of the amount of calcium oxide present; but the tension increases if the

temperature is raised, and diminishes if it is lowered, owing to the recombination of a portion of the carbon dioxide with the calcium oxide; for example, at 800° C. the tension is equivalent to a column of mercury 85 millimetres high, but at 1040° C. it is equivalent to a column of 520 mm. Deville applies the term dissociation to changes which occur in this manner; the term only applies to those cases of decomposition in which products are obtained which under the conditions of the experi- ment are capable of reuniting to form the original sub-

stance. When such substances are heated in a confined space, not only does decomposition take place, but a certain proportion of the decomposition products recombine, and tor each degree of temperature a definite relation exists between the number of molecules broken up and the number of molecules reconstituted ; an equilibrium is thus maintained, and the tension remaius constant. But as the temperature rises, a larger number of molecules are de- composed anda proportionally smaller number reformed than at the lower temperature, so that the tension rises with the temperature. When, however, a substance like calcium carbonate is heated in an open vessel, the carbon dioxide escapes as it is formed, and therefore it is impos- sible for recomposition to occur, and ultimately the whole of the carbonate is decomposed. Apparently whenever solid substances uudergo dissociation and furnish a solid and a gaseous product, the tension of dissociation is always inde- pendent of the amount of the solid decomposition product present. The Elements and their Compounds.

The elements are usually divided into two great classes, the metallic and the non-metallic.elements, the following being classed as uon-metals, and the remainder as metals :—

Hydrogen. Selenium. Chlorine. Tellurium. Bromine. Nitrogen. Todine. Boron. Fluorine. Carbon. Oxygen. Silicon. Sulphur. Phosphorus.

The metals are mostly bodies of high specific gravity ; they exhibit, when polished, a peculiar brilliancy or metallic

lustre, and they are good conductors of heat and electricity;

whereas the non-metals are mostly bodies of low specific gravity, and bad conductors of heat and electricity, and do not exhibit metallic lustre, The non-metallic elements are also sometimes termed metalloids, but this appellation, which signifies metal-like substances, strictly belongs to certain elements which do not possess the properties of the true metals although they more closely resemble them than the non-metals in many respects; thus, selenium and tellurium, which are closely allied to sulphur in their chemical proper- ties, although bad conductors of heat and electricity, exhibit metallic lustre and have relatively high specific gravities,

But when the properties of the elements are carefully contrasted together it is obvious that no strict line of demarcation can be drawn dividing them into two classes ; and if they are arranged in a series, those which are most closely allied in properties being placed next to each other, it is evident that there is a more or less regular altera- tion in properties from term to term in the series.

When binary compounds, or compounds of two elements, are decomposed by an electric current,the two elements make their appearance at opposite poles. Those elements which are disengaged at the negative pole are termed electro- positive, or positive, or basylous elements, whilst those disengaged at the positive pole are termed electro-negative, or negative, or chlorous elements. But the difference between these two classes of elements is one of degree only, and they gradually merge into each other; moreover the electric relations of elements are not absolute, but vary according to the state of combination in which they exist, so that it is just as impossible to divide the elements into two classes according to this property as it is to separate them into two distinct classes of metals and non-metals, The following, however, are negative towards the remain- ing elements which are more or less positive :—

Fluorine. Oxygen. Chlorine. Sulphur. Bromine. Selenium, Iodine. Tellurium.

Elements which readily enter into reaction with each other, and which develop a large amount of heat on com- bination, are said to have a powerful affinity for each other. The tendency of positive elements to unite with positive elements, or of negative elements to unite with negative

elements, is much less than that of positive elements to

unite with negative elements, and the greater the diffcr- ence in properties between two elements the more power- ful is their affinity for each other. Thus, the affinity of hydrogen and oxygen for each other is extremely powerful, much heat being developed by the combination of these two elements; when binary compounds of oxygen are decomposed by the electric current, the oxygen invariably appears at the positive pole, being negative to all other elements, but the hydrogen of hydrogen compounds is always disengaged at the negative pole. Hydrogen and oxygen are, therefore, of very opposite natures, and this is well illustrated by the circumstance that oxygen combines, with very few exceptions, with all the remaining elements, whilst compounds of only a very limited number with hydrogen have been obtained.

Hydrides.—The only elements which are known to form binary compounds with hydrogen are fluorine, chlorine, bromine, iodine, oxygen, sulphur, selenium, tellurium, carbon, silicon, nitrogen, phosphorus, arsenic, antinony, and copper. Palladium has the property of absorbing a large volume of hydrogen gas, and it is supposed forms a definite compound with it; sodium and potassium, when heated to 350° to 400° C., also absorb hydrogen and appear to form definite compounds. With the exception of car- bon, which furnishes an enormous number of compounds with hydrogen, the above-named elements unite with hydrogen only in one proportion, or at most in two or three different proportions, Excepting oxygen, fluorine, chlorine, and bromine, they do uot readily enter into reac- tion with hydrogen, so that in most cases, in order to obtain their compounds with hydrogen, it is necessary to resort to indirect methods of preparation. The compounds of the elements with hydrogen may all be included under the general title of hydrides, but usually they possess spe- cific names; thus, the hydride of oxygen is known as water, and the hydride of nitrogen as ammonia. Some of the hydrides of carbon are gases, but the

majority are either liquids or solids; the two known hydrides of oxygen, water and the so-called peroxide of hydrogen, are liquids ; a gaseous and a liquid hydride of sulphur are known; three hydrides of phosphorus are said to exist, one of which is liquid, one solid, and one gaseous ; hydride of copper is a solid; and the hydrides of the remaining ele- ments are gases. Excepting the hydride of copper, all are colourless substances, The following is a list of the known hydrides, including, however, only the first or simplest hydride of carbon :—

Name. Formula,

Hydrogen hydride, or hydrogen….....0.s0000. H, gas

‘9 fluoride, or hydrofluoric acid…..... HE ne

fe chloride, or hydrochloric acid…..... HCl is

ns bromide, or hydrobromic acid…..... HBr ro

- iodide, or hydriodic acid….....04. HI 5

yo, ORME, Gir WEE... a srseeai te orsecess H,0 liquid

es GUERIN Meee dice coshanannis < pciwaa meee vias H,0; if

Fe sulphide, or sulphuretted hydrogen….H,S gas.

AG EMM EEC ieceisssce soe runaina oe sanseoe H,S; (?) liquid. S Olea MV AG. 6.0… ccxccneseisslsonssnocvenesecaeeove HSe gas Tell uvivinay By MadON, oh akccscisesonosasevesse aveccace H,Te a Nitrogen hydride, or ammonia….....600cc000. 3 5f Phosphorus hydride, or phosphine…... ..... ies: ar

HA oo ee eect. oe ples liquid

i opie ee NRL ee HP, (2) _ solid. Arsenic hydride, or arsine….....:0.0..c.sccseeeeee0, TeAr gas. Antimony hydride, or stibine …..0….....cceeeeccces. H,Sb ‘Is Carbon hydride, methane, or TOTS OAS eee 1Bly RUMNCOMMENAIIMG: ccc ocsuccaccecsases ects ors

asedaescucl Si 00 Copperny dee: .iccccss cesses. vs sosteprocescecvcewnec sel H,Cu, (4) solid.

THEIR COMPOUNDS. |

Oxides.—The element oxygen is known to form com- pounds with all the elements excepting fluorine, but the affinity of the various elements for oxygen, and con- sequently the stability of the compounds resulting from their union with oxygen, varies within very wide limits ; the oxides of many elements which have but a weak affinity for oxygen can only be obtained by indirect means.

Although many of the elements unite with oxygen in several proportions, none are known to furnish more than five distinct oxides, and these belong to a certain limited number of forms, since they contain one, two, three, four, or five atoms of oxygen in the molecule. But as the same number of atoms of oxygen may unite with a given element in more than one proportion, each of these five classes in- cludes sub-classes. The composition of the oxides may be best illustrated and their behaviour explained by regarding them as formed on the type of the two oxides of hydrogen, hydrogen monoxide or water, OH,, and hydrogen dioxide,

The monoxides are formed on the type of a single mole- cule of water, that is to say, they may be regarded as derived from a single molecule of water by the displace- ment of the two atoms of hydrogen by the equivalent amount of other elements, If two atoms of a monad elemeut, or single atom of a dyad element, or of a polyad element which functions as a dyad, displace the two atoms of hydrogen, normal monoxides result, examples of which are potassium monoxide, K’,O, and copper oxide, Cu”O. But monoxides are known in which two atoms of a dyad or it may be polyad element displace the two atoms of hydrogen in water; it is supposed that in this case the two atoms of polyad metal are united together and there- fore function as a dyad compound radicle. Monoxides of this kind are usually termed suboxides; the suboxide of copper, (Cu,)”O, and the suboxide of palladium, (Pd,)O, may be cited as examples. The supposed constitution of the three classes of monoxides is represented by the follow- ing graphic formule :—

O “N Cu—Co.

Copper suboxide,

Cuz0

Copper oxide.

K—O—K

Potassium oxide.

Two classes of dioaides may be distinguished :—the one formed from two molecnles of water by the displacement of the four atoms of hydrogen by a single tetrad atom, such as carbon dioxide, C*’O., and tin dioxide, Su’“O, ; the other formed from a single molecule of hydrogen dioxide by the displacement of the two atoms of hydrogen either by two monad atoms, or by a single dyad atom, such as potassium dioxide, K’,0O,, barium dioxide, Ba”O,, and manganese dioxide, Mn”O,. These two kinds of dioxide differ enormously in chemical properties; their supposed constitution is represented by the following graphic

formule :— O Bag | s

Barium dioxide.

K=0 | K—O

Potassium dioxide.

0=C=0

Carbon dioxide. The dioxides derived from hydrogen dioxide are usually termed peroxides.

The trioxides are divisible into three classes, but all may be regarded as derived from three molecules of water. Tn the one class the six atoms of hydrogen are displaced by a single hexad atom, as in sulphur trioxide, S”O,, and tungsten trioxide, W”O,; in the second class the six atoms of hydrogen

are displaced by two polyad (tetrad ?) elements, which together function as a hexad compound radicle, as in ferric oxide, (Fe,)”‘O,, and chromic oxide,

CHE Wit Pk ¥

aie

(Cr,)“O,.

Bi=O

O

=

Bismuth trioxide.

O Fe=0 I

O Slo

Ferric oxide.

O2=5=—0 Sulphur trioxide.

As examples of ¢etroxides, osmium tetroxide, OsO,, anti- mony tetroxide, Sb,O,, the so-called magnetic oxide of iron, Fe,O,, and lead tetroxide, Pb;0,, may be quoted. These oxides undoubtedly belong to different classes, but too little is known of them for their relations to each other to be defined.

Lastly, the few pentoxides which are known may, with scarcely an exception, be regarded as derived from five molecules of water, the ten atoms of hydrogen being dis- placed by two pentad atoms. This is illustrated by the following graphic formule of phosphorus and arsenic pent- oxides :—

O O O O | | | | P-—-O—P As—O—As | | | | O O O O

Phosphorus pentoxide. Arsenic pentoxide,

Several of the oxides of chlorine and of nitrogen, and one of the oxides of sulphur, are gases; the oxides of hydrogen, and the oxides of chlorine and of nitrogen which are not gaseous, are liquid; and the remaining oxides are solid bodies.

Acids—Bases—Salts.— Many oxides have an extremely powerful affinity for water, and readily combine with it ; but the compounds formed in this manner by different oxides differ remarkably in properties. For example, when sulphur trioxide, SO,, is added to water, a solution is obtained which has the property of changing the colour of blue vegetable colouring matters, such as litmus, to red, and possesses a sharp sour taste; but when the oxide of a highly positive metal, such as barium oxide, is added to water, a solution capable of restoring the blue colour to reddened litmus is obtained. In both cases the water combines with the oxide, the sulphur trioxide being con- verted into sulphuric acid :—

. SO, + OH, =80,H,, and the barium oxide into bar:wm hydroxide :-— BaO + OH, = BaO,H,.

Sulphuric acid and barium hydroxide are representatives of two most important classes of compounds, the aceds and bases ; the oxides which furnish acids when combined with water are conveniently termed acid oaides, whilst those which furnish bases may be termed basic oxides.

The acid oxides, however, unite with the basic oxides to

‘form a third class of compounds called salés, which are

usually neutral bodies, that is to say, they have no action cither on red or on blue litmus ; thus, sulphur trioxide and barium oxide unite to form the salt barium sulphate :—

SO, + BaO =SO,Ba.

The term acid is applied by some chemists to what are here called acid oxides, and what we have called basic oxides are frequently spoken of as bases, the acids being regarded as salts of hydrogen; this view of the constitu- tion of acids is adopted because they are formed by the union of

oxides of negative elements with the oxide of the positive element hydrogen, jnst as what are ordinarily

termed salts arc formed by the union of oxides of negative with oxides of positive elements. In this article, how- ever, the term acid is restricted to compounds containing hydrogen. .

The acids formed from the oxides of the various elements in the manner above explained all enter into reaction with bases, and with especial readiness with those derived from the highly positive elements, in such a manner that salts are produced, the hydrogen of the acid being displaced by the metal of the base, and water formed ; for example,

H,SO, + Ba”0O,H, = BaSO, + 20H,.

Sulphuric acid. Barium hydroxide, Barium sulphate.

We may therefore define an acid to be a compound con- taining one or more atoms of hydrogen which may be displaced by a metal by the action of a base; but, as will be evident later on, although applicable to all acids, this definition is of rather too wide a character.

The hydrides of fluorine, chlorine, bromine, and iodine also readily enter into reaction with bases, exchanging their hydrogen for other elements; and as they also possess an acid taste and redden blue litmus, they are universally regarded as acids. The fact that these com- pounds are powerful acids is of considerable importance, as showing that it is the association of hydrogen with a negative radicle which renders it subject to displacement by positive eloments—that is to say, a compound in which hydrogen is associated with a negative radicle will have the properties of an acid, and the more negative the radicle the more readily can the hydrogen be displaced, The com- position of all known acids is entirely in accordance with this view; thus, in nitric acid a single atom of hydrogen is associated with the negative compound radicle NO, , in sulphuric acid two atoms of hydrogen are combined with the negative compound radicle SO,, and in

phosphoric acid three atoms of hydrogen are associated with the nega- tive compound radicle PO,.

The oxides of the most negative aud most positive elements most readily combine with water to form acids or bases, whilst the oxides of the feebly negative or feebly positive elements either do not unite with water or form extremely unstable combinations. Similarly, the oxides of the most negative and most positive elements unite to- gether to form stable salts, much heat being developed by their combination, whereas the oxides of feebly nega- tive aud feebly positive elements either do not unite or form very unstable salts. The several oxides of an element often differ remarkably in properties, however, one oxide exhibiting acid characters, whilst' another has basic pro- perties.

The oxides of most of the so-called metallic elements are acted upon by acids, such as sulphuric, nitric, and hydrochloric acids, a salt of the metal being formed in all cases in which corresponding salts exist, and the hydro gen of the acid being eliminated in combination with the oxygen of the oxide as water; for example :—

MnO + H,SO, = MnSO, + O8,. Manganese oxide. Sulphuric acid. Manganese sulphate. Water.

If corresponding salts do not exist, however, and action take place, then other products are obtained. Thus, no stable sulphate corresponding with manganese dioxide exists, and when this body is decomposed with sulphuric acid oxygen is evolved :—

2MnO, + 2H,SO, = 2MnSO, + 20H, + O,.

Manganese Sulphuric Water

Manganese dioxide. acid,

sulphate. Oxygen.

Actions of this kind invariably occur with the oxides which may be regarded as formed on the type of hydrogen dioxide.

Sulphides—Sulphur enters into union with most of the

elements forming compounds analogous to the oxides in composition and general properties ; in fact, we may dis- tinguish acid and basic sulphides, corresponding to the acid and basic oxides, and salts formed by the union of these two classes of sulphides. With very few exceptions the sulphides are solid bodies. Seleninm and tcllurium, which are closely allied to sulphur, also form compounds with many elements more or less closely resembling the sul- phides, but they are of little importance.

Chlorides—Bromides—Iodides—L luorides.— With very few exceptions compounds of all the clements with chlorine have been obtained, and, especially from a theoretical point of view, the chlorides are a class of bodies of the highest importance. The affinity of bromine and iodine for other elements being much lower than that of chlorine, and their compounds much less stable than the corresponding chlorides, comparatively few bromides and iodides are known. Fluorides of many of the elements have also been obtained,

Chlorine unites with many of the elements in two or more proportions, but at most six atoms of chlorine unite with a single atom of another element. The majority of the chlorides are either liquids or sclid bodies which may be more or less readily volatilized.

Nitrides — Phosphides. — Nitrogen has but a slight affinity for other elements ; its most important compounds are ammonia, NH., cyanogen, C,N,, and the oxides of nitrogen, The only elements which combine with it readily are tantalum, titanium, tungsten, and vanadium, and most of its compounds can be prepared only by indirect methods.

Phosphorus readily combines with chlorine, bromine, iodine, oxygen, and sulphur, and with most of the metals ; its compounds with the non-metallic elements are of con- siderable importance to the chemist; but its compounds with the metals have been little studied.

Scarcely any of the remaining elements form compounds of importance with elements other than those which have already been considered.

We now proceed to the description of the elements and their more important compounds, commencing with hydro- gen, and theu passing to the so-called non-metallic elements, which will be considered in the following order :— Hydro- gen, oxygen, chlorine, bromine, iodine, fluorine, sulphur, selenium, tellurium, nitrogen, phosphorus, boron, carbon, and silicon; after which the remaining elements will be briefly described as much as possible in the order of their relationship to each other. Hydrogen is placed at the head of the list, because it is the unit or standard of com- parison both for the atomic weights and vualencies of the remaining elements, and jt is now usual also to refer the densities in the state of gas of all compounds to hydrogen. On account of the number and variety of their compounds with other elements the non-metallic elements are by far the most important, and therefore are naturally considered before the metals,

HypRoGEN. Symbol, H; Atomic wt., 1; Molecular wt., 2; Valency, ’.

This element was discovered by Cavendish in 1766, and was called by him inflammable air, the name of Hydrogen is derived from véwp, water, and yevvdw, to generate, on account of its forming water when burnt. It occurs in the frec state in the gases of volcanoes, and by the aid of the spectroscope has been detected in the sun, stars, and nebulz ; it chiefly exists in combination with oxygen as water, and is animportant constituent of all vegetable and animal substauces.

Hydrogen is obtained by the decomposition of water in

various ways. Thus, when two platinum plates, con- nected with the poles of a voltaic battery, are plunged ‘nto water acidulated with a few drops of sulphuric acid, hydrogen is evolved from the plate in connection with the negative pole, oxygen being disengaged from the positive pole. Water is also resolved into its elements when its vapour is heated by passing through an intensely ignited platinum tube, or by discharging electric sparks im an atmosphere of steam ; but under these circumstances, owing to the

recombination of much of the hydrogen and oxygen, only a small quantity of the mixed gases is obtained. Hydrogen may also be obtained from water by the action of the highly positive metals, cesium, rubidium, potassium, sodium, and lithium, at ordinary temperatures ; in each case a solution of the metallic hydroxide is obtained, and hydrogen evolved, thus :— 2Na + 20H, = Sodium Water. Barium, strontium, and calcium also decompose water in the cold, and hydrogen is evolved when magnesium is heated with water at temperatures below the boiling point of the latter. Many other metals, such as iron, manganese, zinc, cadmium, cobalt, nickel, tin, and antimony evolve hydrogen from water when its vapour is passed over the metal heated to redness, the oxide of the metal being formed, thus :— 3Fe + 40H, = 4H, + Fe,0,. Water. F ee Aluminium also decomposes water at a red heat, but owing to the formation of an impermeable coating of aluminium oxide on the surface of the metal the action soon stops. Metals like copper, mercury, silver, gold, and platinum are without action even at a bright red heat. Many metals, however, which do not decompose water unless heated with it, if placed in contact with a more negative element cause the evolution of hydrogen at ordinary atmospheric temperatures ; for example, if a plate of zine, coated with spongy copper by immersion in a solution of copper sulphate, be placed in water, hydrogen is gradually evolved, the reaction which occurs being as follows :— Zn + 20H, = H, + Zn(OH), Zine. Water. ‘Hydrogen. Zinc hydroxide. Hydrogen is usually prepared by the action of zinc or iron on a solution of hydrochloric or sulphuric acid. The change which occurs is represented in the following equa- tions :—

9NaOH .

Sodium hydroxide.

He +

Hydrogen.

Tron. Hydrogen.

yu + 2HCl = H, + ZnCl,

Zinc. Hydrochloric acid. Hydrogen. Zinc chloride Fret-oll SO, = ally. eq LabOm Zinc, Sulphuric acid. Hydrogen. Zinc sulphate.

All metals which readily decompose water when heated readily furnish hydrogen on treatment with hydrochloric and sulphuric acid, and many other metals enter more or léss readily (although none so readily) into reaction with these acids; also many other acids may be used in place of hydrochloric or sulphuric acid, but none act more readily. In all cases the action consists in the displacement of the hydrogen of the acid by the metal employcd, and if the acid is not one which can enter into reaction with the dis- placed hydrogen, the latter is evolved as gas. If pure hydrogen is required, it is necessary to employ pure zinc or iron ; the impurities in the ordinary metal communicate an extremely disagreeable odour to the gas.

On the large scale nearly pure hydrogen may be pre- pared by passing steam over charcoal or coke heated to dull redness. If thé temperature be kept sufficiently low, hydrogen and carbon dioxide are the sole products :—

C3920 = 2 Eeeeeo;’,

and the latter may be removed by causing the gas to traverse a vessel filled with slaked lime; but if the tem- perature be allowed to rise too high carbon monoxide is also produced, and cannot be removed from the mixture,

Pure hydrogen is a colourless, transparent, odourless and tasteless gas. It has never been liquefied, and is very slightly soluble in water, 100 volumes of water dissolving 1:93 volumes of the gas at all temperatures between 0° and 24°C, It is the lightest of all known bodies, its specific gravity being ‘0693, that of air being unity; one litre of hydrogen at 0°C, and under the pressure of 760 nm. of mercury, weighs ‘0896 gramme, and it is impor- tant to remember this number, since the weight of a litre of any other gas may be at once found by multiplying -0896 by half the molecular weight of the gas, the specific gravity of a gas referred to hydrogen being always half its molecular weight (p. 471).

Pure hydrogen is not poisonous, though it cannot sup- port life; and if mixed with a certain proportion of oxygen, it may be breathed for some time without inconvenience. It is extremely inflammable, and burns in the air with a colourless non-luminous flame forming water; a burning taper is extinguished when plunged into hydrogen, and all bodies which burn in the air are incapable of burning in hydrogen.

Hydrogen does not spontaneously enter into reaction with any of the elements, although it has a powerful affinity for several of them. Thus, when hydrogen and oxygen are mixed nothing occurs, but if a burning taper or a heated wire is applied, a violent explosion ensues, water being produced. Similarly, chlorine and hydrogen are without action upon each other in the dark, but if the mixture is exposed to a bright light or is heated by the passage of an electric spark, the gases at once com- bine with explosive violence, forming hydrochloric acid. It has already been pointed out that we must suppose that the molecules which constitute free hydrogen, chlorine, and oxygen gases are diatomic, and that hydrogen and chlo- rine, for example, do not directly combine to form hydro- chloric acid, but that an action occurs such as is represented by the equation—

H,+Cl,=HCl+HCl,

and that, therefore, the combination of the atoms of chlo- rine and hydrogen is preceded by the separation of the two atoms of chlorine in the chlorine molecules, and of the two atoms of hydrogen in the hydrogen molecules, from each other, which necessarily involves an expenditure of energy. The application of heat, we may assume, serves to effect this decomposition of some of the molecules of hydrogen, oxygen, und chlorine into their constituent atoms, and since much heat is evolved by the subsequent combination of the atoms of hydrogen and chlorine, or of hydrogen and oxygen, it is only necessary to apply heat to start the re- action, because the remaining molecules are decomposed by the heat developed in the formation of the first portions of water or hydrochloric acid.

Compounds of hydrogen with bromine, iodine, sulphur, and nitrogen may also be obtained directly from these elements and hydrogen, although only with difficulty and in small quantity.

OXYGEN.

Symbol, 0; Atomic wt., 15°96 ; Molecular wt., 31°92 ; Valency,”.

Oxygen was first isolated by Priestley in 1774; its name is derived from dvs, sour, and yevvdw, to generate, in allu- sion to the circumstance that many of the bodies formed by combining it with other elements dissolve in water, pro- ducing sour or acid solutions. It was long believed, in

fact, that oxygen was a constituent of all acids.

Oxygen is the most abundant and the most important of all the elements. About one-fifth of the atmosphere cousists of free oxygen; it is the chief constituent by weight of water ; it is an important constituent of all animal and vegetable substances, and is contained in greater or less proportion in most mineral substances.

Oxygen may be obtained from water in the manner al- ready mentioned under hydrogen, by decomposing it by an electric current, and also by transmitting chlorine gas and steam through a porcelain tube heated to bright red- ness—

2Cl,

Chlorine.

the oxygen is freed from hydrochloric acid and any ex-

cess of chlorine by passing it through a solution of sodium hydroxide.

The most interesting method of obtaining oxygen, al- though it is not a usual method of preparing it, is that by which it was first isolated by Priestley. When mercury is heated in contact with air to a temperature just below its boiling point, it gradually becomes covered with a red scale of mercuric oxide, HgO, and when this red scale is exposed to a considerably higher temperature it is broken up into oxygen and metallic mercury.

The oxides of gold, platinum, and other metals which have but a slight affinity for oxygen, are very readily decomposed when heated, oxygen being evolved and the metal remaining. Many other metallic oxides, and espe- cially those which may be regarded as formed on the type of hydrogen dioxide, which readily breaks up into water and oxygen, when more or less strongly heated, are re- solved into oxygen and a lower oxide : —lead dioxide, PbO,, barium dioxide, BaO,, and manganese dioxide, MnO,, for example. In the case of manganese dioxide, 3MnO, give Mn,O,, the decomposition taking place at a red heat. Barium dioxide when strongly heated gives up one-half of its oxygen to produce barium monoxide, 2BaO,=0,+ 2Ba0; and by passing moist air over less heated barium mon- oxide it may be reconverted into the dioxide, which may be decomposed by a stronger heat. By repetitions of these processes it is possible to procure large quantities of oxy- gen with the aid of a small quantity of barium dioxide, and it has been proposed to employ this method for the preparation of oxygen on the large scale, but in practice there have been found difficulties attending its use.

Ordinarily when pure oxygen is required it is prepared by heating potassium chlorate, which ultimately furnishes potassium chloride and oxygen: 2KCIO, =30,+2KCI. This decomposition requires a high temperature, and can only be effected in vessels of hard glass, but when the chlorate is mixed with about one-eighth of its weight of a metallic oxide, such as copper oxide, ferric oxide, or manganese dioxide, the oxygen is given off at a consider- ably lower temperature, and with great rapidity; in this case, however, it is impure, being always contaminated with small quantities of chlorine,

_ When potassium chlorate is heated alone the salt fuses, but after a considerable evolution of oxygen has taken place the fused mass becomes pasty, and on examination it is found to consist of a mixture of potassium chloride and potassium perchlorate, KCIO,, so that the first stage in the decomposition may be represented by the equation— 2KClO,; = O, + KCIO, + KCI;

Potassium chlorate. Oxygen. Potassium perchlorate. Potassium chloride.

+ 4HCl;

Hydrochloric acid.

+ 20H, =

Water.

O;

Oxygen,

the potassium perchlorate is resolved on further heating into oxygen and potassium chloride. When a metallic oxide is mixed with the chloride, however, and heat applied, the latter does not fuse, and the formation of potassium perchlorate cannot be detected at any stage of the decom-

position. It is difficult to explain the manner in which the metallic oxide acts in promoting the decompo- sition of the clilorate, since it is found to be un- changed at the conclusion of the reaction; but it is a well-known fact that many bodies which, under ordinary circumstances, do not yield oxygen, readily part with this element when another substance having a tendency to combine or enter into reaction with oxygen is introduced into the sphere of action. Thus, when potassium dichro- mate is heated with concentrated sulphuric acid, oxygen is evolved, the yellow solution becoming green owing to the formation of chromium sulphate— – 2K,Cr,0, + 10H,SO, =

Potassium dichromate. Sulphuric acid.

+ 2Cr,(SO,), + 4KHSO, + 80H,.

Hydrogen potassium sulphate.

30,

Oxygen. Chromium sulphate. Water,

But if the dichromate is dissolved in a considerable quan- tity of water no change of this kind takes place even after prolonged heating ; when, however, a body like sulphur- ous acid, H,SO,, which has a tendency to unite with oxy- gen to form sulphuric acid, is added to the solution, it at once becomes green,—the dichromate being decomposed as represented in the above equation, and the oxygen being fixed by the sulphurous acid. Hence it is not improbable that the metallic oxide acts in virtue of a tendency to form a higher oxide, which higher oxide is no sooner produced, however, than it is broken up into oxygen and the lower oxide. The lower oxide may again undergo conversion into the higher oxide and the latter be broken up into oxygen and lower oxide, so that a relatively small quantity of the metallic oxide may suffice to promote the decomposition of a relatively large quantity of chlorate.

When a small quantity of cobalt sesquioxide, or a few drops of a solution of a cobalt salt, is added to a clear con- centrated aqueous solution of bleaching powder, which is then gently heated, oxygen is evolved with great regularity, and the bleaching powder is completely resolved into oxy- gen and calcium chloride—

2CaCl,O =

Bleaching powder,

O»

Oxy gen.

+ 2CaCl,. Calcium chloride. The bleaching powder solution is not decomposed in this manner when heated alone, aud there is no doubt that the cobalt oxide induces the decomposition by acting as a carrier of oxygen ; that is to say, it first takes oxygen away and passes to a higher state of oxidation, and then gives it up again, the higher oxide being an extremely unstable body.

When silver oxide is added to a solution of hydrogen dioxide in water, metallic silver, water, and oxygen are pro- duced—

AgO + H,O, = O, + 2Ag + OF,. pad oe Oxygen. Silver. Water.

This reaction is especially interesting, as it affords experi- mental evidence in favour of the assumption that the mole- cule of oxygen consists of two atoms; moreover, a very considerable quantity of heat is developed in the reaction, and since there is every reason for believing that the separation of an atom of oxygen from silver oxide, and of an atom of oxygen from hydrogen dioxide, are both opera- tions which involve an expenditure of energy, there can be little doubt that the heat developed is due to the com- bination of the atoms of oxygen to form molecules. In other words, this reaction affords evidence that oxygen atoms have a powerful affinity for each other.

The green leaves of plants with the aid of sunlight are enabled to decompose water and carbon dioxide, and evolve oxygen from them.

OZONE. |

No method has yet been devised of directly separating pure oxygen from air, but Graham has shown that it is possible to obtain an “air” containing about 41-6 per cent. by volume of oxygen instead of about 20°8 per cent., which is the amount present in ordinary air, by dialyzing air through indiarubber. For this purpose a bag com- posed of the thinnest india-rubber supported on cloth is connected with a Sprengel air-pump; if the pump is kept in action, after the air is exhausted from the bag, it is found that it continues slowly to deliver “air” which, however, is richer in oxygen than ordinary air in about the proportions above-mentioned. The gases do not pass through actual pores, but apparently they are dissolved by the rubber, which is thus wetted through by the liquefied gases, aud evaporate into the vacuum on the other side of the membrane, the increased amount of oxygen being doubtless due to the greater solubility of oxygen in rubber.

Many other methods of obtaining oxygen are known, but the above given are sufficient to illustrate the nature of the changes by which it is produced.

Oxygen is a colourless, odourless, and tasteless gas, which has hitherto resisted all attempts to liquefy it; it is only slightly soluble in water, 100 volumes of which at ordi- nary atmospheric temperatures dissolve about

three volumes of oxygen. All bodies which burn in the air burn with greatly increased brilliancy and rapidity in oxygen; thus, a glowing splinter of wood bursts into flame when plunged into oxygen, and burns with great brilliancy; and even iron, if heated to redness before it is introduced into the gas, readily burns init. In all cases in which bodies burn in oxygen the substances burnt combine with the oxygen to form new substances, and the heat and light developed are a consequence of their union. The weight of the pro- ducts corresponds exectly with the weight of the body burned plus the weight of the oxygen consumed. The combination of two or more bodies when thus accom- panied by the development of heat and light is termed combustion, the body burnt being the combustible, and the body in which the burning takes place the supporter of combustion. Thus, hydrogen is a combustible since it burns in oxygen, but oxygen is a supporter of combus- tion. These terms are merely relative, however, since oxygen may just as readily be burnt in hydrogen as hydrogen in oxygen ; and, similarly, air may be burnt in coal gas.

The combination of oxygen with other elements is termed oxidation. In all cases of oxidation heat is developed, but it depends entirely upon the rapidity with which the oxidation is effected whether light is also pro- duced, that is to say, whether what is ordinarily termed combustion takes place. Thus, when iron is burnt in oxygen, the combination of the two elements is effected with great rapidity, and a large amount of heat is developed within a very short space of time, and hence tlie product of com- bustion is intensely heated and becomes incandescent ; when, however, iron slowly oxidizes or rusts, no light is produced, although actually more heat is developed than when the same weight of iron is burnt in oxygen, the oxide Fe,O, being formed in the latter and the oxide Fe,O, in the former case.

The various elements enter into reaction with oxygen with very various degrees of readiness, but as in the case of hydrogen and oxygen it is mostly necessary at least to start the reaction by the application of heat ; and if the com- bination of the two elements can give rise to the develop- ment: of only a moderate amount of heat, it is usually necessary to continue the application of heat until the oxidation is complete. Phosphorus slowly absorbs oxygen, but the remaining non-metallic elements are not affected

by it at ordinary temperatures. The highly positive metals readily absorb it ; the majority of the metals, however, when in the massive state are unacted upon in dry oxygen, but undergo oxidation more or less readily in moist oxygen or air. The coating of oxide first formed frequently protects the metal from more than a superficial oxidation. Some of the metals when in a state of very fine division, for instance, lead as obtained by the ignition of its tartrate, undergo oxidation so readily, however, that spontaneous combustion results from their mere exposure to air or oxygen. The spontaneous combustion of substances such as woollen refuse, greasy tow, and hay is a precisely similar plenomenon,—the heat developed by their slow oxidation being to a great extent retained, as they are bad conductors of heat, until finally it becomes sufficient to inflame them. Most animal and vegetable substances when exposed to the air decay, and it is generally supposed that they simply undergo slow oxidation. Pasteur has shown, however, that the oxidizing power of atmospheric oxygen is mucli exaggeratcd, and that the decay of animal and vegetable substances exposed to air is not simply the resnlt of the action of the atmospheric oxygen, but of the action of oxygen assisted by microscopic organisms, the decay taking place at an extremely slow and almost imperceptible rate when these organisms are entirely excluded.

When the colourless gas nitric oxide is mixed with oxygen, red fumes of higher oxides of uitrogen are formed, and by this reaction oxygen may with facility be detected and distinguished from other gases. A solution of potassium hydroxide and pyrogallol, or pyrogallic acid, or an am- moniacal solution of cuprous chloride, absorbs oxygen with avidity and may be employed to remove it from a mixture of gases

Ozone. Symbol, O03; Molecular wt., 47°88.

When exposed to the action of electricity, and especially under the influence of what is termed the silent discharge, oxygen undergoes a contraction of volume and acquires remarkably different properties, its chemical activity being greatly enhanced. It has been shown that the change consists in the

conversion of the oxygen into an allotropic modification which has received the name of ozone (df) in allusion to its peculiar odour ; and from Sir Benjamin Brodie's experiments (2. Soc. Trans., 1872, p. 435) there can be no doubt that ozone differs from ordinary oxygen merely in that its molecule contains three atoms; this difference is expressed in the following graphic formule :—

O O=0 at O-—O Oxygen. Ozone.

Varions forms of apparatus are employed in ozonizing oxygen, but all are constructed on the principle of the Siemens's induction tube, This consists of two wide tubes of nearly equal diameter placed one within the other and coated on their exterior surfaces with tinfoil; the coat- ings of tinfoil are connected with the terminals of a power- ful induction coil, and a current of oxygen is passed through the narrow space between the two tubes, and is thus submitted to the action of the electric discharge. In the apparatus employed by Brodie the coatings of tinfoil are dispensed with, but the inner tube is filled with water in which is placed one of the terminal wires of the induc- tion coil, and the outer tube is immersed in a vessel of water in connection with the other terminal wire of the coil.

It is essential that the oxygen submitted to the electric action be pure and in a very dry condition ; and it is espe- cially desirable to prevent the elevation of temperature

consequent on the electric action, which may be done by placing fragments of ice in the interior of the tube and also in the water contained in the external cylinder in which the induction tube is immersed.

But it is not possible in this manner to convert more than about 15 per cent. of the oxygen into ozone, and Brodie's experiments prove that there is a fixed limit prescribed by the conditions of experiment, beyond which the forma- tion of ozone cannot pass. The explanation of this appears to be that the formation of ozone belongs to the class of actions termed dissociation

phenomena ; that is to say, not only is oxygen converted into ozone by the electrical action, but ozone is also reconverted into oxygen, the amount of ozone actually obtained under given conditions of experi- ment being dependent upon the extent to which these two opposite kinds of change take place. We may there- fore expect that the amount of oxygen finally obtained in the form of ozone will be greater the less the ozone is exposed to the electric action; and that this is actually the case is proved by the fact that no advantage is gained by submitting the oxygen more than once to the electric action or by passing it slowly through the induction tube, and also by the behaviour of carbon dioxide. When this gas is submitted to the action of the electric discharge, it is partially resolved into carbon monoxide and oxygen, and the latter is in part transformed into ozone. Brodie has shown that it is not difficult, by passing a rapid current of carbon dioxide through the induction tube, to convert 75 per cent. of the oxygen eliminated from the carbon dioxide into ozone, and has even succeeded in converting as much as 85 per cent.

Pure ozone has never yet been obtained, however. Ozone is also formed in small quantity when water is de- composed by the electric current, employing plates of platinum or gold as electrodes; the amount produced is greater the smaller the electrodes. The slow oxidation of phosphorus in moist air is said to be attended with the production of small quantities of ozone, and it is probable that ozone is formed in other slow oxidations; it appears that in all such cases the formation of ozone is accompanied by that of hydrogen dioxide, a fact which is also true of electrolytic ozone.

Traces of ozone are usually present in the atmosphere, especially in the open country; and it no doubt plays an important part in the removal of organic impurities from the atmosphere.

Ozone is a colourless gas of peculiar unpleasant odour ; 100 volumes of water at 0° C. only absorb about °d volume; so that it is considerably less soluble than oxygen. Air charged with ozone exerts an irritating action upon the respiratory organs. Ozone is chiefly remarkable, however, on account of its oxidizing power. Thus, dry mercury, which is not in the least affected by ordinary oxygen, un- less heated to near its boiling point, is at once oxidized by ozone, and dry iodine absorbs ozone and is oxidized by it. It

bleaches a solution of indigo, which is oxidized by it. It also rapidly corrodes organic substances, such as cork and caoutchouc, which therefore cannot be employed in experiments with ozone. Paraffin, however, is not attacked by it, and an excellent air-tight joint between two glass tubes may be made by means of it. A piece of glass tube, into which they exactly fit, is slipped over the two tubes, which are placed close together, and a fragment of pure paraffin is placed at the external junction of the tubes; on gently heating the paraffin it melts, and the liquid being extremely limpid runs into and fills up the narrow space between the tubes.

In the conversion of oxygen into ozone the volume con- tracts by one-third, three molecules of oxygen furnishing two molecules of ozone.

CHEMISTRY

[ozonE.

305 = ZO, ; Oxygen. Ozone. but when ozone is reconverted into oxygen the volume increases to the same extent that it diminishes when oxygen is converted into ozone, since

20, = 30,.

Ozone. Oxygen.

The conversion of ozone into oxygen may be effected by heat. Thus, when ozonized oxygen is passed through a glass tube heated to 110° C. slight decomposition of the ozone takes place; at 200° C. the decomposition is very rapid, about 97 per cent. being converted into oxygen; and below 300° C. decomposition is complete.

Similarly, ozone is decomposed to an unlimited extent by contact with metallic silver, and by manganese dioxide, lead dioxide, and copper oxide, without the substances undergoing more than an excessively minute increase of weight in. the reaction. These decompositions afford in- stances of recurrent action, the active substance being alternately oxidized and reduced by the ozone; in the case of silver, supposing silver monoxide is

formed, although the oxide produced is probably a higher oxide, the reaction may be represented in the following manner :—

2Ag + O, = O, + Ag,O; Silver. Ozone. Oxygen. Silver oxide. AgO + O, = 20, + 2Ag. Silver oxide. Ozone. Oxygen. Silver. Many reactions are known which prove that ozone has this power of effecting deoxidation, although itself a most powerful, oxidizing agent ; thus, by its action on a solution of sodium dioxide, sodium monoxide and oxygen are ob- tained :— Na,O, + O, = 20, + Na,O. Sodium dioxide. Ozone. Oxygen. Sodium oxide.

The decomposition of ozone in this manner by silver, &c,, is accompanied by the development of a considerable amount of heat; thus, according to Berthelot, no less than 29,600 units of heat are evolved in the reaction

20, =30,...

A corresponding amount of energy must therefore be- expended in the formation of ozone from ordinary oxygen. But the conversion of ozone into ordinary oxygen is to be regarded as occurring in two stages,—in the first the mole- cule is resolved into O,+ 0, and in the second two atoms of oxygen from two molecules of ozone unite forming a molecule of ordinary oxygen. The splitting up of the ozone molecule into O,O probably requires an expendi- ture of energy, so that the energy developed in the reaction in the form of heat is due to the combination of the atoms of oxygen to form molecules, but is less than that actually developed by their combination by the amount expended in the decomposition of the ozone molecules. As already pointed out, the fact that so large an amount of heat is developed by the combination of oxygen with oxygen indi- cates that the affinity of the oxygen atoms for each other is very considerable. This being the case, we are enabled also to understand how it is that ozone has such superior power as an oxidizing agent as compared with ordinary oxygen, for it is evident that, in reactions into which oxy- gen enters, for every 32 grammes employed an amount of energy corresponding to at least 29,600 heat units must be expended in order to separate the two atoms forming the oxygen molecules from each other; whereas, mostly, when ozone is employed, the amount of energy to be expended is only that required to effect the decomposition of the ozone molecules into O, 0, which is probably very small. .

The amount of oxidation effected by the same amount of

ozone varies, however, according to the nature of the body

WATER. |

oxidized, and Brodie's experiments show that four classes of oxidations may be effected by ozone :—

In the first class of reactions one-third of the molecule is active in effecting oxidation, the remaining two-thirds being obtained as oxygen, so that the volume of oxygen ob- tained is the same as the volume of ozone operated upon. Tf the number of atoms of oxygen active in effecting oxida- tion are placed within brackets, this class of oxidations is expressed by the cquation —

ORSO(Oy~™ 2. . 1 B The action of ozone on a solution of sodium dioxide, quoted above, and its action on a solution of potassium iodide—

2KI + OH, + O, = O, + I, + 2KHO,

Potassium rene Potassium iodide. Water. hydroxide.

on ferrous chloride and sulphate, on an acid solution of potassium ferrocyanide, and on sodium arsenite, are special cases of this class of oxidations.

In the second class of reactions, four atoms of oxygen from two molecules of ozone are active, the remaining two atoms being obtained as oxygen ; or

20, = 0, + 4(0) See sl

The oxidation of strongly alkaline solutions of sodium hyposulphite, the oxidation of hydriodic acid, and the oxidation of barium pentasulphide are included in this class.

In a third class of reactions, ten atoms of oxygen from four molecules of ozone are active in promoting oxidation, a single molecule of oxygen being obtained ; or

4Op=OaO@je, -. a, Th

The oxidation of sodium sulphydrate and of hydriodic acid at 0° C. are to be referred to this class.

Lastly, in a fourth class of reactions, the entire molecule is active in effecting oxidation ; or

Cpe Ol ote TRY Examples of this class are afforded by the oxidation of tin dichloride, oil of turpentine, and neutral and slightly alkaline solutions of sodium hyposulphite.

That ozone can thus enter into reaction in so many different ways affords the most conclusive evidence of its compound nature, and by these reactions it may be dis- tinguished from all known gases, and estimated.

The reaction with potassium iodide is usually employed for the detection of ozone, the liberation of iodine being rendered evident by the addition of starch paste, which with iodine furnishes a beautiful blue colour. The libera- tion of iodine from potassium iodide is not alone sufficient proof, however, of the presence of ozone. By comparing at different times the depth of colour produced on exposing slips of paper moistened with starch paste and potassium iodide solution to the air, for the same length of time, an estimate of the relative amounts of ozone present may be obtained.

Ozone. Oxygen. Iodine.

Compounds of Hydrogen with Oxygen. Water. Symbol, OH,; Molecular wt., 17°96.

Hydrogen and oxygen when mixed do not enter into reaction at the ordinary temperature; but the contact of flame or of any other red-hot body, the passage of the electric spark, and the contact of platinum cause reaction to take place with explosion. The flame and the electric spark act by their intense heat, and the nature of the influence which, perhaps, heat exercises in inducing the combination of hydrogen and oxygen has already been pointed out; but the action of platinum is more obscure. Spougy platinum and the fine powder of that metal called

platinum black, although cold, cause the mixed gases to explode as readily as flame docs. Even polished slips of platinum, if perfectly clean, will cause the reaction to take place, although more slowly. It appears that at first the absorption of the gases on the surface of the cold metal, and the consequent approximation of their particles, is sufficient to induce the combination of a part of the gases ; this being accompanied by the development of heat, the metal becomes warmed and acts more vigorously, and the combination of further quantities of the gases takes place, by which more heat is developed, so that by degrees the metal becomes red-hot, and if any of the mixcd gases be still uncombined it causes them to explode. In the case of the powder or the sponge, especially the former, all this takes place so rapidly from the enormous surface of the metal, that it becomes red-hot as soon as it is introduced, and fires the mixture as rapidly as a flame. Now, it is well known that metallic platinum, and especially spongy platinum, or platinum black, readily condenses gases upon its surface; but the condensation is attended by the de- velopment of heat, and it seems not improbable, therefore, that its action in causing the combination of hydrogen with oxygen is of the same character as the action of flame,—that the platinum, in fact, does not itself induce the combination, but that the heat resulting from the con- densation of the gases by the platinum is the direct cause of the reaction. Graham’s researches have shown also that heated platinum absorbs hydrogen, and the absorp- tion is doubtless accompanied by the development of heat ; this is an additional reason for the action of platinum becoming more vigorous as it becomes warmer.

A series of experiments by Von Meyer (Journal frir praktische Chemie, 1876, p. 121) may here be referred to, as illustrating in a remarkable manner the influence of finely-divided platinum in causing the combination of gases. It was first shown by Bunsen that when a mixture of hydrogen and carbon monoxide is exploded with insufti- cient oxygen to convert these two gases respectively into water and carbon dioxide, whatever the proportions em- ployed, the quantities oxidized are always in a simple molecular ratio. From Von Meyer’s experiments it ap- pears that, when a

similar mixture is placed in contact with finely-divided platinum, although the oxidation is effected very slowly, the same Jaw obtains. Whereas, however, when the mixture of the three gases is exploded, always relatively more hydrogen than carbon monoxide is oxi- dized, the proportion in which the two gases are burnt being on the average about as 3 to 1, the reverse is the case when their oxidation is slowly effected with the aid of platinum ; in the latter case the number of molecules of carbon mon- oxide oxidized to the dioxide is from 7 to 8 times as great as the number of hydrogen atoms oxidized to water.

When oxygen and hydrogen, from whatever cause, enter into reaction, it is always in the proportions to form water, —that is, invariably in the proportion of 2 volumes of hydrogen gas to 1 volume of oxygen gas. Any excess of either is left uncombined. If the water which is formed be measured as steam or gas, and its volume compared with the volume of the mixed gases at the same tempera- ture before combination, it is found that condensation has taken place, 2 volumes of water gas being obtained from 2 volumes of hydrogen and 1 volume of oxygen gas ; hence—

2H, + O, = 2H,0. Hydrogen. Oxygen. Water. In the liquid state, however, the volume of the water formed is so small as compared with the volume occupied by the mixed gases that it may be neglected, so that if the contraction in volume which occurs on explosion is measured at the ordinary temperature, two-thirds of the

contraction represents the hydrogen, and one-third the oxygen, which has disappeared. This enables us to use hydrogen to determine the amount of free oxygen 1n alr, or in any gaseous mixture, one-third of the contraction which occurs when a measured quantity of the gas 1s ex- ploded with a measured excess of hydrogen representing the amount of oxygen present.

The affinity of oxygen for hydrogen, as measured by the heat developed by their combination, is very great, 68,376 units of heat, according to Thomsen, being evolved in the combination of 16 grammes of oxygen with 2°005 grammes of hydrogen, the product being liquid water at 18°C. By burning the two gases together from a jet the most intense artificial heat that

is known, except that of the discharge of a powerful galvanic battery, is produced.

It is well here to call attention to the circumstance that the equations ordinarily employed to express the formation of water from its elements, and vice versa the resolution of water into its elements, viz.—

2H,+0,=2H,0, and 2H,0 = 0, + 2H,,

do not take into account that in the one case a large amount of heat is developed, and that in the other case a corresponding amount of energy is expended. These equations merely represent, in fact, the distribution of weight in the changes, and therefore are but imperfect ex- pressions of what really occurs, since the devclopment of heat in the formation of water, and the absorption of heat, or the expenditure of a corresponding amount of some other form of energy in its decomposition, are integral parts of the changes, the amount of heat developed or ab- sorbed, under given conditions, being as definite and con- stant as the weights of the substances which enter into reaction and are produced. The same may be said of all equations employed to represent chemical change.

The composition of water may be determined by burn- ing a known weight of hydrogen in an excess of oxygen, and weighing the water produced; then the difference be- tween the weight of the hydrogen burnt and of the water produced is the amount of oxygen combined with the hy- drogen. Or hydrogen is passed over a weighed quantity of copper oxide in a tube heated to redness; the hydrogen then reduces the oxide or removes the oxygen from it, forming water, which is carefully collected and weighed, and the loss of weight which the tube of copper oxide suffers is carefully determined. The loss of weight of the copper oxide gives the amount of oxygen, and the differ. ence between this and the amount of water produced is the amount of hydrogen combined with this amount of oxygen.

The amount of oxygen combined with 2 parts by weight, or 2 atoms, of hydrogen is usually stated to be 16 parts, and 16 is generally regarded as the atomic weight of oxygen. But from the cxamination of the determinations which have been made by various elements of the com- position of water, Staas, to whom we are indebted for the most exact determinations of atomic

weights yet made, arrives at the conclusion that this number is too high, and that the atomic weight of oxygen is certainly not higher than 15°96. Thomsen has recently determined the amount of water produced by burning 2 litres of hydrogen in an excess of oxygen, and taking Regnault's numbers for the specific gravities of oxygen and hydrogen, he obtains a number for the atomic weight of oxygen which is in com- plete accordance with that given by Staas,

At the ordinary temperature of the air water is a clear, transparent, tasteless, and odourless liquid; it appears colourless when scen in small quantity, but that it really

has a pale blue colour is apparent when a shining white object is viewed through a column several feet in thickness.

Water is solid at temperatures below 0°C., 0° C. being the temperature at which frozen water or ice melts; the melting point is diminished by increase of pressure to the slight extent of 0°00757° C. for each additional atmosphere. Water expands in freezing, its density compared with water at 0° C. being 92. 'The conversion of liquid water at 0° C. into solid water or ice is accompanied by the libera- tion of heat, and heat is rendered latent or absorbed to the same extent in the melting of icc,—the quantity of heat absorbed or liberated in the melting of ice or freezing of water being sufficient to raise the temperature of 79 timcs its weight of water from 0° to 1°C.

Water evaporates at all tempcratures when in contact with atmospheric air or other gases, and the vapour given off has a density and tension determined by the tempera- ture; the tension of the vapour rapidly rises with the temperature, untilat 100° C. it is equal to the ordinary at- mospheric pressure (760 mn1.), and the water boils. The boiling point, however, rapidly rises with increase of pres- sure, and sinks when the pressure is diminished; thus under the pressure of two atmospheres water boils at 121° C., and under the pressure of twelve atmospheres at 190° C. When water

boils under the ordinary atmo- spheric temperature it is converted into 1600 times its volume of vapour. The conversion into vapour is attended with the absorption of a large amount of heat,—the quan- tity of heat absorbed or rendcred latent in the conversion of water at 100°C. into steam of the same temperature being sufficient to raise the temperature of 536 times the weight of water converted into steam from 0° to 1°C.

Water, chemically speaking, is a remarkably neutral substance, and hence its great value to the chemist as a solvent. There are very few substances which are not to some extent dissolved by it, but the solubility of different substances is very unequal. Heat generally increases its solvent power, whilst' cold diminishes it; there are many exceptions to this rule, however. The dissolution of sub- stances which may again be separated from the solution undecomposed is accompanied, in the majority of cases, with an absorption of heat, as will be evident on inspection of the table on p. 485. In the first column the name of the substance is given, and in the second its formula; the third exhibits the number of molecules of water (in grammes) in which one molecule (in grammes) of the sub- stance is dissolved at about 18°C.; the fourth column shows the number of units of heat developed or absorbed, the — sign indicating that heat is absorbed, and the + sign that it is developed.

It is extremely difficult to interpret the meaning of num- bers such as are contained in the table, especially as we are almost entirely ignorant of the condition of substances in solution in water. But there is no doubt that the heat developed or absorbed on dissolving a solid substance is the mean result of several distinct operations, which partly, perhaps, involve an absorption, and partly a de- velopment of heat. Thus, in the first place, there is a change of state from the solid to the liquid, which in most if not all cases involves an expenditure of encrgy; then, many substances on dissolving in water combine with it, the combination probably being always attended with de- velopment of heat. Contraction also generally takes placc in the dissolution of salts in water, and is accompanied by a, considerable development of heat, arising from the great resistance which water offers to compression. Chemists, moreover, are inclined to the belief that very many if not all substances, even those which are ordinarily regarded as stable in

presence of water, enter to a greater or less ex- tent into reaction with water when dissolved in it; a solu-

WYDROXIDES. |

tion of sodium chloride, for example, may be regarded as

containing a certain amount of sodium hydroxide and

hydrochloric acid formed by the reaction— Necl = OH, = HCl +

Sodium ehloride. Water. Hydroehlorie acid.

NaOH.

Sodium hydroxide. Table of Phenomena attending Solution of Salts in Water, | |

| No. of No. of units

of heat Name, | Formula. mols. of developed H a or absorbed ; | * | per moleeule, 1. Crystalline Chlorine, Bromine, and Iodine compounds, Lithium chloride ……..... | LiCl 200′ + 8,440 Sodium chloride…..... NaCl | 200 — 1,180 Potassium chloride …..... KCl a a Gi Sodium bromide…..... NaBr HANG) 150 Potassium bromide …..... KBr 200} — 5,080 Sodium iodide …..... Nal 200| + 1,220 Potassium iodide ……..... KI 200) — 5,110 Magnesium chloride …...| MgCl, 800 | + 35,920 Aluminium chloride …... Al,Clg 700 | +153,690 2. Nitrates, Sodium nitrate …..... NaNO, 200} -— 5,060 Potassium nitrate …..... KNO, 200} — 8,520 SUIVODMAL NALS eecaaesseceses AgNOs 200) — 5,440 Thallium nitrate …,..... TNO. 3800} -— 9,970 Barium nitrate …..... Ba(NO,), 400 | — 9,400 Strontium nitrate … .....) Sr(NO3), 400| — 4,620 leead mitrateieawesnedescers Pb(NOsz), 400 | — 7,600 3. Sulphates. Na,SO, 400 | – 60 { 50] — 17,460 : 100| — 18,130 Sodium sulphate …..... Na,S0,10H,0 | 200 |– 18,550 | 400 |— 18,760 { 600 |— 18,810 Potassium sulphate …..., K,SO, 400 |– 6,380 Magnesium sulphate …... MgSO, 7H,O 400 | — 38,910 CVG SULPHOLC ss c.ccaecsssse: ZnSO, + 7H,O 400; ~ 4,240 BLOT SUIPMATE ..6s6..ccc00< 00 FeSO, + 7H,0 400} -— 4,510 Nickel

sulphate….,..... NiSO, + 7H,O 800] ~ 4,250 Cobalt sulphate…..... CoSO, + 7H,O 800] ~ 8,570

The occurrence of reactions of this kind would in many cases involve an absorption, but in others a development of heat. The only two substances mentioned in the above table which develop heat to any extent when dissolved in water, it will be seen, are magnesium and aluminium chlo- rides. Both of thesc, however, are known to form com- pounds with water, and both probably enter to a very con- siderable extent into reaction with it in the manner above pointed out. It is even probable that the latter cannot exist as such when dissolved in water ; the development of so large an amount of heat is therefore readily understood. But at present we are unable satisfactorily to account for the difference observed between salts such as potassium and sodium iodides, which so closely resemble each other in most respects, one of which, it will be noticed, absorbs 5110 units, whilst the other develops 1220 units of heat when dissolved in water.

From this it will be obvious that the study of the con- dition of salts in solution is beset with difficulties ; the thermochemical method of investigation appears in most cases to be the only oue which is applicable, since the in- troduction of new substances at once introduces a new set of conditions, but on account of the complexity of the phenomena attending dissolution, even the results obtained by this method possess only a limited value, and at present only general conclusions can be drawn from them.

Water, as we have already stated, enters into combina- tion with oxides of many of the elements, forming two classes of compounds,—the acids, and the metallic

hydroxides or hydrates. The general properties and rela- tions of these two classes of compounds may with advantage now be discussed.

The monoxides of the highly positive monad elements cesium, rubidium, potassium, sodium, and lithium form with water easily soluble hydroxides,

which cannot be de- composed by heat ; their solutions are soapy to the touch, and restore the blue colour to vegetable infusions which have been reddened by an acid. These hydroxides arc usually termed alkalies,—a solution which has the power of restoring the blue colour to reddened litmus being said to exhibit an alkaline reaction. The term alkali is of Arabic origin, and was at first given to the crude sodium carbonate obtained from the ashes of sea-weed, a solution of which is soapy to the touch and restores the bluc colour to reddened litnius, and like the above-mentioned hydrox- ides also has powerful cleansing properties.

The hydroxides derived from the monoxides of barium, strontium, and calcium, which are less positive elements, also cxhibit an alkaline reaction, but they are not nearly so soluble in water; and, with the exception of barium hy- droxide, they are decomposed on iguition, yielding the oxide and water. None of the remaining positive ele- ments, except thallium, furnish soluble hydroxides which exhibit an alkaline reaction.

Similar differences may be observed betwecn the oxidcs of negative elements, which furnish acids when combined with water. Thus, the monoxide of the highly negative element chlorine readily dissolves in water, but the acid produced is exceedingly unstable; similarly, the acids de- rived from the oxides of nitrogen are soluble, but of low stability. The oxides of the less negative elements, sulphur and phosphorus, however, furnish very soluble acids, which exhibit considerable stability, being with difficulty resolved into the oxide and water.

The lower oxides of the most positive elements enter into combination with water in such proportions as to produce compounds containing an equal number of atoms of hydro- gen and oxygen ; for example, sodium monoxide and water furnish sodium hydroxide—

Na,O + OH, = 2Na0H;

Sodium monoxide. Water. Sodium hydroxide.

and barium oxide and water yield barium hydroxide— BaO + OH, = BaO,H, or Ba(OH)

9 ° Barium oxide. Water, Barium hydroxide.

Hence these hydroxides may be looked upon as combina- tions of the respective elements with the monad compound radicle (OH)’ or hydroxyl; and the various compounds obtained from the oxides of the remaining elements by the action of water may either be regarded as similarly constituted, or may be viewed as combinations of one or more OH groups with compound radicles formed by the union of the elements with oxygen. Thus, we may regard nitric acid, HNO,, as a compound of the two monad radicles, (NO,)’ and (OH)’; sulphuric acid, H,SO,, as a combination of the dyad radicle (SO,) with two OH groups; and phosphoric acid, H,PO,, as a combination of the triad radicle (PO) with three monad hydroxyl groups.

The number of OH groups which may be associated with a single atom of a given simple radicle or element, or with a compound radicle, entirely depends upon the nature of the radicle, but does not appear ever to exceed four ; the stability of the compound also varies with the radicle, the tendency to form stable compounds with OH being the greater the more positive the radicle. In the case of compounds of feebly positive radicles with several OH groups, there is always a tendency for the elements of one or more molecules of water to separate from the com- pound, thns producing a body which is to be regarded as

a combination of one or more OH groups with an oxygen- ated radicle. For instance, ferrie hydroxide, Fe,(OH),, very readily loses water, forming compounds such as Fe,O(OH), and Fe,0,(OH),.

Nearly all the bodies produced by the action of water on the oxides of the non-metals are to be regarded as compounds of oxygenated radicles with hydroxyl, and are more or less acid in character. As a rule, the more negative the radicle with which OH is associated the more powerful will be the acid, and since the addition of oxygen to the radicle renders it more negative, the acid furnished by the higher oxide of an element is usually more stable, and also a more powerful acid, than that furnished by the lower oxide ; thus, sulphurous acid, H,SO,, is extremely unstable as compared with sulphuric acid, H,SO,, and a much less powerful acid, but the former may be regarded as a com- bination of the dyad radicle (SO), and the latter as a com- bination of the dyad radicle (SO,), with twice the monad radicle (OH). The behaviour of the positive elements is exactly complementary of this, since the greater the amount of the negative element oxygen associated with them the less is the tendency to furnish corresponding hydroxides when combined with water, and the less the stability of the resulting hydroxides ; and, as a rule, also the basic pro- perties both of the oxides and of the hydroxides correspond- ing to them become much less pronounced as the relative proportion of oxygen increases,

In all cases in which oxides unite with water to produce stable combinations, much heat is developed ; the stability of the compounds formed by the combination of water with oxides, in fact, appears to be directly in proportion to the amount of heat developed in their formation, and it has been shown that the formation of many of the most unstable hydroxides from their elements would be accom- panied by an absorption of heat; hence their instability is readily understood.

When the hydroxides are added in sufficient quantity to solutions of the acids, mostly neutral solutions are pro- duced,—that is to say, solutions which do not affect either blue or red litmus. The acid is then said to be neutral- ized by the hydroxide, or vice versa. The basic oxides which

furnish hydroxides, and indeed the basic oxides generally, behave in a similar manner withacids, In these cases a salt is produced ; thus, by the addition of sodium hydroxide to sulphuric acid the salt sodium sulphate is ob- tained—

NaOH = H.80, =

Sodium hydroxide. Sulphuric acid.

Na.SO, + 2H,0O. Sodium sulphate. Water. Obviously, we may regard the salts produced in this man- ner as formed by the displacement of the hydrogen of the acid by more or less positive elements or simple radicles, and they may actually in many cases be prepared by the action of the metals on the acids; for example——

Zn + HSO, = H, +, Zn80,

Zinc. Sulphuric acid. Hydrogen, Zinc sulphate. They are also obtained, as we have seen, by the union of a more or less basic with a more or less acid oxide. But a large number of salts are known derived from the acids by the displacement of hydrogen by compound radicles ; thus, many of the salts of the element vanadium are formed by the introduction of the group (V,O,)”, which functions as a tetrad element, in place of the hydrogen of acids, vanadyl sulphate being (V,O,)’*(SO,),. The ammonium salts are formed in a similar manner by the displacement of hydrogen in acids by the monad compound radicle (N’H,Y. But the hydrogen of many hydroxides may also be displaced by positive elements or radicles ; for example, zinc hydrox- ide, although insoluble in water, dissolves in solutions of the alkalies, and on heating metallic zine with a concen-

trated solution of potassium hydroxide, it dissolves with evolution of hydrogen— Zn + 2HOK = Zn”(OK), + H,.

Zine hydroxide and similar compounds, therefore, display both basic and acid functions; and it is difficult to deny the compounds formed from them by introducing positive elements in place of hydrogen the title of salts.

Another class of oxy-salts are formed by the union of two different oxides of the same element; the compounds of fluorine, chlorine, bromine, and iodine with positive elements, and of acid with basic sulphides, are also termed salts, the compounds of sulphur being distinguished as sulpho-salts or thio-salts, whilst those of the four other elements are distinguished as haloid salts.

From this it will be obvious that the ‘term salé is of very wide application, and that it is almost impossible to define it in a few words. It is also extremely diffi- cult strictly to define an acid, for, although the very greatest difference is observable between the compounds of the oxides of highly negative and of highly positive elements with water, the differences become less and less marked as we pass from one end of the series to the other. The only definition which really separates bodies which are usually regarded as true acids from hydroxides pos- sessing acid properties is afforded by the fact that, whilst the hydrogen in all hydroxides which exhibit basic pro- perties may be displaced by negative and also in some instances by positive radicles, the hydrogen in acids can only be displaced by positive radicles. For example, the hydrogen in zinc hydroxide may be displaced by the posi- tive radicle potassium and by the negative radicle NO, , but it is only possible to displace the hydrogen in sulphuric acid by positive radicles. This definition is not applicable, however, to organic acids.

The extent to which hydrogen may be displaced in an acid by positive radicles is termed its basicity, an acid which contains a single atom of displaceable hydrogen being termed monobasic, and acids containing two or three atoms of displaceable hydrogen, dibasic or tribasic. On the other hand, the hydroxides and basic oxides are frequently spoken of as monacid, diacid, or triacid, &c., according as they are capable of neutralizing a single molecule, two, or three molecules of a monobasic acid; thus, sodium hydroxide is monacid since a single molecule neutralizes a single molecule of monobasic nitric acid, forming the salt sodium nitrate—

NaOH + HNO, = NaNO, +. OF,,

Sodium hydroxide, Nitric acid. Sodium nitrate. Water. and barium hydroxide is a diacid base since it neutralizes two molecules of nitric acid—

BaO,H, + 2HNO,= Ba(NO,), + 20H.

Barium hydroxide. Nitricacid. Barium nitrate. Water. But we may also regard the salts formed by the action of acids on hydroxides as derived from the latter by the displace- ment of hydrogen by negative compound radicles, —sodium nitrate, for example, as sodium hydroxide in which the atom of hydrogen has been displaced by the monad com- pound radicle NO,; hence we may define the acidity of hydroxides to be the extent to which hydrogen may be displaced in them by negative radicles.

In polybasic acids, that is to say, in acids containing two or more atoms of displaceable hydrogen, it is possible to displace the hydrogen step by step; thus, by the addi- tion of a single molecule of sodium hydroxide to a single molecule of sulphuric acid, only one-half the hydrogen in the acid is displaced—

NoOH FeO. = NaHSO, + .OH, Sodium hydroxide. Sulphuric acid. Sodium hydrogen sulphate. Water.

but by the addition of a second molecule of the hydroxide

| the second atom of hydrogen is also displaced—

AND SALTS. |

NaOH + NaHSO, = Na,SO, + OH,. Sodium Sodium hydrogen Sodium Wat hydroxide, sulphate. sulphate, ot

Salts derived from acids by the partial displacement of their hydrogen are termed acid salts, those in which the hydrogen displaceable by metals is entirely displaced being termed normal salts, Similarly, when the hydrogen in polyacid hydroxides is entirely displaced by negative radicles, normal salts are obtained, but when it is only partially displaced the so-called basic salts are produced, which bear precisely the same relation to the hydroxides that the acid salts bear to the acids. Thus, from the triacid hydroxide,

bismuth hydroxide, Bi’’(OH),, and the mono- basic acid, nitric acid, we obtain normal bismuth nitrate and two basic bismuth nitrates :—

NO, NO, NO, Bi NO, Bi J NO, Bi OH. \NO OH OH

Normal salt. Basic salts.

These salts are strictly*tomparable with the normal and

two acid salts produced from the tribasic acid, phosphoric acid, and the monacid hydroxide, sodium hydroxide :—

ONa ONa ONa PO < ONa PO ¢~ ONa PO < Os

ONa | OH OH Normal salts. Acid salts,

Two explanations may be given of the constitution of the salts formed by displacing the hydrogen in polybasic acids by polyad elements ; the formula of barium sulphate, for example, may be represented by either of the following

formulze :— One O.Ba.O $04 o> Ba, 80, { ae ee bso,

according as it is supposed that two atoms of hydrogen in a single molecule of the acid are displaced, or that two mole- cules of the acid are concerned in the formation of the salt, one atom of hydrogen in each being displaced by each of the barium atoms. There is not at present sufficient evidence to enable us to decide definitively in favour of one or the other of these views, but the great tendency which the polybasic acids exhibit to form double salts appears to render the latter the more probable.

‘The formation of salts by the action of acids on metallic oxides and hydroxides is in all cases attended with a development of heat. This subject has been very care- fully studied by several chemists, especially by Thomsen, whose results for a number of acids are given in the follow- ing tables. The amount of heat developed in the re-

a NaOH Ag. Otay

that is to say, on adding a solution of a molecules (in grammes) of sodium hydroxide to a solution of one mole- cule (in grammes) of the acid, represented by Q,—is given for a number of acids in the first of the following tables. The second table exhibits the amount of heat developed in the reaction— ; NaOHAgq, aQAq ;

ae, on adding a solution of one molecule of sodium hy- droxide to a solution of a molecules of the acid Q. Each molecule (in grammes) of sodium hydroxide was dissolved in 200 molecules (in grammes) of water, and the solutions of the acids were of equivalent strength; that is to say, the number of grammes of acid required to form a nermal salt with 23+16+1 or 40 grammes of sodium hydroxide were dissolved in 18 × 200 or 3600 grammes of water. The temperature at which the two solutions were mixed in all the experiments was about 18° C. The results are expressed in hundreds of heat-units, and according to Thomsen they may all be relied on within 1 per cent.

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(aNaOH Aq, QAg). Q=1 molecule. a Name of Acid. Formula, | 3 il 2 | 3 4 6 Monobasic Acids. Hydrochloric …. .. lal, ll 68°5 | 137 | 137 Hydrobromic …....| H. Br 68°5 | 137 | 187 Eliydimodi cients: Jets It 68 | 137 | 137 Hydrofiuoric …..... H.F 80 1163] 163 Hydrosulphuric….. i. SH 39 | ces Hydrocyanic..,..... HW. ON 14 28| 27 Hypochlorous …....) H. OCI 49 96} 96 NItliCn. tanec eee H.NO, 68 1137/1187 | Hypophosphorous…| H.PH,O, | 77 |152|153 | Metaphosphoric….. H. PO, 71 1144 ommicssn es omenete H ACEO; beg || ake Acetic wetter H.C,H,0,;66 |182)| 133 Dibasic Acids. Hydrofluosilicic….. H,. Sil’, 138 | 266 Hydrochloroplatinic| H,. PtCl, 136 | 272 272 | 273 SILUNDISHDTBLG pedooneeenae Hs SO) 71 {146/310 310 elec rere veniscsssies H,. Se0, 148 | 804 804 Chorev8lCccgaoo anode aC), 131 | 247 292 SulpWUrOus’.....<..++ H,. S80, 159 | 290 293 SGLEMMOUS cs c.0sscsee ise H,. SeO, 148 | 270 275 WOU OMME ettose 15s: Jag SHO}. ana || gel Phosphorous ..... H,.PHO, | 74 1148] 284) 289 Cambomlchervnstentes: H,. CO, ooo SLIGO hee || Be GIG fh seesevereses H,.B,O, |64 |111|200/205! ... | 206 (Shlbt@ cogonaponencand cos Eins n 52 43) 52)... | 54 SUZWANTIG, Soe GapoepandD: H,. Sn0O,

SOT cre | ee sorely iS Oeil Bheogoomenanedoe: H,.~~C,0, |69 |188/ 288) ... | 285 SHG@OTN soonenqenen doe HH; CO 124 | 242] ... | 244 MANUAL C wea cne es sas Hg. C,11,0¢ 124 | 253 | 258 Tribasic Acids. Oe es caries 05 Hy. OgH;0,| ... 250 | 382 416 Phosphoric …....+... Hy. FO, % 78 271 | 340 353 JASE, Gogagenapsseaee lslae AO) || 7! 276 | 359 374 Tetrabasic Acids. Pyrophosphoric….. H,. P,0, 144 | 286 527 | 554 (NaOHAq , aQ Aq). Q=1 molecule, | a Name of Acid. Formula, 2 1 $ | $ | 3 3 Monobasic Acids. Hydrochloric …..... H.Ol 137 | 187 | 68°5 Hydrobromic …..... H. Br 187 | 187 | 68°5 HEVOTIOMIC ... scacnaers H.I 136 | 1387 | 68°5 Hydrofluoric …..... 1 my 160 | 163} 82 Hydrosulphuric….. H.SH 77| 77189 Hydrocyamic,..... H.ON 28) 28) 14 ENITIOIG noacdepeee ne CucoEE H. NO; 136 | 187 | 68 Hypophosphorous…| H. PH,O, | 154 | 152] 76 Metaphosphoric….. H, PO, 142 | 144 FONG: sss creeiis ees H. CHO, we use PIORINOT ccc osiceres ss oe H.C,H,0, | 182 | 182 | 66 Dibasic Acids. Hydrofluosilicic….. H,. Sif, .» (188 1133 Hydrochloroplatinic He. BtCl, enlelsoulso «=: | 68) 46 SUIPHUMC .....6000008 H,.S0, 142 | 146 /155 Route Ve SOlEMMICH es cccessscene H,. Se0, Ape ee soa ay" sre [ae CHEGMMC.....14…..4.. EL… CxO, veo (HSL (Hee |... | Sulphurous…..... H,. SO, ... | 159 1145 poo i Sel@niOuUS. .... ccesssaee H,. SeO, .. | 148 1135 ae || Oo ID Thal guKONTNIE! Sacensuesooor 13 eee oe 'cutedlecseml ee Phosphorous …..... H,.PHO, |449| [46)iae 96 (Cieheoyobhiite | paugnoeconne HL, COs poo |) EIKO LL aoe |t Bal BOT GP ocsienetsectiaunen He. BO, | 120 | 111 eo ei] Gon | Be (SHIDO s0 >. cangapaedoneonc ihe ON 65; 43) 26 | ... | 135 SLAM. saiceeerie cee H,. Sn0, Perey Perel aed Zoo || Bel @xalicprer metre H,.C,0, {Cee esr |... | "al S:OVACWONO pandogedn Onno H,. CpEOilim:. 124 |121 ve. | Gel Pantin Creninres cco Hy. Cpl Oglers~~ opel lair 86 Tribasic Acids. Citnicks. .ccaccimmete H, (Co,,0> ... M24 bO5 | 127| ... |e Bhosphonemar cen Hig. POR ele | ehh DLS ay EUS | ame |t SO) PATSOTIC! cen eens sone H,. AsO, [147)150)1388 |120] ... | 62

Tetrabasic Acids. Pyrophosphoric….,| Hy.

144 (143

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To facilitate comparison between the various acids they are

[actps AND

the acid salt HF,Na; it differs also by its high heat of

arranged in the following table almost in accordauce with | neutralization.

the amounts of heat developed on the addition of sodium liydroxide to cquivalent quantities.

Units of heat

Q developed in

the reaction

(2Na0HAq, Name of Acid. | Formula, . QAq). Hydrofluoric …..... 2H. Fl 32,540 SMIPNUTIC ...08 6005s. iy. 80, 31,380 SLETIC ies aveiteatress +> H,. Sc, 30,390 Hypophosphorous… o(H. ‘PH, é ») 30,320 Sulphunouss:ee.cn.-s 3 28,970 Metaphosphoric….. o(l. : “PO,) 28,750 Phosphorous …..... H,. PEO, 28,370 Oxalie scoters ne ; : He C20n 28, 280 Hydrochleric ….°...| 2H. Cl 27,480 Hydrobromic …....| 2H. Br 27,500 Iie VOCTC Rive centers Zi. E 27,350 OhilOiiC.. wasn amet: 2H. ClO, 27,520 DEIC snes regen eerie, 2H. NO, 27,360 IDiGHTONIC veer et H,. 8,0 27,070 Selenious …..... H,.SeO, 27, 020 Chloroplatinic….. Hy. Ftcl, 27,220 Vivogibicic, ...c0s0000. H,. Sik, 26,620 SUL PHOVINIG oss 500 2(H . 80,C,H,) 26, 930 WORTMIUG ya, nienesiss ateeeiee 2(H. CHO,) 26,400 BIG ie caninevoinh Binee’ oH. C0.) 26,310 Pyrophosphoric ….. 4(H,. P,O,) 26,370 TOSPHOLIC 5.60%. » H;. POH 27,080 AFIODIC siisserescoerse| Mbyte 27, 580 MURS sisson vie thilvenyes $(H,. C,H;0,) 25,470 ARCTIC oir caiangs H,. ©,H,0, 25,310 WC CEDIE o0 scacpossienae H,. C0, 24, 160 Ghirongies jets sreceeers Onn 24, 720 COPDOMRG .25 care sorcte| – Bigs OO, 20,180 BORG 0. cadsmenanasodnds H,. BO, 20, 010 Hypochlorous. ... oH. od)” 19,370 Hydrosulphuric….. 2(—. SH) 15, 480 Hydrocyanic…..... (2. CN) 5,580 Sie yobUbKely cemeo ee crar ane 4(H,. Sn0,) 4, 780 ROTC is sciny coreorea ne [tarsiog | azto_ | 4(H,. S104) 2, 710

From these tables it will be evident—(1), that when a molecule of sodium hydroxide in aqueous solution euters into reaction with an acid, the heat developed is very nearly proportional to the quantity of acid present until this amounts to 1, 4, 4, or + molecule, according as the acid is mono-, di-, tri-, or tetrabasic; but that when the amount of acid added exceeds that requisite to form the normal salt, the diffcrent acids behave differently, heat being in sonie cases developed, and in others absorbed, according to the constitution of the acid; and (2), that mostly when a niolecule of an acid in aqueous solution entcrs into reaction with sodium hydroxide, the amount of heat developed increases almost in proportion to the amount of the'latter, and until 1, 2, 3, or 4 molecules are added, according as the acid is mono-, dl-, tri-, or tetrabasic ; the further addition of sodium hydroxide is not then attended with any considerable development of heat.

Very different amounts of heat, it will be observed, are developed on neutralizing the different acids, but there is mostly a remarkable similarity in the results obtained in the case of acids which from chemical evidence are known to be closely allied. Thus, hydrochloric, hydrobromic, and hydriodic acids exhibit the same heat of neutralization ; and the numbers for sulphuric and selenic acids, and for phosphoric and arsenic acids, are very similar. Hydro- fluoric acid, it will be seen, differs considerably from the allied monobasic acids since the addition of the first half molecule of sodium hydroxide produces less heat than the second, which is not improbably owing to the formation of

The tables show also that the dibasic acids may be divided into several groups, according to the amounts of heat developed on the addition of the first and second molecules of sodium hydroxide. The first group includes hydrofluosilicic and hydrochloroplatinic acids, the amount of heat developed by the second molecule of hydroxide being equal to that developed on the addition of the first molecule. 'The second group includes sulphuric, selenic, oxalic, and tartaric acids ; with these acids less heat is de- veloped by the first than by the second molecule ; thus :—

. F Sulphuric | Selenic Oxalic Tartaric Sodium hydroxide. acid. acid. acid. acid.

Ist Molecule 146 148 138 124 d 164 156 145 129

In the third group, which includes sulphurous, selenious, carbonic, and boric. acids, and probably also chromic, phosphorous, and succinic acids, the contrary is the case :—

Carbonic acid.

Selenious

Sodium hydroxide. acid.

110

Ist Molceule…..... 148 2d ect 92

rie)

The tribasic acids exhibit similar differences ; thus :-—

Sodium hydroxide,

Citric acid. | Arsenic acid. [Phosphoric acid

150 148 126 123 83 69

These differences which acids of the same basicity ex- hibit when submitted to thermochemical investigation correspond to differences in their chemical behaviour. For example, when a solution of citric acid is neutralized with sodium carbonate and evaporated to crystallization, the trisodium salt Na,C,H,O, is readily obtained, but when a solution of phosphoric or arsenic acid is similarly treated, the disodium salt Na,HPO, or Na,HAsO, is formed ; the trisodium salts of these acids can only be procured by adding sodium hydroxide. Apparently the trisodium salts of phosphoric and arsenic acids are par- tially decomposed by water, as their solutions are strongly alkaline; hence the third molecule of hydroxide does not effect the complete conversion of the di- into the tri-sodium salt. The behaviour of sulphuric acid will be discussed later on.

All soluble hydroxides when in solution appear to have neatly the same heat of neutralization, as will be seen from the following table, which exhibits

the number of units of heat developed on neutralizing solutions of equivalent quantities of various hydroxides with a solution of one molecule (in grammes) of sulphuric acid, or of the equivalent quantities (2 molecules) of hydrochloric or nitric acid at 18° C. :—

Sulphuric {Hydrochloric Name of hydroxide. ae . acid.

Nitric acid. Lithium hydroxide Sodium

Potassium Thallium

Barium

Strontium

Calcium

31,290 31,380 31,290 – 31,130

27,360 27,540 27,380 28,260

30,710 31,140

But very different amounts of heat are developed on dissolving the hydroxides which are insoluble in water in acids. The following numbers represent the heat of

HYDROXIDES. |

neutralization of various hydroxides insoluble mm water by a molecule of sulphuric acid —

Magnesium hydroxide… 10… ..ccccecee cccesesees 31,220 Manganese pe: | Sebbaiananosnaeennaanconncasdnocc 26,480 Niekel 6 sseseeevarans 39. sweian vioedun ye tae aliG Cobalt Meee Sicnuesese sty ert aausteee eee 24,670 Iron Py Ap poauman in np Pemerantirigcrisnercc onder 24,920 Cadmium EE Poeun ete ee 23,820 Zine bg) Ml ieSos caonctintensbabnon ptecdaausens 23,410 Copper 20 : 18,440

Thomsen, however, considers that the differences be- tween the amounts of heat developed when these hydrox- ides are dissolved in acids, and when soluble hydroxides are neutralized, are due to the heat absorbed in rendering them soluble; or in other words, that solutions of these hydroxides would have the same heat of neutralization as solutions of soluble hydroxides,

One of the most interesting results of the thermochemi- cal investigation of the behaviour of acids with metallic hydroxides is the proof that when sodium hydroxide, for example, is added to a mixture of two acids in insufficient quantity to neutralize both, the sodium salts of the two acids are seldom formed in the proportions in which the two acids are mixed. Thus, when a solution of 2 mole- cules of sodium hydroxide is mixed with a solution con- taining two molecules of monobasic nitric acid and one molecule of dibasic sulphuric acid, two-thirds of the sodium hydroxide enter into reaction with the nitric acid and one-third with the sulphuric acid. The avidity, as it is termed by Thomsen, of nitric acid to enter into reaction with sodium hydroxide is thus twice as great as that of sulphuric acid. The avidity of hydrochloric acid for sodium hydroxide is equal to that of nitric acid, but the avidities of hydrobromic, hydriodic, and hydrofluoric acids are less than that of hydrochloric acid in the proportion HCl: HBr: HI: HF=100 :89:79:5.

In concluding this brief account of the thermochemical behaviour of some of the acids and hydroxides, we may observe that the interpretation of most of the remarkable results to which we have alluded has not been given, The study of this branch of chemistry is yet in its infancy, and is beset with difficulties, but its importance can scarcely be exaggerated. At present we scarcely know more than that in the formation of a given substance a certain amount of heat is finally developed or absorbed, bnt in most cases we are ignorant of the value of one or more of the several distinct operations which we believe are involved in the reaction by which it is produced, so that the results given by different substances cannot as a rule be satisfactorily compared.

Many substances belonging to all classes of chemical compounds unite with water, forming combinations from which it may be again expelled by the

application of a greater or less degree of heat, and from the circumstance that many of these combinations are crystalline, the water is said to be present in the form of water of crystallization. Thus, potassium hydroxide crystallizes with 2 molecules of water, as KHO+2H,0 ; copper sulphate with 5 mole- cules, as CuSO,+5H,O; and sodium sulphate with 7 and with 10 molecules. The water may usually be ex- pelled from these compounds by the application of a gentle heat, and many salts part with their water of crystalliza- tion on exposure to the air; but others are not deprived of it, or more than a part, unless very strongly heated. Copper sulphate, for example, readily loses 4 of the 5 molecules of water with which it combines, but the remain- ing molecule is only expelled by heating to about 200° C.; 5 of the 7 molecules of water in crystallized magnesium sulphate are readily removed, and the sixth is expelled at about 150° C., but the seventh is retained at 200° C.

CHa Mis? RY

10)

The compounds containing water of crystallization are usually denied the title of atomic compounds ordinarily applied to combinations of two or more elements in which it is supposed the constituent atoms are all associated in a single molecule under the influence of the force which has received the name of chemical affinity, and in contra- distinction are termed molecular compounds, being regarded as combinations of two or more separate molecules. This, although perhaps true of many of the compounds contain- ing water of crystallization, is certainly not true of all, and notably of the sulphates which are only deprived of their water by heating to high temperatures.

Hydrogen Dioxide, H,O0, = 33°92.

This compound cannot be obtained directly from its elements, but there appears to be little doubt that it may be formed by the combination of oxygen with water, since it is produced in many cases of slow oxidation in presence of water, and particularly in processes where ozone is formed. It is produced in small quantity when water is decomposed by an electric current, especially when small electrodes are employed. Its formation in

this manner may be regarded as an oxidation of water, but it has been suggested that it is the direct product of electrolysis, and that the oxygen evolved is a secondary product derived from the decomposition of the hydrogen dioxide ; thus—

2H,0 =H,+ H,0,;

2H,0,= O,+ 2H,0. It is usually prepared from barium dioxide by double de- composition with hydrochloric or carbonic acid :—

BaO, + Plo) |i H,O, + BaCl,. Barium dioxide. Hydrogen ehloride. Hydrogen dioxide. Barium ehloride.

Hydrogen dioxide or peroxide is an exceedingly un- stable substance, and readily decomposes even in aqueous solution into water and oxygen, especially on heating. The solution is more stable if slightly acid. A. dilute solution may be concentrated by evaporation in vacuo over sul- phuric acid, and hydrogen dioxide was obtained in this manner by its discoverer Thénard as a colourless trans- parent liquid, of specific gravity 1:452, which did not freeze at — 30° C. ; it is doubtful, however, whether it has ever been prepared quite free from water. It did not redden litmus, but had a harsh bitter taste ; when placed upon the hand it instantly turned the cuticle white,

Hydrogen dioxide exhibits the closest resemblance to ozone. ‘Thus, it is decomposed by mere contact with finely- divided metals, such as silver, gold, and platinum, with evolution of oxygen. Like ozone it is a powerful reducing agent, entering into reaction with silver oxide, for example, to form water, oxygen, and metallic silver :—

H,0,+ Ag,O = H,0+ 2Ag+0,. 7 According to Fairley, about 37,000 units of heat are developed in the production of 32 grammes of oxygen by this reaction, which thus affords further proof of the strength of the affinity of oxygen for oxygen, as probably the heat developed is chiefly, if not entirely, due to the combination of the oxygen atoms. Many other oxides are reduced by it, either to the metallic state or to lower oxides, oxygen being evolved and water produced.

But hydrogen dioxide is also a powerful oxidizing agent. ‘Thus, it decolorizes a solution of indigo; it con- verts sulphurous acid, H,SOg, into sulphuric acid, H,SO, ; lead sulphide, PbS, into lead sulphate, PbSO, ; and many oxides into higher oxides. It decomposes a solution of hydriodic acid with separation of iodine :— |

H,0,+ 2HI=2H,0+],. With the aid of this reaction an important series of ex-

periments to ascertain the connection between the con- V. — 62

ditions of a chemical change and its amount have been made by Harcourt and Esson. The experiments consisted in adding successive equal portions of sodium hyposulphite to a solution containing hydrogen dioxide, hydriodic acid, and a little starch. By this reagent the iodine which is continually being liberated by the action of the dioxide on the hydriodic-acid is instantly reconverted into iodide, so that the liquid, though it contain starch, and though iodine is being formed in it, remains quite colourless as long as any hyposulphite is present. But when the last trace of hyposulphite has been removed by the action of the iodine, the portion of iodine next formed remains free, and the liquid becomes suddenly blue. The addition of another small portion of hyposulphite again removes the colour, and until all the hyposulphite is decomposed the solution remains colourless, and then again becomes suddenly blue. The intervals at which the blue colour appeared were carefully noted, and the amount of hydro- gen dioxide decomposed being known from the amount of hyposulphite employed, the quantity of dioxide decom- posed in a given time was thus determined. The observed results are given in the following table :—

Amount of | Te from the | Chemical Interval Bild | Pima” [aca inten 20°95 0:00 16:95 19°87 1 oe 14-95 31°68 1 Bon 12°95 45°23 “7 7-03 11°95 52°82 il 759 10°95 61°12 1 8°30

8°95 80°08 1 9°93 7-95 91°27 i Fels 6°95 103°88 1 12°61 595 118°50 1 14°62 4°95 135 °85 1 17°35 3°95 157°00 il 91°15 1:95 223°45 il 38°99 95 | 20113 1 ae

The general conclusion deducible from these experi- ments is, that the amount of change at any moment varies directly with the amount of dioxide present in the solution ; in accordance with this law, the quantities of dioxide at the end of a series of times taken in arithmetical progression are themselves in geometrical progression. This law of chemical action has been corroborated by the investigation of other reactions, and it is probably of very general appli- cation.

When hydrogen dioxide solution is mixed with a con- centrated solution of barium hydroxide, crystalline hy- drated barium dioxide, BaO, + 6H,O, separates—

H,O, + Ba(OH), = BaO, + 2H,0. Hydrogen dioxide. Barium hyg@apxide, Barium dioxide, Water.

In a similar manner, pe és of many metals are preci- pitated on the addition of their salts to a solution of hydrogen dioxide.

Hydrogen dioxide, it will be evident, differs remarkably from hydrogen monoxide or water. Its instability, and its tendency to enter into reaction with other bodies with separation of oxygen, appear to be explained by the fact that its decomposition into water and oxygen is attended with the development of a very considerable amount of heat. The behaviour of ozone and hydrogen dioxide, in fact, strikingly illustrates one of the most important laws of chemical action, viz., that those decompositions and

reactions which are attended with the development of heat always take place more readily than those which require an absorption of heat, and they take place the more readily the greater the amount of heat which is liberated. The heat developed by the decomposition of ozone and hydrogen dioxide, we have seen, is to be traced to the same cause, being due, it can scarcely be doubted, to the combination of the oxygen atoms.

FLUORINE—CHLORINE—BROMINE—JoDINE.

Fluorine, Symbol, F; Atomic wt., 19°1; Molecular wt., (?)

Chlorine, 45 Cl; s3 35°36 ; $ HO oe Bromine, Pe Br; 5 79°75 ; – 159°50. Iodine, a ie oe 126°58 ; i 25807

These four elements form with metals compounds analogous to sea-salt, and from this circumstance the name halogens, or salt-producers (from GAs, sca-salt), has been applied to them, their compounds with other radicles being frequently termed haloid compounds, They are always classed together on account of their close analogy in, pro- perties, but there are numerous and very important dis- tinctions between them.

The element fluorine is not known in the free state, all attempts to isolate it having failed on account of the im- possibility of obtaining vessels which can withstand its action. Chlorine is a gas of a greenish yellow colour, whilst bromine, at ordinary atmospheric temperatures, is a mobile red liquid, so deep in colour as to be almost opaque, and iodine is a black, crystalline, and very brittle solid, which exhibits metallic lustre.

None of these elements are ever met with in the free state, but their compounds are very widely distributed, and they are to be detected in most rocks and soils, in spring and sea-water, and in the ashes of plants and animals. Fluorine occurs most abundantly in combination with calcium as fluor-spar, and chlorine in combination with sodium as ordinary salt, large deposits of which exist in various parts of the globe; considerable deposits of bromine in combination with potassium have within recent years been discovered in Stassfurt, but no abundant source of iodine has hitherto been discovered.

Chlorine was discovered by Scheele in 1774, and was so named on account of its colour (from yAwpds, green), but its elementary nature was first established by Davy in 1810. Bromine was first described in 1826 by Balard, who obtained it from bettern, the mother liquor of sea- water, after the less soluble salts have been extracted by evaporation and crystallization ; it was named on account of its irritating odour (from Bpwos, a stench). Jodine was discovered by Courtois in 1811, in the waste liquors from the manufacture of sodium carbonate from the ashes of sea-weed ; it received

its namie from the beautiful violet colour of its vapour (ioedys, violet-coloured).

Chlorine is usually prepared, both in the laboratory and on the large scale, by gently heating a concentrated solu- tion of hydrochloric acid with manganese dioxide; the reaction appears to take place in two stages,—the first con- sisting in the formation of the manganese chloride corre- sponding to manganese dioxide—

MnO, + 4HCl = MnCl, + 2H,0;

Manganese Hydrochloric Manganese tetra- Water dioxide. acid. ehloride. pe:

but this compound is so unstable that it breaks up into chlorine and a lower chloride of manganese—

MnCl, = Cl + Mn(l,. Manganese tetra- Mangancse chloride. Chlorine. dichloride.

It may be procured directly from salt by acting on a mixture of salt and manganese dioxide with sulphuric

acid, but in this case hydrochloric acid is first produced by the action of the sulphuric acid on the salt—

NaCl+H,SO,=HCl+NaHSo,

The hydrochloric acid then enters into reaction with the manganese dioxide, as explained above, but the manga- nese dichloride is converted into manganese sulphate and hydrochloric acid by the sulphuric acid. The following equation therefore expresses the final result, but does not take into account that there are several stages in the re- action—

2NaCl + 3H,SO, + MnO, Sodium chloride. Swiphuric acid. Manganese dioxide. = Cl + 20H, + MnSO, + 2NaHSO,. 5 . Manganese Sodium hydrogen Chlorine. Water. sulphate. sulphate. §

Bromine and iodine are obtained in a precisely similar manner by treating the liquid containing the bromide or iodide with manganese dioxide and sulphuric acid.

Another process for the manufacture of chlorine has been recently introduced by Deacon, which consists in passing a mixture of hydrochloric acid gas and air through a heated brickwork chamber filled with pieces of firebrick or marble which have been soaked in a solution of copper sulphate and dried. The hydrogen of the hydrochloric acid forms water with the oxygen of the air, and chlorine is liberated, but the precise nature of the changes by which this is effected is not known, The reaction is at its maximum at a temperature of abont 500° C., which is much below that at which oxygen alone acts upon lydrochloric acid to form water and chlorine ; the copper sulphate is but little affected, although a certain amount is always transformed into chloride. There can be no doubt, however, that the decomposition is the result of recurrent action, and another somewhat similar method of obtaining chlorine may be quoted in illustration. Thus, when a mixture of silica and sodium chloride is heated to redness in a current of oxygen, chlorine is evolved, and the chloride is converted into silicate—

2810, + 4NaCl + O, = 2Na,SiO, + 2Cl,;

Silica. Sodium chloride, Oxygen. Sodium silicate, Chlorine.

but on passing hydrochloric acid gas over the silicate it is re-converted into the chloride and silica—

Na,SiO, + 2HCl = SiO, + 2NaCl + OH, Sodium silicate. Hydrochloric acid. Silfea. Sodium chloride. Water. Hence, by passing hydrochloric acid together with air over the mixture of silica and chloride, a continuous evolution of chlorine is obtained, reaction in the one direction having no sooner taken place than reaction in the opposite direc- tion sets in. ‘There can be little doubt that the produc- tion of chlorine by ‘Deacon’s process is,

in a similar manner, the result of a series of changes in opposite directions, the

nature of which, however, remains to be discovered.

Chlorine is very readily condensed by a pressure of about 4. atmospheres at 15° C., or by cold alone at about 50° C., into a yellow mobile liquid of specific gravity about 1°33, but it has not been solidified. Bromine has at 0° C. the specific gravity 3°188 ; it boils at 59°-5 C., yielding a dense red vapour, and solidifies at —24°°5 C. Iodine melts at 107° C., and boils at. about 175° C., yielding a magnificent purple vapour. Chlorine gas and the vapour of bromine and iodine have a pungent, irritating, disagreeable odour, and are irrespirable. Water at 10° C. dissolves about 2°5 times its bulk of chlorine, and about 3 per cent. of bromine, but iodine is very sparingly soluble in water. When chlorine is passed into a mixture of crushed ice and water a crystalline hydrate, Cl,+10H,O, is produced, and a similar compound of bromine, Br,+10H,O, may be gbtained, but iodine does not furnish a hydrate,

The halogens furnish with hydrogen compounds in which a single atom of hydrogen is united with a single atom of the halogen, viz. :—

Hydrogen fluoride or hydrofluoric acid, HF

i chloride ,, hydrochloric ,, HCl

_ bromide ,, hydrobromic ,, HBr

iodide ,, hydriodic a The conditions under which hydrogen and chlorine enter into reaction have already been described, and we have seen that no change of volume occurs in the formation of hydrogen chloride from its elements. A mixture of hy- drogen and bromine vapour does not explode on the application of flame, but hydrobromic acid is slowly formed when the mixture is heated ; hydriodic acid is also produced when iodine is heated in

hydrogen. Gore has shown that hydrofluoric acid may be prepared by heating silver fluoride in an atmosphere of hydrogen—

2AcF + H, = 2HEF + 2Ag; Silver fluoride. Hydrogen, Hydrofluoric acid. Silver.

and he finds that one volume of hydrogen in uniting with flu- orine produces two volumes of hydrofluoric acid gas, thus proving that the constitution of hydrogen fluoride is similar to that of hydrogen chloride, bromide, and iodide. Hydrogen chloride or hydrochloric acid is usually prepared by gently heating a mixture of sodium chloride or common salt and concentrated sulphuric acid, diluted with a small quantity of water—

NaCl + H,SO, = HCl + #£NaHSO,. Sodium ehloride. Sulphuricacid. Hydrogen chloride, Sodium hydrogen sulphate Hydrogen bromide and iodide cannot be, prepared in this manner from metallic bromides and iodides, as they are partially decomposed by concentrated sulphuric acid, bro- mine or iodine being liberated; this decomposition takes place much more readily with hydriodic acid than with hydrobromic acid—

2HI + HS80, = I, + SO, + 20H,.

Hydrogen iodide. Sulphuricacid. Iodine. Sulphur dioxide. Water. Hydrobromic and hydriodic acid are therefore usually prepared by the action of water on the compounds of phosphorus with bromine and iodine; thus—

PBr, + 3H,0 = 3HBr + _ PH,O, Phosphorus tribromide. Water. Hydrogen bromide. Phosphorous acid. PI + 3H,0 = 3HI + _ PH,O,. Phosphorus triiodide. Water. Hydrogeniodide. Phosphorous acid.

Hydrogen fluoride is procured by gently heating finely powdered calcium fluoride or fluor-spar with concentrated sulphuric acid in leaden or platinum vessels, or by strongly heating potassium hydrogen fluoride in a platinum re tort—

CaF, + H sO, = #HF + CaSO, Caletum fluoride. Sulphuric acid. Hydrogen fluoride. Calcium sulphate, HKF, a HF + KY.

Potassium hydrogen fluoride. Potassium fluoride,

The compounds of hydrogen with the halogens, or, as they are frequently termed, the haloid acids, are not only similar in composition, but they resemble each other very closely in properties. Thus, hydrogen chloride, bromide, and iodide at ordinary atmospheric temperatures are colourless transparent gases, which fume strongly in moist air, whilst hydrogen fluoride is a highly volatile colourless liquid, of specific gravity “988 at 12°-7 C., which boils at 19°-4C.; its vapour fumes strongly in moist air. At a temperature of 10° C., under a pressure of 40 atmospheres, hydrogen chloride is condensed to a colourless liquid of specific gravity 1:27, but it has never been solidified ; hydro- gen bromide and iodide are still more readily liquefied, and both may be caused to solidify, the former at — 73° C., and the latter at — 51°C.

The circumstances which attend the formation of hydro- gen chloride, bromide, and iodide from their elements, and

their general behaviour, show that the affinity of chlorine for hydrogen is much greater than that of bromine, whilst that of bromine is greater than that of iodine; and as already pointed out (p. 475), a considerable amount of heat is developed in the formation of hydrogen chloride, but a less amount in the formation of hydrogen bromide, and the production of hydrogen iodide from its elements involves the absorption of heat. We have seen, how- ever, that the heat developed or absorbed in the forma- tion of these compounds cannot be regarded as an abso- lute measure of the affinity of chlorine, bromine, and iodine for hydrogen, since there is an expenditure of energy due to the change of state, the three compounds being gases, but one being formed from two gases, the second from a gas and a liquid, and the third from a gas and a solid. Moreover, as we believe that the mole- cules which enter into reaction consist each of two atoms, the combination of the dissimilar atoms to form mole- cules of hydrogen chloride, bromide, and iodide must be preceded by the separation of the similar atoms which constitute the molecules of hydrogen, and of chlorine, bromine, and iodine,

and there must be an expenditurc of energy to effect this separation ; it appears probable that different amounts of energy are expended in separating the atoms of chlorine, of bromine, and of iodine from each other, and we may further assume as probable that the amount of energy expended in the separation of the atoms is greater in the case of chlorine than of bromine, and greater in the case of bromine than of iodine, although at present there is scarcely any experimental evidence which cnables us to draw conclusions of any value in proof of this. Hydrogen fluoride is miscible with water in all proportions, and much heat is developed on mixing the two substances ; hydrogen chloride, bromide, and iodide are also extremely soluble in water, forming colourless strongly acid solutions. Water at 0° C. absorbs *825 of its own weight, or about 492 times its bulk, of hydrogen chloride gas, increasing in volume about one-third, and acquiring a density of about 1:23. This saturated solution consists of hydrogen chloride and water in about the proportions indicated by the formula HCl + 3H,O; it fumes strongly, and when heated it gives off hydrogen chloride until at 112° C. a more dilute solution dis- tils over, corresponding approximately in composition with the formula HCl+8H,O. A weaker solution when heated parts with water until it acquires this composition, and then distils unchanged. In like manner, a solution con- taining about 48 per cent. of hydrogen bromide distils un- changed at 125° C., and a solution containing about 57 per cent. of hydrogen iodide boils constantly at 127°C. ; these solutions correspond approximately in composition with the formule HBr+5H,O and 2HI+11H,0. A solution of hydrogen fluoride approximately of the composition TF + 2H,0 distils unchanged at 120°C. Roscoe’s experi- ents have shown, however, that the composition of these solutions varies with the pressure, and that there exists for each pressure a solution of corresponding strength which undergoes no change in composition when distilled under this pressure, and therefore has a constant boiling point. Hence, the apparent constancy of composition cannot be regarded as proof of the cxistence of a definite hydrate corresponding in composition to that of the solutions ob- tained on distilling under a given pressure. There is no evidence, however, to invalidate, but much to support the conclusion that the haloid acids do not dissolve in water as such, but that they form definite hydrates ; and if it be admitted that their solutions contain definite hydrates, their behaviour is precisely similar to that of other com- pounds which decompose when heated, but

furnish pro- ducts which can reunite to form the parent compound, According to Thomsen’s determinations, the amounts of

heat developed when gaseous hydrochloric, hydrobromic, aud hydriodic acids are dissolved in water, in the propor- tion of 1 molecule of the acid to 400 molecules of water, are as follows—

In the dissolution of hydrogen chloride, 17,314 heat-units. bromide, 19,207 ., ,, we 2) ae} iodide, 19,207 99 99

The development of so large an amount of heat, al- though, doubtless, in a great measure arising from the change from the gaseous to the liquid state, may be regarded as evidence that the acids really enter into combination with water, and are not merely dissolved; it may be noticed also that the same amounts of heat are developed in dissolving hydrogen bromide and iodide, and that their solutions, which under the ordinary atmo- spheric pressure distil unchanged, have nearly the same boiling point, and correspond approximately in composition.

Solutions of hydrogen chloride and bromide may be preserved unchanged, but the solution of hydrogen iodide gradually becomes brown, especially on exposure to light, owing to the separation of iodine, the hydrogen being oxidized by the oxygen of the air—

4HI + O, = 281, + 9OH,. Hydrogen iodide. Oxygen. Iodine. Water.

On the other hand, solutions of chlorine or bromine in water may be preserved unchanged in the dark, but when they are exposed to light oxygen is evolved, and hydrogen chloride or bromide produced—

2Cl, + 20,0 = O, +

Chlorine, Water. Oxygen. Hydrogen chloride. A solution of iodine does not undergo alteration. In the presence of substances which have a tendency to

enter into reaction with oxygen, water is often readily decom- posed in this manner by chlorine and bromine without the aid of light, but iodine seldom effects this change ; thus, on passing chiorine into a solution of sulphurous acid, the latter is oxidized to sulphuric acid—

H,S0, + HO + Cl, = HSO, + 2HCl. Sulphurous acid. Water. Chlorine. Sulphuric acid. Hydrogen chloride. The bleaching action which is powerfully exerted by chlorine in presence of water, and less powerfully by bromine, is in most cases the result of a similar change, the substance bleached being usually one which has a tendency to enter into reaction with oxygen.

Chlorine readily displaces bromine and iodine from their compounds with hydrogen and other elements, and, similarly, bromine displaces iodine ; indeed the affinity of chlorine for other elements, with few exceptions, is superior to that of bromine, the affinity of bromine being in like manner superior to that of iodine. The decom- position of many chlorine compounds by the corresponding bromine and iodine compounds, and of bromine coni- pounds by the corresponding iodine compounds, would appear at first sight to be in contradiction to this state- ment, but on examination of all such reactions it is found that they involve a development of heat, and therefore are perfectly normal in character. For example, silver chloride is converted into silver iodide by digestion with an aqueous solution of hydriodic acid—

Ag(l+HI=Agl+HCl.

It will be obvious that, ina molecule of silver iodide and a molecule of hydrogen chloridc, the same quantity of the same elements is present as in a molecule of silver chloride and of a molecule of hydrogen iodide. But in the formation of the latter system from its elements, less heat is developed than in the formation of the former; hence reaction in the direction indicated by the above equation is attended with the development of heat. Thus, in the formation of a mole-

2? d) : 3)

4HCl.

cule of dissolved hydriodic acid from its elements 13,170 units of heat are evolved, and about 34,800 units of heat are developed in the production of a molecule of silver chloride; whereas 39,320 units of heat are developed in the formation of a molecule of dissolved hydrochloric acid from its elements, and about 18,650 units in the pro- duction of a molecule of silver iodide. But—

(34,800 + 13,170) — (18,650 + 39,320) = — 10,000 that is to say, the action of hydriodic acid on silver chloride is attended with the development of no less than 10,000 units of heat.

All metals which decompose water at a red heat or at lower temperatures decompose a selution of hydrogen chloride with evolution of hydrogen, and form the cor- responding metallic chloride, but with very different degrees of readiness ; thus—

Zo + ONC] = LE in), Zine. Hydrogen chloride. Hydrogen. Zinc chloride.

According to Thomsen, the amounts of heat developed in the production of 2 grammes of hydrogen by the action of various metals on a dilute solution of hydrogen chloride are as follows :—

Teens eee coises sucess coe 125,860 heat-units. TEtOAWISSMUNO0T cqpprmenaees concen obnor 235700) an -, SO GhI ONTO AABN sciornas otubesanenesee: 114,880 ,, 5 IW OMeSIUI y.. ccesve cesses sce 108,290 ,, re CAV UTMIMTUIss.., o ese ceensecccese 79,880 ,, if Mamoaneser…....c0-1 csseeee 49,360 ,, 5 WIG Seehoscaaca gape ete one 34,200 ,, 5 omen essereee POCA ED RAD AAR CARCOD Ze SIO) as 3 0/0551 07) (0 ane WL BLOT pe 3 eM er eesetaes ess tes scheinemes 4,130 ,, ne

Exact comparative observations of the degrees of readiness with which the various metals evolve hydrogen from a solution of hydrogen chloride have not as yet been made, but from ordinary observations it appears that those act most readily which develop the greatest amount of heat when dissolved.

It is very difficult to compare the behaviour of different metals, however, since minute quan-

tities of impurity exert a most remarkable influence ; thus, |

ordinary zine and iron dissolve with the greatest readiness in a dilute solution of hydrogen chloride, but the pure metals are only slowly dissolved.

Hydrogen bromide and iodide closely resemble hydro- gen chloride in their behaviour with metals; mercury, however, which is not affected by hydrogen chloride or bromide, slowly dissolves in hydrogen iodide. Hydrogen fluoride not only acts with great readiness upon all metals which are dissolved by the other haloid acids, but likewise on many which these acids do not attack,—copper and silver, for example; and it also dissolves many elements which are insoluble in all other acids, such as silicon, boron, titanium, tantalum, and zirconium, with evolution of hydrogen. Gore has shown that anhydrous liquid hydrogen fluoride and chloride are, in most cases, much less energetic in their chemical reactions than their aqueous solutions; this is probably because the products which are formed in the first instance, being insoluble or diffi- cultly soluble in the acid, form a coating on the surface of the substance submitted to the action of the acid, and thus preserve it from further action, or cause the action to take place more slowly ; when water is present the product is dissolved, and thus a fresh surface is continu- ally exposed,

The haloid acids readily enter into reaction with most metallic oxides forming water, and the corresponding compound of the metal with the halogen; thus—

ZnO + 2HCl = ZnCl, + OH, Zine oxide. Hydrogen chloride. Zinc chloride. Water. FeO, + GHCl = Fe,Cl, + 30H,.

Verric oxide. Hydrogen chloride. Ferric chloride. Water.

CHE MPa KY

Hydrogen fluoride is capable of dissolving some oxides, such as silica, SiO,, for example, which are not affected by the other haloid acids. It is in consequence easily dis- tinguished from the other haloid acids by the powerful corrosive action which it exerts on glass.

The haloid acids also readily enter into reaction with, or neutralize, the hydroxides, forming water, and the cor- responding fluoride, chloride, bromide, or iodide—

NaOH + HCl = NaCl + # 4,0; Sodium hydroxide. Hydrogen chloride. Sodium chloride. Water. Ba(OH), + 2HBr = BaBr, + 2H,0. Barium hydroxide. Wydrogen bromide. Barium bromide. Water.

The thermochemical behaviour of hydrochloric acid with hydroxides has already been discussed.

Chlorine enters into reaction with many of the elements at ordinary atmospheric temperatures, and with all of them, with few exceptions, at more or less elevated tem- peratures ; its union with phosphorus, and with finely divided arsenic, antimony, tin, and copper, is attended with combustion. Bromine and iodine closely resemble chlorine in their behaviour with other elements ; the union of bromine with other elements, however, appears always to take place less readily, and to be accompanied by the development of less heat than is the case with chlorine, and the affinity of iodine for most other elements is still weaker than that of bromine. The iodides also are usually less stable than the corresponding bromides, which are usually less stable than the corresponding chlorides. The com- pounds of the halogens with metals and with positive elements generally are mostly stable in presence of water, but their compounds with negative elements are mostly decomposed by water, and the halogen separated in the form of haloid acid.

The same element does not always enter into combina- tion with chlorine, bromine, and iodine in the same proportions ; thus, phosphorus forms a stable trichloride, PCI,, and an unstable pentachloride, PCl,; a stable tri- bromide, PBr,, and a pentabromide, PBr,, less stable than the pentachloride; but with iodine it forms the com. pounds PI, and P,I,. Many elements furnish compounds with fluorine containing a higher proportion of fluorine

than corresponds to the amount of chlorine in their highest chlorides, or they form stable fluorides but unstable chlorides, bromides, and iodides ; for example, phosphorus pentafluoride, PF,, is not decomposed by heat, whercas the pentachloride, PCl,, is readily resolved into the tri- chloride and chlorine by heating.

The halogens do not only combine with hydrogen and other elements, however, but they are capable of forming compounds with each other. Thus, by the action of iodine on silver fluoride, Gore has obtained iodine pentafluoride, IF';, as a colourless highly volatile liquid ; iodine at once enters into reaction with chlorine, and is first converted into liquid iodine chloride, IC], but ultimately yields iodine trichloride, ICl,, which is a crystalline solid ; with bromine iodine appears to furnish only a liquid mono- bromide, IBr. In like manner, bromine forms with chlorine a liquid bromine chloride, BrCl.

On account of its great affinity for hydrogen, chlorine readily enters into reaction with a large number of hydrogenized carbon compounds, and displaces the hydro- gen more or less completely. Thus, methane, CH,, when submitted to the action of chlorine, is successively con- verted into mouochloromethane, CH,Cl, dichloromethane, CH,Cl,, trichloromethane, CHCl,, and tetrachloromethanc, CCl,,—the displaced hydrogen being evolved as hydrogen chloride. Bromine behaves similarly, but enters into such reactions much less readily ; iodine seldom, if ever, behaves in this way.

AQ4,

Compounds of the Halogens with Oxygen.

Oxides of flucrine are unknown, and the oxides of the remaining halogens are very imperfectly investigated. Three oxides of chlorine have been prepared, viz. :—

GLO, CYOgyeand CQ, Mypochlorous Chlorous Chlorine anhydride.
anhydride. peroxide.

At ordinary temperatures these compounds are greenish- yellow gases, remarkableon account of theirinstability, being decomposed with explosive violence by very slight elevations of temperature. Their instability is accounted for by the circumstance that their decomposition is attended with the development of a very considerable amount of heat ; thus, according to Thomsen, the formation of gaseous hypo- chlorous anhydride from its elements would involve the absorption of 18,040 units of heat per molecule, and con- sequently this amount is developed when the anhydride is resolved into its elements. The explanation of the absorption of heat in the formation of the oxides of chlorine would appear to be that more energy must be expended in separating the atoms of oxygen from each other, and in scparating the atoms of chlorine from each other, than is produced by the combination of the chlorine and oxygen atoms,

Oxides of bromine are also unknown, and since thermo- chemical investigation has shown that oxygen has less affinity to bromine than to chlorine, their non-formation in reactions corresponding to those by which the oxides of chlorine are produced is no longer surprising.

Iodine differs entirely from chlorine and bromine with regard to its affinity for oxygen. Only one oxide of iodine is known, viz., iodic anhydride, I,O;, but this is a white crystalline substance of considerable stability, and, accord- ing to Thomsen's determination, the formation of this com- pound from its elements would involve the development of uo less than 44,860 units of heat per molecule. It has not been directly produced from its elements, although its formation in this manner is not improbable.

Chlorous anhydride is prepared by passing dry chlorine gas over dry mercuric oxide—

2HgO + 2Cl, =Cl1,0 + Hg,O0Cl, .

It may be condensed by surrounding the receiver with a mixture of ice and salt, and thus obtained as a deep red liquid which emits a vapour of a deeper colour than that of chlorine, having a peculiar suffocating chlorous smell. It is with the greatest readiness decomposed into chlorine and oxygen, the warmth of the hand being sufficient to cause it to explode. Water dissolves

about 200 times its bulk of the gas, forming a pale yellow solution of hypo- chlorous acid, which has an acid but not soir taste—

Cl,O +H,0 = 2HOC1.

By neutralizing this solution with metallic hydroxides or carbonates corresponding metallic hypochlorites are formed, but these salts are usually prepared by passing chlorine into water in which the metallic hydroxide or carbonate is suspended or dissolved, the liquid being carefully cooled—

2KOH + Cl, = KOC] + KCl + O8,. Potassium ke Potassium Potassium hydroxide. Chlorine. hypochlorite. chloride. Water

A concentrated solution of hypochlorous acid decom- poses rapidly, even when kept in ice; a dilute solution is more stable, but is decomposed by boiling into chloric acid, water, chlorine, and oxygen. These substances arc probably. the products of several distinct changes, such as are represented by the following equations—

2HOCI O3 + 2HCl 3HOCI HO,Cl + 2HCl.

Hypochlorous acid. Chloric acid. llydrogen chloride. Hypochlorous acid, however, readily decomposes hydro-

chloric acid, aud the chlorine produced is probably the result uf reaction between these bodies—

HCl+HOCI=Cl, + OH,.

Hypochlorous acid is a very powerful oxidizing agent, and rapidly converts many of the elements into their highest oxides, at the same time liberating chlorine; indeed, in many respects it is not unlike ozone and hydrogen

dioxide in its chemical behaviour, and it euters into reaction with the latter in the manner represented by the equation—

HOC]+H,O,=0,+HC1+H,0.

Like chlorine, it possesses powerful bleaching properties. The hypochlorites also act as bleaching agents, probably by yielding oxygen to the substance submitted to their action, but less powerfully than the free acid.

The bleaching powder or chloride of lime of commerce is prepared by exposing slaked lime or calcium hydroxide to the action of chlorine gas. There has becn much dis-

cussion among chemists as to the constitution of the

compound so produced, and it is only quite recently that evidence has been obtained which enables us to pronounce a decision. The composition of bleaching powder is represented by the formula CaCl,O, whereas calcium hypochlorite would be represented by the formula CaCl,O,; it was therefore supposed that the bleaching powder was a mixture of calcium chloride and calcium hypochlorite, since CaCl, +CaCl,O,=2CaCl,O. Appar- ently, however, it is a distinct compound intermediate between calcium chloride and calcium hypochlorite, thus—

Cl Cl (OCI)

Ca} Gy » Cason) + “joc: . Calcium chlorohypochlorite. Calcium

Calcium chloride. (iiendiline Podge). hypddhorite: ;

and its formation from calcium hydroxide may be repre- sented by the following equation—

OH Cl Ca { Ont Cl, =Ca { (oon +OHs-

On dissolving in water, according to Kingzett, it is resolved into calcium chloride and calcium hypochlorite, which may be obtained in crystals by carefully con- centrating the solution in vacuo, so that a solution of

bleaching powder is correctly regarded as a solution of calcium hypochlorite—

cat CA OC]

1 2

20a 4 6a = CaCl + Cay ogy: Bleaching powder. Calcium chloride. Calcium hypochlorite.

Solutions of hypochlorites are very unstable, and when boiled they furnish a mixture of chloride and chlorate ; thus—

3KOCI = Potassium hypochlorite. It is on this account that it is necessary in preparing hypochlorites to act on a cold solution of the hydroxide, since if the solution be heated chlorate is formed by the decomposition of the hypochlorite.

The chlorates are very stable compounds as compared with the hypochlorites. They may be obtained well crys- tallized, and are all soluble in water. They are destitute of bleaching properties. The most important chloratc is potassium chlorate, KC1O,, which is chiefly interesting as a source of oxygen, and is largely employed in the manufacture of fireworks ; the resolution of this salt into oxygen and potassium chloride is attended with a develop- ment of heat amounting to 9700 units per molecule decomposed.,

By exactly decomposing a solution of barium chlorate with sulphuric acid, a solution of chloric acid, HC1Og, is obtained, which may be separated from the insoluble

foe +

Potassium chlorate.

2KCl.

Potassium chloride.

barium sulphate by filtration, and concentrated by evapo- ration in vacuo until it forms a syrupy liquid :— Ba(ClO,), + H,SO, = 2HCI1O, + BaSO,. Chloric acid has a faint chlorous odour, and a powerfully acid reaction; it is instantly decomposed by contact with organic matter, with charring, and frequently even with ignition, In diffused daylight it gradually undergoes spontaneous decomposition, and when heated to a little above 100° C. it is rapidly converted into perchloric acid, water, chlorine, and oxygen— 8HClO, = 4HClO, + 2H,O + 30, + 201. Chlorie acid. Perehloric acid. Water. Oxygen. Chlorine, It is a powerful oxidizing and bleaching agent.

Chloric acid serves for the preparation of the remaining oxides and oxy- acids of chlorine. To prepare chlorous anhydride from it, 10 parts of pure benzene are dissolved in 100 parts of concentrated sulphuric acid, and when the mixture has cooled 12 parts of pulverized potassium chlorate are added. The chloric acid liberated from the chlorate under these circumstances is deprived of a por- tion of its oxygen by the benzene, which is oxidized, and at the same time, by the dehydrating influence exerciscd by the sulphuric acid, the elements of a molecule of water are removed and chlorous anhydride is liberated ; thus—

2HCl1O, – 0, – OH, = C1,0,.

The mixture is heated to about 50° C. in a flask having a delivery tube fitted to its neck by grinding, and blown out in several places into small bulbs; the gas, after passing through water contained in these bulbs, is con- ducted into a glass tube surrounded by a mixture of ice and salt. The condensed liquid deposits crystals of a hydrate of chlorous acid, and the supernatant liquid decanted immediately into a small cooled glass cylinder forms the nearly anhydrous oxide Cl,O,. Liquid chlorous oxide or anhydride thus obtained is very mobile, is of a decp red colour, and has a specific gravity of 1:330 to 1:387 at 0° C.; it boils a little above 0° C., and it explodes some- what readily at a few degrees above 0° C. The specific gravity of the gaseous oxide accords with that required by the formula Cl,O,. Chlurous anhydride is not very soluble in water, 100 grammes of water at 23° C. dissolv- ing 5°65 grammes of the oxide (Brandau). The solution of chlorous acid, HClO,, thus obtained, has powerful bleaching and oxidizing

properties; when it is heated, chloric and hydrochloric acids are formed and chlorine evolved. By neutralizing the solution with hydroxides of the alkali or alkaline earth metals corresponding chlorites are obtained, which arc soluble; and from these the insoluble chlorites of lead and silver are obtained by double decomposition. Chlorites are decomposed by the feeblest acids, even by carbonic acid.

When fused potassium chlorate is carefully treated with concentrated sulphuric acid, chlorine dioxide or peroxide is evolved ; the reaction by which it is produced, it is stated, is represented by the following equation—
dKCIO; + 2H SO, = 2010, + H,0 + KCIO, + 2KHSO,. Potassium Sulphurie Chlorine Water, Potassium Potassium chlorate. acid. peroxide. perchlorate. hydrogen sulphate. The so-called euchlorine gas, which is obtained when a mixture of a chlorate and hydrochloric acid is gently heated, appears to be a mixture of chlorine peroxide with chlorine. Chlorine peroxide is gaseous at ordinary tem- peratures, but by mcans of a mixture of ice and salt it may be condensed to a red liquid. It has a deep greenish- ycllow colour, and peculiar sweet chlorous odour ; a slight degree of heat and mere contact with organic matters at once determine its explosion. Like all the oxides of chlorine, it acts rapidly upon mercury and most metals. From Pebal's recent experiments there appears to be no

doubt that chlorine peroxide is correctly represented by the formula ClO,, and it is, therefore, to be included with nitric oxide and the few other compounds in which we must suppose an odd number of affinities are free (sec p. 473). It is absorbed by alkaline solutions, forming a niixture of a chlorite and a chlorate—

2010, + 2KHO = KCIO, + KCI1O, + OH,.

Chlorine Potassium Potassium Potassium Water

peroxide. ehloride, chlorate, ; In this respect especially it differs from the other oxides of chlorine.

The only remaining chlorine compound to be considered is perchloric acid, HC]O,. It may be formed from chloric acid by oxidation, but, according to Roscoe, the best method of preparing it consists in boiling down a solution of chloric acid; lower oxides of chlorine escape, and a solution of perchloric acid is left. It may also be ob- tained from potassium perchlorate, formed by heating potassium chlorate, by distilling it with sulphuric acid.

Aqueous perchloric acid may be concentrated by boiling till it attains a temperature of 203° C., after which it passes over in the form of an oily liquid which approximately has the composition HClO,+2H,O. By distilling this hydrate with twice its volume of sulphuric acid, ncarly pure perchloric acid is obtained.

The pure acid is a colourless very soluble liquid, of specific gravity 1°782 at 15°5 C. In this state it is one of the most powerful oxidizing agents known ; a single drop brought in contact with charcoal, wood, or almost any organic substance, immediately causes an explosive combustion, which in violence almost equals the sud- den decomposition of the so-called chloride of nitrogen. It produces frightful burns if allowed to fall upon the skin. It undergoes spontaneous decomposition at ordinary tem- peratures, and cannot be distilled unchanged. It unites very energetically with water, and when mixed with it in suitable proportions forms the hydrate HC1O,+ H,O ; this is a white crystalline substance, which melts at 50° O., and undergoes decomposition when heated to 110° C., splitting up into the pure acid and the oily hydrate above men- tioned.

Aqueous perchloric acid has a sour taste, and reddens litmus strongly, but does not bleach ; it dissolves iron and zine with evolution of hydrogen, and when dilute it is unaffected by hydrogen sulphide and sulphurous acid, which reduce all other oxy-acids of chlorine. Perchloric acid, in fact, is distinguished from all other oxidized chlo- rine compounds by its superior stability, oxygen being withdrawn from it with comparative difficulty.

The results of Thomsen’s thermochemical examination of various reactions which are involved in the formation ot some of the oxidized chlorine compounds are exhibited in the following table. The symbols in the first column indi- cate the nature of the reaction, and the numbers in the second column the units of heat developed or absorbed,—the reaction being

supposed to take place between the substances of which the symbols are separated by commas. Thus, the

line Cl,,O -18,040 Gaseous oxide

is to be read as meaning that, in the formation of a mole- cule (in grammes) of gaseous chlorine oxide from chlorine and oxygen, 18,040 units of heat would be absorbed. Similarly, the reaction Cl,O, Aq, that is to say, the absorp- tion of gaseous chlorine oxide by water is attended with the development of 9440 units of heat; hence the reaction Cl,,0, Aq, or the formation of a solution of hypochlor- ous acid (two molecules) from chlorine, oxygen, and water would involve the absorption of 8600 units of heat. For these, as in all Thomsen's experiments, the determinations were made at about 18° C.

hydroxide.

| | Units of heat'

" Reaction. developed or Remarks. absorbed. Jd ¢ Cl, O — 18,040 oe oxide. ; 3 8 Absorption of gas by : Cho ee + 9,440 } pare Formation of aqueous S Cl,, 'OF Aq eeecerecce =) 8, 600 acid. ra a ; S | C1,0,H, Aq…... | +29,880 ae Se : Onl c CIOHAg, KOHAq| + 9,980 | Heat of neutralization. Formation of aqueous CHR Os AG, sss — 20,480 acid from ehlorine, oxygen, and water. Ditto from ehlorine, oxy- (OW, hy 1805 God + 23,940 gen, hydrogen, and : water. '3 | ClO,HAq, KOI Aq |; +18,760| Heat of neutralization. Be; WON, Bocas. – 10,040} Heat of dissolution. |-24 KCl, Oy…..0,.....| — 9:770| Oxidation of dry KCI. = Formation of erystalline | ct | K, Cl, Oy…. ..... | +95,840 |< KClO, from its ele- | | ments. os Oxidation of in : | HOIAg, 04 -...cs0e: ~ 15,380 aa oe e Oxidation of KCl in { KCIAq, O).....| 15,370 ae

In this table, and in all similar tables, the reactions are represented empirically, and the figures after the symbols mercly indicate the number of atoms which entcr into the composition of the compound. Thus, the reaction ex- pressed as Cl, ,O, merely refers to the formation of a mole- cule (in grammes) of hypochlorous anhydride, Cl,0, from chlorine and oxygen, and the arrangement of the symbols in this manner is not intended to indicate

that the com- pound is formed from a molecule of chlorine and an atom of oxygen. The symbol Aq is intended to indicate that an excess of water is employed, 7.¢., such an amount that no appreciable development of heat would be caused by the addition of a further quantity.

When bromine is added to an aqueous solution of sodium hydroxide, sodium hypobromite, NaOBr, is formed, but this is much less stable than the corresponding hypochlorite, and is readily converted into bromate and bromide. The bromates and bromic acid resemble the chlorates and

chloric acid, but are much less stable ; thus, a solution of

bromic acid is decomposed at 100° C., giving off bromine and oxygen, and all reducing agents decompose it with facility. The inferior stability of the oxidized com- pounds of bromine as compared with those of chlorine appears to indicate that the affinity of bromine to oxygen is less than that of chlorine; this is entirely confirmed by thermochemical investigation, Thomsen having obtained the following values for bromic acid :—

a Formation of the aqueous acid from Bin I Fei! bromine, oxygen, and water. ier Formation of the aqueous acid from BrjO;;H ye = hale aes its elements. BrH Aq, O,, =-15,960 Oxidation of hydrobromic aeid.

KOH Aq, BrO,HAq= +18,750 Heat of neutralization.

When iodine is added to solutions of alkaline hydroxides or carbonates, alkaline hypoiodites corresponding to the hypochlorites are perhaps formed, but as yet have not been isolated. By dissolving iodine in a warm solution of potassium hydroxide a mixture of potassium iodide and lodate is produced—

3, + 6KHO =

Iodine. Potassium hydroxide.

LOUGH oh

Potassium iodate.

dKI + 30H,. Potassium iodide. Water, Iodine is converted into iodic acid by heating with the strongest nitric acid, and by the action of many other oxidizing agents ; but iodic acid is usually prepared from barium iodate, which is decomposed with the necessary

quantity of sulphuric acid. Potassium iodate is most

readily prepared by passing chlorine into water in which

iodine is suspended until the latter is dissolved, then adding a corresponding quantity of potassium chlorate and warming ; the iodine is converted into monochloride, which enters into reaction with the chlorate, and chlorine is evolved KClO, + IC1= KIO, + Cl, . By adding a solution of barium hydroxide, insoluble barium iodate is precipitated, from which, as pointed out, iodic acid may be prepared.

Iodic acid separates from its solution on spontaneous evaporation in crystals of the composition HIO,; when heated to 126° C. these crystals lose water, and appar- ently form the compound H1,O, or HIO, +1,0, ; at about 170° C. this compound is resolved into water and iodic anhydride, I,0,. Jodic anhydride is a crystalline sub- stance, which readily dissolves in water, forming iodic acid ; when heated to about 370° C. it is resolved into oxygen and iodine. Iodic acid is a powerful oxidizing agent, being easily decomposed by deoxidizing agents; hydriodic acid reduces it to iodine and water—

HIO, + 5HI = 31, + 3H,0.

The chlorates and bromates are mostly easily soluble, and the corresponding salts are isomorphous; but the iodates are mostly difficultly soluble, and with the cxcep- tion of barium iodate, are not isomorphous with the cor- responding chlorates and bromates. Moreover, chloric and bromic acids furnish but one class of salts, of which potassium chlorate, KC1O,, is typical ; but iodic acid, in addition to the normal iodates, such as

potassium iodate, KIO,, forms acid salts. These differences appear to in- dicate that iodic acid differs in constitution from the other acids, and Thomsen has pointed out that it is probably a dibasic acid of the formula HI,I,O,, since it is readily converted into water and the anhydride I,O0,, a property which is characteristic of dibasic but not of monobasic acids; and since it furnishes acid salts, which is also characteristic of polybasic but not of monobasic acids, and is isomorphous with succinic acid, which is dibasic. Normal potassium iodate would therefore have the formula K,I,0,, and the so-called diiodate is probably the acid salt KHI,O,.

This view of the constitution of iodic acid is rendered the more probebie by the behaviour of periodic acid, the disodium salt of which separates as a crystalline powder on passing chlorine into a solution of sodium iodate and sodium hydroxide ; the reaction is empirically represented by the equation —

NalO, + 3NaOH + Cl, = Na,IH,0, + 2NaCl. Sodium iodate. Disodium periodate. To prepare the acid from this salt, it is dissolved in nitric acid, and silver nitrate added; the precipitate of disilver periodate is dissolved in hot dilute nitric acid, and the solution concentrated ata moderate heat until a salt of the composition AgIO, crystallizes out. By treating this salt with cold water it is decomposed, disilver periodate and periodic acid being produced :— 2AgIO, + 40H, = Ag JH,O, + H,1O, ;

to obtain the latter the solution is evaporated.

Periodic acid separates from its aqueous solution in colourless crystals of the composition H,IO,, which are not altered at 100° C., but melt at 130° C., and when heated to a higher temperature give off water and oxygen, leaving iodic anhydride.

Periodic acid furnishes a complex but extremely in- teresting series of salts. Thus, it forms two potassium salts, one of which has the composition KIO,, and is ob- tained on passing chlorine into a solution of potassium iodate and potassium hydroxide ; the second is represented

by the formula K,1,0,, and is obtained on dissolving the former in potassium hydroxide solution. The latter crystallizes with 9 molecules of water, which, however, it loses when exposed over sulphuric acid. Corresponding sodium salts exist. That which has the composition NalO, crystallizes either in the anhydrous state, or with 3 molecules of water, which it readily loses in dry air; the second salt, the formation of which was above described, separates in crystals of the composition N a,1,0,+2H,0, and is only rendered anhydrous by heating to 220° C. Three silver salts are known, represented by the formule AgIO,, Ag I,0,+3H,O, and Ag.IO,; the second of these loses 2 molecules of water at 100° C., but the third only at 200° C. The barium salt Ba,I,O, separates in the anhydrous state from strongly acid solutions, but when prepared by precipitating a solution of the acid with barium hydroxide, or of an alkali salt with a barium salt, it contains 6 or 7 molecules of water, which are only completely removed by heating to 300°C. It also furnishes a lead salt of the composition Pb,I,0,,+2H,O, and amongst other magnesium salts one of the composition Mg,I,0,, , which crystallizes with 6 and with 9 molecules of water.

The question now arises—What is the nature of the relation between these various ‘salts? By the chemical method alone it is extremely difficult, if not impossible, to decide, but from Thomsen’s thermochemical investigation of the acid there can be little doubt as to the answer we should make to this question. When successive molecules of potassium hydroxide are added to a solution of 1 wolecule of the acid H,;IO, the amounts of heat evolved are as follows :—-

On the addition of the lst molecule, 5,150 heat-units.

” 2d ” 21,440 ” alt) 3d Ne) 3,150 +o : 4th and 5th ,, 2,300 a

The first and second molecules, therefore, together cause the development of 26,590 units of heat, or of 13,295 units per molecule. But we have seen (p. 486) that on neutralizing a large number of acids, between 13,750 and 13,150 units of heat are developed per molecule of hydroxide added ; and as the addition of further quantities of the hydroxide causes a comparatively slight development of heat there is little doubt from these results that the molecule H,IO, is dibasic. But on account of the existence of salts, such as K,1,0, , it appears desirable to double this formula, and to represent the

molecule of periodic acid by the formula Hf,.1,0,,H,. Several of the salts above alluded to may be regarded as derived from this molecule by the partial or total displacement of the hydrogen by metals ; and we may term those which are formed by displacing 4 of the 10 atoms of hydrogen normal salts, while those in which 2, 4, or 6 of the remaining atoms of hydrogen are displaced inay be called basic salts. Thus we have— Normal salts. Na,'. I,0,.H, ; Ag,'. 1,0,.H, Basic salts. ;

Pb," .1,0,,H,Pb"; Mg". 1,0,,H»Mg."; Ag,'. 1,0,,Ag,'. That the tendency to form basic salts is slight in the case of the highly positive elements is also shown by the small amount of heat developed on the addition of the third, fourth, and fifth molecules of potassium hydroxide.

The anhydrous salts such as K,I,O, are to be regarded as derived from a distinct acid formed from the molecule H,.1,0,,H, by the withdrawal of the elements of 3 molecules of water. The salts, such as KIO,, which on account of its isomorphism with potassium permanganate, K,Mn,O,, is more probably represented by the formula K,L0,, are, it may be supposed, also derived from a distinct acid, formed in a similar manner by the with-

drawal of the elements of a fourth molecule of water ; these salts have the same empirical composition as the per- chlorates, and as potassium perchlorate is isomorphous with the compound K,I,0,, it is probable that it corre- sponds with it in composition, and that perchloric acid therefore is represented by the formula H,Cl,0,. If this conclusion be correct, and chloric acid be correctly repre- sented by the formula HClO, , we have an explanation of the great difference which is observed in the properties of these two acids. Perchloric acid, we have seen, has a great tendency to combine with water, and its hydrates may be regarded as distinct acids, the liquid hydrate bear- ing the same relation to the acid H,C1,0, that crystallized periodic acid bears to the hypothetical acid H,1,0,, from which salts such as K,I,0; are derived. Basic per- chlorates corresponding to the basic periodates are not known, but a cuprammonium salt anda lead salt have been obtained which apparently are derived from the crystalline

hydrate of perchloric acid, the latter having the composition Pb’Cl,0, + TbH,O, or rb CLO @meeb «

It will have been noticed that the amount of heat deve- loped on the addition of the first molecule of potassium hydroxide to the solution of periodic acid regarded as H,IO, is much less than is usually observed with other acids, and the amount developed on the addition of the second molecule much greater; the two molecules together, however, produce an effect comparable with that observed in the case of other acids. But the salt produced on passing chlorine into a solution of potassium hydroxide has the composition K,I,0,, so that the first action of potassium hydroxide on a solution of the acid H,. 1,0,,H, apparently does not merely consist in the direct displacement of hydrogen in this acid by potassium; the elements of four molecules of water are also withdrawn, and since this latter operation involves the absorption of heat, the amount of heat finally developed in the reaction is but small. On the addition of a further quantity of hydroxide, however, change in the reverse order is effected, and hence the normal amount of heat is developed by the combined action of the two molecules of hydroxide. It is interesting also to observe that more heat is developed on adding the third than by the fourth and fifth molecules of hydroxide together, and to contrast this with the circumstance that the silver salt Ag,I,O,.H, loses the elements of two molecules of water at 100° C., but the elements of a third only at 200° ©. Apparently there is a tendency on the part of potassium hydroxide to enter into reaction with the acid after the production of the normal salt K,I,0,,H,; but salts con- taining a relatively larger proportion of potassium evidently cannot exist except in solution, and even then only to a limited extent.

We are now in a position also to explain the formation of sodium periodate by the action of chlorine on a solution of sodium iodate and sodium hydroxide. We have learnt that the action of chlorine on the latter is to produce sodium hypochlorite, and that this is a powerful oxidizing agent—

NaOH + Cl,=NaOCl+ HCl, and there can be little doubt, therefore, that the iodate is

at first oxidized by it, and converted into the salt Na,I0,; thus—

Na,I,0, + 2NaOCl=Na,I,0,-+ 2NaCl.

In presence of sodium hydrate and water, however, this salt is at once converted into the normal periodate—

Na,I,0, + 2NaOH + 21,0 = Na,I,0,,H, .

The following are the results of Thomsen's thermochemi- cal examination of iodic and periodic acids :— V. =Gs

Reaction. Units of heat. Remarks. j Formation of the anhy- ove O) qleudetianpopenicacttese 44,860 dride from its ele- l ments. — Ea POGNes osvciies tans 43,070 Do. in aqueoussolution.

' leds adn " ~ Heat a dissolution of

KO); «, JG Sapepeneeooae – 1,790 the anhydride. a= Formation of the acid 3 Te ble. aay aeet a se 57,880 from its elements.

1 By 55,710 Do. inaqueous solution. = | A ile ect Heat of dissolution of 4 | 103H , Aq flalosefetalelecertietere7a = O70 the acid. "

Combination of the an-

j 1205, HyO …... ses + apd hydride with water.

Oxidation of dissolved | THAq ' O; elelovevcieteieisie valet 42,540 hydriodic acid. | KOHAq , 1O,;HAq… 13,810 Heat of neutralization. 85.780 Formation from the { 1, 06 ry Hg eee eee il yf elements. LOB, 5 Gh csci.. sca – 1,880 Heat of dissolution. Formation in aqueous | bOpHs, Aqe.nen| 184,400 — Sj leO is Fg Adic cas cesses 47,680 eve sanante Ss) xidation of dissolve 9) Wiha Qyncssscaro 34,510 te Moan a Formation from the Ff Lo Ops, igh mnapesions viens 27,000 elements in aqueous solution. 10,H;Aq , KOHAq 5,150 tf aifs (1OsH; Aq, 2KOHAy 26,590 Heat of neutralization.

It will be noticed that the amounts of heat developed in the formation of these two acids in aqueous solution from their elements are very simply related ; thus—

(I,, 05, H,, Aq) =111,420 heat-units or 3 × 37,140 (I, Og, Hs, Aq) =184,400 ,, ,, 5× 36,880

Again, both acids are easily decomposed by hydriodic acid, yielding water and iodine, and a similar simple rela- tion obtains between the amounts of heat developed in the two reactions—

(,0,H,Agq , LOH TAq) = 167,040 heat-units, or 5 × 33,408 (1O,H Aq, THIAg) =133,770 » 4× 33,442

The analogous decomposition of chloric acid by hydro- chloric acid would involve the absorption of 30,920 units

of heat, whilst that of bromic acid by hydrobromic acid | would be attended with the development of 101,520 units |} – ling bismuth in colour ; it is very brittle; its specific gra- | vity is 6‘1 to 6°33, and it conducts heat and electricity,

of heat; the difference between these numbers, 132,440, is almost equal to the amount evolved in the decomposition of periodic acid, and on comparing the several reactions it will be evident that the differences between the amounts of heat evolved are approximately simple multiples of a common constant ; thus—

Chi d — Differences, oric aci = ~ 30,92

Bromic ,, = + 01,5204 192440 Jodic nm = + 167,040 65, 520 Periodic ,, = + 183,770 88, 270

The differences are thus to each other as 4:2:1. The meaning of this remarkable relation is at present unknown.

Without further description, it will be obvious that whilst chlorine, bromine, and iodine and their compounds exhibit very considerable general resemblance, yet there are many most important differences between them; and also that chlorine is much more closely related to bromine than is the latter to iodine.

SuLPHUR—SELENIUM—TELLURIUM.

Sulphur, Symbol, 8; Atomic wt., 31°98. Selenium, st Se; if 79. Tellurium, ,, Te; a 128.

These three elements are usually classed together, since most of their compounds with other elements are of the

game type. In some respects they resemble each other closely, but in others they differ very widely,—selenium being much more closely related to sulphur on the one hand than to tellurium on the other.

Sulphur occurs native in most volcanic districts; it is also found abundantly in combination with metals, such as copper, iron, lead, and zinc, and it is widely distributed in the form of sulphates of barium, calcium, magnesium, and strontium ; it is a necessary constituent of animal and vegetable tissues.

Selenium is of rare occurrence, and is always met with in combination with other elements ; it is frequently asso- ciated in minute proportions with sulphur in its ores. Tellurium is also a rare element; it is occasionally found native, but generally in combination with various metals, such as bismuth, copper, lead, gold, or silver, and it is usually accompanied by selenium.

Sulphur is a very brittle solid of a lemon-yellow colour, insoluble in water, and therefore tasteless. It is a bad conductor of heat, and a non-conductor of electricity. Its specific gravity in the native crystalline state is 2°05. Sulphur melts at 115° C., and at 120° C. is converted into a perfectly limpid pale yellow liquid; but as it is gradu- ally heated it becomes darker and more viscid until, at 200°-240° C., it is so thick that the vessel in which it is contained may be inverted without any outflow taking place. At 250°-300° C. it again liquefies, but does not become so fluid as when first melted, and at 440°C. it boils, yielding an orange-coloured vapour.

The density of sulphur vapour at 1000° C. is 32 times as great as that of hydrogen at the same temperature; so that as the atomic weight of sulphur is 32, the molecules of sulphur at this temperature are diatomic; but at about 500° C. its density is three times as great, so that at this temperature its molecules must be regarded as hexa- tomic.

Selenium is a deep brown-coloured brittle solid, of the

| specific gravity 4°5 in the crystalline state; like sulphur,

it is insoluble in water. It boils at a temperature below ared heat, and gives off a deep yellow vapour, the density of which at about 1400° C. is such as to show that it con-

sists of diatomic molecules, but at lower temperatures,

like sulphur, its molecule is more complex. Tellurium is much like a metal in appearance, resemb-

though not very readily. It melts at about 500° C., and at a high temperature is converted into’a yellow vapour, the density of which at 1440° C. is such as to show that the molecule of tellurium at this temperature is diatomic, No tendency has hitherto been observed on the part of tellurium to form a more complex molecule in the manner characteristic of selenium and sulphur; and it is noteworthy also that, whereas the density of sulphur vapour at temperatures not far removed from its boiling point is three times as great as at much higher temperatures, the density of selenium vapour under similar circum- stances is only about one and a half times as great as at about 1400° C,

Sulphur is chiefly remarkable for the great number of aldo- tropic forms in which it can exist. Thus, native sulphur is found crystallized in rhombic octahedra of the specific gra- vity 2°05. This variety melts at 114°-5 C.; it is readily soluble in carbon disulphide, the sulphide of chlorine, §,Cl,, benzene, turpentine, &c., and sulphur is usually deposited in this form on spontaneous evaporation of its solution in carbon disulphide; it is, in fact, the stable form into which all other allotropes tend to change. When, how-

ever, melted sulphur is allowed to cool slowly it crystal- lizes in transparent, yellowish-brown, monoclinic prisms, of

¥

lower specific gravity, viz, 1°98, but of higher melting point (120° C.) ; in the course of a few days, although the

crystals maintain their prismatic form, they become opaque,

and, on examination, are found to be converted into aggre- gations of minute octahedrons. This change of prismatic into octahedral sulphur is attended with the development of a considerable amount of heat, which is especially notice- able when the conversion is caused to take place rapidly by scratching the crystals. The transformation of the octahe- dral variety into the prismatic takes place at about the melt- ing point of the former, a transparent crystal of octahedral sulphur being converted into an opaque mass of prismatic crystals when heated for some time to a temperature of 105°-115° C. ; also, when a saturated solution of sulphur in hot turpentine is allowed to cool, crystals of prismatic sul- phur are at first deposited, but aftcr a time, when the liquid has become comparatively cool, the crystals which separate are octahedral.

Prismatic sulphur is soluble in carbon disulphide and other menstrua which dissolve the octahedral modification ; another modification, which is also soluble, but destitute of crystalline form, is obtained on addition of acids to solu- tions of alkaline polysulphides—

KS, + 2HCl= 48 + HS + 2KCl.

Potassium Hydrogen Hydrogen Potassium pentasulphide. chloride. sulphide. chloride.

It has a greenish-white colour, and constitutes ordinary milk of sulphur; by keeping, it becomes gradually con- verted into octahedral sulphur. Sublimed

sulphur, or flowers of sulphur, is probably closely allied to this form, but always contains a small proportion of insoluble sul- phur.

When sulphur is heated to 260°-300° C. and then poured in athin stream into cold water, it is converted into the so-called plastic modification, and is obtained as a soft yellowish-brown semitransparent mass, capable of being drawn out into fine elastic threads. In this state sulphur has the specific gravity 1:95, and is insoluble in carbon disulphide; in the course of a few hours, however, it again becomes brittle and almost entirely reconverted into the octahedral modification, the change being accompanied by the development of heat.

When the chloride of sulphur, §,Cl,, is decomposed by water, it furnishes sulphur, hydrochloric acid, and thio- sulphuric acid; the sulphur thus obtained is amorphous and insoluble in carbon disulphide, but is converted into octahedral sulphur by fusion, or by exposure for some time to a temperature of 100°C. Thiosulphuric acid also gra- dually decomposes into sulphur and sulphurous acid, and if a solution of a thiosulphate is decomposed by hydro- chloric acid—

Na,S8,0, + 2HCl =

Sodium Hydrogen

Sulphur,

S + H,SO, + 2NaCl.

Sulphurous n ; thiosulphate. chloride. aeid. Sodium chloride.

the sulphur which separates is soluble in carbon disul- phide, but is obtained on evaporation of the solution in an amorphous condition, and cannot then be again dis- solved in carbon disulphide; it is stated, however, that if the hyposulphite is decomposed by dilute sulphuric acid, the sulphur which separates is insoluble in carbon di- sulphide. When a solution of ordinary sulphur in carbon disu] phide is exposed to sunlight, an amorphous insoluble modification separates; the reconversion of this modifica- tion into octahedral sulphur is attended with the absorp- tion of heat.

Several minor modifications of sulphur have been de- scribed, but it is not known whether the differences which they exhibit are inherent, or whether, as is not improbable, they are due to the presence of impurity.

There appears to be a relation between the modification formed in a reaction and the compound or compounds from

which it is obtained, since, generally, the sulphur separated from compounds in which it is associated with positive elements is soluble, whilst that separated from compounds in which it is associated with negative elements is insoluble in carbon disulphide; but the conditions under which the sulphur is separated doubtless exercise an important in- fluence.

At present we have no knowledge as to the manner in which the various allotropes are related to each other ; it has been suggested, however, that the differences between them are at least in some cases due to differences in mole- cular composition.

Several] allotropic modifications of selenium are also known, but a tendency to form allotropes has not been observed in the case of tellurium.

Three principal modifications of selenium, corresponding to the three principal modifications of sulphur, may be distinguished, viz., (1), black crystalline selenium, of specific gravity about 4°80, which may be placed by the side of the octahedra] variety of sulphur, being the form in which selenium separates when solutions of metallic selenides are exposed to the air, and since all other modifications are converted into it when heated to about 150° C. ; (2), red crystalline selenium, of specific gravity 1°46 to 1°51, which probably corresponds to monoclinic sulphur, as it has the same

crystalline form, and may be obtained by rapidly cooling melted selenium ; and (3), red amorphous selenium, of specific gravity about 4°3. This last corresponds to the amorphous allotrope of sulphur, and, as in the case of sulphur, it occurs in two modifications, the one soluble and the other insoluble in carbon disulphide. Black crystal- line selenium, unlike octahedral sulphur, however, is in- soluble in carbon disulphide, but the red crystalline allo- trope is soluble, although to a much less extent than sulphur. The conversion of these modifications of selenium into each other is attended with development or absorption of heat, just as in the case of sulphur, and the melting points of the severa] modifications are different. Thus, if amorphous selenium, which melts a few degrees above 100° C., be heated to about 96° C., it quickly becomes crys- talline, the change being attended with considerable rise of temperature, and the melting point rises to 217° C. The electrical conductivity of selenium is found to vary in a remarkable manner with the temperature, and is also in- fluenced by light. Amorphous seleniuni is a non-conductor up to 80° C., but from this temperature up to 210° C. its conductivity gradually increases, after which it again diminishes. Selenium which has been kept for several hours at 210° C. and then gradually cooled is especially sensitive to the influence of light, its conductivity increas- ing with the intensity of the light.

Sulphur, selenium, and tellurium form gascous com- pounds with hydrogen, analogous in composition to water :—

HS Hydrogen sulphide. H,Se Hydrogen selenide. H,Te Hydrogen telluride.

Hydrogen sulphide may be produced directly from its elements by passing hydrogen gas into boiling sulphur, but it is always prepared by the action of a solution of hydro- chloric or sulphuric acid on a metallic sulphide, that of iron being commonly employed—

FeS + 2HCl = H,9 Ferrous sulphide. Hydrogen chloride. Hydrogen sulphide. The compounds of selenium and tellurium with hydrogen are obtained in a similar manner from metallic selenides and tellurides. Hydrogen and selenium also directly enter into reaction ; the quantity of hydrogen selenide formed is apparently a function of the temperature; it increases from 250° to 260° C., and decreases regularly from the latter point to 700° C,

40 FéCi,.

Ferrous chloride.

200

Hydrogen sulphide, hydrosulphuric acid, or sulphuretted hydrogen gas, is transparent and colourless; it possesses a most offensive odour, and cannot be breathed with im- punity, frequently giving rise to nausea and vertigo even when much diluted. It may be condensed by powerful pressure to an extremely mobile liquid, which solidifies when cooled in a bath of solid carbon dioxide and ether to « white transparent mass, which melts at 85°C. Hydrogen sulphide is readily inflammable, burning in air with a blue flame, and forming water and sulphur dioxide—

28H, + 30, 280, + 2H,0. Hydrogen sulphide. Oxygen. Sulphur dioxide. Water.

Most metals when heated in the gas decompose it, a metallic sulphide being produced, and hydrogen liberated. Hydrogen sulphide dissolves in water, a saturated solution containing about three times its volume of the gas; the solution has the odour and taste of the gas, and a slight acid reaction. It is gradually decomposed on exposure to the air, sulphur being deposited—

28H, + O, = 28 + 20H,. It is decomposed in a similar manuer by nearly all oxidiz- ing agents, and by the action of chlorine, broniine, and iodine—

SH, +Cl,=2HC1+8.

Iodine, however, cannot decompose the gas at ordinary temperatures except in presence of water. This is because the reaction requires an absorption of heat. Thus, in the production of a molecule of hydrogen sulphide from hydro- gen and sulphur in the state in which it separates when hydrogen sulphide is decomposed by iodine, 4500 units of heat are developed ; but in the production of a molecule of hydriodic acid from its elements, 6009 units of heat are absorbed, so that the reaction indicated by the equation HoS+1I,=2HI+S would involve the absorption of 4500 + 2 × 6000 = 16,500 units ofheat. That it takes place in presence of water is due to the fact that

the dissolution of the hydriodic acid produced is attended with the develop- nent of 2 × 19200 = 38,400 units of heat ; hence, when the reaction is effected in a dilute solution, heat is developed to the extent of 38,400 — 16,500 = 21,900 units of heat. But it is found that the reaction takes place the less readily as the concentration of the solution increases, and that it ceases when the solution has attained a specific gravity of 1:56 at ordinary temperatures ; in more concentrated solu- tions sulphur even dissolves with production of hydrogen sulphide and liberation of iodine. A simple explanation of this apparently anomalous result, however, is afforded by the observation that the heat developed by the absorp- tion of equal quantities of hydriodic acid is less as the quantity of acid already dissolved in the water is greater. The amount of heat developed, therefore, diminishing as the quantity of hydriodic formed by the reaction in the liquid increases, at a certain point becomes equal to that absorbed in the decomposition of the hydrogen sulphide by the iodine, and the reaction ceases since it can no longer be attended with a development of heat,

This behaviour of iodine with hydrogen sulphide alone, or in presence of water, is one of the most striking illustra- tions of the fact that reactions involving the expenditure of energy cannot take place directly, and are only possible when the conditions are such that one or more of the pro- ducts of the reactions enter into secondary reactions, so as to cause the development of more heat than is absorbed in the primary reaction.

The hydrogen in hydrogen sulphide may be displaced by metals,—the compounds formed by displacing one-half the hydrogen being termed sulphydrates or hydrosulphides, whilst those in which the whole of the hydrogen is dis- placed are termed sulphides. These two classes of com-|

pounds correspo mnetallic oxides respectively, and in many respects closcly resemble them ; the sulphur compounds, however, are, with few exceptions, far less stable than the corresponding oxygen compounds,

to the metallic hydroxides and the

Hydrogen sulphide enters directly into reaction with the metallic hydroxides, exchanging its hydrogen for the metal ;

for example—

NaSH + HOH.

Sodium eo hydrosulphide. Water.

It therefore exhibits the behaviour of an acid. From Thomsen's experiments it appears that 7740 units of heat are developed on the addition of a solution of one molecule of sodiuni hydroxide to a solution of one molecule of hydrogen sulphide, and that the further addition of the hydroxide is without effect. Hydrogen sulphide is thus proved to be a monobasic acid, and this result also shows that wheu soluble sulphides, such as sodium sulphide, are dissolved in water, double decomposition occurs, thus: Na,S + OH, = NaSH + NaOH, just as when sodium oxide, for example, is added to water: Na,O+OH,=2NaOH. Itis uncertain, however, whether the decomposition of the sulphides by water in this manner is complete, or whether it is only partial, and the more complete the greater the quantity of water present,

The highly positive metals lithium, sodium, potassium, calcium, strontium, barium, and magnesium form soluble sulphides and hydrosulphides, but most of the sulphides of other metals are insoluble. The nature of many of the compounds precipitated from metallic solutions by hydro- gen sulphide or an alkaline hydrosulphide is not well established ; but in many cases apparently they are inter- mediate in composition between the hydroxides and hydro- sulphides ; the precipitate formed on the addition of an alkaline hydrosulphide to a solution of a zinc salt, for example, is probably a compound of this kind, and may be represented by the formula HO. Zn.SH, —ziuc hydroxide being HO, Zn.OH, and zine hydrosulphide HS: Zn. SH. The solutions of salts of heavy metals, such as mercury and lead, furnish precipitates of the corresponding sulphides with hydrogen sulphide or alkaline hydrosulphides.

The hydrosulphides of certain elements, such as alumi- nium and chromium, cannot exist in presence of water, but enter into reaction with it with evolution of hydrogen sulphide ; hence, on the addition of an alkaline

hydro- sulphide to solution of their salts, the corresponding hydroxides are precipitated :—

Al,Cl, + 6NaSH Al,(SH), + 6NaCl

Aluminium Sodium Aluminium Sodium chloride. hydrosulphide. hydrosulphide, chloride,

Al,(SH), + 60H, = Al(OH), + 6SH,. Aluminium Water Aluminium Ilydrogen hydrosulphide. . hydroxide. sulphide.

Sulphur unites with all the metals and with most of the non-metallic elements ; the sulphides are therefore usually prepared directly from their elements. Two classes of sulphides corresponding to the basic and acid oxides may be distinguished, but the distinction between them is much less marked than that between the two classes of oxides, The sulphides of the non-metallic elements and the sulphides of arsenic, antimony, tin, molybdenum, tungsten, vana- dium, gold, and platinum, which are soluble in solutions of alkaline hydrosulphides, belong to the class of acid sul- phides, and the remaining sulphides are basic. These two classes of sulphides are capable of uniting together to form sulphur salts, just as the basic and acid oxides combine forming oxy-salts. Asa rule, the sulphides and oxides of the same element have similar formule and correspond in their general behaviour, Occasionally there are oxides to which there are no corresponding sulphides, but more fre-

NaOH + HS = Sodium Hydrogen hydroxide. sulphide.

quently sulphides to which there are no corresponding oxides. All sulphides are decomposed more or less readily by hydrochloric acid gas, hydrogen sulphide and a chloride being produced, and in some cases sulphur is also liberated. Many of the sulphides which are decomposed when heated in an atmosphere of hydrochloric acid gas are little, if at all, affected by a boiling solution of the acid.

Hydrogen selenide and telluride closely resemble hydro- gen sulphide in properties, but are far less stable com- pounds, ‘The former has a most offensive acrid odour, iinpairing or even destroying the sense of smell for several hours, and producing inflammation of the eyes. Their aqueous solutions are decomposed on exposure to the air with separation of selenium and tellurium respectively; and with solutions of salts of most metals they produce precipi- tates of the corresponding selenhydrates or selenides and tellurhydrates or tellurides. The selenides and the tellu- rides, like the sulphides, may be formed by the direct combinatiou of their elements, and are usually so prepared; in their general behaviour they resemble the corresponding sulphides.

A higher sulphide of hydrogen is known of which the composition has not yet been satisfactorily determined, owing to the difficulty of obtaining it in a pure state; but as it is obtained on adding a solution of potassium penta- sulphide, K,S,, to a dilute solution of hydrochloric acid, and is formed without evolution of hydrogen sulphide or separation of sulphur, it appears most probable that it is the pentasulphide H,S,. It separates as an oily liquid, heavier than water, possessing a peculiar sulphurous dis- agreeable odour; it is soluble in water. It is a very unstable substance, undergoing decomposition into hydrogen sulphide and sulphur with great facility ; this decomposi- tion is instantaneous under the influence of substances such as finely divided platinum, gold, and charcoal. Its stability is increased by the presence of moderately strong acids, but diminished by alkalies. With an alcoholic solu- tion of potassium liydrosulphide it furnishes potassium pentasulphide, hydrogen sulphide being evolved—

H,S, + 2KHS=K,S, + 2H,8.

This reaction is analogous to that between sulphuric

acid and potassium hydroxide :—

H,S0O, + 2KHO=K,80, + 2H,0 ; hydrogen pentasulphide may, in fact, be regarded as the analogue of sulphuric acid.

Sulphur, selenium, and tellurium forra compounds with chlorine, bromine, and iodine, similar in composition, but differing greatly in stability.

With chlorine, sulphur forms the threé compounds—

S,CL, SCl,, and SCL, all of which are liquid. The chloride 8,Cl, is obtained by passing chlorine over sulphur, which is gently heated ; it is a mobile reddish-yellow liquid, having a peculiar, pene- trating, and most disagreeable odour. It boils without suf- fering decomposition at 137° C. It is slowly decomposed by water, yielding hydrogen chloride, sulphur, and thio- sulphuric acid — 28,Cl, + 30H, = 4HCl+ 28 + H,8,0,.

When saturated with chlorine at about 10° C. it is con- verted into the dichloride SCl,, but if saturated with chlo- rine at about — 22° C. it furnishes the tetrachloride SCl,. Both of these compounds are so unstable, however, that they are resolved into the lowest chloride $,Cl, and chlo- rine when very slightly heated.

The chlorides of selenium and tellurium are also obtained by the direct action of chlorine on the elements. Two chlorides of selenium are known, Se,Cl, and SeCl,, the former being liquid and the latter a white crystalline solid,

Tellurium forms the two chlorides TeCl, and TeCl,, both of which are solid. These chlorides of tellurium, as well as selenium tetrachloride, appear to volatilize without de- composition.

Very little is known of the bromides of sulphur and sele- nium, but from the observations which have been made there is no doubt that the sulphur bromides are much less stable than the clilorides ; sulphur, therefore, like oxygen, appears to have less affinity for bromine than for chlorine. Tellurium furnishes two crystalline bromides, TeBr, and TeBr,, both of which may be sublimed without decomposi- tion.

The only iodide of sulphur which is known has the composition §,I,, and is obtained by the direct union of its elements; it isa black crystalline solid, insoluble in water, and readily decomposes when heated. Iodides of

selenium are not known with certainty, but two tellurium iodides have been prepared, Tel, and Tel,; both are black crystalline bodies, which give off iodine when heated.

The chlorides and bromides of selenium and tellurium, like the chlorides and bromides of sulphur, are decomposed by water, but the iodides of these three elements are com- paratively stable and are scarcely affected unless heated with water,

Sulphur, selenium, and tellurium burn in oxygen or air, forming the dioxides

SO, ,. Se, 7 TeO,.

Under certain conditions, sulphur dioxide takes up an additional atom of oxygen, and is converted into the trioxide, SO,; a tellurium trioxide, TeO,, may also be obtained, but the corresponding oxide of selenium is not known. A third oxide of sulphur, §,0,, has recently been described.

The dioxides and trioxides of sulphur, selenium, and tellurium have the property in common of forming corre- sponding acids when combined with water :—

H,S0, H,Se0, H,Te0, Sulphurous acid. Selcnious acid. Tellurous acid.
H,S0O, H,SeO, H,TeO,.

Sulphuric acid. Selenic acid. Telluric acid,

These compounds differ greatly in stability and in their properties generally —the sulphur and selenium compounds being closely related, whilst the tellurium compounds are widely different from them in most respects.

Sulphur dioxide or sulphurous anhydride is a colourless gas, of pungent suffocating odour; by a pressure of three atmospheres, or a refrigerating mixture of ice and salt, it is readily condensed to a colourless mobile liquid, which boils at about —10° C. The liquid anhydride freezes at — 76° C., forming a transparent colourless crystalline solid, which melts at about — 79° C. Water at 0° C. dissolves about 68 times its bulk of the gas, but only

32 times its bulk at 24°, forming a solution of sulphurous acid, H,SO,, which is readily decomposed by heat.

Selenium dioxide or selenious anhydride is a white infusible substance, which volatilizes at a temperature below redness; its vapour condenses in snow white deli- quescent prisms, which dissolve in water forming selenious acid, H,SeQ,.

Tellurium dioxide, however, is only very slightly soluble in water, and the solution does not exhibit an acid reaction ; the attraction of this oxide for water, in fact, is so slight, that when a solution of tellurons hydrate (tellurous acid), H,TeO,, is heated to about 40° C. the oxide separates. It fuses readily and volatilizes, and the fused oxide, which is a transparent, deep yellow liquid, solidifies on cooling to a white crystalline mass.

The difference in physical properties between sulphur and scleniuin dioxides is so great as to suggest that the

molecule of the latter is not represented by the formula SeO,, but that it is more complex; and although the vapour density of selenium dioxide is such as to negative this assumption for the gaseous substance, there is no evidence to show that the expression SeO, is the correct molecular formula for the solid oxide.

Sulphur trioxide or sulphuric anhydride is a white, highly volatile substance which dissolves in water, forming sulphuric acid, H,SO,, the combination being attended with the development of so much heat that when the anhydride comes in contact with the water a violent hissing is produced, just as when a red-hot iron is plunged into water. Selenium trioxide has not been isolated, but selenic acid, H,SeO,, the acid corresponding to sulphuric acid, is known, and very closely resembles the latter com- pound in many of its properties. Tellurium trioxide, TeO,, is an orange yellow solid, insoluble in water, and therefore altogether different in properties from sulphur trioxide; moreover, the resemblance between the com- pound H,TeO,, from which tellurium trioxide is obtained by heating to a temperature below redness, and sulphuric and selenic acids scarcely extends beyond the

similarity of their formuls, since telluric acid is nearly insoluble in water, and its solution has a metallic rather than an acid taste, and reddens litmus but slightly.

Sulphur dioxide is usually prepared for laboratory pur- poses by heating a metal, such as copper or mercury, with concentrated sulphuric acid ; the most probable explana- tion of its formation in this manner appears to be that the metal acting upon the acid produces the corresponding sulphate and hydrogen, and that the latter whilst in the nascent state acts upon another portion of the acid, reduc- ing it to sulphurous acid, which splits up into sulphur dioxide and water; thus—

He + H SO, = 2H + Hgso, Mereury. Sulphuric acid. Hydrogen. Mercuric sulphate. 2H + S80, = H,80, + H,0 Hydrogen. Sulphuric acid. Sulphurous acid. Water. H,SO,; = SO, + HO. Sulphurous. acid. Sulphur dioxide. Water. We may also suppose, however, that the metal merely withdraws an atom of oxygen from the sulphuric acid, aud that the oxide produced dissolves in the acid, forming a sulphate— Hg + H80, = Hg0 + H,80, Mercury. Sulphuric acid. Mercuric oxide. Sulphurous acid. HgO + HSO, = HgSO, + H,O. Mercuric oxide. Sulphuric acid. Mercuric sulphate. Water. The kind of action represented by the first of these equations undoubtedly takes place when carbon in the form of charcoal is heated with sulphuric acid, whereby carbon dioxide, sulphur dioxide, and water are produced— C + 2H,S0, = CO, + 280, + 2H,0.

Carbon. Sulphuric acid. Carbon dioxide. Sulphur dioxide. Water. When copper is employed not only are sulphur dioxide, water, and cupric sulphate produced, but cuprous and cupric sulphides, Cu,S and CuS, it is stated, are also formed ; their production, however, is due to secondary action.

Selenium dioxide is obtained either by burning selenium in a stream of oxygen, or by evaporating a solution of selenious acid to dryness.

Sulphurous acid is always prepared by passing sulphur dioxide gas into cold water; the combination is attended with a slight elevation of temperature. Selenious acid is produced in a similar manner by dissolving the oxide in water, or by dissolving selenium in concentrated nitric acid, and evaporating to expel the excess of nitric acid. Teliurous acid may be

obtained by dissolving tellurium in nitric acid of specific gravity 1:25, and pouring the solution, after the lapse of not more than a few minutes,

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into water. If the precipitation be delayed for a longer time, the oxide TeO, is thrown down instead of the hydrate. It is best prepared by decomposing tellurium tetrachloride with water— TeCl, + 3H,O = H,TeO, + 4H.

Tellurium tetrachloride. Watcr. Tellurous hydrate, Hydrogen chloride.

It is stated that anhydrous sulphurous acid, H,SO,, has been obtained in crystals by cooling a saturated aqueous solution to 0° C.; a crystalline hydrate of the composition H,SO,+8H,O was obtained by Pierre by cooling to —6° C. a saturated solution through which a current of the gas was being transmitted, The solution of sulphur dioxide in water is strongly acid, and effervesces with carbonates ; by passing a current of the gas through water in which metallic hydroxides or carbonates are dissolved or suspended metallic sulphites are produced. Two classes of metallic sulphites may be thus formed :— the acid sulphites or bisulphites in which one-half the hydrogen in sulphurous acid is displaced by a metal; and normal sulphites, in which the whole of the hydrogen is displaced. It is also possible to displace the two atoms of hydrogen in sulphurous acid by two different metals, and thus to obtain so-called double salts. The following table shows the composition of some of the sulphites, disregarding the water of crystallization which several of them contain :—

Potassium hydrogen sulphite……. KHSOs

Vopassitan Sulphite……...0dedsr..sseccessn egg Sodium hydrogen sulphite…….....NaHSO,; POU MUMINBT NUE. 5.2.0 sedesece recess seroes ARO Og CAMA IOMN DUE. ercicsvsi cereueverresecnses CaSO, Calcium hydrogen sulphite ….....46. CaH,(SO3),

The acid sulphites of barium, strontium, calcium, and magnesium, and the acid and normal sulphites of the alkali metals, are soluble in water, although

only the sulphites of alkali metals are freely soluble; but most other sulphites are insoluble, and may be prepared by precipita- tion with an alkaline sulphite. The acid sulphites are prepared by saturating a solution of the metallic hydroxide or carbonate with sulphur dioxide gas, and then adding to it as much of the hydroxide or carbonate as it originally contained ; thus—

Sodium carbonate. Water. Sulphur dioxide, Solum Hyttogen Canton
2NaHSO, + Na,CO, = 2Na,SO, + H,O + CO,. Sodium hydrogen Sodium
Carbon sulphite. carbonate, Sodium sulphite. ‘Water. dioxide,

The alkali and alkaline-earth metals are the only ones, however, which readily produce acid sulphites ; in fact, the tendency to form acid salts is almost restricted to these metals in the case of all acids, and it is difficult to obtain acid salts containing heavy metals.

A solution of sulphurous acid slowly absorbs oxygen from the air and is converted into sulphuric acid; in like manner, the sulphites, particularly if in solution, become converted into sulphates on exposure to the air. All sulphites are decomposed at a red heat, either into sulphate and sulphide, or into sulphur dioxide and metallic oxide. They are also decomposed by all acids excepting carbonic and boric acids, sulphurous acid being liberated. Sulphur- ous acid possesses considerable bleaching powers, and is ex- tensively employed in bleaching straw, wool, and many other articles, which would be injured by chlorine. The articles to be bleached are moistened and suspended in closed chambers in which sulphur is burnt; the sulphur dioxide produced is then absorbed by the damp goods, and their colour is discharged. The manner in which it acts is not well understood, but it appears to be by form- ing colourless compounds with the colouring matters ; it does not, like chlorine, decompose colouring: matters, for.

the colour may usually be restored by acids or alkalies. The reproduction of the yellow colour of new flannel, when it is washed with an alkaline soap for the first time, is an illustration of this. Sulphurous acid is also a powerful antiseptic, and is highly valuable as a disinfecting agent.

Selenious acid is deposited from a hot aqueous solution on slow cooling in colourless prismatic crystals like salt- petre. It closely resembles sulphurous acid in properties, and like it furnishes acd selenites, such as potassium hydro- gen selenite, KHSeO,, and normal selenites, such as potas- sium selenite, K,SeO,, but it also forms so-called hyperacid salts with the alkali metals, e.g., HKSeO,+H,SeO,. The selenites of alkali metals are soluble in water, but the other selenites are insoluble.

Tellurous hydrate, prepared by decomposing tellurium tetrachloride with water, is a bulky precipitate, which, when dried over sulphuric acid, forms a light white earthy powder, having a bitter metallic taste. It is only slightly soluble in water, but dissolves in alkalies and alkaline carbonates. With the alkali metals tellurous acid forms three classes of salts corresponding to the three classes of selenites, of which the following are examples—

Acid potassium tellurite……..... KHTeO, Normal potassium tellurite…..,..K,TeO3 Hyperacid potassium tellurite….KHTeO,+H,Te0;

With the alkaline earth metals tellurous acid. forms normal salts, and also certain peculiar salts, such as BaTe,O, or BaTeO,+TeO,, and BaTe,O, or BaTeO, + 3TeO,. With the heavy metals it appears to form only normal salts, The tellurites of alkali metals are soluble in water, but those of other metals are difficultly soluble or insoluble.

In its oxides, therefore, it will be evident tellurium differs widely from selenium and sulphur, but it much re- sembles metals like bismuth and antimony, since it forms salts with acids. Thus, a tellurium sulphate of the compo- sition Te(SO,)., it is stated, is formed by dissolving tellu- rium in concentrated sulphuric acid, Tellurous hydrate also dissolves readily in acids; the solution in hydrochloric acid probably contains either tellurium chloride, TeCl, , or a compound intermediate in composition between tellurium

chloride and tellurium hydroxide, Te(OH),, formed from }

the latter by the partial displacement of the OH groups by chlorine ; when it is dissolved in oxy-acids, apparently salts are formed in which the group

TeO displaces hydrogen, corresponding to the antimony salts in which the radicle SbO displaces hydrogen.

Sulphurous acid, on account of its tendency to form sulphuric acid, has considerable power as a reducing agent. Thus iodine and sulphurous acid, in presence of a large quantity of water, yield hydriodic and sulphuric acid—

i + ERO — eso) = 20 + H,SO»

Sulphurous acid. Sulphuric acid. With chlorine and bromine similar reactions occur still more readily. On this account, sulphurous acid is largely employed as an “antichlor” to remove the excess of chlorine from articles bleached with bleaching powder. When solutions of sulphurous and selenious acid are mixed, the latter is reduced, especially on warming, and red amorphous selenium precipitated ; similarly, a black precipitate of tellurium is formed on warming a solution containing tellurous and sulphurous acids. But these acids also readily part with at least a portion of their oxygen. For instance, when hydrogen sulphide gas is passed into a solution of sulphurous acid, sulphur is depo- sited, and the solution contains pentathionic acid—

5H.S + 5H,80, = 58 + H,S,0, + 90H. Hydrogen sulphide. i al Sulphur. — Water.

When a solution of selenious acid is similarly treated, a precipitate is thrown down, which apparently consists

chiefly of selenium sulphide, SeS,, mixed with a lower sulphide and free sulphur. Solutions of tellurous hydrate when thus treated furnish a brown precipitate of tellurium

sulphide. Sulphur Trioxide, SO, .

Dry sulphur dioxide gas and oxygen readily combine when the mixture is passed over gently heated platinum black or platinized pumice, forming sulphur trioxide or sulphuric anhydride, SO,. This compound may be obtained from sulphuric acid by distilling it with phosphoric anhydride :—

° < Phosphoric owe Metaphosphori¢ Sulphuric acid. anhydride. Sulphur trioxide. agian

Jt is usually prepared from Nordhausen sulphuric acid, which gives off sulphur trioxide when gently heated, ordinary sulphuric acid remaining behind.

Sulphur trioxide usually crystallizes in white slender needles, but it exists in two modifications. Thus, when the liquid oxide is cooled, it solidifies at 16° C. in long colourless prisms, which melt at the same temperature ; but if kept at temperatures below 25°, it changes into a mass of fine white needles. This second modification gradually liquefies at temperatures above 50°, and again passes into the first modification; it dissolves with extreme slowness in sulphuric acid, whereas the liquid oxide is miscible in all proportions with the acid. Liquid sulphuric anhydride undergoes very great expansion by heat, its mean co- eflicient of expansion between 25° and 45°C. being :0027 for 1° C.; it is quite colourless when pure. Sulphur trioxide very readily parts with one of its atoms of oxygen, convert- ing phosphorus trichloride, for example, into phosphorus oxytrich] oride—

Phosphorus Sulphur Sulphur Phosphorus trichloride. trioxide. dioxide. oxytrichloride.

This reaction takes place when the substances are merely mixed together, although a strong red heat is necessary in order to resolve the trioxide into sulphur dioxide and oxygen,

When finely divided sulphur is added in small quanti- ties to liquid sulphuric anhydride, drops of a deep blue colour sink to the bottom and solidify immediately. These consist of the compound §,0,. The temperature during the operation must be kept at 15° C., for if it is lower the anhydride does not remain liquid, and if higher the sub- stance decomposes. When about a gramme of sulphur has been added the anhydride is poured off, and the solid re- sidue freed from any that remains by a gentle heat. A bluish-green crystalline mass is thus obtained, which de- composes at ordinary temperatures, giving off sulphur dioxide, and leaving sulphur; water immediately decom- poses it, forming sulphuric, sulphurous, and probably thio- sulphuric acids. The corresponding selenium compound, SesO,, may be prepared in a similar manner.

Sulphuric Acid, H,SO,.

Of all chemical compounds this is probably the most important, on account of its numerous practical applica- tions, and enormous quantities of it are now manufactured. The method employed consists essentially in oxidizing sulphurous acid by atmospheric oxygen, which is accom- plished with the aid of nitric oxide gas in the following manner. Sulphur dioxide gas is prepared ty burning sul- phur, or iron pyrites, FeS,,in a properly constructed furnace, sulphur being always employed when the purest qualities of acid are required, and this gas is conveyed into a large

. leaden chamber, into which steam and air are also continu-

ously admitted. At the back of the furnace in which the sulphur is burnt, a small vessel is placed containing sodium

nitrate and sulphuric acid, which continue to generate uitric acid for some time ; thus—

NaNO, + H,SO, = HNO,

Sodium nitrate. Sulphuric acid. Nitric acid.

+ NaHS0,.

Sodium hydrogen sulphate.

The exact changes which occur among the various sub- stances thus introduced into the chambers are but im- perfectly understood ; the nitric acid, however, is appa- rently decomposed by the sulphurous acid in such a manner that finally nitric oxide is produced—

2HNO, + 380, + 2H,0 = 2N0+ 3H,S0,.

But nitric oxide combines directly with oxygen at ordinary temperatures, forming the oxides N,O, and N,O,, and it is generally supposed that the nitric oxide thus formed acts as a carrier of oxygen,—that on coming in

contact with the oxygen of the air introduced into the chamber, it is converted into a higher oxide, which, however, is no sooner produced than it is reduced again to nitric oxide by the sulphurous acid, which is oxidized to sulphuric acid ; supposing the oxide formed to be nitric peroxide, we may represent the change by the following simple equation :—

280, + 2H,O + NO, =2H.S0,+2NO. 2 2 a4 4

The nitric oxide again absorbs oxygen to form the higher oxide, which again enters into reaction with sulphur dioxide and water, with liberation of nitric oxide, and so on con- tinuously. Theoretically, therefore, a limited quantity of nitric oxide should suffice to produce an indefinitely large amount of sulphuric acid, but practically this is not the case, chiefly owing to the loss occasioned by the dissolution of a certain quantity in the sulphuric acid which collects on the floor of the chambers ; a certain amount algo escapes from the chambers with the nitrogen of the air, but this is usually absorbed by passing the escaping vapours through a tower filled with pieces of coke, kept moistened with sulphuric acid, or over which water is coustautly pouring ; when acid is employed it is afterwards pumped into a sunilar scrubber, and deprived of its nitric oxide gas by means of the sulphur dioxide gas from the burning sulphur or pyrites, and when water is used it is pumped into, and distributed on the floors of, the leaden chambers.

In practice the amount of sulphuric acid produced usually approximates very closely to the theoretical quantity.

It is beyond question that the reactions which occur in the formation of sulphuric acid are not all of the simple character represented by the equations above given. Thus, the formation of nitric oxide from nitric acid is probably the final result of three distinct reactions, In the first place, from the sulphur dioxide and nitric acid a compound which is known as the lead chamber crystals, on account of its forming crystals, is probably produced ; thus—

NO,

Or *

Lead chamber crystals.

This compound, it will be observed, is very closely related to sulphuric acid, and may be regarded as formed from it by the displacement of one of the OH groups by the group

NO,. It is decomposed by water, yielding sulphuric and nitrous acids :—

1 SO, + NO.Om — 80, {

Sulphur dioxide. Nitrie acid.

eee. i 60,0. 4 Hon $0, { Or + NOH.

Lead chamber erystals, Water. Sulphiurie acid.

From the nitrous acid thus formed nitric oxide may be produced in two ways,—either by its spontaneous decom- position in accordance with the equation

3HNO, = 2NO + HNO, + H,0;

Nitrous acid. Nitrie oxide. Nitrie acid, Water,

Nifrous acid.

CH EME’? as

[SULPHURIC AUID,

or by the action of sulphur dioxide— 2HNO, + SO, = 2NO + H,SO,.

Nitrous acid. Sulphur dioxide. Nitrie oxide. Sulphuric acid. The latter reaction appcars to be the more probable on account of the large amount of sulphur dioxide present, bunt it is not unlikely that both occur.

With regard to the part which the nitric oxide plays in the conversion of sulphurous into sulphuric acid, it is highly probable that, by the conjoint action of the oxygen and water present, it is converted into nitrous acid,

from which nitric oxide is reproduced by the action of the sulphur dioxide in the manner above pointed out—

4NO+0,+20H,=4HNO,.

If this be the case, nitrous acid is the active agent in the conversion of sulphur dioxide into sulphuric acid. It is known to effect the oxidation of sulphur dioxide with the greatest readiness, whereas dilute nitric acid has very little action. On this account, it is probable also that the nitric oxide is not converted into the peroxide, as sometimes is supposed, and that the latter is the active agent in the formation of sulphuric acid, for our general experience appears to warrant the conclusion that, as sulphur dioxide enters so readily into reaction with nitrous acid, this acid would be produced from the nitric oxide almost entirely to the exclusion of other oxidation products. Moreover, nitric peroxide in presence of water forms nitrous and nitric acids : N,O, + H.O=HNO,+HNO,; so that, even supposing that the nitric oxide is converted into nitric per- oxide, the formation of sulphuric acid would still in a large measure be due to the action of nitrous acid. Although sulphur dioxide acts very slowly on dilute nitric acid, it readily reduces it to nitric oxide in presence of moderately concentrated sulphuric acid ; hence any nitric acid formed in the process, when carried down to the floor of the chamber and mixed with the moderately concentrated sulphuric acid there collected, would also undergo reduc- tion by the sulphur dioxide.

The acid from the leaden chambers has generally a specific gravity of about 1°55; by concentration in shallow leaden pans this is raised to above 17. The further con- centration is effected in glass or platinum retorts. The commercial acid, known as oil of vitriol, has a specific gravity of about 1°84; it is frequently of a more or less brown colour from the preseuce of organic matter, and always contains lead. Other impurities, such as arsenic and nitrous or nitric acid, are not unfrequently present.

Pure sulphuric acid, 11,80, is an oily, colourless, in- odorous liquid, of specific gravity 1-842; it solidifies at — 385°C. It cannot be distilled unchanged, and when heated gives off the anhydride until a liquid remains containing about 1°5 per cent. of water and 98°5 per cent. of sulphuric acid, which boils at 338° C.; acid of this strength may always be obtained by boiling down acid of any other degree of concentration. When the acid is

vaporized, dis- sociation takes place very rapidly, the vapour at tempcra- tures above 400° C. consisting entircly of a mixture of water and sulphuric anhydride. Sulphuric acid chars most organic substances containing oxygen and hydrogen on account of its great affinity for water, causing the separation of these elements in the form of water and the liberation of carbon; when exposed to moist air it will even double its weight in the course of a few days, and ou this account it is much employed as a desiccating agent. Much heat is developed when it is mixed with water, as will be evident from the following table, which represents the amounts of heat developed on mixing one molecnle of the acid (98 grammes) with » molecules of water at about 18° C., according to Thomsen's determinations :—

SULPHURIC ACID. |

j No. of mule- | waits of eat | No. of mole- Union wee Gr ea, developed. || water' added. developed.

1 6,272 99 16,850 2 9,364 199 17,056 3 11,108 499 17,304 5 13,082 799 17,632 9 14,940 1599 17,848

WS 16,248 on) 17,994

49 16,676

The Jast number in the table represents the amount of heat which, according to calculation, would be developed on mixing a molecule of sulphuric acid with an infinitely large quantity of water. It will be seen that the addition of the first two molecules is accompanied with the develop- ment of an amount of heat equal to half the entire amount developed on adding an excess of water; this appears to be accounted for by the formation of definite compounds of sulphuric acid with water. The first of these hydrates, H,SO,+H,O, may be obtained crystallized in colourless six-sided prisms, by cooling a mixture of the acid and water in these proportions to about 8° C.; it boils at 205°-210° C., and may be produced by evaporating any more dilute sulphuric acid at 205° C. until it ceases to lose water. The second hydrate, H,SO,+2H,O, may, in a similar manner, be obtained by evaporating any more dilute acid at 100° C. until it ceases to lose water; it boils at

193°C. The specific gravity of the first hydrate is 1°78, and that of the second 1:62; when water is added to the acid in the proportions to form the latter, the maximum condensation (about 8 per cent.) is observed which occurs on mixing these substances.

Further evidence in support of the view that sulphuric acid forms definite compounds with water which may be regarded as distinct acids is afforded by its behaviour on neutralization, by the persistent manner in which many sulphates retain one or two molecules of water, and by the existence of so-called basic sulphates. Thus, when it is neutralized by sodium hydroxide, considerably less heat is developed by the first than by the second molecule of hydroxide; this behaviour does not appear remarkable if it be supposed that it exists in solution in combination with water, and that, therefore, as in the case of periodic acid, not only is hydrogen displaced by sodium on the addition of the hydroxide, but the elements of one or more mole- cules of water are also separated, the latter being an opera- tion which necessarily would involve the expenditure of energy, as the combination of the acid with water is attended with the development of heat (see page 488).

By displacing one-half the hydrogen in sulphuric acid by metals acid sulphates are formed, and normal sulphates are produced by displacing the whole of the hydrogen. Many of the normal sulphates crystallize with the same number of molecules of water, and are isomorphous, as, for ex- ample —

Magnesium sulphate …….....dg¢80,, 7H,O Zine Pc ceocsacbie: ZnSO,, 7H,O0 Tron ARE Wino ccacseueccenans FeSO, , 7H,O Nickel Aye) Manbadocandanqdosac NiSO, , 7H,O Cobalt sce cneaos erase aeen CoSO, , 7H,O

Five of the seven molecules of water are removed with facility from these salts, but the sixth is less readily re- moved, especially from magnesium sulphate, and they are not deprived of the seventh unless heated to 200°-300° C. Copper, cadmium, and manganese sulphates behave simi- larly, and are only with difficulty deprived of the last molecule of water. The last molecule retained with such persistency by these salts was termed, by Graham, water of constitution, to distinguish it from water of

crystallization. In the present state of our knowledge it is impossible absolutely to define the meaning of these terms, or even to

say that there is an absolute difference between the so. called water of constitution and water of crystallization, and not merely one of degree; but since we have inde- pendent evidence tending to prove the existence of distinct acids formed by the combination of sulphuric acid with water, we may convenieutly regard the above-mentioned salts as derived from these acids. Magnesium sulphate, for example, we may regard as the normal magnesium salt of the acid H,SO,, crystallized with five molecules of water. It will be evident that such salts as this bear a relation to the acid from which they are regarded as derived similar to that which the normal periodates bear to crystalline periodic acid, H,1O,; indeed, a very consider- able general resemblance may be traced between the periodates and the sulphates. Thus, the sulphates of potassium, K,SO,, and of silver, Ag,SO,, separate from aqueous solution in anhydrous crystals; and sodium sul- phate, Na,SO,, is also deposited in the anhydrous state at temperatures above 34° C. ; it is only with metals such as magnesium, zinc, and copper, that salts are obtained which may be regarded as derived from the acids H,SO, or I{,SO,. Similarly, the periodates KIO,, NaIO,, and AglO,, derived from the at present hypothetical acid HI OF are readily produced, but with other metals chiefly salts derived from the acid H,10O, are obtained.

But that these hydrates of sulphuric acid are distinct acids derives its most important confirmation from the existence of the so-called basic sulphates, such as Zn,SO, or ZnSO, + ZnO, Hg,8O, or HgSO, + 2HgO, and Cu,SO, + 3H,0 or CuSO, + 2CuO + 3H,0 ; these salts are strictly comparable with the basic periodates.

A large number of double and mixed salts formed by the union of two or more sulphates are known. Thus, magnesium sulphate and the isomorphous sulphates form isomorphous double salts with potassium, sodium and ammouium sulphates, which crystallize with six molecules of water, and which usually are therefore regarded as

formed by the displacement of the molecule of so-called

water of constitution by the alkaline sulphate— Magnesium potassium sulphate……..... MgK,(SO,), , 6H,O

Zine 5 Wagan Gceceeeare ZnK,(SO,). , 6H,0 Iron o6 SU coe eeteen FeK, (SO,), , 6H,O Nickel as Sy) Cane Nik, (SO,), , 6H,O Cobalt 5 Ahem tocosaeac CoK, (SO,4). , 6H,O

It has already been pointed out that sulphuric acid may be regarded as a compound of the dyad radicle SO, with the monad radicle OH, or as (SO,)'(OH),', this view of its "constitution" being chiefly founded on its behaviour with the chlorides of phosphorus. Thus, by the action of phosphorus pentachloride on sulphuric acid, an atom of oxygen and an atom of hydrogen, in other words, the group OH, are displaced by a single atom of chlorine—

HO.SO,. OH + PCl,=HO.SO,.Cl+ POCI, + HCl. Although evidence of the existence of a second OH group in sulphuric acid cannot be obtained in a similar manner by the continued action of the phosphorus pentachloride, it is afforded by the behaviour of the compound SO,Cl,, produced by the direct union of chlorine and sulphur dioxide with water, which successively converts it into the compound HO.SO,.Cl and sulphuric acid—

Cl. SO,.Cl+ HOH =HO.S0,.Cl + HCI; HO.80O,.Cl+HOH =HO.SO,.OH+HCI.

Sulphuric chloride, SO,Cl,, and sulphuric chlorhydrate, SO,(OH)CI, are both colourless liquids ; the former boils at about 70° C., and the latter at 158°C. Sulphuric chlor- hydrate may be formed by the direct combination of hydrogen chloride with sulphuric anhydride, and when heated in closed vessels to 170° C., it furnishes sulphuric chloride and sulphuric acid :—

AC SOs, Ob = Clo sO, ..Cl + HO: SO,08 . Vv. — 64

Sulphuric acid enters into reaction with a large number of hydrogenized carbon compounds in such a manner that water is formed and hydrogen displaced by the monad group SO,.OH; for example—

HO,sO,..0H + CH, = C.H,.SO,.0H + Og. Sulphuric acid. Benzene. Benzenesulphonic acid.

The sulphonic acids, as the compounds thus produced are

termed, are powerful monobasic acids. But the action

may proceed further, both OH groups in sulphuric acid

being displaced by monad compound radicles, in which case neutral bodies called sudphones are formed ; thus— HO.SO,.OH + 20,H, = C,H,;.SO..C,H, + 20H,.

Sulphuric acid. Benzene, Benzenesulphone.

Selenic Acid, H,SeO,.

This acid may be obtained by oxidizing selenious acid

by the action of chlorine, or bromine, and water— H,SeO, + Br, + H,O=H,SeO,+ 2HBr.

It is a transparent colourless liquid, which in the most concentrated state boils at 280° C., and has a specific gravity of 2°6. In this state it is not quite pure selenic acid, but contains a little water, which cannot be driven off without decomposing the acid into selenium dioxide, oxygen, and water. Selenic acid resembles sulphuric acid in many of its properties, being very hygroscopic, and when it is added to water a considerable amount of heat is deve- loped. It is reduced to selenions acid when boiled with hydrochloric acid—

H,Se0, + 2HCl= H,SeO, + Cl, + H,0 ; but it is not decomposed by the hydrogen produced when zinc or iron is dissolved in its solution. Like sulphuric acid it precipitates barium salts, even in presence of other mineral acids.

The selenates or salts produced by displacing the hydro- gen in selenic acid by metals correspond in composition, and also very closely in their properties, to the sulphates, with which they are isomorphous.

Teluric Acid, H,TeO,.

The potassium salt of this acid is obtained by fusing tellurium or tellurous oxide with potassium nitrate. From this salt barium tellurate may be prepared by precipitating its solution with a barium salt, and the acid is produced by decomposing barium tellurate with sulphuric acid.

Telluric acid crystallizes from water in large prisms of the composition H,TeO,+2H,O. This hydrate has a metallic taste, and reddens litmus slightly. It dissolves slowly in cold water, but freely in boiling water. It loses its water of crystallization at a little above 100° OC. The compound H,TeO, is nearly insoluble in cold water, but dissolves on boiling ; when heated to a temperature below redness it furnishes the oxide TeO,. It is reduced to tellurous acid by boiling with hydrochloric acid, and it is also decomposed by sulphurous acid, which is without action on selenic acid, with precipitation of tellurium.

In addition to acid and normal tellurates, such as KHTeO, and K,TeO,, and hyperacid tellurates, of which the salt KHTeO, + H,TeO, is an example, telluric acid also furnishes so-called di- and tetra-tellurates, such as (NH,),Te,0, and (NH,),Te,0,, or (NH,),TeO, + 3TeO, , and basic tellurates, such as Ag,T’eO, and Ag,T’e,0,. The ditellurates may be regarded as salts of the acid H,Te,O,, analogous to anhydrosulphuric acid, and the basic salt Ag,TeO, as formed from the hydrate H,LeO, or H,TeO,+2H,0; whilst salts such as Ag,T’e,0, are ap- parently derivatives of an acid formed by the withdrawal of the elements of three molecules of water from two molecules of the acid H,TeO,.

CHEMISTRY

[ACIDS OF

Other Acids of Sulphur.

In addition to sulphurous and sulphuric acids, a number , of acids, more or less closely related to them, may be obtained. The following is a complete list of the known acids of sulphur :—

Hiymosulpluroweaaeid «seis. «eeiettitecssss sxc H,S0, Gull pee OE Eis pes vv’en vss aeaimnanweeoteene onole KOK Suljolayeans, eyeiiel Se casuousdbnnbonbsoboddubodopavoneens H,S80O, ANOS UU CHACLU, cacdaasscee ase eerie eee H,8,03 Anhiydrosulpimmiceachd peeecssedsaseseeeeunreeers H,8,0, WUMTOMICHACIler. , secenmeerniressnacever nee teceeees H,8,0¢ Alii oon) CVaNCl, sae epgoosdendeuoadasaopootooncsososaidc H,S830¢ AR aIbEE A OULETINGG CYA \caepraansnggente, endo eocodeabananee H,8,0, POMUROMIDTE TIE asisnics so0. cnsvesuenieewevornstongs H,S;0¢

Hyposulphurous Acid.—This acid is obtained by the action of zine on a solution of sulphurous acid, which dissolves the metal, forming zinc sulphite ; the hydrogen, which is the accessory product of this reaction, is not evolved, however, but reduces a portion of the acid, forming hyposulphurous acid ; thus—

H,S0, + Zn = 2H + ZnSO,

Sulphurous acid. Zine sulphite.

H,SO, + 2H = H,S0, + H,0. Hyposulphurous

Sulphurous acid. aolde

The solution thus obtained is very unstable, and rapidly decomposes with separation of sulphur. Sodium hypo- sulphite, NaHSO,, is a more stable substance, and is produced in a similar manner by the action of zinc on a solution of sodium hydrogen sulphite. This salt crystallizes in slender colourless needles ; it is soluble in water, but insoluble in alcohol. When exposed to the air in a moist state it becomes very hot, and is converted by oxidation into hydrogen sodium sulphite, but in the dry state it is not affected by oxygen. The remarkable observation has been made, however, that when a solution of sodium hyposulphite is oxidized by free oxygen, that is to say, when water saturated with oxygen is added to a solution of the

hyposulphite, only one-half the oxygen is employed in causing the couversion of the hyposulphite into the sulphite, the remaining half becoming affixed to water, forming hydrogen dioxide ; the reaction may be expressed by the following equation—

Sodium hyposulphite.

NaHso0, + 4H,0,. Sodium hydrogen Hydrogen

sulphite. dioxide. Hyposulphurous acid has a much greater decolorizing and reducing power than sulphurous acid; it immediately reduces the metals from mercury and silver salts, and it precipitates copper hydride, Cu,H,, from a solution of copper sulphate.

Thiosulphuric Acid, H,S.Oz.

This acid is formed from su]phurous acid by combining it with sulphur; thus, when a solution of sodium sulphite is digested with sulphur, sodium thiosulphate is produced—

Na,SO, + S = Na,§,0,. Sodium sulphite. Sodium thiosulphate. It will be obvious that this reaction is precisely analogous to that which occurs when sodium sulphite is converted into sodium sulphate by the action of oxygen.

Thiosulphuric acid cannot be isolated, on account of its instability, and when an acid—hydrochloric acid, for ex- ample—is added to a solution of a thiosulphate, the thio- sulphuric acid which is produced rapidly decomposes into sulphur and sulphurous acid: H,S,0,=H,SO,+8. The thiosulphates of alkali and alkaline earth metals are crystalline and soluble in water, and are fairly stable salts; the thiosulphates of the heavy metals, however, which are precipitated on the addition of solutions of

metallic salts to a solution of sodium thiosulphate, are very unstable, and rapidly decompose into a metallic sulphide and sulphuric acid, thus—
_AgS,0, + HO = AgS + HS0,. Silver thiosulphate. Silver sulphide. Sulphuric acid. .

Sodium thiosulphate is largely employed in photography for the purpose of dissolving the chloride, bromide, and iodide of silver. These salts are readily soluble in a solution of the thiosulphate until they are exposed to light, when they become insoluble. If, therefore, a sheet of paper coated with one of these silver salts be exposed to light under an object which is in part transparent and in part opaque, such as a piece of lace, for example, the silver salt is rendered insoluble in those parts upon which the light has fallen, and by then immersing the paper in a solution of sodium thiosulphate the unaltered silver salt is removed, and the picture is thus “fixed.” The solvent power of the thiosulphate is due to the formation of a soluble silver sodium thiosulphate—

Na,8,0, + AgCl= NaAgS,0, + NaCl ;

many other metallic salts insoluble in water are dissolved by a solution of sodium thiosulphate, probably also in cousequence of the formation of similar mixed salts.

Anhydrosulphuric Acid, H,8,0, .

This acid is obtained by dissolving sulphuric anhydride in sulphuric acid in the requisite proportions: H,SO,+ SO,=H,S,O,, It crystallizes in large colourless trans- parent prisms. When gently heated it is decomposed into sulphuric anhydride, which distils over, and sulphuric acid, which remains. Water dissolves it, forming sulphuric acid.

The so-called Nordhausen or fuming sulphuric acid consists chiefly of this acid. It is prepared at Nord- hausen, in Saxony, by distilling an impure ferric sulphate, Fe,(SO,),, obtained by exposing ferrous sulphate, FeSO,, to a moderate heat in contact with the air,—the distillate, consisting chiefly of sulphuric anhydride, being received in sulphuric acid. This acid readily dissolves many hydrogenized carbon compounds which are only with difficulty acted upon by ordinary sulphuric acid, convert- ing them into sulphonic acids; it is employed on this account to dissolve indigo, and in the preparation of anthraquinonedisulphonic acid, from which alizarin is artificially produced.

Salts of this acid, such as Na,6,0,, Ag.S,O,, BaS,O,, are obtained by combining the corresponding normal sulphates with sulphuric anhydride; water decomposes them, forming corresponding acid sulphates. The acid salt, KHS,O,, or hydrogen potassium anhydrosulphate, is obtained by dissolving the normal salt in anhydro- sulphuric acid ; it crystallizes in prisms.

The chloride of anhydrosulphuric acid, S,0,;Cl,, 1s pro- duced by the action of sulphuric anhydride on many chlorinated compounds, thus—

980, + CCl, = 80,0) + COC, Sulphuric Carbon Anhydrosulphuric Carbonic anhydride. tetrachloride. chloride. chloride

It is a colourless oily liquid, of specific gravity 1°829 at 18° C., and boils at 146° C. In contact with water it decomposes slowly and noiselessly, forming sulphuric and hydrochloric acids, and is thus distinguished from sulphuric chlorhydrate, SO,(OH)Cl, which is rapidly decomposed with almost explosive violence when thrown into water. The lead chamber crystals (p. 504), when heated, furnish

a magnificently crystalline body, which is also a derivative

of anhydrosulphuric acid— 280, { NO2=8,0,(NO,), + 1,0 ;

it distils at about 360° C. without decomposing.

Dithionic Acid, H,S,0,.

The manganese salt of this acid is obtained by the action of a solution of sulphurous acid on manganese dione nO ,-+ 2H,80,=Mn8,0, +2H,0.

This salt may be converted into the barium salt by treatment with barium hydroxide, and from a solution of the barium salt the acid is produced by adding exactly sufficient sulphuric acid to precipitate the barium. By concentrating the solution in a vacuum over sulphuric acid it may be

obtained of specific gravity 1°347, but on further concentration the acid is resolved into sulphurous acid and sulphur dioxide—

H,8,0,= H,SO,+80,. A dilute solution decomposes in a similar manner when heated. In contact with the air dithionic acid is slowly oxidized to sulphuric acid.

The dithionates produced by decomposing barium dithionate, BaS,O,, with the corresponding sulphates, are all soluble in water and crystallize well. They exhibit considerable stability, but when heated are more or less readily converted into the corresponding normal sulphate and sulphur dioxide.

Trithionic Acid, H,8,0,.

Potassium trithionate is produced, together with potas- sium thiosulphate, when a saturated solution of hydrogen potassium sulphite is gently heated with sulphur; it is not improbable that the thiosulphate is a secondary product, formed by the action of hydrogen sulphide resulting from the action of the sulphur on the hydrogen potassium sulphite— .

2HKSO, + 28 = K,8,0, + HS.

Hydrogen potassium Potassium sulphite. trithionate.

Trithionic acid may be obtained from a concentrated solution of the potassium salt by precipitating the potas- sium by hydrofluosilicic acid. The solution has a sour and somewhat bitter taste, and is inodorous; it is per- manent in a dilute state only, and on concentrating it in a vacuum over sulphuric acid it begins to decompose, even at 0° C., sulphur dioxide being evolved, and sulphur de- posited, while sulphuric acid remains in solution. The salts of trithionic acid are but little known; they are extremely unstable, and even when boiled with water are decomposed and converted into sulphates, with evolution of sulphur dioxide and deposition of sulphur—

S30, = dee Oy,

2

Potassium trithionate. Potassium sulphate.

Tetrathionic Acid, H,8,0¢.

The salts of this acid are produced by the action of iodine on thiosulphates ; for example—

2Na,8,0, + 1, = Na.S,0, + 2Nal. Sodium thiosulphate. Sodium tctrathionate.

The acid may be prepared from the barium salt by double decomposition with sulphuric acid. A dilute solu- tion may be boiled without decomposing; but a con- centrated solution is decomposed when heated, yielding sulphur, and sulphurous and sulphuric acids. Its salts are all soluble in water, and are much more stable than the trithionates, but for the most part their solutions cannot be evaporated without decomposition.

Pentathionic Acid, H,S,0,.

A solution of this acid is obtained by alternately passing sulphur dioxide and hydrogen sulphide gases through water—

51,80, + 51,8 =H,8,0,+9H,0 +58;

sO, + S.

the solution may be concentrated by a gentle heat till it} ‘The number 4510 for the reaction 8, H, applies strictly attains a specific gravity of 1-25-13, and may then be | only to sulphur in the state in which it separates when further concentrated in a vacuum to the specific gravity | hydrogen sulphide is decomposed by iodine, and would of about 1°6. The solution is colourless and inodorous, | require a small correction to make it applicable to rhombic and has a strongly acid taste; it may be preserved un- | sulphur. ; changed at ordinary temperatures, but on heating a con- On comparing the numbers representing the amounts of centrated solution of the acid, hydrogen sulphide and | heat developed in the formation of sulphurous and sul- sulphur dioxide are evolved, sulphur is deposited, and | phuric acids

and of the corresponding selenium and tellu- sulphuric acid remains. rium compounds, thus—

The salts of pentathionic acid are so unstable that it is

difficult to obtain them in the solidstate. In their forma- Sulphur. | Seleniwn, | Tellurium: tion from the acid there is a great tendency for the fifth ores ees ew atom of sulphur to be separated, tetrathionates being pro- ——s Ba ee duced, which have greater stability, and sometimes two Ot Cc Ree a 78,770 ; 56,790 | 81,190 atoms of sulphur are given up and trithionates are formed. R03, Aqvivve wees 142,400 | 77,240 | 107,040 A number of the reactions involved in the formation of RO. AQ, O verses, 63,630 | 20,450 | 25,850

various sulphur compounds, and also of a few selenium and tellurium compounds, have been submitted to thermo- chemical investigation by Thomsen. The results deduced from his experiments are given in the following table :—

Units of 4 heat lb Reaetion, developed or Remarks.

absorbed.

it will be evident that the affinity of selenium to oxygen, as measured by the heat developed, is Jess than that of sulphur to oxygen, and also less than that of tellurium to oxygen. In this respect, therefore, sulphur, selenium, and tellurium form a series corresponding to that in which chlorine, bromine, and iodine may be arranged. Bromine, we have seen, is intermediate in its properties between chlorine and iodine, and its atomic weight is also almost

Sulphur. the mean of the atomic weights of these two elements, and ™ (iywAg, SHy)..... a) 21,800 its affinity to oxygen is less than that of either chlorine or oe pea (Si aay ieee ineee ees oe lodine ; the atomic weight of selenium, which is inter- i, ae 9.260 mediate in its properties between sulphur and tellurium, CSOs, wah 7700 | Gaseous acid. – also nearly the mean of the atomic weights of these (SO AG) sce aesescsae 1,500} Condensed acid. elements. Sula | ve ; Determined by oe pi Be SOMME. ciaesyaternn 71,070 Favre and Sil- Constitution of the Sulphur Compounds. a eee 78,770 ane: The constitution of the compounds of sulphur with

[(S0,Aq, 2NaOHAg)| 287970 monad elements may be readily deduced ; thus, the only ((Oi Ol acs… 39. 160 | | 803 becomes formule by which the chlorides of sulphur can be repre- | cen ae ae liquid. sented graphically are as follows :— – (0; ho Oe. 8 63,630 (80,, 0,, HM… 121,840 – | Sulphuric | (805, H,0) ..... 21,320 is aia lp ew theo hinge acl i (SO,H, , Aq)... 17,850 (S0,, Ag) sc… 39,170 | Liquidanhydridc. ” Cl 510 eee 103, 230 ut the constitution of each of th i] (0, ME acc. 192,910 |{ Supposing that! | may be expressed in oneal eee lia HS. 04; IIe, Aq) ...| 210,760 |((8, 0,=71,070), y* , 2NaO } (588, : Oa nag) on Aw = Re. { (as02k BO). 53,550 6S eo Dithionic j (SO;Aq, SO,Aq)..... — 10,080 = 0 acid MS, Ob seat. 211,090 (So, Og, Hy, Aq)....| 279,450 Pata ee q)} 27,070 oo 0 1 0 SAG. —LeT6 =s= =s= mriosupn- | 0 ANG) 5 SS) oooonendanae —9,270 Sulphur dioxide, Sulphur trioxide. unig el (S,0y9Aq, Og)eericcess 225,300 In lik tw dine f ls 6 (cme tye 69,500 n like manner, two corresponding formule may be assigned (Sp, 03, Hy, Aq)....| 137,860 to each of the acids formed by combining these oxides ai, ee cay » Se, Aq)..} 62,820 with the elements of a molecule of water. Sulphuric acid, se ae 4 re 3) a a Sy see. Bn for instance, may be represented by either of the following 49 By FL Jo cecevseae ; formule-— (S,, Os, Hy, Aq)....] 273-390 Selenium. SU) Ba ener, 57,710} Cryst. anhydride. | Selenious iO eee! LG) see H—0—O—S—O—O—H H—O—S—O—H acid (Senr@ Gn) acca 56,790 ll (SeO,Aq,2NaOHAq)} 27,020 O ; SERIO s AG) ..cciee ves 77,240 . . Selene teu: 0, i pie ee 19, 530 ae couluerade in He two or more atoms of oxygen FeNo 0) Perea ,450 are directly united together (for example, hydrogen dioxide, ee 30,390 the higher oxides of chlorine, and chloric acid, as to the ee ClLLUrium. constitution of which there can be little doubt as they aa t (Tre, Op BNO...: 81,190 contain only monad elements associated with oxygen) Telluric Fey AGN c.

NITROGEN. |

compounds derived from it. If, however, the second for- inula be adopted, it follows that the formula which repre- sents the three atoms of oxygen in the trioxide as directly associated with the sulphur atom is the more probable. It is probable that sulphur dioxide and sulphurous acid are analogous in constitution to sulphur trioxide and sulphuric acid, and from the manner in which hyposulphurous acid is formed from sulphurous acid we may infer

that it has the constitution represented by the second of the follow- ing formulaee—

I H—O—S—O—H

Sulphurous acid.

I H—S—O—H Hyposulphurous acid.

The following formule are the most probable expres- sions of the constitution of the remaining acids of sulphur ; the constitution of the SO, group is the same as in sulphuric acid, and the dots are used instead of lines —

HO.SO,.0H HO.S0,.SH – : oe Sulphuric acid. Thiosulphuric acid. Dithionic acid.

- . OH S. SO, q OH fr 802 . OH

:) Syse0).0H 7 “Ne

g0,. OH 2 S—SO, . OH

Trithionic acid. Tetrathionic acid. Pentathionic acid. We have previously pointed out (p. 474) the value which is to be attached to constitutional formule such

as are here assigned to the sulphur compounds.

NiTROGEN, Symbol, N ; Atomic wt., 14; Molecular wt., 28.

Nitrogen in the free state constitutes about one-fifth by volume of the atmosphere ; in combination it occurs in nitrates and ammoniacal salts, and it enters into the com- position of all animal and vegetable tissues.

It is best obtained from air by removing the oxygen by means of copper heated to redness; the air being first led through a solution of potassic hydrate to free it from car- ‘ bon dioxide, and then through concentrated sulphuric acid to remove moisture, and when thus purified, passed through

a tube containing metallic copper heated to dull redness. By passing a mixture of air and ammonia over heated copper, the copper oxide is reduced as fast as it is formed, and a short length of copper suffices for the preparation of an indefinite quantity of nitrogen ; thus—

2Cu+0O,=2Cu0, 3Cu0 + 2NH,=N,4+3H,0 + 3Cu.

The supply of air is easily regulated, as an excess shows itself by tarnishing the surface of the copper.

The easiest method of obtaining pure nitrogen is to heat a solution of ammonium nitrate, which splits up into nitrogen and water: NO,NH,=N,+2H,0. Bnt as this salt is difficult to prepare, it is better to substitute for it a mixture of potassium nitrate and ammonium chloride, which together produce ammonium nitrate and potassium chloride—

KNO, + NH,Cl=NH,NO,+KCl.

Nitrogen is a colourless, inodorous, tasteless, incondensable gas ; it is only very sparingly soluble in water, 100 volumes of water at 15° C. dissolving about one and a half volumes of nitrogen. It is incombustible, and does not support the combustion of ordinary combustibles ; it is not poison- ous, but an animal immersed in it dies simply for want of oxygen. Nitrogen evinces but little tendency to enter into reaction with other elements; titanium, tungsten, vanadium, and probably a few others combine directly with it, however, but its compounds are mostly produced by indirect means.

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Atmospheric air consists not only of nitrogen and oxy- gen, which are its chief constituents, but besides these con- tains carbon dioxide, ammonia, water vapour, &c.; solid substances, such as common salt, are also frequently held in suspension by it, especially in the neighbourhood of the sea and of towns. Air from which all other constitu- ents are removed does not always exhibit the same compo- sition, however, although the variations are very slight ; usually in pure air the proportion of oxygen is from 20-9 to

21 volumes in 100 of air, but considerably less oxygen has been found in air from confined spaces and in a few samples collected in warm countries. Full information on this subject may be obtained from Dr Angus Smith's work on Air and Rain.

The fact, however, that oxygen and nitrogen are not always contained in air in the same proportions is alone a sufficient proof that they are not combined, but only mixed together, as the constituents of a compound always occur in invariable proportions, This conclusion is confirmed in many ways. Thus, the proportions in which nitrogen and oxygen are present in air are not those of their atomic weights, nor do they bear any simple relation to them. We know also that when gases enter into reaction to form new compounds their combination is usually attended with an alteration of volume, and heat is developed; moreover, the resulting compound possesses properties which differ strikingly from those of its constituents. But when oxy- gen and nitrogen are mixed together in the proportions in which they are present in air, neither is any alteration in volume' observed, nor is heat developed ; and the proper- ties of the resulting mixture are precisely those of air, and just such as we should expect to result from the admixture of a gas which very readily supports combustion with one in which combustion is impossible. Again, were air a compound it should dissolve in water as such, or in other words, the proportion of oxygen and nitrogen in the dis- solved air should: be the same as in the undissolved air; but if a mixture, the more soluble constituent should dissolve the more readily, and relatively more oxygen than nitrogen should dissolve, since oxygen is more soluble than nitrogen. Experiment proves that the latter is the case, for if water which has been recently boiled to free it from dissolved gases and allowed to cool out of con- tact with air be shaken with air, and the dissolved air be then expelled from it by heating, and collected, it is found on analysis to contain 32 instead of only 21 per cent. by volume of oxygen. Lastly, we have seen (p. 481) that the oxygen may be to a great extent separated from the nitrogen by a mechanical process by submitting air to filtration through a thin caoutchouc membrane.

It is impossible for animals to live for any length of time in pure oxygen, apparently because oxidation takes place so rapidly that the animal is incapable of assimilating sufficient food to supply the waste ; but by

admixture with the perfectly neutral nitrogen the activity of the oxygen becomes greatly diminished.

Air from open places contains usually from 3 to 6 volumes of carbon dioxide in 10,000 volumes, but the amount of carbon dioxide in the atmosphere is subject to continual change, although within narrow limits. It does not continually increase in amount, notwithstanding that animals expire carbon dioxide, and that large quantities are produced by the combustion of wood and coal, because plants exercise a power which is the reverse of that of which animals are possessed, viz., that of decomposing car- bon dioxide and restoring its oxygen to the atmosphere.

Ammonia, NH; Mol. wt., 17.

Ammonia is the only compound of nitrogen and hydro- gen which is known to us. It may be formed directly

from its elements by submitting a mixture of the two gases to the action of the silent electric discharge; the combination is very imperfect, however. It is also obtained by the action of nascent hydrogen on nitric acid and inany of its salts ; but it is always prepared by heating an ammonium salt with an alkaline hydroxide, ammonium chloride and calcium hydroxide or slaked lime being the substances which are usually employed—

2NH,Cl + Ca(OH), = 2NH, + 20H, + CaCl.

Ammonium Calcium Calcium chloride. hydroxide. chloride.

Ammonia is a product of the decay of all nitrogenous animal and vegetable substances, and the ammonia present in the atmosphere is chiefly if not entirely derived from this source; but it appears not improbable that ammonia is directly produced in the atmosphere by the decomposi- tion of water into its elements by the electric discharge, and the combination also under the influence of the dis- charge of the hydrogen thus produced with nitrogen. Am- inonia is present in the atmosphere apparently as car- bonate, and in rain-water, especially in that of thunder showers, as nitrate and

nitrite. Ammonia salts are sometimes found as minerals, chiefly in volcanic districts. The source from which ammonia salts are now obtained, however, is the watery liquid which distils over in the manufacture of coal gas; the ammonia is liberated from this liquid by heating it with slaked lime, and by receiving it in sulphuric acid ammonium sulphate is pro- duced,—a salt which is largely employed as an artificial manure.

Ammonia is a transparent colourless gas, of a very pungent peculiar odour, and a burning taste. It may be reduced to the liquid state by a pressure of about 17 atmospheres at the ordinary temperature, or by cold alone at about — 50° to – 40° C.; by exposing the dry gas to a cold of —75° C, and a pressure of 20 atmospheres, Faraday obtained ammonia as a white transparent crystal- line body, melting at — 75° C. It does not support com- bustion, and is only feebly combustible. It is decomposed into its elements‘by a succession of electric sparks,

Ammonia is dissolved by water with great avidity, much heat being developed and great expansion taking place ; according to Roscoe and Dittmar, 1 gramme of water at 0° C. dissolves no less than ‘875 gramme of ammonia, The solution has the smell and taste of the gas, and a powerfully alkaline reaction; it loses almost all its ammonia below 100° C.

Ammonia completely neutralizes acids, forming definite crystalline salts, known as ammonium salts, which are formed by the direct combination of ammonia with the acids ; ammonia and hydrochloric acid, for example, form ammonium chloride, NH,Cl= NH, + HCl, whilst ammonia and sulphuric acid furnish ammonium sulphate, (NH,),SO, = 2NH,+H,SO,. The constitution of these salts, it will be evident, is analogous to that of the salts of the metals generally if we regard them as derived from the acids by the displacement of the hydrogen of the latter by the monad compound radicle ammoniwm, NH,, and this view is confirmed by the observation that the ammonium salts are isomorphous with the corresponding potassium salts. They are all soluble in water, and are readily decomposed by the alkaline hydroxides, and by most basic oxides, with evolution of ammonia.

The solution of ammonia in water is frequently regarded as the hydroxide of the hypothetical radicle ammonium, that is to say, as a solution of ammonium hydroxide, NH,.OH, the analogue of potassium hydroxide,

KOH. But Thomsen has shown that considerably less heat is de- veloped when an acid is neutralized by a solution of ammonia than when it is neutralized by a solution of an alkaline hydroxide, such as potassium hydroxide, for

example, the reaction KHOAq, HClAq being accompanied by the development of 27,500 units of heat, whilst only 24,500 are developed in the reaction NH,Aq, HClAq. Thomsen is inclined to regard this result as evidence that ammonia exists as such in its aqueous solution, and not as the hydroxide NH,.OH, but the difference observed appears scarcely sufficient to warrant this conclusion in the face of the chemical evidence which points to the existence of an ammonium hydroxide ; it is more probable, perhaps, that an aqueous solution of ammonia consists in part of the hydroxide and in part of free ammonia.

A very large number of derivatives may be obtained from ammonia by displacing one or more atoms of hydro- gen in it by positive or negative radicles. Those which are formed by the introduction of monad positive radicles are distinguished by the name amznes, whilst those con- taining monad negative radicles are called amides; when two atoms of hydrogen in a single molecule of ammonia are displaced by dyad negative radicles so-called cmides are produced. A simple instance of the formation of an amine derivative is afforded by the action which takes place when potassium is heated in an atmosphere of ammonia—

2NH, + 2K = 2NH,K + H,. Ammonia. Potassamine.

By digesting iodine in an excess of aqueous ammonia a black explosive compound is produced, which apparently is formed by the displacement of two of the atoms of hydrogen by iodine—-

3NH, + 21, = NHI, + 2NH,I. Ammonia. Diiodamide. It may be exploded by friction even under water, and in the dry state can scarcely be touched without exploding. When chlorine is passed into an aqueous solution of ammonia, nitrogen is evolved and ammonium chloride is produced ; thus— : | 2NH,+ 3Cl,=N,+6HCl 6NH, + 6HCl = 6NH,Cl 8NH, + 8Cl,=N,+6NH,Cl.

If the action of the chlorine be continued after the whole of the ammonia is thus acted upon, the ammonium chloride becomes attacked, and yellow oily drops of the so-called chloride of nitrogen are formed. The composi- tion of this substance has not yet been. satisfactorily ascertained ; it probably contains hydrogen, and its for- mula is supposed to be NHCl,, but it is not unlikely that the compound NCI, is also produced. It explodes with extreme violence when heated, or when brought in contact with fatty matters, or with turpentine, phosphorus, and many other substances.

The Ourdes and Acids of Nitrogen. No less than five oxides of nitrogen are known, viz.

WO”; NO 5 Beh; BO, 1 mG, Nitrous Nitric Nitrous Nitric Nitric oxide. oxide anhydride. peroxide. anhydride.

Nitrous and nitric oxide are merely dissolved by water, but the remaining oxides enter into reaction with it, producing acids,—nitrous and nitric anhydride being converted into the corresponding acids, nitrous and nitric acid, and a mixture of those two acids being formed from the intermediate oxide, nitric peroxide ; thus— N,O, + H,O = 2HNO, Nitrous anhydride. Nitrous acid. N,O, + H,O = HNO, + HNO, Nitric peroxide. Nitrous acid. Nitric acid. N,O, + H,O = 2HNO, Nitric anhydride. Nitric acid. As these various oxides of nitrogen are all prepared from nitric acid, we may conveniently describe this compound first,

NITRIC ACID. | Nitric Acid, HNO,. This acid is now usually prepared by distilling sodium nitrate or Chili saltpetre, a salt which occurs abundantly in

South America, with concentrated sulphuric acid in the proportions indicated by the equation—

2NaNO, + H,S0,= 2HNO, + Na,80,.

When potassic nitrate is employed, it is advantageous to use double the quantity of sulphuric acid; thus —

as the heat required to produce the reaction— KNO, + KHSO, = HNO, + K,S0,

is so great that a considerable amount of the acid is de- composed,

The acid passes over as an almost colourless liquid in the middle of the process, but is coloured at the beginning and end by decomposition products. To obtain the pure acid, it is mixed with an equal bulk of concentrated sulphuric atid, and the mixture distilled; the first’ portions of the distillate are collected, and a current of dry air passed for several hours through the liquid, which is gently warmed and sheltered from strong daylight.

Pure nitric acid is a colourless, mobile, fuming liquid, of the specific gravity 1:53 at 15° C.; it solidifies at about 55°C. It is an extremely unstable substance, and cannot be distilled without experiencing partial decomposition ; it is also decomposed when exposed to sunlight, becoming yellow, and oxygen being evolved. It begins to boil at 86° C,, but the temperature rises gradually, and oxygen and red fumes of oxides of nitrogen are evolved; when the boiling point reaches about 123°C., an aqueous acid, having a specific gravity of about 1°42, and containing about 68 per cent. of nitric acid, distils unchanged, and weaker and stronger acids may alike be reduced to this strength by boiling: As in the case of other aqueous acids, however, the composition of nitric acid of constant boiling point varies with the pressure under which ebullition takes place.

The addition of water to nitric acid causes the develop- ment of heat. The following table shows the extent to which this occurs, the amount of heat developed on adding m molecules of water to a molecule of the acid being given in the second column of the table, whilst the third exhibits the amount developed on adding a quantity of water equal to that already present :—

NH03, nH,0. | HNO,»H,0, nH,0.

2019 units, 1284 units,

tty ae =i gah. 1572 |,

4844 ,,

5331, ni. 5757 yy 4s 6316 ,, oS

6719 ,, 653,

“373 |. i ot ee = Year 7497 ” – 15 ” 7482, 7a, T4775 Fs eT 55 +74 ,,

7585 iy,

These numbers do not appear to furnish any evidence of the formation of a distinct hydrate on adding water to nitric acid.

Nitric acid is a monobasic acid, and furnishes an impor- tant class of salts called netrates, such as potassium nitrate, KNO,, copper nitrate, Cu(NO,)., and bismuth nitrate, Bi(NO,),. In addition to these normal nitrates, a number of so-called basic nitrates are known which may be regarded

as normal salts of a distinct acid. formed by the combina- tion of a molecule of nitric acid with a molecule of water ; such are the basic bismuth nitrate BiNO, and the basic lead nitrates Pb,H,N,O, and Pb;N,O,. The normal nitrates are best prepared by dissolving the metallic oxides, hydrox- ides, or carbonates in diluted nitric acid; they are all soluble in water. ‘The most important nitrate is that of potassium, which is employed in the manufacture of gun- powder.

Nitric acid is an extremely powerful oxidizing agent, and one of the most corrosive substances known; it rapidly destroys all animal textures and most vegetable products, and even if diluted it stains the skin, wool, and all albu- minous substances a bright yellow colour. Many hydro- genized carbon compounds are converted by it into so-called nitro-derivatives, one or more atoms of hydrogen being dis- placed by the monad compound radicle NO,;

the hydro- carbon benzene, for example, when added to the concen- trated acid yields nitrobenzene—

C,H, + HNO, =C,H;.NO,+H,0.

Most metals, excepting gold, platinum, rhodium, iridium, titanium, and perhaps a few others, are more or less readily acted on by nitric acid and converted into nitrates ; but the non-metallic elements and metalloids—iodine, sulphur, selenium, tellurium, phosphorus, arsenic, antimony, amor-phous boron and carbon, and tungsten—are oxidized by it, and furnish iodic, sulphuric, selenious, tellurous, phos- phoric, arsenic, antimonic, boric, carbonic, and tungstic acids.

The action of nitric acid on metals, however, is much influenced by temperature and concentration. Anacid of the specific gravity 1:25 to 1:35 is usually the most active. The pure concentrated acid is without action on bismuth, iron, tin, and many other metals at ordinary tem- peratures, Thus, a piece of bright ironis at once attacked by an acid of about the specific gravity 1:35, but it may be preserved in acid of the specific gravity 1°45 without losing its brilliancy; what is more remarkable, however, is that by plunging it into the more concentrated acid it is rendered passive to the action of the weaker acid, for on removing it and at once introducing it into the weaker acid, no action is observed, although on diluting the acid below 1°35 the iron is attacked.

In order, however, to understand the behaviour of nitric acid with metals, it is necessary that we should first con- sider the action of metals upon acids generally. There is little doubt that in all cases the metal simply displaces the hydrogen of the acid, forming a salt ; and if, under the con- ditions under which the experiment is made, the acid has no tendency to enter into reaction with the hydrogen which is displaced, whilst it is in the nascent state, hydrogen is also evolved ; but if the acid can enter into reaction with the nascent hydrogen the products of this secondary reaction are obtained instead. For example, zinc readily dissolves in. cold diluted sulphuric acid, forming zine sulphate, and hydrogen is evolved since it is without action on sulphuric acid under these conditions-—

Zn+H,SO, = ZnSO,+H,.

But when zine and concentrated sulphuric acid are heated together, zinc sulphate and sulphur dioxide are obtained, and no hydrogen is evolved. In this case, the hydrogen is displaced from the sulphuric acid under conditions which are favourable to its action upon the acid, and it deprives the acid of a portion of its oxygen, forming sulphurous acid, which is at once resolved into water and sulphur dioxide.

The behaviour of nitric acid with metals is precisely similar to that of zinc with heated concentrated sulphuric acid, nitric acid being a substance which with the greatest

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readiness may be deprived of its oxygen by the action of nascent hydrogen. In fact, hydrogen is never evolved by the action of metals on nitric acid, but instead oxides of nitrogen, nitrogen itself, ammonia, and other products of secondary reaction are obtained. The formation of these products is due to a somewhat complex series of reactions, which most probably are as follows. In the first place, by the removal] of one of the atoms of oxygen the nitric acid is converted into nitrous acid, HNO, ; by further re- duction this acid furnishes the so-called hyponitrous acid, HNO; and by the continued action of the nascent hydro- gen the hyponitrous acid is converted into hydroxylamine or oxyammonia, NH,(OH), which finally is reduced to ammonia, NH,. The reactions which successively occur in the formation of these compounds are represented by the following equations :—

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Nitric acid. Nitrous acid. HNO + H, = HNO + 4H,0O Nitrous acid. lyponitrous acid. HNO + H, = NH,(OH) Hyponitrous acid. Hydroxylamine, s Ilydroxylamine. Ammonia,

But the products of these reactions enter into reaction with each other, and are decomposed, and thus the gases are produced which are evolved when metals are dissolved in nitric acid. The nitric oxide doubtless results chiefly from the decomposition of the nitrous acid in the manner represented by the equation—

3HNO, = 2NO +HNO,+H,0.

The nitrous oxide may be produced in two ways :—from hyponitrous acid, which immediately on formation is resolved into nitrous oxide and water: 2HNO=N,0+ H,O; and by the action of nitrous acid on hydroxy- lamine— _ HNO,+NH,(OH)=N,0+2H,0. The nitrogen produced is probably formed in a similar manner by the action of the nitrous acid on the am- monia— HNO, +H,N =N,+2H,0;

and perhaps also, together with nitric oxide, by the action of nitric acid on hyponitrous acid.

As the product of the action of nitric acid on a metal is always a mixture, it is evident that several of the reactions pointed out must occur simultaneously. The composition of the product varies, in a manner not yet understood, with the metal, the strength of the acid, and with the temperature.

The approximate percentage composition of the gas obtained by the action of a mixture of nitric acid of the specific gravity 1:42 with twice its bulk of water on a number of metals is given iu the following table :—-

INDOKEL ecascisacnca crete 85 4 ll Cobellitemenens tse mie 79 6 15 IMT mer enero on Oe 68 23 9 Magnesium …..... 61 ly 22 FAWN! O88 Os e6cs aoodonoo: 53 40 7 ead ace nee 41 52 i (CHisboaViTHEM sa nononooncedne 20 78 2 elstieil itinniaey ones eee 19 70 11 LIS opith ered Menai 6 89 5 iihaclitinnvene se ee 4 91 5 Aluminium …..... 1 97 wD CONDE ca cc ecessnaescns 1s) OF 15 Sil Vieliae ncn hie ots a] 0 97 3

It is difficult at present to explain the remarkable differ- ence in the behaviour of the various metals with nitric

acid which this table indicates. As we have stated above, the action of the metal probably consists simply in dis- placing the hydrogen of the acid, and the gases evolved are the more or less direct products of the action of the hydrogen so displaced at the moment of liberation on the acid which is

always present in excess, The question, therefore, that we have to consider is, Why does the hydrogen displaced from nitric acid by different metals produce such very different effects? If the behaviour of closely related metals such as magnesium, zinc, and cadmium be compared, it is evident that magnesium is the most active, since it produces a relatively smaller quantity of nitric oxide, and relatively larger quantities of nitrous oxide and nitrogen, than either zine or cadmium, cadmium being the least active ; in other words, the reduction of the nitric acid is most perfect when it is effected by the hydrogen displaced by the aid of magnesium, and least perfect when it is effected by the aid of cadmium. We know that when these metals act upon acids which are not attacked by nascent hydrogen, such as hydrochloric acid, for example, different amounts of heat are developed, most heat being developed by the action of magnesium, and least by the action of cadinium. But since the mere displacement of hydrogen in hydro- chloric acid by different metals is attended with the develop- ment of different amounts of heat, it appears probable that the same will be the case with nitric acid, aud also that more heat would be developed in the reaction Mg + 2HNO, = Mg(NO,), + 2H

than in the corresponding reactions with either zinc or cad- mium ; and that on this account the reduction of nitric acid is carried furthest when magnesium is employed, and further with zinc than with cadmium. Whether this explanation

is applicable to the action of metals generally there is not sufficient evidence at present to show.

Nitrous Oxide, N,O ; Mol. wt., 43°96. This gas is obtained in a pure state by carefully heating

ammonium nitrate, which at a temperature between 200° and 250° C. breaks up into water and nitrous oxide— NH,NO,=N,0 + 2H,0.

It is the chief constituent of the gas produced on dis- solving magnesium, zinc, tin, nickel, or cobalt in nitric acid, and it is also furnished, but to a less extent, by other metals.

Nitrous oxide is a transparent colourless gas, possessing a faint sweetish smell and taste ; it may be condensed by a pressure of about 50 atmospheres at 7° C. to a colour- Jess liquid, and even frozen by the cold produced by its own evaporation. By exposing a mixture of liquid nitrous oxide and carbon disulphide to evaporation in vacuo, Natterer obtained a reduction of temperature which he estimated at — 140°C., which is lower than has been obtained ° by any other means. 100 volumes of water at 0° C. dis- solve 130 of nitrous oxide, but the solubility diminishes rapidly as the temperature rises. It supports the combus- tion of bodies almost, if not quite, as well as oxygen, but is readily distinguished from that gas by its solubility in water, and by not forming red fumes when mixed with nitric oxide gas.

The most remarkable property which nitrous oxide gas pos- sesses 1s that of causing loss of sensibility in animals. When respired for a short time it produces a singular species of transient intoxication, attended in many instances with an irresistible tendency to muscular exertion, and often to uncontrollable laughter ; hence it has acquired the name of laughing gas. It is now largely used as an anesthetic for producing insensibility to pain during surgical operations, and especially in the extraction of teeth.

Nitrous oxide is a perfectly neutral substance, and does

not exhibit any tendency to enter into combination with other bodies.

Nitric Oxide, NO; Mol. wt., 29:96.

This gas is one of the products of the action of nitric acid on metals; the gas obtained on dissolving copper in moderately concentrated nitric acid contains at first about 97 per cent, of nitric oxide, but as the action proceeds and cupric nitrate accumulates in the solution, the proportion of nitric oxide evolved diminishes, whilst that of nitrous oxide increases. ‘This appears to be due to the alternate reduction of the cupric nitrate to cuprous nitrate—

2Cu(NO;). + H, = Cu,(NO,), + 2HNO,

Cupric nitrate. Cuprous nitrate, and reconversiou of the latter into cupric nitrate, as by the action of nitric acid on cuprous nitrate nitric oxide mixed with a large proportion of nitrous oxide is produced.

Pure nitric oxide may be prepared by gently heating a nixture of a ferrous salt, such as ferrous chloride or ferrous sulphate, with hydrochloric or dilute sulphuric acid and potassium or sodium nitrate. The nitric acid liberated from the nitrate is reduced by the ferrous salt, which is oxidized to a ferric salt, and nitric oxide is evolved—

6FeCl,+6HCl + 2HNO, = 2NO + 3Fe,Cl,+4H,0. Ferrous chloride. Nitric acid. Nitric oxide. Ferric chloride. .

Nitric oxide is a colourless, transparent, uncondensable gas, almost insoluble in water ; it is the most stable of the oxides of nitrogen, and may even be exposed to a red heat without undergoing decomposition. A lighted taper and phosphorus just kindled are extinguished by it, but if the phosphorus be burning vigorously when introduced into the gas the temperature is then sufficiently high to enable it to decompose the gas into its elements, and it continues to burn as brilliantly as in pure oxygen.

Nitric oxide immediately combines with oxygen when mixed with it, forming deep red fumes of higher oxides of nitrogen. It is perfectly absorbed by a solution of ferrous chloride or sulphate, which it turns black; when the solution is heated, most of the nitric oxide is expelled from it unchanged, and in this way nitric oxide may be separated from other gases insoluble in solutions of the ferrous salts. Nitric oxide is absorbed by nitric acid, and apparently nitrous acid is produced—

HNO, + 2NO +H,0 =3HNO,.

It combines directly with chlorine, forming the compound NOC, or nitrosyl chloride, which is also produced together with chlorine when a mixture of concentrated nitric and hydrochloric acids—the so-called aqua regia—is heated—

HNO, + 8HCl=NOC1+Cl, + 2H,0.

Nitrosyl chloride is most readily prepared, however, by gently heating a mixture of dry sodiuni chloride and the lead chamber crystal compound (p. 504)—- O.NO os ONa SO, 1 Oa? +NaCl=NOCI+80, | ORs It is an orange-yellow coloured gas, which readily liquefies; the liquid has a deep orange colour, and boils at about -—8°C. It is decomposed by water, forming hydrochloric and nitrous acids—

NOC] + HOH = NO.OH + HCl.

Nitrosyl chloride. Nitrous acid.

Nitrous Anhydride, N,O,.

The properties of this compound have not yet been satis- factorily ascertained. Apparently, it is produced, together with nitric peroxide, when nitric oxide is mixed with oxygen, and when nitric acid is heated with arsenious anhydride ; it is stated that it may be preparcd in a pure

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o13 state by passing a mixture of nitrie peroxide with an excess of nitric oxide through a heated tube, and that it may be condensed to a deep blue coloured liquid, which begins to boil at about 2°C., but is decomposed into nitric oxide and peroxide. It combines readily at ordinary temperatures with oxygen, forming nitric peroxide.

Nitric Perowide, NjO,; Mol. wt., 91°86.

Nitric peroxide may be obtained by combining nitric

oxide with oxygen, and by heating lead nitrate— 2Pb(NO,), = 2N,0, + 2PbO + O,. Lead nitrate. Nitric peroxide. Lead oxide,

At low temperatures it forms colourless prismatic crystals, which melt at —9°C.; at this temperature the liquid oxide is almost colourless, but it assumes a yellow colour, increasing in depth up to its boiling point. It boils at about 25°C., yielding a brownish-red vapour, the depth of which also increases with the temperature, until at 40° C. it is so dark as to be almost

opaque. The vapour of nitric peroxide, however, probably even at tem- peratures below its boiling point, is a mixture of the com- pound N,O, with simpler molecules of the composition NO,; the proportion of the latter increases as the tem- perature rises, and at temperatures above 150° C. the decomposition into NO, is apparently complete. The compound NO, is not decomposed at a dull red heat.

Nitric peroxide has a pungent suffocating odour, and is quite irrespirable. It is decomposed by water with pro- duction of nitrous and nitric acids: N,O,+ H,O = HNO, +HNO,. Chlorine is without action on nitric peroxide in the cold, but when a mixture of the two gases is passed through a heated tube the compound NO,Cl or nitrylic chloride is formed. It is a pale yellow liquid, which is decomposed by water into nitric and hydrochloric acids.

Nitric Anhydride, N,O;.

This compound may be obtained directly from nitric acid by the action of phosphoric anhydride—

2HNO, + P.O; = NO, + 2HPO,.

; q Phosphoric Nitric Metaphosphoric Nitric acid. = anhydride. anhydride. acid.

It may also be obtained by the action of chlorine on silver nitrate— 2AgNO,+2Cl, =2NO,Cl+2AgCl+ 0, AgNO,+NO,Cl1=N,0, + AgCl.

Nitric anhydride crystallizes in transparent prisms, which melt at about 30° C.; it is very unstable, par- ticularly in the fused state, and gradually decomposes even at ordinary temperatures into oxygeu and _ nitric peroxide. Water converts it into nitric acid: N,O,+H,O = 2HNO,.

Nitrous Acid, HNO,.

In the pure state this compound is unknown to us, but its salts, the nitrites, may readily be prepared. Thus, on heating sodium or potassium nitrate to redness until the gas which is evolved begins to contain nitrogen, a residue

which consists chiefly of sodium or potassium nitrite is obtained ; these nitrites are soluble in alcohol, and may

| by its aid be separated from the nitrates, which are

insoluble. A mixture of nitrate and nitrite is also pro- duced on passing the gas evolved when nitric acid is heated with arsenious anhydride, starch, or sugar into a solution of potassium or sodium hydroxide, and when oxygen is added to nitric oxide which is in contact with a solution of an alkali. On adding silver nitrate solution to a concentrated solution of the impure nitrite, silver nitrite, AgNO,, which is difficultly soluble in water, is precipitated ; this salt may be purified by crystallization V. — 65

from a large quantity of hot water, and from it other

nitrites may be prepared in a pure state by double decomposition with the corresponding chlorides ; thus—

AgNO, + KCl = AgCl + KNO,. Silver Potassium Silver Potassium nitrite. chloride. chloride. nitrite.

Although oxygen and nitrogen do not directly combine, when a succession of electric sparks is passed through a mixture of the two gases confined over water, red fumes are produced which dissolve in the water, forming nitric and uitrous acids. The nitrite and nitrate present in the atmosphere and in rain-water are doubtless formed in this manner, .

On adding an acid to a nitrite, nitrous acid is liberated, but at once decomposes with evolution of nitric oxide—

KNO,+HCl = HNO,+KCl 3HNO,=2NO + HNO,+OH,.

Nitrous acid can only exist, in fact, in presence of a large quantity of water, or of nitric acid. It parts with its oxy- gen more readily, and is therefore a more powerful oxidizing agent, than nitric acid. It also appears to act more readily than nitric acid upon many metals. Thus, pure nitric acid is almost

without action upon silver, but on passing a few bubbles of nitric oxide gas into the acid, and thus produc- ing a minute quantity of nitrous acid, the metal is at once attacked, and is dissolved more and more rapidly the longer the action continues, doubtless because the hydrogen dis- placed from the acid by the silver reduces nitric acid to nitrous acid, so that the more silver is dissolved the richer the solution becomes in nitrous acid. Platinum also, which is insoluble in nitric acid, is dissolved by nitrous acid.

On some hydrogenized carbon compounds nitrous acid exerts an action similar to that of nitric acid, and causes the displacement of hydrogen by the monad compound

radicle NO, producing nitroso-compounds. Thus— C,H;.OH + NO.OH = OC,H,NO).OH + H,O. Phenol. Nitrous acid. Nitrosophenol,

Nitrous acid readily absorbs oxygen, and is converted into nitric acid. The nitrites are also converted into nitrates when exposed in the moist state to air. Nitrous acid is easily distinguished from nitric acid by its power of liberating iodine from iodides, by the readiness with which it destroys the blue colour of a solution of indigo at ordi- nary temperatures, and by its decolorizing a solution of potassium permanganate,—nitric acid being without the power of liberating iodine from iodides, or of bleaching permanganate solution.

Hyponitrous Acid, HNO.

When sodium is added to a solution of sodium nitrate, the hydrogen displaced from the water by the sodium re- duces the nitrate to nitrite, which in its turn undergoes further reduction to the hyponitrite, NaNO. On rendering the solution slightly acid with acetic acid, and adding silver nitrate, a yellow pulverulent precipitate of silver hyponi- trite, AgNO, is produced. It is insoluble in water, and almost insoluble in acetic acid, but is soluble in either dilute nitric or sulphuric acid, and without immediate decomposi- tion. Moderately diluted nitric, sulphuric, or hydrochloric acid decomposes it with the evolution of nitrogen, and the production of apparently both nitrous and nitric acids in the solution. It is immediately oxidized by concentrated

nitric acid. A solution of the sodium salt acidified with-

acetic or hydrochloric acid decolorizes potassium perman- ganate ; it does not liberate iodine from iodides, however, but on the contrary decolorizes a solution of iodine. When the solution acidified with acetic acid is heated, nitrous oxide is evolved.

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[NITROGEN COMPOUNDS.

Hydroxylamine, NH,{OH).

This compound is formed when nitric acid is added to a mixture of tin and hydrochloric acid, the hydrogen pro- duced. by the action of the tin on the hydrochloric acid re- ducing the nitric acid. It may also be formed by the dircct union of nitric oxide with hydrogen, namely, by passing a stream of nitric oxide gas through a series of glass cylinders containing tin and hydrochloric acid, together with a little platinum chloride solution, whereby hydrogen is produced at ordinary temperatures.

It is a very unstable substance, and cau be obtained only in solution, but well-crystallized hydroxylammonium salts are formed by its union with acids. Thus, the hydro- chloride, NH,Cl(OH), or NH,(OH). HCl, crystallizes from alcohol in long spicular crystals, and from water in large irregular monoclinic prisms ; it melts at 100° C., but decom- poses, with violent evolution of gas, into nitrogen, ammo- nium chloride, water, and hydrochloric acid. A solution of hydroxylamine has an alkaline reaction, and precipitates many metallic salts ; it decomposes quickly if concentrated, and gradually if dilute, with evolution of nitrogen and formation of ammonia—

3NH,(OH) = N,+NH, + 30H,.

Hydroxylamine is readily reduced to ammonia by the action of the nascent hydrogen from sodium amalgam and water.

The results of Thomsen’s thermochemical investigation of various nitrogen compounds are collected in the following table :—

Units of Reaction. fee é Remarks. absorbed. (NG Ele). ces 26,710 | Ammonia gas. (NH,, Aq)... 8,440 (N, Hy, Aq) 85,150 (NH3,Aq, HClAq) 12,270 (NH;Aq, H,S, Aq) 6,190 (N, H,)“Cl, Aq 86,740 (N, H,, Br, Ag) 75,800 Ammonia {(N, Hy, I, Aq)..... 60,580 (N, H;, S, Aq)..... 50,600 (nied: (6) ean 90,620 (I ei) eisdee ss. 80,180 | | Crystalline salts (ONT op dah gel acccconte: 64,130 formed from (Gals oy JKCND) cearcenon- 41,910 the gaseous (NH,, HBr) 45,080 constituents. ’ GNGig, HT) 6…) 48,46 itrous oxide (Ng, 0) Fey Gaseous, Nitric (NO, O 19,570 Peroxide (NO, GAM) cass… 0000 7,750 — Org, OY. ca… 18,300 a (N10, ,.0,, Aa)... 72,940 NO,, 0, H, Aq)... 51,080

It will be observed that a considerable amount of heat would be absorbed in the formation of nitrous oxide from its elements ; consequently, when this gas is decomposed into its elements, heat is developed, and on this account it is readily decomposed by burning bodies. ‘This fact also explains the non-formation of nitrous oxide from its ele- ments. Probably, heat would also be absorbed in the for- ination of nitric oxide from its elements. The absorption of heat is perhaps necessary, because the amount of energy in the form of heat which can be developed by the com- bination of nitrogen with oxygen to form nitrous and (?) nitric oxides is less than must be expended in separating the atoms of oxygen of the oxygen molecules from each other, and the atoms of nitrogen of the nitrogen molecules from each other.

PHOSPHORUS. |

PHOSPHORUS, Symbol, P; At. wt., 30°96; Mol. wt. of gas, 123-84.

This element never occurs in the free state, but is al- ways found in combination as a salt of phosphoric acid. Considerable deposits of more or less pure calcium phos- phate occur in a few places, and phosphates are found in minute proportions in most rocks and in soils, and in river and spring waters. Phosphates are necessary to the life of all plants and animals. In plants they accumulate chiefly in the seed; in animals they accumulate in the bones, of which calcium phosphate is the chief earthy con- stituent, but they are also an important element of blood and nervous tissue.

Phosphorus was discovered in 1669 by Brandt of Ham- burg, who obtained it by distilling the residue of evapo- rated urine with charcoal. Scheele in 1775, however, was the first who devised a process for its extraction from bones, and it has always since been prepared from this source. ‘The bones are burnt to a white ash, which is finely powdered and mixed with a sufficient quantity of diluted sulphuric acid to displace by hydrogen two-thirds of the calcium in the tricalcium phosphate, which is the main coustituent of bone ash, in the manner represented by the equation—

Ca,(PO,), + 2H,SO, = H,Ca(PO,), + 2CaSO, .

Tricalcium Sulphuric Monocalcium Caleium phosphate, acid. phosphate. sulphate.

The solution of monocalcium phosphate, or superphos- phate of lime as it is ordinarily termed, which is obtained, is separated from the insoluble calcium sulphate, and evaporated to a syrup; this is mixed with about one-fourth its weight of charcoal powder, and heated gradually to dull redness in an iron pot with constant stirring. By this means the elements of two molecules of water are re- moved, the monocalcium phosphate being converted into calcium metaphosphate—

CaH,(PO,),=Ca(PO,), + 2H,0.

The porous mixture of calcium metaphosphate and char- coal thus obtained is introduced into earthen retorts, and distilled at a bright red heat. The calcium metaphos- phate is then converted into tricalclum phosphate and phosphoric anhydride, and the latter is decomposed by the charcoal into carbonic oxide and phosphorus, which passes over in vapour and is condensed in water—

3Ca(PO,), = 2P,0, + Cas(POx), P,0,+5C=2P +500.

The crude phosphorus which is produced is usually puri- fied by adding a mixture of potassium chromate and sul- phuric acid to it when in a melted state. The impurities are thus oxidized, and rise to the surface in the form of a scum, and the pure phosphorus remains colourless and trans- parent at the bottom of the vessel.

Freshly-prepared phosphorus is almost perfectly trans- parent and colourless, or has, at niost, a faint yellow tinge. It melts at 44° C., forming a viscid oily liquid, and boils at 290° ©. Its vapour at a temperature of 1040°C. is about 62 times as heavy as hydrogen gas, and hence, as the atomic weight of phosphorus is about 31, it appears that the molecule of gaseous phosphorus is tetra- tomic. Phosphorus has a specific gravity of about 1°82. It is a non-conductor of heat and electricity. It is in- soluble in water, but freely soluble in carbon disulphide, phosphorus trichloride, and sulphur chloride, 8,Cl,. It crystallizes in forms of the regular system. —

Phosphorus is extremely inflammable, taking fire in the open air at a temperature very little above its melting point; if it contains impurities, it inflames still more easily. It gradually absorbs oxygen when exposed to the

air at ordinary temperatures, giving off a white vapour, which has a peculiar garlic odour ; iu presence of moisture phosphorous acid, H,PO,, and phosphoric acid, H,PO,, are produced.

Phosphorus, like sulphur, can exist in several allotropic modifications, the most remarkable being that produced by exposing ordinary phosphorus to light, or by heating it for some hours to a temperature of about 240° C. in an atmo- sphere free from oxygen. It is thus converted into a red amorphous substance, which is insoluble in carbon disul- phide, and may be heated to 250° C. without alteration, but at 260° C., under the ordinary pressure, it is reconverted into ordinary phosphorus. The red modification has a much higher specific gravity (2°14) than ordinary phosphorus, and it is also distinguished by its inertness as compared with the latter; thus, it is not oxidized in the air at com- mon teniperatures, and it emits no odour. The transfor- mation of ordinary phosphorus into this variety is attended with development of heat. Troost and Hautefeuille lave shown that the formation of the red modification is governed by different laws according as the phosphorus is in the state of gas or liquid, and that it takes place much more rapidly in the latter case. When the tension of the vapour becomes diminished to a certain minimum value, varying for each temperature, the

transformation ceases ; this tension of transformation is established only after some time, Liquid phosphorus at 280° C., for instance, becomes wholly transformed into red phosphorus. The vapour given off at 260° C. is stable, but that formed at higher temperatures becomes slowly and partially converted into red phosphorus, the production of which ceases when the tension attains a given minimum ; the rapidity with which this change takes place is greater the higher the tempera- ture. At temperatures up to 520° C., however, the maxi- mum tensions of phosphorus vapour are much higher than the tensions of transformation ; thus, at 360° C. the tension of transformation is ‘6 atmosphere, but to prevent phos- phorus boiling at this temperature, a pressure of 3°2 atmo- spheres must be exerted, Above 520°C. the maximum tension is not established on account of the rapidity with which the transformation takes place ; and at temperatures above 550° C. the tension observed is no greater than the tension of transformation, because the transformation of the liquid phosphorus takes place more rapidly than its evaporation. The observed maximum tension and tension of transformation at different temperatures are given in the following table :-—

Temperature. Maximum tension. Tension of transformation. 360° 3°2 atmospheres 0°6 atmospheres 440° 75 3 1°75 ” 487° ae 6°8 “pf 494° 18°0 . 503° 21°9 9 510° Age 10°8 np iiilily 26°2 Ap 531° aa 16°0 An 550° 310 ” 577° 56°0 ”

The red phosphorus produced by heating ordinary phos- phorus in closed vessels differs, however, in appearance according to the temperature at which it is prepared. That obtained at 265° C. has a bright red colour and glassy fracture ; that produced at 440° C. is orange-yellow in colour, and exhibits a dull fracture; at 500°C. it is denser, and has a violet grey colour; and, lastly, that prepared at 580° C. has a conchoidal fracture, exhibits signs of commencing fusion, and often encloses ruby red crystals. These modifications differ also in specific gravity, and when oxidized to phosphoric acid by iodic acid solution they develop different amounts of heat. Thus—

O16

Temperature of Heat of oxidation

formation, Sp. gr. at 0° C. per gramme. 265° 2°148 5592 units. 360° 2°19 NSO 56 500° 2:298 above 5272 ,, 580° (fused) 2 RB} 580° fcrystalline) 9°34 GM op

Hydrogen, except in the nascent state, appears to be without action on phosphorus. Oxygen forms the two oxides P,O; and P,O,. Chlorine, bromine, and iodine enter directly into reaction with ordinary phosphorus, the combination being attended with inflammation ; red phos- phorus also enters into reaction with these elements at ordinary temperatures, and heat is developed, although to a much less extent. When sulphur and ordinary phos- phorus are melted together, combination takes place with great violence, and the experiment of bringing the two bodies together is attended with much danger. If dis- solved in carbon disulphide, they are without action upon each other. Red phosphorus readily enters into reaction with sulphur when a mixture of the two substances is gently warmed, and although much heat is developed by their combination, the reaction is not explosively violent. Selenium also unites with phosphorus when the two are heated together nearly to the boiling point of the latter. Most metals combine with phosphorus when they are heated in its vapour, or when it is thrown upon them whilst they are in a state of ignition.

Compounds of Phosphorus with Hydrogen.

Three of these compounds are known, viz., phosphine or phosphoretted hydrogen gas, PH,, and a liquid and a solid hydrogen phosphide,

Phosphine is obtained in a pure state by decomposing phosphonium iodide by a solution of potassium or sodium hydroxide: PH,I+KHO=PH,+KI+H,0. It isacolour- less gas, possessing a most intolerable garlic-like odour ; it is sparingly soluble in water, the solution being neutral to test paper. Phosphine is extremely inflammable, igniting at a temperature a little above 100° C.; contact with a drop of fuming nitric acid, or with chlorine or bromine, also causes it to inflame. A mixture of the gas with oxy- gen standing over water is gradually absorbed, and phos- phorous acid produced. It is a powerful reducing agent, withdrawing oxygen with great readiness from bodies like nitric oxide, sulphur dioxide, and sulphuric acid. It pre- cipitates many metallic salts, the precipitate in most cases consisting either of metallic phosphide, as in the case of copper, or of reduced metal,

as in the case of gold and silver. phonium iodide, PH,I, and with hydrobromic acid forming phosphonium bromide, PH,Br, but not with hydrochloric acid or other acids ; these salts are crystalline bodies, which are decomposed by water into phosphine and hydriodiec or hydrobromic acid.

Phosphine mixed with more or less hydrogen is obtained

by the action of water on the calcium phosphide, prepared |

by heating phosphorus with lime; by heating phosphorus with a solution of an alkaline hydroxide—

3Ca(OH), + 8P + 60H, = 2PH, + 3Ca(PH,O,)

Calcium hydroxide.

and when phosphorous, or hypophosphorous, acid is

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Calcium hypophosphite.

heated— GPOy “= BE, 3 aan Hypophosphorous acid. Phosphoric acid. 4EePQ, = PH, + SH, PO; .

Phosphorous acid. Phosphoric acid.

The gas obtained by the first and second methodsis spon- taneously inflammable, owing to the presence of liquid hydrogen phosphide, which may be separated by passing the gas through a U-tube cooled by a mixture of ice and

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It combines with hydriodic acid, forming phos-

[COMPOUNDS OF

salt. Liquid hydrogen phosphide probably has the com- position P,H,; by contact with various substances, and especially by hydrochloric acid, and by exposure to light, it is converted into phosphine and a yellowish solid hydrogen phosphide, supposed to have the composition P,H or P,H, —

5P,H, = 6PH, + P,H,.

Compounds of Phosphorus with the Halogens.

A gaseous pliosphorus pentafluoride may be obtained by the action of phosphorus pentachloride on arsenic tri- fluoride: 5AsF,+3PCl,=3PF,+5AsCl. It is not de- composed by the passage of electric sparks, even when mixed with oxygen or hydrogen. ‘Two chlorides of phosphorus are produced by the action of chlorine on phosphorns,—a liquid trichloride, PCl,, and a solid penta- chloride, PCl,. Bromine in like manner forms a liquid tribromide, PBr,, and a solid pentabromide, PBr,. Bro- mine also combines with phosphorus trichloride, forming the chlorobromide PCl,Br,, and this componnd is capable of combining with further quantities of bromine, forming the compounds PCI,Br,. Br, and PCl,Br,.3Br,; all these chlorobromides of phosphorus are crystalline bodies. Iodine forms the two iodides PI, and P,I,, which are both crystalline.

Phosphorus trichloride boils at 76° ©., and the tri- bromide is also volatile without decomposition, but the

remaining chlorine and bromine compounds of phosphorus

are decomposed by heat into the trihaloid compounds and halogen : PCl,=PCl,+Cl, The iodides are also decom- posed by, heat, apparently into iodine and amorphous phos- phorus.

The haloid compounds of phosphorus are all readily decomposed by water. The pentachloride and penta- bromide are first converted into the oxychloride and oxy- bromide, two of the atoms of halogen being displaced by a single atom of oxygen—

PCI, + H,O = POCI, + 2HCI;

and by the continued action of water these compounds are converted into phosphoric acid ; thus—

POBr, + 3H,0 = PO,H, + 3HBr.

The behaviour of the trihaloid compounds of phosphorus is analogous to that of the oxychloride and oxybromide, phosphorous acid being produced — PI, + 3H,0 = PO,H, + 3HI.

The compounds containing more than five atoms of halogen behave as mixtures of the pentahaloid compounds with halogens—that is to say, they furnish the products of the decomposition by water of the pentahaloid compound, and also the free halogen. The iodide of phosphorus, P,I,, is peculiar in its behaviour with water ; it is stated that when it is decomposed by a small quantity of water only phos- phorous and hypophosphorous acids are formed—

PI, +5H,0 = H,PO, + H,PO,+4HI; but that when a large quantity of water is employed, a yellow insoluble substance of the composition PHO is produced, the reaction taking place in the manner repre- sented by the equation—

6P,[, + 24H,O0 = P,H,0 + PO,H, + 3P0,H,

Hypophos- Phosphorous phorous acid. acid. +3P0,H, + 24H1.

Phosphoric acid.

Oxides of Phosphorus, The combustion of phosphorus in air produces both phosphorous and phosphoric anhydrides, P,O, and P,O,; the latter may be readily obtained by burning phosphorus

in an excess of dry air, but it is almost impossible to obtain the former free from the latter. The best mode of prepar- ing the trioxide is to burn phosphorus in a very slow cur- rent of dry air; it then condenses as a bulky white amorphous sublimate.

Phosphorous anhydride is readily soluble; it absorbs moisture with avidity, and dissolves in water, producing phosphorous acid: P.O; + 3H,0 = 2H,PO,.

Phosphoric anhydride is a snow-white, flocculent, amor- phous substance. It sublimes below a red heat. an attraction for water which probably is only exceeded by that of sulphuric anhydride, deliquescing quickly in moist air, and dissolving in water with a hissing noise and great development of heat ; the solution contains metaphos- phoric acid : P,O, + H,O = 2HPO, ; but this acid gradually combines with a further quantity of water, forming phos- phoric acid: HPO,+H,O=H,PO, By virtue of its affinity to water, phosphoric anhydride causes the separa- tion of the elements of water from many compounds; sulphuric acid, for example, when heated with phosphoric anhydride is converted into sulphuric anhydride—

HySO, + P.O; = SO; + 2HPO,.

Phosphoric Sulphuric Metaphosphoric

Sulphuric acid. anhydride, anhydride. acid.

Oxyacids of Phosphorus. The following oxyacids of phosphorus are known :—

Hypophosphiorons acid ….....c0.00 00560: HPH,O, PROS PMOTOW ACTA, 5. ..0.0r0ccssonecs cows cecoinen Dg EO, PROB O MOT CHAI, 40500-0.0000ree0rer ooneesnas H,PO, MMCCAPHOSPNOTIC ACI... ..- sccevexsesesseveviess HPO, Pyropho@sphovie’ BOI.....6..c.ccscesceeeeeee H,P,0,

Hypophosphorous acid, HPH,O,.—To prepare this acid a solution of barium hypophosphite is treated with exactly sufficient sulphuric acid to precipitate the barium, and concentrated until its boiling point rises to 130° C. ; on the liquid cooling, a mass of crystals of the acid is obtained. The solution of the barium salt is obtained by warming (not boiling) phosphorus with an excess of a solution of barium hydroxide, and afterwards removing the excess of hydroxide by passing carbon dioxide through the liquid :—

3Ba(OH), + 8P + 60H, = 3Ba(PH,0,), + 2PH,.

Hypophosphorous acid melts at 17° C.; it is perfectly stable at ordinary temperatures, but its solution is slowly oxidized to phosphorous and phosphoric acids when ex- posed to the air. It is a powerful reducing agent, pre- cipitating silver and gold from solutions of their respective salts, and when heated to about 60° C. with a solution of copper sulphate it forms a precipitate of copper hydride, Cu,H,. When zinc is dissolved in the acid, the hydrogen produced reduces a portion of the acid to phosphine, which is given off as gas.

Hypophosphorous acid is a monobasic acid. Its salts are crystallizable and soluble in water. They are per- manent when dry, but their solutions are gradually oxidized on exposure to the air, especially if heated. When boiled with alkaline hydroxides they are decomposed into phosphate and hydrogen, thus—

KPH,0,+ 2KHO = K,PO,+ 2H.

The dry salts are decomposed by heat, and in most cases furnish a residue of pyrophosphate and metaphos- phate, phosphine and hydrogen being evolved, and some- times water produced ; the proportions in which these pro- ducts are formed is not constant, and depends on the nature of the salt, thus-—

5NaPH,O, = Na,P,0,+NaPO, + 2PH, +2H, 78r(PH_0,)9 =3Sr,P,0, + Sr(PO,), + 6PH, + 4H,+ H,0 13Ba(PH,O,),=6Ba,P,0, + Ba(PO;),.+12PH, +4H, + 4H,V

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The behaviour of the nickel and cobalt, and uranyl salts is peculiar, a phosphide being also formed—

6Co(PH,O0,), =4Co(PO;).+ 2CoP 2PH, 9H, 9(U0,)(PH,O0,).= 6UP,0O, U(PO;), 2UP +18H,

Phosphorous acid, H,PHO,.—This acid is most readily prepared by decomposing phosphorus trichloride with water. By concentrating the solution by boiling until the temperature rises to 180° C., and then cooling, it is obtained in the crystalline state. The crystals melt at 70° C. Like hypophosphorous acid, it is resolved into phosphine and phosphoric acid when heated. Its solution is oxidized on exposure to the air. It isa powerful re- ducing agent, precipitating silver, gold, and mercury froin their salts, but it does not form copper hydride with copper sulphate. Iron and zine dissolve in a solution of phosphorous acid with evolution of phosphine, a portion of the acid being reduced by the hydrogen resulting from the conversion of another portion into the metallic salt.

Phosphorous acid is a dibasic acid, the salts produced on neutralizing its solution with alkaline hydroxide being formed by the displacement of at most two atoms of hydrogen by metals; thermochemical investigation also indicates that it is a dibasic acid. It is possible, how- ever, to displace a third atom of hydrogen by metals, and to produce such a compound as Na,PO,, for example, but this cannot exist in presence of water. Many of the phosphites apparently must be regarded not as derived from the acid H,PHO,, but as derivatives of a distinct acid of the composition H,P,H,O,, or 2H,PHO,+H,O; barium phosphite dried at 200°-250° C., for instance, has the composition Ba,P,H,O,.

The phosphites are much more stable than the hypo- phosphites, but are all decomposed by heat. Salts, such as the barium salt Ba,P,H,O,, furnish hydrogen and pyro- phosphate on ignition—

Ba, P,H,O, = 2H, + Ba,P,O, ; but the normal phosphites, such as zinc phosphite ZnPHO,, furnish hydrogen, a pyrophosphate, and a phosphide—
14ZnPHO, = 7H, + 6Zn,P,O, + Zn,P,.

Phosphoric acid, H,PO,.—This acid may be produced by oxidizing phosphorus with nitric acid, by the oxidation of hypophosphorous and phosphorous acids, by the action of water on phosphoric anhydride and on phosphorus pentachloride, and by decomposing its salts with acids,—tricalcium phosphate or bone earth, for example, with sulphuric acid.

It may be obtained in crystals by concentrating an aqueous solution by boiling until the temperature rises to 215° C., and when the liquid is cold adding a few crystals, which cause it to solidify.

The crystals melt at about 38° C. They are readily soluble in water, and furnish a strongly acid solution, which at a boiling heat decomposes the salts of most volatile acids.

Phosphoric acid is a tribasic acid, and furnishes three classes of salts, of which the three sodium salts

NaH,FO,, Na,HPO,, Na,PO, Sodium dihydrogen Disodium hydrogen ey phosphate. phosphate. Trisodium phosphate.

may serve as examples. It has a great tendency, however, to furnish dimetallic salts, such as Na,HPO,, which are always produced when a solution of phosphoric acid is neutralized with a metallic carbonate (see p. 488), Metaphosphoric acid, HPO,.—This acid is the product of the action of water on phosphoric anhydride, and is also obtained by heating phosphoric acid to redness, and by decomposing the metaphosphates with another acid.

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Metaphosphoric acid in the solid state, as obtained by evaporating its solution and heating the residue to redness, is a colourless, glassy, uncrystallizable mass, which dis- solves slowly though somewhat abundantly in water, forming a strongly acid liquid; but the solution is very unstable, and is converted gradually at ordinary tempera- tures, and rapidly on heating, into phosphoric acid. Meta- phosphoric acid is an extremely stable body; it volatilizes completely at a bright red heat, and apparently is only in part decomposed into water and phosphoric anhydride. —

The metaphosphates, or salts of metaphosphoric acid, which may be produced by heating the monometallic salts of phosphoric acid, for example —

NaH,PO, = NaPO,~ + Sodium phosphate. Sodium metaphosphate. and in various other ways, are remarkable for exhibiting very different properties

according to the manner in which they are prepared. Thus, ordinary sodium metaphosphate, obtained by igniting sodium phosphate and sudden cooling, forms a vitreous mass, the aqueous solution of which gives gelatinous precipitates with the salts of the heavy metals. But when a considerable quantity of ordinary fused sodium inetaphosphate is allowed to cool very slowly, a crystalline mass results, and on digesting this in a slight excess of warm water the liquid separates into two layers, one con- taining a crystalline sodium metaphosphate, and the other the ordinary vitreous salt. By heating copper oxide and a slight excess of phosphoric acid together to 350° C., a crystalline powder is formed, insoluble in water; and by treating this copper salt with sodium sulphide another crystalline sodium metaphosphate is produced. If oxide of lead be employed, and the resulting lead salt decom- posed with sodium sulphide, a sodium metaphosphate is obtained which forms with water a gummy mass, which will not pass through a filter. Lastly, a fifth variety of metaphosphates, remarkable for their insolubility in water, are formed by adding phosphoric acid in excess to solutions of sulphates or nitrates, evaporating to dryness, and heat- ing the residue to 316° C, or upwards. They are crystal- line powders.

These different metaphosphates are generally regarded as polymeric compounds, that is to say, as compounds having different molecular weights although of the same empirical composition ; and the attempt has been made to infer their formulz: from the relative number of atoms of the two metals contained in the mixed salts derived from them. Thus, the sodium in ordinary sodium metaphos- phate may be partially displaced by another metal, and a mixed salt produced containing the two metals in the ratio of 5 atoms of the one monad metal to 1 atom of the other hence it is concluded that ordinary sodium metaphosphate is a hexmetaphosphate, Na,P,O,,. The mixed salts de- rived from the second variety of sodium metaphosphate above described contain the twometalsin the ratio of 2 atoms of the one monad metal to 1 atom of another, and are there- fore regarded as trimetaphosphates, the sodium salt being represented by the formula Na,P,0,. The mixed salts formed from the third and fourth varieties coutain equal numbers of atoms of the two metals, and it is therefore supposed that they are respectively di- and tetra-meta- phosphates, and that their sodium salts, for example, have the composition Na,P,O, and Na,P,O,,. The

insoluble crystalline metaphosphates are regarded as monometa-phosphates,

Pyrophosphoric acid, H,P,0,.—The normal salts of this acid, which is tetrabasic, may be produced by igniting the dimetallic phosphates ; for example—

2Na,HPO, = Na,P,0O,+H,0 . A solution of the acid may be prepared by decomposing

H,0,

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lead pyrophosphate suspended in water by hydrogen sulphide. Apparently the acid has not yet been obtained in a pure state.

Pyrophosphoric acidis converted into metaphosphoric acid when heated to redness, and into phosphoric acid when boiled with water ; the latter change, it is stated, takes place also at ordinary temperatures, but very slowly. A solution of pyrophosphoric acid does not precipitate albumen or silver nitrate, but after neutralization it gives a white precipitate with the latter. Metaphosphoric acid coagulates albumen, and gives a white precipitate with silver nitrate; and phosphoric acid does not coagulate albumen, and when neutralized gives a yellow precipitate with silver nitrate.

In addition to the normal pyrophosphates, acid salts may be obtained, formed by the displacement of only one, two, or three of the four atoms of hydrogen in the acid by metals. By fusing together sodium pyrophosphate and sodium metaphosphate the salts Na,P,O,, and N: BoP 90s) have been obtained ; these salts may be regarded as formed from acids derived respectively from four and ten molecules of phosphoric acid by the abstraction of the elements of three and nine molecules of water in the same way that pyrophosphoric acid is derived from two molecules of phos-

phoric acid, by the abstraction of the elements of a single molecule of water —

2H,P0,-H,0 =H,P,0, 4H,PO, – 3H,0 = H,P,O,. 10H,PO, — 9H,0 = HP, ,0,)

These acids are terms in a series, of which pyrophosphoric acid is the first member, formed by the withdrawal of the elements of 2-1 molecules of water from molecules of phosphorie acid.

Very little attention has been paid as yet to the thermo- chemical investigation of the phosphorus compounds. The results obtained by Andrews and by Thomsen are collected in the following table ; the numbers all refer to phosphorus in its ordinary state :—

| Units of. Reaction. Pine or Remarks. absorbed. (CUM. scnewes- 75,000} Andrews. (P,, O,) 362,800 | Abria. aime gee eens 367,800 | Andrews. (POM, Ags… 2,690 . . (POs, ka)... 130 eee solution of the crystalline (PO,H,, Aq)..... —170 ‘ Heat of solution of the fused acids at the same temperature. The (B oe oy ets: bate difference between the heat of (} rid H,) eee 2140 solution of the fused and crys- Ue RS Y talline acids is the heat of fusion. bs ee | nee Sor Formation of the crystalline acids 2) Bo Ata) coors 9 . (P; O,. H,) ne) 139,970 from their elements. tp ‘ i} pas sa, 4 Formation of the fused acids from > ry 3 eanee 9 LJ c,.6,, a)... 137,660 || their elements. iS . Be – oa is Formation of the acids in aqueous (P? O,. ie a) 139,800 solution from their elements. Ss “ O° E a Bac l Formation of the acids from phos- (Er, 0, ‘Aq) cm 5 av 520 \ phorus, oxygen, and water.

Se Sulphides and Sulpho-Acids of Phosphorus.

The compounds P,S,, P,S,, and P,S, are readily pro- duced by carefully heating together sulphur and red amor- phous phosphorus in the required proportions. It is stated that the lower sulphides P,S and P,S may also be obtained by melting together ordinary phosphorus and sulphur under hot water in the proportions indicated by these formule,

PHOSPHORUS. |

and that both are liquid compounds. The sulphides P,S,, P,8,, and P,S, may be crystallized from their solutions in carbon disulphide; they all exhibit acid properties, dis- solving readily in solutions of the metallic sulphides, form- ing salts of sulpho-acids of phosphorus, which have been little studied, however, on account of their instability. They also dissolve in solutions of the alkaline hydroxides and carbonates, forming salts of oxysulpho-acids of phos- phorus; but these are also very unstable bodies, and readily decompose in contact with water. The sulphides of phosphorus are readily decomposed by water alone, their sulphur being displaced by oxygen and corresponding oxy- acids of phosphorus produced, the sulphur being separated as hydrogen sulphide; thus— __—..

PS, + 6H,0 = 3H,S + 2H, PO, .

By heating amorphous phosphorus with selenium in various proportions, the selenides P,Se, P,Se, P,Se,, and P,Se, are produced. They resemble the corresponding sulphides, and also exhibit acid characters, combining with metallic selenides to form salts of seleniophosphoric acids, which are even less stable than the corresponding sulpho- salts.

Oxy- and Sulpho-Huloid Compounds of Phosphorus.

We have already pointed out that phosphorus pentachlo- ride and bromide are converted by water into phosphorus oxychloride, POCI,, and phosphorus oxybromide, POBr,. Phosphorus oxychloride may also be obtained by the direct combination of phosphorus trichloride with oxygen, being produced on passing oxygen through the boiling trichlo- ride ; it is a colourless mobile liquid at ordinary tempera- tures, but solidifies on cooling to a mass of crystals, which melt at 2°C.; it boils at 110°C. The oxybromide is a similar compound; its crystals melt at 46° C., and it, boils at 195° C.

The oxides of phosphorus do not combine with the halo- gens, but by the action of nitric peroxide on phosphorus trichloride an oxychloride of phosphorus is formed, which bears the same relation to pyrophosphoric acid that phos- phorus oxychloride or phosphoric chloride bears to phos- phoric acid—

4PCl, + 3N,0, = 2P,0,Cl, + 2NO+4NOCI,

Pyrophosphoric chloride, as this compound may be termed, is a colourless liquid, which boils between 210° and 215° C., but decomposes partially into phosphoric chloride and phosphoric anhydride: 3P,0,Cl,=4POCI,+P,0,. It is immediately decomposed by water, producing hydrochloric and phosphoric acids.

Phosphorus sulphochloride or sulphophosphoric chloride, PSCl,, and sulphophosphoric bromide, PSBr,, are obtained on heating phosphorus trichloride and tribromide with sulphur, and by the action of hydrogen sulphide on the pentachloride and pentabromide of phosphorus: PCI, + H,S=PSCl,+2HCl. The sulphochloride is an oily liquid, having an intensely pungent odour, and boils at 126° C. The sulphobromide crystallizes; it is partially decomposed on distillation into sulphur and the compound PSBr,, PBr,. They are only slowly decomposed by water, the sulpho- bromide even forming a crystalline hydrate with water, PSBr,,H,O; the decomposition of the sulphochloride is represented by the following equations—

PSCl, + H,O =POCI, +H,8

POCI, + 3H,0 = PO,H, + 3HCl. The sulphobromide apparently is first converted into mono- sulphophosphoric acid: PSBr, + 3H,O = PSO,H, + 3HBr, which is then resolved partly into sulphur and phosphorous acid, and partly, by the action of the water, into phos- phorie acid and hydrogen sulphide. Phosphorus sulpho-

chloride behaves in a similar manner when heated with a solution of sodium hydroxide; thus—

PSCl, + 6NaOH = PSO,Na, + 3NaCl + 3H,0.

A sulphopyrophosphoric bromide, P,S,Br,, correspond- ing to pyrophosphoric chloride, is formed by directly com- bining bromine with the sulphide P,S,. It is an oily liquid, which cannot be distilled, being

resolved by heat into phosphorus pentasulphide and phosphoric bromide : 3P,8,Br, = P,8; + 4PSBr, .

Constitution of the Phosphorus Compounds.

The formule of the two chlorides and of the tetriodide of phosphorus may be given in illustration of the con- stitution of the compounds of phosphorus with monad elements—-

Cl Cl | | LP Cl—P—Cl Cl—P—Cl | % if a a

Phosphorus trichloride. Phosphorus pentachloride. Phosphorus tetriodi.’e.

The two oxychlorides of phosphorus are represented by the following formule, the corresponding bromine and sulphur compounds, of course, being similarly constituted :—

Cl Cl Cl | | | Cl—P—Cl O=P—O—P=O I | | O Cl C) Phosphoric chloride. Pyrophosphoric chloride.

The constitution of the oxides is expressed by the for- mulee—

O O \ O=P—O—P=O P—O—P 4 \ Phosphorous anhydride. Phosphoric anhydride.

Similar formule are assigned to the corresponding sul- phides. | Hypophosphorous, phosphorous, and phosphoric acids may be regarded as derived from the compound POH,, or phosphine oxide, by the displacement of one, two, and three atoms of hydrogen by the monad radicle OH ; although this compound is not known at present, analogous bodies are readily obtained on oxidizing the substituted phosphines formed by displacing the hydrogen in phosphine by positive monad compound radicles, such as methyl, CH,—

O O — a ot Ae H_0-B-0—H

6 : 6

i i i Hypophosphorous Phosphorous Pucebiirideall:

The relation of meta- and pyrophosphoric acid to phos- phoric acid will be evident from the following formula—

| | O O=P—O—H | H—O—P—O—H O Metaphosphoric acid. Pyrophosphoric acid.

520 CHEM Bogon. Symbol, B; At. wt., 11; Valency, ’”.

This element always occurs in the combined state as boric acid, or as a salt of boric acid. Two modifications of boron may be obtained, viz., an amorphous and a crystalline modification; the former is produced by reduc- ing boric anhydride, B,O,, by heating it with sodium, and the latter is formed when the reduction is effected by the aid of aluminium at a very high temperature. _

Amorphous boron is a dark brown powder ; it does not oxidize in the air at ordinary temperatures, but when heated it burns in air or oxygen, in the latter with dazzling brightness, forming the oxide B,O;. By ignition in an atmosphere of nitrogen it is converted into a white amor- phous boron nitride, BN. It does not decompose water, even at the boiling heat, but readily dissolves in nitric acid, producing boric acid; when heated with potassium hydroxide it forms a potassium borate, hydrogen being evolved,

On heating amorphous boron with aluminium it is dis- solved, and crystallizes from the fused metal on cooling; it may be separated from the latter by the aid of hydrochloric

acid. The crystals are usually of a more or less brown

coiour, but in lustre, refracting power, and hardness they are nearly equal to the diamond. Crystalline boron is only slightly oxidized at the temperature at which diamond burns.

Boron forms a trichloride, BCl,, a tribromide, BBr,, and a trifluoride, BF;. The chloride may be obtained by the direct action of chlorine on amorphous boron, the com- bination taking place at ordinary temperatures ; it is also produced by strongly heating a mixture of boric anhydride and charcoal in an atmosphere of chlorine, and by heating boric anhydride with phosphorus

pentachloride to 150° C. The bromide may be obtained in a similar manner by the direct combination of its elements. Both are colourless, mobile liquids; the chloride boils at 17° C., and the bromide at 90°C. They are readily decomposed by water ; thus—

BCl, + 3H,0 = H,BO, + 3HCl. Boron chloride. Boric acid.

Boron chloride is not easily deprived of its chlorine by the action of metals, which is apparently accounted for by the fact that much heat is evolved in its formation from its elements. According to Troost and Hautefeuille, the amounts of heat disengaged in the formation of the chloride and oxide of boron from their elements, and in the decomposition of the former by a large excess of water, are as follows—

(B, Cl;) = 104,000 units of heat. W895 Oa) = Gly) 5 (BCI, , Aq)= 79,200 99 9

Boron fluoride is formed by the action of hydrofluoric acid on boric anhydride, viz., by heating a mixture of boric anhydride and calcium fluoride with concentrated sulphuric acid. It is a colourless gas, of pungent, suffocat- ing odour ; when passed into water, which dissolves about 700 times its volume of the gas, it is partly decomposed into borie and hydrofluoric acids, and partly combines with the hydrofluoric acid thus produced, forming fluoboric acid, HBF,. This acid can only be obtained in a state of dilute solution, but many salts formed from it are known, such as potassium borofluoride, KBF,, for example. Its existence appears to indicate that boron is capable of acting as a pentad element.

Boron oxide, B,O,, is most readily obtained by strongly heating boric acid; it forms a colourless, brittle, glassy mass, which dissolves readily in water, producing boric acid, and is one of the most stable oxides known. It

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unites with metallic oxides, when fused with them, forming borates, and at high temperatures it is capable of decom- posing carbonates, sulphatcs, and indeed the salts of all acids the anhydrides of which are more volatile than itself.

Boric acid, H;BO, or B(OH),, occurs native in many volcanic districts, especially in Tuscany, where it issues from the earth together with vapour of water; borax, Na,B,O,+10H,O, and a few other of its salts are also found in nature. It crystallizes from water in white nacreous lamin, which are easily soluble; when heated to about 100° C., it furnishes a residue of the composition H,B,O), which, on heating to 160° C., becomes H,B,0,, and at a stronger heat it is converted into the anhydride, B,O,;. A large number of borates are known, but the nature of their relation to boric acid is not well understood. A comparatively small number are derived from the acid H,BO,, the majority apparently being formed from an acid of the empirical composition HBO,, to which the name metaboric acid is given. Salts derived from the acids H,B,O, and H,B,O, are also known, and ordinary borax, the most important of the borates, may be regarded as formed from the latter acid.

[Boron.

CARBON.

Symbol, C; At. wt., 11°97 ; Valency, iv,

The properties of carbon itself and its oxides have already been described (p. 86), and necd not therefore be again discussed.

On comparing the compounds of carbon with those of other elements we find that, whereas there is reason to believe that the number of atoms of any of the other elements directly associated together in a molecule of their compounds is very small, probably never exceeding five, carbon compounds frequently contain a relatively very large number of carbon atoms, which from the behaviour of the compounds we are led to suppose are in direct association with each other; and while none of the remain- ing elements are known to furnish more than a single stable compound with hydrogen, the number of stable compounds of carbon with hydrogen which have been obtained may be counted by hundreds. We are thus led to the conclusion that carbon possesses two distinctive pro- perties :—firstly, that of uniting with itself to an almost unlimited extent in comparison with other elements; and secondly, that of combining with hydrogen in numerous proportions. It is in consequence capable of uniting with the same elements

in a multiplicity of proportions, aud of furnishing a great variety of compounds, which probably exceed in number those of all the remaining elements together.

The study of the compounds of carbon constitutes that branch of our science which is termed organic chemistry, which is treated separately below, pp, 544 sqq. ;—the study of the remaining elements and of their compounds constitut- ing inorganic or, as it is also termed, mineral chemistry. The division is both useful and necessary, on account of the great number of carbon compounds which exist, and because, generally speaking, the compounds of other ele- ments are distinguished from those of carbon by their com- parative simplicity, and also by the comparative want of stability which all but the simplest exhibit; this we may attribute to the possession by carbon of the distinctive pro- perties above mentioned, but otherwise there is no essen- tial difference between the compounds of carbon and those of the remaining elements.

Organic chemistry originally dealt only with substances more or less directly derived from the animal or vegetable kingdom, and it was long believed that the chemist was

powerless to produce organic substances from their elements as they were formed in the animal or plant under the influence of life, it being supposed that, therefore, the interposition of a special force, termed the vital force, was requisite. The first step towards the disproval of this hypothesis was made by Wéhler, who in 1828 succeeded in artificially producing urea, the characteristic crystalline constituent of the urine; but its final overthrow was not accomplished until 1845, when Kolbe showed that it was possible to produce acetic acid from carbon by a compara- tively very simple series of reactions. Berthelot’s discovery in 1862 of the formation of acetylene, C.H,, from its elements, however, affords the simplest solution of the problem of the artificial production of organic substances from their elements, as acetylene may be without difficulty converted into ordinary alcohol, and from this body all the carbon compounds which have been artificially pre- pared may be more or less directly derived. Chemists have already succeeded in preparing a large number of substances which occur as

products of animal or vegetable life,—for example, oxalic, tartaric, and salicylic acids ; coumarin, the crystalline substance from which the Tonka bean derives its pleasant odour; and alizarin, the colour- ing matter derived from madder root. From the insight we have recently gained into their constitution, there is little doubt that eventually the synthesis of even the most complex organic bodies, such as albumen, will be possible.

Although carbon combines with hydrogen in a great varicty of proportions, it furnishes only a very limited number of compounds with other elements ; thus, only one sulphide of carbon, CS,, and one nitride of carbon, C,N,, are known, and no well characterized compounds of carbon with the metals have been obtained. The compounds of carbon with the halogens are more numerous. The only compound that calls for consideration here is the sulphide ; the others will be noticed in the section on Organic Chemistry.

Carbon disulphide, CS,, the analogue of carbon dioxide, is obtained by passing sulphur vapour over charcoal heated to redness. It is a colourless, very mobile, highly re- fracting liquid of faint unpleasant odour, insoluble in water; it boils at 46° C. It is extremely inflammable, and its vapour when mixed with air is highly explosive ; the products of its combustion are carbon dioxide and sulphur dioxide. The formation of carbon disulphide from its elements is attended with the absorption of no less than 22,000 units of heat, which explains how it is that it so readily inflames, and also the fact that it is necessary to apply heat continuously in preparing it; whereas the combustion of carbon in oxygen, when once it commences, proceeds spontaneously, owing to the large amount of heat developed in the process; we may suppose that the ex- penditure of energy is necessary because less heat is developed by the combination of the atoms of carbon and sulphur than is requisite to convert the carbon and sulphur from the state in which they ordinarily exist into that in which they exist in carbon disulphide, or, in other words, than is requisite to effect the separation from each other of the atoms of carbon and of sulphur in the carbon and sulphur molecules.

Carbon disulphide belongs to the class of acid sulphides or sulphur-anhydrides. It readily dissolves in solutions of alkaline hydroxides and of metallic sulphides, forming salts analogous to the metallic carbonates, and

which may be regarded as derived from the carbonates by the partial or entire displacement of the oxygen in the latter by sulphur. The stability of these salts and of the corre- sponding acids increases with the amount of sulphur ; thus, sulphocarbonic acid, H,CS;, which is formed from the salt produced by combining carbon disulphide with metallic

sulphides, may be obtained as a yellow oily liquid, whereas carbonic acid, H,CO,, can only exist in extremely dilute solution.

Carbon disulphide readily dissolves sulphur and phos- phorus, and also oils and fatty matters ; on thig account it meets with many practical applications.

By gently heating a mixture of carbon disulphide and sulphuricanhydride, carbon oxysulphideis produced, one-half the sulphur in the former being displaced by oxygen : CS. + SO;=COS+S80,+5; this compound may also be obtained by combining carbon monoxide with sulphur, by passing a mixture of the gas with sulphur vapour through a red hot tube. It is a colourless gas, possessing an odour like that of carbon disulphide ; in properties, as in composition, it is intermediate between carbon dioxide and disulphide.

SILICON. Symbol, Si; At. wt., 28; Valency, Iv.

This element always occurs in combination either with oxygeu alone as silicon dioxide or silica, or with oxygen and metals as silicates,—constituting, in fact, in these forms of combination, the greater part of the earth’s crust.

Silicon may be obtained from its chloride or fluoride by theaction of metals such as potassium, sodium, or aluminium; like carbon it exists in three distinct modifications. Amor- phous silicon produced by heating potassium silicofluoride, K,SiF,, with potassium, or the corresponding sodium salt with sodium, is a dull brown powder, heavier than water ; it is not affected by nitric or sulphuric acid, but is readily dissolved by hydrofluoric acid, and by a warm aqueous solution of potassium hydroxide. It fuses at a temperature below that at which steel melts ; and when heated in air or oxygen it burns brilliantly and is converted into silicon dioxide. When strongly heated in a platinum crucible it becomes much denser and darker in colour, and much legs oxidizable, being converted into graphitoidal silicon. On heatinga mixture of aluminium with potassium silicofluoride to the melting point of silver, a metallic button is obtained, which, when treated successively with hydrochloric and hydrofluoric acids, yields graphitoidal silicon partly in isolated hexagonal tables. This modification

has the specific gravity 2°49, and may be heated to whiteness in oxygen without burning ; it is not attacked by any acid excepting a mixture of nitric and sulphuric acids, and is only slowly dissolved by a solution of potassium hydroxide,

When the vapour of silicon tetrachloride mixed with hydrogen is passed over fused aluminium, the chloride is reduced, and the silicon dissolves in the aluminium ; after a time a point is reached at which the silicon scparates from the fused metal in large beautiful needles, having a dark iron-grey colour. These crystals constitute the adamantine variety of silicon.

Silicon appears to be capable of combining with hydrogen in the nascent statc, as when a plate or wire of aluminium containing silicon is connected with the positive pole of a galvanic battery, and made to decompose a solution of sodium chilcride, gas is evolved which spontancously inflames. Silicon hydride mixed with much hydrogen is also obtained on decomposing with concentrated hydro- chloric acid the magnesium silicide produced by heating a mixture of magnesium chloride, sodium silicofiuoride, and sodium chloride with sodium. The pure gas is pro- duced by the decomposition of triethylsiliconorthoformate in contact with sodium —

4SiH(OC,H,), =

Triethylsiliconorthoformate.

SiH, +

Silicon hydride,

38i(OC,H,),. Tetrethylorthosilicate.

It is a colourless gas, not spontaneously infiammable under the ordinary temperature or pressure, but only when gently heated under reduced pressure, or when mixed with V — 66

hydrogen. When heated by itself, it is decomposed into amorphous silicon and free hydrogen. It is insoluble in water, and is not altered by dilute hydrochloric or sul- phuric acid ; potassium hydroxide, however, decomposes 1t readily—

SiH, + 2KOH + H,O = K,SiO, + 4H).

Silicon hydride, Potassium silicate,

It precipitates silicide of copper from a solution of copper rulphate, and metallic silver mixed with a black substance, which is, perhaps, silver silicide, from a solution of silver nitrate.

By heating silicon in chlorine gas, or in an atmosphere of bromine, or iodine, it is converted into the compounds SiCl,, SiBr,, and Sil, ; the chloride and bromide are best prepared, however, by passing chlorine or bromine vapour over an intimate mixture of silica and charcoal heated to redness, Silicon tetrachloride and tetrabromide are colour- less liquids, boiling at 50° C. and 153° C. respectively ; the tctriodide crystallizes from its solution in carbon di- sulphide in colourless octahedra (which melt at 120°°5 C.), and boils at about 290° C., distilling without alteration in a stream of carbon dioxide. They are quickly decomposed by water; thus—

SiCl, + 2H,O =Si0, + 4HCl.

Wher silicon tetriodide is heated to near its boiling point with finely divided metallic silver it is converted into disili- con hexiodide, Si,[, ; this crystallizes from carbon disulphide in colourless hexagonal prisms which are decomposed on fusion into the tetriodide and a body which is perhaps the subiodide, Si,I,. By the action of bromine, this compound is converted into the corresponding bromide, Si,Br,, and by gently heating it with mercuric chloride the chloride Si,Cl, is obtained. The bromide forms crystals which distil without decomposition at about 240° ©.; disilicon hexachloride is a colourless mobile liquid, which boils at 146°-148° C., the corresponding carbon chloride, C,Cly, being a crystalline solid which boils at 330° C, ; it is very slowly decomposed when heated in closed vessels to 350° C. into the tetrachloride and silicon, and is entirely con- verted into these substances at 800° C. A lower liquid chloride, which probably has the

composition Si,Cl,, is obtained in small quantity together with the hexachloride when the vapour of the tetrachloride is passed over fused silicon heated to a very high temperature.

By passing the vapour of silicon tetrachloride through an exhausted porcelain tube containing fragments of felspar heated nearly to the fusing point of the latter, it is partially converted into the oxychloride (SiCl,),O ; this is a colourless liquid boiling at 186°-139° C., which is decomposed by water in the same manner as silicon tetrachloride. When the vapour of this compound mixed with oxygen is passed several times through a heated tube, silicon tetrachloride is reproduced, and a complex mixture of higher liquid

oxychlorides is obtained containing the compounds SLO ,Clig::

(b. p. 152°-154° C.), Si,O,Cl, (b. p. about 200° G.), SigOioChye (b. p. about 300° C.), together with still higher oxychlorides.

By passing hydrochloric acid over crystallized silicon heated to barely visible redness, a mixture is produced of silicon tetrachloride with the compound SiHCl,, which from its relation in composition to trichloromethane or chloroform, CHCl,, is termed silicon-chloroform. The corresponding iodo-derivative, SiHI,, is formed in a similar manner by the action of hydriodic acid gas mixed with hydrogen. Silicon chloroform is a colourless extremely mobile liquid, and boils at about 36° C.; it is converted by chlorine at ordinary temperatures into the tetrachloride, and when heated with bromine it furnishes silicon tri- chlorobromide, SiC1,Br. which boils at 80° GC. Silicon

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iodoform, SiHI,, is a colourless, strongly refracting liquid; it boils at about 220° C.

When a mixture of silicon tetrachloride vapour and hy- drogen sulphide gas is passed through a tube heated to redness, the compound SiCl,.SH is

obtained ; it isa colour- less liquid boiling at 96° C.

Hydrofluoric acid acts readily on silicon dioxide and silicious substances generally, forming silicon tetrafluoride : Si0,+4HF=SiF,+2H,O. Silicon tetrafluoride is a colourless gas, which liquefies under very strong pressure, and solidifies at—140° C.; it is not inflammable. It is readily absorbed by water, which decomposes it into silica and hydrofluosilicic acid: 38iF,+2H,O = 2H,SiF, + Si0,. This acid is not known except in solution, but its salts, which are readily produced by neutralizing its solution with metallic oxides, hydroxides, or carbonates, are stable compounds, and are mostly soluble in water. By prolonged

‘ignition they are decomposed into silicon fluoride which

escapes, and a metallic fluoride which remains behind. Potassium fluosilicate, K,SiF,, is one of the least soluble of the potassium salts, and consequently this acid is often used to precipitate potassium from solutions of its salts.

By passing the tetrafluoride over silicon heated nearly to the softening point of porcelain, it is converted into a — subfluoride, which probably has the composition Si,F, ; it is a white, very light powder.

Only one oxide of silicon is known, viz., the dioxide or silica, SiO,. According to Troost and Hautefeuille, its formation from amorphous silicon and oxygen is attended with the development of a very large amount of heat, viz.,—

(Si, O.) = 219,240 units of heat.

According to the same observers, in the formation of the tetrachloride from amorphous silicon and chlorine, and in its decomposition by 140 times its weight of water, the following amounts of heat are developed :—

(Si, Cl,) =157,640 (SiCl,, Aq)= 81,640

and from the amount of heat developed on dissolving amorphous and crystallized (?adamantine) silicon in a mixture of nitric and hydrofluoric

acids they calculate that the transformation of the former into the latter is attended with the development of 8120 units of heat.

When obtained by igniting the gelatinous silica from the decomposition of the haloid silicon compounds by water, or of the soluble silicates by acids, silica is a snow- white amorphous powder ; but it occurs native as quartz in Jarge transparent crystals of the hexagonal system, of the specific gravity 2°5 to 2°8, and of extreme hardness. Native silica of all kinds is insoluble in water and in all acids except hydrofluoric acid; this is also true of artificial ignited silica. The gelatinous hydrate which separates on the addition of acids to solutions of alkaline silicates is also almost insoluble in water and in acids, but that which results from the decomposition of silicon fluoride is stated to be suluble in a considerable quantity of water. Gelatinous silica dissolves without difficulty in solutions of potassium or sodium hydroxide at the ordinary temperature, and all forms of silica are more or less readily dissolved by solutions of these alkalies, especially when heated with them under pressure ; in this manner, according to the proportions of silica and alkali employed, various alkaline silicates are formed which are the more soluble the greater the proportion of alkali metal they contain. Those which contain a larger proportion than is indicated by the formula Na,SiO,, but still a sufficient quantity to make them completely soluble in water, are termed “ water-glasses ;” water-glass is now largely manu- factured and employed for hardening and preserving stone,

in the preparation of paints, especially for mural painting, and in the manufacture of soap.

Although silica is an extremely weak acid oxide, on account of its non-volatility, it is capable of decomposing the salts of all volatile acids at more or less elevated temperatures, and the salts formed from it are stable at the highest temperatures. A great variety of artificial and natural silicates are known,—some of which may be regarded as derived from silicic acid, H,SiO,, and others from an acid which may be termed orthosilicic acid, H,8i0,, but the majority are far more complex, those which occur as natural minerals being formed by the association of silica with basic oxides in proportions included between the following limits :—

4M,‘O or 4M”0 : SiO, and M,‘O or M”O : 28i0, 2R0, :Si0, and RO, : 6Si0,.

On adding acids to a solution of an alkaline silicate, a gelatinous “ hydrate of silica” is precipitated ; the whole of the silica may be retained in solution, however, if a dilute solution of an alkaline silicate be poured into a considerable excess of hydrochloric acid, but may be precipitated by gradually neutralizing the acid. The retention of the silica in solution is, perhaps, due to the formation of a soluble chlorhydrin (p. 565), If a stratum 54 of an inch in depth of the hydrochloric acid solution be placed in a “dialyzer” formed by stretching wetted parchment paper across a light hoop of wood or gutta-percha, and the dialyzer be floated in a vessel of water, the water in the outer vessel being changed at intervals, after four or five days the hydrochloric acid and the soluble chlorides are found to have diffused completely into the water; but the solution in the dialyzer still contains the silica, and a5 per cent. solution prepared in this way may be concentrated by boiling down in an open flask until it contains nearly 14 per cent. of silica. The solution is tasteless, limpid, and colourless; it has an acid reaction rather greater than that of carbonic acid; for every 100 parts of silica present, however, only 2:13 parts of potassium hydroxide are requisite to neutralize the acid reaction, The solution is not easily preserved for many days, as it becomes converted into a solid transparent jelly ; coagula- tion is retarded by hydrochloric acid, and by small quantities of potassium or sodium hydroxide, but is effected in a few minutes by the addition of zo455 part of any alkaline carbonate, although ammonia and its salts are without effect. Sulphuric, nitric, and acetic acids are also without action, but a few bubbles of carbon dioxide gas slowly cause coagulation. The condition in which the silica is present in the solution having these very remark- able properties is not known, but on the assumption that a chlorhydrin is produced on decomposing the alkaline silicate by an excess of hydrochloric acid, it appears not improbable that, as the excess of the latter is removed by dialysis, the chlorhydrin is gradually decomposed by the water and, perhaps, converted into the hydroxide H,8i0, , or some other soluble hydroxide, and that the subsequent coagulation may be due to the conversion of this hydroxide into an insoluble hydroxide of different molecular composi- tion, The solution evaporated at 15° C. in a vacuum leaves the silica in the form of a transparent, glassy, very lustrous hydrate,

containing after two days’ exposure over sulphuric acid an amount of water which agrees very nearly with the formula H,SiO..

When silicon chloroform is added to water at the ordinary temperature, hydrogen is evolved, and hydrated silica is produced: SiHCl,+2H,0=H,+S8i0,+3HCl; but if water at zero is employed, a precipitate is obtained which, after drying over sulphuric acid, and then at 150° C., has the composition (HSiO),0. This compound is analogous

in composition to the unknown auhydride of formic acid : (HCO),0 = 2HCO(OH)-— OH, ; its formation is probably preceded by that of the hydroxide SiH(OH),;. It is a snow-white, voluminous, amorphous substance, slightly soluble in water ; it is decomposed by the least heat whcu in a moist state, with evolution of hydrogen, and is dis- solved by ammonia, caustic alkalies, and alkaline carbonates, with evolution of hydrogen and production of an alkaline silicate. It is not acted upon by any acids except hydro- fluoric acid, even concentrated nitric acid being without action. It decomposes when heated above 300° C.

Silicon hexachloride and hexiodide are decomposed by water in a similar manner, being first converted into the hydroxide Si,(OH),, which then furnishes siliconoxalic acid Si,0,(OH),. This is a white substance, and when heated is decomposed, like the preceding compound, with evolution of hydrogen, leaving a residue of silica; it is also decom- posed with evolution of hydrogen by even the weakest bases. It rapidly reduces potassium permanganate in the cold, but is only slowly oxidized by chromic acid, and is without action on solutions of gold chloride or selenious acid. On decomposing the chloride, Si,Cl,, however, by water an hydrated oxide is obtained which not only reduces potassium permanganate and cliromic acid, but also gold chloride and selenious acid. The behaviour of siliconoxalic acid on oxidation is precisely similar to that of its carbon analogue oxalic acid, C,0,(OH),, which, however, is a crystalline, strongly acid body, which dissolves readily in water and furnishes stable salts.

By the action of anhydrous alcohol, silicon tetrachloride is converted into tetrethylorthosilicate, Si(OC,H;),, which is a colourless liquid boiling at 166° C.; it is gradually decomposed by water, being converted into alcohol and gelatinous silica. By the joint action of zinc ethyl and sodium on this compound, it is possible to displace in succession each of the groups (OC,H,) by ethyl, thus:—

28i(OC,H,), + Zn(C,H,), + 2Na = 28i(C,H,)(OC,H,), + 2NaOC,H, + Zn. In this' manner the following compounds have been prepared :—

Boiling Point,

Si(C,H,)(OC.H,)s .. teeseresenee 166″ O, Si(CoHp)q(OC gH s)o - +.sseeseeeeseseesesseeserserseser scenes 159° RO CM ssfhgco vs ans see x0 csineopaenausvevaaanreds es 155° U(CoHs)qenveeeeeecessreesesseesesserenseesneecneesen eneeey 153 MI MTN coisscicesaccleenenahans eyserensentsnesstaseseeret™ 107°

These compounds are all colourless liquids, insoluble in water, and stable in the air; the first only is decomposed when allowed to remain in contact with water. Silicon ethyl, Si(C,H;),, may also be obtained by the action of zine ethyl on silicon tetrachloride ; and from the latter compound and zinc methyl silicon methyl, Si(CH;),, has been prepared; similarly, the hexiodide is converted into the corresponding ethyl derivative Si,(C,H,), by the action of zine ethyl. These silicon hydrocarbons exhibit the closest resemblance to their analogues the paraffins. Thus by the action of bromine on silicon tricthylhydride, Si(C,H,),H, the bromide Si(C,H,),Br is produced, which may be converted by the action of aqueous ammonia into the silicon alcohol triethylsilicol, Si(C,H;),.0H; this method of formation is precisely analogous to that by which the hydrocarbon C(CH;),H is converted into the alcohol C(CH,),.OH. 'Triethylsilicol also resembles the corre- sponding alcohol triethylearbinol, C(C,H,);.OH, in pro- perties ; thus, both are colourless, viscid liquids, having a strong camphor-like odour, difficultly soluble in water ; the former boils at 154° C., the latter at 141° C. ; they dissolve sodium with evolution of hydrogen, being converted into corresponding sodium derivatives Si(C,H,),.0Na and

C(C,H,)s-ONa ; and both are acted upon by acetic chloride in a similar manner— Si(C,H,)3.0H + C,H,0Cl = Si(C,H,),Cl + C,H,0, . C(C,H;)3-OH + C,H,0Cl = C(C,H,),Cl + 0,H,0,.

The most important difference is in their behaviour on oxidation,— triethylsilicol remaining unattacked, while tri- ethylearbinol is readily converted into acids containing fewer atoms of carbon.

Silicon ethyl is converted by the action of chlorine into a chlorinated derivative Si(C,H;),(C,H,Cl), from which the silicon aleohol SiC,H,,. OH may be prepared, corresponding to the yet unknown carbon alcohol C,H,).OH. It is a liquid insoluble in water, smelling like camphor, and boiling at 190°C

By heating the compound §i(C,H,)(OC,H,), with hydriodic acid solution it is converted into siliconpropionic acid— C,H,.Si(OO,H,), + 3HI = C,H;.Si0(OH) + 3C,H,I + HO.

Ariethyl siliconortho- propionate.

In a similar manner, siliconacetic acid, CH,.8i0(OH); may be prepared from the corresponding methyl compound. But although these silicon acids correspond in composi- tion to acetic acid, CH,CO(OH), and propionic acid, C,H;.CO(OH), they exhibit very different properties ; thus, they are white amorphous substances, insoluble in water, although soluble in alkaline solutions, from which they are precipitated by the addition of acids, whereas acetic and propionic acids are colourless liquids, soluble in water, and boil respectively at 119° C. and 140° C,

When the vapour of carbon disulphide is passed over a heated mixture of silica and carbon, silicon disulphide, SiS,, is produced; it crystallizes in white silky needles, which quickly decompose in moist air into hydrogen sulphide and amorphous silica.

From the foregoing description of the silicon compounds, it will be evident that while closely allied both in composi- tion and in many of their properties to the carbon com- pounds, they nevertheless differ from them in numerous important particulars. Thus, carbon dioxide is gaseous, and

silicon dioxide is a non-volatile solid; the chlorides of carbon are stable in presence of water except perhaps at relatively very high temperatures, but the chlorides of silicon are with the greatest readiness decomposed by water; carbon disulphide is a volatile liquid not affected by water, while silicon disulphide is a solid which cannot exist in presence of water; and obviously the representa- tives of the carbon compounds oxalic acid, acetic acid, and propionic acid in the silicon series possess very different properties. In many respects silicon bears considerable resemblance to boron, the resemblance being especially noticeable between the elements themselves, and in the behaviour of their haloid compounds with water, and also in the property which the fluorides of both elements possess of combining with hydrogen fluoride. It is of interest to uote that much more heat is developed in the formation of the oxides of boron and silicon than in the formation of carbon dioxide, which alone is gaseous ; thus—

(By, Os) =817,200 units of heat. (C, 0,) = 93,600 s/ (Si, 0.) =219,200 i

In the case of the corresponding chlorides the order of

volatility is reversed; thus—

BCI, Boiling Point…....17°

Siliconpropionic acid.

CCl,

SiCl, 78°

50°

_ in discussing the remaining elements it will suffice to Indicate the general nature of their relations to each other,

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as a full description of the more important will be given under other headings. instance to consider those elements together which are most

closely related in properties, and afterwards to indicate the manner in which the elements generally aro related to each other.

[METALS OF THE ALKALIES

It will be convenient in the first

METALS OF THE ALKALIES.

——————— eee Melting| Electric

Name. Symbol.| At.wt. | Sp. gr. | At. vol. | point. conductivity a at 20°-21°5 C. Lithium Li it 59 | 11°8 | 180 19:00 Sodium Na 23 Oval 2ou7 97 37°43 Potassium K 39 °86 | 45°3 62 20°83 Rubidium Rb 852 E526 56K0 58 Cesium Cs NB oll ey ik ae

The elements of this class are white metals, volatile at high temperatures ; lithium is softer than lead but harder than sodium, while sodium is harder than potassium, and potassium harder than rubidium, the last mentioned being as soft as wax. ‘They may all be separated from their chlorides by electrolysis, and apparently also by strongly heating mixtures of their carbonates with charcoal in iron retorts ; the latter method is employed in the manufacture of sodium and potassium, and rubidium has been prepared by it. Czsium has not yet been obtained in a pure state, but an amalgam of cesium may be procured by submitting its chloride to electrolysis, employing a globule of mercury as the negative electrode.

Cesium is the most electro-positive element yet dis- covered ; the remaining members of the group follow it in this respect in the order of their atomic weights. They are easily fusible (see table above), and their compounds with other elements are all fusible.

The metals of this group and their compounds furnish characteristic spectra, which are distinguished from those of most other elements by their simplicity. Lithium and its salts communicate a beautiful red colour to flame, sodium salts an intense yellow, and potassium, cesium, and rubidium salts a violet colour.

According to Troost and Hautefeuille, when potassium is heated to 350°-400° C. in an atmosphere of hydrogen, it is converted into a hydride of the composition KH ; and the corresponding hydride, Na,H, may be prepared in a similar manner from sodium. Lithium, however, manifests but little tendency to combine with hydrogen, absorbing only 17 times its volume of the gas at 500°C. The hydrides are white bodies resembling silver in appearance; potassium hydride is very brittle, but sodium hydride is as soft as sodium, although it becomes brittle when heated ; the former takes fire spontaneously in air, but the latter is much more stable. The compounds of lithium, sodium, and potassium with hydrocarbon radicles are only known in combination with the zinc compounds ; thus, the body obtained by the action of sodium on zine ethyl has the composition ZnN a(O,H;),.

The haloid compounds of the elements of this group may be formed by the direct combination of the metals with halogens ; their affinity for halogens, however, appears to be inversely proportional to their atomic weights. Thus, it is requisite to heat sodium to a moderately high tempera- ture in an atmosphere of chlorine in order to secure its conversion into the chloride NaCl; but potassium inflames in chlorine at the ordinary temperature. Similarly, sodium may be preserved unchanged in contact with bromine, and is scarcely affected even when heated with it to 200° C; potassium, however, causes a violent explosion when thrown on bromine. Sodium may also be fused with iodine with- out appreciable reaction occurring, but potassium at once conibines with it with explosive violence.

AND ALKALINE EARTHS.

The metals of this group all decompose water in the cold with evolution of hydrogen and production of a solution of the hydroxide; for example—

2Na+20H, =H, + 2Na.0H.

Lithium does not fuse when thrown on water, and sodium fuses but does not inflame ; potassium and rubidium, however, not only fuse kut also take fire and burn with a violet coloured flame, According to Thomsen’s determina- tions, more heat is developed in the decomposition of water by lithium or sodium than by potassium ; thus—

(Li, Aq) = 49,080 units of heat.

(Na, Aq)=48,100 ‘

(K, Aq) =43,450 es The difference in their behaviour wien thrown on water is, perhaps, due to the circumstance that the action proceeds more rapidly with potassium than with sodium.

All the metals of this group attract oxygen with avidity on exposure to air, but lithium is much less oxidizable than sodium or potassium, rubidium takes fire spontancously in air, and caesium amalgam is much more readily oxidized than rubidium amalgam ; so that their affinity for oxygen, as for the halogens, is proportional to their atomic weights. Only one oxide of lithium, Li,O, has been obtained, but two oxides of sodium, Na,O, and Na,0,, and three oxides of potassium, K,O, K,O,, and K,O,, are known; the oxides of the remaining elements have not been investigated. The oxides of the form M’,O are white deliquescent solids, which readily dissolve in water with the development of much heat, forming solutions of the corresponding hydroxides, M’.OH ; they are the most powerfully basic oxides known. The oxides of the form M,’‘O, dissolve in water, but corresponding salts are unknown; potassium tetroxide dissolves in water with evolution of uxygen. The hydroxides M’.OH, or alkalies, are white fusible solids of remarkable stability, volatilizing at high temperatures apparently without undergoing decomposition ; they are very soluble in water, furnishing strongly alkaline solutions, soapy to the touch.

The metals of the alkalies appear to act uniformly as monads, and the salts derived from them are all formed on the types M’Cl, M,‘SO,, &c. Their salts are colourless excepting those derived from coloured acids; and the cor- responding salts of the several metals are isomorphous. Their chlorides, carbonates, sulphates, and phosphates arc soluble in water, and the chlorides and sulphates furnish neutral solutions, Theirsulphates form characteristic double salts called “ alums” with sulphate of aluminium and the sulphates of allied elements. The alums all crystallize with the same number of molecules of water, and correspond in composition to ordinary alum, K,A1, (SO,),, 24H,O; they are also isomorphous.

Although the general resemblance between the metals of this group is very great, it will be obvious that they differ in many important respects. The properties of potassium, rubidium, and ceesium, which are very closely related, are especially different from those of lithium and sodium, which are also closely related. For instance, the normal lithium and sodium salts of chloroplatinic acid, H,PtCl,, the acid lithium and sodium salts of tartaric acid, H,.C,H,O,, and the lithium and sodium alums are readily soluble in water, whereas the corresponding salts of potas- sium, rubidium, and cesium are dlifficultly soluble. Lithium, however, in many of its propertics is more closely allied to magnesium and calcium than to sodium ; and it may be noticed that its chloride, like that of magnesium, dissolves in water with considerable development of heat.

The reactions involved in the formation of a few com- pounds of lithium, sodium, and potassium have been inves- tigated by Thomsen, with the following results :—

CMe iow iss fh, Y 5

ho Or

Reaction. | R=Li. | R=Na. | R=K. | i, Cll 93,810; 97,690 | 105,610 ‘) Formation of the R, Br ae 85,730 | 95,310! > crystalline salts 18 5 J aa 69,080 | 80,180} from their elements. RCl, Aq 8,440} — 1,180 | —4,440 } Heat developed on RBr, Aq ig ~~150] —5,080 }> dissolving the crys~~ RI, Aq ne 1,220} —5,110 |) talline salts. R, Cl, Aq | 102,250} 96,510 | 101,170 a ‘ R Br, Aq | 2. | 85°580] 90,280 oa ee Weis IW 5 NGL 70,800} 75,020: } © : IR, Op del fue 102,030 | 104,000 | Solid hydroxide. ROH, Aq noe 9,780 | 12,460} Heat of dissolution. R,O, H, Aq! 117,440 | 111,810 | 116,460 R,,O, Aq | 166,520 | 155,260 | 164,560 (Formationinaqueous aS eetie Aq re 60,450 | 65,100 solution. Ry,0,SO;Aq] 197,810 | 186,640 | 195,850.

METALS OF THE ALKALINE EARTHS.

3S ee eer

‘

Electric Name. Symbol. | At. wt. Sp. gr. | At. vol. conductivity at 20° C. Caleium Ca 39°9 1°57 25°4 22°14 Strontium Sr 87°2 | 2°50 | 34:8 erie Barium Ba 136°8 | ?4°0 34°2 a

The members of this group are strougly positive elements, which act uniformly as dyads ; the relations between them are similar to those which obtain in the preceding group, the element with the highest atomic weight being the most positive. Strontium, however, in some respects appcars to be more closely related to barium than to calcium. They are best prepared by the voltaic decomposition of their fused chlorides ; their chlorides are not reduced by sodium, but calcium may be obtained by heating calcium iodide with sodium.

Calcium is a yellow metal of the colour of gold largely alloyed with silver ; in hardness it is intermediate between lead and gold, and it is very ductile. It melts ata red heat. Strontium closely resembles calcium, but has a deeper colour ; little is known of barium, but it appears to resemble strontium and calcium. The behaviour of these elements with halogens is apparently similar to that of the metals of the preceding group with low atomic weights.

They decompose cold water with evolution of hydrogen, but less readily than the alkali metals; it is remarkable that concentrated nitric acid is almost without action on calcium and strontium even when heated to boiling, although the diluted acid dissolves them rapidly.

They are less easily oxidized than the alkali mctals, calcium being the least, and barium apparently the most oxidizable; in dry air calcium and strontium remain untarnished for a considerable period. They burn with great brilliancy when ignited in air.

Each metal furnishes two oxides,—a monoxide such as barium oxide, BaO, and a dioxide such as barium peroxide, BaO,; these oxides are white, earthy, infusible substances ; the dioxides are decomposed into the monoxides and oxygen ata red heat. Their monoxides are powerfully basic, but apparently the dioxides are almost destitute of basic properties; the action of acids on the two classes of oxides is illustrated by the following equations :—

BaO +2HCl=BaCl, +H,0 BaO, + 2HCl = BaCl, + H,0,.

Barium monoxide is converted into the dioxide when heated to dull redness in an atmosphere of oxygen, but the dioxides of strontium and calcium cannot be prepared in this manner. By the action of water the monoxides are converted with development of much heat into the corresponding hydroxides, which are strongly alkaline. Barium hydroxide, Ba(OH),, is dissolved by water, although to a less extent than the

hydroxides of the alkali metals; it separates from water in crystals of the composition Ba(OH),, 8H,O ; it is not decomposed even by prolonged ignition. Strontium hydroxide, which also crystallizes with 8 molecules of water, is much less soluble than the barium compound ; it is not decomposed by ignition. Calcium hydroxide, Ca(OH),, however, requires about 700 parts of cold water to dissolve it, the crystals of strontium hydroxide requiring only 50 parts, and is decomposed into calcium oxide and water by prolonged ignition. When barium hydroxide solution is added to hydrogen dioxide a hydrated barium peroxide, BaO,, 6H,O, is precipitated in crystalline scales ; the cor- responding strontium and calcium compounds, SrO, , 8H,O and CaO,, 8H,O, may be prepared in a similar manner, and are converted into the anhydrous oxides by heating to 100° C.

Barium and strontium carbonates are practically in- soluble in water, and are not decomposed on ignition ; calcium carbonate, CaCO,, is only very slightly soluble in water, and is slowly converted into calcium oxide and carbon dioxide on ignition. In this respect lithium carbonate, Li,CO,, closely resembles calcium carbonate, as it is only sparingly soluble in water, and decomposes on ignition ; whereas the carbonates of the other alkali metals are very soluble, and are not decomposed by heat.

Calcium sulphate, CaSO,, crystallizes with two molecules of water, and is slightly soluble in water; but strontium aud barium sulphates form anhydrous crystals, and are practically insoluble in water. Similarly, calcium nitrate crystallizes in deliquescent, very soluble monoclinic prisms of the composition Ca(NO,),, 4H,O, and an apparently isomorphous salt of similar composition, but efflorescent, may be obtained by crystallizing

strontium nitrate at a low temperature ; but from a hot solution strontium nitrate separates in anhydrous octahedra isomorphous with barium nitrate, which crystallizes without water. The chlorides of calcium and strontium are deliquescent crystalline sub- stances, very soluble in water, and also soluble in alcohol ; barium chloride is very much less soluble in water, and is insoluble in alcohol, and does not deliquesce. The chlorides of barium, strontium, and calcium furnish perfectly neutral solutions. Barium salts communicate an apple-green colour to flame, strontium salts a brilliant crimson, and calcium salts an orange-red ; the spectra of the three elements are comparatively simple. .

GLuctnumM—M acgnesi1um—Zinc—C apMiuM—-MERCcURY.

Electric

Name. {|Symbol.} At. wt.} Sp. gr. | At. vol. conduc- } tivity.

Glucinum G 21 4-4 i 25°47 Magnesium! Mg Loa 137 at 17° Zine Zn 716 | 9-1 | calg | 10g |} 22 Cadmium | Cad ; 865] 129 | 298] 860 es Mercury | Hg | 199-8] 13:56] 14-7 |-38-8| 357 Gee

Glucinum, or beryllium, obtained by the action of sodium on its chloride, is a white, malleable metal fusible below the melting-point of silver ; it does not burn in air or oxygen, but becomes coated with a layer of oxide which seems to protect it from further change. When heated in an atmosphere of chlorine it is converted into the chloride GCl, It does not decompose water even when heated to whiteness. It is easily dissolved by dilute hydrochloric and sulphuric acids; but nitric acid, even when concen- trated, has little action on it. It is readily dissolved by a solution of potassium hydroxide.

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[MAGNESIUM GROUP.

Glucinum hydroxide, G(OH),, separates as a white bulky precipitate on the addition of an alkaline hydroxide to a solution of a glucinum salt; it exhibits

pronounced acid properties, dissolving in solutions of the alkalies and even in those of alkaline carbonates. Glucinum oxide, GO, is a light, very bulky, white powder ; when strongly heated it volatilizes without fusing. Glucinum chloride, GCl,, crystallizes in silky needles ; it is very deliquescent, and dissolves in water with a hissing noise and considerable rise of temperature. Glucinum hydroxide readily dissolves in acids, but the ignited oxide slowly ; the glucinum salts are mostly soluble, and have a sweet, slightly astringent taste. Basic glucinum salts are obtained with great facility ; thus by digestion with the hydroxide, glucinum nitrate, G(NO;),, is converted into the basic nitrate, G,N,Og, and the basic sulphate, G,SO,, may in a similar manner be obtained from the normal sulphate, GSO,. Glucinum sulphate, GSO,, 4H,0, is extremely soluble in water ; it forms a double salt with potassium sulphate of the composition GK,(SO,), , 2H,0.

Magnesium, Zinc, Cadmium.—Magnesium is a white, malleable ductile metal about as hard as calespar ; it melts and volatilizes nearly as readily as zinc. It readily decom- poses water below its boiling-point, but not in the cold, unless associated with a less positive metal such as copper. It is easily dissolved by dilute acids.

Zine is a hard, white metal with a shade of blue ; when pure it is very malleable, but it is usually brittle owing to the presence of impurities such as lead and iron. Com- mercial zinc, however, becomes malleable at 100°-150° C., and may then be rolled ; at 210° C. it again becomes brittle, and may easily be reduced to powder at that temperature. Zinc decomposes vapour of water ata temperature below dull redness, and readily, even at ordinary temperatures, when it is associated with coper or other less positive metals. The pure metal dissolves very slowly in dilute acids, but ordinary zinc dissolves quickly, because the lead contained in it acts as an electro-negative element. Zine dissolves in aqueous alkalies with evolution of hydrogen.

Cadmium is a bluish-white metal like zinc; it is soft, though harder and more tenacious than tin, and is very malleable and ductile. When heated to about 80° ©. it becomes very brittle, and may be powdered with facility. It appears to decompose water at a high temperature, and dissolves when

heated with slightly diluted hydrochloric or sulphuric acid, but its best solvent is dilute nitric acid.

Magnesium is usually prepared by heating its chloride with sodium; zinc and cadmium are readily obtained by reducing their oxides with charcoal. Magnesium, zinc, and cadmium are capable of being polished, and then assume a bright metallic lustre ; they retain their lustre in dry air, but when exposed to moist air a film of oxide forms on the surface which protects them from further oxidation. Magnesium is the most positive metal of the three, as it precipitates zinc and cadmium from their salts, and zinc is more positive than cadmium, When heated in chlorine, or in the vapour of bromine or of iodine, they burn brilliantly, forming corresponding chlorides, -bromides, or iodides, such as MgCl,, ZnBr,, Cd1,; if moistened with water, zinc and cadmium readily combine with the halogens at the ordinary temperature.

They are easily combustible in air or oxygen ; the light emitted by burning magnesium is intensely brilliant and very rich in actinic rays; zinc also burns with a brilliant flame. They are thus converted into the oxides MgO, ZnO, CdO ; magnesium and zinc oxides are white, but the latter becomes lemon yellow when heated ; cadmium oxide is yellowish brown. ‘These oxides are unalterable in the fire; they dissolve readily in acids, forming corresponding

salts, e.g.: MgO+H,S0O,=MgS0O,+H,0. Magnesium oxide, when mixed with water, gradually combines with it, and forms the hydroxide Mg(OH),, but no sensible develop- ment of heat occurs during the hydration. Cadmium oxide also unites with water.

The hydroxides of magnesium, zinc, and cadmium separate as white amorphous precipitates, insoluble in water, on the addition of alkalies to solutions of the salts of these metals. Magnesium hydroxide alone exhibits a faint alkaline reaction ; zinc hydroxide readily dissolves in alkalies ; they

are all dissolved by solutions of ammonium salts ; they are easily resolved by heat into water and the oxide.

Cadmium also furnishes a suboxide, Cd,O, which is a green powder; on treatment with acids it is resolved into metallic cadmium and the oxide CdO ; in other words, a salt of the oxide CdO is produced, and cadmium remains.

The chlorides of these metals, like glucinum chloride, are volatile deliquescent solids ; magnesium and zinc chlorides are extremely soluble in water, and their solutions are strongly acid, but cadmium chloride is less soluble ; their dissolution in water is attended with development of heat, thus :—

MgCl, , Aq=35,920 units of heat.

ZnCl, , Aq =15,630 ” ” CdCl,) Aq = 38,010 ” a9

Their bromides and iodides are also soluble in water. The chlorides of magnesium, zinc, and cadmium form crystalline compounds with the chlorides of many other metals, the tendency to combine with other chlorides being especi- ally marked in the case of cadmium chloride.

_ Their sulphates are soluble in water, especially those of magnesium and zinc, which are isomorphous ; the sulphates of the three metals form isomorphous double salts with potassium sulphate. The composition of their sulphates aud double sulphates with potassium is as follows :— MgSO,, 7H,O MgK,(SO,),, 61,0 ZnSO,, 7H,0 ZnK,(SO4)., 6H,0 CdS0,, 4,0 CaK, (SO,),, 6H,0

Zinc, like glucinum, manifests a great tendency to‘form basic sulphates.

The carbonates of magnesium, zinc, and cadmium are white and insoluble in water; they are without difficulty decomposed by heat into the oxide and carbon dioxide.

Glucinum sulphide is soluble in water without decom- position, but is decomposed by dilute acids ;. magnesium sulphide is converted by water into magnesium hydroxide with evolution of hydrogen sulphide:

MgS+2H,0= Mg(OH),+H,8 ; zine sulphide is insoluble in water, but is dissolved and decomposed by dilute mineral acids ; lastly, cadmium sulphide is insoluble in water and dissolves with difficulty even in boiling dilute hydrochloric acid, though it is readily decomposed by concentrated hydrochloric acid even at ordinary temperatures. Cadmium sulphide is a brilliant yellow substance, the “remaining sulphides are white. i

Mercury.—This element is the only metal that is liquid at common temperatures, with the exception, possibly, of cesium, and the recently discovered element gallium. The latter element, indeed, appears to be closely allied to zinc in properties, but is less positive, and is probably a member of the aluminium group ; its specific gravity is 5-95.

Mercury occurs native chiefly in the form of sulphide, from which it is separated either by distillation with slaked lime (calcium hydroxide), or by burning off the sulphur. It isa highly lustrous metal, and in the solid state is malleable. It slowly combines with the halogens at ordinary tempera- tures, and also with sulphur if triturated with it; it does not tarnish, even in moist air, but slowly absorbs oxygen when heated to about 400° C., bsing converted into the

red oxide HgO ; this oxide is decomposed on ignition. Hydrochloric acid, whether cold or hot, is without action on mercury, but it is slowly dissolved by hydriodic acid ; concentrated nitric acid dissolves it readily ; it is also dissolved by hot concentrated sulphuric acid. It has no action upon water at any temperature. It is capable of uniting with most metals, forming liquid or solid com- pounds called amalgams ; the solid amalgams appear for the most part to be of definite composition, but the two metals are held together by very feeble affinities.

Mercury unites with the halogens, with oxygen, and with sulphur in two proportions, forming the two series distin- guished as mercurous and mercuric compounds ; thus :—

Hg,Cl, Hg,0 Hg,S Mercurous chloride. Mercurous oxide. Mercurous sulphide. HeCl, HgO Hgs

g Mereuric chloride. Mereuric oxide. Mercuric sulphide.

The compounds of mercury with halogens, and mercury compounds generally, are difficultly soluble, or insoluble, in water. But the compounds with halogens dissolve readily in solutions of the haloid compounds of the alkali metals in consequence of the formation of double salts; the haloid compounds of mercury, in fact, exhibit a more marked tendency than those of any other metal of the group to form double salts with the haloid compounds of other metals, cadmium being most nearly allied to mercury in this respect ; they unite also with the haloid acids, forming the compounds HHgCl,, HHgBr,, and HHgl,.

Mercurous chloride or calomel, Hg,Cl,, is a white crys- talline solid, insoluble in water; it blackens slowly on exposure to light, and is decomposed by heat into metallic mercury and mercuric chloride, HgCl,. Mercuric chloride or corrosive sublimate is also white and crystalline, but soluble in water ; it boils without decomposition at 295° C. ; the density of its vapour corresponds with the formula HgCl,. By the action of ammonia on the chlorides of met- cury, one-half the chlorine is removed and displaced by the monad radicle amidogen: Hg,Cl, + 2NH, = Hg,Cl(NH,) + NH,Cl; the lower chloride is thus converted ihto black mercurous amidochloride, the higher chloride furnishing mercuric amidochloride or white precipitate, HgCl(NH,).

Mercury hydroxides are unknown, the chlorides of mer- cury being at once converted into correspondiiig oxides by the action of alkalies ; but when mercury is associated with positive hydrocarbon radicles, it forms powerfully basic hydroxides such as Hg(C,H;)OH, which is a colourless oil. Mercurous oxide, Hg,O, is a black sub-

‘stance which by mere exposure to light, or a very gentle

heat, is converted into the metal and the red oxide. Mercuric oxide, HgO, when prepared by heating mercury in oxgyen, forms red crystalline scales, but it is precipitated as a yellow powder on the addition of an alkali to a

solu- tion of mercuric chloride. ‘These two forms of the oxide differ even in their chemical behaviour, and are perhaps polymeric ; thus, when the yellow oxide is boiled with a solution of potassium dichromate a basic mercuric chromate, Hg,CrO,, is formed, but the crystallized oxide forms a more basic salt, viz, Hg,CrO,, under similar circumstances, Mercuric oxide is dissolved by acids, forming mercuric salts such as mercuric nitrate, Hg(NO,), ; by digesting solutions of these salts with mercury they are converted into corre- sponding mercurous salts such as mercurous nitrate Hg,(NO,),, But mercuric oxide also exhibits feeble acid properties ; thus it forms the compound K,HgO, when dissolved in fused potassium hydroxide. Basic mercuric salts are also very readily produced ; mercuric sulphate, HgSO,, for example, is decomposed by water into a soluble acid salt and the insoluble basic sulphate Hg,SO, Mercuric sulphide, HgS, is thrown down as a black

precipitate on passing hydrogen sulphide through solutions of mercuric salts; it is not decomposed by hydrochloric acid; when heated it becomes red. Native cinnabar and ver- milion consist of the red modification of mercuric oxide.

No tendency to combine with hydrogen has been observed in the case of the metals of this group, but they have all been obtained in combination with hydrocarbon radicles. Their organo-metallic derivatives correspond in composi- tion to zine ethyl, Zn(C,H;)., the attempt to convert mercurous chloride into a corresponding organo-metallic compound by the action of zinc ethyl has been unsuccess- ful, mercury ethyl, Hg(C,H,),, being formed instead and mercury separated ; thus :—

Hg,Cl, + Zn(C,H,), = Hg(C,H,), + Hg + ZnCl.

It would appear, in fact, that only mercurous compounds can exist in which mercury is associated with negative radicles,

It has been shown that the density of the vapour of each of the metals cadmium and mercury is the half of its atomic weight, in other words, the gaseous molecules of these ele- ments are monatomic(p. 471), Aswe are not

acquainted with the density of any other metal in the state of gas, it is impos- sible to say whether these metals are peculiar in this respect.

On comparing the properties thus briefly sketched of the elements of this group, the general resemblance will be at once noticed, but it will be remarked also, that, although in respect of many properties the variations are gradational in the same degree as the atomic weights, certain properties are not continuous, but recur periodically. Thus glucinum, zinc, and mercury, the first, third, and fifth terms of the group, have many characteristics in common which arc apparently wanting in the case of magnesium and cadmium, the second and fourth terms, ‘This is evidenced especially by certain of their physical properties, by the solubility of their hydroxides in alkalies, by the formation of basic salts, and by the behaviour of their sulphides.

The elements of this group are in many respects closely related to the metals of the previous group, of which they may be regarded as forming a sub-group, the formulze of their compounds being similar in most cases > othe general behaviour especially of magnesium and _ its compounds, it will be evident, is in close accordance with that of calcium and its compounds. But many im- portant distinctions characterize the two groups. Thus the metals of the one group decompose cold water ; their oxides are powerfully basic, and readily combine with water ; their carbonates are extremely stable; and their sulphates are insoluble or very slightly soluble in water, and do not readily form double salts, The metals of the other group, however, either are without action on water, or de- compose it only when heated; their oxides, although basic, exhibit little tendency to combine with water ; their car- bonates are comparatively unstable ; and their sulphates are mostly very soluble in water, and readily form double salts, In the one group the positive character becomes more pronounced as the atomic weight increases, whereas in the other the positive character diminishes with increase of atomic weight.

Glucinum, apparently, is much less closely related to magnesium than is the latter to zinc, and mercury much less closely to cadmium than cadmium to zine 3 but zine and cadmium are more closely related than zine and magnesium. These conclusions, which result chiefly from the comparison

of what may be termed chemical properties, are entirely confirmed by Thomsen’s thermochemical investigation of the reactions involved in the formation of a number of compounds of the metals of this group, as will be evident from the following tables :—

CHEMIST H®

Units of heat developed or

absorbed. Reaction, — R=Mg. | R=Zn. | R=Cd. Solid compounds— |

16.6, 0) conc ieener cane aor eRe ern ton aaunae me 85,430 sbi WR 10) MEMOS Soisce se cnccsvecnioeccacne, 148,960 | 82,680 | 65,680

Be 1G rendered teehee 217,320 fa ae Bi Ce one quan an hese, erin 1 151,010 | 97,210 93,240 Re, O53 50;., EIB OL eee Tien aes 181,660 | 158, 2901

Aqueous solutious—

Oe re 35,929 | 15,630] 3,010 TSO. THO WAG <.sc0rcsres.0.¥. .. | —4,2401 95401 By, Ol ae Ghsins. sake aes se 186,930 | 112,840 | 96,950 BO WONG o. sscheesctees cece 180,180 | 106,090} 89,500 ROMO PN oie ccscsscosseesscccck 34,800 | 20,660] ... R(OH), MONG ooccccccscoscscccoes 31,220 | 28,410] 23 820 eee 27,690 | 19,880

18,030

Units of heat | Units of heat |

Reaetion. developed or Reaetion, developed or

absorbed. absorbed. Solid substances-— Aqueoussolutions—

ON AO)” ctradsteuee 42, 200 Hg,0 , 3NO,H AG 5,790 OT BO en csc ck 80,660 Hg,, O, 3NO3;HAq 47,990 Hg, 9 Cr ene eee ee 82,550 HegCl, > Aq sete eee = 3, 3800 fi 5 18 ysggonqonc 68,290 || HgBr,K,, A — 9,750 er 44,440 |) HeCl,,2KClAq…| — 1,380 BE lg scncnoes 63,160 || HgBr,, 2K

BrAq.. 1,640 EBT care. 50,550 |! Hel,, 2KIAq….. 3,450 HU Wy cc cea cxuce 84,310 lel, (ly 5 ANG) Moonee 59,860

ie Bir, 15. | 242, 400 18,920 |

Eleetrie con- duetivity,

Name. Symbol. | At. wt. Sp. gr. At. vol.

—~.

—_

Copper | Cu 63°3 8°9 od 96°4 at 18°C. Silver | Ag 107°6 | 10:5 | 10:2 | 1000 ,, 0°C. Gold Au 196‘2 19°3 10°1 Mone 5,

oj

These metals may be regarded as forming a sub-group to the metals of the alkalies,

Copper is a very tenacious, ductile, malleable metal, of red colour, more easily fused than gold, but less fusible than silver. It is without action on water at a red heat, and does not oxidize in the air at ordinary temperatures, but when heated to redness it rapidly combines with oxygen forming a black oxide CuO; when in a finely divided state, itreadily unites with chlorine at ordinary temperatures. Moderately diluted nitric acid dissolves copper with great facility, and it is also dissolved by heated concentrated sulphuric acid ; hydrochloric acid, even when boiling, has little action on the massive metal, but slowly dissolves the finely divided metal.

Copper forms two chlorides,—cuprous chloride, Cu,Cl,, and cupric chloride, CuCl,, but only one iodide Cub. Cuprous chloride is a white crystalline substance insoluble in water, but it dissolves in hydrochloric acid or ammonia, forming colourless solutions, Cupric chloride is readily soluble ; it is liver-coloured, but its solution in water is blue; it forms crystalline double salts with the chlorides of the alkali metals, It is converted into cuprous chloride and chlorine at a red heat.

Cupric hydroxide, Cu(OH),, separates as a pale blue precipitate on the addition of an alkali to a solution of a cupric salt ; in the dry state it is stable at 100° C., but at a slightly ligher temperature it is converted into the black oxide. Cupric hydroxide, although insoluble in alkalies,

? These numbers refer to a sulphate of the composition CdSO,+ 34,0

[copPER, SILVER,

®’

AND GOLD. |

is dissolved by ammonia to a deep blue solution; the production of deep blue-coloured liquids on dissolution in ammonia is, in fact, characteristic of copper compounds. Cupric oxide, CuO, dissolves in acids, forming cupric salts, which are white when anhydrous, but furnish green or blue solutions; they are mostly soluble. Cupric sulphate crystallizes with 5 molecules of water, but it forms a double sulphate with potassium sulphate, CuK,(SO,),, 6H,O, isomorphous with the corresponding zine and magnesium salts. Basic cupric salts are readily produced by digesting the normal salts with cupric hydroxide.

By igniting cupric oxide with metallic copper it is con- verted into red cuprous oxide, Cu,O; this oxide may also be prepared by heating a solution of a cupric salt with an easily oxidizable substance, such as grape sugar, and an alkali. Most acids decompose cuprous oxide, forming a cupric salt and separating metallic copper; but it is con- verted into cuprous chloride by hydrochloric acid. A number of cuprous salts exist, but they are extremely unstable, and mostly absorb oxygen readily, becoming converted into cupric salts. Both oxides of copper are easily reduced by ignition with hydrogen or charcoal.

A black hydrated cupric sulphide is precipitated by hydrogen sulphide even from strongly acid solutions of cupric salts,

Cuprous hydride, Cu,H,, is deposited as a yellow precipitate when a solution of cupric sulphate mixed with hypophosphorous acid is heated to

about 60° C.; it soon turns brown, and when heated to 70° C. suddenly decom- poses, with evolution of hydrogen; hydrochloric acid converts it into cuprous chloride :—

Cu,H, + 2HCl = Cu,Cl, + 2H.

Silver is a white metal, inferior in malleablity only to gold among the heavy metals; it is harder than gold, and softer than copper. It is the best-known conductor of heat and electricity. It may be distilled by the aid of the oxy-hydrogen flame. It is not oxidized by ordinary oxygen, and is incapable of decomposing water, but like mercury it is oxidized by ozone. Moderately diluted nitric acid dissolves it readily, and it is dissolved by heated concen-trated sulphuric acid; it also resembles copper and mercury in its behaviour with hydrochloric acid, and mercury in its behaviour with hydriodic acid. It unites with the halogens at ordinary temperatures, and, like mercury, readily combines with sulphur, and is precipitated by hydrogen sulphide froin strongly acid solutions of its salts as black sulphide, AgS.

Silver forms two chlorides,—argentic chloride, AgCl, which is white, and insoluble in water, but readily soluble in ammonia, and a black argentous chloride, the composi- tion of which is not known with certainty, but is probably Ag,Cl,. Corresponding bromides exist, but only the one iodide, AgI, is known. Argeutic chloride becomes violet- coloured on exposure to light, apparently owing to the formation of the lower chloride ; the iodide does not alter in appearance, but acquires the property of attracting metal-lic silver, and hence its employment in photography. The subchloride is not changed by nitric acid, but is converted by ammonia into metallic silver and argentic chloride.

A brown argentous hydroxide, Ag (OH), is precipitated from solutions of argentic salts on the addition of an alkali; it is slightly soluble in water and its solution is faintly alkaline ; it loses water at a temperature above 60° C., and is converted into argentic oxide, AgO. Argentic oxide is a brown powder ; it gives off a certain amount of oxygen, even at 100° C., and also when exposed to sunshine ; it neutralizes the strongest acids, forming argentic salts such as argentic nitrate, AgNO; Argentic sulphate, AgSO,, is isomorphous with anhydrous sodium sulphate, and it also

forms an alum,

Silver also forms a suboxide probably of the composition Ag,O,, and a peroxide of which the composition is uncertain, but probably is expressed by the formula Ag,O,, Both are extremely unstable ; the former is decomposed by ammonia into metallic silver and argentic oxide, which dissolves, and acids act upon it in a similar manner,

Argentic carbonate is insoluble in water, and decomposes at 200 C°. into the oxide and carbon dioxide.

Metallic silver is slowly precipitated from solutions of its salts by hydrogen at ordinary temperatures, so that it is a less positive element than hydrogen.

Gold is a metal of rich yellow colour nearly as soft as lead when in a pure state. It exhibits no tendency to combine directly with oxygen, and is not dissolved by any single acid, except selenic acid, but it readily combines with the halogens, and therefore dissolves in a mixture of nitric and hydrochloric acids, which liberates chlorine (p. 466).

Gold is reduced from its compounds with extreme readiness, but varies in properties according to the nature of the compound from which it is separated ; in fact, it appears to exist in several allotropic modifications. Thus, according to Thomsen, when a solution of auric chloride is reduced by sulphurous acid, the gold separates as a light- coloured powder which readily cakes together, but from a solution of auric bromide it separates as an extremely fine dark-coloured powder which exhibits no tendency to agglomerate ; a third modification, also finely pulverulent, but lustrous, is obtained by reducing aurous bromide or iodide with sulphurous acid. Thomsen finds that the con- version of the second (Aua) and third (Auf) of these modifications into that obtained from auric chloride (Au) would involve development of heat, and of different amounts in the two cases; thus :—

Augp=Au-+ 4700 units of heat. Aua=Au+3210 __,, 3

By the action of chlorine, reduced gold is converted into the chloride, Au,Cl,; this is decomposed by water into aurous chloride, Au,Cl,, and auric chloride, AuCl, Auric chloride is soluble in water, but aurous chloride is insoluble ; in contact with water, especially on warming, the latter decomposes into metallic gold and auric chloride. Auric chloride is readily converted into aurous chloride when

- heated to 185° C, The gold bromides may be obtained

in a similar manner, and exhibit similar properties, but are less stable. Aurous and auric iodides, Au,I, and Aul,, are both insoluble, and still less stable. The auric compounds combine with the haloid acids, and with the haloid com- pounds of most other metals, forming crystalline so-called double salts ; these double salts, however, may be regarded as salts of the acids formed by the union of the haloid acids with the auric halogen compounds; the double chloride of gold and potassium, for example, KCl. AuCl,,-as the potassium salt of the acid HAuCl,.

On treating aurous chloride with a solution of potassium hydroxide, a dark-green substance is obtained, which is probably the corresponding hydroxide ; it decomposes spontaneously into metallic gold and auric hydroxide. Auric hydroxide, Au(OH).,, is precipitated by alkalies from a solu- tion of auric chloride as a dark-brown powder, which is quickly reduced on exposure to light. A third gold hydrox- ide, derived from the oxide Au,O,, appears also to exist.

The hydroxides of gold exhibit very feeble basic pro- perties ; in fact, the salts formed on dissolving auric hydroxide in nitric and sulphuric acids are so unstable that they have not been isolated. Auric hydroxide, however, possesses marked acid properties, and is dissolved by a solution of potassium hydroxide,—potassium aurate, a

crystalline salt of the composition KAuO,, 3H,0, separating from the solution on concentration. On digesting auric hydroxide with ammonia it is converted into the so-called fulminating gold, which is obtained in the form of a yellowish-brown powder easily exploded by percussion or heat; it is somewhat uncertain what is the composition of this body, but it is not improbable that it is represented

by the formula Au (NH,) } ONE, :

The distinctions between copper, silver, and gold are obviously very marked; yet they resemble each other in many respects, the relation being especially evident when the cuprous and aurous compounds are compared with the argentic compounds. It is to be noted that their hydroxides and mauy other of their compounds are acted on by ammonia in a characteristic manner, both silver and gold hydroxides being converted into highly explosive bodies ; the nature of the products has not been ascertained with certainty, but apparently they are allied in composition. The ammoniacal derivatives of copper correspond in com- position to those formed from nickel, a metal which in many respects is allied to copper.

As in the magnesium group of metals, the positive character diminishes with increase of atomic weight, but to a much greater extent.

Silver is the only element of the group which exhibits marked analogy with the metals of the alkalies,—being connected with them by the isomorphism of its sulphate with that of sodium, by the formation of an alum, by the alkalinity of its hydroxide, and by its colour, Thermo- chemical investigation also indicates a marked analogy between silver and the metals of the alkalies, the sulphates of silver, sodium, and potassium dissolving in water with absorption of heat, whereas nearly as much heat is developed on dissolving copper sulphate as when the equivalent amount of sulphuric acid is added to water, copper sulphate resembling in this respect the sulphates of magnesium and zinc ; thus :— — 4,480 units of heat.

AgS0O,, Aq =

K,S0,, Aq = 6,380 8 Na,SO, > Aq = Faq 60 99 CuSO,, Aq = 16,300 – ZnSO,, Aq = 18,500 io MgSO,, Aq = 20,300 $s

The existence of double salts such as CuK,(SO,),, 6H,O, isomorphous with those derived from the sulphates of magnesium and zinc, and the readiness with which basic salts of copper are formed, are confirmatory of the conclusion that copper is allied to zinc and magnesium.

The results of the thermo-chemical investigation of copper, silver, and gold are of considerable interest, as will be evident from the following tables. To illustrate the application of the values in these tables, it may be pointed out that the stability of the oxides of copper and the instability of silver oxide and of auric hydroxide are explained by the fact that much heat is developed in the formation of the oxides of copper from their elements, whereas the formation of silver oxide would involve but a slight development of heat, aud the formation of auric hydroxide would even involve a large expenditure of energy. ‘Then it will be noticed that, in the formation of cuprous iodide, heat is developed to the extent of 32,520 units per molecule, and that the formation of an aqueous solution of cupric iodide would involve the development of only 10,410 units per molecule ; hence it follows that the conversion of two molecules of cupric iodide into a molecule of cuprous iodide and a molecule of iodine would be attended by the development of no less than 32520 — 2× 10410 =11700 units of heat. This explains the fact that a mixture of cuprous iodide and iodine, and not cupric

iodide, is obtained on adding potassium iodide to a solution of cupric sulphate:—

2CuSO, + 4KI = Cu, 1, +1, + 2K,80,.

Again, the superior affinity of auric bromide for hydrogen bromide as compared with that of auric chloride for hydrogen chloride is shown by the development of 7700 units of heat in the formation of the compound AuBr,H, aud of only 4530 units in the formation of the corresponding chlorine com- pound AuCl,H ; and that the latter is almost completely decomposed and converted into the former on treatment with hydrobromic

acid is evidenced by the development of 13,800 units of heat in the reaction, complete decomposition requiring the development of 14,300 units.

Units of Units of Reaction. heat Reaction. heat developed. developed. Ce Oe cate mene 37,160 (Clvy i 0) aaa tear enone AOS OM, ARMOR. Wiiecc sce sce 5,900 Chet en 51,630 CHO lE WAG cnc crsscscsnses 11,080 (Chol hag ANG) Genseasae one 62,710 (Cre, 12585 5 AMC aaanceeeds: 40,830 OI inirgh NG) eee 10, 410 Curls 60,700 || Age, Cl … 29,380 (Olt; [BH noncoaaeaeneacen. 49,970 || Ag, Br… 22,700 Olt, od lib oneenner arene BEL SD eA J canteen adsacnaneyr 13,800 (Gin), AeUON Saseen 6 coe 49,300 || Ag,O, 2HCl…..... 77,220 (Oi (0), 218 Bie sey neadoosos 60,640 || Ag.O, 2HBr…..... 90,980 COR 72,150 | Ag,O, 2HI …..... 102,140 Cus 2EICHAGE…...— 14,660 || Ag,O, 2HClAg …... 42,580 Cu,O , 2HBrAq…..... 20,760 |} AgoO, 2HBrAq …... 51,100 Cu,0 , 2HIAq 83,730 || Ag,O, 2H1 Aq …..... 63,720 CuO, 2HiClAg …..... 15,270 Cu(OH), , 2HC1lAq 14,910 CuO , N,O, Aq 15,260 || Ag,O, NgO;Aq …... | 10,880 Cu(OH), , N,O;Aq 14,890 CuO , SO,Aq….eeeees. 18,800 || Ag,O, SO;Aq 14,490 Cu(OH), , SO3Aq …... 18,440

Units of heat! developed or

Units of heat: developed or

Reaction.

absorbed. absorbed. Bn oA .ooverreg 22,820 ||AuCl,HAq,4HBrAq| 18,800 COE Ae cece 8,850 ||AuBr,HAgq,4HClAg} -— 510 ASI e Cline naaties os inisieve GrolO: Maal. AG) cccsssscvers 4,450 PALL MOM sis scie isaaeeeas ~80 ||AuBr,, Aq.. – 3,760 | By Peete «vanes — 5,520 — 11,400 yO. , SHRO .. 0c — 13,190 27,270 Au(OH);, 3HC1Aq 18,440 ||Au, Bry, Aq …..... 5,090 Au(OH),, 3HBrAq 29,180 ||[Au,Cl,, HClAq | 31,800 AuCl,Aq , HClAq … 4,530 ||Au, Brz, HRrAq …| 12,790 AuBr,Aq , HBrAq… 7,700

The values in this table have reference to the modification of gold obtained by reducing a solution of auric chloride with sulphurous acid.

THALLIUM—LEAD.

Electric conduc

At. vol. | “tivity at 0° C.

Symbol. | At. wt.

Sp. gr. 203°6 oer.) 206°4 11°4

Name. Thallium MEL Lead Pb

17:2 181

9°36 8°32

Thallium is a heavy crystalline metal, resembling cadmium in appearance ; it is extremely soft, even lead scratching it readily. It melts at 294° C., and boils below a white heat ; the liquid metal can hardly be distinguished from mercury. It is reduced from solutions of its salts by, zinc, but not by cadmium. It readily dissolves in concen- trated nitric acid, aud is also dissolved by dilute sulphuric acid, especially if it be in contact with a piece of platinum, but it is only slowly attacked even by boiling hydrochloric acid; it decomposes water at a red heat. It combines with the halogens at ordinary temperatures. When exposed

LEAD. |

to the air it oxidizes almost as readily as the more positive alkali metals, chiefly thallious oxide, T1,O, being formed ; and when heated to redness and plunged into oxygen it burns brilliantly with a pure green light, chiefly thallic oxide, Tl,O,, being produced.

Four chlorides of thallium have been described, viz., TIC] or TI,Cl,, T1,Cl,, T1,Cl,, and TICI, or T1,Cl,; corre- sponding bromides, and the two iodides, TII or TI,I,, and TII, or T1,I,, have also been obtained. Thallious chloride, TIC] or TI,Cl,, separates as a white precipitate scarcely distinguishable at first sight from silver chloride, on the addition of hydrochloric acid to a solution of a thallious salt ; but in properties it more nearly resembles lead chlo- ride, PbCl,, being slightly soluble in boiling water, from which it

separates again on cooling in crystals, and scarcely more soluble in aqueous ammonia than in water. Thallium sesquichloride, Tl,Cl,, formed by melting thallious chloride in a stream of chlorine, crystallizes in brilliant orange-yellow plates, moderately soluble without decomposition in water slightly acidulated with hydrochloric acid. Thallic chlo- ride, TICl1, or T1,Cl,, is formed on dissolving thallic oxide in hydrochloric acid; it crystallizes from hydrochloric acid in colourless prisms of the composition TICl,, H,O or TI,Cl,, 2H,O. Little is known of the chloride T1,Cl,, but the corresponding bromide is obtained on adding thallious bromide to a hot solution of thallic bromide, separating from the hot liquid in yellow shining needles. Thajllious bromide is nearly insoluble in water, but thallic bromide is very soluble and deliquescent ; the bromide T1,Br, is de- composed by water into thallious and thallic bromide and the bromide Tl, Br,, which crystallizes in orange-red laminz. This last compound is also decomposed by water, with separation of thallious bromide. Thallious iodide, TII or TI,I,, has a brilliant yellow colour, and is almost insoluble in water, and scarcely more soluble in a solution of potas- sium iodide; when heated it becomes scarlet, but its yellow colour is restored by friction. It is therefore opposite in cha- acter to mercuric iodide, HgI,, which is scarlet, but becomes yellow when heated, andis readily soluble in potassium iodide solution, although insoluble in water. Thallic iodide is an extremely unstable compound, and, like cupric iodide, readily decomposes into iodine and thallious iodide.

Thallious oxide is almost black in colour ; like litharge, PbO, the corresponding lead oxide, it fuses readily, and the fused oxide is absorbed by bone-ash so that a silver thallium alloy may be cupelled like a silver-lead alloy. It dissolves readily in water, forming a colourless, powerfully alkaline solution, greasy to the touch, of thallious hydroxide, TI(OH) or T1(OH),. The latter compound may be ob- tained in pale-yellow prismaticcrystals ; it is reconverted into the oxide by mere exposure over sulphuric acid in a vacuum at the ordinary temperature. The solution of thallious hydroxide has nearly all the properties characteristic of sodium hydroxide; but it has a slight tendency to absorb oxygen. Thallic hydroxide, TI(OH), or Tl,(OH),, separ- ates as a brown gelatinous precipitate on the addition of alkalies to a solution of a thallic salt; by heating to about 260° ©, it is converted into thallic oxide, Tl,O;. This oxide is a dark brown powder fusible with difficulty ; it is reduced to the lower oxide at ared heat. It has much less

marked basic properties than thallious oxide, but dissolves readily in acids, forming thallic salts; it is insoluble in water. Thallious salts are not precipitated by hydrogen sulphide in presence of strong acids, but the thallium is completely precipitated as a brown sulphide from solutions of the salts of weak acids, such as thallious acetate, and by alkaline sulphides.

Thallious hydroxide readily absorbs carbon dioxide, forming thallious carbonate, T1,CO;. This salt crystallizes in prisms, and is soluble in about four times its weight of

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boiling water, forming an alkaline solution; it is fusible, but decomposes when heated to dull redness, Thallious sulphate, T1,SO,, is isomorphous with potassium sulphate ; it also forms an alum, Tl,Al,(SO,),, 24H,O, and double salts such as Tl,Mg(SO,),, 6H,O, isomorphous with the corresponding potassium salts.. A large number of thallious salts, in fact, are isomorphous with the corresponding sodium, potassium, and ammonium salts, Thallic sulphate, T1,(SO,)3, 7H,O, is decomposed even by cold water ; it forms an anhydrous double sulphate with potassium sulphate quite different from the alums in composition, viz., TL(SO, ps 2EGSO,.

Lead is a bluish-white, extremely soft metal; it fuses at 325° C. Itis readily dissolved by nitric acid, and is slowly acted on when boiled with hydrochloric or dilute sulphuric acid, hydrogen being evolved. Although it tarnishes in the air, the oxidation is only superficial, but it readily absorbs oxygen when heated. Its oxides are very easily reduced.

Only one stable chloride of lead, PbCl, is known ; when, however, the oxides Pb,O, and PbO, are dissolved in hydro- chloric acid at a low temperature, solutions are formed which apparently contain the corresponding chlorides Pb,Cl, and PbCl,, as the oxides may be reprecipitated by alkalies, but the slightest leat causes clilorine to be evolved. Lead chloride is difficultly soluble in water, frora which it crystal-

lizes in delicate white needles, Lead iodide, PbI,, crystal- lizes in brilliant yellow plates sparingly soluble in water.

Lead forms a suboxide, Pb,O, a monoxide, PbO, a dioxide or peroxide, PbO,, and a fourth oxide, Pb,O,, which may be regarded as a compound of the monoxide and dioxide. The suboxide is black; like the corresponding oxides of mercury and silver, it furnishes the metal and a salt derived from the monoxide on treatment with acids. The monoxide, PbO, ordinarily known as litharge, is prepared on the large scale by the oxidation of lead in air; the pure oxide has a lemon-yellow colour, and is insoluble in water; it fuses at a heat below redness, ‘The corresponding hydroxide, Pb(OH),, is obtained on adding ammonia to a solution of a lead salt such as lead nitrate, Pb(NO,),, as a white amorphous precipitate, which absorbs carbon dioxide on exposure to air ; it is converted into the oxide when heated above 100° C. ‘The oxide and hydroxide are readily acted on by acids, and form stable salts ; but they are also soluble in alkalies. Lead nitrate is easily soluble, but lead sulphate and carbonate are insoluble in water ; they may be obtained in crystals isomorphous with those of the corresponding barium salts. The carbonate is readily decomposed when heated, and on heating the sulphate with lead sulphide metallic lead is obtained : PbSO, + PbS = 2Pb + 280,.

Lead sesquioxide, Pb,O,, is little known; it has a brown colour, and is converted into the monoxide and oxygen when heated. Lead dioxide, PbO,, also has a brown colour; it may be obtained by passing chlorine into water in which lead oxide is suspended. It unites directly with sulphur dioxide, forming lead sulphate, sutticient heat being developed to cause the mass to glow ; it is converted into the monoxide when heated ; it is insoluble in most acids, but is dissolved by acetic acid, and apparently converted into a corresponding acetate ; by fusing it with potassium hydroxide, potassium plumbate is produced, which may be obtained in crystals of the composition K,PbO,, 3H,0.

By carefully heating lead monoxide to low redness in air it is converted into the red oxide or minium, the most usual composition of which is represented by the formula Pb,O,. On treating this oxide with acids—nitric acid, for example—it furnishes lead nitrate and lead dioxide.

Lead is precipitated by hydrogen sulphide, as a black sulphide, even from strongly acid solutions of its salts.

Although no stable chloride of lead exists containing more than two atoms of chlorine, a stable tetraethyl derivative,

Pb(C,H,),, the existence of which affords conclusive evi- dence that lead may function as a tetrad element, is obtained by the action of zinc ethyl on the chloride PbOl, (?Pb,Cl,). The hydroxide, Pb(C,H,)..OH, is powerfully basic.

Compounds of thallium with hydrocarbon radicles only have not yet been obtained; a thallium diethylchloride, TI(C,H,).Cl, is known, however. It is a crystalline body of remarkable stability, and is readily converted into the hydroxide, T1(C,H,),.OH, which is also crystalline and very soluble in water ; the solution is strongly alkaline, nevertheless the hydroxide does not exhibit the slightest tendency to attract carbon dioxide, although it readily forms salts with other acids.

The relation of thallium to lead will be sufficiently evident from the above sketch of the properties of some of the more important compounds of the two elements; it will be noticed also that thallium has strong points of resemblance with the metals of the alkalies, and that it is in some respects related to mercury. Its relation to the alkali metals is especially indicated by the extreme readi- ness with which it is oxidized, by the properties of thallious hydroxide, and by the isomorphism of many thallious compounds with the corresponding potassium and sodium compounds, Thermochemical investigation entirely con- firms these conclusions, as will be evident from the follow- ing tables, the heat of neutralization of thallium hydroxide being equal to that of the hydroxides of potassium and sodium, but the affinity of thallium for oxygen being only about equal to that of mercury and copper, and somewhat less than that of lead. The heat of neutralization of thallic hydroxide exceeds that of aluminic hydroxide.

Units of heat devel- oped or absorbed.

Reaction. Remarks,

& LAW O.iohescute cone theres 42,240 3 M1), HO bas ixiessevoane 38, 230 3 i OF 8 i. Yo ee 45,470. S ie 9 Nae eriepteivewsincemnsay 56,915 OH be On aves Oss cccmner te 86,010 OECTA cases don 48,580 BB Tg IM6.. te cece wscctinenn at 41,295 a gee eee 80,180 a Formation of the salts from | Lge | i eee ee ee 60,140 the metal, oxygen, and & Bh Ops BO paicicddiasc 149,900 tg: IY aaa! sreisia sisentoatet | noe WIGO 3 5 Big Monee 39,160 Be The salts are produced from 22 |Tl,,0, N,O;Aq…....| 66,540 the metal, oxygen, and se /Th, 0; 80hq 70,290 |] ailute aqueous solutions EI : 23 jT1,Cl,A 88, 480 TI, Cl,, Aq 89,000 Ca et eee 56,180 Gascrestesin: 10,550 ee ee T1g0’s O55 BAO 55 005.- 43,770 — oo enrore into ‘ ic hydroxi . TIOH), 0, H,0…....1 26,270 ae Gen cae ey ORY TOM) AG 5 O sisecass as 28,425 eo of an aqueous 2T1(OH)Aq , H,SO,Aq | 31,180 TIOH)Aq, HNO,Aq..| 13,690 , TUOH)Aq, HClAg…..| 18,760 | {The duacle betng retained T1O,H;, 8HBrAq…... 80,570 TI(OH)Aq , HClAg….. 23,860 |) TI(OH)Aq , HBrAq….. 27,510 no 31,610 2 2 Gielen tiem antes 44,640 Th = TI,0; 2HBrA R101” Giaek samme’ Gece

precipitated.

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Units of heat |

Reaction. developed. Remarks. ee ee ee, 50,800 Fb; Cl, 82,770 Formation of the solid com- Pb Witenes 64,450 pounds. eo oy 39,670 PoO , 2H… 56,830 PbO ,SHBr +... 65,630 PbO, 2HI1…..... 69,810 PbO, 2HClAq….| 22,190 PbO, 2HBrAg … 25,750 The products being entirely PbO, 2HIAQ…... 31,390 precipitated. PbO, SO,Aq…...|. 23,500 PbO, N,O,Aq….. 17,770 PbO, 2HCIAgq…. 15,390 The chloride and bromide being PbO, 2HBrAg … 15, 710 dissolved. PbO, 2C,H,O,Aq! 15,460 Pb, 0, SO,Aqg 73,800 | The sulphate being precipitated. Pb, 0, N,O,Aq 68,070 Pb, Cl,, Aq 75,970 | ak 54, ; PHONO’, ~ a st vane Solutions being formed. Ng, AY ecccsl = 6,800 PbBr,, Aq …....- -10,040 |

Electric conduc-

Name. At. wt. | Sp. gr. hei. vol. tivity.

Borin sigh ce allt ry) Aluminium 278 10°5 Indium {bib 15°3

33°76 at 20° C.

2°6 2°6 7°4

The first of these elements has already been described. Aluminium is related not only to boron but also to silicon among the non-metals, and to magnesium among the metals. Its oxide is one of the most stable known, and, like silicon and boron oxides, cannot be reduced by charcoal alone. The metal is usually obtained by heating the double chloride of sodium and aluminium, 2NaCl,Al,Cl,, with sodium. Aluminium is a white malleable metal, nearly resembling zinc in colour and hardness ; it fuses at a lower temperature than silver, but does not volatilize. It is rapidly dissolved by hydrochloric acid, but only slowly acted on by heated nitric and sulphuric acids ; it is readily dissolved by solutions of the alkalies. In a finely-divided state it appears to decompose water almost as easily as mag- nesium, but when in mass, even if heated to full redness in steam, it decomposes water but slowly, owing to the formation of a coating of oxide on its surface which protects the metal ; on this account also it may be heated intensely in air with- out undergoing more than a superficial oxidation, but in the form of powder it burns brightly when heated to redness in air or oxygen. Aluminium takes fire when heated in chlorine gas, and is converted into the chloride, which is also produced on passing chlorine over an ignited mixture of alumina and charcoal.

Aluminium forms only one chloride, the density of which in the state of vapour corresponds with the formula Al,Cl, ; it also forms only a single oxide, Al,O,. Aluminium chloride is a colourless, crystalline, volatile substance; it is deliquescent and dissolves readily in water, much heat being developed, forming a strongly acid solution. Aluminium hydroxide, Al, (OH),, separates as an almost colourless gelatinous precipitate on the addition of alkalies to a solution of an aluminium salt ; it is readily soluble in acids, forming salts such as aluminium sulphate, Al,(SO,)s. Aluminium

sulphate is extremely soluble in water ; it is very readily converted into basic salts ; it combines with the sulphates of the alkali metals forming characteristic double salts—the so-called alums.

Aluminium hydroxide also possesses marked acid properties, being soluble in alkalies, and furnishing salts such as sodium aluminate, Na,Al,O,. On ignition alumi-

nium hydroxide is converted into aluminium oxide or alumina, Al,O, ; if it has keen exposed only to a moderate red heat the alumina is a soft, white, light powder like magnesium oxide, and is soluble in acids; but after strong ignition it becomes very hard and insoluble, or difficultly soluble, in acids. Alumina occurs native as corundum in crystals isomorphous with the corresponding oxides of chro- mium andiron ; in the crystalline state it is the hardest sub- stance known next to the diamond, and insoluble in all acids, but like silica it is dissolved on fusion with alkalies. The only reactions which, in the case of aluminium, have been submitted to thermochemical investigation are—

Units of heat developed.

Reaction,

321,870 158,690 239, 640 388,800 593,880

55,920

62,970

The resemblance of aluminium to boron, silicon, and magnesium is most evident when the oxides and chlorides are compared, Thus, their oxides are all bodies of great stability, and, excepting magnesium oxide, possess marked acid properties ; and their chlorides behave similarly when added to water, boron and silicon chlorides being entirely decomposed, and aluminium and magnesium chlorides at least partially, the reaction in each case being attended by the development of a very considerable amount of

heat ; thus, according ag quantities are taken which are as the molecular weights of the chlorides, or which contain the same amount of chlorine, we have—

Si@l,, Aq = 8640 §SiCl,, Aq = 61,230 BCl,, Aq = 79,200 BCl,, Aq = 79,200 Al,Cls, Aq = 153,690 4 Al,Cl,, Aq = 76,845 MgCl,, Aq = 35,920 14 MgCl, , Aq = 53,780

It may be remarked also that magnesium and aluminium both form very solubie sulphates, which readily combine with other sulphates.

Indium is easily reduced from its oxide by hydrogen, and is precipitated from solutions of its salts by cadmium and zinc. It is an extremely rare metal, and occurs always associated with zinc. It is a soft, ductile, white metal, destitute of crystalline structure, much resembling lead in appearance. It rapidly dissolves in concentrated hydrochloric acid, slowly in dilute nitric and sulphuric acids. It melts at 176° C., but is much less volatile than cadmium, and may be melted in the air without oxidizing; at a bright red heat it burns with a violet flame form- ing a yellow oxide, In,O,.

Indium chloride, In,Cl,, sublimes without fusion at an incipient white heat, condensing in soft white laminz. Indium oxide, In,O,, is not volatile even at a white heat ; it is readily soluble in acids. It is stated that by heating ina stream of hydrogen the oxides In,O,, In,O,, and InO, are in succession formed from it, but their existence as definite compounds has not been satisfactorily established. Indium hydroxide separates as a white gelatinous precipitate on the addition of ammonia to cold solutions of indic salts ; it is soluble in alkalies, and on ignition is converted into the oxide In,O,. Indium sulphate forms with ammonium sulphate a double sulphate In,(NH,), (SO,),,24H,0, iso- morphous with the alums; when heated only to 36°C, however, this salt is converted into one containing only 4 molecules of water of crystallization.

On passing hydrogen sulphide into solutions of indium a yellow precipitate is obtained, which is decomposed by

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hydrochloric acid ; no precipitate is produced when alumi- nium salts are similarly treated, aluminium sulphide being at once decomposed by water and converted into the hydroxide.

CHromiumM—M ANGANESE—IRon—CoBALT—NICKEL,

Electrical con-

Name. Symbol, | At. wt. | Sp.gr.) At. vol. ductivity. Chromium Cr 52°4 6°8 a Manganese Mn 54°8 8:0 6°7 Tron Fe 55-9 7°8 7-1 | 16°81 at 0°C. Cobalt Co 586 89 (R95 |) 1 2R, Nickel Ni 58‘6 8°2 fal || esata]

The general resemblance between these metals is very great, but each exhibits properties which serve to distinguish it readily from the others. They are also related to many other elements ; thus, chromium and iron are closely allied to aluminium, and chromium is also allied to sulphur and its congeners ; manganese manifests some analogy with the halogens ; nickel has properties in common with copper ; and iron, cobalt, and nickel are closely related to the so-called platinum metals.

The oxides of chromium and manganese are reduced by charcoal only at a white heat ; the oxides of the remaining metals are easily reduced on ignition with hydrogen or carbon.

The properties of chromium appear to differ considerably according to the manner in which it is prepared. Thus, by heating its chloride with potassium it is obtained as a dark grey powder, which oxidizes readily, taking fire in the air at a heat below redness, and dissolving in dilute sulphuric and hydrochloric acids. By heating its chloride with sodium, however, it is obtained in hard, shining crystals, insoluble in all acids. The metal prepared by reducing the oxide with charcoal is shining, has a steel-grey colour, and is hard enough to scratch glass.

Manganese is a soft, brittle, greyish-white metal, which oxidizes quickly on exposure to the air, decomposes water slowly at ordinary temperatures, and dissolves easily in acids ; it is feebly magnetic.

The properties of iron are too well known to need descrip- tion. It dissolves readily in acids, and decomposes water rapidly at a red heat, it does not alter in dry air, but rapidly oxidizes in moist air; especially in presence of carbonic acid.

Cobalt has a steel-grey colour; nickel is silver-white. Both are hard, ductile, malleable metals, of great tenacity, somewhat more fusible than iron; they decompose water at a red heat, and like iron dissolve without difficulty in acids. They are not altered by the combined action of air and water at ordinary temperatures, but if previously heated burn in oxygen like iron. Nickel appears to be less oxidiz- able than cobalt. They are both magnetic metals.

Each of these metals forms several oxides ; and hydrox- ides and chlorides, or fluorides, corresponding to most of their oxides are known, as will be evident from the following list :-—

Oxides. Cr,0, Cr,03 CrO, Mn,0, Mn,0, Mn,Os MnO, – Fe, 0, Fe,0, Fe,03 ae Co, 0, Co,04 Co,O3 Ni,O, a Ni,0, Aydroxides.

Cr,(OH), Cr,(OH)g Mn,(OH), Mn,(OH), Fe,(OH)4 Fe,(OH), Co(OH), Co, (OH)< Ni(OH), Ni,(OH),

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Chlorides. Cr,Cl Cr,Cl, CrF, Mn,Cl, Mu,Cl MnCl, ?MnF, FeCl, FeCl, a ™ Co,Cl, Co,Cl, Ni,Cly s

Their chlorides, and, in fact, their halogen compounds generally, are all easily soluble in water, with the exception of sublimed chromic chloride, Cr,Cl,, which is insoluble in cold, and is only slowly dissolved by boiling water; but if the cold solution contains a minute quantity of chromous chloride, Cr,Cl,, the chromic chloride dissolves immediately with development of heat, forming a green solution identical with that produced by dissolving chromic hydroxide in hydrochloric acid; this effect is, perhaps, duetothe formation in the first instance of an intermediate chloride, or combination of the two chlorides, which is decomposable by water. The chlorides which correspond in composi- tion to ferrous chloride, Fe,Cl,, are

all perfectly stable, and volatilize without decomposition; chromic and ferric chlorides are also highly stable bodies, but the remaining chlorides are exceedingly unstable. Chromium hexafluoride, CrF,, is a very volatile blood-red liquid which is decom- posed by water.

Their oxides, with the exception of chromium trioxide or chromic anhydride, CrO,, and hydroxides are all insoluble in water, but readily dissolve in acids. Chromic oxide, Cr,O3, is green, and chromium trioxide has a magnificent scarlet colour. Ferric oxide, Fe,0,, has a reddish-brown colour ; the oxides of manganese are brownish black ; and the oxides of nickel and cobalt are all intensely black like cupric oxide. Chromic and ferric oxides form crystals isomorphous with those of aluminic oxide, Al,O,.

The affinity of chromium to oxygen is so great that chromous oxide, Cr,O,, is apparently incapable of existing, and itis difficult to obtain ferrous oxide, Fe,O,, on account of the readiness with which it is oxidized to ferric oxide, Fe,O,. Ferric oxide, like chromic oxide, Cr,O,, is a body of great stability, but unlike the latter it is converted into a lower oxide, ferroso-ferric oxide, Fe,O,, on ignition. The most stable oxide of manganese is the corresponding oxide, Mn,O, ; but manganous oxide, Mn,Og, is less readily oxidized than ferrous oxide, and manganic oxide is less stable than ferric oxide ; manganese is the only metal of the iron group which forms. a dioxide, or, as it is usually termed, a peroxide. Cobaltous oxide, Co,O,, absorbs oxygen when heated to dull redness in air, and is converted into the oxide Co,0,, but when more strongly heated this oxide is reconverted into cobaltous oxide, which is also obtained on igniting cobaltic oxide, Co,O,. Nickelous oxide, Ni,O., exhibits no tendency to absorb oxygen, and the higher oxide is very readily decomposed by heat. From this it will be evident that the affinity to oxygen diminishes rapidly from chromium to nickel.

Similar differencesare noticeable between theirhydroxides. Thus, the tendency of chromous hydroxide, Cr(OH),, to become converted into chromic hydroxide, Cr,(OH),, is so great that it decomposes water even at ordinary tempera- tures with evolution of hydrogen: Cr,(OH),+20H, = Cr, (OH),+H,. Ferrous hydroxide does not decompose water in this manner, but in presence of both air and water it is quickly converted into ferric

hydroxide : 2Fe,(OH), + 4OH, + O, = 2Fe,(OH),+20H,; manganous hydroxide behaves similarly, but oxidizes much less rapidly ; cobaltous hydroxide manifests but little tendency to form the higher hydroxide, and nickelous hydroxide is unaffected, when placed in contact with air and water. The two last named hydroxides, however, may be converted into the higher hydroxides by treatment with a solution of sodium hypochlorite.

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Their hydroxides are without difficulty converted into the corresponding oxides, giving off water when very gently heated ; the behaviour of chromous hydroxide is peculiar, as, when ignited, it is converted into chromic oxide with evolution of hydrogen: Or,(OH),= Cr,0, + OH, + Hy. Many hydroxides are known intermediate in composition between the oxides and the highest hydroxides,—such, for example, as are represented by the formulz Fe,O(OH), and Fe,O0,(OH),, which obviously are intermediate in composition between ferric oxide, Fe,O,, and ferric hydroxide, Fe,(OH),.

With the exception of chromium trioxide, the oxides and hydroxides of the metals now under consideration all exhibit marked basic properties ; but chromic hydroxide, like aluminie hydroxide, also has feeble acid properties, dissolving in solutions of the alkalies; and cobaltous and nickelous hydroxides, like cupric hydroxide, readily dissolve in ammonia, the solution of the former being brownish-red, and that of the latter blue. The oxides and hydroxides which correspond in composition with ferrous oxide and hydroxide furnish stable salts such as ferrous sulphate, Fe(SO,).. The chroinous salts, however, are but little known ; they form either red or blue solutions, which absorb oxygen with avidity, and disselve nitric oxidc gas, forming dark brown solutions. The ferrous salts form pale green solutions, which slowly absorb oxygen, and readily dissolve nitric oxide (p. 513), The manganous salts are of a pale pink colour, and their solutions are scarcely altered in con- tact with oxygen. Solutions of cobaltous salts have a rose-red colour, unless they are very concentrated or mixed with a strong acid, in which case they are blue. Nickelous salts are green. ‘The solutions of cobaltous and nickelous salts are permatient in air.

A second series of chromium and iron salts correspond- ing to the oxides Cr,O, and Fe,O, are readily obtained, as they are of great stability. Solutions of chromic salts are green or violet ; solutions of ferric salts are yellow. Chromic salts such as chromic sulphate, Cr(SO,),, for example, arc reduced to chromous salts by the action of the nascent hydrogen produced when zinc is immersed in their solutions, but they cannot be thus reduced by the aid of iron ; ferric salts, however, are readily reduced to ferrous salts even by feeble reducing agents such as hydrogen sulphide. Man- ganic and cobaltic salts corresponding to the chromic and ferric salts may be obtained, but they are extremely un- stable, and nickelic salts appear to be incapable of existing, so that, on treating the higher oxides and hydroxides of manganese, &c., with acids, salts derived from manganous oxide and its congeners are usually obtained. Thus, nickelic oxide, Ni,O,, is converted by the action of sulphuric acid into nickelous sulphate, with evolution of oxygen ; similarly, when manganic oxide, Mn,O,, manganic peroxide, MnQ,, or cobaltic oxide, Co,O,, is carefully dissolved in hydro- chloric acid, solutions are obtained which apparently contain the corresponding chlorides, Mn,Cl,, MnCl,, and Co,Cl,, but these rapidly decompose with evolution of chlorine, leaving manganous chloride, Mn,Cl,, or cobaltous chloride Co,Cl,. ‘The oxides which correspond in composition to ferroso- ferric oxide, Fe,O,, behave with acids as if mixtures of the two oxides. Salts corresponding to chromium tri- oxide are not obtainable, for on treatment with sulphuric acid it is converted into chromic sulphate, with evolution of oxygen ; and by the action of hydrochloric acid it is con- verted into chromic chloride, with evolution of chlorine. Like all feebly positive metals, the metals of the iron group form numerous basic salts, iron and chromium being espe- clally characterized by the formation of basic chromic and ferric salts; a remarkable series of ferric and chromic “mixed salts,” such, for example, as ferric tetraceto-dini- trate, Feo(NO,)(C,H;0,),, and chromic pentacetonitrate,

Cr,(NO,)(C,H;0,);, have been obtained by dissolving the hydroxides in mixtures of two acids in various proportions. Like aluminic sulphate,

chromic, ferric, and manganic sulphates form double salts with the sulphates of the alkali metals, which correspond both in composition and crystalline form with the alums. The chrome alums are almost as stable as the true alums, but the iron alums are much less stable, and the manganese alums are so unstable that water decom- poses them into their component salts. Ferrous, manganous, cobaltous, and nickelous sulphates form double sulphates with the sulphates of the alkali metals, corresponding in composition and isomorphous with double sulphates such as K,Zn(SO,),, 6H,O and K,Cu(SO,),, 6H,O.

The relation of chromium to sulphur and the allied elements 1s indicated by the existence of the trioxide CrO,; this oxide, however, is not merely analogous in composition to sulphuric anhydride, but also resembles it in properties. Thus, it dissolves readily in water, forming a strongly acid, yellow solution of chromic acid, H,CrO, ; and the salts of this acid are not only analogous in composition to the cor- responding sulphates, but are also isomorphous with them,

and are sinilar to them in many respects, the chromates of |

metals which form insoluble or difficultly soluble sulphates being as a rule also insoluble or difficultly soluble. although the chromates are stable salts, chromic acid is not known except in solution, chromic anhydride, CrO,, being obtained when the solution is evaporated; moreover, chromic acid very readily parts with oxygen, and on this account is a most valuable oxidizing agent. Acid salts of chromic acid corresponding to the acid sulphates apparently cannot exist, for when a solution of a chromate is rendered acid the colour changes from pale yellow to orange-yellow, the chromate being converted into an anhydrochromate or di- chromate, which is formed from two molecules of the acid chromate by the withdrawal of the elements of a molecule of water ; thus — .

CrO,(OK), : { CrO,.0K + 2HCl = O 2 + 2KCl + H,O. tain” Panta chromate, anhydrochromate.

The anhydrochromates are mostly orange-red, the cor- responding chromates being yellow ; they are very stable, and unlike the

anhydrosulphates (p. 507), to which they correspond in composition, dissolve in water unchanged.

The relation of chromium to sulphur is also indicated by the existence of an oxychloride, CrO,Cl,, corresponding to sulphuric chloride (p. 505), SO,Cl,; it is a blood-red coloured liquid, which is violently decomposed by water, and boils at 118° C. The determination of the vapour density of this compound shows that it is correctly repre- sented by the formula CrO,Cl,.

On fusing an oxide of manganese with potassium nitrate, a deep green-coloured mass is formed, from which potassium manganate, K,MnO,, may be separated in crystals isomorphous with potassium sulphate. A concentrated solution of this salt is decomposed merely by dilution, and the solution cannot be boiled; on adding an acid the colour changes from green to purple-red, the manganate being converted into permanganate :—

4K,MnO, + O, + 20H, = 2K,Mn,0, + 4KOH

Potassium Potassium

manganate. permanganate. The permanganates are much more stable than the man- ganates, and their solutions may be boiled without their decomposing ; but they readily part with oxygen, and are therefore most powerful oxidizing agents

As the manganates and sulphates are isomorphous it is

probable that the two classes of compounds are analogous in constitution; and from the manner in which the permangan-

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ates are formed from the manganates it is probable that the

former contain at least two atoms of manganese in the mole-

cule, and that potassium permanganate, for example, is re-

0.Mn0,(OK) presented by the formula .Mn0,(0K)’

permanganate is isomorphous with potassium perchlorate and periodate ; it therefore appears probable that, as already pointed out (p. 497), the formula K,C1,O, for the former salt is preferable to the simpler formula KCIO,, by which it is usually represented. The isomorphism of potassium permanganate with potassium perchlorate and periodate is, however, chiefly of interest as an indication that manganese is related to the halogens.

Tron is aiso capable of yielding a compound analogous to potassium manganate, but much less stable, termed potassium ferrate, K,FeO,; it is produced by fusing an oxide of iron with nitre. The solution has a cherry-red colour, and on the addition of acids is at once decomposed with evolution of oxygen. The most characteristic com- pounds of iron, however, are the so-called ferrocyanides and ferricyanides. Potassium ferrocyanide, K,Fe,(CN),, is produced on adding potassium cyanide to a solution of a ferrous salt in sufficient amount to redissolve the precipi- tate which at first forms ; it crystallizes from the concen- trated solution in beautiful yellow plates. The tendency to form this salt is so great that metallic iron is rapidly dissolved when heated with an aqueous solution of potas- sium cyanide : —

12KON + 2Fe + 4H,O =K,Fe,(CN),.+4KHO + 2H,.

Not only is the presence of iron in this compound not discoverable by the ordinary tests, but on treatment with hydrochloric acid it furnishes hydroferrocyanic acid, H,Fe,(CN),,, and is not, like most double cyanides, decom- posed with evolution of hydrocyanic acid. Potassium ferricyanide, K,Fe.(CN),., is produced by the action of chlorine on the ferrocyanide: K,Fe,(CN),. + Cl, = K,Fe(CN),.+2KCl ; it crystallizes in red prisms, and like the ferrocyanide ig an extremely stable compound. Other ferro- and ferri-cyanides may be prepared from the potassium compounds by double decomposition.

Cobalticyanides, such as K,Co,(CN),., isomorphous with the ferricyanides, are readily obtained, and are equally stable ; but the cobaltocyanides are very unstable. Chromi- cyanides and mangano- and mangani-cyanides,

isomorphous with the corresponding iron compounds are also known, but they are much less stable than the latter. Nickel does not furnish compounds of this kind, but like copper forms double cyanides, such as Ni(CN),, 2KCN, which are readily decomposed by acids with evolution of hydrocyanic acid.

Nickel, although of the same atomic weight as cobalt, it will be manifest, is possessed of very different properties, being in many respects much more néarly related to copper than to cobalt, iron, &c.; it is noteworthy that nickel and copper are the only metals whose compounds form blue solutions with ammonia. The relation of chromium, iron, manganese, and cobalt to one another, and of the first two especially to aluminium, will be sufficiently evident with- out further remark; the relation of iron, cobalt, and nickel to the platinum metals will be referred to later on.

Manganese and iron are the only elements of this group which have been submitted to thermochemical investiga- tion. Many of the results are of considerable interest ; thus, it will be noticed, on reference to the following tables, that much more heat is developed in the formation of manganous chloride, MnCl, or Mn,Cl,, than in that of the corresponding chloride of iron ; this is of interest in connection with, and may perhaps serve to explain, the great instability of the higher chlorides of manganese,

But potassium

T Units of

Reaction, heat, de- Remarks. veloped.

: i f th hyd- PROMO Mec ssecsescs sacee 111,990 Set yncupenegmeie Ea, OP MEICO seis vavescc tes sacers 94,770 hydroxide, _ manganic AO: a) 3 ne 116,280 hydroxide — stoned?

d potassium perman-

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WVIMMROMKG GEA) aces ssevesssacace — 20,7 Mn(OH),, S0,Aq_ …..... eC ae se Mn(OH), , 2HC1Ag …..... 22,950 ganous hydroxide. Mn ’ O . S803,Aq Wiviel sisieiwieiale pintarnis 121, 250 Formation in aqueous Mn, Cl,, Aq 128,000 solution.

| F ti f soluti if 2Mn(OH), , Os, 2KOH Ag … 14,760 : Gaeniaingendie an Mee: 2MnO(OH),, O;, 2KOHAq | – 28,260 | ganous and manganic | hydroxide.

———— ee | Units of

Reaction, heat de- Remarks.

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Fe(OH), , SOsAq …

poannnonoana! § We, Gee) He(OH);, SEICIAG ... ss icc)

,

21,390 a 2 Neutralization of Fe,(OH),, 880,Aq …..... 38,750 a ee Fe(OH), , 6HCIAq …..... 33,450 Teeave ie Fe,(OH),, 3N,0,Aq_ …..... 33, 600 y Fe(OH), , 60,H,0,Aq_….. 23,970 th ’ a 9 a SOOUSUnT Cnr nce re je i 1 Formation of the e5 ’ 69 q Cee reer ee ccreecceeves 9 chlorides and sul- QUSOIRAG), Cle. occ scsscccceceoses 55,520 [phates in aqueous Bei@), COMM: scscccsecs sc. 93,200. i ae Bes; Opp SOgAG 20:0. 00ccs00 | 224,880 |J

The only two compounds of the metals of the iron group of which the vapour density has been determined are ferric chloride and chromium oxychloride ; the density of the former corresponds to the formula Fe,Cl,,

and that of the latter to the formula CrO,Cl,. Hence the composition of ferric chloride is similar to that of aluminic chloride, the density of which corresponds to the formula Al,Cl,, and it is therefore probable that chromic chloride, which is in all respects analogous to aluminic and ferric chlorides, is similarly constituted, and that its formula is Cel.

The majority of the formule employed to represent chemical compounds which cannot be converted into gas are merely the simplest expressions of their composition in terms of the atomic weights of their constituent elements. Thus it is usual to express the composition of the lower chlorides of chromium, iron, manganese, &c., by the simple formule CrCl,, MnCl, FeCl,, and the correspond- ing oxides by the similar formule CrO, MnO, FeO ; there are reasons, however, which lead us to suppose that in many cases the less simple formulz, such as CrCl, 1,0, are to be preferred, and that the lower chlorides and oxides of iron, &c., like the higher chlorides and oxides, contain at least two atoms of the metal in the molecule. For example, the lower chlorides of chromium and iron are readily con- verted into the higher chlorides by the action of chlorine ; now if the formula of ferrous chloride is FeCl,, that of ferric chloride being Fe,Cl,, the conversion of the former into the latter by the action of chlorine involves the extremely improbable assumption that a molecule of the ferric compound is formed from two molecules of the ferrous compound :—

2FeCl, + Cl, = Fe, Cl, .

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[TRON GROUP,

Chlorine is not known ever to produce an effect of this kind, that is to say, directly to cause the formation of a more complex from a less complex molecule; but its action is frequently to produce an effect the very reverse of this, many instances of simplification of the molecule by the action of chlorine being known. By adopting the for- mula Fe,Cl, for ferrous chloride a natural interpretation of its conversion into ferric chloride is at once possible, how- ever :—

FeCl, FeCl, + -c =

FeCl,

Ferrous chloride.

Corresponding formule may be assigned to the lower chlorides of chromium, manganese, cobalt, and nickel, on account of their resemblance to ferrous chloride; and from the general resemblance which the nickel compounds bear to the cupric compounds it appears probable that, if nickel chloride has the formula Ni,Cl,, cupric chloride has the formula Cu,Cl,.

The argument may be extended much further, and from the more or less perfect resemblance of silver chloride to cuprous chloride, mercurous chloride, and other chlorides which certainly contain at least two atoms of chlorine in their molecules, we may infer that the formula Ag,Cl, is probably a more correct expression than that commonly employed. The existence of a subchloride and a suboxide of silver indicates that silver is not uniformly a monad element, and if we regard copper, silver, and gold as triad elements (although the last mentioned is undoubtedly capable of assuming pentad functions) we may represent their lower chlorides by similar formule, and thus, in a measure, account for the similarity in their properties :—

CuCl AuCl

| ll |

CuCl AgCl AuCl Cuprous chloride. Argentic chloride. Aurous chloride.

But it has been pointed out that certain of the silver compounds are isomorphous with the corresponding sodium and potassium compounds, and as there is no reason to suppose that the argentic compounds generally are not of

FeCl,

Ferric chloride.

| Similar constitution to argentic chloride, the conclusion

that there are two atoms of silver in the molecule of argentic chloride would appear to necessitate the assump- tion that the compounds of the alkali metals also contain at least two atoms of the metal in their molecules j-— that the formula of sodium nitrate, for example, is Na,(NO3),, and not NaNO,. The existence of a compound of sodium ethyl with zinc ethyl, N aZn(©,H,),, from which the former cannot even be separated, appears to show that sodium does not invariably function as a monad.

Speculations of this kind are extremely hazardous, but, as no method is known enabling us to ascertain the molecular composition of compounds which cannot be volatilized, they possess a certain interest and, moreover, point to the necessity of investigation in this direction.

RutTHENtuM—Ruopium—PaLLapiIuM—Osm1um— IripIumM— PLatTiInuM.

Name.

Ruthenium 103°5 11°4 971 Rhodium Rh 104°1 el 8°6 Palladium Pd 106°2 12°0 8°8 Osmium Os 198°6 224 8°8 Tridium Ir 196‘7 22°4 87 Platinum Pt 196°7 21°5 9°7

These metals always occur in the native state, and are usually associated together. ‘The relation between

PLATINUM GROUP. |

ruthenium, rhodium, and palladium, and between osmium, iridium, and platinum, is similar to that which obtains between iron, cobalt, and nickel; they, are indeed very closely related to these last elements,—the resemblance in properties being greatest between iron, ruthenium, and osmium ; between cobalt, rhodium, and iridium; and between nickel, palladium, and platinum. Palladium and platinum also manifest much analogy to silver and gold, and ruthenium and osmium exhibit properties which con- nect them with the elements molybdenum and tungsten.

They are white, or nearly white, hard metals, of high specific gravity, osmium being the heaviest of the elements ; they may be melted, but only at

a very high temperature with the aid of the oxyhydrogen blowpipe, with the exception of osmium, which does not melt, but volatilizes, palladium being more fusible, and rhodium, ruthenium, and iridium much less fusible, than platinum. Palladium is soluble in concentrated nitric acid, and platinum in nitrous acid, as well as in aqua-regia ; the remaining metals are difficultly soluble or are insoluble in aqua-regia. They are all attacked on fusion with alkalies and _potassic nitrate. Most of them possess in a high degree the property to which allusion has already been made of con- densing gases on their surfaces, especially when in a finely divided state; thus, finely divided platinum at ordinary temperatures absorbs about 240 times its volume of hydro- gen, and finely divided palladium at 200° C, absorbs nearly 700 times its volume of hydrogen. When heated in an atmosphere of the gas platinum and palladium also occlude hydrogen when ina compact state. The latter metal, accord- ing to Troost and Hautefeuille, formsa definite compound with hydrogen of the composition Pd,H, which is further capable of absorbing hydrogen in considerable quantity ; the deusity of the pure compound is 11:06, that of the melted metal from which it was prepared being 12, and, therefore, if it be supposed that the elements unite without condensation, that is to say, that the hydrogen has the same density as it would have if solidified in the free state, the density of solidified hydrogen is ‘62, or slightly higher than that of lithium. Iron, cobalt, and nickel also possess the property of occluding hydrogen, although only in a slight degree.

The following chlorides and oxides of the platinuin metals are known :—

Chlorides.

RuCl, Ru,Cl, RuCl, Os,Cl, Os,Cl, OsCl, nee Rh, Cl ae ie Ir,Cly IrCl, Pd,Cl, – PdCi, Pt,Cl, PtCl, Oxides.

Ru,0, Ru,O3 Ru,0, Os,0, Os,03 03,04 Rh,O, Rh,O, Rh,O, Tr.0, Tr,03 Tr,0,4

Pd,Oz a Pd,0, Pt,0, Pt,0,

Ruthenium absorbs oxygen at a red heat, and is con- verted into the oxide, Ru,O,, which is its most stable oxide, whereas the dioxide is the most stable oxide of osmium. Ruthenium tetroxide, RuO,, is a golden-yellow crystalline

substance, sparingly soluble in water, which melts at 58° C., and boils a little above 100° C.; hydro- chloric acid converts it into the chloride Ru,Cl,, with evolution of chlorine. The solution of this chloride is decomposed by boiling, the hydroxide Ru,(OH), being pre- cipitated ; like ferric chloride, it is reduced to the chloride Ru,Cl, by hydrogen sulphide, the colour changing from orange-yellow to blue.

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Osmium, in the compact state, is slowly converted into the tetroxide, OsO,, when roasted in air, but the pulveru- lent metal obtained by reducing this oxide by hydrogen oxidizes spontaneously in the air. Osmium tetroxide is a white, crystalline, extremely volatile substance; it melts considerably below 100° C., and boils at a temperature a little above its melting point. The vapour density deter- mination shows that it is correctly represented by the formula OsO,. Its vapour has an intolerably pungent odour, and is excessively poisonous. It is dissolved by water, and isa powerful oxidizing agent, but does not evolve chlorine on treatment with hydrochloric acid ; most metals, even silver and mercury, excepting gold and the platinum metals, partially reduce its solution and cause the separation of osmium ; it is decomposed by ammonia, being converted into the hydroxide Os(OH),, with evolution of nitrogen: 30sO0,+4NH,=30s(OH),+2N,. A lower hydroxide of osmium, Os,(OH),, is known, which like ferrous hydroxide rapidly oxidizes on exposure to the air.

The tetroxides of ruthenium and osmium are apparently perfectly neutral bodies, possessing neither basic nor acid properties ; the remaining oxides exhibit only feeble basic properties, and furnish unstable salts, of which very little is known. The oxides of ruthenium are readily reduced when heated in hydrogen ; osmium tetroxide is reduced at a red heat, but the lower oxides of osmium are reduced by hydrogen at ordinary temperatures.

Ruthenium and osmium furnish ruthenio- and osmiv- cyanides, such as K,Ru,(CN),, and K,Os,(CN),., iso- morphous with the corresponding ferrocyanides, from which the acids H,Ru,(CN),,.and H,Os,(CN),,. may be prepared ; the compounds analogous to the ferricyanides are not known. On

heating the metals with potassium nitrate, compounds analogous in composition to potassium ferrate, but more stable, are formed; potassium rutheniate, K,RuO,, is apparently much less stable than potassium osmate, K,OsO,, which may be obtained in large rose-coloured crystals ; their solutions are at once decomposed by acids, the former yielding the hydroxide Ru,(OH), with evolution of oxygen, and the latter the hydroxide Os(OH), and osmium tetroxide. :

The chlorides of ruthenium and osmium form numerous double salts, but the most important are the ruthenio- and osmio-chlorides, such as K,RuCl, and K,OsCl,, which are isomorphous with the corresponding platinochlorides.

Iridium and rhodium are insoluble in aqua-regia, and even when in a finely divided state are only slowly oxidized at a red heat ; the most stable oxide of iridium is the dioxide, and the tendency of iridium is always to form compounds which correspond to this oxide in composition, but compounds corresponding to the oxide Rh,O, are more often produced from rhodium, this being apparently its most stable oxide. The oxides of rhodium are reduced when heated in an atmosphere of hydrogen, but the oxides of iridium are reduced at ordinary temperatures. The differ- ence between tlie two metals is therefore similar to that between ruthenium and osmium, which they much resemble in their general behaviour, although neither furnishes a tetroxide, and rhodium forms only one stable chloride, the hydroxide Rh(OH), being dissolved by hydrochloric acid with evolution of chlorine. Iridium tetrachloride forms double chlorides or iridiochlorides isomorphous with the corresponding platinochlorides. Like cobalt, rhodium and iridium form compounds which are not only analogous in composition to the ferricyanides, but also isomorphous with them. A number of rhodium salts corresponding to the oxide Rh,O, are known, but they crystallize with difficulty , the hydroxides of iridium are soluble in acids, but no definite oxygen salts of iridium have been obtained. The hydroxides Rh,(OH), and Ir,(OH), manifest feeble acid

properties, dissolving in alkalies. Rhodium and iridium are precipitated from solutions of their salts by most metals, but not by silver or gold.

In many of their properties palladium and platinum more nearly resemble silver and gold than the preceding metals, just as nickel is more closely allied to copper than to cobalt and iron. Palladium is superficially oxidized at a lower temperature than silver, but its oxide is decomposed at a red heat; platinum is not in the least affected wheu heated in air or oxygen. The most stable compounds of palladium are the palladious compounds, a solution of palladic chloride, PdCl,, being decomposed when heated, with evolution of chlorine, Pd,Cl, being produced; the most stable compounds of platinum, however, are those which correspond in composition to platinic chloride. Palladium, like silver, is stained by iodine, which is with- out action on platinum, owing to the formation of palladious iodide, which is also obtained on adding potassium iodide to a solution of a palladious salt; it is a black powder insoluble in water but soluble in ammonia, and also, like silver iodide, in a solution of potassium iodide. Both platinous and platinic chlorides, Jike auric chloride, readily unite with hydrochloric acid, forming cliloroplatinous and chloroplatinic acids, H,PtCl, and H,PtCl, ; salts of these acids are produced by the combination of platinous and platinic chlorides with the chlorides of other metals. Palladious and palladic chlorides, and the corresponding chlorides of the other platinum metals, as already pointed out, form similar compounds, those which correspond in composition being in all cases isomorphous. Although platinum and palladium do not furnish compounds analog- ous to the ferro- or ferri-cyanides, they form a distinct series of very beautiful and highlystable salts termed platino- cyanides and palladiocyanides, which are analogous in com- position to the chloroplatinites, and from which the corre- sponding acids may be obtained by decomposing the silver salts, for example, with hydrogen sulphide ; thus :—

K,PtCl, Kk, PHC), K,Pd(CN), Potassium platinochloride. Potassium platinocyanide. Potassium palladiocyanide.

The palladiocyanides are isomorphous with the corre- sponding platinocyanides. These salts combine with the halogens, forming compounds such as potassium platini- chlorocyanide, K,PtCl,(CN),, which

are analogous to the chloroplatinates such as K,PtC]l,, A somewhat similar series of bodies may be obtained from gold, e.g., potassium auricyanide, KAu(CN),, and potassium aurichlorocyanide, KAuCl,(CN),. .

The oxides and hydroxides of platinum and palladium are somewhat more stable than the silver and gold compounds, but are entirely decomposed on ignition ; they dissolve in acids, but the resulting salts have little stability, although they are considerably more stable than those of gold. The hydroxides appear all to possess acid properties, platinic liydroxide dissolving readily in solutions of alkalies, form- ing metallic derivatives which may be obtained in crystals. Platinic hydroxide, like auric hydroxide, is converted into a fulminating compound by the action of ammonia.

Cobalt and the platinum metals are especially character- ized by the readiness with which they enter into reaction with ammonia, forming salts of cobalt and platinum bases, which are often extremely complex in composition. Thus, a solution of platinous chloride in warm, moderately strong ammonia, concentrated by evaporation, on cooling deposits yellow crystals of platinodiammonium chloride, PtN,H,,Cl,, H,O ; by treating a solution of this salt with silver sul- phate it is converted into the sulphate PtN,H,,(SO,), from which the corresponding hydroxide PtN,H,,(OH), may be procured by adding to the solution the equivalent quantity of barium hydroxide, Platinodiammonium hydroxide may

be obtained in crystals ; it is a powerfully alkaline, caustic substance, and, according to Thomsen, its heat of neutral- ization is as great as that of the alkalies and the hydroxides of barium, strontium, and calcium. When platinodiam- monium hydroxide is heated as long as it gives off am- monia and water, it is converted into platinoammonium oxide PtN,H,O, from which salts such as platincammonium chloride, PtN,H,Cl,, may be prepared by the action of acids; on passing chlorine into water in which the latter is suspended it is converted into chloroplatinoammonium chloride, PtCl,N,H,Cly.

The relation of these compounds to platinous chloride and to one another may be expressed by the following for- mulee ;—

PtCl, Pt{NH,ClNH,)}, Pt(NH,Cl), PtCl(NH,Cl), I | __ I PtCl, Pt{NH,Cl(NH,)], Pt(NH,Cl), PtCl(NH,Cl), Platinous Platinodiammonium Platinoammonium Chloroplatinoam- chloride. chloride. chloride. monium chloride

Similarly, when a solution of cobaltous chloride im ammonia is exposed to the air, the liquid assumes first a brown and then a red colour, and if the reddened liquid is mixed with hydrochloric acid a brick-red precipitate is pro- duced ; by recrystallizing this from hot water containing hydrochloric acid it is obtained in beautiful ruby-red crys- tals of the composition Co,N,,H3,Cl,. The relation of this compound, which is termed purpureocobaltic chloride, to cobaltous and cobaltic chlorides may be expressed as follows :—

NH,Cl ii “ee ©? | (NHCINH,)], {. \,NH,Cl(NH CoC, CoC, Co WNC). a) ls Cobaltous Cobaltic chloride. Purpureocobaltic chloride. chloride,

Nickel and copper appear to form ‘similar compounds, but they are mostly very soluble and far less complex, these elements having little or no tendency to function as hexads.

TITANIUM—ZIRCONIUM—TIN.

Name. | Symbol. At. wt. Sp. gr. At. vol j Titanium | T 48 san Zirconium | Zr 90 4°] 21°9 Tin Sn 117°8 73 1671

Titanium and zirconium are closely related to silicon and, therefore, to carbon, and occupy an intermediate position between these elements and the true metals. Titanium and tin, however, are more nearly related than either titanium and zirconium or tin and zirconium,— zirconium more closely resembling silicon, especially in the properties of its oxide. ,

Titanium and zirconium apparently resemble silicon closely in their physical properties, and exist both in the amorphous and crystalline state. In the amorphous state they burn with great brilliancy when heated to reduess

in oxygen, and they take fire when heated to redness in chlorine ; titanium also unites directly with nitrogen at high temperatures, and it is stated forms the three nitrides Ti,N,, Ti,N,, TiN,. Titanium is said to be solnble in warm hydrochloric acid, but zirconium is only slowly attacked by ordinary acids, although it readily dissolves even in cold hydrofluoric acid. Crystalline zirconium is very hard, and resembles antimony in colour, lustre, and brittleness ; it is less fusible than silicon.

Tin is a soft, very malleable, white metal, with a tinge of yellow, and is a tolerably good conductor of electricity, titanium and zirconium being non-conductors of electricity. It fuses at about 230°C. It scarccly tarnishes at ordinary temperatures, but at a red heat it rapidly oxidizes, and readily decomposes water. It is only slowly dissolved by

warm hydrochloric acid, which converts it into stannous chloride, Sn,Cl,, but is rapidly acted on by moderately concentrated nitric acid ; chlorine acts readily on the melted metal, converting it into stannic chloride, SnCl,. Two chlorides of titanium are known, Ti,Cl, and TiCl,, but only one chloride of zirconium, ZrCl,. Titanium and tin tetrachlorides are colourless liquids, which boil respectively at 135° and 115° C.; their lower chlorides are solids, and are powerful reducing agents. Zirconium chloride is a white, crystalline solid ; its vapour density corresponds with the formula ZrCl,. When titanium and tin tetrachlorides are mixed with a small quantity of water, much heat is developed, and they dissolve, probably forming chlorhydrins ; but a large quantity of water causes their conversion into the corresponding hydroxides, which separate as white gelatinous precipitates. Zirconium chloride is dissolved even by a large quantity of water, but the hydroxide Zr(OH), separates as a gelatinous, bulky, white precipitate on the addition of alkalies.

Titanium, zirconium, and tin tetrafluoride unite with metallic fluorides, forming crystalline salts which correspond in composition to the silcofluorides or fluosilicates (p. 522), with which they are isomorphous; thus :—

K,SiF, K,TiF, K,ZrF, K,SnF,. Potassium Potassium Potassium Potassium fluosilicate. fluotitanate. fluozirconate. fluostannate.

Titanic oxide, TiO,, hasa reddish-brown colour ; stannic oxide, SnO,, is white or yellowish-white, but assumes a transient dark yellow or brown colour when heated ; virconic oxide, ZrO,, is white. They may be obtained in crystals which are isomorphous. _Zirconic oxide is infusible, and titanic oxide melts only at the heat of the oxyhydrogen blowpipe ; stannic oxide is somewhat more fusible, although very difficult to fuse. Titanic oxide is reduced by charcoal at a white heat, and stannic oxide at a full red heat; zirconic oxide, however, appears eutirely to resist reduc- tion; by ignition with charcoal in an atmosphere of chlorine they are converted into the corresponding chlorides. After ignition they are insoluble in acids, except con- centrated sulphuric acid; they are dissolved on fusion with alkalies. By dissolving the oxides or the corresponding hydroxides in acids, salts such as stannic sulphate, Sn(SO,)., are produced ; the titanium and tin salts are so unstable, however, that their solutions are decomposed by boiling ; the zirconium salts are somewhat more stable. Stannic hydroxide readily dissolves in alkaline solutions, but titanic and zirconic hydroxides are insoluble. The salts which are formed from the hydroxides or oxides by the action of alkalies are mostly analogous to the silicates of the form M,’SiO, ; thus :—

Na,SiO, Na, TiO, Na,ZrO,

Sodium silicate. Sodium titanate. Sodium zirconate.

When tin is heated with concentrated nitric acid it is converted into white, insoluble, metastannic acid; the air-dry substance has the composition Sn,O,), 10H,O, but on drying at 100° ©. it is converted into the compound H,,9n,0,,; metastannic acid has feeble acid properties, aud furnishes salts which all correspond in composition to potassium metastannate, K,H,S,O,,. On boiling a solution of titanic hydroxide in hydrochloric acid an apparently similar compound is precipitated.

Stannous hydroxide, Sn,(OH),, like stannic hydroxide, exhibits both basic and acid properties, dissolving in acids and also in alkalies; it gradually absorbs oxygen on exposure to the air. When a solution of titanic hydroxide

in hydrochloric acid is digested with metallic copper, it becomes violet-blue, and on the addition of an alkali a dark brown precipitate separates, which probably is the hydroxide gorresponding to the chloride Ti,Cl,.

Na,SnOg.

Sodium stannate.

Tin is the only | impure state as black powders.

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element of this group which may be precipitated as sulphide by hydrogen sulphide.

Vanaprum——ARsENIC-—NIoBIUM—ANTIMONY— TANTALUM—BISMUTH.

Name.

Vanadium Arsenic Niobium Antimony Tantalum Bismuth

These elements belong to the same group as nitrogen and phosphorus, but the relation between them is in a uarked degree periodic, the resemblance being greatest in jaany respects between arsenic, antimony, and bismuth, and between vanadium, niobium, and tantalum. Vanadium is the only member of the group, excepting niobium and, perhaps, tantalum, which furnishes coloured compounds, and in this respect resembles titanium and chromium, to both of which it is about equally related. Relationship may also be traced between arsenic and selenium; between niobium and zirconium, and niobium and molybdenum ; between antimony and tin, and antimony and tellurium ;

| and between tantalum and tungsten.

The following chlorides and oxides of the elements of this group are known :—

Chlorides. (2) NCl, PCl, PCI; VC, Vicl, @) Gl. i – AsCl, . ie i oe NbCl, SbC 1, – SbCl, Ps Sai a TaCl, Bi,Cl, —_-BiCl, i – Oxides N,0 NO N05 N,0, N,O; es = P,0s “ P05 V0. V,05 V0, Vabe ae (As,03)o ae As,Os eee Nb,O; 2 (Sb,0s), i Sb,0; Bi,O; ie 10s

the pentoxide. acid, but nitric acid of all strengths readily dissolves it. It is converted into a mononitride when heated in nitrogen gas.

Niobium and tantalum have been obtained only in an Like vanadium, these

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elements have a great tendency to unite with nitrogen. Vanadium dichloride crystallizes in apple-green coloured plates, and vanadium trichloride forms peach-blossom coloured tables; vanadium tetrachloride is a reddish-brown liquid, which boils at 154°C. An oxychloride of vanadium, VOCI,, corresponding to phosphorus oxychloride, POC, is also known ; it is a yellow liquid, which boils at 126 C. The vapour density of the tetrachloride, according to Roscoe, corresponds with the formula VCl,, but as it is resolved into the trichloride and free chlorine on boiling, and even undergoes the same decomposition at ordinary temperatures, it may be doubted whether the density observed was really that of the tetrachloride, and not that of a mixture of a lower chloride and chlorine, especially as from the analogy which vanadium presents to chromium the formula V,Cl,; appears to be more probable than the simpler formula.

The vanadium chlorides are dissolved and decomposed by water, the tetrachloride forming a blue, the trichloride a green, the dichloride a lavender-coloured, and the oxychloride a yellow liquid; the solution of the dichloride is a most powerful reducing agent, and the solutions of the tri- and tetra-chloride also exhibit reducing properties, owing to the tendency of the dissolved compounds to combine with oxgyen to form vanadic acid.

Vanadium pentoxide or vanadic anhydride, Vee. corresponds in composition and properties to phosphoric anhydride ; it has a brownish-red colour, and fuses at a red heat; it dissolves sparingly in water, forming a yellow, strongly acid solution of vanadic acid. By the combination of vanadic anhydride with basic oxides in various proportions salts corresponding to

the three series of phosphates, as well as salts of a more complex character, are obtained; tlius :—

Sodium metaphosphate, NaPO, | Sodium metavanadate, NaVO,

», orthophosphate, Na,PO, », orthovanadate, Na,VO,

»» pyrophosphate, Na,P,0, »» pyrovanadate, Na,V,O,

Isomorphism has been observed between several corre- sponding phosphates and vanadates, The tetroxide and trioxide of vanadium also possess feeble acid properties and unite with basic oxides. The vanadium oxides dissolve in acids, mostly forming salts such as the sulphate V,0, (SO,)., in which the hydrogen of the acid is displaced by the radicle VO ; the formation of salts of this kind is characteristic of all the metalloids included in this group, and apparently of the metalloids generally. A solution of vanadium pentoxide in sulphuric acid, which is red, becomes blue on treatment with sulphurous acid or hydrogen sulphide, the salt of the pentoxide being reduced to a salt of the tetroxide ; by the aid of magnesium the reduction may be carried a stage further, and a salt of the trioxide is formed, the solution becoming green; and if zinc, cadmium, or sodium amalgam is employed, the solution ‘finally becomes lavender-coloured, and contains a salt of the dioxide.

Arsenic trichloride, AsCl,, the only known chloride of arsenic, is a heavy, colourless, oily liquid, which boils at 132° C.; itis dissolved by water, probably as a chlorhydrin, as its solution in the smallest possible quantity of water deposits after some days crystals of the composition AsCl(OH),.

Antimony trichloride is a crystalline compound which boils at 223° C.; its vapour density corresponds with the formula SbCl,;. Antimony pentachloride, SbOl,, is a heavy, yellowish liquid, which cannot be distilled without decomposition. These chlorides are dissolved by hydro- chloric acid or a small quantity of water, but a large quantity of water converts the trichloride into an insoluble oxychloride, SbOCl, and the pentachloride into a compound which corresponds in composition to pyrophosphoric acid,

viz., H,Sb,0,. No oxychloride of arsenic or antimony corresponding to phosphorus oxychloride is known, but a crystalline antimony sulphochloride, SbSCl, , exists.

[ARSENIC GROUP.

Bismuth trichloride is a very fusible, volatile, delique-

scent, colourless compound ; its vapour density corresponds

with the formula BiCl, ; water converts it into an insoluble oxychloride, BiOCl; when heated in hydrogen it furnishes an unstable dichloride, Bi,Cl, .

Niobium pentachloride, N bCl,, is a yellow, easily fusible, crystalline substance, which boils at 240° O. 3 niobium oxychloride, NbOCI,, is a white, infusible, but volatile, crystalline compound. The formule of these bodies have been established by the determination of their vapour densities ; both are decomposed by water. The solution of niobium chloride in hydrochloric acid becomes blue when a plate of zincis immersed in it. Tantalum pentachloride is a yellow, fusible, crystalline substance, which boils at about 242° C. ; its vapour density corresponds with the formula TaCl,; ; it is decomposed by water.

Both oxides of arsenic are white; the trioxide sublimes at about 200° C. without fusing; the pentoxide, when suddenly heated to redness, fuses and is decomposed into the trioxide and oxygen. The vapour density of the trioxide corresponds with the formula As,O,. Arsenious trioxide is sparingly soluble in cold water, more readily in hot water, and freely in hot hydrochloric acid; the aque- ous solution reddens litmus. The pentoxide is delique- scent and easily soluble in water, forming a solution of arsenic acid, H,AsO,; on evaporating the solution, however, even at ordinary temperatures, crystals of an acid corre- sponding in composition to pyrophosphoric acid, H,As,O, , are obtained, which is converted into the pentoxide when heated at about 260° C. Arsenic acid furnishes a series of salts analogous in composition to and isomorphous with the corresponding phosphates. Arsenic trioxide is almost desti- tute of basic properties, and the salts formed by its union with basic oxides are not very stable, so that it differs greatly from the corresponding oxide of phosphorus ;

thermochemical Thus, on inspection of the following table, which shows the amounts of heat which are developed on adding so- dium hydroxide solution to solutions of the acids of phos- phorus and arsenic, it will be evident that, whereas the behaviour of arsenic acid is similar to that of phosphoric acid, the behaviour of a solution of arsenic trioxide is altogether different from that of a solution of phosphorus trioxide (phosphorous acid), the molecule of arsenic trioxide regarded as As,O,, like boron oxide, evidently existing in solution as a dibasic acid; it is not known whether the molecular composition of phosphorus trioxide is correctly represented by the formula P,O,, and whether therefore the difference between the phosphorus and arsenic compounds is to be referred to the existence of a difference similar to that exhibited by the formule P,O, and As,O0¢.

PO3H ° PO2H3 : PO3H3 * PO,Hg . AsO, ° P,07H, ° | A820 ° |

7,100) 7,700} 7,480] 7,830 7,360 nib ar 14,380] 15,160 | 14,830 | 14,830 14,990 | 14,380 | 7,300

15,270 | 28,370 | 27,080 | 27,580 | 28,640 13,780

28,940 | 34,030 | 35,920

52,740 | 15,070 35,280 | 37,400 | 54,480 | 15,58

It will be evident also on comparing the following table with that on p. 518 that much less heat is developed in

investigation confirms this conclusion, —

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TUNGSTEN GROUP.]

the formation of the arsenic compounds than in the forma- sion of the corresponding phosphorus compounds :—

Units of heat developed.

Remarks.

Reaction.

Formation of the solid compounds,

Formation of the com-

pounds in aqueous solu-

tion.

Pee of the trioxide when dry, and in solution.

Dissolution of the trioxide and pentoxide and of arsenic acid in water.

The oxides of antimony are white or yellowish ; the trioxide is fusible and volatile, and is partly converted into the tetroxide when heated in air; the tetroxide is infusible, and unalterable by heat; the pentoxide is con- verted into the tetroxide ata red heat. The vapour density of the trioxide has not been determined, but as it may be obtained in crystals isomorphous with those of arsenic trioxide its formula is probably Sb,O,. The oxides of antimony all exhibit feeble acid properties, dissolving in alkalies, but the salts mostly have little stability ; the most stable salts apparently are those which correspond to the potassium salt of the formula K,Sb,O,,._ The oxides of antimony are soluble in hydrochloric and concentrated sulphuric acids ; the trioxide may thus be converted into the sulphate, Sb,(SO,),, which is decomposed by water into an acid and a basic salt.

The bismuth oxides are yellow or brown, and are devoid of acid properties, but they dissolve in acids ; the pentoxide is decomposed and converted into the tetroxide when heated to about 220°C., and the latter is reduced to the trioxide at a somewhat higher temperature. Bismuth sulphate, Bi,(SO,),, like antimony sulphate, is decomposed by water into an acid and a basic salt.

On boiling a solution of acid potassium tartrate, HKC,H,0,, with antimony trioxide the so-called tartar emetic (SbO)KC,H,O,, is formed, the oxygenated radicle SbO displacing an atom of hydrogen in the potassium tartrate ; corresponding arsenic and bismuth compounds are formed in a similar manner.

Niobium and tantalum pentoxides are white and infusible ; they do not volatilize ; after ignition they are insoluble in all acids, but dissolve on fusion with alkalies. They exhibit marked acid properties, combining with basic oxides in various proportions. The hydrated oxides obtained on decomposing the chlorides by water are acid to litmus, and are soluble in hydrochloric and hydrofluoric acids. The fluorides of niobium and

tantalum, and niobium oxyfluoride, readily form doukle salts with other fluorides, which in many cases are isomorphous with certain titanium, zirconium, tin, and tungsten compounds which do not exactly correspond to them in composition, but in which apparently fluorine and oxygen displace one another isomorphously ; thus, the following pairs of compounds are isomorphous :—

K,NbF, HK,SnF, (NH,),NbOF, (NH,),Z:F, K,TaF, HK,NbOF, (NH,),WO,F, (NH,),NbOF,

Arsenic and antimony, like phosphorus and nitrogen, form gaseous trihydrides, ASH, and SbHg, and arsenic is said to furnish also a solid dihydride, As,H,. Arsine and stibine, ASH, and SbH,, are formed whenever hydrogen is evolved in presence of an arsenic or antimony compound ; they are extremely unstable compounds, especially the latter, and are entirely devoid of basic properties. The

ot] corresponding compounds of arsenic and antimony with positive hydrocarbon radicles, however, like the analogous nitrogen and phosphorus compounds, are far more stable and combine readily with other elements. Thus, triethyl- amine, N(C,H;),, and triethylphosphine, P(C,H,)3, com- bine with acids, forming salts corresponding to the ammo- nium salts such as the chloride PH(C,H;),Cl; the triethylphosphonium salts, moreover, are stable in presence of water, which at once decomposes phosphonium iodide. Triethylstibine, Sb(C,H,),, decomposes hydrochloric acid with evolution of hydrogen, forming Sb(C,H,)3Cl, ; trimethylarsine, however, does not react with acids, but with chlorine forms thecompound As(CH,),Cl,, the existence of which furnishes a proof that arsenic may function as a pentad element. The phosphorus, antimony, and arsenic compounds absorb oxygen with great avidity, forming powerfully basic oxides such as PO(C,H,),. They also furnish bydroxides such as N(C,H;),.OH, P(C,H,),.OH, &e. (p. 575), which exhibit the closest resemblance to the alkalies; Thomsen, indeed, has shown that the heat of neutralization of the hydroxide N(CH,),.OH is equal to that of the alkalies. The existence of these hydroxides, and their behaviour, afford the strongest reason for believing that a solution of ammonia at least partially consists of ammonium hydroxide, NH,.OH (p. 510).

MoLtyBDENUM—TUNGSTEN— URANIUM.

Name. Symbol. At. wt. Molybdenum Mo 95°8 Tungsten W 184 Uranium U (2) 180

=

Molybdenum and tungsten are closely related to chromium. They may be obtained by reducing their oxides at a high temperature in a stream of hydrogen. Molybdenum, after fusion, is white, and has a silvery lustre ; the powder obtained by reducing tungsten trioxide has a grey colour, and strong lustre. Both are difficult of fusion, and insoluble in most acids except nitric acid; when heated in air or oxygen they are finally converted into the trioxides MoO, and WO,. They form the follow- ing chlorides and oxides : —

Mo,Cl, Mo,Cl, MoCl, MoCl, el, es WCl, WCl; WCl, Mo,0, Mo,0, ee MoO, wis Wo,0, aa Wo;

Molybdenum pentachloride is the highest chloride obtained by heating molybdenum in chlorine gas; it is a black, crystalline substance, which forms a colourless solution when dissolved in a considerable quantity of water ; when heated in air it is converted into a colourless oxychloride, MoO,Cl, ; according to Debray, its vapour density corresponds with the formula MoCl,. The remaining chlorides are not distinctly crystalline; the tetrachloride is brown, the trichloride red, and the dichloride yellow ; the molecular formule of these chlorides are undetermined. In an atmosphere of carbon dioxide the dichloride bears a bright red heat without melting or volatilizing, the trichloride is resolved into di- and tetra- chloride, and the latter when again heated, splits up into pentachloride which sublimes, and trichloride which remains ; the di- and tri-chlorides are insoluble, but the tetrachloride is readily soluble in water.

Tungsten is converted by chlorine at a moderate heat into a hexachloride, WCl,, which forms black-violet crystals ; it melts at 275° C., and boils at 341° C.; from the determination of its vapour density it appears that it undergoes decomposition when heated. When pure it is insoluble in water below 60° C., but if the slightest trace

of oxychloride be present it is decomposed by water even in the cold. Tungsten pentachloride crystallizes in black, highly deliquescent needles ; it melts at 248° C., and boils at 376° C., and its vapour density at 350° C. corre- sponds with the formula WCl;. It has already been pointed out that the existence of pentachlorides of tungsten and molybdenum, and of a vanadium tetrachloride, is apparently anomalous ; at present, these chlorides, chlorine dioxide, ClO,, nitrogen monoxide and dioxide, and, perhaps, uranium pentachloride are the only instances known to us in which apparently an odd number of affinities are disengaged (see p. 473).

Tungsten tetrachloride is a crystalline, greyish-brown substauce ; when strongly heated it decomposes into the volatile pentachloride and the non-volatile dichloride, which is a loose grey powder, destitute of crystalline struc- ture. Tungsten also forms two oxychlorides, WOCI, and WO,Cl, ; the former is obtained in beautiful ruby-red, and the latter in yellow crystals. The formula of the monoxy- chloride, WOCI,, has been established by determining its vapour density.

Molybdenum trioxide has marked acid properties, but the remaining oxides are feebly basic; both oxides of tungsten exhibit acid functions. Solutions of molybdous salts corresponding to the oxide Mo,O, are almost black, and solutions of molybdic salts corresponding to the oxide Mo,O, are reddish-yellow; the molybdates are mostly white. Molybdenum trioxide, MoO,, melts at a red heat to a dark yellow liquid, which on cooling forms a straw-yellow mass, breaking up into crystalline scales ; it is scarcely soluble in water, but dissolves in hydrochloric, nitric, and sulphuric acids. Like silica and other feebly acid oxides it combines with basic oxides in a large number of different proportions, forming molybdates. Tungsten trioxide, WQ,, is a canary-yellow substance, insoluble in water and in most acids; it melts at a high temperature, and, like molybdenum trioxide, may be volatilized by heat ; it dissolves in alkaline solutions, forming tungstates, of which a great variety may be obtained by the union of tungsten trioxide with basic oxides in various proportions. The tungstates are mostly colourless. When a hot solution of an alkaline tungstate is mixed with an acid a yellow precipitate of tungstic acid, H,WO,, is obtained, which is

insoluble in water, and forms insoluble salts with all metals, except the alkali metals; but by decomposing tungstates by the stronger acids at ordinary temperatures a soluble variety of the acid, called metatungstic acid, is produced, which forms soluble salts with nearly all metals.

Uranium.—The atomic weight of uranium has not yet been ascertained, and its position among the elements is therefore uncertain, especially as it does not exhibit marked analogy to any other element. The generally received atomic weight is 120, but Mendeljeff has proposed to double this ; L. Meyer, however, considers that from the high specific gravity of the metal it is more probable that its atomic weight is 180, and that it occupies a position in the series near to tungsten, A redetermination of the equivalent of this element and an investigation of its compounds are much required.

Uranium is like iron in colour; it tarnishes when exposed to the air, and in the pulverulent state takes fire at a comparatively low temperature, and burns with great

brilliancy, forming a green oxide, U,0,; it is dissolved by hydrochloric acid, forming a green solution, which has powerful reducing properties. The highest oxide has the composition UO,. Uranium forms a volatile stable tetrachloride, UCl,, which crystallizes in dark-green octahedra, and an unstable chloride regarded as the pentachloride, UCI,; both are dissolved and decomposed by water,

When uranium, or either of its oxides, is dissolved in nitric acid, a solution of uranic nitrate is formed from which the salt may be crystallized in beautiful yellow prisms of the composition (UO,)(NO,),, 6H,O; on the addition of potassium hydroxide to a solution of uranic nitrate a yellow insoluble precipitate of potassium uranate of the composition K,U,O, is produced. An oxychloride, UO,Cl,, corresponding to the nitrate, is obtained on pass- ing chlorine over an ignited mixture of charcoal with an oxide of uranium. In all these formule, U = 240.

LANTHANUM—CERIUM—DiIDYMIUM—YTTRIUM— ERBIUM—-THORIUM.

Name. Symbol. At. wt. Sp. gr At. vol Lanthanum La 139 6‘1 226 Cerium Ce 141 67 21:0 Didymium Di 147 6°5 22°6 Yttrium iv (2) 89°5 is ie Erbium Er (2) 170°5 os se | Thorium Th (2) 178°5 7. 231 |

Excepting thorium, these elements are closely related in properties; their compounds are of extremely rare occur- rence. Lanthanum, cerium, and didymium are always associated together, and on account of their occurrence in the mineral cerite are usually termed cerite metals ; they appear to occupy a position intermediate between the alkaline earth metals and the metals of the aluminium group. The atomic weights of yttrium and erbium, the so-called gadolinite metals, have not been determined ; their compounds much resemble those of the cerite metals. The atomic weight of thorium is also unknown ; from the properties of its compounds, however, it is not improbable that itis a member of the aluminium group.

Lanthanum, cerium, and didymium have been obtained by the electrolysis of their chlorides. Cerium is an extremely ductile metal, resembling iron in colour and lustre ; it melts more readily than silver, but much less readily than anti- mony. It retains its lustre fora considerable period in dry air, but takes fire much more readily than magnesium, and burns with great brilliancy. It slowly decomposes cold water, and rapidly dissolves in hydrochloric acid.

Lanthanum and didymium closely resemble cerium in their general chemical behaviour. Lanthanum is a slightly harder, less ductile metal than cerium, and appears to melt nearly at the same temperature. It readily oxidizes super- ficially even in dry air, although it takes fire at a much higher temperature than cerium. Didymium more closely resembles lanthanum than cerium, but has a distinct yellowish colour.

Only one oxide of lanthanum is known, namely, La,O, ; it is white, and unalterable by heat, and combines directly with water, forming the hydroxide La,(OH),, which is a soft, white powder resembling calcium hydroxide. The lanthanum salts of colourless acids are all colourless.

Cerium forms the two oxides Ce,0, and Ce,O,. Cerous oxide, Ce,O,, has a(?) greyish-blue colour, and on exposure to the air is converted into yellow ceric oxide, Ce,O,. Cerous hydroxide, Ce,(OH),, precipitated from the solution of a cerous salt by an alkali, is white ; on exposure to the air it is converted into a mixture of cerous carbonate and ceric hydroxide ; the latter is also obtained on passing chlorine into water in which cerous hydroxide is suspended. Ceric hydroxide dissolves in hydrochloric acid with evolution of chlorine, forming a solution of cerous chloride, Ce,Cl,, but it forms with sulphuric acid a brown-red solution of ceric sulphate, which is a powerful oxidizing agent. Cerous salts in solution are colourless, but a few possess a pale rose colour in the solid state.

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PERIODIC RELATIONS. |

Two oxides of didyminm corresponding to the two oxides of cerium are known. The lower oxide, Di,O,, is white, and in contact with water is slowly converted into the hydroxide, Di,(OH), ; didymium hydroxide resembles aluminium hydroxide in appearance, but has a pale rose colour, and the salts formed by dissolving it in acids have either a pure rose or violet colour. By gently heating the oxide Di,O, in air it is converted into the higher oxide Di,O,, which has a dark brown colour ; it dissolves in hydrochloric acid with evolution of chlorine, and in oxy- acids with evolution of oxygen, forming the same salts as are produced on dissolving the lower oxide.

Yttrium and erbium each form only one oxide, and like lanthanum, cerium, and didymium only one corresponding chloride. Yttrium oxide, Y,O,, is white, and erbium oxide, Er,O,, has a pale rose colour ; the former is readily soluble in acids, even after ignition, but the latterdissolves with great difficulty. The yttrium salts are colourless ; but the salts of erbium have a beautiful rose colour, and their solutions give an absorption spectrum, which is not the case with yttrium salts. When erbium oxide is strongly heated it glows with an intense green light, which in the spectroscope exhibits a continuous spectrum intersected by a number of bright bands corresponding in position to the dark bands in the absorption spectrum of solutions of erbium salts. Didymium oxide behaves similarly, and solutions

of didymium salts give an absorption spectrum by which they are readily distinguished from erbium salts.

The chlorides, nitrates, and sulphates of the cerite and gadolinite metals are readily soluble in water, but their carbonates are insoluble ; the solutions of their salts all possess a sweet astringent taste. The most conclusive evidence that lanthanum, cerium, didymium, and yttrium are closely allied to the alkaline earth metals is afforded by thermochemical investigation, the amounts of heat developed on neutralizing their hydroxides being for hydrochloric acid, according to Thomsen's experiments, inferior only to that developed on neutralizing the hydr- oxides of the alkali and alkaline earth metals, as shown by the following examples :—

Units of heat developed

Name of Hydroxide. Salnnonie | Hee bin Be ¢| Difference. acid. acid.

Hydroxides of alkali and alka-

ne earth metals …….0000 61,800 27,600 8,700 Lanthanum hydroxide…….) 27,470 | 25,020 2,450 Cerium et 26,030 } 24,160 1,870 Didymium RE er 25,720 23,980 1,740 Yttrium say) eed 25,070 23,570 1,500 Manganous bie. eee 26,480 22,950 8,530 Ferrous Geet east 24,920 21,390 8,530 Cadmium i meat asrarct-foe 23,820 20,290 3,530 Glucinum ae 16,100 13,640 2,460

Metallic thorium has been obtained as a dark-grey powder of the specific gravity 7°65 to 7°79, easily soluble in nitric acid, but difficultly soluble in hydrochloric acid. Its oxide, Th,O, (if Th=178°5), is white, and after igni- tion is insoluble in all acids except concentrated sulphuric acid ; it appears to be destitute of acid properties as it does not expel carbon dioxide when fused with alkaline car- bonates. Thorium hydroxide is precipitated from solutions of thorium salts by alkalies as a gelatinous mass, soluble in most acids, but insoluble in alkalies. Thorium chloride, Th,Cl,, is a white crystalline substance, which dissolves in water with rise of temperature. 'Thorium sulphate, Th, (SO,),, is crystalline, and, like the sulphates of the cerite and gadolinite metals, is more soluble in cold than in hot water.

PerioDic RELATIONS OF THE ELEMENTS.

The foregoing description of the elements and of some of their more important compounds will be sufficient to show that, while each element manifests certain characters which distinguish it from all others, many of the elements are more or less closely related in properties, as indeed we have already frequently had occasion to point out.

Elements which exhibit similar properties often differ in atomic weight to the same or nearly the same extent ; for example, the difference between the atomic weights of potassium and rubidium is about 46, and of rubidium and cesium 47°5, since K=39, Rb=85:2, and Cs=132°7. As these three elements are closely related in properties, rubidium differing from potassium to about the same extent that cesium differs from rubidium, we are led to suspect a connection between the atomic weight of an element and its properties, especially as with very few exceptions the elements all possess different atomic weights. Many instances of relation between atomic weight and properties, similar in character to that which obtains in the case of potassium, rubidium, and cesium, have been commented on from time to time by various chemists, but the connec- tion between the atomic weights of the elements generally and their properties was not recognized until Mendeljeff in 1869 pointed out that the latter are periodic functions of the former. In other words, if the elements are grouped in the order of their atomic weights, it will be found that nearly the same properties recur periodically throughout the entire series. Hence the whole of the elements may be arranged in a number of groups, each group consisting of members of the same natural family following each other in the same order. The elements are arranged in this manner in the following table, although, in order to retain elements which are undoubtedly members of the same natural family in the same vertical series, a few departures from the order of atomic weights are necessary, but probably they are necessary merely because the atomic weights are incorrectly determined; thus, tellurium is placed before iodine, and osmium, iridium, and platinum before gold. Jf the

position assigned to uranium be correct, the number at present accepted as its atomic weight is much too low.

2 | { K Mn | Fe | Co} Ni 3. 55 | 56 | 58:6] 586 Br Pm sik 4 { 79°8 4 Sr Gs, h cant eae sue Zr | Nb] Mo; ... | Ru |] Rh | Pd 5 2,2 805 90 | 94 | 95°8 103°5|104 |106 Mitre aba Skeet hace In Sn | Sb | Te I Fay yon Weer & 113°4| 117°8122 |128-1| 1265 ike Ea eee Be sce: Vales A aed West tt aerate tn 38! 139 [141 [147 i ; Rete thes Peers tak ¥ :) Ta | W U | Os) Ir | Pt 8.4 21705 21785 182 |184 |2180 |1986/196-7/196-7 { i Tl Bel) tain a Bs ae Wade. Neen sitliwee .9. [2036 206 2075

The position of hydrogen at the head of a series of metals is in accordance with Graham's conclusion that this element possesses the characters of a metal, a conclusion which many chemists are inclined to accept on account of the striking analogies to the metals which it exhibits in its relation to the halogens, oxygen, &c. As the properties of alloys are usually similar to those of their constituent metals, whereas the compounds of metals with non-metallic elements are in most cases widely different from those of the elements which enter into their composition, the fact that Troost and MHautefeuille's sodium and potassium hydrides (?sodium-hydrogen and potassium-hydrogen alloys) (p.'524) retain the metallic character of sodium and potassium

044

affords evidence confirmatory of the assumption that hy- drogen has metallic properties. '

We leave it to the reader to trace out the alteration in properties which accompanies alteration in atomic weight; but we may point out as an instance that the power to combine with other elements is subject to periodic varia- tion; thus, the composition of the highest chlorides and oxides of the elements in the first and second horizontal series in the above table is as follows :—

Chlorides.

Lil GCl BC, CC, (NCL Oc, 3 NaCl MgCl, AlCl, SiCl, PCL scl, Ol, Oxides.

Li,0 GO bo: 0, Ke, 4, 2 Na,O, MgO Al,Og SiO, POs SO, C1,03

The chlorides and oxides of the elements of each of the following horizontal series exhibit similar differences in composition, With very few exceptions, only the ele- ments which are included in the same vertical series as carbon, nitrogen, oxygen, and fluorine form compounds with hydrogen, the stability of which diminishes with increase of atomic weight; but the composition of these hydrides is subject to periodic variation, as is shown by the following list :—

CH, NH, OH, FH SiH, PH, SH, ClH i? AsH, SeH, BrH SbH, TeH, 1H

The periodic character of the relation between the proper- ties of the elements and their atomic weights is especially evident in their physical properties, which are more readily compared than the so-called chemical properties, as they admit of measurement, although, on account of our im per- fect knowledge, comparison is at present possible only to a very limited extent. One of the few physical properties which has been determined for most of the elements is the specific gravity in the solid state ; now, on comparing the specific gravities of the various elements we find that they do not increase progressively with increase of atomic weight, but that they increase and diminish periodically, Hence, as Lothar Meyer has shown, on taking the atomic volumes, or quotients of the atomic weights of the elements divided by their specific gravities in the solid state, as abscisse, and the atomic weights as ordinates, a curve is obtained which exhibits a series of maxima and minima, viz., five maxima and five minima in the portion which includes barium and the elements of lower atomic weight. The most electro-positive elements, lithium, sodium, potas- sium, rubidium, and cesium form the five maxima ; but with increase of atomic weight the height to which the curve rises also rapidly increases, namely, in the proportion

Li: Na:K:Rb:Cs = 12:24:46:57:79,

The remaining physical properties of the elements, so far as they are known to us, appear to be subject to similar periodic variation, but for a full discussion of the connec- tion between the atomic weights of the elements

and their properties the reader is referred to L, Meyer's work, Die modernen Theorien der Chemie (Breslau).

The establishment of the periodic law may truly be said to mark an era in chemical science, and we may anticipate that its application and extension will be fraught with the most important consequences. It reminds us how im- portant above all things is the correct determination of the fundamental constants of our science—the atomic weights of the elements, about which in many cases great uncertainty prevails; it is much to be desired that this may not long remain the case. It also affords the strongest encouragement to the chemist to persevere in the search for new elements. (H. E. A.)

VHEMIST EY

[ORGANIC.

ORGANIC CHEMISTRY.

As has been already explained (p. 520) it was at one time thought that certain chemical compounds were pro- ducible only through the agency of living things, and the name "organic chemistry" was in consequence conferred upon this branch of the science. The progress of discovery has, however, served to break down the barrier that was supposed to exist between those and purely inorganic com- pounds, since it has been found possible to build up artifi- cially a very large number of compounds formerly regarded as essentially organic. Nor must it be forgotten that many living things elaborate compounds which can in no sense be regarded as organic—such as the silica of grasses, the carbonate of calcium secreted by molluscs, &c., and the tri- calcic phosphate forming the bones of the higher animals.

Although the number of elements entering into the composition of organic compounds is comparatively small, yet these compounds far exceed inorganic bodies both in number and complexity of composition. It is indeed the vast and ever-increasing numbers of the organic compounds that render it necessary to form a separate branch of the science for their study, and not any real chemical difference between the matter forming these and mineral compounds,

Definition and Character of Organic Compounds,—~ Carbon is an invariable constituent of organic bodies, so that this branch of the science is sometimes defined as “the chemistry of the carbon compounds.” ‘The best chemical definition of organic compounds, however, is that proposed by Frankland, viz., “compounds the molecules of which consist of one or more atoms of carbon directly combined either with carbon, nitrogen, or hydrogen.”

After carbon, the elements of most frequent occurrence in organic compounds are hydrogen, oxygen, and nitrogen. Sulphur, phosphorus, the halogens, silicon, boron, and the metals are of comparatively rare occurrence. The number of atoms entering into the composition of organic molecules is often very great—far exceeding the atoms of the most complex molecule of a mineral substance. Thus, stearin contains 173 atoms, and albumin no less than 226. Chemical bodies that are possessed of great complexity of composition are generally distinguished by the facility with which they split up under the influence of the physical forces and chemical reagents ; thus organic compounds are as a class characterized by their instability,

Ultimate Analysis of Organic Compounds.

Before the formula of an organic compound can be determined, it is necessary to ascertain the amounts of its several constituents—that is to say, to make a quantitative analysis of it. The elements carbon and hydrogen being of paramount importance are generally first determined. The method employed depends upon the fact that all organic compounds undergo combustion when heated with easily reducible oxidizing substances, their carbon being oxidized to carbon dioxide and their hydrogen to water. These two products of combustion being collected in suit- able apparatus and weighed, the necessary data for calcu- lating the amounts of carbon and hydrogen are obtained. The following is a brief description of the process.

Determination of Carbon and Hydrogen.—A tube of Bohemian hard glass of about 10 or 14 millimeties internal

Fre.].—Combustion Tube.

o-a, pure cupric oxide; a-b, mixture of substance and CuO; b-c,rinsings from mixing wire; c-d, pure CuO; d-e, metallic copper; e-/, plug of asbestos.

diameter, after being scrupulously cleaned and dried, is

drawn off in the blowpipe flame so as to leave a tailed extremity of the form shown in figure 1. The open end of the tube is then held in the flame of the blowpipe till the sharp edge of the glass is rounded off. This tube, known as the combustion tube, is from 500 to 800 millimetres in length, according as the substance contains little or much carbon.

The substance generally employed to effect the combustion of carbon compounds is cupric oxide (CuO), and as this oxide is of a somewhat hygroscopic nature, it is necessary to dry it thoroughly before use, and then exclude it carefully from the air. Should these precautions not be observed, the oxide absorbs water from the air, and when heated in the combustion tube this water distils over and is weighed with that produced by the combustion of the substance. It is therefore found convenient in practice to have another glass tube sealed at one end and closely corked at the other for the reception of the cupric oxide. This tube is of sufficient capacity to contain enough cupric oxide to fill the combustion tube, and its diameter is such as to allow it to be introduced into the open end of the combus- tion tube.

The substance for analysis, after being fincly powdered, is dried in a water oven at 100° C. till it ceases to lose weight, or, if decomposed by heat, in a vacuum over some water- absorbing substance, such as strong sulphuric acid or calcium chloride. When dry it is transferred to a small stoppered bottle or corked tube, sealed at one end, and of about 40 or 50 millimetres in length.

The apparatus for absorbing the carbon dioxide is a series of light glass bulbs (figs. 2 and 3) containing a solution of caustic potash (KHO) of sp. gr. 1-27, through which the gases evolved during the combustion are obliged to pass. It is customary to attach to one end of the potash bulbs a small glass

tube drawn to a point at its free end, and containing a small piece of solid potash enclosed between plugs of cotton wool. This appendage is for the purpose of retaining any trace of carbon dioxide or mois- ture carried over from the bulbs by the escaping gases,

Fig. 2.—Liebig’s Potash Bulbs. Fic. 3.—Geissler’s Potash Bulbs.

The water formed by the combustion is collected in a tube (fig. 4) filled with fragments of dried calcium chloride or pumice stone wetted with strong sulphuric acid.

The combustion tube when charged is heated in a furnace which consists essentially of a row of gas burners con- structed so as to burn a mixture of coal gas and air, and thus obtain a non- luminous but very hot flame. Two forms of furnace are in common use in Fic. 4.—Calcium laboratories. In Hofmann’s furnace a Chloride Tube. clay cylinder perforated by a large number of very fine holes is fitted over the end of each gas burner, thus dividing the escaping gas into a number of fine streams, and so ensuring its perfect combustion. In Griffin’s furnace the burners are coustructed on Bunsen’s principle, that is, each burner 1s perforated by holes at its lower end so that a mixture of gas and air escapes from its upper extremity. The com- bustion tube is supported on a thin iron trough lined with asbestos, the whole being enclosed by unglazed tiles.

The cupric oxide intended for use is first heated to red- ness in a crucible, and transferred while still hot to its tube, wherein it is allowed to cool. When sufficiently cool the cork is withdrawn, and enough cupric oxide poured into the combustion tube to occupy about 3th of its length. The tube or bottle containing the dried pulverized sub- stance having been weighed, about half a gramme is then introduced into the combustion tube, and a small quantity of cupric oxide is poured down after it. The bottle being again weighed gives the exact weight of the substance employed. The substance in the combustion tube is thoroughly mixed with cupric oxide by stirring it about with a long wire with corkscrew point.

More cupric oxide is now added till the tube is filled nearly to its open end, and a plug of freshly ignited asbestos is finally introduced. The tube is then gently tapped while in a horizontal position so as to cause a slight subsidence of the contents, thus allowing a free passage for gas throughout its whole length. The calcium chloride tube is fitted into the open end of the combustion tube by means of a tightly fitting cork or caoutchouc stopper, and the potash apparatus is attached to the calcium chloride tube by means of a short piece of caoutchouc tubing bound tightly round with thin copper wire. Both the potash bulbs and calcium chloride tube are carefully weighed before being attached. The whole apparatus as arranged for the combustion is shown in fig. 5 :—

Fia, 5.—Apparatus arranged for a Combustion.

‘The front part of the tube is first heated to redness, and the gas burners are then gradually turned on so as to cause the slow combustion of the substance. When no more bubbles pass into the potash solution the gas burners are turned out, the point of the tail of the combustion tube is broken off, and dry air passed through the whole system to sweep out the last traces of carbon dioxide and water vapour lingering in the tube. In cases where great accuracy is required it is desirable to sweep out the com- bustion tube first with a current of pure oxygen and then with air. This ensures the complete oxidation of any trace of carbon that may have escaped the first combustion.

When the operation is completed the potash bulbs and calcium chloride tube are allowed to coo] down to the atmospheric temperature and then again weighed. The increase in weight gives the respective amounts of carbon dioxide and water produced. Since carbon dioxide contains in 11 parts by weight 3 of carbon (CO,=12+2 × 16 =44), 7 of the weight of the CO, obtained is due to carbon. Similarly } of the weight of the water found is due to hydrogen (H,O=2×1+16=18). It is customary to ex- press the results in parts per cent. In practice the hydro- gen usually comes out a little too high, and the carbon a little too low.

Cupric oxide is sometimes replaced by lead chromate in cases where the substance is difficultly combustible, and more particularly when the compound contains chlorine, bromine, or sulphur. In these latter cases were

cupric oxide employed, cupric chloride or bromide would be formed, and might volatilize over into the calcium chloride tube, thus unduly increasing its weight. Sulphur in

presence of cupric oxide is oxidized to SO,, and this gas if allowed to pass into the potash bulbs would be absorbed. These sources of error are avoided by the employment of lead chromate, because non-volatile lead chloride or bro- mide are formed, and sulphur is oxidized to SO,, which is fixed as PbSO, When substances rich in nitrogen are burnt with cupric oxide, nitrogen dioxide is likely to be formed, and this on meeting the air and potash in the bulbs is absorbed, and increases the weight of the CO, apparatus. To obviate this source of error it is necessary when dealing with nitrogenous bodies to plug the end of the combustion tube with a roll of freshly reduced copper gauze. This being kept at a bright red heat during the entire operation decomposes the oxides of nitrogen, and retaining the oxygen, allows only nitrogen to escape.!

When the substance to be analyzed is a liquid, a known weight is sealed up in a small glass bulb (fig. 6).

After sealing and weighing (the weight of the empty bulb having been previously determined) the neck of the bulb is broken off, and F!¢- A ae the the broken portion, together with (adinad) fiseh, ere the bulb itself, introduced into the combustion tube, which is afterwards filled up with cupric oxide, &c., in the usual manner. In burning liquids the anterior portion of the combustion tube is, as with solids, first heated to redness; the portion containing the bulb is then gradually warmed so as to expel the liquid, which is thus made to distil slowly over the red-hot cupric oxide which effects its combustion. ;

The analysis of gaseous organic compounds is effected in eudtometers, or in special apparatus, of which several forms have been devised. (See Bunsen’s Gasometry, Sutton’s Volumetric Analysis, Thorpe’s Quantitative Analysis, &c.)

Determination of Nitrogen—Two methods are in use for determining this element. Will and Varrentrapp’s method depends upon the fact that many nitrogenous bodies when heated with caustic alkalies yield their nitro- gen in the form of ammonia. A known weight of the substance is intimately mixed with soda-lime,? and then heated in a combustion tube, the ammonia being absorbed by dilute hydrochloric acid contained in a glass apparatus attached to the end of the tube. (See fig. 7.)

In conducting an operation of this kind some soda-lime is first introduced into the tube; the substance is then mixed intimately with more soda- lime in a mortar, and the mixture transferred to the tube; the mortar is next rinsed out with more soda-lime, and the rinsings are added to the contents of the tube, which is finally filled up with pure soda-lime. When charged the tube is tapped so as to secure a free passage for the escaping gas

? Although the principles upon which the determination of carbon and hydrogen in organic bodies depends remain unaltered, the process has received several modifications which it is unnecessary to describe in detail. Thus in some laboratories, instead of the potash bulbs, a tube filled with “soda-lime” is employed, and the substance, instead of being mixed with the CuO in the tube, is placed in a small boat of porcelain or platinum, and a slow stream of oxygen kept going during the whole process. Other oxidizers have been also proposed instead of cupric oxide, such as potassium perchlorate or a mixture of sulphuric acid and silver iodate, in which latter process the carbon is determined directly from the amount of CO, produced, and the hydrogen indirectly net a amount of oxygen consumed minus the quantity contained in

e CO,.

- Soda-lime is prepared by slaking quicklime with a strong solution of caustic soda,and then heating till thoroughly dry.

Fig. 7.—Determination of Nitrogen by Will and Varrentrapp’s method. AB, combustion tube; a b, soda-lime; dc, mixture;

cd, rinsings; de, soda-lime; e f, asbestos plug; C, acid bulbs.

(as in the combustion for the determination of C and H), and after it is laid in the trough of the gas furnace, the acid bulb is attached to it by means of a tightly fitting cork. The combustion is performed in precisely the same manner as in the process of burning with cupric oxide ; when it is completed the tail of the tube is broken off, and air drawn through the apparatus so as to draw the last traces of ammonia into the acid. If the substance contains much nitrogen it is advisable to mix it with some com- pound which gives off a large quantity of gas when heated in the tube. Sugar or starch are convenient substances for this purpose. This dilution of the ammonia prevents its too rapid absorption by the acid, and thus diminishes the risk of acid being drawn back into the hot tube. Having by the above process obtained the nitrogen in the form of ammonium chloride, its quantity is deter- mined by precipitation as ammonio-platinic chloride, (NH,),PtCl,, the analysis being performed in the same manner as in the quantitative determination of ammonium by means of platinic chloride. In calculating the results the requisite data are furnished by the facts that 223-2 parts of the double salt contain 14 of nitrogen, or 197°5 parts of platinum correspond to 28 of nitrogen. ‘Thus, if w = weight of substance taken, W the weight of double salt obtained, P the weight of platinum, and N the weight

: Wxil4- Px28 100N of nitrogen, we have N= 5555 or To75 > also ~~ fer

the percentage of nitrogen.

Iustead of determining the ammonia gravimetrically it may be absorbed by a known quantity of dilute sulphuric acid of standard strength, and the amount of acid neutra- lized determined by adding litmus, and then a standard solution of soda till complete neutralization is effected as in ordinary acidimetrical determinations.

In cases where nitrogen-containing bodies do not yield the whole of that element as ammonia on ignition with soda-lime, Dumas’s process is employed. This process depends upon the fact that all nitrogenous

substances yield their nitrogen in the free state when burnt with cupric oxide, and in presence of ignited metallic copper. The method is thus carried out.

A combustion tube of suitable length is sealed off at one end, and about 2 or 3 inches of hydrogen sodium carbonate (NaHCO,) introduced, after which a small quantity of cupric oxide is added. A known quantity of the sub- stance, intimately mixed with cupric oxide, is next intro- duced, and then a further quantity of pure cupric oxide, the remainder of the tube being finally filled up with 3 or 4 inches of freshly reduced copper gauze plugging. No special precautions need be taken to keep the cupric oxide dry. A gas passage having been secured through the tube in the usual manner, a delivery tube is tightly adapted to the open end of the combustion tube.

The tube is placed in a gas furnace, and the end of the delivery tube plunged beneath the surface of mercury con- tained in a mercurial trough. The first proceeding is to expel the air from the apparatus. This is effected by heating a portion of the hydrogen sodium carbonate in the pos- terior part of the combustion tube till a bubble of the gas received into caustic potash solution is wholly absorbed. When the apparatus is entirely filled with carbon dioxide, a graduated receiver containing about + of its volume of caustic potash solution, the remainder being filled with mercury, is inverted over the end of the delivery tube as in ordinary cases of gas-receiving over the mercurial trough. The combustion is then proceeded with in the usual manner,—the anterior portion of the tube containing the metallic copper being first heated to redness, and the heat gradually carried back till the combustion is completed, when more of the NaHCO, in the posterior part is heated

so as to expel the last traces of nitrogen. The CO, pro- duced by the combustion and from the NaHCO, being absorbed by the potash solution, the graduated receiver contains only the whole volume of pure nitrogen. The receiver and its contents are accordingly transferred to a vessel of water —the mercury and potash solution allowed to be replaced by water, the

receiver is raised till the pressure is equalized by the water being at the same level both inside and outside, and the volume of gas is read off, the temperature of the air of the room and the height of the barometer being at the same time noted.

If N = weight of nitrogen in grammes, ¢° the tempera- ture of the air, 6 the height of the barometer, ¢ the tension of aqueous vapour at the temperature ¢°, and V the volume of nitrogen in cubic centimetres—

0:0012562

N=V” @y0-003677)760 (0:0012562 being wt. of 1 ec. of N at 0° C. and 760 mm. bar.).

Determination of the Halogen Elements, Sulphur, and Phosphorus.—The halogens are sometimes determined as silver salts, by burning a known weight of the substance with pure quicklime in a combustion tube, dissolving in dilute nitric acid, and adding silver nitrate. Sulphur and phosphorus may be determined by fusing a known quantity of the substance with a mixture of potassium hydroxide and nitrate in a silver dish. The sulphur is by this means oxidized to sulphuric and the phosphorus to phosphoric acid, and, on dissolving the fused mass and acidulating, these acids can be estimated.

By the method of Carius the halogens, sulphur, and phosphorus can be determined, if necessary, in one opera- tion. A known weight of the substance is sealed up in a strong glass tube with about 20 times its weight of nitric acid (sp. gr. 1°4), and the tube then heated for some hours inan oil-bath to a temperature of 140°— 300°C. The sub- stance is completely oxidized by this operation, the sulphur and phosphorus being converted into their respective acids, so that their determination then beconies an operation of inorganic analysis. If halogens are present, it is custo- mary to add a few crystals of silver nitrate before sealing up the tube. After the operation the haloid silver salt is filtered off, the excess of silver is removed from the fil- trate by HCl, and H,SO, or H,PO, is determined in the ordinary way.

Determination of Oxygen.—Although several processes have been devised for the direct estimation of oxygen (by Baumhauer, Maumené, and

Mitscherlich), they are seldom employed in laboratories. This element is usually deter- mined by "‘ difference," z.¢., by adding the percentages of the other elements, and subtracting the result from 100.

b-e

Formule and Constitution of Organic Compounds.

Empirical Formule,—Having by the above methods of analysis arrived at the percentage composition of a sub- stance, the next step is to determine its formula. The empirical formula is obtained by dividing each percentage number by the atomic weight of its respective element. Thus, supposing an analysis of common alcohol gave the following percentage numbers :—

ClasiibyaV alan SRR Oe Gop mocndéicagonn SonubococAcadts Go, badasboc 52°15 Hydrogen ….ccseseeessseseaeeseeeneaeeeeeeeenee eee cneins 18 06 Oxygen (by difference)..... cssesereererreereees 34°79 100°00 Dividing these by the respective atomic weights— 2A Ap __13°06 =12: _ 34°79 _ C= G =43, H=—{— 1370, 0 a =2°2,

These numbers show that the atoms of C, H, and O are

present in numbers having the ratios 2: 6:1, since by the atomic theory the atoms of each element must exist in a compound in integral numbers. The differences between the integral and fractional numbers are justly assignable to the unavoidable "experimental errors" of analysis. Thus the simplest formula that can be given to alcohol from the foregoing analysis is C,H,O, and it is usual to express the results in the following manner :—

Theory C.H,0. Found. GC. = 2t= 5217 Gy ccesanacenevenneesss 52°15 H,= 6=13°04 Do legerrinteccdnaneent ac 13°06 O =16=384‘79 O (by difference) 34°79 46 100°00 100-00

This imaginary example may serve to show that the determination of empirical formule cannot be made accord- ing to any fixed set of rules. The errors of experiment are seldom so small as in the supposed illustration, and in cases where these are large, and where the substance contains a large number of atoms in its molecule, great difficulty is often experienced.

Molecular Formule.—The formule obtained by the method just described express simply the ratios existing between the numbers of atoms in the molecule of a sub- stance, without regard to the actual number of atoms in such a molecule. Reasoning downwards from the law of Avogadro, which has been explained in the foregoing por- tions of this article, it will be seen that the volume of such molecules as do not undergo dissociation when heated is always equal to the volume of the molecule (2 parts by weight) of hydrogen. To ascertain molecular formula, therefore, all that is necessary is to determine the vapour- density of the substance as referred to hydrogen. Thus the analysis of benzene, a hydrocarbon obtained from coal tar, leads to the formula CH, but there is no evidence to show whether its molecular formula is CH, C,H,, C3H,, C,H, C,H,;, or C,H, By experiment its vapour density is found to be 39, so that its molecular weight is 78. Dividing this number in the ratio C: H, 2.¢, 12:1, we obtain 72:6 as the actual ratio of the weights of C and H existing in the molecule. Seventy- two parts of C correspond to 72 =6 atoms, and 6 parts by weight of hydrogen correspond to $ =6 atoms, so that the molecular formula of benzene is C.H,.

Again, with respect to alcohol. The vapour-density (H=1) is 23, so that its molecular weight is 46. This number, however, agrees with the molecular weight of a substance having the formula C,H,O, since 12× 2+6 +16=46; hence this formula must be assigned to alcohol, and we have an illustration of a case in which the empiri- cal and molecular formule are identical.

Determination of Vapour-density.

In practice, the vapour-density is determined by the methods of Dumas or Hofmann.

Dumas’s Method.—In Dumas’s process the weight of a known volume of vapour is ascertained in the following manner (see fig. 8).

A globular glass flask, as light as possible, with a neck fused into it, is first provided. The capacity of the globe may vary from 35 to 4 litre, according to the amount of substance to be operated upon. The neck is drawn out in the blowpipe flame to a capillary termi- nation of about one millimetre diameter, and then bent up so as to project above the surface of the liquid of the bath in which the globe is to be immersed. The globe is first weighed full of air—the temperature and height of the barometer being noted.

By warming the globe, and plunging the point of the neck into

| some of the liquid of which the vapour-density is to be determined,

a few grammes of the latter are introduced. The globe and its con- tents are then plunged into a bath of water, paraffin, or fusible metal kept at a constant temperature, at least 20° or 30° C. above the boiling-point of the substance. As soon asthe vapour ceases to rush out of the capillary orifice of the neck, the point is sealed hermetically by the blowpipe flame, the height of the barometcr and the temperature of the bath being observed.

The globe, after being cleaned and allowed to cool, is again weighed, the tempera- ture and height of the barometer being at the same time observed. The capacity of the globe is measured by breaking the point of the neek under mereury, when the metal rushes in to supply the place of the condensed vapour. As the expulsion of air by the escaping vapour is seldom complete, there usually remains a bubble of residual air, which must be allowed for by running in a known quantity of mer- cury from a_burette. The total quantity of mereury is then poured out and its volume mea- A, glass globe, supported by wire claw; }, project- sured. The calculation shane a i ke oe Ve RR aROT is made from these data ~~’? ” . by the following approximative method :—

our-density Apparatus.

Let m = weight of globe + air at the temperature ¢ of weighing and height of barometer 0; m’= weight of globe + vapour at the temperature ¢’ of scal- ing and height of barometer 0’ ; V = capacity of globe in cubie centimetres ;

A = weight of V cubic centimetres of air at ¢ and 0d. Then m — A = weight of vacuous globe ; m’ —(mv— A)=weight of substance. Let H = wt. of Vc.e. of hydrogen at ¢’ and 0’, then the vapour- density (d) referred to hydrogen is

d= mi’ —(1n—A)

When residual air ® is found in the globe, V—r=capacity of globe.

In very exact determinations cor- rections must be made for (1) the expansion of glass, (2) the difference of temperature and pressure between the first and second weighings of the globe, and (8) the difference in density between the drop of fluid remain- ing in the globe and the density of mercury. For most chemical pur- poses, however, the above-given approximation formula is patheheuids accurate,

For high temperatures the globe is immersed in the vapours of boiling mercury, cadmium, or zine, and the apparatus is modified accordingly.

Gay-Lussacand Hofmann’s Methods. —These methods have for their object the measurement of the volume of a known weight of vapour. Gay-Lussac’s method, being available only for substances boiling below 100° C., has been gradually replaced by Hof- mann’s modification (fig. 9),

A glass tube about 1 metre in length and 20 mm. diameter, closed at one end, is graduated and calibrated. The tube being filled with mercury, and inverted in a vessel of the same liquid, is practically a barometer with an exaggerated Torricellian vacuum. Sur- rounding this tube is a wider tube, through which the vapour of any liquid boiling at a constant tempera- ture can be passed, and thus the baro- meter tube and its contents kept at that temperature,

The substance of which the vapour- density is to be determined is weighed poiling liquid, and ¢’ with a (about #5 gram.) in a minute stoppered condenser, bottle, and passed up into the Torricellian vacuum. According to the boiling-point of the substance (which is, of course, much lowered by the reduced pressure), the vapour of aleohol, water, aniline, or ainylic aleohol is passed through the space between the

Fia. 9, Hofmann’s Vapour- density Apparatus,

AA, graduated barometer tube standing in funnel; 2, height of

mercury column; BB, outer glass cylinder enclosing baro- meter tube; ¢%, tube by which hot vapour is introduced; ?¢’, tube by which hot vapour and overflow of mercury escape; ¢ is connected with the flask of

two tubes till the temperature and volume of vapour remain cen-

stant. The height of the mercury column, the temperature to which the vapour is heated, and the height of the barometer in the room being observed, all the necessary data are obtained.

Let m = weight of substance in grammes ; V = volume (in c.c.) oceupied by vapour at temperature ¢ ; h = height of mercury in tube above mercury in reservoir ; b = height of barometer in room.

Then 6 — h = pressure upon vapour.

Let H = weight of Ve.ec. of hydrogen at a pressure D—A and

temperature 1. ; Then the vapour-density (d) referred to hydrogen is

a=”. H For exact determinations at high temperatures the tension of mer-

cury vapour (¢) at the temperature (¢) must be allowed for, and the pressure upon the vapour then becomes 6—h—e.

In some cases the substance of which the molecular formula is to be determined does not admit of vaporization, being decomposed by heat. With such substances, some method other than the determination of the vapour-density must consequently be resorted to. In the case of acid or basic compounds, the problem admits of easy solution. Thus, supposing we desired to determine the molecular weight of acetic acid without having

recourse to a vapour- density determination. Having ascertained that the acid contains one atom of hydrogen replaceable by metals, or, in other words, that it is monobasic, the silver salt is pre- pared, and the amount of silver determined. All the necessary data are then obtained. Thus, supposing the analysis to give 64°67 per cent. of metal, the molecular weight of the salt, 7.e., the weight containing cne atom of silver, will be.given by the proportion—

64:67 :100::108: 2.

a= 167,

The weight of the “acid-radicle” is therefore

167-108=59.

And as one atom of H is replaced by the Ag, the molecular weight of the acid is 60.

The empirical formula deduced from the ultimate analysis would be CH,O=30, so that the molecular formula is 2(CH,O) = C,H,O,.

With polybasic acids the problem is somewhat more complex, but the solution is effected in a similar manner, ae, by estimating the metal in a normal salt. Silver salts are employed when obtainable, as they are generally anhydrous and easily purified by crystallization.

As a further illustration we now give an example of the determin- ation of the molecular weight of a basic substance. Supposing an analysis of the base triethylamine to have given the following results :—

Whence

(ORS dos” Seqage Oman poe: Dent te nearer coceeer ener 71°29 JUS 10/2100 cpnon anette ten oot eden > cormeoneeceuGor 14°85 INTRO REIN ois season sat of Sake a ctsop nie sans anlereemnniEans 13°86

100°00

The base is monacid, forming a hydrochloride containing one mole- eule of HCl, and this hydrochloride forms a double platinum salt containing two molecules of the hydrochloride to one molecule of platinum ; 100 parts of the platinum salt left, on ignition, 32°14 parts of platinum, so that, to find out the amount of salt containing one atom of platinum, we have—

Sod ; Lor 35 100 ra *, G=6145.,

Putting x for the unknown molecular weight of the base, the molc- cular weight of the salt is— SACl= “730 Pt=197‘5 Cl,=142°0

Qa + 412°5

ORGANIC. |

It was shown by analysis that 197-5 parts of platinum represented 614°5 parts of the double salt, so that—

22+ 412°5=614°5 oo MeO, Making use of the pereentage numbers given by ultimate analysis,

we have the following obvious proportions for finding the weights of the respective elements contained in this molecular weight :—

OO) § Onl 8 ge Wile 9 iC)

100: 101 :: 14°85: H

100 : 101 :;: 18°86: N Whence C=72‘0, H=14°9, N=18°9, and the numbers of the atoms are :—

By the atomic theory these numbers must be integral, so that the numbers of atoms are 6, 15, and 1; and the molecular formula is CgHy5N.

When a base does not readily form double platinum salts, the molecular formula is deduced from the analysis of an auhydrous normal salt. In the case of compounds which are uelther acid nor basic, and which do not admit of vaporization, the molecular formula can only be indirectly arrived at by considering the chemical transformations of the compound and its

relationship to known substances. A molecular formula obtained by this means implies that, could the substance be vaporized, its molecular volume would correspond to the molecular volume of hydrogen.

Rational, Constitutional, or Structural Formule.—The molecular formula of an organic compound simply expresses the fact that the molecule of such compound contains so many atoms of each of its constituent elements, and in the earlier stages of the science chemists were contented with such representation of their analytical results. As the science developed, however, it soon became evident that substances might have the same percentage composition, or even the same molecular formula, and yet exhibit under the influence of the same reagents totally distinct characters. These facts, which will be more fully discussed in a sub- sequent part of this article, led to the necessity of devising some method by which organic formule could be made to represent the behaviour of the respective compounds under the influence of decomposing agents—in other words, the manner in which the compound was capable of splitting up or of being resolved, and, as a necessary result, the converse fact of representing the manner in which the elements of a compound were grouped together. These rational, const- tutional, or structural formule must be regarded solely from a chemical point of view; they are symbolic repre- sentations of chemical facts, and in no way represent the physical grouping of the atoms in space. They may be inost conveniently defined as artificial epitomes of the re- actions of compounds, indicating that when decomposed the compounds separate into such and such groups, and that when it is possible to bring these groups or radicles together, the compound can in most cases be built up or synthesized,

Let us now, by way of illustration, proceed to consider the method of arriving at the constitutional formula of some typical compound.

The molecular formula of acetic acid, as previously shown by its ultimate analysis and the determination of silver in its silver salt, is—

CiHeO:. Being a monobasic acid, one of its hydrogen atoms is

replaceable by metals. This fact is expressed, as in the case of inorganic acids, by the formula—

H.C,H,05. But this formula does not express the whole of the

decompositions possible to the acid; the residue C,H,0, being capable of further subdivision, the formula may be

Crt Witte) i ¥

549

further developed. Thus, acetic acid may be formed by the action of acetyl chloride upon water, according to the reactlon—

C,H,0.Cl+ OH, =C,H,0,.H + HCl. Thus the radicle acetyl C,H,0 is shown to enter into the

‘composition of acetic acid, and the formula therefore be-

oo H.0.0,H,0.

In confirmation of this formula several reactions might be mentioned in which the acetyl group is left unchanged, while the hydroxyl, HO, is withdrawn and replaced by other elements or radicles. For example—

H.0.C,H,O + PCl, = C,H,0.Cl + HCl + POCI,

Phosphoric * Hydrochloric Phosphorus chloride, Acetyl chloride. “*’ goig, oxytrichioride.

5(H.0.0)H,0) + PIS, = 5(H.S.C)8,0) +_P,0; Phosphorus Phosphorus pentasulphide. entoxide,

Na.0.C,H,O + C,H,0.Cl = C,H,0.C,H,0.0 + NaCl.

- Sodium Acetyl chloride, chloride,

Acetic acid,

Acctic acid, Thiacetic acid.

Sodium acetate, Acctic oxide.

Next with respect to acetyl itself. When acetic acid is electrolyzed, hydrogen is evolved at the positive pole and carbon dioxide and ethane (C,H,) at the negative. Now, ethane can be shown to be identical with di-methyl (CH,)., so that the radicle methyl is thus shown to exist in acetic acid—a fact which receives confirmation from several re- actions, two of which may be now considered.

When potassium cyanide acts upon methyl iodide, a substance known as acetonitrile (CH;.CN) is produced —

CH,IE + KCN = CH,CN + KI. Methyl iodide. Potassium cyanide,

When barium acetate is submitted to dry distillation, it decomposes in the manner shown by the following equation :—

Ba.O,,(CH,.CO), = CO.(CH,). + BaCO, .

ah Barlum Barium acctate, carbonate,

Acotone.

Thus the most developed formula of acetic acid is

CH;.CO.O.H, or, as it is more conveniently expressed— CH, COOH.

The bracket signifies that the two carbon atoms are

directly united.

Graphic Formule.—Graphic formule having already been explained (see p. 473), it is here only necessary to

illustrate their application to organic compounds. ‘The following are typical examples :— Name of Compound. Rational Forniula. Graphic Formula. —— CH. Ta Acetic acid. { COOH | H—C—H | O=C—O—H C,H, Ei Triethylamine. N< C,H, | C,H, H—C—If H—C—H iH | H | — H—C—C-——N—-0O—C—If bs if al Hook H H

Name of Compound. Rational Formula. Graphic Formula.

NH. H O Urea. co} NH, Poa N—C— | | H H | oe H 7 H Trimethyl-methane. C 3 ! ! rimethyl-methane CH, i H, | | | ‘ee H-C-H

| i

Isomerism.—It has been mentioned that organic sub- stances may have the same percentage composition and molecular formula, and yet exhibit totally distinct chemical and physical characters. To this phenomenon the general term ¢somerism is applied, and the compounds are termed isomerides, or .are said to be zsomeric. The differences between isomeric bodies are well explained on the view that such bodies possess different constitutions, or that their elements are grouped in different ways. Constitutional formule are thus absolutely indispensable for the repre- sentation of isomerides. As will be seen subsequently, there can be several kinds of isomerism, but we shall here restrict the term to two classes of cases.

(1.) Lsomerism proper or Physical Isomerism.—In these cases the substances are identical in their composition, vapour-density, and chemical behaviour, but exhibit dif- ferent physical properties. Thus there are several hydro- carbons known as terpenes, having the formula C,)H,,, which exist in the oils of turpentine, lemon, bergamot, orange, &c., and which exhibit the same behaviour under the influence of chemical reagents, differing only in their odour and action upon polarized light. Again, the empiri- cal formula C,H,O, includes several organic acids (tartaric acid being one of the number) which are physical isomerides differing from one another only in their crystalline form and action upon polarized light.

(2.) Chemical Isomerism.—In these cases the compounds are identical in composition and in their molecular formule, but differ in physical properties and chemical behaviour in certain reactions.

For instance, by taking one atom of hydrogen from the hydrocarbon propane (C,H,) we obtain the radicle propyl (C,H,), and if we suppose one

atom of hydrogen in marsh gas or methane (CH,) to be replaced by propyl, we get the hydrocarbon tetrane or diethyl—

H C,H, H =| O18 C4 F H ta Methane, Tetrane. NoRMAL SERIES. Name of Compound. Formula, Boiling Specific point. gravity Hexane or dipropyl | C,H,.C3H, 70° | 669 at 16° Propy] chloride or po]. ° Torment t | OsHyCl 46°5° | -915 at 0 Propyl bromide or ; ell ay ° Peon 1h Oem 71° | 1-85 at 16 Propyl iodide or aqoo 14. 0 nie ee 102° | 1°76 at 16 Propyl alcohol or Naat Alls cee carbinel {| CoBly-OH 97°4° | 806 at 15 Propylamine or ‘Ke ° amidopropane C3H,.NH, 49°5° | 728 at 0 Butyric acid C,H,.COOH 162°5° | ‘982 at 0°

i

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[orcante,

Now propyl can be written in two different ways, according as the elements are grouped differently; thus— | (CH,CH,CH,)’, or (CHCH,CH,)’. The differences are still more strikingly shown by the use of graphic formulee—

H H HH EF ba i oe H—C—C—C— H—C— C—C—H om al oa BH & H H Propyl. Pseudopropyl.

Distinguishing these radicles from each other by the names _propyl and pseudopropyl, it is clear that we can have a tetrane containing propyl and another containing pseudopropyl—

CH,CH,CH, CHCH,CH, H cJH H H H Pseudopropy!l methane,

These formule can, of course, be written in a more con- densed form; thus —

etra: ‘ ; propyl-methane. Methyl-pseudopropyl. or (C,H,), CH(CH,), . Tetrane or diethyl. Trimethyl-methane,

The graphic formule help to show still more clearly that the elements can be grouped only in two different ways—

H

| H HH H—C—H | | |

l H—C—O0—C—H u—~0—H l l

l H | # H—C—H

l H—C—H H—C—H aA

| i

H

Tetrane or diethyl. Trimethyl-methane.

The fact thus shown possible by formulation is borne out experimentally. Two tetranes actually exist,—one, which from its mode of formation can be shown to be propyl-methane or diethyl, having a boiling point of 1° C., the other, which can be shown to be pseudopropyl-methane, boiling at -— 15° C.

The experimental confirmation does not, however, end The same isomerism can be shown to exist among Thus we have—

here.

C H Tetrane or propyl-methane. all the derivatives of these two propyls.

IsomERIC SERIES.

Name of Compound. Formula, Boiling Specifie point, gravity. : CH(CHs,) 5 ” Di-pseud 1 3)2 i-psendopropyl | | GH(CHy)g 58 67 at 17 ee ++ ++,| CH(CH,),C1 39° | °874 at 10° ee car CH(CH;),Br 61° | 1°32 at 18° Pseudopropyliodide | CH(CH;),1 89°5° | 1°70 at 15° Pseudopropyl al-coholordimethyl > | CH(CH,),.0H 82°85° | °786 at 16° carbinol Pseudopropylamine | CH(CHs3) ..N Hy, 32° | *69 at 18° 154° | ‘959 at 0°

Pseudobutyric acid CH(CH,)..COOH

This list might be considerably extended, but sufficient examples have been given to illustrate the phenomena under consideration.

Not only do these isomerides differ in physical pro- perties, but they exhibit different and characteristic trans- formations under the actiou of the same reagent. Thus, normal propyl alcohol when oxidized yields propionic acid :—

HM HH Ht HO

or ae) ky a0 =C—_0—_0—4 + 0,=H—C_0—0—_0—8+ 08,

= oe H H H Normal propyl! alcohol.

| H H

Propionic acid. Water.

Under the same circumstances pseudopropyl alcohol yields the substance known as acetone or dimethyl ketone :— H H

| | H—O—H H—O—H

| | H—C—O—H+0= C=O + OH,

| | H—C—H H—O—

H H Pseudopropyl alcohol. Acetone. Water.

The distinguishing character of this class of isomers is that the isomerides can be shown to belong to the same series of compounds, or, according to Schorlemmer, “ they contain the same number of carbon atoms linked together.”

Reactions that give rise to the formation of a compound capable of existing in two isomeric modifications frequently result in the production of both

isomers, but the precise conditions which regulate the relative quantities of the two compounds are not yet known.

Certain relationships have been shown to exist between the physical and chemical properties of isomeric bodies, although numerous exceptions render the exact expression of these relationships an impossibility in the present state of knowledge. Thus, as a rule, the boiling points of the compounds of an isomeric series are lower than those of the normal series (see preceding table)—or, more generally, the boiling point is higher the more simple the constitution of the substance,

Since different amounts of heat are concerned in the production of isomeric bodies, it must be admitted that such bodies are stored with different amounts of potential energy. Adopting this view, some chemists have recently sought an explanation of isomerism in the different amounts of potential energy thus contained in isomerides, and have thrown distrust upon the “constitutional” theory. In taking this view, however, the true position seems reversed ~~—the fact that isomerides contain different stores of potential energy by no means does away with the hypo~~ thesis that they possess different constitutions. It seems, on the contrary, that the difference of energy is accounted for on the view that the bodies possess a difference of constitution, since the contained energy results from the relative positions of the atoms or radicles with regard to the intra-molecular chemical forces.

Metamerism.—Compounds having the same molecular formula may result from the combination of totally distinct radicles, aud exhibit in consequence not only a marked difference of physical properties, but in almost all cases different chemical transformations under the influence of the same reagent. Such substances are said to be meta- meric, The subjoined examples illustrate this class of cases, It is to be observed that, as with true isomeric compounds, two metameric bodies are frequently produced in the same reaction. For instance, most of the methods given for

obtaining ethyl cyanide yield a mixture of this compound with the isocyanide.

Empirical Formula, C,H,N .

C,H, CH, CH, | | N N N / > a oN H H C,H, H CH, CH, Propylamine. Methyl-ethylamine. Trimethylamine. Empirical Formula, C,H,0.

H FH O

ve I HO—-0-H -H=€-0-0-G.8 Hj-0=cH,

i H H

Propionic aldehyde. Empirical Formula, C,H,N .

Ally] alcohol. Acetone,

H,C,—C=N H,C,—N=C Ethyl cyanide or Ethyl isocyanide or propionitrile. ethyl carbamiue.

Polymerism.—Compounds having the same percentage composition but different vapour-densities are said to be polymeric ; thus—

Name of Compound. Formula, Pose — AROBTPIONE o.0cstnwag vee sce C,H, 13 Gas DOMPONG i. .cvccsscvsncvee oof CgHg =8(C Hy) 389 81° SHVTO OM iia acg sistent acenes C,H, =4(C,H,) 52 145° Dihydronaphthalene….) Cy)H 9 =5(C,H,) 65 210″

The above list exhibits the rise in boiling-point with in- crease of vapour-density.

Polymeric bodies may be isomeric or metameric; the following, for example, are metameric polymerides :—

; <7 (H A Formic aldehyde….. COH =CH,0

Acetic acid …....00… Che: | =C,H,0,=2(0H,0) ee Cello | — 0,140; =8(CH,0)

CLASSIFICATION OF ORGANIC CoMPOUNDS.

Homologous Sertes.—Carbon being a tetrad element is only saturated by four atoms of a monad element, or by any number of atoms the joint atomicities of which are equal to four. Thus the following are saturated compounds :—

CH,’ , CHCl,’ , CO”Cl,’, CO,”, ON’’Cl’, CL,’.

Among inorganic compounds many instances occur in which two or more atoms of the same element unite, such, for example, as in the ferric and manganic salts. In these cases, however, the number of atoms thus entering into combination is seldom great. In the carbon atom we meet with the greatest tendency to unite with similar atoms, and this special property of carbon accounts for the great multiplicity of organic compounds.

Making use of graphic notation, the tetrad carbon atom is thus represented —C-—. If two atoms of carbon unite by one bond of each, the resultant atomicity of the group is 6 ; if 3 atoms unite the resultant atomicity is 8, and so on :—

| | |

oe; Se, a | | | | bien:) cecktns! — gable | | | ak ows: a | | ile

Thus every additional atom of carbon brings two active

oo2

units of atomicity into the molecule, and if we suppose these carbon atoms to be saturated by hydrogen, we shall have an ascending series of hydrocarbons, each member of which differs from the one beneath it by +CH,. Such series are known as homologous series. The following are examples :-— CH,, Methane.

C,H,, Ethane. : C3Hg, Propane. | C, C

CH,0,, Formic acid. C,H,O,, Acetic ,, C;H,0,, Propionie,,

C,H, Tetrane. 14H,,0, Buty * C,H,0,, Butyric ,, C;,H,,,Pentane. | C;H,,0, Amyl ,, C;H,,0,, Valeric ,, a oar CH CaH, 0,

Isologous Series. —An inspection of the foregoing formule will show that hydrocarbons of the general formula C, Hot. are the only satwrated compounds, 2.e., the only compounds in which the atom-fixing powers of the carbon atoms are completely satisfied. If an odd number of hydrogen atoms be withdrawn, a compound having a certain odd number of unsatisfied units of atomicity (c.e., a “perissad” radicle) is the result, and such compounds are incapable of existing in the free state. From this and previous considerations it follows, that “all hydrocarbons contain an even number of atoms of hydrogen,” and further, “that the sum of the atoms of monad and triad elements contained in the molecule of a carbon compound must also always be an even number” (Schorlemmer).

Compounds containing an even number of unsatisfied units of atomicity, although non-saturated, are capable of existing in the free state. Thus, commencing with the saturated hydrocarbons of the C,H,,,. series, hydrogen atoms can be withdrawn by pairs, giving rise to a descend- ing series of hydrocarbons, each member of which differs from the one below it by +H,. Such series are termed isologous series. The following table shows at a glance the relationship between homologous and isologous series, and at the same time the system of nomenclature used :—

sologous Series.

TIsologous Series./Isologous Serfes.|Isologous Series.

Name ~~—| Name | ;,,. | Name | Name of Com~~ | A of Com- Boos of Com- ae of Com- pound. | ‘| pound. *) pound. pound. Methane} CH, | Ethane | C,H, | Propane | C3Hg| Butane Methene| CH, | Ethene | Cyl, | Propene | C3Hg | Butene Homo- Ethine | C2li,; Propine | Cll, | Butine logous Propone | C3H, | Butone Series,

Butune

Organic Radicles.—The meaning of the term radicle has already been explained (p. 474), so that it is here only necessary to point out the part

played by such unsaturated groups of atoms in the formation of organic compounds.

It has already been mentioned that an odd number of hydrogen atoms withdrawn from a saturated hydrocarbon of the C,H… series leaves an unsaturated group having an odd number’ of unsatisfied units of atomicity. For example :—

CH,—H = (CH,)’ (C,H,)’— H =(C,H,)”

Methane. Methyl. Ethene. Ethenyl. = , u at i] wy C,H,—H a (C,H;) (C,H, =i (C,H) Ethane, Ethyl. Propene. Propenyl.

CuHonte—H = (CoHons)’ (C,H a4)’ = (C,Hy4_4)”

Thus the C,H.,;. hydrocarbons may be conveniently regarded for some purposes as hydrides of C,H..4, radicles, a series the members of which enter largely into the com- position of organic compounds of all classes,

Perissad radicles are incapable of existing in the free state because on isolation two semi-molecules unite ; for instance——

a re

“ es The names of perissad radicles are made to end in yi.

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[oRGANIC. Hi: H Hii H A P aa ee H—~O2404 8 B60) te | 25 pod | H::H H H:’ HH

Dimethyl = ethane,

eee ee 2 i rs

Diethy] = tetranc. Generally 2(C,Ho441) = ConHgnzo «

It is by no means necessary that a group of atoms should be capable of isolation in order to constitute such group an organic radicle. Any

unsaturated group which through several reactions remains unchanged may be so regarded.? (See, for example, the previously quoted reac- tions of acetic acid.)

The following are additional examples of organic radicles :—

Cyanogen N=C—-; in the free state, N=C—C=N.

CH. Acetyl (C,H,OY =Cco< COOH Carboxyl (COOH)'; in the free state, oxalic acid, | COOH

While hydrocarbon radicles are positive (see p. 476), cyanogen and the oxygen-containing or acid radicles are negative.

fatty and Aromatic Groups.—In order to assist in bringing the vast numbers of organic compounds within the scope of some system of classification, chemists fre- quently adopt the convenient division of them into fatty and aromatic groups.

It will be seen subsequently that most organic com- pounds may be regarded as derived by substitution from hydrocarbons. Starting, then, with the saturated hydro- carbons C,H,,,5, the isologous series, down to C,H,,., *and some of the members of the C,H,,,* serics, with their derivatives, constitute the fatty group, so called because many of its members exist in fatty bodies. The hydro- carbons of the C,H.,_,, &¢., series, with their derivatives, are termed the aromatic group, because many of the com- pounds are obtained from balsams, essential oils, gum- resins, and other aromatic substances. The chief charac- teristic of the aromatic group is the comparative stability of its compounds, for, whereas the artiad (z.e., even) radicles of the fatty group act as unsaturated groups entering freely into direct combination with other elements, the aromatic radicles act more like saturated groups entering into direct combination only with difficulty, and forming substitution compounds with comparative easc.

The division here made between fatty and aromatic substances must not be regarded as one having a sharply defined boundary line. In point of fact, the two scries merge into one another, and compounds belonging to one group can be transformed into compounds of the other. Thus benzene, the typical

hydrocarbon of the aromatic group, can be formed directly from cthine or acetylene, a hydrocarbon of the fatty group, by the polymerization effected by heat :—

3C,H, =

Ethine,

C,H.

Benzene.

Also acetone, a substance directly obtainable from the

2 So numerous, indeed, are these radicles in Organic Chemistry that this branch of the science has been named the ‘ Chemistry of coni- pound radicles.”

3 «¢We may therefore define that part of our science which is gene- rally known as Organic Chemistry as the Chemistry of the Hydro- carbons and their Derivatives,”—Schorlemmer.

salts of the fatty body acetic acid, when it is heated with sulphuric acid, loses water and is transformed into mesitylene or trimethylbenzene :—

3CO(CH;), “| pe = C,H,(CH;)

3° Acctone.

cr, Trimethylbenzene.

Families of Organie Compounds.—Most of the organic compounds at present known can be referred to certain families which we shall now proceed to enumerate.

1. Lydrocarbons.—These are the parent bodies from which the remaining families are derived. Their arrange- ment into homologous and isologous

series has already been discussed.

I]. Alcohols.—Formed from hydrocarbons by the sub- stitution of hydroxyl for hydrogen :—

[2 CHOH ; Coo, , O,0H , C,H,’(08),: Methane. Methyl] alcohol. Ethane, Ethyl! alcohol, Ethene alcohol. Oa, , OH,OH , CAYO), , 0,H,”(0n),. Propane. Propy! alcohol. Propene alcohol, Propenyl alcoho}.

Ill, Malowd Hthers.—Formed from hydrocarbons by the substitution of halogen elements for hydrogen :— moe, » CHLC! , CM Be ». OH, b. Propane. Propy! chloride. Propene dibromide. Propenyl trijiodide.

IV. Ethers.—Derived from alcohols by the substitution of oxygen for hydroxyl; thus, from

2 (C,H,OH)) C,H,”(OH), ’ Ciliy”(OH),

Ethy! alcohol. Ethene alcohol. Propeny] alcohol. we have

(C,H,),0 , C,H,“0 ? (C3H;) “03 :

Ethyl oxide or ether. Ethene oxide. Propenyl oxide,

V. Sulphur, Selenium, and Tellurium Alcohols and /ithers.—These compounds are the analogues of the alcohols and ethers, oxygen being replaced by sulphur, &e, The thio-alcohols are known as mercaptans :-— C,H,OH , C,H,SH , C,H,SeH , (C,H,),S , (C,H,),Te;

Ethyl sulphy- Ethyl selenio- jeer Ethyl

Ethy drate or hydrate or sclenium : mercaptan. mercaptan, sulphide. telluride,

C,H ,”(OH), ’ C,H,”(SH), 3 C.H,”(OH),) C,H,””(SH), e E hene alcohol. Ethene sulphydrate. Propenyl alcohol. Propeny! sulphydrate. VI. Aldehydes,—Derived from hydrocarbons by the replacement of hydrogen by the radicle (COH)’: — oo) , CH,.COM ; Gu , CHCOH, Methane. Acetie

aldehyde. Ethane, Propionic aldehyde. VII. MKetones.—Derived from aldehydes by the replace-

ment of hydrogen in the COH group by monad hydro- carbon radicles :—

CH,.COH , CH,.CO.CH, ; C,H,COH , C,H,.CO.CH,.

Acetic aldehyde. Dimethyl-ketone. Propionic aldehyde. Ethyl-mecthy] ketone.

Ethyl! alcohol.

VIII. Organic Acids.—These compounds may be re- garded as hydrocarbons in which hydrogen is replaced by carboxyl :—

PH, ©H,COOH ; OH, , CoB. (COOM),. Methane. Acctic acid. Ethane. Succinic acid.

The organic acids may likewise be regarded as derived from alcohols by the replacement of H, by O :—

CH,.CH,.OH ; Coe COOH;

Ethyl alcohol. Acetle acid.

0,H,(0H), , ©,H,0(OH), , C,0,’(OH), .

Ethene alcohol. Glycollic acid. Oxalie acid. Corresponding thio-acids are known thus :—

C,H,0.0H C,H,0.SH

Acetie acid. Thiacctic acid. IX. Anhydrides.—Derived from acids by the substitu- tion of oxygen for hydroxyl, and thus bearing the same

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relationship to the acids that the ethers bear to the alco-

hols ; thus, from

ACHRCO OH) , Cm ©O(OH), , 2(C,H,CO.0n) Acetic acid. Succinie acid. Benzoic acid.

we have

(CH,.CO),0

Acctic anhydride.

CH 20lo.0 ,

Succinic anhydride.

Corresponding thio-compounds are capable of existing :— (CH;.CO),S = thiacetic anhydride.

X. Acid Halides.—Derived from acids by the substitu- tion of halogen elements for hydroxyl. These compounds are thus most conveniently formulated as compounds of an oxygenated or acid radicle! with the halogens :—

(C,H,.CO),0.

Benzoic anhydride.

CHLOHO , CHOC , (HON: Acetic acid, Acetyl chloride. Acetyl iodide. C,H,0,”.(OH), Ci, O.4Cl..

Succinic acid. Succiny] chloride.

XI. Lthereal Salts or Compound Ethers.—Derived from acids, organic or inorganic, by the substitution of a hydro- carbon radicle for the hydrogen of the hydroxyl :—

NO,.OH , NO; O(@H,) ; Nitric acid. Ethyl nitrate. SO,(OH), , SO,.0H. (OC,H,) , SO,.(OCH;), ; Sulphuric acid. Ethyl-hy drogen sulphate. Diethyl!

sulphate. PO.(OH), , PO(OH),(OO,H,) , Phosphorie acid, Moncthyl phosphate. C,H,0.0H ;

Acetic acid,

PO.(OC,H;,), ; Triethyl phosphate. C,H,0.(0C,H,) .

Ethyl] acetate The thio-acids also form ethereal salts :-— C.H,O.SH CUHFO.(SC lly. Thiacetic acid, ; *Ethyl (SCE) XII. Organo-metallic Bodies.—Compounds of hydro carbon radicles with metals :—

NaC,H, ; Zn(C,H;), ; Su(C,H,), ; SnI,(C,H,)9.

- a Stannic diiodo- Sodium ethide. Zine ethide. Stannic ethide, dicthide.

XIII. Amines or Compound Ammonias.—These com- pounds are most conveniently regarded as derivatives of ammonia and its hydrate, and of ammonium haloid salts, hydrogen being replaced by hydrocarbon radicles :—

(C,H,” H C,H, C,H, C,H; H NNIH aE: el NY Gr N4 OH, I H CLH, ee) aid Cl Cl I | OH Aube “Oange™ Taanzgame | Melty owb- ginmontam

These compounds may likewise be formulated as hydro- carbon derivatives :—

CE, CEN,): 3 Chie, C,H (NH,), C,H,’(NH,),;

Methylamine ; Neiret| RletHane! omamldne Bolane: Ethylamine or Ethene diamine or methane. amido-cthane. diamldo-cthane, ar \ “ Va CH, 3 C,H, (N H,)) C,H, CN), 5) C,H; (NH,),. Benzene, Amidobenzene, Diamidobenzene. Triamidobenzene.

The phosphorus, arsenic, antimony, and bismuth ana-

logues of ammonia yield derivatives corresponding to the amines :—

} The names of all acid radicles, perissad and artiad (i.e., odd and even), end in yi.

V. — 70

ob4

Coll, CoH, (CH, P{H Pr. OH. As CH, H C,H, a

Ethylphosphine. Triethylphosphine Dimethylarsine. CH, CH, CH. C Hy C,H; Bi. CH, Sb4 0,4, P24 CH, C,H; C,H; | C,H;

ei a.

Triethylbismuthine. Pempeh seein hae eon

XIV. Amides.—These compounds are analogous to the amines, being derived from ammonia by the substitution of acid radicles for hydrogen :—

H C,H,O C,H,O C,H,O N4H NH N4C,H,O Ns C,H.0 H lal H Ammonia. Acetamide. Diacetamide. Triacetamidc. ((C,H,0,)” ; H (C,H,0,) N, H N, (C,H,0,)” | H (C,H,0,) LH Succinamide. Trisuccinamide.

The amides may also be written as compounds of acid radicles with amidogen (NH,)’, imidogen (NH)’, and nitro- gen N”’;—

C,H,O.NH,, (C,H;0),.(NH)’,(C,H,O),N”; (C,H,0,)’.NH Acetamide. Diacetamide. Triacetamide. Succinimide. The fourteen families now enumerated, although com-

prising most of the known organic substances, still leave outstanding a large number of compounds, of which the constitution has not yet been determined, and which consequently cannot be referred to any of the above groups. We propose to consider briefly the individual families in succession, describing the mode of preparation and properties of the most important members of each family, and then proceeding to the consideration of the unclassed organic compounds.

CYANOGEN AND ITS CoMPouNDSs.

The compound which in its chemical behaviour most closely resembles inorganic substances, and which forms as it were a connecting link between

these and organic bodies, is the radicle cyanogen. Before proceeding, therefore, to the systematic consideration of the great organic families, cyanogen and its compounds may be conveniently treated of.

Cyanogen,1 CN or Cy, in the free state Cy,, is generally prepared by heating the cyanide of some heavy metal (usually mercury): HgCy,=Hg+Cy,. A brown sub- Stance, most probably a. polymeride of cyanogen, known as paracyanogen, is always formed in this reaction.

Cyanogen is a colourless gas, having a pungent odour resembling that of bitter almond oil. It burns in air with a purple flame, and is extremely poisonous. The gas 1s condensable into a liquid under a pressure of about 4 atmospheres. The liquid boils at — 21°C., and solidifies at — 34° C. Water absorbs about 4 volumes of the gas in the cold. The aqueous solution decomposes on standing, ammonium oxalate being the chief product of the reaction : C.N,+40H,=(NH,),0,0,. At the same time small quantities of urea, ammonium carbonate, and cyanide are formed. The addition of a mineral acid to the solution greatly retards the decomposition, oxamide being then pro- duced: C,N, + 20H, =C,0,(NH,),. Conversely, when ox- amide or ammonium oxalate is heated cyanogen is produced: (NH,),C,0, – 40H, =0,N, ; C,0,(NH,), ~ 20H, = O,N,.

- From xvavds, blue, because of the colour of many of its com- pounds,

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In its chemical relationships cyanogen is the cxact analogue of the halogen elements. Its compounds with metals or positive radicles are called cyanzdes.

Compounds of cyanogen with Cl, Br, I, 8, OH, and NH, arc known, and are remarkable for their polymeric modi- fications. ‘The following is a list of the more important compounds :—

Cyanogen chloride, CNC1 Cyanuric chloride, C,N,Cl, Cyanogen bromide, CNBr Cyanuric bromide, O,N,Brs Cyanogen iodide, CNI Cyanogen

sulphide, C,N,S Cyanogen selenide, C,N,Se

Cyanic acid, CNOH Cyanuric acid, C,N,0,1, Sulphocyanic acid, CNSH Cyanamide, CN(NH,) Dicyanamide, C,N,(NH,), Cyanuric amide, C,N3(NH.), Ammelide, C3N,(NH,)(OH), Ammeline, C;N,(NH,),0H

Hydrogen Cyanide, or Lydrocyante or Prussic Acid, HON or HCy.—This compound is formed synthetically by passing electric sparks through a mixture of nitrogen and ethine gases: C,H,+N,=2HCN. In practice benzene vapour may be used instead of pure ethine, as it is partially resolved into the latter substance by the action of the spark. The anhydrous acid is also obtained by passing dry hydrogen sulphide over mercuric cyanide. ‘The aque- ous solution of the acid is prepared by the action of acids upon metallic cyanides: HC1+KON=KCI+HON; by the action of ammonia on chloroform : NH, +CHOI, = HCN +3HCl1; and also (most conveniently) by heating a mixture of 5 parts of potassium ferrocyanide with 3 parts of sulphuric acid and 4 parts of water.

The pure acid is a colourless liqnid, having an odour of bitter almonds ; it is a most violent poison. Its boiling- point is 26°°5 C. and its point of solidification — 15°C, The pure acid and its strong aqueous solution are both inflara- mable, burning in air with a violet flame. Both the anhy- drous and aqueous acids are very unstable, the former decomposing into ammonia and a brown substance, and the latter undergoing the same decomposition with the additional formation of ammonium formate. Small quan- tities of formic or of a mineral acid prevent this decom- position, but on mixture with strong acids, a complete decomposition into formic acid ensues :—

HON + 20H, + HCl = H.COOH + NH,(l Hydrocyanic Woon Ty drochloric Formic Ammonium acid, acid. acid. . chloride. Alkalies induce a similar change, alkaline formate and free ammonia being produced. When ammonium formate is

heated, the inverse reaction takes place :— ONH,”>HCO – 20H, = HON

Ammonium Hydrocyanic formate. Water. acid.

A polymeride, H,C,N,, is known.

Metallic Cyanides.—Cyanogen being a monad radicle forms, like Cl, Br, and J, a series of salts typified by the formule M’Cy, M’Cy,, M”,Cy,, M*Cy,. Of these the most important is potassium cyanide, which can be formed

by passing nitrogen over a mixture of red hot carbon and potassium carbonate :—

K,CO, +40 +N, =2KON + 3C0.

This salt is also produced by heating potassium ferrocyanide either alone or mixed with potassium carbonate. Most of the metallic cyanides can be prepared by the action of hydroecyanic acid upon the oxides and hydroxides of the metals, or by double decomposition.

The cyanides have a remarkable tendency to form double salts, such, for example, as the double cyanide of potassium and silver, KCy,AgCy.

Of these double cyanides a certain number are decom- posed by the action of a mineral acid yielding free HCy and salts of the acid :—

KON , AgON + 2HNO, = KNO, + AgNO, + 2HCN,

Other double cyanides do not decompose in this man- ner by the action of mineral acids; the heavy metal can- not be detected by its ordinary reagents, and no HCy is evolved. Thus the double cyanide of potassium and iron, 4KCy,FeCy., when acted on by acids exchanges its potas- sium for hydrogen, but the iron is not removed :— K,FeCy, + 4HCl. = H,FeCy, + 4KCl.

Potassium ferrocyanide. Hydroferrocyanic acid.

Thus the group FeCy, is regarded as an acid radicle (ferrocyanogen), and a large number of its salts (ferro- cyanides) are known. In the same manner we have—

Ferricyanides…….....04. M,Fe,Cy,, =6M’Cy.Fe,Cy, Cobaltocyanides……..... M,CoCy, =4M’Cy.CoCy, Cobalticyanides……..... Mg CopCyy5 = 6M’Cy.Co,Cyg Manganocyanides …..... M,MnCy, =4M’Cy.MnCy, Manganicyanides……..... M, Mn,Cy,,=6M’Cy.Mn,Cy, Chromocyanides,..... M,CrCy, =4M’Cy.CrCy, Chromicyanides……..... M,‘Cr,Cy,.’ =6M’Cy.Cr,Cys Platinocyanides…....., .. M.’PtCy, =2M’Cy.PtCy,

Palladiocyanides…..... ...M,’PdCy, =2M’Cy.PdCy,

Of these compounds the most important are the ferro- cyanides and ferricyanides of potassium.

Potassium ferrocyanide (known commonly as yellow prussiate of potash), is prepared on the large scale by fusing refuse animal matter, such as horn parings, leather scraps, &c., with crude potassium carbonate aud iron filings. This salt is also formed when a ferrous salt is added to a solution of potassium cyanide—

6KCy + FeSO, = K,FeCy,+ K,SO0,. Potassium ferrocyanide crystallizes in large pale yellow crystals belonging to the quadratic system, and having the composition K,FeCy,, 30H, Solutions of ferric salts produce in an aqueous solution of potassium ferrocyanide Sonia blue precipitate of ferric ferrocyanide or Prussian ue — 3K ,FeCy, + 2Fe,Cl, = 2Fe,Cy,.3FeCy, + 12KCl. Prussian blue. Soluble ferrocyanides are thus a delicate test for the pre- sence of ferric salts ; and conversely, ferric salts are used to detect ferrocyanides, and also cyanides by the simultaneous addition of a ferrous salt (Scheele’s test for prussic acid),

Potassium ferricyanide (or red prussiate of potash) is prepared by passing chlorine into a solution of the ferro- cyanide :—

2K,FeCy, + Cl, = K,Fe,Cy,.-+ 2KCl Ferricyanide. The ferricyanide forms large prismatic crystals of a dark red colour soluble in water. Ferric salts give a brown coloration with ferricyanides, while ferrous salts give a blue precipitate of Zurnbull’s blue (Fe,Cy,,.+ Aq).

Nitroprussides are salts of the general formula M,’Fe’Cy,NO obtained by the action of nitric acid upon ferro- and ferri-cyanides.

Cyanides of Hydrocarbon Radicles—The compounds formed by the union of cyanogen with hydrocarbon radicles are of the utmost interest and importance on

account of their metameric modifications. Thus we have— uy os C,H,.CN jp Sey GN), Ethane, 0 ar lene abe Ethene cyanide,

Ethyl] cyanide. On developing the graphic formulz of one of these cyanides containing a monad radicle, taking for brevity the simplest case, viz, CH,.CN, methyl cyanide, it will be seen that two metamerides are possible (see also

551) :— isl

H | Le H—C—N=C H—C—C=N | | Hf H

{In the one compound the carbon of the radicle is in

combination with the nitrogen of the cyanogen. In the other compound the same carbon atom is in combination with the carbon of the cyanogen. Two such metameric series are actually known, one (cyanides or nitriles) being formulated as hydrocarbon derivatives, and the other (isocyanides or carbamines) as ammonia derivatives or amines (see p. 553); thus (representing the monad radicle by R’)— H

H H nN” 6 iv i ay H , * Cyanide or A Isocyanide or Methane. nitrile, Ammonis. Carbamine.

In accordance with what has been previously said con- cerning isomeric bodies (p. 551), these two series ex- hibit different behaviour under the action of the same reagent. For instance, the following equations show the ultimate action of water on them :—

Cyanides. Isocyanides. Ae: “4 isk

C , = jt Nv ? —# : | R +208, =H, +0} or 4h’ 4 20H, =N =” | Goon

Acid, Amine. Formic acid,

In accordance with these reactions cyanides or nitriles can be produced by the action of dehydrating agents on the ammonium salts of the corresponding acids—

H.CO(ONH,) – 20H, = H.CN = (CH)’N Ammonium formate. Hydrogen cyanide. Formonitrile. CH,.CO(ONH,) -— 20H, = CH,;.CN = (C,H,)“N Ammonium acetate. Methyl cyanide. Acetonitrile. C,H,.CO(ONH,) – 20H, = C,H,CN = (C,H,)’“N Ammonium propionate. Propyl cyanide. Propionitrile. C,H,.CO(ONH,) – 20H, = C,H,CN = (C;H,)”“N

Ammonium benzoate. Phenyl cyanide. Benzonitrile.

The action of water upou nitriles thus gives rise to the formation of an acid containing the same number of carbon atoms as the nitrile ; the radicle remaining unchanged, we may consider that in these reactions cyanogen (CN) is converted into carboxyl (COOH)—

B.CN +20H, = NH, + R.COOH.

It has been further stated that both the nitriles and organic acids can be formulated as hydrocarbon derivatives —in the former the H of the radicle being replaced by (CNY’, and in the latter by (COOH)’. Starting then with the cyanide of a hydrocarbon radicle, we get by the action of water an acid containing one atom of carbon more than the hydrocarbon from which the acid is derived, and in this manner acids can be built up from their parent hydrocarbons, and the number of their contained semi- molecules of carboxyl increased ; thus—

H.CN H.COOH Hydrogen cyanide is converted by the action of water into Formic acid. CH,.CN CH,.COOH Methyl cyanide. ” ” Acetie acid.

< C,H,’ (COOH), OH (CN): 4 ye 2 hg acid. hy R*.(CN)a R”. (COOH), CH,.CN.COOH CH,.(COOH),

Cyanacetic acid. 8 Pr Malonic acid. R’ — H,.(CN),.(COOH) R’ — H,. (COOH),4;

The cyanides of the hydrocarbon radicles will be again referred to when treating of the haloid ethers, of which bodies they may be considered the analogues. The isocyanides will be treated of as amines.

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I. HyDROCARBONS.

Starting with the saturated compounds of the C,Hon+. series, the isologous series C,H, ,C,Hoag,-. 00 CHy,_39 are known.

First Series, O,Hon49.-—Marsh Gas or Puraffin Serves.

The first member of the series is CH, (marsh gas or methane), and the homologues down to C,,H,, (hexdecane) have been obtained. The names and formule will be given later on.

General Properties.~~The members of the series exhibit a regular gradation in physical properties with each suc~~ cessive addition of CH,. Thus, the first four members are gaseous at ordinary temperatures, while the succeeding terms are liquids of increasing specific gravity and viscidity as the series is ascended; those containing 20 or more carbon atoms are solid crystalline bodies. The boiling- point increases as the series is ascended, the difference between the boiling-points of the successive terms of the normal series decreasing regularly by about 4° O. as far as C,,H.,, after which there appears to be a constant differ- ence of 19° C,

The paraffins are chemically distinguished for their in- difference, hence the name applied to the series (parwm afinis). Being saturated molecules, they are incapable of uniting directly with any other element or radicle. The halogen elements produce by their action ou paraffins substitution

derivatives (haloid ethers), in which the hydro- gen of the hydrocarbon is replaced by the halogen.

CH, , CH;Cl , CHG), , CHCl as: Cel. Ci; C Heel CoC, , CeneCl.., CjHeCh. C,HCl, , C{Ch, &e., ie,

These compounds will be again referred to under the family of the haloid ethers. Sulphuric acid is without action on paraffins, and at ordinary temperatures they are scarcely attacked by oxidizing agents; but on heating with these agents they are either entirely oxidized to CO, and OH,, or, in addition, to acids of the acetic (C,H,,,,COOH) and succinic [C,H,,. (COOH),] series. Nitric acid exerts no action in the cold, but the concentrated acid attacks the higher members of the series when heated with them, forming nitro-substitution compounds in which hydrogen is replaced by nitryl (NO,), and, in some instances, acids of the acetic and succinic series and nitriles. The lower members of the series are not acted on by nitric acid, but their nitro-derivatives can be obtained by indirect methods, the general method of preparation being the action of silver nitrite on the iodo-paraffin :—

C,Hon4,1 + AZNO, = C,Hon.;,(NO,) + Agl .

These nitro-paraffins are interesting as being metameric with the corresponding ethereal salts of nitrous acid ; thus—

” H. 5 * a . ° Nitromethane, C } NO, , 1s metameric with methy] nitrite, O

Nitroethane, C) Noa S ,, ethyl nitrite, 0 } Vs Generally — are metameric with | , O=N=O O—N=0

Nitro-paraffins, Ethereal nitrites.

Tn accordance with the above formulation the two classes of compounds are differently acted on by nascent hydrogen.

Cleat Chi, | 3II,=201, | NO,

Nitro-paraffin.

: : =

Amine, or amido-paraffin,

CW EM i SB ier

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C. Homa Cnn +3H,=OH,NH, | O—NO OH Ethereal nitrite. Alcohol. The higher members of the series are resolved by pro- longed heating in sealed tubes into members lower in the series and members of the isologous series, C,H, (olefines),

in accordance with the general equation— CrtpHointp)+2 = CuHon ye + CpHop «

Occurrence of Parafins.—Methane, or marsh gas, is an invariable product of the decomposition of organic matter excluded from the air, and is thus produced at the bottom of stagnant ponds, marshes, &c. This gas is the “ fire- damp” of coal mines; it is found in volcanic gases, and the gas issuing from a mud volcano in the Crimea is almost pure methane. The normal paraffins are found in coal formations and other bituminous strata. Thus, Ameri- can petroleum contains a mixture of all the paraffins froin marsh gas to pentadecane (C,,H,,), or even higher mem- bers. In boring for rock oil large quantities of methane escape, and from the freshly drawn petroleum cthane and propane are given off as gases at the ordinary temperature of the air. On distilling off the liquid portion (known commercially as “paraffin oil”) the higher members of the series remain as white crystalline solids. Many paraffins occur also in the oil obtained by the destructive distillation of Boghead and cannel coal. Solid paraffins are likewise formed in the destructive distillation of wood, coal, bitu- minous shale, &., and are found native, as fossil waz,

zokerite, hatchetin, &c.

General Methods of Formation of Paraffins.

1. By the aetion of naseent hydrogen upon haloid ethers of CrHon+y radicles—

CrHon4,Ha + Hy = CuH n+, ae Hila ; (Ha being used to represent a halogen).

Ammonia,

2, By the aetion of zine and water upon the iodides of Cn¥on4, radicles—

2CpHon+iI + 2Zn + 20H, = Zu(HO), + Zul, +2CnHonts «

3. By the aetion of water upon the organo-metallie bodies of the general formula Zn(C,Hon+1)2—

Zn(CrHonti)e + 20H, =Zn(HO), + 2CnHonts »

4. By heating iodides of C,Hgn+4, radieles with zine—

Zn + 20, Hon4 1 = Zul, + ConH ynte 5

In this reaetion the paraffin is, at the same time, resolved into a lower member of the series containing half the number of carbon atoms, and the eorresponding isologue of the CnHgn series—

ConH gnt.= CnHgnte ate CrHon . 5. By the aetion of sodium on the iodides of C,,H4n+4, radieles— 2CnHon4] + Nag=CynHynpo + 2Nal .

6. By the eleetrolysis of the fatty acids of the series CyHyn0,

(see aseetie series)\— 2CnHynO0z = 2005 + Con—pHgn—» + Hy

7. By heating the dry sodium salts of CnHgny,. COOH and CnHon. (COOH), aeids with sodium hydroxide—

CrHgn+1-COONa + NaHO=Na,CO, + CaHynts CnH»n(COONa), + 2NaHO =2Na,C03+ Canto.

8. By the dry distillation of aeetates and butyrates several par- affins are formed.

9. Almost all organic compounds yield paraffins when heated in sealed tubes to a very high temperature with excess of strong hydriodie aeid.

10. Many paraffins have been obtained by aeting on a mixture of

the eorresponding iodides and ethyl aleohol with eopper-eoated zine foil (Gladstone and Tribe’s ‘‘ eopper-zine couple ”)—

Cy Hen jal + C,H, OH + Zn = Znl(C,H;0)+ CaHlents – Formulation and Classification of Paraffins—All the mentbers of the paraffin series can be regarded as methane,

in which one atom of hydrogen is replaced by Cy Howay radicles ; thus— :

HYDROCARBONS. |

+ CM, C als CH,.CH; CrHon+y C H CG H C i ae 0 Bl

H H iH H Ul

H H H H H

Ta pee” Ethane, or 7 Pp :

Methane. Ea de Pies see te id

They may likewise be formulated as hydrides of C,H, radicles, in accordance with their formation from the haloid ethers of these radicles by the action of nascent hydrogen—

CH,=CH,.H ; C,H, = C,H,.H

Methyl Methane. hydride,

Ethane. Ethyl hydride. Propane.

Propyl] hydride.

More generally, the paraffins may be regarded as formed by the coalescence of any hydrocarbon radicles, furnishing by their addition the necessary number of carbon and

hydrogen atoms ; thus— CH, = CH,H = CH,”H, = CH” Methane. Methyl hydride. Methene hydride. Bdteny\ ee = = u a my C,H, = CH,CH, = 0,H,’H, = 0,H,”.H, Ethane. i cA tee “iy Ethene hydride. Ethenyl hydride. Ethyl metnane, Propane. 4» methyl ethane. CH CH CH,””(CH,), or C * o H.C 3 2 (3a H 2 CH, if — Methene dimethide, or dimethy] methane <= a] eS — “ =a C.H, = C,H,C,H, = CH,.C,H, = ©,H,"(CH,), = Butane. or Ethyl ethane, Propyl methane, or Ethene dimethide or tetrane, or diethyl. methyl propane. dimethyl] ethane,

CH” (CH,), .

Trimethyl methane, or methenyl trimethide (isotetranc),

The number of possible methods of representing a paraffin thus greatly increases with the complexity of the molecule, but it must not be inferred from these formule that the radicles represented as composing a paraffin molecule have a separate existence in the compound. Such formulation expresses simply the possible modes of formation by which the compound can be produced. For instance—

a. The ethyl hydride obtained by the action of nascent hydrogen upon ethyl iodide (C,H,I+H,=C,H,+HI) is identical with the ethene hydride produced by the action of nascent hydrogen on an ethene haloid ether (C,H,’I, + 2H, =C,H,“H,+2H1), and with the

dimethyl formed by heating CH3I with a metal [2CH,1 + Zn=(CHs), +ZnI,].

B. The propane (propyl hydride) ag by the action of nascent hydrogen on propyl iodide, (C3H,1+ H,=C,H;.H HI), is identical with the ethyl- ea a by the action of a metal on a mixture of the iodides of methyl and ethyl (CH,1

C,H,I + Na, =CH3.C,H,;+2Nal), or by the action of zinc-ethy! on methyl iodide [Zn(C, H se + 2CH;1 =2CH;.C,H, + Zni,].

y. Methane obtained by the action of naseent hydrogen on methyl iodide is identical with the methenyl hydride formed by the aetion of nascent hydrogen on chloroform (CHCl, +3H,=CH”.H +3HCl).

Thus it must not be supposcd that, because ethane may be written as dimethyl, ethane contains methyl. On treating ethane with chlorine, for example, we do not ob- tain methyl chloride (CH,Cl), but substitution products of ethane, C,H,Cl, and similar relations obtain throughout the series.

Turning to the graphic formule made use of in illus- trating the formation of homologous series by the continuous coalescence of carbon atoms with the consequent increase of atomicity (p. 552), it will be seen that the homologous series of C,H,,,, radicles can be regarded as derived from the first member, methyl, CH,, by the continuous addition

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uf methene, CH,” ; and as the paraffins can be regarded as derived from the first member, methane, by the substitution of C,Ho.4, radicles for hydrogen, we have the following constitutional formule for the four first members :— Methane…CH, , Ethane…..CH;.CH,

Propane …CH3.C,H,=CH;. CH,. CH3 Butane…..Ci,. C,H, —CH,. CH,.C, |H,=CH,.(CH,),.CH,

Thus, with the increase of the number of atoms in the molecule we have an increased number of hydrocarbon radicles coalescing to form the paraffin; in other words, we have increased complexity of structure, and thus the possible modes of arrangement, or the possible number of isomerides (see p. 550), becomes greater as the number of atoms becomes greater. The thrce first members, as will be seen from the above formuls, can only be written in the manner shown, and no isomerides exist. The fourth member, butane

or tetrane, as already shown, when treating of isomerism (p. 550), can be written in two ways, and two isomerides are known. Similarly there can be three pen- tanes, four hexanes, six heptancs, &c.

It has been found by Schorlemmer that all the paraffins of which the constitution is known can be classified under four series, viz. :—

1. Normal paraffins, in which no carbon atom is combined with niore than two other carbon atoms. (See formule above.)

2. Lsoparazjins, in which one carbon atom is combined with three others. Typical formula :—

HC ok

m Hom+y

Colle pti

3. Neoparafins (Odling), in which one carbon atom is combined with four others. Typical formula :— CrHon ty plisp+y – CHaet 4, Mesopara fins (Odling), containing the group [HC(CH,),]' twice. Typical formula :— HO(CHs)

CpHyp HO(CH;),

With regard to the general properties of a paraffin, as compared with those of its isomerides, it has been observed that the boiling-points and specific gravities of the normal compounds are higher than those of the isomers. 'With respect to chemical stability, the normal paraffins are more difficultly decomposable than their isomers.

The following list contains the names, formule, boiling- points, and specific gravities of the most important paraffins known at the present time :—

NORMAL PARAFFINS.

an Names | Formula, Boiling-points. oo Methane… Cll, Ethane…….| CH .CH, Gaseous. Propane:....,.:. CH; 'CH, .CHg Tetrane……. CH. (CH,)..

CH, IMG, “600 at 0°C. Pentane::..... ee (CHy)3.CH3 37° — 39° | 628 ,, 18° DRUGS <1 1c HReonceeee H,.(CH,),.CHg 69°-70° | ‘663 ,, 18° Heptanesnu... CH (CH Ke CHs 98°-99° | 691 ,, 18° OStBBRs. 60.000... CH, (CH,),CH, | 123°=125° | ‘716, 16° Nonane..... CH; (CH,),.CH, 147° —148° | 728 ,, 18° Décane.....: Cy (CHy).. CH. 166°—168° | °739 ,, 13° Endecane.....| CH .(CH»)y.CH, | 180°-184° | *765 ,, 16° Dodécane..... CH3.(CH.),9-CH3 | 202° 774 4,17 Tridecane..... CH3.(CH,),;.CH, | 216°—218° | *792 ,, 20° Tetradecane... | CTII3.(CH»)y9.~~CH3 | 236° — 240° 2 Pentadecane….) CH .(CHy)j3.CHs | 258°~~ 262° | ‘825 ,, 16° Hexdecane…... CH3.(CH,);4.CH, | 278° Solid.

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ISOPARAFFINS. Names. Formule. yen Lteirhel CH, Isotetrane or sma me- Hod cH, |-15°0. | thane.. pees OAN CH, CH, {sopentane or ethyl-dime- Hoc) CH, 30° 1 thyl-methane ……...+e+00 CH, CH, (Propyl-dimethyl- HCJCH, | 62° | 701 at 0°C methane …..445 CH Isohex- A id anes | Diethyl- methyl- Ho) CH , ‘ methane?..... CH, ; 1) or Tetryl-dimethyl- 3) ro) CH, | 90° | 683 at 18° methane …..... CH, CoH, [sohept- J piethyl-methane…| HC} C,H, | 96° | 689 at 67° anes 0H, Propyl-ethyl-me- HC ay A ; thyl- methanel… CH,’ } | OFl !Tsooctane or oe HC thyl-methane ….....

| [er 1 These compounds have not hitherto been obtained, but are intro-

duced in order to illustrate how the “ constitution” theory of isomer- ism enables the existence of new compounds to be predicted with considerable certainty.

I co

NEOPARAFFINS.

pai Boiling- | points,

Names. Formula, ainiaes gray. _

9°B°C. 3

Neopentaue or tetramethyl- O METHANE 06… scsceerserseres

Neohexane or conenail co) CH, ethyl-methane ….....5 C

Trimethyl-pro- pyl-methane?

Neohept- anes

86°-87°

Diethyl-dime- 0 thyl-methane | oe

3

2 See note to last table,

696 at ae

. MESOPARAFFINS, | ames Formate, | Boting- | Specie Meso-hexane or tetrame- Palisa 59°C.| 670 at 17° thyl-ethane vrsrccrercererercce HO(CH,), : (at iia P ihyl-tebonah ate (CHa)) }: 110”. 1-698 wi 16° | \HC(CH,), | HOC, “tm tr | | QB | ase [atte HC(CHs), HC(CHg)q | Mesodesane ovtetame: | ¢ (bai, | ase | rar ae HC(CHs),

a

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[ORG ANIC.

We now proceed to give a few methods of preparing some of the more important paraffins, which methods do not come under the previously described general processes of formation.

Methane.—This hydrocarbon is found as a constituent of coal-gas where it is produced by the destructive dis- tillation of coal. It is formed synthetically by passing a mixture of carbon disulphide vapour and steam (or sul- phuretted hydrogen) over copper heated to redness in a

tube :— CS, + 28H, +4Cu=CH,+4Cus.

Tetrane may be prepared by exposing ethyl iodide over inercury to the action of sunlight :—

Isopentane (ethyl-dimethyl-methane) is formed by the dehydration of amyl alcohol by means of zinc chloride.

Neopentane (tetramethyl-methane) is prepared by the action of zine-methide on trimethy~~iodomethane (katabutyl~~ iodide) :—

20(CH,)I + Zn(CH,), = Zul, + 2C(CH,),.

Hexane is produced by the action of lrydriodic acid on

benzene at 280° :— C,H, + SHI =C,H,,+ 41,.

Ifeso-hevane (tetramethyl-ethane) is formed by the action of hydriodic acid on pinacone a substance having the

formula HOC, |

HOC,

produced by the action of sodium amalgam on dimethyl ketone in presence of water.

Isoheptane (tetryl- dimethyl-methane) is produced by the action of sodium on a mixture of the bromides of ethyl and amyl.

Solid Paraffin is, when purified, a white oan sub- stance, melting between 40° and 60°, and boiling about 370°. It is contained in the tar produced by the distilla- tion of Boghead and cannel coals, and is probably a mixture of several of the higher members of the C,H o,4, series.

Second Series, C,,H»,.—Olefine! Series.

General Properties.—These hydrocarbons furnish a good illustration of polymerism, as they form a series which is both homologous aud polymeric. Being unsaturated com- pounds, they act as dyad radicles, uniting with Cl,, Br,, O, HCl, HBr, HI, ClHO, &c. The haloid compounds of the olefines treated with alcoholic potash give up one halogen atom and furnish mono-haloid derivatives :—

C,Hontla, + KHO = C,H, 7a + KHa+ OH,. These mono-haloid olefines can again combine with Ha, and again lose Ha by the action of KHO :—

C,H ya. Ha, + KHO = C,,Hy,~-.4a, + KHa + OH.

Di-haloid olefine. In this way 3,4…... atoms of hydrogen can be replaced by Has, Ha,, Ha, atoms of halogen, and the final product can again unite with //a,, forming a per-haloid paraffin deriva-

tive. For instance :— O.Cl, + Oly = /C,0h; Tetrachlorcthene. Hexachlorethane,

The compounds of olefines with hypochlorous acid yield the corresponding alcohols by the action of nascent hydrogen :—

C,,H,,CIHO + H, = C,,H.,4,.0H + HCl.

1 So called from the oily liquids which these hydrocarbons produce when combined with chlorine,

Many olefines combine with sulphuric acid, forming ethereal salts, which are converted by the action of water into sulphuric acid and the corresponding alcohol :— | Og LL SO, = C,H. sO). C,H5,4;HSO, + H(HO) =C,,Hn+;,OH + H,SO,.

General Methods of Formation.—1. By heating the C,Hon4,OH alcohols with dehydrating agents (H,SO,, ZnCl, , &e.) :-—

Cr OH = OH, C,H,,. 2. By electrolyzing C,,H,,(COOH), acids :— C,,Hon{(COOH), = C,,Hon + 2CO, + Ha.

3. By heating N(C,,Hon+,),HO amines :—

N (CrHon41)sHO =N (C,,Hon4a)3 + C,H OED.

4, By the action of copper-coated zinc foil (Gladstone and Tribe's '"copper-zinc couple") on the corresponding dibromides :—

C,,H,,Br, + Zn = ZnBr, + C,, Hon –

Tsomerism.—The isomerides of the olefine series have been less completely investigated than those of the paraf-

fins. The formula of the first member (ethene) might be written—

CH, —CH, CH,

or or |

CH, —CH, =CH

The first is probably the radicle in the free state, and the second the radicle in combination with Cl, Br, &ce. The third formula represents a compound unknown im the free state, but known in combination. While the normal series are known as ethene compounds, the isomeric series are known as ethidene compounds,

Similarly there may be 4 propenes, 9 tetrenes, &c.

The following is a list of the C,H,, hydrocarbons known at the present time. An idea of the general physical pro- perties will be obtained from the table.

ErueNnr SERIES OR OLEFINES.

Names, Boiling-points.

Formule. Ethene or cthylene……. Cae, Gaseous Propene or propylenc…….++ C3H, -18°C. SMGtTeMG) OF TEtRV LENG ...c0cnicss oe C4Hs 3° Pentene or amylene ……. C5Hy9 35° Hexene or hexylene ……. CgHye 65° Heptene or heptylenc…… C,Ay4 95° Ottend or,octyleme . sa… crcesmnas gtlig 120° Nonene or nonylenc …... ..... ‘yHyg 140° Decene or paramylenc…… 10 Heo 160° Pentadecene or triamylenc…... 154139 248° Iiexdecene or cetene…… Cipla, 270″ Vigintenc or tetramylene…... notLao 390° — 400° Heptivigintene or cerotenc…... Cop Has ? melts at 57° Trigintenc or melene……. go tLeo yar (i) gg wee

The numerous isomerides of the higher members of the series cannot be described within the limits of the present article.

The first member, ethene, is a colourless inodorous gas, which can be condensed by cold and pressure. It burns with a brilliant flame, and is the constituent to which coal- cas chiefly owes its luminosity. Several olefines can be synthesized from other hydrocarbons; propene, for in- stance, by passing methane and carbon monoxide through

a red-hot tube :— ~ 2CH,+CO= OH, + C,H,.

Third Series, C,Hon~9 +

General Properties —These hydrocarbons are capable of acting as tetrad radicles uniting with 4 atoms of Cl,.Br, i&e., and producing tetra-haloid paraffin derivatives ; or the

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combination may be limited to 2 atoms, thus forming di-haloid olefines. Similarly they can combine directly with one or two molecules of haloid acids, producing C,Hon fa, or C,H,,a,. These combinations show their relations to the olefines and paraffins. Their relation- ship to the latter parent hydrocarbons is further shown by the ultimate action of chlorine :—

Oia, Cly=O,H,,-40: O’u,,..cl. + Ch =“C.H,.0..

Perchlorinated paraffin.

General Methods of Formation.—1. By the action of an alcoholic solution of potassium hydroxide on mono-haloid olefine derivatives :—

C,H,,-,4a + KHO =C,Ho,-9 KHa OH, . 2. By the electrolysis of C,H,,. (COOH), acids :— Cr gen(COOH), =C, Mg… 2C0, + H,.

The following isa list of the hydrocarbons of this series :—

ETdINE OR ACETYLENE SERIES.

Names. Formula, Boiling-point.

Ethine or acetylene…... ...| C,He Gaseous Propine orallylenc……..... C,H, oe Tetrine or crotonylene…....) C,H, 18° € Pentine or valerylenc…..... O;Hg 45° Hexine or hexoylene…..... CeHio 80° Heptine or ceenanthylidene…! C,H, 107° Octine or caprylidene…... ive|) CO adadigs 133° Decine or decenylene…..... oFis 165° Pentadecine or benylene….. ystlog 258 Hexdecine or cetenylenc….. 6H 39 289°

But few of the isomerides of this series are known. Diallyl, CgHyy (b. p. 59° C.), is isomeric with hexine, and rutylene, CyyHy (b. p. 150°), with decine.

Ethine or acetylene may be formed directly from its elements by causing the electric are to pass between poles of dense carbon in an atmosphere of hydrogen. It is formed also by passing a mixture of methane and carbon monoxide through a red hot tube(CH, + CO =C,H, + OH,), by passing chloroform vapour over red hot copper (2CHC1, + 6Cu=3Cu,Cl, + O,H,), and by the imperfect combustion of most organic compounds. thine is a colourless, incon- densable gas, having a characteristic odour. It is absorbed by an ammoniacal solution of cuprous chloride, forming a red precipitate of cuprous acetylide, (C,HCu,),O, which when heated with HCl furnishes pure ethine, so that this is a convenient method for purifying the hydrocarbon.

Ethine can be made to combine with nascent hydrogen with the formation of ethene: C,H, + H,=C,H,.

Fourth Series, C,pHon—, –

The hydrocarbons of this series may be conveniently divided into two groups. The first, consisting only of one member, pentone or valylene (C,H,), is related to the pre- ceding series of hydrocarbons, since, by the addition of bromine the hexabrom-paraffin C;H,Br, is formed.

The other group is composed of decone (C,)Hig) and a series of hydrocarbons known as terpenes, having the gene- ral formula C,,)H,,, and found in the essential oils of various plants, chiefly of the orders Conifere and Aurantiacece.

Ternencs.—These hydrocarbons are found in the wood, leaves, &c., of Coniferous trees, and in the essential oils of lemon, lavender, bergamot, juniper, &e., &c, Many of these oils contain oxidized bodies besides terpenes. The terpenes possess very similar chemical properties, differing chiefly in their boiling-points (which range from 160° to 176°C.), specific gravities, and action upon a ray of polarized light,

thus furnishing a good illustration of physieal isomerism (sce p. 550). They are generally elear, highly refractive liquids, possessing charaeteristie odours, and easily poly- merized by the aetion of heat, H,SO,, BF;, &c. Several polymerides exist ready formed in oils of eopaiba, eubebs, &e, The terpenes are eharaeterized by the extreme readi- ness with which they undergo isomerie ehanges under the influenee of reagents. They act as unsaturated eompounds eombining with at most four monad atoms. Thus, they eombine with HCl, forming sueh eompounds as C,,H,,Cl, C,,H,sCl,, and some terpenes ean be made to combine with water, forming sueh bodies as C,)H,O0., C,)H,,0, and C,)H,,0, which, in eertain respects, resemble aleohols. The best known terpene is turpentine oil, whieh is obtained from the resinous exudation of eertain Frenel and Ameri- ean species of Pinus and Abies.

Camphor (C,)H,,0) is an oxidized compound elosely allied to the terpenes contained in the leaves of Laurus Camphora. .

The relatiouship of the terpencs to the group of aromatie hydrocarbons is shown by the production of cymenc (C,,H,,), a member of the C,H,,_. or benzene series, from turpentine oil and camphor, by the action of certain re- agents,

Fifth Series, C,Hon—g—Benzene ov Aromatic Series.

The general charaeters of these hydrocarbons, as com- pared with the preeeding series, have been previously eon- sidered (p. 552).

Occurrence.—Small quantities of these hydroearbons are found in petroleum, but the ehief source is the tar obtained in the destructive distillation of coal for the manufacture of eoal-gas.

General Method of Synthetic Formation.—By lieating a mixture of a mono- iodated paraffin and a brominated ben- zenc hydrocarbon with sodium :—

(Cie Ue 2 Cree ~ (64-m) BE mn a Nag, = Cr lona(gtwy Calton ce a (Nal). a (NaBr) me

Formulation and Isomerism of Benzene and its Deriva- tives.,—Like the paraftins, the C,H, hydrocarbons form a parent series giving rise to a vast number of derivatives, and just as the higher paraffins ean be regarded as formed from methane by the substitution of C,H,.,,, radieles for H, so the homologues of benzene can be considered as derived from this latter hydrocarbon by similar substitu-

tions, Thus— = q an (Cl GH, C.HiCrneehs C,H,-C,H, = C,H,, Benzene. Methyl! benzene. Ethyl benzene.

OoH,.C,H, = CoHy,

Propy] benzene. The syuthesis of benzene from ethine has already been alluded to (p. 552). In accordanee with this mode of for- ination, the structural formula of benzene may be written—

H II C—C p? 3 H—C! sC—H Wik C=C

YX H H

This formula, as will be scen on iuspeetion, is in accord- anee with the faet that benzene ean aet as a hexatomie radiele, eombining direetly (though with diffieulty) with 6 halogen atoms. Owing to the complex strueture of the ben- zene molecule, an immense number of isomers are eapable

of existing. A few of the most important cases may be here elueidated.

Let us, in the first instanee, suppose one atom of H to be replaeed by another element or radiele. Suppcsing (as there is at present no reason for doubting) that all the H and C atoms in the molecule have the same property, it is obvious that there can be no isomer of a mono-substi- tution derivative, and thus we know only one methyl ben- zene, chlorobenzene, nitrobenzene, é&c.

Passing on to the poly-substitution derivatives, we have several possible eauses of isomerism, Thus, the H atom may be replaeed by one radiele, or more than one H atom may be replaeed by an equivalent number of radieles, furnishing the same total number of C and H atoms. For instance —

H iE | | | C—O C—C a a. 4a * HO ae ac Han ee case C=C C=0 lawl al CH, CH, » CD,

Dimethyl-benzone is metamerie with Ethy]-benzene,

Similarly diethyl-benzene is isomeric with tetramethyl- benzene, &ec., &e. Another cause of isomerism is to be found in the C,H,,,, or other radicles replaeing the H in the benzene moleeule, since these radieals themselves admit of isomerie modifications, as has already been seen when the paraffin series were diseussed. Thus, we may have— C,H,.C,H, and

O,H,;.CH(CH,),. Propyl-benzene. Pseudo-propyl-benzene. With regard to substitution derivatives of the homologues of benzene, the H atoms may be replaeed either in the benzene inolecule or in the radiele ; thus— CAC) ..CH, CMF. ‘CEC!

Methyl-chlorobenzene or : Chloromethyl-benzene monochlorotoluene ‘i is metamerie with { or benzyl! chloride.

Another cause of isomerism depends on the relative posi- tions of the replaced H atoms of the benzenc moleeule, Thus, there can be only one of eaeh mono-substitution derivative, because it is immaterial whieh of the six H atoms is replaced. Di-derivatives eontaining two atoms of the same element or radiele are eapable of three isomerie modifications, aeeording as the replaeed atoms are those numbered in the graphie formula 1 2 orl 3o0rl 4. All other arrangements will be found on trial to be redueible to these (X representing the substituted element or radiele)—

Benzene. Ortho-di-derivative. Meta-di-derivative. Para-di-derivative.

C,HHERAH C.XXHAEE C.xXUXHAA C.X RXTE

Woo) 24) ie, 1 3.4 65 6 Wp ry Yh te 23 45 6

In like manner there ean be three tri- or tetra-derivatives, and only one penta- or hexa-derivative, when the H atoms are replaeed by the same element or radiele.

When the H atoms are replaced by three or more different elements or radieles the possible number of isomerides is greater than when replaced by the same uumber of similar elemeuts or radieles, because the arrangements of the latter with regard to one another are then eapable of variation. Thus, there can be only three di-derivatives containing two different elements or radieles XY, bceause the reversal of their order does not affect the relative posi- tions of X to Y. But when three H atoms are replaced by XXY elements or radieles we may have, for every iso- meride depending on the relative position of AXY to one another and to the remaining H atoms, eorresponding iso- merides depending on the order XYX. The same reason- ing applies to the higher derivatives.

The following is a list of the hydrocarbons of this series :—

HYDROCARBONS. | CHEMIS TR Y 56] AROMATIC OR BENZENE SERIES. Names. Formule. Boiling-points | CsH, CHENG. os ccks cee cee sev osese penne C8) cer ee (Oph: yn onoN Oe eae SiC. C,H; Meth) benzene onmtoluene….211..1 seneeeneeeeereereeeee C,H,(CH) iL POU DOR ACHE. .ocseivecss ons esee++ scl cgullaleeateeeelceeeteee CATE ties yn ten esvce ead 133° C,H : Orthoxylene…..... OFA) Us cage canoer 140° – 141° g”10_-) Dimethyl-benzenes or xylenes { Metaxylene …..... C, (CH,)H(CHs)Hy …....0.. 187° – 188° Paraxylene . .| C,(CH,)Hp(CH,)Hy …....4.- 139° Bropylbenzener s…cihcsteioe ee CAMP C ale eas pos seseautenn ssvnce 157° | Reel pro py Vet zentO! i sa.satecret ew tcedssancesdceccuenecereen CRETE CHING I pets ner occ sy soe 0s 13 CoHyg + Methyl-ethylbenzene a COICO vce cscs suis 159° 1 res F SOUCOCUTMCIO .....55 ccasisceeonens C,(CHs)H(CH,),H, .. 166° | Trimethylbenzenes Ryle cc. cccccscccccocsesea CCH ICE HOH, iT 163° (MVE OMS Fie civseevinn vensma svn cnnviiensi eases sae ean ace ees GLAS Gite (C15) igaemeemersecan 159° – 161° [ebm BO SCALIA ea yisaccesace eves cn tinntyooneciorances oxvnte (Jel (Cis) (Cale leon unondonceonc 178° — 179° J Methyl-pseudopropylbenzene or a eymene …....06+ (Glo l ClB ls (CEL (ClBle”>CIBU Cals ls) one canc canoe: 183° – 184 | Diethylbenzene …..... ode e anneneeacerstirnoesacasacsanncecas CPOs lp cess eseiieed cane sais 178° -—179° letramethvibenzene ou durene: 2. ..anesssceesesaeeses se sear) Cell (OM) yitensssierces es cnieselene | 1g9°= 191° S@ammyMeMeeney neha es ccciisceissn scans estecvoeaains aevevoneue (CASI (OH {CIE Lally son sgnean sooanc ORs Cy,Hig 4 Methyl-diethylbenzene or diethyl-toluene…...,..... CaHg(CHy) (Cols) .....00c000s Wyss Dimethyl-pseudopropylbenzene or laurene …..... O,H,(CH;),.CH(CHs3),.. .| 188° Cool, My cay Mee rettes so. nuscenenecccnsccnca css cnctoanseorens C,H, (CH,).C,H.(CH 3), ...| 213° CisHgy, Dimethyl-isoamiylbemzeme: .....1.0..0sesseecennevesesness …| CgH3(CH3)..C3H;(CHa),.....| 283° y | Other hydrocarbons compounded of benzene residues ‘ —— ames. Formule.

and C,,H,, 1, &c., radicles are known. Dipropargyl, C,H, (b.p. 85°C,), is a substance isomeric with benzene, having the formula HC = C—(CH,),—C

=CH. The hydrocarbons of the benzene series are all colourless liquids (dwrene is solid), having peculiar and characteristic odours. By the action of oxidizing agents aromatic hydrocarbons of the general formula CgH, —= (CnHon+1)mare ultimately converted into acids of the general form C,H,_»(COOH),,. Nitric acid gives rise to the formation of nitro-derivatives CrHon—(g4m)(NO.)n- Sulphuric acid (concentrated) forms sulphonic acids C,Hn—(G4ny(HSO3)n- The halogens pro- duce substitution derivatives C,H. _ (g1m)f/¢m, the parti- cular metameric modification formed being often deter- mined by the temperature at which the halogen is made to act. Benzene, toluene, &c., are formed by heating their corresponding acids with lime : C,H, — (COOH) — CO, = Cron —¢-

The remaining series of hydrocarbons are as follows :—

| Names. Formule. CuH on—g . MORGIOE 0.0, .ccseecsetones one Cs Hy Cinuamene or styrolene…... Cs, Hy =C,H.,C,H, PNUISDOMZEME .... cen. sec ecnecs Cy Hy) =C,H;.C3H5 Phenylbutene…....., CypHyg=C,H,. CH, Tetrahydronaphthalene…..... CyoHy.=CjoHs. Hy Ethinylbenzene or acet- = enylbenzene ….....5 Cy Hyg =CgH;. CoH

Dihydronaphthalene …..... Catlins Ciglts: He

Cholesterenes…ccccc.. ceoneeers optlas

| CnHon—19-

MP PUR AICTION 6… .receseeess C,H Methylnaphthalene …..... ©), Hy = CyoH,. CH Ethylnaphthalene….....| CipHy,=CioH7. C2 Hexa-hydroantliraeeue …... Cy Hig = Cy Ayo H,

(hla lease | MOR siniasssseceveisrsensese CoE) = CeHs. CH, PCC MANU NEMO Garis. siece se ceer es. Oyo =Crolte Coy Diphenyl-methane….....] Cigllis =CHo(CgHs)o Dibenzylor diphenyl ethane | C,,H,y=C,H,4(CeH;). * 4 CH, IDINeollyll cuspagbopegaee sodecoeacnaas Cash a= ‘ ame Phenyl-tolyl-methane or = he 5 Benzyltoluene…..... ae Seb Ae C,H(C3H,)

ee TE I nN

Benzyl-ethyl-benzene C,H e= C.H Cr He Gk.

Benzyl-xylemes……..0-2.000- Cipllie= Coll: CHL CN Cis, Dimesity] methane CFL. c| ees SILYI NCTUANE .....- eases | i9t4o4 2 CH (CH.), CrHan—ig : LPlinaniehayele Goon gammoeonceROcOTsenee CigH},=C,,H,.CH, Stilbene or diphenyl-ethene| C,,4H),.=C,H.(C,H;), Dihydro-anthracene… ..... | Ci gHy,=C, 4H). He Hexa-hydropyrene… ..... | OygHyg =CygH jo. Hg CnHyn—19- 7 HC—C,H AMUWOMENCSE.....s10000000000 Cia on COs, HC—O,H, Piremamtlimenem na. scsesesi. cere Cakly=eul & HC a, O_Cal,

Tolane or Diphenyl-ethine | C,4H,)=|||

C—C,H, ss celta Cy6Hy y= Cy Ha(Clls). {| Cysts = CieHlo(CH),

Dimethy]-anthraeene Tetramethyl-anthraeene or Retene

Cal on—29 . C,H, 4= HEC

Naphthyl-pheny] methane.. Cells

C1 oH,

CrHon- 22° IPAVAIGIING, cpnoooubueuaadoeconnancccn: Diphenyl-diethine or di- aeetenyl-benzene Diphenyl-benzene Triphenylmethane….....

7 CyHyn—og | CHIPYSENE.....05.dseune sees one !

Cigtlio= Cio Hg (CoH) Cygll i) = C,(CgHs)e

C,H y= CH y(CgH5)e Cig Hig= CH(C,H5)3

Coens | DTG pi vcsas cs ave aster senee

Cn Hyn—39 .

GHANIAN. GaSoneene souseesnonon ec (Oppel Triphenyl-benzene…..... Cy4H

Ono | |

14

18— Cell,(CoHs5)s

The hydrocarbons benzene (C,H,), naphthalene (C,9I1,), anthracene (C,,Hj,), chrysene (C,gHj,), and idrialene Vv

_— 7!

& ive

062

(C,.H,,) are noteworthy as forming a homologous series, the successive terms of which differ by +C,H,. These compounds present certain analogies in their chemical

behaviour, and are particularly characterized by their giving rise to gwinones when oxidized. In the formation

Oz a of a quinone H, is replaced by O, (nm) ; thus—

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¢ ~1 7] weigite, is ine bo id ur

Pyrene (C,,H,)), although not a member of the series, furnishes a quinone on oxidation. Benzene does not yield a quinone by direct oxidation.

The relationship of the second and third members of the series to benzene will be seen from their graphic formulae :—

H | C H H H H H—C C—H | | | | é C C C C C—il 7 ™* 7 % a ae ed H—C C—H ae C – CH— H—C C) | | | | I Hi—C C—H H C C C—H H—C C C

—H. \ rd ‘Ss a a \ i % vA C C C C C | | | H H H i H Benzeuc Naphthalene. Anthracene.

The hydrocarbons, being the parent compounds of the remaining organic bodies, have been treated in greater detail than is necessary in the case of the other families.

IT. Anconots. Formulation and Classification.—It has already been

|

pointed out that alcohols can be considered as derivatives of hydrocarbons by the substitution of hydroxy] for hydrogen, and, consequently, as compounds of hydroxyl] with hydro- carbon radicles (p. 553). Each series of hydrocarbons can thus be supposed to give rise to a corresponding serics of alcohols :—

CoH sats CnHyn CHa 4 | CrHyray oe OHant, HO (CnlIpn)”(HO), Ch Hon —3- HO (OnHon—,)”(HO), oh sa = C0) ntlon—y (CnHon—,)’”(HO), | n Qn—p: CnHyn—g(HO),

(CrHgn—1)””(HO), |

Alcohols containing 1, 2, 2 semi-molecules of hydroxyl are said to be monohydric, dihydric, n-hydric. dric alcohols of the ethene series are termed glycols. Alcohols derived from unsaturated hydrocarbons act as unsaturated compounds.

Serves C,Hn4;- HO.—Some of these alcohols (derived from paraffins) have been previously quoted in illustration of homologous series (p. 552), The first member, methyl alcohol (CH,HO), is termed carbinol, and the remaining terms can be derived from this by the replacement of H

by C,,Hon1, radicles. Thus,— CH,HO C(CH,)H,HO O(C,H,)H,HO. Methyl] alcohol or Ethyl alcohol or Propyl alcohol or Carbinol. Methyl carbinol. Ethyl carbinol.

Since the paraffins can be formulated as derivatives of metnane (see p. 556), aud the present series of alcohols as derivatives of paraffins, it follows that these alcohols can be likewise regarded as methane derivatives :—

H i (CH, CH, C,H,

H AYE Sa An Sa Clo @ in | eee Coa Cs A

H HO | Ho HO HO

It will be convenient to distinguish the carbon atom in combination with hydroxyl as the “ typical carbon atom.”

The higher members of the series are susceptible of several kinds of isomerism, which may now be con- sidered. Passing over the first two members, which are not capable of being formulated in more than one way, the third member (propyl alcohol) may be written as—

C. C,H, . H, . HO C(CH,),H . HO

yl carbinol. Dimethyl carbinol.

or

Thus, the first kind of isomerism consists in the replace- ment of one C,,H,,,, radicle by two others, each containing

The dihy- |

(CyrH on—s)*(HO); |

/a smaller number of carbon atoms. The fourth member of the series (tetryl or butyl alcohol) may be written :— C.C,H,.H,.HO C(CH,)(C,H,)H.HO C(CH,),.HO

Propyl carbinol. Mcthyl-cthyl carbinol. Trimethyl carbinol.

The next kind of isomerism, as exemplified by the third of

the above formule, consists in the substitution of three

C,,H.,,4, radicles for the three hydrogen atoms of carbinol.

Now, as carbinol contains but three replaceable hydrogen atoms (not regarding the atom contained in the hydroxyl, the replacement of which gives rise to a new class of com- pounds), trimethyl carbinol is the type of a series of alcohols, in which the number of C,,H,,;, radicles com- bined with the typical carbon atom is a maximum. The isomeric alcohols of the present series can thus be con- veniently classified under the three following groups :—

1. Primary alcohols, in which the typical carbon atom is combined with but one other carbon atom—

C(C,Hon4;)H,.HO.

2. Secondary alcohols, in which the typical carbon

atom is combined with two other carbon atoms—

C(C,Hon)gH-HO.

3. Tertiary alcohols, in which the typical carbon atom

is combined with three other carbon atoms— C(C,Hyn4,)y-HO.

Another cause of isomerism among alcohols is to be found in the constitution of the C,,H,,,,., radicles (sce also p- 550). Thus we may have—

C.C,H,.H,.HO C.CH(CH,),.H,.HO

Propy] carbinol. Pseudopropyl carbinol.

C(CH,)(C,H,)H.HO ,, C.OH,{CH,.CH(CH,),JH. HO

Methyl butyl carbinol. Methyl] isobutyl carbinol.

Each of the three above-named groups is thus capable of a ‘further division into two sub-groups, such as normcl

isomeric with

ALCOMOLS. |

primary and iso-primary, normal secondary and 1so- secondary, &e., &c. In the higher members a further number of isomeric modifications become possible. Many of these isomeric alcohols are known, but a large number

have yet to be discovered to complete the series. The following is a list of the normal primary alcohols :— | Names. | Formule. | Boiiing-points. | Methyl alcohol……..... | CH,HO 66° C. ae C,H,.HO 78°-4 Propyl ne. Sdopedectoort C,H, HO 97°°6 Butyl Ay can enaner C,Hy. HO 116° Amyl Nie Se eee C;H,,.HO 137° Hexyl Re me erste C,H,3. HO ili 0 Ue eereeroce C,H,;. HO 176°‘5 it C,H. HO 196°°5 Nonyl Hi WuoncdaraaKe Cy Hy9- HO 200° ? oe Comat | 50° Ceryl Pare ee. Cy, Hig O 72) maine: | Melissyl 5,0 ..seeee. ‘solle; HO gee) Pols

These alcohols (up to nonyl alcohol) are limpid liquids, the viscidity of which increases with the molecular weight. The three other members are white crystalline solids. Methyl, ethyl, and propyl alcohols are readily miscible with water, the remaining members are more or less of the nature of oils. Most of these alcohols possess peculiar and characteristic odours. The boiling-points of the isomers are gencrally lower than those of the corresponding normal alcohols.

The normal and iso-primary alcohols can be obtained from the corresponding haloid paraffin derivatives by the action of potassium hydroxide :—

Normal primary..C,, H»,4,Ha + KHO= © Hi, HOrneia. 1s0- primey. csc. «eens (CH, CH(CH,),.2a+ KHO = (CH,),CH(CH,),. HO+KHa.

Likewise by the action of nascent hydrogen on the corre- sponding normal primary and iso-primary aldehydes :—

(C,,Hon41) COH + H, = CnHon41-CH,. HO.

The synthesis of alcohols from the corresponding olefines las already been alluded to (p. 559). Since ethine can be formed directly from its elements (p. 559), and ethenc from ethine (p. 559), it is obvious that ethyl alcohol can by these means be formed synthetically.

Secondary alcohols are produced by the action of nascent hydrogen on ketones :—

CO(C,Hon41)9 + Hy = C(CrHanti)oH.HO.

Tertiary alcohols are prepared by the action of organo- zine compounds on the chlorides of acid radicles, C,Hons-COC!, and treatment of the product with water.

The metamerism of the three groups of alcohols is strikingly displayed by their behaviour on oxidation. Thus, primary or iso-primary alcohols are oxidized first to aldehydes—

(C.F,)CH,.HO +O= (Ca COM + OF, ; Alcohol Aldehyde. then to acids containing the same number of carbon atoms— (CB.)COM + Oe Ciliga, COOH . Aldehyde. Acid. Secondary alcohols are oxidized first to ketones —

C(C,Hynsy)sH-HO + 0 = CO(CpHont1)2 + OH; Alcohol. Ketone.

then to one or more acids containing a smaller number of carbon atoms than the aleohol— S910).F,45))+°0= CH i COOH + Cal. Ketone. Acid. Acid. Tertiary alcohols are probably first oxidized to ketones,

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and ultimately to a mixture of two or more acids contain- ing a smaller number of carbon atoms than the alcohol.

By particular reactions an alcohol of one group can be converted into an isomer of another group, such, for instance, as normal primary butyl alcohol into the iso- primary alcohol, and the latter into the tertiary alcohgl.

In many of their reactions alcohols are the analogues of water; for instance —

HHO + K = KHO+4H Water. Potassium. eee C,H,.HO + K = ©,H,KO +H. Ethyl Potassium alcohol. ethylate. In other reactions they resemble metallic hydroxides :-

KHO + HOM = KO) + Om Potassium Potassium : hydroxide. chloride.

C,H,.HO+HCl = C,H;.Cl + OH, Ethyl alcohol. Ethy!] chloride.

Of this serics the best known members are methyl and ethyl alcohols. The former (or “ wood-spirit”) is chiefly obtained from the crude “wood vinegar” produced by the destructive distillation of wood. Ethyl alcohol is common “ spirits of wine,” and is always procured by the fermenta- tion of sugar, which, in contact with yeast, undergoes the following change— C,H,,0, = 2CO, + 2C,H,;.HO.

Many of the higher members are formed by the fermenta- tion of grain, sugar-beet molasses, potato, dc. used orl consists chiefly of isomeric modifications of amyl alcohol.

Names et 7 Formula. Boiling-points. | Opals lpm gl AO VinyValeohol…..-:6.+.0.. C,H, . HO 2 U5 2 | ae oreo vine) Ogle. IO 96°C. | G. Tin, 29 HO” x | Propargyl alcohol…..... C,H,. HO 110°-115° | Borneol and camphol….| Cy)H;,. HO Jie |

Series O, Hon, HO, Phenols.—The alcohols of this serics bear the same relation to the benzene hydrocarbons that the ethyl series of alcohols bear to the paraftins. Thus these alcohols at once divide themselves into two meta- meric series according as the hydroxy] replaces hydrogen in the benzene or paraffin radicle ; for instance, methyl- benzene or toluenc (C,H;.CH,) gives rise to—

O,H,(HO).CH,; and C,H,.CH,(HO) . Cresol. Benzyl alcohol. The alcohols of the benzylic series(C,H, a \ ne ee n**2n+-] /m are true alcohols in their chemical behaviour, being formed from the haloid derivatives of their corresponding bydrocar- bons by theaction of potassium hydroxide, and being oxidized to acids containing the same number of carbon atoms. The alcohols represented by cresol, CO, Hien HO.(C, Hues as or phenols, on the other hand, act more like saturated compounds, and in some respects resemble acids. They cannot be directly obtained from their corresponding haloid hydrocarbon derivatives, and are converted by oxidation into quinones. The phenols yield substitution-derivatives by the action of halogens, nitric acid, &c.; such, for ex- ample, as— CHCl H@

Monochloro- phenol.

C,H,(NO,).HO , CsH,(NO,),HO ,

Mononitrophenol. Dinitrophenol.

GG. wo. ; Pentachloro- phenol.

C,H, (NO,),.1O.

Trinitrophcnol or picric acid.

The phenols yield sulphonic acids when acted on by strong sulphuric acid, C,H,(HO)(HSO,) , C,H,(HO)(HSO3,), ,

&e.; the metameric alcohols do not undergo an analogous reaction,

The homologues of phenol being di-derivatives of benzene are susceptible of the isomeric modifications already pointed out (p. 560). Thus there are known—

C.H,CH, 0,(10)(CH,) HHHH

Methyl-benzene Ortho-cresol.

or Toluene.

: HH(CH,)HH a eg eager ara-cresol,

Meta-cresol. Isomerism analogous to that exhibited by the derivatives of benzene and its homologues likewise extends to all the derivatives of phenol and its homologues. The following is a brief list of the compounds of the present series :-—

Alcohols.

Pere ee Sara

mance C,H .CH,HO | ee CyHay. CHaHO TPhenols.

| PiBHOL.. cc, C,H, HO | Xylenols, Phlorol, &c.,C,Hy. HO

| Cresols ……. CsHs(CH,).HO | Thymol, Carvacrol, C,)H,3.HO

The boiling-poiuts of the alcohols are generally higher than those of the metameric phenols.

Many of the compounds of the present series are trans- parent oily liquids possessed of powerful odours; others are white crystalline solids. Of the phenols the best known is phenol or carbolic acid, obtained from the acid portions of coal-tar.

Series C,, Hon — 9 HO comprises cénnamic alcohol, CyHy.HO, and cholestert, Cy,H4,.HO.

Series C,Hon—y3-HO.—Only one member is known, viz., naphthol, C,,H,.HO.

Series (C,,Hon)(HO)., Glycols,—Of these dihydric aleo- hols the terms corresponding to the first six members of the olefine series are known, and are named ethene glycol, propene glycol, &c. The glycols are colourless, viscid liquids, miscible with water. They are generally prepared by acting on di-haloid olefine compounds with silver acetate: C,H,,Bry + 2AgC,H;0, = C,H»(C,H,0,). + 2AgBr The resulting acetate is then heated with potas-

sium hydroxide: C,Ho,(C,H;0,).~~+ 2KHO = C,H,,(HO), +2KC,H,0,. The glycols are capable of existing in isomeric forms similar to those of analogous olefine com~~ pounds (see p. 559), but these isomers are at present but imperfectly known. A series of compounds known as polyethente glycols are formed from ethene glycol by con- densation, with elimination of water. Their general for- mula is 7{C,H,(HO).} — («~1)(OH,), where the highest value of 2 is 6.

Series C,Hyn—s(HO)., Dihydric Phenols.—The following are known :—

Pyrocatechin (ortho-), Resorcin (meta-), Hydroquinone!

(OTe) Noch cncuasestncaran ais SPORE Sow Seaside slow ian Meee tana CH,(HO), Saligenin, Orcin, Gusimeol vcs c.cccccceccssvsvevevesvenneseonve 7H,(HO), Xylene glycol, Creasol, Veratrol…….....scsssecessssseeeees C3H,(HO), Wi ydrothivangguineine …….....-sascouhnessauccseeeeeaae CyoH),(HO),

Many of these compounds can be formed by suitable reactions from benzene hydrocarbons, phenols, &c.; others are found ready formed in lichens, or can be prepared from substances of vegetable origin.

Series (C,Hon_4)””(HO); comprises propenyl alcohol or glycerin, C,H,. (HO),, and amyl-glycerin, C,H9.(HO), . Glycerin can be formed synthetically, but is generally a

1 The quinones are also closely related to ketones.

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[ORGANIC

obtained from glycertdes, a group of ethereal salts com- posed of glycerin and acids of the acetic and oleic series (see p. 572), which exist ready formed in most animal and vegetable oils and fats. Thus stearin (propeny] tristearate), a constituent of many natural fats, when acted upon by super- heated steam, decomposes as shown in the equation— C,H, (C,.H3,0,), + 30H, = C,H,(HO), + 3H.C,.H,,0,. Stearin. Glycerin, Stearic acid, Large

quantities of glycerin are obtained by this means. Glycerin is a colourless, transparent, viscid liquid of a sweetish taste, readily soluble in water, and boiling (under 50 mm, pressure) at 210°C. Polyglycerins analogous to the polyethenic glycols are known. a Series (C,,Hon_9)”” (HO), .—Zrihydric phenols comprising the isomerides pyrogallic acid (or pyrogallol) and phloro- glucin, C,H3(HO),. Series (C,Hon_»)”*(HO),.—Hrythrite, erythromannite or phycite, C,H,(HO),, and propyl-phycite, C,H,(HO),.

Serves (C,H5,~5)”(HO);.—Pinite and quercite, C,H,(HO), ; : é Series (CyHon_4)“(HO),.—-Mannite and dulcite,

C,H,(HO), , two natural sugars.

Sugar, starch, gum, &c., are members of a group of compounds termed carbohydrates®, which are closely allied to the present series of alcohols. The names, classification, and relationship of these bodies are shown in the following table :—

CARBONYDRATES. Saccharoses. Amyloses. Glucoscs. Polyglucosic alcohols. Poly glucosic anhy- Cgll20¢. n(CgH)20¢)—(n—1)(OH2) drides, (n=2). n(Cgl1} 905).

Dextrose or grape- | Saccharose or cane sugar.| Starch.

sugar, Lactose or milk sugar. | Inulin. Levulose. Arabin or gum-arabic. | Dextrin. Galactose. Melitose. Cellulose or lignin. Sorbin. Melizitose. Glycogen, Eucalin. Trehalose or mycose. Inosite.

Arabinose.

The glucoses exhibit the characters both of aldehydes and of alcohols; the saccharoses bear the same relationship to the glucoses that the polyethenic glycols bear to glycol; the amyloses are formed from the saccharoses by the elimina- tion of one molecule of water.

Many of the sugars are widely diffused throughout the vegetable kingdom —the sugar in ordinary use being obtained from the sugar-cane and sugar-beet. Dextrose and levulose are found in honey, ripe fruits, dsc., lactose in

milk, inosite in flesh. Gum-arabic is the dried exudation of certain species of Acacia. All the amyloses, with the exception of glycogen, which is found in the liver of animals, are of vegetable origin. Cellulose or lignin is the chief constituent of the cells of plants; starch is found in the cells of most plants. Gzmn-cotton or pyroxylin is obtained from cotton-wool, which is almost pure cellulose, by the action of strong nitric acid; it has the composition of trinitro-cellulose, C;H-(NO,),0;. Many of the varieties of the sugars are physical isomerides differing from each other only in their rotatory action on polarized light.

III. Hator Erurrs.

These conrpounds can be formed from saturated hydro- carbons, and from hydrocarbons which behave as such by the direct action of the halogen: —

C,Hiyasdt C10) Ey, CBE,

- So called because the hydrogen and oxygen are always present in these compounds in the proportions to form water.

5

HALOID ETHERS. |

The substitution can in many cases be continued atom by atom, till the whole of the hydrogen is replaced ; thus :—

NICHINGL GR paenepeeREEEee CHa” Wiener. s<.ccccss.ce: CoMg Bemzene…….+<. Cel Tetrachlormethane CCl, Nexachlorethane C,Clg Hexachlorbenzenc CgClg

The reactions are often accelerated and in some cases remarkably modified by light or heat. The presence of iodine, antimony, &c., frequently assists the action of chlo- rine. Chlorine is more energetic than bromine, and the action of iodine less energetic than that of bromine,—iodine, in fact, does not act directly on the paraffins. By the direct action of halogens on paraffins a mixture containing more than one derivative is generally obtained. Thus, when chlorine and methane are mixed and exposed to

diffused light (explosion takes place in direct sunlight), the whole series of derivatives CH,Cl, CH,Cl,, CHCl,, and CCl, are formed.

Unsaturated hydrocarbons first of all combine directly with a certain number of halogen atoms. In some cases the number of halogen atoms thus taken up restores the compound to the type of a saturated body:—

C,H, + Cl, = C,H,Cl, = ethene dichloride = dichlorethane. Ethene.

In other cases the restoration is not to the type of a

saturated hydrocarbon :—

Cy Hg + 2Cl, =C,)HgCl,, tetrachlorinated naphthalene, corresponding eines [to tyne C,Hisn—s.

The mono-haloid derivatives ot paraffins and some other hydrocarbons are conveniently prepared by the action of haloid acids on the corresponding alcohols :—

CH,.HO + HCl=CH,Ci+ OH,

Methyl Methyl

alcohol. chloride. Benzyl Benzyl alcohol. chloride

C,;H,(HO), + 11HI = C,H,,I + 51, + 6OH,.

Mennit ae

Polyhydric alcohols may by these reactions have their hydroxyl only partially replaced by halogens :—thus, by the action of hydrochloric acid on glycerin there are produced C,H,Cl(HO), (chlorhydrin) and O,H,Cl,(HO) (dichlor- hydrin).

The haloid phosphorus compounds act upon alcohols in a manner similar to that of the halogen acids :—

30,H,.HO + PBr, = 3C,H,Br + PH,O, thy]

Ethyl alcohol. nae ” C,H,(HO), + 2PCi, = C,H,Cl, + 2POCI, + 21101
Hthene glycol. dichloride. C;H,Cl,(HO) + PCI, = C,H,Cl, + POC, + HCl.
Trichlorhydrin Dichlorhydrin, or allyl

trichloride.

The haloid ethers are liable to the same isomeric modi- fications as their parent hydrocarbons and derivatives. The conditions which determine the production of any particular modification cannot in all cases be laid down with precision. For instance, the di-haluid paraffin deri- vatives obtained from the paraffins are in some cases iden- tical and in other cases isomeric with the corresponding compounds produced by the direct union of halogens with olefines. Again, the higher members of the paraffin serics when acted on by chlorine yield simultaneously two iso- meric (primary and secondary) mono-chlorinated derivatives. As a final example, when chlorine acts upon toluene in the cold chloro-toluenes (C,H,Cl.CH,, C,H,Cl,.CH,, &c.) are

1 The metameric phenol, cresol (p. 564), does not undergo a similar reaction,

formed, but when the action takes place with boiling toluene the substitution takes place in the methyl radicle, thus forming benzyl compounds (C,H,.CH,Cl, &c.)

Alcohols are reproduced from their haloid cthers by the action of KHO (see p. 563), or by first converting the haloid ether into an acetate of the radicle by treatment with silver acetate, and then acting on the acetate with KHO. The alcohols thus formed are similar in isomeric constitution to the haloid ethers from which they are obtained. For instance, (CH,),CH.I (pseudopropyl iodide) when made to undergo the reactions specified is converted into (CH,),CH.HO (pseudopropyl alcohol) (see also p. 563). Isomeric haloid ethers are thus named in accordance with the radicle composing the alcohols from which they are obtained, or to which they give rise on conversion into acetates and treatment with KHO; thus, we have the following mono- iodobutanes :—

C,H,.C,H,I (CH,),CH.CH,I (CH,)(C,H, CHI rae Isobutyl iodide, Pseudobutyl iodide. C(CH,),I.

Katabutyl iodide.

The same relations exist between the haloid ethers and their isomerides as between the paraffins and their isome- rides. Thus, the boiling points and specific gravities of the normal ethers are higher, and their chemical stability is greater than that of the isomerides.

By the action of nascent hydrogen many haloid ethers are restored to the hydrocarbons from which they are derived by an inverse substitution. Thus _tetrachlor- methane (CCl,) when treated with sodium amalgam and water is ultimately converted into methane (CH,), mono- chlorbenzene (C,H;Cl) into benzene, &c. The action of caustic alkalies upon mono-haloid ethers will be best illus- trated by the following examples :-—

Illustrating formation of an alcohol. (See also p. 563.) The metameric monochlo- rophenols do not undergo an analogous reaction.

(illustrating reduction of a saturated compound toa lower isologue, 7.¢., for- mation of O,Hon from type CrHyn4+.. Asimilar change is sometimes ef- fected by heat alone.

Illustrating reduction of an unsaturated compound to

a lower isologue, 7.¢., re- Ethine. duction of type CrHgn to

CaHgnas

The mono-haloid olefines (typified by monochlorethene in the last cquation) are obtained by the action of a caustic alkali on di-haloid paraffins (see p. 558). These mono-haloid olefines, hke their parent olefines, are dyad radicles com- bining with 77a, and HiZa. Their compounds with halvid acids are under some conditions identical and under other conditions isomeric with the corresponding compounds pro- duced by the direct combination of the olefine with two halogen atoms.

Of the haloid ethers derived from paraffins the best known is trichloromethane or chloroform (CHCl), a colourless, transparent, sweet-tasting, and somewhat fra- grant liquid boiling at 62°, largely used as an anesthetic. It can be prepared by the direct action of chlorine on methane, bnt it is usually obtained by the action of bleaching-powder on common alcohol. The corresponding bromine and iodine compounds, CHBr, and CHI, (bromo- form and todofora), and CH(NO,), (uttroform), are known.

Cyano-derivatives of Hydrocarbons.—The metamerism exhibited by these compounds has been already referred to (p. 555), and since they resemble in many respects the haloid ethers, their modes of preparation may be now touched upon.

C\H,.Cl-+ KHO=C,H,.HO+KC1 Benzyl Benzyl

ehloride. alcohol.

Pseudopropy 1

iodide. Propene,

(CH,),CHI + KHO=0,H, + KI + 0H, |

C,H,Cl+ KHO=C,H,KCl 0H, Mono- olitenethien e,

566

The most general method of obtaining the cyanides (nitriles) in a state of purity is the dehydration of the ammonium salts of acids containing the corresponding hydrocarbon radicles (see also p. 555).

C,H,. CO(ONH,): – 201], Ammonium benzoate.

Most of the other processes yield a mixture of cyanides

and isocyanides :~—

CH,I + KCN CH,I + AgCN Methyl iodide.

In the first of these methods the cyanide predominates, and in the second the isocyanide. By distilling a mix- ture of potassium cyanide with an cthereo-metallic salt of sulphuric or sulphurous acid, a mixture of cyanide and isocyanide of the radicle contained in the ethereal salt is obtained, the cyanide or nitrile being in excess :—

CH;.KSO, + KCN CH,.CN + K,SO, Potassium-methylsu]phate. Methyl cyanide. C,)H,.KSO, + KCN = ©,H,.CN + K,SO,. Potassium. naphthylsulphite, Naphthyl cyanide,

The cyanides or nitriles do not exhibit strongly marked basic properties, nor are they oxidized by Ag,O or HgO. They are not poisonous, and do not possess unpleasant odours, ‘Their boiling-points are generally higher than those of the metameric isocyanides. The nitriles are sus- ceptible of isomeric modifications depending on the iso- incrism of their contained hydrocarbon radicles.

C,H, . ON

Phenyl cyanide.

CH,.ON + KI CH,.CN + Agl!

Mcthyl cyanide.

IV. ErHers,

These compounds bear to the alcohols the same relations that the metallic oxides bear to the hydroxides :—

NaHO Na,O Ca”(HO), Ca” CHO {©H,),0 CH,(HO).. CHO Methyl alcohol. § Methyl ether, Ethene alcohol. Ethenc ether.

In accordance with this view, many ethers are formed by dehydrating their corresponding alcohols by means of strong sulphuric acid, zinc chloride, boron trioxide, &¢. :-—

2CH,HO – OH, = (CH,),0 Methyl alcohol. Methyl ether. 2C;H,HO – OH, = (C,H,),0.

Benzy] alcohol. Benzyl ether.

Conversely, many ethers, by prolonged heating with water, are retransformed into their corresponding alcohols,

Oxygen being a diatomic element combines with two monatomic radicles. When the two radicles are similar the compound is termed a simple ether, when dissimilar a compound ether. Thus, the ethers formulated above (methyl and benzyl) are simple ethers ; while

CHOC Hn, , C.H.O.CH, , CB O.C oH.

Methyl-cthy] ether Mcthyl-amy! ether. Phenyl-allyl ether. are examples of compound ethers. Compound ethers con- taining a C,,H,,,, and a C,,H2,—-, radicle are termed anisols,

Ethers are liable to isomeric modifications dependent on the isomerism of their contained radicles, and likewise to metamerism depending on the presence of different radicles. For example, C,H,.0.C,H, (ethyl-butyl ether) would be metameric with (C,H,).O (propyl ether).

A general method of preparing ethers (simple and com- pound) containing monatomic radicles is to act upon the sodium derivative of the alcohol containing the one radicle with the haloid ether containing the other radicle. When the alcohol and haloid ether contain the same radicles, the result is a simple ether; when they contain different radicles a compound ether is produced :-—

1 The cyanide thus formed unites with AgCN , forming the compound CH;.CN ,AgCN, which, on treatment with KCN in excess, yields the

methyl isocyanide with the formation of KAg(CN)

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[onGaANIc.

C,H,.NaO + C,I,I = (C,H,),0 + Nal Sodium cthylate. Ethyl ether.

C,H;.NaO + CH,I = CH,0.C,H; + Nal Sodium ethylate. Methyl-ethyl ether.
C,H;.NaO + CH, = CH,.0.C,H, + Nal Sodium phenate. Methyl-pheny! ether.

The ethers derived from the phenols are prepared by special methods. Ethers containing diatomic radicles are obtained from the mono-haloid derivatives of the dihydric alcohols (glycols) by the action of KHO :—

C,H,Cl(HO) + KHO =C,H,0 + KCl+0OH,. Monochlorhydrin. Ethene cther.

Compound ethers can be obtained from the sodium derivatives of the glycols by the action of mono-haloid ethers :—

C,I,(NaO), + 2CH,I = CH

Sodium ethenate.

EL ; ocH t oNal Ethene-dimethy] ether.

The ethene series of ethers are more active in their chemical behaviour than those containing C,,H,,,, radicles,

Ethers corresponding to the first seven normal primary alcohols of the series C,H,,,,. HO are known. Of these ‘sulphuric cther” is most frequently met with. It is the oxide of ethyl (C,H,),O, and is prepared by allowing a stream of cthyl alcohol to flow into a mixture of strong sulphuric acid and alcohol kept at a constant temperature of about 140° C. The following reactions occur :—

C,H,HO + H,SO, = C,H;.HSO, + OH, Alcohol. Ethyl-hydrogen sulphate.
C,H;.HSO, + C,H,HO = (C,H;),0 + H,S0,. Ethyl-hydrogen sulphate. Ether,

As will be seen from these equations, a given quantity of H,SO, is theoretically capable of etherifying an un- limited quantity of alcohol; practically, however, a limit is reached, If a mixture of alcohols is employed at starting, a compound ether is produced,

Ethyl ether isa colourless, mobile liquid, but very slightly soluble in water, and possessing an agreeable odour. It boils at 35°°5 C. By the action of chlorine it yields substitution derivatives, C,H,Cl.0.C,H,, (C,Cl,),0.

VY. SutpHuR, SELENIUM, AND TeLLURtuM ALcomors AND ETHERs.

These compounds are the analogues of the alcohols and ethers (see p. 553), and are in many cases prepared by analogous methods. The following are typical reactions :—

Preparation of Sulphur Alcohols.

C,H,Cl + KHS = O,H,(HS) + KCl Ethy!] chloride. Ethyl hydrosulphide. C,H,Cl + 2KHS = (©,H,H8), + 2KOl Ethene dichloride. Ethene dihydrosulphide. CHI + KHS = GHGs) 4 tm Ally] iodide. Ally] hydrosulphide. C,H,Ccl + KHS = OGH + Ka

Benzyl] chloride.

K(0,H,)SO, + KHS

Potassium cthyl-sulphate

Benzyl] hydrosulphide, = (,H,(HS) + K,S0, Ethy] hydrosulphide,

Preparation of Sulphur, d&e., Ethers. PCH) + KS @ (hs + 8k

Mcthy! chioride. Methyl] sulphide.

2K(C,H,)SO, + K,Se (C,H,)Se + 2K,S80, Potassium ethyl-sulphate. Diethyl selenide.

Diethyl telluride is prepared by an analogous reaction, K Te being substituted for K,Se. Polysulphides,(C,H,),8,, (C,H,).8,, can be obtained by employing alkaline poly- sulphides in these reactions. Certain thio-alcohols can be prepared from the corresponding alcohols by the action

ALDEHYDES. |

of phosphorus pentasulphide (5C,H,.HO + PS, = 50) ,.s + P,O,). method. The sulphonic acid (see p. 561) of the corre- sponding hydrocarhkon is converted into a sulphonic chlonide by the action of PCl,, and the sulphonic chloride is then acted on by nascent hydrogen :—

C,H,(S0,Cl) + 3H, = O,H;.HS + 20H,+HCl

Benzene-sulphonic chloride. Pheny! hydrosulphide.

6,H,(S0,Cl), + 6H, = O,H,(HS), + 40H, + 2HCl. Benzene. disulphonie Phenylene dihydro- chloride. sulphide or thioresorein.

The sodium derivatives of these thio-phenols yield com- pound thio-ethers by the action of haloid ethers :— C,H;.NaS + C,H, I = C,H,.8.C,H, + Nal. Sodium thiophenate. Pheny1l-ethy] sulphide, Compounds intermediate between alcohols and thio- alcohols are known :—

O,H,(HO),Cl+ KHS = C,H,(HO),(HS8) + KCl.

The compounds of this family are mobile or oily liquids or crystalline solids. Most of them possess characteristic and offensive odours. They are susceptible of the samc isomerism as their oxygen analogues. The thio-alcohols combine energetically with alkali metals, and with certain metallic oxides and salts, to form derivatives analogous to the metallic alcohol derivatives,—hence the name mercap- tans (corpus mercurio aptum) sometimes given to these bodies. Certain lead mercaptides, when heated in the dry state, yield the corresponding thio-ethers.

VI. ALDEHYDES.

The relations between these compounds and the primary alcohols are clearly brought out by the mode of formula- tion adopted for these alcohols (p. 562). Thus :—

H CH; C,Hony H CH, C,Hont, CoHonsy

| | | CH, CH, CH, CH,OH OH,OH CH,OH COH Carbinol. Methyl Primary Aldehydes.

Methane. Ethane. Paraffins. guninel. alcdnell C,H, ©O,H,.CH, C,.H,.CH,OH C,H,.COH Benzene. Methyl-benzene. Benzyl] aleohol. Benzoie aldehyde. Tt will be seen from these formule that aldehydes are derived from alcohols by the elimination of H, from the group CH,OH, 2.e., 2 hydrogen atoms are withdrawn from the typical carbon atom, leaving the group (COH)’ (com- pare with definition previously given, p. 553); hence the generic name (alcohol dehydrogenatum). It is thus possible for any alcohol to furnish an aldehyde, although great numbers of these compounds have yet to be discovered to complete the various series. The following formule will illustrate the derivation of aldehydes from: polyhydric alcohols :— Cpe, CH,OH COH

GL | | | ; C,H, CH, Ae Ost
COH :

ldehyde Dimethy1- Aldehyd Ethene. Glycol. Goa). Benzene. cen (phthalic).

The aldehydes of monohydric alcohols are metameric with the oxides (ethers) of dyad radicles. Thus, ethyl aldehyde, CH,.COH, is metameric with ethene oxide (O,H,)’0 ; benzoic aldehyde would be metameric with methyl-phenylene oxide [C,H,(CH;)|’O. The aldehydes are liable also to the isomerism of their contained hydro- carbon radicles, while aromatic aldehydes of dihydric alcohols are susceptible of the isomerism incident to the relative positions of the COH groups.

By the action of oxidizing agents aldehydes are con-

verted into acids containing the same number of carbon atoms; thus, R’ being the monatomic radicle—

The sulphur analogues of the phenols and dihydric phenols are prepared by a special general

GHEew@ti., & h Y 567

QR’ R Leama? = ll COW COOH

Aldehyde. Acid.

Starting, therefore, from the parent hydrocarbons, the primary alcohols are the first results of the introduction of hydroxyl into the methyl group, The next step in oxida- tion removes the two remaining hydrogen atoms from this group with the formation of aldehydes, and the final result of the oxidation is to convert COH into carboxyl COOH, with the formation of acids. Aldehydes thus occupy a position intermediate between alcohols and acids :—

rH oo CH os OH, CH,OH COH COOH Ethane or Methyl- Ethyl or ” methyl methane. earbinol, aectic aldehyde. Acetie acid

Aldehydes take up nascent hydrogen, reproducing alco- hols—R’.COH + H,=R’.CH,OH. The acid sulphites of the alkali metals combine directly with aldehydes, forming crystalline compounds, which, on treatment with a mineral acid, yield the aldehyde unaltered.

Aldehydes corresponding to eleven of the primary alcohols of the C,H,,,,,.HO series are known, and are generally prepared by the oxidation of these alcohols: R.CH,OH-H, = R.COH. The contained ©,H,,4, vadicles are in some cases normal primary, and in others iso-primary. The first member, methyl or formic aldehyde, H.COH, is gaseous; the succeeding terms are liquid, and hexdecyl aldehyde is a crystalline solid. The liquid alde- hydes are colourless, transparent, and possessed of pungent ethereal odours ; their

mobility decreases, and their boiling- points rise as the serics is ascended. Their solubility in water decreases in the same manner. By the action of PCI, aldehydes lose their oxygen, and Cl, is substituted. These chloraldehydes are isomeric with the dichlorides of the olefines, and (with the exception of the ethyl com- pound), with the chlorides of monochlorinated C,H,,4,

radicles, Thus :-— CH,.CHCI, CH,CLCH,Cl ele rete a is isomeric with Ethene dichloride.

(See also p. 559.) The aldehydes of the present series combine directly with ammonia, forming aldehyde-cammonius of the general formula RB'. C(OH)(NH,)H, which, by losing the elements of water, condense into basic substances, termed aldines and oxvaldines. When acted on by chlorine in large excess these aldehydes yield the corresponding chlorides of acid radicles (R'CO)'CL — Trichloraldehyde, CCl,.COH, or chloral, can be obtained by the action of chlorine on ethyl alcohol. The acetals are compounds formed by the combination of aldehydes and alcohols of the C,Ho.4,HO series, with elimination of water. By the action of zinc chloride, &c., acetic aldehyde yields crotontc aldehyde: 2C,H,O-OH,=C,H,O. The aldehydes oxi- dize with the greatest readiness to the corresponding acids; thus, silver oxide is reduced to the metallic state when heated with an aldehyde and water. A drop of acetic aldehyde let fall on blue litmus paper shows an acid reaction on mere exposure to the air, owing to the forma- tion of acetic acid. Aldehydes are characterized by their extreme readiness to undergo polymeric modification. Thus the presence of a trace of certain reagents converts acctic aldehyde under some conditions into paraldehyde, C,H,,0, = 38C,H,O, and under other conditions into metaldehyde, n(C,H,O).

The aldehydes corresponding to the C,H,,.,.HO aleo- hols are acrylic aldehyde or acrolein C,H,.COH, and crotome aldehyde, previously mentioned. These aldehydes do not yield compounds analogous to aldehyde-ammonia.

Of the aldehydes of the aromatic series mention may be made of benzoic aldehyde, whieh can be obtained from bitter-almond oil; cumzc aldehyde,

existing in oil of eumin; salicylic aldehyde, which exists in the flowers of “‘ meadow- sweet ;” and cinnamic aldehyde, the chief constituent of the oils of cassia and cinnamon. ‘The aromatie aldehydes, by the aetion of ammonia, are converted into hydramides of the general formula (C,,Ho,—-CH)3”N,

VIL Ketones.

These eompounds are derived from seeondary aleohols, in the same manner that aldehydes are derived from primary alcohols :-—

(Cailj.)CH.OH — Hy = (GC Ha.) co

Secondary alcohol. Ketone. The ketones may thus be regarded as compounds of C,Hon+,, &e., radieles with CO, or as aldehydes in which the H of the COH group is replaeed by sueh radieles. The compounds of this family bear considerable resem- blanee to the aldehydes, but are distinguished by their behaviour on oxidation, for whereas the aldehydes are readily converted into acids eoutaining the same number of carbon atoms, the ketones are converted (with some difficulty) into a mixture of two acids of the C,,H,,, 4 ;.COOH series, each containing a smaller number of carbon atoms. The law of the oxidation of ketones appcars to be that the less complex of the two lydroearbon radieles remains attached to the CO; thus—

cofGls + 30 = CH,COOH + C,H,COOH. pea lal ei ee Acctic acid. Valerie acid.

Ketones are converted by the aetion of nascent hydiogen into seeondary alcohols (see p. 563).

The ketones are liable to isomerie modification depending on the isomerism of their contained hydrocarbon radicles. CH, C,H, Cnt CH,),(methyl-pseudopropyl ketone). Furthermore, there can be metamerism among ketones owing to the presence of different radieles in the moleeule, and every ketone is metamerie with an aldehyde of the same series. Thus, the following are metamerie :-—

For example, cof (methyl propyl ketone) is iso-

mnerie with CO

{ CH, CoH; ae a -Tfexy] aldehyde Ketones eorresponding to the general formule Cail COG... co { Chums and CO(C,Hoay)p are

known, and are formed by various methods, of which the following are the most important :—

1, By the oxidation of seeondary aleohols (see beginning of seetion).

2. By the action of sodium organo-metallie bodies on CO:

2Na(C,,Hon 41) + CO = CO(C, Hon +1). + Nap.

3. By the aetion of zine organo-metallic compounds on acid chlorides (chlorides of acid radicles) :—

2CO (CoH. Ble i) Cl + Zo(C ae. a5 i 2CO(C, Hons. te a

Zell.

4, By the dry distillation of the Ca aud Ba salts of monobasie acids of the series C,H,,,,CO,H, C,Hon—y-CO.H , &e.,—

Ca”0.(C,Hon4.3-CO), = CO(C,»Hon+ 1). + CaCO, Ba”0,(C,Ho,—7-CO), = CO(C,Hon—+)o + BaCO,.

By employing a mixture of the salts of aeids belonging

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to two different series, or of two different acids belonging to the same series, ketones eontaining two different radieles are obtained.

The ketones of the series CO(C,, Hens). and CO { non 7

are, with few exeeyitions, mobile or oily eolourless liquids, possessed of most eharacteristie and penetrating odours; those of the series CO(C,H,,_,)) are crystalline solids, Ketones containing methyl form with acid sulphites white crystalline compounds, from which the ketone is obtained unaltered on distillation with an alkali. The best known ketone of the series CO(C,Hon 4.1). is dimethyl: ketone or acetone, CO(CH;)., a limpid, inflammable liquid, boiling at 55°°5 C., and readily miscible with water. In addition to the general modes of formation previously given, this kctone ean be obtained by the destruetive dis- tillation of eitrie acid, and also by distilling certain carbohydrates with quicklime. Heated with ammonia, aeetone forms acetonine, a basic substanee, of the formula (C3H,)”,N,. Of the aromatie ketones methyl-phenyl ketone or acetophenone is interesting as furnishing, by the aetion of fuming nitric acid, a nitro-derivative, { CO | Git av0,): whieh, when heated with soda-lime and

zine dust, yields ¢ndigotin or indigo-blue—

Cal. 2 ge ~ 2H,O ~0,=C,,.H,,N, — { Gath NO.) ‘ Z eNO ¢

VII. Organic Acips.

The relationship of the organie aeids to the hydro- earbons and to the alcohols has been previously pointed out (pp. 553 and 567). A further development of this relationship, as bearing on the formation of acids from polyhydrie aleohols, is shown in the following examples :—

CH,.OH CH,.OH CO.OH | ‘ CH,.OH CO.OH CO.OH

Ethene glycol. Glycollic acid, . Oxalic acid

In the formation of acids from aleohols, therefore (disre- garding the intermediate formation of aldehydes), one atom of oxygen is substituted for H, in the group CH,OH, thus eonverting this group into carboxyl, COOH.) It has been before mentioned that CH,OH is derived from methyl by the substitution of HO for H, so that carboxyl may be regarded as a methyl derivative, and a similar view may be extended to cyanogen CN, where N’”

may be regarded as replaeing H,. This connection between CN and COOH is shown by the various reactions in which the one radiele is eonverted into the other, but more partieularly, so far as the eompounds now under eonsideration are eon- eerned, by the synthesis of organie acids from the corre- sponding nitriles (p. 555). A few comparative formule will serve to illustrate still further this important relation- ship :—

Gil, OH, CH, | | | CH, CN CO.OH nane, or Methyl] cyanide, ; meinylimetiane, __¢Yane-methane, Acetic acta. Om, CHs0m CH,.CN CH,.COOH | | | CH, CH.OH CH.CN CH.COOIL | | | CH, CH,OH CH,CN ¢iycoon Beane Propenyl! alcoho), Propenyl Tricarballylie TOBne- or glycerin. tricyanide, acid,

1 “ Organic hydroxides are converted into acids, not only by trans- formation of the group CH,OH into COOH, but also when negative elements or radicles accumulate near an alcoholic hydroxy].”—Watts’s Dictionary of Chemistry, second supplement.

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Classification.—By inspecting the formule given at the commencement of the present section, it will be seen that the number of times COOH occurs in an acid is dependent on the number of times the group CH,.OH occurs in the parent alcohol. Now, organic like mineral acids when brought into contact with metallic oxides or hydroxides, give rise to the formation of salts, in which H, H,, H;, &e., are replaced by M’, M’, or M”, M’, or M”, &c.; but the hydrogen thus replaceable is found to be not that which enters simply into the composition of HO, as with mineral acids, but that which exists in the group COOH. The basicity of an organic acid depends therefore on the number of carboxyl groups it contains—acids containing 1, 2, 38, 2 carboxyl groups being mono-, di-, tri-, n-basic.

ORGANIC ACIDS. |

Monobasic Acids.

Series C,Hon4,(CO,H), Acetic or Fatty Series—These acids are prepared— l. By the oxidation of the correspond- ing primary alcohols and aldehydes

(pp. 563 and 567) ; 2. By the action of mineral acids or alkalies on the cyano- derivatives of the paraffins obtained by the methods pre- viously given (p. 566 ; see also p. 555); 3. By the action of organo-sodium compounds on carbon dioxide :—

CrHony,Na+ CO, =C,H,,4;,COONa.

Sodium salt.

Isomerism.—Just as the alcohols of the methyl series are most conveniently formulated as derivatives of the first term carbinol, so the present acids may be regarded as

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derived from formic or acetic acids, the two first members of the series :—
H CH,

I

| | COOH COOH COOH Acetic or Propionic or Formic acid. methyl-formic methacctic acid. acid.

CH,(CH;) Ci Hots CH,(C,Hon1) COOH COOH

CH yn+, Ss

CII n-+,—acctic formic acid. i

The first kind of isomerism which we have to consider is that depending on the replacement of one C,H,,,; radicle by two or three others, each containing a smaller number of carbon atoms. (Compare with isomerism of alcohols, p. 562.) Thus we may have the following isomerides :—

Chie) CH(CHs) (C,H;) C(CHs) | COOH COOH COOH Propacetic or Mcthyl-ethacctic Trimethacetic valeric acid. acid. acid.

Acids are thus classified in the same manner as the alcohols, into primary, secondary, and tertiary, according as the carbon atom in combination with

carboxyl is combined with one, two, or three other carbon atoms.

Another kind of isomerism is dependent on the isomerism of the radicles replacing the H of the CH, of the acetic acid ; thus—

C(CsH,)H,.COOH C[CH(CH,),JH, . COOH

Propacctic acid. is isomeric with Pscudopropacetic acid. Each of the three groups of acids is accordingly sub- divided into normal and iso-acids, although the series are far from being complete. The following is a list of the normal primary acids :—

Names. |

Formule, Boiling-points.| UOTE — EXCMC oonnonanononee H.CO,H 100° C Acetic Pee meet. CH,.CO,H nates IEPOPIONIG Oy5 7012 veces C,H,.CO,H 141° Buynie: gy etseseensenaae C,H,.CO,H 163° Valeric Spare Contes noose C,Hy.CO,H WS (Obyore® 95 cnnnsoneocnbon: C;H,,.CO,H 205° Cinanthy lich yc… cess C,H,3-CO,H 224° (Chyorayst@ 55 asanecs Gono C,H,;.CO,H 238° IRelleyeeyovaW® 5, doonaos candor C3H,,.CO,H 254° Capric Ah CHDSATERD DUONG C,Hy9.CO,H 269°

Names. Formule. Melting-points, MUAY (AOU ac. verse ace C,,H,3.CO,H 44°C, PUTA UNCs cya gence seen ae C,3H._7.CO,H 54° AVSIM Gaines sas eraenssawnes C,;H,;.CO,H 62° UMBAAEIC yy daeensaversnnra CygH33.CO,H 60° ? SSIGeHHOUG Ay. wenonaauounnoS Cy, H,;.CO,H 69° AVSCMMOIO! yy 0 “ineatesseeass Cy9Ho9.CO,H se BeMEMG 5 sieessesoen oas| ‘Cop ilgguCOsE (hoe WENGtCH) Gemecacsnere cae C,H;3.CO,H vin WENGSIC: 9)y. Gaestssecsceres CogHs9. CO,H 88°

These acids exhibit the general physical properties of all homologous series. Up to pelargonic acid they are limpid liquids, possessing penetrating odours, and of increasing viscidity ; the remaining members are solid fats. The acids of this series are found in nature in the free state (formic acid in ants, cerotic acid in beeswax, &c.), or as glyceric, &c., ethereal salts, in natural fats (mutton fat, glyceric stearate ; spermaceti, cetylic palmitate, &c.); hence the term “ fatty series.” Formic acid can be prepared by certain special methods—I. By passing carbon monoxide over moist potash

(CO+KHO=H.COOK); 2. By heating dry oxalic acid with glycerine (H,C,0,=CO, +H.COOH). Acetic acid also can be synthesized from ethine and oxygen in presence of potash (C,H,-+O+KHO =C,H;KO,). This acid is obtained on the large scale by the dry distillation of wood, and is likewise contained in vinegar. Butyric acid is formed by the fermentation of sugar in presence of chalk and putrefying cheese or milk. The metallic salts formed by the fatty acids furnish the organic acids unchanged on distillation with a mineral acid. The potassium salts, when distilled with potassium formate, yield the corresponding aldehydes—

C,Ho41,-COOK + HCOOK = C,Hon4;-COH + CO(OK),

Potassium salt. Formate. Aldchyde. The aldehydes can be converted into the alcohols by the action of nascent hydrogen, and from the alcohols the haloid ethers can be obtained, which, by methods now known to the reader, can be converted into nitriles, and

these again into acids containing one more atom of carbon than the alcohol (p. 555). It will be obvious that by these reactions the homologous series of fatty acids can be ascended term by term. By the action of chlorine, &c., on the fatty acids substitution-compounds are obtained. Thus acetic acid is converted into CH,Cl.CO,H, CHCl,.CO,H, and OCl,.CO,H. Other derivatives can be obtained from these haloid derivatives by double decomposition; for example, (by the action of KCN), CH,(CN).CO,H, cyan-acetic acid ; (by the action of ammonia), CH,(NH,).CO,H, amidacetic acid or glycocine.

Series C,H,,(HO).CO,H , Lactic Series—These acids are the hydroxyl derivatives of the fatty acids, from which they can be obtained by treating the mono-haloid substitu- tion derivatives with Ag,O and water—

2C,,Honlla.CO,H + Ag,0 + OH, = 2C,,Hon(HO).CO,H + 2AgHa.

The isomeric modifications of these acids admit of being grouped under four divisions :—

1. Primary Acids, C(CaHen+,)H.HO.CO,H.—-These are formed by the above reaction from primary fatty acids, and also by the slow oxidation of

glycols of the form CH(CnH.n+,)OH.CH,.OH.

Aldehydes of the acetic series form compounds with HCN,

| which, on heating with HCl and water, yield acids of this group :— | CH,.COH+HCN +20H,+HCl=C(CH,)H.H0.CO,H+NH,Cl. | Acctic aldchyde. Ethidene-lactic acid.

2. Secondary Acids, C(Cr»Hgn+,)2.HO.CO,H.—Produced by the action of Ag,O and water on mono-haloid derivatives of secondary fatty acids. Also by the action of organo-zinc compounds on ethyl | oxalate, C,0,(OC,H;),, and treatment of the resulting compound

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with water. Ketones containing C,H,n4, radicles, when heated with HCN, HCl, and water, produce acids of this group :— CO(CH;), + HON + 20H, + HCl1=C(CH,),. HO.CO,H + NH,Cl. Acetone, Oxybutyric acid. CH,.OH (COOISU ae CH,.OH CH,.OH° 4, Secondary Olefine Acids, CnHyn Coon ‘OH _ produced by the action of nascent hydrogen on certain compounds formed by the action of sodium on ethyl acetate, CH,.CO(C,H;0). (See p. 573.)

The following is a list of the acids of the lactic series :— Warbomicyacide wrrcerascsenitiees- si HO.CO,H Glycollic ,, Ethylidene lactic acid Ethylene 59 Ap

8. Primary Olefine Acids, CuHgn } Produced by the

oxidation of glycols of the form CrHyn

Paralactic i

Hydracrylic ,

ORD MCARIAS Is, ..6.00.05 sean ves oe C3H,(HO).CO,H

Oxsavalericus , suvenerees Sense eunnene C,H,(HO).CO,H

Oey CAPER Mish biaiis |... siscsennaeee C,H, 9(HO).CO,H
Oxyleptylictacidtersaesssn artes C,H,.(HO).CO,H

Oxy@odecaiyHes, sisssiwseavesaenne C),Heo(HO).CO,H

Ethylidene lactic acid is the first product of the butyric fermentation of sugar; ethylene and paralactic acids are contained in the juice of flesh. Zacttde and dilactic acid (C3;H,O, and C,H,,O0,) are produced by the elimination of water from one and two molecules of lactic acid by heat.

Series C,H,,;0.CO,H, Pyruvie Series.—These acids may be regarded as derived from those of the lactic series by the abstraction of H,. The following are known :—

Pyruvic or pyroracemic acid……..... C,H,0.CO,H Epihydric 59 vevevayeltese Cee UCOREL Acetopropionic Pm ont roGns C,H,0.CO,H Convolvulinoleic Pere np ti: C,,H,30.CO,H Jalapinoleic THE peOOHOp0e 1590. CO,H Ricinoleic spirssanoseante Ci7H330.CO,H

Series C,Hon+;05.CO,H comprises glyoaylic and glyceric acids, CH,0,.CO,H and C,H,O,.CO,H.

Series CypHon—;-CO.H, Acrylic Sertes.—The acids known in this series are the following :—

POUCH ssinucondugundiedescvuunas na avarwat C,H;.CO,H Crotonic and methacrylic acids……..... C3H,.CO,H Angelic and methylcrotonic acids…..... C,H,.CO,H Pyroterebic, hydrosorbic, and ethylcro-

COMIC saa Seen treme street rr cain eeeetcret as C;H».CO,H Moringic and cimicic acids……..... C\4H oy. CO.H Hypogeic, gaidic, and physetoleic acids C,,H,9.CO,H OVeschand GIAGICACIAS ...c00000seccecevarsies Cy,H35.CO,H ORE MG BONG eine ses ccasenestuseriins igH35.CO,H

Brassic and crucic acids Cy Hy.CO,H

These acids are produced by the oxidation of the corre- sponding aldehydes, and also by the dehydration of secondary lactic acids. They may be arranged in two iso- meric series:—primary acids of the form CHR”.CO,H, and secondary acids,CR‘‘R’.CO,H. These acids combine directly with Ha, , HHa, and are raised to the C,,H,,,,-CO,H type. On fusion with KHO they yield potassium salts of two fatty acids.

Series CyHon—s-CO,H contains tetroleic (C,H,.0O,H), sorbic (C;H,.CO,H), and stearolic (Cj,H,,.CO,H) acids.

Series C,Hon—y-CO,H, Benzoie or Aromatic Series.—The following are known :—

UBT SU(0) Ts Br ore Aer C,H,;.CO,H DOUG CMS cs cores: anc cn sesame oa C,H,.CO,H Xylic, hydrocinnamic, mesitylenic, ,

and ethylbenzoic acids…..... aE COR Cumic and cumylic acids …....008 C)H,,.CO,H Hiemeocttiieuaeid….513. 0c aienesateacanesy «4 Cy) H)3.CO,H

These acids are prepared by the general methods of oxidizing the corresponding alcohols and aldehydes, and by the action of KHO on the cyanides of the C,,H,,—7 radicles. Benzoic acid exists in gum-benzoin, from which it sublimes, ec a NS a ie

1 This acid (the hydroxyl derivative of formic acid) is unknown in the free state, and is dibasic,

on heating, in white feathery crystals, having a fragrant odour. By the action of Cl, HNO,, &c., these acids yield substitution derivatives, such as C,H,Cl.CO,H and C,H,(NO,).CO,H, chlorobenzoic and nitrobenzoic acids. ‘The latter, by the action of nascent hydrogen, is con- verted into CsH, (NH,).CO,H, amidobenzoic acid. Hippuric acid, the potassium salt of which

occurs in the urine of many herbivorous animals, is benzamido-acetic acid —

CH,(NH.COC,H;).CO,H.

The aromatic acids can be arranged in two metameric series corresponding to the benzylic alcohols and the phenols. Series C,H,,~~s(HO).CO,H, Oxybenzoic Series.—This bears to the preceding series the same relationship as the lactic to the fatty series :— Salicylic (ortho~~), oxybenzoic (meta-), and paraoxy benzoic POM sacs Selene irs caneeas CeH, (HO).CO.H Anisic (or oxymethyl-benzoic), cresotic, and e mandelic (or formo-benzoic) acids …..... hloretic, hydrocoumaric, hydroparacou- maric and phenyl-lactic acids…….....000 CeHs(HO).CO,H Thymotic and thymyl-carbonic acids …..... C,9H,.(HO).CO,H

Series-C,,Hon-9(HO),.CO,H, Dioxybenzore Series, contains oxysalicylic, hypogallic, protocatechuic, and carbohydro- quinonic acids—C,H, (HO),.CO,H.

Allied to this series are piperic (C\»H,)O,) and eugetic (C JH), acids.

Serves C,H, —49(HO)s.CO,H, Gallic Series.—Gallic acid, C,H, (HO);.CO.H, exists ready formed in many plants, such as sumach, hellebore, &e. Zannins are the astringent vegetable principles made use of in tanning. They all contain some form of tannic acid, Cy,H,.O,,, a compound resolved by the action of acids into gallic acid and glucose (see p. 573). Gallic acid is generally prepared from the gallotannic acid extracted from gall-nuts.

Series C,H, —9-CO.H :—Otnnamic, atropic, and isatropic acids, C,H,.CO,H.

Series C,Hon_49(HO).CO,H :—Coumarie and paracouma- rie acids, C,H, (HO).CO,H.

Serves C,H gn-1;-CO,H :—Phenyl-propiolic acid,

C,H;.CO,H.

Series C,,Hn-13-CO.H, comprising two naphthoic acids, C,,H,.CO,H.

Series C,H>,—4(HO).CO,H, containing oxynaphthoic acids, C,)H, (HO).CO,H.

Serves CrHon—1g(HO).CO,H, containing benzilic acid,

C,,;H,)(HO).CO,H.

Series C,H on—yg.CO,H :—Anthracenecarbonic acid, C,,Hy.CO,H.
Dibasie Acids.

Series C,H»,(CO,H),,Succinie Series.—The following are known :—

C,H,(H0).CO,H

Oxalic acid …... (CO,H), Pimelic acid … C;H,)(CO,H), Malonic acid … CH,(CO,H), Suberic acid … C,H,,(CO,H), Suceinic acid … C,H,(CO,H), Anchoic acid C,H,,(CO,H), Pyrotartaric acid C3H,(CO,H), Sebacic acid … CsH,,(CO,H), Adipic acid …... CyH(CO,H), | Roccellicacid… CrsH4, (C0,H},

These acids may be prepared by the general methods of oxidizing the corresponding alcohols (glycols), and from the cyano-olefine compounds, C,H,,(CN), , by the usual reactions. Oxalic acid (sodium salt) may be synthesized by heating sodium in dry CO,, and is manufactured on the large scale by fusing sawdust with caustic alkalies. This acid, free or combined, is found in many plants,—hence the name (from Oxalis, wood-sorrel). Succinie acid exists in amber. Many of these acids are produced by oxidizing various organic substances with nitric acid. The acids of the present series are crystalline solids, forming, like all

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ORGANIC AcTDs. |

dibasic acids, sy oe of salts, normal and acid, of the

OOH COOM’ coom’ 224 CxHs) GOOM’: ides of many of the acids are known. Oxalates may be formed from cyanogen compounds (see p. 554).

Series C,Hon-,(HO)(CO,H),, Afalic Series :—

formule C,Hon Tsomer-

Tartronic or oxymalonic acid ……. CH(HO)(CO,H),

Malic or oxysuccinic acid… ..... C,H,(HO)(CO,H). Citramalic and glutanic acids ……... C3H(CO,H), Oxyadipic acid ….....cseseeeeeeeeeeees C,H,(HO)(CO,H), COMICON MIN. ssc ccssesencrsvereses ons C H,,(HO) (CO,H),

Malic acid is found free or combined in the juice of most fruits.

Series Cy~Hon—9(HO),(CO,H),, Zartarte Series.—The fol- lowing are known :—

Mesoxalic Aid (2) c.ssccuessseeineesenres cv C(HO),(CO,H).

MPS POTIGEACIN, ... cau aveutebsenss.coevvassies« C,H,(HO),(CO,H), Homo-, citra-, and ita-tartaric acids… C;H,(HO),(CO,H). Dioxyadipic GRETA indo beoercnod eokasnar C,H,(HO).(CO,H), WOR VOUWCTO).. .o cic cocescennivnsessainees CgHo(HO),(CO,H),

Tartaric, like malic and oxalic acids, is of frequent occur- rence in the vegetable kingdom, being found free or com- bined in the juice of many fruits. It is generally obtained from argol or tartar (crude acid potassium tartrate), which is deposited from fermenting grape juice. It can be formed by the action of Ag,O and water on dibromsuccinic acid, C,H,Br,(CO,H), Five modifications of tartaric acid, differing chiefly in their optical properties, are known, viz., dextrotartaric, levotartaric, racemic, mesotartaric, and meta- tartaric acids. Normal and acid tartrates are known. Tartar emetic is potassio-antimonious tartrate; the acid potassium tartrate is known as cream of tartar.

Series C,,Hon—9(CO,H) 9, Fumaric Series.—-This consists of fumaric and maleic acids, CxH,(CO,H),; cttraconie, itacontc, and mesaconic acids, C,H, (CO,H)o.)

Series OnHon—g(CO,H),, Phthalic Series, comprises :— ~~hthalic(ortho~~), i i – - ergo ap remaemareens Ca a. Uvitic or mesidic, xylidic, and isoxylidic acids C,H,(CO,H), COWGIEANCTAGION, iesresreccritegeorssrsrsssccccecs eran CgH,(CO,H),

The phthalic acids are obtained by the oxidation of many aromatic hydrocarbons and their derivatives. De- rived from these acids are hydro- phthalic and hydrotere- phthalic acids (CzH,0,).

ee ae

Meconic acid, C,HO(CO,H),, is obtained from opium ; tricarballylic acd, C;H,(CO,H),, from tricyanopropane (see p. 568).

Citric acid, CsH,(HO) (CO,H),, exists in many fruits, and is generally obtained from lemon juice. It forms colourless crystals readily soluble in water. Being a tribasic acid, it forms with metals three classes of salts, typified by M’C,H,O,, M,‘C,H,O,, M,’C,H;0,, de.

Aconitic acid, C;H,(CO,H);, is derived from citric acid, and is found algo in monkshood (Aconitum Napellus).

Trimellitic (para-), trimesic (meta-), and hemimellitic (ortho-) acids, CgH, (COH),, are tricarboxyl derivatives of benzene.

Tetrabasic and Hexabasic Acids,

The following tetracarboxyl benzene derivatives are known :—pyromellitic (para-), prehnitic (meta-), and mello- phanic (ortho-) acids, CsH,(CO,H),.

The hexabasic acids known are medlitic acid, C,(CO,H),, and its derivative hydromellitic acid, CsH,(CO,H)<.

Tt is to be remembered that the foregoing list is neces- sarily brief. Many acids of vegetable and animal origin, and others derived from them by

artificial methods, are known, but their constitution is in many cases still undecided.

CHEMISTRY

avi IX. ANHYDRIDES.

These compounds are the ethers of acid radicles (see p. 553), and may be prepared in many cases by analogous reactions :—

C,H,0.Cl + C,H,0.0Na = (C,H;0),0 + NaCl

Acetyl chloride. Sodium acetate. Acctic anhydride.

C,H,0.Cl + C,H,0.0Na = C,H,0.0.0,H,0 + NaCl.

Acetyl chloride. Sodium butyrate. Aceto-butyric anhydride. Many anhydrides are obtained by heating the correspond-

ing acids :— (C,H,O)”(HO), – OH, = (C;H,O)“0 Lactic acid. Lactic anhydride (lactide). (CsH,0,)”(HO), – OH, = (C3H,0,)“0. Phthalic acid. Phthalic anhydride.

Anhydrides when acted on by water yield the corre- sponding acids :— (C,H,0),0 + OH, = 2(C,H,0)HO C,H,0.0.C,H,O + OH, = (C,H,0)HO + (C,H,O)HO. Accto-butyric anhydride. Acetic acid. Butyric acid. Compound anhydrides when distilled are resolved into two simple anhydrides— 90,H,0.0.0,H,O = (C,H,O),0 + (C,H,O),0. Accto-benzoic anhydride, Acetic anhydride. Benzoic anhydride, Acetic anhydride is an oily liquid, boiling at 137°, and having a pungent odour. By the action of P,S, it yields thiacetic anhydride, (C,H,0),8, and by BaOg acetic per- owide, (CpH,0),0,. It combines directly with aldehydes.

xX. Acip HALIDES.

These may be regarded as the haloid ethers of acid yadicles. They can be prepared by the action of haloid phosphorus compounds on the acids containing the corre- sponding radicles—

3(C,H,0)HO + PCI, = 3C,H,0.Cl + PH,O, Acetic acid, Acetyl chloride. (C,H,0,)”(HO), + 2PCl; = (C,H,O,)“Cl, + 2POCI, + 2HCl Succinic acid. uccinyl chloride.

A similar reaction can be effected with the haloid sub- stitution compounds of the acids. Thus, C,H,CI1O.Cl, C,HCI,0.Cl, and C,Cl,0.Cl (mono-, di-, and _tri-chlor- acetyl chlorides) can be obtained by the action of PCI, on mono-, di-, and tri-chloracetic acids.

The compounds of this family must be distinguished from the haloid salts of the acids which contain the halogen atora in the place of the carboxyl hydrogen ; for instance—

i | | H,C—C—OCl

Chlorine acetate.

I H,C—C—Cl Acetyl! chloride.

The latter compound is a yellow liquid produced by the action of acetic anhydride upon hypochlorous anhydride : (C,H,O),0 + Cl,O = 2C,H,0. OCI. It is very unstable, being decomposed by heat, Br, I, and most metals. The corresponding iodine compound produced by the action of ‘odine on the chlorine acetate is interesting as showing the triad nature of the iodine atom —{(C,H,0)O],1””.

The acid halides are as a rule colourless liquids more or less oily, and possessing characteristic odours. They are decomposed by water :-—

C,H,0.Cl + OH, = (C,H,0O)HO + HCl Acetyl chloride. Acetic acid.

C,H,O.Cl + OH, = (C,H,O)HO + HCl. Benzoyl! chloride. Benzoic acid.

In some cases the whole of the halogen is not removed by the action of cold water :—

(C,H,0)’Cl, + OH, = (C,H,C1O)HO + HCl.

Lactyl dichloride, Chloropropionic acid,

Acetyl chloride, when made to act upon potassium hydrosulphide, forms thiacetic acid :-—

C,H,0.Cl + KHS = (C,H,0)HS + KCl.

When it is mixed with acctic acid, and acted on by sodium amalgam, the corresponding alcohol is produced :— 3CH;.CO,H + (CH,.CO)Cl + 2Na, = 3CH;.CO,Na Acetic acid. Accty! chloride. Sodium acetate. + CH,.CH,(HO) + NaCl. Ethyl alcohol. Some acid halides can be synthesized from hydrocarbons : by the action of carbonyl dichloride (phosgene gas)— C,H, + COCl, = (C,H,O)”CL Ethene. Paralacty] chloride.

C,H, + COCl, = OH,0.Cl + HCl.

Benzene. Benzoyl! ehloride.

XI. ErHereat SAuts.

These compounds are derived from acids by the substi- tution of hydrocarbon radicles for hydrogen, but it is only the hydrogen entering into the composition of hydroxyl that can be thus replaced. Thus, the number of ethereal salts that any acid can form depends upon the number of times it contains HO; in other words, an n-hydric acid can form ethereal salts. It has been previously men- tioned that the basicity of an organic acid depends upon the number of times it contains COOH, hence it follows that monohydric acids must be monobasic, but n-hydric acide may be 1, 2, 3,.....: n-basic. For example, tartaric acid is tetrahydric, but as only two of its hydrogen atoms are replaceable by metals it is dibasic, and consequently contains 2(;COOH). But this acid being tetrahydric con- tains 4(HO), and has thus four hydrogen atoms replace- able by radicles, giving rise to four ethereal salts :—

Metallic COOM’ COOH aalts \ CyH,(H0), | COOM’ C,H,(H0), { COOM’ Normal salt, Acid salt. Ethereal ; R’O.COOR’ HO.COOR’ salts, on, 1 R’O.COOR’ C2H, { R’‘O.COOR’ _ { HO.COOR’ HO.COOH a ‘ HO.COOR —- CzH { HO.COOR’

Ethereal salts are normal or acid according as the carboxyl (basic) hydrogen is entirely or partially replaced by radicles,

Every acid, inorganic and organic, can give rise to the formation of ethereal salts, these being in many cases pro- duced by the direct action of the acid on the alcohol con- taining the necessary radicle :—

NO,HO + C,H,,,HO =NO,(00,H,,) + OH,

Nitric acid. | Amy! alcohol. Amy] nitrate.

HO)

A (PO(HO), +C,H,.HO = PO { tc.tt’o) + Hs Phosphorle thy! aleohol peso i

CH,.COOH + C,H,.HO = CH,.CO(00,H,) + OH,

Acetic acid. Ethyl alcohol. Ethyl] acetate.

3CH,.COOH + 0,H,’”(HO), = C,H,’”(0.COCH,), + 30H,

. Propeny] alcohol Propenyl triacetate Acetle acid. (glycerin). (triacetin).

Other methods of preparing ethereal salts are exemplified by the following reactions :—

C,H,,,HSO, + CH,.COOK = CH,.CO(OC,H,,) + KHSO,. Amy] hydrogen Potassium Tran age sulphate. acctate. pee COcl CO(OC,H,) C,H, { + 20;H, 10 = OyH, { 27° + 2ZHC1. 2°41 COCI* “Vat 2””# | CO(OC,H;)

Succinyl chloride, Ethyl! alcohol, Ethyl succinate.

_ [In practice this reaction is effected by passing HCl gas into a mixture of the acid and aleohol.]

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PO(AgO), + 3C,H,I = PO(OC,H,), + 8Agl Triargentic Ethyl Tricthyl phosphate. iodide. phosphate. C,H,.K.SO, + CH,.K.CO, = C,H,.CH,.CO, + K,S0, Potassium ethyl Potassium methyl Methyl ethyl sulphate. carbonate, carbonate.

30,H,.HO + B,O, = B(OC,H,), + B(HO),

Ethyl alcohol. Fe ac, __Tiietby! borate, Borie acid. 4C,0,.00 + sidl, = SXOC.B,),-+ acl Silicon Tetrethyl Ethyl alcohol. tetrachloride. silicate.

Most ethereal salts are decomposed on heating with water into an acid and an alcohol. ‘The same reaction is more speedily induced by caustic alkalies : —

CH,.CO(OC,H,) + KHO = CH,.COOK + 0,H,.HO.

Potassium Ethy! alcohol.

Ethyl acetate. acetate,

The ethereal salts of nitrous acid are metameric with nitro-derivatives of hydrocarbons ; thus— Ntbodiane eR sine Ethyl nitrite is produced by the action of ethyl sulphuric acid on potassium nitrite. Nitroethane is formed when ethyl iodide acts on silver nitrite. By the action of nascent hydrogen the difference in constitution between these two compounds is well brought out :— C,H;.O(NO) + 3H, = C,H,(OH) + NH, + OH, Ethyl nitrite. Alcohol. Ammonia. C,H,.NO, + 3H,=C,H,.NH, + 20H,.

Amidoethane (Ethylamine),

Many ethereal salts exist ready formed in various animal and vegetable substances. Thus, oil of wintergreen (Gaultheria procumbens) contains methyl salicylate,

is metamerie with

Nitroethane.

CsH,(HO).CO(OCH,), The ethereai salts of glycerin (glycerides) have received special names :—

Oleins. Palmitins. C3H,(HO).(CgH330.), Monolein. | CsH,(HO),(C,,H,,0,) , Monopal- C3H(C,,H5,0,)., Diolein. mitin.

C3H3, Triolein. C3H;(HO)(Cy¢H310,),, Dipalmi- (Triolein exists in animal fats and olive tin.

oil.)

C3H53, Tripalmitin. (Tripalmitin exists in palm oil and other fats.)

Stearins. C,H,(HO),(C,.H3,0.), Monostearin. C3H;(HO)(C,.H,50.). , Distearin. C3H3, Tristearin.

(Stearins oceur in suet, tallow, and other fats.)

Glucosides are compounds existing in vegetables which by the action of reagents or natural ferments are resolved into glucose and some other compound. Thus amygdalin, a crystalline substance from bitter almonds, d&c., when decomposed by the action of synaptase or emulsin, a ferment existing in the plant, is converted into glucose, benzoic aldehyde, and hydrocyanic acid: C.)H»NO,, + 20H, = C,H,O + HCN + 2C,H,,0,. Among the more important giucosides are :—

Gallotannic acid (Cy,H_.0,7), from oak-galls, sumaeh, &c.

Salicin (C\3H},07), from bark and leaves of poplar and willow.

Aiscwlin (Cy,H_40;3), from bark of horse-chestnut, &c.

Glycyrrhizin (Cy4H3g0,), from liquorice root.

Quercitrin (C33H3 90,7), from bark of quereitron (Quercus infectoria).

Phlorizin (Cy,H,40;). 20H,), from root bark of apple, pear, plum, and eherry.

Many of the vegetable colouring matters employed iu dycing are glucosides. Thus indican, from woad (Jsatis tenctorva), is a colourless substance decomposed by acids into indigo-blue and a glucose-like body (indiglucin) :-—

2C yo Hg) N Oy, + 40H = CygH N20, + 6C,Hy)Og- Indican. Indigo blue. Indiglucin. The most valuable tinctorial constituent of madder-root

(Rubia tinctoria) is alizarin (C,,H,O,), which exists in the root as a glucoside (rubsaime acid) (Cy,H,.0,,). When heated with zinc dust alizarin yields anthracene (C,,H,)), and conversely, anthracene can be converted into alizarin by first oxidizing it to anthraquinone (C,,H,O,”), then by treatment with Bror H,SO, transforming the quinone into dibromanthraquinone or anthraquinone-disulphonic acid, and finally fusing either of these products with caustic alkalies: C,,H,Br,0,” + 2KHO := C,,H,O,+2KBr. Large quantities of artificial alizarin are thus manufactured.

Vanillin (C,H,O,), the odorous principle of vanilla, has also been obtained artificially from conzferii (C\,H,.0.), a glucoside obtained from the cambium of Coniferous trees. This glucoside when heated with water and emulsin is resolved into glucose and a crystalline substance (C,)H,,O3) which on oxidation is converted into vanillin.

By the action of sodium on ethyl acetate there is fro- duced among other compounds the sodium salt of an acid, C,H,)O;, which is of extreme interest on account of its enabling the ascent of the series of ketones and fatty acids to be-effected. Thus :—

Ascent (C,H,NaO,C,Hon,[1=CgHy(CaHon+,)0,! + Nal of CgHo(CnHen+,)03 + 2KHO=CH3. COCH,(CrHon+,) + Ketones C,H; .HO+K,CO,.

The ascent of the fatty acids is more simply explained by considering the first products of the action of Na on ethyl acetate to result from the replacement of the methyl hydrogen by Na. Thus:—

CH Na CH, Colt mn | CO(0C,H,) i. C,Hony 1 = \ Coes + Nal ce caes e New cthercal salt. CHNa, _ § CH(C,Hons:) | { CO(OG,H,) + 27C-Hartal = | CO(OG HE? + 2Nal

Ethy! disodacctate. New ethcreal salt. The liberation of the acid from the ethereal salt is

effected by the action of KHO, as previously explained.

XII.—ORGANO-METALLIC BopDIEs.

The constitution of these compounds has been already considered (p. 553); they have to be distinguished from organic compounds containing metals, such as metallic salts of organic acids. In organo-metallic bodies the metal is directly combined with the hydrocarbon radicle, while in organic compounds containing metals the metallic atom is connected with the radicle through the medium of some other element :—

H, Ei, O O I I | H,C—C—Zn—CH,

Zine ethide.

I H,C—-C—O—Zn—O-—C—CH, Zine aectate.

Organo-zinc compounds are prepared by the action of zinc upon the iodides of C,,H,,,, radicles -—

22n + 2C, Hons] = Zn(C,,Hons1)9 + Zul, .

The operation is most rapidly conducted by digesting the iodide with zinc foil coated with copper by previous immersion in a weak solution of cupric sulphate (Glad- stone and Tribe). Zins ethide, the first of these compounds obtained by Frankland, is a limpid, mobile liquid boiling at 118° C., and spontaneously inflammable.

Organo-compounds of tin, lead, mercury, bismuth, arsenic, and antimony have been prepared by the action of the iodides and bromides of the corresponding radicles on the potassium or sodium alloys of the metals :—

HieNea, + OH… = Hg(CH,), + Nal Sodium amalgam. Ethy1 iodide. Mercuric ethide. HgNa, + 2C,H;Br = Hg(C,H;), + 2NaBr.

Sodium amalgam. Phenyl bromide. Mereuric phenide.

1 By the action of naseent hydrogen these compounds are converted into ethereal salts of secondary olefine acids of the lactic series (p. 570).

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Many organo-metallic bodies are derived from others by simple replacement or by double decomposition :—

SnCl, + 2Zu(C,H,). = Sn(C,H,), + 2ZnCl, Stannie chloride. Zine cthide. Stannic cthide.

3Hg(C,H,), + Al, = Al,(CH,), + 3Hg Mereuric ethide, Aluminic ethide. 3Zn(C,H,), + Na, =2[Na(C,H,), Zn(C,H,),]+ Zu. Zine ethide. Sodic zine ethide.

In the case of organo-compounds of monad metals pre- pared by the direct action of the metal on some other body, as in the last reaction, the original compound occurs inseparably in the resulting compound.

The following is a list of the organo-metallic bodies :—

Potassic zine methide…..... K(CH,) , Zn(CH3), Potassic zine ethide…..... K(C,H,) , Zn(C,H;). Sodicizinelethider.. wanes: Na(C,H,), Zn(C.H5), Denthicizimehethnidlen ys. ceac.ccseen-e Li(C, Hs), Zn(C, Hs), Lithic inercuric ethide…..... Li(C,H;), He(C,H;). Magnesium ethide…....: ..... Mg(C.Hs5),

ARMORMeE TING eh sreeas ste cress Zn(CH3),

ALTICHE DML Che caveiueieceseesaciers acne Zn(C,H;),

/AGNG: TROD GIG canboaendaponononoedadoo vo: Zn(C3H,),

Zinio Graty/hiC Wy esooooeenoes. Goasnoonno: Zn(C5Hy1)e Aluminium methide…..... .Al,(CH3), Aluminium ethide…..... Al,(C.H;)4 Aluminium propide…....46. Al,(C3H,)¢ Glucimum Propide…....000000.008 G(C3H,).

Mercuric methide….....5 Heg(CHs),

ANeTCULICIO DME Chase essen ierncn snes He(C,H;),

UMGYOUMNC PVGPIGE.....5 ….c0aeeaens Hg(C3H,), Miencuriclamiylide….c.cs-s1eesceer Hg(CsHy))e Mercurie plenide…...0)-siocre0es He(CeHs).

MIETCUMILC LOMVIICeI rn scsi snsnanee Hg(C,H,),

MM SECHTIC NapNEhide ….. ss… 600 Hg(Cy Hy), Stannous ethide….....00000 Sn,(C,H;), Distannic hexethide…..... Sn,(C,Hs), Sitammicpmmen hd ova ectesies aes sees Sn(CHs)4

Stannic ethide….....: Weise Sn(C,Hs),

Stannic diethodimethide…..... Sn(C,H;)o(CH5). Stannic phenyltriethide…..... Sn(CgH,)(CH3)3 Stannic iodotripropide…..... Sn(C,H,)af PUMNOIERCPMIGE: wo. .ciec secs. t canes Pb(C,Hs)4

Not many isomerides of the above compounds have as yet been obtained ; zinc pseudopropide and mercuric benay- lide (isomeric with the tolylide) are known.

The extreme readiness with which the organo-metallic bodies exchange their hydrocarbon radicles for more nega- tive elements or radicles obviously renders them of parti- cular value in organic synthesis.

The following are further important reactions :—

1. Synthesis of fatty acids by the direct absorption of CO, by organo-sodium compounds :—

CO, + Na(C,, 2,41) = ‘ ae :

2, Displacement of halogens, oxygen, (HO) , (OC,,H5,41). &e., by CxHon4; tadicles (see the preparation of Sn(C,H;), from SnCl, given above) :—

C0(0C,H,) C,H Z C(C,H,),.0H \ Soocns +274 cu, “Hs= 1 coe)

Ethyl oxalate. Zine cthide. Ethy) diethoxalate.

Zit Gee + | CHRO: Zine hydroxide. Alcohol.

Also, formation of paraffins by action of water on organo- zine bodies :— Compounds intermediate between organo-metallic bodics and haloid salts of the metals have been obtained, e.g.— Hg(CH,)I_ , Sn(CH;),1, , Sn, (C,H,),I, , Mercurie methiodide. Stannic dimetho-diiodide. Distannic tetretho-diiodide.

Sn(C,H,)(C,H,)Cl, .

Stannic etho-phenyl- dichloride.

The action of slow oxidation upon the compounds of this family is shown in the following examples :—

Zn(C,H,), + O = Zn(C,H;)(OC,H;) Zinc ethide. Zinc etho-cthylate.
Zn(C,H,), + O, = Zn(OC,H,),. Zinc ethide. ; Zine ethylate.

Organo-boron compounds containing boron directly com- bined with hydrocarbon radicles have been obtained by the aid of zinc methide and ethide :—

2B(OC.H;); + 8 Zn(CHs), = Tricthyl borate. Zine methide. + 32Zn(OC,H,),. Zine ethylate.

Boric ethide has been prepared by an analogous reaction. Boric methide is a gas, and boric ethide a limpid liquid; both are spontaneously inflammable, burning in air with a green-tinted flame. They combine with ammonia form- ing compounds of the formula NH, , BR’,.

Organo-silicon compounds are bodies in which carbon is replaced partially or entirely by silicon. Many of these are formed by means of zinc methide and its homologues :—

SiCl, + 2Zn(C,H,), = Si(C,H,), + 2ZnCl,. Silicic chloride, Zine ethide. Silicic ethide. A large number of these compounds are now known, Their analogy to the carbon compounds will be seen from the following examples :—

2B(CH,),

Boric met hide,

Si(CH,), C(CH,), SiHCl, CHCl, . Silicie methide. Tetramethyl-methane. Silicon chloroform. Chloroform. H.SiO(OH) CH,.SiO(OH) C,H,.Si0(OH) Silicoformic acid Siliconacetic acid. Siliconpropionic acid. H.CO(OH) OH,CO(OH) ,H,.CO(OH).

Formic acid. Acetic acid.

: XTIT. Aminzs.

It has been previously stated that amines are derivatives of ammonia or its hydrate and haloid salts (p. 553), hydro- gen being partially or entirely replaced by hydrocarbon radicles. Amines built on the type of NH, may arise from the replacement of hydrogen in NH, , N,H,, or N;H,, thus forming monamines, diamines, or triamines :—

Propionic acid,

i ee R” NZ N

(H H Hy Hy Ammonia Monamine. a Diamine.

(1 molecule). (2 molecules). Sumilarly triamines are formed by replacement of H, by R’”.

Each of these groups of amines is further divisible into primary, secondary, and tertiary, according as one-third, two-thirds, or all the hydrogen of

ammonia is replaced by hydrocarbon radicles. For example :—

R’ R’ R’ N

ee eS Tertiary triamines.

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Monamines containing C,Hon4,radicles.—The following

-are known :—

Primary. Secondary. Methylamine…..... N(CH;)H, | Dimethylamine N(CH,),H Ethylamine…..... N(C,H;)H, | Methyl-ethyl-

Propylamine …... N(O,H,)H, | amine …. N(CH;)(C,H,)H Butylamine …..... N(C,H,)H, | Diethylamine…N(C,H;),.H .Amylamine…..... N(C;H,,)H, kt bate N(C,H,),H Hexylamine …..... N(C,H),)H, | Dibutylamine…N(C,H,),H Heptylamine…..... N(C,H),)H, | Ethylamyl- Oetylamine…..... N(C,H,,)H, amine…..... N(CyH5)(CsHy,)H. Nonylamine…..... N(CyHy9)H, | Diamylamine …N(C;H,,),H Tertiary. ye ea N(C,H)s DON LAM ss 005 dss t3.5 coriePhe bene vebnaeswn dae N(C,Hs)s PYUSROPT IBRD 5:4 005 siasnadssinns vcaanperyyacaxive 3l7)s DPE VAIO. isencisininy noe vd bion.coa euwccaprsanagmees 4tg)3 DRURY RNA ish, cagssirsk\ sannsnawnosindias conven N(C5Hy1)s

These amines are produced by the following methods :—

1. By heating the haloid compounds of C,,H,,;, radicles with a solution of ammonia in alcohol :—

CrHonil + NH; = N(C,Hoa+,)HI. Iodide of radicle. R’-yl-ammonium iodide.

The resulting compound is formed on the type of the salts of ammonia, and like these bodies is decomposed by fixed alkalies :—

N(C,Hon4;)HzI + KHO = N(C,H,,1,)H, + OH, + KI.

R

/-yl-ammonium lodide.

At the same time, according to the proportion of the re- agents, the temperature, &c., in the first reaction, more or less of the secondary and tertiary monamines are produced :—

Secondary monamine hydriodide.

8C, Hoyt + 3NH, = N(C,Hoai;),HI + 2NH,I. Tertiary monamine hy driodide,

Amines containing different radicles are obtained thus :— N(C,H;)H, + CH,I = N(CH,)(0,H,)H,I

Ethylamine. Methy) iodide. Roy heey ene

The secondary and tertiary amines are in all these cases liberated by the action of KHO.

2. Cyanic and cyanuric acids (p. 554) form two classes of ethereal salts analogous to the cyanides and isocyanides (p. 555); thus—

N=C—OR’

Cyanate.

Amine.

O=C=N—R’

Isocyanate,

Isocyanates are prepared by distilling ethereo-potassium salts of H,SO, containing the necessary radicles with po- tassium cyanate: R’KSO, +

CO”.NK = CO”.NR’ + K,SO,. Isocyanurates are obtained by a similar reaction, substitut- ing potassium cyanurate for cyanate.

Both these classes of ethereal salts furnish primary amines on distillation with caustic alkali :—

CO.NR’ + 2KHO = NR’H, +K,00,.

3. Nitro-substitution derivatives of the paraffins are reduced by nascent hydrogen, ammonium sulphide, &c., with the formation of amines (see reduction of nitroethane to ethylamine, p. 572), ;

With the exception of the methylamines (which are gaseous), the amines of the present class are limpid liquids, having powerful ammoniacal odours and highly basic pro- perties, restoring the colour of red litmus, and uniting with acids to form salts analogous to those of ammonium :—

N(CH,)H, + HCl = N(CH,)H,Cl

Methylamine. ~~ N(C,H;)3 + HI = N(C,H,),HI Triethylamine. Tricthylammonium

iodide,

>

s

AMINES. |

Like ammonium salts, these amines form yellow crystal- line double salts when their hydrochlorides are mixed with a solution of platinic chloride. The general formula of these salts (A representing amine) is 2AHCl, PtOl,. Tertiary amines unite directly with iodides of O,H,,,, radicles, forming compounds of the type of haloid ammo- nium salts :—

N(C,H5)s aE oe = N(C,H,),1 i y etrethylammo- ‘Teisthylamine. iodide, nium Jodide.

These compounds do not again furnish the tertiary amine on treatment with KHO, but on heating with Ag,O and water bodies such as tetrethylammonium hydroxide, N(C,H,;),HO, are produced. These bodies are highly caustic bases analogous to ammonium hydroxide, but more like the fixed alkalies in their general behaviour.

The amines of the present group are susceptible of metamerism and isomerism. For example :—

Metameric…N(C,H,)H, , N(CH,)(C,H,)H , N(CH,),.

Propylamine. Methyl-ethylaimine. Trimethylamine. Isomeric…N(C;H,)H, , N[CH(CH;),|H,. Propylamine. Pseudopropylamine,

By the action of nitrous acid primary amines are con verted into nitrites, which are decomposed on heating, with the formation of the corresponding alcohol :—

N(C,Hon41)Ho-HNO, = C,Hon4HO + OH, +Ny.

The alcohols produced by this reaction are isomeric and not identical with those of the radicle from which the amine is derived in cases where such isomerism is possible.

The action of nascent hydrogen on the nitriles gives rise to the formation of amines :—

C,H CN + 28, = N(CE,C,,H.,2,)H,-

The nitriles can be obtained from the alcohols by com- bining the latter with sulphuric acid, converting the sulpho-acid thus produced into a potassium salt, and dis- tilling this with potassium cyanide (p.566). By combining all these reactions the homologous series of alcohols can be ascended. To give an illustration :—Jethyl alcohol is combined with sulphuric acid, and the resulting sulpho- acid converted into potassium methylsulphate. This latter salt is mixed with potassium cyanide and submitted to dry distillation, when methyl cyanide (acetonitrile) is produced ; this when acted on by nascent hydrogen is converted into ethylamine, which by the action of nitrous acid

is trans- formed into ethyl alcohol. By a similar series of reactions ethyl alcohol can be converted into propylamine, which by the action of HNO, is converted into pseudopropyl alcohol.

Isocyanides or Carbamines.—These compounds, meta- meric with the cyanides of hydrocarbon radicles (p. 555), may be regarded as formed on the type of ammonium salts; thus (X’ representing the acid radicle)—

N’H,X’ Wen Ammonium salts. Carbamine.

Most of the reactions made use of in preparing the cyanides give rise to the simultaneous formation of iso- cyanides (see p. 555); the latter bodies are in excess when the iodides of the radicles are made to act upon silver cyanide. Isocyanides are also obtained by heating primary amines with chloroform and caustic potash :—

NB/H, + CHCl, +3KHO=N | Ri + 3KC1+30H;.

This reaction affords a ready means of distinguishing primary amines, as the isocyanides are at once detected, even in the smallest traces, by their powerful and nauseous odours. The carbamines reduce many metallic oxides (such as HgO, Ag,O, &c.) with the formation of cyanates of the contained hydrocarbon radicles. They possess pro- perties decidedly more basic than their mctamerides, com-

,

bining energetically with acids to form salts. When heated in sealed tubes the isocyanides are partially trans- formed into the corresponding nitriles.

Monamines containing C,Hon—, radicles are represented by allylamine, N(C,H,)H,.

Monamines contaimng C,H», radicles.—These bases belong to two isomeric series corresponding to the alcohols of the benzyl series and tothe

phenols, This relationship is exemplified by the following formule :—

C.H,(NH,). CH, an C,H,. CH,(NH,) Toluidine. isomeric with Benzylamine. C,H,(NH,). (CHs), oor CoH, CH,.CH,(NH,) Xylidine isomeric with Xylylamine.

The following are the more important amines of the present group :—

Primary. Phenylamine (aniline) ..... C,H;(NH,) Bema ylatine’, oisswcesers selersiios vonnre C,H,(NH,) XG la MM Gites sess ssecstacctcscecceee C,H,(NH,) C@ymiylanmiMeresnnescccccevcseesessainvs ese C,.H,,(NH.) SIMO sesecueun veavenaie acer sebaenre C,H4(NH,).CH, 2G hb a eee eens one C,H,(NH,). (CHa). CUMIGING |. se ccns tocuessvceet ene enesuaasle C,H, (NH,).(CH,), WiyAMMON ON, ceesvasenccsiocecaseuscetesd es C,H(NH,).(CH3), Secondary. WDUDCHAVUATAINE .....0NEL) WDiptinerylAMIMGs…...0000.e0scvenserses (C,H,).(N H) Ethyl-phenylamine …..... 0.6 (C,H,)(C,H,)(NH) Methyl-phenylamine… .....(CgH5)(CH)(NH) Tertiary. Tribe eminies:... 1. vstvecgieeee (C,H,),N CPESVAV LGM sess .osseeseesseear ven (CgHy)3N PPG VM IAMAIN inca. seeiens nvadioren sess (Cy9Hy3)3 nip lena 0, 6.210 sae vce aoe (C,H),h Dimethyl-phenylamine…..... (CgH,)(CH).N Dimethyltoluidime…..... (C,H,.CH,)(CH3),.N DimeeylGAIine 5.0.6 cecee senses SE OHS oHeN Dimethyleumidine…..... {C,H.(C Hs), | (CH3).N Dimethyleymrdine.,, ...000. [C,H(CHs),4|(CHs).N

The amines of the benzyl series are obtained by the action of the chlorides of the corresponding radicles on ammonia. Toluidine and its homologues are prepared by reducing the nitro-derivatives of the corresponding hydro-carbons by means of acetic acid and iron (ferrous acetate), ammonium sulphide, &c. :-— C,H,(NO,) + 38H, = C,H,(NH,) + 20H, + 38.

Nitrobenzene, Amidobenzene (aniline).

These latter amines, which may be regarded as amido- benzene, in which 1, 2, 3, &c., H atoms are replaced by R’, R,’, R,’, &e., are susceptible of the isomeric modifica- tion dependent on the relative positions of the replaced H atoms. Thus we have—

H H.)HHHEH ae ane} aE 46 6 4 6 6 Orthotoluidine. Metatoluidine, C, (NH,)HH(CH,)HH

1 2 3 4 6 6

Paratoluidine.

C,(NH,)H(CH,) HHH

1 2 3

All these amines are basic colourless liquids, more or less oily, and possessing highly characteristic odours. They combine with acids forming crystalline salts, which are decomposed by caustic alkalies with the liberation of the amine.

Phenylamine or aniline, the first member of the present series of primary amines, may be regarded as the first homologue of both the above isomeric series. It derives its name from the indigo-plant (Indigofera Avil), as it was first obtained by distilling indigo with caustic potash, Aniline is found in small quantities in coal-tar oils, but is manufactured on the large scale by reducing nitrobenzene with iron and acetic acid. Aniline is, when pure, a colour-

O76 less, oily liquid, having a peculiar odour ; it boils at 182°C., and solidifies at —8° C, The replacement of the phenylic hydrogen by halogens gradually destroys the basic character of aniline. Thus, chloraniline, C,5H,Cl(NH,), and dichlor- aniline, C,H,Cl,(NH,), form crystalline salts with acids ; but trichloraniline, C,H,Cl,(NH,), possesses no basic properties. By the action of the iodides of C,Hon4, radicles upon aniline, the amido-hydrogen can be replaced by these radicles, giving rise to the formation of secondary and tertiary mcvamines containing different radicles, such, for example, as ethyl-aniline, (C,H;)(C,H,)NH, produced by the action of C,H,I upon aniline, and subsequent treatment with KHO; ethyl-amyl-aniline, (C,H,)(C.H;)(C,H,,)N, formed by the action of C,H,,I upon ethyl-aniline, &e. These tertiary amines combine directly with C,H.,4,1, producing stable iodides— N(CgH5)(CaHont1) (Co Homti)(CoHop4a)

which are not decomposed by K HO, but by the action of Ag,O and water are converted into alkaline hydroxides, analogous to NH,HO. It will be seen that the iodides of C,,H,,4, radicles can thus be employed to determine whether the aminc is primary, secondary, or tertiary. When aniline hydrochloride and methyl alcohol are heated together in a sealed tube, the amido-hydrogen is partially or entirely re- placed by methyl, giving rise to the formation of methyl and dimethyl-aniline hydrochlorides. When both atoms of ainido-hydrogen have been thus replaced, if the heating is continued the phenylic hydrogen becomes replaced by methyl] giving rise to dimethyl-toluidine and its homologues. This interesting intra-molecular substitution was discovered by Hofmann. The nature of the transformation will be secn from the following formule :—

N(CH,)(CH3)(CH3) = N[CgH,(CH,) |(CH;)(CH)

Dimethylaniline. Dimethyltoluidine. N[C,H;(CH,),|(CH3)(CHs) . Dimethylxylidine.

(The last atom of phenylic hydrogen does not appear to be removed by this reaction.)

Nitrous acid acts upon aniline in a manner similar to its action upon the C,,H,,4; primary monamines, converting it into the corresponding alcohol (phenol) :—

C,H,;(NH,) + HNO, = C,H,(HO) +OH,+N,. If the aniline is diluted with alcohol, however, intermediate products are formed— 2C,H,(NH,) + HNO, A

niline, C,,H,,N,

Azodiphenyldiamine.,

= C,H),N, + 20H, Azodiphenyldiamine.

+ HNO, = C,H,N, + 20H,. Diazo-diphenyldiamine.,

Tf salts of aniline are employed, salts of these azo-derivatives are produccd,

Aniline combines with aldclydes with the elimination of water, producing phenaldines :—

2C,H,NH, + CH,.COH —- OH, =C,,H,,N, . Paraniline, a polymeride of aniline, having the composition C,.H,,N,, is known.

Allied to the present group of amines is naphthalidine, C,,H,(NH,), produced by the reduction of nitronaphtha- lene.

Natural Alkaloids.—These compounds are organic bases existing already formed in plants. With the exception of piperidine(C,H,,N) and conine, which are secondary mona- mines, the alkaloids at present known are tertiary com- pounds. The following are some of the more important of this group of amines :—

From the bark of species of Cinchona.

Oiainines…5. ici CHO; Quinamine…..... Cop HogN On Cinchonine…... <@H,,N,0 PApMHIG ccc ess aas CopHigy NS

CHiMds th ®

[ORGANIC.

From Opium.

TOU MCN. eee eee C,,H,NO; Pseudomorphine. .C,,H,,NO, Codeiuiern ner Talley NOg Codamiune™.....~~« plete), Narcotimes……0.; optim. Lanthopinc…..... CyogHosNO4 Dhebainel ees Ci 9H. NOs Laudanine…..... Cop H.,N Oy Papaverine…..... Cop Ho NO, Meconidine….. .. Cy, Ha3N O04 Nareeiiieti ics… CygHagN Og Cryptopine…....Cy;HesNO; Hydrocotarnine…C),H,,;N O03 TAPGEOPING 6 …50654~~ Cop High O;

From various Plants.

StryehRiMe. 0. .....0000 C.,H..N.0,) From Nux Vornica, St Jgnatius’s TMC Moines. cccclenelocs CogHagN.O4 bean, &c.

DiGotime «..:0s5- 10d N, From tobacco.

COMM sate scin. sccan sys From hemlock.

SPAM. cirece ses CipHagNo From broom.

AtVOpIION,.....ccae C\7H,,NO; From nightshade.

ACOMMDUME yaisctvsc sins ns C3>HgNO, From monkshood.

Lheobromine……... C,H,N,0, From cocoa seeds.

Caffeine and Theine.. CgH,)N 40, ee Tie ee , &e,

The constitution of the. radicles contained in these various bases has not hitherto been made clear. Among the cinchona alkaloids—of which the valuable medicine quinine is a member—some intcresting cases of physical isomerism occur, Many bases have been obtained by the action of reagents on the opium alkaloids. A base isomeric with conine has been prepared artificially by heating normal butyl aldehyde with an alcoholic solution of ammonia so as to produce dibutyraldine: 2C,H,.COH + NH, — OH, = C,H,,NO, and then submitting this latter substance to dry distillation: C,H,,NO —-OH,=O,I1,,N.

Bases from various Sources.x—The following are a few bases of animal origin :—

CIRC voncsaxcauensners C,H N,0, From juice of raw ficsh. Cueatinine ……..... C,H,N,0 From creatine by the action of strong acids,

: From guano and pancreatic juice

Guanine …eeeeeeeress C;H;N,;0 of matmmalia. nea From guanine and urinary cal-

REAPING... iersscer ese Cro, eae y SAMOIMO RI… cerca C;H,N,O — From flesh of vertebrata.

_Many bases have been obtained by the destructive distillation of organic matter containing nitrogen. These compounds are tertiary monamines:—

Chinoline ……. sesssesee-CgHyN By distilling cinchona alkaloids

with caustic potash. MO Ole ce oss sce atecviececacne CyH;N From coal-tar and animal oil.

Others are derived from oil produced by the destructive distillation of bones, &c., and coal-tar naphtha :—

ByMdiHiG,.0…..0600803 Cs;H;N PAVOUNC A seccca: a2 CyH,,N PCO Ca sine canine C,H,N Cone ene tc. sce C, Hs LAC Gb) 0 are C,H N RUDIGING. 6.005 +: CaN COMMAMG. ....350405 000 C,Hy,N AVAUETGLITNG ayers seer gH igN

Iydramides (p. 568), when boiled with potash solution, are converted into basic compounds. Amarine, C.,H,.No, is a substance formed in this manner from hydrobenzamide.

Diamines are formed by reactions analogous to those employed in the preparation of monamines :—

C,,H,,Br, + 2NH, = N,(C,H.,)H,.2HBr R” dibromide. R’-diamine dihydrobromide. As in the preparation of monamines, secondary diamines are at the same time formed :—

2C,,H,,Br, + 4NH, = N,(C,,H,,),H,. 2HBr+2NH,Br.

R” dibromide. Di-R”-diamine dihydrobromide.

The action of KIO upon the primary diamine dihydro- bromide is different from its action upon the corresponding monamine compound, inasmuch as an oxide of the diamine is formed :—

N,(C,,Ho,)HgBr, + 2K HO =N,(C,,H,,)H,0 + 2K Br+ OH,

h”-diamine dihydro- bromide.

The diamines corresponding to benzene and its homo- logues are produced by the reduction of the dinitro- derivatives of the respective hydrocarbons—

C,H,(NO,), + 6H, = C,H,(NH,), + 40H,.

Dinitrobenzene, Phenylene diamine.

R-“diammonium oxide

7

AMIDES. |

Intermediate products are sometimes formed— C,H,(NO.). + 3H, = C,H, (NO,)(NH,) + 20H,

Dinitrobenzene. Nitraniline,

The diamines have not been investigated with the amount of detail that has been bestowed upon the mona- mines. By the action of the iodides of C,,Hont, radicles upon ethene and diethene diamines a large number of bases have been obtained, in which the ammonic hydrogen is more or less replaced by these radicles. Diamines form two classes of salts, monacid and diacid.

Lriamines.—The following belong to this class :—

GHanidinevor carbotriamMine….....0sccevedereeses N;CH,

Melaniline or carbodiphenyl-triamine…..... N2C,3Hj3 Triphenyl-guanidine or carbotriphenyl-triamine…..N C,H),

Aniline Colours.—A large number of the colours ob- tained from aniline are triamines, and may be conveniently referred to here. osaniline (magenta or fuchsine) is the base of a splendid red dye which serves as the starting point of numerous other colours. It is prepared by oxi- dizing a mixture of aniline and toluidine with arsenic acid :—C,H,N + 2C,H,N — 3H,=C,)H,)N, (Rosaniline), Mauve is a purple dye produced by the oxidation of aniline by means of sulphuric acid and potassium dichromate.

The base of this colour is mauveine (C,,H.,N,), and it is interesting as being the first of the aniline dyes practically . employed in the arts.

The numerous other dyes derived from benzene, phenol, and naphthalene cannot be discussed here.

It has been recently observed by Dr Otto Witt that the peculiar properties of organic colouring substances are in most cases due to the combined presence of two groups or radicles attached to a carbon nucleus. The one which is the colour-producing group is termed the chromophore, the other is a salt-forming group, ¢.¢., a group which confers upon a molecule either acidity or basicity. A substance containing a chromophore does not become a colour until the salt-forming group is introduced into the molecule ; such potential colouring matters are therefore termed chromogens. The chromophoric group exercises its influ- ence more powerfully in the salts of colouring substances. The principal salt-forming groups combined with aromatic nuclei are HO aud NH,, so that most chromogens of this class give rise to two colours according as one or other of the foregoing radicles enters into their composition.

Phosphines, Arsines, Stibines, and Bismuthines.

These compounds are analogues of the amines, and contain the above elements in place of nitrogen. Some of the methods employed in their production are seen in the following reactions :—

2PH,I + 2C,H,I + ZnO = 2P(C,H,)H,I + OH, + Znl,

Phosphonium Ethyl Se oa e

jodide. fodide. jodi 3Zn(C,H,). + 2PCl, = 2P(C,H,), + 3ZnCl, Zinc ethide. Triethyl phosphine. AsNa, + 3C,H,I = Se LE + 3Nal. Sodium Ethyl Triethy, arsenic alloy. iodide. arsine.

The corresponding tertiary stibines and bismuthines are produced by a similar reaction.

The compounds of the present group are possessed of great affinity for oxygen, many of them taking fire spon- taneously when exposed to the air. Arsendimethyl or cacodyl, As,(CH,),, 1s a spontaneously inflammable liquid, having a most repulsive odour, produced by the action of methyl iodide on sodium arsenic alloy, or by distilling a mixture of potassium acetate and arsenious anhydride. The analogy between these compounds and the amines is still further exemplified by the following reactions :—

CHEMESBER Y

oT7 P(C,Hs)3 + CH,I = P(C,H,),(CH,)I

Tricthyl phosphine. Mcthyl iodide. een ee eePaeatam

28b(O,H,),I + Ag,O + OH, = 28b(C,H,),HO + 2Agt

Tetrethyl Tetrethyl stibonium stibonium iodide. hydroxide, P(C,H,),HI + KHO = P(C,H,), + KI + OH,. Tricthyl phosphonium Triethyl f: iodide. phosphine.

XIV. AMIDEs.

The compounds of this class are most conveniently re- garded as derived from acids by the substitution of NH, for the HO contained in the carboxyl group. It will be thus evident that monobasic acids can yield only one amide —a monamide of the form R’CO(NH,). Polybasic acids, on the other hand, can have their hydroxy] partially or entirely replaced by amidogen, thus yielding normal and acid amides. The latter are known as amic acids :-—

From Dibasie Acids,

CO(HO) CO(NH,) Acid amide Normal amide (Amic acid). (Diamidc),

From Tribasic Acids,

CO(NH,) CO(NH,) CO(NH,) R”2 CO(HO) R”2CO(NH,) R”2 CO(NH,) CO(HO) CO(HO} CO(NH,)

Acid amides Normal amide

(Amie acids). (Triamide).

Amides are primary, secondary, or tertiary, according as one-third, two-thirds, or all the hydrogen of the ammonia is replaced by acid radicles (see p. 574).

Amides are produced—(1.) By distilling the normal ammonium salts of the corresponding acids :—

CH,.CO(ONH,) — OH, = CH,.CO(NH,) Ammonium acctate. Acetamide. C,H,.[CO(ONH,)], – 20H, = C,H,.[CO(NH,)}, ; Ammonium succinate. Succinamide. (2.) Also by the action of ammonia on the acid halides :—

CH,.COC] + 2NH, = CH,.CO(NH,) + NH,Cl.

Acetyl chloride. Acetamide.

By the further action of the acid halide upon the primary monamide secondary and tertiary monamides are produced :—

CH,.COCI + CH,.CO(NH,) = (CH,.CO),(NH) + HCl Acetyl chloride. Acctamide. Diacetamide. (CH,.CO),(NH) + CH,;.COC] = (CH,.CO),N + HCl,

Diacetamide. Acetyl chloride. Triacetamide,

Diacetamide is also formed by the action of dry HCl upon acetamide and triacetamide by heating acetonitrile (methyl cyanide) with acetic anhydride.

The formation of amides containing dyad radicles is exemplified by the equation—

O,H,(COCl), + 4NH, = C,H,[CO(NH;)], + 2NH,Cl. Succinyl chloride. Succinamide.

(3.) Amides are formed by the action of ammonia on

the ethereal salts of the corresponding acids :—

CH,,.CO(0C,H,) + NH,=CH,CO(NH,) + C.H,,HO ceta

Ethyl acetate. etamide. Ethy) alcohol. CO(OC,H,) _ §CO(NH, Ethy1 oxalate. Oxamide. Ethyl alcohol. CO0 (CsH,)””(HO) 4 CO(OC,H,) + 3NH, CO(OC,H,

Ethyl citrate.

CO(NH,) =(C,H,)”(HO) 4 CO(NH,) + 30,H,.HO . CO(NH,)

Citramide, Ethyl alcohol,

V. — 73

978

All the known amides are white crystalline solids, many of them possessing both acid and basic properties. Boiled with acids or alkalies the primary amides regenerate their parent acids :—

CH,.CO(NH,) + HCl+ OH, = CH,.COOH + NH,Cl

Acetamide. Acctic acid. CH,.CO(NH,) + KHO = CH,COOK + NH,. Acetamide. Potassium acctate.

Distilled with P,O, primary amides are converted into nitriles -— CH,.CO(NH,) — OH, = CH,.CN i Acctamide. Acetonitrile. C,H;.CO(NH,) — OH, = C,H,.CN Benzamide. Benzonitile, C,0(NH»). – 20H, = (CN)p. Oxamide, Cyanogen. Amic acids are intermediate between the amides and their parent acids, from which they are produced by sub- mitting the acid ammonium salts to dry distillation -—

CO(ONH,) oq of WOWH) 1 COOH 2 COOH ee es Oxamic acid. CO(ONH CO(NH CoH, | COOH! ~ Ob = CoH | OOOH? Acid ammonium d Succinamic succinate. acid,

Diamides of dibasic acids must be distinguished from

secondary monamides containing dyad acid radicles, The latter are termed cmides. Thus,— CO(ONH ” ” CoH, { CONT) _ 20H, = [C,H, (CO),]”(NH)’, pai oa Suecinimide,

Ethereal salts of amic acids have been obtained by various methods. The following are a few examples -— CO(NH,) ” I CO(NH CO(00,H,) CO (NH,)(OC,H;) (CH3) (HO) Colou.tt,) ’ Ethyl! oxamate. Ethyl] malamate, CO(NH.C,H, ” , {cogn mee [NH (CGH }CHO} (Ca (OCHS) { SOLON Ethyloxamic acid.

Ammonium phenylmalamate,

The salts formulated above, containing the radicle in the carboxyl group, are neutral; those in which the radicle replaces amido-hydrogen are acid. The ammonium salt of carbamic acid is formed by the direct action of carbon dioxide on ammonia: CO, +2NH,=CO”(ONH,)(NH,). The neutral ethereal salts of carbamic acid are known as urethanes.

Alkalanudes are compounds intermediate between amines and amides, that is, containing both positive and negative

Ethyl] carbamate.

Phenylcarbamic acid.

radicles. The following are examples ~~— CoH,0 C,H,0 C;H;0 f (C,05)” N1C,H; N~~C,H,0 N~O,H,O N, (CoE). if CH, He UH, atten. Sincgtecavan: tif ences oie

It has been previously mentioned that cyanic acid forms two classes of compounds analogous to the nitriles and carbamines. Sulphocyanic acid forms two analogous series. The ethereal salts of the iso-series derived from these acids can be formulated as alkalimides :-—

CO” CO” CS” CS”

y { H a { CH, a { C,H; bs { CoH, Methyl isocyanate, Ethyl isosulpho- Phenyl isosulpho-

or methyl carbimide. cyanate, or ethyl cyanate, or phenyl y
‘Sulphocarbimide, sulphocarbimide.

Allyl isosulphocyanate, N(CS)”(C,H,), is interesting as being obtained from oil of mustard, e ° Carbamide and Urea, CO(NH,),.—These compounds

Cyanic acid, or carbimide.

CHEMISTRY

[oRGANIC.

are the neutral amides of carbonic acid. Urea is the chief solid constituent of human urine, and is interesting as being the first organic compound synthesized (Wéliler, 1828). It was first produced artificially by heating a solution of ammonium cyanate : CNO=CO(NH,),.

Urea may also be obtained by the action of ammonia on carbon oxydichloride: COCI, + 4NH, = CO(NH,),+ 2NH,Cl; by the action of ammonia on ethyl carbonate : CO(OC,H;),. + 2NH,= CO(NH,), + 2C,H;.HO; and by the action of heat on ammonium carbamate and carbonate : 2CO(NH,)(ONH,) = CO(NH,), + (NH,),CO,, and (NH,),CO, – 20H, = CO(NH

Urea crystallizes in Jong white 4-sided prisms, very soluble in water and alcohol. It combines with acids, form- ing compounds like CO(NH,),.HCl, CO(NH,),.HNO,, and with metallic oxides, forming such compounds as CO(NH,),.2HgO. Heated with water to a very high temperature, it decomposes into carbon dioxide and am- monia: CO(NH,),+OH,=CO,+2NH,; by the action of nitrous acid it is decomposed into carbon dioxide, nitrogen, and water: CO(NH,), + N,O,= CO, + 20H, + 2N,. Urea is also decomposed by chlorine with the for- mation of cyanuric acid, &c.: 6CO(NH,), + 3Cl, = 2H,C,N,0,+4NH,Cl+N,+2HCl.

Urea combines with aldehydes, with the elimination of water, giving rise to a series of compounds termed wreides. By the action of heat on ammonium sulphocyanate, swlpho- urea, OS(NH,)., is obtained. .

Compound ureas are derived from urea by the replace- ment of amido hydrogen by hydrocarbon radicles. Some of the methods employed in their production are shown by the following equations :—

HONO + N(O;H,)H, = co { N(CH) Cyanic acid. Ethylamine, Hitny1-fnenl
HCNO + N(0,H,),H = 00 { Nim Cyanic acid. Diethylamine. Dietytaen
2N(CiH)H, + 08 = O8{ N(CH) 4. 9H,.

2

Aniline. Shei: erotik: i

Urie Accd (C;N,H,O,) is contained in human urine, serpents' excrement, guano, &c. It is a dibasic acid yield- ing a large number of derivatives by oxidation, &e. It has never been obtained artificially.

UNCLASSIFIED ORGANIC CoMPOUNDS.

These are substances of which the formule have uot yet been satisfactorily determined, owing to their com- plexity of composition and to the difficulty of obtaining them in a state of purity. The names and sources of some of these compounds are given below. .

Mucilage, abundant in linseed, mallow root, é&c.; allied to starch and gum; soluble in cold water.

Gum-tragacanth, a kind of mucilage, insoluble in water, but becoming soft and gelatinous. .

Pectin (Cy.H4,0,51), a transparent jelly contained in most ripe fruits; soluble in water, precipitated by alcohol. It is probably allied to the carbohydrates (p. 564).

Lesins, allied to the terpenes. Common resin (colophony), from pine, contains two acids, abietic acid (C,,H,,O,) and pine acid (Co5H,)0,), the former crystalline, the latter amorphous. Other well-known resins are lac, mastic, copal, sandaraec, dragon's blood, &e, Amber is probably a fossil resin.

Caoutchouc (India-rubber) and gutta-percha are the hardened juices of species of Ficus, Huphorbia, Isonandra, &e. These substances appear to consist of a mixture of terpenes (p. 559).

UNCLASSIFIED COMPOUNDS. |

Balsams ate natural mixtures of resins with volatile oils.

Bitumens result from the decay of vegetable matter out of contact with the air. Prt-coal, ignite, and jet are allied to bitumen. Petrolewm and rock-oil have been referred to as paraflins (p. 556).

The remaining compounds we have to notice are of animal origin.

Albuminoid Substances or Proteids.—These contain carbon, hydrogen, nitrogen, oxygen, quantities of sulphur (0°8 to 1°6 per cent.). Serum of blood is an albuminous substance, soluble in water, precipitated by alcohol, and coagulated by heating. Lyg- albumin is the chief constituent of white of egg; it differs from blood serum in being precipitated by ether. Globulin is present in blood serum, connective tissue, &c.; it is insoluble in water, soluble in dilute aeids and alkalies. Myosin, allied to globulin, exists in muscular tissue, and vitellin in yolk of egg. Casein is an alkaline albuminate

which occurs in milk, coagulable by certain animal mem-

branes (such as rennet or stomach of calf), with the forma- tion of cheese. Jibrin ig the proteid which causes the clotting of blood; it is an elastic substance of filamentous structure, insoluble in water at ordinary temperatures. Peptones result from the action of gastric juice upon albuminous substances; they are soluble in water, and are not coagulated by boiling.

Heemoglobin (which, with the other substances to be mentioned, is allied to the proteids) is the chief con- stituent of the red corpuscles of the blood of vertebrate

substances and small

O19 the blood of certain animals, and contains, in addition to the usual elements composing proteids, about 0°4 per cent. of iron. Hematin results from the decomposition of hemoglobin.

Pepsine is the albuminous constituent of gastric juice, which converts proteids into peptones.

Mucin (Mucus) is a secretion from the salivary glands, and from all mucous membranes of the animal body.

Gelatin and Chondrin.—The first of these substances is produced by the action of boiling water on membranous tissue, skin, tendons, and bones. Isinglass is nearly pure gelatin from the swim-bladder of the sturgeon and other fishes. Common size and glue are examples of impure. gelatin. Gelatin is soluble in water and precipitated by alcohol ; the aqueous solution is completely precipitated by tannic acid (p. 570), this last reaction being the basis of the process of tanning. When hides are steeped in an infusion of oak-bark or of other substances yielding tannic acid, the gelatine of the hide by the action of the tannin is converted into leather. Chondrin is a gelatin- ous substance, obtained from the cartilage of the joints and ribs, which differs in some respects from gelatin.

Keratin is a name given to several substances left after the complete exhaustion of horn, nails, feathers, hair, &ec., by various solvents.

Protagon is a phosphoretted fatty substance, forming the chief constituent of nerve tissue. Boiled with baryta water, it decomposes into stearic acid, glycerin, phos- phoric acid, and other substances, among which is in- cluded trimethyl-oxethylammonium hydrate, or newrine,

animals ; it can be obtained in the crystalline form from

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CHEMNITZ, a town of the kingdom of Saxony, in the circle of Zwickau, 50 miles W.S.W. of Dresden by rail, in a beautiful plain at the foot of the Erzgebirge, watered by the River Chemnitz, an affluent of the Mulde. It is the first manufacturing town in the country, and in population ranks next to Dresden and Leipsic. Though in general well built and possessing a large

number of handsome edifices, it has comparatively few of special interest; among the most important are St James's church, the ancient town- house, the post-office, the theatre, the new realschule, and the exchange. It contains a Roman Catholic and five Protestant churches, and has three civic schools, a gymnasium, a royal industrial school, of great repute throughout Saxony, a school of practical designing, and an extensive Sunday school under the direction of the work- men's union. It is the seat of several large administrative offices, and a chamber of commerce and industry; and among its societies are two scholastic associations, a merchants' union, a scientific association, and an architectural and artistic society. The cotton goods, and especially the stockings, for which it is mainly celebrated, rival those of England in quality and cheapness; and it is also famous for the manufacture of spinning-machinery. There are nineteen distinct establishments for the weaving of woollen and half-woollen cloth ; and 3400 hand-looms are engaged in the same trade. The stocking weaving is prosecuted by sixty-three firms, partly in regular factories and partly by the domestic system. The dye-works number thirty-three, the print-works eight, the bleach-works six, and the chemical works six. There are about eighty establishments for engineering operations, one of which, founded about 1844 by Richard Hartmann, employs 4000 workmen, and manufactures steam-engines of all descriptions, mining and boring apparatus, boilers, and a great variety of implements. The export trade is, of course, very extensive ; and in 1871 the value of the goods despatched to America alone amounted to $4,500,000. There is abundant railway communication in all directions. The population in 1849 was 30,753 ; in 1864, 54,875 ; and in 1871, 70,380. In the last of these years it was found that, with the exception of about 1800 Roman Catholics, 380 German Catholics, 48 Jews, and a few dissenters, the people were all Protestants.

Chemnitz was originally a settlement of the Sorbian Wends, which received its first Christian Church from Otto I. in 938. In the 12th century it obtained municipal rights from Lothaire II., and from the 13th to the 17th century it ranked as an imperial city. From its very commencement its prosperity was due mainly to its nanu- facturing industry, the nucleus of which seems to have been the linen-weaving of the Wends. To this were added extensive bleaching and woollen cloth establishments, which raised the town to great importance in the 15th century. In 1539 the Reformation was introduced,

and 1546 saw the dissolution of the great Benedictine monastery which had been founded in 1125 by Lothaire at Schloss Chemnitz, about 2 miles north of the city. In the Thirty Years' War the city was plundered by both Swedes and Imperialists, and its trade was almost completely ruined. By the close of the century, however, it began to recover, chiefly through the introduction of cotton-weaving, which as early as 1739 employed 2000 looms. In 1775 the English quilt manu- facture was commenced, and in 1799 the Arkwright system of cotton-weaving. After the peace of Paris there was another period of decay; but a revival set in about 1834 when Saxony joined the customs union. 'The cotton manufacture suffered considerably during the American Civil War, but by no means so severely as in the English towns.

CHEMNITZ, Martin (1522-1586), probably the ablest Lutheran theologian of the period immediately succeeding

CHEMNITZ

that of Luther himself, was born at Treuenbritzen in the mark of Brandenburg, on the 9th November 1522. father, though of noble rank, was in somewhat straitened circumstances, and Martin's education was frequently interrupted owing to pecuniary difficulties. In fourteenth year he was sent to school at Wittenberg, where he had frequent opportunities of hearing Luther preach. He studied at the universities of Magdeburg (1539-42), Frankfort-on-the-Oder (1543), and Wittenberg

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(1545), devoting himself specially at the last of these,

under the advice of Melanchthon, to mathematics and astrology. In 1547 he removed to K6nigsberg, where he was appointed in the following year rector of the cathedral school, and two years later (1550) librarian to Duke Albert of Prussia, whose patronage he had gained through his acquaintance with astrology. It was during his residence

in Konigsberg that Chemnitz first turned his attention

seriously to theology, and that he first had an opportunity, in the celebrated controversy with Osiander on the doctrine of justification by faith, of displaying the polemical ability in which he was scarcely surpassed by the greatest of the Reformers. Osiander, who assailed the forensic and objective element in the Lutheran doctrine, was favoured by Duke Albert, and, as the controversy incrcased in intensity, Chemnitz judged it expedient to resign his post of librarian and leave Kénigsberg. In 1553 he returned to Wittenberg, and immediately commenced to deliver lectures at the university on the Loct Communes of Melanchthon. formed the basis of his Loci Theologici (Frankfort, 1591), a work which furnishes one of the best existing expositions of the Lutheran theology, as formulated and modified by Melanchthon. His audience was from the first exceptionally large, and a career of great influence seemed open to him at the university, when he was induced to make another

These

change by accepting the office of pastor to the church in Brunswick, to which he removed in 1554. In this position he spent the remainder of his life, though he received numerous offers of important offices from various Protestant princes of Germany. He was unusually active in the duties of his charge, and he also took a leading part in the theological controversies of the time, always representing and defending strictly Lutheran views. In fact, it is in no small degree to his personal influence, exerted as it was at the critical period of its history, that the Lutheran Church owed the purity of its doctrine and the compactness of its organization. Against the Crypto-Calvinists he maintained . the Lutheran doctrine of the Lord’s Supper in a treatise Repetitio sance doctrine de vera Proesentia Corporis et Sanguinis Domini in Cena Sacra (1560, translated into German 1561). Against the Jesuits, on the other hand, he wrote some works of great power, which probably did a good deal to. check the reaction from Lutheranism that seemed to be setting in. Chief of these were the Theologice Jesuitarum preecipua Capita (1562), a very incisive attack on the principles of the order, and his Luamen Concilii Tridentini, in four parts, published at intervals (1565, 1566, 1572, and 1573). The latter is undoubtedly

Chemnitz’s greatest work. Roman Catholics themselves have not been slow to acknowledge its ability, and it may be questioned whether to this day anti-Tridentine literature can show anything more thorough or more acute. In conjunction with Mérlin, Chemnitz compiled the Corpus Doctrine Prutenicum (1567), a doctrinal work, which at once acquired great authority… Perhaps his chief service to the organization of the church was rendered when, in conjunction with Andre& and Selnecker, he induced the

Lutherans of Saxony and Swabia to ‘adopt the Formula

Concordie, and so become one body. In the protracted negotiations which led to this result his learning and tact were of the greatest value.

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Chemnitz resigned office owing to infirm health in 1584, and died at Brunswick on the 8th April 1586. A very full account of his life by Schenkel is given in Herzog’s Real-Encyklopedie.

CHENIER, Anpri-Mariz pe (1762-1794), French poet, was born at Constantinople, where his father, Louis de Chénier, author of several works on Oriental history, was consul-general. Sent in infancy to France, he lived till his ninth year at Carcassonne, under care of a paternal aunt ; and in 1773, on his father’s return, he was placed at the Parisian Collége de Navarre. At sixteen he was rhyming from Sappho and reading the Greek authors. At twenty (1782) he obtained a sub-lieutenancy in the regiment of Angoumois, then in garrison at Strasburg. He left Paris, and reported himself at headquarters, But military life had no charim for him, and neither the neighbourhood of Brounck, whose Analecta was one of his favourite books, nor the classic tradition of the Alsatian capital, could bind him to his calling; in six months he threw up his commission and returned to Paris, There he studied hard, and wrote idylls (Le Mendiant, L’Aveugle, Le Jeune Malade); he sketched out plans of great poems; he sat and talked with Palissot, David, and Pindar-Lebrun, A serious illness was induced by excess of work ; to complete his recovery he set out, in company with the brothers Trudaine, towards the end of 1784, for Switzerland, Italy, and the Archi-pelago. In 1786 he returned to Paris, plunged into study anew, aud conceived the passion for Madame de Lonneuil which inspired so many of

the perfect elegiacs afterwards to win regard and imitation from Hugo himself.

He was five-and-twenty, and at heart a Greek. The Idyllists and Anthologists were his masters. From their styles did he compound his own; and from them did he learn the exquisite purity of form, the admirable restraint, the chastened vigour of thought and diction, that render lum pre-eminent among modern poets. And with the Hlégies and Art d'Aimer, which are the purely subjective fruit of this part of his life, he prepared the plans for other and greater structures. In Z'Znvention, a completed poem, he promulgated a noble theory of esthetics; in the Hermés, an incomparable fragment, he made himself the Lucretius of his epoch; in Suzanne, which remains a mere canevas, he purposed to deal in the style of Milton with a biblical episode. A few only of his friends were admitted to his feast of poesy ; and he continued for some time to work and wait. But his family were anxious that he should settle in life, and a secretaryship in the French Legation at London was offered him. Jt cost him much to accept it, as his fine idyll Za Liberté remaius to prove ; but in the December of 1787 he left for England.

His residence beyond sea was unhappy enough. The duties of his place occupied him scarcely at all; and among English poets he cared only for Milton, the purely intellectual quality of whose verse seems to have been pecu- larly grateful to him. In 1790 he resigned his post, and returned to France. The Revolution was in full coil; and Chénier, who worshipped liberty and loathed anarchy, threw in his Jot at once with the moderate party. Intro- duced into the brilliant "Societé de '89," he drew up for it a manifesto of principles (Avis aux Francais sur leurs Véritables Enuemis), which, moderate in substance and aggressive in form, gained him the honours of a translation into Polish, together with a medal from King Stanislas, and brought down upon him, through the Mévolutions de France et de Brabant, the wrath of Camille Desmoulins. In 1791 he addressed to David the painter his Dithyrambe sur le Jeu de Paume—one of the most Pindaric of modern odes ; he was defeated in his candidature fcr a seat in the National Assembly ; and in 1792 an invective against the jacobins, published in the Journal de Paris, involved him

in a quarrel with his brother, Joseph Chénier, whom he was afterwards to defend against the attacks of Burke. This dispute was followed by his Archilochian iambics, Sur les Suisses Lévoltés du Régiment de Chaéteauvieux. The Tenth of August, in ruining the hopes of monarchy, ended his chances of political success, and he resolved to retire from the arena, and devote himself wholly to art. The trial of Louis XVI. brought him, howcver, once 1aore to the front; he assisted in preparing the defence, the responsibility of which he offered to share with Malesherbes ; and he drew up an appeal to the people which was rejected in favour of the letter afterwards printed in the Monzteur. He was broken in health and spirits ; Paris was dangerous ; he went to Rouen and to Versailles. At the latter place he wrote the poems to “Fanny” and the A Versailles, so highly praised and subtly analyzed by Sainte-Beuve.

But he had never ceased to oppose and to stigmatize the action of the Jacobin section, and his mind was turncd toward the inevitable end. It came at last. At Passy (6th January 1794) his opposition to the arrest of a Madame de Pastoret, with whom he was staying, led to his own seizure and to his incarceration in the Saint-Lazare. A durance of some months ensued; he wrote for Mademoiselle de Coigny, duchess of Fleury, the beautiful elegy, La Jeune Captive, and for the Convention the furious iambics so often read and quoted. At the tribunal he appeared with forty-four others; thirty-eight were con- demned to death. On the morrow (25th July 1794) with Roucher the poet, Trenck, and the Counts de Montalembert and de Créqui, André Chénier was taken to death. As he descended the Conciergerie steps he said to Roucher, “Je nat rien fait pour la posterité. Pourtant (striking his forehead) y’avais quelque chose la.” According to Henri de Latouche, Roucher and Chénier, as the tumbrel rolled scaffoldwards, repeated to each other the first scene of the Andromaque ; another account represents Roucher as noisily valiant, while Chénier was mute and thoughtful. Three days afterwards, in the same place, Robespierre and his fellows were executed, and the Terror was at an end.

The poems of André Chénier, with the exception of the Dithyrambe and the Ode to Charlotte Corday, both of which saw light during his life, remained

unedited for five-and- twenty years.

See Sainte-Beuve, Critiques et Portraits, tome ii.; Tableau de la poésie francaise; Beeq de Fouquitres, Doewments nouveaux sur André Chénier; Cuvres en prose d’ André Chénicr, Paris, 1840. An edition of the poems in one volume forms part of the Bibliothéque Charpentier; a second, in three volumes, was published by Beeq de Fouquieres, 1862; a third, also in three volumes, is ineluded in Lemerre’s valuable series of reprints. (W. E. H.)

CHENIER, Marie-Josepn DE (1764-1811), poet and dramatist, was a younger brother of André Chénier, and,

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like him, was born at Constantinople, reared at Carcassonne, and educated at the Collége de Navarre. Entering the army at seventeen, he left it soon afterwards ; and at twenty he produced Azémire, a tragedy, which had a languid sort of success. His next venture, Charles [X., which commenced the renown of Talma, excited an extraordinary enthusiasm (1789), and still keeps the stage. In 1791 appeared Henri VIII. and Calas, with the performance of the first of which the Thédtre de la République was solemnly inaugurated; in 1792 he produccd his Caius Gracchus, which was proscribed and burned at the instance of Albitte for an anti-anarchical hemistich (Des lois e¢ non du sang /); and in 1793 his Zvmoléon, set in Méhul’s music, was also proscribed. His brother’s death on the scaffold is supposed to have diverted him from the theatre; and only once again, in 1804, with his unsuccessful Cyrus, did he attempt the scene. Long a prominent member of the Jacobins’ Club, Joseph Chénier was one of the busiest of litcrary politicians, one of the most prolific of political poets. He was a member of the Convention and of the Council of Vive Hundred, over both of which he presided; he had a seat in the Tribunate ; he belonged to the Committees of Public Instruction, of General Security, and of Public Safety. In 1801 he was one of the educational jury fcr the Seine ; from 1803 to 1806 he was inspector-general of public instruction. In 1806 and 1807 he delivered a course of lectures at the Athénée on the language and literature of France from the earliest years; and in 1808, at the emperor’s request, he prepared his Zableau has- torique de Vétat et du progrés de la littérature frangaise— a work, reprinted so late as 1862, in which he shows to great

advantage, as a writer, as a critic,as a man. He died January 10, 1811. ‘The list of his works is too long for quotation ; 4 glance at them will indicate his industry and the suppleness and strength of his talent. He wrote hymns and national songs—among others, the famous Chant du Départ ; odes—Sur la Mort de Mirabeau, Sur VOligarchie de Robespierre, &e. ; tragedies, which never reached the stage—Brutus et Cassius, Philippe Deus, Tibére; translations from Sophocles and Lessing, from Gray and Horace, from Tacitus and Aristotle; with elegies, dithyrambics, and Ossianic rhapsodies. As a satirist he is said to possess great merit—see La Calomnie (1797) and the Litre & Voltaire (1806)—though he sins from an excess of severity, and is sometimes malignant and unjust.

See Huvres Completes de Joseph Chénier, 8 vols., Paris, 1823- 1826 ; Poésies, Paris (Charpentier) 1844 ; Chefs-d’euvre des Auteurs Tragiques, vol. ii.

CHEOPS, the name of an Egyptian king Khufu, called Cheops by Herodotus, Chembes by Diodorus, Souphis by Manetho, and Saophis by Eratosthenes. He was the second king of the fourth dynasty of Manetho, and the builder of the Great Pyramid at Gizeh, 120 stadia distant from Memphis and about 45 from the Nile. According to Diodorus, each side was 7 plethra long, and the height 6 plethra; or according to Herodotus, each side of the base was 8 plethra in extent, and the height the same. The former sides are supposed to have been each 764 feet long, their present dimensions being about 746 feet, while the actual present height is 450 feet, and the angle of the casing stones 51° 50’, according to the measurements of Perring. This wonder of the ancient world, the sepulchre of the monarch, was constructed at great expense and suffering, 100,000 men, changed every three months, being employed by forced labour ten years in constructing the causeway by which the blocks of stone were transported from the Tourah quarries, in the Arabian chain, to a quay on the banks of the Nile, where they were transported by boat from the other bank. Immense expense was entailed in the execu- tion of this costly sepulchre, and according to a popular but

improbable tradition, Cheops was compelled through want of moncy to sacrifice the honour of his daughter to complete the task, _ Other popular tales, according to the gloss or extract of Manetho, depicted him as impious towards the gods, closing the temples and stopping the worship, but subsequently repenting, and writing a sacred book much esteemed by the Egyptians. His name was supposed to mean wealthy, or having much hair. The monumental in- formation about Cheops does not confirm the Greek his- torians ; on the contrary, it records the construction of temples in honour of the gods, the repair of the shrine and the gift of various figures of the temple of Isis and Athor close to his own' pyramid, and his construction or repairs of the temple of the same goddess Athor, the Egyptian Venus, at Denderah or Tentyris. The sacred book may have been part of the Egyptian rituals, portions of which were attri- buted to the early kings of Egypt, and a medical papyrus records the discovery in his reign of a treatise on medicine in a temple of a goddess at the town of Debmut. Cheops carried on war at the Wady Magarah in the Peninsula of Sinai in Arabia, and a rock tablet represents him having conquered the hostile tribes in the presence of the god Thoth, who had revealed the mines of the locality. His oppression had so afflicted Egypt that the charges of impiety had attached to his name; but the tombs of his children reveal no change in the established religion, and his pyramid only differs from those of his predecessors and immediate successor by its rather larger size and greater beauty. His name Khufu, sometimes with the addition of that of the god Khnum as Khnum-Khufu, has been found on several monuments, and was found scrawled on the stones from the quarries of Tourah or the Mons Troicus employed in the so-called chambers of construction of tlic Great Pyramid. There is no known {monument with the date of a regnal year of this monarch, so that it is uncertain if he reigned the sixty-three years attributed to him by Manetho, or the twenty-nine assigned by Eratosthenes. It is just possible, from fragment 30 of the Papyrus of Turin, that he may have lived ninety-five years and reigned the higher number, as generally recognized by Egyptologists. The date of Cheops according to Lepsius is 3095-3032 B.C., but great difference of opinion, amounting to nearly 2000 years, exists as to the time of Menes, from whom the lists separate him by the interval of 898 years. Priests of the Apis and Mnevis bulls are mentioned in the tombs of his period. (Herodotus, ii. 124; Diodorus, i. 64; De Rougé, Zecherches, pp. 52, 54; Mariette, Monuments de

Boulaqg, pp. 207-209 ; Birch, in Zeitschrift f. dgyptesche

Sprache, 1871, pp. 61-64; Duemichen, Bauurkunde, pl. xvi., a, 6; Lepsius, Denkm., ii. 2.)

CHEPHREN, an Egyptian monarch, called in the hieroglyphs Khafra, by Herodotus Chephren, by Diodorus Cephren or Chabrias, by Manetho Souphis II, and by Eratosthenes Saophis II. He was, according to the legends, the' son or brother of Cheops, and acted in the saine tyrannical manner. Chephren built the second of the great pyramids at Gizeh close to the Sphinx and the Great Pyramid, and was said to be hated like his brother, his mummy not buried in the sepulchre but torn to picces, and the sarcophagi emptied of their contents. The present length of the base of this pyramid is 690 feet 9 inches, and its perpendicular height 447 feet 6 inches, its angle 52° 20', but it is not built with the same care. The wife of Chephren, named Merisankh, was priestess of the god Thoth, and Kheman another prince of the family, priest of Thoth at Hermopolis, There is no reason for believing in the impiety of the monarch, or any oppression more than in the case of his predecessors and successor, all whose tombs were pyramids. Chephren also built the small tempie behind the great Sphinx, but does not appear

anlongst the monarchs recorded at the Wady Magarah. The lists of Abydos interpose a king called Ra-tatef or Tatefra, between Cheops and Chephren, but his reign was probably short and insignificant, and he may have been the brother of Cheops. According to Herodotus, Chephren reigned 50, according to Manetho 66, and according to

Eratosthenes 27 years, the longest time being probably –

correet. From fragment 30 of the hieratic canon of Turin it is probable that he lived 95 years, and his reign, accord- ing to Lepsius, was from 3032-2966 B.c. A splendid diorite statue of Chephren is in the museum of Boulaq, and others, broken and thrown long ago into the well of the temple near the Sphinx, supposed to have been destroyed by popular hatred with the remains of the tombs of his family in the Gizeh cemeteries, are the

principal monuments of his reign, It is just possible a bull Apis was buried in his pyramid. (Herodotus, ii. 127, 128; Diodorus, ii. 64 ; Maspero, Fragment un commentaire sur le second lwre Herodote, pp. 4-7; De Rougé, Recherches, pp. 52, 54, 62-64; Mariette, Lettre da M. De Rougé, p. 7; Lepsius, Auswahl., taf. iii).

CHEPSTOW, a market-town and river-port of England, in the county of Monmouth, on the Wye, 2 miles from its junction with the Severn, and 135 miles from London. It occupies the slope of a hill on the western bank of the river, and is environed by scenery of much beauty and grandeur. The town is generally well built, and the streets are broad and clean. The church, originally the conventual chapel of a Benedictine priory of Norman erection, was restored to its former dimensions by the rebuilding of the chancel and transepts in the beginning of the present century. The western entrance and some other parts are richly decorated, and the interior contains many interesting monuments. Tho castle, founded in the 11th century by W. Fitz-Osborn, earl of Hereford, and almost wholly rebuilt in the 13th, is still a magnificent pile. It stands on the summit of a cliff which is washed by the Wye, and occupies about 3 acres of ground. The river is crossed by a fine iron bridge of five arches, erected in 1816, which has a total length of 532 feet and a span in the middle of 112 feet. There is free passage for large vessels as far as the bridge; but barges of from 18 to 30 tons can ascend as far as Hereford. From the narrowness and depth of the channel the tide rises suddenly, and to a great height, frequently above 50, and it is said even: to 70 feet, forming a dangerous bore. There are no manufactures, but the trade is considerable. ‘The exports are timber, bark, iron, coal, cider, and millstones. Popu- lation in 1851, 4295, and in 1871, 3347.

CHEQUE. “A check on a banker,” says Mr Justice Byles, “is in legal effect an inland bill of exchange drawn on a banker payable to bearer on demand. A check is consequently subject in general to the rules which regu- late the rights and liabilities of parties to bills of exchange.” Commercial usage has, however, imposed on cheques certain qualities which do not attach to other bills of exchange.

Before 1858 cheques were not subject to the stamp duties imposed on bills in general, if they complied with the following conditions, viz., to have

been drawn on a banker, to have specified truly the place of drawing (which must have been within 75 miles from the banker's place of business), to have been payable to bearer on de- mand, not to have been post-dated, and not to have declared payment to be made in bills or notes. Severe penalties were imposed on persons making or receiving unstamped cheques not falling under thisexemption. In 1858 a stamp duty of a penny was imposed on all cheques, and the restric- tions as to place of drawing, post-dating, &c., abolished. Another restriction making cheques good for sums under twenty shillings is also abolished.

583.

Although a drawer of a bill is not usually liable thereon until acceptance, a banker having effects belonging to his customer is bound to pay his customer's cheques within a reasonable time, There is what is called an implied con- tract that the banker should do so, and if it is broken the customer may recover damages. 'The rule as to present- ment of bills within a reasonable time (¢.e., in general the day after issue) applies to cheques, but a drawer is not relieved by the holder's negligence in presenting unless he has been injured thereby, as for example by the failure of the banker in the interval. The habit of crossing cheques with the name of some banker is believed to have been originally intended as a direction to drawees to pay only to' the bankers so named, but it was held at law that such crossing amounted only to a direction to pay to some banker. The words "and Co.," the name of the particular banker being left out, have the same effect. Payment of a crossed cheque otherwise than through a banker was at common law evidence of negligence on the part of the drawee, render- ing him responsible to the drawer. The Act 19 and 20 Vict. c. 25 enacted that a cheque bearing across its face an addition of the name of any banker or of the words "and Company" should be payable only through some banker. Payment made otherwise than through a banker hitherto indirectly and practically invalid was thus made directly and as a matter of law invalid. In the construction of this statute it was held by the Court of Common Pleas, in the case of Simmons ». Taylor (27 Law Journal, 45), that the crossing was no part of the cheque and that its fraudulent obliteration was no forgery of the cheque, and that the payment, without negligence, of a cheque with the crossing so obliterated was good as against the drawer. This decision led

to the Act 21 and 22 Vict. c. 69, which made the crossing a part of the cheque and its fraudulent obliteration a felony. A holder may cross an uncrossed cheque, or prefix any banker's name to the words "and Co.," but if a particular banker is once named the cheque is henceforth payable through him alone. When a crossing has been obliterated a wrong payment of the cheque in consequence, if without fraud or negligence on the part of the banker, shall not be questioned. In a reeent case (Smith v. Union Bank of London) the effect of these enactments was explained by the Court of Appeal in a manner whieh startled the commercial community. In that case the plaintiff had crossed a cheque received by him from a customer with the name of his own bankers. The check was stolen, and finally passed for full value to C who paid it into his bankers, and they in turn received payment of it from the defendants. The court held that the negotiability of the cheque was not affected by statute, that C had become the lawful holder, and that the plaintiff had no action against the defendants. The consequence of this decision was the Act 39 and 40 Vict. c. 81, which provided that when a cheque bears across its face an addition of the words "and Company," or any abbre- viation thereof, between two parallel transverse lines, or of two parallel transverse lines simply, and either with or without the words "not negotiable," that addi-

'tion shall be deemed a crossing, and the cheque shall be

deemed to be crossed generally. When a cheque bears across its face an addition of the name of a banker, either with or without the words "not negotiable,' that addition shall be deemed a crossing, and the cheque shall be deemed to be crossed specially, and to be crossed to that banker. When a cheque is uncrossed, the lawful holder may cross it generally or specially; when it is crossed generally, he may cross it specially, and whether crossed generally or specially he may add the words " not negotiable." When a cheque is crossed specially, the banker to whom it is specially crossed may again cross it

specially to another banker as his agent for collection. If a cheque is crossed generally, the banker on whom 1t 1s drawn shall not pay it otherwise than to a banker; if crossed specially, not otherwise than to the banker specially

named in the crossing or his agent for collection. When a cheque is crossed specially to more than one banker (except when crossed to an agent for collection) the banker on whom it is drawn shall refuse payment thereof. When a crossed cheque has been paid, either to the special banker in case of a special crossing, or to some banker in case of a general crossing, the banker and (if the cheque has come to the hauds of the payee) the drawer shall be in the same position as if the cheque had been paid to and recovered by the true owner thereof. A banker paying crossed cheques otlerwise than as authorized by this Act shall be liable to the true owner for any loss he may sustain. When a cheque is presented for payment which does not appear at the time to be crossed, or to have had a crossing which has been obliterated, or to have been altered other- wise than as authorized by the Act, a banker paying the same in good faith and without negligence shall not be liable by reason of the cheque having been crossed, obliter-ated, or altered, or by reason of payment having been made otherwise than to some banker, or to the banker named in the special crossing. If the crossed cheque bears the words “ not negotiable,” the person taking it takes and can give no better title to it than the person had from whom he took it.

A cheque is payment unless dishonoured ; but on the question whether a debt has been paid, it is not sufficient to produce a cheque drawn by the debtor in favour of the creditor, and paid by the banker, unless it can be shown to have passed through the creditor’s hands. Where a check has been fraudulently altered, and a banker pays a larger sum than that originally written, he must bear the loss, and cannot charge his customer unless some act of his facilitated the forgery. Where a cheque was filled up in such a way as to make deception easy, the customer was held responsible for the loss.

A. new description of draft on a banker is introduced by the Act 16 and 17 Vict. c. 59, § 19.

CHER, a central department of France, embracing the eastern part of the ancient province of Berry and part of Bourbonnais, bounded N. by the department of Lcire, W. by Loir-et-Cher and Indre, 8. by Allier and Creuse, and HE. by Niévre and Loire. It is situated between 46° 18’ and 47° 41’ N, lat. and between 1° 50’ and 3° 6’ E. long,, and has an area of 2780 square

miles. The surface of the department in general is extremely level, the only elevated districts being on the northern and north-western frontiers, which are skirted by a range of low hills, The prin- cipal rivers, besides the Cher and its tributaries, are the Grande Sauldre and Petite Sauldre on the N., but the Loire and Allier, though not falling within the department, drain the eastern districts, and are available for navigation. The Cher itself becomes navigable when it receives the Arnon and Yévre, and the communications of the province are greatly facilitated by the Canal du Berry, which traverses it in all its length, the lateral canal of the Loire which stretches from Digoin to Briare, and the canal of the Sauldre. Except in the Sologne, a sandy and sterile tract in the north-west, the soil is generally fertile, but varies considerably in different localities. The most pro- ductive region is that on the east, which belongs to the valley of the Loire; the central districts are tolerably fertile but marshy, being often flooded by the Cher ; while in the south and south-west there is a considerable extent of dry and fertile land. The department contains a com- paratively large extent of pasturage, which has given rise to a considerable trade in horses, cattle, sheep, and wool

for the northern markets. Among the agricultural produc- tions hemp holds the first place; but wine, fruits, chestnuts, and truffies are also important articles of traffic, Mines of iron and coal are wrought ; and marble, millstones, lithographic stones, manganese, gypsum, porcelain clay, and peat are procured in different parts. The smelting of iron-ore and the manufacture of steel and cutlery are carried on to a considerable extent. The other manufactures are of coarse cloth and canvas, cotton and woollen gauze, porcelain and toys. The department is divided into three arrondissements, cognominal with the chief towns of Bourges, Saint-Amand, and Sancerre, of which the first is the principal seat of administration. The total population in 1851 was 261,892, and in 1872, 335,392.

CHERASCO, a town of Italy, in the province of Cuneo and district of Mondovia, near the junction of the Stura and the Tanaro, 30 miles south-east of Turin, with which it is connected by railway. It is well built and is

surrounded by walls, A canal from the Stura supplies it with water. The church of the Madonna del Popolo, which was com- pleted in the 18th century, is worthy of notice ; and there are two large triumphal arches and some fine mansions of the nobility. The principal manufacture is silk, and there is some trade in corn, wine, and truffles.

Cherasco (Clerascwm,.or Catirascum) is only two miles from the site of the old Roman town of Pollentia, where there are still remains of a theatre, an amphitheatre, a temple, and other buildings. In the Middle Ages it was one of the strongest fortresses of Northern Italy, and for a time it ranked as a free city. In 1631, it gave its name to a treaty between Spain, France, and Rome, in regard to the duehies of Montferrat and Mantua; and in 1633, to the peace

between France and Savoy. In 1801, its fortifications were dis- mantled by the French. Pop. 8886.

CHERBOURG, a naval station, fortified town, and seaport of France, in the department of La Manche, on the northern shore of the peninsula of Cotentin, at the mouth of the small River Divette, in 49° 38’ N. lat., 1° 38’ W. long. It stands on a bay formed by Cape Levi on the E. and Cape La Hogue on the W.,and is distant 75 miles from the Isle of Wight, 41 miles W. by N. from St Lo, and 212

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Plan of Cherbourg (4°2 miles N, to §.,

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5°35 E, to W.)

in the same direction from Paris. The town in itself is small and unimportant. Its houses are built of stone and roofed with slate ; but the streets are narrow, and the only public buildings of any interest are the tower (a remnant of the old fortifications), the church of La Trinité, in front of which is the colossal statue of Napoleon I. by Level ; the Chapelle de Nétre Dame du Veoeu, formerly part of the abbey founded by the Empress Maude in the 12th century ; the Hétel de Ville, which contains the Henry Museum and the library; the bathing establishments, opened in 1827; and the theatre. The town is supplied with water.

from a reservoir completed in 1874 at Chateau d'Eau, about three quarters of a mile distant, and capable of con- taining upwards of 500,000 gallons. Cherbourg derives its chief importance from its naval and commercial harbours, which are distant from each other about half a mile, The former is cut out of the rock, and is capable of accommodating fifty men-of-war of the largest size. The depth of water at full tide is 50 feet, at low tide 25 feet. Connected with the harbour are the dry docks, the yards where the largest ships in the French navy are constructed, the magazines, the rope walks, and the various workshops requisite for a naval arsenal of the first class. The works are carefully guarded on every side by redoubts and fortifications, and are commanded by batteries on the surrounding hills so completely that the harbour of Cherbourg may be pronounced one of the strongest in the world. The commercial harbour at the mouth of the Divette communicates with the sea by a canal 650 feet in length and 54 in width. It consists of two parts, an outer harbour 262 yards long by 218 wide, and a basin 446 yards long and 138 wide, in which the depth of water is 19 feet at low tide, and will be increased by the dredging operations commenced in 1874. Outside these harbours is the triangular bay, which forms the roads of Cherbonrg. This bay is admirably sheltered by the land on every side but the north. To protect the shipping from tle violence of the north winds the great dague, or break- water. has been constructed. This immense work is 2} miles in length; its breadth at the base is 262 feet, and at the summit 101 feet. Its foundation was formed by massy wooden frames, which were sunk and filled with stones ; and it is now protected from the waves by a parallel line of large blocks weighing each 44 tons. The industrial activity of

Cherbourg is considerable, its principal pro- ducts being cotton yarn, refined sugar, soda, leather, and chemicals. A lace factory gives employment to nearly 400 women. ‘The chief articles of export are farm and dairy produce, more especially potatoes, butter, and pigs’; and the imports consist mainly of coal, iron, timber, and cotton. The population in 1846 was 22,460; in 1872 it amounted to 34,785.

Cherbourg is supposed by some investigators to occupy the site of the Roman station of Corialluwm, but nothing definite is known about its origin. The name was long regarded as a corruption of Cesaris Burgus, or Cxsar’s Borough, but there is at least as much probability that it is the same as the English Scarborough. The castle is mentioned in the 11th century, and the town certainly existed in the 10th. William the Conqueror supplied it with 4 hospital and a church; and Henry II. on several occasions chose it as his residence. In 1295, it was pillaged by an English fleet from Yarmouth; and in the 14th century it frequently suffered during the invasions of Normandy. Captured by the English in 1418 after a» four months’ siege, it was recovered by Charles VII. of France in 1450. An attempt was made under Louis XIV. to construct a military port; but the fortifications were dismantled in 1689, and further damage was inflicted by the English in 1758. Louis XVI. commenced the construction of the breakwater, and his plans were afterwards carried out and extended by Napoleon I., who is said to have declared that he would renew at Cherbourg the wonders of Kgvpt, and raise his pyramid in the sea. It was left, however, to Louis Philippe, and particularly to Napoleon III., to complete his designs, and their successful realization was celebrated in 1858, in the presence of the Quecn of England, against whose dominions they had at one time been mainly directed. Between 1783 and the close of 1857, 66,862,000 francs had been expended on the works.

CHERIBON, or SHERIBON, a seaport town on the north coast of Java, capital of a residency of the same name, and. the seat of a Dutch governor, is situated at the head of a wide bay 125 miles E.S.E. of Batavia, in 6° 48″ 8. lat. and 108° 38’ E. long. It was formerly a place of importance, but it has never fully recovered from the effects of a dis- astrous plague which visited the place at the beginning of this century. The town and harbour are defended by a fort called the Beschermer or Protectur which also serves

as a convict prison. A church, founded in 1842, is used in common by Protestants and Roman Catholics; the Mussulman population has its mosque, and the Chinese their Alin-ting or temple. A school for European children was opened in 1824, and a Government school in 1854, The Chinese district is pretty populous; but no estimate exists of the actual number, At some distance from the town are the graves of the sultans, among whom the most remarkable is Ibnu Mulana, who introduced the Mahometan religion here in 1406. he district is very fertile, and produces the finest coffee raised in the island. ‘Timber, cotton, indigo, sugar, and pepper are exported in large quantities. Total population of district in 1856, 769,331.

CHEROKEES, CyERoxEss, or, in the form employed by themselves, Jsaraghee, or Chelake, a tribe of North American Indians, now settled in the Indian Territory, where they occupy an area of 5960 square miles in the north-east and a strip along the north of about 8500. Before their removal thither they possessed a large tract of country now distributed among the States of Alabama, Georgia, Mississippi, Tennessee, and the western part of Florida. They were then distinguished into two great divisions, the Ottare or Otari, who dwelt in the moun- tainous districts, and the Airate or Erati, who inbabited the lower grounds; and they were further divided into seven clans, each of which prohibited intermarriage between its own members. They attached themselves to the English in the disputes and contests which arose between the European colonizers, formally recognized the English king in 1730, and in 1755 ceded a part of their territory and permitted the erection of English forts. Unfortunately this amity was interrupted not long after ; but peace was again restored in 1761. The tribe was gradually advancing in civilization when the Revolutionary War broke out, and they sided with the Royalist party. This, of course, led to their subjugation by the new republic, and they were forced to surrender that part of their lands which lay to the south of the Savannah and east of the Chattahoochee. Peace was made in 1781, and in 1785 they recognized the supremacy of the United States, and were established in their possessions. The gradual advance of immigration soon led to disputes with the settlers, and the Cherokees were treated with the most high-handed injustice by the States, and more especially by

Georgia. Exodus after exodus took place; a small part of the tribe desired a complete removal to another district ; but the main body was neither to be bribed nor frightened from their country. An appeal was made to the United States Government; but it lent a deaf ear to their prayers, and in Congress voted that a treaty concluded with a miserable minority should be regarded as binding on the whole tribe, which about that time numbered 27,000.

68,868 swine. They live in well-built villages, and main- tain industrial habits. Their territory is distributed into eight districts ; and their chief town is Tahlequah, situated in the south-east corner of the country. A newspaper 18 published in the capital in English and Cherokee, and a literature is being gradually formed. Their language con- sists of two dialects,—a third, called Gidoowa, having been lost. The syllabic alphabet invented in 1821 by George Guess is the character employed.

CHERRY (Cerasus). As a cultivated fruit-tree the cherry is generally supposed to be of Asiatic origin, whence, according to Pliny, it was brought to Italy by Lucullus after his defeat of Mithridates, king of Pontus, 68 s.c. As with most plants which have been long and extensively cultivated, it is a matter of difficulty, if not an impossibility, tovidentify the parent stock of the numer- ous cultivated varieties of cherry; but they are gene- rally referred to two species, Cerasus sylvestris, the wild or corone cherry or gean-tree (the mérisier of the French) and C. vulgaris, the common cherry-tree (French cerisier). The former species appears to be indigenous on the Mediterranean coasts, and in Central Europe, including the British Islands ; and it is probable that it is the latter species or some of its valuable cultivated varieties which was introduced by Lucullus.

The genus Cerasus includes trees of moderate size and shrubs, having smooth serrate leaves, white flowers, and a drupaceous fruit. They are natives of the temperate regions of both hemispheres ; and the cultivated varieties ripen their fruit in Norway as far as 63° N. The geans are generally distinguished from the common cherry by the greater size of the trees, and the deeper colour and compa- rative insipidity of the flesh in the ripe fruit,

which adheres firmly to the ‘‘nut” or kernel ; but among the very numerous cultivated varieties specific distinctions shade away so that the fruit cannot be ranged under these two heads. In the Fruit Catalogue published by the Horticultural Society in 1842, eighty varieties are enumerated, and to these con- siderable additions have since been made by cultivation both in Europe and America. The leading varieties are recognized as Bigarreaux, Dukes, Morellos, and Geans. Several varieties are cultivated as ornamental trees and on account of their flowers.

The cherry is a well flavoured sub-acid fruit, and is much esteemed for dessert ; but it should be used cautiously, as, especially if not quite ripe, it has a tendency to disorder the bowels. Some of the varieties are particularly selected for pies, tarts, &c., and others for the preparation of pre- serves, and for making cherry brandy. ‘The fruit is also very extensively employed in the preparation of the liqueurs known as kirschwasser, ratafia, and maraschino. Kirsch- wasser is made chiefly on the upper Rhine from the wild black gean, and in the manufacture the entire fruit-flesh and kernels are pulped up and allowed to ferment. By distillation of the fermented pulp the liqueur is obtained in a pure colourless condition. Ratafia is similarly manu- factured, also by preference from a gean. Maraschino, a highly valued liqueur, the best of which is produced at Zara in Dalmatia, differs from these in being distilled from a cherry called marasca, the pulp of which is mixed with honey, honey or sugar being added to the distillate for sweet- ening. Itis also said that the flavour is heightened by the use of the leaves of the perfumed cherry, Cerasus Mahaleb.

The wood of the cherry tree is valued by cabinetmakers, and that of the gean tree is largely used in the manufac- ture of tobacco pipes. The American red cherry, Cerasus serotina, is much sought after, it being compact, fine- grained, not liable to warp, and susceptible of receiving a brilliant polish. The bark of this species is very highly

esteemed in America as a mild tonic and sedative medi- cine, and is coming into use for the same purpose in Great Britain. The kernels of the perfumed cherry, C’. Mahaleb, are used in confectionery, and for scenting toilet soap.

A gum exudes from the stem of cherry-trees similar in its properties to gum arabic.

CHERSO, an island of Ilyria, included in the govern- ment of Trieste, in the Gulf of Quarnero, connected with the island of Osero by a bridge, and separated from the mainland by the channel of Farissina. It is about 35 miles in length, with an area of 105 square miles, and has about 7600 inhabitants. It is traversed by a range of mountains, forming natural terraces on which vines and olive trees flourish. The other parts of the island are covered with bushes of laurel and mastic, but there are scarcely any large trees. There isa scarcity of springs, and the houses are generally furnished with cisterns for rain water. The capital of the same name, on the western side of the island, has a cathedral, several churches and monasteries, and 4673 inhabitants. In the centre of the island, at 40 Paris feet above the level of the sea, is an inter- esting lake called the Vrana or Crow's Lake, which, accord- ing to the hypothesis of Dr Lorenz of Fiume, is connected with the island of Osero,

CHERSONESE, Currsonesvs, or CHERRONESUS (from xépcos, mainland, and vfjoos, island), is a word equivalent to peninsula. In ancient geography, the Chersonesus Thracica, Chersonesus Taurica or Scythica, and Chersonesus Cimbrica correspond respectively to the peninsula of the Dardanelies, the Crimea, and Jutland; and the Golden Chersonese (1) xpvo Xeppdvyvos) is usually identified with the peninsula of Malacca. The Tauric Chersonese was further distinguished as the Great, in contrast to the Heracleotic or Little Chersonese at its south-western corner, where the town of Sebastopol now stands.

CHERTSEY (in Saxon Ceortes Lye or Ceorta's Island), a market-town of England, on the south bank of the Thames, in the county of Surrey, about 25 miles W.S.W. from London by railway. It is connected with Middlesex by a bridge of seven arches, built of Purbeck stone in 1785. The parish church, rebuilt in 1808 at a cost of £12,000, contains a tablet to Charles James Fox, who resided at St Anne's Hill in the vicinity, and another to Lawrence Tomson, a translator of the New Testament in the 17th century. The principal educational establishments are sup- ported by a foundation bequeathed in 1725 by the liberality of Sir William Perkins; and they afford

a free education to upwards of 200 children. Hardly any remains are left of the great Benedictine abbey, which was rebuilt by Edgar in 963 on the site of an earlier monastery established by Earconwald, bishop of London, in the 7th century. Its buildings at one time included an area of 4 acres; but they fell into almost complete decay in the 17th century, and a “fair house ” was erected out of the ruins by Sir Nicholas Carew of Beddington. The ground-plan can yet be traced; the fish ponds are still complete; and carved stones, coffins, and encaustic tiles of a peculiar manufacture are frequently exhumed. Among the abbots the most famous was John de Rutherwycke, who was appointed in 1307, and continued, till his death in 1346, to carry on a great system of alteration and extension, which almost made the abbey a new building. The house in which the poet Cowley spent the last years of his life is still extant, and the chamber in which he died is preserved unaltered. The town is the seat of a county court, and possesses a literary institute and an agricultural society. Its principal trade is in produce for the London markets. During the 7th cen- tury Chertsey was the residence of the South Saxon kings. Population of the parish in 1872, 7763; of the town, about 3000.

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CHERUBIM (plural of cherub) were “ celestial genii,” and, in M. de Saulcy’s opinion, little else can be positively affirmed (Histore de Cart judaique, p. 24). Fresh light has, however, recently been thrown upon them from the cuneiform inscriptions, and we are no longer reduced tu admit that “le vaste champ des hypothéses restera toujours ouvert.” According to the Old Testament, the cherub united the functions of bearer and guardian of deity; or rather, perhaps, there was a divergence in the popular beliefs on this subject. In Ps. xviii. 10, 2 Sam. xxii. 11 Yahweh (the so-called Jehovah) is described as “riding upon acherub,” and in the parallel line as “swooping,” the word applied in Deut. xxviii. 49 and elsewhere to the flight of the eagle. Putting the two phrases together, we may conclude that, according to one version of the myth— whether fully believed in or not by the Psalmist need not here be discussed—the cherub was either an eagle or a quadruped with eagle’s wings) This result would seem to justify connecting the word with the Assyrian kurubu, a synonym of kurukku or karakku, the “circling” bird, z.e., according to Friedrich Delitzsch, the

vulture. On the other hand, the prophet Ezekiel (xxviii. 13-16), though agreeing with the Psalmist in mentioning but one cherub, describes him as " walking in the midst of stones of fire" (ae, thunderbolts), and as extending his wings over "the holy mountain of Elohim," in other words, as the attendant and guard rather than as the bearer of deity. And in the fuller account of Paradise in Genesis " the cherubim " (7.¢., the entire band of cherubs) are stationed "' with (or near) the blade of the turning sword" (this, like the " tree of life," has a Babylonian analogue, and is a mythic phrase meaning the lightning,—see references below) "to guard the way to the tree of life" (Gen. iii. 24). Now, according toa talismanic inscription copied by Lenormant, kirubu is a synonym for the steer-god, whose winged image filled the place of guardian at the entrance of the Assyrian palaces. And in the fantastic description of Ezekiel penned by the River Chebar, one of the four faces of a cherub was that of an ox (Hzek. i. 10, after which the corrupt passage in x. 14, must, in spite of Lenormant, be corrected). We should, therefore, connect the word cherub primarily with the Assyrian kirubu, but also, as proposed above, with kurubu. The two forms seem to be co-ordinate and expressive of some quality common to the king of birds and the colossal steer. Their etymology is altogether uncertain, and possibly to be sought for (as Mr Sayce has suggested) outside the sphere of Semitism. Partial parallels to the cherubim in non-Semitic mythologies are not uncommon, but are mostly deceptive. 'The most complete one is that of the winged ypumés (a secondary form of kerubim), who not only watched over the treasures of the gods (cf. Herod. iv. 13, 116), but were also the bearers of deity, if at least Plutarch and Eustathius may be followed in identifying the rerpackeAys oiwvds of Asch. Prom. 395 with the griffin (see Hermann, ad loc.) Probably the griffin was imagined under more than one form. This was certainly the case with the Hebrew cherub, as appears not only from the passages referred to above, but from the inconsistencies of the single prophet Ezekiel (ef i. 6, xli. 18). The significance of the mythical cherubim has been well pointed out by C. P. Tiele. They are probably the masses of clouds, which seem to guard the portals of the sky, and on which the sun-god appears to issue forth at break of day. This will account for the expressions used of the cherubim both of the heavenly and of the earthly "habitation" of Yahweh, expressions taken up by the Biblical writers from the folklore of their times.

For the Assyrian authorities, see Schrader, Jenaer Litteratur- zeitung, 1874, p. 218; Delitzsch (the younger), Assyrische Studien, pp. 107, 108 ; and for the Babylonian lightning-myth, Lenormant,

Bérose, p. 138; Records of the Past, vol. iii. pp. 127-129. Compare also Herder, Werke, vol. xxxiii. (Geist der Ebraischen Poesie), pp. 168-180; Ewald, Antiquities of Israel, Eng. transl., p. 128; Riehm, in Theologische Studien und Kritiken, 1871; Tiele, Vergelijkende geschiedenis der oude godsdicnsten, vol. i. p. 866; and F. W. Farrar in Kitto's Cyclopedia of Biblical Literature, art. '¢ Cherubim." (TE, Kae.)

CHERUBINI, Marta Luici Zenosio CARLO SALVATORE (1760-1842), one of the greatest musical composers of modern times, was born at Florence, 14th September 1760. His father was accompanyist (maestro al cembalo) at the Pergola theatre, and himself guided the first musical education of his son, whose talent began to evince itself at a very early period. 'I commenced learning music," Cherubini says of himself, "at six years, composition at nine ; the former I was taught by my father, the latter by Bartholomew Felici and his son Alexander." Italian music at that time was at a low ebb. The popular composers of opera seria chiefly aimed at inventing pleasing tunes and jiortture for the vocal display of the singers; the dignity and grandeur of the old Italian school were all but lost. To imbue himself with these great traditions of the past was the chief aim of young Cherubini's ambition, and for that purpose he went in 1777 to Bologna, where for four years he studied under Joseph Sarti, a well-known composer and theorist of the time, and himself the pupil of the celebrated Padre Martini, one of the greatest con- trapuntists Italy has produced. It was in this school that Cherubini laid the foundation of that deep knowledge of his art which gives to all his works the impress of perfect mastership. It was also under Sarti's guidance that he made his first attempts at dramatic composition. They were preceded, however, by a mass written at the age of thirteen, and various other sacred compositions. Sarti was the composer of numerous operas, amongst which Le Nozze di Donina may be mentioned as the most successful one, It now became Cherubini's task to supply the music for the minor characters in his master's dramatic works, an excellent

way of gaining versatility of style and resource, turned to full account by the young composer. His first independent work was called Quinto Fabio, an opera, seria, in three acts, first performed in 1780, and soon followed by Armida (1782), Adriano iam Siria (same year), and several other works of a similar kind. At this time of his life his artistic individuality was forming gradually; but as yet he had not emerged from the purely imitative stage of production. Absolute artistic value these juvenile works do not possess, but they tended to prepare Cherubini for greater things, and in the meantime secured him a dignified position amongst contemporary composers. In1784 hewas asked to write two works forthe Italian opera in London, one of which, Lafinta principessa, was favourably received, while the other, Giulio Sabino, was “murdered” by the critics, to use the emphatic ex- pression of a contemporary witness. In 1786 he left London, whither he had gone to be present at the pro- duction of his operas, and went to Paris. After a short stay in Italy he took up his permanent residence in the latter city.

Cherubini may be cited as a striking instance of the amal- gamating power inherent inthe French type of national cul ture ; Spontini, Meyerbeer, and to some extent Gluck, sub- mitted to the same spell. With the last-mentioned master Cherubini shares the grand declamatory pathos, the classic dignity which characterizes the Augustan age of French tragedy. A work like Cherubini’s Aédée is imbued with the same elevation of pathos which in Corneille’s greatest tragedies makes us forget the stilted affectations of his heroes and heroines, The first opera composed by Cherubini in France is called Démophoon, words by Marmontel. Its merits were appreciated by connoisseurs but it

was not a popular success. This, however, was achieved in the most brilliant manner by Cherubini’s next opera, Lodoiska (1791), which opens the series of great dramatic works belonging to the composer’s second period. The representative production of this period is Médée, already alluded to. The main characteristics of the com- poser’s style have also been brieflytouched upon. From a mere musical point of view a bold though always strictly logical sequence of harmonies, a rich vein of melodious de- velopments,

and great brilliancy and originality of instru- mental effects ought to be added.

By the production of Médée (1797) the composer's re- putation was firmly established. All Paris was in rap- turous admiration of his genius, with one exception— Napoleon Bonaparte. The young victorious generalaspired to musical amateurship, and loved to speak authoritatively on that as on most other subjects. But it was not in Cherubini's character to bow to any man, however great, in mattersartistic. Cherubini's repeated remonstrancesagainst Napoleon's exaggerated enthusiasm for Paesiello, Zingarelli, and other ephemeral composers culminated in the blunt repartee, —" Citoyen-général, I perceive that you love only that music which does not prevent you from thinking of your politics." The emperor remembered the affront offered to the citizen-general, and the appointment of Imperial chapelmaster was given to Lesueur, in spite of the Italian composer'ssuperior merits. But Cherubini does not seem to have suffered much under this disappointment. Two works replete with serenest joy owe their origin to thie period alluded to—Anacreon (1803) and Les deux Journées (1804). The last-mentioned work is Cherubini's master- piece of comic opera. In it we admire the grace and true gateté de ceeur, which have made the comic opera of France deservedly famous amongst civilized nations. The libretto of Les deux Journées, although clever and piquant, does not offer many opportunities for musical expansion, the action, as is usual in French comic opera, being to a great extent carried on in spoken dialogue. But Cherubini has succeeded in delineating with a few graphic touches the import: of his characters and situations. A peasant chorus in the third act, a Savoyard's song, and the couplets of Micheli the jovial water-carrier, are insurpassable speci- mens of their genre, equal in melodious beauty and grace to anything that French composers have produced in these forms of art. Cherubini, indeed, ranks with the greatest wnasters of the French schocl,—with Gretry, Dalayrac, Auber, and Boieldieu, all of whom he infinitely surpasses as far as musical workmanship is concerned.

In 1805 Cherubini went to Vienna, in compliance with an invitation to compose an opera for the imperial theatre of that city. Here his chances of success were once more thwarted by his great antagonist Napoleon, who entered Vienna at the head of the victorious French army, and for a time

interrupted all artistic enterprise. The personal meeting of emperor and composer was again of anything but a friendly kind. Soon after the performance of his new work Faniska (1806) at Vienna, Cherubini returned to Paris, and for a long time kept an unbroken silence. His chief occupation was his lessons at the Conservatoire, besides which he filled up great part of the day by cutting the hearts and diamonds of ordinary playing cards into all kinds of fantastic figures and landscapes. The results of his extraordinary ingennity, carefully framed, covered the walls of his study. An accidental circumstance at last roused him from this morbid indolence. He was staying at a country seat of the Prince de Chimay, where a new church was to be inaugurated, Timidly was an appeal made to him for a religious composition to be performed ou the occasion, and in compliance with this request he wrote ina few weeks his. great Mass in F. Thus ata time of

life when most artists rest on their laurels he entered a new field of creative labour—that of sacred music. Of the works of Cherubini's third and perhaps his greatest period only the most important can be mentioned here. They are the Missa Solemnis in D, the coronation mass written for the consecration of Charles X., and the two requiems in C and D, the latter for male voices. Besides these he wrote numerous smaller compositions for the service of the Chapel Royal, most of which are still unpublished. The most striking feature of Cherubini's sacred compositions is their solemn grandeur of conception, combined with an unequalled mastership of artistic treatment."

The Restoration of the Bourbons drew Cherubini from his long seclusion. The royal family were eager to show their favour to the opponent of Napoleon Bonaparte. Cherubini was created composer and conductor to the Chapel Royal, and in 1821 obtained the permanent director- ship of the Conservatoire. His days were prolonged beyond the ordinary age of men, and after having witnessed and partly celebrated numberless revolutions in his adopted country, the more than septuagenarian retained sifficient vigour of mind to write one of his most charming operas when Louis Philippe was king in France. It is called A Baba, and was first performed in 1833. To the list of his dramatic compositions ought also to be added another important opera, Les Abencerrages, written in 1813, but treated with undeserved

neglect by the public. He also wrote several pieces of chamber music, amongst which six quartets for strings, and one quintet and six sonatas for the pianoforte may be mentioned. A great number of his compositions, moreover, remained in manuscript at his death, March 15, 1842. Cherubini's external bearing was frequently harsh and arrogant; his prejudice against Beethoven, both personally and artistically, is a deplorable instance of his one-sidedness. But his more intimate friends found him kind and faithful. His love of order was carried to excess, All his music was carefully labelled and distributed in pigeon-holes, and even his pocket-handkerchiefs were numbered for consecutive use. To this extreme carefulness we owe a complete catalogue of his own compositions frora 1773-1841, edited by M. Bottée de Toulmon, under the title of Notice des Manuscrits autographes de la musique composée par M. L. Z. C. S. Cherubini. We also possess by him a valuable Cours de contrepoint et de fugue, the letterpress of which is written by his pupil the well-known composer Halévy. An English biography—Cherubini, Memorials wlustrative of his Lafe (Lond. 1874)—has been written by Mr E. Bellasis, An interesting article containing personal reminiscences of Cherubini by the German composer Ferdinand Hiller appeared in Macmillan's Magazine in 1875. (HH)

CHERUSCI, a tribe of ancient Germany, whose country was bounded on the E. by the Elbe and on the W. by the Weser. In the timeof Augustus the cruelty of Varus, who commanded the Roman army on their frontier, drove them into war, and they annihilated the legions sent against them. In the 4th century they had become members of

'the Frankish confederation.

CHESHIRE, a maritime county in the north-west of England, is bounded on the N. by the Mersey, which separ- ates it from Lancashire, on the N.E. by Yorkshire, on the E. by Derbyshire and Staffordshire, on the 8. by Shropshire and Denbighshire, on the W. by Flintshire, and on the N.W. by the Irish Sea. Its greatest length from east to west is about 48 miles, and its greatest breadth from sonth to north about 33 miles. It possesses an area of 705,493 statute acres, or 1102 square miles; and its population in 1871 was 561,201 persons (males, 271,033; females, 290,168). Since the first census

in 1801, the population has increased by 368,396 persons, or 191 per cent, and

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since 1851 the increase has amounted to 105,476 persons, or 23 per cent. in twenty years.

The formation of the county is generally flat, with some hills on the east on the Derbyshire and Yorkshire boundary, which extend also to the Staffordshire side. There are also lower hills near Chester and Flintshire, and at Alderley Edge and Beeston insulated hills standing up out of the prevailing level. The principal geological formation is the New Red Sandstone, which occupies nearly the whole of the central and western part of the county. A small patch of lias occurs in the south. The Coal Measures extend along the eastern side on the borders of Staffordshire and Derby-shire, and also are worked on the banks of the Dee below Chester. The principal mineral produce is salt, which is found as rock-salt in mines at Northwich, and is manu- factured there and at Winsford, Middlewich, Sandbach, and Lawton, from the brine-springs overlying the rock- salt, Lead and copper are also found, though not in great quantities. Copper was worked at Alderley Edge at an early period, but the works were discontinued until lately, when they have been recommenced.

The flora of the central plain of Cheshire, which repre- sents its most characteristic vegetation, is intermediate between that of the northern and southern counties of Britain. The botany of the high-lands east of Macclesfield is nearly ericetal in its nature, akin to that of the West Riding of Yorkshire, whilst in the west the botany of Wirral shows more variety than that of the Midland region, and is more southern in its character. The curious system of marl-pits, and the frequent inland meres, each of which has a vegetation of its own, render Mid Cheshire pre-eminent among English counties for the development of such species as Carex and Potamogeton. Two rare species may be cited to prove the strong admixture of northern elements in the flora, viz, Arundo stricta at Oakmere and Sasxifraga Hirculus, now unfortunately extinct, at Knutsford. As compared with one near or south of London, a Cheshire arable field shows a lamentable paucity of species. A botanist would only in a day’s walk mark

150 species of flowering plants, as against 300 species marked in the same time in Kent or Sussex.

The principal rivers in Cheshire are the Dee, which, rising in the Welsh mountains, forms the boundary between the county and Denbighshire and Flintshire, and ultimately, having formed a wide navigable estuary below Chester, falls into the Irish Sea; the Mersey, which rises in the Yorkshire hills, forms the county boundary along the whole of its northern side, and having given the opportunity for the formation of the ports of Liverpool, Birkenhead, and Runcorn, also fall into the Irish Sea; and the Weaver, which, rising in the south-west of the county, traverses it in a north-westerly course, and being joined by the Dane at Northwich, empties itself into the Mersey at Weston Point. By means of a series of locks, the Weaver has been made navigable for vessels of 200 tons as far as Winsford, and thus furnishes a means of transporta- tion for the salt produced in the locality, The profits of the navigation, which was originally undertaken by a few Cheshire squires, belong to the county, and are paid over annually to the relief of the county rates. At present, in consequence of a large outlay in further deepening and improving the navigation, all payments to the county treasury are suspended, but on an average of late years from £16,000 to £20,000 has been paid over.

Distributed over the surface of the county are small lakes or meres, and it seems to have been a point of honour for the old houses of the gentry to have been built on their banks. Combermere, Tatton, Rostherne, Tabley, Dodding- ton, Marbury, and Mere, with a host of, smaller waters, are dotted over the county; whilst nearly in every field

are old marl-pits, whence in former days the sole supply of manure for the permanent pastures was obtained.

The climate is temperate and damp; the soil is varied and irregular, but a large proportion of it is a thin-skinned clay. In only one spot of the county is the soil said to be fertile enough to feed a bullock to the acre. The agriculture of the county, which some twenty-five years ago was back- ward and discreditable, has marvellously improved in the last quarter of the

century. The land, which was wet and full of rushes, has been drained; its fertility has been increased by the periodical application of bone-dust ; the old crooked fences have been removed or straightened ; and the farm-houses and buildings, which were insufficient for the decent accommodation of man and beast, have been replaced on many estates by modern structures well adapted for their purposes. Dairy-farming is the description of agriculture still principally pursued, and in Mareh 1875 there were, according to the Board of Trade returns, 96,170 cows in the county, whose milk if all converted into cheese would have yielded a produce of about 16,000 tons of cheese. But though the tendency to make cheese in some parts of the county still prevails, the influence of the larger population gathered together round the purety agricultural part of the county has greatly diminished the production of the staple article, whilst the competition of American cheese has made the manufacture of all but the best qualities unpro- fitable. Liverpool, Manchester, Stockport, Macclesfield, the cotton districts in the north-east of the county, and the Staf- fordshire Potteries on the south-west, all demand a supply of milk, meat, and garden produce, and the facilities of transit afforded by the railways have in many cases already changed, and gradually in many more will change, the character of Cheshire agriculture. Although in some cases the Cheshire tenant-farmer is little more than a labourer owning cows, working as hard as his own labourers, and with as little or less education, yet there are now a large number of farms as well and skilfully cultivated and producing as large produce to the acre (thanks to the facilities of obtaining manure from the larger towns) as any in the United Kingdom.

During the years 1865 and 1866 a mighty calamity swept over this county. The cattle plague, which had in 1745 destroyed 30,000 head of cattle, appeared in the second week of October 1865 on the southern border of the county. Spreading itself there, and breaking out almost simultaneously on the north-west, west, and east, it had by the 21st February 1866 destroyed 36,823 head of stock. On that day an Act of Parliament was passed to authorize slaughter and to give compensation, and in consequence 35,675 cattle were killed. A loan was granted from the Treasury, on the security of the county rate, of £270,000 to pay the compensation for losses after the 22d February, which entails an annual charge on the county rates of £14,583, 14s. 10d. until the year 1896. Although by this terrible loss many

individuals were ruined, and for the time great distress was caused, yet on the whole the agri- culture of the district was benefited. Landlords discovered that stringent clauses in their leases might safely be mo- dified ; tenant-farmers became convinced that cheesemaking was not the whole duty of the agriculturist, and the possi- bility and even the necessity of new ways of farming, and of the introduction of sheep or feeding-stock, became ap- parent.

From the agricultural returns for 1875 (which, however, are not complete) it appears that the average acreage de- voted in Cheshire to corn crops is exceptionally low, being 16-2, while the average of all England is 312. The follow- ing table shows the distribution of the acreage in the county, and the numbers of live stock, in the years 1872 and 1875 :—

590

Turnips Vetches, Grass

: Cates, Bae: on he. ae aiveeaiae. Conroeay tes an

1872…46,446 34,195 10,072 20,921 10,001 2,501 64,769

1875…44,908 30,745 9,825 18,770 11,054 1,862 57,400

Horses. Cattle. Sheep. Pigs.

1872…..18,818 155, 654 108,377 67,379

USO... 2092 99 162, 466 111,330 61,209

In the latter year there were 84,981 acres under corn crops, and 31,686 under green crops, both showing a de- crease as compared with 1872.

The county is intersected by railways in every direction. At Crewe the London and North-Western Railway divides into three sections, and takes its passengers or goods to Manchester, Liverpool, Chester, and the North. From Stockport and- Manchester the Cheshire lines run into the centre of the county and across Delamere Forest to Chester ; and there are lines from

Chester to Birkeuhead, to Manchester, to Shrewsbury, and into the different parts of North and South Wales,

The canals, too, still convey goods from Runcorn and Ellesmere-port to the Staffordshire potteries, and afford means of communication between Manchester, Liverpool, and the interior of the county.

The principal towns are Chester, Birkenhead, Maccles- field, Stockport, Northwich, Crewe, and Congleton. At Stockport the manufacture of hats and cotton is carried on, and Macclesfield and Congleton are the seats of the silk manufacture. At Crewe are situated the great work- shops of the London and North-Western Railway, and round the station, where in 1841 there was a wooden box to take the tickets and one solitary farmhouse, there is now crowded a population of nearly 30,000 inhabitants. The trade of Northwich and Winsford is the manufacture of salt, by the evaporation of the water from the brine. During the year 1875 it is calculated that 1,500,000 tons of salt were produced, of which 1,000,000 were for export, 350,000 for chemical works, 100,000 for agricultural purposes, and 50,000 for domestic use. In that year there were in Cheshire 1261 salt-pans, employing over 3000 men. About 150 men are engaged in rock-salt mining, and the carriage of salt on the Mersey and Weaver employs at least 1000 men and 500 boys. Steamers are now largely employed in the inland navigation, between thirty and forty being engaged in the carrying trade.

Besides being in part a manufacturing and in part a purely agricultural county, Cheshire, more perhaps than any place except the districts round the metropolis, is the home of business men. The manufacturers of Manchester, the merchants of Liverpool, the gentlemen employed in the pottery trade, all have their villas here. At Alderley and Bowdon near Manchester, in the Wirrall hundred on the banks of the Mersey, at Alsager on the Staffordshire border, are to be found congeries of the dwellings of rich men, which vie in their appointments and surroundings with the houses of the great landowners of the county. Perhaps no stronger proof can be given of this fact than that, in the return lately furnished to the House of Commons of a summary of the returns of owners of land, the number of holdings between 1] acre and 10 is reported to be 3166 out of a total number of 23,720, and the average rental per acre is £24, 13s. These proportions are in the whole

return for England and Wales exceeded only in the ex-metropolitan parts of Surrey and Middlesex, and in the mining and manufacturing counties of Lancashire and Glamorganshire.

Cheshire is emphatically a county full of large estates. In the return just quoted may be found the fact that the rental of estates between 5000 and 10,000 acres amount to 20°4 of the total value of the county, a larger percentage than in any English county save one. Of the owners of more than 10,000 acres Lord Tollemache of Helmingham

owns 25,380; the marquis of Cholmondeley, 16,842; the duke of Westminster, 15,001; Sir Henry Delves Broughton, 13,832 ; the Rev. T. France Hayhurst, 10,650 ; and Lord Crewe, 10,148 ; whilst Lord Egerton of Tatton, Lord Harrington, Lord Stamford and Warrington, Lord Derby, Sir P. D. M. Grey Egerton, Lord Haddington, Lord De Tabley, Lord Delamere, Lord Stanley of Alderley, Lord Kilmorey, Lord Shrewsbury, Mr Legh of Lyme, Mr Leigh of Adlington, Mr R. E. Warburton, Sir Charles Shakerley, and Mr Bromley Davenport make up the seventeen who are returned as owning between 5000 and 10,000 acres each, This list of landowners is composed of men whose names, with one exception, are historic in Cheshire, so small, spite of the neighbourhood of Liverpool and Manchester, have been the transfers. of the large estates from their original owners to the capitalists of the present day.

For parliamentary representation the county is divided into East, West, and Mid Cheshire, each of the three sections returning two members to the House of Commons. In East Cheshire the registered electors in 1876 were 6,587; in Mid Cheshire, 8241; and in West Cheshire, 10,178. There are besides represented within the county the boroughs of Macclesfield and Birkenhead, part of the city of Chester, the limits of which extend into Wales, and parts of the boroughs of Warrington, Stockport, Ashton-under-Lyne, and Stalybridge, all of which extend more or less into Lancashire. There is one court of quarter sessions in the county, which holds its meetings alternately at Chester and Knutsford, and is adjourned from one place to the other for the trial of prisoners at intermediate sessions. The rateable value of the county as assessed to the county rates is £2,690,701.

Perhaps no county has advanced more in material prosperity than Cheshire has in the last half-century. In none have more places of public worship, both of the Church of England and of the various Nonconformist bodies, been erected. In none have more schools been built. The wages of the agricultural labourers are high ; and from the ranks of that body has the army of engineers, porters, and high-class artificers, who are employed in the manufacturing districts and at Crewe, been largely recruited. Yet still the county is cursed with the sin of drunkenness, and with the evil consequences of that sin, in a fearful degree. Whilst serious crime has decreased steadily there has been an increase of all the light offences.

The history of Cheshire is intimately connected with that of the city of Chester. In the time of King Alfred the pre- sent county formed part of the province of Mercia, but it was afterwards separated, and by Wiliam the Conqueror it was constituted a county-palatine. William. bestowed the earldom on his nephew Hugo Lupus, and the title has belonged since then to the heir-apparent of the English Crown. The palatinate privileges existed intact until the reign of Henry VIII., when they were much curtailed in favour of the Crown, and after the Civil War of the Com- monwealth they were almost wholly removed. The county was first represented in Parliament during the reign of Edward VI.

Two Roman roads traversed Cheshire, the north-west branch of Watling Street, running from Chester through Northwich to Stratford, where it crossed the Mersey into Lancashire, and the Via Devana which entered from Salop and extended to Chester. Many handsome and interesting mansions exist in the county, some of them being admirable specimens of Elizabethan architecture. Among the most noteworthy may be mentioned Bramall Hall near Stock- port, Brereton Hall near Sandbach, Crewe Hall, the seat of Lord Crewe, and Eaton Hall, the seat of the duke of Westminster. (a. W. L.)

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CHESNEY, Cuaries Cornwat.is (1826-1876), brevet- colonel in the corps of Royal Engineers, born 29th September 1826, was the third son of

Charles Cornwallis Chesney, captain on the retired list of the Bengal Artillery. Educated at Tiverton grammar school and Mount Radford school, Exeter, and afterwards at the Royal Military Academy, Woolwich, he obtained his first commission as second-lieutenant of engineers in 1845, passing out of the academy with distinction at the head of his term. His early service was spent in the ordinary course of regimental duty at home and abroad, and being stationed in New Zealand during the Crimean War, he lost the opportunity of serving in the only considerable military operations in Europe in which the present generation of British soldiers has been engaged, while India, the great school of war for the English army, was until lately closed to officers of the Royal Artillery and Engineers. Among the various reforms in our military system which followed from that war was the impetus given to military education; military history was now for the first time introduced into the course of instruction at our military colleges, and in 1858 Charles Chesney, who had brought himself under notice by an essay on the subject, prepared under a sort of com- petition invited by the authorities, was appointed professor of military history at Sandhurst. In 1864 Captain Chesney succeeded Colonel Hamley in the corresponding chair at the Staff College. ‘To the admirable teaching of these two officers may be ascribed in great measure the intelligent appreciation of the relation of military history to the prac- ticul business of war now manifested throughout the com- missioned ranks of the British army ; their published writings have been received with great favour on the Con- tinent and in America.

Chesney’s first published work was an account of the civi) war in Virginia, which went through several editions ; and although written in the heat of the struggle, and on the partial information then available, it may still be read with profit. But the work which attained the greatest reputation was his Waterloo Lectures, prepared from the notes of lectures orally delivered at the Staff College. Up to this time the English literature on the Waterloo campaign, although voluminous, was made up of personal reminiscences of actors in the great scene, or of formal records such as Siborne’s accurate but tedious narrative, useful materials for history rather than history itself; the French accounts have mainly taken the form of fiction, the so-called history of Lamartine being as much a work of fancy as the romance of Victor Hugo, while the professedly sober pages of Thiers are not much more to be

relied on. In Chesney’s lucid and vigorous account of the momentous struggle, while it illustrates both the strategy and tactics which culminated in the final catastrophe, the mistakes committed by Napoleon are laid bare, and for the first time an English writer is found to point out that the dispositions of the great duke were not wholly faultless. Yet such criticism is in truth the sincerest praise, since to those who, knowing anything of war, know that even the highest combinations are at best a groping in partial dark- ness, the capacity of a great leader will be more perfectly appreciated by a right estimate of his mistakes than by a blind attribution of infallibility. And in the Waterloo Lectures the Prussians are for the first time credited by an English pen with their proper share in the victory. On this point there had hitherto been an English as well as a Napoleonic legend. The Waterloc Lectures attracted much attention abroad as well as at home; on the appearance of the French edition, published at Brussels, another account of the campaign, written at the instance of the emperor Napoleon III., and quite in the spirit of the Napoleonic legend, was published immediately afterwards in Paris in a

cover to correspond exactly with the Brussels edition, and with the obvious intention that it should circulate in place of the other,—a delicate test of the appreciation of the original on the part of the French Government.

Chesney was for many years a constant contributor to the newspaper press and to periodic literature, devoting himself for the most part to the critical treatment of military operations, and professional subjects generally. Some of his essays on military biography, contributed mainly to the Hdinburgh Review, were afterwards published separately, Hisstyle is forcible, easy, and eminently clear, his judgment impartial and sagacious, and although his mode of treating military operations may be open to the criticism that it does not make sufficient allowance for the inoral element in war—the infirmities of troops and the blunders of generals,—it may be said on the other hand that the whole truth is never told about battles at the time, and cannot be found out afterwards, and that in the long run the less there is of the personal in history, and the broader and more general the statement, the nearer will the historian come to describing what happened.

In 1868 Charles Chesney, who on promotion to field rank had returned to regimental duty, was appointed a member of the Royal Commission on Military Education which sat during that and the following year, under the presidency first of Earl de Grey and afterwards of Lord Dufferin, and to whose recommendations are due the improved organization of our military colleges, and the development of military education throughout the principal military stations of the British army. In 1871, imme- diately after the conclusion of the Franco-German war, he was sent on a special mission to France and Germany, and furnished to the Government a series of valuable reports on the different siege operations which had been carried ont during the war, including especially the two sieges of Paris, and on the condition of the fortresses and military condition and organization of the two powers. These reports were published in a large volume, only a few copies of which have been issued confidentially.

Never seeking regimental or staff preferment, Colonel Chesney never obtained any, but he held at the time of his death a quite unique position in the army, altogether apart from and above his actual place in it. Consulted by officers of all grades on professional matters, his ready and vigorous pen was often placed at the service of the Govern- ment to illustrate and defend in the press the different measures of reform lately adopted in military organization ; while probably few have done more to raise the intellectual standard of the English army and its estimation in that respect among the more intelligent spirits of foreign armies. Constantly engaged in literary pursuits, he was nevertheless laborious and exemplary in the discharge of his public duties, while managing also to devote a large part of his time to charitable and religious offices. He was abstemi- ous to a fault ; and, overwork of both mind and body tell- ing at last on a frail constitution, he died after a short illness on the 19th March 1876, at the age of forty-nine years, to the regret of the whole army, and of avery large circle of friends both within and without the service, to whom he had become endeared in a remarkable degree by his generous, self-denying, and sympathetic disposition. At the time of hig death he was serving as Commanding Royal Engineer of the London district.

Colonel Chesney’s principal works were:—A Military View of Recent Campaigns in Virginia and Maryland, 1863; Campaigns in Virginia and

Maryland, 2d edition, 1865; The Military Resources of Prussia and France, and Recent Changes in the Art of War; Essays by Charles Chesney and Henry Reeve, republished jointly from the Edinburgh Review 1870; Waterloo Lectures, 3d edition, 1874; Essays in Modern Military Biography, reprinted chiefly from the Edinburgh Review, 1874. (G. ©.)

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CHESS, simply defined, is an intellectual pastime. It recreates not so much by way of amusement properly so termed, as by taking possession of the mental faculties and diverting them from their accustomed grooves. The cerebral organ, after being much occupied in business, or greatly worried by cares, or in any way beset by painful reflections, finds in the absorbing and abstracting properties of chess that temporary relief which lighter pastimes will not always afford. The reason of this is not far to seek. Cares are caused by looking forward to or apprehending things to come, and, as such, are neutralized by that fore- sight which the conduct of a game of chess demands. Again, mental perturbations, however much varied, can but be the employment of the imagining and reasoning facul- ties in the digestion of the particular cause of annoyance or pain; but these same faculties are required, and their exclusive exercise demanded, in providing for the emergen- cies of the intellectual combat, and in solving the ever varying problems that arise in the course thereof. It is very commonly supposed that chess is a difficult game, whether to acquire or practise. This, however, is a mistake. The moves may be learned in half an hour, and a week's practice will evoke a sufficient amount of skill.to afford pleasure both to the learner and his tutor. The intelligent novice will soon be convinced that an ignorant manipulation of the pieces does not conduce to success, and he will seek for instruction in the right manner of opening the game ; the various débuts are after all simple, and he will find no difficulty in acquiring them one after the other. Six months will suffice for this purpose if his understanding be not enslaved by obstinacy, indolence, or self-esteem, and the rest goes with his natural capacity. A merely average in- telligence is sufficient for a very fair amount of proficiency and strength ; while intellect not much above the common mean will suffice (assuming here natural aptitude) to lead right up to the second class of players, viz., those to whom the masters of the game can only concede the small odds of "pawn and move." Those wishing to

improve will find it very beneficial to play upon even terms with players stronger than themselves ; for a persistence in taking odds, besides having a discouraging and debilitating effect upon the weaker player, takes the game out of its proper grooves, and tends to produce positions not naturally arising in the ordinary course of the game as developed from the recog- nized openings. In fact, the reception of odds incapacitates a player from acquiring an insight into the principles of the science of chess, and from comprehending the latent meanings and conceptions upon which combinations and a proper plan of warfare are founded; while, upon the con- trary, playing on even terms throws the combatant at once upon his own judgment, and by causing him to study his opponent's play, leads necessarily to a material improvement in his own style.

To turn now to the elements of the game. The accom- panying diagrams represent chess boards, and it will be perceived that they respectively consist of sixty-four checkered squares.

In diagram 1 the chessmen are arranged as they should be at the commencement of the battle, while diagram 2 shows the denomination of the squares according to the English and German systems of notation, to be explained hereafter. Under diagram 1 are the names of the various " Pieces," for so the superior officers are termed—each side, white and black, having a king, a queen, two rooks, two knights, and two bishops. The eight common men in front are called Pawns.

MovEs OF THE DIFFERENT CoESSMEN.—Briefly described, the powers of the various pieces and of the pawns are as follows.

The king may move in any dircction—forward, back-

ward, laterally, or diagonally ;

but he can move only ore

squareata time. Under certain conditions he has once in

BLACK,

Lip

Y Z WYTEE

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Ss Ge L cA AF liidllry Ula, Vol

Wy

YY

WY) EY Hy Y WY A RAR AR AR FS aes When Vir, ot Vila, Vika, YoY YY UY 1 Va is GRO FAL YS © AE aa We. VW Vo Rook. Knight. Bishop. Queen. King. Bishop. Knight. Rook. , WHITE.

DracRaM 1.—Showing the arrangement of the pieces at the conimencement of a game.

the game a peculiar privilege called castling, which will be explained further on.

The queen moves in any straight or diagonal direction, whether forward, backward, or laterally. Thereis no limit to her range, except when her progress is stopped by any piece or pawn. She is the most powerful piece on the board, for her action is a union of those of the rook and

BLACK.

Gttt AK, Ky Zi YY, xy Y yy ead f yy €™ PP kt Uy iY YP y VY, 5 ry mS US; Gud e407 Sad [gy Sy ty, Yy

QR4 QK% oB4 Ui

% UE:

POY, Ube ILI; WHY EO EE ot yLad Uy NAW, LYM yy

Vy VF YY C y YZ

%¢ We Gy G Y L. Buy ; 0 OA Bg YY 8) BS Y yy WV Ya MM, Y Vy WM Che Q K’sq Ai LIT. Vhs Z, Yj

a b c d é “a g h

WHITE. DracRAM 2.—Showing English and German Methods of Notation.

bishop. At the commencement of the game the queen always stands upon a square of her own colour.

The rooks move in straight lines—forward, backward, or laterally ; they cannot move diagonally. Their range is, like the queen’s, unlimited.

The bishops move diagonally in any direction whether backward or forward. They have an unlimited range, with the same exception as before. It is evident that

CHESS

bishops standing originally on differently coloured squares can never meet,

The knights have a mode of moving which it is not easy to describe. Their range is not unlimited, like that of the pieces just noticed, but is restricted in a particular way. They move from one corner of any rectangle of three squares by two to the opposite corner ; thus, in diagram 3, the white knight can move to the square occupied by the black one and vice versa. To illustrate the move further, suppose that in diagram 2 a knight stands on the square marked K4 counting from the white side of the board; that knight can move to any of the following squares, viz., to K B 2, Q 2, K Kt 3,QB3, K Kt5,QB5,KB 6,and Q 6. The squares which the knight appears to pass over in moving may be occu- pied by other pieces, but his move has no thing whatever to do with those intervening squares. A knight may thus vault over any piece or pawn, whether adverse or friendly ; the knights are the only pieces which possess this privi- lege. It will be perceived that the Jocus of the knight, unlike that of the bishop, changes colour at every move.

The king, queen, rooks, and bishops may capture any fooman which stands anywhere within their respective ranges; and the knights can capture the adverse men which stand upon the squares to which they can leap. A capture is effected by the piece which takes occupying the square of the piece which is taken, the latter being then removed from the board. The king cannot capture any man which is protected by another man.

The motions aud capturing powers of the pawns are as follows: —Each pawn for his first move may advance either one or two squares straight forward, but afterwards one square only, and this whether upon starting he exercised his privilege of moving two squares or not. A pawn can never move backwards. He can only capture diagonally,—that is to say, if any adverse piece or pawn stand upon the first diagonal square, either to right or left, such adverse piece or pawn can be captured and removed from the board, the captor taking its place, but a pawn cannot take any man standing directly in front of it. In other words, a pawn moves straight forward except when he captures, in which case he moves diagonally, and for capturing purposes he can only, even for his first move, advance one square. When a pawn arrives at an eighth square, viz., at the extreme limit of the board, he may be promoted, that is to say, he may, at the option of his owner, become a queen, rook, bishop, or knight; and it matters not how many queens or other pieces a player may have on the board at one time.

CuEeck AND CHEeckKMATE—The king can never be captured, but when any piece or pawn attacks him, he is said to be “in check,” and the fact of his being so attacked should be announced by the adverse player saying ‘“ check,” whereupon the king must move from the square he occupies, or be screened from the check by the interposition of one of his own men, or the attacking piece must be captured. cannot move to another square without being still in check, and there is no piece or pawn which can be interposed, and the checking piece or pawn cannot be taken, then it is “ checkmate,” whereupon the game terminates, the player whose king has been thus checkmated being the loser. The position of the king when in check being the same as that of any piece when exposed to be captured, with the only difference that the king cannot be taken, it follows that the pawn gives check just in the same way that he captures, viz., diagonally. One king cannot give check to the other, nor can a king be moved into check.

Diagram 3.

If, however, the king, being thus in check,

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STALEMATE.—When the king is not in check, but his owner has no move left save such as would place the king in check, this is “ stalemate,” and the game is drawn.

CasTLInc.—This is a peculiar move permitted to the king once in the game; it is performed in combination with either the king’s rook or the queen’s rook, and in either case by the king being moved two squares laterally, while the rook is placed on the other side of him. But the king cannot castle after having been moved, nor with a rook that has moved, nor when any piece either white or black stands between him and the rook, nor if he is in check, nor when he has to cross over a square commanded by an adverse piece or pawn ; the rook can, however, move from or cross over such a square. It will be perceived that after castling with the king’s rook the latter will occupy the K B square, while the king stands on the K Kt square, and if with the queen’s rook, the latter will occupy the queen’s square while the king stands on the Q B square. This move will easily be understood with the aid of dia- gram 2.

TAKING EN PassantT.—This is a privilege possessed by any of the pawns under the following circumstances :—If a pawn, say of the white colour, stands upon a fifth square, say upon K 5 counting from the white side, and a black pawn in the supposed case moves to @ 4 or K B 4 counting from the black side, the white pawn can take the black pawn “en passant.” For the purposes of such capture the latter is dealt with as though he had only moved to Q 3 or K B 38, and the white pawn taking him diagonally then occupies the square the captured pawn would have reached had he moved but one square.

Drawn Gamu.—This arises from a stalemate (noticed above), or from either player not having sufficient force wherewith to effect checkmate, as when there are only two kings left on the board, or king and bishop against king, or king and one or even two knights against king. The same consequence

fullows from either player being able to give perpetual check to the adverse king. There are also cases in which one of the players can call upon the other to give checkmate in fifty moves, the result of failure being that the game is drawn. The right to make this requisi- tion arises in various positions, to explain all of which would take up much space ; it is sufficient to say that when neither side has any pawns left on the board the player with the inferior force may make the fifty moves call.

OTHER CHess TermMs.—A “ minor piece” means either a knight or bishop. “ Gaining the exchange” signifies giving a minor piece in exchange for a rook. A “passed pawn” is one that has no adverse pawn either in front or on either of the adjoining files. It may be as well to explain that a “file” is simply a line of squares extending vertically from one end of the board to the other. There are therefore eight files, and they are respectively named after the pieces which occupy the first squares on either side, as, ¢eg., the “king’s file,” which extends from one king to the other, and so forth. An “open file” is one

on which no piece or pawn of either colour is standing.

“Gambit ” is a word derived from the Italian gambetto, a tripping up of the heels; it is a term used to signify an opening in which a pawn is sacrificed to obtain an attack. An “opening,” or “début,” is acertain set method of com- mencing the game ; there are regular and irregular openings. A “check by discovery ” is given when a player, by moving one of his pieces, checks with another of them. ‘“ Double heck,” as its name implies, means attacking the king at once with two pieces,—one of the pieces in this case giving check by discovery.

VALUE OF THE PrEces.—The relative worth of the chess- inen cannot be definitely stated on account of the increase or decrease of their powers according to the position of the

no4

game, but striking an average, and taking the pawn as the unit, the following will be an estimate near enough for practical purposes :—pawn 1, bishop 3°25,‘knight 3°25, rook 5, queen 9°50. Three minor pieces may more often than not be advantageously exchanged for the queen. . The knight is generally stronger than the bishop in the end game, but two bishops are usually stronger than two knights, more especially in open positions.

Laws.—The laws of chess differ, although not very materially, in different countries. Various steps have been taken, but as yet without success, to secure the adoption of a universally authoritative code. In competitions among English players the particular laws to be observed are specially agreed on,—the regulations most generally adopted being those laid down at length in Staunton’s Chess Pramis, or the modification of the Praxis laws issued in the name of the British Chess Association in 1862.

The following rules may be here indicated. The board must be so placed that each combatant has a white square in his right hand corner. A player touching any of bis own men or those of his adversary (except accidentally) without previously saying “j’adoube ,” or “I adjust,” or words to that effect, may be compelled to move or capture (as the case may be) the man so touched ; if this cannot be done he must move his king, but if that be likewise im- possible, there is then no penalty. Ifa player make a false or illegal move or capture, he must, at the choice of his opponent, and according to the case, move his own man legally, capture the man legally, or move any other man legally movable. In practice, the usual demand is that the offender shall move his king. After four moves have been made on each side, any such illegality is waived, and the game must be played out as it stands. Should the king be left in check, all the moves subsequently made must be retraced and the check replied to.

Mopvres oF Noration.—The English and German systems of notation (¢.¢., the manner of describing the moves. made in a game) are different. According to the English method each player counts from his own side of the board, and the moves are denoted according to the names of the files and the numbers of the squares, Thus when a player for his first move advances the king’s pawn two squares, it is described as follows :—“1 P to

K 4;” for the pawn has moved to the fourth square of the king’s file. The following moves of the Giuoco Piano Opening, with the aid of diagram 2, will enable the reader to understand the principles of the British notation, wherein it may also be observed that only the initials of the pieces are now used ;—

WHITE. BLACK. 1. Pto K 4 1. Pto K 4 2, K Kt toK B 3 2. Q Kt to QB3 (i.e, King’s Knight to the (i.¢., Queen’s Knight to the third square of the King’s third square of the Queen’s Bishop’s file.) Bishop’s file.) 3. KBtcQB4 3. K BtoQ B4 (King’s Bishop to the fourth (same as White’s third square of the Queen’s move). Bishop’s file.) 4,.PtoQB3 4, K KttoK B3 (Pawn to the third square (same as White’s second of the Q B file.) move.) , 5. P toQ 4 5. P takes P (Pawn to the fourth square (King’s Pawn takes White’s of the Queen’s file,) Queen’s Pawn.) 6. P takes P 6. K B to Q Kt 5 (ch) – (Queen’s Bishop’s Pawn (King’s Bishop to the fifth

takes Pawn at the fifth square of the adverse Queen’s file.)

square of the Queen’s Knight’s file, giving check to the White King.)

It is now usual to express the notation as concisely as possible ; thus, the third nioves of White and Black would

Cer KE es

be given as 3 B to B 4, because it is clear that only the fourth square of the queen’s bishop’s file is intended. In like manner White’s fourth move would be described as 4 P to B 3, and Black’s fourth move as 4 Kt to B 3. Sometimes instead of the word “takes” a cross is used, thus—6 P x P.

The German notation employs the alphabetical characters a, b, ¢, d, e, f, g, and h, proceeding from left to right, and the numerals 1, 2, 3, 4, 5, 6, 7, and 8, running upwards, these being always calculated from the White side of the board (see diagram 2). Thus the White Queen’s Rook’s square is al; the Black Queen’s Rook’s square, a8; the White Queen’s square is d1; the Black Queen’s square, d3; the White King’s square, el ; the Black King’s square, ¢8, and so with the other pieces and squares. The German names of

the pieces are as follows :—King, Kéneg; Queen, Dame; Rook, Thurm; Bishop, Laufer; Knight, Springer; Pawn, Bauer.

The initals only of the pieces are given, the pawns (Bauern) being understood. The Germans use the follow- ing signs in their notation, viz.:— for “ check ” (t); ‘ check- mate” (t); “takes” (:); “castles on King’s side” (0-0); “castles on Queen’s side” (0-0-0) ; for “best move” a note of admiration (!); for “ weak move” a note of inter- rogation (7). The Giuoco Piano Opening moves just ren- dered in the English will now be given in the German nota- tion, which will make the latter easily intelligible :—

WHITE. BLack.

1. e2-e4 1. e7-e5

2. 8 gl-f3 2. S b8—-c6

3. L fl-c4 3. L f8-c5

4, c2-c3 4, Sg8-f6 ! 5. d2-d4 . 5. eb-d4:

6. c3-d4: 6. L c5-b4t

Both in the English and German notations the moves

Pto K 4

are often rendered in a tabular form, thus :-—1. Pto ka’ e2-e4

ie oy ae? the moves above the line being White’s and

below the line Black’s.

ILLUSTRATIVE GaMmeES.—There are various text-books upou the beginnings and endings of games, to one or other of which the learner should have recourse. Some of them are mentioned further on; but it would be invidious to enter upon any comparison of merits, or to recommend any work in particular. The following are given as indicative illustrations of

certain of the leading openings; but, necessarily, no attempt can be made here to impart detailed instruction on this important branch of the game :—

Giuoco Piano.

WHITE. BLAck. 1. PtoK 4 1. PtoK 4 2. K Kt to B 3 2. Q Kt to B 3 3. B to B 4 3. Bto B 4 4,PtoB3 4, KttoK B3 5. PtoQ4 5. P takes P 6. P takes P 6. B to Kt 5 (ch) . Bto@ 2 7. B takes B(ch) 8. Q Kt takes B 8. PtoQ4 9, P takes P 9. K Kt takes P 10. Q to Kt 3 10. Q Kt to K 2 11. Castles (K's side) 11. Castles Even game. Ruy Lopez. WHITE. BLAcK. 1. Pto K 4 1. PtoK 4 2, K Kt to Bs 2. Q Kt to B 3 3. B to Kt 5 3. PtoQR3

CHESS 595 WHITE. BLACK. King's Bishop's Gambit. 4, Bto R 4 4. Kt to B3 WHITE. BLACK. 5. PtoQ4 5. P takes P l. Pio K 4 1. PtoK 4 6. Pto K 5 6. Kt to K 5 2, Btok bs 2. P takes P 7. Castles 7. Bto K 2 3. Bto B4 3. P to Q 4 8. R to K sq 8. Kt to B 4 4, B takes P 4, Q to R 5 (ch) 9. B takes Kt 9. Q P takes B 5. K to B sq 5. P to K Kt 4 10, Kt takes P 10. Castles 6. K Kt to B 3 6. QtoR4 ll. KttoQB3 ll. P to. 8 3 7, PtoQ4 7. Bto Kt 2 Even game. 8. PtoK R4 8 PtoKR3 9. Kt to B3 9. Kt to K 2 —_ Scotch Gambit. . 10. K to Kt sq 10. P to Kt 5 be LACK. 55 at? Bee Looks 6 ee bees 3. P takes P if Peueen. 14. Q to Kt 6 (ch 4, BtoQ B4 4. BtoB4 . Q to (ch) 5. Pto B3 5. Kt to B3 aGne Rue 6. Pree BP : Drawn game. The position here arrived at is the same as in the Giuoco Salvio Gambit. Piano opening above. Wate ne: a § 1. Pto K 4 1, PtoK 4 Evans Gambit. 2, PtoK B4 2. P takes P WHITE. Back. 3. K Kt to B 3 3. P to K Kt 4 lL. Pto es laP'to k 4 4, BtoB4 4, Pto Kt 5 2. K Kt to BS 2. Q Kt to B3 5. Kt to K 5 5. Q to R 5 (ch) 3, Bto B4 3, Bto B4 6. K to Bsq 6. Kt to K R3 4, PtoQ Kt 4 4, B takes Kt P 7. PtoQ4 7 Bey eG 5. PtoB3 5. BtoB 4 8. Kt to QB3 8. PtoQ 3 6. PtoQ4 6. P takes P 9. Kt to Q 3 9. P takes P(ch) 7. Castles 7. PtoQ3 10. K takes P 10. B to Kt 2 8. P takes P 8. B to Kt 3 1l. Kt toQB4 ll. Kt to B3 White has for his ninth move three approved con- 12. Bto K 3 12. Castles tinuations, viz., B to Kt 2, P to Q 5, and Kt to B 3. To 13. Q Kt to Q 5 13. Q to Q sq take one of them,— 14. Pto B3 9, PtoQ 5 9, Kt to R 4 White has a slight advantage. 10. B to Kt 2 10. Kt to K 2 ; ; 1l. BtoQ3 11. Castles Muzio Gamiit. 12. Kt to B3 12. Kt to Kt 3 PtoKé , PioKB4 , KEttioBs , Bob 13. Kt to K 2 13. PtoQ B4 'PtoK4 ~ PtakesP ~' PtoK Kt4 ~ PtoKt5 14. Q to Q 2 14. PtoB3 Wuirs. BLack. 15. K to R sq 15. B to B 2 5. Castles 5. P takes Kt 16. QR to B sq 16. R to Kt sq 6.

Q takes P 6. QtoB3 The game may be considered about even. i me 6 : ; eee 2 PP to@r . B to a’s Knight! Te oN 9, Bto Q 2 9, Kt to K 2 tong ce re) 10. Kt to B38 10. Q Kt to B3 1. PtoK 4 1. PtoK 4 ll. Q Rto K sq ll. QtoK B4 2, PtoK B4 2. FP takes P 12. RtoK 4 12. Castles 3. K Kt to BS 3. P to K Kt 4 13. Q B takes P la: Beto on 4. BtoB4 4. B to Kt 2 14. Q to K 2 14. P to 5. Castles 5. Pto Q 3 15. B takes B P 15. Q to Kt 4 6. P to Q 4 6. PtooK R383 16. PtooK R4 16. Q to Kt 3 7. PtoB3 7. Kt to K 2 17. Kt takes P 17. Kt takes Kt Black has the advantage. i ‘ ees – i a i He 2 3 . Daas, NON 2 F 20. B takes B 20. P takes B — — 21. RtoK 4 21. R takes R (ch) l. Pto K 4 1. PtoK 4 22. K takes R 22. R to B sq (ch 9 PtoKB4 9. P takes P 23. K to Kt sq 23. Kt to Q 5 3. Kt to K B 3 3. P to K Kt 4 And Black has the better game. .PtoK R4 a, Pito Kt) . Kt to K 5 5. K Kt to B 3 Queen’s Gambit. 6. BtoB 4 6. PtoQ4 Wuitt. BLACK. 7. P takes P 7. B to Kt 2 SA ne | Ee . Ptog4 8. Castles . P to A. . P takes : B ie P 9, Kt takes P a Peto ks 3. PtoK 4 10. B takes Kt 10. Q takes B 4, B takes P 4. P takes P 11. Castles 11. PtoQB4 5. P takes P 5. B to Q3 Black has the better game. 6. Kt toK B 3 6. KttoK B3

WHITE. BLACK. 7. Castles 7. Castles 8. _Pto K RS 8. PtooK R3 9. Kt toQ B3 9, PtooQB3

The game is about equal, though White has a somewhat freer position.

The two following games are brilliant specimens of the style of those eminent players, Herr Anderssen and Mr Paul Morphy. The manner in which White in the first game forces the victory, though losing piece after piece, scarcely finds a parallel in the records of chess strategy.

King’s Bishop’s Gambit. WHITE. BLAck. Herr Anderssen. Herr Kieseritzki.

1 PtoK 4 1. PtoK 4

2 PtoKB4 2. P takes P

3. BtoB 4 3. Q to R 5 (ch) 4. K to B sq 4. Pto@ Kt 4 5. B takes Kt P 5. Kt to K B38 6. KttoK B3 6. Q to R 3

7. Pt Q3 7. Kt to R4 8. Kt to R 4 8. Q to Kt 4

9 Kt to Bd 9 PtoQB3 10. Pto K Kt 4 10. Kt to B3 11. R to Kt sq 11. P takes B 12. PtooK R4 12. Q to Kt 3 13. PtoR5 13. Q to Kt 4 14. Q to B 3 14. Kt to Kt sq 15. B takes P 15. Q to B 3

16. Kt to B 3 16. BtoB4 17. Kt to Q 5 17. Q takes Kt P 18. B to Q 6 18. Q takes R (ch) 19. KtoK @ 19. B takes R 20. P to K 5 20. Kt toQ R 3

White gives checkmate in three moves.

become very general in the chess community, especially within the last twenty years; and to minister to the growing public demand for such compositions is now an important function of chess periodicals, and of the numerous serial publications that devote a column to chess, The six problems given below! are prize-winners. The solutions (necessarily the leading variations only) will be found at the close of the article, p. 603.

Various THEORIES AS TO THE INVENTION or CHESS.— The origin of the game of chess is lost in obscurity, a fact which has rather invited than repelled learned speculations on the subject. The invention of the pastime has been variously ascribed to the Greeks, Romans, Babylonians, Scythians, Egyptians, Jews, Persians, Chinese, Hindus,

1 Prospiem No. 1. By J. Kling.

(Adjudged the best two-move problem of the British Chess Association Tourney, 1872).

BLACK,

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YU) aa

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i “i “a. on _ . ait

Philidor’s Defence. h

WHITE. BuLaok. EB Sa — “em Mr Barnes. Mr Morphy. LU LL! YY Ua 1. PtoK 4 1. PtoK 4 aad . 31 Ke 3 * 3 * ° A 4 White to play and mate in two moves. i O 4 i@) 4, P takes K P 4. B P takes P “ ” 5. Kt to Kt 5 5. PtoQ4 a 6 Pere 6 BtoQB4 By the Rev. George M‘Arthur. 7 KttoB7 7. QtoB3 (The prize problem of the Cambridge Tourney, 1860.) 8, Bto K 3 8. P to Q5 BLACK. 9, BtoK Kt 5 9, QtoB4 10, Kt takes R 10. Q takes B | ae ‘se oe UL ll. BtoB4 ll. Kt toQB3 WY), Vi 12. Kt to B7 12. Q takes P Y a q N Vj gp 13. R to B sq 13. Kt to B3 23 yan cS – 14. PtoK B38 14. Kt to Q Kt 5 “ie vO 15. Kt toQR3 15. B takes P _@ i L 16. B takes B 16. Kt to Q 6 (ch) la Uf Vide Ma, 17. Q takes Kt 17. P takes Q iy 2 a a 18. Castles 18. B takes Kt , y Vi; 4 FG 19. B to Kt 3 19. P to Q7 (ch) “y a 20. K to Kt sq 20. BtoB4 a a a 7 21. Kt to K 5 21. K to Bsq a), — Wit 7 22. Kt to Q 3 22. Rto K s Z BT Yy d Y Yj 23. Kt takes B 23. Q takes R Ey : RU LL And White resigns. a we YY a je Enb-GAMES AND PropLEMs.—Considerable attention has Baia fo Z Udita

Y Yyy WL Vy been devoted by writers on chess to the examination of jy V7 Yj EE end-games, and many of the particular combinations of Bl Vi, LL LL forces that are apt to occur have been fully and carefully ~ WHITE, analyzed. The study of and taste for problems have White to play and mate in three moves.

CHESS

Arabians, Araucanians, Castilians, Irish, and Welsh. Not content with upholding the claims of nations or races, some have endeavoured to fix

upon particular individuals as the originators of the game; and, amongst others, the following have found supporters _— Japhet, Shem, King Solomon, the wife of Ravan king of Ceylon, the philosopher Xerxes, the Grecian prince Palamedes, Hermes, Aristotle, the brothers Lydo and Tyrrhene, Semiramis, Zenobia, Attalus who died about 200 B.c., the mandarin Hausing, the Brahman Sissa, and Shatrenscha, stated to be a celebrated Persian astronomer. Many of these ascriptions are of course fabulous, others rest upon little authority, and some of them proceed from easily traceable errors, so where the Roman games of Zudus Latrunculorum and Ludus Calculorum, the Welsh recreation of Yawlbwrdd, 1.e.,

PROBLEM No. 3. By F. Healey. (One of the first-prize set of the Bristol Tourney, 1861.)

Eun” mae gos ae a aw _ ae a 8 2 i og oH ET

Te

J [= fa: “8 tL EE

WHITE. White to play and mate in three moves.

PROBLEM No. 4. By S. Loyd. (One of the second-prize set of the Paris Tourney, 1867.) BLACK,

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ms Lic VY le a el na 2 V/ a. Vizio

White to play a ee in four moves.

throw-board, and the ancient Irish pastime of Jithcheall are assumed to be synonymous with chess ; whereas, so far as the Romans and Welsh are concerned, the contrary can be proved, while from what little is known of the Irish game it appears not to have been a sedentary game at all, but most likely an open-air recreation. The claims of the Chinese were advocated in a letter addressed by Mr Eyles Irwin in 1793 to the Earl Charlemont. This paper was published in the Z’ransactions of the Royal Irish Academy, and its purport was that chess, called in the Chinese tongue chong-ki, which, according to Mr Irwin, means the “ royal game,” was invented in the reign of Kao Tsu, otherwise Lin Pang, then king, but afterwards emperor of Kiangnan, by a mandarin named Hansing, who was in command of an army invading the Shensi country, and who wanted to

PROBLEM No. 5. By Lieutenant 8. A. Sorensen. (One of the first-prize set of the British Chess Association Tourney, 1872, and also adjudged the best four-move problem of the Tourney.)

Witt

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e .” “. Ey icc Va aa *s

DG, a Muy Y

“ oe ‘o m2 /E

a Ll na

*”

J Mi) U Us Z WHE

WHITE. White to play and mate in four moves.

PRoBLEM No. 6. By Dr Conrad Bayer. (One of the first-prize set of the British Chess Association Tourney, 1862, and also adjudged the best problem in the Tourney.)

BLACK.

Be Aaa r oe

ee Beta 2

Vditidlde o7 YG’ Og, moe 6 a

yy A:

Gi Y// Ve; WHITE. White to play and mate in five moves.

Gay

vr

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amuse his soldiers when in winter quarters so that they might no longer clamour to return home. According to the narrative, this invasion of the Shensi country by Hansing took place about 174 B.c. Captain Hiram Cox, in a com- mentary upon the above letter, states that the game 1s called by

the Chinese choke-choo-hong ki, literally, “ the play of the science of war.” (See also a paper published by the Hon. Daines Barrington in the 9th vol. of the Archeologia.) Mr N. Bland, M.R.A.S., in his Persian Chess (London, 1850), endeavours to prove that the Persians were the inventors of chess, and he maintains that the game, after being born in Persia, found a home in India, whence, after a series of ages, it was brought back to its original birth-place. The view, however, which has been most seriously put forward, and which has obtained the most credence, is that which attributes the origin of chess to the Hindus. Dr Hyde of Oxford, writing in 1694 (De Ludis Orientalibus), seems to have been the first to propound this theory. He, however, laboured under two somewhat serious disadvantages ; he appears to have been ignorant of the game itself, and the treasures of ancient Hindu knowledge contained in Sanskrit records were not accessible in his time. About 1783-89 Sir William Jones took up the mantle of Hyde, and in an essay published in the 2d vol. of Asiatic Researches, argued that Hindustan was the cradle of chess, the game having been known there from time immemorial by the name of chaturanga, that is, the four “angas,” or members of an army which are said in the Amarakosha to be elephants, horses, chariots, and foot soldiers. As applicable to real armies, the term chaturanga is frequently used by the epic poets of India. Sir William Jones was resident in Bengal, and was president of the Asiatic Society of that province; he commenced the study of Sanskrit to assist him in his judicial functions, and was the first who possessed real and profound knowledge of that language; he was, besides, well acquainted with and fond of chess, so that altogether he was more advantageously situated than Hyde for forming an opinion upon the matter. His essay is substantially a translation of and a commentary upon the Bhawishya Purana, in which is given a description of a four-handed game of chess played with dice. A pundit named Rhadhakant informed him that this was mentioned in the oldest law books, as also that it was invented by the wife of Ravan, king of Lanka (Ceylon), in the second age of the world, in order to amuse that monarch while Rama was besieging his metropolis. This account claims for chess an existence of 4900 or 5000 years. Sir William, however, grounds his opiuions as to the Hindu origin of chess upon the testimony of the Persians, and not upon the above manuscript ; while he considers the game described therein to be more modern than the Persian game. Though sure that the latter came from and was invented in India, he yet, with commendable candour, admits that he

could not find any account of it in the classical writings of the Brabmans. He lays it down that chess under the Sanskrit name chaturanga was exported from India into Persia in the 6th century of our era; that by a natural corruption the old Persians changed the name into chatrang, but their country was soon afterwards taken possession of by the Arabs, who had neither the initial nor final letter of the word in their alphabet, wherefore, they altered it farther into Shatranj, which name found its way presently into the modern Persian, and ultimately into the dialects of India.

So far Sir William Jones; but Captain Hiram Oox, in a letter upon Burmese chess, written in 1799, and published in the 7th vol. of Asiatic Researches, refers to the above essay, and considers the four-handed game described in the above-mentioned Sanskrit manuscript to be the most ancieut form of chess,—the Burmese and Persian games

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coming successively second and third in order of precedence- Later on, viz., in the 11th and 24th vols, of the Archeclogia, Mr Francis Douce and Sir Frederick Madden expressed themselves in favour of the views held by Hyde and his followers.

This brings us to the issue of Professor Duncan Forbes’s Lfistory of Chess, in 1860, in which Captain ,Cox’s views, as founded upon Sir William Jones’s Sanskrit manuscript are upheld and developed into an elaborate theory. Professor Forbes holds that the four-handed game of chaturanga described in the Bhawishya Purana was the primeval form of chess ; that it was invented by a people whose language was Sanskrit (7.¢., the Hindus); and that it was known and practised in India from a time lost in the depths of a remote antiquity, but, as he considers, for a period the duration of which may have been from 3000 to 4000 years before the 6th century of the Christian era. He endeavours to show, though certainly quite specula- tively, for he adduces no proof, how the four armies commanded by four kings in Sir William Jones’s manuscript became converted into two opposing armies, on which conversion he says that two of the kings were reduced to a subordinate position, and became “monitors” or “counsellors,” one standing by the side of the white and the other of the black king, these counsellors being the farzins from which we derive our queens. Among other points he

argues, apparently with justice, that chaturanga was evidently the root of shatranj, for the latter word he states is a mere exotic in the language of the inhabitants of Persia, defying all the ingenuity of their grammarians to make it their own.

Van der Linde, in his exhaustive work, Geschichte und Intteratur des Schachsptels (Berlin, 1874), has much to say of the origin theories, nearly all of which he treats as so many myths. He agrees with those who consider that the Persians received the game from the Hindus; but the elaborate chaturanga theories of Forbes receive but scant mercy at the hands of the learned Dutch author. Van der Linde argues that chaturanga is always used of an army, ancl never of a game, by the old Indian poets; that all Sanskrit scholars are agreed that chess is mentioned in none of the really ancient Hindu records; that the Puranas generally, though formerly considered to be extremely old, are held in the light of modern researches to reach no further back in reality than the 10th century,—while, moreover, the copies of the Bhawishya Purana which are in the British Museum and Berlin Library do not contain the extract relied upon by Forbes, though it is to be found in the Raghunendana, which was translated by Weber in 1872, and is stated by Biihler to date from the 16th century. The ultimate outcome of Van der Linde's studies appears to be that chess certainly existed in Hindustan in the 8th century, and that probably that country is the land of its birth. While putting forth nothing as positive which cannot be proved, he inclines to the idea that the game originated among the Buddhists, whose religion was prevalent in India from the 3d to the 9th century. According to their ideas, war and the slaying of one's fellow- man, for any purpose whatever, is criminal, and the punishment of the warrior in the next world will be much worse than that of the simple murderer; but they ministered to the combative propensities of human nature by inventing the bloodless warfare of chess as a harmless imitation of and a substitution for the carnage of the battle-field. In opposition to Forbes, therefore, and agreeing with Sir William Jones, Van der Linde takes the view that the four-handed game of the above-mentioned manuscript is a comparatively modern adaptation of the primal Hindu chess, and he altogether denies that there is any proof of the game in whatever form having the antiquity

attributed to it. Certainly, internal evidences seem to contradict the view of Sir William Jones's manuscript being a very ancient testimony; for it mentions two great sages, Vyasa and Gotama, the former as teaching chaturanga to Prince Yudhishthira, and the other as giving an opinion upon certain principles of the game; but this could not well be, seeing that it was played with dice, and all games of hazard were positively forbidden by Menu. It would appear also that Indian manuscripts cannot be absolutely relied on in evidence of the antiquity of their contents ; for the climate has the effect of destroying such writings in a period of 300 or 400 years. They must therefore be from time to time re-copied, and in this way later interpolations might easily creep in.

Von der Lasa, who had, in an article prefixed to the Handbuch in 1864, accepted Forbes's views, withdraws his support in a review of the work just noticed, published in the September and November numbers of the Deutsche Schachzettung, 1874, and expresses his adherence to the opinions set forth by Van der Linde.

Altogether, therefore, we find the best authorities agreeing that chess existed in India before it is known to have been played anywhere else,—a fact which naturally leads them to fix upon that country as its probable birth- place. In this supposition they are strengthened by the names of the game and of some of the pieces. Shatranj, as Forbes has well pointed out, is a foreign word among the Persians and Arabians, whereas its natural derivation from the term chaturanga will strike an ordinarily educated as well as a scholarly mind. Again, al-fil, the Arabic name of the bishop, means the elephant, otherwise aleph- hind, the Indian ox. As to how long chess has really existed, unless we choose to rely upon evident myths and old fables, we shall find no ground whatever for attributing to it the great antiquity that some have maintained. Our earliest authority is Masudi, an Arabic author who wrote about 950 a.p. According to him, shatranj had existed long before his time; but the spirit of historic criticism will not permit of our unreservedly accepting his testimony in that regard. Say that he may speak not only for his own generation but for a couple of centuries before, and that will give an existence to chess of over a thousand years, a respectable period of time enough, and one to be satisfied with until a greater duration be proved.

Cress IN EaRLy anD Mepizvat Trmes.—The dimness which shrouds from view the origin of chess naturally obscures also its early history. All kinds of fables and legends lie in the way of the inquirer, and obstruct his progress, so that until a comparatively recent date a firm historical foundation is not to be found. We have seen that chess crossed over from India into Persia, and became known in the latter country by the name of shatranj. Some have understood that word to mean “the play of the king; ” but undoubtedly Sir William Jones’s derivation carries with it the most plausibility, if indeed his reasons may not be said to amount to a demonstration of the correctness of his view. But how and when the game was introduced into Persia we have no means of knowing. True, the Persian poet Firdusi, in his historical poem, the Shahnama, gives an account of the introduction of shatranj into Persia in the reign of Naushirawan (Chosroes), to whom came ambassadors from the sovereign of Hind, 2.é,, India, with a chess-board and men, asking him to solve if he could the secrets of the game, and otherwise to pay tribute. Naushirawan was the contemporary of Justinian, and reigned in the 6th century of our era. Professor Forbes seems to think that this poem may be looked upon as substantially an authentic history and credited as such. This appears, however, to be somewhat dangerous, especially as Firdusi lived some 450 years

after the supposed event took place. Other Persian and Arabian writers state that shatranj] came into Persia from India, and there appears, as we have seen, such a consensus of opinion as may be considered to settle that part of the question. We have then the game passing from the Hindus to the Persians, thence to the Arabians after they took possession of Persia in the 7th century, and from whom directly or indirectly it came to various parts of Europe, at a time which cannot be definitely fixed upon, but which was either in or before the 11th century. That the source of the European game is Arabicis clearly enough deducible, not merely from the words “check” and ““mate,” which are evidently from Shah mat, but also from the names of some of the pieces, to be noticed further on. ‘There are various chess legends having reference to the 7th and 8th centuries, but these may be passed by as presenting no appearance of historical verity; and equally unworthy of credence appear the many Oriental and Occidental romances

which revolve around those two great central figures, Harun al Rashid and Charlemagne. There is no proof that either of them knew anything of chess, or, so far as the latter is concerned, that it had been introduced into Europe in his time. True, there is an account given in Gustavus Selenus, taken from various old chronicles, as t¢ the sco of Prince Okar or Otkar of Bavaria having been killed by a blow on the temple struck by a son of Pepin after a game of chess; and there is another well-known tradition as to the magnificent chess-board and set of men said to have been sent over as a present by the Empress Trene to Charlemagne. But both tales are not less mythical than the romance which relates how the great Frankish monarch lost his kingdom over a game of chess to Guerin de Montglave ; for Van der Linde shows that there was no Bavarian prince of the name of Okar or Otkar at the period alluded to, and in an equally relentless manner the sceptical Dutch writer breaks down the tradition about Irene's chessmen. With respect to Harun al Rashid, among the various stories told which connect him with chess, there is one that at first sight may seem entitled to some degree of credit. In the annals of the Moslems by Abulfeda, there is given a copy of a letter stated to be "From Nicephorus, emperor of the Romans, to Harun, sovereign of the Arabs," which (using Professor Forbes's translation) after the usual compliments, runs thus :— "The empress (Irene) into whose place I have succeeded, looked upon you as a /wkh and herself as a mere Pawn, therefore she submitted to pay you a tribute more than the double of which she ought to have exacted from you. All this has been owing to female weakness and timidity. Now, however, I insist that you, immediately on reading this letter, repay to me all the sums of money you ever received from her. If you hesitate, the sword shall settle our accounts." Harun's reply, written on the back of the Byzantine emperor's letter, was terse and to the point. It ran thus:—" In the name of God the merciful and gracious. From Harun, the commander of the faithful, to the Roman dog Nicephorus. I have read thine epistle, thou son of an infidel mother; my answer to it thou shalt see, not hear." Harun was as good as his word, for he marched immediately as far as Heraclea, devastating the Roman territories with fire and sword, and soon compelled Nicephorus to sue for peace. Now the points which give authority to this narrative and the alleged correspondence are that the relations which they assume between Irene and Nicephorus on the one hand and the warlike caliph on the other are confirmed by the history of those times, while, also, the straightforward

brevity of Harun’s reply commends itself as what one might expect from his soldier-like character. Still, the fact must be remembered, that Abulfeda lived about five centuries after the time to which he refers,

Perhaps we may assume it to be not improbable that the correspondence is genuine; but the words “rukh” and “pawn” may have been substituted for other terms of comparison originally made use of.

As to how chess was introduced into Western and Central Europe nothing is really known. The Spaniards very likely received it from their Moslem conquerors, the Italians not improbably from the Byzantines, and in either case it would pass northwards to France, going on thence to Scandinavia and England. Some say that chess was introduced into Europe at the time of the Crusades, the theory being that the Christian warriors learned to play it at Constantinople. This supposition is negatived by a curious epistle of Cardinal Damianus, bishop of Ostia, to Pope Alexander II. written about 1061 a.p., which, assuming its authenticity, shows that chess was known in Italy before the date of the first crusade. ‘The cardinal, as it seems, had imposed a penance upon a bishop whom he had found diverting himself at chess ; and in his letter to the Pope he repeats the language he had held to the erring prelate, viz., “‘ Was it right, I say, and consistent with thy duty, to sport away thy evenings amidst the vanity of chess, and defile the hand which offers up the body of the Lord, the tongue that mediates between God and man, with the pollution of a sacrilegious game?” Following up the same idea the statutes of the church of Elna, in the 3d vol. of the Councils of Sparn, say, “ Clerks playing at dice or chess shall be zpso facto excommunicated.” Eudes de Sully, bishop of Paris under Philip Augustus, is stated in the Ordonn. des Rois de France, to have forbidden clerks to play the game, and according to the Hist. Eccles. of Fleury, St Louis king of France condemned to a fine all who shonld play it. Ecclesiastical authorities, however, seem to have differed among themselves upon the question whether chess was or was not a lawful game according to the canons, and Peirino, De Prelat. chap. 1, holds that it was permissible for ecclesiasties to play thereat. Among those who have taken an unfavourable view of the game may be mentioned John Huss, who, when in prison,

deplored his having played at chess, where- by he had lost time and risked being subject to violent passions. Among authentic records of the game may be quoted the Aleaiad of the Princess Anna Comnena, in which she relates how her father, the Emperor Alexius, used to divert his mind from the cares of state by playing at chess with his relatives. This emperor died in 1118. Con- cerning chess in England there is the nsual mingle-mangle of the legendary and the possibly true. Snorre Sturleson relates that as Canute was playing at chess with Earl Ulfr, a quarrel arose, which resulted in the latter upsetting the board, with the further consequence of his being mur- dered in church a few days afterwards by Canute's orders. Carlyle, in his recent work, The Harly Kings of Norway, repeats this tale, but Van der Linde treats it as a myth ; and certainly the act imputed to the great-minded Dane seems altogether inconsistent with his character. The Ramsey Chronicle relates how Bishop Utheric, coming to Canute at night upon urgent business, found the monarch and his courtiers recreating themselves at dice and chess. There is nothing intrinsically improbable in this last narra- tive ; but Canute died about 1035, and the date therefore is suspiciously early. Moreover, allowance must be made for the ease with which chroniclers turned other games, such as tables, &c., into chess. William the Conqueror, Henry I., John, and Edward I. are variously stated to have played at chess, but such assertions must be taken quantum valeant. Not devoid of plausibility is the allega- tion that the Court of Exchequer derives its name from Eischiquier ; though whether, in support of the same idea, we are to believe, as is stated by an old writer, that

at the coronation of Richard I. in 1189, six earls and barons carried a chess-board with the royal insignia to represent the said court is another thing. According to Edmonson's /feraldry, twenty-six English families bore chess rooks in their coats of arms. Altogether, strewed about the chronicles and writings of the Middle Ages are many allusions to the game, but the subject cannot be further elucidated here; though a word or two about the pieces and the changes they have undergone may be worth adding.

The king seems always to have had the same move as at present; but it is said he could formerly be captured. There seems no recorded proof,

however, of his ever having been subject to this liability in the real shatranj. His castling privilege is a European invention; in lieu thereof he formerly leaped two and even three squares, and also to his Kt 2d, which would be a knight's move. Castling dates no further back than the first half of the 16th century. The queen has suffered curious changes in name, sex, and power. In shatranj she was called farz or firz (also farzan, farzin, and farzi), signifying a ' counsellor," " minister," or "general." This was Latinized into farzia or fercia. The French slightly altered the latter form into fierce, fierge, and as some say, vierge, which, if true, might explain her becoming a female. Another and much more probable account has.it that whereas a pawn on reaching an eighth square became a farzin, aud not formerly any other piece, which promotion was of the same kind as at draughts (in French, dames), so she became a dame or queen 18 in the latter game, and thence dama, donna, &c. There are old Latin manuscripts in which the terms ferzia and segina are used indifferently. The queen formerly moved only one square diagonally, and was consequently the weakest piece on the board. The immense power she now 'possesses seems to have been conferred upon her so late as about the middle of the 15th century, and there can be little doubt that her investiture therewith arose analogically through the similarity of the powers of promotion possessed alike by the pawns and the common men in draughts. It will be noticed that under the old system the queens could never meet each other, for they operated on diagonals of different colours. The bishop's scope of action was also very limited formerly ; he could only move two squares diagonally, and had no power over the intermediate squares, which he could leap over whether they were occupied or not. One result of the peculiar motion of the bishops was that they could never encounter each other even when running on diagonals of the same colour. This limitation of their powers prevailed in urope until the 15th century. This piece, according to Forbes, was called among the Persians, pil, an elephant, but the Arabs, not having the letter p in their alphabet, wrote it fil, or with their definite article al-fil, whence alphilus, alfinus, alfiere, the latter being the word used by the Italians ; while the French no doubt get their fol and fou from the same source. The pawns formerly could move only one square at starting ; their powers in this respect were increased about the early part of the 16th century. It was customary for them on arriving at an eighth square to be exchanged only for a farzin (queen), and not any other piece ; therefore, the plurality of queens

is not, as some.suppose, a new doctrine. The rooks and knights appear to have always had the same powers as at present. As to the chess boards they were formerly uncoloured, and it is not until the 13th century that we hear of checkered boards being used in Europe.

Mopern History or Curss.—The remarkable, not to say revolutionary, changes which, commencing about the middle of the 15th century, transformed the medizval shatranj into our modern chess, took place most probably first in France, and thence made their way into Spain,

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where the new game was called Axedrez de la Dama, being also adopted by the Italians under the name of chess alla rabiosa. ‘This revolution of the ancient method of play is contemporaneous with that tide of discovery which set in shortly after the conquest of Constantinople, and culminated in the introduction of typography, the discovery of America, the enunciation of the Copernican theory, &c. The time of the first important writer on modern chess, the Spaniard Ruy Lopez de Segura (1561), is also the period when the latest improvement, castling, was introduced, for his book (Libro dela invencion liberal y arte del juego del Axedrez), though treating of it as already in use, also gives the old mode of play, which consisted of a solitary leap of the king. Shortly afterwards, the old shatranj disappears altogether, the struggle for existence resulting as usual in the victory of the stronger. Of Lopez it may be said that he was the first who merits the name of chess analyst, as he gives reasons for his different variations in the openings, and for holding different opinions from his predecessor Damiano. At this time flourished the flower of the Spanish and Italian schools of chess—the former represented by Lopez, Ceron, Santa Maria, Busnardo, and Avalos; the latter by Giovanni Leonardo da Cutri (il Puttino), and Paolo Boi (il Syracusano). In the years 1562-1575, both Italian masters visited Spain, and defeated their Spanish antagonists, so that this period is rightly considered as that when international chess tournaments first took place. The following century yielded a great number of chess writers, but scarcely any great players ; and, in fact, during the whole 17th century, we find but one worthy to be mentioned, viz., the very ingenious Giacchino Greco (il Calabrese), whose recorded games abound in the most beautiful, but often not very

sound, combinations. The middle of the 18th century inaugurates a new era in chess, for now the compilations and reprints of very indifferent writers were abandoned by the student and relegated to the collections of bibliophilists. Instead we find real chess- players and painstaking analysts. The leading man of this time was Francois André Danican Philidor. He was born the 7th of September 1726 at Dreux, near Paris, played chess very early, and was trained by the M. de Kemur Sir de Legal, the then star of the Café de la Régence, which has been the centre of French chess ever since the commencement of the 18th century. In 1747 Philidor visited England, and defeated the Arabian player Phillip Stamma by 8 games to 1 and 1 draw. In 1749 he published in London his Analyse des Echecs, a book which went through more editions and was more translated than a score of other works upon the game. In fact it was the chess Koran. During more than half a century Philidor travelled much in England, Holland, and Germany; but unfortunately he never went to Italy, the only country where he could have found opponents of first-rate skill. Italy was represented in Philidor's time by a trio renowned in the history of chess as forming the Modenese school—Ercole del Rio, Lolli, and Ponziani. The style of these experts was less sound than that of Philidor, but certainly a much finer and, in principle, a better one. It may be added that as an analyst the Frenchman was in many points refuted by Ercole del Rio, who wrote under the nom de plume of the Anonymous Modenese. Blindfold chess play, already exhibited in the 11th century by Arabian and Persian experts, was taken up afresh by Philidor, who played on many occasions three games simultaneously without sight of board or men. These exhibitions were given in London, which he visited every season from 1784 as the guest of the Chess Club in St James's Street ; and he died in that city on the 24th of August 1795. As eminent players of this period must be mentioned Count Ph. J. van Zuylen van Nyevelt (1743-

1826), and the German J. Allgaier (1763-1823), after whom is called a well-known brilliant variation of the King's Gambit. Philidor's mantle was taken up by Alexauder Louis Honoré Lebreton Deschapelles (1780- 1847), who possessed undoubtedly a great genius for the game, and was its champion for many years, notwithstand- ing that he lacked all knowledge of the

theory. The only player who is known to have fought Deschapelles not unsuccessfully on even terms isthe veteran John Cochrane. The Frenchman generally declined to play except at odds, and he was ever ready to handicap himself liberally. Helost, however, a match (1821) to W. Lewis, to whom he con- ceded the pawn and move, the Englishman winning 1 and drawing the 2 others. Deschapelles's greatest pupil, and the strongest player France ever possessed, was Louis Charles Mahé de Labourdonnais—born in 1797—who was the Jeader of the French school from 1821 until his death in December 1840. His most memorable achievement was his contest with the English champion, Alexander Mac- donnell, in a series of matches which resulted in the French player winning in the proportion of 3 to 2 of all the

games played.

The English school of chess commenced about the beginning of the present century, and Sarratt was its first leader. He flourished from 1808 to 1821, and was followed by his great pupil W. Lewis, who, however, exhibited his skill in practical play for a short time only, and wil] be principally remembered for his writings, which stamp him as a great and original chess analyst. His literary career belongs to the period from 1818 to 1848, and he died in 1869. A. Macdonnell has been already mentioned ; he was born in 1798 and died in 1835. He was a very ingenious and brilliant player, but lacked soundness. To the same period belongs also Captain Evans, the inventor of the celebrated Evans Gambit (1828), who died at a very advanced age in 1873; Perigal, who participated in the correspondence matches against Edinburgh and Paris; George Walker, for thirty years chess editor of Bell's Life in London, who is still alive ; and John Cochrane, who has crossed swords with every strong player from Deschapelles downwards, and is still in constant play. In the same period Germany possessed but one player who was above the mediocrities of the time,—J, Mendheim, whose name is connected with Berlin chess, in which city he resided from 1810 to 1836. The fifth decennium of the 19th century is marked by the fact that the chess sceptre departed from the French school, and was grasped by the English. After Labourdonnais's death Fournié de Saint-Amant became the leading player in France; as such he visited England in the early part of 1843, and contended successfully against the best English players,

including Howard Staunton ; but the latter soon took his revenge, for in November and December 1843 the great match between Staunton and Saint-Amant took place in Paris, the English champion winning by 11 games to 6 with 4 draws. During the succeeding eight years Staunton maintained his reputation by defeating in matches upon even terms Popert, Horwitz, and Harrwitz, besides a number of strong amateurs to whom he conceded large odds. He had also two other matches with Harrwitz, one at pawn and two moves, and the other at pawn and move—the former being won by Staunton, and the latter lost by him. Staunton's services in the cause of chess literature are adverted to below. That they were very great, and that the game in England owes much of its present popularity to him is not to be questioned, as also that for thirty years he occupied a position in the English chess world possessed by none of his contemporaries. Staunton was defeated by Anderssen at the London tournament in 1851, and from that time his match-playing

career concluded. He died suddenly on the 22d of June 1874, at the age of sixty-four. Among the contemporaries of Staunton, mention should certainly not be omitted of Henry Thomas Buckle, author of the History of Crvilization. His remarkable powers as a chess-player were principally exhibited in games played only for recreation at Simpson' 8 Chess divan, wherein he was successful over Kieseritzli, and used to concede odds to strong players such as Barnes, Bird, é&c. He beat Anderssen in 1851—when the Breslau player was at the height of his strength—in a series of 15 well-contested ganics played between them, by a majority of one game, and he also about tle same time defeated Léweuthal in a match.

In the ten years 1830-1840 anew school arose in Berlin, the seven leaders of which have been called the Pleiades. These were Bledow (1795-1846), Bilguer (1815-1840), Hanstein (1810-1850), Mayet (1810-1868), Schorn (1802-1850), B. Horwitz, born in 1809 and now living in London, and last, but not least, the eminent player and chess author, Von Heydebrandt und der Lasa, at present the imperial German ambassador at Copenhagen. As belonging to the same period must be mentioned the three Hungarian

players,—Grimm, who died in Turkish Asia, whither he had fled after the insurrection of 1848 ; Szen, known by his successful combats with Labourdonnais (who conceded the Pesth player pawn and two moves, but lost 11 games out of 12), his competition in the 1851 tourney, as also his general play with the strongest acepts of his time; and J. Lowenthal, lately deceased, whose career, however, belongs more naturally to the period of later British chess. Among other proofs of the skill of these Hungarians is the correspondence match in 1843-45 be- tween Pesth and Paris, won by the former.

The first modern international chess tournament, held at London in 1851, marks the commencement of the present epoch, and was the forerunner of various similar contests between strong players of different nationalities. This tourney brought forward a player who, so far as beauty of combination goes, stands even to the present moment with- out a rival, viz., A. Anderssen, born in Breslau the 6th of July 1818. Before his appearance in England he had defeated all his German antagonists, and at the above-mentioned tournament he took the first prize, having successively beaten L. Kieseritzki, Szen, Staunton, and Mr Wyvill, M.P. Anderssen played the same year in the tournament of the London Club, and again took first honours. In 1857 he competed in the Manchester tourney, but lost in the last round to Lowenthal, who consequently won the first prize, Anderssen having the second. In December 1858 Anderssen was beaten by Morphy in a match played at Paris, the score being 7 games to 2 and 2 drawn. In 1860 the indefatigable Breslau player again visited Paris, and played successfully against J. Kolisch ; and he also defeated the latter in 1861 in a set match played at London by 4 games to 3. In the London tourna- ment of 1862, Auderssen took the first prize; but in 1866 he lost a match to Steinitz, the winner’s score being 8 to 6. In 1869 Anderssen came out first in the North German and Rhenish tournaments, and again in 1870 at the Baden- Baden congress ; but in the spring of 1871 he lost a match to Zukertort, score 5 to 2, and he took but the third prize at the Vienna congress of 1873. Altogether he has shown himself the most soldier-like of chess players, ever ready for the fight, and never caring to rest upon his reputation. Among those who may be reckoned as more or less owing their training to him are the following eminent players :— D. Harrwitz, J. Dufresne, Max Lange, B.

Suhle, P. Hirschfeld, G. R. Neumann, E. Schallopp, 8. Mieses, J. H. Zukertort, and many others.

Paul Morphy, who beat Anderssen by such a decisive

majority of games, is considered by many competent judges, and probably with truth, to have been the strongest chess player that ever lived. His career was short but brilliant. Born in New Orleans on the 22d of June 1837, he was taught chess by his father when only ten years of age, and in two years time became a strong player, able to contend with success against his uncle Mr Ernest Morphy and Mr Eugene Rousseau, both high-class experts. When not quite thirteen he played three games with Lowenthal, and won two of them, the other being drawn. He was twenty years of age when he competed in the New York congress of 1857, where he won the first prize, having defeated C. H. Stanley, L. Paulsen, and other strong American amateurs. In 1858 he visited Europe, and there met with a series of triumphs. Hearrived first in England, and there defeated by large majorities Boden, Medley, Mongredien, Owen, Bird, aud others. He also, in a match played in London, beat Lowenthal by 9 games to 3 and 2 drawn. In September of the same year (1858) he played a match at Paris with Harrwitz, whom he defeated by 5 to 2 and 1 drawn; and later on he obtained a victory over Anderssen as above stated. During his stay in Europe he on two or three occasions played without sight of board or men and simultaneously against eight strong players, each time with great success. He returned to America in May 1859, and here his chess career virtually finishes. He continued to play in his own circle, but with decreasing interest in the game, until 1866, when he totally abandoned its practice and has never played since.

Wilhelm Steinitz, born at Prague in 1836, and for the last fourteen years resident in London, took the sixth prize at the London congress of 1862. Inmediately afterwards he defeated Blackburne in a match by 7 to 1 and 2 draws. In 1866 he beat Anderssen in a match by 8 games to 6; and in 1867 he took the third prize at the Paris tournament. In 1868 he carried off the first prize in the British Chess Association handicap, in 1870 the second prize of the

-Baden-Baden tournament, and in 1872 the first prize of

the London grand tourney. In the last-mentioned year he defeated Zukertort ina match by 7 games to 1 and 4 draws. Inu 1873 he carried off the first prize at the Vienna congress ; and in 1876 he defeated Blackburne, winning 7 games right off. He has also won matches against Dubois, Mongredien, Deacon, and Bird, and in 1872-4 he, in conjunction with W. N. Potter, conducted and won a telegraphic correspon- dence match for London against Vienna.

One of the special characteristics of the present time is the extraordinary power of playing blindfold chess which we now so often see exhibited. In Philidor's age it was considered an almost incredible wonder that he should be able to play three simultaneous games without seeing board or men, but Paulsen, Blackburne, aud Zukertort have often played 10 or 12 simultaneous blind- fold games, while even as many as 14 and 15 have been so played.

With the following summary of tournaments contested during the last 25 years, the modern history of chess may conclude :—

1851. London. 1 Anderssen, 2 Wyvill, 3 Williams, 4 Staunton, 5 Szen, 6 Kennedy, 7 Horwitz, 8 Mucklow.

1857. Manchester. 1 Lowenthal, 2 Anderssen.

» New York. 1 Morphy, 2 L. Paulsen.

1858. Birmingham. 1 Lowenthal, 2 Falkbeer.

1860. Cambridge. 1 Kolisch, 2 Stanley.

1861. Bristol. 1 L. Paulsen, 2 Boden.

1862. London. 1 Anderssen, 2 L. Paulsen, 8 Owen, 4 G. Mac- Donnell, 5 S. Dubois, 6 Steinitz.

1865. Dublin. 1 Steinitz, 2 MacDonnell.

1866. Redcar. 1 De Vere.

‘3 English Championship Cup. De Vere. British Chess Association. 1 Steinitz, 2 Grecn.

1867. Paris. 1 Kolisch, 2 Winawer, 3 Steinitz, 4 Neumann,

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1867. Dundee. 1 Neumann, 2 Steinitz, 3 De Vere and Mac- Donnell,

1868. English Championship Cup. 1 Blackburne, 2 De Vere.

1868. British Chess Association Handicap. 1 Steinitz, 2 Wisker, 3 Blackburne.

1870. Baden-Baden. 1 Anderssen, 2 Steinitz, 3 Blackburne and

Neumann. » Xnglish Champiouship Cup. 1870-71. City of London Handicap. 1 Potter, 2 De Vere. 1871-72. Do. 1 Steinitz,2 Keats (at odds). 1872. London. 1 Steinitz, 2 Blackburne, 3 Zukertort. » English Championship Cup. 1 Wisker (becoming per- manent holder of the Cup), 2 De Vere.

1 Wisker, 2 Burn.

1878. Vienna. 1 Steinitz, 2 Blackburne, 3 Anderssen, 4 Rosen- thal. 1876, London. 1 Blackburne, 2 Zukertort, 3 Potter.

LITERATURE OF THE GAME. The number of works that have been written upon chess in various languages is very large ; and only a few of the principal books on this subject can be cursorily alluded to here. Confining ourselves to those authors who have treated of the practice and science of the game, we may begin with Jacobus dc Cessolis, otherwise Jacopo Dacciesole, whose main object, however, though he gives the moves, &c., was to teach morals rather than chess. He was a Dominican friar, and his treatise, Solatiwm Ludi Scacchorum, scilicet, Libellus de Moribus Hominum et Offeiis Nobiliwm, was written before the year 1200. It was afterwards translated into French, and in the year 1474 Caxton, under the

title of The Game and Playe of the Chesse, printed an English trans- lation of the French version. It has been held by many that this was the first book printed in England.

In 1490 we have Die Gottinger Handsehrift, a work containing nine different openings and fifty problems. The author of this manuscript is not known. It is supposed that both he and Lucena were indebted to an earlier source, now unknown. Then comes Vicent, a Spanish writer, whose book bears date 1495. This is pretty well all we know about him, for ouly the title page has been pre- served, the rest of the work having been lost in the first Carlist war, forty years ago. Of Lucena, another Spanish author who wrote in or about 1497, we are better informed. His treatise (Repeticion des Amores y Arte de Axedres) comprises various practi- cal chess matters, including 150 positions, illustrated by 160 well executed wood-cuts. Various of those positions are identical with those in Die Gottinger Handschrift. Damiano's work is an un- acknowledged reproduction of Lucena's. In the sixteenth century works upon the game were written by Damiano (as just mentioned), Ruy Lopez, and Horatio Gianutio della Mantia; in the seven- teenth century by Salvio, Polerio, Gustavus Selenus, Carrera, Greco, Fr. Antonio, and the authors of the Zraité de Lausaune; in the eighteenth century by Bertin, Stamma, Ercole del Rio, Lolli, Cozio, Philidor, Ponziani, Stein, Van Nyevelt, Allgaier, and Peter Pratt ; in the present century by J. F. W. Koch and C. F. Koch, Sarratt, John Cochrane, Wm. Lewis, Silberschmidt, Ghulam Kassim and James Cochrane, George Walker, A. MacDonnell, Jaenisch, Petroff, Von Bilguer, Von der Lasa, Staunton, Kling and Horwitz, Bledow, Dubois, Kieseritzki, Max Lange, Léwenthal, Dufresne, Neumann, Suhle, Zukertort, Preti, and others. The titles of several recent works by English writers are quoted below.

English chess owes much to W. Lewis and George Walker for their multifarious literary labours in the early part of the present century, the former being the best original analyst that England has yet produced. But to Howard Staunton must be ascribed the most important share in creating the popularity which the game has achieved in this country. His victory over St Amant in 1843, and his successful career as a match player during the ensuing eight years, tended in the first place to attract the popular attention, while his works gave a style and a shape to the practice of the game

amongst his countrymen such as contributed much towards laying the basis of that high degree of excellence which now characterises chess playing in England. Staunton's first work, the Chess Player's Handbook, was published in 1847, and again (revised) in 1848. For want of further adequate revision many of its variations are now out of date, while later additions and discoveries naturally find no place therein; but taking the Handbook as it was when issued, very high praise must be bestowed upon the author for the good judg- ment, ability, and painstaking labour evidenced in the compilation of the work. If there be anything wanting in original analysis, this is more than compensated for by the care, acumen, learning, and research which enabled him to utilize and condense in a clear, intelligible, and attractive form all the stores of knowledge then accessible. His other works are the Chess Playcr's Text Book and The Chess Player's Companion (1849), the latter being a collection of his own games, the Chess Praxis (1860), and various smaller treatises. 'As has been already stated, the laws of the game, as laid down in the Prazis, form the basis of the rules adopted by the British Chess Association in 1862, the main differences between the two codes atising from a mitigation in the Association laws of some of the

severe penalties laid down in the Praxis, and the enactment of the ''Dummy Pawn" rule, whereby a pawn on reaching an eight square may, if the player chooses, remain a pawn. In 1840 Staunton established the Chess Playcr's Chronicle, which periodical he continued to edit until 1856, while for four years—commencing in 1865—he carricd on the Chess World. Moreover, he was the chess editor of the Illustrated London News during a period of thirty years, viz., from 1844 till his death in 1874. The services which he rendered to chess in thus popularizing the game and suc- cessfully engrafting it upon our periodical literature have been admitted in all quarters. In this respect also George Walker's work in Bell's Life in London, of which publication he was the chess editor for forty years, should not go without special acknow- ledgment. 'To Staunton's works must now be added his posthu- mous Chess Theory and Practice, edited and prepared for the press by R. B. Wormald, 1876.

Among Continental chess authorities Von Heydebrandt und der Lasa (more usually known by his second title) stands pre-eminent. The German Handbuch, the famous volume with which his name is inseparably associated, was commenced in 1843 by Von Bilguer, who died before the first edition was completed. The second, third, fourth, and fifth editions (the last published in 1874) were success- ively edited and revised by Von der Lasa, and the book now stands a lasting monument of his genius and industry.

Of recent English works upon the openings the following may be mentioned :— The Book of Chess, by G. H. Selkirk, 1868; Key to the Chess Openings, by Thomas Long, 1871; Positions in the Chess Openings, by the same author, 1874; Chess Openings, by F. W. Longman, 1874; Synopsis of the Chess Openings, by Wm. Cook, 1874; The Chess Player's Manual, by G. H. D. Gossip, 1875; and The Chess Openings, by Robert B. Wormald, 1875. There has also lately appeared a selection of games, compiled by H. E. Bird, under the title of Chess Masterpieces, 1875; and likewise the following collections of problems, viz., Chess Problems, by J. Pierce, M.A., and W. T. Pierce, 1873; Supplement to Chess Problems, by the same authors, 1874; and English Chess Problems, a selection of chess problems by the best English composers living and lately deceased, also put forth by the brothers Pierce, 1876.

Solutions of Problems at pages 596, 597. PRoBLEM No. 1.

1. QtoQ Rsq 1, Anything

. R or Kt mates accordingly

bo

Prospiem No. 2.

1 Bato Ks 5 1, KtoKk8 2. Q to K B 5 (ch) 2, Any move. 3. Q or B mates If 1. K to Q 3 2. Q to B7 &e. If 1. K to Q sq 2. Q takes P If 1. Rto R38, or RtoK B8 2. Q takes P (ch)

PROBLEM No. 3.

1. RtoK Rsq 1. B to K sq 2. Q to Q Kt sq 2. Any move 8. Q mates accordingly

PROBLEM No, 4. 1. QtoR8 i, IP twos kn 7 2. Oto K Kt 8 2. P moves 8. Q to Q 5 8. K takes either Pawn 4, Q mates

PROBLEM No. 5. 1. RtoK B3 1. Kt takes R 2. Kt to B 6 (ch) 2. K takes P 3. Q to Q 5 (ch) 8. Kt takes Q 4. B mates

If 1. Kt takes Kt or R to K B2

2. Kt to B 6 (ch) 2. K takes P (best) 3. Q to Q 4 (ch) 3. K takes R 4. B mates

ProBLEM No. 6. 1. Kt from Kt 6 takes P 1. P takes P 2.Q to K 6 2. P takes Q 3. Kt to B 5 (double ch) 3. K to Q 5 (best) 4, Kt from K B 4 takes P (ch) 4. K moves 5. Kt or B mates

If 1. Kt to B 6 (ch) 2. P takes Kt (ch) &c. If 1. Kt takes Kt (ch)

2. B takes Kt (ch) &c.

(W. N. P.)

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CHESTER, an ancient city of England in West Cheshire, the capital of the county, situated on the river Dee, 20 miles from the open sea, 16 miles S.E. of Liverpool, and 179 miles N.W. of London by rail. The city is divided into four principal blocks by the four principal streets—North- gate Street, Eastgate Street, Bridge Street, and Watergate Street, which radiate at right angles from the Cross, and terminate in the four gates. These four streets exhibit in what are called “the Rows” a characteristic feature of the city. Their origin is a mystery, and has given rise to much controversy and speculation. In Eastgate Street, Bridge Street, and Watergate Street, the Rows exist on each side of the street throughout the greater part of their length, and may be described as continuous galleries open to the street, over and under which the houses lining the streets project, and which are formed

as it were out of the front first-floor of the houses, approached by flights of steps from the roadway. The Rows are flagged or boarded under foot and ceiled above, thus forming a covered way, standing

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Plan of Chester.

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in the same relation to the shops, which are at their back, as the foot pavement does in other towns. In Northgate Street, on the other hand, the Row on the west side is formed as it were out of the ground floor of the houses, having cellars beneath, while on the east side the Row is formed at the same elevation as in the other three principal streets. In these streets are several examples of the old timbered houses of the 17th century, and some good specimens of modern imitations of them,—all combining to give a picturesque and foreign character to the town. There is also a chamber with stone groined roof of the 14th century in the basement of a house in Eastgate Street, and another of a similar character in Watergate Street. A mortuary chapel of the early part of the 13th century exists in the basement of a house in Bridge Street.

_ Chester is the only city in England that still possesses its walls perfect in their entire circuit of two miles. The gateways have all been rebuilt within the last hundred years,—the north and east gates on the site of the Roman

gates. The Grosvenor Bridge, a single span of stone 200 feet in length, the largest, save one over the Danube, it is believed, in Europe, carries the road to Wrexham and Shrewsbury over the Dee on the south-west, while the old bridge of seven arches is interesting on account of its antiquity and picturesque appearance. The city possesses but few public buildings besides

the cathedr churches. The castle, with the ex- ception of ‘ Ceesar’s Tower,” and a round tower with adjacent buildings in the upper ward, was taken down towards the end of the last century, and replaced by a gateway, a bar- racks, a county hall, a jail, and assize courts,—all buildings of pure classic architecture after the design of Thomas Harrison, a local architect, City Arms.

who was also the architect of the Grosvenor Bridge. In Northgate Street stands the town hall, a handsome stone building of Continental-Gothic design, which replaced the old Exchange, burnt down in 1862. The market-place, a little to the south of it, was opened to the public in 1863. Near the north-west angle of the city walls is the infirmary, founded in 1761, capable of holding 100 beds, and furnished with a fever ward in a detached building to the east of it. The savings-bank is a pretty Gothic structure in Grosvenor Street, erected in 1853. The Grosvenor Hotel, rebuilt by its owner, the late marquis of Westminster, is a handsome building near the east gate, the upper stories being timbered in accordance with the style of the old houses in the city. Besides these may be mentioned the general post-office, designed after the Elizabethan style, the custom-house, the free library, the music hall, and the training college. Among the most interesting of the ancient houses are Derby House, bearing the date 1591, Bishop Lloyd’s House, and God’s Providence House in Watergate Street, and the Bear and Billet in Lower Bridge Street ; the three last bear dates in the 17th century. The Natural Science Society, founded by Canon Kingsley, and the Archzologi- cal Seciety have their lecture-rooms and museums at the Old Albion in Lower Bridge Street.

Besides the Benedictine Abbey of St Werburgh, the Franciscans, the Dominicans, and the Carmelites had houses in Chester, and the sites of the first and last are still commemorated in the names of Grey Friars and White Friars; St John’s, without the walls, was a collegiate church, with a dean, seven prebendaries, and four vicars. Chester was for a time in the diocese of Lichfield and Coventry, but in 1075, ¢ Peter, then bishop, restored the seat of the see to Chester, and made St John’s his cathedral; his successor, however, removed the seat back to Coventry, and in 1541 Henry VIII. erected Chester into an independent see, and the abbey jij church of St Werburgh into the cathedral | of the diocese. He richly endowed the \

cathedral, and constituted in it a dean and six prebendaries, now reduced to four, who are styled canons. The King's School for public education was founded by the same patron, and in it the king provided that 24 poor scholars should be taught free of charge. The school has now, however, been remodelled, and placed under a board of governors by the Endowed Schools Com- missioners. Within the walls are the parish churches of St Oswald, founded about 1093 ; St Peter, founded before the Conquest ; St Michael, probably founded before 1118 ; St Bridget, founded prior to 1224 ; the Holy and Undivided Trinity, founded in or before the 12th century ; St Mary,

Arms of Bishopric.

CHESTER

founded probably in the 12th century ; St Martin, founded prior to 1250; and St Olave, founded prior to the 12th century. The two last-named parishes are amalgamated with St Bridget and St Michael respectively. In the suburbs are St John's, St Paul in Boughton, Christ Church in Newton, All Saints in Hoole, and St Thomas. Among the Nonconformist places of worship, which represent all the principal denominations, may be mentioned the Unitarian Chapel in Crook Lane, built originally by the followers of Matthew Henry, one of the ejected ministers. For the recrea- tion of the inhabitants provision is made by the New Gros- venor Park, presented to the town in 1867 by the marquis of Westminster, and the Roodee, a level tract at the base of the city walls appropriated as a race course.

The original charter which the city received from Earl Ranulph was confirmed, and the privileges extended, by many subsequent charters granted by different sovereigns and princes. Of these the most important were that of Edward I., which granted the office of coroner, defined and extended the jurisdiction of the courts of civil and criminal jurisdiction, and granted freedom from toll, &c., to the citizens throughout his dominions; that of Edward, the Black Prince, which defined and particularized the boundaries of the city, giving it a circuit of 12 or 14 miles, and granted jurisdiction of the river Dee to the mayor and citizens from a spot then and still called "Iron Bridge" above the city, to a point near Hoylake at the

mouth of the river; and lastly, the charter of Henry VII., which ordained that the corporation should consist of a mayor, 24 aldermen, and 40 common councilmen, to be elected annually, created the office of recorder, regulated and gave exclusive jurisdiction to the mayor's and sheriff's courts, empowered the mayor to have his sword of state carried (in the absence of the king and his heirs) before all others with point upwards, and finally erected the city into a county by itself with a separate commission of the peace. The corporation thus constituted continued till the passing of the Municipal Corporations Act, under which the govern- ment of the city is now vested in the mayor, 10 aldermen, and 30 councilmen. The recorder is now a barrister appointed by the Crown, He is the judge of the local courts, called the Portmote (originally the mayor's court), the Pentice (originally held before the two sheriffs in a building now pulled down, called the Pentice), and the Passage Courts now fallen into disuse. He also presides at the city court of quarter sessions, which now alone retains a limited criminal jurisdiction, which once the city courts possessed even to the infliction of capital punishment.

The population of the municipal (as distinguished from the parliamentary) borough was, according to the census of 1861, 31,110, and in 1871, 35,257 (16,910 males and 18,347 females). The area of the municipal borough is 3437 acres, and that of the parliamentary, which includes parts of Hoole, Saltney, Great Boughton, and Newtown, 3455 acres, containing a population in 1871 of 38,390, and returning two members to parliament. The trade of the town is nominally represented by 23 guilds. Within the walls there is no extensive manufacture carried on, save that of shoes and boots for exportation and the wholesale home trade, and furniture and upholstery. In the suburbs shot and white and sheet lead are very largely manufactured, and flour of superior quality is produced. There are also several iron foundries, and the more humble manufacture of pipe-making has been carried on from a remote period. As a port there can be little doubt that Chester was at one time of importance, but the silting up of the channel of the Dee affected its commerce injuriously as early as the 15th century, and now the shipping trade is inconsiderable.

The history of Chester reaches back to very early times. Tligden ascribes the foundation of the town to a very remote period; but

the Welsh name by which it was even in Higden's day and is still known—Caerlleon Vawr or Caerlleon ar Dyfyrdwy, which means the ‘‘great camp or station of the legion on Dee,”—points to a Roman origin. It is the Deva of the Roman Itineraries, and from its position at the head of the then most important estuary on this part of the coast, and at a point where several Roman roads con- verged, it must soon have risen in prosperity and importance. The dignity of a Roman colonia has been elaimed for it by some writers, but there is no certain evidence on which such a claim can be grounded. The pick and spade, however, have revealed numerous proofs that it was ‘‘no mean city.” Among numerous altars from time to time exhumed is one of rare oceurrence with a Greek inscription, and dedicated by Hermogenes, a physician. Of the latest discoveries the most remarkable was made in pulling down the Feathers Hotel on the east side of Bridge Street, when the remains of a fine basilica were brought to light, having a row of seven Corinthian pillars on either side once supporting its roof, and a series of apartments on its south side,—probably in connection with baths,—floored with tesselated and herring-bone tile pavements, and warmed by an exten- sive hypocaust, a portion of which is still to be seen underneath some adjoining houses.

The town was walled, and in form was rectangular and equilateral or nearly so, but was not co-extensive with the present city. The four principal streets followed generally the line of the present streets running north and south and east and west, crossing each other in the centre of the town. The southern wall of the town, running from a point near the distance chair in the racc- course, past St Bridget's rectory eastwards, eut across the present city, about the top of Lower Bridge Street, just below St Michacl's Church, and joined the wall on the eastern side somewhere a little to the north of what are now called ‘‘The Wishing Steps,” and there was probably a tower at each angle of the wall. A Roman arch, however, still existing and impinging upon the Keep or ‘“Ceesar's” Tower in the Castle, and also another arch (now removed), incorporated into the walls near the old bridge, and called ‘‘ The Ship Gate,” attest the existence of some outwork overhanging the river for the protection probably of the trajectus by which the Roman roads to the south and west, emerging from the town by the

southern gate, erossed at a point just below. The renowned XXth Legion was stationed here from an early period of the Roman occupa- tion to as late as the third century.

After the departure of the Romans, Chester appears to have been possessed in turn by Britons, Saxons, and Danes; in 894 it was found a deserted city by the Danes, who then took possession, and were in turn starved out by a besieging Saxon army. Earl Ethelred restored it in 908,extending its walls so as to embrace the castle. After the defeat of the Danes by Edmund in 942, Chester for a time enjoyed comparative repose. Athelstan revived its mint ; Edgar received homage of his vassals there; and Harold's queen found a home there after the battle of Hastings. Mercia had up to this time been governed by its earl. Beyond Chester lay the still hos- tile Welsh, for the reduction of whom the place afforded an important basis of operations, this led to the establishinent after the Conquest of theNorman earldom of Chester, which was first granted to Gher- bod, a noble Fleming. After him Hugh Lupus, the nephew of the Conqueror, was invested as carl of Chester, with sovereign or pala- tinate authority over the tract of country now represented by the county of Cheshire, and the coast-line of Flintshire, as far as Rhuddlan, with Chester as the seat of his Government. In the castle, built, or at least reconstructed by Earl Hugh, the earl assembled his court or eouncil; and here too sat the exehequer and other courts. Earl Hugh was the founder of the Benedictine Abbey of St Werburgh, which he richly endowed. It was dur- ing the rule of these Norman earls that Chester received at the hands of Earl Ranulph I. its first charter, and took rank as a city, but the language of this charter indicates that Chester already possessed some municipal privileges. Under this eharter were established local courts of civil and criminal jurisdiction, which were the germs of the Portmote, Pentice, and Passage Courts. On the death of Earl John in 1237, Henry III. seized the earldom and it has ever since been an apanage of the Crown. The'county, however, retained its palatinate character, and Chester still con- tinued to be the seat of its jurisdiction. Though no longer the metropolis of an almost independent dominion, Chester still, as the eapital of the palatinate and the key to North Wales, yet un- subdued, ranked high among the eities of the west of England, was often honoured by royal visits, and was the object of attack and defence during the many civil wars. In 1256 she narrowly escaped the fury of Llewelyn, who, we are told, carried

fire and sword to her very gates. Edward I. visited the city on several occasions ; in 1276 he summoned Llewelyn to do him homage here, and the next year he marched through with a powerful army to Rhuddlan. In 1800 his son Edward, the first English Prince of Wales, here received the final submission of the Welsh to the sovereignty of England. Hither Henry of Lancaster Jed his captive sovereign, Richard II., fron: Flint Castle, and imprisoned him in a tower over the outer gateway of the Castle, In 1459 queen Margaret

visited the city, and Henry the VII., accompanied by his queen and mother in 1494. In 1507, 1517, and 1550, Chester shared with other places the visitation of the sweating sickness, which carried off many of itsinhabitants. It was also so severely scourged by the plague, 1602 to 1605, that the city fairs were suspended, and the court of exchequer removed to Tarvin, and the assizes to Nant- wich. In 1647-48 this epidemic for the last time raged with a terrible fatality; from June 22 to April 20 it is said that 2099 persons perished of the plague in the several city parishes. But of all the events in the history of Chester, there 1s none so memorable as the protracted siege which the city endured in its loyalty to Charles I. ‘The king, having hoisted his standard at Nottingham, arrived at Chester in the autumn of 1642, where he was enthusias- tically received. ‘The sacrifices made by the citizens for the royal cause were great. In 1644, the pecuniary levies upon them amounted to as much as £200 every fortnight. The siege began in July 1643, and in the autumn of 1645 the assailants, despairing of taking it by assault, converted the siege into a blockade. In 1646-7 the citizens were in such extremities as to be in want of the commonest necessaries of life. It was only after a tenth sum- mons that, on February 8, 1646, they at last agreed to the articles of surrender, by which the garrison were allowed to march out with all the honours of war, the safety of the persons and property of the citizens with liberty to trade was secured, and the sanctity of the sacred edifices and their title deeds preserved. In 1659 Sir George Booth and a large party of the citizens seized the garrison for Charles II., then still an exile, but they were afterwards re- pulsed in an action fought near Winnington bridge, by Lambert, the Parliamentary general. In 1660 the joy felt by the citizens at the Restoration, was expressed by the magnificent

reception accorded to the learned Dr Brian Walton, the new bishop of Chester, on his coming to take possession of his see. he spirit of the inhabitants evinced, however, a change in 1683, when the presence of the duke of Monmouth was the cause of a tumultuous mob, who, after committing other acts of violence, forced the cathedral doors, destroyed most of the painted glass, demolished the font, and did other damage there. James II. visited the city in 1687, and his successor, William III., in 1690. Coming to more modern times, the city accorded a hearty and brilliant welcome to the Prince of Wales on the 14th October 1869, when he honoured them with his presence to open the new Town Hall. (W. W. F.)

CHESTER, a city of the United States, in the county of Delaware, Pennsylvania, on the right bank of the Delaware River, 10 miles south-west of Philadelphia by the railway to Wilmington. It has five or six churches, two high schools, and a national hall, and carries on the manufacture of cotton and woollen goods, machinery, and carriages. Founded by the Swedes in 1643 under the name of Upland, it ranks as the oldest town in the State, and was the seat of the provisional assembly held by Penn in 1682. From that date till the formation of Delaware county in 1789, it was the chief town of the county of Chester,—a position now held by the city of West Chester. Population in 1850, 1667; and in 1870, 9485.

CHESTERFIELD, a municipal borough and market- town of England, in East Derbyshire, 12 miles south of Sheffield by the Midland Railway. It is situated on the Rother and Hipper, and is the terminus of a canal extending a distance of 46 miles to the Trent at Stockwith. It is irregularly built, with narrow streets, but has a spacious market-place. The church of All-Saints is a large and elegant edifice of the 13th century, with a remarkable twisted spire 230 feet high, which has given rise to con- siderable discussion as to whether it was so constructed or owes its deformity to the warping of the woodwork. There are eight or nine dissenting churches, a free grammar school, founded by Queen Elizabeth, and rebuilt in 1710 and 1845, a girls' industrial school established in 1819, and various other educational institutions, a municipal hall erected in 1849, a market-hall (which dates from 1855-7 and contains a corn-exchange), a town-library, a mechanics' institute, a prison, assembly rooms, a hospital, a theatre, and an institute of mining, civil, and mechanical engineers, The manufactures include cotton,

silk, earthen- ware, machinery, and tobacco; and there are coal, iron, and lead mines in the vicinity. Races are held on Whit- tington Common, about a mile from the town, in the neighbourhood of the famous Revolution House. The

population of the municipal borough in 1861 was 9836, and in 1871 it was 11,427. Chesterfield was a Roman station on the road from Derby to York, and its name is partly of Roman origin. At the time of the Con- quest it was of but little importance, but in the reign of King John it received a charter of incorporation. In the year 1266 the rebellious barons were defeated in the neighbourhood by Henry, the nephew of Henry III. In 1642 the town was occupied by the forces of Sir John Gell, and in 1643 by Sir Thomas Fairfax.

CHESTERFIELD, Purttre DoRMER STANHOPE, FouRTH Eart oF (1694-1773), the son of Philip Stanhope, the third earl, and Elizabeth Savile, daughter of the marquis of Halifax, was born in London. Deprived at an early age of his mother, the care of the little Lord Stanhope devolved upon his grandmother, the marchioness of Halifax, a lady of culture and connection, whose house was frequented by the most distinguished Whigs of the epoch. He soon began to prove himself possessed of that systematic spirit of conduct and effort which appeared so much in his life and character. Divined by Ruvigny, earl of Galway, who perceived in him a nascent aptitude for pleasure and politics overlaid with a strong natural tendency to indolence, he was advised by that nobleman, if he would become a man of mark, to rise early; he acquired the habit, and kept it. His education, commenced under a private tutor, was con- tinued (1712) at Trinity Hall, Cambridge; here he seems to have read hard, and to have acquired a considerable knowledge of ancient and modern languages. The great orators of all times were a special object of study with him, and he describes his boyish pedantry pleasantly enough, but by no means without a touch of self-satisfaction in the memory. His university training was supplemented (1714) by a Continental tour, untrammelled by a governor; at the Hague his ambition for the applause awarded to adventure made a gamester of him, and at Paris he began, from the same motive, that worship

of the conventional Venus, the serious inculcation of which has earned for him the largest and most unenviable part of his reputation.

The death of Anne and the accession of George I. opened up a career for him and brought him back to England. His relative James Stanhope, the king's favourite minister, procured for him the place of gentleman of the bedchamber to the Prince of Wales. In 1715 he entered the House of Commons as member for St Germans, and when the impeachment of James, duke of Ormond (June 21, 1715), came before the House, he used the occasion to put to proof his old rhetorical studies. His maiden speech was youthfally fluent and dogmatic ; but on its conclusion the orator was reminded, with many compliments, by an honourable member, that he wanted six weeks of his majority, and consequently that he was amenable to a heavy fine for speaking inthe House. Lord Stanhope quitted the Commons with a low bow, and started for the Continent. From Paris he reudered the Government important service by gathering and transmitting information respecting the Jacobite plot ; and in 1716 he returned to England, resumed his seat, and took frequent part in the debates. In that year came the quarrel between the king and the heir apparent. Stanhope, whose politic instinct obliged him to worship the rising rather than the setting sun, remained faithful to the prince, although the ministry made several attempts to win him over. In 1723 a vote for the Government got him the place of captain of the yeomen of the guard ; his happy reply to his predecessor, Lord Townshend, is a fine example of spiriéwel urbanity, and is valuable as indicating, among other examples, his contempt for the money-jobbing system that obtained at court. In 1725, onthe revival of the Bath, the red riband was offered to him, but was declined.

CHESBSTE

In 1726 his father died, and Lord Stanhope became earl of Chesterfield. He took his seat in the Upper House, and his oratory, never effective in the Commons by reason of its want of force and excess of finish, at once became a power. In 1727, on the accession of George IT., Chester- field was sent to the Hague as ambassador. In this place his tact and temper, his dexterity and discrimination, enabled him to do good service, and he was rewarded with Walpole's friendship, a Garter, and the place of Lord High

Steward. In 1732 there was born to him, by a certain Madame du Bouchet, the son, Philip Stanhope, for whose advice and instruction were afterwards writtcn the famous Letters. In the same year, being somewhat broken in health and fortune by his sojourn abroad, he resigned his embassy and returned to England. A few months' rest enabled him to resume his seat in the Lords, of which he was one of the acknowledged leaders. He supported the ministry, but his allegiance was not the blind fealty Walpole exacted of his followers. The Excise Bill, the great premier's favourite measure, was vehemently opposed by him in the Lords, and by his three brothers in the Com- mons. Walpole bent before the storm, and abandoned the measure ; but Chesterfield was summarily dismissed from his Stewardship. For the next two years he led the opposition in the Upper House, leaving no stone unturned to effect the downfall of the man who had wronged him. In 1742 Walpole fell, and Carteret reigned in his stead. The new ministry, however, had not Chesterfield either in its ranks or among its supporters. He remained in opposi- tion, distinguishing himself by the courtly bitterness of his attacks on George II, who learned to hate him violently. In 1744 the king was compelled to abandon Carteret, and the coalition or " Broad Bottom " party, led by Chester- field and Pitt, came into office. In the troublous state of European politics the earl's conduct and experience were more useful abroad than at home, and he was sent to the Hague as ambassador a second time. The success of his mission was complete ; and on his return a few weeks after- wards he received the lord-lieutenancy of Ireland, a place he had long coveted.

Short as it was, Chesterfield's Irish administration was of great service to his country, and is unquestionably that part of his political life which does him most honour. To have conceived and carried out a policy which, with certain reservations, Burke himself might have originated and owned is indeed no small title to regard. The earl showed himself finely capable in practice as in theory, vigorous and tolerant, a man to be feared, and a leader to be followed ; he took the government entirely into his own hands, re- pressed the jobbery traditional to the office, established schools and manufactures, and at once conciliated and kept in check the Orange and Popish factions. In 1746, how- ever, he had to exchange the lord-lieutenancy for the place of Secretary of State. With a curious respect for those theories his familiarity with the secret social history of France had

caused him to entertain, he hoped and attempted to retain a hold over the king through the influence of Lady Yarmouth, though the futility of such means had already been demonstrated to him by his relations with Queen Caroline's " ma bonne Howard." The influence of New- castle and Sandwich, however, was too strong for him ; he was thwarted and over-reached ; and in 1748, he resigned the seals, and returned to cards and his books with the admirable composure which was one of his most striking characteristics.

The dukedom offered him by George II., whose ill-will his fine tact had overcome, was refused. He continued for some years to attend the Upper House, and to take part in its proceedings. In 1751, seconded by Lord Macclesfield, President of the Royal Society, and Bradley,

the cminent mathematician, he distinguished hinself greatly in the debates on the calendar, and succeeded in making the new style a fact. Deafness, however, was gradually affecting him, and he withdrew little by little from society and the practice of politics. In 1754 occurred the famous dispute with Johnsou over the dedication to the English Dictionary. This quarrel (to which are owing the doctor's noble letter and some half dozen of his roughest mots, and the earl's clever portrait of the " intelligent Hottentot "), with the neglect it assumed on Chesterficld's part, has been fatal to his reputation as a man of heart. During the twenty years of life that followed this episode, Chesterfield wrote and read a great deal, but went little into society. In 1768 died Philip Stanhope, the child of so many hopes; and the earl, who had no children by his wife, Melusina von Schulemberg, illegitimate daughter of George I., whom he married in 1733, adopted his godson the heir to the title and estates. His famous jest (which even Johnson allowed to have merit),—'" Tyrawley and I have been dead these two years, but we don't choose to have it known"-~is the best description possible of lis humour and condition during the latter part of this period of decline. To the deafness was added blindness, but his memory and his fine manners only left him with life ; his last words ("'Give Dayrolles a chair") prove that he had neither forgotten his friend nor the way to receive him. He died on the 24th of March 1773.

Chesterfield was selfish, calculating, and contemptuous ; he was not naturally generous, and he practised dissimula- tion till it became part of his nature. In spite of his brilliant talents, and of the admirable training he received, his life, on the whole, cannot be pronounced a success, His anxiety and the pains he took to become an orator have been already noticed, and Horace Walpole, who had heard all the great orators, preferred a speech of Chester- field's to any other; yet the earl's eloquence is not to be compared with that of Pitt. Samuel Johnson, who was not perhaps the best judge in the world, pronounced his manners to have been " exquisitely elegant ;" yet as a courtier he was utterly worsted by Robert Waipole, whose manners were anything but refined, and even by New- castle. He desired to be known as a protector of letters and literary men; and his want of heart or head over the Dictionary dedication, though explained and excused by Croker, none the less inspired the fainous change in a famous line—' Toil, envy, want, the patron, or the jail." His published writings have had with posterity a very indif- ferent success ; his literary reputation rests on a volume of letters never designed to appearin print. The son for whom he worked so hard and thought so deeply failed especially where his father had most desired he should succeed, becom- ing, not a fine gentleman, but a commonplace book-worm. As a politician and statesman, Chesterfield's fame rests on his short but brilliant admivistration of Ireland. As an author he stands or falls by the Letters to is Son, first published by Stanhope's widow in 1774. The Letters are brilliantly written,—full of elegant wisdom, of keen wit, of admirable portrait-painting, of exquisite observation and deduction. Against the charge of an undue iusistence on the external graces of manner Chesterfield has been adequately defended by Lord Stanhope (History, iii. 34). Against the often iter- ated accusation of immorality, it should be remembered that the Letters reflected the morality of the age, and that their

.author only systematized and reduced to writing the prin-

ciples of conduct by which, deliberately or unconsciously, the best and the worst of his contemporaries were governed.

See Chesterfield's Miscellaneous Works, London, 1777-8, 2 vols. 4to; and Letters to his Son (edited by Lord Mahon), London, 1845- 51, 5 vols. See

also Lord Mahon (Stanhope), History of England rom the Peace of Utrecht to the Peace of Versailles,

CHESTER-LE-STREET, a market-town of England in the county of Durham, near the River Wear, six miles north of Durham, on the North-Eastern Railway. ‘The principal building is the parish church of St Mary and St Cuthbert, an interesting old Gothic structure, restored in 1862, with a tower 156 feet in height. There is a union workhouse at the south end of the town, which con- sists of two long parallel streets. Chester-le-Street is a place of considerable antiquity; under the name of Cuneceastre, it was made the see of a bishop in 882, and continued to be the head of the diocese till the. Danish invasion of 995. During that time the church was the repository of the shrine of St Cuthbert, which was then removed to Durham. About a mile along the river is Lumley Castle, the seat of the earl of Scarborough, and about two miles to the northward lies Lambton Castle, the residence of the earl of Durham, built in 1797 on the site of the old House of Harraton. The iron manufacture is prosecuted to a considerable extent, and about 4000 persons are employed in the coal mines of the neighbourhood. In 1871 the population of the town was 2450, and of the township, 4205.

CHESTNUT. The Spanish or Sweet Chestnut, Castanea vesca (natural order, Corylacece), is a stately and magnificent tree, native of the countries bordering on the Mediterranean, but also ripening its fruit in sheltered situations as far north as Scotland. It lives very long, attains a large size, spreading its branches widely, and it has large lanceolate serrate leaves, long pendulous male catkins, with fewer in- conspicuous female flowers, the fruit being an echinate cap- sule, containing from two to five nuts, of which seldom more than three are mature. The largest known chestnut tree is the famous Castagno di cento cavalli, or the chestnut of a hundred horses, on the slopes of Mount Etna, a tree which when measured nearly a hundred years ago, by Count Borch, was found to have a circumference of 190 feet. By many observers it has been maintained that this colossal tree consisted of a fusion of several trunks; but many specimens not much smaller exist in the neighbourhood, and by digging around it has been found that all the trunks end in one root. The wood of the sweet chestnut is valued by cabinet-

makers and coopers; and among European timbers it was at one time esteemed second to the oak,

which it so closely resembles that in old wood-work the

two timbers are very difficult to distinguish. Chestnuts (the fruit of the tree) are extensively imported into Great Britain, and roasted are much eaten as a delicacy. In a raw state they have a sweet taste, but are difficult of digestion. The trees are very abundant in the south of Europe, and chestnuts bulk largely in the food re- sources of the poor in Spain, Italy, Switzerland, and Germany. In Italy the kernels are ground into meal, and used for thickening soups, and even for bread-making. In North America, the fruits of an allied species, C. americana, are similarly eaten.

The Horse Chestnut, Msculus Hippocastanum, is in no way allied to the sweet chestnut except in name. It isa strikingly beautiful tree, especially in spring, with its large digitate leaves, and conspicuous spikes of white flowers. A useful starch may be extracted from its kernels, but this has not hitherto been practised on an economic basis. The entire tree must be regarded as more ornamental than useful.

CHEVIOT HILLS, a range extending a distance of about 35 miles along the confines of England and Scotland, mainly situated in Northumberland, but partly also in Roxburgh. The western portion consists principally of carboniferous strata, while the eastern is chiefly composed of igneous rocks. They attain their greatest height, of 2684 feet, in Cheviot Peak, which lies eight miles south-

west of Wooler, in Northumberland ; and next in elevation is Carter Fell, which slightly exceeds 2000 feet. The range is now chiefly famous for a valuable breed of sheep, which find abundant pasture on its smooth declivities ; but in earlier days it was the scene of many an episode of border warfare, and its name is inseparably associated with the ballad of Chevy Chase.

CHEZY, Antoine Lionarp (1773-1832), a French orientalist, was born at Neuilly in 1773. He was intended by his father for the profession of engineering; but his taste was for philology; and in 1790 he sought and obtained a post in the Oriental department of the national library. About 1803 he commenced the study of Sanskrit, though he possessed neither grammar nor dictionary, and, by means of great labour, he obtained so complete a knowledge of the language that he composed in it verses which are said to possess great elegance. He had besides a considerable axquaintance with other Eastern languages ; and his attainments place him in a high rank among Orientalists. His merits were recognized by his appoint- ment to the chair of Sanskrit in the Collége de France, in 1803, and to the dignity of chevalier of the legion of honour.

Among other works he left—Fxtrait du livre des Merveilles de la Nature, par Mohammed; Medjouin et Léila, from the Persian ; Yadjanadatta Badha, and Sakountala, from the Sanskrit ; L' Antho- logie érotique d'Amrou; Grammaire sanserite; Vocabulaire sans- crit, pracrit, et frangais; Chrestomathie persanne; Chrestomathie sanserite.

CHHATISGARH, a division or commissionership of British India, under the jurisdiction of the chief-commis- sioner of the Central Provinces, comprising the districts of Raipur, Bilaspur, and Sambalpur, and seven small feudatory states, between 16° 50' and 23°10'N. lat., and between 80" 30' and 83° 15' E. long. It is bounded on the N. by Sohagpur in the Rewah state and by the Sirgujé and Udaipur states of Chutid Nagpur; on the E. by the Orissa tributary states and the northern districts of Madras; on the S. by the Bastar state of the Central Provinces; and on the W. by the districts of Chanda, Bhandara, Balaghat, Seoni, and Mandlé. The area is 39,647 square miles; the population in 1872 was 3,289,043, residing in 16,054 villages or town- ships, and in 726,190 houses. Classified according to reli- gion there are 2,054,874 Hindus, or 62°48 per cent. ; 26,046 Muhammadans; 243 Buddhists and Jains; 451 Christians ; and of aboriginal tribes and persons of unspe- cified religion, 1,207,429, or 36°72 per cent. Two great rivers, the Nerbudda and Son, take their rise at: the side of the Amarkantak hill in the north-west corner of the divi- sion, the former flowing nearly due west to the Bombay coast, the latter ultimately falling into the Ganges in Lower Bengal.

CHHINDWARA, a district of British India, in the Ner- budda division of the Central Provinces, situated between 21° 25’ and 22° 50’ N lat., and between 78° 0’ and 79° 30’ E. long. It is bounded on the N. by the districts of Hoshangdbad and Narsinhpur, on the E. by Seonf, on the S. by Nagpur, and on the W. by Betul, and contains an area of 3852 square miles. The district has two distinct natural subdivisions—the hill country above the slopes of the Sdtpur4 Mountains, called the Balaghat, and a tract of low land to the south called the Zerghat. The high table- land of the Baélaghat lies for the most part upon the great basaltic formation which stretches across the Satpurds as far east as Jabalpur. The country consists of a regular succession of hills and fertile valleys, formed by the small ranges which cross its surface east and west. The average height of the uplands is 2500 feet, but there are many points of greater elevation. Theappearance of the Zerghat below the hills is generally open and undulating. The

country is intersected by several streams, of which the Kanhan is the most considerable. Near the hills and along the streams are strips and patches of jungle; the villages are usually surrounded with picturesque groves of tamarind, mango, and other shade-giving trees. ‘Ihe total population of the district, as ascertained by the census of 1872, is 159,116 males and 156,979 females; total 316,095, classified as follows :—Hindus, 191,669; Muham- madans, 9747; Buddhists and Jains, 574; Christians, 105 ; ‘other denominations,” consisting of aboriginal tribes, 114,000. The average density of the population is 80°72 per square mile. Three towns are returncd as containing a population of upwards of 5000, viz.: Chhindwérd, the administrative head-quarters of the district, population 8626; Lodhikeré, population 5219; and Pandhurna, population 5218. Important discoveries of coal have been nade here of late years; it is estimated that the area under which coal lies is over 250 square miles, some of the seams being as much as 18 feet in thickness. The forests of Chhindwaré are very extensive, and lie principally on the southern slopes of the Sdtpurds. The total revenue of the district in 1873-74 amounted to £31,513, of which £21,687, or 68°8 per cent., was derived from the land-tax. For the protection of person and property, and administra- tion of justice, the district contains 6 magisterial and 5 civil and revenue courts, togcther with a regular police of 361 men of

all ranks, maintained at a cost of £5037. The cost of the district officials and police amounted to £10,514. Two charitable dispensaries are maintained for the relief of the sick. In the hill country the climate is temperate and healthy. In the cold season ice is frequently seen in the small tanks at an elevation of about 2000 feet. Until May the hot wind is little felt, while during the rains the weather is cool and agreeable. The average annual rain- fill amounts to 36 inches.

Cuaninpwir4, the principal town aud administrative head-quarters of the district of the same name, situated on the banks of the Bodri nd/é. The site of the town is 2200 feet above sea level, and is surrounded by ranges of low hills. The European station extends for nearly two miles in length, and is well wooded. It is con- sidered very healthy, and forms a resort for European visitors from Nagpur and Kamthi during the hot weather. The conservancy arrangements are good, and the town is clean and cheerful. The population of the town in 1872 was returned as follows :—Hindus, 6189 ; Muhammadans, 1865 ; Buddhists and Jains, 152; Christians, 105 ; others, 315; total, 8626.

CHIABRERA, Gasrietto (1552-1637), the Italian Pindar, as he is sometimes called, was of patrician descent, and was born at Savona, a little town in the domain of the Genoese republic, twenty-eight years after the birth of Ronsard, with whom he has far more in common than with the great Greek whose echo he sought to make himself. As he has told in the pleasant fragment of autobiography prefixed to his works, in which, like Cesar, he speaks of limself in the third person, he was a posthumous child; he went to Rome at the age of nine years, under the care of his uncle Giovanni. There he read with a private tutor, suffered severely from two fevers in succession, and was sent at last, for the sake of society, to the Jesuits' College, where he remained till his twentieth year, studying philo- sophy, as he says, " pit per trattenimento che per appren- dere,"—rather for occupation than for learning's sake. Losing his uncle about this time, Chiabrera returned to Savona, ''again to see his own and be seen by them." In a little while, however, he returned to Rome, and entered the household of a Cardinal Camerlingo, where he remained for several years, frequenting the society of Panlus Manntius and of Sperone Speroni, the dramatist and critic of Tasso,

and attending the lectures and hearing the conversation of Mureto. His revenge of an insult offered him obliged him to betake himself once more to Savona, where, to amuse himself, he read poetry, and particularly Greek. The poets of his choice were Pindar and Anacreon, and these he studied till it grew to be his ambition to reproduce in his own tongue their rhythms and structures, and so to enrich his country with a new form of verse,—in his own words, “like his countryman, Columbus, to find a new world or drown.” His reputation was made at once; but he seldom quitted Savona, though often invited to do so, saving for journeys of pleasure, in which he greatly delighted, and for occasional visits to the courts of princes, whither he was often summoned, for his verse’s sake, and in his capacity asa dramatist. At the ripe age of fifty he took to himsclf a wife, one Lelia Pavese, by whom he had no children. After a simple and blamcless life, during which he produced a vast quantity of verse—epic, tragic, pastoral, lyrical, and satirical—he died in 1637, at the patriarchal age of eighty- five. An epitaph was written for him in elegant Latin by Urban VIII.; but on his tombstone are graven two quaint Italian hexameters of his own, in which the gazer is warned from the poet’s own example not to prefer Par- nassus to Calvary.

A maker of odes in all their elaborate pomp of strophe and antistrophe, a master of new and complex rhythms, a coiner of ambitious words and composite epithets, an em- ployer of audacious transpositions and inversions, and the inventor of a new system of poetic diction,—it is not surpris- ing that Chiabrera should have bcen compared with Ron- sard. Both were destined to suffer eclipse as great and sudden as had been their glory. Jonsard was succeeded by Malherbe and by French literature, properly so-called ; Chiabrera was the last of the great Italians, and after him literature languished till the second renaissance under Man- zoni. Chiabrera, however, was a man of merit, apart from that of the mere innovator. Setting aside his epics and dramas (one of the latter received the honours of transla- tion at the hands of Nicolas Chrétien, a sort of scenic Du Bartas), much of his work remains yet readable and plea-. sant. His grand

Pindarics are dull, it is true, but some of his Clanzonette, like the anacreontics of Ronsard, are ex- ceedingly elegant and graceful. His autobiographical sketch is also extremely interesting. ‘The simple old poet, with his adoration of Greek (when a thing pleased him greatly he was wont to talk of it as “Greek Verse ”), his delight in journeys and sight-seeing, his dislike for literary talk save with intimates and equals, his vanities and vengeances, his pride in tle memory of favours bestowed on him by popes and princes, his “infinita maraviglia” over Virgil’s versification and metaphor, his fondness for masculine rhymes and blank versc, his quiet Christianity, is a figure deserving perhaps of more study than is likely to be bestowed on that “new world ” of art which it was his glory to fancy his own, by discovery and by conqucst.

The best editions of Chiabrera are those of Rome, 1718, 3 vols. 8vo; of Venice, 1731, 4 vols. 8vo; of Leghorn, 1781, 5 vols, 12mo;

and of Milan, 1807, 8 vols. 8vo. These only contain his lyric work; all the rest he wrote has been long forgotten,

CHIARAMONTE, a town of Sicily, in the province of Syracuse, and 32 miles west from the city of that name. It is regularly built, with broad and straight streets. The view from the Capuchin convent is one of the finest in Sicily; and there is a well-preserved castle. The environs produce excellent wine. Population, 9300.

CHIARI, an ancient walled town of Italy, in the province of Brescia, and 12 miles west of the city of that name, near the left bank of the Oglio. It has several churches, a hospital, and a public library, and manz- facturcs silk, cotton, and leather. In 1701 it was the scene

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of the victory of the Austrians under Prince Eugene over the Spaniards and French. Population, 9479.

CHIAVARI, a maritime town of North Italy, in the province of Genoa, and 21 miles E.S.E. of the town of that name, on the Gulf of Rapallo, at the mouth of the Sturla, It has a hospital, a railway station, and several fine churches, the principal of which is that of the Madonna del' Orto. The Genoa and Sarzano railway passes the town. 'The inhabitants, numbering about 11,500, are engaged in the manufacture of furniture, silk twist, lace, and linen, and in the anchovy fishery. The surrounding hills are well cultivated, and slate and marble are quarried in the neighbourhood.

CHIAVENNA, or CLAFEN, a small town of Italy, in the | province of Sondrio, in a deep valley on the right bank | | of the Maira, and about seven miles from its entrance into |

the Lake of Como. From its situation at the junction of the great roads over the Spliigen and Septimer, between Germany and Italy, it is a place of considerable trade, especially in the wines of the Valtelline, and the pottery manufactured in the vicinity. Its principal manufacture is silk, and its beer is reckoned the best in Northern Italy. Its most remarkable church is San Lorenzo, with a carved font of the 12th century ; and on a neighbouring height are extensive ruins of an ancient castle. The town was known to the Romans as Clavenna, and probably was of some importance from its position. In the Middle Ages it was an independent imperial countship, till it was at last seized by the dukes of Milan, and bestowed on the Balbioni family. Fora long time it was an object of contest between the bishops of Coire and the canton of the Grisons ; and at last it fell to the latter in 1512. Incorporated with the Cisalpine republic in 1797, it passed in 1814 to Lombardy, and thus in 1859 to the kingdom of Italy. Population,

3900.

CHICAGO, in Cook county, State of Illinois, is probably the fourth city in size, and certainly thesecond in commercial importance, in the United States of America. It is situated on the west shore of Lake Michigan, 960 miles by rail from New York. Dearborn Observatory, 34 miles 8. and # mile E. from the court-house, is in 41° 50' 1" N. lat. and 87° 34' 8" W. long. The surrounding country is prairie land, with a loam soil, and a ridge running north and south two miles or more west from the lake. 'The city is at an elevation of nearly 600 feet above the sea level, but only 14 feet above the

lake. When it was originally settled, the elevation above the lake was not. more than 7 feet ; the level was subsequently raised 7 feet, beginning about the year 1855; the streets were filled in, and the largest houses elevated by means of jack-screws, without being vacated for purposes either of business or of residence. ‘he climate is healthful and invigorating, and the city is kept singularly clear of all forms of malaria by the prevailing winds. ‘The average death-rate for several years was 23°] per thousand inhabitants, as compared with 25°3 in Philadelphia, 32°6 in New York, and 30°8 in Boston. The area of the city comprises 23,000 acres, and extends over seven miles north and south along the lake shore, and 5 miles east and west; there were 226,000 building lots of 25 by 125 feet in 1875. The streets intersect each other at right angles. ‘There is an inlet called the Chicago River which runs from the lake nearly a mile west, then separates into two branches, one running north-west, the other sonth-west, thus dividing the city into three divisions, connected by more than 35 bridges, and by two tunnels running under the bed of the river. This river (“‘Chacaqua,” Indian for thunder, and so called after the Indian Thor, or thunder god) gave the city its name. Originally it emptied into the lake, but a remarkable piece of engineering caused it to change its

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course, and, so to speak, run “up-hill.” The Hlinois and

Michigan canal, with which the main branch of the river .

is connected, was so deepened as to draw the water out from the lake ; the canal empties into the Illinois River,

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Plan of Chicago.

8. Court House. 4, University.

i. Wicker Park.

2. Union Park. and the Illinois River into the Mississippi River, so that the water of Lake Michigan flows into the Gulf of Mexico. The river has been so deepened that the largest vessels may be towed into any of its brauches, which are supplied with docks and water-slips, affording a dockage capacity of nearly 40 miles, more than 20 of which are already in use. The population, including the residents of the suburban towns (of which there are more than 50, com- posed exclusively of families of men doing business in Chicago), exceeds 500,000 ; but the population of the city proper, as ascertained at different dates since its organiza- tion in the year 1837, is as follows :—

Date of Census. Taken by. Population. July, City 4,170 July, 1840 Uns 4,479 July, 1843 City 7,580 July, 1845 State 12,088 September, 1846 City 14,169 October, 1847 City 16,859 September, 1848 City 20,023 August, 1849 City 23,047 August, 1850 U.S. 29,963 December, 1853 City * 59,1380 June, 1855 State 80,000 August, 1856 City 84,113 August, 1860 im 5 109, 206 October, 1862 City 138,186 October, 1864 City 169,353 October, 1865 State 178,492 October, 1866 City 200,418 October, 1868 City 252,054 August, 1870 U.S. 806,605 October, 1872 City 867,396 October, 1874 City 395,408 May, 1876 Estimated 420,000

This growth, which is no less than 570 per cent. with- in 20 years, is regarded as without a parallel. ‘The

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foreign population in 1870, numbering 144,557 in all, |

comprised 52,318 Germans, 39,988 Irish, 10,027 English, 4197 Scotch, 565 Welsh, 6374 Norwegians, 6154 Swedes, 1243 Danes, 1226 Swiss, 1418 French, and 9648 from the British provinces in America.

Government and Finances. —The City Governmentconsists of a mayor and common council of 36 members, elected once every two years by a popular vote. There are 18 political districts called “wards,” each of which elects two members to the council. The council is vested with plenary powers as to taxes, appropriations, contracts, &c.; but the bonded debt is limited, by a provision in the constitution of the State, to 5 per cent. on the taxable valuation of all the property. The valuation of all property, personal and real, for taxable purposes (rated at about one-half the actual value) in 1875 was $293,188,950; the tax-levy, $5,123,905 ; the bonded debt, $13,456,000 ; the floating debt, about $4,000,000, abundantly covered by un- collected taxes. Chicago is represented in the National Congress of the United States by three members.

Trade and Commerce.—The amount of trade for 1875 was estimated at close upon $657,000,000, made up as follows:—

$232,328, 000

293,900,000 177,000,000

Theses TH0GV0 1.55 can noo cadeononnodLHOnapetooud Wholesale business SMe TITIES sans ncroceieseicon resents cress riel

Total $703, 228,000 Less manufactures included in the

Nyliolesales DlSIMeSde ca, sccssesseereree srs:

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46,228, 000

MNotalNDUSIR CRS rence er aes «ores $657,000,000 Utonitail veo aMts\/ 4 cpapnennnoasono dee 639,000,000 This business was a growth from $20,000,000 in 1852, since which time there has been a steady increase.

The value of the shipments from Chicago of the products of the farm was stated as follows in the annual report for 1875 of the Board of Trade (an association meeting daily, with a membership of 1929) — Flour and grain equal to 72,369,194

bushels, estimated value …..... $57,500,000 Tih7e WINES ooconnnodenncaoposospsanq0o0Cononnod 56,600, 000 Produce of cattle and hogs…....-.1++ 538,500,000 Produce of the dairy ….....ccssecuse sense 5,700,000 Worl auingl, INIGLES Minoo codesnsonbenenanoopasenD 25,800,000 High wines and alcohol….....00+ 11,300,000. Seeds and DrooOmM COL .....csecenss.sseere 3, 200,000 Sundry other commodities ….....0+ 1,700,000

Total $215,300, 000 Corresponding estimate for 1873, 197,400,000 Corresponding estimate for 1878, 1 80,000,000

The lumber trade showed the receipt of 1,147,193,432 feet and 635,708,120 shingles. The value of the cattle, hogs, sheep, and horses received at the Union Stock Yards during that year was $117,533,941. There is a growing direct trade with Europe. The value of the importations for 1875 was estimated at $10,000,000, meaning those alone which came to Chicago without being stopped for duty at any seaport city; and the direct exportations increased from 7213 tons in 1869 to 219,387 tons in 1875. The total volume of produce pouring through the city was estimated that year at 7,000,000 tons, or 700,000 car-loads, if it had all come by rail; or at the rate of 13} tons for every minute in the year, including nights, Sundays, and holidays. There are 18 grain elevators, with an aggregate storage capacity of 14,650,000 bushels. These are vast storehouses where the grain is elevated from cars and ships, and disposed according to grades, then reloaded on cars and ships, all the work being done by machinery. The shipments of bread stuffs for 1835 were 2,262,030 barrels flour, 23,183,683 bushels wheat, 26,409,420 bushels corn, 10,230,208 bushels of cats, 1,834,117

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bushels of barley, and 310,609 bushels of rye. There was a total city consumption of 67,825,311 bushels of grain. The shipments of provisions for that year were 56,040 barrels of beef, 311,170 barrels of pork, 182,068

tons of meat, 57,490 tons of lard, 3701 tons of tallow, 154,559 dressed hogs, The receipts of live stock during that year were 920,843 cattle, 3,912,110 hogs, 418,948 sheep, and 11,329 horses,—a total of 5,251,901, exclud- ing horses. The aggregate of the wholesale trade of that year was estimated at $293,900,000, being an increase of 74 per cent. over the previous year. The capital invested in wholesale houses (exclusive of that invested in other cities, but connected with Chicago) was $63,200,000. The statistics of manufactures at that date were as follows :—

Number of establishments ….....0008 2,240 Number of employés….....:cccceeeveees 62,600 ei ceen es sar ssessenscesvasavnrane $28,676,000

Peri 69,550,000

Capital employed Val

ue of products …..... soononéenndsaseonte 177,000,009

The principal industries are hog-packing (the number of hogs packed in 1875 being 2,069,200), beef-packing, brewing and distilling, and the manufacture of iron and steel, wood, brick, leather, chemicals, boots and shoes, and cigars and tobacco. There is an annual industrial exhibition held in a building especially erected for that purpose, 200 feet wide and 800 feet long, which attracts exhibitors for one month from all parts of the north-west, and which was visited in October 1875 by 276,000 persons. The shipping of Chicago for 1875 was as follows :—number of vessels arrived, 10,488, with a tonnage of 3,122,004; vessels cleared, 10,607, with a tonnage of 3,157,651. There are eighteen trunk lines of railroads running from Chicago, five to the east, and the others west and south, viz.—The Baltimore and Ohio; Lake Shore and Michigan Southern ; Pittsburgh, Fort Wayne, and Chicago ; Pitts- burgh, Cincinnati, and St Louis; Michigan Central; Chicago and Michigan; Chicago and Alton; Chicago, Danville, and Vincennes; Chicago and Iowa; Chicago, Rock Island, and Pacific; Chicago and North-western (comprising three trunk lines); Chicago and Pacific ; Chicago, Milwawkee, and St Paul; Illinois Central ; Western Union; Chicago, Burlington, and Quincy. The aggregate mileage of the railroads centring directly in Chicago is nearly 10,000 miles, and 750 trains arrive

and depart daily ; but it is estimated that Chicago has an uninterrupted connection with more than one-third of the entire railroad mileage of the continent, which is more than 70,000 miles. A notable peculiarity of the Chicago railway system is that it has been built almost entirely by capital outside of Chicago, and was centred in that city because of its superior advantages as the entrepdt of the north-west. The mails received in Chicago weigh 64,400 pounds daily. The banking capital of Chicago at the latest reports was as follows :—National banks (those organized under the provisions of the United States law) $13,381,000 ; State banks (organized under the State law) $7,165,000 ; private bankers, $3,885,000; total, $24,431,000. The annual bank clearings for three consecutive years were as follows : —1872, $993,060,503; 1873, $1,047,027,828; 1874,

$1,101,347,918.

The Fire of 1871.—The most notable event in the history of Chicago was the destructive fire of 1871, the largest of modern times. The conflagration commenced by the overturning of a lamp, in a district built up almost exclusively of wood, about 9 o'clock in the evening of Sunday, October 8, 1871; it continued through that night and the greater part of the next day, lapping up great blocks of houses, and growing by what it fed on. It was finally checked by explosions of gunpowder in a line of houses on the south of the fire, and exhausted itself on the

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north by burning all there was to ignite. The area burned over in each division of the city was as follows :—West division (in which the fire originated), 194 acres ; south division, 460 acres ; north division, 1470 acres, The total arca burned was 2124 acres, or nearly 34 square miles, about 4 iniles in length, and from 1 to 13 miles in width. he season had been excessively dry; the rainfall in Chicago for the summer had been only 28% per cent. of the average. 'There was a strong south-west wind, made a very sirocco by the heat, and taking irregular, fantastic, and uncontrollable offshoots and eddies, which spread tlic fire in all directions except west. 'The city fire department, though large and efficient, had been cxhausted by an unusually extended fire the Saturday preceding, and the flames outran even their earliest efforts. Wooden buildings were scattered throughout the

eutire city, acting as brands to spread the conflagration, These were the main conditions of the fire. The total number of buildings destroyed was 17,450, and 98,860 people were rendered homeless ; of the latter 259 perished in the flames or iost their lives from ex- posure. Thousands, flying before the flames, sought refuge in the lake, and remained standing in the water for hours as the only means of preservation against the intense heat and the shower of sparks and cinders. Aniong the buildings destroyed were the custom-houscs, post-office, court-house, chamber of cominerce, and nearly all the churches, railway stations, hotels, banks, theatres, newspaper offices, and buildings of a quasi-public character. It is estimated that 73 miles frontage of streets was burned over, most of which had been improved with wood block pavements ; these were partially destroyed. The total loss has been estimated at $196,000,000,—of which $53,000,000 represented the value of the buildings destroyed, $58,710,000 the personal effects, and the remaindcr business stocks, produce, and manufactures of every description. On the losses there was an insurance of $88,634,122, of which about one-half was recovered. A vast system of relief was organized, which received the most generous aid from all parts of the world. The money contributions from the various States and from abroad were $4,996,782; of this England contributed nearly $500,000. These funds, which were over and above the contributions of food, clothing, and supplies, were made to last, under the careful and honest administration of a society of citizens, till the close of the year 1876. Out of them temporary homes were provided for nearly 40,000 people; barracks and shelter-houses were erected, workmen were supplied with tools, and womenwith sewing-machines ; the sick were cared for and the dead buried ; and the poorer classes of Chicago were probably never so comfortable as within two or three years after this fire. The work of rebuilding the city was accomplished with marvcllous rapidity. . Immediately aftcr the fire the most sanguine persons predicted that it would require at least ten years to restore the buildings that had been destroyed. But within three years the city was provided with buildings equal in capacity, and of twofold value. The work was begun before the cinders were cold, and the population seemed to gain new ambition and new energy from the disaster. ‘The “fire limits” were extended so as to exclude the erection of other than stone, brick, or iron buildings within a large area, and subsequently this prohibition was applied to the entire city. The result has been to make New Chicago the most

beautiful city in America in its business centres, Within the first year: after the fire, buildings had been erected or started covering a frontage of 51,619 feet, and costing, when finished, $40,133,600. That the work was not spasmodic is shown from the fact that, in the year 1874, the frontage of new buildings was 33,065 feet, and the cost $5,785,441; and in 1875 the frontage was 55,470 feet (about 10} miles) and the cost

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$9,778,080. The materials used were mostly brick, a pure white sandstone known as Athens (Illinois) marble, a grey sandstone from Ohio and Michigan, and a brown sandstone from Lake Superior. The business and population con- tinued to increase in spite of the disaster,—indeed the ratio of growth became larger. The solidity and permanence of this prosperity were confirmed during the American panic of 1873, when the Chicago banks alone, among those of all large cities, were not compelled to issue certificates of deposit, but continued steadily to pay out current funds. There were few mercantile failures, and the business of the year following the panic stil] showed an increase. This supérior resistance to the general contraction has been attributed to Chicago's position as the distributing point of the breadstuffs and provisions of the great North-West. The comparative value of Chicago real-estate is an interest- ing illustration of its rapid growth. An example case may be cited of one piece of ground in an outlying district which sold in 1868 for $50 an acre, and was resold in 1873 for $1500 an acre. Land obtained 40 years ago from the Government at $1,°, an acre, is now worth $10,000 an acre. Business property which was sold in 1865 for $250 a front foot (with a depth of 125 feet), was resold in 1871 for $1500 a front foot. Another piece of property which was valued at $3845 in 1866 was sold in 1872 for $100,000. These instances are not exceptional, but represent fairly the increase of valucs. The highest price ever paid for business property in Chicago was $5255 per square foot, but the average value of first-class business property is $25 per square foot. The aggregate transfers of Chicago property in 1873 amounted to $78,427,391. Liducation, Religion, Charities, &c.—The public school system in Chicago is regarded as one of the most thorough in the United States. In 1855 the first report of the Board of Education showed the enrolment of 3000 pupils; the report of 1875 gave the number as 49,121. There was then an annual

expenditure of $827,502 to sustain the schools; there were 57 school buildings ; 700 teachers were employed; and the annual cost of tuition per pupil was $15,;%. Of the 102,555 persons in Chicago between the ages of six and twenty-one, besides the 49,121 in the public schools, there were 27,071 in private schools, and 15,947 at work. There were 33,547 neither at work nev in school, but only 186 of all were found who could neither read nor write. The graded system of study is used, and the schools are classified as follows :—1 high school, course of study four years ; 3 division high schools (one for each division in the city), course of study two years; 1 normal school for the preparation especially of teachers; the others are grammar schools and primary schools, the furmer em- bracing the four highest grades, and the latter the four lowest grades. The school year consists of ten months, divided into three terms; the hours of attendance in the grammar and primary schools are 9 a.m. till noon, and 2 p.m. till 4 p.m. The principal studies in the grammar schools are theory of arithmetic, problems in arithmetic, geography, history of the United States, language, composition, reading, spelling, penmanship; drawing and music are also taught, and the study of German is optional. The course of studies in the ligh schools is that of the higher academies. Corpora] punishment was abandoned altogether about the year 1865, and the reading of the Bible was discontinued in 1875, in deference to the dogmatic differences among the religious sects, the theory of the schools being free and secular. Of other educational institutions, besides 82 or- dinary private schools, there are a large number of “ Kinder- garten ” schools, in imitation of the favourite German system for elementary instruction, Among the higher institutions is the university of Chicago, connected with which is the Dearborn Observatory, which has a refracting

telescope of 23 feet focal length and 184 inches aperture. There are also the North-Western University (Methodist), the Baptist Union Theological Seminary, Chicago Theo- logical Seminary, St Ignatius College (Catholic), College of Law, Chicago Musical College, and 7 medical colleges. The principal charitable institutions are the Nursery and Half-Orphan Asylum, Protestant Orphan Asylum, Reform and Industrial School, Erring Women’s Refuge, Foundlings’ Home, Good Samaritan Industrial Home, Home for

the Friendless, Old People's Home, Soldiers' Home, St Joseph's Orphan Asylum (Catholic), Lutheran Orphan Asylum, Washingtonian Home (temperance reform), all liberally en- dowed, and 10 hospitals. 'There are 83 benevolent and other open societies, 49 masonic and other secret societies (exclusive of industrial unions), 14 theatres and opera houses, 84 newspapers (daily and weekly), 25 large hotels, and numerous smaller and private hotels, There are 8 libraries open to the public, of which the Chicago Public Library (established in 1872, and supported by taxation) is the largest; in 1875, three years after it was opened, there were more than 40,000 volumes, and the aggregate circulation of books during that year was 399,156 volumes, the whole number of visitors 236,021, and the total issue of periodicals 135,355. There are 238 houses of public wor- ship in Chicago, including the mission churches. The churches are divided among the different denominations as follows :—Roman Catholic, 28; Baptist, 25; Presby- terian, 24; Methodist, 22; Episcopal, 18 ; Lutheran, 18 ; Congregational, 15 ; Jewish, 8; Free Baptist, 2 ; Christian, 4; Dutch Reformed, 2; Reformed Episcopal, 3; Evangelical, 11; Coloured Methodist, 2; German Methodist, 2; Scandinavian Methodist, 4; Swedenborgian, 5; Unitarian, 4; Universalist, 4; miscellaneous and mission, 37. The value of church property in Chicago (exempt from taxation under the law) is estimated at $12,000,000, of which $5,000,000 is owned by the Roman Catholic Church.

Public Works, Parks, Streets, &c.—Of the public buildings destroyed by the fire, the custom-house and the city hall were still in course of erection in 1876. The National Government appropriated $4,000,000 for the former, and the cost of the latter was estimated at $2,500,000. Among the other public buildings are the county jail, bridewell, the water-works, and a large number of enyine- houses and police-stations. The total cost of maintaining and enlarging the public works in 1875 was $9,368,649, the water system being self-sustaining. The water supply of the city is drawn from two miles out in the lake. A large structure of iron and heavy timber, loaded with stone, and called a "crib," 98 feet in diameter, was located at that distance from the shore. In the centre compartment an iron cylinder is sunk 64 feet, of which 31 feet are below the bottom of the lake, the water being 33 feet deep. Connected with it are two distinct tunnels leading to two separate sets of pumping works, The tunnels are 66 feet below the level of the shore, one

with a diameter of 5, and the other of 10 feet. The latter extends also three miles under the city, so that the two pumping works are removed that distance, and along its line are located 17 large subter- ranean wells or cisterns for use in case of fires. The cost of these tunnels was $1,500,000. ‘Their capacity is 150,000,000 gallons ; the capacity of the pumping engines is 80,000,000 gallons in 24 hours. Telegraphic communi- cation is kept up constantly by cables between the “ crib” aud pumping works. ‘The wateris always pure, cold, and wholesome, and it may be raised to a height of 155 feet for distribution. ‘The consumption for 1875 was 1,449,825,000 gallous. There are over 3860 miles of water pipe, varying from 4 to 24 inches in diameter, 2607 public hydrants, and 2132 stop-cocks. There are over

940 miles of sewers, which cost $4,236,769, and 609 miles of streets, of which 112 miles are paved; of the latter 87 miles are of the wooden block pavement. The side walks of the city measure 725 miles; and there are nearly 60 miles of horse-railways or tramways for intra- mural transit. The park system of Chicago is one of the most extensive in the world. ‘Two parks are in the south division, one containing 372 acres, and the other 593 acres. ‘The latter has a frontage on Lake Michigan of 14 miles, aud the two embrace 14 miles of interior drives, and 30 miles of walks. The larger of the two is to have a series of interior lakes connected with Lake Michigan, and protected by a pier several hundred feet long, so that they may be reached by boats from the lake. The approaches to these two parks are two roadways, each 200 feet wide, known as Grand and Drexel Boulevards. The former may be compared to the Rotten Row in Hyde Park, London ; the latter is modelled after the Avenue |’Impératrice, Paris, with a continuous stretch of floral ornamentation in the centre. The west division parks, inside the city limits, comprise Humboldt Park, 225 acres ; Central Park, 185 acres ; and Douglas Park, 180 acres. The ornamen- tation is varied and elaborate. Lincoln Park, within the northern limits of the city, contains 230 acres, and has a lake shore drive of several miles. All these parks are connected by wide roadways, varying from 150 to 300 feet in width, and giving a continuous drive of 35 miles. The parks are supplied with water from a number of Artesian wells. Besides these principal parks, there are the

following public placesin the diffcrent divisions of the city:—Lake Park, 42 acres; Union Park, 11 acres; Jefferson Park, 6 acres; Washington Square, 2 acres; Union Square, 1 acre; Dearborn Park, 1 acre ; Ellis Park, 3 acres; Vernon Park, 3 acres; Wicker Park, 3 acres. There are thus 1856 acres set aside by Chicago for public grounds, k J, Bi B.) CHICHELY, or CuicwEeLz, Henry (1362-1443), an English primate, was born at Higham Ferrers, in North- amptonshire, in 1362. After studying at Oxford, he was sent on various embassies to the Papal and French courts ; in 1409, he was representative of England in the Council of Pisa, which deposed Gregory and Benedict, and elevated Alexander V. to the papacy; and, in 1414, he became archbishop of Canterbury. He was distinguished for his zeal in the cause of the English Church, which he defended against the pretension of the Pope to dispose‘of ecclesias- tical preferments. He was also, on the other hand, a determined opponent of Wycliffe. He spent much of his wealth in the establishment of All Soul’s College, Oxford, and in adorning Canterbury Cathedral and Lambeth Palace. CHICHESTER, a municipal and parliamentary borough, episcopal city, and market-town of England, in Sussex, situated at the foot of a small spur of the South Down Hills, on the widest part of the plain to which it gives name. It is distant about 60 miles }i S.W. from London, and 14 N.E. from Portsmouth. Chi- ¢ chester still retains. its ancient 7 walls, which have a circuit of about a mile and a half, and probably follow the line of the Roman fortifications, The Pi town is well-built, and con- Ams of Chichester. sists of four principal streets, which meet at right angles at a central octagonal cross, fifty feet high, erected by Bishop Story, and reputed to be one of the finest structures of the kind in Great Britain. Of the public buildings tle most remarkable are the cathedral, which is 407 feet in

length and 150 in breadth, and is note-worthy as having double side-aisles, the church of St Paul—a modern Gothic edifice, the guild-hall, the corn-exchange, the market-house, the infirmary, and the museum of the Chichester Literary Society and Mechanics’ Institute. There is also a large cattle-market at the east of the city capable of accommodating several thousand head of cattle. It is one of the principal cattle-markets in the south of England, and was erected in 1871 by the corporation of the city at a cost

of £15,000. In the cathedral are a number of ancient and curious monuments, besides nine by Flaxman, one of which is in memory of the poet Collins, who was a native of the city, and is buried in the church of St Andrew's. The diocese of Chichester includes the whole county of Sussex except a few parishes which are peculiars, and com- prises nearly 300 benefiees. The palace of the bishop is in the city of Chichester. There isa grammar-school, founded by PB Bishop Story in 1497, and the blue- coat school boards and educates about |= 30 boys. Chichester communicates with the sea by means of a short canal, The borough, which returns one member to parliament, had a population of 9054 in 1871.

Chichester, as already mentioned, is undoubtedly built on an ancient Roman site, near a line of road now known as the Stane Street; and it is usually, though hardly with absolute certainty, identified with Regnum, a town of the Belgze mentioned in the Itinerary of Antonine. A slab of grey Sussex marble, now preserved at Goodwood, was discovered in 1713 on the site of the present council chamber, bearing an inscription which has given rise to an ingenious hypothesis, which represents Chichester as the seat of the native king Cogidubnus, men- tioned by Tacitus as possessing independent authority, and this king as the father of the Claudia to whom reference is made in the Second Epistle to Timothy. The inscrip- tion proves at least that the town was the abode of a considerable body of craftsmen, and that they erected a temple to Neptune and Minerva under the patronage of a certain Pudens. With the conjectural restoration of a few letters it reads as follows : —" Veptuni et Minerve templum pro salute domus divine ex auctoritate 7b. Claud. Cogidubni r. leg. aug. in Brit. Collegium fabror. et qui in eo a sacris sunt d.s. d. donante aream Pudente Pudentini fil." In the early Saxon period the town seems to have been destroyed by Ella, and soon afterwards restored by Cissa, whose memory is preserved in the modern name, equivalent to Cissa's Caster, or Castrum. In 967 it was chosen by King ~~Edgar as the seat of a mint, and specimens of the pennies are still extant. At the time of the Conquest it had only 283 houses and a church; but in 1083 the bishopric was removed thither from Selsey, and a cathe~~ dral was consecrated in 1108. This building having been destroyed by fire, a new one was erected in the end of the 12th century by Bishops Ralph and Seffrid, and this may be regarded as the basis of the present edifice. In 1213 the city was formally incorporated. During the civil war it was captured from the

Royalists by Sir William Waller, whose soldiers did great damage to the cathedral. In spite of all attempts to preserve it, the tower and spire came to the ground in 186] ; but a restoration has since been effected under the direction of Sir G. Gilbert Scott. Besides the poet Collins, Chichester numbers among its worthies Bishop Juxon, Hayley the friend of Cowper, and three artists of the 18th century, generally known as the “Three Smiths of Chichester.” See Lower’s Sussex, 8.v. ; Quarterly Review, vol. xcvil.

Arms of Bishopric.

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CHICKASAWS, a tribe of North American Indians, now settled in a reservation of 6840 square miles in the Indian territory on the left bank of the Red River. According to their own tradition and the evidence of philology, they are closely connected with the Creeks and Choctaws ; and they believe that they emigrated along with these tribes from the West, crossed the Mississippi, and settled in the district that now forms the north-east part of the state of that name. Here thcy were visited ty De Soto in 1540. From the first they showed a hostile spirit against the French colonists, and frequently engaged with them in actual conflict. With the English, on the other hand, their relatious were more satisfactory. In 1786 they made a treaty with the Unitcd States ; and in 1793 theysassisted the Whites in their operations against the Creeks. In the early years of the present century part of their territory was ceded for certain annuities, and a portion of the tribe migrated to Arkansas; and in 1832-34, the remainder, amounting to about 3600, surrendered to the United States the 6,442,400 acres of which they were still possessed, and entered into a treaty with the Choctaws for incorpora- tion with that tribe. In 1855, however, they effected a separation of this union, with which they had soon grown dissatisfied ; and by payment to the Choctaws of $150,000 obtained a complete right to their present territory. In the civil war of 1861 they joined the Confederates and suffered in consequence ; but their rights were restored by the treaty of 1865. In 1866 they surrendered 7,000,000 acres; and in 1873 they adopted their former slaves. They possess a governor, a senate, and a house of represen- tatives, and maintain 14 schools with about

500 pupils. In 1873 they numbered about 6000, and had private property to the value of $2,000,000.

CHICLANA, a town of Spain in the province of Cadiz, 13 miles south-east from that city, divided by the River Tiro into the Banda and Lugor quarters. It contains the residences of many of the Cadiz merchants, possesses baths of great celebrity, and is a favourite resort;of the lower classes. In the neighbourhood is Medina Sidonia, sup- posed by some to be the Phcenician Asidon ; and. about 5 miles south is the field of Barossa, where the Anglo-Spanish army under Sir Thomas Graham (Lord Lynedoch) defeated the French under Marshal Victor, March 5,1811. Popu- lation about 8600. ;

CHICOPEE, a town of the United States, in Hampden county, Massachusetts, at the confluence of the Chicopee river with the Merrimac, 95 miles by rail W.S.W. of Boston. It comprises the villages of Cabotville and Chicopee Falls, and forms a flourishing manufacturing centre. Among its principal establishments are seven cotton mills with upwards of 114,000 spindles, the works of the Ames Company (which are the chief source of small arms in the United States), a woollen mill, two manufactories of agricultural implements, and several foundries, The town dates from 1640, and till 1848 formed part of Springfield. Population in 1870, 9607.

CHICORY. The Chicory or Succory plant, Crchorvum Intybus (natural order, Composite), in its wild state is a native of Great Britain, occurring most frequently in dry chalky soils, and by road-sides. It has a long fleshy tap- root, a rigid branching hairy stem rising to a height of 2 to 3 feet,—the leaves around the base being lobed and toothed, not unlike those of the dandelion. ‘The flower heads are of a bright blue colour, few in number, and measure nearly an inch and a half across. Chicory is cultivated much more extensively on the Continent—in Holland, Belgium, France, and Germany,—than in Great Britain; and as a cultivated plant it has three distinct applications. Its roots roasted and ground are used as a substitute for, adulterant of, or addition to coffee; both

roots and leaves are employed as salads; and the plant is grown as a fodder or herbage crop which is greedily con- sumed by cattle. In Great Britain it is

chiefly in its first capacity, in connection with coffee, that chicory is employed. A large proportion of the chicory root used for this purpose is obtained from Belgium and other neigh- bouring Continental countries ; but a considerable quantity is now cultivated in England, chiefly in Yorkshire. For the preparation of chicory the older stout white roots are selected, and after washing they are sliced up into small pieces and kiln-dried. In this condition the matcrial is sold to the chicory roaster, by whom it is roasted till it assumes a deep brown colour; afterwards when ground it is in external characteristics very like coffee, but is destitute of its pleasing aromatic odour. Neither does the roasted chicory possess any trace of the alkaloid caffeine which gives their peculiar virtues to coffee, tea, and other diet drinks. ‘The fact, however, that for a hundred years it. has been successfully used as a substitute for or recognized addition to coffee, while in the meantime innumerable other substances have been tried for the same purpose and abandoned, indicates that it is agreeable or beneficial to some constitutions. It gives the coffee addi- tional colour, bitterness, and body, and may perhaps, as a sedative, tonic, and diuretic, modify its stimulant and irritating effects. It is at least in very extensive and general use; and in Belgium especially its infusion is largely drunk as an independent beverage. The leaves blanched form a favourite salad on the Continent, known in Paris as Barbe du Capucin. In Belgium the fresh roots are boiled and eaten with butter, and throughout the Continent the roots are stored for use as salads during winter.

The Endive (Cichorium Endivia) is a closely allied plant, cultivated on account of its leaves alone, which, when blanched, constitute a valued salad, and are also some- times cooked fresh. It was cultivated and esteemed by the ancient Egyptians, Greeks, and Romans.

CHIERI, a town of Italy, in the province of Turin, and eight miles south-east of the city of that name, with which it ig connected by a good carriage road. It stands on the declivity of a hill, andis divided into two parts by a branch of the Tepice. Among its numerous churches and con- vents, mention may be made of Santa Maria della Scala, which is one of the largest Gothic structures in Piedmont, and occupies, it is said, the site of an ancient temple of Minerva. The town also possesses a large number of benevolent and educational institutions and a theatre. It ranks as one of the

oldest manufacturing centres in Europe, and still prosecutes the fabrication of silk, cotton, and woollen goods. The population is about 12,000. According to some investigators, Chieri is to be identified with the Roman city of Carrea Potentia ; but, be this as it tay, it appears in history at an early period. In the 9th and 10th centuries it was subject to the bishop of Turin ; in the 11th it became an independent republic ; and in 1155 it was compelled by Barbarossa to recognize again the episcopal authority. In the following centuries it went through numerous vicissitudes of war and politics, but at the same time developed its industrial activity. About the middle, indeed, of the 15th century, no fewer than 100,000 pieces of cotton goods were annually manufactured. In 1551 the town was laid waste by the French, By Victor Emmanuel it was raised to the rank of a princedom ; and Cibrario, the historian of North Italy, thought it worth his while to devote two volumes to the preservation of its annals, Delle Storie di Chiert, Turin, 1827.

CHIETI, or Civrra pi Curett, a town of Italy, capital of the province of Abruzzo Citeriore, situated on a hill near the Pescara, about six miles from the Adriatic, and 40

east of Aquila, with which it will shortly have railway communication. It is the seat of an archbishop and a prefect, and has a fine cathedral, a gymnasium, a hospital, several monastic buildings, and a handsome theatre. There are numerous remains of the ancient Z’eate, of which the most important are seven halls, probably belong- ing to a bathing establishment, a large theatre, a gateway, and several inscriptions referring to the Asinian family ; while the churches of Sta Maria del Tricaglio and 5. Paolo are built respectively on the sites of the temples of Hercules and Diana Trivia. The principal industries are the manufacture of woollen and silk goods ; and there is a trade in corn, wine, oil, and the other productions of the neighbourhood. ‘Teate was the chief city of the Marrucini, and under the Roman dominion continued to be a place of considerable prosperity. It scems to have been the native city of the Asinii and the Vettii. After the fall of the Roman empire it passed into the hands of the Goths and the Lombards, was destroyed by Pepin, and was restored by the Normans. In

1524 it gave its name to the order of the Theatines founded by its bishop Gaetano. Popula- tion, 28,000.

CHIHUAHUA, a city of Mexico, capital of the state of the same name, lies in a beautiful valley opening towards the north, and kemmed in on the other sides by arms of the Sierra Madre, 4640 feet above the level of the sea, in 28° 38’ N. lat. and 106° 30’ W. long. The town is regularly built, and the streets are wide and clean, with many handsome and conveuient houses, plentifully supplied with water, which is brought to the town by an aqueduct three miles in length, The grand square, three sides of which are occupied by public edifices and stores, and the fourth by the cathedral, an imposing building of the 18th ceutury, has its spacious area adorned with fountains, walks, and benches, and with pillars of white porphyry. The principal buildings, besides the cathedral, are the mint, the prison, which was formerly a Jesuit convent, the house of correc- tion, two hospitals, and the military school. In the square in front of the Jesuit chapel of San Felipe, is a simple monument in memory of the three martyrs of Mexican independence, Hidalgo, Allendc, and Ilmenez, who were shot on the spot by the Spaniards. The town was founded in 1691, and in the 18th century was the seat of the captain-general of the Inner Provinces, At the time of its greatest prosperity it had about 70,000 inhabitants; but its present population does not exceed 14,000.

CHILDERS, Rosert C#sar (1838-1876), an eminent Oriental scholar, was the son of the Rev. Charles Childers, English chaplain at Nice. In 1860 he received an appointment in the civil service of Ceylon, which he retained until 1864, when he was compelled to return to England owing to ill-health. He had acquired some know- ledge of Pali during his residence in Ceylon, but it was not until the autumn of 1868 that, under the advice of Dr Rost, he gave himself to the scientific study of the language. Entering at once on the task of preparing a Pali dictionary, he laboured at it with such extraordinary assiduity that he was able to publish the first volume in 1872, and the second and concluding volume in 1875. The work is an enduring monument of learning and zeal, and has been gratefully acknowledged by a competent authority as “ the most valuable contribution that has yet been made to the knowledge of Pali, and as the foundation of all future study of that language.” Myr Childers was a frequent contributor on subjects connected

with Buddhism to scientific and literary periodicals. In 1872 he was appointed sub-librarian at the India Office, and in the following year he became the first professor of Pali and Buddhist literature at University College, London. He diced at London on the 25th July, 1876,

Sea Plate XI. of vol. ihe 6

Mountains.

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Cl i ie

HILI, or Curie, occupies a strip of land on the western side of South America, extending from 24° to

56° 28’ 50” S. lat., from the Bay of Mejillones to Cape Horn, a distance of 2270 miles, On the E. it is bounded by the Andes, on the W. by the Pacific Ocean, and on the N. by Bolivia. Its breadth varies from 40 to 200 miles, and its area iscomputed at 218,925 square miles, with a population of 2,319,266. Between lat. 24° and 32° (comprehending the provinces of Atacama, Coquimbo, and the northern half of Aconcagua) the principal industry is mining; be- tween lat. 32° and 38° (comprehending the southern half of Aconcagua and the provinces of Valparaiso, Santiago, Colchagua, Curicd, Talca, Maule, Nuble, Concepcion, and part of Arauco) the staples are agricultural produce and coal; while the remaining part produces timber, potatoes, aud salted meat. The Andes extend in two parallel lines throughout nearly the entire length of the country. Be- tween these two ranges or “ Cordilleras” is a table-land, which attains its greatest breadth between lat. 33° and 40°, and which narrows both towards the northern and southern extremity, where the ramifications of both chains meet and form a continuous undulating plain. Chili further lays claim to the whole of Patagonia and Tierra del Fuego. Mountains.—The Andes commence in the district called the Colony of Magellan, where their general elevation is lowest, the perpetual snow-line only 3000 feet, the highest peak, Mount .Stokes, 6400 feet, and the coast excessively rough and broken and full of fiords of immense depth, fed by glaciers descending from the high lands. Northwards, towards lat. 41°, the coast becomes less indented, the range

more continuous and elevated, and the peaks higher,—such as Minchinmadiva, 8000 feet, Corcobado Volcano 9158 feet, and Yantcles, 8030 fcet. From lat. 41°, or from the southern extremity of the province of Llanquihue, commence the table-land and the parallel granitic belt that skirts the Chilian coast, which together nowhere exceed 120 geographical miles in breadth from the sea to the Andes. At this lat. the snow-line rises to 8000 feet, at Valparaiso (33° S. lat.) to 12,780 feet, and at Coquimbo (29° S. lat.) to 15,200 feet. The centre table-land is in lat, 41° under 200 feet above the sea; at Talca it rises to 350, at Rancagua to 1560, at Santiago to 1800 ; and it con- tinues to increase in elevation as it extends northward. The mean elevation of the Andes in Chili is 11,830 feet. The culminating peak is the volcano of Aconcagua, in the province of Aconcagua, which reaches the height of 29,427 feet. The principal summits to the north of this are Cima del Mercedario, 22,302 feet, in lat. 32°, and Cima del Cobre, 18,320 feet, in lat. 28° 30'. South of Aconcagua, in the province of Santiago, are Juncal (19,495 feet), and the voleanoes of Tupungato (20,269), San José (20,000 feet), and Maipu (17,664 feet). – In Arauco is the volcano of Villarica, 15,996 feet; in Talca, the great truncate mountain called the Descabezado, 12,757 feet ; in the province of Nuble, the volcano of Chillan, 9446 feet; and in Llanquihue, the volcano of Osorno, 7396 fect. In the Chilian range there are 23 volcanoes, of which only a few, such as the volcanoes of Osorno, Villarica, Antuco, and San José, are occasionally active. There are many passes over the Andes from Chili to the Argentine Republic ; but the western slope of the mountains being steeper than the eastern, the ascent from Chili is more laborious than from the Argentine Republic, into which the mountains descend by a 'series of terraces, con- sisting of Secondary strata terminating in the vast expause of flat country or "Pampas," occupied by the Tertiary

formations. The passes may be said to be open during eight months of the year, but even at their best they can uever be traversed by vehicles,—mules being the only means of conveyance, The highest of the passes, as well as the most frequented, are those of Doiia Ana, 14,770 feet, and Colguén, 14,700 feet, in the province of Coquim- bo; the Dehesa, 14,500 feet, east from Santiago and near the voleano of Tupungato; the Patos, 13,965 feet, and Uspallata, 13,125 feet, both in the province of Aconcagua ; and the Planchon, 11,455 feet, in the province of Curicé, The part of the Andes

bordering the province of Atacama may be crossed at numerous places at any period of tho year, as the range there is generally free from snow.?

Earthquakes.—Chili is subject to frequent earthquake Farth- shocks (temblores), which, without causing damage, occasion quakes.

much alarm lest they should be followed by the earthquake itself (terremoto). The occurrence of this terrible phenome- non is not indicated by any particular state of the weather, but it rarely happens during the night. It is the common belief that when shocks are frequent there is not much fear of their being followed by an earthquake, and certainly experience justifies that opinion. Though shocks are very common, earthquakes are rare,—the same province being the focus of one only about once in fifty years, though it is calculated one in every tenth year makes itself felt in some part of Chili.

Earthquakes manifest themselves by a quick horizontal and some- times rotatory vibration, und when the focus is near the sea it also is agitated. ‘The ground undulates, but very rarely bursts open ; and even the most violent are over in a few seconds, though for some time afterwards (at gradually lengthening intervals from twelve hours) there is a succession of gradually lessening shocks. By the earthquake of February 1835 the Isle of Santa Maria was uplifted, the southern end 8, the central part 9, and the northern end 10 feet ; but both it and Concepcion subsided a few weeks afterwards, and even lost part of their previous elevation. During this carth- ee two great waves rolled over the town of Talcahuano ; the

eep sea, close in shore, was dry for a few moments, and smoke burst from the surface of the water. During a very smart earth- quake at Coquimbo, in November 1849, the sea retired about 150 yards, and then rolled back about 12 feet high. An English ship, anchored in 7 fathoms water, in the neighbouring bay of Herradura, nearly touched the bottom from the receding of the sea, which afterwards rolled in like a bore, and the water continued to ebb and flow for an hour and a half after the shock.

Lakes.—In the southern part of Chili there are several Lakes.

inland lakes abounding with fish, and frequented by numerous varieties of aquatic birds. The largest of these lakes is that of Llanquihue, situated in 41° 10’ S. lat., 197 feet above the sea, at the base of the volcano of Osorno, which rises 7199 feet above its surface. Its shape is triangular, its greatest length from north to south being 30 miles and greatest breadth 22 miles, The little river Maullin is its sole outlet, and conveys its surplus water to the Pacific, in lat. 41° 35’. In the neighbourhood are the lakes Todos los Santos or Esmeralda, 18 miles long by 6 broad, and Rupanco, 24 miles long by 4 broad. Twelve miles northward is Lake Ranco, 32 miles long by 18 broad. In let. 39° is Lake Villarica or Llauquen, measwr- ing 100 square miles. In the province of Concepcion is Lake Guilletué, measuring 50 square miles. Near Santiago, is Lake Aculeo, occupying about 8500 acres. Inall these the water is fresh and pleasant to the taste; but in the small lakes situated near the coast, such as Bacalemu, Cahuil, Vichuquen, and Bolleruca the water is brackish. Rivers. —The rivers, like the lakes, are much larger and nore numerous in the south than in the north of Chili.

aa nn 1 For the general description of the Andes, sce vol. i. p. 670-673, and the article ANDEs, vol. ii. pp. 15-18.

Mineral waters,

Islands.

Climate,

CHILI

They are almost entirely fed by the melting of the snow on the Andes, but are also liable to swelling from the winter rains. A feware navigable for a short distance; but nearly all yield immense service to agriculture by irrigation, carry- ing, like the Nile, both substance and moisture to the other- wise barren plains. The largest river is the Biobio, which, rising near the volcano of Antuco, in lat. 38° 15’, enters the Pacific after a course of 220 miles, wherc it is 2 miles broad. It is navigable for barges and small steamers as far as Nacimiento, 100 miles from the mouth.

The following is a list of the principal rivers, with the provinecs through which they flow, and the lengths of their

COUTSES :-— Rivers. Provinces. Leagucs. | Falling into

JEN CIONS conaosenonmeaeoooadae Concepcion | 74 Pacific Occan. ANGOINCTATUT Goose posenounce: Aconcagua :; 60 np Cauten, or Imperial…... Valdivia 50 ” INE DULG Pee ccc ve tcurewacisivw eee Maule . | 50 3 (Chyelnishxoynll soa cedrencon Goce Santiago 48 Topocalma. IGE Er ycceadieeemanstenncos oes Concepcion | 46 Pacific Occan. AGEN EYGREDICS 5. ngopeonabpscse: Talca { 46 . Topocalma, or Rapcl….}| Colchagua 40 Ae BUC OMe tee cvereees ae seaeen Valdivia 37 3 Valdivia, or Callacalla… oa 34 3 SO OGUUITUIO <5 vccnsanmcesinacs oe Coquimbo ll an MCS ii..3.. cscsnsossmeenure Valdivia 31 Valdivia. 2,2 000 7 BoememgeeR cn stton’ Santiago 30 Pacific (Chojorlay 60) ggondbonosoononontor Atacama 30 Fr MITISGOs,..0. <0 ccatssince comanen – 30 6 NESTED AB nprpererec roc Aconcagua 29 ra “Nolan Genapadeactacedmonnss Valdivia 29 No MEME cote sche uy 9s varenonee Concepcion 28 Biobio. UOMCOLOMING. 02… 220200 0ne Aconcagua 28 Pacific. Lin)B on angen ooqeepaponnece: Coquimbo 27 cfs BOENOse vcs neetee ctserens Santiago 26 Maipu. RVGTEATD sp eccrine csce sex ovation Arauco 26 Biobio. Jeya@el o ogpBaRoDoOdeeHuRRON: Atacama 24 Pacific. TAWGLEAO:.. .ccesesccsee ose) CARAMEO 22 Biobio.

Mineral Waters are numerous in Chili; they are prin- cipally saline and sulphureous, containing carbonate of lime, bicarbonate of soda, and chloride of sodium. In temperature the waters range from 50° to that of boiling water. They are situated at various heights, from 1150 feet above the sea, a8 the baths of Panimavida, 18 miles from Talca, to 10,690 feet, as the baths of Toro, near Elqui in Coquimbo. The most remarkable as well as the most important of the bathing establishments is that of Chillan in the province of Chillan, on the western flank of the Cerro Nevado, 2050 fect above the sea, containing in close proximity icy cold and boiling springs,—sulphurcous, ferruginous, alkaline, and saline. The season is from the first of December to the first of April, when they are visited by naultitudes for the cure of gout, rheumatism, dyspepsia, and cutaneous diseases. Among the others most frequented are the baths of Apoquindo and Colina, near

Santiago ; Cauquenes, near Rancagua ; Tinguiririca, near Colchagua ; Mondaca, near Talea ; Trapa-Trapa, near Los Anjeles; and Nahuelhuapi in Llanquthue.

Islands, —The most important Chilianislands are those of the province of Chiloé, coveredwith great forests of the mag- nificent cedar Fitzroya patagonica, and the tall and elegant cypress Libocedrus tetragona. The interesting island of Juan Fernandez may be included with those of Chih, although it is 360 miles from the coast, in lat, 33° 42 8. It is a mountainous and well-wooded island, 52 miles in circumference, and exhibits generally those features familiar to the readers of Robinson Crusoe as the abode of Alexander Selkirk. It is stocked with herds of goats, while the beach is a haunt of seals. Forty-two miles further out to sea is the smaller island of Mas Afuera.

Climate.—As Chili extends from hot parched deserts 1n the Tropic of Capricorn to a boisterous cold and wet country

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within 12° of the Antarctic Circle, and as while one-fourth of the territory is not much above the level of the sea, another fourth lies slightly below the snow-line, the only general qualification that can be assigned to this union of extremes is that both in the high and the low, the wet and the dry, the hot and the cold regions the climate is healthy through- out. Omitting the inhospitable regions of Cape Horn and Tierra del Fuego, and commencing with the most southern portion colonized by Chili, the Territory of Magellan, between lat. 54° and 51° 50’, we find that although the moisture and rainfall are too great for the ripening of wheat, yet potatoes, cabbage, celery, and carrots are readily grown. The principal town, Punta Arenas, is situated in the pen- insula of New Brunswick, on the Straits of Magellan, in 53° 10’ 30” §. lat. and 70° 50’ W. long. The next zone, between lat. 51° 50’ and 37°, comprehends the provinces of Chiloé, Llanquihue, Valdivia, and Arauco, of which the climate is very like that of Great Britain,—the most southern parts having more rain but less cold than the Highlands of Scotland, while the more northern have a more genial climate than the most

favoured parts of the south of England. In Valdivia the mean temperature throughout the year is 52° Fahr. ‘Tiniber is the great article of export; but potatoes, wheat, barley, rye, and flax are grown in quantities sufficient for exportation. The next zone extends from 37° to 28° lat., embracing the provinces from Concepcion to Aconcagua, where irrigation is more or less necessary, and where flax, corn, grapes, figs, olives, peaches, and melons grow freely, but oranges and lemons only in tho northern portion. Rain falls in June, July, and August with more or less frequency, according to the latitude. During these months a mild northerly wind prevails, inter- rupted occasionally by a dry wind from the east. During all the rest of the year a wind blows from the south, which falls towards the evening. In Santiago the mean annual temperature is 55° Fahr., and in Valparaiso 58° Fahr. From lat. 28° to 24°, including the provinces of Coquimbo and Atacama, there is a gradually decreasing amount of moisture,—-from four or five showers of from five to ten hours, as in Coquimbo, to nothing but an occasional mist, as in Atacama. Spring commences in September, summer in December, autumn in March, and winter in June.

Population.—-The following table gives the population Population.

of Chili according to a census taken in 1875, with the average number of births, deaths, marriages, and other kindred statistics :—

Births,

Provinces.

Deaths to Population. Marriages. Proportion of Marriages to Population.

Iegi- timate.

| Population.

1

Proportion of

Colonia dc

Lianquihue… Valdivia…... ALAUCO weseevee

INWbLe!.. vies na

Colchagua… Santiago…... Valparaiso… Aconcagua… Coquimbo … Atacama…...

71,3802) 4,442

9,068,424] 55,897 = 37 | 16,670 |1 in 1241 68,616 | 21,755 | 90,871 |

It will be seen that the net amount of the population obtained by the census was 2,068,424; but 10 per cent. may be allowed for omissions, and 44,000 for wandering Araucanian and Patagonian tribes, which brings up the total number to about 2,320,000. ae of the

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Health.

History.

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population is urban, and two-thirds rural. Of the deaths no less than 59 per cent. are under seven years, 4°8 from seven to fifteen, 7°3 from fifteen to twenty-five, 15°3 from twenty-five to fifty, and 11-4 from fifty to eighty. Out of every million children born only 543,900 live to the age of five years, One female child is born for every 1°05 male children ; but the death rate is in precisely the opposite proportion. The aunual increase of the population is one in every fifty-seven.

Sanitary Condition.—The deaths, amounting to 55,897, are distributed among the different months of the year as follows :—January, 5333; February, 4398 ; March, 4228 ; April, 3937; May, 4423; June, 4213; July, 4613; August, 4773 ; September, 4767 ; October, 4940; Novem- ber, 4749; December, 5523. The rate is greatest (9°9 per cent.) in December, and least (7°1 per cent.) in April.

It will be seen that the three provinces, Chiloé, Llan- quihue, and Valdivia, which are the wettest are also the most salubrious. The healthiest period is just before the rains set in, the least healthy during the heats of December and January, when dysentery prevails, owing perhaps to a too free consumption of the water-melon. The mortality of children under 7 years ranges from 47 per cent. in some years to 60 per cent. in others of the whole number of deaths ; and four-fifths of the children who die under 7 years of age belong to the poorest classes. The most fatal diseases are gastric, typhoid, and typhus fevers; and the next, pulmonary complaints, dysentery, and syphilis. The system of sewerage in Chili is generally bad, consisting of partially open channels passing through the houses, some- times with running water and at other times nearly dry. Even Valparaiso is not well provided with drainage. Inter- mittent fevers are unknown, and Asiatic cholera has not yet passed the Andes.

History.—The name Chili (or, in its Spanish form, Chile) is supposed to be derived from Tchile, a word belonging to the ancient language of Peru, signifying “snow.” The country first became known to Europeans in the 16th century. It was then to a considerable extent under the dominion of the Incas, but had been previously inhabited by certain tribes of Indians, of whom the most important and only warlike race were the Araucanians.

In the time of the Inca Yupanqui (1433), grandfather of the monarch who occupied the throne of Pern on the arrival of the Spaniards, and the teuth in succession from Manco Capac, the reputed founder of the Peruvian empire, the first attempt was made by the Incas to extend their dominion over the territory of Chili, Yupanqui, leading his army across the desert of Atacama, and penetrating into the southern regions of the country, made himself master of a considerable portion of it. The permanent boundary of the dominions of this prince is said by some writers to have been determined by the River Maule, 35° 30’ §. lat., although it is more probable the River Rapel, 34° 10’ S. lat., constituted the extreme limits of the Peruvian empire towards the south. The latter opinion is to some extent supported by the fact, that the remains of an ancient Peruvian fortress, apparently marking the frontier, are still found upon the banks of the Rapel, while no such remains are known to exist in any part of the country farther south.

The Peruvian dominion in Chili ceased with the Inca Atahualpa in 1533. The first Spanish invasion was led by Diego de Almagro (1535 or 1536), who however met with such determined resistance from the Araucanians that he was compelled to retrace his steps. Undaunted by this failure, Pizarro despatched another expedition, composed of Spanish troops and Peruvian auxiliaries, under Don Pedro de Valdivia, and was preparing to follow it in person with a larger force, when he was assassinated in 1541.

CHILI

Meanwhile Valdivia entered Chili, and fighting his way onwards, encamped on the banks of the Mapocho, where he founded the city of Santiago, the present capital of the republic, and about eleven years afterwards the town of Valdivia. At last, after twelve years' stay in Chili his life and conquests were brought to an end in a desperate engagement with the Araucanians, who for 180 years after- wards continued to wage a sanguinary war with the Spaniards, till 1722, when they consented to a treaty which fixed the River Biobio as the boundary between them. Spanish Chili, extending from the Biobio northward to Atacama, was divided into thirteen provinces, under the rule of a governor appointed by the viceroy of Peru. The last of these governors was Mateo de Toro, 1810.

During the entire period of this connection between Spain and Chili, the viceroys, governors, and all the other Spanish officials of every grade regarded the inhabitants only as a means of furthering their own aggrandizement, which at length so exasperated the better educated classes that they determined to throw off the hateful yoke on the first favourable occasion. In 1810 this desired opportunity at last presented itself, when Spain, overrun by the armies of France, was uo longer able to vindicate her own claims to a national existence. In July of that year the Chilians took the first step towards asserting their independence by deposing the Spanish president, and putting in his place (September 18, 1810) a committee of seven men, nomi- nated by themselves, to whom were entrusted all the executive powers. In April 1811 the first blood was spilt in the cause of Chilian independence. A battalion of royal troops, which had been drawn up in the great square of Santiago, was attacked by a detachment of patriot grena- diers, and routed with considerable loss on both sides. In the same

year (December 20) the government was vested in a triumvirate, and Juan Jose Carrera was appointed general-in-chief of the army about to be formed.

In 1813 a powerful army, under the command of General Paroja, invaded Chili, but was twice defeated by the republican troops under Carrera. The royalists, how- ever, speedily received larger enforcements; and after a severe contest, Chili was once more obliged to own the sovereignty of Spain. For three years more the people submitted (under the Spanish governors Osorio and Pont) to the old system of tyranny and misgovernment, till at length the patriot refugees, having levied an army in La Plata, and received the support of the Buenos Ayreans, marched against the Spaniards, and completely defeated them at Chacabuco in 1817.

The patriots next proceeded to organize an elective government, of which San Martin, the general of the army, was nominated the supreme director. Their arrangements, however, were not completed when they were attacked once more by the royalists, and routed at the battle of Cancharayada with great loss. Betrayed into a fatal security by this success, the royalist troops neglected the most ordinary military precautions, and being suddenly attacked by the patriots in the plains of Maipu, were defeated with great slaughter. This victory secured the independence of Chili.

The new Republic had no sooner vindicated for itself a place among the nations of South America, than it resolved to assist the neighbouring state of Peru in achieving a similar independence, which object was at last effected after a bloody war of six years' duration. No small share of this success was due to the daring courage and con- summate ability with which Lord Cochrane, under the most trying circumstances, conducted the naval affairs. In acknowledgment of these important services a well-executed statue of him has been erected in Valparaiso. With 1817 commenced again the national government, under the

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Races,

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directorship of General O'Higgins, who held it till 1823, when he was compelled to resign in consequence of a popular tumult. For a few weeks, a provisional triumvirate discharged the duties of an executive government. General Freire was next chosen director. During the period of three years in which he held the reins of government, the country was harassed by constant dissensions ; and for the four years subsequent to his resignation it continued in a state of disorder bordering upon anarchy. From 1826 to 1830 the government was administered by six different directors, in addition to a second provisional triumvirate. In 1828, under the administration of General Pinto, a constitution was promulgated, which had the effect of temporarily reconciling political differences and calming party spirit. In 1831, however, when General Prieto was raised to the chief magistracy, a convention was called for the purpose of revising this constitution. The result of its deliberations was the present constitution of Chili, which was promulgated on the 25th of May 1833. From that time Chili has enjoyed remarkable prosperity, and its government has been administered with such firmness and regularity, that it occupies a high rank among nations, and its funds stand well in the Stock Exchange.

After holding office for ten years, Prieto retired, and was succeeded by General Bulnes, a distinguished officer of the war of independence, Like his predecessor, he was fortunate in finding in Manucl Montt an able and intelli- gent prime minister, who was to him what Portales had been to Prieto. In 1851 an insurrectionary movement broke out, headed by General Urriola, who, during the disturbances in Santiago in the Semana Santa was acci- dentally killed. The same party then brought forward as their candidate for the presidency General José Maria de

la Cruz in opposition to D. Manuel Montt, but the

latter was elected, and continued in office for two periods (1851-1861). To him succeeded José Joaquin Peres (1861-1871), who in 1871 was followed by Federico Errazuriz, and he in his turn by Anibal Pinto in 1876, The administration of recent presidents has been conducted with firmness, wisdom, and prudence. They have been ready to use their influence for the reform of abuses and for the advancement of civil and religious liberty, and

for the promotion of every thing which could tend to increase the prosperity of the country.

Races.—The greater part of Chili, when Almagro invaded it, was inhabited by the Araucanians, who were, with other Indians, partly exterminated, but more generally absorbed into the Chilian nationality as at present existing. A remnant of independent Araucanians still occupy a province south of the Biobio; but they scarcely number 24,000, and are on the decrease. These Araucanians are divided into tribes, whose chief, called a cacique, has from two to six wives, or even more, according to his means of supporting them and their progeny. They cultivate maize, rear herds of horses, sheep, and cattle, weave coarse woollens, build comfortable cottages, binding the beams together by the rope creeper Lardizabala biternata, and from the reed Chusquea Coleow make shafts for their lances. They acknowledge a creator god called Pillan, and some inferior divinities, such as Eponeman, the god of war, Moilen, the god of good, and Guécubu, the god of evil. They have neither temples nor priests, their worship con- sisting of the sacrificing of some animal under a tree belonging to the Magnolia order, the Drymis chilensvs, which is considered sacred by them. ‘This tree was first described by Dr Winter, who accompanied Drake in his expedition round Cape Horn in 1577. The Araucanians believe also in sorcerers and enchantments, and that every natural death, other than by old age, is caused by the evil influence of some one, whose life the friends of the

deceased endeavour to take in expiation and revenge. The Patagonians who inhabit the territory of Magellan and Tierra del Fuego, and who may number about 20,000, are not given to polygamy. They worship one god called Coche, and believe in the immortality of the soul. The average height of fifty Patagonians taken at random lately was found to be 6 feet 42 inches. The tallest was 6 feet 84 inches, and the least 6 feet and% inch. The Chalians them- selves hold the same position to Spain as the inhabitants of the United States do towards England. Their instincts and language are Spanish, modified by admixture and. inter- course with other nations. The conventionalities of social life are much the same in Chili as in France, Belgium, and Catholic Germany ; and this remark applies to dress, living,

amusements, and propensities. Sunday is spent as a holiday, and enlivened by festivals, balls, theatricals, and concerts. Cricket and athletic sports are unknown, but good horsemanship is common. ‘The great extent of seaboard not only induces large numbers of the inhabi- tants to visit foreign lands (calculated to average 78,000), but promotes the diffusion of the civilization of the most highly cultivated nations over the whole of Chili. The beautiful provinces of Valdivia and Llanquihue are colo- nized by Germans and North Anmiericans, who prepare timber, meat, cheese, butter, beer, cider, and leather. The university and the learned professions have ever numbered among their distinguished members Polish, French, German, and English men of science. The North American colonists have been chiefly instrumental in the construction of flour-mills, telegraphs, and railways. At the commercial centres, such as Valparaiso, Concepcion, Copiapo, Coquimbo, and Huasco, many of the leading Chilian citizens are of English, French, and German de- scent. There are in the country about 35,000 Europeans, chiefly Germans, French, and English.

Constitution.—By the constitution adopted on the 25th Constitu- of May 1833, the sovereignty is declared to reside in the tion.

people; but the exercise of its functions is delegated to three distinct powers —the legislative, the executive, and the judicial.

Deputies and Senators. The Chamber of Deputies com- prises over 100 members, elected for a term of three years, on the principle of equal electoral districts with cumulative voting, and by a suffrage enjoyed by all citizens who are of twenty-one years of age if married, or twenty- five if unmarried, and who are able to read and write, and pay yearly taxes to a certain amount.

The senate is composed of fewer members, chosen by Senate.

indirect election in cach province for a term of nine years. One-third of the house is renewed every three years.

The Chamber of Deputies and the Senate have concur- Chambers.

rent as well as separate functions. The former body alone can impeach the higher officers of the state before the Senate. It originates all money bills, and measures relating to the military force of the country. The Senate alone has the right of pronouncing judgment on public functionaries impeached by the Chamber of Deputies; it confirms ecclesi- astical nominations, and in certain cases gives or withholds its consent to the Acts of the executive. In all other proceedings of the legislature the concurrent voice of the two houses is necessary. Laws may originate with either body, but require to be passed by both houses, sanctioned by the president (after consultation with the Council of State), and promulgated by the minister to whose depart- ment the matter relates. The period during which the Congress sits is limited to the three winter months ; but the session may be prolonged by the president for fifty days. On the day before the regular session closes, the senators elect seven of their number to form the conserva-

The legislative power is committed to the Legislative National Congress, which consists of the Chambers of depart-

President.

Council of State.

Executive depart- ment,

Loeal go- vernment.

tive committee, which replaces Congress during its proro- gation in the duty of observing the conduct of the execu- tive.

The executive power is committed to the president, with a salary of £3600, as supreme chief of the nation. He 1s chosen by indirect election, and holds office for a term of five years, after cxpiry of which he is not eligible for re-election until other five ycars have elapsed The president concludes treaties, and declares peace or war; he appoints and removes ministers, councillors, and clerks of depart- ment, as well as diplomatic representatives, consuls, and the administrative officers of provinces. He also inducts the higher legal

and judicial functionarics ; but the nomi- nation of these officers, as well as of ecclesiastical digni- taries, must proceed from the Council of State. He distributes the army and navy at will; and when, with the sanction of the Senate, he assumes the command of the national troops in person, he has the exclusive bestowal of naval and military commissions, though ordinarily appointments of this nature must be approved by the Senate.

The president is liable to impeachment, for mal- administration for a year after the expiry of his authority. During that time he is not allowed to leave the country, except with the permission of Congress. All the other officers of Government are subject to the same law; but in their case the time is more limited.

The Council of State is composed of ministers in the exercise of their functions, a member of the courts of justice, an ecclesiastical dignitary, a general or admiral, a chief of the administration of finances, and one ex-ministcr or diplomatic agent,—all named by the president, together with six other councillors, named one-half by the Senate and one-half by the Chamber of Deputies, The duties of the Council of State are to advise and act as a check upon the president.

The government is conducted by five cabinet ministers, cach with a salary of £1200. The Ministro del Interior presides over the preparation of the national statistics, over roads and railroads, public buildings, and hospitals ; the Ministro de Hacienda over the finance; the Ministro de Justicia, Culto, é Instruccion over the law and prisons, the church, and cducation ; the Ministro de Guerra over the army and navy; and the Ministro del Esterior over foreign affairs and colonization. The president has no power of enforcing obedience to orders relating to any one of these departments until they have been confirmed by the minister in charge. The ministers are entitled to take part in all the debates of Congress; but, unless holding at the sainc time the office of senator or of deputy, they are not allowed to vote. Any of them may be impeached by the Chamber of Deputies for treason against the laws of the state, or for the mal-administration of the duties of his office. An action may be brought against them even by private individuals who have suffered by any of their acts if the Senate, to whom

appeal must in the first place be made, decide that there is sufficient ground for complaint.

Local Government.—Upon the executive depend directly the administrative officials throughout the country. For administrative purposes Chili is divided into fifteen pro- vinces, each with subordinate departments, subdelegations, and districts, and one settlement, viz., the provinces of Atacama, Coquimbo, Valparaiso, Aconcagua, Santiago, Col- chagua, Curicd, Talca, Maule, Nuble, Concepcion, Arauco, Valdivia, Llanquihue, and Chiloé, and the settlement of Magellan. The capitalis Santiago, on the Mapocho. Each of the provinces is governed by an intendant, who is nominated by the president, and holds office for three years. The departments are under governors, who hold office for

a similar term. ‘The intendant generally acts as governor in that department in which the capital of the province is situated, and is, at the same time, mayor of the municipal corporation ; but the authority of this body is very limited, as it cannot dispose even of its lccal funds without the permission of Government. The subdelegates are appointed by the governors for a period of two years, as are also the inspectors of districts. Both these offices are com- pulsory,—those who decline to serve being liable to fines.

The united revenue of the municipal corporations of Chili amounts to about £500,000, of which about £80,000 is contributed by the State, and the remainder derived from local sources.

The procedure of the Chilian courts of justice is based Judicial on the same fundamental principles as those which hold dcpart-

among the Latin nations generally, and approximates therefore to that of equity. Evidence is mostly taken by depositions in writing. The suitor appears by a sworn procurator or attorney, who must be conversant with the technicalities of the law. In the higher courts, the aid of an advocate is further obligatory. The advocate, who combines the functions of the consulting lawyer with those of the barrister, is only admitted to practice after taking a university degree, and passing an examination by the

Supreme Court. Trial by jury is unknown, except as applied in a modified form to libel cascs connected with the press. The whole law of Chili is being gradually digested into codes,—the civil, penal, commercial, &c.

The supreme court, which sits at Santiago, takes cog- nizance of criminal and civil causes alike. Its decisions are final, und also bind the Government upon questions of law submitted for the consideration of the bench. There are three courts of intermediate appeal, sitting in Santiago, Serena, and Concepcion, which also have both criminal and civil jurisdiction, and whose decisions are final in certain cases.

In each department of every province there are one or more salaried judges of letters (or judges learned in the law), who divide among them the local jurisdiction,—the criminal and civil sides being, in places of importance, vested in different judges, each of whom, as a rule, sits alone. Below these, again, are the judges of subdelega- tions and of districts, of whoin the latter can only decide civil cases when the valne at issue is below £10, and in criminal causes can arrest the criminal and prepare evidence ; while the former decides civil suits up to £40 value, hears appeals from the district judge, and takes cognizance of minor criminal offences.

In places where access to a judge of letters is difficult, an alealde or local police magistrate retains a limited juris- diction. With a view to reduce litigation, the law expressly encourages reference to arbitration in various forms; and the dutics of public prosecutor and public advocate are performed by officials, who intervene kefore the higher courts and the judges of letters in all cases which involve public morality, or the interests of the State, of minors, of the incapable, of the absent, and of charitable trvsts.

Military and ecclesiastical offences come under the cog- nizance of special tribunals, but neither ecclesiastical nor military persons are, as such, exempt from the jurisdiction of the ordinary tribunals in respect of offences against the law of the land. Certain special jurisdiction is reserved to the Council of State and to the revenue courts; and under a treaty with Great Britain, guaranteeing the mutual right of search in suspected slave vessels, a mixed tri- bunal decides, without appeal, as to the validity of cap- ture.

The clerks and secretaries of the highcr courts, and the secretaries of the judges of letters, must be qualificd advocates, as also the notaries public, who are charged

Religion.

Education.

CHILI

with drawing up and preserving legal instruments, some among their number being particularly entrusted with the registry of landed property, and of dceds of partnership, having then the title of notary conservator. The registers are open to public inspection.

Religion.—The form of worship recognized by the con- stitution is the Roman Catholic, yet Government tolerates the public profession of others. For the purposes of ecclesiastical administration, Chili is divided into four dioceses—one archbishopric and 3 bishoprics—which arc subdivided into 144 parishes. The salary of the archbishop is £1600, of the bishops of Concepcion and Serena £1200 each, and of Ancud £1000. ‘The salaries of the curates range from £20 per annum to £200. ‘The mission department is under the direction of Capuchin friars, and consists of a prefect and sub-prefect, and a staff of 30 missionaries and several chaplains, stationed in the provinces of Arauco, Valdivia, Llanquihuc, and Magallanes. Their labours among the adult Indians produced little fruit, but in their schools they have been more successful. Wor- ship, including salaries and repairs of churches, costs Government annually £63,425. .

In Santiago there is one handsome Protestant church, in Valparaiso three, and a chapel in Talca. Roman Catholicism exists in a mild form among the cducated classes, but with a good deal of superstition among the miners and peasantry (huasos and inguilinos). There is only one great place of pilgrimage in Chili, and that is to an image of the Virgin in the church of Andacollo, a small village near Serena. Upwards of 20,000 persons visit it annually, and the yearly festival is occasionally presided over by the bishop of the province, when the image is carricd in procession round the square. The greatest devotces arc the miners.

Hducation.—The first educational establishments in rank are the University and the National Institute of Santiago. The university, which grants degrees in law and medicine, has 37 professors, besides numerous assistants, and is attended by nearly 700 students. It is governed by a rector and a vice-rector, a secretary, and the five deacons of the faculties of humanity, mathematics, medicine, law, and theology, who are also charged with the inspection of education in all schools throughout the republic. Who- ever has the necessary elementary knowledge may attend the classes without paying fees.

The preparatory section or " Institute," corresponding with our high schools, is under the management of a rector, a vice-rector, 48 masters, and several inspectors. It is attended by about 1000 pupils, of whom only those pay who lodge and board in the establishment, this costing £32 a year. 'The institute is endowed with 45 exhibitions or bursarics, 15 of which are divided equally among youths from Peru, Bolivia, and Ecuador.

These two establishments cost the Government annually £25,000. Lyceums, on the samc plan as the National Institute, arc established in every provincial eapital, 16 altogether, and are supported by local taxation, government grants, and fees from pupils. In these institutions boarders pay an annual sum of £20, and day scholars £2, 8s.; but many receive instruetion gratuitously. The directly practical branches of education receive the largest share of attention, but the learned languages are not neglected. Thclyceums of Talca, Concepcion, and Serena possess the privilege of granting degrees in mathematics and elemistry.

Government expends annually on the lyceums in the province £35,000, and they are attended by 2200 pupils. Government supports besides 810 schools throughout the country, in which 62, 220 ehildren are taught the catechism, reading, writing, arithmetic, and Sen. Those who choose may learn in addition the histories of Chili and America, sacred history, drawing, music, and sewing. There are aso 480 private schools, with 24,000 pupils, which differ more in the rank of the children than in the subjects taught.

One in evcry 3°8 of the population in Santiago ean read, and 1 in every 4°4 can both read aad write—and the proportion is nearly the same in the provinces of Atacama, Coquimbo, Valparaiso, Con-

cepcion, and Chiloé ; while {n the entire population of the republic one in 7 ean read, and one in 8 can both read and write. Uponan average 1 child for every 24°71 inhabitants goes to school. In the public schools each child costs Government an average of 45 shillings.

Table showing the number of children educated at the public and private schools, and the proportion of pupils to inhabitants,

7. Number of ae i Pupils Inhabitants to each Pupil. AN ENGR apanenooese one 71,302 3,935 CHOC RETTING apeponannce: 157,463 6,134 AGONCAGUA.....++ ++ 132,799 5,656 Valpanaiso'.....200: 176,682 9,900 SamplagOrncscacscsss 362,712 19,655 Colchagua …..... 146, 889 4,746 CUnICOM re .casneenee 92,110 3,145 JUS Ga) spepouadbansanaase 110,359 | 4,082 MEATS SM cs ce ges 1,707 Mains… sss. 237,334 3.998 IN ollol aadeencoassocraee 136, 880 4,976 WoneepelOmn. .s..00: 151,365 6,023 /NSTEIUGO! noqemonenenoon: 140,896 3,297 \Weallcbial@)cappnodpuodonr 37,481 1,463 Llanquihue…..... 48,492 2,730 MOO teen csc niceisssn see 65,680 4,780 HUG HWNG; asanodenc 2,111,688 85,442 24°71

Educational Institutions for especial purposes.—For the cducation of priests there are seminaries in Serena, Valparaiso, Santiago, Talca, Concepcion, and Ancud, six in all, attended by about 535 young men, and eosting Government £8000 annually. For the education of teachers, there are two schools for females and one for men. 'There are also in Santiago a school for the blind and another for the deaf and dumb.

In the military academy in Santiago there are 100 pupils, cost- ing annually £7200 ; annexed to it is the naval academy, costing £2600, with 100 pupils. In Valparaiso is the practical naval school, costing £2600, with 100 pupils; a school for music, costing £750, with 100 pupils; an academy of painting, costing £1000, with 70 pupils; one of sculpture, costing £600, with 30 pupils; an agri- culturaland polytechnic school, with 90 pupils, costing £7200. There are also a national library and museum and observatory, costing annually about £4000. Masters are also employed to teach in prisons and in barracks. Altogether there are upwards of 1300 educational

establishments, to which the State contributes £166,000, and these establishments are attended by about 93,000 pupils. Further to aid in the diffusion of knowledge Government distributes among the poorer schools text books, cheap editions of standard authors, —chiefly French translated into Spanish.

Benevolent Institutions. —In Chili there are 42 hospitals, with an average number of 41,930 patients; 18 lazar houses (/azaretos) with 2230 patients; 31 dispensaries, providing medicines during the year to 293,100 sick people; 1 asylum for the insane, with 575 patients; 4 foundling hospitals, with 845 children; 6 hospices, with 765 poor ; 5 refuges for fallen women, with 610 inmates ; and 5 establishments for orphans, with 590. For the support of these charities Government contributes annually on an average £54,500.

There are several prisons, onc house of correction, and Prisons.

a large penitentary, the whole costing Government annually about £23,000.

Legations. —The Chilian legation for France and England Legations,

is in Paris. The minister’s salary is £1800; with other salaries and sundries, it costs £3000. In Washington the expense of the legation is £1400; in Lima, £2800, in Bolivia £1300; in Buenos Ayrcs, which serves also for Brazil, £2600.

The Press.—The press in Chili is improving. There Press,

are one or more daily newspapers in every town of im- portance, and about 50 papers and magazines published weekly or monthly. The official organ of the Government is the Araucano,; of the Law Courts, the Gaceta de los Tribunales; of the university, the Anales de la

Post-office.

Army.

Navy.

Minerals.

Gold.

Silver.

Copper.

Universidad, and of the Church, La Resta Catolica. here are also German and English newspapers. The national literature of Chili belongs chiefly to the belles lettres class, tinged with French ideas. The scientific writers are mostly foreigners or the descendants of foreigners. On an average, three times more books are imported from France than from England; ten times more than from Spain, or the United States, or Germany ; and twenty-two times more than from Belgium.

Post-office—The number of letters that passed through the post-office in 1874 was 5 millions ; of newspapers, periodicals, and circulars, 74 millions; and of samples, 12,000, besides 336,000 official despatches.

Army and Navy.—The army of Chili, which in time of

war has exceeded 4500 men, was reduced in 1875 to 3500, consisting of 700 cavalry, 2000 infantry, and 800 artillery. This force is distributed on sentry duties and upon the frontiers, but the real military strength of the country is the National Guard. – The National Guard, also divided into cavalry, infantry, and artillery, averaged 55,000 men from 1867 to 1871, but in 1875 had become reduced to 22,000, the country being at peace.

The navy consists of two powerful ironclads, the “ Almirante Cochrane” and the “ Valparaiso,” constructed in England, each of 1000 horse-power, and of about 2000 metric tons measurement, besides three corvettes, a sloop, and several transport vessels on active service, and two corvettes allocated to the naval schools. All are steamers. The marine force amounted in 1875 to 1600 men, inelud- ing sailors, engineers, officers, and 200 marines and artillery- men.

Mineral Productions.—Chili is rich in minerals. Among its metals are gold, silver, copper, lead, antimony, cobalt, zine, nickel, bismuth, iron, molybdenum, and quicksilver, found in mines in the northern division, while rich beds of coal occupy the southern divi- sion, but only copper, silver, aud coal are profitable to any extent. ‘he various ores are found in all the series of rocks between granite and trachyte, the latter being sterile in Chili. The veins generally run from N. and N.W. to 8. and S.E. ; in some places, however, their eourse is irregular, or they extend E. and W.

The auriferous veins run nearly parallel to the imperfect cleavage of the surrounding granite rocks, Copper ores, containing a small quantity of gold, are generally associated with micaceons specular iron. Some mines are remarkable for the variety of minerals mixed with the gold, such as galena, blende, copper and iron pyrites, and peroxide of iron. These substances are found disseminated in quartz veins running nearly N. and S. Near Ilapel are some very poor gold mines, in the beds of the. gypseous formation, in altered fel- spathic clay-slate, which alternate with purple porphyritic con- glomerate.

The richest silver mines are found in Jurassic rocks of the Oolitic formation in the province of Atacama. The richest districts are Chafiarcillo, Tres Puntas, Florida, and Caracoles. 1n Chaiiarcillo the upper part of the mines produce immense quantities of embolite, while in ow of Caracoles, on the frontier of Bolivia, the chloride of silver is found in still greater quantities. And in general these are the two kinds of silver ore met with most frequently in the upper region of the veins ; while as the mines become deeper, the prevail- ing ores are various kinds of pyrargyrite or red silver, ‘polybasite, and argentite or the sulphuret of silver. Native silver, in smaller or larger masses, is generally found in the upper region, although at Chatiarcillo, from the vein San Juan, at 825 feet below the surface, 800,000 ounces of metallic silver were extracted in a few months. Gold is also found in Magellan.

Copper is more equally distributed than silver over the northern provinces, and is mostly found in the lower granitic and meta- morphic schistose series, where it is met with most abundantly as pyrites, although other ores are also common, such as bornitc or variegated copper, the black oxide,

malachite, and atacamite. Do- meykite, or arsenical copper, is found in the Calabozo mine, near Coquimbo; the hydrosilicate and olivenite in the mine San Antonio, near Copiapo; the vanadiate of copper in cavities in an arsenio- phosphate of lead, along with amorphous carbonate of lead and copper, in Mina Grande or La Marquesa, near Arqueros. That

rare ore, the oxychloride of copper, or atacamite, occurs at Remo- |

linos and Santa Rosa in veins in granite. The principal copper mines are in the provinces of Atacama, Coquimbo, and Aconcagua,

and the most important are those of San Juan and Carrizal, near |

CnmiLt

Copiapo, La Higuera, near Coquimbo, and Tamaya, about 40 miles from the coast, and 70 from Coquimbo. This last is a mountain district about 3500 feet above the sea, whieh produces about 150,000 ewts. a year of various kinds of sulphurets, of a produce from 9 to 64 per cent. Tambillos, 10 leagues from Coquimbo, produces prin- eipally poor sulphurets ; Runeral, near the river, entirely poor car- bonates; Andacollo, carbonates, oxides, oxysulphurets, and native copper ; La Higuera, black sulphurets and pyrites ; Herradura and Huasco, carbonates and sulphurets of low produce. In the Cordil- leras, above Huasco, are some mines containing ores of copper, silver, and lead combined together. Silver and copper mines are sold by the ‘‘barra,” or twenty-fourth part of the share of the mine.

The most eommon ores of eobalt are the arsenate and the sulph- Cobalt.

arsenate, containing from 19 to 22 percent. of cobalt. The most im- portant mine is the Veta Blanca of San Juan. At Tambillos and Huasco there are mines containing glance cobalt, and arsenate or erythrine ; the former sort is frequently combined with nickel, which has been found in considerable quantities in a mine in the Cordilleras above Copiapo.

The sulphuret of zinc is found in various parts, as well as anti- mony, lead, manganese, bismuth, mercury, and molybdena. Iron ores of every description are very abundant; amongst the most peculiar are coquimbite, or

white copperas, and copiapite, or yellow copperas, much used by the inhabitants for dyeing and tanning, in the manufacture of ink, and for other purposes.

Gypsum is found in immense beds, particularly in the province of Santiago. The fine massive variety called alabaster is found at the Salto de Agua, near to Santiago, of a quality nearly equal to that of Italy. Lapis lazuli is found in the Cordilleras above the province of Coquimbo, but it is impossible to convey large slabs to the coast, and the rincipal use of the small pieces is to make ultramarine ; but as the artificial equals the native in brilliancy of colour and permanency, it isnot of much value. In the province of Atacama, where it borders on Bolivia, are extensive deposits of the nitrate of at' and the borate of lime and soda.

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Chili, extending along the eoast from the province of Concepcion in 36° 50'S. lat. to the Straits of Magellan, including some of the islands of Chiloe. The richest and at the same time the oldest coal mincs are immediately south from the Biobio at Coronel, Lota, and Lebu. 'These coal mines are worked on the same plan as those in England with all the modern improvements anc accessaries, Steamers coal at the pit's mouth, and a great deal of the ore that used to be earried to England to be smelted is now sent to Coronel and Lota. There are also extensive works for amalgamating silver and smelting ores in Copiapo, Chaiiarcillo, Carrizal, and Guayacan.

Of the entire metal exports copper is 70 per cent. and silver 25. The amount of coal produced annually is increasing so rapidly that it will probably soon average from 2 to 3 millions of tons. Tite average value of the minerals exported is above 46 per cent. of the value of the whole of the exports, while that of agricultural pro- ducts is about 44 per cent.

Vegetable Kingdom.—The Chilian flora contains Twenty-two of the genera belonging to the continent of Europe are not indigenous to Chili, while, on the other hand, that country posseses thirty-six genera not belonging to Europe.

Agriculture.—Till Chili had to compete with California and Aus- Agricul-
tralia in the foreign markets, the agricultural appliances were of ture.

that rude description introduced by the Spaniards. The ploughs were jointed sticks ; corn was trodden out by mares or oxen, winnowed by throwing it up against the wind, and ground in small primi- tive mills. All this is now changed. The largest and_most approved agricultural implements manufactured in the United States and in England are now employed, while the flour mills in power and machinery rival the best in Great Britain. Care is also being taken to improve the breeds by the introduction of horses, cattle, and sheep from England. About 82 per cent. of the entire surface of Chili is desert, mountain pasture, and forests, and only about 18 per cent. arable land. There are in the country 30,000 estates of various sizes, from many square miles to a few acres. The most important agricultural product, both for home consumption and exportation, is wheat, of which the average yield over the whole country is 7 for 1, and the average annual quantity from 1,305,000 to 1,380,000 quarters, of which about two-thirds are exported in grain, flour, and biscuit. In the province of Santiago the yield may be estimated at 12 for 1. Of barley the average annual production is 200,000 quarters, and the yield in the pro- vinces in which it is cultivated 16 for 1. The value of the annual export averages £200,000. The rest is used as malt and food for horses. JMJfaize is grown in every part of Chili excepting in Chiloé and the territory of Magellan, and yields 20 to 30 for one. In the green state it forms two of the principal national dishes, choclos and humitas, eaten by both rich and poor. But the most universal national dish is supplied by the kidney bean (Phaseolus vulgaris) both in the green and the dry state. The average annual produce is 106,000 quarters, and the yield 9 for 1. South from the Maule, pease are more eultivated than kidney beans. The average produce ig

great and increasing importance are the coal mines in southern Coal.

128 genera. Flora.

Timber.

‘hair.

27,000 quarters. The potato is indigenous to Chili. The largest quantity and the best are grown in the rainy provinces of Chiloé and Valdivia, where the yield varies from 10 to 40 for 1. The average annual produce is 3,100,000 bushels in the whole of Chili. Of walnuts the average annual produce is 48,000 bushels. Although there are 14,560 bearing olive trees in the country, the extraction of the oil from the berries is only beginning to receive due atteution. There are 890,000 mulberry trees, but the breeding of silkworms has as yet not succeeded. The vinesnumber from eighteen to twenty millions ; and really good imitations of port and claret are made, although the great bulk goes to make a coarse brandy, a catelan-like wine called mosto, and the great beverages of the poorer classes, called chicha and chacoli. The most important plant for the fattening of cattle is a lucerne, the Medicago sativa, which flourishes throughout all the warmer regions of Chili. It is sown in winter, 2} bushels to the cuadra, under a sprinkling of earth, is cut from three to four tinies iu the year, and irrigated from five to ten times, according to the nature of the soil, and yiclds of green food 49 tons the cuadra. Cattle brought from the mountains, and oxen that have been work- ing in carts and in the plough, are speedily fattened ou it, while cows fed on it yieldrich milk and butter. The hills in the warm regions of Chili are sparingly covered with a short and wiry grass, which, after one winter of abundant rain, lasts for two seasons, even although the succeeding winter may have been dry.

The sterile plains and mountains produce the carob tree (Cera- tonia) which, in defiance of a broiling sun, stretches out its spacious limbs, covered with foliage, forming an agreeable retreat to the weary traveller by day as well as by night; the espino (Acacia Cavcwia) inferior to the carob tree in size, hardness, and durability of its timber; and the great torch thistle, whose long, smooth spines are used by the country people for knitting-needles, and whose interior woody substance, stripped of its fleshy bark, forms the beams and rafters of the cottages of the peasantry in the northern provinces. Timber is abundant in all the provinces 8. of San- tiago, but chiefly in Arauco, Valdivia, and Chiloé, which may be termed the forest region of Chili. There are altogether above a hundred different kinds of indigenous trees, of which not more than thirteen ever shed their leaves. Several have

been found serviceable in ship-building, but for purposes of house-carpentry none afford an adequate substitute for pine. Ornamental woods are scarce, and too soft for the use of cabinet-makers. The principal timber trees are the roble or Chilian oak (Fagus obliqua) which attains a height of 100 feet, and as the timber retains its soundness in water, it makes excellent stakes; the lingue (Persea Lingue) 90 feet, which furnishes the best wood for furniture, while the bark is of great value in tanning; the peumo (Cryptocarya Pewmus), the bark of which is used in Valdivia for tanning,—the Germans exporting large quantities of first class sole leather, of which the largest quantity goes to England ; two species of cypress, both exceeding in height the loftiest trees in England,—the timber, of a reddish hue, is used for beams, doors, pillars, and ornamental flooring. The cypress (Libocedrus chilensis) grows on the Andes of the middle provinces, while the Libocedrus tetragona is found on the southern Andes. The quillay tree (Quillaja Saponaria) grows north from the Biobio. A decoction of the bark is used for clearing the colours in dyeing and cleansing articles of silk and woollen cloth, and as a wash for the The laurel (Lauretia aromatica) is a tall handsome tree, but its wood warps so much that it is suitable only for the coarsest work. The lumo (M/yrtus Lwma) produces timber liker the English oak than the Chilian oak. The Araucanian pine (Araucaria imbricata) 150 feet, flourishes on the mountains S. from the Biobio. When seen from a distance the trees look like gigantic umbrellas. The cone, which takes two years to ripen, contains from 50 to 100 oblong nuts 2 inches long, which, when cooked, form more delicate eating than chestnuts. Under the governorship of O'Higgins their trunks were used for ship-masts; but at present the expense of bringing them to the coast prevents their being employed in this way. The Chilian cedar or alerce (Mitzroya patagonica) is the largest and most important treein Chili. The wood is reddish, soft and durable, and not liable to warp. The trunk is divided into pieces of 8 feet long, and then split up into boards 6 or 7 inches broad, and about half an inch ities, which is, on account of the straightness of the fibre, very easily effected. An ordinary tree yields from 500 to 600 of these boards. The general height is from 150 to 180 feet. Yet some specimens have been met with 300 feet high aud 60 in circumference, which yielded upwards of 5200 boards. The best grow in Llanquihue, Chiloé, and Valdivia. Indeed, the luxuriance of vegetation in these regions is as great asin the tropics. The forests are frequently quite impenetrable on account of the creepers and the

‘‘quila,” a rudely branched reed, which, however, affords a good food for the cattle. A creeper (Lardiuabala biternata) is used by the Araucanians instead of ropes. In the same districts grows likewise the coligué or colew (Chusguea Colcou), a bamboo- like reed, which attains a height of 30 feet, and furnishes the shafts of the lances of the Araucanians and Pehuenchces.

Fruit is plentiful. Besides the kinds already mentioned, in Valdivia there are large apple orchards, and further north pears,

cherries, and quinces. The strawberries of the south of Chili have long been famous, and are still unrivalled, especially those of Tomé.

Animais.—The most formidable animal in Chili is the puma. Zoology.

On account of its ravages in the farm-yard, it is frequently hunted with dogs, or caught by the lasso. The guanaco roams about among the lower regions of the Chilian Alps in herds numbering from 20 to 100. The vicuiia is more rare; it inhabits the Andes of the province of Atacama. The huemul is found in the territory of Magellan, and in other districts the otter, wild cat, fox, and chin- chilla. The horses of Chili are infcrior in strength and height to those of England, but greatly superior in point of endurance. The mule isthe beast of burden, and will carry on an average a load of 355 lb. a distance of 20 or even 30 miles a day. The beef is excellent ; meat is mostly cured by drying, making it into charqui. In this manufacture several hundred head of cattle are killed at a time, the flesh rapidly stripped off the bones, cut into long thin shreds, and then dried in the sun.

Birds.—Among the birds of Chili the most remarkable is the condor, which is casily recognised by the white ruff encircling its neck. As its wings on an average extend 8 or 9 feet, its flight has a very majestic appearance. Humboldt mentions having seen onc flying at the height of 22,000 feet above the level of the sea. They scent an exposed carcase for a great distance, but seldom carry off live prey. The turkey-buzzard is also common in the northern districts ; white eagles, hawks, and owls are more numerous in the south. The only song-birds worthy of notice are,—the tenca, the thrush, the tordo (a kind of blackbird), and the loica (a kind of red- breast) ;

but none of these can rival the notes of our English birds. The tenca is said to emulate the mocking-bird in imitative power. The tapaculo (Pteroptochus albicollis), a bird about the same size as the thrush, rarely flies, but runs about with great agility, emitting an odd but cheerful notc. The chingol, or sparrow, has gayer plumage than his European representative. Besides these, parroquets, flamingoes, partridges, and woodpeckers abound in several localities, likewise the black-headed swan, and several varieties of crane. Patagonia has an ostrich much hunted by the Indians. The pelican, the penguin, and the shag inhabit the sea and the salt-water lakes.

Fish.—Great varieties of fish are found off the coast of Chili, and of these the pichihuen, which is caught chiefly in the Bay of Coquim- bo, is regarded as a choice delicacy. There are small sweet oysters off Chiloé ; huge mussels, barnacles, and fissurelle, off Concepcion; and large clams off Coquimbo ; besides sea-urchins, cockles, and limpets, which are found along the whole coast.

Of the reptiles, which are all harmless, the most numerous are lizards ; the snakes vary from 12 to 30 inchesin length. Scorpions and large spiders are common, but not dangerous. Of beetles there are upwards of 4000 species not found in Kurope. Chili is never infested by the clouds of locusts which from time to time devastate the neighbouring plains of the Argentine Republic. Small ants enter houses and attack provisions.

In 1844, J. P. Larrain made an unsuccessful attempt to intro- Rees.

duce bees; however, about two years afterwards he succeeded. Since then they have multiplied so fast that there are now upwards of 100,000 hives, producing on an average £50,000 worth of honey and wax annually, of which by far the greatest part is exported.

Manufactures.—The wealth of Chili consists in the development of Manufac- its great and abundant resources, for which its scanty population is tures,

insufficient ; hence manufactures which require many skilled hands and much cheap labour have as yet not prospered,—the cost of pro- duction being too great. But such works as flour mills, smelting works, tanneries,

breweries, roperies, and soap works have long prove successful. Wine-making is progressing rapidly. At Tomé there is a cloth mill, and at Valparaiso a large sugar refinery.

Numerous banks and insurance and other companies are conducted on the principle of limited liability. Both Santiago and Valparaiso are in this way furnished with street tramways, and the plan has of late been applied to mining.

Commerce.—The commerce of Chili has vastly increased since the Exports.

time when the country lay torpid under the yoke of Spain. In 1855 the total value of the exports was under £4,000,000 ster- ling, ;now it averages £8,000,000. The imports were in 1855 a little above £3,500,000, now they average £7,000,500. The prin- cipal exports are copper in bars and orcs, overaging £3,050,000 ; silver in bars and ores, avcraging £560,000 ; wheat, flour, and bis- cuits, averaging £1,507,000; barley, £300,000; hay of Lucerne (Jfedi- cago sativa), £51,600 ; potatoes, £48,000 ; walnuts, £40,000; butter and cheese, £20,500; eggs, £22,000; hides, £22,000.

Of the imports 17 to 18 per cent. are for nutrition, such as sugar, rice, and cattle ; 20 to 21 per cent. are necessaries of social life, as elothing, domestic utensils, crockery, drugs, machinery, tools, books, paper, &c.; and 13 to 14 per cent. arc articles of luxury, such as rich carpets, satins, silks, and drapery, toys, cards, tobacco, perfumery, musical instruments, pictures, statues, jewellery, tea, coffce, and yerbamaté, This yerba, the dried leaves of the Ilex paraguayensis,

Revenue.

Expendi- ture.

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is infused in an urn-shaped cup from which it is sucked up through a sniall silver tube (bombilla).

The commercial intercourse of Chili is most extensive with Great Britain. ‘The value of the Chilian exports to England averages annually £3,700,000, and the imports from England £3,900, 000. The exports to France are about one-third of those to England, and the imports from France about one-fifth of those from England. Next follow Germany, Peru, the United States, Bolivia, Brazil, and the Argentine Republie. ,

Chili cxports and imports both by sea and by the passes in the Cordillera. Mules do the land traffic, and formerly only sailing vessels the traffic by sea; but steamers are now taking their place. The value of the imports by land averages £198,000, and the exports £23,000 ; and the value of the imports by sea averages £9,302,000, and the exports £9,700,000, which in both cases includes goods in transit. Of the land imports the most valuable article is cattle, which are imported in large herds into the provinces of Coquimbo and Atacama from the Argentine Republic. The number of vesscls that leave the ports of Chili averages 5900, with about 4,019,000 tons; and 5950 enter the ports, with about 4,059,880 tons. Of the total amount three-eighths are English and about the same Chilian, then follow the United States, French, German, Peruvian, Belgian, Dutch, and Portuguese vessels. The merchant navy of Chili in 1875 consisted of 28 steamers with 9880 metric tons, and 59 sailing vessels with 12,554 metric tons. Many small vessels, however, owned in Chili, have reiained under the foreign flags to which they were transferred for safety during the last war with Spain.

Revenue. —The annual income of Chili may be estimated at £3,550,000, and the expenditure at sometimes a little less and some- times a little more. ‘The chief source of revenuc is the eustom- house, which yields about half of the whole amount. Next in importance arc the railways, yielding about a quarter of the whole; and after these, the monopoly of tobacco and cards, the land tax, trade licences, stamps, tolls, the mint, post-office, and telegraphs.

Expenditure. The Ministry of the Interior, £1,018,750 The Ministry of the Eixterior— Section—Foreign Relations, £19,409 Section—Colonization, 31,071 — 50,480 The Ministry of Justice, Worship, and Public Instruction

— Section—Justice, ele (oOo Section— Worship, 63,425 Section —Public Instruction, 236,156 — 417,150 Carry forward, £1,486, 380

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Brought forward, £1, 486,350 The Ministry of War— Section—The Army, . £326,908 Section—The National Guard, 83,861 Section—The Navy, . 234,703 oe §45,472 The Ministry of the Exchequer (Hacienda), 1,305,162 £3, 437,014

National Delt. —The national debt amounts to about £10,000, 000 sterling, of which about £2,000,000 is of internal and £8,000,000 of external debt. The whole of the latter has been contracted in England, and the bulk of it invested in existing railways and rail- ways in construction, which yield both directly and indirectly a fair return. The wanton bombardment of Valparaiso by the Spanish fleet (March 31, 1866) having suggested to the Chilians the necessity of providing against such outrages, they have spent a great deal of mouey in the purchase of ironclads and in the construc- tion of forts, —besides having had to rebuild the bonded warehouses destroyed at that time. House of Congress, which is being built on an ambitious scale.

Communication.—Chili is connected with Europe by telegraph, and the wires ramify over the greater part of the country. Santiago and Valparaiso and all the most important towns south- ward as far as Talcahuano, are connected by rail. In the northern pro- vinceg are also railways, which facilitate the working of the mines.

On the 15th of October 1840, the first steamers of the Pacific Steam Navigation Company arrived at Valparaiso, the ‘‘Peru” (Captain Peacock) and the ‘* Chili” (Captain Glover), both 700 tons. At first they sailed merely between Valparaiso and Callao, calling at the intermediate ports. In Junc 1846, the route was extended by Panama and the Isthmus to Europe. On the 13th of May 1868 the Company commenced their line between Liverpool and Chili by the Straits of Magellan, the first of their steamers which made the voyage being the ‘‘ Pacific,” 1174 tons.

Weights, Measures, and Money.—The weights and_ measures were formerly Spanish, but since January 1858 those of France are in force as the

only legal ones.

In her monetary system Chili possesses the doubic standard, gold and silver, the coins being as follows :—Of gold, a ten-dollar picce, weighing 15°253 grammes, and pieces of five and two dollars in proportion; of silver, a dollar piece of 25 grammes, and picces of fifty, twenty, ten, and five cents in proportion ; and also two- cent pieces, and cent-pieces of a bronze containing zinc and nickel.

The gold and larger silver coins contain one-tenth of alloy; the smaller silver ones, which arc of limited legal tender, are rather less pure. The bronze tokens, the emission of which has been limited to a value of about £20,000, replace the former coinage of copper. Thereisno Government paper; but some of the banks issue, under due restrictions, notes payable in coin. (C. B. B.—F. W.)

CHILLAN, a town of Chili, the capital of the provinee of Nuble, in a depression in the fertile plain between the rivers Nuble and Chillan, about 120 milcs north-cast of Concepcion, in 35° 56’ 8. lat. and 71° 37’ W. long. The houses, with but few exceptions, eonsist of only a ground floor built round a rectangular court, aud are constructed of sun-dried or baked brieks. The streets are about 22 yards wide and have open drains in the middle. The importanee of the town eonsists in its being the centre of a large agricultural district of the greatest productiveness, whieh has a valuable outlet for its grain and eattle by means of the railway to Tomé. Haud-made lace is produced on designs which have beeome traditional in certain families. The district is also celebrated for its mineral baths, Chil- lan was originally founded by Ruiz de Gamboa in 1594, but it has siuce becn frequently destroyed and rebuilt. In 1601 it was laid waste by the Moluehe Indians, in 1657 by the Puelche Indians and an earthquake, by another earthquake in 1751, and in 1797 by the overflow of the River Nuble. This last catastrophe led the inhabitants to remove their city to a place called La Horca, where it was again levelled by the earthquake of 1835. Next year they began to build on the present site the now prosperous town, which has a population of 20,000.

CHILLIANWALLA, a town of British India in the Punjab, situated on the left bank of the River Jhelum,

about 85 miles north-west of Lahore, in 32° 40’ N. lat. and 73° 39’ E. long. It is memorable as the scene of a sauguinary battle fought there on the 13th January 1849, between a British force eommanded by Lord Gough and the Sikh army under Shere Singh. The loss of the British in killed and wounded amounted to 2269, of whom nearly 1000 were Europeans, while that of the Sikhs was estimated at 4000. An obelisk ereeted at Chillianwalla by the British Government preserves the names of the officers and men who fell in the action.

CHILLICOTHE, a city of the United States, capital of the county of Ross in Ohio, on the west bank of the River Scioto, 45 miles south of Columbus. It is beautifully situated in the midst of a rich agricultural district, and has extensive communication by means of the Ohio and Erie canal, and several railway lincs. Its public buildings, many of which are an ornament to the town, comprise a large court-house, which cost over $100,000, fourteen churches, and thirty-six public schools; and among its industrial establishments are carriage-factori¢s, flour and paper mills, an iron foundry, and a manufactory of agricultural implements. Chillicothe was founded in 1796 by immigrants from Virginia and Kentueky, and from 1800 to 1810 it was the capital of the State. Population in

1870, 8920.

CHILLINGWORTH, Wrut1am (1602-1644), a eele-

A large sum has also been spent on the

National Debt.

Weights, measures, and money.

brated divine and controversialist of the Church of England, was born at Oxford in October 1602. In June 1618 he became a scholar of Trinity College, and after a course of logic and philosophy he was admitted to the degree of Master of Arts in 1623, and was made a fellow of Trinity College in June 1628. In those days he industriously cultivated the art of

disputation, as was the fashion among the young theologians of the university. He also excelled in mathematics, and gained some credit as a writer of verses. The controversy between the Church of England and that of Rome was the absorbing topic of the time, which had gained a deeper interest in consequence of the marriage of Charles with Henriette of Frauce. Missionaries of the Church of Rome were busy throughout the country. The Jesnits made the universities their special point of attack ; and one, named Fisher, who had his sphere at Oxford, succeeded in making a convert of young Chillingworth. To secure his conquest, Fisher prevailed upon Chillingworth to go to the Jesuit college at Douay. While he was there, Laud, who was his godfather, and who then was bishop of London, pressed him with arguments against the doctrine and practice of the Church of Rome, which had the effect of determining him to make an impartial inquiry into the elaims of the two churches. For this purpose he quitted Douay in 1631 after a brief stay there, returned to England, and at Oxford, of which Iaud was chancellor, he devoted his energies to a free inquiry into religion, On grounds of Scripture and reason he at length declared for Protestantism, and wrote in 1634, but did not publish, a confutation of the motives which had led him over to Rome. This paper was lost; the other, on the same subject, was probably written on some other occasion at the request of his friends. His return to Protestantism was attended with some scruples, which he expressed in a letter to Dr Sheldon, and which probably gave rise to the report that he had turned papist a second time, and then Protestant again. The extreme sensitiveness of his theological conscience was evinced by the grounds on which he refused a preferment offered to him in 1635 by Sir Thomas Coventry, Lord Keeper of the Great Seal. He was in difficulty about subscribing the Thirty-nine Articles, As he informed Dr Sheldon in a letter, he was fully resolved on two points— that to say the Fourth Commandment is a law of God appertaining to Christians is false and unlawful, and that the damning clauses in St Athanasius’s Creed are most false, and in a high degree presumptuous and schismatical. To subscribe, therefore, he felt would be to “subscribe his own damnation.” At this time his principal work was far towards completion. It was undertaken in defence of Dr Christopher Potter, provost of Queen’s College in Oxford, who had for some time been carrying on a controversy with a Jesuit known as Edward Knott, but whose real ame was Matthias Wilson.

Laud, now archbishop of Canterbury, was not a little golicitous about Chillingworth's reply to Knott, and at his request, as " the young man had given cause why a more watchful eye should be held over him and his writings," it was examined by the vice-chancellor of Oxtord, and two professors of divinity, and published with their approbation in 1637, with the title The Religion of Protestants a Safe Way to Salvation. The work was well received, two elitions being published within less than five months ; and 't called fortl a shower of pamphlets from the opposite side. In the preface Chillingworth expresses a totally different view about subscription to the articles. " For the Church of England," he there says, "I am persuaded that the constant doctrine of it is so pure and orthodox, that whosoever believes it, and lives according to it, undoubtedly he shall be saved, and that there is no error in it which may necessitate or warrant any man to disturb

the peace or renounce the communion of it. This, in my opinion, is all intended by subscription." His scruples having thus been happily overcome, he was, in the following year (1638), promoted to the chancellorship of the church of Sarum, with the prebend of Brixworth in Northampton- shire annexed to it. He was in the king's army at the siege of Gloucester, and invented certain engines for assaulting the town. Shortly afterwards he accompanied Lord Hopton, general of the king's troops in the west, in his march; and being laid up with illness at Arundel Castle, he was there taken prisoner by the Parliamentary forces under Sir William Waller. As he was unable to go to London with the garrison, he was conveyed to Chichester, and died there in January 1644. His last days were spent in controversy with a redoubtable preachier, Francis Cheynell, about the dispute between the king and the parliament.

Besides his principal work, Chillingworth wrote a number of minor pieces of a controversial kind, and some of his sermons have been preserved. In politics he was a zealous Royalist, asserting that even the unjust and tyrannous violence of princes may not be resisted, although it might be avoided in terms of our Saviour's direction, ' when they persecute you in one city, flee into another." His writings long enjoyed a high popularity. The Relegion of Protestants is characterized by much fairness and acuteness of

argument, and was commended by Locke asa discipline of ‘“ perspicuity and the way of right reasoning.” The charge of Socinianism was frequently brought against him. but, as Tillotson thought, “for no other cause but his worthy and successful attempts to make the Christian religion reasonable.” His creed, and the whole gist of his argument, is expressed in a single sentence, which is not without significance even for the present time,—‘“I am fully assured that God does not, and therefore that men ought not to require any more of any man than this, to believe the Scripture to be God’s word, to endeavour to find the true sense of it, and to live according to it.”

CHILMAREE (in Hindustani, Chalamart), a town of British India, in the presidency of Bengal, about 35 miles south-east of Rungpur, on the right bank of the Brahmaputra. It is mainly remarkable as the seat of a great religious and commercial festival, which brings together no fewer that from 60,000 to 100,000 people.

CHILOE, an island off the coast of Chili, separated from the mainland on the N. by the narrow strait of Chacao, and on the E, by the archipelago of the Gulf of Aucud and Corcovado Bay. It is situated between 41° 45’ and 43° 30’ S. lat., and extends in length about 120 miles from N. to S.; its greatest breadth is about 50 miles, and its total area is estimated at 5200 square miles, The western or seaward coast is for the most part steep, and in some places rises to a height of 3000 feet ; the eastern contrasts with it not only in its smaller elevation but also in the extreme irregularity of its outline. There are several lakes in the southern portion of the island, of which the most extensive bears the name of Lago de Cucao. The interior is moun- tainous and but partially explored. The whole island is divided into the five departments of Ancud or San Carlos, Chacao, Dalcaliue, Castro, and Chonchi. Ancud, the capital and the bishop’s seat, is a regularly-built town, with a population of 7000. The total population of the province amounted in 1875 to 64,536. In 1558 the island and the neighbouring archipelago were discovered by Garcia de Mendoza, and not long afterwards were taken possession

| of by Spain. On the expulsion of the Spanish forces from the rest of Chili in 1818 they settled in Chiloé; but in 1826 the island likewisc was

abandoned, and since that period it has formed one of the Chilian provinces. The most valuable article of commerce is the timber of the

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Chilian cedar, the Fitzroya patagonica, which is exported in small planks. The next article in importance is the potato, which is indigenous, and which is produced in annually increasing quantities as land is cleared of forest. Signs of coal-beds of considerable size and value have been discovered in the island. See CHILL.

CHILON, one of the seven sages of Greece, was a Lacedemonian by birth, His father's name was:Damagetos, and he appears to have flourished about the beginuing of the 6th century Bc. In 556 Bo. he acted as ephor eponymous, but little more is known of his life. He is said to have died of joy on hearing that his son had gained a prize at the Olympic games. Diogenes Laertius tells us that he composed elegies, but none of these are extant. Many of his apophthegms have been handed down. They show much of the weight and brevity that might be expected in a Spartan, but are not so pointed and severe as those of Bias. According to Chilon the great virtue of man was prudence, or well grounded judgment as to future events. (Diog. Laer., i. §§ 68-73; Mullach, Mrag. Phil. Greec., i.).

et vaaal HILLS, a range of chalk hills in, England, extending through part of Oxford, Buckingham, and Bedford, and attaining their highest elevation of 904 feet in the neighbourhood of Wendover. At one time the Chilterns were thickly covered with a forest of beech, and the western district of Bernwood was only cleared by James I. The depredations of the bandits, who found shelter within their recesses, became at an early period so alarming that a special officer, known as the Steward of the Chiltern Hundreds, was appointed for the protection of the inhabitants of the neighbouring districts. The necessity for such an appointment has disappeared long ago, but the three hundreds of Stoke, Burnham, and Desborough in Buckingham are still distinguished by the old name, and a steward is still nominated by the Chancellor of the Exchequer, with a salary of 20s. and the fees of the office. The sole importance of the sinecure

consists in the fact that its acceptance enables a member of the House of Commons

to resign his seat, on the plea that he holds a place of honour and profit under the Crown. This appropriation of the post only dates from the middle of the 18th century, and its intrinsic legality has been called in question ; but the custom is now completely legitimated by a long line of precedents. An application for the Stewardship of the Chiltern Hundreds was once refused, in 1842. :

CHIMAiRA, in Grecian fable, a monster resembling a lion in the fore part, a goat in the middle, and a dragon behind, and having three heads corresponding to the three parts of her body. Each mouth breathed forth fire, and she committed great ravages throughout Caria and Lycia, till she was overthrown by Bellerophon, mounted on the winged horse Pegasus. Some have supposed that the myth owed its origin to the volcanic mountain Chimera, in Lycia, where works have been found containing representations of the lion. In modern art, the Chimera is usually represented as a lion, out of the back of which grow the neck and head of a goat. As a general term chimeera signifies any fiction of the imagination made up of incongruous elements, or, generally, any fantastic idea or impracticable scheme of action.

CHIMAY, a town of Belgium, in the province of Hainault, on the Eaublanche, or White Water, about’ 28 miles south of Charleroi. It contains 3000 inhabitants, and has ironworks, marble quarries, breweries, and potteries. In 1470 it was raised to the rank of a countship by Charles the Bold, and in 1486 was erected into a principality in favour of Charles of Croy. Since that date it has passed in 1686 to the counts of Bossu, and in 1804 to the French family of Riquet de Caraman. In 1805 Prince Francis Joseph Philippe married the daughter of the Spanish minister Cabarrus, a woman of great wit and beauty, who had been previously the wife of M. de Fontenay and of Tallien, and had taken an active part in the overthrow of Robespierre. Their son Joseph, born in 1808, is the pre- sent possessor of the title, and has held the office of Bel- gian plenipotentiary.

CHIMPANZER. See Arps, vol. ii. p. 149,

CHINA

HE account of this great empire of Hastern Asia may

fitly.commence with a brief notice, 1st, of China as

known to the ancients (the land of Sine or Seres), and, 2d, of China as known to mediseval Europe (Cathay).

China as known to the Ancients.

The spacious seat of ancient civilization which we call China has loomed always so large to Western eyes, and has, in spite of the distance, subtended so large an angle of vision, that, at eras far apart, we find it to have been distinguished by different appellations, according as it was reached by the southern sea-route, or by the northern Jand- route traversing the longitude of Asia.

In the former aspect the name has nearly always been some form of the name Sin, Chin, Sine, China. In the latter point of view the region in question was known to the ancients as the land of the Seres, to the Middle Ages as the empire of Cathay.

The name of Chin has been supposed (doubtfully) to be derived from the dynasty of Zhsin, which a little more than two centuries before our era enjoyed a brief but very vigorous existence, uniting all the Chinese provinces under its authority, and extending its conquests far beyond those limits to the south and the west.

The mention of the Chinas in ancient Sanskrit litera- ture, both in the laws of Manu and in the Mah4bharat, has often been supposed to prove the application of the name

long before the predominance of the Thsin dynasty, But the coupling of that name with the Daradas, still surviv- ing as the people of Dardistan, on the Indus, suggests it as more probable that those Chinas were a kindred race of

mountaineers, whose name as Shinas in fact likewise re- mains applied to a brauch of the Dard races. Whether the Swim of the prophet Isaiah should be interpreted of the Chinese is probably not at present susceptible of any decision ; by the context it appears certainly to indicate a people of the extreme east or south,

The name probably came to Europe through the Arabs, who made the China of the further east into Stn, and perhaps sometimes into Zhin. Hence the Zhin of the author of the Periplus of the Erythrean Sea, who appears to be the first extant writer to employ the name in this form (ze., assuming Miiller's view that he belongs to the 1st century) ;

: hence also the Sie and Thine of Claudius Ptolemy.

It has often indeed been denied that the Sine of Ptolemy really represented the Chinese. But if we com- pare the statement of Marcianus of Heraclea (a mere con- denser of Ptolemy), when he tells us that the " nations of the Sinz lic at the extremity of the habitable world, and adjoin the eastern Terra Incognita," with that of Cosmas, who says, in speaking of Zz¢zsta, a name of which no one can question the application to China, that "beyond this there is neither habitation nor navigation,"—we cannot doubt the same region to be meant by both, 'The funda-

mental error of Ptolemy's conception of the Indian Sea as a closed basin rendered it impossible but that he should misplace the Chinese coast. But considering that the name of Sin has come down among the Arabs from time immemorial as applied to the Chinese, considering that in the work of Ptolemy this name certainly represented the furthest known East, and considering how inaccurate are Ptolemy's configurations and longitudes much nearer home, it seems almost as reasonable to deny the identity of his India with ours as to deny that his Sines were Chinese.

If we now turn to the Seres we find this name mentioned by classic authors much more frequently and at an earlier date ; for the passages of Eratosthenes (in Strabo), formerly supposed to speak of a parallel passing through Thina— dua Ov, are now known to read correctly 8¢A@nvav. 'The

name Seres indeed is familiar to the Latin poets of the Augustan age, but always in a vague way, and usually with a general reference to Central Asia and the further East. We find, however, that the first endeavours to assign more accurately the position of this people, which are those of Mela and Pliny, gravitate distinctly towards China in its northern aspect as the true idea involved. Thus Mela describes the remotest east of Asia as occupied by the three races (proceeding from south to north), Indians, Seres, and Scyths; just as in a general way we night say still that Eastern Asia is occupied by the Indies, China, and Tartary.

Ptolemy first uses the names of Sera and Serice, the former for the chief city, the latter for the country of the Seres, and as usual defines their position with a precision far beyond what his knowledge justified,—the necessary result of his system. Yet even his definition of Serice is most consistent with the view that this name indicated the Chinese empire in its northern aspect, for he carries it eastward to the 180th degree of longitude, which is also, according to his calculation, in a lower latitude the eastern boundary of the Sine.

Ammianus Marcellinus devotes some paragraphs to a description of the Seres and their country, one passage of which is startling at first sight in its seeming allusion to the Great Wall, and in this sense it has been rashly interpreted by Lassen and by Reinaud. But Ammianus is merely converting Ptolemy's dry tables into fine writing, and speaks only of an encircling rampart of mountains within which the spacious and happy valley of the Seres lies. It is true that Ptolemy makes his Sericc extend westward to Imaus, 2¢, to Pamir. But the Chinesc empire did so extend at that epoch, as it did twenty years ago, and we find Lieut. John Wood in 1838 speaking of "China" as lying immediately beyond Pamir, just as the Arabs of the 8th century spoke of the country beyond the Jaxartes as " Sin," and as Ptolemy spoke of " Serice" as immediately beyond Imaus.

If we fuse into one the ancient notices of the Seres and their country, omitting anomalous statements and manifest fables, the result will be something like the following :— "The region of the Seres is a vast and populous country, touching on the east the Ocean and the limits of the habitable world, and extending west to Imaus and the con- fines of Bactria. The people are civilized, mild, just, and frugal, eschewing collisions with their neighbours, and even shy of close intercourse, but not averse to dispose of their own products, of which raw silk is the staple, but which include also silk-stuffs, fine furs, and iron of remark- able quality." That is manifestly a definition of the Chinese.

That Greek and Roman knowledge of the true position of so remote a nation should at best have been somewhat hazy is nothing wonderful. And it is worthy of note that the view entertained by the ancient Chinese of the Roman

empire and its inhabitants, under the name of T'a-thsin, had some striking points of analogy to those views of the Chinese which are indicated in the classical descriptions of the Seres. There can be no mistaking the fact that in this case also the great object was within the horizon of vision, yet the details ascribed to it are often far from being true characteristics, being only the accidents of its outer borders.

China as known to Medieval Hurope.

CatHay is the name by which the Chinese empire was known to medisval Europe, and is in its original form (Kitai) that by which China is stil] known in Russia, and to most of the nations of Central Asia. West of Russia the name has Jong ceased to be a geographica] expression, but it is associated with a remarkable phase in the history of geography and commerce, of which we purpose under this head to give some account.

The name first became known to Europe in the 13th century, when the vast conquests of Jenghiz and his house drew a new and vivid attention to Asia. For some three centuries previously the northern provinces of China had been detached from indigenous rule, and subject to northern conquerors. The first of these foreign dynasties was of a race called Khitan, issuing from the basin of the Sungari River, and supposed (but doubtfully) to have been of the blood of the modern Tunguses. The rule of this race endured for two centuries, and originated the applica- tion of the name Khitdt or Khitdi to Northern China. The dynasty itself, known in Chinese history as Lvao, or "Tron," disappeared from China 1123, but the name remained attached to the territory which they had ruled.

The Khitan were displaced by the Wydché or Chirché race, akin to the modern Manchus who now rule China. These reigned, under the title of Ain, or " Golden," till Jenghiz and his Mongols invaded them in turn. In 1234 the conquest of the Kin empire was completed, and the dynasty extinguished under Okkodai, the son and suc- cessor of Jenghiz Khan. Forty years later, in the reign of Kublai, grandson and ablest successor of Jenghiz, the Mongol rule was extended over Southern China (1276), which till then had remained under a native dynasty, the Sung, holding its royal residence

in a vast and splendid city, now known as Hang-chow, but then as Ling-ngan, or more commonly as King-sze, ae. the Court. The southern empire was usually called by the conquerors Mantzi (or as some of the old travellers write, Mangi), a name which Western Asiatics seem to have identified with Méchén (from the Sanskrit Mahachin), one of the names by which China was known to the traders from Persian and Arabian ports.

The conquests of Jenghiz and his successors had spread not only over China and the adjoming East, but westward also over all Northern Asia, Persia, Armenia, part of Asia Minor, and Russia, threatening to deluge Christendom. ‘Though the Mongol wave retired, as it seemed almost by an immediate act of Providence, when Europe lay at its feet, it had levelled or covered all poli- tical barriers from the frontier of Poland to the Yellow Sea, and when Western Europe recovered from its alarm, Asia lay open, as never before or since, to the inspection of Christendom. Princes, envoys, priests, —half-missionary half-envoy—visited the court of the great Khan in Mongolia ; and besides these, the accidents of war, commerce, or opportunity carried a variety of persons from various classes of human life into the depths of Asia, “Tis worthy of the grateful remembrance of all Christian people,” says an able missionary friar of the next age (Ricold of Monte Croce), “ that just at the time when God sent forth into the Eastern parts of the world the Tartars to slay and to

be slain, He also sent into the West his faithful and blesscd servants, Dominic and Francis, to enlighten, instruct, and build up in the faith.” Whatever on the whole may be thought of the world’s debt to Dominic, it is to the two mendicant orders, but especially to the Franciscans, that we owe a vast amount of information about medieval Asia, and, among other things, the first mention of Cathay. Among the many strangers who reached Mongolia were (1245-47) John de Plano Carpini (see CaRpPini) and (1253) William of Rubruk (Rubruquis) in French Flanders, both Franciscan friars of high intelligence, who happily have left behind them reports of their observations.

Carpini, after mentioning the wars of Jenghiz against the Kitai, goes on to speak of that people as follows :— “Now these Kitai are heathen men, and

have a written character of their own. . . . They seem, indced, to be kindly and polished folks enough. They have no beard, and in character of countenance have a considerable resem- blance to the Mongols” [are Afongoloid, as our ethnologists would say], “‘ but are not so broad in the face. They havea peculiar langnage. Their betters as craftsmen in every art practised by man are not to be found in the whole world. Their country is very rich in corn, in wine, in gold and silver, in silk, and in every kind of produce tending to the support of mankind.” The notice of Rubruk, shrewder and more graphic, runs thus :—“‘ Further on is Great Cathay, which I take to be.the country which was anciently called the Land of the Seres. For the best silk stuffs are still got from them. . . . The sea lies between it and India. Those Cathayans are little fellows, speaking much through the nose, and, as is general with all those Eastern people, their eyes are very narrow. They are first-rate artists in every kind, and their physicians have a thorough knowledge of the virtues of herbs, and an admirable skill in diagnosis by the pulse. . . . The common money of Cathay consists of pieces of cotton-paper, about a palm in length and breadth, upon which certain lines are printed, resembling the seal of Mangu Khan. They do their writing with a pencil, such as painters paint with, and a single character of theirs comprehends several letters, so as to form a whole word.” Here we have not only what is probably the first European notice of paper- money, but a parteal recognition of the peculiarity of Chinese writing, and a perception that puts to shame the perverse boggling of later critics over the identity of these Cathayans with the Seres of classic fame.

But though these travellers saw Cathayans in the bazaars of the Great Khan’s camps, the first actual visitors of Cathay itself were the Polo family (see Poto, Marco), and it is to the book of Marco’s recollections mainly that Cathay owed the growing familiarity of its name in Europe during the 14th and 15th centuries, It is, however, a great mistake to suppose, as has often been assumed, that the residence of the Polos in that country remained an isolated fact. They were but the pioneers of a very con- siderable intercourse, which endured till the decay of the Mongol dynasty in Cathay, 2.¢., for about half a century.

We have no evidence that either in the 13th or 14th century Cathayans, z.e., Chinese, ever reached Europe, but it is possible that some did, at least, in

the former cen- tury. For, during the campaigns of Hulaku in Persia (1256-1265), and the reigns of his successors, Chinese eugineers were employed on the banks of the Tigris, and Chinese astrologers and physicians could be consulted at Tabriz. Many diplomatic communications passed between the Hulakuid Tlkhans and the princes of Christendom. The former, as the great Khan's liegemen, still received from him their seals of state; and two of their letters which survive in the archives of France exhibit the vermilion impressions of those seals in Chinese characters,—perhaps

affording the earliest specimen of that character which reached Western Europe.

Just as the Polos were reaching their native city (1295), after an absence of quarter of a century, the forerunner ofa new series of travellers was entering Southern China by way of the Indian seas. This was Jolin of Monte Corvino, another Franciscan who, already some fifty years of age, was plunging single-handed into that great ocean of Paganism to preach the gospel according to his lights. After years of uphill and solitary toil converts began to multiply; coadjutors joined him. The Papal Sce became cognizant of the harvest that was being reaped in the far Kast. It made Friar John Archbishop in Cambaluc (or Peking), with patriarchal anthority, and sent him batches of suffragan bishops and preachers of his own order. The Roman Church spread ; churches and Minorite houscs were established at Cambaluc, at Zayton or Tswan-chow in Fuh-keen, at Yang-chow, and elsewhere ; and the missions flourished under the smile of the Great Khan, as the Jesuit missions did for a time under the Manchu emperors three centuries and a half later. Archbishop John was followed to the grave, about 1328, by mourning multitudes of Pagans and Christians alike. Several of the bishops and friars who served under him have left letters or other memoranda of their experience, eg., Andrew, bishop of Zayton, John of Cora, afterwards archbishop of Sultania in Persia, and Odoric of Pordenone, whose fame as a pious traveller won from the vox popult at his funeral a beatifi- cation which the church was fain to seal. The only ecclesiastica] narrative regarding Cathay, of which we aro aware, subsequent to the time

of Archbishop Jolin, is that which has been gathered from the recollections of John de' Marignolli, a Florentine Franciscan, who was sent by Pope Benedict XII. with a mission to the Great Khan, in return for one from that potentate which arrived at Avignon from Cathay in 1338, and who spent four years (1342-46) at the court of Cambaluc as legate of the Holy See. These recollections are found in a singular position, dispersed incoherently over a chronicle of Bohemia which the traveller wrote by order of the emperor Charles IV., whose chaplain he was after his return.

But intercourse during.the period in question was not confined to ecclesiastical channels. Commerce also grew up, and flourished for a time even along the vast line that stretches from Genoa and Florence to the marts of Ché-keang and Fuh-keen, The record is very fragmentary and imperfect, but many circumstances and incidental notices show how frequently the remote East was reached by European traders in the first half of the 14th century,— a state of things which it is very difficult to realize when we see how all those regions, when reopened to knowledge two centuries later, seemed to be discoveries as new as the empires which, about the same time, Cortes and Pizarro were conquering in the West.

This commercial intercourse probably commenced about 1310-1320. Monte Corvino, writing in 1305, says it was twelve years since he had heard any news from Europe , the only Western stranger who had arrived in al] that time being a certain Lombard chirurgeon (probably one of the Patarini who got hard measure at home in those days), who had spread the most incredible blasphemies about the Roman Curia and the order of St Francis. Yet even on his first entrance to Cathay Friar John had been accom- panied by one Master Peter of Lucolongo, whom lie describes as a faithful Christian man and a great merchant, and who seems to have remained many years at Peking. The letter of Andrew, bishop of Zayton (1326), quotes the opinion of Genoese merchants at that port regarding a question of exchanges. Odoric, who was in Cathay about 1323-1327, refers for confirmation of the wonders which

he related of the great city of Cansay (i.¢., King-sze, hod. Hang-chow), to the many persons whom he had met at Venice since his return, who had

themselves been witnesses of those marvels. And John Marignolli, some twenty years later, found attached to one of the convents at Zayton, in Fuh-keen, a fondaco or factory for the aceom- modation of the Christian merchants.

But by far the most distinct and notable evidence of the importanee and frequeney of European trade with Cathay, of which silk and silk goods formed the staple, is to be found in the commercial hand-book (circa 1340) of Franceseo Balducci Pegolotti, a elerk and faetor of the great Florentine house of the Bardi, which was brought to the ground about that time by its dealings with Edward ILI. of England. This book, called by its author Libro di divisamentt di Paest, is a sort of trade-guide, devoting successive chapters to the various ports and markets of his time, detailing the nature of imports and exports at each, the duties and exactions, the local eustoms of business, weights, measures, and money. ‘The first two chapters of this work contain instructions for the merchant proceeding to Cathay ; and it is evident, from the terms used, that the road thither was not unfrequently travelled by European merchants, from whom Pegolotti had derived his informa- tion, The route which he describes lay by Azoff, Astrakhan, Khiva, Otrar (on the Jaxartes), Almalik (Gulja in Ili), Kan-chow (in Kansuh), and so to Hang-ehow and Peking. Particulars are given as to the silver ingots which formed the eurreney of Tartary, and the paper-money of Cathay. That the ventures on this trade were not insignificant is plain from the example taken by the author to illustrate the question of expenses on the journey, which is that of amerchant investing in goods there to the amount of some £12,000 (ze. in actual gold value, not as ealeulated by any fanciful and fallacious equation of values).

Of the same remarkable phase of history that we are here considering we have also a number of notices by Mahometan writers. The establishment of the Mongol dynasty in Persia, by which the Great Khan was acknow-ledged as lord paramount, led (as we have already noticed in part) to a good deal of intereourse. And soine of the Persian historians, writing at Tabriz, under the patronage of the Mongol prinees, have told us much about Cathay, especially Rashiduddin, the great minister and historian of the dynasty (died 1318). Wehavealso in the book of thie Moorish traveller Ibn Batuta, who visited China about 1347-48, many very curious and in great

part true notices, though it is not possible to give eredence to the whole of this episode in his extensive travels.

About the time of the traveller first named the throne of the degenerate descendants of Jenghiz began to totter to its fall, and we have no knowledge of any Frank visitor to Cathay in that age later than Marignolli; missions and merehants alike disappear from the field. We hear, indeed, once and again of ecclesiastics despatehed from Avignon, but they go forth into the darkness, and are heard of no more. Islam, with all its jealousy and exelusiveness, had recovered its grasp over Central Asia; the Nestorian Christianity which onee had prevailed so widely was vanishing, and the new rulers of China reverted to the old national policy, and held the foreigner at arm's length. Night descended upon the further East, covering Cathay with those cities of whieh the old travellers had told such marvels, Cambaluc aud Cansay, Zayton and Chinkalan. And when the veil rose before the Portuguese and Spanish explorers of the 16th century, those names are heard no more. In their stcad we have Cuina, Peking, Hangchow, Chincheo, Canton. Not only were the old naines forgotten, but the faet that those places had ever been known before was forgotten also, Gradually new

missionaries went forth from Rome—Jesuits and Domini- cans now; new converts were made, and new vicariats constituted; but the old Traneisean churches, and the Nestorianism with which they had battled, had alike been swallowed up in the ocean of Pagan indifference. In time a wreck or two floated to the surface,—a MS. Latin Bible or a piecc of Catholie seulpture; and when the intelligent missionaries ealled Marco Polo to mind, and studied his story, one and another became convinced that Cathay aud China were one.

But for a long time all but a sagacious few continued to regard Cathay asa region distinct from any of the new-' found Indies; whilst mapmakers, well on into the 17th eentury, continued to represent it as a great country lying entirely to the north of China, and stretehing to the Aretic Sea.

It was Cathay, with its outlying island of Zipangu (Japan), that Columbus sought to reaeh by sailing west- ward, penetrated as he was by his intense eonvietion of the smallness of the earth, and of the vast extension of Asia eastward ; and to the day of his death he was full of the imagination of the proximity of the domain of the Great Khan to the islands and coasts whieh he had discovered. And sueh imaginations are curiously embodied in sone of the maps of the early 16th century, which intermingle on the same ecoast-line the new discoveries from Labrador to Brazil with the provinees and rivers of Marco Polo's Cathay.

Cathay had been the aim of the first voyage of the Cabots in 1496, and it continued to be the object of many adventurous voyages by English and Hollanders to the N.W. and N.E. till far on in the 16th century. At least one memorable land-journey also was made by Englishmen, of which the exploration of a trade-route to Cathay was a chief object,—that in which Anthony Jenkinson and the two Jolinsons reached Bokhara by way of Russia in 1558-1559. The country of which they eolleeted notices at that eity was still known to them only as Cathay, and its great capital only as Cambaluc.

Cathay as a supposed separate entity may be considered to come to an end with the journey of Benediet Goés, the lay-Jesuit. This admirable person was, in 1603, despatehed through Central Asia by his superiors in India with the specifie object of determining whether the Cathay of old European writers, and of modern Mahometans, was or was not a distinct region from that China of which parallel marvels had now for some time been recounted. Benedict, as one of his brethren pronouneed his epitaph, " seeking Cathay found Heaven." THe died at Suhchow, the frontier city of China, but not before he had aseertained that China and Cathay were the same. After the publication of the narrative of his journey (in the Lapeditio Christiana apud Sinas of Trigault, 1615) inexcusable ignoranee alone could eontinue to distinguish between them, and thoughsuchignor- anee lingered many years longer, the result of his explora- tion fitly briugs this prefatory notice to a close. (H. Y.)

General Description of China Proper.

China, as the nae is at present used, embraces within its boundaries the dependencies of Manchuria, Mon- golia, and Tibet, in addition to China Proper. This vast empire extends from 18° 30’ to 53° 25’ N, lat. and from 80° to 180° E. long. It is bounded on the N. by Asiatie Russia along a frontier extending nearly 3000 miles; on the E. by those portions of the Paeifie Ocean which are known in the north as the Sca of Japan, in the central portion as the Yellow Sea, and in the south as the China Sea; on the 8. and 8.W. by the China Sea, Cochin China, and Burmah; and on the W. by Kashmir and Eastern Turkestan, which province has within the last few years been wrested from China by the Ataligh Ghazee.

Great delta plain.

Mountain ranges,

630

The area of China Proper is not more than half that of the whole empire; it extends as far north only as 41° lat., and as far west as 98° long. It is about 1474 miles in length, and its breadth isabout 1355 miles. Its coast line measures about 2500 miles; its land frontier is described as being 4400 miles in length, and its area is said to contain 1,348,870 square miles.

Surface-—One of the most noticeable features in the surface of China is the immense delta plain in the north- eastern portion of the empire, which, curving round the mountainous districts of Shan-tung, extends for about 700 miles in a southerly direction from the neighbourhood of Peking, and varies from 150 to 500 miles in breadth. Commencing in the prefecture of Yung-pig Foo, in the province of Chih-li, its outer limit passes in a westerly direction as far as Chang-ping Chow, north-west of Peking. Thence running a south-south-westerly course it passes westward of Ching-ting foo and Kwang-ping Foo till it reaches the upper waters of the Wer River in Ho-nan. From this point it turns westward and crosses the J/wang- ho, or Yellow River, in the prefecture of Hwai-king. Leaving this river it takes a course a little to the east of south, and passing west of Joo-ning Foo, in the province of ITo-nan, it turns in a more easterly direction as far as Leuchow Foo. From this prefecture an arm of the plain, in which lies the Z’saow Lake, stretches southward from the Hwai Rwer to the Yang-tsze Keang, and

trending eastward occupies the region between the river and Hang-chow Bay. To the north of this arm rises a hilly district, in the centre of which stands Vanking.

The boundary of the plain round the mountainous region of Shan-tung begins at Lai-chow Moo, and describes a huge bow to the west and south, reaching westward to the prefecture of Z'se-nan, and southward to the frontier of the province of Keang-soo, which boundary it follows to the sea, The greater part of this vast plain descends very gently towards the sea, and is generally below the level of the Yellow River,—hence the disastrous inundations which so often accompany the rise of the Hwang-ho. It is the delta of the Yellow River, and also to some extent of the Yang-tsze Keang, and it is chiefly remarkable for its semi- annular shape, within which it encloses the mountain districts of the province of Shan-tung. Owing to the great quantity of soil which is brought down by the waters of the Yellow River, and to the absence of oceanic currents, this delta is rapidly increasing and the adjoining seas are as rapidly becoming shallower. As an instance, it is said that the town of Pootar was 1 le west of the sea-shore, in the year 220 B.c., and in 1730 it was 140 le inland, thus giving a yearly encroachment on the sea of about 100 feet. Again, Seen-shwuy Kow on the Petho was on the sea-shore in 500 a.D., and it is now about 18 miles inland.

The rest of the empire may be described as being either mountainous or hilly. Several ranges of high mountains, in connection with the mountain system of Central Asia, enter the western provinces of the empire, and after traversing the western and southern provinces in various directions dwindle down to low hills as they approach the sea-coast. In the eastern portion of Tibet the Awan-lun range throws off a number of branches, which spread first of all in a south-easterly direction, and eventually take a north and south course, partly in the provinces of Sze-chuen and Yun-nan, where they divide the beds of the rivers which flow into Siam and Cochin-China, as well as the principal northern tributaries of the Yang-tsze Keang. Another range, known as the Tung-nan, or Foo-new Shan, which appears to be the eastern termination of the great Kwan-lun range of Central Asia, and which is said to have several snow-clad peaks, enters China in the southern portion of the province of Kan-suh, and stretches in an easterly direction across the

province of Shen-se into that of Ho-nan, where it finally disappears. ‘This range separates the waters which enter the Hwang-ho, or Yellow River, through the Wei and the Zo from those which flow into the Yang-tzse Keang, through the Kia-ling andthe Han. Forming the northern frontier of the province of Sze-chwen runs the Kew-lung or Po-mung range, which entering China in 102° long. takes a general course of east as far as 112° long., at about which point it is lost sight of in the province of Hoo-pih. In the south the Nan-shan ranges, some peaks of which are said to reach above the snow-level, take their rise in Yun-nan, and after spreading in a series of ranges over the south and east portions of Awang-se trend in an easterly direction, covering the entire province of Kwang-tung. Then turning north-eastward, they occupy the whole area of the provinces of Luh-keen, Keang-se, Ché-keang, [Hoo-nan, and southern Gan-hwuy, until they reach the Yang-tsze Keang ; which river, from the Z’ung-ting Lake to Chin-keang Koo, forms their northern boundary. It is reckoned that this moun- tain region occupies an area of about 300,000 square miles. Besides these more important ranges there are the Lung Mountains in Kan-suh, the Ta-hang Mountains in Shan-se, the Zae Mountains in Shan-tung, and many others, among which may be mentioned the ranges which form the northern frontier of Cheh-li. It will thus be seen that there is a general subsidence from the mountain districts in the western portions of the empire to the central and south-eastern provinces, where the mountains dwindle down to hills, and where the snowy peaks and rugged sides of the ranges in Yun-nan and Sze-chuen are exchanged for the wooded tops and carefully-cultivated terraces of the littoral provinces.

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Jtwers.—The rivers of China are very numerous, and, Rivers.

with the canals, form some of the most frequented high- ways in the empire. The two largest are the Yang-tsze Keang and the Hwang-ho, or Yellow River, the latter of which is less known to fame for its value in a com- mercial sense, than by reason of the vast and destructive floods which have

from time to time caused it to inundate the low-lying country on either side of its banks. Accord- ing to Chinese geographers the Hwang-ho takes its rise in the “ Sea of Stars,” on the eastern side of the Bayen-kara Mountains, in the Mongolian province of Kokonor, where it has gained for itself the name of Ah-urh-tan, or Golden River, from the colour of its waters. For some miles it runs in two streams, and when united takes at first a south-easterly course. Next trending in a north-easterly direction it traverses the province of Kan-swh and passes northwards through the Great Wall until it reaches the rising ground in the neighbourhood of the Jn-shan, Thence curving to the south-east and south it re-enters China through the Great Wall and continues its southerly course, forming the boundary between the provinces of Shen-se and Shan-se as far as T’ung-kwan. Here it makes a sharp bend and runs nearly due east to Kai-fung foo. In the neighbour- hood of this city it enters on the great eastern plain of China, and the alterations which have taken place in its bed between this district and the sea has earned for it the well-deserved title of “the Sorrow of Han.” According to the Chinese records this portion of the river has changed its course nine times during the last 2500 years, and has emptied itself into the sea at as many different mouths, the most northerly of which is represented as having been in about 39° lat., or in the neighbourhood of the present mouth of the Pecho, and the most southerly being that which existed before the last change in 1851-53, in 34° lat. The breaches that were made in the northern bank of the river east of Kai-fung Yoo during the floods of 1851, 1852, and 1853 caused its waters gradually to overflow the low-lying country to the northwards; and these, after spread-

ing over a belt of country about 12 miles in width, struck the bed of the Za-tsing River, and having forced their way into that narrow, clean cut channel, followed it to the sea. The result of this change has been that the old course of the river is dry, and that the muddy dun-coloured waters—hence the name Hwang-ho, or Yellow River—after permanently flooding a large tract of country, are now leading up to another grand catastrophe by destroying the banks of the new channel which they have found for themselves, Already the increased volume of water has added another obstruction to those before exist- ing to the navigation of the river by destroying a large

stone bridge of seven arches at T’se-hoheen, a town situated 210 miles from the mouth, the ruins of which have seriously impeded the course of the stream. But the Hwang-ho is of little value for navigating purposes. At its mouth lies a bar having at its deepest part about from 7 to 9 feet of water only ; further up, about 3 miles below Z’se-hoheen, there isa shoal extending right across its bed, at the deepest point of which there is about 11 feet of water, while in the passage at the extremity of the sunken bridge at 7’se-hoheen there is a depth of only about 5 feet.

A far more valuable river in every way is the Yang-tsze Keang, which takes its rise in the Min Mountains of Tibet, and after a course of 2900 miles empties itself into the Yellow Sea in about 31° lat. In common with most of the large rivers of China, the Yang-tsze Keang is known by various names in different parts of its course. From its source in Tibet to Seu-chow foo in Sze-chuen, it bears the name of Kin-sha Keang, or River of the Golden Sands. From Seu-chow Foo to Yang-chow Foo in Keang-soo, its volume has gained for it the title of Za Keang, or the Great River; and from the ancient name of the district through which it thence passes, it is known for the re- mainder of its course as the Yang-tze Keang, or the Yang- tze River. Chinese geographers state that it has two sources, the more northerly of which gives birth to the Kang-chuh ah-lin at a point about 1600 le to the south- east of the source of the Yellow River; and to the more southerly one of the two the Wa-ko-to-moo-tsing ah-lin, which rises on the south of the range, owes its existence. Both these streams twist and turn eastward for upwards of 200 le, when they unite and form one stream, which flows in an easterly and afterwards southerly course until it enters the Chinese province of Yun-nan at the Hwang- shing Pass, or Pass of Imperial Victory. It then turns northward into the province of Sze-chwen, and thence after receiving several important tributaries it takes an east-north- easterly course, until passing into Loopih it dips south- wards to the boundary of Hoo-nan in the neighbourhood of the Zung-ting Lake, the waters of which contribute largely to swell its volume. From this point it makes a curve northwards as far as Han-kow, receiving on the way the waters of the an Lwer. From Han-kow it bends its course again southwards to the Po-yang Lake. Thence through the province of Gan-hwuy it proceeds in a north-easterly direction until it reaches Vanking, 200 miles from the sea. Here the influence of the tide begins to be felt, and beyond this point it gradually widens into the

great estuary by which it is connected with the ocean. The basin area of the Yang-tsze Keang is reckoned to be about 548,000 square miles, and it is navigable for steamers as far as [-chang, upwards of 1200 miles from its mouth. Unlike the Yellow River, along the navigable portion of the Yang-tsze Keang are dotted many rich and populous cities, among which the chief are Nanking, Gan-king, Kew-keang, Han-kow, and J-chang. Beyond this last- named city the navigation becomes impossible for any but light native craft, by reason of the rapids which occur at

frequent intervals in the deep mountain gorges through which the river runs beteen Awat-chow and J-chang.

Next in importance to the Yang-tsze Keang as a water Grand highway is the Ywn-ho, or, as it is generally known in Canal.

Europe, the Grand Canal. This magnificent artificial river reaches from Hang-chow Joo in the province of Ché- keang to Tien-tsin in Cheh-li, where it unites with the Petho, and thus may be said to extend to Z'ung-chow in the neighbourhood of Peking. After leaving Hang-chow it passes round the eastern border of the Z'az-hoo, or Great Lake, surrounding in its course the beautiful city of Soo-chow, and then trends in a generally north-westerly direction through the fertile districts of AKeang-soo as far as Chin keang on the Yang-tsze Keang. Mr Ney Elias, who in 1868 travelled along the Grand Canal from Chin-keang to the new course of the Yellow River, thus describes the characteristics of this portion of its course :—

The Grand Canal between Chin-keang and Tsin-keang-pu, or in other words, between the Yang-tsze and the old bed of tho Yellow River, . . . is everywhere in good repair, and the adjacent country well irrigated, and apparently in a thriving state, both as regards cultivation, and, to judge by the aspect of the towns on and near its banks, as regards trade also. After crossing the old Yellow River, however, a part of the canal somewhat less known is reached, and the flourishing condition of the country is no longer noticeable; on the contrary, for a distance of about 150 miles, though the

canal it- self is in tolerably good working order, the country in its vicinity has an arid, sterile appearance, and is but thinly populated. There are few towns or villages, and some there are seem neither populous nor busy, though they are not in ruins, and bear but few traces of the rebellion. . . . The canal, which at one time was so deep that at many places the level of the water was above that of the adjacent country, is now everywhere considerably below it, rendering irriga- tion at even a short distance from its banks, without mechanical appliances, almost an impossibility ; even the dry bed of the Loma Lake is scarcely cultivated on account of its elevation above tho level of the canal, though it is only separated from it in some parts by a bank of a few yards in width. It is true that this lake appears never to have been more than a shallow flood lagoon, nevertheless it was some feet below the general level of the country, and was con- nected with the canal by means of water-courses and sluice gates ; andif this is difficult to irrigate how much more so must be the country above and beyond it! This 150 miles being passed over, the Wai Shan (sometimes called Ya Shan) Lake is reached at a small village, called Han-chuang-cha. ‘This is the most southern of a chain of lakes or rather lagoons, which stretch from far to the south of Han- chuang-cha (I believe from near Su-chan-fu on the old Yellow River) to within a few miles of Tse-ning-chow, and which constitute the only important feeder of the Grand Canal to the southward. In the summer they merge one into the other, and form a continuous sheet of water, though very shallow in parts. In winter, when the water is low, these shallow parts are mere morasses, which divide the sheet into three or four separate lagoons. In former days the canal ran in some places by the side of these lagoons, and in others through portions of them, but being everywhere embanked on both sides, it was only dependent upon them for its supply of water, the canal itself forming an unobstructed means of communication through the year. Of late years, however, this section of the canal has been allowed to go to ruin, and those portions only are used which run through the morasses existing in the dry season, the lagoons themselves forming elsewhere the only channel for naviga- tion. Near the northern limit of these lagoons stands the city of Tse-ning-chow, the first place of any importance on the canal north of Tsin-kiang-pu ; itis said to be a place of considerable trade in ordinary times… . Still proceeding northward, a distance from Tse-ning-chow of about 25 miles, the summit level of the canal ig reached near a small town called Nan Wang. It is here that the River /Ven falls into the

canal, a portion of its waters flowing to the south, and the rest to the north, precisely as described by Staunton and other writers. . . . About 80 miles heyond Nan Wang we come to the new Yellow River, the canal for that distance being extremely narrow and shallow—a mere ditch in fact, running be- twecn embankments large enough to confine a stream of infinitely greater volume. The banks along nearly the whole of the Grand Canal between the old and the new bed of the Yellow River, excepting those portions bordering on or traversing the lagoons, arc surrounded by earthen walls crenellated after the fashion of city walls, behind which are stockades at intervals of every few miles. All this work has the appearance of being recently constructed, though in many places it is already being broken up by the country people to make room for cultivation, for they can ill afford to lose that strip of land immediately adjacent to and irrigated by the canal. The villages

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also make an attempt at fortifications, some of them being sur- rounded by carthen or mud walls or moats; and, indeed, many soli- tary farms have somo species of defensive works round them, and in most cases a small, square brick tower within. These towers are rarely met with to the south of the province of Shan-tung —they are probably the ‘‘ water castles ” mentioned by the historian of the Dutch Embassy.

On the west side of the canal, at the point where the Yellow River now cuts across it, there is laid down in Chinese maps of the last century a dry channel whicli is described as being that of the old Yellow River. Leaving this point the canal passes through a well-wooded and hilly country west of Zung-ping Chow, through the city of Chang- Lew Chin and to the east of Tung-chang Foo. At Lin-tsing- Chow it is joined at right angles by the Wee River in the midst of the city, and from thence crosses the frontier into Chih-li, and passing to the west of Zih Chow and Tsang Chow joins the Peiho at Tien-tsin, after having re- ceived the waters of the Ke-to River in the neighbour- hood of Zsing Heen. At Tien-tsin the eanal ends, and the Peiho completes the communication to the vicinity of Peking.

Another of the large rivers of China is the Han Keang, which rises in the Po-mung or Kew-lung mountains to the north of the city of Ming-keang Chow in Shen-se. Taking a generally casterly course from its source as far as Fan-ching, it from that point takes a more southerly direction and empties itself into the Yang-tsze Keang at Han-kow, “ the mouth of the Han.” This river has some noticeable pecu- liarities. Not the least of these is that it is very narrow at its mouth (200 feet) and grows in width as the distance from its mouth increases. Another marked feature is that the summer high-water line is for a great part of its course, from E-ching Heen to Han-kow, above the level of its banks, the result being that were it not for artificial barriers the whole of the surrounding country would be under water for a great part of the year. In the neighbourhood of Seen-tacu Chin the elevation of the plain above low-water is 11o more than 1 foot, and in summer the river rises about 26 feet above its lowest level. ‘To protect themselves against this inevitably reenrring danger of inundations the natives have here, as elsewhere, thrown up high embank- rents on both sides of the river, but at a distance from the natural banks of about 50 to 100 feet. This inter- vening space is flooded every year, and by the action of the water new layers of sand and soil are deposited every sum- mer, thus strengthening the embankments from season to season. In summer the river would be navigable for steamers of moderate size as far as Laou-ho Kow, which is situated 180 le above Fan-ching, but in winter it would be quite impossible to reach the latter place. The chief trading places on the JJan-keang are Sha-yang Clin, Yo- Kow, Sin-Kow, Seen-taou Chin, Fan-ching, and Laou-ho Kow.

In the southern provinces the Se-keang, or Western River, is the most considerable. This river takes its rise in the prefecture of Kwang-nan Foo in Yun-nan, whence it reaches the frontier of Kwang-se at a distance of about 90 le from its source, Then trending in a north-easterly direction it forms the boundary between the two provinces for about 150 le. From this point it takes a generally sonth-easterly course, passing the cities of Teen Chow, Lung-e Chow, Shang-lin Heen, Lung-gan Heen, Yung-kang Chow, and Nan-ning Foo to Yung-shun een. ere it makes a bend to the north-east, and continues this general direction as far as Sin-chow Foo, a distance of 800 le, where it meets and joins the waters of the Keen Keang from the north. Its course is then easterly, and after passing Woo-chow Foo it crosses the

frontier into Kwang-tung, and finally empties itself into the China Sea in the neighbourhood of Macao. Like the Yang-tsze Keang this river is known by

various natacs in different parts of its course. source to Nan-ning Foo in Kwang-se it is called the Se-yang Keang, or River of the Western Ocean; from Nan-wing Foo to Sin-chow Foo it is known as the Yuh-keang, or the Bending River; and over the remainder of its course it is

From its

recognized by the name of the Se-keang or Western River. The Sekeang is navigable as far as Shaou-hng, 130 miles, for vessels not drawing more than 15 fect of water, and steamers of a light draught might easily reach Woo-chow Foo, in Kwang-se, which is situated 75 miles further up. In winter the navigation for junks is difficult above Woo-chow Foo, and it is said that rapids are met with about 100 miles beyond that city.

The Petho is a river of importance as being the high water-way to Peking. Taking its rise in the Se-shan, or Western Mountains, beyond Peking, it passes the city of Lung-chow, the port of Peking, and Tien-tsin, where it meets the waters of the Yun-ho, and empties itself into the Gulf of Pih-chih-li at the village of Zakoo. The DPetho is navigable for small steamers as far as Tien-tsin during the greater part of the year, but throughout the winter months, that is to say, from the end of November to the beginning of March, it is frozen up.

Lakes,——There are numerous lakes in the central provinces of China, The largest of these is the Zwng-ting Lake inl Hoo-nan, which, according to Chinese geographers, 1s upwards of 800 le, or 266 miles, in circumference. In native gazetteers its various portions are known under distinct names; thus it is said to include the 7’sing-tsaou, or Green Grass Lake; the Ung, or Venerable Lake ; the Chih-sha, or Red Sand Lake; the Jwang-yth, or Imperial Post-house Lake ; the Gan-nan, or Peaceful Sonthern Lake; and

the Z’a-tung, or Great Deep Lake. In ancient times it went by the name of the Mew-keang Loo, or Lake of the Nine Rivers, from the fact that nine rivers flowed into it. During the winter and spring the water is so low that the shallow portions become islands, separated by rivers such as the Seang and Yuen, and numberless streams ; but in summer, owing to the rise in the waters of the Yang-tsze Keang, the whole basin of the lake is filled. The Poyang Lake is also subject to a wide difference between high and low water, but not quite to the same extent as the Pung-tang Lake, and its landmarks are more distinctly defined, The Tai Lake, in the neighbourhood of Soo-chow Joo, is also celebrated for its size and the beauty of its surround- ings. It is about 150 miles in circumference, and is dotted over with islands, on which are built temples for the devotees of religion, and summer-houses for the votaries of pleasure from the rich and voluptuons cities of Uang-chow and Soo- chow. ‘The boundary line between the provinces of Cheé- keang and Keang-soo crosses its blue waters, and its shores are divided among thirteen prefectures. Besides these lakes there are, among others, two in Yun-nan, the Teen- che near Yun-nan Foo, which is 40 miles long and is con- nected with the Yang-tsze Keang by the Poo-to Iter, and the Urh-hai to the east of the city of Z’a-le.

Loess,—-One of the most remarkable features in the physi- cal geography of China is the existence of a vast region of loess in the northern portion of the empire. This peculiar formation covers the province of Chh-li (with the exception of the alluvial plain), Shan-se, northeru Shen-se, Kan-suh, and northern J/o-nan, constitnting altogether an area of about 250,000 square miles. Loess is a solid but friable earth of a brownish-yellow colour, It spreads alike over high and low grounds, smoothing off the irregularities of the surface, and is often to be found covering the sub-soil to a depth of more than 1000 feet. It has a tendency to vertical cleavage, and wherever a river cuts into it, the loess encloses it between perpendicular cliffs, in many places 500 feet in height. These when washed by the

Lakes,

Loess.

Provinces.

water are speedily undermined, and the loess breaks off in vertical sheets, which fall into the river and are carried down by the stream. In this way have been deposited the sediments which to a great extent constitute the great plain, aud render the Gulf of Pzk-chih-li and the Yellow Sea so shallow. From an economical point of view the loess is invaluable to the natives of the north of China. In its perpendicular cliffs which are removed from the action of running water are dug out innumerable caves, in which a large majority of the people inhabiting the loess region dwell, while its surface yields abundant crops, requir- ing no application of manure and but slight expendi- ture of labour in preparation. Wherever it is found, thercfore, whether on the plain or at an elevation of 7000 or 8000 feet, it is available for agricultural purposes. The Chinese call it Hwang-too, or " Yellow Earth," and it has been suggested that the imperial title Mwang-te, "Yellow Emperor," or "Ruler of the Yellow," has had its origin in the fact that the emperor was lord of the loess or the " Yellow Earth,"

Provinces.—China Proper is divided into nineteen pro- vinces,—Chih-li, Shan-tung, Shan-se, Ho-nan, Keang-soo, Gan-hwuy, Keang-se, Ché-keang, Fuh-keen, [Hoo-pth, Hoo- nan, Shen-se, Kan-suh, Sze-chuen, Kwang-tung, Kwang-se, Kwer-chow, Yun-nan, and Shing-king in Manchuria.

The metropolitan province of Chzh-li, in which is situ- ated Peking, the capital of the empire (see PEKING), con- tains eleven prefectural cities, aud occupies an area of 58,949 square miles. By the latest census reports the population was returned as 27,000,000. This province forms part of the great delta plain spoken of above, with the exception of the mountain ranges which define its northern and western fronticr. It is bounded on the LE. by the Gulf of Prh-chth-li and Shan-tung, and on the §. by Shan-tung and JIo-nan. The proportion of Maho- metans among the population is very large. In Peking there are said to be as many as 20,000 Mahometan families, and in Paou-ting Foo, the capital of the province, there are about 1000 followers of the Prophet. The extremes of heat and cold in Chih-li are very marked, as a glance at the accompanying table of the temperature at Tven-

tsin during the year 1861, as chronicled by Dr Lamprey’s self- registering thermometer, will show.

| Thermometer (Fahr.) Thermometer (Falir.) 1°61, Co ar Se 1861 a Maximum. Minimum. Maximum.) Minimum. [gg arn ee a a 9 ce January….| 38 0°8 diy ccooranee 108 61 February…| 46 1°5 August…... 100 60°5 Mareh…... 68 18 September .| 92 40 oy 87 35 October….. a7 40 BAY aah sas os | 94 | 41 November..’ 42 17‘5 UMMC... 42. | 107 53 December..! 50 3 la eee ee —

During the months of December, January, and February the rivers are frozen up, and even the Gulf of Peh-chzh-lz is fringed with a broad border of ice. There are four rivers of some importance in the province, namely, the Perho, which has been described above; the Wén-ho, which rises in the mountains in Mongolia, and flowing to the west of Peking, forms a junction with the Peiho at Tven-tsin ; the Shang-se-ho, which rises in the mountains on the north of the province of Shan-se, and takes a south-easterly course as far as the neighbourhood of Ai Chow, from which point it trends north-east, and eventually joins the Wdn-ho some 15 miles above Z%en-tsin ; the Poo-to-ho, which rises in Shan-se, and after running a parallel course to the Shang- se-ho on the south, empties itself in the same way into the Wan-ho ; and the Lan-ho, which rises in Mongolia, enters the province on the north-east after passing to the west

of Jehol, passes the city of Yung-ping Ico in its course (which is south-easterly) through Chzh-li, and from thence winds its way to its mouth at the north-eastern bound- ary of the Gulf of Pih-chih-lz. ‘The province contains three lakes of considerable size. The largest is the Z’a-loo-tsze Loo, which lies in 37° 40’ lat. and 115° 20’ E. long.; the second in importance is one which is situated to the E. of Paou-ting Foo; and the third is the 7’oo-loo-tsze Hoo, which lies E. by N. of Shan-tth Foo. Four high roads radiate from Peking: one leading to Urga by way of Seuen-hwa Foo, which passes through the Great Wall at Chang-kea Kow ; another, which enters Mongolia through the Koo-pei Kow to the north-east, and after continuing that course

as far as Lung-ning turns in a north-westerly direction to Dolanor ; a third striking due east by way of Zung-chow and Yung- ping Foo to Shan-hat Kwan, the point where the great wall terminates ou the coast ; and a fourth which trends in a south-westerly direction to Paou-ting Moo and on to Tas-yuen Loo in Shan-se. The mountain ranges to the north of the province abound with coal, notably at Chai-tang, Tai-gan-shan, Miaou-gan-ling, and /oo-taow in the Se- shan or Western Hills. “At Chai-tang,” Baron von Richthofen says, “I was surprised to walk over a regular succession of coal-bearing strata, the thickness of which, estimating it step by step as I proceeded gradually from the lowest to the highest strata, exceeds 7000 feet.” The coal here is anthracite, as is also that at Ta-gan-shan, where are found beds of greater value than any in the neighbourhood of Peking. In Seuen-hwa Joo coal is also found, but not in such quantities as iu the places above named. Iron and silver also exist in small quantities in different parts of the province, and hot and warm springs are very common at the foot of the hills along the northern and western edges of the province. ‘The principal agricul- tural products are whcat, kaou-leang, oats, millet, maize, pulse, and potatoes. Fruits and vegetables are also grown in large quantities. Of the former the chief kinds are pears, apples, plums, apricots, peaches, parsimmons, and melons. Z%en-tsin is the Treaty Port of the province, and by the Consular Trade Report for 1874 we tind that the total value of the merchandize exported from that city during the year amounted to 1,144,893 taels, and that of the goods imported to 17,682,684 taels. The articles which figure most conspicuously in the lists of exports are dates, dried lily flowers, wool, tobacco, and rhubarb; and the most valuable of the imports are shirtings, drills, T-cloths, jeans aud twills, opium, woollens, stcel, lead, necdles, Japanese seaweeds, and sugar.

The province of Shan-tung, “or East of the Mountains,” is bounded on the N. by the province of Chih-lu and the Gulf of Pih-chih-li, on the E. by the Yellow Sea, on the 8. by Keang-soo and the Yellow Sea, and on the W. by Chih-li. Jt contains an arca of 65,104 square miles, and the population is estimated to be 30,000,000. It is divided into ten prefectures, with as many prefectural cities, of which Tse-nan Foo, the provincial capital, is the chief. The physical features of the province are very plainly marked. ‘The centre and eastern portions are occupied by a series of mountain ranges running north-east and south- west, between which he fertile valleys, while the

north- western, southern, and western portions form part of the great delta plain of the north of China. The most con- siderable range of mountains is that which lies to the north of the city of Zaz-gan Foo, of which the highest peak is the 7’at-shan, a mountain which has been famous in Chinese history for more than 4000 years, and to which at the present day hundreds of pilgrims annually resort. Another important range is the Laou-shan, which fringes the south-eastern coast for about 18 miles. With the exception of the Yellow River, which a its new course

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Shan-se,

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traverses the province in a north-easterly direction to the sea, there are no large rivers in Shan-tung. The most considerable are the Wei, which flows into the Gulf of Pih-chih-li ; the Yih, which empties itself into a lake lying to the east of the Grand Canal; and the Z’a-wan, which rises at the southern foot of the Yt Mountains and terminates its course in the Grand Canal. There are several lakes in the province, notably the He-shang Hoa and the Man- shang Hoo, both of which border on the Grand Canal in the south-west. Large quantities of foreign and southern goods are consumed in the populous districts surrounding these lakes, the waters of which afford means of export for the cotton, silk, coal, grain, &c., which are produced in the fertile tracts lying in their neighbourhood. Speaking generally the province is not a fertile one. Not being a loess region, the mountains are unproductive, and yield only brushwood and grass, while the plain to the north is so impregnated with salt that it is almost valueless, especially near the sea, for agricultural purposes. The valleys between the mountains and the plain to the south- west are, however, extremely rich and fertile. The chief wealth of Skan-tung consists in its minerals, the principal of which is coal. There are four large coal-fields and several smaller ones now being worked in the province, the most considerable of which lies in the valley of the Laow- foo River in the centre of the province. The coal and coke from this district are conveyed by road to the city of Le-tsing on the Yellow River, a distance of about 75 miles, from whence they are exported in all

directions. Another large field lies on the plain a little to the south of Yth-chow Foo in the south.

The province of Shan-se is bounded on the N. by Mon- golia, on the E. by Chzh-li, on the 8. by Ho-nan, and on the W. by Shen-se. It occupies an area of 53,268 square miles, and contains besides its capital, Z'ae-ywen Loo, eight prefectural cities. The population is returned as being 14,004,210. The configuration of Shan-se is note- worthy, forming, from its southern frontier to as far north as Ning-woo Foo—an area of about 30,000 square miles —a plateau elevated from 5000 to 6000 feet above the level of the sea, the whole of which is one vast coal-field. The northern and western limits of the plateau are bounded by high mountain ranges trending south-west and north-

east. Down the central line of the province from north to south lies a curious series of deep depressions, all of which are ancient lake basins. But though forming a series it is plain that these lakes were not formerly connected with each other, some being separated from those next adjoining by high ridges, and being drained by different rivers: and in different directions. Shan-se is one of the most remark- able coal and iron regions in the world, and Baron von Richthofen gives it as his opinion that the world, at the present rate of consumption of coal, could be supplied for thousands of years from Shan-se alone. The neighbourhood of Z'se-chow Joo in the south of the province abounds in both coal and iron, and has probably, partly by reason of its situation being within reach of the populous plain of Hwai-king Foo, of the Yellow River, of Zavuw-kow Chin and Sew-woo JTeen (the shipping places for Z%en-tsin and the Grand Canal), and of Ho-nan Foo, furnished more iron to the Chinese than any other region of a similar extent in the empire. The iron is of great purity and is easily fusible, while the necessary means for manufacturing it, such as all sorts of clay and sand for crucibles, moulds, &c., and a very superior anthracite coal, lie ready to hand. The coal is of two kinds, bituminous and anthracite, and the line of demarcation between the two is formed by the hills which are the continuation of the Ho-shan range, the fields of bituminous coal being on

the west of these hills, and those of anthracite on the east. In the neighbourhood of Ping- ting Chow the extent of the coal-field is incalculable; and speaking of the whole plateau, Baron von Richthofen says, “These extraordinary conditions, for which I know no parallel on the globe, will eventually give rise to some curious features in mining. It may be predicted that, if a railway should ever be built from the plain to this region— and there is no other means of ever bringing to their due account its mineral resources—branches of it will be con- structed within the body of one or other of these beds of anthracite, which are among the thickest and most valuable known anywhere, and continue for miles underneath tho hills west of the present coal-belt of Ping-ting Chow. Such a tunnel would allow of putting the produce of the various coal-beds immediately on railroad carts destined for distant places.” Salt is produced in the prefecture of Ping-yang in the south of the province, both from a salt lake and from the alluvial soil in the neighbourhood of the Fun River. In agricultural products the province is poor, and as the means of transport at present existing are rude and in- sufficient, all kinds of food command unusually high prices. Meat is a rare luxury, and salt fish, the usual substitute for meat, is consumed only by the wealthier classes. As a rule the people are poor, and in the moun- tainous districts are subject to famine and starvation. The only waggon road leading into and through Shan-se is the great highway from Peking to Se-gan Foo, whicli enters Shan-se west of Ching-ting Foo, and leaves the province at the Zwng-kwan.at the great bend of the Yellow River.

The province of Ho-nan is bounded on the N. partly Ho-nan.

by the Yellow River (which it crosses to the west of Jo- nan Joo, forming an arm northwards between the pro- vinces of Shan-se and Chih-li), on the W. by Shen-se, on the 8. by Hoo-peh, and on the E. by Gan-hwuy. It occupies an area of 65,404 square miles, and contains nine pre- fectural cities. Its capital is Ho-nan Foo. The prefecture of Hwae-king, north of the Yellow River, consists of a fertile plain, “‘rendered park-like by numerous plantations of trees and shrubs, among which thick bosquets of bamboo contrast with the gloomy groves of cypress.” All kinds of cereals grow luxuriantly, and the general productiveness of the district is indicated by the extreme denseness of the population, The most noticeable feature in that portion

of the province which is properly called Ho-nan, or “south of the River,” is the Foo-new Shan range, which runs east and west across this part of the province. As the Kwan-lun range, it forms an almost impassable barrier between Kokonor and Tibet, and in China it separates com- pletely the northern from the central provinces. Coal is found on the south of the Yellow River in the districts of Ho-nan Foo, Lushan, and Joo Chow. The chief products of the province are, however, agricultural, especially in the valley of the Zang-ho and Pe-ho, which is an extensive and densely populated plain running north and south from the Foo-new Shan. Cotton is also grown extensively and forms the principal article of export, and a considerable quantity of wild silk is produced from the Foo-new Shan. Three roads from the east and south unite at J7o-nan Foo, and one from the west. The southern road leads to Joo Chow, where it forks, one branch going to She-ke-chin, connecting the trade from Fan-ching, Han-kow, and the Han River generally, and the other to Chow-kea-kow near the city of Chin-chow Foo, at the confluence of the three rivers which unite to form the Sha-ho; the second road runs parallel with the Yellow River to Kai-fung Foo ; the third crosses the Yellow River at Mang-tsin Heen, and passes thence in a north-easterly direction to Hwae-king Foo, Sew-woo Heen, and Wei-hwuy Foo, at which place it joins the high road from Peking to Fan-ching ; and the western road follows the southern bank of the Yellow River for 700 le to its great bend at the fortified pass known as the Z’ung-kwan, where it unites with the great waggon road leading through Shan-se from Peking to Se-ngan Foo.

The province of Keang-soo is bounded on the N. by Shan-tung, on the 8. by Ché-keang, on the W. by Gan- hwuy, and on the E. by the sea. It occupies an area of 45,000 square miles, and the population, which is larger than that of any other province of China, is estimated at

37,843,501.

Northern China. There are no mountains within its limits, and but few hills It is watered as no other province in China is watered. The Grand Canal

runs through it from south to north; the Yang-tsze Keang crosses its southern portion from west to east; it possesses several lakes, of which the Z'ai-hoo is the most noteworthy, and numberless streams connect the canal with the sea. Its coast is studded with low islands and sand-banks, the results of the deposits brought down by the Yellow River during the different periods in which in the course of its history it has flowed into the Yellow Sea. Keang-soo is rich in places of interest. Manking, "the Southern Capital," was the seat of the Chinese court until the commence- ment of the 15th century, and in modern times it has been famous as having been the headquarters of the Tai-ping rebels from the year 1853, when they took the city by assault, to 1864, when its garrison yielded to Col. Gordon's "ever victorious army" (see NanKinG), and Hang-chow [oo and Soo-chow Foo on the Zat-hoo, are reckoned to be the most beautiful cities in China. ' Above there is Paradise, below are Soo and Hang," says the Chinese proverb. Of late years also Shang-hat has earned for itself a place among the notabilities of the province. Tea and silk are the principal articles of commerce produced in Keang-soo, and next in importance are cotton, sugar, and medicines. The silk manufactured in the looms of Soo-chow is famous all over the empire, as a proof of which it may be mentioned that, on the occasion of the marriage of the late emperor Tung-che, large orders were received by the manufacturers in that city for silken goods to be bestowed as imperial presents and to be converted into wedding garments. In the mountains near Nanking, coal, plumbago, iron ore, and marble are found. Skang-hai on the Woo-sung River, and Chin-keang on the Yang-ts:e Keang, are the two Treaty

Keang-soo forms part of the great plain of

Ports in the province. According to the trade reports for 1874, the value of the goods exported from Shanghai in that year amounted to 27,541,834 taels, and that of those imported to 89,636,343 taels. From Chin-keang during the same period, £317 ,277 worth of merchandize was exported, while the value of the imports amounted to £3,527,066. In explanation of this latter figure the British vice-consul writes, "with the exception of

opium, the sale of which has steadily advanced since the opening of the port (in 1861), all the principal articles of import exhibit a decline."

The province of Gan-hwuy "Peace and Plenty," is Gan-hwuy

bounded on the N. by Ho-nan, on the HE. by Keang-soo and Ohékeang, on the 8. by Keang-se, and on the W. by Hoo-pih and Ho-nan. It covers an area of 48,461 square miles, and contains a population of 34,108,059 souls. Its principal city is Gan-king on the Yang-tsee Keang, besides which it numbers seven prefectural cities. 'The southern half of the province, that portion south of the Yang-tsee Keang, forms part of the Nan-shan, or hilly belt of the south-eastern provinces, and produces, besides cotton and iron ore, large quantities of green tea. Gan-hwuy is one of the most productive provinces of China. Over the whole of its southern portion tea is largely grown, notably in the districts of Lwuy-chow Foo, Tung-lew, Ta-tung, and Woo-hoo. Speaking of this part Baron von Richthofen says, "The exuberant fertility of the soil in the lower portions of the province is not excelled by anything I have seen in temperate climates. No expense has, therefore, been spared in protecting the lowlands by embankments, and introducing a perfect system of irrigation. Both deserve the highest admiration. On the King Rover I have walked for miles through fields of hemp the stalks of which were from 11 to 13 feet high. Cotton, too, is raised in large quantities." The Shun-gan Keang is the prin- cipal river of the province, and is of great importance for foreign commerce, supplying as it does direct water com- munication between some of the principal tea-growing dis- tricts and the neighbourhood of Hang-chow.

The province of Keang-se is bounded on the N. by Keang-se.

Hoo-pih and Gan-hwuy, on the 8. by Kwang-tung, on the E. by Fuh-keen, and on the W. by Hoo-nan. It extends over an area of 72,176 square miles, and its population by the last census was returned as being 19,000,000. It is divided into fourteen prefectures, and the provincial capital is Van-chang Foo, a city situated on the Kea Keang, about 35 miles from the Po-yang Lake, into which the river empties itself. The whole province is mountainous, being traversed in a south-westerly and north-easterly direction by the Wan-shan ranges. The largest river is the Kea Keang, which rises in the mountains in the south of the province and flows westward into

the Po-yang Lake as mentioned above. During the summer time it has water of sufficient depth for steamers of light draught as far as Nan-chang, and it is navigable by native craft for a considerable distance beyond that city. Another river of note is the Chang Keang, which has its source in the province of Gan-hwuy, and flows into the Po-yang Lake, connecting in its course the Woo-yuen district, from whence come the celebrated " Moyune," green teas, and the city of King-tth-chin, celebrated for its pottery, with Jaou-chow Foo on the lake. 'The black "Kaisow" teas are brought from the Ho-kow district, where they are grown, down the River Kin to Juy-hung on the lake, and the Sew-ho connects by a navigable stream L-ning Chow, in the neigh- bourhood of which city the best black teas of this part of China are produced, with Woo-ching, the principal mart of trade on the lake. 'The principal productions of the province are tea (of which 32,733,053 Ib were exported. in 1874), China ware, grass cloth, hemp, paper, tobacco,

and tallow. Kew-keang, the Treaty Port of the province, is situated on the Yang-tsze Keang, a short distance above the junction of the Po-yangy Lake with that river.

The province of Chékeang is bounded on the N. by the province of Keang-soo, on the E. by the sea, on the 8. by the province of /uh-keen, and on the W. by the provinces of Keang-se and Gan-hwuy. It occupies an area of about 36,000 square miles, and contains a population of 21,000,000. With the exception of a small portion of the great delta plain, which extends across the frontier from the province of Keang-soo, and in which are situated the famous cities of Moo Chow, Kea-hing, Hang-chow, Shaou-hing, and Ning-po, the province forms a portion of the Van-shan of south-eastern China, and is hilly throughout. The Van-shan ranges run through the centre of the province from §.W. to N.E., and divide it into a northern portion, the greater part of which is drained by the 7'seen-tang- keang, and a southern portion which is chiefly occupied by the Za-che basin. The valleys enclosed between the moun- tain ranges are numerous, fertile, and

for the most part of exquisite beauty. The hilly portion of the province furnishes large supplies of tea, and in the plain which extends along the coast, north of Ningpo, a great quantity of silk is raised. In minerals the province is poor. Coal and iron are occasionally met with, and traces of copper ore are to be found in places, but none of these minerals exist in sufficiently large deposits to make mining remunerative, The principal cities are Z/ang-chow and the Treaty Port of Ning-po. In the foreign trade returns for Ving-po for 1874 the value of the imports during the year is described as having been £2,565,179, and that of the exports as £2,337,948. Among the latter articles we find tea, silk, cotton, dried cuttle fish, paper fans, straw hats, and medicines occupying the most prominent positions. The principal import was opium, the value of which alone amounted to £1,129,668. Cotton piece goods, annexed to which stands the next largest figure, were imported to the value of £430,692. Opposite Ning-po, at a distance of about 50 miles, lics the sland of Chusan, the largest of a group bearing that general name. This island is 21 miles long, and is about 50 miles in circumference. It is very mountainous, and is surrounded by numerous islands and islets. On its south side stands the walled town of Zing- hat, in front of which is the principal harbour. The population is returned as being 50,000.

The province of Muh-keen, or, as it used to be called, fin, is bounded on the N. by the province of Ché-keang, on the 8. by that of Awang-tung, on the W. by that of Keang-se, and on the E. by the sea. It occupies an area of 53,480 square miles, and its population is estimated at 14,777,410. The provincial capital is Puh-chow Foo, and it is divided into eleven prefectures, besides that ruled over by the prefect of the capital city. Juh-keen is generally mountainous, being overspread by the Wan-shan ranges, which run a general course of N.E. and §.W. The principal river is the Min, which is formed by the junction, in the neighbourhood of the city of Yen-ping Foo, of three rivers,—namely, the Keen-ke, which takes its rise in the mountains on the western frontier in the prefecture of Keen-ning Foo, the Fuh-tun Ke, the source of which is found in the district of Kwang-tsth in the north-west of the province, and the Shaow Ke, which rises in the moun- tains in the western district of Ving-kwa. From Y en-ping Joo the river takes a somewhat south-easterly course, and after passing along the south face of

the city of Muh-chow oo, empties itself into the sea about 30 miles below that town. Its upper course is narrow and rocky and abounds

in rapids, but as it approaches Fwh-chow Moo the channel widens, and the current becomes slow and even. Its depth is very irregular, and it is navigable only by native boats of a small class. Two other rivers flow into the sea near the island of Amoy, neither of which, however, is navigable for any distance from their mouths owing to the shallows and rapids with which they abound. The soil of the province is, as its name, “ Happy Establishment,” indicates, very productive, and the scenery is of a rich and varied character. Most of the hills are covered with verdure, and the less rugged are laid out in terraces. The principal products of the province are tea, of which the best kind is that known as Bohea, which takes its name, by a mispronunciation, from the Woo-e Mountains, in the prefec- ture of Keenning Foo, where it is grown; grains of various kinds, oranges, plantains, lichis, bamboo, ginger, gold, silver, lead, tin, iron, salt (both marine and rock), deers’ horns, beeswax, sugar, fish, birds’ nests, medicine, paper, cloth, timber, &e. Luh-keen boasts of two Treaty Ports, uh- chow Foo and Amoy. The trade reports for 1874 show that the value of goods imported in foreign vessels to Fuh-chow Foo in that year amounted to £1,332,387, 11s. 8d., and that that of goods similarly exported amounted to £4,397,320, 19s. 4d. The chief articles of export from Amoy are tea, sugar, and sugar candy ; of tea £1,129,090 worth was exported during the year 1874.

The Island of Formosa, or Taiwan, “the Great Bay,” Island of as the Chinese call it, forms part of the province of /wh- Formosa.

keen. Situated at a distance of about 80 or 90 miles from the mainland, its highest mountains can be easily recog- nized from the coast near Amoy. And so when Chinese historians assert that its existence first became known to their ancestors in the ycar 1480, they probably mean that at that date emigrants from the mainland first gained a footing in the island. At all events, when the Japanese two centuries Jater attempted to establish a

colony in the island, they found there a Chinese population sufliciently numerous to be formidable. The island stretches from lat. 21° 53’ 30” to lat. 25° 33’. In shape it is long and narrow. Its greatest width is about 70 miles, and it tapers off to a fine point at its southern extremity. A back- bone of mountains runs from north to south through almost its entire length, leaving a plain on the western and northern portions. These level districts are occupied by Chinese settlers, while the mountains and their eastern slopes to the sea are inhabited by native tribes. The fertility of the plains has gained for Formosa the name of the Granary of China. On every available piece of Jand fields of ricc and sugar are carefully cultivated, and recom- pense the farmer by yielding him constant and abundant crops. These alone, in addition to such products as jute, grass cloth, fibre, rice paper, and ratan, would make the island a valuable possession; but far more precious are the sulphur and the camphor, which are obtained from the mines and from the mountains of the island, and which are claimed by the Government as Crown monopolies. When taken from the mine the sulphur is boiled in iron boilers until the slate-like mineral assumes a treacle-like con- sistency. This is constantly stirred until every impurity is separated from the sulphur, which is then ladled out into wooden tubs shaped like sugar-loaves. In these it is left to cool, and the conical cake is freed from the tub by the simple process of knocking out the bottom of the latter. As the gigantic laurels from which the camphor is obtained are found only in the mountains in the possession of the natives, the acquisition of a constant supply is somewhat difficult. In 1874, however, 14,3804 cwts. of this com- modity were exported from the ports of Zam-suy and Kelung. Petroleum also adds to the riches of the island. The Treaty Ports in Yormosa are Taiwan Foo (including

Hoo-pih.

Hoo-nan.

PROVINCES. |

Ta-kow) on the south-west coast, and Zam-suy (includ- ing Kelung) on the north-west and north coast. The foreign trade returns for Zat-wan Foo for 1874 show that goods to the value of £1,678,858 were imported during the year, and that £1,840,016 was the value of the exports during the same

period. The Z’am-suy returns present much smaller totals; £304,243 represents the value of the imports, and £203,428 that of the exports in

1874.

The province of JZoo-pih, “North of the Lakes,” is bounded on the N. by 2/o-nan, on the E. by Gan-hwuy, on the 8. by JZoo-nan, and on the W. by Shen-se and Sze- chuen. It occupies an area of 70,450 square miles, and contains a population of 27,370,098. The most important city within its borders is the Treaty Port of //an-kow, besides which it contains ten other prefectural] cities. The greater part of the province forms a plain, and its most noticeable feature is the Man iver, which runs in a south-easterly direction across the province from its north- westerly corner to its junction with the Yang-tsze Keang at Han-kow, The products of the an valley are exclusively agricultural, consisting of cotton, wheat, rape seed, tobacco, and various kinds of beans. Vegetable tallow is also exported in Jarge quantities from this part of L[oo-pih. Gold is found in the Zan, but not in sufficient quantities to make working it more than barely remunerative. It is washed every winter from banks of coarse gravel, a little above L-ching Leen, on which it is deposited by the river. Kvery winter the supply is exhausted by the washers, and every summer it is renewed by the river. Baron von Richthofen reckoned that the digger earned from 50 to 150 cash a day. Only one waggon road Jeads northwards from J/oo-pth, and that is to Van-yang Foo in Ho-nan, where it forks, one branch going to Peking by way of Kai-fang foo, and the other into Shan-se by J/o-nan Foo. Accord- ing to the Consular Trade Reports for 1874, the value of the foreign trade at l/an-kow during that year amounted to £9,775,754, of which sum £4,388,113 represents the value of the imports, and £5,387,641 that of the exports.

The province of Moo-nan, “South of the Lakes,” is bounded on the N. by Hoo-pih, on the E. by Keang-se, on the 8. by Awang-se and Kwang-tung, and on the W. by Kwei-chow and Sze-chuen. It occupies an area of 84,000 square miles, and its population is estimated at 18,652,507. The provincial capital is Chang-sha Foo, in addition to which it counts eight prefectural cities within its boundaries. It is essentially a province of hills, the only plain of any extent being that around the TZ’ung-ting Lake, but this extends little beyond the area which in summer forms part of the lake. To the north

of Hang-chow I’oo detached groups of higher mountains than are found in the southern portion of the province are met with. Among these is the Hang-shan, one of the]Woo-yo, or five sacred mountains of China, upon which the celebrated tablet of Yu was placed. The principal rivers of the province are—(1.) The Seang- keang, which takes its rise im the Van-shan, and empties itself into the Zung-ting Lake ; it is navigable for a great distance from its mouth, and the area of its basin is 39,000 square miles; (2.) The Z’sze-keang, the basin of which covers an area of 10,000 square miles, and which is full of rapids, and navigable only for the smallest kinds of boats ; and (3.) The Yuen-keang, a large river, which has some of its head-waters in the province of KAwev-chow, and which empties itself into the Zung-ting Lake in the neighbourhood of Chang-tih Foo ;—its basin has an area of 34,300 square miles, 22,500 of which are in the province of Hoo-nan, and 12,500 in that of Kwer-chow; its navigation is difficult and dangerous, and only smal] boats are able to pass beyond LHang-kea, a mart situated about 500 le above

Chang-tth Foo; and (4.) The Ling-keang, which flows from the tea district of Ho-fung Chow to the Tung-ting Lake. Its basin covers an area of about &000 square miles, and it is navigable only in its Jowest portion. The principal places of commerce are—(1.) Seang-tang, on the Seang-keang, which is said to contain 1,000,000 inhabi- tants, aud to extend three miles Jong by five le deep; (2.) Chang-sha Foo, the provincial capital on the same river ; and (3.) Chang-tih Foo, on the Yuen-keang. The pro- ducts of the province are tea (the best quality of which is grown at Gan-hwa, and the greatest quantity at Ping- keang), hemp, cotton, rice, paper, tobacco, tea-oil, and coal. This last is by far the most important of the mineral] products of J/oo-nan. The whole of the south- eastern portion of the province is one vast coal-field, extending over an area of 21,700 square miles, his area is divided into two nearly equal parts,—one, the Luy River coal-fields, yielding anthracite, and the other the Seang Iter coal-fields, yielding bituminous coal. The people are, as a rule, more generally prosperous than are the inhabitants of the other provinces, and Baron von Richthofen, in the course

of his journey through the pro- vince, noticed with surprise the number of fine country seats owned by rich men who had retired from business, which were scattered over the rural districts. Almost all the traffic is conveyed through Hoo-nan by water-ways, which lead northward to LHan-kow on the Yang-tsze Keang, and Laun-ching on the Han River, eastward to Fuh-keen, south- ward to Kwang-tung and Kwang-se, and westward to Sze- chuen. One of the leading features of the province is the Tang-ting Lake, which has been already described.

The province of Shen-se is bounded on the N. by the Shen-se.

Great Wall, on the W. by the province of Kan-suh, on the S. by the province of Sze-chuen, and on the E. by Shan-se, from which it is separated by the Yellow River. It con- tains an area of 67,400 square iniles, and its population was said to number upwards of 10,000,000 before the outbreak of the late Mahometan rebellion. Se-gan Foo is the provincial capital, and besides this there are seven prefectural cities in the province. Shen-se is divided into two parts by a barrier of mountains, consisting of the Loo-new Shan and the Zsing-ling Shan, which runs across the southern portion of the province from east to west. To the north of the mountains lie the basins of the We Ttwver and of several other tributaries to the Hwang-ho. The position of the [Ver basin is peculiar. Cut off from the rest of China on the east by the Yellow River, and on the south by the mountains, it yet forms the great channel of communication witl Central Asia. Its position, there- fore, in a strategical point of view is at once apparent. Were it in the hands of an enemy the Chinese colonies in Central Asia would be completely severed from the mother country, and hence the eagerness which has been evinced by the Government throughout all history to retain posses- sion of the region. Jor upwards of 2000 years, with the exception of intervals, from 1122 B.c. to 1127 a.p., the city of Se-gan Foo, which lies in the basin, was the capital of the empire. Its walls enclose a square space of six geographical miles each way, and, unlike most Chinese cities, its fortifications are kept in perfect repair. During the late Mahometan rebellion it was closely invested for two years by the rebels, who however failed to make themselves masters of it. From Se-gan Foo radiate a number of roads going east, south, and west. The east road is the great Z’ung-kwan road, which forms the principal means of communication between Peking and the

north-eastern provinces of the empire, and Sze-chuen, Yun-nan, and Tibet. To the south, one road crosses the mountains to Shang Chow, and on to the Tan River, an affluent of the Han River, and is thus connected with the

Kan-suh.

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trade of the Yang-tsze Keang ; and another leads to Han- chung Foo and Sze-chuen. Leaving the west gate of the city two roads lead to Lan-chow Foo, from which town commences the great high road into Central Asia by way of Leang-chow Foo, Kan-chow Foo and Suh-chow to Hami, where it forks into two branches, which follow respectively the northern and southern foot of the Zeen-shan range, and are known as the Z'een-shan pih loo and the T'een-shan nan loo. It was along these roads that the fame of China first reached Europe, and it was by the Z'cen-shan nan loo that Marco Polo entered the empire. To defend this line of communication the Great Wall was extended to beyond Suh Chow, and the Kea-yu gate, which is the door of the empire, was built. During the reign of Hea-woo Te of the Han dynasty Chincse colonies and high roads lined with fortified cities were established along this route, and though at times the Government have lost possession of the line beyond the Great Wall, it has always succeeded in re-establishing its supremacy over it, and the earlier emperors of the present dynasty established a firmer hold over the Zeen-shan pih loo and Ili than any of their pre- decessors had been able to acquire. Occupying a position, then, at the confluence of the roads which connect north- eastern China with its western and south-western portions, Se-gan Foo is naturally a city of great commercial import- ance. Producing no manufactures of its own, its trade consists principally in the importation of silk from Ohé-keang and Sze-chuen, tea from Hoo-pih and Hoo-nan, and sugar from Sze-chuen, and in the exportation of these and other articles of commerce to Kan-suh, Russia, and Central Asia. produces nothing for the foreign markets. Its principal products are cotton, wheat, and opium, and these it

exchanges with the neighbouring provinces for coal, iron,

salt, &c.. But besides these, kaou-leang, pulse, millet,

maize, groundnut, barley, beans, pease, lucerne, and rape seed

are grown. The Wei basin is the greatest agricultural country in the north-west. Being a loess region it is unfit for rice, but for the same reason it produces fine crops of the kinds mentioned at a minimum expenditure of labour. The Shen-se opium is much valued by smokers, and ranks next to the Shan-se drug, which is second only to that pro- duced in Kan-suh. Coal abounds in the northern part of the province, but owing to difficulty of transit it is not worked to any great extent. The winters are cold, but short, and though fruit trees abound and are most produc- tive, no evergreen trees or shrubs are to be met with within the province,

The province of Kan-swh, which derives its name from the first syllables of the names of the two cities Kan-chow foo and Suh-chow, is bounded on the N.E. by the Ordo Mongol tribes and the Desert of Gobi, on the E. by Shen-se, on the 8. by Sze-chuen, on the S.W. by Kokonor and the Desert of Gobi, and on the N.W. by Kobdo and li. The boundary on the N. remains undefined, but the province may be said to occupy the territory lying between lat. 32° 30’ and 40°, and long. 108° to 98° 20’, and to contain an area of about 86,688 square miles. The popu- lation is estimated at 15,193,125. Xan-suh is for the most part a howling wilderness of sand and snow, but to the east of the Yellow River the country is cultivated and to some extent productive. The principal river is the Ycllow River, the course of which through the province has already. been described, and in the mountains to the south of Lan-chow Loo rises the Wei River, which traverses Shen-se, and flows into the Yellow River at Tung-kwan. The chief products of Kan-suh are cloth, horse hides, a kind of curd like butter “which melts in the mouth,” and is known by the Mongols under the name of Wuta, musk, plums, onions, dates sweet melons, and medicines.

CHIN.

Sze-chuen, ‘the Four Streams,” is the largest province Sze-chuen.

Shen-se is purely an agricultural province, and ;

[PROVINCES.

in China. It is bounded on the N. by Kokonor, Kan-suh, and Shan-se, on the E. by Hoo-pih and Hoo-nan, on the 8. by Kwed-chow and Yun-nan, and on the W. by Tibet. Its population is estimated at 35,000,000 ; it occupies an area of 220,000 square miles, and contains fifteen prefectural cities, inclusive of Ching-too Foo, the provincial capital. The western portion of the province forms part of the mountain-lands of Central Asia, and the eastern portion, comprising about 100,000 square miles, is, with the cxcep-tion of the plain on which the city of Ching-too oo is situated, emphatically a hilly region. ‘he boundaries of this hilly region may be described by lines drawn from Lung-gan Foo to Kwei-chow Foo on the N., from Kwee-chow Foo to Yung-ning Heen on the 8.E., and from this latter place to Lung-gan Foo on the W. The ethnological and commercial boundaries are clearly and sharply drawn by these physical features. The mountain districts are poorly cultivated, and are inhabited by ‘ Hjin,” or Barbarians, who are distinguished under the tribal names of Se-fan, Lo-lo, and Man-tsze, and whose allegiance to the Chinese Government sits but lightly on them, while the eastern portion is exclusively Chinese, and is one of the most thriving and populous regions in the empire. Through the southern portion of it runs the Yang-tsze Keang, which is thete navigable throughout the year, while it is traversed by three large rivers, the Afin-keang, the To-keang, and the Kea-ling Keang, all of which take their rise in the mountains on its north-west border, and empty themselves into the Yang-tsze Keang at Seu-chow Foo, Loo Chow, and Chung- king Foo respectively. The whole province is intersected by numerous but difficult roads. The Za-pih-loo, or great north road, leads from Ching-too Hoo to Peking. From the same centre there branches out one to Chung-king Foo, one to Paou-ning Foo, and one to Ya-chow Joo, while another road connects Chung-king Foo with Kwei-chow Joo on the Yang-tsee Keang and beyond with L-chang Foo in Loo-pth. From Ya-chow Foo, again, start two important roads, one leading into Tibet by way of Yung-king Heen, Tsing-ke Ieen, Ta-tseen-loo, Le-tang, Pa-tang, and T’’siamdo, and the other to Western Yun-nan via Tsing-ke Heen, Ning-yuen Foo, and Yen-yuen Heen to Ta-le Foo. From TLa-le Loo this road continues through Momien to Bhamo in Burmah. Another road connects Pa-tang and Le-keang Foo with Ta-le Foo, and yet another crosses the southernmost corner of the province connecting Zung-chuen Foo in Yun-nan with Za-le Yoo inthe same province.

The products of Sze-chuen are varied and valuable, and, unlike those of the northern provinces of China, are eminently suitable for foreign export. First on the list stands silk, and of this article of commerce a larger quantity is produced in eastern Sze-chwen than in any other province of the empire. There are few districts in this region in which silk is not produced, and though it is somewhat inferior in quality to that produced in Ché-keang yet in strength and durability it is so far superior to it that it is able to compete successfully with the finer kind in the market. Large quantities are exported to Shen-se, Shan-se, Kan-suh, Peking, Yun-nan, Tibet, MKwei-chow, Kwang-se, Hoo-nan, and Hoo-pih, and lately it has begun to figure in the Shanghai returns as an article of foreign export. The cultivation of the poppy is largely carried on in the same portion of the province. The opium produced is, however, of an inferior quality, and the exportation therefore is limited to those provinces which from exceptional circumstances are unable to procure the better description of drug from elsewhere. White wax is another of the most valuable articles of the Sze-chwen trade. It is made exclusively in the department of KKea- ting Foo, the climate of which appears to favour the pro-

pagation of the disease among the insects which is said by the natives to be the cause of the plentiful secretion of wax. This belief is borne out by the fact, that in the districts where the insects breed only a small quantity of wax is produced, and experience has therefore taught the natives the advantage of breeding the insects in one district and producing the wax in another. The region of Keen-chang in the south of the province has been found most suitable for breeding purposes, and it is there, therefore, on the insect trees, which are evergreens with large and pointed ovate leaves, that the breeding processes are carried on. At the end of April the producers start each with a load of the eges of the insects for the district of Kea-ting Foo, a journey which on foot occupies about a fortnight. The road between the two districts is very mountainous, and as exposure to the heat of the sun would hatch the eggs too rapidly, the travellers journey only during the night. At Kea-ting Foo they are eagerly bought up, and are at once put upon the wax tree. Baron von Richthofen thus describes the subsequent process : —“ When the egg balls are procured they are folded up, six or seven

together, in a bag of palm leaf. These bags are suspended on the twigs of the trees, This is all the human labour required. After a few days the insects commence coming out. They spread as a brownish film over the twigs, but do not touch the leaves. The Chinese describe them as having neither shape, nor head, nor eyes, nor feet. It is known that the insect is a species of coccus, Gradually, while the insect is growing, the surface of the twigs becomes encrustated with a white substance; this is the wax. No care whatever is required. The insect has no enemy, and is not even touched by ants. In the latter half of August the twigs are cut off and boiled in water, when the wax rises to the surface. It is then melted and poured into deep

pans. It cools down to a translucent and highly crystalline substance. Ten taels weight of eggs produce from two to

three catties of wax." Tobacco is another article which occupies a promincnt place among the productions of

ze-chuen. It is grown very generally throughout the province, and is exported in large quantities to Se-fan, Tibet, Yun-nan, Hoo-nan ; and the export to Ilan-kow alone is estimated at 50,000 piculs annually. The best is grown in the district of Pe Heen ; the next quality is said to come from Kin-lang IIeen, and the third quality from She-fang Icen, all these districts being in the plain of Ching-too Foo. The habit, which is unknown in other provinces, of smoking the tobacco leaves rolled up in the shape of cigars obtains largely in Sze-chucn. Salt is also produced in Sze-chuen in large quantities from brine, which is raised from wells. 7'sze-liu-tsing, in T'sze Chow, Woo- tung-keaou, near Kea-ting Foo, Paou-ning Foo, and Tung-chuen Foo, are the districts where the wells are most abundant. 'The brine is raised from the well with long bamboo tubes and bamboo ropes, and is then led to large pans for evaporation, In the district of Tsze-liu-tsing petroleum is struck at a depth of from 1800 to 2000 feet, and is used for evaporating the brine. Coal and iron are found in many parts of the province, but the only coal which is worked is of an inferior quality, and the iron is smelted with wood alone. Sugar, tung oil, wheat, barley, beans, rice, Indian corn, potatocs, &c., are among the other products of Sze-chuen. From the list of exports and re- exports from Man-kow in the Trade Returns for 1871,

Baron vou Richthofen has made a list of the proximate value of the exports of Sze-chwen in this direction.

Piculs. Value in Taels. Sze-chulén Silk' .....c.c00cec ccs 4,075 894,019 Salonen: seccnvanutyene. keene 4,837 294,795 'Waltihe: Wane «.. ccs ceca mutes 10,765 647,029 Carry forward, : 1,835,843

CHINA

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Piculs, Value in Taels. Brought forward, 1,885,843 Sze-chuen rhubarb …..... 2,761 35,616 MNEs kee rach tiray warns ewan saree samains 14 58,629 Ne see alec swpnevasacene +. ols 7,485 (Cli O]UCR caasbintoupobooeeannuedoe dan 515 21,658 WieedEOlie,.....sc2c.cettee s ace 290,441 1,825,701

CeO ei SC SO

Total, Taels 8,784,882

Ning-yuen Foo is the principal district from which the copper is produced, as muchas fron 500 to 600 tons a year being exported from this one prefecture. The mines are owned by private companies, who are bound by the terms of their licence to sell the metal at a fixed price (8 taels per picul) to certain holders of a Government concession, who on their part are bound to pay 2 taels per picul into the provincial treasury.

The province of Kwang-tung is bounded on the N. by Loo-nan, Keang-se, and Fuh-keen, on the §. and E. by the sea, and on the W. by Kwang-se. It contains an area of 79,456 square iniles, and is divided into nine prefectures ; and the population is estimated at about 19,174,030. Its name, which signifies "Hast of Kwang," is derived,

| according to Chinese writers, from the fact of its being to

the east of the old province of /oo-kwang, in the same way that Kwang-se derives its name from its position to the west of Hoo-kwang. Kwang-tung

extends for more than 600 miles from E. to W., and for about 420 from N. to 8. It may be described as a hilly region, formiug part as it does of the Nan Shan ranges. These mountains, speaking generally, trend in a north-east and south-westerly dircc- tion, and are divided by valleys of great fertility. The principal rivers of the province are the Se-keang, which has been already described; the Pth-keang, or North River, which rises in the mountains to the north of the province, aud after a southerly course joins the Se-keang at San-shwuy Heen ; the Tung-keang, or East River, which after flowing in a south-westerly direction from its source in the north-east of the province, empties itself into the estuary which separates the city of Canton from the sea ; and the Han River, which runs a north and south course across the eastern portion of the province, taking its rise in the mountains on the western frontier of uh-keen, and emptying itself into the China Sea in the neighbourhood of Swatow. Kwang-tung is one of the most productive provinces of the empire. Its mineral wealth is very con- siderable, and the soil of the valleys and plains is extremely fertile. The principal article of export is silk, which is produced in the district forming the river delta, extending from Canton to Macao and having its apex at San-shwuy ITeen. The value of the silk and of silken manufactures, especially textures which are annually exported from Canton in foreign bottoms, is estimated at about 14,000,000 dollars. Tea is also grown in many districts, and is exported annually to the amount of about 3,000,000 dollars ; cassia lignea, together with cassia buds and twigs (from the sub-prefecture of o-ting, 150 miles east of Canton), matting, fire-crackers, sugar, and palm leaf fans, which aro annually exported to the number of 4,000,000 or 5,000,000 to New York alone, are among the other prominent articles of merchandize. all the rivers, and 40 per cent. of the ground under cultiva- tion in the districts of Pwan-yu, Tung-kwan, and Tsang- ching, is occupied by sugar plantations. Out of the total exports from Swatow during the year 1874, which amounted in value to £4,367,739, sugar was put down as representing £1,023,810. Three large coal-fields exist in the province, namely, the Shaou-chow Joo field in the north; the wa Heen field distant about 30 miles from Canton; and the west coast field, in the south-west. The last is by far the largest of the three, and extends over the districts of Woo:

Kwang- tung.

Sugar is grown on the banks of almost.

Kwang-se,

Kwei-chow,

640

chuen, Teen-pith, Yunyj-keang, Yang-chuen, Gan-ping, Kae- ping, Sin-hing, Ho-shan, Sin-hwang, and Sin-ning. The coal from the two first named fields is of an inferior quality, but that in the west coast field is of a more valuable kind. Tron ore is found in about twenty different districts, notably in Tsing-yuen, Tsungfa, Lung-mun, and Luh-fung. None, however, is exported in its raw stat2, as all which is produced is manufactured in the province, and principally at Fat-shan, which has been called the Birmingham of China. The Kwang-tung coast abounds with islands, the largest of which is Z/ainan, which forms part of the prefec- ture of Keung-chow Foo. This island extends for about 100 miles from north to south, and the same distance from east to west. The southern and eastern portions of Zaman are mountainous, but on the north there is a plain of some extent. Gold is found in the central part ; and sugar, cocoa nuts, betel nuts, birds' nests, and agar agar, or sea vegetable, are among the other products of the island. By the terms of the treaty Keung-chow Foo on the north coast was to be a Treaty Port, and it is now about to be opened to trade. In the province of Kwang-tung there are two Treaty Ports, namely, Canton and Swatow, At Canton the value of the exports carried in foreign vessels during the year 1874 amounted to £4,672,128, and of imports to £1,985,701. The value of the imports to Swatow during the same period was £3,317,297, and of the exports £1,310,321.

The province of Kwang-se is bounded on the N. by Kwei-chow and foo-nan, on the E. by Kwang-tung, on the S. by the Gulf of Tonquin and Cochin-chiua, and on the W. by Yun-nan. It covers an area of 78,250 square miles, and its population is estimated at 7,313,895. The provincial capital is Kwet-ling Foo, or City of the Forest of Cinnamon Trees, and there are besides ten prefectural cities. In the south and east parts of the province the surface is mountainous, but in the north the mountains are exchanged for hills and plains. The principal rivers are the Se-keang, the course of which

has been described above, and the Kwei-keang, or Cinnamon River, which takes its rise in the district of /Zing-gan, in the north of the province, and in the neighbourhood of that of the Scang iver, which flows northward through /Zoo-nan to the Tung-ting Lake. The Kwei-keang, on the other hand, takes a southerly course, and passes the cities of Kwet-lin, Yang- so Leen, Ping-l6 I'oo, Chaou-ping Heen, aud so finds its way to Woo-chow Foo, where it joins the waters of the Se-Keang. Another considerable river is the Zew-Keang, or Willow River, which rises in the mountains inhabited by the Meaou- tsze, in the district of Yung-tsung, in Kwet-chow. Leaving its source it takes a south-easterly direction, and enters Kwang-se, in the district of Hwae-yuen. After encircling the city of that name, it flows south as far as Lew-ching Heen, where it forms a junction with the Lung-keang, or Dragon River. Adopting the trend of this last-named stream, which has its head-waters in Yun-nan, the mingled flow passes eastward, and further on in a south-easterly direction, by Lew-chow Foo, Woo-seuen een, and Sin-chow Foo, where it receives the waters of the Se-keang, and thenceforth changes its name for that of its affluent.

The province of Kwei-chow is bounded on the N. by Sze- chuen, on the E. by Hoonan, on the 8. by Kwang-se, and on the W. by Yam-nan. It contains 64,554 square miles, and has a population of about 5,288,219. Kwei-yang Foo is the provincial capital, and besides this there are eleven prefectural cities in the province. With the exception of plains in the neighbourhood of Kwet-yang foo, Ta-ling Foo, and Tsun-e Foo, in the central and northern regions, the province may be described ag moun- tainous, But the very disturbed state in which it has been for many years makes it difficult to gain much information

about it. The mountain ranges in the south are largely inhabited by Meaou-tsze, who are the original owners of the soil, and who have been goaded into a state of rebellion by the oppression to which they have been subjected by the Chinese officials. To this disturbing cause has been added also another by the spread of the Mahometan rebellion of Yun-nan into some of the south-western districts of the province. The devastating effects of these

civil wars have been most disastrous to the trade and the prosperity of Kwei-chow. The climate is by nature unhealthy, the supply of running water being small, and that of stagnant water, from which arises a very fatal malaria, being considerable ; but it is at the present time rendered still more dangerous by the number of corpses which are left to putrefy in the fields. The agricultural products of the province are very limited, and its chief wealth lies in its minerals. Copper, silver, lead, and zinc are found in considerable quantities, and as regards quick- silver, Kwei-chow is probably the richest country in the world. It has been from of old the chief product of the province, and the belt in which it occurs extends through the whole province from south-west to north-east. One of the principal mining districts is Kae Chow, in the prefecture of MKwer-yang Joo, and this district has the advantage of being situated near Wang-ping Chow, from which place it can be conveniently and cheaply shipped to TTankow. Cinnabar, realgar, orpiment, and coal form the rest of the mineral products of Jtwev-chow. Wild silk is another valuable article of export. It is chiefly manu- factured in the prefecture of Z'swn-e Yoo, where three kinds are produced. 'The first quality, the trade in which is estimated at about 500,000 taelsa year, is chiefly exported to Shen-se, Shan-se, and Peking, while some finds its way to Seang-tan and so into Kwang-se. The inferior kinds are locally consumed.

The province of Yun-nan, "South of the Clouds," is

bounded on the N. by Sze-chuen, on the E, by Kwet-chow Yuv-nan,

and Awang-se, on the 8S. by Burmah and the Lao tribes, and on the W. by Burmah and Tibet. It occupies an area of 107,969 square miles, but though thus the second largest province of the empire, its population is estimated at only 5,561,320, and probably this number is at the present time, in consequence of the long continuance and violent extinction of the Panthay rebellion, excessive. The greater part of the province may be said to consist of an extensive plateau, containing numerous valley plains, which is divided in the northern portion by mountain ranges that enter at the north-west corner of the pro- vince and separate the waters of the Kin-sha-keang, the Merkon, and the Salweim. Besides Yun-nan Foo, the capital, the province contains twenty prefectural cities, several of which—T'ung-chuen

Noo, Yun-nan Foo, Ta-le Foo, Yung-chang Foo, Tsoo-heung Foo, and Ling-gan Foo, for example—are situated in the valley plains just spoken of. The principal rivers are the Afeckon, which traverses the province from north to south on its way to the China Sea through Anam; the Salwein, which runs a parallel course through its western portion; the Kin-sha-keang, which runs first in a south-east and then in an easterly direction through the north of the province; and the head- waters of the Songka, which takes its rise in the south- eastern part of the province. This last-named river forms a navigable communication from Yun-nan to the Gulf of Tong-king where it empties itself into the sea. The navi- gation commences at d/an-haou, a town only ten days' journey from Yun-nan Foo, and it thus affords an easy outlet for the mining districts of eastern and southern Yun-nan. There are two large lakes in the province, —one in the neighbourhood of Za-le Foo, which is 24 miles in length by 6 miles in breadth, and the other

near Yun-nan Foo, which measures from 70 to 80 miles in circumference. Several important roads intersect the pro- vince, the chief of which are—1,. The road from Yun-nan Foo to Bhamo in Burmah vi&é Za-le Foo (12 days), Téng- yué Chow or Momuen (8 days), and Manwyne,—an easy road as far as Z'a-le Yoo, but beyond this city the mountain ranges spoken of above present obstacles of no little difficulty ; 2. The road from Ya-le Foo northwards to Batang vik Le-keang Joo, which thus connects western Yun-nan with Tibet; 3. The road spoken of in the description of Sze-chuen, from Z'a-le Foo to Ching-too Foo vid Ning-yuen Foo and Ya-chow Foo ; 4. The road from Yun-nan £90 to Seu-chow Foo, vid Tung- chuen Foo and Chaowtung Foo; 5. The road from the same city to Wang-ping Chow, in Kwei-chow, vid Kwet-yang oo, and down the Yuen River to Chang-tih Foo in Ioo- nan; and 6, the ancient and important trade road to Canton. This route connects Yun-nan Koo with Pih-se Foo, in Kwang-se, on the Canton west river, a land journey which occupies about twenty days. From this point the river furnishes in quiet times an easy communication with Canton, but of late, owing to the disturbed condition of Kwang-se, this route has been little used. The agricultural products of the province are fully

sufficient to supply the wants of the inhabitants, but its chief wealth lies in the nunerals with which it abounds. On this subject Baron von Richthofen says, “We are now in an extremely remarkable region, which is highly worthy a detailed examination, because a great variety aud quality of metal-liferous deposits are distributed throughout its extent. The country so distinguished comprehends nearly the whole of Yun-nan, from Za-kwan-ting in the north to Po-urh foo in the south, aud from the eastern boundary of the province to Zdng-yué Chow (Momien) in the west. Besides, it extends across the Yang-tsze, and comprises the whole department of Neng-ywen Poo, till Tsing-ke een, a district of Ya-chow foo; and in the east, the district of Wet-ning Chow in Kwei-chow. There are no positive indications to show that the metalliferous region extends beyond those limits to the south, west, and north, but this is different as regards the direction to the east, or rather north-east. I have had several statements given me concerning the occurrence of ores of copper and silver through a large portion of Awei-chow ; but as no mines are worked outside of Wer-ning Chow, the statement cannot be considered as proved. It is, however, a remarkable fact, that imme- diately adjoining the metalliferous region of Yun-nan to the north-east, commences a belt distinguished by the occurrence of quicksilver and its ores. It extends through the whole width of the province of Kwei-chow. Quicksilver is found only in this belt, and not in Yun-nan.”

Silver and gold are among the metals produced in Yun-nan, but they are not known to exist in any large quantities. Lead is of frequent occurrence in the province, and indeed the area through which copper, silver, lead, tin, and zinc are distributed in sufficient quantities to make mining answer, comprises at least 80,000 square miles. The ores are generally of good quality, and are so deposited as to be easy of extraction. Tea from Po-wrh Foo, in southern Ye-nan, which is well known and appreciated throughout the empire; opium of an inferior quality ; medicines in the shape not only of herbs and roots, but also of fossil shells, bones, teeth, and various products of the animal kingdom ; and precious stones, principally jade and rubies, are among the other exports from Yun-nan.

The imperial province of Shing-king, in southern Manchuria, is bounded on the N. by Mongolia and 7’sz-tsr- har; on the E. by the newly-acquired

Russian province of Amoor, the Sea of Japan, and Corea; on the S. by Corea, the Yellow Sea, and the Gulf of Leaou-tung; and on the W. by Mongolia. It occupies an area of 43,000 square

miles, and coutains a population of 6,000,000. Its capital city is Moukden (41° 40’ N. lat., 130° 30’ E. long.) or, as it is otherwise known, Shing-king, “the Flourishing Capital,” or Shin-yang ; and besides this it has one other prefectural city, namely, Avn-chow Foo. The surface of the province is divided between plain and mountain, the latter feature largely predominating. A line drawn from Aing-chow Foo (41° 12’ N. lat., 121° 10’ E. long.) north-east to Moukden, and then south by west through Leaou-yang and Lai-ching to Kai-chow and the sea, would define the level country, the rest of the province consisting of mountains intersected with valleys. A large portion of the plain being an alluvial deposit is extremely fertile, but in the neigh- bourhood of the sea that saline exudation so common in the north of China renders futile all attempts at cultivation. To the north and east of this district run numerous mountain ranges, for the most part in a north-and-southerly direction. The climate of Shing-king is marked by extremes of heat and cold. In summer the temperature varies from 70° to 90°, and in winter from 50° above to 10° below zero. The mountain scenery is extremely picturesque, and the trees and shrubs are such as are common in England, the mountain ash being the only common English tree which is there conspicuous by its absence. The most important rivers are the Zeaou-ho and the Za-yang-ho. The former takes its rise in Mongolia, and after running an easterly course for about 400 miles, turns in a south-westerly direction, and empties itself into the Gulf of Leaow-tung, in the neighbourhood of Ying- tsze, up to which town, 20 miles from the bar, the river is navigable for large junks. The Za-yang-ho rises in the mountains to the south of the plain, and empties itself into the Yellow Sea. The principal roads through the province are—lst, The imperial highway from Peking, which passes through the Great Wall at Shan-hai-hwan, along the shores of the Gulf of Pih-chih-li to Moukden, and after leaving this city divides into three branches—one going eastward to Corea, another going by

Kirin and Alchuku to San-sing, the limit of the empire in this direction, while a third diverges N. by W. to &a-kwo-mun, thence through Mongolia to Pe-tu-na, and then to Tsi-tsi-har, Jfergen, and the Amoor; 2d, A road from Ying-tsze southward to Kin-chow, in the extremity of the promontory of Leaow-tung; and 3d, a road from the same point in an easterly direction to Fung-hwang-ching and the Gate of Corea. The Treaty Port of the province is Wew-chwang, but owing to the difficulty of reaching this town, the foreign settlement has been established at Yng-tsze. During 1874 the value of goods imported into this port was 2,433,135 taels, and that of exports was 1,753,543 tacls. The chief agricultural products of Shing-king are wheat, barley, millet, oats, maize, cotton, indigo, and tobacco. Coal, iron, and gold are also found in considerable quantities in various localities, but as yet they are very little worked.

Liistory.

Far reaching as is the history of China, it yet fails to History,

give us any account of the origin of the Chinese race. Its' first page begins by describing the nucleus of the nation as a little horde of wanderers, roving among the forests of Shan-se, without houses, without clothing, without fire to dress their victuals, and subsisting on the spoils of the chase, eked out with roots and insects. Investigation, however, has proved beyond doubt that these wanderers were no indigenous sons of the soil, bnt were strangers and pilgrims from other lands. Some believe that their point of departure was in the region to the south-east of the Caspian Sea, and that, having crossed the head waters of the Oxus, they made their way eastward along the southern slopes of the Teen-shan. But however this may ae

be, it is plain that as they journeyed they struck on the northern course of the Yellow River, and that they followed its stream, on the eastern bank, as it trended south as far as Tung-kwan, and that then, turning with it due eastward, they established small colonies on the fertile plains of the modern province of Shan-se. But though these immigrants were for the moment wanderers they brought with them habits of settled labour. Some traces are discernible which might possibly be accepted as evidences that the Chinese

had at one time a tendency to a nomadic rather than to an agricultural state of existence. In the Book of Historical Documents the governors of the province are called “pastors” and “herdsmen,” and Mencius speaks of princes generally as “ pastors of men.” It is impossible also to overlook the identity of outline between the Chinese house and the sweeping roof supported by poles of the Tatar tent ; and it is said that when Jengiz Khan in his invasion of China took a city, his soldiers immediately set about pulling down the four walls of the houses, leaving the overhanging roofs supported by the wooden columns,—by which process theyconverted them into excellent tents for themselves and their horses. To some extent it may be said, too, that the language coun- tenances this belief, since many common words find their expression in characters of which the hieroglyphics for sheep and cattle form part. For instance, we find that the character 4, meaning truthfulness, uprightness, is composed of the two parts, 2& and 9¥, or “my sheep,” thus apparently pointing to a time when the ownership of flocks was a common cause of dispute ; the same is the case also with the character ¥¥, cho, “‘right,” which is made up of ff, Tsze, “one’s own,” and 24, yang, “sheep,” and if, Tseang, “to examine and judge clearly,” which is com- posed of %, yen, “words,” or to talk, and 26, “sheep,” which would indicate that the first idea of a judicial examination arose out of wranglings about sheep. But notwithstanding these apparent evidences in favour of the Chinese having been originally a nomadic rather than an agricultural people, it becomes abundantly evident from the earliest records they possess that at all events, imme- diately on their arrival in China, they settled down as agriculturists. They cultivated grain for their sustenance, and flax, which they wove into garments. They knew the value of silk-worms and planted the mulberry tree ; they developed trade, and established fairs at certain centres in their districts. Neither were they destitute of . the elements of intellectual culture. They had some know- ledge of astromony, and in all probability they brought with them an acquaintanceship with hieroglyphic writing ; at all events, at a very early period, we hear of H Yin (1743-1710 B.c.), presenting a petition in writing to the king, and there is no surer ground for the belief that knotted cords were in use among them before writing was invented than there is for the legend, that the forms of the charac- ters were first suggested to Tsang-Kéé by the marks on the back of a tortoise.

The possession of these habits and acquirements gave the immigrants a great advantage over the nations of the land. As they advanced they found the country inhabited by “fiery dogs” on the north, “great bowmen” in the east, “the ungovernable vermin” on the south, and the “mounted warriors” on the west. Differing in language, as also in every other respect, from the invaders, these tribes became their natural enemies, but they were unable to stand against the “black-haired race.” During the tirst centuries after the establishment of a regular system of government we hear of them now as common enemies of the Chinese, and now as temporary allies of one or another of the states into which the growing kingdom was

divided. But by degrees they drop out of the history of the empire. Step by step they were driven back into the less inhabited parts; whole tribes were transported, others were annihilated, until but a small remnant was left. These wanderers sought and found refuge from their enemies in the mountainous regions of Kwei-chow and Kwang-se, where their descendants, the Meaou-tsze, still maintain themselves against the forces of China.

It was an ancient belief of Chinese writers that there had existed a period of 2,267,000 and odd years between the time when the powers of Heaven and Earth first united to produce man as the possessor of the soil of China, and the time of Confucius. This having been accepted asa fact, it became necessary for the early historians to invent long lines of dynastic rulers to fill up the gap between the creation and the period with which the Book of Historical Documents commences. Accordingly, we find a series of ten epochs described as preceding the Chow dynasty. The events connected with most of these are purely fabulous, and it is not until we come down to the eighth period that we can trace any glimmer, however obscured, of history. This, we are told, commenced with the reign of Yew-chaou She (the Nest-having), who, if such a man ever existed, was probably one of the first of those who, as the immigrants increased and multiplied, was chosen to direct their counsels and to lead their armies. This chicf induced them to settle within the bend of the Ycllow River, the site of the modern province

of Shan-se, and taught them to make huts of the boughs of trees. Under the next chief, Suy-jin She (the Fire-producer), the grand discovery of fire was effected by the accidental friction of two pieces of dry wood. He taught the people to look up to Yeen, the great creating, preserving, and destroying power ; and he invented a method of registering time and events, by making certain knots on thongs or cords twisted out of the bark of trees. Next to him followed Yung- ching She, and then Fuh-he, who separated the people into classes or tribes, giving to cach a particular name, dis- covered iron, appointed certain days to show their grati- tude to heaven, by offering the first-fruits of the earth, and invented the eight diagrams which serve as the founda- tion of the Yih-king, Fuh-he reigned 115 years, and his tomb is shown at Chin-choo, in the province of Shen-se, at this day. His successor, Chin-nung, invented the plough ; and from that moment the civilization of China proceeded by rapid and progressive steps.

As the early history of every ancient people is more or less vitiated by fable, we ought not to be more fastidious or less indulgent towards the marvellous in that of China, than we are towards Egyptian, Greek, or Roman history. The main faets may be true, though the details are in- correct ; and though the accidental discovery of fire may not have happened under Suy-jin She, yet it probably was first communicated by the friction of two sticks, which at this day is a common method among almost all savages of producing fire. Nor is it perhaps strictly correct that Fuh-he made the accidental discovery of iron, by having burnt a quantity of wood on a brown earth, any more than that the Phoenicians discovered the mode of making glass by burning grecn wood on sand; yet it is not improbable that some such processes first led to these discoveries. And if it be objected against the history, that the reign of 115 years exceeds the usual period of human existence, this after all is as nothing, when compared with the contemporaneous ones recorded in biblical history. Thus, also, considerable allowances are to be deducted from the scientific discoveries of Chin-nung in botany, when we read of his having in one day discovered no less than seventy different specics of plants that were of a poisonous nature, and seventy others that were antidotes against their baneful effects.

HISTORY. |

The next sovereign, Hwang-te, was a usurper; but during his reign the Chinese are stated to have made a very rapid progress in the arts and conveniences of civilized life; and to his lady, Se-ling-she, is ascribed the honour of having first observed the silk produced by the worms, of having unravelled their cocoons, and of having worked the fine filaments into a web of cloth. The tomb of Hwang-te is also preserved to this day in the province of Shen-se,

But with the reign of Yaou (2356 B.c.) we emerge to some extent from the mist which hangs over the earlier records of China. Here Confucius takes up the strain, and though his narrative will not bear criticism it yet furnishes us with some historical data. The character of Yaou and his successor Shun have been the theme of every writer on history from the time of Confucius down- wards. So strong was the force of the examples they set that virtue pervaded the land, crime was unknown, and the nation increased in size and prosperity. During the reign of Yaou the empire extended from 23° to 40° N. lat., and from the 6th degree of longitude west from Peking to the 10th degree east. He established his capital at Ke-choo in Shan-tung, and established marts and fairs throughout the land. After his death he was succeeded by Shun, who for some years had shared with him the responsibilities of government. It was during this period that the “ Great ” Yu was employed to drain off the waters of the flood which had visited the north of China in con- sequence, probably, of one of the numerous changes in the course of the Yellow River. This work he accomplished after having expended nine years’ labour upon it, and as a reward for this and other services he was raised to the throne on the death of Shun. After him succecded a number of rulers, each oue less qualified to govern than the last, until one Kéé (1818 B.c.) ascended the throne, In this man were combined all the worst vices of kings. He was licentious, cruel, faithless, and dissolute. From stich a one Heaven withdrew her protection. The people rose against him, and having swept away all traces of him and his bloody house, they proclaimed the commencement of a new dynasty, to be called the Shang dynasty, and their leader, Tang, they named the first emperor of the new line (1766 3.c,), Aided by wise counsellors, this monarch restored to the country some of its former prosperity. But the same fatality which attended the descendants of Yu overtook algo his successors. They became self-indulgent and effeminate. They lost all hold on the

affections of their people, so that when Chow, aided and abetted by his consort Ta-ke, gave vent to passions of a more than usually cruel and debased nature, they revolted, and Woo-Wang ascended the throne as the first emperor of the Chow dynasty. Woo-Wang was all that tradition represents the founders of dynasties to have been, He was brave, talented, and virtuous, but he committed the mistake of dividing his kingdom into seventy-two feudal states in order that he might bestow principalities on his own relations and the descendants of former emperors. The fatal result of this subdivision soon became obvious. Jealousies sprang up among the princes, internecine wars raged unceasingly, and the allegiance of the feudatories to the central authority became daily weakened. Nor were the enemies of the empire confined to those within its borders, for, during the reign of Muh Wang (9386 3.c.) we are told that the Tatars, of whom we now hear for the first time, taking advantage of the confusion which reigned within the limits of the empire, made predatory incursions into the states, and though they were invariably driven off, yet from this time they remained a constant source of danger and annoyance to the Chinese. Such was the state of the empire, distracted by internal wars and harassed by the attacks of a foreign foe, when Confucius was born

(551 3.c.), and though the sage devoted his life to the promulgation of virtue and the right principles of govern- ment, little or no heed was at the time paid to his remonstrances and exhortations, and he died (475 B.c.) in retirement, a neglected and disappointed man. Neither did the efforts of Laou-tsze, who was a few years senior to Confucius, or of Mencius, who succeeded him after an interval of 107 years, meet with any better success, Disorder was rife throughout the land, and the authority of the central Government was on the wane.

Signs now began to appear foreshadowing the fall of the dynasty. During the reign of Wei-léé Wang, the brazen vessels upon which Yu had engraved the different provinces of the empire were observed to shake violently, and shortly afterwards a mountain fell across the stream of the Yellow River causing a wide-spread inundation. As the empire became weakened by

internal dissensions so much the more did the power of the neighbouring states increase. Of these the most important was that of Thsin, on the north-west, which, when it became evident that the kingdom of Chow must fall to pieces, took a prominent part in the wars undertaken by Tsoo on the south and Tsin on the north for the coveted prize. But the struggle was an unequal one. The superiority of Thsin in point of size, and in the number of fighting-men at its command, carried all before it, and in 255 B.c. Chaou-seang Wang, having silenced his rivals, possessed himself of the imperial states. Thus fell the Chow dynasty, during the existence of which the empire may have said to have been extended from the 33d to the 38th parallels of latitude, and from the 106th to the 119th degrec of longitude, that is to say, it included the southern portions of the province of Chib-li, Shan-se, and Shen-se, the northern portions of Ho-nan and Keang-soo, and the western half of Shan-tung. The capital was fixed at Chang-gan Heen in Shen-se. But though virtually emperor, Chaou-seang Wang abstained from adopting the imperial title, and he died in 251 3.c., leaving his son Heaou-win Wang to succeed him. Scarcely was this sovereign seated on the throne when he was attacked with a fatal illness, and after a reign of but three days he became “a guest in heaven,” and Chang-seang Wang his son reigned in his stead. The only title to fame possessed by this monarch was that he was the father of one of the greatest rulers China has ever had. As he was himself a man of no mark, it was probably fortunate for the country that he occupied the throne for only three years, and at the end of that time (246 3.c.), he yielded up his earthly honours to Che Hwang-te, “the first universal emperor.” This sovereign was but thirteen years of age when he ascended the throne, but young as he was he speedily made his influence everywhere felt. He chose Heen-yang, the modern Se-gan Foo, as his capital, and built there a magnificent palace, which was the wonder and admiration of his contemporaries. He constructed roads through the empire, he formed canals and erected numerous and hand- some public buildings. Having by these and other means settled the internal affairs of his kingdom, he turned his attention to the enemies beyond his frontier. Chief ameng these were the Heung-noo Tatars, whose attacks had for years kept the Chinese and neighbouring principalities in a state of disquiet. Against these foes he marched with an army of 800,000 men and completely routed them, exterminating those in the neighbourhood of China, and driving the rest into the mountains of Mongolia. He had no sooner returned from this campaign

than he was called upon to face a formidable rebellion in Ho-nan, which had been set on foot by the adherents of the feudal princes, all of whom he had dispossessed when he reconstructed the empire on the monarchical principle. Against these rebels he was as successful as he had been against the Heung-noo,

and as soon as peace was restored he marched southwards to subdue the tribes on the south of the N an-shan ranges, that is to say the inhabitants of the modern provinces of Fuh-keen, Kwang-tung, and Kwang-se. Having accom- plished this vast undertaking, he returned to his capital to administer the empire he had won, the limits of which were as nearly as possible those of modern China proper. One monument remains to the present day to bear witness to his enterprising energy. Finding that the northern states of Thsin, Chaou, and Yen were building lines of fortification along their northern frontier for pro- tection against the incursions of the Heung-noo, he con- ceived the idea of building one gigantic wall, which was to stretch across the whole northern limit of the huge empire from thc sea to the furthest westeru corner of the modern province of Kan-suh. This work was begun under his immediate supervision in 214 3B.c., but though it was energetically proceeded with, he died before it was com- pleted. Notwithstanding al] that he had done for the country he was very unpopular with the upper classes. He was a reformer, and reformers were as distasteful to the Chinamen of that time as to those of to-day, and schoolmen and pedants were for ever holding up to the admiration of the people the heroes of the feudal times and the advan- tages of the system they administered. This doctrine was full of danger to the state, and Che Hwang-te therefore determined to break once and for all with the past. To this end he ordered the destruction of all books having reference to the past history of the empire. ‘This decree was almost universally carried out, and many scholars were put to death for failing in obedience to it. The measure, however, widened the breach between the emperor and the upper classes, and when, on his death, in 210 B.c., his son Urh-she Hwang-te ascended the throne, the wide-spread discontent broke out into tumults. Taking advantage of the confusion which thus arose, the princes who had been dispossessed by Che Hwang-te again attempted to regain the thrones they had lost. Unlike his

father, Urh-she Hwang-te was quite unable to grapple with troublous times. He was a weak and debauched youth, and was murdered after having offered a feeble resistance to his enemies. His son T'sze-yung thereupon surrendered him- self to Lew Pang, one of the two generals, who at that time were the leaders of the rebellion. Unfortunately, however, he afterwards fell into the hands of Heang Yu, the other chicftain, who was as blood-thirsty as Lew Pang was merciful, and who instantly put lum to death along with all his family and associates. The rivalry between these two chieftains broke out into open warfare almost immediately after this event, on Heang Yu usurp- ing to himself imperial honours. For five years war raged between the two combatants, and at the end of that time Lew Pang was left master of the field after a decisive battle before Woo-keang, in which Heang Yu was slain. Lew Pang was then proclaimed emperor (206 B.C.) under the title of Kaou-te, and the new line was styled the Han dynasty.

On ascending the throne Kaou-te established his capital at Lo-yang in Ho-nan, and afterwards removed it to Chang-gan in Shen-se. Having founded his right to rebel on the oppressive nature of the laws promulgated by Che Hwang-te, he abolished the ordinances of Thsin, with the exception of that referring to the destruction of the books—for, like his great predecessor, he dreaded the influence exercised by the Literati—and he exchanged the worship of the gods of the soil of Thsin for that of those of Han, his native state. His Successor, however, gave every encouragement to literature, and appointed a com- mission to restore as far as possible the texts which had been destroyed by Che Hwang-te. In this the commission

was very successful. It was discovered that in many cases

the law had been evaded, and numerous books whicli had ceased to have any corporeal being were found to exist on the tablets of the memories of scholars.

This new period of literary activity added to the general prosperity of the empire. ‘There was peace within its borders, and _ its frontiers remained unchallenged, except occasionally by the Heung-noo, who suffered many and severe defeats at the hands of the Chinese generals. Thwarted, therefore, in their attacks on China, these incorrigible marauders turned their attention to the kingdom of Yué-che, which had grown up in the western extremity of Shen-se, and after much fighting drove their victims along the Teeu-shan nan-loo to modern Western Tartary, that is to say, the territory between Turkestan and the Caspian Sea. This position of affairs suggested to the emperor the idea of forming an offensive and defensive alliance with the Yut- che against the Heung-noo, With this object an ambas- sador was sent to Western Tartary, who, after having been twice imprisoned by the Heung-noo, returned with no more beneficial result than that his embassy was the means of introducing silk into Europe. However, in 121 Bc, the reigning emperor, Woo-te, sent an expedition against the Heung-noo, and completely de- feated them. The conquered people tendered their sub- mission to the victors, and the Chinese established colonies, built towns, and appointed governors in the vanquished provinces, From this time the power of the Heung-noo began to wane. Dissension broke out among their different chieftains, and in 93 a.p. they were com- pletely driven out of Eastern Asia, and the 3d century witnessed their flight into the district north-east of the Caspian Sea, now occupied by the Kirghese, a broken and impotent remnant. Few Chinese dynasties have lasted much more than two centuries, and the first Han dynasty Was no exception to the rule. About the beginning of the Christian era a notable rebel, one Wang Mang, rose in revolt against the infant successor of Ping-te (1 A.D.), and i1 9 A.D. proclaimed himself emperor. He, however, at best only gained the suffrages of a portion of the nation, and before long his oppressive acts estranged even these supporters from him, In 23 a.p, Lew Sew headed a formidable rising against him and completely defeated him. He was destined, however, to die by the hands of his followers. In a revolt of his remaining troops his head was struck from his shoulders, and his body was torn in pieces by his own soldiery.

His opponent, Lew Sew, was now proclaimed emperor

‘under the title of Kwang-woo-te, and in consequence of his

fixing on Lo-yang in Ho-nan as his capital, the line of which he was the first emperor became known as the Eastern Han dynasty. Within this period are embraced some of the most remarkable cvents in the history of China. During the reign of his successor Ming-te, 65 A.p. , Buddhism was introduced from India into China, and about the same time the celebrated General Pan Chaou was sent on a embassy to the king of Shen-shen, a small state of Turkestan, near the modern Pidjan. So successful was he in his mission, that before long he added the states of Shen-shen, Khoten, Kuché, and Kashgar as apanages to the Chinese crown, But in accordance with precedent, after a time the glory of the dynasty became dimmed, Disturbances occurred in the provinces, and, in 173, a virulent pestilence broke out which held possession of tlic country for eleven years. A magical cure for this plague was said to have been discovered by a Taouist priest named Chang Keo, who rade so good a use of his discovery that in a single month he had gained a sufficiently large following to enable him to gain possession of the northern provinces of the empire. He was, however, opposed and

defeated by Tsaou Tsaou, another aspirant to imperial honours, whose son, Tsaou Pei, on the death of Heen-te (220 a.p.), proclaimed himself emperor, adopting the title of Wei as the appellation of his dynasty. But at the same time there were two other Richmonds in the field, Lew Pei and Sun Keuen, and the strength of these three adventurers were so nearly equal that they agreed to divide the empire between them. Tsaou Pei, under the title of Win-te, ruled over the kingdom of Wei (220), which occupied the whole of the central and northern portion of China. Lew Pei established the Shuh Han dynasty in the modern province of Sze-chuen (221), and called himself Chaou-lé-te ; and to Sun Keuen Khan fell the southern provinces of the empire, from the Yang-tsze Keang south-wards, including the modern Tonquin, which he formed into the kingdom of Woo with Nan-king for his capital, and oo for himself the imperial style of Tate (222 A.D,

But China during the period of the “ Three Kingdoms” was a house divided against itself. Rivalries, the seeds of which had been sown at the time of the partition of territory, broke out moro fiercely as soon as the courts were

established, Lew Pei, as a descendant of the house of Han, looked upon himself as the rightful sovereign of the whole empire, and he despatched an army under the command of the celebrated general Choo-ko Leang to support his claims. This army was met by an opposing force under the Wei commander Sze-ma E, of whom Chinese historians say that “ he led armies like a god,” and who, by adopting a Fabian policy, completely dis- comfited his adversary. But the close of this campaign brought no peace to the country. Wars became chronic, and by degrees the reins of power slipped out of the hands of emperors into those of their generals, Foremost among these were the members of the Sze-ma family of Wei. Sze-ma E left a son, Sze-ma Chaou, scarcely less distin- guished than he was himself, and when Sze-ma Chaou was gathcred to his fathers his honours descended to Sze-ma Yen, who, finding the county ripe for a change, deposed the ruling sovereign of Wei, and proclaimed himself emperor of China (265 a.p.) His dynasty he styled the Western Tsin dynasty, and he adopted for himself the title of Woo-te. The most noticeable event in this reign was the advent of the ambassadors of the Emperor Theodosius in 284, For some years the neighbouring states appear to have transferred their allegiance from the House of Wei to that of Tsin. But the condition of China at this time was such that no government could stand unless admin- istered by an able and powerful chief. Woo-te’s successors failing to fulfil these conditions, the country soon fell again into disorder. The Heung-noo, encouraged by the decad- ence of the Chinese power, renewed incursious into the empire at the beginning of the 4th century, and in the confusion which followed on these attacks from without as well as those that were distracting the country from within, an adventurer named Lew Yuen established himself (in 311) as emperor, first at Ping-yang in Shan-se and after- wards in Lo-yang and Chang-gan. The history of this period is very chaotic. Numerous states sprung up into existence, some founded by the Heung-noo, and others by the Seen-pe tribe, a Tungusic clan inhabiting a territory to the north of China, and who afterwards established the Leaou dynasty in China. The hand of every man was against his neighbour. Nothing was lasting; and in 419 the Eastern Tsin dynasty, which had dragged on a chequered existence for nearly a century, came to an end, and with it disappeared for close on two hundred years all semblance of united authority. The country became divided into two parts, the north and the south. In the north four families reigned successively, two of which

were of Seen-pe origin, viz., the Wei and the How Chow, the other two, the Pih Tse and the How Leang, being Chinese. In the south five different houses supplied rulers, who were all of Chinese descent.

This period of disorder was brought to a close by the establishment of the Suydynasty (590). Among the officials of the ephemeral dyuasty of Chow was one Yang Keen, who on his daughter becoming empress (578) was created duke of Suy. Meanwhile, he waited for an opportunity to overturn the reigning house, and, as has so often happened in the history of China, he had not long to wait. The last of the house of Chin was as weak and profligate as any of his predecessors. Him Yang Keen deposed and immediately ascended the throne (590). The country, weary of contention, was only too glad to acknowledge his undivided authority ; and during the sixteen years of his reign the internal affairs of China were comparatively peaceably and prosperously administered. The emperor instituted a new and improved code of laws, and showed his respect for literature by adding 5000 volumes to the 10,000 which composed the imperial library. Abroad, his policy was equally successful. He defeated the Tatars and chastised the Coreans, who were disposed to throw aside his authority. The only scene of disorder was in his own household. His sons were unruly and violent, and after his death, in 604, his second son forced the heir to the throne to strangle himself, and then instantly assumed the imperial yellow. At first this usurper, Yang-te, gave him- self up to every species of debauchery, but wearying of sensual lusts, he was seized with a desire for conquest. He sent expeditions against the Tatars, and regained some of the influence which had formerly belonged to China in Central Asia. He himself headed an expedition against the Ouigours at the same time that one of his generals aunexed the Lew Kew Island to the imperial crown. During his reign the volumes in the imperial library were increased to 54,000, and he spent vast sums in erccting a magnificent palace at Lo-yang, and in constructing unprofitable canals. These and other extravagances laid so heavy a burden on the country that discontent began again to prevail, and on the cmperor’s return from a successful expedition against the Coreans, he found the

empire divided into rebellious factions. In the turmoil which followed General Le Yuen rose to the surface, aud on the death of the emperor by assassination this man set Kung-te, the rightful heir, on the throne (617) until such time as he should have matured his schemes. In the following year a dose of poison vacated the throne, aud Le Yuen forthwith assumed the imperial sceptre, and proclaimed himself as Tai-tsung the first emperor of the Tang dynasty. At this time the ‘Turks were at the height of their powcr in Asia, and Tai-tsung was glad to purchase their alliance with money as the Emperor Justinian had been in 558, But divisions weakened the power of this mighty horde, and Tai-tsung, taking advantage of the opportunity, regained much of the position in Central Asia which had formerly been held by China. In 640, Hamil, Turfan, and the rest of the Ouigour territory were again included within the Chinese frontier, and four military governorships were appointed in Central Asia, viz., at Kuché, Khoten, Kharastan, and Kashgar. At the same time the frontier was extended as far as Eastern Persia and the Caspian Sea. So great was now the fame of China, that ambassadors from Nepaul, Magadha, Persia, and Rome (643) came to pay their court to the Great Khan. Before this time, in 635, a Nestorian priest, O-lo*peen by name, arrived from Rome, who so ingratiated himself with the emperor that he built for him a church, and appointed twenty priests to perform the services. Subsequently, on the death of Tai-tsung (649), we find the strange phenomenon of the imperial power seized upon by

a woman in a country where women were regarded as little else than slaves. On the accession of Kaou-tsung (650) his wife, Woo How, gained supreme influence in the management of affairs, and on the death of her husband in 683 she set aside his lawful successor, Chung-tsung, and took possession of the throne, Nor was she unequal to the office she had usurped. She governed the empire with discretion, and her armies defeated the Tibetans, who had latterly gained possession of Kuché, Khoten, and Kashgar. Thus she re-established the imperial government in the west, and her generals proved themselves victorious over the Khitan in the north-east. On her death, in 705, Chung-tsung partially left the obscurity in which he had lived during his mother’s reign. But his wife, desiring to play a similar rdle to that

enjoyed by her mother-in-law, poisoned him and set his son, Juy-tsung (710), on the throne. ‘This monarch, who wag weak and vicious, reigned but three years, and was succeeded by Yuen-tsung (713), who was in some respects an enlightened and able prince. He busied himself with introducing reform into the administration of the empire, and encouraged literature and learning with wisdom and discretion. During his reign the king of Khokand applied to him for aid against the Tibetans and Arabs, who wero advancing to attack him, Yuen-tsung promptly sent an army to his succour, and the aggressors were completely defeated, In a war with the Khitans in the north-east he was not so suecess- ful; and in the disorder which arose in consequence of the invasion of the northern provinces by these formidable neighbours, General Gan Luh-shan, an officer of Turkish descent, placed himself at the head of a revolt, and having secured ‘ung-kwan on the Yellow River, advanced on Chang-gan. In this emergency the emperor fled, and placed hig son, Suh-tsung, on the throne (756). This sovereign summoned to his aid the forces of the kings of Khoten and Khokand, of the state of Bokhara, of the Ouigours, and of the Arabs, and with these allies he com- pletely defeated Gan Luh-shan and suppressed the rebellion. The promise held out by this energetic beginning of his reign was not fulfilled by his later career. He fell under the influence of the women and eunuchs of his harem, and died unregretted in 762. During the following reigns the Tibetans made constant incursions into the western pro- vinces of the empire, and Tai-tsung (763-780), was com- pelled to purchase the assistance of the Ouigours against those intruders by giving a Chinese princess as wife to the Khan, At this epoch the eunuchs of the palace succeeded in gaining an unwonted degree of power, and several of the subsequent emperors fell victims to their plots,

The history of this and the following century is for the most part a monotonous record of feeble Governments, low and vicious intrigues, oppressions, and rebellions. Almost the only relief in the constant rounds of these scenes towards the close of the Tang dynasty was the iconoclastic policy of Woo-tsung (841-847). Viewing the increase of monasteries and ecclesiastical establishments as an evil, he abolished all temples, closed the monasteries and nunneries, and sent the inmates back to their families. Foreign priests were subjected to the same repressive legislation, and Christians, Buddhists, and Magi were bidden to turn their faces westward in

the direction of the places from whence they came. With his death terminated also this policy. Buddhism again revived during the reign of the Emperor E-tsung (860-874), who, having had the honour to discover a bone of Buddha, brought it to the capiffl in great state. By constant internal dissensions and outbreaks . the empire became so weakened that the prince of Leang found no difficulty in gaining possession of the throne, and in 907 he assumed the imperial yellow with the title of

Tai-tsoo, the first emperor of the later Leang dynasty. Thus ended the Tang dynasty, which is regarded as being the Golden Age of literature,

Five dynasties, viz., the Later Leang, the Later Tang, the Later Tsin, the Later Han, and the Later Chow fol- lowed each other in quick succession between the years 907 and 960, But though the monarchs of these lines nominally held sway over the empire, their real power was confined to very narrow limits. The disorders which were rife during the time when the Tang dynasty was tottering to its fall fostered the development of indepen- dent states, and so arose Leang in Ho-nan and Shan-tung, Ke in Shen-se, Hwai-nan in Keang-nan, Chow in Sze- chuen and parts of Shen-se and Hoo-kwang, Woo-yué in Ché-keang, Tsoo and King-nan in Hoo-kwang, Ling-nan in Kwang-tung, and the Ouigours in Tangout.

A partial end was made to this recognized disorganiza- tion when, in 960, General Chaou Kwang-yin was pro- claimed by acclamation of the army emperor in succession to the youthful Kung-te, who was compelled to vacate the throne to make way for his quondam lieutenant. The circumstances of the time justified the exchange. It required a strong hand to weld together again the different parts into which the empire had been divided, and to resist the attacks of the Khitan Tatars, whose rule at this period extended over tho whole of Manchuria and Leaou-tung. Against these aggressive neighbours Tai-tsoo né Chaou Kwang-yin directed his best efforts with varying success, and he died in 976, while the war was still being waged. His son Tai-tsung (976-997) entered on the campaign with energy, but in the end was compelled to conclude a peace with the Khitans.

His successor, Chin-tsung (997— 1022), descended a step lower in his dealings with them, and agreed to pay them a tribute to induce them to abstain from their incursions, Probably this tribute was not sent regularly ; at all events, under Jin-tsung (1023-1064), the Khitans again threatened to invade the empire, and were only persuaded to forego their intention by the emperor promising to pay them an annual tribute of 200,000 taels of silver, besides a great quantity of silken piece goods. Neither was this arrangement long binding, and so formid- able were the advances made by the Tatars in the next and following reign, that Hwuy-tsung (1101-1126) invited the Neu-che Tatars to expel the Khitans from Leaou-tung. The call was readily responded to; the service was effectu- ally performed, but having once possessed themselves of the country they declined to yield it to the Chinese, and the result was that a still more aggressive neighbour was established on the north-eastern frontier of China, Without delay the Neu-che or Kins, as they now styled themselves, overran the provinces of Chih-li, Shen-se, Shan-se, and Ho-nan, and during the reign of Kaou-tsung (1127-1163) they advanced their conquests to the line of the Yang-tsze Keang.

It was during this period that the Mongols began to acquiré power in Eastern Asia, and about the beginning of the 12th century they invaded the north-western frontier of China and the principality of Hea, which at that time consisted of the modern provinces of Shen-se and Kan- suh. To purchase the good-will of these subjects of Jenghiz Khan the king of Hea agreed to pay them a tribute, and gave a princess in marriage to their ruler. Hitherto the Mongols had been vassals of the Kin Tatars, but the

-rapid growth of their power indisposed them to remain tributaries of any monarch, and in consequence of a dispute

with the Emperor Wei-chaou Wang, Jenghiz Khan deter- mined to invade the Kin province of Leaou-tung. In this expedition he was aided by the followers of the Khitan leader Yay-lu Tsoo-tsai, and in alliance with this general he captured Leaou-yang the capital city, After an unsuc-

cessful invasion of China in 1212, Jenghiz Khan renewed the attack in the following year and completely defeated the Kins. In the confusion which

followed the emperor was murdered by his generals, and Seuen-tsung ascended the throne. But the change of ruler brought no better fortune to the Kin cause, Jenghiz Khan divided his armies into four divisions, and made a general advance southwards. With resistless force his soldiers swept over the provinces of Ho-nan, Chih-li, and Shan-tung, destroying in their course upwards of ninety cities, and spreading desolation every- where. It was their boast that a horseman might ride without stumbling over the sites where those cities had stood. Panic-stricken by the danger which threatened him, the emperor moved his court to Kai-fung Foo, much against the advice of his ministers, who foresaw the disastrous effect this retreat would have on the fortunes of Kin. And now, as foes advanced, friends fell off from the tottering house. The state of Sung, which up to this time had paid tribute, now declined to recognize Kin as its feudal chief, and a short time afterwards declared war against its quondam ally. Meanwhile, in 1215, Yay-lu Tsoo-tsai advanced into China by the Shan-hai Kwan, and made himself master of Peking, which until then was one of the few cities in Chih-li which remained to Kin. victory his nobles wished him to proclaim himself emperor, but he refused, being mindful of an oath which he had sworn to Jenghiz Khan. In 1216 Tung-kwan, a pass in the mountains between the frontier of Ho-nan and Shen-se, which in the history of China has been the scene of numerous dynastic battles, forming as it does the only gateway between Eastern and Western China, was taken by the invaders. Year after year the war dragged on, the resistance offered by the Kins growing weaker and weaker. In 1220 Tse-nan Foo the capital of Shan-tung was taken, and five years later Jenghiz Khan marched an army westward into Hea and completely con- quered the forces of the king; but it was not until the year following the king’s death that he took possession of the principality. In the succeeding year Jenghiz Khan himself was gathered to his fathers, and Ogdai his son reigned in his stead.

Thus died at the age of 66 this great general, whose armies had triumphed victoriously over the whole of Cen- tral Asia, from the Caspian Sea and the Indus to Corea and the Yang-tsze Keang. With his dying breath he adjured his son to complete the conquest of China, and with a view to this, the crowning desire of his life, he declined to nominate either of the two eldest sons who had been born to his Chinese wives as his heir, but choose rather his third son Ogdai whose mother was a Tatar. On hearing of the death of

Jenghiz Khan the Kins sent an embassy to his successor desiring peace, but Ogdai, remembering the last injunctions of his father, told them there would be no peace for them until their dynasty should be overthrown. Up to this time the Mongols had been without any code of laws, The old rule

‘That they should take who have the power, And they should keep who can,” was the maxim on which they guided their mutual inter- course, and the punishments due for offences were left entirely to the discretion of the officials before whom the culprits were tried. The consistency, however, which had been given to the nation by the conquests of Jenghiz Klan made it necessary to establish a recognized code of laws, and one of the first acts of Ogdai was to form such a code. With the help also of Yay-lu Tsoo-tsai, he established custom houses in Chih-li, Shan-tung, Shan-se, and Leaou-tung; and for this purpose divided these provinces into ten departments. Meanwhile the war with the Kins was carried on with energy. In 1230 Se-gan Foo was taken,

After this’

and sixty important posts were captured. Two years later Too-le, brother of Ogdai, took Fung-tseang Foo and Han- chung Foo, in the flight from which last-named place 100,000 persons are said to have perished. Following the course of the River Han in his victorious career this general destroyed 140 towns and fortresses, and defeated the army of Kin at Mount San-fung.

In the following year the Mongol cause suffered a great loss by the death of Too-le. This famous warrior left behind him twelve sons, two of whom, Mangu, the first- born, and Kublai, the fourth son, were destined to sit in succession on the throne of their uncle Ogdai. But their time was not yet. First of all they had to win their spurs, and well did they prove by their deeds their right to the name of Mongol or “daring.” In China, in Central Asia, and on the banks of the Caspian they led their victorious armies. But meanwhile, in 1232, the Mongols madé an alliance with the state of Sung, by which, on condition of Sung helping to destroy Kin, Ho-nan was to be

the property of Sung for ever. The effect of this coalition soon became apparent. Barely had the Kin emperor retreated from Kai- fung Foo to Joo-ning Foo in Ho-nan when the former place fell into the hands of the allies. Next fell Loyang, and the victorious generals then marched on to besiege Joo-ning Foo. The presence of the emperor gave energy to the defenders, and they held out until every animal in the city had been killed for food, until every old and useless person had suf- fered death to lessen the number of hungry mouths, until so many able-bodied men had fallen by the hand of the enemy that the women manned the ramparts, and then the allies stormed the walls. Once inside the town the inhabitants, enfeebled by starvation, fell ready victims to their swords. The emperor, like another Sardanapalus, despairing now of success, burned himself to death in his palace, that his body might not fall into the hands of his enemies. For a few ‘days the shadow of the imperial crown rested on the head of his heir Changlin, but in a tumult which broke out amongst his followers he lost his life, and with him ended the “Golden” dynasty, which from that time disappeared from the country’s annals until the Manchoo family now reigning came, nearly four cen- turies later, to claim the throno as heirs of the defender of Joo-ning Foo.

Although China was still by no means conquered, yet the extinction of the Kin dynasty enabled Ogdai to send an army of 300,000 men to ravage the country bordering on the Caspian Sea. But so vast were the resources at his command, that he was able to despatch at the same time a force 600,000 strong into Sze-chuen to subdue the power of Sung in that province. For, notwithstanding the treaty which had been made between Ogdai and Sung, no soone were the spoils of Kin to be divided than fierce war broke out again between them, in prosecuting which the Mongol armies swept over the provinces of Hoo-kwang, Keang-nan, and Ho-nan, and were checked only when they reached the walls of Loo-chow Foo in Gan-hwuy. Ogdai was not destined to live to sec his sway acknowledged over the whole empire. In 1241, he died at the age of fifty-six, having reigned thirteen years, and was nominally suc- ceeded by his grandson Cheliemen, But among the numerous ladies who called Ogdai lord, was one named Toliekona, who on the death of the emperor took posses: sion of the throne, and after exercising rule for four years, established her son Kwei-yew, as Great Khan. But in 1248 his life was cut short, and the nobles, disregarding thc claims of Cheliemen, proclaimed as emperor Mangu, the eldest son of Too-le. Under this monarch the war against Sung was carried on with energy, and Kublai, outstripping the bounds of Sung territory, made his way into the pro- vince of Yun-nau, which at that time was divided into a

number of independent states, and having attaehed them to his brother’s erown he passed on into Tibet, Tonquin, and Coehin-China, and from thence striking northwards entered the provinee of Kwang-se. On the death of Mangu in 1259 Kublai ascended the throne, and never in the history of China was the nation more illustrious, nor its power more widely felt, than under his sovereignty. During the first twenty years of his reign Sung kept up a resistance, gradually growing weaker and weaker, against his authority; and it was not, therefore, until 1280 that he assumed complete jurisdietion as emperor of China. At this time his authority was aeknowledged “from the Frozen Sea, almost to the Straits of Malacea. With the exeeption of Hindustan, Arabia, and the westernmost parts of Asia, all the Mongol prinecs as far as the Dnieper deelared themselves his vassals,

and brought regularly their tribute." It was during this reign that Mareo Polo visited China, and he deseribes in glowing colours the virtues and glories of the "Great Khan." But though his rule was charaeterized by discretion and munificenee, his Chinese subjeets were uneasy under his yoke. He undertook publie works, he patronized litera- ture, and relieved the distress of the poor, but still they never forgot that he was an alicn and a barbarian, and he died unregretted in 1294. His son had died duriug his lifetime, and after some eontention his grandson Timur aseended the throne under the title of Yuen-ehing. After an uneventful reign this prinee was gathered to his fathers in 1307, and as he left no son, Woo-tsung, . Mongol prinee, reigned in his stead. To him, sueeeeded Jin-tsung in 1311, who made himself eonspicuous by the honour he showed to the memory of Confueius, and by distributing offiees more equally between Mongols and Chinese than had hitherto been done. This act of justiee gave great satisfaction to the Chinese, and his death ended a peaceful and prosperous reign in 1320. Threc years later,—three years of disorder,— his suceessor, Ying-tsung, was murdered by a band of con- spirators. From this time the star of the Yuen dynasty was in the deseendant. 'Tai-ting-te, Ming-tsung, Win-te, and Shun-te followed one another on the throne in quiek suecession. Hach reign was more troublous than the last, and in the person of Shun-te (1333-1368) were summed up all the viees and faults of his predecessors. Outbreaks, whieh up to his time had been loeal in their charaeter, assumed large aud threatening proportions ; and finally this deseendant of Jenghiz Khan was eompelled to fly from his capital before Choo Yuen-chang, the son of a Chinese labouring man. Deserted by his followers he sought refuge in Ying-chang Foo, and there the last of the Yuen dynasty died. So disunited had the empire beeome by eonstant disturbanees and rebellions, that Choo Yuen-chang met with little opposition to lis forees, more espeeially as his first care on beeoming possessed of a distriet was to suppress law- lessuess and to establish a settled government. In 1355 he erossed the Yang-tsze Keang and captured Nan-king, in consequenee of which sueeess he proelaimed himself duke of Woo, but as yet he earefully avoided adopting any of the insignia of royalty. Even when he had taken the eapital and was the master of the empire thirteen years later, he still professed to dislike the idea of assuming the imperial title. His scruples, however, on this point were overeome, and he solemnly declared himself emperor in 1368. Onee seated upon the throne, he ingratiated himself with his subjeets by his generous

treatment of his enemies, aud by the regard he showed for the welfare of his people. He earried his arms into Tatary, where he subdued the last semblanee of Mongol power in that direetion, and then bent his steps towards Leaou-tung. Here the Mongols defended themselves with the bravery of despair, but

nothing could resist the onslaught of the victorious Chinese, and the conquest of this provinee left Hung-woo, as the founder of the new or Ming, “ Bright,” dynasty styled himself, without a foe in the empire. Beyond the frontier of China he eultivated friendly relations with the rulers of the neighbouring states. The king of Corea sent an embassy to eongratulate him on his aeeession, and the sovereign of the Lew-ehew Islands sent his brothers and sons to his eourt to be edueated. As a quondam Buddhist priest he naturally lent his countenance to that religion to the exclusion of Taouism, whose priests had for eenturies earned the eontempt of all but the most ignorant by their pretended magieal arts and their seareh after the philo- sopher’s stone. In 1398, and in the thirtieth year of his reign, Hung-woo was gathered to his fathers, and Keen-win his grandson reigned in his stead. Aware that the appointment of this youth-—his father was dead —would give offenee to the young emperor’s uncles, Hung-woo dismissed them to their respeetive governments before death elosed his eyes. This, however, only delayed the storm. The prinee of Yen, his eldest surviving son, raised the banner of rebellion in his principality as soon as the news reached him of his nephew’s accession, and after gaining several vietories over the armies of Keen-win he presented himself before the gates of Nanking, the eapital. Treachery opened the gates to him, and the emperor having fled in the disguise of a monk, the vietorious prince elothed himself in imperial yellow and took the title of Yung-lo (1403). At home Yung-lo devoted himself to the eneouragement of literature and the fine arts, and, possibly from a knowledge that Keen-witn was among the Buddhist priests, he renewed the law prohibiting Buddhism. Abroad he swept Coehin-China and Tonquin within the folds of his empire and carried his arms into Tatary, where he made new conquests of waste regions, and erected a monu- ment

of his vietories. His death took place in 1425, and he was in that year succeeded by his son Hung-ke. Hung-ke's reign was short and uneventful. He did that whieh was right as far his knowledge went. He strove to promote only sueh mandarins as had proved themselves to be able aud honest, and to further the welfare of the people. During the reign of his suceessor, Seuen-tih (1426-1436), the empire suffered the first loss of territory since the commeneement of the dynasty. Coehin-China rebelled and gained her independence. But this was but the beginning of troubles. The next emperor, Ching-tung (1436) was defeated and takeu prisoner by a Tatar ehieftain, a descendant of the Yuen family named Ye-seen, who had invaded the northern provinces. With unusual elemeney the Tatar gave him his life, though he kept him a elose prisoner until the fortunes of war turned against him. Having been eompletely defeated by a Chinese force from Leaou-tung, Ye-seen liberated his eaptive, who returned to his eapital amidst the rejoieings of the people, again to occupy the throne which during his imprisonment (1450- 1457) had been held by his brother King-te. The two following reigns, those of Ching-hwa (1465-1488) and of Hung-ehe (1488-1506) were quiet and peaceful. But their suecessor Ching-tih (1506~1522) was ealled upon to face a very formidable insurrection headed by the prinee of Ning. He was, however, victorious over the rebel, who lost 30,000 men in the engagement whieh put an end to his hopes. The disorder into which the empire had been thrown by this eivil war eneouraged the foreign enemies of China. First of all from the dreaded north eame a Tatar army under Yen-ta in 1542, during the reign of Kea-tsing, whieh laid waste the province of Shen-se, and even threatened the eapital, and a little later a Japanese fleet appeared off the eoast and carried fire and sword through the littoral provinces. Tll-blood had arisen between the

two peoples before this, and a Japanese colony had been driven out of Ningpo by force and not without bloodshed a few years previously. Kea-tsing was not equal to such emergencies, and his death, which took place in 1567, would have been an advantage to the empire, had his son been a more able prince. But the only weapon Lung-king (1567-1573) was able to wield against the Tatar Yen-ta was a bribe. He made him a prince of the empire, and gave him certain commercial privileges, which were further

supplemented by the succeeding emperor Wan-leth (1573- 1620) by a grant of land in Shen-se. During the reign of this sovereign, in the year 1592, the Japanese successfully invaded Corea, and Taikosama, the emperor of Japan, was on the point of proclaiming himself king of the peninsula, when a large Chinese force answering to the invitation of the king, appeared on the field and completely routed the Japanese army, at the same time that the Chinese fleet cut off their retreat by sea, In this extremity the Japanese sued for peace, and sent an embassy to Peking to arrange terms, But the peace was of short duration. In 1597 the Japanese again invaded Corea and defeated the Chinese army which was sent against them, nor were they less successful at sea. They destroyed the Chinese fleet and ravaged the coast. Suddenly, however, when in the full tide of conquest, they evacuated Corea, which again fell under the direction of China. Four years later Ricci arrived at the Chinese court; and though at first the emperor was inclined to send him out of the country, his abilities gradually won for him the esteem of the sovereign and his ministers, and he remained the scientific adviser of the court until his death in 1610. Avbout this time the power which was destined to overthrow the Ming dynasty began to grow restless. The Manchoo Tatars, goaded into war by the injustice they were constantly receiving at the hands of the Chinese, led an army into China in 1616 and completely defeated the force which was sent against them. Three years later they were again victorious over the Chinese, and they then gained possession of the province of Leaou-tung. This final series of disasters was more than the emperor could bear, and he died of a broken heart in

1620.

In the same year Teen-ning, the Manchoo sovereign, having declared himself independent, and possessed him- self of Leaou-tung, moved the court to San-koo, to the east vf Moukden, which, five years later, he made his capital. Meanwhile Tai-chang, the son of Wan-leth, ascended the Chinese throne, but barely had he assumed the reins of power when he fell ill. Acting on the advice of his doctors he drank of the liquor of immortality and died. The next emperor Teen-ke, after a brief and troublous rcign, followed him to the grave in 1627, and to him succeeded Tsung- ching, the last emperor of the Ming dynasty. In his reign the storm-clouds, which had been collecting for some years, burst over the empire. In addition to the

threatened danger on the north, rebel bands, enriched by plunder, and grown bold by success, began-to assume the proportion of armies. They dominated over whole districts and provinces and paralyzed the imperial forces by their energy and daring. Out of this seething mass of insubordination two leaders showed themselves con- spicuously. These were Le Tsze-ching and Shang Ko-he. In order that there should be no dispute as to which should be greatest, they decided to divide the empire between them, and to begin with it was agreed that Shang should take possession of Sze-chuen and Hoo-kwang, and that Le should make himself master of Ho-nan. Bent on this mission Le besieged Kaifung Foo, the capital of the pro- vince, and so long and closely did he beleaguer it that in the consequent famine human flesh was regularly sold in the market. At length an imperial force came to raise the

siege, with consequences as fatal to the inhabitants as if the rebels had gained the city ; for, fearful of mecting Le's army in the field, they cut through the dykes of the Yellow River, " China's Sorrow," and flooded the whole country including the city. The rebels escaped to the mountains, but upwards of 200,000 inhabitants perished in the flood, and the city became a heap of ruins (1642). From Kai- fung Foo Le marched against the other strongholds of Ho- nan and Shen-se, and was so completely successful that he determined to attack Peking. A treacherous eunuch opened the gates to him, on being informed of which the emperor comiitted suicide. When the news of this disaster reached the gencral-commanding on the frontier of Manchoo Tatary, he, in an unguarded moment, con- cluded a peace with the Manchoos, and invited them to dispossess the rebel Le Tsze-ching. With ready acquies- cence the Manchoos entered China, and after defeating a rebel army sent against them, they marched towards Peking. On hearing of the approach of the invaders, Le Tsze-ching, after having set fire to the imperial palace, evacuated the city, but was overtaken, and his force was completely routed. The object for which the Manchoos had been introduced into the empire having now been accomplished, the Chinese wished them to retire, but, like the Mongols, having once gained a footing in the empire,

they declared themselves unwilling to leave it, and having taken possession of Peking they proclaimed the ninth son of Teen-ning emperor of China under the title of Shun-che, and adopted the name of Ta-tsing, or “ Great pure,” for the dynasty (1644). Meanwhile the mandarins at Nanking had chosen an imperial prince to ascend the throne. But with all the prestige of victory the Tatars bore down all opposition, and at this most inopportune moment “a claimant” to the throne, in the person of a pretended son of the last emperor, appeared at court. This additional complication still further reduced the Chinese power of acting. While this contention prevailed inside Nanking the Tatar army appeared at the walls. But there was no need for them to use force. The gates were thrown open, and they took possession of the city without shedding a drop of blood. Following the conciliatory policy they had everywhere pursued, they confirmed the mandanins in their offices and granted a general amnesty to all who would lay down their arms. As the Tatars entered the city the emperor left it, and after wandering about for some days in great miscry, he threw himself into the Yang-tsze Keang and was drowned. ‘lus ended the Ming dynasty, and the cmpire passed again under a forcign yoke,

All accounts agree in stating that the Manchoo con- querors are descendants of a branch of the family which gave the Kin dynasty to the north of China; and in licu of any authentic account of their early history, native writers have thrown a cloud of fable over their origin, These tell us that in remote ages three heaven-born virgins dwelt beneath the shadow of the Great White mountains, and that while they were bathing in a lake which reflected in its bosom the snow-clad peaks which towered above it, a magpie dropped a blood-red fruit on the clothes of the youngest. This the maiden instinctively devoured, and forthwith conceived and bore a son, whose name they called Aisin Ghioro, which being interpreted is the “ Golden Family Stem,” and which is the family name of the present emperors of China. When his rnother had entered the icy cave of the dead, her son embarked on a little boat and floated down the River Hurka until he reached a district ocenpied by three families who were at war with each other. The personal appcarance of the supernatural youth so impressed these warlike chiefs that they forgot their enmities and hailed him as their aa as town of

O-to-le (48° 35’ N. lat. and 128° E. long.) was chosen as his capital, and from that day his people waxed fat, and at length, as we have seen, kicked against their oppressors, the Chinese. me,

This legend confirms the general belief that the original seat of the Manchoos was in the valley of the Hurka, a river which flows into the Sungari in about 46° 20’ N. lat., and 129° 50’ E. long. Under a succession of able and hardy chiefs they added land to land and tribe to tribe, until, in the 16th century, we find them able to cope with, and in a position to demand favourable terms by treaty from, their Chinese neighbours. As they became more powerful their complaints became louder against acts of aggressive oppression which they laid at the door of the Mings. But who will say that the fault was all on one side? Doubtless the Mings tried to check their ambition by cruel reprisals— a mistaken policy common to oppressors who find them- selves with waning powers in the presence of growing discontent. But if we are to square the account, against this must be put numerous Manchoo raids into Leaou-tung, entailing loss of life and property on the subjects of China. And the ready rapidity with which these Manchurian horsemen swept round the corner of the Great Wall into China proper on the fatal invitation of the Chinese general shows that they were neither unwilling nor unaccustomed to wander beyond their own frontiers.

But the accession to the throne of the Emperor Shun- che did not by any means at first restore peace to the country. In Keang-se, Fuh-keen, Kwang-tung, and K wang- se the adherents of the Ming dynasty defended themselves vigorously but unsuccessfully against the invaders, while the pirate Ching Che-tung, the father of the celebrated Koxinga, kept up a predatory warfare against them on the coast. On one occasion he was bought over to the Tatar camp and accepted a princess as a reward for his conver- sion, but he soon returned to his former allegiance, only, however, once again to prove himself a turn-coat. Find- ing him too formidable as a foe the Tatars determined again to gain his alliance. A general’s command proved too tempting a bait to the buccaneer to be refused. He accepted the offer and went on shore to visit the Tatar commander, who received him with all civility. But when the pirate wished to return to his ships he was

politely urged to visit Peking. Once there he was thrown into prison, where he died shortly afterwards. His son Koxinga, warned by his father's example, determined to leave the mainland and to seek an empire elsewhere. His choice fell on Formosa, and having driven the Dutch out of the island, he established himself as king and held possession of the island until the reign of Kang-he, when he resigned in favour of the Imperial Government. Meanwhile a prince of the house of Ming was proclaimed emperor in Kwang-sc, under the title of Yung-leth. But the Tatars having reduced the provinces of Fuh-keen and Keang-se, and having taken Canton after a siege of eight months, marched against and so completely routed his followers that he was compelled to fly to Pegu. There he remained for some years until, believing that his adherents in Yun-nan and Kwei-chow were sufficiently numerous to justify his raising his standard in those provinces, he crossed the frontier and advanced to meet the imperial forces. On this as on the former occasion, fortune declarcd against him. His army was scattered to the four winds, and he was taken prisoner and strangled. Gradually opposition to the new regime became weaker and weaker, and the shaved, head with the pig-tail—the symbol of Tatar sovereignty—became morc and more universally adopted. In 1651 died Ama Wang, the uncle of Shun-che, who had acted as regent during his nephew's minority, and the emperor then assumed the government of the state. Little is known of this monarch.

He appears to have taken a great interest in science, and to have patronized Adam Schaal, a German Jesuit, who was at that time resident at Peking. It was during his reign (1656) that the first Russian embassy arrived at the capital, but as the envoy declined to kowtow before the emperor he was sent back without having been admitted to an audience. After an unquiet reign of seventeen years Shun-che was gathered to his fathers (1661), and Kang-he, his son, reigned in his stead. 'This emperor was as renowned as his father had been unknown. He was indefatigable in administering the affairs of the empire, and at the same time he devoted much of his time to literary and scientific studies under the guidance of the Jesuits. The

dictionary of the Chinese language, published under his superintendence, proves him to have been as great a scholar as his conquests over Eleuths shows him to have been famous as a general. During one of his hunting expeditions to Mongolia he caught a fatal cold, and he died in 1721 after a glorious reign of sixty years. Under his rule Tibet was added to the empire, which extended from the Siberian fronticr to Cochin-China, and from the China Sea to Turkestan. Almost the only national misfortunc that visited China while he sat upon the throne was an earthquake at Peking, in which 400,000 people are said to have perished,

Kang-he was succeeded by Yung-ching, who, reaping the benefits of his father's vigorous administration, enjoyed a peaceable reign, though a short one. He died in 1735, and Keen-lung his son reigned in his room. Ambitious and warlike, this monarch despised the conciliatory measures by which his father had maintained peace with his neighbours. On but a slight provocation, he marched an army into Ih, which he converted into a Chinese province, and he afterwards added eastern Turkestan to the far-reaching territories of China 'Twice he invaded Burmah, and once he penetrated into Cochin-China, but in neither country were his arms successful. He is accused of great cruelty towards his subjects, which they repaid by rebelling against him. During his reign it was that the Mahometan standard was first raised in Kansuh. But the Mussulmans were unable to stand against the imperial troops ; their armies were dispersed ; tcn thousand of them were cxiled; and, effectually to prevent a rencwal of the outbreak for some years, an order was issued that every Mahometan in Kansuh above the age of fifteen should be put to death (1784). Amidst all the political calls upon his time Keen-lung still found leisurc for study. He wrote incessantly, both poetry and prose, and did much to promote the cause of literature by collecting libraries and republishing works of value. His campaigns furnished him with themes for his verses, and in the Summer Palace was found a handsome manuscript copy of a laudatory poem he composed on the occasion of his war against the Gorkhas. This was one of the most successful of his military undertakings. His generals marched 70,000 men into Nepaul to within sixty miles of the British frontiers, and having subjugated the Gorkhas they received the submission of the Nepaulese, and acquired an additional hold over Tibet (1792). In other directions his arms were not so successful. We find no poem com-

memorating the campaign against the rebellious Formo- sans, nor lament over the loss of 100,000 men in that island, and the last few years of his reign were disturbed by outbreaks among the Meaou-tsze or hill tribes, living in the mountains in the provinecs of Kwei-chow and Kwang: se. In 1795, after a reign of sixty years, Keen-lung abdicated in favour of his fifteenth son, who adopted the title of Kea-king as the style of his reign. He only lived three years in retirement, and died at the age of eighty- eight in 1798.

HISTORY. |

During the reign of Keen-lung the relations of the East

India Company with his Government had been the reverse of satisfactory. All kinds of unjust exactions were de- manded from the merchants, and many acts of gross injustice were committed on the persons of Englishmen. So notorious, at length, did these matters become that the British Government determined to send an embassy to the court of Peking, and Lord Macartney was chosen to repre- sent George III. on the occasion. On arriving at Jehol, where the court then was, Lord Macartney was received most graciously by the emperor, and subsequently at Yuen-ming-yuen he was admitted into the imperial presence and was treated with every courtesy. But the concessions he sought for his countrymen were not accorded to him, and in this sense, but in this sense only, his mission was a failure. » Kea-king’s reign, which extended over a period of five- and-twenty years, was disturbed and disastrous. In the northern and western provinces, rebellion after rebellion broke out, due in a great measure to the carelessness and incompetency of the emperor, who was as obstinately self-opinionated as he was unfit to rule, and the coasts were infested with bands of pirates, whose number and organi- zation enabled them for a long time to hold the imperial fleet in check. But, fortunately for the Government, dis-sensions broke out among the pirate chiefs, and, weakened by internal fighting, they finally made their peace with the mandarins and accepted posts under the emperor. Mean- while the condition of the foreign merchants at Canton had in no wise improved. ‘The mandarins were as exact- ing and as unjust as ever, and in order to set matters on a better footing the British Government despatched a second ambassador in the

person of Lord Amherst to Peking in 1816. On arriving at the mouth of the Peiho he was received by imperial commissioners who conducted him to Yuen-ming-yuen, taking every advantage on the way of pointing out to him the necessity of his performing the kowtow before the emperor if he wished to be allowed to enter the imperial presence. This he declined to do, and he was consequently dismissed from the palace on the same day on which he arrived, and thus a new impetus was given to mandarinic insolence.

Destitute of all royal qualities, a slave to his passions, and the servant of caprice, the emperor Kea-king died in the year 1820, after a reign of twenty-five years, leaving a disturbed country and a disaffected people as a legacy to his successor Taou-kwang.

Though possessed in his early years of considerable energy Taon-kwang no sooner ascended the throne than he turned his powers, which should have been directed to the pacification of the empire, to the pursuit of pleasure and amusement. The reforms which his subjects had been led by his first manifestoes to believe would be intro- duced never seriously occupied his attention, and the discontent which had been lulled by hope soon became intensified by despair. In Formosa, Kwang-se, Ho-nan, and other parts of the empire insurrections broke out, which the imperial generals were quite unequal to suppress by force, and the Triad Society, which had originated during the reign of Kang-he, again showed a formidable front under his degenerate successor. Meanwhile the hardships inflicted on the English merchants at Canton became so unbearable, that when, in 1834, the monopoly of the East India Company ceased, the English Government determined to send out a minister to superintend the foreign trade at that port. Lord Napier was selected for the office ; but so vexatious was the conduct of the Chinese authorities, and so inadequately was he supported, that the anxieties of his position brought on an attack of fever, from which he died at Macao after but a few months’ residence

in China. The chief cause of complaint adduced by the mandarins was the introduction of opium bythe merchants, and for years they attempted by

every meaus in their power, by stopping all foreign trade, by demands for the prohibition of the traffic in the drug, and by vigilant pre- ventive measures, to put a stop to its importation. At length Captain Elliot, the superintendent of trade, in 1839 agreed that all the opium in the hands of Englishmen should be given up to the native authorities, and he exacted a pledge from the merchants that they would no longer deal inthe drug. On the 3d April, 20,283 chests of opium were handed over to the mandarins and were by them destroyed—a sufficient proof that they were in earnest in their endeavours to suppress the traflic. This demand of commissioner Lin was considered by the English Govern- ment to amount to a casus bellt, and in 1840 war was declared. In the same year the fleet captured Chusan, and in the following year the Bogue Forts fell, in con- sequence of which operations the Chinese agreed to cede Hong-Kong to the victors and to pay them an indennity of 6,000,000 dollars. As soon as this news reached Peking, Ke Shen, who had succeeded commissioner Lin, was dismissed from his post and degraded, and Yih Shan, another Tatar, was appointed in his room. But before the new com- missioner reached his post, Canton had fallen into the hands of Sir Hugh Gough, and shortly afterwards Amoy, Ningpo, Tinghai in Chusan, Chapoo, Shanghai, and Chin- keang Foo shared the same fate, and a like evil would have happened to Nanking had not the Imperial Government, dreading the loss of the “ Southern Capital,” proposed terms of peace. After much discussion, Sir Henry Pot- tinger, who had succeeded Captain Elliot, concluded, in 1842, a treaty with the imperial commissioners, by which the four additional ports of Amoy, Fuh-chow-Foo, Ningpo, and Shanghai were declared open to foreign trade, and an indemnity of 21,000,000 dollars was to be paid to the Eng- lish, Nor was the remainder of the reign of Taou-kwang more fortunate than its beginning; the empire was com- pletely disorganized, rebellious outbreaks were of frequent occurrence, and the imperial armies were powerless to oppose them. So complete was the demoralization of the troops, that on one occasion the Meaou-tsze or hill tribes of Kwang-se defeated an army of 30,000 men sent against them by the viceroy of the two Kwangs. In 1850, while these clouds were hanging gloomily over the land, Taou- kwang “ascended on high,” and MHeen-fung, his son, reigned in his stead.

A cry was now raised for the reforms which had been hoped for under Taou-kwang, but Heen-fung possessed in an exaggerated form the selfish

and tyrannical nature of his father, together with a voluptuary's craving for every kind of sensual pleasure, and he lived to reap as he had sown. For some time Kwang-se had been in a very disturbed state, and when, on the accession of the new emperor, the people found that no relief from the oppres- sion they endured was to be given them, they broke out into open revolt and proclaimed a youth, who was said to be the representative of the last emperor of the Ming dynasty, as emperor, under the title of Teen-tih or "Heavenly Virtue." From Kwang-se the flames spread into Hoo-pih and Hoo-nan, and then languished from want of a leader and a definite political cry. Just at the moment, however, when there appeared to be a possibility that, by force of arms and the persuasive influence of money, the imperialists would re-establish their supre- macy, a leader presented himself in Kwang-se, whose energy of character, combined with great political and religious enthusiasm, speedily gained for him the suffrages of the discontented. This was Hung Sew-tseuen. Seizing on the popular longing for the return of a Chinese dynasty

he proclaimed himself as sent by heaven to drive out the Tatars, and to restore in his own person the succession to China. At the same time having been converted to Christianity, and professing to abhor the vices and sins of the age, he called on all the virtuous of the land to extirpate rulers who, both in their public laws and in their private acts, were standing examples of all that was base and vile in human nature. Crowds soon flocked to his standard. Teen-tih was deserted; and, putting himself at the head of his followers, Hung Sew-tseuen marched northwards into Hoo-nan and Hoo-pih, overthrowing every force which was sent to oppose him. 'The first city of importance which fell into his hands was Woo-chang Foo on the Yang-tsze-Keang, the capital of Hoo-pih. Situated at the junction of the Han River with the Yang-tsze Keang, this city was a point of great strategical importance. But Hung Sew-tseuen was not inclined to rest upon his laurels, knowing full well that he must be able to call Nanking his before there would be any chance that his dreams of empire could be realized. Having made Woo- chang secure, he therefore moved down the river, and after taking Gan-king on his way he proceeded to the attack of Nanking. So wide-spread was the disaffection at this time throughout the country that the

city was ripe for falling, and without much difficulty Hung Sew-tseuen in 1852 established himself, within its walls, and proclaimed the inanguration of the Tai-ping dynasty, of which he nominated himself the first emperor under the title of Teen Wang or “Heavenly king.” For the next few years it appeared as though he had nailed the flag of victory to his staff. His armies penetrated victoriously as far north as Tientsin and as far east as Chin-keang and Soochow, while bands of sympathizers with his cause appeared in the neighbourhood of Amoy. As if still further to aid and abet him in his schemes, England declared war against the Tatar dynasty in 1857, in consequence of an outrage known as the “ Arrow” affair. In December of the same year Canton was taken by an English force under Sir Michael Seymour and General Straubenzee, and a still further blow was struck against the prestige of the ruling Government by the determination arrived at by Lord Elgin, who had been sent out as special ambassador, to go to Peking and communicate directly with the emperor. In May 1858 the Taku Forts were taken, and the way having thus been cleared of obstacles, Lord Elgin went up the Peiho to Tientsin en route for the capital. At Tientsin, however, he was met by the imperial commissioners, who persuaded him so far to alter his plans as to conclude a treaty with them on the spot, which treaty it was agreed should be ratified at Peking in the following year. When, however, Sir Frederick Bruce, who had been in the meanwhile appointed minister to the court of Peking, attempted to pass Taku to carry out this part of the arrangement, the vessels escorting him were fired on from the forts with such precision and persistency that he was compelled to return to Shanghai to await the arrival of a larger force than that which he then had at his command. As soon as news of this defeat reached England Lord Elgin was again sent out with full powers, and accompanied by a large force under the command of Sir Hope Grant. The French likewise took part in the campaign, and on lst August 1860 the allies landed without meeting with any opposition at Peh-tang, a village twelve miles north of Taku. A few days later the forts at that place which had bid defiance to Sir Frederick Bruce twelve months previously were taken, and from thence the allies marched to Peking. Finding further resistance to be hopeless, the Chinese opened negotiations, and as a guarantee of their good faith surrendered the An-ting gate of the capital to the allies. On the 24th October the treaty of 1858 was ratified by

Prince King and Lord Elgin, and a convention was signed under the terms of which the Chinese agreed to pay a war indemnity of 8,000,000 taels. The Emperor Heen-fung did not live long to see the results of his new relations with the hated foreigner, but died in the summer of the following year, leaving the throne to his son Tung-che a child of five years old.

The conclusion of peace with the allies was the signal for a renewal of the campaign against the Tai-pings, and benefiting by the friendly feelings of the English authorities engendered by the return of amicable relations, the Chinese Government succeeded in enlisting Major Gordon of the Royal Engineers in their service. In a surprisingly short space of time this officer formed the troops, which had formerly been under the command of an American named Ward, into a formidable army, and with- out delay took the field against the rebels. From that day the fortunes of the Tai-pings declined. They lost city after city, and, finally in July 1864, the imperialists, after an interval of twelve years, once more gained possession of Nanking. Teen Wang did not survive the capture of his capital, and with him fell his cause. Those of his followers who escaped the sword of the victors dispersed throughout the country, and the Tai-pings ceased to be.

With the measure of peace which was then restored to the country trade rapidly revived, and, with the exception of tne province of Yun-nan, where the Mahometan rebels under Suleiman still kept the imperial forces at bay, prosperity was everywhere re-awakened. Against these foes the Government was careless to take any active measures, until in 1872 Prince Hassan, the adopted son of Suleiman, was sent on a mission to England with the object of gain- ing the recognition of the Queen for his father’s govern- ment. This step at once aroused the susceptibilities of the Imperial Government, and a large force was instantly organized and despatched to the scene of the rebellion. The war was now pushed on with vigour, and before the year was out the Mahometan capital T’a-le Foo fell into the hands of the imperialists, and the followers of Suleiman. at that place and

throughout the province were mercilessly exterminated. In the succeeding February the Regents— 2.¢., the dowager-empresses, who had governed the country since the death of Heen-fung—resigned their powers into the hands of the emperor. This long-expected time was seized upon by the foreign ministers to urge their right of audience with the emperor, and on the 29th June 1873 the privilege of gazing on the “sacred countenance” was accorded to them. From that time until his death from smallpox on the 12th of January 1875, Tung-che’s name fails to appear in connection with any public act of import- ance,

The Emperor Tung-che having died without issue, the succession to the throne, for the first time in the annals of the Tsing dynasty, passed out of the direct line, and a cousin of the deceased emperor, a princeling, said to be not quite four years old, was chosen to reign in his room, under the title of Kwang-seu or “ Succession of Glory.” Thus is the country again doomed to suffer all the incon- veniences of a long imperial minority, at a time, too, when events seem to show that the civilization of China has grown old, and is like to vanish away; when the intro- duction of new ideas and western modes of thought is about to stretch the old bottle of Confucian tradition to its fullest extent ; and when, therefore, the empire will sorely need wisdom and strength at the head of affairs to guide it safely through the critical times which lie before it in the future.

THe ImMperran Faminy.—The present imperial family, Tmperial on gaining possession of the throne on the fall of the Ta- family.

Ming, or “Great Bright” dynasty, assumed the dynastic

Language,

LANGUAGE. }

Chis 4

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title of Ta-Tsing, o1 “ Great Pure,” and the first emperor, | be conjugated; it is destitute of an alphabet, and finds who was styled She-tsu-chang Hwang-

te, adopted the title | its expression on paper in thousands of distinct symbols,

of Shun-che for his reign, which began in the year 1644. The legendary progenitor of these Manchoo rulers was Aisin Gioro, whose name is said to point to the fact of his having been related to the race of Neu-chih, or Kin, ae., Golden Tatars, who reigned in Northern China dur- ing the 12th and 13th centuries. The present emperor, whose reign is styled Kwang-seu or " Succession of Glory," is the eighth from the founder of the dynasty, and is the only ruler since the establishment of the line who has not succeeded as a direct descendant. Kang-he (1661-1722), for instance, was the third son of Shun-che; Yung-ching (1722-1735) was the fourth son of Kang-h2; Keen-lung (1736-1795) was the fourth son of Yung-ching ; Kea-king (1796-1820) was the fifteenth son of Keenlung; Taou- Kwang (1821-1850) was the second son of Kea-king; Heen-fung (1851-1861) was the fourth of the nine sons who were born to the emperor Taou-kwang ; and Tung- che (1862-1875) was the only son of Heen-fung. As by Chinese law the heir must be younger than the individual from whom he inherits, it became necessary when the Emperor Tung-che "became a guest in Heaven," without issue, in 1875, to select as his successor one of the sons of one of his father's younger brothers, and the choice, which was recorded in his will, fell upon the infant son of the Prince of Chun, the seventh son of the Emperor Taou-kwang.

In order to prevent the confusion which would arise among the princes of the imperial house were they each to adopt an arbitrary name, the Emperor Kang-he decreed that each of his twenty-four sons should have a personal name consisting of two characters, the first of which should be Yung, and the second should be compounded with the determinative she, "to manifest," an arrangement which would, as has been remarked, find an exact parallel in a system by which the sons in an English family might be called Louis Zdward, Louis Edwin, Louis Edwy, Louis Edgar, and soon. This device obtained also in the next generation, all the princes of which had Hung for their first names, and the Emperor Keen-lung (1736-1795) extended it into a system, and directed that the succeed- ing generations should take the four characters Yung, Meen, Yih, and Tsae respectively, as the first parts of their names. ight other characters, namely, Pv, Yu, Héng,

Ke, Taou, K’ai, Tseng, Ke, were subsequently added, thus providing generic names for twelve generations. With the present generation the first four characters are exhausted, and the sons of the present emperor, should he have any, will therefore be P’w’s. By the ceremonial law of the “Great Pure” dynasty, twelve degrees of rank are distributed among the princes of the imperial house, and are as follows :—1. Ho-shih Tsin Wang, prince of the first order ; 2. Tolo Keun Wang, prince of the second order; 3. To-lo Beileh, prince of the third order. 4. Koo-shan Baitsze, prince of the fourth order; 5 to 8. Kung, or duke (with distinctive designations); 9 to 12. Tscang-keun, general (with distinctive designations). The sons of emperors usually receive patents of the first or second order on their reaching manhood, and on their sons is bestowed the title of Beileh. A Beileh’s sons become Beitsze ; a Beitsze’s sons become Kung, and so on.

Language and Interature.

The Chinese language is the chief among that small class of languages which includes the Tibetan, Cochin- Chinese, Burmese, Corean, and Chinesc, and which is usually described as monosyllabic. It is language in its most archaic form. Every word is a root, and every root isa word. It is without inflexion or even agglutination ; its substantives are indeclinable, and its verbs are not to

It is then a language of monosyllabic roots, which, as regards the written character, has been checked in its growth and crystallized in its most ancient form by the early occurrence of a period of great literary activity, of which the nation is proud, and to the productions of which every Chinaman even of the present day looks back as containing the true standards of literary excellence.

But in treating of the two branches into which Chincse

naturally divides itself, namely, the written medium or Written characters and the spoken medium or sounds, we propose language.

to begin with the former. And in following this course we shall be doing no violence to the language, for it would be quite possible to separate the characters from the sounds, and to treat them as two languages, as indeed

has already been partly done in Japan, where the Chinese characters were at one time in general use as representing the phonetic value of their Japanese equivalents. Beginning at the other end, but with a similar ultimate' result, various members of the missionary body have published text-books and dictionaries in Romanized Chinese, that is to say, they have avoided the use of the characters by transcribing the sounds of the language in Roman letters. But since, though the characters are rich and copious to a degree, the sounds are out of all proportion poor, this last dismember- ment presents the language in a very denuded form, and is at the same time attended with difficulties which only the most sanguine can hope to see overcome. The neces- sity of distinguishing between words having the same sound can only be met by the adoption of distinct diacritical marks for each word ; and as one sound often represents as many as a hundred words, such a system cannot but be attended with confusion.

The characters of the language form the medium which speaks to the eye, and may be described as the equivalents of the written words of other languages; but unlike these, instead of being composed of letters of an alphabet, they are either symbols intended to represent images, or are formed by a combination of lines, or of two or more such symbols. All characters, say the Chinese lexicographers, had their origin in single strokes, or in hieroglyphics, and this, no doubt, is a correct view of the case. Legends differ as to who was the first inventor of writing in China. One attributes the invention to Fuh-he (3200 B.c.), who is also said to have instituted marriage, and to have introduced the usc of clothing, and who caused the knotted cords, which had been up to that time in use, to be superseded by characters founded on the shapes of his celebrated diagrams, Another record states that Tsang Ke who lived 2700 B.c., was the Cadmus of China. According to received native accounts, Tsang Ke was a man of extra- ordinary ability, and was acquainted with the art of writing from his birth. While wandering in the neighbourhood of his house at Yang-woo, he one day met with a tortoise, and observing its shell distinctly and beautifully spotted, he took it home, and thus formed the idea of representing the objects around him. Looking upwards he carefully observed the figures presented by the stars and the heavenly bodies ; he then attentively considered the forms of birds, and of mountains and rivers, &c., and from them at length originated the written character.

But however great the uncertainty may be as to who invented the first characters, we may take it for granted that they were simply pictures of the various objects of sense which were present to the eye of the writer. Thus, when he wished to express a mountain, he wrote, as did also the ancient Egyptians, A/\A\ a symbol which is written at the present day |[f[; @ now written Ff, served him to signify “the eye,” and so on. Butsuch a written medium

Different classes of characters.

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was naturally extremely limited, and by degrees, in some instances by the addition of strokes, and in others by a combination of one or more of these primary characters, the written language has been formed as it is at the present day. In tracing the growth of the later characters we are assisted by the native philologists, who have divided them into six classes.

The first they call Stang hing, lit. characters represent- ing the forms of the objects meant, or, as we should say, hieroglyphics, such as those just mentioned, and about 600 more, as, for example, © jth, “the sun,” fi ma, “a horse,” &c.; and of these are composed, with a few excep- tions, the 214 determinative or radical characters, one of which enters into the composition of every character in the language.

The second class is called Chi sze, lit. characters indicat- ing things, that is to say, characters intended to represent ideas to the mind by the position of their parts. Thus the character. © tan, “ dawn,” in which the sun is represented as appearing above the horizon, belongs to it, and also such characters as [f shang, “above,” and P hea, “ beneath,” which are formed in the one case by placing a man above the medium level, and in the other below it.

The third class is made up of Hwuy 1, lit. characters combining ideas, or ideographics. This class is formed by uniting two or more significant characters to give the idea of a third. Of the time when these characters were invented we know nothing ; but it is plain that their intro- duction must have given a very extended scope to the language, and they offer an

interesting study, as, in many instances, giving us an insight into the moral and social conditions of those who framed them, For instance, if we analyze the character {§ sé, “sincere,” we find that it is formed by the combination of the characters J\ jin, “a man,” and % yen, “words,” a collocation of ideas which speaks well for the honourable truthfulness of the ancient Chinese, and which, when the unfortunate failing in this respect of their descendants is borne in mind, is decidedly opposed to the Darwinian theory as applied to language. The character &. ZHwang, “Emperor,” is another belonging to this class, which gives anything but a contemptible notion of the moral standard of the people. This symbol was originally written thus E1!, and was composed of the characters meaning “ oneself” and “ruler ;” the emperor was therefore to be ruler of himself, or autocrat in the true sense of the term; for how cau a man, said the ancient sages, rule others unless he first learn to be master of himself ?

Curiously enough, by the omission of a stroke, this character has assumed its present corrupted form, which consists of parts signifying “‘ white ” and “‘ ruler,” and this, as was mentioned in a recent letter from the St Petersburg correspondent of the Z’imes, has been literally translated by the Mongols into Tchagau Khan, and then by the Russians into Biely Tsar, or White Tsar, the name by which the emperor of Russia is now known throughout all Asia.

Another character in this class is WY ming, “ brightness,” which is composed of a combination of the sun and moon to indicate brilliancy. Altogether, of these ideographics there are said to be about 700 in the language, although some writers have held that this class is a very much larger one, and have justified their belief by analyses which, to say the least, are far-fetched. Callery quotes a Jesuit work, in which it is stated that the character fff} chuen, “a ship,” contains to the eye of faith—and we should imagine to that eye alone—a reference to the Flood, since it consists of F¥ chow, “a ship,” JV pd, “eight,” and [1 kow, “a mouth,” plainly pointing, adds the writer, to Noah’s ark with its eight inhabitants; and that 3 lan, “to covet and desire,” bears traces of Eve’s guilt in its component parts,

which are 7 neu, “a woman,” and 7X muh, “a tree,” twice repeated, illustrating the longing desire which overcame our first parent when between the trces of life and of good and evil.

The fourth class is the Chwen choo, or characters which, being inverted, either in form or sound, assume diffcrent meanings. These number about 372, and are formed in two ways,—either by sonie slight alteration of the character, as the turning of a stroke or of strokes to the left instead of the right, as, for instance, the character for the hand pointing to the left in this way >| means “left,” and when turned thus & means“ right ;” or by changing the sound of the character, aud with the sound the meaning. Of this kind are such characters as ##%, which when pronounced yo means “ music,” and when Jd, ‘ delight,” and 9, which as 4 means “ easy,” and as yik means to “ change.”

The fifth class is the Chia chieh, lit. characters having borrowed meanings, and consists of about 600 characters, which are applied, as is indicated by the name of the division, in a double sense, and hence have been called metaphorical. As an illustration of this class, Chinese writers adduce the character 4é shi, “an arrow,” which, from the straight course of an arrow, has come to signify “direct,” “right,” “a word spoken to the point.”

The sixth class, which is known as the Chieh shing, or phonetic, embraces over 20,000 characters. The adoption of these phonetics was the turning-point in the progress of Chinese writing. As was the case with the Egyptians, the Chinese found that, having exhausted their power of invention in forming hieroglyphics and ideographics, a further development of the characters was necessary ; and, like the subjects of the Pharaohs, they adopted certain characters to represent certain sounds. As to when, or by whom, this system was inaugurated, whether it was intro- duced from abroad, or whether it was the product of native intelligence, history is silent; but when it was once decided on, the language rapidly increased and multiplied. “ A character,” writes a well-known Chinese author, “ is not sterile ; once bound to another, it gives birth to a son; and if this be joined to another, a grandson is born, and so on.” The characters, then, which belong to the class called phonetic are composed of two parts, namely, the primitive or phonetic element, that is to say, one of the characters which

have been chosen to represent certain sounds, and which gives the sound to the whole character, and one of the 214 determinatives or radical characters of the language.

One or more of these determinatives enter into the composition of every character in Chinese, and as a very large proportion of them are plainly hieroglyphics, they may be said to be the foundation of the written language. As might be expected from their nature as hieroglyphics, they include the most remarkable objects of nature, such as the sun, moon, a river, a mountain, fire, water, earth, wood, stone, &c.; the chief parts of the human body, as the head, the heart, the hand, the foot, the eye, the ear, dc. ; the principal parts of a house, as the roof, the door, dc. ; domestic animals, such as the sheep, the cow, the horse, the dog, &c.; the primary relations of society, as father, mother, son, daughter, &c.; qualities, such as great, small, straight, crooked, high, low, long, &c. ; and actions, such as to see, to speak, to walk, to run, to stop, to enter, to follow, &c. They are thus admirably adapted to form generic terms, and this is the part they play in composition with the primitives. For instance, into the composition of every character signifying anything made of wood such as a table, a chair, a club, &c., the determinative character meaning “ wood” is introduced, and it then serves much the same purpose as do the words “mat” and “ steam ” in

the compounds “ matshed ” and “ steamboat.

The number of the primitives has been variously estimated. Dr Marshman gives them at 3867, Callery at about 1000, and later writers have reckoned them to be from 1100 to 1200. Taking them even at the lowest of these figures, it will readily be imagined how, by combina- tion with the 214 determinatives, they may be made to form the thirty and odd thousand distinct characters of the language, since, of course, it would be possible by combining each of the 1000 primitives with every one of the 214 determinatives, to form more than seven times that number of characters,

To illustrate this system of formation, we will take the primitive F% ngo, “I,” which by combination with 27 determinatives, produces as many derivatives having the same phonetic value, in this way—combined with the determinative |[{ “a mountain,” it becomes 7% ngo, “a high mountain ;” with 7 neu, “a woman,” HR ngo, “ fair,” “beautiful ;” with #f tsao, “grass,” 34% ngo, “a certain herb ;” with F neaou, “a bird,” 4% ngo, “a goose,” and so on. From these examples it will be observed that the determinatives play the part in some instances of adjec- tives ; and in combination with their primitives they form an exact parallel with many Egyptian and Assyrian ideophonetics. The following example in Egyptian shows precisely the same formation in the composition of the characters, and in the respective value of their parts, as is seen in the Chinese instance just referred to. Un means in Egyptian “a hare ;” combined with this deter-

Cae SME y aR “ .? c minative iS jpit becomes Un, “to open ;” and with

this OX, Ey SX Un, “an hour.” Speaking of Assyrian hieroglyphics, Sir Henry Rawlinson says, “ Certain classes of words have a sign prefixed or suffixed to them, more commonly the former, by which their general character is indicated. The names of gods, of men, of cities, of tribes, of wild animals, of domestic animals, of metals, of months, of the points of the compass, and of dignities are thus accompanied. ‘The sign prefixed or suftixed may have originally represented a word ; but when used in the way here spoken of, it is believed that it was not sounded, but served simply to indicate to the reader the sort of word which was placed before it.”

These words of Sir Henry Rawlinson may be illustrated

by the following examples. ry means in Assyrian “wood,” and is used as the determinative for things made of wood. Thus in combination with the primitive a

it becomes fi “a sceptre;” and when combined with the

primitive CAY we have rV

dog,” and |/>- |] is “a lion.” It will be seen that

both the Egyptian and Assyrian characters here quoted are constructed on exactly the same principle as that to be observed in the formation of the majority of Chinese charac- ters, but it is noticeable that in Assyrian the primitives do not retain in composition their phonetic values, as they generally do in Chinese, and as they often do in Egyptian.

Marking, then, the forces of the two parts of the characters, it is easy to imagine the way in which new characters have from time to time been formed. Suppos- ing, for instance, that a tree for which a Chinaman wishes to give a name on paper is known to him colloquially as ma. The coiner of the new character would then in the first place choose a common phonetic or primitive possessing the sound ma, very possibly he would take the hieroglyphic I) ma, “a horse,” and would combine with it the deter-

minative WE muh, meaning “ wood.” The new character would then stand thus 1%, and might be understood to signify “the ma tree ;” but, unless previously informed, the reader. would be left in complete ignorance as to the sort of tree meant, as the parts of the character would only supply the information that it was either a tree or something made of wood, and that it wasto be pronounced ma. This is equally the case, speaking generally, with all the characters. By a careful study of the phonetics it is possible to arrive at the sounds or approximate sounds— for certain variations constantly occur—of the characters of the language; but the only hint at their meanings is to be derived from the determinatives, which point only to the general nature of the obiects or actions signified.

As has already been said, the determinatives are 214 in number, and these have been considered by many of the native dictionary-makers to furnish convenient headings under which to arrange the characters of the language. Again, others have chosen to classify the characters according to their final sounds. Both systems have their advantages. By adopting the first, the headings are com- paratively few, and the characters are, roughly speaking, classified according to the generic meanings they have in common; and the second gives constant practice to students in remembering the tones and

correct rhyming pronunciation of the characters. But in both the phonetic relationship between the primitives is entirely lost sight of. And this is much to be regretted, since, as Callery and others have pointed out, the scientific way of arranging the characters would be by placing them under their primitives, by which means the respective values of both the prirai- tives and determinatives would be brought out in prominent relief. Only in two Chinese dictionaries that we have met with have any attempts been made thus to arrange tlic characters, and the older of these, on which the later work was probably framed, owes the system on which it is composed to the experience imported from Japan by the co-compiler, who was a native of that country.

In the course of the above remarks a few instances Different have been given of the original and modern forms of the styles of

same characters, as, for example, $ and F%. But, as may readily be supposed, the change from one to the other was not made all at once, and Chinese books afford instances of six distinct styles of writing, varying in clearness from the square character used in the books at the present day to the Seal and Grass or cursive characters, which are noted for their obscurity. These styles are described as the Chuen shoo or “seal character,” the Ze shoo or “ official character,” the Keae shoo or ‘model character,” the Hing shoo or ‘running character,” the Z’saou shoo or “‘erass character,” and the Sung shoo or “ Sung-dynasty character,” and may be illustrated by the following example, in which the character Bl tsaow “herbs” ig shown written in all the six styles just specified :—seal character ¥Y; official character }‘f’; model character YH ; running character 43; grass character “g; and Sung character ¥4. But above and beyond these six styles of writing, Chinese penmen not unfrequently allow their ima- ginations to run riot when engaged in fanciful or ornamen- tal pieccs of caligraphy. An extraordinary specimen of this quaint taste is to be seen in the Chinese Library of the British Museum, where there is a copy of the Emperor Keen- lung’s poem’ on Moukden, printed both in Chinese and Manchoo in 32 kinds of strangely fanciful characters.

We will now pass on to the sounds of the language ; Spoken and the first thing concerning them which strikes the 1a: guage.

student. on becoming acquainted with his dictionary is their extreme poverty as compared with the characters, There are over 30,000 characters in the language, and these

are represented to the ear by only 500 syllabic sounds, No doubt the adoption of primitives as phonetics, as has been already described, has contributed to this result, stnce it provided for the due expression of the syllables then existing, but for no more. And thus, though it vastly euriched the written language—one primitive producing as many as 74 derivatives—it at once put a stop to all increase in the number of the sounds. The difficulty then arose as to the way in which 500 syllables were to be made to represent in conversation the thousands of characters in common use. And three methods have been adopted to prevent the confusion which at first sight would appear to be inevitable. These are—

1. By combining with the word which it is desired should be understood another, bearing a similar or supplementary meaning, to distinguish it by pointing to its mcaning from other words bearing the same sound; thus, for "‘ to hear," it is usual to say in conversation J Fi ting keen,—ting meaning "to hear," and keen "‘ to see or perceive."

2. As regards noun substantives, by placing certain classifying words between them and the numerals which precede them. These classifiers bear some resemblance to our expressions herd, head, fleet, troop, &c., and have a certain reference to the nature of the substantives to which they are attached. For example, the word {J pa, "to grasp with the hand," is used as a classifier to precede anything which is held in the hand, such as a knife, a spoon, a hatchet, &c. Instead of expressing, therefore, a knife by yih taou, which might either mean a knife, a small boot, or a fringe, the classifier is introduced to show which taow is meant, and a speaker would say yih pa taou, literally "(a grasped knife." In like manner [fi] keen "a space," is used as a classifier for houses and enclosures ; Ji Ldn "a root," for trees, poles, clubs, &c., and so on.

And thirdly, by dividing the words of the language among eight tones. ‘These tones partake of the nature of musical intonations, and are divided

by the Chinesé into tivo series, the upper and the lower, and are called by them the upper even, the upper rising, the upper departing, the upper entering, the lower even, the lower rising, the lower departing, and the lower entering. To each character is allotted its appropriate tone, which if wrongly rendered is liable to give an entirely different meaning to the word from that intended by the speaker. This possibility will be understood when it is remembered that the thirty and odd thousand characters find expression in about 500 sounds, thus giving an average of one sound to 60 char- acters, and these figures show that at best the system of tones is but an incomplete solution of the difficulty, since, were this average of 60 characters equally distributed among the full eight tones, there would remain nearly eight characters of each sound identical both in sound and tone.

But as a matter of fact, only the four tones of the upper series are in general use, to which sometimes the first or even tone of the lower series is added. The even tone is, as its name signifies, simply the ordinary tone of voice ; th2 rising tone gives to the voice somewhat of the effect of an interrogation ; the departing tone, of doubtful surprise ; and the entering tone, of peremptory command. These may easily be illustrated by repeating our negative ‘“No,” first in the ordinary tone of conversation, secondly as an interrogation, thirdly as expressing doubtful surprise, and fourthly as a peremptory refusal :—thus 1 No —, 2 No.~, 3 No\,4No-. The difficulty of acquiring a knowledge of the tones proper even to the characters in common use is, as may be supposed, very great, and the only way to master them is to Jearn them, as the children Jearn them, from the lips of the natives themselves. No study of books will give the required knowledge. The Chinese learn them by ear alone, and if an educated man be asked

to give the tone of an isolated character, he generally has to repeat a phrase in which the character occurs in order that his lips may tell his ear the intonation proper to it.

It wil] be easily understood that the mistakes and diffi- culties into which this intricate system drives Chinese- speaking foreigners are often

inconvenient and sometimes dangerous. Some years ago a petition on behalf of a Chinese criminal was presented by a wealthy Chinese merchant in person to the governor and council of Hong Kong. A well-known Chinese scholar undertook to interpret on the occasion, and the Chinaman began his speech with a reference toour Awat \ Kwok or “ Honour- able kingdom,” as he designated England. Now the syllable kwat pronounced kwai / means “ devil,” and used in combination with kwok is an abusive term not uncommonly applied to any foreign country. Unfortunately the inter- preter confused the two tones, and turning indignantly to the governor, he reported that at the very outset the petitioner had begun by speaking of England as ‘the devil kingdom.” The just anger of the council knew no bounds, and it was only after some minutes of wild con- fusion that an explanation followed, which saved the Chinaman from sharing the cell of the man for whom he was pleading. ‘To a Chinaman such a mistake would be wel]-nigh impossible, for the tones form integra] parts of the words, and to the ear of a native the difference between kwai in the ascending tone, and kwat in the descending tone, would be as great as between Awaz and kwan.

There is only one other point in connection with the sounds of the language to which reference need now be made, and that is the system which has been adopted for spelling, as it were, the various sounds. For this purpose 36 characters which begin with the initial consonants of the language have been chosen, and 38 which end with the final sounds. In order, then, to indicate a desired sound, the writer takes a character of the first series which begins with the required initial, and a character of the second series which ends with the requircd final. These are placed together, and the initial of the first and the final of the second give the required sound. For instance, suppos- ing a Chinaman were desirous of expressing that the sound of a certaiu character was ting, he would write the two characters # tang and #€ king, the first of which would give the initial ¢, and the second the final ing. This syllabic spelling, the initials of which are identical with the initial Sanskrit consonants, was introduced by the Buddhist missionaries in the 5th and 6th centuries, and from the time of the appearance of the dictionary Fuh pien, Which was published in the ycar 543, it has been employed in every native dictionary of the language which has since seen the light.

With a language of roots, which is devoid of inflexion Grammar.

or even of agglutination, in which a large number of words each play the part, under varying circumstances, of snb- stantives, adjectives, verbs, and adverbs, it may at first sight appear that grammar must be an impossibility. But inasmuch as there are in Chinese, as there must be in every language, certain words which, to quote Dr Marshman, “denote things, and others which signify qualities, there must be words to express actions done, and these as done by one or many, already done, now doing, or intended to be done ; they must also be described as done absolutely or conditionally, as proper to be done, or peremptorily com- manded. Further, the various circumstances of the doer, and of the subject of the action, must algo be either plainly expressed or tacitly understood ; hence the need of preposi- tions. Connecting words, too, necessarily exist in every language, as well as those which express the emotions of the mind. Thus the principles of grammar must substan- tially exist in every Janguage.” And though the absence

Position of words in sentences.

LANGUAGE. |

of all inflexion in Chinese places the grammar of the language on a different footing from that of the polysyllabic languages, it is yet distinctly defined by the position and connection of the words of the sentence.

Since, when a language is spoken and understood only in the country of its birth or adoption, the study of the grammar affecting it is, as far as the natives are concerned, comparatively unimportant, we find that little attention has been paid by the Chinese to the grammar of their language. But practically the grammar, which, as has just been stated, consists of rules for the construction of the sentence, has for many centuries been enforced by example, and by the censorship of the examiners at the competitive examinatious. If then we observe the connection of words which these authorities have preserved, we find that in every Chinese sentence the subject comes first, then the verb, which is followed by the complement direct and the complement indirect, and further that, as is the case in most of the Turanian languages, every word which defines or modifies another

invariably precedes it. For instance, the adjective precedes the substantive, the adverb the verb, the genitive the word which governs it, and the preposition the word governed by it.

The importance of exactly following these rules becomes at once apparent when we remember that often onc and the same word is capable of being used as a sub- stantive, an adjective, a verb, or an adverb. This is the case also with some words in English. We use the word present, for example, as a substantive when we talk of giving a present ; as an adjective when we say the present time ; and as a verb when we say, “I present you.” (ut is another word which we make use of in the same way. We say, “the cut of a sword,” “cut grass,” and “to cut a man down.”

A number of other instances of the same kind might be adduced, but taking a Chinese word, we may show how, by varying its position in a sentence, it changes its grammatical value. ‘The character 4 hao has for its meanings “to love,” “ good,” “excellent,” “well,” &c., and possibly with the intention of illustrating, as it were, these meanings by representing the highest and purest form of natural affection, that which exists between a mother and her child, the inventor of the character has formed it of two parts signifying respectively ““a woman” and “a son,” If, then, we meet with it in such a connection as this, which is taken from the lips of Confucius, $f bi 3 Je ZAG, Kwei keen chih chia che hao, we recognize it at once as a substantive, since, were it an adjective, it would be followed by a substantive ; were it a verb, it would be followed by its complement, and also because it follows a substantive 3 4, to which is added 77, the sign of the possessive case. The sentence should then be translated —-Kwei keen, “to peep and see,” hao, “the excellence or the goodness,” che, “of,” chth chia, “the apartments.” In the sentence, also from Confucius, An ¥f ff Joo hao hao sih, we see by the position of the two Aaos that the first must be a verb, and that the second must be an adjec- tive, since it is followed by a substantive with which it forms the direct complement to the verb. The meaning of the sentence then is Joo, “as [when],” haon, “we love,” hao 7 sth,’ excellent beauty.” Again, in the modern colloquial expression XF#f we have an example of the use of hao as an adverb preceding a verb, and the phrase is then in- capable of being translated otherwise than as “ well said,” hao, “well,” shwé, “ said.”

The number of characters which might be treated as we have dealt with # is legion. Little has been said on the subject of this peculiarity of the language by native gram- yarians, who have not done much more for the science

of grammar than to divide the characters into 9E 2% Sze tsze or “dead words,” as they call nouns; YR LHw6 tsze, “living words,” or verbs; and [ety Ist tsze, “empty words,” or particles. It is worthy of remark that in a great many instances the transition of a character from one part of speech to another is marked by a change of tone. This is the case with the character hao, of which we have been speaking, When it stands for the adjective “ good,” it should be pronounced in the ascending tone hao ; and when it becomes the verb “to love,” it is transferred to the departing tone hao\N. And in some few cases the character suffers a change of sound as well. f shih, the verb “to eat,” is pronounced in the enter- ing or abrupt tone; but it becomes szeNin the departing tone, when it plays the part of a substantive meaning “food.” In a lecture administered to the king of Leang, Mencius, rebuking him, says, fijpip 2 JV EE Kow che shih jin sze . , “Your dogs and swine eat men’s food.” Here it will be observed the first #€ must by the rules of position be the verb shih “to eat,” and by the same neces- sity this same character at the end of the sentence must be a substantive; and the dictionaries tell us that, when this is the case, it is pronounced sze. But though it is true that a vast number of characters can be made to serve a writer in a variety of capacities, yet each belongs more particularly to some one part of speech, and many are identified with that one alone. For instance, we find that certain substantives which express things, such as cho “a table,” or e “a chair,” remain fixed as substantives, and that others, if they denote actions, are primarily verbs, and if conditions, such as “ honour” or “riches,” are in the first instance adjectives.

As might be expected from the nature of the langnage Gender.

of which this interchangeability forms a part, Chinese admits no variations of gender, and in this particular it agrees with the Manchoo, Mongolian, Turkish, and Finnish families of tongues, in which, as Dr Caldwell points

out, not only are all things which are destitute of reason and life denoted by neuter nouns, but no nouns whatever, not even nouns which denote human beings, are regarded in themselves as being masculine or feminine. All nouns as such are neuter, or rather are destitute of gender. “ ‘The unimaginative Scythian reduced all things,” adds the doctor, “whether rational or irrational, animate or inani- mate, to the same dead level, and regarded them all as impersonal.” But in every language there are certain words the gender of which must necessarily be distin- guished, and in common also with the peoples just referred to, to these the Chinese prefix words denoting sex. Thus a son is spoken of as F4-f nan tsze or “ man-child,” and a daughter as 7 -f* new tsze or “woman-child.” In the case of animals other characters are used. ZS kung, “noble,” “superior,” is employed to denote the male and Bh moo, “mother,” to indicate the female. Thus Z By kung ma is ‘Ca horse,” and fH moo ma is “amare.” With birds other characters are considered more appropriate. Thus, the male is described as kung, “martial” or “brave,” and the female as tsze, ‘‘ weak,” or “ inferior.”

As regards number, Chinese is left in an equally Number.

indefinite condition. As a rule it is the connection of the words of the sentence which determines whether a noun is in the singular or plural. Often, however, the plural is indicated by repeating the noun, as NA jin jin, “the men,” or by the prescnce of a numeral, as in the following expression, taken from the Confucian Analects, = -F 38 tf “The three disciples went out.” Here the character san, “three,” indicates that tsze is in the plural, although it has no inherent mark of number. Another way of pluralizing a noun is by adding to it one of certain words signifying V. — 83

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“all” or “ many.”” The most common of these are Fx chung, 2% choo, ¥ keae, Ay fan, and &% tdng. The first four have for their meaning ‘‘all,” and the last, tdéng, means “a class.” Its use, like its meaning, is distinct from the others; they precede the noun, tdng always follows it, and forms with it a compound such as “animal-class ” for animals, ‘‘ man-class” for men. In

colloquial Chinese the character {}’ mun has been adopted as a sign of the plural, but its use is almost entirely confined to the personal pro- nouns. Thus #% wo means “I,” and FR} wo mun “we.”

The rules of position which serve to fix the parts of speech of the words of a sentence are allowed also in great measure to regulate the cases of nouns and the moods and tenses of verbs. But this is by no means always the case. For example, the possessive case is marked by certain particles of which mention wiil be made presently ; and although European writers on Chinese grammar have been in the habit of considering that when two substan- tives come together, the first is to be taken as being in the possessive case, thus in the sentence FU -— #F Bt Teen tsze hao hed, which we should translate as ‘‘ the Son of Heaven loves learning,” teen, they would say, is in the possessive case,—it may be questioned whether such expressions may not be more appropriately considered as compound terms, in the same way, that we treat their equivalents in English. For instance, we should never consider such an expression as “‘ the Chelsea-water-works” to consist of a nominative and two possessive cases, as it would be parsed by these grammarians, were it turned word for word, as it might be, into Chinese. And this treatment becomes still more difficult of adoption when we

find, as is often the case in Chinese, a number of substan- |

tives strung together, al] of which, with the exception of the last, would then have to be considered as a succession of possessive cases. If we take, for example, one of the ordinary marks on porcelain made in China, such as Te HA RR = SE Za ming Wan leth san neen che, we should be told to consider Za ming, Wan leth, and meen, a8 possessive cases, and that the phrase should be translated, “‘ The manufacture of the third year of (the reign) Wan-leth of the Ta ming dynasty,” instead of treating it as a compound expression on the “ Chelsea-water- works” principle, thus “The Ta-ming-dynasty-Wan-leth- third-year-manufacture.”

Besides, Chinese is by no means destitute of case- particles, In the literary and colloquial Janguages the possessive is expressed by suffixing respectively 2% che and fj tcth to the substantive. Thus these particles answer exactly to the ’s commonly used in English. Kx RR Teen che gin is “The favour of heaven,” or, as we should as often say, “‘ heaven’s favour.”

Hh TE Zo NV Ai) Na ko neu jin teth kow is “The dog of that woman,” or ‘That woman’s dog.” If we trace back the case-particle % che to its earliest use, we find that it was originally a verb, and meant “to proceed to,” and thus, as a sign of the possessive case, it implies the sense of partition which is inherent in our “of” and the French de, In some instances, by its addition to certain substantives, compound nouns of possession are formed which are capable of being used as adjectives, For example, 4¢ kin is “gold,” and 4 >% ig “of gold,” or “golden.” It is used also to express relation, but not as frequently as its colloquial equivalent f¥J teth, which is very commonly thus employed. Such expressions as oS Fe fy kwan ping teth,—teth, “he who,” kwan, “ rules over,” ping, ‘soldiers”—are in constant use.

_ With verbs of giving to and speaking to the dative case 13 marked by position, The person to whom a thing is

given immediately follows the verb, and the thing given comes next. The sentence “The prince gave the officer some money,” is in accordance with the Chinese idiom, which would not admit the more usual English form, “ The prince gave some money to the officer.” The dative case, with the sense of “for,” is marked by the use of the characters {§ tae, “to succeed,” 9 te, “to put another instead of,” and #§ wei, “to be”; thus (§ ARES BE tae wo seay shoo, “ to write a letter for me,” ERIK iy A FA te wo teth neu urh, “ for my daughter,” &c.

The accusative case is as a rule marked by position. But occasionally, as has been shown by M. Julien, the particles Loe, J yu, FF yu, and ¥F hoo, are disassociated from their usual signification, and are employed simply as signs of this case,

The instrumental case is indicated by the character JJ e¢, “by,” in the language of the books, and by Fj yung, “to use,” in the colloquial. As an instance of the use of the first, we may quote the following passage from Mencius :— We [ELI SEG Nan wang e fei ke taou, “(A superior man) cannot be entrapped by that which is contrary to right principles.”

The ablative case, having the sense of “ from,” is marked by the signs f tsze, and ¢y yew, and in the colloquial by {iE tsung, as in the following examples:—f 4E BS LIE Tsze sing min e lae,‘‘ From the birth of mankind until now;” He BIW YT Yew Tang che yu Woo-ting, “From Tang until you arrive at Woo-ting;” Aili 7RyL HEAR ST Za tsung Pith king lae leaou, ‘* He has come from Peking.”

The remarks which have been made on the gender, number, and case of the substantives apply in like manner

to the adjectives, aud we need only now refer therefore to Decrees of the manner in which degrees of comparison are formed, compari- The comparative is denoted either by certain particles 5°”

meaning “more than,” or “beyond,” or in the colloquial

‘by forms of expression such as “ This man compared with

that man is good,” or again, ‘‘ This man has not that man’s goodness.” As signs of the superlative, words such as ix tsuy, “excelling,” #it keth, “the highest point,” or ft shin, “ exceeding ” are employed.

In all Oriental languages the personal pronouns play a Pronouns,

prominent part from their number and the variety of equivalent terms, whether of self-depreciation or of com- plimentary adulation, used to express them; and in Chinese they derive additional importance from the fact that in the absence of all verbal inflexion, they serve to indicate the person, aud in the spoken language the number of the verb. = woo, ff urh, and Hh ke, are the terms most commonly used in classical writings to signify the first, second, and third persons of the personal pronoun, of which 9% wo, (AX ne, and if ta, are the common colloquial equivalents. These latter have for their plural wo mun, ne mun, ta mun. Quite separate and apart from these and all their equivalents is the character }}¥ chin, which is reserved especially for the emperor, and has been the tradi- tional imperial ‘‘ We ” since the time of the three mythical emperors to whose wisdom, energy, and foresight the greatness of China is attributed by the native historians. But not always does the emperor feel himself entitled to

use this inherited character. In times of national mis- fortune he chooses to believe that his own remissness is the cause of the evils which have overtaken the country, and then it is the custom for him to designate himself Awa jin, or “ Deficient man.” With his subjects the assump- tion of a similar humble position is habitual, and among acquaintances the place of “I” is nearly always taken by terms by which the speaker seeks to give a complimentary importance to the person addressed at the expense of his

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own intellectual or social position. “The dullard,” “the little one,” and “the man of low degree,” are terms most frequently used in this sense, while nw tsat, or “slave,” is the self-assumed epithet adopted by ministers when addressing the emperor. In like manner the speaker’s relations and personal belongings are spoken of as “the little,” “the mean,” and “the cheap.” The respect due to age guides on the other hand the choice of expressions employed towards the person addressed, who, instead of being called by the second person of the pronoun, hears himself addressed as “Master,” ‘Old Gentleman,” or “Senior,” ‘The holders of the lower offices, such as the Ieen or district magistrates, are addressed by law as Lao ye or “Old Fathers ;” as they rise, they become Ta lao ye ‘Great Old Fathers ;” and when they reach the higher ranks, such as the governors of the provinces, they are called Ta jin “Great Men.” In the same spirit it is customary to speak of the belongings of another as being “ worship- ful,” “ honourable,” or, “ august.”

History is vague as to the date when the Chinese adopted the numerals they at present employ ; but as we find reference to them in the Book of History, it is fair to infer that they were in existence before the 6th century po. They are 17 in number, and are these: — yh, “one,” urh, “two,” = san, “three,” PY sze, “four,” Ti, woo, “ five,” A luh, “six,” 4 tseth, “seven,” /\ pa, “eight,” JU kew, “nine,” -—F shih, “ten,” B pth, “a hundred,” f° tseen, “a thousand,” B§ wan, “ ten thousand,” 4% yih, “one hundred thousand,” J chaow, “a million,” et keng, “ten millions,” and J% kai, “a hundred millions.” The last four are now very seldom used, the rest are hourly

employed. It will be seen that there is no single numeral between ten and one hundred, and the intervening numbers are therefore formed by shih “ten” in combination with the lower numerals. For example, the numbers between ten and twenty are expressed by shih “ten” with the addition of the number required. Thus “thirteen” would be -+ = Shh san. The figures between twenty and a hundred are denoted by -f shih, “ten” preceded by the other numeral, and in this way = -+ San shih would be “thirty.”

After the explanation given of the manner in which the number, gender, and case of nouns are clearly expressed in composition, it need not be a matter of surprise that by position and the use of particles it is possible to give expression to all the moods and tenses of the’ verb. Such a fact should not astonish us when it is recollected that, as stated by Marshman, in the case of certain English verbs, such as “to cut,” position is found equal to the task of forming 211 out of the 215 verbal variations which such verbs undergo, and four only are formed by the addi- tion of terminations to the original monosyllable, namely “cuttest,” “cuts,” “cutteth,” and “cutting.” As no change, not even the lengthening of a line, or the addition of a dot, can possibly be effected ina Chinese character without entirely altering its meaning, position has to do everything for the Chinese verb, and it accomplishes its mission in two ways, either by stating the time at which the action has taken place, or is about to take place, or by prefixing or suffixing certain words which by their several meanings supply like information. For instance, in the colloquial sentence 44 fib ZR joo hin ta lai, joo kin, “now,” indicates that the action is present, and the three characters are to be translated ‘ he is coming.” But if we were to exchange the joo kin for Wap ming neen, “next year,” the verb daz will be in the future tense, “ next year he will come ;” and if yet once again we say, shang yué ta lai, shang yué meaning “ last month,” the verb will then be in the past tense, and the sentence will run, “last month

he came.” But more frequently the present tense of the verb is not accompanied with any word to denote the time

of the action, and indeed the only tense-particles employed are those which serve to explain the past and future tenses.

The characters leaou, “to complete,” and jh kwéd, “to ? 5] 2 B Use 5 i] pass over,” are the commonest of those which are suffixed

to denote the first, and JRF tseang, “to take,” and bal

yaou, “to want,” are the most frequently used as prefixes

to mark the second. Thus, ta kew leaoun, or ta kew kavd, would mean “he went,” while ta tseang kew or ta yaou heu would be “he will go.”

In every language, as Marshman has pointed out, ‘Ont will sometimes be found necessary to indicate or declare a thing, to command an action to be performed, to express it as desirable, obligatory, or possible, to represent it as conditional, and to describe it in a general way,” and Chinese is no exception to this rule. In the case of the active and infinitive moods, position, which, as we have already seen, has done so much for Chinese grammar, is again equal to the occasion, but the imperative, the optative, and the potential moods all, although not always, have their distinctive signs.

The third person of the imperative mood, for instance

is formed in modern Chinese by prefixing a verb meaning

either “to give” or “to permit,’ and answers exactly to our “let.” FRADE hew ta hew is “let him go,” hew meaning “to allow,” “to permit.” The optative mood. is formed by the addition of words meaning “ to wish” or “to desire,” and the potential by the addition of words implying “ power,” “duty,” or “ doubt.”

The above sketch, although necessarily brief, serves to show that by carefully following the laws of Chinese syntax, it is possible to express in Chinese, as exactly as in other languages, all the parts of speech in all their variety of number, gender, case, mood, tense, and person, and therefore every shade of meaning which it is possible to convey by word of mouth,

The difficulties of acquiring a knowledge of Chinese have hitherto shared that exaggeration which surrounds the unknown. It is time that the language was better understood, and at this period of the world's history we cannot afford to leave unnoticed a language so ancient as to dwarf into insignificance the antiquity cf western tongues, and one which is the solitary medium of communication between 400,000,000 of our fellow-men.

Having thus attempted to trace the growth of the written Chinese character from its first creation as a hiero- glyphic to its final development in the more modern ideophonetic form, and also the rules which govern the position of these characters in a sentence, our object. will now be to show the use which Chinese authors have made of the characters and of the grammar to which they are subservient. It was obviously necessary to begin with the language, before dealing with the literature, since some of the leading characteristics of the literature are, as is the case in every tongue, plainly traceable to the structure of the language. 'The words of a sentence are as a piece of clay in the hands of a potter. If they be soft and pliable, that is to say, if they be capable of inflections and of syntactical motion, they may be moulded to express with varying vigour and force the highest fancies and noblest thoughts of an able writer in all the changing beauty of poetic diction or of rhetorical eloquence. But if on the other hand they be destitute of inflexion, and be cramped by inexorable laws of position, which cannot for a moment be departed from, without a sacrifice of sense, the result must be that the literature of which they are the component parts will partake to some extent of their hard unyielding nature.

If we turn for a moment to the poetry of ancient Greece and Rome, we find that some of the finest effects have been produced by the power which the inflexional nature

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of those languages gave of transposing the position of words in a sentence, so as to give vigour and grace to the rhythm. To prove the truth of this we have only to take some striking passage, and compare it in the original with a plain straightforward translation in prose. The idea is the same in both, but how differently it appeals to the imagination of the reader. The gem is there, but it has lost the advantage of its setting. It must now be judged by the prosaic rule of its intrinsic value, with no softening sur- roundings to add grace and brilliancy to its natural beauty. But the effective weapon which was thus placed in the hands of the poets and authors of ancient Greece and Rome has been completely denied to Chinese writers. As has been explained, the language is absolutely without inflexion, and the grammar consists so entirely of syntax, that no word can be moved out of its determined position in a sentence, without either changing its value or rendering it meaningless. Thus the literature has lost much of the variety and elegance which belongs by nature to that of the polysyllabic languages. And we might go beyond this and say that the lack of that power of expression which is given by syntactical motion has been accompanied by a blighting influence on the imaginations of Chinese authors. Other causes, to which reference will presently be made, are also to some extent responsible for this result; but in our re- view of the various branches of Chinese literature, we shall find that those which are most dependent for their successful development on the powers of imagination are those which least repay attention, and that the more excellent are those which contain simple narrations of facts, or consist of the arguments of the philosopher or of the man of science. But notwithstanding this the Chinese are eminently a literary, in the sense of a reading, people. making competitive examinations the only royal road to posts of honour and emolument, and the law which throws

these open to everybody who chooses to compete, have

caused a wider diffusion of book learning among the

Chinese than is probably to be found among any other

people. As to the date when the literature first took its rise, it is impossible to speak with any certainty. The vicissitudes which attended the early manuscripts and books which were collected by private individuals and in

the imperial libraries have been such as to render the preservation of any ancient record a matter of wonder. Constant references are found in books to works which are said to have existed at early dates, but of many of these the titles are all that remain to us now.

One of the earliest published works on which we can lay our hands is the Book of Changes, the first, and the most revered, because the least understood, of the nine classics. This work first saw the light within a prison's walls. In the year 1150 8.c. its author Win Wang was, we are told, imprisoned for a political offence, and sought to while away the tedium of his confinement by tracing out a system of general philosophy from the eight diagrams and their 64 combinations invented by the Emperor Fu-he. These diagrams have been likened to the mystical numbers of Pythagoras, and the leading idea of Win Wang's system seems to have been founded upon the Chinese notions of the creation of the world, according to which all material things proceed from two great male and female vivifying elements, the Yin and the Yang, which in their turn owe their existence to the Zac kech, or the first great cause. As Sir John Davis says, this " might, with no great impro- priety, be styled a sexual system of the universe, They, that is to say the Chinese, maintain that when from the union of the Yang and the Yin all existences, both animate and inanimate, had been produced, the sexual principle was conveyed to and became inherent in all of them. Thus heaven, the sun, day, «&c., are considered of the male

gender ; earth, the moon, night, &c., of the female.

The system of

This notion pervades every department of knowledge in China. It exists in their theories of anatomy and medicine, and is constantly referred to on every subject. The chief divinities worshipped by the emperor as high priest of the state religion are heaven and earth, which in this senso appear to answer in some degree to the odpavés and yn in the cosmogony of the Greeks." .

The style and matter of Wain Wang's writings were, however, so cramped and vague that Confucius among others attempted the task of elucidating their dark places. Many years the sage spent in endeavours to make straight that which was so crooked ; and the only result attained has been to add some inexplicable chapters to an incom- prehensible book. But the fact that it gave rise to a system of divination saved it from sharing the fate which, in the year 221 x.c., befell all books except those on medicine, divination, and husbandry, at the hand of the Emperor Che Hwang-ti of the Tsin dynasty. This monarch ordered, for political reasons, the destruction of all the books to be found within the empire, except those on the subjects just mentioned. Fortunately, no monarch, how- ever powerful, is able to carry out to the letter an order of sO inquisitorial a nature ; and the roofs of houses, the walls of dwellings, and even the beds of rivers, became the receptacles of the literary treasures of the nation until the tyranny was overpast. The works of Confucius, the Book of History, the Book of Odes, the Spring and Autumn Annals, together with the Book of Lites, and the Your Books by the disciples of the sage and of Mencius, were all alike condemned to the flames. How all these were preserved we know not, but history tells us that, when in after years efforts were made to restore the Book of History, 28 sections out of the 100 composing the entire work were taken down from the lips of a blind man who had treasured them in his memory, One other was recovered from a young girl in the province of Honan. And these aro al] which would probably have come down to us, had not a complete copy been found secreted in the wall of Con- fucius's house, when it was pulled down in the year 140 B.c,

This Book of History takes us back to about the time of Book of

Noah. It consists of a number of records of the Yu, Hea, Shang, and Chow dynasties, embracing the period from the middle of the 24th century B.c. to 721 3.0, These, and a number of other MSS., attracted the attention of Confucius when he was at the court of Chow, and selecting those which he deemed of value, he compiled them in a work which he called the Shoo king or Book of History.

This work, as Mr Wells Williams says, "' contains the seeds of all things that are valuable in the estimation of the Chinese; itis at once the foundation

of their political system, their history, and their religious rites, the basis of their tactics, music, and astronomy." For the most part it consists of conversations between the kings and their ministers, in which are traced out the same patriarchal principles of government as guide the rulers of the empire at the present day. "Virtue," said the minister ih, addressing the emperor, "is the basis of good government ; and this consists first in procuring for the people the things necessary for their sustenance, such as water, fire, metals, wood, and grain. The ruler must also think of rendering them virtuous, and of preserving them from whatever can injure lifeand health. When you would caution them, use gentle words, when you would correct, employ authority." "Do not be ashamed of mistakes, and thus make them crimes," was another piece of wholesome advice offered to the emperor by his advisers, the effect of which is still observable in the outspoken confessions of official incom- petence which are daily to be met with in the columns of the Peking Gazette.

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Book of Rites.

Spring and

Autumn Annals.

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As we shall have occasion at a subsequent stage to treat at some length of the compilation which stands next on the list of the classics,—the Book of Odes,—-we pass on to mention a work whose dicta have entered into the very marrow of Chinese life—namely the Le ke, or Book of ftites. This work is said to have been compiled by the duke of Chow in the 12th century B.c., since which time it has ever been the guide and rule by which Chinamen have regulated all the actions and relations of thcir lives. No every-day ceremony is too insignificant to escape notice, and no social and domestic duty is considered to be beyond its scope. From the nature of its contents, therefore, it is the work of all the classics which has left the most palpable impression on the manners and customs of the people. Its rules are minutely observed at the present day, and one of the six governing boards at

Peking—the Board of Rites—is entirely concerned with sceing that its precepts are carried out throughout the empire.

Speaking of this work, Callery says with justice, “ In ceremonial is summed up the whole soul of the Chinese, and to my mind the Book of [ites is the most exact and complete monograph that this nation can give of itself to the rest of the world. Its affections, if it has any, are satisfied by ceremonial; its duties are fulfilled by means of ceremonial. Its virtues and vices are recognized by cerc- monial; the natural relations of created beings arc essen- tially connected with ceremonial ; in a word, for it ceremonial is man, the man moral, the man politic, and the man religious, in their numberless relations with the family, society, the state, morality, and religion.”

But though each and all of the classics bear to some extent the impress of Confucius, only one, the Chun T’sew, or Spring and Autumn Annals, was written by him. At first sight, therefore, a morc than usual interest attaches to this book, which is not lessened by the statements made by the sage himsclf, and by contcmporary scholars concerning it. ‘The world,” says Mencius, “‘ was fallen into decay, and right principles had dwindled away. Perverse dis- courses and oppressive deeds were again waxenrifc. Cases were occurring of ministers who murdered their rulers, and of sons who murdered their fathcrs. Confucius was afraid, and made the Chun tsew.” As soon as it appeared, we are told that rebellious ministers quaked with fear and undutiful sons were overcome with terror. ‘ Its righteous decisions,” said Confucius himself, “I ventured to make.”

The title also of the book, we are told, was given it, because its commendations werc life-giving like spring, and its censures life-withering like autumn. The expectant student might therefore be excused for anticipating in its pages an intellectual treat. He would look to have the history of the period dealt with treated as a sustained narrative, interspersed with sage reflections and deep analyses of the characters and circumstances of the time. He would expect to find praise and blame distributed with a discriminating pen, and the foul crimes of regicide and murder denounced in impassioned outbursts of indignation. But how different is the book when we take it up! In the words of Dr Legge—‘ Instead of a history of events

woven artistically together, we find a congeries of the briefest possible intimations of matters in which the court and state of Loo were more or less concerned, extending over 242 years, without the slightest tincture of literary ability'in the composition, or the slightest indication of judicial opinion on the part of the writer. The paragraphs are always brief. Each one is designed to commemorate a fact; but whether that fact be a display of virtue calcu- lated to command our admiration, or a deed of atrocity fitted to awaken our disgust, it can hardly be said that there is anything in the language to convey to us the shadow of an idea of the author's feeling about it. The

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notices, for we cannot call them narratives, are absolutely unimpassioned. A base murder and a shining act of heroism are chronicled just as the eclipses of the sun are chronicled. So and so took place: that is all. No details are given; no judgment is expressed."

The following cxtract from the annals of a ycar taken at random will be sufficient to show that Dr Legge's remarks are well founded. '1. In the 15th ycar in spring the duke went to Tsc. 2. A body of men from Tsoo invaded Seu. 3. In the third month the duke had a meeting with the marquis of Tse and others, when they madc a covenant in Mow-Kew, and then went on to Kwang. 4. Kung-sun Gaou led a force and, with the great officers of the other princes, endeavoured to relieve Seu. 5. In summer in the 5th month the sun was eclipsed. 6. In autumn in the 7th month an army of Tse and an army of Tsoo invaded Le. 7. In the 8th month there were locusts. 8. The duke's daughter went to her home in Tsang. 9. On Ke-mao, the last day of the moon, the temple of E-pih was struck by lightning. 10, In winter a body of men from Sung invaded Tsaou." And so on page after page.

Having thus reviewed the Live Classics, we will now The Four briefly consider the Kour Books which, together with those Books.

just mentioned, makc up the full complement of the Wine Classics. The first three of them-—-the Z'a-hed or Great Learning, the Chung-yung or the

Doctrine of the Mean, and Lun-yu or Confucian Analects—are all by the pupils and followers of the sage; whilc the fourth, the Afdng-tsze, or the Works of Mencius, is by a disciple of that philoso- pher. All these, therefore, represent the views of Con. fucius, and if we ask what those views point to, we find that they may be summed up in the admonition: ‘Walk in the trodden paths.” For as Confucius said of himself, he came not to originate but to fulfil, and the primary object of his teaching was to revive in a dissolute age the purity, or supposed purity, of former generations; to quote against the rowés of his day the examples of the ancients, whom he believed to have becn scrupulous in fulfilling the universal obligations existing between sovereign and minister, between father and son, between husband and wife, and between friend and fricnd. He taught that man was a microcosm, and that by striving to improve himself by acquiring knowledge, by purifying his thoughts, by rectify- ing his heart, and by cultivating his person, he would then be able to regulate his family. When he could regulate his family, he might then be able to govern a state; and when he could govern a state, he might then be trusted to rule an empire. The empire was as onc family ; and as it was the part of the emperor to cherish and guard his people as a father docs a child, so it was the duty of the people to render willing and submissive obedience to their sovereign.

It is due to these political opinions that Confucius has become such an object of respect to both rulers and the ruled. The former see in his teaching a ready argument for the maintenance of their authority, and the peoplc, believing that heaven has constituted for them rulers and teachcrs, whose duty it is to extend favour and maintain tranquillity throughout the empirc, have at the samc time learnt to hold that when the ruler ceascs to be a minister of God for good, he forfeits the title by which he holds the throne. Confucius was ambitious, and was a courtier as well as philosopher, and beyond this point he avoided in any shape or way indicating the manner in which an oppressive ruler should be induced to abdicate. No such consideration influenced his disciple Mencius, who, being superior to the ordinary ambitions of man, was superior also to their common timidities, and who with mucli boldness of utterance freely taught that the people were the most important element in a nation, and the sovereign was the lightest ; and he did not scruple to admit the conclusion

that an iniquitous ruler should be dethroned, and, if cir- cumstances required it, that he should be put to death. The Confucian Analects and the Works of Mencius differ in their construction from the Great Learning and the

Doctrine of the Mean, both of which are continuous treatises by individual authors; whereas the two first

named are records of the sayings and doings of the two.

sages, compiled from memory by their faithful disciples, and somewhat resemble in construction, but at a vast interval, the plan of the Gospel narrative.

We have dwelt at some length on the classics, because, since they are the sacred books of China, it is natural to suppose that in them we may find the mainspring of the national literature. Unfortunately, to some extent this is

and style of the case, and Confucius has much to answer for, both as

Confucius.

regards his teaching and the literary model he bequeathed to hiscountrymen. Instead of encouraging his disciples to think for themselves, to look into their own hearts, and to acquire that.personal knowledge that enables a man to stand alone, he led them out both by precept and example into the dreary waste of cold formalism, in which all individuality is lost, and all force and originality of thinking is crushed out. It may be said that, as faras his teachings were concerned, he strove to suit his system to the capacity of his audience; and that he was successful in so doing is proved by the fact that for twenty-two centuries his name has been revered and his precepts have been fol- lowed by his countrymen of whatever rank and station in life,

As has been well observed by Wells Williams, “ If Confucius had transmitted to posterity such works as the Itiad, the De Officirs, or the Dialogues of Plato, he would no doubt have taken a higher rank among the commanding intellects of the world; but it may be reasonably doubted whether his influence among his own countrymen would have been as good or as lasting. The variety and minute- ness of his instructions for the nurture and education of children, the stress he lays upon filial duty, the detail of etiquette and conduct he gives for the intercourse of all classes and ranks in society, characterize his writings from those of all philosophers in other countries, who, compari- tively speaking, gave small thought to the education of the young. The Four Books and the Wve Classics would not, as far as regards their intrinsic character in comparison with other productions, be considered anything more than curiosities in literature, for their antiquity and language, were it not’ for the incomparable influence they have exerted over so many millions of minds.”

But no such apology can be offered for the example he set them in the substance and style of his writings. And we are forced to the conclusion that, though a man of great force of character, he was yet strangely devoid of imagina- tion, and that, in his blind admiration for the ancients, he constrained himself to walk humbly and passively in the paths that had been traced by others. At all events he has done his countrymen an irreparable injury. The inflexible sterility of the earliest specimens of literature might possibly have been the characteristic of a particular phase in the national mind, but Confucius helped to perpetuate it throughout all generations. As might be expected, in no class of the literature is the effect thus produced more apparent than in the commentaries on the classics. These ‘works are to be numbered by thousands, and, with some few exceptions, they are, as has been said of the writings of the scribes at the time of our Lord, cold in manner, second-hand and iterative in their very essence ; with no freshness in them, no force, no fire 3 servile to all authority, opposed to all independence; never passing a hair’s-breadth beyond the carefully-watched boundary line of precedent; full of balanced inference and orthodox

hesitancy, and impossible literalism; elevating mere memory above genius, and repetition above originality.

But whatever may be the shortcoming of Confucius as a writer, the respect he felt and iuculcated for letters gave an impetus to literature. Following the example he set, men began to compile the histories of the various states ; and authors with a turn for more original composition busied themselves with the production of works on such arts and sciences, including medicine, mathematics, law, and husbandry, as were known to them. It was just as this new industry was beginning to flourish that the Emperor Che Hwang-ti, to whom reference has already been made, an able and ambitious prince, ascended the throne. By a judicious mixture of force and diplomacy, he abolished the feudal states, into which the empire had up to his time been divided, and drew all power and authority into his own hands.

Estimating the traditions of the past to be almost as potent as Confucius had supposed, and for that very reason decming them as dangerous to the existence of his rule as Confucius had considered them to be beneficial to the empire, he determined to break with them once and for ever.

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He therefore issued an order that all books should be burned, Wholesale except those containing records of his own reign; that all vee who dared to speak together about the Book of Odes or the * °°°**:

Book of History (harmless subjects enough, one would think) should be put to death, and their bodies exposed in the market-place ; that those who should make mention of the past, so as to blame the present, should be put to death along with their relatives ; and that any one possess- ing a book after the lapse of thirty days from the issuing of the ordinance should be branded and sent to labour on the Great Wall for four years. The publication of this edict was followed shortly afterwards by an order for the execution of upwards of 460 scholars who had failed to obey the mandate of the emperor. .

Curiously enough it was during the reign of this uncompromising enemy to literature that the brush-pencil as at present used in China for writing

purposes, was in- vented,—an invention which implies that about this time a substitute was found for the bamboo tablets which had up to that period served the purposes of paper. At first this new material was a kind of closely woven silk. But this was soon found to be as unsuitable for general pur- poses from its expense as the tablets had been from their cumbrousness ; and shortly after the establishment of the Han dynasty, when the decrees of Che Hwang-ti were re- versed and every encouragement was given by the state to men of letters, the Marquis Tsae " invented the manu- facture of paper from the inner bark of trees, ends of hemp, old rags, and fishing-nets." The increased facility thus afforded for the multiplication of books was eagerly taken advantage of ; and from the Annals of the Han dynasty, 206 B.c. to 25 A.D., we learn that the imperial library of that reigning house consisted of 3123 sections on the classics, 2705 on philosophy, 1318 of poetry, 790 on military affairs, 2528 on mathematics, and 868 on medicine. But at the end of the second century an insurrection, which brought the Han dynasty to a close, gave another check to the growing literary taste. And though the then reigning emperor, in his flight from his capital at Lo-yang, attempted to carry off the contents of the imperial library, only half the books reached their destination at Chang-gan, and the remnant was shortly after given to the flames by the successful revolutionists.

Invention of brush- pencil and of papér,

Such as had been the course of literature up to this time, Invention so it continued until the close of the 6th century, when the °f Printing.

art of printing, which became known in Europe nearly 900 years later, was invented in China. A well-known Chinese Encyclopeedia tells us that on the 8th day of the 12th month

Historical records,

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of the thirteenth year of the reign of Win-ti (593 a.p.), it was ordained by a decree that the various texts in circu- lation should be collected, and should be engraved on wood, to be printed and published. Thus within a few years of the time when St Augustine brought the enlightening influences of

Christianity to these Isles, the art of printing —a civilizing agency second only to Christianity—was made known in China. But at first comparatively little use seems to have been made of the invention, for we are told that though it made some way during the Tang (618— 907) and the five following dynasties (907-960), it only arrived at its full development under the Sung dynasty (960-1127). It was during this last epoch that a further improvement was made in the art by the introduction of movable types, by a blacksmith named Pe Ching. This inventor, writes M. Julien, used to take a paste of fine and glutinous clay, and make of it regular plates of the thickness of a piece of money, on which he engraved the characters. For each character he made a type, which he hardened at the fire. He then placed an iron plate on the table, and covered it with a cement composed of resin, wax, and lime. When he wanted to print, he took an iron frame divided by perpendicular threads of the same metal, and placing it on the iron plate, ranged his types in it. The plate was then held near the fire, and when the cement was sufficiently melted, a wooden board was pressed tightly upon it, so as to render the surface of the type perfectly even. This method was neither convenient nor expeditious, so says a Chinese writer, when only a few copies of a book were to be printed; but when a large number were required, it printed them off at a prodigious speed.

At this and at later periods the art of printing has been turned to no better purpose in China than to the publica- tion of the histories of the various dynasties. Debarred both by the nature of the material at their command and by a lack of original genius from indulging in the higher branches of imaginative writing, Chinese authors have devoted themselves with untiring energy and with very considerable ability to the compilation of information con- cerning the physical and political features of their own and the neighbouring countries. Hach dynasty has its official chronicle of these subjects, and the celebrated collection of twenty-one histories, which forms a well-nigh unbroken record of the nation’s annals, by contemporary authors, from the 3d century B.c. down to the middle of the 17th century, forms a notable monument of the indefatigable industry of their authors, ‘The edition of this huge work which stands on the shelves of the Chinese library at the British Museum is contained in sixty-six European-bound volumes of folio size. In order to facilitate the process of reference the different histories of which it is composed, though they vary considerably in

extent, are all formed on the same model. First in order come the Imperial Records, which consist of the purely political events which occurred in each reign; then follow the Memoirs, including articles on mathematical chronology, rites, music, jurisprudence, political economy, state sacrifices, astronomy, elemental influences, geography, literature, biographies, and records of the neighbouring countries.

On all these subjects they contain a: vast amount of valuable and varied information, much of which possesses considerable interest for European readers. The position which China, as a nation, has occupied and maintained through so many centuries has been such as to render her the natural depository of the annals of the kingdoms of Central and Eastern Asia. With Burmah, Cochin-China, Tibet, Japan, and Corea as her vassels, with a never-ceasing relationship with the tribes of Central Asia, kept up as times and circumstances changed, now as subjects, now as allies,

and now as enemies, alone unchanging in her political |

constitution amidst the recurring wrecks of neighbouring states, she has had the means at her command of collecting masses of ethnological information which are beyoud the reach of any other people. The movements of the tribes in Central Asia, to which her policy has largely contributed, are all clearly traced in the dynastic annals; and it was with the view of placing the record of these within the reach of European readers that a proposal was recently made to translate, as a beginning, the history of the Han dynasty.

Allied to these annals are the topographical works of Topo- China, which for breadth of scope and for minuteness of 8tphical

detail are scarcely to be equalled in the literature of any other country. The most generally comprehensive of these is the Ta V’sing yth tung chi, which forms a geography of the empire, together with the Chinese districts of Mongolia and Manchuria as existing since the accession of the present dynasty. This work, which consists of 356 books, was published at Peking

in the year 1744. In it each province, each prefecture, each department, and each dis- trict is separately dealt with ; and all are severally treated of under the following twenty-four headings :—1. A table of the changes which the district to be described has undergone during the successive dynasties from the Han downwards; 2. Maps; 3. A list of the distances from the various places to the chief towns of the department ; 4, Its astronomical bearings; 5. Its ancient geography ; 6. Its geographical position and its notable localities; 7. The manners and customs of the inhabitants; 8. Its fortified places; 9. Its colleges and schools; 10. The census of the population ; 11. The taxes on land; 12. Its mountains and rivers; 13. Its antiquities; 14. Its means of defence; 15. Its bridges; 16. Itsdykes; 17. Its tombs and monuments ; 18. Its temples and ancestral halls; 19. Its Buddhist and Taouist temples; 20. Patriotic native officials from the time of the Han dynasty downwards; 21. Celebrated men and things; 22. Illustrious women; 23, Saints and immortals; 24. The products of the soil.

On this model distinct topographies have also been com- piled, under official superintendence, of every province, every prefecture, every department, and almost every district. And not only this, but the water-ways of China, as well as the rivers of Manchuria, Mongolia, and Tibet, have all been accurately surveyed and minutely described. The narrow train of thought, however, into which the system of Chinese education has compressed the mind of the people tends to develop in them a faculty for the observation of minute details rather. than to foster the power of taking a correct comprehensive view of any wide subject. This peculiarity is observable in the class of works just spoken of ; for while they are wonderfully accu- rate as to details, their maps and general descriptions are often vague and untrustworthy. But when we remember how only recently the very important duty of causing sur- veys to be made of the British Islands has been under- taken by the Government, it becomes us rather to speak with respect of the energy and wisdom shown by the Chinese topographers, than to criticise too closely their shortcomings,

works.

It would not be dealing fairly by Chinese literature were Encyclo- we to leave this part of our subject without referring to pedias.

the historical and literary encyclopedias which form so very notable a feature in every library throughout the country. The best known of these compilations, and the one which may be taken as a specimen of the class, is the Wan heen tung kaou, by Ma Twan-lin. This work has been more largely drawn upon by European authors than has any other Chinese book of reference, and those who are best acquainted with it are those who speak most highly in its praise, “One cannot cease to admire,” says Remusat, “the depth of research which the author was compelled tg

make in order to collect his materials, the sagacity he has shown in the arrangement of them, and the clearness and precision with which he has presented this multitude of objects in every light. It may fairly be said that this excellent work is a library in itself, and that if Chinese literature contained nothing else, it would be worth while to learn the language in order to read it. One has only to choose the subject one wishes to study, and onc finds all the facts recorded and classified, all the sources of information indicated, and all the authorities cited and discussed." "Tt elevates our opinion," says Wells Williams, "of a nation whose literature can boast of a work like this ex- hibiting such patient investigation and candid comparison of authorities, such varied research and just discrimination of what is truly important, and so extensive a mass of facts and opinions upon every subject of historical interest."

In point of size and importance, however, this encyclo- pedia yields place to one other, entitled Koo kin too shoo tseth ching, or A Complete Collection of Ancient and Modern Books. During the reign of the Emperor Kang-he (1661— 1721) it occurred to that monarch that, in view of the

gradual alterations which were being introduced into the |

this his great object seems to have been to elucidate and develop his idea of the relations between something which he calls Taou and the universe. To this Taou, Laou-tsze refers all things as the ultimate ideal unity of the universe. All things originate from Taou, conform to Taou, and to Taou they at last return Formless, it is the cause of form. It is an eternal road ; along it all beings and all things walk ; but no being made it, for it is being itself, and yet nothing. Itis the path, and also the path-goers, and every- thing and nothing, and the cause and effect of all.

This is a sufficiently mystical foundation to allow of any superstructures, however wildly superstitious, to be based upon it. And just as the religion of ancient Rome became incrusted and overlaid by superstitious vanities gathered from Egypt, and from wherever the Roman arms penetrated, so the teachings of Jaou-tsze have becn debased and disfigured in the hands of later writers, who, casting aside his profound speculations, busy themselves with the pursnit of immortality, the search after the philosopher's stone, the use of amulets, with the observance of fasts and sacrifices, rituals and charms, and the indefinite multiplication of objects of worship

In China, as elsewhere, the first development of literary Poetry, talent is found in poetry. 'The songs and ballads which form the Book of Odes, already spoken of, date back to a Book of time long antecedent to the production of any works of Odes.

texts of works of interest and value, it would be advisable to reprint such from the old editions. He therefore appointed a commission, and directed them to reprint in one huge collection all such works as they might deem'

Taouist literature.

worthy of preservation. A complete set of copper type was cast for the undertaking, and when the commisioners brought their labours to a close, they were able to lay before the emperor a very palpable proof of their diligence in the shape of a compilation consisting of 6109 volumes. The contents they divided under thirty-two heads, embrac- ing works on every subject contained in the national literature. Only a small edition was printed off in the first instance, and before long the Government, yielding to the necessities of a severe monetary crisis, ordered the copper type employed to print it to be melted down for cash, 'Thus only a few copies of the first edition are in existence, and it is but rarely that one finds its way into the market. It so happens, however, that one is now (1876) for sale at Peking, and it is much to be hoped that this copy of a work which is the largest in the world, unique of its kind, and incapable of reproduction, may, though at present fate is adverse, find its way to the shelves of some one of the great libraries of the West.

Space would fail were we even to refer to the immense number of biographies and of works on the sciences, on education, and on jurisprudence, which have from time to time issued, and are still issuing, from the presses in China. Nor necd the literature of the religious sects of China—the Confucianists, the Buddhists, and the Taouists—detain us long, since the works of Confucius have already been noticed, and since the great bulk of Chinese Buddhist literature is of Indian origin. It remains, therefore, for us to refer only to the Taouist literature, which has its foundation in The Sdtra of Reason and of Virtue by Laou- tsze, the founder of the sect. Like Confucius, of whom he was a contemporary, he held office at the court of Chow; but being less ambitious than the sage, he retired early from his post, and we are told that as he passed the frontier on his way westward, whither we know not, he placed in the hands of the officer in charge of the frontier guard a small volume, which embodied the results of his meditations. According to the interpretation put upon his system thus expounded by the famous commentator Choo He, it would appear to bear a strong analogy to those of the Quietists and Manicheists. “ Laou-tsze’s scheme of philosophy,” he tells us, “‘ consists in modesty, self-emptiness, in being void of desires, quiet and free from exertion, in being self-empty, retiring, and self-controlling in actual life.” But beyond

which we have knowledge. In those early days, before China was China, the then empire was divided into a number of feudal states, all of which, however, acknow- ledged fealty to the ruling sovereign, at whose court were a number of music-masters and historiographers, whosc duty it was to collect and set to music the songs of the people, and to preserve the historical records of the empire, In strict imitation of the surroundings of their liege lord the feudatory princes numbered among their retinues officers of like position and professing similar functions. At stated intervals these princes, accompanied by their followings, were in the habit of meeting the king at certain recognized places to take orders for the future and to receive credit or blame as the case might be for their past conduct. On such occasions the music masters would carry with them the ballads and songs collected in their principalities, and present them to their superior at the royal court. These he would collect and classify, reminding one of Queen Elizabeth’s minister, who, according to the Spectator, “had all manner of books and ballads brought to him, of what kind soever, and took

great notice how much they took with the people ; upon which he would, and certainly might very well judge of their present dispositions, and of the most proper way of applying them according to his own purposes." Thus it happened, that at the time of Confucius there existed an official collection of some 3000 songs. On these the sage set to work, and, in the words of the historian Sze-ma Tseen, 'he rejected those which were Only repetitions of others, and selected those which would be serviceable for the inculcation of propriety and righteousness." Such he arranged to the number of 311 under four heads, namely, "'National Airs," the " Lesser " and the "Greater Eulogies," and the "Song of Homage," and gave the title of She king, or Book of Odes, to the collection.

If we can imagine ourselves seated in the study of the royal minister, searching with him into the ballads thus laid before us for an indication of the temper and mind of the people among whom they had had their birth, we should be inclined to congratulate him on the casy task entrusted to him of governing such a population. Through most of them there breathes a quiet calm and patriarchal simplicity of thought and life. There are few sounds of war, little tumult of the camp, but, on the contrary, a spirit of peaceful repose, of family love, and of religious

feeling. We have brought before the mind's eye the lowly cottage, where dwell a family united by the bonds of affection aud of duty. 'Their food is the produce of the soil and the spoils of the chase. The highest ambition of the men is to excel as archers and charioteers, and their religious worship is the same as that which, untainted by Buddhism or any other form of philosophical teaching, is now practised at the imperial temples of heaven and earth, by the emperor only as high priest. Their wives are

objects of affection and respect, and though in one song we

find the belief expressed that ''a wise woman will ruin a city," yet there seems to have been abundance of regard for honest housewives who did their duty, who shared the toil of their husbands, and enjoyed with them the simple pleasures within their reach.

It is true that now and again we meet with traces of scenes of revelry bordering on licentiousness; but their idyllic surroundings, and the absence of all violence, deprive the most dissolute descriptions of all vulgarity and coarse- ness. More serious by far are the wailing complaints of

inisrule and tyranny under which the subjects of certain ° .

princes groan. But even here there are no signs of insubordination or tumult; the remedy which suggests itself to a people patient and long-suffering to a degree is to emigrate beyond the reach of the tyrant, not to rise in rebellion against him. In the following lines, for instance, the writer begs his friends to fly with him from the oppression and misery prevailing in his native state, which he likens to the north wind and thickly falling snow :— “Cold blows the North wind ; Thickly falls the snow. Oh come all ye that love me, Let’s join hands and go. Can we any longer stay, Victims to this dire dismay ?” Foxes and crows were looked upon as creatures of evil omen, and so, giving play to his imagination, he tells us that the only variations noticeable in the monotony of the

present distress were these prognostics of future evil, in

these words :—

‘*Nought red is seen but foxes, Nor aught else black but crows, Oh come all ye that love me, Let’s fly before our foes. Can we any longer stay, Victims to this dire dismay ?

Though the style and diction of these sorigs are of the simplest description, yet through some of them there runs arich vein of sentiment, and in forming a judgment on them it is necessary to remember that they are not studied poenis, but simply what they profess to be, songs of the people. Like all political ballads also, many of them refer to contemporary events about which we know next to nothing. We are therefore much in the hands of the commentators, and they tell us that the following song is intended to depict a rural scene, in which an industrious wife impresses on her husband the necessity of early rising, and encourages him to make virtuous and respectable acquaintances :—

‘* ¢Get up, husband, here ’s the day !’ ‘Not yet, wife, the dawn’s still grey. ‘Get up, sir, and on the right

See the morning star shines bright. Shake off slumber, and prepare Ducks and geese to shoot and snare.

‘¢ ¢ All your darts and line may kill I will dress for you with skill. Thus, a blithesome hour we ’ll pass, Brightened by a cheerful glass ; While your lute its aid imparts To gratify and soothe our hearts.

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*¢€ Qn all whom you may wish to know J’ll girdle ornaments bestow ; And girdle ornaments I 711 send To any one who calls you friend ; With him whose love for you’s abiding My girdle ornaments dividing.’ ”

(The Book of Odes, pt. i. bk. vii. Ode 8.)

One other we will quote, taken from the songs of homage, or hymns which were sung either by or before the emperor when he sacrificed as high priest to God. We are told that this one was sung by King Seuen on the occasion of a great drought inthe 8th century B.c. In it he expostulates with God for bringing this misery upon him, and expresses his belief that he had a right to expect succour instead of disaster from the Most High,

“Brightly resplendent in the sky revolved ‘The milky way. ; The monarch cried, Alas ! What crime is ours, that Heaven thus sends on us Death and Disorder, that with blow on blow Famine attacks us ? mo Surely I have grudged To God no victims ; all our store is spent Of tokens. Why is it I am not heard ? Rages the.drought. he hills are parched, and dry The streams. ‘The demon of the drought Destroys like one who scatters fiery flames. Terrified by the burning heat my heart, My mourning heart, seems all consumed with fire. The many dukes and ministers of the past Pay me no heed. O God! from Thy great Heaven Send me permission to withdraw myself Into seclusion. Fearful is the drought. _ Thesitate, I dread to go away. Why has the drought been sent upon my land ? No cause for it know

I. Full early rose My prayers for a good year ; not late was I In off’ring sacrifice unto the Lords Of the four quarters and the land. Afar In the high Heaven God listens not. Surely a reverent man as I have been To all intelligent Spirits should not be The victim of their overwhelming wrath.” (The Book of Odes, pt. iii. bk. ili, Ode 4.)

Such is the poetry of the Book of Odes, and such we should have expected to find it, since the earliest specimens of poetry in every land partake of a simple and religious nature, are crude in their measure, and are wanting in that harmony which is begotten of study and cultivation. The Chinese say of poetry that the Dook of Odes may be likened to its roots, that during the Han and Wei dynasties it burst into foliage, and that during the Tang dynasty

And yet

(620-907) it came into full bloom. Certainly the change Later that came over it after the time of Confucius is very poetry.

marked. Instead of the peaceful odes of his day, we find pieces reflecting the unsettled condition of political and social affairs. Songs breathing fire and sword, mingled with wild fancies, the offspring of Taouist teaching, have taken the place of the domestic ballads of the Book of Odes. The simple monotheistic belief of the early Chinese is exchanged for a superstitious faith in a host of gods and goddesses, who haunt every hill, and dance in every glade. As a specimen of the poetry of this period, we may quote the following “ Lament of a Soldier on a Campaign,” by Sun Tsze-king, of the Wei dynasty :—

*¢On the hilly way blows the morning brecze ; the Autumn shrubs are veiled in mist and rain. The whole city escorts us far on our way, providing us with rations for a thousand 7%. Their very worst have the three Fates done. Ah me! how can I be saved? There is nought more bitter than an early death. Do not the Gods desire to gain perpetual youth ? V. — 84

Dramatic literature,

As Sorrow and Happiness, so are Fortune and Misfortune intermingled. Heaven and Earth are the moulds in which we are formed, and in them is there nothing which does not bear significance.

Far into the future looks the sage, early striving to avert calamity. But who can examine his own heart, scrutinize it by the light of heaven, regulate it for his present life, and preserve it for the old age which is to come ?

Longer grows the distance from what I have left behind me: my trouble ‘s greater than I can bear.”

With other poets this new phase of belief encouraged a contempt for life, and an uncertainty of all beyond it; and these during the first two centuries gave vent to their indifference in odes advocating the Epicurean philosophy, “Let us eat and drink, for to-morrow we die.” Eight short dynasties, times of confusion and disorder, followed after the Han dynasties (206 B.c. to 221 a.p.) and then came the Tang dynasty (620-907), a period which is Inoked back upon as being the golden age of literature, as, indeed, it was in every field which marks a nation’s greatness. It was during this epoch that impcrial armies occupied Bokhara and Samarcand, that the Buddhist traveller Heuen-tsang made his way to India, and to every spot rendered sacred by the presence of Buddha, and that the softening influences of Christianity were introduced by the Nestorians into the very heart of the empire. It was a time of prosperity and peace. Literature flourished, and skill and art were employed to soften and add harmony to the national poetry. The four syllables, of which nearly all the lines in the Book of Odes were composed, were exchanged for five and seven. The sub- jects also partook of the change. Le Tai-pih, the greatest poet of his time, tuned his lyre to notes on the pleasures of wine and of beauty, which would have done honour to Anacreon. Evening feasts amid the parterres of gardens rich with the bloom of a thousand flowers furnished themes upon which he and his imitators were never tired of dilating. Such sonnets are sometimes pretty, and occasionally the ideas they contain are striking ; but the disadvantages of the language and of education weigh heavily upon their authors, and they seldom rise beyond the level of the merest mediocrity. The following is taken from the writings of the poet just mentioned, and is translated Jineatim ct verbatun :—

A Solitary Carouse on a Day in Spring

‘* The east wind fans a gentle breeze,

The streams and trees glory in the brightness of the Spring, The bright sun illuminates the green shrubs,

And the falling flowers are scattered and fly away.

The solitary cloud retreats to the hollow hill,

The birds return to their leafy haunts.

Every being has a refuge whither he may turn,

I alone have nothing to which to cling.

So, seated opposite the moon shining o’er the cliff,

I drink and sing to the fragrant blossoms.”

Of epic poetry the Chinese know nothing, and this need not surprise us when we remember how entirely that style of writing was an importation from Greece into Western Europe; and Voltaire tells us that, when he was thinking of publishing the Henriade, he consulted a friend on the subject, who recommended him to give up the undertaking, “for,” said he, “ the French have not epic heads.” Neither have the Chinese. A sustained effort of imagination is difficult to them, and the strict laws of rhyme and metre which hamper the poet would make a lengthened poem in Chinese the work of a lifetime. It is probably due to this cause that the literature shows no instance of real dramatic poetry. Their dramas abound with short lyrical pleces, which are introduced to break the monotony of the dialogue ; but dramas in verse are unknown, except in the case of low plays written in vulgar rhythm. As, however, love for the drama is one of the most noticeable features of the

Chinese character, every encouragement has been given to playwrights, and this branch of literature is therefore well supplied both as regards matter and bulk. The most celebrated plays are contained in a collection entitled Zhe Hundred Plays of the Yuen Dynasty, many of which have been translated into European languages, and one of which, the Orphan of Chaou, served as the groundwork of Voltaire's tragedy, L'Orphelin dela Chine. Their dramas are divided in the playbooks into acts, generally four or five, but as there is an absence of all scenery, and as the dresses are never changed during the piece, the acting is as a rule continuous throughout without break or interval. The stage directions are given in their books as in ours, but not with the same minuteness, '" Enter" and "exit" are expressed by "ascend" and "descend," and "aside," by "turn the back and say." By the rules of the Chinese, as was the case also in the Greek drama, only two players are allowed to have possession of the stage at any one tine. This, and the absence of all sceuery, obliges the dramatists to put in the mouths of the actors long pieces of spoken narrative, much after the manner of the prologues in the plays of Euripides, which appear tame and heavy to a European spectator accustomed to have the plot and locality explained by dialogue and scenery. The plots are for the most part simple and well sustained. 'The unities, though sometimes observed, are more often disregarded, especially that of place, the characters being frequently sent to differcut parts of the country in the same act, and niade to inform the audience of their whereabouts by the simple expedient of walking up and down the stage, and exclaiming, "Now I am at such and such a place," or "at such and such a house." The acting, generally speaking, is good. The Chinese are actors by nature, and are no doubt a good deal improved by their inherent cunning and want of sincerity, which make them quick of observation and fertile in resource, and in every-day life enable them easily to catch the tone of those with whom they associate, and on the stage to assume the characters they wish to represent.

The theatre is in China, as it was in Greece, national and religious. It is under the direct control of the law, and is closed by imperial edict during all periods of public mourning, while at the same time it plays a prominent part at all the yearly religious festivals.

quote from Sir John Davis's China an abstract of a play, which he has translated and published at full length, entitled Lhe Hew in Old Age. This piece serves, as is observed by the translator, to illustrate the consequences which the Chinese attach to the due performance of the oblations at the tombs of departed ancestors, and also the true relation of the handmaid to the legitimate wife. The dramatis persone are, he says, "' made up entirely of the members of a family in the middle class of life, consisting of a rich old man, his wife, a handmaid, his nephew, his son-in-law, and his daughter." The old man, having no son to console him in his age, and to perform the obsequies at his tomb, had, like the Jewish patriarch, taken a handmaid, whose preg- nancy is announced at the opening of the play, in which the old man commences with saying, "I am a man of Tung-ping Foo," &c. In order to obtain from Heaven a son, instead of a daughter, he makes a sacrifice of sundry debts due to him, by burning the bonds, and this pro- pitiatory holocaust serves at the same time to quiet some scruples of conscience as to the mode in which part of his money had been acquired. He then delivers over his affairs to his wife and his married daughter, dismissing his nephew (a deceased brother's son) with a hundred pieces of silver to seek his fortune, as he had been subjected at home to the persecution of the wife. This done, the old man sets out for his estate in the country, recommending the mother

In order to give some Abstract of idea of the substance and plot of a Chinese drama, I will @ play.

Novels.

LITERATURE. |

of his expected son to the humane treatment of the family, and with the hope of receiving from them speedy congratu- lations on the birth of a son.

The son-in-law now betrays to the daughter his disappoint- meut at the expected birth, since, if it prove a girl, they shall lose half the family property, and ifa son, the whole, His wife quiets him by a hint how easily the handmaid nay be got rid of, and the old man persuaded that she had suddenly disappeared; and shortly afterwards both the son-in-law and the audience are left to infer that she had actually contrived to make away with

her. In the mean time the old man waits the result in great anxiety ; his family appear in succession to console him for the loss of his hopes. In the bitterness of his disappomtment, he bursts into tears and expresses his suspicions of foul play. He then attributes his misfortunes to his former thirst for gain, resolves to fast for seven days, and to bestow alins publicly at a neighbouring temple, in the hope that the object of his charity may treat him as a father. Among the beggars at the temple his nephew appears in the most hopcless state of poverty, being reduced to take up his lodgings under the furnace of a pottery ; he is insulted by the son-in-law, and reproached by the old wife, but his uncle, moved with compassion, contrives to give him a little money, and earnestly advises him to be punctual in visiting the tombs of his family at the approaching spring, assuring him that a due attention to those sacred rites must ultimately lead to prosperity. It is on the importance attached to the sepulchral ceremonies that the whole drama is made to turn.

The nephew accordingly appears at the tombs, performs his oblations as well as his poverty will admit, and invokes the shades of his ancestors to grant him their protection. He no sooner departs than the old man appears with his wife, expressing their indignation that their own daughter and son-in-law had neglected to come with the customary offerings. ‘They observe, from the appearances at the sepulchre, that thcir nephew must have been there. The scene at the tombs, and the reflections of the old man thereon, havc considerable interest; he reasons with his wife, and convinces her that the nephew is nearer in blood and more worthy than the son-in-law; she relents, and expresses a wish to make him reparation ; he appears, and a reconciliation takes place, and he is received back into the family. he son-in-law and daughter now enter with a great bustle and a procession, to perform the ceremonies, but are received with bitter reproaches for their tardy piety and ingratitude, and forbidden to enter the doors again.

On the old man’s birthday, however, they claim permis- sion to pay their respects, when, to the boundless surprise and joy of the father, his daughter presents him with the long-lost handmaid and child, both of whom, it appears, had been secreted by the daughter, unknown to her jealous husband, who supposed they were otherwise disposed of. The daughter is taken back, and the old man divides his money in three equal shares, between her, his nephew, and his newly-found son,—the play concluding

with expressions of joy and gratitude that the venerable hero of the piece had obtained an “heir in his old age.”

This play furnishes us with a very good type of Chinese plays in general. The incidents are true to life, but they have no psychological interest about them. There is no delineation of character in it, and there is nothing in the plot to make it more appropriate for the groundwork of a play than for that of a novel. In the works of fiction we are treated only to the same crude narration of facts, without any just representation of nature. Exaggerated sentiments, which always precede correct reasoning and refined simplicity, fill the pages of their works of fiction, rendering them favourites only with those who are taught

to judge of them according to their own standard of taste. Of the characters portrayed, we have to judge only from actions attributed to them, which are strung together with no connecting links, except those supplied by the iteration of details, which are wearisome to a degrec. Several novels have been translated into English by Sir John Davis and others; but, from the causes I have described, few have attracted any public interest. Some of their shorter tales, being to a great extent purged of the cumbrous repetitions common to larger works, are better fitted for translation, and the novelty of many of the situations and incidents serves to keep alive the attention of the reader. Unfor- tunately the tone of most Chinese novels is not such as to afford any palliation for the dreariness of their contents. If Chinese novelists are to believed, virtue in women and honour in men are to be found only in a few rarely-gifted individuals, and this has been so constantly insisted on, that it appears to have become one of those beliefs which have been the means of their own justification.

If then, having considered the past and present literature

of China, we cast a glance into the future, the prospect is not encouraging, Already every subject within the scope of Chinese authors has been largely treated of and infinitely elaborated. Every grain of wheat has long ago been

beaten out of it, and any further labour expended upon it can but be as thrashing out of straw. The only hope for the future of the literature is that afforded by the importation of foreign knowledge and experience into the

country. For many years these can only be introduced in the shape of translations of books. But the time will come when Chinese authors will think for themselves ; and when that period arrives, they will learn to estimate their present loudly-vaunted literature at its true value.

Government.

The government may be described as a patriarchal despotism. ‘The emperor is the father of his people, and as a father is responsible for the training and behaviour of his children, receiving blame when they prove unworthy, and reward when they show themselves to be virtuous ; so is the people’s welfare the emperor’s first care, and their preservation from all harm, both moral and physical, his first duty. When the people become unruly the emperor views their conduct as the result of his own negligence or want of wisdom, and when peace prevails he accepts it as the consequence of his fatherly solicitude andcare. Likea father, also, he holds autocratic sway over his household,— the empire. In his hand lies the power of life and death. Whom he will he slays, and whom he will he keeps alive, But there is a limit to his absolutism. The duties attaching to the relations existing between emperor and people are reciprocal; and, while it is the duty of the subject to render willing and submissive obedience to the sovereign so long as his rule is just and beneficent, it is also incumbent on him to resist his authority so soon as he ceases to be a minister of God for good. ‘This sacred right of rebellion was distinctly taught by Confucius, and was emphasized by Mencius, who went the length of asserting that a ruler who, by the practice of injustice and oppression, had forfeited his right to rule, should not only be dethroned, but might, if circumstances required it, be put to death.

All this carries us back to a very primitive state of

-society—to one which probably existed among the Chinese

immigrants who first settled on the plains of China, and which has been perpetuated down to the present day unaltered and without interruption. That among the changing fates of empires this system should have been so accurately maintained in China through so many centuries is a fact into the causes of which it is worth while to inquire. We find it pictured in the records which make up

the Book of History, the earliest of which carry us back to the time of Noah, and we find it enforced in the writings of the great apostle of patriarchal institutions, Confucius, and in all the other works which go to make up the nine

and Keen-lung, who reigned in the last two centuries, and each of whom devoted the sixty years of his reign to the high duties of his position and to the charms of literary pursuits,

In all affairs of state the emperor is assisted in his Govern deliberations by the Muy ko, or privy counal, which, ment according to the regulations of the present dynasty, con- ds. sists of nine Manchoos and seven Chinamen 3 and the ad- ministrative departments are presided over by six boards,

classics. The reverence with which these Scriptures are viewed has been the principal means of perpetuating the primitive form of Chinese imperialism. The contents of their pages form the study of every schoolboy, and supply the only themes at the competitive examinations through

which every one must pass who seeks an official career. Thus the mind of the nation is constantly and almost exclusively turned towards them, and their dogmas have

become part and parcel of the national training. The isolation in which China, owing to her geographical and political position, has been wrapt for

so many centuries has prevented the introduction of foreign opinions and litera- ture, and the national mind has been so emasculated by the constant contemplation of these ready-made models of

excellence, that neither from without nor from within has

there been any temptation to Chinamen, by the creation of

new ideas, on this or any other subject, to dissent from the dicta of Confucius and his predecessors, and the result has been that such as the government was in their time so it is at the present day.

The whole theory of government is the embodiment of parental and filial piety. As the people are the children of

the emperor, so is he the 7'een-tsze or the Son of Heaven ; and standing in this intermediary position, it pertains to him, and to him alone, to mediate between his father, Heaven, and his children, his subjects. His sacrifices and prayers to Heaven are conducted with great parade and ceremony.

The chief of these state observances is the sacrifice at the

winter solstice, which is performed before sunrise on the morning of the 21st of December at the altar of Heaven.

The form of this altar is peculiar, "It consists of a triple 150 in the The emperor, with his immediate snite, kneels in front of the tablet of Shang-tis

circular terrace, 210 feet wide at the base, middle, and 90 at the top… . .

(The Supreme Being, or Heaven), and faces the north. The

platform is laid with marble stones, forming nine concentric

circles; the inner circle consists of nine stones, cut so as

to fit with close edges round the central stone, which is a

perfect circle. Here the emperor kneels, and is surrounded first by the circles of the terraces and their enclosing walls, and then by the circle of the horizon. He then scems to hiraself and to his court to be in the centre of the universe, and turning to the north, assuming the attitnde of a subject, he acknowledges in prayer and by his position that he ig inferior to Heaven, and to Heaven alone. Round him on the pavement are the nine circles of as many Heavens, consisting of nine stones, then eighteen, then twenty-seven, and so on in successive multiples of nine till the square of nine, the favourite number of Chinese philosophy, is reached in the outermost circle of eighty-one stones." On this occasion, also, a bullock of two years old, and without blemish, is offered as a whole-burntoffering in a green porcelain furnace which stands close beside the altar.

But though occupying the lofty position described, the power wielded by the emperor of China is circumscribed by ceremonial laws and hampered by precedents. His whole life is one continual round of ceremonial observances, From the day on which he ascends the throne to the time when he is carried to his tomb in the Eastern Hills, his hours and almost minutes have special duties appointed to them by the Board of Rites. He never leaves his palace except on state occasions, and every relaxation from the cares of sovereignty must therefore be found within its walls. It is thus that the temptations of harem life have been the ruin of so many emperors, and it is rarely the case that such sovereigns are to be met with as Kang-he

namely, the Board of War, the Board of Punish- ments, the Board of Office, the Board of Ceremonies, the Board of Revenue, and the Board of Works. Besides these there are the Board of Music and that of the Censors : and this last, though an inferior office, exercises considerable influence, since its officers, both in the capital and in the pro- vinces, are encouraged to criticise freely the actions of the mandarins and even of the emperor himself. Like many of the other branches of Government, this one has fallen a victim to a great extent to the corruption which prevails throughout all the departments, but it is still at times instrumental in bringing to light official misdeeds ; and only lately a general in command of an army, acting against the Mahometan rebels in North-Western China, was degraded and dismissed from his post for crimes with which he was first charged by a censor.

The provincial governments are mainly self-governed, Provincial Each province (in a few cases, two conjointly) is presided si over by a viceroy, who is supreme within his jurisdiction, “°”* and who has, in cases of emergency, the power of life and death in his hands. Next to him comes the governor, whose authority in all matters relating to the province is second only to that of the viceroy. After these two officials the treasurer holds the highest rank. He con- trols the finances of the whole province, receiving the taxes and paying the salaries of the mandarins, The judge, the salt commissioner, and the grain collector are the only other mandarins whose authority extends over the whole province, the remaining officials being charged with the government of the various divisions into which the provinces are divided. The chief of them is the Taou- tai, or intendant of circuit, who has a direct general superintendence over all the affairs of the circuit intrusted to his charge. Each circuit is divided into a number of prefectures and sub-prefectures which are administered by prefects and sub-prefects, and these, again, are subdivided into districts over each of which is placed a magistrate. Subordinate to this last-named officer are a host of petty officials, among whom the coroner is one of the most important. Each province collects its own taxes, pays its own expenses, and supports its own army and navy. Its officials are held responsible for the preservation of peace Within its borders, and are compelled to contribute a fixed sum annually to the expenses of the Peking Government. Mandarins of all classes are divided into nine ranks, each distinguished by the button worn on the top of the cap. These buttons follow thus in order of superiority—first and highest, a plain red button ; second, a flowered red button 5 third, a transparent blue button ; fourth, an opaque blue button ; fifth, an uncoloured glass button 3 sixth, a white glass button ; seventh, a plain gilt button ; eighth, a gilt button, with flowers in relief; ninth, a gilt button, with engraved flowers, These buttons are no indication of the office held by their wearers, but simply of theirrank, The peacock’s. feather, again, which is worn in the hats, has nothing to do with either the office or the rank of the wearer, but is like the European orders, and is specially granted to individuals as a reward for merit,

Theoretically the system of government in the provinces Official cor is excellent, but as a matter of fact it is corrupt to the ruption, core. Several causes have tended to bring about this

Torture.

GOVERNMEN T. |

disastrous state of things. In the first place, the mandarins, even when they receive their salaries, which is by no means always the case, are so wretchedly underpaid that the money they receive from this source is barely sutticient to support the staff which it is necessary for them to maintain. A district magistrate, for instance, is supposed to receive about .£275 per annum, a prefect about £685, and an intendant of circuit about £1035. The pay of the higher officers varies in different parts of the empire. ‘The salary of the viceroy of the two provinces, Kwang-tung and Kwang-se, is said to be about £9000 a year. The con- sequence is that, as few mandarins have private means, they are obliged to supplemeut their official incomes by illegal exactions and bribes. And this evil is further heightened by the regulation which forbids that a mandarin should hold any office for more than three years. It becomes the selfish interest, therefore, of every office-holder to get as much: out of tlie people within his jurisdiction as he possibly can in that time. The instant he arrives at his post it is customary for all the subordinate officials to pay their respects to him, on which occasion they are expected to display their loyalty by offering presents of more or less value according to the means at their com- raand. No subaltern dare absent himself, being perfectly aware that such an omission of duty would deprive him of all hope of promotion, and would subject him on the slightest pretence, or even without any pretence whatever, to official persecution and ruin. Then, again, when a suitor comes with a legal cause to the Yamun, or mandarin’s office, he is obliged to fee tle mandarin, and all the subordinate officials, the secretary, the police, and the doorkeeper, in proportion to his wealth, or otherwise his chance of gaining a hearing would be very small indeed. In a great many cases also the bribery goes beyond the preliminary fee. In an officialdom, where illegal exactions are recognized, it would be impossible to suppose that the stream of justice should be pure, and a limited acquaint- ance with the practices of Chinese Yamuns is cnough to verify the common belief that justice is bought and sold, and that a suitor’s chance of success is in proportion to his wealth.

As may readily be imagined, this corruption in high places has a most demoralizing effect on the people generally. Dishonesty prevails to a frightful extent, and with it, of course, untruthfulness. The Chinese set little or no value upon truth, and thus some slight excuse is afforded for the use of torture in their courts of justice ; for it is argued that where the valuc of an oath is not understood, some other mcans must be resorted to to extract evidence, and the readiest means to hand is doubtless torture. The kind most commonly inflicted is flogging. The obdurate witness is laid flat on his face, aud the executioner delivers his blows on the upper part of the thighs with the concave side of a split bamboo, the sharp edges of which mutilate the sufferer terribly. The punish- ment is continued until the man either supplies the evidence required or becomes insensible. Numberless other forms of torture are occasiunally resorted to, such as tying the witness up to a beam by his thumbs and big toes, squeezing his fingers between pieces of bamboo, &c. ; and these, of course, vary both in kind and severity, according to the disposition of the presiding mandarin.

Goverment Theoretically every safeguard is adopted to secure for tlic

offices.

public service only officers of enlightened and refined dispo- sitions. The law ordains that every man who wishes to obtain Government employment must qualify himself for office by passing the prescribed competitive examinations ; and as there is, speaking generally, no hereditary nobility nor any class equivalent to English country gentlemen, office supplies the only distinguishing rank in the empire.

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The consequence is that it is sought after by all except those who engage in trade. Thus the Government has the cream of the national talent at its disposal, and if posts were only given to the foremost men at the examina- tions as the law provides, no system could be better, and when it has been carried out China has reaped the benefits of it. Unfortunately, however, it has constantly happened that when the Government has been embarrassed

by want of money, offices have been put up for sale, and thus the man who has the longest purse steps into the post of honour; and if, as must often happen, he should chance to be cruel as wellas uncultured, unjust as well as ignorant, woe betide the people under him. One great defectin the competitive system in China is that there is no limit to the number of candidates, nor to the age when they may go up for examination, and the result is that, what with the sur- plus victors and the unsuccessful aspirants who go on try- ing year after year until they become grey-haired old men, there exists a large non-producing class in the community which acts as a dead weight on the national prosperity.

It is only natural to expect that in a country where the Punish: torture of witnesses is permitted, the punishments inflicted ments.

on the guilty should exceed in cruelty, and this is eminently the case in China. ‘he Mongolian race is confessedly obtuse-nerved and insensible to suffering, and no doubt Chinese culprits do not suffer nearly as much as members of more sensitive races would under similar treatment. But even granting this, the refined cruelties perpetrated by Chinamen on Chinamen admit of no apology. Not long since, for instance, at one of the Treaty Ports, an offender was placed in a cage, through the top of which his head protruded, and which was just long enough to allow the tips of his toes to touch the ground. In this position, hanging as it were by his neck, with just enough support froin his feet to prevent his neck dislocating, the wretched man remained for days, the object of the jeers and laughter of the passers by, until starvation and exhaustion put an end to his sufferings. As punishments for heinous offences such cruelties would be sufficiently shocking, but the fact that this and kindred tortures are not unfrequently inflicted for very iusignificant crimes, and sometimes even to gratify the malice or the greed of the officiating mandarin, is significant of a strangely callous indifference in the Chinese nature to the sufferings of others, For capital offences the usual modes of inflicting the extreme penalty of the law are —in bad cases, such as parricides, ‘‘ cutting to pieces,” and for less aggravated crimes either strangulation or decapita- tion. The culprit who is condemned to be “ cut to pieces ” is fastened to a cross, and while thus suspended cuts are made by the executioner on the fleshy parts of the body, and he is then beheaded. Strangulation is reserved for offenders of high

rank, it being considered a privilege to pass out of life with a whole body. When it has been granted to a criminal thus to meet his eud, a silken cord is sent to him in prison. No cxplanatory message is con- sidered necessary, and he is left to consummate his own doom. Sometimes, of course, the prisoner’s nerve forsakes him at the supreme moment, as was the case with a prince of the blood, who in 1861 was presented with a silken cord for treason. This imperial personage could not make up his mind to be his own executioner, and it became necessary to call in the jailers to carry out the sentence of the law. Decapitation in China is a very speedy death, and were it not that popular scntiment regards it asa peculiarly dis- graceful end, it would be a very merciful one. Constant practice makes the executioners wonderfully expert in the performance of their deadly office. No block or resting- place for the head is used. The neck is simply outstretched to its fnll length by the aid of an assistant, and one blow invariably leaves the body headless.

Marriage customs.

But side by side with all these horrors there is a vast deal of quiet, happy, domestic life in China. It is not every one who gets into the clutches of the mandarins and their satellites, and as long as a man is loyal to the powers that be, and is not over rich, he may expect to be left alone in undisturbed enjoyment of the pleasures within his reach, And in the ordering of a Chinese household there is much that might be imitated with advantage by _ European families. The duty of filial piety, which is the final object of Chinese religious teaching, represents much more than the ceremonial observances which outwardly mark its perform- ance. The reverence with which children are taught to regard their parents fosters the affection of which this reverence is the outward and visible sign, and the peace of each household is assured by the presence of a supreme authority, against whose dicta there is no appeal. Although sons very generally remain under their fathers’ roofs after they are married and have themselves become fathers, yet so impossible would it be for a young Chinaman to rebel against, or even to dispute with, his parent that difficulties seldom arise from this close

association of several genera- tions. ‘The patriarchal system of family life is dear to the heart of every Chinaman, and when his time comes to die, death loses to him half its terrors if he is assured that his sons will be present at his tomb to perform the customary rites and to offer the prescribed sacrifices, It is his belief that the peace of his soul depends on the due celebration of these posthumous observances, and if he has no son present to officiate, to whom can he look for the perform- ance of them ?

It is mainly due to this cause that carly marriages are almost universal in China. Like the Jews of old, the Chinese look upon the possession of children, especially of sons, as the chief blessing of life, and consequently as soon ag a young man comes of age his parents cast about to find a helpmate for him. The would-be bridegroom has very little to say in the matter. Marriage is not the result of acquaintanceship ripening into affection, as amongst Western nations. The bridegroom rarely sees his betrothed until she has become his wife. The preliminaries are entirely arranged by a professional “ go-between” or ‘‘match-maker,” who makes it her duty to acquaint herself with all the marriageable young people of both sexes in the neighbourhood, When employed by the bridegroom’s friends she calls on the parents of some young lady who she considers would make a suitable wife for the futnre bridegroom, armed with a card on which are inscribed the ancestral name, and the eight symbols which denote the year, month, day, and hour of the birth of the suitor. Should the lady’s parents be inclined to accept the proposal they consult a fortune-teller as to the future prospects of such a union. Ifthe answer be favourable a return card is given to the go-between, and this in turn is submitted to the scrutiny of a fortune-teller employed by the man’s parents. Should the oracles prophesy good concerning the match the bridegroom prepares two large cards on which are written the particulars of the engagement ; and on the outer side of the one which he keeps is pasted a paper dragon, and on the one which is sent to the lady, a phoenix,— emblems of conjugal fidelity. Each card is further sewn together with two pieces of red silk. Legend traces the original of these silken cords to the time of the ‘Tang dynasty (618-907). During that period, it is said that a man named Hwuy Ko, while staying at the town of Sung, saw one evening an old man reading a book by the light of the moon, who addressed him thus: “ This book is the register of the engagements of marriage for all places under heaven, and in my pockets I have red cords

with which I tie together the fcet of those who are destined to become man and wife. When this cord has been tied, though the parties are of unfriendly familics, or of different nations, their fates are fixed. Your future wife," said he, "is the child of the old woman who sells vegetables in yonder shop on the north." Upon hearing this Hwuy Ko started off in search of the old woman, and found her possessed of such a hideous little infant of about twelve months old, that in despair he hired a man to kill the child. Years afterwards the prefect of a neighbouring district gave Hwuy Ko in marriage a beautiful young lady whont he affirmed to be his own daughter. Sceing that his bride always wore an artificial flower over her eyebrow, Hwuy Ko asked her the reason of her doing so. "I ar the daughter," she replied, "of the prefect's brother who died at Sung when I was an infant, leaving me to the caro of an old woman who sold vegetables. One day, when I was out with her in the street a ruffian struck me on my eyebrow, and made such a scar that I am obliged to wear this flower to conceal it." On hearing this Hwuy Ko recognized the immutability of fate, and from that timo forward red silken cords have been entwined in the marriage cards of every pairin China, Following the exchange of cards, presents of more or less value according to the wealth of the contracting parties pass between the two households, and at last when the happy day has arrived, the bride, surrounded by her friends, starts from her father's house in a sedan chair for her future home. Half-way between the two houses she is met by a party of the bridegroom's followers, who escort her the rest of the way. In this custom it is impossible not to see a survival of the primitive custom of marriage by capture. At the present day, in some parts of Central Asia, the bride rides off on horseback at full gallop from the door of her father's house or tent, followed by the bridegroom, who, after an exciting chase, is allowed to come up with her, and she straightway becomes his property. Among some of the Siberian tribes, again, the bridegroom is obliged to hunt his bride through the compartments of her father's tent, while old women go through the farce of tripping him up and other- wise hindering him in his pursuit. In more civilized China there are fewer traces of the ancient capture, and the contest has there become but a formal act of taking over the bride on her way to the bridegroom's house. On alighting from her sedan chair she is led with her head covered into the room where her future

husband awaits her. Without ex- changing a word they sit down side by side, and each tries to sit on a part of the dress of the other, it being considered that the one who succeeds in so doing will rule in the house-hold. After this silent trial of skill they adjourn to the reception hall, where stands the family altar, and there they worship Heaven, and Earth, and their ancestors, This donc, they drink a glass of wine together, when for the first timo the bridegroom is allowed to see the face of his bride. Here the marriage ceremony ends, and the guests give themselves up to feasting and rejoicing,

Like many other apparent paradoxes, the co-existence Infanticide.

of infanticide with an universal desire for children among the Chinese admits of a ready explanation. The chief object of desire is the possession of sons, and in the parts of the country where infanticide exists—and this is the case only in poverty-stricken households in certain dis- tricts of certain provinces—female infants are the only victims. In some parts of the province of Fuh-keen the people make no attempt to conceal the existence of the practice, and even go the length of defending it. What is the good of rearing daughters, they say; when they are young they are only an expense, and when they reach an age when they might be able to work for their own living, they marry and leave us, But even the poorest people

Religion.

Education,

CHINA

nourish and cherish their sons, Their labour soon becomes remunerative, they support their parents in their old age, and when these are gathered to their fathers they perform the prescribed observances at their tombs,—offering sacrifices at fixed periods to the souls of the departed, and keeping the tombs in repair. Should anything interfere with the repose of the dead, the living may expect to be visited with misfortune ; and to allow the soul of a parent to pass between its tomb and the households of the descendants, the entrance to the grave must be kept unimpeded. Curiously enough, the

tombs, especially in the south of China, are all made in the shape of an Q. This is probably an importation from the West.

The principal religions of China are Buddhism, Taouism, and Confucianism, to which must be added Mahometanism in the northern and western provinces of the empire. Buddhism was introduced from India during the Ist century of the Christian era; and thus coming at a time when the national mind had been prepared by the teachings of Confucius and' the mysticisms of Laou-tsze for the recep- tion of a religious system which should satisfy the require- ments of its higher nature, the new faith spread rapidly through the country, and at the present day numbers more adherents than either of the other two leading religions. Laou-tsze, who was the founder of the Taouist sect, was a contemporary of Confucius. Like that sage also, he held office at the court of Chow, but being disheartened at the want of success attending his efforts to reform the manners of the age, he retired into private life and devoted himself to the composition of Zhe Sitra of Reasonand Virtue. In this work he enunciated a scheme of philosophy which bears a strong analogy to the doctrines of the Quietists and Manicheists, the leading point being the relation between something which he calls Z'aow and the universe. The philosophical bearing of his system was, however, soon lost sight of and his profound speculations were exchanged for the pursuit of immortality and the search after the philo- sopher's stone by his followers, But while Buddhism and Taouism find their adherents among the common people, Confucianism is par excellence the religion of the learned. The opinions and teachings of the sage are their constant study; and at stated periods they assemble in temples devoted to his honour to worship at the shrine of the "'Throneless King." But the process of decay,which has been going on for so many centuries in the distinctive features of these creeds, has served so to obliterate the lines of demarcation which originally separated them, that at the present day the dogmas of Buddha and Laou-tsze and the teachings of Confucius may, as far as the masses are con- cerned, be treated as the foundations of a common faith.

Education is probably more widely spread among the male population in China than in any other country. Being the only high road to honour and emolument it is eagerly sought after by all who are desirous of following an

official career, while the universal respect for letters which has be- come a national tradition encourages all of every degree to gain at least a smattering of learning—except the women. Very little trouble is taken with the education of girls. If they are taught to be good needle-women and expert cooks, if they learn to act modestly and to show due deference to their superiors, little more is asa rule required of them. But it is very different with the men. No one can hold any Government office unless he has passed at least the first of the three great literary competitive examinations, and the whole education of boys is arranged with the object of enabling them to pass successfully through these ordeals. Unfortunately for the real education of the aspirants to office, the only subject required of them is a knowledge of the Nine Classics, and the result is that from childhood upwards these works are the only

text-books which are put into the hands of Chinese school- boys. These they are taught to regard as the supreme models of excellence, and any deviation either from the opinions they contain or from the style in which they are written, is looked upon as heretical, The result is that there have grown up in China generation after generation of men who have learned to elevate mere memory above genius, and whose mental powers have been dwarfed by servile imitation and by the paltry literalism of the schools.

Turning to the every-day customs and manners of the Chinese, it is passing strange to find how diametrically opposed they are to what we are familiar with. In a country “where,” as has been said by Wingrove Cook, “the roses have no fragrance, and the women no petti- coats ; where the labourer has no Sabbath, and the magistrate no sense of honour; where the needle points to the south, and the sign of being puzzled is to scratch the antipodes of the head; where the place of honour is on the left hand, and the seat of intellect is in the stomach ; where to take off your hat is an insolent gesture, and to wear white garments is to put yourself into mourning,” it would at first sight seem useless to seek for any point of similarity with ourselves. But it is extremely probable, for instance, that the choice of the left as the seat of honour is in principle entirely at one with our custom of considering the right hand as the place due to the most highly-honoured guest, and that both

are survivals of the ancient and almost universal adoration of the sun. The needle of the Chinese compass points towards the south, and every house in China of any pretensions faces the same way, as well as the state seats in all reception rooms. The place on the left of the host, therefore, is that nearest to the light-bringing, life-producing Hast, and hence its title to honour; and in the same way the opposite custom among ourselves is susceptible of a like interpretation. In daily life the Chinese are frugal, sober, and industrious. Their wants are few, and they are easily satisfied. The poorer classes live almost entirely on rice and vegetables, to which they sometimes add small pieces of fish or meat.

Their clothes are of the cheapest kind, and they are so

accustomed to crowded apartments that house rent forms an insignificant item in a Chinaman's expenditure. Thus a Chinaman can live where a European would starve, and it is on account of the advantages which he thus possesses, combined with sobriety and frugality, that he is able to underbid the American workmen in California, and the English colonist in Australia, in almost every branch of industry. The over-populated condition in which China has been for so many centuries has had a powerful influence in thus moulding the national character. Vast as China is, it cannot contain all those who call themselves her sons and daughters, and in many cities a large section of the inhabitants are driven to live in boats on the neigh-bouring rivers and lakes. It would be very difficult to say how the boat population provide food for themselves and their families ; indeed, were it not for the extreme cheap- ness of their ordinary daily food, and for their sober habits, they could not do so. Spirits—they have no wine—appear to have no great attraction toChinamen. They drink ther occasionally, and sometimes to excess, but a reeling Chinaman is rarely to be seen in the streets. Drunkenness is not a national vice, but, unfortunately, their abstinence does not extend to opium, a drug which seems to have a greater attraction for them than for any other people on the face of the earth. They take to it greedily, and when once the habit of smoking it becomes confirmed, the difficulty of relinquishing it is exceedingly great. There has, no doubt, been much exaggeration in what has been talked and written on this subject. But on the testimony of Chinamen themselves the effects of opium smoking must

Every-day customs.

Opium smoking.

Telegraphs and railways.

be regarded as injurions to health and destructive to all the better parts of man's nature. From the time of its introduction into the country, the Chinese Government has opposed the traffic ; and on the occasion of the last revision of the Treaty by Sir Rutherford Alcock, Prince Kung and his colleagues made a vigorous stand against the clause which legalizes its importation. In this as in other attempts they were unsuccessful, and it remains to be seen whether the policy they appear now to be adopting of encouraging the growth of native opium will extinguish the import trade.

Since the conclusion of the treaty in 1860 numerous attempts have been made to induce the Chinese Govern- ment to permit the introduction of railways and telegraphs into China, but to all such counsel the emperor's advisers have turned a deaf ear. Not that they are ignorant of the advantages to be derived from these weapons of progress, but they consider that these advantages would be dearly bought if the price to be paid is to be the admittance of foreigners into the interior of the country, coupled with the hold on the soil which these would acquire were they allowed to construct lines of railway and telegraphs through the provinces. It is difficult, however, even for so autocratic a Government as that of China, to carry out such a curbing policy, and in one or two instances lately, events have forced an advance beyond the hard and fast line laid down by the Peking mandarins. The first step in this direction was taken during the war in Formosa, when the viceroy of the province of Fuh-keen ordered the construction of a line of telegraph from Pagoda Island to his Yamun at Fuh-chow Foo. His action was disapproved by the Government, and several attempts were made tu frustrate the undertak-

ing, but, mainly through the influence of the foreign ministers, who insisted on the fulfilment of the contract with the telegraph company, the line was finished. The introduction of railways is, however, considered to be a more serious matter, and though at several of the arsenals tramways have for some time been employed, no mandarin has, until quite lately, been bold enough to sanction the use of a locomotive. Quite receutly the idea was originated of quietly buying up a strip of land between Shanghai and Woo-sung, and of using it for the con- struction of a railway. The local mandarins and the Peking Government met the projected line with decided opposition ; but here again the arguments brought to bear by the resident foreign ministers were sufficiently cogent to induce it to withdraw all actively obstructive measures, and the first railway in China was opened to traffic under the negative approval of the rulers of the soil. Much importance has been attached to this introduction of railways into China, and the crowded trains which daily travel between the two termini are considered to point to the probable speedy extension of railways throughout the country. But the approval given to the Shanghai railway is merely that of the people; and its completion has at present only intensified the determination of the Govern-nent to withstand the adoption of tle iron road.

See China, by Sir John F. Davis, 2 vols. 1857, 8vo; The Middle Kingdom, by 8. Wells Williams, 2 vols. 8vo; History of China, by Carl Guetzlaff, 2 vols. 8vo; The Social Life of the Chinese, by Justus Doolittle, 2 vols. 8vo ; Letters to the Shanghat Chamber of Commeree, by Baron von Richthofen ; Travels in North China, by A. Williamson, 2 vols.; Geological Researches in China, by Raphael Pumpelly ; The Treaty Ports of China, by W. F. Mayers, &c.; Zhe Chinese Classics, by James Legge, D.D.; The

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CHI—CHI

CHINCHA ISLANDS, three small islands in the Pacific Ocean, about 12 miles from the coast of Peru, op- posite the town of Pisco, and 106 miles distant from Callao, in 13° 38’ S. lat. and 76° 28’ W. long. The largest of the group, known as the North Island or Isla del Norte is only four-fifths of a mile in length, and about a third in breadth; and their whole importance is

due to their im- inense deposits of guano. They are of granitic formation, and rise from the sea in precipitous cliffs, worn out into countless caves and hollows, which furnish convenient rest- ing-places for the sea-fowl. Their highest points. attain an elevation of 113 feet, which was increased about 90 feet by the guano-bed. The name of the islands, and of the town and valley of Chincha on the mainland, is derived from an ancient Indian race which has left some interesting relics of its sojourn. A stone idol and two water-pots of grotesque construction were discovered under 62 feet of guano; and a number of wooden idols, two regal emblems, and a curious stone slab have also been found. That these must be of very great antiquity is obvious ;' but the rate of increase in the guano deposits is too much a matter of conjecture to furnish even an approximate date. Mr George Peacock, of the Pacific Steam Navigation Company, calculated the quantity of guano in the islands in 1846 at 18,250,000 tons; and, according to the survey of the Peruvian Government in 1853, they then still contained 12,376,100. The supply is now practically exhausted ; and the foreign export which had begun in 1841 was brought to a close in 1872. Between 1853 and 1872, 8,000,000 tons were obtained from the North and Middle Islands. The former was still visited by 35 Peruvian vessels in 1873, and furnished 11,634 tons. Its population in 1874 was only 105 persons, and the other islands were quite deserted; whereas in 1868 the total population amounted to 6000, who consisted partly of Peruvians, partly of Chinese coo- lies, and partly of Peruvian convicts. In 1853-4 the Chincha Islands were the chief object in the contest known as the Guano War between President Echenique and General Castilla; and in 1864 they were taken possession of by the Spanish rear-admiral Pinzon in order to bring the Peru- vian Government to apologize for its treatment of the im- migrants from Biscay.

CHINCHEW, or Cuincuu, is the name usually given in English charts to an ancient and famous port of China in the province of Fuh-keen, of which the Chinese name is Chwanchow-foo, or Tswanchow-foo (by French scholars written Zhsiouan-chéou-fou).' It stands in 24° 57' N. lat. and 118° 35' E. long. It is described by Martini (in the 17th century) as pleasantly situated on a tongue of land between two branches of the river which forms the harbour, and these so deep that the largest (Chinese) ships could come up to the walls, The city, though now occasionally visited by missionaries and others, is not one of the treaty- ports, and modern information about it is not

abundant. But large junks still come close to the city. The walls have acircuit of 7 or 8 miles, but embrace much vacant ground. The chief exports are tea and sugar, tobacco, china-ware, nankeens, &c. There are still to be seen the remains of a fine mosque, founded by the Arab traders who resorted thither. The English Presbyterian Mission has had a chapel in the city since about 1862. Beyond the northern branch of the river (which is several miles from the city) there is a suburb called Loyang, which is approached by the most celebrated bridge in China.

Chwanchow was in the Middle Ages the great port of Western trade with China, and was known tothe Arabs and to Europeans as Zaztiéin or Zayton, the name under which it appears in Abulfeda's Geogrgphy, and in the Mongol history of Rashiduddin, as well as in Ibn Batuta, Marco Polo, and other medizval travellers (see CHINA, p. 628).

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Marco Polo calls it "one of the two greatest commercial havens in the world ;' Ibn Batuta, "the greatest seaport in the world."

Some argument has of late been alleged against the identity of Zayton with Chwanchow, and in favour of its being rather Changchow (a great city 60 miles W.S.W. of Chwanchow), or a port on the river of Changchow near Amoy. It is possible that the name "Port of Zayton " covered a good deal, and may have embraced the great basin called Amoy Harbour, the chief part of which lies within the Foo or department of Chwanchow; but there is hardly room for doubt that the Zayton of Marco Polo and Abulfeda was the Chwanchow of the Chinese.

Ibn Batuta informs us that a rich silk texture made here was called Zacténiya ; and there can be little doubt that this is the real origin of our word Satin,—Zettani in medizeval Italian, Aceytwnt in Spanish.

With the question already indicated is connected a singular ambiguity. The name Chinchew is now applied as we have defined ; but the Chincheo or Chinchew of old English books, and of the Spaniards and Portuguese to this day, is, as Mr G. Phillips has lately pointed out, not Chwanchow but Changchow. The province of Fub-keen is often called Chincheo by the

Jesuits of the 16th and 17th centuries. Changchow, and its dependencies seem to have constituted the port of Fuh-keen with which Macao and Manilla chiefly communicated at that period, and where the Portuguese had at one time a factory ; and hence they seem to have applied the same name to the port and the province, though Changchow has never been the official capital of Fuh-keen. How English mariners‘and maps came to transfer the name to Chwanchow is obscure. (See Journal R. Geog. Soc., vol. xliv.; Yule’s Marco Polo, 2d ed., 1875, vol ii,, &c.) (H. Y.)

CHINCHILLA, a city of Spain, in the province of Murcia, picturesquely situated on an abrupt hill ten miles south-east of Albacete, in the immediate neighbourhood of the junction of the railway lines from Cartagena and Valen- cia to the capital. It is surrounded by walls rebuilt in 1837, and defended by a citadel; and in the principal church there are reservoirs capable of furnishing the city with water for several months. Larthenware and crucibles, coarse linen, and woollen cloths are manufactured. Population, 3500.

CHINCHILLA (Chinchilla lanigera), a small Mammal belonging tothe order Rodentza, inhabits the eastern slopes of the Andes in Chili, Bolivia, and Peru, where it has a vertical range of from 8000 to 12,000 feet. It is very similar in size to the common squirrel, being about 10 inches long exclusive of the tail, and in the form of its head it resembles a rabbit. It is covered with a dense soft fur three-fourths of an inch long on the back, and upwards of an inch in length on the sides, of a slate-grey colour, darkly mottled on the upper surface, and of a dusky white beneath; its ears are long and broad and thinly covered with hair. It lives in burrows, and these subterranean dwellings undermine some parts of the Chilian Andes to such an extent as to cause considerable inconvenience and even danger to travellers on horseback. Chinchillas live in communities, forming their burrows among loose rocks, and coming out to feed only in the early morning and towards sunset. They feed chiefly on roots and grasses, in search of which they often travel a considerable distance from their homes ; and when eating they sit on their haunches, holding their food in their fore paws. The Indians in hunting them employ a weasel (Galictes vittata), which is trained to enter the crevices of the rocks, where the chinchillas often lie concealed during the day in order to avoid the sunshine, and drive

them out, when they are readily killed. The fur of this rodent was prized by the ancient Peruvians, who made coverlets and other articles with the skin, and at the present day

they are exported in large numbers to Europe—134,000 skins having been imported into London during 1874— where they are made into muffs, tippets, and trimmings for ladies' dresses. That they have not under such circum- stances become rare, if not altogether extinct, is doubtless owing to their extraordinary fecundity, the female usually producing five or six young twice a year. They are exceedingly docile in disposition and cleanly in their habits, and are thus well fitted for domestication, and in this state, owing to the value of their furs, might no doubt be profitably reared. ; :

CHINDWARA. See CuninpwAri.

CHINGLEPUT, the principal town and fortress of a district of the same name, in the presidency of Madras, in British India, on the left bank of the Palar River, 36 miles §.8.W. of Madras in 12° 41'N. lat. and 80° 2' E. long. Chingleput was taken by the French in 1751, and was re- taken in 1752 by Clive. During the wars of the British with Hyder Ali, it was one of the few strongholds which with- stood his power, and afforded a secure refuge to the natives. In 1780, after the defeat of Colonel Baillie, the army of Sir Hector Munro sought protection under its walls. The town is noted for its manufacture of pottery, and it carries on a trade in rice. Population, 7500.

CHIN-HAE, or CHING-HAI, a district town of China, in the province of Che-keang, at the mouth of the Yung-keang River, 12 miles N.E. of Ningpo, in 29° 58' N. lat. and 121° 45' E. long. It lies at the foot of a hill on a tongue of land, and is partly protected from the sea on the N. by a dike about three miles long, composed entirely of large blocks of hewn granite. The walls are 20 feet high and 3 miles in circumference. The defences were formerly of considerable strength, and included a well-built but now dismantled citadel on a precipitous cliff, 250 feet high, at the extremity of

the tongue of land on which the town is built. In the neighbourhood an engagement took place between the English and Chinese in 1841.

CHIN-KEANG-FOO, a maritime city of China, in the province of Keang-soo, at the junction of the Grand Canal with the Yang-tsze Keang, 48 miles K.N.E. of Nanking. It was formerly a prosperous and important city with a popu- lation of about half a million, well defended by brick walls, in many places 35 feet high, and regarded as the key of the empire towards the sea. In 1842 it yielded to the British forces after a desperate resistance. ‘Since then, however, it has not only suffered from the aberrations of the river system of China, but it has also been laid waste by the insurgents in 1853. It was recaptured by the imperial forces in 1858, and has begun to recover its position.

CHINON (in the Middle Ages Castrum Caino), a town of France, capital of an arrondissement in the department of Indre-et-Loire, pleasantly situated on the right bank of the Vienne, 28 miles 8.W. of ‘Tours. It has a tribunal of primary instance, a communal college, a town house, and some trade in grain, dried fruits, wine, and brandy. Here Henry II. of England died in 1189 ; and on the rock above the town there are extensive ruins of the castle where Charles VII. of France resided after the occupation of Paris by the English, and first gave audience to Joan of Arc. In the castle-rock there are large quarries known as Les Valains, from which building materials have been obtained for ages. Rabelais was born in 1483 at the farm-house of La Deviniere in the vicinity, and his house is shown in the Rue de la Lamproie. Population in 1872, 6553.

CHINSURAH, a town of British India, situated on the western bank of the Hooghly River, 24 miles above Calcutta, and formerly the principal Dutch settlement in Bengal. It was among the cessions on the continent of India made by the king of the Netherlands in 1824 in exchange for the British possessions in the island of

Sumatra. The Dutch erected a factory here in 1656, on a clear and healthy spot of ground, much preferable to that on which Calcutta is situated, and soon attracted a con- siderable number of natives to settle in the vicinity.

About thirty-five years after this they fell under the dis- pleasure of one of the native potentates, who sequestrated their property and prohibited their traffic. In 1686 all their factories were re-established, and their trade long continued to flourish. In 1759, a British force under Colonel Forde was attacked by the garrison of Chinsurah on its march to Chandernagore. The action was short but decisive, for in less than half an hour the Dutch were entirely routed. In 1795, when Holland became a province of France, the British‘offered to retain Chinsurah for the stadtholder, but the governor having declined to surrender, the settlement was reduced by a detachment from the military stations at Barrackpore, and was occupied by a British garrison during the whole war. At the general peace of 1814 it was restored to the Dutch. ‘The town, which extends for half a mile along the banks of the river, is built neatly, and with great solidity, of brick and mortar ; and the houses are plastered with fine lime, and have flat roofs and green Venetian windows. It is the seat of an extensive military establishment which has been consider- ably increased since 1858, and is now capable of accommo- dating 5000 men. The hospital attached is on a large scale. An important educational institution known as Hooghly College is maintained by Government; and there are a number of schools in the town, several of which are carried on by the missionaries of the Free Church of Scotland. Population, about 14,000.

CHIOGGIA, or Cutozza, a town of Italy, in an island of the same name in the Gulf of Venice, 15 miles south of the city of that name., It is united to the mainland by a bridge of 43 arches, protected at the further extremity by Fort Malghera or Haynau; and the port is likewise defended by Forts Caraman and San Felice. The cathedral of Longhera, founded in 1633, is its most remarkable building ; the church of 8. Andrea was of much greater antiquity, but it was restored in 1734. From Chioggia to Malamocco stretches the great sea-wall of the Murazzi, which protects Venice from the inroads of the ocean. Chioggia is the Roman Fossa Claudia, and began to bear the name of Clugia in the 4th century. In 809 it was destroyed by Pepin, and in 901 by the Slavonic invaders. In 1100 it was chosen as his see by the bishop of Malamocco. With the exception of the years from 1379 to 1381, when it was held by the Genoese, it continued subject to Venice till the fall of the republic ; but in spite of its proximity and political

connection, it has maintained to the present day some peculiarities of language and custom. Population, 26,336.

CHIOS. See Scro.

CHIPPENHAM, a parliamentary and municipal borough and market-town of England, in the county of Wiltshire, 30 miles N.N.W. of Salisbury, and 94 miles from London by the Great Western Railway, in a valley on the left bank of the Avon, which is here crossed by a handsome stone bridge of 22 arches. It consists mainly of one well- built street more than half a mile in length, and has a spacious Gothic church of considerable antiquity, a town-hall, a market-house, and a literary ijustitution. Formerly the seat of an extensive broad-cloth manufacture, it is now mainly an agricultural town, with flour-mills and tanneries, and large cattle and cheese markets. The stone quarries in the neighbourhood give employment to three or four hundred workmen. The parliamentary borough, which in- cludes the parishes of Chippenham, Hardenhuish, Langley- Burrell, antl Pewsham, and had in 1871 a population of 6875, returns one member to Parliament; up till 1867

it returned two. Chippenham is several times mentioned in connection with the Danish invasion of the 9th cen- tury. In the reign of Edward I. it sent representatives to Parliament, but it did not receive its incorporation till time of Queen Mary. Dr Thomas Scott, the author of the Commentary on the Bible, and Lodovick Muggleton, the founder of the Muggletonian sect, were natives of the town.

CHIPPEWAY INDIANS. See Osrpway.

CHIRON, in Greek mythology, a Centaur, the son of Chronos and Philyra, who dwelt in a grotto at the foot of Mount Pelion, and who was famous as the wisest of his time, as the founder of the healing art, and as the teacher of most of the ancient heroes, including Hercules, Achilles, Asculapius, Ulysses, Castor and Pollux, Aineas, Theseus, Meleager, and Nestor. Accidentally pierced by a poisoned arrow shot by Hercules, he resigned his immortality to Prometheus, and escaped the prolonged pain by death.

CHISWICK, a village of England, on the north bank of the Thames, in Middlesex, 44 miles from Hyde Park Corner, on a branch of the South-Western Railway. It contains numerous fine villas, the principal of which is Chiswick House, the residence of the duke of ;Devonshire, where Fox died in 1806, and Canning in 1827. The parish church is ancient, and in the churchyard is the tomb of Hogarth. In”the neighbourhood were formerly the gardens of the Horticultural Society, and there are still

extensive market-gardens for the supply of the metropolis.

The Chiswick Press was founded here in 1811 by Charles Whittingham. The population of the parish and the im- provement commissioners district, which are co-extensive, was 6303 in 1851, and in 1871, 8508.

CHITTAGONG, a district of British India, in the division of the same name (which also comprises the dis- tricts of Nodkhali, Tipperah, Chittagong Hill Tracts, and Independent Hill Tipperah), under the jurisdiction of the lieutenaut-governor of Bengal, lies between 20° 45’ and 92° 59’ N. lat., and 91° 30’ and 92° 23’ E. long. It is bounded on the N. by Hill Tipperah and the Chittagong Hill Tracts, E. by the Chittagong Hill Tracts and Arakan, S. by Ardkan, and W. by the Bay of Bengal. It consists of a strip of low-lying Jand along the Bay of Bengal, about 165 miles in length, and of an average breadth of 50 miles. A few unimportant ranges rise within the north-eastern portion,—the highest hill being the sacred Sitakund, 1155 feet high. Lofty mountains separate Chittagong district from Upper Burmah. The principal rivers are the Karna- phuli, on which Chittagong town is situated, navigable by sea-going ships and steamers as far as Chittagong port, and by large trading boats for a considerable distance higher up, and the Halddé and the Sangu, which are also navigable by large boats. Several creeks afford means of communica- tion with the interior. The wild animals are tigers, ele- phants, rhinoceros, leopards, and deer. The area extends to 2498 square miles, of which one-third is cultivated, or capable of cultivation, The census of 18/2 returns the population at 1,127,402. According to religion, the Hin- dus numbered 301,138, or 26°7 per cent. ; Muhammadans, 795,013, or 70°5 per cent. ; Buddhists, 30,149, or 2°7 per cent. ; Christians, 1084 or ‘1 per cent. ; and persons of un- specified religion, 18. The Christian population chiefly con- sists of the half-caste descendants of the early Portuguese

adventurers, or “ Firinghis.” The principal articles of trade are rice, which is exported by sea; cotton, brought down from the hills for use in the district; Liverpool salt, imported by sea ; bamboo and tllatching grass for building purposes; betel-nut, dried fish, petroleum from Burmah, tea,

poultry, and miscellaneous articles of food. Revenue of

the district in 1870-71, £221,116; expenditure, £56,035. The police force in 1872 consisted of 436 men and officers of the regular police, 62 of the municipal police, 2648 of

the village watch, making a total strength of 3146 officers and men, costing £14,185. In 1872-73 the Education Department had under its inspection 88 schools attended by 3512 pupils, and maintained at a total cost of £2168, 8s. The climate of Chittagong is comparatively cool, owing to the sea breeze which prevails during the day; but for the same reagon, the atmosphere is very moist, with heavy dews at night and fogs. The average annual temperature

‘ is 77° Fahr.; the average rainfall for the 13 years ending

1872, 106.50 inches. Chittagong was ceded to the East Indian Company by Nawab Mir Kasim in 1760. Currracone Port, or Islamabad, the principal town of the above district, is situated on the right bank of the Karnaphuli River, in 22° 20’ 55” N. lat. and 91° 52’ 35” E. long. The river is here navigable by ships of 20 feet draught, and the port has long been a place of con- siderable maritime trade. In 1870-71, 215 vessels arrived at the port, with a tonnage of 52,891; and 207 left, with a tonnage of 51,587; total value of imports, 21182, (00’: ditto of exports, £276,019. Shipbuilding is carried on to a considerable extent. The town is an agglomeration of small villages, spread over an area of 9 square miles. Iya 1872, the population amounted to 20,604 souls, viz. 4687 Hindus, 15,051 Muhammadans, 122 Buddhists, and 744 Christians. The municipal income amounted in 1871 to

| £2136, 12s., and the expenditure to £2381, 6s.

CHITTAGONG HILL TRACTS, a district ou the east- ern frontier of British India, in the Chittagong division, lies

between 21° 13’ and 23° 47’ N. lat., and 91° 46’ and 92° 49’

E. long., and is bounded on the N. by the semi-independent state of Tipperah, on the E. and S. by the district of Ardkdn in British Burmah, and on the W. by the regula- tion district of Chittagong. The general aspect of the country is very hilly, with deep ravines and prominent cliffs, covered with forests and gigantie creepers. Irregular masses of jungle, low hills, water-courses, and swamps fill up the intervals between the chief ranges. The principal hills with their heights are— Basitang, 2181 feet; Mrunga Tang 1650 feet; Rangrang-dang, 2789 feet ; and Lurain Tang, 2355 feet. The country is divided into four valleys formed by the Phenf, Karnaphulf, Sangu, and Matamurt rivers. Navigation is, however, difficult, owing to the rapidity and violence of their currents, their sharp turns, and whirling eddies ; but the hillmen manage to float down timber, bamboo, ratan, thatching grass, cotton,garjan oil, chdlmugré oil, and a small quantity of wax and ivory. Among the wild animals may be noticed elephants, rhinoceros, bison, and many kinds of deer. The area of the district is 6882 square miles; the population in 1872 was 69,607 souls, or only 10 persons to the square mile. These consist of Hindus, 598, or ‘8 per cent. ; Muhammadans, 1378, or 2°0 per cent. ; Buddhists, 47,875, or 68°8 per cent. ; Christians, 31; and persons of unspecified religion, 19,725, or 28°4 percent. The hill tribes, who are very primitive in their manners and customs, include the Khyoungthas (children of the river), called also the Jumid Maghs; Chakmas, Tipperahs, Kumis, Mrus, Khyengs, Bangis, Pankhos, Lushais or Kukis, and Shendus. Rangématt village is the capital of the district. The princi- pal crops are rice, Indian corn, tobacco, and cotton, raised every year from soil newly cleared from jungle. Two European landholders have tea-plantations in the district. The Chittagong Hill Tracts were separated from the Chittagong district in 1860, and until lately were subject to the incursions of the wild tribes on their borders. The revenue in 1870-71 was £3545, 14s ; the expenditure, £14,332, 12s, The police is a quasi-military force, con- sisting of 52 officers and 604 men, maintained in 1872 at a total cost of £13,424. This force now suffices to repel the incursions of the border tribes.

CHIUSA, or La Cutusa, a town of Italy on the Pesio, in the province of Cuneo, and about ten miles south-east of the city of that name. It has a population of upwards of 6000, chiefly engaged in the manufacture of silk and glass. It is not to be confounded with a hamlet in the province of Turin, which was named Chiusa (enclosure) from its position near the fortified line erected by Desiderius of Lombardy, in 774, to check the advance of Charlemagne.

CHIUSI, a town of Italy, in the Tuscan province of Siena, situated on a hill, and not far from the Lake of Chiusi. It is a bishop's see, and has a large cathedral, but is chiefly interesting for the Etruscan bronzes, mirrors, vases, and funereal urns found in the vicinity, of which its museums contain collections. Chiusi, the Clasium of the Romans, was one of the twelve cities of the Etruscan confederation, and was the headquarters of Porsena. After the decay of the Roman power it sank in importance, and in the Middle Ages malaria greatly reduced the number of its inhabitants ; of late years, however, the prospects of the place have greatly improved, in consequence of the drainage of the marshes in the neighbourhood, Population,

6460,

CHIVASSO, a city of Italy, in the province of Turin, at a railway janction,15 miles north-east of the city of Turin. Situated on the left bank of the Po near the influx of the Orco, it was formerly considered the key of Piedmont ; but its fortifications were dismantled by the French in 1804, and it is now only enclosed by a single wall with two gates leading to two suburbs. The front of the church of San Pietro, a building of the 15th century, is decorated with ornaments and entire statues in terra cotta, of great elegance, but much defaced. Of the ancient palace of the counts of Montferrat an octagonal tower still remains. The principal trade of the town is in grain and wool; and its lampreys are in repute. On the opposite side of the Po, and a few miles down the stream, are the ruins of the Roman ity of Industria, which were discovered in 1745. Population, 7800.

CHLAMYDOPHORE (Chlamydophorus truncatus), an Edentate Mammal found at Mendoza, on the eastern slope of the Cordilleras, where it is

known as the Pichiciago, but is so seldom seen as to be regarded with curiosity even by the natives. Its total length is from 5 to 6 inches, and its upper surface is covered with a flexible cuirass somewhat resembling the external armature of the Armadilloes—its nearest allies—but differing from the latter in being attached only by the middle of the back and the top of the head, the frontal bone of the skull being provided with two prominent knobs for this purpose. The dorsal shield, which contains 24 rows of square, cubical, or rhomboidal plates of a leathery texture, makes, at its posterior edge, an abrupt bend downwards, and is continued to the extremity of the tail, thus forming a posterior shield for the protec- tion of the creature's hindquarters while it is burrowing. The sides of the back beneath the shield, the under part of the body, and the limbs are covered with silky hair, of a dirty white colour, longer and finer than that of the mole. An examination of the Pichiciago skeleton proves it to be an exceedingly aberrant member of the Armadillo family, having structural affinities with other and widely different mammals, Thus it resembles the beaver in its. flattened paddle-like tail, the mole in its short strong legs and powerful claws, the sloth in its teeth, and ruminants in the form of the lower jaw. It also resembles the ornitho- rhynchus and echidna—the lowest mammalian forms—in points wherein all three show affinity with birds ; while in the form of the skull and pelvis it is unique among mammals. According to Dr Buckland it makes the nearest approach of living Hdentata to the gigantic extinct Megatherium, Tt 1s a burrowing animal, living like the mole in the subter-

ranean galleries which it scoops out with its sharp, powerful claws, assisted probably by the flattened tail, which is supplied with strong muscles, and thus well adapted for throwing out the earth which gradually accumulates under the creature. Like the mole its ears and eyes are exceedingly small and almost hidden by the long silky hair surrounding them. Another species has recently been discovered in Bolivia somewhat larger thau the preceding, and differing from it in having the dorsal shield attached all over to the skin of the back.

CHLORAL, TricHLoraLpEHYDE, or Hypripe or Tri- CHLORACETYL, C,Cl,OH or CCl,.COH, a substance dis- covered by Liebig in 1832, and

further studied by Dumas and Stideler. It is a heavy, oily, and colourless liquid, of specific gravity 1:518 at 0° C., and boiling point-94°-4 ©, It has a greasy, somewhat bitter taste, and gives off a vapour at ordinary temperature which has a pungent odour and an irritating effect on the eyes, The word chloral is derived from the first syllables of chlorine and alcohol, the names of the substances employed for ‘its preparation. Chloral is soluble in alcohol and ether, in less than its own weight of water, and in four times its weight of chloroform; it absorbs but is not acted upon by chlorine, and dissolves bromine, iodine, phosphorus, and sulphur. Chloral deli- quesces in the air, and, like aldehyde, is converted by water into a hydrate, with evolution of heat; it combines also with ethylic alcohol and its homologues, and the derived mercaptans. An amnuoniacal solution of nitrate of silver is reduced by chloral ; sulphites of the alkalies form with it crystalline compounds; and nascent hydrogen, by replacing its three atoms of chlorine, converts it into aldehyde (Personne, Ann. Ch. Pharm., clvii. 113). By means of phosphorus pentachloride, chlorine can be substi- tuted for the oxygen of chloral, the body CCl,;.CCL,H being produced ; an analogous compound, CCl,.C(C,H, gH, containing the radicle phenyl in the place of the oxygen, is obtained by treating chloral with benzene and sulphuric acid. With an alkali, chloral gives chloroform and a formate of the base according to the reaction CCl,.COH + KHO=CCl,H + H.CO(OK) ; it is couverted by oxidiz- ing agents into trichloracetic acid CCl,.CO(OH) ; and forms with cyanie acid the body C,H,ClNO, = (CCl,.COH), ‘COHN. When kept for some days, as also when placed in contact with sulphuric acid or a very small quantity uf water, chloral undergoes spontaneous change into the polymeride metachloral, CsH,Cl,03 =(C,Cl,0H),, a white porcelaneous body, slowly volatile in the air, insoluble in water, alcohol, aud ether, and reconverted into chloral without melting at 180° C.

Chloral is prepared by passing dry chlorine into absolute alcohol ; the latter must be cooled at first, but towards the end of the operation has to be heated nearly to boiling. The alcohol becomes converted finally into a syrupy fluid, from which chloral is procured by treatment with sulphuric acid. The action of chlorine upon alcohol is complex ;— first aldehyde, CH,.COH, is produced, which combines with alcohol to form acetal, CH,.CH(OC,H,), ; this, acted on by chlorine, yields trichloracetal, CCl,.CH(OC,H;),, which is converted by the hydrochloric acid present into chloral alcoholate,

CCl,.CH.OH.OC,H,, and monochlor- ethane, C,H;Cl. The latter body is also formed directly from alcohol, in the process for the manufacture of chloral, and combines with aldehyde, giving monochlorinated ethylic ether, CH;CHC1.0C,H;, which is converted by chlorine into tetrachlorinated ether, CCl, CHCI.O0,H,. By the action of sulphuric acid, chloral alcoholate and tetrachlorinated ether are resolved into alcohol and chloral, and monochlorethane and chloral, respectively. The crude chloral is distilled over lime, and is purified by further treatment with sulphuric acid, and by redistillation.

A mixture of starch or sugar with mauganese peroxide and hydrochloric acid may be employed instead of alcohol and chlorine for the manufacture of chloral (Stideler, Anz. Cha Pharm. \xi. 101-12 1). An isomer of chloral, parachloralide, is made by passing excess of dry chlorine into absolute methylic alcohol; it is a colourless liquid, insoluble in water, and boils at 182° Q. (Cloéz, Ann. Ch. Pharm., iii. 180).

Chloral hydrate, C,Cl,OH.H,O, or CCl,.CH(OH),, the compound formed by the uniou of water with chloral, occurs in the form of oblique, often very short, rhombic prisms ; an acicular form of crystals is considered by Paul to be characteristic only of the alcoholate. The purest saniples of chloral hydrate present the appearance of ordinary alum broken into fragments, are perfectly transparent, only slightly odorous, free from powder, and dry to the touch, aud do not become white by exposure. Jacobsen gives the melting point of pure chloral hydrate as 50° to 51°, the boiling point as 99°C. It can be distilled unchanged at 120°C. ; but when heated with sulphuric acid it is converted into anhydrous chloral and chloralide, C,;H,Cl,0,. When mixed with water, chloral hydrate causes a considerable degree of cold; and, as with camphor, small fragments of it placed on the surface ‘of water exhibit gyratory move- ments. An aqueous solution should be neutral or nearly so, and should give but a faint milkiness when boiled with silver nitrate. A drop or two of ammonia added to solu- tions assists in their preservation. Chloral hydrate may be detected in the presence of other substances ‘by adding an alkali and heating, when chloroform is evolved, which may be collected in a receiver; this process can be employed for the

estimation of the commercial hydrate. When ammonium sulphide is added to a solution of pure chloral hydrate, the liquid turns red, and then becomes rapidly brown and thick; the presence of oily impurities in asolution is shown by the brown colour it acquires when shaken up with concentrated sulphuric acid. Chloral hydrate has the property of checking the decomposition of a great number of albuminous substances, such as milk and meat ; aud a mixture of it with glycerine, according to Personne, is suitable for the preservation of anatomical preparatious. When heated with concentrated glycerine to a temperature of 110°-230° C., chloral hydrate yields chloroform, CHCl, , and formate of allyl, HCO ; and by the action of nitric acid and strong sunlight, at 195° C. it is transformed into trichloracetic acid, CCl,.COOH. The effect of chloral hydrate upon fresh blood, like that of formic acid, is to render it darker.

The breaking up of chloral hydrate, in the presence of alkalies, with the production of chloroform and formates, led Liebreich to the conjecture that a similar decomposition might be produced in the blood ; and hence his introduction of the drug, in 1869, as an anesthetic and : hypnotic (Compt. rend., 1869, lxix., 486). It has been supposed that its physiological action may be due to formic acid as well as to chloroform set free in the blood, the effects of the formic acid being attributed to the production from it of carbon dioxide. Personne, however, has administered sodium formate to dogs, without perceiving in them the slightest anzesthetic phenomena, or the abnormal formation of carbon dioxide (Compt. rend., 1874, Ixxviii. 129). He considers that chloroform is set free in the blood, but is not eliminated as such, being converted into sodium chloride and formate (cbid. 1869, lxix., 983); the prolonged action of chloral on the animal economy he explains on the supposition that, chloroform being produced at the expense of the alkali of the albumen of the blood, the latter, which may be regarded as an amide, forms with the trichlorinated aldehyde chloral a compound which, by the gradual action of the blood, affords a continuous supply of chloroform.

Tanret, on the other hand, suggests that as chloral hydrate, when made alkaline with caustic potash, yields in the presence of the oxidizing agent potassium permanganate the formate, chloride, and carbouate of potassium, together with carbon monoxide, the alkalinity of the serum of the blood

may determine a similar decomposition of chloral hydrate, the physiological effects of which may therefore be ascribed to poisoning or deoxidation of arterial blood by carbon monoxide (Compt. rend., xxix. 662 3 Journ. Pharm. Chim. (4), xx. 355-357).

The first effect of a dose of chloral hydrate is to produce a state of congestion of the brain, as evidenced by the con- dition of the retinal vessels; after 5 or 10 minutes, con-

| traction of the vessels is observed, the retina becomes of a

pale pink colour, and drowsiness ensues ; when this wears off, the retinal and cerebral vessels resume their accustomed size (Dr W. A. Hammond). In cases of death from chloral, the cerebral vessels have been found much congested.

The effects of chloral hydrate vary with different individuals; but, as a rule, a dose of 20 grains acts in a healthy subject as a mild sedative of the sensory nervous system, and produces, about half or three quarters of an

hour after it has been taken, a light, refreshing, and normal sleep, without causing headache or disturbance of the

respiration and pulse.

Taken in large quantities chloral hydrate is a powerful soporific ; it perceptibly lowers the temperature of the body, and diminishes the frequency and force of the heart’s action, probably from paralysis of its intrinsic motor- ganglia; whilst the rate of respiration is lessened, apparently through affection of the medulla oblongata. Ex- cessive doses produce complete insensibility, and diminish, and at last abolish reflex excitability ; pallor, coldness of the extremities, lividity, and muscular relaxation ensue ; and death may result from cardiac syucope.

M. Oré is the originator of a plan for performing opera- tions during anesthesia produced by the intra-venous injection of chloral hydrate. He shows (Compt. rend., 1874, Ixxviii. 515, 651) that it may be harmlessly injected, and that when thus brought into immediate contact with the blood,

it effects complete. anesthesia of long duration, and is a rapid and effectual remedy for tetanus. Chloral hydrate sometimes fails to afford relief from suffering, and when it does not induce sleep, may occasion excitement and delirium. In some cases a dose has produced an eruption of urticaria, It must be administered with caution to children, and to patients having disease of the heart and of the digestive tract, certain affections of the bronchi, or hysteria. It appears that chloral cannot be decomposed and thrown off by a healthy body at a greater rate than from 5 to 7 grains an hour (Richardson, Lancet, 1871, 1, 209); and as the limit of the dose that can be safely taken is not affected by the customary use of the drug, as in the case of opium, but rather the reverse, its incautious employment in large quantities, and the practise of habitually resorting to it to gain relief from sleeplessness, from neuralgia, and from the effects of alcoholic excess, have in not a few instances led to fatal results. In consequence of this risk medical practitioners now use it less extensively. The continued use of chloral hydrate, too, is apt to cause a hyperemic condition of the skin, diffuse inflammatory erythema of the face and chest, conjunctivitis, and interference with re- spiration ; and may bring on deep melancholy, weakness of will, and inability to sleep without the drug.

Chloral hydrate is of special value as a soporific where opium is inadmissible, as in the case of children, in uremia, and in some fevers, It is used in delirium tremens, rabies, severe chorea, acute mania, and phthisis, as well as in dyspnoea, pertussis, cholera, sea-sickness, cancer, chronic rheumatism, and gastralgia, and in parturition and eclampsia;

and in cases of tetanus it is employed to produce muscular relaxation, Its antagonism to strychnia was first pointed out by Liebreich (Compt. rend., 1870, 1xx. 403) When administered to rabbits it has been found to be a remedy for poisonous doses of strychnia (Bennett, Edin. Med. Journ., 1870, xvi. 262); but Oré has shown (Gaz. Médic. de Paris, 1872, p. 401) that the hypodermic injection of that drug is of no avail in the case of rabbits poisoned with fatal doses of chloral hydrate. Numerous experi- ments have led to the conclusions that “chloral hydrate is more likely to save life after a fatal dose of strychnia, than strychnia is to save life after a fatal dose of

chloral hydrate ;” that after a dose of strychnine has produced tetanic convulsions, these convulsions may be reduced in force and frequency, and life may be saved, by means of the influence of chloral hydrate; but that though the effects of a poisonous dose of the hydrate may be mitigated, the coma produced by its action on the brain is not removed

by strychnia (Bennett, Report in Brit, Med. Jour., TEm0),.

1, 97; Ogilvie Will, Zdin. Med. Jour., April 1879, 907). Chloral hydrate modifies the action of a fatal dose of extract of Calabar bean, but is of little service if given some time afterthe latter. he effects of chloralism are combated by provoking emesis, and by stimulating freely. Among the very numerous contributions to the history of chloral, in addition to the above-given, may be mentioned the following :— Liebig, Ann. Ch. Pharm., i. 189; Dumas, Traité de Chimie, t. v. 599; Stideler, Ann. Ch. Pharm., cv. 2938, evi. 253 ; Bouchut, Compt. rend., \xix. 966, Bull. de Thér., Ixxvii. 433 ; SirJ. Y. Simpson, Med. Times, Jan. 1, 1870; Byasson and Follet, Journ. de V Anat. et de Physiol., 1870, 570; Hofmann, Compt. rend., 1870, Ixx. 906; Personne, 7id., Ixxi. 227; Paul, Pharm. Journ. and Trans. (3), i. 621; Hausemann, Schmidt’s Jahrb., cli. 81; Jacobsen, quoted in Journ. Chem. Soc., ix. 257; Rokitansky, Stricker’s Jahrbiicher (iii. and iv. Heft), 1874. (F. H. B.)

CHLORINE, one of the chemical elements (symbol, Cl), discovered by Scheele in 1774. It was long regarded as a compound ; Scheele termed it dephlogistecated murvatic acid, and Berthollet about 1785 gave it the name of oxygenized muriatic acid, which Kirwan contracted into oxymuriatic acid. In 1809 an abstract of a paper was published by Gay-Lussac and Thénard, in the 2d vol. of the Mémoires @Arcueil, in which they demonstrated the possibility of the absence of oxygen from oxymuriatic acid. The atten- tion of Davy being drawn to the subject, he in 1810 com- municated to the Royal Society a paper in which he showed that there was no evidence in support of the opinion that oxymuriatic acid contained oxygen; and in a paper published in the following year he comes to the conclusion that oxymuriatic acid is an uncompounded substance, and gives to it the name of chlorine, on account of the greenish colour it possesses. Chlorine and its combinations with other elements having been already

treated of under the heading CuEemistRy, it will be necessary here only to give Some account of the more important commercial chlorine compounds hydrochloric acid, bleaching powder, and potassium chlorate, and of the methods of preparing them.

Hydrochloric Acid (HCl).—Practically, the whole of the hydrochloric acid now employed in the manufacturing arts is obtained as a collateral product in the celebrated soda process of Leblanc. The first stage in that process consists in treating common salt with sulphuric acid in the salt-cake roasting furnace, by which sodium sulphate and hydrochloric acid are formed :—-2Na0l+ H,SO, = Na,SO, + 2HCL.

Till the year 1863 the acid fumes given off in alkali works were allowed to escape freely into the atmosphere, and being dissolved and brought down by every shower, destroyed or seriously damaged vegetation for miles around the works. In that year the Alkali Act was passed, by which manufacturers were obliged to condense not less than 95 per cent. of the total amount of hydrochloric acid

evolved in their establishments; and since that time great attention has been paid to the condensation, so that now in many works practically no acid fumes escape. The hydrochloric acid gas liberated in the roasting furnace. is conveyed through a range of stoneware pipes, in connection with which are various devices for cooling it in its passage. It is then conducted into condensing towers—long wide funnels packed with coke—through which a stream of water is made to percolate from the top, an enormous surface of moisture being thus presented to the acid fumes. The solution of the gas in the water constitutes the hydrochloric acid, muriatic acid, or spirit of salt of commerce. So prepared, the acid always contains several impurities, such as arsenious acid, ferric chloride, and sulphurous acid ; but these do not interfere with its application to the prepara- tion of bleaching powder, in which it is chiefly consumed. Without any purification it is also employed for “souring ” in bleaching, and in tin and lead soldering.

Bleaching Powder, or Chloride of Lime.—The history of the application of chlorine to bleaching purposes before the introduction of the so-called

chloride of lime will be found under the article BLeacuinc. Bleaching powder is made by exposing pure slaked lime to an atmosphere of chlorine till the lime will absorb no more of the gas. Many plans for the preparation of the chlorine have been proposed, and various important processes adopted, since the manufac- ture of bleaching-powder was established by Messrs Tennant and Co. ‘The original process was as follows.

MnO, + 2NaCl + 3H,SO, = MnSO, + 2NaHSO, + 2H,0 + Cl,.

Through the development of Leblane’s well-known soda process large quantities of hydrochloric acid became available for the manufacture of chlorine, in place, as formerly, of a mixture of common salt and sulphuric acid; and for many years hydro- chloric acid alone has been used. Coarsely ground manganese oxide is placed within an oblong stone still, into which the necessary charge of strong hydrochloric acid is admitted. Steam is then allowed to circulate in the outer case of the still till the temperature of the mixture is raised to about 180° Fahr. When this point is reached, steam at a pressure of 20 to 25 1b. is blown through the charge at intervals for about six hours, after which the reaction is complete—the whole occupying about twenty-four hours. The chemical changes that take place are expressed in the following

equation _— MnO, + 4HCl=MnCl, + 2H,0 + Cle

Native binoxide of manganese being an impure and variable com- pound has to be used in quantities proportionate to the MnO, it contains.

For each molecule of chlorine obtained by the above reaction, it will be observed that one of manganous chloride is formed, a sub- stance that was formerly run off as a waste product. Apart from the nuisance thereby created, the drain on the supply of manganese ore became serious, supplies diminished, and prices rose in proportion. It became therefore an object of much importance to obviate the waste of manganese, and this was sought in two different directions.

CHL—C HL

Efforts in the first place were made to regenerate the manganese waste, so as render it continuously available for manufacturing pur- poses ; and secondly, it was frequently attempted to dispense alto- gether with the use of manganese in the process.

The first really successful plan for the recovery and reoxidation of manganese was devised by Mr Charles Dunlop, and was introduced at Messrs Tennant's works, at St Rollox, Glasgow, whcre it is still (1876) in operation. By Dunlop's process the residual still-liquor is first treated with carbonate of lime to neutralize its free acid and decompose the contained ferric chloride, which thus gives a pre- cipitate, ferric oxide. The clear liquor obtained is a second time mixed with carbonate of lime, then introduced into an enormous iron boiler, in which it boils at a pressure of four atmospheres for about twelve hours. Under the influence of the heat applied the manganese exchanges its chlorine for the carbonic acid of the car- bonate of lime, and a hydrated manganese carbonate, suspended in a solution of chloride of calcium, is produced, thus :—

MnCl, +CaC0,+H,0=MnCO,. H,0+CaCl,.

The manganese carbonate is subsequently allowed to subside, and the solution of chloride of calcium is washed out. The manganese carbonate is drained till it becomes a white putty-like mass, when it is put into shallow iron trays, and roasted in a furnace at a heat gradually increasing to 550° or 600° Fahr. Under the influence of the heat the carbonic acid is driven off, and by degrees, from being a white powder, the manganese compound darkens till on the com- pletion of the process it is a soot-like mass. Owing principally to the expensive nature of the plant necessary, the Dunlop process never extended beyond St Rollox ; but it has satisfactorily main- tained its position in that gigantic establishment.

The method of artificially oxidizing manganese which is now almost universally adopted, and has during the past few years quite revolutionized the bleaching powder manufacture, is that invented by Mr Walter Weldon. Manganous chloride by treatment with lime becomes changed into the lower oxide of manganese (MnO), a body which with great difficulty is raised to the higher sesquioxide (Mn,O,), beyond which stage of oxidation no exposure to oxygen raises it. But when treated with excess of lime the

manganous oxide rapidly unites with oxygen, and becomes transformed intothe peroxide (MnO,), which is the chemical compound available for the preparation of chlorine. It was this fact which Mr Weldon dis- covered, and has turned to advantage in his process. The pheno- menon he accounts for on the assumption that the scsquioxide (Mn,O3) formed by the exposure of manganous oxide (MnQ) to oxygen is really a manganous manganite, or a combination of MnO with MnO,, the former having basic, the latter acid functions. The lime added by Mr Weldon supplies a more powerful base, and enables the whole of the manganese to attain to the condition of peroxide, uniting as it does in such a manner with the lime as to form a calcium manganite (CaMnO,). By employing a diminished quantity of lime along with an increased current of air, it has been found possible to effect the complete oxidation of the manganese, an acid manganite (CaMnO;, H,MnO,) being probably formed.

In his treatment of the still-liquors Mr Weldon first neutralizes the acid, &c., as is done in Mr Dunlop's process. The clear rose- tinted liquor thereby obtained is passcd into a vessel called the oxidizer, at a temperature of about 140° Fahr. A pipe for convey- ing a current of air passes down the centre of the vessel, terminating near the bottom in a series of distributing pipes, and connected at the other end with a blowing engine. The liquor being at, or brought by injected steam to the proper temperature, then, according to Mr Weldon (Soc. of Arts Lecture, May 1874), the injection of air is commenced, and there is rapidly added, in the state of very fine division, 1°6 times the quantity of lime equivalent to the manganese in the liquor. This converts the charge into a thin white mud, which consists of solution of calcic chloride holding in suspension manganous oxide, or MnO, and also holding partly in suspension partly in solution six-tenths of an equivalent—reckoned on the manganese present—of free lime. When a little of this white mud is thrown on to a filter, the clear filtrate is naturally found, owing to the quantity of free lime present, and to the powerfully solvent action upon lime of hot solution of calcic chloride, to possess a strongly alkaline reaction. As the injection of air goes on, the mud becomes gradually darker in colour, owing to the white hydrated MnO becoming converted into black MnO, by absorption of oxygen from the injected air, what was originally a thin white mud being at length converted into a thin black mud. During the progress of this conversion of the originally white

mud into a black mud, it is found that the alkaline reaction of the filtrate from the mud gradually diminishes in intensity, until at length it entirely dis- appears ; and it is found, too, that when this alkaline reaction ceases, the absorption of oxygen from the injected air ceases also. – When this stage is reached, which is at the end of two, three, four, or five hours, according to the relation between the size of the oxidizer and the size of the blowing-engine employed, a little more liquor is run into the oxidizer from the scttlers above, the injection of air is con- tinued for a few minutes longer, and the charge is then run off from

the oxidizer into one or other of a range of scttlers placed bclowit. In these it separatcs, in the course of a few hours, into rather more than half perfectly clear solution of calcic chloride, and a little less than half black mud of rather more than twice the density of that which left the oxidizer. The solution of calcic chloride is now decanted, aud the settled mud is then ready for use for the liberation of chlorine from hydrochloric acid.

The now practically universal use of regenerated manganese oxide in a state of fine division has considcrably modified the older operations for the manufacture of chlorine. Hydrochloric acid, according to the plan at present in use, is first run into the still, and the man- ganese mud is admitted gradually to it in a carefully regulated stream. Instead of the old oblong trough-like still, one much more capa- cious, of pentagonal form, is generally employed. The details of working vary in almost every establishment, but the following may be taken as an example of ordinary practice. A charge of hydro- chloric acid, equal to the amount yielded by about 55 cwt. of common salt, is led into the still, and to it is added from 14 to 15 cwt. of 70 per cent. manganese. Fincly slaked lime to the amount of 40 cwt. is spread in a uniform layer on the floor of the chamber, and from these quantities 70 or 71 cwt. of bleaching powder containing from 35 to 37 per cent. of available chlorine is obtained. The lime, after receiving a first charge of gas, is left 24 hours, when it is turned by workmen. Another charge is then admitted, and on the expiry of twenty-four hours more the bleaching powder is ready to be drawn off and packed in barrels.

Of the many chlorine processes without manganese which have been proposed, the only plan which has stood the test of wide practical application is that introduced in recent years by Mr Henry Deacon, of Widnes, in Lancashire. Doubtless his is a process which would have been widely introduced but for the economy and satisfactory nature of Mr Weldon's method. A process for liberating chlorine from hydrochloric acid gas by exposing it with atmospheric air to a high temperature was patented by Mr Robert Oxlandin 1845. Mr Deacon discovered that in this process, when the air and gas are brought into contact with sulphate of copper the hydrochloric acid is decomposed much more completely and at a far lower temperature than without that salt. In practice hot hydrochloric acid gas and atmospheric air are passed over pieces of brick which have been dipped in a solution of sulphate of copper and sulphate of soda, and dried. Chlorine and water are produced by the decomposition, and some traces of hydrochloric acid also pass undecomposed. The water and acid are condensed, and the, chlorine mixed with the residual nitrogen of the air passes on to the absorbing chambers. As the chlorine is greatly diluted by the nitrogen, the lime has to be exposed in thin layers over a large area, and Mr Deacon so arranges his chambers that the mixed gases as they enter meet almost completely saturated lime, but as the chlorine becomes absorbed, less highly chlorinized lime is met, till at the end it is almost fresh hydrate of lime over which they pass. Mr Deacon obtains from the acid of 1500 ewt. of salt, with the expenditure of 50 tons of small coal, upwards of 50 tons of 85 per cent. bleaching powder. The process is in operation in his own manufactory at Widnes, and in some Continental establishments Mr Deacon's plant was intro- duced, but it has been practically abandoned.

Bleaching powder when fresh is a dry, white lime-like powder emitting a strong odour of hypochlorous acid. Commercial samples vary considerably in strength, but when newly made and of good quality they should contain from 35 to 37 per cent. of available chlorine. On exposure bleaching powder parts with its chlorine with considerable rapidity, losing, according to some experimenters, at the rate of 0°68 per cent. per month. On the composition of bleaching powder see CHEMISTRY, page 494.

Potassium Chlorate or Chlorate of Potash.—The preparation of potassium chlorate is an example of the employment of chlorine on an extensive scale,

its function, according to the ordinary process of manufacture, being to transform potassium chloride (KCl) into potassium chlorate (KC1O;) by supplying the necessary oxygen from lime. It is obtained by passing excess of chlorine into solution of potassium chloride and milk of lime, according to the equation

KC1+3Ca0 +3Cl,=8CaCl, + KCI0,.

The operation is conducted in close leaden vessels, fitted with agitators and heated with steam. On the completion of the above reaction the liquid is filtered and evaporated to near dryness, and the residue is again dissolved in hot water. The two salts—calcium chloride and potassium chlorate—are then easily separated by crystal- lization ; the former, being exceedingly soluble, remains in solution, while the latter deposits in tabular crystals, which may be purified by a slight washing. The salt is very largely used in the manu- facture of lucifer matches and various detonating compounds, and in pyrotechny. It is also employed in calico printing as an oxidizing agent in the fixing of certain colours, and it is a convenient source of pure oxygen in laboratory work.

CHLOROFORM, TricHLOROMETHANE, TERCHLORIDE oF Formyt, or DicHtorinaTeD METHYLIC CHLORIDE,

CHCl,, is a substitution-product of marsh-gas, CH,, from which it can be formed by the action of chlorine. It is a clear, colourless, volatile liquid, which refracts light strongly, with specific gravity of 1°525 at 0° C., and vapour density 1491. It boils at 60°16° C. (Reguault), and is not frozen ata temperature of — 16°C. It has an agreeable ethereal odour, a slightly acrid and intensely sweet taste, is miscible in all proportions with alcohol, but is only slightly soluble in water. Though not ordinarily inflammable, it burns with a green flame when thrown upon hot coals, or if a light be applied to a mixture of it with not less than about 30 per cent. of alcohol. Chloroform may be employed as a solvent for resin, camphor, gutta-percha, iodine, bromine, and the alkaloids. It can be prepared in a great variety of ways :— (1) By the action of alkalies on chloral (see CHLOoRAL); (2) by boiling trichloracetic acid, CCl,.CO(OH), with aqueous solutions of the alkalies ;

(3) by the replace- ment of an atom of chlorine in carbon tetrachloride, CCl, by nascent hydrogen ; (4) on the large scale for commercial purposes by the action of bleaching powder on ethylic alcohol and other carbon compounds. About 8 ib of slaked lime, and 80 ib of the strongest chloride of lime, and 22 gallons of water at a temperature of 80°-90° C. are introduced into a leaden vessel or wooden cask, and thoroughly mixed. Two lb of alcohol are then poured in ; and if the heat evolved in the ensuing reaction is not sufficient to distil over the chloroform, a current of steam is passed into the vessel. The crude distillate is purified by washing with water and agitation with sulphuric acid, and by redistillation, finally, with a small quantity of slaked lime and calcium chloride, by means of a water-bath. The chief impurities to which chloroform is liable are ether, alcohol, aldehyde, hydrochloric, hypochlorous, and sulphuric acids, chloral, and heavy volatile oils. Pure chloroform does not become opalescent in contact with water, and is not coloured yellow or brown by sulphuric acid, or green by chromic acid; with the former, it gradually evolves hydrochloric acid. When exposed to air and light, chloro- form becomes decomposed, with the formatiou of chlorine, hydrochloric acid, carbon tetrachloride, and other products. The “presence of chloroform can be detected by adding to the liquid to be tested for it a monamine, such as aniline, N(C,H,)H,, and an alcoholic solution of caustic potash, when the characteristic odour of the carbamines is given off at once, or on the application of heat.

The history of chloroform affords but one amongst many instances of the importance of chemical research even when no immediate practical advantages are apparently to be derived from its prosecution. Chloroform was dis- covered in 1831 by Guthrie in America, and by Soubeiran in France, and by the latter was described as ether bichlorique. Tiebig, who made the independent discovery of it in the following year, regarded it as a trichloride of carbon ; but in 1834 its true constitution was established by Dumas. In March 1847 Flourens submitted to the Academy of Sciences at Paris a paper containing observations on the anesthetic powers of chloroform upon animals. In the summer of that year “chloric ether,” the active principle of which is chloroform, was used at St Bartholomew’s Hospital by Mr Lawrence instead of sulphuric ether for the production of anesthesia; and in the succeeding autumn Dr J. Y. Simpson of Edinburgh introduced the employment of pure chloroform as an anesthetic into

surgical practice. By its effect upon the nervous system chloroform causes a suspension of voluntary motion and of Sensation, whilst respiration and the action of the sympa- thetic ganglia of the heart are still continued. It is more active, occasions less bronchial irritation, and is easier of application than ether, the use of which in British practice it has to a very great extent superseded ; it possesses also

the advantage that its vapour is uninflammable. The occurreuce, however, from time to time, of deaths in con- sequence of the use of chloroform, has led many practi- tioners to recommend the employment of etlier in its stead ; but in the majority of instances fatal results may be attributed to some fault in administration ; and in some cases death has been thought to be attributable to the giving of a less than customary quantity of chloroform, which, paralyzing the cerebral hemispheres, but not the gauglia of the base of the brain and the medulla, has permitted reflex action of the vagus upon the heart through irritation of a sensory nerve. In operations after which disturbance of the abdomen must be avoided, ether is far preferable to chloroform, on account of the sickness usual for some time after the taking of the latter,

Snow, Anesthetics; Holmes, System of Surgery, 2d ed., vol. v. 480 (1871).

CHOCOLATE is a preparation from the seeds of the cocoa or cacao tree (Theobroma Cacao), used as food. The term is corrupted from the Mexican name chocolatl, and the preparation was in use in Central America before the discovery of the Western Continent by Columbus. For the history of the plant and other details see under Cocoa. At the present day the general distinction between the preparations known as chocolate and cocoa respectively is that the former embraces the forms prepared as cakes or stiff paste, while prepared cocoa is chiefly sold as a powder or simply the ground nibs of the seed. Chocolate is pre- pared usually from the finer varieties of cocoa seeds by first roasting, and then shelling, or depriving the seeds of their husks. They are then ground up to a very fine uniform paste on a hot plate or bed, the heat of which, by melting the fat, present in seeds to the extent of about 50 per cent, keeps the paste in a fluid condition, To the ground seeds a proportion of sugar, with sometimes arrowroot, and

some flavouring essence, most commonly either vanilla or cinnamon, are added, and when thoroughly incorporated the semi-fluid paste is cast into moulds. In addition to being used as a diet drink, a very large quantity of chocolate, specially prepared under various forms for eating, is now consumed as a sweetmeat, and it forms at once a most wholesome, nutritious, and palatable confection. The French and Italians have long excelled in the manufacture of chocolate ; but the varieties made by English manu- facturers are also deservedly in high repute.

CHOCTAWS, or Cuantas, a North American tribe, now settled in the Indian Territory along the northern banks of the Red River, where they possess about 10,450 square miles. When first known to Europeans they occupied the district now forming the southern part of Mississippi and the western part of Alabama. On the settlement of Louisiana they formed an alliance with the French, and assisted them against the Natchez and Chickasaws ;. but by degrees they entered into friendly relations with the English, and at last, in 1786, recognized the supremacy of the United States by the treaty of Hope- well. Their emigration westward began about 1800, and the last remains of their original territory were ceded in 1830. In their new settlements the Choctaws continued to advance in prosperity till the outbreak of the civil war, which considerably diminished the population and ruined a large part of their property: They sided with the Confederates, and their territory was occupied by Confeder- ate troops; and accordingly at the close of the war they were regarded as having lost their rights. Part of their land they were forced to surrender to the Government ; their slaves were emancipated ; and provision was claimed for them in the shape of either land or money. Since then they have considerably recovered their position. In 1873 they numbered 16,000, had 50,000 acres under

cultivation, and possessed private property to the value of upwards of $4,700,000. They are governed by a chief and a national council of 40 members, according to a written constitution, which dates in the main from 1838; and they possess a regular judicial system and employ trial by jury. Missions are maintained amongst them by the American Board of Commissioners, the Presbyterians, the Methodists, and the Baptists. The

Choctaw language has been reduced to writing, and brought to some degree of literary precision by the efforts of the missionaries, wlio have produced in the language the Bible, scliool-books, and lymnals. A newspaper is published weekly in Choctaw and English at New Boggy ; and a grammar was composed by the late Rev. C. Byington (Philadelphia, 1870).

CHODOWIECKI, Danret Niconas (1726-1801), a painter and engraver of Polish descent, was born at Dantzig. Left an orphan at an early age, he devoted himself to the practice of miniature painting, the elements of which his father had taught him, as a means of support for him- self and his mother. In 1743 he went to Berlin, where for some time he worked as clerk in an uncle's office, practising art, however, in his leisure moments, and gaining a sort of reputation as a painter of miniatures for snuff- boxes. The Berlin Academy, attracted by a _ small engraving of his, entrusted to him the illustration of its yearly almanac. After designing and engraving several subjects from the story of the Seven Years' War, Chodowiecki produced the famous History of the Life of Jesus Christ, a set of admirably painted miniatures, which made him at once so popular that he laid aside all occupa- tions save these of painting and engraving. Few books were published in Prussia for some years without plate or vignette by Chodowiecki. It is not surprising, therefore, that the catalogue of his works (Berlin, 1814) should include over 3000 items, of which, however, the picture of Calas and his Family is the only one of any reputation.

The title of the German Hogarth, which he sometimes obtained, was the effect of an admiration rather imaginative than critical, and was disclaimed by Chodowiecki himself. The illustrator of Lavater, the painter of the Hunt the Slipper in the Berlin Museum, had indeed but one point in common with the great Englishman,—the practice of representing actual life and manners. In this he showed skilful drawing and grouping, and considerable expressional power, but no tendency whatever to the use of the grotesque.

CHOISEUL, Ct#sar, Duc pr (1598-1675), commonly known as MarsHAL DU PLEssis, was born at Paris in 1598. He commanded a regiment at the siege of Rochelle, and defended Oléron and Ré against the English, He was employed by Richelieu against the Spaniards, both as general and envoy,and in both capacities he met with considerable success. He was

engaged under Mazarin in the war of the Fronde against Turenne, whom he defeated at Rethel; and he was also concerned in the negotiations of Louis XIV. with Charles II. of England. He became duke in 1665, and died in 1675.

CHOISEUL, CraupE ANTOINE GaBRIEL, Duc DE (1760-1838), was born in August 1760. He was brought up at Chanteloup, under the care of his relative, the Duke

tienne Francois, who was childless. The outbreak of the Revolution found him a colonel of dragoons, and throughout those troublous times he was distinguished for his devotion to the royal house. He made a memorable attempt to rescue Louis XVI. from the hands of the Revolutionists ; but the affair was ill-managed; the royal party was re- captured; a price was put upon Choiseul's head, and he had to seek refuge in flight. His hopes, however, of assisting the royal cause were not relinquished, and he succeeded in raising a regiment of hussars with which he joined the royalist army. He was eventually taken prisoner, and

confined at Dunkirk. Having escaped, and set sail for India, he was wrecked on the French coast, and condemned to death by the decree of the Directory. Nevertheless, he was fortunate enough to escape with his life. Napoleon allowed him to return to France; and at the Restoration he was called to the House of Peers by Louis XVIII. At the revolution of 1830 he was nominated a member of the Provisional Government ; and he afterwards received fro Louis Philippe the post of aide-de-camp to the king and governor of the Louvre. He died in Paris in 1838.

CHOISEUL, Etienne Francors, Duc px (1719-1785), a French statesman, was born on the 28th June 1719, Under the name of Count de Stainville, he entered the army, and rose to the rank of lieutenant-general. Having contracted a wealthy marriage, and gained the friendship of Madame de Pompadour, the mistress of Louis XV., he entered political life as envoy, first to Rome, and then to Vienna ; and in November 1758 he was created Duc de Choiseul and peer of France, and appointed minister of foreign affairs. His first act was to sign a secret treaty of alliance with Maria

Theresa of Austria, who had the sympathy and support of Madame de Pompadour. An invasion of Great Britain was Choiseul's next project ; and so eager was he to carry out this ill-fated scheme, that the French interests in America and the West Indies were miserably neglected. ~~Choiseul is also responsible for allowing the possessions of France in India to be lost with~~ out adeqnate resistance, and for not interfering in time to prevent the dismemberment of Poland.

The principal achievement of Choiseul's policy is known as the " Family Compact," by which all the sovereigns of the house of Bourbon, viz., the kings of France, Spain, and the two Sicilies, were united in an offensive and defensive alliance (1761). Portugal also was afterwards persuaded to join the confederation in war against England. Great enthusiasm was awakened in France; and Choiseul, having handed over to his cousin, Choiseul-Praslin, the department of foreign affairs, devoted himself to the reor- ganization of the army and navy. But the plans of Pitt proved successful, and, in November 1762, France was obliged to cede to England, by the treaty of Fontainebleau, Acadia, Canada, Cape Breton, and all the islands of the Saint Lawrence, all Louisiana to the left of the Mississippi, Ohio, the isles of Grenada and Minorca, and a large part of her possessions in India.

Much more fortunate was his policy against the Jesuits. It was partly due to his influence that they were driven out of Spain; in 1764 he effected their banishment from France ; and teu years later he prevailed on Pope Clement XIV. to declare their order abolished.

Until the end of 1770 Choiseul continued to be foremost among the directors of French policy. But after the death of Madame de Pompadour, the intrigues of the Duc d'Aiguillon, the Abbé Terray, and Chancellor Maupeou, backed by the influence of Madame du Barri, whose friendship Choiseul had scornfully rejected, created an estrangement between him and the king, who banished him to his estate at Chanteloup. His fall, however, only increased his popularity, and on his departure the most dis- tinguished of the courtiers crowded round him to bid him farewell. The four years of his retirement were spent chiefly in writing his autobiography, which was pub- lished at Paris in 1790. He was recalled to Paris by Louis XVI. in 1774, and died there in May 1785. Choiseul appears to have been a man of

considerable, but not first-rate ability; his disposition was haughty but courteous ; and such was the magnificence of his habits that, notwithstanding his vast wealth, he died leaving enormous debts. See his Autobiography and the JZé- motres by Besenval and Duclos.

CHOLERA (from yoAy, bile, and few, to flow). Two

distinct forms of disease are included under this general term, namely, Simple Cholera and Malignant Cholera. Although essentially different both as to their causation and their pathological relationships, these two diseases may in individual cases present many symptoms of mutual resemblance. Bef

Simpte Cuorera (synonyms, Cholera Luropea, British Cholera, Summer or Autumnal Cholera) is the cholera of ancient medical writers, as is apparent from the accurate description of the disease given by Hippocrates, Celsus, and Aratzus. Its occurrence in an epidemic form was noticed by various physicians in the 16th century, and an admirable account of the disease was subsequently given by Sydenham in describing an epidemic of cholera in London in 1669-72. ,

The chief symptoms in well-marked cases are vomiting and purging occurring either together or alternately. The seizure is usually sudden and violent. The contents of the stomach are first ejected, and this is followed by severe retching and vomiting of thin fluid of bilious appearance and bitter taste. The diarrhoea which accompanies or succeeds the vomiting, and is likewise of bilious character, is attended with severe griping abdominal pain, while cramps affecting the legs or arms greatly intensify the suffering. The effect upon the system is rapid and alarming, a few hours of such an attack sufficing to reduce the strongest person to a state of extreme prostration. The surface of the body becomes cold, the pulse weak, the voice husky, and the whole symptoms may resemble in a striking manner those of malignant cholera, to be sub- sequently described. In unfavourable cases, particularly where the disorder is epidemic, death may

result within forty-eight hours. Generally, however, the attack is arrested and recovery soon follows, although there may remain for a considerable time a degree of irritability of the alimentary canal, rendering necessary the utmost care in regard to diet.

Attacks of this kind are of frequent occurrence in summer and autumn in almost all countries. They appear specially liable to occur when cold and damp alternate with heat. Occasionally the disorder prevails so extensively as to constitute an epidemic. The exciting causes of an attack are in many cases errors in diet, particularly the use of unripe fruit and new vegetables, and the excessive drinking of cold liquids during perspiration. Outbreaks of this disorder in a household or community can sometimes be traced to the use of impure water, or to noxious emanations from the sewers.

In the treatment, vomiting should be encouraged so long as it shows the presence of undigested food, after which opiates ought to be administered. Small opium pills, or Dover's powder, or the aromatic powder of chalk with opium, are likely to be retained in the stomach, and will generally succeed in allaying the pain and diarrhoea, while ice and effervescing drinks serve to quench the thirst and subdue the sickness. In aggravated cases where medicines are rejected, enemata of starch and laudanum, or the hypodermic injection of morphia ought to be resorted to, Counterirrita- tion by mustard or turpentine over the abdomen is always of use, as is also friction with the hands where cramps are present. When sinking threatens, brandy and ammonia will be called for. – During convalescence the fond should be in the form of milk and farinaceous diet, or light soups and all indigestible articles must be carefully avoided.

In the treatment of this disease as it affects young children (Cholera Infantum), most reliance is to be placed on the administration of chalk and the use of starch enemata. In their case opium in any form cannot be safely employed.

CHOLERA

MALicNANT CHOLERA (synonyms, Asiatic Cholera, Indian Cholera, Epidemic Cholera, Algide Cholera) is pro- bably the most severe and fatal of all diseases. This form

‘of cholera belongs originally to Asia, more particularly

to India, where, as well as in the Indian Archipelago, epi- demics are known to have occurred at various times for several centuries. It was not, however, till 1817 that the attention of European physicians was specially directed to the disease by the outbreak of a violent epidemic of cholera at Jessore in Bengal. This was followed by its rapid spread over a large portion of British India, where it caused immense destruction of life both among natives and Europeans. During the next three years cholera continued to rage all over India, as well as in Cey- lon and others of the Indian islands. The disease now began to spread over a wider extent than hitherto, invading China on the east, and Persia on the west. In 1823 it had extended into Asia Minor and Russia in Asia, and it continued to advance steadily though slowly westwards, while at the same time fresh epidemics were appearing at intervals in India. From this period up till 1830 no great extension of cholera took place, but in the latter year it reappeared in Persia and along the shores of the Caspian Sea, and thence entered Russia in Europe. Despite the strictest sanitary precautions, the disease spread rapidly through that whole empire, causing great mortality and exciting consternation everywhere. It ravaged the northern and central parts of Europe, and spread onwards to England, appearing in Sunderland in October 1831, and in London in January 1832, during which year it continued to prevail in most of the cities and large towns of Great Britain and Ireland, and its disastrous effects are still in the recollection of many persons. The disease subsequently extended into France, Spain, and Italy, and crossing the Atlantic spread through North and Central America, It had previously prevailed in Arabia, Turkey, Egypt, and the Nile district, and in 1835 it was general throughout North Africa. Up till 1837 cholera continued to break out in various parts of the Continent of Europe, after which this epidemic disappeared, having thus within twenty years visited a large portion of the world.

About the year 1841 another great epidemic of cholera appeared in India and China, and soon began to extend in the directicn traversed by the former, but involving a still wider area. It entered Europe again in 1847, and spread through Russia and Germany on to England, and thence to France, whence it passed to America, and subse- quently appeared in tle West

Indies. This epidemic appears to have been even more deadly than the former, especially as regards Great Britain and France. A third great outbreak of cholera took place in the East in 1850, entering Europe in 1853. During the two succeeding years it prevailed extensively throughout the Continent, and fel] with severity on the armies engaged in the Crimean War. Although widely prevalent in Great Britain and Ireland it was less destructive than former epidemics. It was specially ‘severe throughout both North and South America. A fourth epidemic visited Europe again in 1865-66, but was on the whole less extensive and destruc- tive than its predecessors. Cholera has since appeared in the form of limited epidemics in various districts of Russia, Turkey, and Western Asia, while it still continues to main- tain its footing in India, where sudden outbreaks are of frequent occurrence, being often connected with the as- sembling of crowds at native festivals.

A disease so widespread in its distribution and deadly in its effects has naturally engaged the attention of scientific physicians in all countries. Investigations into the nature of cholera and the conditions favouring its propagation have been extensively carried on in England, in Germany,

and in India, not merely by those whose opportunities of observing and treating the disease have been numerous, but by others specially undertaking such inquiries at the suggestion of Governments or other public authorities. Although many conflicting views have been propounded on the above-named points, the result of these investigations has been the collection of an amount of information sufficient to form the basis of a rational theory of cholera, and which may be expected yet to lead to the discovery of means to counteract the spread of this pestilence.

The following points respecting the nature and mode of propagation of cholera are generally admitted by the best authorities :— :

1. That cholera is a specific disease depending upon the action in the human system of a morbid material (whether of the nature of a parasitic germ or a poisonous miasm being still undetermined) which is originally generated in

certain parts of India, particularly in the delta of the Ganges and the flat lands around Madras and Bombay ;

2. That this infective material is capable of spreading from its centre of origin indefinitely, and thus cholera has appeared in an cpidemic form in almost all countries ; and further that the disease may become acclimatized (endemic) in some places ;

3. That when it spreads abroad the vehicle of its trans- mission is the discharges from the bowels of persons already affected; and that from these the cholera-infecting matter is exceedingly apt to be diffused through the air, to con- timinate water, and to become attached to clothing, bed- ding, furniture, &c., and in these various ways to find ready eatrance through the lungs or alimentary canal into the lodies of healthy persons, where it is capable of developing tle disease in a more or less severe form according to the quantity introduced ;

4, That cholera is thus in a certain seuse contagious ;

5, That overcrowding and other insanitary conditions, particularly the presence of decomposing organic matter, afford the conditions favourable to the multiplication of the cholera matter, and thus tend to spread the disease, although of themselves incapable of originating it.

But even admitting these propositions, it is obvious that they are insufficient to explain the intense tendency of cholera to spread widely at some times more than others. Without alluding to the various hypotheses which have been a lvanced on this point, it seems probable, from the history of the disease as exhibited both in Europe and in India, that various factors may alone or together be concerned in the rise and spread of epidemics of cholera. It is stated that a high temperature favours the development of cholera, and in general this appears to be the case, but it is by no means invariable, as some of the most severe epidemics raged with greatest fury in winter. That cholera might be carried by the agency of winds from one country to another must be? held asia possibility, although no satisfactory evidence exists upon the point. More probable are the theories which assign to local conditions an important part iu the propagation of cholera. With regard to mere locality it appears that the disease has been generally found

to prevail more extensively and with greater virulence in low-lying districts than in elevated situations. In connec- tion with this, the relation of the character of the soil to the propagation of cholera has been elaborately investigated by Professor Pettenkofer of Munich, whose work in this department has attained world-wide reputation, and who ascribes a powerful influence in the diffusion of the disease to the ground-water of a locality where cholera is pre- vailing,—shallow, porous soils affording, according to his views, special facilities for the reception, proliferation, and distribution of the so-called cholera germs. Further, the observations of Dr Snow, Dr Frankland, and Mr Simon

ini certain epidemics of cholera in London have conclusively connected outbreaks of the disease in various districts with the use of drinking-water contaminated with the discharges from cholera patients. All investigations appear clearly to show that the prime factor, and that without which no other conditions can take effect, is the introduction into the local- ity of the specific infecting matter, this being accomplished in general by the arrival of infected persons, for cholera epidemics, as is well known, spread mostly in the lines of human intercourse and travel. But further, in this as in other acute infectious diseases, a special liability of indi- viduals must be admitted, as is proved by the fact that among persons living under precisely the same conditious some will suffer while others escape, and likewise that persons inhabiting cholera districts may come to enjoy an immunity from attacks of the disease. Among known pre- disposing causes, the incautious employment of purgative medicines, the use of unripe fruit, bad and insufficient food, intemperance, personal uncleanliness, overcrowding, and all kinds of unfavourable hygienic surroundings play an im- portant part during the course of any epidemic of cholera,

In describing the symptoms of cholera it is customary to divide them into three stages, but it must be noted that these do not always present themselves in so distinct a form as to be capable of separate recognition, The first or pre- monitory stage consists in the occurrence of diarrhcea, Fre- quently of mild and painless character, and coming on after some error in diet, this symptom is apt to be disregarded. The discharges from the bowels

are similar to those of ordin- ary summer cholera, which the attack closely resembles. There is, however, at first the absence of vomiting. This diarrhoea generally lasts for two or three days, and then if it does not gradually subside either may pass into the more severe phenomena characteristic of the second stage of cholera, or on the other hand may itself prove fatal.

The second stage of cholera is termed the stage of col- lapse or the algide or asphyxial stage. As above mentioned, tls is often preceded by the premonitory diarrhoea, but not unfrequently the phenomena attendant upon this stage are the first to manifest themselves. They come on often suddenly in the night with diarrhoea of the most violent character, the matters discharged being of whey-like appear- ance, and commonly termed the “rice-water” evacuations. They contain large quantitics of disintegrated epithelium from the mucous membrane of the intestines. The dis- charge, which is at first unattended with pain, is soon succeeded by copious vomiting of matters similar to those passed from the bowels, accompanied with severe pain at the pit of the stomach, and with intense thirst. The symp- toms now advance with rapidity. Cramps of the legs, feet, and muscles of the abdomen come on and occasion great agony, while the signs of collapse make their appear- ance. ‘The surface of the body becomes cold and assumes a blue or purple hue, the skin is dry, sodden, and wrinkled, indicating the intense draining away of the fluids of the body, the features are pinched and the eyes deeply sunken, the pulse at the wrist is imperceptible, and the voice is reduced to a hoarse whisper (the vox cholerica). There is complete suppression of the urine.

In this condition death often takes place in less than one day, but in epidemics cases are frequently observed where the collapse is so sudden and complete as to prove fatal in one or two hours even without any great amount of pre- vious purging or vomiting. In most instances the mental faculties are comparatively unaffected, although in the later stages there is in general more or less apathy.

Reaction, however, may take place, and this constitutes the third stage of cholera. It consists in the arrest of the alarming symptoms characterizing

the second stage, and the gradual but evident improvement in the patient's con-

dition. The pulse returns, the surface assumes a natural hue, and the bodily heat is restored. Before long the vomiting ceases, and although diarrhoea may continue for a time, it is not of a very severe character and soon subsides as do also the cramps. 'The urine may remain suppressed for some time, and on returning is often found to be albu- minous. Even in this stage, however, the danger is not past, for relapses sometimes occur which speedily prove fatal, while again the reaction may be of imperfect character, and there may succeed an exhausting fever (the so-called typhoid stage of cholera) which may greatly retard recovery, and under which the patient may sink at a period even as late as two or three weeks from the commencement of the illness.

Many other complications are apt to arise during the progress of convalescence from cholera, such as diphtheritic and local inflammatory affections, all of which are attended with grave danger.

When the attack of cholera is of milder character in all its stages than that above described, it has been named Cholerime, but the term is an arbitrary one and the disease is essentially cholera.

The bodies of persons dying of cholera are found to remain long warm, and the temperature may even rise after death. Peculiar muscular contractions have been observed to take place after death, so that the position of the limbs may become altered. The soft textures of the body are found to be dry and hard, and the muscles of a dark brown appear- ance. The blood is of dark colour and tarry consistence. The upper portion of the small intestines is generally found distended with the rice-water discharges, the mucous inem- brane is swollen, and there is a remarkable loss of its natural epithelium. The kidneys are usually in a state of acute congestion.

With respect to the mortality from cholera no very accurate estimate can be formed, since during the prevalence of the disease the milder cases are apt to escape notice, and it is certain that some epidemics are of a more virulent

character than others. It is generally reckoned, however, that about one-half the cases of fully developed cholera prove fatal, death taking place in a large proportion of in- stances in from twenty-four to forty-eight hours. It has been noticed that in cholera epidemics the mortality is rela- tively greater at the commencement of the outbreak. The disease appears to be most fatal in children and aged persons.

As illustrating the destructive effects of cholera, it may be mentioned that in the first epidemic in England and Wales 52,547 deaths were reported to the Board of Health, but this number was doubtless below the actual amount. In the second epidemic (1848-9) there were 55,181 deaths from cholera in England alone, besides 28,900 from diarrhcea. The subsequent epidemics in this country have been much less fatal.

The treatment of choleraembraces those sanitary measures requisite to be adopted with the view of preventing as far as possible the introduction of the disease into localities previously unaffected, or of checking its spread when intro- duced, as well as the special medical management of those who have been attacked. These topics can be alluded to only in general terms.

When cholera threatens to invade any place, however favourably circumstanced as to its hygienic condition, in- creased vigilance will be requisite on the part of those en- trusted with the care of the public health, Where the disease is likely to be imported by ships, quarantine regu- lations will be necessary, and, where practicable, measures of isolation should be adopted in the case of individuals or companies of people coming from infected localities, more especially if they have, or have recently had, any symptoms of cholera in their own persons. It is certain that cholera

may be introduced into a community by one or more indi- viduals who have themselves only suffered from the first or milder stage of the disease (cholera diarrhcea), since the discharges from the bowels abound in the infective matter, and where sanitary arrangements ‘are deficient may readily eontaminate the water or air of a locality.

The utmost care will be demanded, particularly in popu- lous districts, in cleansing and disinfecting places where accumulations of animal refuse are apt to occur. The condition of the drinking water and of the wells in which it is collected will always require inspection, as will also the quality of the food supplied, more especially to the poor. Where suspicion attaches to the water, it should be boiled before being used, and the same holds true of the milk. The establishment of cholera hospitals, with a thoroughly equipped staff of medical attendants and nurses, is one of the first and most important steps to be taken in any threat- ened epidemic, as affording opportunity for the removal and isolation of those attacked at an early period, while every facility should be given to the poorer classes of obtain- ing medical aid. Instructions should be issued by the authorities warning all persons against the use of unwhole- some food, unripe fruit, and excesses of every kind, and recommending early application for medical advice where there is any tendency to diarrhcea. House to house visita- tion by members of a sanitary staff will be of great service, not merely in discovering cases of the disease, but in the important work of disinfection, which should not be left entirely to the inhabitants, but be done systematically by the authorities. The discharges from cholera patients should be disinfected with such substances as carbolic acid or sulphate of iron before removal, and special care be taken that they are not disposed of in places where they may con- taminate drinking water. very article of clothing which has been in contact with a cholera patient should if possible be burnt, while infected apartments should be thoroughly disinfected with carbolic acid or by fumigation with sul- phur. The early burial of those dying from cholera is obviously a matter of urgent necessity.

The influence of fear in predisposing to attacks of cholera hasbeen greatly exaggerated and is now generally discredited. But apart from such considerations there can be no doubt of the wisdom of those to whom it is practicable in remov- ing from a place where cholera is raging.

With respect to the treatment of cholera, it may be safely affirmed, that as to no disease has so much difference of opinion prevailed or so many extravagant notions been entertained regarding the value of remedies. ‘There is a want of agreement as to fundamental principles of treat- ment ; for while astringents have been regarded by some as their sheet anchor,

others have condemned them as worse than useless, and rely on the elimination of the materies morbt by means of laxatives. Much evil has been done by the manner in which various systems of treatment have been extolled by over-sanguine practi- tioners as possessing special curative value. Indeed to enumerate the different medicines which have been sug- gested and employed for the treatment of this disease would be a work of no little difficulty. It is sufficient to state that no medicinal agent has yet been found to be of infal- lible efficacy in the treatment of cholera. Nevertheless, much may be done, and many lives saved, by the timely application of certain well-approved remedies. The various stages of the disease demand special treatment. In the earlier period of the attack for the cholera-diarrhcea the use of opium is of undoubted value. Given alone in small and oft-repeated doses, or in combination with other astrin- gents, such as catechu, tannin, bismuth, nitrate of silver, or acetate of lead, it frequently succeeds in quelling this symptom, and thus arresting the disease at the outset.

CHO—CHO

Strict confinement to bed and the administration of bland driuks such as milk, barley-water, and beef-tea, along with counter-irritation to the abdomen, will be found valuable adjuvants to treatment. In the second stage of cholera opium is of less value, and other remedies are called for. The violent vomiting and purging and the intense thirst may be relieved by iced effervescing drinks, while at the same time endeavours should be made to maintain the heat of the body by friction with stimulating liniments or mustard to the surface, and by enveloping the body in flannel and surrounding it with hot bottles. For the relief of the cramps the inhalation of chloroform is recommended, and probably chloral would be found of equal value. Stimulants such as ammonia and brandy must be had recourse to where these measures fail to establish reaction and the patient threatens to sink. When reaction occurs and the vomiting ceases, liquid food in small quantities should be cautiously administered.

Report on Epidenvic Cholera Morbus . . . in Bengal, 1817, 1818, 1819, by J. Jameson, Calcutta, 1820; Official Reports on Cholera, by Drs Russell and Barry, London, 1832; Researches into the Pathology and Treatment of

Asiatic Cholera, by HE. A. Parkes, M.D., London, 1847 ; Report of the General Board of Health on the Epidemic Cholera, 1848-49, London, 1850 ; Report on the Mortality of Cholera in England in 1848-49, by Dr W. Farr; Reports on Epidemic Cholera, by Drs Baly and Gull, London, 1854; Unter- suchen und Beobachtungen iiber die Verbreitungsart der Cholera, by Dr Max Pettenkofer, Munich, 1855 ; Reports to the Privy Cowncil on the two last Cholera Epidemics, by Mr J. Simon, London, 1856; Mode of Communicating Cholera, by Dr J. Snow, 2d ed., London, 1855 ; Report on the Constantinople Cholera Conference in 1866, Cal- cutta, 1868 ; Reports of Medical Officer of Privy Council from 1865 upwards; A Treatise on Asiatic Cholera, by C. Macnamara, London, 1870 ; Ziemssen's Cyclopedia of Practical Mcdicine, article '*Cholera," by Prof. H. Lebert, Engl. Trans., London, 1875; A History of Asiatic Cholera, by C. Macnamara, London, 1876. (J. 0. A.)

CHOLET, a town of France, im the south of the depart- ment of Maine-et-Loire, on the right bank of the Moine. It gives its name to an arrondissement, created in 1857. It has a council of prud'hommes, and a tribunal of com- merce; its cattle market is good, and the manufacture of cotton-yarn, calico, cambric, woollen stuffs, and leather is considerable. The town owes the rise of its prosperity to the settlement of weavers there by Colbert. It suffered greatly in the Vendean war in 1793, insomuch that for years afterwards it was almost without inhabitants, Popu- lation (1872), 11,550.

CHOLULA, an ancient town of Mexico, situated on the platean of La Puebla between Vera Cruz and the city of Mexico. Although formerly a populous place, it now con- tiins little over 6000 inhabitants, mostly Indians, who are engaged in agricultural pursuits. At the time of the Spanish conquest Cholula—then known as Chololan—was a town of great importance, consecrated to the worship of the god Quetzalcoatl, who had here one of the noblest temples in the country, built on the summit of a truncated pyramid, This pyramid, which is 160 feet high, is now the most conspicuous feature in the place, and is surrounded by a chapel dedicated to Our Lady de los Remedios. The town was visited by Cortez in 1519 in his march to Tenochtitlan, the city of Montezuma, and on that occasion was

given over to massacre and pillage, owing to a suspicion against the good faith of the inhabitants.

CHONS, an Egyptian deity called also Khons or Khonsou, principally worshipped at Thebes as the great eldest son of Amen Ra and Mut, and identified with Aah the moon. He had two names in the Thebaid, his second being Neferhotep ; as such he is called the god of two names. By the Greeks he was called Chon, and considered to be a form of Hercules, Like Horus he is represented as a youthful god, his form munimied, wearing the lock of hair at the right side of his head and a skullcap surmounted by the full and dichotomized lunar disk, or else lawk-

headed, wearing the same. He holds a crook and whip. He was a celestial deity, and at a later time connected with Thoth, and was said to have proceeded from Nu or Han the celestial waters, or to be the same as Har or Horus and Shu or Sos. The functions of Chons are exceedingly limited ; he is said in the Ritual to overthrow the proud, and to be mystically connected with the Phcenix. But the most remarkable characters of Chons are those mentioned on a tablet found on a temple in the S.W. quarter of Karnak dedicated to the god, which had been repaired or erected by Rameses III. of the 20th dynasty, said to be of sandstoneand basalt, the doors plated with goldand electrum. The temple of calcareous stone in the Karnak quarter was dedicated to Chons in two characters, that of giving oracles and of expelling evil, and the remarkable tablet found there records the departure of the god in his ark in the 16th year of the reign of Rameses XII. to the land of Bakhtan to expel a demon which had possessed the daughter of the king of that country and sister of the queen of Egypt. After effecting this miracle, and remaining some time there, the god returned in his ark conducted by priests in the 33d year of the same reign. Attached to this temple were cynocephali, a species of ape supposed to represent the moon and the living avatar or sacred animal of the lunar gods, under the charge of a priest or prophet. The worship of Chons appears to have been very common at the Ptolemaic period, and figures of the god in bronze and porcelain are not uncommon in collections. He is au inferior deity of the Pantheon, and although in type allied with Ptah, Osiris, and Horus, exercises none of the

attributes of these deities, his chief function being that of the lunar gods; he represents the youngest as Ammon did the oldest of the divine circle.

Jablonski, Panth. diyypt., i. 185; Champollion, Panth. Egypt.s Wilkinson, Mann. and Cust., v. p. 182; De Rougé, Stéle Hgypt., pp. 16-18.

CHOPIN, Freperic-Francois (1810-1849), a cele- brated composer and pianist, was born at Zelazowa-Wola, near Warsaw, on February 8, 1810. His family was of French origin, but in spite of this he has become the greatest and the most national exponent of Slavonic or more especially Polish nationality in music. In looking through the list of his compositions, teeming with mazurkas, valses, polonaises, and other forms of national dance music, one could hardly suppose that here one of the most melancholy natures has revealed itself. This seeming paradox is solved by the type of Chopin's nationality, a nationality of which it has justly been said that its very dances are sadness intensified. But notwithstanding this strongly pronounced national type of his compositions, his music is always expressive of his individual feelings and sufferings to a degree rarely met with in the annals of the art. He is indeed the lyrical composer par excellence of the modern school, and the intensity of his expression finds its equal in literature only in the songs of Heinrich Heine, to whom Chopin has been justly compared. A sensation of such high-strung passion cannot be prolonged. Hence we see that the shorter forms of music, the étude, the nocturne, besides the national dances already alluded to, are chosen by Chopin in preference. Even where he treats the larger forms of the concerto or the sonata, this concen- trated not to say pointed character of Chopin's style becomes obvious. 'The more extended. dimensions seem to encum- ber the freedom of his movements. The concerto for piano- forte with accompaniment of the orchestra in E may be instanced, Here the adagio takes the form of a romance, and in the final rondo the rhythm of a Polish dance be- comes recognizable while the instrumentation throughout is meagre and wanting in colour. Chopin is out of his element, and even the beauty of his melodies and harmonies cannot

wholly banish the impression of incongruity. Fortunately he himself knew the limits of his power, and with very few exceptions his works belong to

that class of minor compe- sitions of which he was an unrivalled master. Barring a collection of Polish songs, two concertos, and a very small number of concerted pieces of chambcr music, almost all his works are written for the’pianoforte solo; the symphony, the oratorio, the opera he never attempted.

The outer life of Chopin was exccedingly simple and almost totally wanting in incident of any kind. His first musica] education he received from a Polish musician of the name of Ziwna, who is said to have been a passionate admirer of J. S. Bach. He also received a good general education at one of the first colleges of Warsaw, where he was supported by the liberality of Prince Antoine Radziwill, a generous protector of artistic talent and himself well known as the composer of music to Goethe’s Maust aud other works. His musical genius opened to Chopin the best circles of Polish society, a society at that time unrivalled in Europe for its ease of intercourse, the beauty and grace of its women, and its liberal appreciation of artistic gifts. These early impressions of refined life were of lasting influence on Chopin’s development both asa man and as an artist. He never was and never wished to be a popular composer; his works are full of the subtlest touches of scntiment, they breathe indeed the perfume of the salon, and it is the sign of highest power in Chopin that his artistic nature could live in, and even derive new vitality from this dangerous atmosphere. While at college he received thorough instruction in the theory of his art from Joseph Elsner, a learned musician and director of the conservatoire at Warsaw. When in 1829 he left his native town for Vienna, where his début as a pianist touvk place, he was in all respects a “perfectly formed and developed artist. This feature again is characteristic of Chopin’s work. There is in his compositions little of that gradual progress which, for instance, in Beethoven necessitates a classification of his works according to different periods. Chopin’s individuality and his style were distinctly pronounced in that first Don Grovanni Fantasia which excited the wondering enthusiasm of Robert Schumann. The same mine of sentiment he worked ever after, but it was one of unbounded wealth. His first appearance in public seems to have been marked by considerable success. A correspoudent of the Aligemeine Mustkalische Zeitung, at that time the first organ of music in Germany, writing from Vienna, November 1829, says that ‘“ M. Chopin has placed himself in the first rank of pianists,” and

goes on to speak in enthusiastic terms of ‘his delicacy of touch, his rare mechanical dexterity, the melancholy tints of his nwances, and the splendid clearness of his phrasing.” In 1831 he left Vienna with the intention of visiting London; but on his way to England he reached Paris and settled there for the rest of his life. Here again he soon became the favourite and musical hero of society. His connection with Madame Dudevant, better known by her literary pseudonym of George Sand, is an important feature of Chopin’s life. When in 1837 his health began to fail, George Sand went with him to Majorca, and it was mainly owing to her tender care that the composer recovered his health for a time. ‘The last ten years of his life were a continual struggle with the pulmonary disease to which he succumbed October 17,1849. The year before his death he visited England, where he was received with enthusiasm by his numerous admirers. A distinguished English amateur thus records his impressions of Chopin’s style of pianoferte- playing compared with those of other masters. ‘ His technical characteristics may be broadly indicated as negation of bravura, absolute perfection of finger-play, and of the legatzssimo touch, on which no other pianist has

ever so entirely leant, to the exclusion of that high relief and point which the modern German school, after the examples of Liszt and Thalberg, has so effectively developed. {t is in these features that we must recognize that Grundverschiedenhert (fundamental difference) which according to Mendelssohn distinguished Chopin’s playing from that of these masters, and in no less degree from the example and teaching of Moscheles….. Imagine a. delicate man of extreme refinement of mien and manner, sitting at the piano and playing with no sway of the body and scarcely any movenent of the arms, depending entirely upon his narrow feminine hands and slender fingers. The wide arpeggivs in the left hand, maintained in a continuous stream of tone by the strict legato and fine and constant use of the damper-pedal, formed an harmonious substructure for «a wonderfully poetic cantabile. His delicate pianissimo, the ever-changing modifications of tone and time (tempo rubato) were of indescribable effect. Even in

energetic passages he scarcely ever exceeded an ordinary mezzoforte. His playing as a whole was unique in its kind, and no traditions of it can remain, for there is no school of Chopin the pianist, for the ebvious reason that he could never be regarded as a public player, and his best pupils were nearly all amateurs.”

A detailed analysis of Chopin’s single works would be impossible. The following is a list of the most important of his compositions :— Two concertos for pianoforte, with orchestra, in E minor (Op. 11) and F minor (Op. 21) respectively ; trio for pianoforte and strings, in G minor (Op. 8); three sonatas for pianoforte solo (Op. 4, 35, 58); one for pianoforte and violoncello (Op. 65), G minor; fifty-two mazurkas, contained in the collections numbered Op. 6, 7, 17, 24, 80, 88, 41, 50, 56, 59, 68, 67, 68 (Nos. 50-52 without number of Op.) ; études (Op. 10, 25); nocturnes (Op. 9, 15, 27, 32, 37, 48, 55, 62, 72); preludes (Op. 28, 45) ; polonaises (Op. 8, 22, 26, 40, 44 58, 61, 71); valses (Op. 18, 34, 42, 64, 69, 70); besides numerous variations, impromptus, and other miscellaneous compositions, also settings of seventcen Polish national songs for one voice, with piano- forte accompaniment. Franz Liszt has written a charming sketch of Chopin’s life and art (7. Chopin, par ¥. Liszt, Paris, 1851), and a very appreciative though somewhat eccentric analysis of his work appeared anonymously in 1842 (dn Essay on the Works of Frederic Chopin, London). A complete and excellent collection of Chopin’s pianoforte works in 6 vols. has been edited by K. Klindworth. (F. H.)

CHORKEA, the scientific name of the disease popularly known as St Vitus’s Dance.

CHORLEY, a manufacturing town of North Lanca- shire, England, is situated eight miles south-east of Preston on the River Yarrow and the Leeds Canal, and on the Lancashire and Yorkshire Railway. The town, which has a weekly market, is well built and is abundantly sup- plied with water. It contains an old church in the Norman style with some interesting monuments, and several dis- senting chapels. A town-hall has been erected recently at a cost of £30,000. Chorley is the seat of a considerabie manufacturing industry. Numerous mills have been erected within and around the town for the manufacture of calico, muslins, jacconets, and

fancy goods, whilc several bleach- fields and print works are in the immediate neighbourhood. Railway-waggon building is extensively carried on. The district contains a number of coal mines and stone quarries. The area of the parish, which forms a local board district, is 3614 acres ; the population in 1861 was 15,013, and in 1871 16,864, of whom 7910 were males and 8954 females,

CHORUS. See Drama and Music.

CHOSROES. See Kuosru and Prrsta.

CHOUANS (a Bas-Breton word signifying screech-owls), the name applied to the royalist insurgents in the west of France, at the time of the Revolution. It has been sug- gested that the name arose from the cry they used when approaching their nocturnal rendezvous; but it is also maintained that it was derived from a nickname applied to their leader Jean Cottereau. Originally a contraband manufacturer of salt, Cottereau had been seized in a scufile

with the Government officers, and condemned to death, bnt his mother's entreaty gained his pardon from Louis XVI, and he never forgot his benefactor. He then became a soldier but deserted, and was imprisoned ; on his release he settled down in a legal occupation, and joined the national guard. On the outbreak of the Revolution he gathered round him a band of royalist peasantry with whom he retired to the wood of Misdon, where they lived in huts and subterranean chambers. From Lower Maine the insurrection soon spread to Brittany, and throughout the west of France. In 1793 Cottereau joined Laval with some 500 men; and the band grew rapidly and swelled into a considerable army, which assumed the name of La Petite Vendée. Cottereau greatly distinguished himself by his personal bravery and-his military ability. But after the decisive defeats at Le Mans and Savenay, he retired again to his old haunts in the wood of Misdon, and resumed his old course of guerilla warfare. Misfortunes here increased upon him, until through treachery he fell into an ambuscade and was mortally wounded. He died among his followers, July 28, 1794. Ignorant as he was, he appears to have been a man of no slight ability. His gratitude was intense; and his magnanimity was such that he is said on several occasions to have spared those who had most deeply injured him. After the death of Cottereau, the chief leaders of the Chouans were Georges Cadoudal and a man who went by the name of Jambe d'Argent. For several months the Chouans continued their petty warfare, which was disgraced by many acts of ferocity and rapine ; in August 1795 they dispersed. See Duchemin-Descepeaux, Lettres sur la Chowannerie ; Seguin, Histoire dela Chouannerie ; and Muret, Histoire des Guerres de l'Ouest.

CHRESTIEN, Frorent (1541-1596), a satirist and Latin poet, was the son of Guillaume Chrestien, an eminent French physician and writer on physiology, and was born at Orleans. A pupil of Henri Estienne, the famous Hellenist, and a zealous Calvinist, at an early age he was appointed tutor to Henry of Navarre, afterwards Henry IV., who made him his librarian. De Thou says of Chrestien ‘that he was an excellent man, a man of such an enlightened and noble soul that he was incapable of writing aught from a base and servile complaisance, but that it was not safe to irritate his Calvinism, as if that were done he hit hard and straight, trusting to reconciliation afterwards. Florent Chrestien was the author of many good translations from the Greek into Latin verse,—amongst others, of versions of the Hero and Leander attributed to Muszus, of several plays, and of many epigrams from the Anthology, all of which were enriched with excellent notes and com- mentaries. In his translations into French, among which are remarked those of Buchanan’s Jephthes and of Oppian De Venatione, he is not so happy, being rather to be praised for fidelity to his original than for excellence of style. He wrote in verse against Ronsard, and in prose against!Pibrac, the apologist of the Saint-Bartholomew ; but his principal claim toa place among memorable satirists is as one of the authors of the Satyre Menippée, the famous pasquinade in the interest of his old pupil, Henry IV., his share in which, however, cannot now be exactly determined.

CHRESTIEN DE TROYES, the most eminent of the early French writers of romance, was born at Troyes in Champagne in the 11th century. Nothing whatever is known of his life ; but from the fact that several of his works are dedicated to Philip of Alsace, count of Flanders, it is conjectured that he was attached to the court of that prince. He was much esteemed and highly praised by his contemporaries, and by the writers of the century following, and not without reason, being a master of style, and possessing in an eminent degree the qualities of invention

and conduct, together with great purity and range of thought, and a remarkable knowledge of men and manners. His books, therefore, apart from the interest attached to them as specimens of the medizval epic, and by reason of their relation to the rest of the Arthurian literature, and in spite of the difficulties and crudities of the unformed lan- guage in which they are written, are still readable, and are rich in instructive details concerning

the age that gave them birth, Many romances are attributed to Chrestien des Troyes. Modern criticism has selected, six only as undoubtedly his, These are—(1) Jree et Hnide, which contains some seven thousand verses, and which has supplied the materials for one of the legends of Tenny- son's Arthurian cycle; (2) Cligés, or Cliget, a second Round Table romance; (3) Le Chevalier au Lion, containing nearly seven thousand verses, an offshoot of the Arthurian legend, if not absolutely forming part of it; (4) Gudllaume ad' Angleterre, a specimen of a more modern style, containing three thousand three hundred verses ; (5) Le Chevalier de la Charette, a romance of nearly seven thousand verses, written by Chrestien and continued by Godefroid de Laigny, the hero of which is Lancelot du Lac; and (6) Perceval le Gallois, a poem of twenty thousand verses, begun by Chrestien and continued by Gautier de Denet and by Menassier,—perhaps the earliest instance of that alliance of the Holy Grail and Round Table legends which enjoyed such an immense popularity in the Middle Ages—translations and imitations of which have appeared in English, French, German, Spanish, Flemish, and Icelandic. Two other romances are known to have been written by Chrestien,— Tristan, ou le Roi Marc et la Reine Yseult, and Le Chevalier de ' Epée, but these are wholly lost; and he is credited with the authorship of six songs and of several Ovidian translations or imitations still unpublished.

CHRIST (Xpuords, the Anointed One), the official title given in the New Testament to Jesus of Nazareth, equiva- lent to the Hebrew Jessiah. See JESuS CHRIST.

CHRISTCHURCH, a parliamentary borough of South Hampshire, England, is situated at the confluence of the rivers Avon and Stour, 14 miles from the sea, 22 miles S.W. of Southampton, and {11 miles from London by rail. Its history commences in Saxon times, when it was known as T'weonaeteam, a name which continued till recently in the form of Christchurch Twineham. The town, which is nominally governed by a mayor, recorder, and councillors, consists of two long irregular streets. It manufactures chains for clocks and watches, and hosiery, while the salmon fishery employs some hands. It is, however, to its priory church that it owes its distinction. This building, which is a conspicuous object at sea, belongs partly to the Norman and partly to the Perpendicular styles of architec- ture, and is one of the best

specimens of its kind, measuring 311 feet long by 104 broad. It was first established as an Augustinian priory by Baldwin, earl of Devon, in the 12th century, and thereafter received successive grants from the Crown. Within recent years the work of restoration has been carried on to a considerable extent. The church con- tains a very fine rood screen of the 14th century, a chapel of the 16th century, built by Margaret, countess of Salisbury, an altar tomb of the same century with effigies, and many other objects of architectural interest. A moni – ment has been erected in the Western tower to Shelley the poet. Little remains of the old castle but an adjoining ruin called the Norman House, which is supposed to date from the time of Henry IJ. The population of the town in 1871 was little over 2000, but the parliamentary borough, which extends to 22,350 acres and includes the greater part of Bournemouth and the parish of Holden- hurst, contained 15,415 persons; it returns one member to parliament.

The two factors in Chris- tianity.

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CHRISTCHURCH, the capital of the province of Canterbury, New Zealand, is situated in 43° 34’ 8. lat. and 172° 35’ E. long., on both banks of the smal] river Avon, about five miles from the sea. It is built upon the great Canterbury plain, which here is a dead level, though the monotony of the site has been much relieved by extensive plantations of English and Australian trees. The town is about a mile square, and the streets, which are wide and well paved, cross one another for the most part at right angles. Christchurch contains a number of handsome public and private buildings, is lighted with gas, and is amply supplied with water from numerous artesian wells. It is the centre of the rapidly extending railway system of the province, and is connected with its port, Lyttelton, by a line eight miles in length, which penetrates the hills enclosing Port Cooper, on which Lyttelton stands, by means of a tunnel a mile in length. The population of the munici- pality of Christchurch in March 1876 was officially estimated at 10,750, and that of the electoral district at 13,000.

CHRISTIANTA, the capital of Norway and of a stift of

Environs of Christiania.

the head of the Christiania fiord, at the foot of the Egeberg, in a finely-wooded and picturesque neighbourhood, in 59°54’ N. lat. and 10° 45’ E. long. It is the seat of the king and of the Storthing or Parliament, of the Hoieste-ret or final court of appeal, and of the bishop of the stift. The new

CHRIST

HRISTIANITY is derived from the adjective Christian,

) which is formed from the name Xpiords, the Anointed, and means the religion introduced by Jesus Christ and communicated by Him to His circle of followers.

The Christian religion is the result of two factors, neither of which can be omitted if a true description is to be given. On the one hand there is the objective element, which consists in the manifestation and revelation of God to His people for the purpose of salvation ; and on the other side there is the subjective element, which consists in the appropriation of this manifestation and what it implies by man through faith. Both elements enter into and form the constituent elements of a new life, which all Christians share in common, and which is the essence of Christianity, This common life of Jesus and His people has many ways by which it can make itself seen and known. Christians have from the beginning exercised no

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town, or Christiania proper, was founded in 1624 by Christian 1V. ; the old town, Opslo, commenced in 1058 by King Harold Haardrada, formerly the capital, is now only one of the suburbs of Christiania. The fortress of Agershuus defends the fiord and the greater part of the town ; it contains the regalia and national records, and its ramparts afford an agreeable promenade. ‘The streets of Christiania are at right angles to one another, and are lighted by gas ; the houses, except in the suburbs, are of brick or stone, and are mostly two-storied. Amongst the buildings may be mentioned the royal palace, containing some of Tidemand’s best pictures ; the cathedral, a brick edifice in the shape of a Greek cross; the university,

founded in 1811, opened in 1813, with a library of about 150,000 volumes ; the legislative hall ; the free museums ; the observatory ; the naval, military, and art schools; the lunatic and two orphan asylums ; the prison, near the Opslo Kirke ; the railway station, Freemasons' Hall, Atheneum, two theatres, and the large dining-hall or Damp-Kojkken. The botanical gardens, about a mile from the town, contain a large collection of plants from Spitzbergen and Iceland. The industrial establishments of Christiania and the circum- jacent amt of Agershuus include weaving and cotton-spin- ning factories, paper and saw-mills, soap and oil works, distilleries, breweries, and tobacco manufactories. As a place of commerce Christiania has surpassed Bergen, and is now the first port of Norway ; by the extension of its rail+ way communications it has also become the chief emporium:

for the inland produce of the country. Its exports ara: wood, pitch, hides, seal-skins, oil and linseed cake, fish-: manure, herrings, anchovies, stock-fish, and iron ; and it: imports wheat, salt, hardware, wines, preserved fruits, and! fancy goods. In 1871 the total value of the imports was: about £2,151,225; the vessels that entered the port in 1872 were 1787, of total tonnage 393,598, out of which: 143 steamers and sailing-ships were British. The customs) duties in 1873 amounted to £329,175. Christiania is im: steam communication with Gothenburg, Copenhagen,. Liibeck, Hamburg, Amsterdam, London, and Hull, as. well as with various places on the fiord, and all the ports of Norway. 'The town is healthy and has an excellent supply of good water. In winter its average temperature is 23° Fahr., in summer 59°-9, giving an average for the year of 41°-4. The harbour during three or four months of the year is ice-locked, and ships then lie at Drobak, about 18 miles south of the town. The population, which in 1812 did not exceed 10,000, had in 18385 reached 21,757; and at the end of 1873 it was 72,725 or, with that of the suburbs, about 83,000.

IANITY

small influence upon the ordinary political and moral life of the world. They have been able to effect changes in generally received moral ideas and maxims. They have altered the course and character of legislation. They have introduced new opinions and beliefs. They have formed fellowships for worship, built places of meeting, held councils and assemblies,.and in

many ways given evidence of their presence and power in the world. But it must always be remembered that Christianity is neither the church simply, nor theology, nor Christian ethics. It is more than all these put together. The common life of Jesus and His people, which is the core of Christianity, manifests itself in an outward visible organization for the purpose of worship, which is commonly called the church (see CuurcH). But this worship is not Christianity; still less

are the various institutions and ceremonies according to which worship is carried on.

Christi- anity and Christ. «.

The rela- tion of Christ and Christi- anity to what went before,

CHRISTIANITY

Christianity cannot help powerfully affecting the whole

of the intellectual side of man's life. The spiritual events on which it rests must have their rationale, and the spiritual forces which course through it must have their rule, and man must more or less comprehend them, and assimilate them. The Christian cannot help having a very different idea of God from that held by Aristotle or Plato. The Christian regards sin as something which affects the whole human race, while the pagan, believes it to be the mistake or misfortune of individuals. Christianity cannot help remoulding the beliefs and opinions of mankind, but theology and Christianity are two very different things. _ The Christian is moved by nioral impulses and guided by moral principles which are peculiar to himself. He cannot look on marriage, for example, from either the purely economic or the purely sensuous point of view. He cannot help reorganizing the scheme of virtues, and giving to the principle of love a pre-eminence which it has not in pagan ethics. Christianity cannot help putting a new face on morality, but Christian ethics and Christianity are still not one and the same thing.

Christianity includes all these and much more besides, It is nothing less than the whole round of human life in all its various departments in so far as

it is related to and illumined and dominated by the divine love revealed in Jesus Christ. It is the presence of Jesus among His people and all that is implied in such a presence.

The close and inseparable connection between Jesus Christ and Christianity, which is implied in the name, and which study only makes more and more evident, produces the inevitable consequence that our view of the nature and characteristics of Christianity must depend on the answer which we give to the question which Jesus himself put to His disciples—-“‘ Whom do ye say that I, the Son of man, am?” There are different theories of Christianity, because there are different theories of Christ, and in order to know how various conceptions of the nature of Christianity arise it is necessary to be familiar with the various views which men have held and hold about the nature and work of Christ. For example, different theories of Christianity arise when we ask what was the relation existing between Jesus and what went before Him, what was the relation in which Jesus stood to His contemporaries and His im- mediate followers, what is the connection which subsisted between Jesus and the future. All these inquiries reveal different theories about the nature and work of Christ, which are reproduced in different theories of the essential nature of Christianity, and enable men whose opinions and principles are widely different to call themselves, to their own satisfaction at least, Christians.

Jesus Christ claimed to have a definite relation to the past history of that people among whoni He was born. In His teaching He put himself at the end of the Old Testa- ment, and declared that He came to fulfil the Law and the Prophets. Christianity, therefore, however it be explained, has a close connection with Judaism, and the religion of Jesus cannot be considered without regard to the religion of Moses. This is now universally acknowledged, Sealy variously the relation between the two may be explained. Criticism finds an ample confirmation of the claims of Christ in the intimate connection in which His teaching, life, and work stand to the Old Testament and the past life of the inspired Hebrew people. The whole of the Mosaic dispensation, the whole of the Jewish economy, with its prophecy, priesthood, and kingship,is recognized as summed up in the person and work of Christ. The Old Testament, which without Christ is but a collection of sacred books written at different times and in various

manners, is re- garded when looked at through Christ as an harmonious whole of anticipatory revelation. Indeed, one of the chief

differences which critical apologetic finds between the Old Testament and other so-called sacred books is, that Christ is at the end of the Old Testament, and that no other scrip- tures have such a conclusion. But all this implies that Christianity is a development from Judaism, and that our idea of the one will be modified by our conception of the other. Those who refuse to admit that Judaism is more than one of the many natural religions of mankind can hardly admit the supernatural character of Christianity, or regard it in any other light than as the outcome, perhaps the highest outcome possible, of that side in man's nature which has been called by some the religious faculty. Those who attempt to derive Mosaic institutions from Egypt, who seek the basis of Hebrew prophecy in epileptic tendencies, and see nothing in the theocratic idea which was not suggested by ordinary kingship, cannot have much difficulty in analyzing Christianity into the natural develop- ment of the religious sentiment aided by a somewhat extravagant enthusiasm. Those, on the other hand, who find it impossible to accept the assumptions, and to get over the innumerable difficulties attending the naturalist theory of the Old Testament and of the history of the Hebrew people, find in Christianity something different in kind as well as in degree from all natural religions. Modern criticism even of the negative kind often indirectly supports the supernaturalist theory of the Old Testament and of Christianity, for its fundamental maxim, that waters cannot rise higher than their source, has proved the impossibility of explaining away Old Testament institutions and New Testament truths into merely the natural outcome of the religious faculties of a peculiar people. It has proved that the Old Testament religion contains materials which were not got from the intercourse of the Jews with other nations, and which did not arise naturally from the geographical position or the ethnographical characteristics of the Hebrew people. It has shown that the Old Testa- ment religion was nota natural stream gathered from many a smaller rill, but came forth gushing, like the water of Hebrew history, from the Rock which contained it ; and in doing so it has given its testimony to the altogether unique and supernatural character of Christianity.

The relation of Jesus to His contemporaries, and of His The rela-

disciples and their writings to the founders of the various t ethnic religions, is another point whence proceed various

adopted and intensified by the Encyclopedists, that Jesus was a charlatan, that His disciples were partly cheats and partly dupes, and that Christianity was founded in fraud and perpetuated by deceit, has to all intents and purposes disappeared. But many believe that Christianity is only one of the many religions which are all of them true though none of them contain the whole truth. The modern notion of evolution has been called in to enforce this view, and Christianity is explained to be the most perfect development yet reached by the religious spirit of mankind ; while the character of Jesus and the New Testament writings are explained on the same principle. On theories of this kind Christianity is the preduction of the natural forces of the period which gave birth to it, and contains nothing which cannot be traced back to the circumstances of the time, and the conditions of humanity. All such theories commonly rest on the general principle that the supernatural is impossible, and that whatever involves a miracle is ¢pso facto incredible, and then proceed by means of some special principle to explain the presence of facts which seem to imply the supernatural. (See article APoLoceEtics.) These principles are used to explain not so much the origin of Christianity itself as the origin of the Christian writings of the New Testament, and the production of the scheme of doctrine and morals therein V. — 87

views of the nature of Christianity. The old deist view, nine

Christi- anity and the future.

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contained. Perhaps. the most ingenious of these theories is that cluster which has been produced by the writers of the Tiibingen school, who have suggested the general method which has been almost universally followed by anti-supernaturalist writers. The method is by an ingenious negative criticism to separate between the original elements of Christianity as these were present in the mind of Jesus and communicated by Him to His

disciples, and those elements which were afterwards added by more philo- sophical adherents, and to explain how, out of the conflict between the two opposite tendencies of Judaism and anti- Judaism, the various and conflicting elements at last settled into a somewhat harmonious whole. By this ingenious method Jesus is reduced to the position of a Jewish rabbi, not much more noticeable than some of his contemporaries, and Christianity is not the religion of Jesus, but what grew out of that religion when it was subjected to the influences of Roman civilization, Greek philosophy, and Eastern theosophy. Such theories are unsupported by external, and rest confessedly on internal evidence. The weakness of internal evidence when unsupported by external is well known, and in this case the internal evidence is any- thing but strong. There are many serious objections to be taken to the Tiibingen hypotheses (see article Brsiz) merely as hypotheses, and these difficulties are so great that it is almost evident the hypotheses would never have been put forward unless the anti-supernaturalist idea of Christianity had been taken for granted at the outset. There can be little doubt that if the supernatural be admitted these various hypotheses, while they suggest some difficulties which have not yet been solved, will be found to be at variance with the plain results both of external and inter- nal evidence.

On the other hand those who believe in the supernatural take a different view of the relation of Jesus to His con- temporaries. He was no mere Jewish rabbi, but spake as never man spake, and did what never man did, He was the manifestation of God, and came to give by His presence, person, and work, as well as by what He said, the full revelation of God. He was while on earth the centre of the world’s history, to whom all had looked forward, to whom all look back. And Christianity is not the simple product of the contemporary philosophical and religious systems, but is the embodiment of the unique appearance and work of Christ.

The relation in which Christianity stands to the future is also a basis on which various views of its nature have been rested, according to the theory of the peculiar powers of diffusion and propagation which it is supposed to possess. Anti-supernaturalists consider Christianity to be merely a moral force, acting through mere moral enlightenment ; but this has already been sufficiently dwelt upon. There are, however, what may be called two

Christian views of the modus propagandi of Christianity, which produce two of the real nature of Christianity itself. This difference of view is best seen in the variety of answers given to the question how ,Christianity subsisted after the departure of Christ, and how it subsists now from age to age, a more or less compact organic life in the world. The various answers given may be roughly placed in two classes as they lay stress on the spiritual or the mechanical side of the process, and enlarge on the spiritual or the mechanical influences at work. Those who take what may be called the spiritual view of Christianity hold that it was sustained after the ascension of Christ by the mission and work of the Holy Spirit, whose presence and influence enable it to go on from age to age, spreading in the world and developing according to the laws of its growth. And they believe that as the chief result of Christ's work consisted in a change of moral relation between God and those for whom

Christ died, the spread and permanence of Christianity is purely moral, and manifests itself mainly in a change of will. Of course all this takes place in special ways and by appropriate means. These means are called the means of grace, and are usually held to be the Word, Sacraments, and Prayer ; but it is always to be understood that all such means are secondary or subordinate, and that the primary means of grace is the Holy Spirit, who works through these subordinate means, but may and does work in other ways. It is always understood that the operations of the Spirit cannot be limited to special actions nor confined by mechanical laws. On the other hand those who look at Christianity from what may be called the mechanical point of view are inclined to lay stress upon the means by which the Spirit works. They do not ignore the mission of the Holy Ghost uor His work, but are apt to say that He works only in certain prescribed ways, and through one set of means, and the tendency is to lay almost exclusive stress on one set of subordinate means—the Sacraments, and to represent that the persistence and spread of Christianity depend upon the constancy and correctness of sacra- mental ceremonies.

These opposite views of the nature of Christianity depend upon differences of dogmatic conception which may be briefly indicated. All through the one view, a change in the relationship between God's will and man's will is held to be the fundamental result which flows from the work of Christ. All through the other view man's nature rather than man's will is considered, and the result of Christ's work is looked on rather as a process within human nature than as a change in moral relations between man and God. In this way the progress of Christianity is looked on as the gradual semi-physical impregnation of human nature by the nature of Christ, a prolongation of the Incarnation rather than a development of the consequences of the finished work of Christ, to be produced by keeping Christ incarnate in the sacrifice of the Mass and impregnat- ing mankind by means of Transubstantiation in the Sacrament of the altar. The one view is the view of churches which have accepted the Reformation, the other is that of churches which have not.

These various conceptions of Christianity may be further illustrated by the views which are held by the partisans of each concerning the relations between Christianity and the Bible. 'The Bible and Christianity cannot be separated, but different opinions may be and have been held about the relation in which the two stand to each other. On the one hand naturalists, and those who take the mechanical view of Christianity, are inclined to regard the Bible chiefly as a compendium of abstract truths, which may be condensed into dogmas and summarized in creeds ; while those who take the spiritual view of Christianity regard the Bible as the medium which reveals God and His gracious dealings personally to the believing reader or hearer. To the one the Bible is a quarry of doctrines to be rationally criticized or implicitly accepted when once stamped as genuine by the church, to the other it is above all things a means of grace which the most ignorant can use and profit by. To the naturalist the Bible has been formed by the church, it is simply the natural production of the minds of those who formed the old Jewish and the early Christian communities, and grew to be what it is without the aid of superhuman intervention. To those who have adopted a mechanical view of Christianity the Bible is also the product of the church, but of the super- natural power in the church, and has grown to be what it is because it has been sanctioned by the church. To those who take the spiritual view of the nature of Christianity, the Bible, on the other

hand, is and always has been the formative power in the church and that round which the

Christi- anity and the Bible.

Definition.

Prepara- tion of the world for the en- trance of Christi- anity.

church gathers itself, for it is the presence of God speaking to His people.

Both naturalists and those who hold a mechanical theory of Christianity agree in holding that there is an external sort of development in the Bible, and that the church can go beyond the Bible, whereas those who hold the spiritual view of Christianity deny both these positions. Naturalists hold that one part of the Bible is beyond the other, and since the Bible is simply the outcome of man's religious thoughts and feelings in certain ages and places, they believe that men now may give utterance to thoughts and sentiments which in depth of feeling and insight may surpass those contained in the Bible. The Tiibingen theologians, for example, believe that the New Testament is a series of deposits of religious truth, in which the truths taught by Jesus are supplemented by the teachings of His disciples, by the lessons of Paul, and by the theories of Christians educated in the philosophy of Greece ; while Dr Newman considers that the church, in virtue of a super-natural gift bestowed upon her, can add to the doctrines contained in the Bible according to certain well-defined lines of development. On the other hand those who hold the spiritual view of Christianity believe that the church can never go beyond the Bible, and that progress in Christian theology means greater insight into the manifesta- tion of God in the Bible and greater power to interpret the supernatural facts and forces made known therein.

The various theories differ also in the closeness of con- nection which they think subsists between Christianity and the Bible. 'The naturalist and those who put the church above the Bible as the formative power in Christianity both make the relation between Christianity and the Bible a purely

intellectual one, whereas those who hold by the spiritual view make the Bible a means of grace and not merely the quarry whence to hew theological dogmas. But the naturalist agrees with spiritual Christians in maintain- ing the authoritative character of the Bible, while the mechanical Christian sets the Bible aside when it does not agree with church tradition. With the naturalist, how- ever, the Bible is authoritative because it is the only set of documents which tell him about Christianity iu its primitive state. It is authoritative because it is the only witness to the historical facts of Christianity, not because it is to be a law to him. ‘To the spiritual Christian, on the other hand, the Bible is authoritative because it is a revelation of those spiritual forces and a record of those spiritual events on which Christianity still depends, and which teach him the way of salvation.

‘To sum up, then, Christianity claims to be no mere social revolution or natural step in the march of human progress. It is a religion whose sources are not to be found within man’s nature but outside of it in the saving revelation of God in Christ, and Jesus is thus the author and giver of an eternal life which spreads itself and is maintained, not by mechanical contrivance, but by the living Spirit of God entering into human history, and building on the basis of reconciliation a kingdom of God which is both human and divine, and which comes and comes again and again in wave after wave of developing completion until the will of God is done on earth as in heaven.

Christianity began its career in the world at a time singularly propitious both politically, socially, and religiously for the advent of a new universal and spiritual religion.

Even apart from the entrance of Christianity the reign of Augustus over the whole Roman empire was an epoch- making period. Never before had the various races of mankind been united under one universal empire which promised to be permanent. For the Roman power was different from the governments of Asiatic adventurers and Greek warriors. Where Rome planted her foot was fated

to remain Roman. ‘The ancient Asiatic empires had been for the most part the creation of victorious generals, and had been kept in life only by a tolerably rapid succession of dynasties ; their power seemed to depend on the character of the individual ruler. And the empire of Alexander, while more enduring, was not coherent. But from the beginning of her conquests the spirit of Rome herself seemed always to be greater than the vigour and ability of her generals and rulers, and she alone of empires seemed to be indifferent to the precarious stability of government ensured by regular dynastic succession. “ The Romans conquered like savages, but ruled like philosophic statesmen, till, from the Euphrates to the Atlantic, from the shores of Britain and the borders of the German forests to the sands of the African desert, the whole Western world was consolidated into one great commonwealth, united by bonds of law and government, by facilities of communication and commerce, and by the general dissemination of the Greek and Latin languages.” ‘The world had a centre as it never had before, and the golden threads of well-established government connected all the world with Rome. Roads were made connecting Rome with the remotest countries, and a system of posts established which provided for easy communication with the capital. Military colonies carried Roman usages and manners, civilization and privileges, to the remotest corners of the empire. Magnificent cities were built in such outlying dependencies as Britain, Gaul, and Germany. ‘The arts and civilization were gradually extending their dominion and subjugating the most distant and most desolate places. ‘To all this Augustus added a more perfectly devised centralization which made the empire a more compact whole, so that any new influence made its throbs felt from centre to extremities in a wonderfully short time. ‘The world was made ready for the furtherance of the spread of opinions as it had never been before, and for becoming spellbound by invisible spiritual laws like those which Christian morality weaves around its disciples. The time of Augustus, if it was the beginning of the decline and fall of the Roman empire as a visible earthly dominion, was also the beginning of its permanent establishment on earth in a purely invisible way, when its policy, statesmanship, and legislation were to pass into all the nations of the earth and become part of their lives so long as the world endured.

Socially, too, the world was wonderfully ripe for the entrance and spread of a universal religion. Slavery it is true flourished, and there were conquerors and conquered, privileged and unprivileged classes. But the beginning had already been made of that lavish distribution of Roman citizenship which laid the foundation of a common political life throughout the empire.

The religious character of the times was also marvellously adapted for furthering the advance of Christianity. The old national creeds were fast disappearing, and were being submerged in the vast cosmopolitan religion of Rome. It was the wise custom of conquering Rome to do nothing to disturb the religions of the peoples subdued by her armies, and commonly the principal deities of the conquered nations were added to the overcrowded pantheon of Rome. This religious tolerance or indifference gradually began to eat the heart out of paganism, and all over the civilized world the pagan creeds sat lightly on their worshippers. The various deities were looked on as interchangeable manifesta- tions of a supreme fate-power who reigned alone in the invisible world, while in this visible earth the genius of Rome seemed to be the one object of worship. The old national religions with their well-defined outlines and limits were being gradually effaced, and men were longing for some religion which, while it had the universal character which the times required, should have more individualityand

personal power in it than were supplied by the thoughts of a supreme spiritual fate, or by the mere materialist concep- tion of the genius of Rome. And all this bred a thirst for information about sacred things which was unknown in earlier times. The claims of conflicting religions were philosophically discussed, and amid all the gross materialism of the period

there were longings for some deeper, truer religion than any they had known. These longings were further stimulated by the gradual but almost universal advance of new religious ideas coming from the far Kast, which was then regarded as the cradle of science and philosophy. In the 5th century before our era the vast Buddhist movement had overspread all the East fram Thibet to Ceylon, and the Greek and Roman conquests in Asia brought Europe within the intoxicating influence of its subtle religious ideas, This strange Eastern theosophy, which during the first four centuries of our era is known by the name of Gnosticism, had a most powerful influence on the old religions of the West, which seemed to dissolve under its touch. Everywhere in the art and literature of the period we find its prevalence in the West during the age of Augustus and his successors, It insensibly undermined the beauteous sensuous mythology of Greece and the harder sterner religion of Rome, and substituted for them a religion in which, if fear was the prevailing emotion, worshippers still felt that there was more spirituality and greater claims to universality than their old national religions could give. And thus the gradual defacement of old religious outlines, the stimulation of strange cravings to know the mysteries of nature and of worship, and the longing for rest in a universal religion of

, deliverance prepared the world for the coming and spread

of the religion of Jesus Christ.

The great problem Christianity had to face and to solve was one of no ordinary difficulty, and one involving a number of side issues which greatly perplexed the early church. The practical side of the problem as it met the early Christians may be put thus :—How could Christi- anity, which was rooted in Judaism, be at the same time a religion equally open to Jew and Gentile; how could the exclusiveness of Judaism and the utter want of exclu- siveness in Christianity be reconciled with each other? And the solution of this problem brought the early Christians into conflicts of a special kind with the government and philosophy of the times.

When Jesus proclaimed His mission, and when He sent forth His disciples on preaching tours to make known himself and His work, we find the ‘phrase “kingdom of heaven” perpetually occurring ; aud it was this phrase and what it suggested that brought the early Christians face to face with the

great problem they had to solve. When Jesus announced that’the kingdom of God was at hand, His message was quite intelligible to His Jewish audiences. The phrase was sacred and familiar, and their thoughts went back at once to the old theocracy of Israel. And when after the death and ascension of our Lord, His Jewish believers got a truer and deeper insight into the meaning of the expression, still the idea it conveyed bound Christianity, with bands that could not be untied, to Judaism, the Old Testament Scriptures, the miraculous life of the Jewish nation, and the ideal Israel long expected and long announced. Throughout the Old Testament Scriptures we find three ideas connected with the thought of the kingdom of God. It implied first and primarily the share in the inheritance in the land which the Lord gave to His people and to their children ; and then it implied security in this possession, deliverance from Egypt and a succession of enemies, and, lastly, the possession of an inward spring of covenant life, which guaranteed them both salvation and possession. These three things were the historical and

material basis on which rested the whole spiritual and. prophetic superstructure of the ideal kingdom of God, which lay enshrined in the heart of every devout Hebrew. When our Lord by His preaching, by His life, death, and rising again, and by His mission of the Holy Spirit, gave new meanings to these thoughts, He only widened, deepened, spiritualized, and gave personal point and ap- plication to what the prophets and holy men of old had already declared. And when He and His apostles guided by His Spirit taught His early followers that His kingdom of God meant possession of the spiritual blessings of God’s grace, aud deliverance from sin, death, and Satan, and a life of adopted sonship which guaranteed them in all these blessings, devout Jews could feel that now they were only learning what the prophets had taught, and they rejoiced in the thoroughgoing oneness which existed between the kingdom of God as proclaimed in the Old Testament and the kingdom of heaven which Jesus preached. But if it was a sine gua non that Christianity should spring out of the Old Testament Scriptures and be identical in all essentials with the Old

Testament church, it was no less necessary that it should be now a religion for Gentiles as well as Jews, and here the difficulty emerged. Could the old Jewish church be carried over into the Christian church if all that outwardly distinguished it were abolished ? Could the continuity be preserved if the ceremonies and restrictions which made up the visible life of the Old Testament worship were no louger to be observed? Would not the Old Testament church be entirely destroyed and the continuity between it and the New Testament church be done away with if the Old Testament ceremonial law So long as the members of the Christian church were Jews only or Gentiles who had become proselytes the difficulty was not felt. The Christians had not openly broken with Judaism, and were acknowledged even by their Jewish opponents to be a Jewish sect,—a sect everywhere spoken against it is true, but still a sect just as the Sadducees were a sect. But whenever Gentiles who were not proselytes became {believers then a fierce struggle arose between those who thought that the con- tinuity between the Old Testament and Christianity could not be kept up unless it were visibly perpetuated in those observances which distinguished the Jewish religion from all others, and those who were contented with a continuity which was more of the spirit than of the letter and the form. The practical shape which the struggle at first assumed was, whether Gentiles could be Christians without first becoming proselytes, and whether Jewish Christians must cease to be believers if they associated with Gentiles who had not been circumcised, and had not rendered themselves servants to the law of Moses. To understand the difficulty rightly it should be remembered that when the difficulty arose the New Testament canon was not in existence, and the church had to be guided mainly by the Old Testament Scriptures and the memory of Jesus preserved by the apostles. In spite of what has been advanced by critics of the Tiibingen school, it seems evident that the apostles one and all in their letters to the church faithfully followed out the solution which Christ’s discourses gave. In these discourses our Lord carefully distinguished between the per- manent and the temporary elements in the Old Testament dispensation, and assumed that His office as Messiah gave him full authority to abolish or alter the latter. He also pointed out that the permanent parts of the Mosaic eco- nomy were the various modes of expressing that love to God and to man which He declared to be the sum of the law and the prophets. These were unalterable, but any change might be made in the subordinate and temporary elementy,

if only this great principle was more fully aud better ex- pressed by the change. This leading thought Christ used

The influ- ence of Judaism.

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as much to detect and condemn false developments of the Mosaic economy (e.g., Pharisaism) as to test its true develop- ment in Christianity. The apostles of Jesus carried out the principles of their Master. There is not a trace in the epistles of Peter, James, and John of the idea that salva- tion and entrance into the kingdom of God could only be obtained by those who were first Jews and then Christians. There is no statement, for example, that Gentiles must be circumcised before they can be baptized. On the contrary, James speaks of the perfect law of liberty, and Peter and John have expressions equally strong. Within the writings of the apostolic circle everything goes to show that the church was taught from the beginning that Christianity was not to be confined within the limits of natural or adopted Jewish nationality.

But when we turn to the Acts of the Apostles, and to the epistles of Paul, especially to the Epistle to the Galatians, we find that the apostolic solution of the diffi- culty was not acceptable to the early Jewish Christians, and was not accepted by many of them. We even find that the practice of members ofjthe apostolic circle was not always in accordance with the principles which they had enounced in accordance with the guidance of the Holy Spirit. There was a strong ultra-Jewish party in the early Christian church, which was able in some measure to control the conduct of the apostles themselves. And this was what was to be expected. Men who had been trained in Judaism, where the connection between religion and poli- tics was so very close, whose religious thoughts were always expressed in outward ordinances, could scarcely avoid insist- dng upon some visible connection between Judaism and Christianity. They could not see that Christianity was the completion of Judaism if the practices of the Mosaic economy were not kept up. Thus we find at Jeast two parties, a Judaizing and a Gentile party, in the early church. At first the Jewish party was so strong as to force a compromise upon the leaders of the Gentile church, and require that every Gentile Christian should at least become a proselyte of

the gate by abstaining from things offered to idols, from things strangled, from blood, and from zropveia or a breach of the Old Testament regulation about marriage ; and it is probable that Jewish Christians were required to keep up all the practices of the Jewish religion and more especially to share in the sacrificial worship of the temple. Afterwards this Jewish party grew weaker, and it became the universal belief in the early church that Christians born Jews did not need to observe the ceremonial law of Moses or to share in the temple-worship, and that .Christians born Gentiles did not require to show, by keeping certain Jewish regulations, that they were believers in a creed which was a development of Old Testament ideas. The capture of Jerusalem and the destruction of the temple separated the Christian Jews who were of the sect of the Pharisees from their fellow Christians, and the severe persecution of Jewish religion and rites which followed the revolt under Bar Cochba sent most of them over into the ranks of the Essenes, and thus the Christian church was left in peace to reconcile its intimate connection with Judaism with its abandonment of Jewish ritual on the principles of Christian liberty. But in solving the problem the early Christian church was scarcely true to the principles of its Master. In order to defend more stren- uously their separation from Judaism, it was customary for the fathers of the church to look at Christianity as supply- ing in detail all that Judaism possessed, and this led them almost as far from the fundamental principles of continuity laid down by Christ as the old Judaizers had gone. They required a new law to set over against the old law of Moses, a new service to take the place of the temple service of the Old Testament, a new daily sacrifice, “the new law’s

new oblation ” instead of the sacrifices of Moses, a new ritual which after it had gradually grown complex enough was found to correspond bit by bit with the ritual of Jerusalem, and a new priesthood whose functions were. to be not unlike the duties of the sons of Aaron. In church traditions, a ritual of worship, and a service of priests, they found the proof of their relation to the religion of the Old Testament, and forgetting the unseen continuity of sameness of spiritual principle, found a consolation in a fancied similarity in external routine of worship. In this way early Christianity succeeded and

failed in realizing to herself the real con- tinuity between the Old Testament and the New Testa- ment kingdoms of God.

But if early Christianity found it difficult to reconcile the New Testament idea of the kingdom of God with the Old Testament conception, it was no less troubled when it came to work out this New Testament thought on the broad basis prepared for it by the existence and character of the Roman empire. There were difficulties without as well as difficulties within. Christians are men with bodies as well as souls, and Christian ideas tend to take sensible shape, sometimes false and sometimes true. No sooner had Christianity shaken off its Jewish thraldom than it seemed eager to betake itself to a new slavery—eager to lay down the kingdom of God on lines already furnished by the government of pagan Rome, or the creeds of pagan philo- sophy. At all events we can trace in early Christianity the workings of two subtle influences, the one of which strove to reduce the kingdom of God to a material and earthly empire, while the other would have dissolved it into a system of philosophy. The ecclesiastical empire of the Middle Ages and the scholastic theology overthrown at the Great Reformation were slowly built up by principles which Christianity almost unconsciously assumed during her long struggle with pagan Rome and with pagan philosophy.

The relation of Rome to Christianity was very peculiar. Both aimed at world-wide dominion, and the one was the very incarnation of polytheism, while the other forbade in the sternest terms all idolatrous worship. The Christians, while citizens of the great empire which ruled the world, found the idolatry which they hated and denounced _inter- woven inextricably with the law of the land, possession of property, social observances, and public ceremonies. And Christianity had scarcely emerged from Palestine when it found itself engaged in a hand to hand struggle with the imperial power of Rome herself.

The uniform policy of Rome was to respect the laws and the religion of the conquered peoples who came under her dominion. ‘The Roman system of jurisprudence, it is true, was extended to all parts of the empire, and capital offences were generally tried according to Roman law before Roman tribunals ; but, generally speaking, conquered nations lived under their own

laws and were allowed to practise their own religions. By this wise policy Rome not only avoided stirring up religious wars, but contrived to be the religious and legal as well as political centre of all the conquered tribes.. In one way only was the religion of the conquered interfered with, when the worship of the emperor was forced upon all his subjects. Whatever motives of policy urged this haughty indifference to all creeds, and this easy toleration of every form of pagan faith, they were in reality founded on an intense belief in the eternity and almost divinity of Rome itself. Rome had remained for ages and seemed likely to endure the Eternal City, and when all other feelings of reverence had fled, the heart of the genuine Roman was full of awe for the majesty and might of perenduring Rome. It was no mere servile adulation which led to the deification of the emperors. The emperor was God, and divine honours were paid to him because he was the visible symbol of imperial Rome making manifest its

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power and permanence. And it was a real feeling of wor- ship that raised in every house the altar to the dwus tmperator, and spread over the whole of the Roman empire, jostling aside its myriad creeds, the one faith in Rome, in its power, its eternity, and its mysterious strength. It was in this way that paganism and Rome became almost synonymous, and that Christianity and Rome were foes from the first. .

Rome never treated Christianity as other religions were treated. Gibbon tells us that the Romans were already somewhat intolerant of Judaism and extended their intol- erance to the new Jewish sect, somewhat more intractable than their neighbours, which Christians were supposed to be.

Healso shows that Christians who had neither temples hor synagogues were supposed to be atheists, and so beyond the pale of toleration, and that the secret assemblies of Christians were supposed to have a hostile political meaning. But something more is required to explain the uucompromising hostility of Rome, especially when we find that latterly that hostility was strongest under the greatest and noblest emperors, Since

Roman toleration was founded on public policy, there was:

an end of it with regard to a religion which was of no use in curbing a conquered people. The Christian religion was nova and ilicita ; it was not a national religion nor a recognized faith, and was a new and unaccountable pheno- menon which might be, and most probably was, fraught with danger to the sacred state. We find, too, in many of Rome's ablest statesmen a strange instinctive dread of Christianity. They made inquiries about it and were watchful of it, and yet could get no real insight into it. They could not help noticing how in spite of edicts and persecutions Christianity was rapidly increasing; they saw how, with a daring which to them was simply inexplicable, it was nothing loath to match itself against the power of Rome. To the ears of these dark and jealous emperors came tidings of Christianity copying the jurisdic. tion of Rome in its ecclesiastical divisions of the land, of its success in the large towns in the empire, of its entrance into the army. They saw, too, what Constantine was the first to make use of, that Christianity acted in such a way upon the physical frame that Christian soldiers were stronger and braver than their fellows, and man for man and battalion for battalion were more than a match for the pagans, Above all, they heard rumours of a new kingdom which the Christians were to establish, of con- fidently expressed hopes that the kingdom would soon come, and of openly asserted resolutions and prophecies that it would be established on the ruins of Rome itself. And, on the side of the Christians, Tertullian was ready to boast that ina few years the Christian empire had more extensive boundaries than the Roman, and that Christian soldiers had penetrated and triumphed in regions where the Roman arms were unknown or defied. Christian martyrs marching to the arena confidently predicted the speedy overthrow of the cruel paganism which sent them there. As the struggle deepened, too, there entered a distinctly new element on the Christian side, and the contest became not merely one of the true religion

against a false paganism and a pagan and persecuting state; it became a battle between two kingdoms. The Christian bishop and the Roman governor were two rival authorities, viceroys in two warring empires; and the saints would inherit the earth, when the church ruled instead of Rome as the mistress of the world. During the long struggle between Rome and Christianity we see this subtle influence entering into and withering the true spiritual conception of the kingdom of God, until at last it is almost transformed into an earthly empire. St Augustine has seized on and represented this idea with sublime dramatic power in his

Civitas Dei in peregrinatione per terras, where the Civitas Dei, or the church, is set over against the Civitas Terrena, or state ; and where the kingdom of God, however grandly pictured, is almost as material, earthly, and sensible as the empire of pagan Rome. From this fatal influence have come all the attempts to realize the universality and catholicity of the church in a purely external or visible way, and the failure to understand how Christianity may be all-embracing without viszbly covering and controlling the earth.

In her contest with Rome Christianity succeeded in realizing and giving expression to her claim to universal dominion, but in Rome's overthrow she inflicted an almost fatal wound on herself when she was unconsciously induced to take the government of a pagan empire as her model for the organization of a spiritual kingdom.

In the contest which Christianity had to maintain with pagan philosophy the early Christians were compelled to work out another side of the great problem which con- fronted the early church—-the relation of the Old Testament to the New Testament kingdom of God. Philosophy when engaged upon topics which belong to Christianity is always easily distinguished by the way in which it puts its questions. 'The question with philosophy, for example, is, What is Sin? How can its existence be explained ? But the Christian question is: Howcan I get rid of sin? To the philosopher sin is food for meditation, but to the Christiau it is something to be escaped from. Outside Christianity there were many schools of thinkers who busied themselves with speculations about the origin and nature of sin, death, God, judgment, holiness, and so on, and there were many

philosophers who were quite willing to take help from the Hebrew Scriptures in their difficulties. It was always a matter of earnest endeavour on the part of Christian theologians to make it clear that Christianity was not a philosophy to be discussed but a life to be lived; but when they were called, by the views of some of the Gnostics, to explain their relation to the Old Testament Scriptures and to the New Testament canon, we find them unable to realize the full significance of the problem. ‘To the early Christians the Old Testament was pre-eminently the scripture, it was in their possession before the New Testament, and the New Testament canon was gradually formed as one after another of the writings which compose it were found worthy of a place beside the Old Testament Scriptures. Certain of the Gnostic sects made use of the facts, statements, and truths contained in the Scriptures in their theories of creation and redemption, of man, sin, and salvation; and Christian theologians were compelled to refute the Gnostics by setting forth over against the false doctrines what they held to be the truths concerning the matters taught. In this way and gradually there grew up an intellectual system of Christian truth, embodied in the creeds of the church and in the writings of her theologians. The necessity was laid upon Christian theologians to present Christianity intellectually in this way, and oppose a true to the false yéous ; but just as in her contest with Judaism and Rome Christianity insensibly adopted part of the error contended against, so here the struggle against intellectual evil had the result of tending to dissociate Christian life from the Holy Scriptures, and of creating two kingdoms of God—one of life which was to be lived on the lines of the old Roman empire, and one of doctrine which was to be based on the foundations of

Greek philosophy. This latter tendency did not appear in-

the church until the early Jewish element had almost died out. To the Jew Judaism was an historical past which it was not to the Gentile, who could with difficulty think of the church of the Old Testament as a spiritual organization into which he was actually brought by regeneration. To

The influ- ence of pagan phi- losophy.

The influ- ence of pietism.

the Jew the Mosaic Law andthe Old Testament Scriptures geuerally did not so much mean a series of commandments or prescriptions as a mode of life. No doubt when they thought of the Old Testament their minds were full of laws and commandments, but still the most prominent idea was that their fathers had dived and had been enjoined to live a particular mode of life. Tothe Jew the Old Testament was the past covenant life of his fathers in which he might share, and it showed him God much more as the covenant God with whom Israel had lived in communion than as a mere Lawgiver. But it was more difficult for the Gentile to feel this. He could not easily feel that the covenant life described in the Old Testament was the life into which Christ had brought him, and he felt as much outside of it as the Jew felt within it. And so to him the Old Testament was not so much a haven of religious fellowship as a series of commandments which he might understand aud at least could obey. When the Gnostics drew false inferences from statements in the Old Testament, and when the church theologians corrected these in creeds, this forced making of creeds intensified the tendency to look at the Bible—Old Testament and New Testament—rather as a storehouse of theological weapons, than as the medium of personal intercourse between a covenant God and His people. One of the main characteristics of the Biblical idea of the kingdom of God was lost—the thought of personal intercourse with the King through His word realized in an act of personal trust, and the idea of faith lost its sense of trust with personal com- munion and took the character of assent to intellectual truths. But as the life can never be fed upon abstract truths and their comprehension, and must have some support, Christian life became gradually divorced from any relation to the Word, and became rooted on a system of observances, of which the sacrament of the Supper became the centre. The efforts of the church to realize its relation to the Scriptures were in this way partly successful, because it recognized its duty to set forth the truth of God; but from the way taken the result was to displace Christianity from its position of rest upon the Old Testament church and the Scriptures, and to send it to its own machinery for life and strength. j

One other phase of early Christianity ought to be referred to, as it illustrates another side of the same great problem which was presented for solution.

Both in the Old Testament and in the New Testament conceptions of the kingdom of heaven the idea of a new life, or at least of a separate consecrated life, is a conspicuous element. The kingdom of God implies that those who are within the kingdom live a life different from those without. In all ages of Christianity this new and separate life has been an object of speculation, and many various ideas of its true nature have been promulgated. The very conception of a life which is new is sufficient of itself to produce strange conjectures respecting its nature, and in the epistles of St Paul we find evidence that many of the Gentile Christians were disposed to think of the new life of Christianity as one entirely outside of the realm of ordinary moral law. This lawless or immoral tendency was sternly checked in the Christian church, and only gained head in sects outside of it; but traces of the tendency were not infrequent. The function of the Holy Spirit in the church was always made a ground of conjecture concerning the real nature of the new Christian life, and it was from mistaken views of the character of the Spirit's influence and work that disturbing pietist theories perplexed early Christianity. These pietist theories gained distinctive form and acquired great power in what has been called Montanism, and the church's efforts to rid herself of this incubus, while well intentioned, led to permanent results by no means satisfactory. One of

the chief characteristics of this early pietism was the idea that the abiding presence of the Holy Spirit rendered possible a continuous revelation, and it was believed that the prophetic gift was permanent in the Church. The Montanist prophets presumed to add to revelation, and to overturn ecclesiastical laws and jurisdiction by means of infallible utterances disclosed tothem. The practical effect would have been to reduce the organization of Christianity and the intercourse between Christians to a precarious dependence upon the dictates of self-constituted prophets, whose ideas of revelation resembled the heathen soothsaying much more closely than the Old Testament prophecy or the New Testament inspiration, and this led the church to adopt a severer discipline and more monarchical constitution. But this must be afterwards referred to.

To sum up, then, early Christianity, in working out the problem of its connection with Judaism and the Old Testament Scriptures, achieved success in four great direc- tions, but at the same time made four great mistakes. It insisted rightly on the fact that in order to be a develop- ment of Judaism Christians did not require to become Jews first, but it erred in attempting to make Christianity the exact counterpart and rival of Judaism. It insisted rightly that the kingdom of heaven was a kingdom to be set up on earth and so all-embracing as to include the whole earth within its boundaries, but it erred when it conceived it to be a kingdom which in any way could be compared with the Roman empire, and when it began to translate spiritual power aud possession into physical and temporal domi- nion. It insisted, rightly, that the church was the custodier of truth, but it erred when it made faith intellectual assent, when it gave to the Bible an entirely intellectual aspect, and laid the foundations for infallible creeds. It rightly expelled from its midst a false pietist prophecy, which in course of time would have undermined alike scriptural and ecclesiastical authority, but it erred when it conferred on a consecrated privileged caste the sole authority to interpret scripture and regulate ecclesiastical discipline. These attempts and failures in early Christianity have been so often repeated that they may be looked upon as true and false principles of development inherent in it.

The history of the world presents no phenomenon so Early pro- striking as the rise and early progress of Christianity. gress of

Originating in a country not remarkable for any political, commercial, or literary influence, emanating from One who occupied a humble sphere in the community amidst which He appeared, and announced in the first instance by men of mean extraction, of no literary culture, and not endowed with any surpassing gifts of intellect, —it nevertheless spread so rapidly that in an incredibly short period of time it had been diffused throughout the whole civilized world, and in the fourth century of its existence became the recognized and established religion of the Roman empire. When it is remembered that this result was achieved not only without the aid of any worldly influence, but in the face of the keenest opposition on the part of all the learning, wealth, wit, and power of the most enlightened and mightiest nations of the earth, the conclusion is strongly forced upon us that a power

beyond that of man was concerned in its success, and that its early and unexampled triumphs afford an incontestable proof of its inherent truth and its divine origin, Nor has the rapid advance of Christianity been confined to its earlier years. “After a revolution of fourteen or fifteen centuries that religion is still professed by the nations of Europe, the most distinguished portion of human kind in art and learning as well as in arms. By the industry and zeal of Europeans, it has been widely diffused to the most distant shores of Asia and Africa, and by means of their colonies has been firmly established from Canada to Chili in a land unknown to the ancients.”

Causes of its pro- gress,

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And when we turn to the results of modern missionary enterprise we find a success no less remarkable.

Historical critics who have no sympathy with the super- natural elements in Christianity have attempted to account for this wonderful success by natural causes, and have pointed out various circumstances which go far to account for the rapidity of its spread. Sceptical critics of a past generation contented themselves with enumerating various distinct causes combining to produce the effect, while naturalist writers of our own day try rather to show that Christianity was the natural outcome of the intellect of the age which produced it. The great disadvantage attaching to the one mode of criticism is that no parade of causes or conditions of success can ever get rid of the supernatural character of Christianity, for it is always

impossible to show that these are the only causes at work,

and the retort cau be made that these causes are themselves part of the supernatural plan for the introduction and furtherance of Christianity, while the other labours under the necessity either of getting rid of the Christ of history and putting in his place an elaborate poem—an attempt not yet successful—or of reducing the character and work of Jesus to the level of those of Confucius, Buddha, Mahomet, or other founder of a purely

naturalist religion. The celebrated five causes of Gibbon are perhaps the best specimen of the one mode of argument, while the elaborate theories of the Tiibingen school are certainly the most notewoithy instance of the other. Gibbon thinks that the Christian faith obtained so remarakable a victory over the established religions of the earth because it was effectually favoured and assisted by the five following causes :—1. The inflexible, and if we may use the expression, the intolerant zeal of the Christians, derived it is true from the Jewish religion, but purified from the narrow and unsocial spirit, which instead of inviting had deterred the Gentiles from embracing the law of Moses; 2. The doctrine of a future life improved by every additional circumstance which could give weight and efficacy to that important truth ; 3. The miraculous powers ascribed to the primitive church ; 4, The pure and austere morals of the Christiaus ; 5. The union and discipline of the Christian republic, which gradually formed an independent and increasing state in the heart of the Roman empire. It does not need the possession of an anti-Christian spirit to admit that these causes of Gibbon's may have helped greatly to spread the Christian religion, and indeed the Christian critic has to object not so much to this statement of causes as to the covert insinuation which lurks in the historian's exposition of their influence. For the question still remains to be put, why was it that Christianity possessed so many character- istics which made it adapted as no other religion was to the needs and capacities of mankind. Still it ought to be observed that when we turn to the pages of the early Christian Apologists, especially to the writings of those of them who were converted to Christianity after having spent many years as intelligent pagans, we find them almost unanimous in declaring that they themselves were attracted to Christianity chiefly by these three reasons:—l. The sublimity and simplicity of the Christian doctrines of God, sin, and salvation; 2. The noble purity of the Christian life, more especially of the life of a Christian woman ; and 3. The grandeur of the doctrine of creation contained in the Old Testament Scriptures. The inefficiency of the theories of modern critics who would explain the origin and success of Christianity on purely naturalist grounds has already been discussed under the head of APOLOGETICS.

The strong and deep influence which Christianity soon began to have even over the lives and opinions of those who were not Christians, is even a more striking testimony to its paramount claims than the rapidity of its spread.

CHRISTIANITY

The struggle of Christianity with Rome has already been alluded to, but even before Home gave up the struggle in despair, before the last persecution, and before the triumph under Constantine, the influence of Christianity was making itself felt morally, socially, and politically, while its influence on intellect and sciencu was no less remark- able.

It is almost impossible for us; to realize how powerfully Pagan im- paganism acted upon the general morality of the great morality.

peoples of antiquity and encouraged all mauner of lawless- ness and indecency. In the time of the later republic and of the early empire we have the spectacle of Roman law and philosophy powerless to restrain the brutal and obscene passions of the people excited by the influence of the popular religion, even when they had ceased to regard itas an intelligible creed. All paganism is at bottom a worship of Nature in some form or other, and in all pagan religions the deepest and most awe-inspiring attribute of nature was its power of reproduction. The mystery of birth and becoming was the deepest mystery of nature ; it lay at the root of all thoughtful paganism and appeared in various forms, some of a more innocent, others of a most debasing type. Toauncient pagan thinkers, as well as to modern men of science, the key to the hidden secret of the origin aud preservation of the universe lay in the mystery of sex. Two energies or agents, one an active and generative, the other a feminine, passive, or susceptible one, were every- where thought to combine for creative purpose, and heaven and earth, sun and moon, day and night, were believed to co-operate to the production of being. Upon some such basis as this rested almost all the polytheistic worship of the old civilization, and to it may be traced back, stage by stage, the separation of divinity into male and female gods, the deification of distinct powers of nature, and the idealization of man’s own faculties, desires, and lusts, where every power of his understanding was embodied as an object of adoration, and every impulse of his will became an incarnation of deity. But in each and every form of polytheism we find the slime-track of the deification of sex; “there is not a single one of the ancient religions which has not consecrated by some ceremonial rite even the grossest forms of sensual indulgence, while many of them actually

elevated prostitution into a solemn service of reli- gion.” The corrupting influence of paganism entered into the very essence of the social life of the Roman at the time when Christianity began its career. The thoughtful reader of contemporary literature cannot fail to observe how day by day the poison instilled itself into every nook and cranny of the social life of the people. “It met him in every incident of life, in business, in pleasure, in literature, in politics, in arms, in the theatres, in the streets, in the baths, at the games, in the decorations of his house, in the orna- ments and service of his table, in the very conditions of the weather and the physical phenomena of nature. It is not easy to call up as a reality the intending sinner addressing to the deified vice which he contemplates a prayer for the success of his design; the adulteress imploring of Venus the favours of her paramour; the harlot praying for an increase of her sinful gains; the pander begging the pro- tection of the goddess on her shameful trade; the thief praying to Hermes Dolios for aid in his enterprizes, or offering up to him the first-fruits of his plunder; young maidens dedicating their girdles to Athene Apaturia ; youtlis entreating Hercules to expedite the death of a rich uncle. And yet these things and far worse than these meet us over and over again in every writer who has left a picture of Roman manners in the later republic and under the begin- ning of the empire” (Worth Brit. Rev., vol. 47). When we turn to the writings of the early Christian Apologists we find them exposing in a scathing way this whole state of

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‘The social More on economic than on moral foundations.

things and contrasting it with that moral law which is written by nature on the heart of men ; and the pure lives of the Christians in the midst of this sea of iniquity had a wonderful effect. There is no contrast more wonderful than that which may be drawn between the grandeur of Roman law and the debasement of the ordinary social life of the Roman people; but Roman law was founded much But when

influence of Christianity entered into the Roman empire, and when it

Christi- anity.

al last had made head against paganism, the imperial law found an ally in Christian ethics which it had been without during the reign of paganism, and discovered, too, a higher sanction for its precepts than mere economic interests. From the time of Constantine onwards the influence of Christianity on Roman law is remarkable, and always on the side of morality in the highest sense of the term. We find from the Acts of the Apostles that the first organiza- tion of Christians was for the better distribution of charity to those in need of it, and one of the earliest results of the political triumph of Christianity in the empire was the pro- mulgation of laws ensuring the protection of the feeble and the helpless. The nineteen years of civil war which pre- ceded the final victory of Constantine had produced the usual scenes of misery, and great numbers of orphan children were thrown upon the world without protection. The influ- ence of the celebrated Lactantius, to whose care Constantine had committed the education of his son Crispus, was able to secure the publication of a law declaring that the emperor was the father of all these children, and that the expense of their upbringing was to be defrayed by the state. At the same time the exposure for sale of unfortunate children was sternly forbidden, and those who so exposed them were condemned to the amphitheatre. The condition of slaves was also greatly ameliorated by the new spirit of Christianity which was then working in society. Slavery was not abolished, but various laws were made restricting the power of slave-holders. The master was deprived of the arbitrary power of life and death. It was ordained that when royal estates were divided the families of slaves of the soil were not to be separated. New laws breathing a more Christian spirit regulated the relation of the sexes. Divorce was made a much more difficult matter. The laws against rape and seduction were made more severe, and adultery became a capital offence. The nameless crime, which was the disgrace of Greek and Roman civilization, was made punishable by death. The making of eunuchs was forbidden, and it was enacted that slaves who had suffered this mutilation might claim their freedom. But the silent revolution which Christianity wrought in social morality cannot be measured by legislation. It is to be traced in a purer literature, a higher moral life, a better public spirit, and, above all, in the establishment of buildings for the reception of strangers (fevéves), alms-houses for the poor

(xtwxorpodeta), hospitals and orphan-houses for the sick and the forsaken, and houses of refuge for the support of helpless old men and women. All these were due to the church, and the bishops vicd with each other in the proper exercise of 4 munificent charity. One of themostcelebrated of these establishments was the Basilias of Basil of Cesarea, where strangers were hospitably entertained, and medical attendance and nursing were provided for those sick of whatever disease. In the Basilias everything was on the mostmagnificent scale. The physicians ofthe establishment resided within the walls, and workshops were provided for all the artizans and labourers whose services were needed. The presence of such institutions, and the Christian charity to which they bore witness, must have had a wonderfully restorative influence on the corrupt pagan society in which they were set up. Law and religion becarae allied, not opposing forces.

The political influence of Christianity is as marked as its moral power, and had as great an effect upon the paganism into which it was thrown. It was Christianity which gave

to the world those two great factors in civil liberty,—a politics.

consolidated public opinion and an efficient system of repre- sentative government. Gibbon has gone out of his way to sneer at the passive resistance of the early Christians, and has lent the weight of his authority to the idea that a struggle for civil liberty is opposed to the whole tenets of primitive Christianity ; but whatever the views of the Christians were on these points, it is plain that Christianity put a new public life into the Roman empire which greatly retarded its final fall. It has been frequently remarked that Christianity did as much for Constantine as he did for it, and the history of the time amply justifies the observation. Whatever be the truth about the sincerity of his conversion, it is undoubted that hc, from first to last, looked at the church from a political point of view, and made use of it accordingly for his own political aggrandizement. Itshould be remembered that the Roman empire hung badly together, and that apart from the sentiment which may be called belief in the genius of Rome there was no common life and no common nationality. There was no popular life, such as we are accustomed to in modern Europe. From the beginning the empire had been a military tyranny. The emperor was imperator, and ruled

because he commanded the state as an army, and the rule in the provinces was really military. It was imposed on the people from without and did not spring from themselves. There was not even that solidarity in it which an hereditary absolutism begets. Of course such an empire had very little cohesion, and was only kept together by the feeling of the genius of Rome and by the grand system of Roman law. But there was within the empire a new corporate life, a new kingdom, which subsisted in virtue of the life which was in it, held together by the inward power of growth. When Constan- tius and Constantine looked at the Christian church with the eyes of statesmen,' they saw before them a great self- regulating organization which had a common life, a cohesion, and a corporate character quite unlike anything else in the empire. It was impossible to touch the church anywhere without the whole body being thrilled throughout from end to end, so thoroughly was it one. If the emperor could bring any influence to bear on the Christian organi- zation, he might hope to move these hidden spiritual springs of action which are so much more powerful than anything lying at the command of a mere military government. The organization of Christianity was such that all over the empire and beyond it there was, without undue centralization, a confederation of local churches whose government was thoroughly democratic and based on the principle of repre- sentation by means of office-bearers elected by the people, which produced a unity of sympathy and action. Besides all this the common life was kept up by active sympathy between the various churches. If there was a famine in Africa, the churches in Spain and Gaul sent grain. i Christian Gauls had been carried off into captivity by the pagan Germans, the wealthy African and Roman churches sent money for their redemption. The military roads, the system of posts, the relays of ships which Rome kept up to bring intelligence and produce from the provinces, were all used by the church for the purpose of keeping up 1 lively communication between all the various parts of the Christian world. In this way Christianity within the empire was the one organization for creating, stimulating, and guiding public opinion. It was that one part of the Roman empire which, scattered over all its extent, had common feelings and all those various common instincts which go to make up a commonwealth. This was the force that Constantine sought to put himsclf at the head Vv. — 88

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of, and because he succeeded he was the first Roman emperor who ruled with something like what we should call "‘ pablic opinion" at his back. The victory of Constantine was the first instance of the triumph of that mysterious popular force which has given organized freedom to the civilized nations of Europe, aud which is equally removed from the civic freedom of the ancient democracy and from the mili- tary tyranny of the great empires of antiquity. It is to Christianity that modern Europe owes organized public opinion and representative government. Thesilent influence which Christianity hasexercised upon the human intellect, and especially upon its scientific researches, is too important to be passed over, Anti- Christian writers have combined to show the hostility which they think exists between religion and science, and have painted in glowing colours the hindrances which Christianity places before the advance of scientific ideas ; but suchattempts resemble the effortsof a man to kick down the ladder which has enabled him to reach the elevation on which he stands, Christianity did not create philosophy nor science, and many of the earlier Christian theologians denounced in no measured terms the philosophies of Greece and Rome because of their connection with paganism, while philosophy on its side was the last remnant of the old pagan civilization which withstood the Christian conquest. Soon, however, philosophy and Christianity came to terms, and in the writings of St Augustine we find the noblest Platonism allied with the loftiest Christian theology. The science of paganism has never been on a par with its philo- sophical speculations, and whether we examine the ancient civilizations of Greece and Rome which have passed away, or those of India and China which remain, we seek in vain science and scientific knowledge in the modern sense of the term. The truth seems to be that science requires to build on a foundation supplied by Christianity, and which paganism is unable to furnish, or at least has never yet furnished. Science presupposes and rests on the idea of the oneness and uniformity of the universe, and this idea is, strictly speaking, a Christian conception. Aristotle, the most scientific of the ancients, was unable to conceive the uniformity of nature or the totality of things in anything like the sense which these phrases have to

modern thinkers. His conceptions of matter and form, of potentiality and actuality, and so on, implied a subtle duality which effectually stood in the way of such a thought. ‘The uniformity of nature, the capacity of the ideal to realize itself in actual things, was always apt to be thwarted by an inward stubbornness of matter which declined on occasions to submit itself to law. It was this idea which stood in the way of the modern thoughts of the uniformity of nature and of the totality of things which are so essential to science. But such a stubborn, formless matter as pagan philosophy and science delighted to speculate about was quite foreign to Christian speculation and was opposed to the deepest instincts of the Christian life—of trust in the Father who is in Heaven, Christianity did not propose to itself the solution or even the statement of scientific problems, but its yearning to get near God enabled it to see deeper into the problem of the basis of science than the whole of pagan thought had been able todo. The Christian doctrine of creation and the Christian doctrine of provi- dence furnish the foundations on which modern science rests. The Christian doctrine of creation states the absolute dependence of all things on God. He made them out of nothing ; and the religious nerve of the doctrine consists in the feeling of absolute dependence on God which this implies, We and all things have our birth and being from God, and froin nothing else. Practically God is all in all to us, for on Him all things depend for their origin, and they depend on Him alone. The Christian doctrine of

providence presents the same thought in another form. The nerve of this doctrine is that God can and does make all things work together for the good of His people. again is the idea of the absolute dependence of all things on God, not merely for their origin but also for their existence and endurance. as the creator and preserver of all things gives a complete unity to the universe which pagan thought never reached, and gave that basis for the thought of the uniformity of nature which sciencc demands, could force this thought on the human intelligence, but until it had permeated the whole round of man’s intellectual work it was vain to look for advances in science, the task of the scholastic theology and philosophy to knead into human thought Christian ideas, and among the rest this idea of the unity and uniformity of nature.

Here

In this way the thought of God

It was long ere Christianity It was

Anti- Christian critics have spoken of the deadness and uselessness of scholasticism, but its value for science and scientific in- quiry can scarcely be over-estimated ; for it was scholasticism which worked Christianity into every department of human and intellectual activity, and so leavened them with it, that when its work was done, the intelligence of man was so thoroughly saturated with the Christian view of nature that it could never again forget it. When scholasticism had accomplished its task modern science sprang into being dependent for its very foundation on that Christianity to which it is supposed to be so bitterly hostile.

The organization of Christianity belongs more properly to The consti-

the description of the church, but it is impossible to pass a bs the subject without any allusion, Christianity, which has j;” oon, been described to be a new life which takes an organic form munity, and grows like other living things, cannot help taking to itself an external form or organization which approaches perfection in the proportion in which it is adapted to express the life which it contains. On the one hand, the external form of Christianity must not be confounded with Christianity itself, and on the other it must be remembered that Christianity does, and must from its very nature, embody itself in an external organization. And a two-fold danger arises from the neglect of this principle, when on the one hand the machinery of Christian worship and discipline is mistaken for Chris- tianity itself, and when on the other it is mischievously imagined that the purity of Christianity depends on the realization of an impossible invisibility or absence of organi- zation.

All the various modes of Christian organization or church government profess to imitate the apostolic model, and to be founded on and agreeable to the New Testament Scriptures, and the comparative scantiness of information therein supplied has led to violent controversies upon the subject into which we need not now enter. Many have supposed The syna- | with great probability that the New Testament contains so 8°8”e few

positive instructions on this subject, because the ve apostles did not invent a new organization for Christianity, but simply took over from Judaism that organization for worship and discipline which had no connection with the temple service—the synagogue system—and that the early Christian worship was simply a reproduction of the synagogue service. We may at all events believe that the early Christian organization, if not exactly the same, was modelled upon that of the synagogue, and that the reason why we have so few descriptions and instructions in the New Testament is that the apostles did not require to describe what was so very well known to the Jewish Christians who composed the apostolic church. At first the Christians seem to have shared in the common worship of the Jews and to have engaged at the same

time in services which were peculiarly Christian (Acts ii.

46), and in this way they appeared to be and were called

Christian office- bearers.

CHRISTIANITY

a sect (aipeors) of the Jews. They do not seem to have had any ecclesiastical organization distinctive enough to separate them from the Jews. Founding on these and other facts Vitringa has derived the whole of the Christian machinery of worship and discipline from the Jewish synagogue. But this is going too far. Two influences, so far as we can gather, seem to have combined to modity the early state of matters which we see existing in the first chapters of the Acts of the Apostles, and these were the hatred of the Jews and the entrance of Gentile Christians. These two circumstances led to the introduction of a new church organization distinct from the Jewish and more suited to the requirements of Christianity. This early Christian organization, whose growth can be obscurely traced in the New Testament, is characterized by two special features. It was evidently founded on and in many respects analogous to the Jewish religious community, and the constitution was thoroughly democratic.

When Christianity arose, Palestine, and indeed the whole of the civilized world where Jews had penetrated and settled, was covered with a network

of synagogues in con- stant correspondence with each other. The synagogue system was an organization for public worship, but also had to do with the lives and conduct of the worshippers, and possessed quasi-judicial functions. The worship of the synagogue was not sacrificial, like that of the temple. It was simply devotional, consisting in prayer, praise, reading, and preaching, and was regulated by a fixed liturgy. The synagogues were ruled by a variety of office-bearers. In the first place, there was commonly a college of elders, with the chief of the synagogue at their head. These elders had a variety of names—almost all of the designations given in the New Testament to the Christian office bearers are used to denote these Jewish Z'Kenim. These elders were the real rulers; they had the power of excommunication, and superintended the worship and charities of the syna-gogue. Besides these elders there was an officiating minister who was the delegate of the congregation ; the rules which Paul laid down to be observed in the choice of a bishop almost exactly correspond to the conditions to be satisfied in the election of the Sheliach. The lowest class of office-bearers were the ordained servants or ministers of the synagogue, who are sometimes called the young men, and who like the Sheliaeh and the Z'Kenim were ordained by laying on of hands. In this synagogue system, with its simple devotional worship, its office-bearers to preserve discipline and encourage the exercise of charity, the early Christians found an organization ready to hand which they could at once take advantage of and either adopt or at least copy in important details.

All throughout the New Testament we are reminded that the office-bearers exist for the community and not the community for the office-bearers, and this truth is enforced with emphasis when the diversity of office in the Christian church is made to depend upon diversity of gifts (Eph. iv. 4-16), and upon the appreciation of those gifts by the Christian community testified to in the process of election.

We get these two primary ideas therefore about the early Christian community, that possession of office meant the possession' of gifts suitable for the edification of the community, and the recognition of this fact by the people. In the New Testament the ordinary office-bearers in the Christian communuity have a variety of designations. They are called mpoiorapevor, mpecPvrepot, elo KOTOL, moy.eves, and iyovpevor; but all these names

are used evidently to express the same kind of officers, for they are continually used interchangeably the one for the other. In the earlier times of Christianity the service was probably

very simple, and the meetings were held in the houses of

the first converts or of the officers of the little Christian

community. In an old liturgy we find a rubric enjoining the deacons to order all mothers to take up their infants at a peculiarly solemn part of the worship, which shows us a picture of an early Christian assembly with the babies crawling peacefully over the floor during the greater part of the service.

Many controversies have arisen about the relation of these office-bearers to the community on the one hand, and to the apostles on the other. As the New Testament writings do not give us more than passing allusions to the mode in which the government of the Christian community was carried on, and describe it in action rather than give a detailed account of the principles on which it was founded and the way to apply them in practice, we may be expected to find there descriptions of the Christian organization at various stages of early development. Some have believed, not without great probability, that we have in the account of the choice and consecration of the seven men (Acts vi. 1—6) the beginning of the Christian organization on a distinct and separate basis of its own, and that these seven men were the first regularly chosen office-bearers in the early Christian community. These seven men were chosen to take charge of the charities of the small Christian com- munity, and it is not difficult to see now from this how they came to rule the community. We find no trace of a distinct and separate election of elders or pastors ; and it is worthy of note that the special service to which these men were appointed, viz. to take charge of the poor, is the work which we find the elders engaged in on the first occasion on which they are mentioned (Acts xi. 29-30). Habitual almsgiving was regarded as a religious service of no ordinary significance, and was specially enjoined on all true believers, and the men appointed to take charge of this must have held a very high position in the church. It is evident, besides, that the

superintendence of the charities involved a certain amount of disciplinary contro!, and so the other duties of the office-bearers in the Christian church naturally clustered around this one. The recipients of charity were to be suitable persons (1 Thess. v. 12—15, 1 Tim. v. 9—16); and we can easily see how gradually the benevolent oversight passed over into the rule of discipline, until men originally elected to regulate the benevolence of the community became the rulers of the church.

But whatever the earliest office-bearers were, and however they were chosen, it seems evident that their special function was to rule or to exercise discipline rather than to teach. In the apostolic church there seem to have been two kinds of teaching recognized, the apostolic announcement of the evangel and the preaching of the word. The latter was evidently at first open to all and sundry who had or who thought that they had the gift, and the only restriction placed upon indiscriminate exhortation was the command forbidding women to speak in public. The gift of preaching or exhortation was looked upon as a gift of the Spinit independent of office ; and the earliest office-bearers were men who ruled rather than men who taught. Open preaching continued for a long time in the post-apostolic church, and is distinctly recognized in the so-called Apos- tolic Constitutions ; but there are evidences in the New Testament that the practice had its inconveniences and was discouraged by the apostles. James warns heedless preachers that they take great responsibility upon them, and shall receive the greater condemnation (Jas. ill. 1), and Paul in several passages takes notice of the irregularities and unedifying confusion attending the practice. Hence we find the function of instruction at an early period engrafted on that of rule, just as the function of rule had grown out of that of oversight of the distribu- tion of charity; and one of the special qualifications of elders of the church was aptness to teach. In the

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Epistles to Timothy we even find traces of a plan for giving a special education and training to young men who wcre set apart to prepare

themselves for the office of elders who were to teach. In the post-apostolic Church we find another office quite distinct from the eldership, the office of deacon, ‘The deacons in the post-apostolic church were officers who waited upon the bishop, and many have thought that the election of the seven men was really the election not of elders but of deacons; but there seems no reason to The real warrant for the existence of the diaconate consists in the fact that the office and duties of the deacon correspond very nearly to those of the “‘ministers” of the synagogue, and also in the many scattered references in the New Testament to the existence of “young men” (one of the technical terms for the synagogue deacons), who waited upon the apostles. To sum up then, the office-bearers in the early Christian community were men selected by the voice of the congregation, and confirmed by the apostles, to administer the charities of the community; and to this

primitive function there was added soon after the duty of

oversight, leadership, or rule, and somewhat later the duty of providing for the proper teaching of the people.

The relation of the apostles to these office-bearers and to the Christian community is a problem not without diffi-

culties. Apostle primarily denotes one who is sent on a special mission, and in the Septuagint is used to translate

the Hebrew Shaluach, meaning one who has a special com- mandment from God. The word was in common use among the Jews to denote a special messenger and more especially Thus the Jews who were sent from Palestine to stir up the foreign synagogues against the Christians are called apostles. All these ideas help to show us what the Christian apostles were. It should be remembered, however, that the term apostle is used in its Christian sense in two ways at least, in a wider and in a narrower sense. Jn the narrower and more strictly techni- cal sense the apostles were the eleven whom Christ chose to be special witnesses for Him because they had been with Him from the beginning, together with Matthias, selected by the apostles to fill the place of Judas before the descent

messengers sent on foreign missions.

of the Holy Spirit, or as some with more probability think, Paul, who was selected for this place by Christ Himself.

On the other hand, many others are called apostles who did

uot belong to this company,—Barnabas, xiv. 14), Andronicus and Junias (2 Cor. viii. 23> Pin, 25). Testament use of the term makes it somewhat difficult to speak with anything like precision of the relation in which the apostles stood to the office-bearers and members of the early Christian community. But one or two statements enable us to see what were the functions of the apostles strictly so called. It is said, for example, that Christians are built upon the foundation of the apostles and prophets, Jesus Christ Himself being the chief corner-stone (Eph. ii. 20), and the capacity of the apostles to act in this way as a foundation is explained by passages which seem to say that the qualifications for apostleship were—to have been with the Lord from the beginning, to have seen and recognized Christ after the resurrection, to have been witnesses of the ascension, and to have been gifted with peculiar spiritual gifts. And we may say generally, that just as the prophets of the Old Testament were the links between their own generation by their speech, and between future generations by their writings, and the Saviour that was to come, so the apostles were the links between the first generation of Christians by their presence and influence, and between all succeeding generations of Christians by their writings, and the Saviour who had come, They were to serve as the connection between the first generation of Christians and Jesus, and were to have

for example (Acts (Rom. xvi. 7), and others

This vagueness in the New

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no successors but the writings of the New Testament canon, which has taken their place and done their work for all succeeding generations.

The relation of the apostles, therefore, to the primitive church was altogether unique, as indeed is implied in their name ; and when they act or give official advice apart from their apostolic office, which they did in certain cases, they do so as elders chosen to act along with the other elders who did not possess apostolic gifts. If these views are correct the autonomy of the early Christian communities was complete during the lifetime of the apostles, aud was quite independent of the apostolic office and authority.

This thought has an important bearing on the history of the growth of the Christian government. In the 5th and 6th centuries we find that the government was episcopal, and that the principles on which it rested were very different from those which lay at the basis of the government of the Christian community during the apostolic times. The identity of the terms bishop and presbyter within the apostolic church is now so universally admitted by scholars that the sole question really is; When did bishops begin to exist as separate and superior officers? and the dispute becomes one of historical facts rather than dogmatic theories. According to one account the episcopate became the form of the government about the year 70 A.D., to ineet and supply in a legitimate way a want which, if not supplied, might have caused the ruin of Christianity ; and according to another and more probable theory, the episcopate in the strict sense of the word was not established until the 3d or 4th century. It arose during a panic, and wag really a false development of the primitive government, and sanctioned neither by scripture nor by the necessities of the times. Of course the discussion is very much mixed up with the question whether the apostolic office was or was not a permanent one in the Christian church.

According to the one theory, the year 70 A.p. may be taken as the turning point. In that year Jerusalem was destroyed and the Jewish church of Jerusalem rudely shaken, and by this time John only of the apostles remained alive, and he had already left Jerusalem. It was at this time, according to several scholars, that the episcopate arose to take the place of the apostolate and preserve the church from breaking up into several small sects when no longer governed by the apostles and not yet in full possession of the New Testament canon. Apart from the his. torical evidence to be urged in support of this theory, its chief strength lies in the mere assumption that the presby- terian rule of the apostolic church was unfit to carry on the

government when unsupported by the authority of the apostles, and had to be supplemented by an episcopate, When examined, the historical proofs for this state of affairs are not very satisfactory. We certainly soon find men who are called bishops distinct from the other elders, and are superior to them; but the name and the duties which belong to them appear to be not so much those which pertain to a bishop in the episcopal sense of the term, but rather those which are performed by a miuister or preaching elder in the modern Presbyterian organiza- tion. In the early church the first convert, the best speaker, he whom the apostle had made his friend during his brief stay, would naturally be elected to preside at the meetings of the college of the elders who ruled the affairs of the community, and to represent it at conferences with other communities, and would naturally be invested with the name which denoted special oversight. And the extension of the church would naturally involve a further development of this process. When one church be- came too small, another was built, and a presbyter sent from the first congregation to work there under the super- intendence of his bishop, and so on until the minister or

The growth |

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presiding elder of the earliest planted or mother chureh became the perpetual president or overseer of various depen- dent congregations. But this is very different from the theory which afterwards became dominant in the church, and fails to account for the origin and almost universal supremacy of episcopacy. Perhaps of all the accounts which have been given of its origin, that which connects it with

tion, of pagan philosophy, and of immorality entered into Cliistianity and tended to corrupt it.

One of the earliest causcs of the corruption of Chris- tianity was the attempt to translate the Christian kingdom of God into a visible monarchy in which the saints inherited the earth in a literal way. ‘The Church was the more tempted to enter into this course during the period

Montanism the disturbances engendered by Montanism is the most | of the decay of the Roman empire, when civil authority

ag the ‘ satisfactory. While the church was governed in the manner | became very weak and the real rulers were in many cases piscopate.

described above, a wave of religious excitement passed over it, connectcd doubtless in some way with the striking pheno- mena of Montanism and the new prophecy, and character- ized by an overstrained zeal for enforcing discipline in all cases of departure from a high standard of Christian life. It was the peculiar characteristic of Montanism to set forward its prophets as successors of the apostles, having the same gifts from the Holy Spirit, and sent on a similar message of instruction to the Christian church. They uttercd prophecies which were deemed supplementary to tlic revel- ation contained in the Old and New Testaments, and they did not scruple to set aside the authority of the regularly ordained officials of the church in order to execute the behests of a supposed spirit of prophecy. And thus the Christian communities were everywhere burdened by the presence of ignorant intolerant fanatics, who insisted that all their fellows should follow the dictates of their narrow and ignorant conscience, and who backed up this unwar- ranted interference with Christian liberty and responsibility by claiming to hold the place and exercise the powers of inspired successors to the apostles. It was at this juncture, according to a not improbable theory, that Cyprian of Carthage was able to popularize and gain acceptance for a theory of Christian organization which had been slowly growing up within the church, and which is now known as Episcopacy. Cyprian, bishop of a church which more than any other had suffered from the consequences of Montanist excesses, was the founder of a revolution of a kind which has been frequently repeated in the political world. Montanism and its after wave had influenced in an especial way the minor clergy and the more fanatical laity. Cyprian, like. many a succeeding absolutist, seems to have subverted the aristocracy of a presbyterate infected with Montanism by

persuading the people to make common cause with the bishop. He promised deliverance from arbitrary and unofficial successors of the apostles by boldly setting forth the episcopate as the true successors of the apostles. He transferred, in all sincerity, to the episcopate all the powers and gifts laid claim to by the Montanist prophets, and at the same time showed the people how easy the yoke of a leyvitimate monarchy was when compared with the lawless rule of a mob of self-anointed tyrants. From Cyprian's time onwards the whole constitution of the church became changed, and the foundations of what ultimately became Ultramontanism were laid. The epis- copate claimed and exercised as part of its official duties all those gifts of rule and special inspiration which the Montanist prophets had laid claim to. The bishops laid claim to powers of rule over the Christian community not as chosen representatives of the Christian people, but as the official representatives of the apostles.

the principal clergy of the place. The consciousness of power inspired a desire for its insignia, and soon the bishop and superior clergy adorned themselves in the official robes of Rome's municipal and provincial officers, This whole tendency received a great impulse during the pericd that Rome was abandoncd by her emperors, and when the chicf citizen in the imperial city was undoubtedly the Christian bishop. How all this tended to corrupt Christianity is very apparent. In the first place it generated the idea that the Christian kingdom is a visible monarchy and that its marks are such as can be seen; and it led Christians to postpone everything to the earthly aggrandizement of thie church. It translated spiritual forces into mechanical and physicalequivalents. The veryterm spiritual, which belongs to the affections and emotions and thoughts and will, to the whole inward life, was used to denote whatever belonged to the church or the clergy. Land became spiritual when it passed into the hands of the bishops ; men were spiritual if they were servants of the church ; things were spiritual if they were church property. 'There resulted, in short, a gradual coarsening of ideas, and all that was most inward, hidden, and sacred was forgotten in the strife for worldly position and power and wealth. On the other hand, this tendency worked a good deal deeper. Worldly men who found their way into the ministry were tempted to favour any kind of superstitious crror that tended to bring them profit and power. 'The people were often dis- posed to fancy that the priests could serve God in their stead, and that there were

mysteries in religion which the priests understood, but which the laity necd not know any- thing of and ought not to inquire into. Hence they were ready to follow blindly the guidance of the priests in reli- gious matters, just as a man trusts his legal concerns to his lawyer, doing what he directs and not considering it neces- sary himself to study law. Ambitious and worldly-minded rulers, too, are generally glad to make use of religion as an instrument for securing the submission of the people to tyrannical oppression, and for aiding their ambitious views when they seek to subdue their neighbours under the pretext of propagating the true faith. Then again, this idea tends to breed false views of Christian unity. It leads men to think that they cannot be true Christians unless they belong to one community which is visible and uni- versal. And this idea tends to keep up and intensify other errors. For if a man is convinced that all Christians are bound to belong to some one community on earth, he will dread nothing so much as separation from that church, whatever it may be, which he considers as having the best claim to be that one community.

Many corruptions of Christianity have been either intro- duced or favoured and kept up by moral corruption in the

Thecorrup- It only remains to allude briefly to the corruptions of | members of a Christian Church. For it belongs to the true tiosof Christianity. It has been already stated that Christianity | gospel to purify and also to elevate the moral character. Chris- had a fourfold conflict to maintain with Judaism, Rome, | Hence there is a complete and constant opposition between Manity. Gnosticism, and an cnthusiastic and sometimes immoral | genuine Christianity and all the evil and base propensities pietism. If we add to these pagan superstition, we shall | of man’s nature. Every kind of depravity or moral defect have the chief heads of the opposition which Christianity | therefore predisposes men either to reject Christianity had to encounter. After its triumph these sources of anti- | altogether, or else to introduce or to accept some erroneons Christian action still remained to be contended against, | views of it. And there is no kind of religious corruption and. became the chief springs of its corruption. The spirit | against which men are usually less on their guard. They of Judaism, of Roman worldly policy, of pagan supersti- | are well aware, indeed, that there is a danger of imen’s

falling into sin in violation of the precepts of religion, but they are too apt to think that a man who has embraced a true faith will therefore be made a good moral man. This erroneous idea appears in its most extreme form in the views of those who have been called Antinomians, and who have appeared in all ages of the church from apostolic times down to our own day. ‘They appear to believe that who- ever has faith is thereby lifted into a new life to which the moral laws of the old life are inapplicable, and are there- fore privileged to do without censure or danger what others would be condemned for.

Nothing perhaps has tended more thoroughly to corrupt Christianity than the introduction into it of superstitions which are really pagan themselves, or have been suggested by pagan practices. Paganism, unable to oppose Christianity successfully, has done much to corrupt it, and in numberless ways has made inroads upon its purity.

The corruptions which entered into Christianity from Judaism have already been noticed, and the corrupting effects of the reproduction of the symbolic temple worship and the Jewish idea of priesthood need not be again referred to. It only remains to speak of those corruptions which have arisen from the contact of Christianity with pagan philosophy. The special corruptions which have arisen from this contact have been called heresies, and have been

of various kinds and degrees, but of these we need not speak. A more subtle influence, and one to be even more jealously guarded against, is the transformation of Christianity itself into an intellectual system or philosophy, or the supposition that it is the intellectual side of Christianity which is the only one or the chief. The inevitable tendency of such an impulse is to remove Christianity as a system to be apprehended from the

Christian people, and to reduce their relation to it to a submissive assent to Christian doctrine as that is manufactured for them by the dogmatic machinery of the church. And thus, in place of that whole-hearted trust which waits for personal illumination, there is on the side of the people a blindfold assent, and on the other side the claim to an infallible system of intellectual truth.

The continual and steady growth of Christianity, its vigorous life in spite of various seasons of unavoidable ebb and notwithstanding the presence of all these and other sources of corruption, and its continual rejuvenescence, are no ordinary proof of its divine origin as well as of its supreme fitness for the position in the world which it claims to occupy.

See the various hand-books of church history, especially those of Gieseler, Neander, and Dollinger; Dean Milman's History of Christianity, and History of Latin Christianity ; Dollinger's Heid- enthum und Judenthum; Ritschl's Lntstehung der Alt-Katholisehen Kirche ; Rothe's Anfang. d. Christl. Kirche. (T. Of. da?

CHRISTIANSAND, a fortified seaport town of South Norway, capital of a stift of the same name, on a fiord of the Skagerrack, in 58° 8' N. lat. and 8° 3' E. long. The town, which is surrounded on three sides by water, is defended by the fort of Fredericksholm, at the mouth of a deep and well sheltered harbour. 'The houses, mostly of painted wood, are regularly built, and the streets are wide. Christiansand 'has a fine cathedral, and a cathedral school ; it isa naval station, and the seat of a bishop, and of a stiftsamtmand or governor of the province. The principal branches of industry are tanning, tobacco-manufacture, ship-building, dyeing, and brewing, and the exportation of timber, pitch, skins, copper and iron, fish, and lob- sters. The mackerel and salmon brought to the harbour are packed in ice on their arrival, and shipped mostly to England. The number of fresh mackerel exported in 1874 was 897,110, value £5441, inclusive of the expense of ice and packing ; of salmon, 209,131 fb, value £9273 ; of lobsters the number exported was 201,980, The number of British ships in cargo and in ballast at Christiansand in 1873 was 203. The town was founded in 1641 by Chris- tian IV., after whom it was named. In 1807 it was held for a time by the British. Population (1870), 11,468.

CHRISTIANSTAD, a town in the south of Sweden in 56° 2’N. lat. and 14° 9’ E., long., the capital of the laen of the same name, stands on a lake formed by the widening out of the Helge River, in a swampy situation, about ten miles from the shores of the Baltic. At the mouth of the river is the village of Ahus, the port of Christianstad. The town of Christianstad, which consists chiefly of wooden structures, contains a fine church, a high school, and an arsenal, and is the residence of the chief governor of the laen. The manufactures are leather, woollen goods, gloves, and tobacco ; and there is some trade in corn. Christianstad was founded and strongly fortified in 1614 by Christian IV. of Denmark ; in 1658 it was ceded to Sweden at the peace of Réskilde ; in 1676 it was taken by Christian V. ; but in 1678 it was again acquired by Sweden. Here began the revolution that was the means of establishing the power of Gustavus III. in Sweden. Population, 6599.

CHRISTIANSUND, a seaport town on the west coast of Norway, in the amt of Romsdal, 85 miles W.S.W. of [

Trondhjem, in 63° 3’ N. lat. and 7° 40’ E. long. It is built on three small islands, by which its harbour is enclosed. The chief exports are wood, fish, and fish products. Till 1742 Christiansund was called Lille-Fosen. Population,

5709,

CHRISTINA (1626-1689), queen of Sweden, was the second daughter of Gustavus Adolphus and Mary Eleanor of Brandenburg. Disappointed in his hopes of male off- spring, her great father reared her in virile fashion, and left her, on his departure for Germany (1630), in the hands of Axel Oxenstiern, the famous chancellor, and of Johannes Matthiz, his own almoner, who was to ground her in sciences and in Latin and Greek.

The battle of Liitzen placed Christina on the throne in her sixth year. She was proclaimed queen without delay, but the government was vested in a council of regency, com- posed of the five chief dignitaries of the kingdom, with Oxenstiern at their head. Placed under the care of her aunt Catharine, the countess-palatine, the little queen made rapid progress in the direction indicated by Gustavus. At ten years old she dressed usually in boy’s clothes,

and was wont to hunt and to go long journeys on foot and on horseback ; and she found means, in the midst of these occupations, to acquire several sciences and modern languages, in addition to the classical tongues. In 1636 Oxenstiern returned from Germany, and again assumed the direction of affairs ; and from him, her father's friend and minister, Christina received the ablest lessons in state-craft and the art of government that the age could furnish. At sixteen, the confidence reposed in her was such, that she was generally solicited to enter on the exercise of her functions as queen regnant. This proposal she declined, however, nor would she listen to any renewal of it till two years later (1644), when the conduct of the state was placed in her hands. For a time all went well. The members of the council of regency were confirmed in their places ; the kingdom was flourishing within and without ; the war with Denmark and Germany promised to bear good fruits. Christina, however, had determined on peace; in this she was opposed by Oxenstiern; but during the following year a treaty was signed with Den- mark exceedingly advantageous to Sweden. Germany was

not so easily dealt with ; Christina was compelled to form a secret conspiracy against her own ministers; and by her efforts, ably seconded by those of Adler Salvius, a young diplomatist to whom she had entrusted the affair, the peace of Westphalia was concluded (1648), and the Thirty Years' War was brought to an end.

The eyes of Europe were now fixed on the young queen. Offers of alliance came to her from all quarters—from Holland and Spain, from England and France. She continued for some time to deserve the esteem with which she was regarded, reforming abuses, filling the treasury, and encouraging arts and commerce to the utmost in her power. It was the geueral wish that she should marry, and many suitors were proposed. Christina excused herself in an epigram ; and to rid herself of further importunities she named her cousin Charles Gustavus her successor, present- ing him in that capacity to the assembled estates in 1649, and in 1650 she solemnly took to herself the title of king.

At this time the change would seem to have come upon Christina's conduct that was to determine so much of her subsequent career, induced apparently

by the maxims of a certain Bourdelot, a French physician in her employ. The practice of a cynical epicureanism became her only occupa- tion, The reign of favourites began; and with it the welfare of the kingdom commenced to decline. Honours, dignities, and treasure were lavished on the most worthless of men; and discontent grew rife everywhere beyond the palace. Christina was alarmed, and had thoughts of abdication (1651); but her designs were vigorously opposed by Oxenstiern, and for a while she yielded to the pressure brought to bear on her by the chancellor and his party. The favourites (among whom were Whitelock, Cromwell's envoy, Pimentelli, the Spanish ambassador, and Chanut, the representative of France) were kept in the background, and Bourdelot, the master cynic, was sent out of Sweden. Christina encouraged the presence of artists and men of science; Descartes, an exile from his native land, was received by her with great consideration ; she made large purchases for the Swedish museums; she corresponded with Vossius and Salmasius, with Puffendorf aud Grotius, with Naudé and Bochard ; she did her best to rule and to be respectable. But she was weary of the roughness and coarseness of the land of her birth ; she longed for freedom and change; she was conscious, more- over, of her own gradual degradation in the eyes of the subjects she despised. 'The conspiracy of Messenius, the chiefs of which perished on the scaffold, gave her an excuse and the opportunity she had long desired. In 1654 the estates were convoked at Upsala, and she resigned the crown to her cousin Charles Gustavus.

She had reserved to herself her own.independence, an absolute authority over such of her subjects as should accompany her, and the revenues of Pomerania and Mecklenburg, with those of several Swedish provinces. Quitting the habit of her sex, and taking the words Fata viam invenient as a device, she left her kingdom, traversed Denmark and Germany, and established herself at Brussels. Here she remained for nearly a year, signalizing her sojourn by the private renunciation of Lutheranism, which she afterwards solemnly and publicly abjured at Innsbruck. From Innsbruck she went to Italy. She entered Rome on horseback, was received, confirmed, and baptized Alex- andra by Alexander VII, and was lodged in the Palazzo Farnese, where she surrounded herself with artists and amorists, with philosophers and scientific mountebanks. In 1656, having quarrelled with some of the College of Cardinals, she made her first trip to France, where

she had much success as a spectacle, called on the king at Compiégne, was lodged at Fontainebleau, and stayed for some time in Paris. She was most gracious with

the men of letters and science, but she outraged all the women, by her expressions of contempt for their sex and themselves (which called forth many illiberal remarks concerning her spare figure and humped shoulder), and declared that Ninon de l'Enclos was the only one of them worth her regard. She also attempted to instil a few of her own political theories into the bosom of Mazarin ; but that subtle diplomatist resisted, and when in the following year, after a journey to Italy, she attempted to renew her visit, he found means to have her detained at Fontainebleau. It was here that, after writing to Cromwell, who would none of her, she caused her favourite Monaldeschi, in re- venge for the betrayal of her secrets, to be put to death by the captain of her guard. The public indignation was great, and she was ordered to leave France. Leibnitz, however, apologized for the crime, and she took no notice of her ex- pulsion till 1658, consoling herself meanwhile with the society of a kindred spirit, Madame de la Suze. In that year she returned to Rome; and the Swedish revenues coming slowly in, Alexander allowed hera pension. In 1660 Charles Gustavus died, and Christina returned to Sweden, to claim the throne she had quitted so lightly and regretted so bitterly. But the Swedes had lost their old reverence for the daughter of Gustavus ; her new religion and her treat- ment of Monaldeschi had made them wary of her ; and she was compelled to sign another and more binding deed of ab- dication, and once more to retreat to Rome. She reappeared in Sweden some six years afterwards; but the exercise of her faith was denied her, and she withdrew to Hamburg, where she begged ijn vain the empty crown of Poland, and whence she made for Rome once more. In that city she lived for some twenty years, quarrelling, intriguing, and collecting, corresponding with men of letters and founding academies, active in the Molinist controversy and in the cause of the Venetians besieged by the Turks, consumed by the desire of that political power which she had thrown away, and endeavouring to assert her vanished influence to the last. She died, with great composure, in 1689, and was buried, under a sonorous epitaph, in St Peter's. Her magnificent library was purchased by Alexander VIII., her collection of antiques and part of her paintings by

Odescalchi, a nephew of the Pope, and the remainder of her pictures by the regent Orléans.

Christina left many MSS., which were collected and published by Archenholtz, librarian to the landgrave of Hesse Cassel, in his memoirs of her life, 4 vols. 4to, 1751.

| Her life was also written by Jacques Lacombe, a trans-

lation of whose work, said to be superior to the original, appeared in London in 1776. See also D'Alembert, Mémoires et Réflexions sur Christine, Reme de Suéde. CHRISTINE DE PISAN (1363-1431), though French by education and renown, was of Italian stock, and was born at Venice. When she was five years old, she went

to her father, a councillor of the Venetian Republic, at

Paris, where he held office as astrologer to Charles V. Educated at that prince's court as completely as the age would allow, at fifteen Christine married Ktienne du Castel, Charles's notary and secretary. After the king's death, her father lost his appointment, and died soon after of grief and infirmity ; and his decease being presently followed by that of her husband, she found herself at five and twenty without a protector, and with three children depending on her for bread. The vexations and discomforts attendant on several suits at law determined her to have recourse to letters as a means of livelihood. Between 1399 and 1405, as she herself declares, without reckoning minor pieces, she composed some fifteen important works. Neither fame nor protection failed her. The earl of Salisbury, in Paris on the occasion of the marriage of Richard II. with Isabella of France (1396), took her eldest son, and reared him as his

own; the boy, after Salisbury's death (1400), being received and nurtured by Philip of Burgundy, at whose solicitation Christine wrote Ze Livre des Faitz et bonnes Meurs du

‘aige Roy Charles. Henry IV. of England desired her to make his court her home, and she received a like invitation from Galeazzo Visconti tyrant of Milan. She preferred, liowever, to sojourn in France, where she enjoyed the favour of Charles VI., the dukes of Berry and Burgundy, the prince of Guienne, and others. Of the circumstances of her death nothing is known. A son of her’s, how- ever, Jean du Castel, is said to have attained distinction as a poet under Charles VII. Christine de Pisan wrote voluminously in prose and verse. Her works are by no means devoid of merit, nor altogether without interest even at the present time, though the language in which they are written is crude and imperfect, and they sin too often on the side of diffuseness. They are principally of a moral character, Christine seldom interfering in the political questions of her age save to clamour for peace and unity. There is no complete edition of her works. One of them, Le Livre des Faitz d’ Armes et de Chevalerie, was translated into English and printed by order of Henry VII.

CHRISTMAS DAY (French, Noél from Dies natalis ; German, Wethnachtsfest; Old Eng. aud Scand., Yule ; Ang.-Sax., Geol), a festival of the Christian church, observed on the 25th of December, in memory of the birth of Jesus Christ. There is, however, a difficulty in accepting this as the date of the Nativity, December being the height of the rainy season in Judea, when neither flocks nor shepherds could have been at night in the fields of Bethlehem.

The Christian communities which keep Christmas (as the Roman Catholic, Greek, Armenian, and indeed all Episcopalian churches, and the Lutherans) would probably agree in laying more stress on keeping a day in memory of the Nativity, than on success in selection of the actual and precise date of the event. Indeed in the parallel case it does not appear that Good Friday and Easter Jose anything of their respective associations from their variableness in different years. Although as regards Christmas an ingeni- ous case on behalf of the month of October has been made out from what is known concerning the course of Abia, (Luke i. 5.) it does not seem possible to arrive at any cer- tain conclusion. By the 5th century, however, whether from the influence of some tradition, or from the desire to supplant heathen festivals of that period of the year, such as the Saturnalia, the 25th of December had been generally agreed upon. Augustine expressly mentions

this date (De Trin. iv. 5); and Chrysostom seems to speak of it as a custom imported from the West within ten years. Before that time it appears to have been kept conjointly with the feast of the Epiphany on the 6th of January. It is gen- erally considered to rank third among the festivals of the church (Easter and Whitsuntide alone being placed above it) and to have a joy peculiarly its own.

In aJl civilized countries the annual recurrence of Christmas has been celebrated with festivities of various kinds. In none, however, was it more joyfully welcomed than in England, where even still the “old honour” has not altogether fled. In that country it was the custom on Christmas eve, after the usual devotions were over, to light large candles and throw on the hearth a huge log, called the Yule Log or Christmas Block. At court, and in the houses of the wealthy, an officer, named the Lord of Misrule, was appointed to superintend the revels; and in Scotland a similar functionary used to be appointed under the title of the Abbot of Unreason, till the year 1555, when the office was abolished by Act of Parliament. The reign of the Lord of Misrule began on All-Hallow eve, and lasted till Candlemas day. The favourite pastimes over which he presided were gaming, music, conjuring, dipping for nuts

and apples, dancing, fool plough, hot cockles, blind-man’s buff, &c.; and various Christian preachers (as, for instance, St Bernard) have taken occasion to remonstrate with their flocks for paying too great attention to the festive character of the season, and too little to its more solemn aspects. The favourite dishes for breakfast aud supper at this season were the boar’s head with an apple or orange in the mouth, and set off with rosemary, plum-pudding, and mince pies. The houses and churches were decked with evergreens, especially with niistleto, to which a traditionary sacredness has attached since the days of the Druids.

As might be expected, this festival has been illustrated by many fine and admirable outpourings of devotion in the way of services, and of Christian oratory, hymnology, and art. The services must be sought in the liturgies and office-books of different communities. Among preachers who have dwelt with striking impressiveness on the ideas and associa- tions of this

sacred season may be specially named St Leo, St Chrysostom, St Bernard, Matthias Faber, Bourdaloue, Bishop Andrewes, Dr Mill, Dr Newman. Medieval Latin hymns may be found in Archbishop Trench's Sacred Latin Poetry (London, 1849) and in Daniel's Zhesaurus Hymnologicus. Many of these have been paraphrased with great effect by German Lutherans, and of late years, with considerable success, by English compilers of hymn-books, Among the most popular original contribu- tions to the English hymns of the season must be men- tioned those of Charles Wesley, Tate, Byrom, Heber, and Keble. The Nativity has been represcnted by a host of great painters; and it is the inspiring theme of a large part of Handel's greatest triumph, the Afessiah.

Discussions of the questions concerning the actual datc of the Nativity and other matters respecting Christmas may be found in Tillemont, Histoire de V Eglise (tome i.); Martigny, Dictionnaire des Antiquités Chrétiennes (Paris, 1865); Caspari, Ohronologieal and Geographical Introduetion to the Life of Christ (Engl. trans. 1876) ; Wordsworth's Greek Testament (1872); Greswell, Dissertations (1840); Pearson, Afinor Works, vol. ii. (1844); Ellicott, Lectwres on the Life of Christ (1861); Smith and Chectham, Dictionary eo Antiquities (1876); A. Macmillan's Greek Testament

76.

CHRISTOPHER, Saint, according to the legend, was a Christian martyr of the 3d century, and a native of Palestine or of Syria. Glorying in his gigantic strength and statura, he resolved to serve none who owned a superior. His first master was more powerful than any man, but it soon appeared that he was exceedingly afraid of the devil. The devil therefore became the master of the future saint. But even he was found not to be superior to fear ; for he trembled before the image of Christ. His servant consequently deserted him, and, meeting a hermit who told him of the Saviour, was baptized, and undertook as penance to carry Christian pilgrims over a bridgeless stream. At Jength a little child requested his aid, but the burden proved more than the giant could support. The child was Christ; and thus is explained the name Chris- topher (Christ-bearer). As a sign, Christopher's staff, being planted, grew into a palm-tree covered with fruit and foliage,—a miracle which effected the conversion of thousands. In consequence, tle prefect

Dagnus seized him, and after cruelly torturing him commandcd him to be shot with poisoned arrows. These, however, instead of harming him, rebounded and wounded his persecutors. One entered the eye of the prefect ; and in pity Christopher sacrificed himself to save his enemy. He was decapitated, and his blood healed the wound. The festival of St Christopher is celebrated by the Roman Catholic church on the 25th July, by the Greek church on the 9th May. St Christopher was invoked as a defence against pestilence, and in order to frighten away the spirits who watch over hidden treasure.

CHRISTOPOULOUS, ArHanastas (1772-1847), a modern Greek poet, was the son of a Greek priest settled

in Wallachia. He studied at Buda and Padua, and became teacher of the children of the Wallachian prince Mourousi. After the fall of that prince in 1811, he was employed by Prince Caradja, who had been appointed hospodar of Moldavia and Wallachia, in drawing up a code of laws tor that country. On the removal of Caradja, he retired into private: life and gave himself to literature. He wrote drinking songs and love ditties which are very popular among the Greeks. He is also the author of a tragedy, of Parallela (a comparison of various systems of govern- ment), of translations of Homer and Herodotus, and of some philological works on the connection between ancient and modern Greek.

CHROMIUM, one of the metallic chemical elements, so called from the Greek ypdye, colour, in allusion to the fine colours of its compounds ; symbol Cr, atomic weight 52-4. It does not occur in the free state or very abundantly in nature, It is a constituent of the minerals chrome iron- stone, Cr,FeO,; chrome-ochre, Cr,O, ; ouvarovite, or chrome garnet, Si,CaCr,O ,,; crocoisite, PbCrO,, in which it was discovered by Vanquelin in 1797; of Vanquelinite, a chromate of lead and copper ; and of some irou-ores and meteoric irons; and it is the cause of the colour of green serpentine, pyrope, and the emerald. The properties of chromium vary much according to the method of its pre- paration. By Wohler’s process of reducing the sesquioxide with zinc, it is obtained as a shining green powder, of specific gravity 6°81, which tarnishes in the air, and dissolves in hydrochloric and

warm dilute sulphuric acid, but is not acted on by strong nitric acid. Deville, by intensely igniting chromic oxide with sugar-charcoal in a lime crucible, procured chromium of a bright steel-grey colonr, very hard, capable of a high polish, less fusible than platinum, and of specific gravity 6. Crystallized chromium obtained by Frémy was unaffected by the strongest acids.

Chromium forms three series of compounds :—the chro- mous, typified by the chloride, Cr,Cl,, in which chromium is a dyad; the chromic or sesqui-compounds, such as the oxide, Cr,O,, and chromic chloride, Cr,Cl,, in which the metal plays the part of a tetrad, or pseudo-triad; and chromate compounds, in which it is a hexad, exemplified by the hexafluoride, Cr, the oxychloride, CrO,Cl,, the anhy- dride, CrO,, and potassium chromate, K,CrO,. In the hypothetical perchromic anhydride, Cr,O,, chromium may be regarded as an octad.

Chromous salts resemble the ferrous, in forming a dark- brown compound when nitric oxide is added to their solutions. The anhydrous protoxide, CrO, has not been obtained; and the hydrate 2CrO.H,0, precipitated of a brown colour from solutions by potassium hydrate, is a very unstable body. ‘The dichloride CrCl, is a powerful deoxidizer ; it forms with water a blue solution, which turns green on exposure to the air,

The salts of the sesquioxide, or chromic salts, have an acid reaction. They are green, or from red to violet in colour. Ammonia precipitates from solutions of the violet salts a grey-blue hydrate, and from solutions of the green salts, a grey-green hydrate,—the former precipitate giving a red, the latter a green solution with acids. Potash or soda throws down from solutions of the violet or green salts a bluish-green hydrate, soluble in excess of the precipitant, but reprecipitated on boiling. Accord- ing to Lowel there are four modifications of the hydrate of chrome, two green, one violet-carmine, and a violet- blue, The hydrate can be economically made by boiling two parts by weight of potassium chromate with one of sulphur ; the presence of a little potash assists the opera- tion. Sesquioxide of chromium, Cr,O,, occurs native in argillaceous deposits. It may be obtained in the amorphous state by the ignition of the hydrate, and crystallized by

decomposing potassium chromate with chlorine at a red heat. It can be melted at a high temperature into a greenish-black mass, and is with difficulty reduced by charcoal at an intense heat. A mixture of nitric acid and potassium chlorate converts it into chromic acid. The chromites are a class of bodies in which chromic oxide Cr,O, is united with protoxides, as in the compound Cr,O,, and in chrome ironstone, Cr,FeO, The latter, the most abundant ore of chromium, contains besides iron and chromium variable proportions of magnesium and aluminium, and is isomorphous with magnetic iron ore, Fe,O,, and spinel, MgAl,O,. It is a massive and compact, granular, rarely crystallized, black-coloured mineral, of specific gravity about 4°4, and hardness 5°5. It occurs usually in serpentine, and is found in the Shetland Isles, the depart- ment of Var in France, Volterra in Tuscany, Silesia, Bohemia, Réraas in Norway, the Urals, near Baltimore in the United States, and in many other localities. In 1869 the exports of

chrome ore from Norway amounted to 210 tons. Chrome ironstone can be decomposed in the dry way for analysis by fusion with potassium bisulphate, to which sodium carbonate and then a little nitre are subsequently added. Chromic chloride, Cr,Cl,, can be obtained either in the anhydrous insoluble condition, or as the green hydrated salt, soluble in water. Similar compounds are the fluoride, Cr,F,, the bromide, Cr,Brg, and the iodide, Cr,I,. The sesquisulphates of chromium are the anhydrous salt, Cr,(SO,),, the hydrated salts with 5 and 15 molecules of water, a basic sulphate, Cr,O,.280,, and the chrome alums, of the general constitution Cr,M,'(SO,),, 24H,0, isomorphous with common alum, Certain oxides intermediate between the sesquioxide and trioxide have been termed chromates of chromium.

The trioxide or anhydride of chromium, CrO,, com- parable with sulphuric anhydride, SO,, can be prepared by the action of strong sulphuric acid upon potassium bichromate ; as the liquid cools, the anhydride separates from it in crimson acicular crystals. It can also be obtained by decomposing barium chromate with nitric acid. Chromic anhydride deliquesces in air, and dissolves in water, forming a solution which contains chromic acid ; it is a powerful oxidizer, and acts violently on organic substances, such as alcohol and ether, becoming reduced to the sesquioxide. Dry ammonia gas is converted by it into nitrogen and aqueous vapour. When peroxide of hydrogen, H,O,, is added to a solution of chromium trioxide, an unstable blue compound of probable constitution H,Cr,Og, or perchromic acid, is formed, which dissolves in ether, and is decomposed by potash and soda, but forms stable compounds with ammonia, quinine, and other bodies. Chromic acid, H,CrO,, has not been isolated, and hydrated salts of the type HM'CrO, are unknown. The chromates are a large class of bodies, isomorphous with the sulphates. They are bitter and poisonous salts, mostly of a yellow or red colour, and except those of the alkali metals, and of calcium, strontium, and magnesium, are more or less insoluble in water. Most of the insoluble chromates are basic. 'The chromates of the alkali metals are the neutral or normal yellow salts, M',CrO,, or M',O.CrO,, and the orange-red bichromates, or acid salts, M',0.2CrO,. Potas- sium trichromate, K,0.3CrO,, represents a third series of chromates. With salts of lead, bismuth, and barium, the alkaline chromates give yellow precipitates; with silver salts, a purplish red; and with mercurous salts, a brick-red

precipitate. Boiled with hydrochloric acid they give a green solution of sesquichloride of chromium ; and with sulphurous acid, or with sulphuric acid and alcohol, sugar, and other reducing agents, they yield chromealum. When a chromate is heated with sulphuric acid and common salt, vapours of oxychloride of chromium, or chlorochromic acid,

are produced. Insoluble chromates fused with nitre yield soluble yellow potassium chromate, K,CrO,. This salt is prepared on a large scale by oxidizing chrome-iron ore 1n a furnace, in the presence of carbonate, sulphate, or chloride of potassium, and chalk or lime. The red bichromate or acid chromate of potassium, K,Cr,O,, is made by acidifying a solution of the neutral salt, or by Jacquelin's process, in which chrome-iron ore is ignited with chalk to obtain the neutral chromate of calcium ; this is then converted by sulphuric acid into calcium bichromate, which by double decomposition with potassium carbonate yields the potas- sium bichromate. It melts at a red heat, and at a white heat evolves oxygen, as also when warmed with sulphuric acid. Heated with sulphur or charcoal it deflagrates. The solution gives with sulphydric acid a precipitate of mixed chromic oxide and sulphur. Ammonium bichromate is decomposed on the application of heat into nitrogen, water, and chromic oxide. The oxides and salts of chromium give, in both the inner and outer blowpipe flames, a green bead with borax. Chromium unites with iron and aluminium; and can be obtained combined with mercury by treating a solution of a chromic salt with sodium amalgam. Chromium is estimated gravimetrically in the form of the sesquioxide, or of a lead or barium salt ; volumetrically, by the oxidizing effect of a chromate on oxalic acid, hydriodic acid, or potassium ferrocyanide. The alloy termed chrometsen, containing about three parts by weight of chromium to one ofiron, is hard enoughto serve for cutting glass. An extremelysoft steel can be made by em- ploying it instead of spzegeleisen in Siemens's steel process. Chromium compounds are in request for a great diversity of purposes. Free chromic acid and potassium bichromate are used in calico-printing, and in bleaching tallow and palm oil, The bichromate is also employed for the volumetric estimation of

ferrous salts, in the printing of photographs, and in galvanic batteries ; it has even been used with lead chromate for the adulteration of snuff. It is itself sometimes adulterated with a mixture of sulphate and chloride of sodium, coloured with a strong solution of bichromate. Potassium bichromate in contact with the skin produces dangerous ulcers, and internally it acts as a violent poison. Fused lead chromate is of value in organic chemistry as an oxidizer, and the unfused salt is the well- known pigment chrome-yellow. Chrome-red is a basic lead chromate, Pb,CrO,;. Other pigments are the sesquioxide of chromium, or chrome-green, used in glass-staining, porcelain- painting, and in the printing of bank-notes; Pannetier's emerald green, a hydrate of the composition H,Cr,O,; Leune and Castelhaz's green, another hydrate; G'ucgnet's pigment vert, a basic chromic borate; and Plessy's green, which is a phosphate of chromium. Casali (Gazzetta Chimica Italiana, 1874) recommends for the preparation of an intense green pigment to calcine an intimate mixture of 1 part of potassium bichromate and 3 parts of baked gypsum ; the mass obtained is boiled with water, or treated with hydrochloric acid. The pigment used to pro- duce a pink colour on earthenware is made by heating to redness a mixture of 30 parts of peroxide of tin, 10 of chalk, and 1 of potassium chromate,—the product being powdered and washed with hydrochloric acid. (7.5m. B.)
CHRONICLES, Booxs or. In the Hebrew Canon the Chronicles form a single book, entitled D''D '735, Events of the Times, The full title would be 2°D°'N 35 78D, Book of Events of the Times; and this again appears to have been a designation commonly applied to special histories in the more definite shape—Lvents of the Times of King David, or the like (1 Chron. xxvii. 24; Esth. x. 2, &c.). The Greek translators divided the long book into two, and adopted the title Hapaderdpeva, Things omitted [scil. in the other historical books}, Jerome, following the sense of the

Hebrew title, suggested the name of Chronicon instead of Paralipomenon primus et secundus. Hence the English Chronicles.

The book of Chronicles begins with Adam and ends abruptly in the middle of Cyrus's decree of restoration. The continuation of the narrative is found in the book of Ezra, which begins by repeating 2 Chron. xxxvi. 22, 23, and filling up the fragment of the decree of Cyrus. A closer examination of those parts of Ezra and Nehemiah which are not extracted word for word

from earlier docu- ments or original memoirs, leads to the conclusion that Chronicles-Ezra-Nehemiah was originally one work, dis- playing throughout the peculiarities of language and thought of a single editor, who, however, cannot be Ezra himself as tradition would have it. Thus the fragmentary close of 2 Chronicles marks the disruption of a previously-existing continuity,—due, presumably, to the fact that in the gradual compilation of the Canon the necessity for incorporating in the Holy Writings an account of the establishment of the post-Exile theocracy was felt, before it was thought desirable to supplement Samuel and Kings by adding a second history of the period before the Exile. Hence Chronicles is the last book of the Hebrew Bible, following the book of Ezra-Nehemiah, which properly is nothing else than the sequel of Chronicles.

While the original unity of this series of histories can hardly be questioned, it will be more convenient in the present article to deal with Chronicles alone, reserving the relation of the several books for the article Ezra anp Nruemian. The author used a different class of sources for the history before and after the Exile; and thus the critical questions affecting the Chronicles are for the most part quite distinct from those which meet usin the book of Ezra. Besides, the identity of authorship in the two histories cannot be conclusively demonstrated except by a comparison of results drawn from a separate consideration of each book.

Of the authorship of Chronicles we know only what can be determined by internal evidence. The colour of the language stamps the book as one of the latest in the Old Testament, but leads to no exact determination of date. In 1 Chron. xxix. 7, which refers to the time of David, a sum of money is reckoned by darics [E. V., drams], which certainly implies that the author wrote after this Persian coin had been long current in Judea. But the chief passage appealed to by critics to fix the date is 1 Chron. ui. 19, sgg., where the descendants of Zerubbabel seem to be reckoned to six generations (so Ewald, Bertheau, &c.). The passage is confused, and the Septuagint reads it so as to give as many as eleven generations (so Zunz, Noldeke) ; while on the other hand those who plead for an early date are disposed to assume an interpolation or corruption of the text, or to separate all that follows the name of Jesaiah in ver. 21, from what precedes (Movers, Keil). But it seems impossible by any fair treatment of the text to obtain fewer than six

generations, and this result agrees with the probability that Hattush, who, on the interpretation which we prefer, belongs to the fourth gene- ration from Zerubbabel, was a contemporary of Ezra (Ezra viii. 2). Thus the Chronicler lived at least two generations after Ezra. With this it accords very well that in Nehemiah five generations of high priests are enumerated from Joshua (xii. 10, sgq.), and that the last name is that of Jaddua, who, as we know from Josephus, was a contem- porary of Alexander the Great. 'That the chronicler wrote after the fall of the Persian monarchy has been argued by Ewald and others from the use of the title King of Persia (1 Chron. xxxvi. 23). What seems to be certain and important for a right estimate of the book is that the author lived a considerable time after Ezra, and stood

entirely under the influence of the religious institutions of the new theocracy. This standpoint determined the nature of his interest in the early history of his people.

The true importance of Hebrew history had' always centred in the fact that this petty nation was the people of Jehovah, the spiritual God. The tragic interest which

distinguishes the annals of Israel from the forgotten history

of Moab or Damascus lies wholly in that long contest which finally vindicated the reality of spiritual things and the supremacy of Jehovah's purpose, in the political ruin of the nation which was the faithless depositary of these sacred truths, After the Captivity it was impossible to write the history of Israel's fortunes otherwise than in a spirit of religious pragmatism. But within the limits of the religious conception of the plan and purpose of the Hebrew history more than one point of view might be taken up. The book of Kings looks upon the history in the spirit of the prophets—in that spirit which is still echoed by Zechariah (i. 5, 6): " Your fathers, where are they ? and the prophets, could they live for ever? But my words and my statutes, which 1 commanded my servants the prophets, did they not overtake your fathers? so that they turned and said, Like as Jehovah of hosts thought to do unto us… so hath he dealt with us." But long before the Chronicler wrote the last spark of prophecy was extinct. The

New Jerusalem of Ezra was organized as a municipality and a church, not as a nation. The centre of religious life was no longer the living prophetic word but the ordinances of the Pentateuch and the liturgical service of the sanctuary. The religious vocation of Israel was no longer national but ecclesiastical or municipal, and the historical continuity of the nation was vividly realized ouly within the walls of Jerusalem and the courts of the 'Temple, in the solemn assembly and stately ceremonial of a feast day. These influences naturally operated most strongly on those' who were officially attached to the sanctuary. Toa Levite, even more than to other Jews, the history of Israel meant above all things the history of Jerusalem, of the Temple, and of the Temple ordinances. Now the author of Chronicles betrays on every page his essentially Levitical habit of mind. It even seems possible from a close attention to his descriptions of sacred ordi- nances to conclude that his special interests are those of a common Levite rather than of a priest, and that of all Levitical functions he is most partial to those of the singers, a member of whose guild Ewald conjectures him to have been. To such a man the older delineation of the history of Israel, especially in the books of Samuel and Kings, could not but appear to be deficient in some directions, while in other respects its narrative seemed superfluous or open to misunderstanding, as for example by recording, and that without condemnation, things inconsistent with the Penta- teuchallaw. The history of the ordinances of worship holds a very small place in the older record. Jerusalem and the Temple have not that central place in the book of Kings which they occupied in the minds of the Jewish community after the Exile. J.arge sections of the old history are de- voted to the religion and politics of the ten tribes, which are altogether unintelligible and uninteresting when measured by a strictly Levitical standard; and in general the whole problems aud struggles of the prophetic period turn on points which had ceased to be cardinal in the life of the New Jerusalem, which was no longer called to decide between the claims of the Word of Jehovah and the exigencies of political affairs and social customs, and which could not comprehend that men absorbed in deeper spiritual contests had no leisure for the niceties of Levitical legisla- tion. Thus there seemed to be room for a new history, which should confine itself to matters still interesting to the theocracy of Zion, keeping Jerusalem and the Temple

in the foreground, and developing the divine pragmatism of the history, not so much with reference to the prophetic word as to the fixed legislation of the Pentateuch, so that the whole narrative might be made to teach that the glory of Israel lies in the observance of the divine law and ritual. For the sake of systematic completeness the author begins with Adam, as is the custom with later Oriental writers. But he had nothing to add to the Pentateuch, and the period from Moses to David contained little that served his purpose. He, therefore, contracts the early history into a series of genealogies, which were doubtless by no means the least interesting part of his work at a time when every Israelite was concerned to prove the purity of his Hebrew descent (of, Ezra ii. 59, 63). From the death of Saul the history becomes fuller and runs parallel with the books of Samuel and Kings. The limitations of the author's interest in past times appear in the omission, among other particu- lars, of David's reign in Hebron, of the disorders in his. family and the revolt of Absalom, of the circumstances of Solomon's accession, and of many details as to the wisdom and splendour of that sovereign, as well as of his fall into idolatry. In the later history the ten tribes are quite neglected, and political affairs in Judah receive attention, not in proportion to their intrinsic importance, but according as they serve to exemplify God's help to the obedient and His chastisement of the rebellious, That the author is always unwilling to speak of the misfortunes of good rulers is not to be ascribed with some critics to a deliberate sup- pression of truth, but shows that the book was throughout composed not in purely historical interests, but with a view to inculcate a single practical lesson. The more important additions which the Chronicler makes to the old narrative consist partly of statistical lists (1 Chron. xii.), partly of full details on points connected with the history of the sanctuary and the great feasts or the archeology of the Levitical ministry (1 Chron. xiii, xv., Xvi, XX1i.-XXIX. ; 2 Chron. xxix.-xxxi., dvc.), and partly of narratives of victories and defeats, of sins and punishments, of obedience and its reward, which could be made to point a plain religious lesson in favour of faithful observance of the law (2 Chron, xiii, xiv. 9, sqg.; Xx., xxi. 11, sqg., &e.). The minor variations of Chronicles from the books of Samuel and Kings are analogous in principle to the larger additions and omissions, so that the whole work has a consistent and well-marked character, presenting the history in quite a different perspective from that of the old narrative. Here, then, a critical question arises. Is the change of perspective wholly due to a different

selection of items from authentic historical tradition? May we assume that every- thing which is new in the Chronicles has been taken exactly from older sources, or must we judge that the standpoint of the author has not only governed the selec- tion, but coloured the statement of historical facts? Are all his novelties new data, or are some of them inferences of his own from the same data as lie before us in other books of the Bible? To answer these questions we must first inquire what were the historical materials at his command. The Chronicler makes frequent reference to earlier histories which he cites by a great variety of names. That the names “Book of the Kings of Israel and Judah,” “ Book of the Kings of Judah and Israel,” “ Book of the Kings of Israel,” and “ Affairs of the Kings of Israel” (2 Chron. xxxiii, 18, Heb.) refer to a single work is not disputed. Under one or other title this book is cited some ten times. Whether it is identical with the Midrash [E.V., story] of the book of the Kings (2 Chron. xxiv. 27) is not certain. According to later usage the term Midrash would mean a commentary on the book of the Kings. But it is perhaps as plausible to suppose with Ewald that the book of the Kings was itself called a Midrash or learned compilation.

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That the work so often cited by the Chronicler is not

the Biblical book of the same name is manifest from what is said of its contents. nee: sive work, for among other things it contained genealogical

statistics (1 Chron, ix. 1), and it incorporated certain older

prophetic writings—in particular, the debarim [words or history] of Jehu the son of Hanani (2 Chron, xx. 34, where for “ who is mentioned in” read “ which was copied into ”) and the vision of Isaiah (2 Chron. xxxii. 32),

prophet (2 Chron. ix. 29; xii. 15, &c.). the same reign. or about prophets which are cited in Chronicles were known

to the author only as parts of the great book of Kings, Even 2 Chron. xxxiii, 18, 19, where the English version

departs from the received Hebrew text, but probably

expresses the correct reading,1 seems rather to confirm than

to oppose this conclusion, which is now disputed by very few scholars except in the case of Isaiah's history of The general conclusion is that it is very doubtful whether the chronicler uscd any his- torical work now lost with the exception of the book of

Uzziah, 2 Chron. xxvi. 22.2

Kings. Even his genealogical lists may have been wholly derived from that work (1 Chron. ix. 1), though for these he may also have had other materials at command,

Now we know that the two chief sources of the canonical

book of Kings were entitled Annals |" events of the times fi] of the Kings of Israel and Judah respectively. That the

lost source of the Chronicles was not independent of these works at once appears probable both from the nature of the case and from the close and often verbal parallelism between

many sections of the two Biblical narratives. But while

the canonical book of Kings had separate sources for the northern and southern kingdoms, the source of Chronicles

was a history of the two kingdoms combined, and so, no

doubt, was a more recent work in great measure extracted Yet it contained also matter not

from the older annals, derived from these works, for it is pretty clear from 2 Kings xxi. 17 that the Annals of the Kings of Judah gave no account of Manasseh's repentance, which, according to

2 Chron. xxxiii. 18, 19, was narrated in the great book of

the Kings of Israel, It was formerly the opinion of

Bertheau, and is still maintained by Keil, that the paral-

lelisms of Chronicles with Samuel and Kings are sufficiently explained by the ultimate common source from which both

narratives drew. But most critics hold that the Chronicler

also drew directly from the canonical books of Samuel and Kings as heunquestionably did from the Pentatench, This opinion is probable in itself, as the earlier books of the Old Testament cannot have been unknown to the author; and perhaps the critical analysis of the canonical book of Kings 1s already far enough advanced to enable us to say that in some of the parallel passages the Chronicler uses words which were not written in the annals but by the author of Kings himself. In particular Chronicles agrees with Kings in those short notes of the moral character of individual monarchs which can hardly be ascribed to an earlier hand than that of the final author of the latter book. It is, of course, possible, as Bertheau points out, that the author of the chief source of Chronicles already used our canonical book of Kings 3; and in general the connections of the successive historical books which preceded the present canonical

es 1 Others, followine the Massoretic text; find i l in verse 19 an unknoy Prophet Chozai. So E.V. margin has Hosai. al Zockler and Keil still dissent from the current view.

It must have been quite an exten-

Now it is noticeable that where the Chronicler does not cite this comprehensive work at the close of a king’s reign he generally refers to some special authority which bears the name of a But the book of the Kings and a special prophetic writing are not cited for It is therefore highly probable that in other cases than those of Isaiah and Jehu the writings of

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histories are sufficiently complex to make it very unwise to indulge in positive assertions ona matter in which so many possibilities may be suggested. Those critics who have a low opinion of the historical value of the Chronicles, and especially Graf, are ready to regard the earlier canonical books as the chief source of the work, and to suppose that the author seldom had authority for his additions to Samuel and Kings; while Keil, on the other hand, is anxious to prove that the earlier canonical histories were not used at all, and so makes the most of the value of the special sources open to the Chronicler. The truth probably lies between these two extremes.

The close and frequently verbal coincidence of the text of so many passages of Chronicles and the earlier books raises a presumption that in general the later author copied his sources with great fidelity. In other cases diversities of statement occur from which inferences unfavourable to the Chronicler have often been drawn. It must, however, be remembered that even copyists at that time were allowed a degree of freedom which modern writers would not venture to exercise, and that different recensions of the same book —for example the extant Hebrew text of Samuel and that which lay before the Greek translators—frequently varied not only in points of expression but in names and numbers, in the addition or omission of details and explanatory remarks, and even in larger matters. Of course such variations must be more numerous and important in the case of parallel narratives which are derived only in an indirect way from the same original sources. If proper weight is allowed to these considerations we must agree with Bertheau that “critics ought not to have charged our author with intentional distortions of the narrative or with inventing false statements; evidence to justify such charges cannot be adduced.” Full proof of the soundness of this observation cannot be given without a long discussion of details. Asan example it may suffice to take the tendency to exaggerate which has been traced in the larger numbers of Chronicles (1 Chron. xxi. 5 compared with 2 Sam, xxiv, 9, 1 Chron. xxi. 25 compared with 2 Sam. xxiv. 24, and so forth). It may fairly be said that such larger numbers are in general characteristic of a later record, But they prove little as to the idiosyncrasy of the Chronicler, and cannot with any certainty be laid to his charge as an individual, when we find that in the Masgoretic text of 1 Sam. vi. 19 the original number 70 has increased to 50,000. The tendency of numbers to grow in successive

transcriptions is one which criticism roust always keep in view, and which, doubtless, was at work before as well as after the time of the Chronicler.

Variations which can be distinctly connected with demonstrable personal peeuliarities of the writer or with the specific object of his work belong to a different category. But here also great caution must be exercised, For

example, no part of the narrative has been more suspected

than the captivity and repentance of Manassech. It is argued that the author's theory of Divine retribution made it incredible to him that a wicked and unrepentant king could enjoy the long reign granted to Manasseh. But it is quite plain from 2 Chron. xxxiii. 18 that this narrative existed in the sources which lay before the writer, and the Assyrian inscriptions have shown that what is said of the captivity of the Judean king is in perfect accordance with the state of affairs in the Assyrian empire at the time (Schrader, Keilinschriften und A. T., p. 238, sqq.).

In general, then, it seems safe to conclude with Ewald, Bertheau, and other cautious critics that there is no founda- tion for the accusation that the Chronicler invented history in the interest of his parenetic and practical purposes. But

on the other hand it is not to be doubted that in shaping

his narrative he allowed himself the same freedoms as were

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taken by other ancient historians, and even by early copyists, and it is the business of historical criticism to form a clear conception of the nature and limits of these freedoms, with a view to distinguish in individual passages between the facts devised by the Chronicler from his written sources and the literary additions, explanations, and influences which are his own. In particular :—

1. His explanations of verbal or material difficulties must be critically considered. Thus even Keil admits an error in 2 Chron. xx. 36, 37, where

the Tharshish-ships, that is ships fit for a long voyage, which Jehoshaphat built on the Red Sea (1 Kings xxii. 48), are explained as ships voyaging to Tartessusin Spain. Such criticism is especially necessary where remarks are introduced tending to explain away the differences in religious observances between early times and the period of the Chronicler, Thus in 1 Chron. xxi. 28, sqq., an explanation is given of the reasons which led David to sacrifice on the threshing-floor of Ornan instead of going to the brazen altar at Gibeon. But it is certain that at the time of David the principle of a single altar was not acknowledged, and therefure no explanation was required. In 1 Kings iii. 3, 4, Gibeon appears only as the chief of many high-places, and it is difficult to avoid the conclusion that the Chronicler has simply inferred from the importance of this sanctuary that it must have possessed a special legitimation, which could only consist in the presence of the old brazen altar.

2. A certain freedom of literary form was always allowed toancient historians, and need not perplex anyone who does not apply a false standard to the narrative. ‘To this head belongs especially the introduction of speeches like that of Abijah in 2 Chron, xiii. This speech is no doubt a free composition, and would be so understood by the author’s contemporaries. By such literary devices the author is enabled to point a lesson without interrupting the thread of his narrative by reflections of his own. Similar remarks apply to the-Psalm in 1 Chron. xvi., which is made up of extracts from Psalms cv., xevi., evi.

3. A usage not peculiar to the Chronicler among Old Testament writers, and which must be carefully taken into account by the historical critic, is that of giving statistical information in a narrative form. This is the principle which underlies many genealogical lists of the Bible, and which alone explains the variations between different accounts of the genealogy proceeding from a_ single ancestor. Information as to the subdivisions of clans, the intermingling of populations, and the like, is thrown into a genealogical form. Thus the different sons of a father often stand merely for the branches of a family as they

oe heaegteaad (from the Greek ypovoAoyia, computa-

tion of time) is the science which treats of time. Its object is to arrange and exhibit the various events which have occurred in the history of the world in the order of their succession, and to ascertain the intervals of time between them.

The preservation of any record, however rude, of the lapse of time implies some knowledge of the celestial motions, by which alone time can be accurately measured, and some advancement in the arts of civilized life, which could only be attained by the accumulated experience of many generations. Before the invention of letters the memory of past transactions could not be preserved beyond a few years with any tolerable degree of accuracy. Events which greatly affected the physical condition of the human race, or were of a nature to make a deep impression on the minds of the rude inhabitants of the earth, might be

existed at some one time. Of course lists made out at different times when the divisions of clans had varied produce an apparent discrepancy in the names of the sons. The union of two clans is expressed as marriage, or the territory is the wife, and her several husbands are succes- sive populations, and so forth.1 A different application of the same principle seems to lic in the account of the institutions of Levitical service which is introduced in connection with the transference of the ark to Jerusalem by David. The author is not concerned to distinguish the gradual steps by which the Levitical organization attained its full development. But he wishes to describe the system in its complete form, especially as regards the service of the singers, and he does this under the reign of David, who was the father of Hebrew psalmody, and the restorer of the sanctuary of the ark.

This account of some of the leading points of view which criticism of the Chronicles has to take up makes no pretence at completeness, but may suffice to indicate the nature of the problems which arise in a detailed study of the narrative, and to show that much is to be learned from the book not only in the way of supplement to the earlier history, but for the better understanding of the religious spirit and ordinances of the theocracy as it was after Ezra.

Literature.—Many parts of the Chronicles offer a very hard task to the expositor, especially the genealogies, where to other troubles is added the extreme corruption and many variations of the proper names in the versions. Jerome already complains of this difficulty in the Greek and Old Latin, and tells us what pains he himself took to secure right readings with the aid of a learned Jew. Com- mentators have rather shrunk from approaching the book. The best exposition is the very careful work of Bertheau (1st ed. 1854, Eng. Trans. 1857, 2d ed. 1860). There are also commentaries by Keil (Leipsic, 1870, Eng. Trans. 1872) and Zockler (in Lange's Bibelwerk, 1874). Bertheau is cautiously critical, Keil conserva- tive and apologetic, Zockler not quite so conservative. Valuable contributions to the exegesis of the book are to be found in Ewald's History of Israel. Rawlinson's notes in the Speaker's Commentary are not very important. There is a large literature on isagogic questions, and especially upon the credibility of the narratives peculiar to Chronicles. Besides the full discussions in books of O. T. introduction (especially De Wette, Schrader, and Keil), the student must refer to the very valuable discussion in the introduc- tory part of Ewald's history, and to the separate treatises of Movers, Kritische Untersuchungen tuber die Biblische Chronik, Bonn, 1834, (in answer to the assaults of De Wette and Gramberg), and Graf, Die Geschichtlichen Biicher des A. T., Leipsic, 1866. Graf con- cludes that the Chronicles have almost no value as a documentary source for the ancient history ; but in private correspondence with Bertheau he subsequently admitted that this statement is too strong (see the preface to Bertheau's 2d edition). The older works are enumerated by Carpzov, and in other books of introduction. Lagarde's edition of the Targum, which is not in the Rabbinical Bibles, deserves special mention (Hagivgrapha Chaldaice, Leipsic, 1873), (W. B.S.)

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vaguely transmitted through several ages by traditional narrative ; but intervals of time, expressed by abstract numbers, and these constantly varying besides, would soon escape the memory. 'The invention of the art of writing afforded the means of substituting precise and permanent records for vague and evanescent tradition ; but in the infancy of the world, mankind had learned neither to estimate accurately the duration of time, nor

to refer pass- ing events to any fixed epoch. Writing was practised many centuries before historians began to assign dates to the events they narrated. The masterpieces of Herodotus and Thucydides, while setting forth, each in the manner suited to the author's aim, events in the order of their succession, are stories without datcs,

1 On the application of this style of expression to the genealogies of Chronicles, the reader may consult Wellhausen, De Gentibus et Familiis Judecis que. Cur. ii, iv. enumerantur, Gvttingen, 1870.

For these reasons the history of the early ages of the world is involved in almost impenetrable obscurity, and chronology, comparatively speaking, is only of recent origin. After political relations began to be established, the neces-

sity of preserving a register of passing seasons and years"

would soon be felt, and the practice of recording important transactions must have grown up as a necessary conse- quence of social life. But of these early records a very smal] portion only has escaped the ravages of time and barbarism.

The earliest written annals of the Greeks, Etruscans, and Romans are irretrievably lost. The traditions of the Druids perished with them. A Chinese emperor has the credit of burning "the books" extant in his day (about 220 B.c.), and of burying alive the scholars who were acquainted with them. Anda Spanish adventurer destroyed the picture records which were found in the pueblo of Montezuma.

Of the more formal historical writings in which the first ineffectual attempts were made in the direction of systematic chronology we have no knowledge at first-hand. Of Hellenicus, the Greek logographer, who appears to have lived through the greater part of the 5th century B.c., and who drew up a chronological list of the priestesses of Here at Argos; of Ephorus, who lived in the 4th century B.c., and is distinguished as the first Greek who attempted the composition of a universal history ; and of Timxus, who in

the following century wrote an elaborate history of Sicily, in which he set the example of using the Olympiads as the basis of chronology, the works have perished, and our meagre knowledge of their contents is derived only from fragmentary citations in later writers. The same fate has befallen the works of Berosus and Manetho, Eratosthenes and Apollodorus. Berosus, a priest of Belus living at Babylon in the 3d century B.c., added to his historical account of Babylonia a chronological list of its kings, which he claimed to have compiled from genuine archives preserved in the temple. Manetho, likewise a priest, living at Sebennytus in Lower Egypt in the 3d century B.c., wrote in Greek a history of Egypt, with an account of its thirty dynasties of sovereigns, which he professed to have drawn from genuine archives in the keeping of the priests. Of these works fragments only, more or less copious and accurate, have been preserved. LEratosthenes, who in the latter half of the 2d century B.c. was keeper of the famous Alexandrian Library, not only made himself a great name by his important work on geography, but by his treatise _ entitled Chronographia, one of the first attempts to establish an exact scheme of general chronology, earned for himself the title of “ father of chronology. ” His method of pro- cedure, however, was usually conjectural; and guess-work, however careful, acute, and plausible, is still guess-work and not testimony. Apollodorus, an Athenian who flourished in the middle of the 2d century B.c., wrote a metrical chronicle of events, ranging from the supposed period of the fall of Troy to his own day. These writers were followed by other investigators and systematizers in the same field, but their works are lost. Of the principal later writers whose works are extant, and to whom we owe what little knowledge we possess of the labours of their prede- cessors, mention will be made hereafter.

The absence or incompleteness of authentic records, however, is not the only source of obscurity and confusion in the chronology of remote ages. There can be no exact computation of time or placing of events without a fixed point or epoch from which the reckoning takes its start. It was long before this was apprehended. When it began to be seen, various epochs were selected by various writers ; and at first each small separate community had its own epoch and method of time-reckoning. Thus in one city the reckoning was by succession of kings, in another by archons or annual magistrates, in a third by succession of

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priests. It seems now surprising that vague counting by generations should so long have prevailed and satisfied the wants of inquiring men, and that so simple, precise, and seemingly obvious a plan as counting by years, the largest natural division of time, did not occur to any investigator before Eratosthenes.

Precision, which was at first unattainable. for want of an epoch, was afterwards no less unattainable from the multi- plicity, and sometimes the variation, of epochs. But by a natural process the mischief was gradually and partially remedied. The extension of intercourse between the various small groups or societies of men, and still more their union in larger groups, made a common epoch necessary, and led to the adoption of such a starting point by each larger group. These leading epochs continued in use for many centuries. The task of the chronologer was thus simplified and reduced to a study and comparison of dates in a few leading systems.

The most important of these systems in what we call ancient times were the Babylonian, the Greek, and the Roman. The Jews had no general era, properly so called. In the history of Babylonia, the fixed point from which time was reckoned was the era of Nabonassar, 747 B.c. Among the Greeks the reckoning was by Olympiads, the point of departure being the year in which Corcebus was victor in the Olympic Games, 776 B.c, The Roman chronology started from the foundation of the city, the year of which, however, was variously given by different authors. The most generally adopted was that assigned by Varro, 753 3.c. It is noteworthy how nearly these three great epochs approach each other,—all lying near the middle of the 8th century B.c. But it is to be remembered that the beginning of an era and its adoption and use as such are not the same thing, nor are they necessarily synchronous. Of the three ancient eras above spoken of, the earliest is that of the Olympiads, next that of the foundation of Rome, and the latest the era of Nabonassar. But in order of adoption and actual usage the last is first. It is believed to have been in use from the year of its origin. It is not known when the Romans began to use their era. The Olympiads were not in current use till about the middle of the 3d century B.c., when Timeeus, as already mentioned, set the example of reckoning by them. Of

these and other ancient and modern eras a full account is given in the following pages.

Even after the adoption in Europe of the Christian era, a great variety of methods of dating—national, provincial, and ecclesiastical—grew up and prevailed for a long time in different countries, thus renewing in modern times the difficulties experienced in ancient times from diversities of reckoning. An acquaintance with these various methods is indispensable tothe student of the charters, chronicles, and legal instruments of the Middle Ages.

In reckoning years from any fixed epoch in constant succession, the number denoting the years is necessarily always on the increase. But rude nations and illiterate people seldom attach any definite idea to large numbers. Hence it has been a practice, very extensively followed, to employ cycles or periods, consisting of a moderate number of years, and to distinguish and reckon the years by their number in the cycle. The Chinese and other nations of Asia reckon, not only the years, but also the months and days, by cycles of sixty. The Saros of the Chaldeans, the Olympiad of the Greeks, and the Roman Indiction are instances of this mode of reckoning time. Several cycles were formerly known in Europe ; but most of them were invented for the purpose of adjusting the solar and lunar divisions of time, and were rather employed in the regulation of the calendar than as chronological eras. They are frequently, however, of very great use in

fixing dates that have been otherwise imperfectly ex- pressed, and consequently form important elements of chronology.

Chronology has shared with history the fruits of the novel researches and remarkable discoveries in the field of autiquity which have especially distinguished the present century. The memorabilia of early peoples and ages were set down not only in written records but in monumental

inscriptions. The latter, graven on stone or metal, could resist the touch of time and the hand of the barbarian better than the former ; and although at various times terrible havoc has been made among them, immense numbers are in existence to this day. In Assyria, Egypt, Persia, Greece, and Italy, the practice of monumental inscription was very general. These inscriptions have attracted the attention of learned meu from very remote ages. But as contributions to history and chronology, they have within the present century risen into new and surpris- ing importance. By Grotefend's decipherment of the cuneiform characters, the language of the Babylonian and Persian inscriptions, and by Young's decipherment of hiero- elyphics, the language of the Egyptian monuments, two dis- coveries made within a few years of each other, new fields of vast extent and unknown richness have been opened to his- torical explorers, These fields are now being diligently worked by some of the greatest living scholars ; and from granite block and fragile papyrus roll results are already obtained of rare value and of rarer promise, The Assyrian inscribed cylinders, disinterred but thirty years ago, are yielding up the secrets of a long-buried past, enlarging the horizon of history, and even furnishing the means of giving a precise chronology to periods where all was vague. The publication of the Assyrian Canon by Sir Henry Rawlinson in 1862, verified as it was by the subsequent discovery of a record of a solar eclipse, must mark an epoch in chrono- logical science. Egyptian researches and interpretations have been of similar service, and have strongly tended, if not to establish the complete accuracy, at least to indicate the credibility, of Manetho's account of the Egyptian dynasties. The period through which these dynasties apparently reached was so vast, stretching so far beyond the traditionally accepted limits of man's existence on the earth, that modern chronologers, when they grew critical, could for a long time only shake their heads in profound doubt over Manetho and his vistas of shadowy kings. For Egyptian chronology the discovery by Mariette, in 1864, of the Apis Stele is one of the highest importance. A flood of light has been poured on some obscure pages of early Persian history by the great cuneiform inscription of Behistun, discovered in 1835 by Colonel Rawlinson, who subsequently copied and translated it,

In the article CALENDAR (q.v.), that part of chronology has been already treated of which relates to the measure- ment of time, and the principal

methods explained with sufficient detail that have been employed, or are still in use, for adjusting the lunar months of the solar year, as well as the intercalations necessary for regulating the civil year according to the celestial motions. In the present article it is our purpose to give an account (without repeating what has been discussed in full in the article just named) of the different Zras and Periods that have been employed by historians, and by the different nations of the world, in recording the succes- sion of time and events, to fix the epochs at which the eras respectively commenced, to ascertain the form and the initial day of the year made use of, and to establish their correspondence with the years of the Christian era. These elements will enable us to convert, by a simple arithmetical operation, any historical date, of which the chronological characters are given according to any era

711i whatever, into the corresponding date in our common era of the Incarnation.

Julian Period.

Although the Julian Period (the invention of Joseph Scaliger, in 1582) is not, properly speaking, a chronological era, yet, on account of its affording considerable facilities in the comparison of different eras with one another, and in marking without ambiguity the years before Christ, it is very generally employed by chronologers. It consists of 7980 Julian years; and the first year of the Christian era corresponded with the year 4714 of the Julian period. (See vol. iv. p. 670.)

Olymprads.

The Olympic games, so famous in Greek history, were celebrated once every four years, between the new and full moon first following the summer solstice, on the small plain named Olympia in Elis, which was bounded on one side by the River Alpheus, on another by the small tributary stream the Cladeus, and on the other two sides by mountains. The games lasted five days. Their origin, lost in the dimness of remote antiquity, was invested by priestly legends with a sacred character. They were said to have been instituted by the Idean Heracles, to commemorate his victory over his four brothers in a foot race. According to a tradition, possibly more authentic,

they were re-established by Iphitus, king of Elis, in concert with the Spartan Lycurgus and Cleosthenes of Pisa. The practice was long afterwards adopted of designating the Olympiad, or period of four years, by the name of the victor in the contests of the stadium, and of inscribing his name in the gymnasium of Olympia. ‘The first who received this honour was Corebus. The games in which Corcebus was victor, and which form the principal epoch of Greek: history, were celebrated about the time of the summer solstice 776 years before the common era of the Incarnation, in the 3938th year of the Julian period, and twenty-three years, according to the account of Varro, before the foundation of Rome.

Before the introduction of the Metonic cycle, the Olympic year began sometimes with the full moon which followed, at other times with that which preceded the sum- mer solstice, because the year sometimes contained 384 days instead of 354, But subsequently to its adoption, the year always commenced with the cleventh day of the moon which followed the solstice. In order to avoid troublesome computations, which it would be necessary to recommence for every year, and of which the results differ only by a few days, chronologers generally regard the Ist of July as the commencement of the Olympic year. Some authors, how- ever, among whom are Eusebius, Jerome, and the historian Socrates, place its commencement at the Ist of September ; these, however, appear to have confounded the Olympic year with the civil year of the Greeks, or the era of the Seleucidee.

It is material to observe, that as the Olympic years and periods begin with the 1st of J uly, the first six months of a year of our era correspond to one Olympic year, and tlie jast six months to another. ‘Thus, when it is said that the first year of the Incarnation corresponds to the first of the 195th Olympiad, we are to understand that it is only with respect to the last six months of that year that the correspondence takes place. The first six months belonged tothe fourth year of the 194th Olympiad. In referring dates expressed by Olympiads to our era, or the contrary, we must therefore distinguish two cases.

1st, When the event in question happened between the Ist of January and the 1st of the following July, the sum of the Olympic year and of the year

before Christ is always equalto 776. The year of the era, therefore, will be found by subtracting the number of the Olympic year from 776,

For example, Varro refers the foundation of Rome to the 21st of April of the third year of the sixth Olympiad, and it is required to find the year before our era. Since five Olympic periods have elapsed, the third year of the sixth Olympiad is 5×4+3=23; therefore, subtracting 23 from 776, we have 753, which is the year before Christ to which the foundation of Rome is referred by Varro.

2d, When the event took place between the summer solstice and the Ist of January following, the sum of the Olympic year and of the year before Christ is equal to 777. The difference therefore between 777 and the year in one of the dates will give the year in the other date. Thus, the moon was eclipsed on the 27th of August, a little before midnight, in the year 413 before our era; and it is required to find the corresponding year in the Olympic era. Subtract 413 from 777, the remainder is 364; and 364 divided by four gives 91 without a remainder; conse- quently the eclipse happened in the fourth year of the ninety-first Olympiad, which is the date to which it is referred by Thucydides.

If the year is after Christ, and the event took place in one of the first six months of the Olympic year, that is to say, between July and January, we must subtract 776 from the number of the Olympic year to find the cor-

responding year of our era; but if it took place in one of

the last six months of the Olympic year, or between January and July, we must deduct 777. The computation by Olympiads seldom occurs in historical records after the middle of the 5th century of our era.

The names of the months were different in the different Grecian states. The Attic months, of which we possess the most certain knowledge, were named as follows:—

Hecatombeon. Gamelion. Metageitnion. Anthesterion. Boedromion. Elaphebolion. Pyanepsion. Munychion. Memacterion. Thargelion. Poseideon. Scirophorion.

Era of the Foundation of Rome.

After the Olympiads, the era most frequently met with in ancient history is that of the foundation of Rome, which is the chronological epoch adopted by all the Roman historians. There are various opinions respecting the year of the foundation of Rome.

1st, Fabins Pictor places this event in the latter half of the first year of the eighth Olympiad, which corresponds with the 3967th of the Julian period, and with the year 747 z.c.

2d, Polybius places it in the second year of the seventh Olympiad, corresponding with 3964 of the Julian period, and 750 B.c.

3d, M. Porcius Cato places it in the first year of the seventh Olympiad, that is, in 3963 of the Julian period, and 751 B.c.

4th, Verrius Flaccus places it in the fourth year of the sixth Olympiad, that is, in the year 3962 of the Julian period, and 752 Bo.

5th, Terentius Varro places it in the third ycar of the |

sixth Olympiad, that is, in the year 3961 of the Julian period, and 753 B.c.

A knowledge of these different computations is necessary, in order to reconcile the Roman historians with one another, and even any one writer with himself. Livy in general adheres to the epoch of Cato, though he sometimes follows that of Fabius Pictor. Cicero follows the account of Varro, which is also in general adopted by Pliny. Dionysius of Halicarnassus follows Cato. Modern chronologers for the most part adopt the account of Varro, which is Supported by a passage in Censorinus, where it is stated that the 991st year of Rome commenced with the festival of the Palilia, in the consulship of Ulpius and Pontianus.

Now this consulship corresponded with the 238th ycar of our era; therefore, deducting 238 from 991, we have 753 to denote the year before Christ. The Palilia commenced on the 21st of April ; and all the accounts agree in regard- ing that day as the epoch of the foundation of Rome.

The Romans employed two sorts of years, the civil year, which was used in the transaction of public and private affairs, and the consular year, according to which the annals of their history have been composed. The civil year com- menced with the calends of January, but this did not hold a fixed place in the solar year till the time of Julius Cesar (see vol. iv..p. 666.) The installation of the consuls regu- lated the commencement of the consular year. The initial day of the consulate was never fixed, at least before the 7th century of Rome, but varied with the different acci- dents which in times of political commotion so frequently occurred to accelerate or retard the elections. Hence it happens that a consular year, generally speaking, com- prehends a part not only of two Julian years, but also of two civil years. The consulate is the date employed by the Latin historians generally, and by many of the Greeks, down to the 6th century of our era.

In the era of Rome the commencement of the year is placed at the 21st of April; an event therefore which happened in the months of January, February, March, or during the first twenty days of April, in the year (for example) 500 of Rome, belongs to the civil year 501. Before the time of the Decemvirs, however, February was the last month of the year. Many authors confound the year of Rome with the civil year, supposing them both to begin on the 1st of January. Others again confound both the year of Rome and the civil year with the Julian year, which in fact became the civil year after the regulation of the calendar by Julius Cesar. Through a like want of attention, many writers also, particularly among the moderns, have confounded the Julian and Olympic years, by making an entire Julian year correspond to an eutire Olympic year, as if both had commenced at the same epoch. Much attention to these particulars is required in the comparison of ancient dates.

The Christian Era.

The Christian or vulgar era, called also the era of the Incarnation, is now almost universally employed in Christian countries, and is even used by some Eastern nations. Its epoch or commencement is the lst of January in the fourth year of the 194th Olympiad, the 753d from the foundation of Rome, and the 4714th of the Julian period, It is usually supposed to begin with the year of the birth of Christ, but there are various opinions with regard to the year in which that event took place. This epoch was introduced in Italy in the 6th century, by Dionysius the Little, a Roman abbot, and began to be used in Gaul in the 8th, though it was not generally followed in that country till a century later. From extant chartcrs it is known to have been in use in England before the close of the 8th century. Before its adoption the usual practice in Latin countries was to distinguish the years by their number in the cycle of Indiction.

In the Christian era the years are simply distinguished by the cardinal nuinbers; those before Christ being marked 8.c. (Before Christ), or a.c. (Ante Christum), and those after Christ a.p. (Anno Domini). This method of reckoning time is more convenient than those which employ cycles or periods of any length whatever; but it still fails _ to satisfy in the simplest manner possible all the conditions that are necessary for registering the succession of events. For, since the commencement of the era is placed at an intermediate period of history, we are compelled to resort to a double manner of reckoning, backward as well

as forward. Some ambiguity is also occasioned by the want of uniformity in the method of numbering the pre- ceding years. Astronomers denote the year which preceded the first of our era by 0, and the year previous to that by 1 B.c.; but chronclogers, in eonformity with common notions, call the year preceding the era 1 B.c., the previous year 2 B.c., and so on, By reckoning in this manner, there is an interruption in the regular succession of the numbers; and in the years preceding the era, the leap years, instead of falling on the fourth, eighth, twelfth, &c., fall, or ought to fall, on the first, fifth, ninth, &e.

In the chronicles of the Middle Ages much uncertainty frequently arises respecting dates on account of tlie different epochs assumed for the

commencement of the Christian year. Dionysius, the author of the era, adopted the day of the Annunciation, or the 25th of March, which preceded the birth of Christ by nine months, as the com- mencement of the first year of the era. This epoch there- fore precedes that of the vulgar era by nine months and seven days. ‘This manner of dating was followed in some of the Italian states, and continued to be used at Pisa even down to the year 1745, It was also adopted in some of the Papal: bulls; and there are proofs of its having been employed in France about the middle of the 11th century.

Some chroniclers, who adhere to the day of the Annuncia-

tion as the commencement of the year, reckon from the 25th of March following our epoch, as the Florentines in the 10th century. Gregory of Tours, and some writers of the 6th and 7th eenturies, make the year commence some- times with the Ist of March, and sometimes with the Ist of January. In France, under the third race of kings, it was usual to begin the year with Easter ; and this practice continued at least till the middle of the 16th century, for an edict was issued by Charles IX. in the month of January 1663, ordaining that the commencement of the year should thenceforth ke considered as taking place on the Ist of January. An instance is given, in L’Art de Vérifier les Dates, of a date in which the year is reckoned from the 18th of March; but itis probable that this refers to the astronomical year, and that the 18th of Mareh was taken for the day of the vernal equinox. In Germany, about the 11th century, it was usual to commence the year at Christmas ; and this practice also prevailed at Milan, Rome, and other Italian cities, in the 13th, 14th, and 15th centuries.

In England, the practice of placing the beginning of the year at Christmas was introduced in the 7th eentury, and traces of it are found even in the 13th. Gervase of Canterbury, who lived in the 13th century, mentions that almost all writers of his country agreed in regarding Christmas day as the first of the year, because it forms, as it were, the term at which the sun finishes and recommences his annual eourse. In the 12th century, however, the custom of beginning the civil year with the day of the Annunciation, or the 25th of March, began to prevail, and continued to be generally followed from that time till the reformation of the calendar in 1752. The historical year has always been reckoned by English authors to begin with the Ist of

January. The liturgic year of the Church of England commences with the first Sunday of Advent.

A knowledge of the different epochs which have been ehosen for the commencement of the year in different countries is indispensably necessary to the right interpreta- tion of ancient chronicles, charters, and other documents in which the dates often appear contradictory. We may eite an example or two. It is well known that Charles the Great was crowned emperor at Rome on Christinas day in the year 800, and that he died in the year 814, according to our present manner of reckoning. But in the aunals of Metz and Moissac, the coronation is stated to have taken

place in the year 801, and his death in 813. In the first case the annalist supposes the year to begin with Christmas, and accordingly reckons the 25th of December and all the following days of that month to belong to 801, whereas in the common reckoning they would be referred to the year 800. In the second ease the year has been supposed to begin with the 25th of March, or perhaps with Easter ; eonsequently the first three months of the year 814, reckoning from the Ist of January, would be referred to the end of the year 813. The English “Revolution is popularly called the Revolution of 1688. Had the year then begun, as it now does, with the Ist of January, it would have been the revolution of 1689, William and Mary being received as king and queen in February in the year 1689 ; but at that time the year was considered in England as beginning on the 25th of March. Another circumstance to which it is often necessary to pay attention in the com- parison of dates, is the alteration of style which took place on the adoption of the Gregorian Calendar (see vol.

iv. pp. 671 sgq.) Eva of the Creation of the World.

As the Greek and Roman methods of computing time were connected with certain pagan rites and observances, which the Christians held in abhorrence, the latter began at an early period to imitate the Jews in reckoning their years from the supposed period of the ereation of the world. The chronological elements on which both Jews and Christians founded their computations for determining this period were derived from the Old Testament narratives, which have been transmitted to us through three distinct ehannels. These are the Hebrew text of the Scriptures, the

Samaritan text, and the Greek version known as the Septuagint. In respect of chronology, the three accounts are totally irreconcilable with each other; and no conclusive reason ean be given for preferring auy one of them to another. We have no eoncurrent testimony with which to compare them; nor is it even known which of them was regarded as the most probable by the Jews themselves, when the books of the Old Testament were revised and transcribed by Ezra, The ordinary rules of probability cannot be applied to a state of things in which the duration of human life is represented as extending to nearly a thousand years,

From computations founded on loose and conflicting data it would be vain to look for knowledge or even for concord of opinion. From the very nature of the case discussion is hopeless labour. The subject is one to which the saying Quot homies tot sententie applies with almost literal truth. Des Vignoles, in the preface to his Chron- ology of Sacred History, asserts that he collected upwards of two hundred different calculations, the shortest of which reckons only 3483 years between the creation of the world aud the eommencement of the vulgar era, and the longest 6984.- The difference amounts to thirty-five centuries. It suffices, therefore, to point out that the so-called era of the creation of the world is a purely conventional and arbitrary epoch ; that, practically, it means the year 4004 B.C.,—this being the date which, under the sanction of Archbishop Ussher's opinion, has won its way, among its hundreds of competitors, into most general acceptance. The reader who is desirous of more detailed information on this subject may eonsult the first volume of the Universal History, or Li Art de Vérifier les Dates, avant J. C., p. 9.

Jewish Year and Eras.

Before the departure of the Israelites from Egypt their year commenced at the autumnal equinox; but in order to solemnize the memory of their deliverance, the month of Nisan or Abid, in which that event took place, and which

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falls about the time of the vernal equinox, was afterwards regarded as the beginning of the ecclesiastical or legal year. In civil affairs, and in the regulation of the jubilces and sabbatical years, the Jews still adhere to the ancient year, which begins with the month Tisri, about the time of the autumnal equinox. (On the regulation of the Jewish year, see vol. iv. p. 677.) ,

After their dispersion, the Jews were constrained, to have recourse to the astronomical rules and cycles of the more enlightened heathen, in order that their religious festivals might be observed on the same days in all the countries through which they were scattered. For this purpose they adopted a cycle of eighty-four years, which is mentioned by several of the ancient fathers of the church, and which the early Christians borrowed from them for the regulation of Easter. This cycle seems to be neither more nor less than the Calippic period of seventy-six years, with the addition of a Greek octaeteris, in order to disguise its true source, and give it an appearance of originality. In fact, the period of Calippus containing 27,759 days, and the octaeteris 2922 days (see vol. iv. p. 688), the sum, which is 30,681, is exactly the number of days in eighty-four Julian years. But the addition was very far from being an improvement on the work of Calippus; for instead of a difference of only five hours and fifty-three minutes between the places of the sun and moon, which was the whole error of the Calippic period, this difference, in the period of eighty-four years, amounted to one day, six hours, and forty-one minutes. Buccherius places the commencement of this cycle in the year 162 3B.c.; Prideaux in the year 291 B.c. According to the account of Prideaux, the fifth cycle must have commenced in the year 46 of our era; and it was in this year, according to St Prosperus, that the Christians began to employ the Jewish cycle of eighty- four years, which they followed, though not uniformly, for the regulation of Easter, till the time of the Council of Nice.

Soon after the Nicene council, the Jews, in imitation of the Christians, abandoned the cycle of eighty-four years, and adopted that of Meton, by which their lunisolar year is regulated at the present day. This improvement was first proposed by Rabbi Samuel, rector of the Jewish school of Sora in Mesopotamia, and was finally accomplished in the year 360 of our era by Rabbi Hillel, who introduced that form of the year which the Jews at

present follow, and which, they say, is to endure till the coming of the Messiah,

Till the 15th century the Jews usually followed the era of the Seleucid or of Contracts. Since that time they have gencrally employed a mundane era, and dated from the creation of the world, which, according to their com- putation, took place 3760 years and about three months before the commencement of our era. No rule can be given for determining with certainty the day on which any given Jewish ycar begins, without entering into the minutie of their irregular and complicated calendar. A table comprising twelve cycles of Jewish years will be found at pp. 678, 679 of vol. iv.

Lra of Constantinople.

This era, which is still used in the Greek Church, and was followed by the Russians till the time of Peter the Great, dates from the creation of the world. The Incarna- tion falls in the year 5509, and corresponds, as in our era, With the fourth year of the 194th Olympiad. The civil year commences with the 1st of September ; the ecclesiastical year sometimes with the 21st of March, sometimes with the Ist of April. It is not certain whether the year was considered at Constantinople as. beginning with September before the separation of the Eastern and Western empires.

At the commencement of our era there had elapsed 5508

years and four months of the era of Constantinople. Hence the first eight months of the Christian year 1 coincide with the Constantinopolitan year 5509, while the last four months belong to the year 5510. In order, therefore, to find the year of Christ corresponding to any given year in the era of Constantinople, we have the following rule:— If the event took place between the 1st of January and the end of August, subtract 5508 from the given year; but if it happened between the 1st of September and the end of the year, subtract 5509.

Era of Alexandria.

The chronological computation of Julius Africanus was adopted by the Christians of Alexandria, who accordingly reckoned 5500 years from the creation of Adam to the birth of Christ. But in reducing Alexandrian dates to.the common era, it must be observed that Julius Africanus placed the epoch of the Incarnation three years earlier than it is placed in the usual reckoning, so that the initial day of the Christian era fellin the year 5503 of the Alex- andrian era. ‘This correspondence, however, continued only from the introduction of the era till the accession of

Diocletian, when an alteration was made by dropping ten

years in the Alexandrian account. Diocletian ascended the imperial throne in the year of Christ 284. According to the Alexandrian computation, this was the year 5787 of the world, and 287 of the Incarnation; but on this occasion ten years were omitted, and that year was thence- forth called the year 5777 of the world, and 277 of the Incarnation. There are, consequently, two distinct eras of Alexandria, the one being used before and the other after the accession of Diocletian. It is not known for what reason the alteration was made; but it is conjectured that it was for the purpose of causing a new revolution of the cycle of nineteen years (which was introduced into the ecclesiastical computation about this time by Anatolius, bishop of Hierapolis) to commence with the first year of the reign of Diocletian. In fact, 5777 being divided by 19 leaves 1 for the year of the cycle. The Alexandrian era continued to be followed by the Copts in the 15th century, and is said to be still used in Abyssinia.

Dates expressed according to this era are reduced to the common era by subtracting 5502, up to the Alexandrian year 5786 inclusive, and after that year by subtracting 5492; but if the date belongs to one of the four last months of the Christian year, we must subtract 5503 till the year 5786, and 5493 after that year.

Mundane Era of Antioch.

The chronological reckoning of Julius Africanus formed also the basis of the era of Antioch, which was adopted by the Christians of Syria, at the instance of Panodorus, an Egyptian monk, who flourished about the beginning of the 4th century. Panodorus struck off ten years from the

account of Julius Africanus with regard to the years of the world, and he placed the Incarnation three years later, referring it to the fourth year of the 194th Olympiad, as in the common era, Hence the era of Antioch differed from the original era of Alexandria by ten years; but after the alteration of the latter at the accession of Diocletian, the two eras coincided. In reckoning from the Incarnation, however, there is a difference of seven years, that epoch being placed, in the reformed era of Alexandria, seven years later than in the mundane era of Antioch or in the Christian era.

As the Syrian year began in autumn, the year of Christ corresponding to any year in the mundane era of Antioch is found by subtracting 5492 or 5493 according as tlie event falls between January and September or from September to January.

CHRONOLOGY

Era of Nabonassar.

This era is famous in astronomy, having been generally followed by Hipparchus and Ptolemy. It is believed to have been in use from the very time of its origin; for the observations of eclipses which were collected in Chaldea by Callisthenes, the general of Alexander, and transmitted by him to Aristotle, were for the greater part referred to the commencement of the reign of Nabonassar, founder of the kingdom of the Babylonians. It is the basis of the famous Canon of Kings, also called Mathematical Canon, preserved to us in the works of Ptolemy, which, before the recent astonishing discoveries at Nineveh, was the sole authentic monument of Assyrian and Babylonian history known to us. The epoch from which it is reckoned is precisely determined by numerous celestial phenomena recorded by Ptolemy, and corresponds to Wednesday at mid-day, the 26th of February of the year 747 before Christ. The year was in all respects the same as the ancient Egyptian year. On account of the difference in the length of the Julian and Babylonian years, the con- version of dates according to the era of Nabonassar into years before Christ is attended with considerable trouble. The surest way is to follow a comparative table. re- quently the year cannot be fixed with certainty, unless we know also the month and the day.

The Greeks of Alexandria formerly employed the era of Nabonassar, with a year of 365 days; but soon after the reformation of the calendar by Julius Cesar, they adopted, like other Roman provinciais, the Julian intercalation. At this time the first of Thoth had receded to the 29th of August. In the year 136 of our era, the first of Thoth in the ancient Egyptian year corresponded with the 20th of July, between which and the 29th' of August there are forty days. The adoption of the Julian year must therefore have taken place about 160 years before the year 136 of our era (the difference between the Egyptian and Julian years being one day in four years), that is to say, about the year 25 B.c. In fact, the first of Thoth corresponded with the 29th of August in the Julian calendar, in the years 25, 24, 23, and 22 B.c.

Lra of the Seleucide, or Macedoman Fra.

The era of the Seleucidz dates from the time of the occupation of Babylon by Seleucus Nicator, 311 years before Christ, in the year of Rome 442, and twelve years after the death of Alexander the Great. It was adopted not only in the monarchy of the Seleucidz but in general in all the Greek countries bordering on the Levant, was followed by the Jews till the 15th century, and is said to be used by some Arabians even at the present day. By the Jews it was called the Hra of Contracts, because the Syrian governors compelled them to make use of it in civil contracts; the writers of the books of Maccabees call it the Lira of Kings. But notwithstanding its general prevalence in the East for many centurics, authors using it differ much with regard to their manner of expressing dates, in conse- quence of the different epochs adopted for the commence- ment of the year. Among the Syrian Greeks the year began with the month Elul, which corresponds to our September. The Nestorians and Jacobites at the present day suppose it to begin with the following month, or October. The author of the first book of Maccabees makes the era commence with the month Nisan, or April ; and the author of the second book with the first Tishrin, or October. Albategni, a celebrated Arabian astronomer, dates from the Ist of October. Some of the Arabian writers, as Alfergani, date from the Ist of September. At Tyre the year was counted from the 19th of our October, at Gaza from the 28th of the same month, and at Damascus from the vernal equinox. These discrepancies

render it extremely difficult to determine the exact corre- spondence of Macedonian dates with those of other eras ; and the difficulty is rendered still greater by the want of uniformity in respect of the length of the year. Some authors who follow the Macedonian era, use the Egyptian or vague year of 365 days; Albategni adopts the Julian year of 365} days.

According to the computation most generally followed, the year 312 of the era of the Seleucid began on the Ist of September in the Julian year preceding the first of our era. Hence, to reduce a Macedonian date to the common era, subtract 311 years and four months.

The names of the Syrian and Macedonian months, and their correspondence with the Roman months, are as follows :—

Syrian, Macedonian. English. Elul. Gorpieus. September. Tishrin I. Hyperberetzeus. October, Tishrin II. Dius. November, Canun I. Apelleus. December. Canun II. Audyneus, January. Sabat. Peritius, February. Adar, : Dystrus. March. Nisan. Xanthicus. April. aAyar, Artemisius. May. Haziran. Desius. June. Tamus. Panemus. July.

Ab. Loiis. August.

La of Alexander.

Some of the Greek historians have assumed as a chron- ological epoch the death of Alexander the Great, which took place in the year 325 B.c. The form of the year is the same as in the preceding era, This era has not been much followed; but it requires to be noticed in order that it may net be confounded with the era of the Seleucidz.

Era of Tyre.

The era of Tyre is reckoned from the 19th of October, or the beginning of the Macedonian month Hyperberetzus, in the year 126 B.c. In order, therefore, to reduce it to the common era, subtract 125; and.when the date is

B.c., subtract it from 126. Dates expressed according to this era occur only on a few medals, and in the acts of certain councils,

Cesarean Era of Antioch.

This era was established to commemorate the victory obtained by Julius Cesar on the plains of Pharsalia, on the 9th of August in the year 48 B.c., and the 706th of Rome. The Syrians computed it from their month Tishrin I.; but the Greeks threw it back to the month Gorpicus of the preceding year. Hence there is a difference of eleven months between the epochs assumed by the Syrians and the Greeks. According to the computation of the Greeks, the 49th year of the Czesarean era began in the autumn of the year preceding the commencement of the Christian era ; and, according to the Syrians, the 49th year began in the autumn of the first year of the Incarnation. It is followed by Evagrius in his Heclestastical History.

Julian Era.

The Julian era commences with the Ist of January, forty-five years B.c. It was designed to commemorate the reformation of the Roman calendar by Julius Cesar,

Era of Spain, or of the Cesars.

The conquest of Spain by Augustus, which was com- pleted in the thirty-ninth year B.o., gave rise to this era, which began with the first day of the following year, and was long used in Spain and Portugal, and generally in all the Roman provinces subdued by the Visigoths, both in Africa and the South of France. Several of the councils

of Carthage, and also that of Arles, are dated according to this era. After the 9th century it became usual to join with it in public acts the year of the Incarnation. It was followed in Catalonia till the year 1180, in the kingdom of Aragon till 1350, in Valencia till 1358, and in Castile till 1382. In Portugal it is said to have been in use so late as the year,1415, or 1422, though it would seem that after the establishment of the Portuguese

monarchy, no other era was used in the public acts of that country than that of the Incarnation. Asthe era of Spain commenced with tlie Ist of January, and the months and days of the year are those of the Julian calendar, any date is reduced to the common era by subtracting thirty-eight from the number of the year.

Era of Actium, and Era of Augustus,

This era was established to commemorate the battle of Actium, which was fought on the 3d of September, in the year 31 B.c., and in the 15th of the Julian era. By the Romans the era of Actium was considered as commencing on the Ist of January of the 16th of the Julian era, which is the 30th B.c. The Egyptians, who used this era till the time of Diocletian, dated its commencement from the beginning of their month Thoth, or the 29th of August ; and the Eastern Greeks from the 2d of September. By the latter it was also called the era of Antioch, and it con- tinued to be used till the 9th century. It must not be confounded with the Cesarean era of Antioch, which began seventeen years earlier. Many of the medals struck by the city of Antioch in honour of Angustus are dated according to this era.

Besides the era of Actium, there was also an Augustan era, which commenced four years later, or 27 B.c., the year in which Augustus prevailed on the senate and people of Rome to decree him the title of Augustus, and to confirm him in the supreme power of the empire.

Era of Diocletian, or Era of Martyrs.

It has been already stated that the Alexandrians, at the accession of the Emperor Diocletian, made an alteration in their mundane era, by striking off ten years from their reckoning. At the same time they established a new era, which is still followed by the Abyssinians and Copts, It commences with the 29th of August (the first day of the Egyptian year) of the year 284 of our era, which was the first of the reign of Diocletian. The denomination of Fra of Martyrs, subsequently given to it in commemoration of the persecution of the Christians, would seem to imply that its commencement ought to be referred to the year 303 of our era, for it was in that year that Diocletian issued his famous edict; but the practice of dating from the accession of Diocletian has prevailed. ‘The ancient Egyptian year consisted of 365 days;

but after the introduction of the Julian calendar, the astronomers of Alexandria adopted an intercalary year, and added six additional days instead of five to the end of the last month .of every fourth year. The year thus became exactly similar to the Julian year. The Egyptian intercalary year, however, does not correspond to the Julian leap year, but is the year immediately preceding; and the intercalation takes place at the end of the year, or on the 29th of August. Hence the first three years of the Egyptian Intercalary period commence on the 29th of our August, and the fourth commences on the 30th of that month. Before the end of that year the Julian intercalation takes place, and the beginning of the following Egyptian year is restored to the 29th of August. Hence to reduce a date according to this era to our own reckoning, it is necessary, for common years, to add 283 years and 240 days ; but if the date belongs to the first three months of the year

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following the intercalation, or, which is the same thing, if in the third year of the Julian cycle it falls between the 30th of August and the end of the year, we must add 283 years and 241 days. The Ethiopians do not reckon the years from the beginning of the era in a consecutive series, but employ a period of 532 years, after the expiration of which they again begin with 1. This is the Dionysian or Great Paschal Period, and is formed by the multiplication of the numbers 28 and 19, that is, of the solar and lunar cycles, into each other.

The following are the names of the Ethiopian or Abys- sinian months, with the days on which they begin in the Julian calendar, or old style -—

Masvaram…29th August. Tikmith…..28th September. adar ness 28th October. Tacsam…... 27th November. MPiterieicccssse 27th December. Hamle…...: 25th June. Vaenitt +...0: 26th January. Nahasse…..25th July.

The additional or epagomenal days begin on the 24th of August. In intercalary years the first seven months com- mence one day later. The Egyptian months, followed by the modern Copts, agree with the above in every respect excepting the names.

Magabit…..25th February. Miazia ….. 27th March. Gimbot…... 26th April. SONG... .seres 26th May.

Indiction.

The cycle of Indiction, already explained at p. 670 of vol. iv., was very generally followed in the Roman empire for some centuries before the adoption of the Christian era. Three Indictions may be distinguished ; but they differ only in regard to the commencement of the year.

1. The Constantinopolitan Indiction, like the Greek year, commenced with the month of September. This was followed in the Eastern empire, and in some instances also in France.

2. The Imperial or Constantinian Indiction is so called because its establishment is attributed to Constantine. This was also called the Cesarean Indiction. It com- mences on the 24th of September. It is not unfrequently met with in the ancient chronicles of France and England.

3. The Roman or Pontifical Indiction began on the 25th of December or Ist of January, according as the. Christian year was held to commence on the one or other of these days. It is often employed in papal bulls, especially after the time of Gregory VII., and traces of its use are found in early French authors,

Era of the Armenians.

The epoch of the Armenian era is that of the Council of Tiben, in which the Armenians consummated their schism from the Greek Church by condemning the acts of the Council of Chalcedon ; and it corresponds to Tuesday, the 9th of July of the year 552 of the Incarnation. In their civil affairs the Armenians follow the ancient vague year of the Egyptians; but their ecclesiastical year, which begins on the 11th of August, is regulated in the same manner as the Julian year, every fourth year consisting of 366 days, so that Kaster and the other festivals are retained at tlie same place in the seasons as well as in the civil year. The Armenians also make use of the mundane era of Constantinople, and sometimes conjoin both methods of computation in the same documents. In their cor- respondence and

transactions with Europeans, they generally follow the era of the Incarnation, and adopt the Julian year.

To reduce the civil dates of the Armenians to the Christian era, procecd as follows. Since the epoch is the 9th of July, thete were 176 days from the beginning of the Armenian era to the end of the year 552 of our era; and since 552 was a leap year, the year 553 began a Julian intercalary period. Multiply, therefore, the number of

Armenian years elapsed by 365; add the number of days from the commencement of the current year to the given date; subtract 176 from the sum, and the remainder will be the number of days from the 1st of January 553 to the given date. This number of days being reduced to Julian years, add the result to 552, and the sum gives the day in the Julian year, or old style.

In the ecclesiastical reckoning the year begins on the llth of August. To reduce a date expressed in this reckoning to the Julian date, add 551 years, and the days elapsed from the Ist of January to the 10th of August, both inclusive, of the year 552,—that is to say (since 552 i3. a leap year), 223 days. In leap years, one day must be subtracted if the date falls between the lst of March and 10th of August.

The following are the Armenian ecclesiastical months with their correspondence with those of the Julian calendar :—

Teg Wawazardt hegiis 2)... ..:ss2:eesaseae st llth August. Ze MEOUD ccc. ceeveeretrasenss acerca eee 10th September. oe: PMI ts sc 300 Set eens yi lonencee ee eee 10th October. 4. Dre Thari 9th November. 5. Kagoths 9th December. A 1) eri ne Rape meer ern re srs ae 8th January. MME YE ss cade cs, tnonve-st turner eek 7th February. 8, MME CMe vids) Gucecesnesssabene enese aie 9th March. SF Ears ede susie Soy cada: Pouce RIES Nea ME 8th April AOS MMEMEL Licks. cost cr cccns sen cased ae 8th May UICC os «osc norsny cehvantsieacimavessiass 7th June Me MEMO OME Zao. /aidsostie seth seieuc ree van sl 7th July.

To complete the year, five complementary days are added in common years, and six in leap years.

The Mahometan Era, or Era of the Hegira.

The era in use among the Turks, Arabs, and other Mahometan nations is that of the Hegira or Hejra, tlie flight of the prophet from Mecca to Medina, 622 a.v. Its commencement, however, does not, as is sometimes stated, coincide with the very day of the flight, but precedes it by sixty-eight days. The prophet, after leaving Mecca, to escape the pursuit of his enemies, the Koreishites, hid himself with his friend Abubekr in a cave near Mecca, and there lay for three days. The departure from the cave and setting out on the way to Medina is assigned to the ninth day of the third month, Rabia I.—corresponding to thé 22d of September of the year 622.a.p. The era begins from the first day of the month of Moharram preceding the flight, or first day of that Arabian year, which coincides with Friday, July 16, 622 a.p. It is necessary to re- member that by astronomers and by some historians the cra is assigned to the preceding day, July 15. It is stated by D'Herbelot that the era of the Hegira was instituted by Omar, the second caliph, in imitation of the Christian era of the martyrs. (For details of the Mahometan year, names and length of months, and for the method of reduction of Mahometan dates to Christian, see vol. iv. pp. 679-681).

Era of Yeedegird, or Persian or Gelalean Era.

This era commences with the elevation of Yezdegird III. to the throne of Persia, on the 16th of June in the year of our era 632. 'Till the year 1079 the Persian year resembled that of the ancient Egyptians, consisting of 365 days without intercalation; but at that time the Persian calendar was reformed by Gelal-ed-din Malek Shah, sultan of Khorasan, and a method of intercalation adopted which, though less convenient, is considerably more accurate than the Julian. The intercalary period is 33 years,—one day being added to the common year seven times successively at the end of four years, and the eighth intercalation being deferred till the end of the fifth year (see vol. iv. p. 667). This era was at one period universally adopted in Persia,

C17 and it still continues to be followed by the Parsees of India. The months consist of thirty days each, and each day is distinguished by a

different name. According to

Alfergani, the names of the Persian months are as follows :—

Afrudin-meh. Merded-meh. Adar-meh. Ardisascht-meh. Schaharir-meh. Di-meh. Cardi-meh. Mahar-meh. Behen-meh. Tir-meh. Aben-meh. Affirer-mch.

The five additional days (in intercalary years six) are named JAfusteraca.

As it does not appear that the above-mentioned rule of intercalation was ever regularly followed, it is impossible to assign exactly the days on which the different years begin. In some provinces of India the Parsees begin tho year with September, in others they begin it with October. We have stated that the era began with the 16th June 632. But the vague year, which was followed till 1079, anticipated the Julian year by one day every four years. In 447 years the anticipation would amount to about 112 days, and the beginning of the year would in consequence be thrown back to near the begiuning of the Julian year 632. To the year of the Persian era, therefore, add 631, and the sum will be the year of our era in which the Persian year begins.

Chinese Chronology.

From the time of the Emperor Yaou, upwards of 2000 years B.c., the Chinese had two different ycars,—a civil year, which was regulated by the moon, and an astro- uomical year, which was solar. The civil year consisted in general of twelve months or lunations, but occasionally a thirteenth was added, in order to preserve its correspond- ence with the solar year. Even at that early period the solar or astronomical year consisted of 365} days, like our Julian year; and it was arranged in the same manner, a day being intercalated every fourth year.

According to the missionary Gaubil, the Chinese divided the day into 100 ke, each ke into 100 minutes, and each minute into 100 seconds. ‘This practice continued to pre- vail till the 17th century, when, at the instance of the Jesuit Schall, president of the tribunal of mathematics, they adopted the European method of dividing the day into twenty-four hours, each hour into

sixty minutes, and each minute into sixty seconds. The civil day commences at midnight and ends at the midnight following.

Since the accession of the emperors of the Han dynasty, 206 B.c., the civil year of the Chinese has begun with the first day of that moon in the course of which the sun enters into the sign of the zodiac which corresponds witli our sign Pisces. From the same period also, they have employed, in the adjustment of their solar and lunar years, a period of nineteen years, twelve of which are common, containing twelve lunations each, and the remaining seven intercalary, containing thirteen lunations. It is not, how- ever, precisely known how they distributed their months of thirty and twenty-nine days, or, as they termed them, great and small moons, This, with other matters appertaining to the calendar, was probably left to be regulated from time to time by the mathematical tribunal.

The Chinese divide the time of 4 complete revolution of the sun with regard to the solstitial points into twelve equal portions, each corresponding to thirty days, ten hours, thirty minutes, Each of these periods, which is denomin- ated a ¢tséé, is subdivided into two equal portions called chung-ki and tsie-ki, the chung-ki denoting the first half of the ¢séé, and the ¢s¢e-ki the latter half. Though the tséé are thus strictly portions of solar time, yet, what is remarkable, though not peculiar to China, they give their name to the lunar months, each month or lunation having the

name of the chung-ki or sign at which the sun arrives during that month. As the.fséé is longer than a synodic revolution of the moon, the sun cannot arrive twice at a chung-ki during the same lunation; and as there are only twelve tséé, the year can contain only twelve months having different names. It must happen sometimes that in the course of a lunation the sun enters into no new sign; in this case the month is intercalary, and is called by the same name as the preceding month.

For chronological purposes, the Chinese, in common with some other nations of the east of Asia, employ cycles of sixty, by means of which they reckon their days, moons, and years. The days are distributed in the calendar into cycles of sixty, in the same manner as ours are distributed into

weeks, or cycles of seven. Each day of the cycle has a particular name, and as it is a usual practice, in mentioning dates, to give the name of the day along with that of the moon and the year, this arrangement affords great facilities in verifying the,epochs of Chinese chronology. The order of the days in the cycle is never interrupted by any intercalation that may be necessary for adjusting the months or years, ‘The moons of the civil year are also distinguished by their place in the cycle of sixty ; and as the intercalary moons are not reckoned, for the reason before stated, namely, that during one of these Junations the sun enters into no new sign, there are only twelve regular moons in a year, so that the cycle is renewed every five years. Thus the first moon of the year 1873 being the first of a new cycle, the first moon of every sixth year, reckoned backwards or forwards from that date, as 1868, 1863, &., or 1877, 1882, &c., will also commence a new lunar cycle of sixty moons. In regard to the years, the arrangement is exactly the same. Each has a distinct number or name which marks its place in the cycle, and as this is generally given in referring to dates, along with the other chronological characters of the year, the ambiguity which arises from following a fluctuating or uncertain epoch is entirely obviated. The present cycle began in the year 1864 of our era; the year 1876 is consequently the 13th of the current cycle,

The cycle of sixty is formed of two subordinate cycles or series of characters, one of ten and the other of twelve, which are joined together so as to afford sixty different combinations. The names of the characters in the cycle of ten, which are‘called celestial signs, are—

1, Kei; 2. Yih; 3. Ping; 4. Ting; 5. Woo; 6. Ke; 7. King; 8. Sin; 9. Jin; 10. Kwei; and in the series of 12, denominated terrestrial signs,

1. Tsze; 2. Chow; 3. Yin; 4. Maou; 5. Shin; 6. Sze;

7. Woo; 8 We; 9. Shin; 10. Yew; 11. Seth; 12. Hae.

The name of the first year, or of the first day, in the sexagenary cycle is formed by combining the first words in each of the above series ; the second is formed by com- bining the second of each series, and so on to the tenth. lor the next year the first word of the first series is com- bined with the eleventh of the second, then the second of the first series with the

twelfth of the second, after this the third of the first series with the first of the second, and so on till the sixtieth combination, when the last of the first series concurs with the last of the second. Thus Kei-tsze is the name of the first year, Yih-Chow that of the second, Kei-seuh that of the eleventh, Yih-hae that of the twelfth, Ping-tsze that of the thirteenth, and so on, The order of proceeding is obvious.

In the Chinese history translated into the Tatar dialect by order of the emperor Kang-he. who died in 1721, the characters of the cycle begin to appear at the year 2357 B.c. From this it has been inferred that the Chinese empire was established previous to that epoch; but it is abviously so easy to extend the cycles backwards indefinitely,

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that the inference can have very little weight. The characters given to that year 2357 3B.c. are Kei-shin, which denote the 41st of the cycle. We must, therefore, suppose the cycle to have begun 2397 B.c., or forty years before the reign of Yaou. ‘Thisis the epoch assumed by the authors of L’Art de Vérvfier les Dates. The mathematical tribunal has, however, from time immemorial counted the first year of the first cycle from the eighty-first of Yaou, that is to say, from the year 2277 B.o.

Since the year 163 3.0. the Chinese writers have adopted the practice of dating the year from the accession of the reigning emperor. An emperor, on succeeding to the throne, gives 4 name to the years of his reign. He ordains, for example, that they shall be called Ta-te. In consequence of this edict, the following year is called the first of Ta-te, and the succeeding years the second, third, fourth, &c., of Ta-te, and so on, till it pleases the same emperor or his successor to ordain that the years shall be called by some other appellation. The periods thus formed are called by the Chinese Nien-hao. According to this method of dating the years a new era commences with every reign ; and the year corresponding to a Chinese date can only be found when we have before us a catalogue of the Nien-hao, with their relation to the years of our era.

The Chinese chronology is discussed with ample detail by Freret, in the Memoirs of the Academy of Inscriptions, tom. xvii. ; and an abridgment of

his memoir is given in L'Art de Vérijier les\ Dates (tom. ii. p. 284, et seg. ; ed. in 4to, 1818), from which the preceding account is principally taken,

Indian Chronology.

The method of dividing and reckoning time followed by the various nations of India resembles in its general features that of the Chinese, but is rendered still more complex by the intermixture of Mahometan with Hindu customs, Like the Chinese, the Hindus have a solar year, which is generally followed in the transaction of public business, especially since the introduction of European power ; and they have also a lunar year, which regulates their religious festivals, and which they follow in their domestic arrangements. Their solar year, or rather sidereal year, is measured by the time in which the sun returns to the same star, and is consequently longer than our astronomical year, by the whole quantity of the precession of the equinoxes. It is reckoned by the Hindus at 365 days, 6 hours, 12 minutes, 30 seconds, and consequently exceeds a Gregorian year by one day in sixty years. The Indian zodiac is divided into twelve solar and twenty-eight lunar signs ; and the year begins with the sun's arrival at the first degree of the first sign. The month is the time the sun takes to pass through one sign ; and as each sign contains the same number of degrees, the months vary somewhat in length, according as the sun is nearer the apogee or the perigee. The longest month may contain 31 days, 14 hours, 39 minutes, and the shortest only 29 days, 8 hours, 21 minutes. The civil months, however, depend solely on the moon ; though, with the same perversion of ingenuity which we have already remarked with regard to the Chinese, and of which it would be difficult to find an example except in the east of Asia, they derive their names from the solar signs of the zodiac. The first civil month commences with the day after the full moon of that luna- tion in the course of which the sun enters the first Hindu sign, and so on with the others. When the sun enters into no new sign during the course of alunation, the monti is intercalary, and is called by the name of that which pre- cedes or follows it, which some prefix to distinguish it from the regular month. In some provinces of India, as in Bengal, the civil month commences with the day after the

new moon; but in the upper or northern proviuces, it begins, as we have stated, with the day after the full moon. From the manner in which they are reckoned, it is evident that the Hindu months, both solar and lunar, neither con- sist of an entire number of days, nor are regulated by any cycle, but depend solely on the motion of the sun and moon. The time of their commencement is different on every different meridian ; and a Hindu has no means of. knowing beforehand on what day any month begins, excepting by consulting his almanac. The civil day in all parts of India begins at sunrise.

The Hindu eras have been the subject of much con- | troversy. According to the dreams of Indian mythology, | the duration of the world is limited to four yugs or ages, three of which have already passed, and the fourth, which is the kali-yug, is the last and most deteriorated. It is this only which has any reference to authentic chronology. It forms the principal era of India, and comprehends | several others in common use, as the era of Vicramaditya, the era of Salivahana, the Bengalee era, and the cycle of sixty years. .

The Kak-yug commenced in the year 8101 z.c. The year is sidereal, and begins when the sun enters the first | sign of the Hindu zodiac, which at present happens about the 11th of April. Owing to the precession of the equinoxes the beginning of the year advances in the seasons at the rate of about one day in sixty years.

The Era of Vicramaditya is reckoned from the year 57 B.C., which corresponds to 3044 of the Kali-yug. This cra, the years of which are called Samvat, prevails chiefly in the higher or northern provinces of India, and in Guzerat. Its name is derived from that of a sovereign of Malwa, who, by defeating Saka, king of Delhi, acquired possession of the principal throne of India. Whether the year from which it is reckoned was that of the accession or death of this prince is uncertain. The years are reckoned in the same manner as those of the Kali-yug; and it may | be remarked of the Indian eras in general that, though some of them profess to be counted from the deaths of their kings, or other historical events, they all commence at the time the sun reaches the same point in his annual course through the zodiac.

The Era of Salivahana is the year 78 a.p., which corresponds to 3179 of the Kali-yug, and 135 of the Vicramaditya. The name is derived from Salivahan, who is said to have reigned many years over the kingdom of Narsinga, and to have been a liberal encourager of the arts and sciences. It is generally used in records or writings of importance, but is most prevalent in the southern provinces of Hindustan. The years are called Saka.

The Fuslee Hra, from the near coincidence of its dates with those of the Hegira, seems to have been imposed on the natives of India by their Mahometan conquerors. It is principally used in revenue transactions, and is pretty generally known over India. There are several eras of this name; but the most common is that which is reckoned from the year 590 a.p. At Madras the commencement of the Fuslee year is fixed on the 12th of July. In Bengal it begins in September, or with the full moon preceding the autumnal equinox.

The Bengalee Era is also supposed to be derived from the Hegira ; but the year is measured by solar time, and therefore differs entirely from the Mahometan year, which is purely lunar. At the present time the Bengalee epoch is about nine years later than the Hegira,—the year 1245 of the Hegira having commenced in July 1829, and the Bengalee year 1236 in April 1829. The sidereal year exceeds the lunar year by 10 days 214 hours nearly ; con- sequently, by reckoning backwards, it will be found that the dates of the Bengalee era and of the Hegira coincided

about the middle of the 16th century. History is silent on the subject; but it seems probable, that though the epoch of the Hegira was partially adopted in India, the Hindus pertinaciously resisted all attempts to-disturb their ancient methods of reckoning the subdivisions of thc ear. : Besides the Indian eras here enumerated, there are somc others which are less generally known, or which are followed only in particular provinces. The cycle of sixty years is also sometimes used, particularly in connection with the era of Vicramaditya. According to the Bengal account, the first cycle began 3185 years B.c.; and the year 1876 of our era is consequently the twenty-first of

the eighty-fifth cycle. In the Telinga account the first cycle began 3114 B.c.; and the year 1876 is the tenth of the eighty-fcurth cycle.

Fuller information regarding Indian chronology will be found in Prinsep's Lssays on Indian Antiquities (1858),

_ vol, ii, Warren's Kala Sankalita (1825), and Burnctt's

Elements of South Indian Paleography (1874).

Principal Works on Chronology.

To meet the wants of those who may desire to enter

| more fully into chronological. studies, we subjoin a list of

the leading works on the subject. In addition to the early

| Greek writings already named, there are the forty books

(some fifteen only extant in their entirety) of universal history compiled (about 8 3.0.) by Diodorus Siculus, and arranged in the form of annals; the Pentabiblos of Julius Africanus (about 220-230 «.p.); the treatise of Censorinus entitled De die natali, written 238 a.p.; the Chronicon, in two books, of Eusebius Pamphili, bishop of Cesarea (about 325 a.p.), distinguished as the first book of a purely chronological character which has come down to us; and three important works forming parts of the Corpus Scriptorum Historie Byzantine, namely, the Chrono- graplia of Georgius Syncellus (800 a.p.), the Chrono- graphia of Johannes Malalas (9th century), and the Chronicon Paschale.

Among the very numerous modern works on Chronology, the most important are the following, which are arranged » in the order of their publication :—

1583. De Emendatione Temporum, by Joseph Scaligcr, in which were laid the foundations of modern chronologieal scienee.

1603. Opus Chronologiewm, by Sethus Calvisius.

1627. De Doetrina Temporum, by Petavius (Denis Pctau), with its continuation published in 1630, and an abridgment entitled Rationarium Temporum, in 1633-1634.

1650. Annales Veteris et Novi Testamenti, by Archbishop Ussher, whose dates have by some means gained a place in the authorized version of the Bible. ~

1651. Regia Epitome Historie Saere et Profane, by Philippe Labbe, of which a French version was also published.

1669. Institutionum Chronologiearum libri duo, by Bishop Beve- ridge.

1672. Chronicus Canon digyptiacus, Ebratcus, ct Greecus, by Sir John Marsham.

1687. L' Antiquité des Temps rétablie et défenduc, by Paul Pezron, with its Défense, 1691.

1701. De Veteribus Gracorwum Romanorummu Cyclis, by Henry Dodwell.

1728. The Chronology of Ancient Kingdoms amended, by Sir Isaac Newton, remarkable as an attempt to construct a system on new bases, independent of the Greek ehronologers,

1738. Chronologie de Uhistoire sainte, by Alphonse des Vignolles:

1744. Tablettes chronologiques de Uhistoire wniverselle, by N. Lenglet-Dufresnoy. ~

1750. The first edition in one vol. 4to of L' Art de Veérifier Ics Dates, which in its third edition (1818-1831) appeared in 38 vols. 8vo., a colossal monument of the learning and labours of various members of the Bencdictine Congregation of Saint-Maur.

1752. Chronological Antiquities, by John Jackson.

1754. Chronology and History of the World, by John Blair; new edition, much enlarged, 1857.

1784. A System of Chronology, by Playfair.

720 CHRON

1799. Handbuch der Geschichte der Staaten des Alterthums, by A. H. L. Heeren. ‘

1803. Handbuch der alten Geschichte, Geographic, und Chronologie, by G. G. Bredow, with his Historische Tabelicn.

1809-1814. New Analysis of Chronology, by William Hales.

1819. Annales Veterum Regnorum, by C.G. Zumpt.

1821. Tableaux historiques, chronologiques, et géographiques, by Buret de Longcliamps. :

1824-1834, Fasti Hellenici, and 1845-1850, Fasti Roman, by fle Fynes Clinton. Epitomes of these elaborate works were published,

1851-1853.

1825-1826. Handbuch der mathematischen und technischen Chrono- logic, by Christian Ludwig Ideler; and his Lehrbuch dcr Chronologic,

1831.

1833. The Chronology of History, by Sir Harris Nieolas,

1852. Fasti Tcemporis Catholici, by Edward Greswell; and by the same author, 1854, Origincs Kalendaria Italice ; and 1862, Origines Kalendariew Hellenice.

1865. Fasti Sacri, a key to the chronology of the New Testament, by Thomas Lewin.

1869. Manual of Ancient History, by G. Rawlinson.

1872. Encyclopedia of Chronology, by B. B. Woodward and W. |

L. R. Cates,

Christian Era, by E. A. Bond. 1875. The Assyrian Eponym Canon, by George Smith.

CHRONOLOGICAL TABLE

Of the principal events of political and military history, with notices of great men and famous books, and of the most important inventions and discoveries, from the earliest times to the close of the year 1875.

Chronological tables, however unattractive to minds whose inclinations or occupations do not lie in the direction of them, are of much value and real interest for those

who have knowledge and occasion to make a right use of |

them. To the historical student they not only serve as

a storehouse of individual facts with dates, but by the |

orderly juxtaposition and scquence of these they indicate relations. They are maps on which are delineated or suggested the lincs of the main currents in the ocean of huinan history. When the student, engaged on any special series of events, desires to find their place and surroundings in world-history, he has but to turn to such tables, and a glance or two will inform him.

In the preparation of the subjoined table great pains have been taken to bring it as closely as possible into agree- ment with the results of recent historical and chronological determinations. Events and datcs of purely legendary character, once accepted as historical facts with unqucs- tioning acquiescence, have no place in it; and the whole has been subjected to a searching examination and com- parison with the best sources of information. The con- flict of the authorities makes absolute certainty in many cases ‘unattainable. ‘The reader will therefore remember in using the table, that, as differences and authorities can- not be given, the dates are necessarily in some cases ap- proximate or probable only.

2234, B.c. Alleged beginning of Chaldean astronomieal observ-

ae sent by Callisthenes to Aristotle; the earliest extant is of 20 B.C,

2200 (circa), The Hia dynasty in China founded.

2000 (circa). Cuneiform writing probably in use (deciphered by Grotefend, 1802 a.p.)

1582. Beginning of ehronology of Arundelian (Parian) marbles. (Brought to England, 1627 a.p.)

1500 (circa). Date of the oldest papyri extant.

1273. Rise of Assyrian empire, according to Rawlinson.

1150 (circa), Cylinder inseription of Tiglath-Pileser, king of Assyria (deciphered, 1857 a.D.) ;

1100 (circa). The Chow dynasty in China founded.

1055. David king of Israel.

1012, Building of Solomon's Temple.

_ 989-959. Capture of Jerusalem by Shishank (Shishak), king of Egypt, in this period. i

1875. Handbook of Rules and Tables for verifying dates with the |

| the kingdom of Israel.

Cl eGy

909 xB.c. Commencement of Assyrian eanon, which ter- minates 640 B.c. (Diseovered and published by Rawlinson, 1862 ADs ;

Bb Ereetion of North-West Palace of Nimroud, aeeording to Layard.

884 (?). Legislation of Lycurgus at Sparta.

776. Olympiad of Corebus. ‘The first authentie date in Greck history.

770. Invasion of Palestine by Pul, king of Assyria.

753. Foundation of Rome, according to Varro.

747. Babylon independent under Nabonassar.

743-723. First Messenian war.

727. Religious reformation under Hezekiah, king of Judah.

721. Samaria taken by Sargon, king of Assyria, Overthrow of Captivity of the ten tribes.

711 (circa). Invasion of Judah by Seunacherib.

685-668. Seeond Messenian war, under Aristomeues.

684. Arehonship at Athens made annual.

667-625. Reign of Assur-bani-pal, king of Assyria.

659. Foundation of Byzantium by Megarians.

640. Religious reformation under Josiah, king of Judah.

632. Invasion of Assyria by Seyths.

625 (606 2). Fall of Nineveh. Babylon independent under Nabopolassar,

624, Legislation of Draeo, arehon at Athens.

610. Battle of Megiddo. Death of Josiah.

598. Siege and capture of Jerusalem by Nebuehadnezzar. eaptivity.

594. Legislation of Solon, arehon at Athens.

588. The Pythian games begin to be eelebrated every five years.

585. Death of Periander, tyrant of Corinth forty years. of the sun, predieted by Thales (?).

579. Tyre taken by Nebuchadnezzar.

569. Nebuehadnezzar’s eonquest of Egypt.

560. Pisistratus tyrant of Athens (died, 527).

559. Anaereon begins to be known (still living in 529).

556. Birth of Simonides (died, 467).

554 (2). Conquest of Lydia and eapture of Croesus by Cyrus, king of Persia.

549. Death of Phalaris tyrant of Agrigentum.

540-510 (%). Pythagoras flourished.

538. Babylou taken by Cyrus. The Jews soon after return to Judea,

536.

535.

532.

[2934-465 nc.

Second.

Lelipse

The Jews, under Zerubbabel, begin to rebuild the Temple. Thespis first exhibits tragedy. Polyerates tyrant of Samos (put to death, 522).

529. Death of Cyrus, Accession of Cambyses.

525. Battle of Pelusium. Conquest of Egypt by Cambyses. Birth of Asehylus (died, 456).

521-485. Reign of Darius Hystaspis, king of Persia. of Behistun (translated by Rawlinson, 1846 A.D.)

520. Deeree of Darius for rebuilding the Temple at Jerusalem.

518. Birth of Pindar (died, 439).

510. The Pisistratidee expelled from Athens. Demoeratie Govern- ment restored.

508. First treaty between Rome and Carthage.

507, 506. Conquest of Thrace, Peonia, and Maeedonia by Darius.

500. Burning of Sardis by the Ionians and Athenians.

497. Battle of Lake Regillus. First authentie date in Roman history.

495. Birth of Sophocles (died, 406).

492. First Persian expedition, under Mardonius, against Greece.

490. Second Persian expedition, under Datis and Artaphernes. Victory of Miltiades at Marathon.

485, Aeeession of Xerxes, king of Persia. Syraeuse.

484, Reeovery of Egypt by the Persians. (died, after 409).

483. Ostracism of Aristides the Just by the Athenians.

481. Expedition of Xerxes to Greece.

480. Battle of Thermopyle,—fall of Leonidas. Battle of Salamis, —-vietory of Themistoeles. Oceupation of Athens by Xerxes. First Carthaginian

invasion of Sicily. Defeat of Carthaginians by Gelon at Himera. Birth of Euripides (died, 406).

480-450. Anaxagoras teaches philosophy at Athens.

479. Oceupation of Athens by Mardonius. Battles of Plata and Myeale. Siege of Sestos. Departure of Xerxes from Greeec. 477. Beginning of Athenian supremacy. :

471. Ostraeism of Themistocles. Birth of Thueydides (died, after 403 2).

470. Vietory of Cimon over the Persians at the Eurymedon.

469. Perieles begins to take part in public affairs at Athens. |

468. Birth of Soerates. Destruction of Myeenz by the Argives.

466. Flight of Themistoeles to Persia. Siege of Naxos. Battles at the Eurymedon.

465. Death of Xerxes.

Inseription

Gelon, tyrant of Birth of Herodotus

464-204 B.c.]

464 B.c. Revolt of the Helots at Sparta. scnian war, which lasts ten years.

460. Revolt of Egypt (suppressed, 455). and Hippocrates (both died, 357).

459. Gorgias flourished.

458. Birth of Lysias the orator (died, 378).

457. Battles of Tanagra. Return of the Jews under Ezra.

456. The long walls of Athens conipleted.

45]. The first Decenivirate at Rome. Laws of the Twelve Tables.

448. Tyranny of thesecond Decemvirate. Secession of the Plebs. Abdication of the Decemvirs. Cirrhzan (first Sacred) war about tle temple of Delphi.

447, Battle of Coronea.

445. Thirty years' truce between Athens and Sparta concluded.

444. Pericles becomes supreme at Athens, Birth of Xenophon about this time (died, 359).

443-438. The Parthenon at Atlicns built by Phidias.

442. New constitution at Rome,—ccnsors and military tribunes appoiuted instead of consuls.

440-439. Siege and reduction of Samos by Pericles.

436. Birth of Isocrates (died, 338).

431. Peloponnesian war began; lasting twenty-seven ycars. Poti- daa besieged by Athenians (reduced, 429). Dcath of Pericles. Influence of Cleon. Birth of Plato (died, 347).

430. The Plaguc at Athens.

428. Revolt of Mytilene.

427. Reduction of Mytilene. First Athenian expedition to Sicily. First comedy of Aristophanes exhibited. Siege of Platza.

423, Alcibiades begins to act in public affairs.

418. Battle of Mantinca.

415, Expedition to Sicily under Nicias:—Siege of Syracuse, 414 ; surrender of Nicias, 413. ,

412, First treaties between Sparta and Persia. Constitution of the Four Hundred at Athens. Intrigues of Alcibiades with the Persians.

409. Second invasion of Sicily by the Carthaginians.

407. Foundation of Rhodes.

406. Battle of Arginuse. Condemnation of the ten generals. Dionysius, tyrant of Syracuse ; reigns thirty-eight years.

405. Battle of Hgospotami.

404, Athens taken by Lysander. Government of the Thirty Tyrants. of Alcibiades.

i 403. Restoration of democratic government at Athens by Thrasy- ulus,

402. Birth of Phocion (died, 317).

401. Expedition of Cyrus the younger. Battle of Cunaxa. Death of Cyrus. Retreat of the ten thousand Greeks.

401-384. Ctesias flourished.

399. Prosecution and death of Socrates.

398. Campaign and peace of Dercyllidas.

396. First campaign of Agesilaus in Asia.

394. Corinthian war begins.

393. The long walls of Athens restored.

392. Veii stormed by Camillus.

389 (circa). Birth of schines (died, 314).

387. Peace of Antalcidas. Greek cities in Asia subjected to Persia. End of Corinthian war. Rome burnt by the Gauls.

384, Birth of Aristotle (died, 322).

382, Seizure of the Cadmea at Thebes by Pheebidas, war (ends, 379). Birth of Demosthenes (died, 322).

380 (circa). Death of Aristophanes.

379. Recovery of the Cadmea by Pelopidas.

376. Victory of Chabrias over the Spartans in sea-fight off Naxos.

372. Peace between Athens and Sparta.

371. Victory of Epaminondas over the Spartans at Leuctra. Foundation of Megalopolis.

370. Jason of Plicre assassinated.

367, Embassy of Pelopidas to Persia. and remains with Plato twenty years.

364. Licinian laws passed at Rome. Institution of pretorship and curule edileship. Plebeian consul elected, 363.

362. Battle of Mantinea,—victory and death of Epaminondas.

359. Philip, king of Maccdonia.

358. Beginning of Social war. Amphipolis taken by Philip.

357. Phocian (or Sacred) war begins. Expedition of Dion to Sicily.

356. Birth of Alexander the Great. Temple of Ephesus burnt. Expulsion of Dionysius from Syracuse by Dion.

355. Tend of Social war. Independence of Rhodes, Cos, Chios, and Byzantium acknowledged by Athens.

352. Demosthenes delivers his first Philippic.

349-347. Olynthian war. Olynthus taken by Philip.

346. Surrender of Phoeis to Philip. End of the Sacred war. Philip admitted to Amphictyonic Council. Dionysius recovers the

tyrauy.

Third (fourth?) Mes-

Births of Democritus

End of Peloponnesian war. Spartan supremacy. Death

Olynthian

Aristotle goes to Athens,

Sieges of Chios and Byzantium.

Delphi seized by Phocians.

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343 B.c. Conquest of Syracuse by Timoleon. Expulsion of Dionysius. Embassy of Demosthenes with others to Philip.

342-341. Philip’s expedition to Thrace.

341. Birth of Epicurus (died, 270).

340. First Samnite war begins. Perinthus and Byzantium be- sieged by Philip. Victory of Timoleon over the Carthaginians at~ the Crimisus.

338. Philip, general of the Amphictyonic League. Cheronea. Greece subjugated.

337-335. The Latin war. Supremacy of Rome over Latium.

336. Murder of Philip. Accession of Alexander. Accession of Darius Codomannus.

335. Alexander destroys Thebes ; is chosen gencralissimo of the Greeks,

334. Battle of the Granicus.

333. Battle of Issus.

332. Siege and capture of Tyre. tion of Alexandria.

331. Battle of Arbela.

330. Murder of Darius.

327-325. Campaigns of Alexander in India. Voyage of Nearchus from the Indus to the Kuplirates.

328. Death of Alexander at Babylon. Second Saninite war ; lasts twenty-one ycars.

321. First war among the ‘‘successors of Alexander.’ The Romans surrender to the Samnites and pass under the yoke at the Caudine Forks.

315. Thebes rebuilt by Cassander.

313. Samnite victory at Lautule.

312. Battle of Gaza. Victory of Ptolemy and Seleucus over De- metrius Poliorcetes. Pyrrhus, king of Epirus. The Appian way and aqueducts constructed (?).

304. Siege of Rhodes by Demetrius.

301. Battle of Ipsus. inal division of Alexander’s dominions.

300 (circa). Chandragupta (Sandracottus) reigns in India; he makes a treaty with Seleucus. Foundation of Antioch by Seleucus.

299. Athens besieged and taken by Demetrius.

298-290. Third Samnite war.

295. Battle of Sentinum.

287. Birth of Archimedes (died, 212).

286. The Hortensian law passed at Rome; pilcbisctta declared binding on the whole people.

284 (circa). Alexandrian library founded by Ptolemy Soter.

280. Achzan League established. Invasion of Italy by Pyrrhus. Birth of Chrysippus (died, 207).

279. Irruption of the Gauls into Greece. First plebeian censor at Rome.

Battle of

Conquest of Egypt. Founda-

Subjugation of Persia.

274. Battle of Beneventum. Pyrrhus defeated,—leaves Italy. 269. Silver money first coined at Rome

268. Berosus flourished.

265. Roime supreme over all Italy.

264. First Punic war begins. Chronology of Parian marbles ends, 260. First Roman fleet launched. Victory of Duilius off Myle.

260-230 (circa). Reign of Asoka in India.

256. Victory of Regulus at Ecnomus. Invasion of Africa,

255. Defeat and capture of Regulus-by Carthaginians. Kvacuation of Africa.

250 (circa). Parthia becomes an independent kingdom undcr Arsaces.

247. The Thsin dynasty in China founded.

241. Defeat of Carthaginians by Catulus at the gates Insule. End of the first Punic war. Attalus, king of Fergaimus.

240. The plays of Livius Andronicus exhibited (the first) at Rome.

238. Date of the Decree of Canopus: tablet of San (discovered by Lepsius, 1866 A.D.) me

237. Conquest of Spain attempted by the Carthaginians. of Sardinia and Corsica by the Itomans.

235. The gate of Janus shut.

234. Birth of Cato Major (died, 149).

227. Cleomenic war begins.

226. Reforms of Cleomenes at Sparta.

225-220. The Gauls driven froin Cisalpine Gaul.

219. Siege of Saguntum by Hannibal. Beginning of sccond Punic war.

218. March of Hanuibal from Spain into Italy. Passage of the Pyrenees and the Alps. Battles of the Ticinus and the Trebia.

217. Hannibal’s passage of the Apennines. Battle of Lake Trasimenus. The two Scipios sent to Spain.

216. Battle of Cann. Alliance of Hannibal with Philip II. of Macedonia.

214-212. Siege and capture of Syracuse by Marcellus,

211. Defeat and death of the two Scipios in Spain. covered by Rome. Conquest of Judea by Antiochus.

211-205. First Macedonian war.

207. Battle of the Metaurus; Hasdrubal defeated and slain by the Romans. First gold coinage at Rome.

204. Scipio conducts the war in Africa.

Seizure

Caja re-

Siege of Utica.

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202 n.c. Defeat of Hannibal at Zama.

201. Treaty of peace ; end of second Punic war.

200-197. Second Macedonian war.

198. Flamininus proclaims liberty to the Greeks. a

197. Battle of Cynoseephele. Philip defeated by Flamininus.

192. Philopcemen preetor of the Achean League.

192-190. War between the Romans and Antiochus the Great. Battle of Magnesia. ; ;

188. The laws and discipline of Lycurgus abolished by Philope:- men,

184. Death of Plautus.

179. Perseus king of Macedonia.

172-168. Third Macedonian war:—battle of Pydna, victory of Emilius Paulus over Perseus ; Macedonia made a Roman province,

142.

168. Jerusalem taken by Antiochus Epiphanes.

167, Revolt of Judas Maccabeeus. His oceupation of Jerusalem (except the citadel), 165.

166. First comedy of Terence performed at Rome.

160-145. Hipparehus flourishes.

159. Death of Terenee.

149. Third Punic war begins.

149-133. Lusitanian war,—Viriathus commands the Lusitanians ; fall of Numantia, 133.

146. Rome declares war against the Achzan League. Carthage. taken and destroyed by Scipio, Corinth by Mummius. Provinee of Africa constituted.

138. Birth of Sulla (died, 78).

134-132. Servile war in Sicily.

133. Laws of Tiberius Gracehus passed at Rome, Gracchus

murdered. Kingdom of Pergamus bequeathed to Rome.

121. Reforms of Caius Gracehus. Gracchus murdered.

116. Birth of Varro (died, 28).

113. The Cimbri and Teutones invade Gaul.

111-106. Jugurthine war, conducted by Metellus and Marius.

109-101. War of Rome with the Cimbri and Teutones.

106. Birth of Pompey and of Cicero. an Victory of Marius over the Teutones at Aque Sextix

A1x).

101. Victory of Mariusoverthe Cimbri at Vercelle, End of the war.

100. Birth of C. Julius Ceesar.

95. Birth of Lueretius (died, 55).

90-88. The Social (Italian) war.

88. First Mithridatic war, Civil war of Marius and Sulla. Sulla oceupies Rome. 87. Marius retakes Rome. Proseription.

86. Death of Marius, Athens stormed by Sulla, Sallust (died, 34)

84. Sulla makes peace with Mithridates.

83. War with Marian party in Italy.

82. Vietory at the Colline Gate. Oecupation of Rome. Dictator- ship. Proscription.

79. Retirement of Sulla (dies, 78).

79-72. Civil war of Sertorius in Catulus in Italy.

74-65. Third Mithridatie war :—73-72. Victories of Lucullus.

73-71. Servile war in Italy. Spartacu$ defeated by Crassus.

70. Consulship of Pompeyand Crassus. Birth of Virgil (died, 19).

69. Victory of Lucullus over Tigranes.

67. First appearanee of Cesar. Pompey reduces the pirates.

66. Lucullus recalled. Pompey sent into Asia ; ends the war.

64, Pompey reduces Syria to a province :—Jerusalem taken, 68.

63. Birth of Augustus. Second conspiraey of Catiline. Orations of Cicero.

60. Pompey, Ceesar, and Crassus form the first Triumvirate.

59. Birth of Livy (died, 17 A.D.)

58 The Gallic war begins.

55, 54. Cesar invades Britain. and killed by the Parthians, 53. we Cesar's war with Vercingetorix. Murder of Claudius by

110. –

51. Subjugation of Gaul completed.

49. Civil war between Cesar and Pompey. Pompey driven from el eer Ce ee — in Spain. Czsar dietator.

. Battle o arsalia, Murd 1 aud Cleopatrs a, er of Pompey in Egypt. Cesar . 47. Cesar dietator again. War in Egypt. Partial destruction of the Alexandrian library. Czsar deta Pharnaces at Zela (Veni, vidi, vici). _ 46. Afriean war. Battle of Thapsus. Death of Cato. tion of the calendar by Cesar. His triumphs.

45. War in Spain. Battlé of Munda ;—defeat of the Pompeiaus er aoe tl for life, Dictator. '

- Assassination of Cesar. Flight of Brutu ssi Antony master of Rome. Corinth ic Carthage Pa — 43. Battle of Mutina. Second triumvirate—C.

Octavius, M.

aay M. Lepidus. Cicero put to death. Birth of Ovid (died,

Spain; and of Lepidus and

Crassus in the east; defeated

Reforma-

CHRONOEOGT

irth of |

[202 b.c.—202 A.D.

42 p.c. Battles of Philippi. Dcaths of Brutus and Cassius. The triumviri masters of the Roman world.

41. Meeting of Antony and Cleopatra at Tarsus.

40. Herod made king of the Jews.

36. Sextus Pompeius driven from Sicily (put to death, 35). Lepidus deprived of power.

32. War between Octavius and Antony.

31. Battle of Actium. Establishment of the Roman empire.

80. Deaths of Antony and Cleopatra.

29. The Gate of Janus shut.

27. Cesar is made emperor for ten years and receives the title Augustus.

25. The Gate of Janus shut.

18. Imperial dignity reeonferred ; again, 8 B.c., 8, and 12 A.D,

17-7. Temple at Jerusalem rebuilt by Herod.

15. Vietories of Drusus over the Rheti.

12. Invasion of Germany by Drusus.

11-9. Campaigns of Tiberius in Pannonia and Dalmatia.

4, Birth of Christ, according to Ussher’s system. Death of Herod.

4-6 A.D. Campaigns of Tiberius in Germany.

9. Destruction of Varus and three legions by Germans under Hermann (Arminius).

14. Death of Augustus. Accession of Tiberius.

14-16. Campaigns of Germanicus in Germany.

28. Influence of Sejanus.

25 or 26. Pontius Pilate, governor of Judea.

27. Tiberius retires to Caprezx.

33. The Crucifixion, according to Eusebius; 29, aecording to

_Lactantius, Augustine, Origen, and other authorities,

37. Accession of Caligula. Birth of Josephus.

41, Claudius emperor.

48, Expedition of Claudius to Britain. Successes of Aulus Plau- tius.

47, London founded by A. Plautius.

50. Defeat and capture of Caractacus.

54, Nero emperor.

61. Insurrection of the Britons under Boadicea. Suetonius Paulinus.

64. Rome on fire six days. Persecution of Christians.

65 (2). Deaths of St Peter and St Paul. Death of Sencca,

66. Jewish war begins, conducted by Vespasian.

68. Galba emperor.

69. Otho, Vitellius, Vespasian, emperors.

70. Fall of Jerusalem, taken by Titus.

71. The Gate of Janus closed. Triumph of Vespasian and Titus. The philosophers expelled from Rome between 71-75.

78. Agricola commands in Britain.

79, Titus emperor. Herculaneum and Pompeii destroyed by cruption of Vesuvius. Death of Pliny the Elder.

80. Advance of Agricola to the Tay.

81. Domitian emperor.

84, Agricola defeats the Caledonians, and sails round Britain.

86. Dacian war begins.

90. The philosophers again expelled from Rome.

95. Persecution of Christians, St John banished to Patmos.

96. Nerva emperor.

98. Trajan. Plutarch flourishes.

103-107. Subjugation of Dacia, &c.

114-117. Trajan’s expedition to the East.

117. Hadrian emperor. Conquests of Trajan abandoned, The Euphrates made the eastern frontier of the empire.

120. Hadrian visits Gaul and Britain. Hadrian’s wall built,

121.

130. Birth of Galen (died, 200).

132-135. Seeond Jewish war,—Barchochebas leader of the Jews.

188. Antoninus Pius emperor. The empire at peace.

139. Conquests of Lollius Urbicus in Britain. Wall of Antoninus (Graham’s Dyke) built.

161. Mareus Aurelius and Lucius Verus joint emperors.

163. Persecution of Christians.

166. Martyrdom of Polycarp.

167-178. War with the Marcomanni, Quadi, &c.

169. Death of Verus. M. Aurelius sole emperor.

180. Commodus.

183. Suceesses of Ulpius Marcellus in Britain. the name Britannieus, 184.

185. Birth of Origen (died, 253).

190-214. Tertullian flourished.

193. Pertinax emperor, murdered. Didius Julianus buys the empire, His rivals, Peseennius Niger and Septimius Severus.

194. Severus emperor alone.

196. Capture of Byzantium after three vears' siege by Severus.

197. The Quartodeciman controversy.

198. Caraealla named Augustus.

202. Persecution of Christians,

Taken prisoner to Rome.

Vietory of

Commodus takes

208-529.]

208. Expedition of Severus to Britain :—invasion of Caledonia, 209 ; his wall completed, 210.

211. Death of Severus at York. Caracalla and Geta emperors. Geta murdered, 212.

214. First contact of the Romans with the Alamanni, German tribes on the upper Rhine.

217. Macrinus emperor. 218. Elagabalus emperor.

922, Alexander Severus emperor.

226. Dissolution of Parthian empire. Foundation of the new Persian monarchy (kingdom of the Sassanide) by Ardshir (Artaxerxes).

231. Persian war begins. ot Triumph of Severus; murdered and succeeded by Maximin,

236. Persecution of Christians. '

938. The Gordiani, Pupienus and Balbinus (jointly), and Gor- dianus I11. emperors.

242. Gordianus defeats Sapor, king of Persia.

944, Gordianus murdered and succeeded by Philip the Arabian.

249. Decius emperor. 250. His edict for persecution of. Chris- tians published. First invasion of the empire by the Goths. Death of Decius and his son in the campaign of 251.

251. Gallus emperor.

252. Pestilence begins, and lasts fifteen years.

253. Irruption of Goths and Burgundians into Mesia and Pannonia. First appearance of the Franks in Gaul about this time.

254. Valerian emperor. Persecution of Christians.

258. Trapezus taken by Goths.

259. Sapor ravages Syria. Valerian taken prisoner.

ag Gallienus sole emperor. The Thirty teiuiita, between 260 and 268.

262. The Goths in Macedonia and Asia Minor. the temple of Ephesus. Antioch taken by Sapor.

263. The Franks invade Gaul.

967. The Heruli invade Greece, and are repulsed by Dexippus.

968. Claudius emperor. 269. He defeats the Goths in Meesia.

970, Aurelian emperor. Victories over the Goths aud the Ala- manni.

272.

273.

275.

His son Gallienus associated with him.

They destroy

Expedition of Aurelian to Palmyra. Capture of Palmyra and of Queen Zenobia. Tacitus emperor. 276. Probus emperor.

277. Probus drives the Alamanni from Gaul.

982. Carus emperor. Expedition to the Hast.

984, Diocletian emperor. 286. Maximian joint emperor with him. Revolt of Carausius in Britain.

289. Victory of Carausius over Maximian.

292. Constantius and Galerius named Cesars. empire.

296, Britain recovered by Constantius.

297. Siege of Alexandria by Diocletian. Persian war.

298. Constantius defeats the Alamanni near Langres. Narses.

303. Persecution of Christians by Diocletian.

305. Abdication of Diocletian and Maximian. Constantius and Galerius emperors. Beginning of monasticism in Egypt under St Antony.

306. Death of Constantius at York. Proclamation of Constantine (the Great).

307. Revolt of Maxentius. Six emperors. Elevation of Licinius.

311. Edict of Nicomedia to stop the persecution.

312. Defeat and death of Maxentius.

313, Defeat and death of Maximian. Edict of Milan, by Con- stantinc and Licinius, for general religious toleration.

314, War between the two emperors.

323. Constantine sole emperor.

324, Foundation of Constantinople ; empire, 330 (or 384).

395, First General Council of the Church meets at Nicma.

326, Athanasius, patriarch of Alexandria. Controversy with Arius.

336. Death of Arius.

337, Constantine 1]., Constans, and Constantius II. joint- emperors. 338. Death of Eusebius.

347. Synod of Sardica.

348, Ulfilas bishop of the Goths (died, 388).

350-353. Revolt of Magnentius. Defeated by Constantius.

357. Victory of Julian over the Alamanni at Argentoratumn (Strasburg). ;

361. Julian emperor ;. his edict recalling the banished bishops and granting gencral toleration published, 362.

363, Persian war. Julian killed. Jovian emperor.

364. Valentinian and Valens joint emperors. Final division of the empire.

367-369. Theodosius in Britain ; aids against Picts and Scots.

370. The Saxons land on coasts of Gaul.

873. Death of Athanasius.

Division of the

Defeat of

dedicated as capital of the

CHRONOLOGY

723

375. War with the Quadi. Gratian emperor of the West, with Valentinian II. Invasion of the Iuns.

376. Valens allows the Goths to settle in Thrace.

378. Constantinople threatened by Goths.

379, Theodosius the Great emperor of the East.

381, Second General Council, held at Constantinople. rites prohibited.

382. Alaric king of the Gothis.

383. Revolt of Maximus in Britain.

390. Final suppression of Paganism. Massacre at Thessalonica. Death of Gregory of Nazianzus.

393. Honorius emperor of the West.

394, Theodosius master of the whole Roman world.

395. Death of Theodosius. Arcadius emperor of the East. The Huns invade the eastern provinces. Augustine made bishop of Hippo (died, 430). Alaric in Greece. Stilicho attains chief power under Honorius.

396. The Britons ask aid of Honorius against Picts and Scots.

397. Deaths of Martin of Tours and Ambrose of Milan.

398. Chrysostom bishop of Constantinople (died, 407).

400. Alaric ravages Italy.

403. Battle of Pollentia,—defeat of Alaric by Stilicho.

406. The Vandals, Alani, and Suevi invade Gaul.

408. Theodosius I]. emperor of the East. Stilicho slain at Ravenna.

409. The Vandals, Alani, and Suevi invade Spain,

410. Sack of Rome by Alaric. Death of Alaric. Pelagius begins to preach about this time.

411. The Roman legions recalled from Britain ; final withdrawal, about 418.

414. Marriage of Ataulphus, king of the Goths, to Placidia, daughter of Theodosius the Great. Persecution of Christians in Persia begins ; lasts thirty years.

420. Death of St Jerome.

423. Death of Honorius at Ravenna.

425. Administration of Actius begins, lasting about thirty years,

428. Nestorius patriarch of Constantinople (banished, 435).

499. The Vandals under Genseric invade Africa. Death of Theo- dore bishop of Mopsuestia.

431, Third General Council held at Ephesus.

433. Attila king of the Huns.

438. Theodosian Code published.

439. The Vandals surprise Carthage.

440. Leo I. (the Great) bishop of ome.

442. Treaty of peace between Valentinian and Genseric. in Thrace and Macedonia.

446, Message of the Britons to Aetius for aid against the Saxons.

447, Attila ravages the Eastern empire. Theodosius concludes treaty with Attila.

449, The Robber-Council of Ephesus. in Britain.

450. Death of Theodosius II.

451. Invasion of Gaul by Attila. Victory of Aetius at Chalons. Fourth General Council held at Chalcedon. Monophysite contro- versy begins.

452. Invasion of Italy by Attila. Foundation of Venice.

453. Death of Attila. Dissolution of his empire.

455. Sack of Rome by Genseric. Intercession of Leo.

457. Hengist founds kingdom of Kent.

461-467. Rule of Ricimer. Severus nominal emperor.

462-472. Conquests of the Visigoths in Spain and Gaul.

465. Great fire at Constantinople.

475. Romulus Augustulus emperor of the West (banished, 476).

476. Odoacer, king of Italy. End of Western empire.

477. Death of Genseric. Landing of Ailla and South Saxons in Britain.

480. Earthquakes at Constantinople, lasted forty days.

489. Clovis, king of the Franks. The Henoticon of Zeno pub- lished.

486. Victory of Clovis over Syagrius at Soissons.

487. Theodoric, king of the Ostrogoths, threatens Constantinople.

489-493. Conquest of Italy by Theodoric.

491. Storming of Anderida by Ailla; kingdom of the South Saxons established.

493. Odoacer slain. Theodoric king of Italy.

495. Landing of Cerdic and West Saxons in Britain.

496. Victory of Clovis over Alamanni at Tolbiae. His baptism.

500. Missions of the Nestorians began early in this century.

502-505. Persian war. Siege and recovery of Armida.

507. Victory of Clovis over the Visigoths.

510. Paris made the seat of the Frankish monarchy.

511. Death of Clovis. Partition of his kingdom.

525. Boetius put to death by Theodoric.

525-526. Antioch destroyed by carthquakc.

527. Justinian emperor. First edition of his Code published, 529;

528. The Benedictine Order founded.

529. Bclisarius general of the Eastern armies; defeats the Per-

aan

Attila

Landing of the English

724 ; CHRONOLOGY [531~803.

i icts ini i he philosophers, 654. Siege of Constantinople by Moawiyah. ee wie pee ee Ge rbelbiey 655. Penda, king of Mercia, defeated and killed by Oswy of

Whnena en oes a oi rhich ravages the | Northumbria. Conversion of Mercia.

ae gees BBE Tera epee wich iravag 658. The emperor Constans II. makes peace with Moawiyah. 582. The Pandects promulgated by Justinian. Sedition (the 663. Constans II. received by Pope Vitalian at Rome. ‘

Nika) at Constantinople, suppressed by Belisarius. a 664. pear of pag Cedmon, the great English poet. 533-534, Belisarius conquers Gelimer; end of Vandal dominion | Wilfrid archbishop of York. »

ae erics 667. Siege of Constantinople by Yezid.

Bo5 510. Thei@ethie aay. 668. Theodore archbishop of Canterbury. 536. Belisarius takes Rome. 670. Kairwan founded. ; 537-538. Siege of Rome by Vitiges. ; 672. Siege of Constantinople by Sofien ben Aouf; the attack 539. Destruction of Milan by the Goths. The Franks in Italy. repeated yearly for seven years ; “‘ Greek fire’ used. – 540. Ravenna taken by Belisarius. Antioch taken and plundered 678. Wilfrid driven from his See ; preaches to the Frisians. by (Rosroes. 680. Sixth General Council held at Constantinople. “541. Totila king of the Ostrogoths. Abolition of the consulate 685. Justinian II. emperor of the East. :

by Justinian. 687. Death of Cuthbert, bishop of Lindisfarne.

542. Earthquake and plague at Constantinople. 688. Ina king of Wessex. Pepin d’Héristal (mayor of the 545. Rome besieged by Totila. Peace between Justinian and palace) sole ruler of France (died, 714). Bulgarian war.

Chosroes, 690. Death of Archbishop Theodore.

546. Rome taken by Totila (recovered by Belisarius, 547). 692-698. Carthage reduced, pillaged, and burnt by Saraccns.

Controversy about the “Three Chapters ” begins about this time. 697. Doge of Venice first elected for life.

547. Kingdom of Bernieia founded by Ida. 699 (690 2). Death of Benedict Biscop.

549, Rome again taken by Totila. 709. Death of Wilfrid. f

550. The empire invaded by Slaves and Huns. 710. First invasion of Spain by the Saracens ; conquest by 551-2. Reform of the calendar by the Armenians ; their era Tarik ; fall of Roderic, 711-713.

fixed. The silkworm introduced into Europe. 714, Charles Martel rules France as mayor of the palace. Toledo 552. Death of Totila. Conquest of Rome by Narses. taken by Tarik.

553. Fifth General Council held at Constantinople. Defeat and 716. Leo the Isaurian emperor. Siege of Constantinople by

‘leath of Teias, last king of the Goths. Saracens. The Bulgarians conclude a commercial treaty with 554. Defeat of the Franks and Alamanni by Narses. Theodosius III.

556. Great earthquake at Constantinople. 718. Mission of Boniface in Germany. 558. Clotaire sole king of the Franks till his death in 561. 719. Narbonne taken by Saracens.

Embassy of the Avars to Constantinople. 721. Invasion of France by Saracens. 562. Peace for fifty years concluded between Justinian and 723. Conquest of Sardinia by Saracens.

Chosroes. 726. Death of Ina king of Wessex. First edict of Leo III. 565. Deaths of Belisarius and Justinian. Justinug II. emperor. | (The Iconoclast) against image-worship. Siege of Nicwa by the

Ethelbert king of Kent. Saracens.

566-567. The Lombards in alliance with the Avars destroy the 728. Ravenna taken by the Lombards (retaken by Eutychius, 729), kingdom of the Gepide in Pannonia, 732. Battle of Tours,—victory of Charles Martel over the 568-571. Conquest of Italy by the Lombards. Exarchate of | Saracens.

Ravenna established. 735. Death of the Venerable Bede.

570 or 571. Birth of Mahomet. 740. Great earthquake at Constantinople, in Thrace, and in 572. War begins between the empire and Persia. Bithynia.

576. Tiberius defeats Chosroes at Melitene. 741. Death of Charles Martel.

579. Death of Chosroes, 744. Abbey of Fulda founded by Boniface.

586. Recared, king of the Goths in Spain, converted to the 746. Great earthquake in Syria. The plague for three years in

Catholic faith. Italy, Greece, and Asia Minor.

590. Gregory I., the Great, bishop of Rome. 747. The plagne at Constantinople.

591. Maurice emperor of the East restores Chosroes II. to the 750. The dynasty of the Ommiades (caliphs) overthrown ; the throne of Persia. Abbasides succeed.

593. Kingdom of Northumbria founded by Ethelfrith. 751. The Exarchate of Ravenna conquered by the Lombards

597. Arrival of Augustine in England (died, 605). under Astolphus. End of the dominion of the Eastern emperors in

599. Reform of chureh service by Gregory the Great. Central Italy.

602. Supremacy of the bishop of Rome aeknowledged by Phocas, 752. The Merovingian line ends with deposition of Childeric III. emperor of the East.

Canterbury, seat of archbishopric. Pepin (Le Bref’}), founder of Carlovingian line, is crowned at Soisscns

604. See of London founded. by Boniface. Stephen II. pope of Rome.

610. Mahomet begins to preach at Mecca. Heraclins emperor 754. Council of Constantinople condemns images, pictures, and of the East. the crucifix, and proseribes the art of painting.

614. Damascus and Jerusalem taken by the Persians, 755. Grant of Exarchate of Ravenna and the Pentapolis to the

615. Death of St Columban. Pope, by Pepin. Beginning of the temporal power. Siege of Rome

616. Invasion of Egypt by Persians. by Astolphus. Death of Bonifacc, apostle of Germany.

622. Flight of Mahomet’ from Mecca to Medina (the Hegira). 756. Cordova made seat of western caliphate by Abdelrahman I.

First of six expeditions of Heraclius against the Persians. 757. Rout of the Bulgarians by the emperor Constantine V.

623. Battle of Beder, first victory of Mahomet. 763. Foundation of Baghdad, seat of the ealiphate. Winter of 626. Siege of Constantinople by Persians and Avars. 763-764, the Bosphorus and the Euxine frozen. 628. Death of Chosroes II. Treaty of peace between Heraclius 766. The imperial fleet destroyed by storm on the Euxine.

and Siroes. 768. Charles the Great (Charlemagne) and Carloman kings of the 629. Visit of Heraclius to J erusalem. Franks. Charles alone, 772.

632. Death of Mahomet. Abu-Bekr succeeds. 770. Charles marries the daughter of Desiderius, last king of the 634. Victory of Khaled at Ajnadin. Capture of Damascus. | Lombards.

Oinar third caliph. Aidan bishop of Lindisfarne. 771. Charles repudiates his wife and marries Hildegarda,

636. Battles of Yermouk and Cadesia. Foundation of Bussorah. 774. Overthrow of the Lombard kingdom by Charles the Great. 637. Caliph Omar takes Jerusalem. Mosque of Omar founded. 778. His expedition to Spain ; battle of Roncesvalles.

638. Conquest of Syria completed by Amrou. 780. Image-worship re-established by the empress Irene, 639-640. Invasion of Egypt and capture of Alexandria. Ecthesis 782. Massacre of the Saxons by Charles.

of Heraclius published and condemmed by the bishop of Rome. 785. Haroun Alraschid caliph of Baghdad.

Monothelite controversy. 787. Seventh General Council, second of N icea, re-establishes 641. Death of Heraclius, image-worship. First landing of Northmen (Danes) in England. 642. Theodorus pope of Rome; the first called “sovereign 794. Charles holds a great council at F rankfort.

pontiff.” 797-802. Irene sole empress.

647. First invasion of Africa by the Saracens, 800. Charles the Great crowned emperor of the Romans by Pope 648. Capture of Cyprus. Leo III. Extinction of supremacy of Byzantine emperors at Rome. 651. Yezdegerd, last king of Persia, killed by Turks. Death of | Egbert, king of the West Saxons,

Aidan, bishop of Lindisfarne. 801. Death of Paulus Diaconus.

0038: Conquest of Rhodes by Moawiyah ; the Colossus destroyed. 802. The Athanasian Creed authoritatively imposed by Charles.

The Pope, Martin I., goes to Constantinople and is imprisoned by 803. Limits of the two empires settled by treaty between Charles

the emperor Constans II. and Nicephorus. Massacre of the Barmecides by Harcun Alraschid,

804—1035.]

804. Death of Alcuin (born about 735). 809. Death of Haroun Alraschid. 814. Death of Charles the Great. of the Romans and king of France.

816-837. Eginhard, historian of Charles the Great, flourished.

816. Coronation of Louis and his wife Hermengarda by the Pope at Rheims.

822. Louis does public penance at Diet of Attigny.

823. Conquest of Crete and foundation of Candia by Saracens. Ebbo missionary to the Northmen about this time.

826. Anschar, apostle of the North, begins teaching in Denmark.

827. Egbert overlord of all the English kingdoms. Collection made of the capitularies of Charles the Great and Louis. The 4lma- gest of Ptolemy translated into Arabic by command of Caliph Almamun.

831. The doctrine of transubstantiation maintained by Paschasius Radbert. Controverted by Rabanus Maurus.

833. Louis does public penance at Soissons.

835. Festival of All Saints instituted about this time.

836. Ethelwulf king of Wessex.

840. Lothaire emperor. Charles Il. (the Bald) king of France.

841. Rouen pillaged by Northmen.

842, Piast chosen duke of Poland. Final establishment of image worship by council of Constantinople.

843. The Picts subdued by Kenneth M‘Alpin. Treaty of Verdun. Division of dominions of Louis among his three sons.

845. Persecution of Paulicians by Empress Theodora. threatened by Northmen.

846, 847. Rome threatened by the Saracens.

849, Birth of Alfred the Great. Persecution of Gottschalk by Hinemar.

850-870. Joannes Scotus Erigena flourished.

851. Great victory of Ethelwulf over the Northmen at Ockley.

855. Louis (of Bavaria) emperor.

857. Photius patriarch of Constantinople.

860. Foundation of kingdom of Navarre about this time.

862. Reputed foundation of Russian monarchy by Rurik. Photius excommunicated by the Pope.

862-868. Preaching of Methodius and Cyrillusin Moravia.

865. First expedition of Russians to Constantinople. South Italy ravaged by Saracens. The forged Decretals (Isidorian) adopted by Pope Nicholas I. about this time.

867. Photius excommunicates the Pope. the East.

868. Photius deposed by council at Rome.

869-870. Highth General Council, held at Constantinople.

871. Alfred king of Wessex.

874. Norwegian settlement in Iccland.

875. Charles (the Bald) erowned emperor at Rome.

877. Louis II. (the Stammerer) king of France. Syracuse taken by Saracens.

878. The Danes defeated by Alfred. Peace of Wedmore.

880. Methodius permitted by the Popc to celebrate divine service in the vernacular tongue (Slavonian).

881. Albategni begins his astronomical observations about this time and continues them till 918. Charles II1. (the Fat) emperor (deposed 887). ;

885. The Northmen under Rolf overrun Neustria (settled there by treaty with Charles the Simple, 912).

886. Siege of Paris by the Northmen. Leo VI. (the Philosopher) emperor of the Fast.

891. Death of Photius in exile.

894. Siege of Rome by Arnulph, king of Germany, who is crowned emperor, 896,

.896. Exhumation of the body of Pope Formosus by order of Stephen VI.; trial, condemnation, and degradation of Formosus ; oH body thrown into the Tiber ; the proceedings quashed by John

X., 898.

898. Charles (the Simple) king of France.

899. Louis IV. emperor,—last of the Carlovingian line.

900. Palermo sacked by Saracens.

901. Edward the Elder king of Wessex.

904. Thessaloniea taken by Saracens. Russians to Constantinople,

907. End of the Tang dynasty in China.

908. Theodora mistress of Rome; she occupics the castle of St Angelo.

909.

910.

911.

913.

915.

917.

918.

Louis le Débonnatre emperor

Paris

Basilius I. emperor of

Second expedition of

Abu Obeidallah, first of the Fatimite caliphs of Egypt.

The congregation of Cluny founded.

Conrad, duke of Franconia, elected emperor.

Constantine VII. (Porphyrogenitus) emperor of the East. Berenger, king of Italy, crowned emperor by Pope John X. Defeat of Byzantine army by Bulgarians at Achelous. Henry the Yowler, duke of Saxony, elected king of Germany. 925. Athclstan king of the West Saxons.

926 (circa). Laws of Howel Dda sanctioned by Pope Anastasius. 929. Mecca pillaged by the Karmathians.

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934. Victory of Henry the Fowler over Hungarians at Merseburg.

936. Louis IV. (D’Outremer), king of France. Otto I., king of Germany.

937. Victory of Athelstan at Brunanburh.

940. Edmund king of Wessex.

941. Third expedition of Russians to Constantinople.

943. Dunstan made abbot of Glastonbury, and chief minister to Edmund.

946. Edred king of Wessex. Constantinople.

951. Otto I. proclaimed king of Italy ; Berenger driven away.

954, Lothaire king of France.

955. Victory of Otto over Hungarians in Bavaria. of Wessex.

956. Banishment of Dunstan. of Paris.

958. Edgar king of Mercia; crowned at Bath, 973, and rowed by eight vassal kings on the Dee.

959. Dunstan archbishop of Canterbury. Italy ravaged by Berenger. Hugh Capet declared duke of France by Lothaire.

960. The Sung dynasty in China founded.

962. Otto I. crowned empcror of the Romans by Pope John X11.

963. Deposition of the Pope by Otto. Nicephorus Phoeas emperor of the Kast.

963-975. Eastern conquests of Nicephorus Phocas and John Zimisccs.

964, Revolt at Rome,-—return of John XII. Otto.

965. Second embassy of Liutprand to Constantinople ; his im- prisonment by Phocas.

967. Magdeburg made seat of archbishopric by Otto I.

969. Jolin I. (Zimisces) emperor of the a

970. Settlement of Paulicians at Philippopolis.

973. Otto II. emperor of the Romans.

974. Pope Benedict VI. strangled at Rome.

975. Edward the Martyr king of England (murdered, 979).

976. Basilius If. (Bulgaroktonos) emperor of the East.

979. Ethelred the Unready king of England.

980 (circa). Birth of Avicenna (died, 1036). of Rome.

983. Otto III. king of Germany. Iceland,

986. Louis V. (le Fainéant) king of Francc,—last of the Car- lovingian line.

987. Hugh Capct, founder of Capetian line, king of France.

988. Death of Dunstan. The Greek ritual introduced into Russia.

990 (circa). Invention of the balance-clock attributed to Gerbert (afterwards Pope Sylvester II.)

993. Earliest instance on record of canonization of a saint.

996. Robert the Wise king of France. Otto III. crowned em- peror at Rome.

998. France laid under interdict. and put to death by Otto III.

999. Sylvester II. (Gerbert) pope.

1000. The emperor Otto III. makes a pilgrimage to the tomb of St Adalbert at Gnesne, founds archbishopric of Gnesne, and crects Poland into a

kingdom for Duke Boleslas. The Pope, Sylvester 11., erects Hungary into a kingdom for Duke Stephen, apostle of Ilungary.

1001. First invasion of India by Mahmud of Ghazni. Insurrection at Rome against Otto I11.

1002. Henry Il. king of Germany. England.

1003. John XVII. pope, three months. dicates, 1009).

1009. Sergius 1V. pope.

1010. Conquest of Ghor by Mahmud in fourth invasion of India.

1012. Benedict VIII. pope.

1013. Submission of all England to Sweyn, king of Denmark.

1014. Battle of Clontarf—defcat of Danes by Brian Boroimhe. Henry I]. crowned emperor.

1016. Edmund Ironside king of England. the Normans in Italy.

1017. Canute king of England. Bulgaria made a province of the empire. Canouj taken by Mahmud.

1020. Death of Firdusi, the Persian poct.

1024. Conrad II. emperor. John X1X. (XX.) pope. expedition of Mahmud to India; capture of Somnauth.

1025 (circa). Invention of musical notation by Guido Aretino,

1027. Birth of William of Normandy. Pilgrimage of Canute to Rome.

1029. Foundation of Aversa by the Normans.

1030. Death of Mahmud of Ghazni.

1031. Henry I. king of France. Fall of the caliphate of Cordova.

1033. Benedict IX. pope.

1035. Death of Sancho the Great of Navarre; division of his states. Foundation of the kingdoms of Castile and Aragon.

First embassy of Liutprand to

Edwig king

Death of Hugh the Great, count

Rome taken by

Crescentius master

Greenland colonized from

Crescentius besieged in Rome

Massacre of the Danes in

Jolin XVIII. pope (ab-

First appearance of

Twelfth

726

1038. The Turkmans defeat the Ghaznivides and conquer Persia. Foundation of the Seljukian dynasty. ‘

1039. Henry III. emperor. Maebeth murders Duncan, king of Scots, and succeeds him. Conquest of Persia by Togrul Bey.

1040-1048. Conquest of Apulia by the Normans. ,

1042. Edward the Confessor king of England. Restoration of English line. ;

1048. Fourth expedition of Russians against Constantinople.

1044. Silvester III. pope three months. Gregory VI. buys the

apacy. : Pode. Council of Sutri; the consent of the emperor declared essential to the election of the pope ; the emperor deposes three popes, appoints Clement II., aud is crowned by lim.

~~1047. Victory of William of Normandy over the baronage at Val~~ és-dunes.

1048. Damasus II. pope three weeks, said to be the first pope crowned. Invasion of the Eastern empire by the Seljukian Turks.

1049. Leo IX. pope. Intrigues of Hildebrand at his election. League of the pope and the two emperors against the Normans in Sicily.

1050. Condemnation of Berengar at councils of Rome and Ver- eclli. Hildebrand created cardinal.

1052. Visit of William the Norman to England. Death of Earl Godwine. The Pope and the cmperor celebrate Christmas at Worms.

1053. The Pope taken prisoncr by Robert Guiscard, at the battle of Civitella (June 16). Open rupture of Greck and Latin churches.

1054. Macbeth defeated by Earl Siward at Dunsinane (slain, 1056). Michael Cerularius, patriarch of Constantinople, assumes the title of Universal Patriarch. The Pope and the Patriarch ex- communicate each other,

1055. Victor II. pope. Togrul Bey takes Baghdad, and rescues the caliph from his enemies.

1056. Henry IV. emperor.

1057. Malcolm III. (Canmore) king of Scotland. Stephen IX. pope.

; 1058, Nicholas II. pope. Peter Damiani created cardinal (died,

1072).

106. Election of the Pope vested in the College of Cardinals by bull of Nicholas II. Robert Guiscard made duke of Apulia and gonfaloniere of the church.

1060. Philip I. king of France.

1060-1090. Conquest of Sicily by the Normans under Count Roger.

1061. Alexander II. pope. Honorius II. anti-pope.

1062. Lanfrane abbot of Caen.

1063. Death of Togrul Bey.

1066. Harold II. king of England. His victory over Harold Hardrada and Tostig at Stamford Bridge, Sept. 25. Victory of William the Norman at Senlac (Hastings), Oct. 14. Norman conquest of England begins.

1068-71. Siege and capture of Bari by the Normans. Byzantine dominion in Italy.

1070. Lanfranc archbishop of Canterbury.

1071. Alp Arslan, Seljuk sultan, defeats and takes prisoner the emperor Romanus IV. at Manzikert.

1072. Palermo taken by Robert Guiscard. Malek Shah sultan of Persia.

1073. Gregory VII. (Hildebrand) pope.

1074-1084. Conquest of Asia Minor by the Turks.

1075. Disputes about investitures begin.

1076. Jerusalem taken by the Turks. Earthquake in England. Matilda countess of Tuscany (the Great Countess). Henry IV. deposes the Pope at Council of Worms. The Pope, at Council of Rome, deposes Henry and

absolves his subjects from allegiance,—the first sentence of the kind. Henry is again excommunicated, 1078 aud 1080.

1077. Submission of the emperor to the Pope at Canossa. don burnt. Holy See.

1079. The New Forest formed by William the ar Nig of Abelard. Reform of the Calendar ordered by Malek Shah.

1080. The duchy of Swabia given to Frederick of Hohenstauffen by the emperor Henry IV. Interdict laid on Poland, and title of king suppressed by the Pope. Anti-pope Clement III. set up by the emperor. Victory of the emperor over his rival Rudolf of Swabia.

1081. Capture and sack of Constantinople by Alexius Comnenus, April 1. Alexius crowned emperor, April 2. Battle of Durazzo,— defeat of the emperor Alexius by Robert Guiscard.

1082. Siege of Rome by the Emperor Henry begins; the city taken, 1084.

1084. Gregory VII. besieged in Sant-Angelo by the empcror ; delivered, and Rome pillaged by Robert Guiscard. Carthusian order founded by Bruno.

1085. Toledo taken from the Arabs by Alphonso VI. of Castile. Death of Robert Guiscard. Death of Gregory VII.

1086. Domesday Book completed. Victor III. pope. The

End of

Lon- Secret gift of her states by Countess Matilda to the

Birth

CHRONOLOGY

[1038—1129,

Moors under Joscf ben Taxfyn enter Spain to aid the Saracens. Battle of Zalaca,—defeat of Alphonso VI.

1087. William II. (Rufus) king of England.

1088. Urban II. pope. The Almoravides predominant in Spain.

1089. Death of Lanfranc (born about 1005).

1091. Birth of St Bernard. Mantua taken by the emperor.

1092. Death of Sultan Malek Shah, and division of the Seljukian empire. Foundation of the order of Knights Hospitallers (knights of St John of Jerusalem, knights of Malta), about this time (?). Roscelin found guilty of heresy at Council of Soissons.

1093. Anselm archbishop of Canterbury.

1095. Council of Clermont. Preaching of Peter the Hermit. The first crusade proclaimed. Excommunication of Philip king of France and his wife Bertrada by the Pope.

1097. Siege of Nicea. Battle of Doryleum. Edessa taken by crusaders and erected into a principality. Westminstcr Hall built about this time.

1098. Siege and capture of Antioch, which is made a principality for Bohemond. The Cistercian order founded. Edgar king of Scotland.

1099. Pascal II. pope. Siege and capture of Jerusalem by crusaders. Godfrey of Bouillon elected king. Battle of Ascalon.

1100. William the Red slain in the New Forest. Henry I. king of England. ‘Woollen manufacture introduced in England by tlic Flemings about this time. Knights of St John settled in England.

1101. Invasion of England by Robert duke of Normandy. . Roger II. (Guiscard), the Great, count of Sicily.

1102. Disputes between Henry I. and Archbishop Anselm about investitures. The emperor excommunicated by Pope Pascal II. Preaching of Peter Bruys against prevalent superstitions, for about twenty years, age ihe 1100 and 1130.

1105. Invasion of Normandy by Henry I. The emperor Henry IV. dethroned by his son Henry V.; excommunicated and deprived of imperial dress.

1106. Henry V. emperor. Battle of Tinchebrai; Henry I. of England defeats and captures Robert of Normandy, and conquers the duchy.

1107. Alexander I. king of Scotland. Bohemond invades thc Eastern empire.

1108. Louis VI. (le Gros) king of France. tween Alexius and Bohemond.

1109. Tripoli in Syria taken by crusaders and crected into a county.

1110. Marriage of Maud daughtcr of Henry I. to the emperor Henry V. Treaty between the emperor and the Pope respecting investitures concluded at Milan.

1111. The emperor arrests the Pope ; obtains a bull respecting investitures ; releases the Pope, and is crowned by him at Rome. The emperor received at Canossa by the Countess Matilda ; namés her his vice-regent in Lombardy. :

1112. Council of Vienne ; excommunicates the emperor.

1113. Bernard becomes a monk of Citeaux. Peace of Gisors.

1114. Thurstan, archbishop of York, refuses consecration from archbishop of Canterbury.

1115. Bernard founds Clairvaux. Tuscany.

1116, March of the emperor into Italy to take possession of states of the countess. Council of the Lateran revokes the privilege of in- vestitures conceded to the emperor.

1117-1120. Henry I. in Normandy. carls of Anjou and Flanders.

1118. Order of Knights Templars founded. Gelasius II. pope, January 19. His seizure by the Frangipani, January 24. Appoint- ment of anti-pope Gregory VIII. bythe emperor. John II. Comnenus empcror of the Hast. Abelard teaches at Paris.

1119. Calixtus 11. pope. Cistercian order re-constituted by Stephen Harding.

1120. Wreck of the White Ship, and death of William, son of Henry I. Premonstratensian order founded by St Norbert.

1121. Council of Soissons compels Abelard to burn his book on the Trinity.

1122. Concordat of Worms. The disputc about investitures settled by the emperor's renunciation. Abelard founds the Paraclete.

1123. Ninth General Council (first of the Lateran), Confirma- tion of the settlement between the Pope and the emperor.

1124. The emperor invades France, but retires before Louis VI. Honorius II. pope. David I. king of Scotland. ,

1125. Lothaire II. king of Germany ; opposed by Conrad, duke of Swabia, and Frederick, duke of Franconia.

1126. Visit of David of Seotland to Henry I.

1127. Roger, the great Count, reeognized as duke of Apulia and Calabria. He carries on war with the Pope and is excommunicated, but obtains investiture the next ycar. Marriage of Geoffrey of Anjou with Maud, daughter of Henry I.

1128. Death of William of Normandy, count of Flanders.

1129. Henry of Blois made bishop of Winchester. Earthquake in England.

Treaty of peace be-

Death of Matilda countess of

War with France and the

1130—1186.]

1180. Innocent II. pope. Anacletus IJ. anti-pope. Roger II, count of Sicily, receives title of king from Anaeletus, and makes Palermo his capital. Abbey-chureh of Cluny eonseerated by Innocent II. Conference between Innocent and Lothaire at cooly St Bernard present. Heloise beeomes abbess of the Para- elete.

1181. Death of Baldwin II., king of Jerusalem; Fulk of Anjou, his son-in-law, suceeeds.

1183. Innocent II. re-cstablished at Rome by Lothaire. Lothaire erowned emperor by the Pope, who is again expelled by Anaeletus. Count Roger takes tli title of king of Sieily.

1184. Death of Alphonso I., king of Navarre and Aragon, and separation of the kingdoms. Arnold of Breseia begins to preacli about this time.

1185. Death of Robert II., duke of Normandy, in Cardiff Castle. Stephen (of Blois) king of England.

1187. Louis VII. (de Jewne) king of Franee, married to Eleanor of Guienne before his accession. King Roger driven out of Italy by Lothaire. Death of Lothaire. Pandects of Justinian discovered at Amalfi. Birth of Saladin.

1138. Conrad III. emperor. Roger king of Sicily takes the Pope prisoner, and eompels him to confirm him in his kingdom. Death of Anaeletus, and end of the schism. David, king of Scotland, invades England, and is defeated at the battle of the Standard (Northallerton). Civil war in England between adherents of Stephen and Maud. ‘

1139. Portugal erected into a kingdom for Count Alphonso Hen-

riquez. Malachy, bishop of Connaught, visits Clairvaux and Rome. –

Tenth General Council (seeond of the Lateran). Arnold of Brescia condemned and banished from Italy. Henry of Blois, bishop of Winchester,

papal legate in England.

1140. Council of Sens, Bernard gets Abelard condemned, Abelard appeals to the Pope. Feast of the Immaculate Coneeption of the Virgin sntigadioed:

1141. Interdict laid on Franee by Innocent II. King Stephen taken prisoner by Robert of Gloucester at the battle of Lincoln. Maud received as ‘‘ Lady of England.” ‘Winchester burnt.

1142. Maud besieged in Oxford by Stephen. Death of Abelard. IIeury the Lion duke of Saxony.

1143. Manuel Comnenus emperor of the East. Celestine II. pope. On submission of Louis VII. the interdict on France is raised.

1144. Lucius II. pope ; he coneludes a treaty with Roger of Sieily. The primacy of the chureh of Toledo confirmed by the Pope.

1145. Maud withdraws from England. Conquests of Noureddin, sultan of Aleppo. Eugenius III. pope.

1146. Seeond Crusade proclaimed by the Pope; preached by St Bernard, Invasion of Greeee by king Roger; Thebes and Cormth plundered. Assembly at Vezelai; Louis VII. takes the cross. Arnold of Brescia heads insurrection at Rome, and expels the Pope. The Almohades enter Spain.

1147. Suger, abbot of St Denis, appointed regent of Franee. The Crusaders, led by Conrad and Louis VIL, arrive at Constantinople. St Bernard pleads in behalf of the Jews. ricians in Languedoe.

1148. The Crusaders reach Jerusalem, unsuecessfully besiege Damaseus, and return to Europe.

1149. Reeovery of Corfu from Saracens by the Emperor Manuel.

1150. Compilation of eanon law completed by Gratian (begun by Ivo of Chartres, 1114). Noureddin eonquers Edessa. Peter the Lombard writes his Sentences. Large silver terrestrial globe made by Edrisi for Roger of Sicily about this time. Almanae first published by Solomon Jarehi.

1151. Death of Geoffrey of Anjou. Manuel ; peaee, 1153.

1152. Eleanor of Guienne, divoreed by Louis VII., marries Henry, son of Maud (Henry II. of England). Frederick I., Barbarossa, emperor of the Romans.

1153. Treaty between Stephen and Henry. Malcolm IV. king of Seotland. Anastasius IV. pope. Death of St Bernard.

1154. Henry II. (Plantagenet line) king of England. Death of Roger of Sicily. Nourcddin takes Damaseus and makes it his capital. Louis VII. marries Constance of Castile. Invasion of Italy by Frederick Barbarossa. Adrian IV. (Nicholas Breakspeare) the only English pope.

1155. Rome laid under interdict by the Pope. Diet at Roneaglia. Arnold of Brescia banished by the Romans, strangled and burnt by order of the emperor. William I. of Sieily exeommunicated and deprived of part of his kingdom by the Pope. Henry II. authorized by the Pope to undertake the conquest of Ireland. Thomas Becket chaneellor of England. Coronation of Frederiek Barbarossa at Rome.

1156. William of Sicily makes peace with the Pope. The mar- graviate of Upper Austria erected intoa duchy. Death of Peter the Venerable, abbot of Cluny.

1157. Invasion of Poland by the emperor. instituted. Munich founded by Henry the Lion. Besangon, .

Suppression of tho Hen-

Invasion of Hungary by

The bank of Venice Diet at

1158. Invasion of Lombardy by the emperor. Siege of Milan. Diet of Roneaglia. Henry II. visits Louis VII. at Paris.

1159. Expedition of Henry II. against Toulouse. War with France. Alexander III. pope. Victor IV. anti-pope.

1160. Council of Pavia eonvoked by the emperor for recognition of Vietor. Iéxcommunieation of the emperor by Alexander. ‘The Albigenses begin to attraet attention about this time. Condemna- tion and branding of German heretics at Oxford,

1161. Peace between England and Franee. Pope Alexander ITI. reeeived by the two kings.

1162. Destruetion of Milan by the emperor. of Canterbury; he resigns the ehancellorship. bishop of London.

1163. Hungarian war renewed by Manuel.

1164. The Constitutions of Clarendon subseribed. Couneil of Northampton. Flight of Becket. Beeket at Sens and at Pon- tigny. Banishment of Becket’s friends by Henry II. Third inva- sion of Lombardy by the emperor. Taseal III. anti-pope.

1165. William I., the Lion, king of Seotland.

1166. Zeugmin stormed by Manuel. Becket at Vezelai ex- eommunieates his enemies. Fourth invasion of Italy by the emperor.

1167. War between Henry and Louis till 1169. The Lombard League formed. The League defeats the emperor at Legnano.

1168. Calixtus III. anti-pope. Victory of Manuel over Hunga- rians at Zeugmin. End of the war. The Lombard League put to the ban by its emperor.

1169. Meeting of Henry and Louis at Montmirail respecting

Becket arehbishop Gilbert Foliot

Becket. Excommunication of Gilbert Foliot, bishop of London, by Becket. Invasion of Ireland by Strongbow. Another meeting of

Henry and Louis at St Denis.

1170. Formal reconciliation of Henry II. and Archbishop Thomas at Freteval. Assassination of the rch belie at Canterbury, Dee. 29. Birth of St Dominic. Peter Waldo begins preaching at Lyons about this time,

1171. Henry IJ. invades Ireland, and is acknowledged king at Council of Cashel. Conquest of Egypt by Shiraeouh and Saladin, generals of Noureddin. End of the Fatimite caliphs. War between Manuel and the Venetians till 1174.

1172. Absolution of Henry II. at Couneil of Avranches.

1173. Civil war stirred up by the king's sons in England and Normandy. Saladin sultan of Egypt. Canonization of Archbishop Thomas by Alexander III. '

1174. Canonization of Bernard by Alexander III. Fifth invasion of Italy by the emperor. Siege of Alexandria. Henry II. does penance at the tomb of St Thomas of Canterbury, July 12. William the Lion captured at Alnwick by Ranulph de Glanville, July 12; he is released after doing homage to Henry for the king- dom. Damaseus taken by Saladin.

1175. The bull of Adrian IV. promulgated in Ireland. The agen prelates refuse eanonical obedience to the archbishop of York.

1176. Vietory of the Milanese over Frederick at Legnano (Como). Great Council at Northampton ; the six circuits of the judges estab- lished. The Carthusian order approved by the Pope. Victory ot Kilidy Arslan, sultan of Iconium, over Manuel at Myriokephalon. John of Salisbury bishop of Chartres.

1177. Earl John named Lord of Ircland; the eountry partitioned for eompletion of the conquest. Meeting of the Pope and the emperor at Venice

; absolution of the emperor. Saladin defcated at Ramla by Renaud de Chatillon.

1178. Reconeiliation of Henry II. and Louis VII. The heretics

of Toulouse cxcommunieated and banished by the legate. Innocent III. anti-pope. 1179, Eleventh General Couneil (third of the Lateran). Crusade

against the Albigenses sanetioned. Pilgrimage of Louis VII. to the tomb of St Thomas.

1180. Philip II., Augustus, king of France. Alexius II., Com- nenus, emperor of the Kast. Henry the Lion, duke of Bavaria, deprived of all his dominions at Diet of Wurzburg. Carthusian mouks in England.

1181. William the Lion cxeommunieated, and Seotland laid under interdict, by Alexander III. Lucius III. pope. First assize of arms in England.

1182. Birth of St Francis. banished from France.

1183. Treaty of Constanec between the cmperor and the con- federate towns of Italy, confirming their privileges, Amida and Aleppo taken by Saladin. Andronicus I., Comnenus, emperor of the East.

r 1184. Reconciliation of the sons of Henry II. at Council of Lon- on.

1185. Urban III. pope. Thessalonica taken by the Normans. Isaae I]., Angelus, cmperor of the East. The crown of Jerusalem offered to Henry II. by the patriareh of Jerusalem and the grand master of the Templars, and refused.

1186, Guy of Lusignan, king of Jerusalem. Revolt of Bulgaria,

Edessa taken by Saladin. The Jews

Second Bulgarian kingdom founded. Marriage of Ilenry, king of the Romans, with Constance, heiress of Sicily. 1187. Battle of Tiberias (Hattin),

—victory of Saladin over the

Christians. Capture of Jerusalem by Saladin. End of the Latin kingdom. Gregory VIII. pope two months. Clement II]. Third Crusade.

1188. The Emperor Frederick and the kings of France and Eng- land take the Cross. The ‘‘ Saladin tenth” imposed.

1189. Siege of Acre begun. Frederick sets out on the crusade. Richard I. king of England. Massacre of Jews in London.

1190. The order of Teutonic knights founded. Richard and Philip meet at Vezelai, and set out for the crusade. Tancred king of Sicily. Frederick twiee defeats the sultan of Iconium, and

takes the city. Frederick drowned in Asia Minor. Henry VI. emperor. . 1191. Marriage of Richard I. to Berengaria. Capture of Acre by

the Crusaders. Celestine III. pope. Return of Philip to France. Vietory of Richard at Arsoof. Naples besieged by the emperor. Coronation of Henry VI. and Constance at Rome. Destruction of ‘Tuseulum.

1192. Guy of Lusignan titular king of Cyprus. Jerusalem threatened by Crusaders. Truce with Saladin. Arrest of Richard on his return by Leopold, duke of Austria. John.

1193. Richard before the Diet of Haguenau. Death of Saladin. Marriage of Philip Augustus with Ingeburga of Denmark.

1194. Liberation and return of Richard. Riehard defeats Philip at Freteval. Conquest of the Two Sicilies by the emperor, who is crowned king at Palermo. Birth of Frederick Il. “Llewelyn ap Jorwerth prince of Wales.

1195. Battle of Alarcos,—Alphonso VIII. of Castile defeated by Saracens. Alexius Angelus emperor of the East.

1196. Marriage of Philip Augustus with Agnes of Méranie,

1197. Chateau Gaillard built by Richard I.

1198. Innocent III. pope. Philip of Swabia (Hohenstauffen) emperor. War with his rival, Otto of Brunswick. Richard defeats the French at Gisors.

1199, Five years' truce between England and France by mediation of the Pope. John king of England. His nephew Arthur sup- vorted by Philip Augustus, Bohemia erected into a kingdom.

larkwald, general of the emperor Henry VI., twice excommunicated by the Pope.

1200. Unigene of Bologna and Paris founded before this time. Interdict laid on Franee by Pope Innocent III. Marriage of Louis of France to Blanche of Castile. Riga founded. Strife of Guelf and Ghibelline in Florence begins about this time. Lay- amon writes his Chronicle of Britain (the Brut).

1201. Council of Soissons. Death of Agnes of Méranie.

1202. Fourth Crusade under Baldwin, count of Flanders. Walde- inar IJ., the Victorious, king of Denmark. War between France

and England. Death of Abbot Joachim about this time. Conquest of Sicily (except Messina) by Markwald completed. Death of Markwald. Zara taken by Crusaders.

1203. Capture of Constantinople by Crusaders. Inquisition

founded by Innocent III. as commission for conversion of the Albi- genses. Murder of Arthur by King John.

1204. Loss and re-capture of Constantinople by Crusaders. Bald- win first, Latin emperor of the East. Capture of Chateau Gaillard and conquest of Normandy from the English by Philip Augustus. Empire of Trebizond ereeted for Alexius Comnenus.

1205 (1193 2). Birth of Albertus Magnus (died, 1280). I. defeated and taken prisoner by the Bulgarians.

1206. Jenghiz Khan proclaimed sovereign of Mogul and Tatar tribes. Mogul Empire. Theodore Lascaris crowned emperor of Nicza (elected at

Constantinople 1204). Henry of Hainault Latin emperor of the East.

1208. England placed under interdict by Innocent III. Crusade against the Albigenses proclaimed by him. Otto IV. acknowledged emperor after murder of Philip.

1209. Franciscan order founded. by the Pope. Otto crowned at Rome.

1210. Council of Paris condemns, burns, and forbids reading of Aristotle's Metaphysics. Alliance of the emperor Henry with the ae of Iconium against 'heodore. Invasion of China by Jenghiz

an.

1211. Otto excommunicated by the Pope. England.

1212. Frederick IJ. crowned emperor of the Romans. Children's Crusade. Battle of Navas de Tolosa,—victory of the kings of Castile, Aragon, and Navarre over the Moors.

,_ 1213. King John of England becomes the Pope's vassal. Second invasion of China by Jenghiz Khan. Battle of Muret.

1214. Birth of Roger Bacon (died, 1294 2), defeat of Emperor Otto IV. by Philip Augustus. Death of William, the Lion, king of Scots ; Alexander II. succeeds him. amet: Siege and capture of Peking (Yen-king) by Jenghiz Khan. The Great Charter signed by King John. Twelfth General Council

Baldwin

King John excommunicated

Pandulph legate in The

Battle of Bouvines,

Usurpation of Earl |

ODO Gey

(fourth of the Lateran). Dominican order founded. Frederick 1]. at Aix-la-Chapelle.

1216. Honorius III. pope. Henry III. king of England. Con- firmation of the Great Charter.

1217. Fifth Crusade under Andrew, ae of Hungary. Hubert de Burgh justiciary of England. Matthew Paris enters Benedictine order at St Albans (died, 1259). Michael Scot, translator of Aris- totle, living at Toledo. Peter of Courtenay emperor of the East. Order of Friar Preachers founded.

1218. Trial by ordeal formally abolished in England. Death of Otto. Battle on the Jaxartes between Jenghiz Khan and the Khar- ismians. Death of Simon de Montfort.

1219. Damietta taken by Crusaders. peror of the Kast.

1221. Conquest of Khorassan and Persia by Jenghiz. Dominican and Francisean friars arrive in England. Birth of Bonaventura (died, 1274). Death of Dominic.

1222. The Golden Bull, basis of Hungarian liberties, signed by Andrew II. .

1223, Louis VIII. king of France.

1224. University of Naples founded by Emperor Frederick II. Peter de Vinea chief adviser to Frederick about this time.

1226. Louis IX. (St Louis) king of France. The Lombard League renewed against Frederick II. Death of Francis.

1227. Gregory 1X. pope. Birth of Thomas Aquinas (died, 1274). Death of Jenghiz Khan.

1228. Sixth Crusade under Frederick I]. Death of Stephen Langton, archbishop of Canterbury. Canonization of Francis by Gregory IX. Baldwin II. emperor of the East ; John of Brienne his colleague and guardian during minority, 1229 to 1237.

1229. Treaty between Sultan KE] Kamel and Frederick II. Jeru- salem given up to the Christians. Council of Toulouse establishes the Inquisition in Languedoc.

1231. Translation of the Almagest by command of Frederick II.

1233. Edmund Rich archbishop of Canterbury (died, 1240). Robert Grosseteste bishop of Lincoln (died, 1253). Gregory IX. intrusts the Dominican Order with sole direction of the Inquisition.

1234. Canonization of Dominic by Gregory IX. Promulgation of new code of the Decretals by Gregory.

1235. Isabella of England married to Frederick 11. of Elizabeth of Hungary.

1236. Invasion of Russia and sack of Moscow by Tatars.

1237. Conrad IV. king of the Romans. Battle of Corte Nuova.

1238. Marriage of Simon de Montfort to Eleanor, sister of Henry IlI.; the earldom of Leicester given to him.

1239. Frederick II. makes his son Enzio king of Sardinia. Her- man von Salza grand-master of the Teutonic knights. Moorish kingdom of Granada founded.

1240. Birth of Cimabue (died, 1802). Frederick invades States of the Church; Crusade against him proclaimed. Carmelite monks in England.

1241. Celestine IV. pope; dies before consecration. Death of Waldemar II. of Denmark. Enzio captures Genoese flect, with cardinals, bishops, &e. Death of Empress Isabella.

1242. Battle of Taillebourg,—St Louis defeats Henry III.

1243. Innocent IV. pope, after nearly two years' vacancy.

1244, Treaty between the Pope and the emperor.

1245. Thirteenth General Council (first of Lyons). Deposition of the emperor by the Pope. Death of Alexander of Hales.

1246. Canonization of Archbishop Edmund (Rich) by Innoeent BY,

1248, Seventh Crusade under St Louis. Inquisition introduced in Spain. Siege of Parma.

1249. Alexander JII. king of Scots, Death of Peter de Vinea. University College, Oxford, founded.

1250. St Louis defeated and captured by the sultan of Egypt; released ina month. Conrad IV. emperor. His claim opposed by William, count of Holland. The Mamelukes become masters of Egypt. Manfred regent of Sieily. College of the Sorbonne founded. Gunpowder probably invented about this time.

1252. Alphonso X. king of Castile. The Alphonsine Tables com- pleted. English laws introduced in Wales.

1253. The Jews expelled from France.

1254. Alexander IV. pope. Birth of Marco Polo (died, 1824).

1255. Inquisition introduced in France. Konigsberg founded by the Teutonic knights. Submission of the Two Sicilics to Manfred.

1257. Richard, earl of Cornwall, and Alphonso X. of Castile rival emperors of the Romans.

1258. Siege and capture of Baghdad by Tatars under Hulaku Khan. Extinction of the caliphate (Abbasides). ‘‘ Provisions of Oxford” passed by the ‘‘ Mad Parliament.” Manfred crowned king of Sicily.

1259. Kublai khan of the Moguls. Manfred excommunicated.

1260. Appearance of the Flagellants in Italy. Manfred master of Tuscany.

1261. Urban IV.

(1187-1261,

Coronation of

Robert of Courtenay em-

Canonization

Manfred again exccmmunicated.

pope.

1263-1324]

Capture of Constantinople by Michael Palologus. empire of the Kast.

1263. Battle of Largs,—defeat of Norwegians by Alexander III. of Scotland. :

1264. Battle of Lewes,—Earl Simon defeats Henry III. and takes him prisoner.

1265. Clement IV. pope. Deputies of the commons sit in the ae of England. Battle of Evesham,—defeat and death of Marl Simon. Birth of Dante (died, 1821). (?)Birth of Duns Scotus (died, 1308). Manfred, king of Sicily, defeated by Charles of Anjou ; defeated again and killed by his rival, 1266. Composition of gun- powder known to Roger Bacen.

1266. Roger Bacon sends his Opus Majus to Pope Clement IV. Sagarelli, leader of the Apostolic Brethren, begins preaching in Parma.

1267. Treaty of Viterbo, between the dethroned emperor Baldwin, Charles of Anjou, and William prince of Achaia.

1268. Edward of England takes the cross at Council of North- ampton. Conradin defeated by Charles of Anjou at Tagliacozza and beheaded at Naples.

1269. Pragmatic Sanction, restricting the power of the Pope in Trance, promulgated by St Louis.

1270. St Louis sets out for the crusade, and dies before Tunis. Philip III., the Bold, king of France. Birth of William of Occam about this time (died about 1350).

1271. Gregory X. pope, after two ycars' vacancy. Marco Polo to the court of Kublai Khan.

1272. Edward I. king of England.

1273. Rudolph of Hapsburg emperor.

1274. Fourteenth General Council (second of Lyons); union of Greek and Roman Churches effeeted. New regulation of papal election.

1275 (circa). Arabic numerals used in treatise on the Astrolabe by Macha-Allah.

1276. Innocent V., Adrian V., and John XX. (XXI.) popes. Birth of Giotto (died, 1337),

1277. Nicholas III. pope.

1279. Statute of Mortmain passed in England.

1280. Conquest of China by Moguls completed.

1281. Martin IV. pope. 'Treaty of Orvieto, between the Pope, the king of Naples, and Venice, for conquest of the Greek eanpire.

1282, The " Sicilian Vespers,"—massacre of the French in Sicily ; end of Angevine rule. Andronicus II. emperor of the East. Con- quest and settlement of Wales by Edward I. Formation of the Zuyder Zee by

inundation of the sea. Union of Greek and Roman churches annulled by Andronicus II. :

1283. Statute of Rhuddlan (Statute of Wales) enacted. Con- quest of Prussia by Teutonic knights completed.

1284, Charles of Anjou defeated and captured by Roger de Loria, grand admiral of Sicily.

1285. Honorius IV. pope. Philip IV., the Bold, king of France. Death of Charles of Anjou.

1286. Margaret of Norway queen of Scots ; a regency during her minority. Sagarelli banished from Parma.

1288. Nicholas IV. pope.

1289. Marriage-treaty of Prince Edward of England and Margaret ueen of Scots eoncluded. Dante present at battle of Campal- ino.

- 1290. Expulsion of Jews from England by Edward I. Death of Margaret of Norway on her way to Scotland. Edward I. appointed arbitrator between Baliol and Bruce, eompctitors for the Scottish crown, 1291.

1291. Capture of Acre by Malek al Aschraf, sultan of Egypt. Final loss of the Holy Land. Conference of Edward I. with northern barons at Norham. Beginnings of Swiss confederation. Seizure and imprisonment of Italian bankers in France.

1292. Adolphus of Nassau emperor. John (Baliol) king of Scots. He does homage to Edward I. at Newcastle, Decémber 26.

1294. Celestine V. pope, after vacaney of more than two years; abdicates. Boniface VIII. pope, December. Death of Kublai Khan. Masoud II., last sultan of Iconium, defeated and slain by the Moguls, and the sultanate divided.

1295. Final organization of English parliament. Return of Marco Polo to Venice. Premislas, duke of Poland, crowned king.

1296. Boniface VIII. publishes the bull Clericts laicos, January ; republished, Augnst 18. Philip issues an edict prohibiting exporta- tion of gold, silver, provisions, &c., without consent of the Crown, August 17. Boniface publishes a second bull, Ineffabilis, Sep- tember. Conquest of Seotland by Edward I.; surrender of Baliol ; interregnum, 1296-1306. The Persian poct Saadi dies about this time.

1297. Battle of Stirling,—yictory of Wallace. St Louis canonized by Boniface VIII. The Peat Charter confirmed by Edward I. Boniface publishes a bull against the Colonna family ; after their reply he passes sentence of degradation, excommunication, and eonfiscation.

End of Latin

Journey of

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Albert I. suc- Peace between The Pope proclaims a erusade against the

1298. Deposition of the Emperor Adolphus. cecds. Battle of Falkirk,—victory of Edward. England and France. Colonnas.

1299. Palestrina surrendered by the Colonnas to Boniface. Intervention of Boniface in affairs of Scotland by bull of June 27.

1300. Centennial Jubilee proclaimed by Pope Boniface VIII.; he assumes the motto Zece duo gladit. Sagarelli burnt by the In- quisition at Parma. Siege of Caerlaverock by Edward I.

1301. Quarrel between Bonifaee VIII. and Philip the Fair begins. Excommunication of Philip. Title of Prince of Wales eonferred on the sou of Edward I.

1302. The parliament of Lincoln replies to the Pope’s bull. Philip burns the Pope’s bull, January 2. States-General of Frang, representative of the three estates, constituted by Philip IV., April. ‘Battle of Spurs,” the French

defeated at Courtrai by the Flemings, July. Philip issues an edict eondemning the Inquisi- tion, October.

1303. The emperor Albert promulgates at Nuremberg a Golden Bull, July. The Pope arrested by William of Nogaret at Anagni, September 7 ; rescued by the people; dies at Rome, October 11. Cession of Guienne to Edward I. by Philip the Fair. Benedict XI. pope. The Catalan Grand Company, formed by Roger di Flor, arrives at Constantinople.

1304. Stirling taken by Edward I. Birth of Petrareh (died, 1374). voked. Puelle.

1305. Clement V. pope. The Knights Templars denounced. Wallace put to death by Edward I., August 23.

1306. Murder of Comyn at Dumfries. Robert Bruce erowned king of Scotland. Roger di Flor assassinated at Adrianople.

1307. Exeommunication of Bruce by papal legate at parliament of Carlisle. Edward II. king of England. Fra Dolcino, with Margarita, tortured and burnt at Vercelli. Arrest of Knights Templars in France and England. Battle of Apros,—victory of the Catalans over the Byzantine army.

1308. Assassination of the emperor by John of Austria. Henry VII. (of Luxembourg) succeeds him. Death of Duns Scotus.

1309. The Pope removes to Avignon. Robert of Anjou crowned king of Naples by the Pope. Sire de Joinville writes his history of Louis IX. Commission for trial of the Templars:opens at Paris, August 7.

1310. Conquest of Rhodes by the knights of St John. Persecu- tion of the memory of Boniface VIII. by Philip. Dante publishes i De Monarchia about this time. Fifty-four Templars burnt at

aris.

1311-12. Fifteenth General Council, held at Vienne, October to November. Dissolution of order of Templars decreed. Condemna- tion of the Beghards.

Rescript of the emperor defining relations of Swiss eonfederation to Austria and the empire. University of Orleans founded.

1318. Death of the emperor Henry VII., followed by interregnum. Birth of Boccaccio (died, 1875). Canonization of Celestine V. by Clement V. Death of Clement V. Stirling Castle besieged by Edward Bruce.

1314. Jacques de Molay, grand-master of the Templars, burnt at Paris. Frederick III. (duke of Austria) and Louis V. (IV.) (duke of Bavaria), rival emperors. Louis X. (Hutin) king of France. Battle of Bannockburn, —victory of Robert Bruce over Edward II., June 24. Stirling Castle given up.

1315. Battle of Morgarten,—victory of Swiss confederation over Leopold, duke of Austria. Final defeat of the Catalan Grand Com-

pany.

: 1316. John XXII. pope. John I. king of France four days. Philip V. king of France. Battle of Athenry,—victory of the English over the Irish.

1317. Mediation of the Pope between England and Scotland re- jected by Bruce. Bruce excommunicated and Scotland laid under interdict.

1318. Edward Bruce defeated and killed at Dundalk.

1320. Insurrection of the peasantry (the Pastoureaux) in France, June. Conference of Robert of Naples with the Pope at Avignon. The Scottish parliament appeals to the Pope.

1321. Persecution of the lepers in France. Robert of Naples declared vicar of Italy during abeyance of the empire.

1321-1328. Civil wars between rival emperors of the East, Andronicus the elder and -the younger.

1322. Charles LV. king of France. Battle of Mihldorf,—Frederick duke of Austria defeated and captured by the Emperor Louis.

1323. Thirteen years’ truce between England and Scotland. The Floral Games instituted at Toulouse. Diet at Frankfort; issues proclamation denying necessity of the pope’s consent to election of emperor, and his right to govern the empire in a vacancy.

1324. The Emperor Louis excommunicated by the Pope, March. John Wycliffe born about this time (died, 1384). Birth of Wilham of Wykeham (died, 1404).

Submission of Scotland. The bulls against France re- Victory of Philip the Fair over the Flemings at Mons-en-

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1326, Cannon used by the Florentines; by French and English, 1338 and 1339.

1327. Edward III. king of England. Edward II. deposed and murdered. The emperor declares the Pope a heretic ; is crowned at Milan, and again excommunicated. y

1328. Philip VI. (house of Valois) king of France. The em- peror crowned at Rome, deposes the Pope, and gets Peter de Corbitre clected (Nicholas V.) Death of Castruccio Castracaui, head of republic of Lucca. Independence of Scotland recognized by treaty of Northampton. Constantinople taken, and Andronicus II. deposed by his grandson Andronicus III. ;

1329. David II. (Bruce) king of Scotland. Blockade of Nicwa by Orkhan. Battle of Pelckanon,—first engagement between the emperor of the East and the sultan of the Ottomans. Istablishment of the Ottoman Empire.

1330. Capitulation of Nicea to Orkhan.

1332. Invasion of Scotland by Edward Baliol, assisted by Edward III. of England.

1333. Battle of Halidon Hill,—victory of Edward III. over the Scots. Casimir III. the Great, king of Poland. Stephen Dushan king of Servia.

1334, Benedict XII. pope.

1336. Birth of Timur (Tamerlane.) Avignon.

1887, Edward III. claims the crown of France. Plagne of locusts in Europe for three years,

1338. Kmbassy from Louis of Bavaria and the king of France to the Pope to seek absolution of Louis ; absolution refused. Mission of Barlaam from the Emperor Andronicus to Benedict XII. respecting reunion of Greek and Latin churches. Alliance of Jacob van Artevelde, captain of Ghent with Edward III. Meeting of the em- peror and Edward III at Diet of Coblentz.

1389. Edward III. invades France from Flanders. Bithynia by the Turks completed.

1340. Battle of Sluys,—victory of Edward I1I. over the French fleet. Siege of Tournay ; a truce concluded. Birth of Chaucer (?)

1341. First passage of the Turks into Europe. John V. (Paleo- logus) emperor of the East. Regency of Anne of Savoy. Intrigues of John Cantacuzenus. Dispute about the Light of Mount Thabor begins. Petrarch crowned in the Capitol at Rome. Disputed suc- cession in Britanny ; gives rise to civil war between John de Mont- fort and Charles of Blois.

1342. Clement VI. pope.

1348. Death of Robert the Wise, king of Naples.

1344. The jubilee period reduced to fifty years by Clement VI. War in Guienne. First English gold coinage (the florin). . Dis- covery of Madeira by Robert Macham, an Englishman. Battle of Salado, —defeat of the Moors by Alphonso IV. of Portugal. Parlia- ment of Paris organized by ordinance of Philip VI.

1345, Assassination of Jacob van Artevelde. Discovery of Canary Islands by Genoese and Spanish seamen. Servian empire established by Stephen Dushan ; his code published, the oldest monument of Servian language. Assassination of the Grand-duke Apokaukos at Constantinople.

1346. Louis of Bavaria again deposed by the Pope. Charles IV. (Count of Luxembourg) elected king of the Romans. Victory of Edward III. over the French at Crecy, August 26. David II. of Scotland defeated and taken prisoner at Neyill's Cross, Durham, October 17. Siege of Calais begun (taken by Edward III. 1347). Marriage of Orkhan, sultan of the Ottomans, with Theodora, daughter of Cantacuzenus.

1347. Invasion of Naples by Louis of Hungary, January. Flight of Quecn Joanna; she sells Avignon to the Pope. Cola di Rienzi tribune and liberator of Rome. University of Prague (Carolinuim) founded by the emperor. Death of Louis of Bavaria. Truce be- tween England and Francc. John Cantacuzenus crowned emperor of the East.

1348-1351. The Black Death prevails in Europe. Jews on suspicion of poisoning the wells. Cantacuzenus.

1349. The Statute of Labourers (England) passed. Dauphiny united to crown of France. Title of Dauphin given to the king's eldest son. The Flagellants condemned by bul! of Clement VI.

1350. Order of the Garter instituted by Edward III. about this time. Johu II. king of France; Order of the Star insti- tuted by him. -Peter the Cruel, king of Castile. Reconstruction . Windsor Castle begun; completed, 1369. Second Jubilce at

ome.

1351. Joanna restored with her husband Louis of Tarentum to throne of Naples. Rienzi at Prague. Alliance of Venice with Cantacuzenus.

1352. Victory of Genoese over Venetians and Grecks, and their treaty with the Emperor Cantacuzenus. Rienzi surrendered to the Pope. Innocent VI. pope, December.

1353. Establishment of the Turks in Europe. First Statute of

Premunire in England. Rienzi made senator of Rome by Cardizal Albornoz,

Philip of France visits

Conquest of

Massacres of War of the Genoese with

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[1326—1386.

1354. Naval Code published by Peter IV. of Aragon. Rienzi slain in insurrection at Rome. Cantacuzenus dethroned, December.

1355. War between England and France renewed. Charles IV. crowned at Rome. Assassination of Inez de Castro by Alphonso IV. of Portugal. Treaty between John Paleologus I. aud Innocent VI. Arabic numerals used by Petrarch.

1856. The Golden Bull of the empire published by Charles IV. Battle of Poitiers, Edward the Black Prince defeats and captures John IJ. and his son. Wycliffe publishes his Last Age of the Church.

1857. Ordinance for the estate of the land of Ircland issued. Truce between England and France. Triumphal entry of the Black Prince into London. David II. returns to Scotland.

1358. Rising of the peasants (the Jacquerie) in France.

1360. Treaty of Bretigny,—renunciation by Edward III. of his claim to the crown of France, to Normandy, Anjou, and Maine, followed by liberation of King John. France ravaged by the Free Companies. Amurath I. sultan of the Ottomans. Leo Pilatus at T”lorence, the first teacher of Greek in Western Europe.

1361. Conquest of Roumania by Amurath I. Adrianople made the seat of the sultans. The Janissaries established. Dcath of Jolin Tauler (born, 1290).

1362. Use of English in law pleadings directed by Act of Parlia- ment. Urban V. pope, October.

1363, Philip the Bold duke of Burgundy.

1364. Charles V. king of France. The coast of Guinca dis- covered by French seamen about this time. Battle of Auray,— defeat and capture of Bertrand Duguesclin by John Chandos; death of Charles of Blois; Brittany secured to John de Montfort. Uni- versity of Cracow founded by Casimir the Great.

1365. Urban V. demands tribute of England. University of Vienna founded by Duke Rudolph IY.

1366. The Black Prince defeats Henry of Trastamare at Najara, and re-establishes Peter the Cruel.

1367-1371. William of Wykeham chancellor of England (again, 1389-1891). Foundation of the Kremlin, 1367.

1368. University of Geneva founded. Ming dynasty founded in China ; expulsion of the Moguls. Wycliffe's treatise De Dominio appears. Visit of the emperor to Rome.

1369. Renewal of war between France and England. John Palexologus visits Urban V. at Rome, and joins the Latin com- union ; heis arrested for debt at Venice. Birth of John Huss (2). Foundation of the Bastille.

1370. Timur sovereign of Tagatai. Limoges stormed by the Black Prince. Gregory XI. pope. Robert II., high steward (first of the Stuart line), king of Scotland. Death of Casimir the Great. Marriage of John of Gaunt with daughter of Peter the Cruel.

1372. Victory of Spanish fleet over the English off Rochelle

1373. March of John of Gaunt from Calais to Bordeaux.

1376. Death of the Black Prince. The ‘‘ Good Parliament” in England.

1377. Return of the Pope from Avignon to Rome.’ Wycliffe cited before the bishop of London. The Pope publishes thrce bulls against Wycliffe. Richard II. king of England.

1378. Urban VI. pope. Clement VII. anti-pope at Avignon. The schism lasts forty years. Wenceslas (king of Bohemia) emperor. Cession of Cherbourg to the English by the king of Navarre. Appearance of Halley’s Comet.

1379. Wycliffe sends out his poor priests. Y. imprisoned.

1380-1386. Conquest of Khorassan by Timur.

1380. Wycliffe’s English New Testament completed. Death of Bertrand Duguesclin. Charles V1. king of France. Regency of duke of Anjou. Joanna queen of Naples deprived by Urban YI. Charles of Durazzo made king of Naples. Birth of Thomas 4 Kempis (died, 1471).

1381. Wycliffe’s declaration against transubstantiation. Doll- tax granted in England. Revolt of the peasantry under Wat the Tyler. Arrest of Lollard preachers ordered. Wycliffe’s opinions condemned by synod of London. An earthquake during the synod. The cmperor John V. escapes from prison and becomes tributary to Amurath I.

1382, Victory of the French over the Flemings at Rosbecque.

1388. Expedition of Spenser bishop of Norwich into Flanders. Death of Queen Joanna of Naples.

1384. Wycliffe’s English Bible completed about this time. Death of Wycliffe, December 31. Philip the Bold becomes count of Flanders.

1385. Urban VI. besieged in castle of Noccra (Luceria) by Charles of Durazzo. He escapes to Genoa and puts five cardinals to death for conspiracy. The Scots aided by the French invade England. Richard IJ. takes and burns Edinburgh. Battle of Aljubarotta,—victory of John I. of Portugal over John I. of Castile.

1386, Timur invades Persia. Battle of Scmpach,—Leopold of Austria defeated by the Swiss, July 9. Council of regency in England, under duke of Gloucester. Impeachment of the earl of

The empcror John

1387-1438. |

Suffolk. University of Heidelberg founded. The Jagellon dynasty established in Poland.

1387. Treaty eoncluded between Amurath I. and the Genoese of Pera. The barons arm against Richard II. and seize the Tower of London. ae

1388. Scottish invasion of England. Battle of Otterburn (August 19). Douglas killed and Percy (Hotspur) taken prisoner. Jubilee period reduced to 33 years. Battle of Falkioping,—Margaret queen of Norway, Denmark, and Sweden defeats and captures Albert of Sweden.

1389. Amurath I. defeats the Servians, Hungarians, and Bul- garians at Kassova and is killed. Bajazet I. succeeds him. Truce between France and England. Riehard II. takes the government into his own hands. Boniface IX. pope. Compact of Nurem- berg, between the emperor and German princes, against the Jews. Rattle of Nafels,—victory of the Swiss over the Austrians, April 9.

1390. Statute passed for uniformity of weights and measures in England (Iiancashire excepted). Constantinople unsuccessfully besieged by Bajazet. Third jubilee celebrated.

1391. Manuel II. emperor of the East (associated with his father since 1875). Conquest of Asia Minor completed by Bajazet.

1393 (circa). Gerson chancellor of the university of Paris.

1394, Four years’ truce between England and France. Benedict XIII. pope at Avignon. Richard II. holds a parliament in Ireland. Jews banished from

France by Charles VII. Nicolas de Clemangis publishes his De Ruina Ecclesic.

1395. Milan erected into a duchy for the Visconti by the Emperor Wenceslas. Battle of Nicopolis,—victory of Bajazet over Sigis- mund of Hungary and the Christians, September 28. Invasion of Russia by Timur.

1396. Marriage of Richard II. with Isabella of France. _ for 25 years.

1397. Murder of the duke of Gloucester at Calais. declared: illegal. and Norway.

1398-1399. Invasion of India, and eapture of Delhi, by Timur. Anti-pope Benedict XIII. imprisoned in his palace at Avignon by Marshal Boucicaut. Boucicaut leads an army to the assistance of Manuel II.

1399. Deposition of Richard II. of Lancaster) king of England. Order of Knights of the Bath instituted. Manuel sets out to visit European Courts, December.

1400. Deposition of the emperor Wenceslaus by the electors ; election of Rupert, Count Palatine. John Huss ordained pricst.

revolt of Owen Glendower in Wales. Invasion of Scotland by Ilenry IV. Death of Chaucer, Oct. 25. Birth of Guttenberg (died, 1467).

1401. The statute of heretics (de hareticis. comburendis) passed in England. William Sautre, a Lollard, burnt.

1402. Sultan Bajazet defeated and taken prisoner by Timur at Augoria ; Soliman I. sultan. The Scots invade England, and are defeated by Hotspur at Homildon Hill. Return of Manuel to Con- stantinople.

1403. Death of Bajazet. and the Isle of Wight. Revolt of the Percies. July 23,

1404. Death of Philip the Bold, duke of Burgundy. Innocent VII. pope, succeeding Boniface. French descents on England. Alliance of the king of France with Glendower.

1405. Death of Timur. Revolt at Rome. Ladislas, king of Naples, seizes Rome and expels Innocent VII. Revolt of Arch- bishop Scrope. Birth of Aneas Sylvius (Pope Pius II.)

1406. James I. king of Scots. He is imprisoned in the Tower of London. Return of Innocent to Rome. Gregory XII. pope.

Truce

The regency Union of Calmar, between Sweden, Denmark,

Henry IV. (first of the house

The French make descents on Wales Benedict XIII. escapes from imprisonment. Battle of Shrewsbury,—Hotspur killed,

1407. Assassination of Louis, duke of Orleans, by Jolin, duke of”

Burgundy, at Paris ; origin of the civil war between Burgundians and Armagnacs, Jolin Risby, Lollard preacher, burnt in Scot-

land. 1408. John Huss appeals to the Pope. Ladislas again enters Rome. Benedict holds a council at Perpignan.

1409. The rival popes are deposed by Council of Pisa. Alexander V. elected. Ladislas driven from Rome. University of Leipsic founded.

1410. Death of Alexander V. John XXIII. pope. John Huss excommunicated. Sigismund, emperor of the Romans, opposed by Josse, margrave of Moravia, who dies in a few months. Jagellon, king of Poland, defeats Teutonic Knights at Tannenberg, July 15. Wood-engraving begins to be practised about this time.

1411. Huss again excommunicated. Ladislas defeated ; crusade published against him. Henry IV. sends troops to the duke of Burgundy. The university of St Andrews founded. Battle of Harlaw,—defeat of Donald, lord of the Isles, by Earl of Mar, July 24.

Ta2, Henry IV. concludes a treaty with the Orleans party. Huss burns the Pope’s bull. Ladislas makes peace with the Pope. Death of Margaret, queen of Norway, Sweden, and Denmark.

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1413. Ladislas expels John XXIII. and plunders Rome. Interview of John XXIII. and the emperor at Lodi. The Pope eonvokes a council at Constanec. Henry V. king of England. Sir John Oldcastle condemned as a heretic ; escapes from the Tower. Mohammed I. sultan of the Ottomans.

1414. Death of Ladislas of Naples. Council of Constance (six- teenth General Council), opened November 5. Persecution of Lol- lards by Henry V.

1415. Abdication of John XXIJJJ. He is arrested, deposed, and imprisoned by the council. Abdication of Gregory XII. John Huss burnt, July 6. Siege and capture of Harfleur by Henry V. Battle of Agincourt, October 25. Mecting of Benedict XIII. and Sigismund at Perpignan.

1416. Jerome of Prague burnt at Constance. the Moors by John I. king of Portugal, May 30. France and England.

1417. Benedict XIII. deposed. Martin V. elected pope by Council of Constance. Death of Cardinal Robert Hallam, bisho of Salisbury, at Constance. Invasion of Normandy by Henry V. Cacn besieged and taken. Gypsies appear in Germany about this time. The county of Savoy erected into a duchy.

1418. Massacre of Armagnacs at Paris by the Burgundians. John Oldcastle hung in chains and burnt. Council of Constance closed, April 22. Prince Henry, the Navigator (born, 1394), begins to send out exploring expeditions.

1419. Madeira re-discovered by Portuguese. Death of the ex- emperor Wenceslas. John Ziska eommander-in-chief of the Hussites. Assassination

of the duke of Burgundy at Montereau. Death of Albany, regent of Scotland.

1420. Treaty of Troyes. Henry V. regent of France. Marriage of Henry with princess Catherine of France. Hussite wars begin. Crusade against Hussites proclaimed by the Pope. Ziska takes Prague and defeats Sigismund. The Pope receives at Florence an las from Manuel Paleologus, emperor of the East; he enters

ome.

1421. Henry V. holds a parliament at Rouen. Amurath II. sultan. Great inundation in Holland, the ‘‘Biesbosch”’ formed.

1422. Henry VI. king of England and Franee. Charles VII. crowned king of France. Regency of Bedford in France, of Glou- cester in England. Siege of Constantinople by Amurath II.

1423. Council of Siena (transferred from Pavia) opened. Earliest specimen of Block Book dated this year. University of Louvain founded.

1424. James I. of Scotland liberated by Henry VI., proclaimed and crowned. Bedford defeats the French and Scots at Verneuil. Death of Benedict XIII. Election of anti-pope Clement VIII. Council of Siena transferred to Basel. Death of Ziska.

1425. John Paleologus II. emperor of the East; he eoncludes treaty with Amurath II. Statute for punishment of heretics and and Lollards passed in Scotland.

1426. Rivalry of Gloucester and Cardinal Beaufort in’ England. Defeat of the Germans by Hussites at Aussitz.

1428. Siege of Orleans by the English. Death of the Earl of Salisbury. Lincoln College, Oxford, founded.

1429. Joan of Arc raises the siege and enters Orleans. Talbot defeated at Patay. Charles VII. crowned at Rheims. Termination of the schism in the

papacy by abdication of Clement VIII. Order of the Golden Flecce instituted by Philip the Good, duke of Bur- gundy. Death of Gerson.

1430. Capture of Joan of Arc. Amurath IT.

1431. Joanof Arc burnt at Rouen (?) Henry VI. crownedat Paris. Eugenius IV. pope: Highteenth General Council transferred from Siena to Basel, opened July 238. Hussite invasion of Germany. Fifth crusade against Hussites. Battle of Taas,—victory of Hussites. Birth of Mantegna (died, 1506).

1432. The Azorcs taken possession of by Portuguese.

1433. Sigismund crowned at Rome by the Pope. Death of John I. the Great, king of Portugal.

1434. René the Good, duke of Anjou, succeeds his brother Louis as king of Naples; opposed by Alphonso V. of Aragon. Death of Ladislas of Poland. Cosmo de' Medici supreme at Florence about this time. Flight of Kugenius from Rome.

1435. Congress and Treaty of Arras,—abandonment of English alliance by the Duke of Burgundy. Death of Bedford.

1436. Paris retaken by the French. Calais unsuccessfully besieged by the duke of Burgundy. States-General meet at Orleans. War between England and Scotland.

1437. John Palzologus embarks at Constantinople in the Pope's galleys for an intcrview at Ferrara. Murder of James I. king of Scots ; James II. succeeds. Death of Sigismund. Birth of Cardinal Ximenes. Ulugh Begh eompiles his Star Tables.

1488. Albert II. emperor (duke of Austria, and king of Hungary and of Bohemia), Council of Ferrara convoked by Eugenius IV. in opposition to Council of Basel; the emperor John Paleologus and the Greek Patriarch present. The Pope deposed by the Fathers of Basel, and the latter excommunicated at Ferrara; Amadeus, duke

Ceuta taken from Sigismund visits

Sir

Conquest of Thessalonica by

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of Savoy, elected pope (Felix V.) at Basel. Pragmatic Sanction (the Palladium of France), limiting the power of the Pope in France, established by Charles VII. Nine years' truce made between England and Scctland.

1439. Council of Ferrara transferred to Florence,—decree for union of Greek and Roman churches signed, but rejected by the Greeks. Doctrine of Purgatory adopted. Death of Albert II. Cardinal Bessarion, '' restorer of learning," settles in Italy. Alliance of Zurich with Austria. — .

1440. Frederick IV. (III.) emperor. Invention of printing with movable types about this time. Amadeus dcclared anti-pope, heretic, &c. by Council of Florence. Belgrade unsuccessfully be- sieged by Amurath IJ. Title of Viscount introduced in England. Eton College founded. Oil painting perfected by Jan van Hyck about this time.

1442. Abdication of Amurath II. Naples taken by Alphonso of Aragon, the kingdom lost by René of Anjou; union of Naples and Sicily as the Two Sicilies. '

1443. Eugenius IV. forms a league against the Turks. Victory of John Hunniades at Kunobitza. King's College, Cambridge, founded by Henry VI.

1444, Peace of ten years between Hungary and the Turks con- cluded at Szegedin. The treaty violated with the Pope's sanction. Victory of the Turks and death of Ladislas and Cardinal Julian at Varna. George Podiebrad scizes the chief power in Hungary. African slave trade begun by Portuguese. Revolt of Albania under Scanderbeg. Expedition of Charles VII. of France, at request of the emperor, against the Swiss. The sicge of Zurich raised. Second abdication of Anurath IT.

1445, Marriage of Heury VI. with Margarec of Anjou.

1447. Deaths of the duke of Gloucester and Cardinal Beaufort. Nicholas V. pope. End of the Visconti dynasty at Milan; Francisco Sforza claims the duchy. Foundation of the Vatican Library by Nicholas V.

1448. Constantine XI., Paleologus, last emperor of the East. Anjou and Maine surrendered to the French. Concordat between the empire and the Pope. Birth of Lorenzo de' Medici.

1449. Abdication of Felix V., anti-pope. Normandy conquered by the French. Quecn's College, Canibridge, founded.

1450. Jubilee at Rome proclaimed by Nicholas V.; the period again raised to 50 years. Francisco Sforza takes Milan and is pro- claimed duke. Impeachment and death of the duke of Suffolk. Insurrection of Jack Cade. Copper-plate cngravimg invented by Maso Finiguerra about this time.

1451. Mohammed IJ. sultan of the Ottomans. Conquest of Gascony by the French ; Calais alone left to the English. Glasgow University founded. :

1452. Murder of the Douglas by James II. The duchies of Modena and Reggio erected by Frederick III. Coronation of Frederick III. by the Pope at Rome (the last emperor crowned at Rome). Birth of Savonarola. Birth of Leonardo da Vinci (died,

1519).

1453. Conspiracy of Stephen Porcaro at Rome. Siege of Con- stantinople by the sultan Mohammed II. formed, April 6; the city taken by assault, May 29. Death of Constantine,—end of the Eastern empire. Austria erected into an archduchy. Talbot defeated and killed at Castillon. First treaty between France and the Swiss.

1454. The duke of York protector in England.

1455. Calixtus 111. pope. The Wars of the Roses begin with the first battle of St Alban's, May 23. The earl of Warwick captain of Calais. Probable date

of the Mazarine Bible, the earliest printed book known.

1456. Mohammed II. besieges Belgrade and is defeated by John Hunniades, who dies soon after.

1457. Death of Ladislas the Posthumous, king of Hungary and Bohemia. Reginald Pecock, bishop of Chichester, condemned by archbishop of Canterbury and imprisoned.

1458. Matthias Corvinus elected king of Hungary, George Podie- brad king of Bohemia. Pius I]. (Aineas Sylvius Piccolomini) pope. Magdalen College, Oxford, founded. Conquest of the Morea by Mohammed II.

1459, Death of Poggio (born 1381). University of Basel founded.

1460. Battle of Northampton. James II]. king of Scots. The duke of York defeated and killed at battle of Wakefield. Cape Verd discovered by Diogo Gomez. Death of Prince Henry, the Navigator.

_1461. Second battle of St Alban's, Edward IV. (house of York)

king of England. Battle of Towton. Louis XI. king of France. Conquest of Trebizond by Mohammed II. _ 1462. Mohammed reduces Wallachia. The emperor besieged in Vienna, is delivered by George Podiebrad. Alliance of Louis XI. with the Swiss and the duke of Milan. Ivan IlI., the Threatening, grand duke of Russia.

1463. The university of Bourges founded by Louis XI.

Venetian and Turkish war.

Alliance between Venice, Hungary, and the Pope.

CHRONOLOGY

[1439—1483.

Excommunication of George Podicbrad. Truce of Hesdin between Louis XI. and Edward IV.

1464. Formation of the Ligue du bien public in France. established by Louis XI. Paul Il. pope. Death of Cosmo de' Medici. Death of Cardinal Nicolas de Cusa. Fifteen years' truce between England and Scotland. Battle of Hexham. Conquest of Genoa by Sforza.

1465. Civil war in France. Conflans and St Maur. Paul IT.

1466. Normandy reannexed to the French crown. Imprisonment of Henry V1. inthe Tower. Treaty of Thorn. Second cxcommuui- cation of Podiebrad. Birth of Colet (died, 1519).

1467. Death of Scanderbeg. Charles the Bold, duke of Burgundy. Alliance between Edward IV. and Charles the Bold. Birth of Erasmus (died, 1536).

1468. The States-General meet at Tours. Bold with Margaret of York. Treaty of Péronne, between Louis and Charles. Louis held prisoner by Charles. Liége taken and burnt by Charles.

1469. Marriage of James Il. of Scotland with Margaret of Denmark. The Orkney and Shetland Islands surrendered to James. Order of St Michael instituted by Louis XI. Lorenzo de' Medici head of the Florentine republic. Marriage of Ferdi- nand of Aragon with Isabella of Castile. Birth of Machiavelli (died, 1527).

1470. Ivan J1I. conquers Kasan and Novgorod. Flight of Warwick to France. Flight of Edward IV. to Burgundy. Henry VI. restored by Warwick. Conquest of Negropont by Mohammed II. The jubilee period fixed at 25 years.

1471. Return of Edward. Battles of Barnet and Tewkesbury. Deatlis of Warwick and Henry VI. Invasion of France by Charles the Bold. SixtusIV. pope. Death of Podichrad. Birth of Wolsey (died, 1530). Birth of Albert Durer (died, 1528). Archbishopric of St Andrews erected.

1472. Charles the Bold buys Guelderland and Zutphen. Guienne annexed to the crown of France. Marriage of Ivan III. with Sophia, daughter of Constantine Paleologus. Birth of Copernicus (died, 1543).

1473. Birth of Chevalier Bayard (died, 1524).

1474. The Perpetual Alliance between Louis X]. and the Swiss Confederation. Holstein erected into a duchy. Ferdinand and Isabella proclaimed sovereigns of Castile. Rival claim of Joanna supported by Alphonso V. of Portugal. Ncuss besicged by Charles the Bold. Birth of Ariosto (died, 1588).

1475. Invasion of Burgundy by the Swiss. The siege of Neuss raised, Alliance of Edward IV. and Charles the Bold. Invasion of France by Edward. Peace of Pecquigny. University of Bor- deaux founded. Birth of Michelangelo (dicd, 1564). Jubilee at Rome.

1476. Invasion of the Swiss Cantons by Charles. Victories ot the Swiss at Granson, March 8, and Morat, June 22. Mohammed II. ravages Moldavia and conquers the Crimea. Caxton sets up his printing press at Westminster, 1476 or 1477.

1477. Siege of Nancy by Charles the Bold, who falls in battle. His daughter Mary succecds him. Marriage of Mary with Maximilian of Austria. Seizure of Burgundy by Louis. The ‘Grand Privi- lege” granted to the Dutch by Mary. Mohammed II. conquers Albania. University of Tiibingen founded. Birth of Titian (died,

1576).

1478. Trial and death of the duke of Clarence. Conspiracy of the Pazzi at Florence sanctioned by Sixtus IV. Lorenzo de’ Medici excommunicated by the Pope. Ivan I11. defeats Ahmed, khan of the Golden Horde. Christian I. of Denmark founds the university of Copenhagen and the order of the Elephant. University of Upsala founded by Sten Sture. ;

1479. Ferdinand, the Catholic, becomes king of Aragon. Battle of Guincgate. Peace of Olmutz betwcen Matthias Corvinus and the emperor. Ludovico il Moro takes possession of Milan.

1480. The Spanish Inquisition established by Ferdinand and Isabella. Birth of Sir Thomas More. Siege of Rhodes hy Mohammed JI. Conquest of

Otranto. War breaks out between England and Scotland. ‘ Alliance of Lorenzo de’ Medici with Ferdi- nand of Naples.

1481. Bajazet II. sultan of the Ottomans. Provence annexed to France. Beginning of the war between the Spaniards and the Moors. Alhama surprised by Spaniards. Otranto recovered from the Turks. First auto da fé in Spain, at Seville, by Torquemada.

1482. Death of Mary of Burgundy. Peace of Arras. The duke of Albany assumes the title of king of Scotland. Alliance of the duke with Edward IV.; siege of Berwick. Capture of Edinburgh by Albany and Gloucester. Cardinal Mendoza appointed archbishop of Toledo. Birth of Guicciardini (died, 1540). Birth of @colam- padius (died, 15381).

1483. Edward V. king of England murdered. Richard III. king of England. Charles VIII. king of France, regency of Anne of Beaujeu. League of Italian states against Venice. The Venetians

Posts

Battle of Montlhéry. Treaties of Podiebrad deprived of his kingdom by

Marriage of Charles the

1484—1521.]

excommunicated by Sixtus IV. Birth of Luther (died, 1546). Birth of Baber. Birth of Raphael (died, 1520). Torquemada inquisitor-general of Castile and Aragon.

1484. Birth of Zwingli. (died, 1531). Innocent VIII. pope.

1485. Battle of Bosworth, August 22, Henry VII. (house of Tudor) king of England. Capture of Vienna by Matthias Corvinus. Birth of Sebastiano del Piombo (died, 1547).

1486. Rising of Lambert Simnel. Cape of Good Hope discovered by Bartolomeo Diaz. Henry VII. marries Elizabeth of York.

1487. Defeat and eapture of Simnel at battle of Stoke. Birth of Miles Coverdale. Couquest of Austrian states by Matthias. De- feat and capture of the khan of Kasan byIvan 111. Zizim, brother of Bajazet IL, kept prisoner by the Pope till 1495.

1488. James IV. king of Seotland. Disturbanees in Flanders. Imprisonment of Maximilian at Bruges. Revolt of French princes. Battle of St Aubin. Grand Swabian Leagne formed (dissolved,

1533). Birth of Andrea del Sarto (died, 1530). 1489. Treaty between Charles VIII. and Maximilian. Maxi- inilian recognized by the Flemish towns as regent. Marriage (by

py) of Maximilian to Annc of Brittany. Cyprus acqnired by enice. The Pope dcposes Ferdinand of Naples. Death of John Wessel (born, 1420).

1490. The marriage of Maximilian annulled. Death of Matthias Corvinus. Austria reeovercd by the emperor. Birth of Hugh Latimer about this time.

1491. Treaty of Presburg between the emperor and Ladislas of Hungary. Marriage of Charles VIII. with Anne of Brittany. Duchy of Brittany annexed to erown of France.

1492. Granada taken by Ferdinand V. End of the Moorish dominion in Spain. ‘The title of ‘‘ Catholic” conferred on Ferdinand by the Pope. Expulsion of Jews from Spain. Death of Lorenzo de’ Medici. Alexander VI. pope. Columbus sails on his first voyage, August 3; lands on San Salvador, October 12. Variation of the compass observed by Columbus. Invasion of France by I{enry VII. Treaty of Etaples. Appearance of ‘‘ Perkin War- beek” in Ireland. ‘Terrestrial Globe (‘* World-Apple’’) construeted by Martin Bchaim.

1493. Birth of Paracelsus (died, 1541), Maximilian I. emperor. Treaty of Narbonne. Treaty of Scnlis. .Sccond voyage of Colum- bus. Bull of Alexander VI., fixing ‘‘ line of demarcation ” between Spanish and Portuguese possessions.

1494, Expedition of Charles VIII. to Italy. Discovery of Jamaica by Columbus. Savonarola restores popular governnient in Florence. Negotiations between the Pope and the sultan. Poenes Law (Ireland) passed. Persecution of the Lollards of

yle.

1495. Death of Cardinal Mendoza. Charles VIII. Charles enters Naples. Battle of Fornova. Treaty of Vercelli. Naples re-entered by Ferdinand Il. ‘‘ Perkin War- beck” invades England. Birth of Holbein (died, 15438).

1496. Evacuation of Naples by the Freneh.

1497. Newfoundland diseovered and the mainland of America reached by the Cabots. The Cape of Goold Hope doubled by Vaseo di Gama. Excommunication of Savonarola. ‘‘ Perkin Warbeek ” captured. Birth of Melanehthon (died, 1560).

1498. Louis XII. king of France. Savonarola hung and burnt, May 23. Third voyage of Columbus; the mainland of Amcriea reached. Death of Torquemada.

1499. Marriage of Louis XII. with Anne of Brittany. Conquest of the Milanese by the French. The mainland of America reached by Ojeda and Amerigo Vespucei. Exeention of ‘* Perkin Warbeek.” Lepanto seized by the Turks.

1500. Birth of Charles the Fifth. Brazil discovered by Pinzon. Triumphal entry of Cesar Borgia into Rome. Insurreetion against the French at Milan. Sforza betrayed by the Swiss at Novara. The Aulic Council established. Germany divided into six cireles ; into ten in 1512. Birth of Benvenuto Cellini (died, 1571).

1501. Conquest of Naples by Louis XII. and Ferdinand the Catholic ; they quarrel about partition of the kingdom ; war lasts till 1504. Marriage of Arthur Tudor with Catherine of Aragon. a of the Moors from Spain. Columbus brought home in chains.

1502. Marriage of James IV. of Seotland with Margaret Tudor. Fourth voyage of Columbus. Treaty of peace between Turks and Venetians. University of Wittenberg founded.

1503. Battle of Cerignola. ‘The Freneh driven from Naples by the

Treaty between the Pope and

Spaniards. Pius III. pope; on his death, Julins II. Borgia driven from Rome. Birth of Robert Stephens (Estienne) (died,

1559).

1504. The Spanish conquest of Naples completed by the capture of Gaeta by Gonsalvo of Cordova, January 1. Treaty of Blois, between Louis XII., Maximilian I., and Archduke Philip. Alliance between Julius II., Louis, and Maximilian. Death of Queen Isabella. Baber becomes king of Cabul. Birth of Parmigiano (died, 1540).

1505. Baber conquers Candahar. Christ’s College, Cambridge, founded. Birth of John Knox. Treaty of Blois between Louis

and Ferdinand. Marriage of Ferdinand with Germaine de Foix. Colet dean of St Paul’s.

1506. Concord of Salamanca, between Ferdinand and Philip king of Castile. Death of Columbus, May 20. Madagascar discovered by Almeida. Birth of George Buchanan (died, 1582). First stone of St Peter’s at Rome laid, April 18.

1507. Margaret of Austria governess of the Netherlands. Re- forms in the empire established at Diet of Constance. 1508. Unsuceessful expedition of Maximilian to Italy. The

League of Cambray formed between the Pope, the emperor, and the king of France, against Veniee, December 10. Birth of Alva.

1509. Henry VIII. king of England, April 22; his marriage with Catherine of Aragon, June. Wolsey almoner to the King. Con- quest of Oran by Cardinal Ximenes. Excommunication of the Venetians by Julius II. Battle of Agnadello. Pisa sold to Florence. Capture of Padua by Venetians. Unsuccessful siege of Padua by Maximilian. Birth of Calvin (died, 1564.) Albuquerque, go- vernor of the Indies.

1510. Reconciliation between the Pope and the Venetians. Death of Cardinal d'? Amboise. Conquest of Cuba by Spaniards. Louis XII. holds a national couneil at Tours. Luther visits Rome. Goa stormed by Albuquerque. Portuguese settlement in the Moluceas. University of Alcala founded by Ximenes.

1511. Capture of Mirandola by Julius 11. The Iloly League between the Pope, Ferdinand, and Venice. League between Ferdinand and Henry VIII. against France. Council of Pisa. Malaeca taken by Albuquerque. Baber aequires Bokhara and Samarcand.

1512. Seliin I. sultan of the Ottomans. Siege and sack of Breseia by Gaston de Foix. Battle of Ravenna, death of Gaston. Death of Giorgione (born, 1477). Nineteenth General Couneil (fifth of the Lateran) opens May 3. League between James of Seot- land and Louis X1I. War between England and France. Julius 11. excommunieates Louis, aud lays interdict on France. The Trinity House founded about this time. Conquest of Navarre and incorporation with Castile. Birth of Tintoretto (died, 1594.) Birth of Vasari (died, 1574.)

1513. Leo X. elected pope, Mareh 11. Battle of the Spurs. Siege and capture of T'erouenne by Henry VIII. Battle of Flodden, James IV. defeated and killed, Capture of Tournay. Christian lI. king of Denmark. Balboa, ''silent upon a peak in Darien," first sees the Pacific Ocean, September 25. Persecution of Reuchlin by the Inquisition. Louis XII. makes peace with the Pope.

1514. Death of Anne of Brittany. Truce between Louis and Ferdinand. Peace between Mngland and France. Marriage of Louis with Mary of England, Oct. 9. Peace between England and Scotland. Wolsey made archbishop of York.

1515. Francis I. king of Franee, January 1.; regency of his mother Louisa. French invasion of Italy. Battle of Marignano. Subjugation of the Milanese. Meeting of Louis X. and Francis I. at Bologna. Coneordat signed and the Pragmatie Sanction abolished. Wolsey created cardinal and appointed chancellor. Birth of Roger Ascham (died, 1568.) First part of the Zpistole

Obscurorum Virorum published (second part, 1517). Death of Botticelli (born, 1447). 1516. Death of Ferdinand the Catholic, January 23. Charles I.

king of Spain. Regency of Ximenes. Treaty of Noyon, between Charles and FrancisI. Treaty of London, —league against France. Peace of Brussels, between the emperor, Francis I., and the Venctians, December 4. The “Perpetual Peace” between France and the Scots. Barbarossa, sultan of Algiers. More’s Utopia published.

1517. Couneil of the Lateran closed, March 16. Sale of Indul- gences authorized by Leo X. Tetzek in Germany. Luther’s Theses published, October 31. Decath of Ximenes, November 8. Sovereignty of the Mamelukes in Egypt overthrown by Selim I. Fernao d’ Andrada visits China. Birth of John Foxe (died, 1587.) Death of Fra Bartolommeo (Baccio della Porta) (born, 1469). Death of Francia (born about 1450).

1518. Wolscy made papal legate. Treaty between Francis I. and Heury VIII. Luther before Cajetan at Diet of Augsburg. Luther condemned by the Pope; appeals to General Council. Zwingli preacher at cathedral of Zurich.

1519. Death of Maximilian I., January 12. Charles I. of Spain elected emperor (Charles V.), June 28. Disputation of Luther and Dr Eck at Leipsic, June-July. Mexico taken by Cortez, November. Magdalen College, Cambridge, founded.

1520. Visit of Charles V. to England. Meeting of Henry VIII. and Francis I. on the Ficld of the Cloth of Gold, June. Bull of Leo X. against Luther, June.

Cortez leaves Mexico, July. Luther burns the bull, December 10. Soliman II., the Magnificent, sultan of the Ottomans. Massacre of Stoekholm by Christian II., Novem- ber. Magellan enters the Pacific Ocean, Novenmiber 28.

1521. Luther excommunicated, January 3. Luther at the Diet of Worms, April. Carried off to the Wartburg. Execution of the duke of Buckingham. Excommunication of Francis I. Treaty of Bruges. Belgrade taken by Soliman. Henry VIII. writes against

Luther and receives the title of Defender of the Faith. Gustavus Vasa administrator of Sweden. Siege and eapture of Mexico by Cortez, May to August. Milan recovered from the French. Death of Leo X., December 1. Ladrone and Philippine Islands diseovered by Magellan 'The Loguicntioned, Melauchthon's Loci Communes published. /

1522. Adrian V. pope, January. The French defeated in Lom- bardy. Charles V. visits England. Henry VIII. invades France. Persecution of the Moors in Spain. Rhodes surrenders to Soliman. Bomb-shells used by Turks at this siege Escape of the Constable de Bourbon from France. Death of Keuehlin (born, 1455) 'First voyage round the world made by a ship of Magellan's squadron. Complutensian Polyglot Bible published.

1523. League of Constable de Bourbon with the emperor and Henry VIII. Invasion of France. League of Rome Capture of Jedburgh by earl of Surrey. Gustavas Vasa, king of Sweden. Invasion of Italy by the Freneh. Death of Ulrieh von Hutten (born, 1488). Clement VII. pope, November19. Christian II. of Denmark deposed ; Frederick I. elected king.

1524. Capture of Copenhagen by Frederiek I. Rout of the French and death of Bayard at the Sesia. Peasant war in Germany breaks out under Munzer. Wolsey made legate for life. Invasion of the Milanese by Francis I. Siege of Pavia. Lahore taken by Baber. Luther's controversy with Carlstadt. Mikkelsen's Danish New Testament published. Birth of Palestrina (died, 1594). Death of Perugino (born, 1446). Death of Signorelli (born about

1440).

188. Battle of Pavia,—Francis I. taken prisoner by Imperialists, February 24. Luther’s marriage. League of Torgau. Treaty between England and France. Munzer defeated at Frankenhausen, and executed. Death of Frederick the Wise of Saxony ; John the Constant succeeds him. Visitation of the monasterics undertaken by Wolsey. Religious liberty established in Denmark. The Buccaneers begin their piracies in the West Indies about this time. Seeularization of the territory of the Teutonic knights; East Prussia erected into a duchy for Albert of Brandenburg, the grand- master.

1526. Marriage of Charles V. with Isabella of Portugal, January. Treaty of Madrid, January 14. Jraneis liberated, February. League of Cognac between Franeis, the Pope, Venice, and Henry VIII., March. Battle of Paniput,—victory of Babcr over Ibrahim Lodi, April. Diet of Spires, June. Victory of Soliman over Hun- garians at Mohacz, August. Buda burnt. The Pope captured by Cardinal Colonna, September, Pizarro and Almagro arrange partition of Peru. Swedish New Testament published. Tyndale’s New Testament.

1527 The erown of Hungary disputed by John Zapolya and Ferdinand of Bohemia. Rome taken and sacked by Imperialists, the Pope taken prisoner, May. Death of Constable de Bourbon. Treaty between the emperor and the Pope. New alliance between England and France. Application of Henry VIII. to the Pope to examine into the lawfulness of his marriage. Capture of Genoa and Pavia by the French. Discovery of the Bermudas by Juan Bermudez, and of New Guinea by the Portuguese. University of Marburg founded.

1528. Coronation of Gustavus, January 12. England and France deelare war on the emperor. Patrick Hamilton burnt at Glasgow, February. Campeggioin England. Expulsion of the French from Genoa by Andrea Doria, September. Latin Bible of Pagninus published.

1529. The legatine court in England opened. Diet of Spires, at which the riame ‘‘ Protestants” is adopted. Peace of Cambray. Soliman takes Buda and gets Zapolya crowned king of Hungary, September. Lutheranism established in Sweden by Diet of Orebro. Vienna besieged by Soliman.

Confercnee of Marburg, October. Fall of Wolsey. Conferences of the Pope and the emperor at Bologna, November to January 1530. Death of Quintin Matsys (born, 1460).

1530. Coronation of Charles as king of Lombardy aud emperor, February. The marquisate of Mantua ereeted into a duchy, March. Malta given by Charles V. to the knights of St John. Diet of Augsburg opens, June 13; closes November 18. Confession of Augsburg. Marriage of Francis I. with Eleanor of Austria, July 4. Death of Wolsey, November 29. Death of Margaret, governess of the Netherlands. Death of Baber, December 26; Humayun succeeds. League of Smalkald formed, December 31.

1531. Inundation in Holland. Earthquake at Lisbon, January. Expulsion of Gypsies from England. Death of Zwingli at the battle of Cappel, Oetober 11.

1582. First religious peace (peace of Nuremberg) coneluded, J uly. Diet of Ratisbon. The Caroline Code passed. Court of Session organized by James V. Private marriage of Henry VIII. with Anne Boleyn. Christian II. imprisoned. Florence ereeted into a duchy for the Medici. Peru taken possession of by Pizarro and Almagro. Duchy of Brittany reunited to the crown of France. Machiavelli’s Del Principe published. Brueeioli’s Italian Bible. Antwerp Exchange built, the first of the kind.

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‘George Wishart begins preaching in Scotland.

[1522=1543.

1533. Cranmer arehbishop of Canterbury. He pronounces Henry’s marriage with Catherine null and void. His decision reversed by the Pope. John Fryth burnt at Smithfield, Marriage of Henry, duke of Orleans, with Catherine de’ Medici. Flight of Calvin from Paris. Treaty between Franeis I. and Barbarossa. Birth of Montaigne (died, 1592). Death of Lucas van Leyden (born, 149+).

1534. The papal power in England abrogated by Act of Parlia- ment. The Act of Supremacy. Anabaptists besicged in Munster by the prince-bishop. Execution of Elizabeth Barton, the holy maid of Kent. Paul III. pope, Oetober 13. Barbarossa seizes the kingdom of Tunis. John of Leyden (Bockelsohn), head of Ana- baptists at Munster. Society of Jesus founded by Loyola, Lainez, and others. Death of the earl of Kildare in the Tower of London, December. Munster's Latin Bible. Luther's Bible completed. Death of Correggio.

1535. Henry VIII. takes the title of Supreme Head of the Chureh of England, January. Expedition of Charles V. to Tunis, defeat of Barbarossa, capture of Tunis, June. Capture of Munster and execu- tion of John, June. Thomas Cromwell vicar-general of the king in England. Visitation of the monasteries undertaken. Persecu- tion of French Protestants. Execution of Fisher and More. Milan taken possession of by Charles V., October. Siege of Copenhagen by Christian III., begun. Buenos Ayres founded by Pedro de Men- doza. Calvin's Jnstitutio Religionis Christiane published. Olivé- tan's French Bible. Coverdale's English Bible. Canada visited by Jacques Cartier.

1536. Death of Catherine of Aragon, January 8. Alliance between Francis I. and Soliman, against Charles VY. Overthrow of the Geraldines in Ireland. Exeeution of Queen Anne (Boleyn), May 19, and marriage of Henry VIII. with Jane Seymour, May 20. Attainder of Reginald Pole for his book De Unitate Ecclesiastica. Incorporation of Wales with England. Calvin goes to Geneva. Dissolution of the lesser monasteries in England. Invasion of France by Charles V., July. Surrender of Copenhagen to Christian III., July 29. Siege of Marseilles by Charles, August to December. Lutheranism established in Denmark. Defeat of Imperialists by Turks at Eszek, November. Tyndale burnt at Vilvoord, October 6. The bull Jn Cana Domini published by Paul III.

1537. Marriage of James V. with Madeleine of France, January 1. Catholie insurrections in England. Campaign of the French in the Netherlands. Death of Queen Madeleine, July 7. Com- mission of inquiry into the grievances of Ireland. Death of Queen Jane, October. Eruption of Etna, lasts a year.

1538. Calvin banished from Geneva, April. Negotiations of Charles V. and Franeis I. at Niee, a truce for ten ycars signed, June. The Holy League of

Nurcmberg formed, June. Marriage of James V. of Scotland with Mary of Lorraine, June. Use of English Bible in ehurches enjoined, September. Parish registers ordered to be kept in England, September. Execution of relatives of Cardinal Pole; imprisonment of his mother the Countess of Salisbury. Paul III. excommunicates and deposes Henry VIII.,

December. Severe ediet of Francis I. against the Protestants. ee Beatoun created cardinal, December. The Great Bible pub- ished,

1539. Treaty of Toledo, ‘‘ perpetual peace ” between Charles and Francis, signed January 10. Dissolution of the Spanish Cortes, February. Revolt of Ghent. Dissolution of all monasteries in England. Statute of the Six Articles passed. Cardinal Beatoun arehbishop of St Andrews, Birth of Soeinus (died, 1604).

1540, Kntry of Charles and Francis into Paris, January 1. Marriage of Henry VIII. with Anne of Cleves, January 6. Charles at Ghent, —execution of leading citizens, ancient liberties suppressed, February. The Order of Knights of St John suppressed in England. Exeeution of Thomas Cromwell, July 28. Henry marrics Cathe- rine Howard, July 28. Appointment of a second seeretary of state in England. Disputation of Papist and Protestant doctors at Worms, November. The Soeicty of Jesus conditionally sanetioned by Paul III. (unconditionally, 1543). The Louvre begun by Francis I. The rupee first issued.

1541. Diet of Ratisbon. Execution of Countess of Salisbury. Invasion of Hungary by Soliman. Occupation of Buda. Death of John Zapolya. Disastrous expedition of Charles V. to Algiers. Calvin returns to Geneva. The Mississippi discovered by De Soto.

1542. The ecclesiastical “Ordinances” adopted at Geneva, January 2. Diet of Spires. Execution of Queen Catherine (Howard), February. War between England and Seotland. War renewed between France and the cmperor. Paul III. eonvokes Couneil of Trent, May. Siege of Perpignan, August to October. Battle of Solway Moss, Nov- ember 25. Mary queen of Scots, December 14. ; Regency of Arran. John Knox becomes a Protestant. Xavier sent to India. Mendez. Pinto in Japan. Swedish Bible published.

1543, Alliance between Henry VIII. and the emperor, February. Death of Copernicus, May 24. Invasion of Hungary by Soliman ; Grau taken, August, and large part of the kingdom conquered, Marriage of Henry VIII. with Catherine Parr, July. Coasts of Italy

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ravaged by Barbarossa. Attack on duchy of Juliers, capture of Diiren by Charles V. Cardinal Beatoun chancellor of Scotland. Knzinas's Spanish New Testament published. Tyndale's Bible pro- seribed by English Parliament. The Copernican system of the world published, May.

1544. The kingdom of Sweden declared hereditary in the house of Gustavus, January. Diet of Spires, opens February 20. Battle of Cerisoles, April. Edinburgh and Leith burnt by the English, May. Henry VIII. invades France, July; takcs Boulogne, September. Peaee of Crespi, September. "Paul III. summons the adjourned council for March 1545, November. Birth of Tasso (died, 1595). University of Konigsberg founded.

1545. Extermination of the Vaudois in Provence ordered by Francis I., January. Battle of Ancrum Muir, February 17. Peter du Breuil, Calvinist preacher, burnt at Tournay, February 19. Dict of Worms, March. Parma and Piacenza erected into a duchy by Paul ITI. for his son, Piero Luigi Farnese. Council of Trent opened, December 18. Silver mincs of Potosi discovered.

1546. Death of Luther, February 18. Assassination of Cardinal Beatoun at St Andrews, May 28. Peace between England and France, June. Tyndale's and Coverdale's New Testaments and many English books proscribed by royal proclamation, July 8. Anne Askew burnt in London, July 16. Stephen Dolet burnt at Paris, Angust 3. The Smalkaldic War begins. Christ Chureh, Oxford, and Trinity College, Cambridge, founded by Henry VIII. Death of Giulio Romano. Birth of Tycho Brahe (died, 1601). The King's Primer, first sketch of the Book of Common Prayer.

1547. Conspiracy of Fieseo at Genoa, January 2. The earl of Surrey beheaded, January 19. Edward VI. king of England, January 28; protectorate of Somerset. Council of Trent trans- ferred to Bologna, March. Henry II. king of France, March 31. Battle of Miihlberg,—defeat and

capture of John Frederick, elector of Saxony, by Charles V., April 24. Capitulation of Wittenberg signed, May 19. The Protector invades Scotland, and defeats the Scots at Pinkie, September 10. Visitation of churches in England. Birth of Cervantes (dicd, 1616). University of Jena founded.

1548. Sigismund II. king of Poland. Charles V. at Diet of Augsburg publishes the Interim, May 15. Risc of Adiaphoristic controversy. Charles's edict of Reformation, June 14. Mary, queen of Scots, is sent to Franee. Thc Netherlands, as the circle of Burgundy, incorporated with the empire. Constance seized by Imperialists and put under the ban, October 14, 15. Marriage of Antoine de Bourbon with Jeanne d'Albret, Oetober.

1549. Act of Uniformity passed in England. Lord Seymour beheaded. War between England and France. Catholic risings in England. Siege of Boulogne by the French begun. Auto-da-fé at Paris at the coronation of Catherine de' Medici, June. Death of Pope Paul IIL, November 10. Death of Paul Fagius, November (born 1504). Death of Margaret, queen of Navarre, December 21. Mission of Xavier to Japan,—to 1551.

1550. Julius III. pope, February 8. Peace between England and France and Scotland ; Boulogne surrendered, April. 'The new liturgy first used at Dublin. Joan Bocher burnt, May 2. The Spanish Inquisition established in the Nethcrlands by Charles V.; his edict against the Protestants, April 29. Diet of Augsburg. Death of the Imperial Chanvellor Granvella, August 28. Siege of Magdeburg by Maurice of Saxony begun, September. Camera Obseura inventcd by Baptista Porta. Rise of Protestantism in England. Vasari's Lives of the Painters published.

1551. Death of Martin Bucer, February (born, 1491). Couneil mects again at Trent, May 1. Warabout duchy of Parma. Treaty between Henry II. of France and Maurice, October 5; ratified by Wenry, January 15, 1552. Capitulation of Magdeburg, November 3. Birth of William Camden (died, 1623). Robert Recorde's Grounde of Artes published. Teklucyan's Polish New Testament. Castalio's Latin Bible.

1552. Act of Uniformity passedin England. Execution of Somer- set, January. War between Maurice and the cmperor. Council of Trent prorogued, April 28, Seizure of the three bishoprics, Metz, Toul, and

Verdun, by Henry II. Siege of Metz begun by Charles V. Invasion of Hungary by Turks. Peace of Passau, August 12. Death of St Francis Xavier, December 2. Birth of Father Paul (Pietro Sarpi) (died, 1623). Birth of Spenser (died, 1599). Birth of Raleigh (died, 1618). Birth of Sir Edward Coke (died, 1632).

1553. Siege of Metz abandoned, January. Mary queen of England, July 6. Lady Jane Grey proclaimed, July 10. Battle of Sievershausen ; the elector Maurice killed, July 9. Servetus burnt at Geneva, October 27. Death of Rabelais. (?) Archangel reached by Richard Chaucellor.

1554. Wyatt's insurrection in Kent, January. John Knox escapes to France, Jannary. Execution of the Lady Jane, February 12. Marriage of Queen Mary with Philip of Spain, July. War con- tinued between the emperor and the king of France. War of Siena. Absolution of England by Cardinal Pole, November. Birth of Sir Philip Sidney (died, 1586). Birth of Hooker (died, 1600).

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lobo. Wietiot ag Pine opens, Fcbruary. The Marian persecu- tion begins. Marcellus II. pope, April 9, three weeks. Paul IV. pope, May 23. The Peaee of Religion published, September 26. Abdication of sovereignty of the Netherlands by Charles in favour of his son Philip, October. The Synergist Controversy begins.

1556. Akbar Mogul emperor, January. Charles resigns the crown of Spain to Philip II., January 16. Truce of Vaucelles between the emperor and the king of France, Feb:uary5. Archbishop Crantner burnt, March 21. Cardinal Pole archbishop of Canterbury, March 22. Charles resigns the imperial crown to his brother Ferdinand I, September 7. 'The Pope refuses to recognize Ferdinand. Inva- sion of Papal States by Alva. Ridley and Latimer burnt at Oxford, October 16. Trinity College, Oxford, founded. Mercator's Projec- tion invented. Beza's Latin New Testament published.

1557. Charles V. retires to a monastery, February. First

ambassador from Russia arrives in England, February. The Inquisition established in France, April 26. England declares war on France, June. Battle of St. Quentin, August 10. The

town taken by Spaniards, August 27. Guise appointed lieutenant- general of the kingdom, August. Peace between the Pope and Philip II. September. St. Jolin's College, Oxford, founded.

1558. Calais taken by Guise, January 1-7. Ferdinand I. recog- nized emperor, Mareh 12. Marriage of Mary, queen of Scots, with the Dauphin, April 24. Battle of Gravelines, July 13. Death of Charles V., September 21. Death of Cardinal Pole, November 17. Elizabeth queen of England, November 17.

1559. The Royal Supremacy restored in England, January. Peace of Cateau-Cambrésis, April 2, John Knox arrives in Scotland, May 2. Marriage of Philip II. with Elizabeth of France, June. English Book of Common Prayer first used, June. Francis II. king of France, July 10. Philip II. returns to Spain, August. Margaret of Austria regent of the Netherlands. First auto-da-fé of Protes- tants at Valladolid. Pius IV. pope, December 26. Birth of Tilly. Birth of Isaac Casaubon (died, 1614).

1560. Death of John Alasco, January (born, 1499). Treaty of Berwick, January. Conspiracy of Amboise, February, March. Edict of Romorantin, May. Freneh evacuate Scotland, J uly. The Reformation established by Scots parliament, August 25. Duke of Savoy makes war on the Vaudois, September. Prince of Condé arrested, November. Charles IX. king of France, December 5. Regency seized by Catherine de' Medici. States-General meet at Orleans, December 31. Birth of Arminius (dicd, 1609). West- minster School founded.

1561. Birth of Bacon, January (died, 1626). Edict of Orleans, January 31. Rebellion of Shane O'Neal in Ireland, spring. The "Triumvirate," alliance against the Huguenots, Easter. Edict of July. Return of Queen Mary to Scotland, August. Colloquy of Poissy, September 9 to October 9. The first observatory built at Cassel. Leonard's Polish Bible published. Tobacco introduced into Europe.

1562. Edict of January (or of Toleration) in France. Apostasy of the king of Navarre, January. Massacre of Vassy, May 1. War between Catholics and Protestants in France begins. Slaughter of Protestants at Toulouse, May. Queen Elizabeth concludes treaty with Condé, September 20. Havre occupied by the English, September. Siege of Rouen begun by the king of Navarre, September 18; taken, October 26. Death of Peter Martyr, November 12 (born, 1500). Death of king of Navarre, November 17. Birth of Lope de Vega, November (died, 1635). Battle of Dreux, Condé taken prisoner, December 19. African slave trade begun by Hawkins. Truce between the emperor and the sultan,

1563. Council of Trent re-opened, January 18. The.Thirty-nine Articles of Church of England settled by Convocation, January 29. Assassination of duke of Guise, February 18. Pacification by Edict of Amboise, March 19, France declares war on England, July 6. Surrender of Havre, July 8. Charles IX. deelared of age, August 17. Council of Trent closed, Decembcr 4. Foxe's Book of Martyrs published.

1564. Acts of Council of Trent confirmed by Pius IV. January 26. Birth of Galileo, February 18 (dicd 1642). Treaty of peace between

England and France, April 1. Birth of Shakspeare. Death of Calvin, May 27. Maximilian II. emperor, July 25. Edict of Roussillon, August 6. Birth of Marlowe (died, 1593). Congre-

gation of the Oratory founded at Rome.

1565. Siege of Malta by Mustapha Pasha, May to September. Marriage of Mary queen of Scots with Lord Darnley, July 29. Confederation of the Gueux founded in the Netherlands, November. Death of Pius IV., December 9. Conferences between Catherine de' Medici and Alva at Bayonne.

1566. Pius V. pope, January 7. The ''Compromise" published by the Leaguers in the Netherlands, January. The Grande Ordon- nance de Moulins published, February. Murder of David Rizzio, March 9. Revolt of the Netherlands begins. Invasion of Hungary by Soliman, Death of Soliman at Szigeth, September 5. Selim II. sultan. Severe decree of Philip II. against

the Moors, November 17. The Russia Company sanctioned by Act of Parliament.

1567. Murder of Darnley, February 10. Marriage of Mary to Bothwell, May15. Shane O'Neal defeated, May ; assassinated, June 2.

Queen Mary compelled to resign the crown to her son, James VL., July 24. Mary imprisoned, Murray regent. Alva sent as governor to the Netherlands, Angust. The Council of Blood organized. War of religion renewed in France. Battle of St Denis, November 10. Death of Constable Montmorenci, November 12. Rugby School founded. '

1568. Seizure and imprisonment of Don Carlos by his father, Philip I1., January. The Inquisition condemns the inhabitants of the Netherlands to death, February 16. Edict of Longjumeau, March 23. Revolt of Moors in Spain, April. Battle of Langside, May 13. Flight of Mary to England. Louis of Nassau defeats the Spaniards at Heyligerlee, May 28. Execution of Egmont and Horn, Junc 5. Death of Don Carlos, July. Eric XIV. of Sweden deposed, September 80. The English College at Douai founded. Party ot the Politiques formed in France. Birth of Campanella (died, 1639).

1569. Battle of Jarnac, Condé killed, March 13. Tuscany crected into a grand duchy, September 1. Coligny proscribed by parliament of Paris, September 13. Battle of Moncontour, October 3. Revolt of Catholic earls in England, November. De Reyna's Spanish Bible published.

1570. Assassination of the Regent Murray, January 28. Excom- munication of Queen Elizabeth by Pins Y., February 25. Invasion of Cyprus by the Turks, July. Peace of St Germain, August 8. Marriage of Charles |X. with Elizabeth of Austria, Noveniber 26. Great inundations in Holland. Conquest of Yemen by Selim II. Ascham's Scholemaster published.

1571. Severe laws against the Catholics in England. The Regent Lennox killed, September 4. Regency of Mar. Holy

League against Turks, formed by the Pope, the King of Spain, and Venice. Victory of Don Jolin of Austria over the ‘lurks at Lepanto, October 7. Universities of Oxford and Cambridge incor- porated, Jesus College, Oxford, founded. Lirth of Kepler (died, 1630). Harrow School founded.

1572. Seizure of Briel by the Confederates, spring. Gregory XIII. pope, May 18. Execution of the duke of Norfolk, June 2. Death of Jeanne d’Albret, June 10. William of Orange declared Stadtholder, July 15. Death of Sigismund H. of Poland, July. Marriage of Henry of Navarre and Margaret of Valois, August 18. Massacre of St Bartholomew, August 24 seq.; Coligny killed. Death of John Knox, November 24. Siege of Haarlem by Spaniards, December 9. Conquest of Guzerat by Akbar (1572-74).

1578. Siege of La Rochelle by duke of Anjou, February. Death of De Hopital, March 13. Duke of Anjou elected king of Poland, May. Treaty with the Huguenots of Rochelle, &c., June 24. Edict of toleration issued by Charles 1X, July. Surrender of Haarlem, July 12. Siege of Alkmaar by Spaniards, August ; raised, October 8. Siege of Leyden, October 31. Karl of Morton regent of Scotland, November. Alva recalled, Requesens governor of the Netherlands, December. Birth of Donne (died 1631). Birth of Inigo Joues. (died, 1652). First English translation of Euclid published.

1574. Henry Ill. king of France, May 30. Expedition of Sebastian king of Portugal against the Moors in Africa. Siege of Leyden raised, October 3. Amurath III. sultan, December. Birth of Ben Jonson (died, 1637.)

1575. Stephen Bathori, elected king of Poland, December. Conquest of Bengal and Behar by Akbar. Birth of Guido (died, 1642). University of Leyden founded by Prince of Orange…

1576. The League, in France, organized, February. Death of Requesens, March 5. La Paix de Monsicur, in favour of the Huguenots, May 14. Rudolph Il. emperor, October 12. Sack of Antwerp, November. Pacification of Guent, November 8. Don John, governor of the Netherlands, November. Henry Ill. joins the League, Decembcr. The plague at Milan. Frobisher’s Strait discovered. Birth of John Fletcher (died, 1625), Birth of Robert Burton (died, 1639). The dipping needle invented by Robert Norman.

1577. The Union of Brussels, Jannary. The Perpetual Edict published by Don John, March 12; confirmed by Philip H., April 7. Peace of Bergerac (or Poitiers), September. Insurrection at Ghent, autumn. Deposition of Don John, December 7. New Union of Brussels, December 10. Drake sails on voyage round the world, December 18. Birth of Rubens (died, 1640).

1578. Treaty between Queen Elizabeth and the Dutch, January 7. Battle of Gemblours, January 31. Battle of Rymenants, August 1. Sebastian of Portugal defeated and killed by the Moors, at Alcazarquivir, August 4. Death of Don John, October 1. Alexander Farnese, duke of Parma, governor of the Netherlands, October. Lyly's Ewphues published. The English State Paper Office founded. Order of the Holy Ghost instituted by Henry III. of France. Birth of William Harvey (died, 1657).

1579. Union of Utrecht, basis of the Dutch Republic, proclaimed, January 29. Treaty of Nérac, between Catherine de' Medici and the king of Navarre, February 28. Treaty between the Walloon pro- vinces and Farnese, May 17. Siege of Maestricht by Spaniards, March to June 29. A body of Spaniards invade Kerry, and oecupy Smerwick, July. Socinus preaches in Poland. Protestantisin proscribed in Austria.

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[1568-1594.

1580. Birth of Archbishop Ussher (died, 1656). William of Orange put under the ban by Philip, June. Battle of Alcantara, August 25. Portugal annexed to Spain, and Philip proclaimed king, September 2. Duke of Anjou made stadtholder of the Netherlands, September 19. Massacre of Smerwick, November 11. Return of Drake. Revolt of the Desmonds in Ireland. Formula of Concord published by the elector of Saxony. Rise of the Brown- ists in England. Montaigne's Essais published.

1581. Kxecution of the Regent Morton, June 3. Declaration of Independence by the United Provinces, July 26. Siege of Cambrai by Spaniards ; raised by Anjou, August. Execution of Campian, December 1. Birth of Domenichino (died, 1641), Birth of Lord Herbert of Cherbury (died, 1648). Turkey Company, of London, incorporated.

1582. Reformation of the Calendar (New Style) introduced by Gregory XIH., February 24. The raid of Ruthven, Angust. Uni- versity of Edinburgh founded. Dcath of St Theresa.

1583. Attempt of Anjou to seize Antwerp, January 17. Birth of Grotius (died, 1645). Birth of Wallenstein.

1584. Death of Anjou, June 10. Assassination of the Prince of Orange, at Delft, July 10. His son Maurice elected stadtholder. Siege of Antwerp by the duke of Parma, July. Treaty between the League and Philip I1., December. Discovery and colonization of Virginia. Emmanuel College, Cambridge, founded. Birth of Selden (died, 1654). Birth of Massinger (died, 1640).

1585. Sextus V. pope, April 24. Edict of Nemours, July 7. Queen Elizabeth accepts protectorate of the Netherlands, July. Barneveldt appointed advocate-general of Holland and West Fries- land, Expedition of Drake against Spanish West Indies, Capitula- tion of Antwerp, August 17. War of the three Henrics, in France. English army under Leicester sent to Netherlands, December. Abbas the Great shah of Persia. Birth of Richelieu. Birth of Beaumont (died, 1616). Birth of Drummond of Hawthornden (died, 1649).

1586. Babyngton's plot against Queen Elizabeth, September. Battle of Zutphen, September 22; Sir Philip Sidney wounded; he dies, October7. Trial of Mary, queen of Scots, October 11. Shakes- peare in London. Camden's Britannia published. The Escorial completed by Philip 11.

1587. Mary, queen of Scots, beheaded, February 8. Expedition of Drake to Cadiz, April. Sluys capitulates to Spaniards, August 4. German invasion of France, Jnly. Battle of Coutras, October 20. Davis's Straits discovercd. Persecution of Christians in Japan (again 1590 and 1597).

1588. Guise enters Paris, May 9. Day of the Barricades, May 12. The ''Invincible Armada" sails from Lisbon, June 1; defeated and dispersed, July and August. Edict of Union between the League and Henry III., July 21. States-General at Blois, October 10. Assassination of Guise, December 28; of Cardinal of Guise, December 24. Birth of Hobbes (died, 1679).

Annales Ecelesiastict of Baronius (1588-1607). ‘Tic Rialto, Venice, built. Death of Paclo Veronese,

1589. Death of Catherine de’ Medici, January 5. Mayenne, head of the League, enters Paris, February 12, and is named lieutenant- general of the kingdom. Alliance of Henry I1I. with the Hugue- nots, April. Expeditton of Drake and Norris to Portugal, April to June. Siege of Paris by the two Henries, July. Assassination of Henry 111., August 1. Henry IV. of Navarre king of France, Battle of Arques, September 21. Paris attacked by Henry IV., October 31-November 1. James VI. of Scotland marries Anne of Denmark, November 24. Patriarchate of Moscow established.

1590. Battle of lvry, March 14. Breda recovered by Prince Maurice, March. Siege of Paris by Henry 1V. May 7; raised by Parma, September 9. Urban VII. pope, September 15 ; thirteen

days. Gregory XIV. pope, December 5. Spenser’s Facric Queene appears. first treatise on Decimal Fractions, by Stevinus.

Sidney’s Arcadia.

1591. Spanish garrison in Paris, February 12. Henry IV. con- demned by the Pope, March 1. Capture of Deventer and Zutphen by Maurice, May, June. Innocent X. pope, October 29; dies, December 30. Siege of Rouen by Henry 1V., November. Arago- nese liberties suppressed, November. ‘Trinity College, Dublin, incorporated. arthquakes in the Azores lasting twelve days. Wynkyn de Worde carries on Caxton’s business after his death.

1592. Clement VIII. pope, January 20. Rouen relieved by Parma, April. Death of Parma, December 3. The Falkland Islands sighted by Davies. Presbyterianism established in Scotland.

1593. Severe acts against Puritans and Popish recusants in England, February—April. Dreux taken by Henry [V., June 18. He abjures Protestantism, July 25. Gertruydenberg taken by Prince Maurice. Birth of Izaak Walton (died, 16838).

1594. Coronation of Henry1V. at Chartres, February 27. Heenters Paris, March 22. Submission of the Sorbonne, April. Reduction of Groningen by Prince Maurice, July 22. Brest taken from Spaniards by French and English, November. Ixpulsion of the Jesuits from Paris, December 29. Rebellion of Tyrone in Ireland. Hooker's Eeelesiastical Polity appears. Birth of Nicolas Poussin (died,

1665).

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1595~1623.]

1595. Mohammed III. sultan, January 17. war on Spain, January 17. Absolution of Henry 1V. by the pope, September 17. Cambray taken by Spaniards, October 2. Dutch East India Company formed. Dutch Settlement in Java.

1596. Treaty of Folembrai between Henry IV. and Mayenne, January, puts an end to the League. Calais taken by Spaniards, April 17. Peace of Teusin, between Russia and Sweden, May 18. Alliance of England and France against Spain, May 24. Invasion of Hungary and eapture of Erlau by Mohammed III., summer. Capture of Cadiz by English and Dutch forces, June 21. Arch- duke Maximilian defeated by Mohamined ITI. at Keresztes, October 24-26. Sidney Sussex College, Cambridge, founded. Birth of Descartes (died, 1650). Spitzbergen reached by Barentz.

1597. Victory of Prince Maurice over the Spaniards at Turnhout, January 22. Amiens taken by Archduke Albert, March 12, and retaken by Henry IV., September 15. Thermometer invented by Galileo before this year. Bacon's Essays published.

1598. The Edict of Nantes, April 30. Peace of Vervins between France and Spain, May 2. Philip III. king of Spain, Sept. 18.

1599. Divorce of Henry IV. from his queen Margaret, February. Essex appointed lord-lieutenant of Ireland, March 12. The Deccan tributary to Akbar. Imprisonment of Campanella (1599-1629). Birth of Velazquez (died,

1660). Birth of Vandyck (died, 1641). Sully appointed superintendent of finance to Henry IV. Birth of Oliver Cromwell, April 25. Birth of Blake.

1600. Giordano Bruno burnt at Rome, February 17. Prince Maurice defeats the Spaniards at Nieuport, July 2. Henry IV. declares war on Savoy, August. Gowrie conspiracy in Scotland, August 5. Marriage of Henry IV. with Mary de' Medici, December 9. The English East India Company chartered, December 31. Birth of Calderon (died, 1681). General symbols in algebra introduced by Vieta. Zodiacal light seen by Tycho Brahe. William Gilbert's De AMfagnete published.-

1601. Treaty of peace between France and Savoy, January 17. Execution of the earl of Essex, February 25. Siege of Ostend by Archduke Albert, July 4. Kinsale oceupied by Spaniards, September.

1602. Submission of Tyrone. Execution of Marshal Biron at Paris, July 29. Culture and manufacture of silk introduced into France. Birth of Mazarin. Hamlet published.

1603. Queen Elizabeth dies, and is succeeded by James VI. of Scotland as James I. of England, March 24. Union of the two erowns, The Millenary Petition of the Puritans presented to the king, April. Ahmed I. sultan, December. The Jesuits recalled to France. Disputes of the Gomarists and Arminians in Holland. Chapman's Jliads of Homer published (Odyssey, 1614).

1604. Hampton Court Conferences between the prelates and the Puritans, January 14-16. Treaty of peace between England and Spain, August 18. Surrender of Ostend to Spinola, September 20. James I. proclaimed King of Great Britain, France, and Ireland, October 24. French settlementin Canada. Hooker's Ecclesiastical Polity completed.

1605. Paul V. pope, May 6. The '' False Demetrius" crowned ezar of Russia, summer. Death of Akbar, October 13. Jehangir succeeds him. Gunpowder Plot; arrest of Guy Fawkes, November 5. Bacon's Advancement of Learning published. Birth of Sir Thomas Browne (died, 1682). The first part of Don Quixote published. The Mereure de France, first French periodical, begun.

1606. Venice laid under interdict by the Pope, April17. The Jesuits expelled from Venice. Peace of Sitvatorok between the emperor and the sultan, November 11. Patent for eolonization of Virginia granted. Birth of Pierre Corneille (died, 1684).

1607. The Spanish fleet at Gibraltar destroyed by the Dutch, April 25. Return of Halley's Comet observed by Kepler. Univer- sity of Giessen founded.

1608. Hungary ceded by Rudolph II. to Archduke Matthias, June 29. Trialof Arminius at the Hague. The telescope invented in Holland. Birth of Clarendon (died, 1674). Birth of Milton (died, 1674). Birth of Fuller (died, 1661), Reform of Port Royal begun by Angélique Arnauld.

1609. Twelve years truce between Spain and the Netherlands, March 29. The Protestant Union of German Princes formed, May 4, Catholic League organized, July. Religious liberty for all sects conceded by the emperor, July 12. Moscow taken by the Poles. Siege of Smolensko by the Poles, November. Two edicts of Philip III. for expulsion of Moriscoes. The satellites of Jupiter discovered by Simon Marius, December ; by Galileo, January 1610. Kepler's Laws (the first and second) published. The Bank of Amsterdam founded.

1610. Assassination of Henry IV. by Ravaillac, May14. Louis X1II. king of France; regency of Mary de' Medici. Charter for coloniza- tion of Newfoundland, May. Hudson's Bay discovered. Wadham College, Oxford, founded. Phases of Venus discovered by Galileo. Douay Bible published.

1611. Christian IV. of Denmark declares war on Sweden, April. Matthias king of Bohemia, May 23. Surrender of Smolensko to the Poles, July. Gustavus Adolphus king of Sweden, November 9.

Henry 1V. declares

The plague at Constantinople. Plantation of Ulster. First crea- tion-of baronets in England. Sun-spots discovered by Fabricius and Galileo. Congregation of the Oratory at Paris founded. Birth of Fairfax. Birth of Turenne. Authorized Version of the Bible published. The Charter House, London, incorporated.

1612. The Great Mogul authorizes English factories at Surat, Ahmedabad, &c., January 11. Death of Emperor Rudolph II., January 20. Matthias elected, June 13. Death of Henry, prince of Wales, November 6 (born, 1593). Birth of Leighton (died, 1684). Birth of Samuel Butler (died, 1680). The pendulum applied to clock-work by Sanctorius.

1613. Marriage of Elector Palatine with Princess Elizabeth of England, February. The Romanoff dynasty in Russia founded, February. The New River, London, completed, Michaelmas. Birth of La Rochefoucauld (died, 1680). Birth of Jeremy Taylor (died, 1667). Birth of Montrose.

1614. Revolt of Condé terminated by Peace of Menehould, May 15. Last meeting at Paris of States-General before the Revolu- tion, September 27. Invention of Logarithms by Napier of Mer- chiston (died, 1617). Birth of Henry More (died, 1687). Raleigh's History of the World published. University of Groningen founded.

1615. Embassy of Sir Thomas Roe to the Great Mogul, January. The Jews again expelled from France, April. Death of Arabella Stuart in the Tower, September 27. Marriage of Louis XIII. with Anne of Austria, and of Don Philip with Elizabeth of France, November 25. Birth of Baxter (died, 1691).
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1616. Death of Shakespeare, April 23 (0.8.). Death of Cervantes, April 23. The Cautionary Towns in Holland delivered up to the Dntch by James I., May 27. Cape Horn doubled by Le Maire aud

Schouten. Baffin's Bay discovered. Circulation of the blood disco- vered by Harvey about this time. Birth of John Owen (died,

1683).

1617. Peace of Stolbowa between Sweden and Russia, February. Bacon appointed lord-keeper, March. Raleigh sails for Guiana, March. Mustapha I. sultan. Assassination of Marshal d'Ancre at Paris, April 24. The qucen-mother banished to Blois, May. Ferdinand king of Bohemia, June. Iixceution of the wife of Marshal d'Anere, Jnly 8. Birth of Cudworth (died, 1688).

1618. Othman II. sultan, February 26. Arrest of Grotius and Barneveldt by Statcs-General, February. The ‘‘ Book of Sports”

romulgated by James I. May 24. Archduke Ferdinand, king of

ungary, July 1. Execution of Raleigh, October 29. The duke of Lerma disinissed from office, October. Synod of Dort, November 13. Revolution in Bohemia; beginning of Thirty Years' War. Birth of Cowley (died, 1667). China invaded by Manchoos about this time. Kepler's third Law announced. Congregation of Saint- Maur formed in France.

1619. Vanini burnt as atheist at Toulouse, February 19. Escape of Mary de' Medici from Blois, February 19. _ Grotius imprisoned, and Barneveldt beheaded, May. Dutch and English trade in the East Indies regulated by treaty, July 17. Ferdinand deposed by States of Bohemia, August 19; elected emperor, August 28. Capture of Presburg by Bethlen Gabor, October 20. Frederick,

Elector Palatine, crowned king of Boliemia, October 25. Vienna besieged by Bethlen Gabor and the Bohemians, December. Batavia built by the Dutch. Birth of Prince Rupert. Birth of

Colbert.

1620. Treaty of Ulm, July 3. Massacre of Protestants in the Valtelline, July 19. Bethlen Gabor king of Hungary, July. Invasion of the Palatinate by Spinola, autuinn. The Pilgrim Fathers sail in the ‘‘ Mayflower” from Delft, September 6, and land in New England, December 11. Victory of the Turks at Jassy over Gratiani and the Poles, September 20. Battle of Prague, —-the elector Frederick defeated, November 8. Lacon's Novum Organum published. Birth of John Evelyn, (died, 1706).

1621. Gregory XV. pope, February 9. linpeachment of Lord Chancellor Bacon, March. Philip 1V. king of Spain, March 31. Grotius escapes from prison, March 21. The Protestant Union dissolved, May. Riga taken by Gustavus Adolphus, September 21. The English Commons claim freedom of discussion, December 19. Death of Cardinal Bellarmine (born, 1542).

1622. Peace of Nikolsburg, between Bethlen Gabor and the emperor, Hungary renounced by the former, January 7. The English parliament dissolved, February 9. Shah Abbas takes Baghdad, May 1. Battle of Wimpfen, May 6. Othman II. deposed and Mustapha restored, May 19. Siege of Bergen-op-Zoom by Spinola, June to October. Heidelberg surrenders to Tilly, Sep- tember 15-19. Richelieu created cardinal, September 5. Peace of Montpellier, end of war with the Huguenots, October 19. Surrender of Mannheim to Tilly, November 1. The bishopric of Paris raised to archbishopric. Birth of Moliére (died, 1673). Congregatio de Propaganda Fide instituted at Rome by Gregory XV.

1623. Journey of Prince Charles of England and the duke of Buckingham to Madrid, March to October. The Valtelline occupied by papal troops, May. Urban VI11. pope, August 6. Tilly defeats

Duke Christian of Brunswick at Stadtlohn, Augrst 9. The Spanish | ss 3

marriage-treaty broken off by England, December. Birth of Pascal (died, 1662). Shakespeare’s Works, the first folio, published.

1624. Monopolies declared illegal in England, February. England declares war on Spain, March 10. Richelieu becomes a member of the Council, April. Treaty of Compiégne between France and Holland, June 20. The Valtelline seized by the French, November. Pembroke College, Oxford, founded. Barbados, first English settle- ment in West Indies. Burton’s Anatomy of Mclancholy published. Lord Herbert’s Tractatus de Veritate. Privilege of Sanctuary in England abolished.

1625. Huguenot insurrection in France, J anuary. Charles I. king of England, March 27. Death of Maurice, prince of Orange, April ‘

23. Charles I. marries (by proxy) Henrietta of France, May 11.

Breda taken by Spinola, June 5, English expedition against Cadiz. |

Charles I. dissolves the parliament, August 12. Grotius De Jure Belli ac Pacis published.

1626. Impeachment of Buckingham, February. Treaty of Moncgon betwecn France and Spain, March 5. Minden taken by Tilly, June 9. Charles I. dissolves his sccond parliament, June 15. Edict of Louis XIII, for demolition of castles in France, July 31. Géttingen taken by Tilly, August 11. Battle of Lutter,—defeat of Christian IV. of Denmark by Tilly, August 27. Birth of Madame de Sévigné (died, 1696), Birth of Robert Boyle (died, 1691).

_ 1627. Siege of Rochelle begun, summer. Expedition of Bucking- ham to Isle of Rhé, July-October. The Rudolphine Tables com- pleted by Kepler, Birth of Bossuet (died, 1704).

1628. Cromwell sits for Huntingdon in third parliament, March. Petition of Right presented to Charles I., May 28; passed, June 7. Laud bishop of London, July. Assassination of Buckingham, August 23. La Rochelle taken by Richelieu, October 28. Death of Shah Abbas, December. Siege of Stralsund by Wallenstein. Birth of Bunyan (died, 1688). The Taj Mehal built.

1629. Campaign of Louis XIII. against duke of Savoy, January to June. Edict of Restitution published by the emperor, March 6. Third parliament of Charles I. dissolved, March 10. Charter granted to the Massachusctts Bay company, March. Peace between England and France, April. Peace of Liibeck, between the emperor and the king of Denmark, May 22, Montauban reduced, August. Richelieu first minister of state, November. Birth of Huyghens (died, 1695).

1630. Richelieu invades Italy, February. Gustavus Adolphus enters Germany, June. Mantua surprised by Imperialists, July 17. Wallenstein deprived of his command, August. Death of Spinola, September 25, Birth of Isaac Barrow (died, 1677). Birth of Tillotson (died, 1694). The Slide Rule invented by Oughtred.

1631, Treaty of Bernwald,—alliance of France and Sweden against the emperor, January 23, Magdeburg besieged by Tilly, March ; stormed and sacked, May 20-22. ‘Treaty of Chierasco concluded, April 6. Gustavus concludes a treaty with Elector of Brandenburg, June 11. Battle of Leipsic, —victory of Gustavus over Tilly, Sep- tember 7. March of Gustavus to the Rhine, September to Christ- mas. Mentz taken, December 13. Wallenstein recalled, December. Great eruption of Vesuvius. Description of the Vernier published by the inventor. Transit of Mercury first observed, by Gassendi. Birth of Dryden (died, 1700).

1632. Lorraine subject to France by treaty of Vic, signed January 6. Passage of the Lech by the Swedes, Tilly wounded, April, 5. Death of Tilly, April 6. Munich entered by Gustavus, May 17. Nuremberg seized by Gustavus. Siege and capture of Maestricht by Prince Frederick Henry, August. Schomberg defeats Montmorency at Castelnaudary, September 1. Execution of Mont- morency, October 30. Battle of Liitzen, victory and death of Gustavus, November 16, Christina queen of Sweden. Regency of Oxenstiern. Birth of John Locke (died, 1704), Birth of Spinoza (died, 1677). Birth of Puffendorf (died, 1694). Birth of Wren (died, 1723).

1633. Union of Heilbronn, April 9, Coronation of Charles I. in Scotland, June 18. Laud archbishop of Canterbury, August. Nancy besieged and taken by and ultimately ceded to Louis Xan September 20. The Book of Sports republished by Charles L., October. Ratisbon taken by Duke Bernhard, November. Prynne fined, pilloried, and imprisoned, for his Histrio-mastyx. Galileo coudemned by the Inquisition,

1634. Lorraine annexed to France; Parliament of Austrasia established at Metz. Wallenstein assassinated, February 25. Urbain Grandier burnt on charge of witchcraft, August 18. Battl!-of Nordlingen,—victory of Imperialists over the Swedes, September 6. Writ of ship-money issued by Charles I. Treaty between the French and the Swedes, November. Siege of

Heidelberg by Imperialists ; raised by the French, December. Order of the Sisters of Charity jonedes by St Vincent de Paul. The Ammergau Passion Play insti- tuted.

1635. Philippsburg taken by Imperialists, J anuary. Alliance between the French and the Dutch, February. Treves surprised by Spaniards, and elector taken prisoner, March 26. France declares war on Spain, May 10. Peace of Prague, between the emperor aud the elector of Saxony, May 30. The French Academy founded by

CHRONOLOGY Richelieu. Church.

measures a degree of the meridian in England.

University of Utrecht founded. Harvard College, U.S., founded.

June 12.

| November, December.

(1624-1647.

Articles of the Church of England adopted by Irish The Jardin des Plantcs, Paris, founded. Norwood

1636. John Hampden resists the imposition of ship-money. Birth of Boileau (died, 1711). 1637. Ferdinand III. emperor, Feb. 15. ‘Trial of Hampden, Prynne, Bastwick, and Burton condemned by Star Chamber, June 14. Decree of Star Chamber for regulation of printing, July 1. Book of Canons and Common Prayer issued for Scotland ; disturbances on its introduction at Edinburgh, July 23. Descartes’s Discours de la Méthode published. Death of Nicholas Ferrar (born, 1593).

1638, The Solemn League and Covenant of the Scots published, March 1. General Assembly at Glasgow abolishes Episcopacy, Siege and capture of Breisach by Bernhard, December 17. Baghdad taken by the Turks, December 25. Cyrillus Iucaris (patriarch of Constantinople) put to death.

Birth o Malebranche (died, 1715). Chillingworth's Religion of Protes- tants published.

1639. The Scots take up arms, January. Lesley takes posses- sion of Edinburgh Castle, March 23. Pacification of Berwick, June 18. Admiral Tromp defeats Spanish Fleet in the Downs, October 11-12. _ Birth of Racine (died, 1699), Transit of Venus first observed by Horrox and Crabtree.

1640. The Short Parliament of Charles I. meets, April 13; dissolved, May 5. Revolt of Catalonia, June, Newcastle occu- pied by Scots, August 27, Turin invested by the French, May ; surrenders, September 24. Last sitting of High Commission Court, October 22. The Long Parliament meets, November 3. Impeach- mentof Strafford, November 11. Independence of Portugal recovered ; John duke of Braganza proclaimed king, December 1. Frederick William, the ‘‘ Great Elector" of Brandenburg, December 1. Treaty between France and the Catalans, December 16. Jansenius pub- lishes his Augustinus. Peruvian bark introduced into Europe. Micrometer invented by Gascoigne.

1641. Union of Catalonia with France, January 23. Ibrahim I, sultan, February. Archbishop Laud sent to the Tower, March 1. Trial of Strafford, March 22; he is beheaded, May 1%. Abolition of the Star Chamber. Visit of Charles I. to Scotland, August to November. Irish Rebellion, massacre of Protestants, October 23. The Grand Remonstrance presented to Charles I., December 1. The terms ‘‘Roundheads" and "Cavaliers" come into use. Malacca taken by the Dutch. The Meditationes of Descartes published.

1642, Attempted arrest of the five members by Charles L., January 4. Death of Mary de' Medici, July 8. Charles I. sets up his standard at Nottingham, August 22. Perpignan surrenders to the French, September 9. Execution of Cing-Mars for conspiracy, September 12. Roussillon taken possession of by France. Battle of Leipsic,—victory of Swedes over Imperialists, October 13. Battle of Edgehill, October 23. Oxford occupied by Charles I., October 26. Death of Richelieu, December 4. Mazarin first minister. New Zealand and Van Diemen's Land discovered by Tasman. Calculat- ing machine invented by Pascal, Birth of Newton (died, 1727).

1643. Louis XIV. king of France, May 14 ; regency of Anne of Austria. Battle of Rocroi, May 19. Death of Hampden, June 24, The Assembly of Divines meets at Westminster, July1. Bristol surrenders to Prince Rupert, July 27, Opening of Congress of Munster, July. Thionville recovered by the French, August 10. Siege of Gloucester by Charles J., August-September, Battle of Newbury, death of Lord Falkland, September 20. ‘The Covenant taken by the House of Commons and Assembly of Divines, Sep- tember 25. Philip IV. drives the French from Aragon, November. The barometer invented by Torricelli. Birth of Bishop Burnet (died, 1715). First volume of the Acta Sanctorum, by Bollandus and Henschen, published.

1644. The Swedes under Torstenson invade Denmark, J anuary 16. The Scots cnter England, January. Trial of Archbishop Laud, March-November. Battle of Marston Moor, July 2. Gravelines taken by the French, July 28. Battle of Freiburg, August 3-5. Philippsburg besieged by the French; taken, September 9. Sack of Aberdeen by Montrose, September 13-16. Second battle of Newbury, October 27. Christina assumes government of Sweden, December 18. Conquest of China by the Manchoos. Milton’s Areopagitica published. Birth of William Penn (died, 1718).

1645. Archbishop Laud beheaded, January 10. ‘Turenne defeated by General Merei at Mariendal, May 5. Battle of Naseby, June 14. Alexis czar of Russia, July 13, Peace between Sweden and Den- mark, August 14. Bristol surrendered by Prince Rupert, Septem- ber 10, Lesley defeats Montrose at na September 13. Capture of Tréves by Turenne, November 9. Death of Olivarez (born, 1587),

1646. Charles I. surrenders to the Scots, May 5. – Surrender of Oxford to the Parliament, June 24. Dunkirk taken by the French, October 12. Birth of Leibnitz (died, 1716).

1647. Charles I. given up by the Scots to the Parliament,

January 380. Treaty of Ulm between France and Bavaria, March,

1648-1670.]

Surrender of Harlech Castle, the last royal post, March 30. Charles I. seized at Holmby House, June 4. Masaniello heads revolt at Naples, July 7. Death of Prince Frederick Henry of Orange. Occupation of London by the army, August 6. Another insurrection at Naples, August 21. George Fox begins to preach. _1648. Treaty of Munster between Spain and the United Pro- vinces, recognizing independence of the latter, January 30. Royalist revolt in England, February. Tortosa stormed by Marshal Schom- berg, July 12. Battle of Preston, August 17. Battle of Lens,— victory of prince of Condé over Archduke Leopold, August 20 The war of the Fronde begins, August 27. Fairfax takes Colchester,

August 28. The Pcace of Westphalia; close of the Thirty Years' War, October 24. '* Pride's Purge," December 6. The '*Rump" Parliament. The pressure of the atmosphere demonstrated by

Pascal's experiment on the Puy de Déme, September 19.

1649. Execution of Charles I., January 30. Blockade of Paris by Condé, January. Charles II. proclaimed at Edinburgh, February 5. England declared a Commonwealth, May 19. Mohammed IV. sultan, July 28. Cromwell storms Drogheda, September 12, and Wexford, October 9. Milton's Eikonoklastes published.

1650. Rebellion of Montrose, January. Arrest of the princes of Condé, Conti, and Longueville, January 18. Execution of Montrose, May 21. Victory of Cromwell over Lesley at Dunbar, September 3. Surrender of Edinburgh Castle, December. Battle of Rethel, December 15. Cape Town founded by the Dutch. Milton's Defensio Popult Anglicani published. First permanent settlement in Carolina. Birth of Marlborough.

1651. The States of Holland abolish office of stadtholder, January. |

Condé and the other princes liberated, February. Mazarin in exile, March. Catholicand Protestant leagues formed in Germany, spring. Charles invades England, August. Monk storms Dundee, September 1. Victory of Cromwell over Charles at Worcester, September 3. Flight of Charles to France, October. Navigation Act passed by English Parliament, October 9. Capitulation of Limerick to Ireton, October 27. Death of Ireton, November

26. Great inundation in Holland from bursting of dyke. Birth of Fenelon (died, 1715). Hobbes's Leviathan published. Taylor's Holy Living and Holy Dying.

1652. Return of Mazarin to power, January. Amnesty granted by English Parliament, February 24. War between English and Dutch begins, May. Irish Rebellion suppressed by May. Battle of the Faubourg St Autoine, Paris, July 2. England declares war on the Dutch, July 8. Mazarin again retires, August. Surrender of Dunkirk to Spaniards, September 18. Victory of Blake and Penn over the Dutch, September 28. Catalonia reunited to Spain. Victory of Van Tromp, November 28. The Liberum Veto first used in Poland.

1658. Return of Mazarin to power, February 3. Victory of Blake over Van Tromp off Portland, February 18, 19, 20. Expulsion of "'The Rump" by Cromwell, April 20. Barcbones's Parliament meets, July 4. Blake destroys the Dutch fleet at the Texel, July 31. Cromwell made Lord Protector, December 16. War between Catholic and Protestant cantons of Switzerland. Walton's Complete Angler published. John de Witt grand pensionary of Holland.

1654. Peace concluded between England and Holland, April 5. Scotland declared incorporated with England, April12. Coronation of Louis XIV., June 7. Abdication of Christina of Sweden, June 16. Turenne relieves Arras, besieged by Spaniards, August 25. First parliament of the Protector meets, September 4. The Cossacks under protection of Russia. War between Russia and Poland, which lasts thirteen years, begins, September. Madras made seat of a presidency. Milton's Second Defence of the People of England published. Air-pump invented by Otto von Guericke.

1655. Cromwell dissolves the parliament, January 31. Alex- ander VII. pope, April 7. Jamaica taken by Penn and Venables, May. Cromwell assists the Vaudois, June. Invasion of Poland by Charles X. of Sweden, July. Treaty of alliance between the elector of Brandenburg and the Dutch, July 27. Surrender of Warsaw to Charles X., August 30; of Cracow, October 8. Treaty of alliance between England and France, October 24. Subjugation of Prussia by Charles X., December. A satellite of Saturn discovered by

Huyghens. Fuller’s Church History of Britain published. The Journal des Savanis begun.

1656. Alliance between Charles X. of Sweden and the Great Elector, June 15. Surrender of Warsaw to Poles, June 21. Warsaw recovered by Charles and the elector, July. Blake captures Spanish treasure fleet off Cadiz, September 9. Czar invades Livonia and takes Dorpat, October 26. Treaty of Liebau between Charles X. and the Great Elector, November20. Pascal’s Lettres Provinciales published. Harrington’s Oceana. Conquests of the Dutch in Ceylon. General Post-Office, London, established.

1657. Attempt to assassinate Cromwell, January 19. Cromwell concludes treaty with France, March 23. Denmark declares war on Sweden, spring. Death of the Emperor Ferdinand III., April 2. Blake destroys the Spanish treasure ships at Santa Cruz, April 20. Cromwell declines the title of king, May 8. Treaty of Vehlau, September 19. Mardyke taken by the English and French, Sept-

; May 29. with the Infanta, June 9.

, published.

ember 28. Walton’s Biblia Polyglotta published. Reflecting telescope constructed by Gregory. Birth of Fontenelle (died,

1757). ,

1658. Passage of Charles X. over the Little Belt on the ice, January 30-81 ; over the Great Belt, February5-10. Treaty of Roeskild signed, March 8. Battle ofthe Dunes, June 14. Dunkirk taken by Turenne, June 17, and delivered over to the English. Leopold I. emperor, July 18. Charles X. renews war with Denmark, August. Aurung- zebe dethrones and succeeds his fatherShah Jehan, August 20. Dcath of Cromwell, September 3. Richard Cromwell named protector. Siege of Copenhagen by Charles X. begun,

September. Surrender of Thorn to the Poles, December 21. Festival of the Sons of the Clergy instituted.

1659. Retirement of Richard Cromwell, May 25. First Conven- tion of the Hague signed, May; second, July; third, August. Peace of the Pyrenees, between France and Spain, concluded, Novem- ber 7. De Ruyter defeats the Swedes near Nyeborg, November 14, and takes Nyeborg.

1660. General Monk occupies London, February 3. king of Sweden, February 18. Peace of Oliva, May 3. of England proclaimed, May 8.

Charles XI.

Charles II. Entry of Charles into London, Treaty of Copenhagen, June 6. Marriage of Louis XIV. The Royal Society of London founded. Episcopacy restored in England. Navigation Act re-enacted. The crown of Denmark made hereditary. Taylor's Ductor Dubitantium Birth of Sir Hans Sloane (died, 1753). Death of St- Vincent de Paul (born, 1577).

1661. Exhumation of the bodies of Cromwell, Bradshaw, and Ireton, January 30. Death of Mazarin, March 9. New charter granted to East India Company, April 8. Savoy Conferences between Episcopalian and Presbyterian divines, April 15 to July 25. Execu- tion of the marquis of Argyll, May 27. Peace of Kardis, between Russia and Sweden, July 1. Treaty between Dutch and Portuguese ean | Brazil, August. Episcopacy restored in Scotland, Dec- ember. The-.Corporation Act passed. Birth of Defoe (died, 1731).

1662. Act of Uniformity passed by English Parliament, May 19. Licensing Act (books). Marriage of Charles II. with Cathcrine of Braganza, May 20. Exccution of Vane, June 14. Duke of Ormond viceroy of Ircland. Nonconformist clergy driven out of the Church by Act of Uniformity, St Bartholomew's day, August 24. Dunkirk sold to Louis XIV., and given up, November. Canal of Languedoc projected by Riquet. Birth of Bentley (died, 1742).

1668. Invasion of Hungary by the Turks, spring. Carolina granted by Charles II. to Clarendon, Monk, and others. The steam-engine suggested by

Marquis of Worcester, in his Century of Inventions. The Academy of Inscriptions, Paris, founded. Guineas first coined in England. Birth of Prince Eugene. First part of Butler's Hudibras published (completed, 1678). Lord Herbcrt's De Religione Gentilium.

1664. Treaty of Pisa between the Pope and France, February 22. Second war between the English and Dutch begins. Battle of St Gotthard,—victory of Montecuculi over the Turks, August 1. Treaty between the emperor and the Porte, August 10. The Conventicle Act passed. The French East India Company established. The Mahratta chief Sivajee attacks Surat. The Binomial Theorem discovered by Newton. Palace of Versailles begun.

1665. England declares war against the Dutch, February 22. Battle of Solebay, June 3. Battle of Villaviciosa, June 17. Charles II. king of Spain. The Great Plague in London. The Five-Mile Act passed. The London Gazette established. John Sobieski grand marshal of Poland.

1666. Louis XIV. declares war on England, January 16. Sea- fight between English and Dutch in the Downs, June 1-4. The Dutch defeated off the North Foreland, July 25. Great Fire of London, September 2-6. The Covenanters defeated at the Pentland Hills, November 28. Academy of Sciences, Paris, founded.

1667. Louis XIV. invades the Spanish Netherlands, May. De Ruyter sails up the Thanies, June-July. Clement IX. pope, June 20. Peace of Breda, end of second Dutch war, July 21. Clarendon dismissed by Charles II., August 30. The ''Cabal" ministry formed, September. Impeachment of Clarendon by the Commons, Novem- ber. Paradise Lost published. Morland's calculating machiue invented. Birth of Swift (died, 1745).

1668. Secret treaty between Louis XIV. and the emperor con cluded, January. The Triple Alliance between England and the Netherlands, afterwards joined by Sweden, against France, January 28, April 25. Peace between Spain and Portugal, February 18. Conquest of Franche Comté by Louis XIV., February. Peace of Aix-la-Chapelle, May 2. Charles II. obtains pension from Louis XIV. Island of Bombay granted by Charles II. to East India Company. Birth of Boerhaave (died, 1738).

1669. Eruption of Etna, March. Candia surrendered to the Turks, September 16. Locke draws up constitution for Carolina. Phos- phorus discovered by Brandt. Reflecting telescope constructed by Newton. Death of Rembrandt (born, 1606).

1670. Clement X. pope, April 29. Scizure of Lorraine by Louis, September. Second Conventicle Act passed. Hudson's Bay Ccm-

pany incorporated. Treaty between France and England, respecting Holland, December 31. Walton's Lives published. Spener begins to hold his Collegia Pietatis (origin of Pietism). Spinoza's T'ract- atus theologico-politicus published.

1671. The island of St Thomas taken possession of by the Danes. Treaty of alliance between Spain and the Dutch concluded, Decem- ber. Paradise Regained and Samson Agonistes published.

1672. Public treaty between France and England, February 12. Deelaration of Indulgence to Nonconformists issued by Charles IT., March 15. England and France declare war on the Dutch, March— April. Treaty of Stockholm between France and Sweden, April. Conquest of Holland by Louis XIV., May-June. Battle of South- wold Bay, May 28. The office of stadtholder restored ; William of Orange appointed, July 8. Massacre of the brothers De Witt, at the Hague, August 20. Birth of Addison (died, 1719). Birth of Muratori (died, 1750).

1673. The Declaration of Indulgence withdrawn, May 8. Treaty of peace between France and elector of Brandenburg, June 16. Maestricht taken by Louis, June 30. Alliance of the Dutch with the emperor and the king of Spain, August 30. Treves taken by Vauban, September 8. Bonn taken by William of Orange, Novem- ber 4-12. The French evacuate Holland, winter. John Sobieski defeats the Turks, November 10. Test Act passed.

1674. Peace between England and Holland, February 9. John Sobieski king of Poland, May 21. Reconquest of Franche Comté by Louis XIV., May-June. The Emperor Leopold declares war on France, June. The Palatinate

ravaged by the French, June. Revolt at Messina, summer. Condé defeats the prince of Orange at Senef, August 11. Turenne defeats Imperialists at Entzheim, October 4. First French settlement in the Kast Indies (Pondicherry). Birth of Isaac Watts (died, 1748),

1675. Battle of Tiirkheim, Turenne drives Imperialists out of Alsace, January 5. Invasion of Brandenburg by Swedes, spring. The elector defeats the Swedes at Fehrbellin, June 28. Conferences of Nimeguen open, July. Turenne killed at Sassbach, July 27. Velocity of light discovered by Roemer. St Paul's Cathedral begun by Wren (completed, 1710). Greenwich Observatory founded. Flamsteed astronomer royal (died, 1719), Spiritual Guide of Migucl Molinos published.

1676. Feodor II. (or III.) czar of Russia, February 8. Secret treaty between Louis and Charles IJ. for annual pension signed, February 17. Death of De Ruyter at Syracuse, April 29. Maestricht invested by prince of Orange, July 8; the siege raised, August 27. Innocent XI. pope, September 21. Differential thermometer invented by Sturm. Birth of Sir Robert Walpole (died, 1745). Barclay's Apology for the True Christian Divinity published.

1677. The French defeat the prince of Orange at Cassel, April 11. Marriage of the prince with Mary, daughter of James, duke of York. November 4. The Society of Sons of the Clergy incorporated. Spinoza's Lthica published,

1678. Treaty of alliance between Charles II. and the Dutch, January 26. Another secret treaty between Charles and Louis signed, May 17. Peace of Nimeguen, between France and Holland, August 10. Accession of Spain, September 17, Invention of Popish Plot by Titus Oates, August 18. First war between Russia and Turkey begins (lasts till 1682). Revolt of Hungarians under Count Tekeli. Polarization of light observed by Huyghens. First part of Bunyan's Pilgrim's Progress published (second, 1684). Birth of Lord Bolingbroke (died, 1751).

1679. Charles II. dissolves the parliament, January 24. between France and the emperor, February 5. Assassination of Archbishop Sharp of St Andrews, May 3. Duke of Monmouth defeats the Covenanters at Bothwell Bridge, June 22. Treaty of St Germain-en-Laye, between France, Sweden, and the elector of Brandenburg, June 29. Treaty of Fontainebleau between France

and Denmark, September 2. Treaty of Lunden between Denmark and Sweden, September 26. Habeas Corpus Act passed, The terms “Whig” and ‘‘Tory” come into use. Death of Cardinal de Retz (born, 1614). zs,

1680. Execution of Lord Stafford, December 29, The Swedish crown made absolute. A great comet excites alarm in Europe.

1681. Pennsylvania granted to William Penn, March 4. Stras- burg seized by Louis XIV., September 30. Shaftesbury imprisoned on a charge of treason, July-November. Bossuet’s Discours sur U’ Histoire Universelle published. Dryden’s Absalom and Achitophetl published (1681-2). Birth of Young the poet (died, 1765).

1632. Ivan V. and Peter I. (the Great) joint’ sovereigns of Russia, June 25. Bombardment of Algiers by the French, August and September. Chelsea Hospital founded.

1683. Death of Shaftesbury, January 21. Alliance of Warsaw between the emperor and the king of Poland, March 31. London deprived of its charters by Charles II., June 12. The Ryehouse plot discovered, June. Vienna besieged by the Turks under Kara Mus- tapha, July 14. Execution of Lord William Russell, J uly 21. John Sobieski defeats the Turks and relieves Vienna, September 12. The French invade the Netherlands and take Courtray and Dixmuyde, November. Execution of Algernon Sidney, December 7. Execution

Peace

. Ireland, March. Louis declares war on Spain, April 15.

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of Kara Mustapha, December 25. The great frost of thirteen weeks in England. Birth of Conyers Middleton (died, 1750).

1684. Oudenarde bombarded by the French, March. Genoa bom- barded by the French, May. Luxembourg taken by Marshal Créqui, June 4. The Holy League against the Turks formed. Persecution of Huguenots; the

dragonnades ordered by Louvois. Truce of Ratisbon, August 15. Siamese embassy received by Louis. Differen- tial calculus invented by Leibnitz. Birth of Berkeley (died, 1753).

1685. James II. king of. England, February 6. Graham of Claverhouse persecutes the Covenanters, spring. Insurrection of Argyll in Scotland, May. The doge of Genoa submits to Louis, at Paris, May 15. Insurrection of the duke of Monmouth, June. Trial and imprisonment of Baxter, June. [Earl of Argyll executed, June 30. Battle of Sedgemoor, July 6. Monmouth beheaded, July 15. The “Bloody Assizes” of Judge Jeffreys, August and Septem- ber. Campaign of Imperialists against Turks in Hungary. Revo- cation of Edict of Nantes, October 22. Molinos, founder of the Quietists, arrested, and his Spiritual Guide condemned by the Inqui- sition, Birth of Handel (died, 1759).

1686. James II. dispenses with the Test Act. League of Augs- burg against France, July 9. Mass publicly celebrated at Oxford, August. Capture of Buda by Imperialists, September 2. Conquests of Venetians in the Morea. School of Saint-Cyr founded. Death of Maimbourg (born, 1620).

1687. Tyrconnel lord deputy of Ireland, January. Declarations of Indulgence by James II., February and April. Reception of papal nuncio by James, July 8, Battle of Mohacz, August 12. Athens surrendered to Venetians, September 29. The kingdom of Hungary made hereditary in house of Austria,October. Soliman III. sultan, November9. Mazeppa hetman of the Cossacks. Newton’s Principia published. La Bruytre’s Caractéres. Dryden’s The Hind and the Panther,

1688. Declaration of Indulgence by James II., April 25. Trial of the seven bishops, June. Belgrade taken by the Imperialists, September 6. Louis declares war on the empire,’ September 24. Avignon seized by the French, October. The pope excommunicates the parliament of Paris. Landing of William, prince of Orange, at Torbay, November 5. Louis declares war on the N etherlands, Nov- ember 26, The English Revolution. Flight of James II., Decem- ber 11. Birth of Pope (died, 1744). Birth.of Nadir Shah. Bossuet’s Histoire des Variations des Kglises Protestantes published.

1689. Meeting of Convention Parliament, January 22. The emperor declares war on France, January 24. Declaration of Right accepted, and William and Mary declared king and queen of Eng- and, February 13; of Scotland, April 11. Landing of James II. in Episco- pacy abolished in Scotland, April. First Mutiny Act passed, ions. Siege of Londonderry by James, April 20; the town relieved, J uly 30, Alliance of the emperor with Dutch Republic, May 12 (the "Grand Alliance," joined by William III., December 30, and by Spain, June 6, 1690). William declares war on France, May 17. Toleration Act passed, May 24. Louis declares war on England, June 25. Battle of Killiekrankie, death of Dundee, July27. Alex- ander VIII. pope, October 6. Bill of Rights passed, November 2. Resignation of Ivan, Peter I. czar alone. Fort St David, Madras, built. Birth of Richardson, the novelist (died, 1761). Birth of Montesquieu (died, 1755). Transit instrument invented by Roemer. Pompeii discovered.

1690. Sea-fight off Beachy Head,—defeat of English and Dutch fleet by the French, June 30. Battle of the Boyne, July 1. Battle of Fleurus, July 1. Limerick besieged by William IIL, August 8- 30. Savoy joins the Grand Alliance, October 20. Locke's Essay concerning Human Understanding published. Death of Robert Barclay (born 1648).

1691. Nonjuring bishops deprived of their sees, February 1. Ahmed II. sultan, June, Innocent XII. pope, July 12. Battle of Aghrim, July 12, Death of Louvois, July 16. Battle of Salankemen, Mustapha Képrili defeated and killed, August 19. Siege of Limerick by General Ginkell formed, August 25. Capitula- tion and treaty of Limerick, October 3.

1692, Marlborough dismissed, January 10. Massacre of Glencoe, February 13. Battle of La Hogue, May 19. Namur taken by Louis, June 5, Battle of Steinkirk, August 3. Birth of Bishop Butler (died, 1752). a

1693, Sea-fight off Cape St Vincent, English under Rooke de- feated by Admiral Tourville, June 29. Battle of Neerwinden (or Landen), July 19. Pondicherry taken by the Dutch, September 5. The Palatinate overrun by the French. Catinat defeats duke of Savoy at Marsaglia, October 4. St Malo bombarded by the English, November 29. Quesnel's Réflexions Morales published.

1694. Bombardment of Dieppe and Havre by the English, July ; of Dunkirk and Calais, September. Death of Archbishop Tillotson, November 22. Death of Queen Mary, December 28. The Triennial Act passed. The Bank of England incorporated. The Dictionnaire del Académie Frangaise published. Birth of Voltaire (died, 1778.) University of Halle founded.

1695. Death of Marshal Luxembourg, January 4. Mustapha II.

1696-1715.]

sultan, January 27. Feénelon archbishop of Cambray, February. Bombardment of Brussels by Marshal Villcroi, August. Namur taken by William III., August 4; the citadel, September 1. Severe laws against Roman Catholics passed by Irish parliament, autumn. Censorship of the press in England ceases. Imprison- ment of Madame Guyon. Death of Pierre Nicole (born, 1625).

1696. Assassination plot against William III., February 15. Calais bombarded by Benbow, March. Death of John Sobieski, June 17. Azoff taken by Czar Peter, July 28. Treaty of peace between France and Savoy, August 29. Bayle's Dictionnaire his- torique et critique published. Greenwich Hospital begun by Wren (finished, 1705). -Asiento treaty between Spain and Portugal. Birth of Marshal Saxe.

1697. Charles XII. king of Sweden, April 16. Barcelona besieged by the French; taken, August 10. Battle of Zenta, victory of Prince Eugene over the Turks, September 11. Peace of Ryswick, Septem- ber 20. Czar Peterin England. St Paul's Cathedral opened, De- cember 2. Dryden's translation of the Mneid published,

1698. First " Partition Treaty" between France, England, and Holland, for partition of Spanish dominions on the death of Charles II., October 11. Fort William, Calcutta, built. Darien Company incorporated. Society for Promoting Christian Know- ledge and Society for Propagation of the Gospel in Foreign Parts founded. French settlement on the Mississippi, Birth of Meta- stasio (died, 1782). Birth of Bishop Warburton (died, 1779).

1699. Peace of Carlowitz, between the Porte and the emperor, the king of Poland, and the republic of Venice, concluded, January 26. Death of the elector of Bavaria, February. Frederick IV. king of Denmark, August 25. Treaty of alliance between Ozar Peter and

Augustus II. of Poland against Sweden, November 21. Dampier's expedition of discovery in the South Seas, 1699-1701. Fénelon's Aventures de Télémaque published.

1700. Second Partition Treaty signed, March 18. Siege of

Copenhagen by Charles XII., August. Peace of 'Travendahl, August 18. Czar Peter declares war on Sweden, September 1, Charles IJ. of Spain appoints the duke of Anjou his successor, October 2. Philip V. (duke of Anjou), the first Bonrbon king of Spain, proclaimed at Fontainebleau, November 16; at Madrid, November 24. Treaty of the Crown between the emperor and the elector of Brandenburg, November 16. Clement XI. pope, Novem- ber 23. Battle of Narva, November 30. Birth of James Thomson, (died, 1748). Birth of Zinzendorf (died 1760).

1701. Frederick III., elector of Brandenburg, king of Prussia, January 18. Order of the Black Eagle founded, January. Mazrl- borough commander-in-chief in Holland, June 1. War of the Spanish succession begins, summer. Second Grand Alliance formed between the emperor, William III., and the Dutch Republie, September 7. Death of James II., September 16; his son recog- nised as king of England by Louis XIV. Courland occupied by Charles XII. Birth of Boscowich (died, 1787).

1702. Act of Settlement (Hanoverian succession) passed, February. William III. died; Anne queen of Great Britain, March 8. England declares war against France and Spain, May 4. Warsaw taken by Charles XII., May 24. Insurrection of the Camisards in the Cevennes, summer, Charles XII. defeats the Poles at Clissow, July 20, andenters Cracow. Cadiz attacked by English and Dutch, August. Spanish fleet at Vigo, destroyed by allies, October 12. Battle of Friedlingen, October 14. Ligge taken by Marlborough, October 23. Clarendon's History of the Grand Rebellion published, Birth of Philip Doddridge (died, 1751).

1703. Ratisbon seized by elector of Bavaria, March. Battle of Pultusk, May 1. The Methuen treaty concluded, May 6. Bonn taken by Marlborough, May 15, Archduke Charles takes title of king of Spain, September 12. Ahmed III. sultan, September, Battle of Hochst4dt, September 20. Surrender of Thorn to Charles XII., October 15. The ‘‘Great Storm” in England, November 26- December 1. St Petersburg founded. Queen Anne’s Bounty established. Order of the Thistle revived. Death of Samuel Pepys (born, 1682), Birth of Jonathan Edwards (died, 1758). Birth of John Wesley (died, 1791).

1704. Fredcrick Augustus of Poland deposed, February ; Stanis- las Leczinski elected king, July. Dorpat taken by Czar Peter, July 18. Gibraltar taken by Admiral Rooke, July 24. Narva taken by Czar Peter, August 9. Battle of Blenheim (or Hochstadt), August 18. Newton’s Optics published. Swift’s Tale of a Tub.

1705. Invasion of Courland by Czar Peter, February, Siege of Gibraltar by French and Spaniards raised, and French squadron destroyed by Admiral Leake, March, Joseph I, emperor, May 5. Expedition of earl of Peterborough and Sir Cloudesley Shovel to Spain, May. Battle of Cassano, August 16. Barcelona invested by English, August ; surrenders, October 4. Invasion of Silesia by Charles XII., September 1. Mittau taken by Peter, September. Peace between Sweden and Poland, November 18. Newcomen’s steam-engine patented. Composition of light discovered by Newton. Death of Spener (born, 1635). Birth of Abraham Tucker (died, 1774).

1706. Battle of Fraustadt, February 138. Turin invested by the

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French, May. Marlborough gains possession of Brabant, May- October. Battle of Ramillies, May 12. Madrid entered by English and Portuguese, June 24. Philip recovers Madrid, August 5. Eugene defeats the French before Turin, and raises the siege, Sep- tember 7. Invasion of Saxony by Charles XII., September 16. Peace of Altranstadt, between Charles XII. and Frederick Augus-

tus, who renounces the throue of Poland, September 24. Milan entered by English and duke of Savoy, September 24. Birth of Franklin (died, 1790). Death of Bayle (born, 1647). Tindal's

Rights of the Christian Church Asserted published (burnt by order of House of Commons, 1710).

1707. Act of Union passed by Scots parliament, January 16; by Euglish parliament, March 6 ; comes into operation, May 1. Death of Aurungzebe, February 21. Battle of Almanza, April 14. Invasion of France by Eugene and the duke of Savoy, June 30. Toulon attacked by the allies, July 17. National flag of Great Britain appointed, July. Invasion of Russia by Charles XII., September. The kingdom of Naples subjugated by Imperialists, September 30. Execution of Patkul, October10. First parliament of Great Britain meets, October 23. Capture of Lerida by the French, November 11. Calcutta made the scat ofa presidency. Academy of Sciences, Berlin, founded. Watts's Hymns published. Birth of Linneus (died, 1778). Birth of Buffon (died, 1788). Birth of Fielding (died, 1754). Birth of Euler (died, 1783).

1708, Attempted descent on Scotland by the Pretender James, March. Suspension of Habeas Corpus Act, March-Octobcr. Ghent and Bruges surrender to the French, July, _ Battle of Oudenarde, July 11, Sardinia surrenders to Sir John Leake, August. Peter defeats the Swedes at Liesna, September 28. Death of Prince George of Denmark, October 28. Lille taken by the allies, Octo- ber; the citadel surrenders, December. Birth of Haller (died, 1777). Birth of Chatham (died, 1778),

1709. Alliance against Charles XIJ., June-October. Tournay taken by Marlborough and Eugene, June 30. Battle of Pultowa, —the power of Sweden broken, July 8, Charles XII. retires to Bender. Frederick Augustus restored to throne of Poland, July. Battle of Malplaquet, September 11. Siege of Mons by the allies, September 25; surrender, October 20. First Barrier Treaty be- tween Great Britain and States-General of Holland, October 29. Birth of Johnson (died, 1784).

1710. Port Royal buildings demolished by decree of Louis XIV., January. Trial of Dr Sacheverell, February-March. The Danes driven out of Sweden

by Stenbock, March 10, Conferences of Gertruydenberg open, March; close, July. Douay takeu by the allies, June 26. Battle of Saragossa, August 20. Charles III. enters Madrid, September 28. ‘The sultan declares war on the czar, November. Philip V. restored, December. Conquest of Carelia and Livonia. The South Sea Company founded. Berkeley’s Principles of Human Knowledge published. Leibnitz’s Théodicée. Matthew Henry’s Exposition of the Old and New Testaments. Birth of Thomas Reid (died, 1796), Birth of Pergolesi (died,

1736).

1711. Peter declares war against Turkey, January 25. Girona taken by the French, January 31. Death of the dauphin, April 14. Death of the Emperor Joseph, April 18, English expedition against Canada, May to October, Harley Lord High Treasurer, May. Peter compelled to make peace with the Turks, July 21. Marlborough takes Bouchain, August. Charles III. quits Spain, September, and is elected emperor (Charles VI,), October 12. Marlborough deprived of all his offices, December. The Spectator published (1711-1712 and 1714). Birth of Hume (died, 1776). Birth of Kaunitz (died, 1794).

1712. The Duke of Ormond appointed commander-in-chief of British forces, January 1. Conferences for peace opencd at Utrecht, January 29. Quesnoy taken by Eugene, July 4. Suspension of arms between Englgnd and France, July 17, Siege of Landrecies by Imperialists; raised by the French, August 21. Philip V. renounccs his claim to crown of France, November, Birth of J. J Rousseau (died, 1778).

1713. Altona burnt by General Stenbock, January 9. Sccond Barrier Treaty, January 30. Frederick William I. king of Prussia, February 25. The peace of Utrecht, March 31. Pragmatic Sanc- tion published by the emperor, April 13. Stenbock surrenders to the allies, May 16, Clarendon Press, Oxford, established. Hercu- laneum discovered. Birth of Diderot (died, 1784). Birth of Sterne (died, 1768), Birth of Lacaille (died, 1762).

1714. Peace of Rastadt between France and the cmperor, March 6, George I. king of England, August 1. Marriage of Philip V. with Elizabeth Farnese, September 16. Escape of Charles XII. to Sweden, November. Birth of Vattel

(died, 1767). Birth of Whitefield. (died, 1770). Imperial Library, St Peters- burg, founded.

1715. War renewed between Sweden and Prussia, April. Im- peachment of Bolingbroke, Oxford, and Ormond, June. The Riot Act passed, July 20. Louis XV. king of France, September 1. The regency seized by duke of Orleans. Jacobite Rebellion, James III. proclaimed by earl of Mar at Braemar, September 6. Ministry

of Walpole, from October 10. Battle of Sheriffmuir (Dunblane), November 18. Battle of Preston, November 12-13. Third Barrier Treaty between the emperor, Great Britain, and the States-General of Holland, November 15. The Morea reconquered by Turks. Treaty of commerce between Great Britain and Spain, December 15. Siege of Stralsund begun, October ; it surrenders to the Prussians, December 22. Gil Blas published. Pope's Homer's Iliad (1715- 1720). Birth of Condillac (died, 1780).

1716. Alliance between Great Britain and Holland, February 17. Execution of the Earl of Derwentwater and Lord Kenmure, February 24, Charles XII. invades Norway, March. Surrender of Wismar to Prussians, April 19. The Mississippi Scheme projected by Law, May. The Septennial Act passed, May 7. Alliance between Great Britain and the emperor, May 25. Turks defeated by Eugene at Peterwardein, August 5. The Perpetual Peace pro- claimed at Warsaw, November 8. Sinking fund for extinction of national debt established. Birth of Garrick (died, 1779). Birth of Thomas Gray (died, 1771). ,

1717. Triple Alliance between France, England, and Holland, January 4. Dismissal of Walpole, April 10. Visit of Czar Peter to Paris, May. Treaty of Amsterdam between France, Russia, and Prussia, August 4. Turks defeated by Eugene at Belgrade, August 16. Sardinia invaded by Spaniards, August- October. Eruption of Vesuvius, described by Berkeley. Birth of Horace Walpole (died, 1797). Birth of D'Alembert (died, 1783).

1718. Invasion of Sicily by Spaniards, July1. Peace of Passaro- wicz, July 21. Byng's expedition to the Mediterranean, summer. The Quadruple

Alliance between Great Britain, France, and the emperor, joined by Holland, August 2. Siege of Fredrikshall by Charles XII., November. Death of Charles, December11. England declares war on Spain, December 27.

1719. Retreat of Swedes from Norway, January. France declares war against Spain, January 10. Execution of Baron Gortz, March 13. Capitulation of Fontarabia to Marshal Berwick, June 18. Capitulation of St Sebastian, August 19. Capture of Vigo by the English, October 21. Treaty of Stockholm between Great Britain and Sweden, November 20. Dismissal of Cardinal Alberoni, December 5. Robinson Crusoe published. Montfaucon's Antiquité Expliqueé. Watts's Psabms of David.

1720. Accession of Spain to the Quadruple Alliance, January 25. Duke of Savoy becomes king of Sardinia. Treaty between Denmark and Sweden, June 12. Failure of the Mississippi Scheme, July, Break-up of the South Sea Scheme, autumn. Birth of Charles Edward Stuart, December 31. Birth of William Collins (died,

1756).

7a. Second administration of Sir Robert Walpole begins, April 4. Innocent XIII. pope, May 8. Treaty of Nystadt, between Sweden and Russia, September 10; cession of Livonia and Ingria to Russia. Peter I. emperor of all the Russias, Novem- ber. The see of Vienna made an archbishopric. Birth of Aken- side (died, 1770). Birth of Robertson, historian (died, 1793). Birth of Smollett (died, 1771).

1722. Jacobite plot in England, May. Suspension of Habeas Corpus Act, October. Bishop Atterbury sent to the Tower, August. Invasion of Persia by Peter, summer. Conquest of Persia by the Ghiljeis completed, October. Coronation of Louis XV., October 25. Moravian settlement at Herrnhut founded by Count von Zinzendorf.

1723. Buda burnt, March 28. Death of Cardinal Dubois, August 10. Death of Regent Orléans, December 2. War between Turkey and Persia. Treaty between Peter I. and Prince Thomas for cession of several provinces. Academy of Sciences of St Petersburg founded. Birth of Sir Joshua

Reynolds (died, 1792). Birth of Adam Smith (died, 1790). Birth of Blackstone (died, 1780).

1724. Abdication of Philip V. in favour of his son Dou Louis, January 8. Coronation of Catherine, empress of Russia, May 7. Benedict XIII. pope, May 29. Treaty of peace between Russia and Turkey, July 8. Ondeath of Don Louis, Philip resumes the crown, September 6. Eruption of Hecla. Voltaire's Henriade published. Rapin's Histoire d' Angleterre. Swift's Drapier's Letters. W ollaston's Religion of Nature Delineated. Fahrenheit's thermometer invented. Birth of Kant (died, 1804).

1725. Death of Peter the Great, February 8. Congress of Cambray breaks up, April. Treaty of Vienna between the emperor and Philip V. signed, April 30. The Hanover treaty between England, France, and Prussia against the Vienna treaty, September 3. Marriage of Louis with Maria Leczinski, September 5. 'Order of St Alexander Newsky founded. Vico's Scienza Nuova published. Flamsteed's Historia Celestis Britannica. Pope's Homer's Odyssey. Birth of Clive (died, 1774). Birth of Semler (died, 1794).

1726. Alliance between Russia and the empire, August 6. Earth- quake at Palermo, August 26. Travels of Gulliver published. Thomson's Seasons (1726-1730). Birth of John Howard (died,

1790). Birth of Christian Friedrich Schwarz (died, 1798). Death of Kneller (born, 1648). 1727. Siege of Gibraltar by Spaniards, February. Peter II.

emperor of Russia, May 27.

Preliminaries of general peace signed at Paris, May 31. 3 7 –

George II. king of England, July 10. Gay's

CHRONOLVET

[1716-1739.

Beggar's Opera produced. Aberration of light discovered by Brad- ley. First part of Lardner's Credibility of the Gospel History pub- lished (completed,

1757). Birth of Gainsborough (died, 1788).

1728. Congress of Soissons, June 14. Behring's Strait discovered. Rise of Methodism. Birth of Goldsmith (died, 1774). Birth of John Hunter (died, 1793). Birth of Joseph Black (died, 1799). Sect of Glassites (Sandemanians) founded. The Duwnciad published.

1729. Revolt of Corsica against the Genoese. Peace of Scville, between Great Britain, France, and Spain, November 9. Accession of Holland, November 21. Birth of Lessing (died 1781). Death of Samuel Clarke (born, 1675). Death of Sir Richard Steele (born,

1671).

1730, Ashraf of Persia defeated and killed by Kouli Khan (Nadir Shah), January ; Tamasp restored. Anne empress of Russia, January 30. Clement XII. pope, July 12. Earthquake in China, September 30. Christian VI. king of Denmark, October 13. Mahmoud I. sultan, October 16. Birth of Burke (died, 1797). Birth of Josiah Wedgwood (cied, 1795). Birth of Suwaroff (died, 1800). Tindal's Christianity as Old as the Creation published. Calmet's Dictionnaire historique et critique de la Bible.

1731. Second Treaty of Vienna, March 16. Accession of Spain, July 22. Kouli Khan defcats Turks at Hamadan. The English language ordered to be used in all courts of justice. Voltaire's Lettres philosophiques published (condemned to be burnt, 1734). Birth of Cowper (died, 1800). Birth of Churchill (died, 1764). Birth of Henry Cavendish (died, 1810).

1732. Treaty between Empress Anne and Kouli Khan, January. Pragmatic sanction guaranteed by Diet of the empire, January 11. Oran retaken by Spaniards, July. Deposition of Shah Tamasp by Kouli Khan, August. Berkeley's Afinute Philosopher published. Birth of Necker (died, 1804). Birth of Lalande (died, 1807). Birth of Washington. Birth of Warren Hastings. Birth of Haydn (died, 1809).

1733. Death of Frederick Augustus HI. of Poland, February 1 ; Stanislas proclaimed king, September 12, supported by France and Spain ; Frederick Augustus, elector of Saxony, elected, October 5, supported by the emperor,

and by Russia. Louis XV. declares war against the emperor, October 10. Capture of Kehl by Marshal Berwick, October 19. Treaty of alliance between France, Spain and Sardinia, October 25. Stanislas takes refuge at Dantzic. Family compact between Philip V. and Louis XV., November. Conquest of the Milanese by the French, November-J anuary, 1734. Pope's Essay on Man published. Birth of Bishop Horsley (died, 1806). Birth of Priestley (died, 1804).

1734. Siege of Dantzic by Russians, March ; surrendered, July 9. Treves taken by the French, May 8. Invasion of Naples by Spaniards, May. Battle of Bitonto,—defeat, of Imperialists, May 25. Marshal Berwick killed before Philippsburg, June 12. Death of Marshal Villars, June 17. Imperialists defeated at Parma, June 29. Surrender of Philippsburg to French, July 18. Battle of Guas- talla,—Imperialists deentad, September 19. Conquest of N aples completed, November 24. Birth of Romney (died, 1802). Birth of Mesmer (died, 1815).

1735. Don Carlos*crowned king of the Two Sicilies (Charles III.), July 3. Preliminaries of peace between France and the emperor signed at Vienna, October 38. The Systema Nature of Linneus published. Expedition of French savants to Peru to measure a degree of the meridian (they return in 1748).

1736. Abdication of Stanislas, January 27. Marriage of Maria Theresa of Austria with Francis of Lorraine, February 12. Kouli Khan proclaimed king of Persia (Nadir Shah), February 26. Porteous riots at Edinburgh, April 14 and September 7. Spain accedes to treaty of peace, April15. War between Russia and Turkey renewed,

April. Death of Prince Eugene, April 27. Azoff taken by the Rus- sians, July 1. Treaty of peace between Nadir Shah and the Porte, July. Tuscany occupied by the Imperialists, December. Steam-

vessel patenteed by Hulls. Butler's Analogy published. Birth of Horne Tooke (died, 1812). Birth of Prince Potemkin (died, 1791). Birth of Lagrange (died, 1813). Birth of James Watt (died,

1819).

1737. The emperor makes war on Turkey, July. Oczakoff taken by Russians, July. Death of Queen Caroline of England, Decem- ber 1. University of Gottingen opened. Whiston's Josephus pub- lished. Birth of Gibbon (died, 1794). Birth of Charles Hutton (died, 1823). Birth of Galvani (died, 1798). $788. Candahar taken by Nadir Shah, March. Russian invasion of the Crimea renewed. Orsova taken by Turks, August 9. Alliance between France and Sweden, November 10. Treaty of Vienna between France and the emperor; cession of Lorraine to France, November 18. Nadir Shah declares war on the Great Mogul, and seizes Ghazni, Cabul, and Peshawur. Handel's Jsrael in Egypt produced. Birth of William Herschel (died, 1822). Birth of Benjamin West (died, 1820). Hume's Yrcatise of Human Nature published. Warburton's Divine Legation of Moses (1738- 1741). Rollin's Histoire Ancicnne, completed. Solar microscope invented by Lieberkiihn.

1739. The Great Mogul defeated and captured by Nadir Shah.

1740-1756.]

February 9. made tributary, April.

Delhi entered, March 8. The Mogul restored and Subsidy treaty betwecn Great Britain and Denmark, March 25. Siege of Belgrade by Turks. Capture of Choczim by Russians, August 29. Capture of Jassy, September 14. Peace of Belgrade between the emperor and the Porte, September 18. England declares war against Spain, October 30. Peace be- tween Russia and the Porte, November. Porto Bello taken by Admiral Vernon, November 22. Birth of Dumouriez (died, 1823). Foundling Hospital, London, established by Thomas Coram. Whitefield begins open-air preaching.

1740, Frederick II., the Great, king of Prussia, May 31. Belgrade restored to Turkey, June. Benedict XIV. pope, August 17. Death of the Emperor Charles VI. October 20. Under the Pragmatic sanction his daughter Maria Theresa, succeeds as queen of Hungary and Bohemia ; opposed by elector of Bavaria. Ivan VI. emperor of Russia, October 29. Invasion of Bokhara and Kharismia by Nadir Shah. Frederick II. invades Silesia, December 16. Birth of Boswell (died, 1795).

1741. Battle of Mollwitz, victory of Frederick II. over Austrians, April 10. Cartagena attacked by Admiral Vernon, April27. Treaty of Nymphenburg between Spain and Bavaria, May. Alliance between George II. and Maria Theresa, June 24. Coronation of Maria Theresa as queen of Hungary, June 25. Elector of Bavaria invades Austrian dominions, end of June. Sweden declares war on Russia, July 24. Frederick II. takes Breslau, August 10. Lower Austria seized by elector of Bavaria, October. Capture of Neiss by Prussians, October 31. Capture of Prague by Bavarians and allies, November 26. Revolution in Russia; Ivan VI. deposed, December 6 ; Elizabeth Petrowna proclaimed empress, December 7. Spanish troops sent to Italy, December. Stockholm Academy of Sciences, founded. Middleton's Life of Ciccro published. Birth of Lavater (died, 1801). Death of Rollin (born, 1661).

1742. Elector of Bavaria chosen emperor, as Charles VII., January 24. Fall of Walpole, February 1. Munich taken posses- sion of by Austrians, February 13. Frederick II. invades Moravia and Bohemia, March—April. France declares war against the queen of Hungary, England, and Holland, July 3. Treaty of peace at Berlin, July 28. Capitulation of Swedish army to Russians, Sep- tember 4, Alliance between Great Britain, Prussia, and Holland (Treaty of Westminster), November. Treaty of Moscow, between Great Britain and Russia, December 11. Retreat of French under Belle-Isle from Prague to Egra, December 16-26. Handcl's Messiah produced. Young's Night Thoughts (1742-1746). Fielding's Joseph Andrews. Robins's New Principles of Gunnery. Hume's Essays (1742-1752). Centigrade thermometer inventcd by Celsius. Birth of Bliicher (died, 1819).

1748. Death of Cardinal Fleury, January 29. Munich again taken by Austrians, June 12. Battle of Dettingen, June 27. Treaty of Abo, between Russia and Sweden, August 17. Broad Bottom administration formed by Pelham, August. Ingolstadt taken by Austrians, September 12. Treaty of Worms, between Great Britain, the queen of Hungary, and the king of Sardinia, September 23. Secret treaty (second ''Family Compact") between France and Spain, October 25. War between Nadir Shah and the Turks. Mosul besieged, October. Academy of Sciences, Copenhagen, and University of Erlangen, founded. Birth of Lavoisier (died, 1794). Birth of

Paley (died, 1805). Birth of Condorcet (died, 1794). Birth of Jefferson (died, 1826).

1744. Unsuccessful attempt of Charles Edward to make a descent on England, February. Sea-fight between English and French and Spanish fleets off Toulon, February 22. Louis XV. declares war against England, March 15; against queen of Hungary, April 26. Louis invades Flanders, May. Union of Frankfort, between the em- peror, the king of Prussia, the elector Palatine, and the king of Sweden, May 22. Secret treaty beween Frederick II. and France, June 5. Frederick II. invades Bohemia, (second Silesian .war), August. Capture of Prague by Frederick, September 16. Capture of Munich by the French, October 16. Praguc evacuated by Prussians, November 26. Anson's voyage round the world com- pleted, June. Great eruption of Cotopaxi. First Wesleyan Con- ference held. Akenside's Pleasures of Imaginasion published. Euler's Theorta Motuum. Birth of Marat. Birth of Herder (died, 1803).

1745. Treaty of Warsaw, between the elector of Saxony, Great Britain, the queen of Hungary, and States-General, January 8. Death of Charles VII., January 20. Peace of Fuessen, between the elector of Bavaria and queen of Hungary, April 22. Treaty between France, Spain, Naples, and the Genoese, May 7. Battle of Fontenoy, May 11. Capture of Cape Breton by the English, June 26. Jacobite rebellion ; Charles Edward lands in Scotland, July 23. Secret treaty between Great Britain and Prussia, August 26. Francis I., grand duke of Tuscany, elected emperor, September 13. James VIII. proclaimed at Edinburgh, September 17. Battle of Prestonpans, September 21. Carlisle taken by the Pretender, November 15. Frederick II. invades Saxony, November. Derby reached by the Pretender, December 4. Surrender of Dresden to Frederick II., December 18. Milan entered by the Spaniards,

December 19. Charles Edward retreats to Scotland, December 20. Frederick concludes treaties of Dresden with Saxony and Austria, December 25. Swedenborg's De Cultu et Amore Dei published. Wahhab begins to propagate his doctrines. Birth of Volta (died,

1826).

1746. Battle of Falkirk, January 17. Brussels taken by Marshal Saxe, February 20. Battle of Culloden, April 16; end of the re- bellion. Antwerp taken by Marshal Saxe, May 19. Ferdinand VI. king of Spain, July 9. Frederick Y. king of Denmark, August 6. Execution of Lords Balmerino and Kilmarnock, August 18. Genoa bombarded by English fleet, surrenders to Austrians, September 6. The French and Spaniards driven out of Italy, September. Madras capitulates to the French, September 19. Namur taken by the French, September 19. Earthquake at Lima, October 28. Aus- trians driven from Genoa, December 10. Frederician Code published. Handel's Judas Maccabeus produced. Hervey's Meditations. Birth of Sir William Jones (died, 1794). Birth of Pestalozzi (died, 1846.)

1747. Lord Lovat beheaded, April 9. Invasion of Brabant by the French, April. William of Nassau appointed stadtholder of the Netherlands, May 4. Admiral Anson defeats French fleet off Finisterre, May 14. Commodore Fox captures French West India fleet, June 16. Nadir Shah assassinated, June. Charles Edward escapes to France, September. Bergen-op-Zoom taken by the French, September 16. Admiral Hawke defeats French fleet off Belle Isle, October 14. University of St Petersburg founded. Origin of the Shakers about this time. Birth of Dr Parr (died, 1825). Birth of Canova (died, 1822). Death of David Brainerd (born, 1718).

1748. Maestricht invested by the French, April 13 ; surrenders, May 7. Peace of Aix-la-Chapelle, October 18. Centenary of Peace of Westphalia celebrated at Hamburg, October 25. Invasion of India by Afghans. Montesquieu's Esprit des Lois published. Richardson's Clarissa Harlowe. Smollett's Roderick Random. Han- del's Solomon produced. Birth of Jeremy Bentham (died, 1832). Birth of J. L. David, painter (died, 1825).

1749. Flanders and Brabant evacuated by the French, January— February. Cape Breton restored to France, June. Eruption of Vesuvius, June-August. Madras restored to the English, September. War of succession in the Carnatic. Swedenborg's Arcana Celestia begun (completed, 1756). Middleton's Free Inquiry published. Birth of Mirabeau. Birth of Alfieri (died, 1803). Birth of La- place (died, 1827). Birth of Goethe (died, 1882).

Birth of ©. J. Fox (died, 1806). Birth of Tippoo Saib (died, 1823). Birth of Jenner (died, 1828).

1750. Treaty of Madrid between Great Britain and Spain, October 5. Death of Marshal Saxe, November 30. Westminster Bridge opened, Fielding's Zom Jones published. Johnson's Rambler, 1750-1752. Baumgarten's sthetica.

1751. Death of Frederick, prince of Wales, March 20. Adolphus Frederick king of Sweden, April 6. Arcot taken by Clive, August 31. Publication of Diderot's Encyclopédie begun (completed, 1765). Philosophia Botanica of Linneus. Birth of Lord Eldon (died, 1838). Birth of R. B. Sheridan (died, 1816). Birth of Voss (died, 1826). Society of Antiquaries of London incorporated.

1752. The New Style adopted in Great Britain, January1. Con- quest of the Punjab by Afghans. Franklin proves identity of light- ning and electricity. Birth of Legendre (died, 1833). Birth of J. G. Eichhorn (died, 1827). Death of Whiston (born, 1667). Birth of Madame D'Arblay (died, 1840). Birth of Blumenbach (died,

1840).

1753. The British Museum founded. Wesley's Hymmns published. Birth of Dugald Stewart (died, 1828). Birth of William Rosese (died, 1831). Birth of Carnot (died, 1823). Birth of Thomas Bewick (died, 1828).

1754. Othman III. sultan, December 18. Peace between French and English in India, December 26. New Marriage Act passed in England. LEartliquakes at Constantinople and Cairo. Condillac's Tratté des Sensations published. Edwards's Inquiry into the Frecdom of the Will. First part of Hume's History of England (completed, 1761). Birth of Madame Roland. Birth of Kléber (died, 1800). Birth of Talleyrand (died, 1838). Birth of Crabbe (died, 1832), Society of Arts, London, founded.

1755. Benedict XIV. concludes concordat with Spain, January 11. General Braddock's expedition against the French in Canada ; he is defeated and killed, July 9. Lisbon destroyed by earthquake, November 1. University of

Moscow founded. Eruption of Catlegia, Iceland, lasts from October 1755 to August 1756. Johnson's Dic- tionary published. Birth of Marie Antoinette. Birth of Flaxman (died, 1826). Birth of Hahnemann (died, 1843). Death of Mosheim (born, 1694).

1756. League of Austria, Russia, Saxony, and Sweden against Prussia. Treaty of alliance between France and Austria, May 2. England declares war against France, May 17. Admiral Byng defeated by French off Minorca, May 20. Capture of Calcutta by Suraja Dowla, June 18. Prisoners perish in the Black Hole. Capi- tulation of English garrison in Minorca to the French, June 28. The Seven Years' War begins with invasion of Saxony by Frederick IL, August 27. Dresden entered and Saxon archives seized, Septem-

ber 10. He defeats the Austrians at Léwositz, October1. Capitul- ation of Saxon army, October 15. William Pitt (Chatham) secretary of state, December. Militia Bill passed in England, December. Burke's Inquiry into the Origin of our Idcas on the Sub- lime and Beautiful published. Birth of William Godwin (died, 1836). Birth of Mozart (died, 1791).

1757. Calcutta retaken by the English, January 2. Treaty between Great Britain and Prussia against France and Austria, January 11. Chandernagore taken by English, March 14. Admiral Byng shot, March 14. The French enter Westphalia, the Prussians Bohemia, April. Pitt dismissed from office, April. Battle of Reichenberg, April 24. Battle of Prague; Marshals Browne and

Schwerin killed, May 6. Russians invade Prussia, June. Pitt secretary of state again, with powers of prime minister, June. Battle of Plassy,—victory of Clive over the Subahdar, June 23. Hesse-

Cassel occupied by French, July. Verden and Bremen occupied by French, August. Minden taken by the French, August 3. Mus- tapha II. sultan, October 29. Order of Maria Theresa founded. Lacaille's Fundamenta Astronomie published. Carbonic acid de- scribed by Black. Birth of Lafayette (died, 1834). Birth of Sir Samuel Romilly (died, 1818). Birth of

Volney (died, 1820). Birth of Baron von Stein (died, 1831). Birth of William Blake (died, 1827).

1758. Prussia overrun by Russians, January. Prince Ferdinand of Brunswick drives the French from Hanover, &c., February—March, and takes Minden, March 14. Subsidy treaty between Great Britain and Prussia, April11. Clement XIII. pope, July 6. Arcot taken by the French, October 4. Battle of Hochkirchen,—Daun defeats Frederick II., October 14. French besiege Madras, Decem- ber 11-February 19, 1759. New treaty of alliance between France and Austria, December 30. Dollond's achromatic object-glass in- vented. Annual Register begun by Dodsley. Swedenborg's New Jerusalem published. Birth of Nelson.

1759. Surat taken by the English, March 2. Treaty between Russia and Sweden for neutrality of the Baltic, March 9. Battle of Minden, August 1. Charles III. king of Spain, August 10. Ad- miral Boscawen defeats French fleet in Bay of Lagos, August 18. Expulsion of Jesuits from Portugal, September 8. Dresden taken by Imperialists, September 5. Battle of Quebec ; deaths of Montcalm and Wolfe, September 13. Admiral Hawke defeats Marshal Con- flans in Quiberon Bay, November 20. Marshal Daun eaptures General Finck and his army at Maxen, November 21. Return of Halley's comet. Births of Porson, Wilberforce, Pitt, Robespierre, Danton, Schiller, Burns. Death of Maupertuis (born, 1697). Rasselas and first part of Tristram Shandy published.

1760. Capture of Arcot by the English, February 9. Battles of Landshut, June 23 ; Corbach, July 10; Liegnitz, August 16. Eng- lish conquest of Canada completed, Sentember 8. Berlin occupied by Russians, October 9-12. George III. king of Great Britain, October 25. Battle of Torgau,—Daun defeated, November 3. Eddy- stone lighthouse completed by Smeaton. Macpherson's Ossian published, 1760-63. Birth of Saint-Simon (died, 1825).

1761. Pondicherry taken by Coote, January 14. Dominica taken by the English, June 6. " Family Compact" between the kings of France and Spain, August 15. Marriage of George III., Septem-

ber 8. Resignation of Pitt, October 5. Colberg taken by Russians, December 16. Bridgewater Canal completed by Brindley. Transit of Venus. Death of William Law (born, 1686).

1762. Englandjdeclares war on Spain, Jannary 2. Peter III. emperor of Russia, January 5. Martinique taken by the English, February 4. Frederick If. concludes peace with Russia, May 5. Earl of Bute prime minister of England, May 29. Portugal invaded by ee May. Peace of Hamburg between Frederick II. and Sweden, May 22. Peter III. deposed, and succeeded by Catherine Il, July 9; put to death, July 19. Havana taken by earl of Albemarle, August 13. The Spaniards driven out of Portugal, autumu. Hyder Ali rajah of Mysore. Roussean's Oontrat Social and £mile published. Death of Anson (born, 1697). Births of Fichte, Cobbett, and William Carey.

1763. Peace of Paris, between Great Britain, France, Spain, and Portugal, February 10. Peace of Hubertsburg, between Austria, Prussia, and Saxony, February 15; end of the Seven Years' War. George Grenville first lord of the treasury, April 8. Arrest of John Wilkes, April 30. Latent heat discovered by Black, 1759-63. Birth of Jean Paul Richter (died, 1825).

1764. Wilkes expelled the House of Commons, January 19. Alliance between Russia and Prussia, Apri! 11. Ivan VI. murdered, July 6. Stanislas Poniatowski elected king of Poland, September 7. Jesuit Order suppressed in France by Louis XV., November 26. Byron's voyage round the world begun. Lardner's Yestimonies to the Truth of the Christian Religion published. Death of Hogarth (born, 1697).

1765. Stamp Act passed by British parliament, March 22. Opposition to it begun by Virginia, May. Lord Clive governor and commander-in-chief at Calcutta, May. Rockingham adininistration formed, July 10. Joseph II. emperor, August 18. Lady Hunting- don's Connexion founded. Blackstone's Commentaries published.

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(1757-1776.

1766. Death of the Chevalier de St George (the old Pretender), January 2. Christian VII. king of Denmark, January 14. Ameri- can Stamp Aet repealed, March 18. Second Pitt administration, August 2. War between Hyder Ali and the Nizam of the Deccan ; alliance of the English with the Nizam, November. Expedition of Wallis and Carteret to the South Seas. Bongainville's voyage round the world begun. Lessing's Laocoon published. Goldsmith's Vicar of Wakefield. Births of Madame de Stael, Dalton, W. H. Wol- laston, and Malthus.

1767. Expulsion of Jesuits from Spain, March 31. Corsica given up by Genoa to France, May 15. © Alliance of Hyder Ali and the Nizam against the English, September. Otaheite discovered by Wallis and Carteret. Nautical Almanac first published. Birtiis of W. von Humboldt, A. W. Schlegel, and Maria Edgeworth.

1768. Wilkes elected M.P. for Middlesex, March; riot caused by his imprisonment, May 10. General Gage arrives with British troops at Boston, September 26. Lord Chatham resigns privy seal, October 15. War between Russia and Turkey, October. Jesuits expelled from Naples, Parma, and Malta. Cook's first voyage round the world, 1768-71. The Royal Academy of Arts, London, founded. Death of Nathaniel Lardner (born, 1684). Births of Schleier- macher, Chateaubriand, and General Hoche.

1769. The Letters of ''Junius" begin to appear, January. Hyder Ali ravages the Carnatic, January. Wilkes again expelled the Conimons, February 2; re-elected for Middlesex, February 16. Hyder Ali compels the English to enter into alliance with him, and to restore their conquests, April. Clement XIV. pope, May 19. Occupation of Corsica by the French, May. Shakespeare Jubilee at Stratford-on-Avon, September 6-8. Moldavia and Wallachia oceupied by Russia, September. Watt's first patent for steam-engine. Robertson's History of Charles V. published. Births of Napoleon I., Wellington, Alexander von Humboldt, Marshal Ney, Cuvier, Lord Castlereagh, Brunel (the elder), Sir Thomas Lawrence, Mehemet Ali, Sir John Maleolin, and M.de Bourrienne.

1770. Resignation of Grafton; Lord North's administration formed, January 28. The '' Boston Massacre," March 5. The French Kast India Company dissolved by Louis XV., April 8. Act for repeal of certain colonial duties

passed, April 12. Liberation of Wilkes, April 17. Marriage of the Dauphin Louis with Marie Antoinette, May 16. Trial of Woodfall, printer of Junius, June 13. Austrians enter Poland, about midsummer. Turkish fleet defeated by Russians off Chios, July 5, and burnt in Chesmeh Bay, July 7. General Romanzoff defeats the Turks on the Kaghul, August 1. Prussian troops enter Poland, autumn. New South Wales dis- covered by Cook. Goldsmith's Deserted Village published. Deatli of Chatterton (born, 1752). Births of Wordsworth, Hegel, John Foster, George Canning, and Thorwaldsen.

1771. Parliament of Paris exiled by Louis XV., Jannary 19. Gustavus III. king of Sweden, February 13. Shah Alum II. enters Delhi, December. The Crimea seized by Russians. Death of Smollett (born, 1721). Births of Sydney Smith, Lingard, Sir Walter Scott, James Montgomery, Archduke Charles, and Murat. First edition of Encyclopedia Britannica published.

1772. Warren Hastings governor of Bengal, April 13. Treaty of St Petersburg for partition of Poland between Austria, Russia, and Prussia, August 5. New constitution established in Sweden, August 21. _Cook's second voyage round the world, 1772-74. Royal Marriage Act passed. Death of Swedenborg (born, 1688). _Birthis of Novalis, S. T. Coleridge, Fourier, and D. Ricardo.

1773. Ahmed IV. sultan, January 21. Ali Bey defeated and captured by Murad Bey, April 13; assassinated a few days later. Constitution of East India Company changed, June. Society of Jesus suppressed by Clement XIV., July 31. Diet of Poland con- cludes cession with the partitioning powers, September 18. Rohileund ravaged by Mahrattas. Agitation in Boston, Mass., against the tea tax, December 16. Births of Jeffrey, F. Schlegel, Sismondi, and Thomas Young.

1774. Warren Hastings first governor-general of India, January. Abdul Hamid sultan, January 21. Boston Port Bill passed, March. General Gage appointed governor of Massachusetts, April 2. Louis XVI. king of France, May 10. General Court of Massachusetts closed, June 17. Treaty of Kutchuk Kainardji, between Russia and Turkey, July 21. Congress opens at Philadelphia, September 5; closes October 26. Death of Pope Clement XIV., September 22. Parliaments of France re-established by Louis XVI., November 12. New Caledonia discovered by Cook. Oxygen discovered by

Priestley and by Scheele. Chestertield's Letters published. Goethe's Leiden des jungen Werther. The Wolfenbiittelsehe Frag- mente. Births of Southey and Mezzofanti.

1775. Pius VI. pope, February 14. Battle of Lexington, Massa- chusetts, April 19. Famine riots at Versailles, May. Washington commander-in-chief of continental army, June 5. Battle of Bunker Hill, June 17. Boston invested by Washington, July 2. Montreal taken by General Montgomery, November 12. Code of Catherine II. published. Lavater's Physiognomy. Births of Charles Lamb, Turner, Jane Austen, and O'Connell.

1776. Evacuation of Boston by the English, March 17. Canada

evacuated by Americans, June 18. Declaration of Independence of the ''United States," July 4. Commissioners of United States sent to France, September. British troops enter New York, Sep- tember 15. Necker's administration (France), November. Battle of Trenton, December 26. Cook's last voyage begun. First vol. of Gibbon's Roman Empire published (completed, 1778). Smith's Wealth of Nations. Birth of Niebuhr.

1777. National flag of United States adopted, June 14. Exe- cution of Dr Dodd for forgery, June 27. Battle of Brandywine, September 11. General Howe takes Philadelphia, September 27. Battle of Germantown, October 4. Surrender of General Burgoyne to General Gates, at Saratoga, October 16. Articles of Confedera- tion of United States agreed to, November 15. Suspension of Habeas Corpus Act in Great Britain, December 11. Death of Maximilian Joseph, elector of Bavaria, December 30, followed by dispute as to succession. Howard's State of the Prisons published. Births of Oersted, De la Motte-Fouqué, and Thomas Campbell.

1778. Independence of United States recognized by France, January 16 ; treaty of amity signed, January 30. English ambas- gador recalled from Paris, March 13. Death of Chatham, May 11. france declares war against England, July 10. Savannah taken by the English, December 28. Sandwich Islands and Owhyhee dis- covered by Cook. Death of Voltaire. Births of Thomas Brown, Sir Humphrey Davy, De Candolle, and Gay-Lussac.

1779. Admiral Keppel tried by court-martial and acquitted, Jan- uary-February 11. Captain Cook (born, 1728) killed in Owhyhee, February 14. Peace of Teschen, May 13, ends war of the Bavarian succession. Spain declares war against Great Britain, June 16. Alliance of Spain with United States, July 13. Fleets of France and Spain in the English Channel, August. Protestant Association founded in England. Johnson's Lives of the Poets published, 1779-81. The Olney Hymns. Births of Moore, Chlenschlager, Oken, and Berzelius.

1780. Rodney defeats Spanish fleet off Cape St Vincent, January 16. Charleston surrenders to Sir H. Clinton, May 13. The Gordon riots in London, June 2. Armed Neutrality between Russia, Denmark, and Sweden, July 9 and August 1; joined by States- General, December 24. Arcot taken by Hyder Ali, October 31. Death of Maria Theresa, November 29. Vaccination suggested by Jenner.

1781. The French invade Jersey, and are defeated, January 6. Bombardment of Gibraltar by Spaniards, April 12 to November 26. Conquest of Florida by Spaniards completed, May. Necker resigns, May. The king of Prussia joins Armed Neutrality, May 8. Sir Eyre Coote defeats Hyder Ali near Porto Novo, July 1. Yorktown oceupied by Lord Cornwallis, August 1. Sea-fight off the Dogger- bank between English and Dutch, August 5. The emperor joins Armed Neutrality, October 9. Edict of toleration issued by the em- peror, October 13. Yorktown capitulatcs to Washington, October 19. The Barrier Treaty dissolved, November. Uranus (Georgium Sidus) discovered by Herschel. Sunday/Schools originated by Robert Raikes. Births of H. F. Clinton, G. Stephenson, and Sir F. Chantrey.

1782. Second Rockingham administration in office, March 27. Victory of Rodney over French fleet off Dominica, April 12. Death of Rockingham, July 1. Shelburne administration, July 10. The 'Royal George" sinks at Spithcad, August 29. Successful defence of Gibraltar against the allies by General Elliott. _Prelimi- naries of peace between England and the United States, November 30. Charleston evacuated by the English, December 14. Death of Hyder Ali, December 7 ; Tippoo Saib succeeds him. Poyning's Law (Ireland) repealed. Rousseau's Confessions published.

1783. Sovereignty of the Crimea sold to Catherine II., January 20. Coalition ministry of Fox and North, April 2. Definitive treaty of peace between England and United States signed at Paris, September 3. Treaty of peace between Great Britain, France, and Spain, September 3. The Coalition ministry dismissed, December 18. Pitt appointed first lord of the treasury, December 19. Washington resigns his commission, December 23. First experiments with Montgolfier's air balloon. Order of St Patrick founded. Birth of Bolivar.

1784. Tippoo concludes peace with the English,—restitution of conquests agreed to, March 11. 'Treaty of peace between England and Holland, June 20. Pitt's India Bill passed, August 13. The Board of Control established. Death of Johnson, December 13. Bramah fock paterted. Mitford's History of Greece, vol. i., pub- lished (completed, 1818).

1785. Resignation of Warren Hastings, February 8. John Adams, first ambassador of United States to England, presented to George IfI., June 1. Confederation of Saxony, Brandenburg, and Hanover, July 23. Treaty of Fontainebleau between the emperor and the States-General, guaranteed by France, signed, November 8. Expedition of La Perouse to South Seas. Royal frish Academy incorporated. Death of General Oglethorpe (born, 1696).

1786. Impeachment of Warren Hastings, February. Fredcrick William If. king of Prussia, August 17. Lord Cornwallis governor- general of India, September. Treaty of navigation and commerce between Great Britain and France, September 26. Sebastopol

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University of Bonn founded. Weslcyan Methodist Burns's Poems published. Death

founded. Missionary Society instituted. of Admiral Keppel (born, 1725).

1787. First Assembly of Notables meets at Versailles, February 22; closes May 25. ‘The parliament of Paris exiled, August-Sep- tember. War between Russia and Turkey renewed, August. The Prussians invade Holland, and restore the stadtholder, September. Eruption of Etna, July to October. Society for suppression of the slave-trade formed in London. Death of Gluck (born, 1712).

1788. First publication of The Times, January 1. Death of Prince Charles Edward, January 31. The emperor declares war against Turkcy, February 9. ‘Trial of Warren Hastings begins, February 18. Turkish fleet defeated and destroyed, June 26. Russia declares war against Sweden, July 11. Necker recalled, August 24. Temporary insanity of George ITI.; regency of Prince of Wales, October to February 1789. Second Assembly of the Notables, November 6—December 12. Oczakoff stormed by Russians under Potemkin, December 17. Penal settlement at Botany Bay. Drainage of the Pontine Marshes completed.

1789. Charles IV. king of Spain, January 17. Selim ITI. sultan, April 7. Mutiny of the ‘‘ Bounty,” April 28. Washington first president of United States, April 30. First French Revolution ; opening of the States-General at Versailles, May 5. National Assembly constituted, June 17. Fall of the Bastille, July 14. Abolition of feudal privileges, August 4. Insurrection in the Netherlands, September. Suwaroff defeats the Turks, September 22. Jacobin Club settles at Paris, about October. The Austrians expelled from the Netherlands, December. Land settlement in India begun. Herschel’s great telescope completed. White’s Natural History of Selborne published. Birth of Ncander.

1790. Act of Union of Belgic United Provinces signed at Brussels, January 11. Treaty of alliance between Prussia and the Porte, January 81. Monastic vows abolished in France, February 138. Death of Joscph I1f., February 20. Defensive alliance between Prussia and Poland, March 29. Titles of honour abolished in France, June 20. Federation Féte of the Champs de Mars, July 14. Peace of Werela between Russia and Sweden, signed, August 14. First issue of assignats in France, September 9. Leopold If. elected emperor, September 30. Austrians enter Brussels, Decem- ber 2. Convention between the emperor and mediating powers ; end of the Belgian Republic, December

10. Ismail taken by Suwaroff, December 22. City of Washington founded. Burke's Reflections on the French Revolution published.

1791. Death of John Wesley, March 2. Death of Mirabeau, April 2. New Polish Constitution promulgated, May 3. Flight of Louis XVI. from Paris, June 20; he is arrested at Varennes and brought back, June 21. Priestley riots at Birmingham, July14. Declara- tion of Pilnitz, August 27. First coalition (between Austria and Prussia) formed, August 27. The constitution completed by National Assembly, September 3; accepted by Louis, September 14. Meeting of National Legislative Assembly at Paris, October 1. Death of Potemkin, October 16. Representative government intro- duced in Canada. Galvani's discovery of animal clectricity pub- lished. D'Israeli's Curiosities of Literature published.

1792. Peace of Jassy between Russia and Turkey, January 9. Attack on Seringapatam by the English, February 6. Death of the Emperor Leopold [f., March 1. Girondist ministry at Paris, March. Gustavus [1f. of Sweden assassinated by Ankarstrom, March 16; Gustavus IV. succeeds. Peace concluded betwecn the English and 'Tippoo ; cession of half of Mysore, March 19. The blacks in St Domingo declared free, April 4. Louis XVI. declares war against the king of Hungary, April 20. Invasion of the Nationaf Assembly and the Tuileries by the mob, '' procession of the black breeches," June 20. Francis If. elected emperor, July 5. Manifesto of duke of Brunswick, July 25. Death of the earl of Guildford (Lord North), August 5. Attack on the Tuileries ; massacre of the Swiss guards, August 10. Louis and his family imprisoned in the Temple, August 13. Invasion of France begins, August 18. The '' September Massacres," at Paris, September 2-8. Opening of National Convention, September 21. Abolition of royalty, September 21. The Republic proclaimed, September 22. "The Revolutionary calendar adopted, September 22. French occupation of Savoy, September. Battle of Jemappes, November 6. Belgium overrun by the French, November—December. The Scheldt opened to all nations, November 22. Fox's Libel Bill passed. Baptist Missionary Society founded. Gas first used for lighting.

1793. Treaty between Russia and Prussia for second partition of Poland, January 4. Alien Bill passed in England, January 4. Execution of Louis

XVI., January 21. Invasion of Holland by Dumourier, February. Washington president of United States (second term), March 4, Insurrection in La Vendée, March 10. Revolutionary Tribunal established, March 11. ‘‘ Reign of Terror.” English army sent to Holland, March. Death of Chief-Justice Mansfield, March 20 (born, 1705). Fall of the Girondists, June 2. Assassination of Marat by Charlotte Corday, July 13; execu- tion of Charlotte, July 17. Levy en masse of the French ordered;

August 23. Pondicherry taken by the English, August 23. Toulon taken by Lord Hood, August 28. Lyons taken by Kellermann, October 9. Execution of Marie Antoinctte, October 15 ; of the Girondists, October 31. Worship of reason introduced, November 10. Toulon retaken,—Napoleon Bonaparte at the siege, December 18,19. The Noyades of Nantes, December. Society of United lrishmen founded. ga

1794. Insurrection in Poland, Kosciuszko generalissimo, March. Execution of Danton and his followers, April 6. Habeas Corpus Act suspended in England, May 23. Victory of Lord Howe over French fleet, off Brest, June 1. Féte del’ Hire Supréme, June 8. Battle of Fleurus, June 26. Fall of Robespierre,—end of the Reign of Terror, July 27. Corsica reduced by the English, August 4. Battle of Macie- wice ; Kosciuszko wounded and captured, October 10. Trials of Hardy, Horne Tooke, and others, October-November. Battle of Praga,—the Poles defeated by Suwaroff, November 4. Warsaw eutered by Russians, November 9. The English driven from Holland, December. Chappe’s telegraph invented. Godwin’s Caleb Williams published. Paley’s Hvidences. Goethe’s Wilhelm Meisters Lehrjahre.

1795. Third partition of Poland arranged between Russia, Austria, and Prussia, January 3. The French enter Amsterdam, January 19. Abolition of the stadtholderate; the Batavian Republic established, February 24. Insurrection at Paris, April 1. Peace of Basel between French Republic and the king of Prussia, April 5. Acquittal of Warren Hastings, April 23. Insurrection at Paris, May 20-21. Treaty of Basel between France and Spain, July 22. The Directory established, August 22. Cape of Good Hope

taken by the English, September. Annexation of Belgium to France, October 1. Last sitting of National Convention, October 26. King Stanislas abdicates, November 25. Dutch settlements in Ceylon taken by English. Institute of France and Ecole Polytechnique founded. Maynooth College, Ireland, founded.

1796. Irish Insurrection Act passed, March 10. Battle of Lodi, May 10. Milan entered by Napoleon, May 15. Treaty between French Republic and the king of Sardinia for cession of Nice, Savoy, &c., May 15. Bologna entered by Napoleon, June 18. Alliance between France and Spain, August 19. Spain declares war against Great Britain, October 6. Suspension of Habeas Corpus Act in Ireland, October 26. Battle of Arcola, November 15-17. Paul emperor of Russia, November17. Cispadane Republic founded, December. Attempt of General Hoche on Ireland, Dec- ember 22-27. Hydraulic press patented by Bramah.

1797. Battle of Rivoli, January 14. Capitulation of Mantua to Napoleon, February 1, 2. Admiral Jervis defeats Spanish fleet off Cape St Vineent, February 14. John Adams president of United States, March 4. Napoleon declares war on Venice, May 3; and enters the city, May16. Councils of Five Hundred and of the Ancients established at Paris, May 20. Ligurian Republic established, June. Cisalpine Republic, June 29. Death of Burke, July 9. Death of Burns, July 21. Coup-d'état of 18th Fructidor, September 4. Admiral Duncan defeats Dutch fleet off Camperdown, October 11. Treaty of Campo Formio between France and Austria, October 17. Frederick William III. king of Prussia, November 16. Congress of Rastadt opens, December 9. Insurrection at Rome, December 27. First issue of one-pound notes by Bank of England.

1798. Oceupation of Rome by the French, February 10; a republic proclaimed, February 15. Subjugation of Switzerland by the French, January-March. Helvetie Republic proclaimed, April 12. Annexation of Geneva to France, April 26. Rebellion in Ireland breaks out, May 23. Malta taken by Napoleon, June 11. French invasion of Egypt, July 1. Battle of the Pyramids, July 21. Battle of the Nile, August 1-2. General Humbert lands French force at Killala, August; surrenders to General Lake, September 8. Rome occupied by Neapolitans, November 29. Abdication of king of

Sardinia, December 9. Alliance between Russia and the Porte, December 23. Treaty between Great Britain and Russia, Decem- ber29. Income Tax proposed by Pitt, December. Jenner's Inquiry (" Vaccinatiou") published. Lithography invented by Senefelder. Haydn's Creation produced.

1799. Naples entered by the French, January. Capitulation of Ehrenbreitstein to the French, January 29. Invasion of Syria by Napoleon, February. Massacre of Jaffa, March 7. Unsuccessful siege of Acre by Napoleon, March 16-May 21. Invasion of Mysore by the English, March. Congress of Rastadt closed, April 7. Seringapatam stormed by the English under Baird ; Tippoo killed, May 4. Sevond coalition against France formed, June 22. Napoleon defeats Turks at Aboukir, July 25. Ferdinand IV. of Naples restored, July 27. Russians enter Switzerland, August. Death of Pius VI., August 29. Zurich entered by the French, September 26. Retreat of Suwaroff from Switzerland, September 29. Rome recovered from the French, September 30. Overthrow of the Directory, 18th Brumaire, November 9. Napoleon " First Consul," December 24. Death of Washington, December 14. Laplace's Mécanique Celeste published (completed, 1825).

1800. Pius VII. elected pope, March 14. East India Company, May 13.

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[1794-1807,

Napoleon, May 17-20. Battle of Marengo, June 14. Legislative

Union of Great Britain and Ireland by Act passed July 2. Malta taken by English, September 5. Cession of Mysore to the English, October 12. Battle of Hohenlinden, December 3. The

Voltaic pile invented. The Journal des Débats founded.

1801. First imperial parliament of United Kingdom meets, January 22. Resignation of Pitt, February 5. Addington first lord of the treasury. Peace

of Lunéville, February 9. Thomas Jefferson president of United States, March 4. Battle of Alexan- dria ; Abercromby mortally wounded, March 21. Kingdom of Etruria erected by Napoleon, March 21. Paul, emperor of Russia, murdered, March 24; Alexander I. succeeds. Victory of Nelson over Danish fleet at Copenhagen, April 2. Cairo surrenders to the English, June 27. Concordat between Pius VII. and Napoleon, July 15. Mecca taken and pillaged by Wahhabees. Evacuation of Egypt by the French, September 2. Peace between Great Britain and France, October 1; between Russia and France, October 8. First Census of Great Britain taken. The asteroid Ceres discovered by Piazzi. Block machinery invented by Brunel.

1802. French expedition against St Domingo, February. Peace of Amiens, March 27. Napoleon First Consul for life, August 3. Rising of the Swiss under Aloys Reding, summer. Piedmont an- nexed to France, September 11. The asteroid Pallas discovered by Olbers. Edinburgh Review commenced, October.

1803. New constitution imposed on Switzerland by Napoleon's '* Act of Mediation," February 19. Cape of Good Hope restored to the Dutch, February 21. Egypt evacuated by the English, March 17. Louisiana sold by Napoleon to United States, April 30. Eng- land declares war against France, May 18. Hanover seized by the French, June. Rising in Ireland under Emmett, July 23. "Pre- parations for French invasion of England, summer. War be- tween the English and Sindia begins, August 3. General Lake defeats Mahrattas near Delhi, and enters the city, September 12. Battle of Assaye, September 28. St Domingo proclaimed independent, Noveniber 29. Treaty with Rajah of Berar, December 17 i with Sindia, December 28. Atomic theory propounded by Dalton.

1804. Publication of the Code Civil (Napoléon), January. Duke of Enghien shot by order of Napoleon, March 21. Surinam taken by the English, April 29. Pitt prime minister the second time, May 12. Napoleon *'Emperor of the French," May 18. The Jesuits readmitted to the Two Sicilies, July 30. Francis II. assumes title of hereditary emperor of Austria, August 11. War with Holkar through this year and the next. Coronation of Napoleon I. and Josephine by the Pope at Paris, December 2. Spain declares war against Great Britain, December 12. Asteroid Juno discovered by Harding. British

and Foreign Bible Society established. Savings Banks originated. Schiller's Wilhelm Tell published.

1805. Siege of Bhurtpore by the English, January. Jefferson aeaecad of the United States (second term), March 4. Battle of

hurtpore, April 2. Third coalition against France, April 11. Death of Earl of Shelburne, May 2 (born, 1737). Napoleon crowned king of Italy at Milan, May 26. Genoa and Ligurian Re- public incorporated with France, June 3. Impeachment of Lord Melville, June 26. Third coalition against France completed, September 8. Capitulation of General Mack to Napoleon at Ulm, October 17 and 19. Victory and death of Nelson at Trafalgar, October 21. Vienna occupied by the French, November 13. Russian and British forces land in Naples, November 20. Battle of Austerlitz, December 2. Treaty with Holkar, cession of territory to the English, December 24. Peace of Presburg, December 26. British and Foreign School Society founded. Foster's Essays pub- lished. Scott's Lay of the Last Minstrel.

1806. The electors of Bavaria and Wiirtemberg take the title of king, January 1. Cape of Good Hope retaken by the English, January 8. Death of Pitt, January 23. Grenville and Fox admini- stration, February. Admiral Duckworth destroys French squadron off St Domingo, February 6. Prussia concludes treaty with Na- poleen I., February 16 ; ratified March 9. Joseph Bonaparte made king of the Two Sicilies, March 30. 'Trial of Lord Melville begins, April 29; acquittal, June 12. Louis Napoleon Bonaparte made king of Holland, June 6. Great Britain declares war against Prussia, June 11. Battle of Maida, July 5. Mutiny of Sepoys at Vellore, July 10. Confederation of the Rhine formed, July 12. Dissolution of the Holy Roman Empire, August 6. Death of Fox, September 13. Fourth coalition against France, October 6. Battles of Jena and Auerstadt, October 14. Napoleon enters Berlin, October 27. Flight of Frederick William III., October. Napoleon's Berlin decree declaring the British Isles in a state of blockade, November 21. Occupation of Hamburg by the French, November. War between Russia and Turkey begins, November 23. Elector of Saxony assumes title of king, December 11. The Russians enter Bucharest, December 27. Haileybury College founded.

1807. Battle of Eylau, February 7-8. Sir J. Duckworth forces the passage of the Dardanelles, February 19. Abolition of the slave trade in British empire by Act passed March 25. The Portland administration, April. Dantzic taken by the French, May 26,

1808-1818.]

Sultan Selim deposed by Janissaries, May 29; Mustapha IV. succceds. Napoleon defeats the Russians at Friedland, June 14. Conference of the emperors Alexander and Napoleon near Tilsit, June 25. Peace of Tilsit, July 7 and 9. Death of the Cardinal York, last of the Stuarts, July 13. Jerome Bonaparte made king of Westphalia, August 18. Bombardment of Copenhagen by English fleet, Sep- tember 2-5; surrender of Danish fleet. Evacuation of Egypt by British forces, September. French invasion of Portugal, Novem- ber; Lisbon entered, November 30. The Prince Regent and Royal family of Portugal embark for Brazil, November 29. Rupture be- tween Great Britain and Russia, November-December. French troops enter Spain, December. The kingdom of Etruria seized by Napoleon, December 10. Napoleon publishes the Milan decree, December 18. The asteroid Vesta discovered by Olbers. Zoological Society of London instituted. Hegel's Phinomenologie des Geistes published. Moore's Irish Melodies.

1808. Napoleon occupies Rome, February 2. A new nobility created in France by Napoleon, March 11. Abdication of Charles IV. of Spain in favour of Ferdinand, prince of Asturias, March 19. Murat enters Madrid, March 28. Insurrection at Madrid, May 2. Treaty of Bayonne between Charles IV. and Napoleon, May 5. Abdication of Ferdinand, May 6. Joseph Bonaparte made king of Spain, June 6. Siege of Saragossa by the French begun, June 15. Murat made king of Naples, July 15. Battle of Baylen, July 21. Sir Arthur Wellesley lands in Spain, August 1. Siege of Saragossa raised, August 4. Battle of Vimeira, Wellesley defeats the French, August 21. Convention of Cintra. Conferenve of Alexander and N at Erfurt,September 27—October14. Mustapha IV. deposed and murdered, November 15; Mahmoud II. succeeds. Madrid entered by Napoleon, December 4. Abolition of Spanish Inqui- sition, December 4. Saragossa again bombarded by the French, December 20. Retreat of Sir John Moore

begun, December 24. Finland incorporated with Russia. Manby's apparatus for saving life in shipwreck invented. Scott's Marmion published.

1809. Treaty of peace between Great Britain and Turkey, January 5. Battle of Corufia; death of Sir John Moore, January 16. Sara- gossa stormed by the French, January 27. Conduct of the duke of York investigated by parliament, January-March. War between Russia and Turkey, —,, The lines of Travancore stormed by English, February 10-21. James. Madison president of United States, March 4. Gustavus IV. of Sweden deposed, March 29; Charles XIII. succeeds. Oporto taken by Soult, March 29. Revolt of Tyrol under Hofer, April 8. Invasion of Bavaria by Austrians, April 11. Passageof the Douro by Wellington ; occupation of Oporto, May 12. Napoleon enters Vienna, May 13. States of the Church annexed to France, May 17. Battle of Aspern, May 21-22. Charles XIII. king of Sweden, June 6. Napoleon excom- municated by the Pope, June 10. Arrest of the Pope, July 5. Battle of Wagram, July 6. Battle of Talavera, July 27-28. English ex- pedition to Walcheren sails, July 28. Finland ceded to Russia, August 7. Flushing taken by the English, August 16. Peace of Vienna between France and Austria, October 14. Perceval admini- stration formed, October 30. Divorce of the Empress Josephine, December 15. vacuation of Walcheren by the English, December 238. The Quarterly Review commenced (February).

1810. Guadaloupe and Amboyna taken by the English, February. Marriage of Napoleon with Archduchess Maria Louisa, April 1.. Sir F. Burdett committed to the Tower, April 9. Silistria taken by Russians, June 23. Holland annexed to France, July 10. Masséna takes Ciudad Rodrigo, July 12. Bernadotte chosen crown prince of Sweden, August 21. Battle of Busaco, September 27. Wellington's army within the lines of Torres Vedras, October 10. Insanity of George III., November. Mauritius taken by English, December 8. University of Berlin founded. Sect of Primitive Methodists founded by Hugh Bourne. Madame de Stael's De ?' Allemagne published. Hahnemann's Organon.

1811. Tortosa taken by Suchet, January 2. The Regency Bill (Great Britain) passed, February 5. Death of Maskelyne, February 9 (born, 1732). Massacre of the Mamelukes at Cairo by Mehemet Ali, March 1. Badajoz surrenders

to the French, March 10. Battle of Fuentes d'Onore, May 4, 5. Battle of Albuera, May 16. Java conquered by the English, August 26. Death of Bishop Percy, September 80 (born, 1728). Luddite riots at Nottingham begin, November. Great comet visible for four months. Bell Rock light-house built by Stevenson. National School Society founded. Niebuhr's Rémische Geschichte published.

1812. Wellington storms Ciudad Rodrigo, January 19 ; invests Badajoz, March 16 ; storms the town, April 6. New Spanish con- stitution promulgated by the Cortes, March 18. Assassination of Mr Perceval, May 11. Peace of Bucharest between Russia and Turkey, —the Pruth declared the boundary of the two empires, May 28. The Liverpool administration formed, June 8. The United States declare war against Great Britain, June 18. Napoleon declares war against Russia, June 22. Treaties of peace between Great Britain, Sweden, and Russia, July18. Battle of Salamanca, July 22. Madrid entered by Wellington, August 12. Smolensko taken by the French, August 17. Battle of Borodino (the Moskwa), Sep-

Moscow entered by Napoleon, the city burnt, Septem- ber 14. Moscow evacuated by the French, October 19. Bell's steam-vessel sails on the Clyde. lodine discovered. Coleridge's The Friend published. First two cantos of Childe Harold. Hegel's Logik.

1813, Fourteen Luddites executed at York, January 10. Con- eordat between Napoleon I. and Pius VII., January 25. Abolition of Spanish Inquisition by the Cortes, February 12. Fifth coalition against France, March 1. James Madison president of United States (second term), March 4. Battle of Liitzen, May 2. Battle of Bautzen, May 20-21. Hamburg seized by Davoust, May 30. Capture of U.S. frigate ''Chesapeake" by H.M.S. ''Shannon," June 1. Battle of Vittoria, June 21. Battles of the Pyrenees, July 25-30. Battles of Dresden, August 24, 25, and 27. St Se- bastian stormed by Wellington, August 31. Treaty of Toplitz ; alliance of Russia, Austria, and Prussia, September,9. Wellington passes the Bidassoa, and invades France, October 7. Battle of Leipsic, October 16, 18, 19. Neutrality of Switzerland

proclaimed, November 8. The French evacuate Germany, November 22, Wil- liam, prince of Orange recalled, December 1. Electric light dis- covered by Davy. Shelley's Queen Mab published. Southey's Life of Nelson.

1814. Bolivar chief of republic of Venezuela, January 1. Ces- sion of Norway to Sweden by treaty of Kiel, January 14. Pius VII. dismissed from Fontainebleau, January 22. Death of Fichte, Janu- ary 27. Battle of Orthez, February 27. Treaty of Claremont, March 1. Capitulation of Paris, March 31. Entry of the allied sovereigns. Deposition of Napoleon by the senate, April 1. Battle of Toulouse, April 10. Abdication of Napoleon, April 11. Louis XVIII. enters Paris (the first Restoration), May 3. Napoleon lands in Elba, May 4. Ferdinand VII. annuls the constitution, May 4; entcrs Madrid, May 14. The Pope enters Rome, May 24. Peace of Paris, May 30. Invasion of Canada by Americans, July. Annexation of Belgium to Holland agreed to, July 21. The In- quisition re-established in Spain, July 21. Capture and burning of Washington by General Ross, August 24. Hanover erected into a kingdom, October 11. Congress of Vienna opens, November 3. Peace of Ghent between Great Britain and United States, December 24, New Orleans attacked by Sir E. Pakenham, December 27. New Corn Law passed in England. Order of Jesuits re-established by Pius VII. Wordsworth's Zxcursion published. Scott's Waver-

tember 7.

ley.

1815. Battle of New Orleans, January 8. Napoleon escapes from Elba, February 26; lands at Cannes, March 1. The kingdom of the Netherlands constituted ; William I. proclaimed king, March 16. Napoleon reaches Paris, March 20. ''The Hundred Days." Treaty of Vienna between Great Britain, Austria, Russia, and Prussia, March 28. Murat begins war against Austria, March 28 ; he is defeated at Tolentino, May 2, 8; surrenders the kingdom of Naples to Ferdinand IV., May 20. Napoleon's new constitution accepted, June 1. German Confederation constituted by treaty of Vienna, June 8. Territorial settlement of Europe by Congress of Vienna, June 9. Battles of Ligny and Quatre Bras, June 16. Battle of Waterloo, June 18. Second abdication of Napoleon I., June 22. The allies enter Paris, July 7. Return of

Louis XVIII. to Paris (second Restoration), July 8. Surrender of Napoleon to Captain Maitland of H M.S. ‘‘ Bellerophon,” July 15. Formation of the ‘‘Holy Alliance,” September 26. Arrival of Napoleon at St Helena, October 16. Ionian Islands placed under protection of Great Britain, November 5. Second Peace of Paris, November 20. Marshal Ney condemned to death by Chamber of Peers, December 6, and shot at Paris, December 7. The safety lamp invented by Davy. Scott’s Guy Mannering published. Wordsworth’s White Doe of Rylstone. North American Review begun.

1816. Marriage of Princess Charlotte of England with Prince Leopold of Saxe-Coburg, May 2. Select Committee on Education appointed, May 21. Death of Admiral Lord Hood, June 27 (born, 1724). Bombardment of Algiers by Admiral Lord Exmouth, August 26. Death of Earl Stanhope, December 15 (born, 1753). Electric telegraph invented by Ronalds. University of Warsaw founded. Cuvier’s Régne Animal published. Scott’s Antiquary and Old Mortality.

1817. James Monroe president of United States, March 4. Sus- pension of Habeas Corpus Act, March 4. The “‘ Blanket Meeting” at Manchester dispersed by the Military, March11. The ‘‘ Derby- shire Insurrection,” June 8, 9. Dissolution of the Mahratta Con- federacy, June 18. Pius VII. condemns Bible Societies by bull of June 29. Death of Curran, October 14 (born, 1750). Death of Kosciuszko, October 15. Pindaree war begins, October. Death of Princess Charlotte, November 6. Holkar defeated by the English at battle of Mehudpore, December 21. Waterloo Bridge, London, opened, The kaleidoscope invented by Brewster. Shelley’s Revolt of Islam published. Moore’s Lalla Rookh. Blackwood’s Edinburgh Magazine commenced.

1818. The English conclude peace with Holkar, January 6. Repeal of Habeas Corpus Suspension Act, January 31. Bernadotte (as Charles XIV.) king of Sweden, February 6. Congress of Aix-la

Chapelle opens, February 14; closed, November 20. End of the Pindaree war, May. Constitutional eharter of Bavaria, May 25. Marriages of duke of Clarence with Princess Adelaide of Saxe-Mein- engen, and of duke of Kent

with Princess Mary of Saxe-Coburg, July 18. Suicide of Sir Samuel Romilly, November 2. Death of Queen Charlotte of England, November 17. Evaeuation of French territory by the army of oeeupation, November 30. Subjugation of the Walthabees completed by Ibrahim Pasha. The stethoscope invented by Laennee. Seott's Heart of Mid-Lothian published. Hallam's Lurope during the Middle Ages.

1819. Cession of Florida by Spain to United States, February 22. Kotzebue assassinated at Mannheim, Mareh 23. Birth of Princess Victoria, May 24. Peel's Curreney Aet passed, June 28. Congress of Carlsbad meets, August 1. Radieal Reform ineetings at Manches- ter dispersed by the yeomanry (the ‘‘ Peterloo" Massacre), August 16. The German Zollverein founded. Maeadam's system of road- making published. Lleetro-magnetism discovered by Oersted. Scott's Bride of Lammermoor and Ivanhoe.

1820. Death of the duke of Kent, January 238. George IV. king of England, January 29. Ferdinand VII. swears to the constitution, Mareh 9. Expulsion of Jesuits from Russia, March 25. Death of Grattan, May 14 (born, 1746). Revolution in Naples, the insur- rection of the Carbonari, July 2. Bill of pains and penalties against Queen Caroline introduced in House of Lords, July 6 (abandoned, November 10). Revolt of Ali Pasha of Joannina, August-September. Revolution in Portugal, the Spanish eonstitu- tion proclaimed, September 15. Congress of Troppau meets, October 20. Congress of Laybach meets, December 17. Astro- nomical Society of London founded. Byron's Don Juan published. Shelley's The Cenet. Foster's Essay on Popular Ignorance.

1821. Revolutionary movements in Brazil, January. Death of John Keats, February 24 (born, 1796). James Monroe president of the United States (second term), March 4. Insurrection in Greece, March 6. Abdication of Victor Emmanuel I. king of Sar- dinia, in favour of his brother Charles Felix, March 23. Naples oceupied by Austrian army, Mareh 24. The Greek patriarch hung at Constantinople, April 21. The independence of Brazil pro- claimed, April 22. Death of Napoleon I. at St Helena, May 5. Congress of Laybach closed, May 6. Provisional government esta- blished in Greece, June 9. Return of John VI. to Lisbon, July. Coronation of George IV., July 19. Death of Quecn Caroline, August 7. George IV. visits Ireland, August

15—-September 15, and Hanover, October. Republic of Liberia founded by Americans. Scott’s Kenilworth and The Pirate published.

1822. Declaration of independence by the Greeks, January 1. Ali Pasha surrenders to the Turks, and is put to death, February 5. Insurrection Act (Ireland) passed, and Habeas Corpus Act suspended, February 11. Massacre of Scio, April-May. Iturbide proclaimed emperor of Mexieo, May 22. Athens taken by the Greeks, June 22. George IV. visits Seotland, August. Suicide of Lord Castle- reagh, August 12. Congress of Verona, August 25-December 14. Don Pedro emperor of Brazil, October 12. Caledonian Canal com- pleted. Caleulating Machine invented by Babbage. Brown’s Philosophy of the Human Mind published. Byron’s Cain.

1823. Abdication of Iturbide, March 20. Invasion of Spain by the French, April 7; Madrid entered, May 23. John VI. of Portugal abolishes the constitution, June 5. Ferdinand VII. declared incapable, and a regency appointed, June 11. Bombard- ment of Cadiz by the French begins, September 20. Death of Pius VIL, August 20. Leo XII. elected pope, September 28. Capitu- lation of Cadiz, October 1. Great Britain sends consuls to South American States, October 30. British Anti-Slavery Society founded. Catholic Association in Ireland. Mormonism originated by Joseph Smith. Lamb’s Hssays of Elia published. Victor Hugo’s Odes et Ballades.

1824. Bolivar dictator of Peru, February 10. Death of Eugéne Beauharnais, February 21 (born, 1781). War with Burmah, March 5. Death of Lord Byron at Missolonghi, April18. Rangoon taken by the English, May 11. Iturbide arrested in Mexico and shot, July 19. Singapore acquired by the English, August. Charles X. king of Franee, September 16. Provisional government formed in Greece, October 12. The Spaniards in Peru finally de- feated at Ayachuco, December 9. Angerstein collection of pictures bought by English Government as foundation of a National Gallery. Westminster Review established. Godwiu’s History of the Common- wealth published (1824-1828).

1825. Treaty of commerce between Great Britain and La Plata,

February 2. Expedition of Ibrahim Pasha against the Greeks, February 28. John Quincy Adams president of United States, March 4. Great earthquake

in Algiers, March 2-7. The Catholic

Association abolished by Act passed March 9. Treaties of commerce between Great Britain and Columbia, April 18, and between Great Britain and Mexico, April 29. Navarino taken by Ibrahim Pasha, May 18; Tripolitza, June 28. Ports of Dutch East Indies opened to ships of all nations, July 21. The independence of Brazil re- cognized by Portugal, September 7. Nicholas I. emperor of Russia, December 1. Commercial panic in England, December. The lime-

light invented by Drummond. First voyage by steam from Eng- land to India made. Coleridge's Aids to keflection published. Pepys's Diary deciphered and published.

1826. War between Brazil and Buenos Ayres begins, January. Bhurtpore stormed by Lord Combermere, January 18. Capitulation of Callao to Peruvian patriots, January 22; evacuation of l'eru by

Spaniards. Treaty of navigation between Great Britain and France, January 26. Treaty of peace between English and Burmese, Feb- ruary 24. Death of John VI.; Don Pedro, emperor of Brazil, be-

comes king of Portugal, March 10. Death of Weber, June 5. Rebellion and massacre of the Janissaries at Constantinople, June 15. Death of Adams and Jefferson, ex-presidents of the United States, July 4. Don Miguel assumes title of king, July 4. Russia deelares war against Persia, September 28. Insurrection in Portu- gal, October 6. Death of l'alma, October 19 (born, 1763). Convention between Great Britain and United States respecting indemnities for damages during the war, November 18. Treaty between Great Britain and Brazil for suppression of slave trade, November 23. Portugal appeals for aid to England, December 3. Death of Flax- man, December 9 (born, 1755). English fleet in the Tagus, Deeember 25. Zoological Society of London founded. London University founded. Menai Suspension Bridge opened. JDisraeli's Vivian Grey published.

1827. Death of Frederick, duke of York, January 5 (born, 1763). Death of Mitford, February 8 (born, 1744). Death of Pestalozzi, February 17 (born, 1746). Canning administration, April 12. National Guard of France disbanded by Charles X., April 29. Erection of kingdom of Greece by treaty of London, July 6. Death of Canning, August 8. The Goderich administration, August 11. Duke of Portland president of the council, August 17. Death of Ugo Foscolo, October 10 (born, about 1776). Battle of Navarino, October 26. Charles X. dissolves the Chamber of Deputies, November 5. Needle-gun invented by Dreyse. Omnibus introduced at Paris. Overland route to India projected. Keble's Christian Year published. Seott's Tales of a Grandfather. Arnott's Elements of Physics. Simrock's version of the Nibelungen-

lied.

1828. Fall of the Villéle ministry in France, January 4. Resig- nation of Lord Goderich, January 8. The Wellington administration in office, January 25. Peace of Turkmanchay between Russia and Persia, February 22. Russia declares war against Turkey, April 26. Last of the British troops leave Portugal, April 28. Don Miguel assumes title of king, May 8. Occupation of Bucharest by Russians, May 12. Passage of the Danube by Russians, June 8. Election of O'Connell M.P. for Clare, July 5; he refuses to take the oaths. Silistria invested by Russians, July 28. Peace concluded between Brazil and Buenos Ayres, August 29. The French land in the Morea, August 29. The Dardanelles closed by the Porte, September 18. Evacuation of Greece by Ibrahim Pasha, October 4. Varna taken by the Russians, October11. The Morea evacuated by Turks, October 28. Siege of Silistria raised, November 10. Death of Lord Liverpool, December 4 (born, 1770). New Corn Law in England ; Peel's ''Sliding Scale" established. Test Act and Corpora- tion Act repealed. London University opened. The Athenwum (literary journal) established.

1829. Death of Leo XII.,February 10. Andrew Jackson president of United States, March 4. Duel fought between Wellington and earl of Winchelsea, March 21. Pius VIII. elected pope, March 381. Catholic Emancipation Act passed, April 18. Capture of Lepanto by the Greeks, May 9. Siege of Silistria resumed, May 17; it sur- renders, June 18. General Paskiewich

takes Erzeroum, July 9. Prince of Polignac first minister of Charles X., August 8. Adrianople entered by Russians, August 20. Peace of Adrianople signed, September 14. Suttee declared illegal, December 14. Rossini's Guillaume Tell produced.

1830. Independence of Greece declared by Allied Powers, February 3; acknowledged by the Porte, April 25. William IV. king of England, June 26. Surrender of Algiers to the French, July 5. Charles X. issues the Six Ordinances, July 26. Paris deelared in a state of siege, July 27. Flight of Charles X. from Paris, July 30. Louis Philippe, duke of Orleans, appointed lieutenant-general of the kingdom, July 31. Abdication of Charles X., August 2. Louis Philippe proclaimed king of the French, August 9. Revolution at Brussels, August 25. Insurrection at Dresden, September 9. Disturbances at Berlin, Hamburg, and other German towns. Three days fighting between Dutch and Belgians at Brussels, September 19-21. Liverpool and Manchester Railway opened, September 15. Independence of Belgium proclaimed, October 4. Antwerp entered by Belgians, October 27; the Dutch bombard the city, October 28. Resignation of the Wellington ministry, November 15. The Grey ministry takes office, November 16. Revolution at Warsaw, November 29. Death of Pope Pius VIII., November 30. Death of Bolivar, December 17. Prince of Polignac, ex-minister of Charles X., convicted of high treason, and sentenced to imprison- ment for life, December 21.. Independence of Belgium recognized by Allied Powers, December 26. Expedition of the Landers to the Niger. Lyell's Prineiples of Geology published. Tennyson's Poems.

1831-1841,]

1831. Adam Czartoryski presideut of National Government of Poland, January 30. Gregory XVI. elected pope, February 2. Insurrection at Modena, February 5; suppressed by Austrians, March 10. The Russians defeated by the Poles at Grochow, Feb- ruary 20. Reform Bill introduced by Lord John Russell, March 1. Revolution in Brazil; abdication of the Emperor Pedro, April 7. British parliament dissolved, April 23. Prince Leopold of Saxe- Coburg elected king of Belgium, June 4. Death of Mrs Siddons, June 8 (born, 1755). Reform Bill re-introduced, June 24. Capture of the Portuguese fleet off Lisbon by French fleet, July 11. New London

Bridge opened, August 1. Capitulation of Warsaw to Russians, September 7. Coronation of William IV. and Queen Adelaide, September 9. Reform Bill thrown out by House of Lords, October 7. Ibrahim Pasha undertakes conquest of Syria, Oetober. Assassination of Count Capo d'Istria, Oetober 9. Riots at Bristol, October 29. Treaty of London respecting Belgium, November 15. First appearance of Asiatic cholerain England, November. General Torrijos shot at Malaga, with fifty associates, December 4. Reform Bill introduced a third time, December 12. Negro insurrection in Jamaiea, December 22. Hereditary peerage abolished in France, December 29. The British Association founded. Victor Hugo's Nétre Dame de Paris published.

1832. Occupation of Ancona by the French, February 23. Poland declared an integral part of Russian empire, February 26. Death of Goethe, Mareh 22. Resignation of English ministers, May 9. Earl Grey returns to office, May 18. Death of Cuvier, May 13. The Reform Act passed, June 7. Acre taken by Ibrahim Pasha, July 2. Revision of Swiss Federal Pact, July 17. Prince Otho of Bavaria proclaimed king of Greece, August 30. Death of Sir Walter Scott, September 21. Ministry of Marshal Soult formed, October 11. Duchess of Berry imprisoned for sedition, November 7. Siege of Antwerp begun by the French, November 13. Dissolution of British parliament, December 3. Ibrahim Pasha defeats army of the Sultan at Konieh, December 20. Surrender of Antwerp, December 24. Heathcoat's steam-plough patented. The Paris Charivari started. The Penny Magazine and Chambers's Edinburgh Journal beguu. Ebenezer Elliott's Corn-Law Rhymes published. George Sand's Indiana.

1833. First Reform parliament of United Kingdom opened, January 29. King Otho lands at Nauplia, January 31. Mediation of France between the Porte and Mehemet Ali, February 21. Andrew Jackson president (second term) of the United States, March 4. Trial and deposition of Edward Irving for heresy, March 13. Coercion Bill for lreland passed, April 2. Santa Anna presi- dent of Mexican Republic, April 18. Treaty of Kutayeh between Egypt and the Porte, May 14. Death of Edmund Kean, May 15 (born 1787?). Capture of Don Miguel's squadron by Admiral Napier, July 5. Treaty of peace and alliance (of '' Unkiar Skelessi'') between Russia and Turkey, July 8. Evacuation of Lisbon by Miguelites'; Donna Maria proclaimed Queen, July 23. Death of Wilberforce, July 29. Irish Church

Temporalities Act passed, August 14, Abolition of slavery in the British Colonies (from August 1, 1834) by Act passed August 28. Death of Hannah More, September 7 (born, 1745). Isabella II. qucen of Spain, September 29. Durham University opened. Artesian well opened at Grenelle, 1833-1841. Carlyle's Sartor Resartus published. Keble's Sermon on National Apostasy preached at Oxford (July). Penny Cyclopedia begun (finished, 1843).

1834. Marshal Saldanha defeats the Miguelites at Santarem, February 18. Death of Lafayette, May 20 (born, 1757). Capitu- lation of Don Miguel, at Evora, May 26. Abolition of monasteries in Portugal, May 28. Shah Soojah defeated by Dost Mahomed, June 29. Resignation of Earl Grey and Lord Althorp, July 9. Lord Melbourne prime minister, July 14. Death of S. T. Coleridge, July 25. Emancipation of slaves in British colonics, August 1. The Poor Law Act passed, August 14. The Houses of Parliament burnt, October 16.. The Melbourne ministry dissolved, November 15. Sir Robert Peel first lord of the treasury, December 8.. First parliamentary grant for education in England. Oxford Traets for the Times begun. Ranke's Popes of Rome published, 1834-1836. Lytton's Last Days of Pompeti and Rienzi. First volume of Bancroft's History of the United States.

1835. Ferdinand I. emperor of Austria, March 2. Wilhelm von Humboldt, April 8 (born, 1767). the Peel ministry, April 8. Lord Melbourne again first lord, April 18. Revolt of Texas against Mexico, July. The Foreign Enlist- ment Bill suspended in favour of the queen of Spain, June 10. Death of William Cobbett, June 18. First battalion of auxiliary legion sails for Spain, July 2. Municipal Corporations (England) Reform Act passed, September 9. Conference of the emperors of Russia and Austria and the king of Prussia at Toplitz, October. Death of James Hogg, the ''Ettrick Shepherd," November 21 (born, 1772). Independence of Texas proelaimed, December 22. Revolver patented by Colt. Appearanee of Halley's Comet. Strauss's Leben Jesu published. De Tocqueville's Démocratie en Amérique. Merle d'Aubigné's Histoire de la Réformation, vol. i.

_ 1836. Death of Lord Stowell, January 28 (born, 1746). M.

Death of Resignation of

CHRORVLOGY

Thiers first minister of Louis Philippe, February 22. Occupation of Cracow by Russian and Austrian troops, February. Carlist entrenchments near Hernani taken by the English Legion, May 5. Death of. Abbé Sieyés, June 20 (born, 1748). Revolution at Madrid, flight of Isturitz, August 12. Resignation of M. Thiers; M. Molé named president of the council, M. Guizot minister of public instruction, September 7. Revolution at Lisbon, September 9-10. Attempt of Louis Napoleon Bonaparte to excite insurrection at Strasburg, October 29. Death of Charles X. of France, November 6. Siege of Bilbao by Carlists raised by Espartero and the British, December 24. Adelaide, S. Australia, founded. Tithe Commutation Act passed. Dissenters' Marriage Act.

1837. Death of Sir John Soane, January 20 (born, 1753). Martin van Buren president of United States, March 4. Hernani taken by Espartero, May 15. lrun stormed by General Evans, May 17. Victoria queen of England, June 20. The Carlists defeated at Valencia, July 15.. The imperial parliament dissolved, July 17. Cholera rages on the continent, July-August. Don Carlos defeats the royal troops near Herrera, August 24. Marshal Saldanha and the duke of Terceira defeated, September 18. The French Chamber of Deputies dissolved, fifty new peers created, October 4. Constantina in Algeria stormed by the French, October 13. The constitution of Hanover abrogated by royal ordinance, November 1. Siege of Herat begun by Persians, November 22. Winter Palace, St Petersburg, burnt, December 29. Durham Uni- versity incorporated. Punishment by the pillory abolished in England. Father Mathew's temperance missions begun about this time. Carlyle's French evolution published. The Pickwick Papers. Ingoldsby Legends. Sara Coleridge's Phantasmion.

1838. Royal Exchange, London, burnt, January 10. Death of Lord Eldon, January 13. Death of Talleyrand, May 17. Espartero defeats the Carlists, and takes Penacerrada, June 22. Coronation of Queen Victoria, June 28. The independence of Peru proclaimed, July 29. The siege of IIerat raised, September 9. Resignation of Lord Durham, October 9. Death of Mrs Maclean (Letitia E. Lan- don), October 15 (born, 1802). Lima evacuated by Chilians, November 10. End of the rebellion in Canada, about November

17. Chartist meetings declared illegal, December 12. Interna. tional Copyright Act passed. Dagunerreotype process discovered, National Gallery, London, opened. First voyage of “Great Western” across the Atlantic. London and Birmingham Railway opened,

1839. Occupation of Aden by troops of East India Company, January 20. The Anti-Corn-Law League formed, March 20, Treaty of London respecting affairs of Holland and Belgium, April 19. Oecupation of Candahar by Anglo-Indian army, April 26. Death of Lord William Bentinck, June 17 (born, 1774). Death of Lady Hester Stanhope, in Syria, June 23 (born 1776). Total defeat of Turkish army under Hafiz Pasha by Ibrahim Pasha, on the Euphrates, June 25. Abdul-Medjid sultan, July 1. Chartist riot at Birmingham, July 15. Ghizni stormed by Sir John Keane, July 22. Shah Soojah restored to sovereignty of Cabul, August 7. Passage of the Khyber Pass by Lieut.~~Col. Wade, September 3. John Williams, missionary,” murdered at Erromanga, November 20. Christian VIII. king of Denmark, December 3. The Pope pro~~ hibits the slave trade, December 3. Trial and conviction of John Frost and other Chartists for high treason, December 24-381. Copyright in Desigus Act passed. First English settlement in New Zealand. Gold discovered in Australia. Committce of Privy Council on Education appointed. Bailcy’s Festus published.

1840. Death of Madame D’Arblay, January 6 (born, 1752). Penny postage in Great Britain comes into operation, January 10. Marriage of Queen Victoria with Prince Albert of Saxe-Coburg, February 10. Ministry of M. Thicrs, March1. Death of Paganini, May 27 (born, 1784). Surrender of Carlist General Morella, May 28. Frederick William IV. king of Prussia, June 7. Insur- rection in Syria against Mehemet Ali, June 7. Blockade of Canton by the English, June 28. Capture of Chusan, July 5. Treaty of

| London between the sultan and Mehemet Ali, July 15; ratified,

September 15. Death of Ottfried Miiller, August 1 (born, 1797). Attempt of Louis Napoleon to excite insurrection at Boulogne; he is arrested, August 6. Abdication of king of Holland, October 7 ; William II. succeeds. Death of Lord Holland, October 22 (born, 1773). Marshal Soult again first minister, October 29. Dost Mahomed surrenders to Sir W. Macnaghten, November 2. The reniains of Napoleon I. landed at Cherbourg, November 30, and

deposited in the Hétel des Invalides, December 15. The papal nuncio expelled from Spain, Deeember 29. Association for the Repeal of the Union (Ireland) established. Irish Municipal Corpora- tions Reform Act passed. Ozone observed by Schénbein. Cole- ridge's Confessions of an Inquiring Spirit published. Carlyle's Heroes and Hero- Worship.

1841. Capture of the Bogue Forts, Canton, by the English, January 7. The sultan concedes hereditary pashalie of Egypt to Mehemet Ali, January 27. Union of Upper and Lower Canada proclaimed, February 10. General Harrison president of United States, March 4. Differences between the Sultan and Mehemet Ali arranged, March 5. No. XC. of Oxford ''Tracts for the Times"

"ondemned, March 15. Death of President Harrison, April 4; Vice-President John Tyler succceds. Attack on Canton and capitulation of the Chinese authorities, May 24. Russian campaign against Circassians begins, May. Death of Wilkie, June 1, (born 1785). Insurrection in Candia, June; suppressed, August. Capture of Amoy, August 26. Resignation of Lord Melbourne, August 30. The second Peel administration formed. Birth of the Prinee of Wales, November 9. Attack on the English at Cabul, Sir Alexander Burnes and others murdered, Nov. 14. Death of Sir F. Chantrey, November 25, (born, 1781). Assassination of Sir W. Maenaghten at 'Cabul, Deeember 23. Copyhold Enfranehisement Aet passed. Mormon Temple at Nauvoo founded. Punch begun. Emerson's Essays published.

1842. Retreat of the English from Cabul, January 6 ; they are mas- sacred in the Khoord Cabul Pass, to January 13. Lord Ellenborough governor-geueral of India, February 28. Death of Cherubini, March 10 (born, 1760). The Afghans repulsed at Jellalabad by Sir R. Sale, April7. General Polloek forees the Khyber Pass, April 5-14; and relieves Sale at Jellalabad, April 16. New corn-law passed, April 29. Chartist procession in London, monster petition to parliament, May 2. Great fire at Hamburg, May 5-7. The English enter the Yang-tsze-Keang, June 13-16. Shanghai entered, June 19. Defeat and submission of the Boers of Natal, June 26. Treaty of commeree between Belgium and France, July 16. Chin-Keang-foo taken by Sir HughGough, July 21. The Maine boundary settled by '' Ashbur- ton Treaty"

between Great Britain and United States, August 9. Treaty of peace between Great Britain and China, August 26 (ratified, December 31). Tahiti taken possession of by the French, September 8. Cabul re-entered by Pollock and Nott, September 15. Death of Channing, October 2 (born 1780). Cabul evacu- ated by the English, October 12. Insurreetion at Barcelona, Nov. 13; snppressed Dec. 3. Income and property tax imposed in Great Britain. Steam hammer patented. The Walhalla opened by king of Bavaria. Lytton's Zanoni published. Macaulay's Lays of Ancient Rome. Illustrated London News begun.

1843, The stronghold of the Baluches taken by Sir C. Napier. January. Battle of Meeanee, February 17. Occupation of Hy- derabad, February 20. Disturbanees in Wales (" Rebecca's Daughters"), Feb. Appearanee of a great comet, March. Death of Southey, Mareh 21. Disruption of the Church of Scotland ; origination of the Free Church, May 18. Annexation of Natal to Cape Colony, May. Sir C. Napier defeats Shere Mahomed and ends the war, June. Annexation of Sinde to British India. Monster repeal meeting on the hill of Tara, August 15. Arrest of O'Connell and other repealers, October 14. The queen of Spain declared of age by the Cortes, November 8. Battle of Maharajpore —defeat of Mahrattas by Sir Hugh Gough, and battle of Punniar, December 29. Occupation of Gwalior. Site of Nineveh dis- covered by Botta. The Thames tunnel opened. Mill's Logic pub- lished. Macaulay's Essays. Carlyle's Past and Present.

1844. Death of Sir Francis Burdett, January 23 (born 1770). Death of Lord Sidmouth, February 15 (born 1757). Death of Thorwaldsen, March 24 (born 1770). Sir Henry Hardinge

overnor-general of India, May 6. War between France and Marocco

egins, May 30. The Mormon prophet, Joseph Smith, murdered, June 27; Brigham Young appointed his suecessor. Bank of Eng- land Charter Act passed, July 19. Death of Joseph Bonaparte, July 28 (born 1768). Bombardment of Tangiers by Prince de Joinville, August 6. Victory of the French over the Moors at Isly, August 14. Capture of Mogador, August 15. Treaty of peace between France and Marocco, Scptember 6. The Codex Sinaiticus discovered by Tischendorf.

1845. Death of Sydney Smith, February 22 (born 1771). Admis- sion of Jowa and Florida as States of the Union, March 1. James Knox Polk president of the United States, March 4. Death of Thomas Hood, May 3 (born 1798). Arctic expedi- tion under Sir John Franklin (his last) sails, May 23. Mexico declares war against United States, June 4. General Pelissier suffocates one of the Kabyle tribes in the cave of Dahra, June 20. Maynooth College incorporated and endowed, June 30. Death of Earl Grey, July 17 (born, 1764). Death of Judge Story, September 10 (born 1779). Squadron of French cavalry cut to pieces by Abd-el-Kader, September 16. Death of Earl Spencer (Lord Althorp), October 1 (born 1782). Death of Elizabeth Fry, October 12 (born 1780). Sir Hugh Gough defeats the Sikhs at Moodkee, December 18. Sir Hugh Gough again defeats the Sikhs at Ferozeshah, December 21, 22. Railway mania and panic in England. Failure of potato crop in Great Britain and Ireland. Gun-cotton invented. Lord Rosse's great telescope erected. Vestiges of the Natural History of Creation published. Newman's Essay on the Development of Christian Doetrine.

1846. The Sikhs routed by Sir H. Smith at Aliwal, January 28. Battle of Sobraon, February 10. Citadel of Lahore occupied by Gough, February 22. Famine in Ireland. Treaty of Lahore, March 8. Narvaez driven from Spain, April 7. General Taylor defeats the Mexicans at Palo Alto, May 8; again, at Resaea de la Palma, May 9. Escape of Louis Napoleon from Ham, May 26. Death of

CHRONOULSSGS

[1842-1848,

Pope Gregory XVI., June 1. Treaty of Washington for settlement of the Oregon boundary, June 15. Election of Pope Pius IX., June 16. Suicide of B. R. Haydon, June 22 (born 1786). Repeal of English eorn laws by Act passed June 26. Resignation of the Peel ministry, June 29, First Russell administration formed, July 6. Death of Louis Bonaparte, ex-king of Holland, July 25. Capture of Santa Fé by Americans, and annexation of New Mexieo to United States, August 23. Affair of the Spanish marriages, September. Capture of Monterey, Mexico, by General Taylor, September 24. The Spanish marriages (of the queen and the Infanta) celebrated at Madrid, October 10. Cracow annexed to Austria, November 16. Santa Anna

president of Mexico, December 6. Constitutional charter of New Zealand granted, December 29. The ‘‘Sonder- bund” formed by Catholic cantons of Switzerland. Evangclical Alliance established. Discovery of the planet Neptune. Grote’s History of Greeec, vols. i. and il. published (completed, 1856).

1847. Frederick William IV. eonvokes a parliament at Berlin, February 3. Mexicans defeated at Buena Vista, February 22, 23. Vera Cruz capitulates to General Scott, March 28. Capture of the Bogue Forts at Canton by the English, April 8. Gencral Scott euters Jalapa, April19. Death of O’Connell, May 15 (born 1774). Death of Dr Chalmers, May 31 (born 1780). Death of Sir John Franklin near Lancaster Sound, June 11. Earl of Dalhousie governor-general of India, August 4. Expulsion of the Jesuits decreed by Swiss Diet, September 3. Mexico bombarded by Gencral Scott, September 14, 15, and the city taken. Roman Catholic hierarchy established in England, October. Death of Mendelssohn, November 4 (born 1809). Army of the Sonderbund defeated at Freiburg, November 13. Sonderbund dissolved. Sur- render of Abd-el-Kader to the duke of Aumale, Deeember 22. Crime and Outrage Act in force in Ireland, December 23. Man- chester ereeted into a bishopric. Salt Lake city founded by Mor- mons. . Jenny Lind in England. Charlotte Bronté’s Jane Lyre published.

1848. Disturbances at Milan, January 8. Insurrection at Messina, January 6. Frederick VII. king of Denmark, January 20. Gold diseovered in California, January. Riots at Munich, February 9-12. Reform banquet at Paris prohibited, February 21. Death of ex-president John Quincy Adams, February 21. Martial law proclaimed in Lombardy, February 22. Street fighting in Paris, February 23. Attack on the Tuileries, abdication of Louis Philippe, February 24. The Republic proclaimed, February 26. Insurree- tion at Munich, March 4. Income-tax riots in London, many arrests made, March 6. Revolution at Vienna, flight of Prince Metternich, March 13, 14. Insurrection at Berlin, March 17. Insurrection at Milan, flight of the viceroy, March 18. Abdieation of the King of Bavaria, March 21. The Spanish Cortes suspended sine die, March 22. Charles Albert, king of Sardinia, invades Lombardy, March 23. Revolt of Schleswig and Holstein, March 25. The Danes defeat the Holsteiners and Prussians near Flensborg, April 10. Chartist demonstration on Kennington Common, April 10. Deposition of

King Ferdinand by Sicilian parliament, April 13. The Prussians take Schleswig and Flensborg, April 22. Abolition of slavery in the French dominions deereed, April 27. National Assembly opened at Paris, May 4. Flight of the emperor Ferdinand from Vieuna, May 17. German ‘‘ National Assembly” meets at Frankfort, May 18. Treaty between Mexico and United States for cession of California and New Mexico, ratified, May 19. Prussian Constituent Assembly meets at Berlin, May 22. Insur- rection renewed at Vienna, May 27. Charles Albert defeats Aus- trians at Goito, May 29, 30. Insurrection at Prague, May 29. An- nexation of Lombardy to Sardinia proclaimed, June 4. Battle of Dippel, June5, 6. Prince Louis Napoleon elected deputy to National Assembly, June 12. Surrender of Padua to Austrians, June 15. In- surrection at Paris, June 23; suppressed by General Cavaignac, dic- tator, June 24-26. The archbishop of Paris shot while mediating, June 26. Death of Heinrich Zschokke, June 27 (born, 1770). Death of Chateaubriand, July 4 (born, 1768). Revolt of Slavonia and Croatia, under Jellachich, July 9. Suspension of Habeas Corpus Act in Ireland, July 24. Charles Albert defeated, July 27. Insurrec- tion attempted in Ireland under O’Brien, July 29. The Sardinians capitulate to Radetsky at Milan, August 4. Death of Berzelius August 7 (born, 1779). Return of the emperor to Vienna, August 12. Death of George Stephenson, August 12 (born, 1781). Trials of the Chartists in London begin, August 25; end, September 30. Sir Henry Smith routs the Dutch rebels at the Cape, August 29. Ibrahim Pasha viceroy of Egypt, September 1. Bombardment and capture of Messina by General Filangieri, September 2-7. Bom- bardment of Mooltan by the English begun, September 12; siege raised, September 22. Prince Louis Napoleon again clected deputy to National Assembly (for six departments), September 20. Death of Lord George Bentinck, September 21 (born, 1802). The Ban Jellachich defeated near Buda by Hungarians, September 29. Insurrection at Vienna, Oetober 6. Flight of the emperor, October

Vienna assaulted by Prince Windischgriitz, October 28; taken, November 1. Constitution of French Republic adopted, November 4. Repulse of Sikhs before Mooltan, November7. General Wrangel

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enters Berlin and expels Assembly, November 10. Death of Ibra- him Pasha, November10. Assassination of Count Rossi, first minis- ter to Pius IX. at Rome, November15. The Pope accepts a demo- cratic ministry. Flight of the Pope in disguise to Gaeta, November 24. Death of Lord Melbourne, November 24 (born, 1779). Abdi- cation of emperor Ferdinand I. in favour of his nephew Francis Joseph, December 2. The king of Prussia dissolves the Constituent Assembly, and publishes a constitution, December 5. Provisional government at Rome appointed by the Chambers, December 11. Jellachich defeats Hungarians at Weisburg, December 18. Louis Napoleon president of the French Republic, December 20. Defeat of Hungarians by General Schlick at Kaschau, December 21 ; again, at Szikszo, December 28; and at Mohr, December 29. Thackeray's Vanity Fair published. Lowell's Biglow Papers. Mill's Political Economy. Mrs Gaskell's Afary Barton.

1849. Mooltan stormed by General Whish, January 2. Buda- Pesth taken by Windischgratz, January 5. Lord Gough defeats the Sikhs at Chillianwallah, January 13. Constituent Assembly mects at Rome, February 5. Flight of grand duke of Tuscany, provisional government at Florence, February 7. Republic pro- claimed at Rome, Feb. 8. Lord Gough routs the Sikhs at Gujerat, February 21. French and English ultimatum to the king of Naples, February 26; accepted, March 4. Gold rush on California, spring. General Taylor president of United States, March 4. Dissolution of Austrian Diet, new constitution published, March 7. The Sicilians reject the ultimatum of mediating powers, March 9. Sardinia resumes hostilities with Austria, March 12. Death of Mezzofanti, March 15 (born, 1774). Radetzky defeats the Sar- dinians and takes possession of Mortara, March 21; defeats them at Novara, March 28. Abdication of Charles Albert in favour of his son, Victor Emmanuel, March 24. Annexation of the Punjab to British India, March 29. The Grand Duke of Tuscany recalled, April 12. The Danes defeated at Diippeler heights, April 13. Independence of Hungary proclaimed ; Kossuth appointed governor, April14. The Germans enter Jutland, April 20. Siege of Komorn raised, and Buda-Pesth evacuated by Austrians, April. Alessan- dria occupied by Austrians, April 24. Insurrection at Montreal, April 26. Occupation of Civita Vecehia by French troops under General Oudinot, April 26. Insurrection at Dresden, May 3; city bombarded by Russians and Saxons, May 7; insurrection suppressed, May 10. Leghorn taken by Austrians, May 12, 13; and Bologna, May 16. Buda stormed by Gérgei,

May 21. Death of Maria Kdgeworth, May 21 (born, 1767). Siege of Rome by French begins, June 3. Death of countess of Blessington, June 4 (born, 1789). Barricades and fighting in Paris, June 14. Death of ex-president Polk, June 15. ‘The Russians invade Hungary, June 17. Capitu- lation of Ancona, June 18. Alessandria evacuated, June 19. Defeat of Gorgei at Szcred by the Russians,June 21. The Prussians defeat the Baden insurgents and enter Heidelberg and Mannheim, June 23, Carlsruhe occupied by Prussians, March 23. Death of K. G. Zumpt, June 25 (born, 1792). Surrender of Rome, entry of the French, July 3. The Danes defeat the Germans besieging Fredcricia, July6. Bombardment of Pesth begun, July 11. Lattle of Waitzen, July 14-17. Restoration of the temporal power of the Pope preclaimed, July 15. Hungarians defeated by Russians at Schassburg, July 31. Judgment in Court of Arches in ‘‘ Gorham Case,” adverse to plaintiff, Aug. 2. Death of Mehemet Ali, August 2 (born, 1769). Treaty of Milan between Austria and Sardinia, August 6. Defeat of Hungarians by Haynau at Temeswar, August 9. Kossuth resigns governorship; Gorgei appointed dictator. Aug 11. Surrender of Gorgei and the Hungarian arnry to the Russians, August 18. Surrender of Venice to Austrians, August 22. Hayti pro- claimed an empire under Soulouque, August 26. Riot at Montreal, September 15. The Porte refuses to give up Hungarian refugecs demanded by Persia and Austria, September 16. Surrender of Komorn to Austrians, September 28. Execution of Batthyany at Pesth, October 6. Death of E. A. Poe, October 7 (born, 1811). Death of Etty, November 13 (born, 1787). Death of the queen- dowager Adelaide, December 2 (born, 1792). Death of Sir M. I. Brunel, December 12 (born, 1769). Cholerain London. The Queen’s Colleges, Ireland, and Encumbered Estates Court, opened. Dis- covery of Lake N’gami by Livingstone. Macaulay’s History of England, vols. i: and ii. published (completed, 1862). Lytton’s The Caxtons. Notes and Querécs begun.

1850. Blockade of the Pireeus by Admiral Sir William Parkcr, January 18—March 1. Death ef Hhlenschlager, January 20 (born, 1779). Death of Francis Jeffrey, January 26 (born, 1773.) Treaty for German Union concluded between Austria, Bavaria, Saxony, and Wiirtemberg, February 27. Judgment in Gorham Case reversed by Judicial Committce of the Privy Council, March 8. Party processions in Ireland prohibited ‘by Act passed March 12. North German parliament opened at Erfurt, March 20. Death of

J. C. Calhoun, March 31 (born, 1782). Death of Wordsworth, April 24 (born, 1770). Greek Government submits to English demands, April 25, 26. Tenant Right agitation in Ireland, summer. Death of Sir Robert Peel, July 2 (born, 1788). Peace between Denmark, Prussia, and the German Confedera-

Death of President Taylor, July 9; vice-presi- dent Filmore succeeds him. Death of Neander, July 14 (boin, 1789). Cracow burnt, July 18. Victory of the Danes over the Schleswig—Holsteiners at Idsted, July 25. Death of Balzac, August 18.(born, 1799). Death of Louis Philippe, August 26 (born, 1773). Flight of elector of Hesse Cassel, September 13; he is restored, December 27. Victory of the Dancs at Missunde, Septem- ber 18. Pius IX. establishes Catholic hierarchy in England, Sep- tember 24. Alliance between Austria, Bavaria, Saxony, and Wiir- temberg, October 4. California admitted a State of the Union. First submarine telegraph between England and France laid. Bri- tannia Bridge, Menai Strait, opened. North-west Passage dis- covered by M‘Clure. Wordsworth’s Prelude published. Tennyson’s In Memoriam. Dobell’s The Roman. Carlyle’s Latter Day Pam- phiets. Thackeray’s Pendennis. Dickens’s David Copperfield. Wagner’s Lohengrin produced.

1851. Death of J. J. Audubon, January 27 (born, 1780.) Occu- pation of Hamburg by Austrians, January 29. Occupation of Lii- beck, February 4. Gold-digging commenced in Australia, February. Death of Oersted, March 9(born, 1777). Insurrection at Lisbon under Saldanha, April 10, The London Great Exhibition opened, May 1 (closed, October 11). Rebellion in South China, June. Evacuation of Cassel by Austro-Bavarian army begun, August 1. Death of J. Fenimore Cooper, September 14 (born, 1789). Return of Prince Metternich to Vienna, September23. Capitulation of Oribe at Monte Video, October 7; the city entered by Urquiza, October 8. Death of duchess of Angouléme, October 19. Death of Marshal Soult, Nov- ember 26 (born, 1765). Coupd’ftat at Paris, December 2, 3. Death of Turner, December 19 (born, 1775). Louis Napoleon elected president of French Republic for ten years, December 20, 21. Dis- missal of Lord Palmerston from office, December 22. Ecclesiastical Titles Assumption Act passed.

Owens College, Manchester, founded. _ Herbert Spencer's Social Statics published. Ruskin's Stones of Venice (1851-1853). _ Carlyle's Life of John Sterling.

1852. New constitution published by Louis Napoleon, January 14. The property of the Orleans family confiscated, January 22. Ur- quiza defeats Rosas, February 3, and occupies Buenos Ayres, Feb- ruary 4. Holstein evacuated by Austrians, February. Resignation of the Russell ministry, February 21. First Derby administration formed, February 27. Death of Thomas Moore, February 26 (born, 1779). Death of Prince Schwarzenberg, April 5 (born, 1800). Martaban and Rangoon captured by the English, April 5 and 14. Treaty of London respecting Denmark and the duchies, May 8. Pegu taken by the English, June 4. Urquiza provisional director of Argentine Confederation, June 23. Death of Henry Clay, June 29 (born, 1777). Prome taken by the English, July 9, afterwards evacu- ated ; retaken, November 21. Treaty recognizing the independence of Paraguay, July 17. Deposition of Urquiza, September 10. Death of the duke of Wellington, Scptember 14 (born, 1769). Death of Daniel Webster, October 24 (born, 1782). Plébiscite in France as to re-establishment of the empire, November 21, 22. Louis Napo- leon proclaimed emperor as Napoleon III., December 2. Resigna- tion of the Derby ministry, December 17. Anuexation of Pegu to British India, December 20. Coalition ministry under the earl of Aberdeen, December 27. Representative constitution granted to New Zealand. University of Sydney opened. Drainage of lake of Haarlem, 1849-1852. Deutsches Wérterbuch of J. and W. Grimm begun. Thackeray's Esmond published. Mrs Stowe's Uncle Tom's Cabin.

1858. Revolution in Mexico, January. Marriage of Napoleon III. to Eugénie de Montijo, January 29. Termination of the Kaffir war, February 22. General Pierce president of the United States, March 4. Nanking taken by the Taepings, March 21. General Santa Anna president of republic of Mexico, April 1. Death of Tieck, April 28 (born, 1773). Prince Menschikoff presents Russian ultimatum to the Porte, May 5; leaves Constantinople, May 21. Russian army crosses the Pruth, July 2. Cholera breaks out in England, September 4._ Shanghai taken by the Taepings, Septem- ber7. Death of Arago, October 2 (born, 1786). English and French fleets enter the Dardanelles, October 22. War between Russia and the Porte begins, October

23. Russians enter Danubian principali- ties, November. Destruction of Turkish fleet at Sinope by Admiral Nachiimoff, November 30. Maurice's Theological Essays published. Ritter's Geschichte dcr Philosophie completed. Lytton's My Novel.

1854. French and English fleets enter the Black Sea, January 4. Declaration of war against Russia by France, March 27, by Eng- land, March 28. Death of John Wilson (Christopher North), April 3 (born, 1785). Treaties of alliance between England and France signed, April 10, and between Austria and Prussia, April 20. Bombardment of Odessa by French and English fleets, April 22. Death of marquis of Anglesey, April 29 (born, 1768). Death of James Montgomery, April 30 (born, 1771). _Silistria unsuccessfully besieged by Russians, May 17 to June 15. The allies land at Varna, May 29. Treaty of Washington signed, June 7. Opening of Crystal Palace, Sydenham, June 10. Insurrection in Spain under O'Donnell, June 27. Battle of Giurgevo, July 8. omarsund taken by allies, August 16. Death of Schelling, August 20 (born,

tion, July 2.

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1775). Occupation of Bucharest by Austrians, September 6. Landing of the allies in the Crimea, September 14. Battle of the Alma, September 20. Occupation of Balaklava by the allies, Sep- tember 28. Bombardment of Sebastopol begins, October 17. Battle of Balaklava, October 25 ; of Inkerman, November 5. Death of Charles Kemble, November 12 (born, 1775). Death of Lockhart, November 25 (born, 1794). Treaty of alliance betwcen Austria, England, and France, December 2. Dogma of the Immaculate Con- ception promulgated at Rome, December 8. Lake dwellings dis- covered in Switzerland. Armstrong gun made. Murchison's Siluria published. George Sand's Histoire de ma Vie.

1855. Sardinia joins the allies, January 26. The Palmerston ad- ministration in office, February 6. Death of the emperor Nicholas of Russia, March 2. Defeat of the Taepings at Canton, March 6. Death of Charlotte Bronté, March 31 (born, 1816). Universal Ex- hibition opened at Paris, May 15. Newspaper stamp abolished in Great Britain, June 15. Death of Lord

Raglan, June 28 (born, 1788). Death of Sir W. E. Parry, July 8 (born, 1790). Battle of the Tchernaya, August 16. Concordat between Austria and the Holy See, August 18. Storming of the Malakoff and Redan, Sep- tember8 ; southside of Sebastopolevacuated by the Russians. Defeat of the Russians before Kars, September 29. Death of Sir William Molesworth, October 22 (born, 1810). Capitulation of Kars to General Mouravieff, November 28. Visit of King Victor Emmanuel to Queen Victoria, November 30 to December 6. Death of Samuel Rogers, December 18 (born, 1762). Bessemer's process for manufacture of steel patented. Niagara Railway Suspension Bridge completed. Milman's Latin Christianity published. Tenny- son's Maud. Thackeray's The Newcomes. Satwrday Review begun.

1856. Vienna protocol as basis of peace with Russia signed, February 1. Annexation of Oudh to British India, February 7. Death of Heine, February 17 (born, 1800). Lord Canning governor-general of India, February 29. Free State Legislature in Kansas constituted, March 4. Treaty of Paris signed, March 30. Kansas refused admission into the Union, April1ll. Death of Sir William Hamilton, May 6 (born, 1788). Death of Augustin Thierry, May 21 (born 1795). Evacuation of the Crimea by allies, July 12. Death of Schumann, July 29 (born, 1810). Coronation of the czar, Alexander II., September 7. Seizure of a ''lorcha" under British flag by Chinese, October 8. Herat taken by Persians, October 18. War proclaimed against Persia by governor-general of India, November 1. Bombardment of Canton by British fleet, November 3. Death of Paul Delaroche, November 4 (born, 1797). Capture of the Bogue Forts, Canton, November 12, 13. Bushire taken by British force, December 10. Death of Hugh Miller, December 24 (born, 1802). Mrs Browning's Aurora Leigh pub- lished. Finlay's History of Greece. Froude's History of England, vol. i. (completed, 1869). Max Miller's Comparative Mythology.

1857. Assassination of the archbishop of Paris (Sibour), January 8. Mutinies of Sepoy regiments at Barrackpore, Berhampore, and Lucknow, January-May. General Outram defeats Persians at Khooshab, February 8. Treaty of peace with Persia, March 4. James Buchanan president of United States, March 4. Abo- lition of the Sound dues, March 14. Mutiny of Sepoys at Mecrut, May 10,11. The mutineers at Delhi, May 11. Mutiny at Lucknow, May 30. Mutineers under Nana Sahib repulsed at Cawnpore by Sir Hugh

Wheeler, June 7. Death of Douglas Jerrold, June 8 (born, 1803). Capitulation of Europeans at Cawnpore to Nana Sahib, June 25. Massacre of women and children at Cawn- pore, July 15. Death of Béranger, July 16 (born, 1780). General Havelock enters Cawnpore, July 17. Death of Eugene Sue, August 3 (born, 1804). Visit of Napoleon III. and the empress to Queen Victoria, August 8. Attempt to lay first Atlantic telegraph cable fails, August 11. Death of Comte, September 5 (born, 1798). Delhi stormed by Generals Wilson and Nicholson, September 14-20. Relief of Lucknow by General Havelock, September 25. Meeting of Napoleon IlI. and Alexander II. at Stuttgart, Sep- tember 25. The garrison of Lucknow rescued by Sir Colin Campbell, November 22. Death of Sir Henry Havelock at Alumbagh, Nov- ember 25 (born, 1795). Bombardment and capture of Canton by English and French, December 28, 29. Civil war in Kansas, end of December. Social Science Association founded. Mont Cenis tunnel begun. Tregelles' edition of the Greck Testament, 1857- 1872. Livingstone's Missionary Travels published.

1858. Death of Marshal Radetzky, January 5 (born 1766). Orsini attempts to assassinate Napoleon III., January 14. Launch of the '' Great Eastern," January 31. Resignation of Lord Palmer- ston, February 20. The Derby ministry installed, February 27. The Livingstone expedition sails, March 10. Siege of Lucknow begins, March 8; the town taken, March 19-21. Minnesota ad- mitted a State of the Union, May 11. Capture of the Peiho forts by English and French, May 19. Great eruption of Vesuvius begins, May 21. Gwalior retaken by Sir Hugh Rose, and Sindia reinstated, June 19. Treaty of Tientsin concluded, June 26. Property qualification of members of parliament abolished by Act passed, June 28. Jews Relief Act passed, July 23. Visit of the Queen and the- Prince Consort to Napoleon III. at Cherbourg,

CHRONOLCEGE

'Hallam, January 21 (born, 1778).

[1855-1860.

August 4, 5. Death of George Combe, August 14 (born, 1788). Atlantie cable completed, and first message received, August 20. The Danubian

Principalities constituted, August 20. Commercial treaty between Great Britain and Japan signed, August 26. Government of India transferred from the Company to the Crown, September 1. Death of Robert Owen, November 17 (born about 1770). Trial of Count de Montalembert at Paris, November 25. Donati's comet discovered, June 2. Lake Victoria Nyanza dis- covered by Speke. First vol. of Buckle's Jntroduetion to the History of Civilization published (vol. ii., 1861). Tennyson's Idylis of the King (first series).. Carlyle's Frederick the Great (completed, 1865).

1859. Miramon president of Mexico, January6. Death of Henry Celebration of centenary of the birth of Burns, January 25. Death of W. H. Prescott, January 28 (born 1796). Oregon admitted a State of the Union, Feb- ruary 12. Ultimatum of Austria, demanding disarmament of Sardinia, April 23. Dcath of Dr Lardner, April 29 (born, 1793). Revolution at Florence, flight of the grand duke of Tuscany, April 27. Declaration of war against Austria by Victor Emmanuel, April 27. The Austrian army crosses the Ticino, April 29. Declaration of war against Austria by Napoleon III., May 3. Death of Alexander von Humboldt, May 6 (born, 1769). Battle of Montebello, May 20. Garibaldi occupies Como, May 27. Battle of Magenta, June 4. Death of David Cox, June 7 (born, 1783). Entry of Napoleon and Victor Emmanuel into Milan, June 8. Annexation of Lombardy to Sardinia proclaimed. Death of Prince Metternich, June 11 (born, 1773). Resignation of the Derby ministry, June 17. Palmerston ministry, June 20. Repulse of French and English squadron on the Peiho, June 24, 25. Battle of Solferino, June 24. Volunteer movement in England, June. Meeting of the Empcrors Francis Joseph and Napoleon III. at Villafranca, July 7. 'Treaty signed, July 11. Confiscation of Church property in Mexico by Juarez, July 13. Acts for estab- lishment of reserve forces of seamen and soldiers passed, August 13. Schamyl captured by the Russians, August 26. Concordat between Rome and Spain, August 26. Death of Leigh Hunt, August 28 (born, 1784). Death of Isambard K. Brunel, September 15 (born, 1806). Death of Robert Stephenson, October 12 (born, 1803). Negro insurrection at Harper's Ferry, Virginia, under John Brown, October 17 ; Brown hanged, December 2. Spain declares war against Marocco, October 22. Death of Ludwig Spohr, October 22 (born, 1784). Treaty of Zurich signed, November 10. Death of Washington Irving, November 28. Sardinian constitution pro- claimed, December 7. Death of De 'Quincey, December 8 (born, 1786). Death of

Lord Macaulay, December 28 (born, 1800). The Victoria Bridge, Montreal, opened. Lake Nyassa explored by Livingstone. George Eliot's Adam Bede published. Darwin's Origin of Species. Kwald's Geschichte des Volkes Israel eompleted. Sir. W. Hamilton's Leetures on Metaphysics (completed, 1861). Thackeray's Virginians. Cornhill Magazine established. —

1860. General Prim defeats the Moors at Castillejos, Janu- uary 1. Count Cavour president of the council in new king- dom of Italy, January 21. Treaty of commerce between Great Britain and France signed at Paris, January 23. Tetuan taken by O'Donnell, February 6. Death of Sir William Napier, Febru- ary 12 (born, 1785). Ultimatum of Great Britain sent to Chinese Government, March 8. Insurrection in Sicily, March15. Death of Mrs Jameson, March 17 (born, 1796). Annexation of Tuscany to Sardinia, March 22. Cession of Savoy and Nice to France by treaty of Turin, March 24. Treaty of peace between Spain and Marocco, April 26. Death of Theodore Parker, May 10 (born, 1810). Japanese embassy received at Washington, May 14. Palermo entered by Garibaldi, May 27. Transfer of Savoy and Nice to the French empire, June 14. First voyage of the '* Great Eastern" across the Atlantic, June 17 to 27. Battle of Melazzo, June 20. Massacres of Maronites by the Druses in Syria, May 21 and} July 9. Prince of Wales sails for Canada and the United States, July 9. Insurrection at Naples, August 17. Capture of the Taku forts by the allied French and English forces, August 21. Occupation of Tientsin, August 23. Garibaldi enters Naples, September 8, and proclaims Victor Emmanuel, September 9. The allies advance on Peking, September 9. Italian troops enter the States of the Church, September 11. Death of Schopenhauer, September 21 (born, 1787). Capitulation of Ancona to the Sar- dinians, September 29. Garibaldi defeats the Neapolitans at the Volturno, October 1. Summer palace of the emperor of China sacked by the French, October 6. | New constitution of Austrian empire established by imperial diploma, October 20. Treaty of peace signed at Peking, October 24. Death of the earl of Dundonald, October 30 (born, 1775). Annexation of the Two Sicilies to Sardinia announced, November 3. Annexation of territory on the Amur by Russia, November 14. Death of Baron Bunsen, Nov- ember 28 (born, 1791). Death of Dr Ferdinand Baur, Decem- ber 2 (born, 1792). Secession of South Carolina from the Union, December 20. Annexation of the Marches, Umbria, Naples, and Sicily to dominions of Victor Emmanucl, December

26. Spectrum analysis established by Bunsen and Kirchhoff. Discovery of oil-

th 4) 1 Tennayloer- or," first British ironclad Lora! L a) ews published. Mill's On January 2. Famine in North- 'sion of Mississippi from the . of Florida, Alabama, Georgia, _—February 1. Kansas admitted 29. Cession of Mentone and y 2. Confederate States con- rson Davis, February 4. Capture 'ebruary 13. First Italian parlia- , 18. New constitution of Austrian bruary 26. New Mexico admitted 2, Emancipation of the serfs in March 3. Abraham Lincoln presi- 4, Title of king of Italy conferred '7. Annexation of St Domingo to alment and capture of Fort Sumter, April 12,13. Secession of Virginia, Tey. ern ports, April 19. Secession of Arkansas, May 6, of Tennessee, May 8, of N. Carolina, May 20. eath of Count Cavour, June 6 (born, 1810). Paper duty in Great britain abolished by yevsed June 12. Confederate States recognized as belligk Great Britain and France, June 15 Death of Lord (eimyiel). Jems 23 (born, 1779). Abdul Aziz sultan 'i ath of Mrs Browning, June 29 (born, Mexico, June 3% Confederate congress 20 First battle of Bull Run (Manassas), Victoria and the Prince Consort to sting of Napoleon III. and the king , October 6. Seizure of Confederate ne British steamer ''Trent," Novem- sndered, December 28. Death of Father r 22 (bern, 1802). Italian ambassador leaves Te Davis elected president of Confede- vember 30. Death of the Prince Con-

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Suspension of cash pay- ments in Federal States, December 31. Post-Office Savings Banks opened in England. Storm warnings begun by Fitzroy.

Stanley’s Liastern. Chureh published. Hymns Ancient and Modern. Max Miiller’s Science of Language.

1862. Death of Biot, February 3 (born, 1774). Encounter between the ironclads ‘‘Merrimac” and ‘‘Monitor” in the James River, March 9, Earl of Elgin governor-general of India, March 12. Japanese embassy received by Napoleon I1I., April 13. France declares war on Mexico, April 16. Surrender of New Orleans to the Federals, April 24. Japanese embassy reaches England, April 30. Opening of International Exhibition, South Kensington, May 1 (closcd, November 1). Battle of Williamsburg, May 5. Ningpo taken by the allies, May 10. Death of Buckle, May 29 (born 1822). Battles on the Chickahominy (before Rich- mond), June 25 to July 1. Treaty of commerce between Great Britain and Belgium, July 23. Death of ex-president Van Buren, July 24 (born, 1782). The ‘‘Alabama’’ Confederate corvette sails from Liverpool, July 29. Garibaldi occupies Catania, August 20. Garibaldi defeated, wounded, and captured at Aspromonte, August 29. Second battle of Bull Run, August 30. Confederates invade Maryland, September 5, 6. Confederates

defeated at South Mountain, September 14; and at Antietam, September 17. Suspension of Habeas Corpus Act in United States, September 24. Abdication of Otho, king of Greece, October 24. Death of Uhland, November 13 (born, 1787). Battle of Fredericks- burg, December 13. Cotton Famine in Lancashire at its height in December. Herbert Spencer’s First Principles published. Helm- holtz’s Die Lehre von den Tonempfindungen.

1863. President Lincoln proclaims the Confederate States to be in rebellion, and declares their slaves free, January 1. Western Virginia admitted a State of the Union, January 1. Death of Horace Vernet, January 17 (born, 1789). Treaty of commerce between France and Italy, January 17. Ismael Pasha viceroy of Egypt, January 18. Insurrection in Poland, under Langiewicz, January 22; he is defeated, March 19. Rebellion: xf Maoris in New Zealand, January; they are defeated, July 17 and November 20. Marriage of the Prince of Wales with the Princess Alexandra of Denmark at Windsor, March 10. Prince William George of Den- mark elected king of Greece, March 18. Puebla taken by the French, March 31. Death of Sir G.

Cornewall Lewis, April 13 (born, 1806). Battle of Chancellorsville, General ‘‘Stonewall” Jackson mortally wounded, May 2 (died, May 9). Puebla, Mexico, entered by French under General Forey, May 17. Vicksburg attacked by General Grant, May 19 ; surrendered, July 4. Capture of Herat by Mahomed Khan, May 26. Death of Dost Mahomed, June 9. General Forcy enters the city of Mexico, June 10. Battles of Gettysburg, July 1-3. Death of Mulready, July 7 (born, 1786). Surrender of Port Hudson to the Federals, July 8. Empire of

Mexico proclaimed; Maximilian, archduke of Austria, elected emperor, July 10. Abolition of the Scheldt dues, July 16. Chattanooga occupied by Federals, September 10. Battle of Chicamauga, September 19, 20. Death of Jacob Grimm, September 20 (born, 1785). Death of Archbishop Whately, October 8 (born, 1787). Prince of Sonderburg-Glucksburg proclaimed king of Denmark as Christian IX., November 16. Prince Frederick of Augustenburg claims the duchies of Schleswig-Holstein, November 18. Battle of Chattanooga, defeat of Confederates, November 24. First Fenian Convention meets at Chicago, November 25. Death of Thackeray, December 24 (born, 1811). Colenso’s Pentatcuch critically ceamined published. George Eliot’s Romola, Renan’s Vie de Jésus.

1864. Sir John Lawrence viceroy of India, January 12. _Ger- man ultimatum presented to Denmark, January 16. Austro-Prus- sian army centers Holstein, January 21. Evacuation of the Danne- werk, February 6. Visit of Garibaldi to England, April 3-27. Seizure of Chincha Islands by Spain, April 14. Capture of Diippel by Prussians, April 18. Russian conquest of Circassia completed. Death of Mcyerbeer, May 2 (born, 1794). Suspension of hostilities in Schleswig, May 12. Death of N. Hawthorne, May 19 (born, 1804). Cession of Ionian Islands to Greece, May 28. Arrival of the emperor Maximilian in Mexico, May 29. The ‘‘ Alabama” sunk by the ‘‘ Kearsage,”’ off Cherbourg, June 19. Hostilities resumed in Denmark, June 26. Nanking taken from the Taepings, July 19; end of the rebellion. Repeal of Fugitive Slave Law, U.S., June 23. Belfast Orange riots, August 8-16. Occupation of Atlanta by Fede- rals, September 2. Evacuation of

Rome by the French in two years agreed to, September 15. Death of W. S. Landor, September 17 (born, 1775). Treaty of peace between Denmark, Prussia, and Austria signed at Vienna, October 30 (ratificd, November 16). Nevada admitted a State of the Union, October 31. Death of David Roberts, R.A., November 25 (born, 1796). Savannah occupied by General Sherman, December 21. Geneva Convention for relief of the wounded in war originated. Dynamite introduced by Nobel. Tennyson's Znoch Arden published. Newman's Apologia pro Vita sua. Taine's Histotre de la Littérature Anglaise. ™

1865. Death of Proudhon, January 19 (born, 1809). Treaty of peace between Spain and Peru, January 25. Occupation of Charles- ton by General Gillmour, February 17. The first telegram received in London direct from Kurrachce, March 1. President Lincoln enters upon second term of office, March 4. Death of Cobden, April 2 (born, 1804). Lichmond entered by General Grant, April 3. Surrender of General Lee, April 9. Assassination of President Lincoln, April 14 ; vice-president Andrew Johnson succeeds him, April 15. Paraguay declares war on Argentine Confederation, April 16. Alliance between Brazil, Uruguay, and Argentine Con- federation, May 1. Capture of President Davis, May 10, and end of American war, Italian seat of government transferred to Florence, May 11. Death of Isaac Taylor, June 28 (born, 1786). Death of Professor Aytoun, August 4 (born, 1813). Death of Sir William J. Hooker, August 12 (born, 1785). Convention of Gastein, re- specting Danish duchies, August 14. Navigation treaty between Great Britain and Prussia, August 16. Rinderpest in England, July—October. Arrest of Fenian leaders in Ireland, September 15. Negro riots at Morant Bay, Jamaica, October 11. Death of Lord Palmerston, October 18 (born, 1784). Earl Russell first lord of the treasury, October 19. Leopold II. king of the Belgians, December 10. Commercial treaty between Great Britain and Austria, December 16. Slavery abolished in United States, December 18. Death of Frederika Bremer, December 31 (born, 1802). Lecky's Rise and Influence of Rationalism published. Pusey's Hirenicon.

1866. Suspension of Habeas Corpus Act in Ireland, February 17, Death of Dr Whewell, March 6 (born, 1794). Death of Keble, March 29 (born, 1792). Alliance between Prussia and Italy signed, March 27. Bombardment of Valparaiso by Spanish fleet, March 31. Civil Rights Bill passed by U.S.

Congress, April12. Prince Charles of Hohenzollern elected hospodar of Roumania, April 15. Suspen~ sion of Bank of England Charter Act, May 11. Fenian raids into Canada, May 31 and June 7. Suspension of Habeas Corpus Act in Canada, June 8. Prussia withdraws from Germanic Confederation, June 14. Prussians enter Saxony and Hanover, June15. Austria declares war, June 17; Prussia, June 18; Italy, June 20. Italians defeated at Custozza, June 24. Resignation of the Russell ministry, | June 26. Surrender of Hanoverian army, June 29. Prussians defeat' Austrians at Sadowa (Koniggratz), July 3. Austria cedes Venetia to France, July 5. The Derby ministry entcr office, July 6.' Occupation of Frankfort by Prussians, July 16. Battle of Lissa, July 20. Preliminaries of peace signed at Nikolsburg, July 26. Insurrection in Crete, August. Treaty of peace between Austria and. Prussia signed at Prague, August 23. 'Treaty of peace between Austria and Italy signed at Vienna, October 3. North German Confederation formed, August-October. Venetia united to Italy, November 4. Rome evacuatcd by the French, December 3-11. Ecce Homo published. Swinburne's Poems and Ballads.

1867. Death of Victor Cousin, January 14(born, 1792). Schleswig- Holstein incorporated with Prveei+, January 24. Hungarian con-

1775). Occupation of Bucharest by Austrians, September 6. Landing of the allies in the Crimea, September 14. Battle of the Alma, September 20. Occupation of Balaklava by the allies, Sep- tember 28. Bombardment of Sebastopol begins, October 17. Battle of Balaklava, October 25 ; of Inkerman, November 5. Death of Charles Kemble, November 12 (born, 1775). Death of Lockhart, November 25 (born, 1794). Treaty of alliance between Austria, England, and France, December 2. Dogma of the Immaculate Con- ception promulgated at Rome, December 8. Lake dwellings dis- covered in Switzerland. Armstrong gun made. Maurchison's Siluria published. George Sand's Histoire de ma Vie.

1855. Sardinia joins the allies, January 26. The Palmerston ad- ministration in office, February 6. Death of the emperor Nicholas of Russia, March 2.

Defeat of the Taepings at Canton, March 6. Death of Charlotte Bronté, March 31 (born, 1816). – Universal Ex- hibition opened at Paris, May 15. Newspaper stamp abolished in Great Britain, June 15. Death of Lord Raglan, June 28 (born, 1788). Death of Sir W. E. Parry, July 8 (born, 1790). Battle of the I'chernaya, August 16. Concordat between Austria and the Holy See, August 18. Storming of the Malakoff and Redan, Sep- tember8 ; southside of Scbastopol evacuated bythe Russians. Defeat of the Russians before Kars, September 29. Death of Sir William Molesworth, October 22 (born, 1810). Capitulation of Kars to General Mouravieff, November 28. Visit of King Victor Emmanuel to Queen Victoria, November 30 to December 6. Death of Samuel Rogers, December 18 (born, 1762). Bessemer's process for manufacture of steel patented. Niagara Railway Suspension Bridge completed. Milman's Latin Christianity published. Tenny- son's Maud. Thackeray's The Newcomes. Saturday Review begun.

1856. Vienna protocol as basis of peace with Russia signed, February 1. Annexation of Oudh to British India, February 7. Death of Heine, February 17 (born, 1800). Lord Canning governor-general of India, February 29. Free State Legislature in Kansas constituted, March 4. Treaty of Paris signed, March 30. Kansas refused admission into the Union, April 11. Death of Sir William Hamilton, May 6 (born, 1788). Death of Augustin Thierry, May 21 (born 1795). Evacuation of the Crimea by allies, July 12. Death of Schumann, July 29 (born, 1810). Coronation of the czar, Alexander 11]., September 7. Seizure of a ''lorcha" under British flag by Chinese, October 8. Herat taken by Persians, October 18. War proclaimed against Persia by governor-general of India, November 1. Bombardment of Canton by British flect, November 8. Death of Paul Delaroche, November 4 (born, 1797). Capture of the Bogue Forts, Canton, November 12, 18. Bushire taken by British force, December 10. Death of Hugh Miller, December 24 (born, 1802). Mrs Browning's Aurora Leigh pub- lished. Finlay's History of Greece. Froude's History of England, vol. i. (completed, 1869). Max Miller's Comparative Mythology.

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March 4. Abo- lition of the Sound dues, March 14. Mutiny of Sepoys at Meerut, May 10,11. The mutineers at Delhi, May 11. Mutiny at Lucknow, May 30. Mutineers under Nana Sahib repulsed at Cawnpore by Sir Hugh Wheeler, June 7. Death of Douglas Jerrold, June 8 (born, 1803). Capitulation of Europeans at Cawnpore to Nana Sahib, Junc 25. Massacre of women and children at Cawn- pore, July 15. Death of Bévanger, July 16 (born, 1780). General Havelock enters Cawnpore, July17. Death of Eugéne Sue, August 3 (born, 1804). Visit of Napoleon III. and the empress to Queen Victoria, August 8. Attempt to lay first Atlantic telegraph cable fails, August 11. Death of Comte, September 5 (born, 1798). Delhi stormed by Generals Wilson and Nicholson, September 14-20. Relief of Lucknow by General Havelock, September 25. Meeting of Napoleon III. and Alexander II. at Stuttgart, Sep- tember 25. The garrison of Lucknow rescued by Sir Colin Campbell, November 22. Death of Sir Henry Havelock at Alumbagh, Nov- ember 25 (born, 1795). Bombardment and capture of Canton by English and French, December 28, 29. Civil war in Kansas, end of December. Social Science Association founded. Mont Cenis tunnel begun. Tregelles' edition of the Greek Testament, 1857- 1872. Livingstone's Missionary Travels published.

1858. Death of Marshal Radetzky, January 5 (born 1766). Orsini attempts to assassinate Napoleon III., January 14. Launch of the " Great Eastern," January 31. Resignation of Lord Palmer- ston, February 20. The Derby ministry installed, February 27. The Livingstone expedition sails, March 10. Siege of Lucknow begins, March 8; the town taken, March 19-21. Minnesota ad- mitted a State of the Union, May 11. Capture of the Peiho forts by English and French, May 19. Great eruption of Vesuvius begins, May 21. Gwalior retaken by Sir Hugh Rose, and Sindia reinstated, June 19. Treaty of Tientsin concluded, June 26. Property qualification of members of parliament abolished by Act passed, June 28. Jews Relief Act passed, July 23. Visit of the Queen and the Prince Consort to Napoleon III. at Cherbourg,

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1861-1867.]

wells in Pennsylvania. The ‘‘ Warrior,” first British ironclad steamer launched. Essays and Reviews published. Mill’s On Liberty.

1861. William I. king of Prussia, January 2. Famine in North- western provinces of India. Secession of Mississippi from the Union, January 9; followed by that of Florida, Alabama, Georgia, Louisiana, and Texas, January 10-February 1. Kansas admitted a State of the Union, January 29. Cession of Mentone and Roquebrune to France, February 2. Confederate States con- stituted under presidency of Jefferson Davis, February 4. Capture of Gaeta by General Cialdini, February 13. First Italian pavrlia- ment meets at Turin, February 18. New constitution of Austrian empire decreed by patent, February 26. New Mexieo admitted a State of the Union, March 2. Emancipation of the serfs in Russia decreed by the Czar, March 3. Abraham Lincoln presi- dent of United States, March 4. Title of king of Italy conferred on Victor Emmanuel, March 17. Annexation of St Domingo to Spain, March 18. Bombardment and capture of Fort Sumter, Charleston, by Confederates, April 12,13. Secession of Virginia, April 17. Blockade of Southern ports, April 19. Secession of Arkansas, May 6, of Tennessee, May 8, of N. Carolina, May 20. Death of Count Cavour, June 6 (born, 1810). Paper duty in Great Britain abolished by Act passed June 12. Confederate States recognized as belligerents by Great Britain and France, June 15 Death of Lord Campbell, June 23 (born, 1779). Abdul Aziz sultan of the Ottomans, June 25. Death of Mrs Browning, June 29 (born, 1809). Juarez president of Mexico, Junc 3%. Confederate eongress sitsat Richmond, Va., July 20. First battle of Bull Run (Manassas), July 21. Visit of Queen Victoria and the Prince Consort to freland, August 21-29. Meeting of Napoleon IIT. and the king of Prussia at Compitgne, October 6. Seizure of Confederate commissioners on board the British steamer ‘‘Trent,’’ Novem- ber 8; they are surrendered, December 28. Death of Father Lacordaire, November 22 (born, 1802). Italian ambassador leaves Madrid, November

26. Jefferson Davis elected president of Confede- rate States for six years, November 30. Death of the Prince Con- sort, December 14, (born, 1819). Ningpo taken by the Taepings, December 23. Principality of Roumania formed by union of Moldavia and Wallachia, December 23. Suspension of cash pay- ments in Federal States, December 31. Post-Office Savings Banks opened in England. Storm warnings begun by Fitzroy. Stanley's Eastern Church published. Hymns Ancient and Modern. Max Miiller's Science of Language.

1862. Death of Biot, February 8 (born, 1774). Encounter between the ironclads ''Merrimac" and ''Monitor" in the James River, March 9. Earl of Elgin governor-general of India, March 12. Japanese embassy received by Napoleon 111., April 13. France declares war on Mexico, April 16. Surrender of New Orleans to the Federals, April 24. Japanese embassy reaches England, April 30. Opening of International Exhibition, South Kensington, May 1 (closed, November 1). Battle of Williamsburg, May 5. Ningpo taken by the allies, May 10. Death of Buckle, May 29 (born 1822). Battles on the Chickahominy (before Rich- mond), June 25 to July 1. Treaty of commerce between Great Britain and Belgium, July 23. Death of ex-president Van Buren, July 24 (born, 1782). The ''Alabama'' Confederate corvette sails from Liverpool, July 29. Garibaldi occupies Catania, August 20. Garibaldi defeated, wounded, and captured at Aspromonte, Angust 29. Second battle of Bull Run, August 30. Confederates invade Maryland, September 5, 6. Confederates defeated at South Mountain, September 14; and at Antietam, September 17. Suspension of Habeas Corpus Act in United States, September 24. Abdication of Otho, king of Greece, October 24. Death of Uhland, November 13 (born, 1787). Battle of Fredericks- burg, December 13. Cotton Famine in Lancashire at its height in December. Herbert Spencer's First Principles published. Helm- holtz's Die Lehre von den Tonempfindungen.

1863. President Lincoln proclaims the Confederate States to be in rebellion, and declares their slaves free, January 1. Western Virginia admitted a State of the Union, January 1. Death of Horace Vernet, January 17 (born, 1789). Treaty of commerce between France and Italy, January 17. Ismael Pasha viceroy of Egypt, January 18. Insurrection in Poland, under Langiewicz, January 22; he is defeated, March 19. Rebellion: xf Maorisin New Zealand,

January; they are defeated, July 17 and November 20. Marriage of the Prince of Wales with the Princess Alexandra of Denmark at Windsor, March 10. Prince William George of Den- mark elected king of Greece, March 18. Pucbla taken by thie French, March 31. Death of Sir G. Cornewall Lewis, April 13 (born, 1806). Battle of Chancellorsville, General “Stonewall” Jackson mortally wounded, May 2(died, May 9). Puebla, Mexico, entered by French under General Forey, May 17. Vicksburg

attacked by General Grant, May 19 ; surrendered, July 4. Capture of Herat by Mahomed Khan, May 26. Death of Dost Mahomed, June 9. General Forey enters the city of Mexico, June 10. Battles

of Gettysburg, July 1-3. Death of Mulready, July 7 (born, 1786).

Surrender of Port Hudson to the Federals, July 8. Empire of |

Mexico proclaimed; Maximilian, archduke of Austria, elected emperor, July 10. Abolition of the Scheldt dues, July 16. Chattanooga occupied by Federals, September 10. Battle of Chicamauga, September 19, 20. Death of Jacob Grimm, September 20 (born, 1785). Deathof Archbishop Whately, October 8 (born, 1787). Prince of Sonderburg-Glucksburg proclaimed king of Denmark as Christian IX., November 16. Prince Frederick of Augustenburg elaims the duchies of Schleswig-Holstein, November 18. Battle of Chattanooga, defeat of Confederates, November 24. First Fenian Convention meets at Chicago, November 25. Death of Thackeray, December 24 (born, 1811). Colenso’s Pentateuch critically examined published. George Eliot’s Romola. Menan’s Vie de Jésus.

1864. Sir John Lawrence viceroy of India, January 12. _Ger- man ultimatum presented to Denmark, January 16. Austro-Prus- sian army enters Holstein, January 21. Evacuation of the Danne- werk, February 6. Visit of Garibaldi to England, April 3-27. Seizure of Chincha Islands by Spain, April 14. Capture of Diippel by Prussians, April 18. Russian conquest of Circassia completed. Death of Meyerbeer, May 2 (born, 1794). Suspension

of hostilities in Schleswig, May 12. Death of N. Hawthorne, May 19 (born, 1804). Cession of Ionian Islands to Greece, May 28. Arrival of the emperor Maximilian in Mexico, May 29. The ‘‘ Alabama” sunk by the ‘‘ Kearsage,’’ off Cherbourg, June 19. Hostilities resumed in Denmark, June 26. Nanking taken from the Taepings, July 19 ; end of the rebellion. Repeal of Fugitive Slave Law, U.S., June 23. Belfast Orange riots, August 8-16. Occupation of Atlanta by Fede- tals, September 2. Evacuation of Rome by the French in two years agreed to, September 15. Death of W. S. Landor, September 17 (born, 1775). Treaty of peace between Denmark, Prussia, and Austria signed at Vienna, October 30 (ratified, November 16). Nevada admitted a State of the Union, October 31. Death of David Roberts, R.A., November 25 (born, 1796). Savannah occupied by General Sherman, December 21. Geneva Convention for relief of the wounded in war originated. Dynamite introduced by Nobel. Tennyson’s Hnoch Arden published. Newman’s Apologia pro Vita sua. ‘Taine’s Histoire de la Littérature Anglaise.

1865. Death of Proudhon, January 19 (born, 1809). Treaty of peace between Spain and Peru, January 25. Occupation of Charles- ton by General Gillmour, February 17. The first telegram received in London direct from Kurrachee, March 1. President Lincoln enters upon second term of office, March 4. Death of Cobden, April 2 (born, 1804). Richmond entered by General Grant, April 3. Surrender of General Lee, April 9. Assassination of President Lincoln, April 14; vice-president Andrew Johnson succeeds him, April 15. Paraguay declares war on Argentinc Confederation, April 16. Alliance between Brazil, Uruguay, and Argentine Con- federation, May 1. Capture of President Davis, May 10, and end of American war. Italian seat of government transferred to Florence, May 11. Death of Isaac Taylor, June 28 (born, 1786). Death of Professor Aytoun, August 4 (born, 1813). Death of Sir William J. Hooker, August 12 (born, 1785). Convention of Gastein, re- specting Danish duchies, August 14. Navigation treaty between Great Britain and Prussia, August 16. Rinderpest in England, July—October. Arrest of Fenian leaders in Ireland, September 15. Negro riots at Morant Bay, Jamaica, October 11. Death of Lord Palmerston, October 18 (born, 1784). Earl Russell first lord of the treasury, October 19. Leopold II. king of the Belgians, December 10. Commercial treaty between Great Britain and Austria, December 16. Slavery abolished in United States, December 18.

Death of Frederika Bremer, December 31 (born, 1802). Lecky's Kise and Influcnce of Rationalism published. Pusey's Hirenicon.

1866. Suspension of Habeas Corpus Act in Ireland, February 17. Death of Dr Whewell, March 6 (born, 1794). Death of Keble, March 29 (born, 1792). Alliance between Prussia and Italy signed, March 27. Bombardment of Valparaiso hy Spanish fleet, March 31. Civil Rights Bill passed by U.S. Congress, April 12. Prince Charles of Hohenzollern elected hospodar of Roumania, April 15. Suspcen- sion of Bank of England Charter Act, May 11. Fenian raids into Canada, May 81 and June 7. Suspension of Habeas Corpus Act in Canada, June 8. Prussia withdraws from Germanic Confederation, June 14. Prussians enter Saxony and Hanover, June1l5. Austria declares war, June 17; Prussia, June 18 ; Italy, June 20. Italians defeated at Custozza, June 24. Resignation of the Russell ministry, . June 26. Surrender of Hanoverian army, June 29. Prussians defeat' Austrians at Sadowa (Koniggratz), July 3. Austria cedes Venetia to France, July 5. The Derby ministry cnter office, July 6.' Occupation of Frankfort by Prussians, July 16. Battle of Lissa, July 20. Preliminaries of peace signed at Nikolsburg, July 26. Insurrection in Cretc, August. Treaty of }:eace between Austria and Prussia signed at Prague, August 23. 'Treaty of peace between Austria and Italy signed at Vienna, October 3. North German Confederation formed, August-October. Venetia united to Italy, November 4. Rome evacuated by the French, December 3-11. Ecce Homo published. Swinburne's Poems and Ballads.

1867. Death of VictorCousin, January 14 (born, 1792). Schleswig- Holstcin incorporated with Prvesio, January 24. Hungarian con-

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Assembly meets at Bordeaux, February 12. M. Thiers chief of the exeeutive, February 17. Preliminaries of peace signed, February 26 ; ratified, March 1. Paris entered by Germans, March 1; evacuated, March 3. Communist revolution at Paris, March 18. National Assembly meets at Versailles, March 20. The commune proclaimed at Paris, March 28. Capture of Herat, by Yakoob Khan, son of Shere Ali, May 6. Treaty of Washington,

May 8 (ratified, May 24). Definitive treaty of peace between Franee and Germany, May 10 (ratified, May 21). Trial of the Tichborne case in Common Pleas begins, May 11; ends, March 6, 1872. Death of Sir John Herschel, May 11 (born, 1792). Death of Auber, May 13 (born, 1784). Paris entered by Versailles army, May 22, The Tuileries, Louvre, Palais Royal, &c., burnt by communists, May 24. Archbishop of Paris shot, May 24. End of insurrection, May 28. Seat of Italian Government transferred to Rome, July 1. M. Thiers appointed president of the republic, August 31. Purchase system in British army abolished by Royal Warrant, July 20, Death of Paul de Kock, August (born, 1794). Formal opening of Mont Cenis tunnel, September 17. Slave emancipation bill passed by senate of Brazil, September 27. Chicago burnt, October 8-10. Alabama Arbitration Commission meets at Geneva, December 18 (award signed, September 14, 1872). British Columbia incorporated with Dominion of Canada. Darwin's Descent of Man published. George Eliot's Middlemarch.

1872. Assassination of Lord Mayo in the Andaman Islands, February 8 (born, 1822). Lord Northbrook viceroy of India, February 22. Death of Giuseppe Mazzini, March 10, (born, 1805). Dutch possessions on the Gold Coast transferred to Great Britain, April 6. Carlist insurrection in Spain, April 22. Great eruption of Vesuvius, April 24-May 1. Expulsion of Jesuits by German Reichstag, June 19. Death of President Juarez, July 18 (born, 1809). The Ballot Act passed by English parliament, July 18. Extradition treaty between Great Britain and Belgium concluded, July 31. Japanese embassy arrives in England, August 17. Riots at Belfast, August 16-22. Death of Dr Merle d'Aubigné, October 19 (born, 1794). Public gaming tables, Baden-Baden, closed, October 31. Commercial treaty between France and England, November 5. Island of San Juan evacuated by British troops, according to award of German Emperor, November 22,

1873, Death of Napoleon III. at Chiselhurst, January 9. Death of Lord Lytton, January 18 (born, 1805), Abdication of King Amadeus of Spain, February 11. Republican government adopted by the Cortes. General Grant president of United States (second term), March 4. International exhibition at Vienna opened, May 1. Death of Dr Livingstone, in Central Africa, May 4, (born 1813). Death of John Stuart Mill, May 8 (born, 1806). Resignation of M. Thiers; Marshal Macmahon president of the French Republic,

May 24. Autonomy of Egypt conceded by the sultan, June 8. Khivataken by Russians, June 10, The Ashantees defeated by the English at Elmina, June 13, Visit of the shah of Persia to England, June 18-July 5. First reception of foreign ministers by emperor of China at Pekin, June 29. Communist rising in Spain, July 10. Insurrection at Cartagena, July 14. Don Carlos re-enters Spain, July 16. New treaty of commerce between England and France signed, July 23. Payment of Alabama indemnity by England, September 9, Evacuation of French territory by Germans, September 16. Death of Sir Edwin Landseer, October 1 (born, 1802). Trial of Marshal Bazaine begins, October 6; he is sentenced, December 10. Encyclical letter of Pius IX. against ‘‘Old Catholics,” November 21. Dutch expedition lands at Atchin, November 28. Death of Agassiz, December 15 (born, 1807). Supreme Court of Judicature Act passed.

1874, Coup d’Etat at Madrid by General Pavia, J anuary 3. Marshal Serrano head of the new Government. Surrender of Carta- gena, January 12. Capture of Coomassie by Sir G. Wolseley, February 4. Death of Strauss, February 8, (born 1808). Resig- nation of the Gladstone ministry, February 17. Mr Disraeli prime minister, February 18, The Tichborne claimant, after 188 days trial, is found guilty of perjury, February 28. Death of Charles Sumner, March 11 (born, 1811). Visit of the czar to England, May 13-21. Death of Van de Weyer, May 23, (born 1802). Marshal Concha killed in engagement with Carlists near Estella, June 28. Spain declared in a state of siege, July 19. Escape of Marshal Bazaine from prison, August 9. Death of Guizot, Sep- tember 12 (born, 1787). Cession of Fiji Islands to England, September 30. Death of Tischendorf, December 7 (born, 1815). Prince Alphonso proclaimed king of Spain, December 30. Transit of Venus, December9. Toughened glassinvented. Supernatural Religion published.

1875. Deposition of the Gaikwar of Baroda, April 23. The Arctic expedition (‘‘Alert’’ and ‘‘Discovery’’) sails from Portsmouth, May 29. Great floods at Toulouse, June 24; and at Buda, June 26. Citadel of Seo d’ Urgel, last Carlist fortress in Catalonia, surrendered, August 27. Occupation of Khokand by Russians, September 16. Prince of Wales sets out on visit to India, October 11. Purchase by England of Khedive’s shares in Suez Canal announced, Novem- ber 26. Tennyson’s Queen Mary published. (W. L, R. C.)

stitution restored, February 7. First passage of a ship through the Suez Canal, February 17. Fenian agitation in Ireland, Feb- ruary~March. Nebraska admitted a State of the Union, March 1. Cession of Russian America to United States, March 13. Evacua- tion of Mexico by the French, March 16. International Exhibition at Paris opened, April 1 (closed, November 3). Dominion of Canada constituted, March 29. Coronation of the empcror and empress of Austria as king and queen of Hungary, at Pesth, June 8. The Livingstone search expedition sails from England, June 9. The emperor Maximilian of Mexico shot at Queretaro, June 19. North German constitution promulgated, June 25. Sultan visits Paris, June 30; London, July 12. New Reform Bill passed for England, August 15 (for Scotland and Ireland, July 13, 1868). Death of Faraday, August 25 (born, 1791). Prussian garrison withdrawn from Luxembourg, September 8. First detachmentfof British expedition against Abyssinia leaves Aden, September 28. Juarez re-elected president of Mexico, October. Garibaldi occupies Monte Rotondo, and threatens Rome, October 26. French troops euter Rome, October 30. Italian troops pass Roman frontier, October 380, Garibaldi defeated at Mentana, November 3 ; arrested, November 4. Annexation of Cochin China to France. Chaucer Society established in London. First vol. of Freeman's Norman Conquest published (completed, 1876).

1868. Death of Brewster, February 10 (born, 1781.) Occupation of Asuncion, Paraguay, by the allies, February 21. Resignation of Lord Derby, February 25, Impeachment of President Johnson, February 25. Magdala bombarded and taken by Sir R. Napier, King Theodore killed, April 13. Death of Marshal Narvaez, April 23 (born, 1800), Death of Lord Brougham, May 7 (born, 1779). Samarcand occupied by Russians, May 14, Death of ex- president Buchanan, June 1 (born, 1791). Prince Michael III. of Servia assassinated at Belgrade, June 10; Milan Obrenovich

roclaimed prince, July 2, Humaita evacuated by Paraguayans,

une 25. Cabul recovered by Shere Ali, August 14. Insurrection in Spain, September 18. Death of Dean Milman, September 24 (born, 1791.) Battle of Alcolea, September 28. Queen Isabella leaves Spain, September 30, General Prim received at Madrid, October 7. Death of Rossini, November 13 (born, 1792). Resig- nation of Disraeli, December 2, The Gladstone

ministry in office, December 9. Paraguayan army defeated and destroyed at Villeta, December 11. Lord Mayo, governor-general of India, December 20,

1869. Death of Lamartine, February 28 (born, 1792). General Grant president of United States, March 4, | Hudson's Bay Territory ceded to the crown, April 9. Marshal Scrrano regent of Spain, June 18, Irish Church Disestablishment Act passed, July 26. Valencia seized by Republicans, October 11; stormed by Government troops, October 16. Death of Sainte-Beuve, Oct 13 (born, 1804). Death of the earl of Derby, October 23 (born, 1799). Formal opening of the Suez Canal, November 17. Pacific Railway completed. Lecky's Lwropean Morals published.

1870. President Lopez, of Paraguay, defeated and _ killed at. battle of Aquidaban, March 1, Death of Charles Dickens, "une 9 (born, 1812), Abdication of Isabella II. of Spain, June 25. Spanish crown offered tq Prince Leopold of Hohenzollern- Sigmaringen, July 4, Proposal denqunced by French Government, July 6. Infallibility of the Pope voted by the Vatican Council, July 18, France declares war against Prussia, July 19. Abrogation of the concordat with Austria, July 30. The Irish Land Act passed, August 1, Attack on Saarbriick by the French, August 2. French defeated at Woerth and Speichern, August 6. Elementary Education Act for England and Wales passed, August 9. Fall of the Ollivier ministry in France, August 9; Count Palikao first minister. Defeat of French at Gravelotte, August 18. Battle of Sedan, September 1. Surrender of N apoleon to the king of Prussia; capitulation of the French army, September 2. Revolution at Paris. Republic proclaimed, September 4. Flight of the empress. Italian troops enter Papal territory, September 17. Paris invested by Germans, September 19. Rome occupied by Italian troops, September 20. Capi- tulation of Strasburg, September 28. Versailles the head- quarters of king of Prussia, October 5. Rome and the Papal States united to the kingdom of Italy, October 9. Qrleans taken by General Von der Tann, October 11. Death of General R. E. Lee, October 13 (born, 1808). Fall of Metz, October 28. Communist insurrection at Paris, October 31. Kussia throws off obligations of treaty of 1856 respecting neutrality of the Black Sea, October 31. Duke of Aosta elected king of Spain, November 16. Bavaria enters North German confederation, November 23. Death of Alexandre Dumas, December 5 (born, 1803). German empire declared, December 10. Tours surrendered,

but not occupied by Ger- mans, December 21. Marshal Prim shot at Madrid, December 28; died, 30. Mont Cenis tunnel completed.

1871. Le Mans occupied by Germans, January 12. King William of Prussia proclaimed emperor of Germany at Versailles, January 18. Battle of St Quentin, January 19. Bombardment of St. Denis begun, J anuary 21. Capitulation of Paris, January 28. The army of Bourbaki interned in Switzerland, February 1. National

chiefly used in determining Ks and WATCHES.

emia, Austria, situated on ‘the Elbe, about 63 miles oital of a circle, and has a five churches in the town, uchins, a high school, an _ Calico-printing is carried | 9400.

3.¢.), one of the greatest of Y in 280 Bc, at Soli, in yee he visited Athens,

to have been instructed in cademy by Arcesilaus and thor ofa prodigious number ely prolix and disfigured by of style and language, were earning and considerable me down to us except small 8 difficult to discover what to Chrysippus. We know, ijerable emendations on the s. With regard to the relation , ve reversed their conclusion, inc time became characteristic sm, that im of philosophy is to dis- ar man’s duty oth mY science that is of real imporsanee itt – Vy _sies is to be regarded merely as an aid to its study. = improved on the crude theory

of perception which had been held by his predecessors, who compared the action of the object on the mind to that of

the seal on the wax, arguing that this would do away with

the possibility of the simultaneous perception of more than

one object, and denying that the mental modification re- sembles the object. He also finally determined the Stoical

theory of the criterion of truth, which, according to him,

is irresistible conviction. Much attention was paid by Chrysippus to formal logic. He held that the hypothetical syllogism is the original type of syllogistic inference, and

he devoted the most elaborate study to its various forms.

He drew upa scheme of the categories,—making the highest Substance (76 troxeiwevov); the next, Form, or essential attribute ; the third, Variety, or that non-essential attribute

which is at the sauie time independent ofall but the object

itself; the fourth, Variety of Relation, or that non-essential attribute which depends on the relation of the object to

some other object. Chrysippus also gave some attention

to linguistic, and especially to grammatical investigations.

The explanation of the universe adopted by Chrysippus

is that of the rest of his school. The real is the corporeal ; man and the world are all that exists. In each there is

that which is inert, and also the informing soul or vivifying

fire. The soul of the universe is God, or Destiny. Each

human soul is part of the universal soul, in which, according

to the view originated by Chrysippus, the souls of all, except

the wise, are again swallowed up at death. The universe

is perfect. So-called physical evil is none. Moral evil

is the necessary complement of good, and is turned by Providence into good. All is the result of perfect law.

Yet Chrysippus employed all his subtilty to establish the freedom of the will. Another inconsistency was his reliance on divination, which he strove to explain on a theory of

natural causation. regarded as ‘symbolical myths; and of many of them he attempted ingenious explanations.

In morals Chrysippus somewhat modified the extreme theory of the earli¢r Stoics. He admitted between the good

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and the bad a third class of things—the indifferent, and even avowed that it is foolish not to desire health, and riches, and honour. In practice a man of unsullied purity, he felt bound to conclude, from the theory that th lower animals live according to nature, that incest and many other crimes, and acts so repulsive as the devouring of the bodies of the dead, are natural, and therefore not to be blamed.

See Diogenes Laertius; Plutarch, De Stoicorwm Repugnantiis; Petersen, Philosophice Chrysinpece “Fundamenta (Altona, 1827); Baguet, Commentatio de Chrysippi vita, doctrina, et reliquiis (Louvain, 1822); Hagedorn, Moralia Chrysippea (1685) ; Richter, De Chrysippo Stoico fastuoso (\eipsic, 1738); Zeller, Stoics, Epicu- rears, and Sceptics.

CHRYSOLORAS, Manuen (c, 1355-1415), a learned Greek who was instrumental in spreading Greek literature in the West, was born at Constantinople, about 1355, of a distinguished family, which had removed with Constantine to Byzantium. While still very young, he was sent by the emperor John Paleologus to implore the aid of the Christian princes against the Turks. After several years he returned to Constantinople ; but at the invitation of the magistrates of Florence, about the year 1395, he became pro- fessor of the Greek language i in that city, where he taught three years. Having visited Milan and Pavia, and resided for several years at Venice, he went to Rome upon the invitation of Aretino, who had been his disciple, and was then secretary to Gregory XII. In 1408 he was sent to Paris on an

important mission from Manuel Palologus, the Greek emperor. In 1413 he was appointed by Pope Martin V. on an embassy to the Emperor Sigismund, of which the object was to fix a place for the assembling of 2 general council. It was decided that the meeting should take place at Constance ; and Chrysoloras was on his way thither, having been chosen to represent the Greek church, when he died suddenly on the 15th of April 1415. Ouly two of his works have been! printed, viz., his Hrotemata, which was for some time the only grammar in use in the West, and Hpistole IJI, de comparatione veteris et nove Rome ; but many others exist in MS.

CHRYSOSTOM, Str Joun (Xpvodoropos, golden-mouth- ed), the most famous of the Greek fathers, was born of a noble family at Antioch, the capital of Syria, most probably about 347. At the school of Libanius the sophist he gave early indications of his mental powers, and would have been the successor of his heathen master, had he not been, to use the expression of his teacher, stolen away to a life of piety (like Augustine, Gregory of Nazianzus, and Theodoret), by the influence of his pious mother Anthusa. Imme- diately after his baptism by Meletius, the bishop of Antioch, he gave up all his forensic prospects, and buried himself in an adjacent desert, where for six years he spent a life of ascetic self-denial and study. His infirmities, however, compelled him to return to the world ; and thu authority of Meletius gained his services to the church. On his arrival he was ordained deacon in his thirty-fifth year (381), and afterwards presbyter at Antioch. Ou the death of Nectarius he was appointed archbishop of Con- stantinople by Eutropius, the favourite minister of the Emperor Arcadius. He had, ten years before this, only escaped promotion to the episcopate bya very questionable stratagem,—wlfich, however, he defends in his instructive and eloquent treatise De Sacerdotio. As a presbyter, he won high reputation by his preaching at Antioch, more especially by his homilies on Zhe Statues, a course of sermons delivered when the citizens were justly alarmed at

The stories of the gods Chrysippus ; the prospect of severe measures being taken against them

by the Emperor Theodosius, whose statues had been © demolished in a riot.

On the archiepiscopal throne Chrysostom still persevered in the practice of monastic simplicity. The ample re

stitution restored, February 7. First passage of a ship through the Suez Canal, February 17. Fenian agitation in Ireland, Feb- ruary~March. Nebraska admitted a State of the Union, March 1. Cession of Russian America to United States, March 18. : Evacua- tion of Mexico by the French, March 16. Intcrnational Exhibition at Paris opened, April 1 (closed, November 3). Dominion of Canada constituted, March 29. Austria as king and queen of Hungary, at Pesth, June 8. Livingstone search expedition sails from England, June 9. The emperor Maximilian of Mexico shot at Queretaro, June 19. North German constitution promulgated, June 25. Sultan visits Paris, June 30; London, July 12. New Reform Bill passed for England, August 15 (for Scotland and Ireland, July 13, 1868).

The

president of Mexico, October. Garibaldi occupies Monte Rotondo, and threatens Rome, October 26. French troops enter Rome, October 30. Italian troops pass Roman frontier, October 30, Garibaldi defeated at Mentana, November 3 ; arrested, November 4.

Annexation of Cochin China to France. Chaucer Society established First vol. of Freeman’s Norman Conquest published

in London. (completed, 1876).

1868. Death of Brewster, February 10 (born, 1781.) Occnpation Resignation of

of Asuncion, Paraguay, by the allies, February 21. Lord Derby, February 25, Impcachinent of President Johnson, February 25. Magdala bombarded and taken by Sir R. Napier, King Theodore killed, April 13. Death of Marshal Narvaez, April 23 (born, 1800), Death of Lord Brougham, May 7 (born, 1779). Samarcand ocoupied by Russians, May 14. Death of ex- president Buchanan, June 1 (born, 1791). Prince Michael III. of Servia assassinated at

Belgrade, June 10; Milan Obrenovich proclaimed prince, July 2, Humaita evacuated by Paraguayans, June 25, Cabul recovered by Shere Ali, August 14. Insurrection in Spain, Septcinber 18. Death of Dean Milman, September 24 (born, 1791.) Battle of Alcolea, September 28. Queen Isabella Icaves Spain, September 30, General Prim received at Madrid, October 7. Death of Rossini, November 13 (born, 1792). Resig- nation of Disraeli, December 2. The Gladstone ministry in office, December 9. Paraguayan army defeated and destroyed at Villeta, December 11. Lord Mayo, governor-general of India, December 20,

1869. Death of Lamartine, February 28 (born, 1792). General Grant president of United States, March 4. Territory ceded to the crown, April 9, Marshal Serrano regent of Spain, June 18, Irish Church Disestablishment Act passed, July 26. Government troops, October 16. (born, 1804). Death of the earl of Derby, October 23 (born, 1799). Formal opening of the Suez Canal, November 17. completed. Lecky's Huropean Morals published.

1870.

at battle of Aquidaban, March 1, Death of Charles Dickens, "une 9 (born, 1812), Abdication of Isabella II. af Spain, June 25. Spanish erown offered ta Prince Leopold of Hohenzollern- Sigmaringen, July 4, Praposal denounced by French Government, July 6. — Infallibility of the Pope voted by the Vatican Council, July 18, France declares war against Prussia, July 19. Abrogation of the concordat with Austria, July 30. The Irish Land Act passed, August 1, Attack on Saarbriick by the French, August 2. French defeated at Woerth and Spcichern, August 6. Elementary Education Act for England and Wales passed, August 9. Fall of the Ollivier ministry in France, August 9; Count Palikao first minister. Defeat of Freuch at Gravelotte, August 18. Battle of Sedan, September 1. Surrender of Napoleon to the king of Prussia; capitulation of the French army, September 2. Revolution at Paris. Republic proclaimed, September 4. Flight of the empress. Italian troops enter Papal territory, September 17. Paris invested by Germans, September 19. Rome occupied by Italian troops, September 20, Capi- tulation of Strasburg, September 28. Versailles the head- quarters of king of Prussia, October 5. Rame and the Papal States united to the kingdom of Italy, October 9. Qrleans taken by General Von der Tann,

October 11. Death of General Kk. E. Lee, October 13 (born, 1808). Fall of Metz, October 28. Communist insurrection at Paris, October 31. Kussia throws off obligations of treaty of 1856 respecting neutrality of the Black Sea, October 31. Duke of Aosta elected king of Spain, November 16. Bavaria enters North German confederation, November 23. Death of Alexandre Dumas, December 5 (born, 1803). German empire declared, December 10. Tours surrendered, but not occupied by Ger- mans, December 21. Marshal Prim shot at Madrid, December 28; died, 30. Mont Cenis tunnel completed.

1871. Le Mans occupied by Germans, January 12. King William of Prussia proclaimed emperor of Germany at Versailles, January 18. Battle of St Quentin, January 19. Bombardment of S¢, Denis begun, January 21. Capitulation of Paris, January 28. The army of Bourbaki interned in Switzerland, February 1. National

CHRONOLOGY

Coronation of the emperor and empress of

Death of | The Tuileries, Louvre, Palais Rc

Faraday, August 25 (born, 1791). Prussian garrison withdrawn from Iuxembourg, September 8. First detachmentfof British expedition against Abyssinia leaves Adcn, September 28. Juarez re-elected

Hudson's Bay

Valencia seized by Republicans, October 11; stormed by Death of Sainte-Beuve, Oct 13 Pacific Railway

President Lopez, of Paraguay, defeated and killed

Assembly meets at Bordeaux, Fe executive, February 17. Prelimiz ratified, March 1. Paris entered i March 3. Communist revolutio Assembly meets at Versailles, Mai; at Paris, March 28. Capture oi

Shere Ali, May 6. 'Treaty of W. 24). Definitive treaty of peace May 10 (ratified, May 21). Common Pleas begins, May 11. of Sir John Herschel, May 11 (May 18 (born, 1784). Paris entey

May 24. Archbishop of Paris she

May 28. Seat of Italian Govern 1. M. Thiers appointed presi Purchase system in British army hic 20. Death of Paul de Kock, August of Mont Cenis tunnel, Septembe: | passed by senate of Brazil, Sep: October 8-10. Alabama Arbitratioy December 18 (award signed, Sv, Columbia incorporated with Domin of Man published. George Eliot's Mid

1872. Assassination of Lord Myyo in February 8 (born, 1822). Lord)% February 22. Death of Giuseppe] Dutch possessions on the Gold Coas April 6. Carlist insurrection in S of Vesuvius, April 24-May 1. E Reichstag, June 19. Death of Presid The Ballot Act passed by English pa treaty between Great Britain and Japanese embassy arrives in Englané August 16-

22. Death of Dr Merle 1794). Public gaming tables, Bad Commercial treaty between Franc Island of San Juan evacuated by Bri of German Emperor, November 22, La MLS

1873, Death of Napolcon III. at Chiselhurst, January 9. Death of Lord Lytton, January 18 (born, 1805), Abdication of King Amadeus of Spain, February 11. Republican government adopted by the Cortes. General Grant president of United States (second term), March 4. International exhibition at Vienna opened, May 1. Death of Dr Livingstone, in Central Africa, May 4, (born 1813). Death of John Stuart Mill, May 8 (born, 1806). Resigna- tion of M. Thiers; Marshal Macmahon president of the French Republic, May 24. Autonomy of Egypt conceded by the sultan, June 8. Khiva taken by Russians, June 10, The Ashantees defeated by the English at Elmina, June 13. Visit of the shah of Persia to England, June 18-July 5. First reception of foreign ministers by emperor of China at Pekin, June 29. Communist rising in Spain, July 10. Insurrection at Cartagena, July 14. Don Carlos re-enters Spain, July 16. New treaty of eommerce between England and France signed, July 23. Payment of Alabama indemnity by England, September 9. Evacuation of French territory by Germans, September 16. Death of Sir Edwin Landseer, October 1 (born, 1802). Trial of Marshal Bazaine begins, October 6; he is sentenced, December 10. Encyclical letter of Pius IX. against ‘‘ Old Catholics,” November 21. Dutch expedition lands at Atchin, November 28. Death of Agassiz, December 15 (born, 1807). Supreme Court of Judicature Act passed.

1874, Coup d’Etat at Madrid by General Pavia, January 3. Marshal Serrano head of the new Government. Surrender of Carta- gena, January 12. Capture af Coomassie by Sir G. Wolseley, February 4. Death of Strauss, February 8, (born 1808). Resig- nation of the Gladstone ministry, February 17. Mr Disraeli prime minister, February 18, The Tichborne claimant, after 188 days trial, is found guilty of perjury, February 28. Death of Charles Sumner, March 11 (born, 1811). Visit of the czar to England, May 13-21. Death of Van de Weyer, May 23, (born 1802). Marshal Concha killed in engagement with Carlists near Estella, June 28. Spain declared in a state of siege, July 19. Escape of Marshal Bazaine from prison, August 9. Death of Guizot, Sep- tember 12 (born, 1787). Cession of Fiji Islands to England, September 30. Death of Tischendorf, December 7 (born, 1815). Prince

Alphonso proclaimed king of Spain, December 30. Transit of Venus, December9. Toughened glassinvented. Supernatural Religion published.

1875. Deposition of the Gaikwar of Baroda, April 23. The Arctic expedition (‘‘Alert’’ and ‘‘Discovery’’) sails from Portsmouth, May 29. Great floods at Toulouse, June 24; and at Buda, June 26. Citadel of Seo d’Urgel, last Carlist fortress in Catalonia, surrendered, August 27. Occupation of Khokand by Russians, September 16. Prince of Wales sets out on visit to India, October 11. Purchase by England of Khedive’s shares in Suez Canal announced, Novem- ber 26. Tennyson’s Queen Mary published. (W. L. BR. C.)

CH R—

CHRONOMETER, a watch of special construction to measure time with great accuracy, chiefly used in determining the longitude at sea. See Crocks and WarTcuHEs.

CHRUDIM, a town in Bohemia, Austria, situated on the Chrudimka, a tributary of the Elbe, about 63 miles I.8.E. of Prague. It is the capital of a circle, and has a district court-house. There are five churches in the town, besides a monastery of the Capuchins, a high school, an infirmary, and an alins-house. Calico-printing is carried on to some extent. Population, 9400.

CHRYSIPPUS (c. 280-206 B.c.), one of the greatest of the Stoics, was born probably in 280 B.c., at Soli, in Cilicia. Being robbed of his property, he visited Athens, and attended the lectures, possibly of Zeno, and certainly of Cleanthes. The latter he succeeded as recognized chief of the school. He is also said to have been instructed in the doctrines of the Middle Academy by Arcesilaus and Lacydes. Chrysippus was the author of a prodigious number of works, which, though extremely prolix and disfigured by great obscurity and carelessness of style and language, were distinguished by extensive learning and considerable acuteness. But nothing has come down to us except small fragments, and from these it is difficult to discover what doctrines are originally due to Chrysippus. We know, however, that he made considerable emendations on the theory of Zeno and Cleanthes. With regard to the relation of moral to physical science, he reversed their conclusion, adopting the view, which from that time became characteristic of Stoicism, that, as the sole aim of philosophy is to dis- cover man’s duty, ethics is the

only science that is of real importance in itself, while physics is to be regarded merely as an aid to its study. He improved on the crude theory of perception which had been held by his predecessors, who compared the action of the object on the mind to that of the seal on the wax, arguing that this would do away with the possibility of the simultaneous perception of more than one object, and denying that the mental modification re- seinbles the object. He also finally determined the Stoical theory of the criterion of truth, which, according to him, is irresistible conviction. Much attention was paid by Chrysippus to formal logic. He held that the hypothetical syllogism is the original type of syllogistic inference, and he devoted the most elaborate study to its various forms. He drew up a scheme of the categories, making the highest Substance (76 trroxeiuevov); the next, Form, or essential attribute ; the third, Variety, or that non-essential attribute which is at the same time independent of all but the object itself; the fourth, Variety of Relation, or that non-essential attribute which depends on the relation of the object to some other object. Chrysippus also gave some attention to linguistic, and especially to grammatical investigations.

The explanation of the universe adopted by Chrysippus is that of the rest of his school. The real is the corporeal ; man and the world are all that exists. In each there is that which is inert, and also the informing soul or vivifying fire. The soul of the universe is God, or Destiny. Each human soul is part of the universal sou], in which, according to the view originated by Chrysippus, the souls of all, except the wise, are again swallowed up at death. The universe is perfect. So-called physical evil is none. Moral evil is the necessary complement of good, and is turned by Providence into good. All is the result of perfect law. Yet Chrysippus employed all his subtilty to establish the freedom of the will. Another inconsistency was his reliance on divination, which he strove to explain on a theory of natural causation. The stories of the gods Chrysippus

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and the bad a third class of things—the indifferent, and even avowed that it is foolish not to desire health, and riches, and honour. In practice a man of unsullied purity, he felt bound to conclude, from the theory that th lower animals live according to nature, that incest and many other crimes, and

acts so repulsive as the devouring of the bodies of the dead, are natural, and therefore not to be blamed.

See Diogenes Laertius; Plutarch, De Stoicorum Repugnantiis; Petersen, Philosophie: Chrysippee Fundamenta (Altona, 1827); Baguet, Commentatio de Chrysippi vita, doctrina, et reliquiis (Louvain, 1822); Hagedorn, Moralia Chrysippea (1685); Richter, De Chrystppo Stoico fastuoso (lueipsic, 1738); Zeller, Stoics, Hpicu- rears, and Sceptics.

CHRYSOLORAS, Manuen (c. 1355-1415), a learned Greek who was instrumental in spreading Greek literature in the West, was born at Constantinople, about 1355, of a distinguished family, which had removed with Constantine to Byzantium. While still very young, he was sent by the emperor John Paleologus to implore the aid of the Christian princes against the Turks. After several years he returned to Constantinople; but at the invitation of the magistrates of Florence, about the year 1395, he became pro- fessor of the Greek language in that city, where he taught three years. Having visited Milan and Pavia, and resided for several years at Venice, he went to Rome upon the invitation of Aretino, wlto had been his disciple, and was then secretary to Gregory XII. In 1408 he was sent to Paris on an important mission from Manuel Paleologus, the Greek emperor. In 1413 he was appointed by Pope Martin V. on an embassy to the Emperor Sigismund, of which the object was to fix a place for the assembling of a general council. It was decided that the meeting should take place at Constance ; and Chrysoloras was on his way thither, having been chosen to represent the Greek church, when he died suddenly on the 15th of April 1415. Only two of his works have been! printed, viz., his Hrotemata, which was for some time the only grammar in use in the West, and Lpistole III. de comparatione veteris et nove Rome ; but many others exist in MS.

CHRYSOSTOM, St Joun (Xpvodcropos, golden-mouthi- ed), the most famous of the Greek fathers, was born of a noble family at Antioch, the capital of Syria, most probably about 347. At the school of Libanius the sophist he gave early indications of his mental powers, and would have been the successor of his heathen master, had he not been, to use the expression of his teacher, stolen away to a life of piety (like Augustine, Gregory of Nazianzus, and Theodoret), by the influence of his pious mother

Anthusa. Imme- diately after his baptism by Meletius, the bishop of Antioch, he gave up all his forensic prospects, and buried himself in an adjacent desert, where for six years he spent a life of ascetic self-denial and study. His infirmities, however, compelled him to return to the world; and the authority of Meletius gained his services to the church. On his arrival he was ordained deacon in his thirty-fifth year (381), and afterwards presbyter at Antioch. On the death of Nectarius he was appointed archbishop of Constantinople by Eutropius, the favourite minister of the Emperor Arcadius. He had, ten years before this, only escaped promotion to the episcopate by a very questionable stratagem,—wlfich, however, he defends in his instructive and eloquent treatise De Sacerdotio. As a presbyter, he won high reputation by his preaching at Antioch, more especially by his homilies on Zhe Statues, a course of sermons delivered when the citizens were justly alarmed at

| the prospect of severe measures being taken against them

regarded as ‘symbolical myths; and of many of them he | by the Emperor Theodosius, whose statues had been |

attempted ingenious explanations. In morals Chrysippus somewhat modified the extreme theory of the earliér Stoics. Headmitted between the good

demolished in a riot. On the archiepiscopal throne Chrysostom still persevered in the practice of monastic simplicity. The ample re

venues which his predecessors hid consumed in pomp and luxury he diligently applied to the establishment of hospitals ; and the multitudes who were supported by his charity preferred the eloquent discourses of their benefactor to the amusements of the theatre or of the circus. His homilies, which are still preserved, furnish ample apology for the partiality of the people, exhibiting the free command of an elegant and copious language, an inexhaustible fund of metaphors and similitudes, giving variety and grace to the most familiar topics, with an almost dramatic exposure of the folly and turpitude of vice. His zeal as a bishop and eloquence as a preacher,

however, gained him enemies both in the church and at the court. The ecclesiastics who were parted at his command from the lay-sisters (whom they kept ostensibly as servants), the thirteen bishops whom he deposed for simony and licentiousness at a single visitation, the idle monks who thronged the avenues to the court and found themselves the public object of his scorn—all conspired against the powerful author of their wrongs. Their reseutmeut was inflamed by a powerful party, embracing the magistrates, the ministers, the favourite eunuchs, the ladies of the court, and Eudoxia the empress herself, against whom the preacher thundered daily from the pulpit of St Sophia. A favourable pretext for gratifying their revenge was discovered in the shelter which Chrysostom had given to four Nitrian monks, known as the tall brothers, who, on being excommunicated by their bishop, had fled to Constantinople ; and a ready tool was found in Theophilus, bishop of the rival city of Alexandria, who had driven them from their diocese, and had long circulated in the East the charge of Origenism against Chrysostom. By his instrumeutality a synod was called to try or rather to condemn the archbishop; butfearing the violence of the mob in the metropolis, who idolized him for the fearlessness with which he exposed the vices of their superiors, it held its sessions in the suburb of Chal- cedon, named the Oak, where Rufinus had erected a stately church and monastery. A bishop and a deacon were sent to accuse the archbishop, and presented to him a list of charges, in which pride, inhospitality, and Origenism were brought forward to procure the votes of those who hated him for his austerity, or were prejudiced against him as a suspected heretic. Four successive summionses were signified to Chrysostom, but he indignantly refused to appear until four of his notorious enemies were removed from the council. Without entering into any examination of the charges brought before them, the synod condemned him on the ground of contumacy ; and, hinting that his audacity merited the punishment of treason, called on the emperor to ratify and enforce their decision. He was immediately arrested and hurried to Nicwa in Bithynia. As soon as the news of his banishment spread through the city, the astonishment of the people was quickly exchanged for a spirit of irresistible fury. In crowds they besieged the palace, and had already begun to take vengeance on the foreign monks and sailors who had come from Chalcedon to the metropolis, when, at the entreaty of Eudoxia, the emperor consented to his recall. His return was graced with all the pomp of a triumphal entry, but in two months

after he was again in exile. His fiery zeal could not blind him to the vices of the court; and heedless of personal danger he thundered against the profane honours that were addressed almost within the precincts of St Sophia to the statue of the empress. The haughty spirit of Eudoxia was inflamed by the report of a discourse commencing with the words,—“ Herodias is again furious ; Herodias again dances ; She once more demands the head of John 3” and though the report was false, it sealed the doom of the archbishop. A new council was summoned, more numerous and more subservient to the wishes of Theophilus ; and troops of

CHR YSOS TO”

j barbarians were quartered in the city to overawe the people.

Without examining it, the council confirmed the former sentence, and condemned him afresh for having resumed his functions without their permission. He was hurried away to the desolate town of Cucusus, among the ridges of Mount Taurus, with a secret hope, perhaps, that he might be a victim to the Isaurians on the march, or to the more implacable fury of the monks. He arrived at his destination in safety ; and the sympathies of the people, which had roused them to fire the cathedral and seuate- house on the day of his exile, followed him to his obscure retreat. His influence, however, became more powerfully felt in the metropolis than before. In his solitude he had ample leisure for forming schemes of missionary enterprise ; and by his correspondence with the different churches, he at once baffled his enemies, and gave greater energy to his friends, This roused the emperor to visit him with a severer punishment. An order was despatched for his instant removal to the. extreme desert of Pityus; and his guards so faithfully obeyed their cruel instructions that, before he reached the sea coast of the Euxine, he expired at Comana in Pontus, in the sixtieth year of his age. His exile gave rise to a schism in the church, and the Johannists (as they were called) did not return to communion with the archbishop of Constantinople till the relics of the saint were, 30 years after, brought back to the Eastern metropolis with great pomp, and the emperor publicly implored for- giveness from Heaven for the guilt of his ancestors. The festival of St Chrysostom is kept in the Greek Church, November 13, and in the Latin Church, January 27.

In his general teaching Chrysostom elevates the ascetic element in religion, and in his homilies he inculcates the need of personal acquaintance with the Scriptures, and denounces ignorance of them as the source of all heresy. If on one or two points, as for instance the invocation of saints, some germs of subsequent Roman teaching may be discovered, there is a want of anything like the doctrine of indulgeuces or of compulsory private confession. Moreover, in writing to Innocent, bishop of Rome, he addresses him as a brother metropolitan, and sends the same letter to Venerius, bishop of Milan, and Chromatius, bishop of Aquileia. His correspondence breathes a most Christian spirit, more especially in its tone of charity towards his persecutors ; and his line of exegesis, if not acutely metaphysical or mystical, .is full of good sense and right feeling.

His works are exceedingly voluminous, and consist chiefly of homilies, commentaries, smaller treatises, epistles, and liturgies. Their excellence is powerfully shown in the history of the times, for the illustration of which they afford highly valuable materials. The school of ‘exegesis formed by him, and especially illustrated by such works as _ his commentaries on the Gospel of St Matthew, the Book of Acts, the Epistle to the Romans, and other parts of the New Testament, is sound, practical, and may (as Dr Newman has justly remarked) almost be called “ English.” It was subsequently adorned by the justly honoured names of Theodoret, Theophylact, Euthymius, and Nicephorus. The best edition is that of Bernard de Montfaucon in 13 vols. fol., 1718-1738, reproduced with some improvements by the Abbé Migne (Paris, 1863); but this edition is greatly indebted to the one issued more than a century earlier (1612) by one of the foremost English scholars of his age, Sir Henry Savile, provost of Eton College, from a press established at Eton by himself. It is in eight volumes, and is said to have cost. its editor £8000. Hallam (Lit. of Hurope, iii. 10, 11) calls it “the first work of learning, on a great scale, published in England.” Numerous MSS. still remain unedited. Some of the homilies and commentaries are translated in the Library

of the Fathers, published at Oxford, and the Greek text has been in part re-edited by a scholar who has shown a very special aptitude for the work, the

Rev. J. Field of King’s College, Cambridge. As authorities for the facts of his life, the most valuable are the ecclesiastical histories of Socrates, Sozomen, and Theodoret ; and amongst the moderns, Erasmus, Cave, Lardner, and Tillemont, with the more recent church history of Neander, and his monogram on the Life and Times of Chrysostom, translated by J. C. Stapleton. There has also appeared a valuable German biography by Dr Forster ; and a narrative, full of interest and told with life-like animation, has been given by the late M. Amedée Thierry in the Revue des Deux Mondes, and since republished (Paris, 1860) in one volume, entitled Recits de’ Histowre Romaine au cinguieme Siecle. A grace- ful and interesting sketch of the concluding scenes of St Chrysostom’s life may be found in Dr Newman’s /Zistorical Sketches (London, 1873), though that eminent writer seems not very favourable to the theology of the Antiochene school, or even of Chrysostom himself. Valuable informa- tion is given in Professor Bright’s History of the Church (Oxford, 1864), and in Canon Robertson’s History of the Christian Church (vol. ii, London, 1874). But the best special contribution to English literature on the subject is St Chrysostom: His Life and Times, by the Rev. W. R. W. Stephens (London, 1872).

CHUB. See Aneuine. Vol. ii. p. 42.

CHUBB, Tuomas (1679-1746), a well-known deistical writer, was the son of a maltster, Henry Chubb, and was born in the village of East-Harnham, near Salisbury, on the 29th September 1679. His father died in 1688, and left in poor circumstances a widow and four children, of whom Thomas was the youngest. All of them were early sent to work; and consequently the education which Thomas received in his boyhood was of a most elementary kind. In 1694 he was apprenticed to a glove-maker in Salisbury ; but as the work was afterwards found to be unsuitable for him on account of the weakness of his sight, he entered the employment of a tallow chandler, and his income for many years was derived partly from this source and partly from glove-making. Through energy and _per- severauce he succeeded in gaining a fair knowledge of mathe- matics, geography, and some other subjects. Theology, however, was what chiefly commanded the attention of Chubb and his companions, among whom he seems to have been the moving spirit. His intellectual activity, and the eagerness he always displayed to gain clear and distinct views of any question that occupied

him, marked him out from the first; and his early habit of committing his thoughts to writing gave him a clear and fluent style which afterwards found much favour with the public. He made his first appearance as an author in the Arian controversy, on the side of Whiston. A dispute having srisen among his friends akout Whiston's argument in favour of the supremacy of the one God and Father, Chubb was led to write an essay which bore the title, The Supremacy of the Father Asserted. This, passed round his friends in manuscript, created so favourakle an impression that the author ultimately submitted it to the judgment of Whiston, who pronounced it well worthy of publication. After a few emendations by Whiston, it was printed in 1715. A number of tracts on various subjects followed, which were published in a 'collected form in 1730. * Chubb was now regarded as a literary phenomenon. Among other persons of eminence, he attracted the attention of Sir Joseph Jekyll, Master of the Rolls, in whose louse he lived for several years, The nature of his position there is not precisely known; but there are stories told of his having waited at table as a servant out of livery, and of the amusement caused by his short stout figure standing as

steward at his patron's sidekoard. His love of independ- ence and retirement drew him back to Salisbury, where by the kindness of friends he was enabled to devote the rest of his days to his favourite studies. He died on the 8th February 1746. His moral character was excellent, and he is said to have continued a regular attendant on divine worship in the parish church.

Chubb was the author of a very large number of controversial tracts. His principal works are—A Discourse Concerning Reason (1731), The True Gospel of Jesus Christ (1739), and Posthumous Works, 2 vols. (1748). The Discourse Concerning Reason aims at showing that reason is, or ought to be, a sufficient guide in matters of religion. After defining the terms of this proposition, he pro- ceeds to argue that if man is accountable to God for his actions, he has a right to possess a power sufficient to discover what he is accountable for, and also to discover such motives to right behaviour as will counterbalance those temptations which are unavoidable in the present constitution of things. It will not help the case to say that man, as originally constituted, had such a power, but lost it through Adam's fall; since it

matters not to mankind whether Adam had originally such a power or not. Men cannot justly be held accountable if they lost in Adam that power. If the power was only impaired through Adam's sin, and if every man will be judged according to the ability he has, then reason is a sufficient guide in matters of religion. Difficulties which unavoidably arise from the constitution of things are only chargeable upon the author of that constitution. If divine revelation was meant to supply the defect of reason, then millions, whom that revelation has never reached, have been unjustly dealt with. The deficiency being general, the revelation should have been given to the whole species. The sufficiency of reason does not make revelation needless, as reason may be neglected or abused, and revelation may be needed to bring men back to a right use of reason in religion. 'I'rue, reason could not discover how divine justice is satisfied by the sufferings and death of Christ, and how the sinner is justified by faith in Him ; but that is repugnant to reason, and can be no part of the genuine revelation. One unjust action cannot satisfy justice for another. Nor can sin, considered abstractedly from the sinner, be the object of favour or displeasure. Only what faith leads to, viz., repentance

'and turning to God, is the true ground of God's mercy and kindness

tomen. This is most evident to reason when discovered, and must therefore be disceverable by reason. If, as is allowed, reason is a proper guide in matters of revelation, it should not be less so in matters of religion, for the one seems to be as much within the province of reason as the other. At the close Chubb disavows any intention to injure divine revelation, or to serve the cause of infidelity. The True Gospel of Christ is characterized by Lechler, in his Geschichte des englischen Deismus, as an essential moment in the historical development of deism. Its leading thought is that Christianity is not doctrine, but life. Jesus requires us to regulate our life according to the eternal and unchangeable law of action which is based on the reason of things. If men, through violation of this law, incur God's wrath, repentance and reformation are the only means of obtaining God's favour and forgiveness. That these truths may make a greater impression, the gospel declares that God has appointed a day of judgment and retribution. The law of nature is thus the essential content of the gospel. It is no historical account of facts, as Christ's death, resurrection,:&c., for it was

preached to the poor before these events occurred. Nor do the private opinions of the evangelists and apostles form any part of the gospel. Like Tindal, Chubb comes to the conclusion that the true gospel of Christ is identical with natural religion. The greater por- tion of the Posthumous Works is taken up with The Author's Fare- well to his Readers, in which 'he comes to a sceptical conclusion regarding a particular providence, the efficacy of prayer, and a future state of existence, although he thinks that man's responsi- bility affords some probability of the latter. He rejects the Jewish revelation, because it sullies God's moral character. Mahomet- anism, he thinks, could not have prevailed by the sword alone ; "it must have prevailed to a very great degree before the sword could have been drawn in its favour." He believed there was a man Jesus, who collected a body of disciples, and laid a foundation for a new sect among the Jews. His objections against the prophecies and miracles are often far-fetched, and contain nothing beyond what had been urged by previous writers. It lends a special interest to Chubb's representation of primitive Christianity that he insists on the fact: that it was a gospel for the poor. There is thus a democratic tendency in the view he takes of the gospel. He represents the rise of deistical notions among the artisan class.

CHUNAR, or CHUNARGHOUR, a town and ancient fortress of India, in the district of Mirzapur, in the North-West Pro- vinces, situated on the south bank of the Ganges. The fort

occupies a conspicuous site on the summit of an abrupt rock which commands the river. It was at one time a place of great strength, and still contains a magazine, and is fortified with batteries. In the old citadel on the height, the remains of a Hindu palace with some interesting carvings indicate the former iniportance of the place. The town, which consists of one or two straggling streets, contains a handsome English church. Chunar is first mentioned in the 16th century, when in possession of Sing Joanpore. In 1530 it became the residence of Shere Khan the Afghan, and forty-five years later was recovered ky the Emperor Akbar after sustaining a siege of six months. It fell into the hands of the English under General Carnac in

1763 after a prolonged resistance which caused cousiderable loss to the assailants.

CHUND, or CuAnp, or CHanDRA-Barpal,a Hindu writer belonging to the 12th century, was court-poet to the last of the Hindu sovereigns of Delhi. His poem is au encyclo- peedic work of immense size. It includes a history, and especially an account of the exploits of the author and of his master. It is still popular among the Rajputs. An account of Chund, with some translations of his poem, is given by Colonel Tod, in vol. i, of the Zransactions of the Royal Asiatic Society.

CHUPRAH, a town of India, in the province of Behar, Bengal, situated ou the north bank of the Ganges, 35 miles north-west of Patna. The town contains several mosques and pagodas, and some churches. It extends nearly a mile along the Ganges, and is not much above the level of the river. A considerable trade is carried on by the inhabitants in saltpetre, sugar, and cotton. The military station is separate from the town. Population about

30,000.

CHUQUISACA, the capital of Bolivia, also known as La Plata, Charcas, and Sucre. See Sucre.

CHUR, the capital of the Swiss canton of Grisons, otherwise known by the French form of the name, Ooire. See CoIReE.

CHURCH. All who call themselves Christians agree in admitting that in the New Testament (and also, though in a more shadowy and less distinct manner, in the Old Testament) there is to be found frequent mention of a corporate body known as the church,—sometimes spoken of more fully as the Church of God, or the Church of Christ. It is referred to by its divine Founder as about to be built upon a rock (Matthew xvi. 18). In the book of Acts it has become a living reality, including apostles, elders, and laity,—holding a council, and making decisions upon most points of doctrine and of practice (Acts xvi. 4-22). In the epistles it is spoken of in terms of great magnificence, akin to the glowing language of prophecy. Christ, in His glorified humanity, is recognized as its head ; it is in turn His kody, His fulness, and His spouse.

The exact ideas involved in the word church, the questions concerning its powers, its nature and essence and modes of governance and continuance, its relation to Holy Scripture, and its relation to the state—have all been fruitful matters of controversy. These questions have emerged in a marked manner during the controversy with the Gnostics, the controversy with the Novatians and the Donatists, and those arising out of the Reformation. Hence among the writings of the fathers, bearing upon the nature of the church, may be specially named those of St Irenzeus in opposition to the Gnostics, of St Cyprian against the Novatians, and of St Augustine against the Donatists. The relations of the church to the state became subjects of discussion directly Constantine had made

Christianity the religion of the empire. These relations are illustrated by the history of Arianism, Donatism, and Priscillianism, by the career of St Chrysostom, and by the fierce conflicts of the Middle Ages between Guelfs and Ghibellines—the former siding with the Pope, the latter with the emperors, The contest between Philip the Fair and Pope Boniface, and that of Philip Augustus of France and John of England against Pope Innocent III. turned upon the same great controversy, again and again renewed during the Middle Ages. Some of the most striking niedizeval illustrations of the conflict are to be found in the life of Occam, and in the Divina Commedia of Dante. The points in dispute have been keenly discussed by modern historians ;—those of the 18th century, as Hume, Henry, Mably, being strongly on the side of the state ; those of the 19th, as Guizot, Voigt, Michelet, Palgrave, Arnold, Bridges, Mill, and even Macaulay, and, to some extent, Milman, more or less emphatically advocating the cause of the medieval chnrch during at least a portion of the

struggle.

The Reformation in great measure turned upon both sets

of questions,—the relation of the church to the Scriptures _and its relation to the state. no small portion toth of the controversial literature and of the political history of the 16th and 17th centuries, the religious side they are illustrated by the lives and

Consequently, they occupy On

writings of Martin Luther, Calvin, Melanchthon, and the Continental Reformers generally, as well by those of Knox

and of Cranmer in Britain, and of their Roman Catholic

opponents, such as Ignatius Loyola, and in a later age by Cardinal Bellarmine and by Hooker, ty Andrewes and others; and on the political side by such events as the Thirty Years' War, the Spanish Armada, the Revolution of 1688. The last two centuries have not witnessed any distinctively religious war. But these questions underlie the numerons "concordats" drawn up between the Church of Rome and various states in Europe and America, the entire history of Gallicanism and Jansenism, the Tractarian controversy commencing in England in 1833 a.p., and the contem- porary discussion in Scotland, which ended in the Disruption of 1843 and the formation of the powerful and energetic body of Presbyterians, known as the Free Church. 'The disestablishment of the Anglican Church in Ireland raised cognate questions, and it is evident that disestablishment, already a fact in the United States, in France, in Ireland, and in some of the British colonies, may at any moment become a question of no slight political importance, Among more modern writers who have treated these questions may be named Bishop Warburton, De Maistre, the Rev. Sir W. Palmer, Rothe, Klee, the Abbé Mignet, Mr Gladstone, Dr Arnold, and many more, especially the commentators on creeds and confessions, as Mohler, Bishop Burnet, Bishop Harold Browne.

It remains to mention a few of the more prominent views and definitions prevalent among leading bodies of Christians.

1. As regards the church triumphant there would probably be little or no controversy. The great bulk of Christians would acknowledge it as "the whole body of the glorified, consisting of the holy angels and of the spirits of the just made perfect who have been redeemed by the merits (whether foreseen or actually wrought) of the divine Head of the church, Jesus Christ, the Incarnate Son of God."

2. But concerning the church on earth, definitions vary considerably. In the first place there emerges the impor- tant question, whether it is a visible or an invisible body. This is not the place to discuss which is the view set forth in Holy Scripture,—that being of course the very point at

issue. It must here suffice to say that the disciples of

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Calvin (followed herein by a very large number, probably the majority, of purely Protestant communities) maintain that it is invisible; while the Lutherans, the Roman Catholics, the Oriental Christians, and the great bulk of the more famous Anglican divines (in accordance with the Anglican formularies) maintain it to be visible. This latter view is, it need hardly be said, the one all but universally adopted by the fathers and the schoolmen. In one passage, however, of his later writings, St Augustine employs an expression at variance with his usual tone, and favourable t» the Calvinistic view, by calling the church “ the society of the predestined.”

3. The relations considered to exist between the visible church and Holy Scripture must necessarily be those of co- ordination, or of sub-ordination on one side or the other An impartial estimate of the Anglican formularies would probably be found to support that view of co-ordinate authority of Scripture and the church which is taken by a large body of her divines, such as Bishops Pearson, Bull, Kay, Dean Jackson, and others; though many of her adherents would undoubtedly incline, more or less com- pletely, to that more Protestant view, which subordinates the church to Scripture, a view held most strongly by those bodies whose confessions of faith (as, eg., the Westminster Confession) seem to imply that the books of Scripture attest themselves as divine. In the Church of Rome there can be no question but that the church is placed above Holy Scripture ; for though Scripture proofs of doctrine are always, if possible, sought by her controversialists, and referred to in her symbolical standards (as, for instance, the Tridentine decrees), yet the traditions preserved in the church are spoken of as to be venerated not merely as com- ments on the meaning of Scripture, but as deserving equal honour and reverence with Scripture (Decret. Canc. Trident., sessio iv.) On the other hand, the Anglican formularies teach that Holy Scripture contains all things necessary to salvation (Art. vi.), though

the church is described as the witness and keeper of Holy Writ and as having authority in controversies of faith (Art. xx.). The school of Anglicanism represented by Field, Hammond, Pearson, Bull, and Bramhall regards a judgmentof thechurch universal, such as that of the Council of Nice against Arius, as “irrevocable, irreformable, never to be altered.” (See Sir W. Palmer’s Church of Christ, part iv. ch. iv.) ‘The Kastern{Church seems to place the relation of Holy Scripture to itself in almost the same position as this school of Anglicans, though it would perhaps lay somewhat stronger stress on the insufficiency of Scripture without the voice of the teaching and interpreting church. It may be remarked that in this, as in other matters, belief has from timo to time been greatly influenced by the course of events. In the first age of Christianity, before the canon of the New Testament was formed, the church is almost everything (as Reuss and others have observed), and the Bible, which chiefly consisted of the Old Testament, was subordinate. By about 200 ,p., when the gospels were becoming better known, the relation between Scripture and the church appears in patristic writings much more like one of co-ordination. During the Middle Ages, as the church’s political power increased, Holy Scripture became more and more subordinate, until we find Dante complaining of the way in which not merely oreeds and fathers but canon law and the decretals are studied instead of the Gospel (Paradiso, ix. 133). The Reformation necessarily caused a reaction, built, as it was so largely, on new translations and on the circulation of the Bible; and in the following century we find the successors of the Reformers laying more stress upon what is commonly called the verbal inspiration of the Scripture and its infallible authority than had been doue for the most part by the

fathers (except perhaps St. Augustine) or by the first Reformers, Luther and Calvin, and their contemporaries, who never seem to have {sanctioned the famous dictum of Chillingworth, “The Bible, and the Bible only, is the religion of Protestants.” Of late years the difficulties arising from science, philology, history, and criticism have tended to modify this view of the supremacy of Scripture. Not ouly in the unreformed communions and among Angli- cans and Lutherans, but even in Calvinistic bodies, is this effect perceived. Thus we find an eminent Presbyterian divine, a minister of

the Scottish Establishment, writing as early as 1848, “ The living church is more than the dead Bible, for it is the Bible and something more” (Life of Dr Norman Macleod). The comment made by Kant on the inconsistency of those Lutherans who virtually say “Go to the Bible, but do not find anything there except what we find” is well known (Streit der Facultaten).

4, Turning to the constitution and government of the church, it is singular that in none of the symbolical utterances of the leading Christian communities is there found such a definition of the church as would really include all that is believed by those respective bodies. Nor is it easy to supply the want by appeal to divines, though many have striven to set forth the “notes” of the true church (see, ¢.g., Klee, Dogmatik, and many others), Neither the Roman Catholic Tridentine decrees nor the Westminster Confession supply any definition, and the one given in the nineteenth of the Articles of the English Church leaves the questions at issue between Rome and the Reformers, between Episcopacy and Presbyterianism, entirely open. For all would claim to represent that “visible church of Christ” which is there described as “‘a congregation of faithful men, in the which the pure word of God is preached, and the sacraments be duly ministered according to Christ’s ordinance in all those things that of necessity are requisite to the same.”

Concerning the question of government there are four leading views. The first is, that no form of governnient was instituted by the divine Founder of the church or His apostles, that there was originally no distinction between clergy and laity, but that officers were in due time appointed as might happen in any human society, for the sake of order and convenience. This view, which is probably that of the majority of Protestants at the present time, has found a thoughtful, devout, and highly gifted exponent in the historian Neander; while the difficulties of reconciling it with the New Testament are all set forth by two inde- pendent translators of his work, the Rev. J. H. Rose and Mr Morrigon. A second view is, that a government was in such wise instituted as rightly to claim a jus divinum, that this government resides in presbyters, and is handed down by succession through the presbyterate. This view was main- tained by many foreign adherents of the Reformation, and in England by Richard Cartwright, the Puritan opponent of Hooker, and an entire school of his day. They appeal to

history, especially that of the Alexandrian Church, and to the fathers, more especially to St Jerome. The third view resembles this in principle, but assigns the governance to a superior order, that of the bishops, and makes the succession pass through them, The Anglican communion acts upon this view, re-ordaining all ministers not episcopally ordained, but accepting Greek or Roman Catholic ordina- tion; and it has been defended by many of the writers of the High Church school, above named, to whom may be added Bishop Bilson, and the able Scottish controversialist Bishop Sage in his work against Gilbert Rule. (See also Bishop Cotterill's Genesis of the Church, and article BisHop), This school lays great stress on the decisions of the cecumenica] councils, of which it recognizes six or (according to Bishop Andrewes) seven before the division of East and Wost,

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This view, though strongly supported by the Eastern | jective fact, history can single out, under the general

churches as well as by an historical and living school of Anglicans, is undoubtedly open to the difficulty, acknow- ledged by Mr Gladstone and others, of making the church asa collective body remain silent for some thirteen centuries and still unable to speak. There remains the fourth, the Roman Catholic view, which subjects the entire episcopate to the bishop of Rome, and makes full communion with liim of the essence of churchmanship. This view has been supported ever since the Middle Ages with immense zeal and learning by many able Catholic writers, Although a strong case against it has been made out from the fathers, especially the Eastern ones, and although the state of matters just before the Reformation was everywhere one of gross abuses and much superstition, yet the good points of the Papacy have been fully recognized by Pro- testants and Anglican writers, such as Guizot, Michelet, Comte, Ranke, Sir James Stephen, Dr Arnold, Archbishop Trench, and Bishop Harold Browne. Nevertheless, the increasing development of the Papal claims has been strongly resisted within the pale of that church by the Jansenists, by the

Gallican divines such as Bossuet, and by the entire body of the Port Royalists, including such brilliant names as those of St Cyran, De Sacy, Arnauld, and above all Pascal. All these display a Calvinistic element in their teaching, and more or less (as for instance Fleury in his famous Church History) modify the distinctively Roman characteristics most opposed by Protestants, and they place a general council far above the Pope. In our own day the counter-theory among Roman Catholics, of which De Maistre was a leading spokesman, has been seemingly ratified by the Vatican Council and the Pope declared infalli- ble. This extreme step has provoked a schism among Roman Catholics, and alienated some of their most eminent men. Of the different views entertained concerning the relation between church and state, it must be enough to say here that occasional collision seems almost unavoidable. For where two independent societies lay claim to a common ground, those claims, unless precisely defined, will some- times militate. No state has yet been known to carry out the theory of Locke, and confine its attention purely to the preservation of life and property. But every state which considers public morality to be within its sphere, and legislates on such matters as marriage and education, must of necessity occupy to some extent the same ground as the various Christian communities which claim to be the local church. (J. @. ©.) CHURCH HISTORY. In this article we shall con- sider (1) The Definition, (2) The Sources, (3) The Method, and (4) The Literature of the subject. Considered as a department of universal knowledge, church history forms a special section of the religious history of mankind, It is an account of the growth and the transactions of the religious community which is marked out from others by its attachment to Christianity. This definition already excludes from consideration a region of inquiry important in itself, which is sometimes regarded as forming an integral part of the subject. Starting from that idea of the church which is represented etymologically by the undoubtedly false derivations of the

word from the German kiiren, to choose, or the Greek |

KUptov otkos, the (figurative) house of the Lord, various writers have assumed the church to be that special section of mankind who in any age have enjoyed the true revela- tion of God as given by himself, and they have in conse- quence regarded church history as bound to deal first with

the Old Testament church and then with the church of the New Dispensation. This, however, involves an amount of dogmatic prepossession to which history, simply as such, cannot commit itself. Surveying the field of mere ob-

appellation of the church, a great society whose origin can be distinctly traced up to the personal activity of Christ, who, for this society, forms a definite and wholly new historical commencement. Whatever etymology we assign to the word church under its various modifications of kirche, kirk, kerk, cyrkew, zerkow, &c.,—whether we follow the derivation suggested by Walafrid Strabo in the 9th cen- tury, and extensively held since, from 76 xupiaxév, the Lord's house, as a term introduced by the Greek missionaries into the language of the heathen tribes whom they con- verted, or whether we adopt the not less probable conjec- ture of Lipsius, and ascribe its origin to " circ" or " cerc" (connected with the Latin circus), the local name for the temple of Northern paganism, adopted by ancient and medizeval Christianity, in conformity with its principle of accommodating itself as far as possible to the usages of its proselytes—there can be no doubt that the community and the movement, which, under some form of the name church among the Germanic races, and of the name ecclesia, such as église, chiesa, &c., among the Latin nations, suc- ceeded in subjugating the Roman empire, along with extensive regions beyond it on all sides, toa religion whose personal centre is Christ, form a fresh phenomenon in the history of mankind, as distinct and individual in its character as Hellenism, Hinduism, or Mohammedanism. In the view of history proper, therefore, the history of Judaism cannot be taken as forming a part of the history of the church.

For the same reason history cannot take action upon a class of distinctions recognized by many who assume the functions of the church historian. Such writers, adopting some strict and special definition of the church, confine the work of church history to that section of professing Christians whose condition satisfies the terms of their de- finition, any other so-called division of Christendom coming in for a share of attention only in the narrative of the opposition encountered by the church. History, in the proper sense, cannot undertake to decide questions of this description. To say which among many competing churches is the true church involves a

dogmatic deliver- ance, which is beyond its province. It must do its work in a more rough and general fashion, Under the name church it comprehends all organizations avowedly basing themselves upon Christianity and recognizing Christ as in some sense their head and leader. It undertakes to delineate the story of these in the aggregate ; and with regard to the distinctions between them, and their pre- tensions to condemn and exclude each other, it confines itself to narrative, without attempting adjudication.

Another limitation has to be introduced into the defini- tion of church history, when regard is had to the exact point of time at which it ought to begin. The church did not come into full-formed existence in a moment. Regarded as a community with more or less of an organization upon a Christian basis, and conscious of itself and of its aim in the history of the world, it was the result of the activity of Christ and his more immediate apostles and followers. The history of what they did in giving existence to the church, as such, is a different thing from the history of the church wheu once existing in that character. The case resembles the difference between embryology and biography in the history of the individual. The precise point of time at which the formative activity of the church founders issues in the actual church is probably to be determined by the emergence of the consciousness of a common Christian life and aim among the separate communities originally established by apostolic labour. By some writers this is placed as low as the destruction of Jeru- salem, by others as high as the first rallying of Christ's.

followers after his own disappearance from the world. In any case church history is relieved of a large amount of work with which it is sometimes burdened, but which does not properly fall to its share.

What church history has to do within the limits thus indicated will perhaps be best understood by considering its province as a department of scientific theology, and its relations to the theological disciplines with which it stauds most closely connected, those, namely, of dogmatics and the history of doctrine. Strictly speaking, the history of doctriue is part of the history of the church. To exhaust its task, a history of the church must embrace at least five departments of inquiry aud narrative,—one con- nected with the

external ‘relations of the church to the world at large and its political institutions, the remaining four treating of developments and relations internal to the church itself. (1) The Proaress of the church must be described, either positively, in respect of its advance, or negatively, with reference to its retrogression, at any given period. ‘To exist at all, it must exist under one or other of these conditions; it must be either attaining or missing, approaching or receding from, its rightful influence on the social condition and political organization of an- kind. (2) Its Consrrrurion must be described. The church exists as such, in virtue of its constitution. It is not the church until it is to some extent organized, and the growth and forms of this organization must be recorded. (3) The Docrrine of the church at the various points of its development must be set forth. Doctrine is the full and finished expression of conviction, and since the church owes its existence to certain convictions, some religious, some moral, the history of doctrine occupies the very central position of the church’s history. (4) WorsuHip, under one form or another, is an essential development of church life, as well as one of the modes in which it announces its existence, and calls for historical recognition. (5) Lirn, as exhibited in the number and character of the members of the church, completes the division of the matter of its history. Doctrine and wor- ship are directed to certain practical ends, either of making proselytes to the church, or of perfecting the character of those who already belong to it, and any such results must be collected and presented both in their numerical and their moral aspects.

But while the history of the church, in the strict and com- prehensive sense, must treat fully these various classes of activity, there is a narrower, if also a somewhat looser sense in which it may be taken, for ends of practical convenieuce. We may distinguish between the organization and its life, between the church and Christianity. On this view, doctrine, worship, and life fall to be treated collectively by the history of the Christian religion or in separate histories, while the history of the church becomes a narrative of the successes or defeats experienced in the world by the Christian community and the varying forms of its constitu- tional framework, with only such allusions to the internal and religious side of its life as are necessary to explain its constitutional changes and external fortunes. By this division it becomes possible to treat both the inner and the outer sides of the subject, each for itself, and therefore more fully and vividly. In this way,

since doctrine lies at the foundation of worship and life, and even constitu- tion, the history of doctrine becomes the key to the whole history of the church, and the indispensable preliminary to a scientific comprehension of it. The life and action of the church in the world are simply the expression of the ideas by which it is governed ; and it is the business of the historian of doctrine to record the vicissitudes and develop- ments of these, whether he writes in the interests of mere knowledge and with absolute impartiality, or, as is more

common, though less scientific, with a bias in favour of a certain class of ideas, all divergences from which he chronicles as errors. The difference between church history read in the light of the history of doctrine and apart from it is like the difference which the phenomena of health and disease present to minds that possess or that waut an acquaintance with the principles of physiology.

Church history, including or co-ordinate with history of doctrine, stands in an important relation to dogmatics. Dogmatics (which also contributes the formal as well as, in part, the material element in Christian ethics) is charged with the scientific statement and proof of whatever is held to be the true doctrine. In the sphere of statement the history of the church is necessary, both as introduction and commentary. Doctrine is a growth, an evolution of part after part, under the influence of special circumstances at special times. The ful] meaning of doctrine can therefore often be understood only in the light of its antithesis, and its relative importance as essential or accidental ascertained only from the practical crisis which demanded its declara- tion,—aids for which recourse must be had to the history of the church and its doctrine. As regards, therefore, the scientific articulation, proportioning, and interpretation of doctrine, church history stands in the position of an essen- tial prelintinary to dogmatics.

As regards actual church life, and any uew expression of it in worship, constitution, or propagandist effort, that assumes to be based on scientific principle, the history of the church is indispensable, not only for the extended view of present circumstances that may be requisite, but also to enable the church fully to know and judge its own mind. The existing

church consciousness is the product of all the past, and cannot be fully understood and criticized except in the light of its history.

2. The Sources of church history are either Monu- mental or Documentary. Monumental sources yield such intimatious of past transactions as are to be found on avowed monuments, memorial tablets, gravestones, churches, and other public edifices or private dwellings, or upon articles of antiquity, seals, crucifixes, furniture, vestments, pictures, coins, weapons, &c. Documentary sources, as their name implies, include all manuscript or printed in- formation, whether originals, copies, or oral traditions com- mitted to record. In point of comparative value, the documentary sources are, of course, the more important, being, from the nature of the case, so immeasurably richer in information. At the same time, within their own range, monumental sources are often more valuable than docu- mentary. Forgery has less chance of success in monu- ments than in documents; and certain classes of facts are frequently commemorated on them which writers do not think of recording. Dates and names and the like have

been fixed by inscriptions on coins, &c., where documents

have proved defective or wrong.

Documentary sources may be divided from the point of view of their destination into (1) Public and (2) Private, and from that of their authorship into (3) Direct and (4) Indirect. Under the head of public documents we have all deliverances of an official character, such as decrees of councils, Papal bulls, civil legislation affecting the church, rules of life for monastic institutions, liturgies, confessions of faith, and even sermons, theological treatises, dc. Pri- vate documents, again, consist of personal memoirs and journals, letters, secret correspondence, and papers not originally intended for the public eye. Then by direct documentary sources are meant those in which we have the actual word of a writer or actor in any event testifying to the nature of the opinion or transaction about which information is desired. Indirect documentary sources are those in which we obtain information about the opinions of

an author or the actions of any historical character, not from statements of his own, but from the testimony of some one else about him. Thus a letter of Constantine would be a direct document in reference to some purpose or performance of his own, while it might be an indirect document in reference to the history or opinions of Athanasius or Arius.

In collecting and sifting these sources so as to place all and only the right materials available before the church historian, recourse must be had to the sciences of antiqui- ties, bibliography, and diplomatics, Antiquities, in its various divisions of numismatics, ecclesiology, heraldry, &c., marshals all the relevant monumental testimony and discriminates the spurious from the genuine; biblio- graphy, taken in its widest sense, as the science which enumerates, classifies, and values all that has been written upon the various heads of human knowledge, states what documentary material is likely to be available at the dif- ferent stages of inquiry, and where it is to be found ; while diplomatics, or the science of documents, defines the genu- ineness, completeness, and general trustworthiness of the material so indicated.

Besides these more immediate sources there are collateral sources on which church history must draw in fulfilling its task. These are mainly ecclesiastical philology, the general history of Christendom, with ecclesiastical geography, sta- tistics, and chronology. Ecclesiastical philology points to acquaintance with those languages, more particularly Greek and Latin, in which the chief part of the historical materials is expressed, whether as original or translation. The necessity of this is obvious. Besides this, some know- ledge of the general history of Christendom is indispen- sable to an understanding of the history of the church, just as the special history of the church is essential to a comprehension of general history. The events of the church aud of the world are so inextricably bound up to- gether that the one are intelligible only in the light of the other. Hence the history of policy, law, philosophy, litera- ture, and art must be laid under contribution in construct- ing a full history of the church. Clear treatment further requires acquaintance with ecclesiastical geography and statistics, the distribution of the world into Christian and non-Christian sections, divisions by patriarchates, dioceses,

parishes, &c., and the physical characteristics and social habits of different localities. And along with this, eccle- siastical chronology, the correct arrangement of persons and events, both in their contemporaneous appearance and in their succession to others, is requisite to complete the list of auxiliaries to church history,

3. After the Sources, the Mernop of dealing with them, So as to produce history, falls to be considered. Method here comprises two main divisions, —(1) Criticism and (2) Construction. In the criticism of the materials two quali- ties have to be called into exercise,—the judicial faculty and historic insight. The jndiéial faculty has to determine two questions,—first, How far are the sources to be relied on? and second, If to be relied on, what do they really say? The question how far the sources are to be relied on depends on both the ability and the willingness of the writer to tell the truth. As to his ability, we must con- sider how far he was in a position to be aware of the facts, and to what extent his j udgment and penetration arc to be trusted in matters of fact. He may have been credulous, or an incompetent or careless observer, or he may have been so greatly biassed by party feeling or personal ani- mosity as to be incapable of forming an impartial opinion. Then, besides the writer's ability to tell the truth, there must be considered further his willingness to tell it. A writer may be perfectly able to tell the truth, if he liked. But he may not like. He may have reasons or motives of his own for withholding the truth, or even for substituting

untruth. In using his sources the historian must be able to judge exactly how far they are in these respects to be relied on. Then supposing he has decided that they may be relied on in a given degree, he must next be able to take from them precisely the testimony as to past fact which they convey, neither more nor less. That is to say, he must be impartial,—capable of holding the scales of fairness evenly, of controlling his mind so as to prevent auy preferences of his own from weakening or distorting the statement of fact derivable from his authorities, in favour of his own opinions. The historic insight, which, in addition to the judicial faculty, is essential to the thorough criticism of the materials, is the power of fully compre- . hending the significance and connection of the facts yielded by the sources, by realizing

the point of view of the actors or writers to whom the facts dealt with are due, and deter- mining their import as related to a general philosophy of history, and embraces three forms of insight, which may be called philosophic, psychologic, and Christian. Philo- sophic insight implies, first of all, ability to enter into the various forms of speculative thought, metaphysical, ethical, or whatever else, that have appeared within the church's history, and have in greater or less degree influenced its movements. It implies further an ability to see the whole recorded facts and their connection under the light of the philosophy of history; but as this obviously cannot take place until the facts in themselves have been completely understood, this aspect of philosophic insight will come into play only when the others have discharged their func- tion. By psychologic insight is meant knowledge of human nature affected by scientific observation of mind and its operations. The facts of history are created by individuals, and each of them may be interpreted as an exhibition of the will and intellect, of the general subjective state of Some one man or body of men. This subjective state, again, may be accounted for, in part at least, by the action of certain preceding facts upon the mind of the man or men in question, which facts again are to be explained as a manifestation of the mind of some preceding man or men, and so on. In short, history is the product of human nature, affected by and dealing with certain external data, natural or supernatural, furnished by God; so that, to understand it, there is needed the ability to place before the imagination what human nature is at any point in or between the moral extremes of goodness and wickedness, and the intellectual extremes of wisdom and folly. By Christian insight is meant special capacity for sympathizing with the spirit and ideas of Christianity. What we have

-in the history of the church is centrally the mind and

motive of Christ organizing itself in a living institution that it may enter into conflict with the evil of the world, and by persuasion subdue it to willing submission. To compreltend the development of facts produced during the activity of such an institution, there would seem to be requisitc at the very outset an understanding of the thought and feeling that constitute its inner life; that is to say, there must be an intelligent sympathy with the spirit of the New Testament, which, as the primitive record of the action of Christ's

spirit and career, is, were it on no other ground, the authoritative exposition and medium of the mind of Christ. And not only must there be this acquaint- ance with the ideas and spiritual impulses of the New Testament, but there would appear to be also necessary some experience of their power. If Christianity be not merely a series of intellectual propositions, but a spiritual force penetrating to the motives of the soul, it can scarcely be adequately comprehended by any one who has not known what it is to yield in his innermost being to Christian in- fluences. For while many of the greatest occurrences in the history of the church have sprung from the spirit of

evil, and are fully intelligible to the historian only in virtue of his own experience of at least germinal evil, a vast num- ber of other events are due to men who were in their degree reproductions of Christ, animated by the single desire to bring about what they believed he would have sought had he been in their circumstances, and ready to submit to any sacrifices that might be demanded as the price of success. To understand fully the genesis of transactions arising out ‘of such a spirit would seem possible only to those who possess the key to their explanation in what is essentially Christian experience. The historical materials having been subjected to criti- _ cism of the kind indicated, the way is open for the actual construction of the history. Construction embraces ar- rangement, proportion, and style. Under the head of arrangemeut there falls to be considered how the material of history is to be divided so as to give the most complete and just conception of what has occurred within the time to be dealt with. It is ubvious that we cannot take in all the events of so great a narrative at one view. We must break it up into a succession of parts, and study each by itself; and the question is on what principle shonld this partition of time be made. In history the element of time has to be considered in two phases—succession and con- temporaneousness. Biography properly records succession alone. An individual can do only one thing at once; whereas a society like the church, consisting of a number of individuals, can be doing a number of different things at one and the same time. Proselytism, worship, the development of sacred art, the formation of doctrine, the activities of Christian life, may all be in progress

simul- taneously. Biography is a thread; history is a web, in which time is broad as well as long. In dividing the breadth or contemporaneous movement of the church, no other classification is possible than that natural one, which has already been mentioned, into some such categories as progress, constitution, doctrine, worship, and life. But in dividing history lengthwise, there may be a choice of prin- ciples, unless indeed it be denied that events hang together by a causal nexus. The time was when such a denial would have been maintained, when the history of the church was regarded as determined by a series of special interpositions of the Divine will, resulting in a succession of events among which it was not given to human reason to trace the sway of law. That view of things, however, has passed away, and for the modern mind, whatever may be thought of the origin of the church, its history is a sequence of cause and effect, in which the moving forces and tendencies can be accounted for, and their operation traced as the evolution of internal ideas dominating the events of distinct periods, and shaping them into orderly processes. Hence arises the possibility of a natural and an artificial division of history. Arbitrary periods such as centuries or half centuries may be chosen, and an acquaint- ance with the events of one of such sections acquired before proceeding to those of its successor. This is the artificial mode of division, It has no reference to the nature of the progress made by the church as a growth which is deter- mined by an inner formative thought. But a division in harmony with this latter view of things is possible. There are for instance in the history of the church greater or smaller crises continually occurring, for which the intermediate events are preparations; or there is a certain character stamped upon one era different from that which belongs to another. The conversion of Constantine, or the sitting of the Councils of Nice, Trent, or the Vatican, is an instance of the one; the prevalence of the ancient and patristic, the medieval and scholastic, the modern and scientific mode of thought is an instance of the other. Divisions of the matter of church history according to such events or

characteristics are natural divisions ; they correspond with the nature of the thing, and rise out of the subject itself, instead of being imposed upon it from without, like the division into centuries and half-centuries, which in

many cases may lead to a misconception of the meaning of his- tory, cutting into the very middle of a development before it has reached its climax, so rendering both parts unintel- ligible, or at all events misrepresenting both. The natural division is thus much better adapted than the artificial to impart a view of the subject as it exists in its real parts. If a framework is to be taken to pieces, with a view to un- derstand its structure, it ought to be separated at the joints, not broken, as it were, across the bones. At the same time, within the great natural periods, once their limits and determining conditions are clearly understood, the subdivision into more or less artificial periods of years facilitates the taking up of all the requisite information as we goalong, very much as in a long journey, when once we know the direction or destination of travel, it is necessary to divide the intervening space into such arbitrary stages as are suitable to our footsteps or other modes of progress.

Proportion has to be considered in the coustruction of church history for two reasons,—one depending on the relative prominence of different phases of church life at different times, the other on the relation of church life to its territorial or sectarian distribution. As regards the first of these reasons, while the categories of progress, con- stitution, doctrine, worship, and life furnish, in the order of interdependence, a summary of headings under which the movement of the church at any time may be exhaus- tively described, it is obvious that whichever of these cate- gories represents the main feature of the ecclesiastical con- dition during any particular period should receive a corresponding prominence and fulness of treatment in the history of the period At one time the progress of the church in the conquest of adverse religions may be the most striking thing about it, at another it may be the for- mation of doctrine, at another development of ritual, and soon. To bea faithful reflex of the facts, history must proportion its treatment to the case, assigning the principal place to the principal thing, and grouping the rest around it. The other reason for observing proportion in historical treatment lies in the territorial and sectarian distribution of the church’s life. National almost necessarily imply eccle- siastical distinctions. The German, Swiss, French, English, Scottish churches, &c., have all separate domestic histories, so that while one has been growing in one direction, another may have been growing in a direction entirely dif- ferent. Controversial differences have had the same result. The Eastern and

Western churches for example, ever since the period of the final schism, have had in each case a self- contained development. The same remark applies also to Protestantism and Catholicism, in regard to that vast extent of thought and action in which they are separated from one another. ‘This state of things compels many to spe- cialize their work, and to pursue one national or sectional stream of ecclesiastical movement to the end, before explor- ing another ; but wherever church history on anything like the universal scale is attempted, the writer must determine where and how the vitality and force of the church are for the time evolving themselves most characteristically and influentially, and give to such localities or forms the cen- tral position in his delineations. Thus in the earlier cen- turies, the East, the conquest of paganism and the rise of theology may claim his chief attention ; in the Middle Ages, Rome and the Papacy, or scholasticism ; in the Reformation period Germany may seem the centre of Christendom; in the modern period the disintegrating influence of philo- sophy and historical criticism may be regarded as the leading phenomenon, &c.

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With respect to style, apart from the general canons on the matter derivable from the science of rhetoric, there are one or two special conditions dictated to the church historian by the nature of his subject. He is engaged on a descrip- tion of what is a lively and varied panorama of events— his model, therefore, should be the picture, not the inven- tory. He is dealing with the progress of a divine idea through the ages—he is bound to leave a certain impres- sion of majesty on the mind of his reader. He is handling matters that concern all men, and that have moved the profoundest and the most passionate natures to the very depth of their being—his pages should be alive wth genuine biographical interest and every relevant form of human sympathy.

4. The history of the LirzraTurn’‘of the subject divides itself naturally into three periods, which may be called the Unscientific, the Transition, and the Scientific periods, Speaking roughly, the Unscientific period may be said to have lasted until the Reformation, the Transition from the Reformation to the time of Mosheim, and the Scientific since then.

The Unscientific period of church history is marked by the absence of impartiality, of thorough criticism, of natural arrangement, and of what, since the days of Polybius, has been called the pragmatic method, i.¢., the treatment of historical phenomena with reference to their causes. The idea of the subjection of history to law had not yet emerged. The church especially was governed by arbitrary divine interpositions, whose effects could not, in any degree, be calculated beforehand; and as the conception of general councils as the organs of the Holy Spirit gained ground, that of ecclesiastical events, and particularly doctrine, as developments in the sequence of ordinary cause and effect vanished more completely if that were possible. History was simply a collection of incidents, often incredibly mar- vellous, threaded by no connection except that of appear- ing to intimate the favour of God for the Catholic Church, and with no other arrangement than the arbitrary one of years, or decades of years, or of the reigns of emperors or popes. This was simply the period of the collection of ma- terials for subsequent scientific history to sift and work into proper form. During the six first centuries the Greek Church furnished almost all that was valuable in church history, but after that it ceased to be productive, and Latin writers took possession of the field. At the head of the Greek School stands Eusebius, bishop of Cesarea in the earlier part of the 4th century, usually called the father of church history, although that title strictly belongs to Hegesippus, who about the middle of the 2d ceutury wrote certain ecclesiastical memorials, all of which have perished, with the exception of a few fragments mostly preserved by Eusebius himself. The history or chronicle of Euse- bius, coming down to 324 «.p., although impaired in value by the writer’s avowed resolution to record only what would reflect honour on the church, is rich in material, the archives of the empire having been placed at his com- mand by Constantine, who held him in peculiar esteem. The other Greek historians were simply continuators of Eusebius. Socrates and Sozomen brought down the narrative to 439, and Theodoret to 428. Of these Socrates writes the best style, while Theodoret gives most new do- cuments and information, especially as to the East. Eva- grius treated of affairs from 431 to 594, while Philostor- gius, most of whose work is lost, wrote, in the Arian interest, a history from the rise of Arianism to 423. The only other Greek historians of any note are Eutychius of Alexandria, about 940, who is chiefly valuable on the relations of Mohammedanism and Christianity, and Nice- phorus Callisti of

Constantinople, about 1350, who, with the assistance of the documents in the library of St Sophia,

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wrote a chureli history to the end of the 6th century. To these may be added, as completing the Greck sources, the ecclesiastical allusions in the long line of Byzantine civil historians from 500 to 1500.

Among the earlier Latin writers, Rufinus translated

Eusebius and added an indifferent continuation of his own to the end of the 4th century.

Sulpicius Severus, a terse writer, sometimes called the Christian Sallust, wrote a history from the creation to the year 400. Cassiodorus, in the middle of the 4th century, first a Government official of the Ostro-Gothic empire, and latterly prior of a monastery, caused a condensed translation of Socrates, Sozomen, and Theodoret to be made, which continued to be authoritative until the revival of letters, From this time to the Reforma- tion, a great amount of historical material was produced both in the form of chronicles and of special and general history. Among the chroniclers may be mentioned the venerable Bede, Regino, Otto of Freisingen, Hermannus Con- tractus, Lambert of Aschaffenburg, Siegbert of Gemblour, with such anonymous chronicles as that of Monte Casino, the Great Belgian, the Saxon, é&c., to which may be added, although it forms perhaps more of a general history, the Liber Pontificalis, or lives of the popes to 885, of uncer- tain authorship. Of the writers of special histories are worthy of mention— Gregory of Tours, the historian of the French Church during the 5th and 6th centuries, and the father of French church history 3 the venerable Bede, the father of English church history, and its narrator to the middle of the 8th century; Paul the deacon, who did the same office for the same period in the case of the Lombards; Adam of Bremen, the authority for Scan- dinavian church history from the 9th to the 11th cen- tury ; and Kranz, who died the year that witnessed the outbreak of the Reformation, and who furnished sources for the ecclesiastical history of Saxony and Westphalia, Of histories of the universal church during this period may be mentioned those of Haymo of Halberstadt in 840, embracing the four first centuries ; of

Odericus Vitalis, from the Christian era to the 12th century ; and of Bartholomew of Lucca to the 14th; while the greatest work of pre-Reformation times on the subject is the Summa Historialis of Antoninus of Florence, narrating events from the crea- tion of the world to 1459. All these works, it must be remembered, are full of legends and fables, and exhibit a credulous spirit.

The Transition period in church history may be taken as beginning with the Reformation. It was marked on all sides by a more searching and comprehensive survey of the sources, and on some sides by an absence of the credulity, which accepted tradition as genuine, and every act and utterance of the dominant church as divinely guided. It was, however, still for the most part devoid of the spirit of impartiality and of the idea of law as traceable in the succession of events, and consequently recognized no great and gradually evolved crises in history, naturally dividing it into periods. It was an approach to the scientific, without actually reaching it. It was stimulated and aided by the same causes which assisted the Reformation itself. The spirit of inquiry was abroad. Already, in the field of the history of the church, Laurentius Valla had led the way in the direction of true criticism by discrediting the legend of the donation of Constantine, in which he had been fol- lowed to a certain extent even by Antoninus, The rise of humanism, consequent on the fall of Constantinople and migration of Greek scholars to the West, had unlocked the store-house of material contained in that language, while the invention of printing, by bringing the sources under the eye of an immensely enlarged and practically unlimited circle of observers, increased proportionally the chances of unpledged criticism. It was the shock of the Reformation

itself, however, which gave the impetus to the new movement in the construction of church history. As Protestantism had everywhere broken more or less completely with tradition, it was for its interest to show that Catholicism had de- parted from primitive purity, and that the history of the church had been a steady course of declension, while Catholicism was equally interested in proving the contrary. This polemical animus, if it was prejudicial to impartiality of investigation, added to its keenness and

thoroughness ; and as the spirit of sectarianism developed, within Catholicism, between Ultramontanism and Gallicanism, Jesuitism and Jansenism, and, within Protestantism, between Luther- anism and Philippism, Calvinism and Arminianism, Pres- byterianism and Episcopacy, the zeal of each party to vin- dicate for itself an exclusive apostolical pedigree, led to an unflinching, if one-sided, sifting of history, especially of primitive antiquity. The way was led in this direction by the Magdeburg Centuries, so called from the place of first publication in 1559. This was a work written by a staff of Lutheran scholars, in the interest of their phase of Protestantism, under the superintendence of Matthias Flacius, and was, from its own point of view, a performance of great ability and learning, continuing for a century to be the store-house of general Protestant polemics. As its name implies, it adopts the artificial division into centuries, discussing the doctrine, heresies, councils, ceremonies, church rulers, &c., in each. The published portion stops with the 13th century. The Centuries evoked on the Catholic side, in 1588, the Zcclesiastical Annals of Cesar Baronius, afterwards cardinal, bringing the history down to the end of the 12th century; and this, with the con- tinuations of Raynaldus and others, and the critical com- mentary of Pagi, forms, from its richness in documents that would otherwise have remained inaccessible, a very valuable contribution to general church history, although written avowedly to present Catholicism in the most favourable light. These great polemical histories led the way for a train of successors on both sides. Kortholt, Spanheim, Casaubon, and Basnage criticized with learning and vigour the one-sidedness of Baronius. On the Catholic side, a bril- liant French school of church history arose, whose chief ornameuts were—Alexander Natalis (Noel), whose history (1676), valuable for its learned excursuses, though placed in the Index on account of its Gallicanism, continues under the corrective commentaries of Noncaglia and Mansi to hold a deservedly high place even in Catholic esteem ; Bossuet, whose History of the Variations of Protestantism (1688) exhibits the dexterous controversialist not less than his Discourse on Universal History, displays the philoso- phical historian ; Fleury, who narrates, with a tinge of Gal- licanism, the story of fourteen Christian centuries in a style ‘as popular and flowing as Natalis, is crowded with erudite discussion ; and Tillemont, the Jansenist, who in his Hzs- tary of the Emperors (to Anastasius) (1690), and his Me- motrs for the Church History of the sia first centuries (1693), has ransacked the whole field of available

materials, and presented, with much skill and fidelity, his narrative in the exact words of his authorities. In the meantime a school of history had developed itself in England, also in answer to controversial wants, of which Jewel (Apology, 1562), Pearson, (Vindiciw, 1672), Beveridge (Synodzcon, 1672), Cave (Primitive Christianity, Lives of the Apostles and Fathers, 1672-77), and Bingham (Antequities, 1708-22) may be mentioned as leaders in the defence, on historical grounds, of the position of the Anglican Church both against Catholicism and Puritanism.

The Scientific period of church history may be said to commence with the great work of Mosheim in 1755, based on an earlier but inferior performance. Isolated attempts hud indeed been made before his time to rise above the

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heated polemical atmosphere of the Reformation struggle and its results, into a region of calmer contemplation. The celebrated Calixtus of Helmstédt had, during the earlier part of the 17th century, laboured hard to show that the tendency to the multiplication of dogma characteristic of his time is foreign to the genius of Christianity, whose essence, in his view, may be reduced to a very few points of faith; and Gottfried Arnold, sometime professor at Giessen, had, in 1699, published his Zmpartial IHistory of the Church anid the Heretics, the practical issue of which was to show that the heretics were quite as often in the right as the church; but the only immediate result of their efforts was to raise a violent storm of opposition and abuse against themselves, proving that the time was not ripe for applying the maxim of audi alteram partem to ecclesiastical questions. But by the middle of the 18th century, a different state of things had arisen. The living fire had died out of theological and ecclesiastical controversy, leaving behind only confused piles of dogma, charred and cold, to which none thought of repairing for heat. ‘The speculations of Descartes, Spinoza, Leibnitz, Wolf, &c,, had given the world something deeper to think about than the disputes of ecclesiastics, and had engendered that spirit of thorough inquiry after reality, which in the theological sphere came to be called rationalism, and in physics the inductive or Baconian method. In the latter form it had exploded the conception of continued arbitrary supernatural

interference in the course of events, and established the belief in the reign of law, the statutes against witchcraft having been abolished even in England by 1736, a few years after the last execution there for that imaginary crime.

Mosheim may be called the first fruits of this spirit in the region of church history. His Institutes of Lcclesv- astical ITistory is constructed avowedly in the interests of science and not of party, with the sole view of stating the facts, fully and exactly as they occurred—ascertaining and declaring the objective reality, independently of subjective partialities or wishes, His fidelity to his principle is con- spicuous, and his success in overturning many previous misrepresentations arising from the neglect of it is un- doubted. His conception of Christian history as a growth under the law of cause and effect is also unmistakable, although he leaves it to be inferred, not so much from the presence of any avowed pragmatic treatment in his pages, as from the absence of everything else. Although he retains the artificial division into centuries out of deference to custom, he acknowledges its objectionableness, and com- bines with it a natural division "' bounded by great revolu- tions and changes in the state of the church." Mosheim has had a train of successors on his own line of investigation, whose name is legion, and in whose hands the scientific method has been steadily developed, and has yielded an in- creasing harvest of results. Only a few can be mentioned. Schréckh, an ornament of the Gottingen school of history, second only to Mosheim himself, whose pupil he was, laboured for forty-one years (1768-1809) at a Universal History of the Church, and brought it down well through the period of the Reformation, two supplementary volumes by Tzschirner, not unworthy of their place, completing the period. This work, in 45 volumes, a huge monument of erudition, clearness, and fairness, is still the quarry of compilers. Glieseler, improving on the method of Tillemont, which had already been partially followed by Schmidt and Danz, in 1824 began his Uni- versal History of the Church on the plan of exhibiting in his text merely such an outline of the results of his re- searches as should, without discussion, present a rapid and succinct view of the march and evolution of events, giving in ample notes the evidence from the sources on which

the statements in the text are based. Asa means by which a careful student may rapidly test the value of historical conclusions, ‘Gieseler’s work has no superior. A year afterwards, Neander, inspired by Schleiermacher, afterwards epitomized by Guericke, and popularized by Hagenbach, issued the first instalment of his General History of the Christian “Ieeligion and Church. The distinguishing characteristic of this great work is its emphatic recogni- tion of the function of history to explain events from their causes, as well as to state them in their objective reality. Neander treats ecclesiastical institutions and events as the necessary outgrowth and embodiment of the peculiar con- dition of Christian ideas and aims at the given time, and his undoubted and profound sympathy with the essential spirit and conception of Christianity, and capacity for tracing these under various forms of manifestation, enable him to throw a light upon the facts of the church’s history, and to account for them in ways that are always interest- ing, sometimes even fascinatingly so, whatever opinion may be ultimately taken of their critical accuracy. Ranke, although his work has been confined to special

histories, has exercised a great influence on the course of.

scientific church history. In his Zistory of the Popes (1834-6), and especially in his German History of the Reformation Period (1839-47), he has furnished a brilliant example of the method in which ecclesiastical facts in all their relations are to be investigated, arranged, and ex- plained. But probably no writer of the century has left a deeper impress on the method of studying and construct- ing church history than F. C. Baur, who, from 1835 to his death in 1860, gave to the world a series of works bearing on this subject, and culminating in his great Church History, which, for wealth of erudition and variety of genius, give him a unique position even in the land of great scholars that claims his fame. Whatever may be thought of his special conclusions, it is certain that since his labours, the study of the history of Christianity, especially during the earlier centuries, must be a far more thorough and profound thing than ever it was before. He may, as has been said of him, be too unwilling to admit the possibility of an entirely new germ of spiritual force in the inception of Christianity, he may be too much warped by a Hegelian tendency to resolve all historical movements into an alternation of antagonisms and conciliation, but his vast mastery of

details and marvellous power of marshalling far-scattered facts in support of a startling and unexpected theory have necessitated a new and more penetrating scrutiny of early sources, which is far from being completed at this hour. Some of his results will probably be found of permanent value, and it is certain that in his conception and working out of the history of dogma he has explained the formation of general ideas in theology, and their power in shaping the course of the church's history, in a way that was needed to counter- balance and supplenient at once the objectivity of Gieseler, and the sentimentality of Neander.

In the Roman Catholic Church, of course, scientific church history in the true sense ig not to be expected ; but there have been movements towards it, aud painstak- ing contributions have been made, which may prove useful in the hands of an unfettered writer. The great collectors of the Acts of Councils, Labbé, Hardouin, and above all, Mansi, we owe to the Catholic Church, Stolberg, Kater- camp, Ritter, and Locherer have written the history of their church from separate points of view that are full of interest, while the names of Méhler, Déllinger, and Mont- alembert do not need to be further characterized. The manuals of Alzog and Krauz are of great value. Hefele's History of Councils is a mine of thoroughly sifted informa- tion. =

schaften, as also to the same author's article

Besides the powerful but one-sided ecclesiastical chap- ters of Gibbon, the original researches of Routh and Burton, and the splendid works of Milman on Christianity and Latin Christianity, replete with critical sagacity, graphic power, and philosophic insight, Great Britain has not produced anything that deserves to be set beside the Continental masterpieces. Much valuable material in the form of historical monographs, biographies, and archzo- logical issues by individuals and societies has been pro-

. duced both in England and Scotland, but nothing that

deserves the name of a great church history, whether special or universal. The tractarian movement has stimn- lated a certain amount of antiquarian

rescarch, and Canon Robertson of Canterbury has compiled a nseful history of the church to the period of the Reformation.

For the full bibliography of the subject, reference may be made to such manuals as those of Hase and Kurtz, which have been translated, and more particularly to the latest edition of Hagen – bach's Eneyklopidie wu. Methodologie der Theologischen Wissen- '* Kirchengeschichte," in Herzog's Real-Encyklopidic, and Hefele's in Wetzer and Welte's Lexicon. (R. W.)

CHURCHILL, Cxarzes (1731-1764), the satirist, was

born in Westminster, where for many years his father held

the curacy and lectureship of St John's. At eight years of age he was sent to Westminster School, where he made no figure except by his irregularities. At nineteen

he applied for matriculation at Oxford, but was rejected.

He was afterwards admitted of Trinity College, Cambridge, which he quitted immediately, and to which he never returned. A Fleet marriage contracted about this time obliged him to retire, first to his father's house, and after- wards to Sunderland, where he began to study for the church. In 1756 he was ordained priest, and officiated in his clerical capacity at Cadbury, in Somersetshire, and at Rainham, in Essex, at which latter place he was obliged to eke out his living by teaching. On his father's death in 1758, Churchill succeeded to his curacy and lectureship, and officiated for some time, employing his leisure in reading the classics at a ladies' boarding school and with private pupils. But his innate Bohemianism was too strong to allow of such a qniet way of life for long together. He gave himself over, in conjunction with Lloyd the poet, who afterwards died in the Fleet, to every kind of loose living, ran into debt, was pursued, and had a composition of five shillings in the pound paid by the father of his boon com- panion. Part of the experience gained during this period he used in his first published poem, The Rosciad (1761), a reckless but amusing satire on the artists of the several London theatres, which was issued anonymously. The success of this work was astonishing ; Churchill was not backward in

avowing its authorship; and the same year he avenged himself on its critics in The Apology, a poem in which he adopted the systematic and scurrilous personality that was to make him rich and famous. He was at this time in his thirtieth year, and in the plenitude of his powers. His conduct, which had scandalized his parishioners, drew down the censure of his dean. The satirist at once resigned his charges, discarded his cassock and bands, and appeared en veveur. He separated from his wife, and apologized in the poem of Wight (1762), which is a sufficiently impudent piece of irony ; and in the same year he published, at irregular intervals, four books of Hudibrastic doggrel called Zhe Ghost, in which Samuel Johuson and his associates are ridiculed with some point and much brutality. An acquailtance with John Wilkes, which seems to have ripened rapidly into friendship, gave occasion for two of Churehill's strongest efforts, The Prophecy of Famine, a violent attack on the Scottish influence and character, and The Epistle to Hogarth,—the latter, which is said to have hastened the great artist's death, being a reply to Hogarth's two carica-

tures of Wilkes and his friend. In 1763 appeared Zhe Conference, a second apology ; The Duellists, three books of loose octosyllabics, called forth by the duel between Wilkes and Martin; and The Author, a satire of more general scope. These were followed in 1764 by Gotham, another piece of indiscriminate censure; by The Candidate, an attack on Lord Sandwich; by Zhe Times, the last of Churchill's successes ; and by The Farewell and Independ- ence, Which are worth little except as proofs of their author's decay. In the October of the same year he accompanied Humphrey Cotes to Boulogne, where Wilkes was then in exile, and died there of fever in a fewdays. He left some property, the proceeds of his writings, and bequeathed the editorship of his poems, with the material for illustrations and notes, to John Wilkes, who contrived to elude the bequest.

Churchill was a literary bravo, a man who liked broils and beating, and who was at the same time not indifferent to the rewards earned by;the conflict. His satires are gene- rally rough and loose in texture, disjointed in structure, and insolent in tone. They are full of good metal, it is true, but the ore lies heaped over with too much schist to repay research. His extreme facility of

composition is perhaps a reason for this, as it is a reason why, writing from day to day, he should have gained and kept the public favour. Cowper praised him, but at best he was but an admirer and imitator of Dryden.

See Churchill's Complete Works, London, 1774, 8 vols. The best edition of the poems is that of Tooke, London, 1804, 2 vols., which has been reprinted (1844) in the Aldine Poets.

CHURCHILL, Joun, first duke of Marlborough. See MARLBOROUGH.

CHURCHYARD, THomas (1520-1604), "the Nestor of the Elizabethan heroes," was born at Shrewsbury in 1520, and was educated at Oxford. At seventeen he went to court, where he roistered through such money as he had. He then became attached to the earl of Surrey, applying himself during his three or four years of service to books, music, and the practice of poetry. He served his first campaign in Flanders (1542-1544) against the French, and his second (1547) in Scotland. He fought at Pinkie, but was captured next year at St Monance, and did not return to England till 1550. A tract called David Dicar's Dream, written at this time, not only involved Churchyard in a fierce quarrel with a contemporary scribbler, but brought down on hiin the censure of the Privy Council ; he only escaped the pillory through the interest of his patron, the duke of Somerset. A third campaign took him to Ireland, whence he returned in 1552. Having been unsuccessful in a love suit, he once more betook himself to the Continent, to serve his fourth campaign, at Metz and elsewhere, under the great emperor. His absence extended over three years. On his return he began writing harder than ever, dedicating two of his works to Queen Mary. The war with France made him a lieutenant in the English army, aud at Guines he acted as mediator between the besieged and the besiegers. He next addressed a poetical appeal to Elizabeth ; he got nothing, however, but fair words, and had to write his Tragedie of Lord Mowbray, a contribution to the Mirrour for Magistrates. He fought at the leaguer of Leith in 1560 ; he again attempted fortune as a courtier ; and he went off to Ireland, campaigning under Henry Sidney. In 1566 he wandered to Antwerp, where he headed a great force of religious partizans; but he speedily had to fly the country by reason, he says, of his extreme moderation. Next year he went back as one of Oxford's agents, returning to England in 1569, when he married. In

1593, after another’, ourney to Scotland, where he witnessed Morton’s execution, Elizabeth gave him a pension ; and cleven years later, immediately after the publication of

his last work, the Blessed Balm to Search and Salve Sedition, he died. Churchyard seems to have been an active, garru- lous, and cheerful adventurer. Strype praises him as a good soldier and poet and a man of honest principles. Of his multifarious publications the Legend of Jane Shore is most highly esteemed, while the Worthinesse of Wales (1 587) and Churchyard’s Ohippes (1575) have been reprinted,—the former in 1776, the latter, by Mr Chalmers, in 1817. See D’lsraeli, Calamities of Authors, and Minto, Characteristics of English Poets.

CHUSAN, the ‘principal island of a group situated off the eastern coast of China, in 30° N. lat. and 122° E. long., and belonging to the province of Che-keang. It lies N.W. and §.E., and has a circumference of 51 miles, the extreme length being 20, the extreme breadth 10, and the minimum breadth 6 miles. The island is beautifully diversified with hill and dale, and well watered with numerous small streams, of which the most considerable is the Tungkeang, falling into the harbour of Tinghae. Most of the surface is capable of cultivation, and nineteen-twentieths of the inhabitants are engaged in agriculture. Wherever it is possible to rear rice every other product is neglected ; yet the quantity produced is not sufficient for the wants of the inhabitants. Millet, wheat, sweet potatoes, yams, and tares are also grown. The tea plant is found almost everywhere, and the cotton plant is largely cultivated near the sea. The capital, Tinghae, stands about half a mile from the southern shore, and is surrounded by a wall nearly three miles in circuit. The ditch outside the wall is interrupted on the N.W. side by a spur from a neighbouring hill, which projects into the town, and forms an easy access to an attacking force. The town is traversed by canals, and the harbour, which has from 4 to 8 fathoms water, is land-locked by several islands. Temple (or Joss-house) Hill, which commands the town and harbour, is 122 feet high close to the beach. The population of the town and suburbs of Tinghae, which at the commencement of 1843 was about 27,500, had increased in 1846 to above 35,000. The population of the entire island

is estimated at 250,000, of which the capital contains about 40,000. Chusan has but few manufactures; the chief are coarse cotton stuffs and agricultural implements. There are salt works on the coast ; and the fisheries employ a number of the inhabitants. In Tinghae a considerable business is carried on in carving and varnishing, and its silver wares are in high repute. The principal exports are fish, coarse black tea, cotton, vegetable tallow, sweet potatoes, aud some wheat. Chusan was occupied by the Japanese during the Ming dynasty, and served as an important commercial entrepét. It was taken by the British forces in 1840 and 1841, and retained till 1846 as a guarantee for the fulfilment of the stipula- tions of the treaty. It was also occupied by the English in 1860. See plan in Jour. of Royal Geogr. Soc., 1853.

CHUTIA or CHOTA NAGPUR, a division or com- niissionership of British India, under the lieutenant- governor of Bengal, comprising the districts of Hazaribagh, Lohardaga, Manbhim, and Sinhbhim, and the seveu tributary states which constitute the South-West Frontier Agency, lies between 21° and 25° N, lat. and 82° and 87° E. long. It is bounded on the N. by the province of Behar, E. by the Bengal districts of Bankur4 and Midnapur, S. by the Orissa Tributary States and the Central Provinces, and W. by the independent state of Rew4. Of its area of 43,901 square miles a large portion is occupied by hills and jungle, and the population is very sparse. The most important peak, Paresndth, with its Jaina temples, has a height of 4400 feet. The Chuti4 Nagpur plateau is an offshoot of the great Vindhyan range, and its mean elevation is upwards of 2000 feet above the sea level. In the W. it rises to 3600 feet, and to the E. and S. its lower steppe,

from 800 to 1000 feet in elevation, comprises a great | Tributary States, and only three villages contain more thai:

portion of the Maénbhim and Sinhbhum districts. The whole is about 14,000 square miles in extent, and forms the source of the Bardkhar, Damodar, K4sai, Subanrekha, Baitarani, Brahmani, Eb, and other rivers. Sd/ forests abound. The principal jungle products are timber, various kinds of medicinal fruits and herbs, lac, tasar silk, and mahud flowers, which are

used as food by the wild tribes and also distilled into a strong country liquor. Coal exists in large quantities, butgis at present only worked on a small scale on the Hazdribagh district. Formerly gold was washed from the sands in the bed of the Subanrekha River, but the operations are now almost wholly abandoned. Iron- ores abound, together with good building stone. The popu- lation in 1872 was 3,825,571, residing in 25,766 villages or townships and 752,287 houses. Of these the Hindus numbered 2,567,292, or 67°1 per cent.; Muhammadans, 169,006, or 4°4 per cent. ; Christians, 15,798, or ‘4 per cent. ; persons of unspecified religion, 1,073,475, or 28°1 per cent. These last consist of nou-Aryan tribes who were driven from the plains by the Hindus and took refuge in the mountain fastnesses of the Chutiaé Nagpur plateau. The principal of them are Kols, 292,036 in number; Santals, 220,096; Uraons or Dhangars, 208,343; Mundas, 190,095; and Bhumij, 128,289. These tribes were formerly turbulent, and a source of trouble to the Muhammadan governors of Bengal and Behar ; but the introduction of British rule has secured peace and security, and the aboriginal races of Chutia Nagpur are now peaceful and orderly subjects. Of late years missionaries have worked hard among them, and several thousands of the Kols and Santdls have accepted the Christian faith. Only six towns contain upwards of 5000 inhabitants, viz., Ranchi, 12,086; Hazaribagh, 11,050; Ichak, 8999; Chatra, 8818; Purulid, 5696; and Raghunathpur, 5380. The principal agricultural pro- ducts are rice, Indian corn, pulses, oil-seeds and potatoes. A small quantity of tea is grown in Hazaribagh and Lohardaga districts. Lac and tasar silkcloth are largely manufactured. The revenue of the British portion of Chutié Nagpur in 1870 was £101,651, the expenditure £79,472. Of the total revenue the receipts from land amounted to £23,698. The police of the British districts consisted in 1872 of 1590 officers and men of the regular force, maintained at a cost of £31,131; 172 officers and men of the municipal police, costing £981; 15,104 men of the village watch, costing £17,592; the total strength being 16,866 officers and men, and the total cost £49,705. In 1872-73, the Educational Department inspected 571 schools attended by 15,871 pupils, and the total cost of Government for the education of the people was £2371. The climate of Chutia Nagpur is dry and healthy. CHUTIA NAGPUR TRIBUTARYSTATES. These are seven in number,—Sirguja, Udaipur, Jashpur, Gangpur, Bondi, Korid4, and Chang Bhakar. At the decline of the Marhatta power in the early part of this century these estates came under

British protection. They are now under the political superintendence of the commissioner of Chutia Nagpur, and the charge of them constitutes what is known as the South-West Frontier Agency. Before the rise of the British power in India their chiefs exercised almost absolute sovereignty in their respective territories. The Rajas now pay a light tribute to the British Govern- ment, and are invested with magisterial authority to punish offenders by fine not exceeding £5 or by imprisonment not exceeding two years. The states are mountainous, thinly cultivated, and inhabited for the most part by wild aboriginal tribes. They cover an area of 15,419 square miles, _the largest states being Sirgujé and Gangpur. Their aggregate population amounts to 405,980 souls, giving an average of 26 persons to the square mile. No towns exist in the

1000 inhabitants. The following is a brief description of each of the States :—

(1.) Sirguja, the largest, lies between 22° 30’ and 24° N. lat., and 82° 35 and 84° 10 E. long. It is bounded on the N. by the in- dependent state of Rewa and the districts of Mirzdpur and Lohardaga, on the E. by the district of Lohdrddgé, on the 8. by the Bilaspur district of the Central Provinces and the states of Udaipur and Jashpur, and on the W. by the state of Korid. It is very hilly, with elevated table-lands affording good pasturages, and cut up by numerous ravines. The rivers are the Kanhar, Rer, Mahan, Son, and Santch, the last being formerly known as the Diamond River. Hot springs exist in the state. Extensive sdd forests cover a large area, affording shelter to herds of wild ele- phants, antelopes, bisons, buffaloes, and many sorts of deer, and also to tigers, bears, and other beasts of prey. The area is 6103 square miles; the population in 1872, 182,831 souls, residing in 1295 villages and 36,463 houses :—classified, according to religion— Hindus 68,789, or 37°6 per cent.; Muhammadans 1370, or ‘8 per cent. ; aborigines of the Dravidian stock 73,256, of the Kolarian stock 39,416, total 112,672, or 61°6 per cent. The principal agri- cultural products are rice, Indian corn, and other inferior cereals, pulses, oilseeds, and cotton ; the articles of export —clarified butter, grain, oilseeds, lac, gums, jungle silk cocoons (taswr), &c. ; imports— brass and pewter vessels, piece goods, and ornaments. The places of trade are Bisrampur, the capital of the state, Pratappur, and Jhilmili. The total revenue of the estates in Sirgujd in possession of the

different members of the chief’s family is £7000; the rental of the personal estate of the Raja, £3000; the expenditure on adminis- tration, £212. A small body of police is maintained by the Raja, and he can at a short notice put himself at the head of 1000 fighting men. Sirguja pays a tribute of £189 to the British Government.

(2.) Udaipur les between 22° 3’ and 22° 50’ N. lat., and 83° 5” and 83° 50’ E. long., and is bounded on the N. by the Mainpat. plateau in Sirgujé, on the E. by Jashpur, on the S. by Rai- garh, and on the W. by Bilaspur in the Central Provinces. Country hilly, diversificd with plains, and possessing one of the most extensive coal fields in India. Principal river, Maud. Area, 1051 square miles, of which 121 are cultivated. Population— 27,708 :— Hindus, 7351; Muhammadans, 118 ; aborigines, 20,239, Principal villages —Rabkob, the capital, and Dorki. LExports— cotton, resinous gums, oilseeds, rice, wild arrowroot, iron, and a small quantity of gold, obtained by washing. Udaipur came under the British protection in 1817, and now pays an annual tribute of £53.

(3.) Jashpur, the most populous of the states, lies between 22° 20’ and 23° 15’ N. lat., and 83° 30’ and 84° 30’ of E. long., and is bounded on the N. and E. by the district of Lohdrdigd, on the S. by the states of Gangpur and Udaipur, and on the W. by the state of Sirguja. The country is divided almost equally into high and low lands. The only river of importance is the Eb, in the bed of which diamonds are found, and from time immemorial its sands have been washed for gold. Jashpur iron, smelted by the Kols, is highly prized. Jungles of sd/ forests abound, harbouring elephants, bisons, and other wild beasts. Jungle products—lac, silk-cocoons, and beeswax, which are exported. Area, 1947 square miles; population, 66,926 :— Hindus, 11,498; Muhammadans, 423; aborigines, 55,005. Principal villages —Jashpur Nagar, the capital, and Sanoa. Agricultural products—rice, barley, Indian corn, and other inferior crops, pulses, oilseeds, hemp, flax, &c. The Raja possesses an income of about £2000, and pays through the Sirguja state a tribute of £77, 10s. to the British Government. Jashpur came under the protection of the British Government in 1818.

(4.) Gangpur extends from 21° 50’ to 22° 80’ N. lat., and 85° 10’ to 85° 40’ of E. long., and is bounded on the N. by Lohardaga district, E. by the

Sinhbhum district, S. by Sambalpur and Bamra, and W. by Raigarh in the Central Provinces. The country is for the most part an undulating plain, broken by detached ranges of hills, one of which, the Mahavira range, possesses a very remarkable and imposing appearance, springing abruptly from the plain in an irregular wall of tilted and disrupted rock, with two flanking peaks. The rivers are the Eb and the Brahmani, formed here by the union of the Sankh and the Koel, both navigable by canoes. The Eb was formerly famous on account of diamonds found in its bed, and its sands are still explored for gold. One of the largest coal fields in India extends into the state. Jungle products—lac, silk cocoons, catechu, and resin, which are exported. Wild ani- mals—bisons, buffaloes, tigers, panthers, leopards, hyenas, wolves, jackals, wild dogs, and many sorts of deer. Area, 2484 square miles ; population, 73,637, viz., Hindus, 28,192; Muhammadans, 231; aborigines, 45,214. Principal village, Suadi, the residence of the Raja. The soil is exceedingly fertile, yiclding sugar cane, tobacco, rice, and other cereals, pulses, oilseeds, and cotton. The chief enjoys a revenue of about £200, out of which he pays £50 as tribute to the British Government, the connection of which with the state dates from 1808.

. (5.) Bonai extends from 20° 10’ to 21° 10’ N. lat., and from 84° 30’ to 85° 25’ E. long., andis bounded on the N. by the Gangpur state and the Sinhbhim district, on the E. by the state of Keunjhar in Orissa, and on the 8S. and W. by the state of Bamra in the Central Provinces. It is for the most part covered with a mass of uninhabited hills, except the central part, through which the Brahmani river passes, forming a fine fertile valley along its course. Principal heights—Mankarnacha, 3639 feet: Baddin- garh, 3525; Kamratar, 3490; Chelidtaka, 3308; and Kondadhar, 3000. Products—almost the same as Gangpur. Area, 1297 square miles ; population, 24,832, viz., Hindus, 10,416; Muhammadans, 32; and aborigines, 14,384. The chief enjoys an income of about £600, and he pays an annual tribute of £20 to the British Govern- ment. In 1803 the British Government entered into treaty rela- tious with Bondi.

(6.) Korid lies between 22° 58’ and 23°-49’ N. lat., and 82° and 82° 59’ E. long., and is bounded on the N. by the Rewa state, E. by Sirguja, S. by

Bilaspur district of the Central Provinces, and on the W. by Chang Bhakar. Country extremely hilly ; highest point, 3370 feet. Rivers—Heshto or Hasdo, Gopath, and other minor streams which feed either the Son on the N. or the Mahanuddy on the 8S. Jungle and agricultural products— same as the other states. Mineral product—iron. Tigers commit great havoc in the villages, and wild animals abound. Area, 1631 square miles; population, 21,127, viz., Hindus, 10,807 ; Muham- madans, 140; aborigines, 10,180. Principal village—Sonhat, the residence of the Raja, which contains a mud fort. The Raja enjoys an income of about £700, and pays a tribute of £40 to the British Government. ‘he relations of the British Government with this state commenced in 1818.

(7.) Chang Bhakar state protrudes like a spur into the Rewa territory, which bounds it to the N., W., and S., the eastern side being bounded by the state of Koria, of which it was formerly a fief. The natural scenery of the country consists of hills, ravines, and plateaus, covered with forests of sdl, with small villages at distant intervals in the jungle. Herds of wild elephants commit sad havoc on the crops, which has caused the desertion of several villages. Area, 906 square miles ; population, 8919, viz., 2728 Hindus, 34 Muhammadans, and 6157 aborigines. The chief has an income of about £300, and pays a tribute of £38,

(W. W. H.)

12s.

CHUTTERPUR, a city of British India, in the province of Bundelcund, 180 miles S.E. of Agra, and 140 S.W. of Allahabad. It was established by the Rajah Chutter Sal, the founder of the short-lived independence of Bundel- cund, and the resolute opponent of the Mogul empire in the 17th century. Situated but a short distance from the diamond mines of Pannah, and forming an important entre- pot in the trade between the Deccan and Benares, it soon grew into a very flourishing city. It is still a thriving place, but it maintains its prosperity less by its transit trade than by its manufactures, of which the most important are paper and coarse cutlery. It is irregularly built, and con- tains but few buildings of individual interest. The palace is a modern structure of hybrid character, combining the features of an Italian villa with those of a Rajput castle. There was formerly a

political agent of the British Govern- ment in the city, but he has been transferred to Nowgong. The territory of which the town is the capital contains an area of 1240 square miles, with a population of from 200,000 to 300,000. The revenue is stated at not more than twenty lacs of rupees per annum. Asthe Rajah Per- taub Singh had no male issue, the territory on his decease would have lapsed to the paramount power; but in acknow- ledgment of his fidelity and the beneficial results of his administration, the British Government recognized a suc- cessor in the person of his grand- nephew Juggut Singh.

CIBBER, or Crsert, Carus Garren (1630-1700), sculptor, was born at Flensburg in Denmark. He was the son of the king's cabinetmaker, and was sent to Rome at the royal charge while yet a youth. Nothing further is known of his earlier life, save that he came to England during the Protectorate, or during the first years of the Restoration. By his second wife, Miss Colley of Glaiston, a son was korn to him afterwards to be known as Colley Cibber, Besides the famous statues of Melancholy and Raving Madness ("great Cibber's brazen brainless brothers"), once in old Betuleham Hospital and now at South Kensing-

tou, Cibber produced the kas-reliefs round the Monument on Fish Street Hill. The several Kings of England and the Sir Thomas Gresham executed by him for the Royal Ex- change were destroyed with the building itself in 1838. Cibber was long employed by William fourth earl of Devon- shire, and many fine specimens of his work are to be seen at Chatsworth. Under that nobleman he took up arms in 1688 for William of Orange, and was appointed in return carver to the king's closet. He died rich, and, according to Horace Walpole, kuilt the Danish church in London, where he lies buried beside his second wife, to whom he erected a monment.

CIBBER, Couey (1671-1757), actor, dramatist, and laureate, was the eldest son of Caius Cibber, and was born in London. Sent in 1682 to the free school at Grantham, he distinguished himself by passing through all its grades, from

'lowest to highest, and by producing an " Oration" on the

death of Charles II.—whom he had seen feeding his ducks in the park—and an “Ode” on the accession of James II., with whom he had sat at worship in Whitehall Chapel. He was removed in 1687 on the chance of election into Winchester College. Caius Cibber, however, had not then presented that institution with his statue of William of Wykeham, and his son’s claim was ignored. ‘The boy went to London, and amused himself with the theatre, for which he had a passion. It was presently decided, on his own recommendation, that he should not return to school, but that he should go straight to Cambridge, for certain colleges in which university the sculptor was then executing com- missions; meantime he was invited to Chatsworth, the seat of his father’s patron. On his way thither, the Revolu- tion broke out, and father and son met at Nottingham, where Colley Cibber was received, at the instance and in the place of Caius Cikber, into Devonshire’s company of volun- teers. He served in the bloodless campaign that resulted in the coronation of the Prince of Orange, and on its con- clusion, at his father’s request, presented a Latin petition to the earl—afterwards duke—-imploring his interest and protection. By that nobleman’s desire the young man returned to London, andere long his craze for things histri- onic enrolled him in Betterton’s grand company of actors. After playing “ full three quarters of a year” without salary, as was then the custom of all apprentice actors, he began to be paid ten shillingsa week. His rendering of the little part of the chaplain in Otway’s Orphan procured him a rise of five shillings; and a subsequent impersonation, on an emergency, and at the author’s request, of Lord Touch- wood in the Double Dealer, advanced him, on Congreve’s recommendation, to a pound a week. On this he contrived to live with his wife and family, and to produce a play— Loves Last Shift. Of this comedy, highly praised by Southern and Dorset, Congreve said that it “had only a great many things that were like wit in it;” Vanbrugh honoured it by writing his excellent Relapse as a sequel. In 1697 Cibber was included by Collier among the repre- hensible in the famous Short View. In 1704 he brought out, for himself and Mrs Oldfield, his best play, the Careless Husband, the most striking scene in which is said to have been suggested by an episode in the life of the notorious Mrs Brett (better known as the Countess Macclesfield) to whom the MS. had teen submitted. In 1711, with Collier, Wilks, and Dogget, he became a patentee of Drury Lane theatre, where, in 1712, Addison’s Cato was produced under his management. In 1715, on the occasion of the Rebel- lion, Cibber adapted the Vonjuror from

Moliére's Tartuffe ; the play, a mere piece de circonstance, ran eighteen nights, and the author received from George I., to whom it was dedicated, a present of two hundred guineas. In 1726 he pleaded the cause of the patentees against Sir Richard Steele (who had succeeded Collier as manager of Drury Lane) be-

fore Jekyll], Master of the Rolls, and won his case. In 1730 Mrs Oldfield died, and her loss was followed in 1731 by that of Wilks; Cibber, who had been named laureate on the death of Eusden, sold his share in the theatre, and retired from the stage, and only appeared thereafter on rare occasions. In 1742 occurred the quarrel with Pope, which resulted in the exclusion of Theobald and the elevation of Cibber as the hero of the Dunciad. At seventy-four he appeared on the stage for the last time as Panulph in his own poor tragedy of Papal Tyranny. His conversation (of which Johnson said that "taking from it all that he ought not to have said, he was a poor creature") was agreeable to the last, and he died as full of worldly honours as of years.

Cibber's reputation has suffered greatly from the acrid censure of Pope and the rough scorn of Johnson. There can be no doukt that he was by no means' an unamiable character, and that he was deficient neither in wit, sense, tact, nor feeling. The little passages of dramatic criticism and reflection scattered through his Apology, while they prove his extreme perspicuity and excellence of experi- ence, are perhaps the most delicate and subtle of their kind in the literature of his time ; while the fact that his version of Aichard ITT. should have kept the stage for a century is of itself no mean proof that his scenic sagacity and instinct were remarkable. As a dramatist, he has neither the broad humour and strong comic vein of Vanbrugh, nor the fine English and the misterfulness of Congreve, nor the frolicsome gaiety and airy fancy of Farquhar. His characters are flat; his plots are neither natural nor well conducted; his dialogue is often flippant. He attempted, moreover, to extract a highly moral end from his sympathetic studies of social weakness and impurity, and the result (par- ticularly in his continuation of Vanbrugh's unfinished Jowr- ney to London) is not happy.

His Odes, the subject of several of Johnson's keenest pleasantries, are wretched. His best work is the Apology for his Life, a book which the same critic declared to be a standing proof that any man might do well who was able and willing to keep to his own ground.

See An Apology for the Life of Colley Cibber, Comedian (London, 1822) ; Cibber, Dramatic Works (London, 1777, 5 vols.) ; Boswell, Life of Samuel Johnson, LL.D. ; and Isaac D'Israeli, Quarrels of Authors.

CICACOLE, a town of British India, in the presidency of Madras and district of Ganjam, about 58 miles N.E. of the town of Vizagapatam, on the left bank of the River Nagawalli or Naglandi, a few miles from its mouth. It is an irregular mud-built place, but possesses several mosques and bazaars of some importance. Its principal manu- factures are cotton goods and excellent muslins, There is a military cantonment a short distance from the now dismantled fort, and a small English church occupies the corner of the parade ground. A school where English is taught is supported by the London Missionary Society. The town formerly gave its name to one of the five Northern Circars. Its population is about 12,800.

CICERO, Marcus Tuxttus, born at Arpinum (Arpino) on the northern border of the Volscian territory, 3d January 647 a.u.c., 106 B.c. His family was of equestrian rank, and his father, though living in retirement, was intimate with some of the public men of the day. The orator Crassus took an early interest in the young M. Cicero and his brother Quintus, and directed their education. As an orator, a Statesman, and a man of letters Marcus became the most consummate specimen of the Roman character under the influence of Hellenic culture. He was first placed under the tuition of the Greek poet Archias, a teacher at Rome, with whom he read the poets and orators of Greece, com- posed in the Greek language, and also wrote Latin verse. This literary training he combined with study under the

two Sczvolas, the augur and the pontifex, and from these Roman masters he imbibed the spirit of the national law and ritual. His aim was to prepare himself by liberal as well as technical training for the career of an advocate; but the Roman institutions required him to serve in the field also, and he

took part in the campaign of Sulla against the Italian confederates in the year 87. Returning to the city he betook himself once more to the pursuits most con- genial to him, and attended on the teaching of Philo the chief of the Academics, of Diodotus the Stoic, and of Molo a philosopher of Rhodes. Many teachers had been driven at that moment from the schools of Greece by the invasion of Mithridates. Cicero, at the age of twenty-six, pleaded a civil cause in the speech pro Quinctio (81 B.c.), and again in a criminal action against Roscius Amerinus in the following year. After these efforts, which brought him some distinction, he suddenly withdrew to Athens, on the plea of weak health, but probably to avoid the displeasure of the dictator Sulla. Here he studied under Molo and others, with a special view to the practice of declamation, and the management of his physical powers in a profession which made severe demands upon them. He travelled also through the Roman province of Asia, and stored up a vast amount of information in a mind singularly acquisitive and endowed with extraordinary facility of arrangement and expression, but with comparatively little fertility of invention or breadth and strength of character. Cicero was from the first an imitator and an adapter rather than an original thinker. He was throughout a follower rather than a leader in action as well as in speculation. His mental training disposed him specially to admire past models or cling to existing institutions, and he was always too easily subjected to the influence of characters stronger than his own. His position, indeed, as a new man, or a strug- gling candidate for political honours which neither his birth nor his means could naturally command, made it necessary for him to attach himself to the leaders of party ; but his versatile talents soon rendered him a valuable adherent, and it speaks well for the times in which his lot was cast, amidst the deep corruption which pervaded them, that his honest and enlightened patriotism was on the whole appreciated and rewarded.

It was from policy, but partly also from his own kindly feelings, that the young orator, on resuming his profession, preferred to distinguish himself in defence rather than in attack. This course impressed the good-natured public in his favour. Moreover, the class from which the judices were taken, conscious that the position of defendants in a criminal suit might at any time be its own, was often glad of an excuse for screening public delinquents. It may be said that even the impeachment of Verres was rather

a defence of the injured Sicilians than a hostile attack upon an individual, who was allowed to withdraw quietly from the city. Cicero's triumph in this famous cause (70 B.o. raised him to the pinnacle of reputation. He had already attained the questorship (77 B.c.). He succeeded to the eedileship in 69, and became preetor in 68, a year memor- able in his career for the passing of the Manilian law, which he warmly supported, by which Pompeius was constituted commander against Mithridates with extraordinary powers, in the place of Lucullus. Pompeius was at this period accepted by the oligarchy as their leader, though not with- out reluctance and distrust. Cicero gladly attached himself to their cause, and flattered himself with the hope of recon- ciling the senate with the knights by a more liberal and genial policy. Meanwhile he hoped, by favour of the dominant party, to attain the consulship. He found him- self a candidate for that magistracy along with Catiline, a man of ruined character and already under suspicion of plotting against the state. Nevertheless he did not hesitate

to combine with him in his canvass, and to undertake his defence on a charge of malversation. Cicero obtained the consulship ; Catiline was defeated, and thereupon betook himself to treasonable machinations. It was the business of his late ally to track these intrigues and defeat them. The vigour and courage with which Cicero conducted himself at this crisis won for him by popular acclamation the title of "Father of his Country" (63 B.c.) But the nobles ill requited the service he had done them. They now felt themselves secure in their ascendency. They affronted Pompeius, they made light of Cicero, and allowed him to be treated contumeliously by a tribune, who, under pretence that he had condemned citizens unheard, forbade him to make the usual declaration of the services he had performed in his consulship. Cicero, in laying down his office, was only permitted to exclaim —' I swear that I have saved the state." Czesar, at the head of the popular party, counte- nanced this affront; while Pompeius, perhaps a little jealous of the rising statesman, on his return from the East vouchsafed him no cordial support. The real weakness of his position was made painfully manifest to him. He would not consent, however, to remove to a distance, and declining to sue for the government of a province, devoted himself for a time mainly to literary pursuits, composing among other things a poem on

the glories of his own con- sulship. Meanwhile the enemies he had made became more emboldened. Clodius, a worthless demagogue, assailed him with a formal charge for putting citizens to death summarily without appeal to the people. In vain did he assume the garb of mourning, and traverse the streets as a suppliant. The magnates stood coldly aloof, and the factions arrayed against him did not scruple to menace his scanty defenders with violence. Cicero was obliged to seek safety in flight, and withdrew to Thessa- lonica. Clodius obtained a decree of the people for his banishment 400 miles from the city, and the destruction of his house on the Palatine, the site to be devoted to the erection of a temple of Liberty (58 8.c.)

Pompeius and Cesar had suffered Cicero to undergo this humiliation for their own purposes, but they were not disposed to submit to the arrogance of the upstart Clodius, who was now making himself generally obnoxious. In the following year they let it be understood that the persecu- tion should cease. The partizans of Clodius raised tumults in the city, but they were speedily put down, and a resolu- tion for the exile's recall was carried in the assembly of the people. Cicero had betrayed much weakness under banishment. The exultation with which he triumphed on his return was hardly more dignified. The senate, however, complimented him, by coming forth to meet him, and the state undertook the restoration of his mansion. The armed opposition of Clodius was met by a counter demonstration on the part of Milo, a no less turbulent instrument of the oligarchy. But Cicero now felt himself powerless in the presence of chiefs of armies and leaders of factions. He attached himself more closely to Pompeius, and devoted his eloquence to the defence of his patron's creatures, while he courted more and more the pursuit of literature in retire- ment. The attainment of a seat in the college of augurs on the death of Crassus (53 8.c) placed him in a position of dignity well suited to the taste of a constitutional antiquarian. But Cesar, though now absent in Gaul, was rapidly becoming a great power in the state, and Cicero did not fail to pay court to him also, proposing to celebrate his British wars in an epic poem. 'The death of Clodius (52 B.c.), whose slayer, Milo, he defended, relieved him from the apprehensions he had never yet shaken off. He accepted, though not without reluctance, the Jot which assigned him the government of Cilicia for the year following. His conduct in this post seems to have been

highly meritorious. He checked the corruption of his officials while he preserved his own purity, and distasteful as warlike affairs were to his studious and quiet temper, he did not shrink from leading his troops against the restless mountaineers. His vanity induced him to pretend toa triumph for his success in these trifling operations; but in those degenerate days greater victories than his would have failed to secure such an honour, unless backed by the influence of the leaders of party, and neither Pompeius nor Czesar was disposed to indulge him.

Thecivil war between these two rivals was now imminent. Cicero naturally threw himself into the ranks of the sena- torial or conservative party, which was blindly following the lead of Pompeius ; but he was coldly received by the violent men who ruled it, to whom his old-fashioned patriot- ism was utterly distasteful. Reluctantly and with mucli misgiving he quitted Italy in the train of the senate and con- sented to set up a shadow of the commonwealth on a foreign shore ; while Casar attached to himself in the city, as dic- tator and consul, both the substance and the forms of cou- stitutional power. After the disaster of Pharsalia and the rout of the senatorial forces, Cicero quickly threw aside his arms and returned to Italy, where Cesar had left Antonius in command. He was soon relieved from apprehensions for his own safety by kind assurances from the victor, and while Caesar was occupied in Egypt, Africa, and Spain, he withdrewaltogetherfrom public life. With his wife Terentia he had never lived happily ; but he now took the step of repudiating her, which according to the ideas of the times caused no unfavourable remark, nor was it made matter of reflection upon him that he straightway married again his own ward Publilia, wealthy as well as beautiful. Theyoung bride seems, however, to have contributed nothing to his domestic happiness, and her, too, he soon repudiated fur the satisfaction she had seemed to evince at the death of his much-loved daughter Tullia, During this period, however, he abstained from making advances to Ceesar, and did himself honour by composing a panegyric upon Cato. to which Ceesar condescended to make an ill-tempered reply. But the conqueror’s clemency to Marcellus at last won his heart, and now, after the death of Pompeius, Cato, and Scipio, with all the other chiefs of his party, he could not refrain from declaring warmly

in favour of the new ruler. Czesar felt the compliment, and repaid it by sparing at his instance the life of Ligarius. The conduct of Cicero at this critical moment was undoubtedly the most truly politic. Other republicans, such as Brutus and Cassius, who had espoused the senatorial cause with feverish zeal or angry fac- tiousness, did not scruple to give their actual support to the new government, and to accept office under it, while they secretly chafed against it and threw themselves into a con- spiracy against the life of their master. The difference between their spirit and that of Cicero is marked by the fact that in a plot which numbered, it was said, as many as eighty men of public note, Cicero himself was not included. The covert assassins dared not consult with men of true honour. When the deed was done, indeed, Cicero might fairly take part with its perpetrators in the name of the free state which in his sanguine view might still be restored. When, however, the liberators, as they called themselves, repaired to the provinces to strengthen their party against the Cesarians, Cicero declined to undertake active service. He remained in Italy, and employed himself in guiding, as he thought, the conduct of the young Octavius, the nephew and heir of the dictator. This crafty dissembler promised well, and Cicero expected to be able to use him as a convenient opponent to Antonius. It must be con- fessed that the veteran statesman was himself playing a part, and dissembling with the youth whom he meant eventually to get rid of. It was a game on both sides, and Octavius

won it. He looked on with satisfaction while Cicero excited the passions of the citizens against Antonius in the series of orations to which he gave the name of Philippics, while he armed the consuls Hirtius and Pansa to overthrow him. The orator, now advanced in years, showed at this crisis all the vigour with which he had encountered Catiline twenty years earlier. To him the people entrusted the government of the city, and while all the forces of the republic were concentrated under various leaders on the Cisalpine, he might fancy himself for a moment the real controller of affairs. But after the deaths of Hirtius and Pansa in the battles before Mutina, and the discomfiture of the republicans under Decimus Brutus, Octavius, Anto- nius, and Lepidus formed a compact, and assumed to be a triumvirate, or a board of three special officers for the regulation of the commonwealth.

Their arrival at Rome was followed by bloody proscriptiens of their public and private enemies. Antonius demanded the head of Cicero, and Octavius yielded it. The orator fled, together with his brother, but he could not endure to abandon Italy, and after some weeks' delay, which seems to show that the pur- suit was not keen, he was overtaken at the door of his Formian villa and his throat cut by the bravo Popilius, His head and hands were cut off and sent to Rome, where Antonius caused them to be affixed to the rostra, and Fulvia, the widow of Clodius and the wife of Antonius, pierced with her needle the tongue which had declaimed against both her husbands. Cicero perished at the close of the year 43, at the age of sixty-three. Octavius, in his later years, as the Emperor Augustus, could coolly say of the great statesman and patriot to whose murder he had consented, " He was a good citizen, who really loved his country." The saying was indeed well deserved, but it should have come from purer lips.

Cicero was indeed not only a good citizen, but a good man; he loved not his country only but mankind in general ; he loved them not merely from a kindly nature, but from reflection and self-discipline. As a specimen of the highest culture of the ancient world both moral and intellectual he must' ever stand pre-eminent. He was a wiser if not a more sincere patriot than Cato; his private virtues were subjected to a severer test than those of M. Aurelius. His intellectual superiority is sufficiently attested by the important place he attained, in the face of many disadvantages, in the conduct of public affairs. But a large portion of his multifarious writings still remains, and constitutes an enduring monument to his fame, which has keen recognized through allages. The great bulk of these works may be conveniently classed as (1) political, (2) philosophical, (3) personal. The first division comprises a collection of fifty-six speeches professing to have been delivered in the forum or the curia, though some of them certainly, as for instance that for Milo and the greater number of the Philippics, were written for publication but not actually delivered. The genuineness of that for Marcellus, and of the four which refer to the orator's return from exile, has been much questioned. [Besides the speeches themselves, Cicero produced several treatises on the subject of oratory, which as part of the Roman training for public life may be regarded as political. Of these the principal are the de Oratore, the Orator, and the Brutus. The origin of the strictly technical treatises de Inventione and fhetoricorum is involved in

much perplexity. To this division belong still more strictly the important works de Legibus and de Republica, which contain valuable references to the events of early Roman history. To our second division belong the famous treatises on philosophy, from which we derive all our knowledge of the Greek systems which succeeded to the schools of Plato and Aristotle, and in which it became the fashion to affect an

interest at Rome. Of these the Academica, the Tusculane, the de Finibus, and others which have been lost were devoted to speculative questions; the de Divinatione and de Natura Deorum refer more strictly to theological tradi- tions ; while the book de Offictis is an elaborate treatise on moral obligations. The smaller works, de Senectute, de Amicitia, de Consolatione, and probably the lost essay de Gloria, may also be ranged more or less definitely under the head of practical philosophy. The third division embraces Cicero's letters in two series, the one those to his friend Atticus, the other (ad familiares) to his correspon- dents generally. To these may be added a collection of letters addressed to his brother Quintus. These together give an account of the writer's life almost from day to day ; they are the most valuable of his works for the historical information they afford us, as well as for the insight they give us into the character not of the writer only but of many of the leading personages of the day. In both these respects they stand unique among the remains of antiquity, and few men of historical note even in recent times have been so fully presented to us in their correspondence as Cicero, whose life acquires thereby its transcendent interest for all students of human nature. It may be added that the great philosopher and orator amused himself further with more than one ambitious flight in poetry. His verses on his consulship attracted some attention from his country- men, and a specimen of them has come down tous. He made also a Latin translation of the astronomical poem of Aratus, and proposed at least, "as has been above mentioned, to execute an epic on the invasion of Britain by Cwsar.

The latest critical and complete edition of Cicero's works is that of J. Caspar Orellius, printed at Zurich (1826-1838). The text, accom- panied by

a full apparatus of various readings, is followed by a collection of the ancient scholiasts, an elaborate Onomasticon, and other valuable supplements. This edition is comprised in eight,

but may be more conveniently bound in twelve large octavo volumes. (C. M.)

CICOGNARA, Leoponpo, Count (1767-1834), archee- ologist and writer on art, was a native of Ferrara. At an early age he evinced strong predilections for the sub- jects on which he was to become so high an authority. Mathematical and physical science diverted him a while ; but his bent was decided, and not even the notice of such men as Spallanzani and Scarpa could make a savant of him. A residence of some years at Rome, devoted to paint- ing and the study of the antiquities and galleries of the Eternal City, was followed by a visit to Naples and Sicily, and by the publication, at Palermo, of his first work, a poem of no merit. The island explored, he betook himself to Florence, Milan, Bologna, and Venice, acquiring a complete and perfect knowledge of these and other cities from the point of view of an archeologist and connoisseur. In 1795 he took up his abode at Modena, and was for twelve years engaged in politics, becoming a member of the legislative body, a councillor of state, and minister plenipotentiary of the Cisalpine Republic at Turin. Napoleon decorated him with the Iron Crown ; and in 1808 he was made president of the Academy of the Fine Arts at Venice, a post in which he did good work for a number of years. In 1808 appeared his treatise Del Bello Ragionamenti, dedicated in glowin terms to Napoleon. This was followed (1813-1818) by his magnum opus, the Storia della Scultura dal suo Risor- gemento in Italia al Secolo di Napoleone, in the composition of which he had been encouraged and advised by Giordano and Schlegel, while the great emperor to whom it was dedi- cated had assisted the publication pecuniarily,—an example which the Bourbons did not follow. This book, designed to complete the works of Winckelmann and D'Agincourt, was the result of many years of meditation and comparison ; it is illustrated with 180 plates in outlines, and if imperfect, is yet of great value. In 1814, on the fall of Napoleon,

Cicognara was patronized by Francis I. of Austria, and pub- lished (1815-1820), under the auspices of that sovereign, his Fabbriche pid cospicue di Venezia, two superb folios, containing some 150 plates. Charged by the Venetians with the presentation of their gifts to the Empress Caroline at Vienna, Cicognara added to the offering an illustrated catalogue of the objects it comprised ; this book, Omaggio delle Provincie Venete alla Maesta di Carolina Augusta, printed for private circulation at the author's own expense, has since become of great value to the bibliophilist. Re- duced to poverty by these splendid editorial speculations, Cicognara contrived to alienate the imperial favour by his political opinions. He left Venice for Rome ; his library was sent to market; and in 1821 he published at Pisa a catalogue rarsonné, rich in bibliographical lore, of this fine collection, the result of thirty years of loving labour, which in 1824 was purchased en bloc by Pope Leo XIL, and added to the Vatican library. The otherworks of Cicognara are—the Memorie Storiche de' Litterati ed Artisti Ferraresi, 1811; the Vite de' pid insigni Pittori e Scultori Ferraresi, MS.; the AWemorve spettanti alla Storia della Calcograjia, 1831; and a large number of dissertations on painting, sculpture, engraving, and other kindred subjects. (See Papoli, in No. ll of the Hxile, a print written and pub- lished by Italian refugees).

Cicognara's reputation is principally founded on his Storia della Scultura. This is a valuable book, but it is disfigured and weakened by the enthusiasm that led the author to sacrifice almost all the lights of modern sculpture to the reputation of his friend Canova, to whom the seventh part of the book is devoted. His work as president of the Academy at Venice was also excellent; to him are attri- buted the increase in number of the professors, the improve- meutin the courses of study, the institution of prizes, and the foundation of a gallery for the reception of Venetian pictures,

CID, Tue, Roprico Diaz DE Brvar, the favourite hero of Spain, and the most prominent figure in her litera- ture, has a name so obscured by myth and fable as scarcely to belong to history. So extravagant are the deeds as- cribed to him, and so marvellous the attributes with which he has been clothed by the fond idolatry of his country- men, that by some he has been classed with the Amadises and the Orlandos whose exploits he emulated. The Jesuit Masdeu stoutly denies that he had any real existence, and this

heresy has not wanted followers even in Spain. The truth of the matter, however, has been expressed by Cer- vantes, through the mouth of the Canon in Don Quixote: “There is no doubt there was such a man as the Cid, but much doubt whether he achieved what is attributed to him.” The recent researches of Professor Dozy, of Ley- den, have amply confirmed this opinion. There is a Cid of history and a Cid of romance, differing very materially in character, but each filling a large space in the annals of his country, and exerting a singular influence in the de- velopment of the national genius.

The Cid of history, though falling short of the poetical ideal which the patriotism of his countrymen has for 700 years cherished, is still the foremost man of the heroical period of Spain—the greatest warrior produced out of the long struggle between Christian and Moslem, and the per- fect type of the Spanish Goth of the 12th century. Rod- rigo Diaz, called de Bivar, from the place of his birth, better known by the title given him by the Arabs as the Cid (#1 Seid, the lord), and £1 Campeador, the champion par excellence, was of a noble family, one of whose members in a former generation had been elected judge of Castile. The date of his birth cannot be fixed with any certainty, but it was probably between 1030 and 1040. As Rodrigo Diaz de Bivar he is first mentioned in a charter of Fernando I. of the year 1064. The legends which speak of the Cid as

accompanying this monarch in his expeditions to France and Italy must be rejected as purely apocryphal. Fer- nando, a great and wise prince under whom the tide of Moslem conquest was first effectually stemmed, on his deathbed, in 1065, divided his territories among his five children. Castile was left to his eldest son Sancho, Leon to Alphonso, Galicia to Garcia, Zamora and Toro to his two daughters Urraca and Elvira. The extinction of the Western Caliphate and the dispersion of the once noble heritage of the Ommiades into numerous petty independent states, had taken place some thirty years previously, so that Castilian and Moslem were once again upon equal terms, the country being almost equally divided between them. On both sides was civil war, urged as fiercely as that against the common enemy, in which the parties sought allies indiscriminately among Christians

and Ma- hometans. No condition of affairs could be more favour- ble to the genius of the Cid. He rose to great distinc- ation in the war between Sancho of Castile and Sancho of Navarre, in which he won his name of Campeador, by slaying the enemy's champion in single combat. In the quarrel between Sancho and his brother Alphonso, Rodrigo Diaz espoused the cause of the former, and it was he who suggested the perfidious stratagem by which Sancho eventually obtained the victory and possession of Leon. Sancho having been slain in 1072, while engaged in the siege of Zamora, Alphonso was taken from his prison and raised to the vacant throne. One of the most striking of the passages in the Cid's legendary history is that wherein he is represented as forcing the new king to swear that he had no part in his brother's death; but there was cause enough without this for Alphonso's animosity against the man who had helped to despoil him of his patrimony. For a time the Cid, already renowned throughout Spain for his prowess in war, was even advanced by the king's favour and entrusted with high commissions of state. In 1074 the Cid was wedded to Ximena, daughter of the count of Oviedo, and granddaughter, by the mother's side, of Alphonsv V. The original deed of the marriage-contract is still extant. Some time afterwards the Cid was sent on an ein- bassy to collect tribute from Motamid, the king of Seville, whom he found engaged in a war with Abdallah, the king of Granada. On Abdallah's side were many Castilian knights, among them Count Garcia Ordojiez, a prince of the blood, whom the Cid endeavoured vainly to persuade of the disloyalty of opposing their master's ally. In the battle which ensued under the walls of Seville, Abdallah and his auxiliaries were routed with great slaughter, tlie Cid returning to Burgos with many prisoners and a rich booty. There fresh proofs of his prowess only served to kindle against him the rancour of his enemies and the jealousy of the king. Garcia Ordofiez accused him to Al- phonso of keeping back part of the tribute received from Seville, and the king took advantage of the Cid's absence on a raid against the Moors to banish him from Castile. Henceforth Rodrigo Diaz began to live that heroic-pica- resque life which has made him famous, sometimes fighting under the Christian banner, sometimes under Moorish, but always for his own hand. At the head of a band of 300 free lances he offered his services first to the count of Barcelona ; then, failing him, to Moctadir, the Arab king of Saragossa, of the race of the Beni Houd. Under Moctadir, and his successors Moutamin and Mostain, the Cid remained for nearly eight years,

fighting their battles against Mahonmietan and Christian, when not engaged upon his own, and being admitted almost to a share of their royal authority. He made more than one attempt to be reconciled with Alphonso, but his overtures being re- jected, le turned his arms against the enemies of the Beni Houd, extending their dominions at the expense of thie

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Christian states of Aragon and Barcelona, and harrying even the border lands of Castile. Among the enterprizes of the Cid the most famous was that against Valencia, then the richest and most flourishing city of the Peninsula, and an object of cupidity to both Christian and Moslem. The Cid appeared before the place at the head of an army of 7000 men, for the greater part Mahometans. In vain did the Valencians implore succour from the emir of Cordova, and from their co-religionists in other parts of the Penin- sula. In defiance of an army which marched to the relief of the beleaguered city under Yussuf the Almoravide, the Cid took'Valencia after a siege of nine months, on the 15th of June 1094—the richest prize which up to that time had been recovered from the Moors. The condi- tions of the surrender were all violated—the cadi Ibn Djahhaff burnt alive, a vast number of the citizens who had escaped death by famine slaughtered, and the possessions divided among the Campeador's companions. In other respects the Cid appears to have used his victory mildly, ruling his kingdom, which now embraced nearly the whole of Valencia and Murcia, for four years with vigour and justice. At length the Almoravides, whom he had several times beaten, marched against him in great force, inflict- ing a crushing defeat at Cuenca upon the Cid's army, under his favourite lieutenant, Alvar Fafiez. The blow was a fatal one to the aged and war-worn Campeador, who died of anger and grief in July 1099. His widow main- tained Valencia for three years longer against the Moors, but was at last compelled to evacuate the city, taking with her the body of the Cid to be buried in the monastery of San Pedro at Cardefia, in the neighbourhood of Burgos. Here, in the centre of a small chapel, surrounded by his chief companions in arms, by Alvar Fafiez Minaya, Pero Bermudez, Martin Antolinez, and Pelaez the Asturian, rest, after frequent disturbances from friend and foe, the bones of the mighty warrior, the truest of Spanish heroes, the embodiment of all the national virtues and most of the national vices. Philip II. tried to get him canonized,

but Rome objected, and not without reason. Whatever were his qualities as a fighter, the Cid was but indifferent material out of which to make a saint, —a man who battled against Christian and against Moslem with equal zeal, who burnt churches and mosques with equal zest, who ravaged, plundered, and slew as much for a livelihood as for any patriotic or religious purpose, and was in truth almost as much of a Mussulman as a Christian ‘in his habits and his character. His true place in history is that of the greatest of the guerrilleros—the perfect type of that sort of warrior in which, from the days of Sertorius to those of El Empecinado, the soil of Spain has been most productive.

The Cid of romance, the Cid of a thousand battles, legends, and dramas, tlhe Cid as apotheosized in literature, the Cid invoked by good Spaniards in every national crisis, whose name is a perpetual and ever-present inspiration to Spanish patriotism, is a very different character from the historical Rodrigo Diaz—the freebooter, the rebel, the consorter with the infidels and the enemies of Spain. He is the Perfect One, the Born in a Happy Hour, “ My Cid,” the invincible, the magnanimous, the all-powerful. He is the type of knightly virtue, the mirror of patriotic duty, the flower of all Christian grace. He is Roland and Bayard in one. In the popular literature of Spain he holds a place such as has no parallel in other countries. From an almost contemporary period he has been the subject of song ; and he who was chanted by wandering minstrels in the 12th century has survived to be hymned in revo- lutionary odes of the 19th. In a barbarous Latin poem, written in celebration of the conquest of Almeria by Al- phonso VII. in the year 1147, we have the bard testifying

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to the supereminence of the Cid among his country’s heroes :— **Tpse Rodericus Afio Cid semper vocatus,

De quo cantatur quod ab hostibus haud superatus, Qui domuit Mauros, comites domuit quoque nostros.”’

Within a hundred years of his death the Cid had become the centre of a whole system of myths. The Poema del Cid, written in the latter half of the 12th century, has scarcely any trace of a historical character. Already the

Cid had reached his apotheosis, and Castilian loyalty could not consent to degrade him when banished by his sove- reign :— ;

‘*Dios, que buen vassalo si oviese buen sefior!”

cry the weeping citizens of Burgos, as they speed the exile on his way.

The Poem of the Cid is but a fragment of, 3744 lines, written in a barbarous style, in rugged assonant rhymes, and a rude Alexandrine measure, but it glows with the pure fire of poetry, aud is full of a noble simplicity and a true epical grandeur, invaluable as a living picture of the age. The ballads relating to the Cid, of which nearly two hundred are extant, are greatly inferior in merit, though some of them are not unworthy to be ranked with the best in this kind. Duran believes the greater part of them to have been written in the 16th century. A few betray, not more by the antiquity of their language than by their natural and simple tone, traces of an earlier age and a freer national life. They all take great liberties with history, thus belying the opinion of Sancho Panza that “the ballads are too old to tell lies.” Such of them as are not genuine relics of the 12th century are either poetical versions of the leading episodes in the hero’s life as con- tained in the Chronicle, that Chronicle itself having been doubtless composed out of still earlier legends as sung by the wandering juglares, or pure inventions of a later time, owing their inspiration to the romances of chivalry. In these last the ballad-mongers, not to let their native hero be outdone bythe Amadises, the Esplandians, and the Felix- martes, engage him in the most extravagant adventures— making war upon the king of France and upon the emperor, receiving embassies from the Soldan of Persia, bearding the Pope at Rome, and performing other feats not mentioned even in the Poem or the Chronicle. The last and the worst of the Cid ballads are those which betray by their frigid conceits and feeble mimicry of the antique the false taste and essentially unheroic spirit of the age of Philip II. As for the innumerable other poems, dramas, and tales which have been founded on the legend of the Cid, from the days of Guillen de Castro and Diamante to those of Quintana and Trueba, they serve merely to prove the abiding popularity of the national hero in his native land.

The chief sources from which the story of the Cid is to be gathered are, first, the Latin chronicle discovered by Risco in the convent of San Isidro at

Leon, proved by internal evidencc to have been written before 1258; the Croniea General, composed by Al- phonso X. in the second half of the 13th century, partly (so far as relates to the Cid) from the above, partly from contemporary Arabic histories, and partly from tradition ; the Cronica del Cid, first published in 1512, by Juan de Velorado, abbot of the monas- tery of San Pedro at Cardefia, which is a compilation from the last, interlarded with new fictions due to the piety of the compiler ; lastly, various Arabic manuscripts, some of contemporary date, which are examined and their claims weighed in the second volume of Professor Dozy's Historie de la littérature de 0 Espagne aw moyen age. Huber, Muller, and Ferdinand Wolf are among the leading authorities in the history and literature of the Cid. M. Damas Hinard has published the poem, with a literal French translation and notes, and John Hookham Frere has rendered it into English with extraordinary spirit and fidelity. The largest collection of the Cid ballads is that of Duran, in the Romaneero General, in

two volumes, forming part of Rivadeneyra's Biblioteca de Autores Espaioles. (HH. E. W.)

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CIDER, an alcoholic beverage obtained by the fernient- ation of the juice of apples. The manufacture is chiefly carried on by the cultivators of the fruit, and it has been conducted from very remote times in Hereford, Worcester, Gloucester, Somerset, and Devonshire in England, and in Normandy in France. Cider is also largely prepared and consumed in Upper Austria, Wurtemberg, in the districts of the Maine and the Moselle, and in Holland; and it is besides a common beverage in tlie New England and Western States of America. In the south-west of England the most esteemed varieties of apple cultivated for cider- making are the Royal Wilding, the Foxwhelp, White Normandy Beech, Yellow Styre, Handsome Mandy, and Skyrme's Kernel. For asuperior quality of cider the large well matured apples of several varieties are selected, and are ground up to a fine pulp either in an old-fashioned cider mill, or in one of several newer machines which have been introduced for pulping the fruit. The old form of mill consists of a circular trough around which a huge heavy stone wheel or runner, weighing

about a ton, is drawn by a horse. Into the trough a charge of apples, to the amount of from 8’to 10 bushels, is thrown, and the mill is kept in motion till the whole mass is reduced to a fine uniform pulp, which is technically called “‘ the cheese.” The old-fashioned mills are now generally superseded by modern inventions, of which Coleman’s cider press may be taken as the type. It consists of two pairs of rollers mounted in a strong wooden frame. The firstand upper pair are of hard wood, studded with iron teeth or knives, set immediately under a hopper into which the fruit is fed. In passing between the first pair the fruit is sliced into small pieces which fall between the second pair of rollers, placed immediately below. These consist of heavy cylinders of stone set quite close so that the opposing surfaces press against each other, and the sliced apples in passing between them are bruised to a fine pulp which is received into a trough placed directly under. ‘The pulp or cheese is, or ought to be, laid aside for at least a night to allow fermentation to set in before the juice is expressed. By this means the aromatic oil contained in the seeds is extracted, communicating its aroma to the mass, and a richer, fuller-flavoured beverage is the result. The cheese is placed iu hair-cloths in a strong framed box for expressing the juice, an operation which must be gently and carefully performed, so that the liquid may be obtained as pure and clear as possible. ‘The juice ought to have a specific gravity of from 1:07 to 1-08, and should contain 10 or 11 per cent. of sugar and 0°6 to 0°7 per cent, of malicacid. The liquor is strained aud placed for fermenting either in large vats or in separate casks. In the fermentation which ensues an abundant sediment is thrown to the bottom and a scum rises to the surface. In a week or ten days this action should leave the liquid clear and bright if the fermentation has continued steady and moderate. The liquidis then racked off into casks, as free as possible from scum and sediment, and excluded from atmospheric influence to stop the further action of the fer- ment. If in the early part of the following spring it is found to be still clear, nothing further is required except to cask it up for the market; but should it have become thick and ropy it must be “ fined” either by means of is- inglass or with stewed and mashed apples. It is frequently found necessary, in order effectually to stop fermentation, to expose the liquor to the influence of sulphurous acid gas, which is done by burning a sulphur tipped stick inside a cask half filled with cider, and shaking the cask so as to make the liquor absorb the acid gas. Such “ matched” cider is readily detected by connoisseurs. The artificial colouring

of cider, when practised, is done either with burnt sugar, the juice of red beet, logwood, or cochineal ; and in Germany a flavour is sometimes communicated to the bever-

age with elder flowers, cinnamon, cloves, or other aromatics. The following analysis of a pint of common cider such as is supplied to agricultural labourers in Somersetshire is by Dr Voelcker :— ;

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Cider is very prone to undergo acetous fermentation, and develop a rough, sharp, vinegary taste ; and in that condi- tion its consumption readily causes diarrhoea and colic. Roughness may be much reduced by treatment with vari- ous compounds prepared for the purpose which contain lime, or by the addition of a quantity of hops boiled with treacle or honey to the acetified cider. When sound it is a wholesome, agreeable, and refreshing stimulant beverage. In Germany a spirit, apple brandy, is distilled from cider.

CIENFUEGOS, Nicasto ALvarez DE (1762-1809), poet and publicist, was born at Madrid. He studied with distinction at Salamanca, where he sat at the feet of the poet Melendez Valdez. The year 1778 saw the first of his poems published, and the attention of his countrymen was immediately attracted. He was appointed editor of the Government organs, the Gaceta and Mercurio, and an article on Napoleon published in the former drew down on him the heavy hand of Murat. Cienfuegos was condemned to death; he refused submission, and would assuredly have been executed but for the prayers of his friends. At their instance the sentence was commuted into one of de- portation into France. Worn out with grief and fatigue, he died at Orthez in the following year. His verses are imitated from these of Melendez Valdez; they are by no means deficient in science or passion, but they are too often disfigured by a spurious sentimentality and by an affectation of the flimsy philosophy of the age. He was blamed for an unsparing use at once of archaisms and of novelties, which some regarded

with approval, but others denounced him as a traitor to the glorious traditions of Castilian art, and as bent on Frenchifying the noble Castilian idiom. His plays—Pitaco, Zoraida, La Condesa de Castilla, and ddomeneo, four tragedies on the pseudo- classic French model, and Las Hermanas Generosas, a comedy—have been long forgotten both in the closet and on the stage. See Ticknor, History of Spanish Literature, vol. iii.; and Cienfuegos, Obras Poeticas, 2 vols., Madrid,

1816.

CIGAR, a form in which tobacco is prepared for smoking without the use of a pipe. Cigars consist of certain portions of small and broken leaf tobacco rolled together in the form of a short stick or rod tapering toa point at one end called the curl or twist, and firmly wrapped round with one or two wrappings of whole leaf tobacco. The manufacture of cigars is conducted by hand-labour, and the various operations are performed with great dexterity. The selected leaves to be used for wrapping are first damped and stripped or freed from the midrib, by which each leaf is torn into two halves. These are smoothed out and pressed to remove any creases, and with a sharp knife the workman cuts each into the proper shape to form a wrapper. On each wrapper so prepared a sufficient quantity of small and broken leaf is placed, and the whole is then wrapped up in the form of a cigar. An external wrapper of; fine uniform leaf is added and secured in a peculiar kind of knot at the smaller end. The thick end is trimmed by placing the cigar in a gauge and cutting it to a definite size. After finishing the cigars are dried on trays either by exposure to

the sun or in artificial heat, and when thoroughly dry. they are packed in boxes for sale. Cheroots differ only in form from ordinary cigars, sloping gradually from the thick to the thin end, which instead of finishing in a point, is cut aud trimmed the same as the thick end. Cugarettes are small cigars, sometimes consisting of fine cut tobacco wrapped up in thin paper or inserted in straw tubes. Cigars are sold under an immense variety of names, derived either from the country of their manufacture, from the kind of tobacco used, or from the fancy of the manufacturer. The finest cigars are obtained from Havana in Cuba, and in them the thick ends are Jeft

untrimmed by the knife ; but although this is characteristic it is obviously no test of genuineness. Cheroots come principally from Manilla in the Philippine Islands. See Tosacco.

CIGNANI, Carto (1628-1719), was born at Bologna, where he studied under Battista Cairo, and afterwards under Albani, Though an intimate friend of the latter, and his most renowned disciple, Cignani was yet strongly and deeply influenced by the genius of Correggio, as a comparison of his drawing and of his manner of treating light and shadow with that of the painter of Parma will prove. His greatest work, moreover, the Assumption round the cupola of the church of the Madonna della Fuoca at Forli, which occupied him some twenty years, and is in some respects one of the grandest and most remarkable works of art of the 17th century, is obviously inspired from the more renowned fresco of Antonio Leti in the cupola of the cathedral of Parma. Cignani had some of the defects of his masters ; his elaborate finish, his audacious artificiality in the use of colour and in composi- tion, mark the disciple of Albani; but he imparted to his work a more intellectual character than either of his models, and is not without other remarkable merits of his own. In private character Cignani was eminently amiable, unassuming, and generous. His success, however, made him many enemies; and the envy of some of these is said to have impelled them to deface certain of his works. He accepted none of the honours offered him by the duke of Parma and other princes, but lived and died an artist. On his removal to Forli, where he died, the school he had founded at Bologna was fain in some sort to follow its master. His most famous pictures, in addition to the Assumption already cited, are—the Entry of Paul III. into Bologna; the Frangois I, Touching for King’s Evil ; a Power of Love, painted under a fine ceiling by Agostino Carracci, on the walls of a room in the ducal palace at Parma; anAdam and Eve; a Temptation of Joseph, in the Florentine Palazzo Arnoldi ; and a Sampson, in the Bolognese Palazzo Zambeccari.

CIGOLI, or Crvou1, Luici Carpi pa (1559-1613), painter, architect, and poet, was born at Cigoli in Tuscany. Educated under Allori and Santo di Titi, he formed a pe- culiar style by the study at Florence of Michelangelo, Correggio, Andrea dal Sarto, and Pontormo. Assimilating more of the second of these masters than of all the others, he laboured for some years

with success ; but the attacks of his enemies, and intense application to the production of a wax model of certain anatomical preparations, induced an alienation of mind which affected him for three years. At the end of this period, he visited Lombardy, whence he returned to Florence. There he painted an Ecce Homo, in competition with Passignani and Caravaggio, which gained the prize. This work was afterwards taken by Bonaparte to the Louvre, and was restored to Florence in 1815. His other pictures of importance are—a St Peter Healing the Lame Man, in the church of St Peter's at Rome; a

Conversion of St Paul, in that of San Paolo fuori le Mura, .

and a Story of Psyche, in fresco, at the Villa Borghese, in the same city ; a Martyrdom of Stephen, which earned him

the name of the Florentine Correggio, a Venus and Satyr, and a Sacrifice of Isaac, at Florence; anda Stigmata of St Francis, at Foligno. Cigoli, who was made a knight of Malta at the request of Pope Paul III, was a good and solid draughtsman and the possessor of a rich and _har- monious palette. He died, it is said, of grief at the failure of his last fresco (in the Roman church of Santa Maria Maggiore), which is rendered ridiculous by an abuse of perspective.

CILICIA, one of the most important provinces in the ancient division of Asia Minor, partly represented by the modern province of Adana. It comprised a large part of the southern coast of that country, extending from Pamphylia on the W. to Mount Amanus and the frontiers of Syriaon the E. Throughout this extent it was bounded by the central ridge of Mount Taurus on the N. and by the Mediterranean on the 8., so that its form was long and narrow, having a length in a direct line of nearly 270 English miles, while its breadth hardly anywhere exceeds 68 miles. It is divided by nature into two portions of a very different character ;—the westernmost, known in ancient times as Cilicia Trachea or Tracheotis (the modern Itsch Ili), the Rugged Cilicia, a well-deserved epithet, as almost the whole region is occupied by a rugged mountain tract, formed by the branches and offshoots of Mount Taurus, which descend for the most part quite to the sea, while the

interior is furrowed by deep and narrow valleys, leaving but scanty spaces fit for cultivation; the eastern- most, on the contrary, called Cilicia Pedias, or “of the Plains,” presenting a broad expanse of level alluvial plains round which the lofty chain of Mount Taurus sweeps in a semicircle, forming a great mountain barrier that encloses it like a wall on the north and east, and separates it from the extensive upland plains of Lycaonia and Cappadocia.

Towards the west the limit between Cilicia and Pamphylia was an arbitrary one; the first place that is assigned by Strabo to Cilicia being Coracesium, a remarkable fortress on a projecting rocky headland, now called Alaja. The whole of this rugged mountain district indeed abounds in such projecting headlands, with small sheltered coves or harbours beneath them,—a character that has peculiarly fitted it, both in ancient and in modern times, for affording shelter to pirates. At the same time the difficulty of com- munication with the interior has prevented any of the towns on the coast from rising into important centres of trade. Notwithstanding these disadvantages there were in ancient times a considerable number of towns surrounding the coasts of Cilicia Trachea ; among which may be mentioned (proceeding from W. to E.) Selinus, afterwards called Trajanopolis; Anemurium, near the promontory of the same name, which is the southernmost point of Asia Minor ; Celenderis, still called Kelenderi, and used as a place of passage to the Island of Cyprus, though now a poor decayed village; and Seleucia, termed for distinction’s sake Seleucia ad Calycadnum, from its position at the mouth of the river of that name. The Calycadnus, now known as the Gok Su, or “Blue River,” is indeed the only river of any importance in Cilicia Trachea, which it traverses nearly through its whole length, rising but a short distance from the sea, and flowing through a very winding valley, but with a general direction from W. to E. The only towns in the interior of this western part of Cilicia—Mout, which occupies the site of Claudiopolis, and Ermenek (Germani- copolis)—are ‘situated in the valley of the Calycadnus, but they are places of little importance. The whole of this mountain tract is still covered:with extensive forests, which in ancient times supplied timber for the navies of the Egyptian and Syrian kings, but are now almost entirely neglected.

_ The small river Lamus still called Lamas Su was con-

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sidered by ancient geographers as constituting the limit between the two different provinces of Cilicia. From that point the mountains begin to recede from the coast, and leave a narrow strip of alluvial plain between them and the sea, which, beyond Soli to the cast, opens out into the broad level expanse that gave name to Cilicia Pedias. The whole of this extensive plain, spreading out in some parts to more than 30 miles in width, is composed of alluvial deposits brought down by the rivers that intersect it. It has consequently a soil of great natural fertility, and would be capable of the richest cultivation; but it is for the most part a desolate uncultivated tract, in which the towns of Tarsus and Adana, with their surrounding gardens and fruit-trees, appear like oases in the midst of a desert. The surrounding plains are the abode in winter of numerous hordes of Turcomans and Kurds, who wander

over them freely with their flocks and herds; while in.

summer they are rendered pestilential by the noxious miasmata produced by the marshes formed by the rivers that flow through them, so that at this season they are almost wholly uninhabited.

The plains of eastern Cilicia are traversed by three con- siderable rivers. Of these the Cydnus, which flows by Tarsus, though much the most celebrated in ancient times, is the least considerable. It is formed by the junction of three streams, all of which rise on the southern slope of the Bulghardagh, as the portion of Mount Taurus imme- diately north of Tarsus is called ; and it has consequently but a short course from thence to the sea. Butit is a deep and rapid stream, and was celebrated in antiquity for the coolness and clearness of its waters, a bath in which nearly cost Alexander the Great his life. The other two rivers, the Sarus and Pyramus, now known as the Sihun and Jihun, are much more important. Both of these take their rise in the upland plains of Cappadocia, beyond the range of Mount Taurus, through which they force their way to the Cilician plains below. On arriving in these they spread out into stagnant pools and marshes, through which the main

streams are continually changing their courses, and cutting out for themselves new channels. These changes have caused much confusion in reconciling the accounts given by ancient writers with the present geography of the country. It appears certain that in ancient times the Sarus joined the Pyramus near its mouth, and both together fell into the sea immediately to the west of the small rocky headland called Karatasch Burun, near the site of the ancient city of Mallus; but at the present day the Sihun holds a separate course from Adana towards the south-west, flowing into the sea within a few miles of the mouth of the Cydnus, while the Jihun, as it approaches the sea, takes a sudden turn to the east, and flows into the Gulf of Scanderoon, between the site of Mallus and that of the ancient Ag, now known as Aias,

Imperfectly as the plains of this part of Cilicia are cultivated, they produce cotton, wheat, barley, tobacco, and sesame in sufficient quantities to show of what they would be capable if properly drained and tilled ; while the gardens around the towns of Tarsus and Adana are planted with palms, orange-trees, figs, and other fruit trees, which flourish with the utmost luxuriance. The climate in summer is intensely hot; and the plaims at that season are burnt up and parched ; but the abundant means of irrigation at hand, if properly utilized, would effectually remedy that disadvantage. These extensive plains are frequented by numbers of gazelles and jerboas, as well as bustards, francolins, and other game. Buffaloes also abound in the marshy tracts near the sea. In the ranges of Mount Taurus leopards, for which the province was noted in the time of Cicero, are still found not unfrequently.

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Besides Tarsus and Adana, which retain their ancient names as well as sites, there were in ancient times several other important cities in the eastern portion of Cilicia. Among these Soli (afterwards called Pompeiopolis, from its having been repeopled and rebuilt by Pompey the Great) was situated at the western extremity of the great plain, a few miles west of Mersina, the modern port of Tarsus ; while Mallus occupied the promontory now called Karatasch Burun, at its eastern cxtremity. In the interior were Mopsuestia (now Missis) on the River Pyramus, and Anazarbus (still called Ain Zarba)

higher up the valley of the same river, which, under the Roman and Byzantine empires, became one of the most flourishing cities of Cilicia. In modern times Adana, which is the capital of the pashalic or vilayet that comprises all Cilicia, is much the most important town in the province, and is estimated to contain 18,000 inhabitants, while Tarsus does not possess more than 7000 or 8000.

Mersina, the port of Tarsus, though still but a small place, is gradually becoming the seat of a considerable trade. being the only outlet for the productions of the interior.

Cilicia is bounded on the east (as already stated) by Mount Amanus, one of the most considerable of the branches or offshoots of Mount Taurus. But the range to which this name was given by ancient geographers is in fact a double one, which forks into two branches about midway between Marasch and the sea, and sends down two arms,—the one in a south-west direction, ending in the Cilician plain before reaching the sea; the other running nearly due south till it curves round the Gulf of Scanderoon, and ends in the lofty mountain promontory of Ras el Khanzin, the Rossicus Scopulus of Ptolemy. Between these two ranges lies the deep bay or inlet called in ancient times the Gulf of Issus, and now known as the Gulf of Scanderoon, from the seaport of that name; this is above 50 miles long and about 20 miles wide at its entrance. On its shores were situated in ancient times the towns of Adige (now Aias) on the western side, and Issus, Myriandrus, and Rhosus on the eastern; but after the foundation of Alexandria on the same side of the gulf, these last towns sank into comparative insignificance. Alexandria still survives under the name of Alexandretta, or Iskeuderun (commonly corrupted into Scanderoon) as it is called by the Turks, and is a place of considerable trade.

The southern branch of Mount Amanus unquestionably constitutes the natural limit of Cilicia, and hence Strabo correctly assigns all the towns north of the promontory of Rhosus to Cilicia, and those on the other side of it to Pieria in Syria. But for political purposes the limit was fixed at a point some miles north of Alexandria, where there was a fortified pass called the Syrian Gates. The name of Pyle Syriz or Syrian Gates was also given, however, to the mountain pass across the range of Mount Amanus, now

known as the Pass of Beilan, which has in all ages formed the direct route from Asia Minor into Syria. It was to its command of these passes, as well as that called the Cilician Gates on the north, leading directly across the chain of Mount Taurus, that Cilicia owed much of its importance in a military and political point of view.

History.—Though the boundaries of Cilicia, as above defined, were generally recognized in ancient times, the people of that name appears to have been in early days much more widely spread, and occupied a considerable extent of country north of Mount Taurus, as well as in the mountain regions extending towards Armenia. Thus Herodotus extends the name of Cilicia to the Euphrates, and must have comprised a large portion of Cappadocia under that appellation. ‘There can be no doubt that the Cilicians, as well as the Cappadocians, were of Semitic or Aramaic descent, and belonged to the same stock as the

Syrians, from whom, however, they were from a very early period politically separate. Cilicia appears as an indepen- dent kingdom under a monarch named Syennesis, in the time of Alyattes, king of Lydia, 610 .c. (Herod., i. 74), and even after it passed under the Persian empire it con- tinued to be governed by its own kings, all of whom appear to have borne the name, or rather appellation, of Syennesis. From its position Cilicia attracted much attention during the expedition of the younger Cyrus (401 2.¢.), as well as in that of Alexander, whose first great victory over the Persian king was fought at Issus, in the narrow pass between Mount Amanus and the sea (333 B.c.)

Cilicia now passed under the Macedonian rule, and was

subject to the Seleucidan kings of Syria. But owing to the feeble and unsettled character of the government under the later monarchs of that dynasty, the western portion of the country, or Cilicia Trachea, became the stronghold of numerous pirates, who carried their depredations to such an extent as to compel the Romans to wage regular war upon them. It was not

till 66 3.c. that they were finally subdued by Pompey, and Cilicia was regularly constituted as a Roman province, which, however, comprised, in addition to Cilicia properly so called, Pamphylia, Pisidia, Isauria, Lycaonia, and a large part of Phrygia. This was the extent of the province when it was governed by Cicero as proconsul (51-50 B.c.), who obtained some successes against the mountain tribes of Mount Amanus, of which he was im- moderately proud. _ Under the Roman empire Cilicia was again reduced to its natural limits, but did not receive its final constitution as a province till the time of Vespasian. It retained its condition as such under the Roman and Byzantine empires till it fell, with the rest of Asia Minor, under the Seljukian Turks in the 11th century. After the break-up of the Turkish monarchy Cilicia was seized by the Armenians, who from the mountain districts of Mount Amanus and Taurus gradually made themselves masters of the whole country, of which they retained possession, notwithstanding frequent struggles with the Lusignans—the lords of the neighbouring island of Cyprus—till both were expelled by the Ottoman Turks in the 15th century. From that period Cilicia has continued to form part of the Turkish empire, with the exception of the brief interval from 1833 to 1840, during which it was annexed to his dominions by Mehemet Ali, viceroy of Egypt ; but after the defeat of that ruler by the allied powers he was compelled to cvacuate Cilicia, which was reunited as before with the Ottoman empire.

The ancient geography of Cilicia is well described by Strabo (bk. xiv. ch. 5). Its coasts were first visited and were described in detail by Captain Beaufort in his Karamania, 8vo, Lond., 1818. A more complete examination of the whole country was made by M. Lang-

lois in 1852-58 (Voyage dans la Cilicte et dans les Montagnes du Laurus, 8vo. Paris, 1861). (E. H. B.)

CIMABUE, Gtovannt (1240 to about 1302), painter, was born in Florence of a creditable family, which seems to have borne the name of Gualtieri, as well as that of Cimabue (Bullhead). He took to the arts of design by natural inclination, and sought the society of men of learn- ing and accomplishment. Vasari, the historian of Italian painting, zealous for his own native state of Florence, has left us the generally current account of

Cimabue, which later researches have to a great extent invalidated. We cannot now accept his assertion that art, extinct in Italy, was re- vived solely by Cimabue, after he had received some training from Grecian artists invited by the Florentine Government #0 paint the chapel of the Gondi in the church of §. Maria Novella 3 for native Italian art was not then a nullity, and this church was only begun when Cimabue was already forty years old. Even Lanzi's qualifying statement that Grecian artists, although they did not paint the chapel of the Gondi, did execute rude decorations in a chapel below

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the existing church, and may thus have inspirited Cimabue, makes little difference in the main facts. What we find as the general upshot is that some Italian painters preceded Cimabue—particularly Guido of Siena and Giunta of Pisa; that he worked on much the same principle as they, and to a like result ; but that he was nevertheless the most advanced master of his time, and, by his own works, and the training which he imparted to his mighty pupil Giotto, he left the art far more formed and more capable of growth than he found it. The undoubted admiration of his contemporaries would alone demonstrate the conspi- cuous position which he held, and deserved to hold. For the chapel of the Rucellai in S. Maria Novellahe painted in tempera a colossal Madonna and Child with Angels, the largest altarpiece produced up to that date ; before its removal from the studio it was visited with admiration by Charles of Anjou, with a host of eminent men and gentle ladies, and it was carried to the church in a festive proces- sion of the people and trumpeters. Cimabue was at this time living in the Borgo Allegri, then outside the walls of Florence ; the legend that the name Allegri (Joyous) was bestowed on the locality in consequence of this striking popular display is more attractive than accurate, for tlic name existed already. Of this celebrated picture, one of the great landmarks of modern and sacred art, some details may be here given, which we condense from the J/istory of Painting in Italy by Messrs Crowe and Cavalcaselle. "The Virgin in a red tunic and blue mantle, with her feet resting on an open- worked stool, is sitting on a chair hung with a white drapery flowered in

gold and blue, and carricd by six angels kneeling in threes above each other. A. deli- cately engraved nimbus surrounds her head, and that of tlic infant Saviour on her lap, who is dressed in a white tunic, and purple mantle shot with gold. A dark-coloured frame surrounds the gabled square of the picture, delicately traced with an ornament interrupted at intervals by thirty mcdal- lions on gold ground, each of which contains the half-figure of asaint. In the face of the Madonna is a soft and melan- choly expression ; in the form of the infant, a certain freshness, animation, and natural proportion ; in the group, affection—but too rare at this period. There is sentiment in the attitudes of the angels, energetic mien in some prophets, comparative clearness and soft harmony in the colours. A certain loss of balance is caused by the overweight of the head in the Virgin as compared with the slightness of her frame. The features are the old ones of the 13th century ; only softened, as regards the expression of the eye, by an exaggeration of elliptical form in the iris, and closeness of the curves of the lids. In the angels, the absence of all true notions of composition may be considered striking ; yet their movements are‘more natural and pleas- ing than hitherto. One indeed, to the spectator’s right of the Virgin, combines more tender reverence in its glance that any that had yet been produced. Cimabue gave to the flesh-tints a clear and carefully fused colour, and im- parted to the forms some of the rotundity which they had lost. With him vanished the sharp contrasts of hard lights, half-tones, and shadows.” Ina general way, it may be said that Cimabue showed himself forcible in his paintings, as especially in heads of aged or strongly characterized men ; and, if the then existing development of art had allowed of this, he might have had it in him to express the beautiful as well. He, according to Vasari, was the first painter who wrote words upon his paintings,—as, for instance, round the head of Christ in a victure of the Crucifixion, the words addressed to Mary, Mulier ecce jilius tuus. Other paintings still extant by this master are the follow- ing :—In the Academy of Arts in Florence, a Madonna and Child, with eight angels, and some prophets in niches, — better than the Rucellai picture in composition and study

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of nature, but more archaic in type, and the colour now spoiled (this work was painted for the Badia of 8. Trinita, Florence); in the National Gallery,

London, a Madonna and Child with Angels, which came from the Ugo Baldi col- lection, and had probably once been in the church of 8. Croce, Florence; in the Louvre, a Madonna and Child, with twenty-six medallions in the frame, originally in the church of S. Francesco, Pisa. In the lower church of the Basilica of 8. Francesco at Assisi, Cimabue, succeeding Giunta da Pisa, probably adorned the south transept,— painting a.colossal Virgin and Child between four Angels, above the altar of the Conception, and a large figure of St Francis. In the upper church, north transept, he has the Saviour Enthroned and some Angels ; and, on the central ceiling of the transept, the Four Evangelists with Angels. Many other works in both the lower and the upper church have been ascribed to Cimabue, but with very scanty evidence; even the above-named can be assigned to him only as matter of probability. Numerous others which he indisputably did paint have perished,—for instance, a series (carlier in date than the Rucellai picture) in the Carmine church at Padua, which were destroyed by a fire.

From Assisi Cimabue returned to Florence. In the closing years of his life he was appointed capomaestro of the mosaics of the Cathedral of Pisa, and was afterwards, hardly a year before his death, joined with Arnolfo di Lapo as architect for the Cathedral of Florence. In Pisa he exe- cuted a Majesty in the apse,—Christ in glory between the Virgin and John the Evangelist, a mosaic, now much damaged, which stamps him as the leading artist of his time in that material. This was probably the last work that he produced.

The debt which art owes to Cimabue is not limited to his own performances. He was the master of Giotto, whom he found a shepherd boy of ten, in the pastures of Vespignano, drawing with a coal on a slate the figure of a lamb. Cimabue took him to Florence, and instructed him in the art ; and after his death Giotto occupied a house which had belonged to his master in the Via del Cocomero. Another painter with whom Cimabue is said to have been intimate was Gaddo Gaddi.

It had always been supposed that the bodily semblance of Cimabue is preserved to us in a portrait-figure by Simon Memmi painted in the Cappella degli Spagnuoli, in 8. Maria Novella,—a thin hooded face in profile, with small beard, reddish and pointed. This is now extremely dubious. Simone Martini of Siena (commonly called Memmi) was born in

1283, and would therefore have been about nineteen years of age when Cimabue died ; it is not certain that he painted the work in question, or that the figure represents Cimabue. The Florentine master is spoken of by a nearly contemporary commentator on Dante (the so-called Anonimo, who wrote about 1334) as arrogante e disdegnoso ; so ‘arrogant and passionate ” that, if any one, or if he himself, found a fault in any work of his, however cherished till then, he would abandon it in disgust. This, however, toa modern mind, looks more like an aspiring and fastidious desire for perfection than any such form of “ arrogance and passion” as blemishes a man’s character. Giovanni Cimabue was buried in the cathedral of Florence, 8. Maria del Fiore, with an epitaph written by onc of the Nini :—

“‘ Credidit ut Cimabos picture castra tenere : Sic tenuit vivens ; nunc tenet astra poli.”

Here we recognize distinctly the suggestion of the first clause in the famous triplet of Dante :

‘‘Credette Cimabue nella Pe Tener lo campo ; ed ora ha Giotto il grido, Si che la fama di colui s’oscura,” (W. M. R.)

CIMAROSA, Domenico (1749-1801), an Italian musical composer, was born at Aversa, in the kingdom of Naples. His parents were poor but anxious to give their son a good education; and after removing to Naples they sent him to a free school connected with one of the monasteries of that city. The organist of the monastery, Padre Polcano, was struck with the boy’s intellect, and voluntarily instructed him in the elements of music, as also in the ancient and modern literature of his country. To the influence of the same worthy monk Cimarosa owed a free scholarship at the musical institute of Santa Maria di Loreto, where he remained for eleven years, studying chiefly the great masters of the old Italian school. Piccini, Sacchini, and ether musicians of repute are mentioned amongst his teachers. At the age of twenty-three Cimarosa entered the lists as a composer with a comic opera called Le Stravaganze del Conte, first performed at the theatre dei Fiorentini at Naples in 1772. The work met with approval, and was followed in the same year by Le Pazzie di Stellidanza e di Zoroastro, a farce full of humour and eccentricity. This work also was successful, and the fame of the young composer began to spread all over Italy. In 1774 he was

invited to Rome to write an opera for the stagione of that year ; and he there produced another comic opera called L'Jtaliana in Londra.

The next thirteen years of Cimarosa's life are not marked by any event worth mentioning. He wrote a number of operas for the various theatres of Italy, residing temporarily in Rome, in Naples, or wherever else his vocation as a con- ductor of his works happened to call him. From 1784-1787 he lived at Florence, writing exclusively for the theatre of that city. The productions of this period of his life are very numerous, consisting of operas, both comic and serious, cantatas, and various sacred compositions. The following works may be mentioned amongst many others :—Cavo Mario; the three Biblical operas, Assalone, La Giuditta, and Il Sacrificio d Abramo ; also Il Convito di Pietra ; and La Ballerina Amante, a pretty comic opera first performed at Venice with enormous success. None of these works have survived, and their individual merits hardly give us cause to regret their loss. Excessive productiveness of this kind cannot but become mechanical. But this is no fault of Cimarosa's. The enormous demand of the Italian stage has become fatal to the genius of some of the most giftcd composers of that country both in the last and in the present century. Looking at Cimarosa's works collectively, it may be said that they represent a style of considerable individuality and a perfect mastership of dramatic effect, so far at least as the vocal part is concerned. Cimarosa's orchestra, like that of most Italian composers, is somewhat meagre, but here also the comparatively primitive stage of orchestration at the time he wrote ought to be taken into account. Cimarosa seldom succeeds in the highest walks of his art. His comic operas are infinitely superior to those in which a tragic subject compelled him to attempt dramatic pathos. As far as grace and melodious charm are concerned, Cimarosa was surpassed by none of his con- temporaries, not even by Paesiello, with whom he shared for a long time the leadership of the Italian school,

In 1787 Cimarosa went to St Petersburg by invitation of the Empress Catherine II. At her court he remained four years and wrote an enormous number of compositions, mostly of the nature of piéces d'occasion. Of most of these not even the names are on record. In 1792 Cimarosa left St Petersburg, the northern climate of Russia proving hurtful to the native of Italy. By in- vitation of the Emperor Leopold II. he went to Vienna, and it

was there that he produced the masterpiece on which his claim to immortality must mainly rest. J Matrimonio Segreto ranks amongst the highest achievements

of light operatic music. In Italy it is surpassed by

Rossini's Barbieri alone. After the lapse of more than

eighty years it evinces its vitality at theatres and concert halls wherever the whole opera or detached pieces are heard. Its humour is founded on human nature itself, and

is therefore independent of local and temporal conditions.

1793 Cimarosa returned to Naples where Zhe Secret Marriage and other works were received with great applause. Amongst the works belonging to his last stay in Naples, the charming opera Le Astuzie Feminili may be mentioned. 'This period of his life is said to have been embittered by the intrigues of envious and hostile persons, amongst whom one is sorry to meet with Paesiello his old rival. During the occupation of Naples by the troops of the French Republic, Cimarosa joined the liberal party, and on the return of the Bourbons, was like mauy of his political friends condemned to death. By the intercession of influential admirers his sentence was commuted into banish- ment, and the composer left Naples with the intention of returning to St Petersburg. But his health was broken, and after much suffering he died at Venice in 1801 of inflammation of the intestines. The nature of his disease led to the rumour of his having been poisoned by his enemies, which, however, a formal inquest proved to be

unfounded. He worked till the last moment of his life,

and one of his operas, Artemizia, remained unfinished at

his death. (F. H.)

CIMBRI, or Cimprians (Greek, KiuBpor), an ancient

nation of unknown affinity, which was one of the most

formidable enemies uf the Roman power, and has proved one of the most difficult subjects for the historical investi-

gator. About 113 z.¢., in company with the Tentones, they defeated the consul Papirius Carbo near Noreia in

Styria; and in 109 3c. they routed another army under

the consul Silanus. By the latter success they opened their way to Gallia Narbonensis – began to threaten the Roman territory itself. They were joined by the Gauls from all quarters ; and the Roman

army sent against them under Cxpio and Manlius was

almost exterminated. Only ten men with two generals are said to have escaped; and, in accordance with @ VOW which they had made before the battle, the conquerors destroyed ail the spoil. The gold and silver they flung into the Rhone; they drowned the horses, and put all the prisoners to death. The Romans were thrown into con- sternation ; but a new army was raised with all expedition, and the command was bestowed on Marius, who at that time enjoyed a high reputation on account of his victories in Africa. The Cimbri were approaching over the eastern Alps, and the Teutones and the other allies over the western. He first attacked and defeated the latter division at Aque Sextis, and then returned to face the Cimbri, who had meanwhile seen the backs of the soldiers of Catullus and Sylla. he vast host attacked the Romans with the utmost fury in the Campi Raudii near Vercellze (101 B.c.); but, unaccustomed to the heats of Italy, they soon began to yield and were easily overcome. They had put it out of their own power to fly ; for, that they might the better keep their ranks, they had, like true barbarians, tied themselves together. It is said that 120,000 were killed on the field of battle and 60,000 were taken prisoners. ‘Che people of the Italian districts known as the Sette Communi in Vicenza and the Tredeci Communi in Verona have a belief that they are descended from the remnants of the Cimbrian army, but it is much more probable that they are the posterity of German settlers introduced by the bishops of Trent. Be this

at it may, it 1s certain that after the victory of Marius the Cimbri were no longer of much importance as antagonists of Rome.

Two great questions have claimed the attention of the

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historian in regard to this people; but to neither of them has anything like a definite answer been obtained. The first has to do with their local habitation, and the second with their ethnographical connection. Cesar, Sallust, Cicero, and Diodorus Siculus seem to have regarded them as Gauls, and assign them a position within the Gallic arca ‘ whereas Strabo, Velleius Paterculus, and Tacitus treat them as Germans and locate them beyond the Rhine. ‘The modern district of Jutland was familiarly known as the Cimbric Chersonese, and mention is made in the Mon. Ancyranum of an embassy from the Cimbrians of that peninsula to Augustus. Beyond this our ancient authorities do not carry us, and modern discussion has done little but maintain a continual oscillation of opinion. ‘That they were closely connected with the Teutones is evident, and that the Teutones at least were Germanic was for a timo regarded as certain ; but more elaborate investigation shows that even this is open to dispute, and can afford no support as an argument. The ancient identification of the people with the Cimmerii and the modern identification with the Cymry are well-nigh exploded,and probably owe their origin to mere similarity of names.

See Cellarius De Cimbris et Teutonibus; Joh. von Miller, Bellum Cimbricwm, 1776; Schiern, De Cimbrorum Origine ct Aigrationibus, 1842 ; Latham, Appendix to edition of the Germania of Tacitus; and a paper read by Canon Rawlinson before the Anthropological Institute, May 1876.

CIMMERII, or Cimmerians, a nomadic people of anti- quity who dwelt near the Palus Mxotis or Sea of Azoff, in the Tauric Chersonese or Crimea, and in the Asiatic Sarmatia or the country of the lower Volga, They are said to have desolated Asia Minor prior to the time of Homer ; and in their second invasion they penetrated ag far westward as Aolis and Ionia, captured Sardis the capital of Lydia in the reign of Ardys, and continued in possession till they were driven out of Asia by Alyattes, the grandson of

that sovereign. The fears of the Ionians are commemorated in the clegiac fragments of Callinus.

The name Cimmerii is also given to a mythical people, represented by Homer as inhabiting a remote region of mist and darkness, but localized by later writers near Lake Avernus, or in the Tauric Chersonesus, or in Spain. Their country was fabled to be so gloomy, that the expression “Cimmerian darkness” becaine proverbial ; and Homer, according to Plutarch, drew his images of hell and Pluto from the dismal region they inhabited.

CIMON, an Athenian statesman, was the sonof Miltiades, His father died in disgrace, leaving the fine which had been imposed on him unpaid. After a time it was paid by Cimon, who, according to one account, also took his place in prison. Distinguished by military ability, by a gentle and agreeable temper, and by the most open-handed liberality, Cimon gradually rose to the front rank among his contemporaries. His victorious attacks on the Persians, his ostracism, his request for leave to fight at Tanagra, and his recall on the motion of his rival Pericles are matters of history. (See Grercz.) He died while besieging Citium, 449 z.¢,

CINCHONA, the generic name of a number of trees belonging to the Natural Order Rubiacee, but which, with a few allied genera, have been by some authorities established as a distinct order under the name Cinchonacee. Botanically the genus includes trees of varying size, some reaching an altitude of 80 feet and upwards, with ever- green leaves and deciduous stipules. The flowers are arranged in panicles, white or pinkish in colour, with a pleasant odour, the calyx being 5-toothed superior, and the corolla tubular, 5-lobed, and fringed at the margin. The stamens arc 5, almost concealed by the tubular corolla, and the ovary terminates in a fleshy disk. The fruit is

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CINCHONA

an ovoid or sub-cylindrical capsule, splitting from the base, and held together at the apex. The numerous seeds are flat and winged all round. According to the enuniera- tion of Bentham and Hooker, 36 species have

been distinguished, but of these not more than about a dozen have been economically utilized. The plants are natives of the western mountainous regions of South America, their geographical range extending from 10° N. to 22° 8. lat. ; and they flourish generally at an elevation of from 5000 to 8000 feet above sea level, although some have been noted growing as high up as 11,000 feet, and others have been found down to 2600 feet.

The trees are valued solely on account of their bark, which as cinchona bark, Jesuits' bark, or Peruvian bark is, and long has been, the source of the most valuable tonic and febrifuge medicines that have ever been discovered. The earliest well-authenticated instance of the medicinal use of cinchona bark is found in the year 1638, when the countess of Chinchon, the wife of the governor of Peru, was cured of an attack of fever by its administration. The raedicine was recommended in her case by the Corregidor of Loxa, who was himself said to have practically experienced its supreme virtues eight years earlier. The name Crnchona is due to the connection of the countess of Chinchon with the introduction of the remedy ; and it is argued by Mr Mark- ham and others that therefore the term should be written Chinchona. A knowledge of the virtues of the bark was disseminated throughout Europe by members of the Jesuit brotherhood, whence it also became generally known as Jesuits' bark. According to another account, this name arose from its value having been first discovered to a Jesuit missionary who, when prostrate with fever, was cured by the administration of the bark by a South American Indian.

The procuring of the bark in the dense forests of New Granada, Ecuador, Peru, and Bolivia is a work of great toil aud hardship to the Indian Cascarilleros or Cascaclores engaged in the pursuit. The trees grow isolated or in small clumps which have to be searched out by the experienced Cascarillero, who laboriously cuts his way through the dense forest to the spot where he discoversa tree. Having freed the stem from adhering parasites and twining plants, he proceeds, by beating and cutting oblong pieces, to detach the stem bark as far as is within his reach. The tree is then felled, andthe entire bark of stem and branches secured. The bark of the smaller branches, as it dries, curls up, forming "quills," the thicker masses from the stems con- stituting the "flat" bark of commerce. The drying,

pack- ing, and transport of the bark are all operations ofa laborious description conducted under most disadvantageous condi- tions.

The enormous medicinal consumption of these barks, and the wasteful and reckless manner of procuring them in America long ago, caused serious and well-grounded appre- hension that the native forests would quickly become exhausted. The attention of European communities was early directed to the necessity of securing steady and permanent supplies by introducing the more valuable species into localities likely to be favourable to their cultivation. The first actual attempt to rear plants was made in Algeria in 1849; but the effort was not successful. In 1854 the Dutch Government seriously undertook the task of intro- ducing the trees into the island of Java, and an expedition for that purpose was fitted out on an adequate scale. Several hundreds of young trees were obtained, of which a small proportion was successfully landed and planted in Java ; and as the result of great attention the cultivation of cinchona plantations in that island is now highly prosper- ous and promising. The desirability of introducing cin- chonas into the East Indies was urged in a memorial ad- dressed to the East India Company between 1838 and

1842 by Sir Robert Christison and backed by Dr Forbes Royle ; but no active step was taken till 1852, when, again on the motion of Dr Royle, some efforts to obtain plants were made through consular agents. In the endthe question was seriously taken up, and Mr Clements R. Markham was appointed to head an expedition to obtain young trees from South America and convey them to India. In 1860 under Mr Markham’s superintendence a first consignment of plants was shipped from Islay in Peru, and planted in a favourable situation in the Neilgherry Hills. For several years subsequently additiona] supplies of plants of various species were obtained from different regions of South America, and some were also procured from the Dutch plantations in Java. Now the culture has spread overpa wide area in Southern India, in Ceylon, on the slopes of the Himalayas, and in British Burmah; and recently plantations which already present a promising appearance have been established in Mauritius. Exclusive of private enterprise, the trees in the Government plantations in India now amountto

several millions, and in the Neilgherry plantations they have attained a height of from 20 to 30 feet. The species introduced in the East are principally Cinchona officinalis, C. Calisaya, C. succirubra, C'. pitayensis, and C. Pahudiana, some agreeing with certain soils and climates better than others, while the yield of alkaloids and the relative proportions of the different alkaloids differ in each species.

In the original memorial above alluded to, presented to the East India Board by Sir R. Christison, he, according to a communication to the Edinburgh Botanical Society (Trans., vol. xi. p. 111), pointed out that " the transplantation, if successful, would become remunerative. Jor although it would be a very arduous undertaking were the bark to be collected only by cutting down large trees, which do not attain sufficient growth in less than twenty or twenty-five years, being the only American method, the case would be very different were it shown that bark could be profitably taken from trees very much younger, and without either destroying or even injuring them. Now, I had ascertained," continues Sir Robert, " by chemical

analysis that—contrary to the analysis of some French

chemists—sulphate of quinia was to be obtained from fine quills of yellow bark taken from twigs two or three years old in as large proportion as from the large flat bark from the trunks and grcat branches. Consequently, as it appeared, from the facility with which the trees grew in their native forests by suckers from the old roots, when the trunks are properly cut down, that young twigs might safely be cut from them at an early period, it followed that the collection of cinchona bark might be conducted in the same way as that of cinnamon bark at Colombo, where only twigs of one or two years' growth are cut for thc purpose, and without injuring the trees….. This doctrine has proved true, so true that it has been found suitable in India even to treat the cinchona plants like osier beds in England, by cutting them down altogether when young, thus using only twigs for the bark, and trusting to suckers for renewing the growth of the plants ; and that the result has been the introduction of fine bark from India in such bulk as to have been sold by auction in the London market only nine years after the first cinchona plants were transplanted to India." Mr. W. G. M'Ivor, to whom the success of Indian plantations is largely due, introduced a system of mossing

the plants, which consists in wrapping the growing stems in a layer of damp moss, whereby the yield of alkaloid is increased, and the growth of renewed bark promoted. It has been pointed out by Dr De Vrij, and the observation is con- firmed by Mr D. Howard, that rcuewed bark contains the alkaloids not only in different proportions frem the

original bark, but that it even develops principles altogether absent in the natural bark.

The officinal barks of the British Pharmacopaia are three in number:—(1) the pale or Loxa bark (cortex cinchone pallide) yielded by Cinchona officinalis ; (2) the yellow, royal, or Calisaya bark (cortex cinchona Slave), the produce of C. Calisaya; and (3) red bark (cortew cinchone rubra) derived from C. succirubra. These are the sources of tho tinctures, extracts, and other preparations of pharmacy, while, in common with several others, they also yield the alkaloids which now constitute the chief form in which the active principles of the barks are administered in medicine. Among the other barks used as sources of quinine, &c., the principal are—the ashy crown bark, C. macrocalyx ; Carthagena bark, C. lanceolata ; Columbian bark, C. lancifolia ; Pitayo bark, C. pitayensis; grey or Lima bark, C. micrantha, C. nitida, and C. peruviana.

Leaving out of view certain alkaloids unimportant as yet in a commercial view, and found very sparingly in particular barks, the four primary alkaloids yielded by cinchona barks are quinine, quinidine, cinchonine, and cinchonidine. Certain secondary alkaloids are developed by chemical treatment of these primary principles, and an amorphous substance precipitated from the mother liquors of the quinine manufactured under the name of quinoidine is in considerable medicinal use. Much confusion has arisen in the terminology of the alkaloids by the application of the same name to chemically distinct principles, and by the converse description of the same alkaloids or products under different names. It is found that different barks derived from the same species vary greatly in richness in alkaloids, and that equally great fluctnations occur in the relative proportions of the various principles they yield. When a comparison is instituted among the barks of different species the variations are of course

even more marked,—some barks having been found to yield as high as 13 per cent. of alkaloids, while in others not a trace has been obtained. Certain barks, however, are known as a rule to contain.quinine in largest proportion, and in others cinchonine is the most abundant principle. Generally quinine is the most constant and abundant constituent, after which cinchonine, then cinchonidine, while quinidine is the rarest both in proportion and in frequency of occur- rence of the principal alkaloids.

The preparation of cinchona bark most extensively employed in medicine is the alkaloid quinine in the form of a sulphate. As the barks from which it is extracted contain besides proportions of one or other of the principal alkaloids above enumerated, a demand for any of them might be supplied without interfering with the production of quinine, and as they also have been proved to be potent febrifuges their non-utilization is a regrettable waste. From the record of an extensive series of experiments instituted by the Indian Government it is demonstrated that quinidine is even more active than quinine, and it forms the principal constituent of a variety of calisaya bark in extensive cultivation in Java. Cinchonidine is only a little less powerful in its febrifugal effect than quinine, and it is abundantly formed by the red bark cultivated in British India. Cinchonine, although the least potent, is an abundant principle, and still a highly valuable and efficient remedial agent. Cie 3!)

CINCINNATI, an important city of the United States, situated in the 8.W. part of Ohio, on the N. bank of the Ohio River, in 39° 6’ N. lat. and 84° 26’ W. long. It is the capital of Hamilton county, and in size is the first city in the State, while, according to the Federal census of 1870, it is the eighth in the United States. It was first settled in 1788 by persons from New Jersey, and is said to have been named in honour of the Cincinnati Society of officers

of the Revolutionary war. It was incorporated as a city in 1814, and soon acquired a commercial importance which has steadily increased. In 1800 Cincinnati con- tained but 750 inhabitants. The population amounted to 9602 in 1820, 46,338 in 1840, 115,436 in 1850, 161,044 in 1860, and 216,239 in 1870. Of the total population in 1870, 79,612 were foreigners,

including 49,448 born in Germany, 18,624 in Ireland, 3526 in England, and 2093 in France. The city is chiefly built upon two terraces or plateaus, the first 60 and the second 112 feet above the river. Beyond these rises an amphi- theatre of hills from 400 to 450 feet high, from which may be obtained a magnificent view of the valley of the Ohio and the surrounding country. On the opposite bank of the river, in the State of Kentucky, are Covington, which had 24,505 inhabitants in 1870, and Newport, which had 15,087. Communication between these cities and Cincinnati is afforded by two bridges and three steam ferries. The wire suspension bridge, which is 1057 feet long between the towers (or, including the approaches, 2252 feet), with a height of 100 feet above low water, was completed in 1867 at a cost of nearly $2,000,000. It has a double waggon road, and two ways for pedestrians, Further up the river is a wrought iron railroad bridge built upon piers; besides a railway track, it has waggon and foot ways, Cincinnati covers an area of 24 square miles, extending along the river about 10 miles, with an average width of 3 miles. The most important part of the city, however, is comprised within a distance of 24 miles along the river. The corporate limits have~ been much extended in recent years by the annexation of numerous villages, the most important being Columbia, Walnut Hills, Mount Auburn, and Cumminsville. In these, which still retain their former names, are seen the most costly residences and villas, with ornamental gronnds embracing from 5 to 80 acres each. The city is also noted for the beauty of its suburbs and its surrounding scenery. The streets, which generally cross one another at right angles, are usually from 14 to 24 miles long, and from 50 to 100 feet wide. Many of them are lined with trees. Brick is chiefly used for buildings, with a greyish buff freestone for fronts. Business buildings are usually five and often six stories high, Cincinnati is well supplied with public parks, the largest of which, Eden, is situated on a hill in the eastern part of the city, and contains 216 acres. In Burnet Woods, recently purchased, there are 170 acres, mostly forest, on the hill north of the city. Centrally situated in the city are Washington, Lincoln, Hopkins, and the City parks, which together contain about 25 acres. One of the most attractive objects in the city is the Tyler Davidson bronze fountain which was unveiled in 1871. It was presented to the city by Mr Henry Probasco, a wealthy citizen, who named it after the late Mr Tyler Davidson, the originator of the proposal. Its cost was nearly $200,000. The design embraces fifteen bronze figures, all cast at Munich, the chief one

representing a female with outstretched arms, from whose fingers the water falls in fine spray. This is the surmounting figure, and reaches a height of 45 feet above the ground. Among the most notable buildings is that of the Federal Govern- ment, built of sawed freestone in the Roman Corinthian style, with a porch of six columns; it is three stories high, with a length of 150 feet and a width of 80 feet. The county court-house, in the same style of architecture, is 175 feet square and three stories high, and has a porcli with six Corinthian stone cblumns. The brick buildings for the city offices are 205 feet long and 52 feet wide. The city workhouse, 34 miles from the heart of the city, is a brick structure, 515 feet long and 55 feet wide, erected ata cost, including 26 acres of land, of $650,000. It

CINCINNATI

has room for 700 prisoners. The Cincinnati hospital, comprising eight buildings arranged around a central court and connected by corridors, occupies a square of 4 acres. It cost more than $1,000,000, and will accom-

modate 700 patients,

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four depdts near the river in different parts of the city. Com- munication with differeut parts of the city and with the suburbs is afforded by fourteen lines of street railroad, with about 50 miles of track, and by numerous lines of omni- buses and stages. The top of the adjacent hills is reached by an inclined steam passenger-railway. The position of the city on the Ohio River gives it water communication with the extensive river system of the Mississippi valley ; while it is connected with Lake Erie by the Miami Canal, whose northern terminus is at Toledo, Ohio. The Miami is connected by a branch with the Wabash and Erie Canal, the largest in the United States (467 miles), which ex- tends from Toledo to Evansville, Indiana, on the Ohio river. The average yearly number of stcamers and barges running between Cincinnati and other ports during the ten years ending with August 1875 was 338; the yearly number of arrivals of steamers during this period was 2713, and of departures 2680. The large steamers of the Mississippi river are enabled to reach Cincinnati by means of the ‘canal around the falls of the Ohio at Louisville, Kentucky, which was opened in 1872. About three-fourths of the commerce of the city is by railroad and canal, and the remainder by river transportation. The extent of the entire commerce is indicated by the value’ of imports, which during the ten years ending in 1875 averaged $314,528,009 ‘a year, and of exports, which averaged $201,236,066.

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Plan of Cincinnati.

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pure Grecian style, 200 by 80 feet, with a stone spire rising to a height of 224 feet; St Paul’s Church (Methodist), with a spire 200 feet high; the First Presbyterian Church, with an immense tower surmounted by a spire 270 feet high ; St John’s Episcopal Church; and two large and attractive Hebrew temples.

Cincinnati is one of the most important commercial and manufacturing centres of the West. The six railroads entering the city are used by twelve companies, and besides these two lines terminate at Covington on the opposite side of the river. About 300 passenger and freight trains arrive and leave daily on these roads. For their use are

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Cincinnati is one of those interior ports to which, under the Act of Congress passed in 1870, foreign merchandize may be transported without appraisement and payment of duties at the port of first arrival. The value of such imports to this city during the year ending June 30, 1875, was $566,989. The total value of the products of manu- facturing industry has increased from $46,995,062 in 1860 to $127,459,021 in 1870 and $144,207,371 in 1874. The details for the last-mentioned years are as follows :—

| 1870. 1874, | a bia Hands Value of Hands | Value of Employed.| Products. |Employed.| Products. $20,804,263 8,713 | $17,129,224

3,873,356 2,147 4,871,362

12,699,165 | 7,977 | 18,776,066

7,227,324 4,929 7,651,118

17,945,651 | 4,957 24,071,077 |. Soap, candles, and oil 7,455,561 1,048 9,527,348 COGN: vesctineiieanceoess an il 12,626,682 15,198 13,329,914 Beer and Whisky …<0....~~2000. 16,361,006 1,835 24,281,273 |. Cotton, wool, hemp, &c. ..... 1,035 1,854,774 832 1,562,160 Drugs, chemicals, &c……..... 735 8,544,195 560 3,987,598 Stone and earth …….0~~+ss00. 2,209 2,980,102 2,199 3,916,401 Carriages, cars, &C…....s00see- 1,175 1,794,413 1,835 1,941,396 PADGD. Chess PIM BitS Leascucosneegvestowseraese 250 540,746 868 694,114 Miscellaneous .;.cc.cefssasavstsess 4,177 5,697,427 1,990 4,363,253 ROCA eva scevsdcguee 59,327 127,459,021 | 60,999 144,207,371 |.

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Boat-building was formerly a prominent industry, but it has recently declined. Prior to 1863 Cincinnati was the chief centre in the United States for the slaughtering of swine and the packing of pork. Since that year this supremacy has been held by Chicago, Cincinnati taking the second rank. There are more than seventy establisli- ments in the latter city employed in this industry. The United Railroads Stock-yards for the reception of live pigs occupy about 60 acres. During the winter season of 1874-75 there were slaughtered 560,164 hogs, weighing in the aggregate 155,864,126 tb, and valued at $10,897,584. The production included 44,232 barrels of pork, and 23,400,157 ib of lard. During the year ending August 31, 1875, pork and bacon valued at $12,645,538 were ex- ported from the city; the imports amounted to $2,580,493. The excess of exports of lard over imports was $2,781,091. After this important industry the brewing of lager beer ranks next, the brewers here turning out about 15,000,000 gallons annually. Distillation is also carried on to a very considerable extent. The city contains five national banks with a capital of $4,000,000, and seventeen private banks with a capital of $2,740,000. The leading com- mercial organization is the Chamber of Commerce and Merchants' Exchange, which has about 1200 members and holds daily sessions. The Board of Trade has about 900 members, chiefly manufacturers. There are also a mechanics' institute, cotton exchange, and pork packers' association. An industrial exhibition has been held in the autumn of each year since 1871, and has attracted large numbers of visitors to the city. The buildings are centrally situated, and occupy 34 acres of ground.

The city is divided into 25 wards, and is governed by a mayor, who is elected by the people for two years, and re- ceives an annual salary of $4000, a board of 25 aldermen, and a board of 50 councilmen, who are also elected by the people. It has a paid fire department under the control of five commissioners appointed by the mayor, and a police force under the control of the mayor and four commis- sioners. The efficiency of these departments is promoted by extensive fire-alarm and police telegraphic lines. The city is supplied with water obtained by pumping from the Ohio river by means of three immense reservoirs, two of which, with a capacity of 100,000,000 gallons each, are in Eden Park. Beside the usual municipal and county

courts, the United States circuit and district courts for the southern district of Ohio are held in the city.

Cincinnati has a large number and variety of well- organized charitable institutions. The Cincinnati hospital is supported by taxation, and affords free treatment to all unable to pay for it ; the city infirmary, besides supporting pauper inmates, affords relief to outdoor poor; the Good Samaritan and St Mary's hospitals are private institutions, under the supervision of Roman Catholic sisters; the Jewish hospital is maintained by persons of that faith. The Longview asylum for the insanc, built at Carthage, 10 miles from the city, at a cost, including 110 acres of land, of $1,000,000, ranks among the first institutions of the kind in the United States. It belongs to Hamilton county, whose population consists chiefly of the inhabit- ants of Cincinnati; patients are, however, sent here by the State, which contributes to its support. The average daily number of inmates in 1874 was 582, nearly all of whom were maintained free of charge. Besides the city orphan asylum, which has accommodation for 300 chil- dren, and is supported by private charity, and the German Protestant asylum, with a capacity for about 100, two large asylums are maintained by the Roman Catholics and by the coloured people. There are also several institutions for indigent and friendless women. The house of refurge

and the city workhouse are maintained by the city flor ,

the confinement of persons convicted of minor offences; children are sent to the former, and adults to the latter. The public schools are under the control of a superin- tendent and a board of 50 clected members, and comprise 3 high, 5 intermediate, and 30 district schools, including those for coloured pupils. There are also a normal school for females and evening schools. In 1874 there were 529 teachers and 28,949 pupils enrolled, with an average daily attendance of 21,486. German isa prominent study in the public schools, and music and drawing are taught. The Woodword and the Hughes high schools have long been known for their excellence. Besides the above, there are a large number of Roman Catholic parochial schools. The university of Cincinnati, recently founded by means of a bequest made by Charles M'Micken, is designed to afford advanced and technical instruction

free of charge. A school of design has been in operation since 1869. Be- sides the Cincinnati Weslcyan College for females (Metho- dist-Episcopal), St Xavier College (Roman Catholic), and Mount St Mary's of the West, the city has 1 law, 6 mcdi- cal, and 2 theological schools, 4 commercial colleges, and 2 schools of music. One of the theological schools is connected with Mount St Mary's of the West, the other is the widely-known Lane Theological Seminary (Presby- terian), founded in 1829. It occupies a site of 7 acres on Walnut Hills, and has 5 professors and a library of 12,000 volumes. Three of the medical schools are classified as regular, one as pharmaceutic, one as homeopathic, and one as dental. The oldest is the medical college of Ohio, which was opened in 1819, and now has 10 instructors; the Cincinnati college of medicine and surgery was opened in 1821, and has 14 instructors; the Miami medical college, opened in 1852, has 12 instructors ; and the Pulte medical college, opened in 1872, has 14. There are 11 public libraries in the city, the largest being the free public library, which has 81,000 bound volumes and 5500 pam- phlets, and the young men's mercantile with uearly 40,000 volumes. The public library occupies one of the best library buildings in the country, The most important literary associations are the natural history and the his- torical and philosophical societies, There are published in the city 70 newspapers and periodicals,-—9 appearing daily, 1 twice a-week, 33 weekly, 8 fortnightly, 21 monthly, and 3 quarterly. Of these 3 daily, 9 weckiy, 1 fortnightly, and 2 monthly are published in German, The city contains 160 churches, the largest denominations being the Roman Catholic, which has 32 churches and 12 chapels, the Methodist with 26 churches, the Presbyterian with 22, the Baptist with 14, and the Protestant Episcopal with 11. (£. 8. DE.}

CINCINNATUS, the hero of one of the early Roman legends, was born about 519 B.c. According to the story, he was ruined by the fine which was imposed on his son Czeso for the murder of a plebcian during the commotions caused by the introduction of a bill by Terentilius Arsa. This measure, which proposed the creation of a code of written laws applicable to plebeian and patrician alike, was also strongly opposed by Cincinnatus himself. Cincinnatusis, in fact, the type of the ancient patrician agriculturist. Twice he was called from the plough to the dictatorship of Rome. On the first occasion his task was to save the army from the Aiquians and Volscians, who had forced it into a posi- tion of imminent danger ; and he is said to have raised an army and defeated the enemy within a single day

(458). On his return he summoned Volscius, the accuser of his son, to take his trial on a charge of perjury ; but Volscius fled from the city. On the second occasion (439) he was appointed by the patricians, in order to crush Spurius Mzlius, who had spent his wealth in relieving the wretched debtors, and who was consequently accused of

desiring popularity that he might seize the supreme authority. Meelius, refusing to appear before the dictator, was killed by Ahala, the master of the horse.

CINEAS, a Thessalian, the chief adviser of Pyrrhus, king of Epirus. The most famous event of his life was the visit which he made to Rome for the purpose of con- cluding the war, after the defeat of the Romans by Pyrrhus at Heraclea (280 8.c.) He performed the feat of learning in one day the name of every man of importance in the city, and displayed besides the most marvellous tact and eloquence ; but the effects of his persuasion being destroyed through the patriotic vehemence of the venerable Appius Claudius Czecus, he returned to his master with the report that Rome was a temple, and its senate an assembly of kings. Cineas also served as an ambassador in Sicily. He is perhaps the Cineas referred to by Cicero as the author of a work De Re Militari.

CINNA, Luctus Cornetivs, a Roman patrician, con- spicuous in the contest between Marius and Sulla. After serving in the war with the Marsi as pretorian legate, he was elected cousul in 87 B.c. Breaking the oath he had sworn to Sulla that he would not attempt any revolution in the state, Cinna allied himself with Marius, raised an army of Italians, and took possession of the city. Soon after his triumphant entry and the massacre of the friends of Sulla, by which he had satisfied his vengeance, Marius died. lL. Valerius Flaccus became Cinna’s colleague, and on the murder of Flaccus, Cn. Papirius Carbo. In 84, however, Cinna, who was still consul, was forced to advance against Sulla ; but while embarking his troops he was killed in a mutiny. See Roman Hisrory.

_CINNABAR, the xwvéBapis of Theophrastus, isthe native sulphide of mercury, and the only commercial source of that metal and its compounds.

It crystallizes in the rhombohedral form, in which condition it is sometimes found; but generally it occurs in fibrous or amorphous masses bedded in slate rocks and shales, and more rarely in veins in granitic or porphyritic rocks. In hardness it is intermediate between gypsum and calespar ; its specific gravity is 8-998, and its colour varies from a fine bright red to a reddish-brown and leaden-grey hue. It possesses the same composition as the ordinary vermilion of com- merce for which it may, when pure and fine in colour, sometimes be used after simple levigation, although the greater part of that brilliant pigment is artificially prepared. Pure cinnabar should contain 86°21 per cent. of mercury, combined with 13°79 of sulphur ; but in its native state the ore is frequently contaminated with oxide of iron, clay, and bituminous matter. The principal European localities for cinnabar are at Idria in Carniola, and at Almaden in Spain, whence the British demand is mainly supplied. It is also extensively worked at New Almaden and several other localities in California, in the southern part of Peru, and in Borneo, Japan, and China. See VERMILION.

CINNAMON is the inner bark of Cinnamomum Zeylani- cum, asmall evergreen tree belonging to the Natural Order Lauracee. The leaves are large ovate-oblong in shape, and the flowers, which are arranged in panicles, have a greenish colour and a rather disagreeable odour. Cinnamon has been known from the most remote antiquity, and it was so highly prized among ancient nations that in very small quantities it was regarded’as a present fit for monarchs and other great potentates. It is mentioned in Exod. xxx. 23, where Moses is commanded to use both sweet cinnamon (Kinman) and cassia. It is likewise alluded to by Herodotus under the name xwvdépwpov, and it is frequently mentioned by many other classical writers. It is now almost exclusively a product of Ceylon, but the origin of the plant and the derivation of its name are matters of considerable doubt and dispute. The Arab traders, by

whom the trade in this and other Oriental spices was con- ducted in ancient times, surrounded the history and produc- tion of these precious and lucrative products with grotesque tales of mystery. It is contended by some that cinnamon was origiually obtained from the promontory of Gardafui

(the regio cinnamomifera of classical geographers), while others lean to the opinion that it was brought from China, whence the chief portion of the closely allied cassia bark is still derived. Although as the produce of Ceylon, cinnamon did not come prominently into the market till the settlement of the Portuguese in the island, it is the opinion of the best authorities that the tree yielding it is indigenous, and certainly no other situation and climate have yet been found where the trees flourish so well and yield a bark so fine and so delicately aromatic.

The cinnamon gardens are confined to a strip of country in the neighbourhood of Colombo, When the trade was at its best, five of the principal gardens measured from 15 to 20 miles in circumference, but now the area of cultiva- tion is very much restricted, and plants which were at one time tended with the greatest care, and guarded with inhuman jealousy, are choked with the natural profusion of jungle vegetation. The bark is taken from shoots of eighteen months or two years growth, in which time they attain a length of from 6 to 10 feet, and a thickness of from 4 to2 inches. The plants are managed on the coppice system, and only four or five shoots are allowed to grow up from each stool. Theshoots are cut down twice a year after the rains, aud the bark is detached in lengths of about a foot. After lying in bundles as taken from the shoots for about a day, each separate piece is carefully scraped to remove the outer and middle layers of the bark, and the remaining portion is thereby often reduced to the thickness of one-hundredth part of an inch. The pieces are then made up into composite quills by placing the smaller pieces inside the larger, and thus the cinnamon is often formed into straight firm rods of from 3 to 4 feet inlength. After drying in the sun the bark is ready to make up into bundles for exportation.

Cinnamon of an inferior quality is grown in Southern India at Tellicherry and Tinnevelly ; and in Java the cul- tivation was introduced by the Dutch about the year 1825. The plaut has also been grown in the colony of French Guiana, and in other localities. The produce of none of these places, however, approaches in quality to the cinna- mon of Ceylon, whence also the largest proportion of the entire consumption is supplied. Nearly the whole quan- tity prepared in Ceylon is brought to the British market. The value of Ceylon cinnamon submitted to the English Board of Trade, was in

1874 more than 2s. 2d. per tb, that from other localities being estimated at about 10d.

Ceylon cinnamon of fine quality is a very thin smooth bark, with a light-yellowish brown colour, a highly fragrant odour, and a peculiarly sweet, warm, and pleasing aromatic taste. Its peculiar flavour is due to an aromatic oil which it contains to the extent of from 0°5 tol percent. The essential oil of cinnamon, as an article of commerce, is pre- pared chiefly in Ceylon, where the coarser pieces of bark are used for its extraction. These are roughly powdered aud macerated in sea water for two days, when the whole is quickly distilled. The oil is of a golden-yellow colour, with the peculiar odour of cinnamon and a very hot aromatic taste. It consists essentially of cinnamic aldehyde or the hydride of cinnamyl, and by the absorption of oxygen as it becomes old it darkens in colour and develops resinous compounds with cinnamic acid.

Cinnamon is principally employed in cookery as a con- diment and flavouring material, being largely used in the preparation of some kinds of chocolate and liqueurs. In medicine it acts as an aromatic stimulant and cordial ; but

it is chiefly prescribed for improving the flavour of bitter substances and to correct the griping action of purgatives. Being a much more costly spice than cassia, that compara- tively harsh-flavoured substance is frequently substituted for or added to cinnamon. The two barks when whole are easily enough distinguished, and their microscopical char- acters are also quite distinct. When powdered bark is treated with tincture of iodine, little effect is visible in the case of pure cinnamon ; but with cassia a deep-blue tint is produced, the intensity of the coloration depending on the proportion of the cassia.

CINO DA PISTOIA (1270-1336), a poet and jurist, whose full name was GUITTONCINO DE’ SINIBULDI, was born in Pistoia, of a noble family. He studied law at Bologna under Dinus and Franciscus Accursius, and in

1307 is understood to have been assessor of civil causes in his uative city. In that year, however, Pistoia was disturbed by the Guelf and Ghibelline feud. The Ghibellines who had for some time been the stronger party, being worsted by the Guelfs, Cino, a prominent member of the former faction, had to quit his office and the city of his birth. Pitecchio, a stronghold on the frontiers of Lombardy, was yet in the hands of Filippo Vergiolesi, chief of the Pistoian Ghibellines ; Selvaggia, his daughter, was beloved by Cino (who was probably already the husband of Margherita degli Unghi); and to Pitecchio did the lawyer-poet betake himself. It is uncertain how long he remained at the for- tress ; it is certain, however, that he was not with the Vergiolesi at the time of Selvaggia's death, which happened three years afterwards (1310), at the Monte della Sambuca, in the Appenines, whither the Ghibellines had been com- pelled to shift their camp. He visited his mistress's grave on his way to Rome, after some time spent in travel in France and elsewhere, and to this visit is owing his finest sonnet, At Rome Cino held office under Louis of Savoy, sent thither by the Ghibelline leader Henry of Luxembourg, who was crowned emperor of the Romans in 1312. In 1313, however, the emperor died, and the Ghibellines lost their last hope. Cino appears to have thrown up his party, and to have returned to Pistoia. Thereafter he devoted himself to law and letters. After filling several high judi- cial offices, a doctor of civil law of Bologna in his forty- fourth year, he lectured and taught from the professor's chair at the universities of Treviso, Siena, Florence, and Perugia in succession ; his reputation and success were great, his judicial experience enabling him to travel out of the routine of the schools. In literature he continued in some sort the tradition of Dante during the interval dividing that great poet from his successor Petrarca. The latter, besides celebrating Cino in an obituary sonnet, has coupled him and his Selvaggia with Dante and Beatrice in the fourth capitolo of his Trionfi d' Amore.

Cino, the master of Bartolus, and of Joannes Andre the celebrated canonist, was long famed as a jurist. His com- mentary on the statutes of Pistoia, written within two years, is said to have great merit ; while that on the code (Lectura Cino Pistoia super Codice, Pavia, 1483, Lyons, 1526) is considered by Savigny to exhibit more practical intelligence and more originality of thought than are found in any commentary on Roman law since the time of Accursius. As a poet he also distinguished himself greatly.

He was the friend and correspondent of Dante's later years, and possibly of his earlier also, and was certainly, with Guido Cavalcanti and Durante da Maiano, one of these who re- plied to the famous sonnet A ciascun' alma presa e gentil core of the Vita Nuova. The great Florentine in the trea- tise De Vulgari Eloguio refers to him as one of " those who have most sweetly and subtly written poems in modern Italian," but his works, printed at Rome in 1559, do not alto-

gether justify the praise bestowed on them by his illustrious |

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friend. Strained and rhetorical as many of his outeries are, however, Cino is not without moments of true passion and fine natural eloquence. Of these qualities the sonnet in memory of Selvaggia, Jo fui in sull'alto e in sul beato monte, and the canzone to Dante, Avegnaché di omaggto pi per tempo, are interesting examples.

The text-book for English readers is Mr D. G. Rossetti's Early Italian Poets, whercin will be found not only a memoir of Cino da Pistoia (pp. 206-211), but also (pp. 381-395) some admirably trans- lated specimens of his verse, —the whole wrought into significant connection with that friendship of Cino's, which is perhaps the

most interesting fact about him. See also Ciampi, Vita e Poesie di Messer Cino da Pistoia, Pisa, 1813.

CINQ-MARS, Henri Corrrrer pe Ruzt, Marquis pz (1620-1642), French courtier, was born in 1620. At thie age of eighteen he was introduced to the court by Richelieu, who had been the patron of his father, and who intended him to fill the post of favourite to the king, Louis XIII. The design succeeded well, and Cing-Mars became grand inaster of the wardrobe, and grand master of the horse. He developed into a gallant courtier, won the affection of the princess of Mantua, and claimed a seat in the royal council. But Richelieu opposed his ambition, and refused to counte- nance his pretensions. Cing-Mars, therefore, in revenge, entered into the conspiracy

against him, of which the duke of Orleans was nominal head. Unfortunately aid had been sought from Spain ; and using this treason as an argument, Richelieu persuaded the weak and fickle king first to forbid Cing-Mars to enter his presence, and then to permit his execution (1642).

CINQUE PORTS. The Cinque Ports, or Five Ports, is the name of an ancient jurisdiction in the south of England, which is still maintained with considerable modi- fications and diminished authority. As the name fimplies, the original members of the body were only five in number Hastings, Romney, Hythe, Dover, and Sandwich ; but to these were afterwards added the “ Ancient Towns” of Winchelsea and Rye with the same privileges, and a good many other places, both corporate and non-corporate, which, with thetitle of Limb or Member,held a subordinate position, To Hastings were attached the corporate members of Pevensey and Seaford, and the non-corporate members of Bulverheeth, Petit Iham, Hidney, Beaksbourne, and Grange ; to Romney, Lydd, and Old Romney, Dengemarsh, and Oswardstone; to Dover, Folkstone and Feversham, and Margate, StJohn’s, Goresend, Burchington Wood, St Peter’s, Kingsdowne, and Ringwold ; to Sandwich, Fordwich, and Deale, Walmer, Ramsgate, Stoner, Sarr, and Brightlingsea. The jurisdiction thus extends along the coast from Seaford in Sussex to Burghington near Margate in Kent ; and it also includes a number of inland districts, at a considerable distance from the ports with which they are connected. The non-incorporated members are within the municipal jurisdiction of the ports to which they are attached 3 but the corporate members are as free within their own liberties as the individual ports themselves. The incor- poration of the Cinque Ports had its origin in the necessity for some means of defence along the southern seaboard of England, and in the lack of any regular navy. Up to the reign of Henry VII. they had to furnish the Crown with nearly all the ships and men that were needful for the state ; and for a long time after they were required to give large assistance to the permanent fleet. The oldest charter now on record is one belonging to the 6th year of Edward I; and it refers to previous documents of the time of Edward the Confessor and William the Conqueror. in return for their services the ports enjoyed extensive privileges. From the Conquest or even earlier they had, besides various lesser rights,—(1) Exemption from tax and tallage ; (2) Soc and sae, or full cognizance of all criminal and civil cases within their liberties ; (3) Toll aud theam,

or the right of receiving toll and of holding serfs; (4) Bloodwith and fledwith, or the right to punish shedders of blood and those who were seized in an attempt to escape from justice ; (5) Pillory and tumbrell; (6); Ingfangtheof and outfangtheof, or power to imprison and execute felons ; (7) Mundbriech, or authority to erect banks or dykes on any man's land as a defence against the sea; (8) Waives and strays, or the right to appropriate lost property or cattle not claimed within a year and a day ; (9) The right to seize all flotsom, jetsom, or witsom, or in other words, whatever of value was cast ashore by the sea; (10) The privilege of being a guild with power to impose taxes for the common weal; and (11) The right of assembling in portmote or parliament at Shepway or Shepway Cross, a few miles west of Hythe—the parliament being empowered to make bye-laws for the Cinque Ports, to regulate the Yarmouth fishery, to hear appeals from the local courts, and to give decision in all cases of treason, sedition, illegal coining, or concealment of treasure trove. The ordinary business of the ports is conducted in two courts known respectively as the Court of Brotherhood and the Court of Brotherhood and Guestling,—the former being composed of the mayors of the seven principal towns and a number of jurats and freemen from each, and the latter including in addition the mayors, kailiffs, and other representatives of the corporate members. The Court of Brotherhood was formerly called the Brotheryeeld, Brodall, or Brodhull ; and the name Guestling seems to owe its origin to the fact that the officials of the "members" were at first in the position of invited guests. The highest office in connection with the Cinque Ports is that of the Lord Warden, who also acts as governor of Dover Castle, and has a maritime jurisdiction as admiral of the ports. His power was formerly of great extent, and he held a court of chancery at Dover in the old parish church of St James. He still presides in the court of Shepway, and appoints the justices of peace for the liberties of the Cinque Ports.

See Samuel Jeake, Charters of the Cinque Ports, London, small folio, 1728; Philipott's Villare Cantianum; the First Report on Municipal Corporations in 1835; and the Census of England and Wales, 1871, vol. i.

CINTRA, a town of Portugal in the province of Estremadura, 14 miles north-west of Lisbon, with about 4500 inhabitants. It stands at the foot of a rocky moun- tain of an altitude varying from 1800 to 3000 feet, and is remarkable for the picturesque beauty of its situa- tion and the salubrity of its climate, which render it a favourite resort of the wealthier inhabitants of Lisbon. On one of the adjacent summits stands the Penha Castle, erected by King Ferdinand of Coburg on the site of the former convent of the Hieronymites ; and on another are the ruins of a Moorish castle. There is also an ancient royal palace descrited as a medley of Moorish and Christian architecture, and long famous as the summer residence of the court ; and in the neighbourhood is the “Cork Convent” of Santa Cruz, which derives its name from the lining of its cells, and owes its origin to Joao de Castro, the celebrated viceroy of the Indies, whose heart is still preserved in the chapel of Penha Verde, near the villa in which he resided after his return. The convention by which the French were allowed to leave Portugal without molestation was signed at Cintra, August, 22, 1808.

CIPHER. See CRYPTOGRAPHY.

CIPRIANI, Giovanni Barrista (1727-1785), painter and draughtsman, was of Pistoian descent, but was born at Florence, where he studied design and colour under Heckford and Gabbiani. After painting several pictures at Pistoia and elsewhere, Cipriani, who had contracted a friendship with Bartolozzi, the eminent engraver, quitted Florence for London. There he worked for the duke of

Richmond and other noblemen and gentlemen, repaired the Rubens ceiling in Whitehall Chapel, and the Verrio frescoes at Windsor, and decorated in part the Royal Academy library. His drawings, which are better than his paintings, engraved by Bartolozzi and his pupils, achieved a wide popularity, and were bought up eagerly all over Europe ; but his reputation is nowadays somewhat faded.

CIRCAR is an Indian term applied to the component parts of a Subah or province, each of which is administered by adeputy-governor. In English it is principally employed in the name of the Northern Circars, used to

designate a now obsolete division of the Madras presidency, which consisted of a narrow slip of territory lying along the western side of the Bay of Bengal from 15° 40’ to 20° 17’ N. lat. These Northern Circars were five in number, Cicacole, Rajamundry, Ellore, Condapilly, and Guntoor, and their total area was about 30,000 square miles. The district corresponds in the main to that now occupied by the modern divisions of Guntoor, Masulipatam, Rajamun- dry, Vizagapatam, and Guujam. It was first invaded by the Mahometans in 1471; in 1541 they conquered Conda- pilly, and nine years later they extended their conquests over all Guntoor and the districts of Masulipatam. But the invaders appear to have acquired only an imperfect possession of the country, as it was again wrested from the Hindu princes of Orissa about the year 1571, during the reign of Ibrahim Kutub, shah of Hyderabad or Golcondah. In 1687 the Circars were added, along with the empire of Hyderabad, to the extensive empire of Aurung- zebe. Salabut Jung, the son of Nizam ul Mulk, who was indebted for his elevation to the throne to the French East India Company, granted them in return for their services the district of Condavir or Guntoor, and soon afterwards the other Circars. In 1759, by the conquest of the fortress of Masulipatam, the dominion of the maritime provinces on both sides, from the River Gondegama to the Chilca Lake, was necessarily transferred from the French to the British. But the latter left them under the administration of the Nizam, with the exception of the town and fortress of Masulipatam, which were retained by the English East India Company. In 1765 Lord Clive obtained from the Mogul a grant of four of the Circars, which in the following year was confirmed by a treaty entered into with Nizam Ali, who had by this time superseded Salabut Jung in his authority. ‘The remaining Circar of Guntoor devolved to the East India Company in 1788.

CIRCASSIA. The name of Circassia is commonly given to the whole of the north-western portion of the Caucasus, including the district between the mountain range and the Black Sea, and extending to the north of the central ridge as far as the River Kuban. In this sense the term is still in use as a geographical appellation, though the Circassians, as a nation, may be regarded as extinct. ‘The region thus defined may be considered as extending from the neighbour- hood of Anapa on the Black Sea to the frontiers of Mingrelia, and having a seaboard of about 280 English miles. Throughout this extent the country is almost wholly mountainous,—the

great range of the Caucasus, which begins in the neighbourhood of Anapa at a moderate eleva- tion, rising gradually as it extends towards the south-east, till it culminates in the lofty summit of Mount Elbruz, at an elevation of 18,526 feet. The strip of land between the dividing ridge. or watershed of these mountains and the sea, a tract varying from twenty to forty miles in width, is extremely rugged, traversed by successive offshoots of the mountains, extending quite down to the sea, and covered for the most part with extensive forests. The slopes on the northern side of the Caucasus are more gentle, and here the valleys afford abundant pasturage, but hardly any portion of Circassia, properly so called, is a level or open country.

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The Tcherkesses or Circassians, who gave name to this region, of which they were until lately the sole inhabitants, are a peculiar race, differing from the other tribes of the Caucasus in origin and language. They designate them- selves by the name of Adighe, that of Tcherkesses being a term of Russian origin. By their long-continued struggles with the power of Russia, during a period of nearly forty years, they attracted the attention of the other nations of Europe in a high degree, and were at the same time an object of interest to the student of the history of civilization, from the strange mixture which their customs exhibited of chivalrous sentiment with savage customs. For this reason it may be still worth while to give a brief summary of their national characteristics and manners, though these must now be regarded as in great measure things of the past.

In the patriarchal simplicity of their manners, the mental qualities with which they were endowed, the beauty of form and regularity of feature by which they were distin- guished, they surpassed most of the other tribes of the Caucasus. At the same time they were remarkable for their warlike and intrepid character, their independence, their hospitality to strangers, and that love of country which they manifested in their determined resistance to an almost overwhelming power during the period of a long and desolat- ing war. The government under which they lived was a peculiar form of the feudal system. The free Circassians were divided into three distinct ranks, the princes or pschi, the nobles or work (Tartar wsden), and the peasants or hokotl. Like the inhabitants of the other regions of the Caucasus, they were

also divided into numerous families, tribes, or clans, some of which were very powerful, and carried on war against each other with great animosity. The slaves, of whom a large proportion were prisoners of war, were generally employed in the cultivation of the soil, or in the domestic service of some of the principal chiefs.

The will of the people was acknowledged as the supreme source of authority; and every free Circassian had a right to express his opinion in those assemblies of his tribe in which the questions of peace and war, almost the only subjects which engaged their attention, were brought under déliberation. The princes and nobles, the leaders of the people in war and their rulers in peace, were only the administrators of a power which was delegated to them. As they had no written laws, the administration of justice was regulated solely by custom and tradition, and in those tribes professing Mahometanism by the precepts of the Koran. The most aged and respected inhabitants of the various aouls or villages frequently sat in judgment, and their decisions were received without a murmur by the contending parties. The Circassian princes and nobles were professedly Mahometans; but in their religious services many of the ceremonies of their former heathen and Christian worship were still preserved, A great' part of the people had remained faithful to the worship of their ancient gods,—Shible, the god of thunder, of war, and of justice, Tleps, the god of fire, and Seosseres, the god of water and of winds. Although the Circassians are said to have possessed minds capable of the highest cultivation, the arts and sciences, with the exception of poetry and music, were completely neglected. They possessed no Written language. The wisdom of their sages, the know- ledge they had acquired, and the memory of their warlike deeds were preserved in verses, which were repeated from mouth to mouth and descended from father to gon,

The education of the young Circassian was confined to riding, fencing, shooting, hunting, and such exercises as were calculated to strengthen his frame, and prepare him for a life of active warfare. The only intellectual duty of the atalik, or instructor with whom the young men lived

uutil they had completed their education, was that of teaching them to express their thoughts shortly, quickly, and appropriately. One of their marriage ceremonies was very strange. ‘The young man who had been approved by the parents, and had paid the stipulated price in money, horses, oxen, or sheep, for his bride, was expected to come with his friends fully armed, and to carry her off by force from her father’s house. Every free Circassian had unlimited right over the lives of his wife and children, Although polygamy was allowed by the laws of the Koran, the custom of the country forbade it, and the Circassians were generally faithful to the marriage bond. The respect for superior age was carried to such an extent, that the young brother used to rise from his seat when the elder entered an apartment, and was silent when he spoke. Like all the other inhabitants of the Caucasus, the Circassians were distinguished for two very opposite qualities, the most generous hospitality, and implacable vindictiveness. Hospitality to the stranger was considered one of the most sacred duties. Whatever were his rank in life, all the members of the family rose to receive him on his entrance,

and conduct him to the principal seat in the apartment.

The host was considered responsible with his own life for the security of his guest, upon whom, even although his deadliest enemy, he would inflict no injury while under the protection of his roof. The chief who had received a stranger’ was also bound to grant him an escort of horse tu conduct him in safety on his journey, atid confide him to the protection of those nobles with whom he might be on friendly terms. The law of vengeance was no less binding on the Circassian. The individual who had slain any member of a family was pursued with implacable vengeance by the relatives, until his crime was expiated by death. The murderer might, indeed, secure his safety by the payment of a certain sum of money, or by carrying off from the house of his enemy a newly-born child, bringing it up as his own, and restoring it when its education was finished. In either case, the family of the slain individual might discontinue the pursuit of vengeance without any stain upon its honour. The man closely followed by his enemy, who, on reaching the dwelling of a woman, had merely touched her hand, was safe from all other pursuit so long as he remained under the protection of her roof. The opinions of the Circassians regarding theft resembled those of the

ancient Spartans. The commission of the crime was not considered so disgraceful as its discovery ; and the punishment of being compelled publicly to restore the stolen property to its original possessor, amid the derision of his tribe, was much dreaded by the Circassian who would glory in a successful theft. The greatest stain upon the Circassian character was the custom of selling their children, the Circassian father being always willing to part with his daughters, many of whom were bought by Turkish merchants for the harems of Eastern monarchs. But no degradation was implied in this transaction, and the young women themselves were generally willing partners in it. Herds of cattle and sheep constituted the chief riches of the inhabitants. The princes and nobles, from whom the members of the various tribes held the land which they cultivated, were the proprietors of the soil. The Circassians carried on little or no commerce, and the state of perpetual warfare in which they lived prevented them from cultivat- ing any of the arts of peace.

The early history of Circassia is exceedingly obscure, This part of the coasts of the Black Sea was inhabited in ancient times only by wild and barbarous tribes, whose names are very differently given by ancient writers. No Greek colonies. were planted within the limits of Circassia proper, though the Greeks carried on an extensive trade with the nations of the interior at Dioscurias, near Sukhum

Kaleh. In the (2th and 13th centuries the princes of Georgia were successful in reducing Circassia into the condition of a province; and are said to have also been the first to introduce Christianity into the country—a religion which they continued to profess (in name at least) till the 18th century, when they were converted to Islamism by the teaching of a fanatical devotee named Mansur. The common people, however, retain to a great extent their pagan customs and beliefs. After they had succeeded in throwing off the Georgian yoke, the Circassians passed for a time under the rule of the Tartar khans of the Crimea, from whom they emancipated themselves, with the assistance of Ivan I., czar of Russia, But the Russian monarchs do not appear to have regarded their conquest as a matter of much importance, until the time of Peter the Great. That powerful monarch,

perceiving how much the possession of the Caucasus would contribute to his political and commercial influence in Western and Central Asia, made an unsuccessful attempt to reduce it permanently under his dominion. Catherine II. pursued a similar line of policy. Georgia having been harassed by the successive invasions of the Persians and Turks, the prince of that country at last threw himself under the protection of the Russians, and became tributary to their power. The River Kouban being afterwards fixed as the southern boundary of the Muscovite empire, the Russians became ambitious of extending their dominion uninterruptedly to the extreme limits of Georgia. In the wars which now took place between the Russians and the Turks, the latter used every exertion, by exciting the fanatical feelings of the Cir- cassians against the infidels, to induce them to harass the Russians by frequent incursions into their territory. After various vicissitudes of fortune, the Turks were worsted, and compelled by the treaty of Adrianople in 1829 to cede a considerable portion of their territory to the czar. Assuming a right of political sovereignty which they had never possessed, they included Circassia in this cession. The Circassians, refusing to acknowledge the right of the sultan (whom they had never recognized as their sovereign, though acknowledging him as head of their religion) thus to dispose of their country, were now exposed to the hostility of the Russians, who determined to become masters of the territory on the coasts of the Black Sea, and indeed of the whole Caucasian region, by force of arms. This was the origin of that remorseless war which was carried on with so much animosity down to a very recent period, and cost the Russians an incredible amount of blood and treasure.

A brief outline of the leading events which characterized this long-protracted struggle will be found in the article Caucasus. After the Circassians were finally reduced to submission, the inhabitants of the sea-coast, rather than submit to the regulations imposed by the Russian Govern- ment, determined to quit their country, and emigrate in a mass to Turkey. Not less than half a million of people carried out this resolution, and were settled in different parts of the Turkish empire,—the greater part of them in Asia Minor, but some also in the mountain country on the borders of Bulgaria and Servia. Since that period the whole tract along the sea-coast from Anapa to Sukhum Kaleh, which was that best known as Circassia, has been almost entirely destitute of inhabitants. But the northern slopes of the

Caucasus, and the valleys descending towards the Kuban, are still occupied by tribes of Circassian race ; and the Kabardans, a kindred tribe, but of less warlike character, extending eastwards to beyond the Terek, have long settled down quietly in the condition of Russian subjects. . (eH. B.)

CIRCE, in classical mythology, the daughter of Sol and Perse, or of Hyperion and Aérope, or, according to some,

of Aetes, king of Colchis (whom others cal] her brother), was a famous sorceress. Having murdered her husband, the prince of Colchis, she was expelled by her subjects, and placed by her father on the solitary island of Aza, on the coast of Italy. Here she was found by Ulysses and his companions ; the latter she changed into swine, but the hero, protected by the herb moly which he had received from Mercury, not only forced her to restore them, but also gained her Jove. Fora year he relinquished himself to her endearments ; but at length he aroused himself, and after descending at her advice to the lower world, to consult the prophet Tiresias as to the fate which awaited him, he left her. The metamorphoses by Circe of Scylla ee of Picus, king of the Ausonians, are celebrated by

vid.

CIRCEII, a town of ancient Italy, in Latium, at the foot of Mons Circeius, or Capo Circello, a short distance from the sea, and 10 or 12 miles along the coast from Terracina, It was originally colonized by the Romans in the reign of Tarquin the Proud, who deemed the position favourable for comimerce and for repressing the inroads of the Volsci. From its foundation till the date of the Latin War, 340 B.c., itseems at one time to have been subject to the Romans, at another to have espoused the cause of the Volsci, and sometimes to have been independent of both powers. After the Latin War it was recolonized by the Romans ; but it continued gradually to decline till the emperors Tiberius and Domitian, attracted to it by the pleasantness of its situation and the excellence of its oysters, erected villas in the neighbourhood. Its ruins are still distinctly visible on the Monte della Cittadella, and consist of walls and gateways built of polygonal blocks.

CIRCUIT, a law term, signifying the periodical progress of a legal tribunal for the sake of carrying out the adminis- tration of the law in the several provinces of a country, It has long been applied to the journey or progress which the judges have been in the habit of making twice every year, through the several counties of England, to hold courts and administer justice, where recourse could not be had to the king's court at Westminster. The country, including Wales, is now, by Order in Council (under the Judicature Act, 1875), dated 5th February 1876, divided into seven circuits, viz., the Northern, North-Eastern, Midland, South- Eastern, Oxford, Western, North Wales, and South Wales Circuits. Counsel are not expected to practice on a circuit other than that to which they have attached themselves, unless they receive a special retainer. This and similar regulations are enforced by the discipline of the circuit bar mess only. In Scotland the judges of the supreme criminal court, or High Court of Justiciary, form also three separate circuit-courts, consisting of two judges each; and thie country, with the exception of the Lothians, is divided into corresponding districts, called the Northern, Western, and Southern Circuits. In certain burghs of each circuit two courts are held in the year, in spring and autumn, called Circuit Courts. One more is held at Glasgow during the Christmas recess. Ireland is divided into the North-East and the North-West Circuits, the Home Circuit, and those of Leinster, Connaught, and Munster.

CIRCUMCISION. The importance of this rite is so largely due to its quasi-sacramental character in Judaism, that any inquiry into its history and meaning must be prefaced by a reference to the Old Testament.

J. There are three distinct narratives in the sacred litera- ture of the Jews which claim to be considered. It is related in Gen, xvii. that when Abram the Hebrew was ninety-nine years of age, he became a party on behalf of himself and his descendants to a covenant with his God. Of this covenant the sign and condition was circumcision, which was directed to be performed (a peculiarity of Judaism) on

the eighth day after the child's birth. Is this account, we may ask, based on a historical tradition? If so, the circumcision of the Israelites is entirely

unconnected with that of other nations unless indeed other nations have borrowed theirs from the Israelites. This has actually been maintained in the case of the Egyptians by Arch- deacon Hardwicke, but the theory is not only im probable in itself, considering the imitative character of the Israelites, and their low reputation in Egypt (Gen. xlvi. 34), but contrary to the evidence of the Egyptian monuments (see below). If, as has been supposed by some, the docu- ment to which Gen. xvii. belongs is of post-captivity origin, this would put it out of court as a witness to the popular tradition of the Hebrews. But there is another narrative, apparently of a more archaic coin- plexion, which leads to a directly opposite historical result. We read in Exod. iv. 25, 26, that when Moses was returning from Midian to Egypt, he was in danger of his life, owing to the neglect of the rite of circumcision in his family, "And Zipporah," his Midianitish wife, "took a sharp stone, and cut off the foreskin of her son, and cast it at his feet, and said, Surely a khathan (Auth, Vers., 'husband') of blood art thou to me; so he (sc., the offended deity) desisted from him. At that time she said, A khathan of blood, with reference to the circumcision." The meaning of this story can still be discerned. Khathan, or khatan, meant originally not "husband" (as Auth. Vers. of Exodus), nor " son-in-law" (as in ordinary Arabic), but "a newly-admitted member of the family." This appears from the sense of Arab. khatana, "to provide a wedding-feast," aud khatana, "to give or receive a daughter in marriage." So that in the seuse of the old Hebrew tra- dition, "'a khathan of blood" meant "one who has become a khathan, not by marriage, but by circumcision," a mean- ing which is still further confirmed by the derived sense of Arab, khatana " to circumcise," circumcision being performed in Arabia at the age of puberty. To sum up:—an Arabian woman plays the chief part in the story, and her words are only explicable from the Arabic; it is also far from im- probable that Yahweh (or Jehovah) was himself first made known to the Jews in Arabia (comp. Judg. v. 4, Hab. iii. 3); putting all which together, we obtain a strong case for the hypothesis of the Arabian origin of Jewish cir- cumcision.

The third narrative is Josh. v, 2~9, where Joshua is said to have circumcised the children of Israel a second time with " kuives of stone," and to have thus "rolled away the reproach of Egypt from off them." It is not unnatural that this should have been used by some to confirm the view of an Egyptian origin of circumcision, among others by Dr Kbers, who refers to the

additional words in the Septuagint, Josh, xxiv. 31, “ There they buried with him. ... . the stone knives with which he had circumcised the children of Israel in Gilgal.” But, first, with regard to this singular statement of the Alexandrine version, it must henceforth be abandoned by all scholars. It is simply an unscientific attempt to account for the existence near Joshua’s supposed tomb of-flint instruments, such as those discovered by M. Guérin on this very site. It need hardly be added that the flint instruments discovered by the French savant werereally pre-historic ; they consist not only of knives, but of Saws, which would hardly have been available for the purpose ascribed to Joshua (see Burton and Drake’s Unexplored Syria, ii. 295-300). And, secondly, Bishop Colenso has shown some reason for the suspicion that verses 2 to 8 (not verse 9) are later additions to the narrative, in which case the ‘“‘ reproach of Egypt” means, not the state of uncircumci- sion, but the contempt of the Egyptians so forcibly expressed in Exod. xxxii, 12, Num. xiv. 13-16. As for the “knives of stone” (comp. Josh. xxiv. 31, Sept.), on which Ebers

has laid some stress, such implements are not distinctively Egyptian, if they were even employed at all by the Egyp- tians for the purpose of circumcision. It is true that Herodotus (ii. 104, comp. Diod. Sic. i, 28) asserts the Egyptian origin of circumcision to have been admitted in Palestine, but he is probably only right so far as the Phoenicians or Canaanites are concerned.

II. We may now proceed to consider circumcision from an ethnographical point of view. It was not a specially Semitic rite, being, only known to the southern and Western Semites, who probably derived it directly or indirectly from the Egyptians, if not from some entirely non-Semitic source. ‘Though not referred to in the Koran, it was a primitive Arabian custom to circumcise youths at their entrance on puberty (¢.e., between their tenth and fifteenth year), as appears not only from Gen. xvii, 25, Jos, Antig., i. 12, 2, but from the express statement of Ibn-al-Athir (quoted by Pococke, Specimen Hist. Arabum, p. 319), which is confirmed by a remarkable passage in the life of the old Arabian poet Dht-lisba (Zeitschr. f. d. Kunde des Morgenlandes, iii. 230). From Arabia it was carried by the preachers of

Islam to Persia, India, and Turkey ; from Arabia, too, as we have seen, it probably came in remote times to the Israelites, The circumcision of the Phcenicians or Canaanites has been disputed, but is attested by Herodotus (ii. 104), and is confirmed by the story in Gen. xxxiv., as also by the fact that the term of contempt, “the uncircumcised,” is reserved in the Old Testament for the Philistines. The rite seems, however, to have fallen into disuse in later times in Phoenicia as well as in Egypt (Dr Ebers refers to the uncircumcised figures on the stele of Pianchi, comp. also Herod. i.c., Jos. Antig., viii. 10, 3, Contr, Ap. i. 22, and perhaps Ezek. xxxil 24, 30), which may partly account for its being afterwards regarded as distinctive of the Jews. The Egyptians, too, were circumcised, and that prior to the immigration of the Hebrews (Wilkinson), as appears from the representations on the very earliest monuments. The most striking of these is the scene on a bas-relief discovered in the temple of Chunsu at Karnak, a drawing of which is given by M. Chabas and Dr Ebers. The subjects of the operation are apparently the two children of Rameses IL., the founder of the temple. Their age, says Dr Ebers, must be between six and ten, which agrees with the present custom in Egypt, where, as Mr Lane tells us, circumcision is generally performed in the fifth or sixth year, though often postponed by peasants to the twelfth, thirteenth, or even fourteenth year (Modern Egyptians, i.71). It has often been asserted that only the priests underwent the operation, but there is no earlier evidence for this than that of Origen (ed. Lommatzsch, iv. 138), in whose time it is quite possible that the Egyptians, like the later Jews, sought to evade a peculiarity which exposed them to ridicule and contempt.

But the rite of circumcision is known among nations which cannot be suspected of communication with Egypt. Similar causes produce similar effects all the world over. It was in use in some form among the ancient civilized peoples of Central America, though this is better attested of the Nahua branch (including the Aztecs) than of the Maya (Bancroft, Vatiwe Races, vol. iii.). It is still kept up among the Teamas and Manaos on the Amazon ; also among three distinct races in the South Seas, among: most of the tribes of Australia, among the Papuans, the New Caledonians, and the inhabitants of the New Hebrides. It is widely spread in Africa, especially among the Kaffir tribes. Among the Bechuanas the boys who are circumcised together form a sort of society, for which among other reasons, Waitz

conjectures that the Bechuanas com- municated the rite to the other Kaffirs. Prichard (Physical

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History of Mankind, ii. 287) rightly dismisses the idea that the Kaffirs borrowed the rite from Mahometan nations, though the progress of Islam will help to account for its prevalence in other parts of Africa.

IIL. Very different views were held in antiquity as to the meaning of the rite of circumcision. There was a myth common to Egypt and Pheenicia, though not of very ancient date in its extant Egyptian form, which seems to bring circumcision into connection with the Sun-god. In the Book of the Dead, chap. xvii., we read of “the blood which proceeded from the limb of the god Ra, when he wished to cut himself,” which the late Vicomte de Rougé interpreted, with much plausibility, of circumcision (Levue archéologique, nouv. série, i. 244), And in a fragment of the Philonian Sanchoniathon (fragmenta Historicorum Grecorum, ed. Miiller, iii. 568, 569), we find a similar tale of El cir- cuncising his father Uranos, or, according to another version, himself, and the blood flowing into the springs and rivers. Space forbids us to discuss the bearings of this myth. Herodotus (ii. 37) ascribes the Egyptian custom to the motive of cleanliness (xafapidrytos «ivexa). This is also one of the four causes reported on the authority of tradition by Philo the Jew (Opera, ed. Mangey, ii. 210), the three others being the avoidance of carbuncle, the symbolizing of purity of heart, and the attainment of a numerous offspring. Mere cleanliness, however, seems hardly an adequate motive for the practice. Sanitary reasons seem much more probable, judging from the well-ascertained physical advantages of circumcision to the Jewish race. But even this is not a complete explanation. Why was the practice adopted by some nations and not by others? The most scientific theory is that which refers it to a religious instinct common to all nations, though not always expressing itself in the same way, and this seems even to be at least obscurely indicated by the tradition of the Israelities. The prophet Jeremiah (ix. 25, 26), too, puts it in the same class with cutting off the hair (comp. Herod. iii. 8), which, like other bodily mutilations, has been shown to be of the nature of a representative sacrifice (Tylor’s Primitive Culture, ii. 363, 364). The

principle of substitution was familiar to all ancient nations, and not least to the Israelites. Witness the story of Gen. xxi., the paschal lamb, and the redemption of the first-born by an offering (Exod. xiii, 11-16), and compare the singular phrase ascribed to Saul in 1 Sam. xviii. 25. On this principle circumcision was an economical recognition of the divine ownership of human life, a part of the body being sacrificed to preserve the remainder. But it was more than this; otherwise it would scarcely have asserted its claim to existence among the Jews, when all other mutilations were strictly forbidden as heathenish (Lev. xix. 27, xxi. 5). It can scarcely be doubted that it was a sacrifice' to the awful power upon whom the fruit of the womb depended, and having once fixed itself in the minds of the people, neither priest nor prophet could eradicate it. All that these coulddo was to spiritualizeitinto a symbol of devotion to a high religious ideal (comp. Jer. iv. 4; Deut. x. 16; Jer. ix. 25).

In conclusion, we must briefly refer to an analogous rite, of which women are in many countries the subjects. It is said to consist in mutilation of the clitoris, which is sometimes connected with the degrading practice of infibu- lation. It was prevalent in the time of Strabo (pp. 771, 824) in Arabia and in Egypt, and, as Mr Lane attests, is still native to those regions (Modern Egyptians, i. 73, Arabic Lexicon, s. v. " hafada"). Carsten Niebuhr heard that it was practised on both shores of the Persian Gulf, and at Baghdad (Description de lArabie, p. 70). It ap- pears in some parts of West Africa, ¢.g., Dahomey, but is said to be still more common in the eastern part of that continent.

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See F. C. Baur, Tubinger Zeitschrift, 1832, Heft 1; Ewald, Antiquities of Israel, Eng. Trans., pp. 89-97 ; Biidinger, " Egypt- ische Einwirkungen auf Hebraische Culte," in Berichte of Vienna Academy ; Sir Gardner Wilkinson, Ancient Egypt, vol. v. p. 318 ; Chabas, Revue arechéologique, un. s., vol. iii. pp. 298-800 ; Ebers, Egypten und die Biicher Mosis, vol. i. pp. 278-284; G. Grey, Travels in Australia, vol. ii. p. 848; Waitz, Anthropologie der Naturvilker, vol. ii. pp. 111, 390 ; Peschel, Volkerkunde ; Burton, 'Notes connected with the Dahomans," in Memoirs of the Anthro- pological Society," 1863-64. cr. &."C.)

CIRCUS, in Roman Antiquity, was a building for the exhibition of horse and chariot racing. It consisted of tiers of seats running parallel with the sides of the course, and forming a crescent round one of the ends. The other end was straight and at right angles to the course, so that the plan of the whole had nearly the form of an ellipse cut in half at its vertical axis. Along the transverse axis ran a fence (spina) separating the return course from the starting one. The straight end had no seats, but was occupied by the stalls (carceres) where the chariots and horses were held in readiness. This end constituted also the front of the building with the main entrance. At each end of the course were conical pillars (mete) to mark its limits.

The oldest building of this kind in Rome was the Circus Maximus, in the valley between the Palatine and Aventine hills, where previous to any permanent structure races ap- pear to have been held beside the altar of the god Consus. The first building is assigned to Tarquin the younger, but for a long time little seems to have been done to complete its accommodation, since it is not till 329 B.c. that we hear of stalls being erected for the chariots and horses. It was not in fact till under the empire that the circus became a conspicuous public resort. Czesar enlarged it to some extent, and also made a canal 10 feet broad between the lowest tier of seats and the course as a precaution for the spec- tators' safety when exhibitions of fighting with wild beasts, such as were afterwards confined to the amphitheatre, took place. When these exhibitions were removed, and the canal (ewrtipus) was no longer necessary, Nero filled it up. Augus- tus is said to have placed an obelisk between the mete or goals, and to have built a new pulvinar, or state box; but if this is taken in connection with the fact that the circus had been partially destroyed by fire in 31 B.c., it may be supposed that besides this he had restored it altogether. Only the lower tiers of seats were of stone, the others being of wood, and this, from the liability to fire, may account for the frequent restorations to which it wassubject ; it would also explain the falling of the seats by which a crowd of people were killed in the time of Antoninus Pius. In the reign of Claudius, apparently after a fire, the car- ceres of stone (tufa) were replaced by marble, and the mete of wood by bronze gilt. Under Domitian, again, after a fire, the circus was rebuilt and the carceres increased to 12 instead of 8 as before. The work was finished by Trajan. The number of people it could seat is given at 150,000 and at 250,000, the latter being supposed to be the more cor- rect.

This was the only public spectacle at which men and women were not assigned to separate places. The lower seats were reserved for persons of rank ; the state box, sag- gestus or cubiculum, was midway in the range of seats. The principal object of attraction apart from the racing must have been the spina or low wall which ran down the middle of the course, with its obelisks, images, and ornamental shrines. On it also were seven figures of dolphins and seven oval objects, one of which was taken down at every round made in a race, so that spectators might see readily how the contest proceeded. The chariot race consisted of seven rounds of the course. The chariots started abreast, but in an oblique line, so that the outer chariot might be compensated for the wider circle it had to make at the other end. Such a race was called a missus, and as many as 24 of these would take place in aday. The competitors

wore different colours, originally white and red (a/bata and russata) ; afterwards the colours green (prasina) and blue (veneta) were added, and further, under Domitian, gold and purple, but these last two were not long retained. To pro- videthe horses and large staff of attendants, it was necessary to apply to rich capitalists and owners, of studs, and from this there grew up in time four select companies (/actiones) of circus purveyors which were identified with the four colours, and with which those who organized the races had to contract for the proper supply of horses and men. The drivers, who were mostly slaves, were sometimes held in high repute for their skill. The horses most valued were those of Sicily, Spain, and Cappadocia. Chariots with two horses (ige) or four (quadrige) were most common, but sometimes also they had three (trig) and exceptionally inore than four horses. Occasionally there was combined with the chariots a race of riders (desultores), each rider having two horses and leaping from one to the other during the race. At certain of the races the proceedings were opened by a pompa or procession in which images of the gods and of the imperial family deified were conveyed in cars drawn by horses, mules, or elephants, attended by the colleges of priests, and led by the presiding magistrate seated in a chariot in the dress and with the insignia of a triumphator. The procession passed from the capitol along the forum, and on to the circus, where it was received by the people standing and clapping

their hands. The pre- siding magistrate gave the signal for the races by throwing a white flag (mappa) on to the course. Next in importance to the Circus Maximus in Rome was the C1zcus FLAMINIUs, erected 221 B.c., in the censorship of C. Flaminius, from whom it may have taken its name; or the name may have been derived from Prata Flaminia, where it was situated, and where also were held plebeian meetings. The only games that are positively known to have been celebrated in this circus were the Ludi Taurti and Plebeti. There is no mention of it after the Ist century. Its ruins were identified in the 16th century at 8. Caterina de Funari and the Palazzo Mattei. A third circus in Rome was erected by Caligula in the gardens of Agrippina, and was known as the Crrcus Neronis, from the notoriety which it obtained through the Circensian pleasures of Nero.

Circus races were held in connection with the following public festivals, and generally on the last day of the festival if it extended over more than one day :—(1) The Consualia, August 21, December 15; (2) Hquiwa, February 27, March 14; (3) Ludi Romani, September 4-19; (4) Ludi Ple- ben, November 4-17; (5) Cerealia, April 12-19; (6) Ludi Apollinares, July 13; (7) Ludi Megalenses, April 4-10; (8) Floralia, April 28—May 3. (A. 8. M.)

CIRENCESTER, or CicesTEr, a parliamentary borough and market-town of England, in the county of Gloucester, 16 miles south-east of the town of that name, and 88 miles by road and 95 by the Great Western Railway from London. It returns one member to Parliament, and is a polling-place for East Gloucestershire. Not being incor- porated, it is governed by two high constables and 14 wardsmen, elected annually. Cirencester was created a separate hundred by a charter granted in the reign of Henry IV. The town, which is situated on the River

Churn, and is in connection with a branch of the Thames and Severn Canal, has four principal streets, and contains a free grammar-school, alms-houses, a savings bank, a museum, a public lib- rary, breweries, and a carpet factory. The church is a fine structure of the 15th century, with an embattled

tower 134 feet high, a fine decorated porch, and several lateral chapels. The Royal Agricultural College, which adjoins Oakley Park, the seat .. of Lord Bathurst, is about a mile and a half fromthetown. Itis a handsome edifice, with a frontage of 190 feet, facing North Wiltshire. Its buildings include a chapel, a dining hall, a library, a lecture theatre, laboratories, class-rooms, private studies and dormitories for the students, apartments for resident professors, and servants' offices; also a museum containing a collection of anatomical and pathological preparations, and mineralogical, botanical, and geological specimens. The college farm comprises 500 acres, 450 of which are arable ; and on it are the well-appointed farm-buildings and the veterinary hospital. Besides agriculture, the course of instruction at the college includes chemistry, natural and mechanical philosophy, natural history, mensuration, surveying, and drawing, and other subjects of practical importance to the farmer, proficiency in which is tested by means of sessional examinations. There is some manufac- ture of carpets, woollen cloths, and curriers' knives, but the industries of Cirencester are chiefly agricultural. It has now a chamber for the promotion of agriculture, and the market is accounted one of the best for live-stock in the west of England. In 1871 the population of the borough, which, including the parish of Stratton, has an area of 5985 acres, amounted to 7681; that of the parish was 7079.

Cirencester occupies the site of Corinum, Corinium, or Duro- cornovium, the capital of the Dobuni, and an important military station of the Romans, situated at the junction of the Fosse-way with the Ermin and Icknield streets. In 577 it was taken by Ceawlin, king of Wessex, and in 878 by the Danes; and it was the seat of a council held by Canute about the year 1020. An abbey for Black Canons, relics of which still exist, was founded here by Henry J. in 1117. The town was garrisoned for the Parliament at the commencement of the Civil War, and was taken by Rupert in 1642; but in 1643 it was finally surrendered to Cromwell's forces. Numerous Roman antiquities have from time to time been discovered at Cirencester, and remains of the ancient walls, two miles in cir- cuit, and of a Roman ampitheatre are still to be seen there. (See All the Year Round, No. 494, Oct. 10, 1868.

CIRILLO, Domenico (1734-1799), physician and patriot, was born at Grugno in the kingdom of Naples. Elected while yet a young man to the

botanical chair left vacant by the death of Pedillo, Cirillo went some years afterwards to England, where he was made member of the Royal Society, and to France, where he became the friend of Buffon, Diderot, D'Alembert, and others of like mark. On his return to Naples he was appointed successively to the chairs of practical and theoretical medicine. He wrote voluminously and well on scientific subjects; and he secured an extensive medical practice. The entry into Naples of the French under Championnet, and the proclamation of the Parthenopeian Republic (1799), brought to a conclusion his life of laborious and thoughtful benevolence. Cirillo was chosen a representative of the people ; he then became a member of the Legislative Commission, and was elected its president. On the abandonment by the French of the young republic (June 1799), cardinal-general Ruffo and the army of Ferdinand of Bourbon returned to Naples, and the republicans withdrew, ill-armed and inadequately pro- visioned, to the forts. After a short siege, in which an English squadron under Captain Foote bore a prominent part, they surrendered, on honourable terms. Life and

Arms of Cirencester.

liberty were guaranteed them by the signatures of Ruffo, of But the arrival of Nelson changed the complexion of affairs ; he Secure under the British flag, too, Ferdinand and Caroline of Austria showed them- lv The patriots were arrested ; and Cirillo, who had tended the queen more than once, and

Foote, and of Micherouxa, the Russian minister. refused to ratify the capitulation. selves eager for revenge.

whose skill had been employed on behalf of the English

admiral himself, was thrown into prison with the others. A

court was formed to try the captives, and Cirillo was brought before them. Neither his age, nor his fair life and fame, nor his heroic speech and bearing, availed with them, and he was condemned to death. Nelson attempted to save him, and Ferdinand consented to forego his vengeance if the republican would ask for mercy. He refused, and was hanged. Cirillo,

whose favourite study was botany, and who was recognized as an entomologist by Linnzus, left many books, in Latin and Italian, all of them treating of medical and scientific subjects, and all of little value now save as indications of the writer's fine qualities as a man of science and humanitarian. Exception must, however, be made in favour of the Virtu Morale dell Asino, a pleasant philosophical opuscule remarkable for its double charm of sense and style.

CIRTA, an ancient city of Numidia, in Africa, in the country of the Massyli. It was regarded by the Romans as the strongest position in Numidia, and was made by them the converging point of all their great military roads in that country. By the early emperors it was allowed to fall into decay, but was afterwards restored by Con- stantine, from whom it took its modern name. See Con- STANTINE.

CIS-SUTLEJ STATES. This term has for many years been obsolete, as inapplicable to modern territorial arrangements. It came into use in 1809, when the Sikh chiefs south of the Sutlej (Satlaj) passed under British protection, and was generally applied to the country south of the Sutlej and north of the Delhi territory, bounded on the E. by the Himalayas, and on the W. by Sois4 District. Prior to 1846, the greater part of this territory was inde- pendent, the chiefs being subject merely to control from a political officer stationed at Ambald, and styled the agent of the governor-general for the Cis-Sutle] States. After the first Sikh war the full administration of the territory became vested in the officer already mentioned. In 1849 occurred the annexation of the Punjab, when the Cis-Sutlej States Commissionership, comprising the districts of Ambala, Ferozpur, Ludhiindé, Thanéswar, and Simla, was incorporated with the new province. The name continued to be applied to this division until 1862, when, owing to Ferozpur having been transferred to the Lahore, and a part of Thanéswar to the Delhi Division, it ceased to be appro- priate. Since then, the tract remaining has been known as the Ambdl4 or Umballa Division. Those of old Cis-Sutle] States which still retain their independence are Gatiala, Jhino, Na&bha, Maler Kotl4, and Faridkot.

CISTERCIANS, a religious order of the rule of St Bene- dict, founded in 1098, by St Robert abbot of Molesme. Tt was so named from its original

convent in the forest of Citeaux (Cistercium), about 14 miles north-east of Beaune. This order became so powerful that it governed almost all Europe both in temporal and spiritual concerns, and through the exertions of St Bernard of Clairvaux had increased so rapidly in power, that within a century from its foundation it embraced 800 rich abbeys in different countries of Europe. Theakbeysof La Ferté, Pontigny, Clairvaux, and Morimond were offshoots of that of Citeaux, and produced in their turn a great number of separate communities, all which continued under the superintendence of the abbey of Citeaux. The abbey of Morimond alone possessed 700 benefices ;

two centuries earlier. only in the rude and scanty fare of the brethren (limited during a great part of the year to one meal a day) and in the great amount of silence imposed, but likewise in the

the order.

and its supremacy was acknowledged by the militéry orders of Calatrava, Alcantara, and Montesa in Spain, and by those of Christ and of Avis in Portugal. But the most famous of all the communities of this order was that of Clairvaux, founded in 1115 by St Bernard (see BERNARD). Towards the end of the 12th century, however, the immense wealth of Citeaux began to operate unfavourably on its discipline, and led the way to great corruptions. Jean de la Barriere, abbot of Nétre-Dame des Feuillants, near Toulouse, succeeded in 1577 in effecting a reform, which gave rise to the Fueillants in France, and likewise to the Reformed Bernardines in Italy. But of all the reforms among the Cistercians, the most celebrated was that effected by the abbot of La Trappe in 1664.

Dependent on the abbey of Citeaux there were about 1800 monasteries and an equal’‘number of nunneries, This ancient abbey was the burial-place of all the dukes of Burgundy of the original line, with the exception of the first two, who died before its foundation.

The Cistercians ‘were involved in the general fate of the religious orders during the period of the French Revolution of 1789, and were reduced to a few convents in Spain, Poland, Austria, and the Saxon part of Upper Lusatia.

The habit of the order is a white robe or cassock, with a black scapulary and a woollen girdle. The nuns wear a white tunic and a black scapulary and girdle.

The order began by exercising more austerity than either

the Benedictines of that period (the 11th century) or the

Cluniac monks who had emerged from the Benedictine order This austerity was exhibited, not

dress, the sacred vestments, and the church furniture of The Cluniac monks not only possessed fine churches, but were also in the habit of adorning them with pictures, jewelled crosses, and other elaborate decora- tions, while their vestments and chalices were in keeping with this splendour. Indeed one of their first men, St Hugh, a contemporary of St Bernard, strongly maintained the principle that nothing could be too rich and costly for the divine service. But St Stephen Harding, the English monk, who, though only the second abbot, was the virtual creator of Cistercian rule and discipline, im- pressed on the Cistercian mind a different principle, and trained up St Bernard in it. Their chasubles were to be only of linen, the chalice not of gold but of silver gilt, and even the white robe of the order was less voluminous in its folds than that of the Cluniac brethren. In one respect, however, the sense of beauty seems to have been allowed to operate. Although the material was to be coarse, yet the form of a vestment might be carefully looked to; and this taste for beauty of form led in due time to great advances in the architecture of their buildings. This difference between the Cistercians and the Cluniacs occasioned considerable rivalry and even Litterness of senti- ment,—the Cistercians being in danger of something like Pharisaic pride in contrasting their own severer rule with the comparative luxury of their neighbours the Cluniacs, who apparently afforded some ground for the charge of relaxa- tion of discipline, especially in the 12th century after the death of St Hugh.

In the matter of government, the Cistercian order (as constituted by St Stephen Harding ‘at a general chapter held in 1119) differed both from the Benedictine and from the Cluniac constitutions. According to the rule of St Benedict each monastery was to bean independent monarchy under its own

abbot; although in extraordinary cases neighbouring monasteries of the order might interfere in the election of an abbot. This independence had not been

found to work well, and the Cluniac rule made each daughter monastery to be subject to Cluny, and to receive its prior frora his appointment. Such subordination tended to greater regularity of discipline, and greatly increased the power of the order, especially when abbeys were assailed by laymen or unduly harassed by bishops. The abbot of Cluny became a veritable prince with 314 monasteries sub- ject to him, and with the right of coining money, which was accepted as readily as that of the king of France. But its concentration of power in a single hand involved the risk attendant upon all such despotisms ; and the Abbot Pontius, who had succeeded St Hugh about 1109 seems to have endangered the entire system by an extravagauce which loaded Cluny with debt, and by his ambition in claiming the title of Abbot of Abbots, and in endeavouring to sway the oldest Benedictine house itself, the famous abbey of Monte Casino. St Stephen Harding framed a constitution for the Cistercians which aimed at combining the excellencies without the defects of the two systems. Although in his rule the abbot of Citeaux was to be recog- nized as the Pater Universalis Ordinis, yet a system of reciprocal visitation was to be carried on, and the four earliest houses which derived their origin from Citeaux—La Ferté, Pontigny, Clairvaux, and Morimond—governed the abbeys which had respectively sprung from them. The four abbots of these eldest daughters of Citeaux might even in an extreme case, with the consent of a general chapter, depose the head of the order, the abbot of Citeaux. This constitution, known as the Chart of Charity, exercised much influence upon other orders, and in soma degree upon that of Cluny. But it gave rise to a claim which (though not intended by its author, and denounced by its greatest

alumnus, St Bernard) was successfully urged in after years

y the Cistercian, as well as by other orders, viz., an exemption from episcopal superintendence.

With respect to intellectual culture and influence, the Cistercian order cannot claim a place in the front rank among the monastic bodies. Devoted to worship, to penance, to contemplation, and to culture of the soil, the order did not, like some others, admit the relaxation of scholastic disputations. No doubt it received learned men into its fold. Tt is also true that St Stephen Harding, with some of his brethren, undertook a revision of the Bible, that copies of many valuable works were made by the brethren (though, with less ornamentation than the illuminated MSS. of some other orders), and that St Bernard was solicitous to furnish all the monasteries founded by himself with good libraries. Nevertheless, as an order, the Cistercians have not achieved such triumphs of learning as the Benedictines, the Dominicans, or the Jesuits,

But no order springing out from the Benedictine proved so popular as the Cistercian. During the 11th century its houses were multiplied in every direction, It touched both ends of the social scale. St Bernard and the thirty novices who joined with him were all of noble birth } INMany similar accessions were made from time to time, and in the 12th century we read of fifteen young German princes entering the order. Buta place was also found for the poor and uneducated. Such as could not be choir brethren, might be lay brethren and till the fields ; and the contrast ~~etween a labourer of this sort, partaking of the dignity of a great and powerful community, and the neighbouring husbandman, the serf of some feudal lord, was in the eyes of many all in favour of the monk. Ti may have tended towards that emancipation of the labourers so largely effected by the monastic orders and celebrated in a well~~

hown sonnet by Wordsworth.

The order seems to have especially thriven in England. From Waverley in Surrey, the earliest Cistercian settle.

CIT—CIT

ment in the country, they spread over Britain, especially by the rivers of Yorkshire, and extended into Scotland.

The overthrow of the Cistercian houses at the time of the Reformation is a part of general monastic history. While some of the dissolutions were unjust, and the exe- cution of abbots mere judicial murders, the luxury of the great Yorkshire houses seems quite undeniable, and per- haps their overthrow may, on the whole, be thought to favour the dictum of Mr Carlyle,—that nothing is crushed from without, until it is ripe to perish from within.

For authorities see the articles already referred to. See also Manriquez, Annales Cistercienses, 4 vols. folio, Lyons, 1642, and the various biographies of St Bernard by Alban Butler, Neander, De Ratisbon, Morrison, and others; and The ~~Cis~~ tercian Saints of England, especially St Stephen Harding, edited by John Henry N ewman, London, 1844. Dean Milman cautions his readers against the love of legend displayed in these biographies, but .praises ‘‘their research and exquisite charm of wigle,” Lat. Christianity, bk. viii. chap. 4. See also Cheruel, Dictionnaire Historique, Paris, 1855 ; and for the artistic elements, so far as regards paintings, Mrs Jamieson’s Legends of the Monastic Orders, London, 1850; also Cosmo Innes’s Scotland in the Middle Ages, Edinburgh, 1860; Records of the Monastery of Kinloss, by John Stuart, LL.D., Edinburgh, 1872; and an article ‘Cistercian Abbeys in Yorkshire” in Fraser’s Magazine for September 1876. (J. G. C.)

CITEAUX, or CistEavx, a village in France, in the department of Céte d’Or, about 7 miles cast of the town of Nuits, and 12 from Dijon. It is celetrated for the great abbey founded by Robert de Molesme in 1098, which became the head-quarters of. the Cistercian order (see last article). The buildings are now occupied as a refor- matory for juvenile criminals ; and in the neighbourhood is an extensive agricultural college.

CITH ARON, or as it is now called from its pine forests, ExaTxA, a famous mountain, or rather mountain range, in the south of Beeotia, separating that state from Megaris and Attica. It was greatly celebrated in Grecian mythology, and is frequently mentioned by the great poets of Greece, especially by Sophocles. It was on Citheron that Actzeon was changed into

a stag, that Pentheus was torn to pieces by the Bacchantes whose orgies he had been watching, and that the infant Cidipus was exposed. This mountain, too, was the scene of the mystic rites of Dionysus; and the festival of the Dedala in honour of Juno was celebrated on its summit. The carriage road from Athens to Thebes crosses the range by a picturesque defile which has at one time been guarded on the Attic side by a strong fortress, the ruins of which are known as Ghyphto-kastro or Gipsy Castle.

CITRIC ACID, or OxyrricarBatnytic Act, C,H,O, or C,H,(OH)(CO.OH),, a tetrahydric tribasic acid, first prepared in the solid state by Scheele, in 1784, from the juice of lemons, in which it exists in large quantity. It is present also in oranges, citrons, currants, gooseberries, and many other fruits, and in several bulbs and tubers, It is made ona large scale from lime or lemon juice, chiefly in the months of November and December. The Juice is fermented for some time to free it from mucilage, then boiled and filtered, and neutralized with powdered chalk and a little milk of lime ; the precipitate of calcium citrate so obtained is decomposed with dilute sulphuric acid, and the resulting solution of citric acid is separated by filtration, evaporated to remove calcium sulphate, and concentrated. The concentration is best effected in vacuum pans. The acid is thus procured in colourless rhombic prisms of the composition C,H,0,+H,O. Crystals of a different form are deposited from a strong boiling solution of the acid. About 20 gallons of lemon juice should yield about 10 fb of crystallized citric acid. The acid may also be prepared from the juice of unripe gooseberries, Calcium citrate for exportation in the place of lemon juice must be manu-

factured with care to avoid an excess of chalk or lime, which would precipitate constituents of the juice that cause the fermentation of the citrate and the production of calcium acetate and butyrate.

long, with a rough, furrowed, adherent rind, the inner portion of which is thick, white, and fleshy, the outer, thin, greenish-yellow, and very fragrant. The pulp is sub-acid and edible, and its seeds are bitter. There are

It is soluble in

Citric acid has an agreeable sour taste.

3ths of its weight of cold, and in half its weight of boiling

water, and dissolves in alcohol, but not in ether. At 150° C. it melts, and on the continued application of heat boils, giving off its water of crystallization.

plants. A higher temperature decomposes this body into carbonic anhydride and itaconic acid, C,H,O,, which, again, by the expulsion of a molecule of water, yields citraconic anhydride, C,H,O,. Citric acid digested at a temperature

below 40° C. with concentrated sulphuric acid gives off

carbonic oxide. With fused potash it forms potassium oxalate and acetate. It is a strong acid, and dissolved in water decomposes the carbonates and attacks iron and zinc. Citric acid, in common with other tribasic acids, evolves about three times the amount of heat disengaged by acetic acid when quantities of these two bodies in the proportion of their molecular weights are saturated with soda,—one molecule of the tribasic being equivalent to three of the monobasic acid.

The citrates are a numerous class of salts, the most soluble of which are those with alkaline bases ; the alkaline earthy citrates are insoluble. Citric acid, being tribasic, forms either acid monometallic, acid dimetallic, or neutral trimetallic salts ; thus, mono-, di-, and tri-potassic and sodic citrates are known. In a few salts a fourth atom of hydrogen is replaced by a metal, and citric acid is therefore considered by some chemists to be tetrabasic. Citric acid gives with excess of lime-water a slight precipitate of calcium citrate ; a further precipitate is produced by boiling, but it is redissolved as the liquid cools. Solution of citric acid may be approximately titrated by means of baryta-water and litmus.

The impurities occasionally present in citric acid are salts of potassium and sodium, traces of iron, lead, and copper derived from the vessels used for its evaporation and crystallization, and free sulphuric, tartaric, and even oxalic acid. Tartaric acid, which is sometimes present in large quantities as an adulterant in commercial citric acid, may be detected in the presence of the latter, by the production of a precipitate of acid potassium tartrate when potassium acetate is added to a cold solution of the sample of acid to be

tested. Another mode of separating the two acids is to convert them into calcium salts, which are then treated with a perfectly neutral solution of cupric chloride, soluble cupric citrate and calcium chloride being formed, while cupric tartrate remains undissolved. Citric is furthermore distinguished from tartaric acid by the fact that an ammonia solution of silver tartrate produces a brilliant silver mirror when boiled, whereas citric of silver is reduced only after prolonged ebullition.

Citric acidis used incalico-printing, also in the preparation of effervescing draughts, and occasionally as a refrigerant and antiscorbutic, instead of fresh lemon juice, to which, however, it is therapeutically inferior. In the form of lime juice it has long been known as an antidote for scurvy, and several of the citrates are much employed as medicines.

CITRON, a species of Citrus (C. medica, Risso), belong- ing to the Natural Order Aurantiacee, which furnishes also the orange, lime, and shaddock. The citron-tree is an evergreen growing to a height of about 8 feet; it has long, pendent, and, in the wild varieties, spiny branches, pale-green, oblong, and sub-serrate leaves, and flowers purple without and white within. The fruit is ovate or oblong, protuberant at the tip, and from 5 to 6 inches

At 175° C., it is resolved into water and aconitic acid, CgH,O,, a substance found in Zguisetum fluviatile, monkshood, and other

many varieties of the fruit, some of them of great weight and size. The Madras citron has the form of an oblate sphere ; and in the “fingered citron” of China, the lobes are separated into finger-like divisions.

Gallesio and De Candolle consider citrons and lemons to be distinct species ; but the former authority states that seed produced by lemon-trees growing amongst citron-trees gave varieties which were intermediate between the two species ; and by some botanists citrons, lemons, and oranges are held to be all varieties of the wild Citrus medica. According to Dr G. Birdwood, however, the orange and lemon are both natives of Upper India, the former being derived from the wild Citrus Aurantiumof.Gurhwal, Sikkim, and Khasia, and the lemon, lime, and prokably citron also, from the wild Citrus Limenum of the valleys of Sikkim and Kumaon, of which the Citrus medica was the first oe variety (Atheneum, No. 2544, July 29, 1876, pe Lob):

The citron-tree thrives in the open air in China, Persia, the West Indies, Madeira, Sicily, Corsica, and the warmer parts of Spain and Italy ; and in conservatories it is often to be seen in more northerly regions. It was described by Theophrastus as growing in Media; it appears, however, not to be indigenous to Persia, but to have been introduced into that country and other lands from North India, where it was found growing wild by Dr Royle. It was early known to the ancients, and the fruit was held in great esteem by them; but they seem to have been acquainted with no other member of the Auwrantiacee, the introduction of orangesand lemons into thecountries of the Mediterranean being due to the Arabs, between the 10th and 15th centu- ries, Josephus tells us that “ the law of the Jews required, that at the feast of tabernacles every one should have branches of palm-tree and citron-tree” (Antog., xiii. 13, 5); and the Hebrew word tappuach, rendered “apples” and “apple-tree” in Cant. ii, 3, 5, Prov. xxv. 11, &e., probably signifies the citron-tree and its fruit. Oribasius in the 4th century describes the fruit, accurately distin- guishing the three parts of it. About the 3d century the tree was introduced into Italy; and, as Gallesio informs us, it was much grown at Salerno in the 11th century. In China, citrons are placed in apartments to make them fragrant. The rind of the citron yields two perfumes, oil of cedra and oil of citron, isomeric with oil of turpentine ; and when preserved it is much esteemed as a sweetmeat.

Oribasii Sardiani Collectorum Medicinalium Libri XVII, 1. i. c. 64 (De citrio); Gallesio, Traité du Citrus (1811); Darwin, Ani- mals and Plants under Domestication, vol. i. pp. 384-6 (1868); nee Forest Flora of North-West and Central India, p. 51

(1874).

CITTA DELLA PIEVE, a town of Italy, in the province of Umbria and district of Orvieto, about six miles from the station of Chiusi on the ‘railway between Siena and Rome. It was thebirthplace of Pietro Perugino, and still preserves some of his finest works. Of these several are to be found in the cathedral, and his fresco of the adoration of the Magi adorns the oratory of the Disciplinati. Population, 6500.

CITTA DI CASTELLO, a town of Italy, pleasantly situated on the left bank of the Tiber, in the province of Perugia, 25 miles N. by W. from the town of

that name. It has a cathedral, dedicated to St Floridus and dating from 1503, a large number of interesting churches with valuable paintings, a communal palace of the 15th century, an epis- copal palace remodelled since 1789, and no fewer than four mansions belonging to the Vitelli family, who governed the town in the 15th century, and were among the first to

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patronize the youthful Raphael. The city for a long time numbered several works of this artist among its most pre- cious possessions ; but they have all been removed except two of minor importance. Citta di Castello occupies the site of the ancient 7%fernum Tiberinum, which was chiefly famous for its connection with the younger Pliny, who had a villa in the neighbourhood. The older city was destroyed by Totila, but numerous inscriptions have been discovered which prove its identity. Population, 6090. ;

CITTA VECCHIA, or Crrra N OTABILE, a fortified city of Malta, situated about six miles west of Valetta, on high ground which affords a view of a large part of the island. It is the seat of a bishop, and contains an episcopal seminary and a handsome modern cathedral, which is said by tradi- tion to occupy the site of the house of the governor Publius, who welcomed the apostle Paul. In the rock beneath the city there are some remarkable catacombs; and a grotto, reputed to have given shelter to the apostle, is pointed out below the church of 8. Paolo. About two miles from the town is the residence of the English governor, known as the palace of St Antonio ; and at a like distance in another direction is the ancient palace of the grand-masters of the order of St John, with an extensive public garden called tH Boschetto. Citta Vecchia was called Medina, or the City, by the Arabs, and it probably represents the town of Melita, which is mentioned by all the ancient geo- graphers. It continued to be the capital of the island till the rise of Valetta in the 16th century. Population about

7000.

CITY. This word, derived through the French cité from the Latin civitas, is used in England with consider- able laxity as little more than a synonym for town; while at the same time there is a kind of traditional feeling of dignity

connected with it. It was maintained by Coke and Blackstone that a city is a town incorporate which is or has been the see of a bishop ; and this opinion has been very generally adopted since. It does not correspond, how- ever, with actual English usage; for Westminster, on the one hand, is called a city though it has no corporation ; and Thetford, Sherbourne, and Dorchester are never so designated though they are regularly incorporated and were once episcopal sees. It is true, indeed, that the actual sees in the country all have a formal right to the title, and that Westminster is the only place without a bishop that has the same claim. In the United States, where the

ecclesiastical distinction does not exist, the application of

the term depends on the kind and extent of the municipal privileges possessed by the corporations, and charters are given raising from the rank of town to that of city. This use of the word is much more in keeping with its deriva- tion, which leads the mind back to the idea of the social life and corporate action of a body of freemen ; and it also agrees better with such classical English phrases as “a free city,” an imperial city. Both in France and in England the word is popularly used to distinguish the older and central nucleus of some of the Jarger towns such as London and Paris. The history of the rise of cities and towns has been given in the article Borovcn.

CIUDAD BOLIVAR. See Ancostura.

CIUDAD REAL, the chief town formerly of La Mancha, and now of the province of Ciudad Real, in Spain, 97 miles south from Madrid, on a plain between the Jabalon and Guadiana. It was built and fortified by Alphonso the Wise in 1264, to check the progress of the Moors; and portions of the walls and towers remain. It has several fine churches, and a large hospital, founded by Cardinal Lorenzana. It is one of the least commercial of the larger towns of Spain, deriving most of its trade from agriculture and an annual fair which is of great importance for the sale of asses and mules, Population, 9000.

CIUDAD REAL, the chief town of the state of Chiapas

in Mexico, otherwise known as San Curisroxat (q. 2.)

CIUDAD RODRIGO, a town of Spain, on the Agueda,

in the province of Salamanca, near the frontier of Portugal. It is fortified, and has some good public buildings, including a cathedral (built in 1190), several churches and convents, an arena for bull-fights, and an episcopal seminary. In the principal square are three Roman columns brought from the ancient Malabriga; and remains of a Roman aqueduct are also extant. suburbs, which are surrounded by a fertile and well-culti- vated district. leather, and linen; and the soap is celebrated in Spain as

A bridge connects the city with the There are manufactures of woollen stuffs,

Jabon de Piedra. During the Peninsular war the town was taken by Marshal Masséna in 1810, and in 1812 by the duke of Wellington, who received from the Cortes the title of duke of Ciudad Rodrigo. Population, 5700. CIUDADELA, a city, formerly the capital of Minorca, at the head of a deep and narrow bay on its west coast, 25 miles north-west of Mahon. It is surrounded by walls, and has a fine Gothic church. Population upwards of 5000, CIVET (Viverra), a genus of Carnivorous Mammals form- ing with the genet and ichneumon the family Viverride, and characterized by the possession of a deep pouch situated in the neighbourhood of the genital organs (divided into two sacs each about the size of an almond), into which the substance known as civet is poured from the glandular follicles secreting it. This fatty substance is at first semifluid and of a yellow colour, but afterwards acquires the consistency of pomade and becomes darker. It has a strong musky odour, exceedingly disagreeable to those unaccustomed to it, but “when properly diluted and combined with other scents it produces a very pleasing effect, and possesses a much more floral fragrance than musk, indeed it would be impossible to imitate some flowers without it ” (Rimmel’s Art, of Perfumery). There are three species of civet-producing Viverride. The Civet (Viverra civetta) is a native of North Africa and extends as far south and west as Fernando Po. It is from 2 to 3 feet in length, exclusive of the tail, which is half the length of the body, and stands

from 10 to 12 inches high. It is covered with long hair, that on the middle line of the back being longest and capable of being raised or depressed at will, of a dark-grey colour, with numerous transverse black bands and spots. It is chiefly nocturnal, and is by preference carnivorous, feeding on birds and the smaller quadrupeds, in pursuit of which it climbs trees, but it is said also to eat fruits, roots, and other vegetable matters. In a state of captivity it is never completely tamed, and is only thus kept for the sake of the civet, which is obtained in largest quantity from the male, especially when he is in good condition and is subjected to irritation. It is scraped from the pouch with a small spoon usually twice a week. The Zibeth (Viverra zibetha) is a widely distributed species extending from Arabia to Malabar, and throughout several of the larger islands ‘of the Indian Archipelago. It is smaller than the civet, and wants the dorsal crest. In the wild state it is exceedingly ferocious, doing great damage among poultry, and frequently making off with the young of the swine and sheep. “To the rapacity of the wolf,” says Captain Williamson, “it joins the agility of the cat and the cunning of the fox.” When hunted it makes a determined resistance, and emits a scent so Strong as even to sicken the dogs, who nevertheless are exceedingly fond of the sport, and cannot be got to pursue any other game while the stench of the zibeth is in their nostrils. In confinement, however, it becomes comparatively tame, and civet is obtained from it in considerable quantity. In

preparing this for the market it is usually spread out on the leaves of the pepper plant in order to free it from the

hairs that have become detached from the pouch. The Rasse (Viverra rasse) is the fiercest and most carnivorous of its kind, and remains untamed in confinement. It is a native of Java, where it is found not unfrequently in forests at a moderate elevation above the sea level. It is almost 3 feet long including the tail, and is prettily marked with dark longitudinal stripes, and with spots which have a distinctly linear arrangement. Its perfume, which is extracted in the same way as in the two preceding species, is highly valued and much used by the Javanese, who, according to Dr Horsfield, apply it to their dresses, and by means of various unguents and mixtures of flowers to

their persons. British imports of civet are chiefly from the Indian Archipelago, and when pure it is worth about £2 per ounce. It is frequently adulterated with butter or lard. Fossil remains of extinct civets are found in the Miocene strata of Europe.

CIVIDALE, or more precisely CIVIDALE DEL FRIULI, a town of Italy, in the province of Udine, and about ten miles east of the city of that name, on the right bank of the Natisone, over which there is a bridge 250 feet in length. It has an interesting collegiate church founded in 750, an antiquarian museum, and a military training college. The archives of the ‘““duomo” contain various manuscripts of value, among which may be mentioned a 5th century copy of the translation of the Gospels by St Jerome, and the prayer-book of St Gertrude which dates from the 11th century. Cividale is generally supposed to occupy the site of the ancient Yorum Julii, a town of the Carni, which rose to the rank of a Roman colony, became the capital of Venetia after the destruction of Aquileia in 452, was made the seat of a duchy under the Lombards, and thus gave its name to the province of Friuli, Many ancient remains have been brought to light from time to time, including vases, bas-reliefs, inscriptions, a temple, and another large building with mosaic floors. In 1874 the tomb of the Lombard duke Gisulfo was discovered. Paulus Diaconus was born at Forum Julii in the 8th century; and the actress Ristori is a native of Cividale. Population, 8200.

CIVIL LAW. This phrase, and its Latin equivalent jus civile, have been used in a great variety of meanings. Jus civile was sometimes used to distinguish that portion of the Roman law which was the proper or ancient law of the city or state of Rome from the jus gentvwm, or the law common to all the nations comprising the Roman world, which was incorporated with the former through the agency of the pretorian edicts. This historical distinction remained as a permanent principle of division in the body of the Roman law. One of the first propositions of the Institutes of Justinian is the following :—“ Jus autem civile vel gentium ita dividitur. Omnes populi qui legibus et moribus reguntur partim suo proprio, partim communi omnium hominum jure utuntur; nam quod quisque populus ipsi sibi jus constituit, id ipsius civitatis proprium est, vocaturque jus civile quasi jus proprium ipsius civitatis. Quod vero naturalis ratio inter omnes homines constituit, id apud omnes pereeque custoditur, vocaturque jus gentium quasi quo jure omnes

gentes utuntur.” The jus gentiwm of this passage is elsewhere identified with jus naturale, so that the distinc- tion comes to be one between civil law and natural or divine law. The municipal or private law of a state is sometimes described as civil law in distinction to public or international law. Again the municipal law of a state may be divided into civil law and criminal law. The phrase, however, is applied par excellence to the system of law created by the genius of the Roman people, and handed down by them to the nations of the modern world. The civil law in this sense would be distinguished from the local or national law of modern states. In England recent changes have reduced the number of courts in which the

principles of the civil law are recognized, but we are still accustomed to say that the civil law has a certain limited application, and that the race of civilians or civil lawyers is not quite extinct. The civil law in this sense is further to be distinguished from that adaptation of its principles to ecclesiastical purposes which is known as the canon law. See Roman Law.

CIVITA CASTELLANA, a town of Italy, in the province of Rome, 17 miles E.S.E. of Viterbo, situated on a volcanic plateau surrounded on all sides but one by deep ravines which send down their streamlets to the Tiber. The road from Borghetto crosses the gorge by a magnificent bridge erected in 1712 by Cardinal Imperiali. The town is a bishop’s see, and has a cathedral dating from 1210, with beautiful mosaics and an interesting crypt adorned by an altar-piece of the 14th century. The citadel, which was founded by Alexander VI. and completed by Leo X., is used for the incarceration of state prisoners. In the neigh- bourhood are the remains of the ancient city of Falerium Vetus, well known in connection with the story of Camillus and the schoolmaster ; portions of the ancient walls, gate- ways, and sepulchres are still to be seen at the edge of the ravine. About four miles to the west are the much more extensive ruins of Faleriz Novi, now known as Sta Maria di Falleri. They present some of the most remarkable specimens of ancient military architecture now in existence, consisting of walls nearly perfect, w Jarge number of square towers in good preservation, and several finely-arched gate- ways. In the internal area the most important buildings are a Roman theatre erected on Etruscan

foundations, and a Lombard church of the 12th century (the Abbadia di Sta Maria). The population of Civita Castellana is about 4000.

CIVITA DI PENNE, an episcopal town of Italy, at the head of a district in the province of Abruzzo Ulteriore L., 19 miles west of Pescara. Under the name of Pinna it was the chief city of the Vestini, and is celebrated in the history of the Social war for its obstinate resistance to the Roman army by which it was besieged. It has still some remains of ancient buildings, and numerous inscriptions that attest its importance, and it is noted for the manu- facture of artificial flowers. Population, 9800.

CIVITA VECCHIA, a maritime city and port of the Roman territory, which gives its name toa “ delegation,” or province. It is the best and almost the only port on the coast of the former territories of the church, and is about 24 miles to the west of Rome. The city occupies the site of the ancient Centum Celle, so called from a palace which the Emperor Trajan built there. That place, which after Trajan had by means of an aqueduct brought good water thither from the mountain of Tolfo, acquired considerable importance as the natural port of Rome. Totila besieged

‘it ; Narses recovered it ; but it was utterly destroyed in 812

by the Saracens, who were then ravaging all that coast. The inhabitants fled to the neighbouring mountains, but when Pope Leo IV. had overcome and driven away the Saracens, they returned to the old site, rebuilt the town, and called it Civita Vecchia. The articles exported from Civita Vecchia are timber, sulphur, wool and silk, skins, decorative marbles, and anchovies. The imports consist of wines, forged iron, salt provisions, stock-fish, linen, woollen, and cotton cloths, silks, coffee, sugar, and general colonial produce. The port enjeyed under the Popes commercial freedom and sundry special privileges. But its commerce declined in recent times almost to zero. Some little life is imparted to the place from its being a station for steamers on their way from Genoa and Leghorn to Naples, and from the residence of consuls of all nations. But the city, which apart from its territory has only 8143 inhabitants, is a squalid-looking place. On the land side it is protected by fortifications ouce of considerable import-

ance. The principal of these is the castle erected by the architect Vangallo for Pope Julius IL. after a design attributed to Michelangelo, and by others to Bramante. In the immediate vicinity of this castle are the arsenal and the bagno or establishment for convicts.

CLACKMANNAN, a county of Scotland, on the north bank of the River Forth, situated between 56° 5’ and 56° 14’ N. lat., and 3° 33’ and 3° 56’ W. long., is bounded on the S.W. by the Forth, W. by Stirlingshire, N. and N.W. by Perthshire and a detached portion of Stirling, E. by Fife, and N.E. by a detached portion of Perth. It is the smallest county in the United Kingdom, is irregular in form, and occupies an area of 474 square miles, or 30,477 acres. The surface of the county is varied in its character. An elevated ridge rises on the west, and, running through the middle of the county, spreads itself gradually till it reaches the eastern boundary, skirting the alluvial or carse lands in the valleys of the Forth and of the Devon. Still further to the north, the Ochil Hills (the highest of which is Bencleuch, 2363 feet, above Tillicoultry) form a very picturesque landscape, having their generally verdant sur- face broken by bold projecting rocks and deeply indented ravines. The range forms a great igneous mound, develop- ing itself in amygdaloid felspar and porphyry, and occa- sionally in pentagonal columns of basaltic greenstone. It is used almost entirely for sheep farming.

The only streams worthy of notice which traverse the county are the Devon and the Black or South Devon. The former, remarkable in the upper parts of its course for its romantic scenery, runs through the county near the base of the Ochils, and falls into the Forth at the village of Cambus. The Black Devon flows westward in a direction nearly parallel to the Devon, and falls into the Forth near Clackmannan. It supplies motive power to numbers of mills and coal engines ; and its whole course is over coal strata. The Forth is navigable as far as it forms the boundary of this county,*and ships of 500 tons burden can run up as far as Alloa.

The soils of the arable land of Clackmannanshire are in general productive and well cultivated ; though the greater part of the elevated range which is . interposed between the carse lands on the Forth and the vale of Devon at the base of the Ochils on the north consists of inferior soils, often incumbent on an impervious clay. All the crops commonly raised in

Scotland grow luxuriantly on both sides of this tract, which also contains within itself a considerable proportion of valuable soil. According to the agricultural returns for 1875 the area of land under cultivation in Clackmannan is considerably above the average for Scotland, and the average under corn is 7 per cent. above the average of other counties. In minerals the county is rich. Jron-ore (hematite), copper, silver, lead, cobalt, and arsenic have all been discovered in small quantity in the Ochils, between Airthry and Dollar. Jron-stone is wrought toa considerable extent for the Devon iron-works, near Clackmannan. It is found either in beds, or in oblate balls imbedded in slaty clay, and yields from twenty-five to thirty per cent. of iron. Coal has been wrought for upwards of two hundred years in this county. A considerable proportion of the quantity obtained is shipped at Alloa for foreign ports. It is all bituminous or common coal of a good quality ; no smithy or caking coal has yet been discovered. In 1871 there were 2137 persons engaged in coal mining and its adjuncts. The strata which compose the coal-field are varieties of sand-stone, shale, fire-clay, and argillaceous ironstone. The great coal-field of Scotland, which passes in a diagonal line from the mouths of the Forth and Tay to the Irish Sea, is bounded by the Ochils; no coal has been found to the north of them, except at Brora, in Sutherlandshire,

There is a considerable manufacturing industry in the county. Woollens are made extensively at Tillicoultry ; and at other parts distilling, brewing, coopering, tanning, glass-blowing, and ‘ship-building are carried on. In 187] there were 4952 persons engaged in connection with the woollen manufacture, or more than a fifth of the whole population.

Among the antiquities of Clackmannan may be mentioned the ruins of Castle Campbell, an old seat of the Argyll family, occupying a singularly wild and almost inaccessible situation, above the village of Dollar. It was burned by Montrose in 1644. The tower of Alloa, built prior to the year 1300, the residence of the Erskines, earls of Mar, now belonging to the representative of that noble family, is in good preservation. The tower of Clackmannan was long the seat of a lineal descendant of the Bruce family after the failure of tlhe male line.

According to the parliamentary return for 1873 Clack- mannan county was divided among 1227 proprietors, the average size of the holdings amounting to 243 acres (that of all Scotland being 143), while the average value of the land was £3, 4s, 6d. per acre (that of Scotland being £1). There were in the same year 1137 holdings of less than 1 acre, 52 of 1 and under 10 acres, 20 of 10 and under 100, and 5 above 2000—the largest amounting to 6163 acres, the property of the earl of Kellie.

Clackmannanshire sends a member to Parliament con- junctly with the county of Kinross and certain adjoining parishes. By the Reform Bill, the parishes of Culross and Tulliallan, formerly comprehended in the county of Perth, Alva, formerly belonging to Stirling, and the Perthshire portion of Logie were included in the parliamentary group. The population of the county in 1861 was 21,450, and in 1871, 23,747, consisting of 11,555 males and 12,192 females. The principal towns are—Alloa, population 9000; Tillicoultry, 3700 ; Dollar, 2100 ; and Clackmannan,

1300.

CLAIRAULT, or Cuairnaut, ALExis-CLaupE (1713- 1765), a French mathematician, was born on May 7,1713, at Paris, where his father was a teacher of mathematics. Under his father’s tuition he made so rapid progress in mathematical studies, that in his thirteenth year he read before the French Academy an account of the properties of four curves which he had then discovered. When only sixteen, he finished his treatise on Curves of Double Curvature, which, on its publication two years later, procured his admission into the Academy of Sciences, although even then he was below the legal age. In 1736, together with his friend Maupertuis, he took part in the famous expedition to Lapland, which was undertaken for the purpose of estimating a degree of the meridian, and on his return he published his treatise Sur la figure de la terre. In his work on this subject he promulgated his theorem in regard to the variation of gravity, which has been corrected by Sir G. Airy. He obtained an ingenious approximate solution of the problem of the three bodies; in 1750 he gained the prize of the St Petersburg Academy for his treatise on the Lunar Theory; and in 1759 he calculated the perihelion of Halley’s comet. Clairault died at Paris, May 17, 1765.

CLAMECY, a town’of France at the head of an arron- dissement, in the department of Niévre, at the confluence of the Yonne and Beuvron, 38 miles N.N.E. of Nevers. It has some remains of its ancient castle, and of the massive walls by which it was formerly surrounded, several Gothic churches, and a handsome modern chateau. There are: manufactures of woollen cloths, earthenwares, paper, and leather, and a considerable trade in wood and charcoal, principally with Paris, by means ofthe Yonne. Population, in 1872, 4717.

CLAN

CLAN. The Goidelic word cland or clann (in Welsh, plant) signifies seed, and in a general sense children, descendants. In the latter sense it was used as one of many terms to designate groups of kindred in the tribal system of government which existed in Ireland and the Highlands of Scotland. Through the latter country the ‘word passed into the English language, first in the special sense of the Highland clan, afterwards as a general name for a tribe or group of kinsmen. The results of inquiries into the tenure of land in different countries and the ancient laws and institutions of Aryan nations, and the publication of various Celtic documents, particularly the ancient laws of Ireland and Wales, have thrown much light on the constitution of the clan system, and given to it a wider and more important interest than it had hitherto possessed.

Before the use of surnames and elaborate written gene- ‘alogies, a tribe in its definite sense was called a twath, a word of wide affinities, from a root tu, to grow, to mul- tiply, existing in all European languages. When the tribal system began to be broken up by conquest/and by the rise of towns and of territorial government, the use of acommon surname furnished a new bond for keeping up a connec- tion between kindred. The head of a tribe or smaller group of kindred selected some ancestor and called himself his Ua, grandson, or as it has been anglicized O’, e.g., Ua Conchobair (O’ Conor), Ua Suilleabhain (O’ Sullivan). All his kindred adopted the same name, the chief using no fore-name however. The usual mode of distinguishing a person before the introduction of surnames was to name his father and grandfather, e.g., Owen, son of Donal, son of Dermot, This naturally led some to form their surnames with Mac, son, instead of Ua, grandson, e.g.,

Mac Car- thaigh, son of Carthach (Mac Carthy), Mac Ruaidhri, son of Rory (Macrory). Both methods have been followed in Treland, but in Scotland Mac came to be exclusively used. The adoption of such genealogical surnames fostered the notion that all who bore the same surname were kinsmen, and hence the genealogical term clann, which properly means the descendants of some progenitor, gradually became synonymous with twath, tribe. Like all purely genealogical terms, clann may be used in the limited sense of a particular tribe governed by a chief, or in that of many tribes claiming descent from a common ancestor. In the latter sense it was synonymous with s7/, siol, seed, ¢.9., Siol Alpine, a great clan which included the smaller clans of the Macgregors, Grants, Mackinnons, Macnabs, Macphies, -Macquarries, and Macaulays.

_ The clan system in the most archaic form of which we have any definite information can be best studied in the Irish twath, or tribe, This consisted of two classes :—(1) tribesmen, and (2) a miscellaneous class of slaves, criminals, strangers, and their descendants. The first class included tribesmen by blood in the male line, including all illegiti- mate children acknowledged by their fathers, and tribesmen by adoption or sons of tribeswomen by strangers, foster-sons, men who had done some signal service to the tribe, and lastly the descendants of the second class after a certain number of generations. Each twath had a chief called a rig, king, a word cognate with the Gaulish rig-s or riz, the Latin reg-s or rex, and the Old Norse rik-ir. The tribes- men formed a number of communities, each of which, like the tribe itself, consisted of a head, ceann fine, his kinsmen, slaves, and other retainers. This was the jine, or sept. Each of these occupied a certain part of the tribe-land, the arakle part being cultivated under a system of co-tillage, the pasture land co-grazed according to certain customs, and the wood, bog, and mountains forming the marchland of the sept being the unrestricted common land of the sept. The sept was in fact a village community like the

Russian mir, or rather like the German gemeinde and Swiss almend, which Sir H. 8. Maine, M. de Laveleye, and others have shown to have preceded

in every European country the existing order of things as respects ownership of land.

What the sept was to the tribe, the homestead was to the sept. The head of a homestead was an aire, a repre- sentative freeman capable of acting as a witness, com- purgator, and bail. These were very important functions, especially when it is borne in mind that the tribal home- stead was the home of many of the kinsfolk of the head of the family as well as of his own children. The descent of property being according to a gavel-kind custom, it con- stantly happened that when an azre died the share of his property which each member of his immediate family was entitled to receive was not sufficient to qualify him to be an aire. In this case the family did not divide the inheritance, but remained together as “a joint and undivided family,” one of the members being elected chief of the family or household, and in this capacity enjoyed the rights and privileges of an aire. Sir H. S. Maine has directed attention to this kind of family as an important feature of the early institutions of all Aryan nations. Beside the “joint and undivided family” there was another kind of family which we might call “the joint family.” This was a partnership composed of three or four members of a sept whose individual wealth was not sufficient to qualify each of them to be an aire, but whose joint wealth qualified one of the co-partners as head of the joint family to be one.

So long as there was abundance of land each family grazed its cattle upon the tribe-land without restriction ; unequal increase of wealth and growth of population naturally led to its limitation, each head of a homestead being entitled to graze an amount of stock in proportion to his wealth, the size of his homestead, and his acquired position. The arable land was no doubt applotted annually at first; gradually, however, some of the richer families of the tribe succeeded in evading this exchange of allotments and converting part of the common land into an estate in sevralty. Septs were at first colonies of the tribe which settled on the march-land; afterwards the conversion of part of the common land into an. estate in sevralty enabled the family that acquired it to be- come the parent of a new sept. The same process might, however, take place within a sept without dividing it; in other words, several members of the sept might hold part of the land of the sept as separate estate. The possession of land in sevralty introduced an

important distinction into the tribal system—it created an aristocracy. An ave whose family held the same land for three generations was called a flaith, or lord, of which rank there were several grades according to their wealth in land and chattels. The acres whose wealth consisted in cattle only were called 64-azres, or cow-aires, of whom there were also several grades, depending on their wealth in stock. When a 6é-azre had twice the wealth of the lowest class of flaith he might enclose part of the land adjoining his house as a lawn ; this was the first step towards his becoming a flaith. The relations which subsisted between the flacths and the 6é6- aires formed the most curious part of the Celtic tribal system, and throw a flood of light on the origin of the feudal system. Every tribesman without exception owed ceilsinne to the rig, or chief, that is, he was bound to become his ceile, or vassal. This consisted in paying the vig a tribute in kind, for which the cetle was entitled to receive a proportionate amount of stock without having to give any bond for their return, giving him service, e.g., in building his dun, or stronghold, reaping his harvest, keeping his roads clean and in repair, killing wolves, and especially service in the field, and doing him homage three times

while seated every time he made his return of tribute. Paying the “calpe” to the Highland chiefs represented this kind of vassalage, a colpdach or heifer being in many cases the amount of food-rent paid by a free or saer ceile. A tribesman might, however, if he pleased, pay a higher rent on receiving more stock together with certain other chattels for which no rent was chargeable. In this case he entered into a contract, and was therefore a bond or daer cetle. No one need have accepted stock on these terms, nor could he do so without the consent of his sept, and he might free himself at any time from his obligation by returning what he had received, and the rent due thereon, What every one was bound to do to his 7%g, or chief, he might do voluntarily to the flaith of his sept, to any flaith of the tribe, or even to one of another tribe. He might also become a bond cez/e. In either case he might renounce his ceileship by returning a greater or lesser amount of stock than what he had received according to the circum- stances under which he terminated his vassalage. In cases of disputed succession to the chiefship of a tribe the rival claimants were always anxious to get as many as possible to

become their vassals. Hence the anxiety of minor chieftains, in later times in the Highlands of Scotland, to induce the clansmen to pay the “calpe” where there happened to be a doubt as to who was entitled to be chief. The effect of the custom of gavel-kind was to equalize the wealth of each and leave no one wealthy enough to be chief. The “joint and undivided family,” and the forma- tion of “ joint families,” or gilds, was one way of obviating this result; another way was the custom of tanistry. The headship of the tribe was practically confined to the mem- bers of one family; this was also the case with the head- ship of a sept. Sometimes a son succeeded his father, but the rule was that the eldest and most capable member of the gedlfine, that is the relatives of the actual chief to the fifth degree,! was selected during his lifetime to be his suc- cessor, —generally the eldest surviving brother or son of the preceding chief. The man selected as successor to a chief of a tribe, or chieftain of a sept, was called the tanist, and should be “ the most experienced, the most noble, the most wealthy, the wisest, the most learned, the most truly popular, the most powerful to oppose, the most steadfast to sue for profits and [be sued] for losses.” In addition to these qualities he should be free from personal blemishes and deformities, and of fit age to lead his tribe or sept, as the case may be, to battle? So far as selecting the man of the geilyine who was supposed to possess all those qualities, the office of chief of a tribe or chieftain of a sept was elective, but as the geiljine was represented by four persons together with the chief or chieftain, the election was prac- tically confined to one of the four. In order to support the dignity of the chief or chieftain a certain portion of the tribe or sept land was attached as an apanage to the office; this land, with the duus, or fortified residences upon it, went to the successor, but a chief’s own property might be gavelled. This custom of tanistry applied at first probably to the selection of the successors of a rig, but was gradually so extended that even a b6-aire had a tanist. A sept might have only one flaith, or lord, connected with it, or might have several. It sometimes happened, however, that a sept might be so broken and reduced as not to have even one man qualified to rank asa flaith. The rank of a jlaith depended upon the number of his ceiles, 1 It is right to mention that the explanation here given of geiljfine is different from that given in the introduction to the third volume of the Ancient Laws of Ireland, which has been followed by Sir H. S. Maine in his account of it in his Harly History of

Institutions, and which the present writer believes to be erroneous. 2 It should also be mentioned that illegitimacy was not a bar. The

issue of “handfast”’ marriages in Scotland were eligible to be chiefs, and even sometimes claimed under feudal law.

CLAN

that is, upon his wealth. The faith of a sept, and the highest when there was more than one, was ceann fine, or head of the sept, or as he was usually called in Scotland, the chieftain. He was also called the flaith geiljine, or head of the getline, that is, the kinsmen to the fifth degree from among whom should be chosen the tanist, and who accord- ing to the custom of gavel-kind were the immediate heirs who received the personal property and were answerable for the liabilities of the sept. The flacths of the different septs were the vassals of the rig, or chief of the tribe, and performed certain functions which were no doubt at first individual, but in time became the hereditary right of the sept. One of those was the office of maer, or steward of the chief’s rents, &c.;> and another that of aire tuzsi, lead- ing aire, or taoisech, a word cognate with the Latin duc-s or dux, and Anglo-Saxon here-tog, leader of the “here,” or army. ‘The taozsech was leader of the tribe in battle; in later times the term seems to have been extended to several offices of rank. The cadet of a Highland clan was always called the taocsech, which has been translated captain; after the conquest of Wales the same term, tywysaug, was used for a ruling prince. Slavery was very common in Ireland and Scotland ; in the former slaves constituted a common element in the stipends or gifts which the higher kings gave their vassal sub-reguli. Female slaves, who were employed in the houses of chiefs and faiths in grinding meal with the hand-mill or quern, and in other domestic work, must have been very common, for the unit or stand- ard for estimating the wealth of a bé-aire, blood-fines, &c., was called a cwmhal, the value of which was three cows, but which literally meant a female slave. The descendants of those slaves, prisoners of war, forfeited hostages, re- fugees from other tribes, broken tribesmen, &c., gathered round the residence of the rig and flaiths, or squatted upon their march-lands, forming a motley band of retainers which made a considerable element in the population, and one of the chief sources of the wealth of

chiefs and flaiths. The other principal source of their income was the food-rent paid by cedles, and especially by the daer or bond cetles, who were hence called biathachs, from biad, food, A flaith, but not a rig, might, if he liked, go to the house of his cetle and consume his food-rent in the house of the latter.

Under the influence of feudal ideas and the growth of the modern views as to ownership of land, the chiefs and other lords of clans claimed in modern times the right of bestowing the tribe-land as turcrec, instead of stock, and receiving rent not for cattle and other chattels as in former times, but proportionate to the extent of land given to them. The twrcrec-land seems to have been at first given upon the same terms as turcrec-stock, but gradually a system of short leases grew up; sometimes, too, it was given on mertgage. In the Highlands of Scotland cezles who received ¢wrcrec-land were called ‘‘taksmen.” On the death of the chief or lord, his successor either bestowed the land upon the same person or. gave it to some other relative. In this way in each generation new families came into possession of land, and others sank into the mass of mere

% This office is of considerable importance in connection with early Scottish history. In the Irish annals the rf, or chief of a great tribe (mor. tyath), such as of Ross, Moray, Marr, Buchan, &c., is called a mor maer, or great maer. Sometimes the same person is called king also in these annals. Thus /indlaec, or Finlay, son of Ruadhri, the father of Shakespeare’s Macbeth, is called king of Moray in the Annals of Ulster, and mor maer in the Annals of Tighernach. The term is never found in Scottish charters, but it occurs in the Book of the Abbey of Deir in Buchan, now in the library of the University of Cam- bridge. The Scotic kings and their successors obviously regarded the chiefs of the great tribes in question merely as their maers, while their tribesmen only knew them as kings. From these ‘‘ mor-maerships,”’ which corresponded with the ancient mor tuatha, came most, if not all, the ancient Scottish earldoms.

CLA—

tribesmen. Sometimes a “ taksman ” succeeded in acquir- ing his land in perpetuity, by gift, marriage, or purchase, or even by the “strong hand.” ‘The universal prevalence of exchangeable allotments, or the rundale

system, shows that down to even comparatively modern times some of the land was still recognized as the property of the tribe, and was cultivated in village communities.

The chief governed the clan by the aid of a council called the sabaid (sab, a prop), but the chief exercised much power, especially over the miscellanous body of non-tribes- men who lived on his own estate. This power seems to have extended to life and death. Several of the flazths, perhaps, all heads of septs, also possessed somewhat exten- sive powers of the same kind.

The Celtic dress, at least in the Middle Ages, consisted of akind of shirt reaching to a little below the knees called a lenn, a jacket called an ¢nar, and a garment called a brat, consisting of a single piece‘of cloth, This was apparently the garb of the aires, who appear to have been further dis- tinguished by the number of colours in their dress, for we are told that while a slave had clothes of one colour, a rig tuatha, or chief of a tribe, had five, and an ollamh and a superior king, six. ‘The breeches was also known, and cloaks with a cowl or hood, which buttoned up tight in front. The denn is the modern kilt, and the brat the plaid, so that the dress of the Irish and Welsh in former times was the same as that of the Scottish Highlander.

By the abolition of the heritable jurisdiction of the Highland chiefs, and the general-disarmament of the clans by the Acts passed in 1747 after the rebellion of 1745, the clan system was practically broken up, though its influence still lingers in the more remote districts. An Act was also passed in 1747 forbidding the use of the Highland garb ; but the injustice and impolicy of such a law being generally felt it was afterwards repealed. (Ww. K. 8.)

CLAPAREDE, Jean Lovis René ANTONE Epovarp, (1832-1870), an eminent naturalist, was born at Geneva, April 24, 1832, and belonged to an ancient family of that city. His father was pastor of the parish of Chancy, and Edouard’s early years were spent in that village. After a distinguished course at the classical college, the gymnasium, and the academy of his native city, he repaired in 1852 to the university of Berlin, and there devoted himself with self-sacrificing ardour to the study of medicine and the natu- ral sciences and the acquisition of the Germanic languages of Northern Europe. The direction of his investigations was greatly affected by

J. Miiller and Ehrenberg, the former of whom was at that period engaged in his important researches about the Echinoderms. In 1855 he accompanied Miiller to Norway, and there spent two months on a desolate reef that he might obtain satisfactory observations. The latter part of his stay at Berlin he devoted, along with Lachmann, to the study of the Infusoria and Rhizopods ; and their united labours resulted in an important publica- tion which at once gave them rank among the chief zoologists of the day. In 1857 he obtained the degree of doctor, and soon after he was chosen professor of com- parative anatomy in the academy of Geneva. Here he continued to teach with ever growing acceptance; and he even became a favourite of the general public through his popular lectures, In 1859 he visited England, and, in

1 The following oath was administered at Fort William and other places in 1747 and 1748 :—

“T, [name], do swear, as I shall answer to God at the great day of judgment, that I have not, nor shall have, in my possession any gun, sword, pistol, or any arm whatsoever, and that I never use tartan, plaid, or any part of the Highland garb ; and if I do so, may I be cursed in my undertakings, family, and property,—may I never see my wife and

children, father, mother, or relations, —may I be killed in battle as a coward, and lie without Christian burial in a strange land, far from the

graves of my forefathers and kindred ; may allthis come across me if

I break my oath.”

company with Dr Carpenter, took a voyage to the Hebrides ; and in 1863 he spent some months in the Bay of Biscay. On the appearance of Darwin’s work on the Origin of Species, he adopted his theories and published a valuable series of articles on the subject in the Revue Germanique, 1861. His enormous activity might’ seem to indicate

vigorous health ; but he was a martyr from the year 1854 to a painful affection of the heart, which caused excessive palpitations, frequertly accom anied by spitting of blood. During 1865 and 1866 he was quite incapable of work, and he determined to pass the winter of 1866-7 in Naples. The change of climate produced some amelioration, and the patient's indomitable energy was attested by two elaborate volumes on the Annelidz of the Gulf. Naples with advantage in 1868; but in 1870, instead of recovering as before, he grew worse, dropsy set in, and on the 3lst of May he died at Siena on his way home, Modest and retiring, he was at the same time generous, hospitable, and helpful; and in spité of his physical weakness, he displayed remarkable spirit in the political disturbances of Geneva. sometimes made him fail of courtesy in debate, and he could be pitilessly;severe in his criticism where he thought severity was deserved; but he was at the same time strikingly free from uncharitableness, jealousy, or resentment. library was bequeathed to his native city. See the notice of his life by Henri de Saussure in the 42d vol. of the Archives des Sciences physiques et naturelles (Bibliothtque Univ. et Revue Suisse), Geneve, 1871.

He again visited

A certain bluntness of expression

His

Besides the works already mentioned his chief contributions

to science are:—" Ueber Actinophrys Eichhornii," in Miiller's Arch, fiir Anatomie, 1855; "Sur la théorie de la formation de 'Muf," in 'Arch. des Sei,, 1855; " Anatomie und Entwickelungs geschichte der

Neritina fluviatilis," in Miiller's Areh., 1857 ; various papers in regard to binocular vision in the Arch. des Sci., 1858 and 1859 ; 'Zur Morphologie der Zusammengesetzten Augen bei den Arthropo- den" in Zeitseh. fiir Wissenseh. Zool., 1860 ; Recherches anat. swr les Oligochétes, Gen., 1862; Rech. sur Vévolution des Araignécs, 1862, which obtained the gold medal of the Utrecht Society of Arts and Sciences ; Beobacht. tiber Anat. und Entwiekelungsgesch. Wir- belloser Thiere an der Kiiste der Normandie, 1868; " De la myopie," in Arch. des Sei., 1868; "Studien an Akariden," in

Zettsch. fiir Wiss. Zool., 1868; and ‘‘Histologische Untersuch. iiber den Regenwurm (Lumbricus terrestris)” in do., 1868. He left in MSS, Reeherehes sur la structure des Annclides sédentatires.

CLAPPERTON, Huecu (1788-1827), an African traveller, was born in 1788 at Annan, Dumfriesshire, where his father was a surgeon. In his youth he gained some knowledge of practieal mathematics and navigation ; and while still very young he was apprenticed on board a vessel which traded between Liverpool and North America, After having made several voyages across the Atlantic, he was impressed for the navy, in which, having a little influence and much intelligence and physical vigour, he goon rose to the rank of midshipman. He acted as drill sergeant in the “Asia,” the flag-ship of Vice-Admiral Cochrane, and was promoted to the rank of lieutenant, and to the command of a schooner on the Canadian lakes. In the year 1817, when the flotilla on the lakes was dismantled, he returned to his native country on half-pay.

In 1820 Clapperton removed to Edinburgh, where he contracted an intimacy with Dr Oudney, who first awoke his interest in the cause in which both were destined to perish. After the return of Captain Lyon, the British Government having determined on equipping a second expedition for the purpose of exploring Northern Africa, Dr Oudney was appointed to proceed to Bornu as consul, and Clapperton and Colonel Denham were added to the party. From Tripoli, early in 1822, they set out south- ward to Murzuk, and from this point Clapperton and Oudney travelled westward into the country of the Tuaricks, as far as Ghraat, 11° E. long. On the 17th February 1823 they reached Kouka the capital of Bornu, where they

were well received by the sultan ; and after remaining here till the 14th December they again set out for the purpose ot exploring the course of the Niger. They arrived in safety at Murmur, where Oudney breathed his last in the arms of his companion. Clapperton, however, penetrated alone as far as Sackatu, 13° N. Jat. and 63° E. long., where he was obliged to:stop, though the Niger was only five days’ journey to the west. Worn out with travel he

returned to Kouka, where he again met Denham. The two travellers then set out for Tripoli, and thence proceeded to England, where they arrived on June 1, 1825. An account of the travels of Denham, Clapperton, and Oudney was published under the title of Zhe Narrative of Travels and Discoveries in Northern and Central Africa in the years

1822-24.

Immediately after his return Clapperton was raised to the rank of commander, and sent out with another expedi- tion to Africa. He set sail in August 1825, in company with Captain Pearce, Mr Dickson, Dr Morrison, and Richard Jiander, who acted as his servant. On this occasion he landed at Badagry in the Bight of Benin, and immediately commenced his journey into the interior, along with Lander, Captain Pearce, and Dr Morrison. The last two soon fell victims to the hardships of the journey ; but in January 1826 Clapperton reached Katunga, the capital of Yariba, and soon afterwards crossed the Niger at Broussa, the spot where Mungo Park met his untimely fate. In July he arrived at Kano, a city which he had previously visited. Here he left his servant with the baggage, and proceeded alone to Sackatu, intending to proceed to Timbuctu. The sultan, however, detained him, and being seized with dysentery he died at Sackatu on the 13th April 1827. His Journal was published by Lander, who also wrote a work entitled Records of Captain Clapperton's last Lixpedition to Africa, which appeared in 1830, in 2 vols. 12mo, *

CLARE, a maritime county in the south-west of Ireland, in the province of Munster, bounded N.W. by the Atlantic, S. by the estuary of the Shannon, S.E. and N.E. by Limerick, Tipperary, Lough Dearg, and Galway, having an area of 1293 square miles, or 827,994 acres,

Although the surface of the county is hilly, and in some parts even mountainous, it nowhere rises to a great eleva- tion. Much of the western baronies of Moyarta and Tbrickan is composed of bog land. Bogs are frequent also in the mountainous districts elsewhere, except in the lime- stone barony of Burren, the inhabitants of some parts of which supply themselves with turf from the opposite shores of Connemara. Generally speaking, the eastern parts of the county are mountainous, with tracts of

rich pasture land interspersed ; the west abounds with bog ; and the north is rocky and best adapted for grazing sheep. In the southern part, along the banks of the Fergus and Shannon, are the bands of rich low grounds called corcasses, of various breadth, indenting the land in a great variety of shapes. They are composed of deep rich loam, and are distinguished. as the black corcasses, adapted for tillage, and the blue, used more advantageously as meadow land.

The coast is in general rocky, and occasionally bold and precipitous in the extreme, as may be observed at the picturesque cliffs of Moher within a few miles of Ennistymon and Lisdoonvarna, which rise perpendicularly at O'Brien's tower to an elevation of 580 feet. The coast of Clare is indented with several bays, the chief of whichare Ballyvaghan, Liscannor, and Malbay; but from Black Head to Loop Head, that is, along the entire western boundary of the county formed bythe Atlantic, there is no safe harbour except Liscannor Bay. The county possesses only one large river, the Fergus ; but nearly 100 miles of its boundary-line are washed by the River Shannon, which, after almost dividing

Treland from north to south, and dispensing its bounties to the adjoining counties of Roscommon, Leitrim, Longford, Westmeath, Galway, King's County, Kerry, Tipperary, and Limerick, enters the Atlantic Ocean between this county and Kerry. The numerous bays and creeks on both sides of this noble river render its navigation safe in every wind ; but the passage to and from Limerick is often tedious, and the port of Kilrush has from that cause gained in import- ance. The River Fergus is navigable from the Shannon to the town of Clare, which is the terminating point of its natural navigation, and the port of all the central districts of the county. A railway traverses Clare county via Ennis, connecting Limerick with Athenry and Galway.

There are upwards of one hundred lakes and tarns in the county, of which the largest are Loughs O'Grady, Graneg, Tedane, Inchiquin, Inniscronan, and Clonlea ; but they are more remarkable for picturesque beauty than size

or utility, with the exception of the extensive and navigable Lough Derg, formed by the River Shannon between this county and Tipperary.

Although metals and minerals have been found in many places throughout the county, they do not often show themselves in sufficient abundance to induce the appli- cation of capital for their extraction. The principal metals are lead, iron, and manganese. Lead mines were recently worked at Kilbricken in the barony of Bunratty (about six miles from Ennis), and at Annaglough. The Milltown lead mine in the barony of Tulla is probably one of the oldest mines in Ireland, and at one time, if the extent of the ancient excavations may be takenas a guide, there must have been a very rich deposit. The richest lead mine worked in recent times is that of Ballyhickey, about twomiles from Kilbricken. Copper pyrites occurs in several parts of Burren, but in small quantity. Coal exists at Labasheeda on the right bank of the Shannon, but the seams are thin. Limestone occupies all the central and northern parts of the county in a tract bounded on the S. by the Shannon, on the E. by a line running parallel with the Ougarnee River to Scariff Bay, on the N. by the mountain of Talla and the confines of Galway, on the W. by Galway Bay and a line including Kilfenora, Corofin, and Ennis, and meeting the Shannon at the mouth of the Fergus. Within half a mile of the Milltown lead mine are immense natural vaulted passages of limestone, through which the River Ardsullas winds a singular course. The lower limestone of the eastern portion of the county has been found to contain several very large deposits of argentiferous galena. Flags, easily quarried, are procured near Kilrush, and thinner flags near Ennistymon. Slates are quarried in several places, the best being those of Broadford and Killaloe, which are nearly equal to the finest procured in Wales. A species of very fine black marble is obtained near Ennis ; it takes a high polish, and is free from the white spots with which the black Kilkenny marble is marked.

The mineral springs, which are found in many places, are chiefly chalybeate. That of Lisdoonvarna, about eight miles from Ennistymon, has long been celebrated for its medicinal qualities. There are chalybeate springs of less note at Scool, Colneen, Kilkishen, Burren, Kilcoran, Broadford, Lahinch, Kilkee, Kilrush, Killadysart, and Cas. sino, near Miltown Malbay. Springs called by the people “holy ” or “blessed” wells,

generally mineral waters, are common ; but the belief in their power of performing cures in inveterate maladies is nearly extinct.

The Atlantic Ocean and the estuary of the Shannon afford many situations admirably adapted for summer bathing-places. Among the best frequented of these locali- ties are Burren, Miltown Malbay, with one of the best beaches on the western coast, Lahinch, about two miles from Ennistymon, and near the interesting cliffs of Moher,

which has a magnificent beach, on Liscannor Bay, and forms a delightful summer residence, Kilkee, perhaps the most fashionable watering-place on the western coast of Ireland, and Kilrush on the Shannon estuary.

The soil and surface of the county is in general better adapted for grazing than for tillage. Agriculture is in a backward state, there not being a fifth part of its area under cultivation. In 1875 the acreage of the county under crops amounted to 147,662 acres, and in 1875 little advance had been made. The number of acres under the principal crops in these two years stood as follows :—

Turnips

Oats. Wheat. Potatoes. and other Meadow. 2 Green Crops.

1870 18,776 7828 33,107 9,764 73,429 1875 17,854 3296 28,459 10,411 84,927

As regards live stock the same stationary condition of its agricultural industry will be apparent from the following figures :—

Horses Cattle. Sheep. Pigs, and Poultry.

Mules, 1870 100, 839 15,100 wal 6601 284,551

1875 100, 405 13,459 21,413 6989 323, 635

As regards the property in the county, the land in 1874 was divided among 1025 separate owners, of whom 243 possessed less than one acre, and 782 one acre and upwards. Twelve proprietors owned more than 10,000 acres each, the most extensive holdings being in the hands of Lord Leconfield, with 37,292 acres ; the marquis of Conyngham, with 27,613; E. P. Westby, 25,779; Lord Inchiquin, 20,321 ; Colonel Vandeleur, 19,790 ; and the Hon. C. W. White, 18,266. The value of the land was at the same date rated at an average of 8s. 3d. per acre, while that of all Munster was 11s. 2d.

There are no extensive manufactures in the county of Clare, although flannels and friezes are made for home use, and hosiery of various kinds, chiefly coarse and strong, is made around Corofin, Ennistymon, and other places. The Shannon, west of Scattery Island, and the sea along the coasts, are good fishing stations, abounding with cod, haddock, ling, sole, turbot, ray, mackerel, and other fish, but the rugged nature of the coast and the tempestuous sea greatly hinder the opera- tions of the fishermen. Near Pooldoody is the great Burren oyster bed called the Red Bank, where a large establishment is maintained, and from which a constant supply of the excellent Red Bank oysters is furnished to the Dublin and other large markets. Crabs and lobsters are caught on the shores of the Bay of Galway in every creek from Blackhead to Ardfry. The salmon fishery of the Shannon is very considerable, and eels, which abound in every rivulet, form an important article of consumption.

The population of the county shows a remarkable decrease within the 30 years between 1841 and 1871, although, after all, this is exceeded by the neigh- bouring counties of Cork, Limerick, and Tipperary. In 1841 the inhabitants numbered 286,394 ; in 1851, 212,440 ; in 1861, 166,305; and in 1871, 147,864, Of these 144,440 were Roman Catholics, 8027 Episcopalians, 220 Presbyterians, and 177 of other denominations. In 1874 there were 8709 persons who had obtained parochial relief throughout the year, while during the twenty-four years ending 1875 there had emigrated from the county 90,154

ersons. At the date of the last census (1871) 64,566 persons could read and write, and 15,972 could read but could not write; and 4432 were returned as speaking Erse only. There were 12 superior and 253 primary schools in the

county. The principal towns in Clare are Ennis, population (1871) 6503; Kilrush, 4424; and Kilkee, 1600. ‘The county returns three members to the Imperial

Parliament,—two for the county and one for the borough of Ennis.

The county of Clare, which is divided into 11 baronies, contains 80 parishes, and includes the diocese of Kilfenora, the greater part of Killaloe, and a very small portion of the diocese of Limerick. It is within the military district of Cork, with barracks for infantry at Clare Castle, Ennis, Killaloe, and Kilrush, and for artillery in the forts at Scattery Island, Donnaha, Kilcredano, Blackwater, and Kilkerrin. The assizes are held at Ennis, where the county prison, the county infirmary, and the district lunatic asylum are situated. There are eight poor-law unions.

This county, together with some of the neighbouring district, was anciently called Thomond or Tuadmuin, that is, North Munster, and formed part of the monarchy of the celebrated Brian Boroihme, who held his court at Kincora near Killaloe, where his palace was situated on the banks of the Shannon. The site is still distinguished by extensive earthern ramparts. Settlements were effected by the Danes, and in the 13th century by the Anglo-Normans, but without permanently affecting the possession of the district by its native proprietors. In 1543 Murrogh O’Brien, after dispossessing his nephew, and vainly attempting a rebellion against the English rule, proceeded to England, and submitted to Henry VIII, resigning his name and possessions. He soon received them back by an English tenure, together with the title of earl of Thomond, on condition of adopting the English dress, manners, and customs, and maintaining no kerns or gallowglasses. In 1565 this part of Thomond (sometimes called O’Brien’s country) was added to Connaught, and made one of the six new counties into which that province was divided by Sir Henry Sidney under the Act 11 Eliz. c. 9. It was then named Clare, probably from the name of an English adventurer, Thomas de Clare, who obtained a grant from Henry III. of all the lands he should conquer from the Irish, and whose family for some time maintained a precarious position in the district. In 1602 the county was re-annexed to Munster. The O’Briens and other native chieftains had many

fierce contests to preserve their independence against the Anglo-Norman and English adventurers, and generally succeeded in maintaining their position as native kings and chieftains of Thomond. From some cause or other the comparative immunity of Clare in ancient times from foreign rule and settlement, and from absenteeism, has proved of doubtful advantage to its modern condition. ‘The chief ancient families of note in the dis- trict were the O’Briens, now represented by Lord Inchiquin of Dromoland, the Macnamaras, and the O’Loghlens.

The county abounds with remains of antiquities, both military and ecclesiastical. There still exist above a huudred fortified” castles, several of which are inhabited. They are mostly of small extent, a large portion being fortified dwellings. The chief of them is Bunvatty Castle, built in 1277. Raths or Danish forts are to be found in every part. They are generally circular, composed either of large stones without mortar, or of earth thrown up and surrounded by one or more ditches. The list of abbeys and other religious houses formerly flourishing here (some now only known by name, but many of them surviving in ruins) comprehends upwards of twenty. The most remarkable are —Quin, considered one of the finest and most perfect specimens of ancient monastic architecture in Ireland; Corcomroe; Ennis, in which is a very fine window of un- commonly elegant workmanship ; and those on Inniscattery, or Scattery Island, in the Shannon, said to have been founded by St Senanus, On the same island there is a round tower, and also the ruins of what are called the seven churches. It is called Holy Island, and is still one of the most popular burial-places in the county. Four other round

towers are to be found in various stages of preservation— at Drumceliffe, Dysert, Kilnby, and Inniscaltra, The cathedral of the diocese of Killaloe, at the town of that name, is a plain massive building originally erected in 1160; and near it are the ruins of the mausoleum of Brian Boroihme. Cromlechs are found, chiefly in the limestone rocky district of Burren, though there are some in other baronies. That at Ballygannor is formed of a stone 40 feet long and 10 broad. The celebrated tomb of Conan, on Mount Callan, is still extant.

CLARE, Joun (1793-1864), commonly known as “ the Northamptonshire Peasant Poet,” was the son of a farm labourer, and was born at Helpstone, near Peterborough, on 13th July 1793. At the age of seven he was taken from school to tend sheep and geese ; five years after he wrought on a farm, paying with his own meagre savings for the edu- cation he received in the evening. He endeavoured to enter a lawyer’s office but failed, studied algebra, and fell in love, became a pot-boy in.a public-house, and subsequently was apprenticed to a gardener, from which employment he ran away. Among the neighbours his manners and _ habits made an unfavourable impression. He enlisted in the inilitia, ‘tried camp life with gipsies, and wrought as a lime burner in 1817, but the following year he was obliged to accept parish relief. In 1820 appeared his Poems Descrip- tive of Rural Life and Scenery, which were very indulgently received, and the year following his Village Minstrel and other Poems were published. He was greatly patronized ; fame, with many curious visitors, broke the tenor of his life, and dangerous habits were formed. From subscriptions he became possessed of £45 annually, a sum far beyond what he had ever earned, but new wants made his income insuf- ficient, and in 1823 he was nearly penniless. His next volume, the Shepherd’s Calendar, 1827, met with little success, which was not increased by his hawking it himself. As he wrought again on the fields his health improved ; but farm operations being unsuccessful he was “as dull asa fog in November,” and became seriously unwell, Although a noble patron presented him with a new cottage and a piece of ground, Clare was full of anguish to leave the “old home of homes.” The removal to Northborough was his culminating period, and gradually bis mind gave way. His last and best work, the Rural Muse, published in 1835, was noticed by “ Christopher North” alone. Bursts of insanity followed, of which he had for some time shown symptoms ; and in July 1837 he was kept in confinement, and was subsequently lodged in Northampton General Lunatic Asylum, where he died May 20, 1864. The neglect of friends and relatives to visit him, together with the non-success of his later poems, preyed heavily upon his ‘mind. In the asylum he penned his most thrilling poem, beginning—*“ T am ! yet what I am who cares or knows ?” In its exceeding sadness of thought there is sublime feeling, —a strain of divine music in the wail of woe,—and the poet longed to

“Sleep as I in childhood sweetly slept Full of high thoughts, unborn. So let me lie, The grass below, above the vaulted sky.”

Clare was one of our most uneducated poets, and sung from the fulness of his heart; he is one of England’s Sweetest singers of nature, whose thoughts “ gild life’s brambles with a flower,” and whose Songs were gathered from the fields. Many of his sonnets, which display great power of word-painting, are sweet as “ sunshine in summer dream.” His ballads and love-songs are wild flowers strewn at will, which “ art and fashion fling as weeds away,” and his Htermity of Nature, and First Loves Lecollections display deftness of touch, pastoral beauty, and genuine poetic ability. All his love and genius were showered on beautifying the rural scenes and humble incidents of his

surroundings. His poems, drawn with a delicate hand, are those of a keen observer, but they greatly want that vigour which is essential to popularity ; in his own words, “ the tide of fashion is a stream too strong for pastoral brooks that gently flow and sing.”

See the Life of John Clare by Frederick Martin, 1865, and Life and Remains of John Clare, by J. L. Cherry, 1873, the latter of

which, though not so complete, contains some of the poet’s asylum verses and prose fragments.

CLARENDON, Epwarp Hypg, rirst Earw or (1609- 1674), historian and statesman, born at Dinton in Wiltshire, on the 18th February 1609, was the third son of Henry Hyde, a gentleman belonging to an ancient Cheshire family. The profession first chosen for him was the church ; and consequently, after being educated at home by the vicar of the parish up to the age of thirteen, he was sent to Magdalen College, Oxford. But his eldest brother having died young, the death of his second brother in 1625 left him heir to his father’s estate; and the law being now considered a more appropriate profession, he was entered at the Middle Temple by his uncle,

Sir Nicholas Hyde, then treasurer of that society. At the age of twenty he married a daughter of Sir George Ayliffe ; but in six months he was left a widower ; and three years later he took as his second wife a daughter of Sir Thomas Aylesbury, Master of Requests.

While yet a young man Hyde had the happiness, as he boasts in his autobiography, of being admitted into the most brilliant literary society of his time. Among poets he knew Ben Jonson, Waller, and Carew; he was acquainted with Selden, and with nearly every other scholar of eminence in his day; and he had a rare opportunity of acquiring, from the conversation of the subtle and impartial Chillingworth and the outspoken but liberal-minded Hales, a breadth of sympathy which unhappily his natural temper and the rough pressure of the times combined to prevent him from ever displaying. The brilliant, tender- hearted Falkland also was his most intimate friend. And, fortunately for his professional advancement, besides possessing considerable family influence, he enjoyed the favour of Laud, who, as commissioner of the treasury, regularly consulted him in regard to mercantile affairs.

When, therefore, in April 1640, Hyde took his seat in the Short Parliament as representative of Wootton-Basset, he was already known as a lawyer of mark. During its session of barely three weeks, he made himself prominent as a zealous supporter of the popular party ; and his maiden speech consisted of a vigorous attack upon the Earl Marshal’s Court, which had become notorious for the savage manner in which it resented the least affront offered to a man of rank,

In the Long Parliament (in which he sat as member for Saltash) his zeal for reform was at first in no degree diminished. He effected the final overthrow of the Earl Marshal’s Court. He sat as chairman of the committee which collected evidence against the Councils of York and of the Marshes, and of the committee which was appointed to consider the advisability of remodelling the government of the church. He went entirely with the popular party in their condemnation of ship-money ; and it was largely through the earnest speech which Hyde delivered against him that Lord Keeper Finch was driven into exile. When, however, Episcopacy was threatened, and it became apparent that the popular leaders were not to be

satisfied with merely temporary reform, but were resolved on gaining a permanent triumph, Hyde, in perfect accordance with both his religious and his political principles, went over to the royalist party. He uttered an open and determined protest against the Grand Remonstrance, and drew up an answer to it which was adopted and published by the king, and

which procured for him the offer of the post of solicitor- general. This he declined; but he complied with the request that he would watch over his Majesty's interests in the House of Commons, in conjunction with Falkland and Colepepper. The king's deepest policy, however, was not disclosed to him, and there is no reason to doubt that the arrest of the five members surprised him as much as he professes. After the retreat of Charles from London, Hyde remained for some weeks in his seat in the Commons, maintaining constant but secret communication with the court; but in May, having been summoned by the king, and being besides alarmed for his own safety, he fled to York. In March 1643 he was made chancellor of the ex- chequer. He was also chosen one of the royal commis- sioners at Uxbridge, and was employed in many other matters of importance; and the most persuasive and dignified of the state papers on the royalist side are from his pen.

In 1645, after the final ruin of the king's cause at Naseby, Hyde was appointed, with Lord Capel, Lord Hopton, and Sir John Colepepper, to watch over the safety of the prince of Wales. In the spring of the next year they were com- pelled to take refuge in Scilly, whence, after six weeks' stay, they passed to Jersey. Soon the prince was called by his mother to Paris, against the will of the council, none of whom accompanied him except Colepepper. Hyde resided at Jersey for nearly two years, solacing himself by studying the Psalms and recording the meditations which they suggested, and also by composing the first four books of his greatest work, the History of the Rebellion. In April 1648 he drew up an answer to the ordinance which had been issued by the parliament declaring the king guilty of the civil war, and forbidding all future addresses to him. At length, in May, his attendance was required by the prince, who about this time assumed the command of the seventeen ships which had gone over to his

side; but various accidents, of which the most serious was his capture by privateers, prevented him from meeting Charles till August, when he found him at Dunkirk.

In the agreement with the Covenanters and in the Scot- tish expedition of 1649 Hyde had no share, as he was then absent with Lord Cottington on a fruitless embassy to Spain. The two years which he passed there were not unpleasantly spent ; for he was free from all serious cares, and had little to do but study Spanish etiquette and write his Animad- versions on the Supremacy of the Pope. In 1651, the slights offered by the Spanish ministers having been crowned .by a request that he would leave the country, he rejoined Charles at Paris. During the nine weary years whicli liad to elapse before the Restoration he was not the least un- fortunate of the exiles. It was no easy matter to fulfil the duty which his office imposed upon him of supplying the wants of his careless master ; and his family and himself were often scarcely able to procure the necessaries of life. Besides, he was far from popular. His attachment to the English church, admitting of compromise with no other sect, brought upon him the aversion alike of the Pres- byterians and of the queen and the Papists. Charles, however, was wise enough to appreciate his disinterested fidelity. He was recognized as chief adviser of the king, and all state papers were drawn up by him; he conducted the correspondence with the English Royalists; and, in 1658, the dignity of lord chancellor was conferred upon hin.

On the Restoration, Hyde retained his posts of lord chancellor and chancellor of the exchequer, and at once assumed the direction of the Government. What the Episcopalian Royalists now required was not so much a leader to stimulate, as a guide to control. Their fervour and their strength were more than sufficient to replace the king firmly on the throne, and to raise

the church to a loftier position than it had ever before attained. ‘The parliament hastened to Yestore to the Crown the command of the militia, to repeal the Triennial Act, and to vote a revenue of/£1,200,000, The Corpor- ation Act, the Act of Uniformity, and the Five Mile Act avenged the church on her enemies, and forced all but the most determined of the clergy into

her ranks. Thousands showed as much enthusiasm for monarchy as Hyde himself, and he was no longer the most Episcopalian of Episco- palians. To some extent, if not to as great an extent as was to be desired, he has the credit of having restrained his party from too insolent a triumph. Desirous as he was of the re-establishment of the full royal prerogative, he had no wish to see it, transgress the limits which he believed to be assigned to it by the constitution, for which he cherished the true lawyer's reverence. Strongly as he held that all were guilty who had in any way countenanced the govern- ment of Cromwell, he was statesman enough to see that it was necessary to carry out the Declaration of Breda by pressing the Acts of Oblivion and Indemnity on the reluctant parliament. On the other hand, with regard to the triumph of the church over dissent, if he was somewhat alarmed at its completeness, his fear arose from no pity for the dissenters. His opinion of them, and of the policy which ought to ke observed towards them, is emphatically stated in his Life (vol. ii. p. 121) :—"'' Their faction is their religion ; nor are those combinations ever entered into upon real and substantial motives of conscience, how erroneous soever, but consist of many glutinous materials of will, and humour, and folly, and knavery, and ambition, 'and malice, which make men cling inseparably together, till they have satisfaction in all their pretences, or till they are absolutely broken and subdued, which may always be more reasonably done than the other."

But, notwithstanding his exaggerated reverence for the sovereign, his passionate attachment to the church, and his real worth, Hyde rapidly became the most unpopular mau in the kingdom. 'The settlement of landed property which had been made by the Act of Indemnity deeply offended hundreds of the cavaliers; for, while it restored all they had lost to those who, like Hyde himself, had both escaped the necessity of selling their land and refused to bow to the government of Cromwell, it did nothing for those who had sold their property, even though they had ruined themselves to support. the cause of the king. By the people, who had no means of judging for what he was responsible and of what he was innocent, he was blamed for every misfortune. The sale of Dunkirk was the chief crime with which they charged him; but there is no reason to disbelieve his own declaration that he was at first opposed to the scheme, while it must be allowed that there is force in his excuses that the fortress was expensive to maintain, that the money offered for it was sorely needed, and that its worth to England

was by no means great. Still its surrender was a great political mistake; it displayed to the popular eye in far too striking a light the difference between the government of Clarendon and the government of Cromwell. He was also held responsible for the marriage of the king with the childless and Catholic princess of Portugal, and he was even accused of having selected her in order that his own descendants might inherit the throne. And, though his worst political weakness—his allowing Charles to accept the bribes of France—was not then made known, it was the general belief that his splendid mansion in Piccadilly had been erected with foreign gold. Of all dissenters, Catholic and Protestant, his bitter dislike had made determined enemies ; and his repellent hauteur, his somewhat conceited austerity, offended the courtiers, and aroused their derision, All these enemies, however, he could afford to scorn so long

as he retained the regard of the king, who, to do him justice, was unusually mindful of his debts to Hyde. In 1661 the chancellor, on the disclosure of the marriage of his daughter to the duke of York, was created Baron Hyde of Hindon, and shortly after earl of ,Clarendon, at the same time receiving a gift of £20,000; he had already refused the offer of a garter and 10,000 acres. Two years later the attempt to impeach him, made by the earl of Bristol, resulted in a miserable failure, and the accuser sought safety in flight. But in 1667 a second impeachment found him powerless to resist. His dignified censoriousness must always have been disagreeable to the king, who was also annoyed by lis strenuous opposition to every scheme for tolerating the Catholics ; and when Clarendon ventured to tliwart his plans and interfere with his pleasures, annoyance was turned into hatred. Charles, having become enamoured of Miss Fanny Stewart, resolved to marry her, and therefore determined to effect a divorce from the queen. This scheme, which threatened to exclude his descendants from the throne, Clarendon was told enough to oppose ; and it was in- sinuated by his enemies that the marriage of Miss Stewart to the duke of Richmond, which put an end to the project, had been brought about partly by his contrivance. Mis- fortunes now pressed thick upon him. About the middle of 1667 his wife died ; and a few days after the duke of York was sent to him with a message requesting him to resign the chancellorship. This he could not be persuaded to do; he

so far forgot his dignity as to plead personally with his master to be allowed to retain his office; and he also addressed to him a humble letter, in which he denied that he had been in any way concerned with Miss Stewart's marriage, and declared that he had no acquaintance with either herself or her husband. But his humiliation was in vain; and on the 30th of August Secretary Morrice was sent to take froin him the great seal. On the 6th November the Commons drew up seventeen articles of impeachment against him. It would not have been easy to convict him of high treason. Several of the charges were exag- gerated, and one or two were altogether false ; there were some, however, sufficiently serious. The chief articles were :—that he had sought to govern by means of a standing army, and without parliament; that he had confined prisoners uncondemned in places where they could not appeal to the law ; that he had sold Dunkirk ; that he had made a sale of offices, and obtained money by means of his position in various illegal ways; that he had introduced arbitrary government into the colonies ; and that he had deceived the king with regard to foreign affairs, and had betrayed his plans to the enemy. It was, 'however, a general charge of high treason, without specified grounds, which was presented to the Lords, and this they refused to accept. Nevertheless it became plain even to Clarendon himself that he was deserted, and that his cause was hope- less. On the 29th November 1667 he left England for ever, after addressing a vindication of his conduct to the Lords, which, being communicated to the Commons, was voted seditious, and burned by the hangman, A bill of attainder was brought in against him, but the Lords rejected it; and the matter was finally compromised by the passing of an Act which condemned him to perpetual banishment, unless he should appear for trial within six weeks. Meanwhile, sick in body and in mind, he had landed in France ; but, before reaching Rouen, he was stopped, and informed that he could not be allowed to remain in the country. After several refusals, however, permission to stay was granted ; and he was conducted to Avignon by a French officer. At Evreux an incident occurred which shows the bitterness of the feeling with which he was regarded by his countrymen. A party of English sailors who happened to be working in the town, on hearing of

his arrival, broke into his bed-room, burst open his trunks, attacked and wounded him with their swords, and were only prevented from murdering him by the arrival of a body of French troops. From Avignon he passed to Montpellier ; and the rest of his life was spent chiefly in this town and in Rouen. His time was thenceforth passed in the quiet pursuit of literature. He resumed his Meditations on the Psalms, concluded his History of the Rebellion, and wrote his Life, A Short View of the State of Ireland, most of his Essays, and his Survey of Hobbes's Leviathan. Twice he humbly appealed to Charles that he might be allowed to die in his native land; but not even a reply was vouchsafed, and it was at Rouen that he expired on the 9th December 1674.

The character of Clarendon is well-marked, In the court of Charles II. he was almost the only man who lived chastely, drank moderately, and swore not at all. Three principles guided his life. The first, from which he never swerved, was a passionate attachment to the religion and polity of the Church of England. The second, to which he was faithful on the whole, though with some declensions, was the determination to maintain what he regarded as the true and ideal English constitution. The third, which he more than once nobly sacrificed to the other two, was a desire for personal advancement. In political practice he sadly wanted both insight and tact, and, though he could plead most cleverly and affectingly in a state paper, he was too apt, when confronted by opposition in Parliament, to lose his temper. He was, however, ready in debate; he could speak well; and for business he was admirably adapted. In political theory he was intensely conserva- tive; no royalist squire who had never seen the king but in moments of dignified ceremony could have cherished a deeper reverence for him than did this courtier, who had watched his every act of crime and _ selfishness, Cold and haughty as he was towards his equals, at least in the end of his life, in his bearing towards the royal family, he sometimes appeared to abjure every feel- ing of manly independence. On two occasions this was miserably exemplified. He was too proud to allow his own wife to visit 'any 'woman of disreputable character, whatever her position ; yet, at the command of his master, he was base enough to urge the queen to admit her husband's favourite mistress as one of her ladies in waiting. And there is another scene in which we cannot help regarding him with still deeper scorn. In his Life he calmly tells us the story. About the

time of the Restora- tion the duke of York had fallen in love with his eldest daughter, Anne Hyde, and before their intimacy had been discovered had given her a written promise of marriage. Of this Clarendon professes to have been completely ignorant ; and when the affair could no longer be con- cealed, he tells us he was the last to be informed of it. Nor is this surprising if his own account of the manner in which he received the news is to be credited in the least. He broke into “a very immoderate passion.” He would turn his daughter from his house. He hoped she was the duke’s mistress, and not his wife, for then he could refuse to harbour her. He would have her sent to the Tower; he would have an Act passed to execute her; nay, he would be the first to propose such an Act. “ Whoever knew the man,” he adds, “ will know that he said all this very heartily.” Modern historians are perhaps too kind in doubting him. Soon after he told the king that he “so mich abominated” the thought of his daughter’s becoming the wife of the prince, that he “had?much rather see her dead, with all the infamy that is due to her presumption.” He even informed the duke himself —when an infamous conspiracy was hatched against her honour, and Sir Charles Berkley swore that she had granted him favours incon-

‘sistent with her duty to her husband—that since she had deceived himself he could not answer for her fidelity to any other man. The conclusion of the affair displays a depth of meanness which could not have been credited on any other testimony than his own. In fear of death Mary of Orange confessed that the accusation was false, and Berkley admitted his perjury ; but in Clarendon’s breast there does not appear to have been kindled a spark of the burning indignation which an honourable stranger could not have repressed; Berkley himself had only to ask forgiveness. Itis possible that this humiliating story—- this basest display of the “besotted loyalty” of the time, is altogether true. Much of it is beyond denial; and if we hold that in the rest Clarendon was merely acting a part, we miserably save a very small portion of his man- liness at the expense of all his sincerity.

It is in literature that Clarendon’s name best deserves to be remembered. His Hssays (which are chiefly didactic) and his Survey of Hobbes’s Leviathan scarcely rise above the commonplace, but his History of the

Rebellion and his Infe of Edward, Earl of Clarendon have a high and permanent value. That he was a historian of wide grasp and deep insight cannot be maintained ; his works are pro- fessedly pleadings on behalf of the Episcopalian Royalists aud himself ; but, though it would be too much to allege that his accuracy is never warped by his purpose, we may in general accept his statements of fact as correct. It is, however, as works of literary art that his histories have at- tained to the position they hold. They charm us by their calm and never-failing grace, by their quiet humour, by their general tone of lofty dignity, but perhaps most of all by the exquisite portraits which they contain. It is true he cannot penetrate to the innermost recesses of men's souls, and let us read the motives of their lives; but he can in- troduce them to us, as it were, in society, can let us observe their career, watch their humours, and listen to their talk. Clarendon's style, too, though extremely loose and often amusingly ungrammatical, has many beauties. His sentences are of extraordinary length, and usually contain numerous involved parentheses ; but while these qualities threaten obscurity, obscurity is always avoided; and they have the merit of enabling the writer to produce a slow, stately, graceful music, of which the short sentence is altogether incapable, (T. M. W.)

CLARENDON, Grorce WILLIAM FREDERICK VILLIERS, FouRTH Earw oF, diplomatist and statesman, was born in London 12th January 1800, and died 27th June 1870. He was the eldest son of the Honourable George Villiers, brother of the third earl of Clarendon (second creation), by Theresa, only daughter of the first Lord Boringdon, and granddaughter of the first Lord Grantham. The earldom of the Lord Chancellor Clarendon became extinct in 1756 by the death of the fourth earl, his last male descendant. Jane Hyde, countess of Essex, the sister of that nobleman (who died in 1724), left two daughters ; of these the eldest, Lady Charlotte, became heiress of the Hyde family. She married Thomas Villiers, second son of the second earl of Jersey, whoserved with distinction as English minister in Germany, and in 1776 the earldom of Clarendon was revived in his favour. Theconnection with the Hyde family wastherefore in the female line and somewhat remote. Buta portion of the pictures and plate of the great chancellor was pre- served to this branch of the family, and remains at the Grove, their family seat at Hertfordshire, to this day.

Young George Villiers, the subject of this notice, entered upon life under circumstances which gave small promise of the brilliancy of his future career. He was well born ; he was heir presumptive to an earldom; and his mother was a woman of great energy, admirable good sense, and high feeling. But the means of his family were contracted ;

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his education was desultory and incomplete ; he had not the advantages of a training either at a public school or in the House of Commons. He went up to Cambridge at the early age of sixteen, and entered St John's College on the 29th June 1816. In 1820, as the eldest son of an earl's brother with royal descent, he was enabled to take his M.A. degree under the statutes of the university then in force ; and in the same year he was appointed attaché to the British embassy at St Petersburg, where he remained three years, and acquired that practical knowledge of the business of diplomacy which was of so much use to him in after-life. He had received from nature a singularly hand- some person, a polished and engaging address, a ready command of languages, and a remarkable power of com- position, .

Upon his return to England in 1828, Mr Villiers was appointcd to a commissionership of customs, an office which he retained for about ten years. Part of this time was spent in Ireland in the work of {fusing the revenue boards of England and Ireland into those of the United Kingdom, It was the period of the liveliest excitement that preeeded Catholic Emancipation, and the young English official incurred the censure of the Tory Government of the day for having presumed to cultivate the acquaintance of the most accomplished of the Catholic leaders. These official duties trained Mr Villiers in the business of civil administration, and likewise enabled him to acquire some useful experience of the Irish character. In 1831 he was despatched to France to negotiate a commercial treaty, which, however, led to no result.

The time was come which was to open to him a wider and more congenial field of action in the politics of Europe. On the 16th of August 1833 Mr Villiers was appointed minister at the court of Spain. Ferdinand VII. died within a month of his arrival at Madrid, and the infant queen Isabella, then in the third year of her age, was placed by the old Spanish law of female

inheritance on her contested throne. Don Carlos, the late king's brother, claimed the crown by virtue of the Salic law of the House of Bourbon whieh Ferdinand had renounced before the birth of hisdaughter. Isabella II. and her mother Christina, the queen regent, became the representatives of constitutional monarchy, Don Carlos of Catholic absolutism. The confliet which had divided the despotic and the constitutional powers of Europe since the French Revolution of 1830 broke out into civil war in Spain, and by the Quadruple Treaty, signed on April 22, 1834, France and England pledged themselves to the defence of the constitutional thrones of Spain and Portugal. For six years Mr Villiers continued to give the most active and intelligent support to the Liberal Government of Spain. He was accused, though unjustly, of having favoured the revolution of La Granja, whieh drove Christina, the queen mother, out of the kingdom, and raised Espartero to the regency. He undoubtedly supported the chiefs of the Liberal party, such as Olozaga and Espartero against the intrigues of the French Court ; but the object of the British Government was to establish the throne of Isabella on a truly national and liberal basis and to avert those complications, dictated by foreign influence, which feventually proved so fatal to that prineess. Spain never forgot what she owed in those years to the youthful and energetic minister of Great Britain, and he, on his part, retained a cordial interest in her welfare. He re- ceived the Grand Cross of the Bath in 1838 in acknowledgment of his.services, and succeeded, on the death of his uncle, to the title of earl of Clarendon ; in the following year, having left Madrid, he married Katharine, eldest daughter of James Walter, first earl of Verulam.

In January 1840 he entered Lord Melbourne's administration as Lord Privy Seal, and from the death of Lord Holland in the autumn of that year, Lord Clarendon also held the office of Chancellor of the Duchy of Lancaster until the dissolution of the ministry in 1841. In this capacity he made his first appearance in parliament, and although he always regretted the want of a previous training in the House of Commons, he was from the first listened to by the House of Peers as a speaker well qualified to assist the deliberations of parliament on questions of foreign policy. But on these questions he was not heartily united with the spirit that then animated the Foreign Office. Deeply convinced that the maintenance of a cordial understanding with France was the most essential condition of peace and of

a liberal policy in Europe, he reluctantly concurred in the measures proposed by Lord Palmerston for the expulsion of the pasha of Egypt from Syria ; he strenuously advocated, with Lord Holland, a more conciliatory policy towards France ; and he was only restrained from sending in his resignation by the dislike he felt to break up a cabinet he had so recently joined. Lord Palmerston's policy (as is shown by his own published letters) was constantly governed by the belief that France must be regarded by England as a rival and an enemy, with whom war was, sooncr or

later, inevitable. Lord Clarendon, on the contrary, regarded France as a rival, but a friend; he relied on the good sense and common interests of the two nations to maintain amicable relations ; and he suceeeded in drawing closer for a pcriod of thirty years, from 1840 to 1870, the ties which still happily remain unbroken betwecn them. That was his great object, and the proudest result of his political life ; and the difficulties he had to encountcr were at times as great on his own side of the Channel as on the other.

The interval of Sir Robert Pcel's great administration (1841-1846) was to the leaders of the Whig party a period of repose ; but Lord Clarendon took the warmest interest in the progressive triumph of the principles of free trade and in the ultimate repeal of the corn-laws, of which his brother, Mr Charles Pelham Villiers, had been the earliest, the most constant, and the most able advo- eate. For this reason, upon the formation of Lord John Russell's first administration, Lord Clarendon accepted the office of President of the Board of Trade. Twice in his career the Governor- Gencralship of India was offered him, and once the Governor- Generalship of Canada ; —these he refused from reluctanee to withdraw from the politics of Europe. But in 1847 a sense of duty compelled him to take a far more laborious and uncongenial appoint- ment. The desire of the cabinet was to abolish the Lord Lieutenancy of Ireland, and Lord Clarendon was prevailed upon to accept that office, with a view to transform it ere long into an Irish Secretaryship of State. But he had not been many months in Dublin before he acknowledged that the difficulties then existing in Ireland could only be met by the most vigilant and energetic authority, exercised on the spot. The crisis was one of extraordin- ary peril. Agrarian erimes of horrible atrocity

had increased three- fold. The Catholic elergy were openly disaffected. This was the sccond year of a famine which had desolated Ireland. The population, decimated by starvation and disease, lived upon the poor-rate and the alms of England, and extraordinary measures were required to regulate the bounty of the Government and the nation. In 1848 the French Revolution let loose fresh elements of discord, which culminated in an abortive insurrection, and for a lengthened period Ireland was a prey to more than her wonted symptoms of disaffection and disorder. During those five years Lord Clarendon held the reins of the vice-regal government ; a task more' entirely repugnant to his own predilections and more eertain to be repaid with un- merited obloquy could not have been imposed upon him. But he bore up against that flood of hostile passions and diffieulties with unshaken firmness. He fed the starving ; he subdued the factious ; he crushed the rebellious. He left behind him permanent marks of improvement in the legislation of Ireland ; and he practised, as far as possible, the broadest toleration of races and of creeds. If any name is associated in Ircland with the recollection of a government at once firm, far-sighted, and liberal, it should be that of Lord Clarendon. His services were expressly acknowledged by her Majesty in the Speech to both Houses of Parliament from the throne, on September 5, 1848,—this bcing the first time that any civil services obtained that honour ; and he was made a Knight of the Garter (retaining also the Grand Cross of the Bath by special order of her Majesty) on the 23d March 1849. Looking back to that period, after an interval of more than twenty years, it must be acknowledged that from this crisis dates the regeneration of Ireland. the population, reduced in numbers, has never ceased to advance in prosperity ; wages have risen; the land has been freed from secular incumbrances ; crime has diminished ; and treason itself has never recovered the crushing defeat of Smith O'Brien and Meagher. Lord Clarendon had a large share in promoting these results ; but he hailed with no common satisfaction the ehange of Government

- which released him from those arduous duties in 1852,

Upon the formation of the coalition ministry between the Whigs and the Peelites, in 1853, under Lord Aberdeen, the premier placed, without hesitation, the foreign office in the hands of Lord Clarendon ; but incredulous himself of the peril of war, which was already casting its dark

shadow over the East, Lord Aberdeen sought rather tocheck than to stimulate the decisions which might possibly have arrested the course of hostilities. It can hardly now be doubted that the hesitation which appeared to mark the successive steps of the Western allies encouraged the czar to more daring aggressions; and Lord Clarendon confessed, in an expression which was never forgotten, that we ‘“ drifted” into war, which a more prompt defiance and an open alliance between the Western powers and the Porte might have arrested. But the war once begun Lord Clarendon continually urged the prosecution of it with the greatest energy. He employed every means in his power to stimulate and assist the war departments, and above all he maintaincd the closest relations with our French allies, on whose co-

operation everything depended. The Emperor Nicholas had speculated on the impossibility of the sustained joint action of France and England in council and in the field. It was mainly by Lord Clarendon at Whitehall and by Lord Raglan before Sebastopol that such a combination was rendered practicable, and did eventually triumph over the enemy. The diplomatic conduct of such an alliance for three years between two great nations jealous of their military honour and fighting for no separate political advantage, tried by excessive hardships and at moments on the verge of defeat, was certainly one of the most arduous duties ever performed by a minister. No one will ever know all the labour it cost ; but the result was due in thie main to the confidence with which Lord Clarendon had inspired the emperor of the French, and to the affection and regard of the empress, whom he had known in Spain from her childhood.

In 1856 Lord Clarendon took his seat at the Congress of Paris convoked for the restoration of peace, as first British Plenipotentiary, invested with full powers. It was the first time since the appearance of Lord Castlereagh at Vienna that a secretary of state for foreign affairs had been present in person at a congress on the Continent. Lord Clarendon’s first care was to obtain the admission of Italy to the council chamber as a belligerent power, and to raise the barrier which still excluded Prussia as a neutral one. But in the general anxiety of all the powers to terminate the war there was no

small danger that the objects for which it had been undertaken would be abandoned or forgotten. It is due, we may say, en- tirely to the firmness of Lord Clarendon that the principle of the neutralization of the Black Sea was preserved, that the Russian attempt to trick the allies out of the cession in Bessarabia was defeated, and that the results of the war were for a time secured.!. The Congress was eager to turn to other subjects, and perhaps the most important result of its deliberations was the celebrated Declaration of the Maritime Powers, which abolished privateering, defined the right of blockade, and limited the right of capture to enemy's property in enemy's ships. Lord Clarendon has been accused of an abandonment of what are termed the belligerent rights of this country, which were undoubtedly based on the old maritime laws of Europe. But he acted in strict conformity with the views of the British cabinet, and the British cabinet adopted those views because it was satisfied that it was not for the benefit of the country to adhere to practices which exposed the vast mercantile interests of Britain to depredation, even by the cruizers of a secondary maritime power, and which, if vigorously enforced against neutrals, could not fail to embroil her with every maritime state in the world. The experi- ence of 1780, when the armed neutrality of the North reacted so fatally on the American war, is the most con- clusive demonstration of the fatal results of such a system of policy ; and the more enlightened views of the present day have shown that a commercial belligerent nation would lose far more than she would gain by the suppression of the neutral trade, even if such a suppression were possible.

Upon the reconstitution of the Whig administration in

1 The Crimean War and the peace of 1856 had results highly bene- ficial to the politics of Europe. They rescued Turkey from the inimical grasp of Russia, and gave to the Ottoman empire twenty years of peace and security, which might, under abler rulers, have restored it to real independence and prosperity. They overthrew the preponderance which the Emperor Nicholas had asserted in Europe ; they cemented the alliance of France and England ; and they led the way to the sub- sequent changes which followed in Italy and Germany. These were all objects whieh Lord Clarendon had at heart, and although no minister can hope to have a permanent influence on the

course of human affairs, the events of the last twenty-five years have not been uninfluenced by his liberal and conciliatory views.

1859, Lord John Russell made it a condition of his accept- ance of office under Lord Palmerston that the Foreign De- partment should be placed in his own hands, which implied that Lord Clarendon should be excluded from office, as it would have been inconsistent alike with his dignity and his tastes to fill any other post in the Government. The consequence was that from 1859 till 1864 Lord Clarendon remained out of office, and the critical relations arising out of the civil war in the United States were left to the guidauce of Earl Russell. But he re-entered the cabinet in May 1864 as Chancellor of the Duchy of Lancaster ; and upon the death of Lord Palmerston in 1865, Lord Russell again became prime minister, when Lord Clarendon returued to the Foreign Office, which was again confided to him for the third time upon the formation of Mr Glad- stone's administration in 1868. To the last moment of his existence, Lord Clarendon continued to devote every faculty of his mind and every instant of his life to the public service ; and he expired surrounded by the boxes and papers of his office on the 27th June 1870, within a few days of that great catastrophe which was about to change the face of Kurope, and which he, if any body, might possibly have retarded or averted. His death called forth expressions of the deepest sympathy and regret from all the courts and statesmen of both hemispheres; and these manifesta- tions of more than official sorrow were collected and laid before parliament by order of the Queen. This is not the place to enlarge on the charm of Lord Clarendon's personal demeanour, or on the playfulness and grace he threw over the conduct of great aifairs. We must content ourselves with a brief record of what he did in public life. But no man owed more to the influence of a generous, unselfish, and liberal disposition, If he had rivals he never ceased to treat them with the consideration and con- fidence of friends, and he cared but little for the ordinary prizes of ambition in comparison with the advancement of the great cause of peace and progress in the world.

A notice of Lord Clarendon, by a friendly hand, was printed in Fraser's Magazine for August 1870, from which we have borrowed some details. No

other biography of this eminent and accomplished statesman has been published. (H. RB.)

CLARI, Giovanni Caro Manta, chapel-masterat Pistoia, wus born at Pisa in 1669. The time of his death is un- known. He was the most celebrated pupil of Colonna, chapel-master of S, Petronio, at Bologna. The works by which Clari distinguished himself pre-eminently are his vocal duets and trios, with a continued bass, published in 1720. In these beautiful and learned compositions the tonal ‘res- ponses and modulations are in the modern style. “An edi- tion of these duets and trios, with a pianoforte accompani- ment, was published at Paris in 1823, by Mirecki, a Polish musician, and a pupil of Cherubini. In such esteem were these compositions held by Cherubini, that, in the course of his studies, he repeatedly transcribed them with his own hand, as models of excellence. Clari composed one opera, Jl Savio Delirante, and for the church a Stabat and four other works.

CLARINET. See Musica INSTRUMENTS.

CLARK, Sir James (1788-1870), an English physician, was born at Cullen, in Banffshire. He was educated at the grammar-school of Fordyce, and at the universities of Aberdeen and Edinburgh, at the former of which he took the degree of M.A., at the latter that of M.D. He served for six years as a surgeon in the navy; he then spent some tie in travelling on the Continent, in order to investigate the effects of the mineral waters and the climate of various places commonly recommended to invalids ; and for eight years he was settled at Rome. In 1824 he was chosen phy- sician to Prince Leopold of Saxe-Coburg, and two years after he commenced to practise in London as physician to

the St George’s Parochial Infirmary. He was elected a fellow of the Royal Society in 1832; in 1835 he was appointed physician to the Duchess of Kent and the Princess Victoria, and on the accession of the latter to the throne he became physician in ordinary to the Queen. On the foundation of the university of London, he was made a member of its senate; and he belonged to many medical societics both at home and abroad. In 1838 he was created baronet. Sir James Clark made a special] study of sanatory science, and he was also regarded as au authority on diseases of the lungs. He published— Medical Notes ; The Sanative Influence of Climate, containing valu- able

meteorological tables; A Treatise on Pulmonary Con- sumption and Scrofulous Disease ; and Clinical Instruction. CLARK, Tuomas (1801-1867), a distinguished chemist, was born at Ayr, on the 3lst March 1801. His father was captain of a merchant vessel, and his mother began the Ayrshire needlework. He was educated at the Ayr Academy, a school of great efficiency and repute. In 1816 he entered the counting-house of Charles Macintosh & Co., the inventors of the waterproof cloth, but soon obtained the more congenial situation of chemist-in Tennant's chemi- cal works at St Rollox. In 1826 he was appointed lecturer on chemistry to the Glasgow mechanics' institution, where he propounded advanced views on the atomic theory and the theory of salts. The same year he published his first papers, containing his discovery of the pyrophospate of soda, which was a turning-poiut in chemical history. Becoming a medical student in the university of Glasgow, he took the degree of M.D. in 1831. He was for several years apothecary to the Glasgow infirmary, and published several important papers on pharmacy. In 1832 he pub- lished in the Westminster Review an elaborate inquiry into the existing system of weights and measures. In 1833 he obtained by competition the chair of chemistry in Marischal College, Aberdeen. About the same time he matured two important practical researches relating to the construction of hydrometers and the means of detecting arsenic. In 1885 he published a paper on the " Application of the Hot-Blast," explaining the principle of its efficacy. In 1836 appeared his letter to Mitscherlich on the Oxygen Salts. Clark's name became most generally known in connection with his water tests and his process for softening hard (chalk) waters. These came out in 1841. The tests have been in use ever since; and the softening process intended for the London waters, but not as yet adopted by any of the London com- panies, has been very successfully carried out in several places. In 1844 his health gave way under mental strain, and he ceased to be able to lecture to his class, Being removed also from his laboratory, he did little more che- mical work, except directing his assistant in perfecting his water tests. His active mind, however, could not rest, and he took up several inquiries, the last of all, which occupied what strength he had for nearly twenty years before his death, beingthe historical origin of the Gospels. Proceeding from one stage to another, he finally concentrated his ener- gies on an attempt to settle the true readings of the Greek text of the three first Gospels. His mode of proceeding displayed the peculiar sagacity and tact shown in his scien- tific

inventions, and his results had reached a form admit- ting of publication at the time of his death, The work would have been very valuable in connection with the re- vision of the Bible, and itis to be regretted that his surviv- ing relatives didnot seefit topublishit. Clark took a leading part in all the discussions relating to the improvement of the university of Aberdeen. He was an.admirable lecturer, but unfortunately his teaching career was short. He died at Glasgow on the 27th November 1867. ; CLARKE, Apam (c. 1760-1832), a Wesleyan divine, dis- tinguished for his varied learning, was born at Moybeg, in V. — 102

the north of Ireland in 1760 or 1762. After receiving a very limited education he was apprenticed toa linen manufacturer, but, finding the employment uncongenial, he soon abandoned it, and devoted himself to study. His parents belonged to a Methodist congregation under the pastoral charge of Breedon, one of Wesley's earliest associates in the Methodist move- ment, by whose advice young Clarke was sent to the school founded by Wesley at Kingswood, near Bristol. In 1782 he entered on the duties of the ministry, being appointed by Wesley to the Bradford (Wiltshire) circuit. His popu- larity as a preacher was very great, and his influence in the denomination is indicated by the fact that he was three times chosen to be president of the Conference. He served twice on the London circuit, the second period being extended considerably longer than the rule allowed, at the special request of the British and Foreign Bible Society, who had employed him in the preparation of their Arabic Bible, He lad found time during his itinerancy for diligent study of Hebrew and other Oriental languages, undertaken chiefly with the view of qualifying himself for the great work of his life, his Commentary on the Holy Scriptures, the first volume of which appeared in 1810, and the eighth and last in 1826. It is a work of much learning aud ability, and it still possesses some value, though it is in great part superseded by the results of later scholarship. Dr Clarke's other literary works were very numerous. In 1802 he published a Bibliographical Dictionary in six vol- umes, to which he afterwards added a supplement. He was selected by the Records Commission to edit Rymer's Federa, a task for which he was not well qualified, and which he did not complete. Healso wrote Memoirs of the Wesley Family (1823), and edited a

large number of reli- gious works, He died of cholera in London on the 16th August 1832. His Miscellaneous Works have been pub- lished in a collected form in 13 vols., and a Life by J. B. B. Clarke appeared in 1833.

CLARKE, Epwarp Dantet (1769-1822), LL.D., an English traveller, was born at Willingdon, Sussex, Junc 5, 1769. In 1786 he obtained the office of chapel clerkat Jesus College, Cambridge, but the loss of his father at this time involved him in many difficulties. In 1790 he took his degree, and soon after became private tutor to the Honour- able Henry Tufton, nephew of the duke of Dorset. In 1792 he obtained an engagement to travel with Lord Berwick through Germany, Switzerland, and Italy. After crossing the Alps, and visiting a few of the principal cities of Italy, including Rome, he repaired to Naples, where he remained nearly two years. Having returned to England in the summer of 1794, he became tutor in several distin- guished families. In 1799 he set out with a Mr Cripps, on a tour through the Continent of Europe, commenc- ing with Norway and Sweden, whence they proceeded through Russia and the Crimea to Constantinople, Rhodes, and afterwards to Egypt and Palestine. After the capitula- tion of Alexandria, Clarke was of considerable use in securing for England the statues, sarcophagi, maps, manu- scripts, &c., which had been collected by the French savans. Greece was the country next visited. From Athens the travellers proceeded by land to Constantinople, and after a short stay in that city, directed their conrse homewards through Rumelia, Austria, Germany, and France. Clarke, who had now obtained considerable reputation, took up his residence at Cambridge, and there he continued chiefly to reside till the day of his death. He received the degree of LL.D. shortly after his return, on account of the valuable donations, including a colossal statue of the Elcusinian Ceres, which he had made to the university. He was also presented to the college living of Harlton, to which, four years later, his father-in-law added that of Yeldham. Towards the end of 1808 Clarke was

appointed to the professorship of mineralogy, then first instituted. Nor was his perseverance as a traveller otlier- wise unrewarded, The MSS. which he had collected in the course of his travels were sold to the Bodleian Library for £1000 ; and by the publication of his travels he realized altogether a

clear profit of £6595. Besides lecturing on mineralogy and discharging his clerical duties, Dr Clarke eagerly prosecuted the study of chemistry, and made several discoveries, principally by means of the gas blowpipe, which he had brought to a high degrce of per- fection. His health gave way under too ardent study ; and after a short illness he expired at London, Marchi 9,1822. In all the relations of life Dr Clarke was a most amiable man; and his enthusiasm was united with a great capacity for enduring long-continued exertion, both mental and physical. The following is a list of his principal works :—

Testimony of Authors respecting the Colossal Statue of Ceres in the Publie Library, Cambridge, 8vo, 1801-8; The Tomb of Alexander, a Dissertation on the Sarcophagus brought from Alex- andria, and now in the British Museum, 4to, 1805; A Methodical Distribution of the Mineral Kingdom, fol., 1807 ; A Description of the Greek Marbles brought from the Shores of the Euxine, Arehi- pelago, and Mediterranean, and deposited in the University Library,

Cambridge, 8vo, 1809 ; Travels in various Countries of Europe, Asia, and Africa, 4to, 1810-1819.

CLARKE, Dr Samuen (1675-1729), a celebrated Eng- lish philosopher aud divine, was the son of Edward Clarke, alderman of Norwich, who had represented that city in parliament for several years. He was born October 11, 1675; and having finished his education at the free school of Norwich in 1691, removed thence to Caius College, Cambridge, where his uncommon abilities soon began to display themselves. Though the philosophy of Descartes was at that time the reigning system at the university, yet Clarke easily mastered the new system of Newton, and contributed greatly to the spread of the Newtonian philo- sophy by publishing an excellent translation of Rohault’s Physics with notes, which he finished before he was twenty-two years of age. The system of Rohault was founded entirely upon Cartesian principles, and was previously known only through the medium of a rude Latin version. Clarke not only gave a new translation, but added to it such notes as were calculated to lead students insensibly to other and truer notions of science. ‘The success,” says Bishop Hoadley, “answered exceedingly well to his hopes ; and he may justly be styled a great

benefactor to the university in this attempt." It continued to be used as a text-book in the university till supplanted by the treatises of Newton, which it had been designed to introduce. Whiston relates that, in 1697, he met young Clarke (at that time chaplain to Moore, bishop of Norwich), then wholly unknown to him, at a coffee-house in that city, where they entered into conversation about the Cartesian philosophy, particularly Rohault's Physics, which Clarke's tutor, as he tells us, had put him upon translating. " The result of this conversation was," says Whiston, "that I was greatly surprised that so. young a man as Clarke then was should know so much of those sublime discoveries, which were then almost a secret to all but to a few particular mathe- maticians. Nor do I remember," continues he, "above one or two at the most, whom J had then met with, that seemed to know so much of that philosophy as Clarke." This translation of Rohault was first printed in 1697, 8vo. There have been four editions of it: the last and best is that of 1718, which has the following title ——Jacoli Rohaulti Physica. Latine vertit, recensuit, et uberioribus jam Annotationibus, ex illustrissimi Isaaci Newtoni Philo- sophia maximam partem haustis, amplificavit et ornavit S. Clarke, S.P.T. Accedunt etiam in hac quarta editione nove aliquot tabule ari incisee et Annotationes multum sunt

aucte. It was translated into English by Dr John Clarke, dean of Sarum, and published in two vols. 8vo.

Clarke afterwards turned his thoughts to divinity, and in order to qualify himself for the sacred office, devoted himself to the study of Scripture in the original, and of the primitive Christian writers. Having taken holy orders, he became chaplain to Moore, bishop of Norwich, who was ever afterwards his constant friend and patron. In 1699 he published two treatises,—one entitled Three Practical Hssays on Baptism, Confirmation, and Repentance, aud the other, Some Reflections on that part of a book called Amyntor, or a Defence of Milton's Life, which relates to the Writings of the Primitive Fathers, and the Canon of the New Testament. In 1701 he published A Paraphrase upon the Gospel of St Matthew, which was followed, in 1702, by the Paraphrases upon the Gospels of St Mark and St Luke, and soon afterwards by a third volume upon St John. They were

subsequently printed together in two volumes 8vo, and have since passed through several cditions. He intended to have treated in the same manner the remaining books of the New Testament, but something accidentally interrupted the execution of his design.

Meanwhile Bishop Moore gave him the rectory of Drayton, near Norwich, and procured him a parish in the city. In 1704 he was appointed to the Boyle lectureship, aud chose for his subject the Being and Attributes of God. Having been appointed to the same office in the following year, he chose for his subject the Evidences of Natural and Revealed Religion. These lectures were first printed in two distinct volumes, but were afterwards collected together, and published under the general title of A Discourse concerning the Being and Attributes of God, the Obligations of Natural Leligion, and the Truth and Certainty of the Christian Revelation, in opposition to Hobbes, Spinoza, the author of the Oracles of Reason, and other Deniers of Natural and Revealed Religion.

In 1706 he wrote a refutation of some positions which had been maintained by Dr Dodwell on the immortality of the soul, and this drew him into controversy with Collins. He also at this time wrote a translation of Newton's Optics, for which the author presented him with £500. In the samme year also, through the influence of Bishop Moore, he obtained the rectory of St Bennet's, Paul's Wharf, London ; and he soon afterwards appeared at the court of Queen Anne, who appointed him one of her chaplains in ordinary, and afterwards, in 1709, presented him to the rectory of St James's, Westminster. On his elevation to this latter office, he took the degree of doctor in divinity, defending as his thesis the two propositions : —' 1. Nullam jfidet Christiane dogma, in Sacris Scripturis traditum, est rectee rationi dissentaneum , no article of the Christain faith, delivered in the Holy Scriptures, is disagreeable to right reason, and 2. Sineactionum humanarum libertate nulla potest esse religio, without the liberty of human actions, there can be no religion. During the same year, at the request of the author, he revised and corrected Whistou's English translation of the Apostolical Constitutions.

In 1712 he published a carefully punctuated and annotated edition of Czsar's Commentaries, adorned with elegant engravings. It was printed in

folio, 1712, and afterwards in 8vo, 1720, and dedicated to the duke of Marlborough. During the same year he published his celebrated treatise on The Scripture Doctrine of the Trinity. It is divided into three parts. The first contains a col- lection and exegesis of all the texts in the New Testament relating to the doctrine of the Trinity ; in the second the doctrine is set forth at large, and explained in particular and distinct propositions ; and in the third the principal prssages in the liturgy of the Church of England relating to the doctrine of the Trinity are considered. Whiston

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informs us that, some time before the publication of this book, a message was sent to him from Lord Godolphin and other ministers of Queen Anne, importing " that the affairs of the public were with difficulty then kept in the hands of those that were for liberty ; that it was therefore an unseasonable time for the publication of a book that would make a great noise aud disturbance ; and that therefore they desired him to forbear till a fitter opportunity should offer itself,'—a message that Clarke of course entirely dis- regarded. The ministers were right in their conjectures ; and the work not only provoked a great number of replies, but occasioned a formal complaint from the Lower House of Convocation. Clarke, in reply, drew up an apologetic preface, and afterwards gave several explanations, which satisfied tlhe Upper House ; and on his pledging himself that his future conduct would occasion no trouble, the

matter dropped.

In 1715 and 1716 he had a discussion with Leibnitz relative to the principles of natural philosophy and religion, which was at length cut short by the death of his antagonist. A collection of the papers which passed between them was published in 1717. In 1719 he was presented by Lord Lechmere to the mastership of Wigston's hospital in Leicester. In 1724 he published seventeen sermons, eleven of which had not before been printed. In 1727, upon the death of Sir Isaac Newton, he was offered by the court the place of Master of the Mint, worth on an average from £1200 to £1500 a year, This secular pre- ferment, however, he absolutely refused,—a circumstance which Whiston regards as "one of the most glorious actions of his life, and affording undeniable conviction that he was in earnest in his

religion.” In 1728 was published “A Letter from Dr Clarke to Benjamin Hoadley, F.R.S., occasioned by the coutroversy relating to the Proportion of Velocity and Force in Bodies in Motion,” printed in the Philosophical Transactions. In 1729 he published the first twelve books of Homer’s Ziad. This edition was printed in quarto, and dedicated to the duke of Cumberland. “The translation of Homer, who was Clarke’s favourite author,” says Bishop Hoadley, “ with his corrections, may now be styled accurate ; and his notes, as far as they go, are indeed a treasury of grammatical and critical knowledge. He was called to his task by royal command, and he has performed it in such a manner as to be worthy of the young prince for whom it was laboured.” ‘The year of its publication was the last of Clarke’s life. Hitherto, though not robust, he had always enjoyed a firm state of health ; but on the morning of Sunday, 11th May 1729, when going out to preach before the judges at Sergeant’s Inn, he was seized with a sudden illness, which caused lis death on the Saturday morning following. He died, May 17, 1729, in the 54th year of his age.

Soon after his death were published, from his original manuscripts, by his brother Dr John Clarke, dean of Sarum, dz Lxposition of the Church Catechism, and ten volumes of sermons, in 8vo. His Lxposition is composed of the lectures which he read every Thursday morning, for some months in the year, at St James’s church. In the latter part of his life he revised them with great care, aud left them completely prepared for the press. Three years after his death appeared also the last twelve books of the Iliad, published in 4to by his son Mr Samuel Clarke, the first three of these books and part of the fourth having, as he states, been revised and annotated by his father.

Clarke was of a cheerful and even playful disposition. An intimate friend relates that happening to call for him he found him swimming upon atable. Atanother time, when Clarke and several other men of ability and learning were indulging in diversion, on looking out at the window he saw a grave blockhead approaching the house; upon which

he cried out, “Boys, boys, be wise; here comes a fool.” This turn of his mind is confirmed by Dr Warton, who, in his observations upon the line of

Mr Pope, ‘Unthought-of frailties cheat us in the wise,”

says, “‘ Who could imagine that Locke wasfond of romances; that Newton once studied astrology ; that Dr Clarke valued himself on his agility, and frequently amused him- self in a private room of his house in leaping over the tables and chairs; and that our author himself was a great epicure ?”

[Clarke, although in no department. a genius of the first order, was a man of great general ability. He was eminent as a theologian, a mathematician, a metaphysician, and a philologist. His chief strength lay in his logical power. He was so disciplined and skilful a reasoner as to be able to contend on equal terms even with a Butler or a Leibnitz. Few have defended so well sa many good causes. The materialism of Hubbes, the pantheism of Spinoza, the empiricism of Locke, the determinism of Leibnitz, Collins’s necessitarianism, Dodwell’s denial of the natural immortality of the soul, rationalistic attacks on Christianity, and the selfish morality of the sensationalists,— all found in him a formidable opponent, possessed of great strength of mind, extraordinary dialectic skill, and a thorough conviction of the importance and truth of the principles which he advocated,

His fame as a theologian and philosopher rests to a large extent on his demonstration of the existence of God and his theory of the foundation of rectitude. The former is not, as it is often described, a purely @ priori argument, nor is it presented as such by its author. It starts from a fact, and it often explicitly appeals to facts. The intelligence, for example, of the self-existence and original cause of all things—-the main question between theists and atheists—is admitted to be “ not easily proved a priori,” but argued to be “demonstrably proved a posteriori from the variety and degrees of perfection in things, and the order of causes and effects, from the intelligence that created beings are con- fessédly endowed with, and from the beauty, order, and final purpose of things.” The propositions maintained in the argument are—‘‘1. That something has existed from eternity ; 2. That there has existed from eternity some one immutable and independent being ; 3. That that immutable and independent being, which has existed from eternity, without any external cause of its existence, must be self- existent, that is, necessarily existing ; 4. What the substance or essence of that being,

which is self-existent or necessarily existing, is, we have no idea, neither is it at all possible for us to comprehend it; 5. That though the substance or essence of the self-existent being is itself absolutely incom- prehensible to us, yet many of the essential attributes of his nature are strictly demonstrable, as well as his existence, and, in the first place, that he must be of necessity eternal ; 6. That the self-existent being must of necessity be infinite and omnipresent, 7. Must be but one, 8. Must be an intelligent being, 9. Must be not a necessary agent, but a being indued with liberty and choice, 10. Must of necessity have infinite power, .11. Must be infinitely wise, and 12. Must of necessity be a being of infinite goodness, justice, and truth, and all other moral perfections, such as become the supreme governor and judge of the world."

In order to establish his sixth proposition, Dr Clarke contends that time and space, eternity and immensity, are not substances but attributes,—the attributes of a self- existent being, Edmund Law, Dugald Stewart, Lord Broughain, and many other writers, have, in consequence, represented Clarke as arguing from the existence of time and space to the existence of Deity. This is a serious mistake. The existence of an immutab'e, independent, and necessary being is supposed to be proved before

any reference is made to the nature of time and space. Clarke has been generally supposed to have derived the opinion that time and space are attributes of an infinite immaterial and spiritual being from the Scholium Generale, first published in the second edition of Newton's Principia (1714). The truth is that his work on the Being and Attributes of God appeared nine years before that Scholiwm. The view propounded by Clarke may have been derived from the Midrash, the Kabbalah, Philo, Henry More, or Cudworth, but not from Newton. It is a view difficult to prove, and probably few will acknowledge that Clarke has conclusively proved it.

His theory as to the nature, foundation, and obligation of virtue is to the following effect. Things differ from oue another in their natures. They necessarily, therefore, stand in different relations to one another. From these different relations of things there must arise an agreement or disagreement of some things to others, a fitness or unfitness of the application of different

things one to – another. ‘Thus there is a fitness or suitableness of certain acts in certain circumstances to certain persons and an unsuitableness of others founded on the nature of things and persons, apart from all positive appointment whatso- ever. It is only imperfection or perversion of intelligence which can make the relations of things, and the fitness and unfitness involved in them, appear to be other than what they are. The fundamental truths of morals are absolutely and in themselves what they seem, no less than the truths of geometry. The obligation to virtue is involved in the very recognition of the moral relations which arise out of the necessary and eternal differences of things. It is impossible for us to apprehend them otherwise than as laws of reason which ought to guide our actions. Prior to all consideration of the divine will or law there is obligation ; and God, although under no necessity to create, must, having resolved to create, have respect to certain propor- tions, abstractly of eternal necessity, and, having resolved to act, must determine His will according to eternal reason. His own law to himself is the Jaw which He has given to every rational being, and which He has sanctioned by rewards and punishments, These are a secondary source of obligation.

This theory has been misunderstood and misrepresented in various ways, Jouffroy, Amédée Jacques, Sir James Mackintosh, Dr Thomas Brown, &c., criticise it on the assumption that Clarke made virtue consist in conformity to the relations of things universally, although the whole tenor of his argument shows him to have had in view only conformity to such relations as ~~elong to the sphere of moral agency. We may admit, however, that he might have pro~~ fitably insisted more on the fact that the relations and

| fitnesses spoken of are those which afford a reason and rule of

action tothe will. In this respect the doctrine of the distin- guished German’philosopher Herbart, which, while resolving morality into relations, lays stress on the fact that these relations are relations of will, may be regarded as an improvement of that of Clarke. Itis erroneous torepresent Clarke as confounding mathematical and moral relations, as overlooking that the relations involved in morality must be distinct from those involved in mere truth, or as meaning by the “fitness” which is constitutive of morality the adaptation of meansand ends. In reality, he simply states an

analogy between mathematical and moral truths, assigns to moral principles the distinctive peculiarity of being related to the will, and being liable to be set aside, anu denotes by fitness the accordance of things with a standard by which they: can be judged.

When Clarke's doctrine, that rectitude is a conformity to certain relations, has been accurately understood, it cannot fail to be obvious that, although it must be vindicated from

many of the objections which have been urged against it, no one can justly regard it as more than the mere starting- point of a theory. It must be followed up by a great araount of research before it can approximate to what a theory should be. But there is no reason why it should not be followed up by research in various directions, nor why it should not be made much more precise and definite than it has yet been, 'The relations involved in morality may be compared with those involved in pure science, in utility both personal and general, and in beauty, and ought to be, for it is only thus that what is distinctive of them can be brouglit clearly and completely out. More, perhaps, than any other theory on the nature of virtue, the theory of relations suggests and implies the necessity of a minute scientific inquiry into how truth, beauty, utility, and good- ness are connected and distinguished. By Socrates and Wollaston truth and goodness, by Plato, Shaftesbury, and Herbart beauty and goodness, and by the selfish school and the utilitarian school of moralists, utility and goodness, have been, if not identified, too nearly so, while there have been held errors as great although directly contrary to these, separating unnaturally goodness from truth, or from beauty, or from utility; and it les directly in the way of those who adopt the theory of relations to institute an investiga- tion into the whole subject of the connection of truth, beauty, utility, and goodness, so thorough and comprehen- sive as to show what is true and what erroneous in all these views, and what are the resemblances and differences, the identities and distinctions, in the things themselves,

As to the biography of Clarke see the Life by Bishop Haadley, and Whiston's Historical Memoirs, Hist. Classe, Bd. xix., Vienna, 1870. It treats of English rationalism before Clarke, his life, the general character of his

philo sophy, his criticism of materialism, his defence of natural religion, his discussion with Leibnitz, and his moral philosophy. (R. F,)]

CLARKSON, THomas (1760-1846), was born on the 28th March 1760, at Wisbeach, in Cambridgeshire, where his father was head-master of the free grammar school. He was educated at St Paul's School and at St John's College, Cambridge. Having taken the first place among the middle bachelors as Latin essayist, he succeeded in 1785 in gaining a similar honour among the senior bachelors. The subject appointed by the vice-chancellor, Dr Peckhard, was one in which he was himself deeply interested —Anne liceat wmvitos in servitutem dare? (Is it right to make men slaves against their will?) In preparing for this essay Clarkson consulted a number of works on African slavery, of which the chief was Benezet's Historical Survey of New Guinea ; and the atrocities of which he read affected him so deeply that he determined to devote all his energies to effect the abolition of {the slave trade, and gave up his intention of entering the church. His first measure was to publish, with additions, an-English translation of his prize-essay (June 1786). He then commenced to search in all quarters for information concerning slavery. He soon discovered that the cause had already been taken up to some extent by others, most of whom belonged to the Society of Friends, and among the chief of whom were William Dillwyn, Joseph Wood, and Granville Sharp. With the aid of these gentlemen, a committee of twelve was formed in May 1787 to do all that was possible to effect the abolition of the slave trade. Meanwhile Clarkson

had also gained the sympathy of Wilberforce, Whitbread, Sturge, and several other men of influence. Travelling from port to port, he now commenced to collect a large mass of evidence; and much of it was embodied in his Summary View of the Slave Trade, and the Probable Consequences of its Abolition, which, with a number of other anti-slavery tracts, was published by the committee. Pitt, Grenville, Fox, and Burke looked favourably on the movement ; in May 1788 Pitt introduced a parliamentary discussion on the subject, and Sir W. Dolben brought forward a bill providing that the number of slaves carried in a vessel should be proportional to its tonnage. A number of Liverpool and Bristol merchants obtained per- mission from the House to be heard by council against the bill, but on the 18th June it passed the Commons. Soon after Clarkson

published an Essay on the Impolicy of the Slave Trade; and for twa months he was continuously engaged in travelling that he might meet men who were personally acquainted with the facts of the trade. From their lips he collected a considerable amount of evidence ; but only nine could be prevailed upon to promise to appear before the privy council. Meanwhile other witnesses had been obtained by Wilberforce and the committee, and on the 12th May 1789 the former led a debate on the subject in the House of Commons, in which he was seconded by Burke and supported by Pitt and Fox, It was now the beginning of the French Revolution, and in the hope that he might arouse the French to sweep away slavery with other abuses, Clarksun crossed to Paris, where he re- mained six nonths. He found Necker head of the Govern- ment, and obtained from him some sympathy but little help. Mirabeau, however, with his assistance, prepared a speech against slavery, to be delivered before the National Assembly, and the Marquis de la Fayette entered enthusi- astically into his views. During this visit Clarkson. also met a deputation of negroes from St Domingo, who had come to France to present a petition to the National Assembly, desiring to be placed on an equal footing with the whites; but the storm of the Revolution permitted no substantial success to be achieved. Soon after his return home he engaged in a search, the apparent hopelessness of which finely displays his unshrinking laboriousness and his passionate enthusiasm. He desired to find some one who had himself witnessed the capture of the negroes in Africa ; and a friend having met by chance a man-of-war's-man who had done so, Clarkson, though ignorant both of the name and of the residence of the sailor, at once set out in search of him, and after many disappointments actually dis- covered him. His last tour was undertaken in order to form anti-slavery committees in all the principal towns. At length, in the autumn of 1794, his health, which had long been impaired by his uninterrupted exertions, gave way, and he was obliged to cease active work. He did not, however, entirely give up the cause. At the sugges- tion of Wilberforce and others, he occupied his time in writing a History of the Abolition of the Slave Trade, which appeared in 1808. In 1818 he had an interview at Paris with the emperor of Russia, to whom he presented an address against the negro slave trade. He again visited the emperor during the conference of the European monarchs which was held at Aix-la-Chapelle, and, through him, the address was also presented to the emperor of Austria and the king of Prussia. In 1823, the slave trade having been

abolished in 1807, the Anti-Slavery Society was formed, and Clarkson was one of its vice-presidents. He was for some time blind from cataract; but several years before his death his sight was restored. He died at the age of eighty-six, at his patrimonial house, Playford Hall, Suffolk.

Eesides the works already mentioned, he published

the Portraiture of Quakerism (1806), Memoirs of Wil- liam Penn (1813), Researches, Antediluvian, Patriarchal, and Historical (1836), intended as a history of the inter- ference of Providence for man's spiritual good, and Stric- tures on several of the remarks concerning himself made in the Life of Wilberforce, in which his claim as originator of the anti-slavery movement is denied. See his J/emozrs by Thomas Elmes and Thomas Taylor.

CLAUBERG, Joun (1622-1665), one of the most noted of the immediate followers of Descartes, was born at Solingen, in Prussia, in the year 1622. After travelling in France aud England, he came to Leyden, where he studied philosophy under the Cartesian John Ray. He became professor of philosophy at Herborn, and afterwards at Duisburg, and was one of the earliest teachers of the new doctrines in Germany. Clauberg is justly celebrated as an exact and methodical commentator on his master's writings; but he was na mere commentator, and his specu- Jations anticipate in a marked degree the subsequent course of thought in the Cartesian school. His theory of the connection between the soul and the body is hardly to be distinguished from that afterwards advanced by Male- branche; while his view of the relation which God holds to his creatures is a distinct foreshadowing of the pantheism of Spinoza. All creatures exist only through the continuous creative energy of the Divine Being, and are no more independent of his will than are our thoughts independent of us,—or rather less, for there are thoughts which force themselves upon us whether we will or not. Clauberg died at Duisburg in 1665. His chief works are—De con- junctione anime et corporis humani scriptum ; Exercitationes centum de cognitione Dei et nostri ; Logica vetus et nova ; Initiatio philosophi, seu Dubitatio Cartesiana. He also wrote a commentary on

Descartes’s Meditations. A com- plete edition of his works in two vols. was published at Amsterdam in 1691.

CLAUDE, Jzan (1619-1687), a famous French Protes- tant preacher and controversialist, was born at Sauvetat near Agen, where his father was a Protestant minister. He held for eight years the office of professor of theology in the Protestant college of Nimes; but in 1661, having opposed a suggestion which was made at a provincial synod for reuniting Catholics and Protestants, he was forbidden to preach in Lower Languedoc. On visiting Paris in order to appeal against this comniand, he became engaged in a controversy with Bossuet and Arnauld con- cerning the Eucharist. In 1662 he obtained a post at Montauban similar to that which he had lost ; but after four years he was removed from it also. He next became pastor in Paris, where he continued his controversy with Bossuet. On the revocation of the Edict of Nantes he fled to Holland, and received a pension from the Prince of Orange. He continued to preach occasionally at the Hague till his death.

His principal works are the Réponse aux deux traités intitulés La Perpétuité de la Fot de ? Eglise Catholique touchant 0 Eucharistic (1665) ; Réponseau livre de P. Nouet sur ? Hucharistie (1668); Défense de la Réformation, ow réponse aux préjugés légitimes de Nieole (1678) ; Plaintes des Protestants cruellement opprimés dans le Royaume de France (1686); GZuvres posthumes (Amsterdam, 1688), containing the T’raité de la Composition d’un Sermon, which was translated into English in 1778. See biographies by Nicéron and Laderize. ;

CLAUDE or Lorratng, or CLAUDE GELKE (1600-1682), the celebrated landscape-painter, was born of very poor parents at the village of Chamagne in Lorraine. When it was discovered that he made no progress at school, he was apprenticed, it is commonly said, to a pastry-cook, but this is extremely dubious. At the age of twelve, being left an orphan, he went to live at Freiburg with an elder brother, Jean Gelée, a wood-carver of moderate merit, and under

hin he designed arabesques and foliage, He afterwards rambled to Rome to seek a livelihood; but from his clownishness and ignorance of the language, he failed to obtain permanent employment. He next went to Naples, to study landscape painting under Godfrey Waals, a painter of much repute. With him he reniained two years ; then he returned to Rome, and was domesticated until April 1625 with another landscape-painter, Augustin Tassi, who hired him to grind his colours and to do all the household drudgery. His master, hoping to make Claude serviceable in some of his greatest works, advanced him in the rules of perspective and the elements of design. Under his tuition the mind of Claude began to expand, and he devoted him- self to artistie study with great eagerness, He exerted his utmost industry to explore the true principles of painting ky an incessant examination of nature ; and for this purpose he made his studies in the open fields, where he very frequently remained from sunrise till sunset, watching the effect of the shifting light upon the landscape. He generally sketched whatever he thought beautiful or striking, marking every tinge of light with a similar colour ; from these sketches he perfected his landscapes. Leaving Tassi, he made a tour in Italy, France, and a part of Germany, including his native Lorraine, suffering numerous misadventures by the way. Karl Dervent, painter to the duke of Lorraine, kept him as assistant for a year; and he paiuted at Nancy the architectural subjects on the ceiling of the Carmelite church. He did not, however, relish this employment, and in 1627 returned to Rome. Here, painting two landscapes for Cardinal Bentivoglio, he earned the protection of Pope Urban VIII, and rapidly rose into celebrity.

Claude was not only acquainted with the facts, but also with the laws, of nature ; and Sandrart relates that he used to explain, as they walked together through the fields, the causes of the different appearances of the same landscape at different hours of the day, from the reflections or refrac- tions of light, or from the morning and evening dews or vapours, with all the precision of a natural philosopher. He elaborated his pictures with great care ; and if any performance fell short of his ideal, he altered, erased, and repainted it several times over.

His skies are aerial and full of lustre, and every object harmoniously illumined, His distances and colouring are delicate, and his tints have a sweetness and variety till then unexampled. He frequently gave an

uncommmon tender- ness to his finished trees by glazing. His figures, however, are very indifferent; but he was so conscious of his deficiency in this respect, that he usually engaged other artists to paint them for him, among whom were Curtois and Filippo Lauri. Indeed, he was wont to say that he sold his landscapes and gave away his figures. In order to avoid a repetition of the;same subject, and also to detect the very nunierous spurious copies of his works, he made tinted outline drawings (in six paper books prepared for this purpose) of all those pictures which were transmitted to different countries; and on the back of each drawing he wrote the name of the purchaser. These books he named Inbri di Verita, This valuable work has keen engraved aud published, and has always been highly esteemed by students of the art of landscape. Claude died at Rome at the age of eighty-two, on the 21st of November 1682, leaving his wealth, which was considerable, between his only surviving relatives, a nephew and niece. Many choice specimens of his genius may be seen in the National Gallery, and in the Louvre ; the landscapes in the Altieri and Colonna Palaces in Rome are also of especial celebrity. He himself regarded a landscape which he painted in the Villa Madama, being acento of various views with great abundance and

varicty of leafage, and a composition of Esther and

Ahasuerus, as his finest works ; the former he refused to sell, although Clement IX. offered to cover its surface with gold pieces. He etched a series of twenty-eight landscapes, tine impressions of which are greatly prized. Full of amenity, and deeply sensitive to the graces of nature, Claude has long been deemed the prince of landscape painters, and indeed he must always be accounted a prime leader in that form of art, and in his day a great enlarger and refiner of its province. Within the last century, however, he has been vastly exceeded—in grasp, power, knowledge, subtlety, variety, and general mastery of all kinds—by many painters, one in one quality and another in another; in proof we need only name Turner, whose range, in com- parison with Claude’s, was as that of a continent to a canton, or a mountain to a hillock.

Claude was a man of amiable and simple character, very kind to his pupils, a patient and unwearied worker ; in his own sphere of study, his mind was stored (as we have seen) with observation and knowledge, but he continued an unlettered man till his death. (W. M. R.)

CLAUDET, Antoine Frangots (1797-1867), an emi- nent photographer, was born at Lyons. Shortly after the publication of Daguerre's results (1839), Claudet, by the addition of bromide and chloride of iodine to the iodide of silver employed by the former discoverer, greatly acceler- ated the process of production. This, with the use of iodide of gold in fixing the image, may be said to have completed the invention. In 1848 Claudet produced the photographometer, an instrument designed to measure the intensity of photogenic rays ; and in 1849 he brought out the focimeter, for securing a perfect focus in photographic portraiture. In 1850 he receiveda medal from the Society of Arts and Manufactures for a machine to cut glass of any curvature of surface. This was followed in 1851, 1855, and 1862 by the medals awarded by the French and English universal exhibitions for eminence in and discoveries connected with his profession, and in 1853 by his election into the Royal Society. In 1858 he produced the stereo-monoscope, in reply toa challenge from Sir David Brewster. Olaudet, who was photographer in ordinary to Her Majesty, was also a decoré of the Legion of Honour, and had received tokens of admiration and regard from Louis Philippe and the Czar Nicholas.

CLAUDIANUS, Cravptius, the gifted poet who shed lustre on the last decrepid era of Roman literature, was, as we learn from himself (Epist. 1), an Egyptian by birth, and probably a native of Alexandria, It may be con-jectured from his name that he was of Roman extraction, and it is hardly possible that he should have acquired such. mastery over the Latin language if it had not been familiar to him from his boyhood. We have, however, his own authority for the assertion that his first poetical composi- tions were in Greek, and that he had written nothing in Latin before 395 a.p. In that year he appears to have come to Rome, and made his début as a Latin poet by a panegyric on the consulship of Olybrius and Probinus, the first brothers not belonging to the imperial family who had ever simultaneously filled the office of consul. This piece proved the precursor of the series of panegyrical poems which compose the bulk of his writings. In 396 appeared the

encomium on the tlird consulship of the Emperor Honorius, and the epic on the downfall of Rufinus, the unworthy minister of Arcadius at Constantinople. This revolution was principally effected by the contrivance of Stilicho, the great general and minister of Honorius. Claudian's poem appears to have obtained his patronage, or rather perhaps that of his wife Serena, by whose 1n- terposition the poet was within a year or two enabled to contract a wealthy marriage in Africa (Epist. 2). Pre- vious to this event he had produced (398) his panegyric

on the fourth consulship of Honorius, his epithalamium on the marriage of Houorius to Stilicho’s daughter, Maria, and his poem on the Gildonic war, celebrating the repres- sion of a revolt in Africa. To these succeeded his piece on the consulship of Mallius Theodorus (399), the un- finished or mutilated invective against the Byzantine prime minister Eutropius, in the same year, the epics ou Stilicho’s first consulship and on his repulse of Alaric (400 and 403), and the panegyric on the sixth con- sulship of Honorius (404). From this time all trace of Claudian is lost, aud he is generally supposed to have perished with his patron Stilicho in 408. It may, how- ever, be plausibly conjectured that he must have died in 404, as he could hardly otherwise have omitted to celebrate the greatest of Stilicho’s achievements, the destruction of the barbarian host led by Radagaisus in the following year. Nor, on the other hand, is ground wanting for the surmise that he may have survived Stilicho, as in the dedication to the second book of his epic on the Rape of Proserpine, he speaks of his disuse of poetry in terms hardly reconcil- able with the fertility which, as we have seen, he displayed during his patron’s lifetime. From the manner in which Augustine alludes to him in his De Civitate Dev, it may be inferred that he was no longer living at the date of the composition of that work, between 415 and 428.

We have already enumerated Claudian’s chief poems, to which ouly remain to be added a number of short descrip- tive pieces and epigrams, his lively Fesceunines on the emperors marriage, his panegyric on Serena, and the Gigantomachia, a fragment of an unfinished epic. Several poems expressing Christian sentiments are undoubtedly spurious. There can be no question of his paganism, which, however, neither prevented his celebrating Christian rulers and magistrates nor his enjoying the distinction of a court laureate. We have his own authority for his having been honoured by a tronze statue in the forum, although the inscription on the pedestal which Pomponius Letus professed to have discovered in the 15th century is almost certainly spurious.

Claudian’s position in literature is unique. It is sufii- ciently remarkable that, after nearly three centuries of torpor, the Latin muse should have

experienced any revival in the age of Honorius, nothing less than amazing that this revival should have been the work of a foreigner, most surprising of all that a just and enduring celebrity should have been gained by official panegyrics on the generally uninteresting transactions of an inglorious epoch. The first of these particulars bespeaks Claudian's taste, rising superior to the prevailing barbarism, the second his command of language, the third his rhetorical skill. As remarked by Gibbon, "he was endowed with the rare and precious talent of raising the meanest, of adorning the most barren, and of diversifying the most similar topics." This gift is especially displayed in his poem on the down- fall of Rufinus, where the punishment of a public male- factor is exalted to the dignity of an epical subject by the magnificence of diction and the ostentation of supernatural machinery. 'The noble exordium, in which the fate of Rufinus is propounded as the vindication of divine justice, places the subject at once on a dignified level ; and the council of the infernal powers has afforded a hint to Tasso, and through him to Milton. The inevitable monotony of the panegyrics on Honorius is relieved by just and brilliant expatiation on the duties ofa sovereign. In his celebration of Stilicho's victories Claudian found a subject more worthy of his powers, and some passages, such as the description of the flight of Alaric, and of Stilicho's arrival at Rome, and the felicitous parallel between his triumphs and those of Marius, rank among the brightest ornaments of Latin poetry. Claudian's panegyric, however lavish and_ re-

gardless of veracity, is in general far less offensive than usual in his age, a circumstance attributable partly to his more refined taste and partly to the genuine merit of his patron Stilicho. He is a valuable authority for the history of his times, and is rarely to be convicted of serious inaccu- racy in his facts, whatever may be thought of the colour- ing he chooses to impart to them. As correctly observed by his latest critic, Mr Hodgkin, lhe was animated by true patriotic feeling, in the shape of a reverence for Rome as the source and symbol of law, order, and_ civilization. Outside the sphere of actual life he is less successful ; his Lape of Proserpine, though the beauties of detail are as great as usual, betrays his deficiency in the creative power requisite for dealing with a purely ideal subject. This denotes the rhetorician

rather than the poet, and in general it may be said that his especial gifts of vivid natural description and of copious illustration, derived from extensive but not cumbrous erudition, are fully as appro- priate to eloquence as to poetry. In the general cast of his 1aind and character of his writings, and especially in his faculty for bestowing enduring interest upon occasional themes, we may fitly compare him with Dryden, remember- ing that while Dryden exulted in the energy of a vigorous aud fast-developing language, Claudian was cramped by an artificial diction, confined to the literary class.

Claudian's works must have been carefully edited in his own time, for his epigrams include several short pieces evidently prepared for insertion in or rejected from poems of greater compass, The editio princeps was printed at Vicenza in 1482 ; the best subsequent editions are those by Gesuer (1759), Burmann (1760), and Jeep (1872). There is a complete English translation of little merit, by Abraham Hawkins (London, 1817), and a version of the Ltape of Proserpine, by Dean Howard. Some excellent criticism on Claudian will be found in Professor Ramsay's article in Smith's Classical Dictionary, and in two lectures by Mr Thomas Hodgkin (Newcastle, 1875). (R. G.)

CLAUDIUS, Apprus Cacus, a Roman patrician and author of the 4th century B.c. In 312 B.c. he was elected censor without having passed through the office of consul. His censorship was remarkable for the actual or attempted achievement of several great constitutional changes. He filled vacancies in the senate with men of low birth 3 and when his list was rejected, and C. Plautius, his colleague, resigned, he continued, in defiance of custom, to hold the office alone. He also retained it for five years, despite the AXmilian law, which limited the duration of its tenure to a year and a half. He transferred the charge of the public worship of Hercules in the Foram Boarium from the hands of the Politian gens to that of publicslaves. Hedistributed the dibertint among all the tribes; and he further invaded the exclusive rights of the patricians by directing his secretary Cneius Flavius (whom, though a freedman, he made a senator) to publish the legis actiones and the list of dives fasti (or days on which legal business could be transacted). And lastly, he gained enduring fame by the construction of a road and an aqueduct, which—a thing unheard of before—he called by his own name. In the year after his resignation of the censorship (307) he was

elected consul. In 298 he was made interrex ; and in 296, as consul, he led the army in Samuium, and the armies of the two consuls gained a victory over the Etruscans and Samnites ; but he never triumphed, nor does his military career appear to have been at all distinguished. Next year he was preetor, and he was once dictator. To the Ogulnian law admitting the plebeians to the offices of augur and pontifex he was strongly opposed; and his advocacy of the cause of the democracy seems to have ended with his censorship. His ambition and his pride of race were, however, accompanied by a passionate love of Rome.

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He was already blind and tottering with age when Cineas, the minister of Pyrrhus visited him, but so vigorously did he oppose every concession that all the eloquence of Cineas was in vain, and the Romans forgot past misfortunes in the inspiration of his patriotism. The story of his blindness, however, may ke merely a method of accounting for his cognomen.

Appius Claudius Cecus is also remarkable as the first of the Roman writers, both in verse and prose, of whom we know anything. He wrote a poem which is mentioned by Cicero, but of which the remaining fragments are of the smallest, and a legal work entitled De Usurpationibus, Itis very likely also that he wasconcerned in the drawing up of the Legis Actiones published by Flavius. His Sententice, which include the famous dictum ‘““Every one is the architect of his own fortunes,” were read ky Paneetius, but are now lost.

CLAUDIUS, Appius Crassus, was, according to Livy, a patrician notorious for his pride and cruelty and his bitter hatred of the plebeians. Twice they » fused to fight under him, and, fleeing before their enemies, brought upon him defeat and disgrace. He retaliated by decimatin g the army. At length they effected his banishment, but he quickly returned, and again became consul. In the same year (451 B, co.) he was made one of the decemviri who had been appointed to draw up a code of written laws, and so carefully did he act during his first year of office that he was the only one of the ten who was re-elected. With Claudius at their head, the new decemviri appear to have resolved on retaining permanent authority, but an outburst of popular feeling suddenly crushed their power. Enainoured of the beautiful

daughter of the plebeian centurion Virginius, Claudius attempted to seize her by an abuse of justice. One of his clients, Marcus Claudius, swore that she was the child of a slave belonging to him, and that she had been stolen by the childless wife of the centurion. Virginius was summoned from the army, but a private message was sent at the same time instructing the general to detain him. The first messenger was more speedy than the second, and on the day of trial Virginius was present to expose the conspiracy. Still judgment was given according to the evidence of Marcus, and Claudius commanded Virginia to be given up to him. ‘There was but one way of escape, and in despair, her father seized a knife from a neighbouring stall and plunged it in her side. The popular passion was deeply stirred. Virginius, with Icilius, the betrothed lover of his daughter, and Namitorius, her uncle, hurried to arouse the army ; Horatius and Valerius put themselves at the head of the people. The decemviri were overthrown; and Appius Claudius died in prison, either by his own hand or by that of the executioner. Mommsen rejects the view given as above by Livy, and is inclined to hold that Claudius, as decemvir, was the pretended champion of the plebs, and that the revolution which ruined him was a return of the people to the rule of the patricians, who are represented by Horatius and Valerius. See appendix to vol. i. of his Listory of Rome.

CLAUDIUS, or Trsertus CLaupius Drusus Nero Grrmanicus (10 B.c.—54 a.p.), the first Roman emperor of the name, born at Lugdunum (Lyons), in 10 B.c., was the son of Drusus and Antonia, and grandson of Livia, the wife of Augustus. Paralyzed and lame, and unable to speak with distinctness, he was an object of scorn even to hig mother ; and the natural diffidence and timidity of his character were increased by neglect and insult, till he was regarded as little better than an imbecile. His time was spent chiefly in the society of servants, and devoted to the industrious pursuit of literature ; and until his accession he took no real part in public affairs, though Caligula honoured

him with the dignity of consul. His first wife was Plautia Urgulanilla, whom he divorced because he suspected her of designs against his life; his second, Aulia Petina, was also divorced; and his third was the infamous Valeria

Messalina. In 41 a.p., on the murder of Caligula, Claudius was seized by the pretorians, and declared emperor. As soon as he

gained resolution to assume the authority of his office, he –

proclaimed an amnesty for all except Cheerea, the assassin of his predecessor, and one or two others. The account, however, of his painstaking government, his laborious personal administration of justice, his conquest of Britain, his extension of the jus honorum to the Gauls, his construc- tion of the Claudian aqueduct and the harbour of Ostia, are inatters of history (see Roman Histrory). The cruelties of his reign appear to have been due to the facility of character which placed him completely under the influence of his favourite freedmen, of whom the most conspicuous were Narcissus, Pallas, and Polybius, and of his wife, the vicious and shameless Messalina, whom he fondly loved and honoured. At length, according to the account of Tacitus, Messalina went through the ceremony of marriage with one of her lovers, and urged by her former confederate Narcissus, the emperor allowed her to be seized, and Narcissus put her to death. Suetonius throws a some- what different light on the story, making it rather more probable, for he tells us that there was a rumour that the emperor desired and assisted in the marriage, because he had been warned by a soothsayer that the husband of Messalina was about to fall into misfortune. The next and fourth wife of Claudius was his niece Agrippina, a woman as criminal as any of her predecessors. She pre- vailed upon him to set aside his own son Britannicus in favour of Nero, her son by a former marriage ; and in 54 A.D., that she might place the act beyond recall, she put the emperor to death by meaus of poison.

Encouraged by Livy, as Suetonius asserts, and assisted by the freedmen who attended him, Claudius produced a history of Rome, commencing with the battle of Actium (31 B.c.), in 41 books, a defence of Cicero against Asinius Pollio, memoirs of his own life, and, in Greek, a history of Carthage and a history of Etruria; but none of his writ- ings have come down to us. He introduced three new letters into the Latin alphabet—-the digamma, the y, and another not now known; but they appear to have been dropped at his death.

The principal authority for the life and times of Claudius is the Annals of Tacitus, in whose high-coloured pictures there is much that gives rise to a“suspicion of exaggera- tion. Suetonius and Dion Cassiusare even less trustworthy.

CLAUDIUS, Magcus Avretivus, Gotuicus, the second of the Roman emperors of the name of Claudius, was born in Illyria or Dardania in the first half of the 3d century. On account of his military ability he was placed in command of an army by Decius; and Valerian appointed him general on the Illyrian frontier, and ruler of the pro- vinces of the lower Danube. During the reign of Gallienus, he was called to Italy in order to crush Aureolus; and, on the death of the emperor (268 A.D.) he was chosen as his successor, in accordance, it was said, with his express desire. He enjoyed great popularity, and, as far as we can now judge, he appears to have been a man of considerable ability and strength of character. The account of his reign belongs to the history of Rome.

CLAUDIUS, Marruras (1743-1815), a German poet, otherwise known by the nom de plume of Asmus, was born in 1743 at Rheinfeld, near Lubeck, and studied at Jena. With the exception of a short time in 1776 and 1777, when he held the office of superior commissioner or Ober- landcommissar at Darmstadt, he spent his life in the little town of Wandsbeck, near Hamburg, for which he had

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conceived so strong an attachment that he would not accept any appointment which required him to settle elsewhere. Here he earned his first literary reputation by the publica- tion, from 1770 to 1775, of a weekly periodical called the Wandsbecker Bote or Wandsbeck Messenger, in which he gave to the world a large number of prose essays and poems of various kinds. They were written in very pure and simple German, and appealed to the popular taste ; in many there was a vein of extravagant humour or even burlesque, while others were full of quiet meditation and solemn sentiment. In his later days, perhaps through the influence of Klopstock, with whom he had formed an intimate acquaint- ance, Claudius became strongly pietistic, and the graver side of his nature was alone permitted to display itself, Instead of firing the German heart with a Rheinweinlied, or shaking the

German sides with a Wenn Jemand eine Reise thut, he translated the works of Saint Martin and Fénelon. At the same time, he thought it notharm to publish a com- plete collection of his writings, under the whimsical title of Asmus omnia sua secum portans, oder Sdmmtliche Werke des Wandsbecker Bothen, 8 vols. 1774-1812. His biography has been written by Herbst (Gotha, 1857) ; and Kahle has given us Claudius und Hebel (Berlin, 1864).

CLAVIJO, Ruy GonzaLez pr, a Spanish traveller of the 15th century, whose narrative is the first important ane of its kind contributed to Spanish literature. He was a native of Madrid, and belonged to a family of some antiquity and position. On the return of the ambassadors Solomayor and Palazuelos from the East, Henry IIT. deter- mined to send another embassy to the court of Timur, who had just risen to power, and for this purpose he selected Clavijo, Gomez de Salazar, and a master of theo- logy.named Fray Alonzo Paez de Santa Maria. They sailed from Seville in May 1403, touched at the Balearic Isles, Gaeta, and Rhodes, spent some time at Constantinople, sailed along the southern coast of the Black Sea to Trebizond, and proceededinland, probably by Etchimazin, Tabreez, Tehran, and Meshud, to Samarcand, where they were well received by the conqueror. ‘Their return was safely accom- plished, and they landed in Spain in 1406, Clavijo proceed- ed at once to the court, at that time in Alcala de Henares, and served as chamberlain till the king’s death in the follow- ing year; he then returned to Madrid, and lived there in opulence till his own death in April 1412. He was buried in the chapel of the monastery of San Francisco, which he had rebuilt at great expense. His itinerary was first published in 1582 at Seville, by Argote de Molina, with the title of Historia del gran Tamorlan e iinerario y enarracion del viage y relacion de la emhaxada que Ruy Gonzalez de Clavijo le hizo,—the editor appending “ a short discourse,” for the better intelligence of his author. Another edition was brought out at Madrid in 1782, by Antonio de Sancha; and from this an English translation was prepared by Clements Markham, and pyblished by the Hakluyt Society in 1860. The identification of a great uumber of the places mentioned by Clavijo is a matter of considerable difficulty, and has given rise to some discussion (see Khanikof’s list in Geographical Magazine, 1874). A short account of his life is given by Alvarez y Baena in the Hijos de Madrid, vol. ix.

CLAY, Henry (1777-1852), a celebrated American politician, born near Richmond, in Virginia, on the 12th April 1777, was the son of a Baptist minister, who died when Henry was only five years old. His youth was consequently spent in some hardship, and fora time he worked on a farm ; but at the age of fifteen he obtained a situation in the office of the clerk of the Court of Chancery. Having gained some influential friends, he began in 1796 to study law under Robert Brooke, the attorney-general. In 1797 he was admitted to the bar, and in the end of that year he

commenced to practise in Lexington. His great power of influencing a jury soon brought him a flourishing practice ; and having taken a prominent part in the discussions as to the constitution which was drawn up for the State of Kentucky, he was in 1803 chosen member of the Legisla- ture of that State. Three years later he became for a few months member of the Senate of the United States. In the next year he again took his seat in the Legislature of Kentucky, of which in 1808 he was appointed speaker. It was during this session that he challenged a fellow- member, who had attacked him warmly in debate. The iaceting took place ; two shots were fired, and both parties were slightly wounded. In 1811 he became at once member for the first time and speaker of the House of Congress, and he subsequently held the latter position four times. All his energies were now devoted to bringing about a declaration of war with Great Britain, and main- taining the contest with all the vigour possible. At the end of the war (1814) he was appointed one of the com- missioners who was sent to Ghent to conclude the treaty of peace, and it was he who caused the erasure of the clause allowing Great Britain to navigate the Mississippi. During his visit to Europe he spent two months at Paris, enjoying the society of which Mine. de Staél was the queen. On his return to America he was again made speaker of Con- gress. In 1824 he allowed himself to be nominated for the office of president ; but the election did not give to any one the required majority, and the decision between the three who had obtained the greatest number of votes had to be made by Congress. Clay, who had been fourth on the list, gave his support to Quincy Adams, whence arose his second duel, that with John Randolph,

in which neither was hurt. Under Adams Clay accepted the post of secretary of state. In 1832. he was again candidate for the presidency, and again unsuccessfully ; and in 1844 he was nominated for the third time with a similar result. He now retired from public life; but in 1848 he was again called into the

Senate ; and in 1850 he carried a bill, which sought to

avert the great battle on the slavery question. In 1851, however, the weakness of his health prevented him from taking any part in public life ; and on the 29th July of the next year he died. On receiving the news of his death Congress adjourned ; next day orations in his praise were delivered in both houses; and the day of his funeral was observed in New York and in all the chief towns of the State to which he belonged.

Henry Clay commenced his political career in 1799 by attempting to persuade the State of Virginia to abolish slavery. He never, however, made any attempt to free the whole country from the system; indeed the effect of his policy (and the most important of his measures were those concerning slavery) was to maintain it. His name is con- nected with the ‘ Missouri Compromise,” which, while abolishing slavery in all other States north of lat. 36° 30’, permitted it in Missouri, and with several other measures sanctioning slavery in the slave States. His bill of 1850, nicknamed the ‘‘ omnibus bill,” provided that New Mexico and Utah, the States newly acquired from Mexico, should be left to their own discretion as to slavery, and that California should be received into the Union as a slave State ; while, on the other hand, slavery should be prohibited in Columbia. Another most important feature of Clay’s policy was the desire to free America from European control, which led him to advocate, in some of his most powerful speeches, the recognition of the independ- euce of the South American republics which had revolted from Spain. The part he took in the war with England has been already noticed. His action with regard to the tariff was not uniform; in 1832 he proposed to reduce gradually a large number of duties, but afterwards he

more than once sought to make it more protective. Though first opposed to the establishment of a national bank, he subsequently spoke vigorously in its favour. For some time he was president of the Colonization Society. See the edition of his speeches and writings, with a life by Calvin Colton (1857 and 1864),

CLAZOMEN #, now KELIsMAn, a town of Tonia, and a member of the Ionian Dodecapolis, or Confederation of Twelve Cities, on the Gulf of Smyrna, about 20 miles from that city in a south-west direction. It stood originally on the isthmus connecting the mainland with the peninsula on which were Erythre and other towns of note; but the inhabitants, alarmed by the encroachments of the Persians, abandoned the continent and removed to one of the small islands of the bay, and there established their city in security, This island was counected with the mainland by Alexander the Great by means of a pier, the remains of which are still visible. Though Clazomenz was not in existence before the arrival of the Jonians in Asia, its original founders were only partly Ionians, the great pro- portion being Phliasians and Cleonzans. It remained for some time sukject to the Athenians, but about the middle of the Peloponnesian war it revolted. After a brief resist- ance, however, it again acknowledged the Athenian supremacy, and repelled the Lacedzemonians when they attempted to gain possession of the town. Under the Romans Clazomenz was included in the province of Asia, and enjoyed an immunity from taxation. The site of the city can still be made out, in the neighbourhood of Vourla, but nearly every portion of its ruins has been removed. Anaxagoras the philosopher was born in Clazomenz, 499 B.O,

CLEANTHES, a Stoic philosopher, born at Assos in Asia Minor, about 300 B.c., was originally a boxer. He first listened to the lectures of Crates the Cynic, and then to those of Zeno, the Stoic, supporting himself meanwhile by working all night as water-carrier to a gardener. His apparent idleness aroused suspicion, and he was summoned before the Areopagus ; but when his story became known the court offered him a present of ten minx, which he refused to accept. His power of patient endurance, or perhaps his slowness, earned him the title of the Ass; but such was the esteem awakened by his high moral qualities that, on the death of Zeno in 263, he became the leader of the school. He still, however, continued to support

himself as before by the labour of his own hands, Among his pupils were his successor, Chrysippus, and Antigonus, king of Macedon, from whom he accepted 2000 mine. The story of his death, which took place about 220 or 225 B.c., is thus related. Being troubled by an ulcer, he had been directed to fast for a short time, but when that time had expired, he still refused to eat on the ground that he was now half-way on the road to death, and need not take the trouble of twice performing the journey.

Cleanthes produced yery little that was original, though he wrote some fifty works, of which fragments have come down tous. The principal is the large portion of the Hymn to Jupiter which has been preserved in Stobeus. He regarded the sun as the abode of God, the intelligent providence, or (in accordance with Stoical materialism) the vivifying fire or ether of the universe. Virtue, he taught, is life according to nature; but pleasure is not according to nature. He also originated a new theory as to the individual existence of the human soul; for he held that the degree of its. vitality after death depends upon the degree of its vitality in this life. The principal fragments of Cleanthes's works are contained in Diogenes Laertius and Stobeeus ; some may be found in Cicero and Seneca. See Zeller, Stoics, Epicureans, and Sceptics; and Ritter, Geschichte der Philosophie. ,

CLEARCHUS, a Spartan general of the 5th century B.c. After serving in the Hellespont and at the battle of Cyzicus, he became harmost of Byzantium; but, during his absence, the town was surrendered, and he was éonsequently

punished bya fine. He continued, however, to be employed in matters of importance ; but at length, after being sent into Thrace to protect the Greek colonies, he was recalled by the Ephors. He refused to obey, and made himself master of Byzantium. Being driven thence, he visited the court of Cyrus, for whom he levied a little army of Greek mercenaries, which he led on the famous Expedition of the Ten Thousand. He was the only one of the Greeks who was acquainted with the real intention of Cyrus ; and it was not till they had proceeded too far to retire with safety that he made known the object for which they had been collected. He commanded a division of his countrymen in the battle of Cunaxa (401 3B.c.); and he led them on their

difficult return journey till, being treacherously seized by Tissaphernes, he was sent to the court of Artaxerxes, where he was put to death.

CLEMENS ALEXANDRINUS. ‘The little we know of Clemens Alexandrinus is mainly derived from his own works, The earliest writer after himself who gives us any information with regard to him is Eusebius. The only points on which his works now extant inform us are his date and his instructors. In the Stromata, while attempting to show that the Jewish Scriptures were older than any writings of the Greeks, he invariably brings down his dates to the death of Commodus, a circumstance which at once suggests that he wrote in the reign of the Emperor Severus, from 193 to 211 a.p. (see Strom., lib. i. cap. xxi. 140, p. 403, Potter’s edition). The passage in regard to his teachers is corrupt, and the sense is therefore doubtful (Strom., lib. iecap.si. V1, pe822;-P;)

‘‘This treatise,” he says, speaking of the Stromata, ‘‘has not becn contrived for mere display, but memoranda are treasured up in it for my old age to be a remedy for forgctfulness,—an image, truly, and an outline of those clear and living discourses, and those men truly blessed and noteworthy I was privileged to hear. One of these was in Greece, the Ionian, the other was in Magna Grecia ; the one of them was from Ceele Syria, the other from Egypt; but there were others in the East, one of whom belonged to the Assyrians, but the other was in Palestine, originally a Jew. The last of those whom I met was first in power. On falling in with him I found rest, having tracked him while he lay concealed in Egypt. He was in truth the Sicilian bee, and, plucking the flowers of the

rophetic and apostolic meadow, he produced a wonderfully pure nowledge in the souls of the listeners.”

Some have supposed that in this passage seven teachers are named, others that there are only five, and various con- jectures have been hazarded as to what persons were meant. The only one about whom conjecture has any basis for speculating is the last, for Eusebius states (Hust. Eccl., v. 11) that Clement made mention of Panteenus as his teacher in the Lfypotyposes. The reference in this passage is plainly to one whom he might well designate as his teacher.

To the information which Clement here supplies subse- quent writers add little. By Eusebius and Photius he is called Titus Flavius Clemens, and “the Alexandrian ” is added to his name. Epiphanius tells us that some said Clement was an Alexandrian, others that he was an Athenian (Her., xxxii. 6), and a modern writer imagined that he reconciled this discordance by the supposition that he was born at Athens, but brought up at Alexandria. We know nothing of his conversion except that he passed from heathenism to Christianity. This is expressly stated by Eusebius (Prep. Hvangel., lib. ii. cap. 2), though it is likely that Eusebius had no other authority than the works of Clement. These,works, however, warrant the inference. They show a singularly minute acquaintance with the ceremonies of pagan religion, and there are indications that Clement himself had been initiated in some of the mysteries (Protrept., cap. ii. sec. 14, p. 13, P.). There is no means of determining the date of his conversion. He attained the position of presbyter in the church of Alexandria (Eus., Jist. Eccl., vi. 11, and Jerome, De Vir.

Iil., 38), and became the successor of Panteenus in the catechetical school of that place. Among his pupils were Origen (Eus., Hist. Hecl., vi. 7) and Alexander, bishop of Jerusalem (Eus., Hist. “ccl., vi. 14). How long he continued in Alexandria, and when and where he died, are all matters of pure conjecture. The only further notice of Clement that we have in history is in a letter written in 211 by Alexander, bishop of Jerusalem, to the Antiochians, and preserved by Eusebius (ist. Eecl., vi. 11). The words are as follows :—‘‘ This letter I sent through Clement the blessed presbyter, a man virtuous and tried, whom ye know and will come to know completely, who being here by the providence and guidance of the Ruler of all strengthened and increased the church of the Lord.”

Eusebius and Jerome give us lists of the works which Clement left behind him. Photius has also described some of them. They are as follows :—1. mpbs “EAAnvas Adyos 6 mporpemrixds, A Hortatory Address to the Grecks. 2. 6 maSaywyes, The Tutor, in threc books. 3. Srpwuareis, or Patch-work, in eight books. 4. rls 6 aw (duevos maovowos, Whois the Rich Man that is Saved? 5, Right books of ‘Yrorurdécets, Adumbrations or

Outlines. 6. On the Pass- over. 7. Discourses on Fasting. 8. On Slander. 9. Exhortation to Patience, or to the Newly Baptized. 10. The ravadv éxxanoiaoricds, the Rule of the Church, or to those who Judaize, a work dedicated to Alexander, bishop of Jerusalem. :

Of these, the first four have eome down to us complete, or nearly complete. The first three form a series. The Hortatory Address to the Greeks is an appeal to them to give up the worship of their gods, and to devote themselves to the worship of the one living and truc God, Clement exhibits the absurdity and immorality of the stories told with regard to the pagan deities, the cruclties per- petrated in their worship, and the utter uselessness of bowing down before images made by hands. He at the same time shows the Greeks that their own greatest philosophers and pocts recognized the unity of the divinc Being, and had caught glimpses of the true nature of God, but that fuller light had been thrown on this subject by the Hebrew prophets. He replies to the objection that it was not right to abandon the eustoms of their forefathers, and points them to Christ as their only safe guide to God.

The Pedogogue is divided into three books. In the first Clement diseusses the necessity for and the true nature of the Pedagogus, and shows how Christ as the Logos acted as Padagogus, and still acts. In the sccond and third books Clement enters into particulars, and cxplains how the Christian following the Logos or Reason ought to behave in the various circumstances of life—in eating, drinking, furnishing a house, in dress, in the relations of social life, in the care of the body, and similar concerns, and eon- cludes with a general description of the life of a Christian. Ap- pended to the Padagogue are two hymns, which are, in all probability, the production of Clement, though some have eon- jectured that they were portions of the church service of that time.

Stromata, or rather Srpwyareis, are covericts made out of miscellaneous pieces of cloth. The title is used by Clement to designate a miscellaneous collection of materials, and ‘Clement’s work is unquestionably of this nature. It is impossible to give a brief account of its varied contents. Sometimes he discusses chron- ology, sometimes philosophy, sometimes poetry, cntering into the most minute critical and clironological details; but

one objeet runs through all, and this is to show what the truc Christian Gnostie is, and what is his relation to philosophy. The work was in eight books. ‘The first seven are complete. ‘The eighth now extant is really an incomplete treatise on logic. Some critics have rejected this book as spurious, since its matter is so different from that of the rest. Others, however, have held to its genuineness, because in a Patch-work or Book of Miscellanies the difference of subject is no sound objection, and because Photius seems to have regarded our present eighth book as genuine (Phot., cod. 111, p. 89b, Bekker),

The treatise Who ts the Lich Man that is Saved? is an admirable exposition of the narrative contained in St Mark’s Gospel, x. 17-31. It was in all probability preached.

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The Hypotyposes have not come down to us. Ca L lated them into Latin, freely altering to suit his own ideas o orthodoxy. Both Eusebius and Photius describe the work. It wasa short commentary on all the books of Scripture, including some of the apocryphal works, such as the Epistle of Barnabas and the Reve- lation of Peter. Photius speaks in strong language of the impicty of some opinions in the book (Bib/., cod. 109, p. 89a, Bekker), but his statements are such as to prove conclusively that he must have had a corrupt copy, or read very carelessly, or grossly misunderstood Clement. Notcs in Latin on the first epistle of Peter, the epistle of Jude, and the first two of John have come down to us; but whether they are the translation of Cassiodorus, or indeed a trans- lation of Clement’s work at all, is a matter of dispute.

The treatise on the Passover was occasioned by a work of Melito on the same subject. Two fragments of this treatise were given by Petavius, and are contained in the modern editions.

We know nothing of the work called The Ecclesiastical Canon from any external testimony. Clement himself often mentions the exkAnoiactinds kavév, and defines it as the agreement and harmony of the law and the prophets with the covenant delivered at the appearance of Christ (Strom., vi. cap. xv. 125, p. 803, P.). No doubt this was the subject of the treatise.

Jerome and Photius call the work Ecclesiastical Canons, but this seems to be a mistake.

Of the other treatiscs mentioned by Eusebius and Jerome nothing is known. A fragment of Clement, quoted by Antonius Melissa, is most probably taken from the treatise on slander.

Besides the treatises mentioned by Eusebius, fragments of treatises on Providence and the Soul have been preserved. Mention is also made of a work by Clement on the Prophet Amos, and another on Definitions.

In addition to these Clement often speaks of his intention to write on certain subjects, but it may well be doubted whether in most cases, if not all, he intended to devote jseparate treatises to them. Some have found an allusion to the treatise on the Soul already mentioned. The other subjects are Marriage (yapuxds Adyos), Continence, the Duties of Bishops, Presbyters, Deacons, and Widows, Prophecy, the Soul, the Transmigration of the Soul and the Devil, Angels, the Origin of the World, First Principles and the Divinity of the Logos, Allegorical Interpretation of Statements made with regard to God's anger and similar affections, the Unity of the Church, and the Resurrection.

Two works are incorporated in the editions of Clement which are not mentioned by himself or any ancient writer. They are ék trav coddrov Kal Tis davaToAikhs Kadovpéevns SidackaAlas KaT& Tovs Ovbadrevrivov xpdvovs émitoual, and ék Tay mpopnTtinv éxdAoyal. The first, if it is the work of Clement, must be a book merely of excerpts, for it contains many opinions which Clement opposed. Mention is made of Pantenus in the sccond, and some have thought it more worthy of him than the first. Others have regarded it as a work similar to the first, and derived from Theodorus.

Cassiodorus trans-

Clement occupies a profoundly interesting position in the history of Christianity. He is the first to bring all the culture of the Greeks and all the speculations of the Christian heretics to bear on the exposition of Christian truth. He does not attain to a systematic exhibition of Christian doctrine, but he paves the way for it, and lays the first stones of the foundation. In some

respects Justin anticipated him. He also was well acquainted with Greek philosophy, and took a genial view of it ; but he was not nearly so widely read as Clement. The list of Greek authors whom Clement has quoted occupies upwards of fourteen of the quarto pages in Fabricius's Bibliotheca Greca. He is at home alike in the epic and the lyric, the tragic and the comic poets, and his knowledge of the prose writers is very extensive. He made a special study of the philosophers. Equally minute is his knowledge of the systems of the Christian heretics. And in all cases it is plain that he not merely read but thought deeply on the questions which the civilization of the Greeks and the various writings of poets, philosophers, and heretics raised. He pondered on all he read that he might gain a clearer insight into the truth. But it was in the Scriptures that he found his greatest delight. He believed them to contain the revelation of God's wisdom to men. He quotes all the books of the Old Testament except Ruth and the Song of Solomon, and amongst the sacred writings of the Old Testament he evidently included the Book of Tobias, the Wisdom of Solomon, and Ecclesiasticus. He is equally full in his quotations from the New Testament, for he

quotes from all the books except the epistle to Philemon, the second epistle of St Peter, and the epistle of St James, and he quotes from the pastor of; dlermas, and the epistles of Clemens Romanus and of Barnabas, as inspired. He appeals also to many of the lost Gospels, such as those of the Hebrews, of the Eeyptians, and of Matthias. Notwithstanding this adequate knowledge of Scripture, the modern theologian is disappointed to find very little of what he deems characteristically Christian. In fact Clement regarded Christianity as a philosophy. The ancient philo- sophers sought through their philosophy to attain to a nobler and holier life, and this also was the aim of Chris- tianity. The difference between the two, in Clement's judgment, was that the Greek philosophers had only glimpses of the truth, that they attained ouly to fragments of the truth, while Christianity revealed in Christ the absolute and perfect truth. All the stages of the world's history were therefore preparations leading up to this full revelation, and God's care was not confined to the Hebrews alone. The worship of the heavenly

bodies, for instance, was given to man at an early stage that he might rise from a contemplation of these sublime objects to the worship of the Creator. Greek philosophy in particular was the pre- paration of the Greeks for Christ. It was the schoolmaster or pedagogue to lead them to Christ. Plato was Moses atticizing. Clement varies in his statement how Plato got his wisdom or his fragments of the Reason. Sometimes he thinks that they came direct from God, like all good things, but he is also fond of maintaining that many of Plato's best thoughts were borrowed from the Hebrew prophets ; and he makes the same statement in regard to the wisdom of the other philosophers. But however this may be, Christ was the end to which all that was true in philosophies pointed. Christ himself was the Logos, the Reason. God the Father was ineffable. The Son alone can manifest Him fully. He is the Reason that pervades the universe, that brings out all goodness, that guides all good men. It was through possessing somewhat of this Reason that the philosophers attained to any truth and goodness ; but in Christians He dwells more fully and guides them through all the perplexities of life. It is easy to see that this doctrine in regard to Christ may be miscon- strued. If Jesus were the Reason, thus visible in all good- ness, how could there be a real difference between Him and the .Father, or how could He really become incarnate ? Photius, probably ona careless reading of Clement, argued that he could not have believed in areal incarnation. But the words of Clement are quite precise and their meaning indisputable. He believed in a personal God different from the universe. He believed in a personal Son of God who was the Reason and Wisdom of God; and he believed that this Son of God really became incarnate. The object of His incarnation and death was to free man from his sins, to lead him into the path of wisdom, and thus in the end elevate him to the position of a god. But man's salvation was to be gradual. It began with faith, passed from that to love, and ended in full and complete knowledge. There could be no faith without knowledge. But the knowledge is imperfect, and the Christian was to do many things in simple obedience without knowing the reason. But he has to move upwards continually until he at length does nothing that is evil, and he knows fully the reason and object of what he does. He thus becomes the true Gnostic, but he can become the true Gnostic only by con- templation and by the practice of what is right. He has to free himself from the power of passion. He has to give up all thoughts of pleasure. He must prefer goodness in the midst of torture to evil with

unlimited pleasure. He has to resist the temptations of the body, keeping it under strict control, and with the eye of the soul undimmed by

corporeal wants and impulses, contemplate God the supreme good, and live a life according to reason. In other words, he must strive after likeness to God as He reveals himself in his Reason or in Christ. Clement thus looks entirely at the enlightened moral elevation to which Christianity raises man. He believed that Christ instructed men before He came into the world, and he therefore viewed heathenism with kindly eye. He was also favourable to the pursuit of all kinds of knowledge. Jl enlightenment tended to lead up to the truths of Christianity, and hence knowledge of every kind not evil was its handmaid. Clement had at the same time a strong belief in evolution or development. The world went through various stages in preparation for Christianity. The man goes through various stages, before he can reach Christian perfection. And Clement conceived that this development took place not merely in this life, but in the future through successive grades. The Jew and the heathen liad the gospel preached to them in the world below by Christ and His apostles, and Christians will have to pass through processes of purification and trial after death before they reach perfect knowledge and perfect bliss.

The beliefs of Clement have caused considerable difference of opinion among modern scholars. He sought the truth from whatever quarter he could get it, believing that all that is good comes from God, wherever it be found. He belongs, therefore, to no school of philosophers. Some have insisted that he was an eclectic. Daehne has tried to show that he was Neo-Platonic, and Reinkens has main- tained that he was essentially Aristotelian. His mode of viewing Christianity does not fit into any classification. It is the result of the period in which he lived, of his wide cul- ture and the simplicity and noble purity of his character.

It is needless to say that his books well deserve study ; but the study is not smoothed by beauty of style. Clement despised ornament. He wished to avoid everything that might seem to deceive. He thought also that it was quite possible to throw pearls before swine, and that care should be taken to prevent this by digressions and difficulties which only the earnest student

would encounter. He is singularly simple in his character. In discussing marriage he refuses to use any but the plainest language. A euphemism is with him a falsehood. But he is temperate in his opinions ; and the practical advices in the second and third books of the Pewedagogue are remarkably sound and moderate. He is not always very critical, and he is passionately fond of allegorical interpretation ; but these were the faults of his age.

All early writers speak of Clement in the highest terms of laudation, and he certainly ought to have been a saint in any Church that reveres saints. But Clement is not a saint in the Roman Church. He was a saint up till the time of Benedict XIV., who read Photius on Clement, believed him, and struck the Alexandrian's name out of the calendar. The Pope was unquestionably wrong; and many Roman Catholic writers, though they yield a practical obedience, have adduced good reason why the decision of the Pope should be reversed (Cognat, p. 451).

The editions of Clement's works are by (1) Petrus Victorius, 1550; (2) Sylburg, 1592; (3) Heinsius, 1616 ; (4) Fronto Ducaens, 1629, 1641, 1688; (5) Potter, London, 1715 (this was by far the best. edition, and has formed the basis of subsequent editions ; it was reprinted at Venice, 1757, and in Gallandi's Bibliotheca, in Oberthiir, and in Migne's Cursus Patrologice Greece); (6) Klotz, Leipsic, 1831; (7) W. Dindorf, Oxford, 1869. There are separate editions of Quis dives salvetur by Ghislar, Combefisius, Fell, Ittig, Segaar, and Lindner.

The writings that discuss Clement are very numerous. Notice is taken of him by ecclesiastical historians, and by the historians of Christian literature,'among whom Lumper, Permaneder, and Konto- gones deserve special mention.

There are monographs on Clement | and his doctrine by J. and F. Tribbechovius, Bielcke, Gucrike, |

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Hofstede de Groot, Daehne, Lentzen, Reinkens, Reuter, Laemmer, Duperron, Cognat, Lipsius, Miller, and Freppel, by Miss Corn- wallis inher Small Books on Great Subjects, No. vii., and by Bishop Kaye. Clement's

works have been translated in Clark’s Ante-Nicene Christian Library, by the Rev. W. Wilson. (J. D.)

CLEMENT, the name borne by fourteen Popes.

Crement J. (Clemens Romanus). See Apostolic FATHERS, vol. il. p. 195.

CremenT II. (Suidger, a Saxon, bishop of Bamberg) was chancellor to the Emperor Henry III., to whom he was indebted for his elevation to the Papacy upon the abdication of Gregory VI. (December 1046). His short pontificate was only signalized by the convocation of a council in which decrees were enacted against simony. He died in October 1047, and was interred at Bamberg.

Ciement IIT. (Paulino Scolari, bishop of Preeneste) was elected Pope in December 1187, and died in March 1191. He succeeded shortly after his accession in allaying the discords which had prevailed for half a century between the Popes and the citizens of Rome, in virtue of an agree- ment by which the latter were allowed to elect their magistrates, while the nomination of the governor of the city remained in the hands of the Pope. He incited Henry II. of England and Philip Augustus to undertake the third crusade, and introduced several minor reforms in ecclesiastical matters.

Crement IV. (Gui Foulques, archbishop of Narbonne) was elected Pope in February 1265. Before taking orders he had been successively a soldier and a lawyer, and in the latter capacity had acted as secretary to Louis IX. of France, to whose influence he was chiefly indebted for his elevation. At this time the Holy See was engaged in a conflict with Manfred, the usurper of Naples; and Clement, whose elec- tion had taken place in his absence, was compelled to repair to Italy in disguise. He immediately took steps to ally himself with Charles of Anjou, the French pretender to the Neapolitan throne, who marched into Naples, and having defeated and slain Manfred in the great battle of Benevento, established himself firmly in the kingdom. Clement is said to have disapproved of the cruelties committed by Charles, and there seems no foundation for the charge of his having advised the latter to execute the unfortunate Conradin, the last of the church’s hereditary antagonists of the house of Hohenstaufen. His private character was unexceptionable, and he is especially commended for his indisposition

to promote and enrich his own relatives. He also did himself great honour by his encouragement and protection of Roger Bacon. He died in November 1268, and was buried at Viterbo, where he had resided throughout his pontificate.

CLEMENT V. (Bertrand de Goth, archbishop of Bordeaux) is memorable in history for his suppression of the order of the Templars, and as the Pope:who removed the seat of the Roinan see to Avignon. He was elected in June 1305, after a year's interregnum occasioned by the disputes between the French and Italian cardinals, who were nearly equally balanced in the conclave. According to Villani he had bound himself to subserviency towards the French monarch by a formal agreement previous to his elevation ; however this may be, it is unquestionable that he conducted himself throughout his pontificate as the mere tool of that monarch. His first act was to create nine French cardinals. The removal of the seat of the Papacy to Avignon (1308) might seem palliated by the factious and tumultuary con- dition of Rome at the period, but it proved the precursor of a long " Babylonish captivity," in Petrarch's phrase, and marks the point from which the decay of the strictly Catholic conception of the Pope as universal bishop is to be dated. The guilt or innocence of the Templars is one of the most difficult of historical problems, the discussion of which belongs, however, to the history of the order,

Clement may have acted conscientiously in his suppression of an order which had heretofore been regarded as a main bulwark of Christianity, but there=can be little doubt that his principal motive was complaisance towards the king of Frauce, or that the latter was mainly actuated by jealousy and cupidity. Clement's pontificate was also disastrous for Italy. The Emperor Henry VII. entered the country, established the Visconti in Milan, and was crowned by Clement's legates in Rome, but was unable to maintain himself there, and died suddenly, leaving great part of Italy in a condition of complete anarchy. The dissensions of the Roman barons reached their height, and the Lateran palace was destroyed in aconflagration. Other remarkable incidents of Clement's reign are his sanguinary repres- sion of the heresy of Fra Dolcino in Lombardy and his

promulgation of tlle Clementine Constitutions in 1313. He died, leaving an inauspicious character for nepotism, avarice, and cunning, in April 1314. He was the first Pope who assumed the triple crown.

CLEMENT VI. (Pierre Roger, archbishop of Rouen), the fourth of the Avignon popes, was elected in May 1342. Like his immediate predecessors, he was devoted to France, and he further evinced his French sympathies by refusing a solemn invitation to return to Rome, and by purchasing the sovereignty of Avignon from Joanna, queen of Naples, for 80,000 crowns. The mouey was never paid, but Clement may have deemed that he gave the queen a full equivalent by absolving her from the murder of her husband. The other chief incidents of his pontificate were his disputes with Edward IIL. of England on account of the latter's encroachments on ecclesiastical jurisdiction, his excommunication of the Emperor Louis of Bavaria, his negotiations for reunion with the Eastern Church, and the commencement of Rienzi's agitation at Rome. He died in December 1352, leaving the reputation of "a fine gentleman, a prince munificent to profusion, a patron of the arts and learning, but no saint" (Gregor- ovius ; see also Gibbon, chap. 66).

CremeEnt VII. (Giulio de' Medici), the most unfortunate of the Popes, was the son of Giuliano de' Medici, assassinated in the conspiracy of the Pazzi, and consequently nephew of Lorenzo the Magnificent and cousin of Pope Leo X. Upon the latter's accession to the Papacy, Giulio became his principal minister and confidant, especially in the mainten- ance of the Medici interest at Florence. At Leo's death, Cardinal Medici, though unable to gain the Papacy for himself or his ally Farnese, took a leading part in deternining the unexpected election of Adrian V., to whom he succeeded in the next conclave (November 1523). He brought to the Papal throne a high reputa- tion for political ability, and possessed in fact all the accomplishments of a wily diplomatist, but the circum- stances of the times required a man of far different mould. His worldliness and lack of insight into the tendencies of his age disqualified him from comprehending the great religious movement which then convulsed the church ; while his timidity and indecision no less disabled him from following a consistent policy in secular affairs. At first attached tothe imperial interest, he was terrified by the overwhelming success of the emperor in the battle of Pavia

intojoining the other Italian princes in a league with France. This policy in itself was sound and patriotic, but Clement's zeal soon cooled ; by his want of foresight and unseasonakle economy he laid himself open to an attack from the turbu- lent Roman barons which obliged him to invoke the media- tion of the emperor. When this danger seemed over he veered back to his former engagements, and ended by drawing down upon himself the host of the imperialist general, the Constable Bourbon, who, compelled to satisfy his clamorous mercenaries by pillage, embraced the

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opportunity of leading them against Rome. The city was assaulted and sacked on May 5, 1527, and Clement, who had displayed no more resolution in his military than in his political conduct, was shortly afterwards obliged to surrender himself together with the castle of St Angelo, where he had taken refuge. After six months' captivity he was released upon very onerous conditions, and for some years subse- quently followed a policy of subserviency to the emperor, endeavouring on the one hand to induce him to act with severity against the Lutherans in Germany, and on the other to elude his demands for a general council. One momentous consequence of this dependence on Charles V. was the breach with England occasioned by Clement's refusal, justifiable in point of principle, but dictated by no higher motive than his fear of offending the emperor, to sauction Henry VIII.'s divorce from Catherine of Aragon. Towards the end of his reign Clement once more gave indications cf a leaning towards a French alliance, which was prevented by his death in September 1534. As a man he possessed few virtues and few vices; as a pontiff he did nothing to disgrace the church and nothing to restore its lustre ; his adroitness and dexterity as a statesman were counteracted by his suspicion and _ irresolution ; his adininistration affords a proof that at eventful crises of the world's history mediocrity of character is more disastrous than mediocrity of talent.

CueMENT VIII. (Ippolito Aldobrandini) was elected in January 1592. The most remarkable event of his reign was the reconciliation to the church of Henry IV. of France after long negotiations carried on with great dexterity

by Cardinal D'Ossat. Europe is principally indebted to this Pope for the peace of Vervins (1598), which put an end to the long contest between France and Spain. Clement also annexed Ferrara to the States of the Church upon the failure of the line of Este, the last addition of importance to the Pope's temporal dominions. The execution of Giordano Bruno, February 17, 1600, is a blot upon an otherwise exemplary pontificate. Clement was an able ruler and a sagacious statesman, the general object of whose policy was to free the Papacy from its undue dependence upon Spain. The conferences to determine the questions of grace and free will, controverted between the Jesuits and Dominicans, were commenced under him, but he wisely abstained from pronouncing a decision. He died in March 1605, leaving a high character for prudence, munificence, and capacity for business. His reign is especially distinguished by the number and beauty of his medals.

CremENT IX. (Giulio Rospigliosi) was elected Pope in June 1667. Nothing remarkable occurred under his short administration beyond the temporary adjustment of the disputes between the Roman see and those prelates of the Gallican church who had refused to join in condemning the writings of Jansenius. He died in December 1669,

CLEMENT X. (Emilio Altieri) was elected in April 1670, at the age of eighty. His years and infirmities led him to devolve the charge of the government upon his nephew, Cardinal Altieri, whose interference with the privileges of ambassadors occasioned disputes in which the Pope was obliged to yield. Little else of importance occurred during his reign, which terminated in July 1676.

CLEMENT XI. (Giovanni Francesco Albani) was elevated to the pontificate in November 1700, and died in March 1721. The most memorable transaction of his adminis- tration was the publication in 1713 of the bull Unigenitus, which so greatly disturbed the peace of the Gallican church. By this famous document 101 propositions extracted from the works of Quesnel were condemned as heretical, and as identical with propositions already condemned in the writings of Jansenius. The resistance of many French ecclesiastics and the refusal of the French parliaments to

register the bull led to controversies extending through the greater part of the 18th century. Another important decision of this Pope's was that by which the Jesuit missionaries were forbidden to take a part in idolatrous worship, and to accommodate Christian language ta pagan ideas under plea of conciliating the heathen. The political troubles of the time greatly embarrassed Clement's relations with the leading Catholic powers, and the moral prestige of the Holy See suffered much from his compulsory recognition af the Archduke Charles of Austria as king of Spain. His private character was irreproachable ; he was also an accomplished scholar, and a patron of letters and science.

CLEMENT XII. (Lorenzo Corsini) was Pope from July 1730 to February 1740. His first act was the trial and condemnation of Cardinal Coscia, guilty of malvergation under hig predecessor. Nothing else of importance occurred under his administration, during the greater part of which, according to some historians, he was afflicted with blindness. He was the first pontiff who condemned the Freemasons.

CLEMENT XIII. (Carlo Rezzonico, bishop of Padua) was lected in July 1758. Notwithstanding the meekness and affability of his character, his pontificate was disturbed by perpetual contentions respecting the investiture of Parma, and subsequently by the demands of France, Spain, and Portugal for the suppression of the Jesuits, Clement warmly espoused the cause of the order in an apostolical brief issued in 1765. The pressure put upon him by the Catholic powers, however, was so strong that he seemed about to give way, when, having convoked a consistory to veceive his decision, he died suddenly, February 3, 1769, not without suspicion of poison.

CLEMENT XIV. (Giovanni Vincenzo Antonio Ganganelh), the best and most calumniated of the popes, was born in 1705, and was originally a Franciscan mouk. Having acquired a'"great reputation as a preacher, he became the friend and confidant of Pope Benedict XIV., and was created a cardinal by his successor. He was elected Pope on May 19, 1769, after a conclave extremely agitated by the intrigues and pretensions of the Catholic sovereigns, who were resolved to exclude every candidate favourable to the Jesuits. Theiner has satisfactorily vindicated Ganganelli from the charge of having givena formal pledge on this subject, He may probably have leant to

the views of the Catholic powers, but if so his motive was widely different from the subservience which had induced his predecessor Clement V. to gratify Philip the Fair by the suppression of the Templars. The breach between the temporal and the spiritual authorities had become threaten- ing, and the guiding principle of Clement's policy was undoubtedly the reconciliation of the European sovereigns, whose alienation threatened to produce the results which we have seen accomplished in our own times. By yielding the Papal pretensions to Parma, he obtained the restitution of Avignon and Benevento, and in general he succeeded in placing the relations of the spiritual and the temporal! wuthorities on a satisfactory footing. Whether from scruple gr policy he proceeded with great circumspection in the suppression of the Jesuits, the decree to this effect not being framed until November 1772, and not signed until July in the following year. This memorable measure, which takes rank in history as the most remarkable, perhaps the guly really substantial, concession ever made by a Pope to the spirit of his age, has covered Clement's memory with obloquy in his own communion. There cannot be any reasonable doubt of the integrity of his conduct, and the vuly question is whether he acted from a conviction of the pernicious character of the Society of Jesus, or merely from asense of expediency. In either case his action wa3 abundantly justified, ard to allege that though beneficial to the world it was detrimental to the church is merely to

insist that the interests of the Papacy are not the interests of mankind. His work was hardly accomplished ere Clement, whose natural constitution was exceedingly vigorous, fell into a languishing sickness, generally and plausibly attributed to poison. Na conclugive evidence of this, however, has been produced; and it is but just to remark that poison would more probably have been administered before the obnoxious measure had been taken than when it was already beyond recall. Clement expired on September 22, 1774, execrated by the Ultramontane party, but regretted by his subjects for his excellent temporal administration. No Pope has better merited the title of a virtuous man, or has given a more perfect example of integrity, unselfishness, and aversion to nepotism. Notwithstanding his monastic education, he approved himself a statesman, a scholar, an amateur of

physical science, and an accomplished man of the world. As Leo X. indicates the manner in which the Fapacy might have been reconciled with the Renaissance had the Reformation never taken place, so Ganganelli exemplifies the type of Pope which the modern world might have learned to accept if the movement towards free thought could, as Voltaire wished, have been confined to the aristocracy of intellect. In both cases the requisite coudition was unattainable ; neither in the 16th nor in the 18th century has it been practicable to set bounds to the spirit of inquiry otherwise than by fire and sword, and Ganganelli's successors have been driven into assuming a position analogous to that of Paul IV. and Pius V. in the age of the Reformation. The estrangement between the secular and the spiritual authority which Ganganelli strove to avert is now irreparable, and his pontificate remains an exceptional episode in the general history of the Papacy, and a proof how little the logical sequence of events can be modified by the virtues and abilities of an individual. The history of Clement's administration has been written in a spirit of the most violent detraction by Cretineau- Joly, and perhaps too unreservedly in the opposite spirit by Father Theiner, the custodian of the archives of the Vatican. Theiner calls attention to the disappearance of many documents which have apparently been abstracted by Clement's enemies. Ganganelli's familiar correspondence has been frequently reprinted and is much admired for its elegance and urbanity. (R. G.)

CLEMENT, Frangois (1714—1793), a French historian, was born at Brézé, near Dijon, and was educated at the Jesuit College at Dijon. At the age of seventeen he entered the society of the Benedictines at Saint Maur, and worked with such intense application that at the age of twenty-five he was obliged to take a protracted rest. He now resided in Paris, where he wrote the 11th and 12th vols. of the Historre littéraire de la Lrance. Clément also revised the Art de vérifier les dates (1783-92). The king appointed him on the committee which was engaged in publishing maps, acts, and other documents connected with French history, and the Academy of Subscriptions chose him asa member. He was engaged in preparing another edition of the Art de vérifier les dates, which was to include the period before the Christian era, when he died suddenly of apoplexy at the age of sixty-nine. (The work was afterwards brought down from 1770 to 1827 by De Courcelles and D'Urban.)

CLEMENTI, Muzio (1752-1832), an Italian pianist and composer, was born at Rome in 1752. His father, a jeweller, encouraged his son's musical talent, which was evinced at a very carly age. Buroni and Cordicelli were his first masters, and at the age of nine Clementi's theoretical and practical studies had advanced to such a degree that he was able to compete successfully for the position of organist ata church. He continued his contrapuntal studies

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under Carpini, and at the age of fourteen wrote a mass which was performed in public and excited universal admira- tion. About this time Beckford, the author of Vathek, per- suaded Clementi to follow him to England, where the young composer lived in retirement at one of the country seats of his protector in Dorsetshire up to 1770. In that year he first appeared in London, where his success both as a com- poser and pianist was rapid and brilliant. In 1777 he was tor some time employed as conductor of the Italian opera, but he soon afterwards left London for Paris. Here also his concerts were crowded by enthusiastic audiences, and the same success accompanied Clementi on an artistic tour to Southern Germany and Austria which he undertook about 1780. At Vienna he was received with high honour by the Emperor Joseph IJ., in whose presence he met Mozart, and sustained a kind of musical duel with him. His technical skill proved to be equal if not, superior to that of his great rival, who on the other hand infinitely surpassed him by the passionate beauty of his rendering. Such seems to have been the opinion of most of the witnesses of this remarkable meeting, and it is confirmed to some extent by the two musicians themselves. Apropos of the connec- tion of these great men the fact may be mentioned that one of the finest of Clementi's sonatas, that in B flat, shows an exactly identical opening theme with Mozart's overture to the Flauto Magico, also that at the concert given by the Philharmonic Society incommemorationof Clementi's death, the German composer's Jecordare was the chief item of the programme. Soon after his meeting with Mozart, Clementi returned to London, where he continued for the next twelve years his lucrative occupations of fashionable teacher and performer at the concerts of the aristocracy. Healso started a pianoforte manufacturing firm

of his own, and the commercial shrewdness characteristic of his nation greatly contributed to the lasting success of the business. Amongst his pupils on the pianoforte during this period may be mentioned John Field, the composer of the celebrated Nocturnes. In his company Clementi paid, in 1804, a prolonged visit to the large cities of tne Continent, including Paris, Vienna, St Petersburg, and Berlin. At the Prussian capital he made a prolonged stay, and there counted Meyerbeer among his pupils. He also revisited his own country after an absence of more than thirty years. In 1810 Clementi returned to London, but refused to play again in public, devoting the remainder of his life to composition, Several symphonies belong to this time, and were played with much success at contemporary concerts, but none of them seem to have been published. Lis intellectual and musical faculties remained unimpaired up to his death, which took place at Evesham, Worcester- shire, March 9, 1832. Clementi has been called the ‘‘ father of pianoforte playing,” and it cannot be denied that the modem style of execution owes a great deal to his teaching and example. His technique is described as all but unequalled at his time, and remarkable even according to our present advanced notions. Moscheles, a pianist of a very different school, gives a vivid description of the effect produced by Clementi’s playing. Ata dinner given in his honour in 1828 the composer was induced to play once more to a larger audience. “ Smart, Cramer (another of Clementi’s pupils), and I,” Moscheles writes in his diary, “conducted him to the piano. Every one’s expectation is raised to the utmost pitch, for Clementi has not been heard for years. He improvises on a theme of Handel and carries us all away to the highest enthusiasm. His eyes shine with the fire of youth, those of his hearers grow humid….. Clementi’s playing in his youth was marked by a most beautiful legato, a supple touch in lively passages, and a most unfailing technique. The remains of these qualities could still be discovered and admired, but

the most charming things were the turns of his improvisa- tion full of youthful genius.” Amongst his compositions the most remarkable are 60 sonatas for pianoforte, and the great collection of Htudes called Gradus ad

Parnassum. As a work of instruction combining absolute artistic beauty with the highest usefulness for the purposes of teaching and self-practice the Gradus remains unrivalled.

CLEOBULUS, one of the Seven Sages, was son of Evagoras, and a native of Lindus, which town he ruled, though whether as monarch or as head of a republic is uncertain, He was distinguished for his strength and his handsome person, for the wisdom of his sayings, the acuteness of his riddles, and the beauty of his lyric poetry. Diogenes Laertius quotes a letter in which Cleobulus invites Solon to take refuge with him against Pisistratus ; and this would imply that he was alive in 560 B.c. He is said to have held advanced views as to female education, and he was the father of the wise Cleobuline, whose riddles were not less famous than his own.

CLEOMENES (K)ecopeévys), the name of three kings of Sparta, the 16th, 25th, and 31st of the Agid line. The second of these does not call for particular notice.

CLEoMENEs I. succeeded as one of the two joint kings about 519 Bc. He led a Spartan force to Atheng in 510 to aid the Alemzeonids and their followers in the expulsion of Hippias. He was called in subsequently to support the oligarchical party there, headed by Isagoras, against the party of Clisthenes. He forcibly expelled from the city, on a technical charge of pollution, no less than 7000 families, and established an entirely new constitution, transferring the government from the old senate to 300 of the oligarchical party. Eventually, however, he and his small force were blockaded by their opponents in the Acropolis, and forced to capitulate and to quit the city. On his return home he at once raised a force. of Spartans and allies in order to avenge his failure, and to establish a despotism at Athens in the person of Isagoras. But when the expedition had reached Eleusis on its march, not only some of thesubject-allies but also his brother-king Demaratus (of the Proclid junior branch) refused to proceed further, and he had to’return without effecting his object. When the Ionian colonies revolted from Persia, in 500, their leader Aristagoras came to seek aid from Sparta. Cleonienes was at first inclined to entertain the tempting offers of Asiatic conquest which the Ionian, in his eagerness to secure the alliauce, laid before him. But when Aristagoras, in reply to his questions, was forced

to confess that Susa, the Persian capital, was no less than three months' journey inland from the sea, the king was startled, and bade his visitor quit Sparta before sunset. The Ionian then tried to bribe him ; and ag his offers mounted higher and higher, his little daughter Gorgo, some eight or nine years old (afterwards the wife of Leonidas) said, "Father, go away, or the stranger will corrupt you." Such at least is the story told by Herodotus, though Grote doubts its authenticity.

During a local war between Sparta and Argos, Cleomenes by a stratagem defeated the Argive forces near Tiryns. Those who escaped from the battle took refuge in a consecrated grove, which was set on fire by order of Cleomenes, and no less than 6000 men, the flower. of the Argive citizens, are said either to have been killed in the battle, or to have perished in the flames,—a loss from which Argos was very long in recovering. For some reason he did not pursue his victory, but'returned at once to Sparta, to the great dissatisfaction of his own people. One legend relates that the city of Argos was successfully defended against him by its women.

When Darius (491) sent heralds to demand the sub- mission of all the Greeks, and the inhabitants of Aigina

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had consented to give the tributary " earth and water," Cleomenes proceeded to the island to punish its treachery to the national cause. His fellow-king Demaratus, who was always jealous of him, privately encouraged the Aigine- tans in their resistance, and the feud between the two became so bitter, that Cleomenes brought up an old charge of illegitimacy against his colleague, and succeeded in driving him into exile. Retributive fate very soon overtook himself; he was convicted of having procured the deposi- tion of Demaratus by tampering with the priestess of the Delphian oracle, and had to retire for safety into Thessaly, and thence into Arcadia. There he endeavonred to raise war against his countrymen, who in their alarm were weak enough to recall him. His renewed reign was not long, Tle soon after showed symptoms of madness, attacking violently with his staff those who came to him for'audience. Some attributed this derangement to a habit of hard drinking which had grown upon him ; others saw in it the just punishment of his impiety, both in his intrigues with the

oracle at Delphi, and in the burning of the sacred grove at Argos and the massacre of those who had taken sanctuary there. At length he had to be placed in close confinement, when he persuaded the slave who had charge of him to bring him a knife, with which he deliberately slashed him- self to pieces.

Creomenes IIL, the last of the Agid line, succeeded |

240 3B.c.,—a king of strong and determined character, who wished to restore at Sparta the old constitution and discipline of Lycurgus, and to destroy the Achzean League. He met Aristomachus, the "' captain" of the League, with a force of 5000 men against 25,000 at Palantium, but the Achzeans, even with this advantage, declined the engagement. The next year he defcated them in a great battle at the foot of Mount Lyceum. He found active opponents at Sparta in the Ephors, whose anomalous authority he held to have been gradually usurped in derogation of the royal prerogative, affecting dangerously the independence of the kings, and which it was therefore his great object to crush. He succeeded in this at last by an unscrupulous coup d@état, surrounding the hall in which the Ephors were feasting with a body of armed mercenaries, and slaughtering them on the spot. He met with no resist- ance from the panic-stricken citizens, and at once proceeded to inaugurate his new constitution, abolishing the Ephorate entirely, restoring the old prerogatives of the kings, and amongst other reforms making a re-distribution of lands, and extending the franchise.

He had still to contend with the Achzean League for the supremacy of Greece. In the war which ensued he was finally defeated by Antigonus of Macedonia, who had become virtually the master of the League, in the battle of Sellasia (222), when the death-blow was given to the independence of Sparta. Cleomenes took refuge in Egypt with Ptolemy Euergetes, who received bim kindly. But the succeeding Ptolemy neglected and even imprisoned him. He escaped and attempted to head an insurrection against the king, failing in which, he committed suicide.

CLEON (K2éwv), one of those popular leaders who rose to great temporary influence at Athens during the Pelopon- nesian War, and especially after the death of Pericles. He was emphatically a man of the people, sprung from their own ranks, his father Cleenetus having been a tanner or leather-

dresser. He possessed considerable ability and was a powerful public speaker, though coarse and violent in manner and language. At first he seems to have formed one of the large party at Athens who protested against the policy of the war, and on that ground became a bitter op- ponent of Pericles. But his views must afterwards have changed, since we find him repeatedly urging active warlike nleasures in opposition to the peace party of which Nicias

and others were the representatives. He was at the height of his political influence when in 427 B.c. the revolted citizens of Mitylene, after a long sicge, submitted to the Athenian forces, and the question of their punishment was discussed in a public assembly. Cleon proposed and carried, though against strong opposition, the terrible decree that all the males who were able to bear arms (Grote estimates them at as many as 6000) should be put to death, and the women and children sold for slaves. However, in a second assembly held next day, the decree was rescinded in spite of Cleon's remonstrances. A vessel hastily despatched was barely in time to stay its execution. Even as it was, a thousand of those who were considered the ringleaders of the revolt were put to death. But it was perhaps fortunate for Cleou's future influence with the Athenian commons that he had not to bear the odium of a cruelty which they might have bitterly repented. He was hated at all times by the aristocracy of Athens, and on one occasion they succeeded in convicting him of something like extortion of money from certain of the islanders who were subject to the Athenian rule. In 425, the seventh year of the war, he achieved his greatest military and political triumph. The Athenians had succeeded in eutting off from their ships and supplies a strong detach-

| ment of Lacedemonian infantry, and blockading them in

the small island of Sphacteria, off Pylos (the modern Navarino). At first it seemed that they must speedily surrender; Cleon persuaded the Athenians to dictate, as the price of their release, hard conditions of peace, which the Lacedzemonians rejected. Time wore on, and the Lacedzemonians still held out, while the blockade was maintained with great difficulty and hardship. Then Cleon came forward, and publicly declared that if he were genéral, he

would undertake to bring the men who were on the island prisoners to Athens, dead or alive, within twenty days. Nicias, who at that time held the command-in-chief, anxious probably to discredit a political opponent, offercd to take him at his word, and make over to him the command at Pylos. Cleon's own party were loud in their encourage- ments; and willingly or unwillingly, after obtaining a strong reinforcement of troops, and getting Demosthenes, an able general then employed on the station, joined with hira in the command, he set out for the scene of operations. The historian Thucydides calls his boast "insane," but admits that he fulfilled it. Within the days named he landed on the island of Sphacteria, compelled the Lacedzemonian force there, after great loss, to surrender at discretion, and brought 300 prisoners to Athens. It is very probable that much of the credit was due to the skilful dispositions of Demosthenes, his colleague in command of the forces; but nevertheless, the man who dared and succeeded where others had so long failed must have had a well-grounded confidence in his own energy and resources. He did not long enjoy his new glories. Two years after- wards he was sent to act against Brasidas, the Lacedemonian commander in Thrace, and to attempt the reconquest of Amphipolis. At first he was successful ; he took Torone, and made an advance upon Amphipolis; but a sudden sally of Brasidas from the town utterly routed the Athenian forces, and Cleon fell there with half his men. Brasidas was at the same time mortally wounded,

We have to judge of the character and conduct of Cleon almost entirely from the history of Thucydides and the satiric comedies of Aristophanes. But the historian, even if his judgment were not warped by the fact asserted by some writers, that Cleon had been instrumental in procuring his disgrace and banishment whilst holding a military command, had at any rate strong oligarchical prejudices, and regarded him as a restless and dangerous agitator. If we might trust the picture given of him by Aristophanes

in his comedy of The Knights, he is the unscrupulous and shifty demagogue, always by lies and cajolery pandering to the worst passions of his master, the populace, filching from other men their glory, and resisting

all the efforts of the peace party for his own selfish ends. But, besides. the general mark which all public characters presented to the licence of the satirist, he had in this case his own private grudge against Cleon, who had laid a complaint before the Athenian senate that in his comedy called The Babylonians he had held up to ridicule the policy and institutions of his country before the eyes of foreigners, and this in the midst of a great national war. With all his real faults, it is likely that Cleon has had less than justice done to him in such portraits of him as have come down to us. (w.L. a)

CLEOPATRA (KXeordrpa), the name of several Egyp- tian princesses of the house of the Ptolemies. The best known was the daughter of Ptolemy Auletes, born 69 B.c. Her father left her, at the age of seventeen, heir to his king- dom jointly with her younger brother Ptolemy, whose wife, in accordance with Egyptian custom, she was to become. A few years afterwards her brother, or rather her guar- dians, deprived her of all royal authority. She withdrew into Syria, and there made preparation to recover her rights by force of arms. It was at this juncture that Julius Cesar followed Pompey into Egypt, resolved to settle there, if possible, the existing dispute as to the throne. The personal fascinations of Cleopatra, which she was not slow in bringing to bear upon him, soon won him entirely to her side ; and as Ptolemy and his advisers still refused to admit her to a share in the kingdom, Cxsar undertook a war on her behalf, in which Ptolemy lost his life, and she was replaced on the throne in conjunction with a younger brother, to whom she was also contracted in marriage. Her relations with Cesar were matter of public notoriety, and soon after his return to Rome she joined him there, in company with her boy-huskand (of whom, however, she soon rid herself by poison), but living openly with her Roman lover, somewhat to the scandal of his fellow-citizens. After Cesar’s assassination, aware of her unpopularity, she returned at once to her native country. But subsequently, during the civil troubles at Rome, she took the part of Antony, on whom she is said to have already made some impression in her earlier years, when he was campaigning in Egypt. When he was in Cilicia, she made a purpose journey to visit him, sailing up the Cydnus in a gorge- ously-decked galley, arrayed in all the attractive splendour which Eastern magnificence could bring in aid of her personal charms. Antony became from that time forth her infatuated slave, followed lier to Egypt, and lived

with her there for some time in the most profuse and wanton luxury. They called themselves “ Osiris ” and “ Isis,” and claimed to be regarded as divinities. His marriage with Octavia broke this connection for a while, but it was soon renewed, and Cleopatra assisted him in his future campaigns both with money and supplies. This infatuation of his rival with a personage already so unpopular at Rome as Cleopatra, was taken advantage of by Octavianus Cxsar (Augustus), who declared war against her personally. In the famous sea- fight at Actium, between the fleets of Octavianus and Antony, Cleopatra, who had accompanied him into action with an Egyptian squadron, took to flight while the issue was yet doubtful, and though hotly pursued by the enemy succeeded in escaping to Alexandria, where she was soon joined by her devoted lover. When the cause of Antony was irretrievably ruined, and all her attempts to strengthen herself against the Roman conqueror by means of foreign alliances had failed, she made overtures of submission. Octavianus suggested to her, as a way to his favour, the assassination of his enemy Antony. She seems to have entertained the base proposal »—enticing him to join her in

a mausoleum which she had built, in order that “ they might die together,” and where he fulfilled his part of the compact by committing suicide, in the belief that she had already done so. Thecharms which had succeeded so easily with Julius and with Antony failed to move the younger Cesar, though he at once granted her an interview; and rather than submit to be carried by him as a prisoner to Rome, she put an end to her life—by applying an asp to her bosom, according to the common version of the story —- in the thirty-ninth year of her age. With-her ended the dyuasty of the Ptolemies in Egypt. Besides her remark- able charms of person, she had very considerable abilities, and unusual literary tastes. She is said to have been able to converse in seven languages. She had three children by Antony, and, as some say, a son, called Cxesarion, by Julius Ceesar. (av. L. 0.)

CLEPSYDRA (from xhérrewv, to steal, and dup, water), the chronometer of the Greeks and Romans, which measured time by the flow of water. In its simplest form it was a short-necked globe of known capacity, pierced at the

bottom with several small holes, through which the water placed in it escaped or stole away. The instrument was employed to set a limit to the speeches in courts of justice, hence the phrases aguam dare, to give the advocates speaking time, and aquam perdere, to waste time ; it was also very generally used instead of the sun-dial. Its defects were—first, that the flow of water varied with the temperature and pressure of the air, and secondly, that the rate of flow became less as the vessel emptied itself. The latter was remedied by keeping the level of the water in the clepsydra uniform, the volume of that discharged being noted. Inthe clepsydra or hydraulic clock of Ctesibius of Alexandria, made about 135 8.c., the movement of water- wheels caused the gradual rise of a little figure, which pointed out the hours on an index attached to the machine. The rate of the flow of water through an orifice being proportional to the square of the vertical distance of its upper surface from the orifice, a clepsydra of simple construction can be formed by making in the bottom of a glass cylinder an opening through which its contents can escape in twelve hours, and graduating the vessel into 144 (= 12°) equal parts. A mark made at division 121 (= Tie) from the bottom indicates the quantity of water remaining at the end of the first hour, and in like manner the squares of 10, 9, 8, and the lower numbers give the divisions to which the level of the water descends at the end of the second, third, fourth, and succeeding hours,

CLERC, Lz. See Lrererc.

CLERGY, a collective term signifying the body of “clerks,” that is, in English, men in holy orders, Clericus, however, has, both itself and its equivalents in the languages of the Catholic countries of the Continent, a wider ecclesiastical signification; while in England a use of the word, originally abusive, but now so entirely accepted as to constitute a proper secondary meaning of the term, comprises in the class of persons signified by it

fall those employed in duties the discharge of which

demands the acquirements of reading and writing, which were originally supposed to be the exclusive qualification of the clergy.

The word is derived from the Greek x)jjpos, which signi- fies a lot; but the authorities are by no means agreed in which sense the root is connected with the sense of the derivative, some conceiving that the original idea was that the clergy received the service of God as their lot or portion; others that they were tlie portion of the Lord ; and others again, with, as Bingham (Orig. Kcel., lib. i. cap. 5, sec. 9) seems to think, more reason, maintain that the word has reference to the choosing by lot, as was the case in early ages, of those to whom public offices were to be entrusted,

In the primitive times of the church the term canon was uscd as synonymous with clerk, from the names of all the persons in the service of any church having been in- scribed on a roll or xavdéy, whence they were termed canonter, a fact which shows that the practice of the Roman Catholic Church in modern times of including all persons of. all ranks in the service of the church, ordained or unordained, in the term clerks, or clergy, is at least in conformity with the practice of antiquity. The Roman hierarchy now reckons four grades of clerks :—Ist, those who are merely tonsured as a sign of the ecclesiastical destination, but have received no orders of any kind ; 2d, those who have received any of the four minor orders, as hostvari, readers, exor- cists, or acolytes; 3d, those who have received orders as subdeacons, deacons, or priests ; 4th, those who have been consecrated to bishoprics, archbishoprics, or other of the higher dignities of the church. Monks, whether eremitic or coeuobite, have not at any time formed as such any part of the body of the clergy. But it would seem that in the earliest ages of the church they were not deemed even eligible to the priesthood, inasmuch as it is said that St Siricius, who became Pope in the year 384, first permitted them to receive priests' orders. And we read in the epistles of St Ambrose that monks began to be ordained priests to- wards the end of the 4th century,—St Athanasius having been the first who ordained monks to the church of Alex- andria, in which course he was imitated in the West by St Eusebius, bishop of Vercelli.

At a very early period the church began to find the necessity of taking measures to stem the evil arising fromthe numbers of persons who embraced an ecclesiastical career from improper motives, and often without

any intention of performing any of the duties of it. Of course the same evil has vexed the church in every age. From the first moment in which she became rich, worldly men were, and have alway been, found eager to share her riches without sharing her work. But in the early times, even while she was poor, the state of society was such that many unworthy iaotives operated to induce men who neither had nor fancied themselves to have any call to the priesthood, to seek its immunities. Not only was an ecclesiastical career the only one which offered to the studious or the lazy man any hopes of a tranquil life, and to the unwarlike immunity from the necessity of fighting, but it offered very solid and valuable privileges in the shape of specialities of jurisdiction both in civil and criminal causes, and in exemption from taxes, There is a very early decree of a congregation of bishops, ordering that no more persons shall be ordained than are needed for the service of each church. And the germ of a politico-economical idea may be observed in the reason given for the prohibition, which oue would hardly have expected to find at that period, and which both eccle- siastical and civil rulers altogether lost sight of at a later time. Clerks, it was decreed, should not be unnecessarily multiplied to the prejudice of the poorer laity. Casuists of a later age have pronounced it to be sinful to receive first orders, without the intention of proceeding to take full orders. Gregory the Great likens those who entered the ecclesiastical state merely for the sake of a benefice to the crowds who followed the Saviour only because He multi- plied the miraculous loaves. The Council of Trent also at its twenty-fourth sitting, chap. 4, directs the refusal of ordination to those who may with probability be sup- posed to desire it for other than godly reasons.

Soldiers, slaves, comedians, tax-gatherers, those who had been married twice, and all persons exercising a mean and servile occupation could not be ordained. To which classes Bingham, particularizing more accurately, adds (Orig. Eccl., lib. 4):—‘ No stranger from another diocese, unless by letters dismissory ; no one who has performed

public penance; no homicide, adulterer, or who had in time of persecution denied the faith ; no usurer; no one who had mutilated any of his members ; no one who had been baptized only by a medical attendant, or by a heretic, or whose baptism was in any wise irregular; no one belong- ing to any guild of artificers ; no legal official of the Roman court ; no guardian of a ward,

as long as that office lasted ; none who had ever suffered from insanity or diabolic possession ; to which certain other canonical impediments might be added.”

Bingham (Orig., lib. 2. cap. 6. sec. 4) says that in some churches the clergy lived in common, Moroni says (article “Qlero,” Dict. Eccles.) that in the 4th and following centuries it is certain that almost everywhere the clergy adopted the practice of living in common. The first assertion seems to be somewhat too narrow in its scope, the second too wide. It is certain that the practice was more common than seems to be indicated by the phrase, “in some churches ;” but the instance which Moroni gives in support of his assertion seems to show that the practice was far from universal. We read in a chronicle of the church of Augsburg, that in the time of Constantine, when a church was dedicated to St Afra, “clerks were established there living in common, according to the apostolic rule.” Of the church of Rino- cotura in Mauritania, Sozomen tells us that the clerks there had “their dwelling, their table, all things, in short, in common.” The veuerable Bede says that Gregory I. ordered that the same rule should be observed in England. Eusebius, bishop of Vercelli, is praised by St Ambrose for restoring the practice in question in his church. Leo IX. ordered that cloisters should be established in connection with the churches in order that the clergy might live in common. Hence divers churches ‘were anciently called monasteries, and in a history of the church of Besangon it is stated “that nothing is more common in ancient writings than to find any church called a monastery.”

The immunities enjoyed by clerks of course differed largely at different times and in different countries, the extent of them having been gradually curtailed from a period a little earlier than the close of the Middle Ages. They consisted mainly in exemption from public burdens, both as regarded person and pocket, and in immunity from lay jurisdiction. This last enormous privilege, which became one of the main and most efficient instruments of the subjection of Europe to clerical tyranny, extended to matters both civil and criminal; though, as Bingham shows, it did not (always and everywhere) prevail in cases of heinous crime. The reader will find the whole subject lucidly set forth in the 5th book of Bingham’s work.

This diversity of jurisdiction, and subjection of the clergy only to the sentences of judges bribed by their esprit de corps to judge leniently, led to the adoption of a scale of punishments for the offences of clerks avowedly much lighter than that which was inflicted for the saine crimes on laymen. This part of the subject will be found fully elucidated in the 1st chapter of Bingham's 17th book; in the remaining chapter of which the penal portion of the canon law as regarding clerks is succinctly treated. (T. A. T.)

CLERGY, Benerir or, an obsolete but once very important feature in the English criminal law. It was a relic of the claim of exemption from the authority of the common law tribunals on the part of the clergy, and marked the extent to which the demand was acceded to in England. The conclusion of the protracted conflict was that the common law courts abandoned the extreme punish- ment of death assigned to some offences, when the person convicted was a clericus, in holy orders, and the church was obliged to accept the compromise and let a secondary punishment be inflicted. For the more atrocious crimes

the partial exemption was not obtained, and hence offences came to be divided into clergyable and unclergyable. According to the common practice in England of working out modern improvements through antiquated forms, this exemption was made the means of modifying the severity of the criminal law. It became the practice for every convict to claim and be allowed the benefit of clergy; and when it was the intention by statute to make a crime really punishable with death, it was awarded '" withont benefit of ciergy." A full account of the origin and progress of the system will be found in the 28th chapter of the fourth book of Blackstone's Commentaries. The benefit of clergy in cases of felony was abolished in the modifications of the criminal law by Sir Robert Peel in 1827 (8 Geo. IV. c. 28).

oo or CLERMONT FERRAND, a city of France, formerly the chief town of Basse Auvergne, and now of the

department of Puy-de-Dome, is situated on a hill composed –

chiefly of volcanic tufa, in the fertile district of Limagne, and surrounded on the S. and W. by a line of mountains, of which the Puy-de-Déme is the culminating point. It lies in 45° 46’ N. lat. and 3° 5’ E. long., and is 220 miles S. by E. from Paris. Since 1633 it is composed of the two towns of Clermont and Mount Ferrand, connected by a fine avenue of walnut. trees and willows, two miles in ‘length. ‘The streets are generally ill laid out, narrow, and crooked ; and the houses are built of dull, grey lava, which had a gloomy effect until the fashion was introduced of cover- ing them with white-wash. It has several handsome squares ornamented with fountains, and is well supplied with water brought by subterranean conduits from Royat, a league distant. The principal public building is the cathedral, a Gothic edifice of the 13th century, and though still unfinished its interior is considered one of the finest existing speciinens of Gothic architecture. The church of Nétre- Dame-du-Port is curiously decorated externally with mosaic work and bas-reliefs, and is very ancient—parts of it dating from 870. Clermont has also a university-academy, a royal college, a botanic garden, a public library of 30,000 vols. (among which are several ancient MSS. of great value), museums of natural history and antiquities, two hospitals, and a theatre. The manufactures are woollen and linen goods, silk stockings, paper, cutlery, and jewellery. Being the entrepdt for the produce of the surrounding depart- ments, the town carries on a considerable trade in hemp, flax, corn, wine, cheese, wool, hides, and cattle. In the suburb of St Allyre, to the north-west of the city, is a remark- able calcareous spring, the copious deposits of which have formed a curious natural bridge over a small stream. The population of Clermont in the end of the 18th century was about 16,000 ; in 1851, 30,566 ; and in 1872,

32,963.

Clermont (7.¢., Clarus Mons or Clarimontium) is identified with the ancicnt Augustonemetum, the chief town of the Arverni, and it still preserves some remains of the Roman period. The present name occurs as carly as the 8th century, but was at first applied to the castle alone. During the disintegration of the Roman empire Clermont suffered as much perhaps from capture and pillage as any city in the country ; but it preserved its municipal liberties down to the Middle Ages, and, even after it was incorporated in the domain of its bishops, maintained the rights of its

communal charter. It was the seat of no fewer than seven ecclesiastical councils, held respectively in the years 535, 549, 587, 1095, 1110, 1124, and 1130; and of these the council of 1095 is for ever memorable as that in which Pope Urban I. first formally organized the great crusade. In the national wars of the 15th and the civil wars of the 16th century the town had its full participation; and in 1665 itacquired a terrible notoriety by the trial and execution of a number of robber chieftains who had infested the neighbouring district. The pro- ceedings lasted six months, and the cpisode is still known as Jes Grands Jours de Clermont. Before the great Revolution the town possessed several monastic establishments, of which the most impor- tant was the abbey of Saint Allyre, founded, it is said, by St Austramonius, the apostle of Auvergne, and the abbey of St

André, where the counts of Clermont were interred. Among the great men whom the town has produced are Gregory of Tours, Pascal, and Montlosier.

CLERMONT EN BEAUVOISIS, frequently but by mistake called CLERMONT suR OISE, a town of France, at the head of an arrondissement in the department of Oise, is situated about 36 miles by rail to the north of Paris, near a small tributary of the Oise, called the Bréche. The town-hall and the church of St Samson date. from the 13th century, and the hill on which the town is built is sur- mounted by an old castle partly of the 10th or 11th, now transformed into a penitentiary capable of accom- modating upwards of 1000 female prisoners. The principal industries are the manufacture of cotton goods and stained paper. Clermont was an important post in the Middle Ages. It was frequently taken and retaken in the wars of the English, and in 1437 it was surrendered to them as a ransom for the great national leader La Hire. In 1569 it was sold to the duke of Brunswick by Charles IX., and about thirty years later it was resold by the duchess of Brunswick to the duke of Lorraine. In 1595 it was captured by Henry IV., and in 1615 it was held by Condé. Cassini the astronomer was a native of the town. Popula- tion in 1872, 5774.

CLERMONT-L'HERAULT, or Clermont pe Lopbvz, a town of France, in the department of Hérault, and about ten miles by rail south of Lodéve, is built on the slope of a hill which is crowned by an ancient castle and skirted by the Ydromiel, a tributary of the Ergue or Lergue. It owes its importance to its woollen manufacture, which was intro- duced in 1678; and it also produces vinegar and vitriol, has quarries of building-stone, plaster, and lime, and deals in brandy, oil, cattle, and wool. Population in 1872, 5487.

CLEVELAND, a city and lake-port, and the capital of Cuyahoga county, in the State of Ohio, situated at the mouth of Cuyahoga River, on the S. shore of Lake Erie, in 41° 30' N. lat. and 81° 47' W. long. Next to Cincinnati, it is the largest and most important city in the State. It was founded in 1796, and named in honour of General Moses Cleveland of Connecticut, who then had charge of the surveying of this region. It was an important point in the war of 1812, and was incorporated as a village in 1814 and as a city in 1836. Its population was 1075 in 1830, 6071 in 1840, 17,034 in 1850, 43,417 in 1860, and 92,829 in 1870. The number of inhabitants in 1876 is estimated at 140,000. Of the total population in 1870, 38,815 were foreigners — including 15,856 born in Germany, 9964 in Ireland, 4008 in England, 2634 in British America, and 2155 in Austria. The city is built on both sides of the river, which is here crossed by several bridges, and chiefly on a plain from 50 to 100 feet above the lake, of which a magnificent view is thus obtained. The streets are regularly laid out, and are generally from 80 to 100 feet wide. Many of them are lined with trees, chiefly maple, whence Cleveland is known as the " Forest City." Monumental Park, near the centre of the city, contains 10 acres divided into four squares by the exten- sion of Ontario and Superior Streets. Besides a fountain and otlier attractive objects, the park contains a statue of Commodore Perry, erected in 1860, in commemoration of his victory on Lake Erie in 1813. It is of Italian marble, is 8 feet high, and stands upon .a granite pedestal 12 feet high. The most noteworthy buildings are that of the United States (containing the post-office, the cnstoni-house, and the federal courts), the city hall, the county court-house, the house of correction and workhouse, the city infirmary, the Cleveland medical college, Case Hall, and the two high- school buildings. The Union Railway depét, an immense structure of stone near the lake shore, is one of the largest of the kind in the United States. Cleveland has import-

ant commercial advantages. Five railways pass through or terminate in the city,—including the Lake Shore and Michigan Southern, a grand trunk line between the east and the west; a division of the Atlantic and Great West- ern, a leading channel of communication between the east and the south- west ; and the Cleveland, Columbus, Cincin- nati, and Indianapolis, a direct line to Cincinnati and the south. Other lines afford communication with the exten- sive coal and petroleum regions of Pennsylvania. Cleve- land is the northern terminus of the Ohio Canal, which extends southwards to Portsmouth on the Ohio River. For the accommodation of the lake commerce, a capacious har- bour has been formed at the mouth of Cuyahoga River by extending two piers, 200 feet apart, 1200 feet into the lake. The city has an extensive trade in copper and iron ore shipped from the Lake Superior mining region, and in coal, petroleum, wool, and lumber, received by railroad, canal, and lake transportation. In 1873 the number of vessels entered in the coast-wise trade was 3238, having an ageregate tonnage of 1,053,232 tons ; 3204 vessels of 1,048,196 tons cleared. The foreign commerce, which is exclusively witli Canada, is considerable,—the imports amounting in 1874 to $449,118, and the domestic exports to $1,426,990; 316 vessels of 64,213 tons entered in this trade, and 325 of 55,152 tons cleared. The total number of vessels registered, enrolled, and licensed in this district was 466, of 86,519 tons. Twenty vessels of 11,242 tons were built during the year. About $20,000,000 of capital is invested in manufactures, the most important industries being those of iron and the production of refined petroleum. There are also several pork-packing establishments and breweries. Thecity contains sixnational banks with a capital of $4,550,000, and two savings banks. The government of the city is vested in a mayor and a common council of two members from each of the eighteen wards. These officers are elected by the people. The city has an efficient police, a paid fire department, a board of public improve- ments, and a board of health. Besides the usual county and municipal courts, the United States circuit and district courts for the northern district of Ohio are held here. The city is supplied with water obtained from the lake by means of a tunnel 14 mile long, and forced into a large reservoir on high ground in the western part of the city. The streets are well paved, are lighted with gas, and are supplied with sewers. The reformatory and charitable institutions

are numerous and varied. The house of correction and workhouse is for the confinement of persons convicted of minor offences. The city infirmary, connected with which are a farm and a house of refuge for the care and instruction of children, besides maintaining its inmates, affords relief to outdoor poor. The city hospital is supported by money received from those patients who are able to pay and from private charity. The charity hospital is maintained partly by contributions and partly by revenue from paying patients; connected with it is a lying-in hospital. There are also a homeopathic hospital founded by the Cleveland homeopathic college, a foundling hospital, and a United States marine hospital, which is supported by appropria- tions made by Congress and by a tax on sailors. The Cleveland Protestant orphan asylum has an endowment fund of abont $50,000, from the interest of which, and by private contributions, it is maintained. St Vincent's orphan asylum for males, and St Mary's orphan asylum for females, are Roman Catholic institutions, accommodating about 150 inmates each. An orphan asylum is also main- tained by the Jews. Among other benevolent institutions are the home for the aged poor, the home for working women under the management of the women's charitable association, and the Bethel home for destitute sailors. The children's aid society, since its organization in 1857,

has secured homes for nearly 1500 children, besides ex- tending aid to more than 5000. There are three industrial schools, maintained partly by the city, and partly by benevolent citizens, for the benefit of destitute children. The total debt of the city in 1875 was $7,397,500; and the property taxed for city purposes was valued at $73,210,144. The public schools in 1874 comprised 18 primary, 17 grammar, and 3 high schools, in which were enrolled, including those in the evening schools, 19,021 pupils, with an average daily attendance of 12,085. The total number of teachers was 261. The expenditure for the public schools during the year amounted to $382,921. Besides the above, there were enrolled in private and parochial schools 8808 pupils. Cleveland has no college or university, but there are several excellent seminaries, academies, and private schools for the advanced education of both sexes. Professional instruction is afforded by the Cleveland medical college, the homeopathic hospital college, and the

medical department of the university of Wooster (each having about fifteen professors), the Ohio State and union law school, and St Mary's theological seminary (Roman Catholic). 'The Cleveland library association has about 11,000 volumes, tlhe public library, supported by taxation, about 20,000, and the law library about 2000. The Bethel free reading-rooms are open to the public, and the western reserve historical society has a valuable collection of books. There are published in the city 51 newspapers and periodicals; of these 6 appear daily, 4 thrice a week, 18 weekly, 2 fortnightly, 11 monthly, and 1 every two months. Of these 7 are published in the German language, and 1 in the Bohemian. Cleveland has about 100 churches, the following being the largest denominations: —the Methodist-Episcopal 18, Roman Catholic 15, Protestant Episcopal 11, Baptist 9, Presby- terlan 8, and Congregational 4 churches.

CLEVELAND, Joun (1613-1658), a poet and satirist, was born at Loughborough. He was educated at Hinckley school, whence he repaired to Cambridge, becoming in 1634 a fellow of St John's, and being appointed college-tutor and reader in rhetoric. The Latinity and oratorical ability displayed by him in the exercise of the latter function were warmly praised by Fuller, who also commends the " lofty fancy " of his verse. He was the most distinguished and the earliest of loyal satirists. Joining the Cavaliers at Oxford, he was warmly received by the king; and having lost his fellowship and his college places, he was named judge-advocate in the garrison at Newark. 'The captain in command at that fortress, however, deprived him (1646) of this office, and he was fain to wander through the country depending on the alms of Royalists for bread. Arrested at Norwich, as one '' whose great abilities rendered him able to do the greater disservice," he was held in durance of some months at Yarmouth, but was released at last by Cromwell (who seems to have behaved admirably towards the strolling libeller), and went to London, where he resided till his death, in the enjoyment of much consideration from his party. Cleveland, who was more highly esteemed than Milton by his contemporaries, was exceedingly popular. His serious poetry is perhaps the most extravagantly conceited in the language ; his satires are more deserving, the best being the Petition to the Lord-Protector for the Scots Febel. See Nichols, History of Leicestershire, and Cleveland's Works, London, 1687.

CLEVES (in German K1eve), a town of Prussia, for- merly the capital of the duchy of its own name, and now the chief town of a circle in the government of Diisseldorf, 46 miles N.W. of Diisseldorf and 12 E. of Nimeguen. it is a neatly-built town in the Dutch style, situated on the declivities of three hills known as Kirchberg, Schlossberg, and Heideberg, in a fertile district near the frontiers of

Holland, and about two miles from the Rhine, with which it has been connected since 1848 by a canal. The old castle of Schwanenburg (formerly the residence of the dukes of Cleves, and the birthplace of Anne of Cleves, one of the wives of Henry VIII.) has a massive tower 180 feet high, which was built in 1439 on the traditional site of Ceesar's Tower and commands an extensive view. Cleves has two Roman Catholic and three Protestant churches, a synagogue, a gymnasium, a house of correction, and a zoological garden. The collegiate church dates from 1345, and contains a number of fine ducal monn- ments, among which the first place is held by that of Adolf VI. of the 14th century. The chief manufactures are linens, cottons, silks, woollens, and tobacco. To the south and west of the city a large district is laid out as a park ; in the southern part, known as the Old Park, there is a statue to the memory of the founder, John Maurice of

1679, and in the western: part there are mineral wells with a pump-room and bathing establishment, which date from about 1848. The town was the seat of the counts of Cleves as early as the 11th century, but it did not receive its incorporation till 1242. It was raised, with the surrounding district on both sides of the Rhine, to the rank of a duchy by the Emperor Sigismund in 1417. On the death of Duke William in 1609, without issue, his inheritance, which also included Jiilich and Berg, became the object of a violent contest between no fewer than six competitors; and it was not till 1614 that the dispute was settled by the treaty of Xanten, which assigned the duchy of Cleves to Sigismund, elector of Brandenburg, who had married a niece of the late duke. In 1805 it was ceded by Prussia to France ; and in 1806 it was made a grand-duchy by Napoleon and bestowed on Murat. In 1815 it was restored to Prussia. The population of the

Nassau-Siegen, who governed the town from 1650 to | town in 1871 was 9038.

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Holland, and about two miles from the Rhine, with which |

it has been connected since 1848 by a canal. The old castle of Schwanenburg (formerly the residence of the dukes of Cleves, and the birthplace of Anne of Cleves, one of the wives of Henry VIII.) has a massive tower 180 feet high, which was built in 1439 on the traditional site

of Ceesar’s Tower and commands an extensive view. Cleves has two Roman Catholic and three Protestant churches, a synagogue, a gymnasium, a house of correction, and a zoological garden. The collegiate church dates from 1345, and contains a number of fine ducal monu- ments, among which the first place is held by that of Adolf VI. of the 14th century. The chief manufactures are linens, cottons, silks, woollens, and tobacco. To the south and west of the city a large district is laid out as a park; in the southern part, known as the Old Park, there is a statue to the memory of the founder, Jolin Maurice of

CLE yes

1679, and in the western part there are mineral wells with a pump-room and bathing establishnient, which date from about 1848. The town was the seat of the counts of Cleves as early as the 11th century, but it did not receive its incorporation till 1242. It was raised, with the surrounding district on both sides of the Rhine, to the rank of a duchy by the Emperor Sigismund in 1417. On the death of Duke William in 1609, without issue, his inheritance, which also included Jiilich and Berg, became the object of a violent contest between no ‘fewer than six competitors; and it was not till 1614 that the dispute was settled by the treaty of Xanten, which assigned the duchy of Cleves to Sigismund, elector of Brandenburg, who had married a niece of the late duke. In 1805 it was ceded by Prussia to France ; and in 1806 it was made a grand-duchy by Napoleon and bestowed on Murat. In 1815 it was restored to Prussia. The population of the

Nassau-Siegen, who governed the town from 1650 to | town in 1871 was 9038.

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ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME VI

EDINBURGH: ADAM AND CHARLES BLACK

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ENCYCLOPADIA BRITANNICA.

LICHY, or Circtty tA GARENNE, a village or township of France, in the department of Seine, situated on the right bank of the river, immediately to the north of the ramparts of Paris, of which it may almost be said to be part. It is the seat of a number of extensive industrial establishments, engaged in the manufacture of steam engines, chemical stuffs, and glass. The village is of high antiquity, and was the residence of some of the early kings of France. Its church was built in the 17th century under the direction of the famous Saint Vincent de Paul, who at that time had charge of the cure. Population in 1872,

14,599.

CLIFTON, a watcring-place and fashionable resort of England, in the county of Gloucestershire, forming practi- cally a part of the city of Bristol. It is situated on the eastern heights above the gorge of the lower Avon, which divides it from the county of Somerset,—partly occupying a spacious table-land about 250 feet above the sea, and partly an abrupt declivity which sinks down to the once fashionable district of the Hotwells, on the same level as Bristol. Three ancicnt British earthworks bear witness to an early scttlement on the spot, and a church was in existence as far back as the time of Henry II., when it was bestowed by William de Clyfton on the abbot of the Austin canons in Bristol ; but, with the exception, perhaps, of Mardyke House, in Hotwells, there are no longer any architectural vestiges of an earlier date than the 18th eeutury. Of the churches the most important are St Andrew’s parish church, an ungainly structure rebuilt in 1819; All Saints, erected in 1863 at a cost of £32,000, alter the designs of G. E. Street, and remarkable for the width of its nave and the narrowness of its aisles ; and the Roman Catholic pro-cathedral church of the Holy Apostles, with a convent and schools attached. Among the other buildings of note may be mentioned the Victoria Rooms, which are used for concerts and other public assemblies, the Fine Arts Academy, dating from 1857, and Clifton College, a well-designed cluster of buildings in the Gothic style, founded in 1862 by a limited liability company, and giving education to 550 boys. The famous suspension bridge across the Avon, designed by Brunel and commenced in 1832, was completed in 1864. It has a span of 702

total weight of the structure is 1500 tons, and it is calcu- lated to stand a burden of 9 tons per square inch. Since it was opened a village called New Clifton has grown up on the opposite bank. The once famous hot springs of Clifton, to which, in fact, the town was indebted for its rise, are no longer frequented. They issue from an aperture at the foot of St Vincent's Rock, and the water has a temperature of about 76° Fahr. The population of Clifton in 1712, the date of the second edition of Sir Thomas Alleyne's work on Gloucester, was only 450; in 1841 it amounted to 14,177 ; in 1857 to 17,634 ; in 1861 to 21,3875: and in 1871 to 26,364. In the last-mentioned year there were 10,319 males and 16,045 females. The average annual mortality is about 14 per 1000. CLIMATE. The word Climate, or xAcua, being derived from the verb xAivew, to incline, was applied by the ancients to signify that obliquity of the sphere with respect to the horizon from which results the incquality of day and night. The great astronomer and geographer Ptolemy divided the surface of the globe, from the equator to the arctic circle, into climates or parallel zones, corresponding to the successive increase of a quarter of an hour in the length of midsummer-day. Within the tropics these zones are nearly of equal breadth; but, in the higher latitudes, they contract so much that it was deemed enough to reckon them by their doubles, answering consequently to intervals of half an hour in the extension of the longest day. To compute them is an easy problem in spherical trigonometry. As-the sine of the excess of the scmidiurnal are above a quadrant is to unity, so is the tangent of the obliquity of the ecliptic, or of 23° 28', to the cotangent of the latitude. The semidiurnal arcs are assumed to be 91° 522', 93° 45', 95° 3734', 97° 380', &c., and the following table, extracted from Ptolemy's great work, will give some general idea of his distribution of scasons over the surface of the globe. The numbers are calculated on the supposi- tion that the obliquity of the ecliptic was 23° 51' 20', to which, according to the theory of Laplace, it must have actually approached in the time of Ptolemy. They seem to be affected by some small errors, especially in the paral- lels beyond the seventeenth, as the irregular breadth of the zone abundantly shows; but they are, on the whole,

feet, and the roadway is 245 feet above high water; the | more accurate than those given by Varenius.

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Climate in its modern acceptation signifies that peculiar state of the atmosphere in regard to heat and moisture which prevails in any given place, together with its meteorological conditions generally in so far as they exert an influence on animal and vegetable life. The infinitely diversified character which climate displays may be referred to the combined operation of different causes, which are chiefly reducible to these four—distance from the equator, height above the sea, distance from the sea, and prevailing winds, which may thus be regarded as forming the great bases of the law of climate.

Of these’ causes which determine climate incomparably the most potent is distance from the equator. The same sunbeam which, falling vertically, acts on a surface equal to its own sectional area is, when falling obliquely on the earth, spread over a surface which becomes larger in in- verse proportion to the sine of the obliquity. Conse- quently less and less heat continues to be received from the sun by the same extent of surface in proceeding from the equator toward the poles ; and this diminution of heat with the increase of obliquity of incidence of the solar rays is enhanced by the cirenmstance that the sun’s heat, being partially absorbed in its passage through the atmosphere, the absorption is greatest where the obliquity is greatest, because there the mass of air to be penetrated is greatest. Hence arise the broad features of the distribu- tion of temperature over the globe, from the great heat of equatorial regions, falling by easy gradations with increase of latitude, to the extreme cold of the poles. If the earth’s surface were uniform, and its atmosphere motionless, these gradations would run everywhere parallel with the latitudes, and Ptolemy’s classification of the climates of the earth would accord with fact. But the distribution of land and water over the earth’s surface and the prevailing winds bring about the

subversion of what Humboldt has termed the solar climate of the earth, and present us with one of the most difficult, as certainly it is one of the most important problems of physical science, viz., the determina- tion of the real climates of its separate regions and localities, and the causes on which they depend.

The decreasc of temperature with height is perceptibly felt in ascending mountainsg, and is still more evident in the snow-clad mountains, which may be seen even in the tropics. The snow-line marks the height below which all the snow that falls annually melts during summer. The height of this line above the sea is chiefly determined by the following causes—by distance from the equator ; by the exposure to the sun's rays of the slope of the mountain, and hence, in northern latitudes, it is higher on the south than on the north slopes of mountains, other things being equal ; by situation with reference to the rain-bringing winds ; by the steepness of the slope ; and by the dryness or wetness of the district. Since, then, no general rule can be laid

down for the height of the snow-line, it can only be ascer- tained by observation. Speaking generally it sinks little from the equator to 20° N. and 8. lat. ; from 20° to 70° it continues to fall equably, but from 70° it falls rapidly to 78°, where it is at sea-level.

The following are a few of the morc noteworthy of the exceptions. On the north side of the Himalayas it is about 4000 feet higher than on the south side, owing to the ereater depth of snow falling on the south side and the greater dryness of the climate of Tibet, resulting in a more active evaporation from the snows and stronger sun-heat on the north side, to which is to be added the comparative want of vegetation on the north side, thus favouring a more rapid melting of the snows. The snow-line is higher in the interior of continents than near their coasts, the rain- fall there being less and the heat of summer greater; and similarly, owing to the greater prevalence of westerly over easterly winds in many regions of the globe, it is higher on the east than on the west sides of continents. In South America the snow-line rises very considerably from the equator to 18° 8. lat. and more so, markedly, on the west than on the east slopes of the Cordilleras, because of the smaller amount of precipitation of the west side of this

mountain range. It is as high in 33° as in 18° S. lat., but south of 33° it rapidly sinks owing to the heavy rains brought by the westerly winds which begin to prevail there. In the south of Chili it is 6000 feet lower than among the Rocky Mountains at the same distance from the cquator, and 3000 feet lower than in, the same latitudes in Western Europe. It is impossible to overestimate the importance of the snow-line as one of the factors of climate in its relations to the distribution of animal and vegetable life.

Glaisher, in his balloon ascents, made observations of temperature at different heights, the results of which may be thus summarized. Within the first 1000 feet the average space passed through for 1° was 223 feet with a cloudy sky and 162 feet with a clear sky; at 10,000 feet the space passed through for 1° was 455 feet for the former and 417 feet for the latter; and above 20,000 feet the space with both states of the sky was 1000 feet nearly for a decline of 1°. It must be noted, however, that these rates of decrease refer to the temperature of the atmosphere at different heights above the ground, which are in all probability altogether different from the rates of decrease for places on the earth's surface at these heights above the level of the sca—the problem with which climatologists have to deal.

Observation shows, as might have been expected, that the rate at which the temperature falls with the height is a very variable quantity,—varying with latitude, situation, the state of the air as regards moisture or dryness, and calm or windy weather, and particularly with the hour of the day and the season of the year. In reducing temperature observations for height, 1° for every 300 feet is generally adopted. In the present state of our knowledge this or any other estimation is at best no more than a rough approximation, since the law of decrease through its variations requires yet to be stated, being in truth one of the most intricate and difficult problems of climatology awaiting investigation at the hands of meteorologists. Among the most important climatic results to be determined in working out this problem are the heights at which in different seasons the following critical mean temperatures, which have important relations to animal and vegetable life, are met with in ascending from low-lying plains in different regions of the world, viz., 80°, 75°, 70°, 65°, 63°, 60°, 58°, 55°, 50°, 45°, 39° (the maximum density of fresh water), 32° (its freezing point), and 20°.

These results, which only affect the mean daily tem- perature in different scasons, and which are due exclusively.

SRIMATE 3

ty differences of absolute height, though of the greatest

ossible practical importance, yet leave untouched a whole field of climatological rescarch—a field embracing the mean

temperature of different hours of the day at different heights, for au explanatiou of which we must look to the of the carth's surface and to the

physical configuration nature of that surface, whether rock, sand, black soil, or covered ,with vegetation.

Under this head by far the most important class of con-

ditions are those which result in extraordinary modifica- tions, amounting frequently to subversions, of the law of

the decrease of temperature with the height. This will perhaps be best explained by supposing an extent of country diversified by plains, valleys, hills, and table-lands ta be under atmospheric conditions favourable to rapid cooling by nocturnal radiation. Each part being under the same meteorological conditions, it is evident that terres- trial radiation will proceed over all at the same rate, but the effects of radiation will be felt in different degrees and intensities in different places. As the air in contact with the declivities of hills and rising grounds becomes cooled by contact with the cooled surface, it acquires greater density, and consequently flows down the slopes and accumulates on the low-lying ground at their base. It follows, therefore, that places on rising ground are never exposed to the full intensity of frosts at night; and the higher they are situated relatively to the immediately

surrounding district the less are they exposed, since their relative elevation provides a ready escape downwards for the cold air almost as speedily as it is produced. On the other hand valleys surrounded by hills and high

grounds not only retain their own cold of radiation, but also serve ag reservoirs for the cold heavy air which pours down Hence mist is low situations whilst adjoining Along low-lying situations in the Great Britain laurels, araucarias, and other trees and shrubs were destroyed during the great frost of Christmas 1860, whereas

upon them from the neighbouring heights. frequently formed in eminences are clear,

valleys of the Tweed and other rivers of

the same species growing on relatively higher grounds

escaped, thus showing by incontestible proof the great and

rapid increase of temperature with height at places rising above the ‘lower parts of the valleys.

This highly interesting subject has been admirably eluci- dated by thenumerous meteorological stationsof Switzerland. It is there observed in calm weather in winter, when the grouud becomes colder than the air above it, that systems of descending currents of air set in over the whole face of the country. The direction and force of these descend- ing currents follow the irregularities of the surface, and like currents of water they tend to converge and unite in the valleys and gorges, down which they flow like rivers in their beds. Since the place of these air-currents must be taken by others, it follows that on such occasions the temperature of the tops of mountains and high grounds is relatively high becausc the counter-currents come from a great height and are therefore warmer. Swiss villages are generally built on eminences rising out of the sides of the mountains with ravines on both sides. They are thus admirably pro- tected from the extremes of cold in winter, because the descending cold air-currents are diverted aside into the ravines, and the counter-currents are constantly supplying warmer air from the higher regions of the atmosphere.

Though the space filled by the down-flowing current of cold air in the bottom of a valley is of greater extent than the bed of a river, it is yet only a difference of degree, the space being in all cases limited and well defined,

so that in rising above it in ascending the slope the increased warinth is readily felt, and, as we have scen, in extreme frosts the destruction to trees and shrubs is seen rapidly to

diminish. The gradual narrowing of a valley tends toa more rapid lowering of the temperature for the obvious reason that the valley thereby resembles a basin almost

-elosed, being thus a receptacle for the cold air-currents

which descend from all sides. The bitterly cold furious gusts of wind which are often encountered in mountainous regions during night are simply the out-rush of cold air from such basins.

The two chief causes which tend to counteract these effects of terrestrial radiation are forests and sheets of water. If a deep lake fills the basin, the cold air which is poured down on its surface having cooled the surface water, the cooled water sinks to a greater depth, and thus the air resting over the lakes is little if at all lowered in tem- perature. Hence deep lakes may be regarded as sources of heat during winter, and places situated near their outlet are little exposed to cold gusts of wind, while places on their shores are free from the severe frosts which are peculiar to other low-lying situations. The frosts of winter are most severely felt in those localities, where the slopes above them are destitute of vegetation, and consist only of bare rock and soil, or of snow. If, however, the slopes be covered with trees, the temperature is warmer at the base and up the sides of the mountain,—the beneficial influence of forests consisting in the obstacle they offer to the descending currents of cold air and in distributing the cold produced by terrestrial radiation through a stratum of the atmosphere equalling in thickness the height of the trees.

Hence as regards strictly local climates, an intelligent knowledge of which is of great practical value, it follows that the best sccurity against the severity of cold in winter is afforded where the dwellings are situated on a gentle acclivity a little above the plain or valley from which it rises with an exposure to the south, and where the ground above is planted with trees, When it is borne in mind that in temperate climates, such as that of Great Britain, the majority of the deaths which occur in the winter months are

occasioned or at least hastened by low temperatures, it will be recognized as of the most vital importance, especially to invalids, to know what are the local situations which afford the best protection against great cold. In truth, mere local situations may during periods of intense cold have the effect of maintaining a temperature many degrces above that which prevails close at hand—a difference which inust mitigate suffering and not unfrequently prolong life.

Iu addition to mere elevation and relative configuration of surface, the land of the globe brings about important modifications of climate in the degree in which its surface is covered with vegetation or is a desert waste. Of all surfaces that the earth presents to the influences of solar and terrestrial radiation an extent of sand is accompanied with the most extreme fluctuations of climate, as these are dependent on the temperature and moisture of the air ; whilst on the other hand, extensive forests tend to mitigate the extremes of temperature and distribute its daily changes more equably over the twenty-four hours.

As regards the influence of the sun’s heat on the tempera- ture of the air, attention is to be given almost exclusively to the temperature of the extreme upper surface of the carth heated by the sun with which the air is in immediate contact. Badly conducting surfaces, such as sand, will evidently have the greatest influence in raising the temperature of the air, for the simple reason that the heat produced by the sun’s rays being conveyed downwards into the soil with extreme slowness must necessarily remain longer on the surface, in other words, remain in immediate contact with the atmosphere. Similarly at night, the cooling effects of terrestrial radiation being greatest on sundy surfaces, the climate of sandy deserts is characterized by nights of comparatively great cold. These daily

alternations of heat and cold are still further intensified by the great dryness of the air over extensive tracts of sand. In warm countries the surface temperature of sandy deserts often rises to 120°, 140°, or even to 200°, and the shade temperature has been observed as high as 125°. It is this hot air, loaded with particles of sand still hotter, and driven onwards by furious whirlwinds, which forms the dreaded simoon of the desert; and the irritating

and enervating sirocco of the regious bordering the Mediterranean is to be traced to the same cause. It is in the deserts of Africa, Arabia, Persia, and the Punjab that the highest tempera- ture on the globe occurs, the mean summer temperature of these regions rising to and exceeding 95°. The extreme surfaee of loam and clay soils is not heated during day nor cooled during night in so high a degree as that of sandy soils, because, the former being better conductors, the heat or the cold is more quickly conveyed downward, and therefore not allowed to accumulate on the surface.

When the ground is covered with vegetation the whole of the sun's heat falls on the vegetable covering, and as none of it falls directly on the soil its temperature does not rise so high as that of land with no vegetable covering. The temperature of plants exposed to the sun does not rise so high as that of soil, because a portion of the sun's heat is lost in evaporation, and the heat cannot accumulate on the surface of the leaves as it does on the soil. Hence the essential difference between the climates of two countries, the one well covered with vegetation, the other not, lies in this, that the heat of the day is more equally distributed over the twenty-four hours in the former case, and there- fore less intense during the warmest part of the day.

But the effect of vegetation on the distribution of the t:mperature during the day is most markedly shown in the case of forests. Trees, like other bodies, are heated and cooled by radiation, but owing to their slow conducting power the times of the daily maximum and minimum temperature do not occur till some hours after the same phases of the temperature of the air. Again, the effects of radiation are in the case of trees not chiefly confined to a surface stratum of air a very few feet in thickness, but as already remarked, are to a very large extent diffused through a stratum of air equalling, in thickness at least, the height of the trees. Hence the conserving influence of forests on climate, making the nights warmer and the days cooler, imparting, in short, to the climates of districts clad with trees something of the character of insular climates, Evaporation proceeds slowly from the damp soil usually found beneath trees, since it is more or less screened from the sun. Since, however, the air under the trees is little agitated or put in circulation by the wind, the vapour arising from the soil is mostly left to accumu- late among the trees, and hence it is probable that forests diminish the evaporation, but increase the humidity, of climates

within their influence. The humidity of forests is further increased by the circumstance that when rain falls less of it passes immediately along the surface into streams and rivers; a considerable portion is at once taken up by the leaves of the trees and percolates the soil, owing to its greater friability in woods, to the roots of the trees, whence it is drawn up to the leaves and there eva- porated, thus adding to the humidity of the atmosphere.

Much has been done by Dr Marsh and ‘others in elucidation of the influence on climate of forests and the denudation of trees, in so far as that can be done by the varying depths of lakes and rivers and other non-instrumental observations. Little comparatively has been done anywhere in the examination of the great practical question of the influence of forests on climate, by means of carefully devised and conducted observations made with thermometers, the evaporating dish, or the rain

gauge. The most extensive inquiry on the subject yet set on foot has been for some years conducted in the forests of Bavaria under the direction of Professor Ebermeyer, and a like inquiry was begun in Germany in 1875,—the more important results being that during the day, particu- larly in the warm months, the temperature in the forest is considerably lower than outside in the open country, there being at the same time a slow but steady outflow of air from the forest; and that during the night the tempera- ture in the forest is higher, while there is an inflow of air from the open country into the forest. The mean annual temperature in the forest increases from the surface of the ground to the tops of the trees (where it is observed to approximate to what is observed in the open country), a result evidently due to the facility of descent to the surface of the cold air produced by terrestrial radiation, and to the obstruction offered by the trees to the solar influence at the surface. The mean annual temperature of the woodland soil from the surface to a depth of 4 feet is from 2° to 3° lower than that of the open country. A series of observations was begun at Carnwath, Lanarkshire, in 1573, at two stations, one outside a wood, and the other inside the wood in a small grass plot of about 50 feet diameter clear of trees. From these valuable results have been obtained relative to the differences in the daily march of temperature and the different rates of humidity, the most important being the substantial agreement of the mean annual temperature of the two

places. The estab- lishment of a station, with underground thermometers, which it is proposed to erect under the shade of the trees close to the station in the cleared space, will furnish data which will not only throw new light on the questions raised in this inquiry, but also on the movements and viscosity of the air and solar and terrestrial radiation.

When the sun's rays fall on water they are not as in the case of land arrested at the surface, but penetrate to a considerable depth, which, judging from observations made by Sir Robert Christison on Loch Lomond, and from those made on board the " Challenger," is probably in clear water about 600 feet. Of all known substances water has the greatest specific heat, this being, as compared with that of the soil and rocks composing the earth's crust, in the proportion of about 4 to 1. Hence water is heated much more slowly by the sun's rays aud cooled more slowly by nocturnal radiation than the land. It is owing to these two essential differences between land and water with respect to heat that climates come to be grouped into the three great classes of oceanic, insular, and coutinental climates.

The maximum densities of fresh and salt water, which are respectively 39°*] and 26°°2 (when the sea-water is the average degree of saltness), mark an essential distinction between the effects of sheets of fresh and salt water on climate. The surface temperature of sea-water falls very slowly from 39°] to 28°:4, its freezing point, because as it falls the temperature of the whole water through its depths must fall; whilst from 39°:1 to 32° the surface temperature of fresh water falls rapidly because it is only the portion floating on the surface which requires to be cooled. If the bottom temperature of fresh water exceed 39°'1 the cooling takes place also very slowly, since in this case the water through all its depth must be cooled down to 39°:1 as wellas that of the surface.

The temperature at the greatest depths of Loch Lomond, which is practically constant at all seasons, is not 47°°8, the mean annual temperature of that part of Scotland, but 42°, which happens to be the mean temperature of the cold half of the year, or that half of the year when terrestrial radiation is the ruling element of the tempera- ture. Thus, then, there is an immense volume of water at the bottom of this lake at a constant temperature 5°-8

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below that of the mean annual temperature of the locality. From this follow two important consequences, viz.—(1) during cach winter no inconsiderable portion of the cold produced by terrestrial radiation is conveyed away from the surface to the depths of the lake, where it therefore no longer exercises any influence whatever on the atmosphere or on the climate of the district in lowering the tem- perature; and (2) this annual accession of cold at these depths is wholly counteracted by the internal heat of the earth. In corroboration of this view it may be pointed out that the water of the Rhone as it issues from Lake Geneva is 3°°7 higher than that of the air at Geneva. Thus, the influence of lakes which do not freeze over is to mitigate in some degree the cold of winter over the district where they are situated. This is well illustrated on a large scale by the winter temperature of the lake region of North America. The influence of the sea is exactly akin to that of lakes. Over the surface of the ground slanting to the sea-shore the cold currents generated by radiation flow down to the sea, and the surface-water being thereby cooled sinks to lower depths. In the same mauner no inconsiderable portion of the cold produced by radiation in all latitudes over the surface of the ocean and land adjoining is conveyed from the surface to greater depths. ‘The enormous extent to which this transference goes on is evinced by the great physical fact disclosed to us in recent years by deep sea observations of temperature, viz., that the whole of the depths of the sea is filled with water at or closely approaching to the freezing point of fresh water, which in the tropical regions is from 40° to 50° lower than the temperature of the surface. The with- drawal from the earth’s surface in high latitudes of such an enormous accumulation of ice-cold water to the depths of the sea of tropical and subtropical regions, rendered possible by the present disposition of land and water over the globe, doubtless results in an amelioration to some extent of the climate of the whole globe, so far as that may be brought about by a higher surface temperature in polar and temperate regions.

Oceanic climates are the most equable of all climates, showing for the same latitudes the least differenccs between the mean temperatures of the different hours of the day and the different months of the year, and being at all times the least subject to violent changes of temperature. So far as man

is concerned, oceanic climates are only to be met with on board ship. The hygienic value of these climates in the treatment of certain classes of chest and other complaints is very great, and doubtless when better understood in their curative effects they will be more largely taken advantage of. It is, for instance, believed by many well qualified to form an opinion that they afford absolute, or all but absolute, immunity from colds, which are so often the precurscrs of serious complicated dis- orders,

The nearest approach to such climates on land is on very small islands such as Monach, which is situated about seven miles to westward of the Hebrides, in the full sweep of the westerly winds of the Atlantic which there prevail. The mean January temperature of this island, which is nearly in the latitude of Inverness, is 43°:4, being 1°°8 higher than the mean of January at Ventnor, Isle of Wight, 0°-8 higher than that of Jersey and Guernsey, and almost as high as that of Truro. Again, Stornoway, being situated on the east coast of Lewis on the Minch, an inland arm of the Atlantic, has thus a less truly insular position than Monach. Its climate is therefore much less insular, and accordingly its mean temperature in January is 38°-7, or 4°°7 lower than that of Monach. ‘From its position near the Moray Firth, on the east of Scotland, Culloden occupies a position still less insular; hence its

January temperature is only 37°:1, being 1°-6 less than that of Stornoway, and 6°°3 less than that of Monach.

On the other hand, the mean temperature of July is 55°-0 at Monach, 57°°8 at Culloden, 61°-0 at Guernsey, and 62°°6 at Ventnor. ‘Thus the conditions of temperature at these stations are completely reversed in summer, for while in January Monach is 1°°8 warmer than Ventnor, in summer it is 7°°6 colder. Since the prevailing winds in the British Isles are westerly, places on the east coast are less truly insular than are places similarly situated on the west, whence it follows that the winter and summer climates of the east coast approach more nearly the character of inland climates than do those of the west.

The facts of the temperature at such places as Monach in Scotland and Valentia in Ireland disclose the existence of an all but purely oceanic climate along the coasts, particularly of the west, so distinct and decided,

and extending inland so short a distance, that it would be impossible to represent it on any map of land isothermals of ordinary size. The only way in which it can he graphically represented is by drawing on the same map the isothermals of the sea for the same months, as Petermann has done on his chart of the North Atlantic and continents adjoining. Such maps best lead to a knowledge of the true character of our seaside climates.

Though it is impossible to overestimate the climatological importance of seaside climates, as evinced by their curative effects on man, and their extraordinary influcnce on the distribution of animal and vegetable life, it must be con- fessed that we are yet only on the threshold of a rational inquiry into their true character. Undoubtedly the first step in this large inquiry is the establishing of a string of about six stations at various distances from a point close to high-water mark to about two miles inland, at which observations at different hours of the day would be made, particularly at 9 a.m. and 3 and 9 p.m., of the pressure, tem- perature, humidity, movements, and chemistry of the air.

Our large towns have climates of a peculiar character, which may be said to consist chiefly in certain disturbances in the diurnal and seasonal distribution of the temperature, an excess of carbonic acid, a deficiency of ozone, and the presence of noxious impurities. Systematic inquiries into the condition and composition of the air of our large towns have been instituted this year (1876) in Paris and Glasgow, in which the ozone, ammonia, nitric acid, and germs present in different districts of these cities are regularly observed, There yet remain to be devised some means of making truly comparable thermometric and hygrometric observa- tions in different localities, including the more densely- peopled districts, for the investigation of what we may call the artificial climates peculiar to each district. While such an inquiry, at least in its earlier stages, must necessarily be regarded as a purely scientific one, it may fairly be expected to lead sooner or later to a knowledge of the causes which determine the course of many epidemics— why, for instance, diphtheria is more frequent and more fatal in the new than in the old town of Edinburgh, and why in some parts of Leicester diarrhoea 1s unknown as a fatal disease, while in othcr parts of the same town it rages every summer as a tcrrible pestilence among infants

—and ultimately suggest the means by which they may be stamped out when they make their appearance.

Tt has been already pointed out (see ATMOSPHERE) that prevailing winds are the simple result of the relative distri- bution of atmospheric pressure, their direction and force being the flow of the air from a region of higher towards a region of lower pressure, or from where tbere is a surplus to where there is a deficiency of air. Since climate is practi- cally determined by the temperature and moisture of the air, and since these are dependcnt on the prevailing winds which

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come charged with the temperature and moisture of the

regions they have traversed, it is evident that isobaric charts, showing the mean pressure of the atmosphere, form

the key to the climates of the different regions of the globe, particularly those different climates which are found to

prevail in different regions having practically the same

latitude and elevation. This principle is all the more

important when it is considered that the prevailing winds determine in a very great degree the currents of the ocean

which exercise so powerful an influence on climate.

Since winds bring with them the temperature of the regions they have traversed, southerly currents of air are warm winds, and northerly currents cold winds. Also since the temperature of the ocean is more uniform than that of the land, winds coming from the ocean do not cause such variations of temperature as winds from a continent. As air loaded with vapour obstructs both solar and terrestrial radiation, when clear as well as when clouded, moist ocean winds are accompanied by a mild temperature in

winter and a cool temperature in summer, and dry winds coming from continents by cold winters and hot summers. Lastly, equatorial currents of air, losing heat as they proceed in their course, are thereby brought nearer the point of satura- tion, aud consequently become moister winds ; whereas northerly currents acquiring greater heat in their progress become drier winds.

It follows from these relations of the wind to temperature and moisture that the §.W: wind in the British Isles is a very moist wind, being both an oceanic and equatorial current ; whereas the N.E. wind, on the other hand, is peculiarly dry and parching, because it is both a northerly and continental current. Owing to the circumstance of atmospheric pressure diminishing from the south of Europe northwards to Iceland, it follows that 8.W. winds are the inost prevalent in Great Britain ; and since this diminution of pressure reaches its maximum amount and persistency during the winter months, S.W. winds are in the greatest preponderance at this season ; hence the abnormally high winter temperature of these islands above what is due to mere latitude. The mean winter temperature of Lerwick, Shetland, in respect of latitude alone would be 3°, and of London 17°, but owing to the heat conveyed from the warm waters of the Atlantic across these islands by the winds, the temperature of Shetland is 39° and of London 38°, In Iceland and Norway the abnormal increase of temperature in winter is still greater. This influence of the Atlantic through the agency of the winds is SO pre- ponderating that the winter isothermals of Great Britain lie north aud south, instead of the normal east and west direction.

This peculiar distribution of the winter temperature of the British Isles has important bearings on the treatment of diseases. Since the teraperature of the whole of the eastern slope of Great Britain is the same, it is clear that to those for whom a milder winter climate is required a journey southward is attended with no practical advantage, unless directed to the west coast. As the temperature on the west is uniform from Shetland to Wales, Scotland is as favourable to weak constitutious during winter as any part of England, except the south-west, the highest winter temperatures being found from the Isle of Wight westward round the Cornish peninsula to the Bristol Channel; and from Carnsore Point in Ireland to Galway Bay the tempera- ture is also high. ”

The height and direction of mountain ranges form an important factor in determining the climatic characteristics of prevailing winds. If the range be perpendicular to the winds, the effect is to drain the winds which cross them of

their moisture, thus rendering the winters colder and the compared with

summers hotter at all places to leeward, as

places to windward, by partially removing the protecting screen of vapour and thus exposing them more effectually to solar and terrestrial radiation. To this cause much of the observed differeuce between the west and east climates of Great Britain is due. In Ireland, on the other hand, where the mountains are not grouped in ranges running north and south, but in isolated masses, the difference between the climates of the east and west is very much less. In the cast of the United States the prevailing winds in summer are 8.W., and as the Alleghanies lie in the same direction the temperature is little affected by these mountains, and the rainfall is pretty evenly dis- tributed on both sides of the range.

In its climatological relations the distribution of rain over the globe presents us with a body of facts which lead, when intelligently interpreted, to a knowledge of the laws regulating the distribution of plants more quickly and certainly than do the facts of temperature. It is to the prevailing winds we must look for an explanation of the rainfall, the broad principles of the connection being these: —l, The rainfall is moderately large when the wind has traversed a considerable extent of ocean; 2, if the winds advance into colder regions the rainfall is largely increased, and if a range of mountains lie across their path the amount precipitated on the side facing the winds is greatly augmented, but diminished over regions on the other side of the range; 3, if the winds, though coming from the ocean, have not traversed a considerable extent of it, the rainfall is not large; and 4, if the winds, even though having traversed a considerable part of the ocean, yet on arriving on the land proceed into lower latitudes, or regions markedly warmer, the rainfall is small or nil. It ig this last consideration which accounts for the rainless character of the summer climates of California, of Southern Europe, and of Northern Africa.

The region extending from Alaska to Lower California presents more sudden transitions of climate, and climates more sharply contrasted with each other, than any other portion of the globe, this arising from the contour of its sur- face and the prevailing winds. A direct contrast to this is offered by the United States to the east of the Mississippi,

a region characterized by a remarkable uniformity in the distribution of its rainfall in all seasons, which, taken in connection with its temperature, affords climatic conditions admirably adapted for a vigorous growth of trees aud for the great staple products of agriculture. India and the region of the Caspian Sea and the Caucasus Mountains also present extraordinary contrasts of climate in all seasous, due to the prevailing winds, upper as well as lower winds, the relative distribution of land and water, and the physical configuration of the surface of the land. In the above remarks the only question dealt with has been the average climate of localities and regions. There are, however, it need scarcely be added, vital elements of climate of which such a discussion can take no cognizance. These are the deviations which occur from the seasonal averages of climate, such as periods of extreme cold and heat, or of extreme humidity and dryness of air, liability to storms of wind, thunderstorms, fogs, and extraordinary downfalls of rain, hail, or snow. An illustration will show the climatic difference here insisted on. The mean winter temperature of the Southern States of America is almost the same as that of Lower Egypt. Lower Egypt is singularly free from violent alternations of temperature as well as frost, whereas these are marked features of the winter climate of the States bordering on the Gulf of Mexico. Robert Russell, in his Climate of America, gives an instance of the temperature falling in Southern Texas with a norther from 81° to 18° in 41 hours, the norther blowing at the same time with great

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violence. A temperature of 18° accompanying a violent wind may be regarded as unknown in Great Britain.

It is to the cyclone and anticyclone (see ATMOSPHERE) we raust look for an explanation of these violent weather changes. Climatically, the significance of the anticyclone or area of high pressure consists in the space

covered for the time by it being on account of its dryness and clear- ness more fully under the influence of solar and terrestrial radiation, and consequently exposed to great cold in winter and great heat in summer; and of the cyclone or area of low pressure, in a moist warm atmosphere occupying its front and southern half, and a cold dry atmosphere its rear and northern half.

The low areas of the American cyclones, as they proceed eastward along the north shores of the Gulf of Mexico, are often immediately followed to west and north-westward by areas of very high pressure, the necessary consequence of which is the setting in of a violent norther over the Southern States. Since similar barometric conditions do not occur in the region of Lower Egypt, its climate is free from these sudden changes which are so injurious to the health even of the robust. Since. many of the centres of the cyclones of North America follow the track of the lakes and advance on the Atlantic by the New England States and Newfoundland, these States and a large portion of Canada frequently experience cold raw easterly and northerly winds. The great majority of European storms travel eastward with their centres to northward of Faré, and hence the general mildness of the winter climate of the British Isles. When it happens, however, that cyclonic centres pass eastwards:along the English Channel or through Belgium and North Germany, while high pressure prevails in the north, the winter is characterized by frosts and snows. The worst summer weather in Great Britain is when low pressures prevail over the North Sea, and the hottest and most brilliant weather when anticyclones lie over Great Britain and extend away to south and eastward.

Low pressures in the Mediterranean, along with high pressures to northward, are the conditions of the worst winter weather in the south of Europe.- A cyclone in the Gulf of Lyons or of Genoa, and an anticyclone over Germany and Russia, have the mistral as their unfailing attendant, blowing with terrible force and dryness on the Mediter- ranean coasts of Spain, France, and North Italy, being alike in its origin and in its climatic qualities the exact counterpart of the norther of the Gulf of Mexico. It follows from the courses taken by the cyclones of the Mediterranean, and the anticyclones which attend on them, that also Algeria, Malta, and Greece are liable to violent alternations of temperature during the cold months.

The investigation of this phase of climate, which can only be carried out by the examination of many thousands of daily weather charts, is as important as it is difficult, since till it be done the advantages and hazards offered by different sanataria cannot be compared and valued. It may in the meantime be enough to say that no place any- where in Europe or even in Algeria offers an immunity from the risks arising from the occurrence of cold weather in winter at all comparable to that afforded by the climates of Egypt and Madeira. See ATMosPHERE, METEOROLOGY, and PuysicaL GroGRAPHY. (4. B.)

CLINTON, a city of the United States, in Clinton County, Iowa, about 42 miles higher up than Davenport, on the Mississippi, which is crossed at this point by an iron drawbridge upwards of 4000 feet long. It is a thriving place, with workshops for the Chicago and North-Western Railway, and an extensive trade in timber. Several news- papers are published weekly. Population in 1870, 6129.

CLINTON, a town of the United States, in Worcester county, Massachusetts, on the Nashua River, about 32

miles west of Boston, at the junction of several railway lines. It is the seat of extensive manufacturing activity, chiefly expended in the production of cotton cloths, woollen carpets, boots and shoes, combs, and machinery. The Lancaster mills rank as perhaps the best in the United States ; and the wire cloth company has the credit of being the first to weave wire by the power-loom. Population in

1870, 5429,

CLINTON, Dz Wirt (1769-1829), an American states- man, born at Little Britain, in the State of New York, was the son of a gentleman of English extraction who served as brigadier-general in the war of independence, and of a lady belonging to the famous Dutch family of De Witts. He was educated at Colombia College; and in 1788 he was admitted to the bar. He at once joined the republican party, among the leaders of which was his uncle, George Clinton, governor of New York, whose secretary he became. At the same time he held the office of secretary to the board of regents of the university, and to the commissioners of fortifications. In 1797 he was

elected member of the Assembly, in 1798 member of the Senate of the State of New York, and in 1801 member of the Senate of the United States. For twelve years, with two short breaks, which amounted only to three years, he occupied the position of mayor of New York. He was also again member of the Senate of New York from 1803 to 1811, and lieutenant-governor of the State from 1811 to 1813. In 1812 he became a candidate for the presidency ; but he was defeated by Madison, and lost even his lieutenant-governorship. Throughout his whole career Clinton had been distinguished by his intelligent support of all schemes of improvement, and he now devoted himself to carrying out the proposal for the construction of canals from Lakes Erie and Champlain to the River Hudson. The Fedcral Government refused to undertake the work ; but some time after, in 1815, the year in which he finally lost the mayoralty, he presented a meniorial on the subject to the Legislature of New York, and the Legislature appointed a commission, of which he was made a member, to make surveys and draw up estimates. Having thus recovered his popularity, in 1816 Clinton was once more chosen governor of the State; in 1819 he was re-elected, and again in 1824 and 1826. In 1825 the Erie Canal was completed; and he afterwards saw the work which owed so much to him carried on by the construction of im- portant branch canals.

De Witt Clinton published a Memoir on the Antiquities of Western New York (1818), Letters on the Natural History and Internal Resourees of New York (1822),and Speeches to the Legislature (1828). His life was written by Hosack (1829) and Renwick (1840); and in 1849 appeared Campbell’s Life and Writings of De Witt Clinton.

CLINTON, Henry Fynes (1781-1852), an English classical scholar, was born at Gamston, in Nottinghamshire. He was descended from the second earl of Lincoln; for some generations the name of his family was Fynes, but his father resumed the older family name of Clinton. Educated at Southwell school in his native county, at Westminster school, and at Christ Church College, Oxford, he devoted himself to the minute and almost uninterrupted study of. classical literature and history. From 1806 to 1826 he was M.P. for Aldborough.

His chief works arc—Fasti Hellenici, a Civil and Literary Chrono- logy of Greece, which also contains dissertations on points of Grecian history and Scriptural chronology (4 vols., 1824, 1827, 1830, 1834); and Fasti Romani, a Civil and Literary Chronology of Rome and Constantinople from the Death of Augustus to the Death of Heraclius (2 vols. 1845 and 1851). In 1851 he published an epitome of the former, and an epitome of the latter appeared in 1858. The Literary Remains of H. F. Clinton were published by C. J. F, Clinton in

1854.

CLITHEROE, a manufacturing town and a municipal and parliamentary borough of England, in the county of

Lancashire, situated not far from the Ribble, at the foot of Pendle Hills, about 28 miles by railway north of Manchester. It has several suburbs, known as Waterloo, Salford, and Bawdlands, and at the side of the river is the little village of Low Moor. Its principal buildings are the parish church of St Michael's, a grammar school founded in 1554, the moothall, and the county court erected in 1864 ; and its industrial establishments comprise cotton- mills, extensive print-works, papcer-mills, foundries, and brick and lime works. The cotton manufacture alone employed upwards of 2000 people in 1871. Clitheroe was a borough by prescription as early as the 11th century, and in 1138 it is mentioned as the scene of a battle be- tween the Scotch and English. Its castle, probably built not long after, was a fortress of the Lacy family, and continued a defensible position till 1649, when it was dis- mantled by the Parliamentary forces. The Honor of Cli- theroe, for a long time a part of the duchy of Lancaster, and bestowed by Charles IT. on General Monk, is now in the pos- session of the Buccleuch family. Population of the municipal borough in 1871, 8208; of the parliamentary, 11,786.

CLITOMACHUS, a leader of the New Academy, was a Carthaginian originally named Hasdrubal, who came to Athens about the middle of the 2d ceutury Bc. He made himself well acquainted with Stoical and Peripatetic philosophy; but he principally studied under Carneades, whose

views he adopted, and whom he succeeded as chief representative of the New Academy in 129 Bo. His works were some 400 in number; but we possess scarcely anything but a few titles, among which are De sustincndis offensionibus, wept éxroxfs (on suspension of judgment), and mept aipécewv (an account of various philosophical sects). In 146 he wrote a philosophical treatise to console his countrymen after the ruin of their city. One of his works was dedicated to the Latin poet Lucilius, another to L. Censorinus, who was consul in 149 B.c.

CLITOR, a town of ancient Greece, in that part of Arcadia which corresponds to the modern eparchy of Kalavryta. It stood in a fertile plain to the south of Mount Chelmos, the highest peak of the Aroanian Moun- tains, and not far from a stream of its own name, which joined the Aroanius, or Katzana. In the neighbourhood was a fountain, the waters of which were said to deprive those who drunk them of the taste for wine. The town was a place of considerable importance in Arcadia, and its inhabitants were noted for their love of liberty. It extended its territory over several neighbouring towns, and in the Theban war fought against Orchomenos. As a member of the Achzan league it suffered siege at the hands of the Aitolians, and was on several occasions the seat of the federal assemblies. The ruins, which bear the common name of Paleopoli, or Old City, are still to be seen about three miles from a village that preserves the ancient designation. The greater part of the walls and several of the circular towers with which they were strengthened can be clearly made out; and there are also remains of a small Doric temple, the columns of which were adorned with strange capitals.

CLIVE, Rozsert (1725-1774), Baron Clive of Plassy, in the peerage of Ireland, was the statesman and general who founded the empire of British India before ho was forty years of age. He is now represented by the Powis family, his son having been made earl of Powis in the peerage of the United Kingdom. Clive was born on the 29th September 1725 at Styche, the family estate in the parish of Moreton-Say, Market-Drayton, Shropshire. We learn from himself, in his second specch in the House of Commons in 1773, that as the estate yielded only £500 a year, his father followed tho profession of the law also. The Clives, or Clyves, formed one of the oldest families in the

county of Shropshire, having held the manor of that name in the reign of Henry II. One Clive was Irish Chancellor of the Exchequer under Henry VIII.; another was a member of the Long Parliament ; Robert's father sat for many years for Montgomeryshire. His mother, to whom throughout life he was tenderly attached, and who had a powerful influence on his career, was a daughter, and with her sister Lady Sempill co-heir, of Nathaniel Gaskell of Mauchester. Robert was their eldest son. With his five sisters, all of whom were married in due time, he ever maintained the most affectionate relations. His only brother survived to 1825. Young Clive was the despair of his teachers. Sent from schocl to school, and for only a short time at .the Merchant Taylors' school, which had then a high reputation, he neglected his books for boyish adventures, often of the most dangerous kind. But he was not so ignorant as it is the fashion of his biographers to represent, He could translate Horace in after life, at the opening of the book ; and he must have laid in his youth the foundation of that clear and vigorous English style which marked all his despatches, and made Lord Chatham declare of one of his speeches in the House of Commons that it was the most eloquent he had ever heard. From his earliest years, however, his anibition was to lead his fellows ; but he never sacrificed honour, as the word was then understood, even to the fear of dcath. At eighteen he was sent out to Madras asa " factor" or " writer" in the civil service of the East India Company. The deten- tion of the ship at Brazil for nine months enabled him to acquire the Portuguese language, which, at a time when few or none of the Company's servants learned the vernaculars of India, he often found of use during his service there. For the first two years of his residence he was miserable. He felt keenly the separation from home; he was always breaking through the restraints imposed on young "writers ;" and he was rarely out of trouble with his fellows, with one of whom he fought a duel. Thus early, too, the effect of the climate on his health began to show itself in those fits of depression during one of which he afterwards pre- maturely ended his life. The story is told of him by his companions, though he himself never spoke of it, that he twice snapped a pistol at his head in vain. His one solace was found in tho Governor's library, where he sought to make up for past carelessness, not only by much reading, but by a course of study. He was just of age, when in 1746 Madras was forced to capitulate to Labourdonnais, during the war of the Austrian Succession. The breach of that capitulation by Dupleix, then at the head of the French

settlements in India, led Clive, with others, to escape from the town to the subordinate Fort St David, some twenty miles to the south. There, disgusted with the state of affairs and the purely commercial duties of an East Indian civilian, as they then were, Clive obtained an ensign's commission.

At this time India was ready to become the prize of the first conqueror who to the dash of the soldier added the skill of the administrator. For the forty years since the death of the Emperor Aurungzebe, the power of the Great Mogul had gradually fallen into the hands of his provincial viceroys or soubadars. The three greatest of these were the nawab of the Deccan, or South and Central India, who ruled from Hyderabad, the nawab of Bengal, whose capital was Moorshedabad, and the nawab or vizier of Oudh. The prize lay between Dupleix, who had thie genius of an administrator, or rather intriguer, but was no soldier, and Clive, the first of a century's brilliant succes- sion of those " soldier-politicals," as they are called in the East, to whom, ending with Sir Henry Lawrence, Great Britain owes the conquest and consolidation of its greatest depeudency. Clive successively established British ascend-

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ency aganist French influence in the three great provinces under these nawabs. But his merit lies especially in the ability and foresight with which he secured for his country, aud for the good of the natives, the richest of the three, Bengal. First, as to Madras and the Deccan, Clive had hardly been able to commend himself to Major Stringer Lawrence, the commander of the British troops, by his courage and skill in several small engagements, when the peace of Aix-la-Chapelle forced him to return to his civil duties for a short time. An attack of the malady which so severely affected his spirits led him to visit Bengal, where he was soon to distinguish himself. On his return he found a contest going on between two sets of rival claimants for the position of viceroy of the Deccan, and for that of nawab of the Carnatic, the greatest of the subor- dinate states under the Deccan. Dupleix, who took the part of the pretenders to power in both places, was carry- ing all beforehim. 'The British had been weakened by the withdrawal of a large force under Admiral] Boscawen, and by the return home, on leave, of Major Lawrence. But that officer had appointed Clive commissary for the supply

of the troops with provisions, with the rank of captain. More than one disaster had taken place ona small scale, when Clive drew up a plan for dividing the enemy's forces, and offered to carry it out himself. The pretender, Chunda Sahib, had been made nawab of the Carnatic with Dupleix's assistance, while the British had taken up the cause of the more legitimate successor, Mahomed Ali. Chunda Sahib had left Arcot, the capital of the Carnatic, to reduce Trichinopoly, then held by a weak English battalion. Clive offered to attack Arcot that he might force Chunda Sahib to raise the siege of Trichinopoly. But Madras and Fort St David could supply him with only 200 Europeans and 300 sepoys. Of the eight officers who led them, four were civilians like Clive himself, and six had never been in action. His force had but three field-pieces. The cir- cumstance that Clive, at the head of this handful, had been seen marching during a storm of thunder and lightning, led the enemy to evacuate the fort, which the British at once vegan to strengthen against a siege. Clive treated the great population of the city with so much considera- tion that they helped him, not only to fortify his position, but to make successful sallies against the enemy. As the days passed on, Chunda Sahib sent a large army under his son and his French supporters, who entered Arcot and closely besieged Clive in the citadel. An attempt to relieve him from Madras was defeated. Meanwhile the news of the marvellous defence of the English reached the Mahratta allies of Mahomed Ali, who advanced to Clive's rescue. This led the enemy to redouble their exertions, but in vain. After for fifty days besieging the fort, and offering large sums to Clive to capitulate, they retired from Arcot. The brave garrison had been so reduced by the gradual failure of provisions that the sepoys offered to be content with the thin gruel which resulted from the boiling of the rice, leaving the grain to their European comrades. Of the 200 Europeans 45 had been killed, aud of the 300 sepoys 30 had fallen, while few of the survivors had escaped wounds. In India, we might say in all history, there is no parallel to this exploit of 1751 till we come to the siege of Lucknow in 1857. Clive, now reinforced, followed up his advan- tage, and Major Lawrence returned in time to carry the war to a successful issue. In 1754 the first of our Carnatic treaties was made provisionally, between Mr T. Saunders, the Company's resident at Madras, and M. Godeheu, the French commander, in which the English protegé, Mahomed Ali, was virtually recognized as nawab, and both nations agreed to equalize their possessions. When war again broke out in 1756,

and the French, during Clive’s absenco in Bengal, obtained successes in the northern districts, his

efforts helped to drive them from their settlements. The Treaty of Paris in 1763 formally confirmed Mahomed Ali in the position which Clive had won for him. Two years after, the Madras work of Clive,was completed by a firmaun from the emperor of Delhi, recognizing the British posses- sions in Southern India.

The siege of Arcot at once gave Clive a European reputa- tion. Pitt pronounced the youth of twenty-seven who had done such deeds a “ heaven-born general,” thus endorsing the generous appreciation of his early commander, Major Lawrence. When the Court of Directors voted him a sword worth £700, he refused to receive it unless Lawrence was similarly honoured. He left Madras for home, after ten years absence, early in 1753, but not before marrying Miss Margaret Maskelyne, the sister of a friend, and of one who was afterwards well known as astronomer royal. All his correspondence proves him to have been a good husband and father, at a time when society was far from pure, and scandal made havoc of the highest reputations. In after days, when Clive’s uprightness and stern reform of the Company’s civil and military services made him many enemies, a biography of him appeared under the assumed name of Charles Carracioli, Gent. All the evidence is against the probability of its scandalous stories being true. Clive’s early life seems occasionally to have led him to yield to one of the vices of his time, loose or free talk among intimate friends, but beyond this nothing has been proved to his detriment. After he had been two years at home the state of affairs in India made the directors anxious for his return. He was sent out, in 1756, as governor of Fort St David, with the reversion of the government of Madras, and he received the commission of lieutenant-colonel in the king’s army. He took Bombay on his way, and there commanded the land force which captured Gheriah, the stronghold of the Mahratta pirate, Angria. In the distribu- tion of prize money which followed this expedition he showed no little self-denial. He took his seat as governor of Fort St David on the day on which the nawab of Bengal captured Calcutta. hither the Madras Government at once sent him, along with Admiral Watson. He entered on the second period of his career.

Since, in August 1690, Job Charnock had landed at the village of Chuttanutti with a guard of one officer and 30 men, the infant capital of Calcutta had become a rich centre of trade. The successive nawabs or viceroys of Bengal had been friendly to it, till, in 1756, Suraj-ud-Dowlah succeeded his uncle at Moorshedabad. His predecessor's financial minister had fled to Calcutta to escape the extor- tion of the new nawab, and the English governor refused to deliver up the refugee. Enraged at this, Suraj-ud- Dowlah captured the old fort of Calcutta on the Sth August, and plundered it of more than two millions sterling, Many of the English fled to the ships and dropped down the river. The 146 who remained, were forced into "the Black Hole" in the stifling heat of the sultriest period of the year. Only 23 came out alive. The fleet was as strong, for those days, as the land force was weak, Disembarking his troops some miles below the city, Clive marched through the jungles, where he lost his way owing to the treachery of his guides, but soon invested Fort William, while the fire of the ships reduced it, on the 2d January 1757, On the 4th February he defeated the whole army of the nawab, which had taken up a strong position just beyond what is now the most northerly suburb of Calcutta. The nawab hastened to conclude a treaty, under which favourable terms were conceded to the Company's trade, the factories and plundered property were restored, and an English mint was established. In the accompanying agreement, offensive and defensive, Clive appears under the name by which he was aver known to

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the natives of India, Sabut Jung, or the daring in war. The hero of Arcot had, at Angria's stronghold, and now again under the walls of Calcutta, established his reputa- tion as the first captain of the time. With 600 British soldiers, 800 sepoys, 7 field-pieces and 500 sailors to draw them, he had routed a force of 34,000 men with 40 pieces of heavy cannon, 50 elephants, and a camp that extended upwards of four miles in length. His own account, ina letter to the archbishop of Canterbury, gives a modest but vivid description of the battle, the importance of which has been overshadowed by Plassy. In spite of his double defeat and the treaty which followed it, the

madness of the nawab burst forth again. As England and France were once more at war, Clive sent the fleet up the river against Chandernagore, while he besieged it by land. After consenting to the siege, the nawab sought to assist the French, but in vain. The capture of their principal settle- ment in India, next to Pondicherry, which had fallen in the previous war, gave the combined forces prize to the value of £130,000. The rule of Suraj-ud-Dowlah became as intolerable to his own people as to the English. They formed a confederacy to depose him, at the head of which was Jaffier Ali Khan, his commander-in-chief. Associating with himself Admiral Watson, Governor Drake, and Mr Watts, Clive made a treaty in which it was agreed to give the office of souba, or viceroy of Bengal, Behar, and Orissa, to Jaffier, who was to pay a million sterling to the Company for its losses in Calcutta and the cost of its troops, half a million to the English inhabitants of Calcutta, £200,000 to the native inhabitants, and £70,000 to its Armenian merchants. Up to this pointall is clear. Suraj ud-Dowlah was hopeless as aruler. His relations alike to his master, the merely titular emperor of Delhi, and to the people left.the province open to the strongest. After “the Black Hole,” the battle of Calcutta, and the treachery at Chandernagore in spite of the treaty which followed that battle, the Hast India Company could treat the nawab only asanenemy. Clive, it is true, might have disregarded all native intrigue, marched on Moorshedabad, and at once held the delta of the Ganges in the Company’s name. But the time was not ripe for this, and the consequences, with so small a force, might have been fatal. The idea of acting directly as rulers, or save under native charters and names, was not developed by events for half a century. The political morality of the time in Europe, as well as the comparative weakness of the Company in India, led Clive not only to meet the dishonesty of his native associate by equal dishonesty, but to justify his conduct by the declara- tion, years after, in Parliament, that he would do the same again. It became necessary to employ the richest Bengalee trader, Omichund, as an agent between Jaffier Ali and the English officials. Master of the secret of the confederacy against Suraj-ud-Dowlah, the Bengalee threatened to betray it unless he was guaranteed, in the treaty itself, £300,000. To dupe the villain, who was really paid by both sides, a second, or fictitious treaty, was shown him with a clause to this effect. This Admiral Watson refused to sign; “ but,” Clive deponed to the House of Commons, “to the best of his remembrance, he gave the gentleman who carried it leave to sign his name upon it; his

lordship never made any secret of it; he thinks it warrantable in such a case, and would do it again a hundred times ; he had no interested motive in doing it, and did it with a design of disappointing the expectations of a rapacious man.” Such is Clive’s own defence of the one act which, in a long career of abounding temptations, stains his public life. The whole hot season of 1757 was spent in these negotiations, till the middle of June, when Clive began his march from Chandernagore, the British in boats, and the sepoys along the right bank of the Hooghly. That river,

above Calcutta is, during the rainy season, fed by the overflow of the Ganges to the north through three streams, which in the hot months are nearly dry. On the left bank of the Bhagarutti, the most westerly of these, 100 miles above Chandernagore, stands Moorshedabad, the capital of the Mogul viceroys of Bengal,‘and then so vast that Clive compared it to the London of his day. Some miles farther down is the field of Plassy, then an extensive grove of mango trees, of which enough yet remains, in spite of the changing course of the stream, to enable the visitor to realize the scene. On the 2lst June Clive arrived on the bank opposite Plassy, in the midst of that outburst of rain which ushers in the south-west monsoon of India. His whole army amounted to 1100 Europeans and 2100 native troops, with 10 field-pieces. The nawab had drawn up 18,000 horse, 50,000 foot, and 53 pieces of heavy ordnance, served by French artillerymen. For once in his career Clive hesitated, and called a council of sixteen officers to decide, as he put it, ‘ whether in our present situation, without assistance, and on our own bottom, it would be prudent to attack the nawab, or whether we should wait till joined by some country power?” Clive himself headed the nine who voted for delay; Major (afterwards Sir) Eyre Coote, led the seven who counselled immediate attack. But, either because his daring asserted itself, or because, also, of a letter that he received from Jaffier Ali, as has been said, Clive was the first to change his mind and to communicate with Major Eyre Coote. One tradition, followed by Macaulay, represents him as spending an hour in thought under the shade of some trees, while he resolved the issues of what was to prove one of the decisive battles of the world. Another, turned into verse by an Anglo-Indian poet, pictures his resolution as the result of a dream. However that may be, he did well as a

soldier to trust to the dash and even rashness that had gained Arcot and triumphed at Calcutta, and as a states- man, since retreat, or even delay, would have put back the civilization of India for years. When, after the heavy rain, the sun rose brightly on the 22d, the 3200 men and the six guns crossed the river and took possession of the grove and its tanks of water, while Clive established his head- quarters in a hunting lodge. On the 23d the engagement took place and lasted the whole day. Except the 40 Frenchmen and the guns which they worked, the enemy did little to reply to the British cannonade which, with the 39th Regiment, scattered the host, inflicting on it a loss of 500men. Clive restrained the ardour of Major Kirkpatrick, for he trusted to Jaffier Ali's abstinence, if not desertion to his ranks, and knew the importance of sparing his own small force. He lost hardly a white soldier; in all 22 sepoys were killed and 50 wounded. His own account, written a nionth after the battle to the secret committee of the court of directors, is not less unaffected than that in which he had announced the defeat of the nawab at Calcutta. Suraj-ud-Dowlah fled from the field on a camel, secured what wealth he could, and came to an untimely end. Clive entered Moorshedabad, and established Jaffier Ali in the position which his descendants have ever since enjoyed, as pensioners, but have not unfrequently abused. When taken through the treasury, amid a million and a half sterling's worth of rupees, gold and silver plate, jewels, and rich goods, and besought to ask what he would, Clive was content with £160,000, while half a million was dis- tributed among the army and navy, both in addition to gifts of £24,000 to each member of the Company's com- mittee, and besides the public compensation stipulated for in the treaty. It was to this occasion that he referred in his defence before the House of Commons, when he declared that he marvelled at his moderation. He sought rather to increase the shares of the fleet and the

troops at his own expense, as he had done at Gheriah, and did more than once afterwards, with prize of war. What he did take from the grateful nawab for himself was less than the circumstances justified from an Oriental point of view, was far less than was pressed upon him, not only by Jaffier Ali, but by the hundreds of the native nobles whose gifts Clive steadily refused, and was openly acknowledged from the first. He followed

a usage fully recognized by the Company, although the fruitful source of future evils which he himself was again sent out to correct. The Company itself acquired a revenue of £100,000 a year, and a contribution towards its losses and military expendi- ture of a million anda half sterling. Such was Jaffier Ali's gratitude to Clive that he afterwards presented him with the quit-rent of the Company's lands in and around Calcutta, amounting to an annuity of £27,000 for life, and left him by will the sum of £79,000, which Clive devoted to the army.

While busy with the civil administration, the conqueror of Plassy continued to follow up his military success. He sent Major Coote in pursuit of the French almost as far as Benarcs, He despatched Colonel Forde to Vizagapatam and the northern districts of Madras, where that officer gained the battle of Condore, pronounced by Broome " one of the most brilliant actions on military record." He came into direct contact, for the first time, with the Great Mogul himself, an event which resulted in the most important consequences during the third period of his career. Shah Aalum, when Shahzada, or heir-apparent, quarrelled with his father Aalum Geer II., the emperor, and united with the viceroys of Oudh and Allahabad for the conquest of Bengal. He advanced as far as Patna, which he besieged with 40,000 men. Jaffier Ali, in terror, sent his son to its relief, and implored the aid of Clive. Major Caillaud defeated the prince's army at the battle of Sirpore, and dis- persed it. Finally, at this period, Clive repelled the ageression of the Dutch, and avenged the massacre of Amboyna, on that occasion when he wrote his famous letter, "Dear Forde, fight them immediately ; I will send you the order of council to-morrow." Meanwhile he never ceased to improve the organization and drill of the sepoy army, after a European model, and enlisted into it many Mahometans of fine physique from Upper India. He re. fortified Calcutta. In 1760, after four years of labour so incessant and ~~results so glorious, his health gave way and he returned to England. "Tt appeared," wrote a con~~ temporary on the spot, "as if the soul was departing from the government of Bengal." He had been formally made governor of Bengal by the court of directors at a time

when his nominal superiors in Madras sought to recall him –

to their help there. But he had discerned the importance of the province even during his first visit to its rich delta, mighty rivers, and teeming population. It should be noticed, also, that he had the kingly gift of selecting the ablest subordinates, for even thus early he had discovered the ability of young Warren Hastings, destined to be his great successor, and, a year after Plassy, made him “resident ” at the nawab’s court.

In 1760, at thirty-five years of age, Clive returned to England with a fortune of at least £300,000 and the quit- rent-of £27,000 a year, after caring for the comfort of his parents and sisters, and giving Major Lawrence, his old commanding officer, who had early encouraged his military genius, £500 a year. The money had been honourably and publicly acquired, with the approval of the Company. The amount might have been four times what it was, had Clive been either greedy after wealth or ungenerous to the colleagues and the troops whom he led to victory. In the five years of his conquests and administration in Bengal, the young man had crowded together a succession of

exploits which led Lord Macaulay, in what that historian termed his “ flashy ” essay on the subject, to compare him to Napoleon Bonaparte. But there was this difference in Clive’s favour, due not more to the circumstances of the time than tothe object of his policy—he gave peace, security, prosperity, and such liberty as the caso allowed of to a people now reckoned at 240 millions, who had for centuries been the prey of oppression, while Napoleon warred only for personal ambition, and the absolutism he established has left not a wreck behind. During the three years that Clive remained in England he sought a political position, chiefly that he might influence the course of events in India, which he had left full of promise. He had been well received at court, had been made Baron Clive of Plassy, in the peerage of Ireland, had bought estates, and had got not only himself but his friends returned to the House of Commons after the fashion of the time. Then it was that he set himself to reform the home system of the East India Company, and commenced a bitter warfare with Mr Sulivan, chairman of the court of directors, whom finally he defeated. In this he was aided by the news of reverses in Bengal. Vansittart, his successor, having no great influence over Jaffier Ali Khan, had put Kossim Ali Khan, the son-in-law, in his place in considera- tion of certain payments to the English

officials. After a brief tenure Kossim Ali had fled, had ordered Summers, or Sumroo, a Swiss mercenary of his, to butcher the garrison of 150 English at Patna, and had disappeared under the protection of his brother viceroy of Oudh. The whole Company's service, civil and military, had become demoralized by such gifts, and by the monopoly of the inland as well as export trade, to such an extent that the natives were pauperized, and the Company was plundered of the revenues which Clive had acquired for them. The court of proprietors, accordingly, who elected the directors, forced them, in spite of Sulivan, to hurry out Lord Clive to Bengal with the double powers of governor and com- mander-in-chief.

What he had done for Madras, what he had accomplished for Bengal proper, and what he had effected in reforming the Company itself, he was now to complete in less than two years, in this the third period of his career, by putting his country politically in the place of the emperor of Delhi, and preventing for ever the possibility of the corrup- tion to which the English in India had been driven by an evil system. On the 3d May 1765, he landed at Calcutta to learn that Jaffier Ali Khan had died, leaving him personally £70,000, and had been succeeded by his son, though not before the Government had becn further demoralized by taking £100,000 as a gift from the new nawab ; while Kossim Ali had induced not only the viceroy of Oudh, but the emperor of Delhi himself, to invade Behar. After the first mutiny in the Bengal army, which was suppressed by blowing the sepoy ringleader from the guns, Major Munro, "the Napier of those times," scattered the united armies on the hard-fought field of Buxar. The emperor, Shah Aalum, detached himself from the league, while the Oudh viceroy threw himself on the mercy of the English. Clive had now an opportunity of repeating in Hindustan, or Upper India, what he had accomplished for the good of Bengal. He might have secured what are now called the North-Western Provinces and Oudh, and have rendered unnecessary the campaigns of Wellesley and Lake. But he had other work in the consolidation of rich Bengal itself, making it a base from which the mighty fabric of British India could afterwards steadily and proportionally grow. Hence he returned to the Oudh viceroy all his territory save the provinces of Allahabad and Corah, which he made over tothe weak emperor. But from that emperor he secured the most important document in the whole'of

our Indian history up to that time, which appears in the records as “ firmaund from the King Shah Aalum, granting the dewany of Bengal, Behar, and Orissa to the Company, 1765.” he date was the 12th August, the place Benares, the throne an English dining-table covered with embroidered cloth and surmounted by a chair in Clive’s tent. It is all pictured by a Mahometan contemporary, who indignantly exclaims that so great a “ transaction was done and finished in less time than would have been taken up in the sale of a jackass.” By this deed the Company became the real sovereign rulers of thirty millions of people, yielding a revenue of four millions sterling. All this had been ac- complished by Clive in the few brief years since he had avenged “ the Black Hole” of Calcutta. This would be a small matter, or might even be a cause of reproach, were it not that the Company’s, now the Queen’s, undisputed sovereignty proved, after a sore period of transition the salvation of these millions. The lieutenant-governorship of Bengal, with some additions since Clive’s time, now

contains sixty millions of people, and yields an annual |

revenue of twelve millions sterling, of which eight goes every year to assist in the good government of the rest of India. But Clive, though thus moderate and even generous to an extent which called forth the astonishment of the natives, had alla statesman’s foresight. Onthe same date, he obtained not only an imperial charter for the Company’s possessions in the Carnatic also, thus completing the work he began at Arcot, but a third firmaun for the highest of all the lieutenancies or soubaships of the empire, that of the Deccan itself, The fact has only recently been discovered, by distinct allusion to it in a letter from the secret committee of the court of directors to the Madras Government, dated 27th April 1768. Still so disproportionate seemed the British force, not only to the number and strength of the princes and people of India, but to the claims and ambition of French, Dutch, and Danish rivals, that Clive’s last advice to the directors, as he finally left India in 1777, was this, given in a remark- able state paper but little known: “ We are sensible that, since the acquisition of the dewany, the power formerly belonging to the soubah of those provinces is totally, in fact, vested in the East India Company.

Nothing remains to him but the name and shadow of authority. This uame, however, this shadow, it is indispensably necessary we should seem to venerate.” Ona wider arena, even that of the Great Mogul himself, the shadow was kept up till it obliterated itself in the massacre of English people in the Delhi palace in 1857 ; and the Queen was proclaimed, first, direct ruler on the lst November 1858, and then empress of India on the 1st January 1377

Having thus founded the empire of British India, Clive’s painful duty was to create a pure and strong administration, such as alone would justify its possession by foreigners. The civil service was de-orientalized by raising the miserable salaries which had tempted its members to be corrupt, by forbidding the acceptance of gifts from natives, and by exacting covenants under which participation in ‘the inland trade was stopped. Not less important were his military reforms. With his usual tact and nerve he put down a mutiny of the English officers, who chose to resent the veto against receiving presents and the reduction of batta at a time when two Mahratta armies were marching on Bengal. His reorganization of the army, on the lines of that which he had begun after Plassy, and which was neglected during his second visit to England, has since attracted the admiration of the ablest Indian officers. He divided the whole into three brigades, so as to make each a complete force, in itself equal to apy single native army that could be brought against it. His one fault was that of his age and his position, with so small a number of men.

CLIVE

He lacked a sufficient number of British artillcrymen, and would not commit the mistake of his successors, who trained natives to work the guns, which were turned against us with such effect in 1857. It is sufficient to say that Government has returned to his policy, for not a native gunner is now to be found save ina few unhealthy and isolated frontier posts.

- Olive’s final return to England, a poorer man than he went out, inspite of still more tremendous teniptations, was the signal for an outburst of his personal enemies, exceeded only by that which the malice of Sir Philip Francis after- wards excited against Warren Hastings. Every civilian, whose

illicit gains he had cut off, every officer whose con- spiracy he had foiled, every proprietor or director, like

‘Sulivan, whose selfish schemes he had thwarted, now

sought their opportunity. He had, with consistent generosity, at once made over the legacy of £70,000 from the grateful Jaffier Ali, as the capital of what has since been known as “the Clive Fund,” for the support of invalided European soldiers, as well as officers, and their widows, and the Company had allowed 8 per cent. on the sum for an object which it was otherwise bound to meet. Burgoyne, of Saratoga memory, did his best to induce the House of Commons, in which Lord Clive was now member for Shrewsbury, to impeach the man who gave his country an empire, and the people of that empire peace and justice, and that, as we have seen, without blot on the gift, save in the matter of Omichund. The result, after the brilliant and honourable defences of his career which will be found in Almon’s Debates for 1773, was a compromise that saved England this time from the dishonour which, when Warren Hastings had to run the gauntlet, put it in the same category with France in the treatment of its public bene- factors abroad. On a division the House, by 155 to 95 carried the motion that Lord Clive “did obtain and possess himself” of £234,000 during his first administration of Bengal; but, refusing to express an opinion on the fact, it passed unanimously the second motion, at five in the morning, “that Robert, Lord Clive, did at the same time render great and meritorious services to his country.” The one moral question, the one stain of all that brilliant and tempted life—the Omichund treaty—was not touched, Only one who can personally understand what Clive’s power and services were will rightly realize the effect on him, though in the prime of life, of the discussions through which he had been dragged. We have referred to Warren Hastings’s impeachment, but there is a more recent parallel. The marquis of Dalhousie did almost as much to complete the territorial area and civilized administration of British India in his eight years’ term of office as Lord Clive to found the empire in a similar period. As Clive’s accusers sought a new weapon in the great famine of 1770, for which he was in no sense responsible, so there were critics who accused Dal- housie of haviug caused that mutiny which, in truth, lie would have prevented had the British Government listened to his counsel not to reduce the small

English army in the country. Clive tells us his own feelings in a passage of first importance when we seek to form an opinion on the fatal act by which he ended his life. In the greatest of his speeches, in reply to Lord North, he said,—“ My situation, sir, has not been an easy one for these twelve montlis past, and though my conscience could never accuse me, yet I felt for my friends who were involved in the same censure as myself. I have been examined by the select committee more like a sheep-stealer than a member of this House.” Fully accepting that statement, and believing him to have been purer than his accusers in spite of temptations unknown to then, we see in Clive’s end the result merely of physical suffering, of chronic disease which opium failed to abate, while the worry and chagrin

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caused by his enemies gave it full scope. This great man, who fell short only of the highest form of moral greatness on one supreme occasion, but who did more for his country than any soldier till Wellington, and more for the people and princes of India than any statesman in history, ceased to exist on the 22d November 1774, in his fiftieth year. The portrait of Clive, by Dance, in the Council Chamber of Government House, Calcutta, faithfully represents him. He was slightly above middle-size, with a countenance rendered heavy and almost sad by a natural fulness above

CLO 18

the eyes. Reserved to the many, he was beloved by his own family and friends. His encouragement of scientific undertakings like Major Rennell’s surveys, and of philo- logical researches like Mr Gladwin’s, was marked by the two honorary distinctions of F.R.S. and LL.D.

The best authorities for his life, which has yet to be worthily written, are—article “Clive,” in the second or Kippis’s edition of the Biographia Britannica, from materials supplied by his brother, Archdeacon Clive, by Henry Beaufoy, M.P. ; Broome’s History of the Bengal Army; Aitchison’s Treaties, second edition, 1876; Orme’s History ; and Malcolm’s Life (G. SM.)

CLOCKS

HE origin of clock work is involved in great obscurity. Notwithstanding the statements by many writers that clocks, horologia, were in use so early as the 9th century, and that they were then invented by an archdeacon of Verona, named Pacificus, there appears to be no clear evidence that they were machines at all resembling those which have been in use for the last five or six centuries. But it may be inferred from various allusions to horologia, and to their striking spontaneously, in the 12th century, that genuine clocks existed then, though there is no surviving description of any one untilthe 13th century, when it appears that a horologium was sent by the sultan of Egypt in 1232 to the Emperor Frederick I]. “It resembled a celestial globe, in which the sun, moon, and planets moved, being impelled by weights and wheels, so that they pointed out the hour, day, and night with cer- tainty.” A clock was put up in a former clock tower at Westminster with some great bells in 1288, out of a fine imposed on a corrupt chief-justice, and the motto Discite

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Fic. 1.—Section of House Clock.

1292 one is mentioned in Canterbury Cathedral as costing £30. And another at St Albans, by R. Wallingford the abbot in 1326, issaid to have been such as there was not in all Europe, showing various astronomical phenomena. A description of one in Dover Castle with the date 1348 on it was published by the late Admiral Smyth, P.R.A.S., in 1851, and the clock itself was exhibited going, in the Scientific Exhibition of 1876. In the early cditions of this Encyclopedia there was a picture of a very similar one, made by De Vick for the French king Charles V. about the same time, much like our common clocks of the last century, except that it had a vibrating balance, but no spring, instead of a pendulum, for pendulums were not invented till three centuries after that.

The general construction of the going part of all clocks, except large or turret clocks, which we shall treat separ- ately, is substantially the same, and fig. 1 is a section of any ordinary house clock. B is the barrel with the rope coiled round it, generally 16 times for the 8 days ; the barrel is fixed to its arbor K, which is prolonged into the winding square coming up to the face or dial of the clock; the dial is here shown as fixed either by small screws 2, or by a socket and pin z, to the prolonged pillars p, p, which (4 or 5 in number) connect the plates or frame of the clock together, though the dial is commonly, but for no good reason, set on to the front plate by another set of pillars of its own. The great wheel G rides on the arbor, and is connected with the barrel by the ratchet R, the action of which is shown more fully in fig 14. The intermediate wheel v in this drawing is for a purpose which will be de- scribed hereafter, and for the present it may be considered as omitted, and the click of the ratchet R as fixed to the great wheel. The great wheel drives the pinion ¢ which is called the centre pinion, on the arbor of the centre wheel C, which goes through to the dial, and carries the long, or

| minute-hand ; this wheel always turns in an hour, and the great wheel generally in 12 hours, by having 12 times _ ag many teeth as the centre pinion. The centre wheel drives

the “second wheel” D by its pinion d, and that again drives the scape-wheel E by its pinion e. If the pinions d and e have each 8 teeth or leaves (as the teeth of pinions are usually called), C will have 64 teeth and D 60, in a clock of which the scape-wheel turns in a minute, so that the seconds hand

may be set on its arbor prolonged to the dial. A represents the pallcts of the escapement, which will be described presently, and their arbor a goes throngh a large hole in the back plate near F, and its back pivot turns in a cock OFQ screwed on to the back plate. From the pallet arbor at F descends the crutch Hy, ending in the fork f, which embraces the pendulum P, so that as the pendulum vibrates, the crutch and the pallets necessarily vibrate with it. The pendulum is hung by a thin spring S from the cock Q, so that the bending point of the spring may be just opposite the end of the pallet arbor, and the

justitiam, moniti, inscribed upon it. The belis were sold | edge of the spring as close to the end of that arbor as or rather, it is said, gambled away, by Henry VIII. In | possible—a point too frequently neglected.

14

We may now go to the front (or left hand) of the clock, and describe the dial or “ motion-work.” The minute hand fits on to a squared end of a brass socket, which is fixed to the wheel M, and fits close, but not tight, on the pro longed arbor of the centre wheel. Behind this wheel is a bent spring which is (or ought to be) set on the same arbor with a square hole (not a round one as it sometimes is) in the middle, so that it must turn with the arbor; the wheel is pressed up against this spring, and kept there, by a cap and a small pin through the end of the arbor. The consequence is, that there is friction enough between the spring and the wheel to carry the hand round, but not enough to resist a moderate push with the finger for the purpose of altering the time indicated. This wheel M, which is sometimes called the minute-wheel, but is better called the howr-wheel as it turns in an hour, drives another wheel N, of the same number of teeth, which has a pinion attached to it; and that pinion drives the twelve-hour wheel H, which is also attached to a large socket or pipe carrying the hour hand, and riding on the former socket, or rather (in order to relieve the centre arbor of that extra weight) on an intermediate socket fixed to the bridge L, which is screwed to the front plate over the hour-wheel M. The weight W, which drives the train and gives the impulse to the pendu- lum through the escapement, is generally hung by a catgut line passing through a pulley attached to the weight, the other end of the cord being tied to some convenient place in the

clock frame or seat-board, to which it is fixed by screws through the lower pillars. It has usually been the practice to make the case of house clocks and astronomical clocks not less than 6 feet high; but that is a very unnecessary waste of space and materials; for by either diminishing the size of the barrel, or the number of its turns, by increasing the size of the great wheel by one-half, or hanging the weights by a treble instead of a double line, a case just long enough for the pendulum will also be long enough for the fall of the weights in 74 or 8 days. Of course the weights have to be increased in the same ratio, and indeed rather more, to overcome the increased friction ; but that is of no consequence.

PENDULUM,

The claim to the invention of the pendulum, like the claim to most inventions, is disputed ; and we have no intention of trying to settle it. It was, like many other discoveries and inventions, probably made by various persons independently, and almost simul- taneously, when the state of science had become ripe forit. The discovery of that peculiarly valuable property of the pendulum called tsochronism, or the disposition to vibrate different arcs in very nearly the same time (provided the arcs are none of them large), is commonly attributed to Galileo, in the well-known story of his being struck with the isochronism of a chandelier hung by a long chain from the roof of the church at Florence. And Galileo's son appears as a rival of Avicenna, Huyghens, Dr Hooke, and a London clockmaker named Harris, for the honour of having first applied the pendulum to regulate the motion of a clock train, all in the early part of the 17th century. Be this as it may, there seems little doubt that Huyghens was the first who mathematically investi- gated, and therefore really knew, the true nature of those properties of the pendulum which may now be found explained in any mathe- matical book on mechanics. He discovered that if a simple pen- dulum (7.¢., a weight or 606 consisting of a single point, and hung. by a rod or string of no weight) can be made to describe, not a circle, but a cycloid of which the string would be the radius of cur- vature at the lowest point, all its vibrations, however large, will be performed in the same time. For a little distance near the bottom, the circle very nearly coincides with the cycloid; and hence it is that, for small arcs, a pendulum vibrating as usual in a circle is nearly enough isochronous for the purposes of horology ; more espe-

cially when contrivances are introduced either to compensate for the variations of the are, or, better still, to destroy them altogether, by making the force on the pendulum so constant that its arc may never sensibly vary.

The difference between the time of any small are of the circle and any are of the cycloid varies nearly as the square of the circular are ; and again, the difference between the times of any two small

and nearly equal circular ares of the same pendulum, varies nearly as the arc itself. Ifa, the arc, is increased by a small amount dea, the pendulum will lose 10800ada seconds a day, which is rather more than 1 second, if @ is 2° (from zero) and da is 10’, since the numerical value of 2° is ‘035. If the increase of arc is considerable, it will not do to reckon thus by differentials, but we must take the difference of time for the day as 5400 (a?—a?), which will be just 8 seconds ifa=2° and a,=8°. For many years it was thought of great importance to obtain cycloidal vibrations of clock pendulums, and it was done by making the suspension string or spring vibrate between cycloidal cheeks, as they were called. But it was in time discovered that all this is a delusion,—first, because there is and ean be no such thing in reality as a simple pendulum, and cycloidal cheeks will only make a simple pendulum vibrate isochronously ; secondly, because a very slight error in the form of the cheeks (as Huyghens himself discovered) would do more harm than the circwlar error uncorrected, even for an arc of 10°, which is much larger than the common pendulum arc ; thirdly, because there was always some friction or adhesion between the cheeks and the string; and fourthly (a reason which applies equally to all the isochronous contrivances since invented), because a common clock escapement itself generally tends to produce an error exactly opponte to the circular error, or to make the pendulum vibrate quicker the farther it swings ; and therefore the circular error is actually useful for the purpose of helping to counteract the error due to the escapement, and the clock goes better than it would with a simple pendulum, describing the most perfect cycloid. At the same time, the thin spring by which pendulums are always suspended, except in some French clocks where a silk string is used (a very inferior plan), causes the pendulum to deviate a little from circular and to approxi- mate to cycloidal

motion, because the bend does not take place at one point, but is spread over some length of the spring. The accurate performance of a clock depends so essentially on the pendulum, that we shall go somewhat into dctail respecting it. First then, the time of vibration depends entirely on the length of the pendulum, the effect of the spring being too small for considera- tion until we come to differences of a higher order. But the time does not vary as the length, but only as the square root of the length ; 7.¢., a pendulum to vibrate two seconds must be four times as long as a seconds pendulum. The relation between the time of vibration and the length of a pendulum is expressedthus :—

a P where ¢ is the time in seconds, w the well-known

symbol for 8°14159, the ratio of the circumference of a circle to its diameter, 7 the length of the pendulum, and g the force of gravity at the latitude where it is intended to vibrate. This letter g, in the latitude of London, is the symbol for 82:2 feet, that being the velocity (or number of feet per secoud) at which a body is found by experiment to be moving at the end of the first second of its fall, being necessarily equal to twice the actual number of feet it has fallen in that second. Consequently, the length of a pendulum to beat seconds in London is 89°14 inches. But the same pendulum carried to the equator, where the force of gravity is less, would lose 24 minutes a day.

The seconds we are here speaking of are the seconds of a common clock indicating mean solar time. But as clocks are also required for sidereal time, it may be as well to mention the proportions between a mean andasidereal pendulum. A sidereal day is the interval between two successive transits over the meridian of a place by that imagin- ary point in the heavens called Y, the first point of Aries, at the intersection of the equator and the ecliptic; and there is one more sidereal day than there are solar days in a year, since the earth has to turn more than once round in space before the sun can come a second time to the meridian, on account of the earth’s own motion in its orbit during the day. A sidereal day or hour is shorter than a mean solar one in the ratio of ‘99727, and consequently a sidereal pendulum must be shorter than a mean time pendulum in the square of that ratio, or in the latitude of J.ondon the sidcreal seconds pen- dulum is 88°87 inches. As we

have mentioned what is 0 or 24 o’clock by sidereal time, we may as well add, that the mean day is also reckoned in astronomy by 24 hours, and not from midnight as in civil reckoning, but from the following noon ; thus, what we call 11 a.m. May 1 in common life is 28 h. April 30 with astronomers.

It must be remembered that the pendulums whose lengths we have been speaking of are simple pendulums ; and as that is a thing which can only exist in theory, the reader may ask how the length of a real pendulum to vibrate in any required time is ascertained. In every pendulum, that is to say, in every body hung so as to be capable of vibrating freely, there isa certain point, always some- where below the centre of gravity, which possesses these remarkable properties—that if the pendulum were turned upside down, and set vibrating about this point, it would vibrate in the same time-as before, and moreover, that the distance of this point from the point of suspension is exactly the length of that imaginary simple pendulum which would vibrate in the same time. This point is therefore called the centre of oscillation. The rules for finding it by calcula

tion are too complicated for ordinary use, except in bodics of certain simple and regular forms; but they are fortunately not requisite in practice, because in all clock pendulums the centre of oscillation is only a short distance below the centre of gravity of the whole pendulum, and generally so near to the centre of gravity of the bob—in fact a little above it—that there is no difficulty in making a pendulum for any given time of vibration near enough to the proper length at once, and then adjusting it by screwing the bob up or down until it is found to vibratc in the proper time.

Revolving or Conical Pendulum.

Thus far we have been speaking of vibrating pendulums ; but the notice of pendulums would be incomplete without some allusion to revolving or conical pendulums, as they are called, because they describe a cone in revolving. Such pendulums are used where a continuous instead of an intermittent motion of the clock train is required, as in the clocks for keeping an equatorial telescope directed to a star, by driving it the opposite

way to the motion of the earth, to whose axis the axis on which the telescope turns is made parallel. Clocks with such pendulums may also be used in bedrooms by persons who cannot bear the ticking of a common clock. The pendulum, instead of being hung by a flat spring, is hung by a thin piece of piano-forte wire ; and it should be under- stood that it has no tendency to twist on its own axis, and so to twist off the wire, as may be apprehended ; in fact, it would require some extra force to make it twist, if it were wanted todo so. The time of revolution of such a pendulum may be easily ascertained as follows :—Let 7 be its length ; a the angle which it makes with the vertical axis of the cone which it describes; w the angular velocity ; then the centrifugal force =w? /sin. a ; and as this is the force which keeps the pendulum away from the vertical, it must balance the force which draws it to the vertical, which is g tan. a:

and therefore J Z cos. 0

scribed in a second of time ; and the time of complete revolution through the angle 360° or 2r is™ = ny / P00s 4; that is to

say, the time of revolution of a pendulum of any given length is less than the time of a double oscillation of the same pendulum, in the proportion of the cosine of the angle which it makes with the axis of revolution to unity.

A rotary pendulum is kept in motion by the train of the clock ending in a horizontal wheel with a vertical axis, from which pro- jects an arm pressing against a spike at the bottom of the pendu- lum ; and it has this disadvantage that any inequality in the force of the train, arising from variations of friction or any other cause, is immediately transmitted to the pendulum ; whereas it will be seen that in scveral kinds of escapements which can be applied to a vibrating pendulum, the variations of force can be rendered nearly or quite insensible. And it is a mistake to imagine that there is any self-correcting power in a conical pendulum analogous to that of the governor of a steam-engine ; for that apparatus, though it is a couple of conical pendulums, has also a communication by a system of levers with the valve which supplies the steam. The governor apparatus has itself been applied to telescope-driving clocks, with a lever ending in a spring which acts by friction on some revolving plate in the clock, increasing the friction, and so diminishing the force as the balls of the governor fly out farther

under any increase in the force. And with the addition of some connection with the hand of the observer, by which the action can be farther moderated, the motion can be made sufficiently uniform for that purpose.

Various. other contrivances have been invented for producing a continuous clock-motion, The great equatorial telescope at Green- wich is kept in motion by a kind of water clock called in books on hydrostatics Barker's Mill, in which two horizontal pipes branching out from a vertical tubular axis have each a hole near their ends on opposite sides, from which water flows, being poured constantly into the tubular axis, which revolves on a pivot. The resistance of the air to the water issuing from the holes drives the mill round, and there are means of regulating it. Another plan is to connect a clock train having a vibrating pendulum with another clock having a conical pendulum by one of the lower wheels in the train, with a spring connection ; the telescope is driven by the revolving clock train, and the other pendulum keeps it sufficiently in order, though allowing it to expatiate enough for each beat of the pendulum. The more complicated plan of Wagner of Paris described in Sir E. Beckett's Rudimentary Treatise on Clocks and Watches and Bells does not appear to have ever come into use, and therefore it is now omitted.

=the angular velocity, or the angle de-

Pendulum Suspension.

The suspension of the pendulum on what are called knife-edges, like those of a scale-beam, has often been advocated. But though it may do well enough for short experiments, in which the effects of

the elasticity of the spring are wantcd to be eliminated, it fails altogether in usc, even if the knife-edges and the plates which carry them are made of the hardest stones. The suspension which is now used universally, in all but some inferior foreign clocks, which have strings instead, is a thin and short spring, with one end let into the top of the pendulum, and the other screwed between two chops of metal with a pin through them, which rests firmly in a nick in the cock which carries the pendulum as shown in fig, 2 a little farther on ; and the steadiness of this cock, and its firm fixing to a wall, are essential to the accurate performance of the clock. 'The thinner the spring

the better ; provided, of course, it is strong enough to carry the pendulum without being bent beyond its elasticity, or bent short ; not that there is much risk of that in practice. Pendulum springs are much oftener too thick than too thin ; and it is worth notice that, independently of their greatcr effect on the natural time of vibration of the pendulum, thick and naitrow springs are more liable to break than thin and broad ones of the same strength. It is of great importance that the spring should be of uniform thickness throughout its breadth ; and the bottom of the chops which carry it should be exactly horizontal ; otherwise the pendulum will swing with a twist, as they may be often seen to do in ill-made clocks. If the bottom of the chops is left sharp, where they clip the spring, it is very likely to break there ; and thercfore the sharp edges should be taken off.

The bob of the pendulum used to be generally made in the shape of a lens, with a view to its passing through the air with the least resistance. But after the importance of making the bob heavy was discovered, it became almost necessary to adopt a form of more solid content in proportion to its surface. A sphere has been occa- sionally used, but it is not a good shape, because a slight error in the place of the hole for the rod may make a serious difference in the amount of weight on each side, and give the pendulum a ten- dency to twist in motion. The mercurial jar pendulum suggested the cylindrical form, which is now generally adopted for astronomical clocks, and in the best turret clocks, with a round top to prevent any bits of mortar or dirt falling and resting upon it, which would alter the time ; italso looks better than a flat-topped cylinder. There is no rule to be given for the weight of pendulums. It will be shown hereafter that, whatever escapement may be used, the errors due to any variation of force are expressed in fractions which inva- riably have the weight and the length of the pendulum in the denominator, though some kind of cscapements require a heavy pendulum to correct their errors much less than others. And as a heavy pendulum requires very little more force to keep it in motion than a light one, being less affected by the resistance of the air, we may almost say that the heavier and longer a pendulum can be made the better ; at any rate, the only limit is one of convenicnce ; for instance, it would obviously be inconvenient to put a large pen- dulum of 100 Ib weight in the case of an astronomical or common house clock. Jt may perhaps be laid down as a rule, that no astronomical clock or regulator (as they are also called) will go as well as is

now expected of such clocks with a pendulum of less than 28 Ib weight, and no turret clock with less than 1 ewt. Long pendulums are generally made with heavier bobs than short ones; and such a clock asthat of the Houses of Par- liament, with a two-seconds pendulum of 6 cwt., ought to go 44 times as well as a small turret clock with a one-second pendulum of 60 ib. Pendulums longer than 14 feet (2 seconds) are incon- venient, liable to be disturbed by wind, and expensive to compen- sate, and they are now quite disused, and most or all of the old ones removed, with their clocks, for better ones,

Pendulum Regulation.

The regulation of pendulums, or their exact adjustment to the proper length, is primarily effected by a nut on the end of the rod, by which the bob can be screwed up or down. In the best clocks the rim of this nut is divided, with an index over it ; so the exact quantity of rise or fall, or the exact acceleration or retardation, may be known, the amount due to one turn of the nut being previously ascertained. By the calculation used below for compensation of pendulums, it may be seen that if the length of the pendulum rod is 7, and the breadth of one thread of the screw is called di, then one turn of the nut will alter the

rate of the clock by 48200 2 seconds a day; which would be

just 30 seconds, if the pendulum rod is 45 inches long, and the screw has 82 threads in the inch. To accelerate the clock the nut has always to be turned to the right, as it is called, and vice versa. But in astronomical and in large turret clocks, it is desirable to avoid stopping, or in any way disturbing the pendulum ; and for the finer adjustments other methods of regulation are adopted. The best is that of fixing a collar, as shown in fig 2, capable of having very small weights laid upon it, half-way down the pen- dulum, this being the place where the addition of any small weight produces the greatest effect, and where, it may be added, any moving of that weight up or down on the rod produces the least

effect. If M is the weight of the pendulum and 7 its length (down to the centre of oscillation), and m a small weight added at the distance @ below the centre of suspension or above the c.o. (since they are reciprocal), ¢ the time of vibration, and — dé the acceleration due to adding m, then

~ dt

2-5 a , t = on (F – #)!

i

from whien it is evident that if d = 3 then ~ dT the daily

10800 2

the pendulum it will accelerate the clock a second a day, or 10 grains will do that on a pendulum of 15 lb. weight (7000 gr. being —. 1]b.), or an ounce on a pendulum of 6 cwt. In like manner if

a= ; from cither top or bottom, m must — Me to accelerate

™~ 7200

the clock a second a day. The higher up the collar is the less risk there is of disturbing the pendulum in putting on or taking off the regulating weights. The weights should be made in a series, and marked }, 4, 1, 2, according to the number of seconds a day by which they will accelerate; .aud the pendulum adjusted at first to lose a little, perhaps a second a day, when there are no weights on the collar, so that it may always have some weight on, which can be diminished or increased from time to time with certainty, as the rate may vary.

acceleration — ; or if m is the 10800th of the weight of

Compensation of Pendulums,

Soon after pendulums began to be generally used in cloeks, it was discovered that they contained within themselves a source of error independent of the action of the cloek upon them, and that they lost time in

the hot weather and gained in cold, in consequence of all the substances of which they could be made expanding as the temperature increases. If 7 is the length of a pendulum, and di the small increase of it from1 increased heat, ¢ time of the pendulum /, and ¢+d@* that of the pendulum /+d/; then

t+dt Witdl |, al ; oa +o’

2

since (+) may be neglected as very small; or dt = a and the daily loss of the clock will be 45200% seconds The following

is a table of the values of ea for 1000° Fahr. of heatin different sub-

stances, and also the weight ot a cubic inch of each :

Tb WVVEHEUGG (CLOG ns Se. sau Nios lee cnation! ah. Gain tesnlneeet “0024 036 Re UI 09. ca Ginna vet guanine ota wn ac wigiale 0048 116 SS eUTOR heme cererrarenie semnnrmarneotniar: ue wahine 0064 28 I rreo ny MOL ret or «eR, Valtstarcloina oleic nissasisaPtelaete els, erent 007 26 ADE PHELS EA yaa Soro b cans otetem ver ime oats era ieacvias eschew aioe art ‘010 30 WBA ces! penne Skates eaeee ours eee racuntncttndaantaae 016 “41 WATE Y Si, 5 Moca gad Avec anit eens snint eee ERE 017 “25 Mercury (in bulk, not in length) ..... “100 °49

Thus a common peudulum with an iron wire rod would lose 43200 x *00007=8 seconds a day for 10° of heat ; and if adjusted for the winter temperature it would lose about a minute a week in summer, unless something in the clock happened to produce a counteracting effect, as we shall see may be the case when we come to escapements. We want therefore some contrivance which will always keep that point of the pendulum on which its time depends, viz., the centre of oscillation, at the same distance from the _ of suspension. A vast number of such contrivances have

een made, but there are only three which can be said to be at all in common use; and the old gridiron pendulum, made of 9 alter- nate bars of brass and steel is not one of them, having been supcer- seded by one of zinc and iron, exactly on the same principle, but requiring much fewer bars on aceount of

the greater expansion of zine than brass. The centre of oscillation so nearly coincides in most clock pendulums with the centre of the bod that we may prac- tically say that the object of compensation is to keep the bob always at the same height. For this purpose we must hang the bob from the top of a column of some metal which has so much more expan- sion than the rod that its expansion upwards will neutralize that of the rod, and of the wires or tube by whieh the bob is hung, down- wards. The complete calculation, taking into account the weight of all the rods and tubes is too long and complicated to be worth going through, especially as it must always be finally adjusted by trial either of that very pendulum or of one exactly similar. For prac- tieal purposes it is found sufficient to treat the expansion of zine as being ‘016 to steel 0064, instead of ‘017 as it is really ; and for large pendulums with very heavy tubes even the ‘016 isa little

too much. Moreover the c.o. is higher above the c.g. of the bob in such large pendulums than in small ones with light rods and tubes.

But neglecting these minutix for the first approximation, and supposing the bob cither to be of iron, in which case it may be con- sidered fixed anywhere to the iron tube which hangs from the top of the zinc tube, or a lead bob attached at its own centre, which obviates the slowness of the transmission ofa change of temperature through it, the following calculation willhold. Let be the length of the steel rod and spring, 2 that of the zinc tube, 0 half the height of the bob ; the length of the iron tube down the centre of the bob is

z—b. lfthe iron tube is of steel for simplicity of ealculation, we must evidently have ‘064(r+z-b) = 162 .2= 5 (r~2). It is

practically found that for a seconds pendulum with a lead cylindrical bob 9 in. x 8 hung by its middle r has to be about 44 inches, and z nearly 27. At any rate it is safest tomake it 27 at first, especially if the second tube is iron, which expands a little more than stecl; and the tube can be shortened after trial but not lengthened. ‘The rod of the standard sidereal gemma at Green- wich (down to the bottom of the bob, whieh is suc

as has been described and weighs 26 tb), is 48% and z is 26 inches, the descending wires being stccl. A solar time pendulum is about 4 inch longer, as stated above. lf the bob were fixed at its bottom to the steel tube the zinc would have to be 4°88 longer. Fig. 2 is a section of the great West- minster pendulum, The iron rod which runs from ie to bottom, ends in a screw, with a nut N, for adjusting the length of the pendulum after it was made by calculation as near the right length as possible. On this nut rests a collar M, which can slide up the rod a little, but is prevented froin turning by a pin through the rod. On a groove or annular channel in the top of this collar stands a zine tube 10 feet 6 inches long, and nearly half an inch thick, made of three tubes all drawn together, so as to become like one (for it should be observed that cast zinc cannot be depended on ; it must be drawn). On the top of this tube or hollow column fits another collar with an annulai groove'much like the bottom one M. The object of these grooves is to kcep the zine column in its place, not touehing the rod within it, as contact might produce friction, which would interfere with their relative motion under expansion and con- traction. Round the collar C is screwed a large iron tube, also not touching the zinc, and. its lower end fits loosely on the collar M; and round its outside it has another collar D of its own fixed to it, on which the bob rests. 'The iron tube has a number of large holes in it down each side, to let the air get to the zinc tube; before that was done, it was found that.the compensation lagged a day or two behind the changes of temperature, in consequence of the iron rod and tube being exposed, while the zinc tube was enclosed without touching the iron. The bottom of the bob is 14 feet 11 inches from the top of the spring A, and the bob itself is 18 inches high, with a dome- shaped top, and twelve inches in diameter, As it is a 2-seconds pendulum, its centre of oseilla- tion is 13 feet from the top A, which is higher than usual above the centre of gravity of the bob, on account of the great weight of the compensa- tion tubes. The whole weighs very nearly 700 Ib, and is probably the heaviest pendulum in the world.

The second kind of compensation pendulum in use is still more simple, but not so effective or certain in its aetion; and that is merely a wooden rod with a long lead bob resting on a nut at the bottom. According to the above table, it would appear that this bob ought to be 14 inches high in a 1-second pendulum ; but the expansion of wood is so uncertain that this proportion is not found capable of being depended on, and a somewhat shorter bob is

said to be generally more correct in point of compensation. All persons who have tried wooden pendulums severely have come to the same conclusion, that they are capricious in their action, and consequently unfit for the highest class of clocks.

The best of all the compensations was long thought to be the mercurial, which was invented by Graham, a London clock- maker, above a century ago, who also invented the well-known dead escapement for clocks, which will be hereafter explained, and the horizontal or cylinder escapement for watches. And the best form of the mercurial pendulum is that which was introduced by the late E. J. Dent, in which the mercury is enclosed in a cast iron jar or cylinder, into the top of which the’ steel rod is screwed, with its end plunged into the mercury itself. For by

Fic. 2.—Section of Great Westmin- ster Pendulum,

this means the mercury, the rod, and the jar all acquire the new temperature at any change more simultaneously than when the mereury is ina glass jar hung by a stirrup (as it is called) at the bottom of the rod; and moreover the pendulum is safe to carry about, and the jar can be made perfectly cylindrical by turning, and also air-tight, so as protect the mercury from oxidation ; and, if necessary, it can be heated in the jar so as to drive off any moisture, without the risk of breaking. The height of mercury required in a cast-iron jar, 2 inches in diameter, is about 6°8 inches ; for it must be remembered, in calculating the rise of the mercury, that the jar itself expands laterally, and that expansion has to be deducted from that of the mercury in bulk.

The success of the Westminster clock pendulum, however, and of smaller zinc and steel pendulums at Greenwich and elsewhere, has established the conclusion that it is uunecessary to incur the expense of a heavy mercurial pendulum, which has become more scrious from the great rise in the price of mercury and the admitted necessity for much heavicr bobs than were once thought sufficient for astronomical clocks. The complete ealculation for a compen- sated pendulum in which the rods and tubes form any cousidcrable proportion of the whole weight, as they must in a zine

pendulum, is too complicated to be worth undertaking generally, especially as it is always necessary to adjust them finally by trial, and for that purpose the tubes should be made at first a little longer than they ought to be by calculation, except where one is exactly copying pendulums previously tried.

BAROMETRICAL Error.

It has loug beeu known that pendulums are affected by varia- tions of density of the air as well as of temperature, though in a much less degree, —in fact, so little as to be immaterial, exccpt in the best clocks, where all the other errors are reduced toa minimum. An increase of density of the air is equivalent toa diminution of the specific gravity of the pendulum, and that is equivalent to diminu- tion of the force of gravity while the inertia remains the same. And as the velocity of the pendulum varies directly as tlic force of gravity and inversely as the inertia, an increase of density must

iminish the velocity or increase the time. The late Francis Baily, P.R.A.S., also found from some elaborate experiments (See Phil. Trans. of 1832) that swinging pendulums carry so much air with them as to affect their specific gravity much beyond that due to the mere difference of stationary weight, and that this also varies with their shape,—a rod with a flat elliptical section dragging more air with it than a thicker round one (whieh is not what one would expect), though a lens-shaped bob was less affected than a sphcrieal one of the same diameter, which of course is much heavier. The frictional effect of the air is neccssarily greater with its increased density, and that diminishes the arc. In the &..A.S. Memoirs of 1853 Mr Bloxam remarked also that the current produced in the descent of the pendulum goes along with it in ascending, and there- fore does not retard the ascent as much as it did the descent, and therefore the two effects do not counteract each other as Baily assumed that they did. He also found the circular crror always less than its theoretical value, and considered that this was due to the resistance of the air. The conclusions which were arrived at by several eminent clockmakers as to the effect of the pendulum spring on the circular error about 40 years ago were evidently erroneous, and the effect due to other causes.

It appears from further investigation of the subject in several papers in the R.A.S. Notices of 1872 and 1873, that the barometri- eal error also varies with the nature of the escapement, and (as Baily had before concluded from calculation) with the arc of the pendulum, so that it can hardly be determined for any particular clock a priori, exeept by inference from a similar one. The barometrical error of an ordinary astronomical clock with a dead escapement was said to be a loss of nearly a second a day for an inch rise of barometer, but with a gravity escapement and a very heavy pendulum not more than‘3 second. Dr Robinson of Armagh (see R..A.S. Mem., vol. v.) suggested the addition of a pair of barometer tubes to the sides of the pendulum, with a bulb at the bottom, and such adiameter of tube as would allow a sufficient quantity of mercury to be transposed to the top by the expansion under heat, to balance the direct effect of the heat upon the pendulum. But it is not necessary to have two tubes. In a paper in the R.A.S. Notices of January 1873 Mr. Denison (now Sir E. Beckett) gave the calculations requisite for the barometrieal compensation of pendulums of various lengths and weights, the principle of which is just the same as that above given for regulating a pendulum by adding small weights near the middle of its length. The formula is also given at p. 69 of the sixth edition of his Rudimentary Treatise on Clocks, A barometrical correction of a different kind has been applied to the standard clock at Green- wich. An independent barometer is made to raise or lower a magnet so as to bring it into more or less aetion on the pendulum and so to accelerate or retard it. But we do not see why that should be better than the barometer tube attached to the pendulum. The necessity for this correction seems to be obviated altogether by giving the

pendulum a sufficient are of vibration. Baily caleulated that if the are (reckoned from 0) is about 2° 45’ the barometrical error will be self-corrected. And it is remarkable that the Westminster clock pendulum, to which that large arc was given for other reasons, appears to be free from any barometric error, after trying the results of the daily rate as automatieally recorded at Greenwich for the whole of the year 1872. We shall see presently that all the escape- ment errors of elocks are represented by fractions which have the square or the cube of the are in the denominator, and therefore if the arc can be inereased and kept constant without any objectionable increase of force and friction, this is an additional

reason for pre- ferring a large arc to a small one, though that is contrary to the usual practice in astronomical clocks,

EscAPEMENTS.

The escapement is that part of the clock in which the rotary motion of the wheels is converted into the vibratory motion of the balance or pendulum, which by some contrivance or other is made to let one tooth of the quickest wheel in the train escape at each vibration ; and hence that wheel is called the ‘scape-wheel.”’ Fig. 3 shows the form of the earliest clock escapement, if it is held sideways, so that the arms on which the two balls are set may vibrate on a horizontal plane. In that case the arms and weights form a balance, and the farther out the weights are sct, the slower would be the vibrations. If we now turn it as it stands here, and consider the upper weight left out, it becomes the carliest form of the pendulum clock, with the crown-wheel or vertieal escapement. CA aud OB are two flat pieces of steel, called pallets, projecting from the axis about at right angles to each other, one of them over the front of the wheel as it stands, and the other over the back. The tooth D is just escaping from the front pallet CA, and at the same time the tooth at the back of the wheel falls on the other pallet CB, a little above its edge. But the pendulum which is now moving to the right does not stop immediately, but swings a little further (otherwise the least failure in the force of the train would stop the clock, as the escape would not take place), and in so doing it is evident that the pallet B will drive the wheel back a little, and produce what is called the recoil; which is visible enough iu any common clock with a seconds-hand, either with this escapement or the one which will be next described.

It will be seen, on looking at figure 3, that the pallet B must turn through a considerable angle before the tooth ean escape ; in other words, the crown-wheel escapement requires a long vibration of the pendulum. This is objectionable on several accounts, —first, because it requires a great force in the clock train, and a great pressure, and therefore friction, on the pallets ; and besides that, any variation in a large arc, as was explained be- fore, produces a much greater variation of time due to the circular error than an equal variation of a small arc, The crown- wheel escapement may in- deed be made so as to allow a more moderate arc of the pendulum, though not so

small as the 2° usually adopted in the best clocks, by putting the pallet arbor a good deal higher above the scape-wheel, and giv- ing a small number of teeth to the wheel; and that also diminishes the length of the run of the teeth, and consequently the friction, on the pallets, though it makes the recoil very great and sudden; but, oddly enough, it never appears to have been resorted to until long after the escapement had be- come superseded by the ‘‘anehor” escapement, which we shall now

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Fic, 3.—Recoil Escapement.

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Fic. 4.—Anehor Eseapement.

describe, and which appears to have been invented by the celebrated Dr Hooke as early as the year 1656, very soon after the invention of pendulums.

In fig. 4a tooth of the scape-wheel is just escaping from the left pallet, and another tooth at the same time falls upon the right hand pallet at some distance from its point. As the pendulum moves on in the same direction, the tooth slides farther up the pallet, thus pro- ducing a recoil, as in the crown-wheel escapement. The acting faces of the pallets should be convex, and not flat, as they are generally made, much less concave, as they have sometimes been made, with a view of checking the motion of the pendulum, which is more likely to injure the rate of the clock than to improve it. But when they are flat, and of course still more when they are concave, the points of the teeth always wear a hole in the pallets at the extremity of their usual swing, and the motion is obviously easier and therefore better when the pallets are made convex; in fact they then approach more nearly to the ‘‘dead” escapement, which will be described presently. We have already alluded to the effect of some escapements in not only counteracting the circular error, or the natural increase of the time of a pendulum as the arc increases, but overbalancing it by an error of the

contrary kind. The recoil escapement does so ; for it is almost invariably found that whatever

may be the shape of these pallets, the clock loses as the arc of

the pendulum falls off, and vice versa. It is unfortunately impossible so to arrange the pallets that the circular error may be thus exactly neutralized, because the escapement error depends, in a manner reducible to no law, upon variations in friction of the pallets themselves and of the clock train, which produce different effects ; and the result is that it is impossible to obtain very accurate time- keeping from any clock of this construction.

But before we pass on to the dead escapement, it may be proper to notice an escapement of the recoiling class, which was invented for the purpose of doing without oil, by the famous Harrison, who was at first a carpenter in Lincolnshire, but afterwards obtained the first Government reward for the improvement of chronometers. We shall not however stop to describe it, since it never came into general use, and it is said that nobody but Harrison himself could make it go at all. It was also objectionable on account of its being directly affected by all variations in the force of the clock. It had the peculiarity of being very nearly silent, though the recoil was very great. Those who are curious about such things will find it described in the seventh edition of this Mncyclopedia, The recorded performance of one of these clocks, which is given in some accounts of it, is evidently fabulous.

Dead Escapements.

The escapement which has now for a century and a half been con- sidered the best practical clock escapement (though there have been constant attempts to invent one free from the defects which 1t must be admitted to pos- sess) is the dead escapement, or, as the French call it with equal expressiveness, Véchappement & repos,—be- cause instead of the recoil of the tooth upon the pallet, which took place in the pre- vious escapements, it falls dead upon the pallet, and teposes there until the >en- dulum returns and lets 1 off again. It is represented in fig. 5. It will be observed that the teeth of the scape- wheel have their points set the opposite way to those of fe) the recoil escapement in fig. 4, the whecls themselves both turning the same way ; or (as our engraver has re- presented it), vice versa. The tooth B

is here also represented in the act of dropping on to the right hand pallet as the tooth A escapes from the left pallet. But instead of the pallet having a con- tinuous face as in the recoil escapement, it is divided into two, of which BE on the right pallet, and FA on the left, are called the im- pulse faces, and BD, FG, the dead faces. The dead faces are portions of circles (not necessarily of the same circle), having the axis of the pallets C for their centre; and the consequence evidently is, that as the pendulum goes on, carrying the pallet still nearer to the wheel than the position in which a tooth falls on to the corner A or B of the impulse and the dead faces, the tooth still rests on the dead faces without any recoil, until the pendulum returns and lets the tooth slide down the impulse face, giving the impulse to the pendulum as it goes.

Fic. 5.—Dead Escapement.

CLOCKS

The great merit of this escapement is that a moderate variation. in the force of the clock train produces a very slight effect in the time of the pendulum. This may be shown in a general way, without resorting to mathematics, thus :—Since the tooth B drops on to the corner of the pallet (or ought to do so) immediately after the tooth A has escaptd, and since the impulse will begin at B when the pendulum returns to the same point at which the impulse ceased on A, it follows that the impulse received by the pendulum before and after its vertical position is very nearly the same. Now that part of the impulse which takes place before zero, or while the pendulum is descending, tends to augment the natural force of gravity on the pendulum, or to make it move faster ; but in the de- scending are the impulse on the pallets acts against the gravity of the pendulum, and prevents it from being stopped so soon ; and so the two parts of the impulse tend to neutralize each other’s disturbing effects on the times of the pendulum, though they both concur in increasing the are, or (what is the same thing) maintaining it against the loss from friction and resistance of the air. However, on the whole, the effect of the impulse is to retard the pendulum a little, because the tooth must fall, not exactly on the corner of the pallet, but (for safety) a little above it; and the next impulse does not begin until that same corner of the pallet has come as far as the point of the tooth; in other words, the

retarding part of the impulse, or that which takes place after zero, acts rather longer than the accel- erating part before zero. Again, the friction on the dead part of the pallets tends to produce the same effect on the time ; the are of course it tends to diminish. For in the descent of the pendulum the friction acts against gravity, but in the ascent with gravity, and so shortens the time; and there is rather less action on the dead part of the pallets in the ascent than in the descent. For these reasons the time of vibration of a pendulum driven by a dead escapement is a little greater than of the same pendulum vibrating the same are freely ; and when you come to the next difference, the variation of time of the same pendulum with the dead escapement, under a moderate variation in the force, is very small indeed, which is not the case in the recoil escapement, for there the napulse begins at each end of the are, and there is much more of it during the descent of the pendulum than during the ascent from zero to the arc at which the escape takes place and the recoil begins on the opposite tooth ; and then the recoil itself acts on the pendulum in its ascent in the same direction as gravity, and so shortens the time. And hence it is that an increase of the are of the pendulum with a recoil escapement is always accompanied with a decrease of the time. Something more than this general reasoning is re- quisite in order to compare the real value of the dead escapement with others of equal or higher pretensions, or of the several contrivances that have been suggested for remedying its defects. But we must refer to the Rudimentary Treatise on Clocks for details of the mathematical calculations by which the numerical results are obtained, and the relative value of the different kinds of escape- ments determined.

It cannot be determined a@ priort whether cleaning and oiling a dead escapement clock will accelerate or retard it, for reasons explained in those calculations; but it may be said conclusively that the larger the arc is for any given weight x the fall per day, the better the clock will be; and in order to diminish the friction and the necessity for using oil as far as possible, the best clocks are made with jewels (sapphires are the heat for the purpose) let into the pallets.

The pallets are gencrally made to embrace about one-third of the circumference of the wheel, and it is not at all desirable that they should embrace more; for the longer they are, the longer is the run of the teeth

upon them, and the greater the friction. There is a good deal of difference in the practice of clockmakers as to the length of the impulse, or the amount of the angle y+8 if the im- pulse begins at 6 before zero and at y after zero. Sometimes you see clocks in which the seconds hand moves very slowly and rests a very short time, showing that y+ is large in proporticn to 205 and in others the contrary. The late Mr Dent was decidedly of opinion that a short impulse was the best, probably because there is less of the force of the impulse wasted in friction then. It isnot to be forgotten that the scape-wheel tooth does not overtake the face of the pallet immediately, on account of the moment of inertia of the wheel. The wheels of astronomical clocks, and indeed of all English house-clocks, are generally made too heavy, especially the scape-wheel, which, by increasing the moment of inertia, requires a larger force, and consequently has more friction. We shall see presently, from another escapement, how much of the force is really wasted in friction in the dead escapement. S

But before proceeding to other escapements, it is proper to notice a very useful form of the dead escapement, which is adopted in many of the best turret clocks, called the pin-wheel escapement. Fig. 6 will sufficiently explain its action and construction. Its advantages are—that it does not require so much accuracy .as the other; if a pin gets’ broken it is easily replaced, whereas in the other the wheel is ruined if the point of a tooth is injured ; a wheel of given size will work with more pins than teeth, and therefore a

train of less velocity will Jo, and that sometimes amounts to a saving | that which gives the impulse as the points of the tecth are farther

of one wheel in the train, and a good deal of friction; and the blow on both pallets being downwards, instead of one up and the other down, the action is more steady; all which things are of more conse- quence in the heavy and rough work of a turret clock than in an astronomical one. The details of the construction are given in the Rudimentary Treatise. It has been found expedient to make the dead faces not quite dead, but with a very slight

recoil, which rather tends to check the variations of arc, and also the general disposition to lose time if the arc is increased ; when so made the escapementis generally called ‘‘half- dead.”

Passing by the various other modifications of the dead escapement which have been suggested and tried with little or no success, we proceed to describe one of an entirely different form, whicl was patented in 1851 by Mr C. Macdowall, though it appeared afterwards that one very similar had been tried before, but failed from the proportions being badly arranged. It is represented in fig. 7. The scape-wheel is only a small disc with a single pin in it, made of ruby, parallel and very near to the arbor. The dise turns half round at every beat of the pendulum, and the pin gives the impulse on the vertical faces of the pallets, and the dead friction takes place on the horizontal faces. Its advantages are—that the greatest part of the impulse is given directly across the line of centres, and consequently with very little friction; and therefore also, the friction on the dead faces is less than usual, and scarcely any oil is required ; moreover, it is very easy to make. But there must be two more wheels in the train, consuming a good deal of the force of the clock-weight by their friction, which rather more than makes up for the friction saved inthe escapement. It was applied successfully to watches, but the expense of the additional wheels prevented their adoption. In order to make the angle of escape not more than 1°, the distance of the pin from the centre of the disc must not be more than ¢jth of the distance of centres of the disc and pallets.

With the view of getting rid of one of these extra wheels in the train, and that part of the impulse which is least effective and most oblique, Mr Denison shortly afterwards invented the three-legged dead escapement ; which, though afterwards superseded by his three-legged gravity escapement, is still worth notice on account of the exceedingly small force which it requires,

DPY

Fia. 6.—Pin- Wheel Escapement.

he : Fia. 7. thereby giving a practical proof of the large a proportion of the force which is wasted in friction pict a

in all the other impulse escapements.

In fig. 8, the three long teeth of the scape-wheel are only used for locking on the dead pallets D and E, which are set on the front of the pallet plate; A and B are impulse pallets, being hard bits : of steel or jewels set in the pallet iz plate, and they are acted upon by the three sharp-cdged pins which are set in the scape-wheel and point backwards. As soon as the pendulum moves a little further to the left than is here shown, the long tooth will slip past the dead pallet or stop D, and the pin at B will run after and catch the corner of that impulse pallet and drive it until the wheel has turned through 60°, and then it will escape; and by that time the uppermost tooth will arrive at the stop E, and will slide along it as in the common dead escapement, but with a pressure as much lessthan

Fic. 8.—Denison s Three-Legged Escapement.

from the centre of the wheel than the impulse pins are. But the impulse is here given with so little friction, that even where the points of the teeth were made identical with the pins, the clock-weight required to keep the same pendulum with the same train (2 common turret-clock movement), swinging to 2°, was only one-fifth of what had been required with the pin-whcel escapement ; and the scape- wheel which kept the 6 cwt. pendulum of the Westminister clock going for half-a-year, until superseded by the gravity escapement, weighed only a sixth of an ounce. It appears also that it would be possible so to adjust the recoil of the half-dead pallets that the time would not be affected by any small variation of the force and the arc ; since it was found that, when a certain amount of recoil was given, the clock gained instead of losing, under an increase of arc due to an increase of clock-weight. Andif the force were kept constant by a train remontoire, such as will be described hereafter, there would in fact be nothing capable of altering the arc or the time. But on account of the small depth of intersection of the circles of the pins and the pallets, on which its action depends, this escape- ment requires very careful adjustment of the pallets, except where they are on a large scale; and considering the 4 sae qualities of the corresponding gravity escapement, it is not likely to be used, except perhaps in clocks required to go a long time, in which economy of force is a matter of consequence. The pallets should be connected with the pendulum

by a spring fork (which indeed is advisable in the common dead escapement with a heavy pendulum, especially the pin-wheel escapement), to prevent the risk of their driving backwards against the scape-wheel when it is not in motion, as it will not clear itself. The distance of the centres should be not less than 25 times the radius of the circle of the edges of the impulse pins. Detached Escapements.

In all the escapements hitherto described the pallets are never out of moving contact with the scape-wheel, and there have been several contrivances for keeping them detached except during the impulse and at the moment of passing a click which is to release the wheel to give the impulse. This is an imitation of the chronometer escapement in watches which is sometimes called the ‘‘ detached.” There are only two of such contrivances which appear worth special notice. One was proposed by Sir G. Airy in vol. ii. of the Cam- bridge Transactions, but not executed (so far as we know) till a few years ago in the standard sidereal clock at Greenwich, which is reported to go extremely well. Suppose a dead escapement consist- ing of a single pallet only, say the right hand one of the pin-wheel escapement (fig. 6), for the Greenwich clock has a pin escapement, and that the wheel is locked generally by a spring detent hooking into any one of its teeth, and capable of being lifted or pushed aside by the pendulum, 7.e., by a pin somewhere on the single pallet as it passes to the right, but also capable of being passed without being lifted as the pendulum goes to the left. We shall see afterwards how this is done, in the article Watcurs. Then as the pendulum goes to the right, it first lifts the detent at about 1° before zero, and then a tooth or a pin drops on to the pallet and gives the impulse, exactly as in the dead pin-wheel escapement, and with exactly the same amount of frietion, substituting only for the dead friction the resistance and friction of passing the detent one way and lifting it the other.

A different escapement on the same principle but involving less friction was adopted by Sir E. Beckett in a clock described in the later editions of his book as having gone for above ten years very satisfactorily, except that, like all direct impulse escapements, in- cluding Sir G. Airy’s, it must vary with the force of the clock train, due to different states of the oil. The scape-wheel (fig. 9) is five- legged, and has five sharp-edged pins which give the impulse to the hard steel pallet P whenever it passes to the right, provided

the wheel is then free to move. It is stopped by the detent DEF, which turns on a pivot F, not in the pendulum crutch, as it looks in the drawing, but on the clock-frame. When the pendulum going to the right arrives at the position here drawn, the click CE on the erutch pushes the detent aside and so unlocks the wheel, which then gives the impulse, moving through 72° until another tooth arrives at the detent and is stopped, the click having then got far beyond it. When the pendulum re- turns the click lightly trips over the top of the detent. Here there is practically no friction

Fig. 9.

in giving the impulse, as it is directly across the line of centres, as in the three-legged dead escapement, and the friction of passing

a -—ll — — ———

and unlocking is as little as possible, for the pressure on the locking teeth is less than half of that of the impulse pins.

In practice the pallet P is a separate bit of steel, screwed on, and therefore adjustable. The locking teeth are about 6 inches long from the centre, and the impulse pin-edges 4 in. from the centre, which is 7 in. below the top of the pendulum and_ crutch, so that the impulse begins 1° before zero and ends 1° after, corresponding each to 36° turn of the scape-wheel. If 7 is the distance of the pins from the centre and p the length of the erutch down to the centre, rsin. 86° must=psin. 1°, if you want an impulse of 1° on each side of O; which makes p=33”7r. BB are eccentric beat pins for adjusting the beat to whatever position of the pendulum you please, z.c., you can make it less than 1° before or after zero as you please. In some respects it would be better to have no crutch, but it would be very difficult to make the adjustments. This escapement should evidently be at the bottom of the clock-frame instead of the top, as in the gravity escapements which will be described presently. The back part of the scape- wheel is carried by a long cock or bridge within which the crutch also moves.

Remontotre or Gravity Hscapements.

A remontoire escapement is one in which the pendulum does not receive its impulse from the scape-wheel, but from some small weight or spring which is lifted or wound up by the scape-wheel at every beat, and the pendulum has nothing to do with the scape- wheel except unlocking it. When this impulse is received from a weight the escapement is also called a gravity escapement ; and in- asmuch as all the remontoire clock escapements that are worth notice have been gravity escapements, we may use that term for them at once. The importance of getting the impulse given to the pendulum in this way was recognized long before all the properties of the dead escapement, as above investigated, were known. For it was soon discovered that, however superior to the old recoil escapement, it was far from perfect, and that its success depended on reducing the friction of the train and the pallets as far as ossible, which involves the necessity of high-numbcred pinions and wheels, small pivots, jewelled pallets, and a generally expensive style of workmanship. Accordingly the invention of an escapement which will give a constant impulse to the pendulum, and be nearly free from friction, has been for a century the great problem of clock-

making. We can do no more than shortly notice a very few of the attempts which have been ay made to solve it. The 2) (2)

most simple form of gra-

vity escapement, and the

one which will serve the

best for investigating their

mathematical properties a (though it fails in some % & essential mechanical con- ‘ ditions), is that invented

by Mudge.

The tooth A J A of the scape-wheel infig. a 10 is resting against the stop or detent a at the end ‘ce of the pallet OA, from the axis or arbor of which de- (q scends the half fork CP to touch the pendulum. From the other pallet CB descends the other half 3

fork CO. The two arbors

are set as near the point

of suspension, or top of J }

the pendulum spring, as alk IP possible. The pendulum, as here represented, must be moving to the right, and just leaving contact with the left pallet and going to take up the right one; as soon as it has raised that pallet a little it will evidently unlock the wheel and let it turn, and then the tooth B will raise the left pallet until it is caught by the stop 6 on that pallet, and then it will stay until the pendulum re- turns and releases it by raising that pallet still higher. Each pallet therefore descends with the pendulum to a lower point than that where it is taken up, and the difference between them is supplied by the lifting of each pallet by the clock, which does not act on the pendulum at all; so that the pendulum is independent of all varia- tions of force and friction in the train.

Again referring to the Rudimentary Treatise on Clocks for the mathematical investigation of the errors of this class of escapements, or to a paper by the late J. M. Bloxam, in the R. 4. 8. Memoirs of 1853, we may say it is proved that though the time of a gravity escapement pendulum differs from that of a free pendulum more than from that of a dead escapement, yet the variations of that difference (which are the real variations of the clock) may be made much less than in any kind of dead escapement.

Fic. 10.—Mudge’s Gravity Escapement.

The difficulty which long prevented the success of gravity escapements was their liability to what is called tripping. Referring again to fig. 10, it will be scen at once that if the scape-wheel should happen to move too fast when it is released, the left pallet will not be raised gradually by the tooth B, but be thrown up with a jerk, perhaps so high that the tooth slips past the hook ; and then not only will that tooth slip, but several more, and at last when the wheel is stopped it will be running fast, and the points of some of the teeth will probably be bent or broken by catching against the pallets. And even if the pallet is not raised high enough for the tooth to get past or completely trip, it may still be raised so high that the point of the tooth does not rest on

the hook exactly where the slope of the pallet ends, but lower, and the friction between them is quite enough to keep the pallet there ; and consequently the pendulum does not begin to lift it at the proper angle y, but at some larger angle; and as the pallet always descends with the pendulum to the same point, the duration of the impulse is increased, and the pendulum made to swing farther. Sir E. Beckett called this approximate tripping, and though not so injurious to the clock as actual tripping, it is obviously fatal to its accurate performance, though it appears never to have been noticed before he pointed it out in 1851. Various contrivances have becn resorted to for preventing tripping. But on account of the delicacy required in all of them, and other objections, nonc of them ever came into use until the invention of the three-legged and four-legged escapements to be mentioned presently. The only one which approached near enough to satisfying all the requisite conditions to be worth description is Mr Bloxam's, and we accordingly give a sketch of it in fig. 11, which is copied (with a little alteration for distinctness) from his own de- scription of it, communicated in 1853 to the Astronomical Society, some years after he had had it in 1 action in a clock of hisown. This H drawing will enable any one con- versant with these matters to un- ! derstand its action. He made the : pallet arbors cranked, to embrace t the pendulum-spring, so that their i centres of motion might coincide 1 with that of the pendulum as nearly as ie A Sie an > unnecessary refinement.; at least the three-legged and four-legged ays gravity escapements answer very well with the ora arbors set Aj/

on each side of the top of the |X (Soe— \s spring. The size of the wheel oS a

determines the length of the &

pallets, as they must be at such SoS

an angle to each other that the << w/e \

radii of the wheel when in : S

1

contact with each stop may be at right angles to the pallet – H and oo – a se | of this size, the depth of lock- ’ : ing can only be weit small. The ee, a a ene pinion in Mr Bloxam’s elock oo

only raises the pallet through 40’ at each beat; @¢., the angle which we called is only 20’; and probably, if it were increased to

a

anything like Va the escapement would trip immediately. The

two broad pins marked E, F, are the fork-pins. The clock which Mr Bloxam had went very well ; but it had an extremely fine train, with pinions of 18; and nobody else appears to have been able to make one to answer. In short Bloxam’s was not a practical solution of the gravity escapement problem, any more than those of Captain Kater, or Hardy, or various other inventors.

The only gravity escapement or escapements that really have eome into common use are the ‘‘four-legged” and the ‘‘ double three- legged” escapements of Sir E. Beckett. They passed through various phases before settling into the present form, of which it is unnecessary to say more now than that the first was the single three-legs described in the last edition of this Encyelopedia, which was suggested by his three-legged dead escapement. A five-legged one was also tried; but though it had some slight advantages they are quite overbalanced by disadvantages, and it requires much more delicacy of construction than either the double three-legs or the four-legs which we shall now describe, remarking that the latter is the best for ‘‘regulators,” and the former in large clocks. Fig. 12 is a back view of the escapement part of an astronomical clock with the four-legged wheel; seen from the front the wheel would turn the other way. The long locking teeth are made about 2 inches long from the centre, and the lifting pins, of which there are four pointing forwards and the other four intermediate pointing back- wards, are at not more than one-30th of the distance between the

CLO

eentres EC, of the wheel and pallets; or rather C is the top of the pendulum spring to which the pallets CS, CS’ converge, though their actual action area little below C. Itis not worth while to crank them as Mr Bloxam did, in order to make them coincide exactly with the top of the pendulum, as the friction of the beat pins on the pendulum at P is iu- significant, and even then would not be quite destroyed. The pallets are not in the same plane, but one is behind and the other in front of the wheel, with one stop pointing backwards and the other forwards to receive the teeth alternately,—it does not matter which; in this figure the stop S is behind and the stop S’ forward. The pendulum is now going to the right, and just beginning to lift the right pallet and free the stop S’; then the wheel will begin to turn and lift the other pallet by one of the pins which is now lowest, and which moves through 45° across the line of centres, and therefore lifts with very little friction. It goes on till the tooth now below S reaches S and _ is stopped there. Meanwhile the pallct CS’ goes on with the pendulum as far as it may go, to the end of the arc which we have through- out called a, starting from y; but it falls with the pendulum again, not only to 4 but to—-y on the other side of 0, so that the impulse is due to the weight of each pallet alternately falling through 2y; and the

Sf

magnitude of the impulse also depends ou Fra. 12. the obliqueness of the pallet on the whole, Four-Legged Gravity 4.¢., on the distance of its centre of gravity Escapement.

from the vertical through C. The defect of the original three-legged escapement was that the pallets were too nearly vertical.

Another most material element of these escapements with very few tecth is that they admit ofa fly KK on the scape-whecl arbor to moderate its velocity, which both obviates all risk of tripping, wholly or partially, and also prevents the bang which goes all through the clock where there is no fly. The fly is set on with a friction spring like the common striking-part fly, and should be as long as there is room for, length being much more effective than width. For this purpose the second wheel arbor is shortened and set in a cock fixed on the front plate of the clock, which leaves room for a fly with vanes 2 inches long. The back pivot of the scape-wheel is carried

by a long cock behind the back plate, so that the escapement is entirely behind it, close to the pendulum. The pallet arbors are short, as they come just behind the centre wheel, which is here also necessarily above the escapement, and the great wheel arbor on a level with it, and at the left hand (from the front) or the string would be in the way of the fly. No beat screws are required, as the pallets end in mere wires which are easily bent. It is found better to make the tails of the pallets long, rather than short as Mr Bloxam did. It is essential, too, that the angle CSE formed by the tooth and the pallet which is struck upwards should not the least fall short of a right angle, nor the other angle CS' be the least obtuse, or the escapement may very likely trip. Practically, therefore, it is safer to let CSE be just greater than 90° and CS'E a little less, so that there may not be the least tend- ency in the blow on the stops to drive the pallets outwards. For the purpose of calculation, however, we must make them both 90° and then it follows that, calling the length of the teeth 7, and the distance of centres d, and the length of the pallets from C down to the stops p, r must = d sin, 225° and p = d cos. 224°. Therefore if ris made 2 inches CE or d will be 5:22, say 5} inches, and p = 4°82. The distance of the lifting pins from the centre will be 4 of an inch to make the angley = 1°. It is certainly not desirable to make it more, and even that requires such light pallets for a pendulum of 30 or 40 tb, that 3 inch distance from the centre is more convenient as giving the smaller lift, assuming the scape-wheel to be from 2 to 2} inches in diameter.

Gravity escapements require more weight than a direct impulse escapement with an equally fine train ; and they try the accuracy of the wheelcutting more severely. If there is a weak place in the train of a common clock the scape-wheel only follows the pendulum more oh an" but in a gravity escapement it always has to raise the pulets, and ought to raise them quickly, and especially in clocks for astronomical purposes where you take its exact time from the sound of the beats, and so the lifting must not lag and sound uneven. 'Therefore although a fine train of high numbers is not requisite it must be perfectly well cut. And as the force of the weight does not reach the pendulum its increase is of no consequence, within reasonable limits. It is worth while to put large friction wheels under the arbor of the great wheel in all astronomical clocks, and it makes a material difference in the friction on account of the necessary thickness of the winding arbor. A variation of are in

dead escapement clocks is sometimes visible between the beginning and the end of the week according as the string is nearest to the thick or the thin end of the great arbor, when there are no friction wheels.

The other form of the gravity escapement, which is now adopted for large clocks by all the best makers, having been first used in the great Westminster clock, is the double three-legged which is shown in fig. 13. The principle of it is the same as of the

- four-legs; but instead of the pallets being one behind and the other in front of the wheel, with two sets of lifting pins, there are two wheels ABC, abc, with the three lifting pins and the two pallets between them like a lantern pinion. One stop points forward and the other A backward. The two wheels have their teeth set inter- mediately or 60° apart, though that is not essential, and the angle of 120° may be divided between them in any other pro- portions, as 70°and 50°, and in that way the pallets may be still more oblique than 30° from the vertical, which however is found enough to prevent tripping even if the fly gcts loose, whieh is more likely to happen from carelessness in large clocks than in astronomical ones. The Wesi- minster one was once found to have been left with the spring loose for several days, and it had not gaincd a second, and there- fore had never tripped. The two wheels must be both squared on the arbor, or on a collar common to them both, and inust not depend upon the threc pins or they will shake loose. If the wheels are set with the teeth cquidistant, their centre is evidently twice the length of the teeth below C, the theoretical eentre of the pallets. The pins should not be farther from the centre than one-24th of the radius of the wheel ; and they should be so placed that the one which is going to lift next may be vertically over the one which has just lifted, and is then holding up the other pallet. The third will then be level with the centre; z.¢., they will stand on the radii which form the acting faces of the teeth of one of the wheels, and half way betwecn those of the other.

Of course the fly for those escapements in large clocks, with weights heavy enough to drive the hands in all weather, must be much larger than in small ones. For average church clocks with 1j sec. pendulum the legs of the scape-wheels are generally made 4 inches long and the fly from 6 to 7

inches long in each vane by lj or14 wide. For 14 sec. pendulums the scape-whecls are generally made 44 radius. At Westminster they are 6 inches.

Sir E. Beckett has come to the conclusion that these escapements act better, especially in regulators, if the palletsdo not fall quite on the lifting pins, but on a banking, or stops at any conveni- ent place, so as to leave the wheel free at the moment of starting ; just as the striking of a common house clock will sometimes fail to start unless the wheel with the pins hasa little run before a pin begins to lift the hammer. The best way to manage the ‘banking is to make the beat-pins long enough to reach a little way behind the pendulum, and let the banking be a thin plate of any metal screwed adjustably to the back of the case. This plate cannot well be shown in the drawings together with the pendulum, which, it may be added, should take up one pallet just when it leaves the other.

It is no longer doubtful that these two escapements are far the best of all for large clocks, the three-legs for very large ones, while the four-legs does very well for smaller turret clocks. And they cost no more to make, though rather more is charged for them by some makers under the pretence that they do. It is absolutely impossible for any large clock exposed to the variations of weather and dust to kecp as good time as an ordinary good house clock unless it has either a gravity cscapement, or a train remontoire, which last is much more expensive, to intercept the variations of force before they reach the pendulum. And though a detached escapement clock while kept clean and the oil in good condition is as good as a gravity one and perhaps better, the gravity one is less affected by variations of the oil, and its rate is altogether more constant. They seem also to have a smaller barometric error.

Fria. 13.—Double Three- legged Escapement.

Gone BARRELS.

A clock which is capable of going accurately must have some contrivance to keep it going while you are winding it up. In the old-fashioned house clocks, which were wound up by merely pulling one of the strings, and in which one such winding served for both the going and striking parts, this was done by what is called the end- less chain of Huyghens, which consists

of a string or chain with the ends joined together, and passing over two pulleys on the arbors of the great wheels, with deep grooves and spikes in them, to prevent the chain from slipping. In one of the two loops or festoons which hang from the upper pulleys is a loose pulley without spikes,

carrying the clock-weight, and in the other a small weight only heavy enough to keep the chain close to the upper pulleys. Now, —— one of those pulleys to be on the arbor of the great wheel of the striking part, with a ratchet and click, and the other pulley fixed to the arbor of the great wheel of the going part ; then (when- ever the clock is not striking) you may pull up the weight by pulling down that part of the string which hangs from the other side of the striking part ; and yet the weight will be acting on the going part all the time. And it would be just the same if you wound up the striking part and its pulley with a key, instead of pulling the string, and also the same, if there were no striking part at all, but the second pulley were put ona blank arbor, except that in that case the weight would take twice as long to run down, supposing that the striking part generally requires the same weight x fall as the going part.

This kind of going barrel, however, is evidently not suited to the delicacy of an astronomi- cal clock ; and Harrison's going ratchet is now univer- sally adopted in such clocks, and also in chronometers and watches for keeping the action of the train on the escapement during the wind- ing. Fig. 14 (in which the same letters are used as in the corresponding parts of fig. 1) shows its construction. The click of the barrel-rat- chet R is set upon another largerratchet-wheel, withits teeth pointing the opposite way, and its click rT is set in the clock-frame. That ratchet is connected with the great wheel by a spring ss' pressing against the two pins s in the ratchet and 3' in the wheel. When you Fie. 14.—Harrison's Going-Ratchet. wind up the weight (which is equivalent to taking it off), the click Tr prevents that ratchet from turning back orto the right; and as the spring ss' is kept by the weight in a state of tension equi- valent to the weight itself it. will drive the wheel to the left for a short distance, when its end s is held fast, with the same force as if that end was pulled forward by the weight ; and as the great

wheel has to move very little during the short time the clock is winding, the spring will keep the clock going long enough.

In the commoner kind of turret clocks a more simple apparatus is used, which goes by the name of the bolt and shutter, because it consists of a weighted lever with a broad end, which shuts up the winding-hole until you lift it, and then a spring-bolt attached to the lever, or its arbor, runs into the teeth of one of the wheels, and the weight of the lever keeps the train going until the bolt has run itself out of gear. Inthe common construction of this apparatus there is nothing to ensure its being raised high enough to beep in gear the whole time of winding, if the man loiters over it. For this purpose Sir E. Beckett has the arbor of the bolt and shutter made to pump in and out of gear; and, instead of the shutter covering the winding-hole, it ends ina circular arc advanced just far enough to prevent the key or winder from being put on, by obstructing a ring set on the end of the pipe. In order to get the winder on, you must raise the lever high enough for the arc to clear the ring. During the two or three minutes which the clock may take to wind, the are will be descending again behind the ring, so that now you cannot get the winder off again without also pulling the maintaining power out of gear; so that even if it is constructed to keep in action ten minutes, if required, still it will never remain in action longer than the actual time of winding. The circular arc must be thick enough, or have a projecting flange added to it deep enough, to prevent the winder being put on by merely pushing back the maintaining power lever without lifting it.

In large clocks with a train remontoire, or even with a gravity escapement, it is hardly safe to use a spring going barrel, because it is very likely to be exhausted too much to wind up the remon- toire, or raise the gravity pallets, before the winding is finished, if it takes more than two or three minutes ; whereas, with the common escapements, the wheel has only to escape, as the pendulum will

keep itself going for some time without any impulse.

EQUATION CLOCKs.

It would occupy too much space to describe the various contriv- ances for making clocks show the variations of solar compared with

‘mean time (called equation clocks), the days of the month, periods

of the moon, and other phenomena. The old day of the month clocks required setting at the end of every month which has not 31 days, and have long been obsolete. Clocks are now made even to provide for leap year. But we doubt whether practically anybody ever takes lis day of the month from a clock face, especially as the figures

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are too small to be seen except quite near. Several persons have taken patents for methods of exhibiting the time by figures appear- ing through a hole.in the dial, on the principle of the “‘numbering machine.” But they do not reflect that no such figures, on any. practicable scale, are as conspicuous as a pair of hands; and that nobody really reads the figures on a dial, but judges of the time in a moment from the position of the hands; for which reason the minute hand should be straight and plain, while the hour hand has a *‘ heart’? near the end; 12 large marks and 48 small ones make a more distinguishable dial than one with figures ; and the smaller the figures are the better, as they only tend to obscure the hands.

STRIKING CLocks.

There ate two kinds of striking work used in clocks. The older of them, which is still used in most foreign clocks, and in turret clocks in England also, will not allow the striking of any hour to be either omitted or repeated, without making the next hour strike wrong; whereas, in that which is used in all English house clocks, the number of blows to be struck depends merely on the position of a wheel attached to the going part ; and therefore the strik- ing of any hour may be omitted or repeated without deranging the following ones. In turret clocks there is no occasion for the repeating movement; and for the purpose of describing the other, which is called the locking-plate movement, we may as well refer to fig. 22, which is the front view of a large clock, striking both hours and quarters on this plan. In the hour part (on the left), you observe a bent lever BAH, called the “lifting-piece,” of which the end H has just been left off by the snail ou the hour-wheel 40 of the going part; and at the other end there are two stops on the back side of the lever, one behind, and rather below the other ; and against

the upper one a pin in the end of a short lever 9 B, which is fixed to the arbor of the fly, is now resting, and thereby the train is stopped from running, and the clock from striking any more. The stops are shown on the quarter lifting-piece in the figure (27) of the Westminster clock. We omit the description of the action of the wheels, because it is evident enough. At D may be seen a piece projecting from the lever AB, and dropping into a notch in the wheel 78. That wheel is the locking-wheel or locking-plate ; and it has in reality notches such as D all round it, at distances 2, 3, up to 12, from any given point in the circumference, which may be considered as marked off into 78 spaces, that being the number of blows struck in 12 hours. These notches are shown in the locking-plate of the quarter part in fig. 22, but not in the hour part, for want of size to show them distinctly.

When the arm AB of the lifting-piece is raised by the snail depressing the other end H, a few minutes before the hour, the fly-pin slips past the first of the stops at B, but is stopped by the second and lower one, until the lever is dropped again exactly at the hour. Thus the pin can pass, and would go once round, allowing the train to go on a little; but before it has got once round, A B has been lifted again high enough to carry both stops out of the way of the fly-pin, by means of the cylinder with two slices taken off it, which is set on the arbor of the wheel 90, and on which the end of the lifting-piece rests, with a small roller to diminish the friction. If the clock has only to strike one, the lifting-piece will then drop again, and the fly-pin will be caught by the first stop, having made (according to the numbers of the teeth given in fig. 22) 5 turns. But if it has to strike more, the locking- wheel comes into action. That wheel turns with the train, being either driven by pinion 20 on the arbor of the great wheel, or by a gathering pallet on the arbor of the second wheel, like G in fig. 15; and when once the lifting-piece is lifted out of a notch in the locking-plate, it cannot fall again until another notch has come under the bit D; and as the distance of the notches is proportioned to the

hours, the locking-plate thus determines the number of blows struck. It may occur to the reader, that the cylinder 10 and roller are not really wanted, and that the

_locking-plate would do as well without; and sometimes

clocks are so made, but it is not safe, for the motion of the locking-plate is so slow, that unless everything is very carefully adjusted and no shake left, the corner of the notch may not have got fairly under the bit D before the fly has got once round, and then the lifting-piece will drop before the clock can strike at all; or it may hold on too long aud strike 13, as St Paul's clock did once at midnight, when it was heard at Windsor by a sentinel.

Small French clocks, which generally have the striking part made in this way, very commonly strike the half hours also, by having a wide slit, like that for one o'clock, in the locking-plate at every hour. But such clocks are unfit for any place except a room, as they strike one three times between 12 and 2, and accordingly turret clocks, or even large house clocks, are never made so. Sir I. Beckett has lately introduced the plan of making turret clocks strike one at all the half hours except 124 and 14, so that any striking of one that is heard between 114 aud 24 must needs be one o'clock. This is done by hay- ing a 12-hour wheel driven by the going part, either continu- ously or bya gathering pallet moving that wheel only ouce an hour, and it has two high steps which come under another piece like D in the lifting detent a little before 12} and 14 so as to prevent it falling when let off by the snail. In the English or rack striking movement, to be presently described, the same thing may be done by a kind of star wheel with flat ends to the rays, attached to the 12-hour snail, which will let the rack fall enough to strike one at every half hour, but with two longer rays to prevent it falling at all at 124 and 14; or it would be better to let those rays, by means of an intervening lever, prevent the lifting piece from falling, as that would involve less fric- tion of the tail of the rack.

In all cases the locking-plate must be considered as divided into as many parts as the number of blows to be struck in 12 hours,7z.e., 78, 90, or 88, according as half hours are or are not struck; and it must have'the same number of teeth, driven by a pinion on the striking wheel arbor of as many teeth as the striking cams, or in the same ratio,

Fig. 15 is a front view of a common English house clock with the face taken off, showing the repeating or rack striking movement. Here, as in fig. 1, M is the hour- wheel, on the pipe of which the minute-hand is set, N the

reversed hour-wheel, and x its pinion, driving the 12-hour wheel H, on whose socket is fixed what is called the snail Y, which belongs to the striking work exclusively. The hammer is raised by the eight pins in the rim of the second wheel in the striking train, in the manner which is obvious.

The hammer does not quite touch the bell, as it would jar in striking if it did, and prevent the full sound; and if you observe the form of the hammer-shank at the arbor where the spring S acts upon it, you will see that the spring both drives the hammer against the bell when the tail T is raised, and also checks it just before it reaches the bell, and so the blow on the bell is given by the hammer having acquired momentum enough to go a little farther than its place of rest. Sometimes two springs are used, one for impelling the hammer, and the other for checking it. A piece of vulcanized India-rubber, tied round the pillar just where the hammer-shank nearly touches it, forms as good a check spring as anything. But nothing will check the chattering of a heavy hammer, except making it lean forward so as to act, partially at least, by its weight. The pinion of the striking-wheel

generally has eight leaves, the same number as the pins ; and as a clock strikes 78 blows in 12 hours, the great wheel will turn in that time if it has 78 teeth instead of 96, which the great wheel of the going part has for a centre pinion of eight. The striking-wheel drives the wheel above it once round for each blow, and that wheel drives a fourth (in which you observe a single pin P), six, or any other integral number of turns, for one turn of its own, and that drives a fan-fly to moderate the velocity of the train by the resistance of the air, an expedient at least as old as De Vick’s clock in 1370,

The wheel N is so adjusted that, within a few minutes of the hour, the pin in it raises the lifting-piece LONF so far that that piece lifts the click © out of the teeth of the rack BKRV, which immediately falls back (helped by a

Fig. 15.—Front view of Common English House Clock,

spring near the bottom) as far as its tail V can go by reason of the snail Y, against which it falls; and it is so arranged that the number of teeth which pass the click is proportionate to the depth of the snail; and as there is one step in the snail for each hour, and it goes round with the hour-hand, the rack always drops just as many teeth as the number of the hour to be struck,

This drop makes the noise of “giving warning.” But the clock is not yet ready to strike till the lifting piece has fallen again; for, as soon as the rack was let off the tail of the thing called the gathering pallet G, on the prolonged arbor of the third wheel, was enabled to pass the pin K of the rack ou which it was pressing before, and the striking train began to move; but before the fourth wheel had got half round, its pin P was caught by the end of the lifting-piece, which is bent back and goes through a hole in the plate, and when raised stands in the way of the pin P, so that the train cannot go on till the lifting-piece drops, which it does exactly at the hour, by the pin N then slipping past it. Then the train is free ; the striking wheel begins to lift the hammer, and the gathering pallet gathers up the rack, a tooth for each blow, until it has returned to the

| A egne + n eeee .

place at which the pallet is stopped by the pin K coming under it. In this figure the lifting-piece is prolonged to F, where there is a string hung to it, as this is the proper place for such a string when it is wanted for the purpose of learning the hour in the dark, and not (as it is generally put) on the click C; for if itis put there and you hold the string a little too long, the clock will strike too many; and if the string accidentally sticks in the case, it will go on striking till it is run down; neither of which things can happen when the string is put on the lifting-piece.

‘ The snail is sometimes set on a separate stud with tho apparatus called a star-wheel and jumper ; but as this only increases the cost without any advantage that we. can see, we omit any further reference to it. On the left side of the frame we have placed a lever x, with the letters s¢ below it, and si above. If it is pushed up to si, the other end will come against a pin in the rack, and prevent it from falling, and will thus make the clock silent; and this is much more simple than the old-fashioned “strike and silent” apparatus, which we shall therefore not describe, especially as it is seldom used now.

If the clock is required to strike quarters, a third “ part” or train of wheels is added on the nght hand of the going part ; and its general construction is the

same as the hour- striking part; only there are two more bells, and two hammers so placed that one is raised a little after the other. If there are more quarter-bells than two, the hammers are generally raised by a chime-barrel, which is merely a cylinder set on the arbor of the striking-wheel (in that case generally the third in the train), with short pins stuck into it in the proper places to raise the hammers in the order required for the tune of the chimes, The quarters are usually made to let off the hour, and this con- nection may be made in two ways. If the chimes are different in tune foreach quarter, and not merely the same tune repeated two, three, and four times, the repetition movement must not be used for them, as it would throw the tunes into confusion, but the old locking-plate move- ment, as in turret clocks; and therefore, if we conceive the hour lifting-piece connected with the quarter locking- plate, as it is with the wheel N, in fig. 15, it is evident that the pin will discharge the hour striking part as the fourth quarter finishes.

But where the repetition movement is required for the quarters, the matter is not quite so simple. The principle of it may shortly be described thus. The quarters them selves have a rack and snail, é&c., just like the hours, ex- cept that the snail is fixed on one of the hour-wheels M or N, instead of on the twelve-hour wheel, and has only four steps in it. Now suppose the quarter-rack to be so placed that when it falls for the fourth quarter (its greatest drop), it falls against the hour lifting-piece some: where between O and N, so as to raise it and the click C. Then the pin Q will be caught by the click Qg, and so the lifting-piece will remain up until all the teeth of the quar. ter-rack are gathered up; and as that is done, it may be made to disengage the click Qg, and so complete the let- ting off the hour striking part. This click Qg has no existence except where there are quarters.

These quarter clocks are sometimes made so as only to strike the quarters at the time when a string is pulled— as by a person in bed, just like repeating watches, which are rarely made now, on account of the difficulty of keep- ing in order such a complicated machine in such a small space. In this case, the act of pulling the string to make the clock strike winds up the quarter- barrel, which is that of a spring clock {not yet described), as far as it is allowed to be wound up by the position of a snail on the hour- wheel

against which a lever is pulled, just as the tail of the common striking-rack falls against the snail on the

twelve-hour wheel; and it is easy to see that the number of blows struck by the two quarter hammers may thus be made to depend upon the extent to which the spring that drives the train is wound up; and it may even be made to indicate half-quarters ; for instance, if the snail has eight steps in it, the seventh of them may be just deep enough to let the two hammers strike three times, and the first of them once more, which would indicate 74 minutes to thie hour. It is generally so arranged that the hour is struck first, and the quarters afterwards.

Alarums.

In connection with these bedroom clocks we ouglit to mention alarums. Perhaps the best illustration of the mode of striking an alarum is to refer to either of the recoil escapements (figs. 3 and 4). If you suppose a short hammer instead of a long pendulum attached to the axis of the pallets, and the wheel to be driven with sufficient force, it will evidently swing the hammer rapidly back- wards and forwards; and the position and length of the

| hammer head may be so adjusted as to strike a bell inside,

first on one side and then on the other. Then as to the rode of letting off the alarum at the time required ; if it was always to be let off at the same time, you would only have to set a pin in the twelve-hour wheel at the proper place to raise the lifting-piece which lets off the alarum at that time. But as you want it to be capable of alteration, this discharging pin must beset in another wheel (without teeth), which rides with a friction-spring on the socket of the twelve-hour wheel, with a small movable dial attached to it, having figures so arranged with reference to the pin that whatever figure is made to come to a small pointer set as a tail to the hour hand, the alarum shall be let off at that hour. ‘The letting off does not require the same apparatus as a common striking part, because an alarum has not to strike a definite number of blows, but to go on till it is run down; and therefore the lifting-piece is nothing but a lever with a stop or hook upon it, which, when it is dropped, takes hold of one of the alarum wheels, and lets them go while

it is raised high enough to disen- gage it. You must of course not wind up an alarum till within twelve hours of the time when it is wanted to go off.

The watchman’s or tell-tale clock may be seen in one of the lobbies of the House of Commons, and in prisons, and some other places. where they want to make sure of a watchman being on the spot and awake all the night ; it is a clock with a set of spikes, generally 48 or 96, sticking out all round the dial, and a handle somewhere in the case, by pulling which you can press in that one of the spikes which is opposite to it, or to some lever connected with if, for a few minutes; and it will be observed, that this wheel of spikes is carried round with the hour-hand, which in these clocks is generally a twenty-four hour one. It is evident that every spike which is seen still sticking out in the morning indicates that at the particular time to which that spike belongs the watchman was not there to push it in—or at any rate, that he did not; and hence its name. At some other part of their circuit, the inner ends of the pins are carried over a roller or an inclined plane which pushes them out again ready for business the next night.

Sprine CLocks.

Hitherto we have supposed all clocks to be kept going by a weight. But, as is well known, many of them are driven by a spring coiled up ina barrel. In this respect they differ nothing from watches, and therefore for con- sideration of the construction of parts belonging to the spring reference is made to the article Watcuxs. It may

however, be mentioned here that the earliest form in which a spring seems to have been used was not that of a spiral rib- bon of steel rolled up, but a straight stiff spring held fast to the clock frame at one end, and a string from the other end going round the barrel, which was wound up ; but such a spring would have a very small range. Spring clocks are generally resorted to for the purpose of saving length ; for as clocks are generally made in England, it is impossible to make a weight-clock capable of going a week, without either a case nearly 4 feet high, or else the weights so heavy as to

produce a great pressure and friction on the arbor of the great wheel. But this arises from nothing but the heavi- ness of the wheels and the badness of the pinions used in most English clocks, as is amply proved by the fact that the American and Austrian clocks go a week with smaller weights and much less fall for them than the English ones, and the American ones with no assistance from fine work- manship for the purpose of diminishing friction, as they are remarkable for their want of what is called “finish” in the machinery, on which so much time and money is wasted in English clock-work.

All the ornamental French clocks, and all the short “dials,” as those clocks are called which look no larger than the dial, or very little, and many of the American clocks, are made with springs. Indeed we might omit the word “French” after “ ornamental ;” for the manufacture of ornamental clocks has practically ceased in England, and we are losing more of all branches of the horological trade yearly, as we are unable, «.e., our workmen do not choose, to compete witn the cheaper labour of the Continent, or with the much more systematic manufacture of clocks and watches by machinery in America than exists here, though labour there is much dearer. It is true that most of the American clocks are very bad, indeed no better than the old-fashioned Dutch clocks (really German) made most ingeniously of wood and wire, besides the wheels. But some better American ones are also made now, and they will no doubt improve as their machine-made watches have done. Though this has been going on now for 30 years and more, no steps appear to have been taken to establish anything of the kind in this country, except that watch “movements,” which means only the wheels set in the frame, are to a certain extent made by machinery in Lancashire and Coventry for the trade, who finish them in London and elsewhere. That is the real meaning of the advertisements of “ machine-made watches” here.

The French clocks have also been greatly improved within | the same time, and are now, at least some of them, | quite different both in construction and execution from the |

old-fashioned French drawing-room clock which generally goes worse than the cheapest “Dutchman,” and is nearly always striking wrong, because they have the locking-plate striking work, which if once let to strike wrong,

either by altering the hands or letting it run down, cannot be set right again except by striking the hours all round, which few people know how to do, even if they can get their fingers in behind the clock to do it, .The Americans have a slight wire hanging down a little below the dial which you can push up and so make the clock strike. All locking- plate clocks ought to have a similar provision.

There is not much use in having clocks to go more than a little over eight days (to allow the possible forgetting of a day), as a week is the easiest period to remember. The French spring-clocks generally go a fortnight, but most people wind them up weekly, Occasionally English clocks are made to goa month by adding another wheel 3 and even a year by adding two. But in the latter case it is better to have two barrels and great wheels acting on opposite sides of a very strong pinion between them, as it both reduces the strain on the teeth and the friction of the pivot of that

pinion. Such clocks sometimes have a 5 feet or 1} sec. pendulum, as the case must be a tallone. The great thing is to make the scape-wheel light, and even then you can never get more than a small arc of vibration, which is undesirable for the reason given above, and such a long train is peculiarly sensitive to friction.

In the American clocks the pinions are all of the kind called lantern pinions, which have their leaves made only of bits of wire set round the axis in two collars ; and, oddly enough, they are the oldest form of pinion, as well as the best, acting with the least friction, and requiring the least accuracy in the wheels, but now universally disused in all English and French house clocks, The American clocks prove that they are not too expensive to be used with advantage when properly made; although, so long as there are no manufactorves of clocks here as there are in America, it may be cheaper to make pinions in the slovenly way of cutting off all the ribs of a piece of pinion wire, so as to reduce it to a pinion aquarter of an inch wide, and an arbor 2 or 3 inches long. On the whole, the common English house clocks, so far from having improved with the general progress of machinery, are worse than they were fifty years ago, and at the same time are of such a

price that they are being fast driven out of the market by the American plain clocks and by the French and German ornamental ones.

Clocks have been contrived to wind themselves up by the alternate expansion and contraction of mercury and other fluids, under variations of temperature. Wind-mill clocks might be made still more easily, the wind Winding up a weight occasionally. Water-clocks have also been made,—not on the clepsydra principle, where the flow of the water determined the time very inaccurately ; but the water is merely the weight, flowing from a tap into a hollow hori- zontal axis, and thence by branches into buckets, which empty themselves as they pass the lowest point of the circle in which they move, or flowing directly into buckets, so emptying themselves. But the slopping of the water, and the rusting of any parts made of iron, and the cost of the water itself always running, destroy all chance of such things coming into use.

ELEctricaL Ciocks.

It should be understood that under this term two, or we may say three, very different things are comprehended. The first is a mere clock movement, z.e., the works of a clock without either weight or pendulum, which is kept going by electrical connection with some other clock of any kind (these ought to be called electrical dials, not clocks) ;

_ the second is a clock with a weight, but with the escape-

ment worked by electrical connection with another clock instead of by a pendulum; and the third alone are truly electrical clocks, the motive power being electricity instead of gravity; for although they have a pendulum, which of course swings by the action of gravity, yet the requisite impulse for maintaining its vibrations against friction and resistance of the air is supplied by a galvanic battery, instead of by the winding up of a weight,

If you take the weight off a common recoil escapement clock, and work the pallets backward and forwards by hand, you will drive the hands round, only the wrong way ; consequently, if the escapement is.reversed, and the pallets are driven by magnets alternatively made and unmade, by the well-known method of sending an electrical current through a wire coil set round

a bar of soft iron, the contact being made at every beat of the pendulum of a standard clock, the clock without the weight will evidently keep exact time with the standard clock ; and the only question is as to the best modc of making the contact, which is not

so easy a matter as it appears to be, and though various plans apparently succeeded for a time, and were mechani- cally perfect, not one has succeeded permanently ; 2.¢., the contact sometimes fails to produce the current of sufficient strength to lift the weight or spring on which the driving of the subordinate clock depends. It is therefore unneces- sary to repeat the description of the various contrivances for this purpose by Wheatstone and others.

The first person who succeeded in making one clock regu- late or govern others by electricity, Mr R. L. Jones, accord- ingly abandoned the idea of electrical driving of one clock by another; and instead of making the electrical connection with a standard clock (whether itself an electrical one or not) drive the others, he makes it simply let the pallets or the pendulum of the subordinate clock, driven by a weight or spring, be influenced by attraction at every beat of the standard clock; and, by way of helping it, the pallets are made what we called half-dead in describing the dead escapement, except that they have no impulse faces, but the dead faces have just so much slope that they would overcome their own friction, and escape of themselves under the pressure of the clock train, except while they are held by the magnet, which is formed at every beat of the standard clock, or at every half-minute contact, if it is intended to work the dials by half-minute jumps. This plan has been extensively used for regulating distant clocks from Greenwich Observatory.

The first electrical clocks, in the proper sense of the term, were invented by Mr Bain in 1840, who availed himself

Fra. 16.—Bain’s Pendulum.

of the discovery of Oersted that a coil of insulated wire in the form of a hollow cylinder is attracted in one direction or the other by a permanent magnet within the coil, not touching it, when the ends of the coil are connected with the poles of a battery; and if the connection is reversed, or the poles changed, so that the current at one time goes one way through the coil from the — or copper plate to the + or zinc plate, and at other times the other way, the direction of the attraction is reversed. Mr Bain made the bob of his pendulum of such a coil enclosed in a brass case so that it looked like a hollow brass cylinder lying horizontal and moving in the direction of its own axis, and in that axis stood the ends of two permanent magnets with the north poles pointed at each otherand nearly touching, asin the right hand part of fig. 16. The pendulum pushed a small sliding bar backwards and forwards so as to reverse the current through the coil as the pendulum passed the middle of the arc, and so caused each magnet in turn to attract the bob. But this also failed practically,

d’e with the other; so that the current has to pass down one spring and one rod and through the coil in the bob and up the

and especially in timekeeping, a8 might have been expected, from the friction and varying resistance of the bar to the motion of the pendulum, and in the attractions.

Mr Ritchie of Edinburgh, however, has combined the

principle of Bain’s and Jones’s clocks ina manner which is testified to be completely successful in enabling one standard clock to control and keep going any number of subordinate ones, which do not require winding up as Jones’s do, but are driven entirely by their pendulums. This differs from Wheatstone’s plan in this, that his subor- dinate clocks had no pendulum swinging naturally and only wanting its vibrations helping a little, but the pallets had to be made to vibrate solely by the electrical force. The figures are taken from Mr Ritchie’s paper read before the Royal Scottish Society of Arts in 1873. The controlled pendu- lum P is that just now described as Bain’s (seen in fig. 17 the other way, across the plane of vibra- tion); the rod

and spring are double, and the wire cd is con- nected with one spring and rod

(say the front one) and the wire

other spring. The other pendu- lum O of the normal or standard clock is a common one, except that it touches two slight contact springs a, 6 alternately, and so closes the circuit on one side and leaves it broken on the other. 4 When that pendulum touches a the B battery does nothing, and the — current from the battery A passes by a to c and d and down the d spring and rod and up through d' to e and back again to + of A. But when the standard pendulum O touches & the A battery does nothing, and the current from — to+of the B battery goes the other way, through the controlled pendulum and its coil. The two fixed magnets SN, NS consequently attract the coil and bob each way alternately. And even if the current is occasionally weak, the natural swing of the pen- dulum will keep it going for a short time with force enough to drive its clock through a reversed escape- ment; and further, if that pendulum is naturally a little too fast or too slow the attraction from the standard pendulums will retard or accelerate it. In practice, however, it is found better not to make the contact by springs, which, however light, dis- turb the pendulum a little, but by a wheel in the train making and breaking contact at every beat; and if the clock has a gravity escape- ment there is no danger of this -. friction affecting the pendulum atall. 1% 18.-—Ritchie's Hilipi In order to get the machinery into cal a smaller compass than a 39 inches pendulum requires, Mr Ritchie uses a short and slow pendulum with two bobs, one above and the other below the suspension, as shown in fig. 17. Such a pendulum, like a common scale-beam, may be made to vibrate as slow as you like by bringing

Fra. 17.—Ritchie's Pendulum.

the suspension nearer to the centre of gravity of the whole mass. But they are quite unfit for independent clock pendulums, having very little regulating power, or what we may call force of vibration. He applies

magnets to both the bobs, so as to double the electrical force. Fig. 17 is the section across the plane of vibration.

Fig. 18 shows the kind of reversed escapement, or "‘ pro- pelment," used with these short and slow pendulums. The pendulum here is returning from the extreme right, and has just deposited the right hand pallet BCD with its end D pressing on a tooth of the scape-wheel, but unable to turn it because another tooth is held by the stop G on the left pallet. As soon as the pendulum lifts that pallet the weight of the other pallet turns the wheel,until a tooth falls against the stop C. When the pendulum returns from the left the left pallet presses on a tooth at E but cannot turn the wheel because it is yet held by ©, until that is released. In order to prevent the hands being driven back by wind where they are exposed to it, a click is added to the teeth. The wind cannot drive the hands forward by reason of the stops CO, G.

CuURCH AND TURRET CLOCKS.

‘ Seeing that a clock—at least the going part of it—is a machine in which the only work to be done is the over- coming of its own friction and the resistance of the air, it is evident, that when the friction and resistance are much increased, it may become necessary to resort to expedients for neutralizing their effects which are not required in a smaller machine with less friction. In a turret clock the friction is enormously increased by the great weight of all the parts; and the resistance of the wind, and sometimes snow, to the motion of the hands, further aggravates the difficulty of maintaining a constant force on the pendulum ; and besides that, there is the exposure of the clock to the dirt and dust which are always found in towers, and of the oil to a temperature which nearly or quite freezes it all through the usual cold of winter. This last circumstance alone will generally make the arc of the pendulum at least half a degree more in summer than in winter; and inas- much as the time is materially affected by the force which arrives at the pendulum, as well as the frictionon the pallets when it does arrive there, it is evidently impossible for any turret clock of the ordinary construction, especially with large dials, to keep any constant rate through the various changes of temperature, weather, and dirt, to which it is exposed. ‘ Within the last twenty years all the best clock- makers have accordingly adopted the four-legged or three- legged gravity escapement for

turret clocks above the smallest size ; though inferior ones still persist in using the dead escapement, which is incapable of maintaining a con- stant rate under a variable state of friction, as has been shown before. When the Astronomer Royal in 1844 laid down thecondition for the Westminster clock that it was not to vary more then a second a day, the London Company of Clockmakers pronounced it impossible, and the late Mr Vulliamy, who had been for many years the best maker of large clocks, refused to tender for it at those terms. The introduction of the gravity escapement enabled the largest and coarsest looking clocks with cast-iron wheels and pinions to go for long periods with a variation much nearer a second a week than a second a day. And the consequence was that the price for large clocks was reduced to about one-third of what it used to be for an article inferior in performance though more showy in appearance. Another great alteration, made by the French clockmakers before ours, was in the shape and construction of the frame. The old form of turret clock-frame was that of a large iron

cage, of which some of the vertical bars take off, and are fitted with brass bushes for the pivots of the wheels to run in; and the wheels of each train, z.e., the striking, the going, and the quarter trains, have their pivots all in the vertical bar belonging to that part. Occasionally they advanced so far a8 to make the bushes movable, 1.¢., fixed with screws instead of rivetted in, so that one wheel may be taken out without the others. This cage generally stood upon a wooden stool on the floor of the clock room. The French clockmakers long ago saw the objections to this kind of arrangement, and adopted the plan of a hori- zontal frame or bed, cast all in one piece, and with such smaller frames or cocks set upon it as might be required for such of the wheels as could not be conveniently got on the same level. The accompanying sketch (fig. 19) of the

+ MEMONTOIRE hy,

Fia. 19.—Clock at Meanwood Church, Leeds.

clock of Meanwood church, near Leeds, one of the first on that plan, will sufficiently explain it. All the wheels of the going part, except the great

wheel, are set in a separate frame called the movement frame, which is complete in itself, and light enough to take off and carry away entire, so that any cleaning or repairs required in the most delicatc part of the work can be done in the clock factory, and the great wheel, barrel, and rope need never be disturbed at_ all, Even this movement-frame is now dispensed with ; but we will reserve the description of the still more simple kind of frame in which add the wheels lie on or under the great horizontal bed, until we have described train remontoires.

Train Remontoitres.

Although the importance of these is lessened by the invention of an effective gravity escapement, they are still occasionally used, and are an essential part of the theory of clockmaking. It was long ago perceived that all the variations of force, except friction of the pallets, might be cut off by making the force of the scape-wheel depend on a small weight or spring wound up at short ‘intervals by the great clock weight and the train of wheels.

This also has the advantage of giving a sudden and visible motion to the minute hand at those intervals, say of half a minute, when the remontoire work is let off, so that time may be taken from the minute hand of a large public clock as exactly as from the seconds hand of an astronomical clock ; and besides that, greater accuracy may be obtained in the letting off of the striking part. We believe the first maker of a large clock with a train remontoire was Mr Thomas Reid of Edinburgh, who wrote the article on clocks in the first edition of this Encyclopedia, which was after- wards expanded into a well-known book, in which his remontoire was described. The scape-wheel was dtiven by a small weight hung by a Huyghens’s endless chain, of which one of the pulleys was fixed to the arbor, and the other rode upon the arbor, with the pinion attached to it, and the pinion was driven and the weight wound up by the wheel below (which we will call the third wheel), as follows. Assuming the scape-wheel to turn in a minute, its arbor has a notch cut half through it on opposite sides in two places near to each other ; on the arbor of the wheel, which turns in ten minutes, suppose, there is another wheel with 20 spikes sticking out of its rim, but alternately in two different planes, so that one set of spikes can only pass through one

of the notches in the scape-wheel arbor, and the other set only through the other. Whenever then the scape-whecl completes a half turn, one spike

is let go, and the third whecl is able to move, and with it the whole clock-train and the hands, until the next spike of the other set is stopped by the seape-wheel arbor; at the same time the pinion on that arbor is turned half round, winding up the remontoire weight, but without taking its pressure off the scape-wheel. Reid says that, so long as this apparatus was kept in good order, the clock went better than it did after it was removed in consequence of its getting out of order from the constant banging of the spikes against the arbor.

The Royal Exchange elock was at first made in 1844 on the same principle, except that, instead of the endless chain, an internal wheel ,was used, with the spikes set on it externally, which is one of the modes by which an occasional secondary motion may be given to a wheel without disturbing its primary and regular motion. A drawing of the original Ex- change clock remontoire is given in the Rudimentary Treatise on Clocks; but for the reasons which will appear presently, it need not be repeated here, especially as the following is a more simple arrangement of a gravity train remontoire, much more frequently used in prineiple. Let E in fig. 20 be the seape-wheel turning in a

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Fic, 20,—Gravity Train Remontoire.

minute, and ¢ its pinion, which is driven by the wheel D having a pinion d driven by the wheel C, which we may suppose to turn in an hour. The arbors of the seape-wheel and re fess are distinct, their pivots meeting in a bush fixed somewhere between the wheels. The pivots of the wheel, D are set in the frame AP, which rides on the arbors of the hour-wheelfand scape-wheel, or on another short arbor between them. The hour-wheel also drives another wheel G, which again drives the pinion f on the arbor which earries the two arms f A, f B; and on the same arbor is set a fly with a ratehet, like a eommon striking fly, and the numbers of the teeth are so arranged that the fly will turn once for each turn of the scape- wheel. The ends of the remontoire arms f A, f B are capable of alternately passing the notches cut half through the arbor of the seape-wheel, as those notches successively come into the proper position at the end of every half minute; as soon as that happens the hour-wheel raises the movable wheel D and its frame through a small angle ; but nevertheless, that wheel keeps pressing on the seape-wheel as if it were not moving, the point of eontact of the wheel C and the pinion @ being the fulcrum or eentre of motion of the lever Ad P. It will be observed that the remontoire arms / A, J B have springs set on them to diminish the blow on the seape- wheel arbor, as it is desirable not to have the fly so large as to make the motion of the train, and consequently of the hands, too slow to be distinet. For the same reason it isnot desirable to drive the fly by an endless serew, as was done in most of the Freneh eloeks on this principle in the 1851 Exhibition. There is also an enormous loss of force by frietion in driving an endless screw, and consequently eonsiderable risk of the elock stopping either from eold or from wasting of the oil.

Another kind of remontoire is on the principle of one bevelled wheel lying between two others at right angles to it. The first of the bevelled wheels is driven by the train, and the third is fixed to the arbor of the scape-wheel; and the intermediate bevelled wheel, of any size, rides on its arbor at right angles to the other two arbors which are in the same line. The scape-wheel will evidently turn with the same average velocity as the first bevelled wheel, though the intermediate one may move up and down at intervals. The transverse arbor which earries it is let off and lifted a little at half-minute intervals, as in the remontoire just now deseribed ; and it gradually works downas the scape-wheel turns under its pressure, until it is freed again and lifted by the elock train.

In all these gravity remontoires, however, it must have been observed that we only get rid of the friction of the heavy parts of the train and the dial-work, and that the seape-wheel is still subject to the friction of the remontoire wheels, which, though inuch less than the other, is still something considerable. And accordingly,

attempts have frequently been made to drive the scape-wheel by a spiral spring, like the mainspring of a watch. One of these was described in the 7th edition of this Lncyclopedia ; and Sir G. Airy, a few years ago, invented another on the same principle, of which two or three specimens were made. But it was found, and indeed it ought to have been foreseen, that these contrivances were all defective in the mode of attaching the spring, by making another wheel or pinion ride on the arbor of the scape-wheel, which produced a very mischievous friction, and so only increased the expense of the clock without any corresponding advantage; and the consequence was that spring remontoires, and remontoires in general, had come to be regarded as a mere delusion. It has however now been fully proved that they are not s0; for, by a very simple alteration of the previous plans, a spiral spring remontoire may be made to act with absolutely no friction, except that of the scape-wheel pivots, and the letting-off springs A, B, in the last drawing. The Mean- wood clock (fig. 17) was the first of this kind ; but it will be necessary to give a separate view of the remontoire work. —. In the next figure (21), A, B, D, E, e, f are the same things as in fig. 20. Bute, the scape-wheel pinion, is no longer fixed to the arbor, nor does it ride on the arbor, as had been the case in all the previous spring remontoires, ‘thereby producing probably more friction than was saved in other respects; but it rides on a stud h, which is setin the clock-frame. On the face of the pinion is a plats of which the only use is to carry a pin / (and consequently its shape is immaterial), and in front of the plate is set a bush }, with a hole through it, of which half is occupied by the end of the stud k to which the bush is fixed by a small pin, and the other half is the pivot-hole for the scape-wheel arbor. On the arbor is set the remontoire spring s (a moderate-sized musical-box spring is generally used) of which the outer end is bent into a loop to take hold of the pin A. In fact, there are two pins at , one a little behind the other, to keep the coils of the spring from touching each uther. Now, it is evident vhat the spring may be wound up half or a quarter of a turn at the proper in- tervals without taking the force off the seape-

wheel, and also without affecting it by any friction whatever. When the scape-wheel turns in a minute, the letting-off would be done as before described, by a couple of notches in the scape-wheel arbor, through which the spikes A, B, as in fig. 20, would pass alternately. But in clocks with only three wheels in the train it is best to make the scape-wheel turn in two minutes, and consequently you would want four notches and four remontoire arms, ae the fly would only make a Es ares of a turn, And Me hs therefore Sir E. Beckett, who invented this remontoire, made the following provision for diminishing the friction of the letting-off work. The fly pinion f has only half the number of teeth of the scape-wheel pinion, being a lantern pinion of 7 or 8, while the other is a leaved pinion of 14 or 16, and therefore the same wheel D will properly drive both, as will be seen hereafter. The scape-wheel arbor ends in a cylinder about $ inch in diameter, with two notches at right angles cut in its face, one of them narrow and deep, and the other broad and shallow, so that a long and thin pin B can pass only through one, and a broad and short pin A through the other. Consequently, at each quarter of a turn of the scape-wheel, the remontoire fly, on which the pins A, B are set on springs, as in fig. 20, can turn half round. It is set on its arbor f by a square ratchet and click, which enables you to adjust the spring to the requisite tension to obtain the proper vibration of the pendulum. better construction, afterwards introduced, is to make the fly separate from the letting-off arms, whereby the blow on the cylinder is dimi- nished, the fly being allowed to go onas in the gravity escapement. The performance of this is so much more satisfactory than that of the gravity remontoires, that Mr Dent altered that of the Royal Exchange to a spring one in 1854, which had the effect of reducing the clock-weight by one-third, besides improving the rate of going. It should be observed, however, that even a spring remontoire requires alarger weight than the same clock without one ; but as none of that additional force reaches ‘the pendulum, that is of no

consequence. The variation of force of the remontoire spring from temperature, as it only affects the pendulum through the medium of the dead escapement, is far too small to produce any appreciable effeet; and it is found that clocks of this kind, with a compensated pendulum 8 feet long,

and of about 2 cwt., will not vary above a second a month, if the pallets are kept clean and well oiled. No turret clock withont either a train remontoire or a gravity escapement will approach that decree of accuracy. The King's Cross inck, which was the first of this kind, went with a variation of about a second in three weeks in the 1851 Exhibition, and has sometimes gone for two months without any discoverable error, though it wants the jewelled pallets which the Exchange clock has. But these clocks require more care than gravity escapement ones, and are certain to be spoilt as soon as they get into ignorant or careless hands; and consequently the gravity ones have superseded them.

The introduction of this remontoire led to another very important alteration in the construction of large clocks. Hitherto it had always been considered necessary, with aview to diminish the friction as far as possible, to make the wheels of brass or gun-metal, with the teeth cut in an engine. The French clockmakers had begun to use cast-iron striking parts, and cast-iron wheels had been oc-

casionally used in the going part of inferior clocks for the sake of }

cheapness ; but they had never been used in any clock making pretensions to accuracy before the one just mentioned. In conse- quence of the success of that, it was determined by the astronomer royal and Mr Denison, who were jointly consulted by the Board of Works about the great Westminster clock in 1852, to alter the ori- ginal requisition for gun-metal wheels there to cast-iron. Some persons expressed their apprehension of iron wheels rusting ; but nothing can be more unfounded, for the non-acting surfaces are always painted, and the acting surfaces oiled. A remarkable proof of the folly of the clockmakers' denunciations of the cast-iron whecls was afforded at the Royal Exchange the next year. In consequence of the bad ventilation of the clock-room, together with the effects of the London atmosphere, some thin parts of the brass work had

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become so much corroded that they had to be renewed, and some of it was replaced with iron ; for all the polished iron and brass work had become as rough as if it had never been polished at all; the only parts of the clock which had not suffered from the damp and the bad air were the painted iron work. The room was also venti- lated, with a draught through it, and all the iron work, except acting surfaces, painted. Even in the most favourable positious brass or gun-metal loses its surface long before cast-iron wants repainting.

There is, however, a curious point to be attended to in using cast- iron wheels. They must drive cast-iron pinions, for they will wear out steel. The smaller wheels of the going part may be of brass driving steel pinions; but the whole of the striking wheels and pinions may be of iron. A great deal of nonsense is talked about gun-metal, as if it was necessarily superior to brass. The best gun- metal may be, and is, for wheels which are too thiek to hammer; but there is great variety in the quality of gun-metal; it is often unsound, and has hard and soft places; and, on the whole, it has no advantage over good brass, when not too thick to be hammered. In clocks made under the pressure of compcting tenders, if the brass is likely not to be hammered, the gun metal is quite as likely to be the cheapest and the worst possible, like everything else which is always specified to be ‘‘best,” as the clockmakers know very well that it is a hundred to one if anybody secs their work that can tell the difference between the best and the worst.

Turret Clocks with Gravity Escapement.

Fig. 22 is a front view of a large quarter clock of Sir E. Beckett’s design, with all the wheels on the great horizontal bed, a gravity escapement, and a compensated pendulum. They are made in two sizes, one with the great striking wheels 18 inches wide, and the other 14. The striking is done by cams cast on the great wheels, about 1§ inch broad in the large-sized clocks, which are strong enough for an hour bell of thirty cwt., and corresponding quarters. Wire ropes are uscd, not only because they last longer, if kept greased,

Fic. 22, —Front view of Turret Quarter Clock,

but because a sufficient number of coils will go on a barrel of less than half the length that would be required for hemp ropes of the same strength, without overlapping, which it is as well to avoid, if possible, though it is not so injurious to wire ropes as it is to hemp ones. By this means also the striking cams can be put on the great wheel, instead of the seeond wheel, which saves more in friction than could be imagined by any one who had not tried both. In clocks of the common construction two- thirds of the ag is often wasted in friction and in the bad arrangement of the hammer work, and the clock is wearing itself out in doing nothing.

The same number of cams are given here to the quarter as to the hour-striking wheel, rather for the purpose of suggesting the expedi- ency of omitting the 4th quarter, as hasbeen done in niany clocks made from this design. It is of no use to strike ding-dong quarters at the hour, and it nearly doubles the work to be done; and if it is omitted it allows the bells to be larger, and therefore louder, because the Ist quarter bell ought to be an octave above the hour bell, if they are struck at the hour ; Whereas, if they are not heard together the quarters may be on ‘the 4th and 7th ofa peal of ‘eight ‘bells,

Morcover, the repetition of the four ding-dongs can give no musical pleasure to any one.

The case is different with the Cambridge and Westminster quarter chimes on 4 bells, and the chime at the hour is the most complete and pleasing of all. It is singular that those beautiful chimes (which are partly attributed to Handel) had been heard by thousands of men scattered all over England for 70 years before any one thought of copying them, but since they were introduced by Sir E. Beckett in the great Westminster clock, on a much larger scale and with a slight difference in the intervals, they have been copied very exten- sively, and are already almost as numerous in new clocks as the old- fashioned ding-dong quarters. Properly, as at Cambridge and Westminster, the hour bell should be an octave below the third (or largest but one) quarter bell; but as the interval between the quarters and hour is always considerable, it is practically found that the ear is not offended by alessinterval. At Worcester cathedral the great 43 ton hour bell is only 14 notes below the 50 cwt. tenor bell of the peal, which is made the

fourth quarter bell; and at some other places the quarters are the 2d, 3d, 4th, and 7th of a peal of 8, and ‘the honr ‘bell the 8th. Thereby you get more powerful and

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altogether better sounding quarters. The quarter bells are the Ist, 2d, 3d, and 6th of a peal of 6—independent of the hour bell; and the following is their arrangement :— ;

od { 3126

1326

8d <¢ 6213

1236 -1st hour,..10

The interval between each successive chime of four should be two or at most two and a half times that between the successive blows. At Cambridge it is three times,—decidedly too slow; at Westminster twice, which is rather too fast; at Worcester cathedral and most of the later large clocks 24 times, which sounds the best.

At Cambridge the chimes are set on a barrel which turns twice in the hour, as this table indicates, and which is driven by the great wheel with a great wastc of power; the clock is wound up every day. An eight-day clock would require a very heavy weight, and a very much greater strain on the wheels, and they are alto- gether inexpedient for these quarters on any large scale of bells.

Indeed there is some reason for doubting whether the modern introduction of eight-day clocks is an improvement, where they have to strike at all on large bells. Such clocks hardly ever bring the full sound out of the bells; because, in order to do so, the weights would have to beso heavy, and the clock so large, as to increase the price considerably. A good bell, even of the ordinary thickness, which is less than in the Westminster bells, requires a hammer of not less than Z5th of its weight, rising 8 or 9 inches from the bell, to bring out the full sound; and_ therefore, allowing for the loss by friction, a bell of 80 cwt., which is not an uncommon tenor for a large peal, would require a clock weight of 15 ewt., with a clear fall of 40 feet; and either the Cambridge quarters on a peal of ten, or the Doncaster ones on the 2d, 3d, 4th, and 7th bells of a peal of eight, will require above a ton,

according to the usual scale of bells in a ring- ing peal (which is thinner than the Westminster clock bells). Very few clocks are adapted for such weights as these ; and without abundance of strength and great size in all the parts, it would be unsafe to use them. But if the striking parts are made to wind up every day, of course #th of these weights will do; and you may a a more yowerful clock in effect, and a safer one to manage, in half the com- _ and for much less cost. Churches with such bells as these

iave always a sexton or some other person belonging to them, and

in attendance every day, who can wind up the clock just as well as a clockmaker's man, 'The going part always requires a much lighter weight, and may as well go a week, and be in the charge of a clock- maker, where it is possible.

There should be some provision for holding the hammers off the bells while ringing, and at the same time a friction-spring or weight should be brought to bear on the fly arbor, to compensate for the removal of the weight of the hammers; otherwisc there is a risk of the train running too fast and being broken when it is stopped.

No particular number of cams is required in the striking wheel; any number from 10 to 20 will do; but when four quarters on two bells are uscd, the quarter-striking whcel should have half as many cams again as the' hour-wheel ; for, if not, the rope will go a second time over half of the barrel, as there are 120 blows on each quarter bell in the 12 hours to 78 of the hours, while with the three quarters there are only 72. If the two quarter levers are on the same arbor, there must be two sets of cams, onc on each side of the wheel ; but one set will do, and the same wheel as the hour-wheel, if they are placed as in fig. 23. The hour-striking lever, it will be seen, is differently shaped, so as to diminish the pressure on its arbor by making it only the difference, instead of the sum, of the pressures at the two points of action. This can be done with the two quarter levers, as shown in the Rudimentary Treatise ; but the arrangement involves a good deal of extra work, andas the quarter hammers are always lighter than the hour one, it is hardly worth while to resort toit. The shape of the cams is a matter requiring some attention, but it will be more properly considered when we come to the teeth of wheels. The 4th quarter bell in the Cambridge and Westminster

quarters should have two hammers and sets of cams longer than the others, acting alternately, on account of the quick repetition of the blows.

The fly ratchets should not be made of cast-iron, as they some- times are by clockmakers who will not use cast-iron wheels on any account, because the teeth get broken off by the click. This break- ing may perhaps be avoided by making the teeth rectangular, like a number of inverted V's set round a circle, and the click only reach- ing so far that the face of the tooth which it touches is at right angles to the click; but, as before observed, cast-iron and steel do not work well together.

Tie hammer of a large clock ought to be left ''on the lift," when the clock has done striking, if the first blow is to be struck exactly at the hour, as there are always a good many seconds lost in the train getting into action and raising the hammer. Moreover, when it stops on the lift, the pressure on the

4th

stops, and on all the pinions above the great wheel, is only that due to the exccss of the power of the clock over the weight of the hammer, and not the full foree of the weight, and it is therefore easier for the going part to discharge, and less likely to break the stops.

id fig. 22 the whecl marked 60 in each of the striking parts is a winding wheel on the front end of the barrel, and the winding pinion is numbered 10; a larger pinion will do where the hammer does not exceed 40 Ib; and in small clocks no auxiliary winding wheel is needed. Butin that case the locking-plate must be driven by a gathering pallet, or pinion with two teeth, on the arbor of the second wheel, with a spring click to keep it steady. In all cases the hammer shanks and tails should not be less than two feet long, if possible; for the shorter they are, the more is lost by the change of inclination for any given rise fromthe bell. In some clocks with fixed (not swinging) bells, the hammer-head is set on a double shank embracing the bell, with the pivots, not aboveit in the French way, which makes the hammer strike at a wrong angle, but on each side of the bell, a little below the top. On this plan lcss of the rise is lost than in the common mode of fixing. The Westminster clock hammers are ail fixed in this way.

The first thing to remark in the going part of fig. 22 is that the hour-wheel which carries the snails for letting off the quarters and striking, is not part of the train leading up to the scape-wheel, but independent, so that the train from the great wheel to the scape- wheel, is one of three wheels only. If it were a dead escapement, instead of a gravity escapement clock, the wheel numbered 96 would be the scape-wheel; and as it turns in 90 seconds, it would require 36 teeth or pins fora 1$ scc. pendulum which most of these gravity-escapement clocks have ; it is about 6 fect long to the bottom of the bob, which, if sunk just below the floor, brings the clock-frame to a very convenient height. The hour-wheel rides loose on its arbor, or rather the arbor can turn within it, carrying. the snails and the regulating hand and the bevelled wheel which. drives all the dials, and it is fixed to the hour-wheel by means of clamping screws on the edge of a round plate on the arbor just, behind it, which turn by hand. In a gravity escapement clock this adjusting work is not really necessary ; because you can set the clock by merely lifting the pallets off the scape-wheel, and letting the train run till the hands point right. The regulating hand, you observe, in fig. 22 turns the wrong way ; because, where the dial is opposite to the back of the clock, no bevelled wheels are wanted, and the arbor leads straight off to the dial. It used to be the fashion to put clocks in the middle of the room, so that the leading- off rod might go straight up to the horizontal bevelled wheel in the middle, which drove all the dials. But the clock can be.set much more firmly on stone corbels, or on cast-iron brackets built into the wall; and it is not at all necessary for the leading-off rod to be vertical, Provided it is only in a vertical plane parallel to the wall, or the teeth of the bevelled wheels adapted to the inclination, the rod may stand as obliquely as you please; and when it does, it ought on no account to be made, as it generally is, with universal joints, but the pivots should go into oblique pivot-holes at the top and bottom. The joints increase the friction considerably, and are of no use whatever, except where the rod is too long to keep itself straight. Where the rod does happen to be in the middle of the room, and there are three or four dials, the two horizontal bevelled wheels at cach end of it must be a little larger than all the othprs— both the one in the clock and those of the dial-work ; for otherwise the’three or four wheels in the middle will meet each other and stick fast. i

When the pendulum is very long and heavy, it should be sus- pended from the wall, unless the clock-frame has some strong support near the middle; buta six-feet pendulum, of not more than two cewt., may be suspended from the clock-frame, provided it is as strong as it ought to be for the general construction of the clock, and supported on corbels or iron beams. It has generally been the practice to hang the pendulum behind the clock-frame ; but inasmuch as the rope of the going part may always be thinner than that of the striking part, and that part requires less depth in other respects, a different and more compact plan is adopted in the clocks we are describing. The back pivots of the going wheels run m bushes in an intermediate bar, three or four inches from the back of the framé, joining the two cross bars, of which the ends are dotted in the drawing. The pendulum cock is set on the back frame, and the pendulum hangs within it. And in the gravity escapement clocks there is yet another thin bar—about half way between the back frame and the bar on which the bushes of the wheels are set— the only use of which is to carry the bush of the scape-wheel, which is set behind the fly; the wheel, the fly, and the pallets, or gravity~ arms, stand between these two intermediate bars; and the pallet- arbors are set in a brass cock screwed to the top of the pendulum- eock. The beat-pins should be of brass, not steel, and no oil put to them, or they are sure to stick. The escapement in fig. 22 18 not drawn rightly for the present form of them, which is given im fig. 13. ,

“The same general arrangement will serve for a dead escapement

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clock with or without a train remontoire; only the penduluin will not stand so high, and the front end of the pallet arbor must be set in a cock like those of the striking flies, on the front bar of the frame. And for a dead escapement, if there are large dials and no remontoire, the pendulum should be longer and heavier than that which is quite sufficient for a gravity escapement. The rod of a wooden pendulum should be as thin as it can conveniently be made, and varnished, to prevent its absorbing moisture.

Dials and Hands.

The old established form of dial for turret clocks is a sheet of copper made convex, to prescrve its shape; and this is just the worst form which could lave been contrived for it. For, in the first place, the minute-hand, being necessarily outside of the hour-hand, is thrown still farther off the minutes to whieh it has to point, by the convexity of the dial; and consequently, when itis in any posi- tion except nearly vertical, it is impossible to see accurately where it is pointing ; and if it is bent enough to avoid this effect of parallax, it looks very ill. Secondly, a convex dial at a consider- able height from the ground looks even more convex than it really is, because the lines of sight from the middle and the top of the dial make a smaller angle with the eye than the lines from the middle and the bottom, in proportion to the degree of convexity. The obvious remedy for these defects, is simply to make the dial concave instead of convex. As convex dials look more curved than they are, concave ones look less curved than they are, and in fact. might easily be taken for flat ones, though the curvature is exactly the same as usual. Old convex dials are easily altered to concave, and the improvement is very striking where it has been done. There is no reason why the same form should not be adopted in stone, cement, slate, or cast-iron, of which materials dials are some- times and properly enough made, with the middle part countersunk for the hour hand, so that the minute-hand may go close to the figures and avoid parallax. When dials are large, copper, or even iron or slate, is quite a useless expense, if the stonework is moder- ately smooth, as most kinds of stone take and retain paint very well, and the gilding will stand upon it better than it often does on copper or iron.

The figures are generally made much too large. People have a pattern dial painted ; and if the figures are not as long as one-third of the radius, and therefore occupying, with the minutes, about two- thirds of the whole area of the dial, they fancy they are not large enough to be read at a distance; whereas the fact is, the more the dial is oecupied by the figures, the less distinct they are, and the more difficult it is to distinguish the position of the hands, which is what people really waht to see, and not to read the figures, which may very well be replaced by twelve large spots. he figures, after all, do not mean what they say, as you read ‘‘ twenty minutes to” something, when the minute-hand points to vir. The rule whieh has been adopted, after various experiments, as the best for the proportions of the dial, is this.

Divide the radius into three, and leave the inner two-thirds clear and flat, and of some colour forming a strong contrast to the colour of the hands, black or dark blue if they are gilt, and white if they are black. The figures, if there are any, should occupy the next two-thirds of the remaining third, and the minutes be set in the remainder, near the edge, and with every fifth minute more strongly marked than the rest; and there should not be a rim round the dial of the same colour or gilding as the figures. The worst kind of dial of all are the things called skeleton-dials, which either have no middle except the stone- work, forming no contrast to the hands, or else taking special trouble to perplex the spectator by filling up the middle with radiating bars. Where a dial cannot be put without interfering with the architecture, it is much better to have none, as is the case in many cathedrals and large churches, leaving the information to be given by the striking of the hours and quarters. This also will save something, perhaps a good deal, in the size and cost of the clock, and if it is one without a train remontoire or gravity escape- unent, will enable it to go better. The size of public dials is often very inadequate to their height and the distance at which they are intended to be seen. They ought to be at least 1 foot in diameter for every 10 feet of height above the ground, and more whenever the dial will be seen far off; and this rule ought to be enforced on archi-tects, as they are often not aware of it; and indeed they seldom make proper provisions for the cloek or the weights in building a tower, or, in short, know anything about the matter.

The art of illuminating dials cannot be said to bein a satisfactory state. Where there happens to be, as there seldom is, a projecting toof at some little distance below the dial, it may be illuminated by reflection, like that at the Horse Guards—about the only merit which that superstitiously venerated and bad clock has ; and the same thing may be done in some places by movable lamp reflectors, like those put before shop windows at night, to be turned back against the wall during the day.’ It has also been proposed to sink the dial within the wall, and illuminate it by jets of gas pointing inwards from a kind of projecting rim, like what is called in church windows a hood-moulding,” carried all round. But it isa great

objection to sunk dials, cven of less depth than would be required: here, that they do not receive light enough by day, aud do not get their faccs washed by the rain. The common mode of illumina- tion is by making the dials either entirely, or all except the figures and minutes and a ring to carry them, of glass, either ground or lined in the inside with linen (paint loses its colour from the gas). The gas is kept always alight, but the clock is made to turn it nearly. off and full on at the proper times by a 24-hour wheel, with pins sct in it by hand as the length of the day varies. Self-acting apparatus has becn applied, but itis somewhat complicated, and an unnecessary expense. ut these dials always look very ill by day; and it seems often to bé forgotten that dials arc wanted much more by day than by night ; and also, that the annual expense of lighting 3 or 4 dials far exceeds the interest of the entire cost of any ordinary clock. Sometimes it exceeds the whole cost of the clovk annually. The use of white opaque glass with black figures is very superior to the common method. It is used in the great Westminster clock dials. It is somewhat of an objection to illuminating large dials from the inside, that it makes it impossible to counterpoise the hands outside, except with very snort, and there- fore very heavy, counterpoises. And if hands are only counterpoised inside, there is no counterpoise at al] to the force of the wind, which is then constantly tending to igosen them on the arbor, and that tendency is aggravated by the hand itself pressing on the arbor ono way as it ascends, and the other way as it descends; and if a large hand once gets in the smallest degrec loose, it becomes rapidly worse by the constant shaking. It is mentioned in Reid's book that the minute-hand of St Paul's cathedral, which is above 8 feet long, used to fall over above a minute as it passed from the left to the right side of x11, before it was counterpoised outside. In the conditions to be followed in the Westminster clock it was expressly required that ''the hands be counterpoised externally, for wind as well as weight." The long hand should be straight and plain, to distinguish it as mueh as possible from the hour hand, which should end in a "heart" or swell. Many clockmakers and architects, on the con- trary, secm to aim at making the hands as like each other as they ean; and it is not uncommon to see even the counterpoiscs gilt, probably with the same object of producing apparent symmetry and the same result of producing real confusion.

The old fashion of having chimes or tunes played by-machinery on church bells at certain hours of the day has greatly revived in the last few years,

and it has extended to town halls, as also that of having very large clock bells, which had almost become extinct until the making of the Westminster clock. The old kind of chime machinery consisted merely of a large wooden barrel about 2 feet in diameter with pins stuck in it like those of a musieal box, which pulled down levers that lifted hammers on the bells. Generally there were several tunes ‘‘ pricked” on the barrel, which had an endway motion acting automatically, so as to make a shift after each tune, and with a special adjustment by hand to make it play a psalm tune on Sundays. But though these tunes were very pleasing and popularin the places where such chimes existed they were generally feeble and irregular, because the pins and levers were not strong enough to lift hammers of sufficient weight for the large bells, and there were no means of regulating the time of dropping off the levers. Probably the last large chime work of this kind was that put up by Dent to play on 16 bells at the Royal Exchange in 1845, with the iraprovement of a cast-iron barrel and stronger pins than in the old wooden barrels.

A much improved chime machine has been introduced since, at first by an inventor named Imhoff, who sold his patent, or the right to use it, to Messrs Gillett and Bland of Croydon, and also to Messrs Lund and Blockley of Pall Mall, who have both added further improvements of their own. The principle of itis this : instead of the hammers being lifted by the pins which let them off, they are lifted whenever they are down by an independent sct of cam wheels of ample strength ; and all that the pins on the barrel have to do is to trip them up by a set of comparatively light levers or detents. Consequently the pins are as small as those of a barrel organ, and many more tunes can be set on the same barrel than in the old plan, and besides that, any number of barrels can be kept, and put in from time to time as you please ; so that you may have as many tunes as the peal of bells will admit. There are various provisions for regulating and adjusting the time, and the machinery is altogether of a very perfect kind for its purpose, but it must be seen to be understood.

It is always necessary in chimes to have at least two hammers to each bell to enable a note to be repeated quickly. Some ambitious musicians determined to try ‘‘chords” or double notes struck at once, in spite of warning that they could not be made to strike quite simultaneously, and so it

turned out, and it is useless to attempt them. The largest peals and chimes yet made have been at Wor- cester cathedral, and the town halls of Bradford and Rochdale, and a still larger one is now making for Manchester, all by Gillett and Bland. ‘The clock at Woreester, which as yet ranks next to West-

‘minster, was made by Mr Joyce of Whitchurch ; the others are by

Gillett ani Bland. At Buston church they have chimes in imitas

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tion of some of the foreign ones on above 40 small bells, which were added for that purpose to the eight of the peal; but they are not successful, and it is stated in Sir E. Beckett’s book on clocks and bells, that he warned them that the large and small bells would not harmonize, thongh either might be used separately. Other persons have attempted chimes on hemispherical bells, like those of house clocks; but they also are a failure for external bells to be heard at a distance. This however belongs rather to the subject of bells ; and we must refer to that book for all practical information about them.

TEETH OF WHEELS.

Before explaining the construction of the largest clock in the world it is necessary to consider the shape of wheel teeth suitable for different purposes, and also of the cams requisite to raise heavy hammers, whieh had been too much neglected by clockmakers pre- viously. At the same time we are not going to write a treatise on all the branches of the important subject of whecl-cutting ; but, assuming a knowledge of the general principles of it, to apply them to the points chiefly involved in cloek-making. The most compre- hensive mathematical view of it is perhaps to be found in a paper by the astronomer royal in the Cambridge Transactions many years ago, which is further expanded in Professor Willis’s Principles of Mechanism. Respecting the latter book, however, we should advise the reader to be content with the mathematical rules there given, which are very simple, without attending much to those of the odontograph, which seem to give not less but more trouble than the mathematical, and are only approximate after

all, and also do not explain themselves, or convey any knowledge of the principle to those who use them.

For all wheels that are to work together, the first thiug to do is to fix the geometrical, or primitive, or piteh eireles of the two wheels, i.¢., the two cireles which, if they rolled perfectly together, would give the velocity-ratio you want. Draw a straight line joining the two centres ; then the action which takes place between any two teeth as they are approaching that line is said to be before the line of centres ; and the action while they are separating is said to be after the line of centres. Now, with a view to reduce the friction, it is essential to have as little action before the line of centres as you can ; for if you make any rude sketeh, on a large scale, of a pair of wheels acting together, and serrate the edges of the teeth (which is an exaggeration of the roughness which produces friction), you will see that the further the contact begins before the line of ceutres, the more the serration will interfere with the motion, and that at a certain distance no force whatever could drive the wheels, but would only jam the teeth faster ; and you will see also that this can- not happen after the line of centres. But with pinions of the numbers generally used in elocks you cannot always get rid of action before the line of centres; for it may be proved (but the

roof is too long to give here), that if a pinion has less than 11 eaves, no wheel of any number of teeth can drive it without some action before the line of centres. And generally it may be stated that the greater the number of teeth the less friction there will be, as indeed is evident enough from considering that if the teeth were infinite in number, and infinitesimal in size, there would be no friction at all, but simple rolling of one pitch circle on the other. And since in clock-work the wheels always drive the pinions, except the hour pinion in the dial work, and the winding pinions in large clocks, it has long been recognized as important to have high num- bered pinions, except where there is a train remontoire, or a gravity escapement, to obviate that necessity.

And with regard to this matter, the art of clock-making has in one sense retrograded ; for the pinions which are now almost univer- sally used in English and French clocks are of a worse form than those of several centurics ago, to which we have several times alluded under the name of

lantern pinions, so called from their re- sembling a lantern with upright ribs. A sketch of one, with a cross section on a large seale, is given at fig. 24. Now it is a property of these pinions, that when they are driven, the action begins just when the centre of the pin is on the Iine of centres, however few the pins may be ; and thus the action of a lantern pinion of 6 is about equal to that of a leaved pinion of 10 ; and indeed, for some reason or other, it appears in practice to be even better, possibly from the teeth of the wheel not requiring to be cut so accurately, and from the pinion never getting clogged with dirt. Certainly the running of the American clocks, which all have these pinions, is remarkably smooth, and they require a much smaller going weight than English clocks ; and the same may be said of the common ‘< Dutch,” z.¢., German clocks. It should be understood, however, that as the action upon these pinions is all after the line of centres when they are driven, it will be all before the line of centres if they drive, and therefore they are not suitable for that purpose. In some of the French clocks in the 1851 Exhibition they were wrongly used, not only for the train, but for winding pinions ; and some of them also had the pins not fixed in the lantern, but rolling,—a very useless refinement, ‘and considerably diminishing the strength of the pinion. For it is one of the advantages of lantern pinions with fixed

pins, that they are very strong, and there is no risk of their being broken in hardening, as there is with common pinions.

The fundamental rule for the tracing of teeth, though very simple, is not so well known as it ought to be, and therefore we will give it, premising that so much of a toothas lies within the pitch circle of the wheel is called its root or flank, and the part beyond the pitch cirele is called the point, or the curve, or the addendum; and moreover, that before the line of centres the action is always between the flanks of the driver and the points of the driven wheel or runner (as it may be called, more appropriately than the usual term follower); and after the line of centres, the action is always between the points of the driver and the flanks of the runner. Con- sequently, if there is no action before the line of centres, no points are required for the teeth of the runner.

In fig. 28, let AQX be the pitch cirele of the runner, and ARY that of the driver; and let GAP be any curve whatever of smaller curvature than AQX (of course a circle is always the kind of curve used); and QP the curve which is traced out by any point P in the gene- rating circle GAP, as it rolls in the pitch circle AQX,; and again let RP be the curve traced by the point P, as the generating circle GAP is rolled on the piteh circle ARY; then RP will be the form of the point of a tooth on the driver ARY, which will drive with uniform and proper motion the flank QP of the runner; though not without A Ry some friction, beeause that can only Driver >»>—» be done with involute teeth, which are Fig, 23. traced in adifferent way, and are subject to otherconditions, rendering them practically useless for machinery, as may be scen in Professor Willis's book. If the motion is reversed, so that the runner becomes the driver, then the flank QP is of the proper form to drive the point RP, if any action has to take place before the line of centres.

And again, any generating curve, uot even necessarily the same as before, may be used to trace the flanks of the driver and the points of the runner, by being rolled within the circle ARY, and on the circle AQX.

Now then, to apply this rule to particnlar cases. Suppose the generating circle is the same as the pitch circle of the driven pinion itself, it evidently can- not roll at all; and the tooth of the pinion is represented by the mere point P on the circumference of the pitch circle ; and the tooth to drive it will be simply an epicyeloid traced by rolling the pitch circle of the pinion on that of the wheel. And we know that in that case there is no action before the line of centres, and no necessity for any flanks on the teeth of the driver. But in- asmuch as the pins of a lantern pinion must have some thick- ness, and cannot be mere lines, a further process is necessary to get the exact form of the teeth; thus if RP, fig. 24, is the tooth : that would drive a pinion with pins of uo sensible thickness, the tooth to drive a pin of the thickness 2 Pp must have the width Pp or Rr ganged off it all round. This, in fact, brings it very nearly to a smaller tooth traced with the same generating cirele; and therefore in practice this mode of construction is not much adhered to, and the teeth are made of the same shape, ouly thinner, as if the pins of the pinion had no thickness. Of course they should be thin enough to allow a

little shake, or ‘ back-lash,” but in clock-work the backs of the teeth never come in contact at all.

Next suppose the generating circle to be half the size of the itch circle of the pinion. The curve, or hypocycloid, traced by rolling this within the pinion, is no other than the diameter of the pinion ; and consequently the flanks of the pinion teeth will be merely radii of it, and such teeth or leaves are ealled radial teeth ; and they are far the most common ; indeed, no others are ever made (except lan- terns) for clock-work. The corresponding epicycloidal points of

Fig, 24.—Lartern Pinion.

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the teeth of the driver are more curved, or a less pointed arc, than those required for a lantern pinion of the same size and number. The teeth in fig. 25 are made of a diffcrent form on the opposite sides of the line of centres eee Ss

CA, in order to show the difference between driving and driven or running teeth, where the number of the pinion happens to be as much as 12, so that no points are required to its teeth when driven, since with that number all the action may be after the line of centres. The great Westmiuster clock affords a very good illustration of this. In both the striking parts the great wheel of the train and the great winding-wheet on the other end of the barrel are about the same size; but in the train the wheel drives, and in winding the pinion drives. And there- fore in the train the pinion-teeth have their points cut off, and wheel-teeth have their points on, as on the right side of fig. 25, and in the winding-wheels the converse ; and thus in both cases the action is made to take place in the way in which there is the least friction. Willis gives the following table, ‘derived organi- cally” (¢.¢., by actual trial with large models), of the least numbers which will work together without any action before the line of centres, provided there are no points to the teeth of the runncr, assuming them to be radial teeth, as usual : —

54 30 24 20171514131211109 8 7 6

Runnet…... 11 12 18 14 15 16 17 18 19 21 23 27 35 32 176

In practice it is hardly safe to leave the driven teeth without points, unless the numbers slightly exceed these; because, if there is any irregularity in them, the square edges of those teeth would not work smoothly with the teeth of the driver. Sometimes it happens that the same wheel has to drive two pinions of different numbers. It is evident that, if both are lanterns, or both pinions with radial teeth, they cannot properly be driven by the same wheel, beeause they would require teeth of a different shape. It is true that on account of the greater indifference of lantern pinions to the aceuracy of the teeth which are to drive them, the same wheel will drive two pinions of that kind, differing in the numbers in the ratio of even 2 to 1, with hardly any sensible shake; but that would not be so with radial pinions, and of course it is not correct. Accordingly, in clocks with the spring remontoire, as in fig. 21, where the scape-wheel or remontoire pinion is double the size of the fly pinion, the larger one is made with radial teeth and the smaller a lantern, which makes the same wheel teeth exactly right for both. In clocks of the same construction as fig. 22, and in the West- minster clock, there is a case of a different kind, which cannot be so accommodated ; for there the great wheel has to drive both the second wheel's pinion of 10 or 12, and the hour-wheel of 40 or 48; the teeth of the great wheel were therefore made to suit the lantern pinion, and those of the hour-wheel (¢.¢., their flanks) then depend on those of the great wheel, and they were accordingly traced by rolling a generating circle of the size of the lantern pinion on the inside of the pitch circle of the hour-wheel ; the result is a tooth thicker at the bottom than usual. These are by no Means unnecessary refinements ; for if the teeth of a set of wheels are not properly shaped so as to work smoothly and regularly into each other, it increases their tendency to wear out in proportion to their inaccuracy, besides increasing the inequalities of force in the train. Sometimes turret clocks are worn out in a few years from the defects in their teeth, especially when they are made of brass or soft gun-metal.

In the construction of clocks which have to raise heavy hammers it is important to obtain the best form for the cams, as pins are quite unfit for the purpose. The conditions which are most impor- tant are—that the action should begin at the greatest advantage, and therefore at the end of the lever,

that when it ceases the face of the lever should be a tangent to the cam at both their points, and that in no part of the motion should the end of the lever scrape on the cam. In the common construction of clocks the first con- dition is deviated from as far as possible, by the striking pins beginning to act at some distance from the end of the lever; and con- sequently, at the time when the most force is required to lift the ham- mer there is the least given, and a great deal is wasted afterwards,

The construction of curve for the cams, which is the most perfect mathematically, is that which is described in mathematical books under the name of the tractriz. But there are such practical difficulties in describiug it that it is of no use. It should be observed that, in a well-known book with an appropriate name (Camus on the Teeth of Wheels), a rule for drawing cams has been inserted by some translator, which is quite wrong. It may be

Fig. 25.

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proved that epicycloidal cams described as follows are so nearly of the proper mathematical form that they may be used without any sensible error. Let r be the radius of the circle or barrel on which the cams are to be set theoretically, i.¢., allowing nothing ; for the clearance which must be cut out afterwards, for fear the } lever should scrape the back of the cams in falling; inother words, r is the radius of the pitch circle of the cams. Call the length of the lever 7. Then the epicycloidal cams may be traced by rolling

on the pitch circle a smaller one whose diameter is Vr?4+P-r, Thus, if 7 is 4 inches and 7 8 inches (which is about the proper size for an 18-inch striking wheel with 20 cams), the radius of tha tracing circle from the cams will be 0°9 inch. The advantage of cams of this kind is that they waste as little force as possible in the lift, and keep the lever acting upon them as a tangent at its point the whole way; and the cams themselves may be of any length according to the angle through which you want the lever to move,

Most people however prefer dealing with circles, when they can, instead of epicycloids; and drawing by compasses is safer than calculating in most hands. We therefore give another rule, sug- gested by Mr E. J. Lawrence, a

member of the horological jury in the 1851 Exhibition, which is easier to work, and satisfies the principal conditions stated just now, though it wastes rather more in lift than the epicycloidal curve; and the cams must not have their points cut off, as epicycloidal ones may, to make the lever drop off sooner; because a short cam has to be drawn with a different radius from a long one, to work a lever of any given length. But, on the other hand, the same curve for the cams will suit a lever of any length, whereas with epicycloidal cams you must take care to put the centre or axis of the lever at the exact distance from the centre of the wheel for which the curve was calculated—an casy enough thing to do, of course, but for the usual disposition of workmen to deviate from your plans, apparently for the mere is of doing wrong. It is astonishing how, by continually making one machine after another, with a little deviation each time, the thing gradually assumes a form in which you can hardly recognise your original design at all. The prevention of this kind of blundering is one of the many advantages of making machines by machinery, for which no machine offers more facilities than clocks, and yet there is none to whieh it is less' applied.

In fig. 26 let CA be a radius of the wheel, L in the same straight line the centre of the lever, and AB the space of onc cam on the pitch circle of the . cams, A being a little below the line of. centres; AP is the arc of the lever. Draw a tangent to the two circles at A, and a tangent to the eam circle at B; then T, their point of in- engin will bes the centre of the . circle which is the Fig. 26. face of the cam BP; and TB also =TA, which is a convenient test of the tangents being rightly drawn. The action begins at the point of the lever, and advances a little way up, but recedes again to the point, and ends with the lever as a tangent to the cam at P. The backs of the cams must be cut out rather deeper than the circle AP, but retaining the point P, to allow enough for clearance of the lever, which should fall against some fixed stop or banking on the clock-frame, before the next cam reachesit. The point of the lever must not be left quite sharp, for if it is, it will in time cut off the points of the cast-iron cams.

We will add a few words on the subject of oil for clocks. Olive- oil is most commonly used, sometimes purified in various ways, and sometimes not purified at all. We believe, however, that purified animal oil is better than any of the vegetable oils, as some of them are too thin, while others soon get thick and viscid. For turret clocks and common house clocks, good sperm oil is fine enough, and is probably the best. For finer work the oil requires some purifi- cation, Even common neat's foot oil may be made fine and clear by the following method. Mix it with about the same quantity of water, and shake it in a large bottle, not full, until it becomes like a white soup; then let it stand till fine oil appears at the top, which may be skimmed. off; it will take several months before it has all separated—into water at the bottom, dirt in the middle, and fine oil at the top. And it should be done in cold weather, because heat makes some oil come out as fine, which in cold would remain among the dirty oil in the middle, and in cold weather that fine oil of hot weather will become muddy. There are various vegetable oils sold at tool-shopsas oil for watches, including some for which a prize medal was awarded in the Exhibition, but not by any of the mechanical juries: we haveno information as to the test which wag

applied to it, and none but actual use for a considerable time would be of much value.

THe WESTMINSTER CLOCK.

It is unnecessary to repeat the account of the long dispute between the Government, the architect of the House of Parliament, the astronomer royal, Sir E. Beckett, and some of the London clock- makers, which ended in the employment of the late KE. J. Dent and his successor F. Dent from the designs and under the superintend- ence of Sir E. Beckett, asthe inscription on it records The fullest account of these was given in the 4th and 5th editions of the Treatise on Clocks, and we shall now only describe its construction. Fig. 27 is a front elevation or section lengthwise of the clock. The frame is 16 fect long and 54 wide, and it rests on two iron plates lying on the top of the walls of the shaft near the middle of the tower, down

which the weights descend, That wall reaches up to the bell chamber, and those iron plates are built right through it, and so is the great cock which carries the pendulum. The clock- room is 28 feet x 19, the remaining 9 of the square being occupied. by the staircase and an air-shaft for ventilating the whole building.

The going part of the clock, however, not requiring such a long barrel as the striking parts, which have steel wire ropes ‘55 inch thick, is shorter than they are, and is carried by an intermediate baz or frame bolted to the cross bars of the principal frame. The back of them is about 24 feet from the wali, to leave room for a man behind, and the pendulum cock is so made as to let his head come within it in order to look square at the cscapement. The escape- ment is the double three legs (fig. 18), and the length of the teeth or legs is 6 inches. The drawing represents the wheels (except the bevelled wheels leading off to the dials) as mere circles to prevent

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confusion, The numbers of tecth and the time of revolution of the principal ones are inserted and require no further notice. Their size can be taken from the scale; the great wheels of the striking parts are 24 and of the going part 2 inches thick, and all the wheels are of cast-iron except the smaller ones of the escapement, which arc brass, but are painted like the iron ones.

The maintaining power for re | the clock going while winding is peculiar and probably unique. one of those already described could have kept in gear long enough, maintaining sufficient force all the time, as that part takes 10 minutes to wind, even if the man does not loiter over it. This ismanaged without a single extra wheel beyond the ordinary winding pinion of large clocks. The winding wheel on the end of the barrel is close to the great wheel, and you see the pinion with the winding arbor in the oblique piece of the front frame of the clock. Consequently that arbor is about 6 feet long,

anda little movement of its back end makes no material obliquity in the two bushes; 7.¢., it may go a little out of parallel with all the other arbors in the clock without any impediment to its action. Its back pivot is carried, not in a fixed bush, but in the lower end of a bara little longer thanthe great wheel’s radius, hang- ing from the back of the great arbor ; and that bar has a spring – click upon it which takes into ratchet teeth cast on the back of the great wheel, When the great wheel is turning, and you are not winding, the ratchets pass the click as usual, but as soon as you begin to wind the back end of the winding arbor would rise but for the click catching those teeth, and so the great wheel itself become the fulcrum for winding for the time. After the winding has gone a few minutes a long tooth projecting from the back of the arbor catches against a stop, because that end of the hanging bar and pinion have all risen a little with the motion of the great wheel.

FLY ABOVE

“QUARTER HAMMER ROPES >

2 SEC | gecnouluM

Fra. 27.—Section of Westminster Clock.

‘Then the man is obliged to turn the handle back alittle, which lets down the pinion, &c., and the click takes up some lower teeth ; and so if he chooses to loiter an hour over the winding he can do no harm. The winding pinion ‘‘pumps” into gear and out again as usual. The going part will go 84 days, to provide for the. possible forgetting of a day in winding. The weight is about 160 Ib; but only one-14th of the whole force of that weight is requisite to drive the pendulum, as was found by trial; the rest goes in overcoming the friction of all the machinery, including a ton and a half of hands and counterpoises, and in providing force enough to drive them through all weathers, except heavy snows, which occasionallyaccumu- late thick enough on several minute hands at once, on the left side of the dials, to stop the clock, those hands being 11 feet long. For the dials are 224 feet in diameter, or contain 400 square feet each, and there are very few rooms where such a dial could he painted on the floor. They are made of iron framing filled in with opal glass. Each minute is 14 inches wide. The only larger dial in the world is in Mechlin church, which is 40 feet wide; but it

has no minute hand, which makes an enormous difference in the foree required in the clock. They are completely walled off from the clock-room by a passage all round, and there are a multitude of gas lights behind them, which are lighted by hand, though provision was originally made in the clock for doing it automatically. The hour hands go so slow that their weight is immaterial, and were left as they were made of gun metal under the architect's direction ; but it was impossible to have minute hands of that construction and weight without injury to the clock, and so they were removed by Sir E. Beckett, and others made of copper tubes, with a section com- posed of two circular ares put together, and are consequently very stiff, while weighing only 28 tb. The great weight is in the wheels, tubes, and counterpoises. The minute hands are partly counterpoised. outside, making their total length 14 feet, to relieve the strain upon

their arbors. They all run on friction wheels imbedded in the larger tubes 5$ inches wide, which carry the hour hands, which themselves run on fixed friction wheels.

There is nothing peculiar in the quarter striking part except its size, and perhaps in the barrel turning in an hour and a half, 7.¢., in three repetitions of the five chimes already described. The cams are of wrought iron with hard steel faces. Each bell has two hammers, which enables the cams to be longer and the pressure on them less. The hour-striking wheel has ten cams 24 in. wide cast on it; but those cams have solid steel faces screwed on them. All this work was made fora hammer of 7 cwt., lifted 13 inches from the bell, .¢., about 9 inches of vertical lift. The hammer was reduced to 4 owt. after the partial cracking of the bell. The rod from the lever to the hammer is made of thesame wire rope as the weight ropes, and the result is that there is no noise in the room while the clock is strik- ing. The lever is 5 feet 4 inches long, and strikes against the buffer spring shown in the drawing, to prevent concussion on the clock-frame, of which you cannot feel the least. The quarter ham- mer levers have smaller springs for the same purpose, and the stops of the striking part are also set on springs instead of rigid as usual. The flies, for which there was not room the drawing, are near the top of the room and are each 2 feet 4 inches square. They make a considerable wind in the room when revoly+ ing. The only noise made in striking is their running on ove? their ratchets when the

striking stops. Each striking weight 1s aton and a half—or was before the great hammer was re uced. They take 5 hours to wind up, and it has to be done twice a week, which was thought better than making the parts larger and the teeth more numerous and the weights twice as much, to go a week, and of course the winding must have taken twice as long, as it was adapted to what a man can do continuously for some hours. Cons sequently it was necessary to contrive something to stop the man

inding just before each time of striking. And that is done by – a tipped over by the snail at that time, which at once stops the winding. When the striking is done the man can put the lever up again and go on. The loose winding wheels are not pumped in and out of gear as usual, being too heavy, but one end of the arbor is pushed into gear by au eccentric bush turned by the oblique handle or lever which you see near the upper corner of each striking part, and they can be turnedin a moment. They are held in their place for gear by a spring catch to prevent any risk of slip- ping out. Moveover the ropes themselves stop the winding when the weights came to the top, pretty much as they do in a spring clock or a watch, though not exactly. wh os

The mode of letting off the hour striking is peculiar, with a view to the first blow of the hour being exactly at the 60th second of

the 60th minute. It was found that this could not be depénded on |

to a single beat of the pendulum, and probably it never can in any clock, by a mere snail turning in an hour, unless it was of a very inconvenient size. Therefore the common snail only letsit off par- tially, and the striking stop still rests against a lever which is not dropped but tipped up with a slight blow by another weighted lever resting on a snail on the 15-minute wheel, which moves more exactly with the escapement than the common snail lower in the train. The hammer is left on the lift, ready to fall, and it always does fall within half a second after the last beat of the pendulum at the hour. This is shown in fig. 28, where BE is the spring stop noticed above, and P the ordinary first stop on the long lifting lever PQ (which goes on far beyond the reach of this figure to the hour snail), The second or warning stop is CD, and BAS is the extra lever with its heavy end at’ S on the 15-

minute snail. When that falls the end B tips up CD with certainty by the blow, and then the striking isfree. The first, second, and third quarters begin at the proper times; but the fourth quarter chimes begin about 20 seconds before the hour.

The clock reports its own rate to Greenwich Observatory by gal- vanic action twice a day, t.¢., an electric circuit is made and broken by the pressing together of certain springs at two given hours, And in this way the rate of the clock is ascertained and recorded, and the general results published by the astronomer royal in his annual report. This has been for some years so remarkably uniform, that the error has only reached 8 seconds on 3 per cent. of the days

in the year, and is generally under two. He has also reported that **the rate of the clock is certain to much less than a second a week ”—subject to abnormal disturbances by thunder storms which sometimes amount to seven or eight seconds, and other casualties, which are easily distinguishable from the spontaneous variations.

Fig. 28.

The original stipulation in 1845 was that the rate should not vary more than a second a day—not a week ; and this was pronounced impossible by Mr Vulliamy and the London Company of Clock- makers, and it is true that up to that time no such rate had ever been attained by any large elock. In 1851 it was by the above- mentioned elock, now at King’s Cross Station, by means of the train remontoire, whieh was then intended to be used at Westminster, but was superseded by the gravity escapement. ; he The great hour bell, of the note E, weighs 134 tons and is 9 feet diameter and 9 inches thick. The quarter bells weigh respectively 78, 334, 26, and 21 cwt.; with diameters 6 feet, 43, 4, wail 3 feet 9 inches, and notes B, E, F sh. and Gsh, The hamniers are on double levers embracing the bells, and turning on pivots pro- jecting from the iron collars which carry the mushroom shaped tops of the bells. The bells, including £750 for recasting the first great bell, cost nearly £6000, and the cloek £4080. The bell frame, which is of wrought iron plates, and the dials and hands, all provided by the architect, cost £11,934—a curious case of the accessories costing more than the principals, (E. B.)

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CLOISTER (Latin, claustrum ; French, clottre ; Italian, chiostro ; Spanish, claustro ; German, kloster): The word “cloister,” though now restricted to the four-sided enclosure, surrounded with covered ambulatories, usually attached to conventual and cathedral churches, and some- times to colleges, or by a still further limitation to the ambulatories themselves, originally signified the entire monastery. In this seuse it is of frequent occurrence in our earlier literature (¢.g., Shakespeare, Meas. for Meas., i. 3, “This day my sister should the cloister enter ”), and is still employed in poetry. The Latin claustrum, as its derivation implies, primarily denoted no more than the enclosing wall of a religious house, and then came to be used for the whole building enclosed within the wall, To this sense the German “ kloster ” is still limited, the covered walks, or cloister in the modern sense, being called “ kloster-gang,” or “ kreuz-gang.” _In French, as with us, the word clottre retains the double sense.

In the special sense now most common, the word “cloister” denotes the quadrilateral arca in a monastery or college of canons, round which the principal buildings are ranged, and which is usually provided with a covered way or ambulatory running all round, and affording a means of communication between the various centres of the eccle- Siastical life, without exposure to the weather. According to the Benedictine arrangement, which from its suitability to the requirements of monastic life was generally adopted in the West, one side of the cloister was formed by the church, the refectory occupying the side opposite to it, that the worshippers might have the least annoyance from the noise or smell of the repasts. On the eastern side the chapter- house was placed, with other apartments belonging to the common life of the brethren adjacent to it, and, as a common rule, the dormitory occupied the whole of the

upper story. On the opposite or western side were generally the cellarer’s lodgings, with the cellars and store-houses, in which the provisions necessary for the sustenance of the confraternity were housed. In Cistercian monasteries tho western side was usually occupied by the “domus con- versorum,” or lodgings of the lay-brethren, with their day- rooms and workshops below, and dormitory above. The cloister, with its surrounding

buildings, generally stood on the south side of the church, to secure as much sunshine as possible. A very early example of this disposition is seen in the plan of the monastery of St Gall (ABBEY, vol. i, p. 12). Local requirements, in some instances, caused the cloister to be placed to the north of the church. This is the case in the English cathedrals, formerly Bene- dictine abbeys, of Canterbury, Gloucester, and Chester, as well as in that of Lincoln. Other examples of the north- ward situation are at Tintern, Buildwas, and Sherborne. Although the covered ambulatories are absolutely essential to the completeness of a monastic cloister, a chief object of which was to enable the inmates to pass from one part of the monastery to another without inconvenience from rai, wind, or sun, it appears that they were sometimes wanting. The cloister at St Alban's seems to have been deficient in ambulatories till the abbacy of Robert of Gorham, 1151- 1166, when the eastern walk was erected. This, as was often the case with the earliest ambulatories, was of wood covered with a pentice roof. We leam from Osbern's account of the conflagration of the monastery of Christ Church, Canterbury, 1067, that a cloister with covered Ways existed at that time, affording communication be- tween the church, the dormitory, and the refectory. We learn from an early drawing of the monastery of Canter- bury that this cloister was formed by an arcade of Norman arches supported on shafts, and covered by a shed roof,

A fragment of an arcaded cloister of this pattern is still found on the eastern side of the infirmary-cloister of the same foundation. This earlier form of cloister has been generally superseded with us by a range of windows, usually unglazed, but sometimes, as at Gloucester, provided with glass, lighting a vaulted ambulatory, of which the cloisters of Westminster Abbey, Salisbury, and Norwich are typical examples. The older design was preserved in the South, where "the cloister is never a window, or anything in the least approaching to it in design, but a range of small elegant pillars, sometimes single, sometimes coupled, and supporting arches of a light and elegant design, all the features being of a character suited to the place where they are used, and to that only" (Fergusson, Hist, of Arch., 1. p. 610). As examples of this description of cloister, we may refer to the exquisite cloisters of St John Lateran, and St Paul's without the walls, at Rome,

where the coupled shafts and arches are richly ornamented with ribbons of mosaic, and those of the convent of St Scholastica at Subiaco, all of the 13th century, and to the beautiful cloisters at Arles, in southern France, “than which no building in this style, perhaps, has been so often drawn or so much admired” (Fergusson) ; and those of Aix, Fonti- froide, Elne, &c., are of the same type; as also the Romanesque cloisters at Zurich, where the design suffers from the deep abacus having only a single slender shaft to support it, and at Laach, where the quadrangle occupies the place of the “atrium” of the early basilicas at the west end, as at St Clement’s at Rome, and St Ambrose at Milan. Spain also presents some magnificent cloisters of both types, of which that of the royal convent of Huelgas, near Burgos, of the arcaded form, is, according to Mr Fergusson, “unrivalled for beauty both of detail and design, and is perhaps unsurpassed by anything in its age and style in any part of Europe.” Few cloisters are more beautiful than those of Monreale and Cefalu in Sicily, where the arrangement is the sane, of slender columns in pairs with capitals of elaborate foliage supporting pointed arches of great elegance of form,

All other cloisters are surpassed in dimensions and in sumptuousness of decoration by the “Campo Santo” at Pisa. This magnificent cloister consists of four ambu- latories as wide and lofty as the nave of a church, erected in 1278 by Giovanni Pisano round a cemetery composed of soil brought from Palestine by Archbishop Lanfranchi in the middle of the 12th century. The window openings are semicircular, filled with elaborate tracery in the latter half of the 15th century. The inncr walls are covered with frescos invaluable in the history of art by Orgagna, Simone Memmi, Buffalmacco, Benozzo Gozzoli, and other early painters of the Florentine school. The ambulatories now serve asa museum of sculpture. The internal dimen- sions are 415 feet 6 inches in length, 137 feet 10 inches in breadth, while each ambulatory is 34 feet 6 inches wide by 46 feet high.

The cloister of a religious house was the sccnc of a large part of the life of the inmates of a monastery. When not in church, refectory, or dormitory, or engaged in manual labour, the monks were usually to be found here. The north walk of the cloister of St Gall appears to have served as the chapter-housc. The cloister was the place of education for the younger members, and of study for the elders. A -canon of the Roman council held under

Eugenius II., in 826, enjoins the erection of a cloister as an essential portion of an ecclesiastical establishment for the better discipline and instruction of the clerks, Peter of Blois (Serm. 25) describes schools for the novices as being in the west walk, and moral lectures delivered in that next the church. At Canterbury the monks' school was in the western ambulatory, and it was in the same walk that the

novices were taught at Durham (Willis, Afonastic Butldings of Canterbury, p. 44; Rites of Durham, p. 71). alleys, especially that next the church, were devoted to the studies of the elder monks. and Dunstan enact that between the services of the church the brethren should sit in the cloister and read theology.

The other

The constitutions of Hildemar

For this purpose small studies, known as carrols, from their

square shape, were often found in the recesses of the

windows. Of this arrangement we have examples at Gloucester, Chester (recently restored), and elsewhere. The use of these studies is thus described in the Rites of Durham :—"In every wyndowe" in the north alley "'were iii pewes or carrells, where every one of the olde monkes had his carrell severally by himselfe, that when they had dyned they dyd resorte to that place of cloister, and there studyed upon their books, every one in his carrell all the afternonne unto evensong tyme. This was there exercise every daie." On the opposite wall were cupboards full of books for the use of the students in thecarrols. The cloister arrangements at Canterbury were similar to those

just described. New studies were made by Prior De Estria

in 1317, and Prior Selling (1472-94) glazed the south alley for the use of the studious brethren, and constructed “the new framed contrivances, of late styled carrols” (Willis, Ifon, Buildings, p. 45). The cloisters were used not for study only but also for recreation. The constitutions of Archbishop Lanfranc, sect. 3, permitted the brethren to converse together there at certain hours of the day. To maintain necessary discipline a special officer was appointed under the title of prior claustri. The cloister was always furnished with a stone bench running along the side. It was also provided with a lavatory, usually adjacent to the refectory, but sometimes standing in the central area, termed the cloister-garth, as at Durham. The cloister- garth was used as a place of sepulture, as well as the sur- rounding alleys. The cloister was in some few instances of two stories, as at Old St Paul’s, and St Stephen’s Chapel, Westminster, and occasionally, as at Wells, Chichester, and Hereford, had only three alleys, there being no ambulatory under the church wall.

The larger monastic establishments had more than one cloister ; there was usually a second connected. with the infirmary, of which we have examples at Westminster Abbey and at Canterbury ; and sometimes one giving access to the kitchen and other domestic offices.

The cloister was not an appendage of monastic houses exclusively. We find it also attached to colleges of secular canons, as at the cathedrals of Lincoln, Salisbury, Wells, Hereford, and Chichester, and formerly at St Paul’s and Exeter. It is, however, absent at York, Lichfield, Beverley, Ripon, Southwell, and Wimborne. A cloister forms an essential part of the colleges of Eton and of St Mary’s, Winchester, and New and Magdalen at Oxford, and was designed by Wolsey at Christ Church. These were used for religious processions and lectures, for ambulatories for the studious at all times, and for places of exercise for the inmates generally in wet weather, as well as in some in- stances for sepulture.

For the arrangements of the Carthusian cloisters, as well as for some account of those appended to the monasteries of the East, see the article ABBEY. (z. V.)

CLONMEL, a parliamentary and municipal borough of Treland, in the province of Munster, partly in the south riding of Tipperary and partly in

Waterford county, 104 miles south-west from Dublin. It is built on both sides of the Suir, and also occupies Moore aud Long Islands, which are connected with the mainland by thrce bridges. The principal buildings are the parish church, two Romar Catholic churches, a Franciscan friary, two convents, an endowed school dating from 1685, a model school under the

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national board, a mechanics' institute, a court-house and prison, a fever hospital and dispensary, two lunatic asylums, a market-house, a workhouse, and barracks. Till the Union the woollen manufacture established in 1667 was extensively carriedon. The town contains a brewery, flour-mills, and tanneries, publishes two newspapers, and has a considerable export trade in grain, cattle, butter, and provisions, The river is navigable for barges of 50 tons to Waterford. Clonmel is a station on the Waterford and Limerick Railway, and the centre of a system, established by Mr Bianconi, for the conveyance of travellers on light cars, extending over a great part of Leinster, Munster, and Counaught. It is governed by a corporation, consisting of a mayor, free burgesses, and a commonalty, and returns one member to parliament. Population in 1851, 15,203 ; in 1871, 10,112.

Clonmel, or Cluain mealla, the Vale of Honey, is a place of un- doubted antiquity. In 1269 it was chosen as the seat of a Fran-

ciscan friary by Otho de Grandison, the first English possessor of

the district; and it frequently comes into notice in the following centuries. In 1641 it declared for the Roman Catholic party, and in 1650 it was gallantly defended by Hugh O'Neal against the English under Cromwell. Compelled at last to capitulate, it was completely dismantled, and has never again been fortified. Sterne was born in the town in 1718,

CLOOTZ, Jean Baptiste, Baron (1755-1794), better

know as Anacharsis Clootz, was born near Cleves, A

baron by descent, and heir to a great fortune, he was sent at eleven to Paris to complete his education, There he

imbibed the theories of his uncle, Cornelius de Pauw, and of the great anarchists of the epoch. He rejected his title and his baptismal names, adopted the pseudonym of Ana- charsis from the famous philosophical romance of Abbé Barthélemy, and traversed Europe, preaching the new ideas as an apostle, and spending his money as a man of pleasure. On the breaking out of the Revolution he returned in 1789 to Paris. In the exercise of the function he assumed of " Orator of the Human Race," he demanded at the bar of the National Assembly a share in the federation for all nations, presenting at the same time a petition against the despots of the world. In 1792 he placed 12,000 livres at the disposal of the Republic—* for the arming of forty

or fifty fighters in the sacred cause of man against tyrant."

The 10th of August impelled him to a still higher flight ;

he declared himself the personal enemy of Jesus Christ, abjured all revealed religions, and commenced preaching materialism. In the same month he had the rights of citizenship conferred on him; and having in September been elected a member of the Convention, he voted the king's death in the name of the human race, Excluded at the instance of Robespierre from the Jacobin Club, he was soon afterwards implicated in an accusation levelled against Hébert and others. His innocence was manifest, but he was condemned and put to death.

Clootz left several works in which his extravagances are developed with much solemnity. The principal of these are La Certitude des Preuves du Mahométisme, L'Orateur du Genre Humain, and La République Universelle.

CLOT, Antoinz (1795-1868), was born in the neigh- bourhood of Marseilles, and was brought up at the charity school of that town. After studying at Montpellier he commenced to practise as surgeon in his native place ; but at the age of twenty-eight he was made chief surgeon to Mehemet Ali, viceroy of Egypt. At Abuzabel, near Cairo, he founded a

hospital and schools for all branches of medical instruction, as well as for the study of the French language ; and, notwithstanding the most serious religious difficulties, he prevailed on some of the Arabs to study anatomy by means of dissection, In 1832 Mehemet Ali gave him the dignity of bey without requiring him to abjure his religion ; aud in 1836 he received the rank of general, and was

appointed head of the medical administration of the country. In 1849 he returned to Marseilles, Clot published — Relation des éprdémies de cholera qui ont régné a CHeggiaz, & Suez, et en Egypte (1832); De la peste observée en Egypte (1840) ; Apergu général sur U Egypte (1840); Coup dil sur la peste et les quarantacnes (1851); De Pophthalmie (1864).

CLOTILDA, Satnr (475-545), was the daughter of Chilperic, king of Burgundy, and the wife of Clovis, king

of the Franks. Her father, mother, and brothers were put

to death by Gundebald, her uncle, but Clotilda was spared and educated. Gundebald opposed her marriage with Clovis, but by the aid of the clergy she escaped to the Frankish court (493), was married, and, having adhered all along to the pure Catholic faith of her mother, effected the conversion of Clovis to Christianity (496). He lost no time in avenging the murder of his wife's parents; Gundebald was defeated, and became his tributary. After her husband's

death Clotilda persuaded her three sons—Clodomir, Childe-

bert, and Clotaire—to renew the quarrel, and to visit on Sigismund, Gundebald's son, his father's crime. The war which followed resulted in the union of Burgundy to the Frank empire. Clotilda retired to Tours, and practised there the austerities of a devout life till her death. She was buried in the Parisian church of St Geneviéve, which Clovis had built, and was canonized a few years afterwards by Pelagius I. Her remains, preserved till the Revolution, were burned at that period by the devout Abbé Rousselet, who dreaded their desecration; the ashes are now in the little church of St Leu. A statue of her adorns the Luxem- bourg, and a splendid church has recently been erected in her honour in Paris, not far from the spot where her

bones rested during so many centuries. See FRANCE, CLOUGH, Arraur Huen (1819-1861), minor English poet, was born at Liverpool in 1819, and belonged to a family of old Welsh descent. His father, a cotton merchant, having removed to the United States about 1823, Arthur spent a number of years at home in Charleston; but in 1828 he was brought back to England and sent to school. From Rugby, where he was a favourite pupil of Dr Arnold's, he passed in 1836 to Oxford ; and there, in spite of an almost unaccountable failure in some of hig examina- tions, he attained a high reputation for scholarship, ability, and character. In 1842 he was chosen fellow of Oriel, and in 1843 appointed tutor in the same college ; but he soon grew dissatisfied with his position, and ultimately decided that it was his duty to resign. Under the influence of the great religious fermentation which had been going on during his university career, he had become deeply sceptical in his habits of thought; and all connection seemed impossible with a system that interfered with the liberty of speculative investigation. After his resignation in 1848 he was for some time principal of University Hall, London. In 1852 he visited America, where he enjoyed the friendship of Longfellow and Emerson ; and in the following year he was called home to accept an appointment as examiner in the Education Office of the Privy Council, During the succeeding years he was fre- quently abroad ; and it was on a tour in Italy in 1861 that he was suddenly cut off by fever at Florence. Clough was a man of singalar purity and integrity of character, with great sensitiveness of feeling, and fine sub-

tlety of thought, at once reserved and retiring and full of

a genial humanity of disposition, with much humour and mirthfulness, and yet capable of a righteous indignation that could hardly have been expected to find fuel in so kindly a breast. A disciple of the great master of Rugby, in the midst of his most relentless scepticism he maintained a spirit of reverence and worship; and his most daring attacks on the popular creed are modified by an under- current of toleration and diffidence. His poems are his

principal works, and of these the best known is the Bothie of Tober-na-Vuolich. It was written and published in 1848, after his removal from

Oxford ; and while warmly praised by such men as Canon Kingsley it was condemned by others as immoral and communistic. The interest of the poem depends on its graphic description of Scottish scenery and the fine analysis of contrasted characters. Evangeline, which had been published in 1847, and partly of his own attachment to the old classical forms, he employed the so-called hexameter ; but it is seldom that he attains the tuneful cadence of the American poet, and much of the versification is rugged and broken in the extreme. Of greater power than the Bothie, at least in individual passages, is the strange irregular tragedy of Dipsychus, which shines at times with jagged fragments of satire andirony. Amours de Voyage, arhymed. epistolary novelette, and Mari Magno, a small collection of tales after the fashion of the Wayside Inn, along with various minor poems, have been republished in the second volume of The Poems and Prose Remains of Arthur H. Clough, edited by his wife, and accompanied by a sketch of his life by F. T. Palgrave, 1869. These will probably do less to keep green the poet's name than the noble poem of Zhyrsis, which Matthew Arnold dedicated to his memory. One work of importance remains to be mentioned,—a careful and scholarly rehabilitation of Dryden's Translation of Plutarch, published in 1859.

CLOVES are the unexpanded flower-budsof Caryophyllus aromaticus, a tree belonging to the natural order Myrtacece. They are so named from the French word clow, on account of their resemblance to a nail. The clove tree is a beauti- ful evergreen which grows to a height of from 30 to 40 feet, having large oblong leaves and crimson flowers in numerous groups of terminal cymes. The flower-buds are at first of a pale colour and gradually become green, after which they develop into a bright red, when they are ready for collecting. Cloves are rather more than half an inch in length, and consist of a long cylindrical calyx, terminating in four spreading sepals, and four unopened petals which form a small ball in the centre. The tree is a native of the small group of islands in the Indian Archipelago called the Moluccas, or Spice Islands ; but it was long cultivated by the Dutch in Amboyna and two or three small neighbouring islands, Cloves were one of the principal Oriental spices which early excited the cupidity of Western commercial communities, having been the basis of a rich and lucrative trade from an early part of the Christian era. The Portuguese, by doubling the Cape of Good Hope, obtained possession of the principal portion of the

clove trade, which they continued to hold for nearly a century, when, in 1605, they were expelled from the Moluccas by the Dutch. That power exerted great and inhuman efforts to obtain a complete monopoly of the trade, attempting to extirpate all the clove trees growing in their native islands, and to concentrate the whole pro- duction in the Amboyna Islands. With great difficulty the French succeeded in introducing the clove tree into Mauritius in the year 1770; subsequently the cultivation was introduced into Guiana, and at the end of the century the trees were planted at Zanzibar. The chief commercial sources of supply are now Zanzibar and its neighbouring island Pemba on the East African coast, and Amboyna, Cloves are also grown in Java, Sumatra, Réunion, Guiana, and the West India Islands.

Cloves as they come into the market have a deep brown colour, a powerfully fragrant odour, and a taste too hot and acrid to be pleasant. When pressed with the nail they exude a volatile oil with which they are charged to the unusual proportion of about 18 per cent. The oil is

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obtained as a commercial product by submitting the cloves with water to repeated distillation. properly prepared, a pale yellow or almost colourless fluid, becoming after some time possesses the odour and taste peculiar to cloves, The essential oil of cloves is a mixture of two oils—one a hydrocarbon isomeric with oil of turpentine, and the other an oxygenated oil, eugenol or eugenic acid, which possesses the taste and odour of cloves. principally as a condiment in culinary operations, in con- fectionery, and in the preparation of liqueurs. In medicine they are tonic and carminative, but they are little used except as adjuncts to other substances on account of their flavour, or with purgatives to prevent nausea and. griping. The essential oil forms a convenient medium for using cloves for flavouring or medicinal purposes, and it also is frequently employed to relieve toothache.

Under the influence partly of Longfellow’s |

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of a brown colour; and it

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CLOVIO, Givti0 (1498-1578), by birth a Croat and

by profession a priest, is said to have learned the elements of design in his own country, and to have studied after- wards with intense diligence at Rome under Giulio

Romano, and at Verona under Girolamo de' Libri. He

excelled in historical pieces and portraits, painting as for microscopical examination, and yet contriving to handle his subjects with great force and precision. In the Vatican library is preserved a MS. life of Frederick, duke of Urbino, superbly illustrated by Clovio, who is facile princeps among Italian miniaturists.

CLOVIS, king of the Franks. See France. CLOYNE (in Irish Cluain-Uamha, or the Meadow of

the Cave), a market town and formerly an episcopal see

of Ireland, in the county of Cork, and about four miles from the east side of Cork harbour. It is now a small place of 1200 inhabitants, but it still gives its name toa Roman Catholic diocese. 'The cathedral, which was founded in the 6th century by Colman, a disciple of Fin-Bane of Cork, is still in existence. It contains a few handsome monuments to its former bishops, but, singular to say, nothing to pre- serve the memory of the illustrious Dr George Berkeley, who filled the see from 1734 to 1753. Opposite the cathedral is a very fine round tower still 96 feet in height, though the conical roof was destroyed by lightning in 1748, The Roman Catholic church is a spacious building with a highly decorated front. The town was several times plun- dered by the Danes in the 9th century ; it was laid waste by Dermot O'Brien in 1071, and was burned in 1137. In 1430 the bishopric was united to that of Cork; in 1638 it again became independent, and in 1660 it was again united to Cork and Ross. In 1678 it was once more de- clared independent, and so continued till 1839, when it was again joined to Cork and Ross. The Pipe Roll of Cloyne, compiled by Bishop Swaffham in 1364, is a very remarkable record, embracing a full account of the feudal

tenures of the see, the nature of the impositions, and the duties the puri homines Sancti Colmani were bound to per form at a very early period. The roll is now in the Record Office, Dublin. It was edited by Richard Caulfield in 1859.

CLUB. The records of all nations agree in attributing the institution of clubs and private companies to the earliest, or one of the earliest, rulers or legislators of whom they have retained any memory. Indeed such associations seem, as Addison has said, ‘to be a natural and necessary offshoot of men’s gregarious and social nature.” In the infancy of national existences, they are almost essential for purposes of mutual support and protection, and to supply the short- comings ofa weak Government. But over and above those fellowships which spring from the inalienable right of-selt preservation, and which are founded either in the ties of kindred or community of material interests, there are commonly found, even in matured and well-organized states,

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a number of secondary or accidental societies, established for the promotion of some comnion object ; and a wise and strong Government usually protects and encourages them They may be roughly divided into four different classes, according to their several objects ; they may be either religious, poli-

as a most important condition of human progress.

tical, commercial, or merely social; and an attempt has

been sometimes made to assign these to different periods of

national development. Sucha distinction, however, cannot be successfully maintained, since the various elements were often most closely united in the same clubs, almost (or quite) from their very foundation. Thus, the corporations

in Rome whose foundation was attributed to Numa would.

seem at first sight to have been merely for convenience of trade. But we are told that they had also a social or poli- tical purpose, viz., to break down the barriers which sepa- rated Romans from Sabines in the infant state. Moreover, Plutarch introduces a religious element into them also, saying that Numa “fixed certain times of meeting for these companies, and certain honours to the gods, assigning to each what was suitable for them.” So again in Greece we have the testimony of Aristotle that members of the same tribe or borough used to club together, men follow- ing the same occupations, as soldiers or sailors, and others again for mere social amusement; yet he immediately adds—“ these meet together for the sake of one another’s company, and to offer sacrifices; when they meet they both pay certain honours to the gods, and at the same time take pleasurable relaxation among themselves.” It is clear, then, that whatever may have been the precise object with which each private club or association was originally formed in pagan times, these distinctive marks were very soon blurred, and finally, in the lapse of time, altogether obliterated.

We need not say anything of the religious sodalities which were appointed in a regular way both in Greece and Rome for the worship of the gods recognized by the state. It is the history of secret confraternities for the exercise of foreign religious rites unknown to the state and strictly forbidden that is more curious and attractive. In Athens the penalty of death stood enacted in the statute book against those who should introduce the worship of strange gods; but it is only on very rare and scandalous occasions that we hear of this statute in real life. There was a great _ Invasion of foreign gods into Attica after the Persian war, and they were not so easily driven out as were the hosts of Xerxes who had imported them. Moreover, inde- pendently of foreign armies, the mere commercial activity of Athens herself did much to promote the same evil. Her sailors and soldiers, colonists and merchants, had explored the coasts of the Augean Sea, and had brought home from Thrace, from Phrygia, from Cyprus, and elsewhere, a whole host of deities, not more false indeed, but certainly more dangerous, than those whom they had been wont to Worship at home. These gods and goddesses soon found little knots of devotees, who were led to form a kind of confraternity among themselves, for the support of the forbidden worship. Fragments both of tragic and comic poets have preserved to us some notice of the kind of Worship that was offered, and it

was obviously in every way less respectable than the worship sanctioned by the state. In the state temples the priests and other officers were obliged to be freemen, citizens, and the sons of citizens – any taint of servile or foreign blood was a fatal disquali- fication, But here slaves, foreigners, and women were admitted indiscriminately. Indeed, if we may judge from monuments that have recently come to light, these secret confraternities found their principal support among these classes. At Rhodes there was one consisting exclusively of the lowest class of slaves,—the public slaves of the

town ; at Salamis, one exclusively of women ; in that of Cnidus eleven members out of twelve were foreigners. All these monuments come from islands ; and of course it was there, and in the seaport towns of the peninsula, that such illicit corporations were likely to be first introduced and to take deepest root. By-and-by it became necessary even to give an official recognition to some of them, e.g., in the Pireus, for the convenience of foreigners who were either detained there for a considerable time by business, or perhaps had even taken up their permanent abode there. Excavations made within the last twenty years in the Pireeus, and still more recently in the neighbourhood of the silver mines of Laurium, enable us to assist at the birth and early growth of some of these illicit clubs, but there is nothing in the history specially inviting. In Rome the general policy of the state towards foreign religions was more tolerant than in Greece. Nevertheless here also the practice of certain religions was forbidden, and the prohibition naturally produced certain secret societies amongst those who were attached to them. The law indeed forbade the worship of any deity that had not been approved by the senate, but then the senate was by no means illiberal in granting its diploma of approbation, and as often as a new deity was introduced, or even a new temple built to an old deity, a new sodality seems to have sprung up, or to have been officially appointed, to look after its interests. It is disputed whether the prohibition of the worship of unknown, unrecognized gods, applied only to acts of public worship, or extended even to the innermost secrecy of private life. Cicero may be quoted in defence of the latter view, Livy of the former. Probably the letter of the law favoured the stricter side and spoke universally, but traditional

practice ruled differently. Certainly the Romans had a scruple about interfering with anything which even pretended to lay claim to a religious character. Even when they repressed with such severity the secret meetings of the Bacchanalians, this was done not so much in the interest of the other gods, as of public order and morality and the security of the state. They even continued to tolerate such foul associations as these, only they imposed the condition that not more than five worshippers should meet together at once ; and under cover- of this permission the number of thiast was much multiplied in the city, and these exercised a powerful attraction over women by the promise which they made of effecting a real purification of the soul. At a later period, when Augustus destroyed all the temples of Serapis which had beenerected in Rome during his absence, he was careful to assign a politi- cal motive for this unusual interference with religious liberty.

If we turn from these religious associations to consider the craft-gilds in ancient Rome, the first thing that strikes us is their extraordinary number. In the days of Numa we are told that there were only eight ; but as time went on they so multiplied that in the imperial period we count more than fourscore of them, including almost every profession and handicraft one can think of, from bankers and doctors down to donkey-drivers and muleteers. Nor does the mere enumeration of the different trades and professions give us at all an adequate idea of their number; for when a club became very large, it was first subdivided into centuries, and then these again broke off into separate clubs, Again, there was one club or company of the watermen who plied their trade on the Saone, and another of the watermen on the Rhone, though both these companies had their headquarters at Lyons. The other navigable rivers, too, each had its own company. Thus, the most ancient notice we have of Paris is derived from a monument which has come down to us of the water- men on the Seine. We find mention, also, of more craft- gilds than one even in a single street of Rome ; nay, further

still, within the limits of a single house, e.g., of the imperial palace, and probably o. other princely establishments, which counted their hundreds or thousands of dependants. Each class of slaves engaged in different domestic

occupations had their own clubs. Thus the chef de cuisine (maguster coguorum) of Augustus bequeathed a sum of money to the collegium, or club, of cooks, in his imperial majesty's house- hold, and there is evidence that there were five or six other clubs in the palace at the same time. We do not know how large each club may have been ; an old inscription tells us of forty seats reserved for a particular club in the amphi- theatre at Nimes, but these belonged probably to the officers of the club, not to the ordinary members. indis- criminately. Sometimes the numberof members was limited, either by the original constitution of the body, or by condi- tions subsequently imposed by benefactors who did not wish their donations to be frittered away and rendered useless by too minute subdivisions. As to the internal organiza- tion of the clubs, the general laws and principles which governed their constitution, both in Athens and in Rome, they were moulded, as was only natural, very much after the pattern of the civil institutions of the country. 'They were republican therefore in spirit, the administration of affairs being wholly in the hands of the members them- selves, all of whom had equal rights ; their watchful control was incessant, and their authority absolute ; their officers were elected by universal suffrage, sometimes by acclama- tion; they were called by the same names as were borne by the magistrates of the state, dpxovres, qucestores, magistre quinquennales, curatores, &c. ; they were elected annually, and on entering into office they took an oath that they would observe the constitution and laws of the corporation ; and on retiring from office they gave an account of their stewardship to the assembled members, who exercised a right of judgment over them. This judgment seems to have been almost uniformly favourable ; a commendatory decree was voted almost as much a matter of course as a vote of thanks to the chairman of our own public meetings. In Greece this vote was accompanied by the offering of a crown of leaves, of olive, ivy, or poplar, according to the sup posed choice of the god or goddess to whom the club was dedicated. ~~In the East, e.g., Bithynia, we find crowns of ribands and flowers; in Rhodes, Delos, and the adjacent islands, it was not uncommonly of gold,—of very little intrinsic worth, however, and provided by special contributions at each monthly meeting. But the most valued part of the reward to these retiring officers (in Greece) seems to have been the proclamation of the honour obtained, which proclama~~ tion took place either after the ceremonies of the chief annual festival, or sometimes on every occasion of meeting. It was also engraved

on a column which was set up in some conspicuous spot in or near their place of meeting. When any special services seemed to call for special recognition, the title of benefactor or benefactress was awarded, and this, too, was of course added to the inscription. A still higher and rarer honour was to offer the retiring officer a statue or portrait of himself, either full length or half figure only or sometimes both together, and even more than one of each But only once among Greek inscriptions belonging to these clubs do we find any mention of a salary awarded to the secretary, in consideration of the zeal and justice with which he had attended to the general interests of the community, the exactness with which he had rendered his own reports and accounts, as well as audited those of others who from time to time had been specially deputed to do anything for the club, and his constant devotion to the interests of all the members both collectively and individually Even in this instance, however, the secretary or treasurer declined the proffered salary, whiere-

zealous and disinterested

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upon the club voted him a golden crown, which again he gave up for the decoration of the temple in which they met. And this, indeed, was the usual fate of these complimentary offerings. The officers fulfilled the duties of their post gratuitously, and often at great expense to themselves, just as the civil magistrates were obliged to do; and it seems to have been pretty generally understood, that any extra- ordinary compliments, such as the offer of a statue or portrait, should, if accepted, be carried out at the expense, not of the donor, but of the receiver. In Rome, also, whenever an inscription states that the members of a collegiwm decree that a statue shall be erected in honour of some patron or benefactor, it is generally added that he undertook to pay for the statue himself (honore contentus, impensam remisit). Besides the acting officials of these clubs, there were also certain honorary patrons, whose connection with them was probably much the same as that of most patrons of benevolent societies in our own day, Tt was a compliment to invite them to become patrons, and they were expected to contribute to the funds in return.

It only remains that we should say a few words about the merely social clubs of pagan times,—those clubs which had no other bond of union, either commercial, political, or religious, but which aimed only at the amusement or private advantage of their members. There was nothing in the functions of these clubs to obtain for them a place in the page of history. The evidence, therefore, of their existence and constitution is but scanty. Monumental inscriptions, however, tell us of clubs of Roman citizens in some of the cities of Spain, of a club of strangers from Asia resident in Malaga, of Phoenician residents at Pozzuoli, and of other strangers elsewhere. These all were probably devised as remedies against that sense of ennut and isolation which is apt to come over a number of foreigners residing at a distance from their native country. Something of the same kind of feeling may have led to the toleration of a club consisting of old soldiers who had been in the armies of Augustus ; these were allowed to meet and fight their battles over again, spite of the legal prohibition of military clubs. Another military club of a different kind existed among the officers of a regiment engaged in foreign service in Africa. Its existence can have been no secret, for its rules were engraved on pillars which were set up near the headquarters of the general, where they have lately been found in the ruins of the camp. The contribu: tion of each member on admission scarcely fell short of £25, and two-thirds of this sum were to be paid to his heir or representative on the occasion of his death, or he might himself recover this proportion of his original sub scription on retirement from military service. The peculiarity, however, of this aristocratic collegiwm was this, that it provided that a portion of the funds might also be spent for other useful purposes, ¢.g., for foreign travelling. It is to be presumed that a member who had availed him- self of this privilege thereby forfeited all claim to be buried at the expense of his club.

Clubs were by no means the exclusive privilege of the male sex in ancient days. Women also were united in similar associations. Their religious sodalities, indeed, were not generally edifying ; but they combined together also for social and political purposes. The most remarkable of these was the great assembly of matrons, called at one time, in a mock-heroic way, “the minor senate,” This ladies’ club received its title from imperial authority, which also legislated as to the needful qualifications of its members, the times of its meeting, and the subjects of its debates. These concerned the

gravest questions of etiquette, such as what dress ladies should wear according to theit social rank ; who was to take precedence one of another on public occasions of state, in processions, or other

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ceremonies; who might ride in a carriage drawn by horses; who must be content to sit behind mules ; whose sedan-chair might have fittings of ivory, whose of silver, Not all ladies could attain to a seat in this little senate, which dealt with such delicate questions of etiquette ; but we find them forming other clubs of their own which occasionally meddled with questions of municipal, if not of They deliberated on the rewards to be given to this or that magistrate, and voted funds for inonuments and statues in honour of those who had earned The names of women are not unfre- quently set down as patronesses of certain craft-gilds, of which they can hardly have been ordinary members; and in one instance at least in Africa, and in another in

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general, interest.

their approbation.

Majorea, inscriptions distinctly mention that certain ladies had filled all the official posts in a collegium, (3.8. N.) Modern Clubs.—The word club, denoting the promotion

of intercommunity and good fellowship, is not very old, and

only became conimon in the time of the Ztler and Spec- tator ; it claims a descent, however, from the Anylo-Saxon, being derived from cleofan, to divide, because the expenses are divided into shares. Thomas Occleve (temp. Henry IV.) mentions a club designated Za Court de Bone Compaignie of which he wasa member. Aubrey (1659) speaks thus of the word: “ We now use the word clubbe for a sodality in @ taverne.” He also mentions tlie ballot box, that potential instruinent too often used in modern days for the indulgence of secret spleen : “Here we had (very formally) a

badlotting bow, and ballotted how things should be carried.” Dr Johnson, according to Boswell, defines a club to be an “assembly of good fellows meeting nnder certain conditions.” And to the same authority may be traced the words “ clubable ” and “ unclubable.”

The numerous London clubs which sprang into existence in the last and previous century had their place and origin almost entirely in the coffee-houses and taverns then so much in vogue. Of these the earliest known was the Bread Street or Friday Street Club originated by Sir Walter Raleigh, and meeting at the Mermaid Tavern. Shakespeare, Beaumont, Fletcher, Selden, Donne, and others were members of this club. Other clubs were subsequently formed, such as that meeting at the Devil Tavern near Temple Bar, of which Ben Jonsou was supposed to be the founder ; and later on (in 1764) we find the Leterary Club was established chiefly at the instance of Sir Joshua Reynolds, which soon acquired a renown no more than pro-portionate to its merits—a renown maintained and brought down to the present day,

Addison, in the Spectator, has a paper on the clubs of his day (No. 9, vol. i 1710). Of the description of club there sketched many exist at the present time, having no object but that of good fellowship and dining. In this category may be included the Joyal Society Club, the history of which has been written by the late Admiral Wm. Henry Smyth, F.B.S., in the privately printed Sketch of is Bi and Progress of the Royal Society Club, published in ,

Of the more notable of the clubs of the past and the early part of the present century but few resembled the club of the Victorian era. Of those which survive may be Mentioned White’s, originally established in 1698. ‘This club was formerly of a high Tory character, and though no longer political is still somewhat conservative and undoubt- edly aristocratic. Brooks’s club, similar to Whte’s in the character of its members, and nearly coeval in date, has continued to maintain a political aspect, and is considered to be identified with Whig principles. Boodle’s, of later date, has always been deemed the resort of country gentle- men, and especially of masters of fox-hounds. Arthur’s, in pome respects an offshoat of Waite’s, was established fully

a century ago, and continues to this day a club of gentle- men associated for no special purpose, but united only by congeniality of tastes and ideas

The number of regularly established clubs in London is upwards of fifty, divided into political, literary and scien- titic, university, naval and military, and general clubs. Of the political clubs the principal are the Carlton, the Conserva- twe, the Junior Carlton, and the St Stephen's, the Reform, and the Devonshire (a kind of junior Reform-club), the conditions of admission into which are of a political nature. Of the literary aud scientific, the Atheneum was " insti- tuted for the association of individuals known for their scientific or literary attainments, artists of eminence iu any class of the fine arts, and noblemen and gentlemen distinguished as liberal patrons of science, literature, or the arts," and has long enjoyed a high reputation, rendering admission to its ranks both tedious as regards the length of time a candidate has to wait before being put up for ballot, aud difficult when le is subjected to that crucial test. Of university clubs the Undted University is the oldest, the others being the Oxford and Cambridge, the Vew University, and others, the qualification for mem- bership of which would be that of connection with the chief universities. The naval and military clubs include the United Service, the Junior United Service, the Army and Navy, with numerous others intended for military and naval officers, and in some instances for officers of militia. The general clubs include the Zravellers', to be deemed eligible for which a candidate must have " travelled out of the British Islands to a distance of at least 500 miles from London ina direct line" (not a very onerous condition in the present day, but one of some weight in 1815 when the club was founded), and the Oriental and Last India United Service clubs, intended more especially for members of Her Majesty's Indian services both civil and military. Besides these there are numerous clubs of a special character, such as the Windham, whose object is stated to be " to secure a convenient and agreeable place of meeting for a society of gentlemen all connected with each other by a common bond of literary or personal acquaintance ;" the ational club, consisting of 'members who hold the doctrines and principles of the Reformed faith, as revealed in Holy Scripture, asserted at the Reformation, and generally embodied in the articles of the Church of England;" or the Garrick, which was instituted in

1831 for “the general patronage of the drama, for bringing together the supporters of the drama, and for the formation of a theatrical library with works on costume.”

This list might be extended, but the gcneral aims of the modern style of club are sufficiently indicated in this reference to the salient features of the clubs named,

The architectural elevations of the London club-houses are such as have lent dignity and character to the parts of London in which they are situated. Pall Mall notably is thus now a street of palaces. Nor should the contents of these handsome and convenient mansions pass unnoticed. The Atheneum has probably the choicest library of its kind, consisting mainly of books of reference, and including 45,000 volumes. The Garrick club has an exceedingly valuable collection of oil and water-colour paintings, chiefly, as might be expected, relating to dramatic episodes. The United Service, the Reform, the Oriental, and some other clubs have an assemblage of portraits of members who have won fame, or of paintings of celebrated battles and public events. The furniture and arrangements of the different apartments correspond to the exteriors, every convenience and luxury being placed at the disposal of the members.

The mode of election of members varies. Insome clubs the committee alone have the power of choosing new members. In athers the election is by ballot of the whole

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club, one black ball in ten ordinarily excluding. In the Atheneum, whilst the principle of election by ballot of the whole club obtains, the duty is also cast upon the committee of annually selecting nine members who are to be “ of distinguished eminence in science, literature, or the arts, or for public services,” and the rule makes stringent provision for the conduct of these elections. On the com- mittee of the same club is likewise conferred power to elect without ballot princes of the blood royal, Cabinet ministers, bishops, speaker of the House of Commons, judges, &c, ;

The general concerns of clubs are managed by committees constituted of the trustees, who are usually permanent mem- bers thereof, and of ordinarily twenty-four other members, chosen by the club at large, one-third of whom go out of office annually. These committees have plenary powers to deal with the affairs of the club committed to their charge, assembling weekly to transact current business and audit the accounts. Once a year a meeting of the whole club is held, before which a report is laid, and any action taken thereupon which may be necessary.

The entrance fee varies from £40 at the United Service and Army and Navy clubs to 20 guineas at the Carlton club. The annual subscription in Jike manner ranges from 10 guineas in the Carlton, Reform, and several others, to 7 guineas in the Uneted Service club. The largest income ‘erived from these and all other sources may be stated to be that of the Army and Navy club, which in the year 1875 amounted to £30,813, of which £19,383 was raised by entrance fees and subscriptions alone. The expenditure is, however, most commonly of nearly equal amount, and of few of the clubs can it be said that they are entirely free from debt. The number of members included in a London club varies from 2200 in the Army and Navy to 475 in the St James’s club.

Numerous provincial clubs are established throughout the country. In both Edinburgh and Dublin are clubs fully coming up to the metropolitan societies. Nor is this great public convenience lacking in the cities and towns of Europe, the United States, and the British colonies.

Of a different nature and with widely different objects are ‘the learned bodies designated publishing clubs, of which the Abbotsford, the Bannatyne, the Roxburghe, and others are examples. These societies devoted themselves solely to the editing of unpublished MSS., or the reprint- of rare and valuable works. (J. c. W.)

Arnold (Walter), Life and Death of the Sublime Society of Beef- steaks, 1871; Aubrey (John), Letters of Eminent Persons, 2 vols. ; Marsh (C.), Clubs of London, with Anecdotes of their Members, Sketches of Character and Conversation, 1832, 2 vols. ; Notes and Queries, 3d series, vols. 1, 9, 10; Pyne (W. H.), Wine and Wal- nuts, 1828, 2 vols.; Smyth (Admiral), Sketch of the Use and Pro- gress of the Royal Society Club, 1860 ; Timbs

(John), Club Life of London, with Anecdotes of Clubs, Coffee-Houses and Taverns, 1866 2 vols., and History of Clubs and Club Life, ISP & Walker (Th.), The Original, fifth edition, by W. A. Guy, 1875; The Secret History of Clubs of all Deseriptions [by Ned Ward], 1709; Com- plete and Humourous Aecount of all the Remarkable Clubs and Societies in the Cities of London and Westminster [by Ned Ward] seventh edition, 1756 ; The London Clubs: their Anecdotes, History,

Private Rules, and Regulations, 18538, 12mo; Hume (R Learned Societies and Printing Clubs, 1847. nara

CLUB-FOOT (Zalipes). The pathology and treatment of the various deformities of the foot, which are included under the above general title, come strictly under ortho- pedie surgery. Several forms of club-foot have been recognized by surgeons There are four primary forms :— (1) Talipes equinus, in which the heel does not touch the ground, the child resting on the toes; (2) Talipes varus, in which the foot is turned inwards and shortened, the imner edge of the foot raised, the outer edge of the foot only touching the ground ; (3) Zalipes calcaneus, a rare

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form, in which the heel only touches the ground, the toes being raised ; (4) Talipes valgus, in which the foot is turned outwards. The third and fourth varieties are so rare that they are of no practical interest, and need not be further alluded to. It is possible to confound true talipes valgus with flat-foot, a deformity which is the result of undue stretching, from weakness, of the fascial and ligarnentous structures which maintain the arched form of the foot. In flat-foot the arch is lost, the patient is splay or flat-footed, and as a secondary deformity the foot is turned outwards, resembling and often confounded with true talipes valgus.

The two common primary forms of club-foot are talipes equinus and talipes varus. These two varieties are frequently combined ; thedeformity is then termed talipes equino-varus. A shortening or contraction of one group, or of allicd groups, of muscles is always to be observed ; as, for instance, in talipes equinus, to which the muscles of the calf are con tracted, or in talépes varus, in which the group of muscles which turn the foot inwards

are contracted, or in talipes equino-varus, in which both sets are at fault. This con- traction is due either to excessive primary irritation of the muscular group implicated, or is secondary to and the result of paralysis of an opposing group of muscles. In certain cases the paralysis affects more or less all the muscles of the limb ; the result of this is a deformity in the diree- tion of the most powerful group. The primary cause of these diseased conditions is some irritation of the cerekro- spinal central nervous system, either occurring before birth, aud termed congenital, or appearing after birth, generally during the period of first dentition, and termed non-congenital. As a rule well-marked cases are congenital. Such deformities are frequently hereditary. Both feet may or may not be affected. Recognition of club-foot is of import- ance, because if not treated early a change takes place in the shape of the bones of the foot, which reuders treatment much more difficult, and in some neglected cases it is impos- sible to restore the foot to its normal shape.

Tt is to Stromeyer in Germany (1837), and to Little and Adams in England, that we owe a true understanding of the pathology and treatment of these affections.

The following broad principles, which govern the treat: ment, are now universally understood and adopted by sur- geons:—(1) A subcutaneous division, by the operation of tenotomy, of the contracted tendons; and (2) A stretching of the newly-formed embryonic tissue which is deposited between the cut extremities of the tendons in the inter space, the result of their retraction after division. This is managed by means of a mechanical appliance termed ° a club-foot boot. Various forms of boot have been used by surgeons; in all the essential feature is that the foot is fixed to the boot by sticking-plaster or by straps, and the stretching is gradually accomplished by the elasticity of Indian-rubber bands, or by steel springs, or by screws. Tn this way the foot gradually assumes a normal appearance. As a general rule, after it is evident that the deformity is a persistent one, the earlier the operation is pet- formed the better. Only in exceptional cases should interference be delayed beyond the third or fourth month. of life. Ifa change takes place in the bones, or if the child is allowed to walk before treatment of the deformity, the cure is rendered more difficult and more tedious. In many cases when the child is young the cutting operation will not be

necessary ; the foot can be restored to its normal position by mechanical appliances alone.

Various rules have been laid down for the proper performance of tenotomy. ‘The simple rule to begin with the most tense tendon, and to divide it where it is most tense, is of universal application. In talipes equinus the tendo achillis, in talipes varus the tibialis posticus and tibialis anticus require division, In the common form,

talipes equino-varus, both groups must be operated on. Very frequently the plantar fascia is shortened and has

also to be divided. After the operation, which is greatly

facilitated by the administration of chloroform, the foot is kept at rest with a bandage for three or four days until the small punctures are healed. The boot is then carefully applied, and gradually the foot is restored to its normal shape without causing pain, which interferes with the object in view, namely, a moulding (by stretching) of the newly-formed tissue between the divided ends of the tendons If there is distinct paralysis the appropriate remedics—friction, passive exercise, and the electric battery —inay be indicated. The boot should be worn for some time _ after the foot has regained its normal appearance, because there is always a tendency for a considerable period to the return of the deformity. Ger) CLUNY, or Cruent, a town of France, in the department

of Sadne-et-Loire, about twelve miles by rail north-west of

Macon, on the left bank of the Groue, a tributary of the Sadne, crossed there by two bridges. It is a place of upwards of 4000 inhabitants, and carries ona considerable agricultural trade, and the manufacture of pottery, paper, and vinegai. ‘The main interest in the town is due to its specimens of medizeval architecture, which include, besides its celebrated abbey, the church of Notre Dame, dating from the 13th century ; the church: of Saint Marcel with a beautiful spire ; the ruins of Saint Mayeul ; portions of the ancient fortifications ; and a number of picturesque houses belonging to various

periods from the 12th century downwards, classed among the historic monuments of France. A mere village at the time when William the Pious and Bernon, abbot of Gigny and Baume, laid the foundations of what was destined to be one of the principal monasteries of Europe, it gradually increased with the development of the religious fraternity, and was raised to the rank of a town. Before the erection of St Peter's at Rome, the abbey church, which was consecrated by Innocent IL., was recognized ag the largest building of its kind in Europe, its length being no less than 656 feet and its breadth 130. During the wars of the 16th century the abbatial buildings were greatly damaged ; and in the Revolution of 1789 a great part of them were completely demolished. Restorations have since been effected at various times, and different portions of the enormous pile are appropriated to civic purposes. The abbot's palace contains @ museum and a library ; the cloisters are occu- pied by a school; and the site of the abbey church _ affords room for a Government stud. The 12th century was the period at which the monks of Cluny reached the height of their prosperity ; and about that time no fewer than 2000 religious establishments throughout Europe acknowledged allegiance. Shortly after they began to decline from the ancient rigidity of their rule ; and their influence gave way before the rising power of the Cister- cians. Among the great men whom they have produced are Gregory VIL, Urban {I., and Pascal II. The town residence erected in Paris by the abbots of Cluny about the end of the 15th century is still extant, and, under the name of Hotel de Cluny, is occupied by the Sommerard archxo- logical collection'; but the Collége de Cluny, which was founded in 1269 by Ives de Vergy, has disappeared.

CLUSIUM. See Cutust.

CLUVER, Patup (1580-1623), a German geographer still regarded as an authority, was born at Danzig in 1580. After travelling in Poland and Germany, he commenced the study of law at Leyden ; but he soon turned his attention to geography, which was then taught there by Joseph Scali ; : * :

ba Wealiger. Displeased with his desertion of the law, his father refused to support him ; and he was forced to enter the army, with which he served for two years in

Bohemia and Hungary. After leaving the army he under- took to get printed in Holland an apology for Baron Popel, who had been imprisoned by the emperor; and in consequence he was himself thrown into prison. On his release he visited England, where he married, and became acquainted with Dr Holland and Dr Prideaux, After spending some time in Scotland and France, he returned to Holland; and in 1611 he commenced to publish his works, being, after 1616, supported by a pension from the Academy of Leyden. His principal works are—Germania Antiqua (1616), Sicilie Antique libri duo, Sardinia et Corsica Antiqua (1619), Italia Antiqua (1624), Zntroductio in Uni- versam Greographiam (1629).

CLYDE, the most important river of Scotland, and the third in poiut of magnitude, has its origin from numerous small streams rising at a height of about 1400 feet above the level of the sea, in the mountains which separate Lanarkshire from the counties of Peebles and Dumfries. It flows first in a northerly direction, with a slight inclina- tion eastward as far as Biggar, where, in time of floods, a junction is sometimes established with the system of the Tweed by means of the Biggar Water. After uniting with the Douglas near Harperfield, it takes a north-west course, passing Lanark, Hamilton, and Glasgow, and merges in the Firth of Clyde below Dumbarton. From its source to Dumbarton it is about 73 miles in length, the direct district being about 52. Its principal tributaries are the Douglas, the Nethan, the Avon, and the Cart from the left, and the Medwyn, the Mouse, the Calder, the Kelvin, and the Leven from the right. Of the celebrated Falls of Clyde, three are above and one below Lanark ; the uppermost is Bon- nington Linn, the height of which is about 30 feet ; the second is Corra Linn, where the water dashes over the rock in three distinct leaps, and resumes its course at a level 54 feet lower. Dundaff Linn is a small fall of 10 feet; and at Stonebyres there are three successive falls, together measuring 76 feet in height. At high water the Clyde is navigable to Glasgow for the largest class of merchant vessels. See Guascow.

CLYDE, Lorn (1792-1863), better known ag Sir CoLIn CAMPBELL, was born at Glasgow on the 16th of October 1792. He received his education at the high school of that city, and when only sixteen years of age cbtained an

ensigncy in the 9th foot, through the influence of Colonel Campbell, his maternal uncle. The youthful officer had an early opportunity of engaging in active service. He fought under Sir Arthur Wellesley at Vimiera, took partin the retreat of Sir John Moore, and was present at the battle of Coruiia. He shared in all the fighting of the next Peninsular campaign, and was severely wounded while leading a storming-party at the attack on San Sebastian. He was again wounded at the passage of the Bidoassa, and compelled to return to England, when his conspicuous gallantry was rewarded with the rank of captain and lieutenant, without purchase. Campbell held a command in the American expedition of 1814; and after the peace of the following year he devoted himself to studying the theoretical branches of his profession. In 1823 he quelled the negro insurrection in Demerara, and two years later obtained his majority by purchase. In 1832 he became lieutenant-colonel of the 98th foot, and with that regiment rendered distinguished service in the Chinese war of 1842. Colonel Campbell was next employed in the Sikh war of 1848-49, under Lord Gough. At Chillianwalla, where he was wounded, and at the decisive victory of Goojerat, his skill and valour largely contributed to the success of the British arms; and his “steady coolness and military precision” were highly praised in official despatches. He was created a K.C.B. in 1849, and specially named in the thanks of Parliament,

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After rendering important services in India, Sir Colin Campbell returned home in 1853. Next year the Crimean war broke out, and he accepted the command of the Highland brigade, which formed the left wing of the duke of Cambridge’s division. The success of the British at the Alma was mainly due to his intrepidity ; and with his “thin red line” of Highlanders he repulsed the Russian attack on Balaklava. At the close of the war Sir Colin was promoted to be Knight Grand Cross of the Bath, and elected honorary D.C.L. of Oxford. His military services, however, had as yet met with tardy recognition ; but, when the crisis came, his true worth was appreciated. The outbreak of the Indian Mutiny called for a general of tricd experience; and on July 11, 1857, the command was offered to him by Lord Palmerston. On being asked when he would be ready to set out, the veteran replied, “ Within twenty-four hours.” He was as good as his word; he left England the

next evening, and reached Calcutta on August 13. The position was one of unusual difficulty, but his energy and resource did not fail for a moment. Having formed an arniy as hastily as possible, he marched with 6000 men and 36 guns to the relief of Lucknow. The odds against him were great, and nothing save con- summate dexterity of mancuvring could have achieved success. When the British guns were silenced by the fire of the rebels, Sir Colin himself headed the final assault, carried the fort, and saved the besieged. He afterwards, by his skilful tactics, thoroughly defeated the enemy, and captured their strongholds,—thus crushing the mutiny and preserving the British rule in India. For these services he was raised to the peerage in 1858, by the title of Lord Clyde; and returning to England in the next year he re- ceived the thanks of both Houses of Parliament. He enjoyed a pension of £2000 a year until his death, which occurred on the 14th of August 1863.

Lord Clyde possessed in abundant measure all the qualities which go to make a successful general. He com- bined the daring of the subaltern with the calm prudence of the veteran commander. The soldiers whom he led were devotedly attached to him; and his courteous demeanour and manly independence of character won him unvarying respect. Though adequate recognition of his merits came slowly, he never allowed any feeling of pique to interfere with duty; and he deserves to be regarded as one of the most distinguished generals that Britain has

roduced.

CLYTEMNESTRA, the daughter of Tyndareus and Leda, and wife of Agamemnon, See AGAMEMNON.

CNIDUS, now TExrR, an ancient city of Caria, in Asia Minor, situated at the extremity of the long peninsula that forms the southern side of the Sinus Ceramicus, or Gulf of Cos. It was built partly on the mainland and partly on the Island of Triopion, or Cape Krio, which anciently com- municated with the continent by a causeway and bridge, and-is now permanently connected by a narrow sandy isth- raus. By means of the causeway the channel between island and mainland was formed into two harbours, of which the larger, or southern, now known as port Freano, was further enclosed by two strongly-built moles that are still in good part entire. The extreme length of

the city was little less than a mile, and the whole intramural area is stil] thickly strewn with architectural remains. The walls, both insular and continental, can be traced throughout their whole circuit ; and in many places, especially round the acropolis, at the north-east corner of the city, they are re- markably perfect. Our knowledge of the site is largely due to the mission of the Dilettanti Society in 1812, and the excavations executed by Mr C, T. Newton in 1857-8. The agora, the theatre, an odeum, a temple of Dionysus, a temple of the Muses, a temple of Venus, and a great number |

of minor buildings have been identified, and the gcneral plan of the city has been very clearly made out. Ina temple- enclosure Mr Newton discovered a fine seated statue of Demeter, which now adorns the British Museum ; and about three miles south-east of the city he came upon the ruins of a splendid tomb, and a colossal figure of a lion carved out of one block of Pentelic marble, 10 feet in length and 6 in height, which has been supposed to commemorate the great naval victory of Conon over the Lacedzemonians in 394 B.c. (see ARCHITECTURE, vol. ii, p. 412). Among the minor antiquities obtained from the city itself, or the great necropolis to the east, perhaps the most interesting are the leaden xardSeopot, or imprecationary tablets, found in the temple of Demeter, and copicd in facsimile in the appendix to the second volume of Newton’s work.

Cnidus was a city of high antiquity and probably of Lacedsemonian colonization. Along with Halicarnassus and Cos, and the Rhodian cities of Lindus, Camirus, and Ialysus, it formed the Dorian Hexapolis, which held its confederate assemblies on the Triopian headland, and there celebrated games in honour of Apollo, Poseidon, and the nymphs. ‘The city was at first governed by an oligarchic senate, composed of sixty members, known as épyyjpoves, and presided over by a magistrate called an dpeornp ; but, though it is proved by inscriptions that the old names con- tinued to a very late period, the constitution underwent a popular transformation. The situation of the city was favourable for commerce, and the Cnidians acquired con- siderable wealth, and were able to colonize the island of Lipara and founded the city of Coreyra Nigra in the Adri- atic. They

ultimately submitted to Cyrus, and from the battle of Eurymedon to the latter part of the Peloponnesian war they were subject to Athens. ‘The Romans easily ob- tained their allegiance, and rewarded them by leaving them the freedom of their city. During the Byzantine period there must still have been a considerable population ; for the ruins contain a large number of buildings belonging to the Byzantine style, and Christian sepulchres are common in the neighbourhood. Eudoxus, the astronomer, Ctesias, the writer on Persian history, and Sostratus, the builder of the cclebrated Pharos at Alexandria, are the most remarkable of the Cnidians mentioned in history.

See Beaufort’s Ionian Antiquities, 1811, and Karamania, 1818 ; Hamilton’s Researches, 1842 ; Newton’s Z’ravels and Discoveries im se eee 1865; and Waddington in the Revue Numismatique,

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CNOSSUS, or Gnossus, the most important city of Crete, on the left bank of the Cseratus, a small stream which falls into the sea on the north side of the island. The city was situated at a distance of about 3 miles from the coast, and, according to the old traditions, was founded by Minos, the mythical king of Crete. The locality was associated with a number of the most interesting legends of Grecian mythology, particularly with those which related to Jupiter, who was said to have beeu born, to have been married, and to have been buried in the vicinity. Cnossus is also assigned as the site of the fabled labyrinth in which the Minotaur was confined, and a physical basis for the legend may perhaps have been found in the caverns and excavations of the district. As the city was originally peopled by Dorians, the manners, customs, and political institutions of its inhabitants were all Dorian. Along with Gortyna and Cydonia, it held for many years the supremacy over the whole of Crete ; and it always took a prominent part in the civil wars which from time to time desolated the island. When the rest of Crete fell under the Roman dominion, Cnossus shared the same fate, and became a Roman colony. Mnesidemus, the sceptic philosopher, and Chersiphron, the architect of the temple of Diana at Ephesus, were natives of Cuossus,

Physical properties.

COAL

N its most general sense the term coal includes all varieties of carbonaceous minerals used as fuel, but it is now usual in England to restrict it to the particular varie- ties of such minerals occurring in the older Carboniferous formations. On the continent of Europe it is customary to consider coal as divisible into two great classes, depend- ing upon differences of colour, namely, brown coal, corre sponding to the term ‘‘ lignite” used in England and France, and black or stone coal, which is equivalent to coal as understood in England. Stone coal is also a local English term, but with a signification restricted to the substance known by mineralogists as anthracite. In old English writings the terms pit-coal ae sea-coal are com- monly used. ‘These have reference to the mode in which the mineral is obtained, and the manner in which it is transported to market.

The root éol is common to all the Teutonic nations, while in French and other Romance languages derivatives of the Latin carbo are used, eg., charbon de terre. In France and Belgium, however, a peculiar word, hoville, is generally used to signify minerai coal. This word is supposed to be derived from the Walloon hove, correspond- ing to the medieval Latin hulle. Littré suggests that it may be related to the Gothic hawzja, coal. Anthracite is from the Greek dv@pag, and the term lithanthrax, stone coal, still survives, with the same meaning in the Italian litantrace.

It must be borne in mind that the signification now attached to the word coal is different from that which for- merly obtained when wood was the only fuel in general use. Coal then meant the carbonaceous residue obtained in the destructive distillation of wood, or what is known as charcoal, and the name collier was applied indifferently to both coal-miners and charcoal-burners.

The spelling “cole” was generally used up to the middle of the 17th century, when it was gradually superseded by the modern form, “coal.” The plural, coals, seems to have been used from a very early period to signify the broken fragments of the mineral as prepared for use.

Coal is an amorphous substance of variable composition, and therefore cannot be as strictly defined as a crystallized or definite mineral can. It varies in colour from a light brown in the newest lignites to a pure black, often with a bluish or yellowish tint in the more compact anthracite of the older formations. It is opaque, except in exceed- ingly thin slices, such as made for microscopic investigation, which are imperfectly transparent, and of a dark brown colour by transmitted light. The streak is black in an- thracite, but more or less brown in the softer varieties. The maximum hardness is from 2°5 to 3 in anthracite and hard bituminous coals, but considerably less in lignites, Which are nearly as soft as rotten wood. A greater hardness is due to the presence of earthy impurities. The densest anthracite is often of a semi-metallic lustre, resembling somewhat that of graphite. Bright, glance, or pitch coal Is another brilliant variety, brittle, and breaking into regu- lar fragments of a black colour and pitchy lustre. Lignite and cannel are usually dull and earthy, and of an irregular fracture, the latter being much tougher than the black coal. Some lignites are, however, quite as brilliant as anthracite : cannel and jet may be turned in the lathe, and are suscep- tible of taking a brilliant polish. The specific gravity is highest in anthracite and lowest in lignite, bituminous coals giving intermediate values (see Table I.) As a rule the density increases with the amount of carbon, but in Some instances a very high specific gravity is due to inter-

mixed earthy matters, which may be separted by mechanical treatment.

Coal is perfectly amorphous, the nearest approach to any thing like crystalline structure being a compound fibrous grouping resembling that of gypsum or arragonite, which occurs in some of the steam coals of S. Wales, and is locally known as “cone in cone,” but no definite form or arrangement can be made out of the fibres. The impres- sions of leaves, woody fibre, and other vegetable remains are to be considered as pseudomorphs in coaly matter of the original plant structures, and do not actually represent the structure of the coal itself. There is generally a ten- dency in coals towards cleaving into cubical or prismatic blocks, but sometimes the cohesion between the particles is so feeble that the mass breaks up into dust when struck. These peculiarities of structure may vary very considerably within small areas; and the position of the divisional planes or cleats with reference to the mass, and the pro- portion of small coal or slack to the

larger fragments when the coal is broken up by cutting-tools, are points of great importance in the working of coal ou a large scale.

The divisional planes often contain sinall films of other minerals, the commonest being calcite, gypsum, and iron pyrites, but in some cases zeolitic minerals and galena have been observed. Salt, in the form of brine, is some- times present in coal. Some years ago a weak brine occur- ring in this way was utilized at a bathing establishment at Ashby-de-la-Zouche. Hydrocarbons, such as petroleum, bitumen, paraffin, é&c., are also found occasionally in coal, but more generally in the associated sandstones and lime- stones of the Carboniferous formation. Gases, consisting principally of light carburetted hydrogen or marsh gas, are often present in considerable quantity in coal, in a dissolved or occluded state, and the evolution of these upon exposure to the air, especially when a sudden diminution of atniospheric pressure takes place, constitutes oue of the most formidable dangers that the coal miner has to encounter,

The classification of the different kinds of coal may be Classifica considered from various points of view, such as_ their tion.

chemical composition, their behaviour when subjected to heat or when burnt, and their geological position and origin. They all contain carbon, hydrogen, oxygen, and nitrogen, forming the carbonaceous or combustible portion, and some quantity of mineral matter, which remains after combustion as a residue or “ash.” As the amount of ash varies very considerably in different coals, and stands in no relation to the proportion of the other constituents, it is necessary in forming a chemical classification to compute the results of analysis after deduction of the ash and hygroscopic water, Examples of analyses treated in this manner arc furnished in the last column of Table I., from which it will be seen that the nearest approach to pure carbon is fur-

nished by anthracite, which contains above 90 per cent. Anthracite.

This class of coal burns with a very small amount of flame, producing intense local heat and no smoke. It is especially used for drying hops aud malt, and in air or blast fur- naces where a high temperature is required, but is not suited for reverberatory furnaces. The American anthracite is largely

used in iron smelting, as is also that of South Wales, but to a less extent, the latter having the disad- vantageous property of decrepitating when first heated.

The most important class of coals is that generally known Bitumin- as bituminous, from their property of softening or under- us coals.

going an apparent fusion when heated to a temperature far below that at which actual combustion takes place. This term is founded on a misapprehension of the nature of the

Gas coal.

Caking coals.

occurrence, since, although the softening takes place at a low temperature, still it marks the point at which destructive distillation commences, and hydrocarbons both of a solid and gaseous character are formed. ‘That nothing analagous to bitumen exists in coals is proved by the fact that the ordinary solvents for bituminous substances, such as bisul- phide of carbon and benzole, have no effect upon them, as would be the case if they contained bitumen soluble in these reagents. The term is, however, a convenient one, and one whose use is almost a necessity, from its having an almost universal currency among coal miners. The propor- tion of carbon in bituminous coals may vary from 80 to 90 per cent.—the amount being highest as they approach the character of anthracite, and least in those which are nearest to lignites. ‘The amount of hydrogen is from 43 to 6 per

| Specific | Gyavity.

|

Anthracite.

Localities. Carbon. | Hydrogen.

Bituminous Steam and Coking Coal.

Cannel or Gas Coal.

9, Wigan, Lancashire …... 10. Boghead, Scotland…..... 11. Albertite, Nova Scotia.. 12. Tasmanite, Van Die-

Mans) Waldenn.-.....

1°276

1:18

Lignite and Brown Coal.

fitness of the coal for use in gas-making. This excess is greatest in what we know as cannel coal, the Lancashire kennel or candle coal, so named from the bright light it gives out when burning. This, although of very small value as fuel, commands a specially high price for gas- making. Cannel is more compact and duller than ordi- nary coal, and can be wrought in the lathe and polished. These properties are most highly developed in the substance known as jet, which is a variety of cannel found in the lower oolitic strata of Yorkshire, and is almost entirely used for ornamental purposes, the whole quantity produced near Whitby, together with a further supply from Spain, being manufactured into articles of jewellery at that town.

When coal is heated to redness out of contact with the air, the more volatile constituents, water, hydrogen, oxygeu, and nitrogen are expelled, a portion of the carbon being also volatilized in the form of hydrocarbons and carbonic oxide,—the greater part, however, remaining behind, to- gether with all the mineral matter or ash, in the form of coke, or, as it is also called, “fixed carbon.” The proportion of this residue is greatest in the more anthracitic or drier coals, but a more valuable product is yielded by those richer in hydrogen. Very important distinctions—those of caking or non-caking—are founded on the behaviour of coals when subjected to the process of coking. ‘The former class undergo an incipient fusion or softening when heated, so that the fragments coalesce and yield a compact coke,

COAL

Oxygen. | Nitrogen. | Sulphur.

1. South Wales ….....+ 1°392 90°39 3°28 2°98 0°83 0°91 161 2°00 93°54 2. Pennsylvania ….....++ 1°462 90°45 2°43 2°45 is 4°67 née 94°89 3), Teil dqoooonssooa mocgn0cDscd 06 82°70 1°41 0°85 10°35 oe 0°94 97°34

4, Risca, South Wales…... 75°49 A738 6°78 Teeall 10°67 Wale 86°78 5. Aberdare, Do. ..... 86°80 4°25 3°06 0°83 4°40 0°66 92°24 6. Hartley, Northumberl'd) _ … 78°65 4°65 13°36 0°55 2°49 Ae 80°67 7, Dudley, Staffordshire …J 1°278 | 78°57 5°29 12°88 1:84 0°39 1:08 1:13 79°70 8. Stranitzen, Styria…..... at 79°90 4°85 12°75 0°64 0°20 1°66 F 81°45

13. Cologne…... ber sevenacsnees 17100 | 63°29 4°98 26°24 nee 8°49 66'97 14. Bovey, Devonshire …... = 66°31 563 22°86 0°57 2°36 2°36 69°53 16. Vriteil, Styria' .. sis… 50°72 5°34 | 33°18 | 2°80 0:90 7°86 55°11

[VARIETIES,

cent., while the oxygen may vary within much wider limits, or from about 3 to 14 per cent. These variations in com- position are attended with corresponding differences in quali- ties, which are distinguished by special names. Thus the semi-anthracitic coals of South Wales are known as "dry" or "steam coals," being especially valuable for use in marine steam-boilers, as they burn more readily than anthracite and with a larger amount of flame, while giving out a great amount of heat, and practically without producing smoke. Coals richer in hydrogen, on the other hand, are more useful for burning in open fires—smiths' forges and furnaces— where a long flame is required.

The excess of hydrogen in a coal, above the amount necessary to combine with its oxygen to form water, is known as "disposable" hydrogen, and is a measure of the

Taste L—LElementary Composition of Coal (the figures denote the amounts per cent).

Composition calculated exclusive of Water, Sulphur, and Ash,

Ash.

——————s {

Water.

0°91

while the latter (also called free-burning) preserve their form, producing a coke which is only serviceable when made from large pieces of coal, the smaller pieces being incoherent and of no value. ‘The reason of this difference is not clearly made out, as non-caking coals are often of very sunilar ultimate chemical composition as those in which the caking property is very highly developed. As matter of experience, it is found that caking coals lose that property when exposed to the action of the air for a lengthened period, or by heating to about 300 C., and that the dust or slack of non-caking coal may, in some instances, be converted into a coherent cake by exposing it suddenly to a very high temperature.

Lignite or brown coal includes all varieties which are Lignite

intermediate in properties between wood and coals of the older formations. A coal of this kind is generally to he distinguished by its brown colour, either in mass or in thie blacker varieties in the streak. The proportion of carbon is comparatively low, usually not exceeding 70 per cent., while the oxygen and hygroscopic water are much higher than in true coals. The property of caking or yielding a coherent cake is usually absent, and the ash is often very high. The specific gravity is low when not brought up by an excessive amount of earthy matter. Sometimes it is almost pasty, and crumbles to powder when dried, so as to be susceptible of use as a pigment, forming the colour known as Cologne earth, which resembles umber or sepia,

sulphur in

S tpal.

Vater in oal,

drigin of ioal.

———S a

ORIGIN. |

In Nassau and Bavaria woody structure is very common, and it is from this eireumstanee that the term lignite is derived. The best varieties are black and pitchy in lustre, or even bright and scareely to be distinguished from true coals. ‘These kinds are most common in Eastern Europe. Lignites, as a rule, are generally found in strata of a newer geological age, but there are many instances of perfect coals being found in such strata.

By the term “ash” is understood the mineral matter re- maining uneonsuméd after the complete combustion of the carbonaeeous portion of a eoal, ‘This represents part .of the mineral matter present in the plants from which the coal was originally formed, with such further addition by infiltration and mechanical admixture as may have arisen during consolidation and subsequent ehanges. The eom- position of the ashes of different eoals is subject to consi- derable variation, as will be seen by the following list of analyses :-—

TABLE II.—Composition of the Ashes of Coals.

| x) J a a 5 q n ° Lal jn ’ & eg : eo jed | os | eo : ed 3 3 ai 42] eo a” £| 2 |bs| 8 |S12)e5| 23/3 a 4 |/hO!]| A [al lalaA By = True Coals. Dowlais, South Wales] 39°64| 39°20] 11°84 | 1°81 | 2°58! ... coe 3°01 | 98:08 Ebbw Vale, do. 53°00] 35°01)... 3°94 |2°20| ... | 4°89 | 088 | 99°92 Knigagrube, Silesia.| 55°41; 18°95) 16-06 | 3:21 |1:87/ 2-05, 1°73 | 0°36 | 99°64 OHIO... .scccssonsscsseeaee 44:60) 41:10} 7°40 | 3°61 |1°28‘1°82; 0°59 | 0:29 |100°69 Lignites. | Helmatadt, Saxony…| 17°27) 11°57) 5°57 | 28°67 | 2°58) 2°64 33:83 97°13 ‘Hdeléney, Hungary..| 56°01] 23:07] 5:05 | 15°62 | 3°64) 2°38, 12°35 98°12

ash of true eoal approximates to

The composition of the that of a fire-elay, allowanee being made for lime, which inay be present either as earbonate or sulphate, and for sulphurie acid. The latter is derived mainly from iron

pyrites, which yields sulphate by combustion. An indi- eation of the eharacter of the ash of a eoal is afforded by its eolour, white ash eoals being generally freer from sulphur than those containing iron pyrites, which yield a red ash. There are, however, several striking exeeptions, as for instance in the anthracite from Peru, given in Table L, which contains more than 10 per cent. of sulphur, and yields but a very small percentage of a white ash. In this eoal, as well as in the lignite of Tasmania, known as white coal or Tasmanite, the sulphur oceurs in organie eom- bination, but is so firmly held that it ean only be very partially expelled, even by exposure to a very high and continued heating out of contact with the air. An anthracite oeeurring in connection with the old volcanie rocks of Arthur's Seat, Edinburgh, which contains a large amount of sulphur in proportion to the ash, has been found to behave in a similar manner. Under ordinary eonditions, from 4 to } of the whole amount of sulphur in a eoal is volatilized during combustion, the remaining + to £ being found in the ash.

The amount of water present in freshly raised coals Varies very considerably. It is generally largest in lignites, which may sometimes contain 30 per cent. or even more, while in the coals of the coal measures it does not usually exeeed from 5 to 10 per eent. The loss of weight by exposure to the atmosphere from drying may be from 4 to ¢ of the total amount of water contained.

Coal is undoubtedly the result of the transformation of vegetable matter, mainly woody fibre, by the partial eli- munation of oxygen and hydrogen giving rise to a substance richer in earbon than the original wood,—-the mineral matter being modified simultaneously by the almost entire removal of the alkalies and lime, and the addition of materials analagous in composition to elay, as will be seen by comparing the analyses in Table II. 'The

following table, given by Perey, shows the relative pro portions of the different eomponents of mineral fuels.

TABLE ITl.—Composition of Fuels (assuming Carbon = 100),

Disposable

Hydro- | Carbon. a Oxygen. Hydrogen. AWD OC ME sltctitattncniace vie stees TOON 2S) || 383207, 1°80 12S toonanind Rae poe Reece cemeenncd 100 9°85 | 55°67 2°89 IGISATING pirong scene pees meeena ne 100 8°37 | 42°42 3°07 Thick Coal, S. Staffordshire..} 100 6°12 | 21°23 3°47 Hartley Steam Coal…..... 100 5°91 | 18°32 | 3°62 South Wales Coals…..... 100 4°75 5:28 4:09 American Anthracite…..... 100 2°84 1:74 2°63

Mohr has computed that the transformation of wood into eoal is attended with a loss of about 75 per eent. in weight; and, having regard to the difference in density of the two substances, the volume of the coal ean only be from 34, to + of the woody fibre from which it is derived.

The nature of the change is essentially a slow oxidation under water or any eovering sufficient to protect the dead wood from the direet aetion of atinospheric air, as in the latter case the vegetable mould or humus would be pro- duced. The produets of sueh decomposition vary with the length of time and the nature of the plants aeted on, and in the case of anthracite the change is so great that no portion of the original plant structure can be reeognized, at the same time the density and conductivity for heat and electricity are inereased. This, however, is a case of metamorphosis analogous to the transformation of sedi- mentary into erystalline rocks, the extreme term of such metamorphosis being the production of graphite or plum- bago. Daubrée has shown that wood may be eonverted into anthracite by exposure to the action of superheated water at a temperature of 400° C.

The plants coneerned in the production of eoal vary very considerably in different geologieal periods. In the eoal measures proper, acrogens, ferns, equisetums, and similar allied forms are most abundant. It is stated by some observers that entire beds of coal are sometimes made up of the spores of ferns. This, however, appears to depend upon the inspection of mieroseopie sections, and may not be eapable of rigorous quantitative demonstration. In

the eoals of newer date exogenous wood and leaves are more eommon than in those of the eoal measures; the former also contain resins, sometimes in considerable quantity.

The number of species of land plants in the British sedimentary formations, which may be taken as a measure of the comparative prevalence of coal in the different series, is as follows :—

DevOMlanpaunataencs woes iiseereuesesss 9 species, Warbommenous Ovni euescacseseer esta B20) 9 a5 IPeromauat®, lop sopssncostndoneospocencoopappenaccose 0) Hay

URE CS. Cl0) penn noone oandanonoacaodosoonasocdeau oss

Thy, ehayel: OXON AIG) Cl ¥inco ono n0cnaonccbaaben bonded 160° ,, Purbeck and Wealden do…….....sse0e8 Bis) lend (Chrsieseioi0) Gloijnoaacos ouedongestonuba pobosooguan 1) 55

HieaeiG7 GIO) ooeeanpnonesodag2J00ncueKbennesnbo° 224. The most generally received opinion is that much if not all eoal results from the transformation of plants upon the the site of their growth. The prineipal evidence in favour of such a supposition is afforded by the common occur- renee of a bed of clay, the so-called “under-clay,” eon- taining the roots of plants, representing the old soil, immediately below every coal seam—a fact that was first pointed out by the late Sir W. E. Logan in South Wales. In Yorkshire the same thing is observed in the siliceous rock called ganister oceurring in similar positions, show- ing that the eoal plants grew there upon sandy soils. The action of water in bringing down drift wood may have also contributed some material, but much less than the local growth. This may probably have been concerned.

ai

Coal-pro.

ducing plants.

sembling that produced from imperfectly coking gas coals. The volume of gas given off by cellulose and starch is much larger and of a higher illuminating power than that produced from gum under the same conditions.

The conditions favourable to the production of coal seem therefore to have been—forest growth in swampy ground about the mouths of rivers, and rapid oscillation of level, the coal produced during subsidence being covered up by the sediment brought down by the river forming beds of sand or clay, which, on re-elevation, formed the soil for fresh growths, the alternation being occasion- ally broken by the deposit of purcly marine beds. We might therefore expect to find coal wherever strata of estuarine origin are developed in great mass ; and this is actually the case,—the Carboniferous, Cretaceous, and Oolitic series being all coal bearing horizons, though in un- equal degrees,—the first being known as the coal measures proper, while the others are of small economic value in Great Britain, though more productive in workable coals on the continent of Europe. The coal measures which form part of the Palaeozoic or oldest of the three great geological divisions are mainly confined to the countries north of the Equator, Mesozoic coals being more abundant in the southern hemisphere, while Tertiary coals seem to be tolerably uniformly distributed irrespective of latitude.

The nature of the coal measures will be best understood gequenee by considering in detail the areas within which they occur of carbo in Britain, together with the rocks with which they are iferous most intimately associated. The general succession of these “7 rocks is given in fig. 1 (cols. 1 to 4),which is taken from

in the production of the very thick masses of coal of small extent found in some coal-fields in Southern Europe.

Another theory, that proposed by Dr Mohr, deserves notice, namely, that coal may be of marine origin, and derived from the carbonization of sea weeds, such as the great kelp plant of the Pacific Ocean. This has been very ingeniously elaborated by the author, and much apparently good evidence adduced in support (see his Geschichte der Erde, Bonn, 1875). But the positive evidence afforded by roots found in the under-clays is sufficient to render such an hypothesis unnecessary in the majority of instances.

It must be remembered, however, that, although cellulose or wood fibre is most probably the chief material concerned in the production of coal, this substance 1s readily con- vertible into dextrine by the action of protei or analogous fermentescible matters containing nitrogen, a change that is attended with the loss of structure, the fibre being con- verted into a gummy mass. Some forms of cellulose, such as that in the lichens known as Iceland moss, are soluble in water, and are without fibre. The prescrvation of recognz- able woody tissue therefore in coals can only be regarded as accidental, and any argument founded upon the relative quantity of the recognizable vegetable structures In ml- croscopic sections is likely to be unsound, unless the rela- tive durability of the different portions of the plants be taken into account. Thus the bark of trees is, as a rule, less perishable than the solid wood, while tissues im- pregnated with resinous matters are almost indestructible by atmospheric agency. Instances of this are afforded by the fossil trees found in the coal measures, which are often

In an investigation of the coking properties of the Saar- briicken coals by Schondorff, it was found that they could

Upper Upper Measures

L-=4Limestones \Oua =]

entirely converted into siliceous masses, the bulk of the a Pe wood having decayed and been replaced by silica, while] 9 wna a z= Bumer the bark is represented by an external layer of bright coal. < = ay > Fossil resins, such as amber, are of common occurrence in| §& Sea a= tL alMaome sian : e 3 ii |Limeston e coals. especially those of secondary or tertiary age. ° . Fe ie oals, especially |.y ag bes os 3 Antefract Rock

spirorbis Limestany Upper

[thin coals] = | (= |

5 : : 4 a Upper thi be separated into three diffcrent materials, which he dis- Red Middle E==|Middle [E=

tinguished as glance or bright coal, dull or striped coal, and fibrous coal, The last, which is known in England as “mother of coal,” resembles a soft, dull, black charcoal, containing abundant traces of vegetable fibre, and yielding a high proportion of non-coherent coke, behaving, in fact,

=| ===> Measures F=|[thick coals]

Millstone

like charcoal. The bright or glance coal is without any eee Grit us bs Swinton COAL 3.4 A 3 : é e § apparent structure, cleaving into cubical masses, contains x Series NES es but little mineral matter, and yields a strong coke. The | Ey” Pe Grit Eo Hittstone |==hamee n 9.9 a 3 0 == Ea Sundstone |= 3 = striped coal consists mainly of a dull substance, with fine | [=| eis =| shales [> :| Series RENTS THIN {10

alternations of bright matter, and is essentially a gas coal or yielding only an inferior coke. These differences are sup-

posed to be due to origina] differences in the substances

KENT’S THICK 4.6)

oe

from which the coals have been derived. Thus the fibrous upper a LLoW WoO0 3

coal may result from unaltered cellulose, the glance coal =| Carboniferous Limestone [=|

from the insoluble mucilage derived from the maceration going rim} Limestone rigs LOCKTANICOALS

of the plants in water, and the dull coal from the soluble | 2} i¢4,.¢ i= wironar

parts, such as gum and dextrine, either original or produced S| series” | Fit oor 82 by the transformation of cellulose and starch. That some-

andlinestncs rh Carbonif $ |—— SILKSTONE * 5.0 thing analogous toa pulping process has gone on in the pro- ose Limestone [wi MOOR * 3

duction of coal is evident from the intimate intermixture | [==|, 7… alternating Mi : Ee Slureen penstone

of the mineral matter constituting the ash, which is quite | =| wate =a dae aga

Sandstone a

\

\ Sandstones & shales, =| with \ |+

Lime stones |7)) |

unrecognizable before burning in the majority of instances.

F. Muck (Chemische Aphorismen tiber Steinkohlen, Bochum, 1873) has recorded some interesting experiments on the behaviour of the three isomeric carbohydrates,—

Series

: with Oil. Shales =| in upper |=

; A t / cellulose, starch, and gum arabic,—which are all of the | Es i yaa Ss = | as Bison en « same ultimate composition, namely, C,H,,9;, When sub- Old Red | No Lower Strat are ~~ ={Shal F]s0FT BED Un Le jected to the process of coking, cellulose, in the form of Sancstone] | Seen in |these =|Rough Rock Swedish filter paper, gave a residue of 6-74 per cent. of a Devonian] sila 3 Ee i a ms re

perfectly non-coherent coke, starch 11-30 per cent. of a bright vesicular coke like that from strongly coking coal, | | Fic. 1,—Succession of Carboniferous Strata. and gum-arabic 20-42 per cent. of a hard dull coke re- | the index of strata issued by the Geological Survey, The

at)

ENGLISH COAL-FIELDS.]

commencement of the carboniferous period is marked by a mass of limestones known as the Carboniferous or moun- tain limestone, whieh contains a large assemblage of marine fossils, and has a maximum thiekness in 8.W. England and Wales of about 2000 feet. The upper portion of this group consists of shales and sandstones known as the Yoredale Rocks, whieh are highly developed in the moor- land region between Laneashire and the north side of Yorkshire. These are also ealled the upper limestone shale, a similar group being found in places below the limestone, and ealled the lower limestone shale, or, in the North of England, the Tuedian group. Going north- ward the beds of limestone diminish in thickness, with a proportional inerease in the interealated sandstones and shales, until in Scotland they are entirely subordinate to a mass of eoal-bearing strata, which forms the most pro- duetive members of the Seoteh coal fields. The next member of the series is a mass of coarse sandstones, with some slates and a few thin eoals, known as the Mill- stone Grit, which is about equally developed in England and in Seotland. In the southern coal-fields it is usually known by the miners' name of Farewell Rock, from its marking the lower limit of possible coal working. The Coal Measures, forming the third great member of the car- boniferous series, consist of alternations of shales and sand- stones, with beds of coal and nodular ironstones, which together make up a thiekness of many thousands of feet— from 12,000 to 14,060 feet when at the maximum of deve- lopment. They are divisible into three parts, the lower coal measures, the middle or Pennant, a mass of sandstone eon- taining some coals, and the upper coal measures, also eon- taining workable coal. The latter member is marked by a thin limestone band near the top, containing Spirorbis carbonarivus, a smal! marine univalve.

The uppermost portion of the eoal measures consists of red sandstone so elosely resembling that of the Permian group, which are next in geological sequence, that it is often difficult to decide upon the true line of demareation between the two formations. 'These are not, however, always found together, the coal measures being often covered by strata belonging to the Trias or upper New Red Sandstone series.

The areas containing productive coal measures are usually known as coal fields or basins, within which coal occurs in more or less regular beds, also called seams or veins, which ean often be followed over a considerable length of country without change of character, although, like all stratified rocks, their continuity may be interrupted by

faults or dislocations, also known as slips, hitehes, heaves, or troubles (fig. 2),

ate: – xX

Fra, 2, representing a seam of coal &, worked towards m, interrupted by faults or hitches, The fault at AC is called an upthrow, that at BD a downthrow.

The thickness of coal seams varies in this country

COAL AQ

from a mere film to 35 or 40 feet; but in the south of France and in India masses of coal are known up to 200 feet in thickness. These very thiek seams are, however, rarely constant in character for any great distanee, being found eommonly to degenerate into carbonaceous shales, or to split up into thinner beds by the intercalation of shale bands or partings. One of the most striking examples of this is afforded by the thiek or ten-yard seam of South Staffordshire, whieh is from 30 to 45 feet thick in one eonnected mass in the neighbourhood of Dudley, but splits up into eight seams, whieh, with the intermediate shales and sandstones, are of a total thiekness of 400 feet in the northern part of the eoal-field in Cannock Chase. Seams of a medium thiekness of 3 to 7 feet are usually the most regular and continuous in eharaeter. Cannel coals are generally variable in quality, being liable to change into shales or blaek-band ironstones within very short horizontal limits. In some instances the coal seams may be changed as a whole, as for instanee in South Wales, where the coking coals of the eastern side of the basin pass through the state of dry steam coal in the centre, and become anthracite in the western side.

British Coal-fields.

There are about twenty principal eoal-fields of Great Britain, besides several smaller ones, whose position is shown in Plate I., which may be classed under three heads:—1. Those forming complete basins, entirely eir-eumseribed by the lower members of the carboniferous series; 2. Those in which one limb of the basin only is visible, the opposite one being obseured by Permian or other strata of newer date; and 3, Those in which the boun-daries are formed by faults, which bring down the upper overlying strata into eontaet with the eoal measures. The South Wales and Dean Forest basins are examples of the first of the above elasses, the North of England and Yorkshire and Derbyshire fields of the seeond, and the South Staffordshire of the third. The last two elasses are of the greatest geologieal interest, as giving rise to the important problem of their probable extension within workable limits beneath the overlying strata. Examples of the three different cases are given in Plate II.,—the first being represented by the section aeross the Forest of Dean, fig. 1 ; the second by that of the Laneashire eoal-fields, fig. 2; and the third by the North Staffordshire section, fig. 3.

The largest and most important of the British eoal-fields South

is that of South Wales, which extends from Pontypool in Monmouthshire on the east, to Kidwelly in Pembrokeshire, a length of about 50 miles, and from Tredegar on the north to Llantrissant on the south, a breadth of about 18 miles, in addition to whieh a further narrow slip of about 20 miles long, E. and W., extends across Pembrokeshire. Exeluding the latter portion, it forms a complete basin of an approximately elliptieal shape, surrounded by older roeks, the Carboniferous limestoue and Devonian shale dipping generally towards the centre. The basin-shaped structure is, however, modified by a eentral antielinal axis, which brings the lower bed within reach of the surface. The total thickness of the eoal measures is estimated at about 11,000 feet on the south, and 7000 feet on the north side in the western district. In the eentral portion between Britton Ferry and the River Taff, it diminishes to 4800 feet on the north side, and is still further reduced in Mon- mouthshire and on the eastern side generally to about 2500 feet. The coal-bearing portions are divisible into three groups, known as—

1. Upper Pennant series.

2, Lower Pennant series.

3. White Ash series. The Upper Pennant series attains the a ais + iil

ment of about 3000 feet on the south rise of the measures near Swansea; at Neath the thickness is reduced to about 1200 feet, and in Monmouthshire to between 500 and 700 feet, It contains all the free burning and bituminous coals of the Swansea and Neath districts, and the house- coals of Monmouthshire and the eastern districts, which latter contain 26 seams above 12 inches thick, making a total of about 100 feet of coal, an amount that increases westward to 82 seams and 182 feet. The Lower Pennant series averages from 1100 to 1500 feet between the Taff Vale and Llanelly, but on the north side of the anticlinal thickens to 3000 feet. The average total of workable coal in seams which do not exceed 8 feet is 25 feet, among which are some fair steam coals, associated in places with black-band ironstone and good manufacturing and house- hold coals, yielding slack suitable for coking,—the most valuable among them being those of the Rhondda valley. The lowest or White Ash series contains the bulk of the valuable steam and iron making coals which have given the coal field its great reputation. It is about 500 feet thick on the eastern side, and about 1000 feet in the centre of the basin. The coals and accompanying ironstone are generally thicker and more abundant on the south than on the north coast. The workable coals in this division amount to about 50 feet, in seams varying from 3 to 9 feet in thickness. ‘The western extension into Pembrokeshire belongs to this part of the series; it covers about 70 square miles, extending in a narrow east and west belt, varying from 2 to 6 miles in breadth from Tenby to St Bride’s Bay. The measures are very much dis-turbed, but are probably about 1500 feet, containing in the upper 1000 feet 8 seams of anthracite of about 18 feet total thickness.

The total area of the coal-field is about 1000 square miles, of which amount about 153 square miles lie beneath the sea in Swansea and Carmarthen Bays. Only one square mile is covered by newer formations.

According to the quantity of the coal produced, the area is divided as follows :-—

Bituminous coal district…….se 410 square miles. Anthracite, meets svete cases 410 7a Intermediate, or Semi-Anthracite …180 AF

The most valuable class of South Wales coals is the semi-anthracite or smokeless steam coal of the lower measures, which is in constant.demand for the use of ocean steamers all over the world. It is principally ex- ported from Cardiff, Neath, and Swansea.

The configuration of the ground, owing to the deep north and south valleys of the Usk, Ebbw, Taff, Rhondda, and Neath Rivers, and the longitudinal anticlinal axis, renders the coals of comparatively easy access. The surface rises to a height of about 2000 feet above the sea-level, and in the valleys a greater vertical range is brought. within working limits than is the case in any other coal-ficld of similar thickness.

The Forest of Dean basin is an outlying portion of that of South Wales, from which, as is shown by Ramsay, it has been separated by denudation. It is of triangular form, occupying an area of 34 square miles, between the Wye and the Severn estuary, with a total thickness of 2765 feet and 31 seams, together 42 feet thick, only 9 of which are above 2 feet in thickness. The depth from the surface to the bottom of the basin, in the centre, is about 2500 feet. The lower beds of sandstone and the Carboniferous lime- stone contain considerable quantities of brown hematite, in irregular deposits, which is smelted in part on the spot and partly exported to other districts. Owing to the symme- trical basin-shaped form of the measures (Plate II. fig. 1), the coals have been worked from the surface downwards along the outerops of the seams, leaving large hollows for

the accumulation of water, which render the working of the lower ground difficult, on account of the great pumping- power required to keep down the water flowing in from the

old shallow mines. North of the Malvern Hills a straggling patch of coal

measures extends about 35 miles N. and 8., from near Worcester to Newport in Shropshire. This is divisible into two nearly equal areas of triangular form. part is known as Forest of Wyre, and the northern as Cole-brookdale.

The southern

The former is unimportant, having a great thickness of measures which rest directly on the Devonian rocks, but scarcely any workable coal seams. The Cole-

brookdale measures rest upon the Upper Silurian rocks, are

about 800 feet thick, with about 50 feet of coal in 18 seams, and many beds of nodular ironstone, which has

given the district a celebrity in the production of i1ron-

work, especially high-class castings. The eastern boundary

is concealed by overlying Permian strata, and it was for-

merly supposed that‘the productive measures had been removed by denudation on this side; but there is little doubt of their continuity towards South Staffordshire.

To the westward of Colebrookdale are the two small

fields of Leebotwood and Shrewsbury. ‘These lie on the

Silurian rocks. ‘The exposed area of the former extends

to 12 square miles; that of the latter (which stretches in

a crescent shape to the south and west of Shrewsbury) to 18. Both are partly hidden by Permian strata.

The South Staffordshire coal-field extends about 22 miles N. and §., from Rugeley to Halesowen, with a greatest breadth of about 10 miles from Wolverhampton to Oldbury. It is entirely surrounded by New Red Sandstone rocks, which in some places are faulted against the coal measures, render- ing it difficult to decide upon the chances of a profitable ex- tension beneath the visible boundaries. The coal measures rest upon the Upper Silurian rocks, which are exposed at several points within the area, especially at Dudley and the Wren's Nest. 'This district is remarkable as containing the thickest known coal seam in England, the Thick or Ten Yard Seam, which varies from 30 to 45 feet in thick- ness in the neighbourhood of Dudley, but splits up north- wards into several thinner seams in the northern or Cannock Chase district. There are 6 principal seams, with a total of from 57 to 70 feet in 1300 feet of measures. The field was formerly very productive of clay ironstone, but the supply has now considerably diminished. The coals are also subject to curious alterations in places, from the in- trusion of igneous rock, especially in the Rowlcy Hills, near Dudley.

The Warwickshire or Tamworth coal-field is a narrow strip of measures, with a maximum thickness of 3000 feet, extending about 12 miles ina N.W. and S.E. line from Coventry to Tamworth. It contains 5 seams, which are mainly worked for house coal and steam purposes. It is entirely surrounded by New Red Sandstone strata, ex- cept for a short distance near Atherstone, where it is seen to rest upon the millstone grit, which is altered into quartzite by intrusive igneous rocks.

The Leicestershire or Ashby coal-field is an irregular patch of 30 square miles, on the east side of Charnwood Forest, about midway between Leicester and Burton-on- Trent. It has 7 principal seams, and probably rests upon the mountain limestone, except at the eastcrn end, where it may lie upon the old slatey rocks of Charnwood Forest. Southward it extends under the New Red marl towards Leicester. In the centre is a patch of barren measures upon which the town of Ashby-de-la-Zouche stands, after which the coal-field is often named. The eastern side, which contains the mines of Whitwick, Snibston, and Cole- Orton, contains some igneous rocks apparently connected with those of Charnwood Forest, which are not seen on the

Severn Valley coal-fields, . |

S. Stafford shire coa. eld.

Tamwort coal-field

Leiceste! shire cod field.

Derbyshire ind York- shire coal- | : eld,

ENGLAND. |

western or Moira side, which contains the more important workings None of the seams occurring in either division can be identified with certainty in the other, although only a few miles distant. The total thickness of the coal measures is about 2500 feet, the principal seams occurring about the middle, as is also the case in Warwickshire. North of the Trent the carboniferous strata present a more complete and regular development than is seen in the central coal-fields The Carboniferous limestone and millstone grit formations form a central ridge of high moorlands and hills, the so-called Pennine chain, in a gently sloping anticlinal, running nearly north and south from the north of Derby- shire to the borders of Scotland. The coal measures occur on both flanks of this ridge, the largest connected mass being that of the Derbyshire and Yorkshire coal- field, which extends north and south for about 60 miles from Bradford to within a few miles from Derby, where it is covered by the New Red Sandstone formation. The exposed breadth varies from 9 miles at the south end to 99 miles at the north. The measures dip regularly at a low angle to the eastward, and pass under the Permian or magnesian limestone formation, which forms the eastern boundary continuously from Nottingham through Worksop

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eastern limb of a basin having a gencral westerly dip, which carries them in a short distance below the New Red marl plain of Cheshire.

The Lancashire coal-field is of an irregular four-sided Lancashire form. The greatest breadth, from Oldham on the east to coal-field.

Saint Helen's on the west, is about 52 miles, and the length, from Burnley on the north to Ashton-under-Lyne, about 19 miles. Within the area are, however, two large islands of the millstone grit, which divide the northern or Burnley district from the main coal-field of Wigan and Manchester. This barren area is about compensated by a tongue of coal measure, which extends southward from Stockport to Macclesfield. The thickness of the measure is very great, and as the ground is much broken by faults, and the beds dip at a high angle, the workings have extended a greater depth than in any other district, the deepest workings being at Rosc Bridge pits near Wigan, which have been sunk to 815 yards, and at Dukinfield, east of Manchester, where the Astley pit is 672 yards deep, and the coals have been wrought to a total depth of 772 yards by inclines. The greatest thickness is observed in the Manchester dis- trict, where the total section is as follows, according to Hull.

and Doncaster to Wakefield. The total thickness of ; . (limestone series, ...6 600 feet. measures is about 4000 feet (with about 20 seams), be- See To Oppenshaw Coal, ... 600 ,, longing to the middle and lower ganister series, the upper Eee eed ne : a " series being absent. A generalized section of the strata in | Middle Coal Measures) taknown Strata, seers: » this coal-field is given in the fifth column of fig. 1. The i Bea = Lote a :. a " rincipal seams are the Black shale, or Silkstone, from 5 ower Coal Measures ack Mine to Royley Mine, 897 ,, tp 7 feet thick, which is extensively worked as a house Ser feet. (Royley Mine to Rough Roek, BA " coal, and the Top hard, or Barnsley coal, which is much | Yimestone Shale, about -vessecsesseseeseeesecsseessessees 2000. 4,

used for steam purposes. At the north end of the field, in the neighbourhood of Leeds and Bradford, two thin seams, known as the Low Moor black bed and better bed, remarkable for their exceptional purity, are used for iron-making purposes at Bowling and Low Moor, Tron ores are also found in considerable quantity on the Derbyshire side of the field, which are smelted at

There is a total of 100 feet of coal in workable seams (exceeding 2 feet), which are chiefly situated in the 3000 feet forming the bottom of the middle and top of the lower coal measures. In the Wigan district there are 18 workable seams, about 65 feet in all, the total section being :—

Butterly and other works near Chesterfield. The area Upper Measures, barren,.....-.4ss00004 1500 feet. covered by the magnesian limestone formation has been Middle Measures, mass seams, ... 2550 ,, Ganister Meg Sunes) cccc.0.. cesesecseo «se ESO,

proved by several borings and sinkings, the first winning having been opened at Shireoak near Worksop, where the Top hard coal was reached at 1548 feet below the surface. It is estimated that about two-thirds of the total area of this field is to be looked for within the concealed part.

On the west side of the Pennine axis, and between the

The Wigan district is remarkable for the production of a large quantity of cannel coal. .

In the Burnley district the lower and middle coal measures together are from 2500 to 3000 feet in thick- ness, the upper mcasures being unrepresented.

The coal-field of Northumberland and Durham lies Northum- north of that of Yorkshire, on the east side of the Pennine berland axis. In the intermediate ground between Leeds and *™¢ Dur

Darlington, about 55 miles, the lower Carboniferous rocks aa

same parallels as the Derbyshire and Yorkshire coal-fields, are those of North Staffordshire and Lancashire, which ex- tend from Longton on the south to Colne on the north, the continuity being, however, broken by a small fold of the

North ; Stafford-

hire coal- field,

Carboniferous limestone shales, which is brought to the surface between Macclesfield and Congleton. Parallel to this group, however, and to the eastward of it, is situated the small but important coal-field of North Staffordshire, also known as the Pottery coal-field. It has an exposed area of about 94 square miles, which is very irregular in form, being 17 miles in greatest breadth E. to W., and about 13 miles from N. to 8S. The south-eastern portion, which is nearly detached, is known as the basin of Cheadle, or Froghall, which is chiefly remarkable for a band of cal- careous iron ore formerly exported to Staffordshire, but now nearly exhausted. The main or western portion con- sists of a mass of strata about 5000 feet thick, with 37 seams of coal, out of which 22, measuring together 97 feet, are over 2 feet in thickness; in addition to which there are inany valuable beds of ironstone, both argillaceous and black-band The strata, which are less regularly arranged than those of §. Lancashire, as will be seen by the trans- verse sections, figs. 2 and 3 in Plate II., being bent in contrasted curves, and much broken by faults, form the

are directly overlain by the magnesian limestone, which preserves the north and south course observed further south until] it reaches the sea at the mouth of the Tyne. The coal-field extends north and south from Darlington through Durham to the mouth of the Coquet, about 65 miles, with a greatest breadth of about 22 miles in Durham. From the Tyne to the Coquet the eastern boundary is formed by the sea, while in the remaining area, from the Tyne to the Tees, which is included in Durham, the coal measures dip beneath the magnesian limestone. The measures are, as a rule, very regular, their dip being lower than that observed in other districts. The total thickness is about 2000 fect, with 16 seams of coal, together about 47 feet thick. The millstone grit is continuously exposed below the coal measures along the eastern edge as far as the Tees, where it is overlapped by the magnesian lime- stone and Triassic rocks, so that there is a portion of the coal-field hidden beyond the exposed southern bound- ary, but the extent is probably not large. The seaward extension has been proved in several deep mincs in the

Cumber- land coal- field,

Denbigh shire and Flintshire coal-fields.

neighbourhood of Sunderland, more especially at Ryhope and Monkwearmouth, which are worked at a depth of about 1850 feet to a short distance from the shore. At these points the coals are nearly flat, but at Harton, near Shields, they rise to the eastward, proving that the eentre of the basin has there been passed. The best estimate gives 11 feet of coal, and about 16 square miles of area, as the probable extent of this submarine portion of the eoal measures. he character of the coal produeed varies in the different parts of the basin. The southern and western districts adjoining Bishop Auckland and Ferryhill produce a strongly caking eoal, whieh is chiefly employed in the manufacture of a pure and dense coke for use in the Cleveland and Cumberland iron works, a considerable amount being also exported for foundry use. The central district, adjoining Newcastle and Sunderland, produces the best class of house coal, known in London under the name of Wallsend, from the pits on the Tyne where it was originally mined, which were close to the eastern termination of the wall built by the Romans to protect the country between the Tyne and the Solway from the incursions of the Picts. These collieries have been long sinee abandoned, but the name is still given in the London market to the best Durham house coals, and even to much that has been produced in other places, as indicating a coal of superlative excellence. The great merit of Wallsend coal is im its small proportion of ash, which also, being dark-coloured, is not so obtrusive on the hearth as the white ash generally characteristic of the Midland coals. The strongly caking property, and the large amount of gas given out in burning, tend to produce a bright and enduring fire. In the district north of the Tyne the produce is principally steam coal, which is known as Hartley coal, being named after one of the principal collieries. It is largely used for sea-going steamers, and was lately in use in the Royal Navy mixed with South Wales coal, a combination which was supposed to give a higher evaporating value in raising stcam than when either class was burnt alone. Although of a lower calorific power, and making more smoke than South Wales coal, the north country coal deteriorates less rapidly than the former when stored in hot climates. There are two small coal-fields in the mountain limestone distriet of the Tyne near Hexham, and another on the Solway at Can- nobie; these are, however, of small importance.

The Cumberland field extends along the coast of the South Irish Channel from Saint Bees northward for 15 miles to Maryport, where it turns eastward for about 17 miles, and is exposed with constantly diminishing breadth until it disappears under the Permian rocks of the Vale of Eden. The greatest breadth is about 5 miles at White- haven and Workington, but, as in Northumberland and Durham, the beds dip and the coals have been worked below the sea to a distance of 14 miles from the shore or 24 miles from the pit. The total thickness of the mea- siires is 1500 feet, with three workable seams. The pro- duce is largely consumed within the district, a considerable portion of the export being to Belfast and other Irish ports.

The coal measures of North Staffordshire and Lanca- shire reappear on the western side of the plain of Cheshire in the coal-fields of Denbighshire and Flintshire, which form a nearly continuous tract from the neighbourhood of Oswestry through Ruabon and Wrexham to the mouth of the Dee, and along the Welsh coast near Mostyn. The separation between them is formed by a slight roll in the mountain limestone near Gresford, corresponding to that dividing the two coal-fields on the eastern out-crop. ‘The Denbighshire field is about 18 miles long, having 7 seams, together from 26 to 30 feet in thickness. The principal workings are near Ruabon, where there are several barge

collieries producing a much esteemed house coal, The Flintshire field is about 15 miles long. ‘The greatest breadth is in the neighbourhood of Mold, whence it nar-

rows in a N.W. direction, being eovered by the estuary of

the Dee. At Mostyn coal has been extensively worked under the river, but great difficulty was experienced in keeping the mines clear of water. The details of the measures in this district have not been fully worked out, but the southern portion is the most valuable. The higher measures eontain six seams, including some valuable beds of cannel, the total being about 28

feet. In the northern district bordering the Dee the beds are much disturbed by faults, but the deeper coals are said to be of good quality.

The basin formed by the North Wales, Lancashire, and North Staffordshire coal-field is probably the most extensive tract of coal measures in the country, as it may be assumed to extend under the overlying Triassic strata under the Dee and the Mersey to South Lancashire and across the plain of Cheshire, an arca of 800 to 1000 square miles, Much of this, however, is far beyond workable limits, the depth to the top of the coal measures being estimated at 10,000 feet below the surface at the point of greatest depression. The area within the limits of 4009 feet below the surface, which has been assumed as a possible maximum working depth, may be seen by refer- ence to Plate I.

There is a small coal-field in the Island of Anglesea, which is interesting for its geological peculiarities, but it is of very small economic value.

The Somersetshire coal-field appears at the surface in the form of several disconnected patches, the largest of which extends northward of Bristol for about 12 miles, while the remainder stretehes southward for about the same distance to the Mendip hills. The Carboniferous lime- stone is seen at many places along the western flank, but the connection is generally hidden by a peculiar modifi- cation of the New Red Sandstone known as the Dolomitic Conglomerate, which overlaps both formations indifferently. Towards the east the measures are further obscured by the overlap of the lias and oolitic rocks, this being the only field in which such an overlap takes place in England. The exposed area of the coal measures is only about 14 square miles, but it is estimated that they extend over 238 square miles, the remainder being concealed by overlying strata. The charaeter of the measures is similar to those of South Wales and Dean Forest, namely an upper and lower pro- ductive series separated by a nearly barren mass of Pen- nant sandstones. The sections, which vary very consider- ably, are summarized by Prestwich as follows :—

Upper series, so… 2600 feet thick, with 16 seams, together 26 ft. 10 in. thick. Pennant sandstone, 2500 to 38000 » & 7s “) “i Lower SCYViCS,....c0008 2800 ,, “n m cle oe) nn 66 6 op Together, ocrserceees 7900 to 8400 46 98 4

The disturbance of the strata by faults is much greater than in any other British coal-field. The whole series is squeezed into a comparatively uarrow trough, which throws the bottom of the basin to about 8000 feet below the surfaec. The coals are in some instances tilted up vertically, or even turned over, a kind of disturbance which is usually attended with considerable shattering of the strata. In one instance the upper scries of measures have been shifted horizontally by an inclined or slide fault for a distance of about .200 feet above the lower series. In spite of the difficulties caused by these disturb- ances, coal seams of only a foot in thickness are regularly worked in Somersetshire, which is far below the limits considered to be profitable in other districts.

The coal-bearing strata of Scotland‘ are confined to the

1 For the following account of the coal-fields of Scotland the writer is indebted to Mr J. Geikie, F.R.5,

Coal-field |

Anglesea, |

Somerset: ” shire coal field,

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Carbonifcrous formation, the only exceptions being the little patch of Oolitic coal at Brora in Sutherland and certain thin seams which occur intercalated among the Miocene voleanic rocks of the Western Islands. The Scottish Car- boniferous Formation is divisible into four series, viz.,— 1.

Coal Measures; 2. Millstone Grit; 3. Carboniferous Limestone series; 4. Calciferous Sandstone series. Coal is confined chicfly to the first and third of these groups, but in West Lothian and Mid-Lothian the lowest (calciferous sandstones) yields some coals, one of which has been worked (Houston coal, 6 feet thick). These coals are associated with the well-known " oil-shales," forming a peculiar deve- lopment of the upper portion of the calciferous sandstone series which is not repeated elsewhere in Scotland. The millstone grit contains no workable coals. The coal bear- ing strata of the coal measures and limestone series are irregularly distributed over the central or lowland district of the country between a line drawn from St Andrews to Ardrossan, and a second line traced parallel to the first from Dunbar to Girvan. Throughout this region the strata are disposed in a series of basins, of which there are properly speaking only three, namely,—(1) The basin of Mid-Lothian and Fifeshire, which is bounded on tho west by the calciferous sandstone series and some older strata, forming the Pentland hills, Arthur's Seat, the rolling ground that extends west of Edinburgh into Linlithgow- shire, and the heights behind Burntisland in Fifeshire, and in the east by the barren sandstones and igneous rocks of the calciferous sandstone series in the east of Hadding- tonshire and Fifeshire; (2) The basin of Lanarkshire and Stirlingshire, the eastern boundary of which begins in the south at Wilsontown, and runs north by Bathgate and Borrowstounness to the borders of Clackmannan, extends west to the foot of the Campsie and Kilbarchan Hills, and is separated by the Paisley and Dunlop Hills from (3) the basin of Ayrshire, the main mass of which is bounded in the south and east by the valley of the Doon, the Silurian uplands behind Dalmellington and New Cumnock, and the calciferous sandstone and Old Red Sandstone heights which overlook the heads of the Ayr and Irvine valleys. Two small outlying coal-fields lie beyond these boundary lines, viz., the Girvan and Sanquhar (Dumfriesshire) coal- fields, but both belong geologically to the Ayrshire basin. Although there are thus only three great basins, it is usual, nevertheless, to speak of five principal coal-fields, each of which is named after the county in which it is most abundantly developed. 'Thus we have the coal-fields of Ayrshire, Lanarkshire, Stirlingshire, Fifeshire, and Mid- Lothian.

Ayrshire Coat-fields——The Ayrshire basin, owing to undulations and faultings of the strata, comprises a number of subsidiary coal-fields, such as

those of Girvan, Sanquhar (Dumfriesshire), Dalmellington, New Cumnock, Lugar and Muirkirk, Kilmarnock, Kilwinning, Dalry, &c. The coal measures of this basin are of variable thickness; they contain from 5 to 8 and 11 principal coal-seams, yielding a united thickness of from 13 ft. to 40 ft. The Carboni- ferous limestone series of Ayrshire sometimes contains no Workable seams of coal, while occasionally its seams equal or surpass in number and thickness those of the coal mea- sures. 'Thus in the Girvan field there are 7 coals with an aggregate thickness of 50 feet, while at Muirkirk the same number yield a thickness of 40 feet of workable coal. The Ayrshire coals consist chiefly of common coals, including "3 hard " or "splint" and " soft" varieties. In some districts the intrusion of igneous rocks has converted certain seams into "blind coal," a kind of anthracite, much used for Steam purposes. Gas or parrot coal (so called from its decrepitating or chattcring when heated) is met with here and there, chiefly near New Cumuock, Parrot coal often

occurs in thin lines or bands, which, when intercalated and alternating with dark carbonaceous ironstone and coaly matter, form seams of what is called black-band ironstone. The Ayrshire black-bands occur chiefly at Dalry, Lugar, and Dalmellington.

Lanarkshire Coal-fields—These are the most extensive in Scotland, covering an area of not less than 150 square miles. The coal measures, which attain a thickness of upward of 2000 feet, contain about 18 workable coals; but all these are not continuous throughout the whole coal- field, while some are too thin in places to pay the cost of working. At their best they yield an aggregate thickness of 70 feet or thereabout, but in many places they do not average more than 40 or 30 feet, or even less. The lime- stone scries is well-developed in the Lanarkshire coal-fields, but it is a very variable group, as indecd is the caso throughout Scotland. It consists of upper, middle, and lower groups, the coals being confined chiefly to the middle group, only one or two seams occurring in the lower, while in the upper only one seam occasionally attains a workable thickness. The principal coals of the limestone serios vary in number from 1 to 9, their

aggregate thick- ness seldom reaching more than 15 feet. The Lanarkshire coals consist chicfly of varieties of common coal, namely, hard or splint, soft, dross, &c. But here and there exccl- lent gas coal is worked, as at Auchenheath, Wilsontown, &c., the former being considered the finest of all the Scotch gas coals. Another well-known parrot coal is that of Bog-head near Bathgate, the subject of much litigation. Par- rot or gas coal frequently occurs forming a part of mussel- band and black-band ironstones, which seams, when traccd along their crop, are often seen to pass into gas coal. The best known blackbands are those wrought at Palacecraig, Airdrie, and Quarter, Bellside, Calderbraes, Bowhousebay and Braco, Goodockhill and Crofthead, Earnockmuir, Possil, Garscadden, and Johnstone.

At Quarrelton, Renfrewshire, an abnormal devclopment of coal seams occurs below the horizon of the main or Hurlet limestone, which is usually the lowest important bed in the limestone series. The strata underlying that limestone contain here and there irregular lenticular patches of coal, never of any valuc. At Quarrelton, how- ever, a number of these seams come together, and form a niass of coal more than 30 feet thick.

Stirlingshire Coal-fields,—These embrace the coal-fields of Falkirk, Carron, and Grangemouth, Slamannan, Clack- mannan, and Borrowstounness. In theeFalkirk, Carron, and Grangemouth fields, the coal measures are about 600 feet thick, and contain 9 workable scams of coal, yielding an aggregate thickness of 30 or 31 feet; the thickest seam is only 4 feet. In the Slamannan field, the coal measures are some 720 feet thick, and show 6 workable coals, yielding an aggregate thickness of 15 or 16 feet, the thickest seam being 44 fect. A small outlicr of coal measures at Concy-park, however, gives a depth of 1140 feet of strata, con- taining 12 workable coals (two of which are 7 feet thick re- spectively), which yield an aggregate thickness of 44 fcet. The coal measures of the Clackmannan district attain a thickness of 900 feet, and yield 10 workable seams of coal (thickest seam 9 feet) with an united thickness of 41 fect. The limestone measures of the Stirlingshire basins contain, as a rule, few coal seams. Where these are best devcloped, they vary in number from 5 (Bannockburn) to I! seams (Oakley); and their aggregate thickness ranges from 114 feet to 37 feet. ‘The coals embrace the variety usually met with in Scotland, viz.,

hard (or splint) and soft coals, some of the seams being good caking coals. Good gas coal was formerly obtained at Oaklcy; and other coarse parrot coals occur in various parts of the fields. Oil shale and black-. band ironstone are also wet with. The coal-field of Bor-

Lanark- shire,

Stirling, shire,

Mid- Lothian,

Fifeshire.

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rowstounness is remarkable for containing thick sheets of basalt rocks, which are of contemporaneous origin, and do not alter the beds that rest upon them.

Mid-Lothian and Fifeshire Coal Iields.—The Mid- Lothian coal field is disposed in what are for Scotland unusually symmetrical and unbroken lines. The basins lie with their principal synclinal axes from north to south. In the deepest basin the coal measures lie in a trough 2} miles broad and 9 miles in length, stretching from the sea at Musselburgh through Dalkeith to Carrington. The trough is underlaid by the millstone grit (Roslin Sandstone or Moor Rock), whose outcrop surrounds that of the coal measures in a band rarely more than half a mile broad. ‘The Carboniferous limestone series rises from beneath the basin of millstone grit and coal measures on its west side, and crosses at a high angle, in a band about a mile in breadth, through Portobello, Gilmerton, and Penicuik. South of Penicuik the millstone grit forms another basin at Auchencorse Moss, but the trough is not deep enough to bring in the coal measures. West of Dalkeith the limestone series forms a shallow undulating basin with an outcrop of about 7 miles broad, extending from the sea at Cockenzie by Tranent and Pathhead. The Dalkeith basin of the coal measures has a total thickness of 1180 feet. There are 14 coal seams of a workable thickness, with an ageregate of 43 ft. 4 in. The limestone series of Mid- Lothian contains numerous coal seams. The total thick- ness of the series is 1582 feet, with 23 workable coal seams, aggregating 68 ft. 3 in. The “great seain ” averages between 8 and 11 feet, and in one place is 12 ft. 6 in. thick. ‘The coals of the Mid-Lothian basins are of the usual varieties met with in Scotland. The basins of the Mid- Lothian coal-fields reappear on the southern coast of Hie, and are undoubtedly continuous (though somewhat de- nuded) bencath the Firth of Forth. A segment of the western half of the coal measures

trough (the prolongation of that of Dalkeith) extends from Dysart by Markinch, Kennoway, and Largo Bay. On the north this trough is bounded by faults, and on the east and south it is covered by the sea. Measured from Coaltown to Methil (at right angles to the line of strike) the thickness of the coal measure strata exposed to view may be roughly estimated at 4600 feet; but as the centre of the basin is not reached at the coast, the total thickness of strata is not seen. There are about 11 workable seams, with an aggregate of 61 feet. The Dysart Main coal is 16 feet thick. Another little basin, comprising the lower seams of the coal measures, occurs at Kinglassie. The Dysart or Leven coal measure basin occupies about 18 square miles, and that of Kin- elassie from 3 to 4. The limestone series of Fife lies in several much broken basins on the south side of the Ochils and Lomond Hills from Alloa to Earlsferry. The prin- cipal coal fields in this series are those of Dunfermline, Halbeath, Lochgelly, and Kelty; but coals have been worked in many other places, as at Ceres, Radernie, Largo Ward, Markinch, &c. The coal-bearing strata vary in thickness, but do not exceed 600 feet. In the Dunfermline coal-ficld there are 10 scams, with an ageregate thickness of 41 feet. Halbeath coal-field yields 8 seams, with an aggregate thickness of 293 feet; Lochgelly coal-field contains some 14 seams, with an ageregate thickness of about 65 feet; in the Kelty and Beath coal-field there are 12 seams, yielding an aggre- gate of 431 feet. The workable seams in these separate ficlds range in thickness from about 2 feet up to 10 and 14 feet, The 14 feet coal of Lochgelly is divided by thin ribs of stone, which thicken out eventually so as to divide the coal into 5 separate workable seams, which, with the inter- vening strata, yield a thickness of 10 fathoms of strata. It is worth noting that, in the lower Carboniferous rocks

of Fifeshire, two coals are worked at Balcarmo and else- where. As a rule, this series in Scotland is barren.

The carboniferous strata of the Carboniferous limestone, which covers the greater por- tion of the island in one connected mass. The coal measures have probably been at one time nearly as exten- sive, but they have been almost entirely removed by denudation, the largest remaining basins being

that of Castlecomer, near Kilkenny, and another in the west, between Tralee, Mallow, and Kilarney. In the north the small basin of Coal Island, on the west side of Lough Neagh, is partly covered by New Red Sandstone strata, and trials have been made to discover a possible extension of the coal measures in the valley of the Lagan, between Belfast and Lisburn.

The two coal fields of South Wales and Somersetshire Probable

differ from those of the central and northern counties in their strike or direction, their longer axes being placed east

and west, instead of north and south, which is the prevail- jneland,

ing direction of the latter,—the strata in the Somersetshire area being sharply bent and broken on a north and south line in a manner which is not seen elsewhere in this country, but is reproduced on a much larger scale in the north of France and Belgium. The most easterly point in England at which the coal measures have been worked is near Bath, where the overlying Liassic and New Red Sand- stone strata are about 360 feet thick, beneath which the coal has been followed for some 5 or 6 miles from the outcrop. From this point nothing certain is known of their extension until we reach the neighbourhood of Valen- ciennes, where a coal field, known as that of Hainault and Valenciennes, extends with a general east and west strike as far as Namur, a distance of 65 miles. At Namur the width is about 2 miles, near Charleroi from 7 to 8, and through the north of France from 6 to 7. Only the eastern half, between Charleroi and Namur, comes to the surface, the western portion being covered by Tertiary and Creta- ceous strata. Within 30 miles of Calais the coal measures end, the shales of the Carboniferous limestone having been pierced in a boring of 1113 feet deep at the latter place. East of Namur the coal measures come in again at Liége, continuing for about 45 miles, with a width of from 3 to 8 miles to beyond Aix la Chapelle, where they are divided by a ridge of Carboniferous limestone into two parallel basins, covered by Cretaceous and newer deposits, till they appear again on the right bank of the Rhine in the valley of the Ruhr, in the great Westphalian basin, which is probably the largest in Europe.

The same general structure is apparent along the whole of this line, which, from the western end of the South Wales basin to Frome, and from the N. of France to the Ruhr, is about 470 miles long. The measures generally dip regularly from N. to S. along the northern line of out- crop where it is known, but on the southern side they are bent into sharp folds by the elevation force which has up- lifted the underlying Carboniferous limestone and Devonian strata along an east and west line, extending from the old slaty rock of the Ardennes to the Mendip Hills and the western part of Pembrokeshire. The known coal fields extend for about 350 miles out of thé above amount.of 470, and from the similarity of their position and structure many geologists are of opinion that other basins similarly placed may be reasonably supposed to exist in the intermediate ground between Somersetshire and Belgium. This subject has been treated in great detail by Mr Godwin Austen and Prof. Prestwich in the Reports of the Royal Commission upon Coal. The probable direction of this axis is shown on the map, Plate I. The only actual determinations of the rocks made within this area have been in two borings at Kentish Town and Harwich. In the former,

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CONTINENTAL EUROPE. |

sandstones, supposed to be of Devonian age, were reached below the Cretaceous strata at 1113 feet, and in the latter the Carboniferous limestone shale at 1025 feet. The most likely positions for the coal measure trough are con- sidered by Prestwich to be in Essex and Hertfordshire, while Mr Godwin Austen places them in the valley of the Thames or under the North Downs. The latter seems to be the more probable than the line further north. The point, however, is purely speculative in the absence of any trial borings as guides; and a great number of these would certainly be required before any generalization as to the position of workable coal measures even within a wide range could be accepted. The deep boring on the southern part of the Wealden area, near Hastings, which it was sup- posed would have thrown a considerable amount of light on this matter, has hitherto been without other result than the proof of the existence of a totally unexpected and exceed- ingly great thickness of the upper Oolitic clays, similar to what is known on the French coast, near Boulogne.

On the south side of the Mendip axis a very large area in Devonshire is occupied by the lowest coal measures or culm series, which consist almost entirely of clay slates, with a few beds of anthracite in the northern portion of the district, near Barnstaple and Bideford. These are only worked to a small extent, their principal use being, not for fuel, but as a pigment for covering iron-work, which is known as Bideford black.

The coal-bearing areas of Secondary and Tertiary age in the United Kingdom are of very small importance. In Devonshire a lignite-bearing series of strata of Miocene age occurs in the flank of the granite of Dartmoor at Bovey Tracey, near Newton Abbot. This is principally remarkable for its associated clays, which are derived from the waste of the granite, and contain numerous impressions of dicotyledonous Jeaves and other plant remains. The coal is a lignite resembling a mere heap of tree stems drifted together and partially decomposed. It is not now worked, the original excavations being filled with water; and as the demand is restricted to supplying the wants of the local potteries, there is no opening for profitable mining.

In the Great Oolite of Yorkshire, some thin seams of coal or lignite were formerly worked at numerous points upon the moors between the Cleveland Hills and the Vale of Picker- ing. The most important product of this district, however, is the jet which is obtained from the waste of coal-bearing strata of the same age along the cliffs near Whitby, where it is manufaetured into ornaments. The largest Oolitic coal deposit in this country is that of Brora in Sutherland, where a seam of about 34 feet in thickness has been worked at intervals for a considerable period, but never to any considerable extent except during the prevalence of high prices in the coal trade.

COAL

5d larly divided into two groups according to their geolo- gical structure, the first being those in which the series is complete, the coal measures being symmetrically arranged upon the Carboniferous limestone and Devonian strata. Examples of this structure are afforded by the long line of coal-fields extending through the north of France and Belgium to the Rhine valley ou the north side of the Ardennes, and those of the more easterly district of Silesia and of the north of Spain. The remaining and far more

numerous European coal-fields are either contained in hollows in crystalline schists, or rest on the older Paleozoic rocks, ¢g., the central and southern French basins, and those of Saxony and Bohemia. Further east, in central and southern Russia, the order observed in Scotland is reproduced, there being a large development of coal in Car- boniferous limestone strata, and something of the samc kind seems to be probably the case in China.

The best developed portions of the Franco-Belgian coal- field are seen within the territory of Belgium, the westerly extension into France being entirely covered by a great thickness of newer strata. Commencing at the eastern side, the first field or basin is that of Lidge, which extends from the Prussian fronticr near Verviers in a S.W. direction for about 45 miles, the greatest breadth being about 9 miles near Liége. The principal working points are concentrated on the western edge, where the lower beds rest on the Carboniferous limestone, the eastern portion being partly covered by Cretaceous and Tertiary strata. The number of coal seams is 83, the upper serics of 31 being so-called fat coals, suitable for coking and smiths' fires; the middle series of 21 scams are semi-dry or flaming coals ; and the remainder or lower serics of 31 are dry, lean, or semi-anthracitic coals. The upper serics, which are the most valued, are found only in a small arca near the centre of the basin at Ougrée, near Lidge. The seams vary from 6 inches to 54 feet in thickness, the average being barely 3 feet. This order of succession is observed in the whole of the districts along this axis. The same general structure also prevails throughout the strata which have a comparatively small slope on the northern crop, and are very sharply contorted, faulted, or broken along on the south side of the basins. The local terms platteurs and dressants are used to distinguish the flat and steep portions of the coals respectively.

The next basin, that of the Sambre, extends for about 30 miles from Namur to Charleroi, the greatest exposed breadth being about 94 miles. The western and a greater part of the northern side are covered by Tertiary strata, which are very heavily watered. At Montcean, near Charleroi, there are 73 seams, which pass through tlie various conditions of fat, flaming, and dry coals, from above downwards, according to the order already described.

Franco- Belgian coal-field,

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cae The most important development of the coal measures | Second-

in Belgium is in the basin of Mons, which extends from

Another area in which coal is found in strata of Second- ary age is that of Scania, near Helsingborg, in south-

western Sweden,in the three coal-fields of Hoganas,Stabbarp, and Réddinge. These are situated in the uppermost Triassic or Rheetic series. At the first, which is the most im- portant locality, the strata vary from 100 to 800 feet in thickness, with two seams of coal respectively 1 and 44 feet in thickness. There is a good fire-clay associated with the lower seam, which is extensively worked for fire bricks and pottery, a large proportion of the coal being used on the spot. In the Danish Island of Bornholm similar coal-bearing strata, probably of Liassic age, form a narrow belt along the south and south-west coast, which it is supposed may continue under the alluvial plain of the Baltic into Pomerania.

The Coal-fields of the Continent of Europe.

The coal-fields of the continent of Europe, though more scattered and disturbed than those of England, may be simi-

Mons to Thulin, a length of about 14 miles, with a breadth)

of about 7 or 8 miles, a large portion of the area being covered by newer strata. The number of known coal seams is 157, out of which number from 117 to 122 arc con- sidered to be workable, their thickness varying generally between 10 and 28 inches, only a very few exceeding 3 feet. These are classified, according to position, into the following groups, which arc taken as a standard for the whole of the north of France and Belgium :—

1. Upper series (charbon jlenu), 47 scams. These, which occur chiefly in the neighbourhood of Mons, are very rich bituminous coals, especially adapted for gasmaking.

2. Hard coal series (charbon dur), 21 seams. These are, in spite of their name, soft caking coals, less rich in volatile matter than the flenu, but excellent for coking purposes.

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3. Forge coal series, 29 scams. ‘These arc chiefly used for smithy purposes and iron works, but the lower mem- bers approximate to dry steam coals.

4, Dry or lean coals, 20 to 25 seams, forming the bot- tom series. Thcy are of small value, being chiefly used for brick or lime burning.

The amount of compression to which the strata have been subjected in these coal-fields, has caused them to be sharply contorted into zig-zag folds. In the neighbour- hood of Mons a single scam may be passed through six times in a pit of 350 yards vertical depth, and the strata, which if flat would be 9 miles broad, are squeczed into a space 7 miles across and about 8200 feet deep to the bottom of the basin. At Charleroi the compression 18 still greater, a breadth of 82 imiles of flat strata being nar- rowed to rather Jess than half that quantity by contortion into 22 zig-zag folds.

The thickness of the overlying Tertiary and Cretaceous strata in the neighbourhood of Mons is from 500 to 900 feet; towards the French frontier the thickness is between 900 and 400 feet, and at Valenciennes about 250 feet. ‘At Aniche these overlying measures, or ¢errains morts, are 40) feet thick, below which the coal measures are found to contain 23 feet of coal in 12 seams. At Anzin, near Denain, there are 18 seams, together 39 feet, which is about the maximum development in the north of France. This coal-field, which was unknown before 1734, has reached a very high state of production in spite of great difficulties interposed by the water-bearing strata covering

he coal measures. It extends for about 45 miles, dimi- nishing in extent and value to the westward. The struc- ture is very similar to that of the Belgian, one of the most remarkable features being the inclined fault called the cran de retour, which brings the lower or dry coal serics of the north side against the higher coking coals of the south sidc, as shown in the scction, Plate Il. fig. 4,

At Hardinghen, near Boulogne, a small patch of disturbed coal strata was formerly worked. These are now supposed to be of the age of the Carboniferous limestoue.

The coal-fields of central and southern France are mostly small in area and irregular in structure, with at times remarkable single accumulations of coal of enormous thick- ness, which do not, however, extend for any distance. The most important basin is that of Saint Etienne and Rive de Gier, south of Lyons, on the right bank of the Rhone. It is of triangular form, about 28 miles long, with a base of 8 miles, The thickness of the three principal seams at the latter place is about 33 fect, but at Saint Etienne there are from 15 to 18 seams, making together about 112 feet in a total depth of measures of about 2500 feet.

The basin of the Sadne et Loire, near Chalons and Autun, is about 25 miles long ina S.W. and N.E. line. At Creusot, on the north crop, the coals, which are in places extremely thick (the main seam averaging 40 feet, but occa- sionally swelling out to 130 feet), dip at a high angle below a covering of New Red Sandstone strata, and appear in a modi- fied form, bothas regards thickness and position, on the south side at Blanzy. An attempt has been made to prove the continuity of the scries in the bottom of the basin by a deep boring, which was, however, abandoned at a depth of over 3000 feet without passing through the overlying strata. At Montchanin a remarkable seam or mass of coal was found extending for about 650 yards, with a thickness varying from 60 to 200 feet at the surface, which, however, di- ininished to one half 60 yards down, and wedged out at 140 yards deep. Another coal field of considerable im- portance is that of Alais and Grand Combe near Nimes, which is partly covered by Liassic strata, and has a total maximum thickness of 80 feet of coal.

In addition to these must be mentioned the anthracitic

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series of the Alps, which extend along the flanks of that chain from Savoy and the Tarentaise into Styria and Carinthia. They are of small economic importance.

paratively small importance. other places, and Fuveau near Marseilles.

The coal-fields of Prussia, situated on the extension of Germany, the Franco-Belgian axis, are the two small basins of the Inde and Worm, east of Adelnau, near Stolberg and Esch-

({coAL-FIELDS.

The Secondary and Tertiary coals of France are of com- Lignite is worked, among near Dax in the Pyrences, and at ‘Trets

weiler, which are included in single sharply sloped folds

of the mountain limestone, and the great Westphalian basin east of the Rhine, in the valley of the Ruhr. latter, which is one of the most important in Europe, extends for about 30 miles east and west from Essen to Dortmund. ‘The breadth is unknown; the beds are exposed for about 15 miles at the broadest part, but the actual boundaries to the north and north-east are hidden by Creta- taceous rocks. The greatest depth from the surface to the

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bottom of the basin is probably about 5000 feet. It is divided lengthways by transverse axes of elevation into four principal basins, besides several smaller ones. The

total thickness of measures already proved is from 6000

to 8000 feet, with about 130 seams of coal, together about 300 feet thick. These are divided into three scries by two bands of barren measures. The thickness of the individual coal seams varies from 8 inches to 7 feet. Seventy-six are considered to be workable, having a combined thickness of 205 feet, and 54 are unworkable, containing 42 feet of coal. ‘The proportion of workable coal to the whole thickness of strata is as 1 to 33. ‘The order of succession as regards quality is similar to that observed in Belgium, the most highly valued gas and coking coals being at the top of the series, and the dry semi-anthracitic seams at the bottom. On the south side of the axis

of the Rhenish De- yonian strata, which is the high ground known as the Eifel and Hunsruck, carboniferous strata reappear in what is known as the Pfalz-Saarbriicken basin, occupying a rect- angular area between Bingen, Donnersberg, Saarbriicken, and Mettlach, about 60 milcs long and 20 miles broad, the productive coal measures being restricted to a triangular space of about 175 square milestin the 8.W. corner. The Carboniferous limestone is absent, but the thickness of the coal measures is very great, the upper or Ottweiler series measuring from 6500 to 11,700 feet, with about 20 feet of coal in different parts of the district, and the lower or Saarbriicken series from 9000 to 5200 feet, with 82 workable and 142 unworkable coal scams, making a total of about 350 to 400 feet of coal. The greatest thickness of the upper strata is found in those localities where the lower are thinnest, but the total thickness is computed to be about 20,000 feet in the thickest known section. The coals of the lower division are divided into groups by certain well- marked horizons, usually prominent seams, which have this peculiarity that the best coking and gas coals are found in the bottom of the series, and the drier ones at the top, thns reversing the order observed in the basins on the northern slope. The amount of hygroscopic water in the coal is also found to diminish downwards.

In the district betwcen the Ems and the Weser, are situated the small coalfields of Ibbenbiiren, on the easterly extension of the Westphalian basin, and the Piesberg, near Osnabriick, which are of true Carboniferousage. Besides these, there is a curious development of coal in the Weal- den strata which extend in a narrow discontinuous band KE, and W. for about 150 miles. The coals are or have been worked at Tecklenburg and Borgloh in the Teutoburger Wald, at Biickeburg in Schaumburg, and in the Osterwald south of Hanover. The coal scams are small and of infe- rior quality, but are intcresting as showing how nearly the

conditions prevailing at the time of tle older coal measures were repeated over a part of the same area in Cretaceous times. There are traces of thin discontinuous coal-beds in the Wealden strata of Sussex, but nowhere approaching to the extent of those in the Wealden strata of N. Germany.

In the low ground north of Halle, small and irregular patches of coal measures are found at Wettin, Lobejun, and Plétz. These are probably the remains of a single coal-field which has been disturbed and broken up at the time of the eruption of a great mass of igneous rocks which is found in a nearly central position between them. The coal measures are also found in the Thiringer Wald, the Schwarzwald, on the south side of the Harz, and in the Bavarian Oberpfalz, but none of these localities are im- portant as centres of production. In Saxony there are two principal coal-fields, the first being that of the Plauens'che Grund, near Dresden, which is chiefly interesting for the very disturbed condition of the measures, and the conse- quent difficulty in working ; and the other that of Zwickau, which is one of the most important in Europe. It forinsan elliptical basin, about 20 miles long, between Zwickau and Chemnitz, and from 6 to 7 miles in maximum breadth, the greater portion being covered by New Red Sandstone strata. The coal measures, which rest upon old argillaceous schists, are about 1700 feet thick ata maximum, containing 12 principal seams of coal, besides several smaller ones. The inmost important is the so-called soot coal (Russkohle), which at times attains toa thickness of 25 feet. 'The series is divided by Geinitz into groups, according to the prevailing character of the associated fossil plants, as follows :—

1. Zone of Ferns, corresponding to the upper group.

2. Zone of Annularia and Calamites, or middle group.

3. Zone of Sigillaria, or lower group.

A fourth, or Sagenaria zone, found in Silesia, corresponding, to the culm measures of Devonshire, completes this classi- fication,

The most important coal-fields of Eastern Europe are those of Silesia. The Carboniferous limestone series and the lowest coal measures or culin strata reappear in these basins, and are associated with numerous valuable mineral deposits, mainly of zinc and lead ore. The coal-field of Lower Silesia and Bohemia forms a basin between Glatz, Waldenburg, Landshiit, and Schatzlar, about 38 miles long and 22 miles broad. The number of seams from 3} to 5 feet thick is very considerable (from 35 to 50); but it is difficult to trace any one continuously for any great distance, as they are

liable to change suddenly in character. The lower seams usually lie at a higher angle thau those above them. There does not appear to be any relation between the coking power of the coals and their geological position, and the same seam often varies in quality in neighbouring mines.

The upper Silesian coal district extends in several dis- connected masses from Mihrisch-Ostrau in Moravia, in a N.W. direction, by Rybnik and Gleiwitz in Prussia, and Myslowitz in Poland, being held partly by Austria, Prussia, and Russia, the Prussian portion between Zrabze and Myslowitz being the most important, extending over 20 miles in length, by nearly 15 in breadth The greatest thickness of coal in workable seams (from 2} to 60 feet thick) Is estimated at a total of 333 feet, the thickness of the measures being about 10,000 feet. A verylarge proportion of this coal-field is hidden by New Red and Cretaceous strata.

The Tertiary coals or lignites of Germany are of consider- able importance, being distributed over large areas, the seams often attaining a great thickness, although rarely continuous for any great distance. The principal deposits are situated in the lower parts of the valleys of the Rhine and the Elbe, in Nassau, and in the high ground of the Rhon in Bavaria, ‘The lignite district of the Rhine ex-

tends from near Bonn down to Deutz and Bensberg below Cologne. The pigment known as Cologne earth is a sepia- coloured lignite, which can be ground to a fine powder when dried. In Nassau the so-called bituminous wood, a variety of lignite containing flattened masses of wood of a light brown colour, is very common. The produce of these districts is mainly consumed for house fuel and steam boilers, some small quantity having been used for the pro- duction of paraffin and photogen oil.

The coal-fields of the empire of Austria-Hungary are of Austria.

very considerable interest, from the great diversity in their geological position. Coals of Carboniferous age are mainly confined to the northern provinces of Bohemia, Moravia, and Silesia; but in Hungary and the Alpine

lands, especially in Styria, coals of Tertiary age are found, which approach very closely in composition and quality to those of the coal measures.

First in importance among the former class, is the basin of Pilsen in Bohemia, which covers an area of about 300 square miles. It rests upon Silurian shale, and is covered unconformably by Permian conglomerate and sand- stone. The coals vary considerably in different localities ; the total thickness of the workable seams, from 3 to 5 in number, does not exceed 20 feet. There is aremarkable bed of slaty cannel in the upper part of the series, which contains animal remains of Permian types associated with the ordinary coal flora. Another important basin, that of Schlan-Kladno, E. of Prague, appears along the north edge of the Silurian strata, extending for about 35 miles Ji. and W. At Kladno, where it is best developed, it contains two principal seanis, of which the upper is from 10 to 20 feet, and the lower or main seam from 19 to 40 feet thick.

At Rossitz, near Brinn, in Moravia, a belt of coal measure, resting upon crystalline rocks, has been consider- ably worked. There are three seams, together from 27 to 30 feet thick. These beds are said to be the equivalent of the upper scams of Pilsen and Kladno.

In Moravia, Silesia, and Poland the coal measures are associated with the mountain limestone, which in Central Germany, east of Westphalia, is generally absent. The upper Silesian coal-field is situated in Prussia, Austria, Sile- sia, and Russian Poland, the largest portion being in the first country. The area of this basin is about 1700 square miles, a considerable portion of it being hidden by Secondary and Tertiary strata. In the Austrian portion at Ostrau in Moravia thcre are 370 seams, of which 117 are workable, with a thickness of about 350 feet of coal. The largest seams are situated in the upper series, the principal one being about 13 feet thick. The coals of the neighbour- hood of Ostrau are very full of gas, which occasionally finds its way into the cellars of the houses in the town, besides giving off large quantities of fire damp in the workings. A bore hole put down 150 feet to a seam of coal in 1852, gave off a stream of gas which was ignited at the surface, and has continued to burn, with a flame many feet in length, to the present time. The same coal-field extends into the district of Cracow, where it contains numerous seams of great thickness,

which, however, have been but partially explored. In the Austrian Alps anthracitic coals occur at various points along the northern slopes, in strata of the age of the culm measures, but nowhere in any great quan- tity. In the Carpathian countries true coal measures are not largely developed, the principal locality being near Reschitza in the Banat, where 4 seams, from 3 to 10 feet in thickness, are worked to a certain extent.

At Steyerdorf, near Oravicza on the Danube, a remark- able coal-field is found in the Lias. There are 5 seams, from 3 to 7 feet in thickness, which are bent into an anticlinal, besides being disturbed by numerous faults. The coal is of a very good quality, yielding a oe suitable for

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iron-smelting. The annual production is about 260,000 tons. Similar coals occur in the Lias at Drenkowa, and near Fiinfkirchen, where there are 25 workable seams, together about 80 feet thick, also of a good coking quality, but very tender in working, making a great deal of slack. Secondary coals occur in the Trias and Oolitic strata at various points in the Alps, but are only of local interest. In the Gosau strata belonging to the chalk, coal is worked at various points in the Alpine lands, the average annual production being about 25,000 tons. Eocene coals occur in Dalmatia, and Miocene lignite in the Vienna basin in Southern Moravia, one seam, about 10 feet thick, cover- ing an area of about 120 square miles. In the Styria-Hun- garian Tcrtiary basin, Tertiary coals are developed on a very great scale, especially in Styria, at Salgo Tarjan im N. Hungary, and in the depression between the Matra and the crystalline rocks of Upper Hungary. These localities represent only those best known by workings, many more

being undeveloped. The lignite beds are often of great

thickness, ¢.g., 70 feet at Hrastnigg, and 130 feet at Trifail. The production of Tertiary coal in Styria is about 500,000 tons annually.

the local forges.

over 100 feet, The trade in this coal is very considerable along the entire valley of the Elbe.

The coal-fields of Russia have been but imperfectly known until a comparatively recent period, when the de- mand for fuel caused by the extension of railways and the

increase in manufacturing industries has stimulated ex- plorations, which have resulted in the discovery of coal- bearing strata of considerable magnitude and extent. These belong to the period of the Carboniferous limestone, like the lower coals of Scotland.

In Central Russia the coal-bearing area belonging to the Carboniferous limestone is said to cover about 13,000 square miles, the centre of the basin being at Tula, 8. of Moscow. There are two principal seams, 3 ft, 6 in. and 7 feet thick, in the bottom-of the scries near the top of the Old Red Sandstone. The coal is of inferior quality, con- taining about 12 to 16 per cent. of ash, and from 2 to 5 per cent. of sulphur.

In Southern Russia, between the river Donetz and the head of the sea of Azoff, a more important coal-field occurs,

also in the Carboniferous limestone, covering an area of

11,000 square miles. There are sixty seams of coal, forty- four being workable, with a total thickness of 114 feet. The best is a dry or semi-anthracitic coal, resembling that of South Wales. At Lugan and Lissitchia Balka, a thick- ness of 30 feet of coal is found in 900 feet of strata.

In the Ural, coal is found in sandstones, interstratified in the Carboniferous limestone in the district north of Perm, between the parallels of 57° and 60° N. latitude. The strata dip at a high angle to the west, under the Permian strata. The thickest coals are at Lithwinsk at the northern end, where there are three seams worked, measuring from 30 to 40 feet each; further south they become thinner. The coals appear to be similar in quality to those of the central coal-field.

In Poland, about Bendzin and Lagorze, N. of Myslo- witz, an extension of the Upper Silesian coal-field covers an area of about 80 square miles, being partly covered by Permian strata. Nine seams of coal are known, varying from 3 to 20 feet in thickness ; but they do not occur to- gether, except in a small part of the centre of the basin.

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At Leoben and Fohnsdorf, lignites are worked of a quality closely approaching to that of Carboni- ferous coal, and are largely consumed in the production of iron and steel, having almost entirely replaced charcoal in In Bohemia, Miocene brown coal strata cover a very large area, the principal basins being those of Eger, Carlsbad, and Teplitz, together about 600 square miles, the main seam occasionally attaining a thickness of

[COAL-FIELDS.

The aggregate thickness of coal is about 60 feet. This is the only district in which true coal measure strata are found in European Russia.

Among the southern ‘countries of Europe, the first place Spain, must be given to the coal-fields of Spain, but even these are of comparatively small importance, when measured by a northern standard, consisting of a few small and scattered basins, in which both Carbouiferous and Secondary coals are represented. The Carboniferous limestone acquires a con- siderable development in the Cantabrian chain along the north coast, and is associated with overlying coal measures near Oviedo and Leon. In the former area the coals are often considerably disturbed, becoming anthracitic at the same time. The best seams are from 5 to 8 feet thick. In the Satero valley near Sotillo, N.E, of Leon, a seam called El Carmen, averaging 60 fcet, is sometimes 100 feet thick, and is gaid to be in places associated with another which is occasionally 180 feet thick. Another basin of importance is that of Belmez and Espiel, occupying a narrow valley in older Paleozoic strata, about 20 miles north of Cordova, which has recently been traversed by a railway connecting it with the main lines from Lisbon and Cadiz. This pro- duces coking and gas coals of good quality, which are in considerable demand for smelting in the lead and other mineral districts in the neighbourhood. The other principal localities are at Villaneuva del Rio near

Seville, and San Juan de la Abaderas in Catalonia. Coals of Neocomian age are found at Montalban, in the province of Teruel, and lignites of Miocene age, among other places, at Alcoy in Valencia, and Calas in Catalonia.

In Portugal a small tract of lower Carboniferous strata, Portus) containing anthracite, occurs at San Pedro de Cova, near | Coimbra, but the produce is very small.

In Italy there is very little Carboniferous coal, what does Italy. | occur being mainly of an anthracitic character in very dis- turbed strata in the Piedmontese Alps. Tertiary lignites are worked at several places in Tuscany and in Naples, but the total output is inconsiderable when measured by the standards of more northern countries.

Extra-European Coal-fields.

In Turkey, Carboniferous coal is found at Heraclea in Turkey) Asia Minor, and has been worked from time to time, but hitherto without much influence upon the coal produce of Europe. Lignites are known to occur near Smyrna, and in the Lebanon and various other points in Syria.

It is doubtful whether any Carboniferous coal exists in Afries Africa. Coal-bearing strata, probably of the age of the New Red Sandstone, the so-called Karoo beds, cover a con- siderable area, both in the Cape Colony and Natal, but little is known of the details of the coal-beds beyond state- ments of the excellence of the quality of the coals. Lig- nite occurs in the high lands of Abyssinia, and probably at numerous other points in the interior.

The coal-bearing strata of India occur in numerous de- tached basins, which are widely distributed over the whole peninsula, their aggregate area, however, being but small. The principal development is in the valley of the Damodar river, one of the southern tributaries of the Hugli, the largest coal field being that of Raniganj, on the line of the East Indian Railway, about 140 miles W. of Calcutta, which covers an area of about §00 square miles. It isa basin resting upon crystalline schists, and partly covered by Triassic sandstones in the centre, and by jungle and alluvium to the eastward, so that the real area is not yet known. The strata are divisible into three series as follows :—

Upper or Raniganj series—coal-bearing. Middle or Ironstone series—no coals. Lower or Barrakur series—coal-bearing.

Ee

‘hina,

way, the coal being used by the railway.

ASIA. |

The total thickness may be from 3000 to 4000 feet ; the ironstone series is a group of shales containing nodular ironstone about 1500 feet thick, but diminishing westward. Numerous coal seams are worked at different points, but they cannot be traced continuously for more than a short distance without change. In the upper series an average of 11 seams, together about 120 feet thick, are known in the eastern or Raniganj district, and 13 seams, together 100 feet, on the western side. Occasionally single seams acquire a great thickness (from 20 to 80 feet), but the average of those worked locally is from 12 to 18 feet. In the lower series, 4 seams, together 69 feet, are known. The coals are generally of inferior quality, containing a con- siderable amount of ash, and are non-coking in character. The coals of the lower series are better, yielding fairly good coking and gas coal at Sanktoria, near the Barrakur River.

A small coal-field at Kurhurbali, near Luckeeserai, on the Hast Indian Railway, has recently been developed to a considerable extent for locomotive purposes. It covers about 11 square miles, with an aggregate of 3 seams, vary- ing from 9 to 33 feet in thickness. They are of better quality than those of any other Indian coal-field at present known, and are of great value to the railway, which is now supplied with fuel at a lower rate than probably any other railway company in the world.

There are several other coal-fields in Bengal, especially that at Jherria, near the sacred mountain of Parisnath, those south of Hazaribagh, and those on the Sone River, but none are as yet developed to any extent, being away from the great lines of communication. On the western side of India the principal workings are at Mopani, on the Nerbudda, on the line of the Great

Indian Peninsular Rail- It is of inferior quality, and the strata are inclined at a considerable angle, rendering the working difficult.

In the Central Provinces a new coal-field of considerable extent has been recently discovered, almost entirely by boring, on the Wardha and Chanda districts, on the upper tributaries of the Godaveri, a considerable portion being within the Nizam's province of Berar. It is probable that this may become one of the most important sources of coal supply for Central and Western India, but no great amount of work has as yet been done upon it.

Besides the above, there are several other known coal- fields, for details of which the reader is referred to the Reports of the Geological Society of India.

The age of the Indian coals is generally supposed to be Permian, the ouly fossils that have been found in them being plants which are referred to Permian types in Europe. If, however, the overlying sandstones, containing reptilian fossils, generally reputed to be of Triassic age, should, as seems likely, prove to be Permian, it is not improbable that the coal-bearing strata may actually belong to the period of the upper coal measures, and the Indian coal-fields would then be strictly analogous to the deep irregular basins of Southern France and Central Europe, with which they have many structural points in common. No marine strata, or anything approximating to the char- acter of the Carboniferous limestone, are known anywhere on the plains of India, although they are found in the salt vange of the Punjab and in the Himalayas.

The coal-fields of China are known, from the researches of Baron von Richthofen, Prof. Pumpelly, and other travellers, to cover a very large area, comparable only with those of North America; but, as may be imagined, no very detailed Information has as yet been obtained concerning them. According to the first-named authority, there are no newer formations than the Trias in China other than alluvial deposits of enormous thickness, but Paleozoic strata, from the Silurian upwards, are developed on a very large

scale. Coal of Carboniferous age exists in Manchuria mostly in inaccessible mountain valleys, and further west, all along the Great Wall. Near Peking there are beds 95 feet thick, which supply the city with fuel. The most extensive development is to the west and north-west, on the south of the great mountain range which stretches across Western China, where there is an area of Carboni- ferous strata of 100,000 square miles. The great plain of China is bounded by a limestone escarpment from 2000 to 3000 feet high, which is capped by a plateau covered by 30,000 square miles of coal measures, in which the coal] seams, 30 feet thick, lie perfectly hori- zontal for 200 miles, and are reported to extend beyond the frontier into Mongolia. Most of the localities are, how- ever, far in the interior. The coal of Shantung, though not near good harbours, is the most accessible of all Chinese coal from the sea. It also occurs in the other maritime provinces, but in districts offering fewer facilities for export. It is obvious, from the enormous dimensions given to these coal-fields, that it will be a long time before anything like a moderately accurate estimate of their value can be obtained.

In Japan coal is worked at several points, but no detailed Japan.

account of the mode of its occurrence has been published. At the island of Takasima, near Nagasaki, a colliery is worked by the Japanese Government for the supply of their steamers on a tolerably large scale.

In the great islands of the Indian and South Pacific Oceans, coal-bearing strata are known at many different points ; but in the absence of systematic investigation, no general estimate can be formed of their position, extent, or value. In the Dutch settlements, coal has been found in

Sumatra and Borneo, the best known deposit being that of Borneo.

Pengaron, on the south-east of the latter island, where a mine has been worked by the Dutch authorities for several years. The section of the strata, as proved by a level, shows a series of 15 seams above 1 foot in thickness, together about 36 feet, in about 520 feet of measures, 6 of these having been worked. The best appear to be somewhat similar to the steam coal of the North of England. In the British

settlement of Labuan, off the north coast of Borneo, 5 Labuan.

workable seams, together about 27 feet thick, are estimated to cover the whole island. This is probably of Tertiary age, but approximates in composition to many of the non- coking coals of the coal measures. The Labuan coal is also remarkable for containing large masses of fossil resin.

The most important southern coal deposits, however, are Australia,

those of Australia, which extend, with short intervals, from the Gulf of Carpentaria to Bass's Straits. In the northern districts, the distribution appears to be somewhat similar to that seen in South America, Secondary and Tertiary basins occupying the ground near the sea, while true Carboniferous coal is found further inland; but in New South Wales, where their development is greatest, older coal-bearing strata extend along the eastern slope of the continent, be- tween the parallels of 29 and 35 degrees S. latitude, covering a very large area in several detached portions, the largest probably exceeding 12,000 miles, and come down to the sea. The principal workings are situated near Newcastle, at the mouth of the Hunter River, at Wollongong, 60 miles south of Sydney, and at Hartley, about 90 miles inland. The coal seams vary from 3 to 30 feet in thickness in the Newcastle district, 16 seams above three feet thick being known. The coals are mainly of a free-burning class, but some are bituminous, giving a good coke. In the upper- most part of the series oil shales and cannel are found, The age of the Australian coal measures has been the subject of considerable controversy. Formerly it was supposed that they were Oolitic, from the supposed affinities of the fossil plants ; but it has since been shown that the coal-bearing

New Zca- land.

North America.

60

portions of the series are interstratified with marine strata, containing fossils of Carboniferous and Devonian types. The same association is observed in the coal series of Bowen River in Queensland, and on those of the Mersey

River in Tasmania, showing the extension of the Carboniferous strata in a chain of detached basins from the 20th to the 40th parallel of S. lat., or about 1400 miles. In Queensland the strata are estimated to cover an area of 24,000 square miles, without taking into account possible extension under the Cretaceous strata of the interior. Up to the present time, however, very little has been done towards their develop- ment, the districts in which they occur being too far from the settled portions of the country. The principal mines now open are on newer strata of Cretaceous age nearer the sea, at Ipswich, in the neighbourhood of Brisbane. Some of these coals are remarkably like those of South Durham, and yield a good hard coke, suitable for blast-furnace purposes.

True coal measures are not known to exist in New Zea- land, but coal-bearing strata of two different periods have becn described by Dr Hector, Dr Haast, Captain Hutton, aud other geologists. The newer series yield a lignite, which is described in the reports as hydrous coal; while the older, which is probably of Cretaceous or Jurassic age, yiclds a superior class of combustible, known as anhydrous coal. ‘These minerals occur at many different points in the two larger islands, and although no systematic detailed account of them is as yet available, a considerable amount of information on this subject is contained in the various geolo- gical reports published by the New Zealand surveyors.

In North America, the Carboniferous strata are divided Ly geologists into two principal groups,—the lower or sub-Carboniferous, which correspond to the Carboniferous limestone of Europe, and the Carboniferous, which includes the millstone grit and coal measures.

The first of these is about 5000 feet thick in Penn- sylvania, consisting mainly of shales and sandstones ; but in the Mississippi valley, in Dlinois, lowa, and Missouri, a considerable thickness of limestone is developed in this part of the series. In the former region some thin coal seams are found, tlie relation between the two areas being in this respect similar to that of tbe Carboniferous lime- stone in England to the coal-bearing formations of similar age in Scotland.

The millstone grit forms a mass of sandstones and conglomerates from 1200 to 1400 fect thick in Eastern Pennsylvania, but thins rapidly to the

westward, being only from 100 to 250 feet thick in Ohio and Tennessee, In

Arkansas, the compact siliceous rock known as novaculite,

er Arkansas hone stone, occurs in this member of the Car- boniferous series.

The coal measures proper cover a very large area, both in the United States andin Canada, First in importance is the Appalachian coal-field, covering about 60,000 square miles, extending through parts of Pennsylvania, Ohio, Virginia, eastern Kentucky, Tennessee, and Alabama. The maximum thickness of strata is from 2500 to 3000 feet ; that of included coal is 120 feet near Pottsville, 62 fect at Wilkesbarre, and about 25 feet at Pittsburg, showing a gradual diminution to the westward. The most persistent coal is the Pittsburg seam, which is known over an area mneasuring 225 miles by 100 miles, but with a thickness varying from 2 to 14 feet.

The anthracite district of central Pennsylvania occupies an area of about 650 miles on the left bank of the Susque- hapna River. The strata betwecn Pottsville and Wyo- ming, which belong to the lowest portion of the coal measures, are probably about 3000 feet thick, but it is difficult to arrive at an exact estimate, owing to the numerous folds and contortions. There are from ten to

twelve seams above 3 fect in thickness ; the principal one, known as the Mammoth or Baltimore vein, is 29} feet thick at Wilkesbarre, and in places even exceeds 60 feet.

The Illinois and Missouri basin covers a considerable part of these States, as well as of Indiana and Kentucky, Towa, Kansas, and Arkansas. Its area 1s estimated at 60,000 square miles, the thickness varying from 600 feet in Missouri to 3000 feet in western Kentucky. The ageregate thickness of coal is about 70 feet. A good furnace coal is obtained in Indiana, the so-called block eoal of Brazil near Indianopolis, which, like the splint coals of

Scotland and those of Staffordshire, can be used in the blast furnace without coking.

In Michigan a nearly circular area of coal measures, of about 5000 square miles, occurs in the lower peninsula between lakes Huron and Erie. The thickness is only 120 feet, and the coals unimportant.

Other coal-bearing areas of less value Texas and Rhode Island.

The Carboniferous strata are largely developed in the eastern provinces of the Dominion of Canada, notably in New Brunswick and Nova Scotia. The lower Carbonifer- ous group here consists of about 6000 fect of red sand- stones and green marls, with thick beds of fossiliferous limestones, accompanied by gypsum. The limestones in- crease in thickness southward. In this series occurs the peculiar pitch-like or asphaltic coal of the Albert mine in New Brunswick, of which an analysis is given in Table I., supra. ‘The overlying coal measures, including the mill- stone grit, occupy an area estimated at 18,000 square miles. The whole thickness of this group at South Joggins is about 14,750 feet, with 76 included coal seams, together 45 feet in thickness, which are contained in the middle division of the serics. At Pictou there are Six seams, together measuring 80 feet in thickness. The coal measures in this area approach more near to the great coal- fields of Europe in thickness than those of the other American Carboniferous districts. Rocks of Carboniferons age occur in various places on both flanks of the Rocky Mountains, and in the Arctic Archipelago, but have not yet been expiored.

Lignite-bearing strata of Cretaceous and Tertiary age occupy a very considerable area in the central and western portions of North America, especially in the upper Missouri and Saskatchewan valleys, in Utah and Texas, and in California, Oregon, and Vancouver Island. In the last locality coal has been extensively mined near Nanaimo, on the east coast, for several years past, in strata of Cretaceousage. ‘Tertiary lignites are worked in Belling- ham Bay, at Coose Bay in Oregon, and at Monte Diabolo, near San Francisco. ‘The lignitic formations of the eastern flank of the Rocky Mountains, which are considered by Hayden to occupy a position between the Cretaceous and Eocene Tertiary strata, occupy an area estimated at

about 50,000 square miles within the United States, and extend both northward into Canada and southward into Mexico.

In South America coal, probably of Carbonifcrous age, South is found in the Brazilian provinces of Sio Pedro, Rio 4m Grande do Sul, and Santa Catharina, and in the neighbouring state of Uraguay. The largest area is that known as the Candiota coal-field, which is exposed for about 50 miles in the valley of the river of the same name. The sections ex- posed show 5 seams from 9 to 25 feet each, or together about 65 feet of coal. Other basins are known at 8. Sepé and §. Jeronimo, on the Jacahahay River. The latter is the only point at which mines are worked, as the coals, though thinner than those of the other localities mentioned, are situated within the reach of navigable

waters, having only to bear a land carriage of 8 miles to the river.

are known in

MINING. |

On the west coast of South America, Cretaccous coals are worked at Lota, in Chili, and at Sandy Point, in the Straits of Magellan. In Peru both Secondary and Carboni- ferous coals are known at various points in the interior, the former occupying a position on the first rise of the table land of the Andes, while the latter occur in higher ground, at a greater distance from the coast. Good coal is also found at many points in the Santa valley.

Much of the Peruvian coal has undergone considerable disturbance and metamorphism subsequent to its deposi- tion. At Porton, 45 miles east of Truxillo, a ridge of coal-bearing sandstones has been changed into a hard quartzite, with an interstratificd seam of anthracite in a nearly vertical position. The coal is remarkable as con- taining a large amount of sulphur (see analysis Table I.).

amounts, 90,206,240,387 and 56,248,000,000 tons, given above. From this it follows that, out of the probable total quantity of coal in the British coal

measures, rather more than three-fourths may become available for consumption, or about 1170 times the amount of the present annual out- put of 125 million tous.

Similar estimates have been formed for the coal-fields of other countries, especially in France and Germany, but it is doubtful whether the necessary structyral details are sufficiently well known to admit of more than a tolerably rough guess being made.

COAL-MINING.

The opening and laying out, or, as it is generally called,

“ winning,” of new collieries is rarely undertaken without a ary trial of preliminary examination of the character of the strata by °4l-work- means of borings, either for the purpose of determining ‘”&*

The hitherto inaccessible position of these places, which are usually more than 10,000 feet above the sea-level, has prevented the development of coal-mining in Peru ;

but the extension of railways into the mountains will probably bring them into importance. by stimulating a local demand for fuel.

Latent of existing Workable Coal.

The following summary of the amount of coal estimated as workable remaining jin the different districts, which is taken from the report of the Royal Commission on coal, and founded upon investigations made in the years 1866-71, furnishes an approximate measure of the comparative value, present and prospective, of the different coal-fields of the United Kingdom. The quantities represent the probable aggregate yield of all seams above 1 foot thick.

Coal remaining in exposed Coal-fields. Within 4000 feet.

Coal-Fields. me ee MOMDH Wales) oo 6….00 severe 32, 456,208,913 4,109, 987,004 Forest of Dean,..... 265,000,000 Somersetshire,

..... 4,218, 970,762 1,885, 340,220 ‘se ae ete, or BOPSWMES sncccscves scenes Forest |) ae 1,906,119, 768 Uc 3 ae i Leicestershire. ....:6. 836,798, 734 Warwickshire, ... 458,652,714 North Wales, ...0…..0…. 2,005,000, 000 PRUE CH EDS oc ccc ses cofh scenes. os 5,000,000

North Staffordshire,..... Yorkshire and Derbyshire, Yorkshire (Oolitic, &c.) ... Lancashire and Cheshire, . Northumberland and

3,825, 488,105 18,172,071, 4383 70,000,000 5,546,000, 000

10,036,660, 236

1,000,785, 488 234,728,010

90,000,000

DB, oc. c6.ecdeer ese Ommberland, ...c…..... 405,203,792 MOGI OG Wcceicesnne ve seevves 9,839, 965,930 do (Oolitie),..... 3,500,000 MVELAWG)cc.oe ane Pics «etches 155,600,000

90,206,240, 387 7,320,840, 722

The quantity estimated as lying above the workable limit of 4000 feet under the Permian and other formations, in the central and northern counties of England, is 56,248,000,000 tons, covering an area of 2044 square miles, in addition to which, in the flat ground between the Mersey, Denbigh- shire, the North Staffordshire hills, Cannock Chase, and Colebrookdale, a further area of 843 square miles at inac- cessible depths is computed to contain—

Between 4000 and 6000 Ha, ca ern cialis) siaisee 29,341,649,067 tons.

” a) 15, 302,741,333 ,,

41,144,300, 400

Adding to this the amount Poe) , below 4000 feet from the previous table, 7,320,840,722

2?

Total unavailable COM ine. sanwwies cs… «. 48,465,141,122 ,,

the number and nature of the coal-seams in new ground, or the position of the particular seam or seams which it is proposed to work in extensions of known coal-fields,

The principle of proving a mineral field by boring is illustrated by figure 3, which represents a line direct from the dip to the rise of the field, the inclination of the strata being one in ‘eight. No. 1 bore is commenced at the dip, and reaches a seam of coal A, at 40 fathoms; at this depth it is cousidered proper to remove nearer to the outcrop, so that lower strata may be bored into ata less depth, and a second bore is commenced. To find the position of No. 2, so as to form a continuous section, it is necessary to reckon the inclination of the strata, which is 1 in 8; and as bore No. 1 was 40 fathoms in depth, we multiply the depth by the rate of inclination, 40 × 8 = 320 fathoms, which gives the point at which the coal scam A should reach the surface. But there is generally a certain depth of alluvial cover which requires to be deducted, and which we call 3 fathoms, then (40 — 3 = 37) x 8 = 296 fathoms; or say 286 fathoms is the distance that the second bore should be placed to tlie rise of the first, so as to have for certain the seam of coal A in clear connection with the seam of coal B. In bore No. 3, where the seam B, according to the same system of arrangement, should have been found at or near the surface, another seam C is proved at a considerable depth, differing in character and thickness from either of the preceding. This derangment being carefully noted, another bore to the outcrop on the same principle is put down for the purpose of proving the seam C; the nature of the strata at first is found to agree with the latter part of that bored through in No. 3, but immediately on crossing the dislocation seen in the figure it is changed, and the deeper seam D is found.

The evidence therefore of these bores (3 and 4) indicates some material derangement, which is then proved by other bores, either towards the dip or the outcrop, according to the judgment of the borer, so as to ascertain the best position for sinking pits.

As compared With ……...0…... —— 146, 454,240,387 ,, The methods of boring are similar to those adopted for Methods of the quantity of workable coal, as made up of the two | deep wells, or in other departments of mining. For shal- boring.

Methods of

working.

62

low bores, the boring is generally with wrought iron. rods screwed together in lengths, armed with a cutting chisel, and working by percussion, the tool being lifted by hand and allowed to fall with its full weight upon the rock. The pounded material is removed at intervals, by substi- tuting a shell pump or tube with valves at the bottom, whose action is similar to that of the foot valves of an ordinary lifting pump. The sludge brought to the sur- face indicates the nature of the ground passed through. In very deep borings, however, the use of rigid rods and fixed tools is found to present two serious evils, namely, the excessive weight on the tool caused by the increased length of the rods, and the great length of time required to withdraw the tool and remove the detritus. The first of these difficulties has been overcome by the use of the free falling cutters, where the tool, instead of being attached rigidly to the rod, moves in a guide-block in such a manner as to be lifted with the rods, falling freely when the top of the stroke is reached. ‘The rods, when lowered, pick up the tool at the bottom of the hole in readiness for the next lift. By this means the momentum of the tool is kept constant whatever may be the weight of rods employed. ;

The use of a wire rope winding on a drum, instead of rods for suspending the boring tool, allows the latter to be withdrawn and replaced with much greater rapidity than can be done with rods. ‘This method has been very successfully adopted by Messrs Mather & Platt of Salford. But perhaps the best methods of expeditious boring are those (Fauvelle’s) whereby the detritus is removed as it forms by con- tinuously flushing out the hole with water, hollow rods being used down which the water flows while it rises through the annular space between the rod and the lining tube of the bore hole. ‘This has the advantage of giving a clear surface for the tool to cut on,

instead of its having to work through its own sludge, as is the case when the shell pump is only used at intervals. Of late years the value of boring for exploratory purposes has been much increased by the adoption of tubular or crown borers, which cut out an annu- lar groove, leaving a core of unbroken rock in the centre, which is then brought out by a grapnel in a solid piece. One of the most successful of these methods is that due to Leschot of Geneva, where a rotating cutter, armed with amorphous black diamond, the hardest known substance, is used, the detritus being continuously removed by water on Fauvelle's plan. 'The machinery adopted for this pur- pose, as modified by Messrs Beaumont & Appleby, has been employed with great success to bore holes exceeding 2000 feet in depth.

The working of coal may be conducted either by means of levels or galleries driven from the outcrop in a valley, or by shafts or pits sunk from the surface. In the early days of coal mining, open working, or quarrying from the out- crop of the seams, was practised to a considerable extent ; but there are now few if any places in England where this can be done. In 18738 there could be seen, in the thick coal seams of Bengal, near Raniganj, a seam about 50 feet thick laid bare, over an area of several acres, by stripping off a superficial covering varying from 10 to 30 feet, in order to remove the whole of the coal without loss by pillars, Such a case, however, is quite exceptional. he operations by which the coal is reached and laid out for removal are known as " winning," the actual working or extraction of the coal being termed "getting." In the accompanying figure, No. 4, A B is a cross cut-level, by which the seams of coal 1 and 2 are won, and C D a ver- tical shaft by which the seams 1, 2, and 3 are won. When the field is won by the former method, the coal lying above

as the capacity for production is less, owing to the smaller size of roadways by which the coal must be brought to the

surface, levels of large section being expensive and difficult to keep open when the mine has been for some time at

is attainable with proper mechanism, and allow of the

Fig. 4.

work, Shafts, on the other hand, may be made of almost any capacity, owing to the high speed in drawing which

use of more perfect arrangements at the surface than can usually be adopted at the mouth of a level on a hill side. A more cogent reason, however, is to be found in the fact that the principal coal-fields are in flat countries, and where the coal cau only be reached by vertical sinking.

The methods adopted in driving levels for collieries are generally similar to those adopted in other mines. The ground is secured by timbering, or more usually by arching in masonry or brick-work. Levels like that in fig. 4, which are driven across the stratification, or generally anywhere not in coal, are known as “stone drifts.” The sinking of colliery Sinking of shafts, however, differs considerably from that of other mines, shafts. owing to their generally large size, and the difficulties that are often encountered from water during the sinking. The actual coal measure strata, consisting mainly of shales and clays, are generally impervious to water, but when strata of a permeable character are sunk through, such as the magnesian limestone of the north of England, the Permian sandstones of the central countries, or the chalk and greensand in the north of France and Westphalia, special methods are required in order to pass the water- bearing beds, and to protect the shaft and workings from the influx of water subsequently. Of these methods one of the chief is the plan of tubbing, or lining the excava- Tubbing. tion with an impermeable casing of wood or iron, gene- rally the latter, which is built up in segments forming rings, that are piled upon each other throughout the whole depth of the water-bearing strata. This method necessitates the use of very considerable pumping power duriug the sinking, as the water has to be kept down in order to allow the sinkers to reach a water-tight stratum upon which the foundation of the tubbing can be placed. This consists in a heavy cast-iron ring, known as a wedging crib, or curb, also fitted together in segments, which is lodged in a square-edged groove cut for its recep- tion, tightly caulked with moss, and wedged into posi- tion. Upon this the tubbing is built up in segments, usually from 10 to 12 being required for the entire cit- cumference, the edges being made

perfectly true. The thickness varies according to the pressure expected, but may be taken at from 3 to 1} inches. The inner face is smooth, but the back is strengthened with angle brackets at the corners. A small hole is left in the centre of each segment, which is kept open during the fitting to prevent undue pressure upon any one, but is stopped as soon as the circle is completed. In the north of France and Belgium wooden tubbings, built of polygonal rings, were at one time in general use. The polygons adopted were of 20 of more sides approximating to a circular form.

the level is said to be “level-free.” The mode of winning by level is of less general application than that by shafts,

The second principal method of sinking through water- Pneumalid bearing ground is that which was first adopted by M. sinking,

MINING. |

Triger, in France, and has also been used by civil engineers in putting down deep foundations for bridge piers, namely, by compressed air. The shaft is lined with a cylinder of wrought iron, within which a tubular cham- ber, provided with doors above and below, known as an air-lock, is fitted by a telescopic joint, which is tightly packed so as to close the top of the shaft air-tight. Air is then forced into the inclosed space by meaus of a compressing engine, until the pressure is sufficient to oppose the flow of water into the excavation, and to drive out any that may collect in the bottom of the shaft through a pipe which is carried through the air-sluice to the surface. The miners work in the bottom in the same- manner as divers in an‘ordinary diving-bell. Access to the surface is obtained through the double doors of the air sluice, the pres- sure being reduced to that of the external atmosphere when it is desired to open the upper door, and increased to that of the working space below when it is intended to communicate with the sinkers, or to raise the stuff broken in the bottom. This method has been adopted in various sinkings on the Continent. At Bracquenie, near Mons, the miners worked in an atmosphere up to 45 ib pressure on the square inch, without experiencing any great difficulty, but they were found to be more susceptible to pulmonary disorder upon changes of weather than those who worked under the ordinary conditions of pressure.

The third metliod: of sinking through water-bearing strata is that of boring, adopted by Messrs Kind & Chau- dron in Belgium and Germany. For this purpose a horizon- tal bar armed with vertical cutting chisels is used, which cuts out the whole section of the shaft simultaneously. In the first instance, a smaller cutting frame is used, boring a holo from 3 to 5 feet in diameter, which is kept some 50 or 60 feet in advance, so as to receive the detritus, which is removed by a shell pump of large size. The large trepan or cutter weighs about 16 tons, and cuts a hole of from 9 to 15 feet in diameter. The water-tight lining may be either a wrought iron tube, which is pressed down by jack screws as the bore hole advances, or cast-iron tubbing put together in short complete rings, in contradistinction to the old plan of building them up of segments. The tubbing, which is considerably less in diameter than the bore hole, is suspended by rods from the surface until a bed suitable for a foundation is reached, upon which a sliding length of tube, known as the moss box, bearing a shoulder, which is filled with dried moss, is placed. The whole weight of the tubbing is made to bear on the moss, which Squeezes outwards, forming a completely water-tight joint. The interval between the back of the tubbing and the sides of the bore hole is then filled up with concrete, which on setting fixes the tubbing firmly in position.

The introduction of these special methods has consider- ably simplified the problem of sinking through water-bear- ing strata. Some of the earlier sinkings of this kind, when pumps had to be depended on for keeping down the water, Were conducted at great cost, as, for instance, at South Hetton, and more recently Ryhope, near Sunderland, through the magnesian limestone of Durham.

The size and form of colliery shafts varies in different dis- tricts, but the tendency is now generally to make them round, and from 12 to 15 feet in diameter. In the Midland counties, from 7 to 9 feet isa very common size, but larger dimensions are adopted where a large production is re- quired, At Bagillt, on the Dee, a shaft of 22 feet in diameter was commenced a few years ago, but was reduced in diameter a short distance down. Since the accident at Hartley colliery, caused by the breaking of the pumping engine beam, which fell into the shaft and blocked it up, whereby the whole company of men in the mine were starved to death—it has been made compulsory upon

mine owners to have two pits for each working, in place of the single one divided by walls or brattices which was formerly thought sufficient. The use of two indepen- dent connections—whether separate pits or sections of the same pit, between the surface and the workings—is neces- sary for the service of the ventilation,—fresh air from the surface being carried down one, known as the “ downcast,” while the foul or return air of the mine riseg through the other or “ upcast” pit back to the surface. Where the mine is heavily watered, it is often necessary to establish a special engine pit, with pumps permanently fixed, or a division of one of the pits may be devoted to this purpose. The uso of direct-acting high-pressure pumping engines placed at the bottom of the shaft has become common during the last tenycars. They have the advantage of doing away with the heavy reciprocating rod from the engine at the surfacc, and may be worked either by steam pipes carried down thc pit, or, what is now more common, by boilers underground, which supply also steam for the underground hauling engines. Where the water does not accumulate very rapidly it is a very common practice to allow it to collect in a pit or sump below the working bottom of the shaft, and to draw it off in a water tub or bucket by the main engine, when the latter is not employed in raising coal. The laying out of a colliery, after the coal has been won, by sinkings or levels, may be accomplished in various ways, according to the nature of the coal, its thickness and dip, and the extent of ground to be worked. In the South Stafford- shire and other Midland coal-fields, where only shallow pits are required, and the coals are thick, a pair of pits may be sunk for a very few’acres, while inthe North of England, on the other hand, where sinking is expensive, an area of some thousands of acres may be commanded from the same number of pits. In the lattcr case, which represents the most approved practice, the sinking is usually placed about the centre of the ground, so that the workings may radiate in every direction from the pit bottom, with the view of employing the greatest number of hands to ad- vantage. Where a large area cannot be commanded, it is best to sink to the lowest point of the field for the convenience of drawing the coal and water which become level-free in regard to the pit. Where properties are much

divided, it is always necessary to maintain a thick barrier of unwrought.coal between the boundary of the mine and the neighbouring workings, especially if the latter are to the dip. Ifa prominent line of fault crosses the area, it may usually be a convenient division of the field into sections or districts. The first process in laying out the workings consists in driving a gallery on the level along the course of the coal seam, which is known as a " dip head level," and a lower parallel one, in which the water collects, known asa ''lodgment level." Galleries driven at right angles to these are known as " dip " or " rise headings," according to their position above or below the pit bottom. In Staffordshire the main levels are also known as " gate roads." To secure the perpendicularity of the shaft, it is necessary to leave a large mass or pillar of the seam un- touched around the pit bottom. 'This pillar is known in Scotland as the "pit bottom stoop." The junction of the levels with the pit is known as the " pit eye ;" it is usually of an enlarged section, and lined with masonry or brick- work, so as to afford room for handling the waggons or trams of coal brought from the working faces. In this portion of the pit are generally placed the furnaces for ventilation, and the boilers required for working stcam- engines underground, as well as the stables and lamp cabin. Figs. 5 and 6 represent the pit bottom arrangements at Cambois colliery in Northumberland, which are of an ex- tremely commodious character. There are four large Cornish boilers, supplying steam to the engines drawing

Laying out workings.

Method of working out coal.

Pillar working.

coals from the workings, as well as to a direct-acting pump- ing engine, the flame and smoke being discharged by drifts into the upcast pit. For the purpose of handling large pieces of machinery and boilers, the level at the bottom is inereased to a chamber 18 feet high, and roofed with rolled iron girders of a double T section. To protect the fillers working at the bottom, strong diagonal guard timbers are placed at S in order to deflect any materials falling down the shaft, and prevent them falling into the work-

ings. This is an unusually large exainple, but is taken from a pit in the highest state of development, and making a very large daily outturn.

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UNDERGROUND PUMPING ENGINES

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Fic. 6.—-Pit bottom arrangements, Camboi

custom of the district. These may, however, all be con- sidered as modifications of two systems viz., pillar work and long-wall work. In the former, which is also known as “port and stall” or “bord and pillar” in the north of England, “pillar and stall” in South Wales, and ‘stoop and room” in Scotland, the field is divided into strips by yumerous openings driven parallel to the main rise head- ings, called “bords” or “bord gates,” which

are again divided by cutting through them at intervals, so as to leave a series of pillars arranged chequer-wise over the entire area, These pillars are left for the support of the roof as the workings advance, so as to keep the mine open and free from waste. Fig. 1, Plate III. represents the oldest form of this class of working as practised in Scotland, from which it will be seen that if the size of the pillar is equal to the width of the stall or excavation, about # of the

whole seam will be removed, the remainder being left in the pillars. A portion of this may be got by the process known as robbing the pillars, but the coal so obtained is liable to be very much crushed from the pressure of the superincumbent strata. This crushing may take place either from above or below, producing what are known as “creeps” or “sits.”

‘A coal seam with a soft pavement and a hard roof is the most subject toa “creep.” The first indication is a dull hollow sound heard when treading on the pavement or floor, probably occasioned by some of the individual layers parting from each other as shown at a fig. 7;

Fic. 7.—‘ Creeps” in Coal-Mines.

of creep are shown at 5, ¢, d, f, and g, in the same figure ; the last being the final stage, when the coal begins to sustain the pressure from the overlying strata, in common with the disturbed pavement.

“Sits” are the reverse of creeps; in the one case the pavement is forced up, and in the other the roof is forced or falls down, for want of proper support or tenacity in itself. This accident generally arises from an improper size of pillars; some roofs, however, are So difficult to support that sits take place where the half of the coal is left in pillars.

Fig. 8 will convey a general idea of the appearance of sits,—zk, m, n showing different stages.

the succeeding stages

Fie. 8.—‘ Sits” in Mines,

The modern method of pillar working is shown in Plate Tv. In the Northumberland steam-coal district, where it is carricd out in the most perfect manner, the boards are 5 to 6 yards in width, while the pillars are 22 yards broad and 30 yards long, which are subsequently got out on coming back. In the same figure is also shown the method of working whole coal and pillars at the same time, a barrier of two or three ranges of pillars or a rib of solid coal being left between the working in the solid and those in the pillars. The space from which the entire quantity of coal has been removed is known in different districts as the “¢ goat,” “ gob,” or © waste.”

Fig. 9 represents the Lancashire system of pillar- working. The area is laid out by two pairs of level drifts, parallel to each other, about 150 yards apart, which are carried to the boundary. About 100 yards back from the boundary a communication is made between these levels, from which other levels are driven forward, dividing the coal into ribs of about 25 or 30 yards wide, which are then cut back by taking off the coal in slices from the level towards the rise in breadths of about six yards. By this method the whole of the coal is got backwards, the main roads being kept in solid coal ; the intermediate levels not being driven til] they are wanted, a greater amoynt cf sup-

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port is given, and the pillars are less crushed than is | usual in pillar working.

MODES OF WORKING. |

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Fia. 9,—Lancashire method of working Coal.

In the South Wales system of working, cross headings are driven from the main roads obliquely across the rise to get a sufficiently easy gradient for horse roads, and from these the stalls are opened out with a narrow entrance, in order to leave support on either side of the road, but after- wards widening to as great a breadth as the seam will allow, leaving pillars of a minimum thickness. The cha- racter of such workings is very irregular

in plan, and as the ventilation is attended with considerable difficulty, it is now becoming generally superseded by more improved methods.

The second great principle of working is that known as long-wall or long-work, in which the coal is taken away either in broad faces from roads about 40 or 50 yards apart and parallel to each other, or aloug curved faces between roads radiating from the pit bottom —the essential feature in both cases being the removal of the whole of the coal at once, without first sub-dividing it into pillars, to be taken away at a second working. The roof is tem- porarily supported by wooden props or pack walling of stone, for a sufficient breadth along the face to protect the work- men, and allow them to work together behind. The general character of a long-wall working is shown in fig. 10, which

Fig. 10.—Long-wall method of working Coal in Derbyshire.

Tepresents an area of about 500 acres of the bottom hard

steam coal at Shipley in Derbyshire. The principal roatl extends from the shafts southward ; and on both sides of it the coal has been removed from the light-shaded area by cutting it back perpendicularly towards the boundaries, along faces about 50 yards in length, those ncarest to the shaft being kept in advance of those farther away, pro- ducing a step-shaped outline to the face of the whole coal. It will be seen that by this method the whole of the seam, with the exception of the pillars left to protect the main roadways, is removed. The roads for drawing the coal from

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the working faces to the shaft are kept open by walling through the waste or goaf produced by the fall of the un. supported roof. The straight roads are the air-ways for carrying pure air from the down-cast shaft to the working faces, while the return air passes along the faces and back

to the up-cast by the curved road. The above is the method .

of working long-wall forward, 7.c., taking the coal in advance from the pit towards the boundary, with roads kept open through the gob. Another

method consists in driving towards the boundary, and taking the coal back-ward towards the shafts, or working homeward, allowing the waste to close up without roads having to be kept open through it. This is of course preferable, but is only applicable where the owner of the mine can afford to expend the capital required to reach the limit of the field in excess of that necessary when the raising of coal pro- ceeds part passu with the extension of the main roads. Fig. 9 is substantially a modification of this kind of long-wall work. Plate ILI. fig 2,represents a method of working prac- tised in the South Yorkshire district, known as bords and banks. The field is divided by levels and headings into rectangular banks, while from the main levels bords or wickets about 30 yards wide, separated from each other by banks of about the same width, are carried forward in long- wall work, as shown on the left side of the figure, the waste being carefully packed behind so as to secure the ventila- tion. When these have been worked up to the extremity,

as shown on the right side, the intermediate bank is

removed by working backward towards the level. This system, therefore, combines both methods of long-wall working, but is not generally applicable, owing to the diffi- culty of ventilation, due to the great length of air-way that has to be kept open around the waste on each bank.

The relative advantages of the different methods may be generally stated as follows. Long-wall work is best suited for thin coals, and those having a good roof, 7.e., one that gives way gradually and fills up the excavation made by removing the coal without scaling off suddenly and falling into the working faces, when practically the whole of the coal may be removed. Against these advantages must be placed the difficulties attending the maintenance of roads through the goaves, and in some cases the large proportion of slack to round or large coal obtained. Pillar working, in the whole coal, is generally reputed to give a more advan- tageous proportion of round coal to slack, the latter being more abundantly produced on the removal of the pillars, but as these form only a small portion of the whole seam, the general yield is more advantageous than in the former method. The ventilation of pillar working is often attended with difficulty, and the coal “is longer exposed to the influ- ence of the air, a point of importance in

some coals, which deteriorate in quality when exposed to a hot damp atmo- sphere. The great increase in the size of the pillars in the best modern collieries worked upon this principle has, however, done much to approximate the two systems to an equality in other respects.

South

Yorkshire

method,

The working of very thick seams presents certain special Working peculiarities, owing to the difficulties of supporting the roof thick

in the excavated portions, and supplying fresh air to the workings. The most typical example of this kind of work- ing in England is afforded by the thick coal of South Staffordshire, which consists of a series of closely associated coal seams, varying from 8 to 12 or 13, divided from each other by their partings, but making together one great bed of from 25 to 40 feet or more in thickness. The partings together do not amount to more than 2 or 3 feet. The method of working which has been long in use 1s repre- sented in fig. 11. The main level or gate road is driven in the benches coal, or lower part of the seam, while a smaller dri‘t for ventilation, called an = heading, is i= 9

seams.

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carried above it in one of the upper beds called the slipper coal. From the gate road a heading called a bolt-hole is opened, and extended into a large rectangular chamber, known asa “side of work,” large pillars being left at regular

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intervals, besides smaller ones or cogs. The order in which the coal is cut is shown in the dotted and numbered squares in the figure. The coal is first cut to the top of the slipper coal from below, after which the upper portion is either broken down by wedging or falls of itself. The working of these upper portions is exceedingly dangerous, owing to the great height of the excavations, and fatal accidents from falls of roof are in consequence more common in South Staffordshire than in any other coal-field in this country. The air from the down-cast shaft enters from the gate road, and passes to the up-cast through the air heading above. About one-half of the total coal (or less) is obtained in the first working ; the roof is then allowed to fall, and when the gob is sufficiently consolidated, fresh roads are driven through it to obtain the ribs and pillars left behind by a second or even, in some cases, a third working. The loss of coal by this method is very considerable, besides great risk to life and danger from fire. It has, therefore, been to some extent superseded by the long-wall method, the upper half being taken at the first working, and removed as completely as possible, working backwards from the bound- aries to the shaft. The lower half is then taken in the same manner, after the fallen roof has become sufficiently consolidated to allow the mine to be re-opened.

In the working of thick seams inclined at a high angle, such as those in the south of France, and in the lignite mines of Styria and Bohemia, the method of working in horizontal slices, about 12 or 15 feet thick, and filling up the excavation with broken rock and earth from the sur- face, is now generally adopted in preference to the systems formerly used. At Monceaux les Mines, in France, a seam 40 feet thick, and dipping at an angle of 20 degrees, is worked in the following manner. A level is driven in a sandstone forming the floor, along the course of the coal, into which communications are made by cross cuts at intervals of 16 yards, which are driven across to

the roof, dividing up the area to be worked into panels. These are worked backwards, the coal being taken to a height of 20 feet, the opening being packed up with stone sent down from the surface. As each stage is worked out, the floor level is connected with that next below it by means of an incline, which facilitates the introduction of the packing material. Stuff containing a considerable amount of clay is found to be the best suited for the purpose of filling, as it consolidates readily under pressure,

COAL

[MINING.

The actual cutting of the coal is chiefly performed by manual labour, the tool employed being a sharp-pointed double-armed pick, which is nearly straight, except when required for use in hard rock, when the arms are made with an inclination or “anchored.” The terms pike, pick, mandril, and slitter are applied to the collier’s pick in different districts, the men being known as pikemen or hewers. In driving levels it is necessary to cut grooves vertically parallel to the walls, a process known as shearing; but the most important operation is that known as holing or kirving, which consists in cutting a notch or groove in the floor of the seam to a depth of about 3 feet, measured back from the face, so as to leave the overhanging part unsupported, which then either falls of its own accord within a few hours, or is brought down either by driving wedges along the top, or by blasting with gunpowder. The process of holing in coal is one of the severest kinds of human labour. It has to be performed in a constrained posi- tion, and the miner lying on his side has to cut to a much greater height, in order to get room to carry the groove in to a sufficient depth, than is required to bring the coal down, giving rise to a great waste in slack as compared with machine work. © This is sometimes obviated by holing in the beds below the coal, or in any portion of a seam of inferior quality that may not be worth working. This loss is proportionately greater in thin than in thick seams, the same quantity being cut to waste in either case. The method of cutting coal on the long-wall system is seen in fig. 12, repre-

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Fra, 12,—Long-wall working-face—Plan and Section.

senting the working at the Shipley colliery. The coal is 40 inches thick, with a seam of fire-clay and a roof of black shale ; about 6 inches of the upper part, known as the roof coal, not being worth working, is left behind. A groove of triangular section of 30 inches base and 9 inches high is cut along the face, inclined timber props being placed at inter- vals to support the overhanging portion until the required length is cut. These are then removed, and the coal is allowed to fall, wedges or blasting being employed when necessary. ‘The roof of the excavation is supported as the coal is removed, by packing up the waste material, and by a double row of props, two feet from each other, placed tem-

_porarily along the face. These are placed 5 feet apart, the props of the back row alternating with those in front. The props used are preferably of small oak or English larch, but large quantities of fir props, cut to the right length, are also imported from the north of Europe. As the work proceeds onwards, the props are withdrawn and replaced in

being usually dependent upon the cleet or divisional planes in the coal, especially when the work is carried perpen- dicular to them or on the end. The substitution of machinery for hand labour in cut- Coal- ting coal has long been a favourite problem with inven- cutting tors, the earliest plan being that of Menzies, in 1761, who ™2chines

advance, except those that may be crushed by the pressure or buried by sudden falls of the roof.

In Yorkshire hollow square pillars, formed by piling up short blocks of wood or chocks, are often used instead of props formed of a single stem. Iron pit props have been proposed at different times, but their use has not become general. When the coal has been under-cut for a sufficient length,

the struts are withdrawn, and the overhanging mass is allowed to fall during the time that the workmen are out of the pit, or it may be brought down by driving wedges, or if it be of a compact character a blast of gunpowder in

a bore hole near the roof may be required. Sometimes, but

rarely, it happens that it is necessary to cut vertical grooves in the face to determine the limit of the fall, such limits

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proposed to work a heavy pick underground by power transmitted from an engine at the surface, through the agencies of spear-rods and chains passing over pulleys; but none of the methods suggested proved to be prac- tically successful until the general introduction of com- pressed air into mines furnished a convenient motive power, susceptible of being carried to considerable distances without any great loss of pressure. This agent has of late years been applied in various ways, in machines which either imitate the action of the collier by cutting with a pick or make a groove by rotating cutters attached to an endless chain or a revolving disc or wheel. The most successful of the first class, or pick machines, is that of Mr William Firth of Sheffield, represented in fig. 13. It consists essen-

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Fic. 18.—Firth's Coal-cutting Machine.

tially of a horizontal piston and cylinder engine fixed upon a platform carried upon four wheels, which are coupled to- gether by side rods, so that on motion being communi- cated by means of a mitre wheel in the hind axle, it can be moved forward by hand. On the forward end of the frame are two bosses forming the centres for a pair of bell cranks or bent levers

placed close to the ground, and facing Iu opposite directions, either one of which can be con nected with the piston rod. The outer arm of each lever tarrles a square socket, into which is fixed the pick, which has two cutting heads, one placed a little in front of the other so as to cut to the whole depth at one operation. In the older forms picks of different length were used, aud it was necessary to go over the work a second or third time, in order to hole to the full depth. The cutting points are loose, being secured by cotters to the pick head, so that broken or blunted ones can be readily replaced without removing the pick arm. The power used is air, at about 40 to 60 Ib above atmospheric pressure. It is con- ducted from the reservoir connected with a compressing engine at the surface, through iron pipes fixed in the pit, and along the main roads to the working face, where thick vulcanized india-rubber pipes are used, sufficient length of pipe lying loose on the ground to allow the engine to move freely, the connection being made by a screwed joint at the back of the slide-valve chest. 'The valve is worked by tappets on the piston-rod, so as to be perfectly self- acting when properly adjusted ; it can also be moved by hand. The pick holders face in opposite directions, in order

that the machine may be worked from either side. 'The size of the machine as ordinarily made is about 4 feet in length, 2 feet 2 inches high, and from 18 to 24 inches gauge of rails, The weight is about 15 cwt. The working speed is from 60 to 90 strokes per minute, corresponding to a Jength of from 10 to 20 yards, cut to a depth of 3 feet per hour. At the former rate, or 60 yards per shift of 6 hours, the work done corresponds to that of twelveaveragemen. The width of the groove is from 2 to 3 inches at the face, diminishing to 14 inches at the back, the proportion of waste being very considerably diminished as compared with the system of holing by hand. The use of this machine has allowed a thin seam of cannel, from 10 to 14 inches in thickness, to be worked to profit, which had formerly been abandoned as too hard to be worked by hand-labour.

An earlier form of the second class of machine, in which the cutters have a continuous motion like those of a slotting machine, is that invented by Mr William Peace in the Wigan district, which is reproduced from the last edition as illustrating the principle which has since been carried out by other inventors in a more convenient and simplified form. It is represented

in Plate V., figs. 1, 2,and 3. AAA is the trame, upon which are fixed one or more cylinders B, arranged so as to turn a crank shaft C, fixed to the frame, as is also another shaft D. This latter is capable of being turned by the former, by means of mitre or bevel wheels EEE; upon the lower end of the latter shaft D is placed a wheel termed the driving wheel, having upon its periphery a groove with

suitable projections for working into and propelling a chain or band. Beneath or to the side of the frame (or both) is fixed temporarily or otherwise « lever, the extremity of which is constructed to carry a wheel called the ter- minal wheel, marked HH ; a chain or band is made to pass round the driving and terminal wheels, and by means of the driving wheel FF it is made to revolve. Into the chain are fixed cutters of different forms (see the parts marked, figs. 4, 5, 6, and 7), which, when the machine is in action, revolve with it, and upon being pressed or drawn against the coal, erode and excavate the same. The dis- tance of the excavation from the face of the coal 1s governed by the dimensions of the machine, and by the length of the lever and the distance between the driving and terminal wheels. The arrangements of the lever allow it to revolve, and to excavate any given range ; see dotted lines fig. 1. ‘

Tf found necessary, two or even three levers may be in operation at the same time, and arranged to cut in any direction. Other parts of the machine not particularly de- scribed are capable of elevating and depressing the front part of the machine, marked V, T, U, W; and those marked X, Y, Z, and K are capable of propelling the machine whilst at work, by acting against the prop.

The Gartsherrie machine of Messrs Baird is of the same character, but the chain of cutters works round a fixed frame or jib projecting at right angles from the engine car- riage, instead of traversing upon a centre, an arrangement which makes it necessary to cut from the end of the block of coal to the full depth, instead of holing into it from the face. The forward feed is given by a chain winding upon a drum, which hauls upon a pulley fixed to a prop about 30 yards in advance. This is one of the most compact form of machines, the smaller size being only 20 inches high. With an air

pressure of from 35 to 40 tb per square inch, a length of from 300 to 350 feet of coal is holed, 2 ft, 9 in. deep, in the shift of from 8 to 10 hours.

One of the simplest forms of coal-cutting machines is that of Messrs Winstanly & Barker (fig. 14), which is driven

Fria. 14.—Winstanly & Barker's Coal-cutting Machine—Plan.

by a pair of oscillating engines placed on a frame run- ning on rails in the usual way. The crank shaft carries a pinion which gears into a toothed wheel of a coarse pitch carrying cutters at the ends of the teeth. This wheel is mounted on a carrier which, being movable about its centre by ascrew gearing worked by hand, gives a radial sweep to the cutting edges, as in the machine figured in Plate V. When at work it is slowly turned until the carrier 1s at right angles to the frame, when the cut has attained the full depth. The forward motion is given by a chain-winding upon a crab placed in front, which is worked by a boy who hauls it slowly forward. With 25 Tb pressure it will hole 3 feet deep, at the rate of 30 yards per hour, the cut being

COAL

t only 22 in. high, carriage.

is that of Messrs replace the use of

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but it will only work on one side of the

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It consists of which forces a set of expanding

worked by hand, the action of

the press being continued until a sufficient strain is obtained to bring down the coal. in fact, a modification of the plug and feather system used in stone quarrying for obtaining large blocks, but with the substitution of the

powerful rending force of the hydraulic press for hand-power in wedges. North Staffordshire, and found to work well, but with the disadvantage of bringing down the coal in unmanageably large masses. always attended with danger, and a method of wedging down coal sufficiently perfected to be of general application would add greatly to the security ing such mines.

The arrangement 1s,

driving up the This apparatus has been used at Harecastle in

The use of gunpowder in very fiery mines is

of the colliers in work-

The removal of the coal when broken from the work-

ing faces to the pit bottom or to the main levels is effected mainly by hand labour when the mize distances to be traversed inconsiderable, greater extent by horse or steam traction. method is that of loading the broken coal on to a sledge,

is small, and the and in mines of The simplest

which is dragged along the floor to the level, but now the practice of carrying railways to the face is almost universal. The old form of flat rail or tram is still largely used, the waggons having sharp-edged disc wheels, but probably edge rails and flanged whecls are now more general. The class of rail used is generally a flat-bottomed or bridge section, weighing from 15 to 25 tb per yard, laid upon cross sleepers, which, in roads that are intended to be kept open for some time, are fixed down firmly, but are laid in a temporary manner along the working faces, and in similar positions where it is necessary to be continually shifting them, as, for instance, wheie coal-cut- ting machines are used. The arrangement of the drawing roads at the face of a long-wall colliery is seen in the plan fig. 12, where the rails are brought to the face upon a smooth iron plate, upon which the trams can be easily

handled by turning on the flanges of the whecls. The names applied to the vehicles in which the coal is carried vary considerably, as do also their size and capacity. The

word “corf” or “corve,” representing the old basket sl edge, is one of the most generally used, as are “ tram,” signifying a tram waggon, and “tub,” of the same signification as the last, but a representative of the old method of drawing in wooden buckets. In South Staffordshire and other Midland districts, a contrivance called a “ skip” is the representative method of conveyance ; this consists of a platform with tram wheels, upon which the coal is built up to a consider- able height, the large pieces round the sides being kept to- gether by loose rings of sheet iron, and the intermediate spaces packed full with small coal,—the whole arrange ment representing a kind of cask. This, however, like most of the similar primitive methods, is giving way to the more improved system of tubs or trams. These are small railway trucks, generally with flanged wheels and square sided bodies, either of wood or wrought iron, varying in capacity from 4 cwt. in thin seams to 10 or 12 ewt. in thicker seams.

In the removal of the coal from the workings the first portion of the journey is generally performed by hand-

kind of application of machinery to coal mining Coal Bidder & Jones, which is intended to wedging — blasting with gunpowder for bringing Machine, down the coal, a practice which in fiery collieries is often attended with considerable danger from the flash of the ex- plosion firing the gas given off the coal. a small hydraulic press, bits or wedges into a bore-hole previously bored by a long screw augur or drill,

Under. ground veyaee,

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CONVEYANCE. |

power, boys being employed to push the trams before them to the main roads. In the thin seams of South York- shire and other places, considerable journeys are often performed in this way, the boys known as “ hurriers” or

“putters” being obliged to crawl at full length, owing to the lowness of the excavation. Asa general rule boys are not allowed to work in collieries when below 12 years of age, but in these thin mines special exemptions are granted, permitting the use of younger boys as putters when re- quired. Where the levels are large, horse traction is in common use; the trams are formed up into trains, aud from 6 to 15 vehicles are drawn by one horse. A considerable number of ponies are imported into the northern ports of this country from Norway and Iceland for this purpose every year. The supply of horses is, however, becoming scarcer, and the price higher, so that the use of under- ground engines is generally adopted where the output is sufficiently large to justify the expenditure. This is done by hauling or, as it is called in the North of England, lead- ing the trains of tubs by rope traction. In a large colliery where the shafts are situated near the centre of the field, aud the workings extend on all sides, both to the dip and rise, the drawing roads for the coal may be of three differ- ent kinds,—(1) levels driven at right angles to the dip, suitable for horse roads, (2) rise ways, known as jinny roads, jig-brows, or up-brows, which, when of sufficient slope, may be used as self-acting planes, 2.e., the loaded waggons may be made to pull back the empty ones to the working faces, and (3) dip or down-brows, requiring engine power. A road may be used as a self-acting or gravitating incline when the gradient is 1 in 30 or steeper, in which case the train is lowered by a rope passing over a pulley or brake drum at the upper end, the return empty train being attached to the opposite end of the rope and hauled up by the descend- ing load. The arrangements for this purpose vary, of course, with the amount of work to be done with one fixing of the machinery; where it is likely to be used for a considerable time, the drum and brake are solidly constructed, and the ropes of steel or iron wire carefully guided over fric- tion rollers, placed at intervals between the rails to pre- vent them from chafing and wearing out on the ground. Where the load has to be hauled up a rising gradient, underground engines, driven by steam or compressed air, are now generally used. In some cases steam generated in boilers at the surface is carried in pipes to the engines below, but this can be done with less loss of power by send- ing down compressed air in the same way. The use of underground boilers placed near the upcast pit, as in fig. 6, so that the smoke and gases help the ventilat- ing furnace, is most convenient in the majority of cases. Water-pressure engines, driven by a column of water equal to the depth of the pit, have also been employed for

hauling. These can, however, only be used advantageously where there are fixed pumps, the fall of water generating the power resulting in a load to be removed by the expen- diture of an equivalent amount of power in the pumping engine above that necessary for keeping down the mine water.

There are four principal methods in which steam power can be applied to underground traction. These, which have been discussed in the fullest manner in the Report of the North of England Institute of Mining Engineers for 1867- 68, are as follows :—

1. Tail rope system.

2. Endless chain system.

3. Endless rope system on the ground.

4, Endless rope system overhead.

The three last may be considered as modifications of the same principle. In the first, which is that generally used in Northumberland and Durham, a single line of rails

is used, the loaded tubs being drawn “cut bye,” i.e , towards the shaft, and the empty ones returned “in bye,” or towards the working faces, by reversing the engine; while in the other systems, double lines, with the rope travelling coatinu- ously in the same direction, are the rule. On the tail rope plan the engine has two drums worked by spur gearing, which can be connected with, or cast loose from, the driving shaft at pleasure. The main rope, which draws out the loaded tubs, coils upon one drum, and passes near the floor over guide sheaves placed about 20 feet apart. The tail rope, which is of lighter section than the main one, is coiled on the second drum, passes over similar guide sheaves placed near the roof or side of the gallery round a pulley at the bottom of the plane, and is fixed to the end of the train or set of tubs. When the loadis being drawn out, the engine pulls directly on

the main rope, coiling it on to its own drum, while tlic tail drum runs loose pay- ing out its rope, a slight brake pressure being used to pre- vent its running out too fast. When the setarrives out bye, the main rope will be wound up, and the tail rope pass out from the drum to the end and back, 7.¢., twice the length of the way; the set is returned in bye, by reversing the engine, casting loose the main, and coupling up the tail drum, so that the tail rope is wound up, and the main rope paid out. This method, which is the oldest, having been in use for twenty-five years or more in the North of Eng- land, is best adapted for ways that are nearly level, or when many branches are intended to be worked from one engine, and can be carried round curves of small radius without deranging the trains; but as it is intermittent in action, considerable engine-power is required in order to get up the required speed, which is from 8 to 10 miles per hour. From 8 to 10 tubs are usually drawn in a set, the ways being often from 2000 to 3000 yards long. In dip workings the tail rope is often made to work a pump con- nected with the bottom pulley, which forces the water back to the cistern of the main puraping engine in the pit.

For the endless chain system, which is much used in the Wigan district a double line of way is necessary, one line for full and the other for empty tubs. The chain passes over a pulley driven by the engine, placed at such a height as to allow it to rest upon the tops of the tubs, and round a similar pulley at the far end of the plane. The forward edge of the tub carries a projecting pin or horn, with a notch into which the chain falls which drags the tub forward. The road at the outer end is made of a less slope than the chain, so that on arrival the tub is lowered, clears the pin, and so becomes detached from the chain. The tubs are placed on at intervals of about 20 yards, the chain moving continuously at a speed of from 24 to 4 miles per hour. This system presents the greatest advantages in point of economy of driving power, especially where the gradients are variable, but is expensive in first cost, and is not well suited for curves, and branch roads cannot be worked con- tinuously, as a fresh set of pulleys worked by bevel gear- ing is required for each branch.

The endless rope system may be used with either a single or double line of way, but the latter is more gene- rally advantageous. The rope, which is guided upon sheaves between the rails, is taken twice round the head

pulley; or a Fowler's clip pulley may be used. It is also customary to use a stretching pulley to keep the rope strained when the pull of the load diminishes. This is done by passing a loop at the upper end round a pulley mounted in a travelling frame, to which is attached a weight of about 15 cwt. hanging by a chain. This weight pulls directly against the rope; so if the latter slacks, the weight pulls out the pulley frame and tightens it up again. The tubs are usually formed into sets of from 2 to 12 the front one being coupled up by a short length of chain

Ventila- tion.

Furnace,

- the coal by a narrow passage walled and arched in brick-

70

to a clamping hook formed of two jaws moulded to the curve of the rope which are attached by the "run rider," as the driver accompanying the train is called. This system in many respects resembles the tail rope, but has the advantage of working with one-third less length of rope for the same length of way. ;

The endless rope system overhead is substantially similar to the endless chain. 'The waggons are attached at intervals by short lengths of chain lapped twice round the rope and hooked into one of the links, or in some cases the chains are hooked into hempen loops on the mam rope. nie of the most important branches of colliery work is the management of the ventilation, involving as it does the supply of fresh air to the men working in the pit, as well as the removal of inflammable gases that may be given off by the coal. This is effected by carrying through the workings a large volume of air which is kept continu- ally moving in the same direction, descending from the surface by one or more pits known.as intake or downcast pits, and leaving the mine by a return or upcast pit. Such a circulation of air can only be effected by mechanical means when the workings are of any extent, as will be apparent from the following considerations :—

Tf the shafts Aand B, fig. 15, were of equal Wy depth from the horizon- 77 tal plane, and connected yy by the mine C, the air YY Yy would fill the openings j Y

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Y and remain quiescent. Y YY If the one were to the 77

dip of the other, but ”/

communicating withthe /// surface ata higher level, as by fig. 16, it would sometimes happen, in summer, that D would be the down- cast, and E the upcast, and in winter, E the downcast, and D the upcast. These conditions are induced by the tem-

E

perature of the earth at a certain depth being nearly con- stant, while the atmosphere is changeable,—the column of air in D d being at a lower temperature in summer than the column of air Ee, and the reverse in winter,

The methods actually adopted are—(1) The rarefaction of the air in the upcast pit by a furnace placed at the bottom; and (2) Exhaustion by machinery at the surface. The former plan, although hitherto most generally used, is in many places becoming replaced by some form of machine,

The usual form of ventilating furnace is a plain fire- grate placed under an arch, and communicating with the upcast shaft by an inclined drift. It is separated from

work on both sides. The size of the grate varies with the requirements of the ventilation, but from 6 to 10 feet broad and from 6 to 8 feet long are usual dimensions.

COAL

At Shireoaks Colliery, suming 6 tons of slack

[MINING.

in Nottinghamshire, a furnace con- per 24 hours upon a grate surface

of 72 square feet maintains a circulation of about 120,000

cubic feet per minute. the grate is a long, narrow rectangle,

At Hetton Colliery, Durham, 25 feet by 5 feet,

with numerous furnace-doors on the long side, so arranged

that the surface fired may

be varied according to the

amount of draught required. There are two bunker-

holes for coals, and a stoking passage, 7 feet front of the furnace.

wide, in The fire should be kept as thin and

bright as possible, to reduce the amount of smoke in the

upcast. When the mine be worked by the return air, but it is better to take air directly from the downcast by a scale, or split, the main current.

is free from gas, the furnace may

fresh from»

The return air from fiery workings is

never allowed to approach the furnace, but is carried into

the upcast by a

special channel, called a dumb drift,

some

distance above the furnace drift, so as not to come in con- tact with the products of combustion until they have been cooled below the igniting point of fire-damp. Where the upeast pit is used for drawing coal, it is usual to discharge.

the smoke and gases through surface into a tall chimney, clear as possible for working. built directly over the mouth of the pit.

Various kinds of machines for ventilation, both by exhaustion and centrifugal

displacement, have been t

a short lateral drift near the so as to keep the pit-top as Otherwise the chimney is

direct Mechani ried YeRwana |

both in England and in Belgium. Of the former class are the great bell machines, resembling gasometers, 12 feet

to 22 feet in diameter, and 9 feet high, moving in a

water

tank with balanced flap valves for alternately admitting

and exhausting the air.

near Liége, and at

These were used at Marihaye, Cwm Avon in South Wales, by Mr

Struvé. Perhaps the largest of the class of piston machines

is that at Nixon’s Navigation Pit, near Aberdare,

has rectangular pistons, 30

which

feet by 22 feet, moving hori-

zontally through a stroke of 7 feet, the lower edge being

supported by rollers running on rails.

The great weight

of the moving parts in this class of machine makes them

any very high speed, and the amount of work done.

incapable of acting at quently expensive for

conse-

This is

in some degree obviated in the rotary piston machines of

Fabry and Lemielle, Root's blower, now so much used smiths' fires, but on a larger scale. is a vertical drum revolving eccentrically within a drical casing. The drum carries which are drawn in or out by radius bars

the former resembling in principle in blowing foundry and Lemielle's ventilator

cylin-

three jointed blades, as it revolves, so

as to enclose and sweep out at each revolution the body of

air included between the two cylinders. high effect for the power expended.

vol. iii. p. 552, fig. 5. Of late years} various

One of the most successful of these is that invented

carrying flat close-boarded blades revolves with the smallest possible

to the centre of the fan. The

height of about 25 feet. can be varied by means of a

This is one of the best machines of its class, producing a comparatively An American machine of this kind is described and figured in the article BELLOWS,

kinds of centrifugal machines, or fans, have come into use instead of ventilating furnaces.

by Mr

Guibal of Liége, represented in fig. 17. The fan has eight arms, framed together of wrought-iron bars, with diagonal struts, so as to obtain rigidity with comparative lightness, at their extremities. It clearance in a chamber of ’masonry, one of the side walls being perforated by a large round hole, through which the air from the mine is admitted t lower quadraut of the casing is enlarged spirally, so as to leave a narrow rectangul opening at the bottom, through which the air is discharged into a chimney of gradually increasing section carrie The size of the discharge aperture | flexible wooden shutter sliding ii

ar ”

d toa

VENTILATION. |

in a groove in a cast-iron plate, curved to the slope of the casing. By the use of the spiral guide casing and the

chimney, the velocity of the effluent air is gradually reduced up to the point of final discharge into the atmosphere, whereby a greater useful effect is realized than is the case when the air streams freely from the circumference

with a velocity equal to that of the rotating fan. The power is applied by steam acting directly on a crank at one end of the axle. In most of the newer examples, which are generally of large size, the power is divided, an engine being placed on each side. At Washington Colliery, Durham, a machine of 36 feet diameter, 12 feet breadth of face, and 13 feet diameter of intake passage, draws 120,000 cubic feet of air per minute, when making 38 revolutions. Another at Usworth, 48 feet diameter and 12 feet breadth of face, driven by two high-pressure engines, with cylinders 3 feet in' diameter and 3 feet stroke, equal 'to about 280 horse-power, exhausts 200,000 cubic feet per minute. The useful effect realized under the most favourable conditions is as much as 50 per cent. of that of the steam power employed.

Waddle's fan, represented in fig. 18, is an example of

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another class of centrifugal ventilator, in which a close cas- Ing is not used, the air exhausted being discharged from the circumference directly into the atmosphere. It con- sists of a hollow sheet-iron drum formed by two conoidal tubes, united together by numerous guide blades, dividing it up into a series of rectangular tubes of diminishing sec- tion, attached to a horizontal axle by cast-iron bosses and wrought-iron arms. The tubes at their smallest part. are connected to a cast-iron ring, 10 feet in diameter, but at their outer circumference they are only 2 feet apart. The extreme diameter is 25 fect. A fan of these dimen- sions at Brownhills in Staffordshire, in making 50 revolutions per minute, circulates 47,000 cubic feet of air through the workings. It has also been in use for some years in South Wales, and is found to work well ; 16 is less expensive in first cost than QGuibal's, although proportionally less

COAL

economical from the smaller effect realized for the power expended. ;

Another method of colliery ventilation is that by jets of Ventilation steam blowing off at a high velocity into the upeast shaft, by steam and producing a draught similar to that of the exhaust Jets.

blast in the chimney of a locomotive. This plan found several advocates some years since, and was the subject of numerous comparative trials against the ventilating fur- nace in the North of England, but the results were unfa- vourable, the amount of air circulation produced being exceedingly small for the fuel expended. It seems probable, however, that this want of success was in great part due to the defective character of the apparatus applied, and that, with properly-constructed aspirators and discharge passages, the steam jet may prove to be a very efficient means of ventilation.

The comparative merits of furnace and machine ventila- tion have long been discussed without any definite result. The former was at one time regarded in England as practi- cally superior in every respect, but this opinion has been modified since the introduetion of the improved forms of fans which have been worked to a considerable extent. In France and Belgium, on the contrary, machine ventilation has been more generally in favour. For a deep and ex- tensive mine where the coal is not fiery, the furnace is undoubtedly the simplest and most efficacious method of producing a large circulation of air; but for moderate depths, especially with fiery return air, a ventilating machine at the surface is in many cases to be preferred. There is also an important advantage procured by the latter, namely, that of reserve power, so that a larger circulation may be obtained immediately in case of need, e.g., when the barometer falls suddenly, by merely increasing the speed of rotation, which cannot so readily be done with the furnace, which has a tendency to slacken at the time

when the increased work is wanted.

The quantity of air required for a large colliery depends Distribu- upon the number of men employed, as for actual respira- tion of air

tion from 100 to 200 cubic feet per minute should be allowed. In fiery mines, however, a very much larger amount must be provided in order to dilute the gas to the point of safety. Even with the best arrangements a dan- gerous increase in the amount of gas is not unfrequent from the sudden release of stored up masses in the coal, which, overpowering the ventilation, produce magazines of explosive material ready for ignition when brought in con- tact with the flame of a lamp or the blast of a shot. The management of such places, therefore, requires the most constant vigilance on the part of the workmen, especially in the examination of the working places that have been standing empty during the night, in which gas may have accumulated, to see that they are properly cleared before the new shift commences. –

The actual conveyance or coursing of the air from the intake to the working faces is effected by splitting or dividing the current at different points in its course, so as to carry it as directly as possible to the places where it is required. In laying out the mine, it is customary to drive the levels or roads in pairs, communication being made between them at intervals by cutting through the inter- mediate pillar, the air then passes along one, and returns by the other. As the roads advance other pillars are driven through in the same manner, the passages first made being closed by stoppings of broken rock, or built up with brick and mortar walls, or both. When it is desired to preserve a way from one road or similar class of work- ing to another, double doors placed at sufficient intervals apart to take in one or more trams between them when closed are used, forming a kind of lock or sluice. These are made to shut air-tight against their frames, so as to

under ground.

comparatively free from marsh gas, a8 compared with those from the steam coal and anthracite pits. The latter class of coal contains the largest proportion of this danger- ous gas, but holds it more tenaciously than do the steam coals, thus rendcring the workings comparatively safer. It was found that, of the entire volume of occluded gas in an anthracite, only one-third could be expelled at the tem- perature of boiling water, and that the whole quantity, amounting to 650 cubic feet per ton, was only to be driven out by

a heat of 300° C. Steam coals being softer and more porous give off enormous volumes of gas from the working face in most of the deep pits, many of which have been the scene of disastrous explosions.

The gases evolved from the sudden outbnrsts or blowers in coal, which are often given off at a considerable tension, are the most dangerous enemy that the collier has to con- tend with. ‘They consist almost entirely of marsh gas, with only a small quantity of carbonic acid, usuaily under 1 per cent., and from 1 to 4 per cent. of nitrogen.

Fire-damp when mixed with from four to twelve times ‘ts volume of atmospheric air is explosive ; but when the proportion is above or below these limits, it is inflam- mable, burning quietly with a pale blue flame. Whena lighted candle is exposed in a non-explosive mixture of this gas, the flame gradually elongates, forming a conical cap, floating above the wick, which may be extinguished by cautious Withdrawal without communicating the fire to the surrounding atmosphere. This method of testing for gas in the working places and wastes, which is obviously only to be trusted in skilled hands, used to be commonly practised, but since the introduction of safety lamps it has fallen into disuse,

prevent the air from taking a short cut back to the np- cast, while preserving free access between the differcnt districts without following the whole round of the air- ways. . The ventilation of ends is cffected by means of brattices or temporary partitions of thin boards placed midway in the drift, and extending to within a few feet of the face. The air passes along one side of the brattice, courses round the free end, and returns on the other side. In many cases a light but air-proof cloth, specially made for the purpose, is used instead of wood for brattices, as being more handy and more easily removed. In large mines where the air-ways are numerous and complicated, it often happens that currents travelling in opposite directions are brought together at one point. In these cases it is neces- sary to cross them in the manner shown I fig. 2, Plate IU. The return air is usually made to pass Over the intake by a curved drift carried some distance above in the solid measures, both ways being arched in brickwork, or even in some cases lined with sheet-iron so as to eusure a separation not likely to be destroyed in case of an ex- plosion. The relation of the ventilation to the workings

under the different systems is indicated on the several plates by arrows and other signs, from which the general character of the arrangements adopted can be made out without further description. we.

The lighting of underground workings in collieries 1s closely connected with the subject of ventilation. In many of the smaller pits in the Midland districts, and generally in South Staffordshire, the coals are sufficiently free from gas, or rather the gases are not liable to become explosive when mixed with air, to allow the use of naked lights, candles being generally used. Oil lamps are em- ployed in many of the Scotch collieries, and are almost universally used in Belgium and other Continental coun- tries. The buildings near the pit bottom, such as the stables and lamp cabin, and even the main roads for some distance, are often in large collieries lighted with gas brought from the surface, or in some cases the gas given off by the coal is used for the same purpose. Where the gases are fiery, the use of protected lights or safety lamps becomes a necessity.

The nature of the gases evolved by coal when freshly exposed to the atmosphere has been investigated by several chemists, more particularly by Playfair and Meyer. The litter observer found the gases given off by coal from the district of Newcastle and Durham to contain carbonic acid (anhydride), marsh gas or light carburetted hydrogen (the fire-damp of the miner), oxygen, aud nitrogen. .A newer investigation, by Mr J. W. Thomas, of the gases dissolved or occluded in coals from South Wales basin shows them to vary considerably with the class of coal. The results given below, which are selected from a much larger series published in the Journal of the Chemical Soctety, were obtained by heating samples of the different coals in vacuo for several hours at the temperature of boiling water.

a protecting metal case, perforated with numerous small holes, through which the air for feeding the flame may freely enter, and the products of combustion pass out, while the passage of flame, or gases sufficiently heated to cause the ignition of the external air when laden with explosive gases, is prevented. In 1816 Sir Humphrey Davy made the great discovery that these conditions are fulfilled by the use of tubes reduced to a mere section, such as the apertures in wire gauze, when the substance of the wire is rightly proportioned to the size of the aperture. The standard adopted as the limit for safety at that time was a gauze of 28 iron wires to the linear inch, having 784 apertures per square inch, which has been used ever since. The common safety or Davy lamp consists of a small cylindrical oil lamp,

covered with a cylinder of wire gauze about 6 inches long and 1} inches in diameter, with a flat gauze top. The upper part of the gauze is doubled to prevent its being worn into holes by the products of combustion, and the air for feeding the flame enters round the wick. ‘The gauze is mounted in a cage, consisting of three upright wires, screwed into a flat brass ring at each end, A handle is attached to the upper ring, while the lower

=e a ia : one screws on toa collar on the oil-vessel of the lamp.

Composition in Volumes per cent.

oe | ice. penton. mr. a, When the two parts are screwed together the lamp is locked feet. | Botte lie cael wae by a bolt passing through both parts, which is screwed

— i |i ee down flush with or below the surface of the outer ring, so Bituminous. | Cwm Clydach. | 1972] 5-44 | 05 | 6376 | 29-75 that the gauze cannot be removed without the use of a key. puminous, | Gropaoee™ | 220k) Sat | Hab | Se | BES | | Tn Stephenson’s safety-lamp, gener eae ne ig mate { Bonville’s \ 199-95 | 2-62} .. { 9313 | 425 “ Geordie,” from the inventor George Stephenson, the light a is covered by a glass chimney, surrounded by an outer

casing and top of wire gauze. The feed air is admitted through numerous small holes in a copper ring @ little below the level of the wick, This is one of the safest forms of lamp, but requires considerable care in use, espe cially in keeping the small feed holes clear from dust and oil ; the glass protects the gauze from becoming overheated,

In one instance, about 1 per cent. of hydride of ethyl was found in the gas from a blower in a pit in the Rhondda dis- trict, which was collected ina tube and brought to the surface to be used in lighting the engine-room and pit-bank, The gases from the bituminous house coals of South Wales are

The principle involved in the construction of safety- Safty. lamps consists in surrounding the flame of a lamp by lamps

SAFETY LAMPS. |

end when the air is dangerously charged with gas the light | dental breakage, which, however, is less frequent than

is extinguished.

Various forms of safety-lamps have been introduced at different times, for the purpose of increasing the amount of light by substituting a glass cylinder for the lower portion of the wire gauze. The oldest of these is that of Dr Clanny, contemporary with those of Davy and Stephenson. The air for supplying the flame, entering at the bottom of the gauze, and passing down the inner side of the glass, protects the latter to some extent from becoming over- heated, but a large amount of light is lost by absorption in the glass, so that there is no great advantage over the ordinary Davy lamp to compensate for the extra weight and cost, especially as the safety property of the lamp depends upon the glass cylinder, which may be readily broken when subjected to the ordinary accidents of work- ing. A more perfect form of lamp of the same character is that of Museler, which is extensively nsed in Belgium. It differs from Clanny's lamp by the addition of a conical chimney above the flame, which produces a rapid draught, and consequently a more perfect cooling of the glass cylinder by the down-draught of feed air for the flame.

Boty's lamp, which was recommended by a commission of the Belgian Government as being safe in use, is essen- tially that of Dr Clanny with Stepheuson's perforated ring for admitting air at the Icvel of the wick. Another Belgian variety is that of Eloin, in which the glass is shaped to the surface produced by the revolution of a parabolic arc, so as to disperse the light in parallel lines. The air is admitted by a Stephenson ring, combined with an Argand cap, the glass being surrounded by a brass chimney with a gauze top. In another form of the same lamp Museler's chimney is added.

The locking of safety-lamps, so as to render them in- capable of being opencd by the iminers when at work, is a point that has given play to a large amount of ingenuity. One of the most favourite devices is a. combination of the wick-holder with the locking bolt, so that the latter cannot be withdrawn without lowering the wick and extinguishing the flame. Another method

consists in the use of a lead rivet, uniting the two parts of the lamp, impressed with a seal, which cannot be removed without defacing the device. All this class of contrivances have the defect of only being etlicacious when the miners are not provided with matches, or other means of obtaining a light. A more physically perfect method is that adopted by Bidder, where the locking bolt is magnetized and held in place by a force which can only be overcome by the application of a battery of heavy and powerful steel magnets. These are kept in the lamp cabin at the pit bottom, where the lamps are cleaned and served out lighted to the miners at the com- mencement of the shift, and are collected before they return to the surface.

When a Davy lamp is exposed to an atmosphere con- taining less than 8 per cent. of marsh gas, the flame lengthens and becomes smoky; when that amount is reached the flame returns to its usual size, but a column of blue flame mises to the top of the gauze. With 10 per cent. the flame of the wick is extinguished, the whole of the space within the gauze being filled with a blue flame of burning gas. If the lamp is allowed to remain too long in a fiery atmo- sphere it becomes dangerous, as the gauze being heated to redness may fire the gas. The safety of the lamp is also endangered by an exposure to a current of gas moving at the rate of more than 6 or 8 feet per second, as the flame can then be readily driven through the gauze. It is there- fore usual to protect the flame by a sliding shield of tin plate, horn, or mica from the direct action of any sudden outburst of gas in the workings. Lamps with glass cylin- ders are generally very safe, except from the risk of acci-

might be imagined, and those taking air through a feed ring, such as Stephenson's, are readily extinguished in a foul atmosphere.

The danger arising from gas in the workings may be considerably increased by the presence of coal dust in the air. 'his point has been the subject of investigation by Galloway, who found that an explosion may be produced by ignited particles of coal dust through the agency of a safety-lamp which under ordinary circumstances would be perfectly trustworthy. At Blanzy, in France, several fatal explosions have been traced to the firing of coal dust

from the flame of a shot, even in cases where no fire-damp was present in the workings.

An electric lamp, where the light is obtained frora the Electric discharge in a Geissler vacuum tube, has been proposed !amps.

by Benoit-Dumas, instead of the ordinary safety lamps, or for use in exploring after explosions or in bad air ways. This consists of a box containing a galvanic battery, cou- sisting of two Bunsen cells, and a small induction coil, with connecting wires which convey the current to the lamp. The Bunsen cells may be conveniently replaced by a single bottle-shaped bichromate battery. The cost and complication of this apparatus must necessarily limit its use.

Apparatus, originating in France, known as aerophores, Acro- which enable the miner to carry sufficient fresh air for Phoves:

his own respiration, and to keep a lamp alight for a short time in a totally irrespirable atmosphere, have of late years come into use for the purposes of saving life after explosions, and repairing shafts and pit-work under water. There are two principal patterns, those of Galibert and Denayrouze. The former, which is the simplest, con- sists of an air-tight bag of about 12 cubic feet capacity, con- taining air at a little above atmospheric pressure, which is carried on the miner's back like a knapsack. The air, after being used, is returned with the products of respiration into the bag, and can be used over again until it becomes too impure for further use. It is obvious, therefore, that such an apparatus must be of very limited application, but its simplicity and cheapness are points in its favour for use in sudden emergencies. The Denayrouze apparatus cousists of a series of sheet metal cylinders, containing air compressed to 300 or 350 ib to the square inch, which can be carried ou the back, and served out at a pressure very slightly above that of the atmosphere by means of a reducing valve, whose construction is essentially the same in principle as that of the ordinary pressure regulator used in gas-works, z.e., a conical plug closed against its seat by the pressure of the air in the reservoir, which is constantly opposed by an external force tending to open it. This force is supplied by a dise of vulcanized india-rubber, which opens the valve at each inspiration, aud allows a fresh supply of air to escape into the chamber of the regulator through the small aperture

of the valve. Of course, all communication with the external air must be cut off, so that respiration can only take place through the mouth, the air-tube being attached by an india-rubber mask called a mouth-closer, and the nostrils closed by a spring clip. A similar regu- lator valve, so constructed as to keep the india-rnbber spring under a slight excess pressure in order to maintain a flow of air, is in connection with the lamp, ‘This is of the ordinary Museler construction, with the addition of a chamber outside the gauze to receive the products of com- bustion, which are discharged through a conical valve at the top, a reflux of the exterior gases being prevented by the pressure of a counter spring. The air is carried tc the lamp by an india-rubber tube, which 1s sufliciently flexible to allow a certain freedom of motion. The dis- tance that an explorer can penetrate with this apparatus is obvicusly limited by the capacity — air-cylinders. Sila == Ke)

Fires in mines.

Methods of

winding.

Cage.

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These have been made large enough to supply air to a man with a lamp for an hour, but this is an inconvenient size, being too large to be carried on the back.

Underground fires are not uncommon accidents in coal- mines. In the thick coal workings in South Staffordshire the slack left behind in the sides of work is especially liable to fire froin so-called spontaneons combustion, due to the rapid oxidization that is set up, when finely-divided coal is brought in coutact with air. The best remedy in such cases is to prevent the air from gaining access to the coal by building a wall round the burning portion, which can in this way be isolated from the remainder of the working, and the fire prevented from spreading, even if it cannot be extinguished. When the coal is fired by the blast of an explosion it is often necessary to completely isolate the mine by stopping up the mouths of the pits with

earth, or in extreme cases it must be flooded with water or carbonic acid before the fire can be bronght under. There have been several instances of this being done in the fiery pits in the Barnsley district, notably at the great explosion at the Oaks colliery in 1866, when 360 lives were lost.

The drawing or winding of the coal from the pit bottom to the surface is one of the most important operations in coal mining, and probably the department in which me- chanical appliances have been brought to the highest state of development. In the simplest case, where the mine is worked by levels, the trains of coal may be drawn from the working faces dircctly to the level mouth by horse powcr, or in some exceptional cases locomotives worked by com- pressed air are used. In South Wales the power for lifting the load in the shaft is still in some small workings fur- nished by a water balance, that is, a box which is filled

with water at a high level, and in descending raises

the loaded trucks by a rope passing over a pulley at the surface. free drainage level for the water to run off when the box reaches the lowest point. Other hydraulic motors, such as wheels, pressure engines, &c., are used in different locali- ties as well as animal power, where the amount of coal to be drawn is small, but as a general rule it is necessary to have recourse to steam power to maintain an adequate output. The old custom of drawing the coals in tubs or hutches (cuffat of the French miner), swinging freely from tho end of the drawing rope, is now almost entirely super- seded by the adoption of cages sliding between fixed guides, which allow the load to move freely up and down while checking lateral oscillation. This improvement, which is due to Mr John Curr of Sheffield, was originally intro- duced in 1798, but made surprisingly little progress for nearly half a century. It was first brought into general use in the North of England, but in many of the smaller pits of the Midland counties the older custom prevailed until recently.

The different elements making up the drawing arrange- ments of a colliery are—(1) the cage, (2) the shaft or pit fittings, (3) the drawing-rope, (4) the engine, and (5) the surface arrangements, The cage, as its name implies, consists of one or more platforms connected by an open framework of vertical bars of wrought iron or steel, with a top bar to which the drawing-

rope is attached. It is customary to have a curved sheet-iron roof or bonnet when the cage is used for raising or lowering the miners, to pre- vent them from injury by falling materials. The number of platforms or decks varies considerably ; in small mines only a single one may be used, but in the larger modern pits two, three, or even four-decked cages are used. The use of several decks ig necessary in old pits of small sec- tion, where only a single tram can be carried on each. In the large shafts of the Northern and Wigan districts the cages are made about 8 feet long and 34 feet broad, being

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This method is only available when there is a

sufficient to carry two large trams on one deck. These are received upon a railway made of two strips of angle iron of the proper gauge for the wheels, and are locked fast by a latch falling over their ends.

The guides or conductors in the pit may be constructed Guides, of wood, in which case rectangular fir beams, about 3 by 4 inches, are used, attached at intervals of a few feet to buntons or cross-beams, built into the lining of the pit. ‘wo guides are required for each cage; they may be placed opposite to each other, either on the long or short sides—the latter being preferable. The cage is guided by shoes of wrought iron, a few inches long and bell-mouthed at the ends, attached to the horizontal bars of the framing, which pass loosely over the guides on three sides. In some of the large collieries in Northumberland wrought iron guides have been adopted with advantage. ‘They are applied on one side of the cage only, forming a complete vertical railway,—light flange rails such as are used for the roadways underground being used instead of wooden rods and iron cross sleepers, with proper seats for the rails snstead of wooden buntons ; the cage is guided by curved shoes of a proper section to cover the heads of the rails. Rigid guides connected with the walling of the pit are probably the best and safest, but they have the disadvan- tage of being liable to distortion, in case of the pit altering its form, owing to irregular movements of the ground, or other causes, Wooden guides being of considerable size, block up a certain portion of the area of

the pit, and tlms offer an impediment to the ventilation, especially in up-cast shafts, where the high temperature, when furnace ventilation is uscd, is also against their use. In the Wigan district, wire-rope guides have been introduced to a very considerable extent, with a view of meeting the above objections, These are simply wire-ropes, from 3 to 14 inches in diameter, hanging from a cross-bar connected with the pit-head framing at the surface, and attached to a similar bar at the bottom, which are kept straight by a stretching weight of from 30 cwt. to 4. tons attached to the lower bar. In some cases four guides are used—two to each of the long sides of the cage; but a more general arrangement is to have three—two on one side, and the third in an intermediate position on the opposite side. Many colliery managers, however, prefer to have only two opposite guides, as being safer, The cage is connected by tubular clips, made in two pieces and bolted together, which slide over the ropes. In addition to this, it is ne cessary to have an extra system of fixed guides at the surface and at the bottom, where it is necessary to keep the cage steady during the operations of loading and landing, there being a much greater amount of oscillation during the passage of the cage than with fixed guides. For the same reason it is necessary to give a considerable clearance between the two lines of guides, which are kept from 15 to 18 inches apart, to prevent the possibility of the two cages striking each other in passing. With proper precautions, however, wire guides are perfectly safe for use at the highest travelling speed. |

The cage is connected with the drawing-rope by short Ropes® | lengths of chain from the corners known as tackling chains. chains, gathered into a central ring, to which the rope is | attached. Round steel wire-ropes, about 2 inches in diameter, are now commonly used ; but in very deep pits they are sometimes tapered in section to reduce the dead weight lifted. Flat ropes of steel or iron wire were and are still used to a great extent, but round ones are now gene- rally preferred. In Belgium flat ropes of aloe fibre are in high repute, being considered preferable by many colliery managers to wire, in spite of their great weight. In South Staffordshire, flat link chains made with three or more parallel links, with a stud of wood filling up the

WINDING. |

hollow, are or were in general use in the numerous shallow pits working the thick coal in the neighbourhood of Dudley, &e.

The best modern engines for drawing in collieries are usually direct-acting, with either horizontal or vertical cylinders. In the north of England a single engine with a heavy fly-wheel is often used, but the more general arrangement is to have two engines coupled to the opposite ends of the winding drum-shaft. In almost all cases steam is used at high pressure without condensation.

The drum, when round ropes are used, is a plain broad cylinder, with flanged rims, and cased with soft wood packing, upon which the rope is coiled; the breadth is made sufficient to take the whole length of the rope at two laps. One drum is usually fixed to the shaft, while the other is loose, with a screw link or other means of coup- ling, in order to be able to adjust the two ropes to exactly the same length, so that one cage may be at the surface when the other is at the bottom, without having to pay out or take up any slack rope by the engine.

For flat ropes, the drum or bobbin consists of a solid disc, of the width of the rope fixed upon the shaft, with numerous parallel pairs of arms or horns, arranged radially on both sides, the space between being just sufficient to allow the rope to enter and coil regularly upon the preced- ing lap. This method has the advantage of equalizing the work of the engine throughout the journey, for when the load is greatest, with the full cage at the bottom and the whole length of rope out, the duty required in the first revolution of the engine is measured by the length of the smallest circumference ; while the assistance derived from gravitating action of the descending cage in the same period is equal to the weight of the falling mass through a height corresponding to the length of the largest lap, and so on, the speed being increased as the weight diminishes, and vice versa.

The same thing can be effected in a more perfect manner |

by the use of spiral or scroll drums, in which the rope is made to coil in a spiral groove upon the surface of the drum, which is formed by the frusta of two obtuse cones placed with their smaller diameters outwards. This plan, though mechanically a very good one, has certain defects, especially in the

possibility of danger resulting from the rope slipping sideways, if the grooves in the bed are not perfectly true. The great size and weight of such drums are also disadvantages, as giving rather unmanageable dimensions in a very deep pit.

The use of a counterbalance chain for the winding engines is common in the collieries of the Midland dis- tricts of England. In this method a third drum is used to receive a heavy flat link chain, shorter than the main drawing-ropes, the end of which hangs down a special or balance pit. At starting, when the full load is to be lifted, the balance chain uncoils, and continues to do so until the desired equilibrium between the working loads is attained, when it is coiled up again in the reverse direc- tion, to be again given out on the return trip.

The surface arrangements of a modern colliery are often of considerable extent and complexity, the most important feature being the pit-frame carrying the guide-pulleys or rope-rolls which lead the drawing-ropes from the verti- cal line of the pit to the engine-drum. This consists essentially of an upright framework, carefully braced together, and strutted by diagonal beams against the wall of the engine-house, or other solid abutment. It is gene- rally necessary to have a clear head-room, 10 or 20 feet or more, for the working arrangements at the surface above the level of the ground, especially in flat countries ; the pit- frames are made of considerable height, from 50 to 70

{vet being not uncommon ; and when, as is generally the |

case, they are made of wood, they afford opportunities for the exercise of skilful carpentry. Of late years, however wrought iron pit-frames have been adopted to some extent, which allows of a comparatively simpler construction being used, the main elements of the frame cousisting of hollow latticed pillars and beams, similar to the construc- tion now generally adopted for the pillars of railway signals, but of course of a more solid construction. They have one great advantage over wooden frames; in

not being liable to destruction by fire, an accident which has occasionally happened with the latter. The guide-pulleys for iron or steel wire-ropes are made of very large dimen- sions, to avoid strain upon the wires by sudden change of

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Fig. 20,

direction when moving at a high speed. The usual construction is a deep channeled rim or tire of east-iron, from 7 to 20 feet in diameter, supported by numerous thin wrought iron arms, inclining inwards from a central cast-iron boss,—a form combining rigidity with comparative lightness. They are in fact very similar to the driving wheels of the large modern bicycles, supposing a channeled rim to be substituted for the india- rubber tire.

or from overwinding when the engine is not stopped at the right moment, whereby the cage may be –

Fig. 21. Figs. 19-21.—White and Grant's Safety Catch.

dragged up to the head pulleys (both which kinds of acci- dent are unhappily not uncommon), various forms of safety catch and disengaging hooks have been proposed. These consist of variously-constructed toothed levers, cams, or eccentrics, mounted upon transverse axes, attached to the top of the cage, whose function is to take hold of the guides, and support the cage in the event of its becoming detached from the rope. They are generally applied by means of springs acting against the pull of the rope. Figs. 19-21 represent a form of safety catch, introduced some years since by Messrs White and Grant of Glasgow. The catches BB consist of partially toothed eccentrics, which when released are forced inwards against the wooden guide a by the coiled springs d d, as shown in fig. 21.

When the rope is drawing, the catches are lifted by the

To prevent accidents from the gafety breakage of the rope on the shaft, catches.

pull of the chains attached to the pulleys ¢ ¢, which turn the broad toothed portions outwards, and away from the guides. The connection with the rope is made by the slide bar C and spring catch # having @ projecting trigger, which, if the cage is lifted too high, strikes against the cross-bar of the framing 4, and detaches the cage, which is then left hanging by the catches to the guides In the pit. The use of safety catches is more common 1n the collieries of France, Belgium, and Germany than 1n Eng- land, where they are not generally popular, owing to their uncertainty in action, as they are often found to fail when most wanted. The constant drag of the catches on the guides when the rope slacks is also objectionable, but this has been overcome to a great extent in a very 1n- genious contrivaitce invented by Mr Calow, where the catches are not brought into action unless the cage ‘s actually falling clear of the rope, with a certain acquired momentum of its own. The only real safeguards against accidents in winding are to be found in constant vigilance, in maintaining the ropes in working efficiency, and in the use of proper signals and brake power in the engine house.

The speed attained by the load in the shaft in the best- appointed English : be paralleled with that of a fast railway train. At Shire- oaks Colliery, Nottinghamshire, the cage with a load of 34 ewts. of coal in five tubs, and weighing in all 60 cwts., or with the rope at the bottom 92} ewts., is raised from a depth of 516 yards in 45 seconds, corresponding to an average of 35 feet per second, or 24 miles per hour, the maximum speed when the load is mid-way being 50 feet per second, or nearly 35 miles an hour. The ropes used are round, of steel wire, weighing 13 Ibs. to the yard, winding on to a spiral drum, increasing from 17 to 20 feet in diameter. There are two engines with vertical cylinders, 32 inches diameter and 6 feet stroke, developing a useful effect of about 320 horse-power. The guide pul- leys are 12 feet in diameter.

The above may be taken as a good example of the mo- dern class of winding engines, such as are required to draw from 600 to 1200 tons in the shift of 10 hours. When the pits are of small depth it is better to increase the weight of the load than to draw at a very high speed, as the loss of time in

filling and unloading or striking the cages is the same for a short as for a long journey, so that it becomes advantageous to diminish the number of journeys for a given quantity of coal drawn.

The great amount of dead weight required to be raised in the ordinary system of winding (e.g., in the instance given above, the total weight moved is nearly four times that of the nett load drawn, that of the ropes being nearly 1} times as much as the latter), has led to the proposal of various plans to obtain a more mechanically economical method, but none of these have at present been brought into successful use. One of the latest is that of M. Blanchet, who proposes to draw a number of tubs linked together into a long vertical train in a closed tube about 54 feet in diameter, by exhausting the air above them in the manner adopted in the pneumatic tubes used for the transmission of parcels. An experimental apparatus of this class has been recently constructed at Creusot, in France, designed to lift a cage with 9 tubs, attached to a piston, weighing in all about 12} tons.

When the cage arrives at the surface, or rather the plat- form forming the working top above the mouth of the pit, it is received upon the keeps, a pair of hinged gratings which are kept in an inclined position over the pit-top by counterbalance weights, so that they are pushed aside to allow the cage to pass upwards, but fall back and receive it when the engine is reversed. The tubs are then removed or struck by the landers, who pull them forward on to the

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collieries is very considerable, and may

[MINING.

platform, which is covered with cast-iron plates; at the same time empty ones are pushed in from the opposite side. The cage is then lifted by the engine clear of the keeps, which are opened by a lever worked by hand, and the empty tubs start on the return trip. Whien the cage has several decks, it is necessary to repeat this operation for each, unless there is a special provision made for load- ing and discharging the tubs at different levels. An arrangement of this kind for shifting the load from a large cage at one

operation has recently been introduced by Mr Fowler at Hucknall, in Leicestershire, where the trains are received into a framework with a number of platforms cor- responding to those of the cage, carried on the head of a plunger movable by hydraulic pressure in a vertical cylinder. The empty tubs are carried by a corresponding arrangement on the opposite side. By this means the time of stoppage is reduced to a minimum, 8 seconds for a three-decked cage as against 28 seconds, as the operations of lowering the tubs to the level of the pit-top, discharging, and replacing them are performed during the time that the following load is being drawn up the pit.

The tub when brought to the surface, after passing over a weigh-bridge, where it is weighed and tallied by a weigher specially appointed for the purpose by the men and the owner jointly, is run into a tipping cage, and the contents are dis- charged into an inclined screen with bars about 1 inch to 1} inches apart. The large coal remaining passes through a spout into a railway waggon placed below, the discharge being regulated by a valve at the lower end. The small coal passing through is either sold as such, or may be lifted by an elevator to a second series of screens, either fixed or rotating, with half-inch apertures. These make a further separation of larger pieces, which are sold as ‘“ nuts,” while the small, or slack, passing through is sent to the coke ovens, if the quality of the coal is suitable. Asa rnle, non-caking coals are not very closely screened, as the small is of comparatively little value, and therefore must have a proportion of larger sizes mixed with it to form saleable slack.

Figs. 22-24, representing the surface arrangements Ilustn:- adopted at a pair of pits in the Wigan district, may be tions of taken as fairly representative of the fittings of a large “a modern colliery, where a considerable output of coal has t0 ments, be screened and Joaded in an ordinary working day of less than twelve hours. The details, of course, will vary, ac- cording to the nature of the outlet or vend, which may be by retailing into carts sent by purchasers, or by canals or railways, or by a combination of all three. In the example selected, the coal is loaded directly from the screens into full-sized trucks, each carrying from 6 to 8 tous, ona main line of railway. Of the two pits, one is an upeast, and is surmounted by a chimney at the surface,—the drawing being confined to the downcast, which is 310 yards deep and 104

feet in diameter. 600 tons of coal are drawn from this depth in 10 hours by a pair of direct-acting engines, with vertical cylinders working a spiral drum, iu- creasing from 13} feet to 174 feet in diameter. The pit-head frame is of wood, with guide pulleys 7 feet in diarmeter,—

a much smaller size than is now usually adopted ; the iron wire drawing-ropes are round, weighing 9 Ib to the yard. Double-decked cages of a light construction in wrought iron are used, carrying four tubs at atime. The landing platform is raised upon pillars 20 feet above the surface of the ground, and covered with iron plates. As soon as the cage arrives at the surface, the tubs are run into tumbling cages, which discharge their contents on to fixed screens, with bars of 1 to 14 inch aperture. The large coal passes by a shoot directly into the railway waggon, while the first screenings fall into a channel below, which is traversed Ly a series of scrapers attached to au endless chain, and are

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SURFACE ARRANGEMENTS. |

carried to an elevator or Jacob’s ladder, aud discharged into rotatory drum sieves of about 4-inch aperture, pro- ducing a second size of saleable coal, known as nuts, aud

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a Engine House

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23.— Plan.

Fig. 24.—Transverse Elevation. Fras, 22-24,—Surface arrangements of Colliery.

slack, which is sent away to the coke ovens attached to the colliery. The whole of the labour required in the screening the output of 600 tons in the day of ten hours is performed by one engineman, who has charge of all the mechanical arrangements, and nine boys, who pick out any large lumps of stone from the coal as it passes the first screens. ‘The engine driving the screens and elevators is in charge of a special engineman.

Fig, 25 represents one of a pair of pits at Pemberton Colliery, near Wigan, having the pit frames constructed in wrought iron lattice truss-work instead of wood. ‘The screens for large coal (S) are arranged symmetrically on the landing platform, three on each side of the pit top, and discharge directly into waggons on the railway below. The small coal from these screens is passed by a screw creeper C, like those used in flour mills, to a bucket elevator E, which delivers it at the top of the second set of screens R, where the nuts and slack are separated. The platform, as 1n most of the new collieries in this district, is roofed over to protect the workinen from the weather. The second pit, which occupies a corresponding position on the oppo- site side of the engine-house, is in every respect similar.

|.general in other countries.

COAL 7

The large collieries in the steam-coal district of North- umberland are amoug the most productive; thus, at Bed- lington, near Morp2th, 1200 tons are raised daily, and at North Seaton from 1500 to 1800 tons,

When the coal is very much mixed with shale, the slack Coal- often contains so much mineral matter as to be quite worth- washing less, until at least a partial separation has been effected, ™2chiner. This is now done by means of coal-washing machines, which were first adopted in France, but have now become There are many different forms, but the most usual is a fixed sieve plate, upon which the slack is received and subjected to the action of a current of water forced through the holes by the action of a fast moving short-stroke plunger pump, which pnts the

Plan. Fic. 25.—Surface arrangements, Pemberton Pit, Wigan.

whole of the materials into suspension, and allows them to fall through the water at each stroke. By this means the coal, being the lighter inaterial, travels to the surface, and the heavier shale and stone going to the bottom are dis- charged through a valve there. ‘he apparatus is in fact a form of the hydraulic jigging hutch used for the dressing of lead and other ores, except that in this case the lighter and not the heavier part is the valuable mineral. In another form of coal-dressing machine introduced by Mr Evrard, the jigging action is produced by a jet of steam acting directly upon the water instead of a plunger piston. Washed slack when suitable is used for conversion into coke, but in France and Belgium it is now generally employed in the production of agglomerated fuel, or bri- quettes, or what is usually known in England as patent fuel. These consist of coal dust mixed with a sufficient amount of gas-pitch to be moulded into coherent bricks or cylinders, which are afterwards dried at a high tem- perature, but below the point of carbonization. The con- solidation of the slack may also be effected by the use of starch or dextrine, or even by cement or clay. This class of fuel is much used upon the French railways, being con- venient for stowage and economical in use; but as a rule it is disagreeable to the passengers from the large amount of coal-dust carried off by the exhaust steam, and the unpleasant vapours produced by the burning pitch. Tlie

principal production of patent fuel in Britain is in South Wales.

The anthracite coal of Pennsylvania is subjected to the exceptional treatment of breaking between toothed rollers, and an elaborate system of

screening before it is fit for sale. The largest or lump coal is that which remains upon a riddle having the bars four inches apart ; the second, or steamboat coal, is above 3 inches ; broken coal includes sizes above 23 or 2# inches; egg coal, pieces above 2 inches square ; large stove coal, 13. inches ; small stove, 1 to 1} or 14 inches; chestnut coal, 2 to # inch; pea coal, + inch; and buckwheat coal, } inch. The most valu- able of these are the egg and stove sizes, which are broken to the proper dimensions for household use, the larger Imps being unfit for burning in open fire-places.

The proportion of coal utilized in the working, as com- pared with the total contents of the seam, varies very considerably in different districts, being greatest in seams of moderate thickness, from 3 to 5 feet, which on the long-wall system can be entirely removed. In thick coals, such as the ten-yard seam of South Staffordshire, the waste is very considerable. In Cheshire and Lancashire about 1330 tons of saleable coal are obtained from an acre for each foot of thickness in the seam, only 8 per cent. of the total being left behind in the workings.

At Dowlais, on the north of the South Wales coal-field, the yield is 1190 tons to the foot by long-wall, but only 866 tons when the same seam was worked by the pillar and stall system ; but on the south side of the basin, where the seams lie at a steep slope, the loss is often much greater, being from 20 to 50 per cent. on pillar and stall workings. In the Barnsley district, the yield is from 1150 to 1280 tons in thick seams, and a maximum of 1417 tons has been obtained in a thin seam, the solid contents of the whole coal being estimated at 1556 tons per foot per acre. In Northumberland about 1200 tons are got out of a total of 1300. In the thick coal of South Staffordshire, from 12,000 to 16,000 tons per acre are got at the first working on an average thickness of 25} feet, or about 640 tons to the foot, or from 50 to 60 per cent. of the whole, which is increased by the second and third working to 70 or 75 per cent., making a loss of from 25 to 30 per cent. This amount is reduced, however, by the long-wall method of working.

Probably from 10 to 15 per cent. may be taken as the unavoidable loss in working under the most favourable conditions, but in many cases the proportion is consider- ably higher.

In the United Kingdom the ownership of coal, like that of other minerals, is in the proprietor of the soil, and passes with it, except when specially reserved in the sale. ‘The greater number of collieries are worked upon leases, the rents or royalties being variously charged in different localities. A minimum reserved rent to cover a certain output, with a rate per ton on any quantity in excess, 18 the most general practice; but in Lancashire and York- shire the royalties are charged at a fixed rate per acre per annum upon each seam worked, and in South Staffordshire at a proportion (from } to yg) of the coal at the pit’s mouth.

Coal lying under the sea below low-water mark belongs to the Crown, and can only be worked upon payment of royalties, even when it is approached from shafts sunk upon land in private ownership.

In the Forest of Dean, which is the property of the Crown as a royal forest, there are certain curious rights held by a portion of the inhabitants known as the Free Miners of the Forest, who are entitled to mine for coal and iron ore, under leases, known as gales, granted by the principal agent or gaveller representing the Crown, in

COAL

tracts uot otherwise occupied. This is the only instance in Great Britain of the custom Government grant or concession, which is the rule in almost - every country on the Continent.

subject to the provi Act of 1872, 35 and 3 by inspectors appointed complete disciplinary code in all matters connected with coal-mining. Among the chief provisions of the Act are the following :—

agement of ventilation, safety lamps, against accidents in shafts and levels, &c.

showing in the one case an average of

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of free mining under a

The working of collieries in the United

by the Home Office, and forms a

1. Females and boys under 10 are not allowed to work under-

ground.

2. Boys between 10 and 12 are not allowed to work exept in

thin mines.

3. No boy under 12 to drive a gin horse, or under 18 a steam-

engine.

4, Wages not to be paid at public-houses. 5. Working of mines by a single shaft prohibited. 6. Managers to be certificated as competent by a board of

examiners.

7, Annual return of coal wrought to be made to Inspectors.

8. Notice of accidents to be sent to Inspector.

9. Openings of abandoned workings to be fenced.

10. Plans to be kept up to within six months of date.

11. Plans of abandoned mines to be deposited with Home

Office.

12. General rules for the safety of miners in fiery mines, mau- and gunpowder, protection

13. Power to frame special rules subject to approval of the

Secretary of State.

Breaches of the provisions of the Act are punishable by fine and imprisonment by a court of summary jurisdiction, subject to appeal to the Quarter Sessions, or to the Circuit Court in Scotland.

The relation between the number of hands employed and the output of collieries varies considerably in different districts, being highest in those where the coal is moder-

ately thick, soft, easily cut, regularly shaped, and with a good roof, and least in faulted and disturbed seams, and

those with a bad roof, where the accessory operations of tinbering and driving stone drifts requires the employ- ment of a large proportion of the working staff on non- productive work, ¢.¢., other than cutting coal. The follow- ing figures give the relative force employed above and below ground in two large steam-coal collieries in South Wales, each producing about 500 tons per day :—

Colliers cutting coal…….. ceceeeeeees 225 200 Other underground hands ……..-..+++ 229 174 Surface hands ……..scceseeene seneeeve sees 43 36

497 410

about 1 ton, in the other about 14 ton per hand per day, but if the hands cutting coal be alone considered, the amount is about the game in both cases, or a little over two tons per day.

The annual output per man on the total force employed in several of the principal European coal-fields has been computed as follows :-—

Neweastle…..cs20 ts. 315 tons per man per annum. ‘Westphalia……..... 215 bs ne Saarbriicken ……... ... 170 “a ue France—Loire …….. 200 ,

+i OR x .c.inaes 149 55 iy Belgium—Charleroi…. 147 – -

*; MOnS…00.505 22 ” os

These figures refer to some years back, and are probably not quite accurate at the present date, as the amount of work done by the individual collier has

sensibly decreased in most countries. It will be seen that the output is smallest in the thin disturbed measures of the Franco- Belgian coal-field.

In Prussia in 1874, with an output of 33,000,000 tons of coal and 8,000,000 tons of lignite, the average pet

Kingdom is Coal Mines sions of the Coal Mines Regulation Regulation 6 Vict. cap. 76, which is administered Acte

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ACCIDENTS. |

underground hand was about 243 tons for the former and about 600 tons for the latter. The larger comparative yield in lignite mines is due to the fact that a very large proportion are worked as quarries.

The annual production of coal throughout the world may be roughly estimated at about 260 millions of tons for 1874, which quantity includes about 17 million tons of lignite and coal from formations newer than the coal measures in Europe. Nearly one-half of the total is raised in the United Kingdom, the approximate quantities of the different countries being as follows :—

Tons,

United Kingdom ……..... 125,000,000 United States of Amcrica 48,000,000

CGEUMIATYioce oss vs eee ecw eceees 35,000,000 Lignite, 9,000,000 ISLS SSaResennAaReennnaAne 17,000,000 PRERINGORO oe eee cce cen accuses 17,500,000 e 320,000 AVUSTILS: cospecg de nee eae omen 4,700,000 », 5,700,000 New South Wales…..... 1,300,000 [0 fo cen Cee aes eaeen 1,000,000 % 30,000 ‘SSCL. :6 0000 Hen ea Oca eoRe Ene 750,000 fy 50,000 OS ee 700,000 Smaller European States. 125,000 an 105,000 British North America… 750,000 (ClO oe nee CeCe See eee 200,000 Other Australian Colonics 50,000

There is no trustworthy information as to the produce of China and Japan, but these probably do not exceed 100,000 tons. In the larger coal-producing European countries the output was very high in 1873, the following year having shown a slight falling off, but in America the annual increase was maintained.

According to the official mineral statistics, the produce of coal in the United Kingdom for the years 1873, 1874, 1875, classified according to districts, was as shown in the following table, from which it will be seen that the check in 1874 was followed by great increase of production in 1875 :—

1873. 1874, 1875.

h Tons. : Tons. Tons.

Nee arham …...~+. , 180,000 – Northumberland …... 12, 204,340 6,463,550 12, 640, 789 Cumberland …..... 1,747,064 1,102, 267 1,226,737 Westmoreland …..... 1,972 1,200 fee 8. Durham ….... 17,486,045 | 17,900,250; 19,456,534 Yorkshire …...0..00..- 15,311,778 | 14,812,515| 15,425,278 ey enire -cOuCROCOMEE 7,150,570 7,091,325 Nottinghamshire …... 3,127,750 3,250,000 Leicestershire …..... 11,568,000 1,100, 465 1,154,619 Warwickshire …..... 851,500 799, 750 S. Staffordshire …..... Worcestershire…..... 9, 463,538 8,389,343 9,251,791 Shropshire …..... 1,570,000] 1,187,950] 1,229,785 N. Staffordshire …..... 3,892,019 4,318,096 4,496,213 CINE Oe oe 1,150,500 615,105 658,945 N, and E. Lancashire}! 9,560,000 8,095,570 8,825,798 W. Lancashire …..... 7,500,000 7,442,950 8,250,246 No WhS 2,450,000 2,425,300 2,337,308 Gloucestershirc…..... 1.858.540 1,147,272 1,273,080 Somersetshirc … ..... aise) 609,684 654,878 Monmouthshire …..... 4,500,000 5,038, 820 3,525,975 S. Wales …..... 9,841,523 | 10,184,885] 10,632,597 Scotland E. ... . 10,142,039 | 10,182,326} 11,419,619

1Do, eee 6,715,733 6,606,835 7,177,888 ee 108, 435 139,213 127,750

Roe, -:..... 127,016,747 | 125,067,916 | 131,908,105

Amount exported, including cokeand 12,748,390 patent fuel… .. ..

14,045,325 | 14,544,916

Leaving for home 3 mz oe °} 115,268,357 | 111,022,591 | 117,368,189

Value at pit's mouth..| £47,629,787 | £45,848,194 | £48,969,370

COA TL

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and other purposes, was investigated by the Royal Com- mission on Coal, from vol. iii. of whose Report, published in 1870, the following summary is taken. The figures refer to the year 1869.

Tons.

Total quantity of coal raised …..... ee OG ALTO 7

Do. emmontede.. a. cece os 4. 9,775,470

Leaving for home consumption…..... 97,652,087

1. Coal used for iron manufacture …... 32,446, 606 2. Do. producing power and gencral

manufacturing purposes… 25,327,213

3. Do. domestic purposes …..... 1&, 481,527

4, Do. gas and water supply…..... 7,811,980

5, Do. mines and collierics ……..... 7,225,428

6. Do. steam navigation …..... 3,277,562

dle Do. ie. Oh eae ee ee 2,027,500 8. Do. smelting metals othcr than

REE Sra RSS ah, 859,231

2: Do. miscellaneous purposes …... 195,045

97,652,087

The above quantities may be proportionally classified as follows :—

Mineral and metallurgical industries (1, 5, 8) 44 per cent. Domestic consumption, including gas and water (3, 4) 26 Gencral manufacturing purposcs (2) .....00c.0..e ee 25 Locomotion by sea and land (6, 7)

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Coal-mining is unfortunately a dangerous occupation, Accidents,

more than a thousand deaths from accident being reported annually by the inspectors of mines as occurring in the collieries of the United Kingdom. The following table shows the number of lives lost during the last five years, classified according to the inspectors' returns :-—

| Accidents

Explo- Falls of Other under- Accidents Year. Gas ground. cei in shafts. a Total.

1871 269 435 176 123 72 1075 1872 154 456 217 155 78 1060

1873 100 491 221. WAL 86 1069

1874 166 413 214 154 109 1056

1875 288 458 227 Ue 99 1244

The principal sources of danger to the collier, as dis- tinguished from other miners, are explosion of fire-damp and falls of roof in getting coal,—these together make up about 70 per cent. of the whole number of deaths. It will

be seen that the former class of accidents, though attended with great loss of life at one time, are less fatal than the latter. The great increase in the deaths from explosion in 1875, over the preceding year, is to be attributed to the Swaithe Main explosion at Barnsley on December 6th, when 143 lives were lost.

The following return expresses the relation between the fatal accidents and the total number of miners employed, and the amount of coal raised for each death. The latter quantities are in some degree conjectural, being dependent upon estimated rcturns of produce, and are probably some- what too large.

Year. 1 death for ab) eae 345 miners employed | 109,246 tons coal raised Te oasoe 394 (,, 5 116,409 ,, » nS /seeeres iO) ss 5 138,667 ,, 36

2 29 138,251 2 9

a7S0 |, |

In Prussia, in the year 1874, there were 484 deaths

The quantities of coal consumed by the different branches | from accidents, which corresponds to about three deaths of manufacturing industry as well as for lighting, heating, | per thousand hands employed, or, according to the above

Analysis of

coal.

80 ere ay

classification, 1 in 334, with a produce of about 65,000 tons of coal for each death. It would appear, therefore, that the proportional loss of life, in the collieries of the United Kingdom, is less than that in foreign countries.

Assay and Analysis.—The chemical examination of a coal may be either complete or partial, When it is desired to obtain information as to the exact composition, the analysis is conducted in the same manner as the analysis

of organic compounds by combustion with oxide of copper or chromate of lead in a hard glass tube, the carbonic acid and water formed being absorbed by solution of hydrate of potassium and dry chloride of calcium respec: tively, and the proportion of carbon and hydrogen being calculated from the increase of weight in the tubes con- taining the absorbing media. It is usual to operate upon a small sample (about 5 grains), which is very fiuely powdered and placed in a small trough or boat of platinum in the tube, the combustion being aided by a stream of oxygen from a gasholder. By this means the incombustible residue or ash is left in a condition for weighing, being free from admixture of foreign substances. Sulphur is determined by the fusion of a weighed quantity with a mixture of salt and nitrate of potassium in a platinum vessel, producing sulphate of potassium, which, on the addition of a salt of barium, is precipitated as sulphate of barium. Care must be taken to perform the operation over a flame free from the vapour of sulphur coi- pounds, which may vitiate the result by apparently increas ing the amount of sulphur present. For this reason, the flame of a spirit lamp is to be preferred in making the fusion to that of coal gas, which is rarely free from sulphur com- pounds. Sulphur existing in the form of gypsum or sul phate of calcium may be removed by washing a sample with boiling water, and determining the sulphuric acid in the solution. The washed sample is then fused with nitre ia the usual way to determine the proportion of sulphur existing as iron pyrites. This distinction is of importance in the examination of coals intended for iron smelting, as the sulphates of the earthy metals are reduced by the gases of the furnace to sulphides, which pass into the slag without affecting the quality of the iron produced, while the sulphur of the metallic sulphides in the ash acts pre- judicially npon the metal.

The difference between the original weight of the sainple and that of the carbon, hydrogen, sulphur, and ash, after inaking allowance for hygroscopic water, is attributed to oxygen and nitrogen, which are not directly deter- inined.

he character of the ash affords some guide to the quality of the coal from which it is derived. Thus, a red tint is generally indicative of the presence of iron pyrites, and a light or white colonr of its absence. Phosphorus if present will be found in the asi, and may be determined by the ordinary processes

of analysis. A useful approximate inethod of determining the character of a coal is by ex- posing a coarsely powdered sample of known weight, in a covered crucible, to a strong red heat as long as inflammable vapours are given off, when it is cooled and weighed. ‘The loss of weight represents the volatile con- stituents—hydrogen, oxygen, and hydrocarbon gases, pro- duced by destructive distillation, while the residual coke includes the ash, and is called fixed carbon. The character of the button of coke obtained is a good indication as to

the caking or non-caking quality of the coal from which it.

is derived, and the amount of ash may be determined by burning it in a muffle or over the flame of a Bunsen burner. The fitness of a coal for gas making is usually determined by operating upon a sample of a few pounds’ weight in a special apparatus which reproduces the pro- cesses of manufacture upon 4 small scale,

[ANALYSIS.

One of the most important factors in the economic valuation of a coal, is the so-called calorific power or value, by which is usually understood the number of pounds of water at boiling point that can be evaporated by the complete combustion of one pound of coal. This may be obtained theoretically, when the composition of the coal is known, by computing the heating etfect of the carbon and the disposable hydrogen ; but in the absence of an analysis, it may also be determined directly by several approximate methods. One of the most con- venient instruments for this purpose is ‘Thompson’s calorimeter. ‘This consists of a copper cylinder in which a weighed quantity of coal intimately mixed with chlorate or nitrate of potassiuin is deflagrated under a copper case like a diving-bell, placed at the bottom of a deep glass jar filled with a known weight of water. ‘The gases produced by the combustion rising through the water are cooled, with a corresponding increase of temperature in the latter, so that the difference between the temperature observed before and after the experiment furnishes a mca- sure of the evaporative power desired. The instrument is so constructed that 30 grains of coal are burnt in 29,010 grains of water, or in the proportion of 1 to 937, these numbers being selected that the observed rise of tempera- ture in Fahrenheit degrees corresponds to the required

evaporative value in pounds, subject only to a correction for the amount of heat absorbed by the mass of the instru- ments, for which a special co-efficient is required, and must be experimentally determined. Another approximate method, due to Berthier, is based upon the reduction of oxide of lead by the carbon and hydrogen of the coal, the amount of lead reduced affording a measure of the oxygen expended, whence the heating power may be calculated, 1 part of pure carbon being capable of producing 344 times its weight of lead. The operation is performed by mixing the weighed sample with a large excess of litharge in a crucible, and exposing it to a bright red heat for a short time. After cooling, the crucible is broken and the reduced button of lead is cleaned and weighed. 'Ihe re-

alts obtained by this method are less accurate with coals

containing much disposable hydrogen and iron pyrites than with those approximating to anthracite, as the heat equivalent of the hydrogen in excess of that required to form water with the oxygen of the coal is calculated aa carbon, while it is really about four times as great. Sulphur in iron pyrites also acts as a reducing agent upon litharge, and increases the apparent effect in a similar manover.

The theoretical evaporative power of a coal found by either of the above methods is always considerably above that obtained by actual combustion under a steam boiler, as +n the latter case numerous sources of loss, such as imperfect combustion of gases, Joss of unburnt coal in cinders, &c., come into play, which cannot be allowed for in theoretical experiments. It is usual, therefore, to determine the value of a coal by the combustion of a weighed quantity in the furnace of a standard boiler, and measuring the amount of water evaporated by the heat developed. Various investi- gations of this kind have been made at different times, both in Europe and America, the most extensive being the following :—

Johnson, Report on American Coals, Washington, 1844 ; De la Beche and Playfair, Three Reports on Coal suited to the Steam Navy, London, 1848-49-51; P. W. Brix, On the Heating Power of Fuel

used in Prussia, Berlin, 1853; Hartig, Heating Power of Saxon Coal, Dresden, 1860.

The following table of the average results obtained from these investigations shows the number of pounds of water evaporated for every pound of the different kinds of coal burnt,

Aterature

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COA—

o, (5S. Wales—Average of 37 kinds, 9-05 tb gs |N.ofEngland ,, 17 ,, 37 A= Lancashire, 9 BE aia Scotland, es & 3, FARO a* | Derbyshire, x Sy, 1358 Wood, ; Egy BEG tio) eG) ¥ + Peat, Hs Dan 8 OCR ie) SG) Lignite, nf 5, Pel aioy Sow Coal (Prussian), ,, 51 ,, 6°42 to 8-16

The literature relating to coal and coal mining, is very extensive,

but the following list includes the titles of the more important ;

works upon these subjects.

ENGLAND AND AMERICA.—The Report of the Royal Coal Commission (8 vols., fol., with Atlas, London, 1870) This is the most comprehensive work upon the subject. Hull, Coal Ficlds of Great Britain (3d ed. London, 1873). Reports and Maps of the Geological Surveys of the United Kingdom. Descriptive memoirs of cach coal field published as completed. Percy, Metallurgy, vol. i, on Fuel (2d ed. London, 1875), containing full details of the chemistry of coal. Greenwell, Praetieal Treatise on Mine Engineering (2d ed. London, 1869). André, Praetieal Treatise

COANZA, or QuaANza, an important river of Western Africa, in the country of Angola. It takes its rise in the Mossamba Mountains, not far from tlie source of the Cunene, probably in 14° §. lat., and its total length is about 600 miles It receives a large number of tributaries, the most important

of which are the Loando and the Cutato in tlic upper part of its course, the Gango and the Quige in the middle portion, and the Lucalla in the lower. Its progress is broken by several falls, and in the last 200 miles of its journey it descends no less than 4800 feet Thuis diminishes its value as a means of transit; but it is navigable for large boats about 140 miles from its mouth, which is situated 50 miles south of Loando, in 9° 15'S. lat. It there forms a number of islands, and pours into the sca a turbid current, which is visible for some distance outwards by its contrast of colour.

COATBRIDGE, a town of Scotland, in the county of Lanark, and parish of Old Monkland, ten miles east of Glasgow by rail, and about two miles west of Airdrie. It owes it rise to the importance of the surrounding district asamining field. The town itself is of a straggling descrip- tion, and is intersected by a branch of the North Calder Water, the Monkland Canal, and the Caledonian Railway. It contains eight places of worship, a literary association, and five branch banks. In the immediate neighbourhood are the Gartsherrie iron works, and there are engineering establishments in the town itself. The population of town in 1871, including Gartsherrie, High Sunnyside, and Lang- loan, numbered 15,802, of whom 8599 were males and 7203 females,

COBALT, a metal of the iron group. The name is derived from the German Kobold, a miner's term for gnome, or evil spirit, akin to the English goblin, which was applied to a mineral found associated with silver ores, and often replacing them in the mines of Schneeberg in Saxony. The use of the oxide of cobalt in colouring glass was only dis- covered in 1546 by Scheurer, and till then the metal had been supposed to be worthless It was first produced, but In an imperfectly purified condition, in 1733, by Brandt.

Cobalt is found alloyed in small quantity together with nickel in many meteoric irons. The principal mode of occurrence, however, is in various complex minerals con- taining arsenic and sulphur and the allied metal nickel. The following are the most important :—

1. Smaltine or speiss cobalt, an arsenide of the isomorphious bases, cobalt, nickel, and iron, of the formula (CoNiFe)As,, isa mineral of the cubical system, forming steel or lead-grey crystals of a metallic lustre, tarnishing in damp air to a pink or green tint according to the pre-

ponderance of cobalt or nickel that is present. In the |

COB

on a. Mining (London, 1876). (2d ed. London 1872). Jevons, 7'he Coal Question 2d ed. : don, 1866). Rogers, Geology of Cnet (2 ole Edinburgh 1850). Proecedings of the South Wales Institute of Engineering (8 vols., Merthyr, 1858-73). Transactions of the North of England Institut of Mining Engineers (28 vols., N ewcastle, 1852-74). Various Geological Reports of the State and General Governments of the United States ; including Newberry's Ohio Reports, Cox's Indiana Re- ports, and Hayden's Reports of Geological Survey of the Territories,

FRANCE AND BELcIuM.—Burat, @éologte de la France (8vo, Paris, 1864). Cours d'Exploitation de Mines (1871). Materiel des Howillieres cn France, de. (1861-68). Bulletin de la Société de l'Industrie Minérale, S. Etienne (20 vols. since 1855). Ponson, Traité de? Exploitation des Mincs de Howille (2d ed. Liege, 1868-71). Supplement to the above (1867-72). De Kuyper, Revne Unirerselle des Mines, de. (Liége, sinee 1854).

GERMANY.—Geinitz, Die Steinkohlen Denisehlands, &e. (3 vols. 4to, Munich, 1865). This is the most complete book on the sub- ject. Zincken, Die Braunkohle (2 vols., Hanover, 1865-71) Zeitschrift fur Berg Hiitten und Salinenwesen, ce. (4to. Berlin, 22 vols. sinee 1854). (H. B.)

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Smyth, Coal and Coal Mining

purest condition it may contain 28-2 per cent. of cobalt to 71°8 per cent. of arsenic, but nickel and iron are almost invariably present to some extent. The principal locality is at Schneeberg in Saxony, where it is associated with silver, bismuth, and nickel ores,

2. Cobalt glance, or cobaltine, is a compound of sulphide and arsenide of cobalt, CoS, + CoAs,, the typical composition being cobalt 35:5, arsenic 45-2, aud sulphur 19°3 per cent. It occurs in very brilliant complex crystals belonging to the cubical system, the principal locality being at Tunaberg in

Sweden. A part of the metal is sometimes replaced by iron, but as a rule it is free from nickel.

3. Linnzite, or cobalt pyrites, is analogous in composi- tion to copper pyrites, being represented by the formula Co,S +Co,8., with 58 per cent. of cobalt and 42 of sulphur. As a general rule a portion of the base is replaced by copper, nickel, or iron. It is a rare mineral, being found only in the Siegen district in Prussia and in Sweden. Cobalt bloom is a hydrated arseniate produced by the action of air and water upon the above minerals ; the composition is Co,As,0, + 8H,O, zc, 374 per cent. of oxide of cobalt, Karthy cobalt ore is a variety of bog manganese, or wad, a mineral of indefinite composition, but containing at times as much as 8 or 10 per cent. of oxide of cobalt with oxides of mangancse, iron, and copper. Cobaltic bismuth ore is a mixture of finely crystalline speiss cobalt with native bismutli, found occasionally in the Schnecberg mines.

The materials from which cobalt is produced by the smelter consist generally of iron or arsenical pyrites, cou- taining a minute quantity of the two metals cobalt and nickel, or various products derived from the smelting of the ores of silver and copper in which these metals are concen- trated as sulphur or arsenic componnds.

When in a compact form cobalt is a stcel-grey metal with a slightly reddish tiut, taking a very high lustre when polished, and breaking with a finely granular fracture. The specific gravity is variously stated at from 8°52 to 8°70. It is slightly malleable, and when quite pure of a higher degree of tenacity than iron, according to Deville. The brittle character attributed to it by former observers is due to impurities, such as arsenic and manganese. it melts at about the same temperature as iron, or a little lower, requiring the strongest heat of a wind furnace. The specific heat is 0°10696 (Regnault). It is susceptible of being magnetized by touch, and retains its magnetism at temperatures below a strong red heat when free from arsenic. Chemically it belongs to the same group as Iron, zine, nickel, manganese, and chromium, which cannot be separated as sulphides by H,S from an – solution. Itis

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diatomic; its atomic weight is 58-6, and its symbol Co. Like iron it may be reduced from its oxides by heating with charcoal or in hydrogen gas ; in the former case a small quantity of carbon is retained, forming a substance analogous to cast-iron, When reduced by hydrogen at a low temperature it forms a black powder which is pyrophoric, or ignites spontaneously in the air, especially if mixed with finely-divided alumina. Ata red heat it decomposes water vapour, producing hydrogen and oxide of cobalt.

There are two principal oxides. The protoxide, CoO, is obtained as a black powder by calcining the hydrate CoH,O,. The latter is a red substance obtained by pre- cipitation with alkalies from the solution of a cobalt salt. The higher, or sesquioxide, Co,O,, is produced in a hy- drated form from the hydrated protoxide by the action of chlorine, bromine, chloride of lime, or similar oxidizing agents. It may be rendered anhydrous by careful heating, but at a red heat it decomposes, giving off part of its oxygen, and produces a compound analogous in composi- tion to magnetic oxide of iron, Fe,O,.

The protoxide forms numerous salts, which are usually of a fine rose-red colour. A weak solution of the nitrate or chloride forms the so-called sympathetic ink, which gives a colourless writing when cold, but appears of a bluish- green colour when heated, and fades again on cooling. This effect may be reproduced a great number of times if the writing is not too strongly heated, in which case the colour becomes permanent from the formation of a basic salt, With ammonia the oxides of cobalt form a series of compound bases, which give rise to salts of great interest and complexity; these may be regarded as ammonium salts, in which part of the hydrogen is replaced by ammonium and another part by cobalt in various conditions of atomicity corresponding to the oxides.

‘The alloys of cobalt are not of much importance. It combines most readily with arsenic or antimony, forming

the highly crystalline compounds known by the general

name of speiss, which can scarcely be considered as alloys. With gold and silver it forms brittle compounds, with

mercury a silver-white magnetic amalgam. With copper

and zine the alloy is white, reserabling the corresponding compounds of the same metals with nickel and manganese. With tin it forms a somewhat ductile alloy of a violet colour. ‘The presence of cobalt in the alloy of copper, zinc, and nickel, known ag German silver, is objectionable, as it renders it hard and difficult to roll.

The chief use of cobalt in the arts is for the preparation of colours. The protoxide has an intense colouring power when vitrified, and forms the basis of all the blue colours used in glass and porcelain manufacture. The purity of the tint is much affected by traces even of other metallic oxides, especially those of iron, nickel, or copper. Another preparation, known as smalts, is a glass formed by melting cobalt oxide with pure quartz sand and carbonate of potas- sium. Sometimes the first two substances are subjected to a preliminary heating to produce fritted silicate of a reddish or purple colour, known as zafire, which when fused with the alkaline carbonate in an ordinary glass furnace produces a deep blue glass. This is rendered friable by running it into water, and is then ground between granite millstones and finally levigated in water. The various products of the levigation are classified into different qualities according to the fineness of the grain and the strength of the colour,— the best being those occupying a medium position, the colour diminishing as the fineness of the grain increascs. The coarsest variety, known as strewing blue, consisting of rough angular fragments up to about 4 inch diameter, is used for the ground-work of the old-fashioned blue and gold sign- boards, a very effective and durable kind of surface orna- mentation. The highest coloured varieties contain from

GOBALT G6 to 7 per cent. of oxide of cobalt,

zioth part of the oxide is of a distinct blue ; with more than 18 per cent. it is black.

Glass containing only

he principal use of smalts is for bluing paper ; it was

formerly employed almost exclusively for this purpose,

but has now been to a very considerable extent superseded by the use of artificial ultramarine, more easily applicd, but is less permanent, as the colour is easily discharged by acids, smalts is used. both in oil and water-colour painting, is obtained by mixing the solutions of a cobalt salt and alum, precipitating with an alkaline carbonate, precipitate of the hydrated oxides of the two metals. Thenard's blue, a phosphate of cobalt aud alumina, is pro- duced in a similar manner, by precipitation with an alkaline phosphate.

which is cheaper and

which is not the case when The pigment known as cobalt blue, used

and strongly heating the gelatinous

Cobalt green, or Rinman's green, is a mixture of the oxides of zine and cobalt produced from the solu-

tions of their sulphates by precipitation with carbonate of

sodium and ignition.

In analysis cobalt is always determined as protoxide, but the scparation from the metals with which it is usually associated, especially nickel, is a difficult and tedious operation. Many different processes have been devised, but the most accurate are those of H. Rose and Liebig. The former depends upon the power possessed by chlorine (or bromine) of converting protoxide of cobalt when in solution into scsquioxide, while the corresponding oxide of nickel is not changed. 'The solution when completely saturated with chlorine is precipitated by carbonate of barium, which carrics down the whole of the cobalt as sesquioxide ; the precipitate is redissolved in hydrochloric acid, the whole of the barium salt separated by sulphuric acid, and the cobalt finally precipitated by means of hydrate of potassium. In Liebig''s method the oxides of the two metals are heated with cyanide of potassium and boiled, which produces cobalticyanide of potassium, K,Co,Cy¢, and cyanide of nickel and potassium, KNiCy,. By the addition of finely-divided red oxide of mercury the whole of the nickel is precipitated, partly as cyanide and partly as hydrate, while the cobalt compound remains

in solution, and is afterwards separated by means of sulphate of copper as cobalticyanide of copper, which is redissolved ; the coppet is separated by sulphuretted hydrogen, and the cobalt then obtained as oxide by boiling with caustic potash. The complexity of the composition of the ores, and the high value of the two metals, has led to the application of more refined methods of chemical analysis in their investigation than are required in the assay of the ores of the commoner metals. Plattner's method of dry assay of cobalt and nickel ores is much more rapidly performed than an analysis, aud in practised hands is susceptible of considerable accuracy. It depends upon the fact that when a speiss or arsenical compound, containing the four metals—iron, cobalt, nickel, and copper—is melted with a vitreous flux such as borax in an oxidizing atmosphere, the metals will be oxidized and pass into a slag with the borax in the order indicated above, no cobalt being taken up until the iron has been entirely removed, and similarly the nickel remaining until the cobalt has been completely oxidized. The steps in the process may be easily recognized owing to the difference in the characteristic colour of the oxides, the dark green or black of the iron slag being rendcred distinctly blue by the faintest trace of cobalt, and the blue of the latter being similarly affected by nickel, which has a strong brown colouring power. 'The arsenides of cobalt and nickel, being of a constant composition, are weighed at each step of the process in the proportion of the metal re- moved calculated from the difference. Cobalt may be readily detected by the blow-pipe even when in very small

quantity, or by the characteristic blue imparted to a bead of borax or salt of phosphorus.

On the large scale cobalt is produced chiefly as an accessory in the treatment of nickel ores. These consist chiefly of mixtures of small quantities of the purer minerals with pyrites, sulphurettced copper ores, or lead and silver ores, which require to be subjected to concentrating processes in order to get rid of the bulk of the iron, sulphur, and arsenic, and produce a small amount of enriched regulus or metal, in which the more valuable metals are in combination with sulphur and arsenic. This is done by calcination, which drives off the sulphur and arsenic combined with the

iron, the latter being oxidized and subsequently converted into slag by fusion with fluxes containing silica. Small quanti- ties of cobalt, nickel, and copper ores, when associated with lead and silver ores, are in like manner gradually accumulated in a regulus by passing the regulus of the first fusion several times through the smelting furnace, whereby the lead and silver are in great part removed. The treatment of these purified and enriched products is conducted on the large scale in a somewhat similar manner to a chemical analysis, in order to obtain both cobalt and nickel. The speiss, or regulus, is calcined and treated with strong hydrochloric acid to dissolve the oxides formed. By the addition of caustic lime, iron and arsenic are pre- cipitated, and the clear liquid is treated with sulphuretted hydrogen so long as metallic sulphides are produced, the precipitate being allowed to settle. The solution then con- taining only cobalt and nickel compounds, the former is separated by the addition of bleaching powder and caustic lime as sesquioxide, Co,O,, and the latter as hydrated oxide by a subsequent precipitation with lime.

In making smalts the purer arsenical ores are used. They are first calcined in a reverberatory or muffle furnace

provided with chambers for condensing the arsenical fumes

as completely as possible. The roasted ore, if it does not contain quartz, is mixed with a proportion of fine glass- house sand and carbonate of potassium, but when it is sufficiently siliceous, as in the mixtures of cobalt ore and silica known as zaffre, only the alkaline carbonate is required. The fusion takes place in pots like those used in plate-glass making, and requires about eight hours. The blue glass is led out into water till the pot is nearly empty, when a speiss containing the whole of the nickel of the ore is found at the bottom. The blue glass is then ground and levigated as already described.

The chief localities producing cobalt ores are Modum in Norway, Tunaberg in Sweden, Schneeberg in Saxony, Musen in Rhenish Prussia, and Mine Lamotte in Missouri ; a con siderable amount has also been obtained from Bolivia. In the Transvaal in South Africa a very pure variety of speiss cobalt free from nickel has been recently discovered. Smaller quantities of speiss

or regulus are obtained from the smelting of silver and lead ores, at Freiberg, in the Harz, in Bohemia, and elsewhere. H. B.)

COBAN, or Santo Dominco Condy, a city of Central America, in the republic of Guatemala, and the department of Vera Paz, situated about 90 miles north of the elty of Guatemala, on the direct route to Flores, not far from the source of the Rio de Cajabon, which flows into the Golfo Dolce. It occupies the slopes of a rounded hill, on the top of which is the central square or plaza, with the cathedral and the ruins of the once magnificent Dominican monastery on the one side, and on the others the shops and houses of the merchants and artizans. The houses of Coban are low and covered with tiles ; and, as each with its garden and croft attached is curtained by a dense and lofty hedge, the streets have rather the appearance of woodland avenues. The cathedral is a large and imposing edifice, decorated in the interior with a barbaric profusion of ornament ; but

like the rest of the public buildings of the town it shows signs of decay. Since the removal of the seat of the Pro- vincial Government to Salama, the prosperity of Cobén has greatly declined, but it still contains about ~~12,000 inhabitants,who carry on the weaving of cotton cloth, the cultivation of coffee, sugar, and pimento, and a considerable trade with the neighbouring provinces. The Spanish and Ladino part of the population does not exceed 2000 > and the rest are Indians originally from the mountains of Chichen and Jucamel, who still speak the Kacchi or Quecchi language. Cobdn owes its origin to the missionary labours of the Dominicans of the 16th century, and morc especially to Fray Pedro de Angulo, whose portrait is pre~~ served in the cathedral. It was made the political capital of the province of Vera Paz, and obtained the arms of a city of the first rank.

COBBETT, Wittram (1766-1835), one of the most vigorous of English political writers, was born near Farn- ham in Surrey, according to his own statement, on the 9th March 1766. He was the grandson of a farm-labourer, and the son of a small farmer; and during his early. life he worked on his father’s farm. At the age of sixteen, inspired with patriotic feeling by the sight of the men-of- war in Portsmouth harbour, he offered himself as a sailor ; and at seventeen (May 1783) having, while on his way to Guildford

fair, met the London coach, he suddenly resolved to accompany it to its destination. He arrived at Ludgate Hill with exactly half-a-crown in his pocket, but an old gentleman who had travelled with him invited him to his house, and obtained for him the situation of copying clerk in an attorney's office. He greatly disliked his new occupa- tion; and rejecting all his father's entreaties that he would return home, he went down to Chatham early in 1784 with the intention of joining the marines. By some mis- take, however, he was enlisted in a regiment of the line, which rather more than a year after proceeded to St John's, New Brunswick. All his leisure time during the months he remained at Chatham was devoted to reading the contents of the circulating library of the town, and getting up by heart Lowth's English Grammar. His uniform good conduct, and the power of writing correctly which he had acquired, quickly raised him to the rank of corporal, from which, without passing through the intcrmediate grade of sergeant, he was promoted to that of sergeant-major. In November 1791 he was discharged at his own request, and received the official thanks of the major and the general who signed his discharge. But Cobbett's connection with the regiment did not end in this agreeable manner. He brought a serious charge against some of its officers, and instead of appearing at the trial fled to France (March 1792). The inquiry which was held in his absence resulted in a complete acquittal of the accused.

In the previous February Cobbett had married the daughter of a sergeant-major of artillery ; he had met her some years before in New Brunswick, and had proved her to be endowed with energy and self-control equal to his own. In September of the same year (1792) he crossed to the United States, and for a time supported himself at Wilmington by teaching English to French emigrants. Among these was Talleyrand, who employed him, according to Cobbett's story, not because he was ignorant of English, but because he wished to purchase his pen. Cobbett made his first literary sensation by his Observations on the Hmi- gration of a Martyr to the Cause of Liberty, a clever retort on Dr Priestley, who had just landed in America complaining of the treatment he had received in England. This pamphlet was followed by a number of papers, signed 'Peter Porcupine," and entitled Prospect from the Congress Gallery, the Political Censor, and the Porcupine's Gazette. In the spring of 1796, having quarrelled with his publisher,

he set up in Philadelphia as bookseller and publisher of his own works. Ou the day of opening, his windows were filled with prints of the most extravagant of the French Revolutionists and of the founders of the American Republic placed side by side, along with portraits of George Tk, the British ministers, and auy one else he could find likely to be obnoxious to the people ; and he coutinucd to pour forth peaises of Great Britain and scorn of the institutions of the United States, with special abuse of the French party. Abuse and threats were of course in turn showered upon him, and in August, for one of his attacks on Spain, he was prosecuted, though unsuccessfully, by the Spanish ambassador. Immediately on this he was taken np for libels npon American statesmen, and bound in recognizances to the amount of $4000, and shortly after le was pro- sceuted a third time for saying that a ecrtain Dr Rush, who was much addicted to blecding, killed nearly all the patients he attended. The trial was repeatedly defcrred, and was not settled till the end of 1799, when he was fined $5000. Aftcr this last misfortune, for a few months Cobbett carried on a newspaper called the Rushlight ; but in June 1800 he set sail for England.

At home he found himself regarded as the champion of order and monarchy. Windham invited him to dinner, ‘ntroduced him to Pitt, and begged him to accept a share in the Zrue Briton. He refused the offer aud joined an old friend, John Morgan, in opening a book shop in Pall Mall. Tor some time he published the Porcupine’s Gazette, which was followed in January 1802 by the Weekly Political Register. Tn 1801 appeared his Letters to Lord Hawkesbury (afterwards earl of Liverpool) and Mr Addington, in opposition to the peace of Amiens, the terms of which had been agreed to by the former on behalf of Great Britain in the October of that year, but which was not finally concluded till 1802. On the conclusion of the peace Cobbett made a still bolder protest ; he deter- mined to take no part in the general illumination, and— assisted by the sympathy of his wife, who, being in delicate health, removed to the house of a friend—he carried out his resolve, allowing his windows to be smashed and his door broken open by the angry mob. The Letters to the Rt. Hon. Henry Addington are among the most polished and dignified of Cobbett’s writings; but by 1803 he was once more revelling in personalities. The government of Ireland was

singled out for wholesale attack ; and a letter published in the Register remarked of Hardwicke, the lord- lieutenant, that the appointment was like setting the sur: geon's apprentice to bleed the pauper patients. For this, though not a word had been uttered against Hardwicke's character, Cobbett was fined £500 ; and two days after the conclusion of this trial a second commenced, at the suit of Plunkett, the solicitor-general for Ireland, which resulted in a similar fine. About this time he began to write in support of Radical views; and to cultivate the friendship of Sir Francis Burdctt, from whom he received considerable sums of money, and other favours, for which he gave no very gratcful return. In 1809 lie was once more in the most serious trouble. He had bitterly commented on the {logging of some militia, because thcir mutiny had been repressed and their sentence carried out by the aid of a body of German troops, and in consequence he was fined £1000 and imprisoned for two years. Ilis indomitable vigour was never better displayed. He still continued to publish the fegister, and to superintend the affairs of his farm; a hamper containing specimens of its produce and other provisions came to him every weck; and he amused himself with the company of some of his children and with weekly letters from the rest. On his release a public dinner, presided over by Sir F. Burdett, was held in honour of the event. He returned to his farm at Botley in Hampshire,

and continued in his old course, extending his influenee by the publication of the Z'wopenny Trash, which, not being periodical, escaped the newspaper stamp tax. However, he had contracted debts to the amount of £34,000 (for it is said that, notwithstanding the aversion he publicly expressed to paper currency, lic had carried on his business by the aid of accommodation bills to a very large amount) ; and in March 1817 he fled to the United States. But his pen was as active as ever ; from Long Island the Register was regularly despatched to England; and it

Meanwhile,

was here that he wrote his clear and interesting Lnglish

Grammar, of which 10,000 copies were sold in a month,

His return to England was accompanied by his weakest exhibition—the exhuming aud bringing over of the boues of Tom Painc, whom he had once heartily abused, but on whom he now wrote a panegyrical ode. Nobody paid any attention to the affair; the relics he offered were not purchased ; and the bones were reinterred.

Cobbett's great aim was now to obtain a seat in the House of Commons. He calmly suggested that his friends should assist him by raising the sum of £5000 ; it would be much better, he said, than a meeting of 50,000 persons, He first offered himself for Coventry, but failed ; in 1826 he was by a large number of votes last of the candidates for Preston; and in 1828 he could find no one to propose him for the office of common councillor. In 1830, that year of revolutions, he was prosecuted for inciting to rebellion, but the jury disagreed, and soon after, through the influence of one of his admirers, Mr Fielden, who was himself a candidate for Oldham, he was returned for that town. In the House his speeches were listencd to with amused attention. His position is sufficiently marked by the sneec of Pecl that he would attend to Mr Cobbett's observations cxactly as if they had been those of a "respectable member ;" and tle only striking part of his career was his absurd motion that the king should be prayed to remove Sir Robert Peel's name from the list of the privy council, because of the change he had proposed in the currency in 1819. In 1834 Cobbett was again member for Oldham, but his health now began to give way, and in June 1835 he left London for his farm, where he died on the 16th of that month.

Cobbett's account of his home-life makes him appear singularly happy ; his love and admiration of his wife never failed; and his education of his children seems to have been distinguished by great kindlincss, and by a good deal of healthy wisdom, mingled with the prejudices due to the peculiarities of his temper and circumstances. Cobbett's ruling characteristic was a sturdy egotism, which had in it something of the nobler element of self-respect. A firm will, a strong brain, feelings not over-sensitive, an intense love of fighting, a resolve to get ou, in the sense of.making himself a power in the world—these are the principal qualities which accouut for the sucecss of his career. His opinions were the fruits of his emotions. It was enough for him to get a thorough grasp of one side of a question, about the other side he did not trouble himself ; but he always

firmly seizes the facts which make for his view, and expresses them with unfailing clearness. His argument, which is never subtle, has always the appearanee of weight, however flimsy it may be in fact. His sarcasm is seldom polished or delicate, but usually rough, and often abusive, while coarse nicknames were his special delight. His style is always extremely forcible, and marked by unusual gramma- tical correctness.

Cobbett's contributions to periodical literature occupy 106 volumes, twelve of which consist of the papers published at Philadelphia between 1794 and 1800, and the rest of the W eekly Political Register, which ended only with Cobbett's life (June 1835). An abridgment of these works, with notes, has been published by his sons, John M, Cobbett and James P. Cobbett. Besides this he

published—An Account of the Horrors of the French Revolution, and a work tracing all these horrors to '' the licentious polities and infidel philosophy of the presentage" (both 1798); 4 Year's Residence inthe United States; Parliamentary History of England from the Nor- man Congnest to 1800 (1806); Cottage Economy; Roman History; French Grammar, and English Granvmar, both in the form of letters ; Geographical Dictionary of England and Wales; History of the Regency and Keign of George JV., containing a defence of Queen Caroline, whose causo he warmly advocated (1830-4); Life of Andrew Jackson, President of the United States (1834); Legaey to Labourers; Legacy to Peel; Legaey to Parsons, an attack on the seeular claims of the Established Chureh; Doom of Tithes; Rural Rides; Advice to Young Men and Women; Cobbett's Corn; and History of the Protestant Reformation in England and Ireland, in whieh he defends the monasteries, Queen Mary, and Bonner, and attacks the Reformation, Henry VIII., Elizabeth, and all who helped to bring it about, with sueh vehemenee that the work was translated into Freneh and Italian, and extensively circulated among Roman Catholies.

In 1798 Cobbett published in America an account of his early hfe, under the title of The Life and Adventures of Peter Poreupine; and he left papers relating to his subsequent career. These materials were embodied in an anonymous Life of Cobbett which appeared soon after his death. See also

Sir Henry Bulwer’s Historical Characters; Brographies of John Wilkes and William Cobbett by Rev. John Watson; and the abridged and annotated edition of the Register.

COBDEN, Ricwarp (1804-1865), was born at a farm- house called Dunford, near Midhurst, in Sussex, on the 3d of June 1804. The family had been resident in that neighbourhood for many generations, oceupied partly in trade and partly in agriculture. Formerly there had been in the town of Midhurst a small manuiaeture of hosiery with which the Cobdens were conuected, though all trace of it had disappeared before the birth of Richard. His grandfather was a maltster in that town, an energetic and prosperous man, almost always the bailiff or chief magistrate, and taking rather a notable part in county matters. But his father, forsaking that trade, took to farming at an unpropitious time. He was amiable and kind-hearted, and greatly liked by his neighbours, but not a man of business habits, and he did not sneeeed in his farming enterprise. He died when his son Richard was a ehild, and the care of the family devolved upon the mother, who was a woman of strong sense and of great energy of eharaeter, and who, after her husband’s death, left Dunford and returned to Midhunrst.

The edueational advantages of Richard Cobden were not very ample. ‘There was a grammar school at Midhurst, which at one time had enjoyed eonsiderable reputation, but which had fallen into decay. It was there that he had to pick up such rudiments of knowledge as formed his first equipment in life, but from his earliest ycars he was indefatigable in the work of self-cultivation. When fifteen or sixteen years of age he went to London to the warehouse of Messrs Partridge and Pricc, in East Cheap, one of the partners being his unele. His relative noting the lad’s passionate addiction to study, solemnly warned him against indulging sueh a taste, as likely to prove a fatal obstaele to his suceess in eommereial life, Happily the admonition was unheeded, for while unweariedly diligent in business, as his rapid after suecess abundantly proved, he was in his intervals of leisure a most assiduous student. During his residence in London he found aceess to the London Institution, and made ample use of its large and well-seleeted library.

When he was about twenty years of age he became a commercial traveller, and throwing into that, as he ever did into whatever his hand found to do, all the thorough- ness and vigour of his natnre, he soon beeame eminently sucessful in his calling, But never eontent to sink into the mere trader, he sought to introduee among those he met on the “road” a higher tone of conversation than usually marks the commercial room, and there were many of his associates who, when he had attained eminence,

reealled the diseussions on pulitical economy and kindred topies with which he was wont to enliven and elevate the travellers’ table. In 1830 Cobden learnt that Messrs Fort, ealico printers at Sabden, near Clitheroe, were about to retire from business, and he, with two other young laen, Messrs Sheriff and Gillet, who were engaged in the same commereial louse as himself, determined to make an effort to acquire the sueeession. They had, however, very little eapital amoung them. But it may be taken as an illustration of the instinctive eonfidenee whieh Cobden through life inspired in those with whom he eame into eontact, that Messrs Fort consented to leave to these untried young men a large portion of their eapital in the business. Nor was their eonfidence misplaced. The new firm had soon three establishments,—one at Sabden, where the printing works were, one in London, and one in Manchester for the sale of their goods, This last was under the direet management of Cobden, who, in 1830 or- 1831, settled in the city with whieh his name beeame afterwards so elosely associated. The sueeess of this enter- prize was decisive and rapid, and the “ Cobden prints” soon beeame known through the eountry as of rare value both for exeellenee of material and beauty of design. ‘There ean be no doubt that if Cobden had been satisfied to devote all his energies to commercial life he might soon have attained to great opulence, for it is understood that his share in the profits of the business he had established amouuted to from £8000 to £10,000 a year. But he had other tastes, whieh impelled him irresistibly to pursue those studies which, as Lord Baeon says, “ serve for delight, for ornament, and for ability.” Mr Prentiee, the historian of the Anti-Corn-Law League, who was then editor of the Man- chester Times, deseribes how, in the year 1835, he reeeived for publication in his paper a series of admirably written letters, under the signature of “ Libra,” discussing eom- mercial and

eeonomieal questions with rare ability. After some time he diseovered that the author of these letters was Cobden, whose name was uutil then quite unknown to him.

Jn 1835 he published his first pamphlct, entitled Eng- land, Ireland, and America, by a Manchester Manufacturer. It attraeted great attention, and ran rapidly through several editions. It was marked by a breadth and boldness of views on politieal and social questions whieh betokened an origina! mind. In this production Cobden advo- eated the same prineiples of peaee, non-intervention, re- trenehment, aud free trade to which he continued faithful to the last day of his life. Immediately after the publiea- tion of this pamplilet, he paid a visit to the Unitcd States, landing in New York on the 7th June 1835. He devoted about three months to this tour, passing rapidly through the seaboard Statcs and the adjaeent portion of Canada, and colleeting as he went large stores of information respecting the eondition, resourees, and prospects of the great Western Republic. Soon after his return to England le began to prepare another work for tle press, which appeared towards the end of 1836, under the title of Russia, It was mainly designed to combat a wild out- break of Russophobia which, under the inspiration of Mr Daniel Urquhart, was at that time taking possession of the public mind. But it eontained also a bold indictment of the whole system of foreign poliey then in vogue, founded on ideas as to the balanee of power and the neecssity of large armameuts for the proteetion of eommeree. While this pamphlet was in the press, delicate health obliged him to leave England, and for several months, at the end of 1836 and the beginning of 1837, he travelled in Spain, Turkey, and Egypt. During his visit to Egypt he had an interview with the redoubtable ruler of that country, Mehemet Ali, of whose character as a reforming monarch

he did not bring away a very favourable impression. He yeturned to England in April 1837. From that time Cobden became a conspicuous figure in Manchester, taking a leading part in the local politics of the town and district. Largely owing to his exertions, the Manchester Atheneum was established, at the opening of which he was chosen to deliver the inaugural address. He became a member of the Chamber of Commerce, and soon

infused new life into that body. He threw himself with great energy into the agitation which led to the incorporation of the city, and was elected one of its first aldermen. He began also to take a warm interest in the cause of popular education. Some of his first attempts in public speaking were at meet- ings which he convened at Manchester, Salford, Bolton, Rochdale, and other adjacent towns, to advocate the estab- lishment of British schools. It was while on a mission for this purpose to Rochdale that he first formed the acquaint- ance of Mr John Bright, who afterwards became his distinguished coadjutor in the free trade agitation. Nor was it long before his fitness for parliamentary life was recognized by his friends. In 1837, the death of William TV. and the accession of Queen Victoria led to a general election. Cobden was candidate for Stockport, but was defeated, though not by a large majority.

In 1838 an Anti-Corn-Law Association was formed at Manchester, which, on his suggestion, was afterwards changed into a national association, under the title of the Anti-Corn-Law League. ‘This is not the place to recount the history of that famous association, of which from first to last Cobden was the presiding genius and the animating soul. During the seven years between the formation of the league and its final triumph, he devoted himself wholly to the work of teaching his countrymen sound economical doctrines, for the agitation which he and his associates conducted with such signal ability and success was pre- eminently an educational agitation. His labours were as various as they were incessant,—now guiding the councils of the League, now addressing crowded and enthusiastic meetings of his supporters in London or the large towns of England aud Scotland, now invading the agricultural districts, and challenging the landlords to meet him in the presence of their own farmers, to discuss the question in dispute, and now encountering the Chartists led on by Feargus O’Connor, who had deluded a portion of the working classes into fanatical opposition to free frade. But whatever was the character of his audicnce he never failed, by the clearness of his statements, the force of his reasoning, and the felicity of his illustrations, to carry conviction to the minds of his hearers.

In 1841, Sir Robert Peel having defeated the Melbourne ministry in Parliament, there was a general election, when Cobden was returned for Stockport. His opponents had confidently predicted that he would fail

utterly in the House of Commons. He did not wait long, after his admission into that assembly, in bringing their predic- tions to the test. Parliament met on the 19th August. On the 24th, in course of the debate on the Address, Cobden delivered his first speech. “It was remarked,” says Miss Martineau, in her History of the Peace, “that he was not treated in the House with the courtesy usually accorded to a new member, and it was perceived that he did not need such observance.” With perfect self-posses- sion, which was not disturbed by the jeers that greeted some of his statements, and with the utmost simplicity, direct- ness, and force, he presented the argument against the corn- laws in such a form as startled his audience, and also irritated some of them, for it was a style of eloquence very unlike the conventional style which prevailed in Parliament.

From that day he became an acknowledged power in the

House, and though addressing a most unfriendly audience,

he compelled attention by his thorough mastery of his

subject, and by the courageous boldness with which he charged the ranks of his adversaries. He soon came to be recognized as one of the foremost debaters on those economical and commercial questions which at that time so much occupied the attention of Parliament; and the most prejudiced and bitter of his opponents were fain to acknow- ledge that they had to deal with a man whom the most practised and powerful orators of their party found it hard to cope with, and to whose eloquence, indeed, the great statesman in whom they put their trust was obliged ultimately to surrender. On the 17th of February 1848 an extraordinary scene took place in the House of Commons. Cobden had spoken with great fervour of the deplorable suffering and distress which at that time pre- vailed in the country, for which, he added, he held Sir Robert Peel, as the head of the Government, responsible, This remark, when it was spoken, passed unnoticed, being indeed nothing more than one of the commonplaces of party warfare. But a few weeks before, Mr Drummond, who was Sir Robert Peel’s private secretary, had been shot dead in the street by a lunatic. In consequence of this, and the manifold anxieties of the time with which he was harassed, the mind of the great statesman was no doubt in a moody and morbid condition, and when he arose to speak later in the evening, he referred in excited and

agitated tones to the remark, as an incitement to violence against his person. Sir Robert Peel's party, catching at this hint, threw themselves into a frantic state of excitement, and when Cobden attempted to explain that he meant official, not personal responsibility, they drowned his voice with clamorous and insulting shouts. But Peel lived to make ample and honourable amend for this unfortunate ebullition, for not only did he "fully and unequivocally withdraw the imputation which was thrown out in the heat of debate under an erroneous impression," but when the great free trade battle had been won, he took the wreath of victory from his own brow, and placed it on that of his old opponent, in the following graceful words :—" The name which ought to be, and will be associated with the success of these measures, is not mine, or that of the noble Lord (Russell), but the name of one who, acting I believe from pure and disinterested motives, has, with untiring energy, made appeals to our reason, and has enforced those appeals with an eloquence the more to be admired because it was unaffected and unadorned; the name which ought to be chiefly associated with the success of these measures is the name of Richard Cobden." Cobden had, indeed, with unexampled devotion, sacrificed his business, his domestic comforts, and for a time his health to the public interests. His friends therefore felt, at the close of that long campaign, that the nation owed him some substantial token of gratitude and admiration for those sacrifices. No sooner was the idea of such a tribute started than liberal contributions came from all quarters, which enabled his friends to present him with a sum of £80,000. Had he been inspired with personal ambition, he might have entered upon the race of political advancement with the prospect of attaining the highest official prizes. Lord John Russell, who, soon after the repeal of the corn laws, succeeded Sir Robert Peel as first minister, invited Cobden to join his Government. But he preferred keeping himself at liberty to serve his countrymen unshackled by official ties, and declined the invitation. He withdrew for a time from England. His first intention was to seek complete seclusion in Egypt oF Italy, to recover health and strength after his long and exhausting labours. But his fame had gone forth throughout Europe, and intimations reached him from many quarters that his voice would be listened to everywhere with favout,

in advocacy of the doctrines to the triumph of which he had so much contributed at home. Writing to a friend in July 1846, he says,—“ lam going to tell you of a fresh project that has been brewing in my brain. I have given up all idea of burying myself in Egypt or Italy. I am going on an agitating tour through the continent of Europe.” Then, referring to messages he had received from influential persous in France, Prussia, Austria, Russia, and Spain to the effect mentioned above, he adds:—“Well, I will, with God’s assistance, during the next twelve months, visit all the large states of Europe, see their potentates or statesmen, and endeavour to enforce those truths which have been irresistible at home. Why should I rust in inactivity? If the public spirit of my countrymen affords me the means of travelling as their missionary, I will be the first ambas- sador from the people of this country to the nations of the Continent. I am impelled to this by an instinctive emotion such as has never deceived me. I feel that I could succeed in making out a stronger case for the prohibitive nations of Europe to compel them to adopt a freer system than I had here to overturn our protection policy.” This programme he fulfilled. He visited in succession France, Spain, Italy, Germany, and Russia. He was received everywhere with marks of distinction and honour. In many of the principal capitals he was invited to public banquets, which afforded him an opportunity of propagating those principles of which he was regarded as the apostle. But beside these public demon- strations he sought and found access in private to many of the leading statesmen, in the various countries he visited, with a view to indoctrinate them with the same principles. During his absence there was a general election, and he was returned for Stockport and for the West Riding of Yorkshire. He chose to sit for the latter.

When Cobden returned from the Continent he addressed himself to what seemed to him the logical complement of free trade, namely, the promotion of peace and the reduc- tion of naval and military armaments. His abhorrence of war amounted to a passion. Throughout his long labours in behalf of unrestricted commerce he never lost sight of this, as being the most precious result of the work in which he was engaged,—its tendency to diminish the hazards of war and to bring the nations of the world into closer and more lasting relations of peace and friendship with each other. He was

not deterred by the fear of ridicule or the reproach of Utopianism from associating himself openly, and with all the ardour of his nature, with the peace party in England. In 1849 he brought forward a proposal in Parliament in favour of international arbitration, and in 1851 a motion for mutual reduction of armaments. He was not successful in either case, nor did he expect to be. In pursuance of the same object, he identified himself with a series of remarkable peace congresses—international assemblies designed to unite the intelligence and philanthropy of the nations of Christendom in a league against war—which from 1848 to 1851 were held succes- sively in Brussels, Paris, Frankfort, London, Manchester, and Edinburgh,

On the establishment of the French empire in 1851-2 a violent panic took possession of the public mind. Without the shadow of producible evidence the leaders of opinion In the press promulgated the wildest alarms as to the intentions of Louis Napoleon, who was represented as con- templating a sudden and piratical descent upon the English Coast without pretext or provocation. Shocked by this pitiful display of national folly, Cobden did not hesitate to throw himself into the breach and withstand the madness of the hour. By a series of powerful speeches in and out of Parliament, and by the publication of his masterly pamphlet, 1793 and 1858, he sought to calm the passions of his countrymen, By this course he sacrificed the great

popularity he had won as the champion of free trade, and became for a time the best abused man in Bngland Immediately afterwards, owing to the quarrel about the Holy Places which arose in the east of Europe, public opinion suddenly veered round, and all the suspicion and hatred which had been directed against the emperor of the French were diverted from him to the emperor of Russia. Louis Napoleon was taken into favour as our faithful ally, and in a whirlwind of popular excitement the nation was swept into the Crimean war. Cobden, who had travelled in Turkey, and had studied the condition of that country with great care for many years, utterly discredited the outcry about maintaining the independence and integrity of the Ottoman empire which was the battle-cry of the day. He denied that it was possible to maintain them, and no less strenuously denied that it was desirable even if it were possible. He believed that the jealousy of Russian aggrandizement and the dread of Russian power to which our countrymen delivered themselves

at that time were absurd exaggerations. He maintained that the future of European Turkey was in the hands of the Christian population, and that it would have been our wisdom to ally ourselves with them rather than with the doomed and decaying Mahometan power. “You must address your- selves,” he said in the House of Commons, “as men of sense and men of energy, to the question—what are you to do with the Christian population? for Malometanism cannot be maintained, and I should be sorry to see this country fighting for the maintenance of Mahometanism Pees You may keep Turkey on the map of Europe, you may call the country by the name of Turkey if you like, but do not think you can keep up the Mahometan rule in the country.” The reader may be left to judge how far his sagacity and statesmanship have been vindicated by the event. But for the time the torrent of popular sentiment in favour of war was irresistible; and Messrs Cobden and Bright, who with admirable courage and eloquence with- stood what they deemed the delusion of the hour, were overwhelmed with obloquy.

At the beginning of 1857 tidings from China reached England of a rupture between the British plenipotentiary in that country and the governor of the Canton provinces in reference toa small vessel or lorcha called the “‘ Arrow,” which had resulted in the English admiral destroying the river forts, burning 23 ships belonging to the Chinese navy, and bombarding the city of Canton. After a careful investigation of the official documents, Cobden became con- vineed that those were utterly unrighteous proceedings. He brought forward a motion in Parliament to this effect, which led to a long and memorable debate, lasting over four nights, in which he was supported by Mr Sydney Herbert, Sir James Graham, Mr Gladstone, Lord John Russell, and Mr Disraeli, and which ended in the defeat of Lord Palmerston by a majority of sixteen. But this triumph cost him his seat in Parliament. On the dissolu- tion which followed Lord Palmerston’s defeat, Cobden became candidate for Huddersfield, but the voters of that

‘town gave the preference to his opponent, who had

supported the Russian war and approved of the proceedings at Canton. Cobden was thus relegated to private life, and retiring to his country house

at Dunford, he spent his time in perfect contentment in cultivating his land and feeding: his pigs.

He took advantage of this seasou of leisure to pay another visit to the United States. During his absence the general election of 1859 occurred, when he was returned unopposed for Rochdale. Lord Palmerston was again prime minister, and having discovered that the advanced liberal party was not so easily “crushed” as he had apprehended, he made overtures of reconciliation, andinvited

Cobden and Milner Gibson to become members of his government. Ina frank, cordial letter which was delivered to Cobden on his landing in Liverpool, Lord Palmerston offered him the Presidency of the Board of Trade, with a seat in the Cabinet. Many of his friends urgently pressed him to accept; but without a moment’s hesitation he determined to decline the proposed honour. On his arrival in London he called on Lord Palmerston, and with the utmost frankness told him that he had opposed and denounced him so frequently in public, and that he still differed so widely from his views, especially on questions of foreign policy, that he could not, without doing violence to his own sense of duty and consistency, serve under him a3 minister. Lord Palmerston tried good-humouredly to combat his objections, but without success. me

But though he declined to share the responsibility of Lord Palmerston’s administration, he was willing to act as its representative in promoting freer commercial intercourse between England and France. But the negotiations for this purpose originated with himself in conjunction with Mr Bright and M. Michel Chevalier. Towards the close of 1859 he called upon Lord Palmerston, Lord John Russell, and Mr Gladstone, and signified his intention to visit France and get into communication with the emperor and his ministers, with a view to promote this object. These statesmen expressed in general terms their approval of his purpose, but he went entirely on his own account, clothed at first with no official authority. His name, however, carried an authority of its own. On his arrival in Paris he had a long audience with Napoleon, in which he urged many arguments in favour of removing those obstacles which prevented the two countries from being

brought into closer dependence on one another, and he succeeded in making a considerable impression on his mind in favour of free trade. He then addressed himself to the French ministers, and had much earnest conversation, especially with M. Fould, Ministre a Etat, and M. Rouher, minister of commerce, both of whom, and especially the latter, he found well inclined to the economical and commercial principles which he advocated. After a good deal of time spent in these preliminary and unofficial negotiations, the question of a treaty of commerce between the two countries having entered into the arena of diplomacy, Cobden was requested by the British Government to act as their plenipotentiary in the matter in conjunction with Lord Cowley, their ambassador in France. But it proved a very long and laborious undertaking. He had to contend with the bitter hostility of the French protectionists, which occasioned a good deal of vacillation on the part of the emperor and his ministers. There were also delays, hesitations, and cavils at home, which were more inexpli- cable. He was, moreover, assailed with great violence bya powerful section of the English press, while the large number of minute details with which he had to deal in connection with proposed changes in the French tariff, involved a tax on his patience and industry which would have daunted a less resolute man. But there was one source of embarrassment greater than all the rest. One strong motive which had impelled him to engage in this enterprise was his anxious desire to establish more friendly relations between England and France, and to dispel those feelings of ‘mutual jealousy and alarm which were so frequently breaking forth and jeopardizing peace between the two countries. This was the most powerful argument with which he had plied the emperor and the members of the French Government, and which he had found most efficacious with them. But unhappily, while he was in the very thick of the uegotations, Lord Palmerston brought forward in the House of Commons a measure for fortifying

the naval arsenals of England, which he introduced in a

warlike specch pointedly directed against Trance, as the source of danger of invasion and attack, against which it was neccssary to guard. This produced irritation and resentment in Paris, and but for the influence which Cobden had acquired, and the perfect trust rcposed in his sincerity, the negotiations would probably have been alto- gether wrecked. At last, however, after

nearly twelve months' incessant labour, the work was completed in November 1860 " Rare," said Mr Gladstone, "is the privilege of any man who, having fourtcen years ago rendered to his country onc signal servicc, now again,

within the same brief span of life, decorated neither by'

land nor title, bearing no mark to distinguish him from the people he loves, has been permitted to perform another great and memorable service to his sovereign and his country."

On the conclusion of this work honours were offered to Cobden by the Governments of both the countries which he had so greatly benefited. Lord Palmerston offered him a baronetcy anda seat in the Privy Council, and the emperor of the French would gladly have conferred upon him some distinguished mark of his favour. But with characteristic disinterestedness and modesty he declined all such honours,

It has already been remarked that Cobden's efforts in fnrtherance of free trade were always subordinated to the highest moral purposes—the promotion of peace on earth and good-will among men. This was his desire and hope as respects the Commercial Treaty with France. He was therefore deeply disappointed and distressed. to find the old feeling of distrust towards our neighbours still actively fomented by the press and some of the leading politicians

lof the country. He therefore, in 1862, published his

pamphlet entitled Zhe Three Panics, the object of which was to trace the history and expose the folly of those periodical visitations of alarm, as respects the designs of our neighbours with which this country had been afflicted for the preceding fifteen or sixteen years.

There was one other conspicuous service which Cobden rendered, or tried to render, to his country before his death. When the great civil war threatened to break out in the United States, it was matter to him of profound affliction. But after the conflict became inevitable his sympathics were wholly with the North, because the South was fighting for slavery. His

great anxiety, however, was that the British nation should not be committed to any unworthy course during the progress of that struggle. And when our relations with America were becoming critical and menacing in consequence of the depredations committed on American commerce by vessels issuing from British ports, he brought the question before the Honse of Coramons in a scries of speeches of rare clearness and force, in which he pointed out the perilous responsibilities we were incurring by connivance or neglect in regard to those vessels. He was first attacked with great animosity both in and out of Parliament for taking this line, but after results amply vindicated his political sagacity and patriotism.

For several years Cobden had been suffering severcly at intervals from bronchial irritation and a difficulty of breathing. Owing to this he had spent the winter of 1860 in Algeria, and every subsequent winter he had to be very carcful and confine himself to the house, especially i damp and foggy weather. In November 1864 he went down to Rochdale aud delivered a speech to his consti: tuents—-the last heeverdelivered. ‘That effort was followed by great physical prostration, and he determined not to quit his retirement at Midhurst until spring had fairly set in. But in the month of March there were discussious in the House of Commons on the alleged necessity © constructing large defensive works in Canada. He was

deeply impressed with the folly of such a project, and he was seized with .a strong desire to go up to London and deliver his sentiments on the subject. But on the 21st of March, the day on which he left home, a bitter easterly wind blew, and struck him in the throat and chest. He recovered a little for a few days after his arrival in London ; but on the 29th there was a relapse, and on the 2d of April 1865, he expired peacefully at his apartments jn Suffolk Street.

On the following day there was a remarkable scene in the House of Commons. When the clerk read the orders of the day Lord Palmerston rose, and in impressive and solemn tones declared “ it was not possible for the House to proceed to business without every member recalling to his mind the great loss which the House and country had sustained by the event which took place yesterday morn- ing.” He then paid a generous tribute to

the virtues, the abilities, and services of Cobden, and he was followed by Mr Disraeli, who with great force and felicity of language delineated the character of the deceased statesman, who, he said, ‘‘ was an ornament to the House of Commons and an honour to England.” Mr Bright also attempted to address the House, but after a sentence or two delivered in a tremulous voice, he was overpowered with emotion, and declared he must leave to acalmer moment what he had to say on the life and character of the manliest and gentlest spirit that ever quitted or tenanted a human form.

In the French Corps Législatif, also, the vice-president, M. Forgade la Roquette, referred to his death, and warm expressions of esteem were repeated and applauded on every side. ‘The death of Richard Cobden, ” said M. la Roquette, “‘is not alone a misfortune for England, but a cause of mourning for France-and humanity.” M. Drouyn de Lhuys, the French minister of foreign affairs, made his death the subject of a special despatch, desiring the French ambassador to express to the Government ‘the mournful sympathy and truly national regret which the death, as lamented as premature, of Richard Cobden had excited on that side of the Channel. ‘‘ He is above all, ” he added, “in our eyes the representative of those sentiments and those cosmopolitan principles before which national frontiers and rivalries disappear ; whilst essentially of his country, he was still more of his time; he knew what mutual relations could accomplish in our day for the prosperity of peoples. Cobden, if I may be permitted to say so, was an international man.”

He was buried at West Lavington Church, on the 7th of April, by the side of his only son, whose death, eight or nine years before, had nearly broken his father’s heart. His grave was surrounded by a large crowd of mourners, among whom were Mr Gladstone, Mr Bright, Mr Milner Gibson, Mr Villiers, and a host besides from all parts of the country. (H. RL)

COBIJA, or, as it is officially called in honour of the first president of the republic, Puerto La Mak, is the principal port of Bolivia, and the chief town of the province of Atacama or Cobija. It is situated on the coast of the Pacific, about 800 miles north of Valparaiso in Chili, in 22° 32’ 50” S. lat. and 70° 21’ 2” W. long.; and it occupies a low-lying position on the beach, at the foot of a lofty range of hills. The surrounding district is desolate in

the extreme, and Cobija is totally dependent on impor- tation even for the common necessaries of life. Water is very scarce; the wells only satisfy the wants of about 400 or 500 persons, and the rest of the population has to be supplied by the distillation of the salt water from the sea. At one time fish formed a valuable article of consumption ; but since the rise of the mining industries the fishers have for the most part forsaken their nets. The town itself is poorly built, and consists of little more than one broad,

long street. The harbour is comparatively safe; but the landing-place is bad, and the danger from the surf con- siderable. As a free port and the principal means of com- munication with the interior, Cobija attracts a considerable amount of foreign trade. It owes its foundation in the course of last century to Charles III. of Spain; it was declared a free port in 1827; and it attained the rank of capital of the department in 1837. In 1827 it consisted of little more than a few huts inhabited by Changas, or sea- faring Indians ; and in 1855 it only numbered 500 or 600 of a population. In 1858, however, the permanent inhabi- tants were no fewer than 2000, and the floating population amounted to 4000 souls. (See Tschudi, Revse von San Pedro de Atacama nach Cobija, 1860.)

COBLENTZ (German, Coblenz), the capital of Rhenish Prussia, is pleasantly situated at the confluence of the Rhine and Moselle. From this circumstance it derived its ancient name of Conjluentes, of which Coblentz is a corrup- tion. This city is still of consequence from a military point of view, since it commands the junction of two great rivers. Its fortifications, which are very extensive, not only protect the town, but connect the works on the left bank of the Rhine with the fortress of Fhrenbreitstein on

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Plan of Coblentz,

1. Military Prison and Lazaretto, 11, Theatre.

2. Florins Church (Evang.) 12. Post Office.

3. Market Hall. 18. Prison (Civil).

4. School of Art, 14, Government Buildings. 5. Hospital. 15. Building-yard for the Forti- 6. General Commando, fications.

7. Deutsches Haus. 16. Gouvernement.

8. Liebfrauenkirche. 17. Commandantur,

9. Casino (Civil). 18. Castle. 10. Commissariat Magazine. 19. Capuchin Church.

A. Weisser Thor. C. Mainzer Thor.

B. Léhr Thor, D. Mosel Thor.

the other side of the river. The city is almost triangular in shape ; two sides are bounded by the Rhine and Moselle, the third by strong fortifications. These are pierced by two massive gates, the Léhr and Mayence gates, with draw- bridges over the fosse. The military works, which were constructed on the combined systems of Carnot and Montalembert, include no fewer than 26 forts, and form a fortified camp capable of containing 100,000 men. ‘The Rhine is crossed here by a bridge of boats 485 yards long, and by the Iron Bridge, built for railway purposes in 1866 The Moselle is spanned by a Gothic freestone bridge of 14 arches, 1100 feet in length, erected in 1344, and also by a railway bridge. In the more ancient part of Coblentz are several buildings which possess an historical

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interest. Prominent among these, at the point of conflu- ence of the rivers, is the church of St Castor, built in the early Lombard style of architecture, and surmounted by four towers. The church was originally founded in 836 by Lewis the Pious, but the present edifice is considerably less ancient. It was here that the sons of Charlemagne met in 843, when they divided the empire into France, Germany, and Italy. In front of the church of St Castor stands a fountain, erected by the French in 1812, with an inscription to commemorate Napoleon's invasion of Russia. Not long after, the Russian troops occupied Coblentz ; and St Priest, their commander, added in irony these words— " Vu et approuvé par nous, Commandant Russe de la Ville de Coblence: Janvier ler, 1814." In this quarter of the town there is also the Liebfrauenkirche, a fine specimen of the old cathedral style, built in 1259; the ancient town- hall; the Castle of the Electors of Treves, erected in 1280, now converted into a manufactory of japan-ware ; and the family-house of the Metternichs, where Prince Metternich, the Austrian statesman, was born in 1772. The more modern part of the town hag open, regular streets, and many of its public buildings are handsome. The principal of these is the Palace or Royal Castle, with one front looking towards the Rhine, the other into the Neustadt, or Great Square. It was built in 1778-86, and contains among other curiosities some fine Gobelin tapestry work. Another large edifice is the Palace of Justice, where the law courts sit, and assizes are held every three mouths, Coblentz has also a gymnasium (formerly a convent of Jesuits), a hospital, managed by the sisters of charity, an orphan asylum, a valuable town library, a theatre, a casino, a picture gallery, a musical institute, and a medical school. Above the Iron Bridge are Anlagen, or pleasure-grounds, much resorted to by the town's-people. The manufactures consist chiefly of linens, cottons, Japan-ware, furniture, and tobacco. Coblentz is a free port, and carries on an exten- sive commerce by means of the Rhine, Moselle, and Lahn. Being in the centre of the hock wine district, a large trade in this class of produce is carried on with Great Britain, Holland, and other countries. 'Large exports of mineral waters are also made, about one million jars of seltzer being shipped annually. Among the products of the neigh- pouring provinces which are exported from Coblentz are corn, iron, volcanic stones, potter's clay, stoneware, and bark. The population is 28,000.

Coblentz was one of the military posts established by Drusus about 9 B.c. It is not unfrequently mentioned during the early centuries of the Christian era as the residence of the Frankish kings, and in 860 and 932 it was the seat of ecclesiastical councils. In 1018 it obtained the rights ofa city from Henry II., but at the same time was made subject to the Bishop of Treves, who entrusted the administration to the count palatine of the Rhine. In the following century the fief was held by the counts of Arnstein and the counts of Nassau; but it returned to the bishops in 1253. Archbishop Arnold surrounded the city with new walls in 1249-54, and, in spite of an insurrection on the part of the inhabitants founded the citadel which still overlooks the town. As a member of the League of the Rhenish cities which took its rise in the 13th century, Coblentz attained to great prosperity ; and it continued to advance till the disasters of the Thirty Years' War occasioned a rapid decline. When in 1632 the Elector Philip Christopher of Sotern surrendered Ehrenbreitstein to the French the town received an imperial garrison, which was soon, however, expelled by the Swedes. They in their turn handed the city over to the French but the imperial forces succeeded in retaking it bystorm. In 1688 it was besieged by the French Marshal Bouflers, but was success- fully defended by Count Lippe. In 1786 the elector of Treves Clemens Wenceslas, took up his residence in the town, and gave great assistance in its extension and improvement; and a few years later it became, through the invitation of his minister, Duminique one of the principal rendezvous of the French émigrés. In 1794 it was taken by the Revolution army, and, after the peace of Lunéville, it was made the chief town of the Rhine and Moselle department.

In 1814 it was occupied by the Russians, and by the Congress at

Vienna it was assigned to Prussia.

COBRA (Naja tripudians), a poisonous Colubrine Snake,

belonging to the family Zlapide, known also as the Hooded Snake, or Cobra di Capello. In this species the anterior ribs are elongated, and by raising and bringing forward these, the neck, which otherwise is not distinct from the head, can be expanded at will into a broad disc or hood, the markings on which bear a striking resemblance to a pair of barnacles, hence the name "Spectacle Snake " also applied to the cobra. It possesses two rows of

palatine teeth in the upper jaw, while the maxillary bones bear the fangs, of which the anterior one only is in connection with the poison gland, the others in various stages of growth

yemaining loose in the surrounding flesh until the destruc- tion of the poison fang brings the one immediately behind to the front, which then gets anchylosed to the maxillary pone, and into connection with the gland secreting the poison, which in the cobra is about the size of an almond. Behind the poison fangs there are usually one or two ordinary teeth. The cobra attains a length' of nearly 6 feet and a girth of about 6 inches, and with the exception of

the markings on the hood is of a uniform brown colour

above and bluish-white beneath. There are, however, many distinct varieties, in some of which the spectacle markings on the hood are awanting. The cobra may be regarded as

nocturnal in its habits, being most active by night, although not unfrequently found in motion during the day. It

usually conceals itself under logs of wood, in the roofs of huts, and in holes in old walls and ruins, where it is often

come upon inadvertently, inflicting a death wound before

it has been observed. It feeds on small quadrupeds, frogs, lizards, insects, and the eggs of birds, in search of which it sometimes ascends trees. When seeking its prey it glides slowly along the ground, holding the anterior third of its body aloft, with its hood distended, on the alert for any-

thing that may come in its way. "This attitude," says Sir

J. Fayrer, "is very striking, and few objects are more cal-

culated to inspire awe than a large cobra when, with his

hood erect, hissing loudly, and his eyes glaring, he prepares

to strike." It is said to drink large quantities of water, although, like reptiles in general it will live for many months without food or drink. The cobra is oviparous ; and its eggs, which are from 18 to 25 in number, are of a pure white coiour, somewhat resembling in size and appearance the eggs of the pigeon, but sometimes larger. These it leaves to be hatched by the heat of the sun. It is found in all parts of India from Ceylon to the Himalayas, where it occurs at a height of 8000 feet, and it is justly regarded as the most deadly of the Indian Thanatophidia. A large proportion of the deaths from snake bite, where the species inflicting the wound has been ascertained, is shown to be due to the cobra; and it is estimated that fully one-half of the 20,000 deaths that annually occur in India from this cause may be attributed to this unluckily common species. The bite of a vigorous cobra will often prove fatal in a few minutes, and as there is no known antidote to the poison, itis only in rare instances that such mechanical expedients as cauterizing, con striction, or amputation can be applied with sufficient promptitude to prevent the virus from entering the cit- culation. Of late years, owing to a small reward offered by the Indian Government for the head of each poisonous snake, great numbers of cobras have been destroyed ; but only low caste Hindus will engage in such work, the cobra being regarded by the natives generally with superstitious reverence, as a divinity powerful to injure, aud therefore to be propitiated; and thus oftentimes when found in their dwellings this snake is allowed to remain, and is fed and protected. 'Should fear," says Sir J. Fayrer, "' and perhaps the death of some inmate bitten by accident prove stronger than superstition, it may be caught,

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tenderly handled, and deported to some field, where it is released and allowed to depart in peace, not killed" Great numbers, especially of young cobras, are killed by the adjutant birds and by the

(Thanatophidia of India).

mungoos—a small mammal which attacks it with impunity,

apparently not from want of susceptibility to the poison, but by its dexterity in eluding the bite of the cobra. Mere scratching or tearing does not appear to be sufficient to bring the poison from the glands ; it is only when the fangs are firmly implanted by the jaws being pressed together that the virus enters the wound, and in those circumstances it

has been shown by actual experiment that the mungoos, like all other warm-blooded animals, succumbs to the poison, In the case of reptiles, the cobra poison takes effect much

more slowly, while it has been proved to have no effect

whatever on other venomous serpents. The cobra is the

snake usually exhibited by the Indian jugglers, who show great dexterity in handling it, even when not deprived of Usually, however, the front fang at least is

its fangs. extracted, the creature being thus rendered harmless until

the succeeding tooth takes its place, and in many cases all the fangs, with the germs behind, are removed—the cobra being thus rendered innocuous for life. The snake charmer

usually plays a few simple notes on the flute, and the cobra, apparently delighted, rears half its length in the air and sways its head and body about, keeping time to the music. The cobra, like almost all poisonous snakes, is by no means aggressive, and when it gets timely warning of the approach of man endeavours to get out of his way. It is only when trampled upon inadvertently, or otherwise irritated, that it attempts to use its fangs, It is a good swimmer, often crossing broad rivers, and probably even narrow arms of the sea, for it has been met with at sea at least a quarter of a mile from land.

COBURG, or, in German Koburg, the capital of the duchy of Saxe-Coburg-Gotha and, alternately with Gotha, the residence of the duke and the seat of the administration, is situated on the left bank of the Itz, an affluent of the Regen, and on the southern slope of the Frankenwald, 40 miles S.S.E. of

Gotha. The town is for the most part old, and contains a large number of remarkable buildings, The ducal palace, or Ehrenburg, is a fine Gothic edifice, with an extensive library, and collections of coins, paintings, and specimens in natural history; it was originally a convent of the Barefooted Friars, received its present appropriation from John Ernest in 1549, and was restored by Ernest in 1844. In front of the palace is a bronze statue of the latter duke by Schwanthaler, and in the court-garden is the ducal mausoleum. Among the churches the most remarkable is the Moritzkirche, with a tower 335 feet high, the beauti ful Hofkirche, and the modern Roman Catholic church. The educational institutions include a gymnasium, founded in 1604 by Casimir, and thus known as the Casimirianum : a Realschule, established in 1848, a normal college, a deaf and dumb asylum, and a school of architecture. The arsenal contains a public library ; and the so-called Augus- tenstift, where the ministry of the duchy is located, has an extensive collection of objects in natural history. Coburg further possesses a town-house, Government buildings, an observatory, anda theatre. Ona commanding eminence in the vicinity is the ancient castle of Coburg, which dates at least from the 11th century. Till 1348 it was the

residence of the counts of Henneberg, and till 1547 belonged | to the dukes of Saxony ; in 1781 it was turned into a penitentiary and lunatic asylum ; but in 1835-8 it received a complete restoration. The most interesting room in this building is that which was occupied by Luther for three months in 1530, and thus became the birthplace of his famous hymn, Line Jeste Burg ist unser Gott; the bed on

Which he slept and the pulpit from which he preached in |

COC

the old chapel are still shown. siderable industry,

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Coburg is a place of con- and possesses a large brewery, factories for the weaving of linen and cotton goods, tanneries, and dye-works ; and there is an important trade in the cattle reared in the neighbourhood. Among various places of interest in the vicinity are the ducal residences of Callenberg and

Rosenau, in the latter of which Albert, the Prince Consort, was born in 1819 ; the castle of Lauterberg ; and the village of Neuses, with the house of the poet Riickert, who died there in 1866, and on the other side of the riverthe tomb of the poet Thiimmel. Population in 1871, 12,819.

COCA. See Cuca.

COCCEIUS, or Cocu, Jonann (1603-1669), a Dutch theologian, was born at Bremen. After studying at Hamburg and Franecker he became in 1629 professor of Hebrew in his native town. In 1636 he was transferred to Franecker, where he held the chair of Hebrew, and from 1643 the chair of theology also, until 1650, when he became professor of theology at Leyden. He died on the 4th November 1669. Cocceius was a profound Oriental scholar, and his chief services were rendered in the depart- ment of Hebrew philology and exegesis. The common statement that he held that every passage has as many meanings as it can be made to bear is founded on an entire misconception of his fundamental law of interpretation. What he really maintained was the sound principle that individual words and phrases are to be interpreted according to their contextual connection, and not according to any predetermined dogmatic system, whether patristic or scholastic. As one of the leading exponents of the “federal ” theology, he spiritualized the Hebrew scriptures to such an extent that it was said that Cocceius found Christ everywhere in the Old Testament and Grotius found him nowhere. He held millenarian views, and was the founder of a school of theologians who were called after him Cocceians. His most distinguished pupil was the celebrated Vitringa. He wrote commentaries on most of the books of the Old Testament, but his most valuable work was his Lexicon et Commentarius Sermonis Heb. et Chald. (Leyden, 1669), which has been frequently repub- lished. The federal or covenant theology which he taught is fully expounded in his Swmma Doctrine de Federe et Testamento Det (1648). His collected works were pub- lished in twelve folio volumes at Amsterdam in 1701.

COCHABAMBA, a city and bishop’s see of Bolivia, capital of a province and department, jis situated about 8370 feet above the level of the sea, on both banks of the Rio de la Rocha, a sub-tributary of the Rio Grande, to the south of a considerable Cordillera. It is about 122 miles N.N.W. of Sucre,

its latitude is 17° 27’ S., and its longi- tude 65° 46’ W. The streets are broad, and the houses for the most part of one story and surrounded by gardens, so that the area of the city is great in comparison with its population. There are fifteen churches, a gymnasium, and a cabildo ; and an extensive industry is maintained in the production of woollen and cotton stuffs, leather, soap, glass-ware, and pottery. The population is largely com- posed of Indians ; and the prevailing language is Quichua. Cochabamba was founded in the 16th century, and for a time was called Oropesa. In the revolution of 1815 the women of the city distinguished themselves by their bravery, and successfully attacked the Spanish camp; and in 1818 a number of the heroines were put to death by the Spanish forces. In 1874 the city was seized by Miguel Aguirre, and a large part of it laid in ruins, but peace was soon afterwards restored, and the regular authorities reinstated. The population in 1858 was 40,678.

COCHIN, a feudatory state of Southern India, situated within the presidency of Fort St George or Madras, between 9° 48’ and 1,0° 50’ N. lat,, and between 76° 5’ and 76°58

up, and a considerable sum, amounting to £13,669 in 1874, is annually spent in public works. The military force is a nominal one of 1 commissioned officer and 340 non- commissioned officers and men. (exclusive of the British port of Cochin) are Malipuram and Narakel, at which 31 vessels, a burden of 22,626 tons, arrived in 1873-74. The capabilities of Narakel as a port of shelter during the S.W. monsoon have been satisfactorily proved, and the mail-steamers of the British India Company touch there for four or five months of the year, when the neighbouring English port of Cochin is unapproachable.

E. long. The state, which is of irregular shape, is bounded on the W., N., and E. by the districts of South Malabar and Coimbatore, and for some distance on the W. by the Indian Ocean; on the S. it is bounded by the state of Travancore. Cochin contains a total area of 1361 square miles, and a population, according to a census taken 1n 1875, of 598,353 souls, dwelling in 118,196 houses. The state is divided into seven ¢dluks, or sub-districts,

v1zZ., Cochin, Cannanore, Mugundapuram, Trichur, Tallapalli, Chitur, and Cranganore.

Cochin consists for the most part of a maritime lowland

hemmed in between the sea and the Ghats. Jt includes, however, the mountains which thus wall it out from inner India, and the lower portion is copiously watered by the torrents which pour down them. These torrents dwindle in the hot weather to rivulets, but during the rains they swell into great cataracts, rising in one instance at least 16 feet in twenty-four hours. On the lowlands, they unite as elsewhere on the western coast into shallow lakes or ‘ pack- waters,” lying behind the beach line and. below its level. In the monsoon the Cochin backwaters are broad navigable channels and lakes; in the hot weather they contract into shallows in many places not 2 feet deep. The vegetation is luxuriant ; rich crops of rice are grown on the lowlands ; the hills send down vast quantities of timber by means of the torrents. ‘The remains of once fine forests of teak are preserved in the north-eastern corner of the state, and still form a considerable source of wealth. Coffee has of late years received much attention and promises well. The other products are the usual ones of an Indianstate,—cotton, pepper, betel-nut, chillies, ginger, various spices, cardamoms, arrowroot, &. An excellent account of Cochin will be found in Dr Day’s Land of the Permauls. The rdjas of Cochin claim to hold the territory by desceut from Chermin Perumal, who governed the whole of the surrounding country, including Travancore and Malabar, as viceroy of the Cholé kings, about the beginning of the 9th century, and who afterwards established himself as an independent raja. In 1776 Cochin was subjugated by and became tributary to Hyder Ali. In 1792 Tippu ceded the sovereignty to the British, who made over the country to the hereditary r4j4, subject to a tribute of Rs.100,000. The state is now in subsidiary alliance with the British Government, under a treaty dated 17th October 1809. By this engagement, which was entered into on the suppression of an insurrection on the part of the réjds of Cochin and Travancore against the British power, the Cochin chief agreed to pay, in addition to the tribute of Rs.100,000, an annual sum, equal to the expense of maintaining a bat- talion of native infantry, or Arcot Rs.176,037, making an ageregate annual payment of Rs. 276,037. In return for this payment, and certain engagements entered into by the raja, the East India Company

undertook to defend the integrity of the state territory against all enemies. Subse- quently the annual tribute to the British Government was reduced to Rs, 240,000, and again afterwards to Rs. 200,000 (£20,000) at which it now stands. A British resident represents the governmeut of India in Cochin conjointly with Travancore, The present raja succeeded to the throne in March 1864.

The total revenue of Cochin for the Malabar year 1049 (1873-74 a.D.), amounted to £130,851, being the highest in- come recorded for any year; the principal items were theland revenue, £61,764; customs, £11,035; and salt, £15,713, The disbursementsfor the sameyear amounted to £111,858, leaving a surplus for the year of £18,993. The state has now the sum of £200,000 invested in British Government securities. A high school, with an average of 170 pupils, and 5 district schools are maintained by the state. Hospitals and dispensaries and a post-office are also kept

reside apart in a village outside the town. the censusof 1871, Cochin town contains 2731 houses and a population of 13,840 souls, classified as follows :—Hindus,

COC

The two trading ports

CocHin, a town and port of British India, belonging to

the Malabar district of Madras, situated in 9° 58’ 5” Te lat. and 76° 13’ 55” E. long, ‘The town lies at the northern extremity of a strip of land about twelve miles in length, but at few places more than a mile in breadth, which is nearly insulated by inlets of the sea and estuaries of streams flowing from the Western Ghats. Cochin backwater Cochin state. length by half a mile in breadth. Its first European possessors were the Portuguese, from whom it was captured by the Dutch in 1663. Under the Dutch the town prospered, and about 1778 an English traveller describes it as a place of great trade; “a harbour filled with ships, streets crowded with merchants, and warehouses stored with goods from every part of Asia and Europe, marked the industry, the commerce, and the wealth of the inhabitants.” In 1796 Cochin was captured from the Dutch by the British, and in 1806 the fortifications and

public buildings were blown up by order of the authorities. destroyed much private property, and for a long time seriously affected the prosperity of the town. Dutch rule Cochin was very populous, containing Europeans, Mopl4s or Musalmdns, Hindus, Arabs, Persians, and Christians of various sects, comprising natives, Armenians, Indo-Portuguese, and those denominated Syrian Christians. The Jews have also a settlement here. classes, the Fair or White Jews, of more recent arrival and

These form the described in the article on the The town of Cochin is about a mile in

The explosion

Under

They are of two settlement in the country, and the Black Jews, who According to

3883 , Muhammadans, 2174; Christians, 7783; and " Others," 46. The town is constituted a municipality,

and in 1873-74 the municipal income (excluding balances)

amounted to £1573 10s., and the expenditure to £1560 10s. The entrance to the port of Cochin is obstructed by a bar across the mouth of the river, and during the S.W. monsoon, which lasts for four or five months, vessels can neither enter nor depart from it in safety. N otwithstand- ing the difficulties of navigation, however, the port has a considerable maritime trade. In 1873-74, 171 British vessels of a burden of 108,579 tons, 27 foreign vessels of 7010 tons, and 1644 native craft of a total of 49,215 tons burden entered the port, and paid a total of £1974 as port dues,—by far the greater part, £1520, being paid by the British ships. The value of the exports in 1873-74 amounted to £755,796, and of the imports to £547,252, paying a total customs duty of £5161. A lighthouse at the south entrance of the harbour marks the entrance to the port, and is visible at a distance of 15 miles. COCHIN CHINA, a name applied to the eastern division of the Indo-Chinese peninsula, composed of the territories of Anam proper, Tong-king, and the French colony of Cochin China. It forms a long strip of country

which stretches in an arc of a circle along a coast-line of 1240 miles from 8° 30’ to 23° N. lat. With a breadth of 372 miles in the north of Tong-king, it is afterwards narrowed by a chain of mountains parallel to the China Sea, and has

no more than 50 miles of breadth in the greater part of the kingdom of Hué; but in Lower Cochin China it widens out again to about 190 miles. The most western point, in Tong-king, reaches 102° 20° E. long., and the most eastern, Cape Varela, in Cochin China, is in 109° 40”. The boundaries are—on the N. the Chinese provinces of Yun-nan and Kwang-se, on the E. and 8S. the China Sea, on the W. the Gulf of Siam, the kingdom of Cambodia, and the Laos country tributary to the Siamese empire. According to the most probable estimates the empire of Anam has an area of from 190,000 to 230,000 square miles, or about the same extent as France; while the Freuch colony occupies about 21,630, The western limits of this empire are, however, very imperfectly determined, and the regions to the west of Tong-king are still unexplored. The N. of Cochin China is washed by the Gulf of Tong-king, a great

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Sketch-Map of Cochin China.

inlet formed by the coast of Tong-king on the W. and the island of Hai-nan and the peninsula of Lien-chow on the E. At its mouth, towards Tiger Island and the 8.W, part of Hai-nan, the gulf has a breadth of about 138 English miles, which almost represents its medium breadth. Near the west coast are several islands, and towards the head of the gulf a great number of islets and banks. From sound- ings which have been taken throughout its whole extent, it has been found that in the middle of the entrance there is a depth of from 210 to 330 feet, which diminishes towards the coasts; and the depth is less half-way up the gulf, where the bottom is generally soft.

Passing along the coast from Cape Pak-loung, where the frontier commences between China and Tong-king, we find that all the part north of the Gulf of Tong-king is little known ; it is said to be fringed with banks and rocks, and some large islands have been visited by English vessels im pursuit of pirates. The most important are the Pirate Island, @ group of multitudinous islets in a bay of which the Chinese name is Fie-tzi-long, and the Pearl Islands. Next we find the mouth of the River Lach-Huyen, which Is deep, but obstructed about a mile inland by a bar prevent- ing the entrance of any vessel drawing more than 11} feet. Next come the mouths of the River of Tong-king, Song-Coi, or Hong-kiang (Red River). The delta of this river is

formed by four main branches—Cua? trh lay, Cua lac, Cua

a rs aa 1 Cua signifies embouchure,

dhai, Cua ba lat—which communicate with each other both by natural channels, called arroyos, and by artificial canals, These are charged with alluvial matter, and produce con- siderable increase of soil. Mr E. Ploix, a hydrographic engineer who visited the gulf between 1857 and 1859, estimates the annual advance of the coast at about 330 feet. It is by these rivers that Ke-cho, or Ha-noi, the capital of Tong-king, can be reached. This town and the port of Ninb-hai, in the province of Hai-dzuong, were opened to foreign commerce by a treaty concluded between France and the Government of Hué, March 15,1874. To allow a ship to pass up the river at any season its draught must not exceed 54 feet, and from the end of May to the end of November, vessels drawing 12 feet can cross the bars.

About 18° 10’ N. lat. lies the island Hon-tseu, or Goats’ Island, near a prominent cape about 1410 feet high, A little to the south of Hon-tseu is the point to the north of which there is only one tide in 24 hours, except during a period of two weeks, when on three or four days there are two tides of little force. At Cape Boung-Qui-hoathere is a good anchorage well sheltered by islands, of which the chief is South Watcher Island, or South Vigie. In front of Cape Lay is the little Tiger Island, where the west coast of the Gulf of Tong-king terminates. On the China Sea the coast presents successively, as we pass south- ward, the mouth of the River Hué,-defended by a fort; the Bay of Tourane, wide, deep, and well sheltered, but unfortunately situated

in an uuhealthy district, and in the poorest part of the country; the Bay of Quit-Quit, a very good anchorage, and the safest on this coast during the N.E. monsoon; the Island Cu-lao-ré, or Pulo Canton ; the port of Qui-nhon, or Binh dhinh, in the province of this name, opened to European commerce by the treaty of March 1874; the bay and the commodious port of Phu- yen; Cape Varela, or Mui-nai, a very lofty peak visible 30 nautical miles out at sea, and to the south of the cape the port of Hon-ro, safe at all seasons of the year; the Bay of Phan-rang and Cape Padaran, or Mui-Din, districts bordered by coral banks ; Cape Ke-ga ; and Cape Ba-kee, which forms the limit between lower Cochin China and the kingdom of Anam. Between Cape Padaran and Cape Ba-kee the coast is low, and bordered by dangerous banks. In front are the little islands of Pulo Cecir, Catwick, and Pulo Sapate, of difficult access.

The whole of lower Cochin China being formed of alluvial deposits, its coast is very low, has little irregularity of surface, and is covered with mangroves. The different mouths of the River Cambodia or Me-kong form a delta of more than 70 miles in extent. ‘The soil is subject to fre- quent changes on account of the alluvial deposits of the river, which is bordered by sand banks stretching seawards out of sight of land. At the entrance of the River Don-nai, which leads to Saigon, rises Cape St Jacques, a peak 920 feet above the level of the sea, At 45 sea-miles from the coast and from the mouths of the Me-kong, is the island of Pulo Condore, with a good port, and a penitentiary esta- blished by the French Government. On the west coast of Lower Cochin China, in the Gulf of Siam, is the port of Ha-Tien, communicating by a canal with one of the arms of the Me-kong.

To the north of Tong-king terminate the last underfalls of the high plateau of Thibet; a long chain stretches parallel to the Sea of China as far as the south of the kingdom of Anam of which it forms the western boundary. The highest point of this chain does not exceed 5250 feet. Between the last ramifications of the mountains of Thibet there descend from the plateau of Yun-nan and in a south- east direction the affluents of the great River Song-Coi or Hong-kiang, which undergoes periodic variations in the supply of its waters, In the month of March it is very

Climate.

low; but every year about the month of July it leaves its channel, floods a part of the country, and rolls along with a very powerful current. Before passing Ha-noi it receives the tribute of two great rivers, known to the natives by the names of the Black River and the Clear River.

The kingdom of Anam, closely shut in between the mountains and the sea, is drained by numerous but unimportant streams. Lower Cochin China, or French Cochin China, is abundantly watered by the numerous mouths and the canals which form the delta of the Me- kong or Cambodia. ‘This river takes its rise in the mountains of Thibet, waters the southern provinces of China and the district of Laos tributary to Siam, and crosses through the kingdom of Cambodia, where it divides into three branches. ‘The first, which does not penetrate into Cochin China, turns towards the north-west and loses itself in the Lake of Tonli Sap. The second, which takes the name of Hinder River (Hau-giang or Song-sau) flows south-east, enters Cochin China, communicates with the Sea of Siam by the Canal Vinh-te of Ha-tien and by that of Rach-gia, and enters the China Sea by two mouths. The third branch, named Front River (Tien-giang or Song-truoc), flows parallel to the preceding, divides at Vinh-long into four arms, and debouches by six mouths. These streams form numerous islands and communicate with each other by means of canals or arroyos. In spite of the length of its course and the great mass of its waters, the Me-kong cannot be utilized as a means of communica- tion with Central China, because of the numerous ressauts and rapids which encumber its course. It is besides subject to an annual flood; the waters begin to rise in May, attain their maximum in October, and decrease until March. From the month of March to the month of May the level is almost constant. Two other streams water the east of Lower Cochin China,—the Vaico, divided into two branches, and the Donnai. ‘These rivers communicate with each other and with the mouths of the Me-kong by numerous arroyos. The Donnai ‘receives the Saigon River ; and it is by this means that the largest vessels reach the town of that name.

The climate of the north of Anam differs much from that of the south. In Tong-king, though it is usual to divide the year into a dry and a wet season, there is properly speaking no dry season. In December and January the

thermometer falls to 41° or 43° Fahr. Summer corresponds to the period of the rains from the end of April to the month of August; and at that time it is excessively hot. Storms are frequent, and the coasts are often visited by typhoons. At the same time Tong-king is a healthy country ; the weather during four months is excellent ; and the French colony of Saigon might find there—what has never been discovered in Cochin China proper—a suitable site for a sanatorium. The climate of the French colony is unhealthy for Europeans ; they cannot be acclimatized. The mortality of the troops is rather high; and before their residence was shortened to two years it might be calculated at 9 or 10 per cent. for a three years' residence. The chief cause of the maladies which affect Europeans is the character of the soil. On the banks of the rivers, in the salt marshes, and along the shores of the sea, inter- mittent fevers of great severity are frequent. In the forest land rages the terrible wood-fever, from which the native himself cannot escape, though he lives unharmed in the midst of the rice swamps. But the great plague of Lower Cochin China is dysentery,—a disease which, endemic in all warm countries, proves in Cochin China particularly fatal. It is to it that the greater part of the deaths among Europeans are to be ascribed ; and they often succumb to its effects after their return to their native country, Most of the children born of European parents

EOREIN CHINA

in Cochin China die a short time after birth. White women are there exposed to many dangers, especially during their delivery ; and there is consequently little hope of forming there a race of creoles. the contrary, are very prolific, and suffer surprisingly little in childbirth. It is also interesting to observe that the Anamites, like the races of the extreme East, recover from wounds of the greatest severity, which would infallibly kill Europeans even in their own country.

falls to 65° Fahr,

places is below the level of the sea. inland, and the borders of the rivers to be alternately

the sun. All the coasts are covered by mangroves (the

The native women, on

The mean temperature of Lower Cochin China is 8a” Fahr. ‘The greatest heat in April and May within doors ig 97° Fahr. In the mornings of December the temperature The year is divided into the dry season, which corresponds to the N.E. monsoon, and the rainy season, which corresponds to the 8.W. monsoon. What renders the climate peculiarly injurious and enervating is that, besides the very slight difference between the tempera- tures of day and night, the hygrometric readings are always very high. ‘The surface of Cochin China, composed of recent alluvial deposits, is absolutely flat, and in some The slightness of the slope of this vast plain allows the tide to advance far

covered with water and exposed to the perpendicular rays of

marsh-tree of the tropics), which with their dull monotonous foliage everywhere betoken the unhealthiness of the soil. The finest species of tiger, the royal tiger, is to be met Animals with from the mountains which bound Tong-king on the north as far as the south of Lower Cochin China ; and a short time ago it was still to be found in the wooded hills close to Saigon. The other wild animals are the panther, the rhinoceros, the elephant—which the people of Anam have not learned to domesticate—the cocoa-nut bear, the stag, the wild boar, the wild ox, and monkeys of various kinds. The domestic animals are goats, horses, buffaloes (with which the Indo-Chinese carry on the difficult and unhealthy cultivation of the rice-fields), and pigs, which are kept in great numbers. ‘There are numerous birds of many species, which—as in all tropical regions—are remarkable for the beauty of their plumage. Among the rest may be men- tioned pea-fowl, pheasants, turtle-doves, the green pigeons of Pulo Condore, paroquets, hornbills, sultana fowls, and various species of wading birds and palmipeds. The rivers abound with life; and the fish, though of poor quality, form an important part of the food of the people. They are caught, along with frogs and snakes, even in the mud of the rice-fields. The crocodile is frequently met with, and adds another item to the native cuisine. This hot damp country swarms with reptiles, of which some species are very dangerous. Among these are the huge cobra di capello (aja), many species of adders, and the immense python, which is of much use in destroying during the

night all kinds of rats, including the intolerable musk-rat. i The forests furnish several kinds of timber for build- Vegdsilt ing. In the plains and valleys are numerous fruit-trees, protues | —the banana, the guava, the papaw, the medlar-tree, the : orange, the citron, and, most abundant of all, the cabbage- r palm and the cocoa-tree, and the cinnamon of which Tong-king furnishes a superior quality. The people of Anam are essentially agricultural. Besides rice, which is the | chief production of the country, the cultivated lands furnish . cotton, mulberry, sugar-cane, maize, betel-nut, and veget- } ables, especially potatoes, earth-nuts, and pepper. Tea is |

cultivated also, especially in Tong-king, but the people of Anam do not know how to prepare it.

To the traveller who pays only a brief visit the kingdom ee | of Anam appears ill provided with metals. Ifa mine be , discovered the natives forbid access to it, and still more fre

ual

cation,

COCHIN

quently, for fear of the authorities, are unwilling to give any information. ‘Two exeellent authors, Messrs T. Crawfurd and M‘Culloch have supported this false opinion in their works. More precise information has, however, been obtained, recent explorers of the country stating that Tong-king is very rich in metals, and furnishes especially soll, silver, brass, zinc, and iron. It is from Tong-king that the famous tain-tains, the manufacture of which is still a seeret to Europeans, are obtained. Cochin China, properly so-called, furnishes also gold, silver, brass, and marble ; and coal is found there in several places. Lower Cochin China, like all alluvial plains, is poor in minerals ; quarrics, however, of granite and of jet are worked.

There is little industrial activity in Anam, bunt in Tong-king the manufacture of articles inlaid with mother- of-pearl is carried on. From China Cochin China re- ecives & large quantity of manufactured goods, cotton and silk stuffs, porcelain, and tea. The importation from France is

also very considerable. The principal exports are tice (which forms of itself half the sum total), salt fish, provided principally by the fisheries at the mouth of the

chief rivers, salt, undyed cotton, pepper, and the skins of animals. ‘The great commercial importance of Cochin China arises from the excellence of its situation, as a way of communication with the rich and populous provinces of middle China. England has long been seeking to open a route for trade between the north-east of India, or Pegu, and the south-west of China, but up to the present time,

notwithstanding the courage and devotion of explorers,

these attempts have failed.

From 1866 to 1868 a French expedition, commanded by Captain Doudart de Lagrée, followed up the course of the Me-kong, and penetrated into middle China. This expedi- tion cost its chief his life, for he died in consequence of the fatigue which he underwent in Yun-nan. This examination of the Me-kong proved that this fine river is, as already noticed, unfit for regular navigation. Another route, however, by the Tong-king, may be opened up; and it is comparatively easy and habitually used by the natives. In 1872 Mr Dupuis, a French merchant, passed up the course of the Hong-kiang as far as Mang-Hao, a town of Yun-nan, Where the river ceases to be navigable. He came down the river again in 1873. He declares it to be navigable in every season, and has thns solved the problem which Captain Doudart de Lagrée sought to solve by means of the Me-kong. M. Dupuis’s expedition led the French authorities, at the solicitation of the Government of Hué, to despatch M. Francis Garnier to the Tong-king ; but the gallant explorer was assassinated by pirates in the

heighbourhood of Ha-noi.

he native of Anam is the worst built and the ugliest of all the Indo-Chinese who belong to the Mongolian race. 116 13 scarcely of middle height, and is shorter and less “igorous than his neighbours, His complexion is tawny, darker than that of the Chinese, but clearer than that of the Cambodian ; his skin is thick; his forehead low; his skull slightly depressed at the top, but

well developed at the Sides. His face is flat, with highly protruding cheek-bones,

and is lozenge-shaped or eurygnathous to a degree that is

nowhere exceeded. His nose is not only the flattest, but also the smallest among the Indo-Chinese ; his mouth is large, and his lips thick; his teeth are blackened and his gums destroyed by the constant use of the betel-nut, the) vey and lime, a custom which perhaps originated in ‘ygienic reasons. His neck is short, his shoulders slope greatly, his body is thick-set, large, all of one piece, as it were, and wanting in suppleness. THis pelvis is large, “ith a considerable separation of the upper part of the

el

femora, giving to his gait a curious swagger, which has, Rot without reason, been described as theatrical. This

odd swagger by itself suffices to distinguish the Anamcse from every other Indo-Chinese people without exception. Another pecuharity, which especially distinguishes this race from the other Indo-Chinese branches, is a greater separation of the big toe from the rest than is found in any of the other peoples that walk bare-footed. It is sufficiently general and well marked to serve as an ethnographic test ; and it indicates that the people of Anam are not descended—as some authors have asserted—from a mingling of indigenous savages with the Chinese, but have existed as a distinct race for a long time. According to Father Legrand de la Liraye (Votes historiques sur la nation Annamite, Saigon, 1865), this curions feature has served to distinguish the people of Anam since the year 2285 B.c., that is to say, 63 years after the Biblical deluge. This statement, taken as it is from the Chinese annals, shows that the Anamese could not have received this char-acteristic from their neighbours ; and it is a very curions fact that it has been transmitted to the present inhabitants despite the frequent intermarriages with other races which inust have taken place during this period of forty centuries. The inhabitants of Lower Cochin China are evidently

. weaker and sinaller than those of Tong-king, and this pro-

bably results from their dwelling in marshy rice-fields.

In the midst of the Anamese live Cambodians and immigrant Chinese, the latter, associated together-accord- ing to the districts they come from, carrying on nearly all the commerce of the country. In the forests on the frontiers of Cochin China dwell certain wretched savages called Mois, or Stiengs, of whom hittle is known; and alongside of these are the Chams, a Mahometan people which appear to be of Arab origi, and, in spite of a strong infusion of Chinese blood, preserve the warlike qualities of their ancestors, their love of fighting, their gay and open character, and their abstinence from theft. Their stature is tall, and they are characterized by the enormous projection of the soft parts of the abdomen. Their woincn, while mixing freely in society without veiling, have a high- spirited virtue which forms a contrast to the corruption that prevails around thein. Their language shows that they once knew the lion and the chamois; and while they are

now inferior in civilization, they preserve traces in their vocabulary of a higher condition. Among the different races which inhabit Indo-China mumnerovs mixtures take place. There are crosses of the Anamite with the Hindu, with the Malay, with the Cambodian, and with the Chinese. The last of these half brecds, who are called Min-huongs, are the most numerous and interesting.

Evidently derived from the Chinese, of which it appears to be a very ancient dialect, the Anamese language 1s com- posed of monosyllables, of slightly varied articulation, expressing absolutely different ideas according to the tone in which they are pronounced. It is quite impossible to connect with our musical system the utterance of the sounds of which the Chinese and Anaincse languages are composed. What is understood by a “tone” in this language is distinguished in reality, not by the number of sonorous vibrations which belong to it, but rather by a use of the vocal apparatus special to each. Thus, the scnse will to a native be completely changed according as the sound is the result of an aspiration or of a simple utterance of the voice. Thence tho difficulty of substituting our phonetic alphabet for the ideographic characters of the ‘hinese, as well as for the ideophonetic writing partly borrowed by the Anamese from the letters of the celestial empire. We owe to the Jesuit missionaries the introduc- tion of an ingenious though very coniplicated syatem, which has caused remarkable progress to be made in tl employ- ment of phonetic characters. By means of six accents,

one bar, and a crotchet, it is possible to note with sufficient

Language.

National character and customs.

Govern- ment.

Chief towns.

badly kept in repair and poorly equipped, was built in the course of last century according to plans furnished by European engineers. The provincial

capitals of Hai-dzuong (30,000 inhabitants), Bac-Ninh, Nam-Dinh, likewise possess important citadels ; and that of Minh-binh, also the chief town of a province, is the strongest of all Tong-king. Hué, or Fhu-tua-tien, capital of the kingdom of Anam, is composed of two portions—the inner town, a vast fortress built on the Vauban system according to the plans of French engineers, and occupied by the Government ; and the outer town, which is inhabited by the mass of the population, who are estimated at 100,000 souls. Mention may also be made of Tourane and Quin-nhon, or Binh-dhinh, important ports open to European commerce. Saigon, the capital of the French colony, is composed of three towns :—lst, an Asiatic town, inhabited by Anamese husbandmen, fishers, or servants, by mercantile Chinamen, by Malays, Tagals, and Hindus engaged jn various occupations; 2d, the town of the colonists ; and 3d, the Government town, inhabited by the Government employés, administrators, officers, and physicians. The houses are mainly built of prick. Two gardens, one belonging to the governor and the other the botanical, overlook the town. 'The latter is very interesting, containing as it does a fine collection of trees and plants, both indigenous and exotic, as well asa very curious menagerie, At the port of Saigon 387 vessels entered and 398 left in 1874, which forms about half of the whole maritime trade in the colony. Eight miles' from Saigon is the town of Cho-len (:.e., the great market), a Chinese town with an extensive commerce, and according to some writers 80,000, according to others 30,000 or 40,000 inhabitants. The other towns of the colony are Go-cong to the south-west of Saigon, where, in the midst of the rice fields, there lives an agricultural population, which presents in all its purity the true Anamese type; Mi-thé, a port on one of the arms of the Me-kong, and the second town of the colony ; the fort and the town of Vinh- long ; the fort and town of Chaudoc ; Ha-tien, on the Gulf of Siam, one of the most unhealthy places on the coast, inhabited by Chinese and Anamese; and at the Cape St Jacques, the military port and fort of Ba-ria.

precision the indications of tone without which the Anamese words have no sense for the natives. This system is universally adopted in French Cochin China, and the new generation, almost without exception, are able to read and write in Latin characters.

The Anamese are idle, incapable of deep emotion, and fond of ease. They show much outward respect for superiors and parents, but they take great delight in mocking and banter. They cherish great love of their native soil and native village, and cannot long remain far from home. On the whole they are mild, or rather apathetic, but the facility with which they learn is remark- able. Buddhism, mingled with coarse popular beliefs, 1s the dominant creed, but the learned hold the doctrine of Confucius, and in truth the people of Anam are but slightly religious. Nevertheless, like their neighbours, the Chinese and the Cambodians, they have a great respect for the dead, and their worship almost entirely consists of ceremonies in honour of their ancestors. Like the Chinese they dispose of the body by inhumation. Among the savage tribes of the interior there is scarcely any idea of a God, and the superstitious practices to which they are addicted can scarcely be considered as the expression of a definite religious idea. Christianity counts 400,000 adherents in Tong-king and 5000 in Lower China. ;

The system of government in the empire of Anam 1s pure and absolute monarchy without any other constitution than powerful custom. ‘The succession to the throne follows the order of primogeniture. Between the citizens there exists the most complete equality, since public offices are open to all, and there are no other social distinctions than those due to office or fortune. The sovereign, at once high priest and supreme judge, governs despotically with the assistance of six ministers. ‘The army, or rather the military list, for a large part of the force exists only on paper, 1s composed of 80 regiments, with 500 men in each. It is recruited from Cochin China ; Tong-king furnishes no soldiers. It is under the command of a commander-in-chief, a kind of constable of the kingdom, or grand marshal, who is personally responsible for the defence of the citadel of Hué. The marine, which has no ships, is composed of 30 regiments, under an admiral-in-chief, who is assisted by a vice-admiral and two rear-admirals, each of whom commands 10 regiments. The mandarins, as in China, form two distinct classes—the civil and the military. The first class are scholars who have passed literary examinations. The latter are chosen chiefly on account of physical fitness; and it is only in the highest ranks that well-educated respectable men are to be found. The people have a great regard for the learned, who have all received a higher moral education,—that of Confucius. The mandarins are divided into nine degrees, and each degree

comprises two classes. Besides the French colony, the empire of Anam is divided into 24 provinces placed each under the authority of a governor. The province is subdivided into departments, arrondissements, cantons, and communes, The French colony,administered by a governor assisted by a privy council, comprehends the six ancient provinces of the south. It is now divided into four provinces, bearing the names of their chief cities,—Saigon, Mi-thd, Vinh-long, and Bassac. The provinces form to- gether 19 inspectorships with an administrator of native affairs at the head of each.

The chief town and the ancient capital of Tong-king, Ha-noi, or Ke-cho (1.¢., the market), situated on one of the branches of the Song-Coi, though at prescnt greatly fallen, still contains at least 50,000 inhabitants. It possesses a very large citadel, which serves as the residence of the viceroy and of the special envoy or royal commissioner, who is the first authority in Tong-king. This citadel, at present

estimates. The data which appear most worthy of credit give a total sum of 10 or 12 millions. As to the French colony, the last official census of which the results have been published was made in 1873; it gives 1,487,200 inhabitants, of whom 49,500 were Chinese and 82,700 Cambodians. The Europeans numbered 1114, exclusive of the Government officials and the garrison.

of the south of China. “In the 2d or 3d century before Abraham,” says Pére Legrand de la Liraije, “ four barbarous tribes occupied the limits of the Chinese empire ; to the south was the tribe of the Giao-chi.” It is from this tribe that the Anamese claim to have descended ; and at the time when history begins to acquire some degree of certitude, about 2357 before our era, the Chinese annals mention the Anamese under the name of Giao-chi, which signifies “ with the big toe.” According to native scholars the history of this epoch is of a legendary character. It results from their labours that for twenty centuries the race of Giao-chi was governed in vassalage to the empire by a dynasty of Chinese origin, which lasted till 257 B.c. From that date till 110 before the Christian era the throne was held by two other vassal dynasties; and from 110 B.C. till 907 A.D. these dynasties were replaced by Chinese governors. In the beginning of the 10th century some of the native

chiefs, weary of the Chinese rule, revolted ; and their efforts were crowned with success. From 960 downwards,

Tt is difficult to state the exact number of the population Popul of the empire of Anam, and authors vary greatly in their tou

The Anamese, according to their own annals, are natives History.

under the government of native princes, the Anamese lived independent, and preserved rather the name than the reality of vassalage to the Chinese empire. Since that time the nation, with a most remarkable aptitude for expansion, has aggrandized itself at the expense of its neighbours, and has conquered from the Cambodians Tsiampa and the six pro- vinces of the south which now form the French colony. It is to be noted that the Cambodians, though endowed with physical force far superior to that of the Cochin Chinese, have been beaten by them in every encounter,

It is nearly a century since the first treaty of alliance was signed between France and the kingdom of Anam. By this treaty, dated the 28th November 1787, the king of Cochin-China ceded to France in full property the Penin- sula of Tourane and the Isle of Pulo-Condore. The agree- ment was only partially executed, but it was sufficient to render the influence of France predominant in Cochin China; and Christianity made rapid progress in Tong-king, At the death of the king Gia-long, in 1820, the party hostile to strangers prevailed ; and several attempts to pro- tect the French missionaries and establish the French influ- ence had failed, when in 1858, in consequence of the murder of M. Diaz,—who was put to death by order of the king, merely on account of the news that a French ship was cruising in sight of the coast,—a squadron was sent under the command of Admiral Rigault de Genouilly, who seized Tourane. Shortly after the admiral made explorations in the south, seeking a better situation for a settlement than Tourane, and passing up the River Don-nai, he took posses- sion of Saigon, the true capital of Lower Cochin China. On the 5th June 1862 the court of Hué accepted a treaty, by which it abandoned three provinces to France, and bound itself to pay an indemnity of war. After various expedi- tions occasioned by revolts, France occupied in 1867 the three other provinces of

Lower Cochin China, and after long negotiations a treaty was signed at Saigon, on the 15th March 1874, definitively abandoning the six provinces to France, This treaty opens besides to the commerce of all nations one port in eastern Cochin China and one port in Tong-king, and guarantees liberty of transit from the sea as far as Yun-nan,

Bibliography.—M. Barbié du Boeage, secretary of the Central Commission of the Geographical Society at Paris, published in 1867 a very complete bibliography of the books, periodicals, manuscripts, and plans relating to the history and geography of Anam, in a pamphlet of 105 pages, 8vo. In M. Vivien de Saint Martin's well- known work—Z' Année Géographique, Hachette and Cie—there is to be found a list well up to date of new works on Indo-China, among which we may mention—Fr. von Riehthofen, Sur les Pro- vinces Sud-ouest de la Chine; MacMahon (Colonel A. P.) Rowtes du Sud-ouest de la Chine; Edinburgh Review, April 1873; F. Vial, Les premieres années de la Cochinehine, 1874; Romanet du Cail- laux, La France au Tong King ; 'Aymonnier, Dictionnaire Srangais- eambodgien et Géographie du Cambodge, 1876; G. Coryton, "On the Routes between British Burmah and the West of China," in vol. x1x. of Journ. R. G. S., 1849; Papers read by Docteur Mondiéres and Docteur A. Morice before the Societé d'Anthropologie, in Jan. 1875; Dr Harmand, Apereu pathologique sur la Cochinehine ; Bigrel, Carte générale de la Cochinchine Srancaise, with an interesting note on the proper names. The following recent works have not been Mentioned in the Année Géographique .—Instructions nautiques publiées par Te Ministére de la Marine; Tableaux de Population, de Culture, de Commerce, et de Navigation, publiés par le Ministéerc

la Marine; Petit cours de Géographie de la Basse Cochinchine, by P. J. Bz Truong-vinh-ky, Saigon, 187 5; Cours dhistotre annamite & Vusage des écoles de la Basse Cochinehine, by Truong- vinh-ky ; Voyage @' Exploration en Indo-Chine pendant les années 1866, 1867, 1868, sous le Commandement de M. Doudart de Lagrée, publié sous la direction de M. Francis Garnier, 2 vols., Hachette,

B—a magnificent work. The following are of earlier date :— Piagyi di Tre Vescovi in 1669 ; Barrow, A Voyage to Cochin China ae years 1792 and 1793; Bissachtre, Etat actuel de Cochin- Chae 1812 ; Crawfurd's Embassy

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848-56, Paris, 1858; Veuillot, La Cochinchine ct la Tonquin,

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1859; Cortambert and De Rosny, Zableau de la Cochinehine ; Mouhot, Siam, Cambodia, and Lao, 1864. A Dietionnarium an- amitieum, lusitanum, et latinum was published at Rome in 1671 Pere Alex. de Rhode; and another, the combined work of Pigneaux and Tabard, appeared in 1838. An essay on the language and writing was published by Schott in 1855. (C. MA.)

COCHINEAL, a dye-stuff used for the production of scarlet, crimson, orange, and other tints, and for the pre- paration of lake and carmine. It consists of the females of Coccus cacti, an insect of the order Hemiptera, which feeds upon various species of the Cactacee, more especi- ally the nopal plant, Opuntia coccinellifera, a native of Mexico and Peru. 'he dye was introduced into Europe from Mexico, where it had been in use long before the entrance of the Spaniards in the year 1518, and where it formed one of the staple tributes to the Crown for certain districts, In 1523 Cortes received instructions from the Spanish court to procure it in as large quantities as possible. It appears not to have been kuown in Italy so late as the year 1548, though the art of dyeing then flourished there. Cornelius van Drebbel, at Alkmaar, first employed cochineal for the production of scarlet in 1650. Until about 1725 the belief was very prevalent that cochineal was the seed of a plant, but Dr Lister in 1672 conjectured it to be a kind of kermes, and in 1703 Leeu- wenhoeck ascertained its true nature by aid of the micro-

Scope. Since its introduction cochineal has supplanted kermes (Coccus ilicis) over the greater part of Europe.

The male of the cochineal insect is half the size of the female, and, unlike it, is devoid of nutritive apparatus ; it has long white wings, and a body of a deep red colour, terminated by two diverging sete. The female is apterous,

and has a dark-brown plano-convex body ; it is found in the proportion of 150 to 200 to one of the male insect. The dead body of the mother insect serves as a protection for the eggs until they are hatched. Cochineal is now furnished not only by Mexico and Peru, but also by Algiers and theS. of Spain. In Teneriffe it was success- fully cultivated in 1858, on the failure of the vines there through disease, but the diminished value of cochineal of late years has much affected its production in the Canaries. Cochineal is collected thrice in the seven months of the season. ‘The insects are carefully brushed from the branches of the cactus into bags, and are then killed by immersion in hot water, or by exposure to the sun, steam, or the heat of an oven—much of the variety of appear- ance in the commercial article being caused by the mode of treatment. The dried insect has the form of irregular, fluted, and concave grains, which weigh about yo of a grain, as many as 70,000 insects being estimated to weigh 1 it. Cochincal has a musty and bitterish taste, There are two principal varieties—silver cochineal, which has a greyish-red colour, and the furrows of the body covered with a white bloom or fine down, and black cochineal, which is of a dark reddish-brown, and destitute of bloom. Granilla is an inferior kind, gathered from uncultivated plants. The best crop is the first of the season, which consists of the unimpregnated females ; the later crops contain an admixture of young insects and skins, which contain proportionally little colouring matter.

Cochineal owes its tinctorial power to the presence of a substance termed cochinealin, or carminie acid, a com- pound of hydrogen, carbon, and oxygen, which may be prepared from the aqueous decoction of cochineal. The comparative value of different specimens of cochineal may be ascertained by a method based upon the bleaching action of ferricyanide of potassium upon a weak potash solution of the dye. The black variety of cochineal is sometimes sold for silver cochineal by shaking it with powdered talc, or heavy-spar; but these adulterations can be readily detectcd by means of a lens. The oe a cochineal was

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repealed in 1845. In 1869 the exports of cochineal from the Canaries reached 6,310,000 tb, value £842,921. Of this amount 4,232,600 ib, consisting of grana, granilla, and polro, were shipped to Great Britain, value £554,092. More than half of this quantity was supplied by the Island of - Grand Canary. In three months ending 31st March 1876 the imports were 10,094 ewts, value £112,534.

For a monograph of the Coccide, including the cochineal insect, see Signoret, Ann. Soc. Ent. France, 1868-74. For accounts of the

cochineal insect consult also—Theis, ibid., v. p. 1; Burmeister,

Handbuch der Entomologie; Vincent, ‘Ann. Sct. Nat., vol. viii., 1st

ser.; Westwood, Modern Classification of Insects, pp- 448, 449. For a description of the cultivation of cochineal in Java, see Veth’s Woordenboek van Nederlandsch Indig—Cochenille. See also ‘‘ Ob- servations on the Making of Cochineal in Jamaica,” in Phil. Zran., 1691, pp. 502-3; and Royle’s Essay on the Productive Resources of India, pp. 47-65, 1840.

COCKATOO (Cacatwide), a family of Scansorial Birds, distinguished from other Old World parrots by their greater size, by a crest of feathers on the head, which can be raised or depressed at will, and by their enormously developed bills. They inhabit the Indian Archipelago, New Guinea, and Australia, and are gregarious, frequenting woods and feeding on seeds, fruits, and the larvee of insects. Their note is generally harsh and unmusical, and although they are readily tamed when taken young, becoming familiar, and in some species showing remarkable intelligence, their powers of vocal imitation are exceedingly limited. Of the true cockatoos (Cacatua) the best known is the Crested Cockatoo (Cacatua galerita), of a pure white plumage with the exception of the crest, which is deep sulphur yellow, and of the ear and tail coverts, which are slightly tinged with yellow. The crest when erect stands 5 inches high. Those birds are found in Australia in flocks varying from 100 to 1000 in number, and do great damage to newly sown grain, for which reason they are mercilessly destroyed by farmers. They deposit their eggs—two in number, and of a pure white colour—in the hollows of decayed trees, or in the fissures of rocks, according to the nature of the locality in which they reside. This is the species usually kept in Europe as a

cage bird. Leadbetter's Cockatoo (Cacatua Leadbeateri), an inhabitant of South Australia, excels all others in the beauty of its plumage, which consists in great.part of white, tinged with rose colour, becoming a deep salmon colour under the wings, while the crest is bright crimson at the base, with a yellow spot in the centre and white at the tip. It is exceedingly shy and difficult of approach, and its note is more plaintive while less harsh than that of the preceding species. In the cockatoos belonging to the genus Calyptorhynchus the general plumage is black or dark brown, usually with a large spot or band of red or yellow on the tail, and in some species behind the ear also. The largest of these is known as the Funereal Cockatoo (Calyptorhynchus funereus), from the lugubrious note or call which it utters, resembling the two syllables Wy—la—, the native name of the species. It deposits its eggs in the hollows of the large gum trees of Australia, and feeds largely on the larvee of insects, in search of which it peels off the bark of trees, and when thus employed it may be approached closely. '' When one is shot, the remainder of the company," says Gould, "fly round for a short distance and perch on the neighbouring 'trees until the whole are brought down."

COCKATRICE, a fabulous monster, the existence of which was firmly believed in throughout ancient and mediseval times,—descriptions and figures of it appearing in the natural history works of such writers as Pliny and Aldrovandus, those of the latter published so late as the beginning of the 17th century. Produced from a cock's egg hatched by a serpent, it was believed to possess the

and animals dying poisoned by its look. It stood in awe, however, of the cock, the sound of whose crowing killed it, and consequently travellers were wont to take this bird with them in travelling over regions supposed to abound in cockatrices. 'The weasel alone among mammals was unaffected by the glance of its evil eye, and attacked it at all times successfully ; for when wounded by the monster's teeth it found a ready remedy in rue—the only plant which the cockatrice could not wither. This myth reminds one of the real contests between the weasel-like mungoos of India and the deadly

cobra, in which the latter is generally killed. The term “cockatrice” is employed on four occasions in the English translation of the Bible, in all of which it denotes nothing more than an exceedingly venomous reptile; it seems also to be synonymous with “ Basilisk,” the mythical king of serpents.

COCKBURN, Mrs Auison (1712-1794), justly cele- brated for having written one of the most exquisite of Scottish ballads, the “Flowers of the Forest,”1 was the daughter of a border laird, Robert Rutherfurd of Fairnalee, and was born in the heart of the Southern Highlands in the autumn of 1712. Her education was slight. She spent her youth in rambling and riding about the country- side, and in paying visits to an aged minister in the neigh- bourhood, of whose “heavenly affection” for her she wrote enthusiastically. in after years. She was a graceful dancer, spent two winter seasons in Edinburgh, and was one of the Edinburgh belles of her time. Different causes have been assigned for the composition of the “ Flowers of the Forest.” Mr Chambers states that it was written on the occasion of a great commercial disaster which ruined the fortunes of some Selkirkshire lairds. Her later bio- graphers, however, think it more probable that it was written on the departure to London of a certain John Aikman, between whom and Alison there appears to have been an early attachment. In 1731 Alison Rutherfurd was married to Patrick Cockburn of Ormiston, oue of a family of stanch Whigs and Presbyterians, and an advo- cate at the Scottish bar. After her marriage she knew all the intellectual and aristocratic celebrities of her day. In the memorable year 1745 she vented her Whiggism in a squib upon Prince Charlie, and narrowly escaped being taken by the Highland guard as she was driving through Edinburgh in the family coach of the Keiths of Ravelston, with the parody in her pocket. Mrs Cockburn was an indefatigable letter-writer and a composer of parodies, squibs, toasts, and “ character-sketches ”—then a favourite form of composi- tion—like other wits of her day ; but the “ Flowers of the Forest” is the only thing she wrote that possesses great lite- rary merit. She survived her husband forty-one years, living to the age of eighty-two, and to the last she main- tained her social popularity. At her house on Castle-bill, and afterwards in Crighton Street, she received many illus- trious friends, among whom were Mackenzie, Robertscn, Hume, Home, Monboddo, the Keiths of Ravelston, the Balcarres family, and Lady Anne Barnard, the

authoress of “Auld Robin Gray.” She was in Edinburgh when Dr Johnson visited that city, towed thither by the triumphant Boswell. She saw and commented upon Burns’s short, bright Edinburgh career. As a Rutherfurd she was a con- nection of Sir Walter Scott’s mother, and was her intimate ee

1 ‘There are two versions of this song,—the one by Mrs Cockburil the other by Miss Jean Elliot of Minto. Both were founded on the remains of an ancient Border ballad. Tt is believed by the descendants of her family that Mrs Cockburn composed her version—that beginning “‘T’ve seen the smiling of fortune beguiling”—before her marriage in 1731. Anyhow, it was composed many years before Jean Elliot’s

sister verses, beginning, ‘‘ I’ve heard them lilting at our ewe-milking. These were written in 1756, and printed soon afterwards. Mrs

: ee ; Cockburn’ : : most deadly powers, plants Withering at its touch, and men | Piers radaiee iy vee hae not published until 1765, when Jean

friend. Lockhart quotes an interesting letter written by Mrs Cockburn in 1777, describing the precocious conduct of little Walter Scott, then scarcely six years old, during a Jt was Mrs Cockburn

visit which she paid to his mother. also who wrote the character-sketch of Scott’s father, which,

when it was given as a toast, was so true as to be Scott himself spent pleasant evenings at Mrs Cockburn’s house when she was a very old lady and he a young advocate. Mrs Cockburn died in 1794, having survived her only child, Captain Adam

immediately recognized.

Cockburn, fourteen years.

COCKBURN, Sir Grorcx (1772-1853), admiral, was of Scottish extraction, and was born in London. He entered the navy in his ninth year. After

serving on the home station,and in the East Indies and the Mediterranean, he assisted, as. captain of the “Minerve,” at the blockade of Leghorn in 1796, and a year afterwards he fought in the battle of Cape St Vincent. In 1809, in command of the naval force on shore, he contributed greatly to the reduction of Martinique, and signed the capitulation by which that island was handed over to the English ; for his services on this occasion he received the thanks of the House of Commons. After service in the Scheldt and at the defence of Cadiz he was sent in 1811 on an unsuc- cessful mission for the reconciliation of Spain and her American colonies. He was made rear-admiral in 1812, and in 1813-14 he took a prominent part in the American war, especially at the battle of Bladensburg and the cap- ture of Washington. Early in 1815 he received the Order of the Bath, and in the autumn of the same year he carried out, in the “ Northumberland,” the sentence of deportation to St Helena which had been passed upon Bonaparte. In 1818 he received the Grand Cross of his Order, and was made a Lord of the Admiralty ; and the same year he was returned to parliament for Portsmouth. He was promoted to the rank of vice-admiral in 1819, and to that of admiral in 1837 ; he became senior naval lord in: 1841, and held office in that capacity till 1846. From 1827 he was a privy councillor. In 1851 he was made Admiral of the Fleet, and in 1852, a year-before his death, his brother’s baronetcy fell to him by inheritance. See O’Byrne, Naval Brography; James, Vaval History ; Gentleman’s Magazine for 1853.

COCKBURN, Henry Dunpas (1779-1854), known as Lord Cockburn, was born in Edinburgh, October 26, 1779. He was educated at the High School and at the university of Edinburgh; and he was a member of the famous Speculative Society, to which Scott, Brougham, and Jeffrey belonged. He entered the faculty of advocates in the year 1800, and attached himself, not to the party of his relatives, who could have afforded him most valuable patronage, but to the Whig or Liberal party, and that at a time when it held out few inducements to men ambitious of success in life. On the accession of Earl Grey’s ministry in 1830, he became Solicitor-General for Scotland, In 1834 he was raised to the bench, and on taking his seat as a judge in the Court of Session he adopted the title of Lord Cockburn. Cockburn’s forensic style was remarkable for its clearness, pathos, and simplicity 3 and his conversational powers were unrivalled among his contemporaries. The extent of his literary ability only became known after he had passed his

seventieth year, on the publication of his biography of Lord Jeffrey in 1852, and from the Memorials of his Time, which appeared posthumously in 1856. He died on the 26th of April 1854, at his mansion of Bonaly, near Edinburgh.

COCKER, Epwazp, the reputed author of the famous Arithmetick, the popularity of which has added a phrase to the list of English proverbialisms, was born about 1632, and died between 1671 and 1675. He was an engraver, and also taught writing and arithmetic, He is credited

with the authorship and execution of some fourteen sets of

copy slips, one of which, Daniel's Copy-Book, ingraven by Edward Cocker, Philomath, is preserved in the British Museum. Pepys, in his Diary, makes very favourable mention of Cocker, who appears to have displayed great skill in his art. Cocker's Arithmetick, the fifty-second edition of which appeared in 1748, and which has passed through some sixty editions in all, was not published during the lifetime of its reputed author, the first impression bear- ing date of 1678. The late Professor De Morgan in his Arithmetical Books (1847) adduces proofs, which may be held to be conclusive, that the work was a forgery of the editor and publisher, John Hawkins; and there appears to be no doubt that the Decimal Arithmetic (1684), and the English Dictionary (second edition, 1715), issued by Hawkins under Cocker's name, are forgeries also. De Morgan condemns the Arithmetich as a diffuse compilation from older and better works, and dates "a very great de- terioration in elementary works on arithmetic" from the appearance of the book, which owed its celebrity far more to persistent puffing than to its merits. He pertinently adds," This same Edward Cocker must have had great reputation, since a bad book under his name pushed out the good ones."

COCKERELL, Cuartes Roser (1788-1 863), architect, was born in London. After a severe preliminary training in his profession, he visited and studied the great architec- tural remains of Greece, Italy, and Asia Minor. At Aigina, Phigalia, and other places of interest, he conducted exca- vations on a large scale, enriching the British Museum with many fine fragments, and

adding several valuable monographs to the literature of archeology, the best of which is said to be that on the mausoleum of Halicarnassus, Elected in 1829 an associate of the Royal Academy, he became a member in 1836, and in 1839 he was appointed professor of architecture, his lectures in which capacity were so greatly esteemed as to be attended by all the students of the several arts professed within the school. On the death in 1837 of Soane, the distinguished architect of the Bank of England, Cockerell was appointed his suc- cessor, and successfully carried out the alterations that have been needed in that building. In addition to branch banks at Liverpool and Manchester he erected in 1840 the New Library at Cambridge, and in 1845 the university galleries at Oxford, the last one of the architect's least happy efforts, as well as the Sun and the Westminster Fire Offices in Bartholomew Lane and in the Strand 3 and Tite and he were joint architects of the London and Westminster Bank. On the death of Henry Lonsdale Elmes in 1847, Cockerell was selected to finish the St George's Hall, Liver- pool, a task which he executed with great success, Cocker- ell's best conceptions were those inspired by classic models ; his essays in the Gothic—the college at Lampeter, for instance, and the chapel at Harrow—are by no means so successful. Among his numerous publications, however, may be mentioned those On the Iconography of Wells Cathedral, and On the Sculptures of Lincoln and Exeter Cathedrals, which prove his thorough knowledge of Gothic art as well as of Greek. His Z'ribute to the Memory of Sur Christopher Wren (1838) is a collection of the whole of Wren's works drawn to the same scale.

COCKERMOUTH, a parliamentary borough and market- town of England, in the county of Cumberland, 25 miles by rail from Carlisle, at the confluence of the Derwent and the Cocker, both of which are crossed by bridges in the immediate vicinity. The town is irregularly built, but is clean and well paved. It has remains of an old castle, built soon after the Conquest, a town-hall, a free grammar school, and a house of correction; and its manufactures include linen and woollen goods, thread, hosiery, hats, and paper. In the neighbourhood are extensive coal mines, which give

employment to nearly 2000 workmen. In 1871 the town- ship had a population of 5115; the borough (which returns one member to parliament), with an area of 8467 acres, had 6936. Of the early occupation of the site of Cockermouth conclusive evidence is afforded by the relics discovered from time to time ; directly north of the town is a tumulus called Toot's Hill; and at Pap Castle, about half a mile to the north-west, are the remains of a Roman camp. The barony or honour of Cockermouth was held shortly after the Conquest by Waltheof, lord of Allerdale, and has since passed through a long series of possessors, including the Umfravilles, Multens, Lucies, Percies, and Nevilles,

down to the present Lord Leconfield. The town was,

captured in 1387 by the Scotch under Douglas; and in 1648 the castle, garrisoned for king Charles, was taken and dismantled by the Parliamentarians. Wordsworth the poet was born at Cockermouth in 1770 ; and Tickell, the friend of Addison, at the village of Bridekirk, about two miles to the north.

COCKLE (Cardium), a genus of Acephalous Mollusks belonging to the family Cardiade, and comprising about 200 species, nearly a third of which are said to occur In the Indian Ocean, while only a few, but these exceedingly abundant in individuals, and widely distributed, are found '1 northern and temperate latitudes. The shells of cockles are highly convex, and almost invariably show a ridge-and- furrow sculpture, the ridges or ribs being often spiny, and the valves locking closely together. The animal inhabiting the shell is provided with a large, fleshy, and highly elastic foot, by means of which it can rapidly bury 'tself in the soft muddy sand which it frequents, reappear- ing above the surface with equal facility. In performing those leaps, for which it is remarkable, "the long taper foot," says Gosse, "is thrust to its utmost, and feels about for some resisting surface, a stone for instance, which it no sooner feels than the hooked point is pressed stiffly against it, the whole foot, by muscular contraction, is made suddenly rigid, and the entire creature—mantle, siphons, foot, shell, and all—is jerked away in an uncouth manner." Many of the species are of considerable value as articles of food, especially the Common Cockle (Cardium edule), gregarious everywhere in the sandy bays and estuaries around the British

coast, from low-water mark to a few fathoms deep, and extending from Iceland to the Canaries, and as far east as the Caspian and Aral Seas, where it occurs in one of its varieties. ‘The shell of the cockle is liable to considerable variation, getting thinner and more elongated posteriorly in sheltered situations and in muddy ground, more convex and thicker when exposed to rougher conditions. ‘They vary also in size from 1 inch to 24 inches‘in breadth. ‘They occur in great abundance on several parts of the British coast, and in many places cockle-gathering gives employment to large numbers of people ; thus at Penclawdd in Glamorganshire, the women and children are regularly employed in gathering and preparing cockles, which they afterwards dispose of in the Swansea market. At Starcross they have “ cockle-gardens,” where those mollusks are reared, and these are said to possess a better flavour than the ordinary cockle. Some species or other of Cardium is used for food by the maritime populations of almost every country in the world, and the dietetic value of these mollusks appears to have been equally appreciated in prehistoric times, as the shell-mounds or kjékkenmoddings of many countries abundantly testify. As cockle shells contain about 90 per cent. of carbonate of lime, they are calcined and used instead of common lime where the latter cannot readily be obtained.

COCKROACH (Blattide), a family of Orthopterous Insects, distinguished by their flattened bodies, long thread-like antennz, and shining leathery integuments.

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Cockroaches are nocturnal ‘=n chinks and crevices about houses, retreats when the lights are extinguished, and moving about with extraordinary rapidity in search of food. They are voracious and omnivorous, devouring, or at least damaging, whatever comes in their way, for all the species emit a disagreeable odour, which they communicate to whatever article of food or clothing they may touch. Common Cockroach (Blatta orientalis) is not indigenous to Europe, but is believed to have been introduced from the Levant in the cargoes of trading vessels. the male are shorter than the body ; in the female they are rudimentary. The eggs, which are 16 in number, are deposited in a leathery capsule fixed by a gum-like sub- stance to the abdomen of the female, and thus carried about till the young are ready to

escape, when the capsule becomes softened by the emission of a fluid substance. The larvee are perfectly white at first, although in other respects not unlike their parents, but they are not mature ‘nsects until after the sixth casting of the skin. The American Cockroach (Blatta americana) is larger than the former, and is not uncommon in European seaports trading with America, being conveyed in cargoes of grain and other food produce. of the West Indies (Blatta gigantea), so called from the tapping noise it makes on wood, sufficient, when joined in by several individuals, slumbers of a household. It is about 2 inches long, with wings 3 inches noisome and injurious of insect pests. destroying cockroaches is, when the fire and lights are extinguished at night, to lay some treacle on a piece of wood afloat on a broad basin of water. temptation to the vermin too great to be resisted. The chinks and holes from which they issue should also be filled up with uuslaked lime, and some may be scattered on the ground.

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creatures, secreting themselves issuing from their

The

The wings in

The largest known species is the Drummer as usually happens, to break the in expanse, and forms one of the most

The best mode of

This proves a

COCLES, Horatius, a Roman hero, who, with Spurius

Lartius and Titus Herminius as sole companions, defended the Sublician bridge against Lars Porsena and the whole army of the Etruscans. the enemy the When it was almost ready to fall his comrades retreated, but Horatius waited till the work was complete, aud Rome was saved. Then, despite the arrows of the enemy, he swam in safety to the opposite shore.

While the three heroes kept back Romans cut down the bridge behind.

A statue was erected in his honour, and he received as much land as he could plough round in a single day. According to another story, Horatius was alone in his heroism, and gave his life for his country. ‘The former version is adopted by Lord Macaulay in his Lays of Ancient’ Rome.

COCOA, or more properly Cacao, is a valuable dietary substance yielded by the seeds of several small trees belonging to the genus T’heobroma, of the natural order Stereuliacee. The whole genus, which comprises nine or ten species, belongs to the tropical parts of the American . continent ; and although the cocoa of commerce is probably the produce of more than one species, by far the greatest and most valuable portion is obtained from the Theobroma Cacao of Linneus. The generic name is derived from Beds (god) and Bp&pa (food), and was bestowed by Linnzus as an indication of the high appreciation in which he held the beverage prepared from the seeds, which he considered to be a food fit for the gods.

The common cocoa tree is of low stature, seldom exceed- ing 16 or 18 feet in height, but it is taller in its native forests than it is in cultivated plantations. ‘The leaves are large, smooth, and glossy, elliptic-oblong and acuminate 10 form, growing principally at the ends of branches, but sometimes springing directly from the main trunk, ‘The flowers are small, and occur in numerous clusters on the

COCOA

niain branches and the trunk, a very marked peculiarity which gives the matured fruit the appearance of being artificially sttached to the tree. Generally only a single fruit is matured from each cluster of flowers. When ripe the fruit or ‘‘ pod” is elliptical-ovoid in form, from 7 to 10 inches in length, and from 3 to 44 inches in diameter. It has a hard, thick, leathery rind of a rich purplish yellow colour, externally rough and marked with ten very distinct longitudinal riks or elevations. The interior of the fruit has five cells, in each of which is a row of from 5 to 10 seeds embedded in a soft delicately pink acid pulp. Each fruit thus contains from 20 to 40 or more seeds, which constitute the raw cocoa or “cocoa beans” of commerce.

~ Branch of Cocoa Tree, with Fruit in section.

The tree appears to have been originally a native of Mexico ; but it can be cultivated in suitable situations within the 25th parallels of latitude. It, however, flourishes best Within the 15th parallels, at elevations ranging from near the sea-level up to about 2000 feet in height. It is now cultivated in Mexico, Honduras, Guatenfala, N icaragua, Brazil, Peru, Ecuador, New Granada, Venezuela, Guiana, and most of the West Indian Islands. Its cultivation has also been attempted in other tropical regions of the globe ; but the industry has hitherto not been developed on any considerable scale away from the American continent and the West Indian Islands,

For the successful cultivation of the cocoa tree a rich well-watered soil and a humid atmosphere, with freedom from cold winds and protection from violent storms, are necessary. As the young plants are extremely delicate and tender, they are reared in nursery grounds till they attain a height of from 15 to 18 inches, and after planting out they still require protection from the wind and sun, which 1s provided by growing “ provisions” (food-yielding plants), and the coral-bean tree, Lrythrina Corallodendron, among the young trees, The trees begin to bear in the fourth or fifth year, but they do not attain their full productive vigour till about their eighth year, and they ought to con- tinue prolific for from thirty to forty years thereafter. As the trees carry buds, flowers, and fruit in all stages at the Same time, ripe pods may be collected at any period of the year, but there are Periodical harvests dependent on the res ag of the weather for collecting the fruit and curing the seeds. In Venezuela, where the famous Caracas cocoa 18 grown, the gathering takes place in June and December,

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these being the crop of St John and the Christmas crop respectively. In gathering the workman is careful to cut down only fully ripened pods, which he adroitly accom- plishes with a long pole armed with two prongs or a knife at its extremity. The pods are left in heaps on the ground for about twenty-four hours; they are then cut open, and the seeds are taken out, and carried in baskets to the place where they undergo the operation of sweating

or curing, There the acid juice which accompanies the seeds is first drained off, after which they are placed in a sweating box, in which they are enclosed and allowed to ferment for some time, great care being taken to keep the temperature from rising too high. The fermenting process is, in some cases, effected by throwing the seeds into holes or trenches in the ground, and covering them with earth or clay. The seeds in this process, which is called claying, are occasionally stirred to keep the fermentation from proceeding too violently. The sweating isa process which requires the very greatest attention and experience, as on it to a great extent depend the flavour of the seeds and their fitness for preservation. The operation varies in duration according to the state of the weather, but a period of about two days yields the best results, Thereafter the seeds are exposed to the sun for drying, and those of a fine quality should then assume a warm reddish tint, which characterizes beans of a superior quality.

The cocoa tree was cultivated, and its produce held in the highest esteem, in Mexico and Peru previous to the discovery of the American continent by Columbus. Prescott, in his Conquest of Peru, says of the followers of Pizarro, that as they sailed along the Pacific coast they saw “hill-sides covered with the yellow maize and the potato, or checkered in the lower levels with blooming plantations of cacao.” The same writer, referring to the use of cocoa in Mexico, says of the Emperor Montezuma that “he was exceedingly fond of it, to judge from the quantity, no less than 50 jars or pitchers being prepared for his own daily consumption ; 2000 more were allowed for that of his household.” « Traffic,” he adds again, “was carried on partly by barter and partly by means of a regulated currency of different values, “This consisted of transparent quills of gold dust, of bits of tin cut in the form of a T, and bags of cacao containing a specified number of grains.”

A knowledge of this valuable article of food was first brought to Europe by Columbus, but some time elapsed ere its virtues were appreciated in the Old World. Spain was the first nation in which its use became common 3 and to this day cocoa is much more extensively consumed among the Spaniards than by any other European community. The earliest intimation of the introduction of cocoa into England is found in an announcement in the Public Advertiser of Tuesday, 16th June 1657, notifying that “In Bishopgate Street, in Queen’s Head Alley, at a Frenchman’s house, is an excellent West

India drink, called chocolate, to be sold, where you may have it ready. at any time, and also unmade, at reasonable rates." About the beginning of the 18th century chocolate had become an exceedingly fashionable beverage, and the cocoa tree was a favourite sign and name for places of public refreshment. Cocoa and chocolate are frequently mentioned: in contem porary literature, and among others Pope, in his Lape of the Lock, alludes to it; the negligent spirit, fixed like Ixion—

"In fumes of burning chocolate shall glow, And tremble at the sea that froths below."

The high price at which it was retailed kept chocolate among the luxuries of the wealthy ; and coffee, which had been introduced two or three years before chocolate, and tea, which came a year later, both soon far out-stripped their rival beverage in public estimation.

Raw cocoas are distinguished in commerce by the name of the localities of their growth ; and it is found that the produce of particular regions maintains, pretty constantly, a distinctive character and appearance. The most esteemed of all varieties is that obtained from Venezuela, known in commerce as Clardcas cocoa, next to which in value stand the red "nuts" of Trinidad. The finest qualities are in form and size not unlike thick round almonds ; they have a husk of a clear brick-red colour, and the cotyledons, which are of a deep chocolate brown, have a fine membrane permeating their entire substance, and dividing them into numerous irregular segments, into which the seeds are easily broken down. The kernels are astringent in taste, with a mild, not disagreeable flavour. In chemical composition, as well as in physical characteristics, they vary within certain limits; but the analysis by Payen may be taken as representing their average constitution. It is as follows :—

Fat (Cocoa Butter) .....:.sceeseeereeeetee os 52°00 Nitrogenous compounds …….....:+s11s000 20°00 TCL eycac cess socdwasusieiseeeaasuesssesrann=: 10°00 (GRIME .cnon cocopnence ansocodnoncesnadousocddo: 2°00 TheobroMine ……..eseeeecencenerennee eeeneees 2°00 Saline substances …..csceeee ceeneeeeeeeeeeees 4°00 TWF dp oanseepnnonsonnonencose

agebeonesocoosononcc: 10°00 WOCODRTCON siocic coedtcdieescersseceesres=sternser Fisgential of] .....csscssescecсseceesceseeeoenes traces 100°00

The constituent upon which the peculiar value of cocoa depends is the theobromine, an alkaloid substance which till recently was supposed to be distinct from, though closely allied to, the theine of tea and coffee. It is now, however, known that the alkaloid in these and in two or three other substances similarly used is identical, and their physiological value is consequently the same. The fat or cocua butter is a firm, solid, white substance at ordinary temperatures, having an agreeable taste and odour, and very remarkable for its freedom from any tendency to become rancid. It consists essentially of stearin with a little olein, and is used in surgical practice, and in France as a material for soap and pomade manufacture. The starch grains present in raw cocoa are small in size, and of a character so peculiar that there is no difficulty in distin- guishing them under the microscope from any other starch granules. As an article of food cocoa differs essentially from both tea and coffee. While only an infusion of these substances is used, leaving a large proportion of their total weight unconsumed, the entire substance of the cocoa seeds is prepared as an emulsion for drinking, and the whole is thus utilized within the system. While the contents of a cup of tea or coffee can thus only be regarded as stimulant in its effect, and almost entirely destitute of essential nutritive properties, a cup of prepared cocoa is really a most nourish- ing article of diet, as, in addition to the value of the theobromine it contains, it introduces into the system no inconsiderable proportion of valuable nitrogenous and oleaginous elements.

The manufacturing processes through which raw cocoa passes ‘have for their object the development of the aroma peculiar to the substance, and its preparation in a soluble palatable and digestible form. The first operation consists in roasting the seeds, whereby the empyreumatic aromatic substance is formed, and the starch particles are changed into dextrin, The roasting is accomplished in large revolving cylinders, after the completion of which the roasted seeds are taken to the crushing and winnowing machine. Here the seeds are reduced to the form of nibs, which are separated from the shells or husks by the action of a powerful fan blast. The

nibs are next subjected to a process of winnowing in small quantities in hand sieves,

by which the hard cocoa “germs” are sifted out, and |

mouldy or discoloured fragments are at the same time removed by hand. Nibs so prepared constitute the simplest and purest preparation in which manufactured cocoa is sold; but they require prolonged boiling to effect their complete disintegration. The nibs when ground to a fine meal can be cooked with much greater facility. Another form in which the pure seeds are prepared is in flaked cocoa, which consists of the nibs ground up into a rather coarse uniform paste. The grinding is effected in cylinder machines, having an outer fixed casing within which a drum revolves. The nibs are fed in by a hopper on the upper part of the apparatus, and are carried round its circumference by the revolution of the drum, and delivered as a thin uniform pasty mass, the heat developed by the friction within the cylinder being sufficient to liquefy the oil, which again sets on cooling of the paste, Of late years a preparation called extract of cocoa has come into extensive use. It is made by removing a certain proportion of the fat from the seeds, whereby the remaining substance can be ground to an impalpable powder, which yields a beverage much more palatable and agreeable to many stomachs then either entire nibs or the so-called soluble cocoas. The removal of the fat is effected by placing nibs, after they have been reduced by grinding to a fine smooth paste, in bags, and subjecting them to power- ful pressure in heated presses. The fat exudes slowly and quickly solidifies, and a solid compact cake is left in the press, which only requires to be broken up and finely powdered for use.

Most other preparations, whether sold as cocoa or cho- colate, are mixtures of various substances with ground nibs, the object of the mixture being to mask the presence of the cocoa fat, and to render the whole readily miscible with boiling water. The ordinary distinction between these soluble cocoas and chocolate is that the cocoa is usually sold in the form of a powder, the chocolate being made up in cakes, which require to be scraped down, boiled, and « milled ” or frothed before being ready for drinking. In making the soluble cocoa, which is sold under such names as homeopathic, Iceland

moss, pearl cocoa, é&c., the nibs are first ground up in a heated stone mill, and, while in a soft pasty condition, thoroughly mixed with certain.proportions of sugar and arrowroot, or other and inferior starches. The compound is afterwards ground to fine powder and sold under various names and at different prices, according to the quality of the cocoa and the nature and proportion of the ingredients which are combined with it. The finer chocolates are combinations of cocoa with sugar alone, flavoured with some aromatic substance, generally vanilla ; but into the composition of cheap qualities starchy substances enter. ‘The nibs for chocolate are brought to a fine pasty state in a heated will, and the sugar or sugar and starch with vanilla are then added and thoroughly in- corporated in the mill, The paste is next passed several times between heavy horizontal rollers to produce a thoroughly homogeneous mixture. It is lastly cast into moulds while still in a thin pasty state, and after cooling it forms hard solid cakes, and is ready to wrap up for the market. Chocolates for eating are prepared with large proportions of sugar and various flavouring substances, and the elegant preparations of these and of chocolate creams by Ménier of Paris and Fry and Sons of Bristol undoubtedly form most wholesome, palatable, and nutritious confections. To the last-named firm we have to express our obligation for information courteously placed at our disposal.

Preparations of cocoa are still much more largely con: sumed in Spain than in any other European country. Tn Great Britain the consumption, partuy simulated by the improvements effected in its manufacture, is steadily increas- ing, although as compared with the consumption of tea an

The following figures exhibit the ratio of increase of cocoa

coffee its employment is yet on a very restricted scale.

entered for home consumption since 1820 :—

1820 267,321 tb 1860 4,583,124 tb

1830 425,382 1870 6,948,102 1840 2,645,470 1874 8,863,646 1850 3,080,641 1875 9,973,926

In addition to these quantities of raw cocoa, a considerable quantity of prepared cocoa and chocolate is nuw imported from France. In 1820 the imports of manufactured cocoa

only amounted to 14 ib, but in 1874 :91,466 tb were im

ported. An import duty of 1d. per tb on raw and 2d. per

Tb on manufactured cocoa is levied in Great Britain,

COCOA-NUT PALM (Cocos nucifera), sometimes, and perhaps more correctly, called the coco-nut palm, is a very beautiful and lofty palm-tree, growing to a height of from 60 to 100 feet, with a cylindrical stem which attains a thickness of 2 feet. The tree terminates in a crown of graceful waving The leaf, which may attain to 20 feet in length, consists of a strong mid-rib, whence numerous long acute leaflets spring, giving the whole the appearance of a The flowers are arranged in branching spikes 5 or 6 feet long, enclosed ina tough spathe, and the fruits mature in bunches of from 10 to 20, The fruits

pinnate leaves,

gigantic feather.

when mature are oblong, and triangular in cross section,

measuring from 12 to 18 inches in length and 6 to 8 inches in diameter, The fruit consists of a thick external husk or rind of a fibrous structure, within which is the ordinary The nut has a very hard, woody shell, enclosing the nucleus or kernel, within which again

cocoa-nut of commerce.

is a milky liquid called cocoa-nut milk, The palm is so widely disseminated throughout tropical countries that it is impossible to distinguish its original habitat. It flourishes with equal vigour on the coast of the East Indies, through- out the tropical islands of the Pacific, and in the West Indies and tropical America. It, however, attains its greatest luxuriance and vigour on

the sea shore, and it is most at home in the innumerable small islands of the Pacific seas, of the vegetation of which it is eminently char- acteristic. Its wide distribution, and its existence in even the smallest coral islets of the Pacific, have been favoured by the peculiar triangular shape of the fruit, which drop- ping into the sea from trees growing on any shores would be carried by tides and currents to be cast up and to vegetate on distant coasts.

The cocoa-nut palm, being the most useful of its entire tribe to the natives of the regions in which it grows, and furnishing many valuable and important commercial pro- ducts, is the subject of careful cultivation in many countries. On the Malabar and Coromandel coasts of India the trees tow in vast numbers ; and in Ceylon, which is peculiarly Well suited for their cultivation, it is estimated that twenty millions of the trees flourish. The wealth of a native in Ceylon is estimated by his property in cocoa-nut trees, and Sir J. Emerson Tennent notes a law case in a district court in which the subject in dispute was a claim to the 2520th part of ten of the precious palms. The cultivation of cocoa- nut plantations in Ceylon is thus described by Sir J. E. Tennent, “The first operation in cocoa-nut planting is the formation of a nursery, for which purpose the ripe nuts are placed in Squares containing about 400 each; these are oe an inch deep with sand and sea-weed or soft mud rom the beach, and watered daily till they germinate.

€ nuts put down in April are sufficiently grown to be ee out before the rains of September, and they are

en set out in holes 3 feet deep and 20 to 30 feet apart. + «Jee efore putting in the young plant it is customary soft mud and sea-weed, and for the years they must be watered and protected from under shades made of the plaited

fronds of the cocoa-nut palm, or the fan-like leaves of the palmyra,” The palm begins to bear fruit from the fifth to the seventh year of its age, each stock carrying from 5 to 30 nuts, the tree maturing on an average 60 nuts yearly,

The uses to which the various parts of the cocoa-nut palm are applied in the regions of their growth are almost endless, The nuts supply no

inconsiderable proportion of the food of the natives, and the milky juice enclosed within them forms a pleasant and refreshing drink. The juice drawn from the unexpanded flower spathes forms “ toddy, ” which may be boiled down to sugar, or it is allowed to ferment and is distilled, when it yields a spirit which, in common with a like product from other sources, is known as “‘arrack.” The trunk yields a timber (known. in European commerce as porcupine wood) which is used for building, furniture, firewood, é&c.; the leaves are plaited into cajan fans and baskets, and used for thatching the roofs of houses ; the shell of the nut is employed as a water vessel ; and the external husk or rind yields the coir fibre, with which are fabricated ropes, cordage, brushes, &c. The cocoa-nut palm also furnishes very important. articles of external commerce, of which the principal is cocoa-nut oil. It is obtained by pressure or boiling from the kernels, which are first broken up into small pieces and dried in the sun, when they are known as copperah or copra. Itis estimated that 1000 full-sized nuts will yield upwards of 500 ib of copra, from which 25 gallons of oil should be obtained. The oil is a white solid substance at ordinary temperatures, with a peculiar, rather disagreeable odour, from the volatile fatty acids it contains, and a mild taste. Under pressure it separates into a liquid and a solid portion, the latter, cocoa-stearin, being extensively used in the manufacture of candles. Cocoa-nut oil is also used in the manufacture of marine soap, which forms a lather with sea water, Coir is also an important article of conimerce, being in large demand for the manufacture of coarse brushes, door mats, and woven coir matting for lobbies and passages. A considerable quantity of fresh nuts is imported, chiefly from the West Indies, and sold as a dainty among the poorer classes, or used in the preparation of a

kind of confectiou.

COCYTUS, a tributary of the Acheron, a river of Thesprotia, which flows into the Ionian Sea. Its modern name is the Vuvo. The name is also applied, in classical mythology, to a tributary of the Acheron, a river in Hades. The etymology suggested is from xwxveuv, to wail.

COD (Morrhua vulgaris), a well-known species of Gadide, a family of Anacanthine Fishes, possessing, in common with the other members of the

genus, three dorsal and two anal fins, and a single barbel at the chin. It is a widely distributed species, being found throughout the northern and temperate seas of Europe, Asia, and America, extending as far south as Gibraltar, but not entering the Mediter- ranean, and inhabits water from 25 to 50 fathoms deep, where it always feeds close to the bottom. It is exceed- ingly voracious, feeding on the smaller denizens of the ocean—fish, crustaceans, worms, and mollusks, and greedily taking almost any bait the fisherman chooses to employ. The cod spawns in February, and is exceedingly prolific, the roe of a single female having been known to contain upwards of eight millions of ova, and to form more than half the weight of the entire fish. Only a small proportion of these get fertilized, and still fewer ever emerge from the egg. The number of cod is still further reduced by the trade carried on in roe, large quantities of which are used in France as ground-bait in the sardine fishery, while it also forms an article of human food. The young are about an inch in length by the end of spring, but are not fit for the market till the second year, and it has been stated that

they do uot reach maturity, as shown by the power of reproduction, till the end of their third year. They usually measure about 3 feet in length, and weigh from 12 to 20 fb, but specimens have been taken from 50 to 70 tb in weight. As an article of food the cod-fish is in greatest perfection during the three months preceding Christmas. It is caught on all parts of the British and Irish coasts, but the Dogger Bank, and Rockall, off the Outer Hebrides, have been specially noted for their cod-fisheries. Until recently, the London market was in great part supplied from the former of these; but now the fishery is chiefly carried on along the coast of Norfolk and Suffolk, where great quantities of the fish are caught with hook and line, and conveyed to market alive +n “well-boats” specially built tor this traffic. Such boats have been in use since the beginning of the 18th century. The most important cod- fishery in the world is that which has been prosecuted for centuries on the Newfoundland banks, where it is not uncommon for a single fisherman to take over 500 of these fish in 10 or {1 hours. The fish have lately been decreas- ing in that well-worn locality, but that the yield is still enormous 1s seen from recently published returns, from which it appears that the quantity of cod obtained by the Canadian fishery alone in 1875 weighed

over 31,000 tons, while in 1874 it reached 34,500 tons. These, salted and dried, are exported to all parts of the world, and form, when taken in connection with the enormous quantity of fresh cod consumed, a valuable addition to the food resources of the human race. The swimming bladder of this fish furnishes isinglass, little, if at all, inferior to that obtained from the sturgeon, while from the liver is obtained cod-liver oil, now largely used in medicine as a remedy in scrofulous complaints and pulmonary consumption. ‘ The Norwegians,” says Cuvier, “give cod heads with marine plants to their cows for the purpose of producing a greater proportion of milk. The vertebre, the ribs, and the bones in general, are giver to their cattle by the Icelanders, and by the-Kamtchatdales to their dogs. These same parts, properly dried, are also employed as fuel in the desolate steppes of the Icy Sea.” At Port Logan in Wigtonshire cod-fish are kept in a large reservoir, scooped out of the solid rock by the action of the sea, egress from which is prevented by a barrier of stones, which does not prevent the ftee access of the water. These cod are fed chiefly on mussels, and when the keeper approaches to feed them they nay be seen rising to the surface in hundreds and eagerly seeking the edge. They have become comparatively tame and familiar. Frank Buckland, who some years ago visited the place, states that after a little while they allowed him to take hold of them, scratch them on the back, and play with them in various ways. Their flavour 1s considered superior to that of the cod taken in the open sea. COD-LIVER OIL is an oil of great medicinal value, obtained from the liver of the common cod (Morrhua vul- garis),and also to some extent from the ling (Lota molva), the whiting (Merlangus vulgaris), the pollack (Merlangus polla- chius), a8 well as other members of the Gadde. The oil ob- tained from the livers differs in quality from a very pure pale-coloured liquid to a dark evil-smelling product, accord- ing to the care exercised and the processes adopted for its extraction. The very dark coloured rank oils are used only for burning and lubricating, and in commerce are known as cod oil. The purer qualities, up to an oil having a brown sherry colour, are alone used medicinally as cod-liver ‘oil. Various methods of extracting the oil are adopted in the different countries where its preparation is prosecuted. Generally it may be stated that the medicinal oil is obtained from selected livers, which are carefully examined, cleaned, spilt up, and thrown together into a large vessel, From these a very small proportion of a pure and almost

tration of unpleasant medicines.

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colourless oil exudes spontaneously, heat of the sun causes a further exudation. application of heat in a steam or water bath to a tempera- ture not exceeding 180° Fahr., a proportion of still pale, or straw-coloured oil is obtained. The oil which results from the-application that obtained from unhealthy aud from putrid livers, are only used industrially as cod oil. oil is most extensively prosecuted in Newfoundland and in Norway ; but the Shetland Islands and along the east coast of Scotland.

and exposure to the By the

of a higher heat and pressure, and The extraction of the a considerable quantity is also prepared in

Three varieties of medicinal oil are recognized in com-

merce—pale, light brown, and brown; but these insensibly merge into each other, and are processes or periods of preparation, The pale oil possesses a taste, while with the darker oil there is a distinctly dis- agreeable empyreumatic odour and taste.

only the result of different as mentioned above. fishy odour and a slightly acrid

In composition

the oil contains olein and margarin, with small proportions of free butyric and acetic acids, a peculiar principle termed gaduin, certain bile acids, free phosphorus, phosphatic salts, and traces of iodine and bromine. ‘n medicine on account of its great nutrient properties ; it adds rapidly to the store of fat within the human frame, and it eariches the blood in red corpuscles. nore digestible than other animal oils, account for its superior therapeutic value. was supposed that its virtues resided in the iodine and bromine which the oil generally contains ; present only in exceedingly minute proportions, and some- times they cannot be traced at all. favourably known in medicine as a

remedy for rheumatic complaints, but its great value in pulmonary consumption has been demonstrated only in comparatively recent times. It is administered internally in chronic rheumatism, scrofula, phthisis, chronic skin diseases, and general debility; and it is sometimes externally applied in affections of the skin. The oil is taken with facility by young children ; but the repugnance of adults to its taste and eructations is not easily overcome, and many methods for masking its taste. in gelatinous capsules, or prepared in the form of aromatized emulsions, of equal parts of mucilage, of gum tragacanth, and the oil.

Cod-liver oil is valuable

It is much a fact which may At one time it

but these are

The oil has long been

have been suggested With that view the oil is enclosed

There are numerous other forms of emulsions recommended, as well as combinations with medicinal

syrups, and cod-liver oil creams, jellies, and bread; and

various devices are familiarly employed as in the adminis-

Failing all these, cod-liver

oil has been introduced into the system by injection. CODE. A code is a complete and systematic body of

law, or a complete and exclusive statement of some portion

of the law. Such, at least, is the sense in which the word is used when it is proposed to recast the laws of a country like England in the form of a code. Many collections of laws, however, which are commonly known as codes, would not correspond to this definition. The ‘Code of Justinian, the most celebrated of all, is not in itself a complete and exclusive system of law. It is

a collection of imperla constitutions, just as the Pandects are a collection of the opinions of jurisconsults. The Code and the Pandects together being, as Austin says, “digests of Roman law 1n force at the time of their conception,” would, if properly arranged, constitute a code, Codification in this sense merely a question of the form of the laws, and has nothing to do with their goodness or badness from an ethical or political point of view. Sometimes codification | only means the changing of unwritten into written law ; in the stricter sense it means the changing of unwritten ot badly written law into law well written.

Roman Codes.—Under the empire the constitutiones Oo

CODE

The praetice of collecting the constitutions of the emperors seems to have been begun by private lawycrs—such at all events is the character of the oldest collection, known as the Codex Gregorianus et Hermogenianus, which formed the model for the imperial codes of Theodosius and Justinian, The Theodosian code was the work of a commission of sixteen, to whom, in 435 a.p., the emperor intrusted the task of collecting the edicts and constitutions from the time It was finished in 438, and promulgated

edicta of the chief of the state had the force of law.

of Constantine. as the law of the empire.

In 528 the Emperor Justinian ordered a new collection to be made, and appointed a commission of ten for that purpose, including the celebrated Tribonian. The com- missioners were to compile one code out of the “ three codes—- Gregorian, Hermogenian, and Theodosian,” and the constitutions which had been ordained since the last of these was confirmed. The commissioners had full power to make such changes as might be necessary in the language of the constitutions, and to omit all that was The collection was to include rescripts as well as constitutions, and was to did) the sources The code was finished

unnecessary, oksolete, or inconsistent.

supersede (as the Theodosian code also from which it had been compiled. within fourteen months, but a revised edition was rendered necessary by some new decisions and constitutions of the

emperor. Jn 534 the new code was published and the first

edition superseded. The second is the Code we now possess ; the first has been lost, books, and each book into titles, under which the constitu- tions are arranged in chronological order, and with the names of the emperors by whom they were enacted. There is @ general correspondence between the order of the Digest and the Code of Justinian, but neither the Digest hor any of the codes pretended to scientific classification, The arrangement was dictated by the order of writers on the Praetorian Edict,

The same causes which made these collections necessary in the time of Justinian have led to similar undertakings among modern peoples. ‘The actual condition of laws until the period when they are consciously remodelled is one of confusion, contradiction, repetition, and disorder ; and to these evils the progress of society adds the burden of perpetually inereasing legislation. Some attempt must be made to simplify the task of learning the laws by improvi ng their expression and arrangement. This is by no means an easy task in any country, but in our own it is surrounded with peculiar difficulties, The independent character of English law has prevented us from attempting what has already been done for other systems which have the basis of the Roman law to fall back upon.

The most celebrated modern code is the Code Napoléon, The necessity of a code in France was mainly caused by the immense number of separate systems of jurisprudence existing in that country before 1789, justifying Voltaire’s sarcasm that a traveller in France had to change laws about as often as he changed horses. The conception of a general code for the whole country had occurred to jurists and statesmen before N apoleon, and the Convention, in fact, discussed two projects presented by Cambacérés, one of Which had been found too complicated and the other too condensed, Napoleon, on becoming consul, appointed a commussion headed by M. Tronchet to review previous efforts and present a’ new project. In four months the Project was presented to the Government, submitted to the Judges, and discussed by the Council of State—Napoleon himself taking

part in the deliberations. At first published under the title of Code Civil des Francais ; it was afterwards entitled the Code Napoléon,—the emperor wishing to attach

1S name to a work which he regarded as the greatest glory

The Code is divided into twelve

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of his reign. The Code N. apoléon consists of 228] articles, arranged under titles and divided into three books, preceded by a preliminary title. The subjects of the different books are—Ist, “Des personnes”; 2d, “ Des biens et des différents modifications de la propriété ;” 3d, “ Des différents manieéreg dacquérir Ja propriété.” The code, it has been said, is the product of Roman and customary law, together with the ordi. nances of the kings and the laws of the Revolution, In form it has passed through several changes caused by the politi- cal vicissitudes of the country, and it has of course suffered from time to time important alterations in substance, but it still remains virtually the same in principle as it left the hands of its framers. The code has produced a vast number of commentaries, among which may be named those of Duranton, Troplong, and Demolombe. The remainin French codes are the Code de procédure civile, the Code de commerce, the Code d’instruction criminelle, and the Code pénal. The merits of the French code have entered into the discussion on the general question of codification, Austin agrees with Savigny in condemning the ignorance and haste with which it was compiled. “It contains,” says Austin, “no definitions of technical terms (even the most leading), no exposition of the rationale of distinctions (even the most leading), no exposition of the broad principles and rules to which the narrower provisions expressed in the code are subordinate ; hence its fallacious brevity.” The French codes have, however, taken firm root in most of the countrics of continental Europe. Intro- duced by French conquest they nevertheless were eagerly adopted by the people after the French arms had withdrawn, The Penal Code, for example, was thus established in Italy, Sicily, Holland, Belgium, the Rhine Provinces, Poland, and Switzerland. The principles of the French code prevail in most of the Latin races,

The Prussian code (Code Frédéric) was published by Frederick the Great in 1751. It was intended to take the place of “Roman, common Saxon, and other foreign subsidiary laws and statutes,” the provincial laws remaining in force as before. One of the objects of the king was to destroy the power of the advocates, whom he hoped to render useless. The Italian civil code, published in 1866, on the establishment of Italian unity, is founded mainly on the French code. The object of all these codes was to frame a common system to take the place of several systems of law, rather than to restate in an exact and exhaustive form the whole laws of a nation, which is the problem of English codification. The French and Prussian codes, although they have been of great service in simplifying the law, have failed to prevent outside themselves that accumulation of judiciary and statute law which in England has been the chief motive for codification. A more exact parallel to the English problem may be found in the Code of the State of New York. The revised constitution of the State, as adopted in 1846, “ordered the appointment of two commissions, one to reduce into a written and a systematic code the whole body of the law of the State, and the other to revise, reform, simplify, and abridge the rules and practice, pleadings, &c., of the courts of record.” By an Act of 1837, the State Legislature declared that the body of substantive law should be contained in three codes —the Political, the Civil, and the Penal. The works of both commissions, completed in 1865, now fills six volumes, containing the Code of Civil Procedure (including the law of evidence), the Book of Forms, the Code of Criminal Procedure, the Political Code, the Penal Code, and the Civil Code. In the introduction to the Civil Code it is claimed that in many departments of the law the codes have “provided for every possible case, so that when a new case arises it is better that it should be provided for by new legislation.” The New York code a in the

important points of definition and arrangement. Much in- terest has attached to the Penal Code drawn up by Edward Livingston for the State of Louisiana, about 50 years ago. The system consists of a Code of Crime and Punishments, a Code of Procedure, a Code of Evidence, a Code of Re- form

and Prison Discipline, and a Book of Definitions. “Though the State for which the codes were prepared,” says Chief: Justice Chase, “neglected to avail itself of the labours assigned and solicited by itself, they have proved, together with their introductions, a treasure of suggestions to which many States are indebted for useful legislation.” A complete edition of Livingston’s works has recently been published by the National Prison Association of the United States.

Since the time of Bentham, the codification of the law of England has been the dream of our most enlightened jurists and statesmen. In the interval between Bentham and our own time there has been an immense advance in the scientific study of law, but it may be doubted whether the problem of codification is at all ncarer solution. Interest has mainly been directed of late to the historical side of legal science, to the phenomena of the evolution of laws as part of the development of society, and from this point of view the question of remodelling the law is one of minor intercst. ‘Co Bentham the problem presented itself in the simplest and most direct form possible. What he proposed to do was to set forth a body of laws, clearly expressed, arranged. in the order of their logical connection, exhibiting their own rationale, and excluding all other law. On the other hand the problem has in some respects become easier since the time of Bentham. With the Benthamite codifica- tion the conception of reform in the substantive law is more or less mixed up. If codification had been possible in his day, it would, unless it had been accompanied by the searching reforms: which have been effected since, and mainly through his influence, perhaps have been more of an evil than a good. ‘The mere dread that, under the guise of codification or improvement in form, some change in substance may secretly be effected has long been a practical obstacle in the way of legal reform. But the law has now been brought into a state of which it may be said that, if st is not the best in all respects that might be desired, it is at least in most respects as good as the conditions of legisla- tion will permit it to be. Codification, in fact, may now be treated purely as a question of form. What is proposed is that the law, being, as we assume, in substance what the nation wishes it to be, should be made as accessible as possible, and as intelligible as possible. ‘These two essential conditions of a sound system of law are, we need hardly say, far from being fulfilled in England. The law of the land is embodied in thousands of statutes and tens of

thousands of reports. It is expressed in language which has never been fixed by a controlling authority, and which has swaycd about with every change of time, place, and circumstance. It has no definitions, no rational distinctions, no connection of parts. Until the passing of the Judica- ture Act it was pervaded throughout its entire sphere by the flagrant antinomy of law and equity, and that Act has only ordered, not executed, its consolidation. No lawyer pretends to know more than a fragment of it. Few practical questions can be answered by a lawyer without a search into numberless Acts of Parliament and reported cases. ‘To laymen, of course, the whole law is a sealed book. As there are no authoritative general principles, it happens that the few legal maxims known to the public, being apprehended out of relation to their authorities, are as often likely to be wrong as to be right, It is hopeless to think of making it possible for every man to be his own lawyer, but we can at least try to make it possible for a lawyer to know the whole law. The earlier advocates of

induction. necessarily uncomprehensive, imperfect, uncertain, and

judiciary laws.

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codification founded their case mainly on the evils of judiciary law, 2.¢., the law contained in the reported decisions of the judges. legislation (Lectures, ed, 1869) contains an exhaustive criticism of the tenable objections to judiciary law. embedded in decisions on particular cases, from which it

Bentham’s is well known,

bitter antipathy to judicial Austin’s thirty-niuth lecture

All such law is

must be extracted by a tedious and difficult process of Being created for particular cases it Ge bulky, These are evils which are incident to the nature of Of late years the defective form of our exist- ing statute law has also given rise to loud complaints. Year

by year the mass of legislation grows larger, and as long as

the basis of a system is judiciary law, it is impossible that the new statutes can be completely integrated therewith, The prevailing mode of framing Acts of Parliament, and especially the practice of legislating by reference to previous Acts, likewise produce much uncertainty and disorder.

Whether any attempt will ever be made to supersede this vast and unarranged mass by a complete code seems very doubtful. Writers on codification have for the most part insisted that the work should be undertaken as a whole, and that the parts should have relation to some general scheme of the law which should be settled first. The practical difficulties in the way of an undertaking so stupendous as the codification uno coetu of the whole mass of the law hardly require to be stated. The probability is that attempts will be made from time to time to cast the leading portions of the law into the form of a code. Some years ago it was believed that the proper preliminary to code would be a digest of the law, and a commission was appointed in 1866, under which draughtsmen were seb to work to prepare specimen digests of three selected portions of law. The attempt was abandoned in 1872, the commissioners being of opinion that it could not be properly proceeded with in detail, and they recommended that a general digest should be undertaken.

Tn discussions on codification two difficulties are insisted on by its opponents, which have some practical interest-— (1) What is to be done in those cases for which the code has not provided ? and (2) How is new law to be incorpo- rated with the code? The objection that a code will hamper the opinions of the court, destroy the flexibility, and elasticity of the common law, &e., disappears when it is stated in the form of a proposition, that law codified will cover a smaller number of cases, or will be less easily adapted to new cases, than law uncodified. The Code Napoléon orders the judges, under a penalty, to give @ decision on all cases, whether contemplated or not by the code, and refer them generally to the following sources :—(1) Equité naturelle, loi naturelle ; (2) Roman law; (3) ancient customs ; (4) usages, examples, decisions, jurisprudence, (5) droit commun; (6) principes généraux, maximes, doctrine, science, The Prussian code, on the other hand, requires the judges to report new cases to the head of the

judicial department, and they are decided by the legislative commission, No provision was made in either case for incorporating the new law with the code, an omission which Austin justly considers fatal to the usefulness of codifica- tion. It is absurd to suppose that any code can remaid , long without requiring substantial arbitration. Cases will – arise when its meaning must be extended and modified by judges, and every year will produce its quota of new legislation by the state. The courts should be left to interpret a code as they now interpret statutes, and provision should be made for the continual revision of the code, so that the new law created by judges or directly by the state may from time to time be worked into the code. he process of gradual codification adopted in India has

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been recommended for imitation in England by those who have had some experience of its working. The first of the Indian codes was the Penal Code drawn up by Macaulay, It did not become law, however, till 1860. It has been highly praised, and its merit is the more remarkable as Macaulay had only a slight professional acquaintance with the law A code of Civil Procedure became law in 1759, and was followed by a code of Penal The substantial law was then under-

and presented to the Governor-general in 1837,

before he went to India.

Procedure in 1861. taken which published its first instalment in 1865, The use of illustrations is a peculiar feature of the Indian code. E, R.) CODOGNO, a town of Italy, in the province of Milan, and district of Lodi, with a station at the junction of the railway from Milan to Piacenza with that between Cremona and Pavia, about 20 miles from the last-named city. In the parish church is an Ascension of the Virgin, the best painting of Callista Piazza, an artist of the 16th century. Lhe town is chiefly important as the centre of a large trade in Parmesan cheese; and it also carries on the manufac- ture of silk. Population upwards of 11,000. CODRINGTON, Sir Epwarp (177 0-1851), admiral, belonged to an old Gloucestershire family.

He entered the navy in 1783. In 1794 he served as lieutenant on board Howe's flagship in the actions off Brest, and was sent home with despatches announcing the result. In 1805 he re- ceived the command of the "Orion," a seventy-four, in which he fought at Trafalgar, receiving a gold medal for his conduct in the action. In 1808 he was gazetted to the "Blake," another seventy-four, in command of which he shared in the Walcheren expedition, assisting in the forcing of the Scheldt in 1809. During the next three years he was on active service off the Spanish coast, In 1813 he sailed for North America, where he was made rear-admiral and captain of the fleet. Returning to England at the close of the war, he received a Knight Commandership of the Bath in 1815; and six years afterwards (1821) he was gazetted vice-admiral. In 1826 he was appointed to the command-in-chief of the Mediterranean squadron of eleven sail sent to restrain Ibrahim Pasha from operating against the Greeks, and sailed in the " Asia" for the Morea. Here he was joined by the French and Russian contingents, of five and eight sail respectively, under Admirals de Rigny and Heiden, who were put under his orders, A literal inter- pretation of instructions led to the battle of Navarino, in which the Turkish and Egyptian fleets, of 36 sail, with a cloud of gunboats, schooners, and craft of all sorts, were almost entirely destroyed. For his share in this action Codrington received a Grand Cross of the Bath; but the steps which led to it occasioned considerable dissatisfaction in England, and he was recalled in 1828. He was returned to Parliament for Devonport in 1832 in the Liberal interest, and was re-elected in 1835 and 1837. In the latter year he Was gazetted admiral. He accepted the Chiltern Hundreds in 1839, on his appointment as commander-in-chief at Portsmouth, and his three years' tenure of that office con- cluded his public life. He died in London, April 28,1851. A memoir of Codrington, by his daughter, Lady Bourchier, ap- peared in 1873,and an abridgment of the larger work in 1875. CODRUS, the hero of an early Athenian legend, was the last king of Athens, and belongs to the 11th century B.c. According to the story, it was prophesied that the Dorians would conquer Attica if they spared the life of the Attic king. Devoting himself to his country, Codrus, in disguise, provoked a quarrel with some Dorian soldiers, He fell, and the Dorians retreated homeward. To so noble a patriot no one Was thought worthy to succeed; and the

title of. king was thenceforth abolished, that of archon taking its place,

COEHORN, Menno, Baron van (1641-1704), “the Dutch Vauban,” was of Swedish extraction, and was born at Leeuwarden, in Friesland. He served in the campaign of 1667 against Turenne, and later distinguished him- self at the sieges of Maestricht (1673) and Graave (1674), and at the battles of Senef (1674), Cassel (1677), and St Denis (1678). The genius of Vauban had made a fine art of the attack and defence of fortified places, and Coe- horn, who had already invented the mortar, had imposed on himself the task of meeting and beating that fine engineer on his own ground. But William of Orange did not recognize the abilities of his young captain, and in despair of success Coehorn had determined to transfer his services to France. William, hearing of this, seized the person of the engineer, and by a mixture of force and persuasion obliged him to renounce his design, and to accept a coloneley in the Dutch service, with the com- mand of two of the Nassau-Friesland battalions. The peace secured by the Treaty of Nimeguen (167 8) gave Coehorn his first great opportunity. He repaired and perfected the defences of many strong places, aud he rushed into polemics with a rival engineer, a certain Paen, His critj- cism and rejoinder appeared at Leeuwarden in 1682 and 1683, and in 1685 he gave to the world, in Dutch, his first great work, The New System of Fortification (Leeu- warden, folio), two French editions of which appeared in 1706, while three others were issued from the Hague in 1711, 1714, and 1741 respectively. From 1688 to 1691 Coehorn’s genius and activity answered the innumerable demands that were made upon them. In 1692 Vauban himself laid siege to Namur, and Coehorn waited within the city. The town was reduced in a week; but the castle in its quintuple enceinte, manned by Coehorn and his own regiment, seemed impregnable. The Dutch chief, however, was severely wounded, and the castle capitulated, with the honours of war, eight days after the city. The campaign of 1695 brought his revenge. He reduced the city, on which Vauban in the meanwhile had expended all the resources of his art, and the castle fell a month afterwards. The Peace of Ryswick (1697) sent Coehorn back to his task of repairing and improving, He laid out the entrenchments round Zwoll and Groningen, and built the fortifications round N imeguen, Breda, Namur, and Bergen-op-Zoom. In 1701, however, the war of the Spanish succession broke out, and Coehorn went at once to the front. By the siege and capture in succession of Venloo, Stevensworth, Ruremond, and

Liége, he rendered the allies masters in a single campaign of the line of the Meuse from Holland to Huy. He followed up these exploits by the investment and reduction of Bonn (1703), and passing thence into Flanders, with Sparr, he forced the French lines in the Waes, between the sea and the left bank of the Scheldt. Returning to the centre of opera- tions on the Meuse, he besieged and took Huy in the same year, under the very eyes of Villeroi. Thence he went to the Hague to confer with Marlborough concerning the next campaign, and was there cut off by apoplexy, March 17, 1704. A monument to him was raised by his children at Wykel, and an historical eulogy of him was published at Frankfort in 1771. For a description and critical esti- mate of the engineering theories of Coehorn, see Marini, Biblioteca di Fortificazione (1810), and Bonomer, Zssai général de Fortification (1814).

CQZELENTERA, or, less correctly, C@LENTERATA, the name of a group of animals, including the classes Hydrozoa, Anthozoa, and Ctenophora. (The two last-mentioned classes are by Huxley and a few others placed in a single class, Actinozoa.) The reader will consult the articles on Actinozoa, Coraus, and: Hyprozoa, with that on the

ANIMAL Kinepom, for the more important details touching

the structure, classification, and affinities of ccelenterate animals,

According to Van Beneden, R. Leuckart, and some others, the Sponges also have their place among Ceelentera,— a view which has of late years received much support in consequence of the profounder study of the calcarious! sponges begun by Miklucho-Maclay and diligently followed up by Haeckel. There is much to be said in favour of regarding the sponges as an aberrant (and, at the same time, degraded) ccelenterate class, but, for the present, 1 will be well to treat them as a group apart.

It is usual to consider the Ccelentera (with or without the sponges) as a primary group, OF sub-kingdom, of animals ; and a high authority has stated that the institu- tion of this group has been the greatest improvement in the arrangement of the animal kingdom effected since the time of Cuvier.

But, should we so interpret the results of certain recent embryological inquiries as to throw the Ccelentera into one great division along with all the higher invertebrates, such a mode of treatment would reduce Coelentera to the rank of a province.

Name.—The word Ccelentera (or rather its German equivalent) first occurs on page 88 of Betrdge zur Kenntniss wirbelloser Thiere, von Frey und Leuckart, Braunschweig (Vieweg), 1847."

Here it should be mentioned that Burmeister (Zoonomische Briefe, Zweiter Theil, p. 27 9) has given the same name to a very different group of animals. He denotes by it the majority of the nematoid worms, placing in a separate sec-

tion(Amorphoceela) Gordius and its allies, whose alimentary'

canal is more or less atrophied. In this sense Cvelentera is nearly equivalent to Coelelminthes of Cuvier.

Colentera is derived from xofAos (hollow) and evrepov (intestine or viscus).

Definition.—Allowing for the difficulty of expressing modern scientific concepts by compounds formed from words in common use, the meaning of which needs to be somewhat stretched, this etymology guides us to the definition of the Ccelentera as animals having a conspicuous alimentary canal, which, with its prolongations, occupies the whole interior of the body,? and does the work of a vascular as well as of a digestive system. It is not true to add, however, that the Coelentera are invariably destitute of cavities comparable (morphologically) to the blood vessels, perivisceral spaces, and other serous passages of the higher animals. Such cavities, hitherto usually overlooked, undoubtedly exist in some cases, as appears from the inves- tigations of Metschnikoff,* Eilhard Schulze,® and others.

Tho wall of the body in the Ccelentera has the same fundamental composition as among the higher animals, and exhibits various degrees of differentiation. Inner and

a a Die Kalkschwimme, von Ernst Haeckel, Berlin (Reimer),

2 See further another work by Leuckart, Ueber die Morphologie und die Verwandtschaftsverhiltnisse der wirbellosen Thiere, ibid., 1848 ; and the valuable ‘‘ Bericht” contributed by the same writer to the Archiv fiir Naturgeschichte from that date to the present ; also his university programme, entitled—De Zoophytorum et historia et dignitate systematica, Lipsie, 1873.

3 The doubts suggested on this point by R. Leuckart (Bericht f. 1868-9, p. 188), in opposition to the views of Noschin, Semper, and Kowalewsky, may now at length be regarded as set at rest by the appearance of the last-named writer’s recent Afemoir on the Development of the Colentera. printed in the Russian language, but the reader may consult its figures, in conjunction with the excellent German abstract, by Hoyer, in the second vol. of the Jahresberichte of Hofmann and Schwalbe.

4 “ Studien iiber die Entwickelung der Medusen und Siphonophoren,” in Zeitschr. f. wiss. Zool., xxiv. Band, p. 73.

5 Uber den Bau von Syncoryne Sarsii, Leipzig (Engelmann), 1873.

6 Almost the only comprehensive details on this subject which we possess are contained in the Russian memoir by Kowalewsky, already referred to.

This indispensable work has unfortunately been |

outer layers of epithelial tissue, splinted by connective tissue (in close relation with which we usually find muscular fibres), are always developed.

Neither the absence of nervous tissues nor the presence

of those curious microscopic organs known as thread-cells can henceforth be enumerated among the characters common to and distiuctive of Ccelentera.

Though a nervous system remains to be discovered in many, it certainly exists in

some ; and in yet cther cases, where anatomical evidence is

wanting, its presence may reasonably be conjectured from

purely physiological data.

Most, if not all, Coelentera have thread-cells ; but these exist likewise in other organisms, notably in certain mollusks which were formerly supposed to derive them from the ccalenterate animals on which they preyed.

The plant-like aspect of many Ccelentera arises in two ways. In the simple (not compound) ccelenterates, such as most sea-anemones, the tentacles or prehensile ap- pendages are so arranged as to simulate, when not too closely inspected, the petals of ordinary flowers (particularly flowers with numerous narrow petals, e.g,, Mesembryanthe- mum) or the strap-shaped corollas of composite plants, like dahlias. In the compound species buds and branches are formed, marking changes in direction of growth ; and hence those wonderful phytoid aggregates which for so many centuries puzzled naturalists.

Affinities. —The nearest relations of Coelentera are undoubtedly the Echinoderms, whose remarkable vascular system is developed from one or more rudiments primarily formed as diverticula of the alimentary canal. The Coelentera exhibit, even more perfectly than the echino- derms, a radiated arrangement of their parts, and, to a lesser degree, have this primitive disposition controlled by a superinduced bilateral symmetry. On the other hand the affinities of ccelenterates to worms, save through the echinoderms, are very obscure.’

Of animals inferior to the Ccelentera in complexity of structure their nearest reputed allies are the Infusoria, We are not yet able, however, to demonstrate the cxistence of any relationship of this kind, in spite of all that has been urged in its favour by Claparéde, Greef, and other eminent anatomists. (a.ReF

COELLO, Atonso SancHez (1515-1590), painter, ac- cording to some authorities a native of Portugal, was born, according to others, at Benifacio, near the city of Valencia. He studied many years in Italy; and return- ing to Spain in 1541 he settled at Madrid, and worked on religious themes for most of the palaces and larger churches. He was a follower of Titian, and, like him, excelled in portraits and single figures, elaborating the tex- tures of his armours, draperics, and such accessories in a manner so masterly as strongly to influence Velasquez in his treatment of like objects. Many of his pictures were destroyed in the fires that consumed the Madrid and Prado palaces, but many good examples are yet extant, among which may be noted the portraits of the Infantes Carlos and Isabella, now in the Madrid gallery, and the St Sebastian painted in the church of San Gerénimo, also in Madrid. Coello left a daughter, Isabella Sanchez, who studied under him, and painted excellent portraits.

COEN, Jan Prererszoon (1587-1630), the founder of Batavia, was born at Hoorn, and was sent when a youth to Rome to be instructed in the principles of commerce. In 1607 he went to India, but returned some four years after- wards, and in 1612 was sent out a second time, with the

command of two ships. He acquitted himself so well of

7 On the mutual relations of these groups, consult the concluding part of an essay by A. Goette—‘‘ Vergleichende Entwickelungs- geschichte der Comatula mediterranea,” in Archiv fir M ikroskopiscie Anatomie, xii. Band. 1876.

his commission, and made himself so remarkable by the brilliance and success of his practice of commerce, that in 1613 he was named director-general of the Indian trade. In 1617 he was made president at Bantam ; and in 1619, having taken and destroyed Jacatra, he founded on its ruins the city of Batavia, which he forthwith proclaimed the capital of the Dutch East Indies. In 1622 Coen revisited Europe, but five years afterwards he returned to Java. In 1629 the Javanese emperor attempted to dislodge the interlopers, and laid siege to Batavia; but Cocn beat off all his attacks. He died the following year.

CINOBITES (from xowéds, common, and Bios, life), a religious order living in a convent, or in community,—in opposition to the auchorets or hermits who live in solitude, See Monasticism.

CGHUR, Jacques, founder of the trade between France and the Levant, was born at Bourges, near the close of the 14th century. His father, Pierre Coeur, was one of the richest peltry merchants of the flourishing city of Bourges ; and we hear first of Jacques in 1418, when he married Macée de Léodepart, danghter of an influential citizen, afterwards provost, a quondam valet of John of Berry. About 1429 he formed a commercial partnership with two brothers named Godard ; and in 1432 he is heard of at Damascus, buying and bartering, and transporting Levan- tine ware (gall-nuts, wools and silks, goats' hair, brocades and carpets) to the interior of France by way of Narbonne, In the same year he established himself at Montpellier, and there commenced those gigantic operations which have made him illustrious among financiers of alltime. Details are absolutely wanting; but it is certain that ina few years he placed his country in a position to contend not unsuc- cessfully with the great trading republics of Italy and Catalonia, and acquired such reputation as to be able, mere trader as he was, to render material assistance to the Order of Rhodes and to Venice herself,

In 1436 Coeur was summoned to Paris by Charles VII., and made master of- the mint that had been established in that city. The post was of vast importance, and the duties Were onerous in proportion. The country was deluged with the base monies of three reigns, charged with super- scriptions both French and English ; and Charles had de- termined on a sweeping reform. In this design he was ably seconded by the great merchant, who, in fact, inspired or prepared all the ordinances concerning the coinage of Prance issued between 1435 and 1451, In 1438 he was made steward of the royal expenditure ; and in 1440 he and his family were ennobled by letters patent. In 1444 he was sent as one of the royal commissioners to preside over the new parliament of Languedoc—a dignity he bore through successive years till the day of his disgrace, In 1445 his agents in the East negotiated a treaty between the Sultan of Egypt and the Knights of Rhodes 3 and in 1447, at his instance, Jean de Village, his nephew by mar- Mage, was charged with a mission to Egypt. The results of this communication were most important ; concessions were obtained which greatly improved

the position of the French consuls in the Levant, and that influence in the East was thereby founded which, though often interrupted, was for several centuries a chief commercial glory of France. In the same year Coeur assisted in an embassy to the counts of Savoy ; and in 1448 he represented the French king at the court of Nicholas V., who treated him with utmost distinction, lodged him in the Papal palace, and gave him a. special licence to traffic with the Infidels. From about this time he made large advances to Charles for carry- 18 On his wars; and in 1449, aftcr fighting at the ae side through the campaign, he entered Rouen in his

At this moment the great trader's glory was at its height,

He had represented France in three embassies, and had su p- plied the sinews of that war which had ousted the English from Normandy. He was invested with various offices of dignity, and possessed the most colossal fortune that had ever been amassed by a private Frenchman, The sea was covered with his ships ; he had 300 factors in his employ, aud houses of business in all chief cities of France. He had built hotels and chapels and had founded colleges in Paris, at Montpellier, at Bourges. Dealing in all things — money and arms, peltry and jewels, brocades and woollens— broking, banking, farming, he had absorbed the trade of the country, and merchants complained they could make no gains on account of "that Jacquet." Soon, however, he was a broken man and a fugitive. Charles was sur- rounded with the enemies of the merchant 3 he was "un- stable as water," and he was always needy. Jacques Coeur had to go the way of others who had been the fricuds and favourites of the king.

In February 1449 Agnes Sorel, the mistress of Charles, died of puerperal fever. It was maintained, however, that the Dauphin Louis had procured her death ; and some con- siderable time after her death, Jacques Coeur, who had been named one of her executors, was accused formally of having poisoned her. There was not even a pretext for such a charge, but for these and other alleged crimes, the king, on the 31st July 1451, gave orders for the arrest of Jacques Coour and for the seizure of his goods, reserving to himself a large sum for the war in Guienne. Commissioners extraordinary, the merchant's declared enemies, were chosen to conduct the trial, and an inquiry commenced, the judges in which were either the prisoner's debtors

or the holders of his forfeited estates. He was accused of having paid French gold and ingots to the Infidels, of coining light money, of kidnapping oarsmen for his galleys, of sending back a Christian slave who had taken sanctuary on board one of his ships, and of committing frauds and exactions in Languedoc to the king's prejudice. He defended himself with all the energy of his nature. His innocence was manifest; but a conviction was neces- sary, and in spite of strenuous efforts on the part of his friends, after twenty-two months of confinement in five prisons, he was condemned to do public penance for his fault, to pay the king a sum equal to about £1,000,000 of modern money, and to remain a prisoner till full satis- faction had been obtained; his sentence also embraced confiscation of all his property, and exile during royal pleasure. On June 5, 1453, the sentence took effect 3 at Poitou the shameful form of making honourable amends was gone through ; and for nearly three years nothing is known of him. It is probable that he remained in prison ; it is certain that his vast possessions were distributed among the intimates of Charles.

In 1455 Jacques Coeur, wherever confined, contrived to escape into Provence. He was pursued ; but a party headed by Jean de Village and two of his old factors, carried him off to Tarascon, whence, by way of Marseilles, Nice, and Pisa, he managed to reach Rome. He was honourably and joyfully received by Nicholas V., who was fitting out an expedition against the Turks. On the death of Nicholas, Calixtus III. continued his work, and named his guest captain of a fleet of sixteen galleys sent to the relief of Rhodes and the Archipelago. He set out on this expedition, but was taken ill at Chios, and died there, November 25, 1456. He was buried on the island, but his place of sepulchre is not known. 'The stain was not removed from his honour till the reign of Louis XI., when, at the instance of Geoffroy Cour, the grcat mer- chant's name was finally rehabilitated.

Sce the admirable monograph of Pierre Clément—Jacques Caur et Charles Scpt, 1858 ; Michelet and Martin's histories; Vallct de

Liberian coffee plant, (C. liberica, which has been brought forward as a rival to the ordinarily cultivated species, is described as a large leaved and large-fruited plant of a robust and hardy constitution. The seeds yield a

highly aromatic and fine-flavoured coffee ; and so prolific is the plant, that a single tree is said to have yielded the enormous quan- tity of 16 tb weight at one gathering. It is a tree, moreover, which grows at low altitudes, and it probably would flourish in many situations which have been proved to be unsuitable for the Arabian coffee. Should it come up to the sanguine expectations of Ceylon planters and others to whom it has been submitted, there is no doubt that it will prove a formidable rival to the species which has hitherto received the exclusive attention of planters. It grows wild in great abundance along the whole of the Guinea coast.

The early history of coffee as an economic product is involved in considerable obscurity, the absence of historical fact being compensated for by an unusual profusion of conjectural statements and by purely mythical stories. According to a statement contained in a manuscript belonging to the Bibliotheque Nationale in Paris, the use of coffee was known at a period so remote as 875 A.D., or exactly 1000 years ago. Ina treatise published in 1566 by an Arab sheikh it ig stated that a knowledge of coffee was first brought from Abyssinia into Arabia about the beginning of the 15th century by a learned and pious Sheikh Djemal-eddin-Ebn-Abou-Alfagger. According to the treatise alluded to the use of coffee as a beverage was prevalent among the Abyssinians from the most remote

Vireville, Charles Sept et son Epoque, 3 vols, 1862-1865; Bonamy, Mémoires sur lcs Dernidres années de la vie de Jacques Ceur; Trouivé, Jacques Coeur, 1840; Louis Raynal, Histoire du Berry, vol. iii. ; Louisa Costello, Jacques Ceur, the French Argonaut, London,

1847.

COFFEE (French, Café ; German, Kaffee). This im- portant and valuable article of food is the produce chiefly of Coffeaarabica,a Rubiaceous plant indigenous to Abyssinia, which, however, as cultivated originally, spread outwards from the southern parts of Arabia. The name is probably derived from the Arabic K’hawah, although by some it has been traced to Caffa, a province in Abyssinia, in which the tree grows wild. In the genus Coffea, to which the common coffee tree belongs, from 50 to 60 species were formerly enumerated, scattered throughout the tropical parts of both hemispheres ; but by referring the American plants to a different genus, the

list is now restricted to about 22 species. Of these 7 belong geographically to Asia; and of the 15 African species 11 are found on the west coast, 2 in Central and East Africa, and 2 are natives of Mauritius. Besides being found wild in Abyssinia, the common coffce plant appears to be widely disseminated in Africa, having been seen on the shores of the Victoria Nyanza and in Angola on the west coast. Within the last year or two considerable attention has been devoted to a West African species, CO. liberica, belonging to the Liberian coast, with a view to its extensive introduction and cultivation. Its produce, obtained from native plants, have been several years in the English market.

The common coffee shrub or tree is an evergreen plant, which under natural conditions grows to a height of from 18 to 20 feet, with oblong-ovate, acuminate, smooth, and period, and in Arabia the beverage when first introduced shining leaves, measuring about 6 inches in length by 24 | only supplanted a preparation from the leaves of the cat, wide. Its flowers, which are produced in dense clusters in | Celastrus edulis. Its peculiar property of dissipating the axils of the leaves, have a five-toothed calyx, a tubular | drowsiness and preventing sleep was taken advantage of five-parted corolla, five stamens, and a single bifid style. | in connection with the prolonged religious services of the The flowers are pure white in colour, with a rich fragrant | Mahometans, and its use as a devotional antisoporific stirred odour, and the plants in blossom have a lovely and | up a fierce opposition on the part of the strictly orthodox attractive appearance, but the bloom is very evanescent. | and conservative section of the priests. Coffee was by The fruit isa fleshy berry, * them held to be an intoxicant beverage, and therefore having the appearance and prohibited by the Koran ; and the dreadful penalties of an size of a. small cherry, and outraged sacred law were held over the heads of all who as it ripens it assumes a became addicted to its use. Notwithstanding the threats dark red colour. Each of divine retribution, and though all manner of devices were fruit contains two seeds adopted to check its growth, the coffee-drinking habit embedded in a yellowish spread rapidly among the Arabian Mahometans, and the pulp, and the seeds are en- growth of coffee as well as its use as a national beverage closed in a thin membran- became as inseparably associated with Arabia as tea is with ous endocarp (the parch- China. For about two centuries the entire supply of the ment). The seeds which world, which,

however, Was then limited, was obtained constitute the raw coffee from the province of Yemen in South Arabia, where the of commerce are plano-celebrated Mocha or Mokha is still cultivated. convex in form, the flat The knowledge of and taste for coffee spread but slowly surfaces which are laid outwards from Arabia Felix, and it was not till the middle against each other within of the 16th century that coffee-houses were established in the berry having a longi- Constantinople. Here also the new habit excited consider- tudinal furrow or groove. able commotion among the ecclesiastical public. The They are of a soft, semi popularity of the coffee-houses had a depressing influence translucent, bluish — or on the attendance at the mosques, and on that account 4 greenish colour, hard and fierce hostility was excited among the religious orders against tough in texture. The the new beverage. They laid their grievances before the regions found to be best sultan, who imposed a heavy tax upon the coffee-houses, adapted for the cultiva- notwithstanding which they flourished and extended, After tion of coffee are well- the lapse of another hundred years coffee reached Great watered mountain slopes Britain, a coffee-house having been opened in 1652 in at an elevation ranging London by a Greek, Pasqua Rossie. Rossie came from from 1000 to 4000 feet Smyrna with Mr D. Edwards, a Turkey merchant, and in above sea-level, in latitudes P16 1. —Branch of Coffea arabica. | the capacity of servant he prepared coffee daily for Mr lying between 15° N. and 15° S., although it is successfully | Edwards and his visitors. So popular did the new drink cultivated from 25° N. to 30° S. of the equator ‘n situations | become with Mr Edwards’s friends that their visits whiere the temperature does not fall beneath 55° Fahr. The | occasioned him great inconvenience to obviate which be

directed Rossie to establish a public coffee-house, which he accordingly did. ‘The original establishment was in St Michael’s Alley, Cornhill, over the door of which Rossie erected a sign with his portrait, subsequently announcing himself to be “the first who made and publicly sold coffee drink in England.” It is remarkable that the introduction of coffee into England encountered the same hostility that it was fated to meet in other couutries, Charles IT., in 1675, attempted to suppress coffee-houses by a royal proclamation, in which it was stated that they were the resort of disaffected

persons “who devised and spread abroad divers false, malicious, and scandalous reports, to the defamation of His Majesty’s Government, and to the disturbance of the peace and quiet of the nation.” On the opinion of legal oflicials being taken as to the legality of this step, an oracular deliverance was given to the effect “that the retailing of coffee might be an innocent trade, but as it was used to nourish sedition, spread lies, and scandalize great men, it might also be a common nuisance,”’ In England as well as in other countries the most effective check on the consumption of coffee was found to be a heavy tax, which, while restricting honest trade, opened a channel for extensive smuggling operations. Coffee is spoken of as being in use in France between 1640 and 1660, and thereafter it may be said that the use of coffee was an established custom in Europe. It is noteworthy that the three principal dietetic beverages of the world were introduced into Great Britain within a few years of each other. Cocoa was the first of the three which actually appeared in Europe, having been brought to Spain from South America; coffee followed, coming from Arabia by way of Constantinople; and tea, the latest of the Series, came from China by the hands of the Dutch.

Down to 1690 the only source of coffee supply was Arabia, but in that year Governor-General Van Hoorne of the Dutch East Indies received a few coffee seeds by traders who plied between the Arabian Gulf and Java, These seeds he planted in a garden at Batavia, where they grew and flourished so abundantly that the culture, on an extended scale, was immediately commenced in Java. One of the first plants grown in that island was sent to Holland as @ present to the governor of the Dutch East India Company. It was planted in the Botanic Garden at Amsterdam, and young plants grown from its seeds were sent to Surinam, where the cultivation was established in

Réunion, Mauritius, and Southern Arabia, and on the west coast of Africa. The present total annual production of the world has been estimated to amount to not less than 1,000,000,000 ib. At the beginning of the 18th century, while Arabia was still the only source of supply, probably not more than 7,500,000 Ib was yearly exported from that country; the consumption of Europe in 1820 was stated by A. Von Humboldt at about 140,000,000tb, while 300,000,000 Ib probably represented the quantity used throughout the

world. The yearly consumption in Great Britain has for about 30 years been drooping in the face of a rapidly increasing population and consuming capacity, while the quantity absorbed by other countries has increased with extraordinary rapidity. The whole amount entered for home consumption in 1790 was 973,110 ib ; and an increase in the duty charged caused the consumption to drop in 1796 to 396,953 ib.

The different estimation in which coffee is held in various countries is well brought out in the following estimate of the consumption per head calculated from the official returns fon 1873 “=—

Total imports of Coffee Average

1718. Ten years later the plant was introduced in the Plico Geldepeatas ant West Indian Islands, and gradually the culture extended AMMAN... cadis..ccobeee…. 49,771,000 13°48 throughout the New World, till now the progeny of the Switzerland ……. 18,779,500 7°03 single plant sent from Java to Holland produces more Eee European ……. aecaecae aaa coffee than is grown by all the other plants in the world. 2 Ga Sita) alia ites 9-80 The cultivation is now general throughout all civilized Tie 26,035,652 13°89 regions of the tropical world, In point of quantity Brazil Dol eee 72,395,800 21°60 heads the lst of coffee-growing countries, its annual produce Hamburg (Germany) ..... 178,715,936 , Pa DY exceeding that of all other localities combined. | Avsttia (1871) «ect ee hr: It is calculated that no less than 530,000,000 coffee trees Italy (1871) esses, 28,511°560 1-00 are at present flourishing throughout that empire. During United Kingdom ……. 32,330,928 1°00 the Brazilian financial year ending 1872, more than United States cccscccsacce 2938, 298, 833 7°61

The commercial distinctions as established in the British market relate— first, to qualities, as “fine,” “middling, ” “ordinary,” “low,” and “ triage, ” the last being broken and damaged seeds; and secondly, to localities of produc- tion,

Shape, size, and colour of seeds are the principal elements which determine the commercial value of coffee. Shape, according to Mr W. P. Hiern (in a communication to the Linnean Society, April 20, 1876), is related to the particu- lar part of the plant upon which the seed grows ; size and

succulence correspond with the nature of the locality of growth ; and colour has reference to the degree of maturity attained by the fruit at the time of gathering. The highly

“00,000,000 bh of Brazilian coffee annually. The other Principal American localities for cofice-growing are Costa

their produce, are Java and Ceylon. The annual produce of Java reaches to about 130,000,000 lb ; and from Ceylon about 100,000,000 ib is annually exported. The culture ol coffee is an important and rapidly growing feature in and it is also prosecuted in Sumatra,

prized variety known as peaberry is the result of the coalescence of the two seeds within the fruit, thus producing the appearance of a single rounded seed, usually of small size, whence the name. Regarding the famous Mocha or “ Mokha” coffee of Arabia, Mr W. G. Palgrave has the following remarks :—

“The best coffee, let cavillers say what they will, is that of Yemen, commonly entitled ‘Mokha,’ from the main port of ex- portation. Now, I should be sorry to incur a lawsuit for libel or defamation from our wholesale or retail tradesmen ; but were the particle not prefixed to the countless labels in London shop windows, that bear the name of the Red Sea haven, they would have a more truthy import than what at present they convey. Very little, so little indeed as to be quite unappreciable, of the Mokha or Yemen berry ever finds its way westward of Constantinople. Arabia itself, Syria, and Egypt consume fuliy two-thirds, and the remainder is almost exclusively absorbed by Turkish and Armeniancesophagi. Nor do these last get for their share the best or the purest. Before reach- ing the harbours of Alexandria, Jaffa, Beyrout, &c., for further exportation, the northern bales have been, while yet on their way, sifted and re-sifted, grain by grain, and whatever they may have contained of the hard, rounded, half-transparent, greenish-brown berry, the only one really worth roasting and pounding, has been

carefully picked out by experienced fingers ; and it is the less

generous residue of flattened, opaque, and whitish grains which alone, or almost alone, goes on board the shipping. So constant 1s this selecting process that a gradation, regular as the degrees in a inap, may be observed in the quality of Mokha, that is, Yemen coffee, even within the limits of Arabia itself, in proportion as one approaches to or recedes from Wadi Nejran and the neighbourhood of Mecca, the first stages of the radiating mart."

The "Mocha" of the English market is principally the produce of India, but a good deal of American coffee is also passed into consumption under that abused name.

The conditions most favourable for coffee planting are found in hilly situations, where the ground is at once friable, well drained, and enriched by the washing down of new soil from above by the frequent rains. The seeds are first sown in a nursery, and the young plants when they are a few inches high are planted out in the permanent plantation at distances from each other of from 6 to 8 feet. The operation of planting is one which requires great care, and much labour must be expended on drainage, weeding, and cleaning the plantation, and in pruning or "handling" the plants. Chiefly for convenience of secur- ing the crop, the trees are rarely allowed to exceed from 4 to 6 feet in height, and being so pruned down they extend their branches laterally in a vigorous manner. 'The plants begin bearing in their second year, and by the third year they should yield a fairly remunerative crop. The berries are ready for picking when they have assumed a dark-red colour and the skin shrivels up. Immediately after the berries are gathered they are conveyed to the storehouse, where they undergo the operation of pulping .; and on some hill estates in Ceylon, having suitable situation and water supply, the gathered berries are carried by a water run through galvanized pipes to the store. The pulping is performed in an apparatus having two roughened cylinders which move in opposite directions. Between these the berries are carried forward with a flow of water, and the seeds are deprived of their surrounding pulp, being left invested in the skin or parchment. In this condition they are spread out to dry, and as soon as practicable they are freed from the husk or parchment by passing them between heavy wooden rollers and winnowing away the broken husks. The shelled coffee is then sized by passing it down a tube

perforated throughout its length with holes of regularly increasing diameter, and the various sizes are next hand-picked to free them from defective or malformed seeds; the coffee is then ready to pack for export. A tree in good bearing will yield from 14 to 2 tb of berries in a year ; but its fertility depends largely upon conditions of climate, situation, and soil. Generally trees planted in lofty dry situations and in light soils yield small berries,

ful in wet seasons.

rota,: and describes

under leaves become black

which give a rich aromatic coffee, while in low, flat, moist climates a more abundant yield of a large-sized berry is obtained. The greater weight of the coarser qualities of coffee more than makes up for the smaller price obtained for them as against the higher cost of the finer growths ; and therefore quality is too often sacrificed to quantity.

The cultivation of coffee is attended with many risks and much anxiety. In Ceylon, where British capital and enterprize have hitherto found their principal scope, the estates are exposed to the attacks of a most mischievous and destructive rodent, the coffee or Golunda rat. A species of insect called the coffee bug, Lecanium coffee, is a still more formidable and alarming pest with which planters have to contend. Of recent years prominent attention has been drawn to two diseased conditions arising in Singalese and Indian plantations by fungus growths. The first, called the coffee-leaf disease, appeared in Ceylon in 1869, and in Mysore a year later. The fungus in this case, Hemileia vastatriz, 1s endophytous, growing within the substance of the leaf, and while no effective cure has been discovered for it, it is not yet clear that it seriously affects the quality or amount of coffee yielded by the plants. The second, known as the coffee-rot, on the other hand, works great havoc in the Mysore plantations, in which it has been observed, being especially hurt-

This fungus has been examined by Mr M. C. Cooke, who names it Pellicularia kole-

the affected leaves as being covered with a slimy. gelatinous film, which the

and quickly drop off, as do also the clusters of coffee berries.

Raw coffee seeds are tough and horny in structure, and are devoid of the peculiar aroma and taste which are so characteristic of the roasted seeds. In minute structure coffee is so distinct from all other vegetable substances that it is readily recognized by means of the microscope, and as roasting does not destroy its distinguishing peculiarities, microscopic examination forms the readiest means of determining the genuineness of any sample. The substance of the seed, according to Dr Hassall, consists "of an assemblage of vesicles or cells of an angular form, which adhere so firmly together that they break up into pleces rather than separate into distinct and perfect cells. The cavities of the cells include, in the form of little drops, a considerable quantity of aromatic volatile oil, on the presence of which the fragrance and many of the active principles of the berry depend" (see fig. 2). The testa or investing membrane of the seeds has a layer of long cells with a peculiar pitted structure. In chemical composition the seeds are complex, and they contain variable pro- portions of proximate principles. The following represents the average constitution of raw coffee according to the analysis of M. Payen :—

ar

Fic. 2.—Microscopic structure of Coffee.

Cellulose …..c.cs0+s0ee sme cnmiige ronan esa cee 34 Water' |. c.cscbsueasusauenaeseeener germs ss 12 Paty <0 0 cciatiacaieemeee ce batueseee ee ataame 10 to 18 Glucose, dextrin, and organic acid … 15°5 Legumin and casein…….ssseresseeees 10 Other nitrogenous substances …..... 3 Cathe… .cuces season 08

COFFEE

Caffetannate of caffeine and potassium 3°5 to 5:0

Viseid essential oil (insoluble in water) 0:001 Aromatic oils (some lighter some

MEAVICL LAT WALCT)....05.0cccswecee ses 0:002 Pe PN Re cers cisce cn sacaickssecessleee 6°7

The physiological and dietetic value of coffee depends principally upon the alkaloid caffeine which it contains, in common with tea, cocoa, maté or Paraguay tea, guarana, and the African kola nut. Its commercial value is, however, determined by the amount of the aromatic oil, caffeone, which develops in it by the process of roasting. By prolonged keeping it is found that the richness of any seeds in this peculiar oil is increased, and with increased aroma the coffee also yields a blander and more mellow beverage. Stored coffee loses weight at first with great rapidity, as much as 8 per cent. having been found to dissipate in the first year of keeping, 5 per cent. in the second, and 2 per cent. in the third ; but such loss of weight is more than compensated by improvement in quality and consequent enhancement of value.

In the process of roasting, coffee seeds swell up by the liberation of gases within their substance,—their weight decreasing in proportion to the extent to which the operation is carried, Roasting also develops with the aromatic caffeone above alluded to a bitter soluble principle, and it liberates a portion of the caffeine from its combination with caffetannic acid, Roasting is an operation of the greatest uicety, and one, moreover, of a crucial nature, for equally by insufficient and by excessive roasting much of the aroma of the coffee is lost; and its infusion is neither agreeable to the palate nor exhilarating in its influence. The roaster must judge of the amount of heat required for the adequate roasting of different qualities, and while that is variable, the range of roasting temperature proper for individual kinds is only narrow. In Continental countries it is the practice to roast in small quantities, and thus the whole charge is well under the control of the roaster; but in Britain large roasts are the rule, in dealing with which much difficulty is experienced in producing uniform torrefaction, and in stopping the process at the proper moment. The coffee-roasting apparatus is usually a malleable iron cylinder mounted to revolve over the fire on a hollow axle which allows the escape of gases generated during torrefaction. Messrs W.

and G. Law of Edinburgh have introduced a very ingenious adaptation of the cylinder whereby a compound simultaneous horizontal and vertical Motion is secured, causing the seeds to be tossed about in all directions and communicating a uniform heat to every portion of the cylinder. The roasting of coffee should be done as short a time as practicable before the grinding for use, and as ground coffee especially parts rapidly with its aroma, the grinding should only be done when coffee is about to be prepared. Any ground coffee which may be kept should be rigidly excluded from the air.

While Arabia produces the choicest variety of coffee, the roasting of the seeds and the preparation of the beverage are also here conducted with unequalled skill. Mr W. GQ. Palgrave gives the following account of these operations in his Central and Eastern Arabia :-—

"Without delay Sowelylim begins his preparations for coffee. These Open by about five minutes' blowing with the bellows, and arranging the chareoal till a sufficient heat has been produced. Next he places the largest of the coffee-pots, a huge machine, and about two-thirds full of clear water, close by the edge of the glowing coal-pit, that its contents may become gradually warm while other i ng are in progress. He then takes a dirty knotted rag out ot a niche in the wall elose by, and having untied it, empties out of it three or four handfuls of unroasted coffee, the which he places on a little trencher of platted grass, and picks carefully out any blackened grains, or other non-homologous substances commonly to be found intermixed with the berries when purchased in gross; then, after much cleansing and Shaking, he pours the grains so cleansed Into a large open iron ladle, and places it over the mouth of the

funnel, at the same time blowing the bellows and stirring the grains gently round and round till they erackle, redden, and smoke a little, but carefully withdrawing them from the heat long before they turn black or charred, after the crroneous fashion of Turkey and Europe; after which he puts them a moment to cool on the grass platter. He then sets the warm water in the large coffee- pot over the fire aperture, that it may be ready boiling at the right moment, and draws in close between his own trouserless legs a large stone mortar with a narrow pit in the middle, just enough to admit the black

stone pestle of a foot long and an inch and a half thick, which he now takes in hand. Next pouring the half-roasted berrics into the mortar he proceeds to pound them, striking right into the narrow hollow with wonderful dexterity, not ever missing his blow till the beans are smashed, but not reduced into powder. He then scoops them out, now reduced to a sort of coarse reddish grit, very unlike the fine chareoal powder which passes in some countries for coffee, and out of which every particle of real aroma has long since been burned or ground. After all these Operations ….. he takes a smaller coffee-pot in hand, fills it more than half with hot water from the larger vessel, and then, shaking the pounded coffee into it, sets it on the fire to boil, occasionally stirring it with a small stick as the water rises, to check the ebullition and prevent overflowing. Nor is the boiling stage to be long or vehement ; on the contrary, it is and should be as slight as possible. In the interim he takes out of another rag-knot a few aromatic seeds called heyl, an Indian product, but of whose scientific name I regret to be wholly ignorant, or a little saffron, and after slightly pounding these ingredients, throws them into the simmering coffee to improve its flavour,—for such an additional spicing is held indispensable in Arabia, though often omitted clsewhere in the East. Sugar, I may say, would be a totally unheard-of profanation. Last of all, he strains off the liquor through some fibres of the inner palm-bark, placed for that purpose in the jug-spout, and gets ready the tray of delicate party-coloured grass and the small coffee-eups ready for pouring out.”

There is no doubt that were proper attention bestowed upon the preparation of coffee it would become a much more popular beverage in Great Britain than it now is R but to obtain it in perfection much greater care is requisite than is necessary in the case of tea. To obtain coffee with a full aroma it must be prepared as an infusion with boiling water, or the water may simply be allowed to reach the boiling point after infusion and nothing more. Dr Parkes has, however, pointed out that by infusion alone much of the valuable soluble matter in ground coffee remains unextracted ; and he recommends that the coffee which has already been used for infusion should be preserved and boiled, and that the liquor therefrom should be used for infnsing a fresh supply. By this means the substance of the previonsly infused coffee and the aroma of the new are obtained together. Among the numerous devices which have been proposed for preparing

coffee, none is more elegant and efficient than an apparatus constructed by Mr James R. Napier, F.R.S., for which a patent was obtained by Mr David Thomson) of Glasgow. It a

consists of a glass .

globe a (fig. 3), an \S » infusing jar 0, of Ve: ee

glass or porcelain iY,

and a bent tube / . ; c. of block tin or f German silver fitted by a cork stopper into the neck of the globe and passing to the bottoin of the jar, where it ends in a finely perforated disc. The appa | ratus aJso re- quires a spirit lamp d or other amount of heat to the globe.

wera

Fic. 3, —Napier's Coffee Apparatus.

means of communicating a certain The coffee is infused with VI 15

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boiling water in the jar, and a small quantity of boiling water is also placed in the globe. 'The tube is then fitted in, and the spirit lamp is lighted under the globe. The steam generated expels the air from the globe, and it bubbles up through the jar. When the bubbles of air cease to appear almost the whole of the air will have been ejected, and on withdrawing the lamp the steam in the globe con- denses, creating a vacuum, to fill up which the infused coffee rushes up through the metal tube, being at the same time filtered by the accumulated ccfice grounds around the perforated disc, An error of very frequent occurrence 1n the preparation of coffee, which results probably from the habit of tea-making, consists in using too little coffee. For a pint of the infusion from an ounce to an ounce and a half of coffee ought to be used. According to the experiments of Aubert a cup of coffee made from a Prus- sian loth ('587 oz.) contains from 15 to 1-9 grains of caffeine.

Coffee belongs to the medicinal or auxiliary class of food substances, bemg solely valuable for its stimulant effect upon the nervous and vascular system. It produces a feeling of buoyancy and exhilaration comparable to a certain stage of alcoholic intoxication, but which does not end in depres- sion or collapse. It increascs the frequency of the pulse, lightens the sensation of fatigue, and it sustains the strength under prolonged and severe muscular exertion. The value of its hot infusion under the rigours of Arctic cold has been demonstrated in the experience ofall Arctic explorers, and it is scarcely less useful in tropical regions, where it beneficially stimulates the action of the skin. It has been affirmed that coffee and other substances containing the alkaloid caffeine have an influence in retarding the waste of tissue in the human frame, but careful and extended observation has demonstrated that they have no such effect.

Although by microscopic, physical, and chemical tests the purity of coffee can be determined with perfect certainty, yet ground coffee is subjected to many and extensive adulterations. Chief among the adulterant substances, if it can be so called, is chicory root; but it occupies a peculiar position, since very many people on the Continent as well as in Great Britain deliberately prefer a mixture of chicory with coffee to pure coffee. Chicory is indeed destitute of the stimulant alkaloid and essential oil for which coffce is valued ; but the facts that it has stood the test of prolonged and extended use, and that its infusion is, in some localities, used alone, indicate that it performs some useful function in connection with coffee, as used at least by Western communities. For one thing, it yields a copious amount of soluble matter in infusion with hot water, and thus givesa specious appearance of strength and substance to what may be really only a very weak prepara- tion of coffee. The mixture of chicory with coffee is easily detected by the microscope, the. structure of both, which they retain after torrefaction, being very characteristic and distinct. The granules of coffee, moreover, remain hard and angular when mixed with water, to which they com- municate but little colour; chicory, on the other hand, swelling up and softening, yields a deep brown colour to water in which it is thrown. The specific gravity of an infusion of chicory is also much higher than that of coffee. Among the numerous other substances used to adulterate coffee are roasted and ground roots of the dandelion, carrot, parsnip, and beet; beans, lupins, and other leguminous seeds; wheat, rice, and various cereal grains;

the seeds of the broom, fenugreek, and iris; acorns; and "'negro coffee," the seeds of Cassta occidentalis. These with many more similar substances have not only been used as adulterants, but under various high-sounding names several of them have been introduced as substitutes for coffee; but they have neither merited nor obtained any success, and their

proportion substitute leaves are actually so used in Sumatra, but being destitute of any attractive aroma such as is possessed by both tea and coffee, the infusion is not palatable. It is, moreover, not practicable to obtain both seeds and leaves from the same plant, and as the commercial demand is for the seed alone, no consideration either of profit economic advantage is likely to lead to the growth of coffee trees on account of their leaves.

cOoOF—COF

sole effect has been to bring coffee into undeserved disrepute with the public.

The leaves of the coffce tree contain caffeine in larger than the seeds themselves, and their use as a for tea has frequently been suggested. The

or of any dietetic or

(5. Bay) COFFER-DAMS have from very early times been

employed as useful, and in some cases indispensable, structures in executing works of marine and river engineering. By excluding the water from the arca they enclose, the work can be carried on within them with nearly the same ease as on dry land. Whether used on a small or a large scale—whether as low-tide dams of clay or concrete of only a few feet in height, or as high-water dams of timber and puddle formed to resist the waves of the sea, they are in every sense structures of great importance in the practice of hydraulic engineering.

Tide-dams are chiefly used in laying the foundations of

piers or other works that must be founded under low-water level. and are only carried to the height of about 3 feet above low-water. the ebb tide

affords one or two hours work at low-water, the dam being submerged on the rise of the tide. In such dams a sluice should be introduced, which when open may allow the water to escape with the falling tide and so save

They are generally made of clay and planking,

The water being pumped out during the last of

pumping. Such tide-dams when exposed to a considerable

wash of sea may advantageously be made of cement rubble masonry, of the application of which to coffer-dams the earliest account we Account of the Bell-Rock Lighthouse (p. 230), where he successfully employed that method of construction in 1808 in excavating the foundation of that work. When it is required to sink the foundation some feet into sand and

know is that stated in Stevenson's

gravel, a convenient expedient is the portable dam proposed by Mr Thomas Stevenson described in the 7''rans. of the, Roy. Scot. Society of Arts, 1848, to which reference is made. The feature in this tide-dam is the use of double framed walings to support and direct the driving of the sheet piles, and its advantages are its cheapness, its portability, and its ready adaptation to a sloping or even very irregular bottom.

But when it is necessary entirely to exclude the water from large areas, as, for example, in dock-works, it is necessary to adopt coffer-dams of varied construction suited to the circumstances of each case, and as these protecting coffer-dam works, notwithstanding their temporary nature, demand much of the engineer's skill in their design and construction, we propose to notice some of the different modes of construction that have been adopted in such cases to suit the varying sub-soil and other features of different works.

It may here be mentioned that, particularly in bridge building, caissons were employed in early times instead of coffer-dams, but they are now entirely out of use. The caisson was a flat-bottomed barge constructed of strongly framed timber-work, in which the under courses forming the foundation of

the piers of a bridge, for example, were built at any convenient spot near the banks of the river. The caisson was then floated to the site of the pier, the bed of the river having previously been dredged so as to present a comparatively level and smooth surface. On the bed so prepared the caisson was sunk by admitting the water gradually by means of a valve provided for that

purpose. The sides were so constructed as to admit of their easy removal from the bottom of the caisson when it had been sunk to its bed. Rankine mentions a caisson described by Becker which measured 63 feet long, 21 feet broad, and 15 feet deep over all, The bottom beams used in constructing this large caisson were 10 inches square and 2 feet 10 inches apart from centre to centre, and the uprights forming the sides were 10 inches square and 5

under the bottom of the sheeting piles and puddle,

fect 8 inches apart from centre to centre, = oa But to return to the subject of this article. The dams tie tsay

used in soft bottoms, where piles can be driven, are con- structed of timber, and vary in strength according to the head of water they have to sustain. But the general style of construction is in all cases the same. he dams are formed of parallel rows of piles driven into the bottom, the space between the rows being filled by a mass of clay

although the timber-work of the dam must be constructed so as to resist pressures, it will generally be found that the greatest risk of failure arises from the filtration of water

‘puddle of sufficient thickness to exclude the water which In cases where the head of water is not great, the coffer-dam is generally -constructed as shown in fig 1., where the gauge piles a

percolates between the joints of the piles.

Fic. 1.—Coffer-dam for Soft Bottom.

are driven at distances varying from 4 to 8 feet apart, to which walings b are fixéd, and between the walings sheet piles c are driven, The sheet piles are shod with iroh, having a sloping edge to cause the piles to cling while being driven, and in the centre of each bay there is a key pile ¢, having a slight taper which on being driven down com- presses the sheet piles on either side of it closely together. In cases where the water pressure is great the sheeting piles are dispensed with, and the dam is formed of two or some- times three rows of whole timbers having the clay puddle between them, Fig. 2 is a dam on this principle, used in the construction of the Thames embankment, and described in the Transactions of the Institution of Civil Engineers by Mr Thomas Ridley, and after the explanations that havebeen 8!¥en, its construction will be easily understood as an outer and inner dam formed of two rows of close-driven whole logs with intervening spaces of 6 feet filled with clay puddle. Tn all cases the dams must be supported by sufficient stays or struts, abutting on firm ground, or, when this cannot be got, on dwarf piles driven deep enough to afford sufficient resistance, It is also important to remove the soft matter

etween the rows of piles to as great a depth as possible, and to fill in the excavated space with clay puddle, for

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Fia. 2.—Coffer-dam used at Thames Embankment.

The coffer-dams described illustrate the general construc- tion of such works, but various arrangements of the timber work have been adopted to suit particular situations, such as Mr James Walker’s coffer-dam for constructing the founda- tions of the river terrace of the Houses of Parliament at Westminster (vide Min. of Proc, of Inst. of C. E., vol. i.), and Sir John Hawkshaw’s dam for the middle level drainage of ig (Min. of Proc. of Inst. of Civil Engineers, vol. XXli.

All the examples that have been given are applicable to situations where the bottom is sufficiently soft to admit of piles being driven. But cases occur where this is impossible, Such, for example, as the removal of obstructions from the beds of rivers where it may be necessary to lay dry a large area of solid rock, and in that case it is necessary to adopt a totally diferent construction of dam. The accompanying cut (fig. 3) shows a coffer-dam designed by Mr D. Stevenson, which is specially adapted to a hard bottom where piles cannot be driven.) Itis formed of two rows of iron piles placed 3 feet apart and jumped into the rock, which supports two linings of planking, the inter- mediate space being filled with puddle and the whole structure properly stayed. This dam has been successfully employed on many works, and on the Ribble navigation, where it was first introduced, it was used to excavate a bed of rock 300 yards in length and of a maximum depth of 13 feet 6 inches, The maximum depth at high water against the dam was 16 feet, but in high river floods the whole dam was completely submerged, and on the water subsiding it was found that the iron rods, although jumped only 15 inches into the rock, were not drawn from their fixtures,

Dams must be designed with a special regard to their sufficiency to resist the water pressures they have to bear, and Professor Rankine gives the following formule, in his Manual of Cwil Engineering, p. 612, for calculating the pressure which the struts may have to bear.

Let b=breadth in feet of the division of the dam sustained by one strut, : x=the depth of water in feet, oe w= the weight of a cubie foot of water in Ibs. P=the pressure of water against that division of dam; cS ee ee i

1 Transactions of institution of Civil Engineers, vol. iii. p. 337,

Then— dock improvements, to which the cylinder system is quite inapplicable, and for which extensive and costly coffer-dams of the kind we have described must continue to be employed. The method of founding by iron cylinders has been described in the article BripGE, to which the reader is referred. (D. 8.) COGNAC, a town of France, at the head of an arrondissement in the department of Charente, on the left bank of the River Charente, about 32 miles by rail west of Angouléme. Tt has a tribunal of

commerce, a communal college, a prison, a hospital, a church of the 12th cen- tury dedicated to St Leger, and an old castle, now used as a wine-store, in the park of which is a bronze statue of Francis 1., marking the spot where, according to tradition, he was born in 1494. ‘The most important industry of Cognac is the distillation and exportation of the celebrated brandy to which the town gives its name (see Branvy). Iron is also manufactured, and a considerable trade is main- tained in grain and cattle. Cognac is probably to be identified with one of the many places that bore the .name of Condate ; it was known as Coniacum in the Middle Ages, At an early period it was governed by lords of its own, but in the 12th century it became subject to the counts of Angoumois. In 1238 it was the seat of an ecclesiastical council summoned by Gerard of Bordeaux; and in 1526 it gave its name to a treaty concluded against Charles V. by Francis I., Henry VIII. of England, the Pope, Venice, and Milan. In 1562 the town was captured by the

P=wha?—-2 and the moment of that pressure relative to a horizontal axis at the level of the ground is M=wbs+6.

Let & be the height above the ground at which the strut abuts against the dam, and ¢ its inclination to the horizon; the thrust along the strut is

T=M sec. i+h, from which the seantling required, depending on the sort of timber employed, ean be ealeulated.

In conclusion it may be noticed that the introduction of iron cylinders and compressed air for founding the piers of bridges has not only superseded the use of timber coffer-

SECTION

Before the Revolution it possessed a fine Benedictine monastery and two other convents. The population, which was only 4000 about the middle of the 18th century, had increased by 1872 to 12,950.

COHESION. See Arrraction, CaPiLLARy AcTIoN, and CoNSTITUTION OF BODIES.

COHOES, one of the most important manufacturing centres in the United States, is situated in Albany County,

P Ps ie dg Ar all eg ee in the State of New York, at the confluence of the Sa ic a Nes Mohawk with the Hudson, just below the famous Cohoes ELEVATION fall on the former river, to which it is indebted for its

prosperity. It contains seven churches and twenty-two public schools, the most remarkable of the churches being the Roman Catholic St Bernard's and the Episcopal St John's. The manufacturing establishments comprise six cotton mills with 4000 looms, eighteen knitting mills, a rolling mill, a pin factory, a knitting-needle factory, two foundries, three machine shops, a paper-mill, and a bedstead factory. 'In 1870 there were produced 54,342,000 yards of cloth, 33,600,000 knitting-needles, and 350,000 pack-ages of pins; while the turn-out of hosiery formed a third

| eee era TEES Gl of the whole amount manufactured in the United States. a TVA PAD we rl The whole water-power of the river for some distance both EDO GINA NG EIN ly Foo by P

bh CELERON PGA above and below the falls is the property of the Cohoes

Company instituted in 1826; and the various mavu- factories obtain their share at a fixed annual charge for each horse-power. The supply is regulated by a dam erected above the falls in 1865, and by a system of five canals, Cohoes owes its rise to the incorporation of the Cohoes Manufacturing Company in 1811. It obtained the rank of a village in 1848 and that of a city in 1869, Its population in 1850 was 4229; in 1860, 8800 ; and in 1870, 15,357. A large number of French Canadians are to be found among the operatives. COIMBATORE, a district of British India, in the Pre- sidency of Fort St George or Madras, situated between 10° 45' and 11° 48' N. lat, and between 76°50' and 78° 10 E. long. It is bounded on the N. by Mysore, on the E. by the district of Salem, the Cauveri River marking the entire boundary line, on the 8. by Madura and Travancore State, and on the W. by Cochin State, Malabar District, and the

CLAY || PUDDLE | l

See eae

weols2aa 6 7 8 9 10 11 IZFEET.

Fria. 3.—Cofferdam for Hard Bottom. A, High Water; B, Low Water.

dams for piers in soft bottoms, but has enabled bridges to be securely placed in situations where no timber dams could have answered the purpose. On the other hand, there are many cnginecring works connected with river, harbour, and

Huguenots, and in 1651 it defied the prince of Condé, ~

COI~—COI

Nilgiri Hills. Coimbatore may be described asa flat, open country, hemmed in by mountains on the north, west, and south, but opening eastwards on to the great plain of the Carnatic ; the average height of the plain above sea-level is about 900 feet. The principal mountains are the Anaméli Hills, in the south of the district, rismg at places to a In the west, the Palghat and Vallagiri Hills form a connecting link between the Anamali range and the Nilgirls, with the exception of

height of between 8000 and 9000 feet.

a remarkable gap known as the Palghat Pass. This gap,

which completely intersects the Ghats, is about twenty

miles wide. In the north is a range of primitive trap-hills known as the Cauveri (Kaveri) chain, extending eastwards

from the Nilgiris, and rising in places to a height of 4000

feet. The principal rivers are the Cauveri, Bhawant, Noyel, and Amrawati.

proved of immense benefit to the country. Well and tank

water is also largely used for irrigation purposes. The total area of Coimbatore is 7432 square miles, of which 38774 square miles or 2,488,000 acres were returned as under cultivation in 1874~75, viz., 2,089,000 acres under food grains or corn crops, 80,000 acres oilseeds, 61,000 acres green and garden crops, 5000 acres orchards, and 253,000 Excellent cotton and tobacco of

acres under special crops. @ superior quality are produced. Extensive teak forests

exist in the neighbourhood, Coimbatore is subdivided

into 10 tdluks or sub-districts, and contains 1515 villages.

. The ceusus report of 1872 returns the population of the

district as follows :—Hindus, 1,715,081 ; 36,026 ; Native Christians, 11,443 ; Eurasians, 595 ;

Muhammadans, Europeans and

station on the line of railway between Beypur and Madras. Population in 1872—Hindus, 30,801 ; Muhammadans, 2599 ; Christians, 1892 ; Buddhists, 18 ; total, 35,310. The municipal revenue of the town amounted in 1874-75 to £3720, and the expenditure to £3367. Two other small towns —Karur and Erode—are also constituted municipali- ties. The total district revenue in 1874-75 amounted to £304,818, of which £253,536 was derived from land. Coimbatore district was acquired by the British in 1799 at the close of the war which ended with the death of Tippu.

COIMBRA, a city of Portugal, capital of the province of Beira, on the north bank of the Mondego, 115 miles N.N.E. of Lisbon, in 40° 14’ N. lat. and 8° 24’ W. long, It is built for the most part on rising ground, and presents from the other side of the river a picturesque and imposing appearance ; though in reality its houses have individually but little pretension, and its streets are, almost without exception, narrow and mean. It derives its present importance from being the seat of the only university in the kingdom,—an institution which was originally estab- lished at Lisbon in 1291, was

transferred to Coimbra in 1306, was again removed to Lisbon, and was finally fixed at Coimbra in 1527. There are five faculties,—theology, law, medicine, mathematics, and philosophy, with fifty-two pro- fessors and twenty-one substitutes; and in 1874-5 the number of students wag 667, of whom 15 came from the Azores and 11 from Brazil. The library contains 80,000 volumes, and the museums and laboratories -are on an extensive scale. In connection with the medical faculty there are regular hospitals; the mathematical faculty maintains an observatory from which an excellent view can be obtained of the whole valley of the Mondego; and outside of the town there is @ botanic garden (especially rich in the flora of Brazil), which also serves as a public Promenade, Among the other educational establishments are a military college, a royal college of arts, and an

Numerous canals are cut from the rivers for the purpose of affording artificial irrigation, which has

Buddhists, or Jains, 56 ; others, 73 ;

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total, 1,763,274, The principal town is Coimbatore, situ- ated in 10° 59’ 41” lat. and 76° 59’ 46” long.; it forms a

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episcopal seminary. The city is the seat of a bishop, suffragan to the archbishop of Braga ; and it POssesses two cathedrals, eight parish churches, and several con- ventual buildings. The new cathedral is of little interest ; but the old is a fine specimen of the Romanesque style, and retains portions of the mosque which it replaced. The principal churches are Santa Cruz, of the 16th century, and San Salvador, founded by Esterio Martinez in 1169, On the bank of the Mondego stand the ruins of the once splendid monastery of Santa Clara, established by Don Mor Dias in 1286; and on the other side of the river, crossed by a fine bridge of several arches, is the celebrated Quinta das lagrimas, or Villa of Tears, where Inez do Castro is believed to have been murdered. The town is supplied with water by means of an aqueduct of 20 arches. The trade is purely local, as the river is navigable only in flood, and the port of Figueira is 20 miles distant ; but

there are manufactures of pottery, linen, cloth, and articles of horn ; and a three days' market is held yearly in front of the Clara monastery. The country to the south is the most fertile and salubrious in Portugal, and the neighbour- hood is accordingly thickly studded with farm-houses and villas. The population of the city in 1864 was 18,147,

Coimbra is identified with the ancient Conembrica, the site of which, however, seems to have been a little to the south. The city was for a long time a Moorish stron hold, but in 1064 it was captured by Ferdinand the Great and the Cid. Previous to the 16th century it was the capital of the country, and no fewer than seven kings—Sancho I. and II., Alphonso I., IJ., and III., Pedro, and Ferdinand—were born within its walls. In 1755 it suffered con- siderably from the earthquake. In 1810 a division of the French army, under Massena, were made prisoners by the English in the neighbourhood. In 1884 Don Miguel made the city his headquar- ters ; and in 1846 it was the scene of a Miguelist insurrection.

COIN, a town of Spain, in the province of Malaga, and 20 miles west of the city of that name. It is well built, and has two large churches, an episcopal palace, and a town hall. Population, 8000.

COINAGE anp COINS. See BULLION, Mint, Money, and Numismatics.

COIR, a rough, strong, fibrous substance obtained from the outer husk of the cocoa-nut. See Cocoa-Nut PALM.

COIRE (the German Chur, Italian Coira, and Quera of the Romance language spoken in the district), the capital of the Swiss canton of the Grisons or Graubiinden, at the foot of the valley of the Plessur, a short distance above the confluence of that river with the Rhone, in 46° 50' 54" N. lat. and 9° 31' 26" BE, long. It lies 1830 feet above the level of the sea, and is overshadowed by the Mittenberg and Pizokelberg. The streets are narrow, and the general appearance of the place bespeaks its antiquity. The upper part of the town, or Bishop's Quarter, was once surrounded with walls, and it is still distinguished from the lower portion as the almost exclusive residence of the Roman Catholic population. The cathedral church of St Lucius is its most remarkable building, ascribed in part to Bishop Tello of the 8th century, and deriving its name from a legendary

British king, who is reputed to have suffered martyrdom in the town. Of antiquarian interest are the statues of the Four Evangelists, the ancient wood carvings, and several monuments by Holbein and Diirer. The episcopal palace on the other side of the court is believed to occupy the site of a Roman castle ; and two ancient towers, probably dating from the 10th century, are popularly regarded as of Roman construction, the opinion being supported by deriving their names, Marsoel and Spinoel, from the Latin Mars in Oculis and Spina in Oculis. The episcopal school is now administered by the canton, and contains a rich collection of native literature. In the lower town are situated the great town-house, with a public library and three stained-glass windows of the 16th century;

the churches of St Martin and St Regula; the administra- tive buildings ; and the hospital founded by Theodosius, a superior of the Capuchins. The prosperity of Coire is chiefly maintained by its transit trade between Germany and Italy ; but it also engages in the manufacture of cotton, wool, leather, and pewter wares, has dye-works and breweries, and deals in cattle and grain. The population, which is mainly Protestant, numbered 7552 in 1870.

Cvire is identified with Curia Rhectorum, a late Roman city, first mentioned about the 4theentury. Its bishoprie, which held sway over au extensive district, seems to have been founded in 470 by ‘Asimo, In the 15th eentury the town made itself free from epis- copal control, and in 1460 obtained from the emperor, Frederick IV., the rank of an imperial eity ; but before the beginning of the next century it split with the empire and joined the confederacy of the Grisons. In 1526 the Reformation was introduced : and a eon- spiraey. for the restoration of the former ecelesiastical regime was vigorously suppressed. In the 17th century the city was frequently the centre of the great struggle between the Cantons aud the Austrian empire which raged with such fury and so many alterna- tions of success. In 1802 the French general Massena oceupied the town, and from that date the bishops have had no territorial pos- sessions.

COJUTEPEC, a town of Central America, in the republic of San Salvador and the department of Cuscatlan, about 15 miles east of the capital. It has a

population of about 15,000, and from 1854 to 1858 it served as the seat of government instead of San Salvador, which had been ruined by an earthquake. In 1872 it took part in a revolutionary outbreak against the existing Government, and the Indian population unsuccessfully attacked the garrison. The town gives its name to a neighbouring volcano, which rises to a height of 5700 feet, and also to the extensive lake, otherwise known as the Lake of Hopango, which lies a few miles to the south and gives rise to the Rio Jiboa.

COKE, the carbonaceous residue produced when coal is subjected to a strong red heat, out of contact with the air, until the volatile constituents are driven off It consists essentially of carbon, the so-called fixed carbon, together with the incombustible matters or ash contained in the coal from which it is derived. In addition to these it almost invariably contains small quantities of hydrogen, oxygen, and nitrogen, the whole, however, not exceeding 2or3 percent. It also contains water, the amount of which may vary considerably according to the method of manu- facture. When produced rapidly and at a low heat, as il gas-making, it is of a dull black colour, and a loose spongy or pumice-like texture, and ignites with comparative ease, though less readily than bituminous coal, so that it may be burnt in open fire-places ; but when a long-continued heat is used, as in the preparation of coke for iron and stcel melting, the product is hard and dense, is often prismatic in structure, has a brilliant semi-metallic lustre and silvery- grey colour, is a good conductor of heat and electricity, and can only be burnt in furnaces provided with a strong chimney draught or an artificial blast. The strength and cohesive propérties are also intimately related to the nature and composition of the coals employed, which are said to be caking or non-caking according to the compact or frag- mentary character of the coke produced.

The simplest method of coking, that in open heaps or piles, is conducted in a very similar manner to charcoal burning. The coal is piled in a domed heap about 30 feet in diameter and 5 feet high, with a chimney of bricks arranged in open chequer work in the centre, around which the largest lumps of coal are piaced so as to allow a free draught through the mass. The outside of the heap is covered with a coating of wet coke dust, except a ring about a foot high at the bottom. Fire is communicated by putting a few live

coals near the top of the chimney, or from the interior by throwing them down the chimney,

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purposes is made in close kilns or ovens. considerably in form and details of construction, but the same general principles are observed in all, the object being

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and the combustion proceeds downwards and outwards by the draught through the uncovered portion at the bottom. Whenever the fire takes too strong a hold and- burns out to the surface it is damped by plastering over the spot with ‘wet coke dust and earth, this being a point requiring considerable skill on the part of the coke burner. When flame and smoke are no longer given off, which usually happens in from five to six days, the whole surface is smothered with coke dust, and the chimney is stopped for three or four days longer, when the heap is sufficiently cooled to allow of the coke being broken up and removed, or, as it is called, ‘drawn. water upon the heap before drawing. coking in rectangular piles is generally similar to the fore- going, but chimneys are not used. The dimensions

The cooling is usually expedited by throwing The prirciple of

generally adopted are a height of from 3} to 5 feet, and a

breadth of 12 feet at the base. ”

In coking by clamps or kilns a rectangular pile of coal is

enclosed between upright walls, having a system of vertical and horizontal passages traversing them at intervals, which serve as chimneys to conduct the combustion through the pile. This system has been used at different times in South Wales, Germany, and other places, but is now generally abandoned, as the draught holes have a tendency to consume

the coal unnecessarily unless very carefully watched. The largest proportion of the coke used for industrial These vary very

to effect the coking as much as possible by the consumption

of the volatile inflammable gases given off above the surface of the coal, and to protect the latter from the direct access of currents of air. A further object is the utilization of the

heat given off by the waste gases, which may be employed to heat the oven by circulating them in flues round the outside, and further by employing them for the accessory — objects of raising steam, heating air, &c., in collieries and

iron-works.

In its oldest and simplest form, the coke oven consists of a round chamber from 7 to 10 feet in diameter, with a low cylindrical wall, and a domed roof rising about 20 inches in height above the floor, ‘A hole about 1 foot in diameter in the crown of the roof serves for charging, and the finished coke is drawn through a door in the wall, about 24 feet square. When eleared for a fresh charge, the oven being red-hot, small coal is introduced through the hole in the roof, and spread uniformly over the floor, until it is filled up to the level of the springing of the roof, when the doorway is filled up with loose bricks which give a sufficient passage between them for the admission of air to ignite the gases given off by the distillation of the heated coal. After a few hours these air-ways must be closed by plastering up the briekwork, except the top layer, which is left open for twenty-four hours. The heat developed by the burning gases eauses the eoking to proceed downwards until the entire charge is eonverted, this taking from three to four days, according to the quantity of eoal. When the eseape of flame from the hole in the roof ceases, all apertures are stopped whereby air ean enter to the incandescent mass, which being no longer pro- teeted by an atmosphere of combustible gases, would burn to waste if brought in contact with the atmosphere. At this point, there- fore, all holes in the oven and ehimney are completely closed for about twelve hours, when the door is opened, and the coke, which forms a coherent mass, somewhat Jess in size than the original charge, and divided by a system of columnar joints, is

removed by an iron drag, or cross-bar, inserted at the far end of the floor, and moved by a ehain and windlass, a stream of water from a hose being used to quench the glowing eoke as it is brought out. This elass of oven, whichis now not much used, was adopted by most of the railway companies, when coke was burnt exclusively in loco motives, and is also common in the Durham coal-field. They are generally known as beehive ovens, also as bakers' ovens. Usually from six to ten, or twelve, or more ovens are placed side hy side in one block of brickwork, which is supplied ;with a tall ehimney, the individual ovens being connected by pillars, with well-regulated dampers. A railway is generally laid i the top of the range of ovens, so that the eharging ean be effected directly from the colliery trucks. The yicld of coke by this method may be from 59 to 65 per cent., according to the nature of the coal. With charges vary-

ing from 3 to,10 tons, the operation, including the period of cooling,

lasts from four to seven days. The coke obtained is of the highest In some cases the cooling There is a i ount of sulphur removed by this method, as the steam tebe being rots into contact with the sulphide of iron in the heated mass, formed from pyrites in the eoal, produces The amount of urization by this method is, however, practically insignifi-

se the st does not last a sufficient tine to allow the mass of thefuel to be affected The proportion of sulphur in finished coke, as compared with that of the original coal, may be roughly stated at about one-half. It has been sought to reduce the amount

lity, being dense and well burned. a By eoits i effected by watering it before drawing.

sulphuretted hydrogen and magnetie oxide of iron

by decomposing the residual ferrous sul hide in various ways, as by the addition of salt, carbonate of so a, lime, &e., to the coal before coking but none of these methods is found to be practically fu,

a4 the South Wales coal-field the ordinary form of coke oven is nearly rectangular, being about 14 feet long, 5 feet wide at the back, and 6 feet at the front or drawing ends ; the height to the crown of the cylindrical roof is 5 feet 6 inches, with usually two charging holes. Two charges are worked weekly, the first, of 44 tons, is finished in three days, while the second, of 5 tons, is allowed four days, so as to remain in the oven over Sunday. The yield in both eases is about the same.

The addition of heating flues exterior to the wall of the oven allows the time of coking to be very muck shortened, Of the numerous contrivances proposed for this purpose, that of a Belgian engineer, Mr Coppée. has latterly come into favour in many places, as very well adapted for use with comparatively dry coal. The coking chamber is a long narrow retort of fire brick, measuring about 30 feet in length, 17 inches in width at the front, and about 2 inches more at the back, where the charge is pushed out, with vertical walls about 84 feet high, covered by a low arched roof. One of these walls is solid, but the other contains twenty-eight vertical descending flues (/) which communicate with the interior at the springing of the roof, and below with the large flue of the same width as the oven, and running along its entire length. As usually built, a series or battery includes about thirty ovens, which are arranged in pairs as in the figure, from which it will be seen that

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¢ rnately at exactly inter-

mediate Periods; thus supposing} the time of eoking to be forty- pent hours, A is drawn twenty-four hours after the charging of » While the latter is in full activity, and keeps up the heat of the empty oven during charging, while necessarily the burning hydrocar- ‘ re —. given off during the first heating of the coal tend to keep up € heat in the adjoining oven. At Ebbw Vale, in Monmouthshire,

numdered con sceutively, theodd numbers bein g drawn and re-charged The com-

special channels () in the brickwork communicating with the gas re top, and becomes heated in the passage. The dafecs ke < a 0 be obtained is the combustion of the gases as much as a tee hs op flues, and not 1m the oven itself. The oven is closed re Y cast-iron doors in two parts, which can be opened chau es ate tty during the drawing and recharging. The int sa Hd e ten through three holes (D D) in the roof, the coal, rungiiaa ™m ot slack, being contained in hopper-shaped trams,

& “pon rails, which are run over the holes and emptied by

drawing a slide. The charge is about 3 tons, and the yield from 36 to 44 ewt., according to the nature of the eoal operated upon. The fintshed eoke forms a prismatie mass, 30 feet long, 3 feet high, and 16 inches broad; it is pushed out by a rain, shaped like the cross séction of the oven, which is moved by steam power acting upon a long racked rod. This apparatus, together with the engine and boiler for moving it, is mounted on a carriage moving on a railway in front of the range of ovens, so that it ean be brought up to any one of them as required. The mass of coke is pushed out on to a floor running along the back, where it is immediately broken, and quenched by heavily watering the frag- ments. The whole operation, including the drawing and recharg- ing of the empty oven, is effected in about eight minutes. The yield of coke very closely approximates to that obtained by experi- ments in erucibles. A similar kind of oven with outside heating flues, that of the Brothers Appolt, has been in use for séveral years on the Continent, more particularly in Franee. It differs from Coppée’s in the position of the eoking chambers, which aro vertical instead of horizontal, the coal being charged from the’ top, and the finished coke dropped into a truck placed below. Various schemes have been proposed at different times for the purpose of utilizing the eondensible products, such as tar, ammoniacal water, &c., given off during the earlier stages of the process of coking, but they are not generally found to be applicable to the manufacture of metallur. gical coke, being only suited for gas-works, where the quality of the coke is only a secondary consideration.

The slack of dry or non-eaking coal, or anthracite, which cannot be eoked alone, may be converted into a useful coke by mixing it with a proportion of bituminous coal, or gas-pitch, or a mixture of both. At Swansea, a mixture of 60 to 70 per cent. of anthra- cite with from 80 to 35 per cent. of bituminous coal, and 5 or 6 of gas pitch, made by grinding the ingredients in one of Carr's disin- tegrator mills, is coked in the ordinary South Wales ovens, a thin layer of bituminous coal being placed above the charge before it is lighted, to prevent the piteh from burning to waste. The yield of coke is about 80 per cent. of the weight of the charge. It is ex- eeedingly hard, and about 23 per cent. heavier than that made from bituminous coal, with a eorrespondingly higher calorifie value,

Coke is used for all purposes where a smokeless fire is required, as, for instance, in drying malt or hops, or in raising steam in locomotives within the limits of towns, also for producing strong local heat, as in melting metals (gold, silver, brass, or stecl) in crucibles in air furnaces, In blast furnaces its value depends upon the difficulty of combustion, so that the particles keep their form until they reach the proper place of combustion at the point of entry of the blast in the lower part of the furnace. The great economy of fue] that has been effected in the process of iron smelting in the Cleveland district by increasing the height of the furnaces, is in great part due to the strength of the coke used, which is made in the south part of the Durham coal-field, and has sufficient cohesive power to bear the pressure of a column of iron-making materials from 80 to 100 feet in height without crushing, a result which cannot be obtained with the coke of other districts, Finely ground coke is used mixed with clay for making crucibles for steel melting, and also for filling the hearths of blast-furnaces in many German smelting works.

Apart from its convenience for special purposes, coke is not an economical fuel, the useful heating effect being about the same as that of an equal weight of coal. This circumstance has led to the nearly general abandonment of coke and the substitution of raw coal as fuel in locomotive engines on railways.

For full accounts of the different systems of coke ovens and details of their construction, see Percy's Metallurgy, introductory volume on fuel, &c., 2d

edition, London, 1875, and Jordan's Album du Cours de Metallurgie, Paris, 1874, (H. B.)

COKE, Sm Epwarp (1552-1633), one of the must erudite of English lawyers, was born at Mileham, in Nor- folk, on February 1, 1552. When only ten years old he lost his father, who was a bencher of Lincoln's Inn. From the grammar-school of Norwich he passed to Trinity College, Cambridge ; and after a course of three years, in 1572 he entered the Iiin to which his father had

| belonged To the study of law he devoted himself from

the first with the intensest application; he slept only six hours, and from three in the morning till nine at night he read or took notes of the cases tried in Westminster Hall with as little interruption as possible. In 1578 he was called to the bar, end in the next year he was chosen reader at Lyon's Inn. His extensive and exact legal erudition, aud the skill with which he argued the intricate cases of Lord Cromwell and Edward Shelley, soon brought him a practice never before equalled, nd caused him to be universally recognized as the greatest lawyer of his day. In 1586 he was made recorder of Norwich, and in 1592 recorder of London, solicitor-general, and reader in the Inner Temple. In 1593 he was returned as member of parliament for his native county, and also chosen speaker of the House of Commons. In 1594 he was promoted to the office of attorney-general, despite the claims of Bacon, who was warmly supported by the earl of Essex. As crown lawycr his treatinent of the accused was marked by more than the harshness and violence common in his time ; and the fame of the victim has caused his behaviour in the trial of Raleigh to be lastingly remembered against him. While the prisoner defended himsclf with the calmest dignity and self-possession, Coke burst into the bitterest invective, brutally addressing the great courtier as if he had been a servant, in the phrase, iong remembered for its insolence and its utter injustice,—' Thou hast an English face, but a Spanish heart !"

In 1582 Coke married the daughter of John Paston, a Suffolkshire gentleman, receiving with her a fortune of £30,000 ; but in six months he

was left a widower. Shortly after he sought the hand of Lady Elizabeth Hatton, daughter of Thomas, second Lord Burghley, and granddaughter of the great Cecil. Bacon was again his rival, and again unsuccessfully ; the wealthy young widow became—not, it is said, to his future comfort—Coke's second wife.

In 1606 Coke was made chief-justice of the Common leas, but in 1613 he was removed to the office of chief- justice of the King's Bench, which gave him less oppor- tunity of interfering with the court. The change, though it brought promotion in dignity, caused a diminution of income as well as of power ; but Coke received some com- pensation in being appointed a member of the Privy Council. 'The independence of his conduct as a judge, though not unmixed with the baser elements of prejudice and vulgar love of authority, has partly earned forgiveness for the harshness which was so prominent in his sturdy character. Full of an extreme reverence for the common law which he knew so well, he defended it alike against the Court of Chancery, the ecclesiastical courts, and the royal prerogative. In a narrow spirit, and strongly in- fluenced, no doubt, by his enmity to the chancellor, Egerton, he sought to prevent the interference of the Court of Chancery with even the unjust decisions of the other courts. In the case of an appeal from a sentence given in the King's Bench, he advised the victorious, but guilty, party to bring an action of premunire against all those who had been concerned in the appeal, and his authority was stretched to the utmost to obtain the verdict he desired. On the other hand, Coke has the credit of hav- ing repeatedly braved the anger of the king. He freely gave his opinion that the royal proclamation cannot make that an offence which was not an offence before. An equally famous but less satisfactory instance occurred during the trial of Peacham, a divine in whose study a sermon had been found containing libellous accusa- tions against the king and the Government. There was nothing to give colour to the charge of high treason with which he was charged, and the sermon had never been

preached or published ; yet Peacham was put to the | Petition of Night.

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torture, and Bacon was ordered to confer with the jndges individually concerning the matter. Coke declared such conference to be illegal, and

refused to give an opinion, except in writing, and even then lie seems to have said nothing decided. But the most remarkable case of all occurred in the next year (1616). A trial was held before Coke in which one of the counsel denied the validity of a grant made by the king to the bishop of Lichfield of a benefice to be held ix commendam. James, through

| Bacon, who was then attorney-general, commanded the

chief-justice to delay judgment till he himself should discuss the question with the judges. At Coke's request Bacon sent a letter containing the same command to each of the judges, and Coke then obtained their signatures to a paper declaring that the attorney-general's instructions were illegal, and that they were bound to proceed with the case. His Majesty expressed his displeasure, and summoned them before him in the council-chamber, where he insisted on his supreme prerogative, which, he said, ouglit not to be discussed in ordinary argument. Upon this all the judges fell. on their knees, seeking pardon for the form of their letter; but Coke ventured to declare his continued belief in the loyalty of its substance, and when asked if he would in the future delay a case at the king's order, the only reply he would vouchsafe was that he would do what became him as a judge. Soon after he was dismissed from all his offices on the following charges,—the concealment, as attorney-general, of a bond belonging to the king, a charge which could not be proved, illegal interference with the Court'? of Chancery, and disrespect to the king in the case of commendams. He was aiso ordered by the council to revise his book of reports, which was said to contain many extravagant opinions (June 1616).

Coke did not suffer these losses with patience. He offered his daughter Frances, then little more than a child, in marriage to Sir John Villiers, brother of the favourite Buckingham. Her mother, supported at first by her husband's great rival and her own former suitor, Bacon, objected to the match, and placed her in conceal- ment. But Coke discovered her hiding-place; and she was forced to wed the man whom she declared that of all others she abhorred. The result was the desertion of the husband and the fall of the wife. It is said, however, that after his daughter's public penance in the Savoy Church, Coke had heart enough to receive her back to the home

which he had foreed her to leave. Almost all that he gained by his heartless diplomacy was a seat in the council and in the Star-Chamber.

In 1620 a new and more honourable career opened for him. He was elected member of parliament for Liskeard; and henceforth he was one of the most prominent of the constitutional party. It. was he who proposed a remon-strance against the growth of Popery and the marriage of Prince Charles to the infanta of Spain, and who led the Commons in the dccisive step of entering on the journal of the House the famous petition of the 18th December 1621, insisting on the freedom of parliamentary discussion, and the liberty of speech of every individual member. In con- sequence, together with Pym and Sir Robert Philips, he was thrown into confinement; and, when in the August of the next year he was released, he was commanded to remain in his house at Stoke-Poges during his Majesty's pleasure. Of the first and second parliaments of Charles I. Coke was again a member. From the second he was excluded by being appointed sheriff of Buckinghamshire. In 1628 he was at once returned for both Buckinghamshire and Suffoll, and he took his seat for the former county. After rendering other valnable support to the popular cause, he took a most important part in drawing up the great The last act of his public career was t0

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bewail with tears the ruin which he declared the duke of Buckingham was bringing upon the country. At the close of the session he retired into private life 3 and the six years that remained to him were spent in revising and improving the works upon which, at least as much as upon his public career, his fame now rests. He died on the 3d September 1633.

Coke published Institutes, of which the first is also known as "Coke upon Littleton," Reports, A Treatise of Bail and Mainprize, The Complete Copyholder, A Reading on Fines and Recoveries.

COLBERG, or Koxpere, a fortified seaport town of Prussia, in the former province of Pomerania, and the govern- ment of Késlin, on the right bank of the Persante, which falls into the Baltic about a mile below the town. Ithasa handsome market-place, adorned since 1864 with a statue of Frederick William IV. ; and there are several pretty extensive suburbs, of which the most important is the Munde, in great measure the growth of the present century. The principal buildings are the cathedral of St Mary's, one

of the most remarkable churches in Pomerania, dating from 1316, the council-house erected after the plans of

Zwirner, the citadel, and the aqueduct by which the town is supplied with water. pitals, a workhouse, a house of correction, an orphan asylun, a gymnasium, a preparatory school of navigation, and an exchange.

visitors, there is an extensive salt-mine

and a fair amount of commercial activity is maintained. Population in 1872, 13,106.

Colberg was the seat of a ecg! as early as the 10th century,

this distinction. Til] 1277 it was the

chief town of the Cassubian Wends, and after that date it ranked

as the most important place in the se

Russian and Swedish forces, both by sea and land, till it was relieved by the advance of Werner; but in 1761 it was compelled by famine to yield to Romanzoff after a four months' investment and violent bombardment. In 1807 it was surrounded by 18,000 men

COLBERT, Jean Baptiste (1619-1683), one of the greatest among the great statesmen of France, was born on the 29th of August 1619, at Rheims, where his father and grandfather were merchants. He claimed to be the descendant of a noble Scottish family, but those who have Investigated the matter have almost without exception

ecided against the pretension. His youth is said to have

been spent in a Jesuit college, in the office of a Parisian banker, and in that of a Parisian notary, Chapelain, the father of the poet. But the first fact on which we can rely with confidence is that, when not yet twenty, he obtained a post in the war-office, by means of the influence that he possessed through the marriage of one of his uncles to the sister of Michel Le Tellier, the secretary of state for war, During some years he was employed In the inspection of troops and other work of the kind, ut at length his ability, his extraordinary energy, and his untiring laboriousness induced Le Tellier to make him his private Secretary. These qualities, combined, it must be confessed, with a not over-delicate readiness to seize every Opportunity of advancement, soon brought Colbert both wealth and influence. Tn 1647 we find him Tecelving the confiscated goods of his uncle Pussort, in 1648 obtaining 40,000 crowns with his wife Marie Charron, in 1649 appointed councillor of state,

Colberg also possesses several hos-

Its bathing establishments are largely frequented and attract a considerable number of summer Woollen cloth and spirits are manufactured ; in the neighbouring Zillenberg ; the salmon and lamprey fisheries are important ;

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It was the period of the wars of the Fronde: and in 1651 the triumph of the Condé family drove Cardinal Mazarin from Paris. Colbert, now aged thirty-two, was engaged to keep him acquainted with what should happen in the capital during his absence. At first Colbert's position was far from satisfactory; for the close wary Italian treated him merely as an ordinary agent. On one occasion, for example, he offered him 1000 crowns. 'The gift was refused somewhat indignantly; and by giving proof of the immense value of his services, Colbert gained all that he desired. His demands were not smal] ; for, with an ambition Iningled, as his letters show, with strong family affection, he aimed at placing all his relatives in positions of affluence and dignity; and Inany a rich benefice and important public office was appropriated by him to that purpose. For these favours, conferred upon him by his patron with no stinted hand, his thanks were expressed in a most remark- able manner; he published a letter defending the cardinal from the charge of ingratitude which was often brought against him, by enumerating the benefits that he and his family had received from him (April 1655). Colbert obtained, besides, the higher object of his ambition ; the confidence of Mazarin, so far as it was granted to any oue, became his, and he was intrusted with matters of the gravest importance. In 1659 he was giving directions as to the suppression of the revolt of the gentry wkich threatened in Normandy, Anjou, and Poitou, with characteristic decision arresting those whom he suspected and arrang- ing every detail of their trial, the immediate and arbitrary destruction of their castles and woods, and the exccution of their chief, Bonnesson. In the same year we have evidence that he was already planning his great attempt at financial reform. His earliest tentative was the drawing up of a mémotre to Mazarin, showing that of the taxes paid by the people not one-half reached the king. The paper also contained an attack upon the superintendent, Fouquet, who, first recommended to Le Tellier by Colbert himself, had since developed into the

most shameless of extortioners ; and being opened by the postmaster of Paris, who hap- pened to be a spy of Fouquet's, it gave rise to a bitter quarrel, which, however, Mazarin repressed during his lifetime.

In 1661 the death of Mazarin allowed Colbert to. take the first place in the administration, It was some time before he assumed official dignities ; but in J anuary 1664 he obtained the post of superintendent of buildings; in 1665 he was made controller-general ; in 1669 he became minister of the marine ; and he was also appointed minister of commerce, the colonies, and the king's palace. In short, he soon acquired power in every department except that of war.

A great financial and fiscal reform at once claimed alk his energies. This' he saw was the first step toward raising France to the lofty position he intended her to occupy. The country was in economic chaos. Those who had the fiscal administration in their hands, from the superintendent to the meanest of the tax-farmers, robbed and misappro- priated almost as they pleased. The Government loans were arranged, not so as to be most advantageous to the state, but so as most to aggrandize the individuals who were interested in them. Not only the nobility, but many others who had no legal claim to exemption, paid no taxes ; the weight of the burden fell on the wretched country-folk. Colbert sternly and fearlessly set about his task. Supported by the young king, Louis XI1V., he aimed the first blow at the greatest of the extortioners—the bold and powerful superin- tendent, Fouquet. He was accused of high treason, not without sufficient grounds, for it was known that he had prepared to meet an arrest formerly contemplated by an appeal to force. The most minutely careful precauticns

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were taken by Colbert for his seizure, and he was tried before a specially prepared chamber of justice. Neverthe- less the trial was protracted during three years, aud the sentence passed was not death but banishment. The Government, however, carried out its planus. The superin- tendent was safely disposed of in the state prison of Pigne- rol; just disgrace fell upon Councillor d'Ormesson and the other judges who had averted the

punishment Fouquet richly deserved; and many minor officials, convicted of peculation, were treated with great severity, some being banished, some sent to the galleys, some even hanged.

The office of superintendent and many others dependent upon it being abolished the supreme control of the finances was vested ina royalcouncil The sovereign was its presl- dent ; but Colbert, though for four years he only possessed the title of intendant, was its ruling spirit, great personal authority being conferred upon him by the king. The career on which Colbert now entered must not be judged svithout constant remembrance of the utter rottenness of the previous financial administration. His ruthlessness in this case, dangerous precedent as it was, was perhaps necessary ; individual interests could not be respected. Guilty officials having been severely punished, the fraudu- lent creditors of the Government remained to be dealt with. Colbert's method was simple. Some of the public loans were totally repudiated, and from others a percentage was cut off, which varied, at first according to his own decision, and afterwards according to that of the council which he established to examine all claims against the state.

Much more serious difficulties met his attempts to intro- duce equality in the pressure of the taxes on the various classes. To diminish the number of the privileged was impossible, but false claims to exemption were firmly resisted, and the unjust direct taxation was lightened by an increase of the indirect taxes, from which the privileged could not escape. The mode of collection was at the same time immenscly improved.

Order and economy being thus introduced into the working of the government, the country, according to Colbert's vast yet detailed plan, was' to be enriched by commerce. Manufactures were fostered in every way he could devise. New industries were established, inventors protected, workmen invited from foreign countries, French workmen absolutely prohibited to emigrate. To maintain the character of French goods in foreign markets, as well as to afford a guarantee to the home consumer, the quality and measure of each article were fixed by law, breach of the regulations being punished by public exposure of the delinquent and destruction of the goods, and, on the third offence, by the pillory. But whatever advantage

resulted from this rule was more than compensated by the disadvantages it entailed. The production of qualities which would have suited many purposes of consumption was prohibited, and the odious supervision which became necessary involved great waste of time and a stereotyped regularity which resisted all improvements. And other parts of Colbert's scheme deserve still less equivocal con- demnation. By his firm maintenance of the corporation system, each industry remained in the hands of certain privileged bourgeois; in this way, too, improvement was greatly discouraged ; while to the lower classes opportunities of advancement were closed. With regard to international commerce Colbert was equally unfortunate in not being in advance of his age ; the tariffs he published were protective to an extreme. The interests of internal commerce were, however, wisely consulted. Unable to abolish the duties on the passage of goods from province to province, he did what he could to induce the provinces to equalize them. 'The roads and canals were improved. The great canal of Languedoc was planned and constructed by Riquet under

was the establishment of the French marine.

Havre.

COLBERT

his patronage. To encourage trade with the Levant, Senegal, Guinea, and other places, privileges were granted to com-

panies; but, like the more importaut East India Company, all were unsuccessful. as well as of the failure of the colonies, on which he bestowed so much watchful care, was the narrowness and

The chief cause of this failure,

rigidity of the Government regulations.

The greatest and most lasting of Colbert's achievements The royal navy owed all to him, for the king thought only of military exploits. For its use, Colbert reconstructed the works

and arsenal of Toulon, founded the port and arsenal of

Rochefort, and the naval schools of Rochefort, Dieppe, and Saint-Malo, and fortified, with some assistance from Vauban (who, however, belonged to the party of his rival Luvois), among other ports those of Calais, Dunkirk, Brest, and To supply it with recruits he invented his famous system of classes, by which each seaman, according to the class in which he was placed, gave six months' service every three or four or five years. For three months after his term of service he was to receive half-pay ; pensions were promised ; and, in short, everything was done to make the navy popular. There was one department, however, that was supplied with men on a very different principle. Letters exist written by Colbert to the judges requiring them to sentence to the oar as many criminals as possible, including all those who had been condemned to death ; and the convict once chained to the bench, the expiration of his sentence was seldom allowed to bring him release. Mendicants also, against whom no crime had been proved, contraband dealers, those who had been engaged in insur- rections, and others immeasurably superior to the criminal class, nay, innocent men—Turkish, Russian, and negro slaves, and poor Iroquois Indians, whom the Canadians were ordered to entrap—were pressed into that terrible service. By these means the benches of the galleys were filled, and Colbert took no thought of the long unrelieved agony borne by those who filled them.

Nor was the mercantile marine forgotten. Encouragemerit was given to the building of ships in France by allowing a premium on those built at home, and imposing a duty on those brought from abroad ; and as French workmen were forbidden to emigrate, so French seamen were forbidden to serve foreigners on pain of death.

Even ecclesiastical affairs, though with these he had no official concern, did not altogether escape Colbert's atten- tion. He took a subordinate part in the struggle between the king and Rome as to the royal rights over vacant pishoprics ; and he seems to have sympathized with the proposal that was made to seize part of the wealth of the clergy. In his hatred of idleness, he ventured to suppress no less than seventeen fétes, and he had a project for lessening the number of those devoted to clerical and monastic life, by fixing the age for taking the vows some years later than was then

customary. With heresy he was at first unwilling to interfere, for he was aware of the commercial value of the Huguenots ; but when the king, under the influence of Mme. de Maintenon, resolved to make all France Catholic, he followed his Majesty, and urged his subordinates to do all that they could to promote conversions.

In art and literature Colbert took much interest. He possessed a remarkably fine private library, which he delighted to fill with valuable manuscripts from every part of Europe where France had placed a consul. He has the honour of having founded the Academy of Sciences (now called the Institut de France), the Observatory, which he employed Perrault to build and brought Cassini from Italy to superintend, the Academies of Inscriptions and Medals, of Architecture, and of Music, the French Academy at

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Rome, and Academies at Arles, Soissons, Nimes, and many other towns, and he reorganized the Academy of Painting and Sculpture which Richelieu had established. He was a member of the French Academy ; and one very characteristic rule, recorded to have been proposed by him with the intention of expediting the great Dictionary, in which he was much interested, was that no one should be

accounted present at any meeting unless he arrived before

the hour of commencement and remained till the hour for leaving. In 1673 he presided over the first exhibition of the works of living painters; and he enriched the Louvre

with hundreds of pictures and statues. He gave many pensions to men of letters, among whom we find Moliére, Corneille, Racine, Boileau, Huet, and Varillas, and even foreigners, as Huyghens, Vossius the geographer, Carlo Dati the Dellacruscan, and Heinsius the great Dutch scholar. There is evidence to show that by this munificence he hoped to draw out praises of his sovereign and himself ; but this motive certainly is far from accounting

for all the splendid, if in some cases specious, services that he rendered to literature, science, and art.

Indeed to everything that concerned the interests of

France Colbert devoted unsparing thought and toil. Be- sides all that has been mentioned, he found time to do something for the better administration of justice (the codification of ordinances, the diminishing of the number of judges, the reduction of the expense and length of trials), for the establishment of a superior system of police, and even for the improvement of the breed of horses and the increase of cattle. As superintendent of public buildings he enriched Paris with boulevards, quays, and triumphal arches ; he relaid the foundation-stone of the Louvre, and brought Bernin from Rome to be its architect'; and he erected its splendid colonnade upon the plan of Claude Perrault, by whom Bernin had been replaced. He was not permitted, however, to complete the work, being compelled to yield to the king's preference for residences outside Paris, and to devote himself to Marly and Versailles,

Amid all these public labours his private fortune was never negiected. While he was reforming the finances of the nation, and organizing its navy, he always found time to direct the management of his smallest farm. He died a millionaire, and left fine estates all over France. For his eldest son, who was created Marquis de Seignelay, he obtained the reversion of the office of minister of marine ; his second son became archbishop of Rouen ; and a third son, the Marquis d' Ormoy, became superintendent of buildings,

In estimating the value of Colbert's ministry, two distinct questions must be considered—What its results would have been in the absence of counteracting influences, over which he had no control, and what they actually Were. To the first it may be answered that France, peace ful, enriched by a wide-spread commerce, and freed from the weight of taxes, alike heavyand intrinsically mischievous, would probably have developed powers that would have enabled her to throw aside what was harmful in his policy, and possibly to attain liberty without the frenzied struggle of the Revolution. To the second question a very different teply must be given. What the great " ministre de la paix" built up was torn down, even as he built it, to erect the unholy fabric of his master's military glory. The war

department was in the hands of Colbert's great rival, Luvois; and to every appeal for peace Louis was deaf, He

'as deaf also to all the appeals against the other forms of his boundless extravagance which Colbert, with all his deference towards his sovereign, bravely ventured to make.! Se

1 See espacially a mémotre hein 1 i F re presented to the king in 1666, punlished in the Lettres, efc., de Colbert, vol. ii, ; a

Thus it came about that, only a few years after he had commenced to free the country from the weight of the loans and taxes which crushed her to the dust, Colbert was forced to heap upon her a new load of loans and taxes more heavy than the last. Henceforth his life was a hopeless struggle, and the financial and fiscal reform which, with the great exception of the establishment of the navy, was the most valuable service to France contemplated by him, came to nought.

Depressed by his failure, deeply wounded by the king's favour for Luvois, and worn out by overwork, Colbert's strength gaye way at a comparatively early age. In 1680 he was the constant victim of severe fevers, from which he recovered for a time through the use of quinine prescribed by an English physician. But in 1683, at the age of sixty-four, he was seized with a fatal illness, and on the 6th of September he expired. It was said that he died of a broken heart, and a conversation with the king is reported in which Louis disparagingly compared the buildings of Versailles, which Colbert was superintend- ing, with the works constructed by Luvois in Flanders. He took to bed, it is true, immediately afterwards, refusing to receive all messages from the king ; but his constitution was utterly broken before, and a post-mortem examination proved that he had been suffering from stone. His body was interred in the secrecy of night, for fear of outrage from the Parisians, by whom his name was cordially de- tested.

Colbert was a great statesman, who did much for France, and would have done vastly more had it been possible. Yet. his insight into political science was not deeper than that of his age; nor did he possess that superiority in

moral qualities which would have inspired him to bring ina reign of purity and righteousness. His rule was a very bad example of over-government. In popular liberty he did not believe ; the parliaments and the States-General received no support from him. The technicalities of justice he never allowed to interfere with his plans ; justice herself he sometimes commanded to stay her course, and beware of crushing any friend of his who happened to lie in her way. He trafficked in public offices for the profit of Mazarin and in his own behalf. He caused the suffering of thousands in the galleys ; he had no ear, it is said, for the cry of the suppliant. There was indeed a more human side to his character, as is shown in his letters, full of wise advice and affectionate care, to his children, his brothers, his cousins even. Yet to all outside he was "the manof marble." To diplomacy he never pretended; persuasion and deceit were not the weapons he employed; all his work was carried out by the iron hand of authority. He was a great states- men in that he conceived a magnificent yet practicable scheme for making France first among nations, and in that he possessed a matchless faculty for work, neither shrink- ing from the vastest undertakings nor scorning the most trivial details.

Numerous vies and éloges of Colbert have been published ; but the most thorough student of his life and administration was Pierre Clément, member of the Institute, who in 1846 published his Ve de Colbert, and in 1861 the first of the 9 vols. of the Lettres, instruc- tions, et mémoires de Colbert. The historical introductions prefixed to each of these volumes have been published by Mme. Clément

under the title of the Histoire de Colbert et dc son administration (1874). Among Colbert's papers are Mémoires sur les affaires de

jinance de France (written about 1663), a fragment entitled Particu-

larites secrétes de la vie du Roy, and other accounts of the earlier part of the reign of Louis XIY. (T. M. W.)

COLCHESTER, a market-town, municipal and parlia- mentary borough, and river-port of England, in the county of Essex, 51 miles from London by the Great Eastern Railway, on the Colne, which is there crossed by three bridges. The town within the walls forms an oblong of

about 108 acres; but new streets stretch far beyond these limits. Large alterations have taken place since the accession of Queen Victoria: the Middle Row and various other districts have been abolished or rebuilt ; the streets have been repaved, and a new supply of water obtained for the town. Of the buildings in Colchester of interest for their antiquity the first is the castle or keep, which occupies an area of 21,168 square feet (or nearly twice that of the White Tower of London), and thus forms the largest specimen extant of this department of Norman architecture. It was founded in 12th century by Eudo, the steward of

Arms of Colchester.

Henry I., to whom the city was also indebted for the Benedictine abbey of St John's now almost totally demolished. Of the churches the oldest is St Peter's, which like several others has been restored within receut years ; the remains of the church of St Botolph's priory, founded in the early part of the 12th century, present fine examples of Norman workmanship; and St James's, St Giles's, and St Leonard's at the Hythe are all of antiquarian interest. The last preserves some early frescoes. The present century has added largely to the number of the churches and chapels, and many of the newer buildings are not unworthy of the city in which they stand. Of secular structures the most important are the town hall, the county police station (formerly the county jail), the borough jail, the theatre, two corn exchanges, the Eastern Counties asylum for idiots and imbeciles, the Essex and Colchester hospital, the assembly rooms, and the public baths. The town also possesses a free grammar-school, with a scholarship at St John's College, Cambridge ; a literary institute with a library attached, botanic gardens, a literary, a medical, and other societies. Colchester is the centre of a large agricultural district, and has very extensive corn and cattle markets. Baize was formerly the principal manufacture ; but this has been superseded by silk, more especially the kind employed for umbrellas. The minor industrial establishments include flour-mills, vinegar-works, foundries, engineering works, rope-yards, printing offices, and lime- works, The import and export trade is conducted at the suburb of Hythe, to which vessels of 150 tons can come up the river. In 1874 the value of the imports

was £48,377, and of the exports £9173. The oyster fishery, for which the town has been famous for centuries, is not so extensive as it once was; but it is still carried on under the control of the Colchester town council, and measures are taken for its maintenance and development. The borough, which returns two members to parliament, has an area of 11,314 acres ; the population was in 1871 26,343, an increase since 1861 of 2534, and since 1801 of 14,823. Colchester is the head-quarters of the Eastern Military District.

That Colchester occupied the site of some important Roman city was all along abundantly evident ; butit is only within the present century that it has been definitively identified with Camulodunum. This Roman settlement was established by Claudius, to assist in the reduction of the fierce Silurians ; but its existence was jeopardized by the sudden rise of the Iceni to avenge the wrongs of Boadicea. The colonists were massacred, their houses burned, and the site left a mass of ruins. The Roman general, Suetonius Paullinus, how- ever, soon after recovered possession of the place; strong fortifica-

tions were erected, and the colony soon attained a high degree of prosperity. To the present day the walls then erected remain almost intact, and form one of the noblest specimens of Roman architecture in the island. Minor antiquities—such as Samian pottery, coins, articles of ornament—occur in the greatest profusion; and, both within the city and in the neighbourhood, numerous villas have been discovered, with tesselated pavements, hypocausts, and baths. The coins belong to all periods, down to the secession of the Romans from the island. On the arrival of the Saxons the old name of Camulodunum gave place to that of Colneceastor, or the Castrum on the Colne, which is still preserved in the present modification. In 921 the town was recovered from the Danes by Edward the Elder, and its fortifications were strengthened. At the time of the Domesday Book it was a place of decided importance, and in the reign of Edward III. it sent five ships and 140 seamen to the siege of Calais. . In 1848 and 1360 it was ravaged by the plague, which again visited it in the dreadful year of 1665. Meanwhile it was the scene of a memorable siege; having in 1648 declared

for the Royalists, it was captured by airfax, after an investment of eleven weeks, its gallant defenders, Sir C. Lucas and Sir C. Lisle, were

ut to Anais and the castle was dismantled. See Morant's Essex ;

ev. Henry Jenkins's 'Observations on the Site of Camulodunum" in vol. xxix. of the Archwologia, 1842, and the same author's Colchester Castle built as a Temple of Claudius Cesar, 1852 ; —. Edward A. Cutts's Colehester Castle not a Roman Temple,

COLCHESTER, Cuaries Azsot, Lorp (1757-1829),

born at Abingdon, was the son of Dr John Abbot, rector of All Saints, Colchester, and, by his mother's second marriage, half-brother of the famous Jeremy Bentham. From Westminster School, Charles Abbot passed to Christ Church College, Oxford, where he gained the chancellor's medal for Latin verse and the Vinerian Scholarship. In 1795, after having practised twelve years as a barrister, and published a treatise proposing the incorporation of the judicial system of Wales with that of England, he was appointed to the office previously held by his brother of clerk of the rules in the King's Bench ; and in June of the same year he was elected member of parliament for Helston, through the influence of the duke of Leeds. In 1796 Abbot commenced his career as a reformer in parliament, by obtaining the appointment of two committees,—the one to report on the arrangements which then existed as to temporary laws or laws about to expire, the other to devise methods for the better publication of new statutes. To the latter committee, and a second committee which he pro- posed some years later, it is owing that copies of new statutes were thenceforth sent to all magistrates and municipal bodies. To Abbot's efforts were also due the establishment of the Royal Record Commission, the reform of the system which allowed the public money to lie for some time at long interest in the hands of the public accountants, and, most important of all, the Act for taking the first census, that of 1801. On the formation of the Addington ministry in March 1801, Abbot became chief secretary and privy seal for Ireland; and in the February of the following year he was chosen speaker of the House of Commons—a position which he held with universal satisfaction till 1817, when an attack of erysipelas com- pelled him to retire, In response to an address to the Commons, he was raised to the peerage as Baron Col-

chester, with a pension of £4000, of which £3000 was to be continued to his heir. On the 8th May 1829, he died of erysipelas. His speeches against the Roman Catholic claims were published in 1828.

COLCHICUM, the Meadow Saffron, or Autumn Crocus (Colchicum autumnale), is a perennial plant of the natural order Melanthacee or Colchicacee, found wild in rich moist meadow-land in England and Ireland, in Middle and Southern Europe, and in the Swiss Alps. It has pale- purple flowers, rarely more than three in number; the perianth is funnel-shaped, and produced inferiorly into @ long slender tube, in the upper part of which the six stamens are inserted. The ovary is three-celled, and lies at the bottom of this tube. – The leaves are three or four

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number, flat, lanceolate, erect, and sheathing; and there is no stem. Propagation is by the formation of corms from the pareut bulb, and by seeds, The latter are numerous, round, reddish-brown, and of the size of black mustard- seeds. ‘The bulb of the meadow-saffron attains its full size in June or early in July. A smaller bulb is then formed from the old one, close to its root ; and this in September and October produces the crocus-like flowers. In the succeeding January or February it sends up its leaves, together with the ovary, which perfects its seeds during the summer. The young corm, at first about the diameter of the flower-stalk, grows continuously, till in the following July it attains the size of a small apricot. The parent bulb remains attached to the new one, aud keeps its form and size till April in the third year of its existence, after which it decays. In some cases a single corm produces several new plants during its second spring by giving rise to immature cornis,

Colchicum owes its medicinal properties to an alkaloid, named colchicine, which is present in all parts of the plant. It was discovered by Pelletier and Caventon, and was identified as distinct from veratrine by Geiger and Hesse in 1833. According to Oberlin, colchicine is a complex body, containing a crystallizable neutral sub- stance, colchiceine. Hiibler assigns to colchicine the formula C,,H,,NO,, and considers it to be isomeric with colehiceine

(Arch. der Pharm., tom. cxi. 194; Journ. de Pharm. et de Chim., tom. ii. 490, 4th ser). Itis an intensely bitter body, soluble in alcohol and water, but insoluble in ether, and is a powerful poison, small quantities causing violent vomiting and purging ; tannin, which precipitates it: from solution, has been recommended as an antidote for it. Colchicine is present in smaller quantity in the seeds than in the bulbs; and in the latter, according to Stolze, it is more abundant in Spring than in autumn ; Shroff, however, states that the corms for medicinal use should be collected after or during the time of flowering. The preparations of colchicum employed as medicine are the extract, made by macerating dried shreds of the bulbs in sherry or acetic acid, the expressed juice of the bulbs, purified and concentrated by heating, straining, and evaporation at a temperature below 160° Fahr., and an alcoholic tincture of the seeds. Whether swallowed or injected into the veins colchicum acts as an irritant of the stomach and intestines and a nervine sedative ; small doses stimulate the secreting and excreting functions, but when continued they impair the appetite, and much disturb the stomach, Large quantities produce vomiting, profuse perspiration, heat in the abdomen, cousiderable reduction of the rate of the pulse, and dysenteric symptoms, and may cause death from exhaustion.

Colchicum was known to the Greeks under the name of KoAxurdy, from Kodxis, or Colchis, a country in which the plant grew; and itis described by Dioscorides as ‘a poi the corms were worn by some of the German peasantry as a charm . The drug was little used”till 1763, when Baron 1enna introduced it for the treatment of dropsy. In

bt ee century for the cure of gout, owes its therapeutic virtues to colehicum ; but general attention was first directed by Sir Everard

i 1 : evidence that it produces any of its effects by

using an increage in the elimination of- urea and uric acid by the

; Dr Graves considers that colchicum operates in gout by

wa: the formation of uric acid in the system.

ae ; chicum may often be employed in acute rheumatism, in the atment of bronchitis, asthma, eruptions of the skin, and of

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dyspepsia in gouty patients ; also asa cholagogue instead of mer- curials. The “‘hermodactyl” of ancient writers 1s supposed to be the same as the modern drug of that name, which consists of the corms of a species of colchicum.

See Christison, Treatise on Poisons, 4th ed., Pp. 3881-6 (1845); Fliickiger and Hanbury, Pharmacographia, p. 636 (1874); Garrod, Gout and Rheumatic Gout, 3d ed. chap, xl. (1876); English Botany, ed. J.T. Boswell Syme, 3d ed. » VOl, Ix, p. 225 (1869); Balfour, Class Book of Botany, 3d ed., p. 931 (1871). On Colchicine, see Watts’s Chemical Dictionary, vol. 1.; Wurtz, Dictionnaire de Chimie, t. il.

COLCHIS, in ancient geography, a nearly triangular district of Asia Minor, at the eastern extremity of the Black Sea, was bounded on the N. by the Caucasus, which separated it from Asiatic Sarmatia, E. by Iberia and the Moutes Moschici, S. by Armenia and part of Pontus, and W. by the Euxine. The ancient district is represented by the modern province of Mingrelia, and part of Abasia. The name of Colchis is first found applied to this country by the Greek poets “Nschylus and Pindar. It was celebrated in Greek mythology as the destination of the Argonauts, the residence of Medea, and the special domain of sorcery. At a remote period it scems to have been incorporated with the Persian empire, though the inhabi- tants ultimately erected their territory into an independent state ; and in this condition it was found by Alexander the Great, when he invaded Persia. From this time till the era of the Mithridatic wars nothing is known of the history of Colchis. At the time of the Roman invasion it

seems to have paid a nominal homage to Mithridates, and

to have been ruled over by Machares, the second son of that monarch. On the defeat of Mithridates by Pompey, it became a Roman province. After the death of Pompey, Pharnaces, the son of Mithridates, rose in rebellion against the Roman yoke, subdued Colchis and Armenia, and made

head, though but for a short time, against the Roman arms.

After this Colchis was incorporated with Pontus, and the Colchians are not again alluded to in ancient history till the 6th century, when, along with the Abasci, they joined Chosroes I., king of Persia, in his war against Justinian. Colchis was inhabited by a number of tribes whose settle- ments lay chiefly along the shore of the Black Sea. The chicf of these were the Lazi, Moschi, Apside, Abasci, Sagadex, Suani, and Coraxi. These tribes differed so completely in language and appearance from the surrounding nations, that the ancients themselves originated various theories to account for the phenomenon. Herodotus, for example, believed them to have sprung from the relics of the army of Sesostris, and thus identified them with the Egyptians. Though this theory was not generally adopted by the ancients, it has been defended, but not with complete success, by some modern writers. From the first-named of these tribes, the Lazi, the country was latterly known as Terra Lazica.

COLDSTREAM, a town of Scotland, in Berwickshire, 15 miles west of Berwick, on the north bank of the Tweed, there crossed by a bridge of five.arches. It is situated on the principal thoroughfare between England and Scotland, and in the neighbourhood of the ford by which the Scotch and English armies were wont to cross the river in olden times. In the period before the Reformation it was the seat of a priory famous in history as the place where the Papal legate, in the reigu of Henry VIII., published a bull against the printing of the Scriptures ; and in the present century, by a curious irony of fate, the very site of the building was occupied by an establishment under Dr Adam Thomson for the production of Bibles at a low rate. Cold- stream, like Gretna Green, was formerly celebrated for its irregular marriages. The regiment of Foot Guards known as the “ Coldstream Guards” was so named from General Monk having set out with it from the town on his march into England in 1659. Population in 1871, 2619.

COLEBROOKE, Henry Tuomas (1765-1837), an eminent Oricntal scholar, the third son of Sir George, the

second baronet of that name, was born in London. He was educated at home; and when only fifteen he had made considerable attainments in classical and mathematical studies. From the age of twelve to sixteen he resided in France, and in 1782 was appointed to a writership in India. About a year after his arrival there he was placed in the Board of Accounts in Calcutta ; and three years later he was removed to a situation in the revenue department at Tirhoot, where he pursued his studies in Eastern science and literature. In 1789 he was removed to Purneah, where he investigated the resources of that part of the country, and published his Remarks on the Husbandry and Commerce of Bengal, in which he advocated free trade between Great Britain and India. After eleven years' residence in India, Colebrooke began the study of Sans- krit; and to him was confided the translation of the great digest of Hindu law, which had been left unfinished by Sir William Jones. After filling a number of important offices, and publishing some works on Oriental literature, including a Sanskrit grammar and dictionary, he returned to London, where he died, March 18, 1837. He was a director of the Asiatic Society, and many of the most valuable papers in the Society's Transactions were com- municated by him.

COLEOPTERA, or BrETLes, a vast and remarkably liomogeneous order of Insects, characterized, as the name implies (koAeds, a sheath, and mtepd, Wings), by the struc- ture of the upper wings, or elytra, as they are called, which are so modified as to form shields for the protection of the under wings—the true organs of flight in those insects. The name was given, and the principal characters of the order defined, by Aristotle ; and owing doubtless to their singular and varied forms and habits, the brilliant colouring and great size of numerous species, and that solid consist- ence which renders their collection and preservation com- paratively easy, Coleopterous insects have since the days of the Stagirite received the special attention of entomologists,

The body in Coleoptera is enclosed in a chitinous integu- ment of a more or less rigid consistence, and is somewhat oval in form, although in most cases greatly longer than

broad. In this respect, however, the utmost diversity pre-

vails even among the members of the same family, the form being modified to suit the habits of the insect. Thus, according to Bates, among the South American forms of Dermestide, the species of one group are cubical in shape, and live in dung; those of another, inhabiting the stems of palm trees, are much flatter; those of a third, only found under the bark of trees, are excessively depressed, some species being literally “as thin as a wafer ;” while the members of a fourth group of the same family are cylindri- cal in shape, and are woodborers, “ looking,” says Bates, “like animated gimlets, their pointed heads: being fixed in the wood, while their glossy bodies work rapidly round so as to create little streams of saw-dust from the holes” (Naturalist on the Amazons). The body, in common with that of all other insects, is divided into three parts,—head, thorax, andabdomen. The head, which .is usually rounded or somewhat triangular in shape (except in the Weevil tribe, where it is produced into an elongated rostrum or snout), bears the organs of the senses. The eyes of beetles are two in number and compound, and in predaceous species are somewhat protuberant, thus affording greater range of vision, ‘The simple eyes, or oceldi, common among butter- flies and moths, are almost unknown among beetles, although present in the larve, In many species, especially of Lamellicorn Beetles, these organs are more or less com- pletely divided by a process known as the canthus ; and in the Gyrinide, or Whirligigs, the intersection is so complete as to give the appearance of a pair of eyes on each side. In burrowing and cave-dwelling species, whose lives are

spent in almost total darkness, the eyes, although distinctly visible in the young, become more or less atrophied in the adult forms. organs of hearing, and by others of smell, are placed be- tween or in front of the eyes, and usually consist of 11 joints. different species, but in the two sexes of the same species, the most prevalent forms being the setaceous, moniliform, serrate, pectinate, clavate, and lamellate. In many groups the antennz are exceedingly short, while in such forms as the Longicorn Beetles they, in a few cases, measure four times the length of the body.

The two antenuz, supposed by sonie to be

These differ greatly in form and size, not only in

The parts which go to form the mouth are typically de- veloped in beetles, and for this among other reasons the order Coleoptera has generally been placed at the head of the class of insects. It is known as the masticatory mouth, and consists of the four parts (Plate VI. fig. 1). (1) The labrum, or upper lip, is usually a continuation of the upper surface of the head. (2) The mandibles, or true mastica- tory organs, consist of two powerful arched jaws generally dentated, moving horizontally and opposed to each other, the . teeth in some cases interlocking, in others, as in the Tiger Beetles, crossing like the blades in a pair of scissors. In many species they are so small as to be almost concealed within the cavity of the mouth, while in such forms as the Stag Beetles they measure half the Jength of the entire body. The form and texture of the mandibles are largely depen- dent on the nature of the insect's food, being acute and sharply dentated in predaceous species, and thick and blunt in vegetable feeders. Their margins are soft and flexible in those which feed on decaying animal and vegetable matters, while the entire mandibles are soft and flattened in those which live on fluids. (3) Tho mazile, or lesser

jaws, placed beneath the mandibles, and like them moving

horizontally, serve to hold the food and guide it to the mouth. Their extremities are in many cases furnished with a movable claw, and their inner surfaces with a series of bristles, which are probably of use in straining the juices from their food. The maxille are provided with a pair of appendages called maxillary palps—delicate organs that vibrate intensely, and are supposed to be principal organs of touch. (4) The Jabiwm, or lower lip, also provided with alps.

The thorax bears the organs of locomotion, consisting of three pairs of legs and two pairs of wings (Plate VI. fig. 2). The legs vary in their structure and development accord- ing to the habits of the species; thus in running and walking beetles these organs are usually of equal length, and generally similar in other respects, the anterior pair, however, being often stronger in the male than in the female; and in a few species, as the Harlequin Beetle, the anterior legs are enormously elongated and propor- tionately thickened. In burrowing beetles the anterior legs are developed into fossorial organs with broad and strongly dentated tarsi, and in arboreal forms the under side

of the tarsi is usually covered with hair, forming cushion-like sole terminating in toothed claws, by which they are enabled to keep their footing on the leaves and branches of trees, Water beetles generally have the posterior pair of legs elongated, flattened, and. ciliated, so as to form swimming organs; those known as Whirligigs using the middle and posterior pairs for this purpose, while the anterior limbs are employed as rudders; and jumping beetles, as Halticide, have the thighs of the posterior pair of legs greatly thickened for saltatory purposes (Plate VIII. fig. 10). The two anterior wings become solidified in beetles, and are thus rendered useless as organs of flight. They are termed elytra (ehu7poy @ shield), and serve to protect the delicate wings beneath, as well as the st¢gmata, or breathing pores, placed along

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The elytra are always present

the sides of the abdomen. except in the females of a few species, as the Glow-worm,

and are generally large enough to cover the upper surface of the abdomen and to conceal the under wings when they are exceedingly short, and the wings in these are only

at rest. In Brachelytrous Beetles, however,

shielded by being folded more than once beneath them.

The elytra when at rest meet on the middle of the back, their internal margins forming a straight longitudinal line or suture highly characteristic of the Coleoptera ; but even this character is not universal, as in the Oil Beetles (Meloé) and a few others the one elytron partly folds over the and membranaceous and form the true organs of flight, but they are much more frequently absent than the elytra, and where this occurs, as in many Carabideous Beetles, the latter During flight the elytra

other. The posterior wings are large, veined,

are more or less soldered together. are either extended horizontally or merely raised without being separated, as in the Rose-Chafers

heavy and seldom long sustained. Their weakness in this

respect is further shown in the- apparent inability of

many species suddenly to alter their course so as to avoid collision with any object that may unexpectedly come in their way, a defect popularly but erroneously attributed, in. the phrase “as blind as a beetle,” to weakness of sight rather than of wing. In certain water beetles (Dytiscide) a. pair of alule, or winglets, are developed at the inner angle of the elytra.

The colouring of the chitinous integument of beetles is often exceedingly brilliant, and the elytra and other parts

of many species are largely used in the manufacture of

personal ornaments. This colouring can in many instances be shown to bear a close resemblance to that of surrounding nature ; thus burrowing beetles, and those which dwell in subterranean caves, are generally black or brown ; Weevils, found on the ground, are carth-coloured 3 while arboreal species of this and other groups are of various shades of green. Bates found a species of beetle, on a particular tree in South America, which so resembled the bark on which it spent its existence as to be, when motionless, no longer visible. This assimilation in colour to surrounding nature is probably useful in assisting them to elude their enemies ; and when the markings are such as to render the beetle Conspicuous it is often provided with, and no doubt protected Y, an offensive odour or nauseous juices; thus the naturalist already mentioned found on a sandy beach two species of Tiger Beetles, the one of a pallid hue like the sand it ran upon, the other of a brilliant and conspicuous copper colour, but having “a strong, offensive, putrid, and musky odour,” from which the other was entirely frec. Fireflies, a group of Coleopterous insects, are also exceed- tngly conspicuous, but are similarly protected. The phenomena of mimicry, or the imitation of one animal by another for protective purposes, have been observed in Several instances among beetles. Mr Belt, in his interesting Work, The Naturalist in waragua, states that he captured what he Supposed was a hairy caterpillar, but On

closer inspection he found it to be a Longicorn Beetle, the antenne being concealed among the hair. Hairy caterpillars are almost universally rejected by insect- eating animals, and thus probably this beetle shared in the immunity from attack accorded to its model. A species of beetle found in South America closely resembles a bee found in the same locality, its body being covered with hair and its legs similarly tufted ; another, with yellow banded abdomen, sufficiently resembled a wasp as to make ts captor both cautious and timid in handling it at first, One of the Chrysomelidee (Orioceris merdigera) is said to

(Cetonia) ; and as might be expected from their general stoutness of body and comparative deficiency of wings, :the flight of beetles is

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disguise itself by covering its upper surface with its own dung; while many species to be afterwards noticed, when in danger, simulate death. Brilliant colouring in beetles is not as in some orders of animals a characteristic mainly of the male sex, both sexes being usually similar in this respect, while in those cases in which they differ, the female is generally the more gaudy insect. The chief external difference, however, between the sexes in many beetles is to be found in the presence of horns on the head and thorax of the males. These vary exccedingly in their development even in individuals of the same Species, while in their form they resemble the horns of the rhinoceros, and the antlers of the stag ; and as among mammals the reindecr is exceptional in the possession of antlers by both sexes, s0 among beetles there is at least one Species, Phancus lancifer, in which both male and female are similarly equipped. The male beetle has not been observed to use its horns either for purposes of offence or defence, some of the most pugnacious species being entirely destitute of them; and in Darwin’s opinion these appendages have been acquired merely as ornaments.

The abdomen of Coleopterous insects is sessile, that is, attached to the thorax by its’largest transverse diameter. On the under side it is always of a firm horny consistence, while the upper surface is generally soft, being protected by the elytra and wings ; when these, however, are absent or abbreviated, it is as hard above as below. It bears the organs of generation as well as the respiratory openings, or stygmata, which form the apertures

of the tracher by means of which air is disseminated through all parts of the insect system. Beetles belonging to several distinct families possess stridulating organs, and these are generally found in both sexes. The apparatus by which the sound, loud enough to be heard in many cases at some yards distance, is produced, consists of a couple of delicate rasps placed on the upper surface of the abdomen, on the elytra, or on the prothorax, and a scraper formed by the margins of the elytra, the edges of the abdominal segments, or the mesothorax, the rapid motion of the latter over the rasps producing the sound. In many cases, according to Darwin, the males only stridulate, the females being destitute of those organs, and in such cases the sound is employed as acall to the female; with most beetles, however, the stridulation proceeds from both sexes and serves as a mutual call. Beetles are entirely destitute of stinging organs, but a few are furnished with a retractile. tube, or ovpositor, at the extremity of the abdomen, by means of which they deposit their eggs in the cracks of wood and other suitable localities.

The eggs of beetles are deposited in a great variety of situations, and in the case of a certain group of Staphylinide found in the nests of white ants in South America, it was recently discovered by Schédte that the eggs are not deposited at all, but remain in the abdomen until they are hatched. These Ovo-viviparous beetles are only one-tenth of an inch in length, and have the abdominal region enormously distended and turned over so as to rest on the back. Dung beetles deposit their eggs in the midst of the manure on which the future larvee feed ; the Sacred Beetle of Egypt rolling each of hers about until a globular pellet is formed, when the whole is buried in the ground ; while the Sexton Beetle finds an appropriate 2¢dus for her eggs in the dead bodies of animals. One species of Cleride selects the nest of the solitary bee, another (Plate VII. fig. 31) that of the hive bee, while several species of Rose Beetles choose the nest of the ant for this purpose, The water beetles belonging to the genus Hydrophilus deposit their eggs in a single mass, which they surround with a oocoon, formed of a silky substance secreted by certain glands in the abdomen, and then either fix this to

the leaf of an aquatic plant or leave it to float on the surface of the water. Certain species of the Weevil tribe deposit their eggs on the leaves of trees, splitting the median nervures in several places, and afterwards rolling them up. In its progress from the egg to the perfect insect the beetle undergoes complete metamorphosis, passing from the larval

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the tail and make use of their larval covering as a protec- . tion to the nymph within. When the condition of nymph ; is assumed in autumn, no further change takes place till the ensuing spring, but under suitable conditions of heat

weeks, after which it emerges a full-blown beetle.

to the pupa stage, and remaining totally quiescent during the latter. Coleopterous larve generally consist of 13 segments, of which those forming the head and thorax are usually of a hard horny texture,—the mouth, as in the perfect insect, being masticatory, and the eyes, when present, simple, or ocell2. They have usually six legs, and prolegs, as in caterpillars, are occasionally present; but the larvee of many species are legless grubs, while in others the limbs are but feebly developed. In those groups in which the elytra are abbreviated, the larvee are exceedingly active and closely resemble the perfect insect. Like their parents the larve of beetles feed on living animals, on plants, or on decaying animal and vegetable substances, but greatly exceed the perfect insect in the quantity of food which they consume, and it is in this condition that beetles do most injury to field crops and forest trees. The larvee of burrowing beetles, known as 'White Worms," spend their existence in the earth, and are destitute of eyes ; those of the Stag Beetles and other wood-boring groups live in the trunks of decaying trees ; mealworms—the larve of Z'enebrio molitor——live enveloped in flour, and those of the Corn Weevil -n the heart of the wheat grain; while those of another species of Weevil make their homes in the fleshy parts of the receptacles of composite flowers. The larve of Oil Beetles (Afeloé), or at least certain species of them whose life-history has been observed, after leaving the egg, which the perfect insect has deposited just bencath the surface of the ground, climb upon the stems of plants, and take the first opportunity of attaching themselves to any

inscct that may happen to alight near them, and in this way they are occasionally conveyed into the hives of bees, in which alone they meet with their appropriate food. Only a few of them are thus fortunate, the majority of the larvze getting attached to the wrong insect, and so perishing of hunger. The species probably owes its preservation to the great number of eggs, amounting to upwards of 4000, deposited by: a single female. The larve of one group of water beetles, Iydrophilus, swim readily by means of their ciliated legs, those of another group, Dytiscus, make use also of their flexible abdomen provided at its extremity with a pair of leaf-like appendages (Plate VIL. fig. 6) ; while the Whirligig larvee (Gyrinus), in addition to ciliated swimming organs, are provided with four movable hooks on the posterior scgment, by which they are enabled to take extensive leaps (Plate VII. fig. 17). The duration of the larval state varies in different groups of beetles, being comparatively short in leaf-eating species, but lasting for three or four years in those which burrow in the earth or in wood. The larve in the latter case pass the winter in a torpid state, abstain- ing almost entirely from food, until awakened from their temporary trance by the return of genial weather, when they greedily attack their favourite food, and grow rapidly. In passing from the condition of a larva, the beetle does not, like the butterfly, assume a form altogether different from that of the perfect insect, but in the pupa or nymph state shows all the parts of the future insect, only in a condi- tion of almost complete immobility. In preparing for this quiescent period, the larve of many species surround themselves with a cocoon, consisting, in the case of the Scarabeide, of earth and small pieces of wood glued together with saliva, and in that of the Goliath Beetles, of mud. Others resemble the larvee of moths in constructing tubcs in which to undergo their transformations, while the larve of Lady-Birds—-Coccinella—suspend themselves by

this stage does not last usually for more than three or four)

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the total number

The number of known species of beetles is estimated at 70,000, and these are probably not more than one-half of | in existence—Great Britain alone possessing 3614 indigenous specics. They occur in greatest abundance in

the wooded parts of tropical regions. “A large proportion of the beetles of the tropics,” says Wallace, ‘Care more or less dependent on vegetation and particularly on timber, bark, and leaves in various stages of decay. In the untouched virgin forest the beetles are found at spots where trees have fallen through decay and old age.” The number gradually decreases towards the poles, only a few species occurring as far north as Greenland. ‘The six zoological provinces proposed by Mr Sclater in 1859 as applicable to the existing distribution of birds, have lately been shown by Mr A. R. Wallace, in his admirable work on the Geographical Distribution of Animals (1876), to mark off equally characteristic groups of Coleopterous insects, a conclusion arrived at from a study of the distribution of the following six important families :—

Cicindelide or Tiger Beetles, containing 35 genera and 803 species.

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Carabide or Ground Beetles, > ms ys “i

Cetoniide or Rose-Chafers, ny 3 970 Lucanide or Stag Beetles, 3 45 9 529) 5 Buprestide or Metallic Beetles, Ay lS » 2eSGaiies Longicornia or Long-horned Beetles ,, 1488 >, (oCGries

The Palearctic Region, which comprises Europe, Africa north of the Sahara, and Northern Asia, possesses about a 20,000 species of beetles, and is specially characterized by abundance of Carabide, nearly two-fifths of the entire number belonging to this region ; Longicorns are also well represented by 196 genera, of which 51 are peculiar to it. The Coleoptera of the Canary Islands, Madeira, and the Azores are Palearctic, but are peculiar in the total absence of such forms as the Tiger Beetles, the Chafers, and the Rose-Chafers, also in the great number of wingless species. The latter are specially numerous in groups of beetles peculiar to those islands, but they also occur in other cases, 22 genera which either usually or at least sometimes aro winged in Southern Europe having only wingless species in Madeira, while at least three species winged in Europe occur in those islands in an apterous condition. On the other hand, those species in Madeira which possess wings have them more largely developed than they are among.| allied continental forms ; the strong-winged and the wing- f less

thus appearing best suited to live in islands exposed, as these Atlantic groups are, to frequent storms. The Ethiopian Region, which includes Africa south of the Sahara and Madagascar, is specially rich in Cetonude, possessing 76, or more than half of the known genera, with 64 of these peculiar to it, of which no less than 21 are found exclusively in Madagascar. It has also 262 genera of Longicorns, 216 of which are peculiar. The Oriental Region, comprising Southern Asia and the islands adjacent, contains some of the most remarkable forms of Carabidae, as Mormolyce phyllodes, and is rich in gorgeous metallic beetles (Buprestide) and in Longicorns, having 360 genera of the latter, with 70 per cent. peculiar to it The Australian Region shows affinity with the Oriental in its Coleoptera ; it is equally rich in peculiar forms of Long} corns, and is the richest of all the regions in Buprestide, having 47, or more than one-half of the known genera, and 20 of these confined to it. Several genera belonging t0 this and other families have their species divided between the Australian and Neotropical or South American Regions,

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and this resemblance has given rise to the supposition that at some distant period a land connection existed between the two continents; it is more probable, however, as Wallace holds, “that it may have arisen from intercom- munication during the warm southern period when floating timber would occasionally transmit a few larve from island to island across the Antarctic seas.” The Neotropical Region comprehends southern and Central America and the West Indies, and is enormously rich in Longicorn Beetles, having no fewer than 516 genera, of which 487 are found nowhere else. The most remarkable fact in the distribution of the Stag Beetles (Lucanide) is their almost total absence from the tropical parts of this region, and their presence in North America, while in the old world they are specially characteristic of the hottest parts of the Oriental and Australian Regions. The Nearctic Region comprises the northern and temperate parts of America, and is comparatively poor in Coleoptera, showing greater affinity, however, with the Palearctic than with the con- tiguous Neotropical Region.

The insects belonging to this extensive Order comprise numerous well-defined and generally recognized families, but great diversity of opinion exists as to the best mode of grouping these together so as to exhibit their natural affinities, Geoffroy, a French naturalist, was the first to make use of the number of joints in the tarsi for this purpose, a method adopted and extended by Olivier, and brought into general use by Latreille. According to the tarsal system the Coleoptera are divided into the following four sections :—(1) PenTameEra, in which all the tarsi are fivejointed; (2) Hrrzromera, with five articulations to the first four tarsi and four to the posterior pair ; (3) TetRaAMERA, with four articulations to all the tarsi ; and (4) TrimmRA, with all the tarsi threejointed. – Macleay, an English naturalist, altogether rejected the tarsal system of Geoffroy, and founded his five primary divisions on characters derived from the larvee of those insects—a system adopted by Stephens in his Classification of British Insects, and by several other English writers on this subject. The tarsal system is toa large extent artificial, and when slavishly followed brings together forms which in other respects differ very widely, while separating many that are as obviously related. Its simplicity and consequent easiness of application have, in the absence of a more natural system, led to its very general adoption by both British and foreign naturalists, who do not, however, apply it where obviously unnatural.

PENTAMERA.—The majority of the beetles in this section have the tarsi of the feet five-jointed, and they comprise fully one-half of all the known species of Coleoptera. It is subdivided into the following 8 groups :—

I. Geodephaga, or Predaceous Land Beetles, resemble the succeeding group and differ from other Coleoptera in having the outer lobe of the maxillze distinct and articulated, thus appearing to possess six palpi. They are extremely active, their legs being admirably adapted for running; the majority are nocturnal in their habits, secreting themselves under stones and clods of earth ; and all are carnivorous, feeding on other insects and occasionally devouring individuals of their own species, while their larvae are equally predaceous. They are exceedingly numerous in temperate regions, and are eminently serviceable in checking the increase of insects which feed on fruit and grain. The mandibles, by which they seize and tear their living prey, are long horny organs, hooked and Sharp at the points, and

toothed on the inner edges. This group includes the Tiger Beetles, Cicindelidee (Plate VI. figs. 4, 9-12), so called from the fierceness of their disposition, and probably also from the spots and stripes With which the elytra are generally adorned. Most of the Species are diyrnal, frequenting hot sandy districts, enjoying

the bright sunshine, and flying for short distances with great velocity. They are elegant in form and adorned with

remarkable. Unfit, from the softness of their bodies and the slowness of their motions, effectually to protect them- selves from the attacks of their enemies, or to capture their prey on the surface of the ground, the larvie of the Tiger Beetles have recourse to stratagem in order to effect these purposes. By means of their short thick legs, assisted by their powerful sickle-shapcd jaws, they dig burrows in tho sandy banks which they frequent, vertical for some distance, and afterwards curving so as to become horizontal. These are about a foot' in depth, and within them the Tiger Beetle remains during its larval and pupa stages. In seeking its food the creature makes its way from the bottom of its den until the head segment, which is broad and flat, reaches the level of the ground, and thus blocks up the aperture of its tunnel. It remains fixed in this position by means of two bent hooks placed on the upper surface of the eighth segment, which is considerably thicker than tbe others, until an unsuspecting ant or other insect passing over or close to it is seized by its formidable jaws and speedily conveyed to the bottom of the pit-fall, where it is greedily devoured. Should the tunnels of different individuals happen to come in contact, the more powerful larva is said to devour its weaker neighbour. When full grown it closes the mouth of its burrow and there undergoes metamorphosis. The best known and most beautiful of British species is the Tiger Beetle, Cicindela campestris, of a sea-green colour with six whitish spots on the elytra. When handled it exhales, according to Westwood, a pleasant odour like that of roses. Ground beetles (Caralide) are generally less brilliant in colour than the Tiger forms, being more nocturnal in their habits, and with the jaws less formidably toothed. Many of the species are entirely aptcrous, with the elytra more or less soldered together, aud the majority of them secrete an acrid juice which they expel whcn menaced or attacked. Of the latter the most remarkable are the Bombardier Beetles,

Brachinus (Plate VI. fig. 8). These congregate together under stones, and when disturbed discharge a caustic fluid of an extremely penetrating odour, and so volatile that no sooner does it come in contact with the atmosphere than it passes into a vapour, accompanied by a considerable explosion, during which they seek to escape. When placed on the tongue this fluid causes a sharp pain and leaves a yellow spot somewhat similar to that produced by a drop of nitric acid. The Bombardiers are said to be capable of giving off as many as 18 of such discharges at a time. One of the most beautiful of European beetles is the Calosoma sycophanta (Plate VII. fig. 2), belonging to this group. Its body is of a deep violet colour, and the elytra, which are striated and punctured, are of a rich green and gold tint. Both in the larva and perfect states these beetles frequent the trunks and branches of the oak, where they find their favourite food—the large caterpillars of the Processionary Moth (Bombyx processionea), of which they devour enormous numbers, apparently undeterred by the hairs which clothe the body of the caterpillar, and which when seized by the human hand cause considerable pain. One of the most curious of Carabideous Beetles, Mormolyce phyllodes (Plate VI. fig. 5), is a native of Java. Its body is about 3 inches long and 14 inches across the elytra. The latter are flat, thin, and greatly dilated, while the other parts of the body are remarkably depressed, the beetle thus somewhat resembling the Orthopterous leaf-insects, and hence the specific name phyllodes, or leaf-like. Many of the ground beetles, such as the typical Carabt (Plate VI. figs. 6, 7) and the Calosoma, live in the sunshine and are generally brilliant in colouring ; others eae their existence — tg,

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in subterranean caves, and are both colourless and blind ; |

while such forms as Blennis areolatus, found on the coast of Normandy, live for the most part under water, being only found when the tide is low.

Il. Hydradephaga, or Carnivorous Water Beetles, are oval and somewhat depressed in form, with the tio posterior pairs of legs flattened and otherwise fitted for swimming. ‘They include the Diving Beetles (Dytiscus)

and the Whirligigs (Gyrinus). The former (Plate VII. figs. 3-7) occur in all quarters of the globe, and are truly amphibious, for although water is their favourite element, they survive for a long time on moist land, and most of them fly about in the evening and morning twilight with great power and speed. When needing to breathe they allow themselves to float on the surface of the water, raise their elytra, and expose their stigmata to the atmosphere, thus getting quit of exhausted air and obtaining a fresh supply, which ig stored up by closing the elytra. They are exceedingly voracious, devouring aquatic insects, as Hydrophilus piceus, much larger than themselves, and doing considerable damage in fish ponds by devouring the young fish. They are readily kept in confinement, having been known to live thus for 34 years, feeding on raw beef and insects. The larve are even more voracious than the perfect insects, sucking the juices of their prey through perforated mandibles, and protected from attack by their horny integuments. Whirligigs (Gyrinus) (Plate VIT. figs. 10, 11) differ from the Diving Beetles in the antenne, which are short and stout, and are so placed as somewhat to resemble ears. They are sociable creatures, and may be seen in ponds and ditches, congregated in groups varying from 2 to 100, swimming upon the surface with their backs above the water, and chasing each other in circles or darting about in more irregular gyrations. Unlike other water beetles their backs show a brilliant metallic lustre, and when darting about in the sunshine they look like pearls dancing on the surface. Their eyes are so divided as to appear to consist of two turned upwards and another pair looking downwards. The larve (Plate VII. fig. 17) are long, slender creatures somewhat resembling small centipedes, having each of the abdominal segments provided with a pair of slender ciliated appendages employed as organs of respiration as well as of locomotion, while the last segment is provided with four hooked organs by means of which they leap about.

Ill. Philhydrida, or Water-loving Beetles, are aquatic or subaquatic in their habits, being found in the water or on the moist margins of ponds and marshes. Along with the two following groups they feed on decaying animal and vegetable substances, and for this reason those insects have been classed together as Rhypophaga, or Cleansers. The antenne are short and clavate, and they are specially dis- tinguished from other aquatic forms by the great length of the maxillary palps, a feature which has procured for

them the name Palpicornes, often applied to them. The best known forms belong to the family Hydrophilide, of which one species, and that the largest, Hydrophilus piceus (Plate VII. fig. 32), is an inhabitant of Europe. This beetle is oval in form, and of a dark olive colour, and measures 1} inches in length. It uses its hind legs for swimming or rather paddling, moving them not together, as the true water beetles do, but alternately. Its movements in the water are thus slower than those of the former, but speed in this case is less necessary, their principal food consisting of aquatic leaves. In the larval stage, however, H. picews makes an approach to the true water beetles in its food, and is so ferocious as to have earned the name ver assassin on the Continent, The mode of respiration in the perfect insect is curious; unable to raise its upper surface above the water, it merely protrudes its head, and folding its club-

shaped antenne, the ends of which are slightly hollow, it thus conveys little bubbles of air beneath the surface of the water, where it brings them into contact with the tracheal openings. The larve swim with facility, and are provided at the posterior extremity with two appendages which serve to maintain them at the surface when they ascend to breathe,

IV. Necrophaga are the beetles of most service in re-

moving decaying animal matter, although a few species live on putrescent fungi, and others resemble the carnivorous groups in attacking and devouring the larve of other insects. They are chiefly marked by the form of the an- tennz, which are not much longer than the head, and get thickened or club-shaped at the extremity. This group comprises the Sexton Beetles (1 ecrophorus), of which Neerophorus vespillo (Plate VII. fig. 27) may be taken as the type. These insects have thick bodies and powerful limbs, and owe their popular name to the peculiar manner in which they provide a nidus for their eggs. Their sense of smell is exceedingly acute, and no sooner does one of the smaller quadrupeds, as mice or moles, die,

than several of those burying beetles, gathering about,

begin to remove the earth from beneath the dead animal, and in a few hours succeed in sinking the carcase beneath

the level of the ground, which they then cover over

with earth. Having thus prevented the body from being devoured by other carrion-eating animals, or from having its juices dried up by exposure to the sun, they make their way into the carcase and there deposit their eggs. Several individuals generally work together in this grave-digging operation, although Mecrophorus germanicus is said to labour alone, and they have been known to show

considerable intelligence in performing this operation ; thus Gleiditsch states that in order to get possession of the

body of a mole, fixed on the end of a stick, they under-

mined the latter and thus brought the dead body to the ground. The larve on leaving the egg thus find them- selves surrounded by an abundance of food; and when full grown they bury themselves fully a foot beneath the surface of the ground, where they forni an oval chamber, the walls of which are strengthened by a coating of a gluey liquid, and in which they undergo metamorphosis. Shield Beetles (Silpha) (Plate VII. fig. 22)—so called from the flattened form of their bodies, feed chiefly on carrion; some, however, climb upon plants, particularly the stems of wheat and other grain, where they find small helices on which they prey ; while others, as Silpha punctata, dwell on trees and devour caterpillars. They exhale a disagree-able odour, probably arising from the nature of their food, and when they are seized a thick dark-coloured liquid exudes from their bodies. The Dermestide are a family of small but widely-distributed beetles, which work great havoc among skins, furs, leather, and the dried or stuffed animals in museums. The perfect insects are timid creatures, which when disturbed fold their short contractile feet under their bodies, and, remaining perfectly motionless, admirably counterfeit death. The mischief is mainly wrought by the larve. These shed their skins several times, and take nearly a year in attaining their full growth. One of the most common and injurious species of this family is the Bacon Beetle (Dermestes lardarius) (Plate VIL fig. 14) —so called from its fondness for lard, but equally ready to attack the furrier’s wares. Their tastes are exceedingly general, as they have been known to destroy a whole cargo of cork and even to perforate asbestos, The larvee of Anthrenus museorum, a species not exceeding one tenth of an inch

in length, is exceedingly injurious to collections of insects, among which it eludes observation by its minuteness and by working in the interior of the spech mens, which are thus ruined before the damage is observed.

V. Brachelytra (Plate VII. figs. 12, 15 20) are readily

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COLEOPTERA

distinguished from the other groups of beetles by having the elytra much shorter than the abdomen, although they still suffice to cover the long membranous wings, which when not in use are completely folded beneath. The abdo- men is long and exceedingly mobile, and is employed in folding and unfolding the wings. It is furnished at its extremity with two vesicles which can be protruded or withdrawn at pleasure, and from which, when irritated, many species emit a most disagreeable odour, although in a few the scent is more pleasing; “one species,” says Kirby, “ which I once took, smelt precisely like a fine high scented pear, another like the water-lily, a third like water- eresses, and a fourth like saffron.” They aro very voracious both in the larval and perfect states, feeding chiefly upon decaying animal and vegetable matters, although a few species devour living prey. Many of the smaller forms reside in and feed on mushrooms, some are found abundantly under putrescent plants, others in manure heaps, where they feed upon the maggots of flies, while there are a few forms which make their homes in the nests of the hornet and the ant. The larves bear a con- siderable resemblance to their parents in form and habits, and have the terminal segment of the abdomen prolonged into a tube with two conical and hairy appendages attached. The Brachelytrous beetles form an extensive group, almost entirely confined to the temperate regions of the northern hemisphere, Great Britain alone possessing nearly 800 species. They are familiarly known in thig country as Cock-tails, one of the largest and most familiar species being that known as the Devil’s Coach-horse (Goérius olens) It is about an inch in length, of a black colour, and its eggs are larger than those of any other British insect, It may often be seen crossing garden walks; and when approached or otherwise threatened, it immediately assumes a most ferocious aspect and attitude, elevating its head and opening wide its formidable jaws, raising and throwing back its

tail after the manner of the scorpion, protruding its anal vesicles, and emitting a disagreeable odour. It is carnivorous.

VL Clavicornes have the antenne terminating in a solid or perfoliated club, and include the Pill Beetles (Byrrhide) and the Mimic Beetles (Histeride). The former are small insects, generally short, oval, and highly convex, although a few species found under the bark of trees are flattened. They most frequently occur in sand- pits and on pathways, and when in danger withdraw their highly contractile legs into cavities prepared for them on the under side of the body, at the same time folding up their antenne and remaining motionless, In this condition they may readily be mistaken for oval seeds or pills, hence the common name. The Mimic Beetles (Plate VII. fig. 13) seldom exceed one-third of an inch in length, and are of very solid consistence, their elytra being so hard that the pin of the entomologist is with difficulty made to enter. They are somewhat square in form, with the upper surface highly polished, feeding chiefly on putrid substances and found in great abundance in spring on the dung of oxen and horses. Like Pill Beetles they roll themselves Up on the approach of danger and feign death with great perseverance, and to this they owe their generic name

ster, from histrio, a stage mimic.

VIL Lamellicornes comprise a vast assemblage of beetles, many of which, especially such as feed on flowers and living Plants, are remarkable alike for beauty of form and splendour of colour. They are distinguished by the form of their antenn, which always terminate in a club Composed of several leaf-like Joints, disposed like the spokes of @ fan, the leaves of a book, or the teeth of a comb, or ina Series of funnels Placed above and within each other. The males often differ from the females in having horn-like

projections on the head and thorax, and in the greater size of their mandibles. They are all Winged insects, althouch somewhat dull and heavy in their flight ; and alike in ihe larval and perfect states they are herbivorous, feeding either on living vegetation and flowers or on putrescent plants and excrementitious substances. ‘The following species may be regarded as illustrative of the most important subdivisons of the

Lamellicorn Beetles :—Stag Beetles (Lucanide) (Plate VIII. fig. 14), with the club of the antenne com- posed of leaflets disposed perpendicularly to its axis like the teeth of a comb, owe their most striking feature to the immense development of the mandibles in the males, the purpose served by these formidable looking organs being by no means fully understood. The males appear to be more numerous than the females, and fierce contests take place among the former for possession of the latter. The Stag Beetle (Lucanus cervus), of a uniform brown colour, measures 2 inches in length including the mandibles, and is the largest of British beetles. It inhabits woods, passing its immature stages in the interior of the oak and beech, and may be seen flying in the evening in search of the female. It has a patch of golden-coloured hair towards the base of the foreleg with which it cleans its autenne after these have been in contact with auy sticky substance, After coupling and depositing their eggs both sexes soon die. The Dor Beetle (Geotrupes stercorarius, is the type of a large tribe of dung-eating beetles (Plate VII. figs. 21, 25, 26). It is a black insect, with brilliant metallic blue or purple reflections on the under side, and well known as “wheeling its drowsy flight ” during fine evenings. This it does in search of a patch of cow-dung, through which it makes its way until reaching the ground, where it bores a perpendicular tunnel about 8 inches deep, and as wide as a man’s finger; then ascending to the surface it conveys a, quantity of dung to the bottom, and on this it proceeds to deposit an egg; another layer of the samo material and another egg follow until the entire shaft is filled. The larvee on leaving the egg thus find themselves surrounded with their appropriate food. The Sacred Beetle of Egypt, Ateuchus sacer (Plate VIL. fig. 2 9), somewhat resembles the Dor in form and habits. After depositing her egg ona piece of dung the female rolls the mass about in the sun. shine with her forelegs until it forms a rounded ball. The process of hatching is thus accelerated, and a thin hardened crust is formed around the softer material inclosing the egg. A hole is then dug in the earth by means of its powerful forelegs, into which the ball is rolled and then covered over with earth, where it remains until fully developed. Those beetles show great perseverance in conveying the egg-laden pellets to their destination, fre- quently carrying them over rough ground on the broad flat surface of their heads, and seeking, when unable singly to complete the work, the assistance of their fellows. Two species of Sacred Beetles were worshipped by the ancient Egyptians, who regarded them as emblems of fertility, and as

representing the resurrection of the soul, owing to their sudden appearance in great numbers on the banks of the Nile after the annual subsidence of that river. They form a conspicuous feature in the hieroglyphics of that nation, and are found sculptured on their monuments, sometimes of gigantic size. They were also formed into separate figures, as seals and amulets, made of gold and other precious materials, and hung around the necks of the living, or buried along with their mummies. The insect itself ig sometimes found in their coffins. The male Hercules Beetle (Scarabeus hercules) of Guiana has the head pro- duced into an enormous horn, bent downwards at the ex- tremity, and clothed on the under surface with a reddish brown pile, and measures 6 inches in length. The Cock- chafers, Melolonthide (Plate VII. fig. 28), have a short

families. ‘“‘ Nothing can excecd,” says Westwood, “ the splendour of colour in many of the species, being decorated with the most brilliant metallic tints ; some have a general coppery hue, whilst some present the beautiful contrast of fine yellow spots and marks upon a highly polished blue or green ground, and others exhibit the appearance of burnished gold or of rubies, inlaid on emerald or ebony.” The elytra of the Metallic Beetles are those usually employed in the embroidery of ladies’ dresses and for other purposes of personal ornament. They are most plentiful in tho thick forests of tropical countries, and seem partial to the various species of fir- trees. They pass their larval stage in the heart of timber, and there is an instance recorded of the escape of Buprestis splendens from the wood of a desk which had stood in one of the Guildhall offices for over twenty years. Springing Beetles, Hlateride (Plate VII. fig. 30), are narrower and more elongate than the former, and their legs are so short that when they fall on their backs they are as unable to right themselves as a capsized turtle, but by bending the head and thorax back- wards, and making use of the prolongation already described, they are enabled to spring to a height fully ten times their own length, and this operation they repeat until they fall on their feet. The noise which accompanies the springing process has earned for them the name of Click Beetles. Some species of Hlateride are luminous in the dark, and are known as Fireflies. A South American form diffuses during the night from its thoracic spots a strong and beautiful light

sufficient to enable a person to read ordinary type, particularly if several are placed together in a glass vessel. By means of this natural illumination the women of the country can pursue their ordinary work, and ladies use this fire-fly as an ornament, placing it among their tresses during thcir evening pro- menades, The larva of Elater lineatus is known as the Wire-worm, a grub which often does great damage to the turnip crop. The Malacodermata include the Glow- worms, Lampyride (Plate VII. fig. 1), of which the best known is the common Glow-worm (Lampyris noctiluca) (Plate VII. figs. 8, 9, 16), found in meadows and under hedges in England, but rare in Scotland. The male of this beetle has large wings and elytra, and flies swiftly, but the female is wingless and is a sluggish nocturnal creature ; the latter, however, emits a beautiful phosphorescent light, by means of which the male, who is generally concealed by day in the trunks of trees, is directed to his mate. In the perfect insect the luminous matter chiefly occupies the under part of the three last segments of the abdomen, which differ from the rest in colour, being usually of a yellow hue, and the luminous property is apparently under the control of the Glow-worm, for when approached it may frequently be observed to diminish or extinguish its light. Iu form the larvee somewhat resemble the female, and possess in common with the pups and eggs a slight degree of luminosity. The larvee are predaccous, attacking and devouring the smaller snails and slugs, but in the perfect state they become entirely herbivorous, only eating the tender leaves of plants. Many of the Mualacodermata are wood-borers ; these include the Death-watch Beetles (Anobium), which as larvee perforate chairs, tables, and other wood-work in such numbers as usually to render the wood completely rotten. During the pairing scason they make a noise like the ticking of a watch, by striking with their jaws against the object on which they rest. This 18 intended as a mutual call of the sexes, but it has long been regarded by the ignorant as of evil omen, lence tho name, and the import of Gay’s words—

labrum and strong mandibles suited for feeding on leaves. The club of the antennw consists of a variable number of plates, those in the male being considerably elongated and resembling a folded fan (Plate VII. fig. 23). The common Cockchafer (Jfelolontha vulgaris) is of a pitchy black colour clothed with a white pubescence or layer of minute scales. It is one of the commonest and most destructive of beetles, feeding in the perfect state on

the leaves of the oak, becch, poplar, and elm, and sometimes appearing in such numbers as to utterly destroy the foliage over large districts; thus in the year 1688 they are said to have covered the hedges and trees in a district of Galway 1n such infinite numbers as to have hung in clusters like bees when they swarm. When on the wing they almost dark- ened the light of day, and when feeding the noise of their jaws might have been mistaken for the sawing of timber. In a short time the foliage of the trees for miles round was so totally consumed that at midsummer the country wore the aspect of leafless winter. Destructive as they are 1n the perfect state they are still more injurious as larvee. The female buries herself beneath the surface of the ground and there deposits about 40 eggs. The larvee produced from these feed on the roots of grass and grain, thus "under- mining," according to Kirby and Spence, "the richest meadows, and so loosening the turf that it will roll up as if cut with a turfing spade." These grubs continue their ravages for three years before undergoing metamorphosis, and thus do incalculable damage to the agriculturist. 'They are believed to have spread with the progress of agri- culture, for it is only on soil rendered light and porous by tillage that they thrive. Enormous numbers of the grub are consumed by birds of the crow tribe, and it is princi- pally in search of these that rooks so industriously follow the plough in England and France. The species is rare in Scotland. "Spinning" the cockchafer is a favourite but barbarous sport, practised by the boys of most countries in which this beetle commonly occurs, and seems to be at least as ancient as the time of Aristophanes, who refers to it in his Clouds as practised by the youth of Greece. Rose Beetles, Cetoniide (Plate VIII. fig. 7), a beautiful tribe of insects, are distinguished from other Lamellicorn Beetles by the membranaceous character of their mandibles and niaxille. The Rose-Chafer (Cetonia aurata) is common in the south of England, where it feeds on the juices and petals of the rose, honeysuckle, and privet. It is about an inch long, of a brilliant-golden green above with coppery reflections beneath, and with whitish markings on the elytra. Its eggs are deposited among decayed wood, but certain species make use for this purpose of the nests of ants, The Goliath Beetles (Plate VIII. fig. 11) of tropical Africa are the largest of known Coleoptera, and their larve form enormous cocoons of mud in which they under- go metamorphosis. One of these, Goliathus cacicus, is gaid to be roasted and eaten by the natives.

VILL. Serricornes form a group of beetles chiefly distin- guished from the others by their elongate filiform antenna of equal thickness throughout, or tapering towards the extremity, but generally serrated or pectinated. They are subdivided into the Sternowi, characterized by the solid con- gistence of their bodies, and by having the middle portion of the thorax elongated and advanced as far as beneath the mouth, and usually marked by a groove on each side, in which the short antenne are lodged, while the opposite extremity is prolonged into a point which is received into a cavity on the hinder part of the breast; .and the Afala- codermata, characterized by their bodies being generally, in whole or in part, of a soft or flexible texture, and by the absence of the prolongation just referred to. The Sternowi include the Metallic Beetles, Buprestide (Plate VIL. figs. 18 19) the most gorgeous of the Coleopterous

‘‘ The solemn death-watch clicked the hour she died. — Another species, Lymerylon navale, abundant in the forests

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of Northern Europe, does great damage by boring into the timber of the oak tree. ;

HetEromera.—The beetles comprising this section have five joints to the first four tarsi, and four to the posterior pair, and form two groups, Z’rachelia and Atrachelia.

I Zrachelia have the head triangular or heart-shaped, and connected with the thorax by a kind of neck or abrupt pedicle. Most of the species in the perfect state live on various plants, of which they devour the foliage or suck the juices, and many when seized bend their heads, contract their limbs, and simulate death. This group includes the Oil Beetles (Afelée) (Plate VIII. fig. 2), large black insects, destitute of wings, and with short elytra. They secrete an oily fluid possessing slightly blistering properties, which when alarmed they emit from the joints of their legs, and when eaten by cattle, as they sometimes are when feeding on the wild buttercups of pasture-lands, they produce sores in the mouth. In some parts of Spain they are used instead of the Blistering Fly, or are mixed with it. The young larvee of several species of Oil Beetles, it has been ascertained, get conveyed to the

nests of bees, where alone they can find their appropriate food, and where also they undergo metamorphosis. The most important insect of this group is the Spanish Fly, or Blistering Beetle (Zytta vesicatoria) (Plate VILL. fig. 19), found abundantly in South- Western Europe, but of rare occurrence in England. It is a handsome insect of a golden green colour, and measures about three-fourths of an inch in length. In Spain, where this species is most abundant, they are collected for commercial purposes in the month of June. A sheet is placed beneath the trees frequented by the blister-flies, and the branches are shaken, so as to cause the insects to fall off. They are then killed by exposure to the vapour of vinegar, and completely dried after they are dead. The blistering principle, known to chemists as cantharadin, is contained in their integuments. See CaANTHARIDES,

Il. The Atrachelia have no distinct neck, the part of the head behind the eyes being immersed in the thorax, They are in most cases nocturnal insects, obscure in colour, and slow inmotion. The Church-yard Beetle (Blaps mortisaga) (Plate VIII. fig. 1) is one of the commonest species. It is of a shining black colour, avoids the light, and emits an offensive odour. It is found in cellars, store-rooms, and the neglected parts of houses, feeding on rubbish of all kinds, and regarded as of evil omen by the superstitious. It is very tenacious of life, having been known to survive several hours immersion in spirits of wine, and cuses are on record in which the larvee have been discharged from the human stomach. The Meal-worm is the larva of Tenebrio molitor (Plate VIII. figs. 4, 5), a well-known insect belonging to this group, which appears in the evening in the least frequented parts of houses. Itis foundabundantly in flour-mills and bake-houses, greatly relishing the heat of the latter. The larvae, which are long, cylindrical, and of an ochry yellow colour, pass their lives enveloped in the flour which forms their favourite food, and in the midst of which they become pupe. While injurious to flour and bran, and destroying great quantities of ship biscuits, the Meal-worm is used as bait by fishermen, and as food for the nightingale and other pet insectivorous birds.

TETRAMERA.—The beetles composing this section have four apparent joints to all the tarsi, but in most cases the tarsi are in reality five-j ointed, the fourth being so minute as to have been overlooked by the founders of the tarsal system. For this Teason Westwood proposed the term Pseudo-

tetramera in place of Tetramera, a change which has been adopted by several systematic writers. This section in- cludes a vast number of small or moderate sized beetles, all

a feeders, found in the perfect state on flowers ana ants,

It is subdivided into the three following groups:— |

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I. Lthynchophora, the species of which are readily re- cognized by having the front of the head produced into a rostrum or snout, which bears the organs of the mouth at its extremity. The larve are either entirely destitute of legs, or have them in the form of small fleshy tubercles, and are in most cases equally destitute of eyes. The most numerous and best-known tribe of Rhynchophorous beetles are the Weevils (Plate VIII. figs. 8, 9, 15, 16, 20, 22), of which several thousand species have been described, and whose larve, dwelling in the interior of fruits and seeds, do immense damage to the produce of the farmer, the grain dealer, and the horticulturist. They are generally minute in size and exceedingly varied in colour, the South American forms, known as Diamond Beetles, being among the most gorgeous of insects. These owe their colour, which in the finest of them is o light-green tinged with golden yellow, to the presence of minute scales on the elytra. The Weevil par excellence (Calandra granaria) measures about one-eighth of an inch in length, is of a pitchy red colour, and does great damage in granaries. The female buries herself among the grains of wheat, in each of which she bores a small hole, where she deposits a single egg, thereafter closing the aperture with a glutinous secretion. The egg is soon hatched, and the larva, furnished with two strong mandibles, eats out the interior of the grain, becomes a nymph, and in the course of eight or ten days is transformed into the perfect insect, ready to raise another brood. The whole time occupied with their reproduction, from the union of the sexes to the appearance of the perfect Weevil, is not more than 50 days, and it has been calculated that from a single pair 23,600 individuals may thus take origin in a single season. Grain injured by these insects is readily detected, from the fact that it floats when immersed in water. Kiln-drying the grain is the mode most generally adopted for arresting the evil. Filberts, acorns, rice, the sugar-cane, and the palm tree have each its own species of Weevil.

The Palm Tree Weevil (Calandra palmarum) is the largest of the tribe, measuring 2 inches in length, and its larve, as well as those of the sugar-cane species, are, when cooked, considered delicacies by the natives of Guiana and the West Indies. Bruchus pisi (Plate VIII fig. 12), belonging to another family of this group, deposits its eggs in peas, the interior of which is devoured by the larva. It has probably been introduced into Britain from America, where its ravages are occasionally such as totally to destroy the pea crop over large districts, The larve of many species burrow beneath the bark of trees and thus destroy immense quantities of timber. Of these the most familiar are Scolytus destructor, whose curiously designed burrows in the bark of the elm are well known, and the Typographic Beetle (Zomicus typographicus), so called from the resemblance which its burrows, made in the soft wood immediately beneath the bark, bear to printed characters. II. Longicornes (Plate VIII. fig. 13) form an extensive group of beetles characteristic of tropical forests, and readily distinguished by the great length of their antenne, which in some cases are several times longer than the body. These-are usually setaceous or filiform, and are occasionally adorned with tufts of hair at the joints (Plate VIII. fig. 3). The larvze of almost all the Longicorns live in the interior, or beneath the bark, of trees, perforating the timber of the largest forest trees, and thus hastening in these the natural process of decay. They are either apodal, or furnished with inconspicuous feet, but progress chiefly by the aid of small tubercles on the upper and under surfaces of the segments. The female is provided with an ovipositor of horny consistence, issuing from the posterior segment, by means of which the eggs are deposited in cracks and fissures of wood. The larvee remain for several years buried in the

heart of timber, and in this way many exotic species are conveyed to this country, and are occasionally taken alive in the London and Liverpool docks. Several of the Longicorn Beetles are among the largest of Coleopterous insects, Prionus giganteus measuring 5 inches in length, while its eggs are nearly as large as those of the smaller birds. The Harlequin Beetle (Acrocinus longimanus), So called from the variety of its colouring, the grotesqueness ofits markings, and the enormous elongation of its front pair of legs, is a South American species of this group, as is also the Musk

Beetle (Callichroma moschata), one of the handsomest of our native species, aud remarkable for the musky odour of its body.

Ill. Phytophaga comprise the tetramerous beetles which have neither the rostrum of the first group nor the lengthened antenna of the second. They are small insects of an oval or quadrate shape, and include the Golden Beetles, Chrysomelide (Plate VIII. fig. 21), ornamented with metallic colours, among which blue, green, gold, and copper are conspicuous. The Turnip-fly (Haltica nemorum), a small species belonging to a family in which the posterior thighs are enlarged for leaping, devours the young leaves of the turnip as soon as they appear above ground, and occasionally does immense injury to the turnip crop. Helmet or Tortoise Beetles, Casside (Plate VIII. figs. 20, 24), so called from the thorax and elytra overlapping so as to shield the limbs and abdomen on all sides, are oval, and in some cases almost square, flat insects, and often beautifully marked with combinations of greeu and golden hues, They are herbivorous, aud are specially fond of artichoke and thistles. The larve are provided at the posterior extremity with a two-branched fork, curved over the back, and usually bearing a pile of excrementitious matter, under which they lie partly concealed. It can elevate or depress this stercoraceous parasol at pleasure, according as it needs shade or shelter. The Colorado Potato Beetle (Doryphora decemlineata) belongs to the phytophagous family Chrysomelide. Tt measures nearly half an inch in length; its body is of a tawny or yellow cream colour, darkly spotted ; and the elytra are marked with ten black longitudinal stripes. It is a native of the eastern slopes of the Rocky Mountains, where it fed on a wild solanaceous plant, Solanum rostratum, until the introduction of the potato plant, consequent on the settle- ment and cultivation of the “Far West,” provided it with what appears to have been a more appropriate food. Since 1859 it has travelled eastward, towards the more highly cultivated lands, at the rate of nearly 100 miles per annum, until it has reached the Atlantic Coast. It is now found over all the central and northern parts of the United States east of the Rocky Mountains, and throughout Canada, and has already done incalculable mischief to the potato crops of those regions. The damage is chiefly wrought by the larve, which are hatched on, and greedily devour, the leaves and stalk of the potato plant. They are said to produce three broods annually.

TRIMERA.—The majority of the beetles composing this section have only three apparent joints to the tarsi of all the feet, but a small articulation has been found to lie be- tween the second and third joints, so that they are in reality fourjointed, and for this reason Westwood has changed the name of the-section to Pseudotrimera.

Trimerous beetles form a single group, the species of which are partly herbivorous, feeding on fungi (Plate VITI. figs. 17, 18), and partly carnivorous, devouring apiudes or plant lice. The most familiar examples of this group are Lady-birds, Coccinellide (Plate VIII. fig. 23), small con- vex insects of a black colour, spotted with red or yellow, or of a reddish colour, spotted with black. The larve do great service by devouring the plant lice, which usually

has a very disagreeable odour.

bushes. When alarmed the Lady-birds retract their limbs and emit a yellow juice from their joints, which They occasionally occur in great numbers, extending for miles, in the south-eastern districts of England, where they are invaluable for freeing the hops of gphides. They walk slowly but fly well. The Seven-Spotted Lady-bird (Coccinella 7-punctata), the com- mon species of Britain, is found in all quarters of the globe, – On CoLLEecTING AND PRESERVING CoLEoPTEROUS In- sEcTs.—The collector of beetles, in order to obtain perfect specimens, need not have recourse to the plan adopted by the lepidopterist of rearing the insect from the egg. The successful rearing of these is much more difficult than in the case of butterflies and moths, and the specimens so procured are generally inferior to those collected in the ordinary way. ‘The complete life history, however, of com- paratively few even of our native species has yet been fully traced; and although the collector thus might not greatly enrich his cabinet with specimens of his own rearing, yet by adopting this method he would almost certainly add to the general stock of knowledge regarding the transforma- tions of these insects. Beetles may often be obtained in what may be termed accidental situations,—sand-pits into which they have fallen, or artificial

traps set for them, as a white sheet spread on the grass; but ‘ ‘sweeping” and “beating” are the means mainly relied on by the coleopterist for filling his cabinet, and for these all the apparatus neces- sary consists of an umbrella-net and a stick for beating. The net is swept over the grass, and among the foliage of trees, and when the branches are shaken with the hand, or beaten with the stick, the net is held beneath to catch the falling insects. An umbrella inverted, or a sheet placed beneath the tree, serves the same purpose. A knowledge of the habits of the various tribes of beetles will give the collector a clue to the localities in which, and the time when, he may expect to find the species he is in search of. In this way the bark and timber of trees, decaying branches and leaves, putrescent fungi, the droppings and the dead bodies of mammals, fresh water ponds, and even the nests of wasps, bees, and ants will all be found to yield their own harvest of Coleoptera. Beetles when caught may either be dropped into a phial containing spirits of any kind, or into what is known as the “killing bottle,” the bottom of which contains cyanide of potassium covered over with @ layer of gypsum. In either case, with few exceptions, the beetles die almost instantaneously. If kept too long in spirits, however, the limbs get loosened through maceration and fall off. The “setting” of a beetle, or of any other insect, consists in placing its limbs and antenn® in a natural position and fixing them there by means of pins until they stiffen on a board on which there is a layer of cork. If not set when either moist or recent, they may be softened by being placed for a night in any small vessel containing a layer of wet sand, aud covered with a damp cloth to prevent evaporation. The smaller beetles are usually mounted on card, each insect being stuck on a small dab of gum with its legs and antenne properly set ; all others are pinned through the centre of the upper part of the right elytron. In the case of large beetles as much of the contents of the body as possible should be removed by making an opening in the abdomen ; and with the Oil Beetles it is necessary to stuff the abdomen. This can be best effected by separating the latter from the body, emptying it, and refilling with wadding; it can then be readily gummed to the body. Mould may be gotrid of by exposing the specimens to a strong heat for some hours, and mites and grease by washing the beetles with a small brush dipped in benzine. (3. GI.) COLERAINE, a municipal and parliamentary borough and market-town of Ircland, in the county of Londondertys

COLERIDGE, Sir Joun Taytor (1790-1876), nephew of S. T. Coleridge, was born at Tiverton, and was edn- cated, with Arnold and Keble, at Corpus Christi College, Oxford. In 1810 he won the Latin verse prize; in 1812 he obtained a first class in classics ; and in 1813 both the English and Latin essay prizes were awarded him, He was soon after made a fellow of Exeter ; in 1819 he was called to the bar, and practised for some years on the Western Circuit. In 1824, on Gifford's retirement, he assumed the editorship of the Quarterly Review, resigning it a year afterwards in favour of Lockhart. In 1895 he pub- lished his excellent edition of Blackstone's Commentaries, and in 1832 he was made a serjeant-at-law. In 1835 he was appointed one of the judges of the King's Bench. In 1852 his university created him a D.C.L., and in 1858 he resigned his judgeship, and was made a member of the Privy Council. In 1869, although in extreme old age, he produced his pleasant Memoir of the Rev. John Keble, M.A., a third edition of which was issued within a year.

COLERIDGE, Samvet Tavtor (1 772-1834), one of tho most remarkable of English poets and thinkers, was born, on the 21st of October 1772, at his father's vicarage of Ottery St Mary's, Devonshire. His father was a man of some mark, He was known for his great scholarship, simplicity of character, and affectionate interest in the pupils of the grammar school, where he reigned until his promotion to the vicarage of the parish. He had married twice. The poet was the youngest child of his second wife, Anne Bowden, a woman of great good sense, and anxiously ambitious for the success of her sons. On the death of his father, a presentation to Christ's H ospital—acceptable in a family of ten—was procured for Coleridge by Judge Buller, an old pupil of his father's, He had already begun to give evidence of a powerful imagination, and he has described in a letter to his valued friend, Mr Poole, the pernicious effect which the admiration of an uncle and his circle of friends had upon him at this period. For eight years he continued at Christ's Hospital. Of these school-days Charles Lamb has given delightful glimpses in the Lssays of Hla, The head master, Bowyer, though a severe disciplinarian, was on the whole respected by his pupils. Middleton, afterwards known as a Greek scholar, and bishop

on the Bann, four miles from its mouth, and 145 miles north of Dublin. The town stands upon both sides of the river, which is there crossed by a handsome stone bridge of three arches, 288 feet in length by 32 in breadth. The principal part is on the east bank, and consists of a central square called the ‘“ Diamond,” and several diverging streets ; the portion on the west side is called the Water- side, or Killowen. Coleraine has two parish churches, two Roman Catholic churches, a town-hall, a market-house, a work-house, au endowed school, a national model school, and free schools founded by the Irish Society of London. The linen trade has long been extensively carried on in the town, from which, indeed, a fine description of cloth is known as “ Coleraines.” Pork-curing and the salmon and cel fisheries are prosecuted. The mouth of the river, which was formerly obstructed by a bar, now admits vessels of 200 tons. The principal trade is carried on through Port Rush, where a harbour is formed by two moles, with an entrance of 200 feet wide, an area of 8 acres, and a depth of from 15 to 20 feet at the wharves. In 1873, 422 vessels entered with a tonnage of 46,589. The parliamentary borough has a population of 6552, and returns one member. Coleraine is reputed to have been the seat of a Christian bishop previous to the arrival of the great apostle of Treland. It owes its modern importance mainly to the Company for the New Plantation of Ulster, on which it was bestowed in 1613. Though fortified only by an earthen

wall, it managed to hold out against the rebels in 1641. COLERIDGE, Harriry (1796-1849), the elder son of Samuel Taylor Coleridge, was bom on the 19th of September 1796, at Clevedon, a small village near Bristol, His early years were passed at Keswick, where his education was conducted in a somewhat desultory manner. He gave promise of great mental power, but derived less advantage from systematic studies than from intercourse with S. T. Coleridge, Wordsworth, Southey, De Quincey, and Pro- fessor Wilson. In 1815 he went to Oxford, as scholar of Merton College, the means for his support being principally provided by Southey. His university career, however, Was very unfortunate. He had inherited the weakness of purpose, as well as the splendid conversational powers, of his father, and, having never enjoyed the benefit of a regular discipline, lost all self-restraint amidst the galeties of Oxford, and finally lapsed into habits of intemperance, He was successful in gaining an Oriel fellowship, but at the close of the probationary year was judged to have forfeited it, The

authorities could not be prevailed on to reverse their decision ; but they awarded to hima free gift of £300. With this, Hartley Coleridge came to London in 1821, and remained there for two years, during which he wrote short poems for the London Magazine. His next step was to set up school at Ambleside, but this scheme failed, after five years of struggle in a position for Which he was wholly unfit. Coleridge then removed to Grasmere, where he lived in great seclusion,—writing between 1826 and 1831 LHssays for Blackwood, and in 1832 his Biographia Borealis, or Lives of Northern Worthies, In 1839 appeared his last work, the Life of Massinger, an elaborate and artistic production. The closing decade of Coleridge's life was wasted in what he himself calls " the woeful impotence of weak resolve." In 1848 his health became sensibly affected, and he expired on the 6th of January 1849, The prose style of Hartley eee 1s marked by Much finish and vivacity ; but his a — cep must chiefly rest on his poetical remains, jd ese the Sonnets, and Prometheus, an unfinished lyric i a te the finest. The Influence of Wordsworth is ible In his poetry, but it does not on that account

Want originality. "(See Memor . Derwent Coleridge) ce Memow of Hartley Coleridge by

read Virgil for amusement, and from that time Bowyer began to notice him, and encouraged his reading, Some conipositions in English poetry, written at sixteen, and not without a touch of genius, give evidence of the influence which Bowles, whose poems, now forgotten, were then in vogue, had over his mind at this time. Before he left school his constitutional delicacy of frame, increased by imprudent bathing in the New River, began to give him serious discomfort.

In February 1791, he was entered at Jesus College, Cambridge. A school-fellow who followed him to the university has described in glowing terms evenings in his rooms, "when Aischylus, and Plato, and Thucydides were pushed aside, witha pile of lexicons and the like, to discuss the pamphlets of the day. Ever and anon a pamphlet issued from the pen of Burke. There was no need of having the book before us ;—Coleridge had read it in the morning, and in the evening he would repeat whole pages verbatim,"

Frend, a fellow of Jesus, accused of sedition and Unitarianism, was at this time tried and expelled from Cambridge. Coleridge had imbibed his

sentiments, and joined the ranks of his partisans. He grew discontented with university life, and, pressed by debt, in a moment of spleen enlisted as a soldier. One of the officers of the dragoon regiment, finding a Latin sentence inscribed on a wall, discovered the condition of the very awkward recruit,

of Calcutta, reported Coleridge to Bowyer as a boy who –

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Shortly afterwards a Cambridge friend recognized him, and informed some members of his family, who with difficulty procured his discharge. He returned for a short time to Cambridge, but quitted the university without a degree in 1794, "In the same year he visited Oxford, and made the acquaintance of Southey, who continued through life, in spite of Coleridge's many misunderstandings, his firm friend and most devoted admirer. The French Revolution had stirred the mind of Southey to its depths. He received with rapture his new friend's scheme of Pantisocracy. On the banks of Susquehanna was to be founded a brotherly community, where selfishness was to be extinguished, and the virtues were to reign supreme. No funds were forthcoming, and in 1795, to the chagrin of Coleridge, the scheme was dropped. In October of the same year, Coleridge was married to Sarah Fricker, and took up his residence at Clevedon on the Bristol Channel. A few weeks afterwards Southey married a sister of Mrs Coleridge, and on the same day quitted England for Portugal.

The cares of matrimony induced Coleridge to commence lectures. 'The Bristol public did not encourage his efforts on 'politics and religion. Coleridge embodied these in his first prose publication, Conciones ad Populum. 'The book contained much invective against Pitt, and in after life he declared that with this exception, and a few pages involving philosophical tenets which he afterwards rejected, there was little or nothing he desired to retract In the course of a summer excursion at this period, he met for the first time the brother poet with whose name his own will be for ever associated. Wordsworth and his sister had established themselves at Racedown in Dorsetshire,—a retired spot,—and it was here the friends first

met. There are few things in literary history more remarkable than this meeting. ‘The gifted Dorothy Wordsworth described Coleridge as “ thin and pale, the lower part of the face not good, wide mouth, thick lips, not very good teeth, longish, loose, half-curling, rough, black hair,”—but all was forgotten in the magic charm of his utterance. Words- worth, who declared, ‘‘ The only wonderful man I ever knew was Coleridge,” seems at once to have desired to see more of his new friend. He and his sister soon removed to Coleridge’s neighbourhood, and in the most delightful and unrestrained intercourse the friends spent many happy days. It was the delight of each one to communicate to the other the productions of their minds, and the creative faculty of both poets was now at its best One evening, on the Quantock Hills, TheAncient Mariner first took shape. Coleridge was anxious to embody a dream of a friend, and the suggestion of the shooting of the albatross came from Wordsworth. A joint volume was planned. The poetry of common life was to be the work of Words- worth, while Coleridge was to indulge in romance. From this sprang the Lyrical Ballads, and after much cogitation the book was published by the amiable but gossiping bookseller at Bristol, Cottle, to whose reminiscences, often indulging too much in detail, we owe the account of this remarkable time. Coleridge projected a periodical called The Watchman, and undertook a journey, well described in the Biographia Literaria, to enlist subscribers. The Watchman had a brief life of two months, and at this time, in the year 1796, the Juvenile Poems, for which Cottle, always ready to help his literary friends, gave thirty guineas, appeared. The volume met with success, but at this time Coleridge began to think of becoming a Unitarian preacher, and abandoning literature for ever. Hazlitt has recorded his very favourable impression of a remarkable sermon delivered at Birmingham ; but there are other accounts of Coleridge’s preaching not so enthusiastic. In 1798 an annuity, granted him by the brothers Wedgwood,

led him to abandon his scheme of life For many years he had desired to see the Continent, and in September of

the same year—the year in which the Lyrical Ballads appeared—in company with Wordsworth and his sister, he i left England for Hamburg.

A new period in Coleridge's life zow begav. He soon left the Wordsworths to attend lectures at Gottingen. A | great intellectual movement had begun in Germany, Coleridge was soon in the full whirl of excitement. He learnt much from Blumenbach and Eichhorn, and took 'nterest in all that was going on around him, During his)

stay of fourteen months in Germany, he made himself master of the language to such purpose that the translation of Wallenstein—his first piece of literary work after his return to England—was actually accomplished in six weeks,

It was published in 1800, and, although it failed to make any impression on the general public, it became at once prized by Scott and others as it deserved. In several passages Coleridge has expanded and paraphrased the thought and expression of the original, but few, even amongst the greatest sticklers for accuracy, will be inclined to quarrel with the departure of the translator. It is matter for regret that a request to Coleridge that he should undertake to translate /'aust never received serious attention from him. During the first two years of this century Coleridge wrote many papers for the Morning Post. He had vehemently opposed Pitt's policy, but a change came over the spirit of his mind, and he found himself separated from Fox on the question of a struggle with Napoleon. Much has been written of this political attitude, but there 's no real reason to doubt his own account of the matter. Like the first Lord Minto, Mr Windham, and many other Whigs, he felt that all questions of domestic policy must at atime of European peril be postponed. From this time, however, his value for the ordered liberty of constitutional government increased ; and though never exactly to be found among the ranks of old-fashioned Constitutionalists, during the remainder of his life he kept steadily in view the principles which received their full exposition in his well-known work on Church and State. In the year 1801 Coleridge left London for the Lakes. His home was for a time with Southey. A temporary estrangement had entirely been forgotten, and Southey, it should be said, for many years extended to Coleridge's wife and family the shelter and care of true friendship.

For fifteen years the record of Coleridge's life is a miserable history. He sank under the dominion of opium. The Ode to Dejection and the poem of

Youth and Age are sad evidences of the utter prostration of spirit, which was his terrible penalty for many a year. Few things are 80 sad to read as the letters in which he details the conse quences of his transgression.

He was occasionally seen in London during the first years of this century, and wherever

he appeared he was the delight of admiring circles.

visit to Malta in 1804, when for a short time he acted as . secretary to the governor, and a brief stay at Rome in the following year, were the chief events of what may be called the opiwn period. In 1809 he published The Friend, and during that and the two following years he lectured on Shakespeare and education. The tragedy of Remorse was produced in 1813, and inet with considerable success. Three years after this, the evil habit against which he had struggled bravely but ineffectually, deter- mined him to enter the family of Mr Gillman, who lived at Highgate. 'The letter in which he discloses his misery to this kind and thoughtful man gives a real insight into his character, Under kind and judicious treatment the hour of mastery at last arrived. The shore was reached, but the . vessel had been miserably shattered in its passage throug)

the rocks, He hardly, for the rest of his life, ever left his

home at Highgate. During his residence there, Christabel, written many years before, and known to a favoured Tew, was first published. He read widely and wisely, In poetry, philosophy, and divinity. In 1816 and the following year, he gave his Lay Sermons to the world. The Biographia Interaria and a revised edition of The Friend soon followed. Seven years afterwards his maturest and best prose work—The Ards to Reflection—first appeared. His

last publication, in 1830, was the work on Church and

State. In 1833 he appeared at the meeting of the British Association at Cambridge, and in the following year he passed away, and was buried in the

churchyard close to the house of Mr Gillman, where he had enjoyed every con- solation which friendship and love could render. Coleridge died in the communion of the Church of England, of whose polity and teaching he had been for many years a loving admirer. An interesting letter to his god-child, written twelve days before his death, sums up his spiritual experience in a most touching form.

Of the extraordinary influence which he exercised in conversation it is impossible to speak fully here. Many of the most remarkable among the younger men of that period resorted to Highgate as to the shrine of an oracle, and although one or two disparaging judgments, such as that of Mr Carlyle, have been recorded, there can be no doubt that since Samuel Johnson there had been no such power in England. His nephew, Henry Nelson Coleridge, gathered together some specimens of the Table Talk of the few last years. But remarkable as these are for the breadth of sympathy and extent of reading disclosed, they will hardly convey the impressions furnished in a dramatic form, as in Boswell's great work. Four volumes of Literary Remains—lately reprinted and rearranged—were published after his death, and these, along with the chapters on the poetry of Wordsworth in the Biographia Literaria, may be said to exhibit the full range of Coleridge's power as acritic of poetry. In this region he stands supreme. With regard to the preface, which contains Wordsworth's theory, Coleridge has honestly expressed his dissent :-— "With many parts of this preface, in the sense attributed to them, and which the words undoubtedly seem to authorize, I never concurred ; but, on the contrary, objected to them as erroneous in principle, and contradictory (in appearance at least) both to other parts of the same preface, and to the author's own practice in the greater number of the poems themselves," This disclaimer of perfect agreement renders the remaining portion of what he Says more valuable. Whoever desires to trace the real essential characteristics of poetry must turn to these pages, where the provinces of imagination and fancy are rightly discriminated, « Here," as Principal Shairp has well said, "are canons of judgment, not mechanical but living." Coleridge Was in England the creator of that higher criticism which had already in Germany accomplished so Inuch in the hands of Lessing and Goethe. It is enough to refer here to the fragmentary series of his Shakespearian criticisms, containing evidence of the truest insight, and a marvellous appreciation of the judicial "sanity" which raises the greatest

name in literature far above even the highest of the poets who approached him.

As a poet Coleridge's own place is safe. His niche in the great gallery of English poets is secure. Of no one can It be more emphatically said that he was " of imagination all compact." "Hig peculiar touch of melancholy tenderness nly prevent his attaining a high place in popular estima- tion. He does not possess the fiery pulse and humaneness of Burns, but the exquisite perfection of his metre and the subtle alliance of his thought and expression must always Secure for him the warmest admiration of true lovers of poetic art. In his early poems mey be found traces of the

fierce struggle of his youth. The most remarkable ig the Monody on the Death of Chatterton and the Religious Musings. In what may be called his second period, the ode entitled Yrance, considered by Shelley the finest in the language, is most memorable. The whole soul of the poet is reflected in the Ode to Dejection. The well-known lines— "*O Lady! we receive but what we give, . And in our life alone does nature live ; Ours is her wedding garment, ours her shroud,"

with the passage which follows, contain more vividly, perhaps, than anything which Coleridge has written, the expression of the shaping and colouring function which he assigns, in the Biographia Lnteraria, to imagination, Christabel and the Ancient Mariner have so conipletely taken possession of the highest place, that it is needless to do more than allude to them. The supernatural has never received such treatment as in these two wonderful produc- tions of his genius, and though the first of them remains a torso, it is the noblest torso in the gallery of English literature. Although Coleridge had, for many years before his death, almost entirely forsaken poetry, the few frag- ments of work which remain, written in later years, show little trace of weakness, although they are wanting in the unearthly melody which imparts such a charm to Kubla Khan, Love, and Youth and Age.

In one of the most remarkable of his republished essays, Mr Mill has contrasted Coleridge with Bentham, and called especial attention to his

position as a political theorist. Few will be tempted to dispute the justice of Mr Mill's exposition of Coleridge's views. He regards him as having in his Lay Sermons done his best to establish prin- ciples involved in English opinions and institutions, He admits, moreover, that in bringing into prominence the trust inherent in landed property Coleridge has done service to those who desire to conserve much of the existing system.

The fifth chapter of the work on Church and State contains the exposition of Coleridge's idea of a church establishment. 'The clerisy of the nation is with him the body of true leaders in all that concerns national life. Theology is only a part of the great province within national control—*it is no essential part of the being of the national cliurch, however conducive, or even indispens- able, it may be to its well-being." This doctrine, however novel it may have been on its first appearance, has long been adopted by those who desire to preserve the endow- ments of establishments. In all his political writings Coleridge is at war with what has been called the lazssez-faire doctrine, and no one has more emphatically declared what the real objects of a state are.

In everything which Coleridge wrote, there are traces of the philosophy which had become to him a second nature. After having abandoned the teaching of Hartley, he directed his attention for a time to Leibuitz and Spinoza, But the systems of these two great men never really captivated him. It was to Kant that he owed his initiation into the higher sphere of philosophy, and it is to Kant that he repeatedly refers as to a master who had moulded his thought. It is impossible to enter here upon the question as to whether Coleridge has-represented Kant's system completely. De Quincey, in one of his Letters to a Y, oung Man, has referred to the modification and alteration which all things received in passing through Coleridge's thoughts, and has declared that this " indocility of mind " has led Coleridge to make various misrepresentations of Kant. A similar accusation has been preferred by Dean Mansel ; but to these charges it may be answered that Coleridge nowhere prcefesses to interpret or describe Kant's teaching. He was content to adopt the distinction between the understanding and the reason, but it was to the doctrine of the practical reason dominating and a

tion that he was irresistibly attracted. The immediate contemplation of truth enjoyed by the reason was the sum and substance of his speculations in this province. This doctrine constituted in Coleridge's mind the bridge of passage from metaphysics to theology. "There," to use the words of Mr Hort, in an able essay on Coleridge, "he found an assurance that man's reasoning powers are not man himself, and that he may rise above their impotence, and have direct faith in unseen realities." Ata time when low and grovelling ideas had obtained great predominance, Coleridge recalled men's thoughts to the reality of spiritual truth, and attempted again to enlist interest for a recon- ciliation between metaphysics and ordinary modes of thought. Zhe Friend contains an interesting application of the Platonic idea to induction. Coleridge declares that there is no real opposition between the method of Plato and that pursued by Bacon. It must, however, be acknow- ledged that the ground of his defence of Bacon hardly satisfies; and the observation of Dr Whewell, " that Bacon does not give due weight to the ideal element of our knowledge" will occur to the reader cf the Hssays on Method, however he may admire the skill and finish of Coleridge's treatment. Scattered throughout the frag- mentary writings of Coleridge may be found remarkable protests against the school of moral philosophy of which Paley was the chief. The governing nature of the moral principle with him determined the quality of moral action. Morality and religion are in his system twin stars, never to be divided. 'The real code, imperatively demanding the subjugation of man, issues from the divine will, resident, in a measure, in each man. He eagerly disclaims, how- ever, all theories which would claim an inherent power in reason to determine questions of civil government. His contention against Rousseau is most effective, and even at the present time must possess an interest for all engaged in political deliberation. Since the able defence of Sara Coleridge, contained in her edition of her father's Biographia Literaria, discussions regarding the plagiarisms of Coleridge may be said to have been forgotten. The infirmity of his character, and the mental confusion caused by the unhappy habit which so long had dominion over him, indisposed him for the exactitude rightly demanded from all who under- take philosophical discussion. An

interesting communica- tion from Schelling to Dean Stanley declares that that great ‘thinker vindicated Coleridge from the charge of plagiarism, In the latter part of his life, more than one of those admitted to his confidence have given curious instances of his confusion between the words of an author and the marginalia which he had written in that author’s pages. A letter to Mr Cottle, written in the year 1807, describes in an interesting way Coleridge’s abandonment of Unitari- anism and his final acquiescence in tbe creed of the church. As a theologian he contended earnestly for the self-evidencing nature of revealed religion. To historical and miraculous proof he may be said to have assigned a secondary place. Grasping the idea of the Incarnation, he held that miracles were the needful outcome of the great fact, and he taught that the adaptation of truth to the moral nature constituted its strongest evidence. For the teaching of Luther he had a profound admiration, and with the works of the great English divines he was thoroughly familiar In the Azds to Rejlection—a work which has been the especial favourite of some of the most remarkable of recent divines—after discussing the diffi- culties of thought and speculation, he grapples with the moral impediments which surround the doctrines of original sin and atonement. His earnest, passionate yearning after truth is manifested in every page of this remarkable book. Whatever may be thought of the conclusions at which he arrives, the convictions of the writer, and his intense

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sympathy with all inquiring spirits, lift the book into a place in the affections of its readers. It is impossible almost to convey any adequate idea of the richness and variety of Coleridge’s speculations on theology and religion, scattered throughout his too fragmentary works, Zhe Confessions of an Inquiring Spirit, published since his death, intended not to lessen but to increase the reverence with which Christians regard the Bible, has been more misunderstood than any portion of his writings. Coleridge was to conserve and not to destroy, now that the mists of controversy are dispelled, must be apparent to every one who peruses this little volume. Much, indeed, that seemed startling in it on its first appéarance has now been accepted as matter of familiar truth.

That the real object of

The fame of Coleridge as a philosophic thinker is

undoubtedly, at present, not so great as it was during the twenty years immediately after his death. The generation of those who “owed” to his teaching ‘“ even their own selves ” has nearly passed away. But the influence which he exerted as a stimulating force, and the intellectual activity of many of his disciples, remain to testify to the greatness of the services which he rendered to philosophy

and religion. He was a true lover of light, and desired

that all philosophical investigation should be conducted in

the independent spirit which is reflected in the noble

aphorism of his Aids to Reflection—“ he who begins by loving Christianity better than truth will proceed by loving

his own sect and church better than Christianity, and end

in loving himself better than all."

After Coleridge's death several of his works were edited by his pein Henry Nelson Coleridge, the husband of Sara, the poet's only daughter. In 1847 Sara Coleridge published the Biographia Literaria, enriched with annotations and biographical supplement from her own pen. 'Three volumes of political writings, entitled Essays on his own Times, were also published by Sara Coleridge in 1850. Besides the essay on Coleridge contained in the first volume of J.S. Mill's Dissertations, there is a very complete study of Coleridge in Principal Shairp's Studies in Poetry and Philosophy. Mr Hort's Essay, in the Cambridge Essays of 1856, is full of interest. In 'Archdeacon Hare's Mission of the Comforter will be found valuable reflections on the theological position of Coleridge. (G. D. B.)

COLERIDGE, Sara (1802-1852), was the fourth child and only daughter of Samuel Taylor Coleridge and his wife Sarah Fricker of Bristol. She was born December 22, 1802, at Greta Hall, Keswick, the residence of her parents, where they were shortly afterwards joined by Southey and his wife, who was Mrs Qoleridge's sister, and by Mrs Lovell, a third sister, and widow of the young quaker poet, Robert Lovell. Here, after 1803, they all lived together ; but Coleridge was often away from home; and " Uncle Southey" was a pater familias. The Wordsworths at Grasmere were their neighbours ; and the children of the three families grew up together. Wordsworth, in his poem, the Triad, has left us a description, or " poetical glorifica- tion," as Sara Coleridge calls it, of the three girls—his own daughter Dora, Edith Southey, and Sara Coleridge, the " Jast of the three, though eldest born." Greta Hall was Sara Coleridge's home until her marriage ; and the little Lake colony of poetical and speculative genius seems to have been her only school. Guided by Southey, and with his ample library at her command, she read by herself the chief Greek and Latin classics, and before she was five-and-twenty had learnt French, German, Italian, and Spanish.

In 1822 Sara Coleridge published a translation in three large volumes of Dobrizhoffer's Account of the Abipones, undertaken in connection with

Southey's Zale of Paraguay, which had been suggested to him by Dobrizhoffer's volumes; and Southey alludes to his niece, the translator (canto iil, stanza 16), where he speaks of the pleasure the old miss

sionary would have felt if

'¢ , . . he could in Merlin's glass have seen

By whom his tomes to speak our tongue were taught."

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In less grandilogent terms, Charles Lamb, writing about the Tale of Paraguay to Southey in 1825, says, "How she Dobrizhoffered it all out, puzzles my slender Latinity to In 1825 her second work appeared, a translation from the medizeval French, in 2 volumes, called Zhe Right Joyous and Pleasant History of the Feats, Jests, and Prowesses of the Chevalier Bayard, the Good Knight with-

conjecture."

out Fear and without Reproach: By the Loyal Servant.

In September 1829, at Crosthwaite Church, Keswick, after an engagement of seven years' duration, Sara Coleridge was married to her cousin, Henry Nelson Coleridge, then The first eight years of her married life were spent in a little cottage on Down- There four of her In 1834 Mrs Coleridge published her Pretty Lessons in Verse for Good Children ; with some Lessons in Latin in Easy Rhyme. These were originally written for the instruction of her own children. On their publication they became very popular ; and a new edition has been lately published by Henry 8S. In 1837 the Coleridges removed to Chester Place, Regent's Park ; and in the same year appeared Phantasmion, a Fairy Tale, Sara Coleridge's longest original work. An edition of this also was published in 1874 by Henry 8. King & Co., with a preface by Lord- The Songs of Phantasmion were much admired at the time by Leigh Hunt and other critics ; and Mr Justice Coleridge is not afraid to say of them in his preface that they are "surely worthy of any great lyrical writer." Without meriting such praise as this,

how- ever, some of these songs, such as “Sylvan Stay” and “One Face Alone,” are extremely graceful and musical, and the whole fairy tale is noticeable for the beauty of the

a Chancery barrister in London.

shire Hill, in the town of Hampstead. children were born, of whom two survived.

King & Co.

Chief-Justice Coleridge.

story and the richness of its language.

In 1843 Mr Henry Coleridge died, leaving to his widow

the unfinished task of editing her father’s works. To

these she added some compositions of her own, among which are the Hssay on Rationalism, with a special applica-

tion to the Doctrine of Baptismal Regeneration, appended to

Coleridge’s Ads to Reflection, a Preface to the Essays on

las Own Times, by 8. 7’. Coleridge, and the Introduction to the Biographia Literaria. During the last few years of her life Sara Coleridge was a confirmed invalid. Shortly before she died she amused herself by writing a little auto- biography for her daughter. This, which reaches only to her ninth year, was completed by her daughter, and pub- lished in 1873, together with some of her letters, under the title Memoirs and Letters of Sara Coleridge. These let- tets show a cultured and highly speculative mind. They contain many apt criticisms of known people and books, and are specially interesting for their allusions to Words. Worth and the Lake Poets. Sara Coleridge died at Chester Place, May 3, 1852, and was buried by the side of her father, mother, and husband, in Highgate churchyard. COLET, Joun (1466-1519) dean of St Paul’s, the cldest son of Sir Henry Colet, was born at London in 1466, His education commenced in St Anthony’s school in

that city, from which, in 1483, he was sent to Mag- dalen College, Oxford. After seven years' study of logic and philosophy, he took his degree in arts. Aboutthe year 1493 he went to Paris, and thence to Italy, in order to im- prove himself in the Greek and Latin languages, which at that time were imperfectly taught in our universities. During his residence abroad he became acquainted with Budeus and Erasmus. On his return to England in 1497 he took orders, and settled at Oxford, where he read lec- tures, without fee, on the Epistles of St Paul. At this period he held the rectory of St Dennington in Suffolk, to which he had been instituted at the early age of nineteen ; and he was also prebendary of York, and canon of St

Martin's le Grand, London. In 1502 he became prebend- ary of Sarum, in 1505 prebendary of St Paul's, and immediately afterwards dean of that cathedral, having previously taken the degree of doctor of divinity. He was no sooner raised to this dignity than he introduced the practice of preaching and expounding the Scriptures ; and he soon afterwards established a perpetual divinity lecture, on three days in each week, in St Paul's Church, —an institution which helped to pave the way for the Refor- mation. About the year 1508 Dean Colet formed his plan for the foundation of St Paul's school, which he completed in 1512, and endowed with estates of an annual value of £122 and upwards. The celebrated grammarian William Lilly was the first master, and the company of mercers were appointed trustees. The dean's religious opinions were so much more liberal than those of the contemporary clergy, that they deemcd him little better than a heretic : and on this account he was so frequently molested that he at last determined to spend the rest of his days in peaceful retirement. To carry this resolution into effect he built a house near the palace of Richmond ; but being seized with the sweating sickness, he died in 1519, in the fifty-third year of his age. He was buried on the south side of the choir of St Paul's, where a stone was laid over his grave, with no other inscription than his name. Besides the preferments above mentioned, he was rector of the guild of Jesus at St Paul's, and chaplain to Henry VIII. Dean Colet, though in communion with the Church of Rome, disapproved of auricular confession, of the celibacy of priests, and other tenets and ceremonies which have since been rejected by all Protestants. He wrote—Absolutissi- mus de octo orationis partium

constructione Libellus (Ant- werp, 1530), Rudimenta Grammatices (London, 1539), Daily Devotions, Monition to a Godly Life, Epistole ad Lrasmum, and commentaries on different parts of the sacred books, together with a number of smaller theological works.

COLET, Lovisz Revor. (1808-1876), French poetess and novelist, belonged to a Provencal family, and was born at Aix. In 1834 she came to Paris; and in 1836 appeared her Fleurs du Midi, a volume of verse, of liberal tendency, which made some noise, and gained her the friendship of Teste and Cousin. It was followed in 1839 by Penserosa, a second volume of verse; by Le Musée de Versailles, a poem crowned by the Institute; by La Jeunesse de Goethe, a one-act comedy; and by Les Cewrs Brisés, a novel. In 1840 she published Les Funerailles de Napoléon, a poem, and La Jeunesse de Mirabeau, a reckless novel. The criticisms on her books, however, on her academical successes, and on her connection with several celebrated men about this time, exasperated her to an incredible de- gree ; and in 1841 Paris was diverted by her attempted re- prisals on Alphonse Karr for certain notices in Les Guépes. In 1849 she had to defend an action brought against her by the heirs of Madame Récamier, whose correspondence with Benjamin Constant she had taken it upon herself to publish in the columns of the Presse. She was crowned five or six times by the Institute, a distinction which she owed, however, to the influence of Cousin rather than to the quality of her work. She produced a host of writings in prose and verse—novels, plays, anacreontics, didactic poems, travels, copy for a milliner's journal, translations from Shakespeare—singularly unequal in matter and style. Only one of her books has survived—Zut: Roman Con- temporain, the novel in which she told the story of her life 5 and that, whatever value it may possess as an historical document, is worthless as a work of art. Madame Colet seems to have been a woman of some literary talent, want- ing altogether in the quality of self-respect and the power of self-control.

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COLIC (from xddoy, the large intestine). By this term is gencrally understood an attack of pain in the abdomen, usually seated in the

neighbourhood of the navel, of spasmodic character, and attended for the most part with constipation of the bowels. Various forms of this complaint are described by medical writers. The most important are simple or flatulent colic and lead colic. The former of these commonly arises from the presence in the alimentary canal of some indigestible matter, which not only excites spasmodic coutraction of the muscular coats of the intestines, but also, by beginning to undergo decomposition, gives rise to the preseuce of gases, which painfully distend the bowels and increase the patient's suffering. The pain of colic is relieved by pressure over the abdomen, and there is no attendant fever—points which are of importance in distinguishing it from inflammation.

Attacks of this form of colic may occur in connectiou with a variety of causes other than that above mentioned, e.g., from accumulations of feculent matter in the intestines in the case of those who suffer from habitual constipation ; also as an accompaniment of nervous and hysterical ailments, and not unfrequently as the result of exposure to cold and damp, particularly where the feet become chilled as in walking through snow. Similar attacks of colic are apt to occur in young infants, especially those who are fed attificially; and in such cases it will generally be found that the food is passing through them almost wholly undigested, and that a temporary change of diet will be necessary. The duration of an attack of simple colic is seldom long, and in general no ill consequences follow from it. It is, however, not free from risk, especially that of sudden obstruction of the bowel from twisting, or invagina- tion of one part within another (intussusception) during the spasmodic seizure, giving rise to the terrible disease known as ileus. ;

Of greater importance and interest in a medical point of view isthe disease known as lead colic (Syn. painters' colic, colica, Pictonum, Devonshire colic, dry belly-ache), from its having been clearly ascertained to be due to the absorption of lead into the system. This disease had been observed and described long before its cause was discovered. Its occurrence in an epidemic form among the inhabitants of Poitou was recorded by Francis Citois, in 1617, under the title of Novus et popularis apud Pictones dolor colicus biliosus. The disease wasthereafter termed colica Pictonum. It was supposed to be due to the acidity of the native wiues, but it was afterwards

found to depend on lead con- tained in them. A similar epidemic broke out in certain parts of Germany in the end of the 17th century, and was at the time belicved by various physicians to be caused by the admixture of acid wines with litharge to sweeten them.

About the middle of last century this disease, which had long been known to prevail in Devonshire, was carefully investigated by Sir George Baker, who succeeded in trac- ing it unmistakably to the contamination of the native beverage, cider, with lead, either accidentally from the lead- work of the vats and other apparatus for preparing the liquor, or from its being sweetened with litharge.

It has subsequently been made out that this complaint is apt to affect all persons who work among lead or its pre- parations, especially lead-miners, manufacturers of white lead, colour-grinders, and painters, also to a less extent plumbers, potters, type-founders, &c. It is said to have occurred in persons who have slept for only a few nights in a newly-painted room. It has frequently arisen from the use of drinking water containing salts of lead in solution, as also from food and condiments adulterated with prepara- tions of this metal, and it has even been known to follow the habitual use of cosmetics composed in part of white lead.

The colig due to lead poisoning, which in its general

characteristics is essentially the same as ordinary colic, is only one of a train of symptoms produced by the absorp-

tion of lead into the body. From prolonged exposure to the action of this poison, the general nutrition of the body becomes deteriorated, and serious nervous phenomena present themselves, sometimes in the form of epilepsy and coma, but more usually as a variety of palsy. This palsy is of local character, affecting in the first instance the muscles composing the ball of the thumb, and also those muscles of the fore-arm which extend the wrist, and giving rise to the condition known as “ wrist-drop,” from the cir- cumstance that when the arm is extended the hand hangs down and cannot be raised by voluntary effort. The affected muscles undergo atrophy while the paralysis con- tinues. If the patient is removed from further exposure to the influence of the lead poison, and suitable treatment employed, complete

recovery from all the ill effects may take place; but otherwise all the symptoms become aggravated, the health becomes completely ruined, and death may result.

One of the phenomena which accompany lead poisoning is the existence of a blue line along the margins of the gums where they meet the teeth. This is almost never absent, and is an important aid to the diagnosis of the disease.

The absorption of copper into the system produces a series of symptoms similar to those of lead poisoning, in- cluding a form of colic. It is of comparatively rare occur- rence, being chiefly observed among workers in copper.

The treatment of colic consists in means to relieve the spasmodic pain, and in the removal, where possible, of the cause upon which it depends. The former of these indica- tions is fulfilled by the administration of opiates (except in the case of children) and the application of warm fomenta- tions to the abdomen. Where the attack appears to depend on accumulations of irritating matter in the alimentary canal, a brisk purgative will, in addition, be called for.

In the case of lead colic it is imperatively necessary that the patient be removed from the source of the lead poison- ing. Here, too, the free evacuation of the bowels by castor oil or saline purgatives is an important part of the treatment. As an antidote to the lead absorbed into the system, the administration of iodide of potassium is recom- mended, while for the paralysis nerve tonics, such as quinine and strychnia, and the use of galvanism, will in general yield good results. Where the patient's occupation necessitates his exposure to the constant influence of the lead poison, as in the case of colour-grinders or manufac. turers of white lead, the evil consequences can in great measure be averted by scrupulous attention to cleansing the body, particularly before eating, by abstention from eating in the work places, and by the habitual use of a drink slightly acidulated with sulphuric acid.

The terms hepatic colic and renal colic are applied to that violent pain which is produced, in the one case, where a biliary calculus or gall stone passes down from the gall bladder into the intestine, and in the other where

a renal calculus descends from the kidney along the ureter into the bladder. These affections are, however, entirely different from true colic. (J. 0. A.)

COLIGNI, Gasparp DE (1517-1572), admiral of France, was son of the Marshal Gaspard de Coligni and Louise de Montmorency, and was born at Chatillon-sur-Loing, the hereditary domain of his house. At twenty-two he came to court, and there contracted a frieudship with Francis of Guise. In the campaign of 1543 Coligni distinguished himself greatly, and was wounded at the sieges of Mont médy and Bains, In 1544 he served in the Italian cam- paign under the Duc d'Enghien, and was knighted on the field of Cerisolles. Returning to France, he took part in

different military operations; and having been made colonel-

general of the infautry, exhibited great capacity and in tellizence as a military reformer. He was soon afterwards made admiral in room of D'Annebaut, Renty (1554) began the quarrel between him aud Francis of Guise, which was to bring such evil on both their houses, and on their native land ; and the enmity was increased tenfold in 1556 by the rupture, at the instance of Guise, of the Treaty of Vauxcelles, In 1557 he was intrusted with the defenca of Saint Quentin. Iu the siege he displayed great courage, resolution, and strength of character; but

the place was taken, and he was imprisoned in the strong-

hold of L'Ecluse. On payment of a ransom of 50,000 crowns he recovered his liberty. But he had by this time become a Huguenot, through the influence of his brother

Dandelot; and he busied himself secretly with protecting his co-religionists, a colonyof whom he sent to Brazil, whence they were afterwards expelled by the Portuguese. On the

death of Henry II. he placed himself, with Louis, prince

of Condé, in the front of his sect, and demanded religious In 1560, at the hostility be-

toleration and certain other reforms, Assembly of Notables at Fontainebleau, the tween Ooligni and Francis of Guise broke violently forth ;

the death of Francis IL. and the policy of Catharine preci- the civil war began; and

pitated matters to an issue ; the battle of Dreux (1562), clearing the ground of the Constable Montmorency and the prince of Condé, set the two great rivals at the head of their respective parties. In 1563, however, the Pacification of Amboise was effected; Francis of Guise was assassinated ; maintained for some years. The Huguenot attempt to seize on the person of Charles IX. at Monceaux brought about a resumption of hostilities. At St Denis defeated Montmorency; in 1569 he was defeated at Jarnac by the duke of Anjou, and repaired with the remains of his army to Cognac, Navarre, who was forthwith placed at the head of the Pro- testant party; the two laid siege to Poitiers, which was defended by Henry of Guise; but the siege was raised, and the Huguenots were routed at Moncontour (1569) with terrible slaughter. A price of 50,000 crowns was set upon the admiral's head; but the peace of St Germain was con- cluded in 1570, and he returned to court. He grew rapidly in favour with Charles IX, As a means of eman- cipating the king from the tutelage of his mother and the faction of tho Guises, the admiral proposed to him a descent on Spanish Flanders, with an army drawn from both sects, and commanded by Charles in person, The king's regard for the admiral, and the bold front of the Huguenots, alarmed the queen mother; and the massacre of St Bartholomew was the consequence. On 224 August 1572 Coligni was shot in the street by Maurevert, a bravo in the pay of Henry of Guise ; the bullets, however, only tore a finger from his right hand and shattered hig left elbow. The king visited him, but the queen mother prevented all pri- vate intercourse between them. On the 24th August, the night of the massacre, he was attacked in his house by the mumons of Guise, led by a German named Behme, who slew him and cast him from a window into the courtyard at their master's feet. His body was gibbeted at Mont- faucon ; it was,

however, carried off by his retainers, and buried at Chatillon, where it remained till 1786, when fontesquieu had it reinterred at his own estate of Mau- pertuis, His papers were seized and burned by the queen mother ; among them, according to Brantéme, was a history of the civil war “trés-beau et trés-bien faict, et digne d’estre Imprimé.” mee the capital of the state of Colima, Mexico, in N, lat. and 103° 7’ W. long. The town is situated in a fertile and Well-watered plain. It has regular streets,

At the battle of

and peace was

(1567) Coligni

There he was joined by the prince of

mostly paved, a Government house, a college, several schools and churches, and two Squares, and is a place of considerable trade in linens, woollens, cotton goods, aud hardware. The population exceeds 31,000. Colima wag founded by Gonzalo de Sandoval in 1522, received incor-poration from Philip IT., and attained the rank of a city in 1824. Thirty miles to the N.E. is the volcano of Colima, the most westerly in Mexico, and 12,000 feet in height. For some days previous to the earthquake which visited the Pacific coast of Mexico on the 20th December 1868, the volcano emitted smoke and steam ; and in 1869, after 40 years’ inactivity, there was another eruption. Man- zauilla, the port of Colima, about 60 miles west of that town, has a good anchorage, and is sheltered from the south winds prevalent during the rainy season ; but, on account of the proximity of a stagnant marsh, it is an unhealthy place; and it abounds, Moreover, with mosquitoes and sandflies,

COLIN, ALexanper (1526-1612), a Flemish sculptor, was born at Mechlin. In 1563 he went, at the invitation of the emperor Ferdinand L., to Innsbruck, to work on the Magnificent monument which was being erected to Maxi- milian I, in the nave of the Franciscan church. Of the twenty-four marble alti-rilievi, representing the emperor’s principal acts and victories,

which adorn the sides of this tomb, twenty were executed by Colin, apparently in three years. The work displays a remarkable combination of liveliness and spirit with extreme care and finish, its delicacy rivalling that of a fine cameo, Thorwaldsen is said to have pronounced it the finest work of its kind. Colin, who was sculptor in ordinary both to the emperor and to his son, the archduke Ferdinand, did a great deal of work for his patrons at Innsbruck, and in its neighbour- hood ; particular mention mlay be made of the sepulchres of the archduke and his first wife Philippa, both in the same church as the Maximilian monument, His tomb in the cemetery at Innsbruck bears a fine bas-relief executed by himself.

COLLAERT, Hans, a Flemish engraver, was the son of Adrian Collaert, a draughtsman and engraver of repute, and was born at Antwerp about 1545. After working some years in luis father's studio, lie went to Rome to per: fect himself in his art. His engravings after Rubens are very highly esteemed. He left many works ; among the best may be mentioned a Life of Saint Francis, 16 prints ; a Last Judgment, folio; Monilium, Bullarum, Inauriumque Artificiosissimee Icones, 10 prints, 1581 ; The Dead Christ in his Mother's Lap ; Marcus Curtius ; Moses Striking the Rock, and The Resurrection of Lazarus, after Lambert Lombard; the Fathers of the Desert; and Biblia Sacra and the History of the Church, after Rubens.

COLLE, Cuartzs (1709-1783), dramatist and song- writer, was the son of a notary, and was born at Paris. At a very early age he began to study the writings of Marot and La Fontaine, of Chapelle and Moliére, to take delight in the theatre, and to be specially interested in the rhymes of Jean Heguanier, then the most famous maker of coup- lets in Paris. From a notary's office Collé, who seems to have had little taste for legal studies, was transferred to that of M. de Meulan, the receiver-general of finance. When about seventeen, lowever, he made the acquaintance of Piron, and afterwards, through Gallet, of Panard. The example of these three masters of the vaudeville, while determining his vocation, made him diffident; and for some time he composed nothing but amphigouris—verses whose merit was measured by their unintelligibility. The friendship of the younger Crébillon, however, diverted him from this byway of art, and the establishment in 17 29 of the famous " Caveau" gave him a field for the display of his fine talent for popular song. In 1739 the Society of

pontifices, &c.), or for political purposes, ¢.g., tribunorum plebis collegia. By the Roman law a collegium must have at least three members. The name is now usually applied to educational corporations, the most important of which are the colleges of Oxford and Cambridge. In the numerous statutes relating to colleges the colleges of Win- chester and Eton are usually associated with those of Oxford and Cambridge.

the Caveau, which numbered among its members Hel- yetius, Duclos, Gentil-Bernard, Boucher, Rameau, Piron, and the two Crébillons, was dissolved, and was not re- constituted till twenty years afterwards. Meanwhile, the Regent Orleans, who was an excellent comic actor, parti- cularly in representations of low life, and who had been looking out for an author to write suitable parts for him, made Collé his secretary. It was for the duke and his associates that Collé composed the greater part of his. Thedtre de Société. Based on the stories of the younger Crébillon and La Fontaine, all the pieces in this collection, while remarkable for ease and gaiety, in point of delicacy are such as might be expected from their source and their avowed object. In 1763, however, Collé, whose jestings the duke had rewarded with a place under Govern- ment, produced at the Théatre Frangais Dupuis et Des- yonais, a sentimental comedy, which met with a decided success, and which was followed in 1771 by La Veuve, an attempt in the same direction, and a complete failure. In 1774 appeared La Partie de Chasse de Henri Quatre (partly taken from Dodsley's King and the Muller of Mans- field), Collé's last and best play. From 1758 to 1782, besides these and a multitude of songs, Collé was writing his Journal Historique, a curious collection of literary and personal strictures and animadversions on his boon com- panions as well as on their enemies, on Piron as on Voltaire, 'on La Harpe as on Corneille. In 1783, having outlived the greater part of his old friends, and grieving for the loss of his wife, to whom he was greatly attached, Collé died. He is best remembered by his lyrics, which form an important link in the chain of style through which the chanson, that peculiarly French form of the song, has passed. They are frank and jovial, though often licentious, and are remarkable for wit and amiability no less than for the artistic management of the refrain and for their popular attractions. The subjects are love and wine; occasion- ally, however, as in

the famous lyric (1756) on the capture of Port Mahon, for which the author received a pension of 600 livres, the note of patriotism is struck with no unskilful hand, while in many others Collé shows himself possessed of considerable epigrammatic force. See Grimm's Corre- spondance, and Taillefer's Zableau Historique de V Esprit et du Caractere des Littératures Frangazses.

COLLE, RAFAELLE DEL, painter, was born at Colle, near Borgo San Sepolcro, in Tuscany, about 1490. A pupil of Raphael, whom he is held to have assisted in the Farnesina and the Vatican, Colle, after his master's death, was the assistant of his chief scholar, Giulio Romano, at Rome and afterwards at Mantua. In 1536, on the occasion of the entry of Charles V. into Florence, he took service in that city under Vasari, whose written works are many degrees superior to his paintings. In his later years Colle resided at Borgo San Sepolcro, where he kept a school of design; among his many pupils of note may be mentioned Cherardi and Vecchi. His works, which are yet to be found at Urbino, at Perugia, at Pesaro, and at Gubbio, are fine examples of the Roman school of Raphael. The best are a painting of the Almighty supported by angels, a Resurrection, and an Assumption, all preserved in churches -at Borgo San Sepolcro.

COLLEGE (Collegium),in Roman law signifieda number of persons associated together by the possession of common functions,—a body of colleagues. Its later meaning applied to any union of persons, and Collegium was the equivalent of éraipeta. In many respects, ¢.9., in the distinction be- tween the responsibilities and rights of the society and those of individual members thereof, the collegium was

what we should now call a corporation (see CoRPORATION). |

Collegia might exist for purposes of trade like our guilds, -or for religious purposes (e.g,, the college of augurs, of

corporations. In some of the earlier statutes of Queen Elizabeth they are spoken of as having an ecclesiastical character, but the doctrine of the common law since the Reformation has been that they are purely lay corporations, notwithstanding that most or all of their members may be

persons in priest's orders. This is said to have been settled by Patrick's case (see Raymond's Reports).

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These colleges are in the eye of the law eleemosynary

Colleges appear to have grown out of the voluntary

association of students and teachers at the university. | According to some accounts these must at one time have been numerous and flourishing beyond anything we are

halls or societies at Oxford, and 30,000 students. Into the truth of these statements, or into the causes which led to the reduction in the number of scholars, we need not now | enter. In early times there seems to have been a strong desire to confine the scholars to certain licensed houses, beyond the influence of the townspeople. Men of wealth and culture, and notably the political bishops and chancellors of England, obtained charters from the Crown for the incorporation of societies of scholars, and these in time became exclusively the places of abode for students attending the university. At the same time the corpora- tions thus founded were not necessarily attached to the locality of the university. 'The early statutes of Merton College, for example, allow the residence of the college to be shifted as occasion required ; and the foundations of Wolsey | at Oxford and Ipswich seem to have been the same in intention. In later times the university and the colleges became coextensive; every member of the university had to attach himself to some college or hall, and every person admitted to a college or hall was obliged to matriculate hira- self in the university. ; In Ayliffe's Ancient and Present State of the University of Oxford it is stated that a college must be "made up of three persons (at least) joined in community. And the reason of this almost seems to speak its own necessity, without the help of any express law to countenance it: because among two persons only there cannot be, in: fact, a major part ; and then if any disagreement should happea to arise between them it cannot be, in fact, brought to conclusion by such a number alone in case both the parties should firmly adhere to their dissenting opinions ; and thus it is declared by the civil law. But by the canon law

it 38 | known to be otherwise ; for by that law two persons 1p number may make and constitute a college, forasmuch as | according to this law two persons make and constitute an assembly or congregation, The common law of England, or rather the constant usage of our princes in erecting ageregate bodies, which has established this rule among US as a law, has been herein agreeable to the method and doctrine of the civil law, for that in all their grants and charters of incorporation of colleges they have not framed any aggregate body consisting of less than three m number." Another principle, apparently derived from the civil law, is that a man cannot be a fellow in two colleges at the same time. The law of England steadily resisted any attempt to introduce the principle of inequality inte colleges. An Act of Henry VIII. (33, ¢. 97), reciting that divers founders of colleges have given in their statutes power of veto to individual members, enacts that every

| now acquainted with. We are told, for example, of 300 |\

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statute made by any such founder, whereby the grant or election of the governor or ruler with the assent of the most part of such corporation should be in any wise hindered by any one or more being the lesser number

(contrary to the common law), shall be void.

The corporation consists of a head or master, fellows, and Students, not being on the foundation, residing in the college, are not considered to be members of tho The governing body in all cases is the head

scholars.

corporation. and fellows. ; — Itisconsidered essential to corporations of an ecclesiastical

or educational character that they should have a visitor

whose duty it is to see that the statutes of the founder are obeyed. The duties of this officer have been ascertained by the courts of law in a great variety of decided cases, Subject to such restrictions as may be imposed on him by the statutes of the college, his duties are generally to inter- pret the statutes of the college in disputed cases, and to enforce them where they have been violated. For this pur- pose he is empowered to " visit" the society—usually at certain stated intervals. In questions within his jurisdic- tion his judgment is conclusive, but his jurisdiction does not extend to any cases under the common laws of the country, or to trusts attached to the college. Generally the visitorship resides in the founder and his heirs unless he has otherwise appointed, and in default of him in the Crown.

The fellowships, scholarships, &c., of colleges were until a comparatively recent date subject to various restrictions. Birth in a particular county, education at a particular school, relationship to the founder, and holy orders, are amongst the most usual of the conditions giving a preferential or conclusive claim to the emoluments. Most of these restrictions have been or are being swept away. See Universrrizs,

The colleges of the English universities are large land- owners. A royal commission in 1874 reported the external income of the colleges of Oxford to be £307,369, 17s. 2d., and of Cambridge £264,256, 17s. 104d. These sums are mainly derived from landed property, and are exclusive of the revenues of the universities, By several Acts of Parliament colleges are allowed to sell their real property with the consent of the copyhold commissioners, who take care that the purchase-money is laid out in other real property. In college and other corporation property a system of letting land under beneficial leases—z.e., at less than the full yearly rent, and recoverable every seven years on payment of a fine—hag long prevailed, and is believed to be responsible for the alleged inferior condition of land

elonging to corporations. The system is now being superseded by leases at rack-rent, At Oxford, in addition to the colleges, there are four or five halls, which differ from colleges mainly in not being Corporate bodies, Their property is held in trust for them

will have to settle these and other

Problems of the higher education,

ae of the colleges of Oxford and Cambridge are old oe oy a few dating from times posterior to the a mation. Among recent foundations are Downing

on ge at Cambridge, Keble College at Oxford (which is

Soverned by a board or council of trustees), and the restora-

tion of Magdalen Hall at Oxford, now endowed and incorporated under the name of Hertford College.

Among educational corporations under the same title elsewhere, Phillimore (Lcclesiastical Law) mentions King's College and University College, London, Sion College, St Bees, St David's, Lampeter, &e. The distinction between college and university is found also at St Andrews, and in the more recently founded university of Durham and the Queen's University in Ireland.

COLLIER, Artruur (1680-1732), metaphysician and divine, was born at the rectory of Langford Magna, near Sarum, on 12th October 1680, There is no account of his childhood and early youth ; but itis probable that, after receiving some rudimentary instruction at home, he went to one of the grammar schools at Salisbury. He entered at Pembroke College, Oxford, in July 1697, and remained there till October in the following year, when he and his brother William became members of Balliol together. His father died in 1697, and as the family owned the advowson of Langford Magna, it was arranged, after some difficulties raised by Burnet, then bishop of Salisbury, that the benefice should be held by a clergyman until Arthur was old enough to be inducted. He was accordingly presented to the benefice in 1704, and continued in it till his death in 1732. Although a bold speculator in theology, his sermons intended for his parish show no traces of his peculiar notions, and he seems to have been faithful in the discharge of his duty. He was often in pecuniary difficulties, from which at last he was

obliged to free himself by selling the reversion of Langford rectory to Corpus Christi College, Oxford, a misfortune which his biographer attributes to his " habits of abstruse speculation, which seem to have unfitted him for all considerations of worldly prudence." Collier's philosophical opinions took shape early in his mind. They grew out of a diligent study of the writings of Descartes and Malebranche. Norris of Bemerton, a neighbouring clergyman, also strongly influenced him by his Hssay on the Ideal World. It is remarkable that Collier makes no reference to Locke, nor shows the least sign of having any knowledge of his works. As early as 1703 Collier seems to have become convinced of the non-existence of an external world. There is among his MSS., under date January 1708, an outline of an essay in three chapters on the question whether the visible world is external or not. In 1712 he wrote two essays, which are still in manuscript, one on substance and accident, and the other termed Clavis Phalosophica. The work on which his philosophical reputation depends appeared in 1713, under the title Clavis Universalis, or a New Inquiry after Truth, being a Demonstration of the Non-Existence or Impossibility of an Lxternal World. It has been favourably mentioned by Reid, Stewart, and others, was frequently referred to by the Leibnitzians, and was translated into German by Professor Eschenbach in 1756. Berkeley's Principles of Knowledge and his Theory of Vision preceded it by three and four years respectively. Although there is no evidence that they were known to Collier before the publication of his book, a passage in a letter written by him in March 1713-14 proves that he was acquainted in some measure with Berkeley's opinions at that date. In this letter and other four, which are given in Benson's Memoirs of Collier (1837), there are some further remarks in defence of his philosophical views ; but they are merely a repetition of the arguments in the Clawis. ' These are grounded on two presuppositions—first, the utter aversion of common sense to any theory of representative perception ; and second, the opinion which Collier held in common with Berkeley, and Hume afterwards, that the difference between imagina- tion and sense perception is only one of degree. The former is the basis of the negative part of his argument ;

the latter supplies him with all the positive account he has to give, aud that is meagre enough. The Clavis consists of two parts. After some introductory remarks, in which he explains that he will use the term “ external world” in the sense of absolute, self-existent, independent matter, and fences the position he is to occupy against sundry possible misinterpretations, he attempts in the first part to prove that the visible world is not external, by showing—first, that the seeming externeity of a visible object is no proof of real externeity, and second, that a visible object, as such, is not external. The image of a centaur seems as much external to the mind as any object of sense ; and since the difference between imagination and perception 18 only one of degree, God could so act upon the mind of a person imagining a centaur, that he would perceive it as vividly as any object can be seen. Descartes and his school affirm that certain objects of sense, as sounds, smells, &c., exist ouly in their respective faculties, although no one can doubt that they seem to exist altogether without them. The same philosophers agree that light and colours, which are allowed to be objects properly visible, are not external. Still they seem to be so. The delusions of the insane and the visions of inspired men are further instances of seeming externality which is not real. So is the familiar case of objects seen in a looking-glass. A number of similar illustrations are used to prove the second proposition, that a visible object, as such, is not external. If we assume, for instance, that there is an external moon, it cannot be the same as the visible moon, for this is ever-changing and is never bigger than a trencher ; but the real moon is some thousands of miles in diameter. Berkeley uses the same argument in his Alciphron (1732). Then, too, the Aristotelian and the Cartesian forms of representative perception agree in holding that the true object of vision is not the external reality. The author concludes his first part by replying to objections based on the universal consent of men, on the assurance given by touch of the extra existence of the visible world, and on the truth and good- ness of God (Descartes), which would be impugned if our senses deceived us. Collier argues naively that if universal consent means the consent of those who have considered the subject, it may be claimed for his view. He thinks with Berkeley that objects of sight are quite distinct from those of touch, and that the one therefore cannot give any assurance of the other; and he asks the Cartesians to-consider how far God’s truth and goodness are called in question by their denial of the externality of the secondary qualities. The second part of the book is

taken up with a number of metaphysical arguments to prove the impos- sibility of an external world. The pivot of this part is the logical principle of contradiction. From the hypothesis of an external world a series of antinomies are deduced, such as that the world is both finite and infinite, is movable and immovable, &c.; and finally, Aristotle and various other philosophers are quoted, to show that the external matter they dealt with, as mere potentiality, is just nothing at all. Among other uses and consequences of his treatise, Collier thinks it furnishes an easy refutation of the Romish doctrine of transubstantiation. If there is no external world, the dis- tinction between substance and accidents vanishes, and these become the sole essence of material objects, so that there is no room for any change whilst they remain as before. Sir William Hamilton thinks that the logically necessary advance from the old theory of representative perception to idealism was stayed by anxiety to save this miracle of the church ; and he gives Collier credit for being the first to make the discovery.1 Professor Ueberweg, on the other hand, is of opinion that idealism and the miracle of the

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1 Hamilton's Discussions, pp. 198-202.

eucharist may be reconciled by regarding substance not as substrate supporting the accideuts, but as intelligible essence ; so that when in the religious act the body and blood of Christ are conjoined with the bread and wine, these cease to be essential and become accidents, and a different substance is present.? But in that form of idealism which recognizes an intelligible essence there must be such a necessary connection between essence and phenomenon as would require the presence of new phenomena along with the new essence. Still it must have been some deeper cause than concern for the church dogma that retarded idealism. Until philosophers could be broughtto reflect on the meaning of such notions as externality, cause, &c., it was inevitable that they should continue striving to justify the belief in an external material world. Collier's blank denial would not have turned the stream. It needed a more subtle thinker to divert it into the course which it afterwards followed.

Collier's book possesses an interest for the student of philo-

sophy on account of the resemblance between his views and those of his contemporary Berkeley. Both were impelled to philosophize

by their dissatisfaction with the theory of representative perception.

Both have the feeling that it is inconsistent with the common sense of mankind, which will insist that the very object perceived is the sole reality, and both claim to substitute for the theory held in favour, and vainly sought to be demonstrated by their predecessors, another that will meet the demands of common sense. They equally affirm that the so-called representative image is the sole reality, and discard the unperceiving material cause of the philo- sophers as an unthinkable monstrosity. Of objects of sense, they say, their esse is percipt. But Collier never got beyond a bald

assertion of the fact, while Berkeley addressed himself to an ex- planation of it, which gave him ever profounder matter for philo- sophical reflection all his days. The thought of a distinction

between direct and indirect perception never dawned upon Collier's

mind. He could only meet the doctrine of the representationists, therefore, with a flat negation. To the question how all matter exists in dependence on percipient mind he could only reply, "Just how my reader pleases, provided it be somehow." As cause of our sensations and ground of our belief in externality, he substituted for an unintelligible material substance an equally unintelligible operation of divine power. But his illustrious contemporary gave a fresh start to philosophy by his exposition of the association between visual and tactual sensations; and his glimpses, faint at first, gradually grew more distinct of an intelligible order in the uni- verse. Collier's book exhibits no traces of a scientific development. In the first part, which may be compared with Berkeley's Theory of Vision, he merely brings together a fewinstances of visual experience, which throw discredit upon the popular opinion. The most that can be said about him is that he was an intelligent student of Descartes and Malcbranche, and had the ability to apply the results of his reading to the facts of his experience. He starts no original conception, contributes nothing to the development of philosophy. The latter half of his book reads like the ingenious quibbling of the schoolmen.

In philosophy he is a curiosity, and nothing more. His biographer tries to make out that the Clavis fell flat on the English public in comparison with the reception accorded to Berkeley's writings, on account of its inferiority in point of style. No doubt it is immenscly inferior in that respect ; but the crude- ness of Collier's thought had quite as much to do with his failure to gain a hearing. Hamilton allews greater sagacity to Collier than to Berkelcy, for not vainly attempting to enlist men's natural belief against the hypothetical realism of the philosophers. But Collier did so as far as his light enabled him. He appealed to the popular conviction that the proper object of sense is the sole reality, although he despaired of getting men to give up their belief in its externality. He moreover distinctly asserted that nothing but prejudice prevented them from doing so ; and there is little doubt that if it had ever occurred to him, as it did to Berkeley, to explain the genesis of the notion of externality, he would have been more hopeful of commend: ing his theory to the popular mind. What Collier simply denied Berkeley tried to explain, and therein lies that real difference between the two writers which accounts for-the comparative oblivion that has been the fate of the one, and justifies the place assigned to the other in the history of philosophy. – In a curious discourse on Genesis i. 1, which Collier published in 1730, under the modest title, A Specimen of a True Philosophy, ¥¢ have a jumble of his theological views and his philosophical opinions Inasmuch as we are often told in Scripture that God created

2 Annotations on Berkeley's Principles, p. 138. 8 Discussions, p. 197.

ings in and by the Son, the apy of the passage commented on — refer to the only begotten Son of God.

thing in particular is in its own proper or immediate apy or sub-

stance; but all these terminate in one, the Son of God, the

substance of the whole creation. This interpretation of the passage is corroborated by the conclusion reached in the Clavis Universalis ; for it is there proved that the visible or material world exists imme- diately in the mind of the percipient, and hence the meaning of the text must be that mind

or spirit is the apxy in which God created the heaven and the earth. As the objects of sense exist imme-

diately in the mind, so the mind exists immediately in the Son of

God ; and thus the ladder of bcing is completed in this Specimen ofa True Philosophy, ; :

TheLogology, or aTreatise on the Logos, in Seven Sermons on Johni. 1, 2, 8, and 14, was published in 1732, the year of Collier's death. It further applies his theory of inexistence to the Son, who is said to be in the Father, as men are in Him, and material objects are in them. The Son is the "'mean proportional' between God and us. Collier was heterodox in regard to the incarnation, as well as the Trinity, maintaining ''that the pre-existent Word, or Son of God, was not united to a created human soul or spirit, but was himself the man called Jesus and the Christ."

See Benson's Memoirs of the Life and Writings of Arthur Collier, 1837; Parr's Metaphysical Tracts by English Philosophers of the Eighteenth Century, 1837; Tennemann's History of Philosophy; Ham- ilton's Discussions; Professor Fraser's edition of Berkeley's Works.

COLLIER, Jeremy (1650-1726), a learned English nonjuring divine, born at Stow-cum-Quy, Cambridge- shire, in 1650, and was educated at Caius College, Cam- bridge. His first appointment was to the small rectory of Ampton, near Bury St Edmunds, which, after six years, he resigned in order to proceed to London, where in 1685 he was made lecturer of Gray's Inn. The change of Government at the Revolution, however, soon rendered the public exercise of his function impracticable. He was committed to Newgate for writing in favour of the de- throned monarch, and again on a charge of carrying on a treasonable correspondence with the enemies of the popu- lar movement ; but he was released on both occasions without trial, by the intervention of his friends, So far did he carry his scruples at this period, that he submitted to confinement rather than make a tacit acknowledgment of the jurisdiction of the court by accepting his liberty upon bail. In the two following years he continued to harass the Government by his publications ; but for his boldness in granting absolution at their execution to Sir John Friend and Sir William Perkins, who had

attempted the assassination of William, he was obliged to flee, and for the rest of his life continued under sentence of outlawry. When the storm had blown over he returned to London, and employed his leisure in literary works, which were less political in their tone. In 1697 appeared the first volume of his Essays on Several Moral Subjects, to which a second was added in 1705, and a third in 1709. All three series enjoyed great popularity at the time of their appearance, It was in 1798, however, that Collier produced the book by which he is best known, and for which he has been most justly praised, the famous Short View of the Immorality and Profaneness of the English Stage. Its publication involved him in a lengthened controversy with Congreve, Vanbrugh, and the other wits of the day. The book abounds in hypercriticism and in useless display of

earming, neither intrinsically valuable nor conducive to the argument. Yet, in the words of Macaulay, who gives an admirable account of the discussion in bis essay on the ree peo wists of the Restoration, "when all deduc- wore a een made, great merit must be allowed to the it ne ére 13 hardly any book of that time from which

ould be possible to select specimens of writing so ex-

If then we exist in

we are made by Him, as St Paul says, "'in him we ba : pe ae and have bur being," we must believe that we exist more immediately in the Son, being told, as in the text, that God made us and all things by and in His Son. Christ, the apxy of the whole creation, must needs be in some sense the subject or object of all that is called science. Things, however, do not exist immediately in Christ, but at various distances and projections from Him. Every-

cellent and so vanous." The Short View was followed by a Defence, a Second Defence, and a Farther Vindication, and in 1703 by Mr Collier's Dissuasive from the Play- house, in a Letter to a Person of Quality. The fight lasted in all some ten years ; but Collier had right on his side, and triumphed ; and the reformation of the English stage, so greatly needed,

may be said to date from the publication of the Short View. From 1701 to 1721 Collier was em- ployed in the translation and publication (in six volumes folio) of Moreri's Dictionnaire LMistorique, and in the com- pilation and issue of the two volumes folio of his own Licclesiastical History of Great Britain. The latter work was attacked by Burnet and others, but the author showed himself as keen a controversialist as ever. Many attempts were made to shake his fidelity to the lost cause of the Stuarts, but he continued-indomitable to the end. His last work was a volume of Practical Discourses, published in 1725, He died April 26, 1726.

COLLINGWOOD, Curueert (1750-1810), the first Baron Collingwood, a celebrated naval commander, was born at Newcastle-upon-Tyne, on the 26th of September 1750. He was early sent to school » and when only eleven years of age he was put on board the " Shannon," then under the command of Captain (afterwards Admiral) Brathwaite, a relative of his own, to whose care and attention he was in a great measure indebted for that nautical knowledge which shone forth so conspicuously in his subsequent career. After serving under Captain Brathwaite for some years, and also under Admiral Roddam, he went in 1774 to Boston with Admiral Graves, who in the year following presented him with a lieutenancy. In 1779 he was made commander of tho " Badger," and shortly afterwards post-captain of the " Hinchinbroke," a small frigate. In the spring of 1780 that vessel, under the command of Nelson, was employed upon an expedition to the Spanish Main, where it was proposed to pass into the Pacific by navigating boats along the River San Juan and the Lakes Nicaragua and Leon. The attempt failed, and most of those engaged in it became victims to the deadly influence of the climate. Nelson was promoted to a larger vessel, and Collingwood succeeded him in the command. It is a fact worthy of record that the latter succeeded the former very frequently from the time when they first became acquainted, until the star of Nelson set at Trafalgar—giving place to that of Collingwood, less brilliant certainly, but not less steady in its lustre.

After commanding in another small frigate, Collingwood was promoted to the " Sampson " of sixty-four guns; and in 1783 he was appointed to the " Mediator," destined for the West Indies, where, with N elson, who had a command on that station, he remained till the end of 1786. With Nelson he

warmly co-operated in carrying into execution the provisions of the navigation laws, which had been infringed by the United States, whose ships, notwithstand- ing the separation of the countries, continued to trade to the West Indies, although that privilege was by law exclusively confined to British vessels, In 1786 Colling- wood returned to England, where, with the exception of a voyage to the West Indies, he remained until IOS, an which year he was appointed captain of the " Prince," the flag-ship of Rear-Admiral Bowyer. About two years pre- vious to this event he had married Miss Sarah Roddam—a fortunate alliance, which continued to be a solace to him amidst the privations to which the life of a seaman must ever be subject.

As captain of the " Barfleur," Collingwood was present at the celebrated naval engagement which was fought on the 1st of June 1794 ; and on that occasion he displayed equal judgment and courage. On board the " Excellent " he shared in the victory of the 14th of February 1797,

when Sir John Jarvis humbled the Spanish fleet off Cape St Vincent. His conduct in this engagement was the theme of universal admiration throughout the fleet, and greatly advanced his fame as a naval officer. After blockading Cadiz for some time, he returned for a few weeks to Portsmouth to repair. In the beginning of 1799 Collingwood was raised to the rank of vice-admiral, and hoisting his flag in the " Triumph," he joined the Channel Fleet, with which he proceeded to the Mediterranean, where the principal naval forces of France and Spain were assembled. Collingwood continued actively employed in watching the enemy, until the peace of Amiens restored him once more to the bosom of his family.

The domestic repose, however, which he so highly relished, was cut short by the recommencement of hostilities with France, and in the spring of 1803 he quitted the home to which he was never again to return. The duty upon which he was employed was that of watching the French fleet off Brest, and in the discharge of it he displayed the most unwearied vigilance. Nearly two years were spent in this employment ; but Napoleon had at

length matured his plans and equipped his armament, and the grand struggle which was to decide the fate of Europe and the dominion of the sea was close at hand. The enemy's fleet jhaving sailed from Toulon, Admiral Collingwood was appointed to the command of a squadron, with orders to pursue them. 'The combined fleets of France and Spain, after spreading terror throughout the West Indies, returned to Cadiz. On their way thither they bore down upon Admiral Collingwood, who had only three vessels with him ; but he succeeded in eluding the pursuit, although chased by sixteen ships of the line. Ere one-half of the enemy had entered the harbour he drew up before it and resumed the blockade, at the same time employing an ingenious artifice to conceal the inferiority of his force. But the combined fleet was at last compelled to quit Cadiz; and the battle of Trafalgar immediately followed. The brilliant conduct of Admiral Collingwood upon this occasion has been much and justly applauded. 'The French admiral drew up his fleet in the form of a crescent, and in a double line, every alternate ship being about a cable's length to windward of her second, both ahead and astern. The British fleet bore down upon this formidable and skilfully arranged armament in two separate lines, the one led by Nelson in the "Victory," and the other by Collingwood in the " Royal Sovereign." The latter vessel was the swifter sailer, and having shot considerably ahead of the rest of the fleet, was the {first engaged. "See," said Nelson, pointing to the " Royal Sovereign" as she penetrated the centre of the enemy's line, "see how that noble fellow Collingwood carries his ship into action!" Probably it was at the same instant that Collingwood, as if in response to the observa- tion of his great commander, remarked to his captain, "' What would Nelson give to be here?" The consummate valour and skill evinced by Collingwood had a powerful moral influence upon both fleets. It was with the Spanish admiral's ship that the " Royal Sovereign" closed ; and with such rapidity and precision did she pour in her broad- sides upon the "Santa Anna," that the latter was on the eve of striking in the midst of thirty-three sail of the line, and almost before another British ship had fired a gun. Several other vessels, however, seeing the imminent peril of the Spanish flag-ship, came to her assistance, and hemmed in the "Royal Sovereign" on all sides; but the latter, after suffering severely, was relieved by the arrival of the rest of the British squadron ; and not long afterwards the "Santa Anna" struck her colours. The result of the battle of Trafalgar, and the expense at which it was purchased, are well

known. On the death of Nelson, Collingwood assumed the supreme command ; and by his

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skill and judgment greatly contributed to the preservation of the British ships, as well as of those which were captured from the enemy. He was raised to the peerage, as Baron Collingwood of Coldburne and Heathpool, and received the thanks of both Houses of Parliament, with a pension of £2000 per annum.

From this period until the death of Lord Collingwood

no great naval action was fought; but he was much occupiedzin important political transactions, in which he displayed remarkable tact and judgment. to the command of the Mediterranean fleet, he continued to cruise about, keeping a watchful eye upon the movements of the enemy. decline previously to the action of Trafalgar in 1805, seemed entirely to give way, and he repeatedly requested Govern- ment to be relieved of his command, that he might return home ; but he was urgently requested to remain, on the ground that his country could not dispense with his services.

Being appointed

His health, however, which had begun to

This conduct has been regarded as harsh; but the good sense and political sagacity which he displayed afford some palliation of the conduct of the Government; and the high estimation in which he was held is, proved by the circumstance that among the many able admirals, equal in rank and duration of service, none stood so prominently forward as to command the confidence of ministers and of the country to the same extent as he did. After many fruitless attempts to induce the enemy to put to sea, as well as to fall in with them when they had done so (which circumstance materially contributed to hasten his death), he expired on board the “Ville de Paris,” then lying off Port Mahon, on the 7th of March 1810.

Lord Collingwood's merits as a naval officer were in every respect of the first order. In original genius and romantic daring he was inferior to Nelson, who indeed had no equal in an age fertile in great commanders. In seamanship, in general talent, and in reasoning upon the probability of events from a number of conflicting and ambiguous state- ments, Collingwood was equal to the bero of the Nile; indeed, many who were familiar with both give him the palm of superiority. His political penetration was remarkable ; and so high was the opinion generally enter- tained of his judgment, that he was consulted in all quarters, and on all occasions, upon questions of general policy, of regulation, and even of trade. He was distinguished for benevolence and generosity; his acts of charity were fre- quent and bountiful, and the petition of real distress was never rejected by him. He was an enemy to impressment and to flogging ; and so kind was he to his crew, that he obtained amongst them the honourable name of father. Between Nelson and Collingwood aclose intimacy subsisted, from their first acquaintance in early life till the fall of the former at Trafalgar; and they lie side by side in the cathedral of St Paul's. 'The selections from the public and private correspondence of Lord Collingwood, published in 2 vols., 8vo, in 1828, contain some of the best specimens of letter-writing in our language. Sve also A ime Old English Gentleman exemplified in the Life and Character of Lord Collingwood, « Biographical Study, by William Davies, London, 1875.

COLLINS, Antnony (1676-1729), an English writer on theology and philosophy, born at Heston, near Hounslow in Middlesex, on the 21st June 1676, was the son of a country gentleman of good fortune. After being educated at Eton, and at King's College, Cambridge, he was entered at the Middle Temple, but he did not pursue the profession of the Jaw. 'The most interesting episode of his life was his intimacy with Locke, who in his letters speaks of him with the most affectionate regard. During a visit {0 Holland, made, it is said, in order to escape the storm raised by the Discourse of Freethinking, he also made the

acquaintance of Leclerc and several other Dutch scholars. In 1715 he settled in Essex ; and he was in that county appointed to the offices of justice of the

peace and deputy- lieutenant, which he had before held in Middlesex. His open expression of his opinions, with all its freedom, was, as he owns, carefully kept “within the bounds of doing him- self no harm ;” he always published anonymously, though the authorship of his books never appears to have been long a secret; and the independence of his position, together with his pure and genial character, saved him from all personal annoyance. The only attack reported, to have beeu made upon him, otherwise than by means of the press, was the fruitless petition presented by Whiston, while smarting under his criticism, praying that he might be removed from the commission of the peace. Collins died at his house in Harley Street, London, on December 13, 1729, at the age of fifty-three.

The first work of note published by Collins was his Essay concerning the Use of Reason in Propositions the Evidence whereof depends on Human Testimony (1707). He demands that the revelation of God should be conformable to man’s natural ideas of God, but draws a distinction between what is contrary to reason and what is merely contrary to our experience. :

Six years later appeared his most famous work, A Dis- course of Hreethinking, occasioned by the Rise and Growth of a Sect called Freethinkers (1718). Notwithstanding the ambiguity of its title, and though it attacks the priests of all churches without moderation, it contends for the most part, at least explicitly, for no more than must be admitted by every Protestant, or than is maintained in such works as Taylor’s Liberty of Prophesying ; and it points out forcibly that the first introduction of Christianity, and the success of all missionary enterprise, involve free-thinking (in its etymological sense) on the part of those converted. In England this essay, which was regarded and treated as a plea for deism, made a great sensation, calling forth several replies, amoug others from Whiston, Bishop Hare, Bishop Hoadly, and Richard Bentley, who, under the signature of Phileleutherus Lipsiensis, roughly handles certain arguments carelessly expressed by Collins, but triumphs chiefly by an attack on his scholarship. Swift also, being satirically referred to in the book, made it the subject of a caricature. In France, where it was answered by Crousaz, it produced a still deeper im- pression.

In 1724 Collins published his extraordinary Discourse on the Grounds and Reasons of the Christian Religion, with An Apology for Free Debate and Lnberty of Writing pre- fixed. Ostensibly it is written in opposition to Whiston's attempt to show that the passages of the Old Testament prophecies quoted in the New had since the time of Christ

thus secretly aims a blow at Christianity as a revelation, The canonicity of the New Testament he ventures openly to deny, on the ground that the canon could only be fixed by men who were inspired. No less than thirty-five answers Were directed against this book, the most noteworthy of which were those of Bishop Edward Chandler, Arthur Sykes, Clarke, and Sherlock. To these, but with special reference to the work of Chandler, which maintained that a number of prophecies were literally fulfilled in Christ, Collins replied by his Scheme of Lateral Prophecy Considered, 1727. An appendix contends against Whiston that the book of Daniel was forged in the time of Antiochus Epiphanes.

In philosophy, Collins takes a foremost place as a defender of Necessitarianism. His brief J, nguiry Concerning Human Liberty (1715) gives, in a remarkably clear and concise form, all the important arguments in favour of his theory, with able and suggestive replies to the chief objections that have been urged against it Little, in fact, of moment has been added by modern determinists, One of his arguments, however, calls for special criticism,—his assertion that it is self-evident that nothing that has a beginning can be without a cause is an unwarranted assumption of the very point at issue. Collins's position was attacked in an elaborate treatise by Samuel Clarke, in whose system the freedom of the will is made essential to religion and morality. During Clarke's lifetime, fearing perhaps (as has been suggested) to be branded as an enemy of religion and morality, Collins gave no reply, but in 1729 he published an answer, entitled Liberty and Necessity.

The other of Collins's two purely philosophical treatises is A Letter to Mr Dodwell. A controversy was then being carried on between Clarke, who asserted the natural im. mortality of the soul, and Dodwell, who held that the soul is mortal till baptism confers immortality upon it ; and Collins entered the lists to suggest other possibilities. Adopting Locke's Suggestion,

he maintained that it is con- ceivable that the soul may be material ; and, secondly, that if the soul be immaterial it does not follow, as Clarke had contended, that it is immortal ; indeed in no way, he argues, can philosophy prove its immortality.

Two of Collins's early works yet remain to be mentioned— his Vindication of the Divine Attributes, in which he attacks a sermon of King, archbishop of Dublin, and maintains that from our knowledge of human qualities we can attain to a true, if limited, knowledge of the divine attributes ; and his Priestcraft in Perfection, or a Detection of the Fraud of inserting and continuing the Clause, "The Church hath power to decree Rites and Ceremonies and Authority in Con- troversies of Faith," in the Twentieth Article of the Church of England (1709), to which—as the question excited a very active controversy—he added, early in the next year, a second pamphlet on the same subject. (T. M. w.)

COLLINS, Morrmer (1827-1876), novelist and writer of lyrics, was born at Plymouth, and was educated at a private school. After some years Spent in tuition and some contributions in verse to the Bristol newspapers, he re- paired to London, and devoted himself to journalism in the Conservative interest. In 1855 he published a volume of verse ; and in 1865 appeared his first story, Who is the Heir? A second volume of lyrics, The Inn of Strange Aleetings, was issued in 1871; and in 1872 he produced his longest and best sustained poem, The British Birds, a communication from the Ghost of Aristophanes. He wrote profusely for journals and magazines—the Owl, the Globe, Punch, Temple Bar, Belgravia, the World, &c.—and pro- duced, besides, several novels, the most readable of which, perhaps, is Sweet Anne Page (1868). As novels merely, these works are not greatly to be commended; as the work of a clever man of pronounced opinions, they are often interest-

that the fulfilment of prophecy by the events of Christ's life is all "secondary, secret, allegorical, and mystical," since the original and literal reference is always to some other fact. To explain this « allegorical " reading, he quotes from the Dutch Hebraist Surenbusius ten methods according to which the authors of the Gemara and other allegorical Writers among the Jews interpret difficult parts of the Scriptures, and Which are

asserted to have been used in the New Testament. Of these methods the gentlest is altering the points, and the most severe is " changing the order of words, adding words, and retrenching words, which is a method often used by Paul;" and the true purpose of the book would appear to have been to show, in a veiled Satire, that the fulfilment of prophecy in the New

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ing enough. 'Their author's great claim to remembrance, however, is based upon his lyrics; some of these, in their light grace, their sparkling wit, their airy philosophy, are equal to anything of their kind in modern English. COLLINS, Wiu1am (1721-1759), who divides with Gray the glory of being the greatest English lyrist of the 18th century, was born on the 25th of December, 1721, at Chichester, of which city his father, a rich hatter, was the

was sent, in January 1733, to Winchester College, where Whitehead and Joseph Warton were his schoolfellows. When he had been nine months at the school, Pope paid Winchester a visit and proposed a subject for a prize poem ; it is legitimate matter or fancy to suppose that the lofty forehead, the brisk dark eyes, and gracious oval of the childish face, as we know it in the only portrait existing of Collins, did not escape the great man's notice, then not a little occupied with the composition of the Lssay on Man. In 1734 it is supposed that the young poet published his first verses, on The Royal Nuptials, of which, however, no copy has come down to us; another poem, probably satiric, called The Battle of the Schoolbooks, was written about this time, and has also been lost. Fired by his poetic fellows to further feats in verse, Collins produced, in his seventeenth year, those Persian Eclogues which were the only writings of his that were valued by the world during his own lifetime. They were not printed for some years, and meanwhile Collins sent, in January and October

attracted the notice and admiration of Johnson, then still young and uninfluential. In March 1740 he was admitted commoner of Queen's College, Oxford, but did not go up to Oxford until July 1741, when he entered Magdalen College. At Oxford he continued his affectionate intimacy with the Wartons, and gained the friendship of Gilbert

London. They were four in number, and formed a modest pamphlet of not more than 300 lines in all. Those pieces inay be compared with Victor Hugo's Les Orventales, to which, of course, they are greatly inferior. Considered with regard to the time at which they were produced, they are more than meritorious, even brilliant, and one at least the sccond—can be read with enjoyment at the present day. The rest, perhaps, will be found somewhat artificial and effete. In November 1743 Collins was made bachelor of arts, and a few days after taking his degree published his second work, an Epistle to Sir Thomas Hanmer. This

individuality, and resembles, in its habit of impersonifying qualities of the mind, the ripcr lyrics of its author. For the rest, it is au enthusiastic review of poetry, culminating in a laudation of Shakcspeare. It is supposed that he left Oxford abruptly in the summer of 1744 to attend his mother's death-bed, and did not return, His indolence, which had been no less marked at the university than his genius, combined with a fatal irresolution to make it extremely difficult to choose for him a path in life. The army and the church were successively suggested and rejected ; and he finally arrived in London, bent on enjoying a small property as an independent man about town. He made the acquaintance of Johnson and others, and was urged by those friends to undertake various important writings—a History of the Revival of Learning, several tragedies, and a version of Aristotle's Poetics, among others ——all of which he commenced and lacked force of will to continue. He soon squandered his means, plunged, with most disastrous effects, into profligate excesses, and sowed the seed of his untimely misfortune. It was at this time, however, that he composed his matchless odes, which | Bird's Nest. In 1815 he was madc associate of the Royal appeared on the 90th of December 1746, dated 1747. | Academy, and was elected R.A. in 1820. For the next

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The original project was to have combined them with the odes of Joseph Warton, but the latter, now forgotten, proved at that time to be the more marketable article, Collins's little volume fell dead from the press, but it won him the admiration and friendship of Thomson, with whom, until the death of the latter in 1748, he lived on terms of affectionate intimacy. The

Odes, in the volume of that name, were twelve in number; to their contents we shall presently return. In 1749 Collins was raised beyond the fear of poverty by the death of his uncle ; and he left London to settle in his native city. He had hardly begun to taste the sweets of a life devoted to literature and quiet, before the weakness of his will began to develop in the direction of insanity, and he hurried abroad to attempt to dispel the gathering gloom by travel. In the interval he had published two short pieces of consummate grace and ‘ beauty—the Elegy on Thomson, in 1749, and the Dirge | in Cymbeline, later in the same year. In the beginning of 1750 he composed the Ode on the Popular Superstitions : of the Highlands, which was dedicated to the author of Douglas, and not printed till long after the death of Collins, and an Odeon the Music of the Grecian Theatre, which no longer exists, and in which our literature probably has sustained a severe loss. With this poem his literary career closes, although he lingered in great misery for nearly nine ears. From Gilbert White we learn that his madness was occasionally violent, and that he was confined for a time in an asylum at Oxford. But for the most part he resided at Chichester, suffering from extreme debility of body when the mind was clear, and incapable of auy regular occupation. Music affected him in a singular manner, and st is recorded that he was wont to slip out into the cathedral cloisters during the scrvices, and moan and howl in horrible accordance with the choir. In this miserable condition he passed out of sight of all his friends, and in 1756 it was supposed, even by Johnson, that he was dead ; in point of fact, however, his sufferings did not cease until the 12th of June 1759. No journal or magazine recorded the death of the forgotten poet, though Goldsmith, only two months before, had commeuced the laudation which was soon to become universal.

No English poet so great as Collins has left behind him so small a bulk of writings. Not more than 1500 lines of his have been handed down to us, but among these not one is slovenly, and few are poor. His odes are the most sculp- turesque and faultless in the language. They lack fire, but in charm and precision of diction, exquisite propriety of form, and lofty poetic suggestion they stand unrivalled. That one named Zhe Passions is the most popular ; that To Evening is the greatest favourite with imaginative persons. In reading this, and the Ode to Simplicity, one secms to be handling an antique vase of matchless delicacy and elegance. Distinction may be said to

be the crowning grace of the style of Collins ; its leading peculiarity is the incessant impersonification of some quality of the character.

In the Ode on Popular Superstitions he produced a stil nobler work ; this poem, the most considerable in size which has been preserved, contains passages which are beyond question unrivalled for rich melancholy fulness 1 our literature between Milton and Keats. ‘The life 0 Collins was written by Dr Johnson, he found an enthusiastic = admirer in Dr Langhorne; and more recently kindly biographer in Mr Moy Thomas. (E. W. G.) COLLINS, Wrii1am (1787-1847), painter, was the son of an Irish picture dealer and man of letters, the authorof a Life of George Morland, and was born in London. ae studied under Etty in 1807, and in 1809 exhibited his first pictures of repute—Boys at Breakfast, and Boys with

After some childish studies in his native town, he

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some verses to the Gentleman’s Magazine, which

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Early in 1742 the Persian Eclogues appeared in

written in heroic couplets, shows a great advance in

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sixteen years he was a constant exhibitor ; his fishermen, shrimp-catchers, boats and nets, stretches of coast and sand,

and, above all, his rustic children were universally popular.

Then, however, he went abroad on the advice of Wilkie, and for two years (1837-1838) studied the life, manners, and scencry of Italy. In 1839 he exhibited the first fruits of this journey ; and in 1840, in which year he was ap- pointed librarian to the Academy, he made his first appear- ance as a painter of history. In 1842 he returned to his carly manner and choice of subject, and during the last years of life enjoyed greater popularity than ever. Asa painter Collins is entitled to high praise. He was a good colourist and an excellent draughtsman ; he was also con- scientious exceediugly, and an ardent lover and student of nature. His earlicr pictures are deficient in breadth and force,—are feeble, in fact, from excess of care and finish ; but his later work, though also carefully executed, is rich in effects of tone and in broadly painted masses. His biography, Life of William Collins, R.A., 2 vols., by his son Wilkie Collins, the well-known novelist, appeared in

1848.

COLLODION (from xéAAa, glue), a colourless, viscid fluid, made by dissolving gun-cotton and the other varieties of pyroxylin, or cellulotrinitrin, C,H,O,(NO,),, in a amix- ture of alcohol and ether. It was discovered in 1848 by Maynard in Boston. The quality of collodion differs according to the proportions of alcohol and ether and the nature of the pyroxylin it contains. Collodion in which there is a great excess of ether gives by its evaporation a very tough film; the film left by collodion containing a large quantity of alcohol is soft and easily torn ; but in hot climates the presence of an excess of alcohol is an advantage, as it prevents the rapid evaporation of the ether. Pyroxyliu for the making of collodion for photographic purposes is prepared by immersing cotton-wool ten minutes in a mixture of nitric and sulphuric acids at a temperature of 140° Fahr, When tolerably strong acids at a low temperature are employcd, the nitric acid being in by far the larger quantity, the pyroxylin made requires an amount of alcohol equal to only about 4th or },th that of the ether in bulk. According to M. Miallic, the most explosive kinds of gun-cotton are not the best adapted for the preparation of collodion sa pyroxylin very soluble in ether isin his process made from 2 parts by weight of carded cotton to 40 parts of nitre and 60 of concentrated sulphuric acid. Under the micro- seope, the film produced by collodion of good quality appears translucent

and colourless, the cotton being perfectly dissolved ; old collodion that does not give good photo- graphic impressions sufficicntly quickly exhibits liquid globules of modified ether. The film from collodion which 18 too alcoholic has the microscopic appearance of cellular tissue ; and when water has been present, the fibrille of the cotton become apparent as amorphous flocks. To pre- serve collodion it should be kept cool, and out of the action of the light ; iodized collodion that has been discoloured by the development of free iodine may be purified by the mnicrsion in it of a strip of silver foil. For the iodizing of collodion, ammonium bromide and iodide and the iodides of calcium and cadmium are the agents employed. The first to suggest the use of collodion in photography was M. le Grey, in Paris ; Mr F. 8, Archer, in February 1851, recommended iodized collodion instead of paper for the taking of photographs (Zhe Chemist, New. Ser., vol. ii. No. XIX. p. 257, March 1851). In surgery collodion is used in its usual condition, or combined with elastic and other substances, for the protection of inflamed surfaces, as in crysipelas and smallpox. When poured upon the skin, it forms a thin film which contracts as it dries. Flexible collodion, which, as it does not crack in drying, is prefer- able for surgical purposes to the ordinary preparation, is

made from collodion Caz. Canada balsam 120 grs., castor- oil one fluid drachm. Vesicating or Blistering Collodion contains cantharidin as one of its constituents. ~The styptic colloid of Richardson is a strong solution of tannin in gun- cotton collodion. Small balloons are manufactured from collodion by coating the interior of glass-globes with the liquid ; the film when dry is removed from the glass by applying suction to the mouth of the vessel. M. E. Gripon has found (Compt. Iend., April 5, 1875) that collodion membranes, like glass, reflect light and polarize it both by transmission and reflection; they also transmit a very much larger proportion of radiant heat, for the study of which they are preferable to mica. Sce Puorocrapapy.
COLLOT D'HERBOIS, Jean Mane (1750-1796), a prominent actor in the French Revolution, was a Parisian actor. After figuring for some years at the principal pro- vincial theatres of France and Holland, he became director of the playhouse at Geneva. He had from the first a share in the revolutionary tumult ; but it was not until 1791 that he became a figure of

importance, Then, however, by the publication of /'Almanach du Pére Gérard, a tract designed to set forth, in homely style, the advantages of a constitu- tional government, he suddenly acquired great popularity. His renown was soon increased by his active interference on behalf of the Swiss of the ChAteau-Vienx Regiment, condemned to the galleys for mutiny at Nancy. His efforts resulted in their liberation ; he went himself to Brest in search of them ; and a civic feast was decreed on his behalf and theirs, which gave occasion for one of the few poems published during his life by André Chénier, He next endeavourcd to obtain the office of iinister of justice, but was disappointed. The Tenth of August, how- ever, placed him in the municipality of Paris. There he attached himself to Billaud-Varenne, and had with him a large share in bringing about the September Massacres. Having been elected a deputy for Paris to the Convention, he was among the first to demand the abolition of royalty ; and from Nice, whither he had gone on an embassy, he voted the death of Louis XVI.—* sans sursis." In the struggle between the Mountain and the Girondists he dis- played great energy ; and after the coup d'état of May 31 (1793) he made himself conspicuous by his pitiless pursuit of the defeated party. In June he was made president of the Convention ; and in September, with Billaud-Vareune, he was admitted to the Committee of Public Safety. He voted loudly and persistently for all the bloodiest and Sternest measures. In November, after the Lyonese insur- rection, he was sent with Fouché to punish the rebellious city, where, it is said, he had once becn hissed as an actor. This he effected by putting about 1500 persons to death in one day. In May 1794 an attempt was made to assas- sinate Collot; but it only increased his popularity. In the struggle for mastery between Robespierre and Tallien, Collot took the part of the latter In spite, however, of his fierce attack on Robespierre he was expelled from the Committee of Public Safety, and was denounced in form by Lecointre. He defended himself, and was acquitted, but only to be denounced anew by Merlin, and to be con- demned, with Billaud-Varenne, to transportation to Cayenne, where he died of fever a few months after his arrival. Colbot d'Herbois wrote and adapted from the oe and Spanish many plays, one of which, Le Paysan Magistrat, kept the stage for several years. L'Almanach du Pére Gérard was reprinted (1792)

under the title of Ltrennes aux Amis de la Constitution Francaise, ou Entretiens du Pere Gérard avec ses Concitoyens, Paris, 12mo.

COLMAN, GeorcE (1733-1794), essayist and dramatist, usually called the Elder, and sometimes George tlic First, to distinguish him from his son, was born at Florence, where his father was stationed as resident at the court of the grand duke of Tuscany. After a preliminary

display than to any intrinsic vitality. The best of them are John Bull (1805), for which the author received the largest sum of money that had till then been paid for any single play, Zhe Poor Gentleman, and Zhe Heir-at-Law. Colman, whose conversational powers were remarkable, as Byron has recorded, was also the author of a great deal of so-called humorous poetry (mostly coarse, though much of it: was popular)—My Night Gown and Shippers (179a Broad Grins (1802), and Poetical Vagaries (1812). Some of his writings were published under the assumed name of Arthur Griffinhood of Turnham Green. See Random Records, London, 1830, 2 vols. ; and R. B. Peake, JJemoirs of the Colman Family, London, 1842, 2 vols.

course of study at a private academy in Marylebone, he was sent to Westminster School, which he left in due course for Christ Church, Oxford. Here he made the acquaintance of Bonnel Thornton, the parodist, and together they founded The Connoisseur (1754-1756), a periodical which reached its 140th number, and which, Johnson said, “wanted weight.” In 1758 he took the degree of Master of Arts, came to London soon afterwards, was entered at Lincoln’s Inn, and was duly called to the bar ; and in 1760 he produced his first play, Polly Honeycomb, which met with great success. In 1761 he brought out The Jealous Wife, a comedy rich in borrowed excellences ; in 1764 the death of Lord Bath placed him in possession of an annuity ; in 1765 appeared his brilliant metrical trausla-tion of the plays of Terence ; and in 1766 he produced The Clandestine Marriage, jointly with Garrick, whose Lord Ogleby was one of his finest impersonations. In 1767 he succeeded to a second annuity, on the death of General Pulteney, purchased a fourth share in Covent Garden Theatre, and was appointed acting manager. Jn 1768 he was elected into the famous Jiterary Club, then nominally consisting of twelve members; in 1774, after seven years of managership, he sold his share in the great playhouse to

Leake ; and in 1777 he purchased of Foote, then broken in health and spirits, and near his end, the Little Theatre in the Haymarket. In 1778 he published an edition of Beaumont and Fletcher ; aud in 1783 appeared his translation of Horace's Epistle De Arte Poetica, with notes and a commentary. He was attacked with palsy in 1785; in 1789 his brain became affected, and he lapsed gradually into idiocy. Besides the works already cited, Colman was author of some 35 plays, of an excellent translation from the Mercator of Plautus for Bonnell Thornton's edition (1769-1772), and of many parodies and occasional pieces. An incomplete edition of his dramatic works was published in 1777, in four volumes. See also Prose on Several Occasions, with some Pieces in Verse, by George Colman, London, 1787, 3 vols. ; and Some Particulars of the Life of the Late George Colman, Written by Himself, London, 17 95.

COLMAN, GzorcE (1762-1836), the Younger, son of the preceding, passed from Westminster School to Christ Church, Oxford, and King's College, Aberdeen, and was finally entered ag a student of law at the Temple, London. While at Aberdeen he published a poem in honour of Charles James Fox, called Zhe Man of the People ; and in 1782 he produced, at his father's playhouse in the Hay- market, his first play, Zhe Memale Dramatists, for which Roderick Random supplied the materials. It was unani- mously condemned, but his next attempt, Two to One, was entirely successful, and the young Temiplar's vocation was decided on. The failing health of the elder Colman oblig- ing him to relinquish the management of the Haymarket theatre, the younger George succeeded him, at a yearly salary of £600, On the death of the father the patent was continued to the son; but difficulties arose in his way, lawsuits and pamphlets accumulated round him, and he was forced to take sanctuary within the Rules of the King's Bench. Here he resided for many years. Released at last through the kindness of George IV., who had appointed him exon of the Yeomen of the Guard, a dignity disposed of by Colman to the highest bidder, he was made examiner of plays by the duke of Montrose, then lord chamberlain. This office, to the disgust of all contemporary dramatists, to whose MSS. he was as illiberal as severe, he held till his death. Colman's comedies, which havenever bcen collected, are @ curious mixture of genuine comic force and platitudinous sentimentality. Several of them are yet acted; but their popularity is rather to be attributed to

the humour of the actors who adopt them as vehicles for

department of Haut Rhin in France, but now of the district

by a canal with the Rhine, and has a station on the railway . from Basel to Strasburg, being about 40 miles 8.8. W. of the |

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COLMAR, or Kormag, till 1870 the chief town of the

of Upper Alsace, in the German empire, is situated on the Lauch and the Fecht, tributaries of the Il]. It communicates |

latter city. It is the seat of the administrative offices for Upper Alsace, an imperial court of appeal for Alsace-Lor-

raine, a commercial court, an imperial lyceum, a Protestant normal college, a literary, an agricultural, and a natural history society. The last, founded in 1861, maintains a valuable museum in the old convent of Unterlinden, and

another museum, named after the old painter Schongau,

for the preservation of works of art; the town library con- tains 50,000 volumes, and the archives of Upper Alsace reach back to the 7th century. The most remarkable edifices in the town are the so-called cathedral, or St Martin's church, a Gothic structure built in 1363, the prefecture or administrational buildings, and the town- house; and there are also civil and military hospitals, barracks, a theatre, and a deaf-mute institution. The manufactures of the town comprise cotton goods of various sorts, packing-cloth, hosiery, starch, silk thread, iron and copper wares, engines, sewing-machines, bricks, matches, and leather ; and there are eight breweries, @ dye-work, and several printing and lithographic establishments. The domestic trade of the country is centred in the city, and large transactions are effected in wine and hops. Colmar grew up round a royal residence called Columbaria, which is first mentioned in the 8th century. It obtained a

char- ter of incorporation in 1226, and was afterwards made & free imperial city by the Emperor Frederick II. Tt was

taken after a six weeks' siege by Adolphus of Nassau in 1293, invested by Duke Otto of. Austria in 1330, occu-

publishes valuable contributions to local science. There is |

pied by Duke Rudolf in 1358, seized by the Swedes in 1632, and finally dismantled by the French after the siege of 1673.

COLNE, a market town of England, in the county of Lancaster, 26 miles north of Manchester, on a small afflu- | ent of the Calder, near the Liverpool and Leeds Canal, with a station on a branch of the Midland line. Itis a place of great antiquity, and many Roman coins have been found on the site. As early as the 14th century it was the seat of a woollen manufacture; but its principal manufactures now are printed calicoes and mousselines-de-laine. The chief buildings are the parish church of St Bartholomew, | an ancient edifice which has been frequently restored, and the cloth or piece-hall, in the Elizabethan style. The grammar school is interesting as the place where Archbishop Tillotson received his early education. In the neighbour: hood are several limestone and slate quarries. Population in 1851, 6644 ; in 1871, 7335.

COLOCYNTH, Corogurnripa, or Brrrer APPLE, Cit- rullus or Cucumis Colocynthis, a plant of the natural order Cucurbitacee or Gourds. The flowers are unisexual ; the male blossoms have five stamens and sinuous anthers,

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the female have reniform stigmas, and a 3 to 6 celled ovary. The fruit is round, and about the size of an orange; it has a thick yellowish rind, anda light, spongy, and very bitter pulp, which furnishes the colocynth of druggists, The seeds, which number from 200 to 300, and are disposed in vertical rows on the three parietal placentee of the fruit, are flat and ovoid,

and dark-brown ; they are used as food by some of the tribes of the Sahara, and a coarse oil may be expressed from them. The foliage resembles that of the cucumber, and the root is perennial. The plant has a wide range, being found in Ceylon, India, Persia, Arabia, Syria, North Africa, the Grecian Archipelago, the Cape Verd Islands, andthe south-east of Spain. The term pakkuoth, translated “wild gourds” in 2 Kings iv. 39, is thought to refer to the fruit of the colocyuth; but, according to Celsius, it sig- nifies a plant known as the squirting cucumber, Hebaliwm purgans, The commercial colocynth consists of the peeled and dried fruits, which are imported from Aleppo, Smyrna, Mogador, Spain, and other localities. In the preparation of the drug, the seeds are always removed from the pulp. Its active principle is an intensely bitter glucoside, colocynthin, CygH540,, soluble in water, ether, and alcohol, and decomposable by acids into glucose and a resin, colo- eynthein, CyyH40,5. Colocynth is a drastic purgative, and in large doses the powdered drug or its decoction has an inflammatory action on the intestines, and may produce fatal effects. It is administered in combination with aloes, Scammony, cardamoms, and potassium sulphate, also with henbane. Colocynth was known to the ancient Greek, Roman, and Arabic physicians; and in a herbal of the llth century, written in Saxon (Cockayne, Leechdoms, &e., vol. i. p. 325, Lond., 1864), the following directions are given as to its use :—“ For stirring of the inwards, take the in- ward neshness of the fruit, without the kernels, by weight of two pennies ; give it, pounded in lithe beer to be drunk ; it stirreth the inwards,”

COLOGNA, a town of Italy, in the province of Verona, 20 miles south-east of the city of that name on the Frasana Canal. It has a cathedral, and carries on an extensive – in hemp, silk, wine, grain, and almonds. Population,

COLOGNE, German Koy or Coun, the chief city of Rhenish Prussia, and a fortress of the first rank, capital of a government of the same name, is situated in the form of a half circle on the left bank of the Rhine, 45 miles N.N.W. of Coblentz, in 50° 56’ 29” N. lat., 6° 57’ 52” E. long. It is connected with the suburb of Deutz, on the opposite side of the Rhine, by a bridge of boats nearly 1400 feet long, and by a handsome iron bridge which serves both for railway and street traffic, Although when viewed from a distance the city has a picturesque aspect, it is very irregularly built, and the older streets are narrow, crooked, and dirty. The most important squares are

the Heumarkt, Neumarkt, Altmarkt,and Waidmarkt, There are two railway stations. the Central, near the cathedral, and the Pantaleon. There are also two stations in Deutz. The cathedral or Dom, the Principal edifice and chief object of interest in Cologne, 1s one of the finest and purest monuments of Gothic architecture in Europe. It stands on the site of a cathedral commenced about the beginning of the 9th a by Hildebold, metropolitan of Cologne, and finished Under Willibert in 873. This structure was ruined by the F ormans, was rebuilt, but in 1948 was almost wholly va ea The foundation of the present cathedral Me toy ce by Conrad of Hochstaden. The original Bile de i has been attributed to Gerhard von

an 2 ‘2 the new choir was consecrated, and the pla – “pt kings were removed to it from the Coes occupied in the former cathedral. After eath the work of building advanced but slowly,

and at the time of the Reformation it ceased entirely, In the early part of the 19th century the repairing of the cathedral was taken in hand, and in 1842 the building of fresh portions necessary for the completion of the whole structure was commenced. The cathedral, which ig in the form of a cross, has a length of 480, a breadth of 289 feet ; the height of the central aisle is 154 feet; that of each of the towers, when completed, will be upwards of 500 feet. The heaviest of the six bells weighs 11 tons, In the choir the heart of Mary de’ Medici is buried ; and in the adjoining side-chapels are monuments of the founder and other archbishops of Cologne, and the shrine of the three kings, which is adorned with The very numerous and richly- at yarious times to the cat

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tae: Plan of Cologne.

1. St Cunibert’s Church. 16. St Martin s Church. 2. Civil Jail. 17. Synagogue. 3. St Ursula’s Church. 18. Church of the Apostles. 4. St Gereon’s Church. 19. Bank. 5. Archbishop’s Palace. 20. Civil Hospital. 6.

Government Palace. 21. Casino. 7. Palace of Justice. 22. St Maria's Church, 8. St Andreas's Church. 23. Gtirzenich (Merchant's Hall) 9. Jesuits' Church. 24. St Mauritius's Church. 10. Cathedral. 25. St Peter's Church. 11. Diorama, 26. Tempelhaus (Exchange) 12. Post Office. 27. Gymnasium 13. Church of the Minorittes, 28. St Pantaleon Church. 14. Museum of Paintings. 29. Garrison Lazaretto. 15. Rathhaus (Town Hall). 30. St Severin Church.

imposing effect of the interior. (See ARCHITECTURE, vol. il. p. 431.) Many of the churches of Cologne are of interest both for their age and for tiie monuments and works of art they contain, In St Peter's are the famous altar-piece by Rubens, representing the Crucifixion of St Peter, several other works by Lucas of Leyden, and some old German glass-paintings. St Martin 's, built between the 10th and 12th centuries, has a fine bapistery, and paintings by Du Bois and Honthorst; St Gereon's, built in the 11th century on the site of a Roman rotunda, is noted for its mosaics

that of Spain and Portugal. About four-fifths lies to the north of the equator. On the Atlantic it possesses a coast line of upwards of Coast, 1000 miles, richly furnished with bays and natural harbours, Proceeding westward from Calabozo Creek, in the Gulf of Maracaibo, the first inlet of real importance which we . discover is the Bahia Honda, which is well protected from . the strong winds of the east and north, but is rendered unsuitable for the establishment of a port by its lack of drinkable water. Passing by the Bay of El Portete, we next reach the ports of Riohacha and Dibulla, of which the a former is of considerable commercial importance as a centre of exportation, though it is greatly surpassed by that of Santa Marta, which is the next to break the coast-line. Santa Marta is situated at the side of the Cienega Lagoon, which stretches 25 miles from south to north, with a breadth of 11 from east to west, has communication with the lakes of Pajaral and Cuatro Bocas, and, though rather shallow, can be navigated by flat-bottomed steamboats. At the mouth of the Magdalena lies the port of Barranquilla, and a short distance to the west that of Sabanilla, one of the most active along the whole coast. After these comes the splendid Bay of Carthagena, known for centuries to all navigators of the Caribbean ; and still further to

the west the coast is broken by the port of Zapote, the Bay of Zispata, the Gulf of Morrosquillo, and finally by the noble Gulf of Darien, with the estuary of the Atrato and the ports of Turbo, Guacuba, Candelaria, &c. Along the isthmus are the Mandinga Creek; the Bay of Portobello, so famous in the history of Spanish America ; the modern port of Colon, or Aspinwall, at the entrance of Navy Bay ; and the now decadent port of Chagres. The coast-line ; of the Pacific is hardly so important as that of the Atlantic, except along the isthmus, where it forms the great Bay of Panamé, with the subordinate inlets of Parita Bay on the west and the Gulf of San Miguel on the east. Along the remainder of the line are Cupica, San Francisco, Solano, Palmar, and Charambira (the last obstructed by a bar), the large Bay of Malaga, protected by the Isla de Palmas, with the harbours of Guapi and Izcuandé, the Bay of Pasa Caballos, the harbour of Tumaco, and in the Island of . Gorgona the fine harbour of Trinidad. | i

and glass and oil paintings; the Minorite church, com- menced in the same year as the cathedral, contains the tomb of Duns Scotus. Besides these may be mentioned the Pantaleon church, a 12th century structure, with a monu- ment to Theophania, wife of Otto IL, ; St Cunibert, in the Byzantine-Moorish style, completed in 1248; St Maria im Capitol, the oldest church in Cologne, dedicated in 1049 by Pope Leo IX., noted for its crypt, organ, and paintings ; St Cecilia, St Ursula, and St George. Other public buildings are the Giirzenich, the former meeting-place of the diets of the German empire, built between 1441 and 1474, the great hall of which is capable of accommodating 3000 persons ; the Rathhaus, which dates from the 13th century ; the Tempelhaus, built partly in the 12th century ; the Museum Wallraf-Richartz, in which is a collection of paintings by old Italian and Dutch masters, together with some works by modern artists; the Zeughaus or arsenal, situated on Roman foundations ; the Government buildings, erected by Bircher in 1830 ; the archbishop's palace, three gymnasia, several normal and commercial schools and literary and scientific institutions, and three theatres. The university, founded in 1388, was suppressed by the French during their occupation of the country. The walls which surround the city are about seven miles in circuit. Outside the walls, to the north side, are the Zoological and the Botanical Gardens. Cologne has a considerable trade in corn, wines, hides, and rape-seed with Holland, Belgium, and other countries; and steamers ply regularly between the city

and the ports on the Rhine. The principal manufactures are cotton yarn and stuffs, hosiery, woollens, silks, tobacco, sugar, soap, wax-lights, starch, malt, dyes, white-lead, porcelain, carpets, brandy and spirits, eau-de-cologne, and leathern and metal wares. In 1815 the population of Cologne was 47,000; in 1871 it amounted to 129,233, or, if that of Deutz be included, about

141,000.

Cologne occupies the site of Oppidum Ubiorum, the chief town of the Ubii, and there in 51 a.p. a Roman colony was planted by the Emperor Claudius, at the request of his wife Agrippina, who was born in the place. After her it was named Colonia Agrippina or Agrippinensis. Cologne rose to be thé chief town of Germania Secunda, and had the privilege of the Jus Italicum. Both Vitellius and Trajan were at Cologne when they became cmperors. Statues, sarcophagi, and other-Rowan remains, and portions of the old Roman walls have been found at Cologne. About 380 the city was taken by the Franks, and in 475 it became the residence of the French king Childeric. In 870 it was annexed to the empire. The bishopric was founded in 314, the archbishopric about the end of the 8th century; in the 14th century the arch-bishops were made electors of the German empire. The last elector, Maximilian, died in 1801. Cologne was besieged by Emperor Henry V. in 1160, and by Philip of Swabia in 1201. From 1452 to 1474, having taken part with England, it was excluded from the Hanseatic League, of which it was one of the most important and wealthy cities. The intolerance of its magistrates in expelling Jews and Protestants, and the closing of the Rhine navigation in the 16th century by the Dutch, contributed to its decline. This last restriction having been removed in 1837, the trade of Cologne has greatly improved. In 1794 Cologne was taken by the French; it was ceded to them by the Treaty of Lunéville in 1801, and from that time till 1814, when it was restored to the Prussians, it was the capital of the department of the Roer.

COLOMBIA, or, according to the official title, the Republic of the United States of Colombia, is a modern confederation in South America, consisting‘ of the nine states of Antioquia, Bolivar, Boyacd, Cauca, Cundinamarca, Magdalena, Panama, Santander, and Tolima, and

comprising a considerable portion of the territory of the old Spanish vice-royalty of New Granada. It is bounded on the N. by the Caribbean Sea, on the E. by Venezuela, on the 8. by Ecuador and Brazil, and on the W. by the Pacific. It thus extends from 12° 20’ N. to 2° 30’ §. lat., and from 65° 50’ to 83° 5’ W. long.,—its total area being roundly estimated at 500,000 square miles, or more than double

The western part of Colombia is one of the most moun: Surface. tainous districts in the world; its eastern extension belongs to the great plains of the Orinoco and the Amazon. The mountains are all more or less directly portions of the system of the Andes. Entering at the south from the territory of Ecuador, they form an extensive plateau from : which a large number of rivers take their rise. The portion : known as the paramo of Cruz Verde has, according to Stein- heil, an elevation of 10,975 old Paris feet, or about | 11,695 English feet. From this table-land the system . breaks up into three ranges, which stretch north through nearly the whole length of the country, with a general parallelism of direction least maintained by the eastern portion. Of these ranges the loftiest at first is the Central, or the Cordillera of Quindiu, which contains the snow- peaks of Huila, Ruiz, and Tolima, the culminating peak of the Andes north of the equator; but in 5° 5’ N. lat, where this range sinks down, the Eastern rises to ihe snow limit, and is the most elevated of the three Cordilleras. The Eastern Cordillera, or the Cordillera de la Suma Paz, runs north-east to the paramos of Pamplona, from which it sends out a branch to meet the massif of the Sierra Nevada of Santa Marta. In its passage through the state of Santander it attains in the Alto de el Viejo an altitude of 12,965 feet, in Alto de el Trio of 9965, and in the Boca del Monte of 12,735. The Sierra Nevada is said to reach a height of 23,779 feet, and it is certainly covered with perpetual snow over a large part of its summit. The

COLOMBIA

Western Cordillera, or Cordillera de Choco, is the least remarkable of the three, and has been worn down in many places into what are comparatively mere rounded hills with it continues northward, however, much further than the central chain, and in fact extends

easy passages between ;

right through the Isthmus of Panamé.

The ¢lanos or plains of the Orinoco extend eastward from the slopes of the Cordillera de la Suma Paz, As far south as the Vichada they form an almost complete level, destitute of trees, and affording abundant pasturage ; while further south they are covered with forests, display con- siderable irregularity of surface, and are not unfrequently of from 300 to

broken by steep rocks rising to a height 600 feet,

The fundamental formations throughout Colombia are igneous and metamorphic, the great masses of the Cordilleras In many places the Carboniferous strata have attained considerable development, though they have been thrown into strange Voleanic forces are still at work, as is shown by occasional earthquakes, and

consisting of gneiss, granite, porphyry, and basalt,

confusion by some unknown disturbance,

also by such phenomena as those at Batan near Sogamoso, where the subterranean heat is great enough to affect the local climate. Ruiz, and possibly in some of the other snow-clad heights. The slopes of the various Cordilleras are frequently covered with deep beds of gravel; aud the alluvial deposits of very various periods. The rivers have in many instances cut remarkable passages for themselves through the mountains ; and, according to Codazzi, the Sogamoso has at one time been the outlet of a vast series of lakes which he believed to have occupied the highlands of Bogotd, ‘Tunja, and Velez.

The rivers of Colombia belong almost entirely to the great Atlautic versant; but they are distributed by the principal water-shed in very various directions. The two lost important are the Magdalena or Rio Grande and the Cauca, which both flow from south to north through nearly the entire length of the country,—the former occupying the valley between the Eastern and the Central Cordilleras, and the latter that between the Central and the Western, They unite about 130 miles before reaching the sea, but they so long maintain an independeut course that neither can fairly be regarded as a mere tributary of the other. The Magdalena takes its rise in a small lake called the Laguna del Buey or Ox Lake, situated in the plateau of Las Papas. It receives from the right hand the Suaza, the Rio N eiva, the Cabrera, the Prado, the Fuzagasanga, famous for the falls of Tequendama, the Bogota, the Carare, the Opon, the Sagamoso, itself a considerable stream, and the Rio Cesar, a fine river from the Sierra Nevada ; and from the left the La Plata, the Paez, the Saldafia, the Cuello, the Guali, the Samaua, or Miel, the Nare or Rio N egro, and various minor tributaries. The Magdalena is one of the most important water high- ways of the country, in spite of the fact that its current 18 So rapid as to make the upward voyage both difficult and tedious. From Honda, where the progress is interrupted by rapids, a native boat takes only about three days to reach the sea, while no fewer than six weeks are spent, even when the water is low, in returning against the stream, Steamers of from 50 to 200 tons burden, however, have plied regularly since 1833 between Honda Barranquilla. ‘The Honda rapids can be surmounted by haulage, and steamers descend them in safety, though there Is a fall of 20 feet in two miles, and of 16 feet in the first. Above this point the channel is clear about half-way to the Source , and though the traffic is stil] mainly carried on

Y native boats and rafts, a German named Alexander

Weckbecker succeeded, in 1875, in taking a large steam-

Glaciers are still extant in the Paramo del

valleys are full of

boat—the “ Moltke ”—three times to the town of Neiva, The Cauca rises to the west of the source of the Magdalena, in the Lake of Santiago, ~~in the paramo of Guanacas. In the upper part of its course it flows through a volcanic region, and its waters are go impregnated with sulphuric and other acids that they are destructive of fish, These acids are mainly contributed by the headstream of the Rio Vinagre or Vinegar River, which rises in the Purace-volcano. The principal tributaries are the Piendamé, the Ovejas, the Palo, the Amaime, and the La Vieja, from the Central Cordillera ; and the Jamundi and a large number of minor streams from the Western, After the junction of the Cauca and the Magdalena the united stream attains an imposing breadth ; but it breaks up into several channels before it falls into the sea, The River Atrato, which disembogues in the Gulf of Darien and separates the main branch of the Eastern Cordillera from the isthmian ranges, is of high importance, not only in itself as an actual means of communication, but as affording, in the opinion of many engineers, one of the most feasible means of forming an interoceanic canal. So important was it regarded by Philip II. that its navigation was forbidden in 1730 on pain of death; and the prohibition was not removed for a considerable period. The account, however, so frequently repeated, of the possibility of passing from the Atlantic to the Pacific versant by means of a canal, excavated about 1788 in the Raspadura ravine by Some enterprising monk, seems to have little or no founda~~ tion. The Atrato rises in the slopes of the Western Cordillera, has a course of about 300 miles, and a breadth, during the last 96 miles, of from 750 to 1000 feet. Its depth in this lower part of its passage varies from 40 to 70 feet or even more. At Quibdé, 220 miles from the embouchure, it is still 850 feet wide and 8 to 20 feet deep ; and as the fall of the river is only about 3 inches to amile, steamboats can pass as far as the confluence of the San Pablo and Certigui, 32 miles above Quibdé,

Of those rivers that belong to the Orinoco system the most important are the Guaviare, the Meta, and the Vichada. The first is formed of the Guayavero and the Iriwida, which flows from the mountains of Tunahi ; and the principal tributaries of the second are the Chire, the Casanare, and the Lipa. Of those that belong to the Amazon are several tributaries of the Rio Negro branch, and the Caquita, or Japura. This last rises in the eastern slopes of the same table-land which gives birth to the Magdalena and the Cauca ; and its principal affluents are the Pescado, the Caguan, and the Apoponi.

Though belonging to Colombia only by its head waters, there js another tributary of the Amazon which bids fair to be of great importance to the country as a means of communica- tion with Brazil. This river, the Rio Iga or Potumayo- rises in the Andes in the province of Pasto, under 2° N. lat., has a total length from its source to its confluence of 932 miles, receives in its course 36 affluents, of which several would afford passage for steamboats, and waters a region that abounds in gum elastic, sarsaparilla, cocoa, nut-wood, Pasto resin, gold, and other means of wealth. Its depth is from 7 to 34 feet during low water, and twice as great during flood ; at some places it has a breadth of 1300 feet, and its current is from 3 to 4 nautical miles an hour. A steamer only takes 10 days to pass from the confluence with the Amazon to the mouth of the Guamués ; and this place is only 80 or 90 miles from the province of Pasto. The opening up of this route is due to Raphael Reyes, a full account of whose exploration will be found in Petermann's Mittheilungen for 1876. The only rivers that remain to be noted are those of the isthmus ; and these are chiefly of importance for their bearing on the question of interoceanic communication. The principal

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Lakes.

Minerals.

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are the Chagres, disemboguing in the Atlantic, and the Tuyra, the Chepa or Bayanos, and the Chiriqui, which find their way to the Pacific.

Many of the Colombian rivers take their rise in moun- tain lakes, and several of them fill considerable basins in their course ; but throughout the country there are very few of those extensive sheets of water that form so usual a feature in most mountainous regions. The River Cesar flows through the lakes of Zipatosa and Adentro; between the Cauca and the Nechi lies Lake Caceres, as well as several others of less importance ; the district of Tunja still pre- serves the Lake of Tota ; and in Bogotd is the famous Guatavita, where the Muiscas are reputed to have sunk their treasures.

Colombia is distinctively a mineral country, and the list of its productions in this department includes gold, silver,

platinum, copper, lead, iron, mercury, and antimony,

limestone, potash, soda, magnesia, alum, and salt, coal and asphalt, emeralds, amethysts, and amber. Many of the most important deposits are as yet untouched, owing mainly to the defective state of internal communication, and even those that have been worked have proved much less remunerative from the same cause. Gold especially is very widely diffused; it was freely used by the natives before the arrival of Europeans, and formed a valuable source of revenue to the Spanish Government, who employed thousands of negroes and Indians in the task of collection. It is principally obtained from alluvial deposits ; and in some districts there is hardly a stream that would not furnish its quota. Hydraulic appliances were introduced about 1870 in some of the workings ; and a more systematic treatment is being gradually adopted. Antioquia is the most important gold-producing state in the confederation ; the total value of gold and silver exported from the capital in 1875 was 2,403,241 dollars; there were upwards of eighty lode mines at work in 1875 ; and 15,000 men and women are employed in the mining. The silver frequently occurs in very rich lodes ; but, owing it would seem to various economical causes, many of the mining operations have been unsuccessful. The “ Santa Anna ” mines in Tolima, which were worked from 1826 to 1873 (for some years under the direction of Mr Robert Stephenson, the railway engineer), yielded during that period about £700,000 worth of ore, but ultimately proved a failure. The “ Frias ” silver mine, belonging to the Tolima Mining Company of London, yielded in 1875 300 tons of ore valued at £100 per ton. The emerald mines are remarkable as being the only known source of the genuine stone. They are situated at Muzo, in the state of Boyacd, in the Central Cordillera, to the north of Bogota. Soon afterthe Spanish Conquest they were worked on a large scale by the Government ; but towards the close of the 18th century it was found that it cost 6500 pesos to extract 1000 pesos worth of emerald, and they were consequently abandoned (see Ezpeleto’s report in Relac. de los Vireyes, p. 347). After the war of independ- ence the mines were appropriated by the republic, from which a French company obtained a monopoly from 1864 to 1874. During this period the stones found a ready

market in Paris, where green was the imperial colour. Since the expiry of the contract the mines have been demono- polized. The emeralds are found in two distinct layers of calcareous bitumen, the upper of which is black and friable, and the undcr compact. In the upper the emeralds occur in “ nests,” in the lower in veins, and usually in the neighbourhood of bands of fluor-spar. The finest stones may be worked up toa value of £20 a carat; the worst sorts are only worth about 5s. Coal is pretty generally distributed throughout the republic, and the great bed of Cali probably extends to the Pacific. Rock-salt is obtained in the tablelands of Bogotd, Tunja, and

Pamplona, and forms an important Government mono- poly.

Though Colombia is situated within the tropics, and, in Climate,

fact, as we have seen, is crossed by the equator in its

southern limits, its great irregularity of surface and its extensive coast-lines develop a great variety of climatic conditions. A comparatively short journey transports the traveller from the sultry valley of the Magdalena, where the water grows tepid and the stones burning hot in the sun’s rays, to the summits of a mountain where the snow lies cold from year to year. In the table-lands and valleys of the Eastern and Western Cordilleras, at a height of 800 to 9500 feet above the level of the sea, there are two dry seasons and two rainy, the former commencing at the solstices and the latter at the equinoxes, while in the lowlands both of the Pacific and the Atlantic seaboard there is only one dry and one rainy of six months each. In the Gulf of Darien and the Isthmus of Panama there is no such distinction, and rain occurs in any part of the year, The greatest mean temperature in the country is about 86° Fahr., aud the lowest in the inhabited parts of the Cordilleras is about 44°. At Honda, which is about 1000 feet above sea-level, the daily range of the thermometer is only from 8° to 12°, aud the annual not more than 20°. “iis hottest place,” says Mosquera, to whom we are largely indebted, “which I have found in New Granada, is the port of Ocafia, where I have on several occasions seen the thermometer in the shade at 104° Fahr.” In the dlanos of the Orinoco the mean annual temperature is about 80° Fahr., while in the forest district to the south the average is about 8°

higher. In the latter the rain is distributed throughout the year, while in the former the seasons are distinctly marked, and from November till April the rains fall in torrents accompanied with dreadful thunderstorms. In keeping with this variety of climate the Colombian Piants, flora ranges from purely tropical forms in the lowlands up to purely Alpine or boreal types in the mouutains. The tree limit on Tolima, in the Central chain, is 10,360 feet. The country abounds with extensive forests, in whieh timber of gigantic proportions waits for the settler's axe. Besides several of the common species of palm trees whieh are found as high as 2500 feet above the sea, there are two remarkable species, the Ceroxylon andicola, Palma de Cera, or Wax-palm, and the Oreodoxa regia, or Palmita del Azufral, which in company with the oak, frequently clothe the Cordilleras to a height of 6000 or 8000 feet. 'They are both of extreme beauty, and the former shoots up to about 180 or 200 feet. From the Sierra Nevada and other districts are obtained logwood, Brazil-wood, and fustic; and the Myroxylon toluifera, from which the balsam of Tolu is collected, grows luxuriantly on the banks of the Rio Negro. Excellent Indian-rubber is obtained 'from the Castilloa elastica, a lofty and luxuriant tree, which occurs in considerable abundance in Panam4, Cauca, and other states. The quantity and quality of the material might be greatly increased and improved, as the collection is still in the hands of a very rude and careless class of men. Under the superintendence of Mr Cross the tree is being introduced into British India. Cinchona of six or seven different varieties is common throughout the country,—the elevation most favourable for its growth being between 7800 and 9000 feet above the sea. Of other medicinal plants there may be mentioned the aloe, the sarsaparilla, the albataque, and the vine of the cross. The cotton plant grows wild in many parts and yields an excellent fibre, indigo 18 indigenous; and an almost endless variety of fruits are found throughout the country. The fauna is perhaps hardly so rich as the flora, but it Animals does not fall far behind. Of monkeys there are at least seventeen distinct species; the feline race is represente

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by seven or eight, including the puma and the jaguar ; there are two species of bears ; the alligator swarms in the Magdalena and some of the other rivers; deer are common at various elevations ; the sloth, the armadillo, the

guagua (Cologenus subniger), the opossum, and the cavy prevail in the forests; and the tapir or danta wanders in the higher regions, and ten other birds of prey, several species of swallows, numerous varieties of parrots, paroquets, lories, and cockatoos, cranes and storks, the pleasant-singing tropial, and the strangely-coloured sol-y-lune, which takes its name

from the figure of the sun and moon on its Wings. The boa constrictor, the yaruma, the cascabel, and various other

serpents are frequent enough in the warmer regions, but are not met with at a greater height than 5400 feet above the sea. Insects are abundantly represented, the most important practically being the ants, which in some districts,

as for instance the isthmus, are almost a plague. Turtle

abounds on the coasts ; and pearl-oysters are the object of a very considerable fishery.

Agriculture holds the first place among the industries of

Colombia ; but the methods employed are still of a very rude description. Maize, wheat, and other cereals are cultivated on the elevated plains ; rice, cotton, tobacco, sugar, coffee, cocoa, yams, arracacha, and bananas in the coast region. Tobacco is especially successful in Ambalema, Carmen, Palmira, Jiron, and Morales, and it forms an important export. In the plains of the Orinoco and the undulating savannahs of Panam4 the

breeding of cattle and horses is largely carried on by the

creole inhabitants, and several of the Indian tribes are also in possession of valuable herds. Beyond such common (almost domestic) trades as hand-weaving, dyeing, tanning, and basket-making, there is almost no manufacturing industry in the country, though the basis for future development has been laid by the establishment in Bogota of glass-works, distilleries, a cigar-factory, and a sulphuric acid factory. One product of the domestic industry alone finds its place in the list of exports—namely, straw hats, usually known as jipijapa or Panama hats, The raw produce, however,

is largely exported ; the principa' articles being cinchona bark, indigo, coffee, cotton, tobacco, silver ore, hides, and the minor items—ivory-nuts, ipecacuanha, and balsam of Tolu. The relation between the exports and imports and the variations of amount from year to year will be seen by the following table :—

Imports. :Exports, 8,137,000 dollars.

rises. citcerese 7,255,092 dollars.

LO i 5,843,451 8,077,153 BE oes sa cienes sarees 5,862,711 8,247,817 ae 8,427,175 8,253, 806 a 12,500, 000 10,500,000

The national government of Colombia is republican,—the main asis of the constitution being a scheme drawn up in 1863 after the model of the United States of North America. The executive yerer 18 exercised by the president and four ministers or secretarios. he presidential clections recur every two years; the choice is determined by a majority of the states; and the new president enters on office on the ist of April. Tespectively of the four de artments of Home and Foreign Affairs,

Larine,

a house suffrage, and a

The number of the ™Presentatives depends on the size of the state-opulation, ~~— one being allowed for every 50,000 inhabitants, and one for the Temainder if it reaches 20,000. In 1875 there were in all 61 repre~~ sentatives, There is a supreme court at Bogota, conducted by a Loa four judges, and a procurator-general ; the judges are elected by the legislative houses of the nine states. There is no state church, and full religious liberty prevails,

profession, however, is the Roman Catholic, and an archbishop is established at Bogota. The national income is very small; but it In 1869-70 it Was 2,883,758 pesos (about ds, value); in 1870-71, 3,573,570; in 1871-72, 3,178,446 ; in 1872-73, 4,000,000. The taxes are

Among the birds may be mentioned the condor

very light, —by far the greater part of the revenue accruing from the custom-houses established at Buenaventura, Carlosama, Cartagena Cucuta, Rio Hacha, Sabanilla, Santa Marta, J umaco, and Turbo. In 1872-78 the various receipts were—customs, 2,77 5,450 pesos; salt monopoly, 799,213; Panama railway, 250,000 ; postal service, 67,609; telegraphs, 10,627 ; mint, 18,000; national property, 72,595 ; ecclesiastical property, 6506. The customs would yield a still greater return were it not for smuggling, which prevails largely, especially at Cartagena. The tariff hitherto in use divides articles into classes, which pay so much per kilogramme; and thns the burden of the duty falls most on inferior goods. The salt- works yielded, in 1869-70, 136,568 cwts., of which 81 per cent. was obtained from Cundinamarca, 18 per cent. from Boyaca, and 1 per cent. from the territory of San Martin. The postal service is Communi- still in a very backward state, and the charges are very high; but cation. this caunot be otherwise till the road system of the country has been developed. Rapid progress, however, is being made by scveral of the states in this preliminary undertaking. Iu April 1875 there were upwards of 1000 miles of telegraph, the principal lines stretch- ing from Honda to Bogoté, and from Ambalema to Manizales, In 1873 the total number of telegraphic messages amounted to 500,000. In the Iess populous districts the maintenance of the lines is very costly, as not ouly are the wires stolen by thieves, but they are frequently damaged by the monkeys, who use them for gymnastic purposes. The only two railways actually in operation are the Panama line (46 miles), and the line between Sabanilla and Barranquilla (17 miles); but great efforts are being made, both by the central Government and by the separate states, to construct lines. throughout the country, and contracts have already been made for some of the most important. The national property consists mainly of waste lands, which are allotted to applicants on ve liberal terms. A great deal of the church property confiscated by the republic has been sold; some of it is rented out; and many of the convents are used for public offices. The public debt amounted, in 1875, to 10,105,500 dollars, of which 10,000,000 are the old debts of the war of independence, which pay an interest of 44 per cent. The English debt of 1863 has been cleared off. There is no

national navy, and the armed force in time of peace only amounts to 1420 men; in time of war the states have to furnish 1 per cent. of their population, The separate states have their own constitutions and governors, and they differ considerably in their political ten- dencies.

The educational condition of Colombia has hitherto been very Education. low ; but, by a law published in 1870, the management of public instruction was taken from the hands of the clergy and intrusted to the state, a complete reform of the school system was effected, teachers were introduced from Enrope, and compulsory education was adopted. In this last point Colteahie has taken the lead in the New World. In Antioquia 486 schools were in operation in 1873, with an attendance of about 21,500 ; in Bolivar, 44; in Boyaca, 208 (public schools), with 9000 pupils; in Cauca, 229, with 9925 ; in Cundinamarca, 338, with 16,489 ; in .Magdalena, 100, with 2968 ; in Santander, 300, with 11,974; in Tolima, 100 schools and 3640 scholars. In Panamé the state of education is not so good, but public schools are being established there also. The expense is borne partly by the special states and partly by the national treasury, which devotes 317,120 dollars annually to this purpose, assigning 200,000 to subsidize the states, and 117,120 to the institutions for the higher education. These include the national university, the Vasquez academy, and schools of engincer- ing, natural science, &., established in the federal capital, state colleges, and normal schools.

It can hardly be said that Colombia possesses a national litera- Literature. ture, the writing and printing hitherto effected serving mainly the immediate purpose of the day. Its inheritance of the Spanish language, however, leaves it in vital contact with one of the older literatures of Europe, and frees it from the painful, though, it might be, fruitful necessity of working its way through con- fusion of dialects to a recognized national speech. Such intellect as the country has spared from war and political activity has mainly been directed to the natural sciences, which found their first footing on Colombian soil through the labours of the celebrated Don José Celestino Mutis. Of those who have attained a greatcr or less degree of fame in this department, it is sufficient to mention Zea, Cabal, Caldas, Pombo, Cespedes, Camacho, Lozano, and Codazzi ; Restrepo and Mosquera have contributed to the history of their country. In several of the more important cities journalism is pretty well represented, and the Government is about to

establish a magazine for the purpose of diffusing a knowlege of Colombian affairs.

The population of the territory of the present republic at the Native time of the Spanish Conquest consisted of a large number of inde- tribes, pendent tribes of very various degrees of civilization. Of these several have totally disappeared as separate unities; others have been in large measure Hispanicized both in language and in habits; many still retain their separate dialects, organization, and customs, and some are even now as opposed to the European movement as they were

Population.

History.

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when the first white foot left its print on their shores. According to Uricoechea there are at least twenty-seven native languages spoken in the western part of Colombia, fourteen in Tolima, thirteen in the region of the Caquita, twelve in Panama, Bolivar, and Mag- dalena, ten in Bogoté and Cundinamarca, and thirty-four in the region of the Meta, while twelve have died out in the cowrso of the last century. The tribes of the Atlantic seaboard, from Chiriqui to Goahira, attach themselves to the great Carib stock ; those of the Eastern portion of the country show affinities with the contiguous Brazilian race ; those of the Tuquerus district are of the Peruvian type; while the tribes of Antioquia, Cauca, Popayan, and Neiva preserve characteristics more akin to those of the Aztecs than to any other race.

At the time of the Spanish Conquest the most important of all the tribes was the Miuscas or Chibchas, who had attained a con- siderable degree of civilization, and established their authority over the table-lands of Bogoté and Tunja. They are now represented by some bands that wander about the Meta ; their ancient language is partly preserved by the labours of Gonzalo Bermudez, Jose Dadei, and Bernardo de Lugo; and they have been the subject of a special study by Uricoechea in his Gramatica, Vocabulario, &c., de la Lengua Chibcha, Paris, 1871. The Chibchas, says this. author, were

divided into three independent nations and several caciqueships; three chiefs exercised supreme power—the Zipa, who resided in Muequeta (the present Funza), the Zaque, resident at Hunsa (now Tunja), and the Jeque,-or chief of Iraca, who held the office of pontiff, was regarded as the successor of the god Nemterequeteba, and had his residence at the city of Suamoz or Sogamoso.

‘Another remarkable tribe, which has now totally disappeared, was the ‘I’ayronas, of the Sierra Nevada of Santamarta. They like- wise were well advanced in civilization, as is proved not only by the reports of their conquerors, but also by such remains of their skill as the gold ornaments which are found from time to time in their territory, and the well-made roads by which it is still traversed. The most important of the tribes that still retain their savage state are the Mesayas, the Caquetas, the Mocoas, the Amariz- anos, the Guipanabis, and the Andaquies in the eastern part of the republic ; the Goahiros, the Motilones, the Guainetas, and the Cocinas, in the districts of Rio Hacha, Upar, and Santamarta ; and the Dariens, the Cunacunas, and the Chocos, on the banks of the Atrato and its affluents. These tribes have all along been a thorn in the side of the country. In the 18th century we have in the vice- regal reports continued complaints of the raids of the Chimilas, the Goahiros, the Andayuies, and the Motiloncs, who defied equally the military and the ecclesiastical method of reduction. The mission- aries who were scattered through the country had a hard time of it with their converts, who even after they were baptized and in- structed, ‘take advantage of their knowledge to elude and assail us.” To the present day the settlement and Christianization of this part of the population is one of the political problems of Colombia, and as recently as 1874 a bill was brought in for the purpose. The exact number of the uncivilized Indians is hardly ascertained ; it was roughly calculated by Mosquera as ranging from 108,000 to 120,000. The rest of the population is composed mainly of Spanish Creoles, Negroes, and mixed races. According to Samper it was divided in 1858 as follows :—1,527,000 whites and white crossbreeds, 447,000 crossbreeds in which the Indian blood is more distinctly present, 90,000 Africans, and 446,000 crossbreeds in which the Negro or Indian blood is plainly predominant.

ing to a communication supplied to Behm and Wagner's Bevilk- erung der Erde, 1874, the distribution of the population, exclusive of the uncivilized Indians, was in 1871 as it appears in the follow- ing table:—

Yo Males. | Females. Capitals. Cae Antioquia….. 22,790 | 181,492 | 184,482 | Medellin, 30,000 Bolivar. ..... 27,027 | 114,306 | 125,042 | Cartagena, 7,800 IBYOW NED angagene 38,349 | 232,727 | 250,147 | Tunja, 8,000 (Chibket Pe gasseeeer 257,451 | 210,363 | 224,715 | Popayan, 16,000 Cundinamarcal 79,845 | 196,848 | 212,759 | Bogota, 50,000 Magdalena….| 26,950 | 40,682) 44,573) Santamarta, ; 3,500 Rariemdr..-: 31,921 | 113,009 | 107,533 | Panama, 18,378 Santander…..| 16,298 | 204,551 | 220,876 | Socorro, 20,000 Molimalessess 18,476 | 110,791 | 120,100 | Guamo, 7,000

Owing to the discordant claims of Colombia, Venezuela, and Brazil, the area of the frontier states is very variously given accord- ing to the limits selected, and the calculation of the population is open to the same irregularity.

History.—The coast of Colombia was one of the first parts of tho American continent visited by the Spanish navigators. Alonso de Ojeda touched at several points in 1499 and 1501; and Columbus himself visited Veragua, Portobello, and other places in his last voyage in 1502. In 1508 Ojeda obtained from the Spanish Crown

agrant of the district from Cape Vela westward to the Gulf of

was waged till 1824.

Accord: .

COLOMBIA

Darien, while the rest Cape Gracias-a-Dios

Nicuessa. Iucia and Castella de Oro were united in 1514 into the province of Tierra-firma, and entrusted to Pedro Arias de Avila. middle of the century the Spanish power was fairly 'established, and flourishing in the

table-lands of Cundinamarca formerly occupied by the Muiscas. monarch erected a presidency of New Granada, which continued till 1718, when it was raised to the rank of a viceroyalty. following year, however, the second viceroy, D. Jorge Villalonga, Count de la Cueva, expressing his opinion that the maintenance of this dignity was too great a burden on the settlers, the viceroyalty gave place to a simple presidency. In 1740 it was restored, and it continued as long as the Spanish authority, mcluding within its limits not only the present Colombia, but also Venezuela and Eeu- ador.

of the country from the Gulf of Darien to was bestowed on his fellow-adventurer The two territories designated respectively Nueva Anda-

By the

communities arose along the – coasts, and

For the better government of the colony the Spanish

In the

An insurrection against the home Government was formally commenced in 1811, and an incessant war against the Spanish forces In 1819 the great national hero, Bolivar (see BoutvaR), effected a union between the three divisions of the country, to which was given the title of the Republic of Colombia; but in 1829 Venezucla withdrew, and in 1830 Quito or Ecuador followed her example. ‘The Republic of New Granada was founded November 21, 1881; and in 1832 a constitution was promulgated, and the

territory divided into eighteen provinces, each of which was to have

control of its local affairs. ‘The president was to hold office for

four years; and the first on whom the dignity was bestowed was

General Santander. His position, however, was far from enviable;

for the country was full of all the elements of unrest and contention.

One of his measures, by which New Granada became responsible

for the half of the debts of the defunct republic of Colombia, gave serious offence to a large party, and he was consequently succeeded not, as he desired, by José Maria Obando, but by a member of the opposition, which lasted till 1841, and not only left the country weak and miserable, but afforded an evil precedent which has since been too frequently followed. The contest terminated in favour of Marquez, and he was succeeded in May 1841 by Pedro Alcantara Herran, who had assisted to obtain the victory.

José Ignacio de Marquez. This gave rise to a civil war,

In 1840 the province of Cartagena had seceded, and the new president had hardly taken office before Panama and Veragua also declared themselves inde-

pendent, under the title of the State of the Isthmus of Panama.

heir restoration was, however, soon effected; the constitution was reformed in 1848; education was fostered, and a treaty con- cluded with the English creditors of the republic. Further progress was made under General Mosquera from 1845 to 1848; a large part of the domestic debt was cleared off, immigration was encouraged, and free trade permitted in gold and tobacco. The petty war with Ecuador, concluded by the peace of Santa Rosa de Carchi, is hardly worthy of mention. From 1849 to 1852 the reins were in the hands of General Lopez, a member of the democratic party, and under him various changes were effected of a liberal tendency. In January 1852 slavery was entirely abolished. The next president was J osé Maria Obando, but his term of office had to be completed by vice- presidents Obaldia and Mallarino. In 1853 an important altera- tion of the constitution took place, by which the right was granted to every province to declare itself independent, and to enter into merely federal connection with the central republic. In 1856 and 1857 Antioquia and Panamd took advantage of the permission. The Conservative party carried their candidate in 1857, Mariano Ospino, a lawyer by profession ; but an insurrection broke out in 1859, which was fostered by the ex-president Mosquera, and finally took the form of a regular civil war. Bogotd was captured by the demo- crats in July 1861, and Mosquera assumed the chief power. A congress at Bogota established a republic, with the name of the United States of Colombia, adopted a new federal constitution, and made Mosquera dictator.

Meanwhile the opposite party was victo- rious in the west ; and their leader, Arboleda, formed an alliance with Don Garcia Moreno, the president of Ecuador. He was assas- sinated, however, in 1862 ; and his successor, Canal, came to terms with Mosquera at Cali. The dictatorship was resigned into the hands of a convention at Rio Negro, in Antioquia; a provisional government was appointed, a constitution was drawn up, an

Mosquera elected president till 1864. An unsuccessful attempt was also made to restore the union between the three republics 0 the former federation. The presidency of Manuel Murillo Toro (1864-66) was disturbed by various rebellions, and even Mosquera, who next came to the helm, found matters in such a disorganized condition that he offered to retire. On the refusal of his resign' tion, he entered into a struggle with the majority in the congress, and ultimately resorted to an adjournment and the unconstitutional arrest of 68 of the senators and representatives. To the decree of impeachment published by the congress he replied by a notice of dissolntion and a declaration of war ; but he soon found that the real power was with his opponents, who effected his arrest, and con-

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COL—

demned him first to two ycars' imprisonment, but afterwards by commutation to two years' exile. The presidency of Santos Gutierrez (1868-70) was disturbed by insurrections in different parts of the republic, the most important of whieh was that in Panama, where the most absolute disorganization prevailed. Under his suecessor, General E. Salgar, a Liberal candidate elected in opposi- tion to General Herran, a treaty was finally concluded with the United States in connection with an intcroceanic canal, a bank was established at Bogota, and educational reforms instituted. Manuel Murillo Toro (1872-74) and Santiago Perez (1874-76) have seen the eountry apparently acquiring constitutional equilibrium, and turn- ing its energies to the development of its matchless resources. There has been 00 war with foreign states for gevcral years ; and though the question of the boundary lines frequently causes dispute between Colombia and her eastern

neighbours, Venezuela and Brazil, it is to be hoped it will be peaceably scttled. ‘The election for the presidential term 1876-78 resulted in favour of Aquileo Parra, Literature :—Bern. de Lugo, Grammatica en la lengua del nuevo reyno llamada Mosca, Madrid, 1619; Fr. de T’auste, Arte y vocabu- lario de la lengua de los Indios de la provincia de Cumana o nueva Andalewia, Madrid, 1680; Piedrahita, Historia general de la conquista del nuevo reyno de Granada, Madrid, 1688; Fr. Ant. Caulin, Hist. corografiea de la nueva Andalucia, &c., Madrid, 1779; Restrepo, Historia de la revolucion de Colombia, Paris, 1827; Acosta, Compendio del: descubrimiento y eolonisacion de la Neuva Granada, Paris, 1848, and ‘‘Sur la Sierra Nevada de Sainte Marthe,” in Bulletin de la Soe. Géol. de Franee, 1851-2; Karsten, Ueber die geognostischen Verhdltnisse der Westl. Colombia, Vienna, 1856; Albert Berg, Physiognomie der Trop. Vegetation Sid Amerikas, 1856 (the views in this fine folio are almost exclusively Colombian) ; Samper, Ensayo sobre las revoluetones pol. y la eon- dieion de las republicas Colombianas, Paris, 1861; E. Reclus, Voyage & la Sierra Nevada de Sainte Marthe, Paris, 1861 ; Wagner in Petermann’s Mittheilungen, 1861 and 1862; Powles, New Gran- ada: its Internal Resources, London, 1863; Mosquera, AfLemoria sobre la geoyrafia de la Nueva Granada, New York, 1852, and his Compendio de geografia dos statos unidos de Colombia, London, 1866 ; Garcia y Gareia, Relaciones de los Vireyes del Nuevo Reino de Granada, New York, 1869 ; Codazzi, Atlas de los estados unidos de Colombia; Reiss and Stiibel, Alturas tomadas en la republ. de Colombia, Quito, 1872 (reproduced in XII. Jahresberieht des Vereins fiir Erdk, zu Dresden, Wissenseh, Theil) ; Steinheil, ‘‘ Barometrisehe Hohenbestimmungen in Colombia,” and ‘ Reisen in Colombien,” in Petermann’s Mittheil., 1876. The literature of the various canal projects is itself very extensive ; it is sufficient to mention the works of Kelly, Puydt, and Selfridge. (H. A. W.) COLOMBO, the capital and principal seaport town of Ceylon, on the west coast of the island, in 6° 55’ N. lat. and 79° 45’. long. The municipal limits include an area of 6415 acres, which is divided into the nine wards of The Fort and Galle Face Pettah, St Sebastian’s, St Paul’s, = E ?) ? Cottanchina, New Bazaar, Marandana, Slave Island, and Colpetty. The fortified part of the town is about a mile and a half in circuit, and occupies a rocky promontory of but slight elevation, surrounded on three sides by the sea, and protected on the land side by a lake, a moat, and draw- . Me) ze “) bridges. The Galle Face

affords a favourite promenade for the European population; Pettah is mainly inhabited by natives and half castes ; and Colpetty is a beautiful suburb, Most of the streets Species of Mibiscus planted by the Dutch ; and the most of the older European houses bear the marks of Dutch occupa- ton, Colombo contains the Government offices and courts, and is the residence of the civil and military authorities, the seat of a Church of Roman Catholic, Wesleyan, Baptist, and other missionary Organizations, or Queen's House, the court-house, the town-hall, the lunatic asylum, the lazaretto, the military barracks and hospitals at re Face, Wellicadde jail, and Wolfendahl church; among the public institutions may be mentioned St Thomas's col- lege and collegiate school, 1821: W, i established in 1870, with six scholarships attached ; i 7 of the Royal Asiatic Society, with a museum ; a /nited Service library ; the military-medical and the cst eel libraries and museums ; the Pettah library, ~~ oF as in 1829; the agri-horticultural society; and the odel farm Maugurated by Prince Alfred. The cinnamon

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gardens and the circular walk are pleasant places of resort ; the former date from the Dutch occupation, and were long celebrated for their beauty and luxuriance, The town is supplied with gas and water by a company incor porated under Acts passed in 1862 and 1867. The principal articles of manufacture in Colombo are coffee, oil, and coir ; the first of these especially keeps a large number of mills in operation. There are also a good many saw-mills in the town and neighbourhood, and the Government maintains a foundry and ironworks. The supply of ice is in the hands of a company. The harbour is small, and the roadstead is safe only during the south-east monsoon, but various improvements now in progress promise to make Colombo one of the chief ports of Southern India. The first stone of a great breakwater was laid by the Prince of Wales in 1875. The population of Colombo is of very various origin :—Sinhalese, Parsees, Chinese, Malabars, Arabs, Persians, Kaftirs, Afghans, descendants of Portu- guese and Dutch, and half castes of all colours, In 1874 the total number of inhabitants was given as 97,129, of whom 42,160 were Sinhalese, 22,389 Moors, 20,633 Tamils and Chatties, and 1765 Europeans. Colombo was originally known as the Kalantotta or Kalany ferry. By the Arabs the name was changed to Kalambu, and the town is men- tioned by Ibn Batuta about

1340 as the largest and finest in Serendib. In 1517 the Portuguese effected a settlement, and in 1520 they fortified their port and bade defiance to the native besiegers. In 1586 the town was again invested by Raja Singh, but without success, On its capture by the Dutch in 1656 it was a flourishing colony with convents of five religious orders, churches, and public offices, inhabited by no fewer than 900 noble families and 1500 families dependant on mercantile or political occupations. In 1796 it was surrendered to the British.

COLON. See ASPINWALL, Vol. ii.

COLONNA, Guiovannr Paoto, Petronio at Bologna, and president Academy there, was born at Brescia about the middle of the 17th century. The music-school which he established at Bologna produced many good musicians, among them Clari. Most of Colonna's works are for the church, and are among the most remarkable compositions of the 17th century. They included settings of the psalms for three, four, five, and eight voices, and several masses and motetts. He also composed an opera, under the title Amuleare, and an oratorio, La Profezia d' Eliseo, Boyce considered Colonna as Handel's model for choruses accompanied with instrumental parts different from the vocal. The same practice, however, was adopted by several of Colonna's contemporaries.

COLONNA, Virrorta (1490-1547), the daughter of Fabrizio Colonna, grand constable of the kingdom of Naples, and of Anna da Montefeltre, daughter of the "Good Duke" Frederick of Urbino, was born at Marino, a Roman fief of her father's house. Betrothed when four years old, at the instance of Ferdinand of Aragon, to Francisco D'Avalos, son of the marquis of Pescara, she received the highest education, and gave early proof of a love of letters. Her hand was sought, among other suitors, by the dukes of Savoy and Braganga, but at seventeen, as she ardently desired, her marriage with D'Avalos took place. The couple resided on the islet of Ischia till 1511, when the husband offered his sword to the Holy League, in whose service he was taken at Ravenna (1512), and carried to France. During the months of exile and the long years of campaigning that followed this mishap, they corre- sponded in most passionate terms, in prose and verse. They saw each other but seldom, for Pescara was one of Charles V.'s most brilliant and

active captains; but Vittoria's influence over him was sufficient to keep him, after Pavia

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G6: chapel-master of St of the Philharmonic

158 CO L— triumphant faction within the native state. The polity of the new community, often founded in defiance of the home authorities, might either be a copy of that just left behind or be its direct political antithesis. But wherever they went, and whether, as apparently in Asia Minor, Greek blood was kept free from barbaric mixture, or whether, as in Magna Grecia and Sicily, it was mingled with that of the aboriginal races, the Greek emigrants carried with them the Hellenic spirit and the Hellenic tongue; and the colonies fostered, not infrequently more rapidly and more brilliantly than at home, Greek literature, Greek art, and Greek speculation. The relation to be preserved towards the mother states was seldom or never definitely arranged, But filial feeling and established custom secured a measure of kindly sympathy, shown by precedence yielded at public games, and by the almost invariable abstinence of the colony from a hostile share in wars in which the mother city was engaged.

(1525), from joining the projected league against the emperor, and to make him refuse the crown of Naples that was offered him as the price of his treason. The same year he died of wounds at Milan. Vittoria, who was hastening to tend him, received the news of his death at Viterbo. She halted, and turned off to Rome, whence, after a brief stay, she departed for Naples. There she remained for about ten years. She refused several suitors, and began to produce those /evme Spirituali that form so distinct a feature in her works. In 1536 she left Naples for Ferrara, calling at Rome, where she was visited by Charles V., and whither in 1538 she came to take up her abode. In Rome, besides winning the esteem of Reginald Pole and Cardinal Contarini, she became the object of a passionate friendship on the part of Michel-angelo, then in his sixty-fourth year. The great artist wrote for her some of his finest sonnets, made drawings for her, and spent long hours in her society. Her removal from Rome to Orvieto (1541), on the occasion of her brother Ascanio Colonna's revolt against Paul III., and her subsequent residence in Viterbo (1541-45), where Reginald Pole was governor and

legate, produced no change in their relations; they visited and corresponded as before. She returned to Rome in 1546, and died there about the end of February 1547.

The amatory and clegiac poems of Vittoria Colonna, which are the production of a delicate and sympathetic imitativeness rather than of a vigorous and original talent, were printed at Parma in 1538 ; a second edition appeared in the following year ; a third, containing sixteen of the Rime Spirituali, was published at Florence soon afterwards; and a fourth, including a still larger proportion of the religious element, was issued at Venice in 1544.

COLONY. The term colony, often loosely applied, is most commonly used to denote a settlement of the sub- jects of a sovereign state in lands beyond its boundaries, owning no allegiance to any foreign power, and retaining a greater or less degree of dependence on the mother country. The founding and the growth of such communities furnish matter for an interesting chapter in the history as well of ancient as of modern civilization ; and the regulation of the relations between the parent state and its dependencies abroad gives rise to important problems alike in national policy and in international economics.

It was mainly the spirit of commercial enterprise that led the Pheenicians to plant their colonies upon the islands and along the southern coast of the Mediterranean ; and even beyond the Pillars of Hercules this earliest great colonizing race left enduring traces of its maritime supremacy. Carthage, indeed, chief of the Phoenician settlements, sent forth colonies to defend her conquests and strengthen her military power ; and these sub-colonies natu- rally remained in strict subjection to her power, whereas the other young Phoenician states assumed and asserted entire independence. .

In this latter respect the Greek colonies resembled those of the Phcenicians. From a very early period the little civic communities of Greece had sent forth numerous colo- nizing streams. At points so far asunder as the Tauric Chersonese, Cyrene, and Massilia were found prosperous centres of Greek commercial energy ; but the regions most thickly peopled by settlers of Greek descent were the western seaboard of Asia Minor, Sicily, and the southern parts of the Italian peninsula. Nor were the least prosper- ous

communities those which were sprung from earlier colonies. The causes that led to the foundation of the Greek colonies were very various. As in Phoenicia, pres- sure created by the narrow limits of the home country coin- cided with an adventurous desire to seek new sources of wealth beyond seas ; but very many Greek emigrations were caused by the expulsion of the inhabitants of conquered cities, or by the intolerable domination of a hated but

The relation of Rome to her colonies was altogether

different. No Roman colony started without the sanction and direction of the public authority ; and while the Coloma Romana differed from the Colonia Latina in that the former permitted its members to retain their political rights intact, the colony, whether planted within the bounds of Italy or in provinces such as Gaul or Britain, remained an integral part of the Roman state. In the earlier colonies, the state allotted to proposing emigrants from amongst the needy or discontented class of citizens portions of such lands as, on the subjection of a hostile people, the state took into its possession as public property.

At a later time, especially after the days of Sulla, the distribution of the territories of a vanquished Roman party was employed by the victorious generals as an easy means of satisfying the claims of the soldiery by whose help they

had triumphed. The Roman colonies were thus not merely

valuable as propugnacula of the state, as permanent supports to Roman garrisons and armies, but they proved a most effective means of extending over wide bounds the language and the laws of Rome, and of inoculating the inhabitants of the provinces with more than the rudiments of Roman civilization.

The occupation of the fairest provinces of the Roman empire by the northern barbarians had little in common with colonization. The Germanic invaders came from no settled state ; they maintained loosely, and but for a

short while, any form of brotherhood with the allied tribes. A nearer parallel to Greek colonization may be found in Iceland, whither the adherents of the old Norse polity fled from the usurpation of Harold Haarfager ; and the early history of the English pale in Ireland shows, though not in orderliness and prosperity, several points of resemblance to the Roman colonial system.

Though both Genoese and Venetians in their day of power planted numerous trading posts on various portions of the Mediterranean shores, of which some almost deserve the name of colonies, the history-of modern colonization on a great scale opens with the Spanish conquests in America. The first Spanish adventurers came, not to colonize, but to satisfy as rapidly as possible and by the labour of the enslaved aborigines, their thirst for silver and gold. Their conquests were rapid, but the extension of their permanent settlements was gradual and slow. 'The terrible cruelty at first exercised on the natives was restrained, not merely by the zeal of the missionaries, but by effective official measures ; and ultimately home-born Spaniards and Creoles lived on terms of comparative fairness with the Indians and with the half-breed population, 'Till the general and successful revolt of her American colonies, Spain mal tained and employed the latter directly and solely for what she conceived to be her own advantage. Her commeret

policy was one of most irrational and intolerable restriction and repression ; and till the end of Spanish rule on the American continent, the whole political power was retained by the court at Madrid, and administered in the colonies by an oligarchy of home-bred Spaniards,

The Portuguese colonization in America, in most respects resembling that of Spain, is remarkable for the develop- ment there given to an institution sadly prominent in the history of the European colonies. 'The nearness of Brazil to the coast of Africa made it easy for the Portuguese to supply the growing lack of native labour by the wholesale importation of purchased or kidnapped Africans.

Of the French it is admitted that in their colonial possessions they displayed an unusual faculty for conciliating the prejudices of native races, and even

for assimilating themselves to the latter. But neither this nor the genius of successive governors and commanders succeeded in preserving for France her once extensive colonies in Canada or her great influence in India. In Algeria the French Government has not merely found a practical training school for her own soldiers, but by opening a recruiting field amongst the native tribes it has added an avail- able contingent to the French army,

The Dutch took early a leading share in the carrying trade of the various European colonies, They have stil] extensive plantations in the East Indian Archipelago ; and though their settlement at the Cape passed into British hands, a republic of Dutch-speaking boers maintains a precarious existence northward from the British possessions. The Danish and Swedish dependencies in the Antilles are but triflmg in extent or importance.

It is the English-speaking race that has shown an un- exampled energy and capacity for colonization, The English settlements in Virginia, New England, Maryland, and Pennsylvania had, between the second decade of the 17th and the seventh decade of the 18th century, developed into a new nation that was soon ablo to take rank with the most powerful of European states. Promoted in great measure by the desire to escape from the political or religious oppression of the English court, the transatlantic settlements were, though remaining under governors appointed by England, permitted to arrange their civil polity—necessarily assuming a democratic shape—very much as they chose ; and, at first, troubles at home, and later, their distance, saved the colonies from much political interference on the part of successive English Governments, Though by the “ N avigation Laws” and other enactments, England had always undertaken to regulate, in her own interest, the commercial relations between herself and her American. colonists, encroachment, in the matter of taxa- tion, on the immunity till then enjoyed provoked the spitit that in 1776 « solemnly published and ‘declared that

surface of the globe, and nearly the same proportion of its population. The various origin of these colonial Posses- sions, and their different relations to the Crown of Great Britain, suggest the question, How the foreign dependencies of a sovereign state may best be classified ?

It is clear that the ultimate constitution of a colony depends but little on the manner in which the territory for settling was originally acquired, Whether it was by conquest or by formal cession from a foreign power, the new population, even if, as in the case of Canada, it at first consisted largely of people alien in blood and language to the colonizing country, may soon obtain a constitution and relations to the ruling state identical with those of lands originally acquired from thinly-scattered and wandering savages merely by the occupancy of citizen emigrants, Of almost equal unimportance for the future organization of the colony are the motives which led the earliest settlers to emigrate, The caprice of mere adventurers, the desperate desire of broken men to repair their fortunes, and the stern determination of public-spirited men to escape for ever some unendurable civil or religious grievance at home, have in their turn given rise to colonies now hardly distin- guishable in their general features, Whether the emigra- tion be purely voluntary and undertaken with or without official sanction, or systematically promoted by a Govern- ment for the furtherance of national commerce or in order to relieve itself of over-population ; whether the new lands be handed over under a royal charter to a company, or granted, as proprietary, to an individual, the traces of the initiatory conditions may speedily disappear. And around a military outpost, a mere trading factory, or the prison walls of a penal settlement, a numerous and enterprizing population may soon be tending increasing herds or engaged in the steady and profitable tillage of the soil.

The circumstances whereon the characteristic develop- ment and permanent constitution of the colony depend are the physical conditions of the territory —its climate and its products. A colony in the fullest sense of our usage of the term can arise only where the European colonist may look on his adopted habitation as his permanent home, where he can found a family and rear his children in robust health, where his and their growing patriotism may come to regard their interests as bound up with the well-being of the community of which they form a part. Here alone can “daughter lands” hope to establish a polity that, without wholly severing the bond that unites them to the parent country, shall secure for them the self-government which the British emigrant regards ag his birthright, New nations of the European stock can arise only where the cereals thrive, where the settler can without physical harm undergo the fatigue of rearing and tending his flocks, and

where the line that divides master from servant is uarrow and easily passed —that is, in a temperate climate. On these conditions it depends whether a foreign settlement shall be, on the one hand, an agricultural or pastoral colony, or, on the other, a plantation colony merely, In the planta- tion the European is a cultivator too, and may from year to year superintend his crops of sugar, coffee, or tobacco ; but his relation to the soil on which he lives is compara- tively a loose and transitory one. The difficulty of main- taining health undeteriorated by the tropical climate for more than a few years, and the impossibility of rearing a family in physical vigour, compel the planter to regard Europe as his home, even though his interests in the plantation pass to sons bred in a northern climate. They in their turn go abroad only to hasten home as soon as their views of what constitutes a competency admit. The number of European residents remains small ; and the necessity of employing negro or coolie labour must divide the population into two castes,—one of masters and one of

settlements ig essentially a system of colonization. The are governed as a "territory" by

the Federal Government, till the population reaches a fixed limit high enough to justify a demand to be admitted to q e Union on an equal footing with tho other States, The American Colonization Society" has made an interesting philanthropic experiment for the establishment of negro reedmen in Africa ; the result is the existing independent epublic of Liberia, A t is estimated that the existing colonies and depen- eneles of Great Britain cover about one-sixth of the land-

servants. And thus results the impossibility of that equal distribution of privileges and of responsibilities wherein lies the advantage of local self-government. Into one or other of the two classes of colonies thus distinguished those some- times technically termed mining and trading colonies are, according to circumstances, likely to pass. Thetrading colony, so long as it is a mere factory or emporium of commodities, differs but little from the settlements of Kuropeans within the bounds of foreign states such as China, sometimes loosely spoken of as colonies of Europeans. The term internal colonization is occasionally used of schemes for promoting the

prosperity of thinly-peopled and unfertile areas in some European states. The military colonies planted by Austria along her southern frontier serve a useful and very obvious purpose.

The Colonial Office [ist arranges British dependencies under three heads, according to their governmental relations with the English Crown. Officially, British “colonial possessions ” are either -—-1, “Crown colonies, in which the Crown has the entire control of legislation, while the administration is carried on by public officers under the control of the Home Government; 2. Colonies possessing representative institutions but not responsible government, in which the Crown has no more than a veto on legislation, but the Home Government retains the control of public officers ; 3. Colonies possessing representative institutions and responsible government, in which the Crown has only a veto on legislation, and the Home Government has no control over any officer except the governor. .. . Under responsible government the executive councillors are appointed by the governor alone with reference to the exigencies of representative government, the other public officers by the governor on the advice of the Executive Council. In no appointment is the concurrence of the Home Government requisite.” Some of the dependencies ranked here as Crown colonies can be called colonies only in a very loose sense. Military stations, such as Gibraltar, Malta, Aden, are convenient both to the navy and the com- mercial marine as coaling stations or ports for repair and for provisioning. The distinction between classes 2 and 3 is manifestly temporary, in most cases at least ; there being, for example, no reason why an agricultural colony like that at the Cape, at present without “ responsible government,” should not ere long possess that privilege. India, a “ Crown colony” in the list, is rarely spoken of under that name ; the enormous numerical disparity between the handful of resident Europeans and the millions of civilized natives makes it seem incongruous to put India under the same category as Canada or Victoria, and to some extent justi- fies the recent adoption of the title ‘‘ Empress of India ” by the Queen.

It is rather the force of circumstances than the consistent maintenance of any definite policy that has shaped the rela- tion of England to her various dependencies. But the colonial policy of the future has of late been largely debated, and with widely divergent issues. The “colonial system ” so long

maintained by England, as well as by all other powers, has been finally abandoned. No one now claims that the mother country has the right, still less that in self-defence she is bound, to restrict and hamper the trade of the colony for her own benefit ; nor are there now found many tv advocate the differential duties in favour of colonial produce, which that ancient system rendered all but neces- sary. Many, indeed, go to an opposite extreme, and argue that for both sides it would be better that the interdependent relation should be totally sundered, and each colony, as soon as possible, left to shift for itself. The trade of neither party, it is alleged, gains anything by the maintenance of the connection; the European state is exposed to needless

risk in time of war by her responsibility to her scattered

COLONY

dependencies, and to additional expense in providing against that risk ; while the colonies are liable to be dragged into wars with which they have no concern. arising from the sense of common origin would, it is said, amply maintain all the mutual advantages enjoyed under the present system, and would secure a virtual confederacy.

The good-will

The democratic experiments some of our colonies have been

freely permitted to carry out, and their trade legislation,

divergent from that of England, the incorporative federa-

tion of contiguous colonies, and the withdrawal of royal troops from the most developed colonial communities, are by many regarded as actual steps taken in the direction of

an eventual separation. To another class of theorizers it appears that a “personal union,” the entire legislative independence of the colonies with allegiance to the sovereign of the old country, would better secure the well-being of the several parts of the empire thus constituted ; while again others contend that the interests of England and of her possessions abroad, and the

cause of freedom and civilization throughout the world, would gain if the bonds of relation were yet more closely drawn together, and if pro- vision could be made for the representation of the colonies in the imperial parliament. Meanwhile, that parliament is supreme over the whole British empire; all the proceedings in the colonial legislatures are liable to be annulled by the Crown, The Crown appoints all governors, is the supreme fountain of justice, and has the sole right of declaring peace and war save in so far as that power is, under certain con- ditions, delegated to the Governor-general of India ; while the admitted aim of colonial policy is to develop the colonies socially, politically, and commercially quite as much as if their ultimate independence were the end contemplated.

Whether European Governments syste matically encourage or repress emigration, it is clear that the overgrowth of population in the more densely-peopled centres of the old civilization must continue to send forth emigrants and to inerease the already rapid growth of the existing colonies. It is significant for the future of European colonization that, of available territory in the temperate regions of America and Australasia (the temperate portions of Central Asia being, as inaccessible, ill adapted for European settlements), eighty per cent. is calculated to belong to the Anglo- Saxon race; and while the colonies of the English-speaking race have welcomed industrious men of all nationalities, tongues, and religious and political prepossessions, the colonial institutions, even where they differ most widely in their administration from those of England, bear an unmis- takably English stamp, and have been manifestly moulded by an English spirit.

See Heeren, Geschichte d. Europ. Staatensystems w. seiner Colonien, 1809; H. Merivale, Lectures on Colonization and the Colonies, 1839-41, new edition, 1861 ; Arthur Mills, Colonial Con- stitutions, 1856 ; Sir E. Creasy, Jmperial and Colonial Constitution of the Britannic Empire, 1872; W. E. Forster, Our Colonial Empire, 1875.

The following table, which is based on the latest returns and estimates, indicates the extent and population of the colonial pos- sessions of the various European countries, but does not include any colony that was settled before the 15th century :—

GREAT BRITAIN.

ts Eng. said Popes Hurope-—

Heligoland (German coast) .....- 5 2,000 Gibrelter (Spain). .....ife-c..ccngee sees 2 15,000 Malta, &c. (Mediterrancan) 115 150,000

N. America— Dominzon of Camila ….....00-0 3,500,000 4,000,000 Newfoundland…....0. vssescrcenses 40,000 161,000 Wetted as Mees aur. sctacs sameness 24 12,000 West India Islands, various…..... 14,000 1,2£0,000 Honduras (Central America) ..... 13,500 25,000 Garry forward…..... 3,507,646 5,015,000

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ae ‘Area, Popsiale 161 Brought f . Bq. miles, pulation 8 Anerica— ght forward ….. 3,567,646 5,615,000 Fea (12 eopooo beongago cote eeeenee Gr Dewi. 22 miles Population iano ae cone Coast Settlement = — lt tt”O”:*~S ? 800 Aner, i) SoguconsGoAS. 5 Ascension and St Helen CO 34,000 9.8 West Coast a oS 80 6,300 St Thomas &c. (West Indies) r , 806 Cape Colony — 17,000 578.000 ag08 140 37.700 aa… 230,000 1,110,000 hh gp eitins, i ee 290,000 a: sia rere es : = Aden and Perim…..... dias Seria i / ia —..... 938 ie 191 seen artholomew (West Indies) .. é oo 25.740 21408000 | ghee noe HON: an ancient city of Asia Mi Lad Tavaan oe oe 1,210 308000 short distance from the coast y of Asia Minor, situated a (OG ae 45 4,900 of Ephesus. It was f ast, and about eight miles eae tar 32 120,000 | take part in th as tounded by the Tonians, but ae ustralia …..cc00. oe. ar, e great politi : 1d not a 8,000,000 —- 1,725,000 The principal facts in Ue i festival of the Apaturia New Zealand ……. ..—-.... 26,215 105,000 Persians and its de lati istory are its capture b ic ee — — 106, 250 345,000 date the name ee eee by Lysimachus. At “a : se 0 . . fe) ’ Wrens er EE a 8,030 oe ae a of Notium, ae aeark to the con- ——— —— me of Cicero ued to flourish ti 8,01 4 at least. ish till th g *8.015,028 204,585,000 determined, but there are h = site of Colophon is ele America~ chon. a i It claimed fo We tho bi id y any traces of its buildin 4 7 a Miquelon (Newfound- Ba lous lesser names, it ee Homer, and, Hbaitlns ANG esses ew eeeeseee test ese ees aes imnermus # ered among i ie eo. Guadeloupe, &c. (West 81 5,000 the Theriaca Tae poet, and Niendee ie ee TLGIES) se sseeeeresseeeeeeeeens : ” ame VY j ro Guiana (South America) ..... 1,093 315,000 the pines on the neighb vas given to a resin obtained fro1 =*

*— rt” 47,000 25009 | Tecognizable in “ ne Vey iene Gallesus, and is still RSOMOMMR TT Ce ecs sce ces asecce The anci pony» and in the ee weenie 150,500 2,150,000 the C mee proverb, tov Kododiva 2 Sie colophane. Coast of Guinea …..... 10,000 200.000 olophon to the matter), has lik emednkev (he has put Be. Gand and Madamssoa 7,750 pee modern language. : ikewise left its trace i J nd Madagascar 80,000 of bibliogra te 8, a more particularly in the sa the POUICMCMES 000-000… see seeeee eee. voc a (Indian Ocean)..... 270 28,500 | *0 hei tnd he ere the word “colophon” is e : ae — = 970 194,000 | containi , concluding lines of early printed work = Te ieec eke: (India , ntaining the title, date, &ec arly printed works Cochin Chi | aoe 20 arisen either f 2 SM The adage is sai Z be, ER noeeneee Leeseaeenes oi ca 1 pad cavalry i er from the decisive influence of th cal ete oe a ,486,000 y in a contest, e Colophoni MemGveiaie and L . , ieee st, or from the fact th i! gm ae ré Lat . a . Marquesas …..... 2 gig Poe 60,000 C Sees m the great Ionian i ee a 10, ; , one of th : a nie 000 | America. Boundaries: N W United States of North ; 4,919,500 | Nebraska and Ka : N.. Wyoming and Nebraska; | America— SPAIN i ra Mexico : gee S., the India : ’ ; E, end P ; ms fexico; and W., Utah. Latit n Territory and New P sl orto Rico (West Indies) 49,500 — N.; longitude, from 102° = Teo ia ee 37 of 13,500 feet, presents rend’ has an average elevation a ,000 | has a mean breadth of f road and massive outline, and Cape Ved Telagag oo 320 115.000 | Tally @ prolongation o rt fifteen to twenty miles. It is ie Scnegambia and Guinea aie 70,000 up to about 40° N. lat. it spastic Madre of Mexico, and a eee 300,0 33,000 | the Atlantic and the Paci ms the dividing line bety Asig 1% &% (East Coast) ..... boven gis jn south we have th we versants, Beginning a ae Goa, &. (Indi } : 00,000 14,106 f e following peaks :—M e ee… ..... ? eet; twelve mil aks :—Mount Bowles Maceo (China) on TehsDelago) Boe” devoee 12136: Bp clits cena Unf este Howard, ne ; fon, | Tat sconce ~~east, La Plata M om 1 3 miles from La P ; Pie: SO | Miers, Meat ae Me ee 13,786, , 3,618,000 lbert, Massive Mountain 1.0 six miles from Mount America | Hotzanp. — —~~ =—— miles north of this last élevati yu. For about eighteen lragoa, Bc. (West Indies) low, but it rises again in wh the range is comparatively giana (8. America) 0.000 436 40.000 | Holy Cross, which attai e great terminal peak of the Tes. ae 66,000 70,000 opin oy a Belle a height of 13,478 feet, and nd o ee u . ; chipelago) ans (Eastern the white lines of its ails ee ons*

are geologically interesting for the almost unexampled dispiacement of the strata of which they are composed, and the apparent confusion which has thence arisen. Among the most remarkable of its separate summits are Italian Mountain, 13,431 feet in height, so called because it displays the red, white, and green of the Italian national colours; Whiterock Mountain, 13,847 feet ; Teocalli Moun- tain, 13,274; Crested Butte, 12,014 ; Gothic Mountain, 12,491; Snow Mass, 13,961 ; Maroon Mountain, 14,000 ; Castlepeak, 14,106; Capitol, 13,992, and Sopris Peak, 12,972. Of less importance, but still distinct and well defined, are the Wet Mountains in the south-east, the Raton Mountains in the south, and the Uncompahgre Mountains in the south-west. The eastern series of eleva- tions which abut on the region of the plains are known as the Front Range, and present a fine bold outline, broken by several peaks of about 14,000 feet or upwards in height. One of the most remarkable features of the orography of Colorado is the unusual development of its upland valleys, or " parks," to use the term that has become distinctively their own. The four most exten- sive are known respectively as the North, the Middle, the South, and the San Luis; the last is by far the finest of the four, They stretch almost in a line from the southern to the northern boundary of the State, just on the western side of the Front Range, and occupy an average breadth of 50 miles. The San Luis Park is, as it were, an "immense elliptical bowl" with an area of 9400 square miles, bounded on the E. by the Wet Mountains and the Sangre de Cristo range, and on the W. by the Sierra de San Juan, which is part of the great Sierra Miembres. Tts surface is nearly as flat as a lake, and it almost certainly was at one time the bed of a great inland sea. The centre of the northern part, which bears the distinctive title of the Rincon, is still occupied by a considerable sheet of water, fed by nineteen mountain streams, and accustomed in the winter to overflow a large stretch of the neighbouring savannah, 'The southern part, which continues onwards into New Mexico, is traversed by the Rio del Norte and several of its tributaries.

Rivers.—Of the rivers of the Atlantic versant, the most important are the South Platte, the Arkansas, and the Rio Grande del Norte ; those of the

Pacific are all members of the great Colorado River. The South Platte has its head waters in Buckskin Mountain, and its earlier tributaries flow from the slopes of the northern part of the Front Range. At its source at Montgomery it has a height above the sea of 11,176 feet; at its exit from the upper cafion it is still 7623, but by the time it reaches Denver it is only 5176. The Arkansas rises in the same district, at a height of 10,176 above the sea, in Tennessee Pass, but as it leaves Chalk Creek has come down to 7877. In the upper part of its course it passes through a cafion from 1000 to 1500 feet in depth. The Rio Grande del Norte has its head waters in the Sawatch range and the Sangre de Cristo range, and flows south through the valley San Luis Park. The river which gives its name to the State belongs to the territory only by some of its most important tributaries, of which it is sufficient to mention the Bear River, and the Gunnison and Grand River, which unite before they pass into the territory of Utah. The numerous minor "creeks" which feed the main streams must uot be forgotten in forming an idea of the main features of the country.

Minerals.—Colorado is pre-eminently a mineral district, and to this fact it owes its colonization. It possesses extensive deposits of gold and silver ore, and between the years 1859 and 1872 it furnished to the United States mint upwards of $20,000,000 worth of the former metal and $1,114,542 of the latter. Iron is pretty widely

'drinking is very scarce ;

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COLORADO

diffused, and zinc and copper occur in many of the mines, Coal is also found extensively on both sides of the main range of mountains; the area occupied by the Tertiary deposits being no less than 7200 square miles, and the annual yield about 200,000 tons. The mining districts are five in number, and are distinguished as the district of the northern mines, the mines of the eastern base, the Conejos county mines, the southern mines, and the mines of Summit County. At Murphy's mine, akout twelve miles from Denver, the stratum is about 16 feet thick, and the per- centage of fixed carbon is found to be 55°31.

The climate of Colorado is remarkable for its regularity and salubrity. During the day the thermometer not unfrequently rises to 90° in summer, but the nights are always cool and dewless. In winter the weather is generally mild,—the lowest thermometric marking being only 7° below zero, in Middle Park 15°, and in Denver 13°. Snow often lies deep in the higher inhabited districts, but in the lowlands it is never more than 10 or 12 inches, and it disappears again almost immediately. All through the year the atmosphere is so dry and light that butcher meat can be preserved by the simplest process of desiccation. Between July and October there is very little rain, day after day bringing a bright and cloudless sky. " An air more delicious to breathe," says Bayard Taylor, " cannot anywhere be found; it is neither too sedative nor too exciting, but has that pure, sweet, flexible quality which seems to support all one's happiest and healthiest moods." For asthmatic and consumptive patients it exercises a restorative influence which cannot te disputed; and the State consequently proimises.to become an extensive sanatorium for the eastern districts of the continent, The only flaw in the climate of Colorado is its violent storms of wind, and in some parts of the country heavy falls of hail. It would seem, however, that the humidity is on the increase ; and whatever be its cause, the change is quite perceptible since the colonization of the territory. The Cache » la Poudre, for instance, is said to be yearly increasing in volume, and streams which formerly dried up in the summer now maintain a continuous flow. Among the secondary hygienic advantages of which Colorado can boast, the mineral wells hold an important place. They occur in various parts of the country, and belong to different classes. Chalybeate waters are found at Manitou, Carlisle, and Red Creek; soda springs at Manitou, Trinidad, and Cafion City; sulphur springs at Fairplay, on the Navajo River, and at Idaho springs; and thermal springs, partly sulphur and partly soda, exist at Pagosa, in the Middle Park, in Seguache County, at Wagon Wheel Gap, and at Del Norte. Manitou is already becoming a fashionable water ing-place ; the fountains and the surrounding land were purchased by a company in 1870 ; and in 1873 there were already six large hotels and numerous private residences erected round the spot. In the lowland districts water for but supplies can frequently be obtained by the sinking of Artesian wells.

Vegetation.—The mountains of Colorado were, till a comparatively recent date, richly clothed with forest ; but owing partly to natural causes, and

still more to the lavish consumption and reckless destruction of the early settlers, the quantity of growing timber in the State is excecdingly small, and before long, if restorative measures are not adopted, the Colorado demand for wood will require to be supplied from without, Whole mountain sides often present the appearance of monstrous cheavaux-de-frise, the dead trunks of the wind-thrown pines being tossed about in all directions. The principal trees, after the pine, ar the so-called hemlock and cedar, the cotton wood, and the aspen (or Populus tremuloides). The minor flora of the country is exceedingly rich ; and especially in the plain

region the abundance of flowers is amazing. "The colour of the landscape," says Dilke, "is in summer green and flowers; in fall time yellow and flowers; but flowers "

ee etiare Wherever irrigation can be obtained the soil of eastern Colorado is well fitted for agriculture. Wheat, oats, and barley afford heavy crops ; potatoes suc- ceed except in the extreme south, and owing to the dryness of the atmosphere are easily kept ; onions vie in size and flavour with any in the continent ; beans might be grown more extensively, but they suffer from the attacks of a smal] insect, possibly a species of Haltica Fs and almost all the garden products of the same latitude in Europe can be satisfactorily cultivated. The wheat affords a very white dry flour, and competes with the finest in the markets of the world. The yield often reaches forty or fifty bushels per acre, and in exceptional cases considerably exceeds this amount. In the higher districts—the parks and the mountain-valleys—a greater proportion of ground is devoted to pasture either of sheep or cattle. The native grasses are of excellent quality as fodder ; and during the winter the natural hay that has withered where it grew is preferred by the cattle to the best thatcan be furnished by the labours of the husbandman. In certain districts the pas- toral departments of husbandry have had to be abandoned, owing to the presence of poisonous plants, the most important of which seems to be Oxytropis Lamberti ; but these districts are of very limited extent. The cost of pasturing is merely nominal, as-the cattle can be driven over extensive districts, under the charge'of Mexican or Indian herdsmen. Wool can be produced for ten cents per tb., and a four-year-old

steer for ten dollars. The chief plague of the agriculturist is the locust, or grasshopper, as it is called in America, This insect is usually hatched in the month of J une, when the cereals are well advanced ; but occasionally in dryer and warmer seasons it appears as early as April and does great damage to the young crops. Another insect, the Doryphora decenlimeata, popularly known as the Colorado Beetle (see p. 134 of the present volume), has recently become famous for its attacks on the potato, not only in thisState but as far east as Ohio. It appears formerly to have fed on the Solanum rostratum, but to have found the new tuber a better habitat,

History.—Recent explorations have shown that the Western parts, at least, of the Colorado territory were at one time inbabited by a native American race of consider- able: civilization, who were perhaps connected or even identical with the Moquis of the regions further south, The first important European mission was that of Vasquez Coronado, despatched from Mexico in 1540. In 1821 the Rocky Mountains were visited by 8. T. Long, the American engineer; and part of the northern district was pretty fully explored by Captain J. C. Fremont during the great ex- pedition of 1843, It wag not till 1858 that the Indian tribes were disturbed in their sparsely-peopled hunting grounds Russell, a Georgian, on the banks of the River Platte, near the present city of Denver, attracted general attention, and bands of pioneers poured in from Kansas, N ebraska, and Missouri, During 1860, 1861, and 1862, there wasa continuous stream of immigration ; Denver, Black Hawk, Golden City, Central City, Mount Vernon, and Nevada city were all founded in 1859; next year saw the rise of

reckenridge, Empire, and Gold Hill ; George Town and Mill City were added in 1861, and Ward District was settled m 1862. In 1861 the region was organized as a territory in accordance with the wish of the inhabitants, | who had held a convention at Denver in 1859 ; its area was declared to include 47,657,000 acres previously assigned to the territories of Utah and Kansas, 10,262,400 from

; but in that year the discovery of gold by W. G. |

that of N ebraska, and 8,960,000 from New Mexico making a total of 66,880,000. The first governor was William Gilpin, a Pennsylvanian by birth and a Quaker in religion, who has done a great deal for the development of the territory, and was the originator of the scheme by which it was made to include part of both slopes of the Sierra. From 1862 to 1865 the natural progress of immigrational movement was checked, partly by the great national struggle, and partly by the local Indian war which broke out in 1864, and fora time rendered the routes extremely unsafe, and even threatened the existence of the new settlements. Many of the sites, indeed, were deserted, and large numbers of the miners left the country. In this way Empire greatly decayed, and Gold Dirt and Bakerville absolutely disappeared. Happily it was only the Indians of the plains who took part in the attacks, and though they numbered from 10,000 to 15,000, they were quickly quelled. In 1865 the immigration again flowed on; and it wag found that at the census of 1870 the population was 39,864 citizens, distributed into 9358 families, and inhabiting 10,009 houses. The proportion of males to females wag 24,820 to 15,044. Since that date the population has very rapidly increased, and it was estimated at 120,000 in 187 a Colorado was received into the Union as a State in 1877.

See Fremont, Narrative of Exploring Expedition, 1846 : Stansbury, Expedition to the Valley of the Great Salt Lake, Edward Bliss, The Gold Mines of Colorado ; to the Silver Mines of Colorado; Bayard Taylor, 4 Sunumer Trip to Colorado, 1867; Bowles, Summer Vacations in the Parks and Mountains of Colorado, 1869 ; W. Blackmore, Colorado: 'ts Resources and Prospects, 1869 ; Greatorex, Summer Lichings in Colorado, 1874; Porter and Coulter, Synopsis of the Flora of Colorado, 1874 ; and as the main source of all topographical, geological, and botanical details regarding the State, the Reports of the United States Geological and Geographical Survey, which have been published from time to time by the Government.

COLORADO RIVER, or Rio Cotorano,,a large river of North America, which rises in the Rocky Mountains and falls into the Gulf of California. Theemain stream, known as the Green River, has its source in Fremont's Peak on the western borders of Wyoming, so that the whole extent of its course must be upwards of 2000 miles, After receiving the waters of the

Yampuh and the White River, it flows south for about 150 miles without any important augmentation till it meets with the great rival stream of the Grand River, which by means of its llumerous confluents drains so large a portion of the western versant in the State of Colorado. The united stream continues to force its way south, till at its junction with the Colorado Chiquito, or Little Colorado, which takes its rise in the'Sierra Madre of New Mexico, it turns almost due west, and cuts right athwart the line of the mountain ranges. Its southern direction is resumed after the confluence of the Virgen from the Wahsatch Mountains, and it only receives one other tributary of real magnitude, the River Gila, before it reaches the sea. The enormous cafions or ravines through which the Colorado and several of its confluents force their way, render this one of the most remarkable river systems of the world. The Grand Cafion alone extends for 4 distance of about 200 miles westward from the junction of the Colorado Chiquito, and its walls rise almost sheer from the water's edge to a height of from 4000 to as much as 7000 feet. Further down is Black Cajion which, with a length of 25 miles and a height of 1000 or 1500 feet, would be considered a magnificent phenomenon, were it not so com- pletely thrown into insignificance by its more stupendous neighbour. 'These very features which give the river its uniqueness prevent it from being of much use as a means of navigation ; but steamers can proceed upwards as far as Callville, about 612 miles from the mouth.

The discovery of the Colorado is due to Fernando Alascon

Capt. ; il Soe Hollister, Flying Trip

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in 1540; but it was not till Lieutenant Ives's expedition in 1857 that even the lower part of its course was properly explored. The mysteries of the Great Caiion were first invaded by an unlucky "prospector," James White, who along with a companion thought it safer to trust himself to the river than to the Indians, In 1869 the whole course from the head-waters in Wyoming to the town of Callville was traversed by a party of explorers, commissioned by the United States Government and commanded by Professor J. W. Powell. Since that date the river and its basin have been the object of systematic survey under the same auspices, and the results of the gigantic

undertaking have been published by Professor Powell in his Exploration of the Colorado River of the West and tts Tributaries, explored in 1869, 1870, 1871, and 1872 (Washington, 1875). COLOSS, a once large and important city of Asia Minor, in Phrygia Major, on the Lycus, a branch of the Moeander. The notices of Colossze in ancient history are few and brief. Xerxes passed through it on his way to Greece, 481 3.c., and at the close of the same century it was visited by Cyrus the younger. It is described by Xenophon in the Anabasis as being at that period a large and flourishing city. Like Laodicea, and other cities in that part of Phrygia, Colossz carried on an extensive trade in wool, and derived a large revenue from the skill of its inhabitants in dyeing that article. After the time of Cyrus the city seems to have gradually decayed, till in the Middle Ages it disappeared altogether. Near its ruins there sprang up another town called Chonzx, the birthplace of the Byzantine historian, Nicetas Choniates, now repre- sented by the town of Khonas. Excavations made in the neighbourhood of this place have brought to light the ruins of a large city, which is believed, with good reason, to be Colosse. The Epistle to the Colossians (see below) is addressed to the inhabitants of this city, in which one of the earliest of the Christian churches in Asia was planted. COLOSSEUM. See AmpnirHeaTRE, vol. i. p. 774; ARCHITECTURE, vol. ii. p. 419; and Rome. COLOSSIANS, Tur Eprstte To THE, belongs to the third of the four groups under which the Pauline epistles may be chronologically arranged,—a group which oceupics a midway position between the lettcrs sent to Corinth, Galatia, and Rome, in the apostle's third mis- sionary journey, and the letters known as the Pastoral Epistles. By similarity of language and matter the epistle to the Colossians is intimately connected with that to the Ephesians ; and the notices of St Paul's companions, and of Onesimus and Archippns, which oceur in the epistle to Philemon, show that this last epistle was also written and sent at the same time as the other two. The epistle to the Philippians belongs to the same group, and the most probable view is that it was from Rome that all four were written by Paul, "tbe prisoner of Jesus Christ" (comp. Philem. 1; Col. iv. 10, 18; Epb. iii. 1, iv. 1, vi. 20; Phil. i. 13, 14, iv. 22). Some critics—among whom may be meutioned Schulz, Béttger, Thiersch, Meyer, and Reuss, whose opinion is strongly advocated by De Pressensé in his Histoire des Trois Premiers Siécles—contend that at least three of the epistles were written from Czsarea; but the traditional view that all four were written from Rome is supported by most

modern writers, and is freest from difficulties. The date of the epistle to the Colossians may be placed about 62 or 63 .p. Assuming for the present its genuineness, we may gather from the contents of the epistle itself its occasion and object. Epaphras, who is spoken of in high terms by the apostle, and may with some probability be considered the founder of the church at Colosse (i. 7), has brought tidings to St Paul which make him anxious concerning the Christians in Colossi and its neighbourhood (ii. 1, iv. 13). False teachers are

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there endeavouring to beguile them with plausible talk (ii, 4), and Paul, as a minister of the gospel earnestly labouring in the cause of proclaiming Christ to the nations (i. 24-29), feels his heart called out towards those whose faith is being insidiously assailed, although he is absent from them, and has never personally visited Colosse or Laodicea (ii. 1). He accordingly writes an epistle the polemical purport of which is patent. negative protest. philosophy " which he so strenuously repudiates (ii. 8), a, "theological conception of the person of Christ, " which strikes at the root of all vain speculations concerning the unseen world, and shows that the work of reconciliation effected by Christ is complete, so that in Him Christians are to see the one Mediator through whom God is to be known, approached, served. 'The latter part of the epistle consists of various practical exhortations, both general and specific; and it closes with several notices of a personal character. 'Tychicus was the bearer of this letter (iv, 7), as he was also of that known as the epistle to the Ephesians, which by some critics is identified with " the letter from Laodicea" (iv. 16).

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Paul's polemic, however, is no mere He sets up, as against the "false

But are these letters genuine? There is no historical

ground for doubting the Pauline authorship, or for the theory which has been advanced that the two epistles are inventions of a later age, or for the supposition that, whilst one of them is genuine, the other is made up of materials derived from that one which was really written by St Paul. The

fact that opponents of the genuineness of the letters do not agree as to which was the original is significant. Mayerhoff thinks, indeed, both epistles to be spurious, but

considers that the epistle to the Colossians was compiled

from that to the Ephesians ; while De Wette holds the epistle to the Ephesians to be a " verbose enlargement" of

that to the Colossians, and advocates the 'genuineness of the latter. The opponents of the Pauline authorship rest

mainly on three lines of argument, viz., the similarity of the two epistles, the peculiarity of their contents, and

peculiarities of style.

The objection founded on the similarity of the language and matter of the two epistles is one that cannot be substantiated. For whilst there are striking resemblances,

there are no less striking differences ; and whilst the

resemblances can be very naturally accounted for by the contemporaneousness of the letters, the differences are so markedly in accordance with the apparent designs of the scparate letters,—that to the Colossians being primarily polemic, and that to the Ephesians being of a mystic and devotional charactcr,—that we may fairly use of each epistle the words applied by Meyer to the epistle to the Colossians, —" The supposed forgery of such an epistle srould be far more marvellous and incxplicable than its genuineness."

Another objection brought forward is that in these epistles we have sentiments that savour of heresies later than the apostolic age. This objection seems to be based upon very superficial grounds, and to spring from prejudice rather than from rescarch. What definite ground is there

for asserting that "Gnostic and Montanist " sentiments

are to be found in these epistles? While certain false teachings and tendencies are alluded to, which evidently go beyond the more naked Pharisaic Judaism controverted in the epistle to the Galatians, nothing can be produced to show that the heretical teaching animadverted upon m the epistlc to the Colossians, or even in the later epistles of Paul to Timothy and Titus, is Gnosticism in the sense 12 which that term is applied to later systematic theosophies and cosmologics, such as those of Basilides and Valentinus. And would it not be natural, as Neander points out, to postulate, even if we had no records to testify to the fact,

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the existence of certain transitional links between the gnosis of the 2d century and the earlier stages of the

in the incipient Gnosticism, if so it is to be called, of which we

apostolic preaching? Such links are found

have traces in the cpistles of the imprisonment and the subsequent Pastoral Epistles.

A third objection has been made to the genuineness of

the epistle to the Colossians, as well as to the Ephesian epistle, on the ground of the peculiarity of their style aud of certain terms used in them, some of which are asserted to be technical terms, as con, pleroma, dic., and others are words not elsewhere used in the Pauline writings. The answer to this objection is that the peculiar terms are not used in the sense which they acquired in heretical writings of a later period, and that the unusual words are to be attributed partly to the nature of the subject and partly to the disposition of the writer's mind at the time. If, indeed, we are to condemn any writing of an author for containing peculiarities not exhibited in other writings of the same author, the questions arise, whence are we to take our standard of judgment, or how are we to know in what cases we should apply so vague a critical canon? Bleek says, sensibly enough, in view of this line

of objection, "We do not for a moment deny that the epistle to the Colossians contains much which is peculiar to itself; but its contents, such as they are, do not tell against its coming from the same author as the other epistles of St Paul, for even those which Baur allows to be genuine contain much that is distinctive and peculiar, e.g., the Galatians as com- pared with the Corinthians, and 2 Corinthians as compared with 1 Corinthians." The fact is that in the Tiibingen school "subjective criticism" has run to riot, The phenomena to be investigated are interpreted according to a preconceived theory, rather than fairly looked at, examined, and explained. The testimony of the early church to the Colossian and Ephesian letters is unexcep- tionable. In the case of the epistle to the Colossians, there are indications of its recognition in allusions by Justin Martyr and Theophilus of Antioch ; it occurs in the Muratorian canon (circ. 170 a.p) ; it is cited by Trenzens, Clement of Alexandria, Tertullian, and Origen ; Eusebius places it among the " acknowledged" books of the apostolical writings; and it occurs in Marcion's list, as given by Epiphanius. Nor is there anything in the epistle itself that is out of accordance with the circumstances of the apostle Paul, or the condition of the Asiatic churches in the seventh decade of the 1st century.

We must now briefly notice the character of the teaching against which St Paul directed the controversial portion of the epistle to the Colossians (ii, 4-23). His warnings are against a philosophy which is vain and fallacious : Against a system of multiplied religious observances and distinctions of meats ; against au arbitrary system of augel- worship ; and against certain rigorous rules of asceticism. The basis of this alien teaching was unmistakably Judaic, but the Judaizing effort was of a mystic and ascetic type ; and it is not unreasonable to see in the theosophical speculations and ascetic ordinances, indicated in St Paul's Picture of the dangers which beset the Colossian Christians, an admixture of Jewish and Oriental elements, Professor Lightfoot has shown that Oriental notions concerning the evil of matter and the need of rigid abstinence, together with "an esoteric doctrine relating to angelic beings" and — to sun worship, appear in Essenism, which he

Be might be called Gnostic Judaism. The Essene side of vUdaism was doubtless tepresented among the Jews who ie settled in, or journeyed to and

from, various places in comme all mystic and ascetic ideas would find a silva Soil in Phrygia. The teaching and tendencies

ed to in the epistle to the Colossians, and subsequently

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in the Pastoral Epistles, form the intermediate link between the " Gnostic Judaism " of the Essenes and teachers allied to them and the " Judaizing Gnosticism" of the 2d century,

The question whether Paul himself planted the church at Colossz is one of minor importance, which has been much discussed by commentators. Lardner argues elaborately in favour of a visit by Paul to Colossee and Laodicea. He bases his view upon a passage cited from Theodoret, in which ch, ii, 1 is interpreted so as to distinguish between the Colossians and Laodiceaus on the one side and the "as many as had not seen Paul's face" on the other, This view has been controverted in detail by Davidson, but is advocated by Wordsworth. Bleek mentions Schulz, Wiggers, and others as following Theodoret, but he takes the contrary view himself, as do also Alford, Conybeare and Howson, and Lightfoot. The last-named commentator says that Theodoret's interpretation is " opposed alike to grammatical and logical considerations,"

Another disputable though not very important point is whether the Ephesian or the Colossian letter was written first. Critics are divided, and it is somewhat difficult to gather from a comparison of the epistles which view is most probable. We are inclined to favour the view that the briefer, more controversial, and in some respects more vigorous letter was written first, and was followed by the fuller and more mystic one. It has been said that this epistle is characterized by a " ruggedness of expression and want of finish that borders on obscurity " (Lightfoot), and it has been suggested that the absence of personal connec- tion on St Paul's part with the Colossian church might partially account for "the diminished fluency of this letter," as compared with other and earlier ones. We do not think this explanation a satisfactory one. The " rugged- ness" should rather be attributed to the intensity of feeling wherewith the apostle, confined as he was in his far-off place of imprisonment, threw himself into the controversy

with the false teachers,—persons whom he must have regarded as among the "grievous wolves," of whom he had forewarned the elders at Miletus some few years previously (Acts xx. 29, 30), men who should "arise out of the Christian community itself, and speak perverse things to draw men after them." This explanation is somewhat corroborated by what Alford points out, viz, that the majority of peculiar expressions in the epistle occur in the second chapter. And Professor Lightfoot himself adds— "No epistle of St Paul is more vigorous in conception or more instinct with meaning. It is the very compression of thoughts which creates the difficulty. If there is a want of fluency there is no want of force. Feebleness is

the last charge which can be brought against this epistle."

The value of this epistle to the church historian, to the Christian theologian, and to any one who wishes fairly to estimate the "philosophic" bearings of Christian dogma is very great. A commentator of the]7th century, H. Suicer, meutioned by Walch in his Bibliotheca Theologica, calls the epistle to the Colossians theologie Christiane compendium.

Authorities for what has been said, and references to further literature upon the subject, may be found in "Introductions," such as those by Davidson and Bleek, and in " Prolegomena" of commentators, e.g., Alford, Wordsworth, and Braune in Lange's Bibelwerk, a treasury of information made accessible to English readers in Dr Schaff's edition, published by T. & T. Clark. Frequent reference has been made in the course of this article to the recent very valuable commentary of Professor Lightfoot. In addition to the exegetical notes, he gives us thorough dissertations on " the churches of the Lycus," the " Colos- sian heresy," and "the Essenes." There is also a digest

of the principal various readings, containing an ingenious conjecture as to the original reading in chap. iL FS: Attention is drawn to the fact that the epistles to the Ephesians and the Colossians, alone among the Pauline epistles, are exposed to those '" harmonizing tendencies " in transcribers which have had such an influence on the text of the gospels. Professor Lightfoot deals, also, in a most exhaustive manner, with the subject of the

apocryphal letter to the Laodiceans (connected with Col. iv. 16), which appears in a considerable number of MSS. of the New Testament, and shows it to be "a cento of Pauline phrases strung together without any definite connection or any clear object." Paley, in his Hore Pauline, has a very satisfactory section on the similarity of the epistles to the Ephesians and the Colossians. On the character of the heretical tendencies in Asia Minor the general reader will find all requisite information in Neander, History of the Planting, &c., of Christianity, and Pressensé, Histoire des Trois Premiers Siecles de U Lglise Chrétienne. Mansel, in his Gnostic Heresies, has a chapter devoted to Notices of Gnosticism in the New Testament. Both Neander and Pressensé draw attention to the arbitrary and unsound theorizing of the Tiibingen school in respect to the group to which the epistle to the Colossians belongs. (W.S. 8.)

COLOSSUS, in antiquity, a term applied generally to statues of great size, and in particular to the bronze statue of Helios, in Rhodes, which for its size came to be reckoned among the wonders of the world. It was made from the spoils left by Demetrius Poliorcetes when he raised the prolonged siege of Rhodes. The sculptor was Chares, a native of Lindus, and of the school of Lysippus, under whose influence the art of sculpture was led to the pro- duction of colossal figures by preference. The work occupied him twelve years, it is said, and the finished statue stood 70 cubits high. It stood near the harbour (émt Aiueve), but at what point is not certain. When, and from what grounds, the belief arose that it had stood across the entrance to the harbour, with a beacon light in its hand and ships passing between its legs, is not known, but the belief was current as early as the 16th century. M. Benndorf has recently endeavoured to trace it toa mistaken reading of a Greek epigram on the Colossus, and his con- jecture seems probable (Mzttheilungen des deutschen Instituts in Athen, part 1, p. 45). The statue was thrown down by an earthquake about the year 224 B.c., that is about 56 years after its erection. Then, after lying broken for nearly 1000 years, it is said, the pieces were bought by a Jew, and probably reconverted into instruments of war.

COLOUR. See Licut and Optics.

COLSTON, Epwarp (1639-1721), was the son of William Colston, a Bristol merchant of good position, He is generally understood to have spent some years of his youth and manhood as a factor in Spain, with which country his family was long connected commercially, and whence, by means of a trade in wines and oil, great part of his own vast fortune was to come. On his return he seems to have settled in London, and to have bent himself resolutely to the task of making money. In 1681, the date of his father's decease, he appears as a governor of Christ's Hospital, to which noble foundation he afterwards gave frequently and largely. In the same year he probably began to take an active interest in the affairs of Bristol, where he is found about this time embarked in a sugar refinery ; and during the remainder of his life he seems to have divided his attention pretty equally between the city of his birth and that of his adoption. In 1682 he appears in the records of the great western port as advancing a sum of £1800 to its needy corporation; in 1683 as "a free burgess and meire (St Kitts) merchant" he was made a member of the Merchant's Hall; and in 1684 he was appointed one of

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a committee for managing the affairs of Clifton. In 1685 he again appears as the city's creditor for about £2000, repayment of which he is found insisting on in 1686. In 1689 he was chosen auditor by the Vestry at Mortlake, where he was residing in an old house once the abode of Ireton and Cromwell. a cost of £8000, he founded an almshouse for the recep- tion of 24 poor men and women, and endowed with accom- modation for "Six Saylors," at a cost of £600, the Merchant's Almshouses in King Street. of £8000, he endowed a foundation for clothing and teaching 40 boys (the books employed were to have in them

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Tn 1691, on St Michael's Hill, Bristol, at

In 1696, at a cost

“ no tincture of Whiggism ”); and six years afterwards he expended a further sum of £1500 in rebuilding the school- house. In 1708, at a cost of £41,200, he built and endowed his great foundation on Saint Augustine’s Back, for the instruction, clothing, maintaining, and apprenticing of 100 boys; and in time of scarcity, during this and next year, he transmitted “by a private hand” some £20,000 to the London committee. In 1710, after a poll of four days, he was sent to Parliament, to represent, on strictest Tory principles, his native city of Bristol; and in 1718, after three years of silent political life, he resigned this charge. He died in 1721, having nearly completed his eighty-fifth year; his remains were conveyed, with all the funereal magnificence his own solemn fastidiousness could suggest, from his house at Mortlake to Bristol, where he was buried in All Saints’ Church. Colston, who was in the habit of bestowing large sums yearly for the release of poor debtors and the relief of indigent age and sickness, and who gave (1711) no less than £6000 to increase Queen Anne’s Bounty Fund for the augmentation of small livings, was always keenly interested in the organization and management of his foundations; the rules and regulations were all drawn up by his hand, and the minutest details of their constitution and economy were dictated by him. A high churchman and Tory, with a genuine intolerance of dissent and dissenters, his name and example have served as excuses for the formation of several politic benevolent societies— the “Anchor,” the “ Dolphin,” the “ Grateful,’— whose rivalry has been perhaps as instrumental in keeping their patron’s memory green as have the splendid charities with which he enriched his native city. See Garrard, Edward Colston, the Philanthropist, 4to, Bristol, 1852; and Pryce, A Popular History of Bristol, 1861.

COLT, SamvuEr (1814-1862), the inventor of the re- volver, was born at Hartford, Connecticut, where his father possessed a manufactory of silks and woollens. At ten years old he left school for the factory, and at fourteen he inade a runaway voyage to India, during which he made a wooden model, yet existing, of what was afterwards to be the revolver. On his return he learned chemistry from his father’s bleaching and dyeing manager, and travelled over the United States and Canada lecturing on that science. The profits of two years of this work enabled him to continue his researches and experiments. In 1835 he visited Europe, and patented his inventions in London and Paris, securing the American right on his return ; and the same

year he founded the Patent Arms Company, for the manufacture of his revolvers only. The scheme did not succeed; some use was indeed made of the arms, but they were not generally appreciated ; and in 1842 the company became insolvent. No revolvers were made for five years; and none were to be had when Taylor sent from Mexico fora supply. The Government ordered 1000 from the inventor; but before these could be produced he had to construct 2 new model, for a pistol of the company's make could no- where be found, This commission was the beginming of an immense success. The little armoury at Whitneyville (New Haven, Connecticut), where the order for Mexico

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was executed, was soon exchanged for larger workshops at Hartford, the inventor's birthplace. These in their turn gave place (1852) to the enormous factory, doubled in 1861, on the banks of the Connecticut River, whence so many millions of revolvers, with all their appendages, have issued, and whence was sent, for the Russian and English Governments, to Tula and Enfield, the whole of the elaborate machinery devised by Colt for the manufacture of his istols,

SCOLUMBA, St, was born on the 7th of December 52] : and the place of ae birth ME pues p es Penegy in the county of Donegal. Both on the father's and on the mother's Side he Be iaccnded from princely families in Ireland, and Conal, king of the Scots in Northern Britain, was his kinsman. Some writers are of opinion that his original name was Crimthan, and that he received the surname of Columba from the dove-like simplicity of his character, but it is more probable that =~ a was his baptismal name. He was afterwards kuown ag Columbkcille, or Columba of the Churches, to distinguish him from others of the same name. Treland was already famous for the learned men who taught in its numerous monasteries ; and Columba studied for some time under one of the most distinguished of these, St Finian of Moville Almost as a matter of course, under such circumstances, he embraced the monastic life. He was ordained deacon while at Moville, and afterwards, when about thirty years of age, was raised to the priesthood. During his residence in Ireland he founded two famous

monasteries, one named Dair Calgach, on the banks of Lough Foyle, the other Dairmagh in Leinster, better known by their modern names of Derry and Durrow.

When upwards of forty years of age he left his native island, accompanied by twelve disciples, and went on a mission to Northern Britain. Argyll and the neighbouring islands were at this time portions of the Christian kingdom of the Scots, and from its sovereign Conal he received the Island of Hy, or Iona, where he fixed his residence. His first task was to erecta church and monastery—humble structures of timber and reeds, according to the fashion of the country and the age, Having spent some years in preparation, he began the great work of his life,—the conversion of the heathen kingdom of the Northern Picts, Crossing over to the mainland he proceeded to the residence, on the banks of the Ness, of Brude, king of the Picts, By his preaching, his holy life, and, as his earliest biographers assert, by the performance of miracles, he converted the king and many of his subjects. The precise details, except in a few cases, are unknown, or obscured

y exaggeration and fiction ; but it is certain that the whole of northern Scotland was converted by the labours of Columba and his disciples, and the religious instruction of i People provided for by the erection of numerous monasteries,

The monastery of Jona was reverenced as the mother house of all these foundations, and its abbots were obeyed as the chief ecclesiastical rulers of the whole nation of the

orthern Picts. There were then neither dioceses nor parishes in Ireland and Celtic Scotland ; and by the

Columbite rule the bishops themselves, although they ordained the clergy, were subject to the jurisdiction of the abbots of Iona, who, like the founder of the order, were only presbyters, -'The controversies connected with this ae are well known to the students of ecclesiastical dis ae a need not here be farther adverted to. Similar ond ie i. existed regarding the doctrines of Columba ae " OMowers, This point algo is beyond the range of ; oe esent article. It may be sufficient to mention that ie 8 no real difficulty as to their belief in its general

ures. It was the same as that of the Western Church

on the Continent, with which also thejr ritual agreed except in a few unimportant particulars, such as the precise time of keeping Easter. The confusion in these matters has been chiefly owing to the careless and incorrect identification of the Columbites with the clergy afterwards known by the name of Culdees.

Columba was honoured by his countrymen, the Scots of Britain and Ireland, as much as by his Pictish converts, and in his character of chief ecclesiastical ruler or primate he gave formal benediction and inauguration to Aidan, the successor of Conal, as king of the Scots. He accompanied that prince to Ireland in 590, and took a leading part in a council held at Drumceat in Ulster, where a controversy was settled which had existed between the king of Ireland and the sovereign of the British Scots. The last years of Columba's life appear to lave been spent at Iona. There he was already revered as a saint, and whatever credit may be given to some portions of the narratives of his biographers, there can be no doubt as to the wonderful influence which he exercised, as to the holiness of his life, and as to the love which he uniformly manifested to God and to his neighbour.

In the summer of 597 he knew that his end was approaching. On Saturday the 8th of June he was able, with the help of one of his monks, to ascend a little hill above the monastery and to give it his farewell biessing. Returning to his cell he continued a labour in which he had been engaged, the transcription of the Psalter, Having finished the verse of the 34th Psalm where jt is written, "They who seek the Lord shall want no manner of thing that is good," he said, "Here I must stop :—what follows let Baithen write;" indicating, as was believed, his wish that Baithen should succeed him as abbot, He was present at evening in the church, and when the midnight bell sounded for the nocturnal office early on Sunday morning he again went thither unsupported, but sank down before the altar and passed away as in a gentle sleep.

The original materials for a life of St Columba are unusually full. The earliest biography was written by one of his successors, Cuminius, who became abbot of Iona in 657. Much more important is the enlargement of

that work by Adamnan, who became abbot of Iona in O79. These narratives are supplemented by the brief but most valuable notices given by the Venerable Bede. The first modern writers who discussed the life and actions of Columba, with any approach to critical accuracy, were two learned clergymen of the Roman communion,—Thomas Innes, the Scottish antiquary, and Dr John Lanigan, the ecclesiastical historian of Ireland. In 1857 Dr Reeves, now dean of Armagh, published his edition of Adamnan's Lnfe, enriched with notes and dissertations which throw light on all the events of the saint's personal history and on everything connected with the state of Celtic Britain at. the time. Later still we have an account of Columba by Count Montalembert, who, in his third volume of the Monks of the West, gives us, to use Gibbon's well-known words about Pope's Homer, "a portrait endowed with every merit excepting that of likeness to the original." (a. @.)

COLUMBANUS (c. 550-615), an Irish monk, was born in Leinster about the year 550, and was educated in the monastery of Bangor. He left the monastery in 590, together with twelve youths whom he was training, and established himself in the Vosges, among the ruins of an ancient town called Anagratis. Crowds quickly flocked round them, and the monasteries of Luxeuil and Fontenay were erected, But the enemies of Columbanus accused him before a synod of French bishops (602) for keeping Easter according to the old British and now unorthodox way, while a more powerful conspiracy was organized against him at the court, for boldly and haughtily rebuk-

ing for their crimes both the king of Burgundy, Thierry I, and the queen-mother Brunchaut. In consequence of this he was banished, but he proudly refused to stir. He was at length removed from his monastery by force, and, with St Gall and others of the monks, he withdrew into Switzerland, where he preached with no great success to the Suevi and Alemanni. Being again compelled to flee, he retired to Italy, and founded the monastery of Bobbio, in which he remained till his death. His writings, which include some Latin poems, prove him a man of learning, and he appears to have been acquainted not only with the Latin classics, but also with Greek, and even

Hebrew. His works were published at Louvain in 1667. His Regula Conobitalis cum Penitentials is to be found in the Codex Regularum (Paris, 1638). The order of the Columbans merged in that of the Benedictines in the beginning of the 8th century. COLUMBIA, the capital of South Carolina, United States of North America, is a city of nearly 10,000 inhabitants. It lies on the east bank of the Congaree River, just below its junction with the Broad and Saluda, and is 124 miles N.N.W. of Charleston, the principal seaport of the State. It is noted for its salubrity and the natural beauty of its site and surroundings. As the capital and political centre of the State, it has held a position second only in importance to Charleston, and has been the home of many distinguished men. Several public institu- tions enhance its dignity. Among these are the South Carolina College, founded in 1804, with which the late Professor Francis Lieber was long officially connected, the asylum for the insane, a theological school, the State- house, court-house, &c. It is the terminus of three railroads which connect it with Charleston and the sea-coast, and with points west and north, and is algo the head of steamboat navigation on the River Congaree. A fertile agricultural region surrounds it, and it enjoys a fair degree of com- mercial prosperity. Near the close of the civil war (1865), the Union army of General Sherman entered the city, being feebly opposed by the Confederates. During the Federal occupation, fires were set—whether by invaders or defenders has never been determined beyond doubt—by which many puildiugs and a large amount of property were destroyed. COLUMBIA, Districr of, a territory of the United States of America, originally erected under a law of Cougress of July 1790, for the establishment of a permanent seat of government. This law authorized the acquisition by the United States of a territory not exceeding ten miles square, at the confluence of the Potomac and its eastern branch. A part of the territory thus designated was ceded to the United States by Virginia, and included the city of Alexandria, and a part by Maryland including the city of Georgetown. Outside of these cities the territory was occupied by planters and farmers, as it had been from the latter part of the 17th century. By a law of Congress of July 1846, that portion of the district which had been ceded to the United States by Virginia was ceded back to that State. The present area of the district is 64 square miles. Under the law of 1790, three commissioners were appointed to receive the cession of the district, and to lay out the city of Washington and erect the public buildings for the reception of the Federal Government. The

corner- stone of the Capitol was laid by Washington, September 18, 1793. On the first Monday of December 1800, the removal of the Government from Philadelphia was effected. The surface of the district is diversified by hill and dale, is well wooded with oak, maple, chestnut, hickory, and other trees, is productive when well cultivated, and affords at several points extended and beautiful views of the valley of the Potomac. 'The scenery of Rock Creek, an affluent of the Potomac, is also celebrated for its romantic beauty, The climate is temperate and healthy. In the autumn

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bilious fevers are sometimes prevalent on the low grounds, The staple product before 1800 was tobacco, the culture of which has of late years been abandoned for grain, Indian corn, hay, fruit, and vegetables, all of which are produced in great abundance, and sold at remunerative prices in the markets of Washington and Georgetown. herring fisheries of the Potomac yield a large revenue.

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The population of the district at each census since its

organization is thus stated :—'

White. Coloured. Total.

2,472 5,126 7,278 9,109 9,819 13,746 14,316 43,404

8,144 15,471 23,336 30,261 33,745 51,687 75,080

131,700

5,672 10,345 16,058

21,152 23,926 37,941 60,763 88,278

The native-born population in 1870 was 115,446 ; the foreign-born, 16,254, The number of dwellings was 23,308; persons to a dwelling, 5°65 ; valuation of real and personal estate, $126,873,618; value of farms,

$3,800,000 ; of farm productions, $319,000. The number of mauufacturing establishments was 952; steam-engines, 54 ; water-wheels, 15; hands employed, 4685; capital, $5,021,925 ; products, $9,292,173,—cousisting mainly of flour, buildiug materials, furniture, clothing, and iron. The debt of the district, mainly 'neurred since 1872 in the construction of sewers and the paving of streets in Washington and Georgetown, is about

$25,000,000.

The district is under the control of Congress, and its municipal affairs are regulated by three commissioners appointed by the president and Senate, by virtue of a law of 1874. The courts are constituted by Act of Congress, and the judges appointed by the president and Senate. By the law of 1874, the municipalities of Georgetown and Washington were abolished, and the elective franchise throughout the district suppressed. It has no representa- tive in Congress,

The Chesapeake and Ohio Canal connects Georgetown, the head of tide-water on the Potomac, with Cumberland, the centre of the bituminous coal region of the State of Mary- land. It is 180 miles in Jength, and transports 1,000,000 tous of coal per annum. The district is intersected by the Washington and Metropolitan branches of the Baltimore and Ohio Railway, and by the Baltimore and Potomac Railway, and is connected with the south by rail to Alexandria, the northern terminus of the Virginia railway system. There are well-managed lines of steamboats running to Norfolk, Baltimore, and New York, the last freighted mainly with flour from the district mills. The coal tonnage of the Potomac exceeds 600,000 tons annually from the port of Georgetown, which is the port of entry for the district of Columbia.

Since 1793 the United States Government has expended $60,000,000 in the erection of public buildings and 1m- provement of public grounds in the district. For each of the years 1873, 1874, and 1875, Congress appropriated over $2,000,000 as its share of the expenses of the district government. The free schools of the district are maintained at an annual cost of $400,000. The Columbian university, established by the Baptists in 1821, is a well-endowed and flourishing institution. The Howard university, established for the education of the freedmen, is also well patronizec. There are 120 church edifices in the district, of which the Baptists have 25, the

Methodists 42, the Roman Catholics 14, the Episcopalians 20, the Presbyterians 14, and the Lutherans 8. 'The United States navy yard in Washington

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is one of the most complete in its appointments of all the

dock-yards in the country.

COLUMBIA, Bririsn, the first of the Canadian pro- vinces organized on the Pacific, was admitted into the Dominion in 1871. Including Vancouver's Island, it em- braces an area of 233,000 square miles, of bold sea-coast, lofty mountain ranges, and rugged picturesque river courses, as well as rich fertile valleys. Unlike the great river sys- tem to the east of the Rocky Mountains, tho rivers of British Columbia make their way by abrupt rapids and falls, in their comparatively brief courses from the Rocky Moun-

tains to the sca,

British Columbia owes its rise to the status of a pro- vince of Canada to the sudden influx of gold-diggers in 1856 and following years. The bed of the Frascr River had been discovercd to be a rich auriferous deposit ; and all who preferred the lottery-like chances of the diggings to the more laborious but certain fruits of patient industry hastened to this new Eldorado. In a

semi-oflicial publication of 1864, it is stated that, in 1860,

"Antler, the most important creek, yielded at one time, at

the lowest estimate, gold to the value of $10,000 per day.

On one claim $1,000 worth was taken out of the sluice-

boxes as the result of a single day's work." But it wag not till 1862 that the unsystematic process of mere surface diggings and washings of nomad adventurers was super: seded by sinking shafts and carrying on a regulated system of mining under the direstion of experienced engineers, Companies were formed; large capital was invested : and an official report of 1870

states the yield of gold for that year from the mines of Cariboo, Silionet, Lilloet, Columbia, Yale, and Lytton at $1,333,745, in addition to the large quantities of the precious metal carried out of the province by private adventurers. It appears from authentic returns that from 1862 to 187] gold to the value of $16,650,036 was shipped from British Columbia by the banks, and so registered and put on record; while the estimated value of that which was carried out of the country by miners themselves during the same period is probably not over-estimated at $6,000,000. Nor is this a jaere temporary supply derived from surface. washings, Extensive tracts of gold-bearing quartz rocks constitute an important element in the permanent mineral resources of the country. According to the Zables of the Trade and Vavigation of the Donvinion of Canada, printed at Ottawa in 1875, the export of gold in dust and bars from the province of British Columbia during the previous year is valued at $1,072,429.

As explorations and Surveys are carried further into the interior the aurifcrous regions prove to be widely extended, aud rich in their promised yield. Gold has been found over an area of not less than 200 miles, and is readily obtained by the simple processes of the adventurous gold- Washer, in the beds of the Fraser, the Thompson, the Peace, and Ominica Rivers, or the creeks and tributaries llowing into them. Stickeen River, towards the Alaska frontier, the most recent gold-ficld, has bcen successfully worked since 1875, and continues to yield an abundant return. But though the rumour of river-beds of golden sand is the readiest of a1] stimulants to emigration, a rush of Gold-diggers is not the most satisfactory addition to the population of a young colony ; nor is wealth thus easily acjuired generally turned to good account. The immigrant Population included bands of lawless adventurers, Texans,

into a province of the Dominion all the more welcome to the industrious settlers who were there seeking a permanent home.

Under the new orderly rule the crowd of gold-seekers wag speedily followed by emigrants in pursuit of more settled industry. Agricultural labourers soon found that the golden harvest could be secured to themselves by providing for the miners the fruits of the soil. Tt is probably no exaggeration to estimate the worth of the gold carried out of the

province from 1856 to 1875 as not less than $36,000,000. Much of this might be considered as pro- ductive of no direct benefit to the country, Indirectly, however, it has largely contributed to the opening up of the new province, and making its many attractions known, It led to the construction of roads, developed the mining districts, encouraged agricultural and general trade, and stimulated the growth of permanent settlements. In 1841 the " Vincennes" ship of the Amcrican exploring expedition entered the Straits of De Fuca; and Dr Pickering has preserved a vivid picture of the forbidding aspect of rudest savage life which then met his eye. Contrasting the then strange uncultivated scenes of that wild coast with the familiar centres of American civilization on the opposite shores of the same continent, he says, " Searcely two centuries ago our New England shores presented only scenes like that before me: and what is to be the lapse of the third?" Within less than twenty years thereafter the town of Victoria was rising on Vancouver's Island, and that of New Westminster on the neighbouring mainland. The printing press was in full operation. The British Colonist, the New Westminster Times, and other newspapers were in circulation, where so recently the Indian trail and wigwam were the sole evidence of the presence of man. The produce and manufactures of the province exported during the year ending June 1874 are valued in The Trade and Navigation Returns for the year at $2,120,624 ; the customs receipts are being chiefly expended on public works, and the varied resources of the country have been rapidly developed and turned to the best account.

Minerals. —The mincral products of British Columbia still occupy the foremost place in its exports. They are valued in 1874 ut $1,351,145. But it is important for the future pees of the young province on the Pacifie that its minerals inc ude coal. Mr Horetsky, in his Canada on the Pacific, describes the shipping of coal at Vancouver Island for the San Francisco market, whcre it sells at $12 per ton; and Mr Grant, in his Occan to Occan, reports his visit to Nanaimo, with a population of seven or eight hundred, all depending on the neighbouring Douglas mine. 'The man- ager," he says, "informed us that they would probably ship 50,000 tons this season, and that next year they would be in a position to ship 100,000 or more. 'he coal measures which the few seams now worked represent extend over the whole eastern coast of Vancouver Island." Fine anthracite coal is also found near

the coast, and in vast quantities, of superior quality, on Queen Charlotte's Island ; and about 160 miles in the interior, on the River Nicholas, 50,671 tons of coal were exported in 1874 to the United States and Mexico, the value of which was $278,213.

When the census was taken in 1870, the population of the little capital of Victoria amounted only to 38,270, including 211 Chinese, but exclusive of Indians. Already it exceeds 5,000 souls, of very diverse character and nationality, but with abundant encrgy, and an assurance of progress. The Government of the Dominion is extending its aid to the young province with a liberal hand. In the fiscal year 1872-8, the total receipts to the Dominion from all sources in British Columbia amounted to $417,409; while the expenditure,—apart from railway surveys, — was $639,037. The same spirit still prevails. Buildings are in progress in Victoria for a post-office, savings bank, Government and Indian department ; plans have also been prepared for a custom house and revenue office; and the efficient organization of courts of law and a system of police is being followed up by the erection of a penitentiary.

Htories, oh eenition is now being cuergetically directed to the treasures of the ocean, the value of which has long been familiar to the native tribes. Mr J. W. Powell, Indian commissioner, in a report to the minister of the interior, dated at Victoria, February 4, 1875, after a general survey of the condition of the Indians of the

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his conciliatory mediation. The construction of a railway through the province is attended with more than the usual diffieulties. In contrast to the vast level ranges of prairie to the east of the Rocky Mountains, its surface is extremely irregular; and the seleetion of a railway route is controlled by the necessity of fiuding both a pass through the Rocky Mountains and a suitable aeeess to the seaboard. Yellow Head Pass affords what appears to be the most advantage. ous route, at an elevation of about 3700 feet above the level of the sea. Immediately to the west of this an irregular plateau extends to within less than 100 miles of the coast, where the Cascade Range is

reached. From this the descent to the coast is abrupt ; the rivers have furrowed deep channels, or direeted their eourses into the natural eafions of this rugged coast line, and much diffi- eulty has been experieneed in selecting an available route. From the mouth of the Columbia River, for 700 miles northward, the eoast is indented with numerous inlets whieh eut deep into the land, and are comparable to the rugged 'fiords of Norway. Bute

province of British Columbia, and the results of efforts to eneour- age their attention to agriculture, thus proceeds :—

'Fish is the great Staple product of all the coast Indians, and owing to the numerous lakes and rivers with which British Columbia is most bountifully supplied, affords the ehief means of subsistence to almost all of the interior tribes. All kinds of fish are found in great abundanee in the Northern Paeifie waters; but the salmon, of which there are some six varieties, is the most eon- stant and appreciated artiele of diet. The fish is now forming one of the most important exports of this province. The dog-fish is caught in large quantities for the oil contained in the liver, which not only forms a eommon article of barter between Indians them- selves, but is sold to and exported as one of the ehief products of the eountry by the Whites.

"The exports of fish, fish-oil, and furs (the two latter being almost solely obtained by Indians) for the fiscal year ended June

1874 were :— July 20, 1870 to

1874. June $0, 1871. Inlet, whieh was first selected as the terminus of.a proposed route

Fish $69,665 00 through the Homathco Valley, is of this character. It isan ex- Fish "1 aeighillttare eee 44 453 00 27.638 00 posed sound, walled by lofty eliffs, and with its waters of great Pur Ihe n voateeBB Gon BuO coe nB DU eHG Goa: 307,625 00 900,407 00 depth, so that no suitable roadstead or anchorage is available. The UES' cocus aad onanao aun eonoe aacHAiano= , pe latest surveys (1876) indicate that the line must pass by the Fraser Oates ance teemsne us onpare $421,743 00 $228,045 00 » | River to New Westminster, where suitable natural harbourage ean

be found. The chief objection to this route is its vieinity to the frontier, so that it very partially opens up the interior of the coun- try. But Dean Inlet, which has been advocated as a preferable terminus, lies too far to the north. The project of an interoceanic railway through British Ameriean territory is, under any eircum- stances, a bold one; and the way in whieh it is being pressed onward to praetieal realization abundantly illustrates the enter- prize of this young country, which only requires the increased population which such facilities would supply to develop its imex- haustible resources.

Altogether, evidence enough has already been diselosed to show the great future which is in store for the Canadian provinces on the Paeific. The next decennial census will embraee British Columbia, and furnish more definite statistics as to its industrial progress and natural resources. A steady influx of emigration of the best quality is its first great need. The present population, apart from the native Indian and half-breed, is of a very miseellaneous charaeter, including British, Canadian, Ameriean, Freneh, German, and Chinese settlers, with as yet a large preponderance of the male sex.

In the Tables of the Trade and Navigation of the Dominion for 1874, the provinee of British Columbia not only exceeds in the value of its exports both the provinces of Prince Edward Island and Manitoba, but it exhibits the exeeptionably favourable con- trast of an excess in value of exports over imports. The total value of all goods imported for the year 1874 amounted to $2,048,336, while the value of its exports during the same period was $2,120,624.

Under the principles of confederation, the full rights of self- government and represcntative institutions both in its own local parliament and in that of the Dominion have been accorded to this young province. It has its own lieutenant-governor and Legislative Assembly, and is represented at Ottawa by three senators and six members of the House of Commons in the Dominion Parliament. (D. We

COLUMBUS, a city of the United States of America, capital of the State of Ohio, in Franklin county, is situated on the Scioto, a tributary of the Ohio, about 100 miles north- cast of Cincinnati. It is well laid out on a level site m

the midst of an extensive plain, and possesses very broad and handsome streets pleasantly shaded with elm-trees. High Street is its principal thoroughfare, and Capitol Square one of the most spacious of its open areas ; while Broad Street, 120 feet wide, is laid out for a stretch of two miles, As the capital of the State it contains the usual public buildings, which are of a higher character than are to be found other cities of the Union. The Capitol is an imposing edifice built of grey limestone, with a rotunda 150 feet high. It covers an area of 55,936 square feet, and its internal accommodation is most complete. There are also in and around the city the penitentiary, extending over more than 10 acres of ground, and accommodating upwards of 1000 prisoners ; the new lunatic asylum, capable of containing 600 patients; the blind asylum, the idiot asylum, the deaf and dumb asylum, the United States arsenal, various hos: pitals and charitable institutions, a city hall, a county court house, a county infirmary, the Starling medical college, the Lutheran university, an agricultural and mechanical college,

All this, it has to be borne in remembranee, is the produce of native Indian enterprize, under the stimulus supplied by the White traders. The eo-operation indeed extends to other industries besides those of the hunter and the fisher. The fur-bearing animals of the provinee inelude the bear, beaver, land and sea otters, fur and hair seals, martens, minks, racoons, fishers, wolve- rines, wolves, foxes, lynx, ermines, skunks, and pumas. Besides the produee resulting from the hunting and trapping of those fur- bearing animals, and the fruits of native industry in the fisheries of the rivers and the coasts, the Indian commissioner also notes the eolleetion of eranberries as another produetive resource of native industry. The export of eranberries from British Columbia varies according to favourable or less produetive seasons. In the year 1874, whieh was regarded as a poor season, eranberries, gathered by the Indians, were exported to the value of $2011.

With such results from the unregulated labours of rude Indian tribes, it is manifest how great must be the resourees of the eountry, not only in the furs whieh have long been an object of trade, but in the unheeded fisheries of the oeean and rivers. The whale still frequents the coast, and is pursued with suceess by the Clallums, Macaws, and other eoast tribes. Now regular companies are being formed for its capture. In 1871 the 'British Columbia Whaling Company" had produced 20,000 gallons of oil ; and the results

eontinue on a progressive seale. The dog-fish also, which has long been an objeet of special favour among the Indians, is now taken in large quantities by the Whites for its oil. In 1870 the produce of this tishery alone yielded 50,000 gallons of oil ; and the price whieh it commanded in California has sinee proved a sufficient stimulus to inereased zeal in proseeuting the fisheries. Cod, halibut, haddock, salmon, sturgeon, smelt, and sardines, all abound along the eoasts, or in the straits and estuaries, and with the growing population and wealth both in the provinces and in the neighbouring States of the Pacific, the value of this braneh of industry must rapidly inerease. The riehes of the sea must, indeed, in the end, far outrival all the produce of the gold mines, and may yet rival the fisheries of Nova Scotia and Newfoundland. Even now, with a sparse population, and trade in its infancy, the exports of the fisheries for 1874 are valued at $114,118.

The provinee of British Columbia has the same advantage over the neighbouring States of the Paeific, owing to climate and favourable geographieal position, which the eastern provinces enjoy in eomparison with the States on the Atlantic. This is specially manifest in the value of its timber ; and this must go on inereasing with the wealth of the surrounding States. Already the value of the produce of the forest has amounted in the year 1874 to $260,116; and in its various forms of planks, spars, laths, and shingles, it is being exported not only to the neighbouring States and to South America, but to Australia and China, as well as to Great Britain, The white and yellow pine and the valuable Douglas pine abound. Cedar and hemlock attain toa great size ; fine oak and maple are also abundant; and the rivers and the natural harbours "afford every facility for a lumber trade for whieh the eountries on both sides of the Pacific will supply as ready a market as the Hastern States and the ports of Europe afford to the lumberers of the pro- vinees of Eastern Canada.

Already railway enterprize is abundantly stimulated by the de- velopment of the resourees of this young province ; and now the preat question of the future is the route of the projected Paeific Railway, and its terminus on the Pacific eoast. The disputes be- tween the Provineial Government and that of the Dominion relative to its immediate eonstruetion have been the cause of much loeal irritation. In the summer of 1876, the Earl of Dufferin, as

Governor-General of the Dominion, made a tour through British Columbia, and greatly contributed to a more reasonable feeling by

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COLUMBUS

The city pos- sesses a fine park of about 40 acres, named in honour of its donor, Dr Lincoln Goodale, and another of equal extent called the City Park. The grounds of the Franklin County Agricultural Society occupy 83 acres, and the gardens of The manufac- tures of the city are rather miscellaneous, and none of them

the odd-fellows' hall, and the opera-house.

the Columbus Horticultural Society 10.

have as yet developed to auy great proportions ; flour-mills, engineering works, and factories foragricultural implements,

brushes, carriages, harness, files, and furniture are among Railways radiate from Columbus in all directions ; and it has water-communication by means The first settlement of

the chief establishments.

vf a branch of the Ohio Canal. Columbus dates from 1812; its borough charter was bestowed in 1816, when it also became the seat of the State Government ; it was made the capital of the county in 1824, and ten years after was raised to the rank of a city, The population in 1830 was 2437; in 1850, 17,882; and in 1870, 31,274.

COLUMBUS, a city of the United States, capital of Muscogee county, in Georgia, is situated on the east bank of the Chattahochee, opposite the town of Girard, 84 miles south- west of Macon. The river, which here separates the States of Georgia and Alabama, is navigable from Macon to the Gulf of Mexico during the greater part of the year, and affords ready communication with the neighbouring cotton- growing districts. A change

in the level of the river at this place furnishes a strong head of water, which has been turned to practical use by the construction of a dam and other hydraulic contrivances. The town, which occu- pies a pretty extensive area, is regularly laid out, and its streets are of a good breadth. It contains a court- house, a temperance hall, and several churches. Its chief industry is connected with the cotton trade, but there are also some flour-mills and other works. The town dates from 1828, when it was laid out on the Coweta Reserve. Population in 1850, 5042, and in 1870, 7401, of whom 3204 were coloured.

COLUMBUS, CuristopuEr (>. 1436-1506), was the eldest son of Dominico Colombo and Suzanna Fontanarossa, and was born at Genoa in 1435 or 1436, the exact date being uncertain. His father was a wool-comber, of some small means, who was yet living two years after the dis- covery of the West Indies, and who removed his business from Genoa to Savona in 1469, His eldest boy was sent to the university of Pavia, where he devoted himself to the niathematical and natural sciences, and where he probably received instruction in nautical astronomy from Antonio da Terzago and Stefano di Faenza. On his removal from the university it appears that he worked for some months at his father's trade; but on reaching his fifteenth year he made his choice of life, and became a sailor.

Of his apprenticeship, and the first years of his career, no records exist. The whole of his earlier life, indeed, is dubious and conjectural, founded as it is on the half dozen dark and evasive chapters devoted by Fernando, his son and biographer, to the first half century of his father's times, — It Seems certain, however, that these unknown years were stormy, laborious, and eventful; " wherever ship has sailed," he writes, "there have I journeyed." He is known, among other places, to have visited England, "Ultima Thule " (Iceland), the Guinea Coast, and the Greek Isles ; and he appears to have been some time in the service of René of Provence, for whom

© 18 recorded to have intercepted and seized a Venetian galley with great bravery and audacity. According to 18 Son, too, he sailed with Colombo el Mozo, a bold sea Captain and privateer ; anda sea fight under this commander was the means of bringing him ashore in Portugal. Mean- while, however, he was preparing himself for greater achieve-

ments by reading and meditating on the works of Ptolemy and Marinus, of Nearchus and Pliny, the Cosmographia of Cardinal Aliaco, the travels of Marco Polo and Mande- ville. He mastered all the sciences essential to his calling, learned to draw charts and coustruct spheres, and thus fitted himself to become a consummate practical seaman and navigator.

In 1470 he arrived at Lisbon, after being wrecked in a sea fight that began off Cape St Vincent, and escaping to land on a plank. In Portugal he married Felipa Munnis Perestrello, daughter of a captain in the service of Prince Henry, called the Navigator, one of the early colonists and the first governor of Porto Santo, an island off Madeira, Columbus visited the island, and employed his time in making maps and charts for a livelihood, while he pored over the logs and papers of his deceased father-in-law, and talked with old seamen of their voyages, and of the mystery of the western seas. About this time, too, he Idea of a seems to have arrived at the conclusion that much of the ree be world remained undiscovered, and step by step to have Tete, conceived that design of reaching Asia by sailing west which was to result in the discovery of America. In 1474 we find him expounding his views to Paolo Toscanelli, the Florentine physician and cosmographer, and receiving the heartiest encouragement.

These views he supported with three different argumeiits, derived from natural reasons, fromthe theories of geographers, and from the reports and traditions of mariners. " He be- lieved the world to be a sphere," says Helps; "he under- estimated its size ; he over-estimated the size of the Asiatic continent. The farther that continent extended to the east, the nearer it came round towards Spain." And he had but to turn from the marvellous propositions of Mandeville and Aliaco to become the recipient of confidences more marvellous still. The air was full of rumours, and the weird imaginings of many generations of medizval navi- gators had taken shape and substance, and appeared bodily to men's eyes. Martin Vicente, a Portuguese pilot, had found, 400 leagues to the westward of Cape St Vincent, and after a westerly gale of many days' duration, a piece of strange wood, wrought, but not with iron ; Pedro Correa, his own brother-in-law, had seen another such waif at Porto Santo, with great canes capable

of holding four quarts of wine between joint and joint, and had heard of two men being washed up at Flores, "very broad-faced, and differing in aspect from Christians." West of the Azores now and then there hove in sight the mysterious islands of St Brandam ; and 200 leagues west of the Canaries lay somewhere the lost Island of the Seven Cities, that two valiant Genoese had vainly endeavoured to discover. In his northern journey, too, some vague and formless tradi. tions may have reached his ear, of the voyages of Biorn and Leif, and of the pleasant coasts of Helleland and Vinland that lay towards the setting sun. All were hints and rumours to bid the bold mariner sail westward, and this he at length determined to do,

*The concurrence of some state or Sovereign, however, Quest of a was necessary for the success of this design. The Senate Patron. of Genoa had the honour to receive the first offer, and the responsibility of refusing it, Rejected by his native city, the projector turned next to John IL. of Portugal. This king had already an open field for discovery and enterprise along the African coast; but he listened to the Genoese, and referred*him to a Committee of Council for Geographical Affairs. The council's report was altogether adverse ; but the king, who was yet inclined to favour the theory of Columbus, assented to the suggestion of the bishop of Ceuta that the plan should be carried out in secret and without Columbus's knowledge by means of a caravel or light frigate. The caravel was dispatched, but*

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it returned after a brief absence, the sailors having lost heart, and having refused to venture farther. Upon discovering this dishonourable transaction Columbus felt so outraged and indignant that he sent off his brother Bartholomew to England with letters for Henry VIL., to whom he had communicated his ideas. He himself left Lisbon for Spain (1484), taking with him his son Diego, the only issue of his marriage with Felipa Munnis, who was by this time dcad. He departed secretly, —according to some writers, to give the slip to King John, according to others, to escape his creditors. Three years after (20th March 1488) a letter was sent by the king to "Christopher Colon, our especial friend," inviting him to return, and assuring him against arrest and proceedings of any kind ; but it was then too late.

Columbus next betook himself to the south of Spain, and seems to have proposed his plan first to the duke of Medina Sidonia (who was at first attracted by it, but finally threw it up as visionary and impracticable), and next to the duke of Medina Celi. The latter gave him great cncouragement, entertained him for two years, and even determined to furnish him with the three or four caravals. Finally, however, being deterred by the con- sideration that the enterprize was too vast for a subject, he turned his guest from the determination he had come to of making instant application at the court of France, by writing on his behalf to queen Isabella ; and Columbus repaired to the court at Cordova at her bidding.

Tt was an ill moment for the navigator's fortune. Castile and Leon were in the thick of that struggle which resulted in the final defeat of the Moors; and neither Ferdinand nor Isabella had time to listen. The adventurer was in- deed kindly received; he was handed over to the care of Alonso de Quintanilla, whom he speedily converted into an enthusiastic supporter of histheory. Hc made many other friends, and here met with Beatriz fnriquez, the mother of his second son Fernando.

From Cordova Columbus followed the court to Salamanca, where he was introduced to the notice of the grand cardinal, Pedro Gonzalez de Mendoza, 'the third king of Spain." The cardinal, while approving the project, thought that it savoured strongly of heterodoxy ; but an interview with the projector brought him over, and through his influcnce Columbus at last got audience of the king. The matter was finally referred, however, to Fernando de Tala- vera, who in 1487 summoned a junta of astronomers and cosmographers to confer with Columbus, and examine his design and the arguments by which he supported it. The Dominicans of San Esteban in Salamanca entertained Columbus during the conference. The jurors, who were most of them ecclesiastics, were by no means unprejudiced, nor were they disposed to abandon their pretensions to knowledge without a struggle. Columbus argued his point, but was overwhelmed with Biblical texts, with quotations from the great divines, with theological objections; and ina short time the junta was adjourned. In 1489 Columbus, who had been following the court from place to place (billeted in towns as an officer of the king's, and gratified from time to time with sums of money toward his expenses), was present at the siege of Malaga. In 1490 the junta decided that his project

was vain and impracticable, and that it did not become their highnesses to have anything to do with it; and this was confirmed, with some reservation, by their highnesses themselves, at Scville.

Columbus was now in despair. He at once betook him- self to Huelva, where his brother-in-law resided, with the intention of taking ship for France. He halted, however, at Palos, a little maritime town in Andalusia. At the inonastery of La Rabida he knocked and asked for bread and water for his boy Diego, and presently got into con-

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versation with Juan Perez de Marchena, the guardian, who invited him to take up his quarters in the monastery, and introduced him to Garci Fernandez, a physician and an ardent student of geography. Columbus propound his theory and explain bis plan. Juan Perez had been the queen's confessor; he wrote to her, and was summoned to her presence; and money was sent to Columbus, to bring him once more to court. rcached Granada in time to witness the surrender of the city ; and negotiations were resumed. Columbus believed im his mission, and stood out for high terms; he asked the rank of Admiral at once, the vice-royalty of all he should dis- cover, and a tenth of all the gain, by conquest or by trade. These conditions were rejected, and the negotiations were again interrupted. An interview with Mendoza appears to have followed; but nothing came of it, and in January

To thesc good men did

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1492 Columbus actnally set out for France. At length,

however, on the entreaty of Luis de Santangel, receiver of the ecclesiastical revenues of the crown of Aragon, Isabella was induced to determine on the expedition.

A messenger was sent after Columbus, and overtook him at the Bridge of Pines, about two leagues from Granada. He returned to the camp at Santa Fé; and on 17th April 1492, the

agreement between him and their Catholic majesties was

signed and sealed.

His aims were nothing less than the discovery of the marvellous province of Cipango and the conversion to Christianity of the Grand Khan, to whom he received a royal letter of introduction. The town of Palos was ordered to find him two ships, and these were soon placed at his disposal. But no crews could be got together, in spite of the indemnity offered to all criminals and broken men who would serve on the expedition; and had not Juan Perez succeeded in interesting Martin Alonso Pinzon and Vicente Yatiez Pinzon in the cause, Columbus's

departure had been long delayed. At last, however, men, First The expedition consisted of Voyase.

ships, and stores were ready. the " Santa Maria," a decked ship, with a crew of 50 men, commanded by the Admiral in person ; and of two caravels, the " Pinta," with 30 men, under Martin Pinzon, and the " Nifia," with 24 men, under his brother Vicente Yariez, afterwards (1499) the first to cross the linc in the American Atlantic. The adventurers numbered 120 souls; and on Friday, 3d August 1492, at eight in the morning, the little fleet weighed anchor, and stood out for the Canary Islands.

An abstract of the Admiral's diary made by the Bishop Las Casas is yet extant ; and from it many particulars may be gleaned concerning this first voyage. 'Threc days after the ships had set sail the "Pinta" lost her rudder; the Admiral was in some alarm, but comforted himself with the reflection that Martin Pinzon was energetic and ready-witted; they had, however, to put in (August 9) at Teneriffe, to refit the caravel. On 6th September they weighed anchor once more with all haste, Columbus having been informed that three Portuguese caravels were on the look-out for him. On 13th September the variations of the magnetic needle were for the first time observed; on the 15th a wonderful meteor fell into the sea at four or five leagues distance. On the 16th they arrived at those vast plains of seawced called the Sargasso Sea; and thenceforward, writes the Admiral, they had most temperate breezes, the sweetness of the mornings being most delightful, the weather like an Andalusian April, and only the song of the

nightingale wanting. On the 17th the men began to murmur; they were frightened by the strange phenomena of the variations of the compass, but the explanation Columbus gave restored their tranquil- lity. On the 18th they saw many birds, and a great ridge of low-lying cloud; and they expected to see land.

On the 20th they saw two pelicans, and were sure the land

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Ce ial)

must be near. In this, however, they were disappointed, and the men began to be afraid and discontented; and thenceforth Columbus, who was keeping all the while a double reckoning, one for the crew and one for himself, had great difficulty in restraining the men from the ex- cesses which they meditated. On the 25th Alonso Pinzon raised the cry of land, but it proved a false alarm; as did the rumour to the same effect of the 7th October, when the " Nita" hoisted a flag and fired a gun, On the 11th the "Pinta" fished up a cane, a log of wood, a stick wrought with iron, and a board, and the " Nijia" sighted a stake covered with dog-roses ; "'and with these signs all of them breathed, and were glad." At ten o'clock on that

Li night Columbus perceived and pointed out a light ahead ; am and at two in the morning of Friday, the 12th October,

1492, Rodrigo de Triana, a sailor aboard the " Nifia, " an- nounced the appearance of what proved to be the New World, The land sighted was an island, called by the In- dians Guanahani, and named by Columbus San Salvador.1 The same morning Columbus landed, richly clad, and bearing the royal banner of Spain. He was accompanied by the brothers Pinzon, bearing banners of the Green Cross, a device of his own, and by great part of the crew. When they all had "given thanks to God, kneeling upon the shore, and kissed the ground with tears of joy, for the great mercy received," the Admiral named the island, and took solemn possession of it for their Catholic majesties of Castile and Leon. At the same time such of the crews as had shown themselves doubtful and mutinous sought his pardon weeping, and prostrated themselves at his feet. Into the detail of this

voyage, of highest interest as it is, it is impossible to go farther. It will be enough to say

eries. that it resulted in the discovery of the islands of Santa

Maria del Concepcion, Exuma, Isabella, Juanna or Cuba, Bohio, the Cuban Archipelago (named by its finder the Jardin del Rey), the island of Santa Catalina, and that of Hispaniola, now called Haiti, or San Domingo. Off the last of these the "Santa Maria" went aground, owing to the carelessness of the steersman. No lives were lost, but the ship had to be unloaded and abandoned; and Columbus, who was anxious to return to Europe with the news of his achievement, resolved to plant a colony on the island, to build a fort out of the material of the stranded hulk, and to leave the crew. The fort was called La Navidad ; 43 Europeans were placed in charge ; and on 16th January 1493, Columbus, who had lost sight of Martin Pinzon, set sail alone in the " Niiia" for the east ; and four days afterwards the "Pinta" joined her sister-ship off Monte Christo. A storm, however, separated the vessels, and a long battle with the trade winds caused great delay; and it was not until the 18th Feb- ruary that Columbus reached the Island of Santa Maria in the Azores. Here he was threatened with capture by the Portuguese governor, who could not for some time be brought to recognize his commission. On 24th February, however, he was allowed to proceed ; and on 4th March the "Nina" dropped anchor off Lisbon. The king of Portugal received the Admiral with the to highest honours ; and on 13th March the " Nifia" put out from the Tagus, and two days afterwards, Friday, 15th March, dropped anchor off Palos, The court was at Barcelona; and thither, after despatching a letter announcing his arrival, Columbus proceeded in person. He entered the city ina sort of triumphal pro-

' Helps refers to the island as "one of the Bahamas," It has been vatlously identified —with Turk's Island, by Navarrete (1825); with Cat Island, by Irving (1828) and Humboldt (1836) ; with Mayaguarra, by Varnhagen (1864) ; and finally, with greatest shew of probability, with Watling Island, by Munoz (1798), supported by Becher (1856), Peschel (1857), and Major (1871) i

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cession, was received by their majesties in ful] court, and, seated in their presence, related the story of hig wanderings, exhibiting the "rich and strange " spoils of the new-found lands,—the gold, the cotton, the parrots, the curious arms, the mysterious plants, the unknown birds and beasts, and the nine Indians he had brought with him for baptism. All his honours and privileges were confirmed to him; the title of Don was conferred on himself and his brothers ; he rode at the king's bridle ; he was served and saluted as a grandee of Spain. And, greatest honour of all, a new and magnificent scutcheon was blazoned for him (4th May 1493), whereon the royal castly and lion of Castile and Leon were combined with the four anchors of his own old coat of arms. Nor were their Catholic highnesses less busy on their own account than on that of their servant. On 3d and 4th May Alexander VI. granted bulls confirming to the crowns of Castile and Leon all the lands discovered,? or to be discovered, beyond a certain line of demarcation, on the same terms as those on which the Portuguese held their colonies along the African coast.

September and steered westwards. It consisted of three gecond great carracks (galleons), and fourteen caravels (light voyage.

frigates), having on board about 1500 men, besides the animals and material necessary for colonization. Twelve missionaries accompanied the expedition, under the orders of Bernardo Buil, a Benedictine friar ; and Columbus had been directed (29th May 1493) to endeavour by all means in his power to Christianize the inhabitants of the islands, to make them presents, and to "honour them much," while all under him were commanded to treatthem "welland lovingly," under pain of severe punishment. On 13th October the ships which had put in at the Canaries, left Ferro; and so early as Sunday, 3d November, after a single storm, " by the goodness of God and the wise management of the Admiral" land was sighted to the west, which was named Dominica. Northwards from this new found island the isles of Maria Galante and Guadaloupe were discovered and named ; and on the north-western course to La Navidad those of Mount: serrat, Antigua, San Martin, and Santa Cruz were sighted, and the island now called Porto Rico was touched at, hur- riedly explored, and

named San Juan. On 22d N ovember Columbus came in sight of Hispaniola, and sailing eastward to La Navidad, found the fort burned and the colony dis- persed. He decided on building a second fort ; and coasting on forty miles east of Cape Haytien, he pitched on a spot where he founded the city and settlement of Isabella,

The character in which Columbus had appeared had till now been that of the greatest of mariners ; but from this point forward his claims to supremacy are embarrassed and complicated with the long series of failures, vexations, miseries, insults, that have rendered his career as a planter of colonies and asa ruler of men most pitiful and remarkable.

The climate of Navidad proved unhealthy ; the colonists were greedy of gold, impatient of coutrol, and as proud, ignorant, and mutinous as Spaniards could be ; and Colum- bus, whose inclinations drew him westward, was doubtless glad to escape the worry and anxiety of his post, and to avail himself of the instructions of his sovereigns as to further discoveries. In January 1494 he sent home, by Antonio de Torres, that dispatch to their Catholic highuesses by which he may be said to have founded

- *"The countries which he had discovered were considered as a part of India. In consequence of this notion, the hame of Indies is given to them by Ferdinand and Isabella in a ratification of their former agreement which was granted to Columbus after his return." — Robert- son's History of America.*

the West Indian slave trade. He founded the mining camp of San Tomaso in the gold country ; and on 24th April 1494, having nominated a council of regency under his brother Diego, and appointed Pedro de Margarite his captain-general, he put again to sea. After following the southern shore of Cuba for some days, he steered south- wards, and discovered the island of Jamaica, which he named Santiago. He then resumed his exploration of the Cuban coast, thread his way through a labyrinth of islets supposed to be the Morant Keys, which he named the Garden of the Queen; and after coasting westwards for many days, he became convinced that he had discovered con-

tinnous land, and caused Perez de Luna, the notary, to draw up a document attesting his discovery (12th June 1494), which was afterwards taken round and signed, in presence of four witnesses, by the masters, mariners, and seamen of lis three caravels, the-" Nifia," the " Cardera, " and the "San Juan." He then stood to the south-east, and sighted the island of Evangelita; and after many days of difficulties and anxieties, he touched at and named the 'sland La Mona. Thence he had intended to sail east- wards, and complete the survey of the Caribbean Archi- pelago, But he was exhausted by the terrible tear and wear of mind and body he had undergone (he says himself that on this expedition he was three and thirty days almost without any sleep), and on the day following his departure from La Mona, he fell into a lethargy, that deprived him of sense and memory, and had well nigh proved fatal to life. At last, on 29th September, the little fleet dropped anchor off Isabella, and in his new city the great Admiral lay sick for five months.

The colony was in a sad plight. Every one was discon- tented, and many were sick, for the climate was unhealthy and there was nothing to eat. Margarite and Buil had quitted Hispaniola for Spain; but ere his departure, the former, in his capacity of captain-general, had done much to outrage and alienate the Indians. The strongest measures were necessary to undo this mischief ; and backed by his brother Bartholomew, a bold and skilful mariner, and a soldier of courage and resource, who had been with Diaz in his voyage round the Cape of Good Hope, Columbus proceeded to reduce the natives under Spanish sway. 'Alonso de Ojeda succeeded by a brilliant coup de main in capturing the cacique Caonabo, and the rest submitted. Five ship-loads of Indians were sent off to Seville (24th June 1495) to be sold as slaves; and a tribute was im- posed upon their fellows, which must be looked upon as the origin of that system of repartimientos or encomtendas which was afterwards to work such cruel mischief among the conquered. But the tide of court favour seemed to have turned against Columbus. In October 1495 Juan Aguado arrived at Isabella, with an open commission from their Catholic majesties, to inquire into the circumstances of his rule; and much contest and recrimination followed, Columbus «found that there was no time to be lost in returning 'home; he appointed his brother Bartholomew "odelantado" of the island; and on 10th March 1496 he quitted Hispaniola in the " Nina." The vessel, after a protracted and

perilous voyage, reached Cadiz on 11th June 1496. The Admiral landed in great dejection, wear- ing the costume of a Franciscan. Reassured, however, by the reception of his sovereigns, he asked at once for eight ships more, two to be sent to the colony with supplies, and six to be put under his orders for new discoveries. The request was not immediately granted, as the Spanish exchequer was not then well supplied. But principally owing to the interest of the queen, an agreement was come to similar to that of 1492, which was now confirmed. By this royal patent, moreover, a tract of land in Hispaniola, of 50 leagves by 20, was madle over to him. He was offered

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a dukedom or a marquisate at his pleasure; for three

years he was to receive an eighth of the gross and a tenth

of the net profits on each voyage ; the right of creating a mayorazgo or perpetual entail of titles and estates was

granted him; and on 24th June his two sons were received

into Isabella's service as pages. preparing of the fleet proceeded slowly ; and it was not till the 30th May 1498 that he and his six ships set sail.

and thence dispatched three of his ships to San Domingo, voyage, He next proceeded to' the? Cape Verd Islands, which he quitted on 4th July. On the 31st of the same month, being greatly in need of water, and fearing that no land lay westwards as they had hoped, Columbus had turned his ship's head north, when Alonso Perez, a mariner of Huelva, saw land about 15 leagues to the south-west. It was crowned with three hill-tops, and so when the sailors had sung the Salve Regina, the Admiral named it Trinidad, which name it yet bears. he beheld for the first time in the mainland of South America the continent he had sought so long, It seemed

Meanwhile, however, thie

From San Lucar he steered for Gomera, in the Canaries, Thing

On Wednesday, Ist August,

to him but an insignificant island, and he called it Zeta. Sailing westwards, next day he saw the Gulf of Paria, which was named by him the Golfo de la Balena, and was borne into it at immense risk on the ridge of waters formed by the meeting with the sea of the great rivers that empty themselves, all swollen with rain, into the ocean. For many days he coasted the continent, esteeming as islands the several projections he saw, and naming them accordingly ; nor was it until he had looked on and con- sidered the immense volume of fresh water poured out through the embouchures of the river now called the Orinoco, that he concluded that the so-called archipelago must be in very deed a great continent.

Unfortunately at this time he was suffering intolerably from gout and ophthalmia ; his ships were crazy ; and he was anxious to inspect the infant colony whence he had been absent so long. And so, after touching at and naming the island of Margarita, he bore away to the north-east, and on 30th August the fleet dropped anchor off Isabella,

He found that affairs had not prospered well in his absence. By the vigour and activity of the adelantado, the whole island had been reduced under Spanish sway, but at the expense of the colonists. Under the leadership of a certain Roldan, a bold and unprincipled adventurer, they had risen in revolt, and Columbus had to compro- mise matters in order to restore peace. Roldan retained his office; such of his followers as chose to remain in the island were gratified with repart'mientos of land and labour; and some fifteen, choosing to return to Spain, were enriched with a number of slaves, and sent home in two ships which sailed in the early part of October 1499.

Five ship-loads of Indians had been deported to Spain some little time before. On the arrival of these living cargoes at Seville, the queen, the stanch and steady friend of Columbus, was moved with compassion and indignation. No one, she declared, had authorized him to dispose of her vassals in any such manner ; and proclamations at Seville, Granada, and other chief places ordered (20th June 1499) the instant liberation and return of all the last gang of Indians. In addition to this the ex-colonists had become incensed against Columbus and his brothers. They were wont to

parade their grievances in the very court-yards of the Alhambra, to surround the king when he came forth with complaints and reclamations, to insult the discoverer § young sons with shouts and jeers. There was no doubt that the colony itself, whatever the cause, had not pros- pered so well as might have been desired. And, on the whole, it is not surprising that Ferdinand, whose sup- port to Columbus had never been very hearty, shoul

about this time have determined to suspend him. Accord- ingly on March 21, 1499, Francisco de Bobadilla was ordered "to ascertain what persons had raised themselves against justice in the island of Hispaniola, and to proceed against them according to law." On May 21st the govern- ment of the island was conferred on him, and he was accredited with an order that all arms and fortresses should 'be handed over to him ; and on May 26 he received a letter for delivery to Columbus, stating that the bearer would "speak certain things to him" on the part of their high- nesses, and praying him "to give faith and credence, and to act accordingly." Bobadilla left Spain in July 1500, and landed in Hispaniola in October.

Columbus, meanwhile, had restored such tranquillity as was possible in his government. With Roldan's help he had beaten off an attempt on the island of the adventurer Ojeda, his old lieutenant ; the Indians were being collected into villages and Christianized. Gold-mining was actively and profitably pursued ; iu three years, he calculated, the royal revenues might be raised to an average of 60,000,000 reals, The arrival of Bobadilla, however, speedily changed this state of affairs into a greater and more pitiable con- fusion than the island had ever before witnessed. On landing, he took possession of the Admiral's house and summoned him and his brothers before him. Accusations of severity, of injustice, of venality even, were poured down on their heads, and Columbus anticipated nothing less than a shameful death. Bobadilla put all three in irons, and shipped them off to Spain.

Alonso de Villejo, captain of the caravel in which the illustrious prisoners sailed, still retained a proper sense of the honour and respect due to Columbus, and would have removed the fetters; but to this Columbus would not consent. He would wear them, he said, until their high- nesses, by whose order they had been affixed, should order their removal ; and he

would keep them afterwards "as relies and as memorials of the reward of his services." He did so. His son Fernando "saw them always hanging in his cabinet, and he requested that when he died they might be buried with him." 'Whether this last wish was complied with is not known.

A heart-broken and indignant letter from Columbus tc Dotia Juana de la Torre, the governess of the infante Don Juan, arrived at court before the despatch of Bobadilla. It was read to the queen, and its tidings were confirmed by communications from Alonso de Villejo, and the alcaide of Cadiz, There was a great movement of indignation; the tide of popular and royal feeling turned once more in the Admiral's favour. He received a large sum to defray his expenses ; and when he appeared at court, on 17th Decem- ber, he was no longer in irons and disgrace, but richly apparelled and surrounded with friends. He was received with all honour and distinction. The queen is said to have been moved to tears by the narration of his story. Their majesties not only repudiated Bobadilla's proceedings, but declined to inquire into the charges that he at the same time brought against his prisoners, and promised Columbus compensation for his losses and satisfaction for his Wrongs. A new governor, Nicolas de Ovando, was ap- pointed in Bobadilla's room, and left San Lucar on 18th February 1592, with a fleet of 30 ships. The latter was to be impeached and sent home ; the Admiral's property was to be restored, and a fresh start was to be made in the conduct of colonial affairs. Thus ended Columbus's

ustory as viceroy and governor of the new Indics which he had Presented to the country of his adoption. Mth His hour of rest, however, was not yet come. Ever ***4s****- anxious to serve their Catholic highnesses, "and parti- cularly the queen," he had determined to find a strait ! through which he might penetrate westwards into Portu-*

guese Asia. After the usual inevitable delays his prayers were granted, and on 9th May 1502, with four caravels and , 150 men, he weighed anchor from Cadiz, and sailed on his fourth and last great voyage. He first betook himself to the relief of the Portuguese fort of Arzilla, which had been

besieged by the Moors, but the siege had been raised volun- tarily before he arrived. He put to sea westwards once more, and on 13th June discovered the island of Martinique. He had received positive instructions from his sovereigns on no account to touch at Hispaniola; but his largest caravel was greatly in need of repairs, and he had no choice but to abandon her or disobey orders. He preferred the latter alternative, and sent a boat ashore to Ovando, asking for a new ship and for permission to enter the harbour to weather a hurricane which he saw was coming on. But his requests were refused, and he coasted the island, cast- ing anchor under lee of the land. Here he weathered the storm, which drove the other caravels out to sea, and anni- hilated the homeward-bound fleet, the richest that had till then been sent from Hispaniola. Roldan and Bobadilla perished with others of the Admiral's enemics ; and Fer- nando Colon, who accompanied his father on this voyage, wrote long years afterwards, "I am satisfied it was the hand of God, for had they arrived in Spain they had never been punished as their crimes deserved, but rather been favoured and preferred."

After recruiting his flotilla at Azua, Columbus pui in at Jaquimo and refitted his four vessels ; and on 14th July 1502 he steered for Jamaica. For nine weeks the ships wandered painfully among the keys and shoals he had named the Garden of the Queen, and only an opportune easterly wind prevented the crews from open mutiny. The first land sighted was the islet of Guanaja, about forty miles east of the coast of Honduras. Here he got news from an old Indian of a rich and vast country lying to the eastward, which he at once concluded must be the long sought for empire of the Grand Khan. Steering along the coast of Honduras, great hardships were endured, but nothing approaching his ideal was discovered. On 12th September Cape Gracias-4-Dios was sighted. The men had become clamorous and insubordinate ; not until the 5th December, however, would he tack abont, and retrace his course, It now became his intention to plant a colony on the river Veragua, which was afterwards to give his descendants a title of nobility; but he had hardly put about when he was caught in a storm, which lasted eight days, wrenched and strained his crazy, worm-eaten ships severely, and finally, on the Epiphany, blew him into an embouchure which he named Bethlehem. Gold was very plentiful in this place, and here he determined to found his settlement. By the end of March 1503 a num- ber of huts had been run up, and in these the adelantado with 80 men was to

remain, while Columbus returned to Spain for men and supplies. Quarrels, however, arose with the natives; the adelantado made an attempt to seize on the person of the cacique, and failed ; and before Columbus could leave the coast he had to abandon a caravel, to take the settlers on board, and to relinquish the enterprize. Steering eastwards, he left a second caravel at Porto Bello; and on May 31st he bore northwards for Cuba, where he obtained supplies from the natives. From Cuba he bore up for Jamaica, and there, in the harbour of Santa Gloria, now St Anne's Bay, he ran his ships aground in a small inlet still called Don Christopher's Cove.

The expedition was received with the greatest kindness by the natives, and here Columbus remained upwards of a year awaiting the return of his lieutenant Diego Mendez, whom he had dispatched to Ovando for assistance. Dur- ing his critical sojourn here, the admiral suffered much from disease and from the lawlessness of his followers,

Closing years.

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whose misconduct had alienated the natives, and provoked them to withhold their accustomed supplies, until he dexterously worked upon their superstitions by prognosti- cating an eclipse. Two vessels having at last arrived for their relief from Mendez and Ovando, Columbus set sail for Spain, and after a tempestuous voyage he landed once more at Seville on 7th September 1504.

As he was too ill to go to court, his son Diego was sent thither in his place, to look after his interests and transact his business. Letter after letter followed the young man from Seville,—one by the hands of Amerigo Vespucci. A licence to ride on muleback was granted him on 23d February 1505 ; and in the following May he was removed to the court at Segovia, and thence again to Valladolid. On the landing of Philip and Juana at Coruita (25th April 1506) although "much oppressed with the gout and troubled to see himself put by his rights," he is known to have sent off the adelantado to pay them his duty and to assure them that he was yet able to do them extraordinary service. 'The last documentary note of him is contained in a final codicil to the will of 1498, made at Valladolid on 19th

May 1506. By this the old will is confirmed; the mayorazgo is bequeathed to his son Diego, and his heirs male, failing these to Fernando, his second son, and failing these to the heirs male of Bartholomew; only in case of the extinction of the male line, direct or collateral, is it to descend to the females of the family; and those into whose hands it may fall are never to diminish it, but always to increase and ennoble it by all means possible. The head of the house is to sign himself "The Admiral." A tenth of the annual income is to be set aside yearly for distribution among the poor relations of the house. A chapel is founded and endowed for the saying of masses. Beatriz Enriquez is left to the care of the young admiral in most grateful terms. Among other legacies is one of "half a mark of silver to a Jew who used to live at the gate of the Jewry, in Lisbon." The codicil was written and signed with the Admiral's own hand. Next day (20th May 1506) he died.

He was buried at Valladolid; but his remains were soon after transferred thence to the Carthusian monastery of Las Cuevas, Seville, where the bones of Diego, the second Admiral, were also laid. Exhumed in 1536, the bodies of both father and son were taken over sea to Hispaniola (San Domingo), and interred in the cathedral. In 1795-96, on the cession of that island to the French, the august relics were re-exhumed, and were transferred with great state and solemnity to the cathedral of the Havana, where they yet remain. The male issue of the Admiral became extinct with the third generation, and the estates and titles passed by marriage to a scion of the

house of Braganga. co A .

A &. X MY Xp ° FEREN

Columbus's Cipher.

The interpretation of the seven-lettered cipher accepting the smaller letters of the second line as the final ones of the words, seems to be—Servate-me, Aristis, Maria, Yosephus. The name Christopher appears in the last line.

In person Columbus was tall and shapely, long-faced and aquiline, white-eyed and auburn-haired, and beautifully complexioned. At thirty his hair was quite grey. He

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was temperate in eating, drinking, and dress; and "go strict in religious matters, that for fasting and saying all the divine office, he might be thought professed in some religious order." earnest and unwavering; it entered into and coloured alike his action and his speech; he tries his pen in a Latin distich of prayer; his signature is a mystical pietistic device. He was pre-eminently fitted for the task he created for himself. Through deceit and opprobrium and disdain he pushed on towards the consummation of his desire; and when the hour for action came the man was not found wanting.

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His piety, as his son has noted, was

See Washington Irving, Life and Voyages of Columbus, London, 1831; Humboldt, Examen Critique de Histoire de la Géographie

du Nouveau Continent, Paris, 1836 ; Spotorno, Codice Diplomatico

Colombo-Americano, Genoa, 1823; Hernan Colon, Vita dell' Ammi-

raglio, 1571 (English translation in vol. ii. of Churchill's Voyages

and Travels, third edition, London, 1744; Spanish, 1745); Prescott,

History of Ferdinand and Isabella, London, 1870 ; Major, Select Letters of Columbus, Hakluyt Society, London, 1847, and "On the Landfall of Columbus," in Journal of the Royal Geographical

Society for 1871; Sir Arthur Helps, Life of Columbus, London, 1868 ; Navarrete, Coleccion de Viages y Descubrimientos desde Fines del Siglo xv., Madrid, 1825 ; Ticknor, History of Spanish Literature, London, 1863. See also Pietro Martire d'Anghiera, Opus Episto- larum, 1530, and De Rebus Oceantcis et de Orbe Novo, 1511; Gomora, in Historiadores Primitivos de Indias, vol. xxii. of Rivadaneyra's collection ; Oviedo y aldes, Cronica de las Indias, Salamanca, 1547 ; Ramusio, Raccolta delle Navigatione et Viaggi, iii., Venetia, 1575; Herrera de Tordesillas, Historia

de las Indias Oceidentales, 1601; Antonio Leon Pinelo, Epitome de la Biblioteca Oriental y Occidental, Madrid, 1623 ; Mufioz, Historia del Nuevo Mundo, Madrid, 1793 ; Cancellieri, Notizia di Christoforo Colombo, 1809; Bossi, Vita di Christoforo Colombo, 1819 ; Charlevoix, His- toire de San Domingo; Lamartine, Christoph Colomb, Paris, 1862 (Spanish translation, 1865) ; Crompton, Life of Colwmbus, London, 1859 ; Voyages and Discoveries of Columbys, sixth edition, London, 1857 ; H. R. St John, Life of Columbus, London, 1850. ~

COLUMELLA, Lucius Junius Moprratus, the author of the most complete classical treatise on agricultural affairs, was born at Gades (Cadiz), and belongs to the Ist century A.D., being contemporary with Seneca. He possessed an estate called Ceretanum, perhaps near the Pyrenees, perhaps in Sardinia, and he also travelled extensively, but he prin- cipally resided at Rome. His extant works treat with great fulness, and ina diffuse but not inelegant style which well represents the silver age, of the cultivation of all kinds of corn and garden vegetables, trees, flowers, the vine, the olive, and other fruits, and of the rearing of all the domestic animals. They consist of the 12 books of the De Ke Rustica, that which treats of gardening being in dactylic hexameters, and of a book De Arboribus, which is the only part we possess of a work treating of the same subjects as De Re Rustica, but carlier and less elaborate. The editio princeps was published by Jenson at Venice in 1472, in the Ret Rustic Scriptores Varit. A good edition is contained in the Rei Rusticee Scriptores Veteres Latins of Gesner (Leipsic, 1735, again edited and collated with a newly discovered MS. by Ernesti, 1773) ; and the best is that given in the Scriptores Rei Rustice by Schneider (Leipsic, 1794). There are translations in English (1748), French (1551), Italian (1554-57-59 and 1808), and German

1769).

COLZA OLlLis a non-drying oil obtained from the seeds of Brassica Napus, var. oletfera, a variety of the plant which produces Swedish turnips. Colza is extensively cultivate in France, Belgium, Holland, and Germany; and, especially in the first-named country, the expression of the oil is an important industry. In commerce colza is classed with rap oil, to which both in source and properties it is very closely allied. It is a comparatively

inodorous oil of yellow colour, having a specific gravity at 60° Fahr. of 0°9128; and it solidifies at 22° Fahr. The cake left after expres sion of the oil is a valuable feeding substance for cattle. Colza oil is extensively used as a lubricant for machinery;

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and for burning in lamps. It was for many years employed Brazos and Colorado on the one hand and the Arkansas in British light-houses, having been favourably reported on | and Missouri on the other. They were brought to nominal for that purpose in 1845 by Professor Faraday, but submission in 1783 by the Spanish general Anza, who mineral oils are now Inore generally used, killed thirty of their chiefs ; but they again became COMACCHIO, a town of Italy, in the province of troublesome, and continued to harass the district of Texas Ferrara, at the head of a circondario, is situated on a long | till they were settled in a reservation in the Indian island near the seaward side of an extensive lagoon in the Territory. In 1872 a portion of the tribe, called the Adriatic, known as the Valli di Comacchio, in 44° 41' 36" Quanhada or Staked Plain Comanches, had to be reduced N, lat. and 29° 51'23" E. long. It is the seat of a bishop, | by military measures. Their total numbers, estimated by aud possesses a Capuchin convent and several fine churches. | President Burnet in 1847 as 10,000 or 12,000, are now It was at one time strongly fortified, and still has remains reduced to little more than 3000 or 4000. of the citadel, which, in accordance with the treaty of COMAYAGUA, a city of Central America, capital of Vienna, was held by tke Austrians till 1859. The inhabi- | the republic of Honduras, and of the department of tants are mainly engaged in the manufacture of salt and Comayagua, is situated in 14° 28' N, lat. and 87° 39' W. the prosecution of the fisheries in the lagoon, which, with long., about half way between the Pacific and the Atlantic, its shallow area of 41,600 acres, affords a rich feeding | on the right bank of the Humuya or Ulua River, and near ground for eels and grey mullets. The seaward entrance | the southern edge of a wide and fertile valley to which it is carefully guarded by a system of nets, so that the fish, | gives its name. It lies 2060 feet above the level of the once within the lagoon, cannot find

their way out again. | sea; and the valley is shut in by mountains varying in The eels are exported to all parts of Italy, sometimes alive, | height from 5000 to 6000 feet, so that it enjoys a com- put more usually in a pickle; and they aro greatly | paratively temperate and equable climate. It is the resid- esteemed for their delicate flavour. The average annual | ence of the president and the seat of the only bishop in production is 1,800,000 ib, and the value about £40,000. | Honduras ; but the political disturbances of the country Population, 8900 have reduced it to a very poor condition. The houses are COMANA (frequently called Curysz, or AUREA, «e., the | mainly of one story and built of sun-dried bricks; and golden, to distinguish it from Comana in Pontus), a city of | the fine fountains, monuments, and public buildings, of Cappadocia, in a deep valley of the Anti-Taurus range, | which it once could boast, have for the most part fallen into through which the River Sarus (Sihun) flows. This city | ruins or decay. Of those still left the principal is the was celebrated in ancient times as the place where the rites cathedral, a rather imposing building, with cupolas and of the goddess Ma, the Greek Hnyo, were celebrated with | towers dating from the beginning of the 18th century. much solemnity. The service was carried on in a The university, founded in 1678, and more than once sumptuous temple and with great magnificence. To defray | nominally restored in the present century, does not prac- expenses, large estates had been set apart, which yielded a | tically exist. The trade of the city is very small, in spite more than royal revenue. The city of Comana, which was | of the fertility of the neighbouring district ; but a railway @ mere apanage of the temple, was governed immediately | is in course of construction, which will put it in direct by the chief priest, who was always a member of the | communication with both sides of the continent. In the reigning family, and took rank next to the king. The | neighbourhood, Mr Squier informs us, "hardly a step can be number of persons engaged in the service of the temple, | taken without encountering evidences of aboriginal occupa- even in Strabo's time, was upwards of 6000. Under tion; but the only relic mentioned in the city itself is a dog- Caracalla, Comana became a Roman colony. Its site has | shaped figure built into the walls of the church of Our not been identified. Lady of Dolores." The present city, originally designated COMANA, an ancient city of Pontus in Asia Minor, said | Valladolid la Nueva, was founded in 1540 by Alonzo to have been colonized from Comana in Cappadocia. It | Caceres, who had been instructed to find out an eligible stood on the River Iris (or

Tocat-su), not far from its source, | site for a town midway between the oceans. In 1557 it and from its central position was a favourite emporium of | received the rights of a city, and in 1561 was made a the Armenian and other merchants, The moon-goddess | bishop's see. Its prosperity is shown by the fact that at Was worshipped in the city with a pomp and ceremony in | the great revolution of 1827 it had about 18,000 inhabi- all respects analogous to those employed in the Cappadocian | tants. Burned in that year by the monarchical party of city. Large multitudes were attracted to the place by the Guatemala, it has since suffered during successive contests, great annual processions, and the permanent population | more especially in 1872, when it witnessed the defeat of Was increased by the influx of devotees. The slaves | General Medina's army by the allied forces of San Salvador attached to the temple alone numbered not less than 6000. and Guatemala, and in 1873, when it was besieged for Remains of Comana.are still to be seen neara village called | about two months. In 1854 Scherzer estimated the umenek on the Tocat-su, seven miles from the city of Tocat. | population at only 2000; but it is believed now to number 'They consist," says Van Lennep, "of a low hill upon | between 7000 and 8000. which are scattered fragments of brick and hewn-stone, COMB, a toothed implement for arranging and dressing with here and there the remains of a wall or a partly fallen | hair and other fibrous substances, Worsted wools, waste vault." The bridge that crosses the river at the spot is | silk, and other long fibres are dressed and prepared for largely composed of fragments of ancient structures, and | spinning by a process called combing, performed formerly several sepulchral inscriptions can be deciphered on the | by hand-combs, but now by an elaborate combing machine, blocks beneath the arches, Still nearer the modern village | This process of combing will be described in connection of Gumenek than these ruins lies a large boulder of marble | with the manufactures to which it belongs. Here we have 1n which tombs or cells have been excavated. One of these | only to do with the implement so well known in domestic 1 Teputed to have been the abode of Chrysostom during | economy. Comb-making is necessarily a prominent and 18 first exile from Constantinople. extensive industry, in which a considerable variety of COMAN CHES, a tribe of North American Indians, so | materials are employed, the must common being the horns and called by the Spaniards, but known to the French as | hoofs of cattle, tortoise-shell, ivory, boxwood, vulcanite or Padouques, and among themselves as Naiini.

They belong | hardened Indian-rubber, and to a small extent German silver to the Shohone family, and when first met by Europeans | and other metals, Of these materials horn is by far the Occupied the regions between the upper waters of the ! most extensively eniployed, and the wouee of that sub- 'I. — 23

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stance illustrates all the peculiarities of the craft. The industry is one still extensively prosecuted on a small scale, with all the disadvantages of manual labour and wasteful and tedious processes; but in several large factories very ingenious labour and material-saving machinery is brought into operation, as in the extensive and complete works of Messrs Stewart & Co. of Aberdeen. In Messrs Stewart's factory the raw material aunually consumed averages 3,500,000 horns, about 1,000,000 hoofs, nearly 600 tb of tortoise-shell and 20 tons of vulcanite, out of which more than 10,000,000 combs are manufactured. The British supply of horn is very limited, aud altogether inadequate to the demand. The sources whence this raw material is drawn are chiefly South America and Australia, whence ox and cow horns are procured, and India, China, and Siam, which supply buffalo horns. When the horn is brought into the factory it is first assorted into sizes, preparatory to being cut up into pieces. From an ordinary horn two cross sections are taken for comb-making, called, first, the head or root cut, and, second, the screw or tip cut. The solid tips remaining are disposed of either for button- making or for being formed into knife and other handles. Other scraps and cuttings are of great value to makers of prussiate of potash and for artificial manure. The sections to be used for combs are taken to the opening department, where they are wetted in water and heated over an open fire till the horny substance becomes quite soft. The head cut is slit longitudinally once, or if it is a large horn it may be slit into two. The screw cut is so termed on account of the peculiar spiral direction in which it is slit, the cut being so directed that the piece when opened out may form an oblong rectangular plate with as little waste of horn as practicable. After slitting, the cuts are opened out between tongs, and inserted between screw plates where they are pressed quite flat. Plates which are intended for staining in imitation of tortoise-shell are at this stage inserted in strong iron frames between heated and oiled iron plates, in which they are submitted

for some time to enormous pressure. After this pressure the plates are found to have a translucent appearance and a uniform greenish hue. The pressure, however, operates injuriously on the fibre or grain of the horn, rendering it liable to split. When, therefore, the horn is of good natural colour, it is preferred to finish it in that condition. 'he prepared plates of horn are laid aside to dry in a room where a high temperature is main- tained by steam-pipes. Subsequently they are squared and trimmed on circular saw benches, and assorted into sizes suitable for the various kinds of combs manufactured.

In the manufacture of ordinary dressing-combs two distinct processes of tooth-cutting are followed. The first method, which is applied to all fine combs, consists in cutting out the teeth by means of circular saws; and this is the only process applicable to the preparation ef small toothed combs and all combs made of ivory and box- wood. Saw-cutting is, moreover, the only process formerly adopted, but instead of a circular saw, the comb-maker used a gauged hand-saw called a stadda or steady. The saws now employed are of small diameter; and, according to the work they have to perform, they are fine-toothed and thin, some of them being constructed to cut from 70 to 80 teeth per lineal inch. The saws are mounted on a spindle which revolves with great rapidity, and the plate or plates of horn to be toothed are clamped up in a holder, which by a cam motion is alternately raised and depressed, bringing the horn each time against the saw, which cuts out one tooth to its full depth. After each cut an auto- matic arrangement moves the horn forward the breadth of a tooth, the gearing being so mounted that the teeth may be cut fine or coarse at pleasure. The second method of cutting the teeth is known as twiuning, from: the fact that a pair of

COM—

combs are cut out of a single plate. The process of twinning consists in so cutting a plate of horn that the whole material is utilized, what is removed to form the teeth of one comb being exactly sufficient for the teeth of a corresponding opposite comb. When the cutting of twinned combs is complete the plate presents the appearance of a pair of combs with their teeth exactly inosculating or dove- tailing into each other. this is accomplished, is a complex and beautiful piece of mechanism. The plates of

horn to be twinned are softened by heat, aud secured in a bed-plate which travels under a pair of cutting chisels, fast or slow, as the teeth are to be cut coarse or fine. to the length of the teeth to be formed, descend alternately and cut through the plate, but as their cutting edges are at a small angle in relation to each other, the cuts are wedge formed or tapering, and thus the pointed ends of one comb are taken out of the roots or head of another. aid of this apparatus a man and boy can cut more than 2000 combs per day, while an old-fashioned comb-maker working with his hand-saw can only cut from two to three dozen combs daily, and that with almost double the material required in the twinning process.

COM

The twinning machine, by which

The chisels, having cutting edges equal

With the

After the combs are formed either by circle saw or by

twinning, they are next thinned or tapered to their outer edges on grindstones. department, where by means of special forms of files or rasps, known as grails and topers, the individual teeth are rounded or bevelled, tapered, and smoothed. If the combs are to be finished in their natural colours, they are then smoothed with sand-paper, buffed on leather wheels, and polished on wheels built up of discs of soft calico. If, as is frequently the case, the combs are to be finished as

They then pass to the " grailing "

imitation tortoise-shell, they are, in the translucent state

before alluded to, treated with dilute nitric acid, which

communicates a light yellow tinge like the ground colour of tortoise-shell. 'The deep semi-opaque orange spotting is next produced by dropping over the surface spots of a composition containing caustic soda, litharge, and

dragon's blood. After some time this composition is washed off and the parts to which it was applied are found to be a little swollen up and stained a deep orange tinge. The combs are then polished as above stated.

The elaborate pierced patterns of ornamental back combs are cut out by small ribbon saws ; and the work is generally finished by hand-carving with proper tools. Plainer and less artistic work is doue by embossing in heated dies and ordinary pierced work is also produced by cutting dies. Formerly the wide set teeth of back combs were frequently stamped out.

In order to economize tortoise-shell, and to obtain large and thick combs out of the comparatively small and thin plates in which that substance usually occurs, a process of cementing or soldering is resorted to. The joining of two plates of tortoise-shell is very perfectly accomplished by first carefully scraping and cleaning the surfaces to be united. They are then applied to each other, heated, and strongly pressed between pincers,—this being sufficient to cause a perfect amalgamation of the two surfaces. After cementation tortoise-shell is treated in every respect as @ piece of fine white or buffalo horn. (J. PA.)

COMBACONUM, a town of Southern India, in the district of Tanjore, 20 miles from the city of that name and 30 miles from the sea, in 10° 58' N. lat. and 79° 26 E. long, It is a large town with wide and airy streets, and is adorned with pagodas, gateways, and other buildings of considerable pretension. The great gopura, OF gate: pyramid, is one of the most imposing buildings of the kind,—rising in twelve stories to a height of upwards of

100 feet, and ornaraented with a bewildering profusion of

figures of men aud animals formed in stucco. One of the water-tanks in the town is popularly reputed to be filled with water admitted from the Ganges every twelve years

by a subterranean passage 1200 miies long ; aud it conse-

quently forms a centre of attraction for large numbers of devotees. A considerable trade is carried on in the town, and weaving is one of its chief industries. The bazaar occupies a long and wide street, and is well supplied with provisions, The city is historically Interesting as the capital of the Chola race, one of the oldest Hindu dynasties of which any traces remain, and from which the whole coast of Coromandel, or more properly Cholamundel, derives its name. Population about 40,000.

COMBE, AnpREw, M.D. (1797-1847), was born in Edinburgh, 27th October 1797. His name holds an honoured place in the roll of sanitary reformers, Instead of waiting till disease was developed, he sought its pre- vention by the adoption of a careful system of hygiene. He served an apprenticeship in a surgery, and in 1817 passed at Surgeons' Hall. He proceeded to Paris to complete his medical studies, aud whilst there he investi- gated phrenology on anatomical principles. He became convinced of the truth of the new science, and, as he acquired much skill in the dissection of the brain, he subsequently gave additional interest to the lectures of his brother George, by his practical demonstrations of the convolutions. He returned to Edinburgh in 1819 with the intention of beginning practice ; but being attacked by the first symptoms of pulmonary disease, he was obliged to seek health in the south of France and in Italy during the two following winters. He began to practise in 1823, and by careful adherence to the laws of health he was enabled to fulfil the duties of his profession for nine years, During that period he assisted in editing the Phrenological Journal and contributed a number of articles to it, defended phrenology before the Royal Medical Society of Edinburgh, published his Observations on Mental Derangement (1831), and prepared the greater portion of his Principles of Physiology Applied to Health. The latter work was issued in 1834, aud immediately obtained extensive public favour. In 1836 he was ap- pointed physician to Leopold I, king of the Belgians, and removed to Brussels, He had only been there a few months, however, when another severe attack of hzemop- tysis warned him that the climate was unsuitable, and would speedily render him unequal to the duties of his position. Scrupulously conscientious in everything, he at once re- signed, The king and Baron Stockmar persuaded him to remain a few weeks longer in the hope that he might re- cover ; but they were disappointed. He continued, however, to hold the position of consulting physician to his

majesty. In Edinburgh he proceeded to work with renewed energy ; he published his Physiology of Digestion, and resumed practice a8 a consulting physician, his advice being eagerly sought by old and new patients and by his professional brethren. In 1838 he was appointed one of the physicians extraor- dinary to the queen in Scotland. Two years later he com- pleted his Physiological and Moral Management of Infancy, which he believed to be his best work, and it was his last. He suffered at intervals from extreme weakness, and in 1842 the Symptoms became alarming. His latter years Were mostly occupied in seeking at various health resorts Some alleviation uf his disease ; he spent two winters in Madeira, and tried a voyage to the United States, but was Compelled to return within a few weeks of the date of his anding at New York. He went on a visit to a nephew at Gorgie, near Edinburgh, and there he died on the 9th August 1347, His last literary effort was a paper on sip es Which was published in the Zimes after his eath ; its Principal suggestions have been carried out by

the Act 12 and 13 Vict. ¢. 23. His biography, written by George Combe, was published in 1850.

COMBE, Grorce (1788-1858), was born in Edinburgh, 21st October 1788. As the first advocate in this country of the phrenological doctrines of Gall and Spurzheim, and as the author of The Constitution of Man Considered in Relation to External Objects, he attracted much attention in Britain, on the Continent, and in America, His father was a brewer,—a man of shrewd business qualities, and of a benevolent disposition, and a strict observer of Calvin- istic practices ; and his children—nine daughters and eight sons ——were placed under a rigid system of religious in- struction. In a fragment of autobiography written by Combe shortly before his death, he coinplains of the irk- someness of the Sunday observances and tasks imposed on his father's household. His frame was feeble ; the Sunday tasks followed weeks of severe mental labour at school, and, so far from cultivating in him a religious spirit, they rendered the church, Sunday, and the Catechism sources of Weariness and terror to him. His character was earnest and thoughtful even as a child; and feelings of despon- dency thus engendered were intensified by the weakness of his constitution. His mind

became largely occupied with the current theological theories and, in time, with doubts of their truth, He attended the High School for five years, and then proceeded to the university. In 1804 he eutered a lawyer's office as an appreutice, aud applied him- self diligently to the acquirement of the details of his pro- fession. At the same time he assisted his younger brothers and sisters in their studies, and read philosophy, history, and general literature ; philosophical works, however, had most attraction for him. In 1812 he obtained his com. mission as writer to the signet, and, soon after, that of notary public. His shrewdness and conscientiousness in dealing with clients speedily obtained for him a degree of practice which exceeded his expectations. Meanwhile, in private, he had vague yearnings to accomplish something which might benefit mankind. In 1815 the Edinburgh Review contained an article on Gall and Spurzheim's system of "craniology," which the reviewer denounced as " a piece of thorough quackery from beginning toend." Combe laughed like others at the absurdities of this so-called new theory of the brain, and thought that it must be finally exploded after such an exposure ; and when Dr Spurzheim delivered lectures in Edinburgh, in refutation of the state- ments of his critic, Combe considered the subject un- worthy of serious attention. He was, however, invited to a friend's house where he saw Spurzheim dissect the brain, and he was so far impressed by the demonstration that he attended the second course of lectures, Proceeding to investigate the subject for himself, he became satisfied, after two years of study and observation, that the fundamental principles of phrenology were true—namely " that the brain is the organ of mind; that the brain is an aggregate of several parts, each subserving a distinct mental faculty ; and that the size of the cerebral organ is, cwteris paribus, an index of power or energy of function." He had moved slowly at first ; he now pursued his investigations with en- thusiasm. He compared the known characteristics of friends with their phrenological developments ; he studied anatomy ; he visited schools, prisons, and large mauufac- tories; and he became more and more satisfied that he was approaching a truth which would be of great value to humanity. He requested his brother Dr Andrew Combe— who was at that time a medical student in Paris—to give particular attention to the dissection of the brain, in order to be prepared to support or to condemn the new theories on anatomical principles. In 1817 his first essay on phren- ology was published in the

Scots Avagazine ; and a series of papers on the same subject appeared soon afterwards in

the Literary and Statistical Magazine ; these were collected and published in 1819 in book form as Essays on Phrenology. His friends became alarmed by his public advocacy of a cause which was the laughing-stock of all men of reputation, and warned him that it would be the ruin of his professional prospects. He was not diverted from his course, and he had the satisfaction of finding his business increase; for the many who laughed at his hobby or regretted it still recognized his assiduity in attending to the affairs of his clients. The Hssays gave an extraordinary impetus to the new science ; friends and foes became numerous; a phrenological society was founded ; the Phrenological Journal was established, and was published quarterly for twenty years; a volume of Phrenological Transactions was issued ; and Combe's first work developed into A System of Phrenology in two large voluines, of which five editions have been published. By his lectures and writings he attracted public attention to the subject on the Continent and in America, as well as at home; and a long discussion with Sir William Hamilton in 1827-28 excited general interest.

The publication of his most popular work, The Constitu- tion of Man, was determined upon after serious deliberation. He had circulated private copies amongst his friends, several of whom regarded the principles of the essay as dangerous to society and urged him to suppress it. The principle on which he based his argument was that all the laws of nature were in harmony with each other, and that man would best fulfil God's will, and attain the greatest happiness for himself, by discovering those laws and obeying them. He saw nothing irreligious in this principle ; he believed that on the contrary it supplied a philosophic basis to religion. When the book was published in 1828, he was charged by the church party with being a materialist and an atheist ; but, on the other hand, he received from near and distant quarters grateful thanks for the new light his work had shed upon religion, and for the satisfaction it afforded to doubting minds. As one indication of the estimation which the work obtained, it is notable that amongst many editions in America there was one for the blind. From this

date the current of Combe's public life broadened ; he became strong in his own con- victions of the truth, and consequently more resolute in carrying them to practical issues. He might hesitate at first, doubting himself; but once satisfied that he was right, he never faltered. He saw everything by the light of phrenology, and the light rendered him patient of the opposition of others, and guided him to the most earnest efforts to benefit his fellow-creatures, morally and socially. He gave time, labour, and money to help forward the education of the poorer classes ; he established the first infant school in Edinburgh under the direction of Mr Wilderspin ; and he originated a series of evening lectures on chemistry, physiology, history, and moral philosophy— the lectures on the latter subject being delivered by himself. He studied the criminal classes, and tried to solve the problem how to reform as well as to punish them; and he strove to introduce into lunatic asylums a humane system of treatment. In 1836 he offered himself as a candidate for the chair of logic in the Edinburgh University, and the testimonials submitted on his behalf on that occasion show that he was held in high esteem by men of very opposite opinions. As he had expected, he was rejected by the town council in favour of Sir William Hamilton.

Having received numerous invitations to visit America, he proceeded thither in 1838, and about two years were occupied in lecturing in the principal States on phrenology, education, and the treatment of the criminal classes. On hig return in 1840 he published his Aforal Philosophy, and in the following year his Notes on the United States of North

dons, a daughter of the great actress. companion of all his travels, and she was with him at the

COMBE

America. twenty-two lectures in the university of Heidelberg—being the first Englishman who had ventured to lecture there in the national language. which prostrated him for some time. He continued to

travel much on the Continent—inquiring into the manage- ment of schools, prisons, and asylums. The commercial crisis) of 1855 elicited his remarkable pamphlet on The Currency

Question. experience of his life is contained in his work On the Relation between Science and Religion, first publicly issued

in 1857, and now in its fifth edition. contributing to periodicals, lecturing, and correcting the new editions of his works rendered his days busy to the last.

In 1842 he delivered, in German, a course of

But the effort resulted in an illness

The culmination of the religious thought and Writing pamphlets,

He was engaged in revising the ninth edition of the Constitution of Man when he died at Moor Park, Farnham, 14th August 1858. He had married in 1833 Cecilia Sid- She had been the

end. Apart from his position as a phrenologist he earned distinction by his efforts on behalf of education, and by his courage in promulgating certain philosophic truths, which at the time were regarded as subversive of every-thing good, but are now accepted so entirely as matters of course that his share in obtaining recognition for them is

apt to be forgotten. (co. G.) COMBE, Wir11am (1741-1823), an anonymous hack writer of great fertility and of some merit, was born at Bristol in 1751. The circumstances cf his bith and parent- age are somewhat doubtful, and it is questioned whether his father was a rich Bristol merchant, or a certain William Alexander, a London alderman, who died in 1763. Be this as it may, it is certain that Combe was educated at Eton, with Fox, Lyttelton, and William Beckford ; that Alexander bequeathed him some £2000—a little fortune that soon disappeared in a course of splendid extravagance, which gained him the nickname of Count Combe; and that he finally fixed his residence in London (about 17a as a law student and bookseller's hack. In 1775 he pub- lished Zhe Philosopher in Bristol, a series of essays of merely local interest; and in 1776 he made his first success in London with The Déaboliad, a satire full of bitter person- alities. Four years afterwards (1780) he became an inmate of the King's Bench; and much of his subsequent life was spent in prison. He appears to have written a

correspon- dence between Sterne and Eliza Draper, and also the Letters of the Late Lord Lyttelton (1780). Periodical literature of all sorts—pamphlets, satires, burlesques, "two thousand columns for the papers," "two hundred biographies," The Origin of Commerce—filled up the next years, and about 1789 Combe was receiving £200 yearly from Pitt. Six volumes of a Devil on Two Sticks in England caused him | to be saluted as "the English Le Sage ;" in 1794-96 he wrote the text for Boydell's History of the Rwer Thames ; |

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in 1803, he was placed on The Times. In 1807 All the Talents, a satire, appeared ; it ran through twenty editions and is generally attributed to Combe. In 1809-11 he wrote for Ackermann's Political Magazine the famous vi haree Tours of Dr Syntax, which, owing greatly to Rowlandson s designs, had an immense success. Then came poems 1 illustration of drawings by Princess Elizabeth, The Mutary Adventures of Johnny Newcome (1815), The English Dance of Death (1815-16), The Dance of Life (1816-11), The Adventures of Johnny Que Genus (1822)—all written for Rowlandson's caricatures ; together with Iistorves of Oxford and Cambridge, Picturesque Tours along the Rhine and other rivers, Histories of Madeira, Antiquities of York, texts for Zurner's Southern Coast Views, and contributions innumerable to the Literary Repository. In his later ye! notwithstanding a by no means-unsullied character, Combe

on —

was courted for the sake of his charming conversation and He is said to have written and burned his autobiography ; but it does not appear that the loss of this memorial is to be regretted. He died in

inexhaustible stock of anecdote.

London in 1823.

Brief obituary memoirs of Ocmbe appeared in Ackermann's Literary Repository and in the Gentleman' s Magazine for August 1823 ; and in May

1859 a list of his works, drawn up by his own ‘ See also Diary of H. Crabb Robinson, Notes and Queries for 1869, and a paper in

hand, was printed in the latter periodical.

the Churchman’s Shilling Magazine for the same year.

COMBERMERH, Stapieron Corton, First Viscount (1773-1865), was the second son of Sir Robert Salusbury Cotton of Comberniere Abbey, Cheshire, and was born, 14th November 1773, at one of the family estates in Denbighshire. Asa boy he was distinguished for his vivacity, courage, and He was educated at Westminster School, and when only sixteen, obtained through his father a second lieutenancy in the 23d Regiment, or Royal Welsh Fusiliers, A few years afterwards (1793) he became by purchase captain of the 6th Dragoon Guards, accompanying them during the disastrous expedition to Flanders against the French, Subsequently, and while yet in his twentieth year, he joined the 25th Light Dragoons as lieutenant- colonel, and, while in attendance with his regiment on George III. at Weymouth, he became a great favourite of the king’s. In 1796 he went with his regiment to India, and in 1799, under Lord Harris and along with Colonel Wellesley, he distinguished himself in the war with Tippoo Saib, and at the storming of Seringapatam. In 1808, being how major-general, he was sent to the seat of war in Portugal, where he shortly rose to the position of com- mander-in-chief of cavalry under Wellington, and it was

fondness of field sports.

here that he most displayed that personal courage, swiftness of action, and judgment which won for him his fame as a cavalry officer, His share in the battle of Salamanca (July 22, 1812) was especially marked, and received the personal thanks of Wellington. wounded in the left arm by a shot from one of the Portu- guese allies, On the conclusion of peace in 1814, General Cotton was raised to the peerage under the style of Baron Combermere. He was not present at Waterloo, the com- mand which he expected, and bitterly regretted not receiving, having been given to Lord Uxbridge. In 1817 he was appointed governor of Barbados and commander of the West Indian forces, His active military life was concluded in India (1826), where he besieged and took Bhartpur—a fort which twenty-two years previously had

defied the genius of Lake, and was deemed impregnable. For this Service he was created Viscount Combermere. A long period of peace and honour still remained to him at home. In 1834 he was sworn a privy councillor, and in 1852 he succeeded his old chief as constable of the Tower and lord lieutenant of the Tower Hamlets. In 1855 he received a marshals baton, and was made G.C.B. He discharged his duties to the last, and died at Clifton in his ninety- Second year, An equestrian statue in bronze, the work of Yaron Marochetti, has been raised in his honour by the inhabitants of Chester. In private life Lord Combermere was most exemplary, and the means by which he attained health and longevity (as detailed in the memoir by Vis- countess Combermere and Captain Knollys, 2 vols., 1866,) afford an interesting illustration of what can be done by the exercise of a strict control over appetite and by a regular regimen :—

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his nine agit November, 1863, Lord Combermere had reached oat ith. Lyear, stil] in the full possession of his mental faculties, and wit! his usual activity very little lnpaired ; indced, the only oceasional weak- as much from slight rheumatism as a i. He still rode three hours daily, and nees with his usual alert step and upright car-

The day after, he was accidentally

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riage. His voice was as strong, nis hand as steady as ever, and he wrote clearly and rapidly without spectacles, whieh he never used except by candle-light. The wonderful memory for which he had always been remarkable never failed, and while it recalled long past events with surprising accuracy, registered and reproduced those of more recent date with equal exactness. No one could detect any failure in his quiek perception or ready conclusions, nor did he betray even the most trifling of those mental deficiencies often attendant on a lesser age than his. When eighty-seven, he had danced a quadrille at a rural féte as lightly as his grandehildren, and at eighty eould climb over a hurdle with ease. All these im- munities from disease and decrepitude were secured by the invariable moderation whieh, in spite of service in various climates, left his naturally

vigorous constitution unimpaired up to the very end. He rose very early in summer, and the last few years of his life rode an hour before breakfast. This meal was always very simple, and without meat of any kind. At half-past one a small luncheon and half a glass of wine satisfied him until dinner. This last was his largest meal, at which he partook plentifully of meat, and drank, for the last fifteen years, one pint of light sherry. ea or coffee he never touched in early life, afterwards seldom indulging at break-fast in the former, usually drinking instead cocoa, as the most wholesome beverage. Plain meat, bread, and potatoes constituted his dinners, and he never for twenty-six years once transgressed the rule which he had determined to observe, of eating only what was wholesome, and avoiding fruit, vegetables, beer, champagne, salt meat, condiments, and every other article proscribed by the most rigid dietetics, Besides carefully rejecting all unwholesome food, he made ita practice to eat so slowly that he was always longer than any one else at meals. Few could resist as he did the temptation of a well-supplied table, which he wished to be luxurious for others, while he contented himself with simple fare, enjoying only the sight of the fine fruits furnished from his productive houses and well-eultivated gardens.

'Such abstinence would to many be impracticable ; but Lord Combermere possessed a power of self-control which few can compass. As an instanee of this, after having long indulged in the habit of taking snuff incessantly, he relinquished it suddenly and entirely. Continual smoking had equally been a practice of his earlier life, until, becoming aware of its evil effects on his health, he restricted himself to two small cigars nightly."

COMBINATIONS among workmen for the purpose of raising their wages, or otherwise altering the terms of their service, were fora long time expressly prohibited by statute. While the state attempted to interfere in the regulation of wages, any combination to defeat the statutory rate would naturally be looked upon with distavour; and we need hardly be surprised to find that in 1425 a statute was actually passed, making it felony for masons to con- federate together to raise their wages above the amount fixed for them by the law. The spirit of such legisla- tion survived to times in which economical principles might be supposed to have been better understood. The Act of 39 and 40 Geo. III. c. 106 (repealing an Act of the previous session on the same subject) made illegal all contracts for

obtaining advance of wages or for altering the hours of work, except contracts made between masters and men 3 and every workman entering into any such contract was liable to be committed to the common jail for three months on conviction before two justices of the peace. The same punishment was reserved for workmen entering into any combination for the same purpose. For the more effectual Suppression of combinations among workmen, it was enacted that persons attending any meeting for the furtherance of such contracts and combinations, or persuading or intimi- dating persons into attending such meetings, or collecting subscriptions for such purposes, should also be liable to be sent to jail for three months by two justices. A law so severe and so one-sided had its natural effect in promoting secret combinations and provoking acts of violence. In 1825, after an inquiry by a committee of the House of Commons, the 6 Geo. IV. « 129 (repealing an Act on the same subject in the previous session) was passed, whereby a vast number of recited statutes relating to masters and workmen, and generally all enactments relative to combinations of workmen, were repealed. Com- binations among workmen were thus relieved from the oppressive statutes specially directed against them. The

Trade Unions Act, 1871, further enacted that the purposes of any trade union shall, not by reason merely that they are in restraint of trade, be unlawful so as to render a inember liable to prosecution for conspiracy or otherwise, or to render void or voidable any agreement or trust. The Act specifies certain agreements which may not be enforced in the courts, but which are still not to be regarded as un- lawful. It also provides for the registration of trade unions. 'Their legal position under the criminal law, and the results of recent legislation on the subject, will be discussed under the heading Conspiracy. For an account of their history and economical relations see the article on TraDEs UNIONS.

COMEDY. See Drama.

COMENIUS, or Komensky, Jonann Amos (1592- 1671), a famous writer on education, and the last bishop of the old church of the Moravian and Bohemian Brethren, was born at Comna, or, according to another account, at Niwnitz, in Moravia, of poor parents belonging to the sect of the

Moravian Brethren. Having studied at Herborn and Heidelberg, and travelled in Holland and England, he be- came rector of a school at Prerau, and after that pastor and rector of a school at Fulnek. In 1621 the Spanish invasion and persecution of the Protestants robbed him of all he possessed, and drove him into Poland. Soon after he was raade bishop of the church of the Brethren. He supported himself by teaching Latin at Lissa, and it was here that he published his Pansophice Prodromus (1 630), a work on education, and his Janua Linguarum Leserata (1631), the latter of which gained for him a great and wide-spread reputation, being produced in twelve European languages, and also in Arabic, Persian, and Turkish. He subsequently published several other works of a similar kind, as the Eruditionis Scholasticee Janua and the Janua Linguarum Trilinguis. His method of teaching languages, which he seems to have been the first to adopt, consisted in giving, in parallel columns, sentences conveying useful information, in the vernacular and the languages intended to be taught (i.e, in Comenius's works, Latin and sometimes Greek). In some of his books, as the Orbis Sensualium Pictus

(1658), pictures are added ; this work is, indeed, the first

children's picture-book. In 1638 Comeuius was requested by the Government of Sweden.to draw up ascheme for the management of the schools of that country; and a few years after he was invited to join the commission that the English Parliament then intended to appoint, in order to reform the system of education. He visited England in 1641, but the disturbed state of politics prevented the appointment of the commission, and Comenius passed over to Sweden in August 1642. The great Swedish minister, Oxenstiern, obtained for him a pension, and a commission to furnish a plan for regulating the Swedish schools according to his own method. Devoting himself to the elaboration of his scheme, Comenius settled first at Elb- ing, and then at Lissa; but, at the burning of the Jatter city by the Poles, he lost nearly all his manuscripts, and he finally removed to Amsterdam, where he died in

1671.

As a theologian, Comenius was greatly influenced by Boehme. In his Synopsis Physice ad Lumen Divinum Reformate he gives a physical theory

of his own, said to be taken from the book of Genesis. He was also famous for his prophecies, aud the support he gave to visionaries, In his Lux in Venebris he published the visions of Kotterns, Dabricius, and Christina Poniatovia. Attempting to interpret the book of Revelation, he promised the millennium in 1672, and guaranteed miraculous assistance to those who would undertake the destruction of the Pope and the house of Austria, even venturing to prophesy that Cromwell, Gustavus Adolphus, and Ragotski, prince of Transylvania, would perform the task. He also wrote to Louis XIV., informing him that the empire of the world should be his reward if he would overthrow the enemies of God.

Comenius also wrote against the Socinians, and published three

historical works— Ratio Discipline Ordinisque in Unitate Pratrum ~

Bohemorum, which was republished with remarks by Buddeus, Historia Persecutionum Ecclesie Bohemice (1648), and Martyro- logium Bohemicum. See Raumer's Geschichte der Padagogik, and Carpzov's Religionsuntersuchung der Béhmischen und Méhrischen Briider.

COMET

o the present article it is proposed to exhibit formula by

means of which the orbital elements of a comet may be determined from three observations, assuming the comet to move in a parabola, an hypothesis upon which the apparent paths of the great majority of these bodies may be closely represented, appending thereto a fully worked example of the practical application of the for- mule; also to put the reader in possession of methods now employed for calculating ephemerides of the apparent positions of a comet, to assist in observation. The limits within which we are confined will necessitate reference to other works for demonstration of our formule, but care will be taken to name those authorities, which are not only most accessible, but by which the subject has been most clearly treated.

A list of comets of short or moderate period, so far as known at present, a class which offers particular interest to the student of this branch of

astronomy, will likewise be included.

The method of calculating a parabolic orbit from three observations which we shall follow is the comparatively expeditious one proposed by Olbers, and demonstrated in his Abhandlung wiber die leichteste und bequemste Methode die Buhn eines Cometen zu berechnen, first published at Weimar in 1797, and since twice reprinted with consider- able modifications and additions, The method is founded

upon the principle that, if ac be the chord between the extreme positions of the comet in its orbit, and A C the similar chord of the earth's path, the radii-vectores at the middle position cut ac and AC proportionally to the

times occupied in describing the arcs, a supposition which,

though not mathematically exact, is but little in error if

the intervals between the observations are pretty nearly equal, and the ares described small. ;

It may be convenient if the notation employed in the subsequent formule be given here, at least as regards the principal quantities entering into our calculations.

b casscyntores Time of observation (in decimals of a day). R. A……. Right Ascension.

Ges neibecse eee Declination; +N,-S.

a …Geocentric longitude.

3) steeeerereooo latitude.

es «he eee True distance of comet from the earth. p=-A cos, B…Curtate distance of comet from the earth. 6 Comet's heliocentric longitude, on the ecliptic. A

"

A

ee eeee cect eaces

5 5 latitude. veseceresseeveee gg FACius=vector.

APP se recisaaeed Sun's true longitude.

Dooce ReEAe Earth's radius-vector.

ar The argument of latitude or distance of the comet from the ascending node. ~ stile 4 ao beReBDEMAa Ce: The epoch of perihelion passage, expressed in

same manner as U.

;.

1.

7

7

,

2A SGC RREREE DAOC The longitude of the perihelion, reckoned on the ecliptic to the nodc and thence on the orbit.

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Writing the equation for /2 W=F+G. p'+ Hp',

2H JF Fr assume tan. p= Slits then p =tan. dy. Jt (1V.)

The amount and direction of the error of interval be- tween the extreme times of observation, resulting from this first value of p', will, after a little experience, guide the computer to another value nearer to the true one; and the error of the second assumption, compared with that of the first, again leads to a much closer value for the third approximation, and so on till the assumed value of p' pro- duces an agreement between the calculated and observed

The longitude of the ascending node. ... Che inclination of the comet's orbit to the ecliptic. ....The perihelion distance, expressed, like other — distances in astronomical calculations, in parts of the earth's mean distance from the sun. Y ..wssseeeeeesee Lhe comet's true anomaly. We suppose that the observations furnish three complete ysitions of the comet referred as usual to the equator, or crise in right ascension and declination, with the mean times of obscrvation at the respective places. é The first step will be to convert the observed right ascensiuns and declinations into longitudes (a) and latitudes

(8), thus :—

Aas cos. (N—e) intervals. In practice we have not found any great ad-

Put tan. N=---,—— Then, tan. a= ha vantage on adopting one or other of the devices suggested the obliquity of the eclip- | for obtaining successive

values' of p' by use of tables or

And tan. B=tan. (N~e). sina €...) tic at date, from the | otherwise—the simple method of continued approximation,

Nautical Almanac.

Thus we find a', a', a", and ', 8", 2", where the quantities with one accent apply to the jist observation, those with two accents to the second place, and with three accents, to the dast observation. This is to be understood

by deducing a new value of the curtate distance propor- tional to the errors in the two preceding assumptions, will be found in the great majority of cases sufficiently expeditious and as little troublesome as any other,

In working Lambert's equation, proceed as follows :—

throughout our formule for the calculation of the orbit. Pa pete Me pat trtnk : Now reduce the times of observation to the meridian of – a ye ee (VA)

Greenwich by applying the longitude of the place of ob- servation with its proper sign, and convert the times so reduced into decimals of a day ; thus we have ¢', ¢", ¢'".

For each of these times interpolate from monthly page iii,, in the Wautical Almanac, the sun's longitude (A) and the logarithm of the earth's .radius-vector ® ; the sun's longitude in the Almanac being apparent, the amount of aberration (20"-42~+-R), which is given in another part of the ephemeris, must be added to the apparent longitude, to obtain the trwe longitude required in the calculation. We have then A', A", A'" and the logarithms of ee teem", and are ready to proceed with the application of Olbers's method.

We commence by calculating M or P , the ratio of the

log. 2 =log. B+4 log. B+1.4878117

log. z'=log. D+4 log. D+1.4378117

2" — "=the time of describing the chord, expressed in days and decimals.

The approximations to p’ may be continued until 2’ — 2” agrees with (¢’” —?’), within 2 or 3 in the fifth place of decimals, though if the computer has only rough observa- tions at command, a larger error may be tolerated.

The comet’s curtate distance from the earth at the third observation is given by

p”=Mp’

With the final values of 7’, r’, p and p”, the direct calculation of the elements of the orbit commences.

The heliocentric longitudes 6’, 6”, and latitudes A’, X’”, are obtained from

p 3 , q / fd iy – tf if, comet’s curtate distances from the earth at the first and 7p coe. A asin. (8 — A eae einem) third observations from ee ae Bain (oA) 2) 0,

tan, 6”. sin. (a”— A”)—tan. B”. sin. (a”—A”) ¢t” —2

tan. 2”

ein, (a”’ — A”)

r’ . cos. a’ . cos. (6 —A’)=p’ .cos. (a —A)-—R’ ¢. Silt. 2 =p’. tan. 8’

and (V1.)

re cos. pee cos. (0” a A”) = ie cos. (a” ae ‘Aes pee Mt

7”. cos. A”. sin. (6 — A’) =p”, sin, (a” —A’”)) = RM =p. tan. p”

?. Sin,

in which equations the right-hand quantities are known. The values of r’ and r’”, resulting from these equations, should agree with the preceding ones if the calculations have been correctly performed. hig agreement forms the first verification of the work. If 6" is in advance of 6’, the motion in the orbit is direct ; if the contrary be the case, the motion is retrograde. Then, if

the motion be direct, the longitude of the ascend- ing node (&) and inclination of the orbit to the ecliptic (7) will be found from tan. 7. sin. (6—-Q)=tan. a’ tan. A”’—tan. a’. cos. (6 — 6’) (VII.); sin. (6 — 6’) and if the motion be retrograde from tan. 7. sin. (Q – 6’)=tan. a’ , oe” ae 1, tan. A” —tan. a’. cos. (6’- 6” tan. 7. sin. (Q @’/)= an (6 = 0" . The distances of the comet from the ascending node reckoned upon the orbit, at the first and third observa tions (w’, w”), are given in the case of direct motion by

tan. ate = 2) tanec Se ap ee) (VII); cos. % cos, 4

or rather more conveniently, by putting m=

from Ma ™- sin. (a/-A”) —tan. Bt” -t” tan. 6” —m. sin. (a’”—A”)” if” — # The following equations must then be formed (& is the chord of the comet-orbit between the extreme observations): 1 2=R2~ OR’ cos, (a’— A’). p’+sec. B”. p2 . = Ra 2R”. M. cos. (a’”— A”\p’+ sec. B’”2, M2, pe k = (+7) — OR’, RB”, cos. (A — A’) (III) +2R”, cos, (a’— A” + 2’, M. cos, (a’”— A’). 9’ ~ 2M. cos. (a” ”—a’)p’— 2M. tan. p’. tan. B’”. 9! If (¢”- t”) be the interval of time between the first and third observations we have, by Lambert’s theorem, (285 Patan —1\4 ———. \ 7

(1I.)

tan. 2. cos. (6’- 9)=

i {= 8m. V2

With an assumed value for p we calculate +’, r’”, and k, and then ¢’” for comparison with the observed interval be- tween the first and third observations, and vary p in

SUCcessive trials until the observed and calculated values / gree. In this solution of the above equations by the | or, if the motion be retrograde, by

—Inethod of trial and error, a first approximate value of pe , tan.(& — 6’)

e e tan. (8 = peites) ay be inferred ag follows :— | bia a eS 7.

cos. 4 COs. %

The arc u’” —u’ is equal to the difference of true ano- malies, and the true anomaly at the first observation (v’) will be obtained from

(Ze NY yt tan. bv’ =cotan. }(a” — wv’) — = vr : pS gin, bl”) (IX.) or from ; yt epee ahh) af ton. yo Vcore ul —

Vr”, sin, (u” —w’) The perihelion distance (q) =7”. cos. 75 fr”. cos, 230”. The longitude of the perihelion, reckoned on the ecliptic to the node and thence on the orbit, is given by

n= Q2+u’-v’.. for dircet motion — r=2+v—-u’.. for retrograde motion

As a further verification of the calculations, we bave— art +r? —2r’ rr”. (XL) which should give the former value of &. an We have now only to determine the time of perihelion passage (T), by finding the interval between the first observation and the perihelion (7) from v’ and g, by means of the equation—

(X.)

cos. (w” —w’),

2q)% ; – > being the Gaussian ra (tan. 40+ § tan. *40) ee [8-2355814]

(29)%

™[8,53866114]

Similarly we may find the interval from the third observation to perihelion by substituting v” for v’; the times thus separately determined should agree, and this agreement will afford a third check upon the accuracy of our work.

Thus the whole of the elements of the parabolic orbit are found, aud it is always desirable to ascertain how the geocentric place calculated from these elements for the time of the second observation agrees with the position ob- served ; the first and third places are necessarily represented.

In the computation of a geocentric position from para- bolic elements we may proceed thus :—-

Find the interval from perihelion passage to the time for which we require to compute (¢—T), in days and decimals,

Put cotan. 2 v = 3k (2q)-2 (¢-T) cotan.& = ay cotan. vy

(XII.) (tan. $v' +[9, 5228787] tan. 53v.)

(XIII.) then tan. }v=2 cotan.2 r=—, . cos. 740 We have thus the true anomaly and radius-vector. Then, if the motion be direct,— cos. A. cos. (@— Q)=cos. (v+a— B) } cos. A. sin. (0— Q)=sin. (v+aw— Q).cos.%? sin. ? =sin. (v+r—- Q).sin.7) or, if the motion be retrograde,—

cos. A. cos. (Q —6)=cos. (v-7+ &)) COS. A. sin. (Q —6)—sin. (v-7+ Q).cos.t 7 . sin. A =sin. (v-7+ 8). sin. % (

Coy)

(XV.)

—equations which give the heliocentric longitude and latitude (6, A). The geocentric longitude and latitude (a, 8) and the true distance from the earth (A) are then obtained from— A. cos. 8. sin. (a— A)=7. cos. A. sin. (–A)) A. cos. B. cos. (a–A)=1 Cos. A. cos. (—~A)+R A. sin. 8 SP o fells If the position of the comet as referred to the equator is required,—

(XVI)

tan. B Put tan..N = on (XVIIJ.) Then 5

: +

tani A. — .tan. a tan.. Decl. =tan. (N+e).sin. R.A.

As an example of the calculation of the orbit of a comet

by Olbers's method, we will compute the elements of the

COMET

comet discovered at the Observatory of Marseilles by M. Borrelly on the 6th of December 1874, employing three . observations taken at that Observatory on December 7 : 16, and 26, viz. :— ;

Long. M. Eq.1875°0…225 2 30

radii-vectores of the earth from monthly page iii of the

Mean Time Comet's Comet's

at Marseilles. Right Ascension. Declination,

187 Fr, nice H. OM. 8. dQ " IDES flecobes 6 40 52 16 O 24°52 +36 388 50 gb Qaesaoe We 23 si 16 11 5°82 +45 37 37 Ap 7 Slaapeoe 6 18 0 16 24 58:97 +55 34 12

Converting the right ascensions into arc, and the times

into decimals of a day, after subtracting 21™ 35° from them, for reduction to the meridian of Greenwich, we have—

Greenwich Right Mean Times. Ascension —). Dee. 7°26339 240 6 8 16°68190 BS hy 7) 5» 26°24751 246 14 45 +55 34 12

The obliquity of the ecliptic, from the Vautecal Almanac,

was 23° 27' 28", and hence, by the formule p. 183, we find the following positions referred to the plane of the ecliptic, and interpolating for the above times from the same ephemeris the corresponding longitudes of the sun and log, radii-vectores of the earth, correcting the sun's longitudes for aberration, and reducing all to mean equinox of 1875-0,

Declination, ;

= 7 +36 88 50 +45 37 87 :

' u

hoe 225 2 30 ee. +55 81 52 ee 221 47 16 es +64 35 27 ee 212 44 8 a ee 474 17 a0 cas 255 32 49 Low: B …:.28 99933590 ae. 265 7 46 im Ge. 99929263

AM oi DTA 62 5 RM. —9°9926916 The right ascension and declination are thus converted

into longitude and latitude for the first observation -—

4 iF 240 6 8 Log. sin. @..... —9°8497775 'Doosan + 36 38 50 Log.tan.(N - e) ..... — 03135945

Log. tan. 4…... + 9°8715409 Log. tan. B…... +0°1688721

Log. sin. Re saone = 9°9879771 oy Lég-tan. N…... — 9.9335638 poe + 55 81 82 i in… 139 21 56 -— © is: 23 27 28 . & N-e…... 115 54 28 Precession to 1875°0 …... + 33 ' — ——— Nutation in longi- Log. cos.(N —e) sce eae — 9°6404058 tude with contrary ; : Log. tan. R.A pete + 0°2403519 sign to Nautical sb r — 9°8807577 Almanac …...0. ga | Log. cos. N…... — 9°8801731 Correction to longitude…. +103 Log. tan. ..a…... + 0°0005846 aaa Linh

225 2) 18

Correction…... +11 |

And so for the second and third positions. The interpolation of the sun's longitudes and the log.

Nautical Almanac requires no illustration. ; We now form the angles a'— A", a" — A", a" —A', &, and take out the sines and cosines required; and it 1s always convenient to have these functions and other of the

principal quantities copied in plain figures on 4 paper

:

I

|

;

:

separate from the calculations. Thus we have,—

a Sine. Cosine. ah ee 319 54 44 =9°S088592 —«—aveeneererere a ON ee 316 39 30 — 98365440 ind eee. 307 36 17 —9‘8988564 ——saeeeneres : rig CS en 329 29 41 — 9°7055368 +9 °9352968 ae Ae oe 297 51 48 — 9:9464841 +. 9°6696554 ed se coe 310 10 15 ssc +.9°8096060

ee 37 1 #2 eee +.9°8654465 De a 19 19 26 49.9748170 ie ee e47. 41 733 4.9°9899924 We have— t” —t/=9-41851 days; t’” —¢”=9°56561 days;

¢’”’ — t= 18-98413 days.

COMET 185

wt

And th ituti vari i , The calculation of M = Br , is as follows, by (iyi Te n us substituting logarithms in the factors for p’ and

p”, our equations stand thus, in the form for proceeding with the work—

Tog. tan.. 8”... + 0°3232781 Log. tan. 6”... +0°5509163 . sin.(a’ — A”)... — 9°8365440 =e f* = 0:960880 — [0°2296858].p’ + [0°4944306] 9/2 Log. ae ORS cosas. csees. +3°5556279 r= 0°966903 — §9-6833570).5" 4 [0-47485361 2 a SE aS Log, m…—0°4867341 He = 0109114 — [9°2612653].p’ + [9:5408186] 62 of. E — aes ® uw A mae 8 Log. sin. (a” ”— A”).,— 9°8988564 We have now to find the value of p by trial and error,

+0°2955933

+ 0°3855905 | Here, if 42=F+G. p’+Hp’2, we have—

sesercesece t 1975119 eae Mo, :. oe a ee FSO TOON, “log, C= — 926197, log. H = 4. 9-54080. P pose san. 8 reo No. 3-—No. 4…..+1°1257162 | And for a first approximate value of p’, by ae) Des ca ecneseves 5 ———— = ——— — Log. F…=9-03788 Log. 2…= 0‘30108 No, 1-No. 2….. +0°518416 Tet ae Log. H…=9°54082 Log. H…= +9°54082 ae Log. (t” - t’)... 0°9739822 9°49706 Log. 2H… = +9‘84185 Log. (No. 3—No, 4) + ee — ——— Log. G… ~9:26127 Ry 96632495 Log. Cs ++» 0°0067305 tog./ ©... 9°74856 — 0°58058 t! = ——— — — — — . — Log. ea)? EEEEII Log. tan. $y… 0°06370 Log, Fr. $9°74856

Log. p’... 9°81226 p.. 0°649

M… 9.6699800

M2… 9°3399600 tan… — 0°83202

a wp… 98° 29,5 Next, we form the equations (III.) for the determination Ay… 49° 11,25 of r’?, 7”, and k? by successive assumptions for the value Be ill 5

of p’,—

In the earlier approximations we may use /ive-figure

Log. R’..... 9°9933590 Log. R”..... 9°9926916 | logarithms. With p’=0-649, the work proceeds thus— 2 0 -0RR712aN ” Log. 1 oon 9°9867180 Log. Ree. a 9 9858832 Log. p oo. 9°81294 Log. p”...9°62448 Re, 0°969880 mm… 0°966903 — 022969 0°49443 R2=, 096988 ——— ——— oki. (9: .p® 9 © (2.)..0.£1°81494 Log. 2 0… 0°3010300 Tage …... 0.301030 | “08 P 9°81224 Log. p’® 962448 No. (2.) pai Log. R’..... 9°9933590 Log. R’”..... 9°9926916 | (1.).....0°041938 — (2.)..... 40°11 891 + 2°28482 Log. cos, (a/ A’)... 9°9352968 Log. M .. ... 9°6699800 9°63336 +0°47485 No (1.).... 1710185 ——. MW Wi . 2 peer ————al 0-2296863 L0G. cos. (”– A”).. 9°6690554 Log. p'.... 9°81224 Log. p"® 962448 v2... 1°18347 F ——— ene ——— /2, Br f\c ee. 1-co7015- ES | Bilis. -84d580 =)... nooepeR Les)... “Oras meee... oon NO. vee eece esses 0'429890 — 926127 a oramoene Veet 1. 0 URGDR I g? 0 4944 06 Log. sec Bp” 0'5674468 Log. p. Wee eres 9°81224 Log. p?

9°62448 40g. sec. B*..,... ' 3 A sa gilcaemae paced SS ee ae S Log. sec. 8..... 11348036 | (5+)s+-.--9°07351 (6)... 1916530 a +3°121983 8 a″ ee — ——— R″2,... 0°96690 Merckens 9 3899600 No. (6.) +0 146382 No (4) +1°25697 ~ 0°4748536 Constant... + 0°10911 | ae: if No + 2°984376 oe Tem(eN) Garbo | - een Nou (.) ~o-1igds. Nor (.).... 0 SS — 119, ; . Therefore the equations for 7? and r’”? are— #2… +0°13699 7s 194487 2 ponanag Log.7”%... 028890 Mig = 9°969880 – 1697015. p’ + 3121988. 92 Log, &2.. +9°13669 ea crore yi = 0‘966903 — 0°429890.p’ + 2-984376. p” Log. &... +9°56835 LOS 7”..... ey m+n = 1-936783 — 2°126905.p’ + 6*106359. p2 hk… 0°37012 r …. 1°08788 Log. 2 …..., 03010300 Log. 2 …... 0°3010306 aaTeear vans 1°39460 198: y or: a , Log. M…... 96699800 i si Ar’ +9”)... 124124 og. R”.. 6 Log. cos. (a” ”— a’)... +.9-9899094 Gs Log. cos, (A” ~ A’). +9°9748170 8 (a a) Tepes BUG ee 0718506 +0-2618976 + 9°9609124 Bad(r’ +9”) +e iawn 1°42630 é ae +0°913929 Date ae For… 1°05618 OmD MN… 1°827669 a enDoa Constant …..... 1°43781 Constant…....., 1°48781 Log. 2… 0°8010300 Tog, Wh ” Beeooee i oot ante B —.0-02878 We 79026016 «= Log. tan. 6… 4-0-1688710 lee iia a eel 08. C08. (a’~ A”), +.9-8096060 Log. tan. 6”... +0°5509163 Log, 2 …..... 166913 (ere 147341 + 0°1083276 +0°6852973 pee ae OF o se… +1-268608 Lo +iaeoeso |= = — —

4 .

Ing. 2 ce ; Neale 22.0… 16-9858 ie Mu 96699300 No: 8+No. 9….. - +5°758068 C’..... 18-9841 if Log, R’ Oe 99933590 ENGGRe sc, claves: — 20488 Og. COS, (a ~ A’)... +.9°3654465 a

+9°8298155 If for a second approximation we take p’= 0°7139, and

ca +0°675796. calculate z’ — 2” precisely as before, the error in the interval No. 6+No, ie eon from the first to the third observation, or (¢’” — ¢’), is found === to be — 04-3606, which, compared with the error of the

frst assumption (— 24-0488), shows a change of + 146882

So that the equation for 7-2 for an increase of 0°0649 in p, or of 5’,th part, and by

is thus formed,— oe

1°936783 — 2126905. 9° +. 6106359 . p?? h ‘= 0°72776, for a third I

~1°89 : ap P. mere proportion we have pe » lor a third approxi- RTO + L9edd04 gf — 2 758968. p’ : mation, giving the error in interval = + 04-0222, so that = 0109114 ~ 0°182501.p’ + 0-347391. p? we are now approaching the true value, and with

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p’ =0°7269562, obtained from the errors of the second and third trial in the same way that the third value of p’ was inferred, we may substitute seven-figure logarithms and work more closely; it will thus be found that the error in interval corresponding to the fourth assumption for p’ is reduced to + 0-00167, or less than 24 minutes, and if we are only seeking an approximate knowledge of the orbit, the direct calculation of the elements might proceed with this fourth value of p’. However, to make the computation in this example a little more complete, we work out two further hypotheses, and finally adopt for the correct value of p’...0°7268994, with which the calcu- lation is as follows :—*

— 0‘2296858 4+0°4944306 R7%.... 0°969880 Log. p’... 978614748 Log. p2.. 9°7229486 No. (2.).. + 1°649602 (1.).e.c06 ~~O°0911601 (2)... +0°2178792~~ ; eile

— 9°6333570 +0°4748536 ~ eat 7) ea Log. p’... 98614743 Log. p®.. 9°7229486 72 1°385922 (Cee — 94948813 (4.)..... +0°1978022 Log. 72. 0°1417388

— 92612653 + 95408186 Log. 7’.. 00708694 Log. p’... 978614743 Log. p?.. 9°7229486 eee a

(B.) seeess —9°1227396 — (6.)..... + 9°2687672

Mo, (6)... 40888855 RAT 0966903

Constant… +0°109114 No. (4.)... 1°576893

+ 0°292669 2°543796

No. (5.) ...-0°132660 No. (8.) ... 0812487

i? .... +0°160009 v2… 2931309

Log. H…. 9°2041444 Log. 7”... 0°8485508

Log. k …. 9°6020722 Log, 1’..... 0°1742799

Ie veces 07400011 re… 1177251

4k… 0200006 ” .

—————— ir’ +7”)... 1°385504

4h 0200006

Bee Care oe eee 1°535510

Do! 9) ie… ee 1135498

Constant 1°4378117 Constant 1°4378117 & 52°14935 Log. B 071862526 | Log. D 0°0551863 2’ —33°15892

‘ 09812 kLog. D 0°02 — ae kLog. B 0°0931263 | $Log 0275982 | » » Roa Log. # 1°7171906 | Log. 2 175205912 | ¢”-¢ 18-98412

which may be considered a perfect agreement.

We have thus for the direct calculation of the orbit Log. p’...9°8614743, and, since p” =Mp’, we find Log. p’”...9°5314543. Log. 7’...0°0708694, and Log 9 0:1742799, as given by our final approximation.

With the aid of the formula (VI.) the heliocentric longitudes and latitudes of the comet at the first and third

observations are found as follows :—

a Bee 9°8614743 Log. sin. (a’— A’).....— 9°7055368 (1.) ches ceconssettencs one = ODT UGG Bis ca ree 9-8614743 Log. cos. (a’— A’)..... ... + 9°9352968 (G3) Serene ene oc JUL No. to (2.).....+0°6262837 Subtract R’..... 0°9848248 (Bi) INhenononete — 0°3585411 Log. (3.)....e00 — 95545389 (1.) agama Tog. @.) = Log, tan. (6’- A’).....-. +0 iain (oo Gaepea = 225° 49’ 21”°4 Add A’.....255° 32 49”°0 t….1 Log. sin. (6’— A’).....— 9°8556316 (1.) 5 as ay mene: Log ain. any (, CODRA crear sa: +9°7113795 Log. (p’. tan. 6’) =Log. (7’. sin. W)....2-0. 00248453 Vomtin Aoc.eec—: +0°3134658 PROP Re oer +64° 5° 7“‘9 TGS, BAND .....022 + 99539758 Loge (Stn) Log. tees 00708695 og. sin. A The equations gave Log. 7”.....- 0:0708694

so that our first verification is complete.

The comet’s heliocentric longitude at the third observa- tion (6’”) being less than that at the first observation (6’), the motion in the orbit is retrograde or contrary to the order of the signs, and we therefore proceed to determine the longitude of the ascending node (3) and the in- clination (7) by the second set of equations in (VII.); thus—

6. SAIS 22 104 gad? 54 57°83

be. 6 28

Log. cos. (6’— 6”)... Log. tan. 2’...

lye:

ING, WO (le None Nat. tan. a”...

Nat. tan. a” — No. (1.)...

+9°9972269

+ 0:3134658

+0°3106927 +2°0449972

+1°‘3776038

— 0°6673934

eee cece ee tee ceecen

+ 0‘3134658

.. +9°5160651 .. 0°7974007 .«. 80° 56 2775

ee ee 9°5314543 Log: sim: “(@”” — Be) 2a. — 9°9464841 (4.)..... ... — 9°4779384 Log. p”... . ... 9°5314543 Log. cos. (¢” A™).. ....- +9°6696554 Gaines + 9°2011097 No. to (5.)...000- +0°1588948 Mabiraetyh © .....< 0°9833124 (6, Mo. caisces — 0°8244176 Woe(Ga) ssa — 9°9161473 (4.) JF, Ww Log. (6.)~ Log. tan. (a — PACAE Sees +9°5617911 CA ae 200° 1’50“‘8 MAGA vs .0 cee 274° 52’ 150 o” .....114°92 Log. sin, (07 > A%).....-3 — 95346921 (4.) i we : Log. sin. (“A 108: (7° a cos. A) ae neces +-9 9432463 Log. (p”. tan. 6”) = Log. (7. sin. A”)..... + 0°0823706 Log: tan. 743 +0°13912438 Matte aes + 54°1'27"0 Tie. in Xx… 2-2 99080907 Log. (7” sin. A”) é ; Log. sin. ee — Log. 7 eeaes eerste) 0 1742799 sided ect daa ts coon Aseenen rarer Log. 9”..... O°1/4aga8 Log… —9°8243819 .. 982° 19 48" Log. sin. (+6)... +9°0517209 oer 114 54 5°‘8

— 0°7726610 Log. tan. 2’... +0°3134658

Log. tan. (2 – 6)... — 9°5408048 Q&-@...160° 50’ 37”°7 Add @’...121° 22’ 10”°4 Q)...282" 1274871 ; Then for the arguments of latitude at first and third observations (w’, w”)—

Log. tan. (Q – @)...-9°5408048 Log. tan.(— 9/”),.. — 93524609 Log. cos. 7… 9°1971480 Log. cos. 4… 91971480

es ——— en Log. tan. wu’... — 0°3436568 Log. tan. #”... — 01553129 ae’ .. 11422! 57°6 at 124? 57 59 wl” — ul =10° 35’ 27-0, and 4(au!” —w)=5° 1731" 0.

Q- 6… 167° 18 42”3

——— — ———

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We have now to calculate the true anomaly at the first observation from the radii-vectores ”’, ”” and the included angle w”—w’, which is =v”’—v’, and for this purpose will employ both expressions for tan, gv in (IX.)—

By the first formula. By the second formula. Log. cotan. $(u””~w’)..... .. +1°0332699 Log. ve Pee ee the 00871400 No (1.)= (Nat. cotan. $(u”—~w”)) 0.0.0… +10°796174 Tog, 608, H(t” —t)..... + 9°9681449 a ~~0°0708694 0°0852849 Log. 7 ….....6. 01742799 BN ec et ssi asdace +1‘2169840 Log. (3) a. ae 98965895 i 0°0354347 a Ce ace eee svesee + 10850125 a Vicar es Mov 1 NO 2… +0°1819715 Log. sin. $(w” - w’)..... +8°9648750 Sn +9°1204801 +0°9834198 Log. (sin. $(u”—w V7”)... eee. +9 0520150 No. orice bas desvunntevens «eat BRORNEOO Log. tan. 40’ A EIA +0°0684651 No. (1.)-No. (2)=Nat. tan. 4v’..... +1:170752 oe… 8 + 49° 29’ 51”+5 Log. tan. $0’.....0… +0°0684649 ae +49° 29’ 515 Ce ss: 98° 59’ 43”°0 The perihelion distance (7) = 7’. cos. 240’, or As already remarked, it is always desirable to ascertain lee ee. Ge 9°8125654 how the comet’s geocentric position, calculated from the 4 ~~. ES elements thus obtained, agrees with the observed position. Log. a Ys fees Smee A close agreement where good observations have been em. eee oe ployed, of course, indicates that the real path of the comet 05 9°6960002

in space does not much differ from a parabola, while a Race 0‘4969525 considerable difference, z.¢., one exceeding the probable .. error of the observation, may be due to the ellipticity of the orbit, and the comet may prove to be one of no long period, We will, therefore, proceed to compute the longi-

The longitude of the perihelion (3r)—

Sa 4 — 2! = 282° 12’ 48”°1 + 98° 59’ 48-0 — 114° 29° 576

= 266° 49 33”°5 tude and latitude from the above elements for the time of

It remains only to determine the time of perihelion from | the second ee med ee

4 , i ee Tle /\eee erlnelion passage > ‘ r n =U + (ul — 4!) = tet (i

aes: Minis id ie ie a me of = Date of second observation (¢”), Pee ue oee iyo

wou / Ta, + 58°48950 dy’ = 49° 29 51-4 Bo!” = 54° 47’ 22”+5 Instead of using Barker’s table, we will compute the true

anomaly directly by the formule (XIII) ; thus, . tan. $v’ = + 0°0684649 Log. tan. 40”... + 0°1513832 as es 4 aa . “or : ” aa daa Log. (8%)... 8°7127027 Log. cotan. vy… 0°7964958 og. tan.® 4o = +0:205: og. tan.3hp” ”... +0°45 Log. (¢”—T)... +1°7670779 oe Log. (4)... 9°5228787 …..... ea alae 9°5228787 08: ( ) “TRU P06 cotan. § = 0°2654986 a —— . © cotan.

*+9°7282734 +9°9770283 Log. (29)%... 9°9955453 a ad —— No…. +0°534901 No…. + 0°948480 Log. cotan. 2y… 4+ 0°4842353 §...28° 29" 76 Nat. tan. Be… 1170752 Nat. tan. Au”... 1°4170438 9 18° 918-8 2&...56° 58’ 1572 . . . 1°705658 … 2°365523 SF Log. cotan, 28… #8130004 Log. ¢.... 9°6960002 Log. 2… 0°8739272 —— oT ee Log. 2…. 0°3010300 (29) Cees Log. cos. 4u”... =9°7850693 tan. }v”... 0°1140304 Log. (29)... 9°9970302 Log. (2k)- ae Log. cos. *40”... 95701386 40”... + 52° 26130 4, Log. (2q)... 9°9985151 1 ‘8328611 Log. q… 9°6960002 . v”... +104° 52! 26-0*

: Log. 7”... 0°1258616 Log. (29)... 9°9955453 No, days from 3d ~ 8 eee 900114 obs. to perihelion | S°°PP517 | vo shen obtain the comet’s heliocentric longitude on the Date of 3d observa. iptic (6) and heliocentric latitude (A”), the motion in 1°4589339 af ecliptic (6) and heliocentric latitu e Add Log. x… 0-2318907 ton, OD a ee the orbit being retrograde, from equations (XV.) -— § =, awa & i a

; 94¢ Perihelion passage, eee October 19°19234

4

° A 8 …282 12 48°1

No. =days from Ist i ” 104 52 26-0 obs. to perihelion ee Omnoy Oe sane Date of 1st observa- 27 5 14-1 tion, – December 7:26339 mw… 266 49 33°5 Perihelion passage, CES 19) aire onion 120 15 40°6 October 1919242 Log. sin. (o”+ 3 —m).. +9°9368812 …..... goers $9°9868812 ‘ ; : 5 E1506 Yonon : We have now the whole of the elements of the parabolic Be BeOS sare Le gueeU = err orbit, viz,, as usually written and entered in catalogues,— + 9°1335292 Log. sin. A”... +9°9309301 ; i Log.cos. (vo + Q- a)... -9 ‘7023823 RE. +58° 39° 7 5 Perihelion Passage, 1874, October 19°1924, Greenwich Mean Time. I 9” DereTiaeo 7 ———e 266° 49’ 33-5) Mean equinox ge ae, (i 0”)... ——— ongedeaacaae 282° 12! 48-1 1875°0 8 -0”...164° 53’ 51““4 0) Goes SON 56! 27/775 (oY panratelén 1A) 28s) MOET .... 9°6960002

th fe} , Ww Motion retrograde. Orel ieelicn 5 Ome”

Oe Aa cece ale? Tl’ oy

Log. 1.0.0 0°1258616

WiGe, edn Ala. cscs 9°7176467

fog am. @ A”).2…... — 9°7264615

howe G)...o0 — 9°5699698

Log. (7”. co8. A”).. ...—. 9°8435083

Log. cos. (6”—A”).....-. — 9°92753849

— 9°77104382

3810) paagepodenese copooueoacet — 0°5902597

ACQUIRE o2e

+ 0°3935844

Log. (2)..... + 9°5950879

Log. (1)—log. (2)=log. tan. (a’” — A”).....++: — 9°9749319 a

~~iene as 221° 46’ 556~~

~~a’ (observed).....- 2-47 16~~

~~Geoc. Long. (comp. — obs.)..... vesenee — 204~~

~~So that the errors of elements for the second observation may be expressed in transcription thus :—~~

~~de’. cos. B= — 87 dp’ — = +245~~

~~These errors are not greater than may be looked for, in a |~~

~~computation upon the method we have adopted.~~

~~We have computed the true distance of the comet from the earth at the second observation A”. If the true distances at the first and third observations are desired,~~

~~? ee p Ae cos. B” > e B A’ = 128437, A” =1:24574, so that the comet was slowly approaching the earth during the interval over which the observations extend.~~

~~If it be preferred to compare with the observed right ascension and declination, the formule (XVII.) have yet to be applied, the calculation, as will be seen, being very similar to that in the conversion of right ascension and declination into longitude and latitude.~~

~~[The formation of the equations for the determination of p’, p’”, and & will perhaps be found the most slippery part of the computation by the beginner, and we add therefore two or three sets of data from observation and the ephemeris, with the resulting equations, which may be verified for the sake of obtaining a better acquaintance with this part of the work.~~

~~we have A'= or, in the present case,~~

~~Tie~~

~~Comet 1870. (Coggia, August 28.)~~

~~t a B IN Log. R~~

~~Aug, 28°5356 46 70 -11 221 155 27-4 0-00411- Sept. 5°4551 41 45°7 — 5192 163 78 0°00825 19°4167 29 30°0 + 9 223 176 438 0:00165~~

~~The equations are yr! %==1°01911+[9°82521] p'+[0°01722] p' 74= 100762 +[0°10261] p' +[9°76209] p? ke 2=0'13813 — [9°41687] o' + [9°36281] o"~~

~~Comet 1874. (Winnecke, April 11.)~~

~~t a B A Log. R~~

~~April 12°60769 320 36-8 + 8 56:0 22 59-9 0-00144 23°58796 3812 57:1 +23 40°7 38 48:2 0-00273~~

~~May 6°47981 281 42°8 +53 59°2 46 18-2 0.00412~~

~~COMET~~

~~01258616~~

~~Log. sin. A"..... +9°9309391~~

~~Log. (r". sin. A")..... + 0°0567917 = Log. (A". sin. B") ee Log. sin. (a"— A")..... — 9°8365895~~

~~. +9°7333803=Log. (A". cos. 6") Log. tan. B"..... +0°3284114~~

~~B'+.. +64° 35' 5175 B" (observed)... + 64° 35' 27°0~~

~~weve $245~~

~~Log, (A". sim. B')..... +0°0567917 Syn, (3 aseooe +9°9558405~~

~~Geoc. Lat. (comp. — obs.)....~~

~~MiG e VAG es 0°1009512 Kee 1°26169 GOS) Br… 9°6324 Log……— 1°8096 — 0°9420 Diff. Long. in are — 37 of great circle § °°"~~

~~The equations are 7' 2=1-00666 —[9°96708] p' +[0°01060]p" ("2 = 101916 +(9°57247 |. p' +(9°48948]p" ie 2=0°16416 —[9°72470] p' + [9°88437]p?~~

~~Comet 1874. The Great Comet of Coggra. i a B A Log. R April 1738074 93 30 "1 +48 85 "3. 27 40 "3 0-0020201 98°37122 92 42 7 +4552 0 38822 2 0-0032594 May 9°39548 9255 24 +45 28 23 49 216 0°0044190 The equations are r' 2=1°009347 —[9°9151992]p' + [0'3257222] p" 7' = 1020559 —[0°1891891 Jp' + 2 2602010 |*p2 ke 2 =0°189596 + [8°5723285 |p' + 8°0795842]"p® It will be remarked that the apparent motion of this comet was very slow during the interval we have taken; it afforded a case where the orbit could only be improved by increased length of observation. | We may correct the elements thus obtained for the main effect of the error due to the assumption made on commencing our calculation, by the following process, also suggested by Olbers, and applicable to the same observa- tions. There are already found 7', 7", v', o'", and p'. 7". sin, (0% —0") (0% — 0" R". sin, (A"- A)~~

~~Put P= 7 in (0) oe) a Ry, sin, (A mst tan. B" : é a m= =e , as in the calculation of the~~

~~ratio of the curtate distances 2 or M. ; p~~

~~Then compute N from RY sin, (A"-AN(q—p).m (t= #+) ~p'(m — gin. (A" = a') — tan. B) . "= t')~~

~~aw f~~

~~vps elit eieal) II=1+ @7—7 .pt+Nn~~

~~Multiply those terms in the equations for p’”? and A? which contain M by H, and the term in the equation for p” which contains M by H?; the equation for p® not containing M or M? remains eat changed. With this new system of equations we find correcte~~

~~values of p’ and of 7’ and 7”, and the elements of the orbit there- from as before. p’” isnowM.H.>’.~~

~~To apply the above formule to our preceding example we have~~

~~. — W s we ”~~

~~vy… 98 59 48 a —y… See .~~

~~v” ...104 52 26 gl —v”... 44 ‘ v’”...109 34 45 Av —A‘.. Oaae~~

~~AMA” 9 44 29~~

~~— —a~~

~~€ Om ET~~

~~Log. 7”... 0°1742799 Log. R’”... 99926916 Log. sin. (v””-v”) 8°9189744 Log. sin. (A’”— A”) 9-2284039 (on (eee — = A… 90882543 C… 9°2210955 Log. 7’... 0°0708694 Log. RB’... 9°9933590 Log. sin. (0”-v’) 9°0108899 Log sin. (A”-· A”). 9-2213297 B… 3°0812593 D… 9°2146887 Ee | ites © 00064068 Br 070069950 nee No…. 1°0162368 No… 1°0148614 — TT no ciesiscsccseseosss 1°0156182 Pw… +0°0006186 q… — 0°0007568~~

~~1. Y- p= — 00012570~~

~~Log. (R’. sin. (A’- A’)) Log Poss + 6°7914099 : ... +9°2146887 Log (t” -¢ 99932695 Log. (7 -p)... — 71884290 Cer)~~

~~Log. m… — 0°4867341 E .. +6°8398518~~

~~Log, (m. sin. (A”— a) net —tan. pf’)... +9°7146784 Log. p’... 98614748 F…... +9°5761527~~

~~+ 6°7846794 .. +0°0006091~~

~~Fe +7-2636991~~

~~ff . Log, aan 9-9932695 Log, N…... +7°2569686 N… +0°0018070~~

~~(=) +0-0006091~~

~~P(g.yy a~~

~~1:0000000~~

~~H.. 1:0024161 Log. H… 0°0010481 Log. M… 9°6699800 Corrected log. M… 9°6710281~~

~~With this corrected value of log. M, we might recalen- late the co-efficients of p' and p" in the equations for r'"2 and &*, and complete the calculation of the orbit, but as the method of procedure is precisely that already illustrated by an example, it is unnecessary to occupy space here by so doing.~~

~~In the majority of cases in practice, the first elements of a comet's orbit are calculated from a much shorter interval of observation than has been taken in the pre- ceding example,—not infrequently from observations on consecutive nights, and in such cases our elements may be open to considerable correction, though the natural desire of the astronomer to learn something of a new comet's position in the system, its track in the heavens, or possible identity with a comet already calculated, induces as speedy a determination of the orbit, however approximate, as practicable,~~

~~If the observations used in the first computations are hear together, or the geocentric motion is slow, it will be preferable to wait for later positions, rather than occupy time in attempting a closer representation of the middle place. When later observations are available, the orbit~~

~~may be re-calculated, M or a being determined by Ol-~~

~~bers's formule of correct i eae on, employing 7', r &c., as deduced from the first anbit, ee. cigs~~

factory. though re iri : a generally iow pee care in working.

distances, We select three

d . es. as practicable, 00d observations at as wide intervals

These observations should be corrected

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for the effects of parallax and aberration by means of distances from the earth (A) calculated from approximate elements.

The aberration will be most conveniently taken into account by subtracting 497*‘8 x A from the time of obser- vation, and interpolating the values of A and Log. R from the Nautical Almanac for the time thus reduced,

Then, introducing the observed longitude aud latitude and the value of p, calculated from the approximate orbit, find 6, A, and r at the first and third observations from—

7. COs. A. sin. (—a) = R.sin. (A—a) r. cos. A. cos. (-a) = R.cos. (A—a)+p r sin. A = p.tan. B

Prom’,', + jvaid 6”, 0’, 7”, we compute the elements in the same manner as before, and thence the geocentric longitude for the time of the second observation, which call a, (The geocentric latitude may be substituted for the longitude, if it be changing more rapidly.) Also find the time by these elements between the first and third observations, which call ¢,. Now vary p’ by a small quan- tity, as 0-01 or 0-005 (=m), and find 6’, X’, r’ again, and with these new values, combined with the previous ones for 6”, X’”, r’, compute the elements, and compare again with the second longitude, and call the difference from the longitude first computed r ; also find the interval between the first and third observations, and call the difference in this case p. Next, with the Jirst values of p’, 6’, XN, 1’, combine 6”, Xd”, r” calculated from a similar slightly changed value of p”, (p”” +n), and, completing the elements, compare again with the longitude at the second observa. tion obtained with the unvaried p;p’, and also with the

corresponding interval between the extreme observations, and call the differeuces from the longitude and interval with unvaried curtate distances s and g. We have thus in the three calculations,—

5% +r, a + 8 ty ? ty oF DP; 4 Ar g The three hypotheses and corrected values of Pap are then— Hyp. I.| Hyp. WW. ; Wyp. IL True orbit, Assumed p' .... p |.p'+m |.p' y +2 wt ee mt pr" pp +n pp +y Interval between : extreme obser- t | ¢ +p t +q |(¢) observed interval. vations..... ; Second longitude % | a+r a +8 I(a) do. longitude. And we have— Bt qQey Mea m n r.2 8.Y dela ar (4) =41s.m—[(a)-a]q.m e)-d r.n-[(a)-a]p.n » S.p — 7.9 Y T.Q-s8.p

If the resulting corrections of the curtate distances are small, the true, or rather corrected, elements may be obtained by interpolation between the values obtained on the different hypotheses. When x and y are large, it is occasionally necessary to repeat the work, to have a close agreement between the middle longitude calculated from the corrected orbit and the longitude observed.

To make our article rather more complete, we may now refer to the calculation of ephemerides of the geocentric places of a comet from the parabolic elements, which are required during its visibility to facilitate observations. i a few places only are required, the right ascensions and declinations may be found in the manner already described ; but if the comet is likely to continue visible any length of time, it is more convenient to work by rectangular equa- torial co-ordinates, introducing the X, Y, Z, depending on the sun's position, which are now given with much detail

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in the Nautical Almanac, Before proceeding further, however, it will be desirable to explain the use of Barker's Table, to which reference has already been made, in the calculation of the true anomalies, as it dispenses with the longer computation introduced above, with the view to render our example independent of any other publication. The table had appeared from time to time, in one form or another, in various astronomical works; but in 1847 it was re-computed with extreme precision by Dr Luther, and printed in Encke's edition of Olbers's Abhandlung uber die leichteste und

~~bequemste Methode die Bahn eines Cometen cu berechnen. It is much too extensive to be reproduced here.~~

~~The true anomaly in the parabola is related to the time from perihelion by the equation—~~

~~75 ke (t-T) A x) where & is the Gaussian constant [log. = 8°2355814], and gq as before the perihelion distance. In the table— M = 75 tan. $v + 25.tan3 30~~

~~75.h.(t—T) or M = ae ae ;~~

~~= 75 tan. 4 v+25 tan.? $v~~

~~an equation, which, when q is known, allows either of (t—'T) being found from M, and consequently from v, or when (¢ — T) is known, gives M, and then, by means of the table, the corresponding v.~~

~~75k~~

~~Pui Cas ; C is therefore a constant and log. C=9'9601277. If, then, there be calculated for any comet the quantity— C is ¥~~

~~we shall have— M=m(t-T)=75 tan. 4 0+25. tan.? 3 0. To afford the reader a clearer idea of the great assist- ance which a table of this kind renders in cometary calcu- lations, we will apply Luther's table in the two cases where we have used direct formula in our example,— (1.) To obtain (¢'—T) from v= 98° 59' 43"-0.~~

~~WONG ssceseoce-+---2cderses- erg eee Plas. 7c smut cee 98480001 Uc 0) eee Sp aee eee 95440003 [Lo Cha ie eee ee 99601277 LOg. 10 .eeeeeeeessseeeeeeeeeeeentcenees 0°4161274~~

~~The table, of which the argument is the true anomaly (v), with interval 100", furnishes these values of log. M, near the above value of e—~~

~~ee ig Log. M. Diff. for 1". 98 58 WoL. 21066640 6), Ci ee 21070109 34°69~~

~~Wherefore, by simple interpolation, we find 98° 59' 43"-0 corresponds to log. M…2°1069519 ; from this value of log. M subtract log. m, as found above, and we have 1908245 for the logarithm of the time (in days and decimals) from perihelion, corresponding to 49°-07096, as before.~~

~~(2.) In the reverse process, the determinatien of 2, when (t —T) is given, we have in our example, as referring to the second observation with which the elements were compared—~~

~~(7 =I) cnpspeceossoasosodAbe +58°48950 DGG AO caalee< s2 nse---s 1°7670779 Geet geese ste ere ewe recess 0°4161274 Tipe PR Feist apace cn scams 22 e 2°1832053 Near this value of M the table gives us-— eee A Log. M. Diff. for 1" TO 4 ee Oe eee: 2°1830332~~

~~104 53 20. eeee 91834081 37°50~~

~~COMET~~

~~Whence, again by simple proportion, we find log. M= 2°1832053, which corresponds to 104° 52' 25:9", differing only 0"*1 from the value found in the example.~~

~~The student should procure the last edition of the work above-named for the sake of this table, and for the exten- sive catalogue of orbits of comets, coming down to 1864 and by far the most complete and reliable yet published.~~

~~It has been remarked that, where an ephemeris of geo- centric positions (right ascension and declination) for any length of time is required, it is convenient to calculate with rectangular equatorial co-ordinates, instead of by the process we have followed in comparing the orbit with the middle observation.~~

~~For this purpose we compute what may be termed co- ordinate constants, from the elements 7, &, and 7, and obliquity of ecliptic (e), by the following formule: :—-~~

~~P=cos. & P'=sin. Q cos. w P'=sin. Q sin.w : ; tan. 4 ; Q=-—sin. 2. cos. 7 tan. y= Q" =s. sin. (p+e) cs ak sin. 7 C Q =tTan. § = sin. v Cia ee =sin. a Q'=s.. cos. (Wy e) sn. G" =sin. ¢ ies A'=A(nr- 8) — = ion. B C'=C+(1r- Q Q Pp' 7 ho sin. 6 B'=B+(r- 8)~~

~~As a partial check upon the calculation, we have— sin. }.sin. c.sin. (C'— B') sin. a. cos. A~~

~~The angle y is to be taken in the first quadrant with its proper sign, and when the comet's motion is retrograde, 1 must be used with a negative sign. The heliocentric co-ordinates of the comet (a, y, 2) will then be obtained from—~~

~~tan. 7 =~~

~~r.sin. @.sin. (A'+%)~~

~~y r.sin. 0.sin. (B+)~~

~~z r.sin. c. sin. (C'+), x being measured in the direction of the first point of Aries, from the sun as origin of co-ordinates, 7 towards 90° of Right Ascension, and z from the plane of the equa- tor, positive to the north.~~

~~Similar co-ordinates of the sun, X, Y, Z, with the earth as origin, are found in the Nautical Almanac for Green- wich noon and midnight.~~

~~The Right Ascension and Declination are given by tan RA. = 58 tan pa Zt cos R.A.~~

~~The true distance of the comet from the earth (A) = L+2 sin. 8~~

~~Ag an example of this calculation we will find the co- ordinate constants applying to the elements of Borrelly's comet in this article.~~

~~Here = 282° 12' 48"-1 a- Q=34f 36 oe~~

~~7 = 80° 56' 275 (the motion being retrograde).~~

~~The mean obliquity of ecliptic, 1875 0 = 28° 27' 19"°9.~~

P=Log. cos. Q…..+9°3254186 Log. tan. 7… — 07974009

ae ee, Sam +9°3254186 — Log. sin. (9 aeition +.9°9900575 Log cos. 88 : Log. tan. Po veee— 14719828

*

Wott

Log. cos. 1….. + 9°1971480 me +£9°1872055 a 88 ge 8 Q….. + 9°1872055 Ye 90 07 19“ ‘9 ———— ae ———— G = 108: tan. A…..-+0°1882181 pre. 0b 06" eas Log. sin. go… — 99945489 Gee eye lafeye A) ee. in, dam 9-9997531 Log. sin. A…..+9°9077758 me ial kd Log. 8…..+9°994 P fo) ————* — — —. = log. sin.a 9°4176428 Log. sin. A

AAPG = Q).n.. 38 eos

ee

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Log. sin. &.....—9°9900575 Deg? sin. &@..... —9°9900575 We thus have, as the expressions are usually written, Log. cos. €..... +9°9625442 Log. sin. €..... +9°5999236 oe aps ~·· = w—r. [9°4176428] sin (88 34 46-540) (All quantities be. P’.....-— 99526017 P”..... —9°5899811 y=r. [9°9963572] sin (279 54 8-840)... ; ity of Bante Log. 5….. +9°994795 8 Log. e….. +9°9947958 z=. [9°9884500] sin (188 9 37°3 +4) logarithmic. Log. cos, (Y+e)-. . +9°6321902 Log. sin. (W+e).....~ 9°9558944 The true anomaly reckoned from 0° to 180°, in a direct Q/.. ... +9 °6269860 Q”..... — 9°9506902 orbit, is to be applied to A’, BY, and C, with a negative ig sign if the time for which we are calculating be before the ye tan. B….. -— 0°3256157 Q7=log. tan. C….. 9-6392909 perihelion passage, and with a positive sign if the time be ——— 3 aor Ring | Subsequent thereto. In a retrograde orbit the contrary pee 17 28“ ‘4 Cee rule is to be observed. Log. sin. B….. —9°9562445 Log. sin. C… . — 9°6015811 In our comparison of the elements of Borrelly’s comet Pp’ n. 99968572 y oe with the second

observation we found v= 104° 52’26”0, Wer a Log. sin, C ~’°8-81n-¢...9°9884500 | ang log. r= 01258616; the calculation of the heliocentric -.. ss 279° 54 8”8 C=C(r-Q Jesu 88° 9’ 879 panpates and geocentric place with these values stands 7 = ———————— | thus : — PAU se shcs 38° 34’ 46”°6 Bier emeiom se 808 C88" iO 87759 Slionad — 104° 52’ 26”-0 Oagonane — 104° 52’ 26”:0 ... —104° 52’ 26-0 A’ +1.....298° 42’ 206 TBReEOy, scsciseoee WSs a Apes C’+4.....83° 17’ 11”°3 og? Sin..... — 9°9617163 i) oe +8:9378148 Log. sin.....+8°9970118 I(x}, Pooaoe 0°1258616 NEGRI). 0°1258616 Log. 7..... 0°1258616 Constant.. ..... 9°4176428 Constiout.....0. 9 9963572 Constant. .... 9 “9884500 Log. 2.0.00: ~ 9°5052233 Log. yoo see vse. + 90600362 Log. z,.... +0°1113260 Bere. oe — 0°3200540 Pe. +0°1148249 . ... +1°2921890 DXi s5 — 0°0835382 Y… ..... — 0°89929894 Z..... — 0°3901925 X+a….6… — 0°4085872 Vt yorcceeeeee — 0°7844645 Z+ 2…4. + 09019965 Log. (Y+Y).0.....6. — 9°8945733 Log. (Z+2).....+9°9552048 Lop. (Z+2) .. +9°95590 Log. (X +2) eee — 9°6059374 Log. eos; Ril… — 9°6603729 Subt. log. BITC sc 0 vee vce +9 85425 Log. tan. R. \e. seen .. £0‘2886359 ~ —9°6155777 Log. A..... 0°10095 RB. Avs.ses…242° 46" 819 iniipitilel ati LA) a T9617 Log. tan. 6..... +0°0096403 6.... + 45° 38’ 9”*1 For the demonstration of the method of determining a Group A. parabolic orbit, which has been here adopted, the reader may I. Encke’s Comet. consult Olbers’s work, already mentioned, and for various | T… ..1875, April 13-0682 ¢... 0°849428 (the eccentricity). modifications and refinements he is referred to Encke’s . 188 24 3 a…2°21105 (the semi-axis major). treatise, Uéber die Olbers’-sche Methode zur Bestimmung der | 9’”” “ “ “334 49 4g | 1880-0 ae SeSryerte Cometenbahnen, in the appendix to the Berliner Astro- | ¢ . 18 7 29

| nomusches Jahrbuch for 1833; he will obtain much addi- tional information from the treatise on Theoretical Astro- nomy, by Prof. Watson of Ann Arbor, U.S., and from Prof. Oppélzer’s work, Bahnbestimmung der Kometen und Planeten, Leipsic, 1870,

On the solution of Lambert’s equation, we may refer him to a paper by Mr Marth in Astronomische Nach- richten, vol. Ixv., Nos, 1557-60, which he will find accom- panied by elaborately constructed tables. To obviate extending this article to inconvenient length, the introduc- tion of tables has

been avoided throughout; and should it fall under the notice of any one practised in such calcula- tons, we must beg him to attribute any deviation from general rules to the wish to make the article complete in itself, so that the student may compute parabolic elements of any new comet, and its apparent track in the heavens therefrom, without extraneous assistance.

For the method of calculating elliptical orbits, when decided deviation from the parabola is indicated, the reader 18 referred to Gausg's classical work, Theoria Motus Corporum Coclestium, originally published in 1809, a translation of which, by Commander Davis, U.S.N., was ge at Boston in 1857 ; in this volume he will also find the demonstration of the formule employed in calculating Seocentric places from the elements of the orbit, of comets of short period we he comets for which periods of either established or have been 8s degree of probability, and in periods, but not exceeding eighty ts in order of length of period.

f longer

] : | Years, the come

We take

T is expressed in Greenwich mean time.

The revolution of this comet in about 3} years was discovered by Encke on its appearance in 1818-19, when it was detected by Pons. Encke, having calculated the effect of perturbation by the planet Jupiter, showed that the comet had been previously observed in 1786, 1795, and 1805, though missed at the intervening returns, It has been observed, with more or less success, at every appear- ance since 1819. Encke's investigations soon led him to infer that the comet's period had slightly diminished since 1795, and that this diminution might be owing to the effect of a resisting medium. The late researches of Dr von Asten of Pulkowa indicate that it is only in certain revolutions that an effect of this nature can be sus- pected, so that great doubt is thrown upon the validity of Encke's

theory. II. Blanpain's Comet. 1819, IV. J eae 1819, Nov. 20, 2148 iO nemectieten 0°686746. 67 18 £b CARR ne Gre 2°84931. Tees eesesesecens

Period…4°81 years, Be ey 77 13 574 1819 Direot: rarer ar 9 1 16

These elements were calculated by Encke, who had ascertained that the motion of the comet could 'not be represented by a para- bolic orbit. Clausen thought the comet was identical with one observed in 1748, which also exhibited a deviation from the para- bola, and Olbers favoured his view, but no elliptical elements have yet been deduced directly from the observations of 1743. Ele- ments which appear in some of the catalogues of comet-orbits with Clausen's name attached, were merely inferred from an assumed semi-axis major of 3°10, founded upon the hypothesis of identity with Blanpain's comet of 1819. The latter has not been observed since that appearance.

III. Burckhardt's Comet. 1766, II. SURE 1766, April 26°9581 Cras 0°86400 5d aes 293368. isthe on newman 251 13 0) 1766 Period…5°025 years, DS Sse Se aleedip

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Though there is great probability of the identity of this comet with Winnecke's comet (No. VII.), it is preferable at present to treat of these bodies separately. The comet of 1766 was undoubtedly moving in an elliptical orbit of no long period, as was established by Burckhardt after a great amount of computation, but the obser- vations were not sufficiently precise to allow of the length of revo- lution being found with exactness.

IV. Tempel's Comet. 1878, Il. ee ae 1873, June 25°3777 (neeneenee 0°544156 he gee (eeaeeeeee 2°94954 The seccesecees Period..5°066 years. DUR oso esen ne 120 54 9 t 1873 : Direct. DeWeese 12 438 20

Discovered by Tempel at Milan, 1873, July 3. The marked deviation from a parabolic orbit was soon independently noticed in England and on the Continent. It does not appear that there is any record of this comet having been observed prior to the year

1873.

V. De Vico's Comet. 1844, I. de oe 1844, September 2°4779 (Terascsone 0°617372 a mf hte 8:10045 TeoseeseeeB42 30 48 1844, Period..5°459 years. {ORS o Ageneipee 63 49 38 Sept. AL. Dircct. NCEE eee: 2 54 46

Discovered by De Vico at Rome, 1844, August 22. Notwith- standing the elaborate calculation of the orbit by Professor Briinnow, the comet has not been detected since 1844. The researches of M. Leverrier make it highly probable that this body is identical with the comet observed by Lahire at Paris in 1678, though it was not dctected at any one of the many returns to perihelion which must have taken place in the interim.

VI. Brorsen's Comet. 1846, III. a eee 1873, October 10°2694 Con. ee 0'808560 lie 2% 90 Goin tees 3°10556 Teese erence : Period..5°473 years. sete 101 12 38 t 1870°0 eae Hibeccceeeccaet 29 24 13°

Discovered by Brorsen at Kiel, 1846, February 26, and since ob- served at several returns, including the last in 1873, to which year, it will be seen, the above elements apply. The comet appears to have been detected at its first passage of the perihelion in the present orbit, the form of which is evidently due to a very near approach to the planet Jupiter in May 1842. A first approximation to the elements previous to this encounter with Jupiter has been given by the late Professor D' Arrest.

VII. Winnecke's Comet. 1858, II (=1819, III. =1766, II. ?) ee 1875, March 12°1765. 2 oop 0°7410138 ~·~· Y ante te 3°20081 iets oni esipereisls { Pe iod..5°727 i Bo oe 1 (180 ee Gm sonccenes 1117 4

A comet discovered by Professor Winnecke, 1858, March 8, was soon found to be moving in an elliptical orbit of short period, and to be identical with the third comet of 1819, to which Encke had assigned a revolution of 5°62 years. The two appearances of 1819 and 1858 have since been connected, from calculation of the per- turbations produced by the planet Jupiter, by Clausen, so that there jg no possible doubt of the identity of the comets of these years. According to Clausen's computation, the intermediate perihelion passages took place, 1825, February 5; 1830, August 21; 1836, March 3; 1841, September 13; 1847, March 29; and 1852, October 11, the comet being missed at every return. Our elements are for the last appearance in 1875. (See No. III.)

VIII. Pigott's Comet. 1783. A bsceraes 1783, November 19°9304 Cate 0°552456 So ff aemaconoos 3°26066 pees ia Lies t 1783-0 Period…5°888 years. BD) Peieeciese nee 55 40 31 Direct. oe 2 se ORES

Certainly a comet which, at the time it was detected by Pigott (of variable-star celebrity) at York, 1788, November 19, was moving in This was first established by Burckhardt about the year 1819, but the most accurate orbit will be that of Professor Peters of Clinton Observatory, New York, who The comet has not been observed since 1783, but Peters has pointed out

an orbit with short period of revolution.

has used improved solar places. His orbit is given above.

that with a major axis differing very little from that he had found,

the comet might have encountered the planet Jupiter at some one of the aphelion passages subsequent to 1783, and thus have under-

gone an entire change of orbital elements.

GoM TT

IX. Lempel's Comet. 1867, II. (deja 1867, May 238°9204 Gaguessaae 0°509706 236 9 54 Pp ae desas 3°18903 Ufoapenoooo cde : eriod..5°695 eS for 10 40 418670 Diet am We euictes sace 6 24 36 Gy Wescaee 1873, May 9°0134 Peeeepenes 0:461999 937 bg fo . weave 3°28895 Meese aateeee 2473, iod..5°96 8 78 44 39 wala io eee i ia ce gemene 9 44 13

Discovered by Tempel in April 1867 ; the periodicity established at the same appearance. We have here given orbits both for that year and for the next return in 1873, on account of the heavy perturbations which the elements suffered from the attraction of Jupiter, near to which the comet passed about the aphelion passage, It will be seen that the node was thereby thrown back more than 22°, the inclination increased 33°, and the revolution lengthened upwards of three months. The least distance between the planet and comet was about 0°32, the earth's mean distance being taken as unity.

X. Biela's Come.

The periodicity of this comet was ascertained on its discovery in February 1826 by Biela, at Josephstadt, Bohemia, and independently by Gambart at Marseilles about ten days later. Both discoverers remarked the similarity of elements to those of the comets of 1772 imperfectly observed by Montaigne at Limoges, and the first comet of 1806. Clausen's calculations showed that the period of revolution between 1772 and 1826 had been about 62 years, the comet having escaped observation at the intermediate returns, excepting that of 1806, when it was detected by Pons. Professor Santini of Padua has principally occupied himself with the investigation of the motions of this comet, and more recently the late Professor Hubbard of Washington. The comet was observed at its re-appearance in 1832, but missed in 1839, from proximity to the sun's place. At the next return in 1845-6 it was again found, and at this appear- ance a remarkable separation into two distinct nebulosities took place under the eyes of astronomers. In 1852 both components were re-observed, and were found to have considerably widened their distance from one another. At the return to perihelion in 1859, there was no possibility of observations from unfavourable position in the heavens; but in 1866, according to calculation, which in- volved accurate determination of the planetary perturbations, its track seemed likely to favour observation, yet, notwithstanding long and minute search, the comet was not found, nor was anything seen of it as a comet in 1872. In this year, however, there occurred an extraordinary shower of meteors at the eud of November, which beyond doubt were moving in the orbit almost identical with that of Biela when last observed. Subjoined are the elements of the two nebulosities forming the comet at the last appearance in 1852 :—

(Xe) al Wanone 1852, September 23°0443 Peete: 0°755838 ; 109 '9 6 } Ceca aeeee 3°52479 ''ipp Ganpadc . Period..6°618 years. Be oe ae Mele as jo Die Ulsan oes 3) ll (6%) Wosooc 1852, September 23°7259 eee 0°755872 'en 6 Fi Or vee 3°525387 A Sox ash SPEC . Period..6°619 years. Q 245 52 15 t 1862-0 ses Pecneate cos We aay 245 XI. D'Arrest's Comet. } T……1877, May 10°3325 6s :sceee 0627805 i » ts Bins. seen 3°541389 Teeveseeserees Period..6°664 years. Ee ee 146 9 28 { 1880 Dine a We cto 1 43009

Discovered by D' Arrest at Leipsic, 1851, June 27 ; he suspected 4 marked deviation of the orbit from a parabola as early as July 8, and elliptical elements were very fairly determined at this first observed visit. MM. Villarceau and Leveau of Paris have prin- cipally occupied themselves with the motions of this body, which, like others of the group, approaches very near to the orbit of Jupr- ter, thereby at times undergoing considerable perturbation. This was the case in 1861, when the distance between the two bodies was only 0°36, so that the elements we have given above for 1877 are materially different from what they were in 1851; the period 0 revolution is now about 100 days longer than when the comet was discovered. It was observed in 1857-58 and in 1870, but at the intermediate return.

XII. Faye's Comet.

T……1873, July 18-4866 © csve.s0°557383 a We 22a 380188 Saat Dericiosod 50 2 53 1870°0 Period…7°412 years. fo EER eABSEEee 209 38 57 Direct. (heSageesannad He S250)

COM FE T 193

Discovered by M. Faye at Paris, 1843, Nov. 22, and period deter- IV. Pons's Comet. 1819.

i this appearance. M. Leverrier has niade very extensive tee sali y ee Beccoe the previous motions of this comet, which he : a ae el juad ae ae a ae 4 considers to have been revolving in an orbit of the above limited P Heabceaenptee

calculations relating to this comet have for many years been in the hands of Dr Axel-Moller of Lund, the results of whose masterly com- putation of the perturbations will be found in various volumes of the Astronomiche Nachrichten. Observations have been made at every return to perihelion since 1843.

Detected by Pons at Marseilles, 1812, July 20, and independently at a later date by Wisniewsky at Novo-Tcherkask. To Encke is due the discovery of the periodicity, but it is doubtful if the length of revolution can be inferred from

~~the observations, within several months, so that although another perihelion passage is approach- ing, no reliable prediction of the track in the heavens is at present~~

~~XIII. Peters's Comet. 1846 (V.) practicable.~~

~~T .,...1846, Juue sand pitas Wey V. De Vico's Comet, 1846, III. ae 240 7 35 1846-0 Period…12°85 years, T……1846, March 5°5454 Ce. ee 0962089 > 260 28 59 Sk we Choc oan GOO: We O72, (eee oO) 24 24 5 Tree eee e ees 90 a oy) 18460 Period…..73°25 years, i ||| pee. ee eA : i Discovered at Naples by Dr Peters, now director of the Observatory i ee: 85 5 42) Pircor~~

~~of Clinton, U.S., 1846, June 26, and not observed elsewhere, ex- cept at Rome on July 2. The period of revolution is uncertain to +1°6 years, according to Peters's last discussion of the observations of 1846, since which year the comet has not been found, though there appears to be no doubt of the great deviation of the orbit from~~

~~Discovered by De Vico at Rome, 1846, Feb. 20, and in a few wecks recoguized as a periodical comet, ellipses having been calculated by Breen, Hind, and Peirce, The most reliable orbit, which is given above, is by Van Galen. This comet makes a near approach to the orbit of the planet Venus,~~

~~a parabola, ' XIV. Tuttle's Comet. VI. Olbers's Comet. 1815. T,.....1871, December 1°7974., Ce, 0°821054 eer 1815, April 25-9929 Orroconaancon: (Ose Oo) te j of 2c RE 5°75652 ona oe (2 Ree OH eeeen 17'6338 'tod ghoeC eee Period…13°81 years, Teves eseees Period …..74'05 years. a… 269 17 125 1870 nen See 83 28 54 we ied } onodo ieee Syl ily) Uae are 44 29 55~~

~~Periodicity discovered in 1858, when the comet was detected by Mr Tuttle at Cambridge, U.S. (January 4). It was soon found to present a great similarity of elements to those of the second comet of 1790, which was found by Mechain at Paris on January 9, and further investigation established the identity of the comets, five revolutions having been performed between 1790 und 1858. The two appearances have been connected by the calculation of the per- turbations in the interval by Clausen and Tischler.~~

Discovered by Olbers at Bremen 1815, March 6. The elements transcribed were calculated by Bessel upon the whole course of observation ; very similar ellipses were also found by Gauss, Nico- lai, and Nicollet. Bessel computed the effect of planetary attrac- tion upon the motion of the comet in the actual revolution, and as- signed the next perihelion passage to 1887, Feb. 9; but unfortunately ey date is not to be relied upon within anything like narrow imits,

VII. Brorsen's Comet. 1847, V.

Group B T……1847, Sept. 9°5427 Bacsesscsente O°OMOBEO : © 4 a" CON aiareel ats yialeisie 177795 I. Comet 18661. ('Tempel.) TW sve seeeeeans 79 12 6 1847 Veriod…..74-97 years, ' Sa) canes 309 48 49 Direct. T……1866, January 11°1339 Cees ic ee i 19 8 25 sili ls, a a rr

(i? deco 60 28 5) 1866-0 Tee ae-te years. Discovered by Brorsen at Altona, 1847, July 20. While there Biv. .281 26 84 Retrograde, appears to be no doubt of the ellipticity, the period is yet open to RE cess 00 sks elise 5 cousiderable uncertainty, Dr Gould (the present director of the

Observatory of Cordova) having inferred a revolution of 81:05 years, It is one of those comets which yet require a more miuute calcu- lation.

| This body is widely known as the '"comet of the November

—MIneteors," which have been found to move in an orbit that is almost

identical. It was discovered by Tempel, 1865, Dec. 19 ; the best determination of the elliptical elements is dune to Prof. Oppolzer. The ensuing return to perihelion will be looked for in 1899, in which year a repetition of the grand meteoric display of 1866 may

VIII. Halley's Comet.

In the case of this celebrated body we shall content ourselves with reproducing the elements for the appearance of 1835-36, as

also be expected, elaborately worked out by Westphalen, and the elements assigned for the next return in the year 1910 by the late Count de Ponté- IT. Stephan's Comet. NS Gvsel: coulant. ; T……1867, January 19-8606 Oscar ee 0'849055 . Elements of 1835-36. 5 go (6 Bek 10°41762 T……Nov. 159082 Coca. ae oe ae Treeae sevens '9 Period….33°62 years. ON AF (inaounoporpaadya 17°9 B veces 78 35 45 iad Direct. Y Tee senereens a 2 1835:0 Penod'…… 76°30 years 4 menwels 12 35 ae cee renters i) Retrograde. Digg by Stephan at Marseilles, 1867, Jan.27. The elliptical SMa > orbit which represents the whole course of observation very closely 1s due to Mr Searle of Cambridge, U.S. This comet appears to Elements of 1910. a. make a very close approach to the orbits of Mars and Uranus, and T……. May 23°86 yeserrans 038 0°9617 33 it is rk the actual form of orbit may be owing to an encounter 365 88 14 Jen G0 cna 179555 with the latter planet near the aphelion., 5 ae 57 10 38 ioig «=F kee ee OOCerorcory vetrograde. i oe 17 46 51 a SS anaes Comet. 1852. It would be useless to attempt to present a history of Halley's T…---1852, Oct. 12°7628 © veeccceeeee 0°918463 comet within the space to which this article must be limited. With | 7 43 14 8 ae 15°8315 regard to its history previous to the year 1456, the earliest Maat an 346 9 4g ¢ 1852°0 Period….60°03 years. known to Halley, the reader may refer to a paper on "'The Past t AO 54 98 Direct. History of the Comet of Halley," Hind in Monthly Notices of the

Royal Astronomical Society, vol. x., in which the appearances of the comet are traced back with a greater or Iess degree of proba- bility to the year B.c. 12, chiefly by aid of the details preserved to us in the Chinese annals ; also to a remarkable memoir by the late Dr Angstrom of Upsala, Sur deux inégalites d'une grandeur re- marquable dans les apparitions de la comete de Halley, Upsala, 1862, which is corroborative of the conclusions in the ae ee paper. . R.A, oe VI. — 25

— Discovered by Westphal at Gottingen, 1852, July 24. The ellip- tical character of the orbit Was first established by Marth in the same year, Elements, in the calculation of which the effect of planetary attraction during the period of observation is included, have been published both by the discoverer and by Dr Axel Moller, whose

~~elaborate investi. ations relating t : mentioned, § g to Faye's comet have been already~~

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~~COMINES, a town of France, in the department of Nord and the arrondissement of Lille, on the River Lys, which there divides Belgium from France. It is a thriving manu- facturing town, with breweries, linen and tape factories, bleachtields, and oil-works. The principal building is the collegiate church of St Peter's. It was in this place that Comines, the French chronicler, was born. Population in 1872, 4020 in the town, and 6353 in the conimune.~~

~~COMINES, Puturprs pe (1445-1509), called the father of modern history, was born at the castle of Comines. He lost both father and mother in his earliest years. In 1463 his godfather, Philip of Burgundy, summoned him to court, and soon after transferred him to the household of his son, afterwards known as Charles the Bold. He speedily acquired considerable influence over the mind of Charles, and in 1468 was appointed chamberlain and councillor ; consequently when in the same year Louis XI. entrapped himself at Peronne, Comines was able both to soften the passion of the duke and to give useful advice to the king, whose life he did much to save. Three years later he was charged with an embassy to Louis, who gained him over to himself by many brilliant promises. In 1472 he left Burgundy for the court of France. He was at once made chamberlain and councillor ; a pension of 6000 livres was bestowed on him; he received the principality of Talmont, the confiscated property of the family of La Tremville ; and many other dignities and presents of land were con- ferred on him by the king. He was employed to carry out the intrigues of Louis in Burgundy, and spent several months as envoy in Italy. On his return he was received with the utmost favour, and in 1479 obtained a decree confirming him in possession of his principality.~~

~~On the death of Louis a suit was commenced against Comines by the family of La Tremville, and he was cast in heavy damages. He plotted against the regent, Anne de Beaujeu, and joined the party of Orleans. Having at- tempted to carry off the king, and so free him from the tutelage of his sister, he was arrested, and put in one of his old master's iron cages at Loches. In~~

1489 he was banished to one of his own estates for ten years, and made to give bail to the amount of 10,000 crowns of gold for his good behaviour. Recalled to the council in 1492, he strenu- ously opposed the Italian expedition of Charles VIII, in which, however, he took part, notably as representing the king in the negotiations which resulted in the treaty of Ver- celli. During the rest of his life, notwithstanding the acces- sion of Louis XII., whom he had served as duke of Orleans, he held no position of importance ; and his last days were disturbed by law-suits. He died at Argenton in 1509.

The Memoirs, to which Comines owes his reputation as a statesman and man of letters, were written during his latter years ; the first six books are assigned to 148894, and the next two to 1497-1501. Hallam says of them that they "almost make an epoch in historical literature ;" and Saint-Beuve, after speaking of Comines as being in date the first truly modern writer, and comparing him with Montaigne, says that his history remains the defini- tive history of his time, and that from it all political history took its rise. None of this applause is undeserved, for the pages of Comines abound with excellences. He analyzes motives and pictures manners, he delineates men and de- scribes events; his reflections are pregnant with suggestive- ness, his conclusions strong with the logic of facts.

of these popular assemblies.

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The Memoirs remained in.MS. till 1524, when part of them were printed by Galliot du Pré, the remainder first seeing light in 1525. Subsequent editions were put forth by Denys Sauvage in 1552, by Denys Godefroy in 1649, and by Lenglet Dufresnoy in 1747. That of Mademoiselle Dupont (1841-48) is the best. Various trans- lations of Comines into English have appeared, from that of T. Danett in 1596 to that, based on the Dupont edition, which was printed in Bohn's series in 1855.

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COMITAN, or ComrTLan, a town of Mexico, in the state of Chiapas, on the River Grijalva, a tributary of the Tabasco, about forty miles south-east of San Cristobal, the capital of the state. It has a superb church, and a convent dedicated to St Domingo, from which it takes the more precise designation of San Domingo Comitan. The inhabitants derive their subsistence in great measure from agriculture ; but they also carry on a smuggling trade with Belize and Guatemala. Population about 10,000.

COMITIA, derived from con and tre, was employed by the Romans to denote an assembly of the people, called for the purpose of accepting or rejecting some proposition submitted to them by the heads of the state. It was a fundamental principle of the Roman constitution that the supreme power was inherent in the citizens, though it might be delegated by them to hereditary or to elected magistrates. All important matters, however, had to be brought before the sovereign people, who could either ratify or reject, but without discussion, the proposals made to them. Such, at least in theory, and, during the best days of the republic, in practice also, was the function

As may be readily understood, different elements had the ascendency among the Roman people at different periods in their history. So far as it was possible for a state exposed to so many and such various influ- ences to be conservative of its political traditions, Rome, whether monarchical, republican, or imperial, was essen- tially so. But under the force of circumstances innovations were introduced from time to time, which materially altered the position of the two political parties—the patricians and the plebeians—into which the state was early divided, and by whose dissensions it was long distracted. And in none of her institutions can the progress of the struggle be- tween these rival factions be more clearly traced, than in the nature and powers of those assemblies or comitia, by which the supreme authority at Rome was in succession

It is usual to describe the Roman comitia as of three kinds, named from the mode in which the people were organized and in which they voted—the comitia curiata, or assembly of the curiz ; the comitia centuriata, or assembly of the centuries ; and the comitia tributa, or assembly of the tribes. To these some add a fourth,—the comitia calata (from calare, to

~~*call); but as this assembly had neither political functions nor a separate organization, it is unnecessary to do more than mention the name.*~~

~~*1. Comitia Curiata, The assembly of the curie is believed to have been coeval with the rise of Rome itself, and its origin is therefore rightly ascribed by tradition to the mythical founder of the city. The system seems to have been an essential part of the constitution of the early Latin communities, of which Rome was originally only one. Its primary object cannot now be satis but the purpose for which it came to be employed 18 sufficiently clear. From a very early period, the Roman curie, or "wardships," as they may be called, numbered thirty, being ten for each of the three once independent com- munities—the Ramnians, Tities, and Luceres—from whose amalgamation the Roman people sprang. At first these lusively of the freeholders, or patricians, as the latter were afterwards designated, 02 whom devolved exclusively the right and duty of bearing arms, It has been maintained by some that the class of dependents called by Roman writers burgesses or citizens had a right to vote in the assembly of the curiz. No direct evidence, however, can be brought forward in support of this supposition, which in the nature of the case is highly improbable ; | present at all, they were likely nothing more than spectators,*~~

~~*factorily determined ;*~~

~~*clients as well as the*~~

~~*and, if allowed to be*~~

~~*. Up of the most wealthy members of the landholder class,*~~

~~*COMLTIA 1s*~~

~~*or, as their name is said to imply, . listeners." In an assembly each curia had one vote, which was determined by the majority of the individual votes in the different curiz. As the number of the latter was even, and no provision was made for deciding the matter in the case of their beg equally divided on any question, it would seem as if this function had not been thought of in fixing the number of the curie, or had been subordinated to some other consideration.*~~

~~2. Comitia Centuriata, By the operation of causes sufficiently obvious, a great increase soon took place in the numbers and influence of the dependent members of the Roman commonwealth. As a natura] consequence, the way was paved for a reform of the constitution, though we may well conceive that the step was hastened by the gradual thinning of the ranks of the old freeholders in the incessant wars in which Rome found herself involved with her neighbours. Thus in the course of time a new class, the plebeians of history, arose out of the clients, pre- ponderating in numbers and by no means destitute of wealth. If this class was allowed no rights as citizens, it was exempt from service in the field; and while their political inferiority must have Leen galling to its members, their immunity from the chances of war can hardly have been looked upon with equanimity by the ruling faction. It was to redress this twofold grievance that the reforra ascribed to King Servius Tullius is generally believed to have been effected. But the whole scheme was one skilfully devised, so as to assign to the plebeians duties rather than to bestow upon them rights, and it was evidently the work of a statesman who was in the interest of the patricians. Our chief authorities for the details of the arrangement are Livy and Dionysius, whose accounts, though they differ in some particulars, agree in the main, We must bear in mind, however, that both of them describe the assembly of the centuries rather as it existed in their own day than as it was at first constituted,~~

~~According to the authors just named, the whole body of free Romans, burgesses and non-burgesses, was divided into a certain number of classes (z.e., " summonings," probably from calare), numbered according to the amount of fortune possessed by each citizen. The class of each man was ascertained by means of a register, drawn up every five years by officers appointed for the purpose, in which were set forth in detail the age of the citizen, the amount of his property, and other particulars. The first class comprised all whose fortune was estimated at not less than 100,000 asses or pounds of copper, sub-divided into 40 centuries of "juniors," who could be called upon for active service, and 40 centuries of "seniors," who in time of war were to do garrison duty at home. In the second class were enrolled those who had property valued at not less than 7 5,000 asses, with 10 centuries of juniors, 10 of seniors, and 2 of artificers, The third, fourth, and fifth classes included those who possessed hot less than 50,000, 25,000,~~

and 12,500 (according to Livy, 1] 000) asses respectively, sub-divided into centuries in @ similar manner. Those who had not a sufficient Money qualification are included by Livy in the fifth class, and made to form a single century, but are reckoned by Dionysius as a sixth class. In addition, there were 18 centuries of equites, or cavalry, who always voted first, made

If they were agreed on the question at issue, the other classes were not called upon to vote atall. As the cen- turies, though nominally "hundreds," might and probably did contain fewer in the first class, and certainly many times more than that number in some of the other classes, it is plain that in the assembly by far the largest share of power was retained in the hands of the wealthy, of whom the original burgess element would long form the main por- tion. How far we have in this scheme merely a modification of an earlier arrangement there are no means of deter- mining, As Mommsen remarks, it is more than pro- bable that the assessments were originally laid on land. Be this as it may, the Servian reform was originally a new inilitary rather than a new political organization, its author intending that the privileges of the patricians, assembled in their curiz, should remain as before. But its results were different from what had been anticipated, By a process easily understood, the rights of the curiz gradually passed to the centuries, The assembly of the former continued indeed to meet, but the assembly of the latter became thenceforth the chief guardian of the rights of the Roman people.

3. Comitia Tributa. The further growth and develop- ment of the democratic element in the Roman constitution, consequent on the change just described, soon led to a demand for greater changes in the same direction, The tribunes of the people, now the acknowledged leaders of the democracy, took advantage of an ancient division of the original territory of Rome into tribes, to give greater prominence to this element than it had yet possessed. These tribes, 30 and afterwards 35 in number, which, as is supposed by some, had already supplied a basis for the arrangement into curie as well as classes, seem to have at first existed for purely local purposes. But the leaders of the people succeeded at length in forming them into a political union entitled to exercise certain functions, chief among which was the election of the inferior magistrates, and the approval or rejection of such legislative measures as affected the interests of the

~~plebeians as a class. Whether the assembly of the tribes was composed of plebeians only, or of all, whether patrician or plebeian, living within certain limits, has not been ascertained, the balance of opinion inclining to the hypothesis that makes it to have consisted of plebeians alone. After the rise of this new power, it became a matter of great difficulty to determine what questions were to be submitted to the tribes and what to the centuries, each claiming to be the real re- presentatives of the whole body of the people. A solution appears to have been sought for and found in some com- bination of the two rival assemblies. At what times this change took place, and what was its exact nature, are matters that must ever remain involved in the greatest obscurity. All that can be said is this ; either by means of their own assembly, or by their using it somehow for the purpose of counterbalancing the power of the patricians in the assembly of the centuries, the plebeiaus ultimately gained what they had so long aimed at— a position of supreme importance in the republic. When the wealthier classes found their influence thus neutralized, they ceased to attend the comitia altogether, and the popular will was represented by the lower classes alone. A period of moral and political corruption followed, ending in the military despotism of the Cxsars. Under the first emperors, the form of calling the assemblies together was still observed, but the people met no longer to control their chief ruler, but simply to receive information as to what he had done. Even this form was by and by discontinued, and in the last days of the empire the comitia was an institution known only as one of the traditions of the past greatness of Rome. (3. MD.)~~

~~the actual possession of land being apparently regarded as @ necessary qualification for this, the favourite branch of the service, Livy gives the whole number of the centuries as 194; Dionysius makes them igs. The Voting in the assembly was by centuries, each century Possessing a collective vote exactly as in the case of the curl, It was go arranged that the 18 centuries of equites and the 8 centuries of the first class voted first,~~

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on the Humber, a Newcastle on the Tyne, and a rapidly rising Middlesborough on the Tees ; why the Thames should maintain, after many centuries of change and amidst many rivals, its pristine supremacy, and yet the western coast of our island be much more brilliant commercially than the eastern. our understanding why the earliest records we have of great seats of population should be on the Euphrates, the Nile,

OMMERCE, in its general acceptation, is the inter- national traffic in goods, or what constitutes the foreign trade of all countries as distinct from their domestic trade, and it will be convenient in this place to treat it chiefly under this aspect .

The same causes which give rise to exchange of com- modities in a limited field call it into operation over more extended territories, and the same effects which flow from it in the smaller flow from it in the larger sphere. There are the same phenomena in either case, but in proportion as trade extends beyond the narrow boundaries of a tribe or a nation, the greater are the obstacles it has to encounter, not only in physical distance, and the practicable transit of commodities, but in computation, in gauging the capacity and course of markets, in the risk of making wrong adven- tures, in the rivalry and exclusiveness, the wars and revolutions of states; aud consequently the more liable it becomes to complications, partly native and partly foreign to itself, by which its advantages have been obscured and its progress has been impeded in all ages.

Special function of labour, but a development of natural resources where most commerce. abundant and accessible. As long as mankind live in scattered and isolated families, each supplying its own wants directly by its own labour, there can be little or no com- merce ; and as long as there is no commerce every local habitation of man must depend on its natural resources,

however poor, unvaried, or difficult to utilize. Division of

~~labour and exchange may be said to be of twin birth, since the existence of the one cannot be conceived without the other ; and as they grow up from the simplest embryo, they act and react on each other, giving always wider scope to their mutual operation, and preparing a certain density of population in central places, or markets, where the traffickers meet and artificers find it their interest to settle, whether in the desert where caravans converge in their various routes from one region to another, or at the conflu- ence of navigable rivers, or in secure bays of inland seas, commanding an extensive coast line, or some interoceanic passage, and thus laying the foundation of towns and cities, to become, it may be, as they have become in many instances, the seats of rule and empire. The direct result of these primitive human instincts, as they may be called, of division and exchange of the products of labour was to extend among mankind a material and social comity, apart from all tribal or political relations, from which sprung, as on a solid base or framework, the fair but often frail fabric of civilization, arts, sciences, letters, philosophy, religion— all that gives grace and dignity to humanity. The special office of commerce, in the material part of the economy, is to organize places, soils, climates, all local conveniences of land or sea, and superior natural resources of various countries, as that of the division of labour is to organize the talent, handiness, and aptitude of individuals.~~

~~The formative and developing power of this function of commerce is much more conspicuous in the phenomena of ancient history and in contemporary results than may at first sight appear It were easy, judging from local quali- ties alone, to expla why the metropolis of the United Kingdom should be on the Thames where London now is ; how rival ports arose along. the western coast of Britain, on the Severn, the Mersey, and the Clyde; why Lancashire should have become the great centre of the cotton manufac- ture; why Dundee, from a small beginning in flax from the adjacent Baltic, should have become a great emporium~~

~~of flaxen and cognate fabrics ; why there should bea Hull !~~

~~Exchange of commodities implies not only a division of~~

~~But the same principle may be no less a guide ta~~

the Ganges, and the Blue and Yellow Rivers of China ; how Palmyra, the ancient grandeur of which has been discovered in its modern ruins, should have been built in the middle of a desert ; how the cradle of navigation and maritime commerce should be so indelibly couched along the coasts and round the numerous islands of the Mediterranean Sea; how international trade, seeking an outlet from its dreary prison of overland desert, war, and rapine, should have found it for a time by the Mediterranean to the Red Sea and the Indian Ocean, only to be diverted by a bold navigation round the cape of Africa, and should now be returning under more secure conditions to the shorter route again. The tendency of commerce to connect one seat of population with another, to open roads, to seize on every physical advantage of transit between them, to create new centres of industry and traffic on the lines of communication, and by the union, not only of human labour and capacities, but of almost boundlessly diversified territorial resources thus effected, to increase the production and circulation of commodities, is too obvious to require illustration. This is what has been called by economists "the territorial division of labour," but the term scarcely reaches a full expression of the effect of commerce. 'There is not only a territorial extension of the division of labour in the sense of being spread over a larger area and a greatly more numerous population, but the physical resources, the natural agents of wealth them- selves, as found in various countries and places, are brought into the general organization as they could be by no other means, and made to yield in due harmony with each other all their special and relative superiorities.

A consideration of this action of international traffic in commodities is sufficient to dispel many false views that have at various times been propounded with much authority—such as that commerce, being an exchange of value for value, can add nothing to the general wealth ; or that the profit of one party to an exchange is the loss of the other party ; or that the only profit of commerce con- sists of the balance accruing in the precious metals ; and similar crudities of conception. The substratum of the whole system of international traffic is that commodities, after bearing the cost of transit, are of more value in one place than in another. Commodities are often so abundant, or capable of being produced so abundautly in some places, as to be superfluities, and absolutely valueless in such places, and yet are of much value in other places. As this relation is mutual, there is nothing inconsistent m an exchange of commodities of more value in one place than in another with a gain of value on both sides of the exchange ; and this becomes all the more apparent when, Ul addition to the profit of the merchants or agents employed in the transaction, there is taken into account the gall arising to the communities in their industry, and in the pro- fits of their industry. a

Exchange of commodities must have been coeval with A human society. However self depending on their own a labour men may have been in the social state, they must soon have had some commodities to exchange with each

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other, and as stock increased the process would rapidly extend. 'The liability to failure of crops and to famine must have led to storing of corn in seasons of plenty, and

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nings, but they were pioneers of foreign trade, and showed to their richer neighbours that the desert could be pierced.

to occasional traftic in the first necessary of life.

~~The earliest records of commerce on an international scale are to be found in the Hebrew Scriptures, transaction as that of Abraham, for example, weighing~~

~~down "four hundred shekels of silver, current with the merchant," for the field of Ephron, is suggestive of a group of facts and ideas indicating an advanced condition of~~

~~commercial intercourse, property in land, sale of land,~~

~~arts of mining and purifying metals, the use of silver of recognized purity as a common medium of exchange, and~~

~~merchandize an established profession, or division of labour.~~

~~That other passage in which we read of Joseph being sold by his brethren for twenty pieces of silver to "a company of Ishmeelites, coming from Gilead, with their camels bearing~~

~~spicery, balm, and myrrh to Egypt," extends our vision~~

~~still farther, and shows us the populous and fertile Egypt~~

~~in commercial relationship with Chaldea, and Arabians,~~

~~foreign to both, as intermediaries in their traffic, generations The~~

~~allusions in Homer and other ancient writings do not~~

~~before the Hebrew commonwealth was founded.~~

~~bespeak so advanced a state of trade as those in Genesis, There would seem to have been brass coins among the~~

~~warriors engaged at the siege of Troy ; and the shields of~~

~~Homeric heroes cost, some nine oxen, some more splendid~~

a hundred oxen, implying much rude magnificence in the form of barter ; and yet probably not such barter, pure and

simple, as is seen in the present day at Kiakhta and

Maimatchin, on the Chinese borders of Russia, where chests of tea are exchanged in bulk for Muscovite manufactures

of cotton or wool. One might fairly infer, from such

archaic touches of the Greek bard, that he had in view an

agricultural and pastoral state of society, in which oxen, from their more ready power of purchase

commodity, had become a rough standard of value; but

oxen could not in any state of society be a general medium

of exchange, and the history of circulating media, by which exchanges were effected in ancient times, is curiously illustrative of the transition of real into symbolic value. It may be doubted whether the hundred kesitas paid by Jacob for a field in Shalem were lambs or pieces of money having lambs as their insignia. The leather money of Carthage, which appears to have been symbolic, was probably much more valuable than the iron money of Sparta, which had an intrinsic worth, Any commodity of the first rank in a public mart might become in small circulable pieces the symbol of so much of that commodity to be delivered to order, and from the constancy of that particular exchange, might be relied upon for the purchase of other commodities. But, generally speaking, the use of gold and silver as instruments of exchange betokens a much higher commercial development than where commodities are priced by a number of oxen, or by rings of brass or iron ; and it is on record that the precious metals were thus employed in Arabia and Syria, some 2000 years B.c., as they, no doubt, had been much anterior to that date both In Egypt on the one band and in the rich and populous plains of the Tigris and Euphrates on the other. The first foreign merchants of whom we read, carrying 80ods and bags of silver from one distant region to another, Were the Southern Arabs, reputed

~~descendants of Ishmael and Esau. Touching in their Red Sea and the right bank of the Nile, and on the north and east the most densely inhabited tracts of Asia, and~~

~~Such a~~

~~than any other~~

~~On the other hand, the first navigators and maritime car- riers of goods of whom we read were the Phoenicians, the Pheenici- débris of the Canaanites overthrown by the conquering ans. Hebrews, who, intent on the plain of the J ordan, the hilly slopes of Judea, and the sacred Mount Moriah—the long~~

~~“ “ promised land, ”—allowed the dispossessed to settle on a narrow strip of territory along the coast of the Mediterra- nean. As the clearance proceeded the number of refugees increased, and this outcast race, with one foot on the sea and the other barely on the land, soon outstripped the Edomites and the Ishmaelites in the career of commerce, They founded Tyre and Sidon, of whose opulence there are abundant proofs both in sacred and in profane history. Launching their oared barks on the wave, and steering close along the shore so as to be able to take shelter in the near- est harbourage from a storm, they established a securer and cheaper passage between Egypt and Syria than had before been known. The corn and ivory of the Nile and the oil, silk, dyes, and spices of Western Asia flowed into their hands. From carriers they became merchants, and to mer- chandize they added manufactures, They enlarged their ships, grew bolder in navigation, and hoisted sails. In the days of Solomon their vessels had penetrated the Red Sea, and brought back to the great king the wealth of Ophir F but that this land of gold was in India, and that the Phe- nician craft crossed the Indian Ocean are conclusions un- supported by evidence. It is certain that they traversed thoroughly the shores of the Mediterranean, both continen-~~

~~tal and insular, established settlements and colonies in | many of the islands of the Greek Archipelago, and, greatest of all, founded Carthage, one of the niost noted, and pro- bably the most lamented in its fall, of the commercial cities and empires of the ancient world. The kings of Tyre and Sidon, though often involved in the wars and troubles of the Hebrew monarchy, remained~~

for the most part in friendly alliance with Judah and Israel, to whom they were the most valuable of allies both in a commercial and defensive point of view; and it was their adhesion to the cause of Zedekiah, king of Judah, that brought upon the Tyrians the terrible and all but fatal revenge of Nebuchad-nezzar, king of Babylon, 3416 a.m. But while their old city on the shore was being reduced to ashes by a thirteen years' siege, the portion of inhabitants who clung to the defence built a new city on an adjacent island, and thus took a new lease of life from the sea—a process which was destined to be almost identically repeated by Venice many centuries afterwards, when the Roman empire was falling under the blows of the barbarians. But Phcenicia never fully recovered her former power, and the coup de grace was given to this famous commercial republic in the capture of Tyre by Alexander the Great, 250 years after the struggle with Nebuchadnezzar. The whole inhabitants of the once proud city, who had not saved themselves by flight, were either put to the sword, crucified, or sold into slavery. After this event the name of the Pheenicians disappeared from history, or was soon absorbed in the rising splendour of the commercial cities of Greece—Athens, Corinth, Argos, and their colonies ; of Carthage, still in full fame ; and of the great seaport named after its founder Alexander, and built in a spot so well chosen that the city retains .its importance to the present hour.

In the commerce of the ante-Christian ages the Jews do Jews. not appear to have performed any conspicuous part. Both the agricultural and the theocratic constitution of their society were unfavourable to a vigorous prosecution of foreign trade. In such traffic as they had with other nations they were served on their eastern borders by Arabian mer- chants, and on the west and south by the Pheenician shippers,

posts and lines of communication, which, though primarily for official and military purposes, must have been useful to traffickers and to the general population. But the free navigable area of great rivers is limited, and when diversion of traffic had to be made to roads and tracks through deserts, there remained the slow aud costly carriage of beasts of burden, by which only articles of small bulk and the rarest value could be conveyed with any hope of profit. Corn, though of the first necessity, could only be thus

transported in famines, when beyond price to those who were in want, and under this extreme pressure could only be drawn from within a narrow sphere, and in quantity sufficient to the sustenance of but a small number of people. The routes of ancient commerce were thus inter- rupted and cut asunder by barriers of transport, and the farther they were extended became the more impassable to any considerable quantity or weight of commodities. As long as navigation was confined to rivers and the shores of inland gulfs and seas, the oceans were a terra incognita, contributing nothing to the facility or security of transport from one part of the world to another, and leaving even one populous part of Asia as unapproachable from another as if they had been in different hemispheres. 'The various routes of trade from Europe and North-Western Asia to India, which have been often referred to, are to be regarded more as speculations of future development than as realities of ancient history. It is uot improbable that the ancient traffic of the Red Sea may have been extended along the shores of the Arabian Sea to some parts of HIndustan, but that vessels braved the Indian Ocean and passed round Cape Comorin into the Bay of Bengal, 2000 or even 1000 years before mariners had learned to double the Cape of Good Hope, is scarcely to be believed. 'The route by the Euxine and the Caspian Sea has probably never in any age reached India. That by the Euphrates and the Persian Gulf is shorter, and was besides the more likely from passing through tracts of country which in the most remote times were seats of great population. There may have been merchants many, who traded on all these various routes, but that commodities were passed in bulk over great distances is inconceivable. It may be doubted whether in the ante-Christian ages there was any heavy transport over even 500 miles, save for warlike or other purposes, which engaged the public resources of imperial states, and in which the idea of commerce, aS noW under- stood, is in a great measure lost.

The advantage which absolute power gave to ancient nations in their warlike enterprises, and in the execution of public works of more or less utility, or of mere ostentation and monumental magnificence, was dearly purchased by the sacrifice of individual freedom, the right to labour, produce, and exchange under the steady operation of natural economic principles, which more than any other cause vitalizes the individual and social energies, and multiplies the commercial resource of communities.

~~Commerce in periods and countries has obtained a certain freedom and hospitality from the fact that the foreign merchant has something desirable to offer ; but the action of trading 18 reciprocal, and requires multitudes of producers and merchants, as free agents, on both sides, searching out by patient experiment wants more advantageously supp ied by exchange than by direct production, before it can attain either permanence or magnitude, or can become @ vital ele- ment of national life. The ancient polities offered much resistance to this development, and in their absolute powel over the liberty, industry, and property of the masses 9 their subjects raised barriers to the extension of commerce scarcely less formidable than the want of means of com- munication itself. The conditions of security under which foreign trade can alone flourish equally exceeded the~~

~~The abundance of gold, silver, and other precious commodi- ties gathered from distant parts, of which we read in the days of greatest Hebrew prosperity, has more the character of spoils of war and tributes of dependent states than the conquest by free exchange of their domestic produce and manufactures. The varied merchandize of Tyre and Sidon must have passed over the roads of Palestine, and helped to enrich the Jewish treasury. Tadmor, built by Solomon in the Syrian desert, where there were wells of water, can only be supposed to have been designed as a post for the service of this traffic; and it became not only a resting-place for traffickers and their camels, but a great centre of commerce and political power, nnder the later name of Palmyra. But it was not until the Jews were scattered by foreign invasions, and finally cast into the world by the destruction of Jerusalem, that they began to develop those commercial qualities for which they have since been so famous. A similar remark may be made of the more ancient nation of Egypt, of whom there is scare a trace to be found as pioneers of foreign trade. When famine visited adjacent tracts of country corn was usually to be obtained on the Nile, but those in want had to go for it, and the Phoenicians at one period, and the Greeks at another, became the corn merchants of Egypt, while Rome for some centuries drew large supplies to order of her Government. One can readily believe the great wealth, industry, and resources of empires of which such cities as Nineveh and Babylon were the capitals ; but the habit of Eastern potentates to drain to their central treasuries the riches of the most distant provinces, and the boundless power by which millions of people were doomed to servi- tude,~~

are calculated to weaken the impression that such emblems of grandeur as may still remain in ruins are to be ascribed to anything which in the present age could be dignified with the name of commerce.

Such being the general spirit and economy of the ancient nations of the East of which we have historic records, it may be more easily conceived how dense populations might grow up on the great plain of Hindustan and the still greater plain of China; have their own wars, Fe- volutions, and social changes ; develop much wealth and varied riches, much art and science, much literary and philosophical refinement; have much internal traffic, with little or no commerce beyond their own widely-extended and impassable frontiers ; and yet be so unknown to the rest of the world that the Persians, even in the days of Xerxes, appear to have had scarce a conjecture that there was such an empire as China in existence ; that Alexander, on conquering Persia and watering his horses in the Indus, should dream that he was master of all Asia—' weep," as the romantic version runs, " that there was no more world to conquer ;" and that, in short, over the growth of these ancient civilizations of Eastern Asia, surviving to the present day and embracing about a half of the human race, the curtain of history should drop as blankly as if they belonged to another planet, or could be seen only through a haze of fable and mystical tradition.

Defective There are three conditions as essential to extensive

conditions international traflic as diversity of natural resources,

ofcom- division of labour, accumulation of stock, or any other

Fr aR: primal element—(1) means of transport, (2) freedom of

world. labour and exchange, and (3) security ; and in all these con- ditions the ancient world was signally deficient.

The great rivers, which became the first seats of popula-

- tion and empire, must have been of much utility as channels of transport, and hence the course of human power of which they are the geographical delineation, and probably the idolatry with which they were sometimes

~~*honoured. Nor were the ancient rulers insensible of the importance of opening roads through their dominions, and establishing*~~

~~*Roan CO} Lests,*~~

~~*COMMERCE*~~

~~*Such roads as exist must be protected from robbers, the rivers and seas from pirates ; goods must have safe passagé and safe storage, must be held in a manner sacred in the territories through which they pass, be insured against accidents, be respected even in the madness of hostilities; the laws of nations must give a guarantee on which traders can proceed in their operations with reasonable confidence ; and the Govern- ments, while protecting the commerce of their subjects with foreigners as if it were their own enterprise, must in their fiscal policy, and in all their acts, be endued with the Every great breach of this security stops the continuous circulation, which is*~~

~~*resources of ancient civilization.*~~

~~*highest spirit of commercial honour.*~~

~~*the life of traffic and of the industries to which it ministers,*~~

~~*But in the ancient records we see commerce exposed to*~~

~~*great risks, subject to constant pillage, hunted down in peace, and utterly extinguished in war. Hence it became*~~

~~*necessary that foreign trade should itself be an armed force*~~

~~*in the world ; and though the states of purely commercial origin soon fell into the same arts and wiles as the powers to which they were opposed, yet their history exhibits clearly enough the necessity out of which they arose. Once organized, it was inevitable that they should meet intrigue with intrigue, and force with force. The political empires, while but imperfectly developing industry and traffic within their own territories, had little sympathy with any means of prosperity from without. Their sole policy was*~~

either to absorb under their own spirit and conditions of rule, or to destroy, whatever was rich or great beyond their borders,

Nothing is more marked in the past history of the world than this struggle of commerce to establish conditions of security and means of communication with distant parts, When almost driven from the land, it often found both on the sea; and often, when its success had become brilliant and renowned, it perished under the assault of stronger powers, only to rise again in new centres and to find new channels of intercourse.

While Rome was giving laws and order to the half- civilized tribes of Italy, Carthage, operating on a different base, and by other methods, was opening trade with less accessible parts of Europe. The strength of Rome was in her legions, that of Carthage in her ships; and her ships could cover ground where the legions were powerless. Her Mariners had passed the mythical straits into the Atlantic, and established the port of Cadiz. Within the Mediter- ranean itself they founded Carthagena and Barcelona on the same Iberian peninsula, and ahead of the Roman legions had depots and traders on the shores of Gaul. After the destruction of Tyre, Carthage became the greatest powe1 in the Mediterranean, and inherited the trade of her Pheenician ancestors with Egypt, Greece, aud Asia Minor, as well as her own settlements in Sicily and on the European coasts. An antagonism between the great naval and the great military power, whose interests crossed each other at sO Many points, was sure to occur; and in the fo wars Carthage measured her strength with that

me both on sea and land with no unequal success.

ut a commercial state impelled into a series of great wars ip departed from its Own proper base; and in the year a antes Was so totally destroyed by the Romans ie Mec more than 20 miles in circumference, onli thle eo period near a million of inhabitants,

So ne 8 were found within its ruined walls. cafe ac t Corinth, one of the greatest of the Greek wealth and es was captured, plundered of vast

te in s : en to the flames by a Roman consul, fellows. ge e og harbour of the Pirzus Presumed. that oe ands 60 years later. It may be

rade went on under the Roman con

quests in some degree as before; but these were grave events to occur within a brief period, aud the spirit of the seat of trade in every case having been broken, and its means and resources more or less plundered, and dissipated—in some cases, as in that of Carthage, irreparably the most necessary commerce could only proceed with feeble and languid interest under the military, con- sular, and proconsular licence of Rome at that period, It may be remarked that Tyre, the great seaport of Palestine, having been destroyed by Alexander the Great, Palmyra, the great inland centre of Syrian trade, was visited with a still more complete annihilation by the Roman Emperor Aurelian within little more than half a century after the capture and spoliation of Atheus. The walls were razed to their foundations; the population—men, women, children, and the rustics round the city—were all either massacred or dispersed ; and the queen Zenobia was carried captive to Rome. Palmyra had for centuries, as a centre of commercial intercourse and transit, been of great service to her neighbours, east and west. In the wars of the Romans and Parthians she was respected by both as an asylum of common interests which it would have been simple barbarity to invade or injure ; and when the Parthians were subdued, and Palmyra became a Roman annexe, sho continued to flourish as before. Her relations with Rome were more than friendly ; they became enthusiastic and heroic ; and her citizens, in a most brave expedition, having inflicted signal chastisement on the king of Persia for the imprisonment of the emperor Valerian, the admiration of this conduct at Rome was so great that their spirited leader Odenathus, the husband of Zenobia, was proclaimed Augustus, and became co-emperor with Gallienus. But the Palmyrians, on receiving this exalted honour from the Roman senate and people, might have said, " 'Timeo Danaos dona ferentes," for it introduced into their secure, palm- covered, and Jucrative groves of commerce the bane of imperial politics and ambition ; and it was the passionate impulse of Palmyra and her widowed queen to erect an empire of their own that brought down upon them the terrible and enduring retribution of Aurelian. It is obvious that the destruction of Palmyra must not only have doomed Palestine, already bereft of her seaports, to greater poverty and commercial

isolation than had been known in long preceding ages, but have also rendered it more difficult to Rome herself to hold or turn to any profitable account her conquests in Asia ; and, being an example of the policy of Rome to the seats of trade over nearly the whole ancient world, it may be said to contain in graphic characters a presage of what came to be the actual event—the collapse and fall of the Roman empire itself.

The repeated invasions of Italy by the Goths and Huns Venice. gave rise to a seat of trade in the Adriatic, which was to sustain during more than a thousand years a history of unusual splendour. The Veneti cultivated fertile lands on the Po, and built several towns, of which Padua was the chief. They appear from the earliest note of them in history to have been both an agricultural and trading people ; and they offered a rich prey to the barbarian hordes when these broke through every barrier into the plains of Italy. Thirty years before Attila razed the neighbouring city of Aquileia, the consuls and senate of Padua, oppressed and terrified by the prior ravages of Alaric passed a decree for erecting Rialto, the largest of the numerous islets at the mouth of the Po, into a chief town and port, not more as a convenience to the islanders than as a security for them- selves and their goods, But every fresh incursion, every new act of spoliation by the dreaded enemies, increased the flight of the rich and the industrious to the islands, and thus gradually arose the second Venice, whose glory was so greatly to exceed that of the first. Approachable from the

and service under a legal system to each other and to the sovereign power, must have been well adapted tothenecessity

of the times in which it spread so rapidly ; but it would

be impossible to say that the feudal system was favourable

to trade, or the extension of trade. The commercial spirit

in the feudal, as in preceding ages, had to find for itself

places of security, and it could only find them in towns, (armed with powers of self-regulation and defence, and prepared, like the feudal barons themselves, to resist violence from whatever quarter it might come. Rome, in her best days, had founded the municipal system, and when this system was more than ever necessary as the bulwark of arts and manufactures, its extension became an essential element of the whole European civilization. Towns formed themselves into leagues for mutual protection, and out of leagues not infrequently arose commercial republics. The Hanseatic League, founded as early as 1241, gave the first note of an increasing traffic between countries on the Baltic and in northern Germany, which a century or two before were sunk in isolated barbarism, From Lubeck and Hamburg, commanding the navigation of the Elbe, it gradually spread over 85 towns, including Amsterdam, Cologne, and Frankfort in the south, and Dantzic, Kénigsberg, and Riga in the north. The last trace of this league, long of much service in protecting trade, and as a means of political mediation, passed away the other year in the erection of the new German empire, but only from the same cause that had brought about its gradual dis- solution—the formation of powerfuland legal governments— which, while leaving to the free cities their municipal rights, were well capable of protecting their mercantile interests. The towns of Holland found lasting strength and security from other causes. 'Their foundations were laid as literally in the sea as those of Venice had been. They were not easily attacked whether by sea or land, and if attacked had formidable means of defence. The Zuyder Zee, which had been opened to the German Ocean in 1282, carried into the docks and canals of Amsterdam the traffic of the ports of the Baltic, of the English Channel, and of the south of Europe, and what the seas did for Amsterdam from without the Rhine and the Maese did for Dort and Rotterdam from the interior. By the Union of Utrecht in 1579 Holland became an independent republic, and for long after, as 1t had been for some time before, was the greatest centre of maritime traffic in Europe. 'The rise of the Dutch power in a low country, exposed to the most destructive inunda- tions, difficult to cultivate or even to inhabit, affords a striking illustration of those conditions which in all times have been found specially favourable 0 commercial development, and which are not indistinctly reflected in the mercantile history of England, preserved by its insular position from hostile invasions, and capable by its fleets and arms

~~to protect its goods on the seas and the rights of its subjects in foreign lands.~~

~~The progress of trade and productive arts 1m, the Middle Ages, though not rising to much international exchange, was very considerable both in quality an extent. The republics of Italy, which had no claim to rival Venice or Genoa in maritime power or traffic, developed a degree of art, opulence, and refinement commanding the admiration of modern times ; and if any historian of trans: Alpine Europe, when Venice had already attained some greatness, could have seen it 500 years afterwards, the many strong towns of France, Germany, and the Low~~

~~mainland only by boats, through river passes easily defended by practised sailors against barbarians who had never plied an oar, the Venetian refugees could look in peace on the desolation which swept over Italy ; their warehouses, their markets, their treasures were safe from plunder ; and stretching their hands over the sea, they found in it fish and salt, and in the rich possessions of trade and territory which it opened to them, more than compensation for the fat lands and inland towns which had long been their home. The Venetians traded with Constantinople, Greece, Syria, and Egypt. They became lords of the Morea, and of Candia, Cyprus, and other islands of the Levant. 'The trade of Venice with India, though spoken of, was probably never great. But the crusades of the 12th and 13th centuries against the Saracens in Palestine extended her repute more widely east and west, and increased both her naval and her commercial resources. It is enough, indeed, to account for the grandeur of Venice that in course of centuries, from the security of her position, the growth and energy of her population, and the regularity of her government at a period when these sources of prosperity were rare, she became the great emporium of the Mediterranean—all that Carthage, Corinth, and Athens had been in a former age on a scene the most remarkable in the world for its fertility and facilities of traffic, —and that as Italy and other parts of the Western empire became again more settled her commerce found always a wider range. The political history of the Venetian Republic is deeply interesting, were this the proper place to do more than glance at the fortune of commerce and the circumstances and conditions under which it attains its grandest success. 'The bridge built from the largest of the islands to the opposite bank~~

~~*became the ‘ Rialto,” or famous exchange of Venice, whose transactions reached farther, and assumed a more consolidated form, than had been known before. There it was where the first public bank was organized ; that bills of exchange were first negotiated, and funded debt became transferable; that finance became a science, and book-keeping an art. Nor must the effect of the example of Venice on other cities of Italy be left out of account. Genoa, following her steps, rose into great prosperity and power at the foot of the Maritime Alps, and became her rival, and finally her enemy. Naples, Gaeta, Florence, many other towns of Italy, and Rome herself, long after her fall, were encouraged to struggle for the preservation of their municipal freedom, and to foster trade, arts, and navigation, by the brilliant success set before them on the Adriatic ; but Venice, from the early start she had made, and her command of the sea, had the commercial pre-eminence.*~~

~~*The Middle ‘he state of things which arose on the collapse of the*~~

~~*Ages. Roman empire presents two concurrent facts, deeply affecting the course of trade—(1) the ancient seats of industry and civilisation were undergoing constant decay, while (2) the energetic races of Europe were rising into more civilized forms and manifold vigour and copiousness of life. The fall of the Eastern division of the empire prolonged the effect of the fall of the Western empire ; and the advance of the Saracens over Asia Minor, Syria, Greece, Egypt, over Cyprus and other possessions of Venice in the Mediterranean, over the richest provinces of Spain, and finally across the Hellespont into the Danubian provinces of Europe, was a new irruption of barbarians from another point of the compass, and revived the calamities and disorders inflicted by the successive invasions of Goths, Huns, and other Northern tribes. For more than ten | Countries, the great number of their artizans, the products centuries the naked power of the sword was vivid and | of their looms and anvils, and their various cunning work-terrible as flashes of lightning over all the seats of commerce, | manship might have added many a brilliant page 6° his whether of ancient or more modern origin. The feudal | annals. Two centuries before England had discovered ny system of Europe, in organizing the open country under | manufacturing quality, or knew even how to utilize het military leaders and*~~

~~defenders subordinated in possession ‘ most valuable raw materials, and was importing goods from~~

~~0 sing of Aw era,~~

~~C@emeRC E~~

~~the Continent for the production of which she was soon to be found to have special resources, the Flemings were selling their woollen and linen fabrics, and the French their wines, silks, and laces in all the richer parts of the Ié is more commonly, indeed, when com- merce is somewhat still, and men, finding their means resting within limited bounds, learn to delight in labour and inveution for their own sake apart from their imme- diate profits, that the quality of work is improved, and a vantage’ ground is established for more extended operations, than when commerce is in full career, everything buoyant, saleable, and rising in value, and the lust of gain has The Middle Ages They placed the barbarous populations of Europe under a severe discipline, trained them in the most varied branches of industry, and developed an amount of handicraft and ingenuity which became an always more solid basis for the But trade was too walled in, too much clad in armour, and too incessautly disturbed by wars and tumults, and violations of common right and interest, to exert its full influence over the general society, or even to realize It wanted especially the free- dom and mobility essential to much internatioual increase, and these it was now to receive from a series of the most~~

~~British Islands.~~

~~taken possession of the human spirit. may be said to have had this result on a large scale.~~

~~future.~~

~~its most direct advantages.~~

~~pregnant events.~~

~~The mariner’s compass had become familiar in the~~

European ports about the beginning of the 14th century, and the seamen of Italy, Portugal, France, Holland, and England entered upon a more enlightened and adventurous course of navigation. 'The Canary Islands were sighted by a French vessel in 1330, and colonized in 1418 by the Portuguese, who two years later landed on Madeira. In

- 1431 the Azores were discovered by a shipmaster of

Bruges. The Atlantic was being gradually explored. In 1486, Diaz, a Portuguese, steering his course almost unwittingly along the coast of Africa, came upon the land's-end of that continent; and nine years afterwards Vasco de Gama, of the same nation, not only doubled the Cape of Good Hope, but reached Zanzibar, About the same period a Portuguese traveller penetrated to India by the old time-honoured way of Suez; and a land, which tradition and imagination had invested with almost fabulous wealth and splendonr, was becoming more real to the European world at the moment when the expedition of Vaseo de Gama had made an oceanic route to its shores distinctly visible. One can hardly now realize the impression made by these discoveries in an age when the minds of men were awakening out of a loug sleep, when the printing press was disseminating the ancient classical and saered literature, and when geography and astronomy Were subjects of eager study in the seats both of traffic and of learning, But their practical effect was seen in swiftly-Succeeding events. Before the end of the century Columbus had thrice crossed the Atlantic, touched at San Salvador, discovered J. amaica, Porto Rico, and the Isthmus of Darien, and had seen the waters of the Orinoeo in South America. Meanwhile Cabot, sent out by England, had discovered New- foundland, planted the English flagon Labrador, Nova Scotia, and Virginia, and made known the existence of an expanse of land now known as Canada. This tide of discovery by np .odtors flowed on withoutintermission. But the opening of a Maritime route to India and the discovery of America, surprising as these events must have been at the time, were slow in Producing the results of which they were a sure Prognostic. The Portuguese established at Goa the first

Uropean factory in India a few years after Vasco de Gama's expedition, and other maritime nations of Europe traced a ee Course. But it was not till

1600 the English East udia Company was established, and the opening of the

first factory of the Company in India must be dated some ten or eleven years later. So also it was one thing to discover tlic two Americas, and another, in any real sense, to possess or colonize them, or to bring their productions into the general traffic and use of the world. Spain, following the stroke of the valiant oar of Columbus, found in Mexico and Peru remarkable remains of an ancient though feeble civilization, and a wealth of gold and silver mines, which to Europeans of that period was fascinating from the rarity of the precious metals in their own realms, and consequently gave to the Spanish colonizations and conquests in South America an extraordinary but unsolid prosperity. The valuc of the precious metals in Europe was found to fall as soon as they began to be more widely distributed, a process in itself at that period of no small tediousness ; and it was discovered further, after a century or two, that the production of gold and silver is much like the production of othercommodities for which they exchange, viz., limited, and only increased in quantity at a heavier cost, that is only reduced again by greater art and science in the process of production. Many difficulties, in short, had to be overcome, many wars to be waged, and many deplorable errors to be committed, in turning the new advantages to account. But given a maritime route to India and the discovery of a new world of continent and islands in the richest tropical and subtropical latitudes, it could not be difficult to foresee that the course of trade was to be wholly changed as well as vastly extended,

The substantial advantage of the oceanic passage to Maritime India by the Cape of Good Hope, as seen at the time, was route to to cnable European trade with the East to escape from the dia. Moors, Algerines, and Turks who now swarmed round the shores of the Mediterranean, and waged a predatory war on ships and cargoes which would have been a formidable obstacle even if traffic, after running this danger, had not to be further lost, or filtered into the smallest proportions, in the sands of the Isthmus, and among the Arabs who commanded the navigation of the Red and Arabian Seas, Venice had already begun to decline in her wars with the Turks, and

could inadequately protect her own trade in the Mediterranean. Armed vessels sent out in strength from the Western ports often fared badly at the hands of the pirates. European trade with India can scarcely be said, indeed, to have yet come into existence. The maritime route was round about, and it lay on the hitherto almost untrodden ocean, but the ocean was a safer element than inland seas and deserts infested by the lawlessness and ferocity of hostile tribes of men. In short, the maritime route enabled European traders to see India for themselves, to examine what were its products and its wants, and by what means a profitable exchange on both sides could be established ; and on this basis of knowledge, ships could leave the ports of their owners in Europe with a reasonable hope, via the Cape, of reaching the places to which they were destined without transshipment or other intermediary obstacle. This is the explanation to be given of the joy with which the Cape of Good Hope route was received in one age, as well as the immense influence it exerted on the future course and extension of trade, and of the no less apparent satisfaction with which it has been to some extent discarded in favour of the ancient line, sa the Mediterranean, Isthmus of Suez, and the Red Sea in our own time.

The maritime route to India was the discovery to the Discovery European nations of a "new world" quite as much as the of America. discovery of North and South America and their central isthmus and islands. The one was the far, populous Eastern world, heard of from time immemorial, but with which there had been no patent lines of communication, The other was a vast and comparatively unpeopled solitude,

yet full of material resourees, and capable in a high degree of European colonization. America offered less resistance to the action of Europe than India, China, and Japan ; but on the other hand this new populous Eastern world held out much attraction to trade. These two great ter- restrial discoveries were contemporaneous ; and it would be difficult to name any conjuncture of material events bear- ing so importantly on the history of the world. The Atlantic Ocean was the medium of both; and the waves of the Atlantic beat into all the bays and tidal rivers of Western Europe. 'The

centre of commercial activity was thus physically changed; and the formative power of trade over human affairs was seen in the subsequent phenomena, —the rise of great seaports ou the Atlantic seaboard, and the ceaseless activity of geographical exploration, manufactures, shipping, and emigration, of which they became the outlets. Increase of 'The Portuguese are entitled to the first place in utilizing trading the new sources of wealth and commerce. 'They obtained ieee Macao as a settlement from the Chinese as early as 1537, colonies, nd their trading operations followed close on the discoveries of their navigators on the coast of Africa, in India, and in the Indian Archipelago. Spain spread her dominion over Central and Sonth America, and forced the labour of the subject natives into the gold and silver mines, which seemed in that age the chief prize of her conquests. rauce intro- duced her trade in both the East and West Indies, and was the first to colonize Canada and the Lower Mississippi. The Dutch fonnded New York in 1621; and England, which in boldness of naval and commercial enterprize had attained high rank in the reign of Elizabeth, established the thirteen colonies which became the United States, and otherwise had a full share in all the operations which were transforming the state of the world, 'The original disposi- tion of affairs was destined to be much changed by the fortune of war; and success in foreign trade and coloniza- tion, indeed, called into play other qualities besides those of naval and military prowess. 'The products of so many new countries—tissucs, dyes, metals, articles of food, chemical substances—greatly extended the range of European manufacture. But in addition to the mercantile faculty of discovering how they were to be exchanged and wrought into a profitable trade, their use in arts and manu- factures required skill, invention, and aptitude for inannfacturing labour, aud these again, im many cases, were found to depend on abundant possession of natural materials, such as coal and iron. In old and populons countries, like India and China, modern mannfacture had to meet and contend with ancient manufacture, and had at once to learn from and improve economically on the estab- lished models, befure an opening could be made for its extension. In many parts of the New World there were vast tracts of country, withont population or with native races too wild and savage to be reclaimed to habits of industry, whose resources could only be developed by the introduction of colonies of Europeans ; and innumerable experiments disclosed great variety of qualification among the European nations for the adventure, hardship, and

per- severance of colonial life. 'There were countries which, whatever their fertility of soil or favour of climate, produced nothing for which a market could be found ; and products such as the sugar-cane and the seed of the cotton plant had to be carried from regions where they were indigenous to other regions where they might be successfully cultivated, and the art of planting had to pass throngh an ordeal of risk and speculation. 'There were also countries where no European could labour; and the ominous work of transport- ing African negroes as slaves into the colunies—begun by Spain in the first decade of the 16th century, followed up by Portugal, and introduced by England in 1562 into the

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West Indies, at a later period into New England and the Southern States, and finally domiciled by royal privilege of trade in the Thames and three or more outports of the kingdom, —after being done on an claborate scale, and made the basis of an immense superstructure of labour, property, and mercantile interest over nearly three centuries, had, under a more just and ennobling view of humanity, to be as cluborately undone at a future time, These are some of the difficulties that had to be encountered in utilizmg the great maritime and geographical conquests of the new epoch. But one cannot leave out of view the obstacles, arising from other sources, to what might be dreamed to be the regular and easy course of affairs. Commerce, though an undying and prevailing interest of civilized countries, is but one of the furces acting on the policy of states, and has often to yield the pace to other elements of national life. It were needless to say what injury the great but vain and purpose- less wars of Louis XIV. of France inflicted on that country, or how largely the fruitful and heroic energies of England were absorbed in the civil wars between Charles and the Parliament, to what poverty Scotland was reduced, or in what distraction and savagery Ireland was kept by the same course of events. The grandeur of Spain in the preceding century was due partly to the claim of her kings to be Holy Roman Emperors, in which imperial capacity they entailed intolerable mischief on the Low Countries and on the commercial civilization of Europe, and partly to their command of the gold and silver mines of Mexico and Pern, in an eager lust of whose produce they brought cruel calamities on a newly-discovered continent where there were many traces of antique

life, the records of which perished in their hands or under their feet. These ephemeral causes of greatness removed, the hollowness of the situation was exposed; and Spain, thongh rich in her own natural resources, was found to be actually poor—poor in number of people, poor in roads, in industrial art, and in all the primary conditions of interior develop- ment. An examination ef the foreign trade of Europe two centuries after the opening of the maritime route to India and the discovery of America woull probably give more reason to be surprised at the smallness than the magmi- tude of the uso that had been made of these events.

Mr David Macpherson, who published his elaborate Annals of Commerce in 1805, states that in 1764 the total imports of Great Britain amounted in official value to £114,250,660, and the total exports tv £17,446,306.1 He found from the Custom House books that in 1800 the imports had increased to £30,570,004, and the exports to £43,152,019, which he deemed an encouraging amount of progresa, as, in view of the events, then deemed peculiarly disastrous, that had oceurred in the interval—the loss of the American colonies, the French Revolution, and the wars of Bonaparte—it may, no doubt, be held to be. Of the exports in 1800 £24,304,283 were British, and £18,847 ,735 foreign and colonial merchandize. The proportion of the latter shows to what extent this country had become the medium of trade between Enrope and the East and West Indies ; but as these re-exports must be deducted from the total imports, there is left only £11,722,269 of imports to IO A

1 The imports and exports of Ireland at this period, and till the Union, formed a separate account, but the great bulk of them were in her trade with England and Scotland. In 1799 the imports of lre- land from all other ports than Great Britain were £1,268,595, and her exports £759,692; while her imports from Great Britain were £4,011,468, and her exports to Great Britain £4,891,161. Foreign markets were found for lrish manufactures throngh the British perts, and Ireland was supplied with foreign and colonial merchandize throngh

the saine channels. In 1771 the exports of British linen from England were 4,411,040 yards, and of Ivish linen 8,450,224 yards, Im the

same year the exports of linen from Scotland included 701,012 yards

of Irish manufacture,

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Great Britain four her own purposes of manufacture and consumption, At the beginning of the century two-tlurds of the foreign commerce of England was through London, and was largely in the hands of privileged companies. The commercial towns of the provinces and of Scotland had only begun to make some figure. In 1787 Liverpool was a small seaport, having only 445 vessels of 72,731 aggregate tonnage, and clearing inward and outward in foreign trade less than double the amonnt of her own tonnage. At the same period Glasgow, enriched though she had been by the trade with America, had only 46,000 inhabitants; and Manchester, though a place of considerable manufacture, was still waiting the great impulse to be given to her industry by liberal supplies of cotton, and by the inventions of Arkwright and Crompton.

It may be said, however, that in throe eventful centuries the world had been well explored. Colonies had been planted on every coast; great nations had sprung up in vast solitudes or in countries inhabited only by savage or decadent races of men ; the most haughty and exclusive of ancient nations had opened their ports to fureign merchant- men ; and all parts of the world been brought into habitual commercial intercourse. The seas, subdued by the progress of navigation to the service of man, had begun to yield their own fiches in great abundance; and the whale, seal, herring, cod, and other fisheries, prosecuted with ample eapital and hardy seamanship, had beeome the source of no small traflicin themselves. 'The lists of imports and exports and of the places from which they flowed to and from the eentres of trade, as they swelled in bulk from time to time, show how busily and steadily the threads of commerce had been weaving together the labour and interests of mankind, and extending a security and bounty of existence unknown in former ages.

Apart from wars, which comuineree directly tends to avert, but which often spring from forees more powerful for the time than commercial interest, there remained little more by which a rapid extension of international trade could be impeded, save causes arising from ignorance or impolicy; and among these deserves chiefly to be noticed the prevailing practice of

nations, in promoting their own several industries and trade, to wage a subtle war in times of peace on the industrics and trade of each other. 'That foreign imports, and even dumestic exports, should contribute some quota to the public revenue is in itself a reasonable proposition. The custom-house, which has to register goods coming in and going out, and to exercise an official regulation in the ports, should defray at the least its own expense, like any other necessary mercantile function. The convenience of raising public revenue by duties on imports and exports is amply evinced by the universal adoption of this expedient ; and the convenience will always be materially modified by the more or less

better and cheaper than it can prodnce them for itself, it is wise and expedient to place the admission of nearly all foreign goods and produce under a enstom duty protective of the native industry. The interest of the public revenue

is here lost in another line of policy, because protective duties carry the consequence that several parts of a vation have to pay to several other parts more of their own means for what they need than they should have had to pay to the foreigner, and under a system of this kind the sourees of public revenue, so far from being increased, are certain of being impaired. On the other hand, there are imports so entirely of foreign origin, and so free from considera- tions of competition with domestic industry, that a large revenue inay be raised upon them in the custom-house, without disturbing the freedum or equity of international trade. 'The immense customs reveune of the United Kingdom from duties on tea, coffee, and tobacco (duties on wines and foreign spirits may be exeluded since they are set off by excise duties on native Inquors) is a remarkable example of the power of levying public revenue in the ports without infringing any commercial or economic principle. 'The question of tariffs thus appears to be capable of reasonable solution as long as it 1s kept within the circle of what is permanently expedient to the public revenue. When it passes beyond these hounds it launches into a sea of complicated errors. 'The idea or self-interest that has furee to discourage the imports of foreign com- modities by protective duties passes naturally onward to bounties on the export of some favoured articles of domestic produee, under which the same practical result is conversely produced, and one part of the nation has to pay in taxes

~~to the state some proportion of the price necessary to effect a sale abroad of the produce of another part of the nation. When bounties are given, they have to be accompanied with a series of compensations or " draw- backs ;" and the confusion has often become so great, as when the export bounty is on the manufactured article and the protective duty on the imported raw material, or as, say, When there is a duty on foreign wool, and woollen guods on export are entitled to a drawback, that the state has been reduced to a dilemma, and anything it did seemed only to make the condition worse. 'This medley of eross- purposes is increased by the means adopted by parent states on one hand to bolster, on another to monopolize to themselves, the trade of their colonies, and by the elaborate rules of preference and exelusion by which maritime vations have attempted to favour their own ships in the earrying trade of the seas.~~

~~All the mischief of the protective and prohibitory system was exhibited by the Orders in Council of the British Government, and the Berlin and Milan decrees of Sonaparte, fulminated in the passion and fury of war ; and if these high acts of power were seen to be not only futile and sublimely ridiculous, but in their aim and effects destructive of all commercial civilization, it would argue little reason on the part of nations to carry out the same objects through the more calm, systematic, and~~

~~| erude or scientific form which the system of taxation has | insidious operation of mutually hostile tariffs. Though~~

~~; assumed, by the financial exigency of states, and by the | nothing dies more slowly than the spirit of monopoly in degree in which other objects than those of revenue have trade, yet from many signs 1 may be hoped that this~~

~~| been permitted to enter into the general policy. It has obstacle to commerce will gradually disappear like been argued with much plausibility that there are certain others. . — ee stages and conditions of some branches of industry, in The present century has witnessed an extension of t " ' » ' which it is politie to protect them against unequal com- commercial relations of mankind of which pany — aaceal petition in their own markets with the more advanced arts parallel? in previous history. The facts are so ¥ ell oui imal~~

| and appliances of foreign countries, until they have by | that it is unnecessary to reproduce them — ps bop 3 trade,

| this means acquired ability to stand upon their own merits ; and yet it may be useful to eng te ya ak ioe and this being once admitted, the transition is easy to the principal plenonema. The heavy de A. 3 2 ~~

| general doctrine that, since every nation always finds that | the currency complications mm which the c¢ ro oie there are commodities which other nations can produce much | Napoleonic wars left the European nations, as we

fall of prices which was the necessary effect of the sudden closure of a vast war expenditure and absorption of labour,

had a crippling effect for many years on trading energies. Yet even under such circumstances commerce 1s usually

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found, on its well-established modern basis, to make steady progress from one series of years to another. The powers of production had been greatly increased by a brilliant development of mechanical arts end inventions. The United States had grown into a commercial nation of the first rank. 'The European colonies and settlements were being extended, and assiduously cultivated, and were open- ing larger and more varied markets for manufactures. In 1819 the first steamboat crossed the Atlantic from New York to Liverpool, and a similar adventure was accor- plished from England to Tudia in 1825—events in themselves the harbingers of a new em in trade. 'There began also to be signs, in the general prominence given to the study of economic principles, and in the policy of Mr Huskisson in England, of a growing public opinion in favour of greater freedom of trade; and China, after many efforts, was opened under treaty to an intercourse with foreign nations which was soon to attain surprising dimensions. 'These various causes supported the activity of commerce in the first four decades ; but the great movement which has made the century so remarkable was chiefly disclosed in practical results from about 1840.

It has been seen above what the amount of the foreign trade of Great Britain was in the first year of the century. In 1839 the total value of British produce and manufactures exported, then including under the Legislative Union of the Kingdoms Irish produce and manufactures, was £53,233,980 ; and the total value of imports was £62,048,000, of which £12,796,000 was exported to other countries. 'The number of vessels belonging to the British empire in 1839, while the navigation laws were still in force, was 27,745, of an aggregate tonnage of 3,068,433, and 191,283 men. In. 1850 the exports of home pro- duce and manufactures had increased to £71,368,000, and the imports to £100,469,000, of which £21,874,000, was exported. In 1878, which may be taken as the close of the period under review, the declared value of exports of British and Irish produce and manufactures reached the enormous total of £255,073,336, and the imports the still more astonishing total of £370,380,742. In the returns for 1873 the exports of foreign and colonial merchandize are given only in quantities, but in the two succeeding years the value of this branch of export trade is given as £10,251,220 in 1874, when the total imports were £370,054,834, and £12,103,732 in 1875, when the total imports were £373,941,125—much less than in 1800, when the official value of re-exports is given as £18,847,735, on a total import of only £30,570,004, indicating, on the one hand, how greatly direct import from the countries of origin to the countries of use must have increased during the century, and, on the other hand, in how much larger proportion our imports of foreign and colonial merchandize had been entered for home consumption. The shipping in 1573, not of the British empire as in 1839, but of the United Kingdom alone, had increased, under repeal of the navigation laws, to 21,581 vessels, 5,748,097 tons, and 202,239 men.

The total value of British and Irish exports in 1873, as compared with 1839, shows an increase of 379 per cent., and of imports an increase of 496 per cent.—an expansion of trade within the third of a century wholly without example. In the years from 1800 to 1839 the increase of domestic exports had been only 119 per cent., and of imports 102 per cent. A larger progressive increase of imports than of exports has been a feature of British com- merce for the last twenty years, and would seem to bear out the opinion of economists that this is the result of all prosperous foreign trade, though an excess of imports over exports so large as £120,000,000 per

annum cannot possibly be due to the cause which they have usually assigned for

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it, viz. the profit accruing frora the exchange of goods less valuable for goods more valuable in the respective countries, and is probably only accounted for by the large investments

of British capital of late years abroad, the interest of which

has for the most part to be paid in merchandize.'

An increase of the foreign trade of the United Kingdom from £115,281,580 to £625,454,078, in the course of thirty-four years, presents a vaster theme than can be easily grasped, and it may be cnough here simply to supply some concise information—(1) as to the commodities which entered into so large a commerce, and (2) as to the distribution of the movement in the various quarters of the world. In the Parliamentary Account of Revenue, Population, and Commerce for 1839, a summary is given of the principal articles of British and Irish export, and their respective values ; and by placing these in juxtaposi- tion with the same articles of export from the Board of 'Trade returns for 1873, as in the following table, a pretty comprehensive view may be obtained of the impulse given to our various manufacturing industries :—

1859. 1873.

——— and Haberdashery… £1,332,427 .ceccscccssccerereeseeecscrecenes £10,032,485 sie ge alae le TIGBOAUI <-.c0se siti teeesees err 3,820,508 Copper Unwrought… 1,207,401 onl sneemtsesnsesrecccnssss potas 542,609 … 3 Cotton Manufactures … 16,878,445 A Twist and Yarn 6,858, 193 Earthenware …..e00- 771,173 NGI Wesco cecceesenencennesces 357,315 ie Cutlery— 1,828,521 ron and Steel, Wrought and a" a ee \ DeTWO SIL scavconssaonsconseeeees ame 37,779,586 Linen Manufactures ……0.04 B,292,220 .sesescceaseeseeeeescsrsrcretees 7,295,121 a1 LOTT crcccescersssrcccescsoees B1S,485 ..ereeeseseerereeseeseeten sees 1,975,783 Jute Manufacture 1,591,581 a1 VANT seseeesseveeees 206,925

Machinery and Mill Work … Q3G,4S2 — seceeeeeeccensrerencrerenesors . 9,994,169 Silk Manufactures ……..ssecvee 6 SEB, L1S sesescecceeeeeoesceeeseeerearens 1,876,313 Thrown, Twist, and sips Gein ro a 167,887 ee Manufactures— a Y PieCC ….ecreeeeeeesessoreeere 5,800,869 – AL. ean "620.2 i a 25,279,285 Woollen and Worsted Yarn… 423,320 scoeeeresnscneceereeecanecrers 5,408,983

These figures speak largely for themselves. The British export of cotton manufactures in 1839 was so great as to cast into the shade every other export, and, though its increase since that period has been wonderful, yet it 13 gratifying to observe, in the progress of other branches, the greater breadth and variety which the manufacturing industry of the United Kingdom has assumed, The export of cotton goods and yarns in 1839 was nearly a half of our whole export of produce and manufactures. In 1873 they were less than a third. Indeed, if coal and iron, and iron and steel manufactures be put together, they

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1 'The difference between official and real value in the returns, over the periods here referred to, vitiates in some measure the figures, not only as regards the old and discarded criterion of "the balance of trade," but as a means of exact comparison of one period with another ; while, at the same time, they hold valid enough as regards the relative value of the several branches of import and export trade, Official valuation, the rates of which were fixed as far back as 1698, was long applied both to imports and exports, till at the close of last century the real or declared value of domestic exports began to be given along with the official valuc, and the discrepancy of the two—the official value increasing, and the real value declining in proportion to the quantities—gave rise to an opinion that we were always selling more of the products of our industry for less value in exchange, whereas it was the result of the cheapening of production by machines steam-power, and anything but a proof either of industrial or merean- tile loss. The official valuation of imports was much longer

to than in the case of exports, till of late years the practice has been to give the real or declared value in both branches of the commerce. It must be admitted, however, to Mr M'Culloch and other authorities, that these

returns of value, however near the mark, can never show a balance of trade in the sense once supposed. The value given in the ports cannot exactly correspond with the value realized, simee the whole system of trade proceeds on the fact that certain produce are of more value in one country than in another. It was Te marked as long ago as 1800 that the expart of coffee was much over valued in the official returns, and if coffee, one would say ted

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will be found much to exceed in export value the cotton Decennial Inerease of Trade.

industry, though it must be added that to the extension of — ee oe me the latter there are yet no apparent limits. Many articles ma eS 158 34 of export, which in 1839 were too ilapgnot to be ar 61 144 84 ; jn a summary of principal articles, and not a few ME… cece ne es 26 274 I gaged 2 aaa All countries… 39 90 48

which had not then appeared in the export list, have since risen to a value much exceeding that of some principal articles in 1839 ; as for example, in 1873 alkali and chemi- eal produets, £4,676,861; beer and ale, £2,419,575; books, £919,534; herrings, £1,027,121 ; paper manufactures, £973,899 ; painters' colours and materials, £1,016,975 ; stationery other than paper, £672,970 ; telegraphic Wire and apparatus, £2,359,563 ; and iron, steam, and sail- ing ships, made to foreign order, of which there is no record in the Board of Trade returns whatever. The imports of the United Kingdom in 1873, besides many new commodities of great aggregate value, such as esparto, guano, gutta-percha, hops, jute, oil-seed and oil-seed cakes, petroleum, pyrites, and various chemical substances, present a general increase over the whole range of foreigu and eolouial merchandize, most marked in raw materials and provisions, of which the chicfly notable example, since they mnay fitly be embraced in the same category, includes wheat, eorn, flour, rice, cattle, sheep, pigs, bacon, butter, cheese, eggs, poultry, potatoes, all manner of farm and dairy pro- duce, the import value of which in 1873 is found to have amounted to £85,036,365,.

~~This, however marvellous, is indeed, but the commerce of our kingdom, but it contains the main current of the commerce of the whole world, and is consequently an example, though a strong and concentrated example, of what has been passing in other mercantile communities. The exports of all nations have not been computed at more than £800,000,000 to £850,000,000, Deducting from the larger sum the British and Irish exports, it follows that more thau two-thirds of the exports of all other parts of the world are imported into the United Kingdom. Any permanent inerease of trade in so large a centre is impossible without an iucrease throughout the general sphere, though this inerease may be variously distributed. 'The following statistical results of Professor Levi exhibit in the briefest form where the chief movement has been in the remarkable epoch under consideration, so far as it can be seen through the trade of the United Kingdom.) «~~

~~Relation of Whole Trade of United Kingdom.~~

~~It is always critical to assign specific causes for com- mercial results on so vast a scale and over so wide a theatre, for in such cases there must not only have been a long antecedent preparation of means to enable such rapid and gigantic efforts to be made, but it is certain that many economic causes will be found to have been in concurrent operation, efects themselves becoming causes in turn, and though in apparent conflict, one checking tlte excess of the other, yet in reality extending and sustaining the general impulse, But three grand characteristics of the period have been adduced with almost common consent as affording an explanation of the phenomena—(1) the adoption of free trade by Great Britain, (2) the Californian and Australian gold discoveries, and (3) steam navigation, railways, tele- graphs ;—and these may obviously be accepted as the most powerful forces ever brought to bear on the extension of trade in any one age.~~

~~The measures by which Sir Robert Peel introduced Adoption this great change in the policy of the United Kingdom Offree trade Were marked by four general objects, merging by PY, Great~~

~~: ; Britain. practical sequence in the absolute principle of freedom of trade —Ist, to remove from the tariff all prohibi- tions of foreign import, among~~

the chief of which were agricultural live stock, while retaining for a limited period some protective regulation ; 2d, to place hundreds of articles of the nature of raw materials of manu- facture, and others of less importance, yet useful in the arts, on a footing of entire freedom from customs duty ; 3d, to reduce the duties on foreign manufactures which came into competition with home manufactures ; and 4th, to repeal the corn laws, admitting foreign grain on a nominal fixed duty, which last involved an equally com- plete relief to provisions, live stock, agricultural produce of every kind, and to foreign manufactures. When the land- lords and farmers were placed iu full and direct competition with the world, no class of manufacturers had any excuse left for the slightest shred of protection. All these measures had the appearance more of liberal concessions to foreign uations than of any advantage to home pro-

With Enrone ay me Er ducers ; and this is, no doubt, the reason why free trade ' eames o ee was so long resisted, and many were unable to see, until Meer… 5 a the problem was visibly demonstrated, that in liberating 2 rrr a7 oe x commerce, even in developing foreign resources, the most OT) 4 mm 35

powerfulimpulse may be given to all the springs of domestic prosperity. The immediate effects in increasing the public revenue—even the customs revenue, which seemed en- dangered by the abolition of so many duties—in reviving British trade and manufactures, and imparting new life to agriculture itself, were so great that the free trade policy was speedily carried up to its highest points of triumph. The differential duties on foreign and colonial, slave and free labour sugar were removed ; and the navigation laws, in favour of which the greatest prejudice had loug existed, were fully conformed to the new policy. The expected influence of so successful an illustration of free trade on other nations has not yet been realized to any consider- able extent. A more liberal system of trade with France and other European countries has only been effected by treaty, which, however mutually advantageous in its results, is in its temporary and provisional character more or less unsatisfactory. It was not enough that Great Britain could say to her neighbours that free trade had worked well not only for herself but for them. There was always the ready retort of the protected interests in the

most other foreign and colonial produce » but the import of these articles having been valued on the same official scale, this could not affect the proportion either in quantity or value between the re-export and the total Import of foreign and colonial merchandize. What is shown by the above figures to have been this proportion then, and "a has oceurred Since 80 greatly to change the relation of imports

exports, is consistent with what might be predicated on grounds ol general reason. It was certain that when Britain was supporting a ae War on the Continent, and paying heavy subsidies to European prod she should have to send large quantities both of her own ie ede her foreign and colonial imports to the countries where aaa spending her capital so freely and continuously. It was qually oe that, when this burden was thrown off, when her great = et Ja consolidated, and its interest was being paid out of he esources, and a surplus capital was once more developed,

» Manufactures, and consumption i i Tengtineml ae ' ption, and that in any

: itish capital in foreign and colonial securities 'story of British Commerce, by Leone Levi, aa

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Immensely important as the creative and stimulating step… effect of the free trade of Britain and the Californian "a gation ih Australian gold discoveries had been, they pale before a WY, |

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respective countries that what was good for England in her somewhat exceptional condition, might not be good, or might even be impossible, for them ; and here the contro-

Californian The effect of the Californian and Australian gold mines | Kingdom alone there are now 1597 steam vessels, of nearly andAustra- has been compared to that of the silver mines of South | 1000 average tonnage,

wholly employed in foreign trade, ae fue = America at two periods—when their treasures began to be | All the greater maritime states have lines of ocean steamers,

versy has rested. But it must be allowed to argue a vast deal for the power of free trade that Great Britain, in the face of so many unreciprocal tariffs, has been able to open an effective market in her ports for amounts of foreign goods and produce which thirty years ago would have been deemed fabulous, while at the same time circulating her own commodities in such increasing quantities to all parts of the world. 'There can be little question that the free commercial policy of this country has been one of the leading springs of the late marvellous extension of inter- national trade.

distributed in Europe, and again when the abundance and cheapness of quicksilver increased their productivencss ;—put there is one difference at least, viz., that under the greatly more active life of the present age, as compared with the 16th and 17th centuries, the results of the Californian and Australian gold discoveries were much more rapidly developed than in the other case, and may be said to have passed and been exhausted under the cyes of a single generation. We should thus be better able to judge the effect of sudden, though, as they prove, always temporary increases of the supplies of the precious metals.

he two events in question were almost coincident, and they came when a general extension of trade had already been ten years in progress. 'The first effect was to produce a great emigration to the countries in which the gold-fields were situated, and this was followed by large exports of goods to the same quarters, which, as usually happens when business falls under speculative impulses out of the ordinary mercantile course, were much overdone, and ended eventually in heavy loss to the shippers. Abundance of labour had been supplied to the gold-fields with unwonted celerity, and as the labour was not unremunerative, and in many cases was even rewarded by large findings of gold, the commotion in emigration, traffic, and shipping was sustained for a considerable time. The coffers of the banks of England and France were soon filled with the new supplies of gold, and these imparted increased confidence to banking operations by which they were as soon redistri- buted. All this was calculated to give additional impulse and

extension to the commercial forces already in motion. There was a uew increase of demand for goods ; much labour had been transferred from old seats of industry to new fields ; and there was rise of wages, and rise of prices. But whether the effects would have been different whatever other produce than gold had been the impelling cause may be much doubted. The effect of increased supplies of the precious metals per se on prices is difficult to trace, and is seldom detected by the keenest analysis, more especially in a period of extending trade and industry, for the precious metals are then more quickly absorbed, and many causes, of which their increased supply is but one and the least, are operating on the value of goods. The Californian and Australian mines remain productive, though in much diminished amount, and their most permanent effect on commerce will probably be found to be that they helped materially to build California into a populous State, which has become one of the largest granaries of wheat in the world, and to make the Australian colonies a growing empire, of such varied resources that its foreign trade, greatly as it had increased in the first ten years of the gold discoveries, continued to increase in the subsequent ten years, when its produce of gold had declined into a sub-ordinate interest.

mighty service that remains to be noticed, and which, in the prolific force of a world aroused to commerce, they had all the while been carrying forward in their train.

railways, and telegraphs—-equally marvellous in their power of facilitating commerce and in the rapidity of their construc- tion to this end—beyond a simple indication. The words alone convey what an age we have been living in, and the international progress in commerce must have

een.

and there is scarce any part of the world to which goods

| deemed possible when George Stephenson opened the first short railway in England in 1825.

both goods and passengers with the ease and celerity of this new system. A similar work has been done in other civilized

There is little need of remark in this place on steam ships,

In 1839 the. ocean steamers in the world, if any,

could have been counted on one's fingers. In the United

and passengers are not carried with the speed, regularity, and capacity which steam-power has given to navigation, That goods might be hauled overland by steam was only

There are now 17,000 miles of railway in the United Kingdom, or one mile of steam-road to every seven square miles of area, carrying

nations, and over many thousands of miles of comparatively desert tracts of country. The only densely-peopled quarter of the world unknown to railway enterprize is China, and in China a short railway has just been opened from Shanghai to Woosung, amid the curiosity and welcome of the populace. The rapid development of telegraphy is more wonderful even than that of steam ships or rail ways. Difficult problems of pure science, of science applied to art, and of material manufacture, had to be solved and tested at every step, and all this had to be done with the slightest attractions to capital on the stock exchange, Yet the telegraph wires have been laid successfully under the Atlantic, the Pacific, and the Eastern Seas, and there remain now but few parts of the commercial world to which messages may not be sent and answers received within a few hours. These wondrous and wondrously combined powers of science and mechanism have realized, in the highest form conceivable to the practical mind, the facility of transport and the means of rapid communication and intelligence which commerce had been seeking at infinite distance from the beginning of time, but seeking in vain. Their influence on the interior economy of commonwealths has been no less marked than on the exterior distribution of their products. They are the work of less than half a century, and yet to form them has cost tens of thousands of millions sterling of capital. On whatever side the question is considered, nothing less than marvels are presented to our reason, For supposing these achievements possible, the science, art, and labour prepared and ready, where was the wealth to be found to accomplish them? It may be said that steam ships, railways, and telegraphs have been called into existence by the rising energy and resources of commerce, and it may

also be said that at every stage they have created the traffic by which alone they could be sustained and extended.

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The international lending of capital has attained ae ee)

magnitude, and is so often lost sight of in the study 0 more visible imports and exports, as to require careful con- sideration, not only on the part of the immediate lenders and borrowers, but of all who are engaged in foreign trade."

1 The amount of foreign loans and securities, of a public character,

held in the United Kingdom has been variously estimated at from to 1500 millions sterling.

elegra e t

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Capital, in its monetary ee of oe F as — a | This ti — ie be i pursued, but its bearings modity as the more usual articles of trade; and when | on trade are sufficiently apparent. Sie, nid large sums to another country, the same It may be said, in conclusion, that commerce has acquired Conclusion, effects are produced on the rates of exchange for the time | a security and extension, in all its most essential conditions, being, and more protractedly on the general course of | of which it was void in any previous age. It can hardly import and export, as would be produced by an equivalent | ever again exhibit that wandering course from route to amount of goods exported by the borrowing country. | route, and from one solitary centre to another, which is $0 The imports of the borrower, during the period of expendi- | characteristic of its ancient history, because it is established ture of the loans, will increase ; and the exports, though in every quarter of the globe, and all the seas and ways they may not diminish, will lose in some measure thei: | are open to it on terms fair and equal to every nation. previous proportion to the imports. These are consequences | Wherever there is population, industry, resource, art, and worthy of observation in the

general conduct of mercantile skill, there will be international trade. Commerce will have business, but they also go a. The “i eri — — Ae Maes es — or relatively wr money from country to country, with its inci ents or higher | but such decay and ruin as have smitten many once prou rates ve interest, and a certain degree of speculative adven- | seats of wealth into dust cannot again occur without such ture, is legitimate. en — means the — = of the nee of bl ae ~ i as the growing world help to develop the poorer, as well as to increaso | civilization an reason of mankind, and the power of law, their own prosperity ; and when the debts thus contracted | right, and common interest forbid us to anticipate. But, become valid and transferable securities, they are an import- | with all these advantages, it must not be supposed that ant element in equalizing exchange where temporarily dis- | the future course of trade is free of difficulty. The very turbed. But the extreme looseness with which this branch magnitude of commerce now suggests what serious work of commerce is conducted almost exceeds belief. The pro- devolves on all who are engaged init. If in the older times ceedings of the recent — rs a — — it = — me yi gaa seth to Kp thrown some light on the subject. § tong as bankers and | only a good man of bnsiness, but even a sta esman, it is finauciers of repute put loans on the market without care | evident that all the higher faculties of the mercantile pro- as to their objects or security, or an exercise of the least | fession must still moro be called into request when imports mercantile judgment as to the probable effect of the loans | and exports are reckoned by hundreds instead of fives or on the value of requisite materials,and with the view simply | tens of millions, when the markets are so much larger and of making ene — al . a = si pemeasl no ted so much more a, and dropping the whole charge and risks, often by deceptive | varie , the problems to be solved in every course of trans- means, into the hands of a helpless public of investors, the | action so much more complex, the whole range of affairs most deplorable consequences must ensue. It is scarcely | to be overseen so immensely widened. Itis nota company an exaggeration to say that in the years 1869- 72 the foreign | of merchants, havinga monopoly, and doing whatever they railway and other undertakings thus launched were such | please, whether right or wrong, that now hold the com- as there were not materials in the markets of the whole | merce of the world in their hands, but large communities of world to carry through, without an enhancement of values | free merchants in all parts of the world, affiliated to manu- that should not

only render the undertakings themselves | facturers and producers equally free, each under strong hopeless, but seriously cripple much well-established trade. temptation to do what may be wrong in the pursuit of his In the more solid class of foreign loans, bearing the security | own interest, and the only security of doing right being of not unprosperous states, it has frequently happened that | to follow steady lights of information and economic science nearly the whole revenue of the state was derived from | common to all, The triumphs of commerce and its auxil- customs duties. While the borrowing proceeded, the | iaries have been exhibited in the present article. Easy Imports of the state increased, and the revenue flourished, transport of goods by land and sea, prompt intelligence giving a guarantee to the creditors. When the loan had from every point of the compass, general prevalence of been expended, and the return interest and redemptions | mercantile law and safety, have all been accomplished; and had to be paid, the imports suddenly declined, and the | the world is opened to trade. But intellectual grasp of revenue security on which the money had been lent disap- | principles and details, and the moral integrity which is the peared, throwing the statesthemselvesinto much commercial | root of all commercial success, have to be severely tested embarrassment, in some cases into political convulsions, | in this vaster sphere. (R. 80.)

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COMMERCY , ® town of France in the department of | the prince of Vaudemont; and in 1744 it became the residence of Meuse, at the head of an arrondissement, on the left bank | Stanislas, king of Poland, who spent a great deal of care on the of the Meuse, twent miles east of Bar-le D It ‘ embellishment of the town and neighbourhood. A description of °c we c pt ‘ : ast o = e a “ ietaa his improvements is given in the Journal des Savants for 1752.

na now used as cava ry Darracks, a

Benedictine convent occupied by the prefecture, a hospital COMMODUS, Lvctus Avretius (161-192), emperor of . rebuilt In the 18th century, and a cloth-market. Its | Rome from 180 to 192, was born at Lanuvium in 161, and | public walks are very fine, and lead out in various directions | was the son of the philosopher-emperor M, Aurelius, and

~~to Pleasant suburban villages. The industrial establish- | of the younger Faustina. His teachers were carefully | Ments include foundries, lime-kilns, and a cotton factory ; | Selected ; but all the pains bestowed on his education did~~

~~and the trade runs mainly on cattle, grain, wood, and | not prevent him from choosing the society and the basket-work, Population, 4191, | pursuits of profligate favourites and commou gladiators,~~

~~Commerey dates back to the 9th century, and at that time its | Plind to his faults, however, his father gave him the title ords were dependent on the bishop of Metz. In 1544 it was | of emperor when not more than fifteen years of age; and fe ges ua in person. For some time the lordship was | at sixteen he shared the imperial power in every department number Siem — om ent Aen lived in fhe ee; 4 | except the chief pontificate. On the death of Aurelius, Was purchased by Charles 1, die ot ine, ie Wesco it i whom he had accompanied in the war against the Germans, 1S daughter Anne on her marriage with the prince of Ile-Bonne, | Commodus hastily concluded peace, and hurried back to | 1 the beginning of the 18th century it formed a principality under | the pleasures of the capital (180). From the first he gave~~

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~~the living oracles who must decide in all cases of doubt, and who are bound by an oath to decide according to the law of the land." Their judgments are preserved as records, and "it isan established rule to abide by former precedents where the same points come again in litigation." The extraordinary deference paid to precedents is the source of the most striking peculiarities of the English common law, There can be little doubt that it was the rigid adherence of the common law courts to established precedent which caused the rise of an independent tribunal administering justice on more equitable principles—the tribunal of the chancellor, the Court of Chancery. And the common law courts—the Queen's Bench, Common Pleas, and Exchequer—have always, as compared with the Court of Chancery, been distinguished for a certain narrowness and teclmicality of reasoning. At the same time the common law has never been a fixed or rigid system. In the application of old precedents to the changing circumstances~~

of society, and in the development of new principles to meet new cases, the common law courts have displayed an immense amount of subtlety and ingenuity and a great deal of sound sense, The continuity of the system is not less remarkable than its elasticity. Two great defects of form disfgure the English law. The first is the separation of common law and equity. The second is the overwhelming mass of precedents in which the law is embedded. The recent Judicature Act is an attempt to remedy the first by merging the jurisdiction of all the courts in one supreme court, and causing equitable principles to prevail over those of the common law where they differ. The second can only be removed by some well-conceived scheme of the nature of a code or digest (see Copn). The English common law may be described as a pre-eminently national system. Based on Saxon customs, moulded by Norman lawyers, and jealous of foreign systems, it is, as Bacon says, as mixed as our language and as truly national.

himself up to unbounded licence ; but for some years his vices were all private. In 183, however, he was attacked, at the instigation of his sister Lucilla, by an assassin, who declared that he struck inthe name of the senate ; and the nobility paid the penalty by the murder of any of that rank who afterwards aroused the slightest suspicion in the mind of theemperor. At the same time the vulgar vanity of Commodus manifested itself in a manner that exposed him to the scorn of the meanest citizen. No longer content with showing his strength and dexterity to a little group of favourites in the palace, he presented himself as a spectacle in the arena, and, carefully protected from serious danger, displayed his skill by shooting hundreds of wild animals, and by meeting in fight hundreds of gladiators. He called himself the Roman Hercules, and commanded that he should be worshipped as such. Plots against his life naturally began to spring up. That of his favourite Perennis was discovered in time. The next danger was from the people, who were infuriated by the dearth of corn. The mob repelled the pretorian guard, but the execution of the hated minister, Cleander, quicted the tumult. The attempt also of the daring highwayman Maternus to Se1Zc the empire was betrayed; but at last Eclectus the emperor's chamberlain, Leetus the prefect of the pratorians, and his mistress Marcia, finding their names on the list of those doomed to death, united to destroy him. He was poisoned, and then strangled by a wrestler named Narcissus, on the 3lst December 192, in the thirty-second year of his

age. It was said that he had intended to disgrace the office of consul by taking the auspices at the commence- ment of a new year of office, not in the consular robe but in the garb of a secutor, and surrounded not by the senate but by a band of gladiators. His guards alone, accustomed to his lavish bounty, regretted his death ; and Pertinax, being chosen by the conspirators, was allowed quietly to succeed him.

COMMON LAW, like civil law, is a phrase with many shades of meaning, and it is probably safest to define it with reference to the various things to which it is opposed. It ig contrasted with statute law, as law not promulgated by the sovereign body; with equity, as the law prevailing between man and man, unless when the Court of Chancery assumes jurisdiction ; and with local or customary law, as the general law for the whole realm, tolerating variatious in certain districts and under certain conditions. It is also sometimes contrasted with civil, or canon, or interna- tional law, which are foreign systems recognized in certain special courts only and within limits defined by the common law. As against all these contrasted kinds of law, it may be described broadly as the universal law of the realm, which applies wherever they have not been introduced, and which ig supposed to have a principle for every possible case. Occasionally, it would appear to be used in a sense which would exclude the law developed by at all events the more recent decisions of the courts.

Blackstone divides the civil law of England into lex scripta, or statute law, and lew non scripta, or common law. The latter, he says, consists of (L) general customs, which ure the common law strictly so called, (2) particular customs prevailing in certain districts, and (3) laws used in particular courts. The first is the law by which " proceed- ings and determinations in the king's ordinary courts of justice are guided and directed." That the eldest son alone is heir to his ancestor, that a deed is of no validity unless scaled and delivered, that wills shall be construed more favourably and deeds more strictly, are examples of common law doctrines, "not set down in any written statute or ordinance, but depending on immemorial usage for their support." The validity of these usages is to be determined by the judges—" the depositaries of the law,

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~~COMMON PLEAS, Court or (Communia Placita), was one of the three common law courts at Westminster— the other two being the Queen's Bench and Exchequer. The jurisdiction of all three, together with that of the Court of Chancery, the Court of Probate and Matrimonal Causes, and the Court of Bankruptcy, is vested in the new HIgh Court of Justice, established by the Judicature Act, 1873, One division of that court is called the Commo Pleas division, and there all the business which before the Act was "within the exclusive cognizance of the Court of Common Pleas" must still be transacted.~~

~~COMMON PRAYER. See Lirurey.~~

~~COMMONS. ° It is a well-known result of the applica- tion of the historical method to laws and institutions, that it has reversed many of our leading conceptions of the natural or original forms of property. That the primitive form of property in land was not severalty but commonalty, that land was held not by individuals but by communities, and that individual ownership was slowly evolved out of common ownership, are propositions as nearly as possible the opposite of our a prior ideas on the subject. 'The existence of rights of common is one of the traces of the ancient system still remaining in our law, but its real significance was for a long time obscured by the feudal theories on which the law of real property 1s based.~~

~~There seems to be good reason to believe that among the English, as among other Teutonic nations, the system ° land-holding by village communities prevailed. io account of that system reference may be made to Sir H. Maine's lectures, or to the short essay by Professor Nasse, a translation of which has been published by the Cobden Chub (On the Agricultural Community of the Muddle Ages): It may be sufficient to state here the bare outlines of the system. The "mark," or territory occupied by the community,~~

~~COMMONS~~

~~was divided into the following parts :—(1) The township, where were the houses held by heads of families in severalty ; (2) The arable land, divided into several plots, but subject to regulations as to common cultivation—the most usual of which is the three-field system; the land was to be fallow every third year, and the whole commu- nity had rights of pasturage on the~~

~~fallow portion, and or the stubble of the fields under crop at certain portions of the year between harvest and seed-time ; (3) The meadow- land, which in like manner was common for a period after the hay harvest, and was afterwards fenced off in separate allotments for the new crop ; (4) The common or waste land, not appropriated for cultivation, and over which the community had rights of pasturage, wood-cutting, &, After the Conquest we find the mark superseded by the manor, and although it has long been the fashion to find the absolute beginning of the latter system in the Conquest, there seems to be good reason to believe that its leading elements—the ideas of lordship and tenure—had been developed among the Anglo-Saxons themselves (see Digby's Introduction to the History of the Law of Real Property). At all events, the manorial system became defined and fixed under the Norman lawyers, and remains still the legal basis of property in land. All land is regarded as being held of the king, and the king's tenants might have tenants of their own. The practice of sub-infeudation, as it was called, was stopped by the statute Quid Limptores, 1290, which enacted that, when a lord alienated a portion of luis land, the alienee, instead of being tenant of the alienor, should take his place as tenant to the lord next above him. Since this statute, therefore, no new manors coali be created, All lands were supposed to be traceable originally to a grant from the king. Out of the lands so granted to him, the lord would grant certain portions to free tenants on certain rents and services, and these are the freeholders of the manor, His own portion would be cultivated by willains, or ser/s, attached to the soil, and these ultimately developed into the important class of copyholders. 'There remains the uncultivated and unappropriated land, over which the free- holders had certain rights of common supposed to be inci- dent to their original grant. Within the manor were certain courts (Court Leet, Court Baron, Customary Court), the most important of which is the Court Baron, or assembly of the freeholders, partly judicial aud partly administrative, It is regarded by the comnion law as the inseparable con- comitant of a manor, so that if there be no Court Baron thereisno manor, The historical investigations to which we have referred point to the identity cf the Court Baron With the assembly of the village community. The lord's Waste in like Manner represents the common waste of the community not appropriated in severalty, and used by all In common for pasturage, &c. The legal theory, however, supposes that the whole organization is created by grant ; the lord is the owner of the soil, and the rights of tenants~~

are merely such as he has granted to them out of considera- tion for rents and Services reserved. Whatever has not een 80 granted belongs as a matter of course to the lord. e Tights of common come to be regarded as of the nature of servitudes—jura in alieno solo—exceptional privileges granted over land by its real owner to his tenants. Rights of common enjoyed by the freeholders of the manor

4s incident to their tenure are said to be appendant, or attached to their holdings, with the original

of land not belongin

& most important ri ht of common is Common o asteure, which if . of

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useful for tillage—such ag horses, oxen, and sheep,—and in respect of arable land only (for manure) ; if appurtenant, it may extend to swine, goats, and geese, &c., and is not con. fined to arable land; if zn gross, it is subject to no restriction as to the species of beasts, The claim must be for some number limited and defined, and where no number is fixed, it is restricted to beasts Jevant and couchant—a phrase which, according to judicial interpretation, means such cattle as the winter eatage of the tenement, together with the hay, &ec., obtained from it in summer, could support. Some lands are subject to this common of pasture during certain portious of the year only—e.g., in the case of lammas. lands from the Ist of August, for eight months after which they are held in severalty. This arrangement may be com- pared with what is said of the village community above, Such lands are said to be commonabdle.

Common of Piscary is a right of fishing in a particular stream,

Common of Estovers is the right of cutting wood on another's estate.

Common of Turbary is the right of cutting turfs, and must be claimed in respect of land on which a house has been built, as "turves are only wanted to burn in a house, "

~~In some manors there is a right of digging and taking coals, minerals, &c, Subject to these rights, everything belongs to the lord of the manor, and a custom to exclude him from all manner of profit would be held void as being unreasonable.~~

~~In our earliest legislation on the subject of commons, the rights of the commoner appear to have a firmer footing than the theory which derives them from the grant of the lord would lead us to expect. The Statute of Merton (1235) gives relief to the lords whose efforts to improve their wastes have been frustrated by commoners bringing an assize of novel disseisin for their pasture, and the lord in such cases was to be held blameless if sufficient pasture, With ingress and egress, had been provided. It only applied, as we learn from the criticism of Bracton, to comimon appendant, and to cases where the right is expressly limited in number or kind. The Statute of Westminster the second (1285) extended it to rights appurtenant. Under these statutes inclosures can be made on the following conditions only :—~~

~~1. It must be the commoners.~~

~~2. If there is common made.~~

~~3. The statutes do not authorize inclosures which would infringe upon any other common rights, as turbary, piscary, &c.~~

~~4, They do not affect copyholders.~~

~~(See Six Essays on the Preservation of Commons).~~

~~It will be observed that, in relation to the rights described, the lord and the commoners are the only parties recognized by the law. The public in general have no rights, It has been alleged, indeed, that the immemorial use of open spaces near large towns by the inhabitants for exercise and recreation raises the presumption of a dedication—a question we need not discuss here. It ig chiefly, however, in connection with the needs of the public, especially of the inhabitants of large towns, that the law of commons is still a subject of some practical importance. Until quite recently the in- closure of commons was regarded as a matter affecting the lord alone, or at most~~

the lord and the commoners. Of late, the interest of the public at large in preserving the commons uninclosed has been strenuously asserted, and as we shall see has been recognized in legislation.

At common law, in spite of the predominance given to the rights of the lord, there was no means of converting the common or any portion of it into the severalty of the lord, unless to a comparatively smail extent, under the Statutes of Merton and Westminster the second. The in-

proved that sufficient pasturage has been left for

of pasture in gross, inclosure cannot be

crease of population and the growing need for food-producing land made it the interest of the lord,and it may be considered of the public also, that much of the common ground should be brought under cultivation. Down to the year 1860 this was effected by private Inclosure Acts, of which there were as many as 1600 or 1700. The provisions which it had been customary to insert in these special Acts were in 1801, after the manner of which we have so many examples, consolidated in Sir John Sinclair's Inclosure Act, 4] Geo. TIL c. 109. At this time the inclosure and cultivation of common lands were looked forward to as a means of in- creasing the national wealth. It is not till 1836 that we find any recognition of the desirability, on public grounds, of preventing inclosures under certain circumstances, Viz., in the 6 and7 Will. LV. ¢. 115, for facilitating the inclosure of open and arable fields (which applied to what have been called commonable lands and not to manorial wastes). The 55th section forbids inclosures within ten miles of London, or within corresponding distances of smaller towns. Sub- ject to the provisions of these Acts about 2000 private In- closure Acts had been passed, when in 1845 came the General Inclosure Act, 8 and 9 Vict. c. 148. Its object is stated to be to facilitate the inclosure and improvement of commons and other lands, now subject to rights of property, which obstruct cultivation and the productive employment of labour, &c. Commissioners are to be appointed who shall judge of the expedience of an inclosure and

superin- tend its execution, All common lands are brought within the scope of the Act, but rnanorial wastes are not to be in- closed without the previous sanction of Parliament, which was also made necessary for inclosures within fifteen miles of London, or within two miles of any city of 10,000 'nhabitants, or within two and a half miles of any city of 20,000 inhabitants, and soon. (A later Act, 15 and 16 Vict. c. 79, made the consent of parliament necessary in all cases under this Act.) Village greens are not to be inclosed, and by § 30 the commissioners are authorized to require, as one of the conditions of the inclosure, the appropriation of an allotment for the exercise and recreation of the neigh- bourhood on the following scale — In a parish of 10,000 inhabitants not more than 10 acres; between 5000 and 10,000 inhabitants not more than 8 acres ; between 2000 and 5000 not more than 5 acres ; and under 2000 not more than 4. Allotments might also be made for the labouring poor. Under this Act inclosures proceeded apace, and the commissioners have been accused of unduly favour ing inclosure, and neglecting the powers with which they were intrusted for the protection of the public. Alluding to this fesling the Home Secretary (My Cross), in propos- ing the Bill which afterwards became the Act of 1876, stated that of 414,000 acres which had been inclosed under the Act less than 4000 had been dedicated to purposes of recreation and exercise, and he admitted that, whereas in- closures had formerly been treated as a private estate im- provement to which the owner was entitled, agreat change of opinion had taken place as to the rights of the public. This feeling found expression in the Metropolitan Commons Act, 1866, which absolutely prohibits all further inclosure of metropolitan commons, and facilitates schemes for the management and improvement of such commons for the benefit of the public, due compensation being made for beneficial interests affected thereby. This, it will be observed, is a complete change of attitude. Whereas the lord was formerly treated as the real owner, and allowed to buy off partial interests, the public is now placed in that position, and the Jord becomes an encumbrancer, to be pought off like any other.

The revival of public interest in commons led to resistance being offered in courts of law to the unauthorized inclosure of commons by lords of the manor. One of the most im-

~~*and the latter comprises (1) draining, maunuring, the common, (2) planting trees, or it, (3) making bye-laws, (4)*~~

~~*appointment of conservators.*~~

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~~*portant of these cases Oxford (6 Chancery Appeals, as a freeholder of the manor decree against the defendants, of the common of the manor. Chancellor (Hatherley) on that occasion contains a state- ment of the view now taken rights of common. Glasse, the Corporation of London defeated attempted in- closures in Epping Forest.*~~

~~*ss that of Warrick v. Queen's College, 716), in which the plaintiff, of Plumstead, obtained a who had inclosed a portion The judgment of the Lord*~~

~~*by the courts of claims to In the Commissioners of Sewers v,*~~

~~*In 1869, a committee of the House of Commons presented*~~

~~*a report on metropolitan commons, and many of their re- commendations have been embodied in the Inclosure Act 1876, of which the following are the The preamble of the Commons Act 1876 states that, under the Inclosure Acts 1845 to 1868, the commissioners are ernpowered to authorize, assent of Parliament, the inclosure of commons, provided the inclosure is made on for the protection of public interests, and provided they are of opinion that such inclosure is expedient, having regard tothe benefit of the neighbourhood ; and that it is desirable that circumstances bearing on posed inclosure should notice of the commissioners, in severalty should not be made unle:s the commissioners are satisfied that it would be of benefit to the neighbour- hood as well as to private interests, and that further effect ought to be given to the provisions relating to allotments for purposes of may entertain applications either for (2) the inclosure of a common. the adjustinent of rights and the improvement*~~

~~*chief provisions.*~~

~~by provisional orders subject to~~

~~such terms as may be necessary~~

~~the expediency of the pro- be more fully brought under the and that inclosure of commons~~

~~The commissioners (1) the regulation or The regulation includes of a common; and levelling otherwise beautifying general management, and (5)~~

~~Tn case of ‘ inclosure,” as well as “ regulation,” the commissioners may insert pro- visions for the benefit of the neighbourhood, ¢.7., the secur- ing free access to particular points of view, preserving trees or historical objects, reserving playing-grounds, raaking roads, &c. In the case of suburban commons (7.¢., situated within six miles of any town) the sanitary authority shall be represented. The commissioners are directed to require evidence as to the benefit of the neighbourhood, and, in the case of inclosure, information as to the advantages of in- closure as compared with regulation. Rules are provided for inspecting the common, holding meetings, &c. The pro- visional order shall contain all the statutory provisions for the benefit of the neighbourhood that are applicable to the case, and, where the common to be inclosed is waste land of a manor, 2 description of the allotments for recreation ground. Compensation must be provided for private interests affected by the order. Two-thirds of the persons whose interests are affected must assent to the order, and “1 the case of a manorial waste the lord must consent, of his representative in interest, before the commissioners can certify the expediency of the order. When the freemen of « town have interests in the common, the consent of two- thirds of them must be obtained. amended by certain sections relating to field-gardens and recreation-grounds. Encroachments on or inclosure 0 village-greens are to be deemed a public nuisance. Ilegal ‘nclosures on commons settled under this Act are within the jurisdiction of the county court. ‘nclose a common otherwise than under this Act must give three months’ notice of their intention by advertisement. The section of the Inclosure Act 1845 which fixes a limit to allotments for recreation-grounds is repealed. he Ack does not apply to metropolitan commons. (E. RB)”**

~~exercise and recreation.~~

Persons intending t ;

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The Inclosure Acts are

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’ COMMONS, House or. Sco PARLIAMENT. COMMUNE, the smallest administrative division of France, corresponding in its main features to the muni- cipal borough of England. Communes constitute legal corporations of elaborate organization, capable of holding i property, contracting debts, and appearing as persons in) court, The chief magistrate of a commune is the mare, who is assisted by one or more adjoints, and a deliberative assembly, called the consedl municipal, or municipal council, . As an agent of the uational Government, he is charged with | the local promulgation and execution of the general laws and decrees of the country; and as a member of the municipality he has to attend to the police, the revenue, and the public works of the commune, and, in general, to act as representative of the corporation. In communes that either rank as the administrative centres of a department, arrondissement, or canton, or have a population of more than 3000, the mazre is nominated by the central Government ; in those which are not thus distinguished, the appointment lies with the prefect of the department, Suspension from office may be inflicted by the prefect ; but deposition can only proceed from the Government. Au adjoint may be intrusted by the matre with the discharge of any of his functions ; and as the maire’s representative he may preside over the consetl municipal even if he be not otherwise a member of the body. ‘he couucillors are elected by the votes of the communal electors ; and like the maitre and the adjoints, they hold office for a term of five years. The decisions of the council in regard to the local budget and various other matters are subject to revision and amendment by the prefect of the department,

some way towards the refutation of the popular conception of a communist as a needy adventurer seeking a means to possess himself of the property of others, There may have been some so-called communists attracted to the

movement by the hope of being enabled to live on the labour and industry of their neighbours; but such men have never originated any socialistic movement, and their motives have generally been quickly detected by the genuine communists, who have not infrequently adopted very vigorous means to expel such black sheep from their 'lock. Among the modern leaders of communistic movements who have actually reduced to practice the theoretical schemes of Zhe Republic and Utopia have been men who have devoted great wealth and rare organizing faculties to the carrying out of their plans for the reconstruction of society. It has been estimated that Robert Owen, during the course of his long life, devoted no less a sum than £60,000 from his own private fortune to the promotion of communistic schemes ; what he sacrificed indirectly to his views on social reform cannct be easily estimated. HIs faculty for the successful conduct of business was so remarkable that at the early age of twenty-six, without a shilling of capital of his own, he was appointed manager of the mills of the Chorlton Company with a salary of £1000 a year, besides one-ninth of the profits realized by the company. There can be no doubt that Owen had the personal qualities which would have enabled him to amass a colossal fortune if his ambition had lain in that direction. The immense pecuniary and personal sacrifices which he made to the cause of communism show that he at least was animated by motives the direct opposite of the selfishness and sloth generally attributed to the advocates of that system. Another leading communist, Saint Simon, was the representative of one of the most ancient families of the French nobility, A career in the army was open to him in which he might easily have satisfied the usual ambition of the class to which he belonged. As a young man he served with distinction through five campaigns,

Many other instances might be given of the dis- interestedness of the leaders of communistic schemes, Among American associations one of the most successful ag to the number and material prosperity of its members is the society known as the Perfectionists of Oneida and Wallingford. Their founder, John Humphrey Noyes, is the son of a banker, and a man fitted by education and natural gifts to have succeeded in any of the ordinary careers of professional or commercial activity. Whether we look at communism as depicted in the pages of Plato's Lepublic and Sir Thomas More's Utopia, or in the practical efforts made to realize these philosophical speculations by

such men as Owen and N oyes, we find no justification for the assumption that the movement is one for enabling "idlers and buuglers" to live on the industry and talents of their more energetic and skilful neighbours,

As we are here saying what communism is not, rather than endeavouring to define what it is, this is perhaps the right place to state that communism, meaning thereby community of goods and the abolition of private property, has no connection with the doings of the Commune of Paris which was overthrown in May 1871. The French word Commune is a household word in France for " Township " or " Corporation." Every town and village in France has its Commune or municipality. In nearly every town and village there is corporate property called Les Biens Com- munawsx, and this property is vested in the corporation or Commune. The similarity, however, of the French word for corporation to ours for expressing the doctrine of com- munity of goods, has led to a great amount of misconception and confusion, even among writers who are generally careful and well informed. The revolution of the Commune was

See Leber, Hist. critique du pouvoir municipal, 1828 ; Reynouard,

) Hist, de droit municipal, 1829; Dupin, Hist. de administration

locale, 1829; Champagnac, Du passé, du présent, et de Vavenir de

lorgan. munic. en Hrance, 1843 ; Gorges, Organisation de la com- mune en France, 1848,

COMMUNISM is the name that has been given to the schemes of social innovation which have for their starting- point the attempted overthrow of the institution of private

property. It is not to be wondered at that so stupendous an undertaking should have failed, except in a very few instances, in its immediate object. The principle of private property has been called by one who was by no means a blind worshipper of the social condition which has been built upon it, "that primary and fundamental institution on which, unless in some exceptional and very limited Cases, the economical arrangements of society have always Tested." To attack this primary and fundamental institu- Hon

indicates a mind so bold as well as So imaginative that —-: It might well be thought that the assaults upon it would be few and far between, limited to a single country or to a | 'Single age, or at least to a class of individuals rendered | desperate by having nothing to lose by a general social —- Yevolution. The Opinion that a communist is a man who . has no property to lose and who therefore advocates a Seneral redistribution of wealth ig very wide-spread and

popular. It ig embodied in the well-known lines of the corn-law rhymer :—

"What is a Communist? One who hath yearnings For equal division of unequal earnings, dler or bungler, or both, he is willing s·~· To fork out his penny and pocket your shilling."

The facts conn Show that the movements against the institution of private

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"Enough, my friend! but what is enough while anything remains wanting?" These sentences indicate the spirit in which philosophical as distinguished from practical com- munists from the time of Plato till to-day have undertaken to reconstruct human society.

Sir Thomas More's Utopia has very many of the Morey characteristics of The Republic. There is in it the same Utopii 3 wonderful power of shaking off the prejudices of the place and time in which it was written. The government of Utopia is described as founded on popular election ; com- munity of goods prevailed, the magistrates distributed the instruments of production among the inhabitants, and the wealth resulting from their industry was shared by all. The use of money and all outward ostentation of wealth were forbidden. All meals were taken in common, and they were rendered attractive by the accompaniment of sweet strains of music, while the air was filled by the | scent of the most delicate perfumes. More's ideal state differs in one important respect from Plato's. Therewas | no community of wives in Utopia. The sacredness of | the family relation and fidelity to the marriage contract were recognized by More as indispensable to the well- being of modern society. Plato, notwithstanding all the | extraordinary originality with which he advocated the emancipation of

women, was not able to free himself from the theory and practice of regarding the wife as | part and parcel of the property of her husband. 'The fact, therefore, that he advocated community of property led him also to advocate community of wives. He speaks of "the possession and use of women and children," and proceeds to show how this possession and use must be regulated in his ideal state. Monogamy was to him mere exclusive possession on the part of one man of a pieceof

entirely political ; it propounded no new economic theories. Tt arose from a joint effort of many sections of extreme politicians who were agreed in nothing but in demanding the establishment of (1) a democratic republic, and (2) the communal (or corporate) independence of Paris. Only about seven out of the seventy members of the Communal Government were communists in the economic sense, and these seven were among the most thoughtful and least violent of the party to which they belonged. They never had an opportunity of giving any official sanction to their communistic views, and they were gradually thrust on one side by their more violent and unscrupulous comrades. This is therefore not the place to attempt anything like an account of the brief reign of the Commune, which indeed belongs to the history of Paris. It is sufficient to state that its doings were not even tinged with communism in the economic sense of the word,

Communistic schemes have found advocates in almost every age and in many different countries. 'The foremost men both of thought and action have from time to time been attracted by them. They have been so various in scope, and the amount of detail with which they are described by their authors is so considerable, that it is difficult to get at the underlying principle which is common to them all. It must be remembered that the philosophic communism of Plato and More has been adapted tc tue wants of actual daily life by rough German peasants and Lancashire operatives ; and though of course the actual has differed a good deal from the ideal commune, yet their resemblance is, under the circumstances, very much more striking than their divergence. The one thing that is shared by all communists, whether speculative or practical, is deep dissatisfaction with the economic conditions by which

Plato's they are surrounded. In Plato's Republic the dissatisfac- Republic. tion is not limited to merely economic conditions. In his examination of the body politic there is hardly any part which he can pronounce to be healthy. He would alter the life of the citizens of his state from the very moment of birth, Children are to be taken away from their parents and nurtured under the supervision of the state. The old nursery tales, '" the blasphemous nonsense with which mothers fool the manhood out of their children," are to be suppressed. Dramatic and imitative poetry are not to be allowed. Education, marriage, the number of births, the occupations of the citizens are to be controlled by the guardians or heads of the state. 'The most perfect equality of conditions and careers is to be preserved; the women are to have similar training with the men, no careers and no ambition are to be forbidden to them; the inequalities and rivalries between rich and poor are to cease, because all will be provided for by the state. Other cities are divided against themselves. " Any ordinary city, however small, is in fact two cities, one the city of the poor, the other of the rich, at war with one another " (epublic, bk. iv. p. 249, Jowett's translation). But this ideal state is to be a perfect unit; although the citizens are divided into classes according to their capacity and ability, there is none of the exclusiveness of birth, and no inequality is to break the accord which binds all the citizens, both male and female, together into one harmonious whole. The marvel- lous comprehensiveness of the scheme for the government of this ideal state makes it belong as much to the modern as to the ancient world. Many of the social problems to which Plato draws attention are yet unsolved, and some are in process of solution in the direction indicated by him. He is not appalled by the immensity of the task which he has sketched out for himself and his followers. He admits that there are difficulties to be overcome, but he says in a sort of parenthesis, "N othing great is easy." He refuses to be satisfied with half meqsures and patchwork reforms.

wise than as the property of their husbands only makes it the more remarkable that he claimed for women absolute equality of training and careers. 'The circumstance that / communists have so frequently wrecked their projects by attacking marriage and advocating promiscuous intercourse between the sexes may probably be traced to the notion | which regards a wife as being a mere item among the — goods and chattels of her husband. It is not difficult to — find evidence of the survival of this ancient

habit of mind, ~ "Twill be master of what is mine own," says Petruchio. "She is my goods, my chattels." » « The Perfectionists of Oneida, a well-known communistic society in the United States which has put into practice community of wives, or, as they call it, complex marriage, justify their extraordinary social system by affirming that there is "no intrinsic difference between property in persons and property in things; and that the same spirit which abolished exclusiveness in regard to money would abolish, '¢ circumstances allowed full scope to it, exclusiveness 1 regard to women and children " (Nordoff's Communiste | Societies of the United States, pp. 271-2). It is this notion — ofa wife as property that is responsible for the wild opinions communists have often held in favour of a community 0 | wives and the break-up of family relations. If they could — shake off this notion and take hold of the conception of marriage as a contract, there is no reason why their views on the community of property should lead them to think — that this contract should not include mutual fidelity and \ remain in force during the life of the contracting parties. — Tt was probably not this conception of the marriage relation | so much as the influence of Christianity which led More to — discountenance community of wives in Utopia. It 8 | strange that the same influence did not make him include the absence of slavery as one of the characteristics of his ideal state. On the contrary, however, we find in Utop'@

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the anomaly of slavery existing side by side with institu- tions which otherwise embody the most absolute personal, political, and religious freedom. The presence of slaves in Utopia is made use of to get rid of one of the practical difficulties of communism, viz., the performance of disagree-able work. In a society where one man is as good as another, and the means of subsistence are guaranteed to all alike, it is easy to imagine that it would be difficult to ensure the performance of the more laborious, dangerous, and offensive kinds of labour. In Utopia, therefore, we are expressly told that "all the uneasy and sordid services " are performed by slaves. 'The institution of slavery was also made supplementary to the criminal system of Utopia, as the slaves were for the racst part men who had been con-

victed of crime ; slavery for life was made a substitute for capital punishment.

In many respects, however, More's views on the labour question were vastly in advance of his own time, and indeed of ours. He repeats the indignant protest of the Republic that existing society is a warfare between rich and poor. " The rich," he says, "devise every means by which they may in the first place secure to themselves what they have amassed by wrong, and then take to their own use and profit, at the lowest possible price, the work and labour of the poor. And so soon as the rich decide ou adopting these devices in the name of the public, then they become law." One might imagine these words had been quoted from the programme of the International Society, so completely is their tone in sympathy with the hardships of the poor in all ages. More shared to the full the keen sympathy with the hopeless misery of the poor which has been the strong motive power of nearly all speculative communism, The life of the poor as he saw it was so wretched that he said, " Even a beast's life seems enviable ! " Besides community of goods and equality of conditions, More advocated other means of ameliorating the condition of the people. Although the hours of labour were limited to six a day there was no scarcity, for in Utopia every one worked; there was no idle class, no idle individual even.

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proposed to his partners to spend £5000 upon new schools, They not unnaturally objected to an expenditure at that time quite unprecedented ; whereupon Owen bought his partners out for £84,000, and took his own course upon the educational system he had brought forward. It is to be observed that communists have seldom or never relied on their peculiar system alone for the regeneration of society, Community of goods has indeed been their central idea, but they have almost invariably supported it by other projects of less questionable utility. Compulsory education, free trade, and law reform, the various movements connected with the improvement of the condition of women, have found their earliest advocates among theoretical and practical communists. The communists denounce the evils of the present state of society ; the hopeless poverty of the poor, side by side with the self-regarding luxury of the rich, seems to them to cry aloud to

Heaven for the creation of a new social organization. They proclaim the necessity of sweeping away the institution of private property, and insist that this great revolution, accompanied by universal education, free trade, a perfect administration of justice, and a duc limitation of the numbers of the community, would put an end to half the self-made distresses of humanity. Has it never occurred to them that a similarly happy result might be attained if all these subsidiary reforms were carried out, leaving the principles of private property and competition to their old predominance in the economic world ? If the principles of communism and of private property are to be fairly compared, the comparison must not be between communism as it might be and private property as it is. Communism to be successful requires to be accompanied by important reforms, towards which existing society founded on private property is gradually finding its way. The power which society, as at pre- sent constituted, has shown of adapting itself to altered circumstances, and of assimilating by slow degrees the more valuable concomitants of the most revolutionary theories, is strong proof that it does not deserve to be dealt with in the summary manner advocated by the communists.

The importance of this from an economic point of view is

the We find in many socialistic writings of thirty or forty years Louis insisted on by More in a passage remarkable for the

ago the assumption expressed or implied that, in society as it Blanc on

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importance which he attaches to the industrial condition of | is, the most valuable and essential reforms are impracticable, ane women, "And this

you will easily apprehend," he says, | M. Louis Blanc, for instance, in his book called LP' Organisa- tions.

"if you consider how great a part of all other nations is quite idle. First, women generally do little, who are the half of mankind." 'Translated into modern language his proposals comprise universal compulsory education, a reduction of the hours of labour to six a day, the most modern principles of sanitary reform, a complete revision of criminal legislation, and the most absolute religious toleration. The romantic form which Sir Thomas More gave to his dream of a new social order found many imitators, The Utopia may be regarded as the prototype of Campanella's City of the Sun, Harrington's Oceana, Bacon's Nowa Atlantis, Defoe's Essay of Projects, Fénelon's Voyage dans I'Ile des Plaisirs, and other works of minor importance,

It is Temarkable that all communists have made a great point of the importance of universal education. All ideal ommunes have been provided by their authors with & perfect machinery for securing the education of every child. One of the first things done in every attempt to fer ee custic theories into practice, has been to me tS a good school and guarantee education to every ae ' ee impulse to national education in the Re eed probably sprang from the very marked ae ss obert Owen's schools in connection with the Reo a at New Lanark. Ata time (1806) when

education was in the lowest possible condition,

» 48 manager and part owner of the New Lanark Mills,

tion du Travail, first published in 1839, says that in the existing order of society the spread of education among the masses would be dangerous,—would, in fact, be impossible. This, if true, would be the strongest possible indictment against the existing order of society. But how have events falsified the assumptions made in the following passage ? "On a vu pourquoi, dans le systéme actuel, l'éducation des enfants du peuple était impossible… .. Beaucoup @esprits sérieux pensent qu'il serait dangereux aujourd'hui de répandre linstruction dans les rangs du peuple, et ils ont raison, Mais comment ne s'apercoivent-ils pas que ce danger de l'éducation cst une preuve accablante de Yabsurdité de notre ordre social?

Dans cet ordre social, tout est faux: Je travail n'y est pas en honneur ; les pro- fessions Jes plus utiles y sont dédaignées ; un laboureur y est tout au plus un objet de compassion, et on n'a pas assez de couronnes pour une danseuse. Voild, voila pourquoi Péducation du peuple est un danger!" (p. 100). Hence, he concludes, a social revolution ought to be attempted ; a new system of society ought to be introduced ; the old system of society is, he says, so " full of iniquities " that it cannot co-exist with a diffusion of education among the people Even at the time when these words were written there was much to show that they were not true. Since they were written the spread of education has been most general in those countries in which the old social order, founded on private property and competition, is unshaken,

Opposition to banking.

Credit banks in Germany.

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Germany, Scotland, and America have an educated people, and they are distinguished among other countries for pos- sessing a peaceful, law-abiding, and order-loving population. So far from education being a danger to the institution of private property, nearly every onc has been convinced by events that it is much more seriously threatened by ignor- ance and the helpless desperation ignorance brings ; and the old order of society has recognized the necessity of protecting itself by the diffusion of education.

Organisation du Travail furnishes another example of the mistake communists often make in thinking it 1s neces- sary to turn the world upside down in order to bring about some desirable economic change. M. Louis Blane is deserib- ing the organization neccssary for the establishment of his " ateliers nationaux," which became so famous nine years later when the eloquent author of LOrganisation dw Travail was a member of the Government of 1848. He isspeaking of the place occupied by the credit and banking system in the existing economical order of society. " Que doit étre le crédit ? Un moyen de fournir des instruments de travail au travailleur. Aujourd'hui, nous l'avons montré ailleurs " (in an article in the Revue de Progrés called " Question des Banques") "le crédit est tout autre chose,

~~*Les banques ne prétent qu'au riche. Voulussent-elles préter au pauvre, elles ne le pourraient pas sans courir aux abimes. Les banques constitutées au point de vue individuel ne saurai- ent done jamais étre, quoi qu'on fasse, qu'un procédé admirablement imaginé pour rendre les riches plus riches et les puissants plus puissants. Toujours le monopole sous les dehors de la liberté, toujours la tyrannie sons les appar- ences du progres ! L' Organisation proposée " (that of the national workshops) "couperait court b tant d'iniquités. Cette portion de bénéfices, specialement et invariablement consacrée b Pagrandissement de l'atelier social par le recrnte- ment des travailleurs, voild le crédit. Maijntenant, qu'avez vous besoin des banques % Supprimez-les" (pp. 97-8). This passage is a striking instance of the way in which communistic writers are inclined to treat social and economic problems. M. Louis Blanc observed that the banking syste at the time in which he wrote was in some respects defective. From the nature of their business and the security they were obliged from motives of self-preserva- tion to demand, the banks lent only to those who were able to give them that security, te. to the rich. Tiven this statement requires some modification unless in the expression " the rich" is included every struggling farmer or tradesman who is helped over a time of pecuniary diffi- culty by the credit afforded to him by his banker. 'The fact remains, however, that the banks did not give credit to the labouring classes. Credit, urges M. Louis Blanc, which ought to be a means of furnishing the instruments of production to the labourer, is in reality no such thing. What is the remedy which he suggests for this deficiency in the credit system? An entire reorganization of the industrial world, in which every labourer will be supplied by the state with the tools and raw materials which his work requires. If this proposed reorganization were adopted there would no longer be any scarcity of credit, and as for banks, he cries triumphantly, they would no longer be necessary, let them be put down.*~~

~~*it is not M. Louis Blanc only who observed that the ordinary banking systent cannot, from want of security, afford to make advances to the labouring classes. Herr Schulze-Delitzsch noted the same fact, but the remedy which he suggested, and which has been carried out with such great success in Germany, is very different from the heroic treatment recommended in the passage we have quoted from M. Blanc. The Schulze-*~~

~~Delitzsch credit banks which began to be established in Germany in the year 1851 are associations of artizans formed for the purpose of~~

~~inquired into.~~

~~that they then possessed nearly 170,000 the money annually advanced sterling.~~

~~associations has during~~

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~~enabling the members to obtain by means of credit the capital necessary to production. entirely self-supporting ; they have up-rooted nothing. Their success, so far from weakening the ordinary banking it by supplying one of its deficiencies. workman cannot obtain an advance of capital upon credit because he cannot give adequate repaid. But who are jointly and severally of loans made to any ouc of~~

~~These associations are they have supplanted nothing,~~

~~system, has strengthened The individual~~

~~security tliat it will be the credit banks are associations of workmen responsible for the repayment their number. A member of through its means obtain 2 loan principle of the unlimited~~

~~one of these associations can on favourable terms, because the~~

~~liability of each of the members for the repayment of a Joan made to any one of them affords the means of offering to the lender most ample and fact that the principle of unlimited liability is strictly maintained is really the essential characteristic of the security which the associatiou is able to give to those who~~

~~sufficient security. The~~

~~advance capital to it. If this principle were relaxed it is more than doubtful whether the security offered by the association would be sufficiently good to~~

ensure advances of capital being made to its members on remuunerative terms. The unlimited liability of each for the debts of all necessi- tates great caution before a new member can be elected into one of these associations. The circumstances and previous career of candidates for membership are most carefully They must give satisfactory evidence as to their previous character and industry, and they are required to give substantial proof that they are in a position to share the pecuniary responsibilities of the association by becoming shareholders in it. Care, however, is taken to elect no one who is not a bora fide workman. The capital required for making loans is partly obtained from the subscriptions of members, but the principal part of it is obteined in the open market, where the association, being able to offer good security, can obtain money on reasonable terms,

The success of these associations has been most striking. In 1865 there were 961 credit banks in existence in Germany. Of these 498 sent in a report of their financial condition to the central bureau, and their accounts showed raembers, and that was equal to £10,600,000 As ten years have passed since the time when these reports were sent 10, and the prosperity of the the interval been uninterrupted,

there is every reason to believe that the number of members

and the amount of the loans would at the present time

show a very considerable increase. The very remarkable

success of the credit banks 1s an instance of what great

things can be done by self-help and without initiating any

attack on the existing order of economic life. It is one of the least pleasing aspects of communism that communists not only do not attempt themselves to bring about by similar means an amelioration in the economic condition of society, but they have often gone out of their way to pour contempt and ridicule on such reforms as that introduced by Herr Schulze-Delitzsch. The establishment of the eredit banks was looked on with great disfavour by the German com munists. 'Their leader, Ferdinand Lassalle, published a book, said to be the most important of his economic writings, in which he bitterly

~~attacked the credit banks and the Co- operative system generally (Ller7 Schulze-Delitzsch, Der skonomische Julian, oder Kajtal und Arbeit, Berlin, 1864 ; Dem deutschen Arbettsstande und den deutschen Bourgeorsre gewidmet). Co-operation, he saw, made no attack on the principles of private property and competition ; and it was these principles which he had set himself to destroy. The good achieved by an amelioration of the condition of the people did not appear to him to outweigh the evils which~~

~~I~~

~~) only to make it more hateful to him.~~

~~"Jontempt~~

~~shown great contempt for political liberalism,~~

~~before anything better can be substituted in its place.~~

~~emphatic in expressing themselves in a sivailar strain.~~

~~on the value and results of political liberalism :—~~

~~"Although the liberals have not carried out their principles in any land as yet completely, still the attempts which have been made are sufficient to prove the uselessness of their efforts. They endeavoured to free labour, but only~~

~~succeeded in subjecting it more completely under the yoke of capital ; they aimed at setting at liberty all labour powers,~~

~~and only riveted the chains of misery which held them~~

~~bound ; they wanted to release the boudman from the clod,~~

~~and deprived him of the soil on which he stood by buying~~

~~and only created superfluity on one hand and dire want on the other; they desired to seeure for merit its own honourable reward, and only made it the slave of wealth ;~~

they wanted to abolish all monopolics, and placed in their

stead the monster monopoly, capital ; they wanted to do away with all wars between kindled the flames of civil war ; they tried to get rid of | the state, and yet have multiplied its burdens; they wanted to make education the common property of all, and made it the privilege of the rich; they aimed at the greatest moral improvement of society, and have only left it In a state of rotten immorality ; they wanted, to say all ina word, unbounded liberty, and have produced the meanest servitude ; they wanted the reverse of all which they actually obtained, and have thus given a proof that liberalism in all its ramifications is nothing but a perfect

——Utopia," Ce The condition of England is often pointed at triumphantly Booland by Communists of other countries as a complete condemna- com. 40n of the prineiples of private property, capitalism, and muism, Competition, Lassalle, Marx, Louis Blanc, and others quote passages from bluebooks, speeches of English statesmen, and writings of our public: men in which the condition of the English poor is painted in the darkest colours. In England, they say, for the last half century . ee had liberalism in the ascendant ; you have had free ; — e, you have had an energetic and industrious people ; Ga a of capital eager for employment is practically eaten : » Competition has had in nearly every branch of Pte most unrestricted development. In England, if sition « may surely look for the nearest approach to sogiiag 0 ge the present economic condition of oa a €&. Then they proceed to quote passages Fi i. a speeches and official reports, and vieewee ems writers on political economy, all bearing € terrible poverty and squalor in which a large

up the land ; they yearned fora happy condition of society,

nation and nation, and

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he believed to be associated with every circumstance that favoured the aecuniulation of capital in private hands. Co- operation, he urges, is only improved capitalism, and the very improvement by making it more formidable seemed

*In the same spirit of bitter hostility to all means of or political jmproving the existing condition of society without chang- viberalism ing the basis on which it rests, communists have a | e changes proposed and carried out l*y political liberals are -condemned by the communists as a mere patching up of an essentially worthless fabric which must be got rid of*

At the time when the agitation for the Reform Bill carried in 1832 was uppermost in the minds of all English politicians, Robert Owen took an opportunity of pro- | claiming in public his belief in the utter futility of all political reform. The German conimunisis, or socialists ag they are often called, have, generally speaking, been Lao

e following passage, taken from the writings of Karl Marx, a member of the International Society, is scarcely an exag- geration of the views of the German school of communisin

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proportion of the labouring class in this country spend their lives. M. Louis Blanc, in the book already referred to, quoted from Lord Lytton's Lnyland and the English a passage showing that the amount and quality of nutriment consumed by the inmates of our jails and workhouses were at that time far in excess of what could be obtained by the wages of the frugal and industrious working-'man. Marx cites the following passage from Dr Hunter's report to the Privy Council (1862-3) on the domiciliary condition of the agricultural labourer :—'" The means of existence of the hind are fixed at the very lowest possible scale. What he gets in wages and domicile is not at all commensurate with the profit produced by his work. His means of subsistence are always treated as a fixed quantity; as for any further reduction of his income he may say nihil habeo, nihil curo, He is not afraid of the future ; he has reached zero, a point from which dates the farmer's calculation. Come what may he takes no interest in either fortune or misfortune,"

Whatever may be the value of the remedy which communism suggests for so melancholy a condition as that here described, it is surely useful that the attention of people who have "much goods laid up for many years" should be forcibly arrested, and that they should be made to consider why it is that

in the richest country in the world the condition of a large proportion of the labouring classes is so bad that it can hardly be made worse. But at present there is a general conviction that the remedy proposed by communists is one which it would be over- whelmingly difficult to apply, and it is also believed that even if it were applied it would be of doubtful efficacy.

Some of the most obvious difficulties associated with the practical adoption of communism have been already adverted to. The social, political, and industrial edifice which is the outcome of centuries of effort and sacrifice would be destroyed by the adoption of communism 3 i would be necessary to reconstruct society from its very foundations ; and society, like a constitution, is one of those things which cannot be made—it must grow. 'Then also the efficacy of communism as a remedy for the miserable condition of the poor is, to say the least, doubtful. To what cause may be assigned most of the pauperism, misery, and squalor which hang like a cloud over the lives of so many of the labouring classes? What was the principal agency which brought about calamities like the Irish and the Orissa famines? There can be but one answer to these questions,—the pressure of population on the means of subsistence. Many communistic writers have passionately denied this, and have denounced with all the fervour of emotional natures the doctrine laid down by Malthus that population tends to increase faster than subsistence is capable of being increased. No one, however, has Checks on atterapted to throw doubt on the main fact on which the popula- Malthusian doctrine rests, that everywhere, except in very #™ new countries with a large extent of unoccupied fertile land, checks on population are in active operation. These checks must exist everywhere where population does not increase at its greatest possible speed. Under favourable conditions population sometimes has doubled. itself in 20 years. Professor Cairnes has stated that in Ireland the population more than doubled itself in the 38 years between 1767 and 1805. At the rate of increase of the ten years ending 1870, the population of England would double itself in 63 years, that of France in 265 years. In France and England, therefore, checks on popu- lation are, in a varying degree, in active operation ; and the same may be said of all old countries. It is important, however, to inquire into the nature of the checks on

population in actual operation. They may be divided into two classes, the first carrying with it nothing but misery and degradation, the second implying a high degvee of self-

The Separatists, an American community of German origin, established in 1817, favour celibacy although they do not enforce it. No marriage can take place without the consent of the trustees of the society; and they further discourage marriage by entering among the articles of their religion a declaration of their belief that celibacy is more in accordance with the divine will than marriage. The Amana community also, a German society in the United States, which dates its origin from early in the last century, discourages marriage among its members, No man is allowed to marry before he is twenty-four years of age. Mr Nordhoff relates that the reason for this rule was explained to him by one of the elders of the Amana Society in these words,—" They " (the young men) " ave few cares in life, and would marry too early for their own good—food and lodging being secured them—if there were not a rule upon the subject." The religious tone of the community is also set against marriage. "In the Amana Church there are three classes, orders, or grades, the highest consisting of those members who have manifested in their lives the greatest spirituality and piety. Now if the newly-married couple should have belonged for years to this highest class, their wedding would put them down into the lowest, or the ' children's order,' for a year or two until they had won their slow way back by deepening piety" (Nordhoff's Communistic Societies of the United States, pp. 36-7). Even the Perfectionists, whose extra- ordinary system of " complex marriage " has been already referred to, take many precautions against a superabundant population, The number of births is controlled by the heads of the society. 'The founder of the community writes as follows: 'Previous to about two and a halt years ago, we refrained from the usual rate of child-bearing, for several reasons—financial and otherwise." Even when the number of births was increased it was stated that they were purposely kept within such limits that "judicious moral and spiritual care, with the advantage of a liberal education," could be guaranteed to every child (Nordhoff, p. 276). The practical answer made by communists to the population question, even in so wealthy a country as America, in which

unoccupied fertile land can be easily and cheaply obtained, is that a strict limitation of num- bers is absolutely essential to their social and industrial well-being. As a matter of fact the population of nearly all the American communistic societies has not increased at all, but has greatly declined during the last fifty years The number of Shakers, for instance, in 1823 was 3800; their number in 1874 was 2415. The Icarians, the only American community which makes marriage compulsory, have declined in twenty-five years from 1500 to 65.

It would, however, be rash to conclude from these facts that the general adoption of communism would tend to strengthen the prudential checks on population. We have seen that modern communists, when freed from the trammels of actual experience of the daily working of the system they advocate, have vigorously denounced the theory 2 practice of Malthusianism. The American communities ee have declined in numbers partly in consequence of the Ferenc adoption in two of them of celibacy asa religious principle. with do It is also impossible to avoid the conclusion that their mestit | numbers have fallen off partly in consequence 0 the | unattractive conditions of communistic life. "They ysis members of these societies not unfrequently leave them when they arrive at manhood and womanhood. The routine and absence of spontaneity of a communistic life 18 ® weight to young and active minds that is not counter: balanced by security from want, or what has been called bread-and-butter prosperity. The numbers of marrage and of births have been controlled in other of these societe? 'n virtue of the absolute despotism which ig vested in thert

restraint, independence, and foresight. In the first class may be placed war, pestilence, famine, and all the diseases incident to insufficient food and overcrowding. In the second class may be placed prudential restraints on marriage and on the number of births to each marriage, and emigration. Every circumstance which weakens the efficiency of the checks on population comprised in the second class necessarily adds to the force of the checks which we have placed in the first class. In other words, any circumstance which relaxes the force of the prudential checks on population tends to produce the miseries of famine, scarcity, and " starvation diseases." What would be the effect of communism on the population question ? Would it strengthen or weaken the motives which promote a

prudential limitation of numbers? Nearly all com- munists, whether theoretical or practical, have faced in one way or another the population question. The solutions they have offered differ widely. Let us first see what the greatest of theoretical communists have had to say on the subject. Controlof Plato seems to have thought the matter an easy one, marriages and says that the guardians of lis state must control the and births. y umber of births. In Utopia the age at which men and women were allowed to marry was fixed by the state, and all irregularities in defiance of this rule were to be severely punished. 'The population was also to be kept within certain limits by means of migration, emigration, or colonization, But the theoretical communists of modern times have hardly found words strong enough to express their detestation of the principle that any limitation is desirable to the possible number of births. The writings of Malthus are spoken of as "an outrage on household life.' His language, it is said, " brutalized the purest feelings of domesticity." M. Louis Blanc inveighs against the doctrines of political economists, and protests that they are blaspheming God when they say that the pros- perity of the poor would be promoted by a limitation of the population. Why are you not logical? he cries. If you were you would recommend that the children of the poor should be put to death ! And in another place he speaks of " cette économie politique sans entrailles dort Ricardo a si complaisament posé les prémisses, et dont Malthus a tiré avec tant de sang-froid Vhorrible con- clusion. Cette économie politique portait en elle méme un vice qui devait la rendre fatale » |'Angleterre et au monde" (L' Organisation du Travail, p. 71), Practical communists have not, however, met the population question in the spirit indicated by these quotations. Several of the most successful realizations of communistic life have maintained the strictest celibacy ainong their members. The Essenes, who practised community of goods before the Christian era, were a sect composed entirely of men, who lived in seclusion from the world and were in many impor- tant respects the prototypes of Christian hermits or monks. Two of the most important communistic societies of the United States have also made celibacy an essential feature of their system. The «'Economites " and " the Shakers," the societies to which reference is made, have existed since 1805 and 1792 respectively. 'They are strictly celibate, their numbers being recruited by converts from the outside world and to a slight extent by the adoption of pauper children and orphans from neighbouring towns. Other communistic

societies maintain the authority of the heads of the society to limit the number of marriages. The Spartan Government, which in many important respects was communistic, exercised the most absolute control over the increase of population. Among the Moravians marriage is not permitted to take place without the consent of the heads of the society, who furnish the newly married couples with a suitable marriage portion.

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chiefs; individual liberty is entirely suspended; the smmallest minutize of the daily life of their members is regulated from headquarters. A government which decides at what hour its subjects shall go to bed at night and rise in the morning; which prescribes the colour, shape, and material of the dresses worn, the time of meals, the quality of the food consumed, the daily task apportioned to each member; which enforces a rule that each of its subjects shall leave every morning a notice stating at what exact spot he or she will be found during each hour of the day ; a government which can do all these things will find no great difficulty in controlling the number of marriages aud births, Mr Nordhoff states-that 'the fundamental principle of communal life is the subordination of the individual's will to the general interest or the general will ; practically this takes the shape of unquestioning obedience by the members towards the elders or chiefs of their society." If, however, communism were adopted through- out a whole nation, the minute despotism which now distinguishes the government of existing communistic societies, and which furnishes them with an effectual con-

trol over the growth of population, would cease to be |

possible ; or if, indeed, it should ever become possible it would be through the careful suppression of individual liberty, and through the strenuous encouragement of everything which tended to destroy self-reliance on the part of the people and to build up the absolute power of the state. A people who purchased material prosperity at the price of their liberty would strike a bad bargain, especially when it is remembered that the limitation of the number of marriages and births which is enforced by the central authority in a communistic society can be effected by voluntary self-control in a society based on private property and competition. The difference,

~~therefore, so far as the population question is concerned, between communism and private property is whether the necessary restraint upon the possible number of births shall proceed from the direct intervention of the state, or whether it shall proceed from the combined motives of self-interest, self-control, and parental obligation on the part of the people themselves. It should be remembered that what communism professes to be able to dois to ensure to every member of a com- munistic society an ample supply of the necessaries and conveniences of life. Ifthe population question is pressing now when the workhouse and parochial relief are the only refuge of those who cannot maintain themselves, would it not become much more pressing if a man could obtain freely, and without fulfilling any disagreeable conditions,~~

~~—food, house, and clothing for himself, and as many children~~

~~as he chose to bring into existence? Itis this consideration which has forced upon the government of communistic societies the control of the marriages and births of their members, Even where the principles of communism are adopted in so very materially modified a form as they are 12 Our poor law system, legislative control over population has been enforced. The regulation which separates man and wife in the workhouse is a practical recognition of the principle that, where must, in self-protection, exercise control over the numbers of those dependent on it for support. Self-help brings With it self-control 3 State-help makes state-control indis- Pensable. In the present economic condition of society the solution of the Population question is not to be found~~

~~i ic; : | In placing in the hands of the state, as communism has~~

~~cE geeete control over domestic life. The solution of 2 a em must be sought in edneation, in an improved~~

~~andard of comfort and a determination on the part of the People not to sink below it, and in a reform of the most communistic portion of ony poor law system, —the lavish~~

~~distribution of out-door relief.~~

the State guarantees a maintenance, it

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There are some charges made agaist communis which may be brought with at Icast equal force agaiust the economic and industrial arrangements which now prevail.

One of these is that communism does not avail itself Self.

sufficiently of the motive of self-interest in order to obtain interest as

from each labourer the best and most conscientious work ® a to our.

of which he is capable. If, it is urged, the result of a man's industry belongs not to himself solely but to the whole community of which he is a member, he will not throw the same energy aud zeal into his work as he will if everything which he produces belongs solely to himself. There can be no doubt of the truth of this statement ; self-interest is a force on which industrial machinery chiefly relics for motive power. But it is remarkable that the prevailing system of working for fixed weekly wages checks the play of self-interest in the workman much more completely thau it is checked in a communistic society by the fact that the results of the labour of each are shared by all. A workman who is in receipt of fixed weekly wages has no motive to reach any higher standard of excellence or expedition in his work than such as will prevent him from being dis- charged for bad work or laziness. Itis a complaint con- stantly heard among employers of labour that the only ambition of the men seems to be to see how little work they can do for their wages. The actual existence of this feeling among workmen is proved by many of the rules of trades' unions,—such as that which limits the number of bricks which a hod-man is allowed to carry, and which in one case forbade the use of wheel barrows in taking bricks from one spot to another. Mr Thornton's book On Labour gives several examples of the rules adopted by trades' unions to check the tendency which is sometimes found ina workman to exert himself to do his best and thns show his superiority over his fellows. " 'Not besting one's mates' has by several unions been made the subject of special enactment. . Association has a rule providing that 'any man found running or working beyond a regular speed shall be

fined 2s, od. for the first offence, 5s. for the second, 10s. for the third, and if still persisting shall be dealt with as the committee think proper.'" It was urged by the trade unionists in the textile manufactures of Lancashire and Yorkshire asa serious argument for placing impediments in the way of the employment of women in these industries that they were apt to take a pride and pleasure in the excel- lence and rapidity of their work, and that their vanity was such that a word of praise or encouragement from the overlooker would canse them to redouble their exertions (Report of Dr Bridges and Mr Holmes on the condition of women and children employed in Textile Industries, 1873).

These examples are more than sufficient evidence that the present industrial system does not bring into play the motive force of direct self-interest in stimulating the exertions of the labourers. In this respect com- munism would seem at first sight to compare favourably with mere wages-receiving industry; for 'in a commu- nistic society every man and woman has some direct share, however small, in the results of his or her labour. If more is produced, there will be more to receive ; and instead of a trades' union, every member of which is pledged, under penalties, to work slowly and to watch that his fellow-workmen do the same, communism gives to each labourer a direct interest not only in work- ing well himself, but in watching to see that honest and steady work is done by his neighbours. As a matter of fact, the American communistic societies have found no difficulty in enforcing the habit of careful and regular in- dustry on their members. The American communists do not as a rule work hard; for they find that they can

| provide for all the wants of the community without exces-

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. . . The Manchester Bricklayers' °

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sive or exhausting toil, But there are no idle members, and every member works well and steadily while he is working. That the quality of their work is good is proved by the fact that their commercial reputation stands very high. The garden seeds, the production of which is the staple trade among the Shakers, have been celebrated for their excellence for more than seventy years all over the United States. "The Oneida Perfectionists established the reputation of their silk twist in the market by giving accurate weight and sound material ; the woollen stuffs of Amana command a constant market, because they are well and honestly made ; and in general T have found that the communists have a reputation for honesty and fair dealing among their neighbours, wherever their products are bought and sold" (Nordhoff).

It must, however, be remembered that a few small communities, such as those which exist in America, afford no fair test of what would be the effect of a general adoption of communism on industrial activity and efficiency. THe communists in the United States only number about 5000, including children ; and though there are eight different societies, these are divided into 72 separate communities, the Shakers alone having 58. On an average, therefore, each community consists of less than 70 persons. The elaborate despotism of communistic governinent, together with the minute surveillance which the small size of these communities renders possible, makes it easy for the leaders of these societies to exact from each member his quota of toil ; idleness would be at once detected and would not be suffered to exist, as the power of expelling an idle member would be resorted to if the voice of public opinion were not sufficient to induce him to mend his ways. Similar meaus of detecting and preventing idleness would be completely absent if communism were generally adopted. There would, of course, in this ease be no power of ex- pelling an idle member, and the difficulty of detecting and proving to the central authorities a disposition on the part of any of the members to avoid a fair share of work would increas? pari passw with the size of the community. The motive of self-interest in promoting good work is much more powerful in a small communistic society than in a large one. A man can appreciate the value of his own industry much more clearly if the resulting product is shared between 60 or 70 persons, every one of whom is well known to him, than he can if it is thrown into the common stock of 20,000 people. The weakening of the motives of self- interest which is inherent.in communism is reduced to a

minimum in small communities, but it would act with fatal results to industrial activity if there should ever be an attempt to make communism universal, For, much as the present system falls short of making the most of the great engine of self-interest among those who merely work for wages, there is no such failure among the other indus- trial classes. Capitalists, landowners, inventors, Cornish tributers, and members of co-operative productive socicties and copartnerslhiips are all brought under the stimulating influence of self-interest, and thus devote themselves to industrial projects with a zeal completely and necessarily unknown among those who work for wages or those who arc members of communistic socicties.. It is the special feature of co-operation that it brings the motive of self- interest into activity among manual labourers. Without attempting, as communism does, to overthrow all existing economic institutions, jt takes these as they are, and men and women as they ave, and suggests a means by which the labourer, no less than the capitalist, can be stimulated by direct self-interest to throw some energy and enthusiasm into his work.

We referred above to the melancholy picture drawn by Karl Marx, Louis Blanc and others of the condition of

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the English poor. some parts of England done much to brighten the social tive and industrial condition of the working classes. Times of 18th August 1875 gives an account of the co- operative manufactures in the town of Oldham. In this one town there are 80 joint-stock co-operative mills ; in the county of Lancashire there are 150, The bulk of the share- holders are artizans, who labour in the mills, and who there- fore have a direct and immediate interest in the results of their industry. Cotton-spinning and weaving are the principal businesses carried on in these mills. The principle of self-interest has had the effect of producing, not mere activity on the part of the labourer, but thoroughly sound and honest work. We are told by the Zimes that these mills possess a high reputation for probity of manufacture, They are worked partly with capital subscribed by the sharcholders, in £5 or £10 shares, and partly with borrowed capital which bears a fixed rate of interest. Many of the mills pay a dividend of 10 per cent. on their share capital ; the ledgers and account-books of each society

are open to all the shareholders, who also exercise the power of electing in open meeting the managers and officers of the association. The shareholders frequently invest money on loan to the societies of which they are members, so that the interests of the lenders and of the sharcholders are identified in the most absolute manner possible. The most important of these associations is perhaps the Industrial Co-operative Society of Oldham founded in the year 1850-1. From very small beginnings it has gradually extended its opera- tions until in the year 1874 it divided a dividend of £40,000 among its shareholders in four quarterly instal- ments of £10,000 each. he total turnover of this society is £250,000 a year. It forms, as it were, a kind of bank to the other co-operative societies. At Christmas 1874 it had out on loan to these associations a number of sums varying from £11,732 downwards, making a total of £45,437. The Sun Mill Company, anothcr of the Oldham co-operative associations, has a share capital of £100,000, It is stated in a parliamentary return published in 1874 that there are in England and Wales 790 co-operative societies, with 340,930 members, a share capital of £3,334,104, and a loan capital of £431,808. Their net profits for the year 1873 were £958,721, of which £861,964 was distributed as dividends among the members of the society, and £18,555 was paid away as interest to non- members. There can be no doubt that co-operation was to a great extent originated in England by communists. It is an outcome of the commanistic movement, for it was in the first instance mainly promoted by social reformers who had proved by many failures the futility of communism as an cngine of social regeneration. Notwithstanding its origin, there is, however, no movement more distinctly non- communistic than co-operation. It strengthens the principles of capital and private property by making every co-operator a capitalist, and thus personally interesting him in the maintenance of the present economic condition of society. When the really great results of co-operation in this country are compared with the very limited success of nearly a century of communism in America, the conclusion is inevitable that co-operation is much more effectual than communism in producing a radical improvement in the condition and status of labour, that it is casier to graft upoR existing institutions, and that its working is unaccompanle by the despotism, the crushing of individuality, and the discouragement of self-help, which are the admitted dangers and drawbacks of communism. The state banks and national workshops of M. Louis Blanc's economic dreams were realized in

1848-50 ina manner that must have cause the severest disappointment to their philanthropic author ; failure and discredit were their only practical results. The

Since they wrote, co-operation has in Cooper.

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Social Democrats of Germany, with Lassalle at their head, have left nothing tangible which can be said to have advanced their cause. The Schulze-Delitzsch credit banks, which they assailed as an improved form of capitalism, have

done and are doing more for labour in Germany than the.

whole Social Democratic party has ever done.

In France the names of Saint Simon, Fourier, Bazard, and Enfantin suggest chiefly a series of tragic failures, In England Owen's name recalls the brief existence of Harmony Hall and Orbiston, the establishment of the Labour Exchange and the issue of Labour Notes, and a number of other schemes which raised great hopes and expectations that were doomed to a speedy disappointment. In America the success of communism, such as it is, is hardly more encouraging than its failure in Kurope. The mea- sure of material prosperity achieved is not very con- siderable, bearing in mind the length of time most of the societies have existed and the case and cheapness with which unoccupied land can be obtained in'the United States. Mr Nordhoff estimates the capitalized wealth of the 72 American communes at twelve millions of dollars, or about £2,400,000 sterling. They own between 150,000 and 180,000 acres of land, or on an average about 36 acres a head —a coniparatively small holding for America. The 72 communes are spread over 13 States; they possess some of the most fertile land in the world; one of the Shaker villages owns a magnificent estate of 4500 acres lying in the famous Miami bottom, a soil much of which is so fertile that after sixty

years of cropping it will still yield from 60 to 70 bushels of corn to the acre without manuring. The material condition of the inhabitants of the communistic villages compares favourably, no doubt, with that of the German peasants by whom the majority of American communes were originally started; but the monotony, the personal submission, the impossibility of privacy or temporary seclusion, the absence of anything like intellectual activity in these societies, would render the life well-nigh unbearable to people who had been previously accustomed to a higher standard of happiness than that at present within the reach of the ordinary day-labourer. Many communistic experiments in America have been unsuccessful, Mr J. H. Noyes, in his book on " American. Socialisms," gives a short history of no fewer than forty- seven of these failures. Comparing the history of those societies which have dicd a natural death with that of those which still continue to exist, it is found that the successful societies had no advantage either in the wealth of their members or the intellectual ability of their leaders. Most of the successful societies began poor; most of the unsuccessful societies began with what were believed to be sufficient means to achieve success, Many of the unsuc- cessful societies were founded by high-minded, highly- cultivated men and women, and their members were distinguished for their education and intellectual attain- Tents. From these facts and with ample means through personal experience for forming a correct opinion, Mr Nordhoff draws the conclusion that in a communistic experiment success depends upon a feeling among all the members " of the unbearableness of the circumstances " in Which their lives were originally cast. They must have suffered from Wrong and oppression, as well as from want,

efore communism can appear asa welcome change in their manner of life. Hence the poorer and more narrow and miserable the condition of the people who start a com- munistic experiment the more likely is it under judicious leaders to Succeed. People are easily satisfied when almost any change in their lives must be foy the better. It would be most undesirable to detract from the achievement of the merican communes in raising the poorest and most miserable peasants to a degree of material prosperity, which

~~compares with that of the well-to-do small farmer in England or America. This is no small feat ; and they have also proved the possibility of putting communism into a practical form, at any rate on a small scale, and under exceptionally favourable economic conditions. But it is impossible to doubt that their principal value to the world has been in illustrating the limitations and drawbacks of the system. As long as communism remained an unex- plored region given over to the dreamers of dreams and the seers of visions, it was impossible to prove that it did not possess all the marvellous perfection they fondly attributed to it. The American societies offer a life which is confessedly attractive only to those whose original circum- stances are exceptionally unfortunate ; to these communism can give, together with a congenial religious atmosphere, material prosperity of a humble type, accompanied by the sacrifice of individuality, liberty, privacy, and intellectual development. It can hardly be denied' that these experi- ments prove that, even were communism on a large scale practically possible, it could never satisfy the aspirations of those who look for a time when increased material prosperity among the working-classes shall be accompanied by a corresponding increase of intellectual activity, political responsibility, and personal independence. The old form of society would seem to be more favourable than com- raunism to the growth of these qualities ; and it is probable that the American experiments may help to establish the conviction among economic revolutionists that more can be accomplished by grafting new institutions, such as co-operation, on the old plant of private property than can be achieved by rooting it up altogether, and planting the seedling of communism in its stead.~~

~~See Reybaud, Les Reformateurs Modernes ; Nordhoff, Commu- nistie Soereties of the United States; Rev. M. Kaufmann, Socialism; Louis Blane, L' Organisation du Travail; A. J. Booth, Life of Robert Owen, Saint-Simon and Saint-Simonism, and art. '*Charles Fourier" in Fortnightly Review, vol. xii., new series. See also the articles Fourrer, OWEN, and Saint Simon, (M. G. F.)~~

~~COMO, a city of Italy, capital of the province of its own name, at the south-west corner of the Lake of Como, in a beautiful valley surrounded by richly-clad mountains. It lies in 45° 48' 26" N, lat. and 9° 4' 45" E, long., and is distant twenty-eight miles by rail from Milan. The city proper is still~~

surrounded by its ancient walls and towers ; but two pretty extensive suburbs, known as Vico and St Agostino, have grown up outside—the former containing a large number of fine villas, and the latter devoted specially to manufacturing purposes. The principal buildings are the cathedral, the broletto or town hall, the churches of St Fedele and St Abondio, the Palazzo Giovio, with its library and collection of antiquities, the Gallio College, and the theatre. The cathedral, erected by the voluntary contribu- tions of the citizens, is a structure of various dates and styles of architecture,—the earliest portions being by Lorenzo de' Spazi of the end of the 14th century, while the cupola is the work of Guvara, an architect of the first half of the 18th. The most interesting, perhaps, of the monuments which it preserves, is that of Benedetto Giovio, an early historian of the city. The broletto dates from 1215, and igs built of alternate courses of black and white marble ; but of still greater value as an artistic effort is the church of St Abondio, a small but exquisite structure of the 11th century, built, it would seem, in the lower portions of Roman remains, and remarkable for an "apse of extraordinary height and richness rising between two tall campaniles." There are extensive factories in Como for the spinning and weaving of silk; it also manufactures woollens, cotton, and soap; and there are iron-works in the immediate vicinity. To its position on the lake and its command of the Spliigen and St Gotthard lines of com- munication, it is indebted for a considerable trade by way—

—Comum. On the accession of Ceesar to supreme power, Comum

lake are studded with ancient castles, flourishing hamlets, and the villas of wealthy proprietors. On the eastern side the principal places are Colico-piano, Dervio, Bellano Vareima, Mandello, and Lecco; and along the western Gravedoua, Dongo, Menaggio, Cadenabbia, Argegno Moltrasio, and Cernobbio. Bellaggio, as alreacy mentioned, is situated at the promontory where the lake bifurcates southwards. The Villa Vigorni, near Menaggio, formerly the property of Mylius of Frankfort, contains sculptures of Thorwaldsen, Marchesi, and Argenti; the Villa Giulia near Bellaggio, belongs to the king of the Belgians; sie Villa Carlotta or Sommariva, near Cadenabbia, took its name from Charlotte of Prussia, wife of the duke of

Saxe- Meiningen ; the Villa d'Este, near Cernobbio, was at one time the residence of Queen Caroline of England. The Villa Raimondi or Odescalchi, is the largest of all.

of transit and distribution. About a mile to the south of the town is the tower of Baradello, famous as the place where the Torriani of Milan were confined in cages by the Visconti party, over whom they had previously tyranuized. The population of Como is 24,350.

Como is readily identified with the ancient Comum, a city of Gallic origin, situated within the territory of the Galli Insubres. Though from an early period a flourishing and important centre, it never played a very conspicuous part in ancient history. Soon after the beginning of the 2d century B.C., the people of Comum joined the Insubres in an attack on the Romans; but they were defeated, and their city fell into the hands of the conquerors, and beeame a Roman colony. The first colonists, however, were unable to main- tain themselves against the inroads of the Rhetian Gauls; and additional settlers were sent down from time to time. Julius Cesar, in particular, introduced 5000, of whom a tenth were Greeks ; and the colony assumed for a short time the name of Novum

obtained the complete right of citizenship ; but though it was at this time at the height of its prosperity, it never took rank higher than a municipal town. In the early part of the Middle Ages it formed for a time, like many of the towns of Italy, an independ- ent republic ; but after a considerable struggle it had to submit to Milan. Its deliverance was effected in 1158 by Frederick I. of Germany, to whom its citizens had appealed ; but in the 15th cen-

For further details, besides the publications already referred to see Cantu, Comoe il swo lago (last edition, 1872); Leonhardi, Der Comersee und seine Umgebungen, Leipsic, 1862; P. A. Curti; Il lago di Como e il pian d' Erba, 1872; and an article by John Ball in the eighth volume of the G'col. Mag.

tury it again succumbed before the Milanese nobles. In 1520 it was captured by Charles V. During the Roman period the Pliny family were connected with the city ; and in more modern times it numbers among its celebrities Paulus Jovius, Piazzi the astronomer, and Volta the electrician. See Cantu, Storia di Como, 1829; and Mouti, Storia di Como, 1829.

COMO, Lakz oF, or, in Italian, Lago di Como, known to the Romans as Lacus Larius, is, from the beauty of its scenery and the mildness of its climate, one of the most celebrated of all the Italian lakes. It is situated in the province of Como, in that part of the country which belonged to the kingdom of Lombardy; and it occupies the bottom of a great valley, which, stretching south from the neighbourhood of Chiavenna at the foot of the Spliigen, breaks up at Bellaggio into two branches which run respec- tively south-east and south-west. The lake is thus divided into three basins, of which the south-western is known inore particularly.as the Lago di Como, and the south- eastern as the Lago di Lecco. The northern part of the original basin has been silted up by the debris brought down from the valleys of San Giacomo and Bregaglia by the River Mera; and not only has the Adda, which enters from the east, filled up the branch that in all probability once extended up the Valtelline as far as Morbegno, but it has also, by its delta, or cone of ejection, cut off from the main body of the lake the part now known as the Lago di Mezzola. Of the real form of the bed of the lake there was hardly any knowledge till 1865, when a survey was undertaken by Signor Gentilli and MM. Casella and Bernasconi. The results obtained were published by Gentilli in the second volume of the Memoirs of the Societa Italiana di Scienze Naturali, and by his coadjutors in a separate pamphlet entitled Cenni Orograficr sul Lago di Como. It appears that the greatest depth is 1341 feet, which was registered in a section of the Lago di Como from Torrigia to Como. From the northern extremity of the lake the basin gradually grows deeper as we advance southwards, till it shallows towards the promontory of Bellaggio ; in the south-western branch it grows rapidly deeper again, while in the south-eastern it shallows to 390 or 290 feet. This difference of the two branches is easily explained by the fact that the Lago di Como is a closed basin except at its junction with the main body of the lake, and throughout a coast line of upwards of forty miles receives only two unimportant torrents, while the Lago di Lecco is in the direct course of the Adda, which makes its exit by the southern extremity. The total length of the lake, from Como to its northern extremity, is about thirty miles, and its greatest width, between Menaggio and Varenna, about two miles and a half. The shores of the

and politician, who, after occupying a variety of civil and military posts, was in December 1859 made provisional president by Alvarez, and from

December 1857 was for a few weeks constitutional president. See MExtco.

bique Channel, between Madagascar and Cape Delgado,

islets. 1. Comoro, the largest, has a length of about

COMONFORT, Ienacto (1812-1863), a Mexican soldier

COMORES or Comoro IsLanps, a group in the Mozam-

on the east coast of Africa, discovered by Houtman in 1598, and consisting of the four main islands of Angaziya, Angazecha, or Great Comoro, Anzuan or Johanna, Mohilla, and Mayotta, and a considerable number of diminutive

thirty -five miles, with a width of about twelve, and population of 35,000. Near its southern extremity it rises into a fine dome-shaped mountain, which lias a height of upwards of 8500 feet, and is visible for more than 100 miles. Eruptions are recorded for the years 1830, 1855, and 1858; and traces of the last of these commotions are still very distinct. The island is politically divided into various petty principalities, and maiutains its own petty feuds. The natives are tall of stature and well- formed, and appear to be mainly of Arabic descent, with a mixture of Malagasy blood. 'Tke chief towns are Maroni, Itzanda, and Mouchamouli; the first, situated at the head of a bay in 11° 40' 44" S. lat., being the seat of the principal sultan in the island. 2. Johanna, next in size, rises in a succession of richly wooded heights till it culminates in a central peak, upwards of 5000 feet above the sea, in 12° 14 17"S. lat. and 44° 27' 34" E. long. The whole island is under one sultan, who resides at the town of Johanna on the north side. The natives are hospitable to foreigners, and especially to Englishmen. Domestic slavery exists, but of a very mild description. The capital, which is sometimes called Moussamondon, is substantially built of stone, surrounded by a wall, and commanded by a dilapidated citadel ; it is the seat of an English consul, and carries on a considerable trade i supplying ships with provisions. There is a small but safe anchorage at Pomony, where coal is kept for H.M. ships in the Mozambique Channel. The population amounts to about 12,000. 3. Afayotta, about 21 miles long by 6 or 7 miles in breadth, is surrounded by an extensive and dan- gerous coral-reef. The principal

heights on its extremely irregular surface are Mavegani Mountain, which rises in two peaks to a maximum of 2164 feet, and Uchongin, whie only falls below it by about 60 feet. The island belongs to the French since 1843, and they have established 4 small military and naval colony on the contiguous islet 0 Zaudzi, which lies within the reef in 12° 46' 48" 8. lat

- practice, however, it is — tions,

Yast proportions and wide ramifications are among the most — striking features

Members were rend

COM—COM

There are substantial Govern- meut buildings and store-houses; the garrison numbers about 100 soldiers; and a number of sugar estates have been formed, especially on the eastern side of the island. Before the French acquisition Mayotta was subject to Dansulu, king of the Sacalavas, who had been expelled from the north-west coast of Madagascar by the conquests Population, 12,000. 4. Mohilla, the smallest, is 15 miles in length, and 7 or 8 niles at its maximum breadth, with a population of 6000. Unlike the other tliree it has no peaks, but rises gradually to | a central ridge about 1900 feet in height. It is governed by an independent sovereign resident at Douany, a walled town close to the coast, in 12°.17'S. lat. aud 43° 46' E. The

and 45° 20' 14" E. long.

of Radama, king of the Ovahs,

most important town besides the capital is Numa-Choa.

All the islands possess a very fertile soil ; they produce

cocoa-nuts, rice, maize, sweet-potatoes, yams, sugar, coffee, cotton, indigo, and various tropical fruits,

the area. Population of the group, 65,000.

See T. S. Leigh, " Mayotta and the Comoro Islands," in Jour. Roy. Geog. Soc., 1849; De Horsey, "On.the Comoro Islands," in Jour. Roy. Geog. Soc., 1864,

COMPANY is one of the many words used to denote the association of individuals in the pursuit of some common purpose, Partnership, union, society, club, corporation, and compauy, all have this shade of meaning in common, although they differ from each other in many particulars, The suggested derivation of the word company (from cum pants) may be compared with the original meaning of gild, A gild was a feast, and the first associations named gilds, like the first associations named companies, had for their object the furtherance of.a common entertainment. Corporation, unlike the other words of similar meaning, has in law a very definite signification, It applies only to an association which has been endowed with a fictitious personality, enabling it to sue and be sued, to acquire rights and incur

—obligations, without the individual members thereof being

implicated. Company, on the other hand, may be used geuerally to describe almost any kind of association. In confined to two classes of associa- The first are those joint-stock companies whose

! of modern industrial life. The other are the livery or city companies, which still retain the name and the constitution, while they have long abandoned the objects of the gilds of the Middle Ages, See Corpora- TIONS,

Joint Stock Companies.—Commercial companies are a comparatively modern creation in English law. The com- mon law appears to have recognized no privileged associa- tions except those which were incorporated by charter, or statute, or prescription. All other associations, no matter what their numbers or purpose, were mere assemblages of individuals, A trading association was at the best only a partnership, and between large partnerships and small part- herships there was no legal difference whatever.

the members was responsible for all the debts of the associa- tion, and all the—alee

disabilities must ha On the other hand, a charter, and suce

Was wanted for tr

be sued 1}; : ees : ed like a Corporation, while its members remained

Personally liable for its debts. Joint-stock companies were

A large number of cattle and sheep, the former similar to the smal! species at Aden, are reared by the natives; turtle is cauglit in abundance along the coasts, and forms an article of ex- port, and the fauna is comparatively rich for the size of

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regarded at first with great disfavour by tke Legislature. In 1719 was passed the Bubble Act (6 Geo. I. «. 18). The first part of the Act, reciting the utility of the practice of assuring ships and lending money on bottomry, empowers the king to create by charter two corporations to deal in such veutures ; and all assuring of ships, or lending of money on bottomry by any other corporation, partnership, or society, is made illegal. Private persons, acting for themselves, may still continue to underwrite policies and lend money. 'The Act then recites the growth of dangerous and mischievous undertakings and projects, wherein the undertakers and subscribers have presumed to act as if they were corporate bodies, and have pretended to make their shares transferable, and enacts that "all and every the undertakings and attempts described as aforesaid, and all other public undertakings and attempts tending to the common grievance, prejudice, and inconvenience of hig Majesty's subjects, or great numbers of them, in their trade, commerce, or other lawful affairs ; and all public subscriptions, receipts, payments, assignments, transfers, pretended assigninents and transfers ; and all other matters and things whatsoever, for furthering, countenancing, or proceeding in any such undertaking or attempt ; and more particularly, the acting or presuming to act as a corporate body or bodies, the raising or pretending to raise transfer- able stock or stocks, the transferring or pretending to transfer or assign any share or shares in such stock or stocks, without legal authority, either by Act of Parliament or by any charter from the Crown, to warrant such acting as a body corporate, or

~~to raise such transferable stock or stocks, or to transfer shares therein ; and all acting, or pretending to act, under any charter formerly granted from the Crown for particular or special purposes therein expressed, by persons who do or shall use, or endeavour to use, the same charters for raising a capital stock, or for making transfers or assiguments, or pretended transfers or assignments, of such stock, not intended or designed by such charter to be raised or transferred; and all acting or pretending to act under any obsolete charter, become void by non-user or abuser, or for want of inaking lawful elections which were necessary to continue the corporations thereby intended, shall (as to all or any such acts, matters, and things, as shall be acted, done, attempted, endeavoured, or proceeded upon after the said 24th day of June 1720) for ever be deemed to be illegal or void, and shall not be practised or in wise put in execution." Aud all such undertakings are to be deemed public nuisances. Although wholly powerless to prevent the growth of joint-stock com- panies, the Bubble Act was not repealed till 1825, The Bubble Act is supposed to have been passed in the interest of the famous South Sea Company. By 9 Anne c. 21 the Crown was empowered to incorporate the persons interested in the public debt, with certain privileges of trade on the South Seas, By 6 Geo. I. c. 4 the company thus created was authorized to increase its stock. The supposed advantages of the company turned out to bea delusion, In the meantime numberless other speculations of a similar character were started, and in many cases pretended to act under charters which were either obsolete or insufficient for the purpose, The South Sea Company prosecuted these adventurers under the Bubble Act, but While it succeeded in exposing their real character it also helped thereby to weaken public confidence in its own. For a period of nearly ninety years the Bubble Act remained inoperative, but at the end of that period several cases under it were brought into court (Collyer Ox Partner- ship). At the same time, by 6 Geo. IV. c. 91 the Crown was enabled to grant charters of incorporation under which members might be made responsible for the corporation's debts, In 1834 the Crown was empowercd to grant to com-~~

~~panies by letters patent, without incorporation, the privilege of suing and being sued by a public officer. When a charter could not be obtained,~~

~~companies might be incorporated, or empowered to plead by public officers, under special Acts of Parliament. For such corporate or quasi-corporate privileges application had to be made either to the Crown or Parliament. In 1826 banking companies were allowed to obtain the privilege of suing by public officer on complying with certain rules. In 1844, all companies (with some exceptions) were enabled to obtain a cecrtificate of incorpora- tion without applying for a charter or a special Act. Banking companies, however, were required to apply to the Crown for a charter. Members of companies thus created were still responsible, to the whole extent of their fortune, for the debts of the companies. In 1855 limited liability was introduced by 18 and 19 Vict. c. 133, shareholders being made responsible to the extent only of the amount of their shares. Companies with this privilege must use the word "limited" after their names. The dissolution and winding-up of insolvent companies remained to be simplified, and from 1846 to 1850 various measures were introduced, enabling different classes of companies to be wound up, with- out the usual process by bill to which the shareholders, as partners, necessarily had to appear. 'The legislative history of companies, thus briefly traced, exhibits their development out of simple partnerships in a not uninstructive manner. Partnerships in the cye of the law, they are looked upon by the Legislature as false pretenders to the character of corporations ; they are at first denounced as nuisances, then tolerated, and gradually relieved one by one from those legal incidents of partnership which impede their functions in the organization of commerce. In 1862 a consolidation of the numerous Acts relating to companies was effected by the Act for the incorporation, regulation, and winding-up of trading companies and other associations, which gave to the Court of Chancery exclusive jurisdiction in winding-up. The following are a few of the chief provisions of this important Act. It prohibits the formation of any company, association, or partnership, of more than ten persons for the business of banking, and of more than twenty persons for any business having for its object the acquisition of gain, unless it is registered under this Act. Companies, formed by Act of Parliament or letters patent, or engaged in mining within the jurisdiction of the stannaries, are exceptions. Or, as it may be otherwise stated, all associa- tions for the acquisition of gain, other than those last mentioned, and excluding banking partnerships of fewer than ten, or other trading societies of fewer than twenty members, will be illegal unless registered under this~~

~~Act. Any seven or more persons, joining together for the pursuit of any lawful object, may form an incorporated company by subscribing a memorandum of association and registering. The liability of members may be wulimited, or it may be limited to the amount unpaid of the nominal value of their shares, or to sums guaranteed. 'The memor- andum of association must contain particulars as to the name, object, &c., of the proposed company ; and companies limited by share or guarantee must use the word " limited " after their names. Companies limited by shares may, and other companies, whether limited by guarantee or unlimited, must also send articles of association, containing regulations for the management of the company. The Act contains in a schedule a table of regulations which may be adopted in such companies, and in the case of companies limited by shares will be held to apply, unless expressly modified or excluded by the articles. The memorandum and articles of association are sent to the registrar, who issues a certificate of incorporation, and the subscribers and persons joining them thereupon become a corporate body with perpetual succession, and a common~~

~~COMPANY~~

~~seal, and power to hold lands, but with liability on the part of members to contribute to the assets of the company in the manner preseribed by the Act. intended for the pursuit of gain, may not hold more than 2 acres of land without a licence from the Board of Trade, Part If. deals with the distribution of capital and liabilities of members of companies and associations under this Act, When a company is wound up, every present and past member shall be liable to contribute to the assets of the company, with the following (among other) qualifica- tions :—No past member shall be liable, if he has ceased to be a member for a year before the winding-up, nor shall he be liable for any debt contracted by the company after he has ceased to be a member, nor unless present members are unable to satisfy the contributions required. Part III, contains provisions for the protection of creditors and of members. which may be either by the court or voluntary. A company~~

~~Companies, not~~

~~Part LV. treats of the winding-up of companies,~~

~~may be wound up by the court (ze, the Conrt of Chancery~~

~~in England and Ireland, and Court of Session in Scotland)~~

~~in the following cases, viz., when a special resolution of the company has been passed requiring it ; when the company does not begin business within a year from its incorporation, or suspends business for a year; when the members are reduced to less than seven ; when it is unable to pay its debts ; and when the court thinks it ought to be wound up. Where a voluntary winding-up has been begun, the court may order it to be continued, subject to the supervision of the court. Part V. constitutes a registration office. Part VI. applies the Act to companies registered under the various Joint-Stock Companies Acts. Part VII. defines the companies "authorized to register under this Act." Part VIII. applies the Act to unregistered companies. Part IX. contains a repealing clause and some temporary provisions. After five years' experience of the original Act an amending Act was published in 1867, and the two are to be construed together. The Companies Act 1867 contains provisions facilitating changes in the constitution of companies. A limited company may have directors with unlimited liability. A company limited by shares may under certain conditions reduce its capital, or divide its capital or part thereof into shares of smaller amount than is fixed by the memorandum of association. Associations not intended for gain may have the privileges of limited liability without being compelled to use the word "limited " after their names. A company may have some shares fully paid and others not. A limited company may issue warrants for shares fully paid up, in name of bearer. There are several sections dealing with contracts made on behalf of a company, and one important section, the 38th, enacts that any prospectus not specifying such contracts shall be deemed fraudulent on the part of the promoters, de, issuing the same, as regards any person taking shares in the company on the faith of such prospectus. This section was drawn to meet the practice of concealing from investors contracts which would be binding on the intended company when formed, and its somewhat ambiguous phraseology has been the subject of much discussion in the law courts. See, for example, in re Coal Economizing Gas Company— Lover's Case, Law Reports 1, Chancery Division 182. The objects of certain trading companies, as, for example, railways, involve an interference with the rights of private persons, which requires the direct~~

~~authority of the Legisla- ture. Such undertakings are therefore authorized by special Acts of Parliament, which begin as private bills before one or other of the two Heuses, and pass through both, and receive the assent of the sovereign m the same manuer as public bills (see Bizz). 'The principles on which state interference with private rights is thus grante have so far been ascertained and fixed by the practice ©~~

~~—the earlier gilds and finally defeated them.~~

~~of much the same~~

~~Officers (including members of—Tepresentatives to the trading companies.~~

~~SOmMP AW Y~~

~~many puliaments, that the procedure in private bills has~~

~~tended to assimilate itself more and more to an ordinary litivation, The committees are tribunals acknowledging oO 7~~

~~certain rules of policy, and hearing evidence from witnasses and arguments from professional advocates. An point in the history of this kind of legislation is marked by the three Consolidation Acts of 1845 (8 and 9 Vict.) The Companies Clauses Consolidation Act consolidates sundry provisions relating to the constitution and manage-~~

~~ment of joint-stock companies, usually introduced into Acts~~

~~of Parliament authorizing the execution of undertakings of a public nature by such companies. The Lands Clauses~~

~~Consolidation Act applies to undertakings authorized by~~

~~special Act to take or purchase land. The Railways Clauses Consolidation Act applies to Acts authorizing the construction of railways. The clauses of the Consolidation~~

~~Acts are to be taken as incorporated in a special Act of the~~

class in question, unless they are expressly varied or

excepted thereby. A further development of the same tendency may be observed in proposals which have been

mide from time to time to hand over the authority of

Parliameat, in relation to such companies, to a permanent

tribunal,

Iwery Companies.—These societies, now chiefly remark-

able as a feature in the municipal organization of London, belong toa class of institutions which at one time were universally prevalent in Europe. In most other countries they have disappeared ; in England, while their functions have wholly changed, the organization remains, The origin of the city companies is to be found in the craftgilds of the Middle Ages) The absence of a strong central authority, such as we are now accustomed to, doubtless accounts for thetendency to confederation in the beginning of modern societies, the family, discharged the duties which the family was no longer able, and which the state was not yet able, to undertake. The inhabitants of towns were foreed by external pressure into the societies known as gild- merchants, which in course of time monopolized the municipal government, became exclusive, and so caused the growth of similar societies among their excluded citizens. The craftgilds were such societies, composed of handicrafts- men, which entered upon a severe struggle for power with The cireum- the strnggle are stated to have been character in England and on the Con- In London the victory of the crafts is decisively

stances and results of

tincnt,

—marked by the ordinance of thé time of Edward II., which

required every citizen to be a member of some trade or inystery, and by another ordinance in the 49th of Edw. TIL, which transferred the right of election of corporate Parliament) from the ward- Henceforward, and for many years, the companies engrossed political and municipal power in the city of London.

The trading fraternities assumed generally the character of corporations in the reign of Edward IIL.

: Edward III. himself became a member of the fraternity of Linen Armourers, or Merchant Taylors, and other distinguished Persons followed lis example. From this time forward they are called livery companies, "from now generally assuming a distinctive dress or livery." The origin of the rocers' Company is thus described :—"Twenty-two persons, carrying on the business of Pepperers in Soper's Lane, of Dae agree to meet together, to a dinner, at the Abbot tha UYS St Mary Axe, and commit the particulars of

t eir fo ; i : 6 ae Tmation into a trading Society to writing.

An important

Artificial groups, formed in imitation of

They |

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elect after dinner two persons of the company so assembled— Roger Osekyn and Lawrence de Hallwell—as their first governors or wardens, appointing, at the same time, in conformity with the pious custom of the age, & priest or chaplain to celebrate divine offices for their souls" (Heath's "Account of the Grocers' Company," quoted in Herbert's Twelve Great Livery Companies, vol. i, p. 43) The religious observances and the common feasts were characteristic features of those institutions. They were therefore not merely trade unions in the current meaniny of that phrase, but may rather be described as forms os industrial self-government, the basis of union being the membership of a common trade, and the authority of the society extending to the general welfare, spiritual and temporal, of its

members. It must be remembered that they flourished at a time when the Separate intercsts of master aud servant had not yet been created; and indeed, when that fundamental division of interests aruse, the companies gradually lost their functions in the regulation of industry. The fact that the craftsmen were a homogeneous order will account for the wide authority claimed by their societies, and the important public powers | which were conceded to them. Their regulations, says Herbert, "chiefly regarded the qualifications of members, keeping of their trade secrets, the regulations of apprentice- ship and of the company's peculiar concerns, the domestic management of the fraternity and its funds, and the uniting together of it in brotherly love and affection. To these may be added, as forming a prominent feature in all the ancient commuuities, the regulation of their religious aud other ceremonies." In the regulation of trade they possessed extensive powers. They required every one carrying on the trade to join the compauy. In the 37th of Edward III, in answer to a remonstrance against the mischief caused by "the merchants called grocers who engrossed all manner of merchandize vendable, and who suddenly raised the prices of such merchandize within the realm," it was enacted "that all artificers and people of mysteries shall each choose his own mystery before next Candlemas, and that, having so chosen it, he shall hence- forth use no other." Dr Brentano (Ox Gilds) holds that it is wrong to represent such regulations as monopolistic, inas- inuch as there was no question whatever of a monopoly in that time nor until the degeneration of the craftgilds into limited corporations of capitalists, In the regulation of trade the right of search was an important instrument. The wardens of the grocers are to " assayen weights, powders, confeccions, platers, oyntments, and all other things belong- ing to the same crifte." The goldsmiths had the assay of metals, tho fishmongers the oversight of fish, the vint- ners of the tasting of wine, &c. The companies enforced their regulations on their members by force. Many of their ordinances looked to the domestic affairs and private conduct of the members. The grocers ordain " that no man of the fraternite take his neyghbor's house y' is of the same fraternite, or enhaunce the rent against the will of tlie foresaid neyghbor." Perjury is to be punished by the wardens and society with such correction as that other men of the fellowship may be warned thereby. Members reduced to poverty by adventures on the sea, increased price of goods, borrowing and pledging, or any other misfortune, are to be assisted " out of the common money,

according to his situation, if he could not do without." , Following what appears to be the natural law of their being, the companies gradually lost their industrial charac- ter, The course of decay would seem to have been the following. The capitalists gradually assumed the lead in the various societies, and the richer members engrossed the power, and the companies.tended to become hereditary and exclusive. Persons might be members who had nothing to

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do with the craft, and the rise of great capitalists and the development of competition in trade made the regulation of industry by means of companies no longer possible. For an account of the " degeneration of craftgilds" a general reference may be made to Brentano On Gilds, ¢. iv. The usurpation of power on the part of the richer members was not always effceted without opposition. Brentano refers to a pamphlet on the Clothworkers' Company, published in 1649, which asserts that '" the commonalty " in the old charters meant, not the whole gild, but only the masters, wardens, and assistants. Herbert records a most interesting dispute in the Goldsmiths' Company in 1529. The mode of elceting officers, and the system of management generally, was challenged by three members who ealled themselves " artifieers, poor men of the craft of goldsmiths." The company, or rather the wardens, the assistants, and livery, presented a petition to the lord mayor, which was answered by the discontented craftsmen. The dispute was earried into the Court of Chaneery and the Star Chamber. The artificers aceused the company of subverting their grants, misappropriating the funds, and changing the con- stitution of the society, and they complain of this being done by the usurpation of persons who " were but merehant goldsmiths, and had but little knowledge in the seienee. " Tn 1531 the three complainants were summarily expelled from the company, and then the dispute seems tq have ended. In the last stage of the companies the members have eeased to have any connection with the trades, and in most easestheir regulative functions have disappeared, ihe one characteristie which has elung to them throughout is that of owners of property and managers of eharitable trusts. 'The eonnection between the companies and the raunieipality is shortly as follows. The ordinance of Edward II. required freemen of the city to be members of one or other of the companies. By the

ordinance of 49 Edw. III. the trading companies were to nominate the members of common council, and the persons so nominated alone were to attend both at common councils and at elec- tions. An ordinance in7 Richard II. restored the elections of common councilmen to the wards, but corporate officers and representatives in Parliament were elected by a conven- tion summoned by the lord mayor from the nominees of the companies, An Act of Common Council in 7 Edw. IV. appointed the election of mayor, sheriffs, &c., to be in the common council, together with the masters and wardens of the companies By 15 Edw. IV. masters and wardens were ordered to associate with themselves the honest men of their mysteries, and come in their best liveries to the elections; that is to say, the franchise was restricted to the "liverymen" of the companies. At this time the corpora- tion exercised supreme control over the companies, and the companies were still genuine associations of the traders and householders of the city. The delegation of the franchise to the liverymen was thus, in point of fact, the selection of a superior class of householders to represent the rest. When the corporation lost its control over the companies, and the members of the companies ceased to be traders and householders, the liverymen were no longer a representative class, and some change in the system became necessary. The Act 11 Geo. II. c. 18, and the Reform Acts of 1832 and 1867, reformed the representation in several particulars. The liverymen of the companies, being freemen of the city, have still, however, the exclusive power of electing the lord mayor, sheriffs, chamberlain, and other corporate officers. The contributions made by the companies to the public purposes of the state and the city are interesting points in their early history. Their wealth and their representative character made them a most appropriate instrument for the enforcement of irregular taxation. The loan of £21,263, 6s. 8d. to Henry VIII. for his wars in Scotland, in 1544, is

COMPANY

believed by Herbert to be the first instance of a pecuniary grant to the Crown, but the practice rapidly gained ground, The confiscation of ecclesiastical property at the time of the Reformation affected many of the trusts of the com- panies ; and they were compelled to make returns of their property devoted to religious uses, and to pay over the rents to the Crown. In course of time the taxation of the com- panies became "a regular source

of supply to Government." The historians of the city have for the most part deseribed these as unjust and tyrannical exaetions, but, looking at the representative and municipal eliaracter of the companies and the purposes to which their contri- butions were applied, we may regard them as a rough but not unfair mode of taxation. The Government, when money was wanted for public works, informed the lord mayor, who apportioned the sums required among the various societies, and issued preeepts for its payment, Contributions towards setting the poor to work, erecting the Royal Exchange, eleansing the city ditch, discovering new countries, furnishing military and naval armaments, for men, arms, and ammuniton for the defenee of the city, are among what Herbert ealls the sponging expedients of the Government. The Crown oeeasionally interfered in a more unjustifiable manner with the compames in the exereise of their patrouage. The Stuarts made strenuous efforts to get the eontrol of the companies. Terrified by the proceedings in the guo warranto ease, most of the com- panies surrendered their charters to the Crown, but such surrenders were annulled by the Aet of 2 William and Mary reversing the judgment in quo warranto against the city, The livery companies now in existence are the following —

Apothecaries. Felt Makers. Needlemakers, Armourers and Bra- | Fishmongers. Painter Stainers. ziers. Fletchers. Parish Clerks. Bakers. Founders. Pattern Makers.

Barbers. Framework Knitters. | Pewterers. Basket Makers. Fruiterers. Plasterers. Blacksmiths. Girdlers. Plumbers. Bowyers. Glass-sellers. Poulterers. Brewers. Glaziers. Saddlers. Broderers. Glovers. Salters. Butchers. Gold and Silver Wire- | Seriveners. Carmen. drawers. Shipwrights, Carpenters. Goldsmiths. Silkthrowsters. Clockmakers. Grocers. Skinners. Clothworkers. Gunmakers. Spectacle Makers. Coach and Coach-| Haberdashers. Stationers. harness Makers. Horners. Tallow Chandlers. Cooks. Innholders. Tilers and Brick- Coopers. Ironmongers. layers. Cordwainers. Joiners. Tinplate Workers. Curriers. Leathersellers. Turners. Cutlers. Loriners. Upholsterers. Distillers. Makers of Playing | Vintners. Drapers. Cards. Watermen. Dyers. Masons. Wax Chandlers. Fan Makers. Mercers. Weavers. Farriers. Merchant Taylors. Wheelwrights. Fellowship Porters. | Musicians. Woolmen.

The following are the twelve great companies :—Mercers, Grocers, Drapers, Fishmongers, Goldsmiths, Skinners, Merchant Taylors, Haberdashers, Salters, Tronmongers, Vintners, Cloth-workers. The " Irish Society " was M- corporatedin the 11 James I. as "the governor and assistants of the new plantation in Ulster, within the realm of Ireland." The twelve companies contributed in equal portions the sum of £60,000 for the new seheme, by which it was intended to settle a Protestant eolony in the lands forfeited by the Irish rebels. The companies divided the settlement into twelve nearly equal parts, assigning one to each, but the separate estates are still held to be under the paramount jurisdiction of the Irish Soeiety. The charter of the society was revoked by the Court of Star Chamber in the reign of Charles I., but a new one was granted by Charles IL., under which the soeiety still acts.

. anatomy of the lower animals, but this is an imperfect and

Most of the companies administer charities of large but unascertained value. Many of them are governors of im- portant schools, ¢.g., the Skinners have the Tonbridge Grammar School; the Mercers, St Paul's School; the Merchant Taylors, the school bearing their name,. &c. There is no exact information to be had as to the value of these trusts, or the manner in which

they are administered. The History of the Twelve Great Livery Companies, by W. Herbert (London, 1837), may be referred to on this subject.

Admission to the companies is now subject to the pay- ment of considerable fees. For example, in the Merchant Taylors the fees are—Upon taking up the freedom, by patrimony or servitude, £1, 3s. 4d., by redemption, £84 ; on admission to the livery, £80, 8s.; on election to the Court of Assistants, £115, 103. The hospitality of the companies is well-known. The advantages of being a member, still more of being a liveryman or assistant, of one of the rich companies are doubtless considerable. There are indications that the position of the city companies is likely to be for some time to come the subject of political discussion. It may be briefly said that they are being threatened on two sides—on one side by those who desire to see extensive reforms in the municipal organization of the metropolis; and on the other by those who wish to carry forward the process of inspection and revision of endowments, which has already overtaken the universities, schools, and other charities. (B. R.)

COMPARATIVE ANATOMY is the term employed to express that branch of anatomy in which the con- struction, form, and structure of two or more animals are compared with each other, so as to bring out their features |. of similarity or dissimilarity. It is sometimes used, in contrast with the term human anatomy, to signify the

inexact use of the term, as the anatomy of man may be made comparative when it is examined in comparison with that of animals. The study of comparative anatomy is of especial importance to the physiologist, the embryologist, the veterinarian, and the zoologist. To the physiologist because, from the comparison of the bodies of different animals with each other, modifications in the size, form, and structure of any particular organ can be traced, and conclusions can be drawn on the importance of the function of the organ in the economy. Moreover, witha knowledge of comparative anatomy, the physiologist can conduct experiments on animals which have organs similar in structure to those of man, and determine their function more precisely than would be possible in the human body. To the veterinarian a knowledge of the comparative anatomy of the domestic animals is essential to the study of their diseases. To the embryologist, a

knowledge of the anatomy of different animals throws light on the signification of the structural changes which the body of any particular animal passes through in the course of its

development. To the zoologist, a knowledge not only of the external form but of the internal structure of animals—18 essential in order that he may frame a precise system of classification. In the present work the anatomy of the «different great classes and some of the more important orders of the animal kingdom is arranged under special —heads—that of the amphibia under Ampurpta, of birds under Braps, of monkeys under ApEs, &c. See also

NATOMY, vol. i. pp. 799 and 818.

COMPASS, Tue Mariner's, consists of three principal parts,—the card, the needle on its lower surface, and the | on The whole is enclosed in the compass-box, or | ee The term compass is said to have been applied to Ve ole He because the card involves or compasses the

i. P ane of the horizon, or because the needle indicates Vile whole circle of possible variations of direction. The

surface of the card is divided by radiating lines into 32 parts, each containing 11° 15'; these constitute the 32 points or rhumbs; the half-points and quarters are subdivisions of the same. The north pole is denoted on the card by a fleur-de-lis; and the line which joins the north and south poles passes through the axis of the needle. The points are named according to their proximity to the four cardinal points ; for instance, the point mid-way between N, and N.E. is called north-north-east, being nearer north than east, and is marked N.N.E; the point mid-way between N. and N.N.E. is termed north by east, and is marked N. by E. The circumference of the card is sometimes divided into 360°. The divisions of the card are shown in the accompanying figure. The card is directed by the needle,

Fia. 1.—Compass Card.

which, with it, is pivoted on a vertical axis, With a little variation, the needle points nearly to the geographical north, aud hence the mode of

steering by the compass, Four or more parallel magnets, with like poles pointing in like directions, may be combined to form the needle 3 and by this arrangement the magnetic moment is increased for a given weight of steel. The needle is usually suspended on a central cap of ruby or agate, the point of suspension being of a similar hard material. On the inside of the compass-box is a vertical line known as lubber's point ; and since this and the pivot of the card are in the same plane with the ship's keel, the point on the circumference of the card opposite to lubber's point shows the angle the ship's course makes with the magnetic meridian. The compass is kept horizontal by the use of a gimbal, or ring moving freely on an axis, within which it swings on an axis at right angles. In the azimuth compass the circumference of the card 1s divided into degrees and parts by a vernier, and is fitted up with sight-vanes to take amplitudes and azimuths, for the purpose of determining the variation of the compass by observation. The variation is applied to the magnetic course shown by the steering compass, and thus the true course with respect to the meridian becomes known,

The conditions that chiefly affect the use of the mariner's compass are those of the magnetic declination and deviation. The declination is the angle contained between the geo- graphical or true and the magnetic meridian 3. OF, 38 Barlowe defines it, the swerving of the pointing of the magnetical needle.in the horizon from the meridian line there. The angle of declination varies according to locality, and must be ascertained at sea by means of the

1 According to Mr T. 8. Davies, this may originally have been an ornamented cross. VI. — 29

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azimuth compass. 'The discovery of the variation of declination was made by Stephen Burrowes when voyaging between the north cape of Finmark and Vaigatch (Vay- gates),and was afterwards determined by Gillebrand, pro- fessor of geometry at Gresham College. In 1683, in a communication to the Royal Society (Phil. Trans., June 16, p. 214), Dr E. Halley shows that the irregularity observed in the variations of the compass at sea is uot due to the attraction of the land, and comes to the conclusion that the whole

globe of the earth is one great magnet, having four magnetical poles or points of direction. The declination for any place is subject to secular variations : thus, at Paris in 1681, it was 2° 30' to the W., in 1865 it was 18° 44' W. Halley, in a paper entitled " Account of the Cause of the Change of the Variation of the Magnetical Needle" (Phil. Trans., Oct. 19, 1692, pp. 563-578), points out, with other iustances of secular variation, that between 1580 and 1692 the direction of the needle at London changed from 11° 15' E. to 6° W., or more than 17°, and demonstrates that the direction is in no place fixed or constant, though in some places it changes faster than in others. Besides the secular, there are annual and diurnal variations of small amount. The existence of the latter was discovered by Mr Graham about 1719. The deviation of the compass is the departure of the north and south line from the magnetic meridian, owing to the magnetism of the ship itself, or that induced in it by the earth's magnetic force. It was first observed during 1772- 74 by Mr Wales, the astronomer of Captain Cook. When surveying along the coast of New Holland in 1801 and 1802, Captain Matthew Flinders made the discovery that there was a difference in the direction of the magnetic needle, according as his ship's head pointed to the E. or W. — westerly in the former, easterly in the latter case. When the ship's head was N. or S. the needle took the same direction, or nearly so, that it would on shore, and showed a variation from the true meridian which was about a medium between that given by it when east and when west. He found, also, that the error in variation was nearly proportionate to the number of points which the ship's head was from the north or south. (Pil. Trans., 1805, p. 186.) The deviation in wooden ships can be practically obviated, but in iron ships it has to be partly allowed for, partly compensated. Barlow used a correcting plate of iron to overcome the directive action on the compass due to the magnetism of wooden vessels. On Professor Airy's method, the permanent magnetism of ships is compensated by a steel magnet placed at a given distance below the compass; it is, however, liable to changes of intensity, occasioned by shocks, vibration, unequal heating, and other causes, a fact which led the late Dr Scoresby to propose the employment of a compass aloft, out of the region of the ship's influence. The induced magnetism of ships can be only imperfectly compensated, since it varies according to the ship's bearing, and as she rolls and pitches; but corrections can be made for the heeling error. The discovery of the dip of the magnetic needle is ascribed by Gilbert

~~to Robert Norman, a nautical instrument maker at Wapping, who, about 1590, introduced the employment of a sliding weight on the needle for the correction of the dip at different points of the earth's surface.~~

~~The earliest references to the use of the compass are to be found in Chinese history, from which we learn how, in the sixty-fourth year of the reign of Ho-ang-ti (2634 3.c.), the emperor Hiuan-yuan, or Ho-ang-ti, attacked one Tchi-yeou, on the plains of Tchou-lou, and finding his army embarrassed by a thick fog raised by the cnemy, constructed a chariot (Tchi-nan) for iudicating the south, so as to distinguish the four cardinal points, and was thus cnabled to pursue Tchi-yeou, and take him prisoner. (Klaproth, Lettre & M. le Baron Humboldt sur Vinvention de la Boussolc, Paris, 1834. See also Mailla, Histoire générale de la Chine, tom i. p. 316, Paris, 1777.) Several other allusions to the compass are con-~~

~~tained in early Chinese records. communicate polarity to iron is said to be for the first time explicitly mentioned in a Chinese dictionary, finished in 121 a.p where the loadstone is defined as "a stone with which an attraction can be given to the needle." The first mention of the use of the compass for the. purpose of navigation—an art that has apparently retrograded rather than advanced among the Chinese—oceurs in the Chinese encyclopedia, Poei-wen-ywn-fow, in which it is stated that under the Tsin dynasty, or between 265 and 419 4.D., "'there were ships directed to the south by the needle." The Chinese, Mr Davis informs us, once navigated as far as India, but their most distant voyages at present extend not further than Java and the Malay Islands to the south (The Chinese, vol. iii. p. 14, London 1844). According to an Arabic manuscript, a translation of which was published by Eusebius Renaudot (Paris, 1718), they traded in ships to the Persian Gulf and Red Sea in the 9th century. Staun. ton, in vol. i. of his Hmbassy to China (London, 1797), after refer. ring to the early acquaintance of the Chinese with the property of the magnet to point southwards, remarks (p. 445), "'The nature and the cause of~~

~~The power of the loadstone to~~

~~the qualities of the magnet have at all times been~~

subjects of contemplation among the Chinese. The Chinese name for the compass is ting-nan-ching, or needle pointing to the south; and a distinguishing mark is fixed on the magnet's southern pole, as in European compasses upon the northern one." 'The sphere of Chinese navigation," he tells us (p. 447), "'is too limited to have afforded experience and observation for forming any system of laws supposed to govern the variation of the needle. . . . The Chinese had soon occasion to perceive how much more essential the perfection of the compass was to the superior navigators of Europe than to themselves, as the commanders of the 'Lion' and 'Hindostan, trusting to that instrument, stood out directly from the land into the sea, The number of points of the compass, according to the Chinese, is twenty-four, which are reckoned from the south pole ; the form also of the instrument they employ is different from that familiar to Europeans. The needle is peculiarly poised, with its point of sus- pension a little below its centre of gravity, and is exceedingly sensitive ; it is seldom more than an inch in length, and is less than a line in thickness. It appears thus sufficiently evident that the Chinese are not indebted to Western nations for their knowledge of the use of the compass. "It may be urged," writes Mr 7. 8. Davies, "that the different manner of constructing the needle amongst the Chinese and European navigators shows the independence of the Chinese of us, as theirs is the worse method, and had the copied from us, they would have used the better one" (Thomson's British Annual, 1837, p. 291). On the other hand, it does not seem improbable that a knowledge of the mariner's compass was communicated by them directly or indirectly to the early Arabs, and through the latter was introduced into Europe. Sismondi has remarked (Literature of Europe, voli.) that it is peculiarly charac- teristic of all the pretended discoveries of the Middle Ages that when the historians mention them for the first time they treat them as things in general use. Gunpowder, the compass, the Arabic numerals, and paper, are nowhere spoken of as

discoveries, and yet they must have wrought a total change in war, in navigation, in science, and in education. 'Tiraboschi (Storia della Letteratura Itahana, tom. iv. lib. ii. p. 204, cé seg., ed. 2., 1788), in support of the conjecture that the compass was introduced into Europe by the Arabs, adduces'their supériority in scientific learning, and their carly skill in navigation. He quotes a passage on the polarity of the loadstone from a treatise translated by Albertus Magnus, attributed by the latter to Aristotle, but apparently only an Arabic compilation from the works of various philosophers. As the terms Zoran and Aphron, used there to signify the south and north poles, are neither Latin nor Greek, Tiraboschi suggests that they may be of Arabian origin, and that the whole passfge concerniug the loadstone may have been added to the original treatise by the Arabian translators. Dr W. Robertson asserts (Historical Disquisition concerning Ancient India, p. 227) that the Arabs, Turks, and Persians have no original name for the compass, it being called by them Bossola, the Italian name, which shows that the thing signified is foreign to them as well as the word. The Rev. G. P. Badger has, however, pointed out (Travels of Ludovico di Varthema, trans., : Jones, ed. G. P. Badger, Hakluyt Soc., 1863, note, pp. 31 and 82) that the name of Bushla or Busba, from the Italian Bussolt, though common among Arab sailors in the Mediterranean, is very

| seldom used in the Eastern seas,—Datrah and Beit el-Ibrah (the

Circle, or House of the Needle) being the ordinary appellatives in the Red Sea, whilst in the Persian Gulf Kiblah-ndmeh 1s 0 more general use. Robertson quotes Sir J. Chardin as boldly assert- ing "that the Asiatics are beholden to us for this wonderlu iustrumeut, which they had from Europe a long time before the Portuguese conquests. For, first, their compasses are exactly like ours, and they buy them of Europeans as much as they can, scarce daring to meddle with their ueedlcs themselves. Secondly, it 18 certain that the old navigators only coasted it along, which I mph" to their want of this instrument to guide and instruct them in the middle of the ocean. .... I have nothing but argument t0 cr

(Travels of Varthema, Introd. xciv., and p, 249). We have already

points, the four Cardinal and the four Collateral." That the value

The Saracen geographer, Edrisi, who lived about 1100, is said by Boucher to give an account, though in a confused manner, of the polarity of the magnet (Hallam, Mfid. Ages, vol. iii. chap. 9 part 2); but the earliest definite mention as yet known of the use of the mariner's compass in the Middle Ages occurs in a treatise entitled De Utensilibus, written by Alexander Neckam in the 12th century. He speaks there of a needle carried on board ship which, being placed on a pivot, and allowed to take its own position of repose, shows mariners their course when the polar star is hidden. In another work, De Naturis Rerwin, lib. ii. c. 89, he writes, — *' Mariners at sea, when, through cloudy weather in the day which hides the sun, or through the darkness of the night, they lose the knowledge of the quarter of the world to which they are sailing, touch a needle with the magnet, which will turn round till, on its motion ceasing, its point will be directed towards the north" (W. Chappell, Nature, No. 346, June 15, 1876). The magnetical needle, and its suspension on a stick or straw in water, are clearly described in La Bible Guiot, a poem probably of the 13th century, by Guiot de Provins, wherein we are told that through the magnet (la manette or Vamaniére), an ugly brown stone to which iron turns of its own accord, mariners possess an art that cannot fail them. A needle touched by it, and floated by a stick on water, turns its point towards the pole-star, and a light being placed near the needle on dark nights, the proper course is known (Hist. litléraire de la Franee, tom. ix. p. 199; Barbazan, Fabliaux, tom. ii. p. 328). Cardinal Jacques de Vitry, bishop of Acon in Palestine, in his History (cap. 89), written about the year 1218, speaks of the magnetic needle as " most necessary for such as sail the sea ;"! and another French crusader, his contemporary, Vincent de Beauvais, states that the adamant (loadstone) is found in Arabia, and men- tions a method of using a needle magnetized by it which is similar to that described by Kibdjaki. From quotations given by Antonio Capmany (Questiones Critieas) from the De Contemplatione of Ray- mond Lully, of the date 1272, it appears that the latter was well ee with the use of the magnet at sea;? and before the middle of the 18th century Gauthier d'Espinois alludes to its polarity, as if generally known, in the lines :—

~~*‘Tous autresi comme I’aimant decoit [detourne] Laiguillette par force de vertu, A ma dame tot le mont [monde] retenue Qui sa beauté connoit et apercoit.”*~~

~~*Guido Guinizzelli, a poet of the same period, writes :—‘“‘ In those parts under the north are the mountains of loadstone, which give the virtue to the air of attracting iron; but because it [the load- stone] is far off, [it] wishes to have the help of a similar stone to make it [the virtue] work, and to direct the needle towards the star.’”3 Brunetto Latini also makes reference to the compass in his encyclo- pedia Livres dou trésor, composed about 1260 ; and a letter written in 1269, attributed to Peter Adsiger, shows that the declination of the needle had already been observed at that date. From Torfeus we learn that the compass, fitted into a box, was already in use among the Norwegians about the middle of the 18th century (Hist. Rer. Norvegiearum, iv. c. 4, p. 845, Hafnie, 1711) ; and it is probable that the use of the magnet at sea was known in Scotland at or shortly subsequent to that time, though King Robert, in crossing from Arran to Carrick in 1806, as Barbour writing in 1375 informs us, ‘*na nedill had na stane,” but steered by a fire on the shore.*~~

~~*From the above it will have been evident that, as Barlowe remarks concerning the compass, “ the lame tale of one Flavius at Amelphus, in the kingdome of Naples [Flavio Gioja of Amalphi, cir. 1307], for to have devised it, is of very slender probabilitie ;” and as regards the assertion of Dr Gilbert, of Colchester (De Magnete, p. 4, 1600), that Marco Polo introduced the compass into Italy from the East in 1260,4 we need only quote the words of Col. Yule (Book of Marco Polo) :—“ Respecting the mariner’s compass and gunpowder, I shall say nothing, as no one now, I believe, imagines Marco to have had anything to do with their introduction.”*~~

~~*When and by whom the card was added are still matters of con- jecture ; but the thirty-two points orrhumbs into which it is divided were recognized at least as early as the time of Chaucer, who, in 1891, wrote, “ Now is thin Orisonte departed in xxiiii a a by thi azymutz, in significacion of xxiiii partiez of the world; al be it so that ship men rikne thilke partiez in xxxii” (Treatise on the Astrolabe, ed. Skeat, Karly Eng. Text Soc., Lond. 1872).*~~

The improvement of the compass has been but a slow process. The Libel of English Policie, a poem of the first half of the 15th century, says with reference to Iceland (chap. x,) —

ing this matter, having never met with any person in Persia eo 'ies to inform 4 when the compass was first known among them, though I made inquiry of the most learned men in both countries. I have sailed from the Indies to Persia in Indian ships, when no European has been aboard but myself. The pilots were all Indians, and they used the forestaff and quadrant for their observations. These instruments they have from us, and made by our artists, and they do not in the least vary from ours, except that the characters are Arabic. The Arabs are the most skilful navi- gators of all the Asiatics or Africans; but neither they nor the Indians make use of charts, and they do not much want them; some they have, but they are copied from ours, for they are alto- gether ignorant of perspective." The observations of Chardin, who flourished between 1643 and 1713, cannot be said to receive support from the testimony of some earlier authorities. That the Arabs must have been acquainted with the compass, and with the construc- tion and use of charts, at a period nearly two centuries previous to Chardin's first voyage to the East, may be gathered from the descrip- tion given by Barros of a map of all the coast of India, shown to Vasco da Gama by a Moor of Guzerat (about the 15th July 1498), in which the bearings were laid down "after the manner of the Moors," or " with meridians and parallels very small (or close together), without other bearings of the compass ; because, as the squares of these meridians and parallels were very small, the coast was laid down by these two bearings of N. and S., and E. and W., with great certainty, without that multiplication of bearings of the points of the compass usual in our maps, which serves as the root of the others." Further, we learn from Osorio that the Arabs at the time of Gama '"'were instructed in so many of the arts of navi- gation, that they did not yield much to the Portuguese mariners in the science and practice of maritime matters." (See The Three Voyages of Vasco da Gama, Hakluyt Soc., 1869 ; note to chap. xv. by the Hon. H. E. J. Stanley, p. 188.) Also the Arabs that navigated the Red Sea at the same period are shown by Varthema to have used the mariner's chart and compass (7ravels, p. 81). Again, it appears that compasses of a primitive description, which can hardly be supposed to have been brought from Europe, were employed in the East Indies certainly

*as early as several years previous to the close of the 16th century. In William Barlowe's Navigator's Supply, published in 1597, we read:—"Some fewe yeeres since, it so fell out that I had severall conferences with two Kast Indians which were brought into England by master Candish [Thomas Cavendish], and had learned our language : The onc of them was of Mamillia [Manilla] in the Isle of Luzon, the other of Miaco in Japan, I ee with them concerning their shipping and manner of sayling. They described all things farre different from ours, and shewed, that in steade of our Compas, they use a mag- neticall needle of sixe ynches long, and longer, upon a pinne in a dish of white China earth filled with water; In the bottome whereof they have two crosse lines, for the foure principall windes; the rest of the divisions being reserved to the skill of their Pilots." Bailak Kibdjaki, also, an Arabian writer, shows in his Merchant's Treasure, a work given to the world in 1282, that the mag- netized needle, floated on water by means of a splinter of wood orareed, was employed on the Syrian seas at the time of his voyage from Tripoli to Alexandria (1242), and adds :—'*They say that the captains who navigate the Indian seas use, instead of the needle and splinter, a sort of fish made out of hollow iron, which, when thrown into the water, swims upon the surface, and points out the north and south with its head and tail " (Klaproth, Lettre, p. 57). Furthermore, although the sailors in the Indian vessels in which Niccola de'Conti traversed the Indian seas in 1420 are stated to have had no compass, still, on board the ship in which Varthema, less than a century later, sailed from Borneo to Java, both the mariner's chart and compass were used; it has been questioned, however, whether in this case the compass was of Hastern manufacture*

seen that the Chinese as late as the end of the 18th century made Voyages with compasses on which but little reliance could be placed ; anit may perhaps be assumed that the compasses early used in the East were mostly too imperfect to be of much assistance to navi- gators, and were therefore often dispensed with on customary routes. The simple Water-compass is said to have been used by the Coreans 80 late ag the middle of the 18th century; and Dr T. Smith, writing in the Philosophical Lransactions for 1683-4, says of the Turks (p. 439), "They havo no genius for Sea-voyages, and consequently hab taw and unexperienced in the art of Navigation, scarce ven- fee to sail out of sight of land. I speak of the natural Turks, who

~~a e either into the black Sea or some part of the Morea, or between she mente and Alemandria, and not of the Pyrats of Barbary, e fe a for the most part Renegado's, and learnt their skill in~~

~~mistendom. ...,, The Turkish compass consists but of 8~~

~~1 Adamas in India reperitur…. . Ferrum occulta quadam natura ad se trahit. Acus ferrea postquam adamantem contigerit, ad stellam septentrionalem ….. semper convertitur, unde valde necessarius est navigantibus in mari. : ;~~

- ~~Sicut acus per naturam vertitur ad septentrionem dum sit tacta a magnete,—Sicut acus nautica dirigit marinarios in sua navigstione.~~

~~8 Ginguené, Hist. lit. de (Italie, t.i. p. 418.~~

~~4 " According to all the texts he returned to Venice in 1295 or, as is more probable, in 1296,"—Yule.~~

~~of the compass was thus, even in the latter 5; 1us, & part of the 17th century, cule aaa Tecognized in the East may serve to explain how in * mes that instrument, long after the first discovery of its pro- perties, may have been generally neglected by navigators.~~

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- ~~Out of Bristowe, and costes many one, Men haue practised by nedle and by stone Thider wardes within a litle while." Hakluyt, Princtpal Navigations, p. 201, Lond, 1599. From this it would seem that the compasses used at that time by English mariners were of a very primitive description. Barlowe, in his treatise Magnetical Advertisements, printed in 1616 (p. 66), complains that "the Compasse needle, being the most admirable and usefull instrument of the whole world, is both amongst ours and other nations for the most part, so bungerly and absurdly contrived, as nothing more." The form he recommends for the needle is that of "a true circle, having his Axis going out beyond the circle, at each end narrow and narrower, unto a reasonable sharpe point, and being pure steele as the circle it selfe is,~~

having in the middest a convenient receptacle to place the capitell in." In 1750 Dr Gowan Knight found that the needles of merchant-ships were made of two pieces of steel bent in the middle and united in the shape of a rhombus, and proposed to substitute straight steel bars of small breadth, suspended edgewise, and hardened throughout. He also showed that the Chinese mode of suspending the needle conduces most to sensibility. In 1820 Prof. Barlow reported to the Admi- ralty that half the compasses in the Royal Navy were mere lumber, and ought to be destroyed. Since then many improved varieties of ships' compasses have been introduced, of which may be men- tioned those of Pope, Prestou, Walker, Dent, Stebbing, Gowland, Gray, Duchemin, and Harris. In the last the needle turns upon a point which is the centre of a doubly-curved bar of copper, fixed as a diameter to a ring of the same metal. In the Admiralty com-

pass the bowl is of copper, the card of mica ; and compound mag- netic bars, as proposed by Scoresby, are employed.

The most remarkable and, as shown by trial, most satisfactory form of the compass is that patented in 1876 by Sir William Thom- The card consists of a central boss and an

son (see fig. 2).

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Fig. 2.—Plan and Transverse Section of Sir William Thomson's Compass-card.

~~B, Corrector for quadrantal error; C, Box for corrector; @, Aluminium boss ; b, Central cap of sapphire; c, Cords connecting rim and boss; d, Magnets; e, Threads connecting magnets; /, Aluminium rim; /, Cords supporting magnets; 9,9', Knife edges for gimbals.~~

~~outer rim, both of aluminium, connected together by fine silk cords. Eight or twelve small magnets, 2 to 3 inches long, having their corresponding ends tied together by threads of equal lengths, are suspended by silk cords from the rim, to which 1s attached thin paper marked with the points of the compass and degrees. The concentration, in this wise, of the greater part of the weight in the~~

~~COM—COM~~

~~rim gives a long period of free oscillation, and consequently great steadiness; and as the card of a 10-inch compass, with its suspended needle and sapphire, weighs only 178 grains, the frictional error ig very slight. rection for all latitudes of a quadrantal error of 5 or 6 degrees for a 10-inch, and of 11 or 12 degrees for a 7-inch compass can be effeeted by means of a couplé of iron globes not more than 6 inches in dia- meter, fixed on opposite sides of the binnacle. and the fore-and-aft components of the ship's magnetic force are neutralized by two adjustable correctors p aced one over the other, and so arranged that in their zero position the middle line of both is vertically under the centre of the compass. consists of two bar magnets movable round a common horizontal axis perpendicular to their lengths. an adjustable magnet is applied below the compass in a line through its centre perpendicular to the deck. instrument, the azimuth mirror, is provided, whereby the image of the object reflected from a plane nurror is thrown, as in a camera lucida, on the graduated circle of the compass card, and is seen through a convex lens. edges instead of journals for supporting the gimbals. spherical space below the compass-case, nearly filled with castor-oil, serves to calm the vibrations of the bowl.~~

~~Nature, vol. x. p. 888, 1874.~~

~~Owing to the smallness of the needles, a perfect cor.~~

~~The thwart-ship~~

~~Each corrector To correct the heeling error,~~

~~For taking bearings, a new~~

~~Another improvement is the use of knife A hemi-~~

~~See articles MAGNETISM and NAVIGATION ; Cavallo, Z'reatise on~~

~~Magnetism, 2d ed., Lond. 1800 ; Macpherson, Annals of Comimeree,~~

~~1805 ; Airy, Phil. Trans., 1889, and 1846, part i., and Magnetism,~~

~~sect. x., 1870 ; Johnson, On the Deviations of the Compass, 1852; Evans, Phil. Trans., 1860; Scoresby, The Compass in Iron Ships, 1855, &c.; Evans and Smith, The Admiralty Manual of the Compass;~~

~~Merrifield, Magnetism and the Deviation of the Compass, part ii., 1872; Harris, Rud. Treat. on Magnetism, 1872; Thomson, in : (F. H. B.)~~

~~COMPIEGNE, a town of France, at the head of an arrondissement, in the department of Oise, situated on the left bank of the Oise, which is there crossed by a hand- some bridge of three arches, 36 miles east of Beauvais, on the railway between Paris and St Quentin, in 49° 25' 4" N. lat. and 2° 49' 35" E. long. It is famous as the occasional residence of the French kings from a very early period ; and it possesses a considerable number of fine edifices. Among these may be mentioned the church of St Jacques, of the 13th century ; Saint Antoine, of the 15th and 16th; the town-house, a picturesque building of the late Gothic style, dating from the 16th; the theatre ; and the royal palace, which is one of the most extensive and magnificent structures of the kind in France. It was erected mainly under Louis XV. and XVI, but large additions have been made in more recent times. The gardens are beautifully laid out, and in the neighbourhood is the famous forest of Compiégne, which covers an area of 30,000 acres, and includes the site of the camp constructed by Cesar in his campaign against the Bellovaci. 'The town is the seat of a civil and a commercial tribunal, and has a communal college, a public library, and a museum in the town-hall. The principal manufactures are hosiery, muslins, ropes, and wooden~~

wares ; and there is a fair trade in com and wood. Population in 1872, 11,859 in the town, and 12,281 in the commune.

Compitgne, or, as it is called in the Latin chronicles, Com endium, seems originally to have been a hunting-lodge of the early rankish kings. It was enriched by Charles the Bald with two castles, and a Benedictine abbey dedicated to Saint Corneille, the monks of which retained down to the 18th century the privilege of acting for three days as lords of Compiégne, with full power to release prisoners, condemn the guilty, and even inflict sentence of death. It wasm Compidgne that Louis the Debonnaire was deposed in 833; and at the siege of the town in 1430, Joan of Are was taken prisoner by the English. The abbey church received the dust of Louis II., Louis V., and Hugh the Great; and for a long time it had the distinction of possessing the oldest organ in France, gift from Constantine Copronymus to Pepin the Short. In 1624 the town gave its name to a treaty of alliance concluded by Richelieu with the Dutch ; and it was in the palace that Louis XV. gave welcome to Marie Antoinette, that Napoleon I. received Marie Louise of Austria, that Louis XVIII. entertained the Emperor Alexander of Russia, and that Leopold king of the Belgians was married to the Princess Louise. Under Napoleon III. it was the annual resort of the court during the hunting season, and thus became the scene of many a remarkable assembly. In 1871 the town was an 1mpol- tant post of communication between France and Germany,

COM—COM

COMPOSTELLA, a city of Spain in the Galician pro- vince of Coruiia, more frequently called Santiago, it lonour of its patron saint, St J. ames, whose shrine was long onc of the principal places of pilgrimage in Christendom. Tt gives its name to one of the four military orders of Spain which rank as follows :—Compostella, Calatrava,

Alcantara, and Manresa. See Santraco,

COMPTON Henry (1632-1713), bishop of London, After the restoration of Charles II. he became cornet in a regiment of horse, but he soon quitted the army for the church. He was made bishop of Oxford in 1674, and in

~~was the youngest son of the earl of Northampton.~~

~~the following year was translated to the sec of London.~~

~~He was also appointed a member of the Privy Council, and~~

~~intrusted with the education of the two princesses—Mary~~

~~and Anne. Compton showed a liberality most unusual at the time to Protestant dissenters, whom he wished to reunite with the established church. He held several conferences~~

~~ou the subject with the clergy of his diocese; and in the~~

~~hope of influencing candid minds by means of the opinions~~

~~of unbiassed foreigners, he obtained letters treating of the question (since printed at the end of Stillingfleet's Unreasonableness of Separation), from Le Moyne, professor of divinity at Leyden, and the famous French Protestant . divine, Claude. But to Roman Catholicism he was strongly opposed. On the accession of James IT. he consequently lost his seat in the council and his deanery in the Chapel Royal ; and for his firmness in refusing to suspend Dr Sharpe, whose writings against Popery had rendered him obnoxious to the king, he was himself suspended. At the Revolution, Compton embraced the cause of William and Mary; he performed the ceremony of their coronation ; his old position was restored to him : and, among other appointments, he was chosen as one of the commissioners for revising the liturgy. During the reign of Anne he remained a member of the Privy Council, and he was one of the commissioners appointed to arrange the terms of the union of England and Scotland 3 Dutyato his bitter disappointment, his claims to the primacy were twice passed over.~~

~~He published, besides several theological works, 4 Translation from the Italian of the Life of Donna Olympia Maladichint, who governed the Church during the time of Pope Innocent X., which was from the year 1644 'to 1655 (1667), and A Translation Jrom the French of the Jesuits' Intrigues (1669).~~

COMTE, Aveusrz, the most eminent and important of that interesting group of thinkers whom the overthrow of old institutions in France turned towards social specu- lation. Vastly superior as he was to men like De Maistre on the one hand, and to men like Saint Simon or Fourier on the other, as well in scientific acquisitions as in mental capacity, still the aim and interest of all his thinking was also theirs, namely, the renovation of the conditions of the social union, If, however, we classify him, not thus according to aim, but according to method, then he takes rank among men of a very different type from these. What distinguishes him in method from his contemporaries is his discernment that the social order cannot be transformed until all the theoretic conceptions that belong to it have been rehandled in a scientific spirit, and maturely gathered Up ito a systematic whole along with the rest of our knowledge, This presiding doctrine connects Conte with the social thinkers of the 18th century,—indirectly with Montesquieu, directly with Turgot, and more closely than either with Condorcet, of whom he was accustomed to speak as his philosophic father, Tsidore-Auguste-Marie-Francois-Xavier Comte was born 1n January 1798, at Montpellier, where his father was a 7 -elver-general of taxes for the district. He was sent for his earliest instruction to the school of the town, and in

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1814 was admitted to the eole Polytechnique. His youth was marked by a constant willingness to rebel against merely official authority ; to genuine excellence, whether moral or intellectual, he was always ready to pay unbounded deference. That sttenuous application which was one of his most remarkable gifts in manhood showed itself in his youth, and his application was backed or inspired by superior intelligence and aptness, After he had been two years at the Ecole Polytzchnique he took a foremost part in a mutinous demonstration against one of the masters 3 the school was broken up, and Comte like the other scholars was sent home. To the great dissatisfaction of his parents, he resolved to return to Paris (1816), and to earn his living there by giving lessonsin mathematics, Benjamin Franklin was the youth's idol at this moment. "TI sack to imitate the modern Socrates," he wrote to a school friend, " not in talents, but in way of living. You know that at five and twenty he formed the design of becoming perfectly wise, and that he fulfilled his design. I have dared to undertake the same

thing, though I am not yet twenty." Though Comte's character and aims were as far removed as possible from Franklin's type, neither Franklin nor any ian that ever lived could surpass him in the heroic tenacity with which, in the face of a thousand obstacles, he pursued his own ideal of a vocation.

Fora moment circumstances led him to think of seekin a career in America, but a friend who preceded him thither warned him of the purely practical spirit that prevailed in the new country. "If Lagrange were to come to the United States, he could only earn his livelihood by turning land surveyor." So Comte remained in Paris, living as he best could on something less than £80 a year, and hoping, when he took the trouble to break his meditations upon greater things by hopes about himself, that he might by- and-by obtain an appointment as mathematical master in a school. A friend procured him a situation as tutor in the house of Casimir Périer. The salary was good, but the duties were too miscellaneous, and what was still worse, there was an end of the delicious liberty of the garret. After a short experience of three weeks Comte returned to needi- ness and contentment. He was not altogether without the young man's appetite for pleasure ; yet when he was only nineteen we find him wondering, amid the gaieties of the carnival of 1817, how a gavotte or a minuet could make people forget that thirty thousand human beings around them had barely a morsel to eat. Hardship in youth has many drawbacks, but it has the immense advan- tage over academic ease of making the student's interest in men real, and not merely literary.

Towards 1818 Comte became associated as friend and Influence disciple with a man who was destined to exercise a very of Saint decisive influence upon the turn of his speculation, Henry, Simon. count of Saint Simon, was second cousin of the famous duke of Saint Simon, the friend of the Regent, and author of the most important set of memoirs in a language that is so incomparably rich in memoirs. He was now nearly sixty, and if he had not gained a serious reputation, he had at least excited the curiosity dnd interest of his con- temporaries by the social eccentricities of his life, by the multitude of his schemes and devices, and by the fantastic ingenuity of his political ideas. Saint Simon's most char- acteristic faculty was an exuberant imagination, working inthe sphere of real things. Scientific discipline did nothing for him; he had never undergone it, and he never felt its value, He

was an artist in social construction; and if right ideas, or the suggestion of right ideas, sometimes came into his head, about history, about human progress, about a stable polity, such ideas were not the products of trains of ordered reasoning ; they were the intuitional glimpses of the poet, and consequently as they professed to be in

real matter, even the right ideas were as often as not accom- puied by wrong ones. av:

The young Comte, now twenty, was enchanted by the philosophic veteran. In after years he so far forgot him- self as to write of Saint Simon as a depraved quack, and to deplore his connection with him as purely mischievous. While the connection lasted he thought very differently. Saint Simon is described as the most estimable and lovable of men, and the most delightful in his relations ; he is the worthiest of philosophers. Even after the association lad come to an end, and at the very moment when Comte was congratulating himself on having thrown off the yoke, he honestly admits that Saint Simon's influence has been of powerful service in his philosophic education. "T certainly," he writes to his most intimate friend, 'am under great personal obligations to Saint Simon ; that is to say, he helped in a powerful degree to launch me in the philosophical direction that I have now definitely marked out for myself, and that I shall follow without looking back for the rest of my life." Even if there were no such unmistakable expressions as these, the most cursory glance into Saint Simon's writings is enough to reveal the thread of connection between the ingenious visionary and the systematic thinker. We see the debt, and we also see that when it is stated at the highest possible, nothing has really been taken either from Comte's claims as a powerful original thinker, or from his immeasurable pre-eminence over Saint Simon in intellectual grasp and vigour and coherence. As high a degree of originality may be shown in transformationas in invention, as Molitre and Shakespeare have proved in the region of dramatic art. In philosophy the conditions are not different. IU faut prendre son bien ow on le trouve.

It is no detriment to Comte's fame that some of the ideas which he recombined and incorporated in a great philoso- phic structure had their

~~origin in ideas that were produced almost at random in the incessant fermentation of Saint Simon's brain. Comte isin no true sense a follower of Saint Simon, but it was undoubtedly Saint Simon who launched him, to take Comte's own word, by suggesting to his strong and penetrating mind the two starting points of what grew into the Comtist system—first, that political phenomena are as capable of being grouped under laws as other phenomena; and second, that the true destination of philosophy must be social, and the true object of the thinker must be the reorganization of the moral, religious, and poli- tical systems. We can readily see what an impulse these far-reaching conceptions would give to Comte's meditations. There were conceptions of less importance than these, in which it is impossible not to feel that it was Saint Simon's wrong or imperfect idea that put his young admirer on the track to a right and perfected idea. The subject is not worthy of further discussion, That Comte would have performed some great intellectual achievement, if Saint Simon had never been born, is certain. It is hardly less certain that the great achievement which he did actually perform was originally set in motion by Saint Simon's con- versation, though it was afterwards directly filiated with the fertile speculations of Turgot and Condorcet. Comte thought almost as meanly of Plato as he did of Saint Simon, and he considered Aristotle the prince of all true thinkers ; yet their vital difference about Ideas did not prevent Aristotle from calling Plato master.~~

~~After six years the differences between the old and the young philosopher grew too marked for friendship. Comte began to fret under Saint Simon's pretensions to be his director. Saint Simon, on the other hand, perhaps began to feel uncomfortably conscious of the superiority of his disciple. The occasion of the breach between them (1824) was anattempt on Saint Simon's part to print a production~~

~~COMTE~~

~~of Comte's as if it were in some sort connected with Saint Simon's schemes of social reorganization. a man to quarrel by halves, and not only was the breach not repaired, but long afterwards Comte, as we have said, with painful ungraciousness took to calling the encourager of his youth by very hard names.~~

of which "'nagnanimity owes no account to prudence," 1 and it did not turn out prosperously. strongly Catholic and royalist, and they were outraged by his refusal to have the marriage performed other than civilly, They consented, however, to receive his wife, and the pair went on a visit to Montpellier. a dislike to the circle she found there, and this was the too early beginning of disputes which lasted for the remainder of their union.

have nothing left but to concentrate my whole moral exist- ence inmy intelleetual work, a precious but inadequate compensation; and so I must give up, if not the most dazzling, still the sweetest part of my happiness." We cannot help admiring the heroism which cherishes great ideas in the midst of petty miseries, and intrepidly throws all squalid interruptions into the background which is their true place. cares that come with want of money made a harmonious life none the more easy. Comte tried to find pupils to board

question, than in runuing after some empty-headed and

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Comte wasnever

fl

In 1825 Comte married. His marriage was one of those Mars,

His family were

Madame Comte conceived

In the year of his marriage we find Comte writing to the most intimate of his correspondents :—"]

Still, we may well suppose that the sordid'

with him, but only one pupil came, and he was soon sent away for lack of companions. 'I would rather spend an evening," wrote the needy

enthusiast, 'in solving a difficult

consequential millionaire in search of a pupil." A little money was earned by an occasional article in Le Producteur, in which he began to expound the philosophic ideas that were now maturing in his mind. He announced a course of lectures (1826), which it was hoped would bring money as well as fame, and which were to be the first dogmatic exposition of the Positive Philosophy. A. friend had said to him, " You talk too freely, your ideas are getting abroad, and other people use them without giving you the credit ; put your ownership on record." The lectures were intended to do this among other things, and they attracted hearers so eminent as Humboldt the cosmologist, as Poinsot the geometer, as Blainville the physiologist.

Unhappily, after the third lecture of the course, Comte Seris) | had a severe attack of cerebral derangement, brought on iin by intense aud prolonged meditation, acting on a system that was already irritated by the chagrin of domestic failure. He did not recover his health for more than a year, and as soon as convalescence set in he was seized by so profound a melancholy at the disaster which had thus overtaken him, that he threw himself into the Seine. Fortunately he was rescued, and the shock did not stay his return to mental soundness, One incident of this painful episode is worth mentioning. Lamennais, then in the height of his Catholic exaltation, persuaded Comte's mother to insist on her son being married with the religious ceremony, and as the younger Madame Comte apparently did not resist, the rite was duly performed, in spite of the fact that the unfortunate man was at the time neither more nor less than raving mad. To such shocking colr spiracies against common sense and decency does ecclesias- tical zealotry bring even good men like Lamennais, U2 the other hand, philosophic assailants of Comtism have not always resisted the temptation to recall the circumstance that its founder was once out of his mind,—an unworthy and irrelevant device, that cannot be excused even by the provocation of Comte's own occasional acerbity. As has been justly said, if Newton once suffered:a cerebral attack without on that account forfeiting our veneration for the

COMTE

Principia, Comte may have suffered in the same way, and still not have forfeited our respect for what is good in the

systems of Positive Philosophy and Positive Polity.

In 1828 the lectures were renewed, and in 1830 was published the first volume of the Course of Positive Phi- losophy. The sketch and ground plan of this great under- The sixth and last volume was published in 1842. The twelve years covering the publication of the first of Comte's two elaborate works were years of indefatigable toil, and they were the only portion of his life in which he enjoyed a certain measure, and that

taking had appeared in 1826,

a very modest measure, of material prosperity. In 1833

he was appointed examiner of the boys in the various provincial schools who aspired to enter the Kcole Poly- This and two other engagements as a

technique at Paris. ; teacher of mathematics secured him an income of some £400 a year. He made M. Guizot, then Louis Philippe's

minister, the important proposal to establish a chair of

general history of the sciences. If there are four chairs, he argued, devoted to the history of philosophy, that is to say, the minute study of all sorts of dreams and aberrations through the ages, surely there ought to be at least one to explain the formation and progress of our real knowledge This wise suggestion, which still remains to be acted upon, was at first welcomed, according to Comte's own account, by Guizot's philosophic instinct, and then repulsed by his "metaphysical rancour."

Meanwhile Comte did his official work conscientiously, sorely as he grudged the time which it took from the execution of the great object of his thoughts. We cannot forbear to transcribe one delightful and touching trait in connection with this part of Comte's life. "TI hardly know if even to you," he writes in the expansion of domestic confidence to his wife, "I dare disclose the sweet and softened feeling that comes over me when I find a young man whose examination is thoroughly satisfactory. Yes, though you may smile, the emotion would easily stir me to tears if I were not carefully on my guard." Such sympathy with youthful hope, in union with the industry

~~and intelligence that are the only means of bringing the hope to fulfilment, shows that Comte's dry and austere manner veiled the fires of a generous social emotion. It was this which made the over-worked student take upon himself the burden of delivering every year from 1831 to 1848 a course of gratuitous lectures on astronomy for a popular audience. The social feeling that inspired this disinterested act showed itself in other ways. He suffered the penalty of imprisonment rather than serve in the national guard ; his position was that though he would not take arms against the new monarchy of July, yet being a republican he would take no oath to defend it. The only amusement that Comte permitted himself was a visit to the opera. In his youth he had been a play-goer, but he shortly came to the conclusion that tragedy is a stilted and bombastic art, and after a time comedy interested him no more than tragedy. For the opera he had a genuine Passion, which he gratified as often as he could, until his means became too narrow to afford even that single relaxation. ian his manner and personal appearance we have the i "a lig from one who was his pupil :—" Daily as "ita – struck eight on the horologe of the Luxembourg, door sa hammer on the bell was yet audible, the cial ae an opened, and there entered a man, short, Socal = 'i most what one might call sleek, freshly invengata = ee of whisker or moustache. He was it sl Sa na suit of the most spotless black, as fice . a on party; his white neck-cloth was fresh coat, al ndress's hands, and his hat shining like a racer's~~

~~» He advanced to the arm-chair prepared for him in~~

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~~the centre of the writing-table, laid his hat on the left-hand corner ; his snuff-box was deposited on the same side beside the quire of paper placed in readiness for his use, and dipping the pen twice into the ink-bottle, then bringing it to within an inch of his nose, to make sure it was properly filled, he broke silence: 'We have said that the chord AB,' &. For three quarters of an hour he continued his demonstration, making short notes as he went on, to guide the listener in repeating the problem alone ; then, taking up another cahier which lay beside him, he went over the written repetition of the former lesson. He explained, corrected, or commented till the clock struck nine ; then, with the little finger of the right hand brushing from hig~~

coat and waistcoat the shower of superfluous snuff which had fallen on them, he pocketed his snuff-box, and resuming his hat, he as silently as when he came in made his exit by the door which I rushed to open for him." In 1842, as we have said, the last volume of the Positive Completion Philosophy was given to the public, Instead of that con- of Positive tentment which we like to picture as the reward of twelve Vhilosophy. years of meritorious toil devoted to the erection of a high philosophic edifice, the author of this great contribution found himself in the midst of a very sea of small troubles, And they were troubles of that uncompensated kind that harass without elevating, and waste a man's spirit without softening or enlarging it. First, the jar of temperament between Comte and his wife had become so unbearable that they separated (1842). It is not expedient for strangers to attempt to allot blame in such cases, for it is impossible for strangers to know all the deciding circum- stances. We need only say that in spite of one or two disadvantageous facts in her career which do not con- cern the public, Madame Comte seems to have uni- formly comported herself towards her husband with an honourable solicitude for his well-being. Comte made her an annual allowance, and for some years after the separation they corresponded on friendly terms. Next in the list of the vexations that greeted Comte on emerging from the long tunnel of philosophizing, was a lawsuit with his publisher. The publisher had impertinently inserted in the sixth volume a protest against a certain foot-note, in which Comte had used some hard words about M. Arago, Comte threw himself into the suit with an energy worthy of Voltaire, and he won it. Third, and worst of all, he had prefixed a preface to the sixth volume, in which he deliberately went out of his way to rouse the active enmity of the very men on whom depended his annual re-election to the post of examiner for the Polytechnic School. The result of this perversity was that by-and-by he lost the appointment, and with it one-half of his very modest income. This was the occasion of an episode, which is of more than merely personal interest. Before 1842 Comte had been in correspondence with our J. §. Mill. distinguished countryman, J. 8. Mill. Mr Mill had been greatly impressed by Comte's philosophic ideas; he admits that his own System of Logic owes many valuable thoughts to Comte, and that, in the portion of that work which treats of the logic of the moral sciences, a radical improvement in the conceptions of logical method was derived from the Positive Philosophy. Their correspondence, which was extremely full and copious, and which we

~~may hope will one day be made accessible to the public, turned principally upon the two great questions of the equality between men and women, and of the expediency and constitution of a sacerdotal or spiritual order. When Comte found himself straitened, he confided the entire circumstances to his English friend. As might be supposed by those who know the affectionate anxiety with which Mr Mill regarded the welfare of any one whom he believed to be doing good work in the world, he at once took pains to have Comte's~~

~~Question of subsidy,~~

~~Money.~~

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~~loss of income made up to him, until Comte should have had time to repair that loss by his own endeavour. Mr Mill persuaded Grote, Molesworth, and Raikes Currie ic advance the sum of £240. At the end of the year (that is in 1845) Comte had taken no steps to enable himself to dispense with the aid of the three Englishmen. Mr Mill applied to them again, but with the exception of Grote, who sent a small sum, they gave Comte to understand that they expected him to earn his own living. Mr Mill had suggested to Comte that he should write articles for the English periodicals, and expressed his own willingness to translate any such articles from the French, Comte at first 'fell in with "the plan, but he speedily surprised and disconcerted Mr Mill by boldly taking up the position of "high moral magistrate," and accusing the three defaulting contributors of a scandalous falling away from righteousness anda high mind. Mr Mill was chilled by these pretensions ; they struck him as savouring of a totally unexpected charlatanry ; and the correspondence came to an end. For Comte's position in the argument onc feels that there is much to be said. If you have good reason for believing that a given thinker is doing work that will destroy the official system of science or philosophy, and if you desire its destruction, then you may fairly be asked to help to provide for him the same kind of material free- dom that is secured to the professors and propagators of the official system by the state or by the universities. And if it is a fine thing for a man to leave money behind him in the shape of an endowment for the support of a scientific teacher of wliom he has never heard, why should it~~

not be just as natural and as laudable to give money, while he is yet alive, to a teacher whom he both knows and approves of? On the other hand, Grote and Molesworth might say that, for anything they could tell, they would find themselves to be helping the construction of a system of which they utterly disapproved. And, as things turned out, they would have been perfectly justified in this serious appre- hension. 'To have done anything to make the production of the Positive Polity easier would have been no ground for anything but remorse to any of the three. It is just to Comte to remark that he always assumed that the con- tributors to the support of a thinker should be in all essentials of method and doctrine that thinker's disciples ; aid from indifferent persons he counted irrational and humiliating. But is an endowment ever a blessing to the man who receives it?) The question is difficult to answer generally; in Comte's case there is reason in the doubts felt by Madame Comte as to the expediency of relieving the philosopher from the necessity of being in plain and business-like relations with indifferent persons for a certain number of hours in the week. Such relations do as much as a doctrine to keep egoism within decent bounds, and they must be not only a relief, but a wholesome corrective to the tendencies of concentrated thinking on abstract subjects.

What finally happened was this, From 1845 to 1848 Comte lived as best he could, as well as made his wife her allowance, on an income of £200 a year. We need scarcely say that he was rigorously thrifty. His little account books of income and outlay, with every item entered down to a few hours before his death, are accurate and neat enough to have satisfied an ancient Roman householder. In 1848, through no fault of his own, his salary was reduced to £80. M. Littré and others, with Comte's approval, published an appeal for subscriptions, and on the money thus contributed Comte subsisted for the remaining nine years of his life. By 1852 the subsidy produced as much as £200 a year. It is worth noticing, after the story we have told, that Mr Mill was one of the subscribers, and that M. Littré continued

hig assistance after he had been driven from Comte's society by his high pontifical airs. be able to record any similar trait of magnanimity on

~~Comte's part. ness, for intensity, for inexorable will, for iron devotion to what he thought the service of mankind, yet offers few of~~

~~pity bad ones.~~

~~it is best to think of him only as the intellectual worker, pursuing in uncomforted obscurity the laborious and absorb-~~

~~We are sorry not to~~

~~His character, admirable as it is for firm-~~

~~those softening qualities that make us; love good men and He is of the type of Brutus or of Cato—g model of austere fixity of purpose, but ungracious, domi- neering, and not quite free from petty bitterness.~~

~~If you seek to place yourself in sympathy with Comte Literary method,~~

~~ing task to which he had given up his whole life. Hig~~

~~singularly conscientious fashion of elaborating his ideas~~

~~made the mental strain more intense than even so exhaust- ing a work as the abstract exposition of the principles of positive science need have been, if he had followed a more self-indulgent plan. He did not write down a word until he had first composed the whole matter in his mind. When~~

~~he had thoroughly meditated every sentence, he sat down~~

~~to write, and then, such was the grip of his memory, the exact order of his thoughts came back to him as if without an effort, and he wrote down precisely what he had intended to write, without the aid of a note or a memo- randum, and without check or pause. For example, he began and completed in about six weeks a chapter in the Positive Philosophy (vol. v. ch. 55), which would fill forty of the large pages of this Encyclopedia. Even if his subject had been merely narrative or descriptive, this would~~

~~be a very satisfactory piece of continuous production,~~

When we reflect that the chapter in question is not narrative, but an abstract exposition of the guiding principles of the movements of several centuries, with many threads of complex thought running along side by side all through the speculation, then the circumstances under which it was reduced to literary form are really astonishing. It is hardly possible for a critic to share the admiration expressed by some of Comte's disciples for his style. We are not so unreasonable as to blame him for failing to make his pages picturesque or thrilling ; we do not want sunsets and stars and roses and ecstasy; but there isa certain standard for the most serious and abstract subjects. When compared with such philosophic writing as Hume', Diderot's, Berkeley's, then Comte's manner is heavy, laboured, monotonous, without relief, and without light. There is now and then an energetic phrase, but as a whole the vocabulary is jejune ; the senteuces are overloaded ; the pitch is flat. A scrupulous insistence on making his meaning clear led to an iteration of certain adjectives and adverbs, which at length deaden the effect beyond the endurance of all but the most resolute students. Only the profound and stimulating interest of much of the matter prevents one from thinking of Rivarol's ill-natured remark upon Condorcet, that he wrote with opium on a page ¢ lead. 'The general effect is impressive, not by any virtues of style, for we do not discern one, but by reason of the magnitude and importance of the undertaking, and the visible conscientiousness and the grasp with which it 1s executed. It is by sheer strength of thought, by the vigorous perspicacity with which he strikes the lines of cleavage of his subject, that he makes his way into the mind of the reader; in the presence of gifts of this power we need not quarrel with an ungainly style. oan Comte pursued one practice which ought to be mentioned Hystese in connection with his personal history, the practice of ° what he styled hygiene cérébrale. After he had acquired what he considered to be a sufficient stock of material, an this happened before he had completed the Positiws Philosophy, he abstained deliberately and scrupulously from

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reading newspapers, reviews, scientific transactions, and everything clse whatever, except two or three poets (notably Dante) and the Jmdtatio Christi. It is true that his friends kept him informed of what was going on in the scientific world. Still this partial divorce of himself from the record of

the social and scientific activity of hig time, though it may save a thinker from the deplorable evils of dispersion, moral and intellectual, accounts in no small measure for the exaggerated egoism, and the ab- sence of all feeling for reality, which marked Comte's later days. ade aly one tmportant incident in Comte's life now remains to be spoken of. In 1845 he made the acquaintance of Madame Clotilde de Vaux, a lady whose husband had been sent to the galleys for life, and who was therefore, in all but the legal incidents of her position, a widow. Very little is known about her qualities. She wrote a little piece which Comte rated so preposterously as to talk about George Sand in the same senteuce ; it is in truth a flimsy performance, though it contains one or two gracious thoughts. There is trne beauty in the saying— Jt 7s unworthy of a noble nature to diffuse its pain." Madame de Vaux's letters speak well for her good sense and good feeling, and it would have been better for Comte's later work if she had survived to exert a wholesome restraint on his exaltation. Their friendship had only lasted a year wheu she died (1846), but the period was long enough to give her memory a supreme ascendency in Comte's mind. Condillac, Joubert, Mill, and other eminent men have shown what the intellectual ascendeéncy of a woman can be. Comte was as inconsolable after Madame de Vaux's death as D'Alembert after the death of Mademoiselle L'Espinasse. Every Wednesday afternoon he made a reverential pilgrim- age to her tomb, and three times every day he invoked her memory in words of passionate expansion. His disciples believe that in time the world will reverence Comte's senti- ment about Clotilde de Vaux, as it reveres Dante's adoration of Beatrice—a parallel that Comte himself was the first to hit upon, It is no doubt the worst kind of cynicism to—make a mock in a realistic vein of any personality that has set in motion the idealizing thaumaturgy of the affections, Yet we cannot help feeling that it is a grotesque and unseemly anachronism to apply in grave prose, addressed - to the whole world, those terms of saint and angel which are touching and in their place amid the trouble and passion of the great mystic poet. Only an energetic and beautiful imagination, together with a mastery of the rhythm and swell of impassioned speech, can prevent an invitation to the public to hearken to the raptures of intense personal attachment from seeming ludicrous and almost indecent, Whatever other gifts Comte may have had—and he had 'Many of the rarest kind,—poetic imagination was not among them, any more than poetic or emotional expression Was among them. His*

~~was one of those natvres whose faculty of deep feeling ig unhappily doomed to be inarticulate, and to pass away without the magic power of transmitting itself Comte lost no time, after the completion of his Course of Positive Philosophy, in proceeding with the System of Positive Polity, to which the earlier work was designed to bea foundation. he first volume was published in 1851, and the fourth and last in 1854, In 1848, when the political air was charged with stimulating elements, he founded the Positive Society, with the expectation that it fuight grow into a reunion as powerfal over the new revolution as the Jacobin Club had been in the revolution bf 1789. The hope was not fulfilled, but a certain lumber of philosophic disciples gathered round Comte, and~~

~~In the years'1849, 1850, and 1851, Comte gave three courses of lectures at the Palais Royal. They were gratuitous and popular, and in them he boldly advanced the whole of his doctrine, as well as the direct and immediate pretensions of himself and his system. The third course ended in the following uncompromising terms—"In the name of the Past and of the Future, the servants of HIumanity—both its philosophical and its practical servants—come forward to claim as their due the general direction of this world. Their object is to constitute at length a real Providence in all departments,—moral, intellectual, aud material, Con- sequently they exclude once for all from political supremacy all the different servants of God—Catholic, Protestant, or Deist—as being at once behindhand, and a cause of disturbance." A few weeks after this invitation, a very different person stepped forward to constitute himself a real Providence.~~

~~In 1852 Comte published the Catechism of Positivism. In the preface to it he took occasion to express his approval of Louis Napoleon's coup @état of the second of December,—"'a fortunate crisis which has set aside the parliameutary system, and instituted a dictatorial republic." Whatever we may think of the political Sagacity of such a judgment, it is due to Comte to say that he did not expect to see his dictatorial republic transformed into a dynastic empire, and, next, that le did expect from the Man of December freedom of the press and of public meeting, HIs later hero was the Emperor Nicholas, "the only statesman in Christendom,"—as unlucky a judgment as that which placed Dr Francia in the Comtist Calendar,~~

In 1857 he was attacked by cancer, and died peaceably neath, on the 5th of September of that year. The anniversary ig always celebrated by ceremonial gatherings of his French and English followers, who then commemorate the name and the services of the founder of their religion. Comte was under sixty when he died. We cannot help reflecting that one of the worst of all the evils counected with the shortness of human life is the impatience which it breeds in some of the most ardent and enlightened minds to hurry on the execution of projects, for which neither the time nor the spirit of their author is fully ripe.

In proceeding to give an outline of Comte's system, We Comte's shall consider the Positive Polity as the more or less philosophic legitimate sequel of the Positive Philosophy, notwithstand- consistency' ing the deep gulf which so eminent a critic as Mr Mill insisted upon fixing between the earlier and the later work, There may be, as we think there is, the greatest difference in their value, and the temper is not the same, nor the method. But the two are quite capable of being regarded, and for the purposes of an account of Comte's career ought to be regarded, as an integral whole. HIs letters when he was @ young man of one-and-tweuty, and before he had published a word, show how strongly present the social motive was in his mind, and in what little account he should hold his scientific works, if he did not perpetually think of their utility for the Species, "T feel," he wrote, "that such scientific reputation as I might acquire would give more value, more weight, more useful influence to my political sermons." In 1822 he published a Plan of the arly Scientific Works necessary to Reorganize Society. In this writings. opuscule he points out that modern society is passing through a great crisis, due to the conflict of two opposing movements,—the first, a disorganizing movement owing to the break-up of old institutions and beliefs; the second, a movement towards a definite social state, in which all means of humau prosperity will receive their most complete development and most direct application. HOw is this crisis to be déalt with? What are the undertakings ventually formed themselves, under the guidance of the | necessary in order to pass successfully through it towards i ideas of the latter half of his life, into a kind of church. | an organic state? The answer to this is ie there are two : se

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~~series of works. at the development of a new~~

~~The first is theoretic or spiritual, aiming principle of co-ordinating~~

~~social relations, and the formation of the system of general ideas which are destined to guide society. The second~~

~~work is practical or temporal power, and the institutions~~

~~; it settles the distribution of that are most conformable to~~

~~the spirit of the system which has previously been thought~~

~~out in the course of the theoretic work.~~

~~As the practical~~

~~work depends on the conclusions of the theoretical, the~~

~~latter must obviously come~~

~~first in order of execution.~~

~~In 1826 this was pushed further in a most remarkable~~

~~piece called Considerations on~~

~~the Spiritual Power—the~~

~~main object of which is to demonstrate the necessity of~~

~~instituting a spiritual power, power and independent of it. of a spiritual power proper~~

~~in so many terms the presence in his mind of a~~

~~*distinct from the temporal In examining the conditions for modern times, he 'indicates*~~

~~*direct*~~

~~*analogy between his proposed spiritual power and the func-*~~

~~*tions of the Catholic clergy*~~

~~*at the time of its greatest*~~

~~*vigour and most complete independence,—that is to say, from about the middle of the llth century until towards*~~

~~*the end of the 13th. He refers to book, Du Pape, as the most profound, methodical account of the old spiritual*~~

~~*De Maistre's memorable accurate, and organization, and*~~

~~*etarts from that as the model to be adapted to the changed*~~

~~*intellectual and social conditions of the modern time. (vol. v. p. 344), he distinctly*~~

~~*the Positive Philosophy, again*~~

~~*In*~~

~~*says that Catholicism, reconstituted asa system on new*~~

~~*intellectual foundations, spiritual reorganization of modern society. could easily be quoted to the same effect.*~~

~~*would finally preside over the Much else If unity of*~~

~~*career, then, means that Comte from the beginning*~~

~~*designed the institution of*~~

~~*a spiritual power, and the*~~

~~*systematic reorganization of life, it is difficult to deny him*~~

~~*whatever credit that unity may perhaps not particularly great. the Catholic system 1 his mind thirty years Positive Polity, though foresaw the religious mysticism in which the task land him. A great analysis was to precede a synthesis, but it was was centred from the first. Let us first sketch the of the analysis. Society is ta be reorganized on tl of knowledge. What is the sum and significance of*~~

~~*before the final excecution*~~

~~*be worth, and the credit is Even the re-adaptation of to a scientific doctrine was plainly in*~~

~~*of the*~~

~~*it is difficult to believe that he*~~

~~*was to great*~~

~~*the synthesis on which Comte's vision*~~

~~*nature 1e base know-*~~

~~*ledge? 'That is the question which Comte's first master-*~~

~~*work professes to answer. The Positive Philosophy opens with*~~

~~*the statement of a*~~

~~*certain law of which Comte was the discoverer, and which*~~

~~*has always been treated both by disciples and dis as the key to his system.*~~

~~*States. It is as follows.*~~

which the human mind explains phenomena, following the other in order. Theological, the Metaphysical, and the Positive.

ledge, or a branch of knowledge, is in the Theological state, when it supposes the phenomena under consideration either in the object or in In the Metaphysical state,

to be due to immediate volition, some supernatural being. volition is substituted abstract force residing in the yet existing independently of the object ; are viewed as if apart from the bodies manifesting

and the properties of each substance have attributed to

them an existence distinct from that substance. Positive state, inherent volition or external voliti

the phenomena

sidents

This is the Law of the Three Each of our leading conceptions, each branch of our knowledge, passes successively through three different phases; there are three different ways in each way These three stages are the

Know-

for object,

them ;

In the on and

inherent force or abstraction personified have both disap-

peared from men's minds, and the explanation of a

pheno-

Menon means a reference of it, by way of succession or

resemblance, to some other phenomenon,—means the establishment of a relation between the given fact and some more general fact. In the Theological and Meta- physical state men seek a causc or an essence; in the Positive they are content with a law. To borrow an 'Jlustration from an able English disciple of Comte:—"Tako the phenomenon of the sleep produced by opium. The Arabs are content to attribute it to the 'will of God? Molidre's medical student accounts for it by a soporyie principle contained in the opium. 'The modern physiologist knows that he cannot account for it at all. He can simply observe, analyze, and experiment upon the phenomena attending the action of the drug, and classify it with other agents analogous in character."—(Dr Bridges.)

The first and greatest aim of the Positive Philosophy is to advance the study of sociсty into the third of the three stages,—to remove social phenomena from the sphere of theological and metaphysical conceptions, and to introduco among them the same scientific observation of their laws which has given us physics, chemistry, physiology. Social physics wall consist of the conditions and relations of the facts of society, and will have two departments,—one, statical, containing the laws of order; the other dynamical, containing the laws of progress. While men's minds were in the theological state, political events, for example, were explained by the will of the gods, and political authority based on divine right. In the metaphysical state of mind, then, to retain our instance, political authority was based on the sovereignty of the people, and social facts were explained by the figment of a falling away from a state of nature. When the positive method has been finally extended to society, as it has been to chemistry and physiology, these social facts will be resolved, as their ultimate analysis, into relations with one another, and instead of seeking causes in the old sense of the word, men will only examine the conditions of social existence. When that stage has been reached, not merely the greater part, but the whole, of our knowledge will be impressed with one character, the character, namely, of positivity or scientifical- ness ; and all our conceptions in every part of knowledge will be thoroughly homogeneous. The gains of such 4 change are enormous. The new philosophical unity will now in its turn regenerate all the elements that went to its own formation. The mind will pursue knowledge without the

wasteful jar and friction of conflicting methods and mutually hostile conceptions ; education will be regenerated ; and society will reorganize itself on the only possible solid base—a homogeneous philosophy.

the demonstration of the science of society. This object is to show the sciences as branches from a single truuk,—is to give to science the ensemble or spirit of generality hitherto confined to philo- sophy, and to give to philosophy the rigour and solidity of science. Comte's special object is a study of social physics, a science that before his advent was still to be formed; his second object is a review of the methods and leading generalities of all the positive sciences already formed, so that we may know both what system of inquity to follow in our new science, and also where the new science will stand in relation to other knowledge. ,

The first step in this direction is to arrange scientific method and positive knowledge in order, and this brings us to another cardinal element in the Comtist system, the classification of the sciences. In the front of the inquily lies one main division, that, namely, between speculative and practical knowledge. With the latter we have no concern. Speculative or theoretic knowledge is divided 'nto abstract and concrete. The former is concerned wit the laws that regulate phenomena in all conceivable ¢as°s

The Positive Philosophy has another object besides Cal necessity and propriety of oie |

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the latter is concerned with the application of these laws. Concrete science relates to objects or beings ; abstract science to events. The former is particular or descriptive ; the latter is general. Thus, physiology is an abstract science; but zoology 1s concrete. Chemistry is abstract ; mineralogy is concrete. It is the method and knowledge of the abstract sciences that the Positive Philosophy has to reorganize ina great whole,

Comte's principle of classification is that the dependence and order of scientific study follows the dependence of the phenomena. 'Thus, as has

been said, it represents both the objective dependence of the phenomena and the subjective dependence of our means of knowing them. The more particular and complex phenomena depend upon the simpler and more general. 'The latter are the more easy to study. Therefore science will begin with those attributes of objects which are most general, and pass on gradually to other | attributes that are combined in greater complexity. Thus,

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in a succession gives a radically wrong idea of their genesis and their interdependence; no true filiation exists; no science develops itself inisolation; no one is independent, either logically or historically. M, Littré, by far the most eminent of the scientific followers of Comte, concedes a certain force to Mr Spencer's objections, and makes certain secondary modifications in the hierarchy in consequence, while still cherishing his faith in the Comtist theory of the sciences. Mr Mill, while admitting the objections as good, if Comte's arrangement pretended to be the only one possible, still holds that arrangement as tenable for the purpose with which it was devised. Mr Lewes asserts against Mr Spencer that the arrangement in a series is necessary, on grounds similar to those which require that the various truths constituting a science should be systematically co-ordinated, although in nature the phenomena are intermingled.

The first three volumes of the Posdtive Philosophy contain an exposition of the partial philosophies of the five sciences that precede sociology in the hierarchy. Their value has usually been placed very low by the special followers of the sciences concerned ; they say that tho knowledge is second-hand, is not coherent, aud is too con- fidently taken for final. The Comtist replies that the task is philosophic, and is not to be judged by the minute accuracies of science. In these three volumes Comte took the sciences roughly as he found them. His eminence as anian of science must be measured by his only original work in that department, the construction, namely, of the new science of society. This work is accomplished in the last three volumes of the Positive Philosophy, and the second and third volunies of the Positive Polity. The Comtist maintains that even if these five volumes together fail in laying down correctly and finally the lines of the new

~~science, still they are the first solution of a great problem hitherto unattempted. " Modern biology has got beyond Aristotle's conception ; but in the construction of the biological science, not even the most unphilosophical biologist would fail to recognize the value of Aristotle's attempt. So for sociology. Subsequent sociologists may have conceivably to remodel the whole science, yet not the less will they recognize the merit of the first work which has facilitated their labours."—(Congreve.)~~

~~too, each science rests on the truths of the sciences that precede it, while it adds to them the truths by which it is itself coustituted. Comte's series or hierarchy is arranged | as follows :—(1) Mathematics (that is, number, geometry, and mechanics), (2) Astronomy, (3) Physics, (4) Chemistry, (5) Biology, (6) Sociology. Hach of the members of this series is one degree more special than the member before it, and depends upon the facts of all the members preceding it, and cannot be fully understood without them. It follows that the crowning science of the hierarchy, dealing with the phenomena of human society, will remain longest under the influence of theological dogmas and abstract figments, and will be the last to pass into the positive stage.~~

~~You cannot discover the relations of the facts of human | society without reference to the conditions of animal life : | you cannot understand the conditions of animal life without the laws of chemistry; and so with the rest.~~

~~This arrangement of the sciences, and the Law of the Three States, are together explanatory of the course of human thought and knowledge. They are thus the double b 1 key of Comte's systematization of the philosophy of all the—Sciences from mathematics to physiology, and his analysis—of social evolution, which is the base of sociology. Each science contributes its philosophy. The co-ordination of~~

~~dole fi~~

~~—all these partial philosophies produces~~

~~to be effected,~~

~~m ; that Comte's classi~~

the general Positive Philosophy. " Thousands had cultivated science, and with splendid success; not one had conceived the philosophy which the sciences when organized would naturally evolve. A few had seen the necessity of extending the scientific method to all inquiries, but no one had seen how this was ... The Positive Philosophy is novel as a philosophy, not as a collection of truths never before suspected, Its novelty is the organization of existing elements. Its very principle implies the absorption of all that great thinkers had achieved ; while incorporating their results it extended their methods... . What tradition brought was the results ; what Comte brought was the organization of these results. He always claimed to be the founder of the Positive Philosophy. That he had every tight to such a title is demonstrable to all who distinguish between the positive sciences and the philosophy which co ordinated the truths and methods of these sciences into a doctrine." —(, H, Lewes.) We may interrupt our short exposition here to remark : fication of the sciences has been subjected to vigorous criticism by Mr Herbert Spencer. Mr Spencer's two chief points are these :—(1) He denies that the Principle of the development of the sciences is the Principle of decreasing generality ; he asserts that there ie as many examples of the advent of a science being Slermined by uicreasing generality as by increasing 'Speciality, (2) He holds that any grouping of the sciences

"We shall now briefly describe Comte's principal con- Socio-

ceptions in sociology, his position in respect to which is held by himself, and by others, to raise him to the level of Descartes or Leibnitz. Of course the first step was to approach the phenomena of human character and social existence with the expectation of finding them as reducible to general laws as the other phenomena of the universe, and with the hope of exploring these laws. by the same instruments of observation and verification as had done such triumphant work in the case of the latter. Comte separates the collective facts of society and history from the individual phenomena of biology; then he withdraws these collective facts from the region of external volition, and places them in the region of Jaw. The facts of history must be explained, not by providential interven- tions, but by referring them to conditions inherent in the successive stages of social existence. This conception makes a science of society possible. What

is the method ? It comprises, besides observation and experiment (which is, in fact, ouly the observation of abnormal social states), a certain peculiarity of verification. We begin by deducing every well-known historica] situation from the series of its antecedents, Thus we acquire a body of empirical generalizations as to social phenomena, and then we connect the generalizations with the positive theory of human nature. A sociological demonstration lies in the establish- ment of an accordance between the conclusions of historical analysis and the preparatory conceptions of biological

logical concep- tions.

Method.

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theory. As Mr Mill puts it :—"If a sociological theory,

collected from historical evidence, contradicts the estab.

lished general laws of human nature ; if (to use M. i Comte's instances) it implies, in the mass of mankind, any very decided natural bent, either in a good or in a bad direction; if it supposes that the reason, in average human beings, predominates over the desires, or the disinterested desires over the personal ;—we may know that history has been misinterpreted, and that the theory 1s false. On the other hand, if laws of social phenomena, empirically generalized from history, can, when once suggested, be affiliated to the known laws of human nature ; if tho direction actually taken by the developments and changes of human society, can be seen to be such as the properties of man and of his dwelling-place made ante- cedently probable, the empirical generalizations are raised into positive laws, and sociology becomes science." The result of this method is an exhibition of the events of human experience in co-ordinated series that manifest their own graduated connection.

Next, as all investigation proceeds from that which is known best to that whicli is unknown or less well known, and as, in social states, it is the collective phenomenon that is more easy of access to the observer than its

parts, therefore we raust consider and pursue all the elements of a given social state together and in common, The social organization must be viewed and explored as a whole. There is 2 nexus between each leading group of social phenomena and other leading groups ; if there is a change in one of them, that change is accompanied by a corre- sponding modification of all the rest. " Not only must political institutions and social manners, on the one hand, and manners and ideas, on the other, be always mutually connected ; but further, this consolidated whole must be always connected by its nature with the corresponding state of the integral development of humanity, considered in all its aspects of intellectual, moral, and pliysical activity."—(Comte.)

Ts there any one element which communicates the decisive predominating agency in the

Decisive importance impulse to all the rest,—any

of intellec- course of social evolution? The answer is that all the ne de- other parts of social existence are associated with, and elopment. ee ¢ drawn along by, tle contemporary condition of intellectual development. The Reason is the superior and preponderant element which settles the direction in which all the other faculties shall expand. "It is only through the more and more marked influence of the reason over the general con- duct of man and of society, that the gradual march of our race has attained that regularity and persevering continuity which distinguish it so radically from the desultory and barren expansion of even the highest animal orders, which share, and with enhanced strength, the appetites, the passions, and even the primary sentiments of man." The history of intellectual development, therefore, is the key to social evolution, and the key to the history of intel- lectual development is the Law of the Three States. Among other central thoughts in Comte's explanation of history are these :—The displacement of theological by positive conceptions has been accompanied by a gradual rise of au industrial régime out of the military régime ;— the great permanent contribution of Catholicism was the separation which it set up between the temporal and the spiritual powers ;—the progress of the race consists in the increasing preponderance of the distinctively human elements over tle animal elements ;—the absolute tendency of ordinary

~~social theories will be replaced by an unfailing adherence to the relative point of view, and from this it follows that the social state, regarded as a whole, has been as perfect in each period as the co-existing condition of humanity and its environment would allow;~~

~~Historical elucida- tions;~~

~~CcCOMT E~~

~~The elaboration of these ideas in relation to the history 1, i aes oe : ely yy of the civilization of the most advanced portion of the and py, human race occupies two of the volumes of the Positive ity, Philosophy, and las been accepted by competent persons of very different schools as a master-piece of rich, luminous and far-reaching suggestion. Whatever additions it may receive, and whatever corrections it may require, this analysis of social evolution will continue to be regarded as one of the great achievements of human intellect. The dermand for the first of Comte's two works has gone on increasing in a significant degree. It was completed, as we have said, in 1842. A second edition was published in 1864; a third some years afterwards ; and while we write (1876) a fourth is in the press. Three editions within twelve years of a work of abstract philosophy in six considerable volumes are the measure of a very striking influence. On the whole, we may suspect that no part of Comte's works has had so much to do with this marked success as his survey and review of the course of history. The third volume of the later work, the Positive Polity, Soca treats of social dynamics, and takes us again over the djum: ground of historic evolution. Tt abounds with remarks of ™ extraordinary fertility and comprehensivencss ; but it i" often arbitrary; its views of the past are strained into coberence with the statical views of the preceding volume; and so far as concerns the period to which the present writer happens to have given special attention, it is usually slight and sometimes random. As it was composed in rather less than six months, and as the author honestly warns us that he has given all his attention to a mere profound co- ordination, instead of working out the special explanations rnore fully, as he had promised, we need not be surprised if the result is disappointing to those who had raastered the corresponding portion of the Positive Philosophy. Comte explains the difference between his two works, In the first his " chief~~

object was to discover and demonstrate the laws of progress, and to exhibit in one unbroken sequence the collective destinies of mankind, till then invariably regarded as a series of events wholly beyond the reach of explanation, and almost depending on arbitrary will. The present work, on the contrary, is addressed to those who are already sufficiently convinced of the certain existence of social laws, and desire only to have them reduced to a true and conclusive system." a What that system is it would take far more space than we The Po | can afford to sketch even in outline. All we can do is to tiv) enumerate some of its main positions. They are to be te | drawn not only from the Positive Polity, but from two other works, —the Positivist Catechism: a@ Summary Exposition of the Universal Religion, in Twelve Dialogues between a Woman and a Priest of Humanity ; and, second, The Subjective Synthesis (1856), which is the first and only volume of a work upon mathematics announced ab the end of the Positive Philosophy. The system for which the Positive Philosophy is alleged to have been the scientific preparation .contains a Polity and a Religion ; a complete arrangement of life in all its aspects, giving a wider sphere to Intellect, Energy, and Feeling than could be found ia any of the previous organic types,—Greek, Roman, Of Catholic-feudal. Comte's immense superiority over sue pre-Revolutionary utopians as the Abbe Saint Pierre, no less than over the group of post-revolutionary utopians, is especially visible in his firm grasp of the cardinal tru that the improvement of the social organisin can only be effected by a moral development, and never by any change in mere political mechanism, or any violences in the way © an artificial redistribution of wealth. A moral transforma tion must precede any real advance. The aim, both 1 public and private life, is to secure to the utmost possible extent the victory of the social feeling over self-love,

vy to Altruism over Egoism. This is the key to the regenera- e- tion of social existence, as it is the key to that unity of 'individual Jife which makes all our energies converge freely and without wasteful friction towards a common cad. What are the instruments for securing the pre- ponderauce of Altruism? Clearly they must work from the strongest element in human nature, and this ele- ment is Feeling or the Heart. Under the Catholic system the supremacy of Feeling was abused, and the Intellect was made its slave. Then followed a revolt of Intellect against Sentiment. The business of the new systera will be to bring back the Intellect into a condition not of

slavery, but of willing ministry to the Feelings. The subordination never was, and never will be, effected except by means of a religion, and a religion, to be final, ' must include a harmonious synthesis of all our conceptions of the external order of the universe. The characteristic basis of a religion is the existence of a Power without us, so superior to ourselves as to command the complete sub- mission of our whole life. This basis is to be found in the Positive stage, in Humanity, past, present, and to come, conceived as the Great Being. "A deeper study of the great universal order reveals to us at gi length the ruling power within it of the truc Great Being, whose destiny it is to bring that order continually to perfection by con- stantly conforming to its laws, and which thus best represents to us that system as a whole. 'his undeniable Providence, the supreme dispenser of our destinies, becomes in the natural course the common centre of our affections, our thoughts, and our actions. Although this Great Being evidently exceeds the utmost strength of any, even of any collective, human force, its necessary constitu- tion and its peeuliar function endow it with the truest sympathy towards all its servants. he least amongst us ean and ought con- stantly to aspire to maintain and even to improve this Being. This | natural objeet of all our activity, both public and private, deter- | mines the true general character of the rest of our existenee, whether

in feeling or in thought ; which must be devoted to love, and to

know, in order rightly to serve, our Providence, by a wise use of all

the means which it furnishes to us. Reciprocally this continued Sservice, whilst strengthening our truce unity, renders us at once both happier and better."

The exaltation of Humanity into the throne occupied by the Supreme Being under monotheistic systems made all ' the rest of Comte's construction easy enough. Utility

remains the test of every institution, impulse, act; his fabric becomes substantially an arch of utilitarian pro-

positions, with an artificial Great Being inserted at the top to keep them in their place. The Comtist system is utilitarianism crowned by a fantastic

decoration. ‘Trans- lated into the plainest English, the position is as follows: “Society can only be regenerated by the greater subordina- tion of politics to morals, by the moralization of capital, by the renovation of the family, by a higher conception of marriage, and soon. These ends can only be reached by a heartier development of the sympathetic instincts. The Sympathetic instincts can only be developed by the Religion

of Humanity.” Looking at the problem in this way, even @ moralist who does not expect theology to be the instru- ment of social revival, might still ask whether the sympathetic instincts will not necessarily be already developed to their highest point, before people will be persuaded to accept the religion, which is at bottom hardly more than Sympathy under a more imposing name. How- ever that may be,

not enter—as to the legitimateness of Comtism as a

re turns upon this erection of Humanity into a

the aa — various hypotheses, dogmas, proposals, as to

ed Ys to pe &c., are merely propositions measur- nee y = ee of utility and a balance of expedi- ee ny of these proposals are of the highest interest, | rm many of them are actually available ; but there does : ai A to be one of them of an available kind, which not equally well be approached from other sides, and

the whole battle—into which we shall

even incorporated in some radically antagouistic system. Adoption, for example, as a practice for improving the happiness of families and the welfare of society, is capable of being weighed, and can in truth only be weighed, by utilitarian considerations, and has been commended by men to whom the Comtist religion is naught. The singularity of Comte’s construction, aud the test by which it must be tried, is the transfer of the

worship aud discipline of Catholicism to a system in which " the conception of God is superseded" by the abstract idea of Humanity, conceived as a kind of Personality.

And when all is said, the invention does not help us. We have still to settle what zs for the good of Humanity, and we can only do that in the old-fashioned way. There is no guidance in the conception. No effective unity can follow from it, because you can only find out the right and wrong of a given course by summing up the advantages and disadvantages, and striking a balance, and there is nothing in the Religion of Humanity to force two men to find the balance on the same side. The Comtists are no better off than other utilitarians in judging policy, events, conduct.

The particularities of the worship, its minute and truly The wor- ingenious re-adaptations of sacrameuts, prayers, reverent ship and signs, down even to the invocation of a new Trinity, need 'iscipline. not detain us, They are said, though it is not easy to believe, to have been elaborated by way of Utopia. If so, no Utopia has ever yet been presented in a style so little calculated to stir the imagination, to warm the feelings, to soothe the insurgency of the reason. It is a mistake to present a great body of hypotheses—if Comte meant them for hypotheses—in the most dogmatic and peremptory form to which language can lend itself, And there is no more extraordinary thing in the history of opinion than the perversity with which Comte has succeeded in clothing a philosophic doctrine, so intrinsically conciliatory as his, ina shape that excites so little sympathy and gives so much provocation. An enemy defined Comtism as Catholicism minus Christianity, to which an able champion retorted by calling it Catholicism plus Science. Hitherto Comte's Utopia has pleased the followers of the Catholic, just as little as those of the scientific, spirit.

The elaborate and minute systematization of life, pro- The priest- per to the religion of Humanity, is to be directed by a hood. priesthood. 'The priests are to possess neither wealth nor material power; they are not to command, but to counsel ; their authority is to rest on persuasion, not on force. When religion has become positive, and society indus- trial, then the influence of the church upon the state becomes really free and independent, which was not the case in the Middle Age. The power of the priesthood rests upon

special knowledge of man and nature; but: to this intellectual eminence must also be added moral power and a certain greatness of character, without which force of intellect. and completeness of attainment will not receive the confidence they ought to inspire. The functions of the priesthood are of this kind :—To exercise a systematic direction over education ; to hold a consultative influence over all the important acts of actual life, public and private ; to arbitrate in cases of practical conflict ; to preach sermons recalling those principles of generality and universal harmony which our special activities dispose us to ignore; to order the due classification of society ; to perform the various ceremonies appointed by the founder of the religion. The authority of the priesthood is to rest wholly on voluntary adhesion, and there is to be perfect freedom of speech and discussion; though, by the way, we cannot forget Comte's detestable congratulations to the Czar

| Nicholas on the " wise vigilance " with which he kept watch

over the importation of Western books,

Women,

Conclusion.

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From his carliest manhood Comte had been powerfully im- pressed by the necessityof elevating the condition of women. (See remarkable passage in his letters to M. Valat, pp. 84-7.) His friendship with Madame de Vaux had deepened the impression, and in the reconstructed society women are to play a highly important part. They are to be care- fully excluded from public action, but they are to do many more important things than things political. To fit them for their functions, they are to be raised above material cares, and they are to be thoroughly educated. The family, which is so important an element of the Comtist scheme of things, exists to carry the influence of woman over man to the highest point of cultivation. Through affection she purifies the activity of man. "Superior in power of affection, more able to keep both the intellectual and the active powers in continual subordination to feeling, women are formed as the natural intermediaries

between Humanity and man. The Great Being confides specially to them its moral Providence, maintaining through them the direct and constant cultivation of universal affection, in the midst of all the distractions of thought or action, which are for ever withdrawing men from its influ- ence. . Beside the uniform influence of every yvoman on every man, to attach him to Humanity, such is the importance and the difficulty of this ministry that each of us should be placed under the special guidance of one of these angels, to answer for him, as it were, to the Great Being. This moral guardianship may assume three types,— the mother, the wife, and the daughter ; each having several modifications, as shown in the concluding volume. Together they form the three simple modes of solidarity, or unity with contemporaries,—obedience, union, and protection,—as well as the three degrees of continuity between ages, by uniting us with the past, the present, and the future. In accordance with my theory of the brain, each corresponds with one of our three altruistic instincts,—veneration, attachment, and benevolence."

How the positive method of observation and verifica- tion of real facts has landed us in this, and much else of the same kind, is extremely hard to guess. Seriously to ex- amine an eucyclopedic system, that touches life, society, and knowledge at every.point, is evidently beyond the compass of such an article as this, There is in every chapter a whole group of speculative suggestions, each of which would need a long chapter to itself to elaborate or to discuss. There is at least one biological speculation of astounding audacity, that could be examined in nothing less than a treatise. Perhaps we have said enough to show that after performing a great and real service to thought, Comte almost sacrificed his claims to gratitude by the invention of a system that, as such, and independently of detached suggestions, is markedly retrograde. But the world has strong self-protecting qualities. It will take what is available in Comte, while forgetting that in his work which is as irrational in one way as Hegel is in another.

The English reader is specially well placed for satisfying such curiosity as he may have aboutComte's philosophy. Miss Martineau condensed thesix volumes of the Philosophie Positive into two volumes of excellent English (1853); Comte himself gave them a place in the Positivist Library. The Catechism was translated by Dr Con- ereve in 1858. The Politique Positive

~~*has been reproduced in English (Longmans, 1875-7) by the conscientious labour of Comte's London followers. This translation is accompanied by a careful running analysis and explanatory summary of contents, which make the work more readily intelligible than the original. For criticisms, the reader may be referred to Mr Mill's Auguste Comte and Posi- tivism; Dr Bridges's reply to Mr Mill, The Unity of Comte's Life and Doctrines (1866); Mr Herbert Spencer's essay on the Genesis of Science, and pamphlet on The Classification of the Sciences; Pro- fessor Huxley's "Scientific Aspects of Positivism," in his Lay Scr- mons; Dr Congreve's Essays Political, Social, and Religious (1874); Mr Fiske's Outlines of Cosmic Philosophy (1874); Mr Lewes's History of Philosophy, vol. ii. (J. MO.)*~~

~~*COM—CON*~~

~~*to improve his drawing.*~~

~~*COMUS (from «Gos, revel, or a company of revellers)*~~

~~*was, in the later mythology of the Greeks, the god of festive mirth. In classic mythology the personification does not exist; but Comus appears in the Hixoves, or Descriptions of Pictures, of Philostratus, a writer of the 3d century A.D., as a winged youth, slumbering in a standing attitude, his legs crossed, his countenance flushed with wine, his head—which is sunk upon his breast—crowned with dewy flowers, his left hand feebly grasping a hunting spear, his right an inverted torch. Ben Jonson introduces Comus, iu his masque entitled Pleaswre reconciled to Virtue*~~

~~*(1619),.;*~~

~~*father of sauce and deviser of jelly." sive Phagesiposia Cimmeria: Somnium (1608, and at Oxford, 1634), a moral allegory by a Dutch author, Hendrik van der Putten, or Erycius Puteanus, the conception is more nearly akin to Milton's, and Comus is a being whose enticements are more disguised and delicate than those of Jonson's deity. But Milton's Comus is a creation of his own.*~~

~~*as the portly jovial patron of good cheer, " First In the Comus,*~~

~~His story is one~~

~~“ Which never yet was heard in tale or song ¥rom old or modern bard, in hall or bower.”~~

~~Born from the loves of Bacchus and Circe, he is “ much~~

~~like his father, but his mother more ”—a sorcerer, like her, who gives to travellers a magic draught that changes their human face into the “ brutal form of some wild beast,” and, hiding from them their own foul disfigurement, makes them forget all the pure ties of life, in a sensual sty.”~~

~~“to roll with pleasure~~

~~CONGA, Supastiano (1676-1764), a painter of the~~

~~Florentine school, was born at Gaeta, and studied at Naples under Francesco Solimena. brother Giovanni, who acted as his assistant, he settled at~~

~~In 1706, along with his~~

~~Rome, where for several years he worked in chalk only, HIe was patronized by the Cardinal Ottoboni, who introduced him to Clement KL; and a Jeremiah painted in the church of St John Lateran, was rewarded by the Pope with knighthood and by the cardinal with a diamond cross. HIs fame grew quickly, and by-and-by he received the patronage of most of the crowned heads of Europe. HIe painted on till near the day of his death, and left behind him an immense number of pictures, mostly of a brilliant and showy kind, which are distributed among the churches of Italy. Of these the Probatica, or Pool of Siloam, in the hospital of Santa Maria della Scala, at Siena, is considered the finest. CONCAN, orKoncan,a maritime tract of Western India, situated within the limits of the Presidency of Bombay, and extending from the Portuguese settlement of Goa on the §. to the territory of Daman, belonging to the same nation, on the N. On the E. it is bounded by the Ghats, and on the W. by the Indian Ocean. This tract comprises the two British districts of Tannah and Ratnagiri, and may be estimated at 300 miles in length, with an averag® breadth of about 40. From the mountains~~

on its eastern frontier, which in one place attain a height of 47 00 feet, the surface, marked by a succession of irregular hilly spurs from the Ghats, slopes to the westward, where the meal elevation of the coast is not more than 100 feet above the level of the sea. Several mountain streams, but none ¢ any magnitude, traverse the country in the same directiol. One of the most striking characteristics of the climate 18 the violence of the monsoon rains — the mean annual fi at MabAbleshwar amounting to 239 inches. It 1s believed that the abundant moisture borne along from the i Ocean by this aerial current, becomes arrested and condense by the mountain barrier of the Ghats, and in this mannet accounts for the excessive rains which deluge the Concan. The products of this country are the same as those ©

— and constructed in Chili ;

and Taleahuano,

— the technical meaning,

CON—

Malabar ; and the hemp raised is said to be of a stronger quality than that grown above the Ghats. The coast has a straight general outline, but is much broken into smal] bays and harbours. This, with the uninterrupted view along the shore, and the land and sea breezes, which force vessels steering along the coast to be always within sight of it, rendered this country from time immeniorial the seat of piracy ; and so formidable had the pirates become in the 18th century, that all ships suffered which did not The Great Mogul maintained a fleet for the express purpose of checking them, and they were frequently attacked by the Portuguese. British commerce was protected by occasional expeditions from Bombay, commencing about 1756 ; but the piratical system was not finally extinguished until

receive a pass from the chiefs of the pirates,

1812.

~~According to ancient traditions, this country was inhabited by a tribe of savages, till they were conquered by the HIndus, who gave it toa tribe of Brahmans; and it was held by them until it was HIt was eonquered in the 17th century by Sivaji, the founder of the~~

~~taken possession of by the Mahometan kings of Bijapur.~~

~~Mahratta empire. 'Towards the close of the same century Konaji~~

~~Angria established a kingdom on this coast, extending 120 miles~~

~~from Tannah to Bankut, together with the inland country as far back as the mountains. The dominion of this prince and his family over a portion of the tract continued till the line became extinet, and the territory lapsed to the paramount power. 'The remainder of the Concan had been already incorporated with the British dominions since the fall of the Peshwa in 1818.~~

~~CONCEPCION, a city of Chili, the capital of the pro-~~

~~vineeof thesame name. I*ounded by Pedro de Valdivia, it~~

~~was originally situated where the small village of Penco now stands, on the Bay of Talcahuano ; but having been first pillaged and destroyed by the Araucanians, and in 1730 levelled to the ground by an earthauake, the town was removed to its present site, 36° 49' S. lat., 72° 50' W. long., in a fertile plain on the north side of the Bic-Bio, about~~

~~five miles trom the sea and 270 miles south-west of~~

~~Santiago. In the year 1835 it was again Jaid in ruins by an earthquake, which so terrified the inhabitants that for a long time the place remained partly unoccupied. A fter- wards, however, the streets were rebuilt, and the area occu- pied by the town has been greatly extended. The main streets and squares are broad and spacious ; the dwelling. houses (mostly of only one floor) are among the best planned and the cathedral, churches, and public buildings are handsome cdificcs. Powerful flour mills are in the town and neighbourhood, as well as immense cellars (bodegas) for the- storage~~

of wheat and wine. It is connected by rail with its two ports—Tomé and with all the important towns of the interior. Population, 19,200,

CONCLAVE. The word conclave is used to signify any company of persons gathered together in consultation ; its Proper meaning is any such gathering of persons locked wp together (con, collective pronoun, and clavis,a key); and which has superseded all other uses of the word, save where some other significance is specially indicated, is the meeting of the members of the Sacred College of Cardinals for the purpose of electing a Pope.

The Pope, who is simply the bishop of Rome, was originally chosen by the entire body of the people con- stituting the church at Rome. Gradually, and by a process of encroachment, the several steps of which are, as might be expected, very obscure, the right of nomination was confined to the clergy, the people still retaining a right of objection, exercised very much in the same manner as the forbidding banns of matriage is now exercised. The Stasping tyranny of the clergy combined with the lawless turbulence of the laity, consisting no longer, as originally, of a select body of religious men, but of the entire popula-

| tion, to cause this participation of the laity also to fall into

election,

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disuse. The next step was to allow the privilege of the: vote only to the chief among the clergy—cardinales—the cardinal clergy, so called as the principal virtues were called cardinal virtues (see CARDINAL), During some centuries the emperor was understood to have a controlling voice in the election, in such sort that his approbation was necessary for the validity of it. But the practice varied much in this respect, according as the emperor was or was not strong, near at hand, or interested in the election. The history of this part of the subject is exceedingly obscure ; but it ig certain that at least one Pope provided that the consent of the emperor should be necessary for the election of his successor, and on the other hand that other

elections were made about the same period without. the emperor's participation.

It was not till many years after the right of election had been abusively confined to the cardinals, that the practice of shutting up those dignitaries for the purpose of exercising that right was resorted to, And in the earliest instances the "conclave" seems to have been an involuntary im- prisonment imposed on them ab extra. In 1216 the Perugians constrained the nineteen cardinals who elected HIonorius III. to enter into conclave the day after the death of Innocent III., who died at Perugia, keeping them imprisoned till the election should be completed. Gregory

IX. was similarly elected at Rome in 1227, the cardinals

having been shut up against their will by the senators and people of Rome. In 1272 Gregory X. was elected at Viterbo by seventeen cardinals, who had not only been shut up against their will, but from over whose heads the tuof of the building in which the conclave was held was removed by the citizens in order to hasten their delibera- tions,

This Gregory, in a council held at Lyons in 1274, promulgated a code of law for the conducting of the Papal comprised in fifteen rules. And these rules, though modified by subsequent pontiffs in some respects, and supplemented by a vast number of more minuto regulations, remain to the present day the foundation and origin of all the law and practice of Papal elections. The text of this code is too lengthy to be given here. It may be read in the original Latin in the Life of Gregory X., by Pagi, as in many other works,—the Notes to Platina by Panvinius, &¢. ;—or in English, slightly abbreviated, in a volume on the Papal conclaves by I. A. Trollope. (p. 64). The substance of some of the more important: provisions may be given summarily, as follows. Cardinals to go into conclave on the tenth day after the Pope's death, attended by one person only, unless in a case of evident need, when two may be permitted. Cardinals to live in conclave in common without separation between bed and bed by wall, curtain, or veil (modified by subsequent rules to the present practice of a wooden cell for each cardinal), No access to conclave to be permitted. An opening to be left for food to be passed in. No vote shall be given save in conclave. Cardinals who quit the conclave by reason of sickness cannot vote. Those who arrive

after the closing of it may enter and vote. Cardinals who may have been censured or excommunicated cannot be excluded from conclave. An election can only be made by a two- thirds majority of those present. Any man, lay or ecclesiastic, not a heretic and not canonically incapacitated, may be elected Pope. No entreaties or promises to be made by one cardinal to another with a view of influencing the vote. All bargains, agreements, undertakings, even though corroborated by an oath, having such an object to be of no validity; and "let him that breaks such be deenied worthy of praise rather than of the blame of perjury."

Very many popes have sought to enforce and make yet

more stringent this last all-important rule, by reiterated fulminations of excommunication ¢pso facto, in any and every case of its contravention, The most solemn forms of oath that langnage can devise have been prescribed. The Bulls condemning all simoniacal bargainings. have been ordered to be invariably read with every circumstance of solemnity in every conclave before the business of the meeting is entered on. And the result of all these multiplied precautions, precepts, prohibitions, and menaces has been that a study of the history of the Papal conclaves leaves the student with the conviction that no election untainted by simony has ever yet been made, while in a great number of instances the simony practised in the con- clave has been of the grossest, most shameless, and most overt kind

The form of oath, as practised at the present day, which the cardinal pronounces in the act of delivering his vote, is as follows: "Testor Christum Dominum, qui me judicaturus est, me eligere quem secundum Deum judico eligi debere""—"I call to witness Christ our Lord, who shall be my judge, that I am electing him who before God I think ought to be elected." The words seem at first sight to have been chosen and pnt together with the view of rendering them as solemn and as binding on the con- science of the elector as possible. Yet a little examination of them will show that they are well adapted to afford room for a whole host of equivocations. And, in fact, volumes of subtle casuistry have been written on the exact sense of the terms of the cardinal's oath, and on thie degree of literalness in which it must be assumed to be binding on the conscience ; e.g., it is the opinion of

conclave tacticians that an elector may often injure the final chance of success of a candidate by voting for him at those first scrutinies, which are not intended really to result in any election, but are a mere exploring of the ground and trial of strength. Is an elector, then, to injure the chance of the man he deems the fittest to be elected by voting for him at such times? Again a man may, doubtless often does, con- scientiously believe himself to be the fittest man to be elected, Must he invalidate his own election by voting for himself? Or must he vote for some other, whom he does not think the fittest man? It has been asked, may a man vote for a candidate whom he does not think the fittest man, when it is clear that that candidate will be elected? The answer has been in the affirmative, " because it is fitting that an election be made with concord and without giving rise to evil passions." In fact, it is well- nigh certain that if every elector at every scrutiny voted for the man whom he thought fittest to be elected, there could not be any election by a two-thirds majority at all,— so absolutely and necessarily a matter of compromise is every election !

The present practice is fur such cardinals as are present in Rome to enter conclave on the tenth day after the Pope's death. Each cardinal finds a boarded cell constructed in the Quirinal or Vatican,—recently the Quirinal, hence- forward necessarily the Vatican,—assigned to him by lot. Every morning and every evening they proceed to a scrutiny, z.¢., to a solemn voting by specially prepared voting papers (which conceal the name of the voter, to be opened only in the case of an election being made at that scrutiny) in the Sistine or inthe Paoline Chapel. After each scrutiny an "accessit" takes place ;—ze., after the number of the votes for each candidate has been declared, it is open to every voter to declare by a similar secret vote that he "accedes" to such or such a candidate. If no election is thus arrived at, the same process is repeated every morning and every evening, till some cardinal is found to have the requisite majority of two-thirds of those who are present, plus one, the candidate's own vote being

CON—CON

subtracted. takes place, and the Habemus Pontificem is proclaimed " Urbi et Orbs."

Thereupon the "adoration" immediately

(T. Aa CONCORD, a city of the United States of oa

capital of New Hampshire, is situated near the centre of the State, on the Merrimack River, 42 miles N.W. of Ports- mouth and 75 miles N.N.W. of Boston by railroad. It ig pleasantly laid out, for the most part on the west side of

the river; and its principal streets are lined with trees,

The State-house, which is a handsome edifice built of

granite, occupies an open space ornamented with elms and maple trees. The town contains also a city hall and three public libraries ; while in the neighbourhood there is the State asylum for the insane, with a farm attached for the employment of the inmates. Concord is well supplied with water, and, having both railroad and canal communication, is advantageously situated for the development of its manu- factures, These consist chiefly of carriages, dry goods, leather goods, and furniture. Granite of a supcrior quality isalso quarried in the neighbourhood ; and a large trade is carried on in dressed and undressed blocks. The site of the town was first occupied by settlers in 1725; it was known as Rumford until 1765, when it received its present name. It was incorporated as a city in 1853, and is now the seat of the courts formerly held in Portsmouth, Popu- lation in 1870, 12,241.

CONCORD, a town of the United States, in Middlesex county, Massachusetis, is 20 miles north-west of Boston by railroad. It is a quiet place of 2400 inhabitants, contain- ing a good public library. The interest attached to the town arises from the prominent part its citizens took in the early revolutionary war. It was here, on the 19th April 1775, that the first blood was shed in the War of Independ- ence (concurrent with the battle of Lexington), when an Euglish detachment was driven from the town by Colonel Barrett at the head of some militia and " minutemen." A granite obelisk, 25 feet in height, was erected in 1835 on the spot where the first English soldiers fell.

CONCORDANCE, a verbal index, in which all the leading words used by an author are alphabctically arranged, with a reference to the place where each occurs, The want of such a work first made itself felt in the department of biblical interpretation, and the earliest con- cordances were those of the Scriptures. Hence the application of the term has been generally limited to » Biblical index. The first of these was compiled under the direction of Cardinal Hugo de St Caro, who died about 1262. This concordance was formed from the Vulgate translation, and it is said that nearly 500 Dominican monks were employed on it, The carliest Hebrew con- cordance, called The Light of the Way, was produced by Rabbi Mordecai Nathan (1438-48), and published at Venice in 1523. This was followed by the much more complete and accurate work of Marius de Calasio, 4 Franciscan friar, whose coucordance, based on that of Nathan, was published at Rome in 1621. Buxtorf's is the next Hebrew concordance that deserves mention—a work marked by much care aud scholarship, but following the Masoretic divisions of the Old Testament, and so less likely to be of use to the general student. It was published at Basel in 1632, and abridged by Ravius, under the title Fount of Zion (Berlin, 1677). In 1754, Dr John Laylot of Norwich published his Hebrew Concordance, Adapted to the English Bible, Disposed after the Manner of Bustorf. This held the first place among works of the kind, until iy appearance of Dr Julius Fiirst's Hebrew and Chaldee Concordance. Of Greek concordances to the Septuagin' the best is that compiled by Abraham Tromm1us, roe of Groningen, which was published at Amsterdam in 174°. This isa work distinguished by great industry and erudl

tion; it forms a complete index and lexicon to the

Septuagint, all save the book of Daniel, which was not at

that time ineluded in the Septuagint version. Among Greek

~~*concordances to the New Testament, the principal place is held by that of Erasmus Sehmid (1638), reprinted in a corrected form at Gotha in 1717, An abridged edition of this valuable work is published by Messrs Bagster, in their Polymicrian Series. The first of English concordances was one to the New Testament, published at London, before 1540. The earliest concordance to the entire Bible, in*~~

~~*English, was formed by Marbeck (London, 1550). This work is very imperfect, and refers only to chapters, not to verses. It was followed by various others, among which*~~

~~*may be noted the Cambridge Concordance (1689), The*~~

~~*Linglishman's Concordance, designed for the use of students who are acquainted only with the vernacular, is valuable*~~

~~*for purposes of exegesis, and the comparison of: different*~~

~~*English translations of the same Greek and Hebrew words.*~~

~~*But all of these were thrown into the shade by the full and*~~

~~*trustworthy work of Alexander Cruden, This is entitled A Complete Concordance to the Holy Scriptures of the Old aud New Testament, and was published in 1737, It has been frequently re-edited, and still retains its place as an authority. Besides concordances to the entire Bible, verbal indexes to separate portions of it have been prepared.*~~

~~*There is a Concordance of the Proverbs of Solomon, and of*~~

~~*his Sentences in Ecclesiastes ; a Concordance of the Metrical Psalms and Paraphrases (Edin., 1856); and a Concordance of the Prayer-Book Version of the Psalms. There is also a Concordance of the Apocrypha. Concordances to other works than the Scriptures are of more recent date. The very earliest is a Concordance of Feudal Law, compiled at the end of the 17th century. Twiss and Ayscough each prepared a concordance to the works of Shakespeare, but these were both incomplete and incorrect. Mrs M. Cowden Clarke, in 1847, supplied the deficiency by her elaborate*~~

~~Concordance to Shakespeare. A Concordance to Milton was published in 1867. The latest works of this class are the Coucordance to the Works of Alfred Tennyson, D.C.L., by D. B. Brightwell (1869), and that to the works of Alex. Pope by Edwin Abbott (1875).~~

~~CONCORDAT is an agreement between the Pope, as representing the Catholic Church,' and a temporal sovereign, with reference to the rights of the church within the territory of the latter. It must be borne in mind that~~

~~- the pretensions of Hildebrandism (1074 to 1300 a.v.) were~~

~~very great ; they ineluded a power of absolving sovereigns and subjects from their oaths, a large feudal revenue col- lected abroad, a peeuliar status for the Catholic clergy. Against these, temporal Sovereigns claimed what were called~~

~~| Jura majestatis circa sacra,—viz., jus advocatic (Schutzrech t),~~

~~or the supreme patronage of the national church ; jus cavende (Recht der Versorge), or right of considering whether ecclesiastical regulations conflict with civil duties 3 and jus tusprciendt, or general right of Superintending the morals of the church and the administration of its property. The great historical assertions of Papal supremacy were made in the Decretals :—« Venerabilem," sent in 1197 by Innocent TIT. forthe majority of the imperial electors who had chosen Philip of Swabia; « 4d Apostolice, " by which Innocent TV. in 1245 deposed Frederick IT. from the imperial throne on the ground of perjury, sacrilege, and heresy ;~~

~~Clericts Laicos" and « Unam Sanctam" (1296 and 1302), which dealt with the taxation of church property, and laid down the Principle " oportet autem gladium esse sub gladio." The Same claims appear in the Extravagant " De Con- Suetudine," issued by John XXII. in 1322, and in the fre- qrently published Bull "Zn Cana Domini" (1773). The Tec, elical Letter « Quanta Cura," and relative Syllabus of~~

~~64, and the Costituzione " Pastor Aternus" of 1870~~

contain the latest expression by the Pope of his inter- national functions. It was after the empire had, by the decree of Frankfort (1338), declared that Papal con- firmation and coronation were unnecessary, and the reforma- tory councils of Constance and Basel had increased the controlling power of the whole church, and diminished the appeals and annates which caused so much discontent, that pragmatic sanctions and concordats began to be used to regu- late the relations between the different European powers and the Papacy. The French Pragmatic of 1268, which defended the local jurisdictions and rights of presentation, and prohibi- ted Papal imports except for pious, rational, and urgent causes, and the Pragmatic Sanction which in 1438 at the Council of Bruges the French clergy composed in imitation of the Basel decrees, were largely modified in favour of Rome by the concordat entered into in 1510 between Francis I. and Leo X. This arrangement left the nomination of bishops with the Crown, which had before merely given a congé @éhire for the election by chapter, but assigned no term within which the Pope must institute. The consequence was that whenever it suited his purpose the Pope delayed institution. After a long period of irritating dispute the French clergy, led by Le Pellier and Bossuet, in their famous declaration of 1682, formally asserted what aro now called Cismontane or national church principles. Louis XTYV. had considerably enlarged the Crown right of Légale, which included the revenues of vacant churches, but he was now (1693) ignominiously compelled to write a letter to Innocent XI., in which he undertook not to enforce the edict of 1682. The suppression of the Jesuits, in 1773, was a heavy blow to the temporal influence of Rome. It was mainly brought about by the behaviour of Clement XIII. The duke of Parma had probibited appeals from his territory to Rome in questions about the benefices of Parma, and had also republished the principle, familiar in the common law of Europe, that no Papal rescript should take effect in Parma without receiving the ducal exeequatur. Clement then fired off the " Monitorio di Parma," excom- municating in terms of the Bull " J Cena" all concerned in the Parmesan edict. The indignant reaction which followed in all the courts of Catholic Europe decided the triumph of Ganganelli and the Regalisti party, who were opposed at the Vatican by the Ultramontane party of Zelanti. Under the civil constitution which the French Church received from the Revolution, the bishops received institution from their metropolitan. In 1801, a concordat was arranged between Napoleon as first consul and Pius

VII. Under this the consul nominated and the Pope appointed bishops, who were all required to swear allegiance to the republic. The much more important matters of the verification of Bulls by Hxaquatur, Placitum, or Letters of Pareatis, the position of the delegates of the church, the cfiect to be given to the decrees of councils held out of France, and the Appe? comme d'Abus, were all settled by the " Regulations of the Gallican Church," better known as the Organic Articles, with regard to which the Pope was not consulted. Shortly afterwards Napoleon, by the decree of Schénbrunn (1809), annexed the Papal dominions to France, and imprisoned the Pope at Fontainebleau, where the " false " concordat of 1813 was signed. The main provision of this was to devolve the right of institu- tion on the metropolitan bishop, if not exercised by the Pope within six months. In 1817 the Bourbons tried to negotiate a retrograde concordat, but the attempt was for- tunately frustrated. The political attitude of Guizot and Napoleon III. towards Gregory XVI. and Pius IX. was friendly, but in 1870 the Prussian victories brought to an

1 Several bishops, who refused this oath, were driven from France,

and formed in England La Petite Eglise, which existed for some time (see The Guardian, 4 Feb. 1852).

end the French occupation of the Papal States which had begun in the intervention of 1849, and had been continuous from 1864. By the Italian statute of guarantees (13th May 1871) personal inviolability and the honours of a sovereign are secured to the Pope. He has also a large income and several residences, and a private postal and telegraphic service ; and he is allowed to receive diplomatic agents from foreign states. The same statute gives com- plete freedom to the church, but deprives it of coercive jurisdiction. The royal Placet is relinquished as unne- cessary, but a stringent penal law (7th June 1871) is directed against seditious words, writings, or acts of the clergy.

In the empire the earliest concordat is the Con- cordatum Calixtinum of 1122, between Henry V. and Pope Calixtus II. The benefits of the Basel Decrees were in great measure lost by the concordat entered into in 1448 between Iredcrick III. and Nicholas V. The politi- cal position of the Pope was much altered by the Treaty of Westphalia, which, without his consent, and even against his protests, conceded the right to certain nations of freely exercising the Protestant religion.

Early in the 18th century the cause of the national church in Austria, and of the immediate divine right of Episcapacy, was placed on solid foundations of learning and argument by the writings of Van Espen (Jus ecclesiasticum universum hodierne discipline, Cologne, 1702; Tractatus de promulgatione legum ecclesiasticarum), The abuses of the permanent MVuntiatura, maintained by the Pope, called forth the Punctation of the four archbishops who met at Ems, 25th August 1786. Joseph I. had already carried out large reforms, but these episcopal resolutions recommended still further changes in the '"Recursus ad Principem," or prohibition of appeals to Rome, the power of dispensation and of granting faculties, the administration of conventual property and charitable funds, the reservation of benefices and their transmission by inheritance, the exaction of annates and pallium money, &c. Under the decrees of Joseph II. in 1781, no Papal Bulls or rescripts were allowed to be published, except such as had received the Placitum Regium, and had been effected through the intervention of the imperial and royal agency at Rome. In 1850, however, both the bishops and the faithful under their charge were allowed to have recourse to the Pope in spiritual matters, and to receive the decisions of his Holiness without the previous consent of the secular authorities. With the exception of the three archbishoprics of Olmiitz, Salzburg, and Breslau, where the archbishop is elected by the chapter, the practice was, on a bishopric becoming vacant, for the emperor to propose three candidates from whom the Pope selects one— a selection subsequently ratified by the emperor. The same decree of 1850, proceeding on the anti-revolutionary imperial patent of 4th March 1849 (§ 2), permits Catholic bishops to issue admonitions and ordinances, without consent of the civil power, to decrec ecclesiastical punish- ments which do not affect purely civil rights, to suspend and remove from ecclesiastical office, and to declare emolu- ments forfeited, and to control education in primary and intermediate schools and in the universities. This

~~arrange- ment was sealed by the concordat of 18th August 1855 (printed fully in Zémes, 20th November 1855), which, however, was repealed by the series of Church Acts passed by Prince Auersperg in 1874, in imitation of the Falk legislation of Prussia.~~

~~The relations of Belgium with Rome were of course at one time determined by the decree of the French National~~

~~Assembly (1791), and the concordat between Pius VII.~~

~~and Napoleon (1801). On 18th June 1827, William L., Protestant king of the Netherlands, entered into a concordat~~

~~CONGCORDAT~~

~~with Pope Leo XII., which coufirmed and, extended the provisions of the earlier concordat relating to the institu. tion of bishops by letters apostolic. Crown then reserved of striking out objectionable names from the list of candidates prepared by the chapter was entirely renounced by the 16th Article of the Belgian Constitution of 1830, which declares that the state has no right to interfere with the nomination or installation of any religious ministers, or to prevent them from corre- sponding with their superiors or from publishing their Acts, But then the Government has this indirect control, that all the salaries of the Catholic clergy are voted in the annual budget, and do not belong to the church. of 1827 was never fundamental law of 1848 (§ 65) declares that no Dutch- man can accept titles without the permission of the king, and where public opinion has prevented the creation of Catholic bishops.~~

~~The power which the~~

~~The concordat in force in Holland, where the~~

~~Spain, although the most Catholic of powers, has, at~~

~~least since the accession of the Austrian dynasty, zealously defended its national church rights against the Pope. In~~

~~1568, Philip II. claimed as royal prerogative the right to~~

~~present to all Spanish bishoprics, and created a Board, "Supremo Consejo de la Camara," to preserve the royal jurisdiction, to protect the canons, and to watch over the external policy in ecclesiastical matters. sided with Austria in the Succession War, the breach~~

~~The Pope having~~

~~between Spain and Rome widened during the 15th century,~~

~~The principles that no causes should be carried before a judge outside the kingdom, that benefices should be con- ferred only on natives, that sovereigns are not subject to interdict or spiritual censure, that all Bulls should, before publication,~~

~~be subject to the royal Cedula, were loudly and angrily proclaimed ; and in 1805 the king attacked the secret influences of the Cwria by dirceting that all applications to Rome for grants and dispensation should receive the Visto Bueno of the royal agent at Rome. The estrangement continued in the 19th century, when till 1848 the Pope refused to recognize the succession of Isabella IL. under the Pragmatic Sanction of 1830, From 1753 to 1851, matters had stood on a concordat which the eminent statesman, De Carbajal, persuaded Ferdinand WI. to negotiate with Clement XII. It gave the king the right of presentation to vacant bishoprics (patronatos), and to the Pope 22,000,000 reales as compensation for the loss of annates and fees on briefs. The concordats of 1851 and 1859 are more favourable to Rome; but the attempt of Canovas del Castillo and the Cardinal Simeont to procure a recognition of the 1851 concordat, in 1875, was defeated by General Jovellar.~~

~~In non-Roman Catholic states, of course, no valid concor- dat could be framed. Accordingly, as in the cases of Prussia (1821) and Hanover (1824), edicts relating to the adjustment of dioceses, or other matters not purely spiritual, were issued by the Pope under the name of Bulle Circumscriptionis. These were formally sanctioned by the Home Government, and directed to be printed in the col- lection of laws.~~

*The most important sources of information on this subject ate the reports presented to Parliament in 1816 and 1851, on the * Regt- lation of Roman Catholic Subjects in Foreign Countries, " which have been summarized in the 2d volume of Sir R. Phillimore§ Commentaries on International Law. The works of Van Espen an the Euchiridion Juris Ecclesiastict of George Rechberger (1809) aré standard works. The French concordats have been elaborately dis- cussed by M. dc Pradt, at one time archbishop of Malines, in Les Quatres Concordats, 8 vols., Brussels, 1816, and Suite des Quatre Concordats, 1 vol., Paris, 1820. The works of the eminent Jus Portalis, who took an active part in the discussion of the Jatter French concordats, may also be consulted, —Dzscowrs, Rapporis, Travaun inédits sur le Concordat de 1801, les Articles ony &c. (W. ¢. 5.*

CON—

CONCORDIA, the goddess of concord, a Roman divinity, in whose honour several temples were erected at eo of the Capitol by Camillus, 367 3.c. temple the senate sometimes assembled.

Tiberius, 9 A.D.

Hill. Concordia was represented as a matron holding in her right hand a patera, or an olive branch, and in her left a cornucopia. Hersymbols were two hands joined together,

and two serpents entwined about a caduceus, or herald's

staff. : : ; CONCORDIA, a village of Italy in the province of

Venice, 35 miles N.E. of the city of that name, and in the

immediate neighboughood of the town of Portogruaro, of importance as preserving the name and marking the site It was pro- bably founded by Augustus, on the pacification of his

of a famous Roman city of the later empire.

~~dominions, and consequently bears the full title of Colonia Julia Concordia. attested even by the fragmentary remains of its buildings, was suddenly crushed by Attila in 452 a.p.; but its con- tinued existence throughout the Middle Ages is proved both by history and by archeology. The baptistry still ex- tant is im the style of the 9th century, and an inscription preserves the memory of a bishop Regimpotus of the 10th. The place has been brought again into notice by the dis- covery, in 1873, of the old Christian cemetery which has furnished upwards of 160 stone coffins, in several cases distinguished by inscriptions of considerable import to the historian.—See Budlettino dell' Instituto di Corr. Arch.~~

~~1874,~~

~~CONCRETE, an artificial conglomerate or rubble masonry, consisting of a mixture of coarse pieces of stone, gravel, shingle, broken brick, or crushed slag with sand and Portland or other cement. It is employed for laying the foundations of bridges and of buildings on soft or wet ground, as also in the construction of moles and break- waters, and of houses and churches; for the backing of wharves, of the abutments of arches, and of masonry generally where heavy walls are required; for the substance of fire-proof doors ; for the making of sewer-pipes; and as a paving for strects and floors, It soon hardens after use, becoming a stony mass little permeated by~~

~~moisture, In the shape of blocks, sometimes weighing | very many tons, it has: been found of great value for the~~

~~formation of harbours and sea-walls in places to which stone conld not have been transported. The foundations of the breakwater pier at Douglas, Isle of Man, were made by laying down concrete within frames resting on sub- marine rock. The quay walls of Stobcross Docks, Glasgow, 8re supported on triple groups of concrete cylinders, 274 feet in length and Testing on iron shoes. Each cylinder 18 formed by sinking in the soil a column of cleven rings of concrete ; this, after being cleared of the sand and gravel it contains, is filled with Portland cemeut con- crete, Walls are made of concrete either by allow- 8 1 to harden in mass' between two faces of boarding, he by making it into blocks and building as with~~

~~a Concrete Was employed by the Romans, by whom~~

“le term signinum was applied to a kind of plaster com-

no of powdered tiles and mortar; and Smeaton gained

fom a of applying it to the construction of river: works

A athy — of the ruins of Corfe Castle in Dorset-

oy. : a Tucture, In the Middle Ages it was much

ing of fortifications.

c iti ; Composition of concrete necessarily depends to some

The most ancient of these was that built on the In this It was restored by Livia, the wife of Augustus, and consecrated by In the time of Constantine and Maxentius it was destroyed by fire, but was again restored. The second temple was erected close to that of Vulcan by Cn. Flavius ; and there was a third built by L. Manlius, on the Capitoline

Its rapidly growing prosperity, well

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extent upon the nature and qualities of the materials most available for making it. The béton aggloméré of M. F, Coignet is composed of about 180 parts of sand, 44 of slaked lime, 33 of Portland cement, and 20 of water, A mixture of the cement with the sand and lime is first made, with the addition of small quantities of water ; the mass is then incorporated with the requisite amount of water in a cylindrical machine, from the bottom of which it is delivered ready for compression in moulds, This composition can be formed into blocks of any desired bulk ; and these, after exposure to the weather for a few weeks, acquire a hardness equal to that of good building stone. A good concrete can be made from 60 parts of coarse pebbles, 25 of rough sand, and 15 of lime. Semple recommends a mixture of 8 parts of pebbles, 4 of sharp river sand, and 1 of lime. The proportions given by Treussart are un- slaked hydraulic lime 30 parts by measure, trass of Andernach 30, sand 30, gravel 20, broken stone or hard

‘limestone 40 parts ; and for another concrete, hydraulic lime

33 parts, pozzuolana 45, sand 22, broken stone and gravel 60 parts; the former is used as soon as made, the latter should be exposed about 12 hours after preparation, Burnt clay and pounded brick may be used in the same propor- tions as the trass, but are best not employed in sea-water. The quantity of natural or artificial pozzuolanas is increased, and that of the gravel or stone decreased, if rich limes are used (Burnell, Limes, dc), Excellent concrete is mado from Thames or other river ballast mingled with 4th or 4th its bulk of lime ; in setting it contracts by about one-fifth of its volume, a cubic yard of the concrete requiring 30 cubic feet of ballast and 34 cubic feet of lime, HHydraulic concrete iiuust contain a sufficiency of mortar to aggregate the whole mass of rubbly material, and the lime or cement should be thoroughly slaked before the immersion of the concrete. For the breakwater at Dover Mr Lee employed 16 foot cubes of concrete made in moulds, composed of Portland cement, Portland stone chippings, sand, and shingle. The blocks at the mole, Marseilles, were formed from 5 parts of sand, 2 of broken stone, and 3 of Theil lime. The concrete used at the extension of the London docks consisted of 1 part of blne Lias lime to 6 of gravel and sand ; and that made by M. Vicat for the bridge at Souillac, on the Dordogne, contained, with 26 parts of hy- draulic lime, 39 of granitic sand, and 66 of gravel, The composition for the Copenhagen sea-forts was 1 part of Portland cement, 4 of sand, and 16 of fragments of stone,

Austin’s artificial stone is a conercte of sand and other materials cemented by lime. Ransome’s concrete stone is made by subjecting a mixture of sodium silicate and clean pit sand, to which between 5 and 10 percent. of chalk has been added, to the action of a solution of calcium chloride, whereby insoluble calcium silicate and soluble sodium chloride, or common salt, are produced, the former acting as a cementing material for the particles of sand. The stone is made non-absorbent by giving the face of it a wash with sodium silicate, and then a second application of the calcium chloride. (See H. Reid, A Practical Treatise on Concrete, London, 1869.)

CONCUBINAGE, the state of a man and woman cohabit- ing as married persons without the sanction of a legal mar- riage, In a scriptural sense, it

denotes cohabiting lawfully with a wife of second rank, who enjoyed no other conjugal right but that of cohabitation, and whom the husband could repudiate and dismiss with a small present (Gen. xxi.) Tn like manner he could, by means of presents, exclude his children by her from the heritage (Gen. xxv.) To judge from the conjugal histories of Abraham and Jacob, the im- mediate cause of concubinage was the barreuness of the lawful wife, who in that case introduced her maid-servant

to her husband, for the sake of having children. This ro- sémbles tho singular practice authorized not only in Israel (Deut. xxv.), and anciently in Athens and Sparta, but by the laws of Menu, that a brother, or some other person, should be substituted when the married couple had been unable to produce offspring. In process of time, however, concubinage appears to have degenerated into a regular custom among the Jews ; and the institrtions of Moses were directed to prevent excess and abuse in that respect.

The Roman concubinatus differed from juste nuptie mM not giving tho father the potestas over his children, and from contubernium, which was the concubinage of slaves. It was a permanent monogamous relation, free from sume of the restrictions imposed by the civil law upon marriages. Although the married woman had a more dignified position, concubinage was thought the appropriate union for persons of different ranks, as a patrowus aud liberta. By imperial legislation, 2atwrales liberi and concubines were gradually admitted to limited rights of succession ; and the legiti- nation per subsequens matrimonium completed their status.

Concubinage is also used to siguify a marringe with a woman of inferior condition, to whom the husband does not convey his rank. Such concubinage was beneath marriage both as to dignity and civil rights, yet concubine was a re- putable title, aud very different from that of " mistress " among us. The concubine also might be acensed of adultery in the same manner asa wife. By French law the presence of a concubine in the house entitles the wife to a divorcee. This kind of coneubinage is still in use in seme countries, particularly in Germany, under the title of hald- ehe (half-marriage), or left-hand marriage, in allusion to the manner of its being

~~contracted, namely, by the man giving the woman his left hand instead of the right. This is a real marriage, though without the usual solemnity ; and the parties are both bound to each other for ever, thongh the female cannot bear the husband's name and title. Neither spouse has any right of snecession to the other, but the children take a third of the father's estate, if he leaves no lawful children.~~

~~Du Cange observes that one may gather from several passages in the epistles of the popes that they anciently allowed of such connections. The seventeenth canon of the first Council of Toledo (400 a.p.) declares that he who with a faithful wife keeps a concubine is excommunicated ; but that if the concubine serve him as a wife, so that he has only one woman, under the title of concubine, he shall not be rejected from communion. This applied not only to laymen, but to inferior priests, who were then allowed to marry. The latter councils extend the name concubine to disreputable women not kept in the honse. 'That is also the meaning of the word in the Sth rubric of the concordat of 1517 between Leo X. and Francis I. The Council of Niciwa refers to a class of secret concubines, superinductr, and St Augustine denounces all irregular relations.~~

~~It is certain the patriarchs had a great number of Wives, and that theso did notall hold the same rank,—some being inferior to the principal wife. Solomon had 700 wives and 300 concubines. Q. Curtius observes that Darius was fol- lowed in his army by 365 concubines, all in the equipage of queens,~~

~~In most Mahometan and other polygamous countries, female slaves are used as concubines and enjoy a cer- tain status. Under the ancient Mueros, which succeeded tho Lex Visigothorum in Spain, coneubinage was recognized by the name of barraganiu. contract (carta de mancebia e campanera), by which the man took the coneubine por todos los dios que yo visquiere, aud she received right to bread, table, and knife (@ pan, mesa, ¢ cuchello), Apart from contract, some F'veros gave the faith- ful concubine a right of succession to one-half of the man's~~

~~The parties entered into a-~~

~~CON—CON~~

acquired property. The Council of Valladolid (1228) re.

proved the barragania of priests. Similarly the Grayas, or ancient law of Iceland, recognized the frilla, or coneu- bine, alongside of the Ausfreyta, or lawful wife, though the two were not permitted to dwell in the same house. According to the Danish and vesten, the concubine who had publicly lived with a man and partaken his meals for three winters became a lawful wife. The Celtic handfast marriage may also be referred to. (w. ¢. .)

CONDAMINE, Cuan ces Marm pe La. See La Cox- DAMINE. |

CONDE, a town of France, in the department of Nord, arrondissement of Valenciennes, is situated at the con- fluence of the Scheldt and the Haine, and at the terminus of the Mons canal, two miles from the Belgian frontier, It contains a hétel de ville and an arsenal, a church and a hospital, Brewing is carried on to a small extent, as well as the manufacture of oil and salt, and there is a large trade in coal. The place is of considerable anti- quity, dating at least from the later Roman period. Taken in 1676 by Louis X1V., it definitely passed into the possession of France by the Treaty of Nimeguen two years later, and was afterwards fortified by Vauban. Dur- ing the revolutionary war it was attacked and taken by the Austrians (1794); and in 1815 it again fell to the Allies. Condé gives its name to a distinguished branch of the Bourbon family. Population of the town in 1872, 3748 ; of the commune, 4964.

CONDI SUR NOIREAU, a town of France, in the de partinent of Calvados, and arrondissement of Vire, is situated at the confluence of the Noireau and the Drouance, 28 miles south of Caen, The town is the seat of a civil tribunal, and its manufactures are not unimportant, comprising cot- ton and woollen weaving, dyving, and tanning. The two old churches of St Sauveur and St Martin are worthy of remark, the latter possessing a very fino stained-glass window representing cur Lord's Passion, A statue has been erected here to Dumont d' Urville, the traveller, n native of the town. Condé formerly belonged to the countship of Mortain; und it owes its origin to a fort which is said to have been constructed by the Romans. It fell into the hands of the English in 1418, but was retaken by Charles VIT. in 1449. Much interest was shown by the inhabitants inthe Reformation movement, and a provincial synod was held in the town in 1674. At the Revolution it

~~lost its name of Condé, and during that period was known only as Noireau. Population of the town in 1872,~~

~~6445,~~

~~CONDE, Prixcrs or. The title of prince of Condé (assumed from the ancient town of Condé, noticed above) was borne by a branch of the House of Bourbon. The first who assumed it was the famons Huguenot leader, Louis de 3ourbon, the fifth son of Charles de Bourbon, duke of Ven- dome (see next article), His son, Henry, prince of Condé (1552-1588), also belonged to the Huguenot party. Flee- ing to Germany, he raised a small army, with which in 1575 he joined Alengon. He beeame leader of the Hugue- nots, but after several years' fighting was taken prisoner of war. Not long after he died of poison, administered, accord- ing to the belief of his contemporaries, by his wife, Catherine de la Trémouille. This event, among others, awoko strong suspicions as to the legitimacy of his heir and namesake, Henry, prince of Condé (1588-1646), King Henry LY., how- ever, did not take ndvantage of the scandal. In 1609 he caused the prince of Condé to marry Charlotte de Montimor- ency, whom shortly after Condé was obliged to save from the king's persistent gallantry by a hasty flight, first to Spain and then to Italy, On the death of Henry, Condé returned to France, and intrigued against the regent, Mary de' Medici ; but he was seized, and imprisoned for threo years.~~

~~There was at that time before the court a plea for his divorce from his wife, but she now devoted herself to enliven his captivity at the cost of her own liberty. Dur- ing the rest of his life Condé was a faithful servant of the king. He strove to blot out the memory of the Huguenot connections of his house by atfecting the greatest zeal against Protestants. His old ambition changed into a desire for the safe aggrandizement of his family, which he magnificently achieved, and with that end he bowed be- fore Richelieu, whose niece he forced his son to marry. His son Louis, the great Condé, is separately noticed below. 'The next in succession was Henry Jules, prince of Condé (1643-1709), the son of the great Condé and of Clémence de Maillé, niece of Richelieu. He fought with distinction under his father in Franche-Comté and the Low Countries ; but he was heartless, avaricious, and undoubt- edly insane. The end of his life was marked by singular~~

hypochondriacal fancies. He believed at one time that he was dead, and refused to eat till some of his attendants dressed in sheets set him the example. His grandson, Louis Henry, duke of Bourbon (1692-1740), who did not assume the title of prince of Cond$ which belonged to him, was member of the council of regency which ruled during the minority of Louis XV., and first minister from the death of the duke of Orleans in 1723 to 1726, when he was superseded by Cardinal de Fleury. He greatly enriched his family and his mistress, De Prie, by taking every advantage of his position; but he made hin- self unpopular by the weight of taxes which he im- posed. The son of the duke of Bourbon, Louis Joseph, prince of Condé (1736-1818), after receiving a good education, distinguished himself in the Seven Years' War, and most of all by his victory at Juhannisberg. As governor of Burgundy he did much to improve the industries and means of communication of that province. At the Revolu- tion he took up arms in behalf of the king, became com- mander of the "army of Condé," and fought in conjunction with the Austriaus till the peace of Campo Formio in 1797, being during the last year in the pay of England. He then served the emperor of Russia in Poland, and after that (1800) returned into the pay of England, and fought in Bavaria. In 1800 Condé arrived in England, where he resided for several years. On the restoration of Louis XVIII. he returned to France. He died at Paris in

1818. He wrote Mesat sur la Vie du grand Condé | dobads

See L'Mistoire de UArmée de Conde, by Muret ; Vie de Louis Joseph, prince de Condé, by Chaimballand , Histoire des trois der- niers princes de li maison de Condé, by Crétinean-Joly ; and Histoire de la maison de Condé, vy the Duc d' Aunnale (translated by R. B. Borthwick, 1872). ,

CONDE, Lovts pe Bourros, Prixcr or (1530-1569), fifth son of Charles de Bourbon, duke of Vendome, younger brother of Anthony, king of Navarre, wa3 the first of tho famous House of Condé. Brave though deformed, gay but extremely poor for his rank, Condé was led by his ambition to a military career. — Tle fought with distinction in Piedmont under Marshal de Brissac ; in 1552 he forced his way with reinforcements into Metz, then besieged by Charles V.; he led several brilliant sorties from that town ; and in 1554 he command- ed the light cavalry on the Meuse against Charles. He then

joined the Huguenots, and he was concerned in the conspiracy of Ambvise, which aimed at forcing from the king by aid of arms the recognition of the Refurmed religion. He was consequently condemned to death, and was only saved by the decease of Francis If. At the accession of the boy-king, Charles IX., the policy of the court was mai ani Condé received from Catherine de' Medici the government of Picardy But the struggle between the Catholics and the Huguenots soon recommenced ; in 1562 200 of the latter were massacred at Vassy by Puke Prahes

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of Guise. Upon this Condé retired from Paris, put him- self at the head of 1500 horsemen, and took possession of

Orleans. Having raised troops in Germany, and entered juto negotiations with Elizabeth of England, he marched on Paria, with 8000 foot and 500 horse, A battle took place at Dreux, in which the leaders on both sides, Condé and Montmorency, were taken prisoners, Condé was liberated by the pacification of Amboise in the next year (1563). In 1567 the war broke out again, It was strougly suspected by the Huguenots that Catherine was meditating a great and final blow—the revocation of the Edict of Amboise, the perpetual imprisonment of Condé, and the death of Coligni ; and their suspicions were confirmed by the levy of soldiers, including 6000 Swiss, which she was engaged in making. Coligni determined to oppose her with a still bolder plan. The Huguenots were to rise en masse, crush the Swiss before they could join the main army, and take possession of the young king, his brothers, and Catherine herself. But both the Swiss and the royal family eseaped safely to Paris. Paris was blockaded, and an indecisive battle fought at St Denis, During the next year peace was again made, but soon after Catherine attempted to seize both Condé and Coligni They fled to La Rochelle, and troops were col- lected. At the battle of Jarnac, with only 400 horsemen, and without having made himself sufficiently certain of the support of the infantry, Condé rashly charged the whole Catholic army. Worn out with fighting, he at last gave up his sword, and a Catholic officer named Montesquieu trea- cherously shot him through the head (15th December 1569).

CONDE, Lours pe Bournon, Prince or (1621-1681), called during the lifetime of his father Duc d'Enghien, but usually known as Condé the Great, was a distinguished French general, and one of the leaders of the Fronde. He was the son of Henry, prince of Condé, and Charlotte de Montmorency, and was born at Paris on the 7th September 1621. As a boy, under the careful supervision of his father, he studied diligently and displayed much talent at the Jesuits' College at Bourges; at seventeen he was sent to govern Burgundy ; and while yet in his teens he had dis- played his extraordinary conrage in more thanone campaign.

During the youth of Enghien all power in France was in the hands of Richelien ; to him even the princes of the blood had to yield precedence ; and among the obsequious courtiers none more eagerly songht his favour than Henry, prince of Condé. Enghien, therefore, with all his exagger- ated pride, was forced to bow and render homage. Once, having ventured to pass through Lyons without visiting the great minister's brother, he was forced to retrace Ins steps 200 leagues, in order to atone for the slight. Buta far moro momentous sacrifice was required of lim. He was already deeply in love with Mlle. de Vigean, who in turn was passionately devoted to him, yet, to flatter the car- dinal, he was cympelled by his father, at the ave of twenty, to give his hand to Richelieu's niece, Claire Clémence de Maillé Brézé, a child of thirteen years of age.

In 1643 Enghien was appointed to command against the Spaniards. Fle was opposed by experienced generals, De Mello and Fuentes, and the forces of the enemy were composed of veterans ; on the other hand, the strength of the French army was placed at his command, and with him served Gassion and other skilful leaders who had fought under Gustavus Adolphus. At Rocroy a great battle took place. At first defeat threatened the French, but, by the rapidity and boldness of his tactics, Snghien changed the event into a decided victory, and at the age of twenty-two made himself the most famous French general of lis day. The achievement was well followed up, and, after several other suecesses, Thionville was forced to capitulate. Returning to Paris in trinmph, Enghien gave himself up to pleasure, and in gallantry and intrigues strove to forget

his enforced and hateful marriage. In 1644 he was sent into Germany to the assistance of Turenne, who was hard pressed by the able Comte de Mercy. At Fribourg for several days there was continuous fighting, which eost dear to both sides, but especially to the French, whose lives were ruthlessly squandered by their general. The result, however, was equal to a great French victory ; for, alarmed at the stern discipline displayed by his army, the towns of the Rhine, including Mayence, opened their gates to the duke. The next winter Enghien spent, like every other winter during the war, amid the gaieties of Paris. The stunmer campaign of 1645 opened with the defeat of Turenne by Mercy, but there followed a series of brilliant victories won by Enghien, who fought in person with untiring energy and eareless eourage. In the battle of Nordlingen, in which Mercy was killed, his horse was twice shot under him, and he received several serious wounds. The capture of Philipsburg was the most important of his other achievements during this eampaign. In 1646 the dnke of Orleans took the eommand, and Enghien volunteered to serve under him; but after the capture of Mardyke Orleans returned to Paris, leaving Enghien to take Dunkirk.

It was in this year that the old prince of Condé died. The enormous power that fell into the hands of his successor was naturally looked upon with serious alarm by the regent and her minister. Condé' birth and military renown placed him at the head of the Freneli nobility ; but, added to that, the family of which he was chief was both enormously rich and master of no small portion of France. Condé himself held Burgundy, Berry, and the marches of Lorraine, as well as other less important territory ; his brother Conti held Champagne, his brother- in-law Longueville Normandy. When, therefore, he sought the office of admiral of France, the Government, determined to permit no increase of his already overgrown authority, refused on various pretexts to comply. But Mazarin did not dare to use it, as he had intended, as a dowry for his niece; and compensation was made to the ptince by the gift of the post of captain-general, with power to appoint every officer in the army. Still dis- satisfied, Condé now sought permission to raise an army at his own expense, and eonquer Franche-Comté for himself. This eould not be allowed ; and Mazarin made an attempt, which for the moment proved sneeessful, at once to find him employment and to tarnish his fame as a general, He was sent to lead the revolted Catalans. Supported in the meanest way, he was unable to achieve anything, and,

being forced to raise the siege of Lerida, he returned home in bitter indignation. In 1648, however, he received the command in the important field of the Low Countries ; and at Lens a battle took place, which, commencing with a panic in his own regiment, was retrieved by Condeé's cool- ness and bravery, and ended in a victory that fully restored his prestige.

in September of the same year Condé was recalled to court, for the regent required his support. She was then engaged in a determined struggle against the Parliament of Paris, which, led by the noble Matthien Molé, the Pym of France, was, like the contemporary Long Parliament in England, fighting for popular freedom, but hampered, unlike the Long Parliament, both by its too tender reverence for the royal prerogative and by its alliance with

De Retz and a section of the nobility, whose sole wish was.

to make of it a tool to gain the ends of their personal ambition. Influenced by the fact of his royal birth and by his arrogant seorn for the bourgeois, Condé lent himself to the court party. With his usual insolence he bullied and swore in the Parliament; and finally, after much hesitation, he consented to lead the army which was to reduce Paris.

CONDE

On his side, insufficient as were his forces, the war wags carried on with vigour. When an opportunity offered at Charenton, he struck terror into tle Parisians by putting 3000 of their picked forces to the sword. But such opportunities were seldom afforded him. The burgher soldiers had too tender a regard for their own safety to expose themselves outside the walls when his troops were in sight ; their most warlike achievement was the sham- fight with the garrison of the Bastille, when both sides used blank cartridge, and the duchess de Longueville with her ladies, seated in the thiekest of the fire, ate sweatmeats and smiled on their valour. The prince of Conti, who had been won over by De Retz to accept the office of commander-in-chief of the army of the Parliament, con- sidered that he sufficiently fulfilled the duties of his exalted position by riding at the head of his troops through the streets of Paris, and regularly quitting them as they

passed out of the gates. Enthusiasm was kept up by the duchess de Longueville's brilliant and crowded receptions. But at length their substantial losses, and a threatening of scarcity of food, made the citizens weary of the war. The Parliament became timid as it watched the events of the contemporary revolution in England. The regent and Mazarin were still more alarmed by the same terrible warning, as well as by their fears of a Spanish invasion and a declaration in favour of Paris from Turenne, who was advancing thither with his army. A conference was accordingly held at Ruel, and with great difficulty Mazarm and Molé brought about peace.

Once more the court met at Paris, again given up to selfish ambition, vanity, and intrigues. Condé, most ambitious and vain of all, too vain to stoop even to civility, quickly earned for himself universal dislike. With no other apparent reason than an arbitrary whim, he forced the queen to reinstate as captain of the guard a certain conceited marquis named Jarsay, who had tormented her with his presumptuous love addresses. He prevented the marriage of one of Mazarin's nieces with the duke of Mercceur, refused to meet the cardinal in the council, and treated him with vulgar rudeness. The other nobles he offended by his airs of unapproachable superiority ; he thwarted their attempts to attain the paltry ceremonial dignities—such as the high privilege of sitting at the royal receptions or assisting in the royal toilettc—which were the dearest objects of their ambition ; he kept them waiting hours in his antechamber, and yawned in their faces when they were admitted into his presence. With the Fronde he was tricked into an open quarrel. By the contrivance of Mazarin shots were fired into his empty carriage, and he was pet suaded that they had been aimed at his life, and that De Retz and Beaufort, the noble patrons of the Fronde, were responsible for the deed. The sptince at once accused them openly before the Parliament, nor would his pride allow him to own his mistake when the utter worthlessness of Mazarin's witnesses was conclusively proved. De Retz, an intriguer superior to Mazarm m boldness and scarcely inferior in duplicity, now secretly joined with the court. Yet, knowing as he did that he was surrounded by powerful enemies, Condé, secure in his own strength, ventured, by a fresh insult, 10 goad the resentment of the regent into an uncontrollable desire for vengeance. The young duke of Richelicu was engaged, with the ganetion of the queen and of lis aunt and guardian, the duchess of Aiguillon, to the profligate Mlle. de Chevreuse, but was in love

~~witha widow named Mme. de Pons. His alliance was of the highest value, for his uncle, the great minister, had left him several offiees of importance, including the governorship of Havre de Grace. Wishing therefore to gain his friendship, Conde contrived his marriage with the lady he loved,~~

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~~hanehtily informed the queen that his presence rendered it valid without her consent. Urged by her own passionate indignation at the prince's defiance, and by the bitter com- plaints of the duchess of Aiguillon and Mlle. de Chevreuse,~~

~~CONDE 944~~

~~Anne no longer hesitated to resort to force. Condé, Conti, and Longueville.were accordingly arrested.~~

~~*But Bouillon and Turenne, who were also to bo seized, made their escape; and Prince Marsillac (the Rochefoucauld of the Maximes) carried off his mistress, Condé's sister, the duchess of Longueville. By stratagem the young princess of Condé also obtained refuge in her husband's strong castle of Montrond. Vigorous attempts for the release of the princes began tobe made. 'The women of the family were now its heroes. The dowager princess, though too miserly to part with her money to help her children, claimed from*~~

~~*the Parliament the fulfilment*~~

~~*which forbad imprisonment without trial, Longueville entered into negotiations with Spain. slighted young wife, with Lenet as adviser, having gathered an army around her, obtained entrance into Bordeaux and the support of the Parliament of that town.*~~

~~*of the reformed law of arrest,*~~

~~*among the nobles who took part in the folly of the Fronde,*~~

~~*gains our respect and sympathy. Faithful to a faithless husband, she came forth from tho retirement to which he had condemned her, to fight for him with tact and bravery amid the rough bustle of war and politics, and to display*~~

~~*an unselfishness and a sense of justice of which there is no*~~

~~*ther example among those who surrounded her, with their paltry aims and worthless lives. Bordeaux patriotically refused to accept the assistance from*~~

~~*Spain which the Frondeurs wished to force upon it, and the*~~

~~*mob was stirred up by the du*~~

~~*ke of Bouillon to constrain it*~~

~~*by violence, she risked her life to quiet the tumult,*~~

The delivery of the princes

was not, however, due to her

efforts. Bordeaux was fortified, it is true, and resisted

Mazarin for a time, but, after

the defeat of Turenne by Du

Plessis at Rethel, peace was made on account of the Vintage, The discomfiture of Mazarin was caused by the junction of the old Fronde (the party of the Parliament and of De Retz) and the uew Fronde (the party of the Condés). An

angry comparison, that had

been drawn by the cardinal

between the popular leaders and those who in England had

two years before overthrown their king to the scaffold, was to arouse in the Parliament a

the monarchy and brought made by the skill of De Retz characteristic storm of indig-

nation, from which Mazarin was glad to escape by flight. The regent prepared to follow him; but her intention became known, The night air resounded with the peals of bells from Notre Dame and all the lesser churches of Paris. The refuse of the city, mingled with respectable burghers and hanghty nobles, poured into the streets. Thenews that the

Ing was about to be carried away was spread everywhere

y the emissaries of the coadjutor. 'The court of the palace

was soon filled by the motley crowd, They passed up the Staircase, and into the very room where the child-king lay,

~~*With precocious cunning feigning to be asleep. At*~~

~~*the awful sight, and abashed*~~

~~*by the queen's cool derision,*~~

~~*the mob reverentially withdrew, But Anne was forced to order the release of the princes from their prison at Havre; and Mazarin, humbling himself, rode down thither, and, falling at Conde's feet, piteously begged his protection and*~~

~~*friendship,*~~

~~*The regent at once employed every means to draw Condé*~~

~~*from his alliance with the Fy*~~

~~*onde. She made him offers*~~

~~*a from their very extravagance, might have aroused » SUSpicion,—he and his family were to hold some-*~~

~~*thing like tho half of the On these faithless promises, argain by breaking with De of whose mistress, Mle. de*~~

~~*kingdom ; and Condé, relying*~~

~~*carried out his part of the Retz, the intended marriage Chevreuse, with the duke of*~~

~~*The duchess of And the*~~

~~*She alone,*~~

~~*When the Parliament of*~~

~~*Conti he refused in haughty terms to permit. Meanwhile the queen had secretly gained over the coadjutor, A rumour reached Condé that he was to be assassinated or arrested ; he fortified the Hotel de Condé, and then*~~

retired from Paris, collected soldiers, and entered into negotiations with the archduke. He was consequently accused of high treason before the Parliament by order of the regent, and De Retz bronght forward the charge. Condé appeared in erson to meet it ; and the building was filled with two bands of armed soldiers in the pay of the two parties. Tt seemed thatthe very Parliament House was to be the scene of civil war. 'The prince and the coadjutor spoke with veliemence and passion. Condé's hand was on the hilt of his sword, and the soldiers were only waiting for the signal to commence a deadly conflict, when a sulemn appeal from President Molé calmed the frenzied assembly, and prevailed upon the rival nobles to dismiss their troops. Condé at once retired to his fortress of Montrond, where, after conference with his brother and sister, as well as Nemours and La Rochefoucauld, he resolved on renewing the civil war, But his party was far from being as strong as it had been in the previous rising. Two causes alienated many of his most important allies: the rebellion was no longer against a regent, for the king had just attained his majority ; and the rebel had sought and obtained aid from the foreign power of Spain. The Parliament of Paris declared him a traitor; Longueville, Orleans, Turenne, and Bouillon went over to the court. Even the faithful city of Bordeaux became estranged, for the duchess of Longueville encouraged the mob in acts of outrage. Mazarin now ventured to cross the frontier with an army. But at once the Parliament proscribed him; and the eutenant-general, followed by Nemours and Beaufort, took up arms against the court. Mademoiselle forced her way through a hole in the walls of Orleans, with one or two of her ladies, and frightened the magistrates into espousing the revolt. But Beaufort and Nemours did not agree, and their army was in danger of being destroyed by Turenne. Condé came to its help, having in discuise crossed the enemy's country and passed close by the royal troops. The very next night Hocquin- court's camp was burnt, and Condé, hurrying to Paris, formed an alliance with Turenne, and s ht to win over the Parliament. But Mold stripped off the veil of patriotism with which he sought to conceal his selfishness, and pointed out that he was allied with a foreign power, and that he was actually treating with the detested cardinal. The prince retaliated by stirring up the mob, and leaving the city to its savage caprice. At length he quitted Paris to save the rebel army which was hotly pressed by Turenne, and the magistrates persuaded the facile licutenant-general to close the gates, At the gate St Antoine, on the 2d July

1652, Turenne and Condé met. Condé fought in person with marvellous energy;; he seemed, said Turenne, to be twelve men at once 7 UL, pressed by numbers as he was, it was apparent that he could hope for safety only by being admitted within the walls of Paris, Fortunately he had in the city as champion one of the most remarkable women of that strange time, Mademoiselle, the daughter of Gaston, duke of Orleans, and the author of the Mémoires, who hoped to succeed his sickly wife, or, better still, by his means to obtain the hand of the youngking, She frightened and persuaded the provost of the merchants and L'H6pital, the governor of Paris, into opening the gates, and turned the cannon of the Bastille on the army of Turenne. Keeping his ground so long as daylight lasted, at nightfall Condé entered the city. It was given up to pillage and murder. Fire was set to the building where the magistrates had met, and the magistrates themselves narrowly escaped with their lives. Famine began to be felt, and pestilence appeared. Deserted by

crowds of his followers, bitterly disappointed, and worn out, as was whispered at the time, by his excesses, Condé was seized with fever. Mazarin, going into exile, freed the court from the odium of his name ; and the Fronde melted away.

On his recovery (October 1652) Condé fled from Paris and joined the Spanisharmy. The swift, bold tactics which had gained him glory were now impossible ; he was constantly hampered by tne ancient and ponderous methods of the Spaniards, by their inflexible etiquette, and their lordly laziness. He gained some successes, as the entry into Cambray, which was invested by Turenne, and the raising of the siege of Valenciennes; but fortune was in general on the side of France. At length in 1659, after the disastrous battle of the Dunes, Spain, tired of the war, consented to the disadvantageous peace of the Pyrenees, and at the same time Condé obtained his pardon from Louis, who thought him less dangerous as a subject than as possessor of the independent sovereignty of Luxembourg, which had been offered him by Spain as a reward for his services.

Thenceforth he was excluded from court intrigues, and for several years he resided on his estate at Chautilly, where he gathered round him a brilliaut

~~company, which included many of the greatest men of genius that France has seen—Molidre, Racine, Boileau, La Bruyére, La Fontaine, Nicole, Bourdaloue, and Bossuet. But the quarrel between Luvois the minister of war and Turenne again opened a field for his ambition. In 1668 he laid before the former a scheme for seizing Franche-Comté, the execution of which was intrusted to him, and successfully carried out. In the next year Condé was offered the crown of Poland, which, however, Louis would not allow him to accept. In 1672, he took part in the war with Holland, and forced the passage of the Rhine, at which engagement he was severely wounded in the wrist. In 1673, he met the Prince of Orange in the great but undecided battle of Seneffe. He served for the last time in 1675, as general of the army of the Rhine, which had been left without commander by the death of Turenne. After this campaign, prematurely worn out by the toils and excesses of his life, and tortured by the gout, he returned to Chantilly, where he spent the eleven years that remained to him in quiet retirement, In the end of his life he specially sought the companionship of Bourdaloue, Nicole, and Bossuet, declared himself a convert, and devoted himself to the ordinances of religion. He died on the 11th December 1686, at the age of sixty-five. Bourdaloue attended him on his death-bed, and Bossuet pronounced a glowing funeral panegyric upon hun.~~

~~Condé's character is a type of that of the French noble of hisday. To be regarded as a brilliant conqueror in love and war, to hold the first place at court, swaying the councils of his sovereign at his will, and receiving universal homage—these were the selfish and only objects of his ambition. Jlis vanity was such that he looked on no man as his equal; Louis XIV. himself could not have shown an arrogance more insolent. He was said by one who knew him well to be the hardest-hearted man in France. Ruth- less and savage, he was also an intriguer not less unscrupulous, though incomparably less adroit, than his victorions enemy, the subtile Italian cardinal. Thus he had all the faults of the French noble on a colossal scale ; he had also his virtues in a more extraordinary degree. Where all were brave, he was conspicuous above all for a thoughtless courage which nothing could dismay, and to which, combined with the intense enthusiasm and rapidity of thought that inspired him on the field of battle, he owed the most brilliant of his victories. And the evening of his life, when, done with ambition, he gave himself to the de-~~

CONDE

lights of literature, reveals a new and finer side of character that would otherwise appear all harsh and with- out beauty.

before had been banished to Chateauroux. seized upon by her husband with unseemly eagerness brought about her ruin. room, and after threatening her loudly, stabbed her, and made his escape. of scandal, refused to believe any evil of one so pure and noble; but the prince declared himself convinced of her unfaithfulness, placed her in confinement, and carried his resentment so far that his last letter to the king was to request him never to allow her to be released.

Motteville, La Rochefoucauld, De Retz, Grammont, Nemours Coligni, and Mademoiselle ; the Lettres de Mme. de Sévigné; the lives of Condé, by Adrien Lemereier, Desormeaux, , Voivreuil Mahon, and Louis Joseph, prinee of Condé ; Fitzpatrick, The Great Condé and the period of the Fronde ; Cousin, Histoire de Mile. de Longueville. .

Condé's unhappy wife, Clémence de Maillé, some years An accident,

A servant had entered her private

Her contemporaries, greedy as they were

See the numerous Mémoires of the time, especially those of Lenet,

(lL Mw) | O CONDE, Louis Henry Josrrn (1756-1830), duke of

Bourbon, and last prince of Condé, was the son of Louis Joseph, prince of Condé. Several of the earlier eventsofhis life,especially his marriage with the Princess Louise of Orleans, and the duel that the prince of Artois provoked by raising the veil of the princess at a masked ball, caused much scandal. the emigrés in Li¢ge. Elba and the battle of Waterloo, he headed with no success

At the Revolution he fought with the army of Between the return of Napoleon at

~~a royalist rising in La Vendée. In 1829 he appointed the~~

~~Duc d'Aumale his heir; and exactly a year after he was found strangled with a handkerchief round his neck, A famous trial was the consequence, in which no verdict was~~

~~iven.~~

~~CONDE, Jost Anronro (1765-1820), a distinguished Spanish Orientalist, was born at Paraleja, in the province of Cuenca, and was educated at the university of Alcala. Intended by his father for the law, he found means to . learn not only Greek, but even Hebrew and Arabic. Asub- . ordinate post in the royal library enabled him at an early . age to abandon his legal studies, and to devote himself entirely to literature ; and in 1796 he published a volume of paraphrases from the Greek idyllists. This was followed, | in 1799, by an edition of the Arabic text of Edrist's De- scription of Spain, accompanied with notes and a transla- tion. Though by no means free from inaccuracies, this pub- lication greatly advanced the editor's reputation, He was made 2 member of several learned societies, and was one of the commission of three appointed to continue the biblio- | graphical] labours of Sanchez; and he receivedroyalaid in the studies requisite for the composition of his next work, the . famous History of Moorish Rule in Spain. On Napoleon's : appearance in Madrid (1808), Conde identified himself with the party of France. Joseph Bonaparte made him librarian in chief at the royal library; and he had to leave his native land with the retreating invaders. After ate sidence of some years in Paris, spent in arranging materials for his history, Conde was at last permitted to retum to Spain in 1818 or 1819. His countrymen, however, wou not forgive him for his apostasy ; he sunk into poverty, and died soon after his return. His history (sons de la Dominacion de los Arabos en Espatia) was published by subscription. Only the first volume received the authors final corrections, the other two being compilations from his MSS. This work, although confused and inexact chronicle rather than a history, may yet be read wit advantage ; an English translation (1854) occupies: three volumes of Bohn's Standard Inbrary. Notwithstanding Wg imperfections, the book opened an era in Spanish literature; and Conde himself must be regarded as the earliest labourer~~

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in a field which has since yielded a rich and abundant

harvest.

CONDER, Josiau, an English littérateur, was born in Falcon Street, Aldersgate, London, on 17th September 1789, and belonged to an old nonconformist family, proud Leaving school at the age of thirteen, he began to assist his father in his business as a bookseller at Bucklersbury ; and in this situation he found abundant pabulum for the literary tastes which he had already begun to develop. The first time he appeared in print was in the poet's corner of the Atheneum, No. 11; and in 1810 he joined the well-known Taylor family in the little volume called the Associate Minstrels, From 1811, when his father retired, till 1819, he carried on the business on his own account; but in the latter year he determined to adopt literature as a profession,

of its hereditary piety and nonconformity.

and thenceforward till his death his pen was never idle.

As editor of the Helectic Review, which had been published under his name since 1814, he was regarded as the literary representative of evangelical nonconformity ; and in 1832 he became still more publicly and completely associated with the interests of the party as the editor of the newly established organ called the Patriot. Besides contributing voluminously to both these periodicals, he published work after work on religious, political, and miscellaneous subjects ; but in too many cases these owed their origin merely to the necessity of producing something that had a market value, That he frequently put forth mere paste and scissors work he makes no shame to confess,— conscious that if his labour was somewhat ignoble it was at least performed with scrupulous honesty, His whole literary activity was not only as editor of the Helectic that he endeavoured to " reconcile those long divorced parties—religion and literature." His most popular

~~work was his Modern Traveller, a series of thirty volumes descriptive of the various countries of the~~

~~influenced by his religious convictions, and it was~~

~~globe ; but he will probably be longest remembered as the author of a few hymns not unworthy to rank with the best examples of nonconformist psalmody. He died on December 27,1855. His life has been written by his son,~~

~~Eustace R, Conder, His principal publications are—On Protestant Noneonformity, 2 1818; The Star in the East, with other Poems, 1828 ;~~

~~vols., Analytical View of all Religions, 18388 ; The Literary History of the of History with Prophecy,~~

~~ie Testament, 1845; The Harmony~~

~~CONDILLAC, Brrenve Bonnor pr (1715-1780), Abbé e Mureaux, a distinguished writer in logic, psychology, and economic science, was born at Grenoble. Very little is known about the particulars of his life. He was the younger brother of the Abbé de Mably, and associated in his youth with Rousseau, Diderot, Duclos, and other Philosophers, but afterwards allowed the intimacy to die out. He was of a serious and dignified character, and devoted himself to a life of laborious study. Like Comte and Mill, he acknowledges himself to have been largely indebted to a lady for his philosophical inspiration While still young he wag appointed preceptor to the duke of Parma, grandson of Louis XV., for whose instruction a | arge number of his works were composed. He was chosen by the French Academy of Sciences to succeed the Abbé POlivet In 1768, but after delivering a discourse on that Fe he never again appeared at the meetings. He lved in retirement on his estate of Flux, near Beaugency, till his death on 3d August 1780, ' Condillac's Philosophical opinions are contained mainly ee Li Origine des Connaissances Humaines, Traité des nee f: raué des Sensations, Grammaire, L' Art d' Ecrire, hi Art de Raisonner, L'Art de Penser, La Logique, and 18 posthumous work, La Langue des Calculs. The first of~~

these was his earliest production, and may be regarded as the preliminary sketch of his entire system. It touches more or less distiuctly on all the topics which are discussed in the others. But the doctrines it contains receive a fuller and more mature statement elsewhere, and there are many important departures from them in the later works,

Condillac's philosophical writings may be studied from three points of view. Like Locke, he begins with a polemic against innate ideas and abstract systems, This takes up a large part of the Essai sur ? Origine and almost the whole of the Z'raité des Systemes. In the Logique and the Art de Raisonner he expounds and illustrates the analytic method, which he regards as the only true method of science, and which is further illustrated in La Langue des Calculs, L'Art de Penser consists largely of quotations from the Zssai sur ' Origine. Inthe Traits des Sensations, Condillac applies his analytic method to the solution of the psychological problem of the origin of our ideas and the formation of the meutal faculties, Tt cannot be said that he strictly confines himself to the questions here assigned to his different works. His inveterate antipathy to innate ideas and abstract systems, his favour for analysis, and his peculiar psychological doctrines appear more or less in them all.

Condillac's main attacks are directed against the innate ideas of Descartes, Malebranche's theory of the mental faculties, the monadology of Leibnitz, and the first part of Spinoza's Ethik. He thinks that innate ideas were assumed because men had not Sagacity and penetration enough to go back to the origin of ideas and trace their genesis, and he finds the consequences of the system to be the multiplication of abstract principles, and a pretence of accounting for everything by the use of abstract terms, Malebranche is justly censured for giving comparisons instead of reasons in his explanation of understanding and will, In criticizing the monadology of Leibnitz, Condillac exaggerates the vagueness and inadequacy of the ideas furnished by the reason, and the clearness of those of the senses. He cannot comprehend how each monad represents the universe in virtue of its relations to it. But may there not be a sense in which the ultimate particular in the infinitude of

its relations is a mirror of the universe? Condillac regarded Spinozism as the best example of an abstract system, and criticized in detail the first part of the Zthzk, in order to show that Spinoza failed both as to clearness of ideas and precision in the use of signs—two essential conditions of the geometrical method which he adopted. Condillac divides the various philoso- phical systems into three classes :—(1) abstract systems which rest only on abstract principles ; (2) hypotheses, or systems grounded on mere suppositions ; (3) one true system, that of Locke, which is evolved from the facts of experience. The first he treats with unmitigated scorn ; the second he admits under limitations ; the third alone he regards as the true method of philosophy.

An act of reasoning, according to Condillac, consists in detecting a judgment which is implicitly contained in another. Sometimes, to go from the known to the unknown, it is necessary to pass through a series of inter- mediate judgments, each of which is contained in the one preceding. For example, the judgment that mercury will rise to a certain height in the barometer is contained implicitly in the judgment that air has weight; but we require a series of intermediate judgments to see that the former is a cou- sequence of the latter. The evidential force of a reasoning thus consists in the identity between the judgments of which it consists. They are the same; only the expression changes. Such a principle could not be made to cover all the varieties of reasoning Accordingly Condillac tries to

reduce them all to the mathematical form. 'To reason is to calculate, and to calculate is to reason ; and reasoning, like calculation, comes to be a merely mechanical operation. Condillac rejects the common explanation of reasoning, that it is a comparison of two terms with a common third to find their relation to each other. He sees no need for a middle term. 'The force of the demonstration, he thinks, lies in the identity of the two extremes, which is made evident by decomposing them. Of the syllogism he says that it makes reasoning consist in the form of expression rather than in the development of the ideas, and that most of its rules have been framed with a

~~view to concluding from the genus to the species, whiercas thought sets out from particulars.~~

~~Regarding the criterion of truth, he attacks the Cartesian test of truth, and proposes instead of it his own criterion of identity. Inthe Lssai sur Origine des Connaissances he brings two objections against Descartes :—(1) the methodic doubt is insufficient and even useless, because, while calling our ideas in question, it leaves them in all their indeterminateness; (2) it is impracticable, for we cannot doubt about the relations which exist between familiar and determinate ideas like those of numbers. Of the Cartesian criterion of truth, "all that is contained in the clear and distinct idea of a thing may be affirmed of it with truth," Condillac says that itis both useless and dangerous, and should not have been extended to cases different from the one which gave it birth. For Condillac the sign of truth isidentity. The evidence of a proposition is in the identity of the two terms. The evidence of a reasoning is in the identity of the successive propositions. No definition, however, is given of identity. It is said to be recognized when a proposition can be expressed in terms equivalent to these,—' the same is the same." But Condillac draws a distinction between identical proposi- tious that are frivolous and those which are instructive, and explains the latter to be those in which the terms are identical in thought, but different in expression. Condillac held that three kinds of evidence are needed to arrive at certainty —the evidence of fact, the evidence of feeling, and the evidence of reason. The evidence of fact informs us of the relations which bodies have to us; it can have no other object. 'The evidence of feeling enables us to distin- guish what passes in us, the modes or states of the mind. Some good remarks are made in chapter iii., part not L' Art de Penser, on the attentive observation of conscions- ness. The evidence of reason is discussed in the first three chapters of the first part of LZ' Art de Iavsonner. There Condillac merely formulates the principle of identity, and cites as examples the geometrical theorems which his pupil will require, that he may understand the rest of the work.~~

~~Condillac was of opinion that one method of analysis is common to all the sciences. Our cognitions ought to form a system in which all is strictly connected together. Every series of facts should be reduced to an initial fact, of which the others are only transformations. Identity is a rule of~~

~~method as well as a criterion of certainty ; and analogy completes the primary lessons which are given us by nature. Condillac takes as his model the method of mathematics, and reiterates through his logical writings that we must take nature for our guide. On the relation of analysis to language he held that there is an innate language, although there are no innate ideas. This language produces a kind of analysis, since it is necessary for the communication of our ideas to analyze and express in succession what is simultaneous in thought. Analysis then reacts on language and improves it. Finally, perfec- tion of language leads to perfection of analysis, and science is only a langue bien faite.~~

~~CENDILGESAL~~

~~The method of invention is discussed chiefly in the Essai sur 0 Origine des Connaissances and in the Langue des Calculs. In the former, Condillac bids us take the simple ideas furnished by sensation and reflection, form different collections of them, which in their turn wil] produce others, and give distinct names to these different collections. In the Langue des Calculs the idea of analogy is developed. This is not the analogy set forth in the Art de Raisonner, which consists only in forming more or less probable conjectures about the unknown from the known. 'The analogy of the Logigue and the Langue des Calculs is that which creates and regulates languages, which causes us to invent different systems of signs and submit them to uniform rules.~~

~~Reasoning cannot have the purely subjective character which Condillac's theory assigns to it. It takes its departure from the idea, which is objective, and therefore establishes a real relation between the mind and its object, On the question of the need for a middle term it is not enough to decompose the two ideas. The two decomposi- tions must meet at a point, and that is the middle tem, Laromiguiére preserves the intermediate ideas, which he thinks are found by analysis of the extremes, So they ar, But it has been urged that there is a twofold analysis—of the species into its genera and of the genus into its species—whereby the middle term is found. Condillac is incon- sisteut with himself in his criticism of Descartes. HIs first objection to the methodic doubt is based on the opinion that all our errors proceed from the indeterminate character of language, and that the use of definite~~

signs is the only security against error. But he believes that analysis makes language; and the methodic doubt is a kind of analysis, for it remounts to the primary truths. His second objection, that we cannot doubt about mathematical rela- tions, is invalidated by his own statement that mathe- matics are only part of metaphysics. Condillac is right in saying that the Cartesian criterion of truth lacks a theory of ideas and of their origin. But it is not to be condemned as useless because it is incomplete. Condillac was led away by the supposed need for a sign whereby to recognize truth, As Hegel would have put it, he refused to go into the water until he could swim. But it would be as difficult to determine the value of the sign as that of the truth itself. Some such criterion as identity is the only resource of empiricism. But if the notion of identity is derived from experience, it cannot give certainty. If, that it may serve as the basis of logic, it is regarded as necessary, then empiricism caunot reconcile it with its psychology. Laromiguiére tries to get over the difficulty of accounting for progress in a system based on the notion of identity, by drawing a distinction between partial identity and total identity, and saying that the former alone should be admitted. But what is partial identity ? Condillac himself takes refuge in extreme idealism. Truth, he says, considerced in itself and in the divine intelligence, is one and identical. But he had himself laid down the rule to limit our consideration to the condition of human know- ledge, and of course he had no idea of developing thought as such from its primal unit by a dialectic process after the manner of Hegel. As to the three kinds of evidence, Condillac in reality reduces the evidence of fact to that of feeling and that of reason. His numerous contradictions are largely due to his attempts to defend the authority of the senses, while he accepts the idealistic theory of external perception. The objections to identity as a criterion 0 truth apply as well to Condillac's statement of the evidence of reason. And if the three kinds of evidence a! inadequate taken separately, they cannot suffice when combined. Condillac rightly insisted that there 1s one fundamental method for all the sciences; but he nowhere

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reconciles this unity of method with the variety of form which it assumes as applied to different objects. By demanding at the outset the initial fact, of which all the others are to be shown to be transformations, he virtually quits the safe road of experience. He errs, too, in thinking that the method of mathematics is applicable to all the sciences, His oft-repeated advice to follow nature would have been advantageously accompanied by a clearer ex plana- tion of what nature is. One thing which he certainly excludes from it is the mind viewed as the seat of intel- lectual principles. Condillac's analysis combines what are generally regarded as the two distinct processes of analysis and synthesis. Syuthesis:he conceives to be that method which starts from abstract principles, and accordingly he treats it with supreme disdain. But while banishing the | name he retains the thing, and insists that no analysis is — complete without a process of recomposition.

The logic of Condillac finds its most important applica- tio in psychology. In the Zssaz sur VOrigine des Connarssances he starts from sensation as the primitive fact, and seeks to show that all the ideas and operations of the mind are only transformations of it. He neglected, how- ever, to make sure of his way back to the primitive fact of sensation, before using it as his starting point. Under the influence of Locke, he simply assumed it, and applied his ingenuity to derive from it all the ideas and operations of the mind. Throughout the Zssai swr Origine he con- founds sensation with perception in a way that vitiates his whole argument. At the outset he affirms that sensations are ideas, because representative of objects. It is difficult to understand in what sense he uses such language. For a long time it was supposed that he regarded the pure sensation as the primary element of consciousness 3 but his more recent followers have adopted a different interpreta- tion, They try to make out that his meaning was that in — the simplest state of consciousness the whole mind is to be' found, equipped with all its so-called faculties. Condillac

found an opinion prevailing that the mind is partitioned off, as it were, into a variety of different faculties, each having its separate function, which it discharges independ- ently of the others. It wag against this opinion, they say, that he éontended. He maintained that the mind is not a congeries of faculties, but is one and indivisible, and appears in all its forms of activity in the simplest state of consciousness, This opinion is difficult to reconcile

with his avowed purpose, to which he adheres throughout all his psychological treatises, of tracing the genesis of the faculties ; for sensation would then not be a primitive fact, from which all the later furniture of the mind is derived by a process of transformation. There would, in fact, be no generation of the faculties, for all would be 'given in the rudimentary consciousness, and any reasoned Account of their relations to each other would need to refer to something anterior to the individual consciousness, Probably the more correct view to take of Condillac's psychology is that when he tried to deal with sensation, pure and simple, he found it impossible to do so, and was compelled to invest the mere Sensation with all the ideas of Teason, that it might do duty in his system. No doubt | either interpretation would save Condillac's consistency with his great principle of identity. The sameness of the elementary Sensation with the higher faculties and ideas is secured, whether the faculty is degraded to the level of the Sensation, or the sensation ig raised to the level of the ia And there is much in Condillac to countenance " er 4. But it 1s probable that if he had been willing concede that the mind is all in the primary sensation, in it In which his later followers understand him, he tree ave felt the necessity of exhibiting the relations of

"8 Citerent mental operations, which in such case would

be moments of the Sensation, anterior to the sensation, instead of subsequent to it, in terms of the relations of different sensations to each other, The opening sentences of the Z'raité des Sensations show that Condillae was awaro of the difficulties attending the study of our rudimentary consciousness on the presuppositions of sensationalism, If the mind at birth was a tabula rasa, there can be no traces left of our primary state. It is in vain therefore to interrogate our consciousness to learn what it was then. To show how all proceeds from sensation, we must consider our senses separately. As Condillac could not do this by examining his own consciousness, he devised the experiment of the statue. It is supposed to be possessed of a mind destitute at first of every sort of ideas, aud only to have the use of its senses at the pleasure of the experimenter, who opens them at his choice to their appropriate impres- sions. A beginning is made with the sense of smell, because it seems to contribute least to our knowledge. The other senses are successively experimented on, singly and in groups, and at

last the statue is found to have become an animal able to preserve itself. Condillac claims to have stripped man for the first time of all his habits. Feeling is observed at its birth, and proof is given of how we acquire the use of our faculties, The principle of their development is found in the various degrees of pleasure and pain attaching to our sensations ; for none of them are indifferent absolutely. The contrast between pleasure and pain impels us to court some sensations and flee others. A sense of need is produced by the want of an object judged necessary for happiness. Needs beget desires ; old needs repeated and new ones formed are the ground of the development of our knowledge and our faculties, The outcome of Condillac's psychology is given in briefest form in chapters vii. and viii. of the' Logigque. Laromiguiére corrected Condillac by substituting attention for sensation as the principle of the active half of the mental phenomena. Cousin pointed out that attention is a voluntary act. HIe showed the essential difference between desire and will, as also between sensation and desire, and remarked that the organic impression must not be con: founded with the sensation. If the sensation is the con- dition of the exercise of the faculties, still it is not tle principle of any.

Condillac defines personality to be a collection of sensations plus the ability to say "me." But this plus is of vast importance. HIow comes it that this particular collection of sensations can say "me?" Because, answers Condillac, it is a collection of present and remembered sensations, But whether does the statue say "me" because it can remember its sensations, or remem- ber its sensations because it can say "me"? Is not all that is involved in saying me already involved in memory, so that his answer merely repeats the fact which it professes to explain? Condillae thought so in his first stage, as he then found the feeling of one's own existence to be an essential element of reminiscence. Then, indeed, reminiscence was distinguished by him from memory. but only in an artificial way. A collection of sensations is a less correct account of personality than the synthetic unity of Kant. What renders the collection possible } For Condillac its essential condition, a unifying principle, is wanting. That cannot be found in sensation. It isa condition of the ordering of sensations, and is the all- important unit out of which a true philosophy of spirit must grow. Sensations cannot give an answer to the question what constitutes experience. Even Mill had to confess that it must at least be sensations

which have the strange property of turning back upon themselves, Condillac has the very same phrase, "'As long as the state changes not, it exists without any return upon -itself,'"

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Thus, in their own inarticulate way, the sensationalists are compelled to postulate the synthetic unity of Kant. And just as it is present in the first fibre of personality, the first flash of self-consciousness, its various modes of opera- tion are no less essentially present throughout all the subsequent fabric of experience, and in the full sunlight of conscious life. To trace and treat them is the work of philosophy proper, which may be briefly distinguished from the natural sciences as that which deals with the universal aspect of thought, while they deal with the particular. Both are necessary factors of concrete thought. Experience will never spring out of categories alone, nor will it arise out of particulars alone. The method of observation proper to the natural sciences may lead us to the border-ground of the two territories, but for exploring the region of the universals there is needed a keener vision and a deeper principle. It is the fault of Condillac, as of all the sensationalists, that he does not apply the analytic method faithfully enough to bring himself consciously face to face with the universal factor of experience. It is interesting to note in hin the progress towards a more thorough use of analysis In the Essai sur ' Origine he was of opinion that any single sensation was an idea, 2.e., representative of external entities, and that a single sense is adequate to produce an experience more limited in degree, but the same in kind as ours. So he maintained against Locke and Berkeley that we can know through sight alone the magnitudes, distances, and situations of objects. His position then much resembled that of the so-called common- sense philosophers. To him an external world was as necessarily present in sense as to them; and his criticism of Spinoza, that the assumption in his definitions of what he meant to prove by means of them made his work easy, may very aptly be applied to the Hssaz sur POrigine. If a complete experience is given ina single sensation, it will be easy to find it in asuccession of them. But the Traité des Sensations marks an advance upon these views. Now a sensation is not perse anidea, A stricter use of analysis detects other elements in ideas. Condillac saw from the first that a sensation to be an idea must be

representative of something out of the present consciousness. Now he sees that, to be so, it must either exist in the memory or be modified by judgments, That is to say, it must be the sensation of a series of sensations, which has the marvellous power of returning upon itself; or, in more intelligible language, it must be held in the grasp of the synthetic unity of thought. In the Origine Condillacreally develops experience out of perceptions, or sensations regarded as synonymous with ideas. In the Zrasté des Sensations he has come to know that a sensation as such is not an idea. But although he still professes to develop all the mental operations out of sensation, he is as far as ever from bridging over the gap between sensations and ideas, or even from acknowledging in his actual procedure the existence of such a gap at all.

When Condillac, largely owing, as he tells us to the influence of Mlle, Ferrand, abandoned the position of the Essai sur U Origine, that by sight alone we can judge of the magnitudes, distances, d&c., of objects he seems to have been in unstable equilibrium between sensationalism and a very different mode of philosophizing. In the Traité des Sensations he shows how these judgments are founded not upon the direct intimations of sight, but upon an association that has sprung up between the sensations which we owe to different senses. 'The mind, he sees clearly, has come to deal with relations among sensations. He even goes the length of saying that the idea of impenetrability cannot be a sensation, but is a judgment founded on sensation. He was then on the verge of intellect proper, and within sight of something deeper than sensation, The intelligible

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order of things is dimly seen by him to be the reality for us, and he tries hard, in the 7raité des Sensations, to show how we become aware of it through the interaction of the different senses. But just then he falls back again into sensationalism. He loses hold of judgment as the all- important element, and conceives the senses in some strange way to acquire a habit of immediately informing us of what a moment before he saw it needed an act of judgment to reach. For an instant he had a glimpse of thought as constitutive of experience. But forthwith the vision passes, and its place is

taken by a mysterious and totally unintelligible habit or instinct of sense. Accordingly, in the Art de Penser, he is back again to the gross statements of the Origine, that we may find in sensation the ideas of extension and figure, and perceive as distinctly and clearly that they do not belong to us, or to what in us is the subject of thought, but to something outside of us.

It is not difficult to see how his theory of reason sprang out of his theory of the origin of knowledge, for of course his psychology was thought out before his logic. If all is sensation, and we can never get beyond sensation, then our advancing knowledge must be only a ringing of the changes upon the primary sensation. The latest results will be identical in the fullest sense with the first begin- nings, and all science will be reduced to a development of language, a series of identical expressions, to which we are driven by the limitation of our faculties preventing us from seeing the identity between remote terms. Thus, in L'Art de Raisonner, he shows at length that the demonstration of the rule for finding the area of a triangle is necessitated by our inability to see the identity between the idea we have of " measure" and that we have of the product of the height of the triangle by half the base. Similarly, the argument in the Z'raité des Sensations is necessitated by our inability to see the essential identity between sensation and thought. Every successive proposition is identical in idea with the preceding one, and differs from it only in expres- sion. There is no advance or development in matter, In his psychology it is the same sensation throughout, In his theory of reasoning it is always the same idea throughout. The difference is merely in form, and it is not difficult to see how, in a philosophy which neglects intelligible relations, and ignores the truth that they are constitutive of experience, form must of necessity be degraded and become mere form of words. 'This is the complaint which is urged by HIegel against all the natural sciences. HIe, so to speak, accepts the verdict of Condillac upon them. 80 far as they attempt to prove anything, he says, they area mere string of identical propositions. But to HIegel form was everything. The development of the notion is what constitutes the universe ; and accordingly he thought that a different formula of reasoning must be found from any hitherto recognized. Syllogistic reasoning is not adequate to any real development of form. It sinks down into a mere change of verbal expression, as Condillac had asserted, while the matter of thought is left precisely where 1 was But matter is only the potentiality of form, and form 18 n10

mere transformation of verbal expression, but an organle growth of thought. Is there any standing ground between the identity of Condillac and the dialectic of Hegel |

There are many later systems which it would be interest- ing to compare with the thoughts of Condillac, notably the psychology of Beneke, the later views of Mr Lewes, and the logical doctrines of Professor Jevons. There 8 @ remarkable similarity between the identity of Condillacand the substitution of similars of Professor Jevons. The logical machine is almost like a realized ideal of Condillac; and Professor Jevons's new system of symbols wo? probably have been hailed by Condillac as the langué bien faite, the counterpart of algebra, for which he sighed in val.

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Condillac's important work Le Commerce et le Gouverne- ment was published in 1776, the same year in which the The best European econo- mists are said to be now gravitating to the opinion =

is work treats economic science as the science of commerce or It was originally intended to consist of three parts, but the last never appeared. In the first part he develops the principles of economic science, and treats of The second art considers the relations of commerce and government, The third part was to have contained a number of examples, to show that his theories

Wealth of Nations appeared.

Condillac's is the true conception of economic science,

exchanges.

the phenomena of commerce or exchanges, and their reciprocal influence.

had facts to rest upon as well as argument. His great

merit was to have fixed upon the wants and desires of the Hence he did not

human mind as the source of value. look on Jabour as a cause of value. In an exchange both parties are gainers, for each gives what is comparatively superfluous to him for what is necessary. Therein,

he thinks, lies the spring of all commercial activity, He is a strong free trader, and answers by anticipation Saint Simon, Fourier, and their followers regarding the right of

inheritance.

Condillae was a most voluminous writer. A collected edition of his works was published in 23 volumes at Paris in 1798, and was followed by another in 32 volumes in 1803. Several partial editions, contain- ing those of his works which form the Cours d'Htudes for the young ied of Parma,! were published at different times. The following is a list of his works:—ZXssai sur Uorigine des connaissances humoines (1746); Traité des systémes (1749); Traité des sensa- tions (1754); Cours détudes, published in 138 volumes in 1755, comprising the " Grammaire," "]'Art d'écrire," '"'l'Art de raison- ner," '"'PArt de penser," "l'Histoire ancienne" and '1]'Histoire moderne," 'Etude de histoire," and "Traité des animaux;" a sequel to the Traité des sensations (1775); Le commerce et le gouverne- ment (1776). La Logique, written as an elementary treatise at the request of the Polish council of public instruction, appeared in 1780, a few months before the authior's death. Za langue des calewls was not published till 1798. An English translation of the Essui sur Porigine by Thomas Nugent was published in 1756, avowedly as a supplement to Locke's Essay on the Human Under. standing,

References—Louis Robert, Les Théorics logiques de Condillac (Paris, 1869); F, Réthori, Condillac ou VEmpirisme et le Rationalisme (Paris, 1864) ; Laromiguidre, Lecons de Philosophie, Paradoxes de Condillac; George H. Lewes, History of Philosophy, vol. ii. (1871);

Whewell's Philosophy of Discovery (1860); Mill's Logic, book ii. chap. 2, sec. 2, There is an excellent account of Condillac's—economic doctrines in Macleod's Dictionary of Political Economy. See also Dugald Stewart's "Preliminary Dissertation" in the eighth edition of the Encyclopedia Britannica, vol. i. p. 172. (D. B.)

CONDOM, a town of France, at the head of an arrondissement, in the department of Gers, 26 miles from Auch, on the Bayse, a tributary of the Garonne, there crossed by two stone bridges. The church of St Peter, formerly a cathedral, is included among the historic monu-

‘ x Condillae’s opinions about education, which he carried out in the instruction of the young duke of Parma, are interesting and important. He declares his method to be the same as that by which men have created the arts and sciences, He is very severe upon the error of cultivating only the memory until a supposed “age of reason” has been reached. The young child begins to reason, he thinks, in learn- Ing to use its Senses, and no delay should be made in encouraging him to observe his own mental processes and the facts around him. So long as he is unable to make observations for himself he should be informed about those of others, The teacher’s great object should be by train his pupil to think, to find pleasure in mental exercise, and to | yume just ideas. Condillac took the hint as to the right order of studies from the experience of nations. First he directed his pupil’s — to those objects and studies which meet the primary wants i ae Then he cultivated his taste. Finally, he directed his : ae, 3 to speculation, — He characteristically regarded the arts of ie a rae writing, reasoning, and thinking as fundamentally the same, pe i them all to that of speaking. Condillac had perfect con- — ‘ in his method, and boasted of its success, although it does not His aan appropriate for a child of seven years, the age of the prince. a. rea on the importance of early attention to the cultivation of 08 Powers and the educational uses of observation and experiment are far from being obsolete,

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ments of France, and deserves notice for the height of its vaulted roof. The manufactures of the town include woollen fabrics and porcelain; and its trade is mainly in rural produce and brandy. The nucleus of the place was furnished by an abbey, founded in the 10th century ; in 1317 it was made a bishopric by Pope John XXII, and in 1549 the monks were appointed canons of the cathedral, In the 18th century it was the centre of a district called Condomois, which contained the towns of N erac, Gabaret, and Mont de Marsan ; and it possessed three convents and two nunneries. Among its

celebrities are Dupleix the historian, and Montluc the leader of the crusade against the Albigensians. Bossuet was bishop of Condom in 1669. Population in 1872, 5205,

CONDOR (Sarcorhamphus gryphus), a New World vulture, and the largest of existing birds, although by no means attaining the dimensions attributed to it by early writers. It usually measures about 4 feet from the point of the beak to the extremity of the tail, and 9 feet between the tips of its wings, while it is probable that the expalse of wing never exceeds 12 feet. The head and neck are destitute of feathers, and the former, which is much flattened above, is in the male crowned with a caruncle, or comb, while the skin of the latter in the same sex lies in folds, forming a wattle, dilatable at pleasure. The adult plumage is of a uniform black, with the exception of a frill of white feathers nearly surrounding the base of the neck, and certain wing feathers which, especially in the male, have large patches of white. The middle toe is greatly elongated, and the third but slightly developed, while the talons of all the toes are comparatively straight and blunt, and are thus of little use as organs of prehension, The female, contrary to the usual rule among birds of prey, is smaller than the male.

The condor is a native of South America, where it is confined to the region of the Andes, from the Straits of Magellan to 4° north latitude,—the largest condors, it is said, being found about the volcano of Coquimba, situated on the equator. It is often seen on the shores of the Pacific, especially during the rainy season, but its favourite haunts for roosting and breeding are at elevations of 10,000 to 16,000 feet. There, during the months of February and March, on inaccessible ledges of rock, it deposits two white eggs, from 3 to 4 inches in length, its nest consisting merely of a few sticks placed around the eggs. 'The period of incubation lasts for seven weeks, and the young are covered with a whitish down until almost as large as their parents. They are unable to fly till nearly two years old, and continue for a considerable time after taking wing to roost and hunt with their parents, The white ruff on the neck, and the similarly coloured feathers of the wing, do not appear until the completion of the first moulting. By preference the condor feeds on carrion, but it does not hesitate to attack sheep, goats, and deer, and for this reason it is hunted down by the shepherds, who, it is said, train their dogs to look up and bark at the con- dors as they fly overhead,

They are exceedingly voracious, a single condor of moderate size having been known, according to Orton, to devour a calf, a sheep, and a dog in a single week. When thus gorged with food, they are exceedingly stupid, and may then be readily caught. For this purpose a horse or mule is killed, and the carcase surrounded with palisades to which the condors are soon attracted by the prospect of food, for the weight of evidence seems to favour the opinion that those vultures owe their knowledge of the presence of carrion more to sight than to scent. Having feasted themselves to excess, they are set upon by the hunters with sticks, and being unable, owing to the want of space within the pen, to take the run without which they are unable to rise on wing, they are.

readily killed or captured. They sleep during the greater part of the day, searching for food in the clearer light of morning and evening. They are remarkably heavy sleepers, and are readily captured by the inhabitants ascending the trees on which they roost, and uoosing them before they awaken. Great numbers of condors are thus taken alive, and these, in certain districts, are employed in a variety of bull-fighting. They are exceedingly tenacious of life, and can exist, it is said, without food for over forty days. Although the favourite haunts of the condor are at the level of perpetual snow, yet it rises to a much greater height, Humboldt having observed it flying over Chimborazo at a height of over 23,000 feet. "No other living creature," says a recent traveller in the Andes, 'can remove at pleasure so great a distance from the earth, and it seems to fly and respire as easily under the low barometric pressure of 13 inches as at the sea-shore. It can dart in an instant from the dome of Chimborazo to the sultry coast of the Pacific." In walking it trails its wings on the ground, and has an exceedingly awkward gait, but on wing the movements of the condor, as it wheels in majestic circles, are remarkably graceful.' The birds flap their wings on rising from the ground, but after attaining a moderate elevation they seem to sai] on the air, Darwin having watched them for half an hour without once observing a flap of their wings. There is a brown condor, "condor pardo," which naturalists have generally regarded as the young of the "condor negro." Recent investigations have, however, proved it to be a distinct species. It has been named Sarcorhamphus cequatorialis,

~~CONDORCET, Marie Jzan Antoine NIcoLAs Carrrat, MARQUIS DE, was born at Ribemont, in Picardy, on the 17th of September 1743. He descended from an ancient family who took their title from the castle of Condorcet, near Nion, in Dauphiny. He was educated at the Jesuit College in Rheims and at the College of Navarre in Paris, and early displayed the most varicd mental activity. His first public distinctions were gained in the department of mathematics. At the age of sixteen, his performances in analysis elicited high commendation from D'Alembert and Clairaut, and at the age of twenty- two, he composed a treatise on the integral calculus which obtained warm and general approbation from the most competent judges. With his many-sided intellect and richly-endowed emotional nature, however, it was impos- sible for him to be a mere specialist, aud least of all to be a mere mathematician. Philosophy and literature attracted him no less than geometry or the calculus, and social action, work for the public weal, was dearer to him than any form of intellectual exercise. In the year 1769 he was received as a member of the Academy of: Sciences. His contributions to its memoirs are numerous, and many of them are on the most abstruse and difficult mathematical problems. Being of a very genial, susceptible, and enthusiastic disposition, he was the friend of almost all the distinguished men of his time, and a zealous propagator of the religious and political views then current among the literati of France. D'Alembert, Turgot, and Voltaire, for whom he had great affection and veneration, and by whom lie was highly respected and esteemed, contributed largely to the formation of his opinions. His Leltre d'un laboureur de Picardie & M. Necker was written under the inspiration of Turgot, in defence of free internal trade in corn. His Lettre d'un théologien, éc., was attributed to Voltaire, being impregnated throughout with the Voltairian anti-religious spirit, He was induced by D'Alembert to take an active part in the preparation of the Encyclopédie. His Eloges des Académiciens de V Académie Royale des Sciences morts depuis 1666 jusqu'en 1699 (1773) gained him the merited reputation of being an eloquent and graceful writer. He~~

~~jeux de hazard, & la loterie, et aux jugements des hommes, ke,~~

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~~was elected to the perpetual secretaryship of the Academy — of Sciences in 1777, and was received into the French Academy in 1782, 'Three years afterwards he published a work on the application of the mathematical theory of probabilities to judicial decisions. 'This work is admitted to have demonstrated that the calculus had a wider range than had previously been suspected, and to have per. — manently secured for its author a distinguished place in~~

~~the history of the doctrine of probability. A second edition~~

~~of it greatly cnlarged and completely recast and revised~~

~~appeared in 1804, ten years after his death, under the title | of Kléments du calcul des probabilités et son application aux |~~

~~He married, in 1786, a sister of Marshal Grouchy and of Madame Cabanis. His wife, said to have been one of the most beautiful women of her time, is known in literature~~

~~by her excellent translation of Adam Smith's Theory of Moral Sentiments. In 1786 Condorcet published his Vie de Turgot, and in 1787 his Vie de Voltaire. Both works were widely and eagerly read,and are, perhaps, from a merely Iiterary point of view, the best of Condorcet's writings. The political tempest which had been long gathering over France, now began to break and to carry everything beforo it. Condorcet was, of course, at once hurried along by it into the midst of the conflicts and confusion of the Revolu- tion. He greeted with enthusiasm the advent of democracy, and laboured hard to secure and hasten its triumph. He was indefatigable in writing pamphlets, suggesting reforms, and planning constitutions. The first political functions which he exercised were those of a member of the muni- cipality of Paris. He was next chosen by the Parisians to represent them in the Legislative Assembly, and then appointed by that body one of its secretaries. In this capacity he drew up most of its addresses, but seldom ascended the tribune, his pen being a more effective weapon than his tongue. He was the chief author of the address to the European powers when they threatened France with war. He devised likewise a bold and comprehensive scheme for the organization of public instruction, and not only brought it before the Assembly but published an exposition of it in five elaborate memoirs. In the~~

Conven- tion he sat for the department of the Aisne. At the trial of Louis XVI. he voted the king guilty of conspiring against liberty, and worthy of any punishment short of death, but recommended an appeal to the people. He took an active part in the framing of a constitution, which was laid before the Convention in February 1793, with an elaborate prefatory dissertation of Condorcet's composition, but another was introduced, adopted, and decreed, Con- |

dorcet's severe criticism of this latter document, his denunciation of the arrest of the Girondists, and his opposition to the violent conduct of the Mountain, Jed to his being accused of conspiring against the Republic. He was condemned and declared to be horsla loi, Friends sought for him an asylum in the house of a Madame Vernet. Without even requesting to know his name, this truly heroic woman, as soon as she was assured that he was an honest and virtuous man, said, "Let him come, and lose not a moment, for while we talk he may be seized." When the execution of the Giroudists showed him that his presence exposed his protectress to @ terrible danger, he resolved to seek a refuge elsewhere. "Tan outlawed," he said, "and if I am discovered you will meet the same sad end as myself. I must not stay.

Madame Vernet's reply deserves to be immortal, an

should be given in her own words: "La Convention, Monsieur, a le droit de mettre hors la loi: elle n'a pas le pouvoir de mettre hors de 'humanité ; vous resterez.

From that time she had his movements strictly watched lest he should attempt to quit her house, It was partly tu:

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CONDORCET

turn his mind from the idea of attempting this, by oceupy- ing it otherwise, that his wife and some of his friends, with the co-operation of Madame Vernet, prevailed on him to engage in the composition of the work by which he is best known—the Lsquisse d'un tableau historique des progés de Vesprit humain. Certain circumstances having led him to believe that the

~~house of Madame Vernet, 21 Rue Servandoni, was suspected and watched by his enemies, he, by a fatally successful artifice, baffled the vigilance of his generous friend and escaped. Disappointed in finding even a night's shelter at the chateau of one whom he had befriended, he had to hide for three days and nights in the thickets and stone-quarries of Clamart. On the evening of the 7th April 1794—not, as Carlyle says, on a "bleared May morning,"—with garments torn, with wounded leg, with famished looks, he entered a tavern in the village named, and called for an omelette. "How many eggs in your omelette?" "A dozen." 'What is your trade?" "A carpenter." "Carpenters have not hands like these, and do not ask for a dozen eggs in an omelette." When his papers were demanded he had none to show 3; when his person was searched a Horace was found on him. The villagers seized him, bound him, haled him forthwith on bleeding feet towards Bourg-la-Reine ; he fainted by the way, was set on a horse offered in pity by a passing peasant, and, at the journey's end, was cast into the cold damp prison-cell. When the jailers looked in on the morning his body lay dead on the floor. Whether he had died from suffering and exhaustion, from apoplexy, or from poison, is an undetermined question.~~

~~Condorcet held many opinions which comparatively few will be found ready to indorse, but he was undoubtedly a most sincere, generous, and noble-minded man. He was eager in the pursuit of truth, ardent in his love of human good, and ever ready to undertake labour or encounter danger on behalf of the philanthropic plans which his fertile mind contrived and his benevolent heart inspired. He lived at a time when calumny was rife, and various slanders were circulated regarding him, but fortunately the slightest examination proves them to have been inexcus- able fabrications, That while openly opposing royalty he was secretly soliciting the office of tutor to the Dauphin ; that he was accessory to the murder of the Duc de la Rochefoucauld ; or that he sanctioned the burning of the literary treasures of the learned congregations, are stories~~

~~—which can be distinctly shown to be utterly untrue.~~

~~Condorcet's philosophical fame is chiefly associated with~~

~~—the work which he wrote when lying concealéd from the~~

emissaries of Robespierre in the house of Madame Vernet. With the vision of the guillotine before him, with con- fusion and violence around him, he comforted himself by trying to demonstrate that the evils of life had arisen from & conspiracy of priests and rulers against their fellows, and from the bad laws and institutions which they had succeeded

—'Increating, but that the human race would finally conquer its enemies and completely free itself of its evils. HIs) fundamental idea is that of a human perfectibility which has manifested itself in continuous progress in the past, and must lead to indefinite progress in the future. HIe '(presents man as starting from the lowest stage of barbarism, with no Superiority over the other animals Which does not result directly from superiority of bodily — organization, and as advancing uninterruptedly, at a more or less rapid rate, in the path of enlightenment, virtue, and "eppiness. The stages which the human race has already Fae through, or, in other words, the great epochs of ~Alstory, are regarded as nine in number, The first three ; e, confessedly be described only conjecturally from general—observations as to the development of the human faculties, and the analogies of Savage life. In the first epoch, men

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are united into hordes of hunters and fishers, who acknow- ledge in some degree public authority and the claims of family relationship, and who make use of an articulate language. In the second epoch—the pastoral state—property is introduced, and along with it inequality of con- ditions, and even slavery, but also leisure to cultivate intelligence, to invent some of the simpler arts, and to acquire some of the more elementary truths of science, In the third epoch—the agricultural' state—as leisure and wealth are greater, labour better distributed and applied, and the means of communication increased and extended, progress is still more rapid. With the invention of alphabetic writing the conjectural part of history closes, and the more or less authenticated part commences. The fourth and the fifth epochs are represented as correspond- ing to Greece and Rome. The Middle Ages are divided into two epochs, the former of which terminates with the Crusades, and the latter with the invention of printing. The eighth epoch extends from the invention of printing to the revolution in the method of

~~*philosophic thinking accomplished by Descartes. And the ninth epoch begins with that great intellectual revolution, and ends with the great political and moral Revolution of 1789, and is illustrious, according to Condorcet, through the discovery of the true system of the physical universe by Newton, of human nature by Locke and Condillac, and of society by Turgot, Price, and Rousseau. There is an epoch of the future—a tenth epoch,—and the most original part of Condorcet's treatise is that which is devoted to it, After insisting that general laws regulative of the past warrant general inferences as to the future, he argues that the three tendencies which the entire history of the past shows will be characteristic features of the future are :—(1) the destruction of inequality between nations; (2) the destruction of inequality between classes; and (3) the improvement of individuals, the indefinite perfectibility of human nature itself—intellectually, morally, and physically, These propositions have been much misunderstood. The equality to which he represents nations and individuals as tending is not absolute equality, but equality of freedom and of rights. It is that equality which would make the inequality of the natural advantages and faculties of each community and person beneficial to all. Nations and men, he thinks, are equal, if equally free, and are all tending to equality because all tending to freedom. As to indefinite perfectibility, he nowhere denies that progress is conditioned both by the constitution of humanity and the character of its surroundings. But he affirms that these conditions are compatible with endless progress, and that the human mind can assign no fixed limits to its own advancement in knowledge and virtue, or even to the prolongation of bodily life,*~~

~~*The book of Condorcet is pervaded by a spirit of exces- sive hopefulness, and contains numerous errors of detail, which are fully accounted for by the circumstances in which it was written. Its value lies entirely in its general ideas. Its chief defects spring from its author's narrow and fanatical aversion to all philosophy which did not attempt to explain the world exclusively on mechanical and sensational principles, to all religion whatever, and especially to Christianity and Christian institutions, and to monarchy.*~~

~~*Of the two editions of Condorcet's works which have been pub- lished, the earlier is in 21, and the later, to which is prefixed 4 Biographic de*~~

~~Condorcet, by M. Arago, is in 10 volumes. 'There is an able essay on Condorcet in Mr J. Morley's Critical Miscellanies, On Condorcet as an historical philosopher see A. Comte's Cours de Philosophie Positive, iv. 252-253, and Systéme de Politique Positive, iv., Appendice Général, 109-111; Laurent's Hiudes, xii, 121-126 ; Morley's Crit. Misc., 89-110; and Flint's Philosophy of History in France and Germany, i, 125-1388, (R. F.)~~

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~~CONDOTTIERI. The condottieri (Italian, condottzere, captain, from condotta, conduct, condurre, to lead ; Latin, conducere) were leaders of military companies, often numerous enough to constitute a large army, which they used to hire out to carry on the wars of the Italian states. The condottieri played a very important part in Italian history during the 14th and 15th centuries, especially from the middle of the 14th to the middle of the 15th. The explanation of their origin is to be sought in the special circumstances of Italy towards the close of the Middle Ages. The republics and lordships into which the country was divided were incessantly engaged in war, while the arts of peace and luxury were cultivated to such a degree that the military spirit of the people had greatly declined in comparison with the rest of Europe. In many cities, such as Milan, tyrants had begun to supersede the old republican governments, and they found it much safer to engage a mercenary army to fight their battles than to arm their own subjects. Soldiers of foreign armies, which then as afterwards not seldom overran the Italian soil, did not always returu, but often stayed with their feudal leaders, and lived at free quarters. Montreal d'Albarno, a gentleman of the Provence, was the first to give a definite form to these lawless bands. A severe discipline and an elaborate organization were introduced within the company itself, while in their relatious to the people the most barbaric licence was permitted. Montreal himself was put to death at Rome by Cola di Rienza, and Count Lando succeeded to the command. The Grand Company, as it was called, soon numbered about 7000 cavalry and 1500 select infantry, and was for some years the terror of Italy. They seem to have been Germans chiefly. On the conclu- sion (1360) of the peace of Bretigny between England and France, Sir John Hawkwood, an able general, led an army of English mercenaries, called the White Company, into Italy, which, in the service of Pisa, and afterwards of Florence, took a~~

~~prominent part in the confused intermin- able wars of the next thirty years. 'Towards the end of the century the Italians began to organize armies of the same description, the first of importance being the company of St George, originated by Alberigo, count of Barbiano. The defeat of the German emperor, Rupert, by the great con- dottiere, Jacopo del Verme, due to the superior equipment aud organization of the Italian army, taught the northern barbarians to respect the skill of the south. Shortly after, the organization of these mercenary armies was carried to the highest perfection by Sforza Attendolo, condottiere in the service of Naples, who had been a peasant of thie Romagna, and by his rival Braccio di Montone in the service of Florence. 'The army and the renown of Sforza were inherited by his son Francesco Sforza, who married a natural daughter of one of the Visconti of Milan, conducted the wars of that city against Venice, and eventually became duke of Milan (1450), which his family continued to rule for some generations. Less fortunate was another great coudottiere, Carmagnola, who first served one of the Visconti, and then conducted the wars of Venice against his former masters, but at last awoke the suspicion of the Venetian oligarchy, and was put to death before the palace of St Mark (1432). Towards the end of the 15th century, when the large cities had gradually swallowed up the small states, and Italy itself was drawn into the general current of European politics, and became the battle-field of powerful armies,—French, Spanish, and German,—the condottieri disappeared. The soldiers of the condottieri were almost entirely cavalry, aud were clad in armour from head to foot. Not being connected with the people among whom they fought by any of the ordinary ties of humanity, and given up to all the licence of the worst profession in the world, they were a dreadful scourge wherever they went.~~

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~~They were always ready to change sides at the prospect of higher pay. And as they were connected with each other by the interest of a common profession, and the possibili:~~

~~that the enemy of to-day might be the friend and fellow. . soldier of to-morrow, their battles were often as bloodless~~

as they were theatrical. Splendidly equipped armies of | several thousand strong were known to fight for several hours with hardly the loss of a man. (See Symonds's Re. naissance in Italy: the Age of the Despots, ch. ii.) .

CONECTE, Tuomas, a French Carmelite monk and preacher, was born at Rennes. He travelled through Flanders and Picardy, denouncing the vices of the cler and the extravagant dress of the women, especially their lofty head-dresses, or hennins. He ventured to teach that he who is a true servant of God need fear no Papal curse that the Roman hierarchy is corrupt, and that marriage is permissible to the clergy, of whom only some have the gift of continence. He was listened to by immense con gregations; and it is said that one of the means he employed to maintain his reputation asa preacher was never allowing himself to be seen in private. From Flanders, where his sumptuary reform disappeared with his departure, he passed to Italy, and, despite the opposition of Nicolas Kenton, provincial of the Carnielites, he introduced several changes into the rules of that order. But at length he was seized by order of the Pope, condemned, and burnt for — heresy (1434).

CONEGLIANO, a town of Italy, in the province of Tre- | viso, on the River Mutega, with a station on the railway from Venice to Trieste, about 36 miles north of the former city,

It is commanded by a large castle on a neighbouring height, and it possesses a cathedral, two conventual buildings, a number of benevolent institutions, and a triumphal arch erected in honour of the Emperor Francis I. of Austria, Several of the private houses were adorned with frescoes by Pordenone ; and the cathedral and the church of 8. Fiore) preserve the handiwork of Cima da Conegliano, an eminent artist born in the town. Marshal Mouucey bore the title of duke of Conegliano. Population about 6000. \

CONFARREATIO, a ceremony observed among the — ancient Romans at the nuptials of those persons more par- ; ticularly whose children were destined to be vestal virgins or flamines diales. Confarreatio was the most solemn of the three forms of marriage, but in later times the cere- : mony fell into disuse, and Cicero mentions but two, namely, coemptio and usus. The name is said to have originated in the bride and bridegroom sharing a cake of salted wheaten bread (far or pants farreus), in the pre | sence of the

pontifea maximus, or flamen dialis, who per- | formed the ceremony. 'his form of marriage could only | be dissolved by another equally solemn ceremony, Which was called disfarreatio. The names patrimi and matrim were applied to children sprung from this kind of mar- | riage. :

CONFECTIONERY, a term of rather vague application, but which may be held to embrace all preparations which have sugar for their basis or principal ingredient. Tn this way it may be said to include the preservation of fruits by means of sugar, the manufacture of jams and. jellies, the art of preparing fruit-syrups and pastes, ices, and sweetened beverages, in addition to the various manufactures 1 which sugar is the more prominent and principal ingredient. The variety of the preparations thus indicated is unlimited; and we can here but notice the branches of the manufac ture of sugar preparations, such as lozenges, comfits, &., which now constitute an extensive industry.

The simplest form in which sugar is prepared as 8 Ae for eating is that of lozenges. 'These are simply refine sugar ground to a very fine powder, mixed with dissolY gum, and flavoured with essential oil or other ingredients.

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The appliances for making lozenges on the large scale, and the processes through wluch the materials pass, are in many The fine

respects similar to those used in biscuit baking. loaf sugar is ground to an impalpable powder between a pair

of millstones, after which it is mixed with dissolved gum arabic sufficient to form a very stiff dough, and the whole is thoroughly incorporated in a mechanical mixer similar The

to Vicker's dough-mixing machine (see Baxrna.) doughy mass is then rendered homogeneous and reduced to a uniform cake by repeatedly

passing pieces backward and forward between a pair of heavy metal rollers, the sur-

faces being kept from adhering by being dusted with starch

flour. The cake, when sufficiently spread out, is transferred

toa piece of tough web paper, and passed by an intermit-

jacket or double casing,

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tent motion under a frame of cutters of the size and form of.the lozenges to be formed. These punch out and take up the lozenges, and when the tube of the cutters is well filled, the whole frame is turned over, and the cut out lozenges emptied into a tray. The scrap passes along on the web, and is again rolled out into cakes with the paste from the mixer. Nothing further is done with the lozenges than allowing them to dry and hardeu on trays in racks in a heated apartment. Lozenges are coloured and flavoured with a great variety of ingredients, which are added in proper proportions with the dissolved gum. Medicated lozenges of many kinds are in extensive use, the various medicinal ingredients being similarly incorporated with the gum,

Hard confections, or com/its, constitute the secoud leading variety of confectionery. To make these a core or centre of some kind is required, and this may consist either of a seed or fruit, as a coriander or an almond 3 or it may be a small lozenge, as in the case of pan drops. Around such a core are deposited successive layers of sugar, and there is uo limit to the size to which such comfits may be made. The cores are placed in large copper pans or vessels, which are geared to revolve at an inclined angle, so that by their

revolution their contents keep constantly in motion,

tumbling over each other, The copper pans are revolved by steam or other power, and they are kept hot by a steam into which steam is admitted through the centre on which the pans revolve. A pure strained syrup of sugar is prepared, a quantity of which is periodically applied to the

contents of the pan as they appear to get dry, and after receiving a certain coating, the comfits in progress of manufacture are removed to dry and harden for some time. The comfits thus receive alternate coatings in the pan and dryings till they attain the size wanted, when they are finished with a coating of thin syrup, which may be coloured if required, and long continued friction in the pan. After hardening in a drying apartment these comfits are ready for use. A great variety of seeds and fruits are used as cores, the principal of which are almonds, caraways, corianders, cloves, cassia, pistachios, and perfumed cherry kernels.

Many forms of confection are prepared from solutions of sugar, which are boiled up to the point of crystallization. Of these ordinary sugar-cand) , or crystallized sugar, may be taken as the type. It is prepared from solutions of either brown or refined Sugar, to the latter of which cochi- neal or some other colouring ingredient is frequently added, These solutions, when boiled to a proper degree, are poured into moulds across which at sufficient intervals are stretched Pieces of string. The sugar gradually crystallizes from its mee on the sides of the mould and on the string,—it BOP od jag ameaittine kept in an apartment heated from a oa Fahr, When sufficiently deposited, the

maining liquor is drained off, and the crystals removed and dried in a high uniform heat, Fondants, in the pre- |Paration of which the French confectioners excel, are made

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from solutions boiled to the point of crystallization, properly coloured and flavoured, and cast jiato moulds made of starch. Sugar drops are made from fine sugar mixed with a small proportion of water and colouring and flavouring material as desired. The mixture is dissolved by heat without allowing it to boil, and it is then poured in separate drops on a sheet of paper, on which they quickly set and harden.

~~What is termed boiled sugar, that is sugar which has been boiled till, on cooling and hardening, it assumes a glassy appearance and fracture, is the basis of another ex- tensive variety of confectionery. Of this class barley sugar is the type and simplest example. It merely consists of sugar boiled as above indicated, flavoured with a little oil of lemon, poured on a marble.slab, cut into strips, and rolled or twisted into sticks, Boiled Sugar is prepared in innumerable fanciful forms by passing it, while still in a viscous condition, through small machines in which pairs of brass rollers, having patterns sunk in their surface, stamp these patterns in the plastic material, It is also worked up into the form of balls, plaited into coils, and formed into party-coloured stalks, &c. By vigorous and loug-continued drawing out of boiled sugar, while it is in a plastic condi- tion, the molecular structure of the material is changed, and from being glassy and transparent it becomes opaque, porous, and granular in appearance. In this way the pre- paration known as rock is manufactured. Various prepara- tions of chocolate are largely used as confectionery (see CHocoLatTr).~~

~~CONFESSION is a verbal acknowledgment of sin. Among the Jews it was the custom, on the annual feast of expiation, for the high priest to make confession of sins to God in the name of the whole people. Besides this general confession, the Jews were enjoined, as a first principle of their religion, to confess their sins individually to God. Herein, indeed, lay one marked and leading feature of difference between their creed and that of the heathen around them. The Jew was taught to regard his Maker as a merciful God, who forgives sin (Mic. vii, 18, 19; Isa. lvii. 16-19). While, however, the contrite heart was insisted on as the all-important element on man's part, outward signs of humiliation were valued as tokens aud manifestations of the inward sentiment, as is seen in such cases as those of David, Ahab, and the captives who returned from Babylon (2 Sam. xii. 16; 1 Kings xxii, 27; Neh. ix, 2, 3). Such conduct implied admission of wrong- doing before man as well as before heaven. In some cases, as in that of Achan (Josh. vii. 19), acknowledgment before man wasdemanded. In others, as-in those involving sin or trespass offerings, some degree of acknowledgment to the priest seems to be implied (Lev. iv. v.). Restitution of things stolen, and general reparation for injustice were also enjoined (Ezek. xxxiii. 15, &c.) as evidences of sincerity.~~

~~In the Christian church public offenders were from an early period put to open penance. We find St Paul en-~~

~~joining this, but subsequently interceding that the offender~~

~~be not dealt with too severely (1 Cor. v.2; 2 Cor. ii. 6, 7). The growth of private (or auricular) confession is more diffi- cult to trace. Even those who would be most inclined to represent it as primitive admit that for the first three centuries little or no mention is made of any such practice; and though they would fain attribute such silence to per- secution, or to the reserve known as the disciplina arcant, they seem inclined to admit that private confession was a development, and grew up gradually. Passages from the fathers, such as St Cyprian, St Basil, St Gregory of Nyssa, and others, recommending the practice, have to be confronted with the small prominence given to it in the works of St Augustine and the strong declarations of St Chrysostom on the sufficiency of ee to God. But — «636~~

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~~confessor—say of the king of Spain—means, of coume that he is the person to whom that sovereign confesses : but the term found simply after a name, as "St Leonard. confessor," means that the person so designated underwent more or less of suffering on behalf of the Christian faith though he may not have been an actual martyr, 'This latter sense is the usual one in ancient writers, In like manner the term confessional, which is now common~~

~~the practice gradually became more common, especially in the West, and more a matter of rule and precept; until at length, in the fourth Lateran Council, held under Pope Innocent ILL, in 1215, it was enjoined upon all members of the Church of Rome once a year, by the famous 21st canon, beginning with the words, Omnis utriusque sexus fidelis, The medieval church of.the West fixed the number of sacraments as seven, and insisted on auricular confession as an essential part of the sacrament of penance. Confes- sion and absolution was reserved for the priesthood. Yet a certain recognition of a quasi-priestly power, residing in the church at large, and in some sense therefore in the laity, appears in the Roman office-books, and we find laymen, in cases of extreme emergency, confessing and absolving each other. (An instance occurs in one of the earliest and~~

most admirable of French biographies, Joinville's Life of

St Louis.) Russia appears now to be the country where, at least in theory, confession is most insisted upon as a certificate of annual confession (often, it is said, purchased) is a condition of being a witness in court.

At the Reformation the reformed communities were unanimous in rejecting enforced auricular confession, but itis a mistake to suppose that they were equally unanimous in reprobating its use in cases where it was souglit by the free choiceof penitents. The Augsburg Confession (part i. art. 11) retains it, and Melanchthon asserts that many frequently availed themselves of it. Luther did not even deny its claim to a sacramental character; nor has it ever died out among the Lutherans. But the sacramental character is denied by Calvin and the Calvinistic churches generally. Peter Martyr, Chamier, and others seem to identify absolution with the preaching of God's Word. Nevertheless absolution still retained, for a long time, a disciplinarian character even among these bodies. Thus we find the Scottish ministers offering absolution to the marquis of Montrose before his execution at Edinburgh on May 21, 1650; and his refusal seems, according to the historian Burton, to have influenced his enemies in the matter of the sepulture granted to his remains. Private

confession also finds a place in the English prayer-book and –

homilies. Before the Revolution of 1688 it was so far common that we find Bishop Burnet, in his History of His Own Times, naming this or that clergyman as confessor in the family of such and such a nobleman. To divulge anything thus confided is as strictly forbidden in the reformed English as in the medizval or modern Roman church, though an exception is made in the English canons in the case of such crimes as might endanger the life of the recipient of the confession by making him an accessory in the eye of the law.

The connection of confession with casuistry and with the morality of nations, cannot be discussed here. As regards casuistry, it must suffice to allude to the great name of Pascal, and the controversy arising out of his celebrated Lettres Provinciales. The question of its effect on morality is still more complex and difficult to estimate. As a rule, we may expect to find its

~~influence well spoken of by Roman Catholics and the reverse in the opposite camps; nevertheless, some Protestant writers, as Hallam, and perhaps Sismondi, appear to view it with a certain amount of tolerance and even favour, while some Roman Catholic writers (¢.g., Vitellaschi, under the pseudonym Pomponio Leto), on the contrary, seem inclined to censure at any rate its extreme devclopment in the form of direction, as injurious to proper self-reliance and independence of character.~~

~~It remains to add, that the terms confessor and con- fessional are used by ecclesiastical writers in very distinct senses, which can only be judged of by the context in which they are found. The statement that a given priest is the~~

~~originally, in Christian antiquity, the place where a martyr had been buried. It was subsequently applied to a tomb built over a spot thus hallowed either in the crypt or jn the upper part of a church.~~

~~-in such works as Klee's Doymatik and History of Dogmas (Mayence,~~

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~~employed to signify the structure placed in Roman Catholic churches for the purpose of hearing confessions, meant~~

~~The authorities on the subject embrace, as has been seen, acts of councils, confessions of faith, andan abundance of controversial works The foreign Reformers—Luther, Melanchthon, Calvin, Zwingli—have all touched upon it in their writings. Among Anglican works may be named Jewell's Apology, and Marshall's Penitential Discipline of the Early Church (republished in the Anglo-Catholic Library, 1844), and various modern Catcnc of authorities, as Gray's Statement on Confession. 'The Roman Catholic view is set forth~~

~~1834, 1838), and Martigny's Dictionnaire des antiquités chréviennes, Paris, 1865. The subject is a prominent one in the Acts of the Council of Trent, and for the fourth Lateran Council the student may refer to Labbé's Concilia (tom. vii., Paris, 1714), (J. GC.)~~

CONFIRMATION, an ecclesiastical term denoting the laying on of hands, in the admission of baptized persons to the enjoyment of full Christian privileges. The antiquity of this ceremony is, by all the older writers, carried as high as the apostles, and founded upon their example and practice. In the primitive church the ceremony was performed immediately after baptism, if the bishop were present at the solemnity. Among the Greeks, and through. out the East, it still accompanies baptism; but the Roman Catholics make it a distinct and independent sacrament. Seven years is the stated but not the uni- form age for confirmation. The view put forth in the English prayer-book is, that the person confirmed releases his godfather and godmother, by taking upon himself the baptismal vows in their place,—an aspect of the matter not apparently recognized in the ancient church, which regarded it almost exclusively as a means of grace and a prepara tion for the reception of the Holy Communion.—This ordinance is usually reserved for the bishop only. It has, however, always been a moot point, whether he may not delegate a presbyter to perform it for him, Such delega- tion is not uncommon in the Eastern Churches, but is practically unknown in the West. The Calvinists (in com- mon with most non-episcopal communities) have always rejected confirmation.

CONFUCIUS, the famous sage of China (550 or 5d1- 478 Bc.) They are very few among all the millions of the Chinese people who would not heartily repeat the lines with which the first paragraph in a popular history of the sage concludes :—

‘Confucius ! Confucius! How great was Confucius! Before him there was no Confucius, Since him there has been no other. Confucius ! Confucius ! How great was Confucius!”

The man whose memory is thus cherished by @ third portion of the human race, and the stamp of whose character and teachings is still impressed, after so long time, on the institutions of his country, demands ste 4 careful study. In order to understand the events of his OF life and the influence of his opinions, we must endeavour to get some impression of the China that existed 1n IS con time, in the 5th and 6th centuries before our Christian

The dynasty of Chow, the third which within histori¢ time had ruled the country, lasting from 1122 to 266 BO had passed its zenith, and its kings no

~~longer held tho~~

~~sceptre with a firm grasp. the territory under their sway extended over all the eighteen provinces which mow constitute what is called " Chma~~

~~It must uot be supposed that~~

~~proper." It was not a sixth part of the present enrpire. On the south it hardly reached half-way from the Ho, or Yellow River, to the Kiang, or Yang-tze. Cheh-kiang, Kiang-si, Hu-nan, Ful-kien, Kwang-tung, Kwang-si, Kwei-chow, and the great provinces of Yun-nan, Sze-ch'uen, and Kan-suh on the west, were thinly peopled by barbarous tribes which acknowledged no subjection to " the Middle State." Ho-nan and Shan-si, with portions of Shen-si, Chih-li, Shan-tung, Gan-hwui, Kiang-su, and Hu-pih, were all which formed the dominions of Chow. Tor thirteen years of his life Confucius wandered about from state to state, seeking rest and patrons ; but his journeyings were confined within the modern provinces of Ho-nan and Shan- tung, and the borders of Chih-li and Hu-pih, Many Europeans now living have travelled over much more of China than he did. The fact helps us to realize the relation of Confucius to his age, and it shows us that he gained his high position through his own unaided powers and the influences of his native country. It has never been hinted, as in the case of his contemporary, the founder of Taoism, that he learned anything from abroad.~~

~~Within this China of the Chow dynasty there might be a population, in Confucius's time, of from 10,000,000 to 15,000,000. We read frequently, in the classical books, of the "ten thousand states," in which the people were distributed ; but that is merely a grand exaggeration. In what has been called, though erroneously, as we shall see, Confucius's History of his own Times, we find only 13 states of note, aud the number of all the states, large and small, which can be brought together from it, and the much more extensive supplement to it by Tso K'iu-ming, not much posterior to the sage, is under 150.~~

~~Chow was a feudal kingdom. The lords of the different territories belonged to five orders of nobility, corresponding closely to the dukes, marquises,~~

earls, counts, and barons of feudal Europe. The theory of the constitution required that the princes, on every fresh succession, should receive investiture from the king, and thereafter appear at his court at stated times. 'They paid to him annually certain specified tributes, and might be called out with their military levies at any time in his service. A feudal kingdom was sure to be a prey to disorder unless there were energy and ability in the character and adininistration of the sovereign ; and Confucius has sketched, in the work referred to above, the Annals of Lu, his native state, for 242 years, from 722 to 481 n.c., which might almost be summed up in the words: "In those days there was no king in China, and every prince did what was right in his own eyes." In 770 B.c. a northern horde had plundered the capital, which was then in the present department of Si-gan, Shen-si, and killed the king, whose son withdrew across the Ho and established himself in a new centre, near the present city of Loh-yang in Ho-nan ; but froin that time the prestige of Chow was gone. Its representa- tives continned for four centuries and a half with the title of king, but they were less powerful than several of their feudatories, The Annals of Lu, cularged by Tso K4u- ming so as to embrace the history of the kingdom generally, are as full of life and interest as the pages of Froissart. Feats of arms, great battles, heroic virtues, devoted friend- ships, and atrocious crimes make the chronicles of China in the 5th, 6th, and 7th centuries before the birth of Christ as attractive as those of France and England in the 14th and some other centuries after it. There was in China in the former period more of literary culture and of many arts of civilization than there was in Europe in the latter. Not only the royal court, but every feudal court,

had its historiographers and musicians. educational character abounded.

suffering and degeneracy.

Institutions of an There were ancient his- tories and poeins, and codes of laws, and books of ceremonies. Yet the period was one of wide-spread and ever-increasing While the general government was feeble, disorgauization was at work in each particular

~~state.~~

~~But three things must be kept in mind when we compare~~

~~feudal China with feudal Europe,—three elements which~~

~~wrought to give to the former peculiarities of character for which our better acquaintance with the latter will not have prepared us. First, we must take into account the~~

~~long duration of the time through which the central authority was devoid of vigour. state was left to contend with state, and clan with clan in the several states.~~

~~For about five centuries~~

~~The result was chronic misrule, and misery to the masses of the people, with frequent famines. Secondly, we must take into account the imstitution of poly- gamy, With the low status assigned to woman, and the many restraints put upon her. In the ancient poems, indeed, there are a few pieces which are true love songs, and ex- press a high appreciation of the virtue of their subjects ; but there are many more which tell a different tale. The intrigues, quarrels, murders, and grossnesses that grew out of this social condition it is difficult to conceive, and would be impossible to detail. Thirdly, we must take into account the absence of strong and definite religious beliefs, properly so called, which has always been a characteristic of the Chinese people. We are little troubled, of course, with heresies, and are not shocked by the outbreaks of theologi- cal zeal ; but where thought as well as action does not reach beyond the limits of earth and time, we do not find man in his best estate. We miss the graces and consola- tions of faith; we have human efforts and ambitions, but they are unimpregnated with divine impulses and heavenly aspirings.~~

~~Confucius appeared, according to Mencius, one of his most distinguished followers (371-288 n.c.), at a crisis in the nation's history. " The world," he says, " had fallen into decay, and right principles had disappeared. Perverse discourses and oppressive deeds were waxen rife. Ministers~~

murdered their rulers, and sous their fathers. Confucius was frightened by what he saw,—and he undertook the work of reformation."

The sage was born, according to the historian Sze-ma History of 'Ts'in, in the year 550 B.c.; according to Kung-yang and. his life. Kuh-liang, two earlier commentators on his Annals of In, in 551; butall three agree in the month and day assigned to his birth, which took place in winter. His clan name was K'ung, and it need hardly be stated that Confucius is merely the Latinized form of K'ung Fu-tze, meaning " the philosopher or master K'ung." He was a native of the state of Lu, a part of the modern Shan-tung, embracing the present department of Yen-chow and other portions of the province. Lu had a great name among the other states of Chow, its marquises being descended from the duke of Chow, the legislator and consolidator of the dynasty which had been founded by his father and brother, the famous kings Wain aud Wu. Confucius's own ancestry is traced up, through the sovereigns of the previous dynasty of Shang, to Hwang-ti, whose figure looms out through the mists of fable in prehistoric times. A scion of the house of Shang, the surname of which was ze, was invested by King Wu with the dukedom of Sung in the present provinee of Ho. nan. There, in the Tze line, towards the end of the 8th century B.c., we find a K'ung Kia, whose posterity, accord- ing to the rules for the dropping of surnames, became the K'ung clan. He was a high officer of loyalty and probity, and unfortunately for himself had a wife of extraordinary beauty. Hwa Tuh, another high officer of the duchy, that

Grief for loss of his mother.

CONFUCIUS

complete this work. They were long in rejoining him, and had then to tell him that they had been detained by q heavy fall of rain, which threw down the first product of their labour. He burst into tears, and exclaimed, " Ah ! they did not raise mounds over their graves in antiquity," Tis affection for the memory of his mother and dissatis. faction with his own innovation on ancient customs thus blended together ; and we can sympathize with his tears, For the regular period of 27 months, commonly spoken of as three years, he observed all the rules of mouming, When they were over he allowed five more days to elapse before he would take his lute, of which he

had been de. votedly fond, in his hands. He played, but when he tried to sing to the accompaniment of the instrument, his feel- ings overcame him.

For some years after this our information about Con. fucius is scanty. Hints, indeed, occur of his devotion to the study of music and of ancient history; and we can perceive that his character was more and more appreciated by the principal men of Lu. He had passed his thirtieth year when, as he tells us, "he stood firm" in his. convic- tions on all the subjects to the learniug of which he had bent his mind fifteen years before. In 517 Bc. two scions of one of the principal houses in Lu joined the company of his disciples in consequence of the dying command of its

he might get this lady into his possession, brought about the death of K'ung Kia, and was carrying his prize in a carriage to his own palace, when she strangled herself on the way. The K'ung family, however, became reduced, and by-and-by its chief representative moved from Sung to Lu, where in the early part of the 6th century we meet with Shubh-liang Heih, the father of Confucius, as command- ant of the district of Tsow, and an officer renowned for his feats of strength and daring.

There was thus no grander lineage in China than that of Confucius ; and on all his progenitors, since the throne of Shang passed from their line, wi

with perhaps one exception, he could look back with complacency. He was the son of Heih's old age. 'That officer, when over seventy years, and having already nine daughters and one son, because that son was a cripple, sought an alliance with a gentleman of the Yen clan, who had three daughters. The father sub- mitted to them Heih's application, saying that, though he was old and austere, he was of most illustrious descent, and they need have no misgivings about him. Ching-tsai, the youngest of the three, observed that it was for their father to decide in the case. ' You shall marry him then," said the father, and accordingly she became the bride of the old man, and in the next year the mother of the sage. It is

one of the undesigned coincidences which confirm the credibility of Confucius's history, that his favourite disciple was a scion of the Yen clan.

Heih died in the child's third year, leaving his family in straitened circumstances. Long afterwards, when Confucius was complimented on his acquaintance with many arts, he accounted for it on the ground of the poverty of his youth, which obliged him to acquire a knowledge of matters belonging to a mean condition. When he was five or six, people took notice of his fondness for playing with his companions at setting out sacrifices, and at postures of ceremony. He tells us himself that at fifteen his mind was set on learning ; and at nineteen, according to the ancient and modern practice in China, in regard to early unions, he was married,—his wife being from his ancestral state of Sung. A son, the only one, so far as we know, that he ever had, was born in the following year; but he had subsequently two daughters. Immediately after his mar- riage we find him employed under the chief of the Ki clan to whose jurisdiction the district of Tsow belonged, first as keeper of stores, and then as superintendent of parks and herds. Mencius says that he undertook such mean offices because of his poverty, and distinguished himself by the efficiency with which he discharged them, without any attempt to become rich.

In his twenty-second year Confucius commenced his labours asa teacher. He did so at first, probably, in a humble way; but a school, not of boys to be taught the elements of learning, but of young and inquiring spirits who wished to be instructed in the principles of right con- duct and government, gradually gathered round him. He accepted the substantial aid of his disciples ; but he rejected none who could give him even the smallest fee, and he would retain none who did not show earnestness and capa- city. '" When I have presented," he said, "' one corner of a subject, and the pupil cannot of himself make out the other three, I do not repeat my lesson."

Two years after, his mother died, and he buried her in the same grave with his father. Some idea of what his future life was likely to be was already present to his mind. Tt was not the custom of antiquity to raise any tumulus over graves, but Confucius resolved to innovate in thie matter. He would be travelling, he said, to all quarters of the kingdom, and must therefore have a mound by which to recognize his parents' resting-place. He returned home from the interment alone, having left his disciples to

~~chief; and being furnished with the means by the marquis of the state, he made a visit with them to the capital of the kingdom. library, highest style at the court. ma Ts'in, he had several interviews with Lao-tze, the father of Taoism. latter, a transcendental dreamer, appears to have thought little of his visitor, while Confucius, an inquiring thinker,~~

~~There he examined the treasures of the royal and studied the music which was found in its There, too, according to Sze-~~

~~It is characteristic of the two men, that the~~

~~was profoundly impressed with him.~~

~~On his return to Lu, in the same year, that state fell into great disorder. The marquis was worsted in a struggle with his ministers, and fled to the neighbouring state of Ts, Thither also went Confucius, for he would not countenance by his presence the men who had driven their ruler away. He was accompanied by many of his disciples ; and as they passed by the T'ai Mountain, an incident occurred, which may be narrated as a specimen of the way in which he communicated to them his lessons. The attention of the travellers was arrested by a woman weeping and wailing ata grave, The sage stopped, and sent one of his followers to ask the reason of her grief, " My husband's father" said she, "was killed here by a tiger, and my huskand also, and now my son has met the same fate." Being asked why she did not leave so fatal a spot, she replied that there was there no oppressive govern: ment. '" Remember this," said Confucius to his disciples, "remember this, my children, oppressive government '8 fiercer and more feared than a tiger."~~

~~He did not find in Ts'i a home to his liking. The~~

~~marquis of the state was puzzled how to treat him. The~~

~~teacher was not a man of rank, and yet the prince felt that he ought to give him more honour than rank could claist Some counsellors of the court spoke of him as " impractil¢- able and conceited, with a thousand peculiarities." It was proposed to assign to him a considerable revenue, but he would not accept it while his counsels were not follow Dissatisfactions~~

ensued, and he went back to Lu. ; There for fifteen more years he continued in private i prosecuting his studies, and receiving many acc his disciples. He had a difficult part to play with te. different parties in the state, but he adroitly aloof from them all; and at he was made chief magistrate of the city of Chung ! t00 ! marvellous reformation, we are told, forthw

a a Ss

kept himsel. r last, in his fifty-second yea, ai

ith ensued |

CORPFUCIUS

the manners of the people , and the marquis, a younger brother of the one that fled to Ts“ and died there, called him to higher office. He was finally appointed minister of crime, —and there was an end of crime. Two of his disciples at the same time obtained influential positions in the two most powerful clans of the state, and co-operated with him. He signalized his vigour by the punishment of a great officer and in negotiations with the state of Ts‘i. He laboured to restore to the marquis his proper authority, and as an important step to that end, to dismantle the fortified cities where the great chiefs of clans maintained themselves like the barons of feudal Europe. Fora couple of years he seemed to be master of the situation. ‘He strengthened the ruler,” it is said, “and repressed the barons. A transforming government went abroad. Dis- honesty and dissoluteness lid their heads. Loyalty and good faith became the characteristics of the men, and chastity and docility those of the women. He was the idol of the people, and flew in songs through their mouths.” Tho sky of bright promise was soon overcast. The marquis of Ts and his advisers saw that if Confucius were allowed to prosecute his course, the influence of Lu would become supreme throughout the kingdom, and Ts‘i would be the first to suffer. A large company of beautiful women, trained in music and dancing, and a troop of fine horses, were sentto Lu. The bait took ; the women were welcomed, and the sage was neglected. ‘The marquis forgot the lessons

of the master, and yielded supinely to the fascinations of

the harem. Confucius felt that he must leave the state.

The neglect of the marquis to send round, according to

rule, among the ministers portions of the flesh after a great sacrifice, furnished a plausible reason for leaving the court.

He withdrew, though very unwillingly and slowly, hoping

that a change would come over the marquis and his counsellors, and a message of recall be sent to him. But no such message came ; and he went forth in his fifty-sixth year to a weary period of wandering among various states, It may be well to pause here in the sketch of his life, and

consider what his object and hope had been. Adisciple once asked him what he would consider the first thing to be done, if intrusted with the government of a state. His reply was, "The rectification of names," When told that such a thing was wide of the mark, he held to it, and indeed his whole social and political system was wrapped up in the saying. He had told the marquis of Ts4 that good government obtained when the ruler was ruler, and the minister minister ; when the father was father, and the son son. Society, he considered, was an ordinance of heaven, and was made up of five relationships, — ruler and subject, husband and wife, father and son, elder brothers and younger, and friends. There was rule on the one side of the first four, and submission on the other. The tule should be in righteousness and benevolence ; the submission in righteousness and sincerity. Between friends the mutual promotion of virtue should be the guiding principle. It was true that the duties of the several relations were being continually violated by the passions of men, and the social state had become an anarchy. But Confucius had confidence in the preponderating goodness of human nature, and in the power of example in superiors. h ot more surely," he said, "does the grass bend before the wind than the masses yield to the will of those above wat Given the model ruler, and the model people would orthwith appear. And he himself could make the model ruler, He could tell the princes of the states what they ought: to be ; and he could point them to examples of oom. virtue in former times, — to the sage founders of ta a dynasty ; to the sage Tang, who had founded eon sper

dynasty of Shang 3 to the sage Yu, who first *stabiished a hereditary kingdom in China; and to the

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greater sages still who lived in a more distant golden age. With his own lessons and those patterns, any ruler of his day, who would listen to him, might reform and renovate his own state, and his influence would break forth beyond its limits till the face of the whole kingdom should be filled with a multitudinous relation-keeping, well-fed, happy people. "If any ruler," he once said, "would submit to me as his director for twelve months, I should accomplish something considerable ; and in three years I should attain the realization of my hopes." Such were the ideas, the dreams of Confucius. But he had not been able to get the ruler of his native state to listen to him. HIs sage counsels had melted away before the glance of beauty and the pomps of life.

HIs professed disciples amounted to 3000, and among HIs dis- them were between 70 and 80 whom he described ciples. as "scholars of extraordinary ability." The most at- tached of them were seldom long away from him. They stood or sat reverently by his side, watched the minutest particulars of his conduct, studied under his direction the ancient history, poetry, and rites of their country, and treasured up every syllable which dropped from his lips. They have told us how he never shot at a bird perching nor fished with a net, the creatures not having in such a case a fair chance for their lives ; how he conducted himself in court and among villagers ; how he ate his food, and lay in his bed, and sat in his carriage ; how he rose up before the old man and the mourner; how he changed countenance when it thundered, and when he saw a grand display of viands at a feast. HIe was free and unreserved in his intercourse with them, and was hurt once when they seemed to think that he kept back some of his doctrines from them. Several of them were men of mark among the statesmen of the time, and it is the highest testimony to the character of Confucius that he inspired them with feelings of admiration and reverence. It was they who set the example of speaking of him as the greatest of mortal men; it was they who struck the first notes of that pean which has gone on resounding to the present day.

~~Confucius was, it has been seen, in his fifty-sixth year when he left Lu; and thirteen years elapsed ere he returned to it. In this period were comprised his travels among the different states, when he hoped, and ever hoped in vain, to meet with some prince who would accept him as his counsellor, and initiate a government that should become the centre of an universal reformation. Several of the princes were willing to entertain and support him ; but for all that he could say, they would not change their ways.~~

~~His first refuge was in Wei, a part of the present Ho-nan, His wan- the marquis of which received him kindly;; but he was a derings. weak man, ruled by his wife, a woman notorious for her accomplishments and wickedness. In attempting to pass from Wei to another state, Confucius was set upon by a mob, which mistook him for an officer who had made himself hated by his oppressive deeds. He himself was perfectly calm amid the danger, though his followers were filled with alarm. They were obliged, however, to retrace their way to Wei, and he had there to appear before the marchioness, who wished to see how a sage looked. There was a screen between them at the interview, such as the present regent-empresses of China use in giving audience to their ministers ; but Tze-lu, one of his principal disciples, was indignant that the master should have demeaned him- self to be near such a woman, and to pacify him Confucius swore an oath appealing to Heaven to reject him if he had acted improperly. Soon afterwards he left the state.~~

~~Twice again, during his protracted wanderings, he was~~

~~placed in imminent peril, but he manifested the same fear- lessness, and expressed his confidence in the protection of Heaven till his course should be run. On one of the~~

~~His death.~~

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~~occasions he and his company were in danger of perishing from want, and the courage of even Tze-lu gave way. 'Has the superior man, indeed, to endure in this way 1" he asked. "The superior man may have to endure~~

~~*want," was the reply, "but he is still the superior man. The small man in the same circumstances loses his self-com- mand."*~~

~~*While travelling about, Confucius repeatedly came across recluses,—a class of men who had retired from the world in disgust. That there was such a class gives us a striking glimpse into the character of the age. Scholarly, and of good principles, they had given up the conflict with the vices and disorder that prevailed. But they did not understand the sage, and felt a euntempt for him strug- gling on against the tide, and always hoping against hope. We get a fine idea of him from his encounters with them. Once he was looking about for a ford, and sent Tze-lu to ask a man who was at work in a neighbonring field where it was, The man was a recluse, and having found that his questioner was a disciple of Confucius, he said to him: " Disorder in a swelling flood spreads over the kingdom, and no one is able to repress it. Than follow a master who withdraws from one ruler and another that will not take his advice, had you not better follow those who with- draw from the world altogether?" With these words he resumed his hoe, and would give no information about the ford. 'T'ze-lu went back, and reported what the man had uid to the master, who observed: 'It is impossible to withdraw from the world, and associate with birds and beasts that have no affinity with us. With whom should I associate but with suffering men? The disorder that prevails is what requires my efforts. If right principles ruled through the kingdom, there would be no necessity for me to change its state." We must recognize in those words a brave heart and a noble sympathy. Confucius would not abandon the cause of the people. He would hold on his way tothe end. Defeated he might be, but he would be true to his humane and nghteous inission.*~~

~~*It was in his sixty-ninth year, 483 b.c., that Confucius returned to Lu. One of his disciples, who had remained in the state, had been successful in the command of a mili- tary expedition, and told the priine minister that he had learned his skill in war from the master,—urging his recall, and that thereafter mean persons should not be allowed to come between the rulerand him. The state was now in the hands of the son of the marquis whose neglect had driven the sage away ; but Confucius would not again take office. Only a few years remained to him, and he devoted them to the*~~

completion of his literary tasks, and the delivery of his lessons to his disciples.

The next year was inarked by the death of his son, which he bore with equanimity. His wife hed died many years before, and it jars upon us to read how he then commanded the young inan to hush his lamentations of sorrow. We hike him better when he mourned, as has been related, for his own mother. It is not true, however, as has often been said, that he had divorced his wife before her death. The death of his favourite disciple, Yen Hwui, in 481 n.c., was more trying to him. Then he wept and mourned beyond what seeined to his other followers the bounds of propriety, exclaiming that Heaven was destroying him. His own last year, 478 3.c., dawned on him with the tragic end of his next beloved disciple, T'ze-lu. Early one morning, we are told, in the fourth month, he got up, and with his hands behind his back, dragging his staff, he moved about his door, crooning over—

"The great mountain must crumble

The strong bean must break The wise man must wither away like a plant."

Tze-kung heard the words, and hastened to him. The

master told him a dream of the previous night, which, he

thought, presaged his death. '" No intelligent ruler, le said, arises to take me as his master. My time has come to die." So it was. He took to his bed, and after seven days expired. Such is the account we have of the last days of the sage of China. His end was not unimpressive, but it was melancholy. Disappointed hopes made his soul bitter. No wife nor child was by to do the offices of affection, nor was the expectation of another life with him, when he passed away from among men. He uttered no prayer, and he betrayed no apprehension. Years before, when he was very ill, and Tze-lu asked leave to pray for him, he expressed a doubt whetke: such a thing might be done, and added, " I have prayed for a long time." Deep treasured now in his heart may have been the thought that he had served his generation by the will of God ; but he gave no sign.

When their master thus died, his disciples buried him with great pomp. A multitude of them built huts near his grave, and reinained there, mourning as for a father, for nearly three years ; and when all the rest were gone, Tze-kung, the last of his favourite three, continued alone by the grave for another period of the same duration. The news of his death went through the states as with an electric thrill. The man who had been neglected when alive seemed to become all at once an object of unbounded admiration. The tide began to flow which has hardly ever ebbed during three-and-twenty centuries.

The grave of Confucius is in a large rectangle separated from the rest of the K'ung cemetery, outside the city of K'iuh-fow. A magnificent gate gives admission to a fine aveine, lined with cypress trees and conducting to the tomb, a large and lofty mound, with a marble statue in front bearing the inscription of the title given to Confucius under the Sung dynasty :—" The most sagely ancient Teacher ; the all-accomplished, all-informed King." A little in front of the tomb, on the left and right, are smaller inounds over the graves of his son and grandson, from the latter of whom we have the remarkable treatise called The Doctrine of the Mean. All over the place are imperial tablets of diflerent dynasties, with glowing tributes to the one man whom China delights to honour; and on the right of the grandson's mound is a small house said to mark the place of the hut where Tze-kung passed his nearly five years of loving vigil. On the mound grow cypresses, acacias, what is ealled "the crystal tree," said not to be elsewhere found, and the Achillea, the plant whose stalks were employed in ancient times for purposes of divination.

The adjoining city is still the home of the K'ung family ; and there are said to be in it between 40,000 and 50,000 of the descendants of the sage. The present chief of the family is in the line of the 75th generation, and has large estates by imperial gift, with the title of "Duke by im- perial appointment and hereditary right, continuator of the sage." It is thus no empty honour which is still given by the sovereigns of China to Confucius, in the persons of his descendants.

The dynasty of Chow finally perished two centuries and Influence

~~a quarter after the death of the sage at the hands of ths on China first historic emperor of the nation,—the first of the dynasty~~

~~of Ts''in, who swept away the fouudations of the feudal system, and laid those of the despotie rule which was subsequently and gradually matured, and continues to the present day. State after state went down before his blows, but the name and followers of Confucius were the chief obstacles in his way. He made an effort to destroy the inemory of the sage from off the earth, consigning to the flames all the ancient books from which he drew his rules and examples (save one), and burying alive hundreds of scholars who were ready to swear by his name. But~~

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~~Jonnection vith the terature f China.~~

~~Confucius could not be soextinguished. The tyranny of Ts'in was of short duration ; and the next dynasty, that of Han, while entering into the new China, found its surest strength in doing honour to his name, and trying to gather up the wreck of the ancient books. It is a great and a difficult undertaking to determine what there was about Confucius to secure for him the influenee which he has wielded. Reference has been made to his literary tasks ; but the study of them only renders the undertaking more dificult. He left no writings in which he detailed the principles of his moral and social system. The Doctrine of the Mean, by his grandson Tze-sze, and Zhe Great Learning, by 'Tsing Sin, the most profound, perhaps, of his disciples, give us the fullest information on that subject, and contain many of his sayings. 'he Lun Yu, or Analects, " Discourses and Dialogues," is a compilation in which many of his disciples must have taken part, and has great value as a record of his ways and utterances; but its chapters are mostly disjecta membra, affording faint traces of any guiding method or mind. Mencius, Hsiin Wing, and writers of the Han dynasty, whose works, however, are more or less apocryphal, tell us much about him and his opinions, but all in a louse and unconnected way. No Chinese writer has ever seriously undertaken to compare him with the philosophers and sages of other nations.~~

~~The sage, probably, did not think it necessary to put down many of his owu thoughts in writing, for he said of himself that he was "a transmitter, and not a maker." Nor did he lay claim to have any divine revelations. He was not born, he declared, with knowledge, but was fond of antiquity, and carnest in secking knowledge there. The rule of life fur men in all their relations, he held, was to be found within themselves. The right development of that rule, in the ordering not of the individual only, but of society, was to be found in the words and institu- tions of the ancient sages.~~

~~China, it has already been observed, had a literature before Confucius. All the monuments of it, however, were in danger of perishing through the disorder into which the kingdom had fallen. The feudal system that had subsisted for more than 1500 years had becoine old. Confucius did not see this—did not see how~~

~~"The old order changeth, giving place to new, And God fulfils himself in many ways, Lest one gooid custom should corrupt the world."~~

~~It was impossible that in his cireumstances lic should see it. China was in his eyes drifting from its ancient moorings, drifting on a sea of storms "to hideous ruin and combustion ;" and the expedient that oceurred to him to arrest the evil was to gather up and preserve the records of antiquity, illustrating and commending them by his own teachings. For this purpose he lectured to his disciples on the historics, poems, and constitutional works of the nation. What he thus did was of inestimable value to his own countrymen, and all other men are indebted to him fur what they know of China before his time, though all the contents of the ancient works have not come down to us.~~

~~He wrote, we are told, a preface to the Shu Keng, or Book of Historical Documents. 'The preface is, in fact, only a schedule, without any remark by Confucius himself, giving the names of 100 books, of which it consisted. Of these we now possess 59, the oldest going back to the 23d century, and the latest dating in the 8th century B.c. 'The credibility of the earlier portions, and the genuineness of several of the documents have been questioned, but the collection as a whole is exceedingly valuable.~~

The Shi King, or Ancient Poems, as existing in his time, or compiled by him (as generally stated, contrary to the evidence in the case), consisted of 311 pieces, of which we possess 305, The latest of them dates 585 years B.c., and

the oldest of them ascends perhaps twelve centuries higher. It is the most interesting book of ancient poetry in the world, and many of the pieces are really fine ballads. Confucius was wont to say that he who was not acquainted with the Shi was not fit to be conversed with, and that the study of it would produce a mind without a single depraved thought. This is nearly all we have from him about the poems.

The Zi, or Books of Rites and Ancient Ceremonies and of Institutions, chiefly of the Chow dynasty, have come down to us in a sadly mutilated condition, They are still more than sufficiently voluminous, but they were edited, when recovered under the Han dynasty, with so many additions, that it is hardly worth while to speak of them in connection with Confneius, though much of what was added to them is occupied with his history and sayings.

Of all the ancient books not one was more prized by him than the Yih King, or " The Book of Changes," the rudi- nents of which are assigned t:. Puh-hsi in the 30th century B.c. Those rudiments, however, are merely the 8 trigrams and 64 diagrains, composed of a whole and a broken line ,——), without any text or explanation of them earlier than the rise of the Chow dynasty. The leather thongs, by which the tablets of Confucius's copy were tied together, were thrice worn out by his constant handling. He said that if his life were lengthened he would give fifty

years to the study of the Yi, and might then be without

great faults. 'This has come down to us entire, If not intended from the first for purposes of divination, it was so used both before and after Confucius, and on that account it was exempted, through the superstition of the

emperor of the T's'in dynasty, from the flames, It is supposed to give a theory of the phenomena of the physical universe, and of moral and political principles by the trigrams and the different lines and numbers of the diagrams of Fuh-hi. Almost every sentence in it is enigmatic, As now published, there are always subjoined to it certain appendixes, which are ascribed to Confucius himself. Pythagoras and he were contemporaries, aud in the fragments of the Samian philosopher about the "elements of numbers as the elements of realities " there is a remarkable analogy with much of the Yih. No Chinese critic or furcign student of Chinese literature has yet been able to give a satisfactory account of the book.

But a greater and more serious difficulty is presented by his last literary labour, the work claimed by him as his own, and which has already been referred to more than once as the Annals of Lu. Its title is the Ch'un T's'vu, or 'Spring and Autunm," the events of every year being digested under the heads of the four seasons, two of which are used by synecdoche for the whole. Mencius held that the composition of the Ch'un 7's'tu was as great a work as Yu's regulation of the waters of the deluge with which the Shu Aing commences, and did for the face of society what the earlier labour did for the face of nature. This work also has been preserved nearly entire, but it is excessively meagre. 'The events of 242 years barely furnish au hour or two's reading. Confucius's annals do not bear a greater proportion to the events which they in- dicate than the headings in our Bibles bear to the contents of the chapters to which they are prefixed. Happily J'so K'iu-ming took it in hand to supply those events, incor- porating also others with them, and continuing his narra- tives over some additional years, so that through him the history of China in all its states, from year to year, for more than two centuries and a half, lies bare before us, T'so never challenges the text of the master as being incorrect, yet he does not warp or modify his own narratives to make them square with it; and the astounding fact is, that when we compare the events with the summary of

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tion in all the relations of society. He taught emphatically that a bad man was not fit to rule. As a father or a magistrate, he might wield the

~~instruments of authority. and punish the transgressors of his laws, but no forth.~~

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~~them, we must pronounce the latter misleading in the extreme. Men are charged with murder who were not guilty of it, and base murders are related us if they had been natural deaths. Villains, over whose fate the reader rejoices, are put down as victims of vile treason, and those who dealt with them as he would have been glad to do are subjected to horrible executions without one word of sympathy. Ignoring, concealing, and misrepresenting are the characteristics of the Spring and Autumn.~~

~~And yet this work is the model for all historical summaries in China, The want of harmony between the facts and the statements about them is patent to all scholars, and it is the knowledge of this, unacknowledged to them-selves, which has made the literati, down to the present day, labour with an astonishing amount of fruitless ingenuity and learning to find in individual words, and the turn of~~

~~putting of force would countervail the influence of his example. On the other hand, it only needed virtue in the higher position to secure it in the lower. This latter side of his teaching is far from being complete and correct, but |~~

~~the former has, no doubt, been a check on the " powers that be," both in the family and the state ever since Confucius became the acknowledged sage of his country, | It has operated both asa restraint upon evil, and'a stimulus | to good. | A few of his more characteristic sayings may here be Wig, given, the pith and point of which attest his discrimination ings '| of character, and show the tendencies of his views :— \ 'What the superior man seeks is in himself; what the small "~~

~~every sentence, some mysterious indication of praise or blame. But the majority of them will admit no flaw in the sage or in his annals. His example in the book has been very injurious to his country. One almost wishes that critical reasons could be found for denying its authenticity. Confucius said that 'by the Spring and Autumn men would know him and~~

men would condemn him." It certainly obliges us to make a large deduction from our estimate of his character and of the beneficial in- fluence which he has exerted. The examination of his literary labours does not on the whole increase our appre- ciation of him. We get a higher idea of the man from the accounts which his disciples have given us of his intercourse and conversations with them, and the attempts which they made to present his teachings in some systematic form. If he could not arrest the progress of disorder in his country, nor throw out principles which should be helpful in guid- ing it to a better state under some new constitutional system, he gave important lessons for the formation of in- dividual character, and the manner in which the duties in the relations of society should be discharged.

Foremost among these we must rank his distinct enuncia- tion of "the golden rule," deduced by him from his study of man's mental constitution. Several times he gave that rule in express words :—' What you do not like when done to yourself do not do to others." The peculiar nature of the Chinese language enabled him to express this rule by one character, which for want of a better term we may translate in English by "reciprocity." When the ideagram is looked at, it tells its meaning to the eye,—"'a thing seen weightier than a thing heard." It is composed of two other characters, one denoting "heart," and the other— itself composite—denoting "as." Tze-kung once asked if there were any one word which would serve as a rule of practice for all one's life, and the master replied, yes, nam- ing this character (48, shu), the "as heart," my heart, that is, in sympathy with yours; and then he added his usual explanation of it, which has been given above. It has been said that he only gave the rule in a negative form, but he understood it also in its positive and most compre- hensive force, and deplored, on one occasion at least, that he had not himself always attained to taking the initiative in doing to others as he would have them do to him.

Another valuable contribution to ethical and social science was the way in which he inculcated the power of example, and the necessity of benevolence and righteous- ness in all who were in authority. 1200 years before he was born, an ancient hero and king had proclaimed in China: "The great God has conferred on the people a moral sense, compliance with which would show their nature invariably right. To cause them tranquilly to pursue the course which it indicates is the task of the sovereign." Confucius knew the

~~*utterance well; and he carried out the principle of it, and insisted on its applica-*~~

~~*but not a partisan. his words, nor does he put good words*~~

~~*'*A poor man who does not flatter, and a rich man who is not proud, are passable characters; but they are not equal to the poor yet love the rules of pro-*~~

~~*man seeks is in others."*~~

~~*"The superior man is dignified, but does not wrangle; social,*~~

~~*aside because of the man,"*~~

~~*who yet are cheerful, and the rich who pricty."*~~

~~*"Tearning, undigested by thought, 1s labour lost; thought,*~~

~~*unassisted by learning, is perilous." "In style all that is required is that it convey the meaning."*~~

~~*"Extravagance leads to insubordination, and parsimony to mean-*~~

~~*ness, It is better to be mean than insubordinate.*~~

~~*man." That is, man is greater than any system of thought. 'The cautious seldom err."*~~

~~*Sententious sayings like these have gone far to form the Hundreds of thousands of the literati can repeat every sentence in the classical books; the masses of the people have scores of the Confucian maxims, and little else of an ethical nature, in their*~~

~~*ordinary Chinese character.*~~

~~*memories,—and with a beneficial result.*~~

~~Confucius laid no claim, it has been seen, to divine revela- tions. Twice or thrice he did vaguely intimate that he had a mission from heaven, and that until it was accomplished he was safe against all attempts to injure him; but his teachings were singularly devoid of reference to anything but what was seen and temporal. Man as he is, and the duties belonging to him in society, were all that he con- cerned himself about. Man's nature was from God; the harmonious acting out of it was obedience to the will of God; and the violation of it was disobedience. But in affirming this, there was a striking difference between his language and that of his own ancient models. In the King the references to the Supreme Being are abundant; there ig an exulting awful recognition of Him as the almighty personal Ruler, who orders the course of nature and providence. With Confucius the vague, impersonal term, Heaven, took the place of the divine name. There is no glow of piety in any of his sentiments. He thought that it was better that men should not occupy themselves with anything but themselves.~~

~~There were, we are told in the Analects, four things of which he seldom spoke—extraordinary things, feats of strength, rebellious disorder, and spiritual beings. Whatever the institutions of Chow prescribed about the services to be paid to the spirits of the departed, and to other spirits, he performed reverently, up to the letter ; but at the same time, when one of the ministers of Lu asked him what constituted wisdom, he replied: " To give one's self earnestly to the duties due to men, and while respecting spiritual beings, to keep aloof from them,—that may be called wisdom."~~

~~But what belief underlay the practice, as ancient as the first foot-prints of history in China, of sacrificing to be spirits of the departed ? Confucius would not say. There~~

~~He does not promote a man simply because of~~

~~«*A man can enlarge his princi les; principles do not enlarge the~~

~~Hise ligion philo- sophy.~~

~~eerie ee~~

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was no need, in his opinion, to trouble the mind about it. " While you cannot serve men," he replied to the inquiry of Tzelu, " how can you serve spirits?" And what | becomes of a man's own self, when he has passed from the stage of life? The oracle of Confucius was equally dumb on this question. " While you do not know life," he said to the same inquirer, " what can you know about death 2?" | Doubts as to the continued existence of the departed were \ manifested by many leading men in China before the era of Confucius. In the pages of Tso K'iu-ming, when men are swearing in the heat of passion, they sometimes pause, and rest the validity of their oaths on the proviso that the dead to whom they appeal really exist. The " expressive silence " of Confucius Las gone to confirm this scepticism. | His pets a ire hardly more co – pure secu- larism. e had faith in man, man made for society, but he did not care to follow him out of society, — to present to him motives of conduct derived from the consideration of a future state. Good and evil would be recompensed by the natural issues of conduct within the sphere of time,—if not in the person of the actor, yet in the persons of his descendants. If there were any joys of heaven to reward virtue, or terrors of future retribution to punish vice, the sage took no heed of the one or the other. A very remarkable man Confucius was, persistent and condensed, but neither his views nor his character were perfect. In the China then existing he saw terrible evils and disorders, which he set himself, in the benevolence of his heart, to remedy, but of one principal cause of its unhappy condition he had no idea. Near the beginning of this article, the existence of polygamy and the evils flowing from it were referred to. Confucius never appeared to givethe subject a thought. We saw how he mourned on the death of his mother ; but no generous word ever passed his lips about woman as woman, and apparently no chival 'fous sentiment ever kindled in his bosom. Nor had he she idea of any progress or regeneration of society. The stars all shone to him in the heavens behind ; none »eckoned brightly before. It was no doubt the moral lement of his teaching, springing out of his view of 'uman nature, which attracted many of his disciples, and till holds the best part of the Chinese men of learning bound o him; but the conservative tendency of his lessons— towhere so apparent as in the Ch'wn s'iu—is the chief /eason why successive dynasties have delighted to do him 1onour, J. LE, CONGE D'ELIRE, a licence from the Grow ei inder the Great Seal to the dean and chapter of the athedral church of the diocese, authorizing them to elect » bishop or archbishop, as

the case may be, upon the ‘acancy of any episcopal or archi-episcopal see in England vr in Wales. According to the Chronicle of Ingulphus, bbot of Crowland, who wrote in the reign of William the vonqueror, the bishoprics in England had been, for many ears prior to the Norman Conquest, royal donatives con- erred by delivery of the ring and of the pastoral staff. Jisputes arose for the first time between the Crown of ‘ogland and the See of Rome in the reign of William tufus, the Pope claiming to dispose of the English reli and ultimately King John, by his charter Ut re a electiones tottus Anglie (1214), granted that e bishops should be elected freely by the deans and haplains of the cathedral churches, provided the royal ermission was first asked, and the royal assent was tape after the election. This arrangement was con- eed Subsequent statutes passed in the reigns of ia = Edward IIL. respectively, and the practice yi ae ely settled in its present form by the statute BH n-payment of first-fruits to the bishop of Rome POMPE PEEL. &.: 20), According to the provisions of

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this statute, upon the avoidance of any episcopal see, the dean and chapter of the cathedral church are to certify the vacancy of the see to the Crown, and to pray that they may be allowed to proceed to a new election. © The Crown thereupon grants to the dean and chapter its licence under the Great Seal to elect a new bishop, accompanied by a letter missive containing the name of the person whom the dean and chapter are to elect. The dean and chapter are thereupon bound to elect the person so named by the Crown within twelve days, in default of which the Crown is empowered by the statute to nominate by letters patent such person as it may think fit, to the vacant bishopric. Upon the return of the election of the new bishop, the inetropolitan is required by the Crown to examine and to confirm the election, and the metropolitan’s confirmation gives to the election its canonical completeness. In case of a vacancy in a metropolitical see, an episcopal commission is appointed by the guardians of the spiritualities of the vacant see to confirm the election of the new metropolitan.

CONGER. See Het.

CONGLETON, a market-town and municipal borough of England, in the connty of Cheshire, near the border of Staffordshire, 26 miles south of

Manchester by rail. It is finely situated in a deep valley, on the banks of the Dane, a tributary of the Weaver. Its Ve main streets are well built, and its western suburb con- sists of handsome villas and gardens. Though a place of considerable antiquity, itmakes 4% little figure in history, and pos- sesses few buildings of archi- tectural interest. The parish churches, the guildhall, built in 1822, the market hall, and \ the town-hall dating from 1864 = are the most important. At Arms of Congleton. one time the Teather laces known as "Congleton points" were in high repute; but the principal industry of the town is now the manufacture of silk, which was introduced in 1752 by a Mr Pattison of London. The making of salt is carried on to an extent which gives employment to nearly 200 men ; and at the census of 1871 upwards of 700 were engaged in the neighbouring coal mines. 'There is canal communication with Macclesfield. In 1871 the population of the municipal borough, which embraces 2564 acres, was 11,344, inhabiting 2559 houses.

CONGLETON, Henry Broox Parnett, First Baron (1776-1842), was the second son of Sir John Parnell, chan- cellor of the Irish Exchequer, and was educated at Eton and Cambridge. In 1801 he succeeded to the family estates, and married a daughter of the earl of Portarlington ; and in 1802, by his father-in-law's interest, he was returned for Portarlington to Parliament, but he speedily resigned the seat. In 1806 he was returned for Queen's County, for which he sat till 1832, when he withdrew from the repre- sentation. In 1833, however, he was returned for Dundee; and after being twice re-elected for the same city (1835 and 1837), he was raised to the peerage in 1841 with the title of Baron Congleton of Congleton. In 1842, having suffered for some time from ill health and melancholy, he committed suicide. He was a liberal Whig, and took a prominent part in the struggle of his party. In 1806 he was a lord of the Treasury for Ireland ; it was on his motion on the Civil List that the duke of Wellington was defeated in 1830 ; in that year and in 1831 he was secretary at war; and from 1836 till 1841 he was paymaster of the forces and treasurer of the ordnance and navy. He was the author of several volumes and pamphlets on matters connected ve financial and

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Minerals.

Climate.

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penal questions, the most important being that On Pinar cial Reform, 1830.

CONGO, a country of Western Africa, extending along the coast of the Atlantic for about 185 English miles, from the River Zaire, or Congo (see Arrica, vol. i. p. 254), which separates it from Cacongo and Loango on the north, to the Dande, which marks the boundary of Angola on the south. No very definite limit can be assigned on the eastern side; but it is hardly to be regarded as Congo territory at more than 250 miles inland. At one time the name Congo was applied not only to the country thus defined, but also to Loango, Angola, and Benguela—in short, to all the territory claimed by the Portuguese in this part of the continent.

The coast of Congo presents for the most part a succes- sion of low cliffs and bluffs of red sandstone, sinking at intervals almost to the level of the sea; and for about 30 to 60 miles inland the country remains comparatively flat. It then begins to rise in irregular terraces till it reaches a height of about 1500 or 1600 feet; and its surface is broken with an endless variety of hill and valley and undulating plateau. The prevailing rocks in the lower terraces are mica, schist, gneiss, and shale; further inland there are extensive limestone formations ; and igneous rocks occur in several quarters. The whole country is abundantly watered, partly by tributaries of the Zaire, and partly by independent streams that flow westward to the

~~Atlantic. Of the latter the more important are the Ambrizzette, the Loge, and the Lifune ; but even these are only navigable for barges. 'The former, as far as Congo proper is con- cerned, are individually insignificant. During the rainy season the surplus water is carried down in a thousand torrents, but the beds are quite dry during most of the year.~~

~~The mineral wealth of Congo is only partially explored, and even the deposits that are known to exist are very sparingly utilized. Copper mines have been worked at intervals for a considerable period at Bembe ; and, though now abandoned by the Portuguese, they appeared to Lieutenant Grandy to contain a good supply of ore. Very fine malachite is also found in other parts of the country. Tron is obtained in the northern districts along the Zaire, where the general diffusion of the metal is proved by the red ferruginous character of the soil, and the fact that most of the streams are more om less chalybeate. A lake of bitumen is reported at Kinsao, near Mangue Grande ; the same substance occurs at Musserra, and another deposit has been worked by the natives at Libongo. Red gum- copal occurs in various places,—among others, near Mangue Grande and in the Mossulo country; but the supersti- tion of the natives interferes with its excavation. That diamonds have ever been found there seems no reason to believe; but garnets and even rubies occur. Salt is manu- factured by the natives along the coast.~~

~~The climate of Congo is, in comparison with that of most tropical countries, remarkably cool and agreeable. In the hot season the thermometer is seldom more than from 80° to 86° Fahr. in the shade, and in the " cacimbo," or cool season, it usually ranges from 60° during the night to 75° during the day. 'This low temperature is principally due to the westerly breeze which sets in from the Atlantic about nine or ten o'clock in the morning, and continues blowing, not unfrequently with considerable violence, till after sunset. As this breeze dies away towards the interior, the heat is perceptibly greater ; but the increasing elevation of the country soon reduces the temperature to similar limits. The different seasons of the year occur at slightly different periods, according to the altitude and position of the several districts ; but the hot or rainy season may be regarded as extending from October to May or~~

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June, and the "cacimbo" as occupying the rest of the In October there are usually light rains in the lower country ; and these are succeeded by the Moula ng Chintomba, or great rains, which are accompanied by violent Next follows, from December to March, a period known as the "little dries," and then comes another spell of heavy rains and atmospheric dig. In the neighbourhood of Banza Umpata, about 200 miles inland, the natives, according to Lieutenant Grandy, divide the year into the following five seasons :— Sevoo, or summer, from the beginning of July to the middle of September ; Bangala, or the dry season, to the Masanza, to the middle of February;

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year. storms and thunder.

turbance.

end of November ; Kundey, or the period of the heavy rains, to the middle of April; and Kintombo, or spring, to the end of June, In its effects on the human constitution, the climate of Congo is much less deleterious than that of the coast regions further to the north ; and in the higher districts even the European can maintain himself with ease in a fair state of health. Fevers and agues are not uncommon, but do not last long; and the natives suffer from bronchitis, pleurisy, small-pox, and skin diseases. disease appeared in 1870, but did not spread through the country.

The curious sleep-

The flora of Congo is rich and various; and the Vow

country may be divided with remarkable precision into different zones, distinguished by the prevailing char- acter of the vegetation. the traveller, as he advances inland from Ambriz, finds during the first 25 miles baobabs, euphorbias, aloes,

According to Mr Monteiro,

“ muxixes” or “mukazo” (Sterculia tomentosa), and a great

abundance of Sansewiera angolensis ; he passes next into a region of larger, shadier trees, which continue for the

next 35 miles, when the scene again changes, and the

whole forest becomes one tangled maze of the most luxuriant and beautiful creepers.

Near Bembe the country opens up and the oil-palm becomes the prevailing tree. In the first zone the grasses are short and delicate, in the second they are stronger and taller; in the third they develop into gigantic species with sharp knife-like blades, from 5 to 16 feet in height, which cover vast open stretches, and for several months in the year render com- munication through the country almost impossible, The cashew tree is exceedingly abundant along the coast from Congo to Ambrizzette. The principal objects of native cultivation are manioc or cassava, yams, ground-nuts (Arachis hypogea), and maize. Sesamum and sweet potatoes are sparingly grown. Coffee of good quality 18 found wild in various parts, especially in the neighbourhood of Encoge. Chili pepper is abundant, and forms the prin- cipal condiment in use among the natives, who not unfre- quently eat it to their own injury. The plantam, the papaw, the orange, and the pine-apple are the principal fruits, but many others thrive well. Beans, cabbages, pumpkins, cucumbers, melons, spinach, and other Europeat vegetables can be successfully cultivated, and the first two are used by the natives. Of the beans, indeed, there ar¢ two species, the ordinary haricot and the tree-bean ; the latter is sometimes left to grow for two years. pal beverage of the inhabitants is the palm wine, but they also manufacture a beer called “ garapa,” from the Indian corn. According to Selim Agha, who accompanied Burton in 1863, cotton and rice come to perfection in four months, the cassava takes six or nine, and three or four ares cient for cabbages, lettuce, endive, and carrots. P

The domestic animals of Congo consist chiefly of goats, an

swine, dogs, and cats ; and there are also a few sheep ‘I coats of hair instead of wool. The goats are heautif

creatures, but the swine and dogs are poorand halts No beasts of burden are employed by the natives ; and the

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out. well enough on the coast under the white man's eare,

The larger wild animals are similar to those of the neigh- bouring countries on the south; but the River Zaire seems

to be a natural Himit for many species on the north. The variety of birds is remarkable. Flamingoes, spoon-bills, herons, ducks, and various other aquatic species abound in the rivers and marshes. The common A frican crow, bright- coloured starlings, rollers, and doves are very common in the lower country ; and sun-birds and other insectivora frequent the palin-trees. Tho white ant is the most abundant of the insect tribes; and mosquitoes of a most virulent sort are very common. The chigoe (Pulex pene- trans), introduced in 1870, spread through the country, but seems to be dying out again. Bees abound, but are not domesticated.

Animal food is net in very general use, although the natives will eat the flesh of ahnost any beast or bird. The Mussurongos consider the cat a great dainty ; field rats are regularly captured for the kitchen, by the various tribes ; the king-cricket, and some species of caterpillars, are sought after for the same purpose; and the white ant is greedily devoured in the winged state.

Congo is as destitute as the other countries of tropical Africa of what a European would call a city. The native banzas, or townships, consist of a few hundred huts clustered together; and the Portuguese settlements are merely commercial factories or military posts. The places of most importance along the coast are Mangue Pequeiio, Mangne Grande, Quinzao, Moculla, Ainbrizzette, Musserra, Quicimbo, Ambriz, and Libongo. On the River Zuire may be mentioned King Antonio's Town, Boma

(anciently Lambi), and Vinda la Nzadi, or Congo Town ; but tho last two are on the north side of the river, and therefore aro hardly to bo included within our hmits. The principal in- land town is Sao Salvador, or Congo Grande, with a popu- lation at one time extravagantly estimated at 50,000 ; and Banza Nokito the north and Bembe and Encoge to the south are worthy of mention. The number of villages is very considerable, and together they inust make up a fair population ; but it is evident from the condition of the country, a8 well as from the reports of the older travellers, that formerly the inhabitants must have been much more numerous.

The ordinary huts of the natives aro formed of mats woven from a reedy grass, or the fibres of plants. 'That of the chief is constrncted more skilfully of palin leaves, and is encompassed with a fence of reeds. In the coast towns the huts, though each is built separate, are comparatively close to each other; whilo further inland much moro space is allowed to intervene, and hedges are frequently grown round small groups. The Mushicongos build on a larger seale than their Ambriz neighbonra, and not unfreqnently have two compartments. 'The honschold furniture and utensils, in simplicity and rndeness, are on a par with the domestic inclosures. Baskets are made of tho fibres of tho palm tree, and bowls and bottles of gourds and other vegetables; earthen vessels are used for boiling the victuals, and wooden spoons to eat them; while a mat of grass thrown on a raised platform constitutes the only bedding.

There is no political or ethnographieal umty in the country. No one tribe is predominant, and the king of Congo, whatever may have formerly been his authority, is now no more than a loeal chieftain, like a dozen others. The tribes numerically important are the Mussurongos, who extend from the Zaire as far south as Mangue Grande ; the Mushicongos, who lie inland to the north of Bembe; the Ambrizians along the coast, and inland as far as

Quiballa ; and the Mossulos to the north of the Dande. | Ambasse Congo.

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mules, asses, and camels introduced hy the Portuguese died Horned cattle there are none, though they thrive

Besides tho king of Congo, the king of North Bamba, or of the district between the Ambrizzette and the Loge, and the king of Encoge, with the title of '" Dembo Ambuilla," possess a certain amount of prestige. Every " town" has its own headman and assembly of " Macotas," or coun- cillors; and these in company manage its affairs. The office of headman confers no despotic power; and it descends by inheritance not from father to son, but from uncle to nephew or nicce. surongo, Mushiconge, and Ambriz tribes are radically one; and indeed the natives of the whole of this part of the coast, for a distance of 450 miles, can understand one another's speech. Under the namo of Fiote, this com- mon tongue has been the object of some little attention. Barbot gives a list of 83 words, Douville a more extended vocabulary of what he calls da langue Magialoua, and the authors of the Congo Expedition a third and much better collection. Vowels and liqnids are numerous, and gutturals altogether absent, so that the language has a soft and har- monious sound, Inu number of words it is remarkably rich. According to Captain Burton, its likeness to the Kisawahili of Zanzibar is so great that he was frequently able to under- stand whole sentences from this resemblance alone, Along the coast a considerable number of the natives can speak Portuguese or even English; but their pronunciation 1s extremely faulty, and they transfer the idiom of their own speech to the foreign tongue.

Tho religion, if such it can be called, of the Congoese Manners is a gross fetishism, and almost the only trace of their and former superficial Christianization is the superstitious "ustoms. value attached to some stray crucifix now employed as a charm, a little more potent, it may be, than a string of beads or a land-shell filled full of birds' dung and feathers. Belief in witchcraft is very general, and develops itself in the most trivial and irrational style. Cireumei- sion is practised by all the tribes ; and the rite is usually performed on boys of from eight to twelve years of age, who have to undergo a preparatory discipline, and live apart from tho rest of the community for a month in a special hut. Polygamy prevails,— every man having wives according to his wealth and rank. There is no nuptial ceremony ; but the bridegroom makes a present to the father-in-law, provides the bride with her marriage outfit, and bears the cost of a family

feast. The costume of both inen and women varies considerably with rank and the degree of Enropean inflnence ; but in general it is very slight.

The bodies of the dead are not unfrequently desiccated by roasting, and then buried in the huts which they formerly ocenpied, The interment is often delayed for a year or more, that all the relatives may be present at tho " wake."

Since the stoppage of the slave trade, a very considerable Trade. traftic has been developed in tho natural products of the country, and were it not for the inherent indolence of the natives it might be increased almost to any extent. The principal exports are the fibre of the baobab, first utilized as a paper material by Mr Monteiro in 1858; ground nuts, which find a ready market, especially in France, as an oil seed; ivory brought down from the interior; palm oil, sesamum, coffee, and an inferior kind of Indian-rubber obtained from a species of Landolfia. The commercial prosperity of the Congo River has been frequently inter- rupted by the attacks of the Mussnrongo pirates, but this annoyance has been somewhat checked by tho vigorous measures of the English ernisers. The last expedition of repression was that of Commodore Sir W. Hewett in 1875.

Congo was discovered by Diego Cam, probably in 1484. He History. erected a stone pillar at the mouth of the river, which accordingly took the title of Rio de Padrio, and established friendly relations with the natives, who reported that the country was subject to a great monarch, Mwani Congo, or Lord of Congo, resident at The Portuguese were not long in making them-

The languages of the Mus- Language.

Literature.

selves influential in the country. Gongalo de Sousa was despatched on a formal embassy in 1490; and the first missionaries entered the country in his train. he king was soon afterwards baptized, and Christianity was nominally established as the national religion. In 1534 a cathedral was

founded, and in 1560 the Jesuits arrived with Paulo Dias de Novaes. Of the prosperity of the country at this time the Portuguese have left ithe most glowing and indeed in- eredible accounts. The attention of the Portuguese was, however, turned more particularly to the southern districts of Angola and Benguela, and thcir hold on Congo loosened. In 1627 their cathedral was removed to S%o Paul de Loanda, and Sao Sal- vador declined in importance. In the 18th century, again, spite of the invasions of the Dutch and French, some steps were taken towards re-establishing their authority ; in 1758 they formed a sctttle- ment at Encoge ; from 17 84 to 1789 they carried on a war against the natives of Mussolo; in 1791 they built a fort at Quincollo on the Loge, the ruins of which are still existent, and for a time they worked the mines of Bembe. At present, however, they possess no fort or settlement to the north of Ambriz, which was first occupied in 1855. The connection of other European nations with Congo has hitherto been either exploratory or commercial, and nothing more powerful has been established than a "factory" or "comptoir." In 1816 an expedition was despatched from England under the command of J. K. Tuckey, R.N., for the examination of the Zaire. It reached the river on July 6th, and managed to push up stream as far as Sangala, the highest rapid ; but sickness broke out, the com- mander and several others died, and the expedition had to return. A survey of the first twenty-five miles of the river was effected in 1826 by the " Levin" and the "Barracouta," belonging to Captain Owen's expedition ; and in 1827-29 the Frenchman Douville spent some time in varions parts of the country. In 1857 the German explorer, Dr Bastian, passed from Ambriz inland as far as Sao Salvador; and in the same year Captain Hunt, in the " Alecto," made an attempt to ascend the river, but only reached the.cataracts. Captain Burton attained the same limit in 1863, and also proceeded inland as far as Banza Noki. In 1872 an expedition under Lieutenant Grandy was despatched from England for the purpose of advancing from the west coast to the relief of Livingstone. Ambriz was chosen as the starting point, and Bembe was reached in 11 days, on the 23d of March 1873. The 15th of May found the party at Congo, but they were detained there till June 20th. Pass- ing through Kilembella, Moila, and Tungwa (a place of about 1600 inhabitants), they arrived at Banza Umpala, on a tributary of the Zaire, about 200 miles inland, but were then obliged to retrace their steps to Congo, whence they proceeded to Banza Noki and the main river, intending to push their way up the stream. The death of

~~Livingstone was soon after reported ; and a recall shortly reached them, which brought the expedition to a close. They found the natives "exceedingly timid, superstitious, and suspicious, evi- dently believing that the foreigners had come to interfere with their trade and country." In 1875 a German expedition, under Captain von Homeyer, commenced exploratory operations along the Congo for the purpose of preparing the way for German colonization.~~

~~See the older travellers in the collections of Astley, Pinkerton, Churchill, Purchas, and Philipp; Pellicer de Tovar, Mission Evan- gelica al Reyno de Congo, Madrid, 1649; Tuckey, Narrative of an Expedition to cuplore the Congo, 1818; Douville, Voyage au Congo, 1832; Owen, Voyages to Africa, Arabia, &c., 1833; Hunt, "Ascent of the Congo," in the Proceedings of the Roy. Geo. Soc. for 1858 ; Bastian, Ein Besuch in San Salvador, Bremen, 1859, and Die Deutsche Expedition an die Loango Kiiste, Jena, 1874; Behm, "'Die Congo Fluss," in Petermann's Mittheilungen, 1872; Lieut. Grandy's report in the Proceedings of Roy. Geo. Soc., 1874, and also in the Geograph. Mag., 1875; J. J. Monteiro, Angola and the River Congo, London, 1875; Burton, Two Trips to Gorilla Land and the Cataracts of the Congo, 1876; P. Duparquet, " Voyage au Zaire," and Codine, " Decouverte de la cdte d'Afrique. . . pendant les années 1484-1488," in Bull. de la Soc. de Géogr., 1876.~~

~~CONGREGATIONALISM, a designation assumed of late years by the religious denomination formerly known as Independents. This change of name has arisen from no radical alteration in the particular doctrinal or ecclesiastical opinions of that sect (see INDEPENDENTS), but in order to express more definitely the positive aspects of their church life and organization. The negative term Indepen- dent implied chiefly a renunciation " of the authority of pope, prelate, presbytery, prince, or parliament," and thus brought into prominence the antagonistic position of the churches so named towards National, Episcopal, and Presbyterian Churches. The word Congregational has been now almost universally substituted for it to indicate more clearly the brotherhood and fellowship maintained in their separate communities, the spiritual equality of every~~

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~~member, the right and the duty of all in the church to have a voice in its deliberations and decisions, the eggep. tial necessity for each society to originate its own outward forms of life. tionalism has said,! " When the restraints of outward lay are repudiated, it is necessary to insist with all the greater intensity on making the polity of the church the expression of its own highest life.~~

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~~As one of the latest exponents of Congregs.~~

~~Everything must be subordinated~~

~~to this. The polity must come from within ; it must not~~

~~be imposed from without ; it may recognize outward cir.~~

~~cumstances but must not be controlled by them. If the orgaization of the church is to be a vital growth, the life which it is to reveal is the life which the church has received from Christ. Ecclesiastical statesmen have no right to construct various forms of polity to express the spirit and tendencies prevailing among different races of men, in different countries, and in different churches; the polity of the church must be created by the idea of the church." It is maintained that this conception of a church organization is entirely in harmony with the genius of the New Testament, and is better expressed by the word Con- gregational than Independent. In this sense it is applicable to other communities, in particular to the Baptists, who sometimes adopt it. Probably another reason for its em- ployment has been the growing tendency towards outward union among churches that were mainly characterized by their isolation from each other. Independency was often regarded as a synonym for non-catholicity, and there was so strict a jealousy against all possible interference from without that close association or united action was exceed- ingly difficult, even amongst those whose doctrinal beliefs and ecclesiastical polity were thesame. An endeavour has been made to overcome such obstacles common to co-opera- tion without destroying or infringing the independence of the individual church, and the Congregationalists now have numerous missionary societies for home and foreign work, an association in every county, and a~~

general Congre gational Union for England and Wales. The last was established after much discussion in 1833, when a declara- tion of faith, church order, and discipline was adopted under these express conditions. 'It is not intended that the following statement should be put forth with any authority, or as a standard to which assent should be re quired. Disallowing the utility of creeds and articles of religion as a bond of union, and protesting against subserip- tion to any human formularies as a term of communion, Congregationalists are yet willing to declare, for general information, what is commonly believed among them, reserving to every one the most perfect liberty of com science." In 1871 a revision of the constitution of the Union took place, when the "fundamental principle" of its existence was thus re-asserted. "The Union recognizes the right of every individual church to administer its affairs, free from external control, and shall not, in any case, assume legislative authority or become a court of appeal." The objects it seeks to promote were then also more definitely stated in these words, "to uphold and extend evangelical religion primarily in connection with churches of the Congregational order; to promote Scriptural views of church fellowship and organization ; to strengthen the fraternal relations of the Congregational churches, and facilitate co-operation in everything affecting their common interests; to maintain correspondence with the Congres tional churches and other Christian communities throughout the world ; to obtain statistics relating to Congregationa churches at home and abroad ; to assist in procuring Pp? fect religious equality for all British subjects, and 1 ee

1 Reclesia, A Second Series of Essays on Theological and Ecclesias: tical Questions, p. 371.

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romoting reforms bearing on their moral and social condi- tion." The chairman is elected annually by the vote of the delegates from the churches present at the annual meeting. Unions of a similar character exist in Scotland, Ireland, and the colonies. In 1876 it was computed! that the total of Congregational churches and branch churches in Great Britain and the colonies was 3895, with other preaching places, supplied mainly by lay agency, to the number of 1248. The ordained ministers, includiug the

missionaries of the London Missionary Society, were 3205; there were 17 colleges, employing 52 professors and edueating 430 students. 'The expenditure for missions at home and abroad, not calculating the amounts expended by individnal churches throughout the world for special local missions, was £147,270. In 1875 the Congregationalists opened their Memorial Hall and Library, which is erected in London on the site of the old Fleet Prison, in commemoration of the heroism and spiritual fidelity of the two thousand clergymen who were ejected "from their homes and livings as ministers of Christ in the Church of England, under the stringent, inhuman, and unjust provisions of the Act of Uniformity." In that building the various societies of the Congregationalists now hold their meetings. Congregationalism in the United States has, from the earliest period of its existence, recognized the principle that each Christian society, though complete in itself, is nevertheless related to all other churches of the same faith aud order. 'The weakness and scattered condition of those little communities which followed the settlement of the Pilgrim Fathers threw them into close association, they assisted each other by friendly advice, and from that sprang the system of conncils. These have now become important institutions exercising considerable influence. It is claimed that, though every church is " independent of all outward eontrol," "a fraternal fellowship is yet to be maintained ainoug these independent churches ; and when insoluble difficulties arise, or specially important matters claim decision—as where a pastor is to be settled or dismissed, or a church itself is to adopt its creed and commence its organic life—it is proper that the advice of other churches should be sought and given in council; such action, how- ever, in no case being anything more than a labour of fraternal suasion or self-justification."2 Increase Mather says, "It has ever been their declared judgment that, where there is want either of light or peace in a particular church, it is their duty to ask for counsel, with whicli neighbour churches ought to assist by sending their elders and other messengers to advise and help them in their difficulties ; and that in momentous matters of common cuncernment particular churches should proceed with the conenrrence of neighbour churches ; so in the ordination of a pastor, much more in the deposing of one. 'Thus it has ever been in the churches of New England." Some writers contend that '"Congregationalism differs from Independency by its recognition of this practical fellowship between the churches." The councils thus suinmoned are dissolved as soon as the

business is settled, and should the church to which advice is offered be unwilling tv accept aud act upon it the other churches may consider the desirability of withdrawing from any further association with it. There are permanent councils in Connecticut, called "consociations," but they are not general in the States. In some of the county unions vf England a committee is appointed annually, to which churches may appeal in any difficulty which they are unable to remove of thein- selves,—an approach towards the American system.

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1 See Congregational Year Book, 1877. 2 Congreyationalism : What itis, whence itis, and how it works, 3 ed., Boston, 1871

cording to a religious census taken by the Government there were in the United States in 1850, 1725 Congrega- tivnal churches with 807,335 sittings ; these had increased in 1870 to 2887 churches and 1,117,212 sittings. For the education of the ministry there are seven theological institutions, (w. 3B.) CONGRESS, in diplomacy, a term applied to an assem- blage of sovereigns or ambassadors of the highest rank, convoked for the purpose of concluding a general peace, or of treating the general political interests of Europe. In this latter sense a modern congress may be regarded as a representative council of states or nations, by which differ- ences may be adjusted, and the rules of international law determined and enforced. The greatest progress yet made in the relations of sovereign states is, that disputes, which in former times would have led to immediate war, may now be resclved, in many instanees, by the commen deliberations of the European powers. The term ConGress, however, is only strictly applicable to meetings of this nature on the most important occasions, and when all the powers are re- presented. The term ConFrEerencx is used to deseribe diplo- matic meetings of ministers of the first or second rank, called together for a special purpose, cither to modify existing treaties by consent, or to suggest means of dealing with a critical state of affnirs. Meetings of this kind have become in modern times very frequent, and are the recognized mode of dealing with the questions arising between sovereign states, and sometimes even between states and their subjects. The proeeedings of these

conferences are recorded in protocols, agreed to and signed by the plemipo-tentiaries. These documents have not always the form of treaties or conventions, but they establish the principles on which the powers agree to act, and the rules by which they are bound in honour and good faith. The number of Con- gresses which have heen held in the last two centuries is not very large, and we shall proceed briefly to pass them in review. Conferences have occurred so frequently that it would be impossible to describe them in detail. The most important examples are, perhaps, the Conference of Petersburg in 1825, which led to the independence of Greeee ; the Conferenee of London in 1831, which separated the kingdom of Belgium from Holland ; the Conference of Paris on the affairs of Crete ; the Conference of 1871 for the modification of the Treaty of Paris of 1856 ; and the abortive Conference of Constantinople in 1877, when the six powers vainly endeavoured to obtain from the Porte guarantees for the better government of its Christian subjects. These two forms of diplomatic council differ more, however, in form and degree than in kind. Their object is the same, namely, to determine and enforce the mutual obligations cf states; and they may therefore be treated under one head. The first time we have been able to trace the use of the term Congress in its modern sense, is in 1636, when the Pope attempted to open negotiations for peace at Cologne, under his own mediation ; but the attempt failed, and the Thirty Years' War continued for twelve years more to devastate the world. At length, however, it was agreed by the preliminaries of Hamburg, signed on the 25th Deeem-ber 1641, that a Congress should be held at Munster and at Osnaburgh, in Westphalia, meeting simultaneously in both those towns ; the French mediating minister, representing the Catholic party, being at Munster, and the Swedish ininister, representing the Protestants, at Osnaburgh. The opening of the Congress was fixed for the 11th July 1643 ; but the proceedings were delayed by numerous formalities, by questions of rank and precedence, by questions of neu- trality and safe-conduet, and by the death of Richelieu and Louis XH. The negotiations began in earnest in June 1645. Never before had so angust an assembly met in Europe for the termination of a sanguinary war, for the

establishment of peace between two hostile creeds, and for the regulation of territorial questions by common agreement. The Empire was represented by Count Maximilian von Trautmansdorf; France by Count @Avaux; Sweden by John Oxenstiern, a son of the great chancellor ; the Pope by Cardinal Chigi, afterwards himself Pope Alexander VII. ; Spain by Count Pefiaranda, and by two of her subjects from Franche Comté, not to mention lesser names. England had no representative at the Congress of West-phalia, The questions in dispute and the result of these long deliberations (which were not terminated until the 94th October 1648 by the signature of the two great treaties of Munster and Osnaburgh) were worthy of the statesmen engaged in them and of the time spent in the negotiations ; for the Congress of Westphalia laid the foundations of modern Europe, and its leading principles subsisted not only into the present century, but down to the war of 1870-71. It terminated the long contest between France and Austria. It established the equal rights of the Catholic, Lutheran, and Calvinistic churches in Germany. It rendered 350 German princes almost independent of the Empire, and it planted the germ of the future greatness of Prussia. This form of the German body remained unaltered till the French Revolution. But it also gave to France and Sweden a right, as mediating powers at Munster, to interfere in the affairs of Germany—a right which supported the aggressive policy of Louis XIV., and caused, in the event, innumerable quarrels. The diplomatic communications at Munster all passed through the mediators, and were generally framed in Latin, The discussions were also carried on in that language. A separate peace between the Dutch and the Spaniards was also signed at Munster in 1648, as represented in Terburg's celebrated picture, now in the National Gallery, but this was not an act of the Congress.

The term Congress was applied to the diplomatic meetings which negotiated the Peace of Nimeguen in 1678 and the Peace of Ryswick (so called from a castle near the Hague) in 1697. A contemporary French author, De Rouille, remarked that these meetings ought to be termed assemblies, not congresses, since the latter word was coarse and inappropriate. The term has since entirely lost its improper meaning, derived from an obsolete form of ecclesiastical procedure, and the diplomatic signification has triumphed. At Nimeguen England appeared for the frst time at a Continental Congress, from the interest she took in the fate

~~of Holland, and was worthily represented by Sir William Temple; France by Colbert de Croissy, D'Estrades, and D'Avaux ; Spain by Don Pedro Ronquillo, governor of the Low Countries ; and Holland by the count of Nassau and Beverning. Separate treaties were signed between the various parties. The Congress of Ryswick was of still greater importance to England, for it ter- minated the war in which we had long been engaged with France, and extorted from Louis XIV. the recognition of the right of William and Mary to the British crown. The peace was of short duration, for the War of Succession broke out in 1701; the grand alliance was formed between England, Holland, and Austria; France was defeated; peace was nearly restored in 1709 at the conferences of Gertruydenberg, which were privately carried on between the marquis de Torey and the Grand Pensionary, but not finally concluded till 1712, when a Congress of all the belligerent powers (except the king of Spain) assembled at Utrecht. France was represented by the marshal d'Huxelles, England by the bishop of Bristol (it was the last time an English bishop acted ina civil and diplomatic capacity), the emperor by Count Sinzendorf. The decisive negotiation for peace was, however, carried on secretly and separately between London and Versailles, and whilst the~~

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~~Congress was occupied with formalities, Bolingbroke came to an agreement with France, which broke up the alliance and compelled the other powers to terminate the war. The other Congresses of the 18th century are those of Soissons in 1727, remarkable for the fact that Cardinal Fleury, then prime minister of Louis XV., attended it in person, and of Aix-la-Chapelle in 1748, which terminated a general war, By each of these Congresses the treaties of Westphalia, Nimeguen, Ryswick, and Utrecht were renewed and con. firmed; so that their labours formed a continuous series and identical body of international legislation. No Con. gress was held at the termination either of the Seven Years' War in 1763 or but the style of a Congress was assumed by the German~~

~~of the American war in 1783,~~

~~plenipotentiaries who met at Teschen in 1779 to end the war of the Bavarian succession. It hardly deserved the name,~~

The French Revolution and the wars of the Empire swept away the entire political fabric of continental Europe and the treaties on which it was based. No attempt was made during that period to convoke a Congress for the purpose of a general pacification and territorial settlement ; for the Congress of Rastadt, which met in December 1797 and sat till April 1799, was designed mainly to re-establish amicable relations between France and the German empire, and was not attended by the re- presentatives of England, Russia, or Spain. These nego- tiations proved abortive ; war was renewed ; the Congress was broken up; and the ministers of the French Directory—Bonnier and Roberjot—were massacred by a party of Austrian Szeklers as they quitted the town. The 'Austrian Government never entirely cleared itself of com- plicity in this crime against the rights and usages of nations ; and the event aggravated the hostility existing between France and Germany.

Upon the fall of Napoleon, it was agreed by the 32d Article of the Peace of Paris, signed on the 30th May 1814 between France and the allied powers, that "within two months all the powers which had been engaged in the war on either side should send plenipotentiaries to Vienna to settle, at a general Congress, the arrangements required to complete the provisions of the Treaty of Peace." 'The Congress of Vienna, which met, with some allowance for delays, early in November of the same year, was by far the most splendid and important assembly ever convoked to discuss and determine the affairs of Europe. The emperor of Russia, the king of Prussia, the kings of Bavaria, Denmark, and Wurtemberg, were present in person in the Austrian capital at the court of the Emperor Francis. Prince Metternich presided over the Congress. Prince Talleyrand represented France. Great Britain sent the secretary of state for foreign affairs—Lord Castlereagh,—besides the duke of Wellington, Lord Clancarty, and Lord Cathcart. Mr Stratford Canning, now the sole survivor of that illustrious assembly, took part in the discussion of the affairs of Switzerland, where he was then minister. Prussia was represented by Prince Hardenberg aud Baron Humboldt. A hundred sovereigns and ministers were collected m Vienna, all animated by a general desire for peace and & lively sense of their own interests. Chevalier Gentz, who was named protocolist to the Congress, and who in fact drafted the treaties which were ultimately signed by all the powers, has left us a curious account of the secret proceet- ings of this

prodigious assembly. Strange to say, the Con- gress itself, that is to say, the representatives of all these principalities and powers, never met in council; nor id any formal exchange of their respective credentials take place The business was entirely transacted by committees of the five great powers—Austria, England, France, Prussia, e Russia ; to whom, for certain purposes, the ministers ° Spain, Sweden, and Portugal were added. Even with this

arrangement the progress of the negotiations was extremely slow. For three months nothing was done, It was said, " Le Congrés danse, mais ne marche pas." Serious differ- ences arose ; the pretensions of Russia and Prussia, acting in concert, seemed even to threaten a renewal of war; and a seeret treaty was concluded on the 3d December between England, France, and Austria, in view of that con- tingency. The return of Napoleon from Elba in March 1815 roused the Congress from its lethargy and terminated its disputes, by the necessity for common action ; and at length the great treaties of Vienna were signed on the 7th June 1815—eleven days before the battle of Waterloo—by the plenipotentiaries of the eight powers, It is acknow- ledged by the draftsman of these treaties that, after all, this work was somewhat hastily and imperfectly done. Yet upon the whole, that Congress succeeded in restoring peace to Europe, which was not seriously disturbed for forty years; and it laid the foundation of a system of public law, which was long held sacred, as the common basis of the rights of every member of the European family. At the present time, after the changes which have taken place in Poland, in Italy, in Germany, in Denmark, and in France, it can hardly be said that any fragments of the work of the Congress of Vienna retain their authority, or that any similar general compact has taken its place.

example of the authority which may be fitly assumed and tions of public law by a species of declaratory enactment.

proposed to the other great Powers that a Congress should

Europe. To this proposal the Continental states assented : but England gave a positive refusal, on the ground, stated by Lord Russell, that such measures

~~of prospective legisla- tion were more likely to embroil the several Powers than to establish peace. The project was therefore abandoned ; but the wars which ensued in Denmark, in jAustria, and in France, within the next seven years, justified the views taken by Napoleon III. as to the dangers that threatened the peace of the world.~~

~~The most convenient summary of the Acts of the various Con- gresses which have been held from 1645 to 1815 is to be found in Koch Schile's Histoire Abrégée des Traités de Paix. The Acts of the Congress of Vienna were published at great length by Kluber in his Geschichte des Wvener Congresses. The proceedings of the~~

~~Congresses and Conferences in which (Great Britain has taken part have invariably been laid before Parliament, (H. &.)~~

~~CONGREVE, Wituam (1670-1729), the greatest~~

~~which has been discussed more fully in another place, (See DECLARATION oF Paris.) But this is an important~~

~~exercised by a Congress, to determine controverted ques- In the autumn of 1863, the Emperor Napoleon formally~~

~~assemble in Paris for the purpose of settling various ques- tions, which appeared to threaten the future peace of~~

~~The intimate relations which had sprung up during the~~

~~war gave rise to a mystical union of the northern~~

~~sovereigns, projected and prepared by the emperor of~~

~~Russia, under the name of the; Holy Alliance; and the intention of the authors of that agreement was that the powers should meet and act together in the event of fresh disturbances occurring in Europe. . The practical result of this policy was seen in 1823 when another Congress met at Verona, not for the purpose of restoring peace, but in order to crush the signs of freedom and independence then beginning to display themselves in Europe.~~

~~In Spain the nation demanded a constitution—she was invaded by France; in Naples a popular movement took place—Naples was occupied by Austrian troops, and the king fled to Laybach ; in Germany, the people were irritated by the breach of all the liberal promises made during the war. The Congress of Verona was the source and centre of the | most violent reactionary policy ; and although the duke of Wellington attended it on behalf of England, it was — chiefly to protest against its system of despotic intervention in the affairs of other States. M. de Chateaubriand has cleft an account of this, the darkest hour of the politics of — Surope, in which he took an active and inglorious part. On this occasion, however, England renewed her protest against the slave trade, and obtained a declaration of the Powers condemning it, | The last Congress held in Europe was that of 185 6, which inet in Paris to terminate the Crimean war. Austria and Prussia, though not actual belligerents, were admitted to~~

~~take part in the deliberations and general acts of the Con- | 8tess, and for the first time j~~

~~Were formally recaived into the concert of the great powers.~~

~~foreign affairs of France ; 'L~~

~~ae: <— Lord Cowley were the representatives of Sand. In this Congress it was remarkable that France,~~

~~8 to court the good-will of Russia, ; versary, and that the c ion — ent a Y; oncessions tained by the ~— pe allies were due mainly to the ak ee. Plenipotentiaries. After the con. ett hn hegotiations for peace, the question of the rought bef Serents and neutrals was formally great powe oy e Congress, as a body representing all the tS Of Europes and a declaration was signed,~~

~~English master of pure comedy, was born, according to the latest and likeliest accounts, in 1670, according to the in- Scription on his monument, in 1672 3 and whether in England or in Ireland, at Bardsey near Leeds or at some place unknown beyond St George's Channel, has likewise been matter of doubt and dispute ; but we may presum- ably accept the authority of Lord Macaulay, who decides against Dr Johnson in favour of the later~~

date, and dis- misses without notice the tradition of an Trish birth- place. To Ireland, at all events, is due the credit of his education,—as a schoolboy at Kilkenny, as an under-

graduate at Dublin. From college he came to London, and was entered as a student of law at the Middle Temple. The first-fruits of his studies appeared under the boyish pseudonym of "Cleophil," in the form of a novel whose existence is now remembered only through the unabashed avowal of so austere a moralist as Dr Johnson, that he "would rather praise it than read it.? In 1693 Con- greve's real career began, and early enough by the latest computation, with the brilliant appearauce and instant success of his first comedy, Zhe Old Bachelor, under the generous auspices of Dryden, then as ever a living and immortal witness to the falschood of the vulgar charge which taxes the greater among poets with jealousy or envy, the natural badge and brand of the smallest that would claim a place among their kind. The discrowned laureate had never, he said, seen such a first play ; and indeed the graceless grace of the dialogue was as yet only to be matched by the last and best work of Etherege, standing as till then it had done alone among the barefaced brutali- ties of Wycherley and Shadwell. The types of Congreve's first work were the common conventional properties of stage tradition ; but the fine and clear-cut style in which these types were reproduced was his own. Tho gift of one place and the reversion of another were the solid fruits of his splendid success. Next year a better play from the same hand met with worse fortune on the stage, and with yet, higher honour from the first living poet of his nation. The noble verses, as faultless in the expression as reckless in the extravagance of their applause, prefixed by Dryden to Lhe Double Dealer, must naturally have supported the younger poet, if indeed such support can have been required, against the momentary annoyance of assailants Whose passing clamour left uninjured and secure the fame of his second comedy; for the following year witnessed the

models as were eclipsed by this earliest effort of their imitator ; and tragedy under his hands appears rouged and wrinkled, in the patches and powder of Lady Wishfort, But his three great comedies are more than enough to sustain a reputation as durable as our language. Were it not for these we

should have no samples to show of comedy in its purest and highest form. Ben Jonson, who alone attempted to introduce it by way of reform among the mixed work of a time when comedy and tragedy were as inextricably blended on the stage as in actual life, failed to give the requisite ease and the indispensable grace of comic life and movement to the action and passion of his elaborate and magnificent work. Of Congreve's immediate predecessors, whose aim had been to raise on French founda- tions a new English fabric of simple and unmixed comedy, Wycherley was of too base metal and Etherege was of metal too light to be weighed against him; and besides theirs no other or finer coin was current than the crude British ore of Shadwell's brutal and burly talent. Borrow- ing a metaphor from Landor, we may say that a limb of Molitre would have sufficed to make a Congreve, a limb of Congreve would have sufficed to make a Sheridan. The broad and robust humour of Vanbrugh's admirable comedies gives him a place on the master's right hand; on the left stands Farquhar, whose bright light genius is to Congreve's as female is to male, or ""'as moonlight unto sunlight." No English writer, on the whole, has so nearly touched the skirts of Moliére; but his splendid intelligence is wanting in the deepest and subtlest quality which has won for Moliére from the greatest poet of his country and our age the tribute of exact and final definition conveyed in that perfect phrase which salutes at once and denotes him— "ce moqueur pensif comme un apotre." Only perhaps m a single part has Congreve half consciously touched a note of almost tragic depth and suggestion ; there is something well-nigh akin to the grotesque and piteous figure of Arnolphe himself in the unvenerable old age of Lady Wishfort, set off and relieved as it is, with grace and art worthy of the supreme French master, against the only figure on any stage which need not shun comparison even with that of Célimeéne. (A, ©. &)

CONGREVE, Siz Witu1am, Bart. (177 92-1828), the inventor of the Congreve rocket, was the eldest son of Sit William Congreve, Bart., of Walton in Staffordshire. He procured a commission in the artillery, became lieutenant general, and assisted the duke of York in the changes introduced by him into the management of the army. He — also obtained a seat in the House of Commons for Gatton, and afterwards for Plymouth. He wrote an Elementary Treatise on the Mounting of Naval Ordnance (1812), and a Description of the Hydro-pneumatic Lock (1815).

CONI (Italian, Cunzo), the capital of the province of the same name, is situated on an eminence at the junction of the Stura and Gesso, 46 miles south-west by rail from Turin and 86 miles north-east from Nice by the Col di Tenda. It was famous in Piedmontese warfare a3 4 place of great strength; but in 1801, after the battle of Marengo, it was dismantled by the French. Itis the seat of a bishopric (founded in 1817), and the official residence of the intendant-general of the division. The principal street and square are arcaded on both sides. The churches ar built ina line with the houses, and though of very 'ee exterior they are ornamented internally with beautifu marbles, frescoes, and gilding. Their form is nearly ee but in the interior that of a Greek cross is produced py tne arrangement of the piers. Since the railway has a opened between Savena and Turin, Coni has lost the Med terranean traffic; its commerce is now confined to Ls and the neighbouring towns on the plain. In the Co. a good wine is made called Barolo, Population, 24,30"

crowning triumph of his art and life, in the appearance of Love for Love. Two years later his ambition rather than his genius adventured on the foreign ground of tragedy, and Lhe Mourning Bride began such a long career of good fortune as in earlier or later times would have been closed against a far better work. Next year he attempted, with- out his usual success, a reply to the attack of Jeremy Qollier, the nonjuror, "on the immorality and profaneness of the English stage,"—-an attack for once not discreditable to the assailant, whose honesty and courage were evident enough to approve him incapable alike of the ignominious precaution which might have suppressed his own name, and of the dastardly mendacity which would have stolen the mask of a stranger's. Against this merit must be set the mistake of confounding in one indiscriminate indictment the levities of a writer like Congreve with the brutalitics of a writer like Wycherley,—an error which ever since has more or less perverted the judgment of succeeding critics. The general case of comedy was then, however, as untenable by the argument as indefensible by the sarcasm of its most brilliant and comparatively blameless champion. Art itself, more than anything else, had been outraged and degraded by the recent school of the Restoration ; and the comic work of Congreve, though different rather in kind than in degree from the bestial and blatant licence of his immediate precursors, was inevitably for a time 'nvolved in the sentence passed upon

the comic work of men in all ways alike his inferiors. The true and triuni-phant answer to all possible attacks of honest men or hars, brave men or cowards, was then as ever to be given by the production of work unarraignable alike by fair means or foul, by frank impeachment or furtive imputation, In 1700 Congreve thus replied to Collier with the crowning work of his genius,—the unequalled and unapproached master-piece of English comedy. The one play in our language which may fairly claim a place beside or but just beneath the mightiest work of Moliére is The Way of the World. On the stage which had recently acclaimed with uncritical applause the author's more questionable appear- ance in the field of tragedy, this final and flawless evidence of his incomparable powers met with a rejection then and ever since inexplicable on any ground of conjecture. During the twenty-eight years which remained to him, Congreve produced little beyond a volume of fugitive verses, published ten years after the miscarriage of his master-piece. His even course of good fortune under Whig and Tory Governments alike was counterweighed by the physical infirmities of gout and failing sight. He died, January 29, 1729, in consequence of an injury received on a journey to Bath by the upsetting of his carriage ; was buried in Westininster Abbey, after lying in state in the Jerusalem Chamber ; and bequeathed the bulk of his fortune to the chief friend of his last years, Henrietta, duchess of Marlborough, daughter of the great duke, rather than to his family, which, according to Johnson, was then in difficulties, or to Mrs Bracegirdle, the actress, with whom he had lived longer on intimate terms than with any other saistress or friend, but who inherited by his will only £200. The one memorable incident of his later life was the visit of Voltaire, whom he astonished and repelled by his rejection of proffered praise and the expression of his wish to be considered merely as any other gentleman of no literary fame. The great master of well-nigh every province in the empire of letters, except the only one in which his host reigned supreme, replied that in that sad case Congreve would not have received his visit. The fame of our greatest comic dramatist is founded wholly or mainly on but three of his five plays. His first comedy was little more than @ brilliant study after such

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~~CONIC SECTIONS~~

~~CONIC section is the curve in which a plane cuts a cone, which is defined in Euclid's Llements as "a solid figure described by the revolution of a right-angled triangle about one of the sides containing the right angle, which side remains fixed." Though the properties of conic sections can be investigated from this point of view, we consider it more advantageous to start from the following definition, which is derived from one of the properties which all conic sections possess in common.~~

~~Definition.—If a point move in such a way in a plane that its distance from a fixed point in the plane always bears a fixed ratio to its distance from a fixed straight line in the plane, the point will trace out a conic section.~~

~~The curve is called an ellipse if the distance from the fixed point is less than, a parabola if it is equal to, and a hyperbola if it is greater than, the distance from the fixed straight line.~~

The fixed point is called a focus, and the fixed straight line a directrix of the curve.

The fixed ratio of the distance from the focus to the dis- tance from the directrix is called the eccentricity of the curve,

The discovery of the conic sections seems to have origin- ated in the school of Plato. It is probable that the followers of that philosopher were led to the discovery of these curves, and to the investigation of many of their pro- perties, in seeking to resolve the two famous problems of the duplication of the cube and the trisection of an angle, for which the artifices of the ordinary or plane geometry were insufficient. Two solutions of the former problem, by the help of the conic sections, are preserved by Eutocius, and are attributed by him to Menzchmus, the scholar of Eudoxus, who lived a little after the time of Plato.

The writings of Archimedes that have reached us show that the geometers before his time had advanced a great length in investigating the properties of the conic sections, This author expressly mentions numerous de- | monstrations of preceding writers, and often refers to properties as known to mathematicians. His own dis- coveries are worthy of the most profound and inventive genius of antiquity. In the quadrature of the parabola he gave the first and the most remarkable instance that has yet been discovered of the exact equality of a curvilinear to arectilinear space. He determined the proportion of the elliptic spaces to the circle; and he invented many pro- positions respecting the mensuration of the solids formed by the revolution of the conic sections about their axes,

It is chiefly from the writings of Apollonius of Perga that we know how far the ancient mathematicians carried their speculations concerning these curves. (See APpoL- LONIUs.) His work on the conic sections, written in eight books, was held in such high estimation by the ancients as to procure for him the name of the Great Geometer. The first four books of this treatise only have come down

to us in the original Greek ; in these the author claims | no further merit than that of having collected, amplified, and arranged the discoveries of

preceding mathematicians,

ne improvement he introduced deserves particular notice. y: ia ps who preceded him derived each curve from | nerves which they conceived to be cut by a plane kee . its slant side; and Apollonius was the first sone a . ll the curves are produced from any sort of inclined e P right or oblique, according to the different 'eee ro — the cutting plane. An Arabic MS. dis- pee hh 8, and two others brought from the East a of fe i, ater, contain the first seven books of the treatise

peHonlus ; the eighth book appears to be irrecoverably

lost. Dr Halley, who in 1710 put forth a correct edition of the Conics of Apollonius, guided by the account of the different books preserved by Pappus, has given a very able restoration of the eighth book. The last four books of the Conics of Apollonius, containing the higher or more recondite parts of the science, are generally supposed to be the fruit of the author's own researches, and do much. honour to his geometrical skill and invention. Even in our times the whole treatise must be regarded as a very extensive work on the conic sections,—modern mathema- ticians having made few discoveries of which there are not some traces to be found in the work of Apollonius,

The geometers who followed Apollonius seem to have contented themselves with commenting on his treatise. It was only about the middle of the 16th century that the study of this branch of mathematical science was revived ; since that time no part of mathematics has been more cul- tivated, or has been illustrated by a greater variety of ingenious writings. The applications of the properties of these curves in natural philosophy have, in modern times, given them a degree of importance which they did not formerly possess ; and a knowledge of them is now indis- pensable to any one who seeks to acquaint himself with the remarkable physical discoveries of the present age.

Apollonius and all the earlier writers on conic sections derived the elementary properties of the curves from the nature of the cone; but in 1665 Dr Wallis, in his De Sectionibus Conicis, laid aside the consideration of the cone, deriving the properties of the curves from a description in plano. In

~~the following treatise, as has been already stated, the properties of the conic sections are deduced from their description in a plane.~~

~~An assemblage of points, all of which satisfy some con- dition, whether or not they form a continuous curve, is called a docus; as, for example, we could define a circle as the locus of a point whose distance from a fixed pointis constant, or a conic section as the locus of a point whose distance from a fixed point always bears a constant ratio to its distance from a fixed straight line.~~

~~The following is a proposition which is very useful in the discussion of the properties of conic sections,~~

~~Lremms.—tThe locus of a point in a plane whose dis- tances from two fixed points in the plane always bear a constant ratio to one another is a a circle,~~

~~Let A, B (fig. 1) be the two fixed~~

~~any point on the locus. D NN~~

~~points, m the common ratio, and P Divide BA internally and exter- Fic. 1 in the given ratio, so that See CA DA | PA "ia Fa * Join PC, PD. Then, because PA:PB=CA : CB, PC is the internal bisector of the angle APE (Eucl. vi. 3); and because PA: PB=DA : DB, PD is the external bisector of the angle APB (Eucl. vi. A). Therefore the angle CPD is a right angle, and the locus of Pa circle described on the line CD as diameter.~~

~~PART I.—THE PARABOLA. DEFINITIONS.~~

~~A straight line perpendicular to the directrix, terminated at one extremity by the parabola, and produced indefinitely within it, is called a diameter.~~

~~The point in which a diameter meets the parabola is called its vertex.~~

~~The diameter which passes through 7 focus is called~~

~~274 ° the awis of the parabola; and the vertex of the axis is called the principal vertex.~~

~~Corornary. A perpendicular drawn from the focus to the directrix is bisected at the vertex of the axis.~~

~~A straight line terminated both ways by the parabola, and bisected by a diameter, is called an ordinate to that diameter.~~

~~The segment of a diameter between its vertex and an ordinate, is called an abscissa. é~~

~~A straight line meeting the parabola in two points P, Q is called a chord. '~~

~~The focal chord which is bisected by a diameter 1s called the parameter of that diameter. ie"~~

~~The limiting position of the chord PQ, which it assumes when the point Q moves up to and coincides with P, is called tho tangent at P. :~~

~~A line through P at right angles to the tangent is called the normal at P.~~

~~Proposirion I.~~

~~To find where a parabola of given focus and directrix is cut by a straight line parallel to the directrix.~~

~~Let 8 (fig. 2) be the focus, and XK the directrix. Draw SX perpen- dicular to KX, and bisect SX in A; draw AZ at right angles to SX, and equal to AS. Join XZ,~~

~~Let QN be any straight line parallel to the directrix, cutting XZ in Q and the axis in N.~~

~~With centre S and radius equal to QN, describe a circle cutting QN in P and P'; these will be points on the parabola, because~~

~~gp: XN = QN: XN a A YAKS dey~~

~~.. SP = XN = distance of P from the directrix. Fie. 2 It is clear that if the point P aie exists, the point P' on the opposite side of the axis and therefore the parabola is symmetrical with respect~~

~~Again, the point~~

~~also exists, to the axis. P will exist, or, in other words, the circle will cut QN, as long as SP or QN is greater than SN, which is always the case as long as QN lies on the same side of AZ as the focus.~~

~~The whole of the curve, therefore, lies to the right of AZ, and branches off to an infinite distance from the directrix.~~

~~Prop. II.~~

~~To find where a parabola of given focus and directrix is cut by straight line parallel to the axis.~~

~~Let S (fig. 3) be the focus, and XK the directrix ; draw AY bisect- ing SX at right angles.~~

~~Let KQ be any line parallel to the axis cutting the directrixin K. Join SK cutting AY in Y, and draw YP at right angles to SK eut- ting KQ in P. P will be a point on the curve.~~

~~It is easily shown that the tri- angles SPY, KPY are equal in all respects, and that SP=PK.~~

~~Fig. 5.~~

~~Fig. 4.~~

~~Now, the point P will exist, or, in other words, YP will inter- sect KQ, for all positions of KQ. The parabola, therefore, branches off on either side of the axis to |~~

~~CONIC SECTIONS~~

~~an infinite distance, and is cut by a straight lime parallel to the axis in one point only. It appears from what has gone before that the general shape of the curve is of the form given in fig. 4, which shows the focus directrix, and axis. ; It can be easily seen that all points within the curve are nearer to the focus than to the directrix, and all points without the curve are nearer to the directrix than to the focus. ; | A parabola can be described mechanically in the following | nianner (see fig. 5) :— | Suppose a bar KQ to move always parallel to itself, with its md K on a line at right angles to it; then, if a string of length equal to KQ, attached to the bar at Q, and also to a fixed point 8, be | always kept tight by means of a ring P sliding on KQ, a pencil | at P would tracea parabola whose focus is § and directrix xi 4%~~

~~Prop. Il.~~

~~Ifa chord PQ (fig. 6) intersect the diree- trix in Z, then SZ will be the external bisector of the angle PSQ.~~

~~Join SP, SQ, and draw PM, QN per- pendicular to the directrix.~~

~~Then, because the triangles PMZ, QNZ are similar,~~

~~PZ : QZ = PM: QN = SP : SQ. ~2:~~

~~.*, (Eucl. vi. A) SZ bisects the external — | angle of the triangle PSQ. Mig, 6. Corollary.—If the point Q move up to and become coincident with P, or if, in other words, the chord PQ become the tangent to —~~

~~the parabola at P, then the angle PSZ will become a right angle.~~

~~Prop. LY. |~~

~~The tangent at any point of a parabola bisects the angle between the focal distance of the point and the perpendicular from the point on the directrix.~~

~~Let PZ (fig. 7) be the tangent at P, meeting the directrix in Z; then, if PM be drawn per- pendicular to the directrix, it is easily seen that the two triangles SPZ, MPZ are equal in all respects, and the angle SPZ equal to the angle MPZ.~~

~~1f SM be joined, it can NA be shown that it is bisected a at right angles by PZ, and | that its middle point is the Fig. 7. point Y in Prop. il. |~~

~~|~~

~~The line AY, it will be observed, is the tangent to the parabola at the vertex A.~~

~~1t appears, therefore, that the locus of the foot of the perpendi- cular from the focus on the tangent at any point is the tangent at the vertex.~~

~~It can also be seen that, if the tangent at P meet the axis in T, then SP=ST. For the angles STP, SPT are each equal to the angle MPT, and therefore (Eucl. i. 6) SP, ST are equal,~~

~~It may further be remarked that, if O be any point in the tangent at P, then the triangles SPO, MPO are equal in all respects.~~

~~If PN be drawn perpendicular to the axis to meet it in N, then it will be seen that PN = 2AY and TN = 2AN = 2AT.~~

~~Now, in the right-angled triangle TYS,— TA:AY = AY:AS (Euel. vi. 8), yA?= TA. AS PN? = 4YA? = 4TA.AS 448. AN, ' If the norma: PG be drawn meeting the axis in G, then the t- angles PNG, YAS are similar, and. therefore—~~

~~and therefore Therefore~~

~~Pudi~~

~~|~~

~~NG-AS = PN: YA = 2:1 ot. NG = 2A5 Prop. V.~~

~~To draw a tangent to a parabola at a point on the curve.~~

~~First Method. —Take a point T in the axis (fig. 7), such that ST is equal to SP, and join TP. Then STP will be the tangent at P.~~

~~Second Method.—Draw 8Z at right angles to SP, meeting the directrix in Z. ZP is the tangent at P. ; + will~~

~~Third Method.—On SP as diameter describe a circle; this wl) touch the tangent at the vertex AY in a point Y. YP is the tangent at P.~~

~~Prov. VI. To draw a pair of tangents to a parabola from an external point.~~
~~—~~

~~Firsh Mothod—Let 0 (Gg. 8) be the point, Join Osama~~

~~CONIC SECTIONS 275~~

~~'contre 0 and radius OS describe a circle cutting the directrix (which Suppose in fig. 10 SQ, SR joined, and PO produced to meet~~

~~+t will always do) in M and M'. : , ' the axis in T.~~

~~i Draw MP, M'P', parallel to the axis, cutting the parabola in P and Then angle ORQ=3 angle QSP (Prop. ix.) =angle QSR (Prop. Pp Join OP, OP'. They are tangents to the parabola at P and P', vii.), and angle QRS =angle RPS (Prop. vii.) =angle STP (Prop,~~

~~: " iv.) =anglo QOR (Eucl. i. 29) ; therefore the two triangles OQR~~

~~ae OPS, OPM, SQR are similar, and . ; OP, PM = OP, PS each to each, 0Q :QR=QR:8Q~~

~~and OM = OS by the construction; therefore OR—= SO" .OO-~~

~~therefore the angles OPS, OPM are equal, and therefore OP is a | But bi > " bo 0Q=QY,~~

~~tangent to the curve at P (Prop. iv.) ; therefore V?=4SQ. QV. Second Method.—Let O (fig. 9) be the point. Upon OS as~~

~~diameter describe a circle cutting Prop XII.~~

~~Pp~~

~~the tangent at the vertex (which — | The parameter of the diameter QV is 48Q. If 'the tangent at Q (fig. 11) meets the axis in T, SQ=ST =QV. Therefore the equality PV2=4SQ. QV 7~~

~~ni' it will always do) in Y and Y'. '. be 10, ¥'0, and, if necessar} Q roduce them to meet the curve in 4 , P'. They will be tangents to T the curve at P, PY, a. Because OYS is a semicircle, O therefore theangle OYS is aright ™ angle, and therefore YO is a tan- = " becomes PV? =48Q2 g gent to the parabola (Prop. iv.) thonglors Py 20 | a Prop. VII. or "= 480), g. 11. If OP, OF' (fig. 8) be tangents to the parabola at P) P', then the ; Prop. XIII. triangles OSP, P'SO are similar, If POP' (fig. 12) be any chord, and OR be aia arallel to the axis and SO? =SP. SP', through any point O to meet the curve in R, then PO, OP' = | Because the angle OSP=angle 4SQ . RO, wheré 4SQ is the parameter of diameter PP',~~

~~OMP=angle OM'P'=angle OSP', Draw RW parallel to PP' to meet QV in W.~~

~~and the angle OPS=angle OPM= Then PV2=48Q. QV~~

~~angle SMM'=4 angle SOM' (Eucl. and RW?=4SQ. QW,~~

~~iii, 20)=angle SOP' (Prop. vi.); Fie. 8 and RO=WV and RW=OV. therefore the remaining angles 1g. Therefore PO, OP'= PV? — OV? (Eucl, ii, 5), OPS, P'OS are equal, and the triangles OPS, P'OS similar ; and =PV?— RW?~~

~~ therefore (Eucl. vi. 4) =48Q.QV-48Q0.QW SP:S0 = SO; SP, or =48SQ. WV=4SQ. RO ae Prop. XIV. Prop. VIII.~~

~~U , * e If 0 be the intersection of OP, OP', the tangents to the parabola POF, DOp beaup bo chendainserseeting~~

~~| ts to the in O, and Q, at Pand P', then OV drawn parallel to the axis will bisect PP, | 1")» pam bo reeks ade From fig. 8 we see that, if a line through O meet MM' in Z, MM' PO. OP': pO. Op'=SQ :Sq~~

~~is bisected in Z; and, because MP. ZOV, and M'P' are parallel,~~

:

~~l ; ; By Prop. xiii. PO . OP'= 48Q . RO Fig. 12. therefore PP' is bisected in V. asidb digits ' vce be Prop. IX. Therefore~~

~~PO. OP': pO. Op'=48Q. RO: 4Sq. RO=SQ:S The angle between two tangents , ? . me . lig~~

~~is — to half the angle sub- tended at the focus by tho chord of contact,~~

~~From fig. 9 we see that angle YOY' = angle YSY' = angle YSA = angle Y'SA = 4 angle phe angle PSA = 4 angle~~

~~Prov, XY.~~

~~The area included between any chord of a parabola and the curve is two-thirds of the area of the triangle formed by the chord and tho tangents to the curve at its extremities,~~

~~It is easily seen in fig. 10 that the area of the triangle ORR' is one quarter the area of the triangle OPP', and therefore one half the area of the triangle QPP'.~~

~~Now if we draw tangents where RW, R'W' meet the curve, we shall have two pairs of triangles whose areas are in the ratio 1: 2, and so we may go on indefinitely. The sum of all the external triangles will be half the sum of all the internal triangles,~~

~~The sum of the external triangles is the curvilinear area OPOr and the sum of the internal triangles is the curvilinear area PQP'.~~

~~It may be shown, by means of this proposition, that the circle which is described about the triangle formed by any three~~

~~tangents to a bol, through the ne —~~

~~: Therefore Fig. 9, 2x area OPQP'=area PQP' akop, X, .*. 2x triangle OPP'=8 area PQP' If OV (i. 10) meet the parabola or area PQP'=2~~

triangle OPP', in Q, the tangent at Q is paral- lel to PP, and OV will bo isected in Q, PART II.—THE ELLIPSE,

Draw the tangent RQR' meeting OP,OP'in R, "a ria i Q, and let RW be drawn paral- el to OQV meeting PQ in W

DEFINITIONS,

A straight line passing through the centre, and termi- Then PW tr " nated both ways by the ellipse, is called a diameter, Therefore OR — At dee Viil.) The extremities of a diameter are called its vertices, Similarly we can show a oe The diameter which passes through the foci is called the =RP. "Therefore transverse axis, also the major axis.

and th 2 (OF: RP, The diameter which is perpendicular to the transverse etefore RP' is parallel to axis is called the conjugate axis, also the minor axis, (Euel, yj 2) ; and also Fig.10. '

Any straight line not passing through the centre, but terminated both ways by the ellipse, and bisected by a If ¥ be th Prop. XI, diameter, is called an ordinate to that diameter.

wilt a ets Point of a chord PP', and Q be the point at | Each of the segments of a diameter intercepted between even the tangent is Parallel to PP', then PV2=4S0 , Ov. its vertices and an ordinate, is called an abscissa,

Oe 0Q=QY, 0Q:QV=OR:RP

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A chord, tangent, and normal are defined exactly in the game words as in the case of the parabola.

Prop. I.

To find where an ellipse of given focus, directrix, and eccentricity is cut by a straight line parallel to the directrix.

Let S (fig. 18) be the focus, XK the directrix, and ¢ the eccen- tricity. '

~~Draw SX perpendicular to XK, and divide it internally and externally in the ratio ¢:1 in the points A, A', so that SA:AX=SA': AX=e:1.~~

~~It is clear that A and A' will both be on the same side of X as S§ is, because the eccentricity ¢ is less than 1.~~

~~Draw AZ at right angles to SX and equal to AS; and join XZ.~~

~~Let QN be any straight line parallel to the directrix, cutting XZ in Q and the axis in N. With centre S and radius equal to QN describe a circle cutting QN in P and P' ; these will be points on the ellipse ; for we have~~

~~SP: XN=QN :XN=ZA: AX=SA:AX=e:1.~~

~~It is clear that if this point P exists, the point P' on the opposite side of the axis also exists, and therefore the ellipse is symmetrical with respect to the axis. Again, the point P will exist, or, in other words, the circle will cut QN as long as SP or QN is greater than SN, which is always the case as long as the angle QSN is greater than half a right angle. Now if SL, A'Z' be drawn at right angles to SX, cutting XZ in L, Z/, then (Eucl. vi. 4)~~

~~WA: ATX=ZA: AX.~~

~~But SA': AUX=SA: AX and SA=ZA SA'=Z/A'~~

~~From which it is easily seen that the angle Z'SA' is half a right mm The whole curve therefore lies between the two lines AZ, ie Prop. II. To find where an ellipse of given focus, directrix, and eccentricity is cut by a straight line perpendicular to the directrix. Let S (fig. 14) be the focus, XK the directrix, and e the eccen- tricity. ; Draw SX perpendicular to XK, and \|~~

~~divide SX in A, A', so that SA: AX=SA': A'K=e:13 x—=~~

~~and draw AR, A'R' at right angles to~~

~~pep a~~

~~Let KQ be any line parallel to the axis cutting the directrix in K. Join~~

~~Fig. 14. SK cutting AR, A'R' in R, R', and upon RR' as diameter describe~~

~~a circle cutting KQ in P, P'; For~~

~~these will be points on the curve. SR:RK=SA:AX=e:1=S8A': AX =SR' : WK. Therefore by the Lemma in the introduction SP: PK=SP': PK=SR:RK=e:1. Therefore P and P" are points on the ellipse.~~

~~Now, if the point P exists, the point P' also exists, and it is easily seen that the middle point L of PP' lies on a straight line bisect- ing AA' at right angles. The curve therefore is symmetrical, not only with respect to the axis AA', but also with respect to this line bisecting AA' at right angles. The middle point C of AA' is called the centre of the curve, from the fact that every straight line through C is bisected at the point.~~

~~It is evident from what has preceded that, if we measure CS'= CS, and CX'=CX, in the opposite direction to CS and CX, and draw X'K' parallel to XK, the cllipse might be described with y for focus, X'K' for directrix, and eccentricity e.~~

~~The ellipse, therefore, has two foci and two directrices.~~

~~Now, since SP: PK=SP': P'K=e:1. Therefore SP+SP': PK+P'K=e:1, but PK+P'K=2KL=2CX,~~

~~.. SP+S8P'=2e .CX, Now, it is easily seen that SP'=S'P; therefore SP+S'P=2e .CX ; or the sum of the focal distances of any point on the curve is con- stant.~~

~~Again SA: AX=SA': A'X=e:1 therefore SA4+SA': AX+A'X =e: 1. But AX eA 2CX,~~

~~.*, SA+SA'/=SP4+87P. And SA'=S'A, therefore SP+9'P=SA+NA =AX';~~

~~CONIC SECTIONS~~

~~or the sum of the focal distances oi any point on the ellipse is equal to the major ants. .~~

~~diameter will intersect KQ, if OL is less than OR when O is the mniddlé point of RR'.~~

~~The point P will exist, or, in other words, the circle on RR' as~~

~~Now SX :SK=CA:OR, OR. SX=SK.CA; endl 0L.=00.0L=E. ct KX,~~

~~Therefore the point exists if . KX .SC+KX.SX~~

~~4.6.5 if X.CX~~

~~if KX2, OX2~~

~~if KX? .(COX2-CA?)~~

~~: Sx? . CA? :~~

~~f tee ee KX 3~~

~~i KX~~

~~when CX2-CA?: CA2=SX?: CB + KX has this value the points P, P' coincide in CL, say at B or BY 'i It appears therefore that the ellipse lies wholly within a certain rectangle, and that its general shape is of the form given in fig, 15 which shews the centre C, the foci 8, 8', and directrices XK and X'K', K It can easily be shown that the sum of the focal distances of any point within the ellipse is less X than, and the sum of any point without greater than, AA', and also that the ratio of the focal distance of any point within the ellipse to its distance from the corresponding directrix is less than, and the ratio for any point without greater than, the eccentricity. An ellipse can be described mechanically in the following manner. If an endless string be placed over two small fixed pegs 8, 8' and be kept tight so as to form a triangle PSS', then a pencil at P would trace out an ellipse whose foci are S, S', and whose major axis is equal to the length of the string minus the distance between the pegs. ;~~

~~Fig. 15,~~

~~Prop. III. 1f a chord PQ (fig. 16) intersect in Z the directrix corresponding~~

~~to the focus 8, then SZ will be the external bisector of the angle~~

~~PSQ.~~

~~Join SP, SQ; and draw PM, QN perpendicular to the directrix.~~

~~Then because the triangles PMZ, QNZ are similar,~~

~~PZ: QZ=PM: QN PES~~

~~.*, (Eucl. vi. A) SZ bisects the ex- y ternal angle of the triangle PSQ.~~

~~CoroLLARY.—If the point Q moves up 2 to and coincides with P, or, in other words, the chord PQ becomes the tangent |: = to the ellipse at P, then the angle PSZ will become a right angle.~~

~~Prop. IV.~~

~~The foot of the perpendicular from the focus on the tangent . always lies on the circle described on the major axis as diameter. —~~

~~Let PZ (fig. 17) be the tangent at P, meeting the directrix in Z. Let § be the corresponding focus. Join SP, SZ, and draw PM, SY, perpendicular to the directrix and the tangent respectively. Join YX, SM.~~

~~Because the angles PMZ, PSZ are right angles, a circle will cir- cumscribe PSZM; and because the angles SYZ, SXZ are right angles, a circle will circumscribe SYZX.~~

~~Therefore angle SYX =angle SZX = supplement of angle SZM =angle SPM ; and angle SX Y =angle SZY =angle SMP. Therefore the triangles SYX, SPM are similar, and SY : YX=SP : PM=SA : AX. Therefore the locus of Y is a circle on AA' as diameter. ' (Lemma, Introduction.)~~

~~Fig. 17.~~

~~Prop. V.~~

~~The product of the perpendiculars from tne foci on the tangent is constant.~~

~~If SY, S'Y' (fig. 18) be the perpendicu- lars from the foci ou any tangent, then it is easily seen that, if YS be produced to meet. the circle on AA' bs ear again in Z; aa hi suple inc, an~~

~~Therefore SY.S'Y'=SY.SZ=AS. SA' : (Eucl. iii. 35).~~

~~Prop. VI.~~

~~The tangent at any point of an ellipse makes equal angles with the focal distances of the point.~~

~~Let the tangent ZPZ' (fig. 19) 3 at the point P meet the two direc- trices in Z,Z', Join ZS, SP, PS', S'Z', and draw MPM' parallel to the axis, to meet the directrices in M, M'. Then because SP: PZ=ePM : PZ=ePM': PZ' ae =P : PZ, and the angles PSZ, PS'Z' are right angles (Prop. vii.), there- fore the triangles PSZ, PS'Z' are | similar (Eucl. vi. 7). | Therefore the angle SPZ=angle S'PZ'.~~

~~Prop. VII.~~

~~To draw a tangent to an ellipse at a point on the curve. First Method.—Join SP, S'P, and draw a line bisecti ternal angle of SPS'. This line is the tangent at P. Second Method.—Draw SZ at right angles to SP, corresponding directrix in Z. ZP is the tangent at P, Third Method.—On SP as diameter describe a circle touch the circle on AA' as diameter in a point Y. YP is the~~

~~tangent at P. (Prop. iv.) Prop. VIII.~~

~~To draw a pair of tangents to an ellipse from an external point. First Method.—Let O (fig. 20) be the point, and S, S' the foci.~~

~~Join OS. With centre O and radius OS describe a circle ; and with centre 8' and radius equal to AA' describe another circle, It can be shown that these two circles will always intersect in two points~~

~~Join S'M, S'M', cutting the curve in P,P'. Then OP, OP' will be tangents to the curve.~~

~~Join SP, SP',~~

~~Now SP+PS'= A A'=MS'=MP + Ps' therefore SP=MP; and OS=O0M ; therefore the two triangles OPS, OPM are equal in all respects, and the angle OPS=angle OPM.~~

~~Therefore OP is a tangent to the ellipse at P (Prop. vi.)~~

~~9~~

~~Second Method. —Let O (fig. 21) be the point, and S, S' the foci.~~

~~Join OS, and upon it as diameter de- scribe a circle, cutting the circle described on AA' as diameter (which it will always do) in Y, Y',~~

~~Join OY, OY', and produce them if ne- cessary to meet the curve in P, P',~~ ~~They~~

~~1 be tangents to the curve at BE.~~

~~Because OYS is a semicircle, the angle OYS is a right angle, and therefore OY is a tangent to the ellipse (Prop. iv.)~~

~~Prop. IX,~~

~~If OP, OP' be tangents to the ellipse at P, P', and S be a focus,~~

~~the angles OSP, OSP' are equal,~~

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~~In fig. 21 suppose S'Z, S'Z' be drawn perpendicular to OP, OP'~~

~~respectively, then SY . S''Z=SY'. S'Z' (Prop. v.)~~

~~therefore SY :SY'=S'Z' : 8'Z, Also the angle YSY'= supplement of angle POP'=7/SZ, Therefore the triangles YSY', Z/SZ are similar, and the angle Y'YS=S'Z'Z, and angle Y'YS=angle Y'OS, and angle S'Z'Z =angle S'OZ. Therefore angle SOP =angle S'OP',~~

~~Prop. XI.~~

~~If C (fig. 22) be the middie point of AA', then CA2=CS, CX, SA': A/X =e :1=SA: AX, . SA'+SA :SA=A'X+AX: AX,~~

~~or AA': SA=XX': AX~~

~~.. AA': XX'=SA :AX=e:1. . » "ty Again,~~

~~SA'-SA :SA=A'/X-AX: AX, or SS': SA=AA': AX~~

~~.', SS': AA'=SA : AX=e 31, 7 , « »(%) From (1) and (2), AA' : XX'=SS' : AA',~~

~~or CA :CX=0S:CA -, CA2=CS.CX. . ; ' » (8) Also~~

~~CS :CX=CS?: CA? =CA?2:CX?, : 2 (4)~~

~~Prop. XII.~~

~~I. PN be an ordinate of the ellipse, then PN? always bears a con- stant ratio to AN. NA'.~~

~~By similar triangles PNA', Z'XA' (fig. 22), PN: NA'=Z'K : XA', and by similar triangles PNA, ZXA, PN : NA=ZX : XA. Therefore PN?:; AN, NA'=ZX. XZ': XA. XA'. Now it appears from Prop. iii. that the angle Z'SZ isa right angle ; therefore ZX. XZ'=SX? (Eucl. vi. 8.) ; and XA. XA'=CX?-CA?~~

~~Therefore N?:; AN, NA'=SX%: CX2-CA? = CB? : CA? (Prop. if.) Prop. XIII.~~

~~The ordinates of the ellipse and of the circle described on AA' as diameter are in a constant ratio,~~

~~If, in fig. 22, NP be produced to meet the circle on AA' as diameter in Q, then QN?=AN{. NA' and PN?: AN. NA'=CB?:(CA? (Prop. xii.) -*. PN?: QN?=CB? : CA? and PN : QN=CB: CA.~~

~~CoroLLARy.—The ordinates of two ellipses which have a common * major axis are in a constant ratio.~~

It can easily be shown from the last result, if QPN, Q'P'N' be two common ordinates of the circle and ellipse,—(1) that the chords PP', QQ' will meet the axis in the mo

oint; (2) that the tangents at P, ' trill As) the axis at the same Fig 22. point ; (3) that the intersection of the ates at P, P'and the intersection of the tangents at Q, Q' will ie on a straight line perpendicular to the axis ; (4) that the middle points of PP' and QQ' lie on a straight line perpendicular to the axis,

It can also be shown by means of this proposition that the area of the circle is to the area of the ellipse as AC to BC, and that the area of the parallelogram formed by the four tangents at the ex- tremities of two conjugate diameters (see definition below) is con- stant, and is equal to AC. BC.

Prop. XIV.

The middle points of all parallel chords in an ellipse lie on a straight

r4

In fig. 20 we have angle OSP=angle OMP =angle M'MS'— angle M'MO =angle MM'S' — angle MM'O =angle OM'S' =angle OSP', Prop. X.

*If OP 5) OP' be tw ; ? * ges SOP, SOP a opal T° BS #04 8, 8 bo the fos, the*

' line through the centre. Let QPN, Q'P'N (fig. 23) be two common ordi- nates of the circleon AA' as diameter and the ellipse. Let W, V be the middle points of QQ', PP'. W,V he on a straight line which } bisects NN'at rightangles. Fig. 23,

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Now, as long as PP' remains parallel to itself, QQ' must remain parallel to itself, and therefore its middle point W hes on a fixed straight line, the diameter at right angles to QQ'. Therefore V lies on a fixed straight line through C, since WM : VM=BC : AC.

~~The tangents at the points where CV cuts the ellipse will be parallel to the chords PP' which CV bisects. ~~ Definition.—If CD be drawn parallel to the tangent at P, then CD is said to be conjugate to CP.~~

~~Now it is evident that CD and CP will correspond to two radii at right angles in the eirele on AA' as diameter, and therefore if CD is conjugate to CP, CP will also be conjugate to CD.~~

~~Prop. XV.~~

~~If CP, CD (fig, 24) be semi-conjugate diameters, then CP?CD?= AC? BC. Draw QPN, Q'DN' common ordinates of the circle and the ellipse.~~

~~Fig. 24. Fig. 25.~~

~~Then CQ, CQ' will be at right angles, and therefore the two triangles QCN, CQ'N' will be equal in all respects. ., NO=QN~~

~~QN=CN'. 1, QN?4+Q/N?=QN?4+NC?=AC?, .. PN?4+DN?=BC? (Prop. xii.). . CP?+CD2=CN? + NP?+CON? + N'D? = Q/N?4+NP2+QN?N'D? =AC? BC?. ; It follows that if the tangent at P meets the axes in T, T' (fig. 25), then Pt, PP =CbD*. Draw ordinates PM, DM' to the major axis, and PN to the minor axis. Then and.~~

~~and~~

~~PT: PM=CD : DM' pr: PN=CD: CM'~~

~~. PER.Arl' + PM, PN=CD?2: CM'. DM'. foe RE elie CD?2=PM. PN: CM' DM'. PM, DM~~

~~CM' ' CM WBC MG. «., +7 \cmhaiae . PT. PY'=CD?.~~

~~Prov, XVI.~~

~~If CP, CD be semi-conjugates, and QV be an ordinate parallel to CD, then QV?: PV. VP'=CD?: CP'. Draw QB an ordinate parallel to CP, and draw UQW the tangent to the ellipse at Q, meeting CP, CMiin UW, Ww.~~

~~Then OR.CW =CD? .. CR?: CD?=CR: CW =UV:CU. Again cU:..CV=CP? ,, CU;CV=CF;CY2,~~

~~, OU-CV: CU=CP?2-CV?: CP? or UV:CU=PV.VP: CP. Hence CR?:CD? =PV. VP': CP? or QV?:PV. VP'=CD?: CP,~~

~~Prop. XVIL. If POP" (fig. 26) be any chord, and ROCR' the diameter through O, then PO.OP : RO. OR'=CD?: CR', where CD is the semi-diameter parallel to PEC Draw CVWQ conjugate to PP', meeting~~

~~the curve in Q, and the ordinate through Rin W.~~

~~Fig. 26,~~

~~Then PY? : CQ? — CV?=CD?: CQ? and RW? CQ? —- CW2=CD? : CQ? (Prop. xvi.) cv? ." 2 2 0Q2 CV?- 2 CW? PV?— RW?. ag: CQ*— CV? (CQ! CW) Gas =CD?:0@ Now py2-Rw?. OU =Py?- OV?=PO. OP~~

~~CW~~

~~CONIC SECTIONS~~

~~d 0?- cv? — (cg?-cw2 CY" —co2,(CW?2=CV? 00".("“aya—) OR? — CO?~~

~~= 3~~

~~cy. Ha. Therefore PO.OP':CQ?. he OR' cp?- 0Q or PO. OP': RO. OR' =CD2: CR,~~

~~Prov. XVIH.~~

~~1f POP', pOp' be any two chords, and CD, Cd the semi-diameters parallel to them, then ;~~

~~PO. OP': pO. Op' =CD?: Cd', From the last proposition we have PO .OP': RO. OR'=CD?: CR? O. Op'=RO. OR' =Cd?: Ck'. PO. OP': CD?=RO. OR': CR? = pO. Op': Cd? or PO.OP':pO. Op' =CD?: Cd'.~~

~~Prov. XIX.~~

If the two extremities of a rod slide along two fixed straight lines at right angles to one another, any fixed point in the rod will describe an ellipse.

and Therefore

—Let OM, ON (fig. 27) be the two fixed straight N Q lines, and MPN any position of the rod, and P

Complete the rectangle QMON and join OQ, and draw, parallel to ON, RPH to meet

the tracing point. OQ in R and OM in H. P

Then it can easily be shown that OR=NP ‘i and that RH: PH=OR:PM 0 HM

=PN:PM. ‘ The locus of R is a circle whose centre is O Fig. 27. and radius PN. And the loeus therefore of P is an ellipse whose axes are in OM and ON and equal to PN, PM respectively;

Prov. XX.

If a cirele roll on the inside of a fixed cirele of double the radius, any fixed point in the cireum- ference of the moving cirele will trace out a diameter of the fixed circle, and any other point in the plane of the moving circle will trace out an ellipse.

If the point M (fig. 28) coincided with A at the beginning of the motion and the cirele now touch at Q, the arcs MQ, QA must be equal. There- fore if C and O be the centres, the Fie 28. angle QCM is double the angle QOM, < and therefore OCQ is alwaysa straight line; as also MCN.

It is clear therefore that the motion of a point P in MN is exactly the same as in that of a point in the moving rod, (Prop. xix.)

PART II].—THE HYPERBOLA. DEFINITIONS. A straight line passing through the centre, and termmn-

~~ated by the hyperbola, is called a diameter. The extremities of a diameter are called its vertoes.~~

~~transverse axts.~~

~~pendicular to the transverse axis, such that BC? = BC? = SC? — AC?~~

~~is called the conjugate axis.~~

~~bola, and bisected by a diameter produced, is called a0 ordinate to that diameter. F Each of the segments of a transverse diameter producet, intercepted by its vertices and an ordinate, 18 called an~~

~~abscissa. ae A chord, tangent, and normal are defined exactly 1~~

~~same words as in the case of the parabola,~~

~~Tho diameter which passes through the foci is called the —~~

~~A straight line BCB' passing through the centre, pe~~

~~Any straight line terminated both ways by the hyper~~

~~Prop. I.~~

~~here an hyperbola of given focus, directrix, and cecen- 1 a pe by a straight line parallel to the directrix,~~

~~Let S$ (fig. 29) be the focus, XK the directrix, and ¢ the eccen- a SX perpendicular to XR, and divide it internally and ex- ternally in the ratio ¢ to 1 in the points A, A', so that~~

~~SA :AX=SA': A'X=e:1.~~

~~Fig. 29,~~

~~It is clear that A will lie between S and X, and A' without SX on the side remote from S. ; Draw AZ at right angles to SX and equal to AS, and join~~

~~XZ. Let QN be any straight line parallel to the directrix, cutting XZ in Q and the axis in N.~~

~~With centre S and radius equal to | QN in P and P' ; these will be points on the hyperbola.~~

~~It is clear that if the point P exists, the point P' on the opposite side of the axis also exists, and therefore the hyperbola is sym- metrical with respect to the axis,~~

~~Again, the point P will exist, or, in other words, the circle will cut QN as long as SP or QN is greater than SN, which is always the case as long as the angle QSN is greater than half a right~~

~~QN, describe a circle cutting~~

~~angle,~~

~~Now, if SL, A'Z' be drawn at right angles to SX, cutting XZ in L, Z', then (Eucl. vi. 4) ZA'; A'X=ZA : AX,~~

~~but Pa :AX=SA ; AX, and SA=ZA, -. BA'=Z'A',~~

~~— which it is easily seen that the angle Z'SA' is half a right angle,~~

~~The whole curve therefore lies without the two lines AZ, A'Z'.~~

~~Prop. II.~~

~~hyperbola of given focus, directrix, and eccen- a straight line perpendicular to the directrix. be the focus, XK the directrix, and ¢ the eccen-~~

~~To find where an ticity is cut by Let § (fig. 30)~~

~~"— raw SX perpendicular to~~

~~XK, and divide SX in A, A',~~

~~80 that~~

SA: AX=S8A'; A'X=e:1;

and draw AR, A'R' ew angles to SX.' R' at right

to the axis, cutting the direc.

No SR: RK=SA :AX=e¢:1 = SA': AX =SR RK, Therefore by the Lemma in on

the introduct SP: PK=SP': pxigp. Therefore P and P' PR=SR : RK

Now, if the point P

Fig. 30. cee chi, are points on the hyperbola.

exists, the point P' also exists, and it is

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bisecting not only

easily seen that the middle point L lies on a straight line AA' at right angles. The curve, therefore, is symmetrical, with respect to the axis AA', but also with respect to the line bisecting AA' at right angles. The middle point C of AA' is called the centre of the curve, from the fact that every straight line through C is bisected at the point.

It is evident from what has preceded that if we measure CS' = CS and CX'=CX, in the opposite direction to CS and CX, and draw X'K' parallel to XK, the hyperbola might be described with S' for focus, X'K' for directrix, and eccentricity e.

The hyperbola therefore has two foci and two directrices.

Now, since

~~SP: PK=SP' : PK=e : 1, therefore SP'-SP : PK-PK=e: 1, but P'K — PK = 2LK =2CX~~

~~.. SP' — -SP=2 . OX, Now it is easily seen that SF' =§'P, therefore S'P-SP=2e . OX, or the difference of the focal distances of any point on the curve is constant,~~

~~Again SA : AX=SA': A'X=e;1 .. SA'-SA; A'X-AX=e;], but SA'-SA=AA' and A'/X — AX =2CX,~~

~~.. SP'-SP=SA'-SA=AA', or the difference of the focal distances of any point on the hyper. bola is equal to the transverse axis, The point P will always exist, or in other words, the circle on~~

~~|-| i): aes i mes /P §8 Fig. 32 Fig. 31.~~

~~R, R' as diameter will always intersect KQ, because R, R' are on opposite sides of KQ.~~

~~Any straight line therefore parallel to the axis cuts the curve, and the curve must take the form given in fig. 31 which shows the centre C, the foci S, S', and the directrices AK, eK~~

~~It can easily be shown that the difference of the focal distances of any point on the concave side of either of the two branches (which is called within the curve) is greater than AA', and the dif- ference of the focal distances of any point outside the curve is less than A.A'; and also that the ratio of the focal distance of any point within the hyperbola to its distance from the corresponding direc- trix is less, and the ratio for any point without is greater, than the eccentricity.~~

~~If a line BCB' be drawn perpendicular to ACA', and points B, B' taken in it such that CB? =CB?=(Cs?— CA?, then AA' is called the transverse axis, and BB' the conjugate axis of the hyperbola.~~

~~If an hyperbola be described with BB' for transverse axis, and AA' for conjugate axis, then this hyperbola is said to be conjugate to the first one.~~

~~*It is clear that the foci of the conjugate hyperbola will be in BCB' at the same distance from C as S and S'.*~~

~~*An hyperbola can be described mechanically in the following manner :—*~~

~~*Suppose a bar SQ (fig. 32) to revolve round its extremity S which is fixed ; then ifa string of given length, attached to the bar at Q, and also to a fixed point 8', be always kept tight by means of a ring P sliding on 80, a pencil at P would trace a hyperbola whose foci are S, 8', and whose transverse axis is equal to the length of the rod minus the length of the string.*~~

~~*Prop. III.*~~

~~*If a chord PQ intersect in Z the directrix corresponding to the focus 8, then SZ will be the external bisector of PSQ if P,Q both lie on the same branch of the hyperbola, and SZ will be the internal bisector of the angle PSQ, if P, Q lie on different branches,*~~

~~*It can be shewn exactly as in Prop. iii. on the ellipse that P2:QZ=SP: PQ,*~~

~~*which proves the proposition. : CorotLary.—If the point Q moves up to and coincides with Py*~~

~~*or in other words, the chord PQ becomes the tangent to the hypers*~~

~~*bola at P, then the angle PSZ will become a right angle,*~~

~~*280*~~

~~*Prop. IV.*~~

~~*The foot of the perpendicular from the focus on the tangent always lies on the circle described on the transverse axis as diameter. This proposition is proved in exactly the same way as Prop. iv.*~~

~~*on the ellipse.*~~

~~*Prop. Y.*~~

~~*The product of the perpendiculars from the foci on the tangent is constant. This proposition is proved exactly in the same way as. Prop. V on the ellipse, the only difference in the figure being that S, 8' lie without the circle instead of within as in the case of the ellipse.*~~

~~*Prop. VI*~~

~~*The tangent at any point of an hyperbola makes equal angles with the focal distances of the point.*~~

~~*Let the a PZZ' at the point P (fig. 38) meet the two directrices in Z, Z'.*~~

~~*Join ZS, SP, PS', 8'Z', and draw PMM' parallel to the axis to meet the directrices in M, M'.*~~

~~*Then because*~~

~~*SP: PZ=ePM: PZ =¢ePM': PZ' = PS': PZ', and the angles PSZ, PS'Z' are right angles (Prop. iik), therefore the triangles PSZ,*~~

~~*Ps'Z' are similar (Eucl. vi.*~~

~~*7). Therefore the angle*~~

~~*SPZ=angle S'PZ'.*~~

~~*Prop. VII.*~~

~~*To draw a tangent to an hyperbola at a point on the curve.*~~

~~*First Method.—Join SP, S'P, and draw a line bisecting the angle SPS': this line is the tangent at P. Prop. vi.)*~~

~~*Second Method,—Draw SZ at right angles to SP meeting the cor-responding directrix in Z: ZP is the tangent at P. (Prop. iii.)*~~

~~*Third Method.—On SP as diameter describe a circle which will touch the circle on AA' tangent at P,*~~

Fig. 33.

as diameter in some point Y: YP is the (Prop. iv.)

Prop. VIII. To draw a pair of tangents to an hyperbo.a from an external point. First Method.—Let O (fig. 84) be the point, and §, 8' the foci.

o (a Fig. 84.

Join OS; with centre O, and radius OS, describe a circle; and with centre 8S' and radius equal to AA' describe another cirele. It can be shown that these circles will always intersect in two points M, M'.

Join S'M, S'M' cutting the curve in P, P. Then OP, OP' will be tangents to the curve.

Join SP, SP'.

Now 98'P -SP=AA'=

S'M =S'/P — MP, therefore SP=MP; and OS=OM; therefore the two tri-angles OPS, OPM are equal in OPM.

Fig. 35. all respects, and the angle OPS=

CONIC SECTIONS

Therefore OP is a tangent to the hyperbola at P (Prop. vi.)

Second Method—Let O (fig. 35) be the point, and 8, 9' the foci

Join OS, and upon it as diameter describe a circle cutting the circle described on AA' as diameter (which it will always do) in Vatie

Join OY, OY', and produce them if necessary to meet the curve in P, P'. They will be tangents to the curve at P, P,

Because OYS is a semicircle, the angle OYS is a right angle, and therefore OY is a tangent to the hyperbola (Prop. iv.) '

~~Prop. IX.~~

~~If OP, OF' be tangents to the same branch of an hyperbola at P, P' — | and 8 bea focus, the angles OSP, OSP' are equal: if OP, OP' be tangents to different branches, the angles OSP, OSP" are supple. mentary.~~

~~This proposition is proved in the same manner as Prop. ix. on the ellipse. Prop. X.~~

~~If OP, OP' be two tangents to the hyperbola, and S, & be the foci, the angles, SOP, S'OP" are equal.~~

~~This proposition is proved exactly in the same way as Prop. x.~~

~~on the ellipse. Prop. XI.~~

~~1f C be the middle point of AA', then CA?=CS. CX. SA': A'K =e: 1=SA: AX.~~

~~.*, SA'-SA:SA=A'X— - AX? AX. ., AA': XX'=SA: AXK=e:1. SA'+SA:SA=A'X+ AX: AX.~~

~~S98': SA=AA': AX, 1, 99: AA'=SA: AX =e: 1.~~

~~From (1) and (2) AA': XX'=88': AA' CA:CX=CS:CA 2. CA2=CS.CX. . OS: CX =Cs?: CA? =os7 4 Cx?. s s~~

~~(1.)~~

~~Again or~~

~~or~~

~~Also~~

~~).~~

~~Fig. 36.~~

Prop. XII. If PN be an ordinate of the hyperbola, then PN? always bears acon- stant ratio to AN .NA'.

It is proved exactly as in the case of the ellipse Prop. xii., that PN?2: AN. NA'=CB? : CA.*

;

The ordinates of two hyperbolas which have the same transverse axis are in a constant ratio. Let PP'N be the common ordinate of two hyperbolas, whos

i Prop. XIII. | :

transverse axis is AA', and whose conjugate axes are CB, Cb.

Then PN? : AN. NA'=CB?: CA?

all PN?: AN. NA'=CB? : CA% Therefore PN?: CB°= AN . NA': CA? | P'N?: CB?. , PN:CB=PN: CB' or PN: P/N=CB: GB,

{ DEFINITION. :

The diagonals of the rectangle formed by the tangents to a hyper |

bola and its conjugate at their vertices are called asymptotes. |

If a straight line be drawn through any point Q ee ahs | asymptotes perpendicular to the transverse axis, meeting | fig. 36), t m

hyperbola in P, P' and the other asymptote in Q' (

~~| Prop. XIV. ‘~~

~~QP. QP’=BC?. From similar triangles QNC, EAC, we have QN? : CN2? =BC? : AC?,~~

~~. xil ; and from PROP Py2 > AN ~· NA’ =BC2 : AC?. +, ON?-PN?: CN?- AN.NA’=BC? : AC? but 7 QN? — PN?=QP’. QP,~~

~~nd AN .NA’=CN?-CA?; 4 .. QP.QP’ : CA?=BC? : CA?, QP.QP’=BC?. is casily seen that It is casily Qp-qP’, therefore PQ. PQ’=BC?,~~

~~Similarly it can be shewn that if RQR’ be drawn parallel to AA’, — to meet the hyperbola in R, R’, then QR .QR’=AC?.~~

~~It is clear that the further the point Q moves away the greater the line PQ’ becomes, and it can be made greater than any assign- able quantity, however large; and since PQ. PQ’=BC?, therefore the line PQ becomes smaller and smaller, and can be made less than any assignable quantity, however small. Hence the asymptote never actually reaches the curve, though the distance between thein con- stantly decreases, and can be made smaller than any assignable~~

~~tity. Te ma easily be shewn that if the asymptote cuts a directrix in the point F, then CF=CA.~~

~~As the asymptote may be considered as the tangent to the hyper- bola at a point at an infinite distance, the foot of the perpendicular from the focus on the asymptote must He on the circle whose diameter is AA’ (Prop. iv.)~~

~~SF therefore must be perpendicular to the asymptote, as appears from other reasons (from Prop. iii., for example.)~~

~~Prop. XV.~~

~~Tf QPP’ (fig. 37) be any chord cutting the asymptotes in Q, Q’ and the curve in P, P’, then QP= P’Q’. and QP. PQ’=CD?, where CD is the semi- diameter in the conjugate hyperbola parallel to ERA~~

~~Draw RPR', DWW' perpendicular to the transverse axis, meet- ing the asymptotes in R, R', and W, W',~~

~~Fig, 37. Then from similar triangles PRQ, DWC PQ: PR=CD : DW and from similar triangles PR'Q', DW'C PQ': PR=DC: DW'. Therefore 1PQ.PQ': PR, PR"=CD?: DW.DW' ; but DW. DW'=BC?—PR. PR' (Prop. xiv.): therefore PQ. PQ'=CD? == P'Q i P'Q' ; Now, if V be the middle point of QQ', then PQ .PQ'=QV?- Py?~~

~~and PQ. P''Q'=QV?- P'V?, Therefore PV=P'V.~~

~~Thus V is the middle point of PP', as well as of QQ', or in other words PQ=Q'P" ,~~

~~It is clear that when the points PP' coincide, or we have the tangent parallel to PP', say g.p q, then~~

~~qp=pq7=CD,~~

~~and also that the line Cp will bisect all chords parallel to the~~

~~tangent at p. PY is called an ordinate to the diameter Cp.~~

~~r DEFINITION, iat to CP hich is parallel to the tangent at P is said to be con- the ae CD be drawn parallel to the tangent at P to meet~~

~~semni-diameteeg eer eola in D, CP, CD are said to be conjugate~~

~~t is : : : chords = aS xv. that a diameter is conjugate to the~~

~~Prop. XVI. If CD be conjugate to CP, then CP is conjugate to CD.~~

~~Let the tangent at P meet the asymptote in L, then PL is paralle: to CD ; it is also equal to CD (Prop. xv.); therefore DL is equal and parallel to CP (Euclid i. 33).~~

~~Therefore LD is the tangent to the conjugate hyperbola at D, and therefore CP is conjugate to CD.~~

~~It is easily seen that PD is bisected by one asymptote, and parallel to the other asymptote.~~

~~Prop. XVII.~~

~~If P'CPV (fig. 88) be a diameter, and QV be an ordinate to CP, then QV?: PV.P'V=CD? : CP?.~~

~~Draw PL the tangent at P to meet an asymptote in L, and let QV produced meet the asymptotes in R, R'.~~

~~Fig. 38. Then RV?- QV? =RQ.QR' =PL?*. Therefore QV?= Bys- = PL?~~

~~= 2~~

~~ops — 1) PL CV2— CP? 2 Tan. <4 aan CD? Therefore QV? : PV. P'V=CD? : OF2.~~

~~Prop. XVIII. If heey (fig. 39) be any chord, and ORCR' the diameter through~~

~~Q, then PO.OP' : RO.OR'=CD®? : CR, Where CD 1s the semi-diameter parallel to PP'.~~

~~Draw CQWYV conjugate to PP' meeting tho curve in Q, and the ordinate through R in W.~~

~~Fig, 39. Then PO. OP'=Py?- ov? =Pv?-Rw?, CV? OS OW Now PV? : CV2-CQ?=CD? : CQ? and RW? CW? -CQ?—CD? : Co? Py? RW?, SY : cv2-092- (cw?- CQ) Yop? : cq? % ow Twan CD? : COs. ove op' : qo £Y* — 1)=cp2 : cq?. or PO. OP: CQ,— 1) Q~~

~~.* PO.OP' : CD?=CV?2~ CW? : CW? =CO?~CR? : CR? =RO.OR' : CR?.~~

~~PO.OP' : RO.OR'=CD? : CR?. Vit = '96~~

~~Therefore~~

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~~The fixed point V is called the vertea of the cone.~~

~~The circle ADB is called the base of the cone.~~

~~Any straight line drawn from the vertex~~

~~Prop. XIX~~

~~If POP', pOp' be any two chords, and CD, Cd the semi-diameters parallel to them, then PO.OP : pO .Op'=CD? : Ca?. From the last proposition we have PO.OP' : RO.OR'=CD? : CR',~~

~~os hye « 2 — and leo | 150 Ops Cot ROO} : CH to the circumference of =0 . Op': Cd?, the base is called a sede or > PO.OP : pO. Op' =CD?: Ca. of the cone. A straight line VC Prop, XX.~~

~~drawn through the ver- tex of the cone, and the 4 centre of the base, is called the axis of the~~

~~Tf from a point Q on one asymptote (fig. 40) orainates QPM, QDN be drawn to two conjugate hyperbolas in P, D, PD will be parallel to the other asymptote.~~

~~q QM? : QN?2=QM? : OM?=BC? : Ac' . 2, | cone. M2—PM?: ne 2— RBO2: AC?. ' ; and OM DAP SBC? AC? = QM: ON TE the axis of the er ~ PM :DN=-QM : ® cone be perpendicular to the base, it is called a right cone.~~

~~QN. Therefore DP is parallel to NM (Eucl. vi. 2), . and NM is parallel to BA, and therefore to the other asymptote. c OM CoroLLARY.—It follows therefore that CP, . CD are conjugate (Prop. xvi.) Fig. 40.~~

~~If the axis of the cone be not perpendicular to the base. it is called a scalene cone.~~

~~Prop. I.~~

~~If a cone be cut by a plane passing through the vertex, the section will be a triangle. .~~

~~Let ADVB bea cone of which VC is the axis; let AD be the common section of the base of the cone and the, cutting plane; join VA, VD. When the generating line comes to the points A and D, it is evident that it will coincide with the straight lines VA, VD; they are therefore in the surface of the cone, and they are in the~~

~~Prop. XXI. If CP, CD be conjugate semi-diameters, CP? — CD?=CA?— CB?.~~

~~Let ordinates PM, DN (fig. 41) in the two hyperbolas be produced, they will meet ina point Q on the asymptote (Prop. xx., Cor.)~~

~~a =(M2 2 a — 2 4 \ ae = es oN o Lee ee ti plane which passes through the points V, A, D, therefore the tri- — QN?— DN? — (QM? — PM?) angle VAD is the common section of the cone and the plane which~~

~~N ad passes through its vertex.~~

~~= CA? — CB? (Prop. xiv.) It follows that if the tangent at P meets the 5 axes in T, T', then~~

~~Prop. I. If a cone be cut by a plane parallel to its base, the section willbe~~

~~: rr PT sc> ae, a circle, the centre of which is in the axis. = Ai op Sa ; we lH Let EFG be the section made by a plane parallel to the base of~~

~~the cone, and VAB, VOD two sections of the cone made by any two planes passing through the axis VC ; let EG, HF be the common sections of the plane EFG and the planes VAB, VCD. Because the planes EFG, ADB are parallel, HE, HF will be parallel to CA~~

~~CD, and~~

~~AC: EH=(VC: VH=)CD: HF; but AC=CD, therefore FH=HF. For the same reason GH=HF; therefore EFG is a circle of which H is the centre and EG the diameter. é~~

~~«+ PT. PT' : CD?=PM.CM : CN. DN =PM.QN :QM.DN~~

~~=1:1~~

~~, PT. PY=CD?. Fig. 41,~~

~~Prop. XXII. .~~

~~If CP, CD be conjugate semi-diameters, the area of the triangle CPQ is constant.~~

~~Produce QP (fig: 42) to meet the other asymptote in Q'; and join MON, PLD. They are parallel to CQ'. ac QO : LO=QM : PM (Euel. vi. 2.) QO? : LO?=QM? : PM? ; " \ QO?- LO? : QO?=QM? — PM? : QM?~~

~~Pror. III.~~

~~If a scalene cone ADBV (fig. 44) be eut through the axis by a plane perpendicular to the base, making the triangle VAB, and from any point H in the straight line AV a straight line HK be drawn in the plane of the triangle VAB, so that the angle VHK may be~~

~~or QL.LC : QO?= BC? : QM? N equal to the angle VBA, and the cone be eut by another plane~~

~~2. 40L.LQ : CQ?=BC? : QM? passing through HK perpendicular to the plane of the triangle~~

~~or 4CL. LQ : BC? =CQ? : QM? ABV, the common section HEKN of this plane and the cone Boe ; CB? will be a circle.~~

~~«AOL. Lone : c Take any point I. in the straight line HK, and through L draw~~

~~EG parallel to AB, and let EFGN be a section parallel to the base, passing through EG; then the two planes HFEKN, EFGN being perpendicular to the plane VAB, their common section FLN is perpendicular to ELG, andsince EFGN is a circle (by last Prop.), and EG its diameter, the square of FL is equal to the At rectangle contained by EL and LG (Euel. iit. 35); but since the angle VHK is equal to VBA or VGE, the ; angles EHK, EGK are Fig. 44. ‘ equal, therefore the points E, H, G, K, are in the circumference a circle (Buel. iii. 21), and HL. LK =EL. LG (Buel, ih 35) a. therefore the section HFKN is a cirele of which HLK is a diamett (Euel. iii. 35). This section is called a Swbcontrary Section.~~

~~Now in the right angled triangle PQD, Lis the middle point of the hypotenuse ; therefore PL=LD=LQ.~~

~~.. 4CL. LP=CS?. ; lf PL’ be drawn parallel to CL to meet the other asymptote, ; 4PL . PL’ =C8%, Fig. 42. and the area of the quadrilateral CLPL’ is constant.~~

~~It follows that, if the tangent at P meets the asymptotes in K, K’, the area of the triangle CKK’ is constant ; also that the area of the quadrilateral formed by the tangents at the extremities of two conjugate diameters is constant.~~

~~PART IV.—THE CONE AND ITS SECTIONS.~~

~~DEFINITIONS.~~

~~If through the point V, without the plane of the circle ADB (fig. 43), a straight line AV be drawn, and produced indefinitely both ways, and if the poimt V remain fixed while the straight line AV is moved round the whole cir- cumference of the circle, a superficies of two sheets, which is called a cone, will be generated by its motion.~~

~~ma~~

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~~therefore KL: LG=KH: HQ,~~

~~and HL: LE=KH; KR;~~

~~therefore KL.HL:LG.LE (or LF*):: KH?; HQ.KR.~~

~~Now the ratioof KH? to HQ. KR is the same wherever the sections HFKM, EFGM intersect each other ; therefore KL. HI, has a con- stant ratio to: LF, consequently (Prop. xii. on the ellipse) the sec- tion HFKM is an ellipse, of which HK is a diameter and MF an ordinate.~~

~~Case 2. Next, suppose the line ONP to touch the circumfer- ence of the base in A. Let DIS (fig. 46) be the common section of the base and the plane FKM ; the line DIS is evidently parallel to FLM, and perpendicular to AB, therefore DI2—AII. IB, hence DI?: FL?=AI IB: EL. LG.~~

~~But since EG is parallel to AB, and IK parallel to AV, Al is equal~~

~~to EL, and~~

~~IB: LG=KI: KL, therefore DI?; FL?=KI: KL. Hence it follows from Prop. xi. on the parabola that the section DFKMS is a parabola, of which KLI is a diameter, and DIS, FLM ordinates to that diameter.~~

~~Casu 3. Lastly, let the line PNO fall within the base ; draw VT (fig. 47) through the vertex parallel to EG. The triangles HVT, HEL are similar, as also the triangles KVT, KGL, therefore~~

~~HT: TV=HL: LE, and KT: TV=KL: LG; therefore HT.KT:TV?=HL.LK: LE. LG or LF? Hence it appears that HL.LK has to LF? a constant ratio, there- fore the section DFKMS is an hyperbola, of which KH js a trans- verse diameter and FM an ordinate to that diameter (Prop. xii. on the hyperbola).~~

~~From the four preceding propositions it appears that the only lines which can be formed by the common section of a plane and a cone are these five : —1. Two straight lines intersecting each other in the vertex of the cone; 2. A circle; 3. An ellipse ; 4, A para- bola ; 5. An hyperbola. The first two of these, however, viz., the pair of straight lines and circle, may be referred to the hyperbola and the ellipse ; for if the axes of an hyperbola be supposed to re- tain a constant ratio to each other, and, at the same time, to dimi- nish continually, till at last the vertices coincide, the hyperbola will evidently become two straight lines intersecting each other in a point ; and a circle may be considered as an ellipse, whose axes are equal, or whose foci coincide ; so that the only three sections which require to be separately considered are the ellipse, the para- bola, and the hypertola.~~

~~Prop. IV.~~

~~be cut by a plane which does not pass through the vertex, If Ge chich is ic parallel to the base nor to the plane of a- subcontrary section, the common section of the plane and the surface of the cone will be an ellipse, a parabola, or an hyperbola, according as the plane passing through the vertex parallel to the cutting plane falls without the cone, touches it, or falls within it. Let ADBY (figs. 45, 46, 47) be any cone, and let ONP be the~~

~~common section of a plane passing through its vertex and the plane of the base, which will either fall without the base, or touch it, or fall within it. Let FKM bea section of the cone parallel to VPO ; through C the centre of the base draw CN perpendicu — lar toOP, meeting the circumference of the base in A and B; let~~

~~a plane pass through V, A, and B, meeting the plane OVP in the line NV, the surface of the cone in VA, VB, and the of the section FKM in g LK; then, because the planes OV P, MKF are parallel, KL will be parallel to VN, and will meet VB one side of the cone in K; it will either meet VA the — side in H, as in fig. 45, within : the a, ; or it will Fig. 46.~~

~~be parallel to VA, as in fig. 46; or it will meet VA, produced~~

~~PART V.—OF CURVATURE DEFINITIONS.~~

If a circle touch a curve at any point P and pass through another point Q on the curve, then if Q move up to P the limiting position of the circle, when Q coincides with P, is called the circle of curvature of the curve at P.

The centre of this circle is called the centre of curvature of the curve at the point P.

,

beyond the vertex, in H, as in fic. 4 Let EFGM be a sec. j a 'tion of the cone parallel | tothe base, meeting the plane VAB in EG, and the plane FKM in FM, and let L be the inter. section of EG and FM; then EG will be parallel] to NB, and FM will be parallel to PO, and therefore will make the Same angle with LK, Wherever the lines FM, JK cut each other; and 'ince BN is perpendicu. lar to PO, EG is per- pendicular toF M. Now the section EFGM is a circle of which EG is the diameter (Prop. ii.), ne, FM ig bj- Sected at L, a: 2 a. OL ce nd FL

Proposition I.

The common chords of any conic and any intersecting circle are equally inclined to the axis or axes of the conic,

Let P, Q, R, S be the points of intersection of a conic and a circle.

Let PR, QS intersect in O.

Then because P, Q, R, S lie on a circle

PO.OR=QO0.OS (Eucl. iii. 35); and because POR, QOS are two chords in a conic, the ratio PO.OR:Q0.08 (in the parabola) = parameter of PR : parameter of QS. (in the ellipse and hyperbola) —square on the semi-diameter paral- lel to PR: square on the semi-diameter parallel to QS.

Now parameters of chords in the parabola, and semi-diameters parallel to chords in the ellipse and hyperbola, are equal only when the chords are equally inclined to the axes,

The same proof applies to the pairs of chords PQ, RS and PS, QR

~~CoroLtary 1.—If a circle touch a conic at P and cut itin Q and R, the chords PQ, PR are equally inclined to the axis, and the chord QR and the tangent at P are also equally inclined to the axis. This is seen by considering the case of § moving up to and coincid-~~

~~Case 1. Let the line ing with P.~~

~~aa "se tibo base—CoRoLtary 2,—If the circle of curvature of a conic at a point P~~

~~K and Hig hrough intersect the conic again in Q, then the chord PQ and the tangent~~

~~KR and . Gallen Fin 2 to the conic at P are equally inclined to the axis of the conic.~~

~~AB, T 20 parallel to » 4. | This is seen by considering the case of R and 8, both moving up ; to and coinciding with P. ;~~

~~¢ triangles KLG, KHQ are similar, as also HLE, HKR—~~

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~~Prop. Il. To draw the circle of curvature at any point of a conic. Draw the tangent at P, of which methods have been given above. Draw PQ equally inclined to the axis, cutting the conic again in — Draw PO at right angles to the tangent, and make the angle PQO equal to the angle Qro. This gives O the centre of the circle of curvature.~~

~~Prop. I1I.~~

~~The focal chord of curvature in the parabola is equal to 48P.~~

~~Let the common chord of the circle P of curvature and the parabola be PQ, c cutting the axis at F (fig. 48). J N~~

~~Draw the double ordinate PNP, / He cutting the axis at N ; the tangents aN s a at P, PY will meet the axis in the . x~~

P\— —

same point T. Then angle PFT =angle PIF = angle P'TF. \ +, TP', PQ are parallel. > 5 PQ=2PV=4PF=4PT. Now let PS produced cut the ci rele 4

again in U ; join UQ. Thenangle UQP =angle TPU(Eucl.

iii, 32) =angle PTS =angle PFT ; Fig. 48.

therefore UQ is parallel to SF PU : PB=PQ: PpFr=4:1, or , PU=48P. Prop. IV. To find an expression for the chord of curvature at any point |

of a parabola drawn in any ' direction.

Using the same construction asin Prop. iii., let PW (fig. 49) be the chord required. —

Draw SY parallel to the given direction to meet the tangent at P in Y.

Then angle PWU =angle SPY (Eucl. iii. 32). and angle UPW=angle YSP. Therefore the triangles UWP, YSP are similar, and

PW :PU=SP :SY or PW.SY=PU "a 45P?. , 48P4 ~, PW a CoroLLary.—The diameter of

Fig. 49.

2

curvature = Se where SY is the perpendicular on the tangent.

i a ee eee

CONINGTON, Joun (1825-1869), the first occupant of the "Corpus " chair of Latin literature in the University of Oxford, was born on the 10th August 1825 at Boston in Lincolnshire, his father, the Rev. Richard Conington, being incumbent of the chapel of ease in that town. He was a remarkably precocious child, knowing his letters when fourteen months old, and being able to read well at three and ahalf. After two years' training at Beverley

grammar school, he was sent in 1838 to Rugby, where his " remark- able memory and very good scholarship" drew special commendation from Dr Arnold. In 1843 he went to Oxford, matriculating at University College at midsummer, but entering upon residence in the October term at Magdalen, where in the interval he had been nominated to a demyship. His university distinctions were numerous. He was Ireland and Hertford scholar in 1844; in March 1846 he was elected to a scholarship at University College ; in December of the same year he obtained a first-class in classics, graduating B.A. soon afterwards ; and in February 1848 he became a fellow of University College. Finding no career open to him at the university, and having obtained the Eldon scholarship in 1849, he proceeded to London in fulfilment of its conditions to keep his terms at

CON—CON

Prop. VY.

If the chord of intersection PQ (fig. 50) of an ellipse or hyperbol

with the circle of curvature at P meet CD the semi-diam haa

conjugate to CP in K, then eter PQ. PK=2CD?

Draw the double ordinate PNP' ; the tangeuts at P, P' meet in the axis at I', and the tangent at Pigs P

parallel to PQ, and therefore CP' TL e \| 7 P .

bisects PQ in V. Let PQ meet the axes in F, F', then PV: PF=PV: PC=TF : TC =PP PK since CD is parallel to PT. Therefore PV. PK=PF. ip

=PT.PT'=CD? Fig 50 (Ellipse, Prop. xv. and Hyperbola, Prop. xxi.) and ~, PQ. PK=20D*. Prop. VI.

If the chord of curvature PQ' (fig. 51) of an ellipse or hyperbola in any direction meet CD in K', then PQ. PK' =2CD?. The angle Q'QP=angle TPK'=angle PRS therefore the triangles PKK', PQ'Q are similar, PQ' : PQ=PK : PK' — PQ'. PK'=PQ.PK=2CD".

~~and~~

~~Fig. 51 If PQ" be the chord of curvature through the focus, then PR'=Ca and PQ". CA=2CD*. If PQ" be the chord of curvature through the centre PK" =CP~~

~~and. PQ". CP=2CD?. If PQ" be the diameter of curvature PK", CD.= CA.GB PO", PR" = 29CD? fs , PQ". CA. CB=2CD*. For other powerful methods of investigating the properties of the conic sections which have been much developed of late reference is made to GEOMETRY and other headings. (H. MT.)~~

~~and~~

~~Lincoln's Inn. eminently distasteful to him, resigned the scholarship, and work at Oxford. During his formed a connection with the ; was maintained for some time. He showed no special aptitude for journalism, but a series of articles on University Reform (1849-50) are noteworthy as the first public expression of his views on a subject that always deeply interested him. In 1854 his appointment to the chair of Latin literature, newly founded by Corpus Christi College, gave him a position which exactly suited him. He ha published, in 1848, an edition of the Agamemnon of ZEschylus with notes and a translation into English vers; and he had devoted much study to the other plays °~~

~~The profession of law, however, proved and after six months he returned to more congenial brief residence in London he Morning Chronicle, which~~

~~ZEschylus, of which the only published result is the vey | From the time —~~

~~valuable edition of the Choephors (1857). that he became professor, however, he confined hums with characteristic conscientiousness : Latin literature. The only important exception was 1 translation of the last twelve books Spenserian and this was undertaken as labour of love, 12~~

~~of the Tliad 10 ¢~~

~~almost exclusively") @~~

~~the |~~

~~stanza in completion of the work of Worsley:~~

~~fulfilment~~

~~–~~

~~CON—~~

~~of a promise made to his dying friend. In 1852 he com- menced, in conjunction with Mr Goldwin Smith, a complete edition of Virgil with a commentary, of which the first volume appeared in 1858, the second in 1864, and the third soon after his death. Mr Goldwin Smith was com- elled to withdraw from the work at an early stage, and in the last volume his place was taken by Mr Nettleship. In 1863 appeared Conington's translation of the Odes and Carmen Seculare of Horace. This was followed in 1866 by the work by which its author is best known to the general public, the translation of the Heid of Virgil into the octosyllabic metre of Scott, which deservedly takes almost the highest rank in its own department. The~~

~~version of Dryden is the work of a stronger artist ; but for~~

~~fidelity of rendering, for happy use of the principle of compensation so as to preserve the general effect of the original, and for beauty as an independent pvem, Conington's version is unrivalled. That the measure chosen does not~~

~~reproduce the majestic sweep of the Virgilian verse is a~~

~~posthumously in 1872.~~

~~| occupying the western quarter of the island.~~

~~fault in the conception and not in the execution of the task, and Conington maintained that his choice had advantages which more than counterbalanced this defect. His last effort in his favourite task of translation was his rendering of the Satdres, Hpistles, and Art of Poetry of Horace, which was publishedin 1869. Hedied at Boston on the 23d October 1869. His edition of Persius, with a commentary and a spirited prose~~

~~translation, was published In the same year appeared his Miscellaneous Writings, edited by Symonds, with a memoir by Professor H. J. S. Smith.~~

~~CONJEVERAM, a town of South-Eastern India, in the district of Chingleput, situated in the valley of the Wegawati, about 45 miles south-west of Madras, on the~~

~~route to Arcot. It consists of wide irregular streets of mud- built houses, with cocoa-nut trees planted between them. The town is celebrated for its two pagodas, one dedicated to Kamachuma, and the larger one to Siva. The principal inhabitants are Brahmans. Handkerchiefs and cloths are manufactured. CONNAUGHT, one of the four provinces of Ireland, It comprises the counties of Galway, Mayo, Sligo, Leitrim, and Ros- common, and contains an area of 6862 square miles, or | 4,392,085 acres, of which 2,889,000 are under cultivation. The annual value of property, which, however, is based on @ lower scale of prices than now obtains, is estimated at | £4,188,631 ; and the land is divided among 5264 pro-prietors, An average holding in this province amounts in extent to 795 acres, while in all Ireland it amounts to only 293 acres ; and the average value is 6s. 94d. per acre, while that of all Ireland amounts to 13s. 2d. The western portion 1s hilly and occasionally mountainous, while the eastern part is generally level. It is well watered, and has on the greater portion of its eastern boundary the River Shannon. The River Moy is navigable from Killala to Ballina ; the extensive lakes Conn, Corrib, and Mask, are navigable ; and the sea coast affords many fine bays and harbours. . The climate is moist and temperate. Agriculture is the ('Main support of the population, but little progress has been fete In its pursuit. 'The population may be considered as "nost purely Celtic, and more than a third of the people hier the Irish language—a larger proportion than in the : *t Provinces. The number of inhabitants in the pro- "mee at and since the census of 1841 has been as follows :—~~

~~Inhabitants, Catholics, Protestants. WOH. Svec as. 1,418,859 US 1,010,031 ae tee ae 913,135 866,023 47,112 | 845,075 803,849 41,226 Tn early times Connaught comprised, beyond its present~~

limits, the territory of Thomond, forming the present county of Clare, and North Breifne, the present county of Cavan. When Sir Henry Sydney, in the 16th century,

‘divided the province into counties, he adopted the ancient

boundaries, excluding North Breifne; but in 1602 the county of Clare was restored to Munster, and Connaught now comprises the counties mentioned above.

CONNECTICUT (Indian, Quonektacat, 7.¢., Long River), one of the six New England, and one of the thirteen original, States of the American Union, lies between 41° and 42° 3’N. lat., and 71° 55’ and 73° 50’ W. long,

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Sketch Map of Connecticut,

Physical Description.—It is bounded N. by Massachusetts about 88 miles ; E. by Rhode Island, 45 miles; S. by Long Island Sound, 100 miles; W. by New York about 68 miles (in a direct line). The S.W. corner projects along the Sound under New York for about 13 miles. The area is 4750 square miles, or one-tenth of that of New York. The State lies on the S. slope of the hilly regions of New England, with a general surface much diversified; there is, however, no land above 1000 feet in elevation. Besides the Connecticut, two other large rivers flow from the N. into the Sound—the Housatonic and the Thames. The Connecticut is the largest river in New England, rising cn the N. border of New Hampshire, 1600 feet above the sea, flowing 8.S.W., separating Vermont and New Hampshire, crossing the W. part of Massachusetts, and central part of Connecticut, flowing 8.8.E. below Middletown, and falling into the Sound at Saybrook. Its length is more than 400 miles, with a width in Connecticut varying from 500 to 1000 feet. Itis navigable to Middletown (30 miles) for vessels drawing 10 feet, and to Hartford (50 miles) for those drawing 8 feet, Its principal tributary in Connecticut is the Tunxis, or Farmington, which flows S.E. from the slopes of the Green Mountains in Massachusetts, then abruptly N., and, breaking through the trap range, S.E. again to the Connecticut River at Windsor, instead of taking its seemingly natural course to New Haven, whither a part of its waters were formerly carried by the Farmington Canal. The E, pars of the State is drained by the Thames, which is formed by the Yantic and Shetucket,—the Quinnebang joining the latter about two miles above. It is navigable to Norwich for the Sound steamers and West India trading ~ vessels, In the W. part of the State is the Housatonic, with its main branch—the Naugatuck—which joins it at Derby. To this place it is navigable for small vessels. Besides these large streams there are very many smaller ones, affording, in their rapid descent from the bills, an immense amount of water power. Geologically the State

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is chiefly Eozoic, excepting the Triassic Sandstone and post- Tertiary terraces of the Connecticut River valley. There are several well-defined ranges of hills. Of these the Housatonic Hills are the most westerly, and

extend along that river to the coast. The Green Mountain range, run- ning S. from Vermont, terminates near New Haven. The Blue Hills of Southington —the highest in the State—are a part of the Mount Tom range of Massachusetts, and lie be- tween the Green Mountain range and the Connecticut River. On the E, side of the river is a fourth range which the river crosses at Chatham. While the hills run N. and 8., 1t is noticeable that the three main rivers bend (and on about the same parallel) to the S.E. The ridges and dikes of trap are exceedingly numerous through the centre of the State, having been forced up through the red sandstone which is found underlying and on the borders of the trap. These ridges have abrupt columnar W. fronts and gentle E. slopes. The mineral wealth of the State is considerable. Copper is found in the Simsbury mines at Granby, and at

Bristol; but these mines have lost their former importance .

since the-working of the abundant and purer ores of Lake Superior, Iron ore is found in great quantities in Salis- bury, Kent, Sharon, Cornwall, and Canaan, and has been worked for 125 years. Limestone and marble of the very best quality are found at Canaan, Washington, and Milford. At Portland and Cromwell, on both sides of the Connecticut River, are the well-known immense quarries of freestone largely in demand for building. The excellent slate flagging from Bolton and Haddam is abundant in supply, and in great demand. Granite, gneiss, hydraulic lime, tiling slate, clay (fire, potters', and porcelain), and sulphate of barytes are found in great quantities. There were twenty extensive quarries and mines in the State in 1870. There are over 100 miles of deeply indented coast on the Sound (which measures 140 miles by 24 miles), affording excellent harbours. The chief of these are Stonington, New London, Saybrook, New Haven, Bridgeport, and Fairfield. The harbour at New London is one of the best in the country, capacious, and never frozen over. The climate of the State, while very changeable, is very health- ful,—the mortality being below the average of the other States. There is scarcely any spring season, but summer opens abruptly about May 3, and the cold weather begins in November. The winters, with their keen N.W. winds, are severe, but the serenity of the sky and dryness of the air make some compensation. The mean temperature for the year is 48° Fahr. Consumption is the most fatal disease, causing 16 per cent. of all the deaths. The vege- tation is rich and

~~varied. The most abundant trees are chestnut, walnut, birch, oak, elm, maple, beech, and ash. The forests have been recklessly cut away, and only patches of woodland remain ; but the people are waking up to the importance of tree-planting. As for zoology, songbirds of all sorts are plentiful, and the grouse and woodcock are increasing under the game laws, after having been nearly killed out. The Sound abounds in the best qualities of fish and shell-fish, while the freshwater varieties of the fornier are found in great quantities in the rivers and ponds, Aside from these there are few aninials of importance save the domestic ones.~~

~~Population. Divisions.—The State is divided into 8 counties :—Hartford, New Haven, New London, Fairfield (all incorporated in 1666), Windham (1726), Litchfield, (1751), Middlesex, and Tolland (1785). New London, Middlesex, New Haven, and Fairfield occupy the lower half of the State, bordering on the Sound; the others occupy the other half, adjoining Massachusetts. 'The number of towns in 1876 was 167; and there were ten cities :—Hart- ford, the capital (population in 1870, 37,180), New Haven (50,840), Bridgeport (18,969), Norwich (16,653), Water-~~

~~CORN TC T £Uts~~

~~It is the third State in the density of its population (11316~~

~~bury (10,826), Middletown (6923), Meriden (10,521), New — London (9576), New Britain (9480), and South Norwalk, There were also 17 boroughs largely engaged in industry of whichthe chief are Birmingham, Danbury, Danielsonville | Fairfield, Stamford, Stonington, Willimantic, and Winsted, The population of the State in 1679 was 12,535; in 1774 it had risen to 197,856; and from 1790 it was as follows — (the last column showing its place among the other States as regards population) :~~

~~White. | coloured,~~

~~2808 5330 6453 7870 8047 8105 7698 8627 9668~~

~~232,374 244,721 255,179~~

~~267,181 289,603 301,856 363,099 451,504 527,549~~

537,454 ji

Tn 1870 there were about 7000 more females than males, About one-fifth of the population were foreign born, chiefly Irish, German, English, French, Canadian, and Scotch. |

to the square mile), Massachusetts (186) and Rhode Island (208) exceeding it, while New York follows next (87). In 1875 the births were 14,328 (141 illegitimate); marriages, 4385 (below the average for the last 11 years) ; deaths, 9833 (25 per cent. from diseases of the respiratory organs) ; divorces, 476 (one for every 9°21 marriages solemnized ;

the average for 12 years is 455). The laws regarding divorce are very lax. Industry and Finances.—Of the total population over ten years of age in 1870 (425,896), there were engaged in all occupations, 193,421; chiefly classed as—in agriculture, 43,653; in professional and personal service, 38,704; in trade, 24,720; and in manufactures, 86,344. There ig very little soil that can be called good, except in the river valleys, and agriculture is as backward as in other parts of New England. The hills through the State furnish excellent pasturage and cheap fuel. The chief cultivated fruits are apples, pears, grapes, and the numerous kinds of berries.

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The principal crops are hay, oats, rye, corn, potatoes, and tobacco ; and in the Connecticut River valley (extending, in this State, 30 miles N. of Middletown, and 20 miles wide) farming is very productive. The tobacco raised in the valley is said to be superior to any other. In the up- lands dairy products and cattle raising are the chief re- sources of thefarmer. There were in 1870, 25,508 farms, — having 1,646,752 acres of improved land, and 717,064 acres | unimproved, of which 577,333 were woodland. The value of these farms was $124,241,382. Though the number of farms has increased since 1850 and 1860, yet the acreage » devoted to them has decreased, as has also the cultivated — farm land in proportion to the uncultivated. The farms — are passing into the hands of the Irish and Germans, who do their own work and live with few comforts. Pisciculture is receiving much attention, commissioners having been —

‘appointed in 1866, who have well stocked the ponds and

rivers. Black-bass, trout, and shad have been very success” | fully cultivated, and it is hoped as much can be done with | salmon. Notwithstanding the extensive sea coast and fine harbours, the foreign commerce is not heavy,—the coast trade and fisheries being more important. Thereare ID the State five custom districts, of which the ports of entry are: Fairfield, Middletown, New Haven, New London, and | Stonington. The imports from foreign countries a domestic exports for the year ending June 30, 1875, were as follows :—

CONNECTICUT 287

Ports. Imports, Exports. the poorer hill towns. There are about 13,000 miles of them; RRTAEIG ....0s..0cceens $6617 $28, 927 costing annually about $650,000. The banking interest of the’ Middletown ..... 619 none State is commensurate with its large business, and shows a steadily New Haven ..... 1,174,921 2,925,631 increasing prosperity. At January 1, 1876, there were 79 national New London ..... 274,165 118,605 banks in the State, with a capital of $25,687,820; 4 State banks, Stonington ..... ee 858 none with a capital of $1,450,000, and assets $3,917,953 ; 12 trust

=——— ——— ———. companies, with a capital of $2,450,000, and assets $6,183,643, BGT, 2. 2+ 00ecee $1, 457,180 $3,073,163 These all do a heavy discounting and lending business with their

capital and deposits, and pay dividends of § to 12 per cent. on their stock. ‘The savings banks numbered 87, with a deposit of $76,489,310, and 208,030 depositors. The average income (during 1875) was 6°62 per cent., nearly all of which is paid to depositors, there being no capital stock. © The management is very strictly controlled by law, and about three-quarters of the assets ate lent on real estate in the State. The whole number of fire and marine insurance companies doing business in the State in 1875 was 130, of which 32 were Connecticut companies. The assets of these last were $17,345,790, of which over 16 millions were held by 10 companies (mostly in Hartford). The premiums received by all the companies were $1,949,867, and the corresponding losses $1,248,989 ; total risks written in the State, $165,660, 801. The premiums received by the Connecticut companies from

their entire business were $9,195,617, and corresponding losses $5,203,416. The life and accident companies doing business numbered 27, of which 11 were Connecticut companies ; the assets of the last were $98,964,945. There were 2740 life policies issued in Connecticut in 1875, insuring $5,066,438. The life premiums paid amounted to $1,927,663. The policies in force in the State numbered 25,259, insuring $51,063,720. The Connecticut com- panies (all of Hartford) issued 26,104 policies, insuring $48, 822,881 in 1875 (a large reduction on previous years), and paid losses of $6,463,473. The State debt in 1860 was only $50,000, which was borrowed from the school fund. From July 1, 1861, to October alle 1865, five issues of bonds were made, amounting to $10,000,000, drawing 6 per cent. interest. This debt has been steadily reduced, and on April 1, 1876, was $5,014,500, or deducting cash in the' treasury, only $4,302,775. The revenue of the State for the year

The chief articles of export were grain, fire-arnis, provi- sions, and manufactures of wood. Of the total number of enrolled, registered, and licensed vessels (820), 718 were sailing vessels, with a tonnage of 53,329, and 78 were steam vessels, with a tonnage of 26,550. 'The fisheries are carried on from New London and Stonington. In 1875, there were 173 vessels engaged in the cod and mackerel fisheries, with a tonnage of 3756; and in the whale fishery 14, with a tonnage of 2050—a great reduction on the do- cade from 1850 to 1860. Engaged in coastwise trade and fisheries, there entered 2257 vessels and cleared 1678. In forcign trade there entered 161 and cleared 102. In 187 0, 1001 persons were engaged in fisheries, and the annual product was $769,799. Ship-building is a considerable industry. In 1875, 34 vessels were built of 5915 tons, The great industry of the State is in manufactures. Thess are exceedingly numerous and very productive, and most of them such as require ingenuity and intelligence on the part of the workmen. The chief industries and some of their statistics in 1870 were :

—

' ; Steam | Water- ae engines! wheels ments, | 10's$- | Horse- "| power | power,

Annual

Hands.) Capital. Product,

~~a ending March 31, 1876, was $2,117,719. This amount was chiefly~~

~~ie (of all |) ee 8 ; of ene from the tax of 1 mill oie grand list of the towns~~

~~SOLtS)eeeeeteee e 6 f ,086 | 12,710,700 | 14, 26,334 ($437,473), from savings banks ($462,664), mutual insurance~~

~~i tae ee nae terrane aie companies ($398, 266), foe railroads ($302,758). In 1860 the~~

~~Iron work (all sorts) | 124 | 2:791 | 1/480 3,486 | 5,320,650 7.552.725 assessed value of all property in the State was $341, 256,976, and~~

~~Machinery, _,, 108 | 1,424} 728! 2,770| 43491641 5,010,379 the true value $444,274,114. In 1870 the assessed value of real~~

~~:. Esmee ar 66 | 567 | 5,007} 1,497 | 2,988,046] 4/874,91 estate was $204,110,500, and of personal estate $221,322,728;~~

~~; FIXEULCSsrrroreonee| 9 | 815 30 | 2,525 | 2,492,000] 3,949,000 total, $425, 433,228, The true value was $774,631,524. In 1860~~

~~ey ae 82) 685} 499} 2,107] 2,337,500 4,066,806} | the total taxation, not hoes was Sees i ee~~

~~; and wag- ; $6,064,843. — The total indebtedness of towns and cities in the State~~

~~nia ne a) 185) 401) 2,41 | 2,202,810 a 1ee00 on June 1, 1874, was $13,995,090, more than one-third of which Clastic goods.....0.| 18 | 1,183 981} 1,946] 2,345,000} 4,939,329 was incurred in aid of railroads,~~

~~Frogs sesesenme ps ah 300} 1,708 | 1,414,130 8,314,845 Social Statistics. —A large number of public and charitable in-~~

~~Cutlery andedgetools | 41 376 1 O46 1738 1‘506‘350 aati stitutions are maintained wholly or in part by the State, and for~~

Hats and caps..e…..s.« 83/ 534| ‘56| 92\464 1,153 300 3,740,871 them it spent $135, 463 during the year ending March 31, 1876.

Se also materials Among them are the following. The American Asylum for the

Boate a” a eo = roils a ome Deaf and Dumb, at Hartford, was incorporated in 1816, being the

Bleaching and dyeing! “18 13] 258! “Iss 150/100 91743 oldest institution of the kind in the United States. In all, 2056 per-

Total (the above and) |=) ———-}———|| sons have received instruction, with an average attendance in 1875

all others). f | 5128 25,979 | 54,395 80,523 | 95,281,278 161,065,474 | of 218. The funds of the institution amount to $338,925. The

annual State grant is $11,000. The charge per pupil is $175 a year. There is no asylum for the blind, but an annual grant of $6000 is made for the eare of the indigent blind at the Perkins Institute at Boston. There is a general hospital at New Haven chartered in 1827, with a training school for nurses attached ; funds, $20,000 ; annual grant, $2000; patients in 1875, 4386. The Hartford Hos- pital was opened August 1, 1860; funds, $153,500, but considerably in debt; annual grant, $2000 ; patients in 1875, 707. The Con- necticut Hospital for the Insane, at Middleton, was opened in 1868 ; cost, $640,048 ; it accommodates 450 with attendants and physicians, and is always crowded. To April 1, 1876, 1272 had been admitted. One-half the board of panpers is paid by the State. Revenue in 1875, $124,305, of which the State paid $62,004. The Retreat for

It ranks first among the States in the production of clocks, Indian- te and hardware, and (small as it is) eighth in the total value of all manufactured products.

ee in connection with the above statistics, that the ninth United

the way of under-estimate,

Tailway to 5°16 square miles of territor] y, and to 585 inhabitants. an eee had 1 mile to 4-29 Square miles and 909 inhabi-

d companies, with 1184 miles of single

& cost of these

?

e a Was $59,289,784 (paid in), and debt,

c was $75,831,210; receipts for the

toa es (50 per cent. from passengers) ; A earnings, 2020, eing 3°71 per cent. on the cost of the roads. Nine roads, The eapital stock of Se APR 17,077,739. In dividends (only eight companies make any) ire capital of all the roads, but 9°24

There is an elaborate oads and their accounts. There is after deduetin Per cent. on the market value of stock and bonds inning N. & cas The principal lines are those

for patients who can pay for comfortable accommodation.

cost $122,363, mostly given by individuals.

the Insane at Hartford was opened in 1824, and has treated 5786 patients. Though recciving large State and private aid, itis "rn gn

iad in 1875 about 159inmates. The Reform School at West Meriden was opened in 1854; cost $115,000, with a farm of 195 acres. The expense to the State in 1875 was $30,368, Boys from ten to sixteen years old may be sent to it for crime, by the several courts, for not less than 9 months, and during minority. The inmates are required to

labour 64 hours a day, and attend school 43 hours. The Industrial

School for Girls at Middleton was opened in 1870. Its property has The expense to the

State in 1875 was $16,223, and the inmates numbered 53. Girls from eight to sixteen may be committed to it for vagrancy, and are taught housekeeping, sewing, box-making, and farm and garden work. The School for Imbeciles at Lakeville cost $10,000, appropriated by the legislature. In 1875 its income was $14,165, with an average of 95 inmates. The State prison at Wethersfield, erected

ik highways between the important cities of

Connected with these are nger and freight) from Stonington, ; . New York. The Waggon road- € are kept in very fair condition, except in

ew London a Ways all over the Sta

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in 1827, is inadequate to the needs of the State, having, in March 1876, 40 more prisoners than cells, viz., 252 prisoners. Its income in 1875 was $25,539, and payments $28, 414,—the deficit being due to the recent decrease in the demand for convict labour. The punishments are solitary confinement, fetters, and shackles. The warder may deduct five days from the term of imprisonment for good behaviour. Schools were begun in New Haven in 1640. The provision and regulation of schools rested with the towns till 1712 ; with towns and parishes together till 1798 ; with parishes alone till 1856, when the towns were restored to their original place in the system. Though school districts existed in 1725, and were legalized in 1766, they were not fully endowed eorporate bodies till 1859. Schools have been maintained in three ways,—by taxes, by tuition fees or rate bills, and by the income of invested funds. Taxes were a source of income from the beginning to 1821, and were restored in 1854. Rate bills were not discontinued till 1868. Local school funds were begun towards the close of the 17th century, and in creased by sales of land in 1738, and by excise on liquors, tea, &c., authorized by Acts of May 1766 and October 1774. The State school fund was begun in 1795, it being the money procured by the sale of lands granted by Charles Il. in 1662, and described as 'from Narrogancett Bay on the cast to the South Sea on the west." This was, in fact, a strip of land 70 miles wide, and run- ning one-eighth of the cireuinference of the globe. Subsequeutly, this being found to interfere with other colonial grants, all

this territory was given up, save portions in New York and Ohio. The land was sold for $1,200,000; the fund, however, has increased, and at September 1, 1874, was $2,044, 266 ; the dividend per child has varied from $1, 50 to $1 per year, decreasing with the increase of population; the fund is almost wholly invested in real estate mortgages at 7 per cent. Another fund, the entire income of which since 1855 has been devoted to schools, is the Town Deposit Fund. The 24th Congress of 1835-6 voted to deposit the surplus revenue of the Union, then on hand, with the different States in proportion to their national representation. Connecticut received $764,670, whicli was divided among the towns according to their population in 1830; the present income from this is about $46,000 a year. (While Connecticut has preserved this fund almost intact, in other States it has been squandered or lost.) At present, aside from the income of these funds, the maintenance of the schools is provided for by these taxes :—the town tax, which must he sufficient to maintain 30 weeks of school in the larger, and 24 in the smaller districts ; the district tax to provide for buildings and repairs, or any deficit ; and the State appropriation of $1, 50 per child per year. In 1865 a State Board of Education was established, whose secretary is Superintendent of Public Instruc- tion. The following are statistics for the year ending August 31, 1875:—Districts, 1506 ; public schools, 1650 ; children from four to sixteen (on January 1, 1875), 134,976, of whom 95 per cent. attended school. Average length of school, 176 days. Teachers: males, 721; females, 1910. Average pay per month ; malcs, $70 ; females, $39. Income of public schools from all sources, $1,592,858. Pro- vision for higher education is made by various private and endowed schools, but is by no means complete. The State Normal School at New Britain was opened in 1850; the annual State grant is $12,000, and it graduates about 100 pupilsa year. 1n 1870 there were in the State 29 academies and seminaries, with 127 instructors, 1602 pupils, and 8000 volumes in their libraries. There are three colleges. Yale College (Congregatioual), in New Haven, was established in 1701 by the ten foremost ministers of the colony; in 1876 it had 90 instructors, nearly 1100 students in all departments, and 101,000 volumes in the libraries; its productive funds were about $1,500,000, and its property $5,000,000. Besides its classical course, it has faculties and schools of theology, law, medicine, fine arts, together with the very prosperous Sheffield Scientific School, and several post-graduate courses of study. Trinity (formerly

Washington) College, at Hartford, was founded in 1828 by Episco- palians ; its property is about $1,000,000, a considerable portion of which is in productive funds; it has about 20 instructors, 90 students, and 16,000 volumes in its library. Wesleyan University (Methodist) at Middletown was founded in 1831; property in 1875, $400,000; income, $47,000; instructors, 15; students, 190; library, 27,000 volumes ; women were admitted in 1872. There isa theological institute (Congregational) at Hartford, and the Berkeley Divinity School (Episcopal) is at Middleton. In1870 the State had 64 public libraries, with 285,937 volumes ; these receive State aid. There are several valuable private libraries relating to American subjects at Hartford. The newspapers and periodicals numbered 71, circulating 203,725, and issuing annually 17,454,740 copies. There were 827 religious organizations, having 902 edifices, with 338,735 sittings, and property worth $18,428,109. The Congrega- tionalist is by far the most numerous and wealthy denomination, followed by Episcopalians, Methodists, Baptists, and Roman Catholics. .

Goverament.—Connecticut is represented in the National Congress by two senators and four representatives, and

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has now six votes in the Presidential electoral college. The State constitution provides distinct executive, legislative, and judicial powers. be over thirty years of age. of the legislature carries a bill over his veto. His salary is $2000. 'The legislature, or General Assembly, consists of a senate and house of representatives, and meets annually on the Wednesday after the first Monday in January. The senate consists of not less than 18, or more than 24, mem- bers from districts determined by the General Assembly according to population. each town incorporated before 1785 or having over 5000 inhabitants, and one from every other. number 18, the representatives 244, Each legislator is paid $300 a year. lation. elected annually, and the general State officers and senators biennially, November. twenty-one, who shall have resided in the State one year, and in the town where he offers to vote, six months, and who can read any article of the constitution, is entitled to vote. The judicial power, is vested in the following courts:~A | supreme court of errors, associates; a superior court, together

~~with the five of the court of errors. all chosen for eight years by the Assembly, but, are dis- qualified on attaining the age of seventy. They may be removed by impeachment, or by the governor ona two- thirds address of each house. There are also five courts of common pleas, presided over by a single judge, with a salary of $2500. certain cities and boroughs, with judges by the Assembly. elected biennially by the people of the towns where they live. there are 113; the judges are people.~~

~~the State is that, when cities are formed, they still remaill~~

~~The chief officer, or governor, must A majority vote in each house~~

~~The representatives are two from The senators now~~

~~There is much special and excessive legis. All elections are by ballot. Representatives are~~

~~on the Tuesday after the first Monday in Any male citizen of the United States, aged~~

~~The pardoning power is vested in the Assembly.~~

~~consisting of a chief and four consisting of six judges, These are~~

~~Their salary is $4000 each.~~

~~chosen for four years by the Assembly, There are inferior courts in chosen biennially Numerous justices of the peace are~~

~~Probate courts are held in each district, of which elected biennially by the revision of the General~~

~~A somewhat faulty—A peculiarity of~~

~~Statutes of the State was made in 1875.~~

~~(frequently) parts of towns, and have a double government. The State militia embraced, 1 1875, 2636 men, though those liable to serve (viz., between the ages of eighteen and forty-five) numbered 62,103. The~~

governor 18 con- mander-in-chief, and under him are a brigadier-general and staff and field officers. The brigade comprises four regiments of infantry (one from each congressional district) and one section of light artillery. Two regiments go Into encampment for a week, and the other two have a ful parade each year. The arms of the State are—three vines in fruit—2 and 1, all proper—with the motto, "Qu transtulit sustinet." History.—The Dutch first explored the country in 1620, but made no settlement till 1633, Then they settled at Hartford, buying of the Pequot Indians, but selling soo after to the English. James I. granted the first English patent to all New Englaud, in 1620, to Lord Say-and-Seal andothers. In 1634-36 permanent settlements were made at Hartford, Wethersfield, and Windsor by compantes from Massachusetts under a patent from the Plymouth colony, covering the present State and also portions of aaa Tsland, Massachusetts, Long Tsland, and an undefine territory to the west. In 1637 these towns organized a0 independent goverument, declared war against the a and, uuder Captain J. Mason, nearly destroyed the Wt fi In 1638 New Haven and. vicinity was settled by . English corapany under Rev. J. Davenport and Govern | Eaton.

This colony was united to Connecticut in

as was Saybrook in 1644. In 1639 Connecticut, chiefly through the influence of the Rev. J. Hooker of Hartford, adopted a constitution. This was " the first one written out, as a complete form of civil order, in the New World, and embodies all the essential features of the constitutions of the American States, and of the Republic itself, as they exist at the present day. Itis the free representative plan which characterizes the country." In this constitution, and during the administration of it (till 1661), the only) authority ceeoguized was the "supreme power of the commonwealth," and ee people ee eae! indepen- ent, When Charles II. came to the throne, J. Winthro : 'al succeeded, in 1662, in obtaining a most ent charter, which constituted Connecticut so completely a self- | governed colony that no changes were needed in the i instrument when she became one of the American States. | Nor was it altered till 1818. From 1685 to 1687 James If. made strenuous efforts to take away all the New England charters; and in

the latter year, Sir E. Andross, the royally appointed governor, came to Hartford while the Assembly was sitting, and demanded the charter. It was, however, concealed in the famous charter oak ; and, at the dethronement of James IT. in 1689 (after a year and a half of oppressive rule by Andross), the colonial Government resumed its functions as if nothing had: happened. From the union of the colonies, Hartford was the seat of Govern. ment till 1701, from which date it shared the honour with New Haven until 1874, when it became the sole capital. The code, commonly called the Blue Laws of Connecticut, is now generally considered to have been a forgery by the Rey. Samuel Peters. The early statutes were not peculiarly severe or intolerant, and no case of execution for witchcraft is known. During the French and Indian wars Connecticut supplied her full quota of soldiers ; and, during the revolt of the colonies, she furnished more men in proportion to her population, and more aid in proportion to her wealth, than any other colony.

| bg Ge a wild and picturesque district in the

the Atlantic, wh

in boundary with the barony of Ballinahinch, lying between the bays of Kilkieran and Ballinakill ; but the name is often applied in a general way to the whole western division of county Galway.

CONNOR, Bernarp (1666-1698), physician, was born in Kerry, Ireland. He studied medicine at Montpellier, and afterwards at Paris. Having travelled through Italy with the two sons of the high chancellor of Poland, he was introduced at the court of Warsaw, and appointed physician to John Sobieski, king of Poland. In 1695 he visited England, and read a course of lectures on physiology in London and Oxford. He was afterwards clected member of the Royal Society and College of Physicians, and was invited to Cambridge, where he also delivered public lectures. He was the author of a treatise entitled Hvan- gelium Medici (the Physician's Gospel), in which he endeavoured to explain the Christian miracles as due to natural causes. He also wrote a History of Poland in 2 vols,

CONOLLY, Joun (1794-1867), physician, studied medicine at Edinburgh, where he took the degree of M.D. in 1821, He settled in practice at

~~Chichester, whence he removed to Stratford-on-Avon. In 1897 he was appointed, when only thirty-three years of age, professor of practice of physic in University College, London. This chair he resigned after holding it four years. Subsequently he practised medicine in Warwick until 1839, in which year he was elected resident physician to the Middlesex County Asylum at Hanwell. It was in this capacity that Conolly made his name famous, by carrying out in its entirety and on a large scale the principle of non-restraint in the treat- ment of the insane. This principle had been acted on in two small asylums—the Retreat near York, and the Lincoln Asylum; but it was due to the philanthropic energy of Conolly in sweeping away all mechanical restraint in the great metropolitan lunatic hospital, in the face of strong opposition, that the principle became diffused over the whole kingdom, and accepted as funda- mental. Dr Conolly was granted the degree of D.C.L. by the University of Oxford in 1851, in acknowledgment of these services. He died in 1867. See a memoir by Sir James Clark, Bart., published in 1869,~~

~~CONON, an Athenian general. Having already com- manded on several occasions, he was chosen as one of the ten generals who superseded Alcibiades in 406 3.c, He Was not present at the battle of Arginusz, and consequently he was allowed to remain in command. Jn 405, however, the Athenian fleet was surprised by Lysander, at AXgospotami, and Conon fied to his friend, Evagoras, king of Cyprus. On the outbreak of the war between Sparta and the Persians, he obtained from King Artaxerxes joint command with Pharnabazus of a Persian fleet. With it in 394 B.c. he defeated the Lacedzemonians near Cnidos, and thus deprived them of the empire of the sea, which they had held since the taking of Athens. Sailing down the /Egean to Athens, he expelled the Lacedeemonian harmosts from most of the maritime towns, and finally completed his services to his country by restoring the long walls and the fortifications of the Pirzeus. According to one account, he was put to death by Tiribazus, when on an embassy from Athens to the Persian court ; but it seems more prob- able that he escaped to Cyprus, where he had considerable property, and that he died there a natural death. See GREECE,~~

~~CONRAD. For the four emperors of this name, see GERMANY,~~

CONRADIN (1252-1268), son of the Emperor Conrad IV. and Elizabeth of Bavaria, was at the death of his father an infant some two years old. HIs uncle, Manfred, Treland, indented by numerous bays from | the illegitimate son of Frederick II., declared himself his ence it derives its name, [t corresponds | champion, but, having recovered the Two Sicilies, himself

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seized the throne. Innocent IV. now called in the aid of Charles of Anjou, who defeated Manfred, and took posses- gion of the crown. But Charles showed favour to none but his own countrymen, and at the entreaty of the Ghibelline leaders, by whom he was acknowledged as emperor, Conradin, now only sixteen, led an army into Italy. After gaining some advantages he was utterly defeated in August 1268, and soon after, being betrayed into the hands of Charles, he was unjustly tried, con- demned, and executed in the market-place of Naples, with the consent of the Pope. HIe left his kingdom by will to Peter of Aragon. See SICILY.

CONRART, or Conrarp, VALENTIN (1603-1675), one of the founders of the French Academy, was born at Paris in 1603, and was educated, under Calvinist parents, for a commercial life. After his father's death, however, he turned. his attention to literature, made himself proficient in lis own language, and in those of Italy and Spain, and being brought into contact with men of letters, soon acquired a reputation, which for many years he did nothing to sup- port. HIe was made councillor and secretary to the king ; and this, together with a benevolent character, a faultless tasté, and a certain charm of disposition and conversation, gained him a host of friends in the highest circles. Some, however, refused to join in the applause that everywhere greeted Conrart, and posterity has echoed their verdict. HIs literary reputation has passed away almost as completely as that of his friend Chapelain; and a certain distinction of style, recognized by Sainte-Beuve, is all that he is now credited with. In 1629 Courart's house became the resort of a knot of literary men, who met to talk over professional subjects, and to read for advice and approval such work as they produced.

The indiscretion of one of the number led to an involuntary notoriety, and to the influx into the meet- ings of the club of many strangers. Among these was Boisrobert, Richelieu's newsmonger and jester, who reported to his patron what he had seen and heard. The cardinal offered the society his protection, and in this way (1634) the French Academy was created. Conrart was unani- mously elected secretary, and discharged the duties of his post for forty-three years, till his death in 1675. The in- telligence and conscientiousness he displayed in this capacity are perhaps his greatest titles to distinction. To the last he rigidly adhered to his hereditary faith. See Acapemy, vol. i. p. 743 Petitot, IMdémozres Rélatifs & DP Histoire de France, tome xlviii.; and Sainte-Beuve, Caw- series de Lundi, 19 Juillet 1858.

CONSALVI, or Goysatvi, Ercors (1757-1824), car- dinal and statesman, was born at Rome on the 8th of June 1757, of a noble family originally belonging to Pisa. His boyhood was sickly, and presents nothing remarkable. From the college at Urbino, he passed to the Frascati College and the religious academy at Rome, studying theology, politics, music, and literature. Entering the Pontifical court as page in 1783, he rapidly advanced, and in 1797 obtained the office of auditor of the rota, which brought him into public notice. Accused of partici- pation in the assassination of Duphot, he was arrested by the French on their seizure of Rome, and after a period of incarceration condemned, like so many of his brethren, to exile. On the death of Pius VI. he succeeded, in con- junction with Cardinal Maury, in securing in the conclave at Venice the election of Chiaramonti as Pius VIL; and

the new Pope rewarded his devotion by appointing him

secretary of state. Though from the beginning an avowed. antagonist of the principles of the Revolution, Censalvi was too wise not to know that even Rome required in some degree to acknowledge their influence. He accordingly instituted various reforms, and but for the bitter opposition of the Conservative party his measures would have been

more thoroughgoing than they were. He permitted laymen to hold certain public offices, under surveillance of the pre. lates, organized a guard from among the Roman nobility. decreed a plan for redeeming the base coinage, permitted the communes a certain degree of municipal liberty, and promised the liquidation of the public debt. In the long debates between Rome and France about the Concordat Consalvi was the leading power on the side of the church : and he fought for the Papal privileges during his visit to Paris, with a pertinacity and spirit that won at once the hatred and respect of Napoleon. Impressed with Napoleon's — power, and anxious, if possible, to make him subservient | to the designs of Rome, he strongly urged the Pope to — accede to the conqueror's request that the imperial crown should be placed on his head by the most sacred hands in Christendom. During the Pope's absence on this mission — he remained as virtual sovereign in Rome ; and his regency — was rendered remarkable by a great inundation, caused by the overflow of the Tiber, during which he exposed himself with heroic humanity, for the preservation of the sufferers, Not long after the return of the Pope, the amity between the Vatican and the Tuileries was again broken. Rome was full of anti-Revolutionary and anti-Napoleonic strangers from all parts of Europe. his ambassador, Cardinal Fesch, kept up the irritation by perpetual complaints directed more especially against Consalvi himself. still flushed with Austerlitz, "that if he loves his country he must either resign or do what I demand." Consalvi did accordingly resign on the 17th June 1 807, and was followed in rapid succession by Casoni, Doria, Gabrielli, and Pacca, When in 1808 power of the Pope was formally abolished, he broke off all

The emperor was irritated ; and —

Tel] Consalvi," wrote the conqueror,

Miollis entered Rome, and the temporal

relations with the French, though several of them were his 'ntimate friends. In 1809 he was at Paris, and, in a re- markable interview, of which he has left a graphic account in his memoirs, he received from Napoleon's own lips what was practically an apology for the treatment he had received. With unbending dignity, however, he retained his antagonism ; and shortly

afterwards he was one of the thirteen cardinals who refused to recognize the marriage of

Marie Louise. The result, as is well known, was @ con- . finement at Rheims which only terminated about three years afterwards, when Napoleon had extorted what terms he pleased from the half-captive Pope at Fontainebleau. On his release Consalvi hastened to his master's assistance ; and he was soon after permitted to resume his functions under the restored pontificate at Rome. Despatched to England to meet the allied sovereigns, he was well received both by king and people; and at the Congress of Vienna he obtained the restitution of the Marches (Ancona, Treviso, and Fermo) and the Legations (Bologna, Ferrara, and Ravenna). The rest of his life was spent in the work of reorganizing the States of the Church, and bringing back the allegiance of Europe to the Papal throne. He was practically governor of Rome; and Pius was so much under his control that "Pasquin" said the Pope would have to wait at the gates of paradise till the cardinal came from purgatory with the keys. In his foreign policy he was actuated mainly by antagonism to Austria ; in his domestic policy he imitated the centralizing system of France. Jn all essentials a most rigid churchman, he was disposed to yield in minor matters, and obtained the praise of many Protestant visitors to Rome for his affability and liberality. —Science, literature, and especially the fine arts received his most abundant patronage ; the ancient buildings of Rome were excavated and preserved by his direction ; chats of natural science and archeology were founded in the ex sity ; and extensive purchases were made for the bs aticen Museum, which was augmented by the addition of tha

- fact, except Egypt and Persia, nearly the whole world,

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beautiful Braccio Nuovo, or new wing. These and the like expenses, however, were a heavy drain on the Papal treasury, and brought Consalvi into financial difficulties, from which he only got free by the imposing of unpopular taxes, On the death of Pius VII. he retired to his villa of Porto @Anzio; and, though he afterwards accepted from the new Pope the honorary office of prefect of the college De Propaganda Fide, his political career was closed. He died on 22d of January 1824, leaving the most of his

mode- A fine portrait of Consalvi by Sir T. Lawrence is preserved at Windsor, and his tomb in South Marcello is surmounted by a monument by

rate fortune to the poor.

Rinaldi,

The memoirs of his life, written with great freedom of statement and considerable force of style, have been published by Crétineau- Joly in 1864, See also M. de Pradt, Histoire des Quatre Concordats, 1818-1820; L. Cardinali, Elogio detto alla memorta del card. Consalvi; Cenni biografict sul Consalvi, published at Venice in 1824; Bartholdi, Ziige aus dem Leben des Cardinals Here. Consalvi, 1825; Cardinal Wiseman, Recollections of the last Four Popes, 1858 ; CrétineauJoly, L'église Romaine en face de la Revolution, 1859 ;

and Emest Daudet, Le Cardinal Consalvi, 1866.

CONSANGUINITY, or Krinprep, is defined by the writers on the subject to be winculwm personarum ab eodem stipite descendentiwm, that is, the connection or relation of persons descended from the same stock or common ancestor. This consanguinity is either lineal or collateral. Lineal con- sanguinity is that which subsists between persons of whom one is descended in a direct line from the other, while col- lateral relations descend from the same stock or ancestor, but Collateral kinsmen, then, are such as lineally spring from one and the same ancestor, Who is the stirps, or root, as well as the stipes, trunk, or common stock, whence these relations branch out, It will be seen that the modern idea of consanguinity is larger than that of agnatio in the civil law, which was limited to connection through males, and was modified by the ceremonies of adoption and emancipation, and also

do not descend the one from the other.

than that of cognatio, which did not go beyond the sixth

generation, and was made the basis of Justinian's law of

~~succession. The more limited meaning of consangwinei was brothers or sisters by, the same father, as opposed to uterinz, brothers or sisters by the same mother. The degrees of collateral consanguinity were differently reckoned in the civil and in the canon law. "The civil law reckons the number of descents between the persons on both sides from the common ancestor. The canon law counts the number of descents between the common ancestor and the two persons on one side only," and always on the side of the person who is more distant from the common ancestor. A~~

~~Tecent American writer, Lewis Morgan (Systems of Con- sanguumty and Affinity im the Human Family,~~

~~1871), has given the terms used to denote kindred in 139~~

~~languages,~~

~~The Mongoloids, the Malays, the Dravidas, and the Ameri-~~

~~can aborigines have the following system. All the descendants of a common ancestor or ancestors of the Same generation call each other brother and sister 3 they call all males of the previous generation fathers, and of the following one sons. From this he draws the mistaken inference (shared by Lubbock) that the primitive marriage state was hetarism, or community of wives. The linguistic acts are more probakly connected with considerations of social rank, and such associations as the vendetta, In~~

~~both civilized and savage, have joined in repudiating incest. . chief danger has now been seen to lie in the risk of dee defects IM an aggravated form. The force of . feeling 1S seen in the custom of wife-stealing, or exo- fe Violence. In many places even identity of name MLe to be an impediment to marriage. (See also ennan On Primitive Marriage, 2d edition, 1876.)~~

~~CONSCRIPTION. See Army, vol. ii., pp. 565, 601 602, &c.~~

~~CONSECRATION, the act of devoting anything to sacred uses. The Mosaic law ordained that all the first- born both of man and beast should be~~

~~consecrated to God. We find also that Joshua consecrated the Gibeonites, ag Solomon and David did the N ethinims, to the service of the Temple ; and that the Hebrews sometimes consecrated their fields and cattle to the Lord, after which they were no longer in their own power. In England (and, indeed, in all countries where any form of episcopacy prevails) churches have always been consecrated with particular ceremonies, the form of which is either left in a great measure to the discretion of the bishops, or provided. for in the recognized office-books. Cemeteries are in like manner episcopally consecrated. Consecration is also used for'the benediction of the elements in the Eucharist, Consecration, or the ancient heathen ceremony of the apotheosis of an emperor, is thus represented on medals :—On one side is the emperor's head, crowned with laurel, sometimes veiled, while the inscription gives him the title of dius; on the reverse is a temple, a bustum, an altar, or an eagle taking its flight towards heaven, either from off the altar, or from a cippus. In others the emperor is borne up in the air by the eagle. The inscription is always consecratio, These are the usual symbols ; but on the reverse of that of Antoninus is the Antonine column. In the apotheosis of empresses, instead of an eagle, there is a peacock. The honours rendered to these princes after death were explained by the words consecratio, pater, divus, and deus. Sometimes around the témple or altar are put the words memoria feliz, or memorie cterne; and for princesses, weternitas, and sideribus recepta; Whilst on the one side of the head is dea, or bed. The term consecratio is also applied by Roman authors to the devotion of priests and temples to the gods; this is likewise called dedicatio and txauguratio. In Greek we find the verbs idpvw, lepdw, used to express the same idea, with the cognate noun (Spvors and (in late authors) xaeépwors.~~

~~CONSERVATORY (Ital. Conservatorio, Fr. Conserva- tore, Ger. Conservatorium), a name applied first in Italy, and afterwards throughout the Continent, to institutions for training in music and for preserving the true theory and practice of the art. They arose out of the necessity of pro-viding trained choristers for the service of the church, and were generally maintained upon some charitable foundation which provided board in addition to a musical education for orphans and the children of poor parents, other pupils being occasionally taken on payment of fees. When fully equipped, each conservatorio had two maestri or principals, one for~~

composition and one for singing, besides professors for the various instruments. Though St Ambrose and Pope Leo I., in the 4th and 5th centuries respectively, are sometimes named in connection with the subject, the historic continuity of the conservatoire in its modern sense cannot be traced farther back than the 16th century. The first to which a definite date can te assigned is the Conservatorio di Santa Maria di Loretto, at Naples, founded by Giovanni di Tappia in 1537. Three other similar schools were afterwards established in the city, of which the Conserva- torio di Sant' Onofrio deserves special mention on account of the fame of its teachers, such as Alessandro Scarlatti, Leo, Durante, and Porpora. There were thus for a con- siderable time four flourishing conservatorios in Naples. Two of them, however, ceased to exist in the course of last century, and on the French occupation of the city the other two were united by Murat in a new institution under the title Real Collegio di Musica, which admitted pupils of both sexes, the earlier conservatorios having been exclusively for boys, In Venice, on the other hand, there

were from an early date four conservatorios conducted on

a similar plan to those in Naples, but exclusively for girls.

These died out with the decay of the Venetian republic,

and the centre of musical instruction for Northern Italy

was transferred to Milan, where a conservatorio on a large

scale was established by Prince Eugene Beauharnais in 1808. The celebrated conservatoire of Paris owes its origin to the Ecole Royale de Chant et de Declamation, founded by Baron de Breteuil in 1784, for the purpose of training singers for the opera. Suspended during the stormy period of the Revolution, its place was taken by the Conservatoire de Musique, established in 1795 on the basis of a school for gratuitous instruction in military music, founded by the mayor of Paris in 1792. The plan and scale on which it was founded had to be modified more than once in suc- ceeding years, but it continued to flourish, and in the inter- val

between 1820and 1840, under the direction of Cherubini, may be said to have led the van of musical progress in Europe. Inmore recent years that place of honour belongs decidedly to the conservatorium at Leipsic, founded by Mendelssohn in 1842, which, so far as composition and instrumental music are concerned, is now the chief resort of those who wish to rise to eminence in the art. Of other Continental conservatoires of the first rank may be named those of Prague, founded in 1810, of Brussels, founded in 1833 and long presided over by the celebrated Fetis, of Cologne, founded in 1849, and those instituted more re- cently at Munich and Berlin, the instrumental school in the latter being under the direction of Joachim. In England the functions of a conservatoire have been discharged by the Royal Academy of Music of London, which was founded in 1822, and received a charter of incorporation in 1830. With very limited resources as compared with the larger Continental establishments, it has done excellent service in providing a constant succession of thoroughly trained pro- fessional musicians. A national training school of music was opened at South Kensington under distinguished

auspices in May 1876, the object being to provide a free.

education of the highest kind to pupils of remarkable promise as tested by examination.

CONSISTORY, a term applied originally to an ante- chamber or outer- room of the palace of the emperors of Rome, where the petitioners for justice assembled and awaited the presence of the emperor, who upon his entrance into the consistory took his seat upon a tribunal, whilst the others stood around him (consistebant). The word "con- sistory," as a term of ecclesiastical law, in which sense it is for the most part employed in modern times, came to be used first of all to denote certain ecclesiastical councils, in which the bishop was seated, whilst the presbyters and other clergy stood around him. It came by degrees to be used generally for all ecclesiastical councils in which a bishop presided, and in which matters of order rather than of doctrine were discussed and decided. The term "con- sistory," as used in the Latin Church, is applied at Rome to denote the assembly of the cardinals convoked by the Pope. This assembly is styled a consistory, "quia

simul presente Papa consistunt cardinales," the Pope's presence being a necessary condition to constitute the assembly of the cardinals a consistory.

There are two kinds of consistory which the Pope is in the habit of convoking—a public consistory and a private consistory. A public consistory is now rarely summoned ; it is, in fact, an extraordinary assembly of the cardinals, at which other prelates and ecclesiastical magnates are present, and over which the Pope presides in his pontifical robes of state. It was usual for the Pope to receive foreign sovereigns and their ambassadors in a public consistory, and the hat used to be conferred on newly-created cardinals in such a consistory. The private or secret consistory is

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the ordinary court in which the cardinals attend on the Pope, and in which the Pope formally transacts certain ecclesiastical matters, which are of high importance and are termed consistorial matters; for instance, his Holiness nominates in secret consistory to all consistorial beuefices, creates cardinals, appoints to vacant bishoprics, confirms the election of bishops, deposes bishops, decrees the pallium to be sent to archbishops, unites churches, grants extraordinary dispensations, &e. consistory of the Pope is for the most part held in a chamber of the Papal palace at Rome known as the camera papagali or papagallr, which may be translated "The Painted Chamber," as Ducange renders it, "aula oma- mentis decora." The phrase seems to have come into use in the Cerimoniale Romanum, as "the Star Chamber" at Westminster came to be so called from the painting or tapestry on its walls. the Church of England to signify the tribunal or place of justice, which in olden times was fitted up within the nave of every cathedral church, for the | hand side of the western entrance, for the bishop of the diocese or his vicar-general to hold his court for the hearing and deciding of ecclesiastical causes. able influence of the spirit of resistance to the authority of the bishop, cathedral bodies in the Church of England from the earliest period of the Papal exemptions, the deans and chapters of the cathedral churches of England have in most cases caused the consistorial court of the diocesan bishop to he removed from the nave of the cathedrals, so that it is very rare to find at the present time traces of any such struc-

~~ture. bishop of Canterbury was removed from his cathedral within the memory of the living, nave was made ;~~

~~COW~~

~~This ordinary~~

~~The term ‘ consistory ” is used in most part on the left~~

~~Under the question-~~

~~which has been a distinctive characteristic of the~~

~~The last trace of the diocesan consistory of the arch-~~

~~when a restoration of the and the consistorial court of the bishop of London, which was on the south side of the nave of St Paul’s cathedral church, has been converted in very recent times, under the auspices of the late Dean Milman, into a memorial chapel for the reception of a national monument of the first Duke of Wellington. The consistorial courts of the bishops of the Church of England are now but “the shadows of great names,” as the state has~~

~~exercised by them in matrimonial and testamentary matters,~~

~~and their corrective jurisdiction over criminous clerks has~~

~~been transferred to other tribunals. It is not necessary, nor is it usual for the bishops to hold their diocesan visita- tions in their consistorial courts.~~

~~The term “consistory” is used in certain of the Reformed churches, which do not recognize the order of bishops, to signify the supreme governing council of presbyters and clders, and such churches are hence termed consistorial churches.~~

~~CONSOLIDATION ACTS. The practice of legislat- ing for small portions of a subject only at a time, whic.~~

~~is characteristic of the English Parliament, produces a8 4~~

~~necessary consequence great confusion in the statute law. The Acts relating to any subject of importance oF difi- culty will be found to be scattered over many years, and through the operation of clauses partially repealing OT amending former Acts, the final sense of the Legislature becomes enveloped in unintelligible or contradictory @X pressions. Where opportunity offers, the law thus express¢ in any statute is sometimes recast in a single statute, calle~~

~~a Consolidation Act. Among such are the Criminal Laws Consolidation Act and the Customs Laws Consolidation Act. These observations apply to the public gent Acts of the Legislature. On the other hand, in settling private Acts, such as those relating to railway and cane enterprize, the Legislature always inserted certain claus' —~~

~~deprived the . judges of the consistorial courts of the jurisdiction formerly~~

~~—The funds of the savings' banks have been applied to the~~

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~~founded on reasons of public policy applicable to the busi- ness in question. To avoid the necessity of constantly re-enacting the same principles in private Acts, their common clauses were embodied in separate statutes, and their provisions are ordered to be incorporated In any private Act of the description mentioned therein. Such are the Lands Clauses Consolidation Act, the Companies Clauses Consolidation Act, and the Railways Clauses Consolidation Act, all passed in 1845. j~~

~~CONSOLS, an abbreviation of Consolidated Annuities, had their origin in 1751, and now form the larger portion of the funded debt of the United Kingdom. In the progress of the national debt it was deemed expedient, on grounds which have been much questioned, instead of borrowing at various rates of interest, according to the state of the izarket or the need and credit of the Government, to offer a fixed rate of interest, usually three or three and a half per cent., and as the market required to give the lenders an advantage in the principal funded. 'Thus subscribers of £100 would~~

sometimes receive £150 of three percent. stock. In 1815, at the close of the French wars, a large loan was raised at as much as £174 three per cent. and £10 four per cent. stockfor£100. Thelowrate ofinterestwas thus purely nominal, while the principal of the debt was increased beyond all due proportion. This practice began in the reign of George II, when some portions of the debt on which the interest had been successfully reduced were con- solidated into three per cent. annuities, and consols, as the annuities were called, and other stocks of nominally low interest, rapidly increased under the same practice during the great wars. In times of peace, when the rate of money has enabled portions of the debt at a higher interest to be commuted into stock of lower interest, it has usually been intoconsolsthat the conversion has been effected, Tem- porary deficits of the revenue have been covered by an issue of consols ; exchequer bills when funded have taken the same form, though not constantly or exclusively ; and some loans of the Government in recent times for special pur- poses, such as the relief of the Irish famine and the expenditure in the Crimean war, have been wholly or partly raised in consols. 'The consequence has been to give this stock a pre-eminence in the amount of the funded debt. It appears from a recent parliamentary return than of £773,313,229 of funded debt of the United Kingdom £398,147,075 consisted of;consols, £107,227,854 of three per cent, reduced annuities, and £225, 256,099 of new threes,

single person, not acting in concert with others, The following are enumerated in text-books as the things, an agreement to do which, made between several persons, constitutes the offence of conspiracy :—(1) Falsely to charge another with a crime punishable by law, either from a malicious or vindictive motive or feeling towards the party, or for the purpose of extorting money from him; (2) wrongfully to injure or prejudice a third person or any body of men in any other manner ; (3) to commit any offence punishable by law; (4) to do any act with intent to per- vert the course of justice; (5) to effect a legal purpose with a corrupt intent or by improper means; to which are added (6) conspiracies or combinations among work- men to raise wages,

The division is not a perfect one, but a few examples under each of the heads will indicate the nature of the offence in English law. First, a conspiracy to charge a man falsely with any felony or misdemeanor is

criminal ; but an agreement to prosecute a man who is guilty, or against whom there are reasonable grounds for suspicion, is not. Under the second head the text-books give a great variety of examples,—e.g. mock auctions, where sham bidders cause the goods to go off at prices grossly above their worth ; a conspiracy to raise the price of goods by spreading false Tumours ; a conspiracy by persons to cause themselves to be reputed men of property, in order to deceive tradesmen : a conspiracy to cause by threats, contrivances, or other sinister means a pauper of one parish to marry a pauper of another in order to charge one of the parishes with the maintenance of both. These examples show how wide the law stretches its conception of criminal agreement. The third head requires no explanation. A conspiracy to murder is expressly made punishable by penal servitude and imprisonment (24 and 25 Vict. ec. 100). A curious example of conspiracy under the fourth head is the case in which several persons were convicted of conspiracy to procure another to rob one of them, so that by convicting the robber they might obtain the reward given in such cases. The combination to effect a lawful purpose with corrupt intent or by improper means is exemplified by agreements to procure seduction, «ec.

The most important question in the law of conspiracy, apart from the statute law affecting labourers, is how far things which may be lawfully done by individuals can become criminal when done by individuals acting in concert, and some light may be thrown on it by a short statement of the history of the law. In the early period of the law down to the 17th century, conspiracy was defined by the Ordinance of Conspirators of the 33 Edward I. :—" Con spirators be they that do confedr or bind themselves by oath, covenant, or other alliance, that every of them shall aid the other falsely and maliciously to indite, or cause to indite, or falsely to move or maintain pleas, and also such as cause children within age to appeal men of felony, whereby they are imprisoned and gore grieved, and such as retain men in the country with liveries or fees to maintain their malicious enterprizes, and this extendeth as well to the takers as to the givers." The offence aimed at here is conspiracy to indict or to maintain suits falsely ; and it was held that a conspiracy under the Act was not complete, unless some suit had been maintained or some person had been falsely indicted and acquitted. A doctrine, however, grew up that the agreement was in itself criminal, although the conspiracy was not actually completed (Poulterer's case,

1611). This developed into the rule that any agreement to commit a crime might be prosecuted as a conspiracy. A still further development of this doctrine is that a com- bination might be criminal, although the object apart from combination would not be criminal. The cases bearing on this question will be found arranged under the following

absorption of reduced annuities and new threes in larger Proportion than of consols. The characteristics of this large portion of the debt, though it would seem almost Indistinguishable from the three per cent. reduced, which originated about the same period as the consolidated threes, are that the interest has never varied ; no attempt has been made to convert it to a lower interest or into another form of stock; and not only from its larger amount than otherstock 18 If most convenient to dealers, but from the great number and vaniety of its holders it is believed to express with the Steatest nicety the state of monetary affairs. The price Or consols, however, doesnot in ordinary times vary much. t has a tendency, indeed, to rise when all other securities are most shaken. In periods of panic and extreme pressure oF Money, it has gone down for a few days between 80 and 90; its most customary range may be said to be 95 to a ; and it has occasionally touched par. The legal provi- 'Ons erecting consols are found in several clauses of 25 eorge IL, c. 27, and the regulations for their redemption

Section 24 of the same Act. ee SPIRACY, in English law, isan agreement between a i Persons to do certain wrongful acts, which ¥ not, however, be punishable When committed by a

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by two or more persons to do, or procure to be done, any act in contemplation or furtherance of a trade dispute between employers and workmen shall not be indictable as a conspiracy, if such act committed by one person would not be punishable as a crime. When a person is convicted of any such agreement or combination to do an act which is punishable only on summary conviction, and is sentenced to imprisonment, the imprisonment shall not exceed threo months, or such longer period, if any, as may have been prescribed by the statute for the punishment of the said

act when committed by one person." The effect of the two Acts of 1875 is that breach of contract between master and workmen is to be dealt with as a civil and not as a criminal case, with two exceptions. A person employed on the supply of gas and water, breaking his contract with his employer, and knowing, or having reasonable cause to believe, that the consequence of his doing so, either alone or in combination with others, will be to deprive the inhabitants of the place wholly or to a great extent of their supply of gas or water, shall be liable on conviction toa penalty not exceeding £20, or a term of imprisonment not exceeding three months. And generally any person wilfully and maliciously breaking a contract of service or hiring, knowing or having reasonable cause to believe that the probable consequences of his so doing either alone or in combination with others will be to endanger human life or cause serious bodily injury, or to expose valuable property whether real or personal to destruction or serious injury, shall be liable to the same penalty. By section 7 every person who, with a view to compel any other person to abstain from doing or to do any act which such other person has a legal right to do or abstain from doing, wrongfully and without legal authority, (1) uses violence to or intimi- dates such other person, or his wife and children, or injures his property ; or (2) persistently follows such other person about from place to place ; or (3) hides any tools, clothes, or other property owned or used by such other person, or deprives him of or hinders him in the use thereof ; or (4) watches or besets the house or other place where such other person resides, or works, or carries on business, or happens to be, or the approach to such house or place; or (5) follows such other person with two or more other persons, in a disorderly manner, in or through any street or road, shall be liable to the before-mentioned penalties, Of course a combination to do any of these acts would be punishable as a conspiracy, as mentioned in section 3 above.

Seamen are expressly exempted from the operation of this Act. 'The exceptions as to contracts of service for the supply of gas and water, d&c., were supported by the circumstances of the London gas stokers' case above mentioned.

Conspiracy at common law is a misdemeanour, and the punishment is fine or imprisonment, or both, to which may be added hard labour in the case of any conspiracy to cheat and defraud, or to extort money or goods, or falsely

~~to accuse of any crime, and to obstruct, pervert, prevent, or defeat the cause of justice. Conspiracy to murder, whether the victim be a subject of the Queen or resident 2 her dominions or not, is by 24 and 25 Viet. c. 100 punish- able by penal servitude. E.R.~~

~~CONSTABLE, in England, an ancient officer of the peace. The name, as well as the office, are, according to Blackstone, borrowed from the French. In the Middle Ages there was a great officer of this name, whose duties related to matters of chivalry. '"' The office of Lord High Constable," says Blackstone, "hath been disused in England, except only upon great and solemn occasions—as the kings coronation and the like—ever since the attainder 0!~~

~~Stafford, duke of Buckingham, under King Henry Vill,~~

~~heads, and in chronological order, in the Law of Criminal Conspiracies and Agreements, by R. 8. Wright (London, 1873) :—Combinations against Government ; combinations to defeat or pervert justice ; combinations against public morals or decency ; combination to defraud ; combination to injure otherwise than by fraud; trade combinations. 'Tt ig conceived," says the author, "' that on a review of all the decisions, there is a great preponderance of authority in favour of the proposition that, as a rule, an agreemens or combination is not criminal unless it be for acts or omissions (whether as ends or means) which would be criminal apart from agreement." A dictum of Lord Denman's is often quoted as supplying a definition of conspiracy. It is, he says, either a combination to procure an unlawful object, or to procure a lawful object by unlawful means; but the exact meaning to be given to the word "lawful" in this antithesis has nowhere been precisely stated. A thing may be unlawful in the sense that the law will not aid it, although it may not expressly punish it. The extreme limit of the doctrine is reached in the suggestion that a combination to hiss an actor at a theatre is a punishable conspiracy. : ; The application of this wide conception of conspiracy to trade disputes caused great dissatisfaction among workmen. By the Master and Servant Act, 1867, breach of contract of service might be made the subject of complaint before a magistrate, who was empowered to impose a fine when he thought it necessary. Trades unions were relieved from the stigma of illegality—which had hitherto~~

attached to them by reason of their being combinations "in restraint of trade"—by the Trades Unions Act, 1871. In the same year the Criminal Law Amendment Act (34 and 35 Vict. c. 82) specified certain acts which, if done with a view to coercing either master or workman, were to be punishable with imprisonment. But in the meantime, the mere com- bination of workmen not to work with a particular person was held by the judges to amount to a conspiracy at common law (so held by Mr Baron Pollock at Leeds assizes in 1874). And the case of the London gas stokers, who were in 1872 convicted of a conspiracy to break their contract of service, directed attention to the question of punishing breach of contract as a crime. The following extract from Mr Justice Brett's charge to the jury will show the view taken by the judge: "If you think there was an agreement between the defendants to interfere with the masters by molesting them so as to control their will, and if you think that molestation was such as would be likely in the minds of men of ordinary nerve to deter them from carrying on their business according to their own will, then that is an illegal conspiracy." Again "was there a combination to hinder the company from carrying on and exercising their business by means of the men simultaneously breaking their contracts of service! Breach of contract is an illegal, nay more, it is a criminal act, and if they combined to interfere with their employers by breaking their contracts this would be using unlawful means." Soin 1867, in the case of Druett, it had been laid down that if any set of men agreed among themselves to coerce the liberty of mind and thought of another by com- pulsion and restraint, they would be guilty of a criminal offence. These judicial opinions led to much agitation, which ended in the legislation of 1875. In that year was passed the Act for amending the law relating to conspiracy and to the protection of property, and for other purposes, 38 and 39 Vict. c. 86. This Act was intended to regulate the criminal, as the Employers and Workmen Act of the same year (c. 90) was intended to regulate the civil questions arising out of the contract for service. The corresponding Acts of 1867 and 1871 are repealed. The 38 and 39 Vict. c, 86 enacts (§ 3) that "an agreement or combination

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g in France it was suppressed about a century after by an | emergencies o of Louis XIII, but from that office, says Lambard, this lower constableship was first drawn, and is, as it were,

a very finger of that hand."

The Statute of Winchester (13 Edw. I st. 2, c. 6), ordain- ing every citizen to have armour according to his condition to keep the peace, requires that in every hundred and fran- chise two constables be chosen to make the view of armour twice a year, and that the said constables " shall present before justices assigned such defaults as they do see in the county about armour, and of the suits, and of watches, and of highways ; and also shall present all such as do lodge strangers in uplandish towns, for whom they will not answer." These are the officers known as high constables : who are especially charged with the peace of the hundred, just as the petty constables are charged with the peace of the parish or township. They were appointed at the court of the hundred, or in default thereof by justices at special Bya recent Act, 32 and 83 Vict. « 47, they are practically abolished, as the justices of eacli county are required to consider and deter- mine whether it is necessary that the office of high con- stable of each hundred, or other like district, should be

sessions (7 and 8 Vict. c. 33, § 8).

continued,

The petty or parish constable unites two offices—the ancient one of head-borough or tithing man, and the modern one, instituted about the reign of Edward IIL, of Considering what manner of men were for the most part appointed to these offices, Blackstone thought it was well that they should be kept in Besides their—general duties in the preservation of the peace they are charged with the execution of warrants and the service of summonses. No action can be brought against a constable for any act done in the execution of his office unless within

assistant to the higli constable.

ignorance of the extent of their powers.

six months from the time of its being committed. By 24

Geo. IL c. 44, the justice who signed the warrant must be

— ‘made a co-defendant in any action against the constable, — and on the production of such warrant at the trial the — jury must find for the constable, notwithstanding any want of jurisdiction in the magistrate. Petty constables were formerly elected at the court leet or, in default thereof, by two justices. But by 5 and 6 Vict. c. 109, it is ordered

i that the justices shall annually issue their précept to the | Overseers of each parish in their county, requiring them to — return a list of persons in such parish qualified and liable — to serveas constables, and that the justices on special petty — Sessions shall revise the list, and select therefrom such | number of constables as they may deem necessary. Every able-bodied man resident within the parish, between the ages of twenty-five and fifty-five, rated to the relief of the — peor or to the county rate, on any tenements of the net yearly value of £4 and upwards, is qualified and liable to Seve as constable for that parish. But large classes of

. Persons are specially exempted from the liability to serve,— Including peers and members of Parliament, judges, justices,

| clergymen and ministers, lawyers, physicans, officers of the

| army and navy, public servants, &c. Licensed victuallers | and beer-sellers, game-keepers, and convicts are disqualified. | “very person so chosen must serve ; but those who have — Served already shall not be liable to serve again until every liable shall have served. Boroughs under

| n consequence of the establishment of a county con- — such — .” enacted, by 35 and 36 Vict. c. 92, that no “Tegard to hee be appointed unless for parishes in ape which the magistrates for the county shall at their

that euch store Sessions determine that it is necessary i such appointment shall be made,

)—*

Special Constables are appointed to act on occasional

family,

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when the ordinary police force is thought to be deficient. In the absence of volunteers the office is compulsory, on the appointment of two justices, The lord-lieutenant may also appoint special constables, and the statutory exemptions may be disregarded.

The Acts establishing and regulating county constabulary are the 2 and 8 Vict. c. 93, 3 and 4 Vict, c. 88, 19 and 20 Vict. ¢, 69, 20 Vict. ¢. 2, and 22 and 23 Vict. c. 32. The police force of every county shall be under the superintendence of a chief-constable, who,

with the approbation of justices in petty sessions, may appoint constables and provisional superintendents. The chief-constable has the general superintendence and direction of the force (includ- ing the petty constables where they still exist), and he may dismiss them at his pleasure, subject to the orders: of Quarter Sessions, and the rules established for the government of the force. The salaries and other expenses under these Acts are to be paid by a police rate, to be made by the justices at Quarter Sessions, Counties and boroughs may consolidate their police force. The Crown appoints inspectors to report on the efficiency of the police, and whenever a certificate shall be granted by the Secretary of State that the police has been maintained during the preceding year in a state of efficiency as to discipline and numbers, the Treasury shall grant a sum in aid of the expenses not exceeding one-fourth of the charge for pay and clothing.

CONSTABLE, Arcurpatp (1774-1827), the well- known Edinburgh publisher, was born in the parish of Carnbee, Fifeshire, on the 24th February 1774. Having been educated at the parish school, he was, at his own request, apprenticed to a bookseller in Edinburgh, named Peter Hill. From the first he took a great interest in books; and he obtained permission from his master to attend book sales, and purchase rare works, of which he drew up carefully executed catalogues. When not yet twenty-one years of

age he had married and commenced business on his own account. He took special interest in Scottish literature; the rare works in. that depart- ment which he offered for sale soon brought him into notice, and from this and from his genial disposition and his unprecedented liberality towards authors, his business grew rapidly. In 1801 he became proprietor of the LKarmers' Magazine and the Scots' Magazine, and on the 10th October 1802 he published the first number of the Edinburgh Review. Constable was for many years on the most intimate and friendly relations with' Sir Walter Scott. In January 1802 he had a share in the publication of the Alinstrelsy of the Scottish Border, and atterwards published a large proportion of Scotts poems and novels. Besides these, he published the Annual Register, and the works of Dugald Stewart, Brown, Playfair, and Leslie, In 1812 he purchased the copyright of the Encyclopedia Britannica, to which he added the supplement to the 4th, Oth, and 6th editions (1815-1 524), extending to six volumes, and containing the celebrated dissertations by Stewart, Playfair, and Brande. Not the least important of his undertakings was Constable's Aliscellany, projected in 1825, consisting of a series of original works, and standard works republished in a cheap form, the earliest and one of the most famous of the attempts to popularize wholesome literature. In 1826 pecuniary difficulties in which the firm of Constable and Co. became involved (its liabilities exceeding £250,000) obliged it to stop payment. From this time Constable's health gave way, and he died on 21st July 1827, having, by his generous dealings with authors, his literary enthusiasm, and his efforts to promote the diffusion of standard literature, gained for himself one of the most distinguished names among British publishers.

See Archibald Constable and His Literary Correspondents, by his son, Thomas Constable (1873).

CONSTABLE, Henry, one of the most considerable of the Elizabethan sonneteers, was born about 1556, in York- shire, as it is supposed, and certainly of a Roman Catholic He was sent to St John's College, Cambridge, where in 1579 he took his degree of B.A. In the same

year there appeared a volume entitled The Forest of Fancy by H. C., which has been attributed to Henry Chettle, but may with far more probability be assigned to Constable. This is a black-letter romance in prose and verse, of some slight literary value. Until 1592 we lose sight of the poet altogether, but in that year appeared his principal work, the book of sonnets called Diana. The only sonnets 1n the Italian form which had preceded them were those of Sidney, printed the year before, and as Constable had been writing those poems for many years he deserves credit as being one of the first to introduce this elegant form of verse among us. His sonnets are not merely quatorzains, like Shakespeare's ; he preserves the exact arrangement of rhymes, except that he usually closes with a couplet. So popular was Diana that in 1594 a second enlarged edition appeared. But all this time a cloud was gathering round the poet. Asa Catholic and a pronounced admirer of the queen of Scots, he caine under suspicion of plotting treason against Elizabeth. Almost immediately after ushering Sir Philip Sidney's Apology for Poetry into the world with four magnificent sonnets, in 1595, he was obliged, in October of that year, to fly for his life to France. After a short stay in Paris, he wintered at Rouen, and then set off on a long pilgrimage to Rome, Poland, the Low Countries, and Scotland. In 1600 we find him still an exile, this time in Spain. About the year 1601 he could endure the growing home-sickness no longer, and returned to England in disguise. He was discovered at once and committed to the Tower, where he languished until 1604, when he was released. Of the date of his death we know no more than can be gathered from the fact that he is spoken of as alive in 1606, and as apparently not long dead in 1616. Besides the Diana he was the author of four important poems which were printed in the 1600 edition of Lngland's Helicon. Two of these, the exquisite lyric of ' Diaphenia like the Daffadowndilly," and the charming pastoral song of Verus and Adonis, hold a prominent place in our early literature,—the latter especially being believed to precede Shakespeare's epic in date of composition. Some very fine Spiritual Sonnets of Constable have been printed in our own day, and it is understood that certain compositions of this "ambrosiac muse," as Ben Jonson styled it, are still awaiting an editor. The style of Constable is fervid andfull of colour. Mr Minto has well said that his words flow with happiest impulse «when his whole being is aglow with the rapture of beauty."

CONSTABLE, Joun (1776-1837), landscape painter, was born at East Bergholt, in the Stour valley, Suffolk, | Jnne 11, 1776. Under the guidance of a certain John Dunthune, a plumber, he acquired in early life some insight into the first principles of landscape art, together with a habit of studying in the open air that was after- wards of much service to him. HIs father, who was a yeoman farmer, did not care to encourage this tendency, and set him to work in one of his windmills, The in- cessant watchfulness of the weather which this occupation required laid the foundation of that wonderful knowledge of atmospheric changes and effects of which his works give evidence. From an introduction to Sir George Beaumont, an amiable man but a poor painter, he became acquainted with the works of Claude and Girtin. In 1795 he was sent to London with a letter to Farington, the landscape painter. Farington encouraged him with predictions of coming eminence ; and for two years he plodded on, draw- ing cottages, studying anatomy, and copying and painting, sometimes in London and sometimes in Suffolk. HIs progress, however, was not encouraging ; and in 1797 he returned home, aud for some time worked in his father's counting-house. In 1799 he again went to London to |

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perfect himself as a painter ; and on the 4th of February he was admitted a student of the Royal Academy. The lights and shadows of his studies from the antique at this period are praised by Leslie, but they were sometimes defective in outline. HIe worked from dawn till dusk, and was an untiring copyist of such masters as he had sympathy with, as Wilson, Ruysdael, and Claude. Drawings from nature made during the next year or two, in Suffolk or in Derbyshire, were of no great promise. Being naturally slow, he was yet groping blindly for something not to be found for many years. In 1802 he attended Brookes's anatomical lectures, exhibited his first picture, and, refusing a drawing mastership offered him by Dr Fisher, gave him- self wholly to his vocation. HIe exhibited a number of paintings during the next eight years, but it was not till 1811 that he gave to the world, in his Dedham Vale, the first work in which his distinctive manuer and excellences are evident, In 1816, having inherited £4000 on his father's death, he emerged

~~from a painful state of poverty with which he had been struggling, and married. In 1818 he exhibited four of his finest works; and next year he sent to Somerset House the largest picture he had yet painted, the landscape known as Constable's White Horse. In the November following he was made associate of the Academy. His power at this time, though unrecognized, was at its highest. In 1823, however, after the exhibition of such masterpieces as the Stratford Mull, the Hay Cart, and the Salisbury Cathedral, he did not disdain to copy two Claudes. In 1824 two of his larger pictures, which he sold, were taken to Paris, and created there a profound sensation, Allowing a great deal for the influence of Bonington, who died four years afterwards, much of the best in contem- porary French landscape may be said to date from them. Constable received a gold medal from Charles X., and his pictures were honourably hung in the Louvre.~~

~~In 1825, he painted his Loch (''silvery, windy, delicious" is his own description of it), and sent his White Horse to Lille for exhibition. It made, like the others, a great impression, and procured the painter a second gold medal. Other great works followed ; and in 1829 he was elected Academician, to the astonishment and ill-concealed dis- pleasure of many, and began to devote himself, in con- junction with Lucas, to the preparation of his book of English Landscape Scenery. Hard work brought on ill- health and low spirits; rheumatism laid hold of him, and for some time he could neither write nor paint. In 1882, however, he exhibited his Waterloo Bridge (painted, said his enemies, with his palette-knife only), with three other pictures and four drawings. In 1834 he painted his Salis- bury from the Meadows, more generally known as the Rainbow, a picture he valued greatly; and in 1836 he delivered a course of lectures on his art at the Royal Institution. He died suddenly on the Ist of April 1887, leaving his Arundel Castle and Mill wet on his easel.~~

~~The principles on which this great painter worked are not far to seek. He himself has said, "Ideal art in landscape is al] nonsense;" and this sentence may be said to sum up the whole of his theory and practice of painting. Turner's pictures to him were merely "golden dreams ;" Both and Berghem were only fit for burning ; if he proclaimed the greatness of Claude and Titian, it was that he recognized their truth. Truth in its broadest and finest sense was his only aim. He studied the country~~

~~untiringly and intently, sacrificing mere detail to the larger necessities of tone ("tone is the most seductive and inviting quality a picture can possess "), reproducing to an eminent degree the sentiment of what he saw, flooding his canvas with light and shadows as one finds them, am faithfully translating such glimpses as were revealed to him of the geniality of nature. His range was limited ; he suc-~~

~~ceeded best with the county familiar to him from his boy- hood; but his repetitions of manner and subject are in reality so many tentatives towards perfection. His merits were recognized in France; but his studio was full of unsold pictures at his death, and it is certain that he could ot have earned a livelihood by his art without abandoning his theories. Since his death, however, his pictures have greatly increased in value; and his influence on contem- porary French and English landscape is recognized as both great and good.~~

~~See Leslie, Memoirs of the Life of John Constable, R.A., London, second edition, 1845 ; and English Landseape Scenery, a Series of Forty Mezzotint Engravings on Steel, by David Lucas, from pictures painted by John Constable, R.A., London, folio, 1855,~~

~~CONSTANCE, or Costyitz, a city of the grand duchy of Baden, and the chief town of a circle of its own name, formerly called the See Kreis, or Lake Circle, is situated on the southern or Swiss side of the Rhine, at its exit from the Lake of Constance, 30 miles east of Schaffhausen by railway. It stands 1298 feet above the level of the sea. The older portion of the city is still surrounded by its ancient walls, but beyond their limits lie extensive suburbs, of which the most remarkable are Briihl, Kreuzlingen, Paradies, and Petershausen. 'The last of these, which has grown up round a free imperial abbey, is situated ou the other side of the river, and communicates with the city by means of a long covered bridge raised on stone piers. A large number of the buildings of Constance are of medieval origin, and several are of high interest both to the historian and antiquary. Most remarkable are the minster, originally founded in 1048, but dating in its present form mainly from the beginning of the 16th century; St Stephen's Church, belonging to the 14th ; the old Dominican convent on the island of~~

~~Genf (now a cotton-printing factory) ; the Kaufhaus, or public mart, in the hall of which sat the famous council of 1414-1418; and the old chancery or town-hall, erected in 1508. Besides the various administra- tive offices of the circle the town further possesses a gymnasium, a lyceum, various collections of antiquities, a public collection of books and pictures in the Wessenberg Haus, and a valuable series of archives. Since the intro- duction of steam-boat and railway communication the commercial prosperity of the city has greatly increased. It now contains cotton-factories, linen-factories, carpet-looms, and breweries, maintains a considerable activity in printing and publishing, and has a vigorous and varied local trade. Population in 1864, 8516 ; in 1872, 10,061.~~

~~Constance probably dates from the 3d or 4th century ; but it first began to be of importance in the 6th, when it became the seat of the bishop who had previously been settled at Windisch or Vindonissa in Aargau. It afterwards obtained the rank of an imperial city, and rose to be one of the largest and most flourishing municipalities in Germany. From 1414 to 1418 it was the seat of~~

~~the great ecclesiastical council which, under the presidency of the emperor Sigismund, and consisting of 26 princes, 140 counts, more than 20 cardinals, 20 archbishops, 91 bishops, 600 prelates and doctors, and about 4000 priests, constituted itself the highest authority in the church, condemned to death the reformers Huss and Jerome of Prague, expelled the three rival popes John XXIII.,~~

~~Gregory XII., and Benedict XIII, and elected Martin V. as the legitimate successor of St Peter. Constance joined the Smalkaldic~~

~~League and refused to accept the "Interim." It was accordingly |~~

~~deprived of its imperial privileges, and in 1549 was presented by the emperor to his brother, the Archduke Ferdinand, in whose territory itremained till 1805, when it was acquired by Baden. The bishopric, which was secularized in the latter year, had become the largest in all Germany, stretching over a great part of Wiirtemberg, Baden, and Switzerland, and containing 350 conventual establishments and~~

1760 parsonages,

CONSTANCE, Lake or (German, BopENSEE), a large sheet of water on the confines of Switzerland, surrounded on the S.W. by the cantons of Thurgau and St Gall, E. by Tyrol, N.E. and N.W. by Wiirtemberg and Baden respectively. Itis of an oblong shape, the western extre-

mity being considerably contracted. 'The length of the lake from Bregenz to Spittelberg is 42 miles, with an average width of 74 miles. It forms the great reservoir of the Rhine, receiving the upper waters of that river near the village of Altenrhein and parting with them at Con- stance. The mean level of the surface is 1290 feet above the sea. 'The depth between Romanshorn and Langenar- gen is 152 fathoms, between Constance and Friederichs-hafen 120 fathoms, and between Lindau and the mouth of the Rhine 45 fathoms.

CONSTANT DE REBECQUE, Henri Bengamrn,'an eminent French statesman and publicist, was born at Lausanne, 25th October 1757, and died at Paris 10th December 1830, His family was French, and had taken refuge in Switzerland during the religious persecutions. Till the age of thirteen he lived in his father's house at Lausanne ; he afterwards studied at Oxford, Erlangen, and Edinburgh successively. It was in these foreign studies that he made a beginning in the cosmopolitan culture which afterwards characterized him; in England especially he learned to admire constitutional government, and made the acquaintance of such men as Erskine and Mackintosh. Shortly before the Revolution he went to Paris, and became acquainted with some of the leading liberal spirits of that city, where, after further travels, he finally settled in 1795. He attached himself to the moderate republican party, and supported it through many changes of fortune, both in the Assemblies and by writing, under the Directory and the Consulate, till 1802, when he was expelled from the Tribunate by Napoleon. The circle to which he belonged again provoked the anger of the First Consul by its private opposition to the Government, whereupon Constant, with his celebrated friend Madame de Staél, found it advis- able to retire from France. Thus arrested in his political career he turned to literature, and proceeded to Weimar, where he enjoyed the acquaintance of Goethe and Schiller, translated Wallenstein, and wrote the romance of Adolphe. He

did not return to France till the overthrow of Napoleon in 1814. Attracted by the prospect of the restoration of constitutional government he supported the Bourbons ; and, apparently for a similar reason, he adhered to Napoleon during the Hundred Days. After the violence of the second Bourbon restoration had subsided Constant re- appeared on the political scene to maintain the principles of constitutionalism, By all legal means, in the journals and in the Chambers, as well as by political tractates and pamphlets, under Louis X VIII. and Charles X. he combated, not without success, the reactionary measures of the government. [ll-health detained him in the country during the revolution of July (1830); but at the urgent request of Lafayette he returned to the capital, and concurred in the elevation to the vacant throne of Louis Philippe. Notwithstanding his feeble health Constant continued to support the new Government, but an unsuc- cessful candidature for a seat in the Academy so aggravated his previous complaint, that he died a few months after the triumph of the principles to which he had consecrated his life. Adverse circumstances had prevented the champion of representative government from playing a first part in the history of France, assuming that he had the faculty to do so. His voice was dry, his manner deficient in ease and grace, and he did not excel in improvising a reply ; but his intellect was clear and powerful, his culture wide, and his industry remarkable.

The greater part of his political tractates have been collected by himself under the title of Cours de Polrtique Constitutionelle. J. P. Pagés collected the speeches delivered at the Chamber of Depnties, 3 vols. in 8vo, (1832—1833). His great philosophical work was De la religion

considérée dans sa source, ses formes, et ses développements. VI. — 38

conquest of the Arabians it shared the samc fate as the surrounding country. During the 12th century it was still a place of consider able prosperity ; and its commerce was extensive enough to attract the merchants of Pisa, Genoa, and Venice. Frequently taken and retaken by the Turks, it finally became under their dominion the scat of a bey subordinate to the dey of Algiers. In 1826 it asserted its independence of that potentate, and was governed by Hadj Ahmed, the choice of the Kabyles. In 1837 the French under Marshal

Valée took possession of the place, and about ten years afterwards it was occupied as a regular colony.

CONSTANTINE. Of the thirteen emperors of this name, two are here noticed separately. For the others see Roman History and GREEK EmpIre.

CONSTANTINE I. (274-337). Flavius Valerius Aurelius Constantinus, surnamed Magnus, or the Great, was born at Naissus (V$sse)!,in upper Moesia, in February 974, He was the son of Constantius Chlorus and Helena, the wife of obscure origin (a stabularia, or innkeeper, according to St Ambrose) whom her husband was com- pelled to repudiate on attaining the dignity of Cesar in 992.2 The part of the empire assigned to Constantius was the extreme West, including Spain, Gaul, and Britain ; but Constantine was detained in the East at the court of Diocletian, doubtless as a pledge for his father's loyalty. He served with such distinction under Diocletian in the campaign in Egypt which closed in 296, and subsequently under Galerius in the war with Persia, that he was appointed a tribune of the first rank, His majestic presence, his per- sonal courage, and his skill in military exercises made him a great favourite with the army, and excited in a correspond- ing degree the jealousy of the naturally suspicious Galerius, who did not scruple, it is said, to expose lim repeatedly to unusual hazards in the hope of getting rid of him. The effect of this was to strengthen in Constantine a constitu- tional wariness and discretion which were often of advan- tage to him in after life. In 305 Diocletian and Maximian abdicated, and were succeeded in the supreme rank of Augustus by the two Cesars, Constantius and Galertus. Constantine, who had naturally the strongest claim to a Cesarship, was passed over by Galerius, and Constantius could not venture to bestow the office while his son re mained at what was virtually a hostile court. It was only after repeated letters from his colleague that Galerius gave a reluctant consent that Constantine should join his father. There was ground for supposing even then that the permis- sion was given only to be cancelled, and Constantine accordingly acted upon it with the utmost promptitude, making the journey across Europe from Nicomedia to Boulogne in an unusually short time, At Boulogne he found his father on the point of setting out for Britain, and accompanied him. The death of Constantius soon after at York (25th July 306) brought Constantine to the first great turning-point in his career. The circumstances

were critical : it was necessary to avoid on the one hand losing the favour of the army by undue hesitation, and on the other incurring the active hostility of Galerius by undue

The most important of his purely literary productions are the novels, Adolphe and Cécile, and the translation of Wallenstein. HIs philosophical work on religion, which occupied him more or less almost all his life, is an attempt to trace the successive transformations of the religious sentiment, his conclusion being that, while the religious instinct is imperishable, the doctrinal and ceremonial forms by which it expresses 'iself are transitory. A quotation or two will suffice to indicate his attitude towards the liberalism of the 18th century. " Christianity has intro- duced moral and political liberty into the world." "If Christianity has been often despised, it is because men have not understood it. 'Lucian was incapable of under-standing Homer; Voltaire has never understood the Bible." CONSTANTINE, the capital of the French province of the same name in Algeria, situated in the richest and most populous part of the country, about 50 miles inland from the port of Philippeville, in 36° 22' 21" N. Jat. and 6 36 36" E. long, It holds a highly romantic position on a rocky plateau, cut off on all sides but the west by a deep but beautiful ravine, through which the Rummel finds its way. A striking contrast exists between the older and Moorish portion ef the city, with its tortuous lanes and Oriental architecture, and the modern and French portion, with its rectangular streets and wide open squares, frequently bordered with trees and adorned with fountains. Of the squares the Place Nemours is the most spacious, but the Place du Palaisis of more importance in the commercial and social life of the city. The public buildings may be divided into those dating from before the French conquest and later erections. Among the former are the Kasba or citadel, the mosques, the palace of the bey, and the harem of Salah; among the latter the court-house or palais de justice, the theatre, the Protestant church, and several administrative buildings. The Kasba, which occupies the northern corner of the town, is partly of Roman construc- tion, and preserves in its more modern portions numerous remains of other Roman edifices. It is now turned into barracks, and contains within its precincts a hospital capable of accommodating 1500 patients. The mosque of Sidi el Kattani, which ranks as the finest in the city, dates only from the 18th century ; but that of Souk-er Rezel, now transformed into a Christian

church, and bearing the name of Notre Dame des Sept Douleurs, was built as early as 1143. The Great Mosque, or Djama-Kebir, occupies the site of what was probably an ancient Pantheon. A religious seminary, or Medersa, is maintained in connection with the Sidi el Kattain ; and the French support a college and various minor educational establishments for both Arabic and European culture. There is an archeological society, and a collection of local antiquities has been formed. The native industry of Constantine is chiefly con- fined to leather goods and woollen fabrics. A considerable ab is carried on with Tunis and other places on the editerranean, and caravans proceed regularly by Biscara : ; : ; . and Tuggurt into the ssiefion, The = opelicig of the city, se tiginsnsliankog 9 and Constantine displayed just that uni composed of various elements, amounted in 1672 | oO and prudence that the occasion require: 30,330. Accepting with well-feigned reluctance the enthusiastic nomination of the army to the vacant throne, he wrote al

Constantine, or as it was originally called, Cirta or Kirtha, from | the same time a carefully worded letter to Galerius, expres

the Pheenician word for a city, was in ancient times one of the most } gj i i i important towns of Numidia and the residence of the kings of the ae Co ia ay et jis a pera am Massylii. Under Micipsa it reached the height of its prosperity, delay assuming the purple until the ae ial appeaae and was able to furnish an army of 10,000 cavalry and 20,000 could be signified, and begging to be recognized as Augustus infantry. Though it afterwards declined, it still continued to be | in succession to his father. On the reception of the news considered an important military post, and consequently its name Oe is frequently mentioned during successive wars. Cesar having 1 The legend that Constantine was a native of Britain has long been bestowed a part of its territory on his supporter Sittius, the latter | generally abandoned. 'The passage in the panegyrist that speaks of introduced a Roman settlement, and the town for a time was known his having ennobled Britain "'illic oriendo" refers probably to his as Colonia Sittianorum. In the war of Maxentius against Alexander, | accession, as Gibbon suggests.

the Numidian usurper, it was laid in ruins ; and on its restoration 2 A later tradition, adopted with characteristic credulity by Geoffrey in 313 by Constantine it received the name which it stillretains. It | of Monmouth, that Helena was the daughter of a British king, 184

was left uncaptured during the Vandal invasion of Africa, buton the | pure invention.

CONSTANTINE 299

Galerius was greatly incensed, and threatened to give both

thé letter and its bearer to the flames ; but more prudent counsels prevailed, and he ventured to indulge his resent- ment only so far as to deny the titls of Augustus, which was conferred upon Severus, Constantine being acknowledged as Oxsar. The latter acquiesced in this arrangement with apparent contentment, and at once set himself as the recog- nized inheritor of his father's power to carry out his father's wise and vigorous policy. The barbarians of the north sustained repeated defeats, and were permanently held in check by the building of a line of forts on the Rhine ; and the internal prosperity of the country was promoted by a confirmation of the tolerant policy adopted by Constantius towards the Christians, the persecuting edict of Galerius being treated as a dead letter.

The events of the next few years showed clearly the essential instability of the arrangement devised by Diocletian for the partition of the imperial power.among Augustuses and Cesars. It was in the very nature of the plan that under it those who were nominally colleagues should be in reality rivals, constantly plotting and counter-plotting for the sole supremacy. Accordingly the history of the empire from the period of the division of the imperial power by Diocletian to that of its reconsolidation under Constantine is mainly a record of the struggle for that supremacy. The narrative is necessarily intricate, and can only be fully given in a general historical article. The state of matters was complicated by a rebellion at Rome against Galerius, which had for its final result the contemporaneous reign of no less than six emperors,—-Galerius, Licinius, and Maximin in the East, and Maximian, Maxentius, and Constantine in the West (308). Maxentius was the son of Maximian, and Constantine was his son-in-law;

~~*having married his daughter Fausta at Arles in 307, ou which occasion he received the title of Augustus; but this family relationship did not prevent a conflict of interests. Maxentius claimed to be the sole rightful sovereign of Italy, and being supported by the pretorian guards compelled his father to quit Rome. Maximian, after a brief residence in Illyricum, from which he was driven by Galerius, took refuge at the court of his son-in-law, Constantine, who received him with the respect due to his rank. For the second time he resigned the purple, and affected to have no longer any desire of power. Very soon after, however, he was tempted, during the absence of Constantine on the Rhine, to reassume the imperial dignity and to enter into a plot with Maxentius for the overthrow of his son-in-law. Constantine, on receiving the news, acted with the necessary promptitude. He appeared at once with his troops before Arles, and compelled Maximian to retreat to Marseilles, whither he followed him. The town might have stood a protracted siege, but it preferred to deliver up the usurper, who avoided the execution of the sentence of death pronounced upon him by committing suicide! (February 310).*~~

~~*The death of Maximian was the first of a series of events which ended in the establishment of Constantine as the sole emperor of the West. It was seized upon by Maxentius as a pretext for hostile measures, which Constantine, unwilling to engage in war, ignored as long as he safely could. When the time came for action, however, he acted, as was his Wont, with decision. Maxentius was preparing to invade Gaul, when Constantine, encouraged by an embassy from Rome, anticipated him by entering Italy at the head of a*~~

~~*arge and well-disciplined army. He had crossed the Oottian Alps (Mont Cenis), and was in the plains of "= ikea ee*~~

~~*1 : '*~~

~~*P According to Lactantius (De Mort. Persec., c. 29, 80,) Maximian : – pardoned for this attempt, and the clemency of Constantine was y exhausted by the discovery of a plot for his assassination in bed,*~~

~~*Which failed, owing to th j i ; iSe credits this fey. g € conjugal fidelity of Fausta. Gibbon dis*~~

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Piedmont before Maxentius knew that he had set out. A series of successes at Susa, Turin, and Verona culminated in the decisive victory of the Milvian Bridge, near Rome (28th October 312), which left the capital open to the invader. In the hurried retreat of the defeated army Maxentius was pressed by the throng over the bridge into the river, and wasdrowned. The conduct of the conqueror was marked on the whole by wisdom and moderation. The slaughter of the two sons and of the more intimate favourites of the fallen emperor was a measure deemed essential if the fruits of the victory were to be retained, and cannot be imputed to wanton cruelty, especially as Constantine seems to have abstained from the too common practice of an indiscriminate massacre. The final disbanding of the pretorian guards and the destruction of their camp, the imposition of a poll-tax on the senators, and the assumption of the title of Pontifex Maximus were the other chief events of Constantine's first residence in Rome, which lasted only a few weeks,—a fact in itself significant of the decaying importance of the capital, if not prophetic of the early rise of a Nova Roma.

It was in the course of the expedition that ended with the victory of the Milvian Bridge that the celebrated incident occurred, which is said to have caused Constan- tine's conversion,—the appearance of a flaming cross in the sky at noon-day with the motto "Ev rovrw vika (By this conquer). The story is told by Eusebius, who professes to have had it from the lips of the emperor himself, and also with considerable variation in the details by Lactantius, Nazarius, and Philostorgius. In order to understand the true relation of Constantine to Christianity, however, it is necessary to consider all the incidents bearing upon that relation together, and this, therefore, along with the others. There is the less violence to chronological order in delaying the critical examination of the story, inasmuch as it was first communicated by Constantine to Eusebius several years later, and as the Labarum, or standard of the cross, made in obedience to the heavenly vision was not exhibited to the army, according to Gibkon, till 323. The conver- sion, whatever its nature and whatever its cause, was followed, indeed, by one more immediate result of a significant kind in the important Edict of Milan (March 313), issued by Constantine and Licinius conjointly,

restoring all forfeited civil and religious rights to the Christians, and securing them full and equal toleration throughout the empire.

By the victory of the Milvian Bridge Constantine became the sole emperor of the West. Very soon after a like change took place in the East. Galerius had died in May 311, and a war ensued between the two surviving emperors in which Maximin was the aggressur and the loser, as Maxentius had beenin the West. After a decisive defeat near Heraclea (April 313) he took to flight, and died at Tarsus, probably by his own hand, in August of the same year. lLicinius thus attained the same place in the East as Constantine held in the West. The interests of. the two who now divided between them the empire of the world had been apparently identified by the marriage of Licinius to Constantine's sister Constantia, which was celebrated with great pomp at Milan in March 313. But in little more than a year they were engaged in a war, the origin of which is somewhat obscure, though it probably arose from the treachery of Licinius. After two battles, in which the Eastern emperor suffered severely, he was fain to sue for peace, which Constantine granted only on condi- tion that Illyricum, Pannonia, and Greece should be trans- ferred to his territory.

The peace lasted for nine years, a period during which Constantine's position grew stronger while that of Licinius grew weaker, wise and humane legal reforms and vigoroug

measures against the barbarians of the north marking the policy of the one, and caprice, indolence, and cruelty being the most conspicuous features in the conduct of the other. When the inevitable struggle for the supremacy came, though the army of Licinius was the larger, the issue was scarcely doubtful. The origin of the war which broke out in 323 is, like that of the previous one in 314, not quite clear; but it is probable that Constantine, having deter- mined to make himself the sole master of the world, did not think it necessary to wait for provocation. The campaign was short but decisive. Licinius was totally defeated in a battle fought at Adrianople on the 3d July 393. 'This was followed by the siege of Byzantium, in which Crispus, Constantine's eldest son, who was in com- mand of the fleet, co-operated with his father by entering the Hellespont and defeating Amandus,

~~the admiral of Licinius, after a two days' engagement. Ina final battle fought at Chrysopolis (now Scutari) Licinius was totally ronted, and he fled to Nicomedia. On the intercession of his wife Constantia, the sister of Constantine, the emperor promised to spare his life; but the promise was not kept. Tn 324 the defeated monarch was put to death by Con- stantine's orders at Thessalonica, which had been fixed as the place of his exile. A treasonable conspiracy was alleged against him, but there is no evidence in support of the charge; and possible danger in the future rather than any plot actually discovered seems to have prompted Con- stautine to a deed which cannot escape the censure of bad faith, if not of wanton cruelty.~~

~~With the war against Licinius the military career of Constantine may be said to have closed. He was now the sole emperor of both East and West. His enlightened policy had made his power throughout the empire so secure that any attempt to usurp it would have been utterly vain. Accordingly the remainder of his reign was passed in undisturbed tranquillity. The period of peace was not inglorious, including among lesser events the convocation of the Council of Nicea (325) and the foundation of Constantinople (328). But unfortunately it was disgraced by a series of bloody deeds that have left an indelible stain on the emperor's memory. In 326 Constantine visited Rome to celebrate the twentieth anniversary (vicennalia) of his accession. During the festivities his eldest son Crispus was accused of treason by Fausta, and banished to Pola, in Istria, where he was put to death. Licinius, the emperor's nephew, being included in the same charge, likewise fell a victim, and a number of the courtiers also suffered. According to another version of the story Fausta accused her step-son of attempting incestuous intercourse, and Constantine, discovering when it was too late that the accusation was false, caused her to be suffocated in her bath. 'The whole circumstances of Fausta's death, how- ever, are involved in uncertainty owing to the contradic- tions of the different narratives. The bloody tragedy struck horror into the minds of the citizens, and it was amid ominous indications of unpopularity that Constantine quitted Rome for the last time.~~

~~It had probably been for some time clear to his mind that the empire required in its new circumstances a new political centre. A Nova Roma would mark in a visible and concrete form the new departure in imperial policy which it had been the main object of the emperor's life to initiate. At~~

~~*least two other places—Sardica in Meesia, and Troy—had been thought of ere his choice was fixed upon Byzantium. No happier selection has ever been made. 'The natural advantages of the site are probably unsurpassed by those of any capital either in the Old or in the New World, and its political importance is evidenced by the frequency with which it has been the key to the situation in European diplomacy. The new capital, the*~~

~~*building of which had been commenced in 328, was solemnly inaugurated on the 11th May 330, being dedi- cated to the Virgin Mary. The fact that the ceremonial was performed exclusively by Christian ecclesiastics, and that no pagan temple was permitted to be erected in the new city, marks in an emphatic way the establishment of Christianity as the state religion.*~~

~~*The closing years of Constantine's life were uneventful,*~~

~~*One of his last schemes was that for the partition of the empire after his death among his three sons by Fausta,— Constantine, Constantius, and Constans; but it proved even less stable than the analogous scheme of Diocletian,*~~

~~*In 337 Sapor II. of Persia asserted by force his claim to*~~

~~*the provinces that had been taken from him by Galerius.*~~

~~*Constantine was preparing to meet him at the head of an army, when he was taken ill, and after a brief and vain trial of the baths of Helenopolis retired to Nicomedia, Here he died on the 22d May 337. The significance of his baptism on his deathbed by the Arian bishop, Eusebius of Nicomedia, will be indicated afterwards. His body was taken to Constantinople, and buried according to his own instructions in the Church of the Apostles with imposing ceremony.*~~

~~*The most interesting and the most disputed subject in connection with the life of Constantine is the nature of his relation to Christianity. The facts bearing upon it are clear enough, and the controversy must therefore be entirely attributed to the manipulation and distortion of partisans. A brief statement of these facts will suffice to show how far his acceptance of Christianity was a matter of personal conviction, and how far, on the other*~~

hand, it was a matter of statesmanship. 'Th? generous conduct of Constantius towards the Christians betokens a certain measure of sympathy, and the term Xpuoriavddpov (Christian-minded) applied to him by Theophanes gives some ground for supposing that the paternal influence may have acted as a sort of preparatio evangelica in the mind of Constantine. But whatever may have been due to this, it did not bring him over to the new faith. HIs own narrative to Eusebius attributed his conversion to the miraculous appearance of a flaming cross in the sky at noon-day uuder the circum- stances already indicated. The story has met with nearly every degree of acceptance from the unquestioning faith of Eusebius himself to the incredulity of Gibbon, who treats it as a fable, while not denying the sincerity of the conver- sion. On the supposition that Constantine narrated the incident in good faith, the amount of objective reality that it possesses is a question of altogether secondary importance. There is nothing improbable in the theory that accounts for the appearance of the cross by the not infrequent natural phenomenon of a parhelion. It seems likelier, however, that Constantine gave external reality to what was nothing more than an optical delusion or a dream. Eusebius, it 1s true, narrates both the appearance at noon-day and a dream on the following night, in which the appearance was in-

terpreted ; but the very strength of the impression made on.

Constantine's mind may have led him to magnify the incident without conscious misrepresentation. Whatever the nature of the appearance may have been, its effect upon the emperor, to judge from his subsequent conduct, fell far

short of a true or thorough conversion ; it probably did not —

amount to more than the creation of a superstitious belief in the symkol of the cross, This is sufficient to account for the edict of toleration and for all his legislation that seems to be based upon sympathy with Christian ideas. On the other hand, the notion of conversion in the sense 0 a real acceptance of the new religion, and a thorough rejec- tion of the old, is inconsistent with the hesitating attitude in which he stood towards both. Much of this may indeed be due to motives of political expediency, but there Is 4

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good deal that cannot be so explained. Paganism must still have been an operative belief with the man who, down almost to the close of his life, retained so many pagan superstitions. He was at best only half heathen, half Christian, who could seek to combine the worship of Christ with the worship of Apollo, having the name of the one and the figure of the other impressed upon his coins, and ordaining the observance of Sunday under the name Dives Solis in his celebrated decree of March 321, though such a combination was far from uncommon in the first Christian centuries, Perhaps the most significant illustration of the ambiguity of his religious position is furnished by the fact that in the same year in which he issued the Sun- day decree he gave orders that, if hghtning struck the imperial palace or any other public building, "the haru- spices, according to ancient usage, should be consulted as to what it might signify, and a careful report of the answer should be drawn up for his use." J*rom the time of the Council of Niczea there are fewer signs of halting between two opinions, but the interest of the emperor in Christianity was still primarily political and official rather than personal. He summoned the council, presided over its first meeting, and took a prominent part in its proceed- ings both before and behind the scenes. The year before it met he had, in a noteworthy letter to the Alexandrian bishops, urged such a scheme of comprehension as might include Ariaus and orthodox in the one church ; and on this ground he has been claimed as the earliest of broad churchmen. When the result of its deliberations was the adoption, for the first time in the history of the church, of a written creed, he cordially approved of the pro- posal, and was thus the earliest to enforce uniformity by means of subscription. The two plans were incom- patible, but the conduct of Constantine in supporting first the one and then the other was perfectly consistent. Throughout he acted in the interest of the state. The splitting up of the church into a number of bitterly contending factions would be a constant source of danger to the unity of the empire, while on the other hand the empire might gain fresh strength from the growing power of Christianity if that power

were embodied in a compact and united organization. It was by this con-sideration, probably, that Constantine was guided in deal- ing with the Arian controversy ; there are no traces of any engrossing personal interest on his part in the cardinal question of the homoousion. There are not wanting, indeed, several facts that show a real concern in the trutlis of Christianity as distinct from its social and political influence, Eusebius has recorded one of his sermons, and he seems to have preached frequently in refutation of the errors of paganism and in illustration and defence of the doctrines of the new faith. The same historian speaks of lis taking part in the ceremonies of worship, and of his long vigils at the season of Easter. His delaying to receive baptism until he was on his deathbed does not imply that he delayed till then the full acceptance of Christianity, though it has frequently been so interpreted by those who Were unaware that the doctrine that all sin committed before baptism was washed away by the simple observance of the rite not unnaturally made such procrastination very common. There is no historical foundation for the assertion of Baronius and other Catholic writers that the emperor received baptism from Pope Sylvester at Rome in 326. Equally baseless is the story of the so-called donation of Constantine, according to which the emperor after his baptism endowed the Pope with temporal dominicn. It is to this that Dante alludes in his Inferno —

Ah, Constantine ! of how much ill was cause, Not thy conversion, but those rich domains That the first wealthy Pope received of thee.

It has been remarked by Stanley that Constantine was entitled to be called Great in virtue rather of what he did than of what he was. Tested by character, indeed, he stands among the lowest of all those to whom the epithet has in ancient or modern times been applied. earlessness, decision, political sagacity, and religious tolerance he possessed from first to last; but the generous clemency of which there are traces in his earlier years cannot have any longer worked effectually in him when he sanctioned the treacherous treatment of Licinius and the atrocities that connected themselves with the murder of Crispus.. Tried by achievement, however, he stands among the very first of those who have ever won the title. In fact, there are two grounds at least on which as important a place may be claimed for him as for any sovereign who has reigned during the Christian

~~era. What he did as the founder of the complex political system which exists among all civilized nations down to the present day, and what he did as the first Christian emperor, had results of the most enduring and far-reaching kind. It belongs to the historian of the empire to give a detailed account of the elaborate scheme he devised by which tho civil functions of the state were separated from the military, and both from the spiritual,— the very idea of such distinctions having been previously unknown. 'The empire he by such means revived, though in the East it lasted a thousand years, was never again so strong as it was in his own hands; but the importance of his scheme consisted in this that it gave to empire itself, regarded as a system of government, a new structure and a new power which still survive in the political constitu- tions of the various nations of Europe. As to Christianity the historically significant fact is not his personal accept- ance of it. It is rather that by his policy as a statesman~~

~~he endowed the new religion for the first time with that~~

~~instrument of worldly power which has made it—whether for good or for evil or for both is a subject of much discus- sion—the strongest social and political agent that affects the destinies of the human race.~~

~~The chief early sources for the life of Constantine are Eusebius, De Vita Constantini, which is strongly partial from the Christian standpoint of its author, and Zosimus, Historia, lib. ii., which is tinged by Pagan prejudice. Of secondary importance are Eutropius, Aurelius Victor, Lactantius De MMortibus Perseeutorum, and the Panegyrict Veteres, vi.-x. The most valuable modern sources are Manso's Leben Constantins des Grossen (1817), Burckhardt's Die Zeit Constantins des Grossen (1858), and Broglie's L' Lglise et Vempire romain dw IV ® stéele. (W. B.S.)~~

~~CONSTANTINE, a Roman soldier who, in the time of Honorius, in the 5th century a.p., rose to the dignity of emperor of Gaul, Spain, and Britain, but was finally conquered and put to death by Honorius, Seo Roman HisTory.~~

~~CONSTANTINE VIL, Fravius Porrnyrocenitus (905-959), emperor of the East, author, and patron of literature, born in 905 a.p., was the only son of Leo VI. The Eastern Church sanctioned no marriage beyond the second, and when Leo, being childless by three wives, had a son by his concubine~~

Zoe, his attempt to legitimize his wife and his son was inflexibly resisted by the Patriarch Nicholas, and his will was only carried out at the expense of excommunication. These circumstances were probably the reason why the name Porphyrogenitus, "born in the purple," @.¢., in the purple chamber in which the empresses were confined, was, while applicable to all the emperors, emphatically applied to Constantine VII. When Constantine was only six years old Leo died, leaving him under the guardianship of his uncle Alexander ; but Alexander also died in the next year; and Romanus Lecapenus, the chief admiral, supported by Zoe, was appointed colleague to Constantine, and held all real power till 944, when he was forced by his sons to entera monastery.

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Meanwhile Constantine, though powerless, had been well treated, and had married Helena, the daughter of Romanus. On the deposition of his colleague, the people gave willing aid to Constantine's cause; and having banished his brothers-in-law, he became emperor in reality. Though wanting in strength of will, Constantine had intelligence ond many other good qualities, and his reign on the whole was not unsatisfactory. (See GREEK Empire.) He was poisoned by his son Romanus in 959. Constantine was @ painter and a patron of art, a literary man and a patron of literature ; and herein consists his real import- ance. Unable as he was to sift out the really important from the unimportant, and the credible from the incredible, it is yet from his pages that we gain the only knowledge of any extent which we possess of his time. He is the author of several works of considerable size :—1. Tlept toy Oeparov, an account of the provinces (themata) of the empire; 2. De Administrando Imperio, an account of the condition of the empire, and an exposition of the authors view of government, written for the use of his son Romanus; 1t also contains most valuable information as to the condition and history of various foreign nations with which the Eastern empire had been brought into connection,—as the Arabs, Iberians, Armenians, and the tribes north of the Danube—the Russians, Bulgarians, Hungarians, Chazars, and Patzinacite ; 3." ExOeows Tis Bacirelov Tagews, which describes the customs of the Eastern Church and court ; 4. A life of Basilius I., his grandfather ; 5. Two treatises on warfare, of which his father Leo was perhaps part or gole author. 'The Tewzovixdé, a treatise on

agriculture with which his name is connected, is generally supposed. to have been executed at his command by Bassus Cas- sianus; and under his patronage many other works— "including collections of the ancient historians (of which fragments are extant), lives of saints, and treatises on medicine—were compiled. Several Latin translations of the works of Constantine have been made, and his com- plete works were published at Leyden, 1617, and Paris, Wii,

CONSTANTINE PAVLOVICH (1779-1831), second son of the Czar Paul I. of Russia, was born at St Petersburg on the 8th May 1779. His name was chosen by his grandmother, the Empress Catherine, on account, it was believed, of the tradition according to which an emperor Constantine was to reign at Constantinople. At the age of seventeen the prince was married to the Princess Juliana of Saxe-Coburg, but after four years a separation took place. In all affairs connected with the army Constantine took the intensest interest. In 1799 he served in Italy, and he gained distinction at the battle of Austerlitz (1805) by the admirable order in which he retreated. He also served throughout the rest of the war with France, but never held supreme command. In the end of 1815 he was appointed generalissimo of the army of Poland. His rule was marked by an unreasonable severity, which produced deep and general discontent; buthe introduced the strictest discipline. Though not nominally head of the Government, Constan- tine's influence was very considerable ; and it was all employed in support of arbitrary principles. He abo- lished the liberty of the press, and any literary man or student who expressed any opinion obnoxious to him was immediately thrown into prison. On the other hand he did much to carry out many material improvements. In 1820, having fallen in love with a Polish lady, he obtained through the influence of the emperor, his brother, a decree of the Holy Synod permitting him to marry the lady ; and in return he signed a paper resigning all claim to the succession to the throne. On the death of the Czar Alexander in December 1825, Nicholas, Constantine's younger brother, and after him heir to the throne, refused

or Scutari (Chrysopolis), Asia Minor, have been always distinct cities.

from the other by cut the western shore of the channel known as the

ships.

to allow himself to be crowned; but Constantine remained true to his promise, and, though a conspiracy of the officers of the army in favour of a constitution took place, and the conspirators proclaimed Constantine czar, he per- sisted in supporting his brother, appeared to take the oath of homage. stantine's power in Poland became greater than before ; his system of espionage and arbitrary government was more harshly put in force, charge became more common, year of revolutions, the general hatred of Russia burst into a rebellion. palace at Warsaw ; faithful, he escaped. He was, however, all Polish political prisoners, and of not calling in the Russian army to attack Poland. His Polish guard now requested liberty to rejoin the rest of the amy. After granting permission, guard deserted him. He was, reach the frontier in safety.

Constantine took no important part, and after a time even the inferior command which he held was taken from him. The czar refused to allow him to live near St Petersburg, and the place of his residence was fixed at the little town of Bialystok, on He died on the

at whose coronation he After this Con-

and arrests without any specified At length in 1830, that

Some of the conspirators entered the prince' but, the Polish guard remaining forced to release to declare his intention

he withdrew it, and the nevertheless, allowed to In the consequent war

the border line of Poland and Lithuania, 97th June of the following year (1831). CONSTANTINOPLE, the capital of Turkey and of the

Ottoman empire, is situated at the junction of the Bosphorus and the Sea of Marmora,

in 41° 0' 16" N. lat. and 28° 09

14" E. long. It may be said to stand upon two promon-

tories rather than upon two continents, since the quarter now called Galata was reckoned in the time of Arcadius the

13th Region, whereas Kadikeui (Chalcedon) and Iskudar situated on the opposite coast of The promontories on which the capital lies are divided the one the last and largest of those inlets which

Bosphorus. This inlet is a large and important harbour, running from east to north west, capable of floating 1200 It curls up in a course of little more than four foot of the hills which, joining the heights on seem to form a vast amphitheatre, till it meets

miles to the either side,

the united volume of two streams—the Cydaris and Bar-

bysus of the ancients—the two whelps of the oracle,—

"Bless'd they who make that sacred town their home, By Pontus' mouth upon the shore of Thrace, There where two whelps lap up the ocean foam, Where hind and fish find pasture at one place."

This peculiar harbour has always, by reason both of its form and its fulness, been called the Golden Horn. It is "like a stag's hom," Strabo says, "for it is broken into wavy creeks like so many branches, into which the fish pelamys (ayAapds) running is easily snared." In former times this fish was, and at the present day might be, & source of rich revenue—ever from time immemorial rushing down from the Sea of Azoff and the Black Sea, and when it approaches the white rock, on which stands the Maiden's (miscalled Leander's) Tower, glancing off it, and shooting straight into the Horn, but never enriching the rival city on the coast of Asia—Chalcedon, "the City of the Blind."

If the figure of a stag's horn resembles the harbour, that—

of an ancient drinking-horn would represent the genera form of Constantinople proper—the Seraglio point being turned inward like the sculptured mouth-piece. On this knot the Megarian city stood gathered

~~about its Acropolis, and occupying the easternmost hill on the verge of Europe. Constantine aimed at building his new capital, after the old, on seven hills ; his wish was fulfilled—not at first,~~

~~however, but a century after its dedication,—and he wished~~

~~tension 'ler Con- sotine,~~

~~Wis,~~

~~odosian under Theodosius~~

~~it to be in name, as in foundation, a counterpart of the ancient city. But it is the founder, not the model, that is commemorated in the name Constantinople, while its designation as "New Rome" lingers nowhere but in the official language of the Orthodox Fastern Church. Its Turkish name of Istamboul, or Stamboul, is said to be a corruption of the Greek words eis tiv xédw. About the end of the 18th century it was corrupted by a fanatical fancy into Islambol, or the city of Islam. Like the name, the emblem also of the city was adopted from the Greeks by the Ottomans. The crescent and star formed its device from the earliest times, and is found on Byzantine coins and on the statues of Hecate. So the body-guard of the Sultan retain insignia of the Varangian Guard of the Greek empire, of which traces seem to have been discovered in the Crimea, The sign manual of the sultans, rudely representing a left hand, originated with the action of a sultan who is said to have signed with a bloody hand a treaty with the republic of Ragusa.~~

~~Under Constantine, who founded it on the gite of Byzantium (q.v.), the city was more than doubled. HIs forum was fixed on the second hill; the walls were extended till a new inclosure was made, which spanned the peninsula from about the end of the old bridge to the mouth of the River Lycus in Vlanga Bostan; the line of his walls was not direct, but made a compass round the Polyandrion, or Heroon. It is said that 40,000 Goths were employed in first raising and afterwards manning these works; the seven gates separated the eight cohorts, each of 5000 men, Being Arians, the Goths were allowed no room within the city which they made safe for the Orthodox, but had assigned to them a quarter outside, which was called, either from several columns or from the one of Constantine that stood~~

~~thereabout, Lxokionion (the region without the columns), and the Gothic inhabitants of the quarter were styled Mxokiontta. So noble was this body or guild accounted among their countrymen, that many illustrious Goths were enrolled in it,—with others, the kings of Italy. In the course of time, after Anastasius had drawn a longer line of defences higher up, from the neighbourhood of Lake Dercon on the Euxine to Selymbria on the Propontis, and many of the Gothic cohorts were called away to defend these fortifications, the meaning of the name was by degrees forgotten, until it was changed into Hexe-Kionia, or Hexe-Marmora (six marble columns); and at last this corrupt form was rendered literally by the new occupants in their tongue Alti- Mermer (six columns), which name remains to the present day. As this is a landmark showing the limit of Con- stantine's walls on the south, another sign is extant bearing Witness to their extent on the north. This is a mosque, once a church, which is visible from the Golden Horn. Its Turkish name, Kahireh, or Kahrieh, is thought to have been formed into a resemblance of that of the capital of Egypt from the Greek x#pa, The monastery to which this church of the Saviour belonged was Movi ris ydpas, or, as we say, "in the fields." This was an ancient establish- Fi and its church, the oldest church in the city,~~

~~ates from the 8d century. Hither were brought, and entombed in sarcophagi, the remains of St Babylas and two other martyrs who suffered under Decius in the ite its of 250 A.D, At the beginning of the 5th ong a, Goths, being pressed by Attila and his Huns Olteae aa hoe below the Balkan, flocked towards aie gem to join their countrymen there and find i its suburbs. It then 'became necessary to~~

~~nen this extra-mural camp. Accordingly in 412, IL, the first Theodosian wall was raised Anthemius; and in 447 a second was y the prefect Cyrus Constantinus, who advanced~~

~~by the prefect added b~~

the fosse, and of the earth dug out of it formed aii artificial terrace between two lines of defence. The Goths were long subjected to exclusion from the city; Justinian exempted the LExocionites, indeed, from the penalties which he exacted from all other Arians in the empire, but required them still to meet for public worship outside the walls) Some monuments to members of the body of Hederati, found outside the fifth gate, and perhaps the name Cerco-porta, a memento of their round church, or one of their circular forts, may mark the residence, as they intimate the heresy, of the noble guards of the Greek emperor. Arianism had died out when this body was reinforced by the Varangians—Anglo-Danes—in the 11th century ; accordingly, it is not surprising to recognize in a Byzantine church in a quarter called Bogdan-Serai, within the walls on the fifth hill, the church of St Nicholas and Augustine, founded by an Anglo-Saxon who fled from the Normans to take service under the Greek emperor. It is maintained that most of the numbers distinguishing the cohorts attached to the several regions and walls remain to this day, as Deuteron, Triton, Pempton, and Hebdomon. walls there ensued a double arrangement of gates; town- gates, communicating with the public roads, alternated with military gates which opened upon the terraces only. These town-gates, to the number of seven, communicated with the seven gates of Constantine's wall each by a broad street, which separated the cohorts and their quarters. 'These gates were opened in peace but shut in time of war, and then the bridges connecting them with the country roads and crossing the fosse in front were taken down at the approach of the enemy. The military gates had no such bridges leading from them; they served only to give egress to that part of the garrison which was required to work the engines of war planted upon the terraces outside and below. The city gates in the Theodosian walls had for the most part the same names as the gates in the wall of Constantine which corresponded to them—with this difference, that they were styled "New." 'hus the gate "Roussion," so named-from the "demus" of the "Reds," in the latter, answered to the "New" Roussion in the former. It is on this accouut that the existing gate is to this day called Yeni Kapu (New gate) as well as Mevlaneh Kapusi (gate of the Dervishes). The gate of Adrianople (Edrench Kapusi) was formerly that of Polyandrion, and took its title from the corresponding gate in the wall of Constantine, called so because it stood near the Polyandrion or Heroon adjoining it, which was attached to

~~the church of the Holy Apostles; the site is now occupied by the mosque of Mahomet the Conqueror (Mehmedich).~~

~~The landward walls of Constantinople bear marks of the labour of many hands, and represent different and distant epochs! Their construction is unique, If tho~~

~~1 At several points these walls have been repaired and restored, and display the names of "rois constructeurs" from Theodosius to John Palexologus. They may be described roughly as four lines drawn across the promontory which they inclose for the distance of about four English miles, and knotted at each end into a citadel. The work at each extremity is more recent than what intervenes—that near the Sea of Marmora is to this day almost perfect; and the Golden Gate remains with its flanking towers of marble, much as it appeared in the 5th century, and fronted by the smaller arch which has generally appropriated the name. Of the five towers at the other end near the Golden Horn some remains exist, viz., the tower of Anema and that of Isaac Angelus. On the north side the wall of Theodosius breaks off at the palace of the Hebdomon, and the continuous fosse ceases where a later line has been thrown out with massive towers—this is the wall of Heraclius, supposed te have been raised to protect the imperial quarter of Blacherni, containing the palace of that name and the church of St Mary. Similarly a second wall was constructed to cover the @hurch of St Nicolas, in the time of Leo the Armenian, whence it is called the Leontine wall. This line of defence, long impregnable, withstood siege after siege till the new artillery made~~

~~Upon the completion of these Theodosian Gates.~~

~~Imperial palaces.~~

~~304~~

~~outer defence of the fosse is reckoned they are quadruple ;~~

~~. the two inner lines are furnished with a series of towers,~~

the smaller below, the larger above—round, octagonal, or square—at about 50 feet apart. As the gaunt array of castles droops into the valley, or seems to climb the hill beyond, one may decipher some of its now obscure 1nscrlp-tions on marble or in tile work (one seems to be a prayer to Christ), and wonder at the contrivance which appears to defy a natural law. The great ditch, now a productive vegetable garden, is divided into a number of compartments or open cisterns, which used to be filled with water brought by pipes, carried along each partition-wall, and furnishing the supply from cisterns from within and without the city.

eee remarkable with these fortifications is the system of large cisterns, which are said to have furnished water to 1,000,000 men during four months; they were a necessity to a city subject to perpetual assault. One seems to have been annexed to every considerable monastery and palace—imperial and patrician. They may be reckoned the more ancient portion of the city, which is thus subterraneous ;—for while the buildings above ground are scarcely any of them, in the condition now visible, older than the time of Justinian, the cisterns that can be distinguished date from the times of Arcadius, Theodosius, and Constantine.

The position assigned to the old imperial palace is, generally speaking, that of the mosque of Ahmed, which adjoins the Hippodrome. It was not one large edifice, but a scattered group of buildings within gardens, spreading to the Hippodrome on the one side, and on the other to the seashore; the northernmost point of its inclosure reached the site occupied now by the fountain of Ahmed III., then by the Geranion. This palace was gradually abandoned after the 12th century for that of Blachernz within the Horn. It was separated from the church of St Sophia by the Augusteum—the square in which stood the statue of Justinian looking towards Persia, the Milliarium, and among other monuments the column that bore the silver statue of the Empress Eudoxia, which occasioned the remonstrances of St Chrysostom. Ma-

three great breaches—the first between Tekfur-Serai and Edreneh Kapusi ; the second near the fifth military gate—that of Charisius, in the valley of the Lycus; and the third between Selymbria gate and Mevlaneh gate.

The walls on the western or land side of the city are connected with the continuous line which defended it on the two sides that face the water, and which, with a few breaks, is still standing. That part which runs parallel with the Golden Horn is varied in Balata by the insertion of an arch, still preserving a Victory, and by a pier now lying far back on the strand ; built first by Zeno, it displays on its successive towers the names of Michael and Theophilus. The other part which turns the point shows the same names, but differs widely here and there in construction from the portions across the land and by the Horn, being formed so as to receive the beating of the waves indirectly, aud strengthened with shafts of marble so as to resist most effectually the corrosive action of sea-water. This contrivance is especially to be noticed between Vlanga and Ahor-Kapusi, and shows the foresight of the builders; the great tower which locks the sea-wall with the land-walls is one mass of marble,—on the other hand the land-walls are constructed for the most part of marble or stone and brick alternately, to resist more easily, as it has been supposed, shocks of earthquake. In tracing the course of the sea-wall from the Acro- polis to the Seven Towers, the sites of all and the ruins of some of the 'ollowing places have been noted in order :—the Orphanotropheum ; the churches of St Demetrius, St Barbara, and the

Hodegetria ; the Porta Carea (corrupted into Karacapu) beyond the palace and harbour of Boucoleon; the imperial palace; the Porphyry Chamber (the origin of the epithet "born in the purple"); the palace of Hormisdas ; the churches of Sts Sergius and Bacchus; the Portus Julianus and Sophianus, now Caterga Liman, with the Sophiana Palace ; the Con- toscalium, Koum-Capu; the harbour of Theodosius—outer and inner—now a garden called Vlanga Bostan,—its mouth flanked by two noble towers joined by a wall before the last siege ; the harbour of Aimi- lianus ; St John of the Studium ; and at last the citadel called Hepta- pyrgion, the Seven Towers.

The entire circuit of the walls is about 13 miles,

CONSTAN TINOTES

homet II, built his new palace (the seraglio) on the site of the Acropolis, about which ancient Byzantium had clus- tered, a situation specially favourable to his purpose, as it afforded the combined advantages of a lovely prospect, a perfect retreat from the noise of the city, and a facility

part held by the guards; (2)

for observing all the movements in the harbour. In erect- ing it he followed the three divisions of the palace of the Byzantine emperors—(1) the Chalce, the defensive the Daphne, which touched the Hippodrome and was used for receptions ; and (3) the private chambers occupied by the imperial house-

hold. The three corresponding portions of the Ottoman

palace are distinguished by their several gates .:—(1) Babi Houmaioum, the Imperial Gate, opening into the court of the Janissaries ; (2) Orta-Kapusi, Middle Gate, in which the sultan receives on high festivals; and (3) Babi Saadet, Gate of Felicity, where he formerly received ambassadors. Of late years the sovereign has resided in winter at Dolma-bakcheh or "icheragan ; in summer at Begler-beg on the Asiatic shore, or at some inland kiosk.

The main streets of the Stamboul of the present day Outi follow the lines of the city of Constantine ; thus the mode: tramway, which turns from the New Bridge towards Serai ity. |

Bournou, upon reaching the platform of St Sophia, enters upon the direction of the Méon (Mése, middle street), now called Divan Yoli. The Mése parted into two branches, of which the one went to the gate Roussion ,or new gate, the other to the Polyandrion, On the north of the middle street one branch passed along the shore of the Golden Horn from the place where the railway station is, and issued at the gate Xylocircus near Balata. On the south, another street passed through the two Golden Gates. These three main lines were distinguished from the smaller tortuous streets by their adornment as well as by their breadth. They were bordered by rows or covered ways and arcades called %uoror, some of them double, with pavements above, decorated with statues, &c. A few traces of the emboli still remain 77 situ, just as there are fragments of the ancient bazaars, khans, and baths. Imperial gates closed the lines of these principal thoroughfares.

The following is an outline of the modern city, divided according to the seven hills and the intervening valleys. On the Ist hill, the most easterly, are situated the remains of the Seraglio, former palace of the Ottoman sultans ; the great church-mosque St Sophia ; St Irene ; the. imperial

mint ; the Atmeidan (Hippodrome), with three of its numerous monuments remaining; the mosque of Ahmed, &c. Along the Ist valley are traced the walls of the Seraglio on the west, made up of ancient materials, and the Babi Ali or Sublime Porte. The tramway runs along this valley. On the 2d hill stands the Burnt Column, that of Constantine the Great (which stood in the centre of his forum, and under which are said to be the instruments of the Crucifixion and a Palladium of Troy), and the Mosque of Osman. The 2d valley is occupied by the bazaars, several khans, and the mosque of Valideh Sultan, or Yeni Jami, overlooking the bridge and the head of the tram- way. On the 3d hill are the Seraskierat (War Office) on the site of the cemetery of the Byzantines and the forum of Theodosius ; the fire-tower, and the mosque of Suliman. Along the 3d valley is carried the Aqueduct of Valens, built out of the walls of Chalcedon destroyed for the citizens'

rebellion ; near it is At-Bazar (horse-market). On the 4th hill rises the mosque of Mahomet II., where stood the church of the Holy Apostles and the church of the Pantocrator. South of this mosque, in a garden, is seen Kiztash, the Maiden's Column, or column ©

Marcian, once that of Venus. On the 5th hill follows the mosque of Selim, on the edge of a large open cistern, south of which is the covered cistern of Arcadius. Below

on the north lies the Phanar (so named from a lighthouse), the Greek quarter which reaches to the Golden Horn. This division includes the church of the Patriarchate, the

great school of the Greek nation, the church-mosque

; La

Fetiyeh Jamisi (Pammacaristou), and the church of the Mongols (Mougloutissa). The 6th hill is distinguished

by the palace of the Hebdomon, with its coronation hall, built, it is said, by Constantine I., and known vulgarly as Tekfur-Serai—palace of the lord (rod Kupiov). At its foot appears the church-mosque Kahrieh, or Kahireh,

CONSTANTINOPLE

CONSTANTINOPLE

ONE ENGLISH MILE

formerly Mone tes Choras (Movi tis xépas). Below this hill, the quarter called Balata, from Palatium, now occupied by Jews, follows the Phanar, then the ancient suburb of Blacherne. Here are seen some remains of the Pentapyrgion,—five towers used by the Greeks of the Lower Empire as a political prison. This quarter is succeeded by Eyoub, celebrated for its mosque—which no Christian may enter—and for its cemetery. In this

~~quarter, after Greek precedent, the sovereign is invested. On the hill near, in the Cosmidion, the first crusaders pitched their tents. The~~

~~OP tke fl~~

~~1, St Sophia, 13. Mosque of Mahomet IT.~~

~~2. Mint. 14, Kiz Tash (Column of Marcian).~~

~~8, St Irene. 15, Mosque of Selim.~~

~~4, Atmeidan (Hippodrome). 16. Cistern of Arcadius,~~

~~5. Mosque of Sultan Ahmed. 17. Column of Do.~~

~~6. Babi Humaioum. 18, Emer-ahor Jamisi (St John of the 7, Babi Ali Gublime Porte). Studium).~~

~~8. Mosque of Sultan Osman, 19. Mosque of Exi Marmora.~~

~~9, Porphyry Column (Burnt Column). {20. Kahireh Jamisi (Church of the~~

~~10. Seraskierat (War Office). 11, Mosque of Valideh Sultan. 21, 12, Kutchuk Aya Sophia (Little Sophia). | 22.~~

~~7th hill is to be looked for in the most southern corner of the city. It is occupied by the fortress of the Seven Towers, the political prison of the sultans. It is isolated by the River Lycus.~~

~~Of the ecclesiastical buildings of Constantinople by far the most important is the Mosque of St Sophia, or Aya Sofia Jamisi, which ranks as perhaps the finest example of the Byzantine style. In striking contrast with the nobler Specimens of Gothic architecture, it presents from the out- side an uncouth and disproportionate appearance, even the effect of its unusual dimensions being destroyed by its lack of symmetry. But within the visitor cannot fail to be Impressed by the bold span of the arches and the still bolder sweep of the dome, while his eye is at once bewil- dered and charmed by the rich, if not altogether harmoni-~~

Saviour). St Mary of Blacherne. Blachernsz Palace.

be

2 Se] SAM NN yy A ISN ff f Militar See VID Hospital

GF MARMORA

A WWuss

GEN 5)

84. Galata Palace. 35, Crimean Memorial Church.

. Mosque of Suliman. . Column of Theodosius.

25. Naval Building Basin and Bar- | 86. Divan Hanch (Admiralty), racks.

26. Naval Hospital. GaTEs.

27. English Embassy. A. Edrench Kapusi.

28. German Do. B. Top Kapusi.

29. Dutch Do. C. Yeni Kapu or Mevlanch Kapusi.

30. French 'Do. D. Selymbria Kapusi.

31, Swedish Do. E. Yedi Koulch Kapusi (Seven

32. Russian Do. Towers).

38. Austrian Do. F. Golden Gate.

ous variety of decoration, from the many-coloured pillars down to the mosaics and inscriptions on the walls. The dome is raised at the centre 180 feet above the ground, and has a diameter of 107 feet; its curve is so slight that the depth is only 46 feet, and round the rim it is relieved by a row of forty windows. The arrangement of the building may be understood fron the

plan on next page ; and the magnificent volumes of Fossati and Salzen-burg furnish all that can be desired in the way of views of the different parts of the interior. The first stone of St Sophia, or the Church of the Divine Wisdom, was laid in 532 on the site of several successive churches of the same name, the first of which had been erected by Constantine the Great. Anthemius of Tralles and Isidorus of Miletus were the architects employed by the emperor 4 sagt! at whose «— 39

command the enterprize was commenced. No fewer than 10,000 workmen are said to have been engaged under the direction of 100 master builders; and when the work

Plan of Mosque of St Sophia,

A. Ancient Sacristy. G. Front Gallery.

B. Ancient Baptistry. H. Formerly the Emperor's and Patri- Cc. The Side Galleries. arch's seats.

D. The Four Minarets. I. The Mihrab, where the Koran is kept. E. F. 1st and 2d Porch or Narthex. | K. Formerly the Altar.

was completed it had cost the imperial treasury about £1,000,000. The principal material of the walls was brick, but the whole interior was lined with costly marbles ; and to add to its splendours the temples of the ancient gods at Heliopolis and Ephesus, at Delos and Baalbec, at Athens and Cyzicus, were plundered of their columns. To render the dome as light as possible it was constructed of pumice-stone and Rhodian bricks, and to secure the building from the ravages of fire no wood was employed except for the doors, Not long after its completion the dome was shaken by an earthquake, but it was repaired by Isidore, the grandson of the original architect. In 1453 Mahomet converted the church into a mosque, and since that date numerous minor alterations have been made in the less essential parts of the building. A pretty com- plete restoration was effected in 1847-49 by Fossati, who found that the weight of the dome was too great for the supporting walls, threatening the whole with destruction.?

The most remarkable of the church-mosques, besides St

fa a a i

1 The churches of Constantinople in 1202 were, according to Alberich, 500. Of more than 50 the remains or the sites have been identified. Six of these are in the possession of Christians,—five being held by the Greeks and one by the Armenians. The five churches are (1) Mougloutissa (Mongolian); (2) St George of the Cypress in Psamathia; (3) the Ayasma (holy well) of St Mary in Blacherne ; (4) the Ayasma of the Sleep of St Mary, between the mosques Zeirek and Vefa ; (5) the Ayasma of St Therapos (a Cyprian martyr) in the Seraglio wall near Pasha Kapusi. The church indicated as given to the Armenians is Perioleptou (Soulou Monastir). Possibly another church similarly transferred might be named, in Balata, to which a monastery was annexed, Three other churches, though not turned into mosques, have passed out of the hands of the Christians— St Irene, Sts Nicolas and Augustine, and St Juliana. In the sea-wall of the Seraglio gardens is the eastern entrance of another church— perhaps St George of the Mangana ; to the north, is the Ayasma of the Saviour.

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Sophia, are the following:—(1) Kutchuk Aya Sophia, the church.

original model of the great church. It was built for Jug. mosques,

tinian before his accession, and dedicated to martyrs of hig own Illyrian race—SS. Sergius and Bacchus. The lower stage is the original fabric. Here, according to Mahometan tradition, Messiah appeared among the worshippers. (2) Pantocrator (the Almighty), now Zeirek Jamisi, a triple church of the Comneni. Its monastery became the head- quarters of the Latins in the 13th century. (3) St John of the Studium—Emer-ahor—a basilica. Here was the famous monastery of Accemeti (watchers) and a school of church poets. (4) The Church of the Saviour, with the monastery of the Chora, as being not only év r7 xépq (" in the fields,") but 4 xépa tov Cévrov the (land of the living), a gem of beauty still, even in its decay, rich with mosaic of the 14th century of a style purer and more refined than that which is more often seen and admired at Ravenna and Palermo, In this

church, alternately with the Hodegetria, was kept the Holy Robe of the Virgin, which was wont to be carried in procession when the walls were threatened, and with which the patriarch Photius is said to have scared away the first Russian fleet which came against the city down the Bosphorus in the 9th century. (5) Pammacaristou—Fetiyeh Jamisi. The Greek patriarch moved hither from the Church of the Holy Apostles which had been assigned him. One dome of this church is still full of mosaic work.

The mosques of Constantinople are reckoned variously from 350 to 500, mesjids (chapels) included. Many of them retain the materials as well as occupy the sites of ancient churches. The great mosque of Suliman was chiefly built of the remains of the church of St Euphemia at

-Chalcedon, where the fourth CEcumenical Council was h

451, This church stood above the valley of Haidar-Pasha, near Kadikeui ; an ayasma belonging to it stands near the railway terminus at a little distance from the shore. The imperial mosques, that of Eyoub included, are nine in number. Most of them stand on high ground ; and, with the harmonious contrast of dome and minaret, they offer to the eye a more pleasing view than the Christian churches of the past. The hills may be counted as these lordly struc- tures follow in stately order, and the monuments of Osman, Suliman, Mahomet, and Selim seem to repeat the form fixed on the first hill by the architects of Justinian ; and on high festivals their soaring minarets, more airy than the campaniles of the West, and beaming with festoons of light, shine out like beacons over the neighbouring waters.

Galata and Pera.—Along the north shore of the Golden cata Horn spreads the quarter known as Galata, rising up to Pera

the crest of the hill and including the massive tower which crowns it. Beyond and above Galata, Pera stretches forward along the ridge that runs parallel with the shore, Both these quarters are chiefly inhabited by Christians, ative and foreign. Galata is the seat of commercial establishments, Pera that of the diplomatic bodies. At the foot of the great tower of Galata is gathered a cluster of English institutions,—the consulate, consular court, consular prison, seamen's hospital, post-office, and sailors'

home. Several institutions, native and foreign, have been established of late years in Pera. The main street which connects these two quarters winds up from the outer bridge. A little beyond the Municipality House, it is crossed by another near the point where it separates the Russia Embassy from the Hotel d'Angleterre ; hence the Greek name of Pera SravpoSpépov (the cross roads). 'This street, rising tortuously from above Tophaneh, is said to have been formed by the track of Mahomet's fleet of boats, which were rolled up to the crest of the hill and then down on the other side to the inlet below Kassim-Pasha, on the edge of which the Divan-Haneh (Admiralty) now stands, Before reaching the point of intersection this street,

Mosques.

called Koumbaraji Sukak (street of bombardiers), passes peside the elegaut English church (Crimean memorial church) which was consecrated under the name of Christ Church in 1868. The great tower of Galata, like that of the Seraskierat (War Office) on the opposite height in Stamboul, is used as afire-tower. In the times of Genoese occupation it was the main castle or keep of the town ; it was heightened, not founded, by those settlers from Italy. The original tower was built about the end of the 5th cen- tury by the emperor Anastasius Dicorus. Since that time it communicated with another huge tower (long ago destroyed), which stood near the site of the present terminus of the Adrianople Railway in Stamboul,—the tower of Eugenius, It was joined to this tower in time of war by an iron chain laid across the Golden Horn to keep out enemies' ships, while a similar chain, fastening the tower of Eugenius to a fort replaced now by the Maiden's tower (miscalled Leander's), barred the passage of the Bosphorus. From the tower of Galata there spread out, as spokes from an axle, some three or four lines of wall, which ran down- ward till they met on the right the line which guarded the quays, on the left a sweeping line which embraced that ex- tension of the town which had crept along the shore as far asthe modern Tophaneh, The inner line, which unequally. divided the quarter that lies between the bridges, was double. Some portions of this and of the others still exist, with towers and gateways; but of the numerous tablets visible

upon them when they were standing, two only remain in their original place. Below the double wall, which gave passage to troops from the great tower to the seaward wall, stands the remarkable mosque called Arab-jamisi (Saracens' mosque). Its form and contents serve as a record of the history of Galata. Its minaret, unlike the minarets of Turkish mosques, is square, recalling the Moorish towers of Spain, Remains of Genoese monuments on its floor and in the outer court testify to its Christian use. Originally a Mahometan place of worship, it is not orien- tated, nor has it an apsidal termination. It is said to have been first built for the Arab colony that lingered here since the invasions of Constantinople by the Arabs. When Galata, already occupied by the Genoese at the commence- ment of the 13th century, was, from motives of gratitude or of policy, given up entirely to that colony of daring merchants by Michael Paleeologus on his recovery of the city from the Latins, this mosque became their chief church ; but when, nearly two centuries afterwards, the Ottoman Turks became masters of Constantinople, it reverted to its first purpose, and Christian worship gave way to Mahometan. Besides the great tower and some—ruins of walls and towers, the massive blocks of building that are now banks and merchants' offices, the palace of the podest&, the Lombard church known as St Benedict's, which is at this day a centre of French philanthropic and religious works, are existing memorials of the settlements | of those Genoese merchants, the active and successful rivals of the Pisans and Venetians,—whose proper quarters lay at the foot of the tower of Eugenius, now within the Seraglio wall—and the ancestors of the enterprizing merchants of later times who are known and respected as the Greeks of the island of Scio. The names Pera and Galata have not always been restricted to their present limits. Pera, like Perea, is Greek, designating the region over the water, and was naturally employed as from Constantinople to mark that quarter of the city which lay on the other side of the Golden Horn. The name was accordingly first given to the lower portion of the town, now called Galata and formerly Sycz (the fig-trees). This quarter of the city was enlarged and adorned by Justinian, but before his time, under Arcadius, it was reckoned one of the regions of Constantinople. The ground which it covered

seems to have been used still earlier as a cemetery of the Christian citizens, and corresponded thus with the site of the Seraskierat in Stamboul, on the third hill, which heathen monuments—discovered on the spot—show to have been the burial-place of the citizens of Byzantium. As all Galata was in former times called Pera, so Pera seems to have been sometimes included in Galata. Galata- Serai, the palace of the Turkish governor of Galata (now a Franco-Turkish lyceum), is situated in the centre of Pera. The name Galata, which has been the subject of much dis- cussion, appears to be the corruption of the Italian Calate (descent), the name whereby that quarter of an Italian seaport town is known which spreads over the sloping shore, Until a few years ago Galata and Pera were separated by a dry moat. This has lately been filled up with streets.

Two bridges of boats span the Golden Horn and unite Bridges.

Galata to Stamboul. The inner one, constructed of iron, though new, has, in taking the place, adopted the name of a former bridge constructed in the reign of the Sultan Mahmoud, and is still called the Old Bridge. It stretches from the western end of Galata to the quarter on the Stamboul side which is called Oun-Capou. The outer bridge is known as that of Karakeui, as it extends from a part of Galata so named, and also as the bridge of the Valideh Sultan, because the opposite end of it rests on the shore below the mosque of the Valideh-Sultan, otherwise Yeni Jami, or the new mosque. A third bridge, con- structed during the Crimean war between Hasskeui and Aivan Serai, has disappeared. There is said to have existed in ancient times one bridge—that of Justinian. The bridge built by Philip of Macedon seems to have crossed the river at the head of the Horn.

The climate of Constantinople is generally healthy, Climate.

owing to the position of the city, its natural drainage, and the currents of the Bosphorus, but the temperature is subject to great and sudden changes.

It is true of the capital, as of the country at large, that Popula. no point is so hard to ascertain as the sum total of the 1

inhabitants and the relative proportions of its parts. Byzantius in 1851 reckoned the population of the city and its suburbs at about one ‘million,

viz.,—500,000 Turks, 220,000 or 300,000 Greeks, 50,000 or 120,000 Armenians, 70,000 Jews, 10,000 Franks, and 70,000 miscellaneous. Official statistics return the population of the city and suburbs as not exceeding 700,000 in 1877,

The Mahometan public schools are of three classes :— Dducation,

(1) The primary district schools—Mahaleh—for boys and girls mixed ; (2) for boys, the provincial schools—Rushdiyeh —of a higher order; (3) for young men, the mosque schools—Jedresseh,—a sort of theological seminaries. There are said to be 500 medressehs in Stamboul alone. In the first class of schools are taught the Turkish alphabet and the reading of the Koran in Arabic ; in the second, reading, elements of writing, principles of arithmetic, and Turkish geography and history ; in the third, besides theology, Turkish, Arabic, and sometimes the Persian language. The age of entrance into the first is about five years ; into the second, ten. Most lads, on leaving these secondary schools, at about sixteen years of age, pro- ceed no higher. Besides the public schools, which are open to all Mahometan youth without distinction, there are special Government schools. The five chief establishments are the military, naval, and artillery schools, the school of military engineering, and the medical school. To each of these is annexed a preparatory school—Idadiyek, A few other special schools are a training-school for teachers in the Rushdiyeh, a school of languages for translators, and a school for managers of woods and forests, The most important institution for supplying good secondary instruc- tion is the metropolitan lyceum of Galata, which has

Trade.

Fire- brigade.

Ancient monu- ments.

History.

~~generally been under French direction. A large school for orphans of different nationalities was opened some years ago near the mosque of Selim in Stamboul.~~

~~Among the philanthropic establishments of the capital must be reckoned the Jmarets, intended like the Greek Xenones to be at once hospitals and poor-houses. They are attached to most of the mosques, and may be about 300, though many are fallen into decay.~~

~~The bazaars call for particular notice. They are large fire-proof buildings, lighted from above, where the varied wares of the city are retailed.~~

~~The city numbers, besides, about 180 khans (groups of offices and store-houses for merchandize), and some 130 hammams, or baths.~~

~~The trade of Constantinople carried on now, as under the Greek empire, by foreigners, is not distinguished by any speciality. Its harbour is aconvenient centre to many lines of commerce, sheep's wool, mohair, goat-skins, grain, &c., being transhipped from the coasts of Asia and the Black Sea. Great improvements have been introduced of late. Besides the steamers which secure communication with foreign ports, others ply between the city and its suburbs on the Horn, the Bosphorus, and the Sea of Marmora.~~

~~The streets, though ill paved, have been some of them enlarged, and many on the Pera side are lighted with gas; but the greatest improvement of all is the formation of an active and highly disciplined fire-brigade.~~

~~It is sometimes said that modern Constantinople, after so many earthquakes in earlier centuries, and conflagrations in all, retains few relics of the past ; but several monu- ments have been already named, and others might be added. They are most numerous about the Hippodrome— that centre and focus of the city's life, and theatre of its revolutions, its festivities, and its crimes. Besides the re- mains of six palaces, five columns entire or in fragments are pointed out—memorials of the Ist, 3d, 4th, and 5th centuries, and associated with the historical names of Claudius IL. and Constantine, Theodosius and Arius, Arcadius, Eudoxia, Marcian, and Chrysostom. Tombs of the great lie about in various corners and courts. It is to be remembered, moreover, that the greater part of the Greek city is under~~

ground,—that besides the ruins or remains of more than 20 churches, and of the colonnades that lined the streets or divided the bazaars, and which still are met with by the passenger along its public thoroughfares, there spread out of sight beneath his feet labyrinths of passages, cisterns, and prisons of length and direction un- known, so that he may be said to walk not so much on terra firma, as on a continuous roof.

The history of the city is almost a record of its sieges. About 100 years after its enlargement or foundation by Constantine the Great (330 a.p.) began that series of assaults by sea and land before which it gave way only thrice, when its gates were opened to Dandolo, Michael Paleologus, and Mahomet II. Michael, by the aid of his Varangians, recovered, 200 years before its final capture, what the Latins had held nearly 60 years; and 100 years before it surrendered, the Ottoman Turks profited by the divisions in the empire, and were called into the east of Europe as the followers of the same anti-Christian standard had been called into the west, till the last Constantine fell in defending the city which the first had raised and named. Constantinople was threatened by the Huns in the reign of Theodosius the Younger, 450; by the Huns and Slavs in that of Justinian, 553 ; by the Persians and Avars in that of Heraclius, 626. The Arabs besieged it in three different expeditions. They came under Sophian in 668, and attacked it six times, once every year (672-679), when Con- stantine Pogonatus was emperor. Leo the Isaurian repelled a second invasion under Moslemeh in 717. Thay were

CONSTANTINOPLE

finally led by Haroun-al-Rashid, who made peace with Constantine and Irene in 782. sea-walls of the capital four times from 865 to 1043, in the reigns of Michael III. and his successors. Lecapenus, who beat them back when they were come down the second time, had to repel another enemy—the Hungarians—in 924. treachery of Gilpracht, the leader of the German guard that Alexius Commnenus entered one of the land-gates and seized the throne(1081); and another Alexius, with his father Isaac Angelus, brought the Latins, who occupied the city for 56 years, after the two sieges of 1203 and 1204, until Michael Paleologus embossed his name as conqueror on the bronze gates of St Sophia. stantinople was attacked by the Turks twice;

under Manuel it resisted Amurath in 1422; but under Constantine Paleologus it yielded to Mahomet in 1453. The city has thus been often the aim, rarely the prize, of invasion.

The Russians assailed the

Romanus

It was not by arms, but by the

In the 15th century Con-

The captures of the city by the Latins and the Turks

brought loss to the East and gain to the West. In an age when the Goths on the one side, and Arabs on the other, had ruined traffic elsewhere, Constantinople was the great- est and almost the only commercial town in the world,

while Greek supremacy at sea secured a flow of riches into

the state ; but, the citizens being dispersed during the sixty years of Latin occupation, all commerce was trans-

ferred to the cities of Italy. To that Latin conquest is mainly attributed the sudden development of the formative

arts in the 13th century, for then there arose more frequent intercourse between the Greeks and the Italians, and many Greek artists were established in Italy, especially at Venice,

Siena, Pisa, and Florence. In like manner, the fall of the city before the Turks scattered Greek learning among the Latin and Teutonic races ; when Greek libraries were burnt

and the Greek language proscribed, Greek MSS. of the

Bible, sedulously copied by the monks of Constantinople from the 5th to the 15th century, conveyed the text into Western Europe ; the overthrow of the

capital of Greek literature synchronized with the invention of printing, and in a great measure caused the revival of learning, Since that last siege which introduced the Ottoman rule, the city from being the object became the starting-point of invasion; for long ages the busy hive of science and art, it was turned into a swarming nest of hornets. The mausoleum of Haireddin (Barbarossa) at Beshiktash, a suburb of the city, is a memorial of the subjugation of the Northern States of Africa ; a ruin, beneath the Burnt Column, once the resi- dence of Busbek, in the 16th century, bears witness to the privileges and the restraints of the ambassadors of Germany; and inscriptions left on the inner walls of the Seven Towers, ranging in date from 1698 to 1800, record the imprisonment and the liberation or death of captives, Venetians, French, &c., and the obstinate struggles in which the Ottomans engaged with the different powers of Europe. The last European ambassador imprisoned there was Le Brun, envoy of the French republic ; he was thrown in on the news of the French landing in Egypt, and remained three years. After the tide of fortune turned on the repulse of the Turkish forces from Vienna in 1683, Constantinople began to be once more the special mark for ambition or Te venge. When the peace of Carlowitz was signed in 1699 a new enemy was rising in the North ; in 1770 the aity was threatened by the Russian fleet joined by the English squadron. Vice-Admiral Duckworth, having forced the passage of the Dardanelles, appeared before Constantinople, but the Turks put themselves in ® posture of defence, and after eight days his squadron retreated. For further historical details, see TURKEY.

Authorities—Paspati, Déthier, Glavany (local), besides an

| on Procopius, Byzantius, Gibbon, Montesquieu, &c. (C, Ga Us

CON—CON

CONSTANTINUS CEPHALAS. vol ii. p. 103.

CONSTANTIUS, Fravius Vatertus, commonly called Consrantius CHLoRUS, or the Pale (an epithet first applied by the Byzantine historians, though with doubtful accuracy, for there is evidence to show that he was, like his son, ruddy), Roman emperor and father of Constantine the Great, was born of noble Dalmatian family about 250 a.p. Having distinguished

himself by his military ability and his able and gentle rule of Dalmatia, he was, in March 292, adopted and appointed Cwsar by Maximian, whose daughter Theodosia he was obliged to marry after renounc- ing his wife Helena. By Theodosia he became the father of Constantine. He obtained the title Augustus in 305, and died the following year. See Roman History.

CONSTITUTION axp CONSTITUTIONAL LAW. The word Constitution in the time of the Roman empire signified a collection of laws or ordinances made by the emperor. We find the word used in the same sense in the early history of English law, eg., the Coustitutions of Clarendon. In its modern use constitution has been re- stricted to those rules which concern the political structure of society. If we take the accepted definition of a law as a command imposed by a sovereign on the subject, the constitution would consist of the rules which point out where the sovereign is to be found, the form in which his powers are exercised, and the relations of the different members of the sovereign body to each other where it con- sists of more persons than one. In every independent political society, it is assumed by these definitions, there will be found somewhere or other a sovereign, whether that sovereign be asingle person, or a body of persons, or several bodies of persons. The commands imposed by the sovereign person or body on the rest of the society are positive laws, properly so called. 'The sovereign body not only makes

aws, but has two other leading functions, viz., those of judicature and administration. Legislation is for the most part performed directly by the sovereign body itself; judi- cature and administration, for the most part, by delegates. The constitution of a society, accordingly, would show how the sovereign body is composed, and what are the relations of its members inter se, and how the sovereign functions of legislation, judicature, aud administration are exercised. Constitutional law consists of the rules relating to these subjects, and these rules may either be laws properly so called, or they may not—z.e., they may or may not be commands imposed by the sovereign body itself. The con- stitutional rule, for example, that the Queen and Parliament are the sovereign, cannot be called a law; for a law presup- poses the fact which it asserts. And other rules, which are constantly observed in practice, but have never been enacted by the sovereign power, are in the same way con- stitutional rules which are not

laws. It is an undoubted rule of the constitution that the king shall not refuse his assent toa bill which has passed both Houses, but it is certainly not a law. Should the king veto such a bill his action would be unconstitutional, but not illegal. On the other hand the rules relating to the election of members to the House of Commons are nearly all positive laws strictly 80 called. Constitutional law, as the phrase is commonly used, would include all the laws dealing with the sovereign body in the exercise of its various functions, and all the rules, not being laws properly so called, relating to the same subject.

The above is an attempt to indicate the meaning of the Phrases in their stricter or more technical uses. Some Wider meanings may be noticed. In the phrase constitutional government, a form of government based on a principles which may roughly be called popular is the leading idea, England, Switzerland, the United States,

See ANTHOLOGY,

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are all constitutional governments in this sense of the word. Russia, France under the last empire, and Spain, on the other hand, would generally be said to be countries without constitutional government. A country where a large portion of the people has some considerable share in the supreme power would be a constitutional country. On the other hand constitutional, as applied to governments, may mean stable as opposed to unstable and anarchic societies, Again, as a term of politics, constitutional has come to mean, in England at least, not obedience to con- stitutional rules as abuve described, but adherence to the existing type of the constitution or to some conspicuous portions thereof,—in other words, Conservative. Thus the abolition of the Irish Church, which was in every way a constitutional measure in the judicial meaning of words, was not a constitutional measure in the party sense. In a country like Spain, on the other hand, the party called constitutional is liberal.

The ideas associated with constitution and constitu- tionalism are thus, it will be seen, mainly of modern and European growth. They are wholly inapplicable to the primitive and simple societies of the present or of former

times. 'The discussion of forms of government occupies a large space in the writings of the Greek philosophers,—a fact which is to be explained by the existence among the Greeks of mauy independent political communities, variously organized, and more or less democratic in character. Between the political problems of the smaller societies and those of the great European nations there is no useful parallel to be drawn, although the predominance of classical Jearning made it the fashion for a long time to apply Greek speculations on the uature of monarchy, aristocracy, and democracy to public questions in modern Europe. Representation, the characteristic principle of European constitutions, has, of course, no place in societies which were not too large to admit of every free citizen participating personally in the business of government. Nor is there much in the politics or the political literature of the Romans to compare with the constitutions of modern states. Their political system was almost from the begin- ning one of empire, ruled absolutely by a small assembly or by one man.

The impetus to constitutional government in modern times has to a large extent come from England, and it is from English politics that the phrase and its associations have been borrowed. England has offered to the world the one conspicuous example of a long, continuous, and orderly development of political institutions. The early date at which the principle of self-government was established in this country, the steady growth of the principle, the absence of civil dissension, and the preservation in the midst of change of so much of the old organization, have given the English constitution a great influence over the ideas of politicians in other countries. This fact is expressed in the proverbial phrase—" England is the mother of parlia- ments." It would not be difficult to show that the leading features of the constitutions now established in other nations have been based on, or defended by, considerations arising from the political history of England.

In one important respect England differs conspicuously from most other countries. Her constitution is to a large extent unwritten, using the word in much the same sense as when we speak of unwritten law. Its rules can be found in no written document, but depend, as so much of English law does, on precedent modified by a constant process of interpretation, Many rules of the constitution have in fact a purely legal history, that is to say, they

have been developed by the law courts, as part of the general body of the common law. Others have in a similar way been. developed by the practice of Parliament, Both Houses,

the other, and noneis supreme, So Blackstone and writers of his class tell us that the English constitution is the per- fection of political wisdom, inasmuch as it combines the virtues of monarchy, aristocracy, and democracy without the faults which would attend any one of these varieties of government unmodified by the others. The tendency to repeat the English type of Parliament, in artificial or paper constitutions, is probably not entirely unconnected with this habit of mind. The question of a second chamber has been a practical difficulty of the first importance in all such constitutions. The attempt to imitate the duality of the English Parliament results in two co-ordinate Houses of le- gislature, each of which mayat any moment bring legislation toa stop. "In both the American and the Swiss constitu- tion," says an eminent writer on this subject (Mr Bagehot), "the Upper House has as much authority as the second; it could produce the maximum of impediment, the dead-lock, if it liked; if it does not do so jt is owing, not to the goodness of the legal constitution, but to the discreetness of members of the chamber." 'The explanation may not unreasonably be found in the impossibility of creating a second chamber with the same character which its history has imposed on the English House of Lords. Our two Houses are far from being of co-ordinate authority. In the last result, the will of the House of Commons must prevail.

A further exemplification of this view of the British constitution may be found in the fact that its highest executive council, the Cabinet, is not even known to the law.

Between England and some other constitutional countries a difference of much constitutional importance is to be found in the terms on which the component parts of the country were brought together. All great societies have been produced by the aggregation of small societies into larger and larger groups. In England the process of con- solidation was completed before the constitution settled down into its preseut form. In the United States, on the other hand, in Switzerland, and in Germany the constitu- tion

is in form an alliance among a number of independent states, each of which may have a constitution and laws of its own for local purposes. In federal governments it remains a question how far the independence of individual states has been sacrificed by submission to a constitution. In the United States constitutional progress is hampered by the necessity thus created of having every amend- ment ratified by the separate vote of three-fourths of the States. (E. R.)

CONSTITUTION OF BODIES. The question whether the smallest parts of which bodies are composed are-finite in number, or whether, on the other hand, bodies are infinitely divisible, relates to the ultimate constitution of bodies, and is treated of in the article ATOM.

The mode in which elementary substances combine to form compound substances is called the chemical constitu- tion of bodies, and is treated of in CHEMISTRY.

The mode in which sensible quantities of matter, whether elementary or compound, are aggregated together so as to form a mass having certain observed properties, 18 called the physical constitution of bodies. ;

Bodies may be classed in relation to their physical con- stitution by considering the eifects of internal stress changing their dimensions. When a body can exist In equilibrium under the action of a stress which is not uniform in all directions it is said to be solid. a

When a body is such that it cannot be in equilibrium unless the stress at every point is uniform in all directions, it is said to be fluid.

There are certain fluids, any portion of which, however small, is capable of expanding indefinitely, so as to fill any vessel, however large. These are called gases. There are

in fact, have exhibited the same spirit of adherence to precedent, coupled with a power of modifying precedent to suit circumstances, which distinguishes thejudici al tribunals. In a constitutional crisis the HIouse of Commons appoints a committee to " search its journals for precedents," just as the Court of Queen's Bench would examine the records of its own

decisions. And just as the law, while professing to remain the same, is in process of constant change, 80, too, the unwritten constitution is, without any acknowledg- ment of the fact, constantly taking up new ground.

In contrast with the mobility of an unwritten constitu- tion is the fixity of a constitution written out, like that of the United States or Switzerland, in one authoritative code. The constitution of the United States, drawn up by a Convention in 1789, is contained in a code of articles. It was ratified separately by each State, and thenceforward became the positive and exclusive statement of the con- stitution. The legislative powers of the legislature are not to extend to certain kinds of bills, eg., ex post facto bills ; the president has a veto which can only be overcome by a majority of two-thirds in both Houses; the constitution itself can only be changed in any particular by the consent of the legislatures or conventions of three-fourths of the several States; and finally the judges of the supreme court are to decide in all disputed cases whether an act of the legisla- ture is permitted by the constitution or not. This is truly a formidable apparatus of provisions against change, and, in fact, only fifteen constitutional amendments have been passed from 1789 to the present day. In the same period the unwritten constitution of England has made a most marked advance, chiefly in the direction of eliminat- ing the separate powers of the Crown, and diminishing those of the House of Lords. The Commons, through its nominees, the Ministry, has absorbed the entire power of the Crown, and it has more and more reduced the other House to a position of secondary importance. The American constitution of 1789 was a faithful copy, so far as it was possible to make one out of the materials in hand, of the contemporary constitu- tion of England, 'The position and powers of the president were a fair counterpart of the royal prerogative of that day ; the Senate and the Congress corresponded sufficiently well to the Honse of Lords and the House of Commons, allowing for the absence of the elements of hereditary rank and territorial influence. While the English constitution has changed much, the American constitution has changed little, if at all, in these respects. Allowing for the more democratic character of the constituencies, the organization of the supreme power in the United States is nearer the English type of the last century—is less modern, in fact —than is the English constitution of the present day.

~~One conspicuous feature of the English constitution, by which it is broadly distinguished from written or artificial constitutions, is the presence throughout its entire extent of legal fictions. The influence of the lawyers on the pro- gress of the constitution has already been noticed, and is nowhere more clearly shown than in this peculiarity of its structure. As in the common law, so in the constitutions, change has been effected in substance without any corres- ponding change in terminology. 'There is hardly one of the phrases used to describe the position of the Crown which can be understood in its literal sense, and many of them are currently accepted in more senses than one.~~

~~Notwithstanding the strongly marked historical character of our political institutions, the fallacy of regarding them as elakorate contrivances devised to effect the end of good government has always more or less prevailed. It finds expression in what is called the theory of checks and balances—the theory that power is so distributed among the different elements of the state that each acts as a check on~~

~~CONSTIFTUTEON OF BODIES~~

~~other fluids, a small portion of which, when placed in a large vessel, does not at once expand so as to fill the vessel uniformly, but remains in a collected mass at the bottom, even when the pressure is removed. These fluids are called liquids.~~

~~When a liquid is placed in a vessel so large that it only occupies a part of it, part of the liquid begins to evaporate, or in other words it passes into the state of a gas, and this process goes on either till the whole of the liquid is evapor- ated, or till the density of the gaseous part of the substance has reached a certain limit. The liquid and the gaseous portions of the substance are then in equilibrium. If the volume of the vessel be now made smaller, part of the gas will be condensed as a liquid, and if it be made larger, part of the liquid will be evaporated as a gas,~~

~~The processes of evaporation and condensation, by which the substance passes from the liquid to the gaseous, and from the gaseous to the liquid state, are discontinuous processes, that is to say, the properties of the substance are very different just before and just after the change has been~~

effected. But this difference is less in all respects the higher the temperature at which the change takes place, and Cagniard de la Tour in 1822! first showed that several substances, such as ether, alcohol, bisulphide of carbon, and water, wien heated to a temperature sufficiently high, pass into a state which differs from the ordinary gaseous state as much as from the liquid state. Dr Andrews has since' made a complete investigation of the properties of carbonic acid both below and above the temperature at which the phenomena of condensation and evaporation cease to take place, and has thus explored as well as established the continuity of the liquid and gaseous states of matter.

For carbonic acid at a temperature, say of 0° C., and at the ordinary pressure of the atmosphere, is a gas. If tho gas be compressed till the pressure rises to about 40 atmo- spheres, condensation takes place, that is to say, the sub- stance passes in successive portions from the gaseous to the liquid condition,

If we examine the substance when part of it is condensed,

we find that the liquid carbonic acid at the bottom of the vessel has all the properties of a liquid, and is separated by a distinct surface from the gaseous carbonic acid which occupies the upper part of the vessel. But we may transform gaseous carbonic acid at 0° C. into liquid carbonic acid at 0° C. without any abrupt change, by first raising the temperature of the gas above 30°.92 C. which is the critical temperature, then raising the pressure to about 80 atmospheres, and then cooling the substance, still at high pressure, to zero.

During the whole of this process the substance remains perfectly homogeneous. There is no surface of separation between two forms of the substance, nor can any sudden change be observed like that which takes place when the 848 18 condensed into a liquid at low temperatures ; but at the end of the process the substance is undoubtedly in the liquid state, for if we now diminish the pressure to some- what less than 40 atmospheres the substance will exhibit the ordinary distinction between the liquid and the gaseous state, that is to say, part of it will evaporate, leaving the rest at the bottom of the vessel, with a distinct surface of ee between the gaseous and the liquid parts. wee of a substance between the liquid and the Song ; takes

~~place with various degrees of abruptness. meal oe such as some of the ‘more crystalline sola o-pass from a completely fluid to a completely~~

~~State very suddenly. In some cases the melted matter ee l—‘“‘COCSCSCSC 1 Annales de Chimie, 2me série, xxi et xxii.~~

- ~~Phil. Trans. 1869, p. 575.~~

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~~appears to become thicker before it solidifies, but this may arise from a multitude of solid crystals being formed in the still liquid mass, so that the consistency of the mass becomes like that of a mixture of sand and water, till the melted matter in which the crystals are swimming becomes all solid.~~

~~There are other substances, most of them colloidal, such that when the melted substance cools it becomes more and more viscous, passing into the solid state with hardly any discontinuity. This is the case with pitch.~~

~~The theory of the consistency of solid bodies will be discussed in the article Exasticrry, but the manner in which a solid behaves when acted on by stress furnishes us with a system of names of different degrees and kinds of solidity.~~

~~A fluid, as we have seen, can support a stress only when it is uniform in all directions, that is to say, when it is of the nature of a hydrostatic pressure.~~

~~There are a great many substances which so far corre- spond to this definition of a fluid that they cannot remain in permanent equilibrium if the stress within them is not uniform in all directions.~~

~~In all existing fluids, however, when their motion is such that the shape of any small portion is continually changing, the internal stress is not uniform in all directions, but is of such a kind as to tend to check the relative motion of the parts of the fluid,~~

~~This capacity of having inequality of stress called into play by inequality of motion is called viscosity. All real fluids are viscous, from treacle and tar to~~

~~water and ether and air and hydrogen,~~

~~When the viscosity is very small the fluid is said to be mobile, like water and ether,~~

~~When the viscosity is so great that a considerable inequality of stress, though it produces a continuously increasing displacement, produces it so slowly that we can hardly see it, we are often inclined to call the substance a solid, and even a hard solid. Thus the viscosity of cold pitch or of asphalt is so great that the substance will break rather than yield to any sudden blow, and yet if it is Jeft for a sufficient time it will be found unable to remain in equilibrium under the slight inequality of stress produced by its own weight, but will flow like a fluid till its surface becomes level.~~

~~If, therefore, we define a fluid as a substance which cannot remain in permanent equilibrium under a stress not equal in all directions, we must call these substances fluids, though they are so viscous that we can walk on them without leaving any footprints.~~

~~If a body, after having its form altered by the applica- tion of stress, tends to recover its original form when the stress is removed, the body is said to be elastic.~~

~~The ratio of the numerical value of the stress to the numerical value of the strain produced by it is called the coefficient of elasticity, and the ratio of the strain to the stress is called the coefficient of pliability.~~

~~There are as many kinds of these coefficients as there are kinds of stress and of strains or components of strains produced by them.~~

~~If, then, the values of the coefficients of elasticity were to increase without limit, the body would approximate to the condition of a rigid body.~~

~~We may form an elastic body of great pliability by dissolving gelatine or isinglass in hot water aud allowing the solution to cool into a jelly. By diminishing the proportion of gelatine the coefficient of elasticity of the jelly may be diminished, so that a very small force is required to produce a large change of form in the substance.~~

~~*When the deformation of an elastic body is pushed beyond certain limits depending on the nature of the sub-*~~

~~*the phenomena has been proposed by Dr L. Boltzmann (Wiener Sttzungsberichte, 8th October 1874).*~~

~~*The German writers refer to the phenomena by the name of "elastische Nachwirkung," which might be translated « elastic reaction" if the word reaction were not already used in a different sense. Sir W. Thomson speaks of the viscosity of elastic bodies.*~~

~~*The phenomena are most easily observed by twisting a fine wire suspended from a fixed support, and having a small mirror suspended from the lower end, the position of which can be observed in the usual way by means of a telescope and scale, If the lower end of the wire is turned round through an angle not too great, and then left to itself, the mirror makes oscillations, the extent of which may be read off on the scale. These oscillations decay much more rapidly than if the only retarding force were the resistance of the air, showing that the force of torsion in the wire must be greater when the twist is increasing than when it is diminishing. This is the phenomenon described by Sir W. Thomson under the name of the viscosity of elastic solids. But we may also ascertain the middle point of these oscillations, or the point of temporary equilibrium when the oscillations have subsided, and trace the variations of its position.*~~

~~*If we begin by keeping the wire twisted, say for a minute or an hour, and then leave it to itself, we find that the point of temporary equilibrium is displaced in the direction of twisting, and that this displacement is greater the longer the wire has been kept twisted. But this dis- placement of the point of equilibrium is not of the nature of a permanent set, for the wire, if left to itself, creeps back towards its original position, but always slower and slower. This slow motion has been observed by the writer going on for more than a week, and he also found that if the wire was set in vibration the motion of the point of equilibrium was more rapid than when the wire was not in vibration.*~~

~~We may produce a very complicated series of motions of the lower end of the wire by previously subjecting the wire to a series of twists. or instance, we may first twist it in the positive direction, and keep it twisted for a day, then in the negative direction for an hour, and then in the~~

~~ositive direction for a minute. When the wire is left to itself the displacement, at first positive, becomes negative in a few seconds, and this negative displacement increases for some time. It then diminishes, and the displacement becomes positive, and lasts a longer time, till it too finally dies away.~~

~~The phenomena are in some respects analogous to the variations of the surface temperature of a very large ball of iron which has been heated in a furnace for @ day, then placed in melting 'ce for an hour, then in boiling water for a minute, aud then exposed to the air; but a still more perfect analogy may be found in the variations of potential of a Leyden jar which has been charged positively fora day, negatively for an hour, and positively again for a minute.'~~

~~The effects of successive magnetization on iron and steel are also in many respects analogous to those of strain and electrification." :)~~

~~The method proposed by Boltzmann for representing such phenomena mathematically 1s to express the actual stress, Lip, in terms not only of the actual strain, Oy, but 0 the strains to which the body has been subjected during all previous time.~~

~~His equation is of the form~~

~~L=KO.—f W(w)be- wide~~

~~1 See Dr Hopkinson, " On the Residual Charge of the Leyden Jar; Proc. Re S., eave 498; March 30, 1876. 2 See Wiedemann's Galvanismus, vol. ii, p. 567.~~

~~stance, it is found that when the stress is removed it does not return exactly to its original shape, but remains per- manently deformed. These limits of the different kinds of strain are called the limits of perfect elasticity.~~

~~There are other limits which may be called the limits of cohesion or of tenacity, such that when the deformation of the body reaches these limits the body breaks, tears asunder, or otherwise gives way, and the continuity of its substance is destroyed.~~

~~A body which can have its form permanently changed without any flaw or break taking place is called mld. When the force required is small the body is said to be soft ; when it is great the body is said to be tough. A body which becomes flawed or broken before it can be permanently deformed is called brittle. When the force required is great the body is said to be hard. .~~

~~The stiffness of a body is measured by the force required to produce a given amount of deformation.~~

~~Its strength is measured by the force required to break or crush it.~~

~~We may conceive a solid body to approximate to the condition of a fluid in several different ways.~~

~~If we knead fine clay with water, the more water we add the softer does the mixture become till at last we have water with particles of clay slowly subsiding through it. This is an instance of a mechanical mixture the constituents of which separate of themselves. But if we mix bees- wax with oil, or rosin with turpentine, we may form per- manent mixtures of all degrees of softness, aud so pass fron the solid to the fluid state through all degrees of viscosity.~~

~~We may also begin with an elastic and somewhat brittle substance like gelatine, and add more and more water till we form a very weak. jelly which opposes a very feeble resistance to the motion of a solid body, such as a spoon, through it. But even such a weak jelly may not be a true fluid, for it may be able to withstand a very small force, such as the weight of a small mote. If a small mote or seed is enclosed in the jelly, and if its specific gravity is different from that of the jelly, it will tend to rise to the top or sink to the bottom. Tf it does not do so we con- clude that the jelly is not a fluid but a solid body, very weak, indeed, but able to sustain the force with which the mote tends to move.~~

~~It appears, therefore, that the passage from the solid to the fluid state may be conceived to take place by the diminution without limit either of the coefficient of rigidity, or of the ultimate strength against rupture, as well as by the diminution of the viscosity. But whereas the body is not a true fluid till the ultimate strength, or the coefficient of rigidity, are reduced to zero, it is not a true solid as long as the viscosity is not infinite.~~

~~Solids, however, which are not viscous in the sense of being capable of an unlimited amount of change of form, are yet subject to alterations depending on the time during which stress has acted on them. In other words, the stress at any given instant depends, not only on the strain at that instant, but on the previous history of the body. Thus the stress is somewhat greater when the strain is increasing than wken it is diminishing, and if the strain is continued for a long time, the body, when left to itself, does not at once return to its original shape, but appears to have taken a set, which, however, is not a permanent set, for the body slowly creeps back towards its original shape with a motion~~

~~which may be observed to go on for hours and even weeks after the body is left to itself.~~

~~Phenomena of this kind were pointed out by Weber and Kohlrausch (Pogg. Ann. Bd. 54, 119 and 128), and have been described by O. E. Meyer (Pogg. Ann. Bd. 131, 108), and by Maxwell (Paw, Trans. 1886, p. 249), and a theory of~~

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~~where w is the interval of time reckoned backwards from the actual time ¢ to the time t—a, when the strain 6, _,, existed, and y(w) is some function of that interval.~~

~~We may describe this method of deducing the actual state from the previous states as the historical method, be- cause it involves a knowledge of the previous history of the body. But this method may be transformed into another, in which the present state is not regarded as in- fluenced by any state which has ceased to exist. For if we expand 6;-,) by Taylor's theorem,~~

dO @? 76

b:-w= Ow ie

ae lo de ke,

and if we also write Ke D 7.2 haf Yoylo , Baf waldo , C=f iP5 YWulde, &c.,

θ

then equation (1) becomes

Le(KAjo+B 9 -c ts where no symbols of time are subscribed, because all the quantities refer to the present time.

This expression of Boltzmann's, however, is not in any sense a physical theory of the phenomena; it is merely a mathematical formula which, though it represents some of the observed phenomena, fails to express the phenomenon of permanent deformation. Now we know tliat several substances, such as gutta-percha, India-rubber, &c., may be permanently stretched when cold, and yet when afterwards heated to a certain temperature they recover their original form. Gelatine also may be dried when in a state of strain, and may recover its form by absorbing water.

We know that the molecules of all bodies are in motion. In gases and liquids the motion is such that there is nothing to prevent any molecule from passing from any part of the mass to any other part; but in solids we must suppose that some, at least, of the molecules merely oscillate about a certain mean position, so that, if we consider a certain group of molecules, its configuration is never very different from a certain stable configuration, about which it oscillates,

This will be the case even when the solid is in a state of strain, provided the amplitude of the oscillations does not exceed acertain limit, but if it exceeds this limit the group does not tend to return to its former configuration, but begins to oscillate about a new configuration of stability, the strain in which is either zero, or at least less than in the original configuration.

The condition of this breaking up of a configuration must depend partly on the amplitude of the oscillations, and partly on the amount of strain in the ori ginal configura- tion; and we may suppose that different groups of molecules, even in a homogencous solid, are not in similar circumstances in this respect.

Thus we may suppose that in a certain number of groups the ordinary agitation of the molecules is liable to accumulate so much that every now and then the con- figuration of one of the groups breaks up, and this whether 1 Is in a state of strain or not. We inay in this case assume that in every second a certain proportion of these groups break up, and assume configurations corresponding to a strain uniform in all directions.

Tfall the groups were of this kind, the medium woula be a viscous fluid. onan May suppose that there are other groups, the i ae a 'Moana 1s so stable that they will not break neni ie ag agitation of the molecules unless the

' dt scant a S a certain limit, and this limit may

Noms? aa luerent systems of these groups. choot nee ch groups of greater stability are disseminated

$i the substance in such abundance as to build up a

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solid framework, the substance will be a solid, which will not be permanently deformed except by a stress greater than a certain given stress.

But if the solid also contains groups of smaller stability and also groups of the first kind which break up of them- selves, then when a strain is applied the uesistance to it will gradually diminish as the groups of the first kind break up, and this will go on till the stress is reduced to that due to the more permanent groups. If the body is now left to itself, it will not at once return

~~*to its original form, but will only do so when the groups of the first kind have broken up so often as to get back to their original state of strain,*~~

~~*This view of the constitution of a solid, as consisting of groups of molecules some of which are in different circum- stances from others, also helps to explain the state of the solid after a permanent deformation has been given to it. In this case some of the less stable groups have broken up and assumed new configurations, but it is quite possible that others, more stable, may still retain their original configurations, so that the form of the body is determined by the equilibrium between these two sets of groups; but if, on account of rise of temperature, increase of moisture, violent vibration, or any other cause, the breaking up of the less stable groups is facilitated, the more stable groups nay again assert their sway, and tend to restore the body to the shape it had before its deformation. (J.C: Mf.)*~~

~~*CONSUEGRA, a town of Spain, on the Amarguilla, in the province of Toledo, and 36 miles south-east of the city of that name. It contains about 7000 inhabitants, princi- pally engaged in the manufacture of coarse woollens.. Roman inscriptions and other remains bear witness to the antiquity of the town, which was formerly knownas Consabrum; and on a neighbouring hill are the ruins of its ancient castle.*~~

~~*CONSUL (draros), the highest magistrate of the republic of ancient Rome. It is probable that the word is compounded of con and salto, so that consules signifies those who go together. They were in early times called pretores, imperatores, or judices.*~~

~~*From the abuse of the power which had been vested in the kings, the Romans were induced not only to expel the hated Tarquins from the city, but even to abolish the monarchical form of government altogether. Brutus and his companions, after the rape of Lucretia, made the people swear that no king should ever again reign at Rome: The state was henceforth ruled by two supreme magistrates called consuls. The consular office was instituted after the expulsion of the kings, 510 B.c., and continued, with few interruptions, till the establishment of the empire—a period of nearly 560 years. The leaders of the revolution which had expelled the kings were first raised to this rank. All the royal insignia were preserved except the crown. Twelve lictors preceded thei alternately. The elder of the two, or he who had*~~

most children, or who had been first elected, had the fasces first, the other meanwhile being preceded by a public officer called accensus, and followed by the lictors. Sometimes they agreed to enjoy the fasces on alternate days, but generally for alternate months. By the law of Poplicola, the axe was taken from them and their fasces were lowered when they entered the assemblies of the people. Acloak with a scarlet border, and an ivory staff, were badges of their office. On public occasions they used a seat of ornamented ivory called the curule chair.

From the great power which their order originally possessed in the state, the patricians succeeded for a long time in retaining the' consulship among themselves. It was not till the year 445 u.c. that the plebeians acquired sufficient courage and strength to make any attempts to acquire the right of being elected to this office. Having once begun the struggle, however, they ae a it for 'I. — 40

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the space of eighty years with a spirit and resolution which made even a foreign war desirable as a relief from internal contests. Livy relates that for five years (375-371 B.C.) the opposition raised by the plebeiaus, under the guidance of the tribunes L. Licinius Stolo and L. Sextius, was so formidable that neither consuls nor any other magis- trates could be appointed, and there was what he calls a solitudo magistratwuum. At length the patricians, after attempting an evasion by the appointment of five military tribunes, were compelled to accede to the Liciman law, by which it was ordained (367 p.c.) that in all time coming one of the consuls should be a plebeian. L. Sextius was the first plebeian consul. But the power which was effec- tual in the passing of the law was not equal to its enforcement, for in 355 B.C. both consuls were patricians ; and, as was often the case with Roman laws, it was found necessary to re-enact it. This time, however, the demands of the plebeians increased ; and not satisfied with having one consul, they tried to add a clause ordaining it to be lawful for the people to elect both consuls from their own number. Although the attempt was successful, no exaniple of the appointment of two plebeian consuls occurs till the year 215 B.C. The honour seems for the most part to have been equally divided between the

two orders. The first foreigner who obtained the consulship was Cornelius Balbus, a native of Cadiz, and a man of extraordinary wealth.

The legal age for enjoying the consulship was forty-five ; but this regulation was not strictly observed. Pompey was made consul in his thirty-sixth year, M. Valerius Corvus in his twenty-third, 'T. Quinctius Flaminius was created consul before he was thirty, Scipio Africanus the Elder at twenty-eight, and the Younger at thirty-eight. It was necessary for candidates to have discharged the inferior duties of questor, edile, and pretor before they were eligible ; and a regulation was made that they should be present at the election in a private capacity. It was also enacted that no one should be made consul a second time till after the lapse of ten years. But we find cases in which all these conditions were disregarded. Some were elected who had not previously borne any curtile magistracy ; and others were appointed in their absence. Some con- tinued in office more than a year, as Marius, who was seven times consul without intermission ; and others were elected before the allotted time had elapsed.

The election of consuls was made by the cometia centuriatu in the Campus Martius. The assembly at which they were elected was always convoked and presided over by a consul, dictator, or interrex. It generally took place in the month of July, that an opportunity might be afforded for investigating the conduct of the successful candidates before they entered on their office, and that they might have time to become conversant with their duties. From their appointment to the day of their in- duction they were called consules designati, or consuls elect, and had the privilege of being first asked their opinion in the senate. The day upon which they assumed office was repeatedly changed. It seems originally to have been the Ides of September, when, in the rude days of Roman history, the consuls used annually to fix a nail in the temple of Jupiter Capitolinus to mark the year; but as it sometimes happened, when one died before the term of his office had expired, that another was immediately chosen to fill his * place, the year of his successor was naturally finished before the usual time, and this necessitated a repeated change in the days of their appointment and induction. Sometimes, too, civil commotions prevented the election taking place at the usual time. As the consul whose year was completed could not

~~in such cases discharge any of the consular duties, it was customary for the senate to nominate a temporary magistrate called interrex. HIs authority~~

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~~being limited to five days, a succession of interreges had frequently to be chosen before tranquillity was restored. At length (154 3.c.) ordinary magistrates, with the exception of the tribunes of the people, should begin their duties on the 1st of January, That day was marked by peculiar solemnities. At day- break the consuls arose and consulted the auspices. wards. the senate and people waited upon them at their houses, and then, with the new state robes at their head, they all marched in solemn procession to the capitol. prayers presented for the safety and prosperity of the Roman people. a meeting of the senate was held, and the new consuls first exercised their functions by consulting it about the per- formance of religious ceremonies. their induction they were obliged to swear, as they had done at their election, that they would strictly observe the laws ; and at the close of their consulship they were required to take a similar oath declaring that they had done nothing contrary to the constitution.~~

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~~similar to that of the kings; but in process of time several distinctions arose which combined to render the consular authority inferior to the regal, which had been discharged by the kings, was in the time of the consulship executed by a special magistrate, called rex sacrorum, or rex sacrificulus. was afterwards denied to the consuls, and the symbolic axe removed from the fasces. there were two consuls.~~

~~it was enacted that consuls and all the~~

~~After- magistrates clad in their There victims were offered, and~~

~~After the conclusion of the religious rites~~

~~Within five days after~~

~~The power of the consuls appears at first to lave been~~

~~*The office of high priest,*~~

~~*The power of life and death*~~

~~*While there was only one king, The obvious design of the Romans in dividing the consulship was that their power might be weakened, and the safety of the people made more secure by the resistance which the ambitious designs of the one would receive from the other. For the same reason they elected them annually, and thus prevented that insolence of authority which the long continuation of it is apt to produce. They were restrained from illegal measures still further by fear of punishment when their term of office had expired ; for the people had reserved to themselves the right of bringing them to trial for misconduct. 'The Valerian law weakened their authority by decreeing that no magistrate should scourge or put to death a Roman citizen who appealed to the people. Even the decision of one consul could be repealed by the other. But it was the creation of the tribunes of the people that especially cou- tributed to limit their prerogatives, and strengthen the cause of liberty. And as additional magistracies were instituted, many of their old privileges were taken from them. Their judicial power was transferred to the pretors, and their censorial to the censors, while other duties originally discharged by them devolved upon eediles and other new magistrates.*~~

~~*But notwithstanding these limitations, the power of the consuls was at all times very great. As civil magistrates they were at the head of the government, and all others, with the exception of the tribunes of the people, were sub: ject to them. They assembled and presided over the senate and comitia centuriata ; they introduced subjects of deliberation, proposed Jaws, and executed the decrees ° both senate and people. The laws proposed by them generally received their name. The year was called after them. They gave audience to embassies, and communicate with other states. Before the establishment of the praetor ship and censorship, they discharged the highest judicial functions, and superintended the assessment of the citizens They had the right of summoning and enforcing th? presence of any one they pleased. Every person was bouD to turn out of the way, dismount, rise up, Uncover the head, or show some similar token of respect, on passing them.*~~

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~~The consul Acilius ordered the curule chair of the pretor Lucullus to be broken in pieces for a breach of this regula- tion. As military commanders they had absolute authority. They had the power of lite and death over the lives of their soldiers ; and accordingly they had axes in their fascces when in the field, When any great danger threatened the state the consuls were invested by the senate with extra- ordinary powers, which made them supreme in the city as well as out of it, Accordingly, in the early days of the republic, when the patricians were in sole possession of the consulship, and wished to subdue any outbreak of the plebeians, they feigned that some powerful cnemy was marching against the city, and thus succeeded in obtaining extraordinary powers for the consuls.~~

~~After the consuls had resigned their office, they were commissioned by the senate to assume the government of provinces under the title of proconsuls. It was the prerogative of the senate to determine the provinces for the consuls, although it was left to themselves to decide by lot or agreement which of them each should receive. When the time arrived for a proconsul to set out for his province, he was furnished by the senate with the troops appointed for him, and everything requisite for his command. Surrounded by a train of friends, and a numerous personal staff, he marched out of the city with great pomp. He was bound to travel direct to his province ; and the towns through which he passed had to supply him with necessaries for his journey. Within his province he had the command of the troops, and could employ them as he pleased. He was supreme judge both in criminal and in civil causes, and could inflict the punishment of death—except on Roman citizens, who could appeal to Rome. Justice was generally administered at circuit courts, held oncea year in the principal towns. The proconsulship continued likewise for one year only, but it was often prolonged by a decree of the senate.~~

~~Under the empire the consuls were superseded by the emperors. 'The title, indeed, remained, and all the cere- monies were performed with exactness, and perhaps even with more magnificence than formerly. It would seem as if they attempted to conceal the loss of real power by the trappings of external pomp. 'The day of their induction was even more than ever a day of note in~~

~~the city. Sitting on curule chairs, which were placed on lofty chariots, arrayed in rich dresses in imitation of those which used to be worn by generals in a triumph, with shoes of cloth of gold upon their feet and sceptres in their hands, they passed through the city, scattering money among the crowd, and bestowing gifts upon their friends. Their first duty, however, no longer consisted in consulting the senate about the religious duties of the state, but in formally returning thanks to the emperor for their election. Tho emperors had arrogated the right of assuming the consul- ship to themselves, or disposing of it as they thought proper, Julius Caesar was dictator and consul at the samo time. Augustus made himself consul thirteen times during his reign. Vespasian proclaimed himself perpetual consul.~~

~~And in bestowing it upon others, the emperors were not content with having one pair of consuls for one year. Desirous to conciliate as many of their friends as possible, they greatly shortened the duration of the office. It was held generally for two months, which allowed twelve con- suls during one year, But sometimes it lasted only a few weeks, a few days, or even a few hours, according to the Pleasnre of the emperor. There happened to be twenty-five consuls in the year 189 a.D. But those who entered upon their office on the Ist of J anuary were held in greater respect, and gave their names to the year. They were ie — in the time of the republic, consules ordinarit ; ee ose who were raised to the office at other times ermed consules suffecti, or consules minores,~~

~~BU GL 315~~

~~While the republic lasted, the time that elapsed between the election and ordination of consuls was short, generally from July to January. In the time of the emperors, ordination was sometimes deferred several years. The triumvirs in 39 B.c, nominated consuls for eight succeed- ing years. In this way the title of designatus was frequently enjoyed long before the actual consulship. Caius, the grandson of Augustus, was consul designatus for five years, Nero was fourteen years old when he was nominated consul designatus, and twenty when he became consul.~~

~~Besides these different kinds of consuls, all of which existed in the republic, we find another class peculiar to the later days of the empire—honorary~~

~~consuls. These enjoyed the titles and badges of consuls, but nothing more. They possessed their honours, though altogether free from their duties. All the consuls, in truth, during the period of which we speak, may with propriety be termed honorary, for the substance of their power had been taken from them. They had become the mere slaves of the emperors, although they still continued the formal discharge of their functions. Nevertheless, even in this degraded condition, the consul- ship was always regarded with veneration, and considered the highest dignity to which a Roman citizen could aspire,~~

~~CONSUL, a public officer authorized by the state whose commission he bears to manage the commercial affairs of its subjects in a foreign country, and formally permitted by the Government of the country wherein he resides to perform the duties which are specified in his commission, or lettre de provision. A consul, as such, is not invested with any diplomatic character, and he cannot enter on his official duties until a rescript, termed an exeequatur (sometimes a mere countersign endorsed on the commission) has been delivered to him by the authorities of the state to which his nomination has been communicated by his own Government. This exequatur, called in Turkey a barat, may be revoked at any time at the discretion of the Government where he resides. The status of consuls commissioned by the Christian powers of Europe to reside in the Levant, and to exercise judicial functions in civil and criminal matters between their own countrymen and strangers, is exceptional to the common law, and is founded on special conventions or capitulations with the Ottoman Porte. The English consuls in the Levant were originally the officers of " the governor and company of merchants of England trading in the Levant seas," created by letters patent from James I., which were cancelled in 1826. Besides the pure consular jurisdiction—exercised under the Order in Council 30th November 1864, by a judge in the Supreme Consular Court at Constantinople, and by the ordinary consuls in provincial courts, subject to an appeal to Her Majesty's Imperial Court of Appeal, in cases beyond £500 in value—there is also the jurisdiction of the consular court of the defender's nation, where the parties are both foreign Christians, and a Turkish tribunal for cases between Turks and foreign Christians. The tendency now is to substitute mixed tribunals in both these cases. The right of British consuls to be present in the native courts, when one of the parties~~

~~is a British subject, was conceded by the Treaty of Dardanelles (1809). [tis not unusual in the case of consuls-general resident in Mahometan countries that they should also be accredited as political agents, or chargés @affaires, in which case they are invested with the diplomatic character, and are entitled to the privileges of public ministers.~~

~~The present system of consuls d'outre mer, or & Pétranger, was preceded by the system of domestic consuls, juges consuls, or marchands, in the chief maritime cities of the south of Europe. These constituted mere tribunals of commerce which had no special concern with foreign~~

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~~shipping or trade. Later on, the need was felt of a safe place of deposit and of an independent jurisdiction. Particular quarters of mercantile cities were assigned to foreign traders, and disputes were decided by officers variously called governors, protectors, ancients, alder- men (in the Hause towns), syndics, jurats, prévosts, capitouls, and échevins — all names borrowed from muull- cipal offices. The consul was generally a wholesale dealer, named by the rector and council of the home city. He had power to fine and banish from the quarter. Similar to these were the judge-conservators, elected by British residents in the Portuguese ports. This privilege long cemented the friendly relations of the two nations, and was formally renounced only in 1842, Another singular institution, containing more than the germ of the modern consulate, was " the Cour de la SLonde, whose jurisdiction had supplanted the old Court of the Reis or Baillis (established by Godfrey de Bouillon at Jerusalem for the benefit of Syrian merchants), and which included a cognizance of all commercial matters, its judges being a mixed body of Franks and Syrians" (Kent's Commentarves, by Abdy, p. 137). The 16th century saw the introduction of foreign consuls, but the earliest treaties of Great Britain with Spain and Turkey oa this subject are dated in 1665 and 1675. The right to establish consuls is now universally recognized by Christian civilized states. Jurists at one time contended that according to international law a right of "extra-territoriality" attached to consuls, their persons and dwellings being sacred, and themselves amenable to local authority only in cases of strong suspicion on political grounds, It is now admitted that, apart from treaty,~~

~~cus- fom has established very few consular privileges ; that perhaps consuls may be arrested and incarcerated, not merely on criminal charges, but for civil debt ; and that, if they engage in trade or become the owners of immovable property, their persons certainly lose protection. This question of arrest has been frequently raised in Europe:— 'n the casé of Barbuit, a tallow-chandler, who from 1717 to 1735 acted as Prussian consul in London, and to whom the exemption conferred by statute on ambassadors was held not to apply ; in the case of Cretico, the Turkish consul at London in 1808; in the case of Begley, the United States consul at Genoa, arrested in Paris in 1840 ; and in the case of De la Fuente Hermosa, Uruguayan con- sul, whom the Cour Loyale of Paris in 1842 held liable to arrest for debt. In the same way consuls, unless pro- tected by treaty, pay local taxes, although they are generally exempt from general duties on articles of personal consump- tion, relief from income tax being often given by treaty. They are exempt from billeting and military service, but are not entitled (except in the Levant, where also freedom from arrest and trial is the rule) to have private chapels in their houses. The exception in favour of the Levant was illustrated in 1853, when the refugee Martin Koszta, who had become United States consul at Smyrna and chargé affaires at Constantinople, was seized by the Turks. This, although a case of suspicion on political grounds, called forth a protest from America, and restitution was made. 'The right of consuls to exhibit their national arms and flag over the door of the bureau is not disputed.~~

~~The duty of consuls, under the " General Instructions to British Consuls," is to advise Her Majesty's trading subjects, to quiet their differences, and to conciliate as much as possible the subjects of the two countries. Treaty rights he is to support in a mild and moderate spirit ; and he is to check as far as possible evasions by British traders of the local revenue Jaws. Besides assisting British subjects who are tried for offences in the local courts, and ascertaining the humanity of their treatment after sentence, he has to consider whether home or foreign law is more~~

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appropriate to the case, having regard to the convenience of witnesses and the time required for decision ; and, where local courts have wrongfully interfered, he puts the HIome Government in motion through the consul-general or ambassador. import trade of the district in which he resides; and he reports to the secretary of state when a vice-consul ig required

merchant. by the Consular Marriage Act, 1868, consuls are empowered, .

HIe sends in reports on the export and

in any place, generally naming an English Under the Act 12 and 13 Vict. c. 68, extended

on certain notices and declarations being given, to celebrate marriage between persons who have resided one month in the district, one of them being a British subject. They are also empowered by statute to advance for the erection or maintenance of Anglican churches, hospitals, and places of interment sums equal to the amount subscribed for the purpose by the resident British subjects.

As the powers and duties of consuls vary with the parti- cular commercial interests they have to protect, and the civilization of the state in whose territory they reside, instead of abstract definition, we summarize the provisions on this subject of the British Merchant Shipping Acts, Consuls are bound to send to the Board of Trade such reports or returns on aby matter reJating to British merchant shipping or seamen as they may think necessary. Where a consul suspects that the shipping or navigation laws are being evaded, he may require the owner or master to produce the log-book or other ship documents (such as the agreement with the seamen, the account of the crew, the certificate of registration) ; he may muster the crew, and order explanations with regard to the documents. Where an offence has been committed on the high seas, or abroad ashore, by British seamen or apprentices, the consul makes inquiry on oath, and may send home the offender and witnesses by a British slip, particulars for the Board of Trade being endorsed on the agreement for conveyance. HIe is also empowered to detain a foreign ship, the master or seamen of which appear to him through their misconduct or want of skill to have caused injury to a British vessel, until the necessary application for satisfaction or security be

made to the local authorities. Every British mercantile ship, not carrying passengers, on entering a port gives into the custody of the consul to be endorsed by him the seamen's agreement, the indentures, é&c.; a failure to do this is reported to the registrar-general of seamen. The following five provisions are also made for the protection of seamen. If a British master engage seamen ata foreign port, the engagement is sanctioned by the consul, acting as a Superintendent of Mercantile Marine Offices. The consul collects the property (including arrears of wages) of British seamen or apprentices dying abroad, and remits to H.M. paymaster-general. He also provides for the subsistence of seamen who are shipwrecked, discharged, or left behind, evel if their service was with foreign merchants; they are generally sent home in the first British ship that happens to be in want of a complement, and the expenses thus incurred form a charge on the Parliamentary fund for tho relief of distressed seamen, tle consul receiving a comms: sion of 24 per cent. on the amount disbursed. Complaints by crews as to the quality and quantity of the provisions on board are investigated by the cousul, who enters 4 statement in the log-book and reports to the Board of Trade. Money disbursed by consuls on account of the illness or injury of seamen. is generally recoverable from the owner. With regard to passenger vessels, the master is bound to give the consul facilities for inspection and for communication with passengers, and to exhibit his "master's

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1 See also instructions to Consuls prepared by the Board of Trade and approved by the Secretary of State for Foreign Affairs, 1855, and Supplementary Instructions, 1868,

list," or list of passengers, so that the consul may transmit to the registrar-general, for insertion in the Marine Register Book, a report of the passengers dying and children born during the voyage. — The consul may even defray the expenses of maintaining, and forwarding to their destination, passengers taken off or picked up from wrecked or injured vessels, if the master does not undertake to proceed in six weeks; these expenses becoming, in terms of the Passenger Acts 1855 and 1863, a debt due to Her

Majesty from the owner or charterer. Where a salvor is justified in detaining a British vessel, the master may obtain leave to depart by going with the salvor before the consul, who after hearing evidence as to the service rendered and the proportion of ship's valne and freight claimed, fixes the amount for which the master is to give bond and security. In the case of a foreign wreck the consul is held to be the agent of the foreign owner. Much of the notarial business which is imposed on consuls, partly by statute and partly by the request of private parties, consists in taking the declarations as to registry, transfers, &c., mentioned in Schedules B, C, F, G, H, L of the Mercantile Shipping Act. .Under commercial treaties with China, British consuls in the free ports of Canton, Amoy, I'oo-chow-fuo, Ningpo, and Shanghae have extensive judicial and execu- tive powers. The same observation applies to Japan. (See Order in Conncil of 9th March 1865 and relative rules.)

The position of United States consuls is minutely described in the Regulations, Washington, 1870. Under various treaties and conventions they enjoy large privileges and jurisdiction. By a treaty with Sweden in 1818 the United States Government agreed that the consuls of the two states respectively should be sole judges in disputes between captains and crews of vessels. By convention with France in 1857 they likewise agreed that the consuls of both countries should be permitted to hold real estate, and to have the "police interne des navires 4 commerce." In Kastern Asia an exclusive jurisdiction, civil and criminal, is always stipnlated in cases where United States subjects are interested. Exemption from liability to appear as a Witness is often stipulated. The question was raised in France in 1843 by the case of the Spanish consul Soller at Aix, and in Americain 1854 by the case of Dillon, the French consul at San Francisco, who, on being arrested by Judge Hoffmann for declining to give evidence in acriminal suit, pulled down his consular flag. So, also, inviolability of national archives is often stipulated. The archives of a French consul in London were once seized by a collector of local taxes and sold by auction, and in 1858 the flag, seal, arms, and record-book of the United States consulate at Manchester were levied on for a'private debt of the consul. To the consuls of other nations the United States Govern- ment have always accorded the privileges of arresting deserters, and of being themselves

amenable only to the Federal and not to the States courts, They also recognize foreign consuls as representative suitors for absent foreigners,

The United States commercial agents, although appointed by the president, receive no exceqnatur. They form a class by themselves, and are distinct from the cousular See who are simply deputy consuls in districts where

ore 18 no principal consul. France is distinguished far nations for au organization of trained consuls who

€ intimate relations with the diplomatic corps. 1 aa He ES tsied des Consuls, London and Berlin, 1837— fines a ier oie ee Consulaires des principaux cats mart diplomate ot du el. Ti ein 1851, and Dictionnaire a ; psic, 1846; Fynn's British Consul Abroad;

Meee of Select Committee on Consular Service (Parl. Papers), 1872;

rartens, Guide diplomati ipsi ; ones plomatigq

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CONSULATE OF THE SEA, a celebrated eollection of maritime customs and ordinances in the Catalan language, published at Barcelona in the latter part of the 15th century. Its proper title is Zhe Book of the Consulate, or in Catalan, Lo Libre de Consolat. The earliest extant edition of the work, which was printed at Barcelona in 1494, is without a title-page or frontispiece, but it is described by the above-mentioned title in the epistle dedieatory pre- fixed to the table of contents. The only known copy of this edition is preserved in the National Library in Paris, The epistle dedicatory states that the work is an amended version of the Look of the Consulate, compiled by Francis Celelles with the assistance of numerous shipmasters and merehants well versed in maritime affairs. Aecording to a statement made by Capmany in his Codzgo de los Cestumbras Maritimas de Barcelona, published at Madrid in 1791, there was extant to his knowledge in the last century a rnore alcient edition of the Bock of the Consulate, printed in semi-Gothic characters, which he believed to be of a date prior to 1484. This is the earliest period to which any lustorical reeord of the Bock of the Ccnsulate being in print can be traced back. 'There are,

~~*however, two Catalan MSS. preserved in the National Library in Paris, the earliest of which, being MS. Espagnol 124, con- tains the two first treatises which are printed in the Bock of the Consulate of 1494, and which are the most ancient portion of its contents, written in a hand of the 14th century, on paper of that century. The subsequent parts of this MS. are on paper of the 15th century, but there is no docnment of a date more recent than 1436. The later of the two MSS., being MS. Espagnol 56, is written throughout on paper of the 15th century, and in a hand of that century, and it purports, from a certificate on the face of the last leaf, to have been exeented under the superintendence of Peter Thomas, a notary public, and the scribe of the Consulate of the Sea at Barcelona. .*~~

~~*The edition of 1494, which is justly regarded as the editio princeps of the Book of the Consulate, contains, in the first place, a code of procedure issued by the kings of Aragon for the guidance of the courts of the consuls of the sea, in the second place, a collection of ancient customs of the sea, and thirdly, a body of ordinanees for the government of cruisers of war. A colophon at the end of these ordinances informs the readers that "the book commonly called the*~~

~~*book of the Consulate ends here ;" after which there follows a document known by the title of Zhe Acceptations, which purports to record that the previous chapters and ordinances had been approved by the Roman people in the 11th century, and by various princes and peoples in the 12th and 13th centuries. Capmany was the first person to question the authenticity of this document in his Alemorias ITistoricas sobre la Marina, &c., de Barcelona, published at Madrid in 1779-92. M. Pardessus and other writers on maritime law have followed up the inquiry in the present century, and have conclusively shown that the document, whatever may have been its origin, has no proper reference to the Book of the Consulate, and is, in fact, of no historical value whatsoever. 'The paging of the edition of 1494 ceases with this document, at the end of which is the printer's colophon, reciting that 'the work was completed on 14th Jnly 1494, at Barcelona, hy Pere Posa, priest and printer." The remainder of the volume consists of what may be regarded as an appendix to the original Book of the Consulate. This appendix contains various maritime ordinances of the kings of Aragon and of the councillors of the city of Barcelona, ranging over a period from 1340*~~

~~to 1484. It is printed apparently in the same type with the preceding part of the volume. 'The original Book of the Consulate, coupled with this appendix, con- stitutes the work which has obtained general circnlation~~

~~in Europe under the title of The Consulate of the Sea, and which in the course of the 16th century was translated into the Castilian, the Italian, and the French languages. The Italian translation, printed at Venice in 1549 by Jean Baptista Pedrezano, was the version which obtained the largest circulation in the north of Europe, and led many jurists to suppose the work to have been of Italian origin. In the next following century the work was translated into Dutch by Westerven, and into German by Engelbrecht, and it is also said to have been translated into Latin. An excellent translation into French of "The Customs of the Sea," which are the most valuable portion of the Book of the Consulate, has been recently published by M. Pardessus in the second volume of his Collection des Lois Maritimes, under the title of "La compilation connue sous le nom de consulat de la mer," whilst an English translation of "The Customs of the Sea," under that title, with the Catalan text, has been published for the first time by Sir Travers Twiss, in the appendix to the Black Book of the Admiralty, vol. iii. London, 1874. The introduction to the latter work contains a full account of the two Catalan M&S. in the National Library in Paris, and of the various editions of the Book of the Consulate. (t.#2.)~~

~~CONSUMPTION. See ParTuists.~~

~~CONTEMPT OF COURT is any insult offered to a court of justice, or any defiance or resistance to its authority. 'If the contempt be committed in the face of the court, the offender may be instantly apprehended and imprisoned at the discretion of the judges, without any further proof or examination." In other cases if the judges have reason to believe, from an affidavit, that a contempt has been committed, they make a rule calling on the suspected person to show cause why an attachment should not issue against him, or in flagrant cases the attachment issues in the first instance. (See ATTACHMENT.) The process of attachment merely brings the accused into court; he is then required to answer on oath interroga- tories administered to him, so that the court may be better informed of the~~

circumstances of the contempt. If he can clear himself on oath he is discharged; if he confesses the court will punish him by fine or imprisonment, or both, at its discretion. Both in courts of common law and courts of equity many acts are punished as contempts which are properly civil injuries, and the process of contempt enforced against them is, as Blackstone points out, to be looked upon rather as a civil execution for the benefit of the injured party than as a criminal process for a contempt of the authority of the court. Among the offences enumerated in the text books as the most usual instances of contempt are the following :—(1) Disobedience of inferior judges and magistrates; (2) Wrongdoing by sheriffs, bailiffs, jailers, and other officers in executing the process of the law; (3) Malpractice of attorneys and solicitors ; (4) Misbehaviour of jurymen in collateral matters relating to the discharge of their duties; (5) Misbehaviour of witnesses ; (6) Disobedience of parties in a cause to an order of the court, non-payment of costs, non-observance of awards ; (7) Those committed by other persons. Among those general contempts some, says Blackstone, " may arise in the face of the court, as by rude and contumelious behaviour, by obstinacy, perverseness, or prevarication, by breach of the peace, or any wilful disturbance whatever ; and others in the absence of the party, as by disobeying or treating with disrespect the king's writ or the rules and process of the court, by perverting such writ or process to the purposes of private malice, &c., by speaking or writing contemptu- ously of the court or judges acting in their judicial capacity, by printing false accounts (or even true ones without proper permission) of causes depending in judgment," &c.

The practice of the courts in punishing the last class of

judges ;

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contempts is of great importance in these days, inasmuch ag it involves the question of the liberty of the press. It will be seen from the following statement that the judges have assumed very extensive and arbitrary powers of interfering with the free discussion by the public of the proceedings in courts of justice.

~~A judgment prepared by Lord Chief-justice Wilmot in the~~

~~case of an application for an attachment against J. Almon in 1765, for publishing a pamphlet libelling the Queen's~~

~~Bench, is, although it never was delivered in court,~~

~~constantly referred to as authoritative by later judges and writers. judges in their judicial capacity is the most proper case for an attachment, for the " arraignment of the justice of the judges~~

~~The chief-justice said that the offence of libelling~~

~~is arraigning the king's justice ; it is an Impeach- ment of his wisdom and goodness in the choice of his and excites in the minds of the people a general~~

~~dissatisfaction with all judicial determinations, and~~

~~indisposes their minds to obey them. To be impartial, and~~

~~to be universally thought so, are both absolutely necessary for the giving justice that free, open, and uninterrupted current which it has for many ages found all over this kingdom, and which so eminently distinguishes and exalts it above all nations upon the earth." Again " the consti- tution has provided very apt and proper remedies for cor- recting and rectifying the involuntary mistakes of judges, and for punishing and removing them for any perversion of justice. But if their authority is to be trampled on by pamphleteers and news-writers, and the people are to be told that the power given to the judges for their protection is prostituted to their destruction, the court may retain its power some little time, but I am sure it will eventually lose all its authority." In several cases the judges have declared that while their administration of justice may be discussed fairly and bona fide, it is not open to @ journalist to impute corruption. A recent writer (Shortt, Law relating to Works of Literature) states the law to be that the temperate and respectful discussion of judicial determina- tion is not prohibited, but mere invective and abuse, and still more the imputation of false, corrupt, and dishonest motives is punishable. In an information~~

granted in 1788 against the corporation of Yarmouth for having entered upon their books an order " stating that the assembly were sensible that Mr W. (against whom an action had been brought for malicious prosecution, and a verdict for £3000 returned, which the court refused to disturb) was actuated by motives of public justice, of preserving the rights of the corporation to their admiralty jurisdiction, and of support ing the honour and credit of the chief magistrate," Mr — Justice Buller said, "The judge and jury who tried the case, confirmed by the Court of Common Pleas, have said that snstead of his having been actuated by motives of public justice, or by any motives which should influence the actions of an honest man, he had been actuated by malice. These opinions are not reconcilable; if the one be right the other must be wrong. It is therefore a direct insinuation that the court had judged wrong in all they have done in this case, and is therefore clearly a libel on the administra- tion of justice." Many of the doctrines expressed in the above extracts go beyond the practice, if not the strict jaw of later times. The tendency has been to restrict the process of contempt to cases in which judges are insulte

or defied in the discharge of their duties, or in whic

matters relating to a pending cause are publicly discussed. Bribes or menaces offered to the judges have been punished as contempts. In a recent case a judge of assize having ordered the court to be cleared on account of some disturb- ance, the high sheriff issued a placard protesting against "this unlawful proceeding," "and prohibiting his officers from aiding and abetting any attempt to par out the public

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from free access to the court." The lord chief-justice of England, sitting in the other court, summoned the sheriff before him and fined him £500 for the contempt, and £500 more for persisting in addressing the grand jury in court, after he had been ordered to desist.

The difference between pending and decided cases has been frequently recognized by the courts. What would be a fair comment in a decided case may tend to influence the mind of the judge or the jury in acase waiting to be heard, and will accordingly be punished as a contempt. This is distinctly

~~laid down in the case of Tichborne v. Mostyn, where the publisher of a newspaper was held to have com- mitted a contempt by printing in his paper extracts from affidavits in apending suit, with comments upon them. In the case of the Queen v. Castro, it was held that after a true bill has been found, and the indictment removed into the Court of Queen's Bench, and a day fixed for trial, the case is pending ; and it is a contempt of court to address public meetings, alleging that the defendant is not guilty, that there is a conspiracy against the defendant, and that he cannot have a fair trial; and the court will order the parties to answer for their contempt, and fine or imprison them at discretion, In another case the publica- tion of a winding-up petition, containing charges of fraud, before the hearing of the petition was held to be a contempt of court. The courts may, if they choose, prohibit any publication of their proceedings while the litigation is pending. It is now the invariable rule of the English press to refrain from expressing an opinion on matters relating to any pending suit. On the other hand, the dis- cussion of decided cases shares in the licence now allowed to the expression of opinion on all public affairs in England.~~

~~The Scotch and colonial courts exercise the same power of committing for contempt as the English, It has been held in a case arising under the County Court Act, that inferior courts of record have only power over contempts committed a facie curve. The county court judge has no power of proceeding against a person for a contempt com- mitted out of court,~~

~~The proper punishment of contenipt is by fine or im- prisonment at the discretion of the court. Ina recent case it was held that no person can be punished for contempt, unless the specific offence charged against him is distinctly stated, and an opportunity given him of answering it. When a barrister had been suspended from practice by the supreme court of Nova Scotia for addressing a letter to the chief justice which was a contempt of court, the Privy Council on appeal discharged the order, as substituting a penalty and mode of punishment which was not the appropriate and fitting punishment for the offence. The letter was written by the defendant in his individual capacity of suitor, and had no connection with his profes- sional status or character. ;~~

Blackstone notices the exceptional character of the punishment provided for this offence. "It cannot have escaped the attention of the reader," he says, "that this method of making the defendant answer upon oath to a criminal charge is not agreeable to the genius of the com- mon Jaw in any other instance." There can be no doubt that the discretionary powor of judges to punish summarily by fine or imprisonment offences committed against their own dignity Is liable to abuse, and careful as English Inge are in enforcing it, a trial and conviction in the —. would probably be more satisfactory. The pat 2 18 by no means clearly defined, but it will be i | agreed that it is desirable to prevent and punish pare dea and disorderly conduct in courts of ten Well a8 any such publications as may really

© prejudice a pending cause.- A judge may

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safely be intrusted with the power of keeping order in his court, but contempts committed elsewhere should be Dro- ceeded against like other offences,

A similar power of punishing for contempt is exercised by the two Houses of Parliament. The question was discussed in the case of Burdett v. Abbott, where Lord Ellenborough said, "Can the High Court of Parliament, or either of the two Houses of which it consists, be deemed not to possess intrinsically that authority of punishing summarily for contempts which is acknowledged to belong, and is duly exercised as belonging, to every superior court of law of less dignity doubtless than itself?" It was at one time held that the "privilege of committing for contempt is inherent in every deliberative body invested with authority by the constitution ;" and that accordingly it extended to colonial assemblies. This opinion has been overruled by subsequent decisions. Baron Parke, in the case of Kielley ». Carson, says that the power of punish- ment for contempt attaches to bodies having judicial functions, and is an incident of those functions, except only in the case of the House of Commons, whose authority in this respect rests upon ancient usage. The Legislative Assembly of Victoria is entitled by enactment to the privileges, immunities, and powers held, and enjoyed, and exercised by the English House of Commons. Where a legislative assembly has the power of committing for contempt, the punishment lasts only till the

end of the current session. ‘“ Though the party should deserve the severest censure,” says Lord Denman, “yet his offence being committed the day before a prorogation, if the House ordered his imprisonment but for a week, every court in Westminster Hall, and every judge in all the courts would be bound to discharge him by habeas corpus.” See PRIVILEGE. (E. R.)

CONTI, Prince orf, the title assumed by a younger branch of the House of Condé. Armand de Bourbon, prince of Conti (1629-1666), one of the princes of the blood who took part in the wars of the Fronde, was son of Henry, prince of Condé, and brother of the Great Condé. Originally destined for the church on account of the weakness of his health and the deformity of his person, he received several rich benefices, and studied at the Sorbonne, but did not enter into orders. Wanting in strength of character, he was throughout life the follower of his sister, the duchess of Longueville, whose influence over him was such as to give rise to scandal. He was induced by her to join the old Fronde, and was appointed commander-in-chief of its forces during the siege of Paris (1648) ; but he contented himself with riding every day at their head through the streets, never failing to leave them as they passed out of the gates. At the end of the contest the whole Condé family came into political agree- ment, and Conti shared his brother’s imprisonment (1650). After his release his engagemcut to be married to the profligate Mlle. de Chevreuse was broken off by the prince of Condé, who had been won over to the court party by extravagant promises. In Condé’s second rebellion Conti was concerned ; but when the former fled to Spain, he made his peace with the court, married Mazarin’s niece, and obtained the government of Guienne, together with the command in Catalonia, in which latter capacity he was not distinguished. He followed his sister in her conversion, entering into all her enthusiastic views, and maintaining constant correspondence with her. He wrote Du devoir des grands ct des devoirs des gouverneurs de province ; Lettres sur la grace ; and T’raité de la comédie et des spectacles selon la tradition de VEglise. (See the numerous Ifémoires of the time and the Lettres de Mme. de Sévigné.) His second son, Frangois Louis, prince of Conti (1664-1709), fought with much distinction in

~~several campaigns ; and, being distinguished by informa- tion, wit, attractive manners, and never-failing affability, he enjoyed, heartless as he was, a wonderful popularity. But this very popularity, together with a sneer he had incautiously uttered against the king, caused his banish- ment to Chantilly. In 1697 he was elected king of. Poland, but on reaching that country he found the throne in the possession of the elector of Saxony, and at once retired without making any attempt to dispossess his rival. (See the Mémoires de Saint-Simon, and Desormeaux, Tistoire de la. Maison de Bourbon.) Louis Francois, prince of Conti (1717-1776), the grandson of Frangois, was a brave and popular general. He was engaged in the war caused by the claims of Maria Theresa to the imperial throne ; he commanded the army which crossed the Alps into Italy and defeated the Sardinians in 1744 ; and he also served in Germany and Flanders in 1745 and 1746. Not, how- ever, being allowed to take part in the Seven Years' War, he supported the Parliament of Paris against the court, and earned the nickname of "the Advocate." His son was the last of the house of Conti.~~

~~CONTRABAND (Low Latin, contrabannum) means, according to Ducauge, "'merces banno interdicta," and was originally applied to a prohibited domestic trade in time of peace, such as that in salt. The term does not occur in the Guidon de la Mer, or in Grotius, and is first used to denote a prohibited neutral trade with a belligerent in the Treaty of Southampton (17th September 1625) between Charles I. and the States-General of Holland. That treaty declared that all provisions (mznetions de bouche), provisions of war, ships, arms, sails, &c., silver, iron, &c., carried to Spanish ports, would along with the carrier ships and their crews be good prize. It was partly from the general use of such treaty-stipulatious with neutrals, and partly from the custom of belligerents at the beginning of a war to issue declarations which they formally intimated to neutrals, and which forbade all trade in certain articles with the ports of their enemies, that the international law of contra- band grew up. Anexample of the latter mode of proceed- ing is the "Placaart" issued in 1599 by the States-General, which, like the Berlin Decrees, completely interdicted all trade with Spain. The Treaty of Southampton itself was followed by two proclamations, which assume a belligerent right to place restrictions on neutral commerce, and which go the length of authorizing private ships to capture neutral bottoms carrying contraband. 'The practice of contraband~~

~~is of course much older than the name. Thus in the Code of Justinian (iv. 41, 42) Marcian prohibits the sale to barbari alienigene of oil, wine, several specified kinds of arms, and generally of iron. So also the Decretals, Gregory IX. (v. 6-12), and the Bull "In Coena Domini," c. 7, denounced excommunication against such as should supply Saracens with arms. It isin the 17th century that the military policy and commercial interests of the various European nations begin to be indicated in their treaties relating to contraband. Opinion varied so much with the political situation, that it is difficult to extract from these treaties the prevailing custom even of a single nation. At first provisions, that is corn, &c., seem generally to have been excluded from the list, and in 1674 a great English lawyer, Sir Leoline J enkins, told Charles II. that nothing ought to be deemed contraband "but what is directly and immediately subservient to the nse of war, except it be in the case of besieged places" (which raises the distinct ques- tion of blockade), or of a '" general certification by Spain to all the world." The definition of the French Ordonnance de la Marine of 1681 is also limited to muni- tions of war, and even to such as have " la forme d'un instrument pouvant servir directement & DPusage de la guerre."~~

~~On the other hand, the early writers on contra- |~~

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~~band, such as Dr Zouch (De Jure Fetiali, 1634) and Albericus Gentilis (Advocationes Hispanicee), in discussing the question " An res amicorum ad hostes transeuntes in- tercipere liceat)" seem to assume that the belligerent has~~

~~apart from treaty, a right indefinitely to vary the list of articles constituting munitions of war, and it is clear that the test of " immediate subserviency " must vary with the character of the hostilities, the resources of the combatants, and the actual position of the conflict. In 1543 the English envoy, Sadler, challenged the Scotch fish trade to France as a species of "aid," a word often used in the older treaties of alliance, but which can scarcely have been intended to cover the case of habitual trade ; and in 1589 Queen Elizabeth successfully justified the capture of a fleet of sixty vessels, belonging to the Hanse confederation, and carrying corn and naval munitions to Spain.! In all these cases some ordinance, placaart, or treaty~~

~~was appealed to, but these docnments were of course liable to ex post facto interpretation, and such interpretations were acquiesced ini from necessity or from motives of policy. A powerful neutral, dissatisfied with the decision of the captor's prize court, might issue letters of reprisal. This was done by England when a cargo of tobacco, bound for Holland, was condemned in Spain on the ground that by its use " the consumption of victuals might be prolonged." The general principle, before the writings of Grotius permanently affected the public law of Europe, was, therefore, that the private right of neutral merchants to free trade must yield to the public right of the belligerent to put such limits on neutral trade as were reasonably necessary in the conduct of war,— that right being exercised in a public and legal manner. After the Peace of Westphalia, the grand pensionary of Holland, John de Witt, contended strongly for the exten- sion of neutral rights, and in 1662 by treaty with France the Dutch adopted the definition of contraband in the 12th and 13th articles of the Treaty of the Pyrenecs between France and Spain (1659), which included munitions of war, and specially excluded almost everything in the nature of ordinary provisions. For some time England maintained (as in her Treaty of Whitehall with Sweden, 1661) the doctrine that money, ships, and provisions were to be deemed contraband, but in her Treaty of Breda with Holland (1667), and her Treaty of St Germain-en-Laye with France (1677), she practically adopted the rule of the Pyrenees, with this extension, that the neutral trade might take place event between two enemy ports, provided neither was blockaded. 'This explains the singular agreement made by England and Holland in 1689 for a wholesale blockade of the ports, harbours, and roadsteads of France. The treaties of the 18th century proceeded for the most part on the Treaty of Utrecht, ' which embodied the French doctrine of contraband " (Hall, Rights and Duties of Neutrals, 1874).~~

~~As, however, some powers never contracted with each other on the subject, and as the treatics made were for limited periods, and were often broken by the outbreak of war,~~

~~there was plenty of room for controversy and for the~~

~~enforcement of national opinions. The classical division of~~

~~contraband by Grotius was as follows: " Sunt res que m~~

bello tantum usum habent, ut arma; sunt que in bello

nullum habent usum, ut que voluptati inserviunt ; sunt

que et in bello et extra bellum usum habent, ut pecume,

commeatus, naves, et que navibus adsunt." 'The only

difficulty arises in connection with the third class, of which

Grotius says that the state of the war must be considered,

and that " if seizure is necessary for defence, the necessity

confers a right of arresting the goods" (De Jure Bella et . Pacis, iii. 1. 5). A leading question in the 18th century

was whether naval stores should be deemed contraband, the en

1 Continental jurists called this an attempt to starve Spain out.

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Baltic powers (supported by the writings of Heinescius and Valin) inclining to the affirmative, while Bynkershoek (Quest. Jur. Pub. i. 10, 1737) and Lampredi (Del Com- mercio det Popolt Neutralt in Tempo di Guerra, § 70) main- tained, in conformity with the 20th article of the Treaty of Utrecht, that goods, though possibly of warlike use, were not contraband, if not worked into the form of an instrument of war. Other authors, as Vattel (Droit des Gens, iii. 7, 112) and Heineccius (De navibus ob vecturam vetitarum mercium commissis, Comm. xiv.), attached great value to the fact of urgent ueel among the enemy—" si hostis laboret inopid"—aud were prepared on this ground even to include provisions as contraband. The first armed neutrality of 1789, alarmed by the growing naval power of Great Britain, declared that only munitions of war and sulphur should be contraband. (This is the kriegs-contrebande of German jurists. See Lord Grenville's Letters of Sulpicius Ward.)) In 1793 both England and France made large seizures of provisions, the former pretending that there was a chance of reducing France by famine, and the French executive having

assumed the direction of the whole corn trade of their country. Both sides were wrong, aud were nobly rebuked by the counter declaration of tle Danish minister, Count Bernstorf, in which he explained that a neutral was neither a party nor a judge, and could take no notice of a reciprocity of injuries. The United States also energetically protested against the notion that provisions, not destined to a blockaded port, could in any circumstances be contra- band,—a position inconsistent with the modern American doctrine that an actual mzletary destination even of luxuries will impress on the cargo a contraband character. The second armed neutrality of 1800 took up the same position as the first ; and in 1803 England and Russia agreed that money, horses, ships, and manufactured articles for naval use were to be confiscated, naval stores, the produce of either country, being brought in for pre-emption. The only existing treaties of England on this subject are those with Portugal in 1820 (munitions of war, sulphur, horses, money, and naval stores) and with Brazil in 1827 (munitions of war and naval stores). Throughout the French wars, however, tlic law administered by Lord Stowell and others in the English prize court was much harsher than the treaty obligations of the nation. The circumstances which Lord Stowell considered favourable to a cargo were these :—1. Its being the product of the neutral country, and thereforea natural export ; 2. Its being in an unmanufactured State, as hemp or iron; 3. Its destination to a commercial not a military-port (“Jonge Margaretha,” 1 Rob. Adm. Rep.) Among modern jurists Ortolan (Diplomatie de la Mer., ii, 190) and Heffter (Le Droit International, § 160), as quoted by Hall, agree that contraband cannot be limited to munitions of war, but must extend to raw materials and merchandize, if clearly destined for actual and immediate military use. Ortolan expressly excludes provisions under all circumstances, but the tendency of modern decision is to bring all articles to the test proposed by Mr Dana, the editor of Wheaton,—“ the right of the belligerent to prevent certain things from getting into the military use of tlic enemy,” ”—a principle which is obviously independent of the sunocent or fraudulent intention of the owner of the cargo. Mr Hall proposes a classification of contraband goods, not being munitions of war, based on their more or less intimate connection with military operations. Among these he inelndes horses, saltpetre, sulphur, materials of naval con- struction, such as timber, cordage, pitch (stated by the British Government

~~during the Crimean war to be con- traband), marine engines, &c., and coal, if its immediato~~

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~~Essay on Contraband, London, 1801; Lord Liverpool's Discourse on~~

~~the conduct of the Government of Great Britain in respect to Neutral ations, London, 1801. –~~

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~~destination be military. Thus in the Franco-German war, 1870, vessels laden with coal were forbidden to sail from English ports to the French fleet in the North Sea. France, on the other hand, still holds by the decision in the case of "Tl Volante" (an Austrian ship Jaden with bods de construc- tion from Lisbon to Messina, and captured in 1807 by the French cruiser "Etoile de Bonaparte"), that ship's timber and naval stores are not contraband. Provisions of very various kinds, biscuits, cheese, wine, corn have both in England and America been held contraband (The "Com- mercen," 1 Wheaton's Reports).1 A ship, available for war, and sent to an enemy's port with instructions either to sell or charter, has been condemned in England. The general subject of ships, however, belongs to the subject Neutrality. With regard to clothing, money, and unwrought metals, " there are no recent decisions, but the rule would probably be applied that they may become contraband in certain circumstances. The ordiuary penalty of carrying con- traband is confiscation of cargo, but where the capture is only justified by special circumstauces, or, as it is sometimes expressed, where the contraband is "conditional," and where the cargo is ordinary neutral produce, and there is perfect bona fides of the owner, the ship is merely carried in for pre-emption, which means the owner's value plus 10 per cent., with indemnity for freight and expenses of detention. Anciently, in cases of absolute contraband, both ship and cargo were forfeited ; it is said Russia still does this. The right of pre-emption (droit d'achat) is stated by Lord Stowell to apply to all cargoes whatever bound for an enemy's port ; and it is settled that any attempt at frand, as false papers, or a concealed destination, will diseutitle the owners to compensation. The same circumstances occurring in the case of a cargo of absolute contraband,**

even where the ship does not belong to the owner of the contraband, may forfeit the ship.

It will be remembered that the blockade runners of the American civil war raised very nice questions on this point. It was impossible to prove that these vessels after leaving Nassau were not going to Matamoras in Mexico, for they had. only a floating intention of " running." The question, there- fore, which came before the Supreme Court of the United States in the "Bermuda" and " Peterhoff" cases was whether the interposition of a neutral port between the neutral point of departure and the belligerent destination did protect the cargo which was admitted to be contraband 'There could be little doubt that the goods went straight through Texas to the Confederate States. But in several cases these cargoes were not condemned. The "' Peterhoff's " cargo was army boots, artillery harness, regulation blankets, chloro form, and quinine.

Where the shipowner is innocent and does not own the cargo, he merely loses his freight and expenses. Contraband articles also involve innocent parts of a cargo in corfisca- tion when both belong to one owner. The United {tates and Prussia are tlic only powers that have chosen the bold plan of entirely renouncing by treaty between themselves the right of confiscation, for which they have substituted an unlimited right of stoppage and detention and appropria- tion, subject tofull compensation. This is an arrangement which may probably become more common, and will of course much weaken the effects of the law of contraband. It is impossible to prevent the seizure of private property in war, but it has been suggested that the value should be

1 The " Commereen" was a Swedish' vessel, carrying English provi- sions to a Spanish port for delivery to the British commissariat in the Peninsular War. Sweden and Spain were British allies in the war with France, but nentral in the war with the United States, and there was no alliance between France and the States. The particular cargo was therefore (unjustly) condemned as enemy's goods, but doctrines were laid down as to contraband.

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at once paid over by the captor's government to the neutral government for distribution. 'There is only one case 1) which a return cargo has been confiscated on the ground that the outward cargo was contraband, with fraudulent papers and fraudulent destination ; the voyage was 4 long one, —to the East Indies. Where a neutral vessel carries despatches to a belligerent, as the ship has become a quasl- servaut of the enemy, the captor generally not only seizes the papers but confiscates the ship. Despatches from or to accredited diplomatic agents or consuls residing In a neutral country do not fall under this rule, the neutral having an interest in their safe transmission. — But ignorance of the contents of despatches addressed to military officials, or unaccredited agents, will not excuse their carriage. Even where the despatches have been received through force or imposition, the English prize court holds that the carrier is liable, because his suspicions ought to have been roused. A very difficult question rose in the American civil war with regard to the searching of mail bags. Ifthe right were renounced absolutely, all belligerent despatches would choose this safe route. It was arranged that all British mails, certified to be such, should on capture

be forwarded unopened. 'The carriage of persons in the.

service of a belligerent also leads to confiscation of the ship, ¢ it amount to an intentional assistance of the belligerent. The persons carried may be mere civilians, and the port of destination neutral. Thc most common case is the carriage of soldiers. The exception to this rule is the case of trans port of diplomatic agents, which is generally recognized as lawful, but which in the Trent affair the United States Government repudiated.

Besides the works mentioned the following may be consulted :— Twiss, On the Rights and Duties of Nations in Time of War; Phillimore, Commentaries on I nternational Law, iii., where the literature of the subject is fully noticed ; Wheaton's Elements of International Law; Neutrality Laws Commissioners' Report, State Papers, 71, 1871. (W. C. 8.)

CONTRACT is a bargain or agreement enforceable by law. The law of contract occupies so large 4 space in all civilized systems of law, that only a few of its more leading principles can be conveniently stated here. There is a general harmony in the jurisprudence of modern nations on this subject which is not to be found in other departments of law. The following definitions are taken from the Indian Contract Act, 1872 :—

a. When one person signifies to another his willingness to do or abstain from doing anything with a view to obtaining the assent of that other to such act or abstinonee, he is said to make a proposal.

b. When the person to whom the proposal is made signifies his assent thereto, the proposal is saideto be aecepted. A proposal

when accepted beeomes a promise.

c. The person making the proposal is ealled the promiser, the person aecepting the proposal the promisee.

d. When at the desire of the promiser, the promisee or any other person has done or abstained from doing, or docs or abstains from doing, or promises to do or abstain from doing something, such aet or abstinence or promise is called the consideration for the promise.

e. Every promise and every set of promises forming the considera- tion for each other is an agreement.

f. Promises which form the consideration or part of the considera- tion for each other are called reciprocal promises.

g. An agreement not enforceable by law is said to be void.

h. An agreement enforceable by law is a contract.

é. An agreement which is enforceable by law at the option of one or more of the parties thereto, but not at the option of the other or others, is a voidable contract.

j. A contract which ceases to be enforceable by law becomes void when it ceases to be enforceable.

These definitions, with some changes of expression in the direction of greater precision, are in effect the same as those which are found in English law books. The phrase "void contract," which would be a contradiction in the Indian definitions, is frequently used in English law.

The exchange of proposals and acceptances by corre-

spondence gives rise to some peculiar difficulties. An offer or proposal may be revoked any time before acceptance ; and it is revoked when notice to that effect is given to the promiscr. So much is clear and free from difficulty. But when letters containing proposals or acceptances are delayed or misdirected, it is not very easy to say whether there has been a contract or not. When A wrote to B, "I offer you 800 tods of wether fleeces, &c.," " receiving your answer in course of post," but misdirected the letter, which arrived late, and B's answer accepting the offer not arriving at the

expected time, A sold the goods to some one else, it was

held that as the delay was caused by A's default, it must be taken as against him that the answer did not arrive in

course of post (Adams v. Lindsell, 1 B. and Ald. 681). In cases following this some of the judges seem to be inclined

to hold that a proposer is bound by an acceptance bemg

posted to him whether it reaches him or not, and others that lie is not bound unless he actually receives the accept- ance. An acceptance of a proposal must be unqualified, otherwise there is no contract ; the introduction of a new condition by the acceptor, or a reference to something still to be done, prevents the contract from being completed, To constitute a contract the terms must be certain; eg, an agreement to take a house, " if it were put into thorough

repair, and the drawing-rooms handsomely decorated according to present style," has been rejected as too vague,

A contract of course may be concluded by mere conduct,

without the exchange of a single word, and multitudes of contracts in small matters of constant occurrence are 80 concluded. These are 'called implied contracts—a phrase, however, which covers two very different things—(1) a real contract which may be inferred as a fact from the

conduct of the parties, and (2) a quasi contract, in which

the law will treat the parties as if they had made a contract.

Certain classes of persons are under peculiar disabilities :n matters of contract, viz., infants, lunatics, and married women, J. As a general rule at common law contracts

made by an infant (a person under twenty-one years) are voidable, unless they are in some way for his benefit, and

in particular for " necessaries." By the Infants' Relief Act, 1874, contracts forrepayment of money lent to infants,

or for payment of goods other than " necessaries," are made

absolutely void ; and no action can be brought, even if they are ratified after full age and for a new consideratien. The question what are necessaries is to be decided by the court and jury on the circumstances of the case, including partt- cularly the rank in life of the infant. The protection of

infants has been extended by the Court of Chancery to ©

"expectant heirs" as they are called, 7.e., persons who

borrow money on the credit of their expectations, The

principle is a survival from the times when usury was Col: sidered wrongful, and the preservation of great families 2 public duty, and is utterly indefensible on any other con- siderations. 2. A married woman, being in the eye of the law merged in her husband, cannot bind herself by contract. 3. Contracts made by a lunatic are voidable, except where his state of mind was not known to the other contracting party. The principle is extended to drunken- ness. For further information as to such disabilities see under the respective headings. The general rule as to corporations is that they can only make binding contracts under their common seal, excepting in cases of " con- venience almost amounting to necessity" (see CorPoni: TIONS).

Of tho technical terms mentioned above the most important, and certainly the most characteristic, of English law is consideration. A consideration is essential to the validity of every contract unless it be made in writing under seal. 'The meaning of the word is quite accurately

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expressed by a phrase used in one of the earliest cases on the subject—it is strictly a quid pro quo. Something, whether it be in the nature of an act or a forbearance,

must move from one of the parties in order to support a

promise made by the other. A mere promise by A to give something to B cannot be enforced unless there is some consideration " moving from B." Such a promise the early lawyers called a nude or naked promise—in imitation of the phrase in Roman law, nudum pactum, which does not, however, Mean a promise unsupported by a consideration, put a contract destitute of certain essential legal formalities. But while every contract requires a consideration, it is held that the court will not inquire into the adequacy thereof ; any consideration will do. Inadequacy of consideration, however, may be important where a contract is to be set aside on the ground of fraud.

Modern English law requires no formalities to make a contract enforceable, unless in certain special cases. The ancient rule both in early English and Roman law made certain formalities essential, unless in certain special

~~cases, The ancient rule is thus the modern exception. 'The exceptions to the general rule in English law are tho following :—~~

~~1. Contracts within the Statute of Frands, 29 Car. IT. c. 3.—The fourth section of this important Act specifies certain classes of con- tracts in which "' no action shall be brought " unless the agreement upon which such action shall be brought, or some memorandum or note thercof, shall be in writing and signed by the party to be charged therewith, or some other person thereunto by him lawfully authorized. Such contracts are—(1) any special promise by an executor or administrator to answer damages out of his own estate ; (2) any promise to answer for the debt, default, or miscarriage of another. person; (3) any agreement made on consideration of marriage ; (4) any contract or sale of lands, tenements, or here- ditaments, or any interest in or concerning them ; (5) any agree- ment that is not to be performed within the space of one year from the making thereof. The 17th section enacts that no contract for the sale of any goods, wares, or merchandize for the price of £10 sterling or upwards shall be allowed to be good, except the buyer shall first accept part of the goods so sold, and actually receive the same, or shall give something in earnest to bind the bargain or in part payment ; or unless some memorandum or note in writing of the said bargain be made and signed by the parties to be charged, or their authorized agents. The difference between the two sections should be noted. Contracts under the 17th section are simply void ; contracts under the 4th are not void, but they are not en- forceable. The 4th section is alaw of procedure, and therefore a contract of the kind specified therein validly made in a foreign country could not be enforced in England, whereas a valid contract made abroad, which would be wholly void if made in England, under the 17th section, might be enforeed in England. And again, money paid under an agreement made unenforeeable by section 4 could not be recovered back.~~

~~2, Contracts of corporations, already alluded to.~~

~~3. Negotiable instruments, which must, of course, be in writing.~~

~~4. Other cases in which writing is required are transfer of ships, assignments of copyright, and ratification of debts barred by the Statute of Limitations.~~

To contracts made by deed (ce. under seal) the law attributes certain qualities which do not belong to simple contracts, i.e, contracts whether verbal or in writing without seal. The peculiar properties of a deed are thus described :—' It works a merger ; it operates by way of estoppel ; it requires no consideration to support it; it will in some cases bind the heir of the covenanter or obligor ; it can only be discharged by an instrument under seal, by the judgment of a court of competent authority, or by Act of Parliament." The language of the law-books is that from the solemnity of a deed the law itself will imply the existence of a consideration, a formula designed to bring the exceptional case of deeds within the general legal theory of consideration, and by no means to be accepted as an his- torical explanation. The subordinate agreements in a deed are termed covenants. The formal definition, as given in Platt on Covenants, is "an agreement between two or more persons by an instrument in writing sealed and delivered,

whereby some of the parties engage, or one of them engages with the other or others of them, that some act hath or hath not been already done, or for the performance or non-performance of some specified duty." See Dzxp.

An agreement is said to be void for impossibility when the thing contemplated is in itself impossible, as contrary to the course of nature, and when it is by construction of law impossible, e.g., to create a new manor. But when the thing is not iu itself impossible, but is or becomes impossible in fact, an unconditional agreement is not thereby void, Thus a contract to Joad a full cargo of guano at a certain island does not become void by the fact that there is not enough guano on the island to make a full cargo. In a recent case (Thorn v. Lord Mayor of London) a con- tractor, who had undertaken to build a bridge according to specifications supplied by defendant, found it impossible to execute part of the work according to specification, and it had to be executed in another way. It washeld that there was no condition that the plans should be reasonably prac- ticable, and the plaintiff was not allowed to recover for work executed in an impossible attempt to comply with the specifications. In another case, a contractor bound himself under penalties to finish some buildings within a

certain time, with any alterations and additions required by the defendants, and no extension of time was to be allowed for such alterations, unless expressly granted by defendants. It was held that the contractor could not excuse himself for non-completion within the proper time by showing that the alterations and additions made it impossible.

Besides the contracts which are void through defect of form or want of capacity in the parties, there is a large class of agreements which the law refuses to recognize on account of the character of the contemplated action. These may be reduced to three main divisions—dlegal contracts, when the thing to be done is forbidden by law ; 'mmora/ con- tracts, when the consideration belongs to the indefinite class of things recognized as immoral; and contracts, agadnst public policy, t.e., certain wide and more or less indefinite principles of government. In some cases, the act of agree- ment is in itself a criminal offence, for which see Conspiracy. An agreement to commit an offence, as to burn a house, or kill a man, or an agreement to do a civil injury to another, would be illegal. Promises made in con- sideration of illicit cohabitation in the future are void as . immoral; if the consideration is illicit cohabitation in the past, itis of course no consideration, and a promise founded upon it will be void unless expressed in a deed. Of agreements which are void as being against public policy, the most important class is that of contracts in restraint of trade. The leading authority on this subject is the case of Mitchell v. Reynolds (1 Smzth's Leading Cases). The law, it seems, is so jealous of the freedom of the trader, that it will not allow him to part with it on any considera- tion. " It is the privilege of a trader in a free country, in all matters not contrary to law, to regulate his own mode of carrying it on according to his own discretion and choice. If the law has regulated or restrained his mode of doing this, the law must be obeyed. But no power short of the general law ought to restrain his free discretion." It has been suggested that the rule dates from a time when a covenant by a man not to exercise his own trade meant a covenant not to exercise any trade at all,—every man being obliged to confine himself to the trade to which he had been apprenticed. At any rate, it is difficult to reconcile this protection of the individual will, carried to the point of absolutely limiting its exercise in one class of cases, with modern principles as to freedom of trade and contract. And the law itself breaks in upon its

own theory by admitting that contracts which are only in partial restraint of trade may be good. A contract not to carry on the

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business of an ironmonger would be bad; but a contract made by the seller of an ironmonger's business not to compete with the buyer would be good. It is held that to make such a promise binding, it must be founded on a valuable consideration, must not be unlimited as to the area over which the restriction is to extend, and must not otherwise ge beyond what is reasonably necessary for the protection of the other party. On the whole, it would be simpler to leave individuals to make what contracts they please in this as in other matters. The public policy which disallows contracts in restraint of marriage depends on a different set of considerations. A contract not to marry at all. is void; in one case it is described as a contract to omit a moral duty, and tending to depopulation, " the greatest of all political sins." But apparently a contract by a widow not to marry is not void. The whole doctrine of public policy appears to have grown up out of the efforts of judges to counteract the admission of wagers In the common law as legal contracts. In their desire to avoid enforcing them in particular cases, they developed a tlicory of state interests of startling wideness and originality. A wager about the death of Napoleon I. was held void because it gave one party an interest in keeping the king's enemy alive, and the other an interest in putting him to death. (See Pollock on Contracts, p. 25 2.)

Contracts may be vitiated by mistake, misrepresentation, fraud, undue influence, &c. Mistake, to avoid a contract, must be such that there was no real agreement at all, or that the real agreement was erroneously expressed ; and money paid under a mistake as to fact may be recovered. .The general rule is that relief will be given against mistake as to fact, but not agaiust mistake in law. Contracts induced by fraud, misrepresentation, &ec., are in general not void but voidable at the instance of the party injured or imposed upon.

The common law did not permit the benefit of contracts to be assigned so as to give the assignee a right of action in his own name—a right which was, however, recognized in equity. By the Judicature Act, 1873, section 6, a

legal right is created in the assignee when the assignment is absolute and in writing, and notice in writing given to the debtor.

The only remedy for breach of contract given by the common law was an action for the sum certain due by the defaulter, or for damages, to be ascertained by a jury. The mere payment of damages would in many cases not be a complete satisfaction to the other party, and the Court of Chaucery accordingly gave in certain cases decrees for the specific performance of the contract.

The best English works on Contract are those by Addison, Chitty, and S. Martin Leake. The Principles of Contract at Law and in Equity, by F. Pollock, is a recent work of great merit. (E. R.)

CONVERSANO, an episcopal city of Italy, in the pro- vince of Terra di Bari, and 20 miles south-east of the city of Bari, with about 10,000 inhabitants. It has a castle, a cathedral, several convents, a diocesan seminary, a hospital, and a foundling asylum, Some trade is carried on in wine, oil, almonds, and cotton. 4

CONVEYANCING, the art of preparing writings to effect the transference or conveyance from one person to another of any piece of property or valuable right. It is sometimes applied in a restricted sense to the cumbrous forms which the feudal system has rendered necessary for the transference and tenure of landed property. When left to shape itself by individual practice, without legislative intervention, there were several causes rendering such con- veyancing cumbrous and complex. The theory of the feudal tenures and hierarchy remaining unchanged through- out the social revolution which had virtually abolished superiority and vassalage, and brought land out of feudality

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into ordinary commerce, it became necessary to retain the feudal ceremonies of the Middle Ages, and to adapt them by fictions and explanations to modern exigencies. Hence, many years have not yet passed since, in Scotland, when a field was bought and sold, a party of men assembled on it, and went through the old form of symbolic investiture by

~~the delivery of so much earth and stone from the superior bailiff to the vassal's attorney, who took instru-~~

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~~ments and had the whole recorded at length by a notary of the empire. In England, from the want of the general system of registration known in Scotland, the complexities of conveyancing had become so inextricable, that one of the most approved forms of transference was a. fictitious suit and judgment of possession called a fine and recovery, To these innate sources of complexity must be added the timidity of conveyancers, who, afraid to commit themselves by attempting to abbreviate or reconstruct the forms which they find in existence, repeat them with additions from time to time as new circumstances must be provided for, Hence, to keep conveyancing within rational bounds, the legislature must interfere from time to time to sweep away excrescences, and provide brief and simple forms. This, however, is a task which cannot be easily accomplished, since it requires the very highest legal skill to adjust simple forms to all exigencies, and anticipate the various shapes in which property may fall to be dealt with. This service has been on various-occasions performed by distinguished lawyers ; and, while it is productive of the greatest benefits to society, it is one of the public services least susceptible of popular appreciation. In 1834 the Act abolishing fines and recoveries created a reform of this kind in the con- veyancing of England, and a series of statutes passed in 1847 purified and simplified the — conveyancing of Scotland.~~

~~An attempt was made in 1862 to simplify the practice of conveyancing by two Acts—one entitled an Act to Facilitate the Proof of Title to and Conveyance of Real Estate, and the other the Declaration of Title Act, 1862. The former (called also the Land Registry Act) provided for the registration of real estates and of the title thereto. The latter was'intended to enable persons having interests in land to obtain a declaration of their title by which they could give an indefeasible title to any person purchasing from them. Both statutes have failed; of the latter a standard book of practice says, "it is deemed unnecessary to detail its provisions." A commission, reporting in 1868, attributed the failure of the Registry Act to the principle of registering indefeasible titles only. The " Act aimed at a standard of~~

~~*certainty and perfection of title beyond what is ordinarily required in conveyancing transactions, and hence as a natural consequence instead of facilitating it was found in practice to impede the transfer of land." Another attempt has been made by the Land Transfer Act of 1875, which allows the registration of a possessory, as well as of an absolute, title. It is the opinion of an eminent conveyancer that the statute will probably achieve a success greater than that achieved by its predecessors, but less than that which would be commensurate with the ability and labour with which it has been framed.*~~

~~*Conveyancing, which in Scotland forms part of the ordinary business of a solicitor, is in England almost a profession by itself. It is to a large extent undertaken by barristers who devote themselves specially to the work. There is also a class of conveyancers, qualified to be called to the bar, but not called, who practise under annual certificates.*~~

~~*An Act was passed in 1868 to consolidate the statutes relating to the constitution and completion of titles to heritable property in Scotland, and to make certain changes on the law of Scotland relating to heritable rights, and an*~~

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~~*Amendment Act was passed in the following year. In 1874 tho Conveyancing (Scotland) Act was passed, having for its object to cemend the law relating to land rights and conveyancing, and to simplify the law.*~~

~~*CONVOCATION, an assembly of the spirituality of the realm of England, which is summoned by the metro- politan archbishops of Canterbury and of York respectively, within their ecclesiastical provinces, pursuant to a royal writ, whenever the Parliament of the realm is summoned, and which is also continued or discharged, as the case may be, whenever the Parliament is prorogued or dissolved, This assembly of the spirituality, which is at present sum- moned only in pursuance of a writ from the Crown, differs in its constitution and in the purport for which it is summoned from an ordinary provincial council, such as the two nictropolitan archbishops of England have also been in*~~

the habit of summoning from time to time ; for whereas.

the ordinary provincial councils of the metropolitans have comprised only the bishops of their respective provinces, with whom, however, the deans and the abbots and other governing dignitaries of the church have been on occasions associated, the Convocations of the two provinces have always comprised a definite number of representatives of the clergy of the chapters and of the beneficed clergy of the several dioceses. J'urther, whereas the purport of an ordinary provincial council is to consult on matters which concern the faith or the peace of the church as a religious body, the Convocations are called together to treat of matters which concern the Crown, and the security and defence of the Church of England, and the tranquillity, public good, and defence of the realm itself. All these subjects are specified as probable matters for deliberation in the royal writs, under which the archbishops are commanded to call together their respective Convocations. 'These assemblies would thus appear to be integral parts of the body politic of the realm of England; but when and how they originated, and when and how they became so incorporated in it is not historically clear. This much is known from authentic records, that the present constitution of the Convocation of the prelates and clergy of the province of Canterbury was recognized as early as in the eleventh year of the reign of Edward I. (1283) as its normal constitution; and that in extorting that recognition from the Crown, which the clergy accomplished by refusing to attend unless summoned in lawful manner (delito modo) through their metropolitan, the clergy of the province of Canterbury taught the laity the possibility of maintaining the freedom of the nation against the encroachments of the royal power. It had been a provision of the Anglo-Saxon period, the

is identical in its purport with the writ issuel by the Crown in 1283 to the metropolitan of the province of Canterbury, after the clergy of that province had refused to meet at Northampton in the previous year, because they had not been summoned in lawful manner; whilst the mandates issued by the metropolitans in pursuance of the royal writs, aud the citations issued by the bishops in pursuance of the mandates of their respective metropolitans,

~~are identical in their purport and form with those used in summoning the Convocation of 1283, which met at the New Temple in the city of London, and voted a " benevol- ence" to the Crown, as having been convoked in lawful mauner.~~

~~apply to that of the province of York—in respect of its comprising representatives of the chapters and of the beneficed clergy, in addition to the bishops and other dignitaries of the church, would thus appear to be of even more ancient date than the existing constitution of the Parliament of the realm; for the council of the realm, to which representatives of the counties and of the boroughs were for the first time summoned to the same place with the barons, to meet the king at Shrewsbury in the same year (1283) in which the Convocation of the province of Canterbury was summoned to the New Temple, differed in several important particulars from the Parltament of the realm, as at present constituted, although it is sometimes styled the Parliament of Shrewsbury, or of Acton Burnell. It was, in fact, an extraordinary council, to which the prelates, who were a constituent part of the Commune Concilium of the realm, were not summoned, its object being to try David, the brother of Llewelyn, prince of Wales, who had surrendered himself a prisoner, on a charge of high treason against the Crown of England. The barons alone appear to have tried and condemned the prisoner, as far as may be inferred from the language of the annalists, although the commons may have been allowed a consultative voice, At all events the commons agreed with the barons in voting an "aid" of athirtieth to support the king's expedition into Wales, and the issuing of the ordinance known as the "Statutum de Mercatoribus" concluded the business for which the council was summoned. The settled constitu- tion of Parliament as it exists in the present day was not completed until 1295 (23 Edward I.), when the repre- sentatives of the commons were summoned to the same place with the barons, and the clergy as a body were also convened with the laity, under a novel clause known as the "pramunientes" clause, which was inserted in the writs issued by the Crown directly to the bishops.~~

~~The existing constitution of the convocation of Constitu- the province of Canterbury—and the same observation will tion older~~

~~From this period down to the eleventh year of the reign Contest~~

~~otigin of which is generally referred to the Council of of Edward IIL. there were continual contests between the between~~

~~Cloveshoo (747), that the possessions of the church should spirituality~~

~~be exempt from taxation by the secular power, and that it should be left to the benevolence of the clergy to grant such subsidies to the Crown from the endowments of their churches as they should agree to in their own assemblies. It may be inferred, however, from the language of the various writs issued by the Crown for the collection of the "aids" voted by the Commune Concilium of the realm in the reign of Henry III, that the clergy were unable to maintain the exemption of church property from being taxed to those "aids" during that king's reign ; and it was uot until some years had elapsed of the reign of Edward 1. that the spirituality succeeded in vindicating their constitutional privilege of voting in their own assemblies their free gifts or "benevolences," and in insisting on the Crown observing the lawful form of con- voking those assemblies through the metropolitan of each province. «ae — of the royal writ, which it is customary to is- ©1n the present day to the metropolitan of each province,~~

~~spirituality of the realm and the Crown, —the spirituality contending for their constitutional right to vote their subsidies in their provincial Convocations; the Crown, on the other hand, insisting on the immediate attendance of the clergy in Parliament. The resistance of the clergy to the innovation of the " premunientes " clause had so far prevailed in the reign of Edward II. that the Crown con- sented to summon the clergy to Parliament through their metropolitans, anda special form of provincial writ was for that purpose framed; but the clergy protested against this writ, and the struggle was maintained between the spirituality and the Crown until 1337 (11 Edward III), when the Crown reverted to the ancient practice of com- manding the metropolitans to call together their clergy in their provincial assemblies, where their subsidies were voted in the manner as accustomed before the " pramunientes " clause was introduced. 'he " premunientes " clause, how- ever, was continued in the Parliamentary writs issued to the several bishops of both provinces, whilst the bishops were~~

~~and Crown.~~

~~The clergy's place in parliament.~~

~~Convoca- tion more than a provincial council.~~

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~~permitted to neglect at their pleasure the execution of the writs. It is a moot question, in which of the two Houses of Parliament the representatives of the chapters and of the beneficed clergy sat, when summoned to Parliament, and whether they had a deliberative vote, or only a consultative voice. According to the "Modus tenendi Parliamentum 4 the proctors of the clergy sat and voted in the Lower House of Parliament. But tbe authority of that treatise has been impugned by many writers, because the introduc- tory paragraph announces it to be a description of the manner of holding a Parliament in the time of King Edward, the son of Ethelred, and of William the Conqueror~~

~~and his successors, The treatise itself, however, is not a merc imposture,~~

~~as Dr Hody has contended in his History of English Councils and Convocations. Tt is found in several MSS. of the 14th century, and the Parliamentary writs and records of the reign of Edward II. warrant us in re- garding it as a treatise framed after the actual constitution of Parliament in the reign of that king.' This treatise contains a chapter entitled "De Auxilio Regi," in which it is explicitly stated that the proctors of the clergy sat in the Lower House, and voted as members of the Commons on all questions which required the consent of Parliament. "Tdeo oportet, quod omnia que affirmari vel infirmari, concedi vel negari, vel fieri debent per Parliamentum, per communitatem Parliamenti concedi debent, que est ex tribus gradibus sive generibus Parliamenti, scilicet ex procuratoribus cleri, militibus comitatuum, civibus et burgensibus, qui repreesentant totam communitatem ; et non de magnatibus, quia quilibet eorum est pro sua propria persona ad Parliamentum, et pro nulja alia." This view is borne out by the language of the petition of the Lower House itself in the Convocation of 1547 (1 Edward VI.), that "according to the ancient custom of this realm and the tenor of the king's writs for the summoning of the~~

Parliament, which be now, and ever have been, directed to the bishops of every diocese, the clergy of the Lower House of Convocation may be adjoined and associated with the Lower House of Parliament" (Cardwell's Synodalia, p. 421). The weight of evidence would thus seem to be in favour of the view that the proctors of the clergy, when summoned to Parliament under the "preemunientes" clause, sat and voted in the Lower House of Parliament, which is not altogether irreconcilable with the statement in Lord Coke's Fourth Institute, that the proctors of the clergy never had a voice in Parliament, "because they were no lords of Parliament." The reason alleged in this passage of the Fourth Institute is clearly inadequate as regards the Lower House, inasmuch as the magnates were excluded from it; but if the compiler of the Fourth Institute had in view the Upper House he is justified in saying that the proctors of the clergy did not vote in that House.

Tt has been matter of controversy between divines and lawyers, whether the Convocations of the two provinces arc properly to be regarded as high courts of the spirituality of the realm of England, or as ecclesiastical councils of their respective metropolitans. The divines prefer to regard them as provincial councils, although perhaps in so doing they unconsciously depreciate them. It may be admitted that there is nothing in the constitution of either Convocation which is inconsistent with its being a provincial council sé generis, as the constituent elements of provincial councils vary indefinitely according to the custom of different national churches,—for instance the parochial clergy, whose presence by their representatives is a remark- able feature of the Convocation of the two provinces, have been allowed to appear by their representatives in more

1ciy Thomas Duffus Hardy, who edited this treatise for the — Commissioners in 1846, places it somewhere between 1294 and

1327.

adjudicating upon them. record of a kind of cumulative vote of the Lower House of

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than one provincial council of the ancient Gallican Church , but the Convocations of the province of Canterbury and of York, as summoned in pursuance of a royal writ, are assuredly something more than ecclesiastical councils of their respective metropolitans. of Lord Coke for regarding the Convocations of the two provinces as courts of the spirituality, and the Upper House of Convocation is by statute (24 Henry VIII. ch. 12) con- stituted the high court of appeal in matters in which the Crown is a party in any cause before an ecclesiastical court. found in distinguishing the Upper House of Convocation from the Lower House, and just as the Upper House of

There is the high authority

Perhaps the true solution of the controversy will be

Parliament is the High Court of Parliament which exercises. the judicial functions of the Parliament, so the Upper House of Convocation is the High Court of Convocation, the Lower House having the right to make presentments

to the Upper House in like manner as the Lower House of

Parliament has the right to prefer impeachments before the Upper House of Parliament, but not to take part in There is, indeed, an instance on

Convocation in 1640, when it added its voice to that of

the Upper House in suspending a member of the Upper House (the bishop of Gloucester) from his office and

benefice; but this was rather a question touching the

privileges of the two Houses in a business which they con- sidered to have brought scandal on the proceedings of the Convocation, the bishop of Gloucester having refused to conform himself to a resolution of both Houses in a matter of subscription to certain new canons. not a precedent of a safc period. 'There is, indeed, another point of view from which the Convocation appears to have all the attributes of a high court of the

metropolitan, inas- much as the metropolitan, when he presides, or his com- missary in the absence of the metropolitan, has the Authori coercive power of an ecclesiastic members of the Convocation :

course of business; he may pronounce the members con-

This, however, is

tumacious and punish their contumacy by suspension from

office, or by sequestration of benefice, and at his pleasure may remit the penalties, and upon submission absolve the offender. He may further suspend the sittings of Convoca-

tion when he sees fit, and may continue them to such times

as he thinks proper; and a schedule, or written sentence of

continuation and prorogation at the termination of each session, is signed by the archbishop or his commissary, in which he is described as " judicially sitting." A curious argument has been raised in modern times upon the wording of certain ancient schedules in which it is recited that the archbishop has continued and prorogued the Con- vocation to acertain day '"'cumconsensu confratrum suorum." Tt has been contended that these recitals are not consistent with the claim of the metropolitan to prorogue the Convoca- tion at his pleasvre. But this argument is founded on @ total misconception of the object of these recitals, which was to save the legal right of the metropolitan to pronounce the bishops and clergy contumacious, if they should not attend on the day to which the Convocation was continued. Of strict right the members of Convocation were not liable to be pronounced in contempt, unless they had been cited in lawful manner to attend upon the archbishop on a given day; but if they were consenting parties to the continuation of the sittings of the Convocation to a future day, and theit consent was recorded in the instrument of continuation, which is read aloud before it issigned by the metropolitan, they would thereby be perempted of all excuse for non attendance on the plea that they had not been duly cited. Such we conceive

~~to be the true meaning of this clause, which is rarely found in the older schedules, but occurs~~

~~al judge in respect of the of the he directs absolutely the~~

~~CONVOCATION~~

~~freqnently in the schedules of the most turbulent period of the history of Convocation, namely, during the reign of Queen Aune. It was probably inserted in those schedules, ex majort cautela, after an ancient precedent with which the reaistrar of the Convocation was familiar. This much, however, is certain, that the phrase does not occur in any schedule of prorogation, which is not also a schedule of continuation of the sittings of Convocation to a further day,~~

~~The history of the Convocation of the province of Canterbury, as at present constituted, is full of stirring incidents, and it resolves itself readily into five periods. The first period, by which is meant the first period which dates from an epoch of authentic history, is the period of its greatest freedom, but not of its greatest activity. It ex- tends from the reign of Edward I. (1283) to that of Henry YIU. The second period is the period of its greatest activity and of its greatest usefulness, and it extends from the twenty-fifth year of the reign of Henry VIII. to the reign of Charles II. The third period extends from the fifteenth year of the reign of Charles II. (1664) to the reign of George I. This was a period of turbulent activity and little usefulness, and the anarchy of the Lower House of Convocation during this period has created a strong prejudice against the revival of Convocation in the mind of the laity. The fourth period extends from the third year of the reign of George I. (1716) to the fifteenth year of the reign of Queen Victoria. This was a period of torpid inactivity, during which it was custom- ary for Convocation to be summoned and to meet pro forma, and to be continued and prorogued indefinitely. The fifth period may be considered to have commenced in the fifteenth year of the reign of Queen Victoria (1852), and it would be premature to pronounce an opinion upon itscharacter. It has not hitherto had to pass through any severe ordeal of political strife.~~

~~During the first of the five periods above mentioned, it would appear from the records preserved at Lambeth and at York that the metropolitans~~

frequently convened con- gregations (so-called) of their clergy without the authority of a royal writ, which were constituted precisely as the Convocations were constituted, wlicn the metropolitans were commanded to call their clergy together pursuant to a writ from the Crown. As soon, however, as King Henry VIII. had obtained from the clergy their acknowledgment of the Supremacy of the Crown in all ecclesiastical causes, he constrained the spirituality to declare, by what has been termed the Act of Submission on behalf of the clergy, that the Convocation "is, always has been, and ought to be suinmoned by authority of a royal writ ;" and this declara- tion was embodied in a statute of the realm (25 Henry VIIL. ¢. 19), which further enacted that the Convocation "should thenceforth make no provincial canons, constitu- tions, or ordinances without the royal assent and licence." The spirituality was thus more closely incorporated than heretofore in the body politic of tle realm, seeing that no deliberations on its part can take place unless the Crown has previously granted its licence for such deliberations. It had been already provided during this period by 8 Henry VI..c. 1, that the prelates and other clergy, with their servants and attendants, when called to the Convocation pursuant to the king's writ, should enjoy the same liberty and defence in coming, tarrying, and returning as the magnates and the commons of the realm enjoy when summoned to the king's Parliament.

The Second period, which dates from 1533 to 1664, has been distinguished by four important assemblies of the spirituality of the realm in pursuance of a royal cio two first of which occurred in the reign of dward VI., the third in the reign of Queen Elizabcth, and the fourth in the reignof Charles II. The two earliest

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of these Convocations were summoned to complete the work of the reformation of the Church of England, which had been commenced by Henry VIIL. ; the third was called together to reconstruct that work, which had been marred on the accession of Mary, the consort of Philip II. of Spain; whilst the fourth was summoted to re-establish the Church of England, the framework of which had been demolished during the great rebellion. On all of these occasions the Convocations worked hand in hand

with the Parliament of the realm under a licence and with the assent of the Crown. Meanwhile the Convocation of 1603 had framed a body of canons for the governance. of the clergy. Another Convocation requires a passing notice, in which certain canons were drawn up in 1640, but by reason of au irregularity in the proceedings of this: Convocation (chiefly, on the ground that its sessions were continued for some time after the Parliament of the realm had been dissolved), its canons are not held to have any binding obligation on the clergy. 'The Convocations had up to this time maintained their liberty of voting the subsidies of the clergy in the form of " benevolences," separate and apart from the " aids" granted by the laity in Parliament, and one of the objections taken to the pro-: ceedings of the Convocation of 1640 was that it had con- tinued to sit and to vote its subsidies to the Crown after the Parliament itself had been dissolved. It is not, there- fore, surprising on the restoration of the monarchy in 1661 that the spirituality was not anxious to retain thc liberty of taxing itself apart from the laity, seeing that its ancient liberty was likely to prove of questionable advantage to it. It voted, however, a benevolence to the Crown on tho occasion of its first assembling in 166] after the restoration of King Charles If., and it continued so to do until 1664,

when an arrangement was made between Archbishop Sheldou Sheldonian and Lord Chaneellor Hyde, under which the spirituality compact.

silently waived its long asserted right of voting its own subsidies to the Crown, and submitted itself thencefortli to be assessed to the "aids " directly granted to the Crown by Parliament. An Act was accordingly passed by the Parliament in the following year (16 and 17 Car. IT. ¢. 1), entitled An Act to grant a Royal Aid unto the King's Majesty, to which aid the clergy were assessed by the commissioners named in the statute without any objec- being raised on their part or belialf,! there being a proviso that in so contributing the clergy should be relieved of the liability to pay two subsidies out of four, which had been voted by them in the Convocation of a previous year. There was also a further proviso inserted in the same Act, that " nothing therein contained shall be drawn into ex- ample to the prejudice of the ancieut rights belonging to the lords spiritual and temporal, or clergy of this realm, &c.," which Mr Hallara considers to be a saving of the rights of the clergy to tax themselves, if they think fit (Constitutional

History, ed. 1842, ii, p. 395). But the spirituality has never reasserted its ancient liberty of self- taxation. In consequence of this practical renunciation of their separate status, as regards their liability to taxation, the clergy have assumed and enjoyed in common with the laity the right of voting at the election of members of the House of Commons, in virtue of their ecclesiastical freeholds, and this right has been recognized by subsequent statutes, such for instance as 10 Anne c. 23, and 18 George II. c. 18. According to a note of Speaker Onslow's, appended to Burnet's Llistory of his Own Times (Oxford ed. vol. iv. p. 308), the matter was first settled by a private agreement between Sheldon and Clarendon, and tacitly assented to by

1Tt had always been the practice, when the clergy voted their sub- sidies in their Convocation, for Parliament to authorize the collec- tion of each subsidy by the same commissioners who collected the Parliamentary aid.

Revision of

Prayer Book.

Third period.

Claim of Lower House to sit inde- ~ pendently.

18.

the clergy. Onslow says, "Gibson, bishop of London, said to me that it was the greatest alteration in the constitution ever made without an express law."

The most important and the last work of the Couvocation during this second period of its activity was the revision of the Book of Common Prayer, which was completed in thie latter part of 1661. The revised book, after it had been sanctioned by the Convocation of the province of York, was presented to the Crown for its approval. The Crown having approved the book, sent it forthwith to the Upper House of Parliament, with a recommendation that the book, as reviewed by the Convocation, should be appointed by an Act of Uniformity ; aud accordingly the two Houses of Parliament after a

conference accepted the revised book, and enacted that it should be the book which should be appointed to be used in all places of public worship in the realm. It was believed for some considerable time that the original book which had been attached to the Act of Uniformity on this occasion had been lost from the archives of the House of Lords, It was, indeed, missing for some time, but in consequeuce of a more careful search having been instituted in 1870 by Dr A. P. Stanley, the dean of Westminster, the original book has been discovered detached from the Act of Uniformity in the library of the House of Lords, and a fac-simile of the book with the MS. revision was made under the authority of the lords of the treasury for the use of the royal comniissiouers on ritual in 1871.

The Revolution in 1688 is the most important epocli in the third period of the history of the synodical pro- ceedings of the spirituality, when the Convocation of Canterbury, having met in 1689 in pursuance of a royal writ, obtained a licence under the great seal, to prepare certain alterations in the liturgy and in the canons, and to deliberate on the reformation of the ecclesiastical courts. A feeling, however, of panic seems to have come over the Lower House, which took up a position of violent antagonism to the Upper House. This circumstance led to the prorogation of the Convocation and to its subsequent discharge without any practical fruit resulting from the king's licence. Ten years elapsed during which the Con- vocation was prorogued from time to time without any meeting of its members for business being allowed. The next Convocation which was permitted to meet for business, in 1700, was marked by great turbulence and insubordina- tion on the part of the members of the Lower Honse, who refused to recognize the authority of the arclibishop to prorogue their sessions. This controversy was kept up until the discharge of the Convocation took place con- currently with the dissolution of the Parliament in the autumn of that year. The proceedings of the Lower House in this Convocation were disfigured by excesses which were clearly violations of the constitutional order of the Convocation. The Lower House refused to take notice of the archbishop's schedule of prorogation, and adjourned itself by its own authority, and upon the demise of the Crown it disputed the fact of its sessions having expired, and as Parliament was to continue for a short time, prayed that its sessions might be continued as a part of the Parliament under the "pramunientes" clause. The next Couvocation was summoned in the first year of Queen Anne, when the Lower House, under the leadership of Dean Aldrich, its prolocutor, challenged the ri ght of the archbishop to prorogue it, and presented a petition to the queen, praying Her Majesty to call the question into her own presence. The question was thereupon exainined by the Queen's Cou acil, whea the right of the president to prorogue both Houses of Convocation by a schedule of prorogation was held to be proved, and further, that it could not be altered except by an Act of Parliament. This decision of

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the Queen's Council is of great importance in its bearing upon the constitution of the Convocation as a part of ie body politic of the realm, and is in striking contrast to a legal opinion which was circulated in print in 1855 with the names of two eminent lawyers subscribed to it, to the effect that the Convocation has the power of altering its own constitution, provided only that it has the licence of the Crown to make a canon to that effect, and such canon is subsequently approved by the Crown. During the remaining years of the reign of Queen Anne the two Houses of Convocation were engaged cither in internecine strife, or in censuring sermons or books, as teaching latitudinarian or heretical doctrines ; and, when it had been assembled concurrently with Parliament on the accession of King George 1., a great breach was before long created between the two Houses by the Bangorian controversy. Dr Toadly, bishop of Bangor, having preached a sermon before the Bangor: king, in the Royal Chapel at St James's Palace in 1717, coutro against the principles and practice of the non-jurors, which "at had been printed by the king's command, the Lower House, which was offended by the sermon and had also been offended by a treatise on the same subject published by Dr Hoadly in the previous year, lost no time in representing the sermon to the Upper House, and in calling for its con. demnation, A controversy thereupon arose between the two Houses which was kept up with untiring energy by ths Lower House, until the Convocation was prorogued in 1717 in pursuance of a royal writ; from which time until 1861 uo licence from the Crown to proceed to business. During this period, which may be regarded as the fourth distinguishing period in the history Fourth of the Convocations of the Church of England, it was usual period, for a few members of the Convocation to meet when first sunuuoned with every new Parliament, in pursuance of the royal writ, for the Lower House to elect a prolocutor, and for both Houses to vote an address to the Crown, after which the Convocation was prorogued from time to time, pursuant to royal writs, the Parliament several occasions between 1717 and 1741 when the Con- vocation of the province of Canterbury transacted certain

licence from the Crown, and there was 4 session of 1741 when there was a probability of its being allowed to resume its deliberative functions, as the Lower

prorogation; but the Lower House having declined to receive a communication from the Upper House, the Convocation

its long repose in 1852, and on this occasion

has been granted to Convocation

and ultimately discharged when

was dissolved. There were, however,

way of consultation, which did not require any

niatters, by short period in its

House had consented to obey the president's schedule of

was forthwith prorogued, from which time until the middle of the preseut century the Convocation was not per mitted by the Crown to enjoy any opportunity even for consultation. The spirituality at last aroused itself from the Upper House took the lead. The active spirit of the movement Fifth was Samuel, bishop of Oxford, but the master mind was?" Henry, bishop of Exeter. On the Convocation assembling several petitions were presented to both Houses, praying them to take steps to procure from the Crown the neces sary licence for their meeting for the despatch of business, and an address to the Upper House was brought up frora the Lower House, calling the attention of the Upper House to the reasonableness of the prayer of the various petitions. After some discussion the Upper House, influenced mainly by the argument of Ienry, bishop of I:xeter, consented to. receive the address of the Lower House, and the Convocation was thereupon prorogued, shortly after which it was dis- charged concurrently with the dissolution of Parliament. On the assembling of the next Convocation of the province cf Canterbury, no royal writ of exonerativn having been cent by the Crown to the nictropolitan, the sessions of the

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Convocation were continued for several days ; and from this time forth Convocation may be considered to have resumed its action asa consultative body, whilst it has also been permitted on more than one occasion to exercise its functions as a deliberative body. Its first action as a deliberative body commenced in 1861, in pursuance of a licence from the Crown granted to it upon its prayer, to amend the twenty- ninth of the canons of 1603 on the subject of sponsors at baptism. Its deliberations, however, on this subject have not yet been brought to a final conclusion. Both Houses came to an agreement as to the form of a canon to be substituted in place of the existing canon, and the Convoca- tion of the province of York having consented to the amended canon, it was submitted to the Crown for its approval pursuant to the terms of the royal licence, under which the new canon could only acquire the validity of law by its confirmation under letters patent of the Crown. On this occasion, however, the new canon appeared to Her Majesty's Government to exceed in its terms the royal licence, and to be likely to cause greater perplexity to the clergy than the existing canon. It was accordingly sent back to the Convocation in 1865 for further amendnient. The Upper House thereupon made a further amendment in the proposed form of canon, and sent it down to the Lower House for its concurrence, but the Lower House, in the Convocation of 1867, resolved to defer the consideration of the further amendment of the canon, until a committee, which has been appointed to consider the whole body of the canons of 1603 shall have made its report. This is a proceeding which cannot be considered of good augury to the Convocation as a deliberative body, seeing that the licence of the Crown to amend the particular canon was granted to Convocation at its own request. The proceed- ings of the Convocation on the second occasion have been of more favourable augnry. A royal licence was granted to the Convocation of 1865 in response to an address on its part to the Crown, authorizing it to make a new canon in the place of the thirty-sixth, and to amend the thirty- seventh and the thirty-eighth canons so as to be in harmony with the new canon, and also to amend the fortieth canon ; and certain alterations and amendments in those canons having been accordingly made by the Convocation of the province of Canterbury; and agreed to by the Convocation of the province of York under a similar licence from the Crown, the royal assent was given to the amended canons in the Convocation of 1866. On this occasion the Convocations acted with

becoming promptness and decision, as there was a pressing emergency for their co-operation with the Parliament in relieving the clergy from certain subscriptions and oaths, and in altering the forms of declarations to be made by them on their admission to office or benefice (28 and 29 Vict. c. 122.) With regard to the twenty-ninth canon there was no corresponding emergency, and it may be said of it, as of other canons Which have been abrogated by custom—' ubi consuetudo loquitur, lex manet sopita." It appears, however, that the report of the committee of the Lower House on the subject of an amended code of canons ecclesiastical was laid on the table of the Upper House in the session of 1874, but no

further action has been taken upon it. " The order of convening the Convocation of the province of Canter- ury 18 as follows. A writ issues from the Crown, addressed to the metropolitan archbishop of Canterbury, commanding him 'by Teason of certain difficult and urgent affairs concerning us, the secu- nity and defence of our Church of England, and the peace and tran- quillity, public good, and defence of our kingdom and our subjects of thesame, to cal] together with all convenient speed, and in lawful of Aa ao bishops of the province of Canterbury, and deans colleges, Raa ia i pee as ee ons, chapters and g 'very diocese of the said province, to

Li the said metropolitan in the cathedral church of St » London, on a certain day, or elsewhere, as shall seem most

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expedient, to treat of, agree to, and conclude upon the premises and other things, which to them shall then at the same place be more clearly explained on our behalf." In case the metropolitical see of Canterbury should be vacant, the writ of the Crown is addressed to the dean and chapter of the metropolitical church of Canterbury in similar terms, as being the guardians of the spiritualities of the see during a vacancy. Thereupon the metropolitan, or as the case may be, the dean and chapter of the metropolitical church, issue a mandate to the bishop of London, as dean of the province, and if the bishopric of London should be vacant, then to the bishop of Winchester as subdean, which embodies the royal writ, and directs the bishop to cause all the bishops of the province to be cited, and through them the deans of the cathedral and collegiate churches, and the

~~*archdeacons and other dignitaries of churches, and each chapter by one, and the clergy of each diocese by two sufficient proctors, to appear before the metropolitan or his commissary, or, as the case may be, before the dean and chapter of the metropoliti- cal church or their commissary, in the chapter-house of the cathe- dral church of St Paul, London, if that place be named in the mandate, or elsewhere, with continuation and prorogation of days next following, if that should be necessary, to treat upon arduous and weighty affairs, which shall concern the state and welfare, public good, and defence of this kingdom and the subjects thereof, to be then and there seriously laid before them, and to give their good counsel and assistance on the said affairs, and to consent to such things as shall happen to be wholesomely ordered and ap- pointed by their common advisement, for the honour of God and the good of the church.*~~

~~*The provincial dean, or the subdean, as the case may be, there- upon issues a citation to the several bishops of the province, which embodies the mandate of the metropolitan or of the dean and chap- ter of the metropolitical church, as the case may be, and admonishes them to appear, and to cite and admonish their clergy, as specified in the metropolitical mandate, to appear at the time and place mentioned in the mandate. The bishops thereupon either summon directly the clergy of their respective dioceses to appear before them or their commissaries to elect two proctors, or they send a citation to their archdeacons, according to the custom of the diocese, direct- ing them to summon the clergy of their respective archdeaconries to elect a proctor. The practice of each diocese in this matter is the law of the Convocation, and the practice varies indefinitely as regards the election of proctors to represent the beneficed clergy. As regards the deans, the bishops 'send special writs to them to appear in person, and to cause their chapters to appear severally by one proctor, Writs also go to every archdeacon, and on the day named in the royal writ, which is always the day next following that named in the writ to summon the Parliament, the Convocation assembles in the place named.in the archbishop's mandate. There- upon, after the Litany has been sung or said, and a Latin sermon preached by a preacher appointed by the metropolitan, the clergy are preconized or summoned by name to appear before the metro- politan or his commissary ; after which the clergy of the Lower House are directed to withdrawand elect a prolocutor, to be presented to the metropolitan for his*~~

approbation. The Convocation thus constituted resolves itself at its next meeting into two Houses, and it is in a fit state to proceed to business. The regular forms of pro- ceeding have been carefully kept up in the Convocation of the pro- vince of Canterbury, which consists of 20 bishops, exclusive of the inetropolitan, 24 deans, 56 archdeacons, 23 proctors for the chapter clergy, and 42 proctors for the beneficed clergy.

On the other hand, the proceedings of the Convocation of the province of York have been less regular, and no prolocutor of the Lower\House of the Convocation appears to have been appointed since 1661, until the recent resuscitation of the Convocation as a consul- tative body. Its constitution differs slightly from that of the Con- vocation of the province of Canterbury, as each archdeaconry is re- presented by two proctors, precisely as in Parliament formerly under the Premunientes clause. It consists of 6 bishops, including the bishop of Sodor and Man and exclusive of the metropolitan, 6 deans, 15 archdeacons, 6 proctors of the chapter clergy, and 30 proctors for the beneficed clergy. There are some anomalies in the diocesan returns of the two Convocations, but in all such matters the consuetudo of the diocese is the governing rule.

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Archbishop to continue or prorogue the whole Convocation, 4to, 1701 ; Kennet, The Case of the Premunientes, 4to, 1701; Hooper, The Narrative of the Lower House vindicated from the Exceptions of a Letter, intituled The Right of the

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1787, was a grandson of Bishop Conybeare. He received his early education at Westminster School, and in 1805 went to Christ Church College, Oxford, where in 1808 he took his degree of B.A., as first-class in classics and second in mathematics, and that of M.A. three years later. Early attracted to the study of geology, he became one of the frst members of the Geological Society, of which he was afterwards fellow, and to,whose Transactions he contributed many important memoirs. His first paper was com- municated in 1814. In his researches he was often associated with Buckland and Phillips. In 1821 he distin- guished himself greatly by the first discovery and deserip- tion of a skeleton of the plesiosaurus,—his account (partly conjectural reconstruction) being minutely confirmed by subsequent discoveries. Among his most important memoirs is that on the south-western coal district of England, written in conjunction with Dr Buckland, and published in 1824. His principal work, however, is the Outlines of the Geology of England and Wales, written in co-operation with W. Philips, and forming at the time of its appearance (1822) the best manual on the subject. Conybeare was a fellow of the Royal Society and a corres- ponding member of the Institute of France. He was appointed Bampton Lecturer in 1839, and was instituted to the deanery of Llandaff in 1845. The loss of his eldest son, W. J. Conybeare, joint author with Mr Howson of the Life and Letters of St Paul, preyed on his mind and hastened his end. He died at Itchenstoke, near Portsmouth, a few months after his son, August 12, leon.

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~~CONWAY, or ABERCONWAY, @ town of Carnarvonshire, in North Wales, at the mouth of the Conway, four miles gouth of Llandudno and forty-five miles west of Chester by railway. It is situated on the western bank of the river, and is inclosed by a lofty wall, which approaches the form 'of 'a triangle, and is a mile in circumference. The style of this ancient and highly interesting wall is Saracenic; it is fenced with twenty-one round towers, now somewhat dilapidated, and entered by three principal gateways with two strong towers. The south-eastern angle is occupied by the castle, one of the noblest of the old fortresses in England. It was built in 1284 by Edward I. to secure his possession of North Wales, and was the residence of Richard II. in 1389, During the war of the Commonwealth it was held for Charles I. by Archbishop Williams, but was taken by General Mytton in 1646. In the following reign it was dismantled by its new proprietor Earl Conway, and remains a ruin. The building is oblong in form; it is strengthened with eight massive drum towers ; and part of the interior is occupied by a great hall,~~

~~*known as Llewelyn's, 130 feet long. The town contains some curious old houses of the Elizabethan period, a town-hall where the petty sessions are held, and St Mary's Church. The Parliamentary borough of Conway (which with Carnarvon and four others returns in conjunc- tion a member to Parliament) extends beyond the walls of the town, and over to the right bank of the river, occupy- ing a total area of 3312 acres. Population of town, 1862 ; of borough, 2620.*~~

~~*CONYBEARE, Jonn (1692-1755), a learned English divine, was born at Pinhoe, near Exeter, January 31, 1692. At the age of sixteen he entered Exeter College, Oxford, of which he was elected in 1710 probationary fellow. He graduated B.A. in 1713, and M.A. in 1716, and in the latter year was ordained priest. After holding a country curacy for about a year he returned to Oxford, and became tutor in his college. Ere long he made himself favourably known by the publication of two well-reasoned sermons, on "Miracles," and on the " Mysteries of the Christian Religion," and was appointed one of the preachers to the king at Whitehall. He took his degree of D.D. in January 1729, and in 1730 he was chosen master of Exeter College. By this time he had increased his reputation by several additional sermons, and in 1732 he published his great work, A Defence of Revealed Religion. This was written in reply to Matthew Tindal's Christianity as Old as the Creation, which had appeared two years before. It became very popular, and reached a third edition in 1733. It was characterized by Bishop Warburton as one of the best reasoned books in the world. Soon after its publication Conybeare was appointed dean of Christ Church, Oxford, and this post he held till 1750, when he succeeded Dr Butler in the see of Bristol. He died at Bath, July 18,1755. A selection of his sermons, in two volumes, was published after his death.*~~

~~*CONYBEARE, Witi1am DaNIEL (1787-1857), dean of Llandaff, an eminent geologist, born in London, June 7,*~~

~~*navigator, was born on October 28, 1728, at the village of Marton, Yorkshire, where his father was first an agricul- tural labourer and then a farm bailiff. At thirteen years of age he was apprenticed to a haberdasher at Straiths, near Whitby, but having quarrelled with lis master, he went as an*~~

~~apprentice on board a collier belonging to the port, and was soon afterwards appointed mate.~~

~~Having distinguished himself, he was, on the recommen: dation of Sir Hugh Palliser, his commander, appointed master successively of the sloop " Grampus," of the~~

~~served in the St Lawrence, and was present at the capture of Quebec. He was employed also in sounding and surveying the river, and he published a chart of the channel from Quebec to the sea. In 1762 he was present at the recapture of Newfoundland ; early in the following year he was employed in surveying the coasts of Newfoundland; and in 1764 he was appointed marine surveyor of New- foundland and Labrador. While in this capacity, Cook~~

~~COOK, Caprain James (17 28-1779), the celebrated~~

~~Early in the year 1755 Cook joined the royal navy.~~

~~" Garland," and the " Mercury," in the last of which he~~

~~published in the Philosophical Transactions an observation of a solar eclipse made at one of the Burgeo Islands, near Cape Ray, which added considerably to his reputation. About this time the spirit for geographical discovery, which had gradually declined since the beginning of the 17th century, began to revive ; and Cook was appointed to conduct an expedition which was then projected for the purpose of making observations on the impending transit of Venus, and prosecuting geographical researches in the South Pacific Ocean. For this purpose he received a coll mission as lieutenant, and set sail in the " Endeavour," 2 vessel of 370 tons, accompanied by several nen of science, including Sir Joseph Banks. On the 13th April 1769 he reached Otaheite or Tahiti, where he erected an observatory, and succeeded in making the necessary astronomica Sbservations. From Otaheite Cook sailed im quest of the great continent then supposed to exist in the South Pacific, and reached the islands of New Zealand, which had remained a terra incognita since the time of their first dis covery. His attempts to penetrate to the interior, however.~~

~~were thwarted by the continued hostility of the natives ; and he had to content himself with a voyage of six months' duration round the coast, in which he traced the existence of a narrow channel dividing New Zealand into two large islands. From New Zealand he proceeded to Australia (then called New Holland), and on April 28 came in sight of Botany Bay. On account of the hostility of the natives his discoveries here also were confined to the coast, of which he took possession in the name of Great Britain. The prosecution of this voyage was attended with dangers which, on several occasions, threatened the entire loss of the ship and crew. From Australia Cook sailed to New Guinea, and thence to Batavia, where his ship, greatly shattered and disabled, had to put in for repairs.~~

~~Arriving in England, on June 11, 1771, Cook was imme- diately raised by the king to the rank of captain. Shortly after his return, the existence of a great southern continent began to be matter of renewed speculation, and Cook was again appointed to lead an exploratory expedition. For this purpose he was placed in command of the " Resolution," a ship of 462 tons burden, and a smaller ship called the " Adventure," with a complement in all of 193 men. Setting sail from Plymouth, July 13, 1772, he reached Madeira on the 29th of the same month, and after touch- ing at the Cape of Good Hope, he explored the specified latitudes, but without discovering land. Satisfied that no Jand existed within the limits of his researches, he abandoned the investigation on the 17th January 1773, and sailed for New Zealand. After wintering among the Society Islands, he set out to make further explorations to the eastward ; and afterwards, steering northward, he navigated the southern tropic from Easter Island to the New Hebrides, and discovered the island named by him New Caledonia. After a third attempt he gave up all hope of finding land, and returned to England (July 30, 1774). He was immediately raised to the rank of post-captain, appointed captain of Greenwich Hospital, and soon afterwards unani- mously elected a member of the Royal Society, from which he received the Copley gold medal for the best experi- mental paper which had appeared during the year.~~

The attention of Government having been turned to the discovery of a north-west passage in the Arctic regions, Cook volunteered to conduct the expedition, and his offer was gladly accepted. 'Two ships, the " Resolution" and the " Discovery," were speedily equipped and placed under his care. Cook's instructions were to sail first into the Pacific through the chain of the newly discovered islands which he had recently visited, and on reaching New Albion to proceed northward as far as latitude 65° and then to endeavour to find a passage to the Atlantic. Several ships were at the same time fitted out to attempt a passage on the other side from the Atlantic to the Pacific Ocean. Setting sail from the Nore, June 25, 1776, he cruised for a considerable time in the South Pacific, dis- covering several small islands; and in the spring of 1777, judging it too far advanced in the season for attempt- ing the navigation of the northern seas, he bore away to the Friendly Islands. Here he continued for several months, and only set sail for the north in J anuary 1778. On his passage from the Friendly Islands, he discovered a group which he named the Sandwich Islands, after the earl of Sandwich, who had taken great interest in the expedition. After circumnavigating these, and laying down their posi- tion on a chart, Cook reached the coast of America in March 1778; and following the coast-line northward, penetrated into the bay afterwards known as Cook's Inlet. Disappointed of @ passage in this direction, he sailed for Behring's Straits, where again he found the passage inter- cepted by an impenetrable wall of ice. Returning to winter at the Sandwich Islands, he discovered Mowee (Maui)

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and Owhyhee or Hawaii, where he met his tragical death. During the night of the 13th February 1779, one of the '" Discovery's" boats was stolen by the natives ; and Cook, in order to recover it, proceeded to put in force his usual expedient of seizing the person of the king until reparation should be made. Having landed on the following day, a scuffle ensued with the natives, which compelled the party of marines who attended him to retreat to their boats. Cook was the last to retire ; and as he was nearing the shore he received a blow from behind which felled him to the ground. He rose immediately, and vigorously resisted the crowds that pressed upon him ; but

~~as the boats' crews were able to render him no assistance, he was soon over- powered (14th February 1779).~~

~~As a navigator, the merits of Captain Cook were of the very highest order. His commanding personal presence, his sagacity, decision, and perseverance enabled him to overcome all difficulties ; while his humanity and sym- pathetic kindness rendered him a favourite with his crews. HIs valuable researches into the nature and use of anti- scorbutic medicines proved of the greatest utility. The account of his first voyage was published under the care of Dr Hawkesworth, but his second was chronicled directly by himself. A narrative of his third voyage was published from his notes, by Lieutenant King. Distinguished honours were paid to his memory both at home and by foreign courts ; and a suitable pension was settled upon his widow.~~

~~COOK'S ISLANDS, or the Hervey ARCHIPELAGO, a considerable cluster of islands in the South Pacific, lying between the Friendly Islands and the Society Islands, in 160° W. long. and about 20°S. lat. They were discovered by Captain Cook in 1777, and in 1823 became the scene of the remarkable missionary labours of John Williams. The most important members of the group, which has a total area. of about 300 square miles, are Mangeia, Raratonga, Aitutake, and Atiu. They are almost destitute of drinking water ; but abound in cocoa-palmns, bread-fruit trees, and plantains. The inhabitants belong to the Malay race, and display great industry and skill in various manufactures. Their houses are well built, and have a pleasant appearance with their white walls of coral lime. The population of Raratonga is estimated at 2000, of Mangeia at 2300, of Aitutake at 1550, and of Atiu at 1200 or 1500. ;~~

~~COOKERY. In the condition in which man finds most of the natural substances used as food they are difficult of digestion. By the application of heat he can change the character of his food, and make it more palatable and more easily digestible. The application of heat to animal and vegetable substances for the purpose of attaining these objects constitutes the science and art of cookery. In- numerable discussions have taken place among scientific men as to the natural food of man. Too much importance is,~~

perhaps, attached to meat, but it is now generally accepted that a mixed animal and vegetable diet is best.

If we take a comnion vegetable food, such for instauce as the potato, we find that in 1000 parts we have 760 of water, 200 parts of starch, and some mineral salts and albu- minous compounds. In cooking the starch cells absorb water, 'and the greater number of them burst. This disin- tegration of the starch cells is preparatory and necessary to more important changes. The starch in all vegetable substances must undergo a similar change before it can mix with the various fluids developed in the mouth and the walls of the alimentary canal. Some of these fluids, such as the saliva and pancreatic fluid, change the starch into dextrin and then into glucose or grape sugar, and this change appears necessary before the carbon and hydrogen can be oxidized. Without the preliminary operation of cooking this change would in all cases be imperfect and often im- possible ; and the thorough cooking of all starchy foods is

oxygen of the surrounding air. The empyreumatic oils generated on the surface are neither wholesome nor agreeable, and these are perhaps better removed by roasting than any other method except broiling. The chief object 's to retain as much as possible all the sapid juicy proper- ties of the meat, so that at the first cut the gravy flows out of a rich reddish colour, and this can only be accomplished by a quick coagulation of the surface albumen. The time for roasting varies slightly with the kind of meat and the size of the joint. Asa rule beef and mutton require a quarter of an hour to the pound; veal and pork about 17 minutes to the pound. To tell whether the joint is done, press the fleshy part with a spoon ; if the meat yield easily it is done. With poultry or game the flesh of the leg may be tried in thc same way. Some attach importance to occasional jcts of steam drawing to the fire. Roasting, when well done (and the way to do it can only be learned by careful practice), is a wholesome method of cooking. Baking meat is in many respects objectionable, and should never be done if any other method is available. The gradual disuse of open grates for roasting has led to a practice of first baking and then browning before the fire, This method completely reverses the true order of cooking by beginning with the lowest

temperature and finishing with the highest. Baked meat has never the delicate flavour of roast meat, nor is it so digestible. The vapours given off by the charring of the surface cannot freely escape, and the meat is cooked in an atmosphere charged with empyreumatic oil. A brick or earthenware oven is prefer- able to iron, because the porous nature of the bricks absorbs a good deal of the vapour. When potatoes are baked with meat, they should always be first parboiled, because they take a longer time to bake, and the moisture rising from the potatocs retards the process of baking, and makes the meat sodden. A baked meat pie, though not always very digestible, is far less objectionable than plain baked meat. In the case of a meat pie the surfaces of the meat are pre- tected by a bad conductor of heat from that charring of the surface which generates empyreumatic vapours, and the fat and gravy, gradually rising in temperature, assist the cooking, and such cooking more nearly resembles stew- ing than baking. The process may go on for a long time after the removal of the meat from the oven, if surrounded with flannel, or some bad conductor of heat. The Cornish pasty is the best example of this kind of cooking. Meat, fish, game, parboiled vegetables, apples, or anything that fancy suggests, are surrounded with a thick flour and water crust and slowly baked. When removed from the oven, and packed in layers of flannel, the pastry will keep hot for hours. When baked dishes contain eggs, it should be remembcred that the albumen becomes harder and more insoluble, according to the time occupied in cooking. About the same time is required for baking as roasting. Boiling is one of the easiest methods of cooking, but a successful result depends on a number of conditions which, though they appear trifling, are nevertheless necessary. The fire must be watched so as properly to regulate the heat. The saucepan should be scrupulously clean and have a closely-fitting lid, and be large enough to hold sufficient water to well cover and surround the meat, and all scum should be removed as it comes to the surface ; the addition of small quantities of cold water will assist the rising of the scum. For all cooking purposes clean rain water is to be preferred. Among cooks a great difference of opimol exists as to whether meat should be put into cold water and gradually brought to the boiling point, or shoul be put into boiling water. This, like many other unsettled questions in cookery, is best decided by careful scientine experiment and observation. If a piece of meat be put into water at a temperature of 60°, and gradually

of the utmost importance. When this is imperfectly done the albuminoid envelope which incloses the starch granule has to be dissolved by the gastric juice, which is often difficult and even impossible. Much indigestion probably arises from the imperfect cooking of starchy foods. ;

The chief constituents of animal food are albumen, fibrin, and fat, with mineral salts and juices. The flavour of meat is due to the osmazone, and some methods of cooking, such as roasting and broiling, appear to increase this flavour. Albumen and fibrin form about one-fifth of the meat. The former always coagulates by heat, and the expansion of the juices tends to separate the solid fibres, and this separation depends very much on the methods of cooking. Albumen is as constant a constituent of all animal food as starch is of vegetable, but these bodies differ greatly in their chemical composition and in the changes which they undergo in the stomach. Albumen is taken into the system as an insoluble substance, but in contact with the gastric fluid it becomes soluble—a condition necessary for every kind of food before it can nourish the body.

Broiling.—The earliest method of cuoking was probably

burying seeds and flesh in hot ashes, a kind of broiling on all the surfaces at the same time, which when properly done is the most delicate kind of cooking. Broiling is now done over a clear uniform charcoal fire extending at least 2 inches beyond the edges of the gridiron, which should slightly incline towards the cook. It is usual to rub the bars with 'a piece of suet for meat, and chalk for fish, to prevent the thing broiled being marked with the bars of the gridiron. Tn this kind of cookery the object is to coagulate as quickly as possible all the albumen on the surface, and seal up the pores of the meat soas to keep in all the juices aud flavour. Tt is, therefore, necessary to thoroughly warm the gridiron before putting on the meat, or the heat of the fire is con- ducted away while the juices and flavour of the neat run into the fire. roiling isa simple kind of cookery, and one well suited to invalids and persons of delicate appetites. There is no other way in which small quantities of meat can be so well and so quickly cooked, and for persons who dine alone it is the most convenient method of cookery. Broiling cannot be well done in front of an open fire, because one side of the meat is

exposed to a current of cold air. A pair of tongs should be used instead of a fork for turning all broiled meat and fish.

Roasting.—Two conditions are necessary for good roasting—a clear bright fire and frequent basting. Next to boiling or stewing it is the most economical method of cooking. The meat at first should be placed close to a brisk fire for five minutes to coagulate the albumen. It should then be drawn back a short distance and roasted slowly. Tf a meat screen be used it should be placed before the fire to be moderately heated before the meat is put to roast. The centre of gravity of the fire should be a little above the centre of gravity of the joint. No kitchen can be com- plete without an open range, for it is almost impossible to have a properly roasted joint in closed kitcheners. The heat radiated from a good open fire quickly coagulates the albumen on the surface, and thus to a large extent prevents that which is fluid in the interior from solidifying. The con- nective tissue which unites the fibres is gradually converted into gelatine, and rendered easily soluble. The fiorin and albumen appear to undergo a higher oxidation and are more readily dissolved. The fat cells are gradually broken, and the liquid fat unites to a small extent with the chloride of sodium and the tribasic phosphate of sodium contained in the serum of the blood. It is easily seen that roasting by coagulating the external albumen keeps together the most valuable parts of the meat, till they have gradually and slowly undergone the desired change. Tus surface coagu- lation is not sufficient to prevent the free access of the

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yaised to 212°, the meat is undergoing a gradual loss of its soluble and nutritious properties, which are dissolved in the ater. From the surface to the interior the albumen is a lly dissolved out of the meat, the fibres become hard ec and the thinner the piece of meat the greater the loss of all those sapid constituents which make boiled meat savoury, juicy, and palatable. To put meat into cold water is clearly the best method for making soups and broth ; it is the F'vench method of preparing the pot au feu ; put the meat at the end of the operation has lost much of that juicy sapid property which makes boiled meat so acceptable. 'The practice of soaking fresh meat in cold water before cooking is for the same reasons highly objectionable ; if necessary, wipe it with a clean cloth. But in the case of salted, smoked, and

dried meats soaking for several hours is indispensable, and the water should be occasionally changed. The other method of boiling meat has the authority of the late Baron Liebig, who recommends | putting the meat into water when in a state of ebullition, and after five minutes the saucepan is to be drawn aside, and the contents kept at a temperature of 162° (50° below boiling). 'The effect of boiling water is to coagulate the albumen on the surface of the neat, which prevents, but not entirely, the juices passing into the water, and meat thus boiled has more flavour and has lost much less in weight. To obtain well-flavoured boiled meat the idea of 'soups or broth must be a secondary consideration. It is, however, impossible to cook a piece of meat in water without extracting some of its juices and nutriment, and the liquor should in both cases be made into a soup. Stewing.—When meat is slowly cooked in a close vessel it is said to be stewed; this method is generally adopted in the preparation of made dishes. Different kinds of meat may be used, or only one kind according to taste. The better the meat the better the stew; but by carefully stewing the coarsest and roughest parts will become soft, tender, and digestible, which would not be possible by any other kind of cooking. 'The only objection to stewing is the length of time; but a dinner may be prepared in this way the day before it is required. Odd pieces of meat and trimmings and bones can often be purchased cheaply, and may be turned into good food by stewing. Bones, although containing little meat, contain from 39 to 49 per cent. of gelatine. The large bones should be broken into small pieces, and allowed to simmer till every piece is white and dry. Gelatine is largely used both in the form of jellies and soups. It is said by some authorities to be comparatively valueless as a food, but more recent investigations seem to prove that gelatine, although not of the same food value as albumen, | leaves the body as urea, and must therefore have taken part in nutrition. can meat, free from blood, is best for stewing, and, when cut into convenient pieces, it should be slightly browned in a little butter or dripping. Constant attention is necessary during this process, to prevent burning. The meat should be covered with soft water or, better, a little stock, and set aside to simmer for four or five hours, according to the nature of the material. When vegetables are used, these should also be slightly browned and added at intervals, so as not materially to lower the temperature. Stews may be thickened by the addition of pearl barley, sago, rice, potatoes, oatmeal, flour, &c., and flavoured with herbs and condiments according to taste. Although stewing is usually done in a stewpan or sauce-

pan with a closely-fitting cover, a good stone jar, with a well-fitting lid, is preferable in the homes of working people. This is better than a metal saucepan, and can be more easily kept clean ; it retains the heat longer, and can be placed in the oven or covered with hot ashes. The rommon red jar is not suitable; it does not stand the heat so well as a grey jar; and the red glaze inside often

gives way in the presence of salt. The lid of a vessel used for stewing should be removed as little as possible. An occasional shake will prevent the meat sticking. At the end of the operation all the fat should be carefully removed,

Frying.—Lard, oil, butter, or dripping may be used for

frying. There are two methods of frying,—the dry method, as in frying a pancake, and the wet method, as when the thing fried is immersed in a bath of hot fat. In the former case a frying pan is used, in the other a frying kettle or stewpan. It is usual for most things to have a wire frying basket; the things to be fried are placed in the basket and immersed at the proper temperature in the hot fat. The fat should gradually rise in temperature over a slow fire till it attains nearly 400° Fahr. Great care is required to fry properly. If the temperature is too low the things immersed in the fat are not fried, but soddened; if, on the other hand, the temperature is too high, they are charred. The temperature of the fat varies slightly with the nature of things to be fried. Fish, cutlets, croquets, rissoles, and fritters are well fried at a temperature of 380° Fahr. Potatoes, chops, aud white bait are better fried at a tem- perature of 400° Fahr. Care must be taken not to lower the temperature too much by introducing too many things. The most successful frying is when the fat rises two or three degrees during the frying. Fried things should be of a golden brown colour, crisp, and free from fat. When fat or oil has been used for fish it must be kept for fish. It is customary first to use fat for croquets, rissoles, fritters, and other delicate things, and then to take it for fish. Every thing fried in fat should be placed on bibulous paper to absorb any fat on the surfaces. (5. ©. Br)

COOLIE, or Cooty, a word applied to designate an Asiatic labourer not belonging to the skilled or artizan class. Its derivation is far from certain.

Dr Engelbert Kampfer, in his History of Japan (London, 1727), describes as "coolies" the dock labourers, or, as they are called in England, "lumpers," who unloaded the Dutch merchant ships at Nagasaki. At Canton to this day a labourer in any European factory is known as a "coolie;" and though some have thought that the word may be of Chinese origin, as a matter of fact it is through Europeans that the natives of the Celestial Empire first became acquainted with the term. Of late the word is almost exclusively used to designate those natives of India and China who leave their native country under contracts of service to work as field-hands or labourers in foreign plantations and elsewhere.

The organization, partly official and partly voluntary, by means of which these Eastern labourers are collected, engaged, and conveyed to their respective destinations, has within recent times developed itself into a regular trade. The French, Portuguese, and Spanish nations prosecute this trade to a certain extent, and one or two South American republics also take part in it; but the great bulk of the traffic is now undoubtedly British.

Coolie emigration is the direct offspring of the discon- tinuance of slavery. When slave labour was no longer available, the colonists who had used it were placed in an awkward dilemma. White men were physically incapable of field work on tropical plantations, and free negroes could not be induced to engage in it. In these circum- stances there were but two alternatives open to the planters. Either they must abandon their estates, or they must import labour from other countries than those which had been drained and devastated by the slave trade. There were many considerations that pointed to India and China as the fields most likely to yield that supply of workers on getting which the very existence of the West Indies de- pended. Those great Asiatic empires were over-peopled; their rigid forms of civilization, which had rooted them to the soil, were gradually being loosened by the impact cf

European commerce; and their reluctance to leave their native shores was removed by tempting offers made to them.

Chinese Coolies—The first public recognition of the traffic was in 1844, when the British colony of Guiana made provision for the encouragement of Chinese emigra- tion, About the same time the Peruvian planters, who since their separation from the mother country had restricted slavery within the narrowest limits, also looked to China as being likely to furnish an efficient substitute for the negro bondsman. Agents armed with consular commissions from Peru began to appear in Chinese ports, where they collected and sent away ship-loads of coolies. Each one was bound to serve the Peruvian planter to whom he might be assigned for seven or eight years, at fixed wages, generally about 17s. a month,—food, clothes, and lodging being provided. Cuba, profiting by the example of Peru, also engaged in the traffic. In 1847, therefore, two ships went from Amoy to Havana, one with 350, the other with 629 coolies on board. From 1847 to 1856 the trade went on briskly without attracting much notice. Gradually, however, ugly reports as to the treatment the coolies received, both on their voyage to and after their arrival in Peru and Cuba, began to come to Europe and Asia. Still more painful rumours were set afloat regarding the thievish devices used to induce Chinese emigrants to leave their native land. It was said they were kidnapped, or tempted to engage under false pretences. Tt was declared that the transport ships were badly equipped and overcrowded, and that on their voyages they reproduced all the horrors of the "middle passage" in the old African slave trade. Those who were safely landed in Cuba or Peru were sold by auc- tion in the open market to the highest bidders, who thus purchased them, holding them virtually as slaves for seven years instead of for life. Brutal as was the treatment to which these poor wretches were exposed on the planta- tions, it was merciful compared with that which fell to the lot of those who, contrary to their agreements, had been sent to labour in the foul guano pits of the Chincha Islands. HIere they were forced to toil in gangs, each under an over- seer, armed with a cowhide lash 5 feet long and 14 inches thick. It was claimed as a merit that up to four o'clock each afternoon this weapon " was not much used." After that hour, however, the weaker coolies had their flagging energies stimulated by cuts of the whip, and remonstrance and entreaty were "punished by a flogging little short of murder." This horrible treatment speedily aroused atten- tion ; and a memorial was presented to the British Govern- ment by shipmasters engaged in the Chincha Islands guano trade. Even the United States skippers declared they "never saw or

heard of slavery approaching that of the middle island of the Chinchas in misery." In 1860 it was calculated that of the 4000 coolies who since the traffic began had been fraudulently consigned to the guano pits of Peru, not one had survived. Some had poisoned themselves with opium ; others deliberately contrived that they should be buried alive under falling masses of guano ; many jumped off the cliffs and drowned themselves in the sea. When these atrocities came to light in 1854, the British governor of Hong Kong issued a proclamation forbidding British subjects or vessels to engage in the transport of coolies to the Chinchas. 'Technically this was wltra vires on his part, But in the following year Parliament confirmed his humane policy by passing the Chinese Passengers Act (18 and 19 Vict. c. 104), which put an end to the more abominable phase of the traffic. After that no British ship was allowed to sail on more than a week's voyage with

more than twenty coolies on board, unless her master had

complied with certain very stringent regulations.

The consequence of this was that the business of ship-

ping coolies for Peru was transferred to the Portuguese

settlement of Macao. There the Peruvian and Cuban "Jabour-agents" established depots, which they unblush- ingly called "barracoons," the very term used in the West African slave trade. In these places coolies were ' ' received," or in plain words, imprisoned and kept under close guard until a sufficient number were collected for export. Some of these were decoyed by fraudulent promises of profitable employment. Others were kidnapped by piratical junks hired to scour the neighbouring coasts. Many were bought from leaders of turbulent native factions, only too glad to sell the prisoners they captured whilst waging their internecine wars. The procurador or registrar-general of Macao went through the form of certifying the contracts ; but his in- spection was therefore practically useless. After the war of 1856-57 this masked slave trade pushed its agencies into Wampoa and Canton, In April 1859, however, the whole mercantile community of the latter port rose up in

indignation against it, and transmitted such strong re- presentations to the British embassy in China, that steps

were taken to mitigate the evil. New regulations were from time to time passed by the Portuguese authorities for

the purpose of minimizing the horrors of tle Macao trade.

They seem, however, to have been systematically evaded, and to have been practically inoperative. In 1868 the governor of Macao attempted to put in force humane regu-

lations, but without success, as was proved by the trial of a

Chinaman, Kwok-a-Sing, on the 29th of March 1871 before Chief-Justice Smale of Hong-Kong. The prisoner had been an emigrant on board the French ship "' Nouvelle Pénélope," which sailed in October 1871 from Macao with 300 coolies. They mutinied on the voyage, and killed the master and seven of the crew. Kwok-a-Sing was acquitted when tried for being an accessory to this crime. In the course of his trial, however, it was proved that though some of the mutineers were hardened criminals who had shipped as coolies merely for the purpose of raising a mutiny and plundering the ship, upwards of one-third of the emigrants on board had been kidnapped and were feloniously held in bondage. Commenting on this case, the British consul said the benevolent regulations of the Macao Government looked well on paper, but in practice they were capable of being evaded to an extent that made the coolie traffic '" simply a slave trade, and a disgrace to any Christian Government that permits its perpetration within its jurisdiction." At Canton and Hong-Kong the coolie trade was put under various regulations, which in the latter port worked well only when the profits of " head-money" were ruined. In March

1866 the representatives of the Governments of France,

England, and China drew up a convention for the regula- tion of the Canton trade, which had an unfortunate effect, It left head-money, the source of most of the abuses, com- paratively untouched. Tt enacted that every coolie

~~must at the end of a five years' engagement have his return passage-money paid to him. The West Indian colonies at~~

~~once objected to this, They wanted permanent not temporary settlers. They could not afford to burden the coolie's expensive contract with return passage-money, 8° they declined to accept emigrants on these terms. Thus a legalized coolie trade between the West Indies and China was extinguished. Indian Coolies.—With reference to the Indian coolie trade it is scarcely possible to say when it began. Before the end of last century Tamil labourers from Southern India were wont to emigrate to the Straits settlements, an they also flocked to Tenasserim from the other side of the Bay of Bengal after the conquest had produced @ demand for labour. Ceylon also obtained workers from Souther India, and the extent of the emigration may be estimated by the fact that, taking a period of ten years ending 1869, about 65,000 emigrants, of whom 50,000 were adult males,~~

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~~janded annually in the island, and some 48,000 returned each year to their homes. In 'Penang it is calculated that 25,000 souls out of a population of 150,000 are Indian coolies, It isin domestic and agricultural service that they are employed in the Straits settlements, and more recently large numbers of coolies have been induced to work in the tea-gardens of Assam. On the other hand, in Burmah, they work as dock labourers and porters. In Mauritius, again, the first regularly recorded attempt at organizing coolie emigration from India took place in 1834, when forty coolies were imported. Between 1834 and 1837 about 7000 labourers must have been shipped from Calcutta, and about 100 from Bombay, to Mauritius, but it was not till 1836 that the colonial Government determined to put the trade under official regulations. In 1837 an emi- gration law was passed for Calcutta, but it also applied to all territories of the East India Company, providing that a "permit" must be got from the Government for every shipment of coolies, that all contracts should terminate in five years, that a return passage should be guaranteed, and that the terms of his contract should be carefully explained to each coolie. As regards the emigrant ships they were allowed to carry one coolie for every ton and a half of burthen—a rule now extended to one coolie for every two tons burthen. Then as now~~

the Indian Government watched the deportation of labour from their dominions with jealous and anxious care, and when in 1838 it was found that up- wards of 25,000 natives had, up to that year, gone from all parts of India to Mauritius, the Government became a little alarmed at the dimensions the traffic was assuming. Brougham and the old anti-slavery party denounced the trade as a revival of slavery, and the Presidency Government suspended it in order to investigate its alleged abuses. The nature of these may be guessed when it is said that the inquiry condemned the fraudulent methods of recruit- ing them in vogue, and the brutal treatment coolies often received from ship captains and masters. It was not till 1842 that steps were taken to formally reopen the coolie trade between Mauritius and India. A regulating Act was passed, the most important provisus of which were the appointment of authorized emigration agents at Indian ports, and a prohibition against contracts being signed till the coolie had been forty-eight hours on shore in the colony for which he was bound. At first the term was for one year, and the wages were five rupees a mouth, food, clothing, and medical attendance being found. Return passages were also guaranteed. In 1844 coolie emigration to the West Indies was sanctioned by the Indian Government. Jamaica, Trinidad, and Demerara were permitted to import coolies under the Mauritius rules, slightly modified,—one of the most important differences being that 12 per cent. of the emigrants to the West Indies were to be women. None of the colonial codes, however, seem to have carried out this modification. In 1847 Ceylon suffered by the political accident of having a separate Government. Her supply of labour was cut off, as the Indian Government prohibited all emigration save to the West Indies and Mauritius. The unfair prohibition was withdrawn, on the Ceylon Government adopting certain protective regulations In favour of the emigrants, and ever since the coolie trade with the island has gone on pretty smoothly. In 1851 the Indian Government agreed to relieve Mauritius of the ee to provide return passages save for the destitute xin a In 1853 Lord Dalhousie's Government for ae a term qualifying the West Indian coolie me ; Tom five to ten years' service. In 1857 the date te Se al to commute the coolie's bat ie a. urn passage, by giving him its value in land ; renee anning's Government viewed the suggestion with

Jealousy, saying there must be some guarantee that

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in arranging the commutation the coolie was not swindled. In 1859 voluntary commutation was agreed to by the Indian authorities. Since then many changes have taken place, but, generally speaking, the Indian coolie trade is now regulated by two Acts—those of 1864 and 1869, of which the main provisions are as follows :—

Resident colonial emigration agents are appointed for the different ports. They appoint sub-agents or remitting parties, who must bear licences from the Protector of Emigrants at Calcutta. It is their business to beat up the country for coolies when there is a demand for them. The intending emigrants, when collected, must be taken by the agents before the resident magistrate of the district, who registers each one. A copy or certificate of registration is given to each coolie, stating particulars as to age, sex, name, caste, and former occupation. Of these documents duplicates are trans-mitted to the colonial emigration agent. When this formality has been complied with, the coolie is then sent on to the depét and examined there by the colonial agent and surgeons. Jf physically unfit for the work for which he is wanted, of course he is summarily rejected. Each coolie ship must undergo rigorous sanitary inspec- tion, and carry a surgeon, who reports on all the deaths and cases of sickness that occur during the passage. The contract which the coolie signs with the emigration agent binds him to serve not more than for 74 hours a day for five years, as an agricultural labourer, on the estate to which he may be sent by the authorities at the port of debarkation. The wage in money is to be that which from time to time is paid to unindentured labourers in the colony. (In Demerara the Indian coolie earns 1s. 2d. a day,—women about Is., and children 6d. each). The coolie also is provided with a house, garden, and medical attendance,—rations and clothing being subject to the special arrangements affecting wages; while at the end of ten years' service they are entitled to a free return passage to India.

As to the treatment 0. the coofie in the colonies wnen he arrives, of course there is much dispute. Statistics in- dicate that it cannot have been very considerate. Frora 1834 to 1872 Demerara, Trinidad, Jamaica, St Vincent, and Grenada imported 161,539 coolies, of whom 16,938 have returned

~~home, and 48,548 are dead, leaving 96,053 in those colonies. As far as official rules can protect him a great deal is done by the Govern- ment. When he lands he is subjected to an examina- tion by the immigration agent-general and an officer of health. Those not fit for agricultural labour are set aside, and those that are fit are allotted to different planta- tions in accordance with the demand made for them. Family life is respected, and children under fifteen years of age must not be parted from their parents. After their five years' indenture is ended, they are at liberty to re-engage on an independent footing, a bounty of about £11 being given to those who re-contract for another term of similar duration. How these apparently equitable provisions work became a matter of dispute in the case of Demerara and Mauritius ; and serious complaints were made in 1869 with reference to the former colony by Mr G. W. des Veeux, a stipendiary magistrate, who had spent five years in the country. Commissioners were therefore despatched to inquire into the matter. They suggested certain reforms for the purpose of guarding the indentured labourer against the possibility of ill-treatment, and the powers of the immi- gration agent-general, or protector of immigrants, were en- larged so as to enable him to inspect estates more regularly, frequently, and efficiently. The medical officers of planta- tions, too, were made civil servants, and relieved from their dependence on the planters for their salaries. The question of re-engagements was also dealt with by the reforming ordinance of 1868 in a provision enacting that the manager of every estate should, at the half-yearly visit of the agent- general, produce before him every coolie who had com- pleted his term of service, or would complete it in the course of the next six months. To each coolie in this position a certificate or a provisional certificate of exemption from labour must be handed, and not till then may the manager or any employer negotiate with him for re-indenture.~~

~~The case of Mauritius was more serious. It had long | been suspected that the colony had been indulging in course of legislation, the tendency of which, says Mr Geoghegan, the under-secretary to the department of agriculture in the Government of India, was " towards reducing the Indian labourer to a more complete state of dependence upon the planter, and towards driving him into indentures, a free labour market being both~~

directly and indirectly discouraged." In 1871, acting on a petition presented by M. Adolph de Plevitz, a resident in the colony, who loudly denounced this injustice, the governor, sir Arthur Gordon, appointed a police inquiry commission to investigate the matter ; and thereafter a royal commission was appointed at the request of the planters, and its report was presented to the Imperial Parliament in 1875. The investigation showed that the treatment experienced by the coolies was extremely unsatisfactory, and that in many respects they were too much in the power of the planters.

With reference to the treatment of the coolie in forcign colonies it is more difficult to obtain the necessary informa- tion. In Cuba the Chinese labourers were subjected to such scandalous ill-usage that the Spanish Government was forced to interfere, especially when it was found the Chinese were beginning to take part with the insurgents. In 1871 a royal decree was issued suspending the importation of evolics to the colony, and giving power to the Government to give return passages to all who had finished their contracts and were not willing to re-engage. The decree, however, has been ignored. Tt is well known that rather than enter into another contract the Chinaman will leave the island. But then the Cubans desire him to remain so that a permanent labouring class may be created.

In many of the French colonies Indian labourers are 11- ported, there being a convention between the Governments of France and India which admits of this being done. There, it is feared, the coolie is the victim of abuses and oppression which, happening as they do in foreign dominions, are not easily redressed. In Cayenne there is reason to believe tle mortality amongst the coolies who labour in the gold mines is abnormally high ; it is said that more than half the Indians imported "cannot be accounted for." In Réunion, Guadaloupe, and Murtinique they are said to be systematically over-worked ; and ac- cording to Mr Geoghegan there seems to be a disposi- tion in Réunion to prevent their having free access to the British consul when they have occasion to claim his protection. (R. WI.)

COOMASSIE, or Kumasst, the capital of Ashantee, in Guinea, West Africa, in 6° 34' 50" N. lat. and 2° 12' W. long., and 130 miles N.N.W. of Cape Coast Castle, is situ- ated on a low rocky eminence, from which it extends across a valley to the hill opposite, and occupies an area of about 14 miles

~~in length and over 34 miles in circum- ference. It lies in the midst of a thick and jungly forest, and is nearly surrounded by a pestilential swamp. The town was founded in the middle of the 18th century by Sy Tutu. Atthe time of its capture by the British (February 4, 1874) it consisted of numerous streets, some of which were broad and regular; the main avenue was 70 yards in length. The houses were painted red and white, and had alcoves and stuccoed facades. The king's palace, a hand- some building, was blown up on the destruction and evacuation of the town by Wolseley's forces (February 6). About 300 yards from the site of the palace is the grove into which the bodies of some thousand criminals and victims of the rites of Ashantee superstitions were yearly cast. Coomassie has a considerable trade with Central Africa. Bowdich estimated its population at 18,000. See ASHANTEE, Vol. ii. p. 681.~~

~~COOPER, ABRAHAM (1787-1868), an animal and battle painter, was the son of a tobacconist, and was born in London, in 1787. At the age of thirteen he became an employé at Astley's amphitheatre, and was afterwards groom in the service of Sir Henry Meux. When he was twenty-two, wishing to possess a portrait of a favourite horse under his care, he bought a manual of painting learned something of the use of oil-colours, and painted ie picture on a canvas hung against the stable wall. His master bought it and encouraged him to continue in his efforts. He accordingly began to copy prints of horses, and was introduced by Davis, the equestrian, to Benjamin Marshall, the animal painter, who took him into his studio and seems to have introduced him to the Sporting Mage cine, an illustrated periodical to which he was himself a contributor. In 1814 he exhibited his Tam O'Shanter. and in 1816 he won a prize of £100 for his Battle of Ligny. In 1817 he exhibited his Battle of Marston Moor and was made Associate of the Academy, and in 1820 he was elected Academician. He died in 1868. Cooper although ill educated, was a clever and conscientious artist : his colouring was somewhat flat and dead, but he was a skilful draughtsman and a master of equine portraiture and anatomy, and had some antiquarian knowledge. He had a special fondness for Cavalier and Roundhead work, and his best pictures are those in which he has reproduced the subjects of that period.~~

~~COOPER, AntHony AsHLEY. See SHAFTESBURY.~~

COOPER, Sir AstLEY Paston (1768-1841), 4 celebrated surgeon, was born at the village of Brooke, in Norfolk, August 23, 1768. HIs father, Dr Cooper, was a clergyman of the Church of England ; his mother was the author of several novels, At the age of sixteen he was sent to London and placed under Mr Cline, surgeon to St Thomas's Hospital. From the first he devoted him- self to the study of anatomy, and had the privilege of attending the lectures of John Hunter. In 1787 he was appointed demonstrator of anatomy at St Thomas's Hospital. Tn 1791 he delivered part of the course of lectures on anatomy and surgery at St Thomas's Hospital. In this year he married ; and in the spring of 1792 he visited Paris. In the latter year he was also appointed professor of anatomy to Surgeon's Hall,—a situation which he again flled in 1794 and 1795. In 1800 he was appointed surgeon to Guy's Hospital, on the death of his uncle, William Cooper. In 1802 he received the Copley medal for two papers read before the Royal Society of London on the destruction of the membrana tympani ; and in 1805 he was elected a fellow of that society. Having taken an active part in the formation of the Medico-Chirurgical Society, he published in the first volume of its Transactions an account of an unsuccessful attempt to tie the carotid artery. Another of his remarkable attempts was to tie the aorta. In 1804 he brought out the first, and in 1807 the second, part of his great work on Hernia—the operation for which, on account of the defective knowledge of the local anatomy, was then frequently unsuccessful. 50 greatly did this' work add to his reputation, that in 1813 his annual professional income rose to £21,000 sterling. HIe was soon after appointed professor of comparatiy? anatomy to the Royal College of Surgeons. In 1820, he removed a steatomatous tumour from the head of George IV. About six months afterwards he accepted ® baronetcy, which, as he had no son, was to descend to his nephew and adopted son, Astley Cooper; in 1827 he was elected president of the Royal College of Surgeons; and 10 1830 vice-president of the Royal Society. HIe was also chosen member of the French Institute; the degree 0 D.C.L. was conferred on him by Oxford, and that of LL.D. by Edinburgh ; and he was appointed sergeant-surgeo! to

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the king. HIe died on the 12th February 1841, at the age of seventy-three. HIe was interred, by his own desire, beneath the chapel of Guy's HIospital;

and a statue by Bailey was erected to his memory in St Paul's Cathedral.

His chief works are Medical Records and Researches (1798); On Hernia (1804-7) ; Dislocations and Fraetwres (1822) ; T'rcatise on the Anatomy and Diseases of the Breast (1829-40) ; Anatomy of the Thymus Gland (1832). See Life of Sir A. Cooper, by B. Cooper.

COOPER, Cuartes Henry (1808-1866), the historian of Cambridge, was born at Great Marlow, 20th March 1808, being deseended from a family formerly settled at Bray, Berkshire. He received his education at a private school in Reading. In 1826 he fixed his residence at Cambridge, and in 1836 was elected coroner of the borough. Four years later he wasadmitted a solicitor, and in course of time he acquired an extensive practice, but his taste aud inclination ultimately led him to devote almost the whole of his time to literary research, and especially the elucidation of the history of the university of Cambridge. In 1849 he resigned the office of borough eoroner on being elected to the town-elerkship, which he retained till his death on March 21, 1866. His earliest production, A New Guide to the University and Town of Cambridge, was published anonymously in 1831. Zhe Annals of Cambridge followed, in.4 vols, 8vo, 1842-52, containing a chronological history of the university and town from the carliest period to the year 1849, His most important work, the Athen Cantabrigienses, 2 companion work to the famous Athenw O.xonienses of Anthony & Wood, contains biographical memoirs of the authors and other men of eminence who were educated at the university of Cambridge. The work has not been completed; only two volumes have been published (in 1858 and 1861), embracing the period between 1500 and 1609. Cooper's other works are Zhe Memorials of Cambridge, 3 vols. 1858-66, and a Memoir of Margaret, Countess of Richmond and Derby, 1874, a posthumous publication, He was a constant contributor to Votes and Queries, the Gentleman's Magazine, and other antiquarian publications, and left an immiense collection of MS. materials for a biographical history of Great Britain and Ireland,

COOPER, Jamus Fenumore (1789-1851), an American novelist, was born at Burlington, New Jersey, on the 15th September 1789. eared in the wild country round the Otsego Lake, on the yet unsettled estates of his father, a judge and member of Congress, he was sent to school at Albany and at

Newhaven, and entered Yale College in his thirteenth year, remaining for some time the youngest student on the rolls, 'Three years afterwards he joined the United States navy ; but after making a voyage or two in a merchant vessel, to perfect himself in seamanship, and obtaining his lieutenancy, he married and resigned his commission (1811). He settled for a while at Westchester, the "Neutral Ground" of his earliest American romance, and produced anonymously (1819) his first book, Precau- fon, a novel of the fashionable school. This was followed (1821) by The Spy, which was very successful at the date of Issue ; The Pioneers, the first of the "Leatherstocking " series; and The Pilot (1823), a bold and dashing sea-story. The next was Lionel Lincoln (1825), a feeble and unattractive work ; and this was succeeded in 1826 by the famous Last of theMohicans, a book that is often quoted as its author's masterpiece, Quitting America for Europe he published at Paris The Prairie (1826), the best of his books in nearly al] respects, and The Ited Rover, by no means his worst.

At this period the unequal and uncertain talent of Cooper would seem to have been at its best. These excel- a Woe ee ye cent by one very inferior, Travelling 2 ae Vish (827) ; by The Notions of a

avetting Bachelor (1828), an uninteresting book; and by

The Waterwitch (1830), one of the poorest of his many sea-stories. In 1830 he entered the lists as a party writer, defending in a series of letters to the National, a Parisian journal, the United States against a string of charges brought against them by the Révue Britannique ; and for the rest of his life he continued skirmishing in print, sometimes for the national interest, sometimes for that of the individual, and not infrequently for both at onee. This opportunity of making a political confession of faith appears not only to have fortified him in his own eonvic- tions, but to have inspired lim with the idea of imposing them on the public through the medium of his art. His next three novels, Zhe Lravo (1831), The Heidenmauer (1832), and Zhe Headman of Berne (1833), were designed to exalt the pegple at the expense of the aristoeracy. Of these the first is by no means a bad story, but the others are among the dullest ever written ; all were widely read on both sides of the Atlantie.

In 1833 Cooper returned to America, and immediately published A Letter to my Countrymen, in which he gave his own version of the controversy he had been engaged in, and passed some sharp censure on his compatriots for their share init. This attaek he followed up with Zhe Monikins and The American Democrat (1835); with several sets of notes on his travels and experiences in Europe, among which may be remarked his Zngland (1837), in three volumes, a burst of vanity and ill-temper; and with Jomeward Bound, and Home as Found (1838), noticeable as containing a highly idealized portrait of him- self. All these books tended to increase the ill-feeling between author and publie ; the press was virulent and seandalous in its comments, and Cooper plunged at once into a series of actions for libel. Victorious in all of them, he returned to his old oecupation with something of his old vigour and success.

Cooper was certainly one of the most popular authors that have ever written. His stories have been translated into nearly all the languages of Europe and into some of those of Asia, and are even now found worthy the honours of a cheap reprint. Balzae admired him greatly, but with discrimination ; Victor Hugo pronounced him greater than the great master of modern romance, and this verdict was echoed by a multitude of inferior readers, who were satisfied with no title for their favourite less than that cf ‘“‘the American Scott.” As a satirist and observer he ts simply the ‘“ Cooper who ’s written six volumes to prove he ’s as good asa Lord” of Lowell’s clever portrait; his enormous vanity and his irritability find vent in a sort of dull violenee, which is exceedingly tiresome. It is only as a novelist that he deserves consideration. His qualities are not those of the great masters of a ; but he had

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means. Tight casks are generally made of well-seasoned oak of the best quality, free from twists and warping Whether accomplished by hand or machinery the follow- ing are the essential operations. Ist, The preparation of the staves is the most important and difficult task of the cooper, inasmuch as a cask being a double conoid having its greatest diameter (technically the bulge or belly) in its centre, each stave must be accurately curved to

~~form a segment of the whole. The taper from the centre to the extremities must be curved ; in cross section it must be double concave, and the joints, or edges, must be so bevelled that when bent into position they shall form a true plane through the central axis of the vessel. 2d, Trussing con- sists of setting the separate staves, properly bevelled and jointed, upright in a frame in order to receive trussing hoops at both ends, which serve to keep them together for the permanent hooping. The lower ends of the staves are set together in a frame and a hoop passed round them. A . rope is then carried round the upper part and gradually tightened till the joints are brought quite close, when a hoop is dropped over and the rope removed. 3d, Chiming and ecrozing consists in finishing the two ends for receiving the heads. The chime is the bevel formed on the extremity of the staves, and the croze consists of the groove into which the ends or heads fit. 4th, Hooping, and 5th, Prepar- ing heads or ends, are the other operations to be noticed. For wet casks hoops are generally made of iron, although wooden hoops also are employed. The heads, when made of two or more pieces, are jointed by means of dowel pins, and after being cut to the proper size they are chamfered or bevelled at the edges. to fit into the croze grooves. Drawings and descriptions of a very elaborate and com- plete series of machines made by Messrs Allen, Ransome, & Co. of Chelsea, from the designs of Mr John Richard, for performing these various operations, will be found in Engineering (vol. xxi. J anuary—June 1876).~~

~~The quantity of tight casks required in certain industries 's incalculable. On the continent of Europe they are in most extensive demand in the wine-producing districts, In Great Britain, brewers and distillers must have enormous stocks, and both in Great Britain and in the United States the mineral oil and petroleum trade employ vast quantities. Slack barrels are almost as extensively employed in con- nection with chemical industries and the fruit and fish trades. In America slack barrels are the form most generally adopted for packing almost all kinds of dry goods for storing and transport, and the flour, rosin, fruit, and other products sent to Europe are almost invariably inclosed in such vessels.~~

~~CO-OPERATION, a term in social economies, which, though of generic significance in the science of industry and trade, has a specific and technical sense, implying the association of any number of individuals or~~

societies for mutual profit, whether in the purchase and distribution of commodities for consumption, or in the production of com: moidities, or in the borrowing and lending of capital among workmen. ; The most powerful co-operative force in the industrial system is what economists have termed "the division 0 labour," but that is in reality also a union and graduation of labour towards productive ends, and has its counterpart in the multiform divisions of capital in its application to the maintenance and extension of industry. P

Co-operation, as technically un derstood, occupies amiddle position between the doctrines of the communists and socialists (see Communism) en the one hand, and the private property and freedom of individual labour and enterpriz? on the other. It takes its departure from communism ab? very definite and significant point. While the latter wou extinguish the motive of individual gain and possession

an inexhaustible imagination, some faculty for simple combi- nation of incident, a homely tragic force which is very genu- ine and effective, and up to a certain point a fine narrative power. HIs literary training was inadequate ; his vocabu- lary is limited and his style awkward and pretentious ; and he had a fondness for moralizing tritely and obviously, which mars his best passages. In point of conception, each of his three-and-thirty novels is either absolutely good or is possessed of a certain amount of merit ; but hitches occur in all, so that every one of them is remarkable rather in 'its episodes than as @ whole. Nothing can be more vividly told than the escape of the Yankee aman-of-war through the shoals and from the English cruisers 10 The Pilot, but there are few things flatter in the range of fiction than the other incidents of the novel. It is therefore with some show of reason that The Last of the Mohicans, which as a chain of brilliantly narrated episodes is certainly the least faulty in this matter of sustained excellence of execu- tion, should be held to be the best of his works.

The personages of his drama are rather to be accounted as so much painted cloth and cardboard, than as anything approaching the nature of men and women. As a creator of aught but romantic incident, indeed, Cooper's claims to renown must rest on the fine figure of the Leatherstocking, and, in a less degree, on that of his friend and companion, the Big Serpent. The

latter has many and obvious merits, not the least of which is the pathos shed about him in his last incarnation as the Indian John of The Pioneers. Natty Bumpo, however, is a creation of no common unity and consistency. There are lapses and flaws, and Natty ig made to say things of which only Cooper, in his most verbosely didactic vein, could have been uttered. But on on the whole the impression left is good and true. In the dignity and simplicity of the old backwoodsman there is something almost Hebraic. With his naive vanity and strong reverent piety, his valiant wariness, his discriminat- ing cruelty, his fine natural sense of right and wrong, his rough Jimpid honesty, his kindly humour, his picturesque dialect, and his rare skill in wooderaft, he has all the breadth and roundness of a type and all the eccentricities and peculiarities of a portrait.

See Griswold, Prose Writers of America, Philadelphia, 1847; Eclectic Magazine, 1851; J. R. Lowell, Fable for Critics ; and AMERICAN LITERATURE, Vol. i. p. 725. (W. E. H.)

COOPERAGE, the art of making casks, barrels, and other rounded vessels, the sides of which are composed of separate staves, held together by hoops surrounding them. The art is one of great antiquity, being mentioned by Pliny, who ascribes its invention to the inhabitants of the Alpine valleys. The cask or barrel form is at once the strongest, tightest, and most convenient form into which wood can be fashioned as a vessel for storing either liquid or solid substances, and the manufacture has attained great pre- cision and perfection. The trade is one in which there are numerous subdivisions, the chief of which are tight or wet and dry or slack cask manufacture. To these may be added white cooperage, & department which em- braces the construction of wooden tubs, pails, churns, and other even- staved vessels. Of all departments, the manufacture of tight casks or barrels for holding liquids is that which demands the greatest care, experience, and skill; as, in addition to perfect tightness when filled with liquid, the vessels must bear the strain of transportation to great distances, and in many cases they have to resist consider- able internal pressure when they contain fermenting liquors. Cooperage 1s still most commonly pursued as a handicraft with the tools and appliances which have been employed from the earliest times; but many expedients of the greatest ingenuity and

efficiency have been introduced or performing the numerous operations by mechanical

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CO-OPERATION

in the sentiment of a universal happiness or good, and remodel all the existing rights, laws, aud arrangements of society on a basis deemed consonant to this end, co-opera- tion seeks, in consistency with the fundamental institutes of society as hitherto developed, to ameliorate the social condition by a concurrence of increasing numbers of asso- ciates in a common interest.

The co-operative societies, springing from this idea, though attended with the most varied fortune, have greatly increased in number and in amount of business in recent years. The form, particular objects, and organic rules of these associations are by no means uniform. But, ag we find them in the principal countries of Europe, they may be divided into three general classes :—1. Societies of consumption, the object of which is to buy and sell to members alone, or to members and non-members under differing conditions, the necessaries of life or the raw ma- terials of their industry ; 2. Societies of production, the object of which is to sell the collective or individual work of the members; 3. Societies of credit or banking, the object of which is to open accounts of credit with their members, and advance them loans for industrial purposes. There are numerous modifications of the principle, such as friendly societies, burial societies, societies of workmen which undertake the execution of work by contract, arrange- ments of private firms by which the workmen share in the profits of the employers, and building societies, now rife in most large towns, the object of which is to enable members to become owners of dwelling houses. But the above three categories define the distinguishing cha- racteristics of the co-oparative society proper; and it is some- what remarkable that the three kinds of association have attained marked success in three different European countries. England stands at the head in societies of con- sumption ; France, in societies of production ; Germany, in societies of credit, With reference to this variety of result it may be observed that the social equality resulting from the great Revolution, in connection with the

character of much of the manufacturing industry of France, has given that country a larger number of artizans who work in their own houses, and have a passion for independence in their handicraft, than is to be found in any other country. On the other hand, the masses of opera- tives in the factories and other great works of England, while retaining their position as wage-earners, have put forth most energy and attained their highest co-opera- tive success in societies for the purchase, and in some degree the production, of their own immediate necessaries of life. The less abundant capital, and the want of banks and other institutions of credit in the smaller towns and remoter parts of Germany, may explain in some measure the notable development of societies of credit in that country. But no account of the phenomena in Germany would be satisfactory without placing at the head of Influences the personal agency of one man—M. Schulze, of Delitzsch (a town of only 6000 inhabitants)—who had the sagacity to perceive that societies of credit were the necessary foundation of the co-operative system, and who reasoned out principles, planned, and laboured with a skill, disinterestedness, and perseverance which have crowned his idea with remarkable success.

The Credit Society of M. Schulze is practically a bank, but @ bank organized on principles specially adapted to the Working classes within certain limits of transaction, to which it is strictly confined, The members of the society must be men of "self-help," able to work and in regular rerent, and they must hold each one equal share of a etl of the society, which may be paid up in — or by regular instalment. Dividends are only paid to

€ members who have paid in full, the profits due on the

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partly-paid shares being added-to these till they reach their fullamount. It follows from the principle of the society— "in proportion to the chance of gain the risk of loss—" that when the share-capital has to be called upon to liquidate the debts, it is the capital actually paid in that loses, Equality of shares and equality of advantages and risks are thus attained. But in addition to the share-capital there is a reserve fund formed out of entrance fees and a per- centage of the net profits. The order of liability for deficits in the balance sheets is thus (1) reserve fund, (2) paid-in capital, and (3)

private property of the members— the final principle being that of unlimited liability. Every member is responsible for the debts of the society, and the society for the debts of every member. It is obvious that a company thus constituted, and composed of the most saving and industrious workmen of a town or district, offers a solid security, and consequently the share-capital is sup- plemented by loans for given periods of time, debentures, and savings deposits, the last having to be guarded by conditions as to notice of withdrawal. At the beginning of a society the paid-up share-capital may not be more than the proportion of 10 to 90 of borrowed funds, but it has to be brought up as rapidly as possible to 25 per cent., and should reach a maximum of 50 per cent. The share-capital, as originally fixed, has also to be increased as the business, and the amount of funds necessary for its transaction, increase; so that the amount of each share has thus to be supplemented plus the increase of business mznus the increase of members. By these means the society is protected from too small a share-capital for its liabilities, and from the temptation of appropriating large dividends out of the surplus profit, accruing from borrowed funds, Another peculiarity of the German "credit union" is that it makes advances of the funds of which it is possessed to its own members only. The two great ends to be secured being the minimum of risk and the maximum of responsibility, the first is promoted by advancing money only for industrial purposes, within due limits, among borrowers whose requirements and circum- stances are or may be thoroughly known to the society, and the second by the fact that every member of the society is unlimitedly liable for any errors or losses that may arise in the administration. The advances are made in the usual forms of promissory notes with the indorsation of sureties, ordinary bills of exchange, and occasionally mortgages over real property in current accounts. Advances are not made for longer periods than the society can itself borrow ; partial repayment at dates is sometimes conditioned within the period of advance; and the interest charged follows the public money-market rate. It is thus that M. Schulze, through a series of skilful regulations beyond our space to follow, solved the problem, which vexed and puzzled the socialists of a past generation, of bringing capital direct to the workman or "immediate producer." . When the little "credit union" of Delitzsch was fully organized in 1852, popular opinion was so well prepared and enlightened on the subject by M. Schuize's efforts in the Prussian Parliament and on the platform, that similar societies were rapidly

organized in other parts of the country. While each society had full powers of self-regula-, tion, they were all much on the Delitzsch model, and a general affiliation was brought about for mutual counsel and encouragement. M. Schulze then applied in the legislature for corporate rights and legal status to the associations, and after tedious labours obtained them. In 1865 he established a central credit bank at Berlin, by which the societies, while depending mainly on local credit supplies, might have access, in case of need, to the general loan market. The "credit unions," though now numerous, are only a section of the co-operative movement in Germany.

The law of the Prussian Parliament granting corporate rights to loan and credit associations extends the same privileges to 'raw material and store unions," " unions for the production and sale of finished wares on a common account," "unions for the purchase of the necessaries of life wholesale and the selling of them retail," and " unions for providing their members with dwelling-houses."

The history of the co-operative movement in France 1s much too extensive to be traced here. But it may be observed that the French co-operators have discovered, at various periods, a strong leaning to the opinion that, while they supply thelabour, thestate is under obligation to supply in whole or in part the capital and other means of labour ; and under this idea co-operation merges very nearly into communism. " Létat! cest moi," said Louis XIV., and in the days of democracy the same idea not unnaturally suggests itself to au overwhelming majority of the people. This was precisely the argument which the late M. Lasalle, following the French socialists, used against Schulze and the economists in Germany. "Society," he in effect argued, "consists of 96 prolétaires and four capitalists. There 1s the state! 'The prolétaires have no capital, can save nothing, have nothing to save from. But the state, of which they are 96 out of 100, can come forward, cover the prolétaires with its ercdit, and give a new departure to the production and distribution of wealth. Capital in its personal accumulation is merely the spawn of ages of slavery, craft, and plunder." The discussion of this question had been exhausted in France more than

once. Bastiat and Proudhon had quite recently fought it out between them. But there were also practical experiments and illustrations. On the revolntion of February 1848, the French state recognized to some extent its duty to the proletaires, organized national workshops, and voted 3,000,000 francs for the use of fifty-six co-operative societies. Threefourths of these societies perished after a brief period. The state lost its money, aud the members did themselves no good. Only a remnant, by organizing themselves on sounder principles, survived. 'The " Société des Tourners en Chaises," which refused assistance from the state, and declined the principle of equality of wages, is flourishing to this day. 'The Society of Masons, of Piano-Makers, of " Quvriers Lunettiers," and others, have established a strong position, beginning with small capital, and increasing it to large amounts. In Lyons there are the " Société des Tisseurs," of 1800 members, and others ; at St Etienne the « Association des Rubanniers," of 1200 members, said to have half a million sterling of capital. The "society of production," of which there are at least forty examples in Paris alone, is found in nearly all the French provinces, and has proved the capacity of workmen by union to carve out business for themselves and be their own masters, while, in many cases, employing other workmen cr auxiliaries at wages, who have no share in the profits. There are also in France more examples, probably, than in any other country, of workmen sharing in the profits of the firms by which they are employed, under arrangements offered and regulated by the employers or capitalists thiem- selves.

Of the "society of consumption" there are innumerable examples in the United Kingdom, the chief being the Rochdale, Leeds, and Halifax Societies, embracing nearly the whole working population of a large manufacturing district, aud carrying out their operations, from the wholesale and retail stores to dairies, flour-mills, and other auxiliary branches, including libraries and newsrooms. The supply associations in London organized by members of the Govern- ment civil service have also attained much importance ; but, as these trade with the public, aud divide large profits among privileged holders of shares, it has been questioned

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whether they can be properly regarded as co-operative societies. Nearly every town of the kingdom has a "9. operative store;" and when these are numerous in a district they usually affiliate, and open a common wholesale depart. ment in Liverpool, Glasgow, or some other emporium, The advantages in many cases may not be great, and aftera brief existence the societies not unfrequently windup, But when properly conducted and supported, they secure whole- some commodities, encourage among their members ready- money payments, and as the goods are sold at a fair margin of profit, there is every quarter or half year a dividend at the rate of 5 to 10 or more per cent. to the members on their share-capital, and a bonus to non- members on the amount of their purchases. indirect advantages of the co-operative store, when estab- lished in a community, is its influence as a formidable rival on private grocers and dealers.

One of the

The most signal instances of failure of the co-operative

principle in the United Kingdom have occurred in the sphere of " production," where France has given many successful examples. Yorkshire purchased the Shirland Collieries in 1874 at a price of £70,000, of which they paid down £31,000, rais- ing the remainder of the purchase money in debenture bonds, The working and proprietary company thus formed has never been able to pay the interest due on its bonds, and the collieries have now passed into other hands for

The united coal-miners of South

£11,000 with the liabilities attaching to them, and the whole capital of the workinen has been lost. The purchase

of collieries at a period when the coal trade and wages of

mining labour were in a state of inflation, followed sharply

by successive collapses, may account for this unfortunate result, The engineering factory at Ousekurn, and worked for a titae by operatives, is again, after

bought up

a stoppage, re-established on a co-operative basis, But the failure of co-operative production has been recently illustrated in another form. In 1865 Messrs Briggs & Co., proprietors of the Whitwood and Methley Junction Collieries, entered into a permanent contract with their workmen, whereby the latter were to receive, in addi- tion to the current rate of wages, one-half of the profits above 10 per cent. for the redemption of capital invested. As long as there were profits, and the rate of wages presented no difficulty, this answered well enough ; but when the tide turned, and there were no profits, but only loss unless wages were reduced, the situation was wholly altered in the estimate of the workmen, and the compact was broken up in 1874 on the demand of the men them- selves, who said they would prefer to be simply members of the " Miners' Union."

The numerous cotton factories in Lancashire, on a basis of small joint-stock shares, yielding in some cases large dividends, might almost be considered as great an example of co-operative production as any effort of the kind in France. The operatives have a large stake and much ad- vantage in those factories; but since the spinner or weaver does not necessarily work in the factory of which he has a small proprietary share, these joint-stock establish- ments are probably to be regarded more as investments of the savings of the operatives than as co-operative societies. The co-operative idea, as would probably be held by its most staunch propounders, requires identity © purpose and interest, with community of advantages al risks, though not necessarily absolute equality or uniformity of individual relations, among the co-operators. When the association passes into a mere investment and trading com pany, the idea would seem to be lost.

The co-operative system in the United Kingdom has attaine! such magnitude as well as variety of development that our literatu

Lon the subject cannot be deemed so complete as would be desirable.

CO O0—

Mr G. J. Holyoake, than whom probably no one in England has more command of the subject, is engaged on a History of Co-opera- tion, the first

volume of which has been published. Valuable information on co-operative soeleties oecurs in official documents ; see, for example, the appendix of the Eleventh and Final Report of Royall Commission as Trades Unions, 1869. (it. SO.) COORG, a province of Southern India, near the centre of the Western Ghats, between aE 56' and 12° 45' N. lat. and 75° 25' and 76° 13' E. long., is bounded by Mysore, Malabar, and South Kanara, and has an area of 2000 square miles, It isa mountainous district, presenting throughout a series of wooded hills and deep valleys; the lowest elevations are 3000 feet above sea-level, The loftiest peak, Tandiandamol, has an altitude of 5781 feet ; Pushpagiri, another peak, is 5682 feet high. The principal river is the Cauvery, or Kaveri, which rises on the eastern side of the Western Ghats, and with its tributaries drains the greater part of Coorg. Besides these there are several large streams that take their rise in Coorg. In the rainy season, Which lasts during the continuance of the south- west monsoon, or from June to the end of September, the rivers flow with violence and great rapidity. In July and August the rainfall is excessive, and the month of November is often showery. The yearly rainfall may exceed 160 inches; iu the dense jungle tract it reaches from 120 to 150; in the bamboo district from 60 to 100 inches. The climate, though humid, is on the whole healthy ; it is believed to have been rendered hotter and drier of late years by the clearing of forest land. Coorg has an average temperature of about 60° Fabr., the extremes being 52° and 82°. The hottest season is in April and May. In the direction of Mysore the whole country is thickly wooded ; but to the westward the forests are more open. The flora of the jungle includes AZichelia (Chumpak), ALesua (Iron-wood), Diospyros (Ebony and other species), Cedrela Toona (White cedar), Chickrassia tubularis (Red cedar), Calophyllum angustifolium (Poon spar), Canarium strictum (Black Dammar tree), Artocarpus, Dipterocarpus, Garcinia, Fuonymus, Cinnamomum tners, Muyristica, Vaccinium, Myrtacee, Melastomacee, Rubus (three species), and a rose. In the undergrowth are found cardamom, arcca, plantain, canes, wild pepper, tree and other ferns, and arums. In the forest of the less thickly-wooded bamboo country in the west of Coorg the trees most cominon are the Dalbergia latifolia (Black wood), Pterocarpus Marsupium (Kino tree), Zerminalia coriacea (Mutti), Lagerstriémia parviflora (Benteak), Conocarpus latifolius (Dindul), Bassia latifolia, Butea frondosu, Nauclea parviflora, and several acacias, with which, in the eastern part of the district, teak and sandalwood occur.

Among the fauna may be mentioned the elephant, tiger, tiger-cat, cheetah or hunting leopard, wild dog, elk, bison, wild boar, several species of deer, hares, monkeys, the buceros and various other birds, the cobra di capello, and afew alligators. The most interesting antiquities of Coorg are the earth redoubts (kunnidegs), which are from 15 to 25 feet high, and provided with a ditch 10 feet deep by 8 or 10 feet wide. Their linear extent is reckoned at between 500 and 600 miles. The exports of Coorg are mainly rice, coffee, and cardamom ; aud the only important manufacture is a kind of coarse blanket. Fruits of many descriptions, especially oranges, are produced in abundance, and are of excellent quality. The Coorgs, of whom the Kodagas are the chief tribe, constitute thirteen castes, They are of Dravidian origin, and retain the devil-worship of their ancestors; they speak a dialect of Canarese. They are a well-formed, bold and active, but ignorant and superstitious race. The strange institution of polyandry prevalent among them, according to which the wives of the brothers of a family are common property, appears to have arisen from the uccessity of counteracting the exterminating influence of wars by

making the brothers of the slain the rightful husbands of their widows. The principal towns of Coorg are Merkara, the capital, Fraserpett, Somwarpett, Periapatam, and Verajenderpetta, In 1872 Coorg contained 510 villages, and its population numbered 168,312.

Previous to its annexation to British India, Coorg was governed by a line of rajahs of the Nair easte of Hindus, inentioned in history as early as the year 1583. The aseendeucy of the last family of these rulers dates from the year 1632. Its prinees retained their independence till the year 1773, when Hyder Ali, who had long sought the subjugation of the country, took advantage of a dispute about the suecession to seize upon the sovereignty, and imprisoned the rajah. The latter subsequently effeeted his eseape from eap- tivity, and drove the armies of Tippoo Sultan out of Coorg; and in the war against Tippoo in the year 1791 he proved a useful auxili- ary to the British. On the defeat of Tippoo a treaty was entered into between the East India Company and Viraraja of Coorg, who dying in 1807, left the throne to his daughter Devammaji. Lin- garaja, her unele, who now usurped the

~~throne, was sueeeeded in 1820 by his son, Viraraja. This monarel's misgovernment and oppression of Coorg brought upon him at length the armed inter- ferenee of Lord William Bentinek ; in April 1834 he was deposed by General Fraser, aud his dominions were annexed to British territory. Sinee then the revenue has improved, cultivation has been extended, and the general prosperity of the country has steadily inereased.,~~

~~COOT, a well-known British water-fow]l, the Fulica atra of Linnzeus, belonging to the family Pallide or Rails. The word Coot, in some parts of England pronounced Cute, or Scute, is of uncertain origin, but perhaps cognate with Scout and Scoter—both names of aquatic birds—a possibility which seems to be more likely since the name " Macreuse," by which the Coot is known in the south of France, being in the north of that country applied to the Scoter (A/demia nigra) shews that, though belonging to very different families, there is in popular estimation some connection between the two birds.) The Latin /wlica (in polite French, Loulque) is probably allied to fuligo, and has reference to the bird's dark colour.2 The Coot breeds abundantly in many of the larger inland waters of the northern parts of the Old World, in winter commonly resorting, and often in great numbers, to the mouth of rivers or shallow bays of the sea, where it becomes a general object of pursuit by gunners whether for sport or gain. At other times of the year it is comparatively unmolested, and being very prolific its abundance is easily understood. The nest is a large mass of flags, reeds, or sedge, piled together among rushes in the water or on the margin, and not unfrequently contains as many as ten eggs. The young, when first hatched, are beautiful little creatures, clothed in jet-black down, with their heads of a bright orange-scarlet, varied with purplish-blue. This brilliant colouring is soon lost, and they begin to assume the almost uniform sooty-black plumage which is worn for the rest of their life; but a characteristic of the adult is a bare patch or callosity on the forehead, which being nearly white gives rise to the epithet "bald" often prefixed to the bird's name. The Coot is about 18 inches in length, and will sometimes weigh over 2 ib. Though its wings appear to be short in proportion to its size, and it seems to rise with difficulty from the water, it is capable of long-sustained and rather rapid flight, which is performed with the legs stretched out behind the stumpy tail. It swims buoyantly, and looks a much larger bird in the water than it really is. It dives with ease, and when wounded is said frequently to clutch the~~

weeds at the bottom with a grasp so firm as not even to be loosened by death. It does not often come on dry land, but when there, marches leisurely and not without a certain degree of grace. The feet of the Ccot are very

lit is owing to this interchange of their names that Yarrell in his British Birds yefers M. Vietor Hugo's deseription of the "chasse aux Macreuses" to the Scoter instead of the Coot.

.2 Hence also we have Fuliz or Fuligula applied to a Duck of dingy appearance, and thus forming another parallel ease.

remarkable, the toes being fringed by a lobed membraue, which must be of considerable assistance in swimming as well as in walking over the ooze—acting as they do like mud-boards.

In England the sport of Coot-shooting is pursued to some extent on the broads aud back-waters of. the eastern counties—in Southampton Water, Christchurch Bay, and at Slapton Lay—and is often conducted battue-fashion by a number of guns. But even in these cases the numbers killed in a day seldom reach more than a few hundreds, and come very short of those that fall in the officially-organized chasses of the lakes near the coast of Languedoc and Provence, of which an excellent description is given by the Vicomte Louis de Dax.! 'The flesh of the Coot is very variously regarded as food, To prepare the bird for the table, the feathers should be stripped, and the down, which is very close, thick, and hard to pluck, be rubbed with powdered resin; the body is then to be dipped in boiling water, which dissolving the resin causes

it to mix with the down, and then both can be removed

together with tolerable ease. After this the bird should be

left to soak for the night in cold spring-water, which will Without

make it look as white and delicate as a chicken. this process the skin after roasting is found to be very oily,

with a fishy flavour, and if the skin be taken off the flesh

becomes dry and good for nothing (Hawker's Instructions to Young Sportsmen ; Hele's Notes about Aldeburgh). The Coot is found throughout the Palearctic Region from

Iceland to Japan, and in most other parts of the world is represented by nearly allied species, having almost the same

habits. An African species (F. cristata), easily distin- guished by a red caruncle on its forehead, is of rare appear- ance in the south of Europe. 'The Australian and North American species (Z. australis and F. americana) have very great resemblance to our own bird ; but in South America half-a-dozen or more additional species are found which range to Patagonia, and vary much in size, one (/. gigantea) being of considerable magnitude. The remains of a very large species (I. newtont) have been discovered in Mauritius, where it must have been a contemporary of the Dodo, but like that bird is now extinct. (A. N.) COOTE, Six Eyre (1726-1783), a celebrated general, born at Limerick in 1726, was the son of aclergyman. He served against the Pretender in 1745, and in 1754 sailed for India to join the army of Clive. In 1760, having attained the rank of colonel for his services at Plassy and Calcutta, he was sent to the Carnatic, where he took Wandewash and defeated Lally. For these exploits he received on his return to England a jewelled sword from the East India Company, and a vote of thanks from the House of Commons. In 1769 he was appointed to the chief command in Madras; but in the next year, having quarrelled with the governor, he returned to England. He was made Knight of the Bath, colonel of the 7th Foot, and governor of Fort St George. In 1780 he returned to Caleutta as commander-in-chief in Bengal and member of the supreme council. Soon after he was sent by Warren Hastings into the Carnatic, where Hyder Ali was seriously threatening the British possessions ; and on the Ist July 1781 he won a decided victory at Ponto Novo, which checked the advance of his antagonist. But there was a serious deficiency of supplies, and in the next year Coote returned to Calcutta. Notwithstanding his feeble health, he again set sail in the spring of 1783 for Madras. His ship was pursued by the French; and this aunoyance, acting upon his

broken constitution and now extremely irritable temper, brought on a third fit of apoplexy, causing ne

be 'La Volée aux Macreuses." Nouveaux Souvenirs de Chasse et dc Péche dans le midi de la France, pp. 58-65 (Paris : 1860).

coo—COP his death on the 26th April 1783.

A monument was erected to his memory in Westminster Abbey.

A very flattering account of Coote is given by Wilks in his His. torical Sketches of Mysorc, 1810 ; see also Mill's British India,

COPAIBA. See Basa, vol. ii. p. 293.

COPAL, a hard lustrous resin, varying in hue from an almost colourless transparent mass to a bright yellowish brown, having a copchoidal fracture, and, when dissolved in alcohol, spirit of turpentine, or any other suitable men- struum, forming one of the most valuable varnishes. Like many other commercial substances, copal is obtained from a variety of sources ; the term is not uniformly applied or restricted to the products of any particular region or series of plants, but is vaguely used for resins which, though very similar in their physical properties, differ somewhat in their constitution, and are altogether distinct as to their source. Thus the resin obtained from 7'rachylobium Hornemannianum is known in commerce as Zanzibar copal, or guin animé. Madagascar copal is the produce of 7, verrucosum. From Guibourtia copallifera is obtained Sierra Leone copal, and another variety of the same resin is found in a fossil state on the west coast of Africa, probably the produce of a tree now extinct. From Brazil and other South American countries, again, copal is obtained which is yielded by Z'rachylobium Martianum, Hymenea Courbaril, and various other species, while the dammar resins and the piney varnish of India are occasionally classed and spoken of as copal. Of the varieties abovo enumerated by far the most important in a commercial point of view is the Zanzibar or East African copal, yielded by Trachylobium Hornemannianum. The resin is found in two distinct conditions :—Ist, raw or recent, called by the inhabitants of the coast sandarusiza miti or chakaui, the latter name being corrupted by Zanzibar traders into " jackass" copal ; and 2d, ripe or true

copal, the sandarusi inti of the natives. Theraw copal, which is obtained direct from the trees, or found at their roots or near the surface of the ground, is not regarded by the natives as of much value, and does not enter into European commerce, It is sent to India and China, where it is manufactured into a coarse kind of varnish. The true or fossil copal is found embedded in the earth over a wide belt of the mainland coast of Zauzibar, on tracks where not a single tree is now visible. The copal is not found at a greater depth in the ground than 4 feet, and it is seldom the diggers go deeper than about 3 feet. It occurs in pieces varying from the size of small pebbles up to masses of several ounces in weight, and occasionally lumps weighing 4 or 5 tb have been obtained; and it is said that one piece of 35 Ib weight has been found. After garbling and freeing from foreign matter, the resin is submitted to various chemical operations for the purpose of cleariug the « goose-skil," the name given to the peculiar pitted-like surface possessed by fossil copal, The goose-skin was formerly supposed to be caused by the impression of the small stones and sand of the soil into which the soft resin fell in its raw condition ; put Dr Kirk states that the copal when first dug up has no trace of the goose-skin on it. He believes the appearance to arise from an oxidation of the surface taking place toa certain depth after exposure to the air, or to be caused by some molecular change which renders the skin more brittle than the inner mass. The copal digging is conducted by the natives in a careless and desultory manner, and the whole trade is, as usual in dealings with untutored tribes, surrounded with many difficulties. It is believed that the supply is practically inexhaustible, and with prop! organization the trade would be a permanent souree ? support to a larger community than at present inhabits the copal-yielding regions.

siderable quantities are also shipped direct to Hamburg and to British ports. The amount annually exported is subject to great fluctuations, which equally affect the market value of the product. During the year 1872-73 the imports into Bombay were 966 cwts., and probably at least an equal quantity went in other directions. The following analysis of Zanzibar and Madagascar copal is given by Filhol :—

Zanzibar .. Madagascar. Oo eS a 79°70 79°80
Hydrogen……..2..:0000sseees 10°40 9°42 OXYGEN... -.eeseeeeeeee sees

9°90 10°78

COPAN, a village of Central America, in the republic of Honduras, famous for the remarkable ruins in its neigh- pbourhood, It is situated not far from the frontier of Guatemala, on the right bank of the Rio Copan, a tributary of the Motagua, about thirty miles east of Chiquimula, in 14° 45' N. lat. and 90° 52° W. long. The ruins occupy a rectangular area of about 1600 feet in length and 900 feet in breadth; and the outer walls appear to be about 25 feet thick at the bottom. The principal building is an immense terrace with a perpendicular front towards the river, extending a distance of 624 feet, and attaining a height of about 70 feet above the soil. It has been calculated that this single structure must have required upwards of 26,000,000 cubic feet of stone. Numerous obelisks and ' statues are still standing, covered in bewildering profusion—with grotesque sculpturings, which in many cases can only have been ornamental, but in others belong pretty evidently to some hieroglyphical system of symbols. The presence of what appear to be altars in front of several of the figures gives reason to suppose that they were worshipped as deities, That these erections were the work of a people of considerable artistic and engineering skill is abundantly evident ; but not the slightest datum is afforded by tradition—for any conjecture in regard to their origin. An identifica- tion at one time attempted with the city which offered so brave a resistance to Hernando de Chaves in 1530 is now considered as unsatisfactory. The ruins unfortunately are expused not only to the destructive influences of nature, but also to the attacks of an ignorant populace; and according to Dr Bernouilli, who visited the spot in 1870, the dangers from the latter source are rapidly increasing as the little hamlet, which now contains a church and a cabildo, has become the centre for the surrounding district.

—A very complete résumé of the various descriptions of Copan will be found in Bancroft's Native Races of the Pacific States of North | America, vol. iv., 1875, his most important authorities being Palacio's Carta dirijada al rey (a 16th century account, published at Albany in 1860) ; the report of Col. Juan Galindo in 1835 ; Stephens, Incidents of Travel in Central America, 1841 ; Catherwood, Views of Ancient Monuments in Central America, 1844. Among those who have visited the ruins in more recent years are M. César Daly, Abbé Brasseur de Bourbourg, Mr Hardcastle, and Mr Ellerly.

COPENHAGEN (Danish, Kiébenhavn ; Latin, Hafnia or Haunia), the capital of Denmark, is situated at the southern extremity of the Sound, at that part about 20 miles broad, 180 miles north-east of Hamburg, in 55° 40' 52" N. lat. and 12° 35' 46" FE, long. The main portion of the city is built on low-lying ground on the east coast of the island of Seeland between the sea and a series of freshwater lakes, known respectively as St Jérgens 86, Peblings Sé, and | Sortedams 86 ; a southern and smaller portion, distinguished as Christianshavn, occupies the northern part of the island of Amager or Amak, An excellent harbour is furnished by the natural channel between the two islands; and com-

munication from one division to the other is afforded by two bridges—the Langebro and the Knippelsbro, the latter of which, an iron structure erected in 1869, has replaced the wooden drawbridge built by Christian IV. in 1620. The older city, including both the Seeland and Amager Portions, was formerly surrounded by a complete line of ramparts and moats ; but since 1863 these defences are

being gradually demolished and filled up, to make way for new streets and squares. Towards the sea the city will be still protected by the citadel of Frederikshavn and several minor forts. Outside of the line of the ramparts, which had a circuit of about five miles, there have sprung up several extensive suburbs,—Oesterbro, Noérrebro, and Vesterbro (East Bridge, North Bridge, and West Bridge) in the Seeland portion, and Amagerbro to the south of Christianshavn ; and with these suburbs the city occupies an area of 3200 acres. In the intramural city there are numerous public squares of considerable extent :—Amalien- borg Place, or I'rederick's Place, a handsome octagon formed by four palaces of uniform size and design, and having in the centre an equestrian statue of Frederick V., erected in 1768 at the cost of the former Asiatic Company ; Kongens Nytorv (the king's new market, formerly called Hollandsaas) an irregular square, the largest in the city, with an eques- trian statue of Christian V. in the centre, remarkable only for its size; the Gammeltorv and Nytorv (old and

new markets), forming one oblong area; and the Slotsplace on which stand the Christiansborg Palace, the chapel royal,

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' Plan of Copenhagen.

1. Kongens Nytorv. 8. Holmens Kirke.

2. Communal Hospital. 9, Trinity Church.

3. Gammel-og-Nytorv. 10. Royal Castle of Christiansborg, 4. Frederick's Place. 11. Minlsterium.

5. Rosenborg Palace. 12. Thorwaldsen Museum.

6. Church of St Peter. 13, University.

7. Cathedral (Frue Kirke). 14, Theatre.

the exchange, and the chancery buildings. A long street called Gothers Gade divides the Seeland portion of the intramural city into two nearly equal halves.

Public Buildings.—The citadel already mentioned is a regular polygon with five bastions, and is connected with the city by an esplanade. It was founded by Frederick III. about 1662-63, and has become associated as a stata prison with the names of Griffenfeld, Struensee, and Brandt.

The royal palace of Christiansborg, originally built by Christian VI., but afterwards destroyed by fire in 1794, has since been rebuilt on an extensive scale. It occupies the site of the old castle of Bishop Absolon, which was restored at great expense by Frederick IV., and is famous in history for its Blaataarn, or Blue Tower, long used as a state prison. Over the principal entrance are two bas- reliefs by Thorwaldsen, representing Minerva and Prometheus, Hercules and Hebe, Jupiter and Nemesis, and' AXsculapius

and Hygeia. The Riddersal (knights' hall) is' a magnificent apartment, 120 feet long, 44 feet high, and-

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50 feet wide, with a gallery supported by Corinthian columns. In the great entrance hall is the Triumphal March of Alexander into Babylon by Thorwaldsen. In the upper part of the building is the Royal Gallery of Paintings, enriched by many valuable specimens of the Flemish, Dutch, and Italian schools. The palace also contains the council chamber and the apartments in which both Houses of the Parliament hold their sittings. The large exterior court on the west side forms a riding ground, and is inclosed on both sides by regular buildings with piazzas, contaimbg the court theatre, stables, and riding-house. In connection with the palace is the royal library, with about 550,000 volumes and 30,000 manuscripts ; and the chapel, adorned with works by Thorwaldsen and Bissen.

The palace of Rosenborg, supposed to have been planned by Inigo Jones, was erected in 1604. It is an irregular building in the Gothic style, with a high pointed roof, aud flanked by four towers of unequal dimensions. It contains the coin and medal cabinet, a fine collection of Venetian glass, the famous silver drinking-horn of Oldenburg, the regalia, and other objects of interest as illustrating the history of Denmark. The Riddersal, a spacious room, is covered with tapestry representing the various battles of Christian V., and has at one end a massive silver throne. The gardens, formerly much more extensive, are open to the public, and afford an agreeable promenade.

The palace of Charlottenborg, on the Kongens Nytorv, which takes its name from Charlotte, the wife of Christian V., is a huge desolate-looking building, built in 1672. Frederick V. made a grant of it to the Academy of Arts, which holds its annual exhibition of paintings and sculpture within its walls, in April and May.

The four palaces on ihe Amalienborg were built for the residence of four noble families ; but on the destruction of Christiansborg in 1794 they became the residence of the king and court, and so continued till the death of Christian VIII. in 1848. At present (1877) one of the four is inhabited by the king, the second by the crown prince, and the third by the queen-

dowager, while the fourth is occu- pied by the foreign office and the principal court of justice or Llojeste Let.

Prindsens Palais to the west of Christiansborg, once the residence of Christian V. and Frederick VI. when crown princes, now contains the Royal Museum of Art, the Ethnographical Museum, and the Royal Museum of Northern Antiquities. The last named was founded in 1807, and under the management of Mr Worsaae has become the richest collection of Scandinavian antiquities in the world. The chancery buildings, immediately adjoining the Christiansborg, and united to it by a corridor, consist of a large main building erected by Frederick IV., and of three others since added. Tere are deposited the privy archives of the state and of the royal family. The town- hall and court-house, in the Slotsholm or Castle Island (built 1805-15), contains the municipal council chamber, the police and criminal courts, and other public offices. The exchange, alsu on the Castle Island, is surmounted by a remarkable spire, formed of four dragons, with their heads directed to the four points of the compass, and their bodies entwining each other till their tails come to a point at the top.

The Thorwaldsen Museum, built 1837-46 ina combina- tion of the Egyptian and Etruscan styles, is 230 feet in length, 125 feet in breadth, and 46 feet high, and consists of two stories. In the centre is an open court, 116 feet long and 50 fect broad, containing the artist's tomb. The exterior walls are decorated with groups of figures of coloured stucco, illustrative of events connected with the formation of the museum. Over the principal entrance is the Chariot of Victory drawn by four Horses, executed in bronze from

a model by Bissen. The front hall, corridors, and apart- ments are painted in the Pompeian style, with brilliant colours and with great artistic skill. The museum contains about 300 of Thorwaldsen's works ; and in one apartment is his sitting-room furniture arranged as it was found at the time of his death in 1844.

Educational Buildings.—At the head of the educational institutions is the university, which, with its library and zoological museum, occupies @ series of buildings forming a large quadrangle next Frue Kirke. It was

~~founded by Christian I. in 1479; but its present constitution dates from 1788. There are five faculties,—a theological juridical, medical, philosophical, and mathematical—with thirty-four professors ; and the average number of students 'sabout 1000. In 1851 an English, and in 1852 ay Anglo. Saxon, lectureship was established. All the professors are bound to give aseries of lectures open to the public free of charge. The university possesses considerable endowments and has several foundations for the assistance of poor students ; the "regent's charity," for instance, founded by Christian, affords free residence and a small allowance to 100 bursars. In connection with the university are the observatory, the chemical laboratory in Ny Vester Gade, the surgical academy in Bred Gade, founded in 1786, and the botanic garden. The university library, formerly lodged in Trinity Church, but now in a special building erected in 1863, has been incorporated with the former Classen Labrary, collected by the famous merchants of that name, and now contains about 200,000 volumes, besides about 4000 manu- scripts, which include Rask's valuable Oriental collection and the Arne-Magnean serics of Scandinavian documents. It shares with the royal library, which has 550,000 volumes and.30,000 MSS., the right of receiving a copy of evely book published in Denmark. Among the other educational institutions may be mentioned the polytechnic school, founded in 1829; the veterinary and agricultural college, established by Abildgaird in 1778, and adopted by the state in 1776; the military academy, and the school of navigation.~~

~~Among the literary and scientific associations may he mentioned the Danish Royal Society, founded in 1742, for the advancement of the sciences of mathematics, astronomy, natural philosophy, &c., by the publication of papers and essays; the Royal Antiquarian Society, founded in 1825, for diffusing a knowledge of Northern and Icelandic arche- ology, and stimulated by the efforts of such men as Thomsen, Rape, Finn Magnusen, and Petersen ; the Society for the Promotion of Danish Literature, for the publication of works chiefly connected with the history of Danish literature ; the Natural Philosophy Society ; the Royal Agricultural Society ; the Danish Church History Society; the Industrial Association, founded in 1838, the Royal Geographical Society, established in 1876; and several musical and other societies. The Academy of Arts was founded by Frederick V. in 1754, for the instruction of artists, and for disseminating a taste for the~~

~~fine arts among manufacturers and operatives. Attached to it are schools for the study of architecture, ornamental drawing, and modelling. An Art Union was founded in 1826, and a musical couservatorium in 1870, under the direction of the composers Gado aud Hartmann.~~

~~Churches.—The principal church, or cathedral, Frue the Kirke (Church of our Lady), was almost entirely destroyed in the bombardment of 1807, but was completely restorel in 1811-29. The works of Thorwaldsen, by which it 8 adorned, constitute its chief attraction. In the pediment is a group in terra cotta of sixteen figures, representing John the Baptist preaching in the wilderness ; over te sntrance within the portico is a bas-relief of Christs entrance into Jerusalem ; on one side of the entrance 18 4~~

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~~atatue of Moses by Bissen, and on the other a statue of David by Jerichan. In a niche behind the altar stands a colossal marble statue of our Saviour, and marble statues of the twelve apostles adorn both sides of the church. Nearly opposite the Frue Kirke is St Peter's Church, built in a quasi-Gothic style, with a spire 260 feet high, and appropriated since 1585 as a parish church for the German residents in Copenhagen, The round tower of Trinity Church is 115 feet high, and is considered to be unique in Europe. It was constructed from a plan of Tycho Brahe's favourite disciple Longomontanus, and was formerly used as an observatory. It is ascended by a broad inclined spiral way, up which Peter the Great is said to have driven in acarriageand four. The Church of our Saviour in Christianshavn, dedicated in 1696, has a curious steeple 300 feet high, ascended by an external spiral staircase. The lower part of the altar is composed of Italian marble, with a representation of Christ's sufferings in the garden of Gethsemane; and the organ is considered the finest in Copenhagen. 'The Marble Church, intended to have been an edifice of great extent and magnificence, was commenced in the reign of Frederick V., but after twenty years was left unfinished. The Holmens Kirke, or church for the royal navy, originally erected as an anchor-smithy by Frederick II., but consecrated by Christian IV., is remarkable for a chapel containing the tombs of the great admirals Niels Juel and Tordenskjold. 'The churches above mentioned belong to the national Lutheran Church ; the most important of those~~

belonging to other denominations are the Reformed church, founded in 1688, and rebuilt in 1731, the Catholic church of St Ansgarius, consecrated in 1842, and the Jewish synagogue in Krystalgade, which dates from

1853.

Of the monastic buildings of medizeval Copenhagen various traces are preserved in the present nomenclature of the streets. The Franciscan establishment gives its name to the Graabrédretorv or Grey Friars' market; and St Clara's Mouastery, the largest of all, which was fonnded by Queen Christina, is still commemorated by the Klareboder or Clara buildings, near the present post-office. The Duebridre Kloster occupied the site of the hospital of the Holy Ghost.

Hospitals,—Among the hospitals of Copenhagen the most important are Frederick's Hospital, erected in 1752-57 by Frederick V., with accommodation for 600 patients; the Communal Hospital, erected in 1859-63, on the eastern side of the Sortedamssé, with room for 850; the General Hospital in Amalia Street, founded in 1769; the Garrison Hospital, in Rigens Gade or Empire Street, established in 1816 by Frederick VI. ; a children's hospital in the same street dating from 1849 ; and a maternity hospital with a school of midwifery. The lunatic asylum for Copenhagen 1s situated at Roskilde. Of the numerous benevolent Institutions in the city it is sufficient to mention Barton Hospital, dedicated by its founder, Christian I., to the Holy Ghost, with accommodation for 508 inmates ; Abel Kathrine's Buildings for 24 poor women; the Copenhagen Invalids' Home, erected in 1857-59; an orphan asylum, dating from 1727; a blind asylum, erected in 1811 by a Private society; a deaf and dumb asylum, founded' in 1807 ; and an asylum for imbeciles, established in 1855. The Jewish community has several important institutions of its own, After the cholera epidemic of 1853 the medical association built several ranges of workmen's houses, and their example has been followed by various private capitalists, among whom may be mentioned the Classen trustees, whose buildings occupy an open site on the Western outskirts of the city.

1. *heaires.—The principal theatre is the Royal, on Kongens*

yrorv, & beautiful edifice of modern erection on the site of a

former building of the same name which dates from 1748, Statues of Holberg and Oehlenschliger, tle former by Stein and the latter by Bissen, keep watch on either side of the entrance, and the front is crowned by a group by King, representing Apollo and Pegasus and the fountain of Hippocrene. 'The royal court theatre is elegantly fitted up, and can accommodate about 800 spectators. The Vesterbro Theatre, outside the western gate, is seated for about 1400 persons. The casino, built in 1846, is used as a theatre, and is capable of containing about 2300 spectators ; while the small saloon in the same building, seated for from 600 to 700 persons, is usually let for concerts and similar entertainments. The Tivoli Gardens, immediately beyond the western gate, form the favourite place of resort in the summer evenings. The amusements include concerts, pantomimes, gymnastic feats, and other performances. A freemasous' lodge was founded in 1870, the building being erected after the designs of Tvede.

In the neighbourhood of the city there are numerous places of public resort, — the most important being Frederiksberg, with its royal palace, its park, and its zoological gardens, about a mile and a half from the old west gate, and the Dyrehave about six miles to the north, with its fine forest of beech and oak.

Trade.— Copenhagen is becoming more and more the commercial centre of Denmark ; its local industries and its foreign trade are both making rapid advances. At the commencement of 1872, 500 merchant vessels of about 51,000 tons burden belonged to the port. The harbour is large and commodious, and by the aid of canals, large vessels can come almust to the centre of the town. The entrance is commanded by the powerful batteries of Trekroner, Provesten, and Sextus. The principal imports are timber, pitch, and tar, chiefly from Norway aud Sweden ; flax, hemp, masts, sailcloth, and cordage from Russia ; tobacco from America ; wines and brandy from France ; coal, earthenware, iron, steel, and salt from England ; and West India produce. The principal exports are corn, rape-seed, butter, cheese, beef, pork, horses, cattle, wool, hides, skins, bones, and grain-spirits.

There are extensive cloth and calico factories, foundries, and iron-works, as well as breweries, distilleries, tanneries, sugar-refineries, lime-works, and tobacco-factories. Piano- fortes, clocks, watches, surgical and

mathematical instru- nents, and porcelain are among its other productions. Tha royal China factory is celebrated for 'its models of Thorwaldsen's works in biscuit China. Among institutions for the furthering of commerce, the most important besides the Exchange are the National Bank, with a capital of £2,190,000, the Private Bank, the Industrial, the Agricul- tural, and the Commercial. A large Industrial Exhibition was held in 1872; and the building, which is situated at the western side of the town near the railway station, is intended to be permanent. The population of Copenhagen in 1769 was 92,571; in 1801, 100,975; in 1834, 119,292 ; in 1840, 120,819 ; in 1845, 126,787; in 1850, 129,695; in 1860, 155,143; and in 1870, 184,291. In the last year the number of females was 96,965, and that of inales 89,326 ; there were 3145 Jews, 1092 Catholics, 220 Baptists, and 172 Mormons. Including the suburbs, the population in 1876 was estimated at 233,000*

History.——The first mention of Copenhagen in Danish history belongs to the year 1027, when the kings of Norway and Sweden took advantage of the absence of Canute in England to attack his kingdom. It is called merely the Hofn or Haven ; and it was still only a fishing village about the middle of the 12th century, when Valdemar I. presented that part of the island to Axel Hvide, re- nowned in Danish history as Absolon, bishop of Roskilde, and afterwards archbishop of Lund. In 1165, or shortly after, this prelate erected a castle on the spot where the Christiansborg palace now stands, and the building was called after him Axel-huus. The settlement gradually became a great resort for merchants, and thug

in a corrupted form, it still bears, of

Kaupmannahofn, Kjobmannshavn, or Portus Mercatorum, as it is Bishop Absolon bestowed the castle and village, with the lands of Amager, on the see of Roskilde ; and Bishop Erlandsen granted the little community municipal rights and privileges, which were confirmed and augmented in 1284 by King Eric Glypping. Meanwhile its prosperity was checked by an attack by the people of Liibeck in 1248, and by another on the part of

Prince Yarimar of Riga in 1259. In 1306 it managed to repel the Norwegians, but in 1362, and again In 1868, it was cap- tured by the opponents of Valdemar Atterdag. In the following century a new enemy appeared in the Hanscatic League, which was jealous of its rivalry, but their invasion was frustrated by Queen Philippa. Various attempts were made by successive kings to obtain the town from the see of Roskilde, as the most suitable for the Royal residence ; but it was not till 1443 that the transference was effected, and Copenhagen became the capital of the kingdom. From 1523 to 1524 it held out for Christian II. against Frederick I.; and it was only after a year's siege that it yielded in 1536 to Christian II]. From 1658 to 1660 it was unsuccessfully beleaguered by Charles Gustavus of Sweden; and in the following year 1t was rewarded by various privileges for its gallant defence. In 1660 it gave its name to the treaty which concluded the Swedish war of Frederick IIJ. In 1700 it was bombarded by the united fleets of England, Holland, and Sweden; in 1728 a conflagration destroyed 1640 houses and five churches ; another in 1794 consumed the Christiansborg ; and a third in 1795 laid waste 943 houses, the church of' St Nicolas, and the Town House. In 1801 the Danish fleet was destroyed in the roadstead by the English, under Nelson ; and in 1807 the city was bombarded by the British army under Lord Cathcart, and saw the destruction of the university buildings, its principal church, and numerous other edifices. In 1853 it lost 4100 of its population from cholera.

COPERNICUS, or KopPpERNIGK, Nicoraus (1473- 1543), was born on the 19th February 1473, at Thorn in Prussia, where his father, a native of Cracow, had settled as a wholesale trader. His mother, Barbel Watzelrode, was the daughter of a well-to-do merchant. The education of Nicolaus, whose father died early, was undertaken by his uncle Lukas Watzelrode, subsequently (1489) bishop of Ermeland. After a course of instruction at the school in Thorn, he entered the university of Cracow in 1491, and during four years studied mathematical science under Albert Brudzewski, devoting his spare time to painting. At the age of twenty-three he repaired to Bologna, and attended the lectures of Dominico Maria Novarra, professor of astronomy there. He next spent some years at Padua, where, in addition to mathematics and astronomy, he applied himself to medicine, in which, in 1499, he took the degree of doctor. In 1500 he was at Rome, enjoying the friend- ship of the astronomer Regiomontanus, and fulfilling with

distinction the duties of a chair of mathematics. Copernicus had already been for some time a member of the chapter of Frauenburg, at which place he appears to have taken up his abode in 1503. His time was now engaged in clerical work, in giving gratuitous medical aid to the poor, and, though with but a slender stock of instruments, in the prosecution of his favourite studies. The house which he occupied at Allenstein is still to be seen, with the perfora- tions which he made in the walls of his chamber in order to observe the passage of the stars across the meridian ; also the remains of an hydraulic machine, similar to that at Marly, which he constructed for the purpose of raising the water of a rivulet for the supply of Frauenburg.

By his bishop and fellow-canons Copernicus was employed in defending their rights and privileges against the encroachments of the Teutonic knights ; and when sent as a deputy to the diet of Grodno, he busied himself in con- sidering the means of improving the corrupt coinage, and wrote a paper on that subject, which was placed among the archives of the diet. Copernicus sought by a comparative study of the various astronomical systems of the ancients to evolve from them a single system, at once simple and consistent. According to the hypothesis of the ancient Egyptians, Mercury and Venus revolved round the sun, which itself. with Mars, Jupiter and Saturn, moved round

prepared to endure. importunities

coPp—CcoOP

the earth. Apollonius of Perga chose the sun as the common centre of all the planetary motions, but held that like the moon, it turned round about the earth. The principal Pythagorean philosophers, on the other hand regarded the sun as the centre of the universe, about which the earth performed a circuit. others assigned a central position to the earth, but supposed it to have a motion of rotation round its axis, which produced the phenomena of the rising and setting of the stars, and the alternations of day and night. Philolaus removed the earth conceived it to have not only an axial rotation, but also an independent annual revolution round the sun. From the various ill-founded and unshapely theories of his predeces- sors Copernicus obtained the material for erecting a solid and imposing structure—the

system with which his name is connected. entitled De Orbium Coelestiwm Revolutionibus Libri VI,

Nicetas, Heraclides, and

from the centre of his system, and

This was expounded in a treatise

the preparation of which occupied its author from about 1507 to 1530. This work Copernicus long delayed bring-

ing before the world, being content to defer for a while the popular outery against himself, which, as a setter-forth of truths hitherto unknown to science and as an impugner

of the rights of time-honoured dogmatism, he must be At length, however, yielding to the of his friends, he permitted the publication of the book, which he dedicated to Pope Paul III. ; in order, as he says, that he might not be accused of seeking to shun the judgment of enlightened men, and that the authority of his Holiness, if he approved of it, might protect him from the baleful tooth of calumny.

The work was printed at Nuremberg, under the super sntendence of Rheticus, one of the disciples of Copernicus. The impression had just been completed, when Copernicus, — who had all his life enjoyed perfect health, was attacked with dysentery, followed almost immediately by a paralysis of the right side, with loss of memory, and obscuration of the understanding. For some time he lingered, and on the day of his death, only a few hours before he expired, a copy of his work sent by Rheticus arrived, and was placed in his hands. He touched it, and seemed conscious what it was; butafter regarding it for an instant, he relapsed into a state of insensibility, which soon terminated in death. He died on the 24th May 1543, at the age of seventy. His tomb, which is not distinguished from that of the other canons of Frauenburg, was in 1581 'adorned with a Latin epitaph by the Polish Bishop Cromer. In 1830 a statue of Copernicus, by Thorwaldsen, was placed in the Casimir Palace at Warsaw; and in 1853 another monu-ment to him, by Tieck, was erected at Thorn.

~~*The first formal exposition of the theories of Copernicus in con-tradistinction to the notions which had hitherto prevailed, was @ letter published by Rheticus, and entitled 4d Clar. V. d. Schonerum de Libris Revolutionum eruditiss. Viri et Mathematict excellenttss. Rev. Doctoris Nicolai Copernict Torunneei, Canonict Warmienss, per quemdam juvenem Mathematice studiosum, Narratio prum. Dantzic, 1540, 4to; reprinted, with a enlogium, at Basel, 1541, 8vo. The works of Copernicus are—l. De Revolutionthus Orbium Celestium Libri VI., Nuremberg, 1543, small folio ; reprinted at Basel in 1566, with the letter of Rheticus, and also included in the 'Astronomia Instaurata of Nicolas Muler, Amsterdam, 1617 an 1640, 4to; 2. A treatise on trigonometry, with tables of simes, entitled De Lateribus et*~~

~~*The Life of Copernicus has been treated of by the following authors :—Gas-sendi (Paris, 1654); Sniadeski (Warsaw, 1803); Westphal (Constance, 1822); Percy (Paris, 1824) ; Czynski (Paris, 1846) ; Szyrma (Lond., 1846); Prowe ae 1852-55-60-65); Szule (Warsaw, 1855); and Domenico Berti, in Copernico é Vicende del Sistema Copernicano in Italia (Rome, 1876). See ASTRONOMY.*~~

~~*COPIAPO, an inland town of Chili, capital of the pro. vince of Atacama, is situated on a stream of the same*~~

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name about 35 miles from the sea, in 27° 36’ S, lat., 70° 93’ W. long. The streets of the town, which was founded in 1734 by Count José de Manso, are straight and wide, with side pavements ; but the houses are low and of timber, excepting in the streets Chaiiarcillo and Atacama, where they are built with more elegance and of more solid material. ‘The principal square is 403 feet on each side, with flowers and shrubs in the centre surrounded by rows of shady pepper trees; while at the western end of the town is an avenue 52 feet broad and half a mile long with four rows of willow trees. Copiapo is connected by rail with the port of Caldera, 50 miles westward, and with the surrounding great mining districts, to which it owes its importance. From its situation in one of the driest regions of America, water is scarce, and the stream Copiapo is all utilized before it reaches the sea. Population, 12,000.

COPLEY, Joun SineLeron (1737-1815), historical painter, was born of Irish parents at Boston, Massachusetts. HIe was self-educated, and commenced his career as a portrait-painter in his native city. The germ of his reputation in England was a little picture of a boy and squirrel, exhibited at the Society of Arts in 1760. In 1774 he went to Rome, and thence in 1775 came to England. In 1777 he was admitted Associate of the Royal Academy ;

in 1783 he was made Academician on the exhibition of his

most famous picture, the Death of Chatham, popularized immediately by Bartolozzi’s elaborate engraving ; and in 1790 he was commissioned to paint a portrait picture of the defence of Gibraltar. The Death of Major Pierson, now in the national collection, also deserves mention. Copley’s numerous other works are little esteemed, being feeble and lifeless in drawing, and cold and dull in colour. HIs powers appears to greatest advantage in his portraits. HIe was the father of Lord Chancellor Lyndhurst. See LYNDHURST.

COPPER is a metal which has been known to and used by the human race from the most remote periods. Its alloy with tin (bronze) was the first metallic compound in common use by mankind, and so extensive and

characteristic was its employment at an early stage in pre-historic times that the epoch is known in archzological chronology as the Bronze Age. Metallic relics of that age in the form of arms, ornaments, and domestic implements are still very abundant. By the Greeks and Romans both the metal and its alloys were indifferently known as yaAxés and as. As, according to Pliny, the Roman supply was chiefly drawn from Cyprus, it came to be termed ws cyprium, which was gradually shortened to cyprium, and corrupted into cuprum, whence comes our copper, the French cuivre, and the German kupfer,

Copper (chemically, Cuprum, Cu) is a brilliant metal of @ peculiar red colour, in which respect it differs from all others excepting, perhaps, titanium. The atomic weight of copper is 63-3, and its specific gravity varies between 8°91 and 8:95, according to the treatment to which it may have been subjected. It takes a brilliant polish, is ina high degree malleable and ductile, and in tenacity it only falls short of iron, exceeding in that quality both silver and gold. By different authorities its melting point is stated at from 1000° ©. to 1398° ©. In electric conduc- uuvity it stands next to silver 3 the conducting power of silver being equal to 100, that of perfectly pure copper is fe by Matthiessen as 96°4 at 13° GC." On solidifying ee i molten condition it expands. Copper is not ne "e Py exposure in dry air, but in a moist atmosphere Pecomes coated with green carbonate. When heated or a it emits a peculiar disagreeable odour. ¥ aa, oe to Walchner, is as widely distributed fino iron, and occurs in all soils, and ferruginous

vat Waters and ores, It has been discovered in sea-

weed ; in the blood of certain Cephalopoda and Ascidia, and of a species of Limulus ; in straw, hay, eggs, cheese, meat, and other food-stuffs ; in the liver and kidneys, and, in traces, in the blood of man and other animals ; it has also been shown by Churcli to exist to the extent of 5:9 per cent. in turacin, the colouring-matter of the wing-feathers of the Zuraco, The ores containing copper in suffi- cient proportion to render its extraction economically practicable are numerous. Jt occurs not unfrequently native, sometimes in very great masses, as on the south shores of Lake Superior, where pieces of 150 tons weight have sometinies been obtained. Native

copper most frequently occurs in masses of irregular form in rocky fissures, and often crystallized, The principal ores of copper are Cuprite, Melaconite, Malachite, Chessylite, Atacamite, Chrysocolla, Chalcocite, Chalcopyrite, Hrubescite, and Zetrahedrite. Cuprite, or red oxide of copper, Cu,O, is a mineral which crystallizes in the cubic system, and con- tains 88°78 of metal. It occurs in most cupriferous mines, but never by itself in large quantities. Melaconite, or black oxide of copper, CuO, contains, when pure, 79°85 of the meta]. It was formerly largely worked in the Lake Superior region, and is abundant in some of the mines of Tennessee and the Mississippi valley. Malachite, or green carbonate of copper, CuCO,, Cu(HO),, is a beautiful and valuable ore containing about 56 per cent. of the metal ; it is obtained in very large quantities from South Australia, Siberia, and other localities. Frequently intermixed with the green carbonate is the blue carbonate of copper, chessy- lite or azurite, 2CuCO,, Cu(HO),, an ore containing when pure 55°16 per cent. of the metal. It was formerly char- acteristic of Chessy, near Lyons. Atacamite is a hydrated oxychloride of copper, occurring chiefly in Chili and Peru ; it crystallizes in the rhombic system. Chrysocolla is a hydrated silicate of copper, CuSiO,, 2H,O, containing in the pure state 30 per cent. of the metal; it is an abundant ore in Chili, Winsconsin, and Missouri. The sulphur compounds of copper are, however, the most valuable in an economical point of view. Chalcocite, redruthite, copper-glance, or vitreous copper, is a sulphide, Cu,S, containing very nearly 80 per cent. of copper. Copper pyrites, or chalcopyrite, a sulphide of copper aud iron, CuFeS,, crystallizes in the pyramidal system and contains 34°6 per cent. of copper when pure; but many of the ores, such as those worked specially by wet processes on account of the presence of a large pro- portion of sulphide of iron, contain less than 5 per cent. of copper. Cornish ores are almost entirely pyritous ; and indeed it is from such ores that by far the largest pro- portion of copper is extracted throughout the world. In Cornwall copper lodes usually run east and west. They occur both in the 'illas or clay-slate, and in the growan 01 granite. Erubescite, bornite, or horseflesh ore is a sulphide of copper and iron much richer in copper than the ordinary pyrites, and containing 56 or 57 or, according to the for- mula FeCu,S,, 62°5 per cent. of copper. Tetrahedrite, fahlerz, or grey copper, a sulphide crystallizing in the cubical system, contains from 30 to 48 per cent. of copper, with arsenic, antimony, iron, and sometimes zinc, silver, or mercury. The numerous other

compounds of copper have more interest from a mineralovical than from a metal- lurgical point of view.

Copper is obtained from its ores by two principal methods, which may be denominated—(1) the pyro-metal- lurgical or dry method, and (2) the hydro-metallurgical or

wet method ; and a small proportion of metallic copper is:

procured by (3) the electro-metallurgical method.

The methods of working vary according to the nature of the ores treated and local circumstances. The dry method, or ordinary smelting, cannot be profitably practised with

ores containing less than 4 pet cent. of copper, for which and for still poorer ores the wet process is preferred.

Suurtinc.—In Great Britain ordinary copper smelting is almost entirely centred at Swansea in Wales, although it is also practised in Lancashire. 'The processes there employed for extracting copper are technically known as the " English method, " in contradistinction to numerous other modified processes adopted at Continental and other foreign smelting centres. The following is an outline of the English method as conducted at Swansea.

The ores are divided by the smelter into two general classes—those containing sulphur, and those having little orno sulphur. The former are subdivided according as they contain much silica, iron pyrites, tin, arsenic, &c., OF a larger or smaller quantity of copper. The object of this classification of ores in the yard is to enable the operative smelter to make up a constant working mixture, having the following characters :—

1. The copper present is not under 9 nor above 14 per ecnt.; if under the former it would be unprofitably poor , if over the latter, the slags would have a tendency to retain copper, creating a loss.

9. After being calcined for an ordinary length of time, it will fuse easily without the necessity of adding flux, giving a clean and easily

fused slag. ; . ; f 3. The mat or coarse metal obtained from fusion contains as nearly as possible 30 per cent of copper.

4. The mixture does not contain ores having impurities cal-

culated to make the copper of too low a quality.

There is no definite or fixed rule to guide the smelter in these classifications, except a practised eye in distinguish- ing the character of ores, and the report of the assayer.

L. Calcination of the Ores.—The mixture of ores being selected according to these rules, it is carried to hoppers on the top of a large reverberatory furnace, termed the calcining furnace, and is then let down into the hearth, where, after drying a little, it is spread equally over the bottom, and covered to a depth of from 6 to 8inches. The quantity of ore put in varies, according to the size of the furnace, from 3 tons to 4 tons. The fire of the furnace is kept low at first; after two or three hours the ore on the sur- face becomes visibly red, and the heat is gradually increased to a yellow red ; but this heat penetrates to the depth of only about 2 inches, consequently the ore has to be stirred and turned over by means of long iron paddles every hour, so as to expose a new surface to the action of the air and fire. The calcination lasts generally from twelve to twenty- four hours, the length of time being dependent on the proportions of silica and sulphide of iron in the charge. Calcining furnaces are now very commonly provided with Siemens regenerators and heated with gas. The following changes take place :—the sulphur is partly burned off, form- ing sulphurous and sulphuric acids, and partly volatilized in the free state; arsenic is volatilized and oxidized ; and part of the copper and iron lose sulphur and combine with oxygen, forming oxides.

When the ore is sufficiently calcined, it is let down into the cubs or vaults beneath, by openings in the floor. Water is added to the hot ore in the cubs to prevent dust and assist further oxidation; the ore is then removed to a yard, and there stored up, ready for the fusing furnace. The following

analysis of ore, before and after calcining, will give an idea of the changes that have taken place :—

Before Calcination. After Calcination.

Copper …..sseeeeeeeees Gepper 2.2.00. c6.sssnes 12°2 WOH aoss.ssasuceaess «+x 32°7 1) OS ene eee Per SUDHUE.. ..c.sre0ces+ss3 31°0 Oxide of Iron. ..... 18°5 Sicdinccesndenenan Be SNE 5… 1.2 concenees 1632 ; SiC co deonogenanebeoeose 30°4

100°0 100°0

IL Fusion of Calcined Ore.—The next operation is the fusing of the calcined ore, which is done in a reverberatory

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furnace, termed an ore-fusing furnace, fitted also with a hopper on the top for charging it. The charge consists of

From 25 to 30 cwt. of calcined ore ; From 7 to 9 cwt. of sharp or metal slag from operation IV,; From 2to 8 cwt. cobbing.? ”

When the charge is let down into the furnace it is spread

equally over the bottom, the doors are all closed, every air- hole is stopped with clay, and the heat of the furnace increased as rapidly as possible.

After about five hours’ firing, when the furnace has

reached a white heat, the door-plate is removed, and a long

iron rake passed through the contents to make sure that the whole is perfectly fused. This being the case, the workman begins the operation of skimming, that is, drawing off the slag, which fluats on the surface of the mat, and removing it at the front door. When the surface is skimmed, the common practice is to let down a second charge of ore, and to fuse and skim in the same manner, before tapping the furnace to let out the metal or mat, which is generally tapped into large pits of water, and so granulated.

These pits are from 6 to 8 feet deep, and from 4 to 5 feet square, and into them a perforated box is lowered, which receives the charge of metal, and is raised by a crane or pulley. The metal is then removed toa yard for the next operation. This mat is termed granulated coarse metal. In many cases the coarse metal is first run into moulds andsubsequently crushed for the next operation,

The average composition of good coarse metal is given by Le Play as

oe, a ne mr rE a naanad 0000 oo: 33‘7 Sulphur
……ccscseeesesconsensens seereonswetins 29°2 TREN»
apooaaEaqessnbod cena ceaeeasteeetinelsseeee nares 33°6 Foreign metals.
……s0ssceerssesseerereeeeneraee 2°0 Slag, mechanically mixed …
s..sssee eeeerees all die 99°6

That of the slag or scori 18 Silica, mixed and combined …….+ ssssee eeeees
60°5 Protoxide of iON. ……cssceeeeeeeeeneeeeneneeens » 28°5 Alumina,
Lime, &C¢. ……sssssesesersneeeeerers 11:0 100°0

IIL. Calcination of Coarse Metal.—This operation is performed in the same manner as the calcination of the ore. The charge of metal, which is about 4 tons, covers the bottom of the hearth to the depth of 4 inches or so. It is put in through the hoppers fitted upon the top of the fur- nace, as described for the ore. The coarse metal being easily fused, great care is required not to raise the heat of the furnace too high, otherwise the metal will cake, and by adhering to the bricks will prove prejudicial both to the calcination and to the furnace. When the charge is let into the furnace, it is slowly brought to a visible red, which during the next fourteen hours is gradually increased to & bright red heat. This temperature is continued until the charge has been altogether twenty-four hours in‘the furnace, when it is let down through the bottom into the cubs, and water is thrown upon it.

The following analyses give an average result of the changes effected in this operation :—

Metal put into Calciner. Metal after cnn ae

COopper…..ccescereeereeees Copper……sereee cenrreee

PEO Mises. ce anaes senencaen'ees 39 Tron.…....7%a..940 38 SulpMar….s-.ccccar bees 25 Sulphur… ....csosoeeeeail Other matters and loss, 4 Oxygen, &C. ...seeeeerers 16

100 100

IV. Fusion of Calcined Coarse Metal.—In this operation the charge for an ordinary-sized furnace of 8 feet by |. feet is—

1 Cobbing is the name given to broken pieces of old bricks and bot toms of furnaces that have absorbed copper.

—ye eee

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95 ewt. of calcined metal, 5 to 7 ewt. slags from the roaster and refinery furnaces; 2 to 3-cwt. of cobbing.

In this mixture the oxide of iron is in excess in relation to the silica, and it is therefore much more easily fused than the ore ; but the reactions which take place are similar : the silica and oxide of iron combine to form slag, which floats upon the surface of the mat and has to be skimmed off, after which the mat is tapped out into sand-moulds. Two charges are generally fused before the metal is tapped out. This mat is termed d/we metal from its being of a slate-blue colour; the scoria is termed sharp slag, from its containing an excess of oxide of iron, aud being consequently used as a flux for fusing the ore in operation IT.

'The following is the composition of good blue metal and sharp slag :—

Blue Metal. Sharp Slag.

CGPI neereeeeeveer ae 8 Oxide'of tron..... 53 SHIPHUT.....00.0.0eeeee 20°5 Oxide of copper…..... 2 UGIMEEccsecssccrecese 12°6 MCR) Ciro in se eeee caees 45 IEOMIDIC7.. 6.000000 4:2 Rio Oxygen and loss …... 3°9 100

~~100~~

~~Should there be no ores such as carbonates or oxides on hand to smelt, the blue metal, instead of being tapped into sand-beds as described, is run into pits of water in the same manner as coarse metal, and subjected to another cal- cination and fusion.~~

~~When oxides and carbonates, such as the Australian ores, are on hand, they are generally fused with the calcined coarse metal, by which means a double advantage is obtained ; the excess of oxide of iron in the calcined metal fluxes the silica of the ore which has little iron, and the copper in the ore is converted into cupric sulphide, a con- dition necessary for reduction by the present method of smelting. The produce of this fusion is a mat termed pimpled or white metal, from its having small rough granules on the surface of the ingots. The average com- position of this metal is—~~

~~0 CCE Ee 78~~

~~0 18~~

~~gee soos ecccsecoccsceeeecsnsese 2 sc ceeccsseses ceosesnscneces 2~~

~~100~~

~~The composition of the slag from this Operation is very variable; italways contains copper, and has to be remelted. V. Roasting.—This operation has been often identified with calcining, from which, however, it is distinct. The roasting differs from the fusing furnace by having a large opening in the side for putting in the charge, and it is fur- nished with more air-holes in the bridge. 'The charge for au ordinary-sized furnace is 3 tons. When the metal is brought to fusion, the air-holes of the furnace are all opened, and a free current is allowed to pass over the surface of the fused mass: the heat of the fire is then regulated so as to keep the charge in a sort of semi-fluid state. This is con- tinued for about twenty-four hours, during which a great portion of the sulphur is driven off, and the iron, by unit- ing with silica and other matters, forms scoria, which is from time to time skimmed off. When all the impurities are removed, and the mat or regulus acquires the composi- tion of sulphide of copper, Cu S, then (except when the regulus~~

~~has been very rich) begins another operation termed the second roasting, or roasting proper, requiring other twenty-four hours, In this last roasting, when the alr-holes are opened, a brisk effervescence ensues over the surface of the fluid mass. he chemical reactions which give rise to this effer-vescence may be explained thns, The oxygen of the air combines in the first place with a portion of the sulphur,~~

~~forming sulphurous acid. A portion of the copper is also oxidized, to form the sub-oxide, and instantly reacts upon another portion of the sulphide, reducing the metal. 'The reactions are chemically represented thus :—~~

~~2Cu,0 + Cu,S = 6Cu+SO,.~~

~~The process is a very beautiful one, and exhibits a nice adaptation of principles to practice. The sponge regulus has a specific gravity of 5, the reduced copper of about 8 ; so that the copper sinks to the bottom, where it is protected, and a new surface of regulus becomes exposed to the action of the air.~~

~~If the ore be pure, or if no select copper be required, the operation of roasting is continued until the whole of the copper is reduced ; when it is tapped out into sand-moulds, forming coarse copper, bed copper, pimpled copper, or blistered copper, according to quality. 'The term coarse copper is applied occasionally to all these kinds except the blistered. If the ingot sets with contraction and exhibits a smooth hollow surface, it is termed bed, and generally indicates the presence of other metals, as tin. When the surface of the ingot is covered with pimples, it is termed pumpled copper, and indicates the presence of sulphur. When covered with large scales of oxide of copper, it is termed blistered ; but this is only when the copper is good and ready for refining. The following analysis of blister copper is given by Le Play :—~~

~~OPO ononsinan scenes sie eee eeee eee ian 98°4 RES 2 excises See «ee ee ee "tt Nickel, Cobalt, and Manganese ……..0… 3 Dimond AvSGRiGi, … dice ss es inecsscnneees *4 RIEDEL vswinnen aaa sene aeiuee dev eereaceetae ee 2~~

~~100'0~~

~~To make select copper, the roasting is carried on until about one-fourth of the copper in the regulus is reduced ; the furnace is then tapped, and the reduced metal is obtained at the bottom of the first and second ingots, or pigs, as copper bottoms, which contain most of the metallic impurities. The regulus is collected and again roasted, which produces the purest metal the ordinary process of smelting can give ; it is termed best selected.~~

~~VI. Refining.—In this operation, the remainder of the sulphur and foreign metals present in the copper is removed, and the metal is brought into a condition fit for the market. The refining furnace is similar in general form to a roasting furnace, except that the bottom inclines gradually down from all sides towards a deep part, or well, which is near the end door. It has also a large door on one side, but neither opening in the roof nor side tap-hole. Siemens's regenerative furnace has been very generally intro- duced for refinery purposes. When the copper is to be finally ladled out of the furnace the deep part, or well, allows of the ladle being dipped into the metal till the last portions are quite baled out. From 6 to 8 tons of copper from the roasting furnace are put into the refining furnace, the doors and air-holes of which are closed, and the heat is raised until the metal is in fusion, when the air-holes are opened. A short roasting is generally required, which is done in the manner above described, and the scoria which collects is carefully skimmed off. The separation of impurities is facilitated by occasionally stirring the metal with a rake. Some refiners throw pieces of green wood upon the surface, under the impression that it assists the escape of sulphur. The roasting is continued until a ladleful of the metal taken out sets with contraction. If the metal be very coarse, it will set with a surface having a frothy appearance ; if finer, it sets with expansion, first round the edge, then swelling towards the centre, forming a little mound or cone, and occasionally boiling over and throwing up jets of metal, forming @ miniature volcano. When the setting of the~~

~~which in Great Britain now occupies a most important position among metallurgical industries. :~~

~~The orestreated by the Henderson process are remarkably constant in character, and the following may be taken as representing their average~~

~~composition :—~~

~~metal in the ladle is favourable, the charge is ready for the operation of poling. A quantity of charcoal or anthracite coal is first thrown upon the metal to prevent oxidation by the air, and then the end of a large pole of green wood, generally of birch or oak, is inserted into the melted~~

~~copper, and kept pressed down to the bottom of the metal, Sulphur 49-00 which spurts and boils violently. 'This operation, it will Iron 43°55 be at once apparent, consists in the reduction of an oxide ae 3-20 or suboxide. Since oxide of copper dissolves in metallic as oe copper, as a salt dissolves in water, and makes it brittle, to ee me put pieces of wood or charcoal upon the surface would not Lime, with traces of silver, gold, &. ..... 2°50 remove the oxygen ; hence the necessity of poling, 1n order 100-00~~

~~to bring the carbonaceous matters into contact with the dissolved oxide. As the poling proceeds the refiner takes from time to time small samples called assays, which he hammers and breaks for examination. When the copper reaches the proper " pitch" the assay bends without break- ing, and if cut and broken the fracture is fibrous, and pre- sents a silky lustre. When this pitch is attained the pole is withdrawn, and a quantity of charcoal thrown upon the surface ; and, if the copper is for rolling or hammering, a little lead is added to the charges to insure toughness.~~

~~In making what is termed best selected copper, the refining is performed in the manner described, but no lead is added. This quality of copper is used for the manufacture of fine alloys, such as the best brass, or Muntz's yellow metal, Copper a little over-poled is .generally preferred for these purposes.~~

~~When the copper is brought to the proper pitch by the refining operation it is ladled out into moulds. The follow- ing are the forms in which British smelted copper is usually cast :—~~

~~Cake, 19 × 124 × 12 inches, weight 1 cwt. 1 qr.~~

~~Tile, 19×124× 4 9 » Lor aie~~

Ingot, 11× 8}x1h 5, ” 14 to 16 Ib. During the ladling out the refiner takes an assay at short intervals, as the metal is liable to get out of pitch, or be-come dry, as under-poled copper is termed, in which case poling has to be resumed. So much depends upon refining, that the best copper by a defect in this operation will be rendered unmarketable.

A great variety of improvements in copper-smelting have been proposed and patented, one or two of which have been usefully applied. Several modifications of the various processes are also adopted, to suit the quality of the ores and the kind of copper to be produced. These are all suggested by the experience of the smelters in dealing with the materials at their disposal.

Wer Procrsszs.—Several methods of extracting copper by the wet way have been more or less in practice at various periods ; but it is only of recent years that one of these has been established on a scale of great commercial extent and importance. From a very early time it has been known that the water which drained from mines containing pyritous copper ores, and which from the oxidation of the sulphide of copper contained some proportion of cupric sul- phate, yielded metallic copper by precipitation in the. presence of malleable or cast iron. The copper obtained in this way is known as cementation copper, and from the Spanish and Portuguese pytites mines a considerable amount of metallic copper has long been so precipitated. The process now very extensively adopted for treating Spanish and Portuguese pyrites, and some ores of similar composition from other countries is that patented by Mr William Henderson in 1859. Mr Henderson’s process is in several essential particulars the same as one patented in 1842 by Mr William Longmaid, which, however, was chiefly designed for,the productionof sulphate of soda, copper being only a by-product. There can be no doubt that Mr Henderson is the practical originator of the wet process,

The pyrites is first employed by alkali manufacturers and other consumers of sulphuric acid ag a source of that sub- stance, in burning for which the ore loses about 30 per cent, of its weight. It is this burnt pyrites which forms the raw material of the process. The various stages it undergoes are briefly as under.

~~I. Grinding.—The burnt ore, as received from the acid burners, is first mixed with about 15 per cent. of common salt, and ground to a fine powder by passing it between a pair of heavy cast-iron rolls. As the amount of sulphur left in the burnt ore is apt to vary, it is necessary to ascertain its proportion in each parcel of burnt pyrites. When the sulphur falls short of the proportion necessary for effecting the decomposition which follows, a sufficient quantity of " green" or unburned pyrites, is added to pro- duce a proper balance. If, on the other hand, the sulphur has been insufficiently extracted, " dead" roasted ore is added.~~

~~TL. Calcination.—This' operation is accomplished in several kinds of furnaces, that used by the Tharsis Sulphur and Copper Company being @ large muffle or close furnace, By others a patent furnace with a revolving hearth and mechanical stirring arrangement has been adopted with good results ; and some use open reverberatory furnaces heated by gas from Siemens's generators. During the roasting the mixture is frequently stirred, and, in the case of hand-worked furnaces, turned with long rabbles, and the completion of the operation is ascertained by test assays. When the copper has been brought into a soluble condition, the charge is raked out of the furnace and permitted to cool under a screen at its mouth. By the calcination the sulphur in the compound is first oxidized, sulphate of sodium is formed, and at the same time the chlorine from the sodium chloride unites with the copper to form cupric chloride. A small proportion of cuprous chloride is also formed, and special precautions have to be taken to prevent the extensive formation of this compound, which is dissolved only with difficulty. The hydrochloric acid and other gaseous products evolved during the calcination are con densed as " tower liquor" in ordinary condensing towers, and the product is used in the subsequent process of lixiviation. ;~~

~~IIL. Lixiviation—The calcined ore is conveyed to tightly- caulked wooden tanks, in which it receives repeated wash- ings with hot water, tower liquor, and dilute hydrochloric acid, till all the soluble copper ig thereby extracted. The product of the later washings is pumped or drawn up by 4 modification of Giffard's injector, to serve as 4 first liquot for subsequent charges of the lixiviating tanks, and 00 solution under a definite strength is permitted to pass On to the next stage in the process. 'The insoluble residue in the tanks~~

consists of "purple ore," an almost pure ferric oxide, largely used in "fettling" blast furnaces, and "i smelting purposes ; besides which it is available as jewes ler's rouge. , ¢

IV. Precipitation.—The precipitation of. metallic copper from the solution of its chloride is accomplished 10 large

COPPER

tanks by means of metallic iron in the same way that cementation copper is obtained from solutions of the sulphate. The solution is run into the tanks, in which there are miscellaneous heaps of old malleable Iron ; the chlorine combined with the copper unites with the iron, and metallic copper in a state of fine division is thrown down. The completion of the precipitation is ascertained by dipping a bright steel knife into the solution in the tank, and when no deposit of copper covers the steel the liquor is run off and a new charge conveyed into the tank, The tanks are drained periodically for removing the precipitate, which is first roughly separated from small pieces of iron, after which it is more thoroughly freed from iron, &c., by washing in water in a rocking sieve apparatus. The

precipitate so obtained should contain 80 per cent. of

metallic copper, which is either smelted directly for blister copper, or may be fused with the white metal of the ordinary smelting process, and subsequently roasted,

It has been found possible to extract in this process with profit the small proportions of lead, silver, and gold which Spanish pyrites is known to contain. Two processes are in operation for this purposes—one devised by Mr F. Claudet and the other by Mr W. Henderson, the original patentee of the wet process. The liquors from the first three washings contain practically all these metals, and they alone are treated. Mr Claudet precipitates them from the solution by means of iodide of potassium. Mr Henderson dilutes his solutions to from 20° to 25° Twaddell, and adds a very weak solution of a lead salt, such as the acetate, by which he obtains a cream-coloured precipitate containing about 53 per cent. of lead, 5 or 6 per cent. of silver, and 3 oz, of gold to each ton of the precipitate.

~~The importance of the wet process may be estimated from the fact that although it originated only in 1860, already 14,000 tons of copper are annually produced by it in Great Britain alone, out of an annual production for the whole world estimated at from 126,000 to 130,000 tons.~~

~~Attoys of Coprrr.—Copper unites with facility with almost all other metals, and a large number of its com- pounds are of the highest importance in the arts. Indeed copper is much more important and valuable as a con- stituent element in numerous alloys than it is as pure metal, The principal alloys in which it forms a leading ingredient are—Ist, brass; 2d, bronze ; and 3d, German or nickel silver; and under these several heads their respective applications and qualities will be found. These alloys are each much diversified as regards the relative proportions of the various metals which enter into their constitution, and these differences similarly modify the appearance and physical properties of the compounds. In this way for practical purposes they may be regarded as a great number of separate metals, eacli possessed of distinct qualities which fit it for special industrial uses, The following tables, compiled from various authorities, represent the analysis of typical examples of the several alloys: —~~

~~Taste A.— Composition of Brass or Copper and Zine Alloys.~~

~~Dy ree~~

~~Copper. SSS | ee es ee~~

~~70°29 60°20 .| 54°00 52°73~~

~~| English brass~~

~~Muntz's metal, or of copper and 40 of zine, but the copper may vary from 50~~

~~yellow sheathing, consists of 60 parts~~

~~to 63 per cent. and the zine from 50 down to 37,~~

~~Bol~~

~~TABLE B.—Composttion of Bronzes.~~

Copper.} Tin. 98°92 9 95°84 3 Maxentius 88°72 By Justinian …..... 84°53 Ancient arrowhead 70°30 Common bell metal 79°90 Bronze statue, Thorwaldsen's 8877

76°10 se evaf 10°50 60°50 73°60 89°00 65°15

0-71

Bell of 12th century. trace |. 1° Chimese gong, ...0

Japanese bell metal

9°00 | 7:00 | 0°42

Aluminium bronzes are composed of pure copper with from 24 up to 10 per cent. of aluminium. Phosphor bronze, according to the purposes for which it is intended, contains from 3 to 15 per cent. of tin and from 4} to 24 per cent. of phosphorus. Small proportions of other metals, among which are silver, nickel, cobalt, antimony, and bismuth, with sulphur, frequently enter into the composi- tion of bronzes.

TABLE C.—Composition of Nickel Silver,

F E a 8 Sy 3 Chinese' PaeKiong…77…..... 40°40 | 31°60 | 2°60 | 25°40]...] ... Parisian metal for 69°80 4-7 spoons, forks, eS aoe "ae atekel silver fort | gg galhio-mg limon | 15:01 aa BOGS mus n> Sais ee mee ews ens English nickel silver for 62°63 | 10°85 |trace | 26-05

plating (another kind)

Satts or Coprer.—Several salts of copper possess con- siderable industrial value, chiefly for the formation of bluo and green pigments, in dyeing and calico-printing, and. for the deposition of metallic copper by electro-metallurgy, &c. The principal salts of copper are the acetate, the carbonate, and the sulphate.

Acetate of Copper or Verdigris.—This salt is found in commerce in the two forms of basic and neutral acetate. The principal seat of the manufacture of the basic acetate is Montpellier in France, where the marc and other refuse

of grapes, after the expression of the juice for wine-making, is employed as a source ofthe acetic acid necessary. Sheets of copper are placed among this refuse, and these soon become coated with a deposit of verdigris, which has only to be seraped off, kneaded up with water, and pressed into cakes, The neutral salt is prepared from basic acetate by dissolving it in pyroligneous acid (wood vinegar) and evaporating the solution to the crystallizing point. It is also formed -by the double decomposition of the acetates of lead and calcium with sulphate of copper. Verdigris is much used as a pigment both in oil and water-colour paint- ing and in dyeing, and as a basis of compound pigments.

Carbonate of Copper in an impure condition forms a valuable series of pigments called verditer, Bremen blue, or Bremen green, possessing various shades of mingled green and blue according to the nature of the compounds with which the carbonate is mixed. The basis of these pigments is prepared by an elaborate and tedious process from the oxychloride of copper.

Sulphate of Copper, CuSO,, 5H,0, called also blue stone, or Roman vitriol, is, on the large scale, prepared direct from the cementation water from pyrites mines by evaporation to the crystallizing point. It is also prepared by the

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oxidation of sulphide of copper in a furnace at a comparar tively low heat, and by the direct action of sulphuric acid on metallic copper, as well as by various other processes. The sulphate of copper is very largely used as a basis for the preparation of other copper compounds, in electrome- tallurgy, in calico-printing, and in the American amalgama- tion metnod of extracting silver from its ores. In medicine it is employed as anemetic. On its use in the manufacture of chlorine, see vol. v. pp. 491 and 679.

Of pigments other than those above-mentioned having a copper basis, there may be enumerated the native carbonate, mountain or mineralgreen; Brunswick green, an oxychloride obtained by moistening copper foil exposed to the atmo- sphere with hydrochloric acid or solution of ammonium chloride ; Scheele's green (Cu,As,05), an arsenite of copper ; and Schweinfurt green, an aceto-arsenite of copper. Casselmann's green, a

pigment discovered in 1865, 1s a compound of cupric sulphate with potassium or sodium acetate. While it almost rivals Schweinfurt green in prilliancy, it possesses the advantage of being entirely free from arsenic, which renders the latter pigment and Scheele's green so virulently poisonous. At the same time it must be remembered that all copper compounds are poisonous, although the preparations that do not contain arsenic are not so deleterious in their manufacture and applications as are the others. (3. PA.)

Copper Assayinc.—In the Cornish method of assaying there are five operations,—the fusion for regulus, the roasting of the regulus, fusion for coarse copper, refining, and the cleaning of the slags. (1) The sample of ore is first inspected to ascertain its quality, and is then reduced to powder. If too much sulphur is present it may be expelled by roasting the ore, or by using nitre in the fusion ; in some cases it may be requisite to add sulphur in order to obtain a good regulus. A flux is employed consisting usually of lime, borax, fluor-spar, and glass, which form a slag with the excess of iron in the ore. The button of regulus obtained must be such that it separates easily from the slag without breaking. (2) The regulus ground to a fine powder is next roasted for from 20 to 30 minutes, the heat applied being raised towards the end of the operation ; the sulphides of iron and copper are thus converted into oxides. (3) In the fusion for coarse copper a flux of sodium bicarbonate with tartar or borax and nitre is employed ; a button of metallic copper is obtained which breaks with a fine-grained and greyish or orange-coloured fracture. (4) Refining consists first in the fusion of the button of coarse copper and the oxidation by the air of sulphur and foreign metals present in it; secondly, in the addition of refining flux, with the production of dry copper, or copper at tough pitch. Commonly a flux of three parts by measure of tartar, two of nitre, and a little salt is melted in the crucible employed for the previous operation, and into it the button of coarse copper is dropped ; the surface of the fused copper having become clear of oxides, a little refining flux is now added, and in about a couple of minutes the contents of the crucible are transferred to the mould. (5) The slags from the two last operations are mixed with tartar or charcoal and fused; and the weight of the small prills or shots of copper obtained is ascertained. Assaying by the wet way is usually conducted by treating a weighed sample of the ore with nitric acid, neutralizing with ammonia, and

adding standard solution of potassium cyanide till the blue colour of the liquid is discharged, copper- ammonium-cyanide, free ammonium cyanide, ammonium formate, and urea being produced. Silver, nickel, cobalt, and zinc may interefere with the estimation of the copper by this method ; the first may be removed by adding a little hydrochloric acid ; from the three other metals the copper can be freed by precipitating it as sulphide by

coPp—CcOoOP

means of sodium thiosulphate, the sulphide obtained beiag decomposed by nitric acid, and the copper estimated by ammonia and potassium cyanide in the usual manner, Before analysis by the wet way it is often advisable to roast the copper ore in order to expel sulphur. Steinbeck's process for determining the amount of copper in poor ores and schists consists in the treatment of the pulverized rock with hydrochloric acid, digestion in the cold, subsequent boil- ing with nitric acid, precipitation of the copper from the re- sulting solution by zinc in presence of platinum, and finally the titration of a solution of the precipitated copper. Dr Haen's method of estimation is based upon the formation of free iodine when excess of potassium iodide is mixed with solution of a copper salt,—the sulphate, for example. Copper is estimated gravimetrically in the metallic state, as in Luckow's electrolytical process; as cuprous sulphide, Cu,S, which may be obtained by heating cupric sulphide, CuS, in a current of hydrogen, or @ mixture of cuprous sulphocyanate, Cu,(CNS),, with sulphur ; and as cupric oxide, prepared by igniting the precipitate of hydrate, Cu(OH),, formed when potash or soda is added to solu- tions of cupric salts, Before the blowpipe, copper com- pounds give with microcosmic salt or borax a green bead, which becomes blue on cooling ; when ignited on charcoal in the inner flame with sodium carbonate and cyanide, they afford scales of metallic copper; most of them, also, when heated in the inner, impart to the outer flamo a brilliant greeu coloration.

For further details as to the chemistry of copper see Cuemistry, vol. v. pp. 528-30.

COPPERAS (French, couperase ; Latin, cupri rosa, the flower of copper), melanterite, green-vitriol, or ferrous sul- phate, is a saltof iron of the composition FeSO,, 7H,O. thas 2 bluish-green colour and an astringent,

inky, and somewhat gweetish taste. It crystallizes in oblique rhombic prisms of the monoclinic system, but generally occurs reniform, botryoidal, incrusting, stalactitic, pulverulent, or massive in nature. Itis readily dissolved by water, but is insoluble in alcohol. On exposure to the air it effloresces slightly, and if moist becomes coated with a basic ferric sulphate having, according to Berzelius, the formula 2Fe,0,, 803, or Fe, (SO,)3.5Fe,O3. If precipitated from its aqueous solution by alcohol, copperas does not readily absorb oxygen. Whien heated to 114° C. it loses six molecules of water, but the last molecule is not given up at a temperature of 280° C. Copperas is frequently found in metalliferous mines, being produced by the oxidation of marcasite and iron-pyrites, FeS,, in a damp atmosphere. The oxidation of the pyrites of coal to ferrous sulphate tends to promote the disintegration of the coal; occasion- ally, in the presence of shale, it gives rise to the formation of finely crystallized "' feather-alum," FeAl,(SO,),, 24,0. Copperas is manufactured, with alum, by the oxidation 0 the iron-pyrites contained in aluminous schists, such a8 those of the Coal-measures of Renfrew and Lanark (seo Aum, vol. i. p. 646). It may also be prepared by Spences method of heating ground puddling-furnace slag, tap-cinder, or Cleveland or black-band ironstone with sulphuric acid. factory for making copperas from the pyritous nodules 6 the clay of the Island of Sheppey, is said to have been established at Queenborough by Matthias Falconer, 4 Brabanter, in 1597.

Copperas is used in dyeing and tanning, in the manufacture of ink, Prussiau blue, and Nordhausen sulphuric acid or fuming oil 0 vitriol, in medicine as an astringent and tonic, and in analytica chemistry. In the 18th century it was in request for sheep dressing. When calcined it yields first a white salt, F eSO0p Hs, the ferri sulphas exsiccata of pharmacy, and finally prownish-Te ferric oxide or colcothar of vitriol (colcothar vitrioli, caput mor tuum, or crocus Martis), employed as a paint and polishing-powder Colecothar may also be prepared by calcining a mixture °

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as

CO P—

veight of copperas with 42 of common salt, and washing

ae Fading sodium sulphate. Jeweller's rouge or plate- weve is the washed and calcined precipitate of ferric oxide Potained py adding solution of sodium carbonate to solution of

copperas.

COPROLITES (from xozpos, dung, aiGos, stone), the fos- silized excrements of extinct animals. The discovery of their true nature was made by Dr William Buckland, who observed that certain convoluted bodies occurring in the Lias of Gloucestershire had the form which would have been

by their passage in the soft state through the

produced by their passag) intestines of reptiles or fishes. These bodies had long been known as "fossil fir cones" and "'bezoar stones." Buckland's conjecture that they were of fecal origin, and similar to the album greecum or excrement of hyzenas, was confirmed by Dr Prout, who on analysis found they consisted essen- tially of calcium phosphate and carbonate, and not unfre- quently contained fragments of unaltered bone. The name

"coprolites" was accordingly given to them by Buckland, who

subsequently expressed his belief that they might be found

useful in agriculture on account of the calcium phosphate they contained. The Liassic coprolites are described by Bucklandas resembling oblong pebbles, or kidney-potatoes ; they are mostly 2 to 4 inches long, and from 1 to 2 inches in diameter, but those of the larger Ichthyosauri are of much greater dimensions. In colour they vary from ash- grey to black, and their fracture is conchoidal. Internally they are found to consist of a lamina twisted upon itself, and externally they generally exhibit a tortuous structure, produced, before the cloaca was reached, by the spiral valve of a compressed small intestine (as in skates, sharks, and dog-fishes) ; the

surface shows also vascular impressions and corrugations due to the same cause. Often the bones, teeth, and scales of fishes are to be found dispersed through the coprolites, and sometimes the bones of small Ichthyo- sauri, which were apparently a prey to the larger marine saurians. Ooprolites have been found at Lyme Regis, en- closed by the ribs of Ichthyosauri, and in the remains of

several species of fish ; also in the abdominal cavities of a

species of fossil fish, Macropoma Mantelli, from the chalk

of Lewes. Professor Jiiger has described coprolites from the alum-slate of Gaildorf in Wiirtemberg, assigned by him | to the Keuper formation; and the fish-coprolites of

Burdiehouse and of Newcastle-under-Lyme are of Carboni- ferousage. The so-called "'beetle-stones" of the coal-forma- tion of Newhaven, near Leith, which have mostlya coprolitic nucleus, have been applied to various ornamental purposes by lapidaries, The name "cololites" (from x@dAoyv, the large intestine, Atos, stone) was given by Agassiz to fossil worm- like bodies, found in the lithographic slate of Solenhofen,

which he determined to be either the petrified intestines or

contents of the intestines of fishes. The bone-bed of

Axmouth in Devonshire and Westbury and Aust in Gloucestershire, in the Penarth or Rheetic series of strata, contains the scales, teeth, and bones of saurians and fishes, together with abundance of coprolites ; but neither there nor at Lyme Regis is there a sufficient quantity of phos- phatic material to render the working of it for agricultural purposes remunerative.

The term coprolites has been made to include all kinds of phosphatic nodules employed as manures, such, for example, as those obtained from the Coralline and the Red Crag of Suffolk, At the base of the Red Crag in that county is a bed, 3 to 18 inches thick, containing rolled fossil bones, cetacean and fish teeth, and shells of the Crag period, with nodules or pebbles of phos- Phatic matter derived from the Loudon Clay, and often

mvesting fossils from that formation, These are distin- guishable from the grey Chalk coprolites by their brownish ferruginous colour and smooth appearance. When ground

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they give a yellowish-red powder. These nodules were at first taken by Professor Henslow for coprolites ; they were afterwards termed by Buckland " pseudo-coprolites," "The nodules, having been imbued with phosphatic matter from their matrix in the London Clay, were dislodged," says Buckland, " by the waters of the seas of the first period, and accumulated by myriads at the bottom of those shallow seas where is now the coast of Suffolk, Here they were long rolled together with the boneg of large mammalia, fishes, and with the shells of molluscous creatures that lived in shells. From the bottom of this sea they have been raised to form the dry lands along the shores of Suffolk, whence they are now extracted as articles of commercial value, being ground to powder in the mills of Mr Lawes, at Deptford, to supply our farms with a valuable substitute for guano, under the accepted name of coprolite manure." 'The phosphatic nodules occurring throughout the Red Crag of Suffolk are regarded by Mr Prestwich as derived from the Coralline Crag. The Suffolk beds have been worked since 1846; and immense quantities of coprolite have also been obtained from Essex, Norfolk, and Cambridgeshire. The Cambridgeshire cop- rolites are believed to be derived from deposits of Gault age; they are obtained by washing from a stratum about a foot thick, resting on the Gault, at the base of the Chalk Marl, and probably homotaxeous with the Chloritic Marl. An acre yields on an average 300 tons of phosphatic nodules, value £750. About £140 per acre is paid for the lease of the land, which after two years is restored to its owners re-soiled and levelled, Plicatules have been found attached to these coprolites, showing that they were already hard bodies when lying at the bottom of the Chalk ocean. The Cambridgeshire coprolites are either amorphous or finger-shaped ; the coprolites from the Greensand are of a black or dark brown colour; while those from the Gault are greenish-white on the surface, brownish-black internally. Samples of Cambridgeshire and Suffolk coprolite have been found by Voelcker to give

onanalysis phosphoric acid equivalent to about 55 and 52°5 per cent. of tribasic calcium phosphate respectively (Journ. R. Agric. Soc. Eng., vol. xxi. p. 358,

1860). The following analysis of a saurio-coprolite from Lyme Regis is given by Herapath (¢bid. vol. xii. p. 91) :— De poate cp Vcdlihic- «+ saicslagidchiaiadna wsleanesanee 3°976 SUSE MEUCES va cro oo censinesnsayeaduieanveasiens 2°001 CHITAMINSUI OGLE. ..01..sc.ccccesassocesecescouses 2°026 GeUUMVCATDONALEC,....0..0000cccestesnseneevensase 28°121 ETM TMQ E OG iss. 2 =o. con eec aes eosney ons oseassl Oh COLCDIMINEUs Calcium and magnesium phosphate..... 53°996 Magnesium Carbonate .....cccercecserevesenses 0°423 AULT IC PHOS ALE'... .+..s0ccacesarseoceeseeee se 1°276 HECPOMMIGS PHAR Le. sunse vasndsieccesearqessaceeses 6°182 DU CO ss ciiniesisciniue s codanaadadinnsssseshdtiss-ctecsare 0°733 98°734

An ichthyo-coprolite from Tenby was found to contain 15:4 per cent. of phosphoric anhydride. The pseudo-copro- lites of the Suffolk Crag have been estimated by Herapath to be as rich in phosphates as the true ichthyo-coprolites and saurio-coprolites of other formations, the proportion of P.O; contained varying between 12°5 and 37°25 per cent., the average proportion, however, being 32 or 33 per cent.

Coprolite is reduced to powder by powerful mills of peculiar construction, furnished with granite and bubhr- stones, before being treated with concentrated sulphuric acid. The acid renders it available as a manure by converting the calcium phosphate, Ca,P,Og, that it contains into the soluble monocalcic salt, CaH,P,O,, or " superphos- phate." The phosphate thus produced forms an efficacious turnip manure, and is quite equal in value to that produced from any other source. The chien Marl in the

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monothelites. They have altogether about 130 clitrches or convents. Their religious orders are a patriarch, a metropolitan of the Abyssinians, bishops,

arch-priests, priests, deacons, and monks. 'The " patriarch," called of Alexandria," resides at Cairo, and is generally chosen by lot out of eight or nine monks of the convent of St Antony in the eastern desert designated as capable of filling the office. but he may be appointed by his predecessor. The metro- politan is appointed by the patriarch, and the twelve bishops are selected by preference from the monks. They generally baptize their children within the year, and some circumcise them about eight years of age; this rite was evidently handed down by their ancestors, as it is repre- sented in Egyptian sculptures of the Pharaonic period. In their schools the Coptic language is taught imperfectly. In their prayers appear to be many repetitions, and they pray in this manner riding or walking. Their churches are divided into five compartments, the most important of which is the chancel (heykel). They observe many fasts and festivals, and some perform pilgrimages to Jerusalem, They also abstain from parts of the flesh of the pig and camel, and froin that of animals which have been strangled and from blood. They do not perform military service, In their habits and customs they follow those of the other populations of Egypt ; they rarely intermarry with any other sect; in their marriages they employ a go-between sakel, and two-thirds of the dowry is settled upon the wife during lier life. 'The marriages take place on Saturday night, and the festivities sometimes are kept up for eight days. At these a singular custom prevails of attaching two cascabels to the wings of two pigeons, whereby the birds fly about till they are giddy, and then placing them in two hollow balls of sugar, each set on a dish ; the balls are afterwards broken and the pigeons fly about the room. The preparations for the marriage consist of ablution, a procession of the bride covered with a shawl, attended by musicians, to the house of the bridegroom, stepping over the blood of a slaughtered lamb at the door, the crowning of the bride and bridegroom, and subsequent entertainments, much abridged or even omitted when a widow is married. The etiquette is not to leave the house for a year to pay visits Divorces are only given for adultery on the part of the wife. The Copts are exceedingly bigoted, prone to be con- verted to Islamism, sullen, as Ammianus Marcellinus describes the Egyptians, false, faithless, and deceitful, but extremely useful as secretaries and accountants and skilful workmen. In their funeral ceremonies they follow Mussulman customs, but pay special visits on two days of the year to the sepulchres, and give away a slaughtered bullock and other viands, Both in their physical type and in

some of their ceremonies they retain a resemblance t0 their ancestors, the ancient Egyptians.

Seventy years after their conquest by the Mahometans, 640, unsuccessful in revolt, they suffered the persecution of their masters. The monks were branded in the hand, civilians oppressed with heavy taxation, churches demo- lished, pictures and crosses destroyed, 729-98, A few years later all Copts were so branded. Degrading dresses were imposed upon them, 849-50. Later, under El Hakim, 997, they were compelled to wear heavy crosses and black turbans as an ignominious distinction ; churches wele destroyed, and many of the Copts converted. In 130), the blue turban was introduced, but many Copts preferred a change of religion to the adoption of this head-dress In 1321 a dreadful religious strife, attended by the destruc tion of churches and mosques and great loss of life, 748° at Cairo between the Copts and the Mohametans ; bub ® 1354-55 great numbers embraced Islamism, appear to have gradually declined. nr

The language of the Copts, or so-called Coptic, 18 that 0

Wealden district furnishes much phosphatic material, which has been extensively worked at Froyle. In the vicinity of Farnham it contains a bed of "coprolites" of considerable extent, and 2 to 15 feet in thickness. Specimens of these from the Dippen Hall pits, analyzed by Messrs Paine and Way, showed the presence of phosphates equivalent to 55°96 of bone-earth (Journ. Le. Agric. Soc. Eng., vol. ix. p. 56). Phosphatic nodules occur also in the Chloritic Marl of the Isle of Wight and Dorsetshire, and at Wroughton, near Swindon. They are found in the Lower Greensand, or Upper Neocomitan series, in the Atherfield Clay at Stopham, near Pulborough ; occasionally at the junction of the Hythe and Sandgate beds; and in the Folkeston beds, at Farnham. At Woburn, Leighton, Ampthill, Sandy, Upware, Wicken, and Potton, near the base of Upper Neocomian iron-sands, there is a band between 6 inches and 2 feet in thickness containing " coprolites ;" these consist of phosphatized wood, bones, casts of shells, and shapeless lumps. The coprolitic stratum of the Speeton Clay, on the coast to the N. of Flamborough Head, is included by Prof. Judd with the Portland beds of that formation. In 1864 two phos- phatic deposits, a limestone 3 feet thick, with beds of calcium phosphate, and a shale of half

that thickness, were discovered by Mr Hope Jones in the neighbourhood of Cwmgynen, about sixteen miles from Oswestry. They are at a depth of about 12 feet, in slaty shale containing Llandeilo fossils and contemporaneous felspathic ash and scorie. A specimen of the phosphatic limestone analyzed byVoelcker yielded 34°92 per cent. of tricalcic phosphate, a specimen of the shale 52°15 per cent. (Report of Brit. Assoc., 1865).

Herapath, Chem. Gaz. 1849, p. 449 ; Buckland, Geology and Mine- ralogy, 4th ed., 1869; Fisher, Quart. Journ. Geol. Soc. 1878, p. 52 5 Teall, On the Potton and Wicken Phosphatic Deposits (Sedgwick tae Essay for 1878), 1875; Bonney, Cambridgeshire Geology,

COPTS, the name given to the descendants of the native inhabitants of Egypt after the Mahometan conquest, supposed by some to be descended from the ancient Egyptians or else from the mixed race which inhabited the country under the Roman empire. They are Christians, and are said to comprise less than one fourteenth of the whole population. Although numerous, their numbers continue to dwindle, and they are being gradually, by marriage or conversion, absorbed in the Mussulman population of the country. Their name Kubt, or Kubti, is supposed to be derived either from /Rgyptos or Egypt, or else from the town of Coptos, or even Jakobitai. Although scarcely distinguishable from the other inhabitants, they are said to have large and elongated black eyes, high cheek -bones, the lobe of the ear high, the nose straight and spread at the end, black and curly hair, thick and spread lips, and large chin. In height they are rather under the middle size ; they have in general little embonpoint, slender limbs, and pale or bronze complexion, and a sullen expression ; but they differ considerably, those who have embraced Roman Catholicism resembling more Greeks or Syrians, while the others of the Said retain their primitive type. Their dress is like that of the Mahometans, except that their turban is of a black-greyish or light-brown colour, and they often wear a black coat or gown over their other dress. In their general customs they follow the rules of the other inhabi- tants; the women veil their faces, both in public and at home when male visitors are present. In religion they are followers of the Eutychian heresy or Jacobite sect, so called from J acobus Baradeus, a Syrian, who propagated the doctrine; and in 1840 there were 150,000 of this sect, while

~~5000 were said tobe Roman Catholics, and as many of the Greek faith. The Jacobites are monophysites and~~

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~~the last stage of ancient. Egyptian civilization, and that in use at the time of the Romans. In the course of centuries the old Egyptian rapidly changed, especially at the time of the 19th dynasty, whea foreign conquests and high civiliza- fae had introduced into it a number of Semitic words, rncipally of the Arameean family. This continued till time of the 26th dynasty, or about the 7th century B.c., when the old forms had almost died out, and not only a great number of new words but also a difference of struc- ture appeared in the Egyptian, which approached more nearly to the modern Coptic. 'This continued till the Ptolemies, under whose government a fresh infusion of words (many of them Greek) considerably altered the language, as they displaced the ancient words, and some new grammatical forms appeared ; a considerable difference took place in the prefixes and affixes at that pdriod. After the conversion of Egypt to Christianity the old demotic alphabet fell into disuse, and another was sub- stituted twenty-four letters of the Greek alphabet, to which were added seven others, supposed to be borrowed from the older demotic to represent sounds not found in the Greek. 'The language was written in this character from the end of the 4th or beginning of the 5th century, in all works relating to Christianity, and in this con- dition has been handed down to the present day in three different dialects, called the Sahidic or that of Upper Egypt, the Memphitic or that spoken in the neighbourhood of Memphis, and the Bashmuric or dialect of the Lake Menzaleh and its environs. Great difference of opinion has prevailed as to the relative antiquity of these dialects, some considering the Memphitic and others the Sahidic to be the most ancient. The Sahidic is softer than the Memphitic, has none of the harder aspirations, and is more intermixed with Greek, It chiefly differs, however, in construction and the use of vowels. The Bashmuric is intermediate between the two, but is softer than the Memphitic, and one great peculiarity is the use of 2 for 7, which last letter was not known to the ancient Egyptians, The Coptic or Egyptian was in use at the 9th century, but had ceased to be intelligible in Middle Egypt in the 12th. It survived, however, as a spoken dialect till the 17th, an old man who spoke it having died only in 1633, In the Coptic Church, however, it is still~~

~~in use for the religious services, and is read, although not understood except by an Arabic interpretation or glossary. It is partly studied by the Copts, and an attempt to revive the ancient language was made by the missionary Lieder at Cairo, who founded~~

~~Schools within the last half century. The discovery of the~~

~~mode of reading hieroglyphs has rehabilitated the Coptic language, and there is no doubt that it is essentially the same as the Egyptian of the time of the Pyramids, and has retained many words of that and succeeding epochs. Like the Egyptian it is intermediate between the Aryan and Semitic languages in its copia verborum, and partly resembles the Semitic in its construction, in which, however, it is more closely allied to the African languages than the older Egyptian, while it differs greatly in the copia verborum from them. The Psalms and some other portions of the Scriptures had been translated into Coptic as early as Pachomius, 303, and from that time a succession of works, chiefly religious, were compiled in it. The com- mencement of the knowledge of Coptic in modern Europe 1s due to Kircher, who published his Prodromus Coptus in 1636. He was followed by Blumberg, who compiled a grammar, called Fundamenta Lingucee Coptice,in 1716. A Copt, named Tuki, bishop of Arsinoe, gave out another, the Rudimenta Linguee Coptice, in 1778, in Arabic and Latin, out still in a very uncritical condition. Scholz's grammar, edited by Woide in the same year, was a remarkable work for the time ; in 1783 Calusius published another grammar ;~~

~~but these chiefly related to the Memphitic dialect, the Sahidic being imperfectly known, and the Bashmuric quite unknown,—the first grammar of the three dialects being that of Tattam in 1830. Another more critical grammar prepared by Champollion, was edited by Rosellini aut. Ungarelli, and another by Peyron in 1841, which was succeeded by the work of Schwartze in 1847. The litera- ture chiefly consists of religious works,—the Pentateuch, Psalms, Kings, minor prophets, and book of Daniel, existing in Coptic, and few fragments in Sahidic of the book of Chronicles, and several unedited portions in that dialect, Besides these several of the apocryphal gospels aud some Gnostic works, as the Pistis Sophia, are found in the same language ; the Acts of the Apostles, sermons, homilies, martyrologies,~~

~~and many liturgical compositions, and Acts of Councils occur. A great mine of this literature is found in the Catalogus Codicum Copticorum Manuscriptorum in Museo Borgiano, 4to, Rome, 1810, and other sources. A great number of fragmentary inscriptions on calcareous stone or pottery, chiefly found at Elephantine, exist in the different museums of Europe. Altogether the Coptic literature is not interesting to general students beyond the relation it bears to the ancient Egyptian and its connec- tion with exegetical theology.~~

~~Clot-Bey, Aperçu général sur l' Egypte (Paris, 1840, p. 158, 248) ; Lane, The Modern Egyptians (8vo, Lond. 1860, p. 529); Peyron, Grammatica lingue Coptice introductio, 1841; Quatremere, La langue et la "literature de UV Egypte, 1808; Prichard, Physical History of Mankind, Lond. 1875, p. 202, foll. (S. B.)~~

~~COPTOS, the modern Kobt or Koft, a town of Egypt, a short distance from the right bank of the Nile, about 25 miles north-east of Thebes, Itis a place of great antiquity, as is proved by the name of Thothmes III. still extant on a granite pillar, but its ruins for the most part belong to a comparatively late period. After the foundation of the port of Berenice on the Red Sea in 266 B.c., its position on the caravan line raised it to great commercial prosperity; but in 292 a.p. its share in the rebellion against Diocletian led to an almost total devastation. It again appears, how- ever, as a place of importance, and as the seat of a con- siderable Christian community, though the stream of traffic turned aside to the neighbouring Koos. During part of the 7th century it was called Justinianopolis in honour of the Emperor Justinian.~~

~~COPYHOLD, in English law, is an ancient form of land tenure, legally defined as a "holding at the will of the lord according to the custom of the manor." Its origin is to be found in the occupation by villani, or non-freemen, of por- tions of land belonging to the manor of a feudal lord. In the time of the Domesday survey the manor was in part granted to free tenants, in part reserved by the lord himself for his own uses. The estate of the free tenants is the freehold estate of English law; as tenants of the same manor they assembled together in manorial court or court baron, of which they were the judges. The portion of the manor reserved for the lord (the~~

demesne, or domain) was cultivated by labourers who were bound to the land (adscripti glebe). They could not leave the manor, and their service was obligatory. These villani, however, were allowed by the lord to cultivate portions of land for their own use. It was a mere occupation at the pleasure of the lord, but in course of time it grew into an occupation by right, recognized first of all by custom, and afterwards by law. This kind of tenure is called by the lawyers villenagium, and it probably marks a great advance in the general recognition of the right when the name 1s applied to lands held on the same conditions not by villeins but by freemen. The tenants in villenage were not, like the free- holders, members of the court baron, but they appear to have attended in a humbler capacity, and to have solicited

A species of tenure resembling copyhold prevails in some parts of the country under the name of customary freehold, The land is held by copy of court-roll, but not by will of the lord. The question has been raised whether the free. hold of such lands is in the lord of the manor or in the tenant, and the courts of law have decided in favour of the former. In some instances copyhold for lives alone ig recognized, and in such cases the lord of the manor ma ultimately, when all the lives have dropped, get back the land into his own hands.

The feudal obligations attaching to copyhold tenure have been found to cause much inconvenience to the tenants while they are of no great value to the lord. One of the most vexatious of these is the heriot, under which name the lord is entitled to seize the tenant's best beast or other chattel in the event of the tenant's death. The custom dates from the time when all the copyholder's property, including the copyholder himself, belonged to the lord, and is supposed to have been fixed by way of analogy to the custom which gave a military tenant's habiliments to his lord in order to equip his successor. Instances have occurred in quite recent times of articles of great value being seized as heriots for the copyhold tenements of their owners. A race horse worth £2000 or £3000 was thus seized. The fine payable on the admission of a new tenant, whether by alienation or succession, is to a certain extent arbitrary, but the courts long ago laid down the rule that it must be reasonable, and anything beyond two years' improved value of the

lands they disallowed. The inconvenience caused by these feudal incidents of the tenure has led to a series of statutes, having for their object the conversion of copyhold into freehold.

In 1841 an Act was passed for the commutation of manorial rights in respect of lands of copyhold and cus- tomary tenure, and in respect of other lands subject to such rights, and for facilitating the enfranchisement of such land and the improvement of such tenure.

COPYRIGHT is the exclusive right of multiplying for sale copies of works of literature or art, allowed to the author thereof or his assignees. As a recognized form of property it is, compared with others, of very recent origin, being in fact the result of the facility for multiplying copies created by the discovery of printing and kindred arts. Whether it was recognized at all by the common law of England was long a legal question of the first magnitude,— and the reasons for recognizing it, and the extent of the right itself, are not quite clear from controversy even now. The short paragraph in Blackstone may still be read with interest. He thinks that "this species of property, being grounded on labour and invention, is more properly re ducible to the head of occupancy than any other, since the right of occupancy itself is supposed by Mr Locke and many others to be founded on the personal labour of the occupant." But he speaks doubtfully of its existence,— merely mentioning the opposing views, 'that on the one hand it hath been thought no other man can have a right to exhibit the author's work without his consent, and that it is urged on the other hand that the right is of too subtle and unsubstantial a nature to become the subject of property at the common law, and only capable of being guarded by positive statutes and special provisions of the magistrate." He notices that the Roman law adjudged that if one man wrote anything on the paper or parchment of another, the writing should belong to the owner of the blank materials, but as to any other property in the works of the understanding the law is silent, and he adds that neither with us in England hath there been (till very lately) any final determination upon the rights of authors at the common law. :

The nature of the right itself, and the reasons why 1

~~the succession to the land occupied by a deceased father, or the admission of a new tenant who had purchased the good-will, as it might be called, of the holding, paying for such favours certain customary fines or dues. In relation to the tenants in villenage, the court baron was called the customary court. The records of the court constituted the title of the villein tenant, held by copy of the court roll ; and the customs of the manor therein recorded formed the real property law applicable to his case. Each manor might have peculiar customs of its own, and as a matter of fact there has been a great variety in the conditions under which copyhold lands are held. ;-)~~

~~Copyhold had long been established in practice before it was formally recognized by the law. At first it was in fact, as it is now in the fictitious theory of the law, a tenancy at will, for which none of the legal remedies of a freeholder were available. In the reign of Edward IV., however, it was held that a tenant in villenage had an action of trespass against the Jord. In this way a species of tenant-right, depending on and strongly supported by popular opinion, was changed into a legal right. The nature of the change is vigorously described by Sir Edward Coke, '" As I con- jecture in Saxon's, sure Tam in the Norman's time the copy- holders were so far subject to the lord's will, that the lords upon the least occasion (sometimes without any colour of reason, only upon discontentment and malice, sometimes again upon sudden fantastic humour, only to make evident to the world the height of their power and authority) would expel out of house and home their poor copyholders, leaving them helpless and remediless by any course of law, and driving them to one by way of petition ; but now copy- holders stand upon a sure ground; now they weigh not their lord's displeasure and shake at every blast of wind ; they eat, drink, sleep securely ; only having a special care of the main chance, to perform exactly what duties and services soever their term doth require: then let lord frown, the copyholder cares not, knowing himself safe and not within any danger."~~

~~While copyhold was thus convertea into a legal estate of the same security as any other, it retained and does still retain many incidents characteristic of its historical origin. The life of copyhold assurance, it is said, iscustom. Copy- hold is necessarily parcel of a manor, and the freehold is said to be in the lord of the manor. The court roll of the manor is the evidence of title and~~

~~the record of the special laws as to fines, quit rents, heriots, éc., prevailing in the manor. Whencopyhold land is conveyed from one person to another, it is surrendered by the owner to the lord, who by his payment of the customary fine makes a new grant of it to the purchaser. The lord must admit the vendor's nominee, but the form of the conveyance is still that of surrender and re-grant. The lord, as legal owner of the fee-simple of the lands, has a right to all the mines and minerals and to all the growing timber, although the tenant may have planted it himself. Hence it appears that the existence of copyhold tenures may be traced in some parts of the country by the total absence of timber from such lands, while on freehold lands it grows in abundance. Hence also the popular saying that the "oak grows not except on free land." The copyholder must not commit waste either by cutting down timber, &c., or by neglecting to repair buildings. In such respects the law treats him as a mere lessee,—the real owner being supposed to be the lord. On the other hand, the lord may not enter the land to cut his own timber or open his mines. The limitations of estates usual in respect of other lands, as found in copypold, be- come subject of course to the operations of its peculiar conditions as to the relation of lord and tenant. An estate for life, or pour autre vie (i.e, for another's life), an estate entail, or in fee-simple, may be carved out of copyhold.~~

~~COrwrickhr 357~~

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~~ubject of bitter aispute. y some it has been pie as a monopoly, by others as a kind of property. Fach of these words covers certain assumptions from which the most opposite conclusions have been drawn. As a monopoly it is argued that copyright should be looked upon as a doubtful exception to the general law regulating trade, and should at all events be strictly limited in point of duration. As property, on the other hand, it is claimed that it should be perpetual There would appear to be no harm in describing copyright either as property or monopoly, if care be taken that the words are not used to cover suppressed arguments as to its proper extent and duration. Historically, and in legal definition, there would appear to be no doubt that copyright, as regulated by statute, is a monopoly. 'The Parliamentary protection of works of art for the period of fourteen years by the 8 Anne c,~~

19 and later statutes appears, as Blackstone points out, to have been suggested by the exception in the Statute of Monopolies, 21 James Ic. 3. The object of that statute was to suppress the royal grants of exclusive right to trade in certain articles, and to reassert in relation to all such monopolies the common law of the land. Certain excep- tions were made on grounds of public policy, and among others it was allowed that a royal patent of privilege might be granted — a od "to any hae : a new manufacture for the sole working or making of the same.' Copyright, like patent right, would be covered by the legal definition of a monopoly. It is a mere right to preveut other people from manufacturing certain articles. But objections to monopolies in general do not apply to this particular class of cases, in which the author ofa new work in literature or art has the right of preventing others from manufacturing copies thereof and selling them to the public. The rights of persons licensed to sell spirits, to hold theatrical exhibitions, &c., are also of the nature of monopolies, and may be defended on special grounds of public policy. The monopoly of authors and inventors rests on the general sentiment underlying all civilized law, that a man should be protected in the enjoyment of the fruits of his own labour.

The first Copyright Act in England is 8 Anne c. 19, The preamble states that printers, booksellers, and other | persons were frequently in the habit of printing, reprinting, and publishing "books and other writings without the consent of the authors or proprietors of such books and writings, to their very great detriment, and too often to the ruin of them and their families." 'For preventing, there-

fore, such practices for the future, and for the encourage- ment of learned men to compose and write useful books, it isenacted that the author of any book or books already printed, who hath not transferred to any other the copy or copies of such book or books in order to print or reprint the same, shall have the sole right and liberty of printing such book or books for the term of one-and-twenty years, and that the author of any book or books already composed, and not printed and published, or that shall hereafter be composed,'and his assignee, or assignees, shall have the sole liberty of printing andfreprinting such book or books for the term of fourteen years, to commence from the day of first publishing the same, and no longer." he penalty for offences against the Act was declared to be the forfeiture of the

illicit copies to the true proprietor, and the fine of one penny per sheet, half to the Crown, and half to any person suing for thesame. " After the expiration of the said term of fourteen years the sole right of printing or disposing of Copies shall return to the authors thereof, if they are then

INS, OF their representatives, for another term of fourteen

years." The last provision points to a particular view of

the nature of copyright, to which wo shall call attention |

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further on. To secure the benefit of the Act registration'

at Stationers' Hall was necessary. In section 4 is contained the provision that if any person thought the price of a book 'too high and unreasonable," he might complain to the archbishop of Canterbury, the lord chancellor, the bishop of London, the chiefs of the three courts at West minster, and the vice-chancellors of the two universities in England, and to the lord president, lord justice general, lord chief baron of the Exchequer, and the rector of the college of Edinburgh in Scotland, who may fix a reasonable price. Nine copies of each book were to be'provided for the royal library, the libraries of the universities of Oxford and Cambridge, the four Scotch universities, Sion College, and the faculty of advocates at Edinburgh. The copyright of the universities was not to be prejudiced by the Act.

It was believed for a long time that this statute had not interfered with the rights of authors at common law. Ownership of literary property at common law appears to have been recognized in some earlier statutes. The Licensing Act, 13 and 14 Car. II. c. 33, prohibited the printing of any work without the consent of the owner on pain of forfeiture, &c. This Act expired in 1679, and attempts to renew it were unsuccessful. The records of the Stationers' Company show that the purchase and sale of copyrights had become an established usage, and the loss of the protection, incidentally afforded by the Licensing Act, was felt as a serious grievance, which ultimately led to the statute of Anne. That statute, as the judges in Millar v. Taylor pointed out, speaks of the ownership of literary property as a known

thing. One of the petitions in support of the proposed legislation in 1709 states that by common law a bookseller can recover no more costs than he can prove damages. "Besides," it continues, " the defendant is always a pauper, and so the plaintiff must lose his costs of suit. No man of substance has been known to offend in this particular; nor will any ever appear in it." Therefore the confiscation of counterfeit properties is prayed for, And many cases are recorded in which the courts protected copyrights not falling within the periods laid down by the Act. Thus in 1735 the master of the Rolls restrained the printing of an edition of the Whole Duty of Afan, published in 1657. In 1739 an injunction was granted by Lord Hardwicke against the publication of Paradise Lost, at the instance of persons claiming under an assignment from Milton in 1667. Tho question, however, was raised in the case of Millar v. Taylor (4 Burrow, 2303) in 1769, in which the plaintiff, who had purchased the copyright of Thomson's Seasons in 1729, claimed damages for an unlicensed publication thereof by the defendant in 1763. The jury found that before the statute it was usual to purchase from authors the perpetual copyright of their works. Three judges, among whom was Lord Mansfield, decided in favour of the common law right; one was of the contrary opinion. The majority thought that the Act of Anne was not intended to destroy copyright at common law, but merely to protect it more efficiently during the limited periods. Millar v. Taylor, however, was speedily overruled by the case of Donaldson v. Beckett in the House of Lords in 1774. The judges were called upon to state theiropinions. A majority (seven to four) were of opinion that the author and his assigns had at common law the sole right of publication in perpetuity. A majority (six to five) were of opinion that this common law right had been taken away by the statute of Anne, and a term of years substituted for the perpetuity. Lord Mansfield did not deliver an opinion, as it was unusual for a peer to support his own judgment on an appeal to the Lords, Lord Camden argued against the existence of a common law right, and on his motion, seconded by the lord chancellor, the decree of the court below was reversed. The

reprinted elsewhere. Another change was made by ¢ Act 54 Geo. III. c. 156, which in substitution for the two periods of fourteen years gave to the

~~author and his assignees copyright for the full term of twenty-eight years from the date of the first publication, '" and also, if the author be living at the end of that period, for the residue of his natural life."~~

~~The Copyright Act now in force is the 5 and 6 Vict. ¢. pig 45, which repealed the previous Acts on the same subject, iy The principal clause is the following (§ 3):—That the copy. Pig,~~

~~decision appears to have taken the trade by surp rise. Many booksellers had purchased copyrights not protected by the statute, and they now petitioned Parliament to be relieved from the consequences of the decision in Donaldson ¥. Beckett. A bill for this purpose actually passed the House of Commons, but Lord Camden's influence succeeded in defeating it in the House of Lords. The university copy- rights were, however, protected in perpetuity by an Act passed in 1775. The arguments in the cases above mentioned raise the fundamental question whether there~~

~~can be any property in literary works, and are really argu- ments for and against the desirability of recognizing the rights on general principles. Lord Camden was the great opponent of copyright, both as a legislator and as a judge. HIs sentiments may be judged by his answer to the plea that copyright was a reward to men of genius :—" Glory is the reward of science, and those who deserve it scorn all meauer views. I speak not of the scribblers for bread, who teaze the press with their wretched productions. Fourteen years are too long a privilege for their perishable trash, It was not for gain that Bacon, Newton, Milton, and Locke instructed and delighted the world, When the bookseller offered Milton five pounds for his Paradise Lost, he did not reject it and commit his poem to the flames, nor did he accept the miserable pittance as the reward of his labour ; he knew that the real price of his work was im- mortality, and that posterity would pay it."~~

~~The battle of copyright at this time appears to have been fought mainly in the interests of the booksellers, and more particularly of the London booksellers. One member presented petitions from the country booksellers, another from the booksellers of Glasgow against the Booksellers' Copyright Bill. Burke supported the bill, and Fox opposed. it. In both~~

Houses the opponents of the bill denounced the booksellers vehemently. Speaking of the Stationers' Company, Lord Camden said, " Tn 1681 we find a by-law for the protection of their own company and their copy- rights, which then consisted of all the literature of the kingdom ; for they had contrived to get all the copies into their own hands." Again, owner was the term applied to every holder of copies, and the word author does not occur once in all their entries. "All our learning will be locked up in the hands of the Tonsons and Lintons of the age, who will set that price upon it their avarice chooses to demand, till the public become their slaves as much as their hackney compilers now are. Instead of salesmen the booksellers of late years have forestalled the market, and become engrossers." In the discussions which preceded the last Copyright Act, the interests of the authors are more prominent, but there are still curious traces of the ancient hostility to booksellers. 'The proceedings both in Donaldson v. Beckett and in the Booksellers' Copyright Bill are recorded at considerable length im the Parliamentary History, vol. xvii.

By the 41 Geo. III. c. 107 the penalty for infringement of copyright was increased to threepence per sheet, in addition to the forfeiture of the book. 'The proprietor was to have an action on the case against any person in the United Kingdom, or British dominions in Europe, who should print, reprint, or import without the consent of the proprietor, first had in writing, signed in the presence of two or more credible witnesses, any book or books, or who knowing them to be printed, &c., without the proprietor's consent should sell, publish, or expose them for sale ; the proprietor to have his damages as assessed by the jury, and double costs of suit. A second period of fourteen years was confirmed to the author, should he still be alive at the end of the first. Further, it was forbidden to import into the United Kingdom for sale books first composed, written, or printed and published within the United Kingdom, and.

judicial committee of the Privy Council may license | republication of books which the proprietor of the copyright thereof refuses to publish after the death of the author. The sixth section provides for the delivery within certain times of copies of all books the Act, and of all subsequent editions thereof, at the British Museum. And a copy of every book and its sub-

~~sequent editions must be sent on demand to the following libraries :—The Bodleian at Oxford, the public library at~~

~~right in every book which shall after the passing of this Act be published in the lifetime of its author shall endure for the natural life of such author, and for the further term of seven years, commencing at the time of his death, and shall be the property of such author and his assignees ; provided always that if the gaid term of seven years shall expire before the end of forty-two years from the first publication of such book the copylight shall in that case endure for such period of forty-two years; and that the copyright of every book which shall be published after the death of its author shall endure for the term of forty-two years from the first publication thereof, and shall be the property of the proprietor of the author's manuscript from which such book shall be first published and his assigns, The benefit of the enlarged period is extended to sub- sisting copyrights, assignee who has acquired them by purchase, in which case the period of copyright will be extended only if the author or his personal prietor to accept the benefit of the Act.~~

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~~published after the passing of~~

~~Cambridge, the Library of the Faculty of Advocates in Edinburgh, and that of Trinity College, Dublin. The other~~

~~libraries entitled to this privilege under the old Acts had~~

~~been deprived thereof by an Act passed in 1836, and grants from the treasury, calculated on the annual average value of the books they had received, were ordered. to be paid to them as compensation, A book of registry is ordered to be kept at Stationers' Hall for the registration of~~

copyrights to be open to inspection on payment of one shilling for every entry which shall be searched for or inspected, And the officer of Stationers' Hall shall give a certified copy of any entry when required, on payment of five shillings ; and such certified copies shall be received in evidence in the courts as prima facie proof of proprietorship or assignment of copyright or licence as therein expressed, and, in me case of dramatic or musical pieces, of the right of represent- ation or performance. False entries shall be punished as misdemeanours. 'The entry is to record the title of the book, the time of its publication, and the name and placa of abode of the publisher and proprietor of copyright. Without making such entry no proprietor can bring 2 action for infringement of his copyright, but the entry 8 not otherwise to affect the copyright itself. Any person deeming himself aggrieved by an entry in the registly may complain to one of the superior courts, which will order it to be expunged or varied if necessary. A proprietor may bring an action on the case for infringement of huis cop)" right, and the defendant in such an action must give nour of the objections to the plaintiff's title on which he means to rely. No person except the proprietor of the copyright is allowed to import into the British dominions for salé ¥

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hire any book first composed or written or printed and published in the United Kingdom, and reprinted else- where, under penalty of forfeiture and a fine of £10. The proprietor of any encyclopedia, review, magazine, periodical work, or work published in a series of books or parts, who shall have employed any person to compose the same, or any volumes, parts, essays, articles, cr portions thereof, for publication on the terms that the copyright therein shall belong to such proprietor, shall enjoy the term of copyright granted by the Act. But the proprietor may not publish separately any article or review without the author's con- sent, nor may the author unless he has reserved the right of separate publication. Where neither party has reserved the right they may publish by agreement, but the author at the end of twenty-eight years may publish separately. Proprietors of periodical works shall be entitled to all the benefits of registration under

~~the Act, on entering in the registry the title, the date of first publication of the first volume or part, and the names of proprietor and publisher. The interpretation clause of the Act defines a book to be every volume, part, or division of a volume, pamphlet sheet of letter-press, sheet of music, map, chart, or plan separately published. The Act is not to prejudice the tights of the universities and the colleges of Eton, West- minster, and Winchester.~~

~~The Copyright Act was the result of a Parliamentary movement conducted by Mr Sergeant Talfourd and after- wards by Lord Mahon. Talfourd's bill of 1841 proposed to extend copyright to a period of sixty years after the author's death. The proposer based his claim on the same erounds as other property rights,—which would of course, as Macaulay pointed out, go to justify a perpetual copyright. He refused to accept any shorter term than sixty years. He was answered by Macaulay in a speech full of brilliant illustration and superficial argument. If copyright is to be regarded, as Macaulay regarded it, as a mere bounty to authors,—-a tax imposed upon the public for the encourage- ment of people to write books,—his opposition to an extended term is not only justified, but capable of being applied to the existence of the right for any period whatever. The system of bounty, or of taxation for the special benefit of any class of citizen, is condemned by the principles of political economy and the practice of modern legislation. But if copyright is defended on the same principles which protect the acquisitions of the individual in other lines of activity, the reasoning of Macaulay and the opponents of perpetuity is altogether wide of the mark. The use of the phrase perpetual copyright has caused much confusion. A perpetual copyright is precisely the same sort of right, in respect of duration, as a fee-simple in land, or an investment in consolidated bank annuities. When Macaulay therefore Says, "Even if I believed in a natural right of property inde-~~

~~pendent of utility and anterior to legislation, I should still deny that this right could survive the original proprietors," his argument applies equally to property in land and in) bank annuities. The original purchaser of a bank annuity acquires a right to the receipt of a certain sum every year for ever, and such right he may assign or bequeath to any body he chooses. 'The writer of a book, if the law recognized a perpetual copyright, would acquire an exclusive right to the profits of its publication for ever, and might~~

assign or bequeath that right as he chose. In both cases the right survives the owner—if indeed such a phrase can Properly be used at all, Again, Macaulay points out that @ copyright fifty years after one's death is at the present moment comparatively worthless :—' An advantage to be enjoyed half a century after we are dead, by somebody, we —-. tei eeeemeee lias

' Such articles must be paj i mS e paid for. 3 Ti Proprietor of the Petidiical
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know not whom, perhaps by somebody unborn, by somebody utterly unconnected with us, is really no motive at all to action." No doubt there is a point in the future at which a right coming into existence would for us now living be virtually worth nothing. But thisis true of all rights, and not merely of the rights called copyright ; and this reason- ing would justify the cutting off at some point in the future of all individual rights of property whatever. The present value of a right to rent, a right to annuities, and a copyright—to arise a hundred years hence—is probably next tonothing. There may be good reasons for saying now that no such perpetuity of right ought to be recognized, that the state ought to pass a law to take for itself all—profits arising out of land, and all annuities from the public funds, from and after the year 1977. The injury done to the present owners would be precisely of the same sort and extent as in the case of a copyright being cut short a hundred years hence. Macaulay asks, " Would a copyright for sixty years have roused Dr Johnson to any vigorous effort, or sustained his spirits under depressing circumstances?" A sixty years' copyright, or a perpetual copyright, would have been to Dr Johnson in his last days of the same value as a sixty years' lease or a fee-simple respectively of property yielding the same amount of income. Again, says Macaulay, the property would be certain to leave the author's family; the monopoly would fall into the hands of a bookseller. The same thing may be said of all property that is assignable ; and if there is any good reason for preventing the assignment of property in certain circumstances, whether by a law of entail or otherwise, that reason may be urged in the case of copy- right with the same force, and only with the same force, as in the case of land. The old animus against the book- seller is still apparent in such objections as the last.

~~A. former Copyright Act, as we have already noticed, gave the author two periods of fourteen years, the second to be conditional on his surviving the first. The object of this enactment is evidently to prevent the copyright from falling into the hands of a bookseller. The legislature appears to have deemed authors incapable of managing their own affairs. To prevent them from being made the victims of unscrupulous publishers they put it out of their power to assign the entire copyright, by making the second period a mere contingency. It was forgotten that future profits have a present money value, and that if an author sells his copyright for its fair market value, as he surely may be left to do, he reaps the advantage of the entire period of copyright as completely as if he remained the owner to the end. From this point of view the condition attached to the second period was a positive hardship to the author, inasmuch as it gave him an uncertain instead of a certain interest. Itis the difference between an assignable annuity for a certain period of twenty-eight years, and two assign- able annuities for fourteen years—the second only to come into existence if the original annuitant survives the first period. The same fallacy lurks under Talfourd's complaint that as copyright is usually drawing towards an end at the close of the author's life, it is taken away at the very time when it might be useful to him in providing for his family. But if the period fixed is otherwise a fair period, the future of the author's family is an irrelevant consideration. He has, by supposition, the full property rights to which he is entitled, and he may sell them or otherwise deal with them as he pleases, and he will make provision for his family as other men do for theirs, Nothing short of a strict Entail Act can keep copyright, any more than other property, in his or his family's possession. The attempt to do this by making the latter portion of the period conditional has disappeared from legislation, but the same fallacy remains in the objections urged against long terms of copyright.~~

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~~increased period of copyright fixed by that Act is extended to the right of representing dramatic pieces and musical compositions—the first public representation or perform. ance being the equivalent of the first publication of a book, In such cases the right of representation is not conveyed by the assignment of the copyright only.~~

Lithographs, hitherto a doubtful subject, were brought Lith

ore os . . 4 Os within the provisions relating to prints and engravings by stp, a clause of the 15 and 16 Vict. c. 12.

Lastly, in 1862, an Act was passed, 25 and 26 Vict. ¢. Copics 68, by which the author of every original painting, drawing, Paintin, and photograph, and his assigns, obtained the exclusive right of copying, engraving, reproducing, and multiplying it, and the design thereof, for the term of the natural life of the author and seven years after his death. The Acts relating to copyright of designs will be noticed below.

We may now notice a few of the more important prin- ciples developed and applied by courts of justice in admi- nistering the law of copyright. One of them is that there can be no copyright in any but innocent publications. Books of an immoral or irreligious tendency have been Inm repeatedly decided to be incapable of being made the publi subject of copyright. In a case (Lawrence 2. Smith) before Lord Eldon, an injunction had been obtained against a pirated publication of the plaintifi's Lectures on Physiology, Zoology, and the Natural History of Man, which the judge refused to continue, "recollecting that the immortality of the soul is one of the doctrines of the Scriptures, and con- sidering that the law does not give protection to those who contradict the Scriptures." The same judge refused in 1822 to restrain a piracy of Lord Byron's Cam, and Don Juan was refused protection in 1823. It would appear from a recent case, arising out of a different subject matter,! that the courts are still disposed to enforce these principles. To refuse copyright in such cases is futile as a mode of punishment or repression, inasmuch as it directly opens up a wider circulation to the objectionable works. When the authorship of a book is misrepresented with intent to deceive the public, copyright will not be recog- nized.

The writer of private letters sent to another person may Pris in general restrain their publication. It was urged in some letter of the cases that the sender had abandoned his property in the letter by the act of sending ; put this was denied by Lord Hardwicke, who held that at most the receiver only might take some kind of joint property in the letter along with the author. Judge Story, in the American case of Folsom v. Marsh, states the law as

follows —" The author of any letter or letters, and his representatives, whether they are literary letters or letters of business, possess the sole and exclusive copyright therein ; and no person, neither those to whom they are addressed, nor other persons, have any right or authority to publish the same upon their own account or for their own benefit." But there may be special occasions justifying such publication. | A kind of property in unpublished works, net created by Uy the copyright Acts, has been recognized by the courts. ee The leading case on the subject is Prince Albert v, Strange (2 De Gex and Smale's Reports). Copies of etchings by the Queen and Prince Albert, which had been lithographed for private circulation, fell into the hands of the defendant, 4 London publisher, who proposed to exhibit them, and issue a catalogue entitled A Descriptive Catalogue of the Royal Victoria and Albert Gallery of Etchings. The Court of Chancery restrained the publication of the catalogue,

holding that property in mechanical works, or works of att

What would be a fair term may depend on a variety of considerations, but the chance or certainty of copyrights becoming publishers' property is certainly not one of them.

Macaulay's speech convinced the House of Commons, and Talfourd's bill was defeated. Lord Mahon's bill in 1842 reduced the proposed period to twenty-five years after death; Macaulay proposed forty-two as the fixed number in all cases. It was at Macaulay's suggestion that the clause against the possible suppression of books by the owners of copyright was introduced. Under a longer period of copyright the danger apprehended might possibly become areal one ; at present we are not aware of any complaint having been made to the judicial committee under this section.

Art copy- The preceding narrative records the changes in the

right. law of copyright in books only. In the meantime the

principle had been extended to other forms of mental work. The 8 Geo. IL. c. 13 is an Act " for the encourage- ment of the arts of designing, engraving, and etching historical and other prints by vesting the properties thereof in the inventors and engravers during the time therein mentioned."

It gave to every person who should "invent and design, engrave, etch, or work in mezzotinto or chiaro-oscuro, or from his own works and invention should cause to be designed and engraved, etched, or worked in mezzotinto or chiaro-oscuro, any historical or other print or prints, which shall be truly engraved with the namie of the proprietor on each plate and printed on every such print or prints," a copyright for fourteen years—the period fixed by the statute of Anne,—and inflicts a penalty on those who engrave, &c., as aforesaid, without the consent of the proprietor. The 7 Geo. III. c. 38 extended the protection to those who should engrave, «c., any print taken from any picture, drawing, model, or sculpture, either ancient or modern, in like manner as if such print had been graved or drawn from the original design of such graver, etcher, or draughtsman ; and in both cases the period is fixed at twenty-eight instead of fourteen years. 'Ten years later a further remedy was provided by giving a special action on the case against persons infringing the copyright. By the 38 Geo. III. c. 71 the sole right of making models and casts was vested in the original proprietor for the period of fourteen years.

Stageright. Stage right was first protected by the 3 and 4 Will. PY. c. 15, which provided that the author (or his assignee) of any tragedy, comedy, play, opera, farce, or other dramatic piece or entertainment composed, or which should thereafter be composed, and not printed or published by the author, should have as his own property the sole liberty of representing or causing to be represented at any place of dramatic entertainment in the British dominions any such production, and should be deemed the proprietor thereof ; and that the author of any such production printed and published within the ten years preceding the passing of the Act, or which should thereafter be so published, should have sole liberty of representation for twenty-eight years from the passing of the Act, or the first publication respectively, and further during the natural life of the author if he survived that period.

~~Lectures The publication of lectures' without consent of the~~

~~and authors or their assignees is prohibited by 5 and 6 Will.~~

~~sermons. JV. c, 65. This Act excepts from its provisions—(1) lectures of which notice has not been given two days before their delivery to two justices of the peace living within five miles of the place of delivery, and (2) lectures delivered in universities and other public institutions. Sermons by clergy of the Established Church arc believed to fall within this exception.~~

~~Music. Musical compositions are protected by a section of the Copyright Act 5 and 6 Vict. c, 45 akove mentioned. The~~

~~1 Cowan v. Milbourn, Law Reports, 2, Exchequer 230, in which it was held that a contract to let a room for lectures might be broken py we lessor on finding that the proposed lectures were of an irreligiols blasphemous, and illegal character,~~

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~~does certainly subsist, and is invaded, before publication, not only by copying but by description or catalogue.~~

~~The question what is a piracy against copyright has been »s the subject of much discussion in the courts. It was decided under the statute of Anne that a repetition from memory was not a publication so as to be an infringement of copyright. In the recent case of Reade v, Comquest the same view was taken. The defendant had "dramatized" the plaintiff's novel, and the piece was performed at his theatre. This was held to be no breach of copyright ; but the circulation of copies of a drama, so taken from a copy- right novel, whether gratuitously or for sale, is not allowed. Then again itis often a difficult question to decide whether the alleged piratical copyright does more than make that fair use of the original author's materials which the law permits. It is not every act of borrowing literary matter from another which is piracy, and the difficulty is tu draw the Jine between what is fair and what is unfair, Jord Eldon put the question thus,—whether the second publica- tion is a legitimate use of the other in the fair exercise of a mental~~

operation deserving the character of an original work. Another test proposed is "' whether you find on the

part of the defendant an animus furandi—an intention to—

tike for the purpose of saving himself labour." No one, it has been said, has a right to take, whether with or without acknowledgment, a material and substantial portion of another's work, his arguments, his illustrations, his authorities, for the purpose of making or improving a rival publication. When the materials are open to all, an author may acquire copyright in his selection or arrange- meut of them, Several cases have arisen on this point between the publishers of rival directories. Here it has been held that the subsequent compiler is bound to do for himself what the original compiler had done. When the materials are thus 2 medio, as the phrase is, it is considered a fair test of piracy to examine whether the mistakes of both works are the same. If they are, piracy will be inferred. Translations stand to each other in the same relation as books constructed of materials incommon. The animus furandi, mentioned above as a test of piracy, does not imply deliberate intention to steal ; it may be quite compatible with ignorance even of -the copyright work. This is shown by the case of Readew. Lacy. The plaintiff wrote a drama called Gold, and founded on it a novel called Never too Late to Mend. The defendant dramatized the novel,—his play reproducing scenes and incidents which appeared in the original play. The vice-chancellor, presum- ing that the defendant had a right to dramatize the novel, found that the second play was an infringement of the copyright in the first. Abridgments of original works appear to be favoured by the courts —when the act of abridgment is itself an act of the understanding, "' employed In carrying a large work into a smaller compass, and rendering it less expensive." Lord Hatherly, however, in Tinsley », Lacy, incidentally expressed his disapproval of this feeling,—holding that the courts had gone far enough—Inthis direction, and that it was difficult to acquiesce in the reason sometimes given that the compiler of an abridg. ment is a benefactor to mankind by assisting in the dif- fusion of knowledge. A mere selection or compilation, so as to bring the materials into smaller space, will not be a bona Jide abridgment; "'there must be real substantial con- ons and intellectual labour, and judgment bestowed ge " (Justice Story.) A publication professing to hy F *ristmas Ghost Story, Reoriginated from the

~~Original Yy Charles Dickens, Esq., and Analytically Condensed ex- aig this Work, was found to be an invasion of Mr ete copyright in the original. In the case of a The oo Lord Lyndhurst held that it is piracy | nthe appropriated music, though adapted to a different~~

~~purpose, may still be recognized by the ear. The quasi- copyright in names of books, periodicals, &c., is founded on the desirability of preventing one person from putting off on the public his own productions as those of another. The name of a journal is a species of trade-mark on which the law recognizes what it calls a "species of property." The Wonderful Magazine is invaded by a publication calling itself the Wonderful Magazine, New Series Improved. Bell's Life in London is pirated by a paper calling itself the Penny Bell's Life. So the proprietors of the London Journal got an injunction against the Daily London Journal, which was projected by the person from whom they had bought their own paper, and who had covenanted with them not to publish any weekly journal of a similar nature. A song published under the title of Mznnie, sung by Madame Anna Thillon and Miss Dolby at Monsieur Jullien's concerts, was invaded by a song to the same air published as Afinnie Dale, Sung at Jullien's Concerts by Madame Anna Thillon.~~

~~Dramatic and musical compositions, it should be observed, stand on this peculiar footing, that they may be the subject of two entirely distinct rights. As writings they come within the general Copyright Act, and the unauthorized multiplication of copies is a piracy of the usual sort. This was decided to be so even in the case of musical composi- tions under the Act of Anne. The Copyright Act now includes a " sheet of music" in its definition of a book. Separate from the copyright thus existing in dramatic or musical compositions is the right of representing them on the stage; this was the right created by 3 and 4 Will. IV. c. 15, above mentioned in the case of dramatic pieces. The Copyright Act, 5 and 6 Vict. c. 45, extended this right to musical compositions, and made the period in both cases the same as that fixed for copyright. And the Act ex- pressly provides (meeting a contrary decision in the courts), that the assignment of copyright of dramatic and musical pieces shall not include the right of representation~~

unless that is expressly mentioned. The 3 and 4 Will. IV. c. 15, prohibited representation "at any place of public entertain- ment," a phrase which has been omitted in the later Act, and it may perhaps be inferred that the restriction is now more general and would extend to any unauthorized representation anywhere. A question has also been raised whether, to obtain the benefit of the Act, a musical piece must be of a dramatic character. The dramatization of a novel, z.¢., the acting of a drama constructed out of materials derived from a novel, is not an infringement of the copy- right in the novel, but to publish a drama so constructed has been held to be a breach of copyright (Tinsley v. Lacy, where defendant had published two plays founded on two of Miss Braddon's novels, and reproducing the incidents and in many cases the language of the original). Where two persons dramatize the same novel, what, it may be asked, are their respective rights ? In Toole v. Young (9 Q. B., 523) this point actually arose. A, the author of a published novel, dramatized it and assigned the drama to the plaintiff, but it was never printed, published, or repre- sented upon the stage. B, ignorant of A's drama, also dramatized the novel and assigned his drama to the defendant, who represented it on the stage. It was held that auy one might dramatize A's published novel, and that the representation of B's drama was not a representation of A's drama. This case may be compared with Reade v. Lacy mentioned above.

Relation of copyright and stage- right.

For preventing the importation of pirated copies of books, Importa- the commissioners of customs are required to make out a tion of list of books on which copyright subsists, and of which they Pitted have received notice from the owner or his agent, and such "°'**

lists are to be exposed at the ports of the United Kingdom. If notice is not sent.the importation of ae a not be ; . —4

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English courts. A foreigner who during residence in the British dominions should publish a work was admitted to have a copyright therein. The question was whether residence at the time of publication was necessary, nq Cocks v. Purday, the Court of Common Pleas held that it was not, In Boosey

~~v. Davidson, the Court of Queen's Bench, following the decision of the Court of Common Pleas in Cocks v. Purday, held that a foreign author might have copyright in works first published in England, although he was abroad at the time of publication. But the Court of Exchequer, in Boosey 2. Purday, refused to follow these decisions, holding that the legislature intended only to protect its own subjects,— whether subjects by birth or by residence. The question came before the House of Lords on appeal in the case of Boosey v. Jeffreys, in which the Court of Exchequer had taken the same line. The judges having been consulted were found to be divided in opinion, Six of them held that a foreigner resident abroad might acquire copyright by publishing first in England. Fourmain- tained the contrary. The views of the minority were affirmed by the House of Lords (Lord Chancellor Cranworth and Lords Brougham and St Leonards). The lord chancellors opinion was founded upon "the general doctrine that a British senate would legislate for British subjects properlyso called, or for such persons who might obtain that character for a time by being resident in this country, and therefore under allegiance to the Crown, and under the protection of the laws of England." Lord Brougham said that 'The statute of Anne had been passed for the purpose of encourag- ing learned men, and with that view that Act had giver! them the exclusive right in their publications for twenty-one years. This, however, was clear, they had no copyright at common law, for if they had there would have been no necessity for the passing of that statute. It could scarcely be said that the legislature had decided a century and a half since that an Act was to be passed to create a monopoly in literary works solely for the benefit of foreigners. In the present case he was clearly of opinion that the copyright did not exist, and therefore that foreign law should not prevail over British law where there was such diversity between the two." Against the authority of this case, however, must be set the opinion of two of the greatest lawyers who have oc- cupied the woolsack in this generation—Lord Cairns and Lord Westbury. In the case of Routledge ». Low (Law Reports, 3 House of Lords, 100) Lord Cairms said, 'The aim of the legislature is to increase the common stock of the literature of the country ; and if that stock can be increased b the publication for the first time here of a new and valuable wor composed by an al~~

ien who has never been in the country, I see nothing in the wording of the Act which prevents, nothing im the

policy of the Act which should prevent, and everyiay in the pro- rovisions

fessed object of the Act and in its wide and genera which should entitle such a person. to the protection of the Act, in return and compensation for the addition he has made to the lite-

rature of the country."

And Lord Westbury said, in the same case,

'The case of Jeffreys v. Boosey is a decision which is attached to and depends on the particular statute of which it was the exponent, and as that statute has been repealed and is now replaced by another Act, with different enactments expressed in different tan- guage, the case of Jeffreys 7. Boosey is not a binding authority m the exposition of this later statute. The Act appears to have been dictated by a wise and liberal spirit, and in the same spirit it should

be interpreted, adhering of course to the settled rules of legal con- struction. The preamble is, in my opinion, quite inconsistent wit tatute was intende

the conclusion that the protection given by the s I

to be confined to the works of British authors. The real comucr of obtaining its advantages is the first publication by the author 0 his work in the United Kingdom. Nothing renders necessaly 8 bodily presence here at the time, and I find it impossible toe any reason why it should be required, or what it can ad d to merit of the first publication. If the intrimsi¢ merits of the reaso : ing on which Jeffreys 0. Boosey was decided be considered, [mu

frankly admit that it by no means commands my assent.

'These conclusions appear to follow also from the recent Naturalization Act of 1870, which enacts that real personal property of every description

may be takell

interfered with. If any one wrongfully causes a book to

be entered on the custom lists, any one injured thereby may

apply to a judge in chambers to have the entry expunged.

News- Newspapers stand at present on a somewhat peculiar papers. footing with reference to the law of copyright. Their posi- tion was put in issue in the case of Cox v. the Land and

Water Journal Company (Law Reports, 9 Eq. 324), in

which the plaintiff sought to restrain the defendant from publishing a "List of Hounds" taken from plaintiff's paper—the Field. It was argued that there was no copy-

right in a newspaper article, or, if there were, that it was

lost by non-registration. Vice-Chancellor Malins held that

a newspaper is not within the copyright Acts, that there-

fore the rules as to non-registration do not apply, and that

the proprietor of a paper acquires such a property (not copyright) in every article for which he pays under the

18th section of the Act, or by the general rules of property,

as will entitle him to prohibit any other person from publishing the same thing in any other newspaper. The

substantial justice of this decision is beyond impeachment,

but asa matter of law it is by no means satisfactory. 'The

right to prohibit publication is copyright and nothing else; and it is difficult to see how it can be enjoyed at all outside the Copyright Act, or how, if it is acquired in virtue of compliance with any of the provisions of the Act, 1t can avoid forfeiture as a penalty for non-registration. It is highly improbable that this decision would be confirmed, should the question ever come before-a higher court. 'The property of a newspaper, i.e. the good-will of printing and publishing it, and the exclusive right to its title, are not

rights of the same nature as copyright. Crown and A special kind of perpetual copyright in various publica- university tions has for various reasons been recognized by the law (1) copytights. jn the Crown and (2) in the universities and colleges. The various copyright Acts, including the last, except from their provisions the copyrights vested in the two English and the four Scotch universities, Trinity College, Dublin, and the colleges of Eton, Westminster, and Winchester. Crown copyrights are saved by the general principle which exempts Crown rights from the operation of statutes unless they are expressly mentioned. Among the books in which the Crown has claimed copyright are the English translation of the Bible, the Book of Common Prayer, statutes, orders of Privy Council, proclamations, almanacs, Lilly's Latin Grammar, year books, and law reports. The copyright in the Bible is rested by some on the king's position as head of the church; Lord Lyndhurst rested it on his duties as the chief executive officer of the state charged with the publication of authorized manuals of religion. The right of printing the Bible and the Book of Common Prayer is vested in the queen's printer and the universities of Oxford and Cambridge. These copyrights do not extend to prohibit independent translations from the original. The obsolete copyright of the Crown in Lilly's Latin Grammar was founded on the fact of its having been drawn up at the king's expense. The universities have a joint right (with the Crown's patentees) of printing Acts of Parliament. Law reports were decided to be the property of the Crown in the reign of Charles IT. ; by Act of Parliament they were forbidden to be published without licence from the chancellor and the chiefs of the three courts, and this form of licence remained in use after the Act had expired. The courts still maintain their right to restrain the publication of reports of their proceedings, but on quite other grounds than those pertaining to the law of copyright. University and college copyrights are made perpetual by an Act of George IIL, but only on condition of the books being printed at

their printing presses and for their own benefit. Rights of The rights of foreigners under the copyright Acts pro- foreigners. duced an extraordinary conflict of judicial opinion in the

acquired, held, and disposed of by an alien in the same manner in all respects as by a natural born British subject. As the latter can acquire copyright by first publication, without residence in England, and as copyright is personal property, it would seem that an alien also must have copy- right without the necessity of residence. It is quite clear, at all events, that residence in any part of the British dominions—not merely the United Kingdom—is sufficient ; but the first publication must be in the United Kingdom. But the copyright once created extends to the whole of the British dominions. : Colonial copyright, however, is subject to a special Act, . the 10and 11 Vict.c.95. Under English copyright books of the United Kingdom were protected in the colonies, and copies of them printed or reprinted elsewhere could not be imported into the colonies. At the same time books published in the colonies are not, aS we have just men- tioned, within the protection of the Copyright Act. By the Colonial Copyright Act, 10 and 11 Vict. ¢. 95, it is now enacted that when the legislative authority in any British possession makes proper provision by Act or ordinance for the protection of the rights of British authors, the Crown may, by Order in Council, suspend the prohibition against the importation, &vc., of foreign reprints of English copyright books, so far as such colony is concerned, and the local Act shall thereupon come into operation. The following colonies have taken advantage of the Act :—New Bruns- wick, Nova Scotia, Prince Edward's Island, Bermuda, Bahamas, Barbados, Canada, St Lucia, St Vincent, British Guiana, Mauritius, Jamaica, Newfoundland, Granada, St Christopher, Antigua, Nevis, Cape of Good Hope, Natal (Shortt). In 1875 an Act was passed to give effect to an Act of the Parliament of the Dominion of Canada respecting copyright. An Order in Council in 1868 had suspended the prohibition against the importation of foreign reprints of English books into Canada, and the Parliament had passed a Bill on the subject of copyright as to which doubts had arisen whether it was not repugnant to the Order in Council. Her Majesty in Council is therefore authorized to assent to the Canadian Bill (which is printed as a Schedule to the Act) ; and it is also enacted that, after the Bill comes into operation, if an English copyright book becomes entitled to Canadian copyright, no

Canadian reprints thereof shall be imported into the United Kingdom, unless by the owner of the copyright. The following points in the Canadian Act are worth noting. Any person printing or publishing an unprinted manuscript without the consent of the author or legal pro- prietor shall be liable in damages (§ 3). Any person domiciled in Canada, or in any part of the British Posses- 'Sions, or being a citizen of any country having an interna- tional copyright treaty with the United Kingdom, who is the author of any book, map, é&c., d&c.,—shall have the sole right and liberty of printing, reprinting, publishing, &e,, for the term of twenty-eight years. The work must be printed and published, or reprinted or republished

in Canada, whether before or after its publication else- where; and the Canadian privilege is not to be continued after the copyright has ceased elsewhere. And "no immoral or licentious, or irreligious, or treasonable, or seditious literary scientific or artistic work" shall be the subject of copyright (§ 4). A further period of fourteen years will be continued to the author or his widow and children. n "interim copyright" pending publication may be obtained by depositing in the office of the minister of agriculture (who keeps the register of copyrights) a copy of the title of the work; and works printed first in a series serials In a periodical, but intended to be published as ooks, may have the benefit of this interim copyright. If

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a copyright work becomes out of print, the owner may be notified of the Act through the minister of agriculture, who, if he does not apply a remedy, may license a new edition, subject to a.royalty to the owner. Anonymous books may be entered in the name of the first publisher. Books published in a colony stand on the same footing, so far as the United Kingdom is concerned, as books published in a foreign country. Their protection in England depends on the International Copyright Acts.

The International Copyright Acts were passed in order Tnterna- to give foreign authors the same sort of privilege as is tional Acts.

accorded to English authors, on the basis of reciprocity. The principal Act is the 7 and 8 Vict. c. 12, repealing an earlier Act, 1 and 2 Vict. c. 59, and

amended by 15 Vict. c. 12. Her Majesty may, by Order in Council, grant the privilege of copyright to the authors of books, é&c., first published in any foreign country to be named in such order—pro vided always that "due protection has beensecured by the foreign power, so named in such Order in Council, for the benefit of parties interested in works first published in the dominions of Her Majesty similar to those com- priscdin such order." Different provisoes may be fixed for different countries and different classes of works protected. No right of property shall be recognized in any book, &c., first published out of Her Majesty's dominions, save such as is created by this Act. Hence British as well as foreign authors first publishing abroad, have no protection in England unless there is a convention between England and the country in which they publish under the International Copy- right Act. Thus in Boucicault v, Delafield,! the plaintiff had first performed a drama in New York, and afterwards registered it in England on the first day of its performance there, and now sought to have its unauthorized representa- tion restrained. The court refused, holding that the Act 7 and 8 Vict. c. 12, § 19 says in effect that if 'any person, British subject or not, chooses to deprive this country of the first representation of his work, then he may get the benefit of copyright if he can, under any arrangement which may have been come to between this couutry and the country which he so favours with his representation." If there is no such treaty or arrangement, then this country has nothing more to say tohim. The publication in the British dominions of unauthorized translations of works published abroad may be prohibited by the authors for a period of five years, except in the case of political articles in the newspapers, &c. Copyright in foreign works of art, prints, articles of sculpture, é&c., may also be protected under the conditions applicable to copyright in the same subjects in England. The right of representing in England dramatic pieces, &c., first performed abroad, may also be recognized in the same way. The authors of dramatic pieces first performed abroad may also acquire (under the 15 Vict. ¢. 12) the right to prevent the representation of any unauthorized translation of such dramatic pieces for a period not exceeding five years from the date of first publication or representation of an authorized translation. Section 6 of this Act contains the important exception that "nothing herein contained shall be so construed as to prevent fair imitations or adaptations to the English stage of any dramatic piece or musical composition published in any foreign country." This

clause has given great dis- satisfaction, and it has been virtually repealed by 38 Vict. c. 12.2. The right to prevent translations of foreign books

1 The same question was decided in the same way in the recent case (Nov. 1876) of the same plaintiff against Mr Chatterton for represent- ing "Shaughraun," a play first brought out by plaintiff in America.

2 The state of the law, as it is left by this Act, is worth noticing. By the 15 Vict. c. 12, the Queen may, by Order in Council, grant stage-right to foreign dramatists as mentioned above, and the enact- ments in force for protecting domestic stage rights are available for them ; but nothing in the Act is to prevent fair imitations or adapta-

or dramatic pieces is subject to certain conditions enumerated in section 8 —requiring registration, publication of an The Act

authorized translation within a certain time, &c. s, that the translation should give the English people the means of knowing the original as accurately as is possible by means of au English version ; and in a recent case, where the authors of J'row Frou had authorized a free English version with many cbanges of names, &c., and considerable omissions, it was held not to be a sufficient compliance with the statute.' The judge pronounced it to be an imitation or adaptation only, and said that if a true translation had been published first, the plaintiff might then have acted the " version," and nobody else would have been allowed to act anything like it.

In all these cases, it must be remembered, the Crown can grant copyright to foreign productions, only on condition that a convention securing reciprocal rights 1s concluded with the foreign power in question, in terms of the Interna- tional Copyright Act. The countries with which conven- tions have been concluded are the following :—Prussia, Saxony, and other German states, in 1846 and 1847; France, 1852; Belgium, 1855; Spain, 1857; Sardinia ; and Hesse Darmstadt, 1862.

An Association to Protect the Rights of Authors has recently been formed with the object of calling attention to the more glaring defects of the existing laws of copyright. The chief points noticed by this association are the loss of rights by first production out of the United Kingdom ; the loss by dramatization of novels; the unfair conditions of stage-right in translations of foreign plays, and especially the hardship of the " fair adaptation " clause ; the loss caused by the inefficient prohibition of pirated copies in Canada since the International Copyright Act was passed, and the absence of an international copyright treaty with the United States. Of these defects the " adaptation clause" has been repealed since the association was formed, and the Act already noticed was passed in 1875 to give effect to a new Copyright Act of the Canadian Parliament. In 1876 a royal commission was appointed to consider the whole question of home, colonial, and international copyright.

The question of international copyright between England

and the United States has for sometime been the subject of active discussion among the authors and publishers of both countries. The chief opposition to a convention pro- ceeds from various sections of the publishing trade in America. An interesting statement of the various groups of opinion on this subject in the United States, and of the attempts to frame a satisfactory International Copyright Act, will be found in an article by Dr C. E, Appleton in the Fortnightly Review for February 1877. At present a sort of customary copyright in English books is recognized by certain leading firms. When one of them has, by arrangement with the author, obtained the advance sheets of an English work, there is a tacit understanding that the others are not to reprint that particular work ; but this arrangement, it appears, "1s practically confined to those who are able to retaliate when the trade courtesy is vio- lated." — These great publishers have a monopoly of the English trade, and those who would gladly become their competitors, the booksellers of the Middle and Western

States, would, according to Dr Appleton, oppose any Inter-

national Copyright Act which did not aid them to break

requires, it seem

~~tions to the English stage of foreign plays, &c. Now comes the Act of 1875, which says that in case of any such order the Queen may direct that the said section 6 shall not apply, and thereupon the 15 Vict. c. 12 "shall take effect with respect to such dramatic pieces, and to the translations thereof as if the said sixth section of the said Act were hereby repealed.' So that the Queen may repeal the sixth section in any particular case so far as to remit the question of " fair adaptations and imitations" to the common law. 2 Wood v, Chart, (Law Reports, 10 Equity 204).~~

~~CGP Y Rl Gas~~

~~Gown that monopoly. Some of the resolutions of a meet. ing of the opponents of International Copyright at Phila. delphia in January 1872 are worth quoting :— 1. That thought, unless expressed, is the property of the thinker: when given to : 2. As property it cipal law of the country to which the thinker is subject. 3. Theauthor of any country, assuming and performing the duties thereof, can have the same otection that an American author has. 4, The trading of privileges to foreign authors, for privileges to be grauted to Americans, is not just, because the interests of others than theirs are sacrificed thereby. 5. Because the good of the republican costly for the multitude by giving the power to forcign authors to fix their price here as well as abroad.~~

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~~tected by the amending the same. tected, the copyright in designs for the manufacture of linens, cottons, The 5 and 6 Vict. c. new and original design, whether such design be applicable to the ornamentiug of any article of manufacture, or of any substance, artificial or natural or partly artificial and partly natural, and whether for the pattern, for the shape or configuration, means the same may be applicable, whether by printing, painting, applying such design, for the terms specified in the Act, which vary according to the tion." was granted for designs " having reference to some purpose of utility, shape or configuration of such article." both cases is necessary. The period of protection varies from nine months to five years, tended period may be granted Cases under these Acts are more than to copyrights.~~

~~in France is recognized in distinct rights are secured by duction of literary works, musical compositions, of art; and 2d, the right of representation of dramatic works and musical compositions. life of the author and fifty years after his death. After the author's death the surviving consort has the usu- fruvtuary enjoyment not disposed of in reduction for the benefit of the author's protected heirs if~~

~~any. The anthor may dispose of his rights in the most absolute manuer in the forms Code Napoléon.~~

~~of a seller from 25 to 500 francs. will be confiscated. Piracy also forms the~~

~~the world it is as light, free to all. can only demand the protection of the muni.~~

~~by becoming a citizen of this, and~~

~~e th whole people, and the safety of our institutions, demand that books shall not be made too~~

~~of designs applicable to manufactures 18 pro- yon, . 5 and 6 Vict. c. 100, and subsequent Acts facturiss Before designs in general were pro- designs)~~

~~Copyright~~

~~calicos, and muslins had been recognized. 100. § 3, enacts "' with regard to any~~

~~or for the ornament thereof, and by whatever &c., the proprietor shall have the sole night of~~

~~class of manufacture in ques- By 6 and 7 Vict. c. 66, copyright for three years so far as design shall be for the Registration in~~

~~and in certain cases an eX- by the Board of Trade. nearly allied to patents~~

~~CopyRIGHT IN FOREIGN Srates,—France,—Copyright Frano, the most ample manner. Two law—lst, the right of repro- and works~~

The period is for the

of the rights which the author has his lifetime or by will, subject to

and within the limits of the Piracy is a crime punishable by fine of than 2000 franes ; in the case The pirated edition ground for 4 civil action of damages to the amount of the injury sustained—the produce of the confiscation, if any, to 80 towards payment of the indemnity (Penal Code, Art. 425-429), The piracy on French territory of works published in a foreign country is, by a decree of 25th March 1852, brought within the above provisions. Howevef, when a convention has been concluded with any state this treaty modifies the effects of the decree of 28th March, m so far as its provisions may be in opposition to the said decree ; the prescriptions of the new convention become the special law of the parties, and the rights of the authors and artists of that state are regulated in France by the intervening convention" (Iesumé of the Rights of Literary and Artistic Property in France, Longman é& Co.).

not less than 100 nor more

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COPWERIGHT

The following statements regarding copyright in other European countries are abridged from Copinger's Law of Copyright (London ; Stevens & Haynes, 1870) :—

Prussia. Copyright endures for the author's life, and his heirs have a term of thirty years from his decease. When acopyrightis

oned without any special stipulation, the publisher cannot

assl vt ; ; : ote more than one edition without the author's written permission. He may issue a reprint, on paying the author half the sum

i the first issue. an ai by treaty with Sardinia, Tuscany, and the Papal States,

; ioht for thirty years after author's death. ae 'and Puan. — Copyright formerly perpetual, now limited to the life of the author, and twenty years thereafter. Denmark and Sweden. — Copyright formerly perpetual, now limited to thirty years in the former and twenty in the latter ; if the publication is allowed to lapse, copyright falls to the state. Spain. —The period is the author's life and fifty years thereafter. Russia.—The author's life and twenty-five years, and ten years more if an edition is published within five years of the end of the

term. ie —Pevíod fixed in 1837 at ten years ; but copyright for

longer periods was granted for voluminous and costly works, and for the works of German poets. Among others the works of Schiller, Goethe, Wieland, &c., were protected for a period of twenty years from the date of the decree in each case. In 1845 the period was extended in all cases to the author's life and thirty

1 Copyright is for fifteen years from publication,

United States.—The first legislation on the subject of lite- rary property in the United States appears at the close of the revolution, In 1783 laws were passed by Connecticut and Massachusetts securing to authors for specified periods the exclusive property in their literary productions, and prescrib- ing penalties for its violation. Similar laws were passed by Virginia in 1785, by New York in 1786, and by other States. Under this system it was necessary for authors, in order to enjoy the benefits of protection in States other than that in which they resided, to copyright their works in each State having such laws. Authors' rights therefore depended on the legislation in the several States, as there was no national law relating to copyright. In order to afford to literary property, as well as to useful inventions and discoveries, adequate protection throughout the United States by a general law, the Federal Constitution, which came into force in 1789, empowered Congress "to promote the pro- gress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." Pursuant to this provision the first copyright law of the United States was passed, May 31, 1790, entitled " An Act for the Encourage- ment of Learning by securing the Copies of Maps, Charts, and Books to the Authors and Proprietors of such Copies during the

~~times therein mentioned." his statute gave to authors, who were citizens or residents of the United States, their heirs and assigns, copyright in maps, charts, and books for fourteen years, and provided for a second term of the same duration, if the author should be living at the expiration of the first. The penalty prescribed for publisb- 1ug, importing, or selling a book in violation of the Act was forfeiture of copies to the author or proprietor, " who shall forthwith destroy the same," and the payment of 50 cents for every sheet found in possession of the offender, one-half to go to the author or proprietor, and the other half to the United States. The Act also provided a remedy agaist the unauthorized publication of manuscripts belonging to citizens or residents of the United States. In on the Provisions of the Act of 1790 were extended to~~

~~e arts of designing, engraving, and etching historical and other prints." Jn 1831 the several Acts relating to oe were amended and consolidated by a general law, ihe aa the term of protection from fourteen to ma e t years, with provision f ora renewal for fourteen~~

~~ae t author, his widow or children. Musical com- Positions were now for the first time expressly provided~~

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~~for, being placed upon the same footing as books. In 1856 was passed the first statute for giving to dramatists the exclusive right of representing their plays in public, and in 1865 photographs and negatives were declared subjects of copyright in the same manner as books, engravings, &c. All statutes relating to copyright were repealed by the general law of 1870, which, with an amendment passed in 1874, now regulates the entire subject. This law may be found in the revised statutes of the United States of 1873, and the amendment in the statutes at large of 1873-74. The term of protection is the same as that under the Act of 1831. To the subjects of copyright protected by previous statutes were added paint- ings, drawings, chromos, statues, statuary, and models or designs intended to be perfected as works of the fine arts.~~

~~Every author or owner, native or foreign, of an unpublished literary composition or work of art has exclu- sive property therein at common law.~~

Before publication he may make of it any use which does not interfere with the rights of others. When the work is published the owner's common law rights are Jost. The author or proprietor of a manuscript, if a citizen or resident of the United States, has also a statutory remedy for damages against its unlicensed publication.

In 1834 was contested in the Supreme Ccurt of the United States the same question which had been so elaborately argued in the English case of Millar v. Taylor, decided by the Court of King's Bench in 1769, and finally settled by the House of Lords five years latcr in Donald- son v. Becket, viz., whether copyright in published works exists by the common law, and is therefore of unlimited duration, or is created by and wholly governed by statute. The Supreme Court, following the authority of the House of Lords, held that there was no copyright after publication except for the limited term given by the statute. Of the seven judges four concurred in this conclusion, two delivered elaborate dissenting opinions, and one was absent. This judgment has since continued to be the supreme law.

The policy of the American Government in relation to foreign authors has been far less Jiberal than that of England. No special arrangement for international copyright, such as subsists between Great Britain and many Continental countries, has been entered into between the United States and any foreign Government. While a foreigner in the United States is entitled to common Jaw protection for his unpublished works, his rights after publication are deter- mined wholly by statute. The question concerning the status of a foreign author under the copyright laws, as well as of a citizen who derives title from a foreigner, is freed from niuchi of the doubt and difficulty that have surrounded it in the English courts. While Parliament from the reign of Anne to the present time has legislated for the benefit of " authors," leaving to the courts to determine whether that general language is applicable to all authors or is limited to those of Great Britain, the American Congress, in all its legislation for the encouragement of literature from the Act of 1790 to that of 1870, has extended protection only to such author as may be a "citizen of the United States or resident therein." Thus by express words is a foreigner excluded from the benefits of the statute. This language has nevertheless given rise to some discussion as to who may be regarded as a "resident." That word has been judicially construed to

mean any person domiciled in the United States with the intention of making there his permanent abode. Neither naturalization nor a formal declaration of such intention is required. No definite period of time and no specific acts are indicated as necessary to constitute such residence. The question is to be deter- mined by the intention of the person at the time of record- ing his title, while his abode is in the United States,

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and by his acts so far as they indicate what that intention was. If at that time he intended to remain there and make the country his place of permanent abode, his home, he becomes during the continuance of that intention a resident within the meaning of the Act, though he may afterwards change his mind and return to his native land. How loug such intention shall continue the courts have not deter- mined; but if it exists bona jide at the time of recording the title, valid copyright vests, and will not be defeated by any subsequent acts or change of mind on the part of the claimant. On the other hand, if a foreign author should come to the United States intending to stay temporarily, although with that intention he should actually remain a year or ten years, he would be a mere sojourner, and would not acquire a residence within the meaning of the Act. 'To determine thus the intention in the mind of a person will in many cases be attended with difficulty and even with fraud. It is a question of fact for the jury, whose finding will determine the law. In case of a work composed jointly by a foreign and a native author, and copyrighted by either one or both, the copyright in the part contributed by the foreign author sf it could be distinguished, would not be valid. The assignee—although a citizen—of a foreign author, can ac- quire no more rights under the statute than the latter has.

There is, however, nothing in the statute to prevent a citizen or resident from acquiring copyright in certain works of art which he has purchased from a foreign author. By section 4952 copyright is vested in "any citizen of the United States, or resident therein, who shall be the author, inventor, designer, or proprietor of a book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or negative thereof, or of a painting, drawing, chromo, statue, statuary, and of models or designs

intended to be perfected as works of the fine arts." Under this section any "proprietor," who is a citizen or resident, might acquire copyright in a work purchased from a foreign author. But a subsequent section, 4971, declares that nothing in the Act "shall be construed to prohibit the printing, publishing, importation, or sale of any book, map, chart, dramatic or musical composition, print, cut, engraving, or photograph, composed or made by any person not a citizen of the United States nor resident therein." This language clearly disqualifies a foreigner, or any one deriving title from him, from acquiring in the United States copy- right in the works mentioned. But no mention is made of paintings, drawings, chromos, statues, statuary, models, or designs which are included in the previous section. Whether this omission is intentional or otherwise cannot be determined from the Act, but in the absence of any judicial or legislative light on this point, the only sound interpreta- tion would seem to be that if a citizen or resident of the United States, having purchased from a foreign author any work of art of these classes, should take the requisite steps to secure copyright therein, his title would be valid. A citizen of the United States may acquire copyright while temporarily resident in a foreign country.

The same liberal construction given to the word " book" by the English courts has been accepted in the United States. A brief literary composition on a single sheet may be copy- righted as abook. There is no special provision concerning copyright in an encyclopedia, review, magazine, or periodical as is prescribed by sections 18 and 19 of the 5 and 6 Vict. c. 45. Such works are protected in the same manner as books. In the absence of special agreement to the contrary, the copyright of an article contributed to a magazine or other periodical would doubtless remain with the author for all purposes which would not deprive the purchaser of any advantage arising from its publication in the magazine. The right of subsequent publication in book form would

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belong to the author and not to the owner of the periodical Such publication might be made at any time after the issue of the magazine, provided the circulation of the latter was

~~righted; hence any uncopyrighted article first published in~~

~~not thereby injured. In practice newspapers are not copy.~~

~~a newspaper becomes publict juris, and valid copyright could not be subsequently obtained for it. But either the entire newspaper or any article published in it may be copy. righted by a compliance with the general statutory provisions relating to books. Authors may reserve the right to dramatize or to translate their own works, by printing a notice to that effect in the book. The copyright law does not protect a title independently of the book ; but a title may be registered as a trade mark, or its unlawful use may be restrained on the general principles of equity, Nor is there any provision in the copyright law, as in England, for the protection of designs for industrial pro- ducts. The statute of 1874 prescribes that the words "engraving," "cut," and " print " shall be applied only to pictorial illustrations or works connected with the fine arts, and that no prints or labels designed to be used for any other articles of manufacture shall be entered under the copyrigh law, but must be registered in the patent office.~~*

~~The statu.e now in force grants to authors, and their executors, administrators, or assigns, copyright for twenty- eight years from the time of recording the title. At the expiration of that period the author or his widow or children may obtain an additional term of fourteen years. Yn order to secure copyright every applicant is required to perform three acts : —I1st, before publication to transmit to the librarian of Congress in Washington a printed copy of the title of the book, map, chart, dramatic or musical com- position, engraving, cut, print, or photograph, or a deserip- tion of the painting, drawing, chromo, statue, statuary, model, or design ; 2d, within ten days after publication to send to the same official two copies of such book or other article, or in the case of a painting, drawing, statue, model, or design a photograph thereof ; 3d, to print on the title page, or the page next following, of every copy of a book, or in the case of a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, model, or design to inscribe upon some visible portion of it, or upon the substance upon which it is mounted, the notice of entry for copyright in the form prescribed. 'Two forms are prescribed, either of which may be used :—l1. " Entered, according to Act of Congress,~~

in the year by , in the office of the librarian at Washington ;" 2. "Copyright 18..by In each caf the year when the copyright was entered and the name of the person, persons, or firm by whom entered are to he given. Compliance with all these conditions is essential to valid copyright. Until they are performed an action at law for infringement cannot be maintained. But equity wil protect the copyright as soon as the title is recorded, and before the performance of the other two requisites. When the right is perfected an action at law may be maintained for any infringement after the recording of the title. A penalty of $25 is further prescribed for failure to deliver to the librarian of Congress, within ten days after publication, two copies of the best edition of the book, or description or photograph of the other articles above mentioned, . copy of every subsequent edition containing substantia! changes, A penalty of $100 is imposed upon any person who causes notice of copyright to be inserted in @ book, us impressed upon any other article for which a copyright 43° not been obtained. The fee for securing copyright '8 50 cents, to be paid to the librarian for recording the title A copy of such record may be obtained for 50 cents. librarian receives $1 for recording and certifying 4

assignment, and $1 for every copy of an assignment furnished. Another essential condition to valid copyright s publication, and the work must be first published in the United States ; but a contemporaneous publication abroad will not prejudice the author's rights. The production must also be original and innocent in character. Copy- right will not vest in an unpublished work. But the statute provides that every person who shall print or pub- lish any manuscript, without the consent of the author or proprietor, if the latter is a citizen or resident of the United States, shall be liable for damages. There is nothing in the Act to exclude a resident assignee of a foreign author from the benefits of this provision.

Copyrights pass to heirs and are assignable in law by any instrument of writing. Every assignment must be recorded in the office of the librarian of Congress within sixty days after its execution, in default of which it becomes void as against any subsequent purchaser or mortgagee for a valu- able consideration without notice.

The existing statute provides that if any person without due authority shall print, publish, or import a copyrighted book, or knowing it to be so printed, published, or imported shall sell or offer it for sale, he shall forfeit every copy to she proprietor and pay such damages as may be recovered in acivil action, Incase of piracy of a map, chart, musical composition, print, cut, engraving, photograph, or chromo, the offender is made liable to forfeit the plates and every sheet copied or printed, and to pay $1 for every sheet found in his possession either printing, printed, copied, published,

equity an injunction against the publication and sale of the pirated work, and may recover at law the damages sustained by such publication. Allactions at law and suits in equity under the copyright statutes must be brought in the circuit or district courts of the United States, except in the District of Columbia or any territory where the proper tribunal is the Supreme Court. Appeal lies to the Supreme Court of the United States. All actions for forfeitures or penalties must be brought within two years after the cause of action has arisen. Redress for the nvasion of common law rights in unpublished works must be sought in a State court, unless the parties to the con- troversy are citizens of different States, in which case the courts of the United States have jurisdiction.

Stage right in the United States, —Until 1856 there was no statute giving to dramatists control over the public representation of their plays. This want was met by the Act of August 18 of that year, which was passed expressly to confer upon the author or owner of a dramatic composition the sole liberty of performing, or causing it to be performed, in public ; and any one infring- Ing this right was made liable to damages in a sum not less than $100 for the first and $50 for every subsequent Unauthorized performance. The provisions of this Act have been held to apply only to cases in which copyright Was secured under the Act of 1831 ; and as the benefits of that law were by express words limited to citizen or resident authors, foreign dramatists acquired no rights by the se of 1856. The Act of 1870 gives to dramatists, oe the exclusive right of publishing in print, the sole verty of representing their dramatic compositions on the Stage, and declares that any person who publicly represents

ok and endures for the same term as does the copy-

right in the book, The Act must be construed as giving the sole liberty of representation only in cases where the exclusive right of publication has been secured. In other words, the copyright in the printed production is made to include the right of public representation. As the former can be acquired only by citizens and residents, foreign dramatists and their assignees, as under the Act of 1856, are excluded from the benefits of the statutes. There is no statutory provision, as in England, giving to either native or foreign dramatists the exclusive right to represent their manuscript plays. While foreign dramatists are entitled to no statutory protection whatever, their manuscript plays are protected by the common law. In this respect the rights of native and foreign dramatists are the same. Such protection ceases when the play is published. When published in print the owner's rights are lost, unless in the case of a citizen, protected by statute. Whether the authorized public performance of a manuscript play, unpro- tected by statutory copyright, is such a publication as will give to any one, without licence from the owner, the right either to represent it on the stage or to publish it in print, is a question which is not determined by statute, as in England, but is left entirely to the courts. It has been much discussed in several leading cases since 1860; and its importance is enhanced by the fact that many, if not most, of the dramas which American managers are expected and even required to provide for an exacting public and a critical press are from the pens of English and French play- wrights. It is well settled that the public performance of

imported, or exposed for sale. For every pirated copy of | a manuscript drama is not such a publication as will a painting, statue, or statuary found in his possession, or | invalidate a copyright subsequently obtained by the author ; which he has sold or offered for sale, the offender must pay | and that no one, without leave, may publish in print, or $10, The injured person may obtain from a court of | publicly represent the play, if obtained by stenography, the

use of writing, or in any other way than through the memory of one or more persons who have witnessed its lawful representation. Thetheory has been advanced, and has received some judicial approval, that the owner of an

uncopyrighted manuscript play cannot lawfully prevent another from publicly representing it, when the latter has obtained a copy through the memory of any person who has witnessed the authorized performance. This doctrine is supported by a single case decided in the Supreme Court of Massachusetts in 1860. Its soundness has been questioned by high authority, and there is little doubt that when the direct issue shall be presented for judicial deter- mination such unlicensed use of the play will be held to be

piracy. It may be regarded as conceded that the courts.

would not hesitate to declare unauthorized publication in print to be an invasion of the owner's rights.

Property in unpublished musical compositions, lectures, sermons, works of arts, &., are governed by the same principles that apply in the case of dramatic productions, There is no statute, as in England, regulating the author's rights in manuscript lectures. The writer of an unpub- lished letter, whether possessing literary value or not, may prevent at common law its unauthorized publication by the receiver, unless publication is necessary to protect the latter against injurious representations made by the former. (E. R.—E. 8. DR.)

COQUEREL, ArHanasEe Josu# (1820-1875), son of A. L. C. Coquerel, noticed below, a minister of the French Protestant Church, was born at Amsterdam in 1820, At an early age he succeeded his father as editor of Le Lien, and he held this post till 1852. In that year he took part in establishing the Wouvelle Revue de Théologie, which had the distinction of being the first periodical organ of scientific theology published in France. Meanwhile he had gained a high reputation as an eloquent and earnest preacher, and especially as the advocate of religious freedom in opposition to the imposition of tests. Advancing beyond his father's

doctrinal position, his teaching became more and more offensive to the old orthodox party ; and on the appearance (1864) of his article on Renan's Vie de Jésus in the Nouvelle Revue de Théologie, the storm of suspicion and

dislike which had long been gathering burst on his head, and he was forbidden by the Paris Consistory to continue his ministerial functions. He received an address of regretful sympathy from the consistory of Anduze, and a provision was voted for him by the Protestant Liberal Union, to enable him to continue his preaching. This he did with much earnestness and success till within a few weeks of his death. Coquerel received the cross of the Legion of Honour in 1862. He died at Paris, July 25, VSio.

Coquerel's principal writings are — Jean Calas et sa famille (1858); Des Beaux-Arts cn Ttalic, (of which an English translation was published in 1859); La Saint Barthélemy (1860) ; Précis dc s'église réformée (1862); Le Catholicisme et le Protestantisme con- lidérée dans leur origine ct leur développement (1864); Libres etudes, and La conscicnce et la foi (1867).

COQUEREL, AtHaNasE LAUREST Cuartes (1795- 1868), French Protestant divine, president of the Presby- terian Council of Paris, was born in that city, August 27, 1795. He received his early education from his aunt, Helen Maria Williams, an Englishwoman, who at the close of the 18th century made herself a reputation by various translations and by her Letters from France. He completed his theological studies at the Protestant faculty of Mont- aban, and in 1816 was ordained pastor. During the follow- ing twelve years he resided in Holland, and preached with acceptance before Calvinistic congregations at Amsterdam, Leyden, and Utrecht. In 1830, at the suggestion of Cuvier, who then filled the office of minister of Protestant worship, Coquerel was called to Paris ; and there he spent the rest of his life. Ardently attached to liberal ideas, ha was not content with advocating them from the pulpit, bnt resolved to speak also through the press. In the first year of his Paris life he therefore established a p2riodical entitled Le Protestant, which was continued till December 1833. In the course of this year he was chosen a member of the consistory. In January 1834 appeared the first number of the Libre Examen, under the joint- editorship of Coquerel and Artaud, which was carried on till July 1836. Coquerel rapidly acquired the re- putation of a great pulpit orator, and the liberal views which he announced with fearless freedom brought him more and more into antagonism with the rigid Calvinists. He took a warm interest in all matters of education, and distinguished himself so much by his defence of the university of Paris against a sharp attack, that in 1835 he

was chosen a member of the Legion of Honour. Pained by the doctrinal divergencieswhich separated the Protestants of France, and longing to bring about a real union, he originated, in 1841, a periodical entitled Le Lien, of which such union was the avowed object. 'The same year appeared his Réponse to the Leben Jesu of Strauss. After the revolution of February 1848, Coquerel was elected a member of the National Assembly, where he sat as a moderate republican, subsequently becoming a member of the Legislative Assembly. He supported the first ministry of Louis Napoleon, and gave his vote in favour of the expedition to Rome and the restoration of the temporal power of the Pope. After the coup d'état of December 2, 1851, he confined himself to the duties of his pastorate, which he had not ceased to discharge. He was one of the most prolific of French sermon-writers, as well as one of the most famous orators of his day, and retained his popularity to the last. He died at Paris, January 10, 1868.

A large collection of his sermons was published in 8 vols. between 1819 and 1852. And in addition to the works already named, he

was author of Biographie sacrée (1825-1826) ; Histoire sainte ct analyse de la Bible (1889) ; Orthodoxte moderne (1842); Christo-

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COR logic (1858), &¢. These works have had a large circulation, and most of them have been translated into English, German, and Dutch,

*COQUES, or Cocx, Gonzaez (1614-1684), the son of Peeter Willemsen Cocx, a respectable Flemish citizen, ang not, as his name might imply, a Spaniard, was born at Antwerp. At the age of twelve he entered the house of Peeter, the son of "Hell" Brueghel, an obscure portrait painter, and at the expiration of his time as an apprentice became a journeyman in the workshop of David Ryckaert the second, under whom he made accurate studies of still life. At twenty-six he matriculated in the guild of 8 Luke; he then married Ryckaert's daughter, and in 1653 joined the literary and dramatic club known as tho *' Retorijkerkamer." After having been made president of his guild in 1665, and in 1671 painter in ordinary to Count Monterey, governor-general of the Low Countries, he married again in 1674, and died full of honours in his native place. Coques chose his*

vocation as a boy when he took lessons from the last of the Brueghels. He was trained to the execution of portraits. One of his canvases in the gallery of the Hague represents a suite of rooms hung with pictures, in which the artist himself may be seen at a table with his wife and two children, surronnded by masterpieces composed and signed by several contemporaries. Partner. ship in painting was common amongst the small masters of the Antwerp school ; and it has been truly said of Coques that he employed Arthois for landscapes, Ghering and Van Ehrenberg for architectural backgrounds, Steenwijck the younger for rooms, and Peeter Gysels for still life aad flowers; but the model upon which Coques formed himself was Van Dyck, whose sparkling touch and refined manner he imitated with great success. He never ventured beyond the "cabinet," but in this limited field the family groups of his middle time are full of life, brilliant from the sheen of costly dress and sparkling play of light and shade, combined with finished execution and enamelled surface. The finest examples of Coques are in England. 'Three of his family pieces are in the collection of Sir Richard Wallacc, a fourth in Buckingham Palace, a fifth and sixth in the galleries of Mr Labouchere and Mr Walter of Bearwood, a seventh in the collection of Mr Robarts, an eighth in the National Gallery. Three portraits of the Elector Palatine Frederick and his wife Elizabeth, and David 'Teniers, the painter, are in the Ellesmere collection. The finest specimen abroad is Coques's Family in the Dresden Museum.

CORA, an ancient city of Italy, about seven miles south- east of Rome by the Appian Way. Various traditions about its origin are found in the Roman writers; but all agree in acknowledging its great antiquity, and fora long period it ranked as one of the most important cities of Latium. After being lost sight of in history for about twelve hundred years it reappears in the 13th century, and under the name of Cori it continues to the present day, o town of from 5000 to 6000 inhabitants. Situated on a hill that rises above the Ponptine marshes, and divided by an olive grove into two portions, Cori presents @ fins appearance from the plain. Besides the walls erected in the 15th century by Ladislas of Naples, it preserves important remains of its earlier and perhaps its earliest defences, constructed of large polygonal blocks ; part of a temple, usually distinguished by the name of Hercules, 8 incorporated in the church of St Pietro ; two Corinthian columns of admirable execution mark the site of the temple of Castor and Pollux;

numerous minor antiquities scattered about the town; and the ravine outside the : way leading to Ninfa is spanned by the Ponte della Catena, built of massive blocks of tufa.

See for further details Nibby, Dintornt di Roma; Antolini, IJ tempio d@' Ercole in Cort, Milan, 1828.

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ORALS (Coraniiaria) Under the general name of | "Qoral-Animals" are included all those members of the Actinoczoa which have the power of secreting hard struc- tures of the nature of a skeleton. Whether this skeleton be continuous or discontinuous, of conspicuous dimensions or simply of microscopic spicula, it constitutes what is known properly as the " coral" or "corallum ;" and the animals which produce it are the so-called "Coralligenous Zoophytes" (Actinozoa Coralligena). The class of the Actinozoa is one of the primary divisions of the sub-kingdom of the Celenterata, or Radiated Animals ; and those forms of the class which secrete a corallum belong to the orders of the Zoantharia, Rugosa, and Alcyonaria. No corallum is ever produced in the order Ctenophora, and many members of the Zoantharia are either destitute of a skeleton or have but an imperfect one, whilst the corallum of the Alcyonaria is also often rudimentary. The Ctenophora, therefore, will be wholly omitted here; and only those members of the Zoantharia and Alcyonaria in which a well-developed corallum 1s present, will be considered at any length,—the soft-bodied forms requiring no notice except in so far as they serve to elucidate the peculiarities of the Coralligenous groups.

The class of the Actznozoa comprises those Coelenterate animals in which the space included within the body-walls is divided into an inner " gastric" cavity or stomach and an outer " perivisceral" cavity. The gastric sac is short and is open below, so that the perivisceral cavity freely communicates

with the outer world through the mouth, and the two cavities become practically one. The perivisceral cavity, in turn, is divided into a series of compartments by the development of a series of vertical membranous plates

(the "mesenteries"), which are arranged in a radiating manner between the walls of the gastric sac and the wall of the body. The reproductive organs are not external, but are attached to the faces of the mesenteries, and shed their contents into the body-cavity. The ova reach the external medium either through the mouth or through the ends of the tentacles,

The class of the Actinozoa is divided into four orders, viz., the Zoantharia (Sea-Anemones, Madreporaria, &c.), the Rugosa (Cyathophyllum, Zaphrentis,.dcc.), the Aleyonaria (Red Coral, Sea-Pens, Sea-Shrubs, Organ-pipe Corals, &c.), te) the Ctenophora (Beroé, Plewrobrachia, Venus's Girdle, oC,

Orper I.—Zoanruarta (He«acoralla).

The members of this order are distinguished by the fact that the intermesenteric chambers and tentacles are generally and fundamentally six in number, or some multiple of six, however largely they may be subsequently increased, whilst the tentacles are simple, rounded, or conical, not fringed with lateral processes. The corallum may be wholly absent (Actinide), spicular (Zoanthide), in the form) of an internal axis or "sclerobasis" (Antipathide), or "sclerodermic," with a distinct wall, and generally distinct

septa (as in the Madrepores, and the " Stone-corals " generally). According to the nature of the skeletal struc-

tures the Zoantharia are divided into the three groups of | the malacodermata, sclerobasica, and sclerodermata. Zoantharia malaccdermata.—In this section are the anunals commonly known as Sea-Anemones, in which there 18 either no skeleton at all (Actinide), or simply a discon- finuous pseudo-skeleton composed of minute adventitious) Poe Scattered through the integuments (Zoanthide). — Though possessing nothing that would ordinarily be termed

~~a "coral," it may be well to insert here a general descrip- tion of the anatomy of the Sea-Anemones, as they are readily accessible for study, and may be regarded as being fundamentally identical in the structure of their soft parts with the coralligenous Zoantharia, as well (probably) as with the extinct Rugosa.~~

~~The true Sea-Anemones (Actinia, Yealia, Actinoloba, Sagartia, &c,) are under ordinary circumstances simple animals, but some closely allied forms (Zoanthus and Palythoa) form compound growths or colonies, which are produced by budding, and consist of numerous polypes united, by a fleshy base or ccenosare. In the simple forms the body is generally a short cylinder or truncated cone (the " column "), usually of a fleshy or leathery consistence, and capable of undergoing great variations in shape. The lower extremity of the column usually forms a flattened dis- coidal area (the "base"), whereby the animal attaches itself at will to foreign bodies. The base, however, may be wholly non-adherent, pointed (I/yanthus), thin, distensible, and imperforate (Zdwardsia), or swollen, rounded, and pierced with a distinct orifice (Peachia and Cerianthus). The upper surface of the column constitutes a circular flattened area (thé "disc"), which carries the tentacles round its margin, and is perforated centrally by the aperture of the mouth.~~

~~In size the Sea-Anemones vary from less than a sixth of an inch up to 2 feet in diameter; and their habits of life are very various. Generally they attach themselves by the muscular base to foreign bodies, in rock-pools, at low-water mark, orextendingtoconsiderabledepths. Others, again (such as Peachia, Halcampa, and Edwardsia), live more or less completely buried in the sand; Cerianthus has the same habit, and further protects the body by the secretion of a loose, membranous, non-adherent tube ; whilst Avachnactis is free-swimming and pelagic.~~

~~Fia. 1.—Sea Anemones,~~

~~A, Edwardsia callimorpha, Gosse. B, Jlyanthus Mitchellii, Gosse, of the natural size. (After Gosse.)~~

~~The integuments of the Sea-Anemones consist of an outer layer (" ectoderm "), an inner layer (" endoderm"), and a more or less largely developed~~

intermediate layer (“ meso- derm ”), each of which may in turn be differentiated into successive more or less distinguishable strata. The ecto-derm is composed of an exterior stratum of ciliated epithelial cells, a granular stratum crowded with “ thread-cells,” and a stratum of pigment to which the brilliant coloration so characteristic of these animals is due. The peripheral epithelial cells are constantly being thrown off from the surface as a viscid mucus, which may entangle foreign bodies and form a species of investing tube. In other cases (Talia, Bunodes), the surface is studded with adhesive

vesicular warts, by means of which the integument obtains

an adventitious coat of fragments of shell, grains of sand, and small pieces of stone. The mesoderm is essentially composed of two layers of muscular fibres, those of the outer layer having a circular direction, whilst those of the inner layer are longitudinal in the column and become radial in the base and disc. The endoderm is likewise double in its composition, its inner stratum being formed of ciliated epithelial cells.

The “thread-cells” (cnide or nematocysts), which are so abundantly developed in the integument of the Sea- Anemones, are microscopic organs of offence and defence. Though differing very much in size and in the details of structure in different species, the thread-cells consist essentially of an elastic double-walled sac, one extremity of which is invaginated and carries a long, often serrated or spinose filament, which lies coiled up in the interior of the sac. On the slightest pressure the sac is instantaneously everted, and the lasso-like thread in its interior is shot forth with the rapidity of lightning, having the power of pene- trating any soft body with which it may come in contact, and apparently inflicting an envenomed puncture.

Fra. 2.—Morphology of the Actinide.

A, Ideal representation of a Sea-Anemone, vertically bisected; ?/, tentacles ; p;

peristomial space; m, mouth; s, stomach; 6, interior of the general body-

cavity, below the stomach, showing the free edges of the mesenteries ; me, one

of the mesenteries; 0, ovary;; @, acontium. B, Thread-cell of Caryophyllia

Smithit (after Gosse), greatly enlarged. C, Thread cell of Tealia crassicornis

(after Gosse), with the filament everted, greatly enlarged.

The organs of prehension of the Sea-Anemones are the "tentacles" (tentwewla). These arc hollow, smooth, coni- cal or filiform organs, arranged around the margin of the disc in one or more successive circles. The walls of the tentacles are formed of the general integuments of the body, and each communicates inferiorly with an inter- mesenteric chamber, and is thus filled with fluid derived from the general cavity of the body. 'They are capable of extension and retraction, and their extremities are com- monly perforated, though sometimes swollen and impervious (Corynactis, Caryophyllia). They are abundantly furnished with thread-cells, and are, therefore, organs of touch as well as of prehension. Except in some cases, where one or more tentacles may be aborted, the number of the tentacles seems to be primitively six, and remains some multiple of this during life,—the number of these organs being increased by the development of successive cycles arranged in concentric and alternating circles. The primi- tive cycle consists of siz tentacles, the second cycle also of siz, the third cycle of twelve, the fourth cycle of twenty-four, the fifth of forty-eight, and so on, the number of each cycle being invariably double that of the preceding cycle, except in the case of the second cycle. Though it has been generally accepted that the number of the tentacles is primitively six in the Zoantharia (hence often called

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grave doubts have of late arisen as to the correctness of this view. According to Lacaze-Duthiers, the primitive tentacles are first two in number, then four, then six, then eight, and finally twelve (in the Actine). According, also, to com- petent observers (Gosse, Fischer, and others) the adult Sea-Anemones by no means invariably possess tentacles which are a raultiple of six, or even of five. On the contrary, various species lave tentacles which are a multiple of eight, whilst in others the numerical arrangement of the tentacles seems to belong toan indeterminate type. Though showing a marked radiate arrangement, it will be sub. sequently shown, in speaking of the mesenteries, that even the tentacles occasionally show distinct traces of bilateral symmetry. Internal to the circle of tentacles, the upper surface of the disc exhibits a more or less conspicuous flattened area (peristomial space ”), which is destitute of appendages, but is marked with converging lines (“ radii”), which start from the bases of the tentacles and meet round the mouth, and which' represent the upper attached edges of the mescnteries. In the centre of the peristomial space, often at the summit of a kind of proboscis, is placed the opening of the oval or fissure-like mouth. The angles of the mouth are furnished with grooves (‘gonidial grooves ”) which serve as chaunels for the conveyance of the ova to the exterior. The mouth opens by the intervention of a short corrugated and folded gullet into a membranous stomach, with thin muscular walls, usually descending about one- third of the distance towards the base. The stomach, when distended, is of a globular form, and it opens inferiorly directly into the general cavity of the body, bya wide patulous opening. When not in use, the walls of the stomach are in contact ; its sides exhibit the downward con- tinuation of the oral gonidial grooves. In some forms, a layer of coloured fat-cells is developed in the walls of the stomach towards its upper portion, and this is conjectured by Mr Gosse to represent the liver. No other distinct alimentary organs exist, and indigestible matters are got rid of through the mouth. The general cavity of the body (“ somatic cavity ”) freely communicates with the external medium through the stomachic sac and mouth, and is bounded externally by the integuments, and lined by the endoderm. The space thus formed is subdivided into a series of chambers or compart- ments by a number of radiating vertical membranous lamine, to which the name of © mesenteries” 18 given. The mesenteries are essentially double, each being composed of an inward reduplication

~~of the muscular mesoderm, covered by the endoderm, and they vary greatly in width. The first-formed and~~

~~widest mesenteries (“ primary mesenteries”) are attached by the whole of their outer edges to the column-wall, by their upper edges to the dise from its margin to the mouth, and by their lower edges to the base from the circumference to the centre. The wer edges of the primary mesenteries are attached to the sides of the stomach, from the mouth almost to its inferior opening; but below this point they present a free, pO margin, which looks inwards towards the centre . viscerai chamber, being ultimately continued to the cent of the base. Between the primary mesenterles a developed other shorter lamin, which agree “— : preceding in being attached externally along their mh length to the column-wall, but which do not & sufficiently far inwards to reach the walls of the mo , According to their width these are known as “ secon ie and “tertiary ” mesenteries. The primitive number 0 a primary mesenteries is normally Six, and the Saale: : of the remaining mesenteries is effected by the same — governs the development of the tentacles. Thus the sec?~~

~~Hewxactinice), and that their increase is as above stated,~~

~~CORALS~~

~~cle of mesenteries agrees with the first in being s¢x in number, the third cycle is twelve, the fourth twenty-four, the fifth forty-eight, and so on. In some Sea-Anemones only twelve mesenteries are developed (Peachia), but ordinarily the number of these organs present in the adult is much greater AS already indicated with regard to the tentacles, it cannot be regarded as certain that the hexameral arrangement of the mesenteries, which is so conspicuous a feature in many of the Zoantharia, is by any means universal in the order, or even in the Zoantharia malacodermata in particular. Many of the adult forms, at any rate, appear to invariably possess mesenteries which are not a multiple of six in number. According to the researches of Ritteken and Schneider, the mesenteries are invariably of three orders in the Actinic, each individual mesentery being double, and the smallest number of each order that was observed being six of the first cycle, six of the second, and twelve of the third order~~

~~It is chiefly to the star-like disposition of the mesenteries and tentacles that the Sea-Anemones owe their conspicuous radial symmetry ; but indications are not wanting of true bilaterality Thus a single tentacle may be of a different colour from, or a larger size than the others ; the two radii of the disc which correspond with the gonidial grooves and run to the angles of the mouth are often more con- spicuous than the other radii ; the mouth itself runs fore-~~

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~~and-aft, and divides the body into a right and left half ;.~~

~~there may be ouly a single mouth-angle and gonidial groove (Actinolobda) ; and lastly, two of the mesenteries, correspond- ing with the oppositemouth angles, arecommonly developed before the rest ven more conspicuous traces of bilateral symmetry which will be subsequently alluded to, are recognizable in many corals.~~

~~The entire body-cavity, with the intermesentericchambers and tentacular diverticula, is filled with a transparent fluid (" chylaqueous fluid"), which is to be regarded as the representative of the blood. It consists of sea-water mixed with the products of digestion, containing albumen in solution along with numerous floating corpuscles, represent- ing the "blood-corpuscles " of the higher animals. There are no proper cu7culateng organs, but a free circulation of the chylaqueous fluid through all parts of the body is effected by means of the richly ciliated endoderm which lines all parts of the somatic cavity.~~

~~No distinct respiratory organs are prescut, as a rule, the function of respiration being discharged by the ciliated endoderm, as well as by the currents in the external water maintained by the cilia covering the tentacles. In some species, however, which live half-buried in the sand, there are found lobed and frilled organs attached to or beside the tentacles, and these have been conjectured to be branchial (Verrill). In the Zoanthide, aiso, there are found curious~~

~~paired organs covered with cilia, and attached to the~~

crowded with thread-cells,

primary mesenteries a little below the stomach ; and these may probably be regarded as gills (Dana)

The free edges of the mescnteries below the stomach are thickened, and constitute a puckered and convoluted mar- ginal cord (" craspedum "), which is richly furnished with thread-cells, Also attached to the free edges of the mesenteries are sometimes found the organs known as

acontia." These are long, thread-like filaments, which are ouiy attached by one end to the mesentery, and arc The acontia seem to be undoubtedly organs of offence and defence, as they can, on irritation, be rapidly shot forth from the mouth, as well as from certain minute orifices in the body-wall (cinclides) which appear to be specially intended for their emission.

Specialized organs of the senses are either wanting in the

ea-Anemones, or only present ina rudimentary condition. Tactile sensibility, though well developed, is generally

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diffused over the surface, residing more particularly in the tentacles. Organs of hearing are wholly unknown. As regards the sense of sight, many species possess round the margins of the disc a series of brightly-coloured bead-like bodies (" marginal spherules," " bourses marginales," or " chromatophores "), which are said to be furnished with nervous filaments, and which may with great probability be regarded as imperfect organs of vision. The condition of the nervous system is still a matter of great obscurity, and its very existence has generally been considered as doubtful. According, however, to recent researches (Duncan), it would appear that a plexiform arrangement of nerve fibres can be detected in the base of Actinia, a similar nervous apparatus probably existing in the disc as well.

The reproductive organs are in the form of thickened bands, of an orange or pink colour, enclosed in the mesenteries near their free edges, and the ovaries and testes are similar to one another in form and structure,

differing only in their contents. As a rule, the sexes appear to be distinct, but in some forms they are united in the same individual. The reproductive elements escape into the body-cavity by dehiscence of the reproductive glands, but the precise manner in which the ova of the diccious species are fertilized has not beendetermined. In addition to true sexual reproduction, increase is sometimes effected, non-sexually, by gemmation or fission. Gemmation is rare amongst the Sea-Anemones, the new polypes being budded forth from the sides of the parents close to the base, and being finally detached as independent animals. Fission is not by any means so rare, aud may either take place by a longitudinal cleavage of the original polype into two wholly or partially independent individuals (Anthews and Actinia), or by the separation of portions of the margins of the base of the parent, and by the development of these into new polypes (Actinoloba, Sagartia).

As regards their development, the fecundated ovum becomes converted into an ovate, ciliated, actively locomo- tive embryo ("planula"), with a double wall enclosing a central cavity. A depression next appears at one extremity, indicating the future mouth, and the embryo passes into the " gastrula " stage, by the opening up of a communication between its central cavity and the exterior medium, or by invagination on itself, it being still uncertain which of these modes is employed. The gastrula now fixes itself by one extremity to some foreign body, and the primitive mesenteries and tentacles are developed. These are originally six in number ; but according to Lacaze- Duthiers the first and second cycles (twelve in all) are developed by passing successively through the numbers two, four, six, and eight. The remaining cycles of tentacles and mesenteries are rapidly added, until the animal attains the full number of these organs proper to the adult.

As to the geographical distribution of the Zoantharia malacodermata little need be said, as the members of this group, taken as a whole, are cosmopolitan iu their range. They are, however, pre-eminently characteristic of the littoral and laminarian zones, only very few forms, and these not typical Sea-Anemones, extending to depths of over 500 fathoms (Palythoa), and one genus (Arachnactis) being pelagic. As to their distribution in time, nothing at all can be said, as, from the soft nature of their bodies, they have left no traces of their past existence.

The Zoantharia malacodermata may be divided into the following three families :—

Fam. I. Actinrp#.—Polypes essentially simple, the base form ing a flattened sucker by means of which the animal ad- heres at pleasure to foreign bodies. No corallum. (dctinia, Sagartia, Bunodes, Tealia, Bolocera, Anthcus, Phymactis, Adamsia, Cancrisocia, Corynactis, dc.)

Fam. II. InyanrH1pa,—Polypes simple, destitute of an adherent

base, free and pelagic, or living buried to the lips in mud or sand. No corallum, but occasionally a membranous epidermic tube of investment. (Ilyanthus, Peachia, Edwardsia, Cerian- thus, Halcampa.) :

Fam. II]. Zoanruipa.—Polypes adherent, united by a creepin

or crust-like ccenosare, rarely solitary, and never capable 0 locomotion. No true corallum, put generally a pseudo- skeleton formed by adventitious particles of sand or stone imbedded in the cctoderm. (Zoanthus, Epizoanthus, Paly- thoa.)

Zoantharia sclerobasica.—The "Black Corals," or Anti- pathide, which comprise this group, are always composite, consisting of a number of polypes united together by a thin fleshy coenosarc, which is spread over and supported by a simple or commonly branched horny axis, or 'sclero: base." The tissues are not furnished with calcareous secretions, and the polypes have in general six simple tentacles.

The Antipathide form colonies which are attached by the base to some foreign object, and are generally more or less branched and plant-like. The colony consists of a thin fleshy crust or ccenosarc, in which the minute polypes are imbedded at intervals. The polypes are furnished with six simple conical tentacles each, though in the genus Gerardva as many as twenty-four of these organs may be present. The soft tissues appear to be wholly destitute of calcareous secretions of any kind, such as are found in the Gorgonide. The entire ccenosarc, with its imbedded polypes, is sup-

ported by a horny corallum, which is generally black in colour, and forms an axis or stem covered by the soft parts. The corallum is secreted by the ccenosarc, and is wholly external to the polypes, for which reason it constitutes what is technically called a "sclerobasis" or "sclerobasic coral- lum" ("foot-secretion" of Mr Dana), in contradistinction to the true tissue secretions of so many other Actinozoa. In some instances (Cirrhipathes) the sclerobasis is simple and unbranched, and may attain a length of several feet ; but it is more commonly branched in a more or less plant- like and complicated manner (Antipathes, Arachnopathes, Rhipidopathes). The surface of the corallum may be smooth (Leiopathes) ; but it ig more commonly covered with minute spines (Antipathes), being thus readily distin- guished from the grooved or striated sclerobasis of the Gorgonide. In composition the corallum is horny.

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ay / Fig. 3.—Portion of the colony of Antipathes anguina, Edw. and H., in its living condition, enlarged. (After Dana.)

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The Antipathide constitute the only known family of the Zoantharia sclerobasica, as most naturalists are now agreed that the "Glass-rope Zoophytes" (Hyalonemade), with their twisted siliceous axis, are truly referable to the sponges. As regards their distribution in space, the Antipathide are principally inhabitants of warm seas, and are, therefore, most abundant in the neighbourhood of the equator. Several species are known from the Mediter- ranean ; they have been found at various points in the North Atlantic; and they have even been recorded from the coasts of Greenland. They occur in depths of from 10 feet up to several hundred fathoms. As regards their distribution in time, the Antipathide are not known to have come into existence during the Paleozoic or Mesozoic period. They appear for the first time in the Miocene Tertiary, where they are represented by a single species (Leiopathes vetusta).

—Zoantharia sclerodermata (Madreporaria).—This group includes the majority of the coralligenous zoophytes of

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recent seas. They may be simple, consisting of a single polype only, united by a fleshy allum, which is partially or wholly developed within the tissues of the polypes themselves (" sclerodermic"), which does not consist simply of scattered spicules, and in which the parts are so very generally disposed in multiples of six as to justify the name of Hexacoralla applied to the group;

sclerodermata may be considered as practically identical may be regarded as being essentially composed of a number

It will, therefore, be unnecessary to treat here of more than

or composite, consisting of many polypes ccenosare, They always possess a cor-

The anatomy of the soft parts of the simple Zoantharia

with that of the Sea-Anemones ; and the compound forms

of actinoid polypes united by a common flesh or coenosare.

the leading peculiarities of the hard parts, or " corallum," from which these organisms derive their comnion name of " corals." An ordinary simple coral of this group may, then, be regarded as being essentially a Sea-Anemone, in which a more or less complicated skeleton has been developed. As 'n the Sea-Anemones, the animal possesses a column, a base, and a disc, the margin of the disc supporting the tentacles, and its centre being perforated by the aperture of the mouth, The mouth, often more or less proboscidiform, opens into a stomachal sac, the walls of which are connected with the parietes of the body by vertical folds of the meso- derm and endoderm (" mesenteries "), and which communi- cates freely below with the general cavity of the body. Within the mesenteries are contained the reproductive organs; and the dise, with its tentacles and dependent gas- tric sac, is permanently soft and capable of retraction and expansion. Below the stomach the soft tissues of the animal are strengthened and supported by @ more or less perfect calcareous skeleton or corallum. 'This

is composed of calcareous matter ("sclerenchyma") deposited by and in the tissues themselves, and the corallum is therefore within the polype, and is said to be "sclerodermic." It is thus a true " tissue-secretion," and differs very conspicuously from the "sclerobasis" of other Actinozoa (« foot-secretion " of Dana), which is secreted by the ccenosarc, and is not formed by a calcification of the soft parts of the polypes themselves. A typical simple corallum may be regarded as a cone, sometimes extremely depressed, sometimes 80 elongated as to be almost a cylinder, with an outer wall and an internal included space. The wall of the cone is known as the "theca," and it may be very imperfect, or it may be covered externally more or less completely with a secondary calcareous investment (the " epitheca "). The theca encloses a space which is known as the " visceral chamber," is variously subdivided inferiorly, and superiorly presents itself as a shallower or deeper cup-shaped depres: sion (the "calice"). The centre of the calice is hollowed out for the reception and protection of the stomach-sac of the polype, but the theca generally rises round its margins nearly to the level of the disc. Below the calice the visceral chamber is divided into a series of vertical com- partments (the " interseptal loculi") by a series of upright partitions or "septa," which spring from the inner surface of the theca and are directed inwards towards the centre. The septa are of different breadths. Some of them ar much wider than the others, and often extend far enoug 'nwards to meet in the centre of the visceral chamber These are the " primary septa ;" but there are others which — fall short of the centre by a greater or less distance, 40¢ — these are known as the " secondary" and " tertiary " septa, — according to their width. The centre of the visceral chamn- ber may or may not be occupied by a variously-forme structure known as the " columella." Tn its most typi — form the columella is a calcareous rod, which extends from the bottom of the visceral chamber to the floor of the calice,

projecting upwards into the latter, and having the primary septa usually closely connected with it. The continuity of the interseptal loculi is often more or less broken up by the development of incomplete more or less horizontal plates, the " dissepiments," which stretch from one septum to another ; or the septa may be connected by numerous deli-

cate cross-bars (“ synapticulee ”’.

Fic, 4.—Caryophyllia borealis, Fleming, a simple sclerodermatous coral, twice the natural size. (After Sir Wyville Thomson.)

‘The above expresses the general features of the structure of a simple sclerodermic corallum, and itis easy to see that this structure owes its peculiarities to the fact that it has been produced by the calcification of the lower portion of a polype similar in its anatomy to an ordinary Sea-Anemone. Thus, the “theca” of the corallum corresponds to the column-wall of the polype, in the interior of which it is secreted. The “ septa,” again, are developed within the mesenteries of the living animal, with which they corre- spond, and, like the mesenteries, they are “ primary,” “secondary,” or “tertiary,” according as they reach the centre or fall short of it by a greater or less distance. It is to be recollected, however, that it is only the inferior por- tion of the polype which is thus hardened with carbonate of lime. The tentacular disc and mouth are placed at a level higher than the upper margin of the theca, and the digestive sac occupies the calice ; whilst the whole of the space comprised within the theca is lined by the endoderm, and its outer surface is covered by the ectoderm.

Fic, 5.—Astrea pallida, Dana, a compound sclerodermatous coral, in its living condition. (After Dana.)

Whilst the sim polype, the compo skeleton compos varies in form colony by whi

ple corallum is the skeleton of a single und sclerodermic corallum is the aggregate ed by a colony of such polypes, and it according to the form and nature of the chit is produced. Sucha colony consists in

general of a number of polypes united together by a com- mon flesh or “ coenosare,” and corresponding elements are found in the corallum. Thus a compound coral consists generally of certain portions which are secreted by the in- dividual polypes of the colony, and are known as the “corallites,” and of a common calcareous basis or tissue, which unites the various corallites into a whole, is secreted by the ccenosarc, and is known as the ‘ ccenenchyma.” The latter element of a compound corallum is, however, by

no means always present, the entire structure often consist- ing simply of the skeletons of the individual polypes ("corallites") united with one another directly and in different ways.

The compound coralla are, of course, primitively simple, and they become composite either by budding or by cleavage of the original polype. The principal methods in which this increase is effected in the Zoantharia sclerodermata are

| the following :—

1. Lateral Gemmation.—In this method of increase the original

olype throws out buds from some point on its sides between the x and the circle of tentacles. The bud is at first simply a pro- tnberance of the ectoderm and endoderm of the parent, containing in its interior a diverticulum of the somatic cavity; but a mouth and tentacles are developed at its distal extremity, mesenteries and septa appear in its interior, and it gradually assumes all the

—characeters of the polype from which it was budded forth. Lateral

or parietal gemmation generally gives rise to dendroid or arborescent coralla, as in the genera Madrepora, Dendrophyllia, Cladocora, Oculina, Lophohelia, &c., but the precise form of the resulting colony depends on the way in which the buds are given off, regularly or irregularly, singly or in numbers together, alternately or at opposite points, and also on the continuance or arrest of the growth of the parent. In other cases, where the parietal buds are given off from the edge of the calice ('* marginal gemmation"'), the resulting coral- lum may become massive by the soldering together of the separate corallites, as occurs in the genus Astroceenia, where the parent cor- allite continues to grow side by side with its buds.

2. Basal Gemmation.—In this mode of growth the original

'polype gives forth from its base a rudimentary ccenosare from

which new buds are thrown up. Sometimes the ccenosare has the form of rootlike prolongations from which the buds are developed at intervals. More commonly, the ccenosarec forms a more or less extensive horizontal expansion. The resulting form of corallum varies, being sometimes fasciculate, but more commonly massive or encrusting ; and in all cases the youngest corallites are those which oceupy the circumference of the mass. Good examples of the process of basilar gemmation are to be found in Rhizangia, Astrangia, &c.

3. Calicular Gemmation.—This consists in the production of buds from the calicine disc of the parent polype, which may or may not continue to grow thereafter. This mode of increase, though known to occur in forms like Isastrwa, and some of the Montlivaltie and Thecosmilia, is very rare amongst the Zoantharia sclerodermaia, and it may be doubted whether in certain cases it should not rather be regarded as a species of fission. Calicular gemmation, however, is seen in characteristic form amongst many Rugose corals, in treat- ing of which it will be noticed at length. .

4, Fission.—This consists in a process of spontaneous divi- sion or cleavage of the original polype into two individuals. This is usually effected by means of "oral cleavage," the ealicine disc of the parent polype becoming divided into two portions by a groove, which gradually deepens till the original mass is converted into two halves. The proximal extremity of the parent always remains undivided, and, according to Dana, the pri- mitive mouth and stomach are appropriated by one of the halves produced by the fission, whilst a new mouth and stomach are developed in the other half. The form of corallum produced by fission varies in different eases. Sometimes the corallum becomes '* cespitose" or tufted, consisting of a number of short diverging pairs of branches, each pair produced by the cleavage of a single corallite (e.g., Caulastrea). In other cases the corallum becomes '* massive," the corallites produced by fission remaining per- manently connected with one another. In other cases, again, the secondary corallites do not become perfectly separated from one another, their calices remaining more or less Goingietaly continuous, —often so much so as to give rise to one long calicine groove, with a long line of septa on each side, or to an aggregation of such grooves. By this "'scrial" growth the corallum becomes "gyrate" or '**meandrine ;" and excellent examples may be

~~found in the genera Meandrina, Diploria, Latimeandra, Rhipidogyra, Phytogyra, &c.~~

~~Finally, it should be noticed that, though the above mentioned modes of growth may be conveniently distinguished from one~~

~~another, they are nevertheless not unfrequently combined in the same individual. Thus, lateral may be combined with basal gemma- tion, and gemmation is commonly found accompanying fission.~~

~~It is next necessary to consider the different structures which compose the sclerodermic corallum in greater detail.~~

~~The general form of the corallum varies so much, that it is scarcely possible to make any statements on this subject except of an entirely general nature. The simplest corallum is most commonly cylindrical, conical, or turbinate (Caryophyllia, Turbinolia, Balanophyllia, &c.), but it may be more or less compressed (Flabellum), discoidal (some species of Fungia), or concavo-convex. Tt may be rooted by its base to some foreign object, or it may be wholly free, The compound coralla are of the most varied shape. Commonly they are arborescent or dendroid (Aladrepora, Dendrophyllia, Lophohelia, &.); at other times they grow in clusters of branches springing from a common base (Mussa, Caulastrea, and many species of Portes, Madrepora, &c.), the colony being "esespitose," and convex on its distal aspect ; others are " fasciculate," or composed of numerous cylindrical corallites placed parallel with one another, or slightly diverging from the base (e.g., Calamophyllia) ; others are massive and " astreiform," composed of polygonal corallites united with one another, and forming rounded, globular, hemispherical, or irregular masses (as in the typical Astreide); others are " foliaceous " (species of Aadrepora, Pocilopora, Manopora, &c.) ; others, finally, are " 'encrusting " (eg., some of the species of Afanopora, Agaricia, &c.)~~

~~The "wall" ("muraille," "eigentliche Wand") is the proper outer investment of the visceral chamber, whether we consider a simple corallum or take a single corallite in a compound corallum. The hard structures~~

~~which are placed on the inside of the wall are the " endotheca," whilst those which are developed exteriorly to the wall constitute what is collectively known as the "exotheca." 'The condition of the wall varies greatly in different groups of the Zoantharia, being thick, compact, and impervious in some (Aporosa), and at other times more or less incomplete and pierced by larger or smaller apertures (Per forata). The surface of the wall may be smooth, or it may be marked with vertical ridges (coste), or by transverse striz or annulations of growth. 'Though often very distinctly recognizable, the wall may become so united with the ccenenchyma as to be no longer determinable, or its place may be more or less completely taken by the epitheca.~~

~~The " epitheca" is a secondary calcareous investment, which is very commonly developed in both simple and compound coralla, and is probably an integumentary secretion. In the simple coralla it is placed outside the proper wall, to which it may be closely applicd, or from which it may be separated by the cost. It may be extremely thin, or very dense ; and in the latter case its development is generally at the expense of the wall, which becomes so thin as to be often irrecognizable. It varies also in its extent, sometimes covering only the basal region of the coral, and at other times extending to the margin of the calice. It is gencrally marked with concentric stric and vertical ridges, often with accretions of growth, and it may give off spines or root-like processes of attachment. In the compound corals it is not unusual to find a well- developed epitheca enclosing the entire corallum below and on the sides, whilst each individual corallite is furnished with its own wall.~~

~~The external surface of the corallum often exhibits more or less prominent vertical ridges, which are known as the " costes." The cost in a general way correspond with the septa in number and arrangement, and they usually appear, therefore, as so many prolongations of the septa outside the wall. It does not appear, however, that this is due to~~

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~~the septa being really continued tarough the wall so ag ¢~~

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form the costs, but these structures would really seem to have an entirely independent origin. The projection of the coste from the wall is generally proportionate to the development of the septa to which they correspond, and there are great differences in different cases as to their size and distance apart. They may be ornamented with spines or tubercles, and they may be united by transverse plates ("exothecal dissepiments "), which run horizontally across the intercostal spaces. Sometimes the costz, instead of corresponding with the septa, are placed opposite the interseptal loculi, and are thus seen to be really independent of the septa. In compound coralla the cost are often wanting when the corallites are amalgamated by their walls. In other cases the cost are greatly developed, and serve by their coalescence to unite the various corallites into a single colony.

The "calice" is the generally cup-shaped depression which is seen at the upper end of a corallnm or of a single corallite of a compound mass, and which lodges the gastric sac of the animal in its living condition.

The " margin" of the calice is formed by the wall, and its "floor" is occupied by the septa, the interseptal loculi, and the central structures of the corallum. Though in general more or less cup-shaped and depressed, the calice may be prominent, and the septa may be produced beyond it ("exsert"). 'he outline of the calice is very different in different cases, though typically more or less circular ; its depth is also extraordinarily variable ; and its plane varies much in the angle which it forms with the axis of the corallum. The " septa" ("cloisons," " Lingsscheidewande"), as previously noticed, are the vertical plates which radiate from the wall towards the centre and divide the visceral cliamber into a series of vertical chambers or compartments ("interseptal loculi"), The septa correspond with the mesenteries of the living animal, within which they are developed, and the tentacles correspond each with an interseptal space. In their most rudimentary condition the septa appear simply as rows of spines or tubercles, but they in general present themselves as calcareous lamine, which can usnally be shown to consist each of two closely apposed plates (in Dasmia of three), though often so thin and delicate as to appear single. When fully developed, septum may be regarded as a somewhat triangular lamina, the base of which projects freely into the calice, whilst its outer margin is attached to the internal surface of the wall, and its inner margin

~~is directed towards the centre of the visceral chamber, extending from the bottom of the coral to the floor of the calice, and being either free or united with certain other steuctures to be spoken of hereafter. The free edges of the septa are usually thin, and they may be plain or ornamented with spines, serrations, or granules. The parietal or attached edges of the septa are usually the thickest, but occasionally the septum widens out in the middle or centrally. The sides of the septa, looking into the interseptal loculi, may be smooth or may be ornamente with ridges, stris, papilla, or granules. The septa may be compact and imperforate, or they may be more or less porous and cribriform. Usually the various septa are quite independent of each other, but occasionally some of the smallest and latest formed septa may become incline towards, and coalescent with, the larger and older septa.~~

~~The number of septa varies, but in none of the Zoantharia selerodermata, in which septa are developed at all, ate there found less than six septa in the adult corallum. Sometimes this number is permanently retained ; some times twelve septa are present ; most commonly the sep! of the adult are over twelve in number. When there are more than six septa then their breadth varies, according as the mesenteries vary, and they thus beeome «¢ primaty;~~

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~~secondary," and "tertiary." The chief facts which it is important to know about the development and arrangement of the septa are the following, taking the generally received views on this subject. At first six septa 'make their appearance simultaneously. These are the primary septa, and they may not be further added to. In other cases~~

~~Fic, 6.—Diagram of the arrangement of the septa in the Zoantharia selerodermata and Rugosa.~~

~~A, Transverse section of a simple selerodermatous corallum (Turbdinolia), show- ing the septa, cost, and columella. B, Transverse section of a simple Rugose coral (Cyathophylium), showing the septa, wall, and cost. é~~

~~six additional and smaller secondary septa are next~~

~~produced, one bisecting each of the six interseptal loculi~~

~~between the primary septa; and this condition may also be permanently retained (Alveopora). In other cases twelve additional septa are produced in the now existing — twelve interseptal loculi, one to each loculus, and these are the tertiary septa. Ina corallum in which this last state of things was permanent, we should, therefore, find twenty- four septa in all, belonging to three orders or cycles, six septa of the jirst order, six of the second order, and twelve of the third order. Such a corallum has obviously twenty- four interseptal loculi, and we should imagine that the next order of septa (if developed at all) ought to consist of twenty-four septa bisecting these loculi. This is not the case, however, and any further orders of septa that may be produced are always twelve in number. If, therefore, a fourth order of septa be developed, it consists of twelve shorter septa intercalated in alternate interseptal loculi ; whilst the loculi still vacant are filled by the development of twelve additional septa of the fifth order ; the twenty- four septa thus produced collectively constituting the fourth cycle. The septa between each pair of primary septa con- stitute a system; and in the instance just taken there are forty-eight septa in all, arranged in five orders according to the time of their development, but only constituting four cycles of equally sized septa, and forming six systems of eight septa each. Each system contains the following orders : — Ist, 4th, 3d, 5th, 2d, 5th, 3d, 4th, — Ist, &c. a i ae~~

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~~My If a fifth cycle of septa be formed, then there are 96 septa, in Six systems of sixteen septa each. Six cycles give 192 septa, and seven cycles produce 384; but it is far from common for these higher cycles to be completely developed.~~

~~The rule amongst the Zoantharia sclerodermata is that the septa are arranged in six systems, and are therefore, however numerous, some multiple of six; but this rule is not of universal application, and the typical hexameral 'Tangement may be departed from altogether. Thus, certain forms have the primary septa four, five, eight, or ten in number, and,~~

therefore, have the septa of the adult arranged in a corresponding number of systems. It should be added that the researches of Lacaze-Duthiers have given bp ri — doubt as to the above being truly the method hi me the septa are successively developed. According © this observer the septa are developed before the wall

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(coutrary to the received opinion), and are primitively twelve in number ;, but it seems clear that though this may be the case in the species exaniined by the French naturalist, it cannot be true of all the Zoantharia sclerodermata.

Between the internal edges of the septa and the axis of the visceral chamber there may exist a series of laminar processes to which the name of " pali" is given. The pali vary in number and size, and they may be developed internal to several orders of the septa, forming so many "crowns." They are united by their outer edges with the inner edges of the septa, whilst their internal edges are free, or are united with the columella (if present).

The axis of the visceral chamber may be vacant and unoccupied; but it is very commonly filled by the structure known as the "columella." The true or "essential " columella is an axial rod of a lamellar, compact. or fasciculate structure, extending from tle bottom of the visceral chamber to the floor of the calice, into which it projects, aud formed independently of the septa. The septa may or may not be, some of them, attached by their inner ends to the columella, or there may be pali attached to it. A " parietal" or " septal" columella may be formed by the coalescence in different ways of the inner edges of the septa, which divide and inosculate so as to form a spongy or cellular central structure. In other cases a "' pseudo-columella " may be produced by the twisting together of the inner ends of a certain number of the septa.

The continuity of the interseptal loculi is liable to be more or less interfered with by the development of the eudothecal structures known as the dissepiments, synap- ticule, and tabulw. The " dissepiments" (" traverses ") are incomplete, approximately horizontal plates, which stretch between adjacent septa, and break up the interseptal loculi into secondary

compartments or cells. They may be absent, or rudimentary, or they may be so greatly developed as to render a greater or less portion of the corallum completely "vesicular," in the vicinity of the wall more especially.

The " tabula " (" planchers," " Boden") may be regarded as highly developed dissepiments, and like them are approximately horizoutal, as a rule at any rate. They differ from the dissepiments in cutting across the interseptal loculi at the same level. When completely developed they extend right across the visceral chamber, and divide it into a series of stories placed one above the other, the only living portion of the corallum being that above the last formed tabula. They may, however, be present only in the central portion of the corallum, or they may spring from the wall, but not extend across the visceral chamber. Tabulee may exist in conjunction with well-developed septa (Alveopora), or the septa may be rudimentary or absent (Halysites, Favosites).

The " synaptecule " are transverse calcareons bars whicli stretch across the interseptal loculi, like a kind of trellis- work. They are formed by papille developed on the opposite faces of adjacent septa, coalescing with one another in the middle of the interseptalloculi. In other cases they may be so greatly developed as to constitute elongated ridges between the septa. They are characteristic of the Fungide.

In compound coralla the various corallites of the colony are often united together by a common calcareous tissue, which is known as the " canenchyma," and which varies very much in texture, being sometimes loose and spongy (e.9., Madreporide), at other times dense and compact (¢.g., Oculinide). In other cases the ccenenchyma is absent or rudimentary (Astraide, Turbinolide), and the corallites are then united together in different ways. In some of the arborescent and fasciculate coralla the corallites are only united with one another at the points where they are budded out; but in other cases (Syringopora, for example) they may be united by horizontal outgrowths,

c. Poritide.—Corallum wholly composed of reticulate sclerenchyma; septa well developed, but only composed of styliform processes, which by their

fang form a kind of irregular lattice-work. Walls reticulate, not distinct from the sclerenchyma; a few dissepiments, but no tabula, The principal genera of this family are Porites, Litharza, Coscinareza, Rhodarxa, Porarea, Protarza, Micros. lena, Goniopora, Montipora, and Psammocora.

(3.) The TABULATA constitute a group founded by Milne-Edwards and Haime for the reception of a number of corals essentially char. acterized by the rudimentary condition or absence of septa, con- joined with the presence of well-developed tabule dividi g the visceral chamber into so many distinct stories. Recent researches however, by Agassiz, Verrill, Lindstrom, Duncan, Dollfus, Moseley, and others, have clearly shown that the old order Tabulata is ; heterogeneous assemblage, comprising forms of very different zoolo- gical affinities, and that it must be broken up and redistributed, or greatly restricted. It has been unequivocally shown, in fact, that the presence of tabule cannot, of itself, be regarded as a point of igh classificatory value, since these structures occur in forms in other respects no way related to each other. Thus, tabule occur in Pocillopora, Cyathophora, and occasionally in Lophohelia amongst the Aporosa, in Alveopora and Favositopora amongst the Per, in Heliopora amongst the Alcyonaria, in the great majority of the Rugosa, and in certain of the Polyzoa (¢.g., Radiopora and Helersdi). It has also been shown that some of the so-called "' tabulate con® are not Actinozoa at all, but that they belong to the Molluscan order of the Polyzoa; and good authorities believe that this is the true position of a very large number of the forms previously in- cluded under this head. The whole of this subject is at pre. sent under investigation, and the ultimate results of the inquiry are uncertain. It will, therefore, be sufficient here to indicate the views which are now generally entertained as to the true affinities of the principal forms included by Milne-Edwards and Haime amongst the Zabulata.

Sometimes the corallites are simply in contact with one another, or their walls may be fused together, in which case there is a great tendency for the calices to become polygonal by mutual pressure. In other cases, again, the corallites are united together by the great development and coalescence of the costze.

~~The Zoantharia sclerodermata were divided by Milne- Edwards and Jules Haime into the four great sections of the Aporosa, Perforata, Tabulata, and Tubulosa. The first two of these groups constitute large, important, and natural divisions, whilst the two latter are of doubtful affinities and uncertain value,~~

~~(1.) The APoROSA are characterized by the fact that the calcareous tissue of the corallum is more or less compact and imperforate ; the septa are well developed, and usually constitute complete lam- elle ; while the walls are generally quite complete, and, as a rule, are not | moni by any apertures. Dissepiments or synapti- cule are usually present, but tabule are rarely developed. 'This section includes the most highly developed of erie corals, and it ig subdivided by Milne-Edwards and Haime into six families :—~~

~~a. Turbinolide,—Corallum simple or compound, but never possessing a coonenchyma; septa well developed, usually regularly granulated on the two sides, but their free edges not denticulated ; interseptal loculi open and free from dissepiments or synapticule ; costs well marked and straight; wall im- perforate. The principal genera of this family are Bathycyathus, Brachycyathus, Trochocyathus, Leptocyathus, Thecocyathus, Discocyathus, Cyclocyathus, Para- cyathus, Deltocyathus, Placocyathus, Turbinolia, Sphenotrochus, Platytrochus, Ceratotrochus, Discotrochus, Placotrochus, Blastotrochus, Rhizotrochus, Onchotrochus, Desmophyllum, and Flabellum,~~

~~b. Pseudoturdinolide#.—Corallum simple, resembling that of the preceding in most respects, but having the septa composed of three laminas each, which are free internally, but are united externally by a sIngle costa, The only genus of this group is the extinct Dasmia.~~

~~¢. Oculinide.—Corallum compound; ccnenchyma abundant, compact, its surface smooth or striated, but not echinulate; walls Imperforate, the lower part of the corallites becoming filled up In advancing age; dissepiments scanty ; no synapticules; occasionally tabula, The principal genera of this family are Oculina, Cyathohelia, Astrohelia, Synhelia, Lophohetlia, Amphihelia, Diplohelia, Axohelia, Cryptohelia, Endohelia, Stylaster, Stylophora, Dendracis, Orbicella, Pocillopora, and Seriatopora (#)~~

~~d. Astreide,—Corallum simple or compound, usually increasing by fission ; walls perfect and imperforate ; coenenchyma absent, or if present lax; inter- septal disseplments abundantly developed; no synapticule nor tabule. The principal genera of this family are Placosmilia, Trochosmilia, Parasmilia, Eusmilia, Thecosmilia, Barysmilia, Diploctenium, Montlivaltia, Dendrogyra, Rhipidogyra, Pachygyra, Stylina, Astroceenia, Stephanocenia, Phylloceenia, Dichocenia, Heterocenia, Sarcinula, Caryophyllia, Lobophyllia, Rhabdophyliia, Cladophyllia, Symphyllia, Oulophyitia, Calamophyllia, Eunomia, Latimeandra, Meandrina, Diploria, Leptoria, Manicina, Cladocora, Favia, Goniocora, Mussa, Pleurocora, Astrea, Oulastrexa, Leptasirxa, Solenastrea, Prionastrea, Sider- astrea, Septastrea, Isastrea, Synastrea, Thamnastrea, Goniastrexa, Astroides, Angia, Cryptangia, Rhizangia,~~

~~e. Pseudofungide.—Corallum compound, the basal plate or wall perforated (as in the Fungide), but the corallites without synapticule and with interseptal dissepiments (as in the Astrwid#), The only genus of this family is Merulina,~~

~~ft Fungide.—Corallum simple or compound, usually discoidal or laminar; the callce shallow and open at its sides in the simple forms, confluent and not cir- cumseribed in the compound forms; septa complete, coalescent with the costa, imperforate, their edges dentate, and their sides echinulate or furnished with synapticule; wall basal, generally perforated; no dissepiments, nor tabulz. The chief genera of this family are Cyclolites, Fungia, Ctenactis, Micra- bacia, Anabacia, Cryptobacia, Cycloseris, Trochoseris, Cyathoseris, Comoseris, Protoseris, Lophoseris, Agaricia, Pachyseris, Leptoseris, and Phyllastraa.~~

~~(2.) The PerroraTa are distinguished by the fact that the calcareous tissue of the corallum is more or less porous, loosely aggregated, spongy, or reticulate, the walls in all being perforated with more or fewer apertures. The septa are generally well de- veloped, but may be represented only by trabecule. The visceral chamber is usually more or less completely open from top to bottom, but there may be imperfect dissepiments, and in some cases well-developed tabule are present. The section Perforata comprises the following families :—-~~

Fic. 7,.—' Tabulate " Corals.*

A, Portion of the corallam of Favosites favosa, Goldfuss, of the natural size. B, Portion of four corallites of Favosttes Gothlandica, Lamarck, enlarged, show- ing the tabule and the mural pores. ; .

The affinities of the great and important reef-building genus, Millepora, are still not absolutely settled. By Professor Louis Agassiz it was taken out of the true corals and placed amongst the Hydrozoa, and the most recent researchies of Mr Mosely upon the living animal appear to corroborate this view. According to this observer, the spongy corallum is composed of calcareous trabeculae dis- posed in layers concentric with the surface of the mass, and there is the unique feature that these layers are penetrated by a series of ramifying and anastomosing canals, which communicate with the calicular cavities. 'There are two kinds of calices in the species examined, large and small, the former being surrounded each by a ring of the Jatter. The polypes, or zodids, are of two kinds, the larger ones, occupying the large calices, having a mouth and from four to six knobbed tentacles. The smaller zodids are more slender, have no mouth, and have from five to twenty tentacles. My Mosely appears to consider that the struc: ture of Méllepora, as examined by him, is Hydrozan; but a recent investigation carried out, on the other han by Major-General Nelson and Professor Martin Duncal Icads these authors to the opinion that Mullepora 8 really Alcyonarian, and therefore truly referable to the Actinozoa.

The genus Heliopora has recently been examined by Mosely in its living condition, and it has been shown to

a. Eupsammide.—Corallum simple or compound; septa well developed, lamellar, for the most part perforated; a spongy columella is present; walls perforated, granular, sub-costulate, often thleckened with age. Septa numerous, those of the last cycle bent towards those of the penultimate cycle, so as to pro- duce the appearance of a six or twelve-branched star; interseptal loculi open, or only with a few dissepiments ; costes rudimentary, The chief genera of this family are Zupsammia Endopachys, Balanophyllia, Heteropsammia, Lobopsammia, Cenopsammia, Stereopsammia, Stephanophyllia, and Dendrophyliia.

6 Madreporide,—Corallum compound, increasing by gemmation; cenen-chyma abundant, spongy, and reticulate; walls porous, not distinct from the cenenchyma; septa often well developed; no synapticule, and, generally speak- Ing, no dissepiments, but occasionally tabula. (The diagnosis of this family may require amendment for the reception of the Favositide proper). The chief genera of this family are Madrepora, Explanaria, Asti #opora, Turbinaria, Palexacis, Alveopora, Favositopora, and Columnopora (?)

L * . . | The other genera of this group have ho communication between

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Alcyonarian and not Zoantharian. With Heliopora must | corals. The former do not constitute the great aggregations of unquestionably be placed the extinct genera Heliolites, coral which are known as "reefs," and though some of the com- Plasmopora, Lyellia, and Polytremacis, all of which have an essentially tubular and tabulate cenenchyma, the corallites having tabula and more or less distinct pseudo- septa. These, therefore, must also be removed to the Alcyonavia. The genus Pocillopora, as shown by Verrill, is a true Zoantharian, belonging to the Aporosa, and appa referable to the Oculinide. Seriatopora, though still imperfectly known, may with great probability -be placed in the immediate neighbourhood of Pocillopora ; and Rhabdopora and Prackypora may be provisionally grouped along with it. The genus Axopora, with its great columella, its reticulate sclerenchyma, and its want of septa, is in an extremely uncertain position, but may possibly be Alcyonarian.

Thereremain four groups of the Z'abulata, which are in themselves well marked, but which are still in a doubtful position. The first of these is the group of the Favositide (comprising Favosites, Hm- monsia, Michelinia, Koninckia, Striatopora, Alveolites, &c), in which the septa are rudimentary or absent, the tabule are extremely well developed, and the walls are perforated more or less freely with mural pores. 'Their septa (when present at all) may be only pseudo- septa, Hike those of the genus Heliopora, and these forms may per- haps be Alcyonaria. In their perforated walls, however, they elosely resemble the recent genera Alveopora and Favositopora, and their true affinities would thus seem to be rather with the Madreporide in the Zoantharia perforata. This view is further supported by

the occurrence of genera like Columnopora, in which the perforated walls and tabulate corallites are associated with com- paratively well-developed septa. Another group is that of the Chectetidae (comprising Cheetetes, Monticulipora, Dania, Constellaria, &c., and probably Fistulipora, Callopora, and some allied forms), in which the walls of the corallites are imperforate, the tabule are well developed, and there are no traces of septa. This group is in a most uncertain position, it being an open question whether it should be referred to the Alcyonaria, the Polyzoa, or the Hydrozoa, or whether it ean be retained in the Zoantharia. Though often associated with the Favositidc, it seems certain that there is little true relationship between the two groups; and the most probable viewis perhaps the one which refers the Chetetidae tothe A leyonaria. The genus Labechia has not been examined in sufficient detail to render its reference to this group at all certain. A third group is that of the Thecide, comprising the single genus Theeta, in which the eorallites have no true wall, but the costz are greatly developed, and are so filled up as to constitute a dense ceenenchyma. The aflinities of this group are quite uncertain, though it may be regarded with some probability as belonging to the Aleyonaria. Lastly, there is a fourth group, comprising the genera Halysites, Syringopora, Chonostegites, and Thecostegites, with probably Fleteheria and Beaumontia, in which there are rudimentary septa (typically twelve m number), well : a tabule, and imperforate walls. In Syringopora, though the walls are compact, the visceral chambers of eontiguous eorallites are placed in communication by means of tubular connecting processes, and there is thus a decided approach to the structure of the Favositide on the one hand, whilst, on the other hand, the genus in some respects is nearly allied to Aulopora.

Fria. 8.—Tubulosa.

A, Portion of the corallum of Aulopora tubeformis, Goldfuss, of the natural size. B, Two corallites of the same, enlarged, showing the septal strix,. C, Pyrgia Aichelint, Edw, and H., of the natural size, D, The same, slightly enlarged, showing the interior of the calice,

pound forms may, as individuals, attain a large size, they are desti- tute of the loose cellular coenenchyma of so many of the reef- builders, and thus do

not tend to increase indefinitely in dimensions. The solitary corals, further, are essentially and principally deep-sea forms, only rarely found in the littoral zone, or at extreme low water, abounding most in depths of from 10 to 200 fathoms, and extending their range even to depths of from 500 to over 1500 fathoms. They may, as already remarked, be either simple or compound, and amongst the more important recent genera which are solely, or chiefly, deep-water forms, may be mentioned Caryophyllia (rarely found in the littoral zone), Balanophyllia, Flabellum, Sphenotrochus,

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Paracyathus, Desmophyllum, Lobopsammia, Thecopsammia, Dendro-phyllia, Allopora, Oculina, Lophohelia, and Amphihelia,

Coral Reefs.

The " reef-building " corals are essentiaily shallow-water forms, flourishing between extreme low-water mark and depths of from 20 to 25 fathoms. By their continued growth and aggregation they give rise to the great banks of coral which are known as " coral-reefs," the compound species often possessing a lax cellular coenenchyma, enabling them to increase almost indefinitely in size. In other cases they increase rapidly by spontaneous fission. Amongst the more important reef-building corals of the present day may be mentioned the Astraide generally (Astrea, Meandrina, Diploria,. Astrangia, Cladocora, &c.), the Madreporide (Madrepora, &c.), the Poritide (Porites, Goniopora, Montipora, &ec.), many of the Oculinide (Orbicella, Stylaster, Pocillopora, éc.), the majority of the Fungide (two species of Fungia inhabit deep water), and the Millepores. Though principally formed by corals belonging to the Zoantharia sclerodermata, the growth of coral-reefs is further con- tributed to by various Alcyonoid corals (Heliopora, Lubipora, and numerous forms belonging to the Gorgonide), and by the calcareous alge (Nullipores and Corallines).

The distribution of the reef-building corals seems to depend mainly upon the mean winter temperature of the sea, and they are confined to seas in which the temperature of the water during the winter does not sink on an average below 66° or 68° Fahr. The seas thus limited may be said to be comprised within a distance of about 1800 miles on either side of the

equator. Even within these limits, however, apparently owing to the influence of Arctic currents, no coral-reefs are found on the western coasts of Africa and South America. The metropolis of the reef- building corals may be said to be the central Pacific Ocean, with its numerous islands and masses of mew: land ; ; — 4

their corallites If any forms can be retained to constitutea "tabu- ate order of the Zoantharia, it would seem to be these ; but it is — at present to come to any decided conclusion on this

: (4). The Tusvosa constitute a small group, including princi- pally the ewe Aulopora and Pyrgia, to which perhaps Clado- chonus and Stomatopora should be added. The corallum in this fhe eae simple (Pyrgia) or compound (Aulopora), the corallites in 4 - ease being united by a creeping and branched ccenenchyma. in fee are trumpet-shaped, tubular or pyriform, without ie and having the Septa indicated by mere stris on the joneee of the wall. The affinities of this group are very Zone it seems questionable if it can be retained in the tie ma, In Some respects the forms included under this head ig ae of relationship with the Cyclostomatous Polyzoa, such

7h ey Neen of the Actinozoa, exclusively : € very widely distributed over the lobe, occurring In all seas exeept the coldest, but attaining their aaron develop-

but reefs are also fourid mote or Jess largely developed in the Indian Ocean, the Persian Gulf, the Red Sea, the coasts of Zanzibar, Madagascar, and Mauritius, the Gulf of Panama, the coast of Brazil, around the West Indian Islands and the shores of Florida, and around the Bermudas. According to the classification of Darwin, which is essen- tially the same as that adopted by other authorities, coral- reefs may be separated into three principal groups, VIZ. : Fringing-reefs, Barrier-reefs, and Atolls. Fringing-reefs are shallow-water reefs, found in the immediate neighbour- hood of land, either surrounding islands or skirting the shores of continents. These shore-reefs have no channel of any great depth of water intervening between them and the land, and the soundings on their sea-ward margin indicate that they repose upon a gently-sloping surface. Barrier-reefs, like

~~the preceding, may either encircle islands or skirt continents. They are distinguished from Fringing-reefs by the fact that they are placed at a much greater distance from the land, that there intervenes a channel of comparatively deep water between them and the shore, and that soundings taken close to their seaward mar- gin indicate profound depths of water outside them. The Barrier-reefs which surround islands are termed " encircl- ing Barrier-reefs," and they occasionally form a complete ring, though more usually discontinuous and broken at intervals. The Barrier-reefs which skirt continents attain a greater size. As an example of these may be taken the succession of reefs which form the great " barrier " on the north-east coast of Australia. These run, with occasional breaches in their continuity, for a distance of over 1000 miles, their average distance from the shore being between 20 and 30 miles, the depth of the inner channel being from 10 to 60 fathoms, and the sea outside being sometimes over 2000 feet in depth.~~

~~Atolls are ring-shaped reefs usually oval or circular in form, which enclose a central expanse of water or lagoon, without any land. Occasionally (as in Whitsunday Island) the entire circle of the Atoll may have been raised above the water. More commonly the ring is not complete, but is preached by one or more openings, which are always placed on the leeward side of the Atoll, or on the side most com- pletely sheltered from the prevailing winds. In their struc- ture Atolls are identical with " encircling Barrier-reefs," from which they differ only in the fact that the lagoon which they enclose does not contain an island in its centre.~~

~~Many coral-reefs are constantly submerged below the sea, and are not laid bare even at extreme low water ; others are exposed to view by the recession of the tide, and are covered at high water ; others, again, are partially raised above the level of the highest tides, and thus constitute dry land. If we examine a reef of the last class—say a portion of an Atoll or an encircling Barrier-reef—the fol- lowing are the general phenomena which may be noticed. The general form of the reef is approximately triangular, as seen in section, with a steep and abrupt seaward face, and along and gentle slope towards the inner lagoon or~~

~~channel. 'Ihe extreme outer margin of the reef is the only'~~

portion of the whole which is composed of actually living coral, and this part is not exposed to view even at extreme low water. Soundings outside this line always indicate a more or less considerable depth of water, and the outer margin of the reef is usually exposed to the beating of a tremendous surf, in which the coral-polypes find their most

congenial home. Immediately inside the line of breakers.

is a broader or narrower platform of dead coral and coral- rock, which is only laid bare at low water, and which may be bounded internally by a ledge of brecciated coral-rock only reached by the waves at high water. Finally, the inner portion of the reef rises to the height of a few feet above the level of high water, and constitutes dry land. It

is composed of blocks of coral more or less completely cemented together by the percolation of water holding car bonate of Jime in solution, along with blown sand derived from the disintegration of the coral. The land generally |

|

Fic. 9.—Section of Keeling Atoll. (After Darwin.)

a, Level of the sea at low water; 0, outer edge of that flat part of the hi dries at low water; ¢, flat of coral-rock, covered at high water ; a — jecting ledge of brecciated coral-rock, washed by the waves at high 'wage slope of loose fragments reached by the sea only during galcs (the upper i which is from 6 to 12 feet high, is clothed with vegetation; the surface Othe

islet slopes gently to the lagoon); 7, level of the lagoon at low water, a bears a luxuriant vegetation, and slopes with a prolonged and gentle inclination to the inner lagoon. The beach of the Atoll is covered with coral-sand, and with fragments of coral, which are often cemented together by the percolation of water so as to form compact oolitic or brecciated lime- — stones. The bottom of the inner lagoon usually supports many living corals, along with accumulations of fine chalky mud, apparently largely formed from the excreta of animals, which, like the Scar? and Holothurians, feed

upon the living corals. Outside the reef, at depths greater than 25 fathoms, the bottom seems to be covered with coral-sand and dead coral.

The general method of formation of a coral-reef becomes readily intelligible on a consideration of the conditions which are requisite for the existence and welfare of the coral-polypes. 'The reef-building corals, in the first place, flourish most vigorously in depths up to 10 fathoms, and appear to be incapable of existing at all at depths exceeding 25, or at the utmost 30 fathoms. It follows from this | that no coral-reef can begin to be formed on a sea-bottom covered by more than 30 fathoms of water. In the case, however, of Atolls and Barrier-reefs, we have reefs rising out of profound depths, soundings on their seaward margin indicating depths of from 100 up to more than 1000 fathoms, at points not far removed from the actual edge of the reef. Originally it was believed that the reef had been raised from these great depths to the surface by the exertions of the polypes themselves ; but the extremely limited bathymetrical range of these animals renders this view wholly untenable. The true explanation of this problem was first afforded by the masterly researches of Mr Darwin, who showed that the production of Barrier-reefs and Atolls is really to be ascribed to the subsidence by slow

| degrees of the foundations on which they rest. Thus 4

Fringing-reef surrounding an island may be formed in depths of from 10 to 15 fathoms, and may grow till it reaches the level of low water. If, now, such a reef be | supposed to sink gradually beneath the sea bya sufficiently | slovr subsidence, the upward growth of the corals will | neutralize the downward movement of the land, so that the reef will appear to be stationary, whilst it is really | growing upwards. Whilst the reef will remain to 9° appearance unaffected in its form, position, and size, the island which it surrounds will gradually diminish m as the subsidence goes on, and a wide and deep channel will be formed between it and the reef. If the depression should be continued still further, the island will be reduce to a mere peak in the centre of a lagoon, and the reef, from a " Fringing-reef," will have become converted into an "encircling Barrier-reef." Simultaneously, we shou find that there is now deep water all round the reef, on Its

~~outer mnargins; for the coral-polypes grow principally in a vertical direction, so that the width of the reef can be little or not at ali greater than the width of its original base. If the depression of the land be still further continued, the central island will ultimately disappear altogether, and the~~

~~Fia, 10.—Diagrams illustrating the mode of Formation of the different kinds of Coral-reefs,~~

~~A, Ideal section of a fringing-reef surrounding an is!and, B, ideal section of the same, after the land has considerably subsided, and the fringing-reef has been converted into an encircling barrier-reef; C, ideal section of the same, when the subsidence has been so far continued as to bury the island under the ocean, and the batrier-reef has been converted into an atoll. a, sea-level; }, coral- reef; ¢, land.~~

~~reef will become an oval or circular ring, usually more or~~

~~Jess incomplete, and perhaps 30, 40, or 50 miles in diameter,~~

~~enclosing a central expanse of water or lagoon. It is thus~~

~~seen that Fringing-reefs, Barrier-reefs, and Atolls are different stages of the same thing, the latter being produced out of the-former by the progressive subsidence of the~~

~~Jand. In order, however, that this process should be carried~~

~~out, it is necessary that the rate of subsidence should not~~

~~be more rapid than the rate of upward growth of the corals.~~

~~If it should be so, then the reef is carried down into deep~~

~~water, and becomes submerged, as is the case, for example,~~

~~with the great Chagos Bank. In accordance with Mr~~

~~Darwin's theory on this subject, it is found that Barrier-~~

~~reefs and Atolls do not occur in the immediate vicinity of~~

~~active volcanoes—regions where geology teaches us that the land is either stationary, or is undergoing slow upheaval. On the other hand, the existence of Fringing- reefs is only possible where the land is either slowly rising, oris stationary ; and, as a matter of fact, Fringing-reefs are often found to be conjoined with upraised strata of post-Tertiary age. As regards their upward limits of growth, again, the coral-polypes cannot exist on levels higher~~

~~than extreme low water, exposure to the sun, even for a~~

~~short period, proving generally, if not invariably, fatal.~~

~~The coral-polypes, therefore, can raise the reef to the level~~

~~of extreme low water, but no further ; and it is to the~~

~~denuding power of the ocean that the elevation of the reef above this level is due. The breakers which fall upon the outer edge of the reef detach masses of dead coral, often of very large size, and these become gradually accumulated at particular spots, till they rise above the level of high water, The detached masses, thus heaped up, become~~

~~compacted together by the finer sediment of the reef, and agglutinated by the percolation through them of water holding carbonate of lime in solution, till they become ultimately converted into a hard compact limestone. The new land produced in this way is protected from destruction by the vital activity of the living corals, which occupy a fringe at the outermost margin of the reef just below the level of extreme low water, and which by their continual growth preserve the inner parts of the reef from the waves,~~

~~Another condition very essential to the welfare of the coral-polypes is an abundant supply of pure and properly aerated water. They flourish, therefore, in their highest vigour at the extreme outer edge of the reef, and on its windward side, where they are exposed to the constant beating of the surge ; and hence it is that the growth of the reef is principally carried on at these points. Mud and sediment are, on the other hand, very injurious to~~

corals, and they rarely occur, therefore, on sandy or muddy bottoms. It is for this reason, also, as much probably as from the pernicious effect of an intermixture of fresh water, that openings in coral-reefs are always found to exist at points opposite the mouths of rivers, It has been shown, however, by experiment, that corals will flourish on a sandy bottom provided the water is free from sediment in suspension.

As regards the distribution in time of the Zoantharia scleroder- mata, the distinction which obtains at the present day between the solitary and the reef-building corals is found to have subsisted in the past, so far at any rate as the Tertiary and Secondary periods are concerned, Thus the solitary and essentially deep-sea forms are represented in the Kainozoic and Mesozoic deposits by forms such as Sphenotrochus, Flabellum, Balanophyllia, Turbinolia, Leptocyathus, Trochocyathus, Paracyathus, Oculina, Diplohelia, Astrohelia, Stephanophyllia, Stereopsammia, Parasmilia, Trocho- smilia, Thecosmilia, Montlivaltia, Dendrophyllia, &c. On the other hand, the reef-building and essentially shallow-water forms are represented by such genera as Madrepora, Axopora, Porites, Lithareea, Solenastrea, Isastrea, Scptastrea, Dendracis, Astro- cenia, Stylocenia, &c.

Taken asa whole, the Zoantharia sclerodermata have attained their maximum of development at the present day, being largely a. sented in the Tertiary and Secondary periods, but having their plac toa greatextent usurped in the Palzozoic period by the Rugose Corals. The Aporosa are only represented with certainty in the Paleozoic series by the two remarkable genera Battersbyia and Heterophyllia, which form an aberrant group of the Astreide (Palastrwide), and of which the former is Devonian, whilst the latter is Carboniferous. The Silurian genus Paleocyclus was formerly regarded as belonging to the Fungide, but it is a genuine Rugose Coral. The genus Duncanella, of the Upper Silurian, may yey belong to the Turbinolide, and this may very probably be the true position of some of the corals referred to the genus Petrata, of the Silurian and Devonian. The genus Coluwmnaria (Favistella) may perhaps also be referred to the Astrwide. In the Permian rocks no Aporosa are known to have existed, the whole of this formation, as well as the greater portion of the Trias, being singularly destitute of remains of corals. Towards the summit of the Triassic series, however, in the St Cassian beds, we find a great development of the

~~Aporosa, which are now represented by a number of Astraide, belonging to well-known Secondary types, such as Montlivaltia, Thecosmilia, Cladophyllia, Rhabdophyllia, Goniocora, Isastrea, Thamnastrea, Elysastrea, Latimeandra, and Astrocenia. In the succeeding formation of the Lias the Astreide are repre- sented by all the genera just mentioned, along with others such as Septastreea, Stylastrea, Cyathocenia, Oppelismilia, and Lepido- phyllia, whilst the Turbinolide are now represented for the first time (Thecocyathus). In the great series of the Oolites, we still find an enormous preponderance of forms belonging to the Astreide, the principal genera of this period being Jsastrea, Thamnastrea, Septastrea, Clausastrea, Convexrastrea, H eliastreea, Pleurosmilia, Peplosmilia, Blastosmilia, Aplosmilia, Stylosmslia, Thecosmilia, Astrocenia, Stephanocenia, Rhabdophyllia, Clado- phyllia, Calamophyllia, Baryphyllia, Stylina, Goniocora, Latt- meandra, Cyathophora, Montlivaltia, Rhipidogyra, Pachygyra, Dendrogyra, Phytogyra, Favia, &c. 'The Turbinolide are represented in the Oolites by genera such as Discocyathus, Trocho- cyathus, and Thecocyathus; the Oculinidee appear under forms such as Stylophora, Euhelia, Enallohelia, Psammohelia, &c. 3 whilst the Fungide are largely represented by species of Comoseris,~~

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~~Protoseris, Dimorphoseris, Oroseris, Anabacia, Genadbacia, &c. In the Cretaceous period the proportions of the different families of the Aporosa are much the same as in the Oolitic. The Astraide are still by far the most numerous, the principal Cretaceous genera being Thanwnastrea, Synastrea, Goniastreea, Isastrea, Heliasirea, Cyphastrea, Barysmilia, Trochosmilia, Placosmilia, Parasmilia, Peplosmilia, Diplocteniwm, Phyllocenia, Cryptocenia, Astro- cenia, Stylocenia, Centrocenia, Plewrocora, Cladocora, Hydno- phora, Caryophyllia, Brachyphyllia, Favia, Cyathophora, Mean- drina, Latimeandra, Diploria, Leptoria, Stelloria, Rhipidogyra, Eugyra, Pachygyra, Montlivaltia, Rhizangia, &c. The Turbinolide are represented by species of Trochocyathus, Leptocyathus, Brachy- cyathus, Cyclocyathus, Smilotrochus, Stylotrochus, Onchotrochus, &c. 5 and the Pseudoturbinolide by the genus Dasmia. Amongst the Oculinide we meet with such genera as Synhclia and Diblasus ; and the family of the Fungide is well represented by species of Cyclolites,~~

Micrabacia, Cycloseris, Podoseris, Cyathoserts, Trocho- seris, Oroseris, and Turbinoseris. The Cretaceous corals are not separated from those of the Eocene period by any break similar in extent to that which separates the coral-fauna of the later Paleozoic rocks from that of the younger Mesozoic ; but there is nevertheless a considerable difference observable. The Astraide are no longer so abundant, and are represented by genera such as Solenastrea, Astrea, Heliastrea, Montlivaltra, Stephanoceenia, Phyllocenia, Astrocenia, Stylocenia, Parasmilva, Coeloemilia, Cylicosmilia, Rhizangia, Dasyphyllia, Circophyllia, Latimeandra, Hydnophora, &c. The Turbinolide are greatly developed, and are represented by numerous genera, such as Turbinolia, Trocho- cyathus, Leptocyathus, Paracyathus, Flabelium, Platytrochus, Discotrochus, Sphenotrochus, &c. The Pseudoturbinolide are repre- sented by the genus Dasmia, which dies out here. Amongst the Oculinide, we meet with the genus Oculina itself, along with species of Diplohelia, Stylophora, &c. Lastly, the Fungide are represented by forms such as' Cyathoseris, Trochoseris, and Cyclo- lites. In deposits of Miocene age, the Astreide are represented by the genera Astrea, Prionastrea, Plesiastreea, Solenastrea, Septa- strea, Astrocenia, Caryophyliia, Lithophyllia, Montlivaitia, Hydnophora, Cladocora, Trochosmilia, Diploctenium, Rhizangia, Phyllangia, Cryptangia, Cladangia, kc, Amongst the Miocene Turbinolide are the genera Trochocyathus, Deltocyathus, Acantho- cyathus, Sphenotrochus, Ceratotrochus, Desmophyllum, and Fla- bellum ; whilst the Oculinide are represented by species of Oculina, Diplohelia, Astrohelia, and' Stylophora, and for the first time Pocillopora. The Fungida, finally, are poorly represented by the genus Cyclolites. The Pliocene deposits have hitherto yielded 4 small number of corals, belonging to solitary forms, the Astrwide being represented by Caryophyllia, Cryptangia, &c., the Oculinide by Oculina itself, and the T'urbinolide by forms such as Flabelium, Sphenotrochus, and Paracyathus.

The geological history of the great group of the Perforata is shorter and less perfectly known than that of the Aporosa. Leav- ing out of sight forms of uncertain affinities, the Perforata are but represented in the great pile of Paleozoic deposits by some two or three genera, and they are absent or very poorly represented in all the lower Mesozoic sediments. In the Cretaceous period they for the first time begin to he more abundant, though still sparsely developed, and it is not till the commencement of the Tertiary

period that this group assumes anything like its present pro- portions. In the vast series of Silurian deposits the Perforate corals are only represented by two undoubted genera, namely the Protarea of the Lower Silurian, which belongs to the Poritide, and is nearly allied to the genus Litharewa, and the sin- gular Calostylis of the Upper Silurian. The Lower Silurian genus Columnopora may perhaps be referred to the Madreporide, and if

the Favositide were ultimately referred to the same family, then we

should have to admit a very considerable development of the Perforata in Upper Silurian times. In the succeeding period of the Devonian, rich as it is in corals, no certain representative of the Perforata is known. The genus Pleurodictyum has been referred here, but is apparently founded upon casts of Favosttes. great coralliferous deposits of the Carboniferous, again, no represen- tative of the group is known, save the single genus Paleacis, which appears to be a Madreporacean. In the Permian rocks, the Trias, and the Lias, no single example of a Perforate coral has hitherto been brought to light, and the group is represented in the Oolitic series by the single genus Aficrosolena, an aberrant member of the Poritide. In the Cretaceous series the Perforate corals are represented by members of all the existing families, Stephano- phyllia amongst the Eupsammide, Porites amongst the Poritide, and Actinacis amongst the Madreporide. In the Eocene rocks a much more striking development of the Perforata takes place. The Eupsammide are now represented by Lupsammia, Stereo- psammia, Lobopsammia, Endopachys, Balanophyllia, Stephano- phyllia, Dendrophyllia, &c. The Madreporide appear under such forms as Madrepora, Alveopora, Astreopora, and Dendracis ; and the Poritide are represented by such genera as Porites and Lith- area, In the Miocene period the Lupsammide are represented by

CORALS

Syringopora, &c.) Accepting the order in this provisional aspect, i: will be found j sively, confined to the Palzozoic period. The Milleporide, how: ever, belong to ‘i

been stated to occur in the Oolitic series, though this determination is not free from doubt. The family of the Thecide, including the

~~| zoic period. The type-genus Aulopora is found in the Lower and~~

~~In the~~

~~Balanophyllia, Stephanophyllia, Dendrophyllia, Eupsammia, &c the Madreporide by Madrcepora and Turbinaria, and the Con by Porites and Rhodarcea. appear to be principally represented by Eupsammide, such ag Balanophyllia, psammia.~~

~~P ope In the Pliocene period the Sad~~

~~Stephanophyllia, Dendrophyllia, and Cony.~~

~~In discussing the geological distribution of the Tabulate Corals, it~~

~~will be convenient to consider the group as a merely provisional semblage at jams, which cannot at present be ie, 4 The genus Heliopora and its allies Heliolites, Plasmopora, ke. been shown to be Alcyonaria, and will be considered pn ae head. Here, therefore, the order Tabulata will be taken as tempo. rarily including the groups of the Afilleporide (Billepora, the Thecide (Thecia), the Favositide (Favosites and its~~

~~finally systematized.~~

~~a),~~

~~Cheetetidee {Cheetetes and its allies), and the Halysitide (a~~

~~that the Tabulate are mainly, indeed almost exclu. the Tertiary and recent periods; Koninckia is~~

~~Cretaceous; whilst Michelinia and some of the Chwietide have~~

~~single genus Thecia, is exclusively Upper Silurian. Amongst 1 Favositide, the type-genus Favosiles 4 Silurian, Devoni ze Carboniferous, attaining its maximum of development in the Wao. nian ; Emmonsia hag nearly the same range as Favosites ; Mich:.- linia is found in the Devonian and Ca: iferous, and is ae quoted from the Qolites ; Striatopora belongs to the Upper Silurian and Devonian ; Alveolites is abundant in the Silurian and nian,~~

*and disappears in the Carboniferous; Rxmeria is Devonian, ant Ronineki*a *is only known from the White Chalk. Of the Chatelide, Cheteles, Monticulipora, and Stenopora are three ———— pa. rated and closely allied groups, which are represen cl orseparately, in all the Paleozoic formations from the Lower Siluriai to the Permian, inclusive ; and forms very similar, if not identical, (Heteropora, Newropora) oceur in deposits of Mesozoic age. The genera Dania and Constellaria are ¢ osely allied to the preceding, and are Silurian. Labechia may be temporarily placed here also, and is likewise Silurian. Fistulipora and Callopora are nearly related to the preceding and to one another (if not identical), and they range from the Silurian to the Carboniferous. Lastly, Beawmontia is Carboniferous. Amongst the Halysitide, the type-genus Haly- sites is Silurian ; Syringopora ranges from the Silurian to the Car- boniferous, attaining its maximum in the Devonian; whilst the singular genus Fletcheria, though typically Silurian, is said to be represented by a species in the Trias (Muschelkalk). Lastly, the aberrant family of the Milleporide does not seem to hare come into existence till the Eocene Tertiary, where it is represented by the genus MMillepora. The remarkable genus Azopora also dates its first appearance from the Eocene. There remain some other so-called Tabulate corals which have not been noticed in the above summary, but they are not of sufficient importance to require special mention.*

The small group of the Z'wbwlosa is confined exclusively tothe Paleo-

Upper Silurian,the Devonian, and the Carboniferous, attaining its maximum in the Devonian. The genus Pyrgia is only known es occurring in the Carboniferous rocks.

Regarding the geological history of the Zoantharia sclerodermata in a summary form, it will be seen that the Paleozoic period is characterized by the exclusive possession of the Tubulesa, the great development of the Zabulata, and the very small number of Aporosa and Perforata, the place of these latter groups being takenby the Tabulate and Rugose corals. The Mesozoic period is characterized by the great development of the Aporosa, and, towards its close, of the Perforata, though ina less degree ; whilst the Tubulosa se wholly gone, and the abulata, along with the Rugose corals, have very nearly disappeared. Finally, the Kainozoic period is chame-

terized by the greatly increased development of the Perforata, the Aporosa being proportionately diminished, thongh still remaming in great force, and the great recent group of the Millepores (Tabulata ?) now for the first time making its appearance,

OrvER II.—Rwcosa.

The members of this order agree with the Zoantharia sclerodermata in possessing a well-developed sclerodermic corallum, with a true theca, and generally presenting both tabule and septa combined. The septa, however, are generally (though apparently not always) some multiple of four, and there is commonly a single predominant septum, or a vacant space (fossula) representing such a septum. Some of the Rugosa are simple, others are compol but the latter are destitute of a true ccenenchyma.

alone has been preserved to us in a fossil condition.

parts of the animal which produced it. groups

——— EE Eor—S>—>O EOE eee

Rugose corallum in succession.

ey | (il

A, Fragment of Zaphrentis gigantea, Lesneur, showing the

. septa (s) with the

sparse dissepiments crossing the interseptal loculi, Sctaiiiers'o, a the thin

proper wall (w). B, Transverse section of Zaphrentis Guerangeri, Edw. and

nies the septa and dissepiments, the central area occupied solely by tabulz, and the fossula (J) fo

© septa, £5 Longitudinal section of the last, showing the arrangement of the

tabule, (A ls after Edwards and Haime; B and Care after James Thomson.)

rmed by the confluence of a certain number of

The form of the corallum, when simple, is usually more — less conical, turbinate, cono-cylindrical, or cylindroidal, ut if may be discoidal (Paleoclycus, Microcyclus, &c.); " even everted (some species. of Ptychophyllum), or some- re pnismatic (Goniophyllum), whilst it is often irregularly c ened by accretions of growth. The compound coralla Ae ne Nay much in form, being massive, fasciculate, ~ according to the method in which new corallites are Produced. The principal modes in which the corallum er compound amongstthe Rugosaare the following :— Rs Fr calteular gemmation.—In this process the original single bad growing for a hee inet of time, sends up a same axis as that of it, Ary which usually is continued in the

The primiti lice may or ma eo he prinitive calice y orm ot be more or lesg completely obliterated by the gradual growth

|| Fig. 11.—Morphology of the Rugosa.

CORALS

As there are only two living genera which agree with the ugosa in the tetrameral arrangement of their septa, and as it is doubtful whether we are justified in positively asserting on this ground that these genera really are Rugosa, this great order of Actinozoa requires to be considered simply as regards the hard skeleton or corallum which The corallum of the Rugosa is in most essential respects identical in structure with that of the Hexacoralla, differing princi- ly in the numerical law of the septa and in the common conjunction of tabula with the septa. It is very difficult to entertain any doubt but that the corallum of the Rugosa was secreted in a manner precisely similar to that of the existing Zoantharia sclerodermata, and that it bore essentially, if not precisely, similar relations to the soft Thus, in both alike the corallum may be simple or compound ; in both alike the simple form of corallum consists of an 'outer wall or "theca," inclosing a central space or " visceral chamber," which is divided into compartments by a series of radiating lamelle, or "septa;" in both alike the structures known

as "dissepiments," "tabule," and "columella" may be developed; in both alike the compound corallum may be regarded as essentially formed by an aggregation of "corallites," similar in their fundamental structure to the simple corallum. With these striking and substantial points of agreement there are, nevertheless, not a few respects in which the Rugosa differ from the Zoantharia sclerodermata, and these will be best discussed by briefly considering the different parts of the

and extension of the epitheca over it, and the secondary bud may or may not produce a tertiary bud in the same manner in which it was itself produced. Not uncommonly several buds may be produced successively, each from the oral disc of its predecessor, till the aged corallum comes to consist of a series of short turbinate cups or inverted cones, superimposed one upon the other, the younger upon the older. This singular mode of gemmation is seen in various species of Heliophyllum, Cystiphyllum, &c; and it cannot possibly i regarded as being merely accidental; whilst it may not improbably be regarded as an advanced form of the physiological process by which "'accretions of growth" are produced. (2) Compound calicular gemmation.—In this process, the primitive corallite throws up from its calicine disc two or more buds, which, after reaching a certain size, in most cases repeat the process. Tho resulting form of corallum differs in different cases. In such forms as Cyathophyllum truncatum and C. paracida, the parent corallite is destroyed by its buds, and these are in turn destroyed by the buds which they put forth, all the corallites remaining more or less separate, and the entire corallum assuming the form of an inverted pyramidal mass, the base of which is formed by the primitive corallite. In other cases, as in Cyathophyllum regium, the corallites become intimately united by their walls, and the corallum becomes massive and astreiform. In other cases, again, the corallum becomes fasciculate, the budding corallites not being killed by their buds, but continuing to grow upwards side by side with them, as is seen in some of the species of Cyathophyllum, Lonsdaleia, Endo- phyllum, &. (8) Parietal Gemmation.—This process consists in the production of buds from the sides of the corallites at some point between the base and the margin of the calice. It does not differ in its nature or results from the same process as seen in the

~~Zoantharia sclerodermata, and it generally gives rise to a loosely fasciculate corallum, ! as is well seen in various forms of Diphy- phyllum, Lithostrotion, &. (4) Basal Gemmation.—This process consists in the formation of buds by an extension of the substance of the original polype from the margin of its base; but it is doubtful if this mode of increase occurs at all amongst the true Rugose corals. (5) Fission.—Increase by spontaneous cleavage or fission is also of rare occurrence amongst the Rugosa, though it undoubtedly occurs occasionally, as in some species of Diphy- phylium.~~

~~However they may be produced, the corallites of the compound coralla of the Rugosa are never connected together by a true coonenchyma. When the corallites are in close contact, so that the corallum becomes massive, there is often fusion of the adjoining walls, but this is not necessarily the case. At other times the walls are wanting, and the corallites are united together by the extension and confluence of their septa (Phillipsastrea, Syringophyllum, Smithia, &c.), or by coste and vesicular dissepiments (Pachyphyllum). In other cases the corallites are united by exothecal outgrowths (as in Hridophyllum).~~

~~The wall is usually well developed, and is not perforate. It is, however, often wanting altogether (as in Chonawis, Phillipsastrea, Smithia, &c.), or very feebly represented. In many cases also there is a morc or less strongly developed accessory wail, or internal mural investment ("muraille interne"), which is placed concentrically within the true wall, and thus divides the visceral chamber into a central and a circumferential space. This accessory wall may be present along with a well developed true wall (as in Acervularia and Cyclophyllum), or the accessory wall alone may be present, the true wall may be absent, and the corallites may be united with one another by the amalgamation of their septa and dissepiments (as in Pachyphyllum, Chonazxis, &c.)~~

~~The epitheca is usually well developed in the Rugosa, though sometimes very thin. It is closely applied as a rule to the true wall, and when thickened, the latter may be very feebly developed. In the compound coralla, there is often a general epitheca inclosing the corallites basally and laterally. We may, perhaps, also regar as being of an epithecal nature~~

the extraordinary opercular struc- tures which have been fully described by Lindstrém as occurrin gin certain Rugose corals, such as Goniophyllum, Calceola, and Rhizophyllum. In these forms the calice is closed completely by a calcareous plate or operculum which is single in Calceola, but com- posed of four pieces in Goniophyllwm, and which must be supposed to have been capable of erection and retraction,—the corallum thus becoming like a bivalve shell. Indeed, the genus Calceola was long supposed to be referable to the Brachiopoda. It seems pro- bable that some other Rugose corals, more normal in their charac- ters than the above mentioned forms, were likewise provided with an operculum. Similar structures are observable in some Tabulate corals (as in certain species of Favosties), where the calices become closed in progress of growth by a false operculum ; and analogous structures have been recognized in certain living corals (Primuwa

septum of larger size than all the others (one of the four primitive

in any given form, is variable, being sometimes on the convex gidg

and Paramuricca). Though not strictly epithecal, we may also eonsider inthis connection theremarkable root-like processes ("radici- form prolongations") which are so characteristic of many of the Rugosa (e.g. Omphyma, Gontophyllum, Rhizophyllum, Pholidophyl- lum, Ptychophyllum, &c.) These processes may attain a length of several inches, and they consist of a process of the epitheca and wall, inclosing a,diverticulum of the visceral chamber, and in some cases papaivided by dissepiments. In the simple species (such as Omphyma) they serve to attach the corallum to foreign objects ; but similar processes occur in various compound forms (Eridophyllum, &c.), and serve to unite the various corallites with one another, being thus of the same nature and function as the tubular connect- ing processes of the Tabulate genus Syringopora. :

The epitheca of the Rugose corals is usually marked withnumerous fine encircling strie, and with longitudinal lines, grooves, or ridges. The latter, however, are usually regarded as not being true coste. They differ, in fact, from tuc cost of the Zoantharia scleroder- mata in not being placed opposite the septa, but alternating with these structures, and thus

~~corresponding with the interseptal loculi. Not uncommonly (as in many species of Zaphrentis, in Strep- tclasma, &c.) therearetwo of theso pseudo-coste, which are pre-emin- ently developed and run along the dorsal surface of the corallum, the other ridges converging towards this central pair in a pinnate manner. This appearanee seems to be due to the fact that the growth of thecor- rallum was effected by the intercalation of successive septa along the sides of the primary septum to which this principal pair of pseudo- cost corresponds. In / *holidophyllum the coste are ouble, and are covered by double longitudinal rows of small imbricated scales of an epithecal nature. In genera in which the wall is absent and the corallites are united together by the confluence of the septa (e.g. in Pachyphyllum, Smithia, Phillipsastreea), it is impossible to deter- mine whether true coste are present or not. True coste are also certainly present in the genus Holocystis.~~

~~The calice in the Rugosa varics greatly in form, shape, depth, &c. It is usually more or less circular, or oval, sometimes semicircular or subtriangular in outline (Rhizophyllum), sometimes quadri- lateral (Gontophyllum). It may be very shallow, or very deep, and its edges may be completely everted (e.g. in Plychophyllum patellatum). It may be at right angles to the axis of the corallum, or it may have any degree of obliquity. In the simple and curved or horn-shaped coralla, it is very common for the calice to be very oblique to the axis of the coral; and in these cases the convex side of the corallum (dorsal side) is the longest, and the eoncave side (ventral side) is the shortest.~~

~~The scpta of the Rugosa are substantially similar to those of the Joantharia sclerodermata in form and structure, forming, when well developed, a series of vertical calcareous lamine which are primitively double, spring from the inner surface of the wall, and radiate towards the centre of the visceral chamber. They arc rarely or never perforate, and they vary much in the extent of their development. Sometimes they are almost wholly aborted, being only recognizable as so many faint striw on the inner surfacc of the calice (as in the typical examples of Cystiphyllum). At other times, they extend inwards only an extremely short distance from the wall, as in the genus Amplexus. In other cases, again, they are well devcloped towards the centre of the corallum, but have no connection with the outer wall, from which they are separated by dissepimental vesicles, as in the genus~~

Lonsdaleia. In other instances, finally, they have their normal arrangement, being attached externally to the wall, and extending inwards to, or near to, the centre of the visceral chamber. In rare cases the septa may be all of nearly the same size ; more commonly they are markedly different in size. Most of the forms in which the septa are well developed, show a distinct tetrameral arrangement of the septa, though it does not appear possible to assert positively that the primitive and first developed cycle of septa consists of only four elements. In many cases, however, the septa of the adult are a multiple of four, and their quadripartite disposition may be plainly manifested by the fact that four of the septa are pre- eminently developed and form a conspicuous cross (Stawria), or by the presence of four calicine depressions which have a similar cruciform arrangement (Omphyma). In the typical Rugosa the septa, though undoubtedly not simultaneously developed, are never- theless of only two sizes, a larger and a smaller, alternating regularly with one another ; and they cannot, therefore, be distin-

uished according to their dimensions into a series of regular cycles.

"he small or secondary septa also may be occasionally absent. The primary or larger septa, be their development what it may, are for the most part equal in size ; but, notwithstanding this fact, the corallum often shows a very distinct bilateral symmetry, due apparently to the primitive tetrameral disposition of the septa. This is especially shown in the general existence either of a single

septa), or of an extraordinary vacant space, representing this septum, and known as the "septal fossula." The septal fossula usually presents itself as a more or less conspicuous depression or groove in the calice, and its position, though apparently constant

side, and rarely situated laterally. In general it is a simple space

of the corallum in the simple forms, sometimes on the concave or deficiency caused by the absence or abortion of one of the four

primary septa, and it is seen in transverse sections to be occupied by from one to three short septa. Sometimes it is accompanied)

a tubular oe of the tabuleat that point. Sometimes ale. . are two smaller lateral fossule, directed at right angles to the ae depression, and representing two others of the primitive septa, At other times there may be four shallow fossule arranged in a crucial

manner (Omphyma), but it is not certain that these correspond | with the four primitive septa. Lastly, in the genus Metriophyllum —

the septa are arranged in four groups, which are separated from one another by vacant spaces or fossule, though in this ease also it js not certain that these spaces are homologous with the true septal fossule of forms like Zaphrentis. The precise physiological import of the fossula is uncertain ; but its presence gives rise to an irregu- larity in the arrangement of the septa which 1s highly characteristic of the Rugosa. Whilst in Stawria all four of the primitive septa are pre-eminently developed, only three are thus predominant jn 'Anisopyllum, and only one in Mallia, The free edges of the septa where they appear in the calice, are in general plain and smooth, but they may bear granular tubercles (Paleocyclus), or teeth (Zaphrentis cornicula, Heliophylium). The sides of the septa are likewise generally smooth, but they may be granulated (Paleo. cyclus), or they may be adorned with arched and ascending strie (Heliophyllum).

The axis of the corallum is very often occupied by a columella. which varies much in structure in different cases. In forms such as Cyathaxonia, Lithostrotion, Koninckophylium, &., we have proper or essential columella, which is developed independently of the septa, occupies the eentre of the visceral chamber, and projects as a solid rod into the floor of the calice. In other cascs the eolue mella is composed of twisted lamelle, which inosculate with one another so as to give rise to a vesicular axis, as in Lonsdaleta and Axophyllum. In other cases, a false columella may be produced by the twisting together of the inner edges of some of the primary septa (as in some species of Cyathophyliwm). In other cases, finally, the axis of the visceral chamber may be occupied by a series of more or less complicated structures, which may occupy a consi- derable space, and which have sometimes been regarded as repre. senting a kind of columella

(Clisiophyllum, Dibunophytlum, Ehodo- phyllum, Cyclophyllum, &c). These axial structures, however, can only in a very limited sense be regarded as columellar.

The continuity of the interseptal loculi in the Rrgosa is generally more or less interfered with by the development of endothecal dis- sepiments ; but in no case are synapticule present. The dissepi- ments vary greatly in character and amount. Sometimes they are wholly wanting (Cyathaxonide and some species of Ampleus) ; at other times they may be present in small amount (Lophophyllum, somes species of Amplexus, &c.) ; at other times they are exceed: ingly abundant. In the species of Cyathophyllum, in Litho- strotion, in Koninckophyllum, and in other forms, the dissepiments are so largely developed towards the circumference of the visceral chamber as to give rise to a dense peripheral zone of vesicular tissue, In longitudinal sections of the corallum this vesicular tissue is seen to be composed of very minute lenticular cells arranged in oblique rows directed upwards and outwards. In other forms, such as Campophyllum, Lonsdaleia, &c., a similar zone of vesicular tissue exists, but the cells which enter into its composition are of very large size. In the genus HeliophyIlum, and in certain other forms, there are found singular dissepimental structures, which are attached to the sides of the septa, but do not extend completely across the interseptal loculi. The structures in question constitute a series of plates which are attached by their bases to the sides 0 the septa, projecting freely into the interseptal loculi, and directed inwards and upwards in an arched manner from the interior of the wall towards the centre of the visceral chamber. These arched ridges are placed at corresponding points on the opposite side 0 each septum; they consequently appear on the free edges of the septa within the calice as so many spines, and they communicate to cross-sections of the septa a characteristic cross-barred appeal ance. In the Cystiphyllide, again, the entire visceral chamber is filled with a vesicular tissue of convex and inclined. cells, which may be regarded as formed partly by dissepiments and partly by tabule.

Tabulee are in general well developed amongst the Rugose corals, and coexist with well devcloped septa. In some genel But as Amplexus and Zaphrentis) the tabule are "complete," that '8 to say, they pass completely across the visceral chamber from sit¢ side, thus dividing it into a succession

of distinct stories, of wile only the uppermost is occupied by the living tissues of the ion ; In a greater number of cases (e.g. Cyathophyllum, Lit " Lonsdaleia, Heliophyllum, &c,), the tabula are " incomp/t! ; that is to say they do not extend across the visceral chamber, DY' are confined to a larger or smaller central area, The cen 4 late area may or may not be pierced by a columella; and the s¢?

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; rolongéd across the upper surfaces of the tabule to rk ee he a hun, or they may fall short of the centre, ' a thus leave a larger or smaller area of the tabule free to view, | aif conspicuously visible in the floor of the calice. The tabule < be well developed, approximately horizontal, remote plates, as a ee the case in Zaphrentis and Amplexus, or they may anasto- ; wet various ways, and become so intimately connected with one

voter as to give rise to a species of vesicular tissue. ma regards the affinities of the Rugose corals, doubts have of late years been expressed as to their systematic position and rela- tionships. By Professor Louis Agassiz the entire order of the Rugosa was transferred from the Actinozoa to the Hydrozoa, but upon insufficient evidence. It had been observed by Agassiz that the living animal of Mzllepora was apparently a hydroid, closely allied to Hydractinia, and it was upon the strength of this observa- tion alone that the distinguished American naturalist proposed this sweeping change. The following considerations show, however, that this change cannot be accepted. (1) Millepora is not a Rugose coral, but lores to the so-called Tabulate corals, of which it constitutes a very aberrant member. ven, therefore, were it satisfactorily proved that the genus Afillepora is a true Hydrozoin, as to which naturalists are not yet agreed, this would not affect the classification of the Rugosa, which are very distinct in their structure from the Zabulata, and have no affinities with them further than is implied by the fact that tabule are present in both. (2) It has been shown that the group of the Tabuwlata itself contains both true Zoantharia and true Alcyonaria, so that the hydroid character of Millepora, if admitted, would not so much as cause the removal of the Tabulata to the Hydrozoa. (8) It has further been shown that tabule are present in certain forms which are

~~unquestionably Actinozoa, as shown by an examination of the living animal (Pocillopora and Lophohelia). It is evident, there- fore, that the presence of tabulz in itself should have no weight in determining the systematic position of any given form, unless at the same time the structure of the living animal be known. (4) Apart from the close similarity between the corallum of the Rugosa and that of the recent Zoantharia sclerodcrmata, the Rugose corals are provided, almost invariably, with structures which, so far as we know, are absolutely irreconcilable with the belief in their Hydrozoal affinities. They possess, namely, in almost all cases, well developed sepia, which, if they do not absolutely imply the existence of mesenteries in the living animal, are, at any rate, wholly unknown as occurring amongst the recent Hydrozoa, We may, therefore safely accept the conclusion of Verrill, Pourtales, Claus, Duncan, Milne-Edwards, and other distinguished authori- ties, that Agassiz has failed to bring forward sufficient evidence in favour of his view that the Rugosa are referable to the Hydrozoa.~~

~~More lately Dr Lindstrom has endeavoured to show—that the Rugosa cannot be placed amongst the Actinozoa, | but "must form a class of their own in the great division~~

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~~—of the Radiated Animals." The chief grounds upon which—this conclusion is reached are "the compact imperforate structure of the calyx and septa (the septa originating from four primary ones), the absence of costz, the strange septal fossee in the bottom of the calyx, the processes resembling—-Tootlets, the transverse floors or tabule in the interior, which often have a cellular or vesicular structure," and—the occasional presence of an operculum. It is obvious, however, that none of the above-mentioned peculiarities—are of such fundamental importance as to justify us in overlooking the substantial identity of structure which subsists between the corallum of the Ltugosa and that of the Aporose section of the Zoantharia sclerodermata. The wall and septa are often compact amongst the latter; the |~~

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~~- Septa have a tetrameral arrangement in the unquestionable living Actinozoa, Haplophyllia and Guynia ; the septal fossula is not always recognizable amongst the Rugosa ; the Presence of rootlets and the nature of the costs are Points of secondary importance ; tabula are present in undoubted corals belonging to the Zoantharia scleroder- mata ; and the occasioual presence in some abnormal forms of an operculum would no more justify us in removing the ugosa from the Actinozoa that we should be warranted ft Me *ame reason in removing the living Primnow from & Aleyonaria, Upon the whole, then, there appears to~~

~~; be little da 7 . : Professor Vorrll, in accepting the conclusion reached by~~

~~authorities on the Teasonable doubt~~

~~one of the most distinguished of living subject, that there can no longer be any~~

~~but that the coralla of the great majority |~~

~~|~~

~~of the Rugosa were made by "true polypes essentially similar to those ofthe existing corals." Indeed, if any great change in our classification is to be made, it would seem rather to be in the direction of more closely approximating the Rugosa to the Zoantharia sclerodermata. The tetra-meral arrangement of the septa is by no means always very conspicuous amongst the Jugosa, and it seems not unlikely that too high a classificatory value has been attached to it. Leaving this out of account, the affinities of the typical Rugosa with the Aporosu are very close, and it may be doubted if it would not be proper to establish a more intimate union between these groups. At the same time, it must not be overlooked, as pointed out by Mosely, that the Rugosa have certain affinities with~~

~~| the Alcyonaria, and especially with singular recent~~

~~Heliopora. Great stress, however, can hardly be laid upon the existence of paired opercular structures in Goniophyllum and in the existing Alcyonarian genus Primnoa, since Goniophyllum, if a Rugose coral at all, must be referred to the Cystiphyllide, a family in which all the more characteristic features of the Rugose organization have disappeared.~~

~~The divisions of the Rugosa recognized and founded by Milne- Edwards and Jules Haime, and subsequently generally adopted, are the following :—~~

~~Fam, I. Stauripz.—The wall is well developed ; the septa lamellar, extending without interruption from the bottom to the top of the visceral chamber, and showing a conspicuous quaternary arrangement. The interseptal loculi are crossed by ecndothecal dissepiments, and there is a central tabulate area. Of the five genera which form the family, Stawria hasa compound corallum, astreiform in shape, and increasing by calicular gemmation ; there is no columella; and the four primitive septa form a couspicnous eross. olocystis is also composite and astreiform,—the corallites being united by well developed coste, and a styliform columella being present. Of the simple genera, the Permian Polycalia and the Tertiary Conosmilia are closely allied to one another; but the third, Metriophyllum, is so aberrant that it may require to be placed in a separate family, as its septa are arranged in four distinct groups, separated from one another by four distinct fossulz.~~

~~Fam. II. Cyarmaxonipz.—In this family the corallum is simple, with a deep calice; the septa are well developed, and extend from the bottom of the visceral chamber to the floor of the calice; the interseptal loculi are completely open, and there are neither dissepiments nor tabule. Though exhibiting a quaternary arrangement, the four primary septa are not conspicuously developed above the others. This family makes an exceedingly close approach to the Aporose group of the Turbinolide, from which it is separated by the tetrameral arrangement of the septa. Of the genera of the family, Cyathazonia is Paleozoic, whilst Haplophyllia and Guynia are recent. No Secondary or Tertiary forms are as yet known.~~

Fam. JII. Cyarnoruytiipa.—In this family the corallum is simple or compound ; and the septa are always more or less inter- rupted, and do not extend as complete lamelle from the bottom to the top of the visceral chamber, being more or less imperfect either internally or externally. The four primitive septa are not

re-eminently developed, so as to give rise to a conspicuous cross.

he interseptal loculi are generally more or less interrupted by the development of dissepiments, and tabule are invariably present. The family of the Cyathophyllide is divided by Milne-Edwards and Haime into the two tribes of the Zaphrentine and the Cyatho- phylline.

a. Zaphrentine.—In this tribe the corallum is simple and free ; a well-developed septal fossula is present, which may be formed by a tubular inflection of the tabule on one side, or may be replaced by a cristiform process. The septa usually fall short of the centre of the visceral chamber, and, from the presence of a septal fossula, are invariably more or less irregular in their arrangement. The tabula are complete, and pass from one side of the visceral chamber to the other ; while dissepiments are poorly developed, and there is usually nothing of the nature of a columella. The Zaphrentine are exclusively Paleozoic, and the principal genera of the family are Zaphrentis, Amplexus, Menophyllum, Lopho- phyllum, Anisophyllum, Baryphyllum, Hadrophyllum, Microcyclus, Combophyllum, Trochophyllum, Aulacophyllum, Hallwa, and Streptelasma. a

b. Cyathophylline.—In this family the septa do not exhibit the irregularity which is so conspicuous in the Zaphrentine, but are more or less regularly radiate in their arrangement. In some

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cases, the septa may be equally divided into four groups by four shallow fosse in the calice. A true columella may be present or absent, or there may be a pseudo-columella formed by the twisting together of the inner edges of the septa. A more or less well- developed zone of vesicular tissue, formed by

endothecal dissepi- ments, is usually found on the exterior of the visceral chamber ; and the tabula are not complete, but occupy a more or less exten- sively developed central area. The corallum may be simple or compound. All the Cyathophyllide are Paleozoic, and the principal genera are Cyathophyllum, Campophyllum, Omphyma, Pachy- phyllum, Chonophyllum, Ptychophyllum, Heliophyllum, Paleo- cyclus, Clisiophyllum, Dibunophyllum, Aspidophyllum, Rhodo- phyllum, Aulophyllum, Cyclophyllum, Acervularia, Strombodes, Phillipsastrea, Smithia, Endophyllum, Spongophyllum, Syringo- phyllum, Eridophyllum, Diphyphylium, Lithostrotion, Lonsdaleia, Chonaxis, Axophyllum, Koninckophyllum, &c. —~.

Fam. IV. Ovystieuyvitipa.—The corallum in this family is siinple, or rarely compound ; the septa are rudimentary, and are generally only recognizable as so many vertical striz within the calice. The outer wall is complete, but the entire visceral chamber is filled with small convex vesicles, sometimes arranged in infundibuli- form layers, and formed by the dissepiments and tabule in combi- nation. A distinct septal fossula may or may not be present. The entire family is Paleozoic, and the only undoubted genus is Cystiphyllum itself. In their internal structure, however, the sin- gular operculate corals of the genera Goniophyllum, Lhizophyllum, and Calceola present striking affinities with the Cystiphyllida, whilst a species of the genus Cystiphyllum (C. prismaticwm) has been described by Lindstrom as being furnished with an operculum. We may, therefore, with great probability, refer the above mentioned abnormal genera to this family of the Rugosa. It should be borne in mind that the Cystiphyllide, with or without Goniophyllum and its allies, are such abnormal forms that it is difficult to assert positively that they belong to the Rugosa, and it remains possible that they should be separated to form a special group.

As regards their geological distribution, the Rugose corals have a vast development in the seas of the Palaeozoic period, where they seem to take the place, to a large extent at any rate, of the Aporose section of the Zoantharia sclerodermata. In the Secondary period only one genus (Lolocystis) of the

~~Rugosa is known, and but one is known in the Tertiary rocks (Conosmilia), whilst the only two living genera which could be referred here are the Haplophyllia of Florida and the Guynza of the Mediterranean.~~

~~In the Silurian period the Rugosa are very largely developed, especially in the upper division. The principal genera of this period are—Cyathophyllum, Zaphrentis, Cystiphyllum, Streptelasma, Acervularia, Strombodcs, Omphyma, Paleocyclus, Diphyphyllum, Amplexus, Ptychophyllum, Stauria, Syringophyllum, Gontophylium, Rhizophyllum, and Pholsdophyllum. [The Lower Silurian Colwm- nari with complete septa (Lavistella) are probably Aporose corals ; Columnopora is perhaps one of the Perforata; and Petrata and Duncanella are in a somewhat dubious position.] In deposits of Devonian age, Rugose corals are exceedingly abundant, the principal genera of this period being Cyathophyllum, Heliophyllum, Diphy- phyllum, Eridophyllum, Campophyllum, Endophyllum, Pachyphyl- lum, Phillipsastrea, Acervularia, Smtthia, Spongophylium, Blothrophyllum, Zaphrentis, Baryphyllum, Aulacophyllum, Aniso- phyllum, Trochophyllum, Combophyllum, Hadrophyllum, Aficro- cyclus, Hallia, Mctriophyllwm, and Amplexus. In the Carboniferous ee the Rugose corals still remain very abundantly represented~~

~~y forms belonging to such genera as Cyathophyllum, Lithostrotion, Diphyphyllum, Lonsdaleia, Axophyllum, Clisiophyllwm, Cyclophyl- lum, Rhodophyllum, Zaphrentis, Amplexus, Lophophyllum, Meno- phyllum, Campophyllum, Phillipsastrea, &c. In the Permian rocks, which so far have proved to be extremely uncoralliferous, no examples of the Rugosa are known save the genus Polycelia, so far at any rate as Britain is concerned. In the great series of the Secondary formations no Rugosa are as yet known save two species of the single genus Holocystis of the Lower Cretaceous. In the great series of the Tertiary deposits, again, there has hitherto been discovered only a single Rugose genus, the Conosmilia of the later Tertiaries of Australia.~~

~~Orpver III.—Aucyonarta (Octocoralla),~~

~~The members of this order are Actinozoa in which the polypes possess eight tentacles, which are fringed on their sides with lateral pinne, or papille. Asin the Zoantharia, the mouth opens into a tubular stomach, which in turn~~

~~communicates freely with the body-cavity, and the stomach~~

~~is connected with the body-wall by means of a series fo vertical membranous laminz or mesenteries.~~

~~CORATL®~~

~~mesenteries, however, are only eight in number, and arp not paired, one of the tentacles corresponding with ang opening into each inter-mesenteric chamber. rule a corallum is secreted, though this may be wanting and its nature differs in different cases. (Alcyonium, Xenia, &c.) the corallum is sclerodermic, and consists of variously-formed spicules of lime scattered in the soft tissues. and sclerodermic, with true thece, but without septa or tabule, and formed of fused spicules, detached structures of the same nature existing in the soft parts. (Heliopora) the corallum is external and sclerodermie, with true thecee provided with septa and tabule. finally (Gorgonia, Corallium, Pennatula, &c.), there js double corallum, the one consisting of a calcareous or horn sclerobasis, over which the soft parts are spread, the other consisting of sclerodermic spicules scattered in the integu- ments. which is possibly not a mature form, all the Alceyonaria are composite. and their body-cavities are placed in communication by means of canals which ramify through the ccenosare, and permit of a free circulation of nutrient fluids, of the colony varies greatly in different cases, being usually more or Jess branched, arborescent, or lobate, but being at other None of them possess the power of independent locomotion, most being rooted to foreign objects in their adult condi- tion, but some being simply sunk in the mud, and a few floating freely in the sea. brilliant coloration, due in many instances to the brightly- coloured spicules disseminated in their tissues. lastly, it has been shown that the colony normally consists~~

~~The~~

~~As a general~~

~~In some forms~~

~~*In others (Zubcpora) the corallum is externa]*~~

~~*In others*~~

~~*In others*~~,

~~*With the exception of the single genus Maimeia*~~,

~~*The tubular polypes are united by a coenosare*~~,

~~*The form*~~

~~*times massive, incrusting, creeping, linear, ée*~~,

~~*Many of them exhibit the most In some*~~,

~~*of two kinds of polypes, one sexual, the other sexless and permanently rudimentary. The Alcyonarza may be briefly discussed under the five following families :—*~~

~~*Fam. I. ALcyontp#.—The members of this family are all fixed to foreign objects, and are more or less fleshy in their consist- ence, owing to the fact that the corallum consists simply of selero- dermic spicules scattered in the integuments, and there is no selero- basis. The spicules are of various forms, but prac fusiform, and they are scattered through the ccenosare and the soft tissues generally, but are oftcn specially aggregated at the bases of the tentacles and along the tentacles themselves. The spicules may be present in very small numbers (as in some species of Soggodes), but they may be present in such numbers as to render the surface rough and prickly (as in Nepthya, Paraleyoniwm, and the typical species of Spoggodcs). The actinosoma may form lobate masses within which the polypes can be retracted at will (Alcyonium), or more or less branched and having the polypes non-retractile (Xenia). Others form membranous crusts, attached to foreign bodies, the polypes being sometimes retractile (Anthelia), sometimes non- retractile (Sympodiwm). Others form a creeping colony of slender stolons, sending up polypes at different points, the lower portion of the colony being so thickened by spicular secretions as to constitute & kind of*~~

tubular corallum into which the polypes can withdray (Cornularia). In the genus Sarcophyton, lastly, it has recently been shown (Mosely)* that the colony, like that of many of the Pennatulide, is dimorphic, consisting partly of sexually perfect polypes, and partly of zodids which are destitute of generative organs and of tentacles. The zodids, however, have a stomach and mouth, and are connected with the perfect polypes by a canal- system. :

"ih, II. Tupirorip#.—This forms a very small family, includ:

ing only the various species of the " Organ-pipe corals" (7! ubigora) and often included with the preceding, to which itis closely related. In the common Zubipora musica, which may be taken as the type of the family, there is a very well developed sclerodermie i: allum, with true thece enclosing the polypes, but without septs. The corallum is bright red in colour, and is composed of tabula cylindrical theew, usually growing regularly side by side, but a a little distance from one another, and united at intervals horizontal epithecal expansions, which represent external ta waht There are no septa, nor internal tabule ; and Dr Perceval ear has shown that the tubes are really composed of fused Pe dded The polypes are green, with eight pinnate tentacles ei with lenticular spicules. The polypes when alarmed m > themselves within their tubes, the upper portion of the tube

| mature polypes,

ich are Joose, ' ae dense portion of the theca. The mouth is placed betwee

Fria, 12.—Tubiporide.

A, Portion of the corallum of Tubipora musica, of the natural size, showing the tubular corallites and the exothecal tabule. B, Polype of the same, greatly enlarged, showing the mouth and tentacles.

bases of the tentacles, with a slightly elevated lip, and leads into a small stomach-sac. There are eight mesenteries, within which the reproductive organs are contained. 'The exothecal expansions, by which the tubes are united, appear to be produced periodically as horizontal extensions from the mouths of the tubes.

~~Fam. lJ. PeNNATULIDZ.—The "Sea-pens" and "Sea-rods' are compound Alcyonaria, but instead of being rooted to some foreign object, they possess a fleshy, usually columnar or rod-like base, which is non-polypiferous, and is plunged in the sand and mud of the sea-bottom. The upper portion of the colony carries the polypes, and varies much in shape. | borne on long lateral pinne, which give the upper portion of the actinosoma a feather-like appearance (Pennatula) ; whilst at other times there are similar but much shorter pinne (Virgularia). In Veretillum the upper portion ot the colony is short and club- shaped, and carries the polypes all around its circumference, and the same is the case in Cophobel- emnon. In Pavonaria the polypes are non-retractile, and are disposed on one side of the slender acti- nosoma; whilst in Renilla the polypes are also unilateral, but the bee surface is thin and reniform. In Umbellularia, the polypes are carried in a cluster at the top of the actinosoma. The corallum in the Pennatulidee is usually two-fold, consisting on the one hand of a slender, styliform, horny, or calcareous axis (sclero- basis) concealed within the cceno- sare, which it serves to support, and, on the other hand, of small calcareous spicules scattered amongst the soft tissues. In some cases the sclerobasis is rudi- mentary. The Pennatulide often~~

~~Fira, 13.—Pennatulide. possess the power of phosphores- Colony of Veretillum cynomorium,~~

~~Linn., of the natural size, with the~~

~~cence in a high degree, and they polypes protruded.~~

~~possess the same system of ccono- sarcal canals as is characteristic of the Alcyonaria generally. The~~

~~| polypes have eight pinnately-fringed tentacles, and eight mesenteric~~

~~In many cases,~~

~~cotalsilet tee ae", as originally shown by Kélliker, the colony~~

~~of zodids, the one composed of sexually 8, the other, more numerous, composed of sexless polypes, in which the tentacles are not developed. Fam.~~

1V. Gorconrpm.—The ‘ Sea-shrubs ”

ossess a& more or less branched ccenosare,

“nciens ae : » Which is permanently rooted to some pee = object, and is provided with a grooved or sulcate branched hess ora with which are associated true tissue-secretions in the wl. ey shaped sclerodermic spicules (“sclerites”). As ym lelr soft parts, the Gorgonide do not differ from the other eight ei i polypes erage eight fringed tentacles, with eidek ae ce united by a canal-system, which ramifies Gisded ‘ . Y ceeosare, The ccenosarc, however, is always wn ee hic? and supported by, a more or less branched sclero- mt Walch it forms a thin fleshy expansion (“ cortex’), and a rhe are capable of complete retraction within the ccenosare. issues are also abundantly supplied with true sclerodermie

CORALS

Dr Wright, being composed of fusiform warty spicules shoe and thus allow this part to be pulled into the

Sometimes the polypes are |

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secretions, in the form of calcareous spicules of very various shapes. and often of very brilliant colours, which are in many instances so characteristic in their form that they can be employed as a ground of generic distinction. The spicules (“*sclerites”) are usually buried in the soft tissues, but they may project beyond the surface of the ccenosare in such numbers as to render the integument rough and scoriaceous (Muricea), The sclerobasis varices greatly both in tex- ture and form. Sometimes it resembles that of the Antipathide in being corneous and unjointed, but its surface is always striate or grooved, whereas in the “ Black Corals ” it is smooth or echinulate. Its form is usually more or less branched, dendroid, or minutely arborescent (asin Primnoa, Muricea, Gorgonia, Leptogorgia, &c.), or it may be in the shape of a regularly reticulate flabelliform expan- sion (Rhipidogorgia). In the genus Jsis the sclerobasis is branched and articulated, composed of alternating

calcareous and horny joints, and having the new branches produced from the calcareous nodes. In Melithwa and Mopsea, again, the corallum is likewise branched and articulated ; but the joints are alternately hard and soft ; the hard joints being composed of fused calcareous spicules, and the flexible joints of horny matter intermixed with calcareous spicules and connective tissue, whilst the new branches are deve- loped from the corneous segments. Lastly, in Red Coral (Coral- lium) the sclerobasis is unjointed, more or less branched, and densely calcareous. It is of ared or pink colour, and finely grooved upon its surface ; and it is really composed of fused spicules, and thus differs very materially from the true sclerodermic corallum. The calcareous axis is covered with a bright red ccenosar-

Fra. 14.—Red Coral (Corallium rubrum), of the natural size, and a portion enlarged.

cal crust or cortex, which is studded by the apertures for the polpes: The polypes are milk-white in colour, with eight pinnately- ringed tentacles, and completely retractile within the fleshy bark. The polypes are further placed in direct communication by means of anastomozing canals channelled out of the ccenosarc and filled with a nutrient fluid. It has been shown by Lacazc-Duthiers that the colonies of Coralliwm are sometimes composed of male polypes, sometimes of female, or occasionally all the polypes of some branches of a colony may be of one sex, and all the polypes of other branches of the opposite sex, whilst in some instances polypes occur which are hermaphrodite and combine in themselves the organs of both sexes.

Fam. V. HELIopORIDZ.—An examination of the living Heltopora in its fresh state has recently induced Mr Mosely to found this family for the reception of the existing genus Heliopora and a number of extinct forms previously placed amongst the Tadulata. In Helzopora there exists a well-developed sclerodermic corallum, of a composite nature, and composed of corallites united by ccenen- chyma. The corallites are tubular, crossed regularly by well-de- veloped tabule, and having their walls folded in such a manner as to

ive rise to a variable number (generally twelve) of septal laminz.

he ccenenchyma is composed of slender tubes, of smaller size than the true corallites, and packed closely side by side. The ccenen- chymal tubuli are destitute of septa, but, like the corallites, arc crossed by regular transverse tabula. The sclerenchyma is not com- posed of fused spicules, as in Corallium and Tubipora, but of fibro- crystalline calcareous tissue, as in the Zoantharia sclerodermata. The soft parts occupy only the parts of the corallum above the uppermost tabule, and therefore only a surface-layer of the colony is actually alive. The polypes are completely retractile, with pinnately- fringed tentacles, which are introverted in retraction. There are also eight lobed mesenteries, but these in no way correspond with the

fathoms or more. It is very largely sought after, and obtains a high price for ornamental purposes. The "coral fishery" is carried on by means of machines of different construction, which are dragged over the sea-bottom, and which usually injure more of the coral than they actually bring to the surface. Hence many valuable coral-beds have been completely exhausted, and the industry has no longer the importance that it formerly possessed. The " Organ-pipe corals" (Tubipora) are confined to the warm seas of the "coral-reef region ;" and the genus Heliopora the only living representative of the family Helioporide, is confined to the Pacific and Indian Oceans.

As regards their distribution wm time, none of the Alcyonaria, except the Helioporide, can be said to be known with certainty in deposits of Paleozoic age, The genus Protovirgularia was founded by M'Coy for the reception of a Silurian fossil which he believed to be allied to the living Virgularie, but it appears to be certainly not of this nature, and is probably a graptolite. The family of the Helioporide is well represented in the Paleozoic period ; the genus Heliolites being Silurian and Devonian, Propora and Lyellia being Silurian, and Plasmopora Silurian and doubtfully * Devonian. If Callopora and Fistulipora be referred to this group, then we may also consider that we have Carboniferous and Permian representatives of it. The genus Polytremacis, again, is confined to the Cretaceous period. The family of the Gorgonide is not known to be represented with certainty earlier than the Eocene Tertiary, two genera (Mopsea and Websteria) being found in the

London clay. The genus Coralliwm has been doubtfully quoted from the Upper Oolites and Upper Cretaceous, and undoubtedly occurs as early as the Miocene. The Miocene deposits have also yielded species of Isis, Gorgoma, Gorgonella, and Melithea. The family of the Pennatulide is not represented earlier than the latest Secondary or the earlier Tertiary deposits. The genus Pavonaria is said to oceur in the Pisolitic Limestone of France, whilst Graphu- laria (and perhaps Virgularia) is found in the Eocene. The Miocene Tertiary has also yielded species of Vérgularea, Graphularia, and Calographula. The family of the Tubiporide has not been recognized at all in a fossil con- dition. Lastly, the past existence of the Alcyonide has only been recognized with any certainty in the Pliocene deposits, the Red and White Crags having yielded a species of Alcyoniwm.

septa, the latter being twelve in number. 'The septa are thus seen to be pseudo-septa, and they cannot be regarded as homologous with the septa of the Zountharia sclerodermata. The conen- chymal tubes are occupied by sacs lined by the endoderm, which are closed externally but communicate freely with the somatic cavl- ties of the polypes by means of transverse canals. Mr Mosely suggests, with great probability, that the sacs lining the coenen- chymal tubes are really of the nature of aborted polypes. similar suggestion was put forth by the present writer with regar

to the coonenchymal tubuli of Heliolites and its allies, upon other grounds 9 Trans, Loy. Soc. Edin., Vol. XXV1l. P- 248.)

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Fig. 15. A, Small colony of Helioliiés megastoma, M'Coy, of the natural size, 3B, Small

portion of the surface of the same, magnified, showing the ealices (a) and coenenchymal tubuli (6). ©, Vertical section of the same, enlarged, showing

' the tabulate corallites and the tabulate tubes of the conenchyma.

~~The investigations and discoveries of Mr Mosely with regard to Heliopora are of special interest, as settling the true position of a number of fossil corals, which had previously been placed in the Tabulate division of the Zoantharia sclerodermata, put which must now be referred to the Alcyonaria. The discovery, also, of tabules combined with a genuine sclerodermic corallum in an undoubted Alcyonarian further raises a question as to the true affinities not only of the Tabulata generally, but also of the Rugosa ; whilst the discovery of septa which do not correspond with the mesenteries of the living animal will produce important results in the study of the fossil corals generally. Without entering into any of these questions here, there can be no doubt but that the extinct genus Heliolites and its allies are so closely related to Heliopora as to necessitate their being placed in the Aloyonaria as members of the family Helioporidw. In the genus Heliolites there isa well- developed sclerodermic corallum, the corallites being tubular, regularly tabulate, and usually with well-developed septa, whilst the ccenenchyma is composed of tabulate, geometric tubuli, smaller than the corallites and without septa. 'In the genus Plasmopora the corallum is very similar to that of Heliolites, differing chiefly in the fact that the conenchyma is more vesicular, and the tubuli are not so distinct. Propora, again, can hardly be separated from. Plasmopora, its chief distinction being that the calices are exsert. Lyellia, also, is closely related to Heliolites. Polytremacis, also, differs from Heliolites chiefly in its granular surface, and it is hardly separable from Heliopora except by the fact that its septa are more developed. Finally, there are various extinct genera, such as Fistulipora, Callopora, &c., which have very close relationships to Heliolites, though they are destitute of septa, and which very probably will have to be ultimately associated in the same group.~~

~~Breuiocrapay.—Amongst the more important works and memoirs which may be consulted by the student of recent and fossil corals may be mentioned the following :—Agassiz, Louis Contributions to the Natural History of the United States, vols. iil. and iy., on' Acalephs ;" De Blainville, Manuel @& Actinologie ot de Zoophytology, 1887; Bronn, Die Klassen und Ordnungen | Thicrreich's (Strahlenthiere), vol. ii. parts 1-6, 1859-60; -Ouvier, Regne Animal, 8d ed. vol. iii., Zoophytes;" Dana, Rep. of Wilkes's Expl., Exped. "Zoophytes," 1848 ; also Corals and Coral Islands, 1872; Edwards and Haime, Histoire Naturelle des Coralliawres, || ow Polypes~~

proprement dits, 1857-60 ; also by the same, "Recherches sur la Structure et Classification des Polypiers recents et fossiles, in Ann. Se. Nat., 1848-52; Ehrenberg, Bettrage zur Physiologischen Kenntniss der Corallenthiere im Allgemeinen, und besonders des Rothen Meeres, Berl. 1884 ; Ellis, Essay towards a Natural History of the Corallines, &c., 1755; Ellis and Solander, The Natural Hisiory of many Curious and Uncommon Zoophytes, 1786; Gosse, Actinologia Britannica, A History of the British Sea- Anemones and Madrepores, 1860; Greenc, Manual of the Coelenterata, 1861; Johnston, History of British Zoophytes, 24 ed. 1847; Kolliker, Jenis Histiologice, Ath. t., die Bindesubstana der Colenteraten, 1865; Lacaze-Duthiers, Histoire Naturelle du Corail, also "Developpment des Coralliaires," in Archives de Zool. Experimentale, ad Lamarck, Hist. Nat. des Animaus sans Vert., 2a ed., 1836-39 j Lamouroux, Exposition Méthodique des genres de l'ordre des rg oti 1821 ; also Histoire des Polypiers flexibles, 1816 5 Leuckart, a die Morphologie der wirbellosen Thiere, 1848 ; Pourtales, '"Deep> Corals," No. 4 of the Zlust, Catalogue of the Mus. of Comp. 4 1871; Quoy and Gaimard, Voyage de [Astrolabe, also Voyage dis PUranie; Rapp, Ueber die Polypen tm Allgememen und

With regard to the distribution in space of the Alcyonaria, it is sufficient to say that they are very widely spread over the globe, occurring in all seas from the warmest to the coldest, and at almost all depths. The Alcyonide are for the most part inhabitants of shallow water, but the Pennatulide are represented up to almost the greatest depths yet sounded by the dredge. The Gorgonide are principally shallow-water forms, and attain their maximum of development in the seas of the tropics, abounding on coral-reefs, to the beauty of which they greatly contribute. The red coral of commerce (Coralliwm rubrum) is a Mediterranean species, and occurs principally at depths of from 5 to 6 fathoms, though extending its range up to 120

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~~. maere, 1829. There are also numerous works and ae Baie referred to by Alexander Agassiz, Louis ¥ Asbjornsen, Brandt, Busch, Claus, Cobbold, Agassiz, Allman, pee : Costa, Dalyell, Dana, Darwin, Duncan, Fischer, EK. Forbes, Frey d Leuckart, Gosse, Gray, Haime, Hollard, Johnston, Leidy, iiitken Michelin, Milne-Edwards, Mobius, Moseley, Oecersted, Philippi Pourtales, Quatrefages, Quoy and Gaimard, Rathke, Ratteken, Sars, Schmarda, Schneider, Stimpson, Teale, Verrill, Willemoes-Suhm, Perceval Wright, Strethill Wright, and others. As regards Coral-reefs, the following may be consulted:—Dana, Corals and Coral Islands, 1872, and "Zoophytes" in Report of Wilkes's Expl. Faped., 1848; Darwin, On the Structure and Distribution of Coral-Reefs, 1st ed. 1842, 2d. ed. 1874 ; Chamisso and Von Kotzebue, Hntdeckungs-Reise in die Stidsee, 1815; Ehrenberg, Veber die Natur and Bildung der Coralleninseln und Corallenbiinke im Rothen Meere, Berlin, 18384; also works or papers by Beechey, Couthouy, Flinders, Foster, Jukes, Quoy and Gaimard, Semper, &c. : ; As regards the Rugosa and Fossil Corals generally, the following may be consulted :—Bronn, Lethowa Geognostica, 1851-1856 ; De Fromentel, Introduction a étude des Polypiers Fossiles, 1858-61 ; D'Orbigny, Cowrs Hilémentaire de Paléontologic, 1849; Duncan, British Fossil Corals, Supplement, in the Monographs of the Pale- ontographical Society (Tertiary and Secondary Corals), also Reports of the British Association, 1868, 1869, 1871 ; Dybowski, Monogra- hie der Zoantharia Sclerodermata Rugosa aus der Silurformation Fistlands, ¢e., 1873 ; Edwards and Haime, Histoire Naturelle des Coralliaires, 1857-60, also British Fossil Corals, Monographs of the Paleontographical Society; Geinitz, Grundriss der Versteine- rungskunde, 1846; Kunth, Beitrage zur Kenntniss Fossiler Korallen, 1870; Michelin, leonographie Zoophytologique, 1840-47 ; Miinster, Beitriige zur Petrefaktenkunde, 1840; Pictet, Traité de Paléontologie, 9d ed. 1853; Owen, Paleontology, 2d ed. 1861; Quenstedt, Hand- buch der Petrefaktenkunde; Reuss, Die Fossilen Polyparien des Wiener Tertitir-beeken's, 1847. In addition to the above, descriptions of various Rugose or other fossil corals are to be found in palzontolo- gical and geological treatises, such as—Billings, Palwozoie~~

~~Fossils of Canada, vol. 1., 1861-65; De Koninck, Animaux Fossiles du Terrain Carbonifere de Belgique, 1842-71 ; Hichwald, Lethewa Ros- sica, 1855; Goldfuss, Petrefakten Deutschlands, 1826-88; Hall, Paleontology of New York, 1847, Geology of Iowa, 1858, and various Reports on the State Cabinet ; Hisinger, Lethoa Succiea, 1837 ; Lons- dale in Siluria, and Appendix to Murch., Vern., and Keys., Russia in Europe; M'Coy, British Palewozoie Fossils, 1851, Contributions to British Paleontology, 1854 ; Synopsis of the Carboniferous Fossils of Ireland, 1844; Meek and Worthen, Geological Survey of Illinois, 1866-73 ; Pander, Beitrdge zwr G'eognosie des Russisehen Reiches, 1830; Philips, Geology of Yorkshire, vol. ii., 1886, and Palao- zoe Fossils of Cornwall, Devon, &c., 1841; Portlock, Report on the Geology of Londonderry, &c., 1848 ; Roemer, Die Silurisehe Fawna des Westlichen Tennessee, 1860 ; Salter, Catalogue of Cambrian and Silurian Fossils in the Geological Musewm of Cambridge University, 18783 ; Sowerby, Mineral Conchology, 1822, &c. In addition to the above there are various works and memoirs, wholly or in part oceupied with lists or descriptions of fossil corals, and not referred to in the foregoing, by Billings, Bronn, Castelnau, Dale-Owen, Dana, De Koninck, D'Orbigny, Dunean, Dybowski, Edwards (Milne), Hichwald, Fischer von Waldheim, Fougt, Fromentel, Haime, Nall, Howse, Keyserling, King, Kunth, Kutorga, Lamarck, Le- sueur, Lindstrém, Linné, Lonsdale, Ludwig, M'Coy, Morren, Morris, Nicholson, Phillips, Reuss, Romer, Rominger, Safford, Salter, Schlotheim, Schmidt, Schweigger, Steininger, Thomson (James), Tornquist, Verril, Wahlenberg, Whitfield, Wright (Dr Thomas), Zaphrinesque, & que, aC. (H. A. N.)~~

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~~IypustRian Uszs or Corars.—Beyond their general utility and value as sources of lime, none of the corals presents any special feature of industrial importance, ex- cepting the red or precious coral (Corallium rubrum) of the Mediterranean Sea. It, however, is and has been from remote times very highly prized for jewellery, personal ornamentation, and decorative purposes generally, About the beginning of the Christian éra a great trade was carried on in coral between the Mediterranean and India, where it was highly esteemed as asubstance endowed with mysteri- ous 'sacred properties, It is remarked by Pliny that,) of the Indian demand, the Gauls~~

Were in the habit of using it for the ornamentation of their oe of war and helmets ; but in his day, so great was astern demand, that it was very rarely seen even in : © regions which produced it. Among the Romans

tanches of coral were hung around children's necks to pre-

serve them from danger, and the substance had many medicinal virtues attributed to it. A belief in its potency. as a charm continued to be entertained throughout medi- eeval times ; and even to the present day in Italy it is worn as a preservative from the evil eye, and by females as a cure for sterility. "

The precious coral is found widespread on the borders and around the islands of the Mediterranean Sea. — The beds are generally from 2 to 10 miles from the land, and in water of about 30 up to 130 fathoms deep; but it finds its most favourable conditions in 80 fathoms water. The most important fisheries extend along the coasts of Tunis, Algeria, and Morocco ; but red coral is also obtained in the vicinity of Naples, near Leghorn and Genoa, and on the coasts of Sardinia, Corsica, Catalonia, and Provence. It is said that it attains greater perfection in the east than in the south, and that it is rarely found in a western and never in a- northern aspect. It is found attached to rocks embedded in a muddy sea bottom, in which it flourishes more than in a clear or sandy bed. In colour it varies through all shades of red, from a deep crimson to a delicate rose pink or flesh colour, fine tints of which are very rare and highly prized. Itisalso sometimes obtained of a milk white colour.

From the Middle Ages downwards the securing of the right to the coral fisheries on the African coasts was an object of considerable rivalry among the Mediterranean communities of Europe. Previous to the 16th century they were controlled by the Italian republics. For a short period the Tunisian fisheries were secured by Charles V. to Spain; but the monopoly soon fell into the hands of the French, who held the right till the Revolutionary Government in 1793 threw the trade open. For a short period (about 1806) the British Government controlled the fisheries, and now they are again in the hands of French authorities, Previous to the

~~French Revolution much of the coral trade centred in Marseilles ; but since that period, both the pro- curing of the raw material and the working of it up into the various forms in which it is used have become peculiarly Italian industries, centring largely in Naples, Rome, and Genoa. Although foreign crafts have to pay heavy dues for the right to fish on the Algerian coasts, the great majority of the vessels and crews belong to Torre del Greco. Two classes of boats engage in the pursuit,—a large size of from 12 to 14 tons, manned by ten or twelve hands, and a small size of 3 or 4 tons, with a crew of five or six. The large boats, dredging from March to October, collect from 650 to 850 Ib of coral, and the small, working throughout the year, collect from 390 to 500 Ib. The Algerian reefs are divided into ten portions, of which only one is fished annually,—ten years being considered sufficient for the proper growth of the coral. No reliable estimates of the amount and value of coral obtained annually exist ; but in 1873 the Algerian fisheries alone, employing 311 vessels, manned by 3150 sailors, yielded raw coral valued at £113,000,~~

~~The range of value of the various qualities of coral, according to colour and size, is exceedingly wide, and not- withstanding the steady Oriental demand its price is con- siderably affected by the fluctuations of fashion. While the price of the finest tints of rose pink may range from £80 to £120 per oz., ordinary red-coloured small pieces sell for about £2 per oz., and the small fragments called collette, used for children's necklaces, cost about 5s. per oz In China large spheres of good coloured coral command high prices, being in great requisition for the button of office worn by the mandarins. It also finds a ready market throughout India and in Central Asia ; and with the negroes of Central Africa and of America it is a favourite ornamental substance,~~

~~CORDAY D'ARMANS, Manrtz-AnnE-Caarzorte, born in 1768, at St Saturnin near Séez in Normandy, was descended from a noble family, and numbered among hor ancestors the dramatist Corneille. She was educated in 4 convent, and then sent to live with anaunt at Caen. Herg she saw hardly any one but her relative, and passed her lonely hours in reading the works of the philosophes especially Voltaire and the Abbé Raynal. Another~~

of her favourite authors was Plutarch, from whose pages sho doubtless imbibed the idea of classic heroism and ciyjc virtue which prompted the act that has made her name famous. On the outbreak of the Revolution she began to study current politics, chiefly through the medium of the papers issued by the party afterwards known as the Girondins. On the downfall of this party, on May 3] 1793, many of the leaders took refuge in Normandy, ail proposed to make Caen the headquarters of an army of volunteers, at the head of whom Wimpfenn, the com. mandant of Cherbourg, was to have marched upon Paris, Charlotte attended their meetings, and heard them speak; but we have no reason to believe that she saw any of them privately, till the day when she went to ask for introduc. tions to friznds of theirs in Paris. She saw that their efforts in Normandy were doomed to fail. She had heard of Marat as a tyrant and the chief agent in their overthrow, and she had conceived the idea of going alone to Paris and assassinating him,—doubtless thinking that this would break up the party of the Terrorists and be the signal of counter-revolution. Apparently she had thought of going to Paris in April, before the fall of the Girondins, for she had then procured a passport which she used in July. It contained the usual description of the bearer, and ran thus: " Laissez passer la citoyenne Marie, &c., Corday, agée de 24 ans, taille de 5 pieds 1 pouce, cheveux et sourcils chatains, yeux gris, front élevé, nez long, bouche moyenne, menton rond fourchu, visage ovale." Arrived in Paris she first attended to some business for a friend at Caen, and then she wrote to Marat :—" Citizen, I have just arrived from Caen. Your love for your native place doubtless makes you desirous of learning the events which have occurred in that part of the republic. I shall call at your residence in about an hour; have the goodness to receive me, and to give me a brief interview. I will put you in a condition to render great service to France." On calling she was refused admittance, and wrote again, promising to reveal important secrets, and appealing to Marat's sympathy on the ground that she herself was persecuted by the enemies of the republic. She was again

CORAM, Taomas (1668-1751), an English philanthro- pist, began life as a seaman, and rose to the position of merchant captain, He settled at Taunton, Massachu- setts, for several years engaging there in farming and boat-building, and in 1703 returned to England. His acquaint- ance with the destitute East End of London, and the miserable condition of the children

there, inspired him with the idea of providing a refuge for such of them as had no legal protector ; and after seventeen years of unwearied exertion, he obtained in 1739 a royal charter authorizing the establishment of his hospital for foundling infants. It was opened in Hatton Garden, on 17th October 1740, with twenty inmates. For fifteen years it was supported by voluntary contributions ; but in 1756 it was endowed with a Parliamentary grant of £10,000 for the support of all that might be sent to it. Children were brought, how- ever, in such numbers, and so few (not one-third, it 1s said) survived infancy, that the grant was stopped, and the charity, which had been removed to Guildford Street, was from that time only administered under careful restrictions. Coram's later years were spent in watching over the interests of the hospital; he was also one of the pro- moters of the settlement of Georgia and Nova Scotia; and his name is honourably connected with various other charities. In carrying out his philanthropic schemes he spent nearly all his private means, and an annuity of £170 was raised for him by public subscription.

CORAY, Apamantius (1748-1833), a Greek scholar, was the son of a merchant of Smyrna, His grandfather, Professor Rhysius, had left a library to whoever of his grandsons should distinguish himself most at school in the study of ancient Greek. Adamantius won the prize, and a strong interest in literature was thence awakened in him. For a time, however, he devoted himself to commerce, carrying on the management of his father's business affairs in Amsterdam. But in 1779 his father's warehouse in Smyrna was destroyed by fire; and Coray was left free to follow his tastes. T'wo or three years after he removed to Montpellier, where he remained for six years, studying medicine, and supporting himself by translating German and English medical works into French. In 1788 he settled in Paris, where he died forty-five years later, at the age of eighty-five.

Coray's chief works are his editions of Greek authors contained in his Bibliotheque hellénique and his wapepyd; and his editions of the Characters of Theophrastus, of the De Aére, Aquis, et Locis of Hippocrates, and of the Zthiopica of Heliodorus, elaborately

annotated. See Bids 'Adanavtiov Kopay (Paris, 1833) ; and 'Amdy- Oicua emororAay *Adazavtlov Koay (Athens, 1839).

CORBEIL, a town of France at the head of an arron- dissement in the department of Seine-et-Oise, is situated at the confluence of the Essonne with the Seine, about 18 miles 8.8.E. of Paris. A bridge across the larger river unites the main part of the town with a suburb on the other side, and a continuous line of houses leads to the village of Essonnes. The church of St Spire was rebuilt in the 15th century; St Jean-en-l'Isle belonged to the Templars, and dates from the 13th; and the corn-market was erected in 1780 by Viel. The industrial establishments in the town and neighbourhood include more than forty flour-mills, and several print-works, cotton-factories, and paper-mills.

From the 10th to the 12th century Corbeil was the chief town of a powerful countship ; and it continued for a long time to be an important military post in connection with the commissariat of Paris. Of the numerous sieges to which it has been exposed, the most important are those by the duke of Burgundy in 1418, by the Huguenots in 1562, and by Alexander Farnese in 1590. The

pouveges of Corbeil proper in 1872 was 6016, and that of Essonnes,

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third time (July 15) that Marat, hearing her voice in the ante- chamber, consented to see her. He lay in a bathing tub, wrapped in towels, for he was suffering from a horrible disease which had almost reduced him to a state of putre- faction. Our only source of information as to what followed is Charlotte's own confession. She spoke to Mamt of what was passing at Caen, and his only comment on her narrative was that all the men she had mentioned should be guillotined in a few days. As he spoke she drew from her bosom a dinner knife (which she had bought the day before for two francs) and plunged it into his left side. It pierced the lung and the aorta. He cried out, "A mor, ma chére amie!" and expired. Two women rushed in, and pre- vented Charlotte from escaping. A crowd collected round the house, and it was with difficulty that she was escorted to the prison of the Abbaye. On being brought before the Revolutionary Tribunal she gloried in her act, and when the indictment against her was read, and the president asked her what she had to say in reply, her answer was, " Nothing, except

~~that I have succeeded." Her advocate, Chaveau Lagarde, put forward the plea of insanity, but of~~

~~refused an audience, and it was only when she called a~~

~~-'Tailway system of Spain.~~

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~~course he could not sustain it. She was sentenced to death, and calmly thanked her counsel for his efforts on her behalf, adding, however, that the only defence worthy of her was an avowal of the act. She was then conducted to the Conciergerie, where at her own desire her portrait (now in the museum of Versailles) was painted by the artist Hauer. She preserved her perfect calmness to the last. There was a momentary shudder when she saw the guillotine, but she recovered immediately, and placed herself in position under the fatal blade without assistance fromany one. The knife fell, and one of the executioners held up her head by the hair, and bad the brutality to strike it with his fist. Many believed they saw the dead face blush,—probably an effect of the red stormy sunset. It was the 17th of July 1793, It is difficult to analyze the character of Charlotte Corday, we know so little of her; but there was in it much that was noble and exalted. Her mind had been formed by her studies on a pagan type. To Barbaroux and the Girondins of Caen she wrote from her prison, anticipating happiness "with Brutus in the Elysian Fields" after her death, and with this letter she sent a simple loving farewell to her father, revealing a tender side to her cha- racter that otherwise we would hardly have looked for in such a woman,~~

~~Every writer on the Revolution has dwelt at more or less length on Charlotte Corday. Many of the current versions of her life are very incorrect and even absurd. Of biographies we ma mention that of Couet de Gironville, published in 1796, that of Alphonse Esquiros which attempts a defence of Marat, and Adolphe Huard's Mémoires sur Charlotte Corday, 1866. Her letters and her address to the French people were printed at Caen in 1863 under the title of Gwures politiques de Charlotte Corday. Wamartine in his Histoire des Girondins has an eloquent eulogy, which~~

ends by—her "'Pange de Passassination." She has even less appro-pmiately been called the " Jeanne d' Are de la Révolution."

CORDELIERS, the name given to the Franciscans in France, from the cords which they wore round their waists ; and also the name of a notorious club of the time of the French Revolution, so called because it met in a Franciscan chapel, Early in 1790 this club was thoroughly organized under the presidency of Danton. Among its other mem- bers were Marat and Camille Desmoulins, and the latter edited a paper expressing its views, under the name of Le Vieux Cordelier,

CORDERIUS, the Latinized form of name used by Matuurin Corprer (1478-1564), the author of the well- known Colloquia, a native in N ormandy. He possessed special tact and liking for teaching children, and taught first at Paris, where Calvin was among his scholars, and, after @ number of changes, finally at Geneva. He wrote several books for children; the most famous is his Collo- quia, which has passed through innumerable editions, being used in schools for three centuries after his time.

He also Wrote—Principia Latine Loquendi Seribendique, selecta ex Epistolis Ciceronis ; De Corrupti Sermonis apud Gallos Emenda- pes Latini Loquendi fatione; De Quantitate Syllabarum ;

onciones Sacre Gallice ; Remontrances ct exhortations au rot et we grands de son royawme (Geneva, 1561).

CORDOVA (Latin, Corduba ; French, Cordoue), a city of Spain, capital of a province of its own name in Andalusia, 1s situated on the southern declivity of the Sierra Morena and the right bank of the Guadalquivir, 75 miles north-east of Seville, and not far from one of the junctions on the ; Its walls, erected on Roman ns,and principally Moorish in their superstructure, ~ 4 very large area; but much of the space is jane by garden-ground cleared from the ruins of ancient Took streets are for the most part so narrow and ot chel — 1 would be much more descriptive to speak Plaza M anes ; and, with the exception of those in the

ayor, the houses are greatly dilapidated, As every

building, however, is profusely covered with whitewash,

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there is little difference on the surrace oetween tne oldest and the most modern specimens. The southern suburb communicates witli the town by means of a bridge of six- teen arches across the river, exhibiting the usual combination of Roman and Moorish masonry, and dominated at the ono end by an elevated statue of the patron saint, St Raphael,

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Plan of Cordova.

1. Pases de la Victoria. 9. Triunfo and St 16. Plaza de la Corredera, 2. P. de S. Martin. Raphael. 17. Jardin de 8, Pablo.

3. 8. Nicolas de Villa. 10. Aleazar Nuevo. 18. 8. Andres,

4. S. Juan. 11. Alcazar Viejo. 19. 8. Lorenzo.

5. Compania, 12. Campo Santo. 20. S. Pablo.

6. 8. Hipolito, 13. S. Pedro. 21. Sta. Marina.

7. Cathedral. 14. Campo S. Anton. 22. Mahnuerta Tower

8. Bishop's Patace. 15. Sta, Maria Magdalena. "

whose effigy is to be seen in various other quarters of the city. The most important of the public buildings are thie cathedral, the old monastic establishments, the churches, the bishop's palace, the lyceum, the city hall, the hospitals, and the colleges. The old royal palace (Alcazar) is in ruins,—only one wing being sufficiently entire to serve the purpose of a prison. 'The cathedral, which throws all the other churches into insignificance, was

originally built as a mosque by Abderrahman I. on the site, it is believed, of a Roman temple. The exterior, with the straight lines of its square buttress towers, has a heavy and somewhat ungainly appearance; but the interior is one of the most beautiful specimens of Moorish archi- tecture in Europe. Passing through a grand courtyard about 500 feet in length, shady with palm, and cypress, aud orange-trees, and fresh with the full flow of fountains, the visitor enters a magnificent and bewildering labyrinth of pillars. Porphyry and jasper and marbles of many a tint are boldly combined in a matchless mosaic. Part have come from the spoils of Nimes or Narbonne, part from Seville or Tarragona, some from the older ruins of Carthage, and others as a present to Abderrahman from Leo of Byzantium, Of different heights, they have been adjusted to their present standard of 12 feet by being either sunk into the soil or lengthened by the addition of Corinthian capitals. Twelve hundred was the number of the columns in the original building ; but many have been destroyed, and, according to some accounts, less than 700 remain. They divide the area of the building, which measures 395 feet from east to west by 356 feet from north to south, longitudinally into nineteen and trans- versely into twenty-nine aisles—each row supporting a tier of open Moorish arches, which in its turn gives the basis for a second tier with its pillars resting on the keystones of the tier beneath. The full height of the ceiling is thus about 35 feet. The Moorish character of the building was unfortunately impaired in the 16th century by the forma- tion in the interior of a crucero or high altar and choir, in the Roman style, by the addition of numerous chapels along

supported by the Government; a national observator instituted in 1871; and an academy of sciences, The cabildo or Government-house (adorned with a pillered portico), an orphan asylum, two hospitals, and several con. vents complete the list of the public edifices. The popula. tion in 1869 numbered about 28,500, consisting of half. breeds of various degrees, with a considerable predomip. ance of the Spanish type.- Since the opening of the railway to Rosario in 1870, the trade of the city, always of some importance, has begun todevelop. The exports "a mainly hides and wool, and the imports miscellaneous manufactures. Cordova was founded by Cabrera in 1573 and made the capital of the province of Tucuman by Philip

V.; its main importance arose from its being the centre of the Jesuit missions of South America and the principal seat of learning on the continent. The revolutionary wars for a time destroyed its prosperity; but latterly it has much recovered. In 1871 it was the seat of a national exhibition. . :

CORDOVA, a town of Mexico, with about 6500 in. habitants, in the province of Vera Cruz, and 57 miles inland from the city of that name. It is situated in a very fertile district near the volcano of Orizava, and trades in tobacco, coffee, sugar, and cotton. Its streets are well paved and regularly laid out ; the most of its houses are built of stone, and the cathedral, which occupies one side of a large central square, is a fine edifice, with a highly ornamented interior. The neighbourhood abounds in antiquarian remains, and at Amatlan de los Reyes especially there are traces of a temple and a cave, with fragments of carving and pottery.

COREA, a kingdom of Eastern Asia, the greater part of which occupies a peninsula stretching south from the north.

the sides of the vast quadrangle, and by the erection of a modern tower in room of the old muezzin. The crucero n itself is no disgrace to the architect Hernan Ruiz, but every lover of art must sympathize with the rebuke administered by Charles V, to the cathedral authorities : ‘“‘ You have built here what could have been built as well anywhere else ; and you have destroyed what was unique ‘in the world.” Magnificent, indeed, as the cathedral still is, 1t 1s almost impossible to realize what the mosque must have been when the worshippers thronged through its nineteen gateways of bronze, and its 4700 lamps, fed with perfumed oil, shed at once light and fragrance through its brilliant aisles. Of the exquisite elaboration bestowed on the more sacred portions abundant proof is afforded by the small heptagonal chapel of the Mihrab, roofed with a single shell- like block of snow-white marble, and inlaid with Byzantine mosaics of glass and gold. ;

- Cordova was celebrated in the time of the Moors for its silversmiths, who are said to have come originally from Damascus; and it exported a peculiar kind of leather which took its name from the city, whence we have still the word “cordwainer.” These industries, however, dis- appeared with the race that introduced them. In modern times, especially since the opening of the railway to Cadiz and Seville, its industry has developed in various

directions, and flax, linen, silk, and woollens are now manufactured. Population, 42,000.

Corduba, probably of Carthaginian origin, was occupied by Marcus Marcellus in 152 3.¢., and shortly afterwards became the first Roman colony in Spain. From the large number of men of noble rank among the colonists, the city obtained the title of Putricia ; and to this day the Cordovese pride themselves on the purity and antiquity of their descent. The city was the usual residence of the proctor of the province of Betica, and the seat of one of the four provincial assizes. In the wars between Cesar and the sons of Pompey, Corduba espoused the cause of the latter. After the battle of Munda, it fell into the hands of Casar, who avenged the obstinacy of its resistance by putting 20,000 of the inhabitants to the sword ; but in the time of Strabo it still ranked as the largest city of Spain. Under the Goths Corduba maintained its importance ; and in the person of Hosius, its bishop, it furnished a president for the Council of Nice. Under the Moors it was at first an apanage of ths caliphate of Damascus, but it soon became the capital of the Moorish dominions in Spain. At the death of Abderrahman, it is said, perhaps with Arabic exaggeration, to have contained within its walls 200,000 houses, 600 mosques, 900 baths, and numerous public libraries ; whilst on the bank of the Guadalquiver, under the power of that monarch, there were eight cities, 800 towns, and 12,000 populous villages. In the beginning of the 13th century the Moorish empire became dismembered, and fell an easy prey to St Ferdinand of Castile in 1236. Since that period Cordova has gradually declined ; and in modern times it has never recovered the assault of the French under Dupont in 1808, who stormed and afterwards pillaged the town. In the Roman period Cordova was the birthplace of Lean and the two Senecas ; and in modern times it numbers among its celebrities Avicenna, Averroes, Juan de Mena, Ambrosio Morales, Cespedes the painter, and Luis de Gongora. It also gives its name to the famous captain Gonzalo de Cordova.

CORDOVA, or Corposa, the chief town of a province of the same name in the Argentine Republic, 246 miles by rail from Rosario, in 31° 24’S. lat. and 64° 9’ W. long. It lies in the very heart of the country, and occupies the bottom of aconsiderable depression to the south cf the River Primero. The streets, which cut each other at right angles, are for the most part unpaved,

but are furnished with side paths of brick ; and the houses are almost all of one story. The cathedral of St Peter, built by the Italian Jesiit Primoli, ranks among the finest churches in South America, though the interior hardly corresponds to the promise of the outside ; and the church of the convent of Santa Catalina is also worthy of notice. The educational institutions are of great and increasing importance, in- cluding a university established in the Colegio San Carlos, or old Jesuit monastery, which was built by the same architect as the cathedral; an ecclesiastical seminary,

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Sketch Map of Corea.

ern portion of the Chinese empire. It is bounded on he by the elevated plains of Manchuria, E. by the Sea of Japa,

8, by the strait to which it gives its hame, aud W. by the Yellow Sea, and extends from about 34° to 42° 2 dD' N. lat., and from 124° 35' to 130° 50° E. long. The natives assert that it has a length of 3000 lys, or about 1000 English miles, and a breadth of 1300 lys, or about 460 miles ; but this is undoubtedly an exaggeration, and the total area is probably a little more than 79,400 square miles, or about ©1 times the size of Scotland.

"The eastern coast trends south-west from the confines of Russian Manchuria to the neighbourhood of the 39th parallel of latitude, and then, changing its direction to the south-east, it forms an extensive gulf, named Broughton Bay in honour of a navigator of the 18th century, With this

exception it presents no remarkable irregularity of line; put even such superficial surveys as have already been effected show that it affords a considerable number of bays and harkours. Of these the most important are Lazaref, Pingai, and Chosan. 'The first, called Virginia Bay on the French maps, is situated in 39° 25' N. lat., has an area of about 36 square miles, is well protected, and furnishes excellent anchoring ground. 'The second iu 36° 36' is com-

aratively small, but completely sheltered by a conical island, The third in 35° 2' is large enough to shelter merchant vessels of all sizes and even ships of war below the rank of frigates. Throughcut its whole extent this eastern shore presents mainly a succession of steep but not very lofty cliffs, sinking at intervals into irregular dunes, or into stretches of almost level sand. The southand west coasts, on the other hand, are much more varied with inlet and promontory, estuary and peninsula ; and the neigh- bouring sea is occupied by a multitude of islandsand rocks, Of these islands the largest is Quelpart, with a length of 46 iniles and a breadth of about 20; but of greater importance to the navigator is the Port Hamilton group, on account of the excellent harbour to which it partly owes its name.

Mountains.—Corea is eminently a mountainous country, and the general appearance of the surface is compared by a French missionary to that of the sea under a strong gale, The principal range winds through the peninsula from north to south. From the northern frontier, till it reaches 37° of north latitude, it keeps pretty close to the eastern coast; but from that point it trends westward, and runs obliquely across the southern extremity of the country, leaving the contour of the coast to be defined by a subordinate range, Of individual summits the highest known to Europeans are Hien-fung and Tao-kwang in the Pepi Shan Mountains, to the north of Broughton Bay ; and these attain no greater elevation than 8114 and 6310 feet respectively, Another of special mark, called Sedlovaya, or the Saddle, by the Russian navigators, is situated in 38°

| 10° 30°N. lat. The country to the west of the main ridge | 18 occupied by irregular spurs; and throughout its whole

extent there is no district that can properly be described as a plain.

—Rivers—Corea is well furnished with rivers and streams, In the north the boundary line is mainly marked by two of considerable size, the Ya-lu-kiang and the Mi-kiang. The former, known to the Chinese as the Aye-kiang, and to the Coreans as Am-no-kang, or the river of the Green Duck, receives numerous affluents in the early part of its

course, flows first north-west and then south-west, and falls

Into the Yellow Sea by three distinct mouths. Its most Important tributary, the Tong-kia-ula, comes from the Shan-alin Mountains in Manchuria, and forms its junction about 40° 50' N. lat. The Mi-kiang, called by the Coreans ying, has a very much shorter course than the — but owing to the number of its tributaries, 1 attains no mean proportions before it reaches the eastern

(Fea In 42" 19' 5" N. Jat. and 130° 38' 51" E. long. At its thouth it is about half a mile wide. and at Hung-chung 300

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yards, with a depth of about 20 feet in the middle. Its current is about 14 knots au hour. Of the numerous streams that find their way to the Sea of J apan none require special mention till we come to the Nak-tong-kang, which rises in the eastern slopes of the main chain, and after flowing almost directly south, reaches the Strait of Corea in 34° 50'N. lat. Among those of the western coast three at least are of considerable magnitude—the Keum-kang, the Hang-kang, on which Seoul, the capital of the kingdom, is situated, and the Tai-tang-kang, which flows past the city of Pieug-lang.

Climate and Agriculture—The temperature of Corea, though much more equable than that of the neighbouring continent, is higher in winter and lower in summer than under the same latitudes in Europe. Such advantages as it actually has over the climate of Northern China are mainly due to the effects of the south-west monsoon, Jn the north the rivers remain frozen for several months in the year, and even in the furthest south the snow lies for a considerable period. In latitude 35° the lowest reading of the thermometer

observed by the French missionaries was 5° Fahr.; in 37° or 38° they often found it 13° below zero. The principal articles of cultivation are rice, wheat, millet, rye, tobacco, cotton, hemp, and genseng; and of these several afford a good return. The potato, which was re- cently introduced, is under a Government interdict, and is only to be found in outlying districts; though its general use might do much to prevent the reeurrence of the famines with which the country is ever and anon visited. Almost all the fruits of central Europe are to be obtained ; but their quality is greatly deteriorated by the humidity of the climate. Water-melons and the fruit of the Diospyros Lotus (called kam by the natives) are mentioned as the best.

Afinerals.—Corea has the reputation of being richly furnished with mineral resources ; gold, silver, copper, iron, and coal are all saidto be common. Gold-mining, however, is strictly prohibited ; the permission at one time granted to work the silver ore at Sioun-heng-fu was shortly after- wards withdrawn ; the copper mines arc neglected, and Japanese copper imported; and the general use of coal is confined to certain districts.

Animals.—Of the wild animals the most remarkable are a small species of tiger, the bear, and the wild boar ; and of the domestic kinds the principal are cattle, horses of diminutive proportions but considerable strength, swine, and dogs. The last are a favourite article of food. The king alone has the right of rearing sheep and goats, which are kept for the purpose of being sacrificed in religious ceremonials,

Political Divisions and Towns,—The kingdom of Corea is divided into eight provinces, of which three, Ham- kieng, Kang-wen, and Kieng-sang lie along the eastern side of the peninsula, while the others, Pieng-an, Hoang-hai, Kieng-kei, Tsiong-tsieng, and Tsien-la face the Yellow Sea. Ham-kieng and Pieng-an are the two that border on Manchuria. The former contains fourteen walled towns, among which may be mentioned Ham-heng, the provincial capital, Kieng-wen, and Mou-san ; and the latter, with its centre at Pieng-iang, possesses an equal number. The chief town of Kang-wen is Wen-tsiou, situated in the heart of the country to the east of the River Hang-kang; that of Kieng-sang is Tai-kou, near a tributary of the Nak-tong- kang ; of Hoang-hai, Hai-tsiou on the western coast. Han- iang, Seoul, or Seyool, the chief town of Kieng-kei, is also the capital of the kingdom and the

permanent residence of the court ; it is situated on the Hang-kang, and surrounded with high and thick walls, 9975 paces in circuit. The chief towns of the two remaining provinces are respectively Kong-tsiou near the River Keum-kang, and Tien-tsiou, at

the foot of the range of mountains that traverses the province.

The king of Corea, though a vassal of the Chinese empire, is within his own country an absolute monarch, with power of life and death over the noblest in the land. He is the object of almost divine honours ; it is sacrilege t) utter the name which he receives from his suzerain, and that by which he is known in history is only bestowed upon him after his death by his successor. 'To touch his person with a weapon of iron is high treason ; and so rigidly 1s this rule enforced that 'Ticng-tsong-tai-oang suffered an abscess to put an end to his life in 1800, rather than sub- rait to the contact of the lancet. Every horseman must dismount as he passes the palace, and whoever enters the presence-chamber must fall prostrate before the throne. Should the ignoble body of a subject be touched by the royal hands, the honour thus conferred must be ever after commemorated by a badge. In consequence of such punctilious etiquette, personal access to tlie king is exceed- ingly difficult; but, as according to theory, his car ought always to be open to the complaints of his people, an appeal to his authority is nominally permitted. He is ex- pected to provide for the poor of his realm, and there are always a large number of pensioners on the royal bounty. The princes of the blood are most jealously excluded from power, and their interference in the slightest degree in a matter of politics is regarded as treason. The nobles, how- ever, have within the present century extended their influence, and infringed on the royal prerogatives. The palaces are poor buildings, but an extensive harem and a large body of eunuchs are maintained.

The government is practically in the hands o the three principal ministers of the king, who are called respectively seug-ei-tsieng or adinirable councillor, tsoa-et-tsteng or councillor of the left, and ow-ei-tsieng or councillor of the right. They are nominally assisted by six pan-tso or judges, each of whom has his own tsam-pan or substitute and tsam- oj or adviser. The ni-tso, the first of these judges' depart- ments, has charge of the public offices and

employments ; the ho-tso takes the census, apportions the taxes, and looks after the mints; the zci-tso supervises religious and official ceremonial ; the peng-tso is the department of war ; the hieng-tso administers the criminal courts ; and the kong- tso has the oversight of public works, commerce, ae. In the palace there are three sug-tsz, or functionaries charged to put on record day by day all the royal words and actions. The eight provinces of the kingdom are each administered by a governor, dependent on the ministerial council ; and each of the 332 districts into which the provinces are sub-divided is under a separate mandarin. Military commanders have the chief authority in the four fortified towns of Kang-hoa, Sou-wen, Koang-tsiou, and Siong-to or Kai-seng. Theoretically every one of these posts is open to any Corean who has acquired the necessary degree in the public examinations ; but actually they are almost all appropriated by the nobles. A postal system is maintained along the principal highways,—the horses being kept by the Government, and the grooms and riders holding almost the position of royal serfs. The army nominally includes every individual capable of bearing arms, who does not belong to the nobility ; but only a small proportion of the men are brought under discipline. The military mandarins, though chosen from the nobles, are in far less estimation than the civil functionaries of corresponding rank. The salaries of the governors and other high officials are large, but as the term is only two years, and the custom of the country is for a person in office to support all his rela- tives, it is seldom that the position proves genuinely lucrative. In addition to the various regular officials already mentioned there are a number of e¢-sa, or anaik-sa, who

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are despatched by the king, armed with absolute power, to visit the provinces at irregular intervals and secretly obsereg the condition of affairs. Corruption, however, universal) and openly prevails, and the supervision even of per irresponsible emissaries affords little protection against in. justice. The mandarin is for ordinary civil cases the absolute judge within his district ; but if the matter is very important it may be referred to the provincial governor, or even ultimately to the king himself. Criminal cases ie decided by the military mandarin, and the final appeal is to the great court of the capital, which consists of two parts—the po-tseng

which collects the evidence, and the ieng-tso which passes the sentence. Public functionaries and culprits accused of treason or rebellion are tried by a special court called the kewm-pou, the meinbers of which are named directly by the king. In a case of high treason the whole family of the guilty person is involved in his fate. A large portion of the real administrative power lies in the hands of the subaltern officials of the civil and military mandarins, who are distinguished by M. Dallet as "pretorians" and "satellites." The former compose a formidable hereditary class, which rarely intermarries with the rest of the community; the latter are recruited from the lower ranks of society. Torture is freely employed in judicial proceedings; and the unhappy victim may either have the bones of his legs dislocated or bent, his calves reduced to rags by blows from a heavy plank, the flesh of his thighs cut through by the continuous friction of a rough cord, or his whole body agonized by a prolonged suspension by the arms. Decapitation is the usual form of execution both in civil and military cases.

The language of Corea belongs to the Turanian family, and agrees with the other Turanian tongues in all the main grammatical features. It is written alphabetically, by means of fourteen consonants corresponding to the Euro pean k, U, 2, r, t, m (or 0), p (or 6), s, ng or nasal n, és, tsh, kh, th, ph (2.¢., p aspirated, not f) and h, and eleven vowels, which go to the composition of thirteen diphthongs. The letters appear cither in an ordinary or a cursive form, Every line is written from the top to the bottom of the page, syllable by syllable. The vocabulary is greatly mingled with Chinese words; but these undergo the regular Corean declension, The noun has nine cases, including the nominative. Adjectives proper there are none, the nouns and verbs supplying their place, For the names of the numerals above 90, such as 100, 1000, é&c., recourse is had to the Chinese. The verb possesses, besides the simple affirmative, a conditional, an interr0- gative, an honorific, a causative, and several other forms; but it has no distinctive inflections for number o person, The honorific form is employed in speaking of dignitaries ; and indeed the verb must slightly vary accord: ing to the status of the person addressed.

The study of their native language is greatly neglected by the Coreans, and the educated classes regularly employ Chinese both in literature and social intercourse. 'the annals of the kingdom, the laws, scientific treatises, public

inscriptions, and even shop-signs are all written in the foreign language ; at the same time the Corean pronunciation 18 peculiar as tobe unintelligiblein the ears of the inhabitants of the empire. Thatat one time there was an extensive native literature there seems no doubt; but it is now represe only by a few poetic collections, popular romances, a! nursery tales,—to which, indeed, must be added a number of works composed by the missionaries, who have encoura the preservation and cultivation of the national language. There is an official translation of the sacred books of Con-fucianism, in which it is criminal to change 4 single wor? without the order of the Government; and a sibylline book, prohibited by the authorities, circulates secretly among ‘°

by gilt copper hinges ;

- Inerusted on the marble.

ignitaries of the state, the examiners, &c.

wise subjected to whimsical insults, at once without the previous possession of the others,

capital and the palace. and is sought only by the poorer nobles.

or of doctoral theses is far from uncommon.

-oreters, who are trained either in Chinese, Manchu

uk), or Mongolian ;

voyal service and another for the public ; or school of recorders, wchives and the drawing up of official reports for Pekin ; he to-hoa-si, intrusted with the preparation of maps, and he execution of the portrait of the king, which after his leath is added to the royal gallery; the nioul-hak, or chool of law, which deals mainly with the penal code ; he iei-sa, from which clerks are obtained for the financial nd public works department ; and the hem-nou-koan, which 3 intrusted with the management of the Government

ydraulic clock. Leligion.—Buddhism, according to native tradition, was atroduced into Corea in the 4th century of our era, and oder the dynasty of Korio it became the official religion. Mn the establishment, however, of the Tsi-tsien in the 14th *ntury it gave place to the doctrine of Confucius, which ontinues to the present day as the established creed. In 8 main features the Confncianism of Corea is identical ith the Chinese system; but it is accompanied and 'termingled with various popular superstitions. Worship — Offered not only to the Sia-tsik, or patron of the king- 2m; but also to the Siang-tiei, whom some regard as a 'preme divinity, and others identify with the sky. To 2 latter public Sacrifices, consisting of pigs, sheep, and pats, are offered for the purpose of preventing or obtaining 1, Temoving epidemic diseases, or otherwise interfering th t ° Course of natural events. The Sia-tsik is hardly + in the provinces ; but in the capital his temple is

the sa-tsa-koan,

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people. On the capture of Kang-hoa in 1866, Admiral Roze found a library of 3000 or 4000 books finely covered with green and crimson silk, and arranged and preserved with sreat care. One volume particularly attracted M. Ridel's | attention ; it consisted of a number of marble tablets, united each tablet was protected by a cushion of scarlet silk, and the letters were in gold

Education.—aAs in China, so in Corea, lcarning is ; ostensibly in high estimation, and all public officials must pass certain examinations. The student is left perfectly "free to follow any system and reccive instruction from any teacher whatever,—the examiners, who are appointed by the Government, taking account of nothing but results, The most important examinations are held once a year in the capital, and candidates flock thither from all the provinces, After the examination is over, those who have passed put on the robes of their new title, and proceed & horseback with sound of music to visit the chicf dig Then follows a "burlesque initiation which, though not enforced by law, is rendered imperative by custom. The novice has his face stained with ink and besprinkled with flour, and is other- There are three separate degrees, that of the tcho-s:, that of the tsiv-sa, and that of the heup-tchver,—the last or highest being obtainable Tho tsin-sa

are destined to fill administrative posts in the province, the kewp-tchier the higher positions about the The military degree, which is also known as the hewp-tchiet, involves but little literary culture, The whole system i3 in a state of great decay, and the purchasing of degrees Besides the possessors of the above-mentioned degrees there is a special class of scholars, known as the middle class, who devote themselves from father to son to the study of various special branches necessary in public employ :—the inter- (Hon- the koang-sang-kam, or school of sciences, devoted to astronomy, geoscopy, and auspication ; fe e-sa, or school of medicine, including a branch for the

employed in the preservation of the

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the most sacred of all. Among the educated classes the only form of religion in real force is the worship of their ancestors, and consequently the greatest importance is attached to all the ceremonial details of funerals, mourn- ing, and tombs. In every district there is a temple of Confucius called siang-kio, with an extensive domain attached ; and if the revenue is not sufficient to maintain the necessary expenses, the treasury of the district must supply the deficit. There still exist several of the large pagodas erected during the period of the official status of Buddhism ; they are built in the Chinese style, and are frequently remarkable for the beauty of their situation. Except in the province of Kieng-sang the Buddhist monks, or bonzes, retain no influence ; they have but little learning, and their numbers are diminishing. Tho belief in evil spirits is common among the Coreans ; their action is frequently controlled by the propitious or unpropitious character of times and seasons, and almost every event is the sign of fortune or mishap. The serpent is the object of superstitious respect ; and, instead of killing it, the Corean feeds it as regularly as his domestic animals. Of first importance for the happiness of a family is the preservation of the ancestral fire, and every housewife has all the anxiety and responsibility of a Vestal Virgin, The number of astrologers and fortune- tellers throughout the country is extraordinary, The blind are reputed to be endowed with special prophetic aptitude, and, as a natural consequence, a large proportion of those who are deprived of sight make gain of their afflic- tion. In the capital these blind seers are formed into a regular corporation legally recognized, and

their services are in great request for the discovery of secrets, the fore-telling of the future, and the exorcizing of devils. In this latter operation they trust principally to noise as a means of frightening the spirits, whom they ultimately catch in a bottle and carry off in triumph.

Manners and Customs.—Women hold a very low posi- tion in Corean estimation, and count for little in the sight of the law. Not only are they destitute of all political and social influence, but they are not held personally responsible for their actions, and live in a state of lifelong pupilage. At the same time they enjoy a con- siderable amount of freedom, and it is only among the upper classes that they are kept in seclusion. Marriage is altogether an affair of etiquette ; the terms are settled by the heads of the families, and the bride and bridegroom have no opportunity of seeing each other till they meet on the marriage platform, and bow to each other as man and wife. After marriage there is little social intercourse between the pair, both men and women keeping company with their own sex. Among the lower classes second marriages are equally permissible to both sexes ; but among the nobles the second marriage of a widow is considered so reprehensible that the offspring of such a union is branded as illegitimate. Polygamy is not permitted, but concubin- age is a recognized institution. Strong affection for their children is one of the better characteristics of the Coreans, and infanticide and exposure are almost unknown. Adop- tion is a common expedient to prevent the extinction of a family, and the choice of the child is regulated by a rigid etiquette. Filial picty is in the highest estimation, and the conduct of a son towards his father is guided by innumer- able rules. If he mcets him on the way, he must do him humblest obeisanco ; if he writes to him, he must employ the most respectful forms in tho language ; if the father is sick, the son must attend him ; if the father is in prison, the son must be at hand without ; if the father is exiled, the son must accompany him on his journey. On the death of his father the eldest son becomes the head of the

family, responsible for all the duties of a father towards

destroyed, in spite of the fact that two Chinese kings appeared to assist the Coreans with a force of 100,000 horsemen. The death of Taiko-sama in 1598 led the Japanese to abandon their conquest ; and in 1615 peace was definitively signed, but only on conditions of great hardship for the Coreans. A tribute was exacted and the fort of Fusan-kai was retained; and the Corean king till 1790 had to send an embassy to Japan to announce his accession. When the Manchu dynasty ascended the throne of China, the Coreans defended the Mings ; but being defeated by the new power, they had in 1637 formally to recognize the Manchu sovereignty, and to pay heneefoy. ward a heavy annual tribute. Since 1636 there has been no war with China or with Japan ; and the Coreans have maintained in regard to every other nation the most absolute isolation. The ambassadors ser: annually to Peking have been the means of conveying some little knowledge of Western nations to their countrymen ; but the result has rather been to make them more exclusive. It is recorded ina Corean work that Tsiang-tou-wen-i saw a European named Jean Niouk in the Chinese capital, and obtained from him books, pistols telescopes, and other curiosities ; and Ricci's 7en-tsou-sir-ei, or True principles about God, are mentioned by Ni-siou-sipong, a Corean author. In 1784 Ni-tek-tso having had his attention aroused by some Chinese work on the Christian religion thus introduced requested his friend Seng-houng-i, soon after sent with the embassy, to make inquiry about the subject. The result was the formation of a Christian sect, which speedily attracted the attention of the Roman Catholic mission, whose agents succeeded, in spite of the jealous watch of the Corean authorities, in making their way into the country. Perseeution soon broke out, and has continued at inter- vals ever since. In 1831 a vicar apostolic was appointed by the Pope, and repeated efforts were made to effect a firm footing; but in 1866 the last Europeans were expelled. To avenge the murder of the French missionaries, Admiral Roze undertook an expedition in the end of that year. He destroyed the city of Kang-hoa, with its important military establishments, but obtained no concessions from the Government. Several American vessels having been burned by the Coreans, the United States in 1867 despatched Commander Schufeldt to remonstrate with the native authorities, but he returned as he went. Nothing further was done till 1870, when a force under Admiral Rodgers proceeded 7 the river towards the capital, with the intention of communicating irectly with the Government, It was met by a determined resistance on the part of the

Coreans, and though the American vessels were secure against the native artillery, and American guns soon silenced the forts, the admiral was constrained by political difficulties to bring his expedition to a close. In 1875 a convention was arranged by the Coreans with Moriyama, the Japanese ambassador ; but its terms were Soon infringed and an attack was made on the gun-boat ‘ Unyokan.” The Japanese Government accordingly despatched Karoda as high commissioner, who succeeded in concluding a treaty with important concessions to Japan. The Japanese are how entitled to send a permanent resident to the capital ; three ports are opened to Japanese trade 5 Corean ports may be entered by Japancse vessels in distress; and Japaneso mariners are free to survey the Corcan coast. ‘ Literature.—The European literature about Corea is comparatively scanty ; of all the works that have yet been published, that which gives the completest account is M. Dallet’s LD Eglise de la Corée (1874), based mainly on the reports of the members of the Roman Catholic mission. The earliest source of information is the narrative of H. Hamel, a Dutchman, who was shipwrecked on the coast of the Island of Quelpart in 1654, and spent thirteen years mn captivity ; itis contained in the collections of Astley, Pinkerton, &c. Brief notices will be found in B. Hall’s Accownt of a Voyage to the West Coast of Corea, 1818 ; Macleod, Voyage of H. M. 8. Aleeste, 1819; A. Young, Remarks on Corea, 1865; A. Williamson, Journeys to North China, 1870; and Fortnightly Review, 1875. Professor Pfizmaier of Vienna, the Japanese scholar, has published a German -translation of the Japanese account of the campaign of 1597, in the Denkschriften d. k. ‘Akad. d. Wissenschaften, 1876, and promises Darlegungen aus der Geschichte und Geographie Corea s. A French translation of the journal of Kwei-lin, Chinese ambassador to Cores in 1866, appears in the Revue de Géog., 1877. For the language se? A Translation of a Comparative Vocabulary of Chinese, Corean, en Japanese, by W. H. Medhurst, Batavia, 1835. A grammiat – vocabulary by W. F. Meyers, secretary of the English Legation 4 Pekin, and a dictionary compiled by the French missionanes 7 be published. (8, A.W.

CORELLI, ArcancELo (1653-17 13),a celebrated violin player and composer for that instrument, was , Fusignano near Imola. Of his life little 1s known. master on the violin was Bassani. Matteo Simonelli, ¢ well-known singer of the Pope’s chapel, taught him we position. His talent as a

~~*player on the violin seems ©: have been acknowledged at an early period, but his " decided success he gained in Paris at the ago of ninetec*~~

~~*his brothers and sisters, who receive no share in the patri- mony, but merely dowries and donations en marriage, &c. Between the various members of a family, even after they have separated from the domestic hearth, there remains the greatest intimacy and affection; and the slightest con- nection of blood is recognized as a bond of attachment.*~~

~~*Industry and Trade.—The industrial arts are but slightly developed, the peasant himself in most cases supplying by his own labour the greater part of his needs. The one manufacture in which the Corean ranks really high is that of paper, a material employed as in Japan in a great variety of ways. Trade is mainly carried on by means of markets or fairs, but transactions arc hampered by the deficiency of the currency. Only one kind of coi, a small piece of copper known as a "saneke," is recognized, and even this is not in use in the northern provinces, where barter alone is in vogue. The roads of the country offer but few facilities for traffic ; wheeled vehicles are unknown, and much of the transport of goods is effected by porterage. Except at the capital there is hardly, over any of the numerous streams, a structure worthy to be called a bridge. Foreign commerce there is none, unless the fair which is held annually for several days at Pien-men on the occasion of the passage of the ambassadors, or that which takes place every two years at Hung-chung, is to be counted an exception. 'The Chinese or Japanese ships are allowed to fish for trepang along the coast of Pieng-an and for her- ring on that of Hoang-hai; but they are prohibited, not only from landing, but from holding any communication with the Coreans at sea.*~~

~~*Dwellings and Dress.—The houses of the Coreans are of one story, flimsily constructed of wood, clay, and rice- straw, usually covered with thatch and badly provided with windows. Lamentable accounts are given of the general poverty of the common people. Their houses are only about ten or twelve feet square ; the floor is the bare earth, covered in rare instances with mats of poor quality ; no chairs are in use, people squatting on the floor ; and there is nothing worthy of the name of a bed. The ordinary shoe or sandal is formed of straw, and leaves the great toe exposed ; but stockings are worn by all. Wide pantaloons and a long vest arc the principal articles of attire,—*~~

the well-to-do wearing also a large overcoat, which the peasant uses on gala occasions only. The national hat is composed of a framework of bamboos covered with an open kind of haircloth; it protects neither from rain, cold, norsun, and is altogether very inconvenient. The principal material of the wearing apparel is cotton cloth, rough in texture, and of its natural colour ; but a rude kind of silk fabric is not uncommon among the wealthier classes.

History.—Corea, or Chosen, as it is called by the natives, appears for the first time in Chinese history in 1122 B.c., as affording an asylum to the refugee viscount of Ke; and since that period it has been claimed as an integral part of the Chinese empire. Neither at that time, nor for centuries afterwards, does it seem to have formed a political unity,—various states, as Hwuy, Shin-han, Pih-tse, and Sin-lo being wientioned in the Chinese records. In the first century of our cra three of these states stand out as important: Kao-li inthe north and north-east, Pih-tse in the west, and Sin-lo in the south. Out of the civil wars which fill the next ten hundred years Sin-lo emerges predominant ; but in the 11th century the king of Kao-li, known as Wang-kian, or Wang the founder, united the whole peninsula under his sway, and established the dynasty which has given its name to the country. The fall of the Mongolian dynasty in China brought about a similar revolution in Corea ; and in 1392 Tai-tso or Li-tan became the founder of the present dynasty of Tsi-tsicn, and the author of the system of administration still in foree. 'The Chincse at that time imposed on the Coreans the use of their chronology and calendar.

Under Siong-siong, who held the throne from 1506 to 1544, the Coreans carried on a war with Japan, but in 1597 the great Japanese monarch Taiko-sama retaliated by a remarkable invasion. According to tho journal of O-o-gawutsi, a Japanese general who took part in the expedition, the force consisted of 168,000 horsemen ; three- fourths of the country was occupied and several of the oldest cities

To this success he owed his European reputation. From Paris Corelli went to Germany and settled at Munich, where he remained for nearly nine years, much admired at court and in the city. In 1681 he returned to Rome, and contracted a close friendship with Cardinal Ottoboni, who made him

~~the conductor of his private chapel. With the exception of a visit to Naples by invitation of the king, Corelli remained in Rome till his death in 1713. His life was quiet and wholly devoted to his art. The style of execution introduced by him and preserved by his pupils, such as Geminiani, Locatelli, and many otheis, has been of vital importance for the development of violin-playing. Tn the same sense it may be said that his compositions for the instrument mark an epoch in the history of chamber music; for his influence was not confined to his own country. Even the great Sebastian Bach submitted to it. Musical society in Rome owed much to Corelli. He was received in the highest circles of the aristocracy, and arranged and for a long time presided at the celebrated Monday concerts in the palace of Cardinal Ottoboni. Corelli died possessed of a considerable sum of money and a valuable collection of pictures, the only luxury he had indulged in. Both he left to his benefactor and friend, who, however, generously made over the first part of the legacy to Corelli's relations,~~

~~The composer's bust, placed on his grave at the expense of the Count Palatine Philip William, and under the super- vision of Cardinal Ottoboni, is at present in the Museo Capitolino, Corelli's compositions are distinguished by a beautiful flow of melody and by a masterly treatment of the accompanying parts, which he is justly said to have liberated from the strict rules of counterpoint. Six collec- tions of concerti, sonatas, and minor pieces for violin, with accompaniment of other instruments, besides several con- certed pieces for strings, are authentically ascribed to this composer. The most important of these is the X/JZ. Suonati a Violino e Violone o Cimbalo (Rome, 1700). CORENZIO, Buttsario (c. 1558-1643), a Greek, studied at Venice under Tintoretto, and then settled at Naples, where he became famous for unscrupulous conduct as a man | and rapid execution as an artist. Though careless in com- . position and a mamnerist in style, he possessed an acknow- lsdged fertility of invention and readiness of hand 3 and these qualities, allied to a certain breadth of conception, , Seem in the eyes of his contemporaries to have atoned for many defects, When Guido Reni came in 1621 to N aples to paint in the chapel of St Januarius, Corenzio suborned an assassin to take his life. he hired bravo killed Guido's assistant, and effectually frightened Reni, who prudently withdrew to Rome. Corenzio, however, only suffered tem- porary imprisonment, and lived long enough to supplant Ribera in the good graces of Don Pedro di~~

Toledo, viceroy of Naples, who made him his court painter. Corenzio
- Yainly endeavoured to fill Guido's place in the chapel of St Januarius. HIs work was adjudged to have been under the mark and inferior to that of Fabrizio Santafede and Carraeciolo. Yet the numerous frescoes which he left in | Neapolitan churches and palaces, and the large wall paint ings which still cover the cupola of the church of Monte- Casino are evidence of uncommon facility, and show that Corenzio was not greatly inferior to the Ja prestos of his time. HIs florid style, indeed, seems well in keeping with the overladen architecture and full-blown decorative orna- ment peculiar to the Jesuit builders of the 17th century. Corenzio died, it is said, at the age of eighty-five by a fall from a scaffolding, H CORFU, the ancient Corcyra, an island of Greece, in the 'onlan Sea, off the coast of Albania or Epirus, from Which it is Separated by a strait varying in breadth from

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'ee than two toabout fifteen miles, In shape it is not un- | tixe the sickle or drepane, to which it was compared by the

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aucients,—the hollow side, with the town and harbour of Corfu in the centre, being turned towards the Albanian coast. Its extreme length is about forty miles and its greatest breadth about twenty. The area is estimated at 227 square miles, and the population is about 72,500. Two high and well-defined ranges divide the island into three districts, of which the northern is mountainous, the central undulating, and the southern low-lying. The most im- portant of the two ranges is that of San Salvador, probably the ancient Istone, which stretches east and west from Cape St Angelo to Cape St Stefano, and attains its greatest elevation of 3300 feet in the summit from which it takes itsname. The second culminates in the mountain of Santi Deca, or Santa Decca, as it is called by misinterpre- tation of the Greek designation of "Ayton Aéka, or the Ten Saints. The whole island, composed as it is of various limestone formations, presents great diversity of surface, and the prospects from the more elevated spots are magnificent.

Vegetation and Agricultwre.—Travellers generally agree that, with the exception, perhaps, of Crete, Corfu is the most beautiful of all the Greek isles, but resident foreigners com- plain of the monotonous colour of the olive, whose grayish- green is little relieved by the cypress and pine, or the mul- berry and jujubier. This lack of variety, which is the more to be regretted as the island is adapted for the oak, the plane, the Spanish chestnut, and the walnut, is mainly due to the fact that the government of Venice at one time gave premiums for planting olive-trees, partly to encourage the produce of oil, and partly to discourage the raising of wheat. Once planted, the olive has suited the people. Single trees of first quality yield sometimes as much as 2 gallons of oil, and this with little trouble or expense beyond the collecting and pressing of the fallen fruit, As the trees are allowed to grow unrestrained, they are generally much larger and more wide-spreading than those in Provence or Tuscany, and some are not less than three centuries old. It is worthy of remark that Homer names, as adorning the garden of Alcinous, seven plants only—the wild olive, the oil olive, the pear, pomegranate, apple, fig, and vine. Of these the apple and pear are now very inferior in Corfu ; the others thrive well, and are accom- panied by all the fruit-trees known in Southern Europe, with addition of the Japanese medlar (or loquat) and, in some spots, of the banana. When undisturbed by cultivation, the myrtle, arbutus, bay, and ilex form a rich brushwood and the minor jlora of the island is extensive.

Corfiot proprietors in general display little taste for the country, and their absenteeism is probably increased by the "colonia perpetua," by which the landlord grants a lease to the tenant and his heirs for ever, in return for a rent, payable in kind, and fixed at a certain proportion of the produce. Of old, a tenant thus obtaining half the produce to himself was held to be co- owner of the soil to the extent of one-fourth ; and if he had three-fourths of the crop, his ownership came to one-half. Such a tenant could not be expelled but for non-payment, bad culture, or the transfer of his lease without the landlord's consent. Attempts have been made to prohibit so embarrassing a system ; but as it is preferred by the agriculturists, the existing laws permit it. The portion of the olive crop due to the landlord, whether by colonia or ordinary lease, is paid, not according to the actual harvest, but in keeping with the estimates of valuators mutually appointed, who, just before the fruit is ripe, calculate how much each tree will

probably yield. The large old fiefs (baronie) in Corfu, as in the other islands, have left their traces in the form of quit-rents (known in Scotland by the name of feu- duties), generally equal to one-tenth of the produce. But they have been much subdivided, and the vassals may by. law redeem them.

Corrv, the capital of the above island, stands on the broad part of a peninsula, whose termination in the citadel is ent from it by an artificial fosse formed in a natural gulley with a salt-water ditch at the bottom. Seen from the water, or from a height, it is picturesque in masses, but in detail it is not to be praised for either beauty or comfort, Having grown up within fortifications, where every foot of ground was precious, there is nothing spacious about it except the handsome esplanade between the tewn and the citadel. Indeed, it is still, in spite of recent improvements a perfect labyrinth of narrow, tortuous, up-and-down streets, accommodating themselves to the irregularities of the ground, few of them fit for wheel carriages. The palace, built by Sir Thomas Maitland, is a large structure of white Maltese stone, but the exterior has no architectural nerits, although internally its apartments are very stately, In several parts of the town may be found houses of the Venetian time, with some traces of past splendour, but they are few, and are giving place to structures in the modern and more convenient French style. Of the thirty-seven Greek churches the most important are the cathedral, dedicated to Our Lady of the Cave (1) Mavayla Sanhudricoa) ; St Spiri- dion's, with the tomb of the patron saint of the island; and the suburban church of St Jason and St Sosipater, reputed the oldest in the island. The city is the seat of a Greek and a Roman Catholic bishop ; and it possesses a gymnasium, a theatre, an agricultural and industrial society, and a library and museum preserved in the buildings formerly devoted to the university, which was founded by Lord Guildford in 1823, but disestablished on the cessation of the English protectorate. There are three suburbs of some importance—Castrades, Manduchio, and San Rocco. The old fortifications of the town, being so extensive as to require a force of from 10,000 to 20,000 troops to man them, were in great part thrown down by the English, and a simpler plan adopted, limiting the defences to the island of Vido and the old citadel. Population about 25,000.

~~CORIANDER, the fruit, improperly called: seed, of an Umbelliferous plant (Coriandrum sativum), a native of the south of Europe and Asia Minor, but naturalized and cultivated in the south of England. The plaut produces a stem rising about a foot in height, with bipinnate leaves and flowers in pink or whitish umbels. The fruit is globular and externally smooth, having five indistinct ridges, and the mericarps, or half-fruits, do not readily separate from each other. It is used in medicine as an aromatic and carminative, and on account of its pleasant and pungent flavour it is a favourite ingredient in het curries and sauces. 'The fruit is also used in confectionery, and as a flavouring ingredient in various liqueurs, The essential oil on which its aroma depends is obtained from it by distillation. The tender leaves and shoots of the young plant are used in soups and salads. ;~~

~~CORIGLIANO, a town of Italy, in the provinee of Calabria Citeriore and the district of Rossano, situated ou a river of the same name, about four miles from the coast, on a steep hill, which is surmounted by an ancient castle and fringed at the foot by orange and lemon plantations. It is supplied with water by an extensive aqueduct, and carries ov the manufacture of liquorico and a trade 1 timber. Population about 10,000. :~~

~~CORINGA, a seaport town of British India, in che collectorate of Godavery and presidency of Madras, 1 cituated in 82° 19' E. long. aud 16° 49' N. Intyon ie estuary of a branch of the Godavery River. The a is protected from the swell of the sea by the ae~~

~~Literature :—Baron Theotoky, Détails sur Corfou; Mustoxidi, Notizt projection of Point Godavery, and affords » an vire alla storia Corctrese, 1804; J oda Bellare, Précis Bas onatons Genie 'a vessels during the south-west monsoon. Across 1s entrap~~

~~la division francaise du Levant, 1805; Jervis, Iistory of Corfu, 1852; Alb | j hich shows a d f about 15 feet at spring poe Ein Besuch auf Korfu im Sept. 1858, Zurich, 1859; Ansted's The Ionian es " bar, sitle . = : oe i sting ships slands, 1863; Tuckermann"s Greeks of To-day, 1874. (tides. The repairing and building of small coasting~~

~~The Corfiot peasantry are reputed the idlest of all the Tonians. The olive receives little or no culture from them, and the vineries alone are laboured~~

by the broad heart-shaped hoe. The vintage, whicli begins on the festival of Santa Croce, or the 26th of September (0.8.), is neither a pretty nor a lively scene, and little care 1s taken in the various operations. None of the Corfu wines are prized.

Cottagers cultivate no gardens for themselves; they purchase their vegetables in the Corfu market, and a con- siderable sum goes annually to buy in Apulia the garlic and onions so largely used by the people.

The capital (noticed below) is the only city or town of much extent in the island; but there are a number of villages, such as Benizze, Gasturi, Ipso, Glypho, with populations varying from 300 to 1000.

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Corfu contains very fewand unimportant remains of antiquity. The

site of the ancient city of Kerkyra is'well ascertained, about 14 milesto the south-cast of Corfu, upon the'narrow piece of ground between the sea-lake of Calichiopulo and the Bay of Castrades, in each of which it hada port. Under the hill of Ascension are the remains of atemple, popularly calledof Neptune, avery simple Doric structure, which still in its mutilated state presents some peculiarities of architecture. Of Cassiope, the only other city of ancientimportauce, the name is still preserved by the village of Cassopo, and there are some rude remains of building on the site ; but the temple of Zeus Cassius for which it was celebrated has totally disappeared. Throughout the island there are numerous monasteries and other buildings of Venetian erection, of which the best known are Paleocastrizza, San Salvador, and Pelleka.

The ancient Corcyreans delighted to identify their island with the Homeric Scheria—the kingdom of Alcinous and his Pheacian subjects ; but the first authentic event in the history of Corcyra is its colonization in 734 B.c. by the Corinthians, and the expulsion of the previous Cretan aud Liburnian settlers. So prosperous was the new community that in a short time it rivalled the mother country, and in 695 B.c., in a sea-fight which is

remarkable as the first on record, destroyed the fleet which had been sent to compel its allegiance. Not long afterwards, however, it was forced to recognize Corinthian supremacy by the tyrant Periander, the son of Cypselus. Ata subsequent period its dissensions with the parent state brought on the Peloponnesian war, during which it repelled several attempts of the Lacedemonians. After various vicissitudes it fell into the hands of Pyrrhus, king of Epirus, and on his death it was seized by the Illyrian pirates. Under the Romans, who obtained possession in 229 B.c., it became an important naval station, and so continued till the fall of the Eastern Empire. In 1081 Robert Guiscard, the Norman, captured Corfu, and in 1085 he died at Cassopo. It was again conquered by his nephew Roger of Sicily in 1146; but it was recovered by coal Comnenus in 1152. In 1192 Richard I. of England landed at Corfu on his voyage from Palestine ; and the forces of the fifth erusade were welcomed to the island after the capture of Zara. The Genoese corsair, Leon Vetrano, who had made himself master of what was then regarded as a Venetian possession, was defeated and executed, and the Venetian senate in 1206 sent a colony of ten noble families to secure its occupancy. Through the rest of the 13th and most of the 14th century, Corfu and the other Ionian Islands were a prey by turns to corsairs, and to Greek and Neapolitan claimants ; and it was not till 1386 that the Corfiots voluntarily placed them- selves under,Venice, which in 1401, on the payment of 30,000 ducats, had its right to the island recognized by Ladislas, king of Naples. Barbarossa ravaged Corfu in 1537, and Selim IJ. did much the same in 1570. In 1571 the great fleet which was about to become illustrious through the battle of Lepauto, was reviewed at Corfu by the generalissimo, Don John of Austria. The last and greatest struggle for the possession of the city and island was in 1716, when the forces of Achinet III. were defeated by the Venetians under Count Schulenburg, already famous for his crossing of the Oder and his share in the battle of Malplaquet. The peace of Campo Formio gave the Ionian Islands to the French, but in 1799 they were forced to capitulate to a Russo-Turkish fleet. By the treaty of Paris, 1815, the republic of the Ionian Islands was revived, and placed under the protectorate of Great Britain, Corfu being the chief island of the group. In 1864 that protectorate was resigned in favour of the kingdom of Greece, and Corfu now forms one of the nomarchies of that country, along with the neighbouring islands of Merlera, Fano, Salmastraki, Paxo, Antipaxo, and Leukadia.

is a staple industry of Coringa, The chief exports are teak, salt, and piece-goods ; the imports are silk, paper, and copper. In 1787 a gale from the north-éast occa- sioned an inundation which swept away the greater part of the town with its inhabitants ; and in 1832 another storm desolated the place, carrying vessels into the fields and leaving them aground. Of Europeans the French, who still hold the neighbouring settlement of Yanaon, were the first to establish themselves at Coringa. In 1759 the English took te town, and erected a factory 've miles to the south of 16. GOORIN NA, a Greek poetess, burn at Tanagra in Beeotia, of interest for the influence which she exerted on Pindar. The fragmentary traditions which have been preserved represent her now as the poet's friend and instructress, and again as his rival and competitor. By her he is said to have been advised to adorn his poems with the Greek myths, and then when he employed tliem too lavishly, to have been warned that they ought to "be sown by the hand and not poured "i ae = sack." She a ey es him for having used an Attic idiom in one of his lyrics. The victory which she gained in the poetic contest with her friend in the public games at Thebes is ascribed by Pausanius to her beauty and the free use she nade of the local Boestian dialect; and the story goes that Pindar gave expression to the same opinion by calling her in the heat of his chagrin a " Boeotian swine," with allusion to a common Greek proverb. By the Greeks she was esteemed as the first of the nine lyrical muses. The fragments of her poetry have been collected by Ursiuus, Wolf, Schneider, and Bergk. See Leopold Schmidt, Pindar's Leben und Dichtungen, 1862. CORINTH (now corrupted into Gortho) was

originally called Ephyre, but the name Képu6os is as old as Homer. This most populous and thriving of Greek cities was situated at the southern end of the isthmus which connects Peloponnesus with the mainland of Hellas. 'The citadel, Acrocorinthus, occupied the summit of a precipitous rock, 1886 feet in height, which is in fact an offshoot from the Oneion, a mountain range skirting the northern shore of "—but which appears, especially when viewed from the north, to be detached. From this height the view includes the Geraneian range at the opposite end of the isthmus, and the higher mountains of Northern Greece be- a it, while in the foreground lies to the left the Corinthian ulf stretching westward, and the Saronic Gulf to the east, together with the strip of flat land which divides the one of these from the other. Another narrow plain stretches along the southern shore of the Corinthian Gulf In the direction of Sicyon, and was proverbial in ancient times for the value of its agricultural produce. The city of Corinth lay not at the foot of the hill on which the citadel stood, but on a ledge or shelf of that hill at a height of about 200 English feet. A lofty wall—according to Strabo, 85 stadia (about ten miles) in length—inclosed both city and citadel, and two walls, each 12 stadia in length, Inclosed the road to the harbour of Lechzeum on the Corin- thiam Gulf; Schoonus and Genchires, the two harbours belong- ing to the city on the Saronic Gulf, lay at a greater distance. From its position Corinth enjoyed in prehistoric times two advantayes especially important in the infancy of navi- gation. On the Jong gulf which stretched from Corinth westwards, called in early times after Crissa, the port of elphi, aud later after Corinth itself, vessels could sail for aq o miles without losing sight of land and between Er a And secondly, the natives of Corinth were = a ragging vessels of all kinds across from sea to roa Tt ee them the dangers of the perilous voyage ovestane e€ Peloponnesus. That the Pheenicians did not eriook these advantages we know from the many traces of

Pheenician occupation remaining in later times, especially the worship of the Phcenician Athene, Aphrodite Urania (the Sidonian Astarte), and Melicertes (the Tyrian Melkarth).

The important cwltus, at the isthmus, of Poseidon, the great divinity of the Ionians, proves the earliest Greek inhabitants of Corinth to have been Ionian, but Thucydides states that it was under /Molian princes. The

earliest of these of whom we hear is Sisyphus, according to one legend lover of Medea, according to another grandfather of Bellerophon, the great local hero who tamed the winged horse Pegasus, and slew the monstrous Chimera, The character of mingled greed and cunning, ascribed to Sisyphus, is doubtless intended to embody the qualities which distinguished the people of the commercial city from their rural neighbours. This was in the age preceding the Trojan War. On the return of the Heraclide the Dorian invaders, after subduing the rest of Peloponnesus, attacked Corinth, and having mastered it proceeded against Megara and Athens, Corinth fell into the hands of a descendant of Hercules, named Aletes (the wanderer), and was recon- stituted on Dorian principles, but not, it would appear, with the same rigidity as Argos, Sicyon, and other cities, for we find eight tribes instead of the usual three, and it is certain that the aristocracy of the city did not disdain to lead in trade, and resembled rather the nobility of Venice than the pure-blooded warrior-caste of other Dorian cities. The most wealthy family was that of the Bacchiade, the descendants of Aletes, who furnished first a succession of kings, and afterwards yearly prytaneis who ruled with kingly power. It was about 657 3.c. that Cypselus, a Bacchiad on his mother's side, succeeded in' overthrowing this oligarchy and, by the aid of the commons, establishing his power at Corinth so firmly that he could even forego the foreign body-guard and thé external supports of the Greek tyrant. His son and successor, Periander was some- times reckoned among the wise men of Greece, and probably did more than any other man to shape the colonial and mercantile policy of the city. Under him Corinth reached the summit of prosperity, but Periander's family was destroyed by internal dissensions, and his nephew Psammetichus was after a bricf reign put down by thie Spartans about 58+ B.c.

It was in the period between Aletes and Psammetichus that lay the golden days of Corinth. Then were made a series of splendid discoveries and inventions, which increased the trade and multiplied the resources of the city, and enabled it to found the numerous colonies which were tho basis at once of its wealth, its power, and its policy. To begin with the loftier arts. Arion graced the court of Periander, and secured for Corinth the honour of the in- vention of the dithyramb ; Eumelus and Eumolpus, both Corinthians, were among the earliest and the most cele- brated of the cyclic poets. Corinthian architecture was renowned until the later time when a light and

ornate style of building took its origin and its name from the city. Corinthian pottery was early celebrated, and it is said that the art of ornamenting earthenware was improved at Corinth by Butades, Eucheir, aud Eugrammus. Even paint- ing was either introduced into Greece, or was much improved, by the Corinthians Aridices, Ecphantus, and Cleanthes. Still it was in the useful rather than the ornamental and imaginative arts that Corinth most excelled. There the trireme was invented, and the machinery for the transport of ships carried to the highest perfection, while Corinthian bronzes, tables, coffers, and objects of luxury were renowned on all shores of the AZgean and Adriatic. One of the most remarkable of these pieces of handiwork was the well- known chest of Cypselus, still preserved at Olympia in tho time of Pausanias, made of cedar and inlaid with a mul- titude of figures in gold and ivory, a niiracle of archaic art,

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The wealth and prosperity of tho city caused its rulers to plan early a scheme of colonization. Professor Ernst Curtius has given reasons for supposing that at the time of the Lelantian war, of which Thucydides speaks, between 'halcis and Eretria in Eubeea, Corinth was, together with Samos, a firm ally of the former city, and that it was m company with the Chalcidians that the Corinthians made their first attempts at colonization. That theso attempts were, through a series of years, made almost constantly im a western rather than an eastern direction was due to the position of Agina, which island lay right in the track of travellers from Corinth to Asia Minor or the Euxine,—the /Eginetans having maintained a constant hostility to the Corinthians from the earliest times, until their island was finally conquered by the Athenians, who had received for tho war a detachment of ships sent from Corinth. It was in the Sth century that the two greatest colonies, Corcyra and Syracuse, were founded. Syracuse remained, even in the time of her greatest prosperity, a grateful and dutiful daughter, but Corcyra very soon after its foundation was engaged in hostilities with tho mother-city, and, though reduced to obedience in the time of Periander, finally ousted Corinthian commerce from the northern part of tho Adriatie, aml maintained undivided supremacy over the cities of Dyrrhachium and

Apollonia, But south of tho straits of Sybota, which divided the southern point of Corcyra from the mainland, Corinth was supreine. To her the towns of Achaia, Phocis, and Loeri, on both sides of the Corinthian Ciulf, looked as their head ; she ruled all the rich country watered by the Achelous, which region, indeed, became in time almost more Corinthian than the isthmus itself, while all the Dorian cities of Sicily and Soutnern Italy looked to the navy of Corinth to keep up their connection with the mother country.

It is said that Corinth adhered in a special manner to the customs of Phoenicia as regards colonies, at any rate the city was in this respect successful beyond the rest of Greece. Expeditions were directed to some promising pomt on the [lyrian or Acarnanian coast, the approval of the Delphic oracle was secured, and volunteers were invited from all parts of Greece At the head of the colony was placed some eadet of the Bacchiadw, or another great family, and some of the mercantile nobility accompanied it, retaining in the new home much of the oligarchical predominance which they had enjoyed at home. It was probably the preservation of this aristocratic tinge which made the union closer between colony and mother-city, so that the Corinthian envoys could boast (Thucydides, i. 38) that Corinth was of all cities the most popular with her colonies ; and, with the exception of Corcyra, few of the ew settlements gave the mother-city any trouble. Alone among cities Corinth imposed on all her colonies a uniform comage, the different issues of which are so similar in appearance that it has been doubted if Corinth did not keep in her own hands all minting of silver.

— After Psammetichus had been put down, a timocracy was instituted, with hierarchy of grades. Corinth set an early example in that system of political classification according to revenue which was afterwards adopted in Rome and other cities. — At the same tine, it is clear that in so com- mercial a city an organization of this kind would not produce an exclusive land-owning aristocracy.

Jt was about the middlo of the 5th century B.c. that Corinth started upon a rnore restless and aggressive career.

At that time her very existence was threatened by the.

growing greatness of Athens, which city had gained the mastery of Megara and predominant power among the cities of Achaia. Soon after the beginning of the Peloponnesian war, an Athenian fleet under Tolmides appeared in the Corinthian Gulf, and seizig upon Naupactus, and expelling

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thence the Locrian colonists whom Corinth had stationed there to defend her interests, established in that city a colony of Messanian fugitives, in order to cut the com- munications of Corinth close to their base. Hence the bitter and vindictive animosity felt by the Corinthians towards Athens, which caused them, after that city had surrendered to Lysander, to urge upon the Spartans its total destruction. No sooner, however, was the Spartan supremacy undisputed, than a party among the Corinthians, whether seduced by Persian gold, or following notions of supposed expediency, began to cabal with Athens and Argos against the Lacedwmonians, with whom the aristo- cracy of the city still sided. Hence bitter dissensions and many calamities to the Corinthians, whose city was more than once the battle-field of parties, as well as of the Argive and Lacedeemonian troops. The events of the war hence arising, and called Corinthian, belong to the listory of Greece. 'The city, weakened by sedition, fell easily into the hands of Philip Ii. of Macedon, whose successor, the fifth Philip, called it, im virtue of its splendid position, one of the three fetters of Greece. As the chief city of the Achwan League during the Jatter part of its existence, Corinth claimed a share in the 2d century in the latest glories of Greece. 'There Flamininus proclaimed the liber- ties of Greece; and as the ally of Nome, Corinth reached a high point of wealth and splendour. But that alliance was broken off, and the result was the total destruction of the city by Mummius in 146 3.c., and the sale of its inhabitants into slavery. 'The richness of the city at this period in all the accumulated results of Greek science and art was im- niense, as we know from the statements of Polybius, an cye-witness, The Romans secured a vast spoil of statues, pictures, and furniture, of which a part was purchased by Attalus of Pergamus, a part sent in many ships to Rome, and much also destroyed in mere wantonness. Notwith- standing, the place remained a quarry whence in after ages were dug innumerable treasures of art. The Corinthian territory was given to Sicyon, and the site lay waste until the time of Julius

~~Cesar. The great dictator settled there a colony of needy Greeks and Roman freediwen, which he called after himself Laus Julia, and made the seat of government of Achaia. Between the new Corinth and the old the site was the only bond of connection, yet the historic splendours of the place seem to have mastered the minds of the new inhabitants, who before long began to resume all the local cu/¢s, and to claim the past glory of the city as their own. Latin, however, as we kuow from coins, remained the cflicial language, and the duumviri were usually the freedmen of the emperors or of Roman nobles.~~

~~The new city, from its position, soon acquired a great trade with Ephesus, Thessalonica, and other cities. For this reason it attracted St Paul, who visited it more than once, and spent many months there in converse with Aquila and Priscilla, and in preaching in the synagogue. Hence were written the two Epistles to the Thessalonians, and here was founded a church which claimed fora long period the deepest anxieties of the apostle and after his death of Clement,—the temptations to sensual indulgence and antinomian heresies being here stronger than in most of the Creek cities,~~

~~Unfortunately, it is only of this, second Corinth that we possess detailed descriptions, It was visited both by Strabo and Pausanias. JTrom the former wo learn that the sum- mit of the Acrocorinthus bore a little temple of Aphrodite, and that just below tho summit gushed out the fountain Peirene, which once more rose to the surface down in the lower city. Just below this fountain were the remains of a imarble building, supposed to have been the remains of the palace of the monarch Sisyphus. From the account of Pausanias (ii. ch. 1-4) we may gain a clear notion of the~~

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~~topography of the city and the isthmus. In the midst of the city was the market-place, commanded by a lofty statue of Pallas made of bronze, and surrounded by many temples, among others those of the LEphesian Artemis and of Fortune, and by statues standing in the open air. Hence three principal roads led in various directions, Tho first passed westwards towards Sicyon, leading by a temple of Apollo, the Odeum, and the tomb of~~

~~the children of Medea, Mermerus and Pheres, whom a local legend asserted to have perished at the hands of the Corinthians, after they had brought their poisoned gifts to Glauce. A little further on was tho temple of Athene Chalinitis (the bridler), so called because she bridled for Bellerophon the unruly Pegasus ; the statue of the goddess was of wood and doubtless ancient, a fact which proves that the sack by Mummius cannot have been so complete as might have been imagined, Near this temple was a theatre, probably a work of Roman times, and a temple of the Roman Jupiter Capitolinus.~~

~~The second road led north towards the harbour of Lechewum and the Corinthian Gulf. It first passed Propylwa, surmounted by two gilt quadrigw driven by Phaethon and Helios, and next the grotto where issued afresh the same fountain Peirene which rises near the summit of the Acrocorinthus, and filled a large basin with sweet water, used by tbe inhabitants for drinking, and as a bath in which to dip the vessels of Corinthian bronze while still red-hot, a process which was supposed to inake their fineness unapproachable. 'The water-supply of the city was unrivalled, yet the emperor Hadrian cunstructed an aqueduct all the way from the Stymphalian Lake, a work, if we may believe Pausanias, of vain ostentation,~~

~~The third road led eastwards, first to the fashionable suburb of the city, a cypress-grove called Craneion, 'This quarter is well described in Becker's Chartcles. It abonnded with the life which distinguished Corinth from other citics, crowds of travellers, seeking both gain and pleasure, with the lively bvoths which offered the former, and the crowds of female slaves who ministered to the latter. Here was the tomb of Lais, to whom her fellow-citizens paid almost divine honours, and here, strangely, the monument of the great cynic, Diogenes of Sinvpe, who had passed his life in the midst of this gay and dissvlute company. On the Craueion the road divided into two branches. Of these the more southerly ran to tho harbour of Cenchresw, a roadstead fenced on both sides by pro- montories stretching out to sea, but not much assisted by art; whilo the more important Lecheum, on the other sido of the isthmus, was almost entirely artificial. 'The moro northerly branch of the road led to the little harbour of Scheenus, and the world-renowned spot where were celebrated every second year the Isthmian Games. These gaines were held in honour in early times of Melicertes, in~~

later times of Poseidon, and close by were temples of both deities. That of Poseidon was not largo; it contained statues of Poseidon, Amphitrite, and Thalassa, and in front was a crowd of statues of tho victors in the games. 'The shrine of Melicertes stood under a pine; it was circular, and contained, as wo know from coins, a statue of the divinity reclining on the back of a dolphin. Melicertes (also called Pakemon) had also a subterranean chapel where the most solemn oaths were administered, and it was said that perjurers seldom left the spot unpunished. Close to the temples was the stadium of the games made of white marble, and not far from it the road on which triremes Were transported from sea to sea. 'There were also traces of a canal which, projected by Alexander the Great, resolved on by Julius Caesar, commenced by Nero, was never dug me than a few hundred yards inland from the Cormthian xulf,

In the Middle Ages Corinth suffered many disasters. lt was sacked by Alaric, and at a later period was most bitterly contended for by the 'Turks and the Venetians, During the Middle Ages the city occupied the hill of Acrocorinthus itself, not the ledye at its base, but it has now resumed its earlier position. 'The modern town is small and wretched, and retains few remains of antiquity. The most remarkable among these are seven columns of an exeeedingly aucient temple of the Doric order, and some traces of the Roman amphitheatre.

The best authorities on the subject are—Ernst Curtius, Pelopon- nesos, Vol. ii. p. 514, and a dissertation in the J/ermes, vol. x.; Barth, Corinthiorum Commercii et Mercature Historia Particula, Berlin, 1843 ; Dr Wm. Smmith's article in his Dictionary of Ancient Geography. The autonomous coins afford valuable data for the history of the Corinthian league, and the coins of Roman times ofler representations of many of the most interesting objects of the later city. (P. G.)

CORINTHIANS, Ertsties to tue. These two letters of St Paul occupy a unique position among the Paulino epistles, 'They are remarkable as being in their primary aspect historical rather than doctrinal, while, at the same time, all the fundamental doctrines of Christianity, as connected with the miraculous facts on which they rest, are suggestively implied. 'These epistles, too, together with those to the Galatians and to the Romans, have

been admitted as genuine writings of St Paul, even by the most audacious critical assailants of the New 'Testament canon. The external testimony to them is early and complete, and the internal evidence of authorship and ago makes it impossible to doubt the genuineness and authenticity of these remarkable documents. There are, perhaps, uo other epistles in the New Testament in which there is so much of "local colouring," or so many temporal and local allusions, hese letters throw great light both upon the early circumstances of the Christian church and upon the character of the great missionary to the Gentiles; and whilst they are very full of what was due to the special occasions on which they were written, tho universal applicability of the Christian principles laid down in thein must be patent to every thoughtful student. Stier speaks of the Epistles to the Corinthians as being "a patholog and materia medica for all that are designed to bo physicians of the church in a larger or lesser circle ;" and Bleck remarks on the first epistle, that it "serves as a type and pattern in dealing with the multifarions tendencies, relations, and disorders of the Christian church, ahnost all of which have their counterpart in the Corinthian Church, and are continually repeated with various modifications at various times."

he history of the two epistles seems to be this. Paul's first visit to Corinth and his long and eventful sojourn there are mentioned in Acts xviii, 1-18. After his departnre from the rich and luxurious capital of Achaia, evils which, we can perceive, were very likely to spring up in such a place began to appear in the Christian community. 'The Hellenic tendency to philosophical speculation and to fac- tious partisanship, and the sensuality and licentiousness which had made the word corinthianize a synonyin for self- indulgence and wantonness, became roots of bitterness, strife, and immorality. he presence of Apollos (Acts xviii. 27, 28) was doubtless advantageous, and St Paul evidently alludes to a successful prosecution of evangelistic work by the learned Alexandrian, when he says "I planted, Apollos watered" (1 Cor. iii. 6). Yet it would seem that invidious comparisons had been made between the simpler preaching of the Apostle Paul and the probably more philo- sophical and refined style of Apollos, so that some of the Corinthian Christians began to regard Apollos as their leader, rather than Paul, who had first preached the gospel unto them. Tho reluctance of Apollos to return to Corinth,

at the time when Paul wrote what we know as the first epistle (1 Cor. xvi. 12), can best be accounted for by a consciousness on his part of the rivalry which had arisen between the two factions; and the manner in which Paul urged, and Apollos declined, the mission of the latter to Corinth may be viewed as equally creditable to the mag- nanimity of the older teacher and to the modesty and prudence of the younger. But a far more dangerous division of the church existed than that between those who favoured Paul and those who preferred Apollos. In the Epistles to the Corinthians we have indications of the antagonism and envy ofa Judaizing section, who may have been encouraged by emissaries from Palestine, like those complained of in Galat. ii, 4 (comp. Acts xv. 1, 24), These Judaizers would make much of the fact that Paul was not one of the original twelve apostles ; and they seem to have endeavoured to undermine his authority, by depre- ciating his position as a teacher, and by deriding his personal qualifications. Nor were dissensions and tenden- cies to split up into parties the only evils that infested the Corinthian Churches. Paul, when at Ephesus on his third missionary journey, heard of these " contentions " from the members of a Christian household, who were either resident at Corinth or connected with the place (1 Cor. i. 11); but he heard of something worse still, and more glaringly inconsistent with the Christian profession. Licentiousness was common among them, and a griev- ous case of incest had taken place (1 Cor. v. 1, &c.), which called for the severest censure and punishment. That the apostle had been awake to the peculiar dangers of the Corinthian Christians in respect of the licentiousness and luxury for which Corinth was noted, appears from the fact that he had previously written a letter which has not come down to us (1 Cor. v. 9), exhorting the Christians to avoid intercourse with fornicators, Alford conjectures that this letter may have also contained some instructions as to the collection (1 Cor. xvi. 1), and an announcement of an intended plan of visiting them, which he afterwards abandoned, perhaps on purpose to see what effect would be produced by the letter known to us as the first 'epistle, which was in reality a second one.

A good opportunity was presented for communicating with the Corinthians by the arrival of Stephanas, Fortunatus, and Achaicus (1 Cor. xvi, 17), who

~~probably brought a letter from Corinth (1 Cor. vii. 1, &c.), requesting instruc- tions on divers points to which St Paul replies in the first of our two epistles, This letter from Corinth (as Paley points out) seems to have made little or no mention of the disorders and divisions which the apostle rebukes. These came to the apostle's ears by private report and not in an official communication. We have here a satisfactory explanation of the varied contents of our first epistle. After an introduction which is graceful, conciliatory, and affectionate (1 Cor. i. 1-9), the writer alludes to the indications of party spirit and dissension which had been reported to him, and, while he very earnestly vindicates the claim of the gospel to be a revelation of divine wisdom, deprecates the tendency to overrate human eloquence and intellect (i 10-iv. 16.) He tells them that he is sending Timotheus to remind them of his teaching, and that he intends himself to come soon (iv. 17-21). He then rebukes their licentiousness and their litigiousness (v., vi.), and afterwards proceeds to answer the several inquiries which had been put before him by the Corinthian letter, viz., questions concerning marriage, questions concerning meat offered to idols, and questions concerning spiritual gifts (vii—xiv.). With his replies to particular points he blends a spirited defence of his own authority and conduct (ix.), and serious exhortations as to the behaviour of women in the Christian assemblies, and the manner in which~~

~~CORINTHIAARS~~

~~Christians should partake of the Lord's Supper (x, xi.) One doctrinal subject is treated of directly in the epistle Some among the Corinthians had denied the resurrection of the dead. The apostle shows that the fact of the resurrection of Jesus Christ from the dead is the basis of Christian teaching and the spring of Christian "hope (xv.) He then makes reference to the collection which he was making for the brethren at Jerusalem, speaks of his own plans, sends greetings from the churches of Asia, and con. cludes with solemnity and tenderness (xvi.)~~

~~was written from Philippi, is a palpable error, possibl grounded upon a misapprehension of xvi. 5. The letter was evidently written from Ephesus, some time befofe Pentecost, and after winter (xvi. 6, 8), and, not improbably, near the season of the Jewish feast of the Passover (v, 7 8), in~~

~~the year 57 A.D. of the letter or not seems doubtful (xvi. 10); and it is more probable that the three messengers from Corinth, already mentioned as having brought a letter for St Paul, returned with his reply. But Timothy and Erastus were sent together into Macedonia, and Erastus (comp. Rom, xvi, 23 and 2 Tim. iv. 20) may have been returning to his home in Corinth. Then occurred the notable disturbance at Ephesus recorded in Acts xix. 23, &c. for Macedonia (Acts xx. 1), and our second epistle to the Corinthians may have been written either at Philippi or at Thessalonica, at a time when Timothy had rejoined him (2 Cer. ii, 1), there is no letter among those written by St Paul so full of personal feeling as the Second Epistle to the Corinthians. The "tumultuous conflict of feeling," "the labyrinth of —~~

~~reflected in the rapid transitions and confused eagerness, as~~

~~The subscribed note to this epistle, which asserts that it~~

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~~Whether Timothy was the bearer~~

~~Paul left Asia~~

~~It has been a frequent remark of commentators that~~

~~conflicting emotions," by which the writer was agitated, is~~

~~we may term it, of his style. We can trace a twofold current of emotion,— one, of relief and gratitude because he had heard from Titus (2 Cor. vii. 7) better tidings than he had expected of the effect produced by his former letter, and the other, of righteous indignation against those persons at Corinth, who were trying to undermine his influence and misrepresent his work. We may also perceive indications of mental dejection, and references to bodily suffering which add mucli to the personal interest of the letter. It has been conjectured that, besides "the troublein — Asia" (i. 8) and his daily anxieties about " all the churches j for which he felt himself responsible (xi. 28), the apostle — was suffering about this time from an attack of that painful end chronic malady which he calls "a stake in the flesh" | (xii. 7). 'Titus had been sent to Corinth as a special messenger~~

~~some time after the despatch of the letter from Ephesus, and was expected by Paul at Troas, but did not rejoin him until he had come into Macedonia. The news — that the greater part of the Corinthian Church was loyal to their old teacher, and had attended to his injunctions 2) the matter of the offender mentioned in 1 Cor. v., and had ‘ sorrowed unto repentance” (2 Cor. vii. 10, 11), was very — consolatory to him; but it is plain that Titus must have also informed Paul of very distinct and virulent opposition to him on the part of certain teachers and a faction of the Corinthians attached to them. Hence the indignant stra which especially appears in the latter part of the epistle, where irony and remonstrance and pathos are 80 wonder fully blended, and where the desire to vindicate ie authority, to substantiate his personal claims to the So oe and affection of the church, and to expose the mischte | which was being done by the false teachers, causes him to review his own toils and infirmities in the touching picture of his work which we have in xi, 21-xii, 21. The epistle (so far as it admits of analysis) may be rouglily divid~~

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~~into three portions, viz. :—(1) a very earnest description of his own interest in and relation to the Corinthian churches, and of the impression produced on his mind by what Titus reported (i-vii.); (2) some exhortations to liberality in respect of the collection which was going on in Macedonia and Achaia for the brethren at Jerusalem (viii., ix.) ; (3) a vindication of his apostolic authority against the calumnies and misrepresentations of those who were eudeavouring to subvert it (x.xtii.) The epistle was taken to Corinth by Titus, who was quite ready to undertake a second journey (viii. 17), and with him went two other brethren (ib. 18, 9), who were selected “messengers of the churches,” in charge of the contributions to the collection already men tioned, Ithas been noticed that this letter was~~

~~"addressed not to Corinth only but to all the churches in the whole province of Achaia, including Athens and Cenchrex, and pethaps also Sicyon, Argos, Megara, Patre, and other neighbouring towns, all of which probably shared more or less in the agitation which affected the Christian com- munity at Corinth" (Howson).~~

~~We may here mention the conjecture of Bleck that between our 1 Corinthians and 2 Corinthians another letter intervened, which Titus took with him on his first mission, and that this is the letter which is referred to in 2 Cor. ii, 3, vii. 8 as onc of unusual severity. If this con- jecture, which is a plausible one, be admitted, there must have been four letters from the Apostle Paul to the Corinthians, two of which have not been preserved. At any rate our 2d epistle is one in which all the affection and eagerness of the apostle culminate, and it gives to us, more than any other of his letters which have come down to us, an idea of the intensity of the zeal and sympathy with which he laboured in the cause of the gospel. 'What an admirable epistle," wrote George Herbert, "is the second to the Corinthians! how full of affections; he joys, he sorrows, he grieves, and he glories; never was there such care of a flock expressed save in the great Shepherd of the fold, who first shed tears over Jerusalem, and then blood."~~

~~There are three special points in connection with the Epistles to the Corinthians on which a few further remarks must be made. One is the question whether a visit to Corinth, which is not mentioned in the Acts, yet seems alluded toin several passages of the epistles (2 Cor. xii. 14, xii, I, 2, and comp. ii. 1, xii. 21), took place. The opponents of this view rely principally on the argumentum a silentio (which in this case, however, is a very weak one, when we consider the evidently compendious nature of St Luke's narrative in the Acts), and on the expression " a second benefit," in 2 Cor. i. 15, 16. But this expression seems to refer to St Paul's intention to pay a double visit to Corinth, one in going to, and a second in returning from, Macedonia, The advocates of the unrecorded visit urge, first, that the language about the " third " visit cannot~~

~~'Teasonably be explained by saying that it was the third time St Paul entended to come ; and, secondly, that it is~~

very natural to suppose that the apostle would have found some opportunity for at least a short visit during his three years residence at Ephesus. This visit appears to have been a very painful one, during which St Paul must have had sad forebodings of the evils which he rebukes in our first epistle ; but it must have been a brief one, and the language of 1 Cor, xvi. 7 might possibly allude to the hurried nature of a former Visit.

Another disputed point, and one which it is perhaps im- Poneto determine, is, What was the nature of the s hristine " party at Corinth? Were they a separate

a at all? if so, were they a Judaizing faction or a | i one? Some hold that 1 Cor. i. 12 does not 22ige us to believe in the existence of distinct parties or | actions in the church, but only of certain tendencies, 'The

indications throughout the epistles are, at any rate, sufficient to show that a strong antagonism existed between a Judaizing faction anda more liberal, less formal, and less scrupulous body of professed Christians, some of whom adhered to Paul as their recognized leader, while others preferred Apollos. We can quite understand how the Judaizing party would seize on the name and position of Peter, or Cephas (and it is noticeable that the Hebrew designation is preferred), as a rallying point, where they could oppose the claims of Paul and Apollos. But who were those who boasted that they were peculiarly Christ's ? Some (as Howson, Alford, Stanley) think it probable they were an extreme section of the Judaizers. Others (as Neander and Olshausen) consider that they may have been " philosophical" Greeks who, " with arrogant self-will," professed to belong to no party, and renounced all '" apostolic " intervention, perhaps modelling for themselves a peculiar form of Christian doctrine by means of some collection of memorable sayings and actions of Christ.

A third point which calls for brief notice is the " gift of tongues," of which so much is said in the first of our two epistles. It is quite what we should expect that a gilt which ministered rather to individual notoriety than to general edification should have been abused and overrated in a Greek community like that at Corinth. It does not seem probable, nor is there evidence forthcoming to show, that the " gift of tongues " was used for purposes of in- struction. It was a mystical condition rather than a

~~linguistic faculty,—an ecstatic utterance connected with a peculiar state of religious emotion. Stanley compares Montanist utterances, the prophets of Cevennes, Wesleyan paroxysms, and Irvingite manifestations as phenomena which, '" however inferior to the manifestations of Apostolic times, have their origin in the same mysterious phase of human life and human nature."~~

~~The evidential value of the epistles to the Corinthians is very great. For we have in them indisputable historical and biographical data which in various ways imply and establish all the fundamental facts which concern the origin of the Christian church, and indicate the process, of which we have a more direct narrative in the Acts, whereby Christianity was extended beyond the range of Jewish in- fluences and prejudices, and its principles brought into con- tact with "the culture and vices of the ancient classical world."~~

~~There are not many special writers on these epistles. Among the Germans may be mentioned Osiander, Heydenreich, Billroth. But the book in which English readers will find the most complete and spceific treatment of the subject is that by Dean Stanley. He divides the epistles into sections, and appends paraphrases of their contents. There are important notes on the allusions to the Eucharist in 1 Cor., on the miracles and organization of the apostolic age, and on the gifts of tongues and of prophecy. He adds a short dissertation on the relation of the epistles to the gospel history. In Conybeare aud Howson's Life and Epistles of St Paul there 1s a very instructive review of the condition of the primitive church, with special reference to spiritual gifts, ordinances, divisions, &c. (ch. xiii.), and the whole history of the period during which the Epistles to the Corinthians were written is admirably treated. The Armenian epistles from the Corinthians to St Paul, and from St Paul to the Corinthians, are apocryphal. They may be seen in Stanley's book. Paley's Hore Pauline and PBirks's Hore Apostolicce contain interesting examples of undesigned coincidences between the epistles and the narrative in the Acts. Birks thinks that the Sosthenes mentioned in 1 Cor. i. 1, whose name never occurs in the other epistles, may be identified with the ruler of the synagogue nicntioned in Acts xviii. 17. A full discussion on "the thorn in the flesh" will be found in an interesting note of Professor Light- foot on Gal. iv. 13. (W.. Sioa)~~

CORIOLANUS, Carus (or Cyzrus) Marcius, a Roman patrician, said in the legend to have belonged to the 5th century B.c., and to have been a descendant of King Ancus Marcius. Brought up by his proud but patriotic mother Veturia (or, as Plutarch calls her, Volumnia), Coriolanus

doveloped into the foremost warrior of his time, and it was from his prowess at the siege of Corioli, when he took the town single-handed, that he received his cognomen. But his hatred of the plebs lost him the consulship, and when ho ventured to advise that the people, who were suffering from a dearth of eorn, should not be relieved from the supplies obtained from Sicily unless they would consent to tho abolition of their tribunes, he was condemned to banishment. Obtaining the comniand of the Volscian army, he advanced against his native city. In vain the first men of Rome prayed for moderate terms. He would agreo to nothing less than the restoration to the Volseians of all their land, and their admission among the Roman citizens. At last his mother, bis wife, Volunmia, and his children, accompanied by a company of Roman matrons of the highest birth, came to the Volscian camp, and by their tears and entreaties prevailed. He led back the Volscian army, and, according to one account, paid with his life the penalty of his tenderness. Niebulr has shown that several important parts of the legend are probably historical.

CORIOLI, an ancient Latin city, celebrated as giving a surname to C. Mareius Coriolanus. It is first mentioned in Roman story as falling into the hands of the Volsci, and being retaken from them by the Romans, 493 B.c, It was never a large orimportant place, and seems to have dropped out of existenee before the elose of the 5th eentury B.c. Tho site ofj Corioli is now unknown. Nibbey and Gell have quite conjecturally assigned it to the hill called Monte Giove, about nineteen miles from Rome on the way to Antium, while others, with as little ground, have suggested a hill four miles nearer Antiuin.

CORK (perhaps from cortex, bark) is the outer layer of the bark of an evergreen species of oak (Quercus Suber). The tree reaches the height vf

about 30 feet, growing in the south of Europe and on the North African cousts generally ; but it is principally cultivated in Spain and Portugal. 'The outer layer of bark in the cork oak by annual additions from within gradually becomes a thick soft homogeneous mass, possessing those compressible and elastic properties upon which the economic value of the material chiefly depends. The first stripping of cork from young trees takes place when they are from fifteen to twenty years of age. 'The yield, which is rough, unequal, and woody in texture is called virgin cork, and is useful only as a tanning substance, or for forming rustic work in ferneries, conservatories, &c. Subsequently the bark is removed every cight or ten years, the quality of the cork improving with each successive stripping ; and the trees continue to lve and thrive under the operation for 150 years and upwards. The produce of the second barking is still so coarse in texture that it is only fit for making floats for nets and for similar applications. The operation of strip- ping the trees takes place during the months of July and August. Two cuts are made round the stem,—ono a little above the ground, and the other immediately under the spring of the main branches. Between these three or four longitudinal incisions are then made, the utmost care being taken not to injure the inner bark. The cork is thereafter removed in the sections into which it has been cut, by inserting under it the wedge-shaped handle of the implement used in making the ineisions. After the outer surface has been scraped and cleaned, the Pieces are flattened by heating them over a fire and subinitting them to pressure on a flat surface. In the heating operation the surface is charred, and thereby the pores are closed up, and what is termed "nerve" is given to the material, In this State the cork is ready for manufacture or exportation. Qae eS a ie of properties which we. ce many and diverse uses, for some of

one 1s found applicable. The leading purpose

for which it is used is for forming bungs and stoppers for bottles and other vessels containing liquids. Its com- pressibility, elasticity, and practical imperviousness to both air and water so fit it for this purpose that the term cork is even more applied to the function than to the substance. Its specific lightness, combined with strength and durability, recommend it above all

other substances for forming life- buoys, belts, and jackets, and in the construction of life- buats and other apparatus for saving from drowning. On account of its lightness, softness, and non-conducting pro- perties it is used for hat-linings and the soles of shoes, the latter being a very ancient application of cork. It is also used in inaking artificial limbs, for lining entomological cases, for pommels in leather-dressing, and as a medium for making architectural models. Chips and cuttings are ground up and mixed with india-rubber to form kamptulicon fluor-cloth, a preparation now, however, almost superseded by linoleum, which consists chiefly of a mixture of boiled linseed oil and ground cork applied over a canvas backing. The inner bark of the cork-tree-is a valuable tanning material,

Certain of the properties and nses of cork were known to the ancient Greeks and Romans, and the latter, we find by Horace (Odes, iii. 8), used it as a stopper for wine: vessels :—

'*Corticem adstrictum pice dimovebit Amphora "—

It appears, however, that cork was not generally used for stopping bottles till so recent a period as near the end of the 17th century, and bottles themselves were not employed for storing liquids till the 15th century. Many substitutes have been proposed for cork as a stoppering agent ; but except in the case of aerated liquids none of these has recommended itself in practice. Lor aerated water bottles several successful devices have recently been introduced. 'The most simple of these is an Indian-rubber ball pressed upwards into the narrow of the bottle neck by the force of the gas contained in the water; and in another system a glass ball is similarly pressed against an Indian-rubber collar inserted in the neck of the bottle.

The cutting of corks by machinery has been found to be a matter of much difficulty, owing to the lability of the cutting edges becoming blunt, and the necessity of keeping them very sharp. Many machines have been proposed, but the work is still almost entirely done by hand labour. Messrs Crawhall & Campbell of Glasgow have recently introduced a machine which appears to be at once simple, expeditious, and efficient. The apparatus cuts corks and bungs of any diameter up to 3} inches, either parallel or tapered, and an expert workman can tum off about 6 gross of corks per hour.

CORK, a maritime county in the south-west of Treland, province of Munster, bounded on the S. by the Atlantic, E. by Waterford and 'Tipperary, N. by Limerick, and W. by Kerry. It is the largest county in Ireland, and contains an area of 1,849,686 acres, or 2890 square miles. The outline of the county is irregular; its sea margin is for the most part bold and rocky, and is intersected by the Bays of Bantry, Dunmanus, and Roaring Water. 'The southern part of the coast projects several headlands into the ocean, and its south-eastern side is indented by Cork Harbour, and Ballycotton and Youghal Bays.

The surface of the country is undulating. It consists of low rounded ridges, with corresponding valleys, running east and west, except in the western portion of the county, which is more mountainous. Thoso valleys are drained by the Blackwater, the Lee, and the Bandon River. The most elevated part of the county is in connection with the Boghra Mountains, the highest of which, Cahorbanaghor, reaches 2239 feet. North of the Blackwater the county is

Tepresents the scar limestone and Yoredale series

CORK

aratively level, being a portion of the great plain ai — a large part of the centre of Ireland. Of the principal rivers the Blackwater has its source in the county of Limerick. The Lee originates in Goughanbarra

Lake, and the Bandon River rises in the Cullinagh Lake.

There are also some smaller streams which flow directly into the sea, the more important of these being in the south- west portion of the county. No lakes of any magnitude occur, the largest being Inchigeelagh, which is an expansion Of the

The scenery of the western parts of the county is bold and rugged. In the central and eastern parts, especially in the valleys, it is green and sheltered, and in some spots well

~~of the River Lee between Macroom and its source. total area 14,868 acres are covered with water…~~

~~wooded.~~

~~Geology and Minerals.—With reference to the geology of the county, the hills are principally composed of Old Red~~

~~Sandstone, which is the lowest formation that occurs, In~~

~~the western and mountainous districts these rocks consist~~

~~of purple and green-coloured sandstones and grits—“ Qlengarriff grits”—which are several thousand feet thick. In the central and eastern districts the same rocks occur in the form of brownish purple sandstone and shales—“ brounstones.” The veins are highly contorted, and form anticlinal axes, and they exhibit change in various degrees, They are locally extensively used as building stones, and are usually split along their cleavage planes. These Old Red Sandstones have afforded no traces of fossils in this county. Upon the “ brounstones, ” the highest membet of the Old Red Sandstones, the “YellowSandstones” occur. They have a thickness of about 800 feet, and afford fossil plants, shells, and crustaceans. To the Yellow Sandstone succeeds the base of the Carboniferous group. These consist of black slaty rock—“ Carboniferous slabs.” In the eastern parts of the county these strata rise about 900 feet thick ; westwards they increase greatly, being at the Old Head of Kinsale about 6500 feet in thickness, They have at their base grey gritty beds of varying thickness—the “‘ Coomhola grits.” Both members of the series are fossiliferous, and the Car- boniferous slates have been extensively worked in many localities for roofing, They are, however, much inferior to the Baugor slates,~~

~~The principal valleys in the county of Cork, except in the case of the Bandon River, are in their lower parts occupied by Carboniferous limestone, overlying the Carboni- ferous slate and occurring at synclinal troughs. The lime- stones are commonly light grey in colour and of great thick- ness, For the most part they are very pure carbonate of lime, thick-bedded and compact. Some are usedas marbles, but their most extensive application is as building stones, Which are durable and of good colour. In~~

~~the neighbour- hood of the city of Cork (Little Island), near the centre of the synclinal trough, a brecciated red limestone is worked, being polished as a marble. It is known as " Red Cork Marble" In some localities near the city of Cork the~~

~~limestone is dolomitic, and is extensively quarried for the~~

~~manufacture of magnesia. Some portions of the limestones are very fossiliferous. Near Mallow it is thin-bedded and contains nodules of schist, Succeeding the limestone, which of England, are shales and flags, equivalents of the millstone grits, on Which lie the coal measures gouth of Kanturk. The coal 18 anthracitic, very irregular in thickness, and highly Inclined. The strata are much contorted and crushed, the coal frequently occurring in " pockets." Several seams are known, some of which are worked, These coals have only a local sale, being used principally for lime-burning.~~

~~In the south-west part of the county igneous rocks are~~

~~nal 2 ott Copper pyrites was formerly exten-~~

~~the south-west of the county, especially at~~

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~~Berehaven or Allihies,—the rocks more prolific in copper being the Yellow Sandstone series, Little is now being done at those or other copper mines in the county.~~

~~Lead also occurs in small veins, but not in sufficient quantity to be worked. Near Glandore manganese, mostly in the form of psilomelane, has been largely worked, but is now abandoned.~~

~~Clay which is used for brick-making occurs near Youghal, where there are extensive potteries, Bricks are also made from the silty clay deposited by the River Lee on small islands in the Douglas Channel.~~

Chimate.—The climate is moist and warm, the pre- vailing winds being from the west and south-west. The rain- fall in the city is about 40 inches per annwm,—that of the whole county being somewhat higher, about 44 inches. The mean average annual temperature is-about 52° Fahr. The snow-fall during the winter is usually slight, and snow rarely remains long on the ground except in sheltered places. The thermal spring of Mallow was formerly in considerable repute ; it is situated in a basin on the banks of the Black- water, rising from the base of a limestone hill, It has been long celebrated for the cure of pulmonary, chlorotic, stomach, and urinary complaints, in the cure of which its waters are said to be very efficacious. The temperature of the water, 72° Fahr., is nearly invariable. The climate of Mallow is soft and agreeable. The chief places for sea- bathing are Blackrock, Passage, Monkstown, and Queens- town in the vicinity of Cork; Kinsale, Ballycotton, and Youghal are also much frequented by invalids during the summer months.

Lisheries,—The Kinsale fishery, now established about fifteen years, promises to be the most remunerative of the industrial resources of the south of Ireland. The mackerel- fishery in 1875 commenced as usual about the middle of March, and lasted to the second week in June, at which time over £185,000 worth of fish was caught and purchased from the fishermen. In 1876 there were engaged in the trade 383 boats from Cornwall, the Isle of Man, Howth, Arklow, and Kinsale, the proportion from the last-named place numbering 60, There were also twenty-two hulks in the harbour used as icehouses, on the deck of which the fish was packed for the English markets. Eight Norwegian barks laden with ice arrived. These, with eleven steamers especially chartered for the fish trade, fifteen Jersey trading cutters for conveying fish, and three Cork tugs, comprised the staff of the local trade. The fishing boats are supplied with trains of nets, 2} miles in length and 8 feet in depth. They start early in the morning for the fishing grounds, and at sunset let down the nets. They are floated with small pieces of cork, and the bottom of the nets is sunk by heavy ropes. They are allowed to drift all night, and the mackerel are caught by running their heads into the meshes of the net. They are purchased by the fish-buyers, packed in boxes containing 120 each, and immediately forwarded per steamer to Bristol, Milford, and Holyhead, for Birming- ham, London, Manchester, and Liverpool. The fishery extends from Cape Clear nearly to Cork

Harbour. Hake, cod, and haddock, which were formerly taken in great abund- ance here, seem to have in a great measure left the coast.

Agriculture.—The soils of the county exhibit no great variety. They may be reduced in number to four :—the calcareous in the limestone districts ; the deep mellow loams found in districts remote from limestone, and generally occurring in the less elevated parts of the grey and red sandstone districts ; the light shallow soils, and the moor- land or peat soils, the usual substratum of which is coarse retentive clay.

In a district of such extent and variety of surface, the state of agriculture must be liable to much variation. The more populous parts near the sea, and in the vicinity of

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the great lines of communication, exhibit very favourable specimens of agricultural improvement.

No advancement has recently been made in the extent of land placed under tillage, and the principal crops raised are oats, potatoes, and turnips. In 1876 the total area under tillage amounted to 430,541 acres, of which 157,365 were under corn crops, 127,206 under green crops, and 145,370 grass under rotation, The corn and green crops were thus distributed in the two years 1873 and 1876 respectively

Acreage. Oats. Wheat. Barley, &c. Potatoes. Turnips. Si Bseo0c 115,990 19,133 25,470 68,338 40,476 SWIGE.. ses 117,330 18,043 21,990 71,958 39,628

Dairies are extensive, and the character of the Cork butter stands -high in the English and foreign markets. Cork possesses the largest number of live stock of any | county in Ireland, except in sheep and asses, in the former of which it is exceeded by Galway, and in the latter by Tipperary. The numbers of live stock in the years 1873 and 1876 were as follows :—

een Asses. Cattle. Sheep. Pigs. Poultry.

1873…54,044 8168 372,412 342,697 136,661 23,526 971,821 1876… 53,425 9312 365,729 322,349 170,048 25,102 1,135,951

The total value of the land, exclusive of the city of Cork, according to the return of 1875, was £1,059,994, and the average value per acre 11s. 74d.—that of all Munster being lls. 24d. The county in the same year was divided among 5889 separate proprietors, of whom 3091 possessed less than one acre, being a much larger proportion of small owners than in the rest of Munster. The average size of the hold- ings amounted to 309} acres—that of all Munster being 374, Eighteen proprietors owned upwards of 10,000 acres each, and held a total of one-fifth of the whole county. The principal proprietors were the earl of Bantry, 69,500 acres ; duke of Devonshire, 32,550; Sir George C. Colthurst (Ardrum), 31,260; Countess of Kingston (Mitchelstown), 24,421 ; earl of Kenmare, 22,700 ; earl of Cork and Orrery, 90,165; Sir H. W. Becher (Ballygiblin), 18,938 ; earl of Egmont (Lohort Castle), 16,766; R. H. E. White (Glen- garriff), 16,175; and Lord Fermoy, 15,543. Of waste ground there was estimated to be 15,350 acres.

Administration.—The county is divided into east and west ridings (the county of the city is in the east riding) ; it is subdivided into 33. baronies, containing 251 parishes, which form the diocese of Cork, Cloyne, Ross, and part of Ardfert. Since the disestablishment of the Irish Church, that body has under the diocesan scheme reduced the number of parishes by amalgamation to ninety-five.

The Cork military district has barracks at Cork (nead- quarters), Kinsale, Fermoy, Ballincollig, Queenstown, Spike Island, Camden and Carlisle Forts at the entrance to the harbour (lately fortified with all the improvements of modern science), Bandon, Youghal, and Buttevant. The constabulary force of the county consists of 674 men in the east and west ridings, two iuspectors, and seventeen sub- inspectors ; the officers have their headquarters at Cork and Bandon. 'The poor law unions are Bandon, Bantry, Castletown, Clonakilty, Cork, Dunmanway, Fermoy, Kanturk, Kinsale, Macroom, Mallow, Midleton, Mullstreet, Mitchelstown, Skibbereen, Skull, and Youghal.

Population.—The number of inhabitants in this county has greatly decreased within the last thirty years. At the last census (1871) there was a

population of 517,076 persons (males, 956,062 ; females, 261,014) ; in 1861 it was 544,818 and in 1851, 649,308, showing a decrease between 1851 and 1871 of about 20 per cent., while that of all Munster was 25 per cent. The estimated population of the county for 1875 was 507,016. The principal towns are Cork, population 102,526 ; Queenstown, 10,340; Fer-oy, 7388; Kinsale, 7050 ; Bandon, 6131 ; Youghal, 6081; Mallow, 4165; Skibbereen, 8695 ; and Midleton, 3603.

Goats.

i

During the five years ending 1875, the average number of emigrants per annum amounted to 7110, and the ial number from 1851 was 301,573, the largest proportion of any Irish county. Of late years, however, the exodus has considerably abated. .

The prevailing religion of the inhabitants is the Roman Catholic. In 1871 there were 517,076 Catholics to 49,455 Protestants (40,493 Episcopalians, and 8962 of various denominations)—-the proportion of Protestants to the whole population amounting to little more than 9} per cent., while that of all Munster was 64. '

The number of persons in 1871 of five years and upwards who could read and write was 219,074; 49,091 could read but could not write, and 183,114 could neither read nor write ; 11,628 were returned as able to speak Ese only,

Representation.—Previous to the Union the county re- turned twenty-six members to the Irish Parhament. At that time, however, the representation was reduced to eight—two for the county, two for Cork city, and one each for the boroughs of Mallow, Bandon, Youghal, and Kinsale.

History.—According to Ptolemy, the districts now known ly the names of the county of Cork and Desmond were aneiently inha- bited by the Coriondi, Udiz or Vodii, Velabori, and Uterni, which Dr Smith considers to be a corruption of the name Iberi. Before the arrival of Strongbow Cork was a kingdom of itself, governed by the MacCarthys ; but in 1172 Dermod

MacCarthy, who had sworn fealty to Henry II., threw off his allegiance, and attacked the English under Raymond le Gros, thereby forfeiting the crown. What formed his kingdom was granted by Henry II. to Robert Fitz. stephen and Milo de Cogan, with the exceptions of the city of Cork and the adjoining cantred belonging to the Ostmen of the same city, which were retained by the king. It was made shire ground by King John in 1210, who appointed sheriffs and other local officers for its government. For many years, however, the royal writs were of little efficacy in many parts of it, as the great families still virtually commanded the allegiance of the inhabitants.

Fitzstephen's share of the grant descended through the female line to the Barrys and Roches, whilst that of De Cogan became vested in Maurice Fitzgerald, growing into an extent of territory and consequent power far exceeding any ever possessed by the MacCarthys. Whilst making a show of attachment to the English, the Fitzgeralds intrigued with the foreign Roman Catholic powers (who projected the conquest of Ireland during the reign of Queen Elizabeth), and ultimately broke out into open rebellion, Alter being utterly defeated, Gerald, the fifteenth and last carl of Desmond, when a fugitive in the wilds of Kerry, was slain by an obscure individual named Kelly. Against this earl of Desmond an act of attainder was passed in 1583, and the Fitzgeralds of Desmond, after having maintained their power and possessions for upwards of 300 years, were reduced to utter ruin ; their strong castles were seized, and their vast estates, to the extent of no less than 574,628 acres, confiscated by the Crown. These were agail transferred to English settlers, called undertakers or planters, who were bound not to convey any part of the lands to the native Irish, or to intermarry with or maintain any of them. Sir Walter Raleigh obtained 40,000 acres, which afterwards passed to the family of Boyle, earl of Cork; Arthur Robius, 18,000; Hugh Worth, 12,000 ; Fane Beecher, 12,000 ; Arthur Hyde, 12,000; Sir Warham St Leger, 6000 ; Sir Thomas Norris, 6000 ; Hugh Cue, 6000 ; Thomas Say, 5800 ; Sir Richard Beacon, 1600 ; and Edmund Spenser, the poet, 3028. This attempt to set aside or extirpate the native population failed. The Irish outbade the English settlers, and were therefore, at least for a time, found to be more profitable tenants, so that ultimately they re-occupied nearly all the lands 8 tenants under the English undertakers. Jn 1602 a large portion ¢ the estates of Sir Walter Raleigh and Fane Beecher

were purchase by the earl of Cork, who had them colonized with English settlers ; and by founding or rebuilding the towns of Bandon, Clonakilty, Baltimore, Youghal, and afterwards those of Midleton, Castlemarty', Charleville, and Doneraile, which were incorporated and i parliainentary boroughs, the family cf Boyle became possessed 0 nearly the entire political power of the county. In 1641 and the following years the sons of the earl of Cork, more especially Lot Broghill, rendered good service to the Parliamentary caus ane obtained considerable military renown. The course of events led to the forfeiture of the estates of Lords Muskerry and Roche, and after ; wards of those ofthe earl of Clancarty, Viscount Kenmare, Sir Me — Nagle, and others, to the extent of 250,000 acres. Since bie

eriod no events of equal importance have occurred in this county, .

Antiquities. —The earlier antiquities of the county are 1

; he Pagan era, such as stone circles, druids' altars, 46 — as mounds of earth, and stone pillars, There are two

'e Hed druids' altars, the most perfect at Castlemary near Cloyne, mat ertain pillar stones scattered through the county, with straight "¢ a cut on the edges called Ogham inscriptions, the interpretation of which js still a subject of much controversy. —

The remains of the old ecclesiastical buildings are in a very ruinous condition, being used as burial-places by the county people. The principal is Kilerea, founded by Cormack M 'Carthy about 1465, some of the tombs of whose descendants are still in the chancel ; the

teeple is still nearly perfect, and chapter-house, cloister, dormitory,

f ' idighen can be seen. Timoleague, situated on a romantic spot * arising ground at the extremeend of Courtmacsherry Bay, contains ae tombs of interest, and is still in fair condition. — Buttevant Abbey contains some tombs of the Barrys and other distinguished families. All these were the property of the Franciscans. There are two yound towers in the county, one ina fine state of preservation opposite Cloyne Cathedral, the other at Kinneigh. From the chapter seal of Ross, which is dated 1661, and seéms to

have been a copy of a much earlier one, there isa good representation of a round tower and stone yoofed church, with St Fachnan, to whom the church is dedicated, standing by, with a book in one hand and a cross in the other. Of Mourne Abbey, near Mallow, once a preceptory of the Knights Templars, and Tracton Abbey, which once sent a prior to Parliament, the very ruins have perished. —

Of the castles, Lohort, built in the reign of king John, is by far the oldest, and in its architectural features the most interesting; it is still quite perfect and kept in excellent repair by the owner, the earl of Egmont. Blarney Castle, built by Cormack M 'Carthy about 1449, has a world-wide reputation, to which Millikin's song, " The Groves of Blarney," in no small degree contributed ; it is also bound up with the civil history of the county and the war of the great rebellion.

Castles Mahon and Macroom have been incorporated into the residences of the earls of Bandon and Bantry. 'he walls of Mallow Castle attest its former strength and extent, as also the castle of Kilbolane. "The castles of Kilerea and Dripsy are still in good condition. (R.C.)

yo)

2. Custom House, 5. Queen's College, 8. Com Exchange, | 8, Theatre, 6. Cathedral 9, Blind Asylum. Cork, a city and port, is a county in itself, 138 miles south-west of Dublin direct and 165 by rail, and 11 miles north-west of the port of Queenstown, in 51° 53' 39-3 N. lat and 8° 20' W, long. Until lately it ranked as the second city in Irelana, but of late Belfast has far surpassed it in population, wealth, and commerce. The original site of the city seems to have been located in the vicinity of the cathedral, which was founded by St Fin-Barre about 622. Tn the 9th century this place was frequently pillaged by the Northmen or Danes. :

the Four Masters, a fleet burned Cork in 821; in 846 the anes ap

osting was made to demolish their fortress ; and in 1012 a gteat fleet of foreigners burned Cork. The Danes

1. School of Design and Museum. | 4. Court House. é: Barracks.

The city was anciently ney with a wall, and we find in the city council book order for its reparation so late as the year 1748, In

the beginning of the 18th century the ground on which the principal part of the present city is built consisted of numerous islands intersected by canals or connected by drawbridges, through which small vessels could pass at high tide. The river now consists of the north and south branches. Both are lined with fine quays of cut limestone, the north spanned by four and the south by as many more bridges. The principal streets are St Patrick Street, Grand Parade, South Mall, and Great George Street. There are 517 streets, roads, lanes, and public passages in the borough, measuring 54} miles. St Patrick's Bridge is an elegant structure, commenced in 1859.

Churches.—There are eight Protestant parish churches, including the cathedral. St Luke's has lately been sepa- rated from St Ann de Shandon. There are three Roman Catholic parish churches, and the church of St Patrick. The Franciscan, Dominican, Augustinian, Carmelite, and St Vincent de Paul orders have also their respective churches ; there are besides three convents and two monas- teries. The principal church is the new Protestant cathedral, the foundation stone of which was laid, 12th January 1865. It succeeds a rather mean building, the foundation stone of which was laid in 1735 on the site of a very ancient cathedral which suffered during the siege of Cork in September 1689-90. This building is in the Early French style, and when completed will cost near £100,000. The tower and spires now being erected are the gift of two merchant princes of Cork—Mr William Crawford and Mr Francis Wise—and will cost £30,000. The entire cathedral is due to the indefatigable exertions and munificence of Dr John Gregg, bishop of Cork, Cloyne, and Ross. The other Protestant churches are extremely poor externally, except St Nicholas and St Luke's; the latter is a neat structure on the high ground north-east of the city. The Roman Catholic cathedral is being restored to suit the fine Gothic steeple which adjoins it. The other Roman Catholic churches, St Mary, St Peter and Paul, St Patrick, Holy Trinity, and St Vincent de Paul are magnificent structures, and rank amongst the finest modern ecclesiastical edifices in

Ireland. There are also the Presbyterian, a Baptist, an Independent, and two Wesleyan Methodist places of worship, as well as a Friends' meeting house.

| Public Buildings.—-The court-house is an elegant Grecian structure with a Corinthian portico about 30 feet in height. The Corn Exchange, Savings Bank, Provincial Bank, and Bank of Ireland are handsome buildings of cut limestone. The custom-house is built at the juncture of the two branches of the River Lee, and commands the river. The Commercial Buildings, Chamber of Commerce, and Hiber- nian, National, and Munster Banks all possess some archi- tectural merit.

Educational, Scientific, and Charitable Institutions.— The Queen's College, built on the site of an old feudal castle, is a fine structure, in the Tudor-Gothic style. It was opened 1849, and now possesses a library of about 22,000 volumes, a good museum, and a laboratory furnished with all the apparatus necessary for the advancement of modern scientific inquiry. The Model School has a daily attendance of about 381 pupils; Christian Brothers, 1870 pupils ; Sisters of Charity, 750 pupils ; Presentation Nuns, 1650 pupils ; Sisters of Mercy, 600 pupils; Presentation Brothers, 1200 pupils. There are also the several parochial and industrial schools which are well attended. Under the auspices of the National Board is the Cork Agricultural School, about two miles from the city, for the purpose of educating pupils exclusively in agricultural science.

The Cork Library, which was founded 1790, contairs a valuable collection of books in every department of literature. The Royal Cork Institution, established by a royal charter in 1807, in addition to an extensive library of

works chiefly scientific and historical, and a rare collection of Oriental MSS., possesses a valuable collection of minerals classified for examination. 'The fine collection of casts from the antique presented by the Pope to King George IV., which are now the property of the institution, are used by the pupils of the Cork School of Art. There are numerous literary and scientific societies, and the Cork Cuvierian and Archeological Society, which publishes a monthly report of its proceedings. There also are young

men's societies presided over by the clergy of the different religious denominations.

The North aud South Infirmary and Fever Hospital are supported by public grants, and hospitals have been estab- lished and supported by private benevolence for almost every form of human suffering. The Cork District Lunatic Asylum occupies a fine position on the brow of a hill in the western suburb, It contains a daily average of 730 patients; the recoveries are computed at about 43°3 per cent. 'The Cork Union Workhouse contains a daily average of 2000 inmates, about one-half of whom are daily under hospital treatment. The buildings, out-offices, &c., occupy about 18 acres of land; the annual income from taxation is £40,000;

The city water-works were erected under local Acts of 1852-56 at a cost of £100,000. They supply the city with 5,000,000 gallons of water daily, also 625 hydrants and 166 public fountains; the extent of main pipes is 59 miles, of service pipes, about 66, Since the passing of the Intramural Burial Act the corporation of Cork has established a new cemetery (St Fin-Barre's) about a mile west of the city, at a cost of £12,000. It is already adorned with some handsome and costly monuments. St Joseph's cemetery, founded by Father Matthew in 1830 on the site of the old Botanic Gardens of the Cork Institution, is also beautifully planted and much used.

Trade.—The Cork Butter Exchange may be considered as the centre of the most important branch of manufacture not only in the county but in the entire province of Munster. Stafford in his letters mentions the exportation of corn and butter from Cork in 1633 to Spain. The pre- sent market dates from 1769, from which time there exists an unbroken series of accounts. The largest number of firkins of butter on record that passed through the market was that of the year ending 14th April 1876. The number amounted to 431,796 firkins, representing a marketable value of nearly £1,700,000. The season 1859-60 ap- proached it very closely (431,462), which was accounted for by the gold fever then at its height in Australia, Cork being the only market capable of meeting the demand, supplying a kind of butter suited to bear a long voyage ; its prepara- tion is a spécialité, the system of classification by brand- ing being carried out under the inspection of an expert. Each firkin contains on an average 74 tb. Wheat and corn are

extensively imported into Cork, the facilities for discharging vessels of great burden being lately increased by deepening the channels of the river and erecting jetties along the Marina. For the year ending 31st December 1875 there were 620,240 quarters of wheat and 289,275 quarters of corn discharged in the port of Cork (a quarter is about 480 ib). There are three distilleries and four breweries in the city, which manufacture largely for home consumption and exportation. The tanning trade is also extensively carried on, An extensive flax-mill has been lately established, and a manufactory for chemical manure, which produces about 10,000 tons annually. A large traffic is also carried on in the exportation of cattle (for which special steamers are sometimes run twice aweek), egos, feathers, and fish, particularly salmon, for which the River Lee is celebrated. The registered tonnage of vessels at the portin1876 was 34,801. The number and tonnage of vessels

entering the port, employed in the cross channel and coast. ; ing trade, reached 2644 vessels and 667,316 tons ; in the

British colonial trade, 62 vessels of 27,641 tons ; in the

foreign trade, 637 vessels, tonnage 161,739. The custom

duties of the port average about £288,641. Municipality.—The city, which is represented in Paria.

ment by two members, is presided over by a mayor, a high

sheriff, fourteen aldermen, and forty-one town councillors It has from time to time received several charters ; the oldest, a copy of which only remains, is preserved in the Library of the British Museum (Harl., No. 441). The principal charter is that of James I. The council books of the corporation from 1610 to 1800 have just been published, Cork holds

a conspicuous place in the annals of Ireland, as will be seen by reference to the calendar of state papers, lately published under the master of the rolls.

~~On 28th September 1689-90, the city surrendered to the earl of Marlborough~~

~~after five days' siege, when the duke of Grafton was~~

~~mortally wounded, 'The Irish were in possession of the city and Elizabeth Fort adjoining, which capitulated after~~

~~being attacked with the muskets of a few soldiers, who~~

~~fired into it from the steeple of the cathedral of Cork, which was directly opposite. The principal subsequent events of any moment will be found recorded in the council books above mentioned.~~

~~Population.—The decrease in the population of the county has not extended to the city in the same proportion, In 1851 the inhabitants of the municipal borough, within an area of 2266 acres, numbered 85,745 ; in 1861, 80,121, and in 1871, 78,642 (males, 36,847 ; females, 41,795), showing a decrease within twenty years of about 8} per cent., that of the county being 20 per cent. The Parlia- mentary borough, which has an area extending to 46,086 acres, contained 102,526 inhabitants in 1871. Of the population in the municipal borough 66,716 were Catholics and 11,926 Protestants. 'The proportion of Protestants, of whom 9196 were Presbyterians and 1028 Episcopalians, is equal to 15} per cent. of the whole population, con- siderably higher than in the county. (R.c.)~~

~~CORK, Earts or. See Boyzs, vol, iv. p. 183.~~

~~CORLEONE, a town of Sicily, in the province of Palermo, about 23 miles south of the city of that name, on the slope of a hill near the head waters of the Belici, It is well built and has two castles, one in ruins and the other used as a prison, and several good churches, of which the chief was restored in 1392, The town was one of the Saracen settlements in Sicily, and the castles are believed to be of Saracen erection ; the inhabitants are principally descendants of a Lombard colony, introduced in 1227 by Frederick IL, and traces of the Lombard dialect are still observable. A fair trade is carried on with~~

Palermo. ‘The population, including the suburb of Bo

Niccolo, exceeds 16,000. CORMENIN, Lovis Marr pe 1A Haye, Viscount pE (1788-1868), a French jurist and political pamphleteer, was born at Paris, January 6, 1788, His father and his grandfather both held the rank of lieutenant-general of the admiralty. In consequence of the suppression of the colleges he received his early education at a private school at Paris, and afterwards studied in the school of law. At the age of twenty he was received advocate, and about the same time he gained some reputation asa writer of piquant and delicate poems. In 1810 he received from Napoloos I. the appointment of auditor to the council of state; a after the restoration of the Bourbons he became master requests. During the period of his connection with the council he devoted himself zealously to the study 0! administrative law, and acquired those stores | of = knowledge which afterwards furnished the material for i principal work as a jurist. He was selected to prepé

some of tho most important reports of the council. Among his separate publications at this time are noted,—Du Conseil d’ Etat envisagé comme conseil et comme juridiction dans notre monarchte constitutionelle (1818), and De la responsabilué des agents du gouvernement. In the former he claimed, for the protection of the rights of private persons in tho administration of justice, the institution of a special court whose members should be irremovable, the right of oral defence, and publicity of trial. In 1822 appeared his Questions de droit administratif, in which he for tho first time brought together and gave scientific shape to the scattered elements of administrative law. These he arranged and stated clearly in the form of aphorisms, with logical deductions, establishing them by proofs drawn from the archives of the council of state. This is reeognized as his most important work as a jurist, and has become the chief authority on its subject. It has passed through five editions, the fifth, which was published in 1840, being thoroughly revised. In 1828 Cormenin entered the Chainber of Deputies as member for Orleans, took his seat in the Left Centre, and began a vigorous opposition to the Government of Charles X. As he was not gifted with the qualifications of the orator, he seldom appeared at the tribune; but in the various committees he defended all forms of popular liberties, and at the same time delivered, in a series of powerful pamphlets, under the

pseudonym of "Timon," the most formidable blows against tyranny and all political and administrative abuses, The ministerialists named him "Y homme du contentieux." After the revolu- tion of July 1830, Cormenin was one of the 221 who signed the protest against the elevation of the Orleans dynasty to the throne ; and he resigned both his office in the council of state and his seat in the chamber. IIe was, however, soon re-elected deputy, and now voted with the extreme Left. Tho discussions on the budget in 1831 gave rise to the publication of his famous series of Lettres sur lu liste civile, which in ten years ran through twenty-five editions. In the following year lie had the distinction of being elected by four arrondissements; le took his seat for Belley. In 1834 he was elected by two arrondissements, and sat for Joigny, which he represented till 1846, In this year he lost his seat in consequence of the popular prejudice aroused against him by his trenchant pamphlet Ow? e¢ non (1845) against attacks on religious liberty, and a second entitled Feu/ Feu / (1846), written in reply to those who demanded a retractation of the former. In this he re-asserted his principles still more relentlessly. Sixty thousand copies were rapidly sold. One inevitable penalty which he had to suffer for these incisive manifestoes was exclusion from the French Academy and the Academy of Moral and Political Sciences. Cormenin was an earnest advocate of universal suffrage before the revolution of February 1848, and had remorselessly exposed the corrupt practices at elections in his pamphlet—Ordre du jour sur la corruption électorale. After the revolution he was elected by four departments to the constituent assembly, and became one of its vice- presidents. IIe was also member and president of the con- stitutional commission, and for some time took a leading part in drawing up tho republican constitution. But the disputes which broke out among the members led him to resign the presidency. IIe was soon after named member of the council of state and president of the cometé du con- tenticux, It was at this period that he published two pamphlets—Sur Pindépendence de UItalie, After the coup @état of December 2, 1851, Cormenin, who had under- taken the defence of Prince Louis Napoleon after his attempt at Strasburg, aceepted a place in the new council of state of the empire. Four years later, by imperial ordin- ance, he was inado a member of tho Institute. One of the most characteristic works of Cormenin, not yet mentioned,

is the Javre des orateurs, a series of brilliant studies of the principal parliamentary orators of the restoration and the inonarchy of July, the first edition of which appeared in 1838, and the eighteenth in 1860. In 1846 he published his Lnéretiens de village, which procured him the Montyon prize, and of which six editions were called for the same

year. His last work was Le droit de tonnage en Algérie (1860). Cormenin was distinguished also as a practical

philanthropist, and is said to have established more chari- table institutions than any layman of his time in Franco, He was admitted to the Legion of Honour in 1821, and was promoted commander in 1865. He died at Paris, May 6, 1868.

CORMONTAIGNE, Lovis pg (1696-1752), a French military engineer, was born at Strasburg. He was present as a volunteer at the sieges of Friburg and Landau, and in 1715 he entered the Engineers, From 1733 to 1745 he took part in several of the most important sieges in the Polish and Austrian wars. Having gained the rank of maréchal de camp he received chargo of the line of fortifica- tions from Calais to the Rhone ; and he built new defences at Strasburg, Metz, and Thionville, at which last place he died.

With the exception of the Architecture militaire, printed at the Hague in 1741, aud reprinted at Paris in 1809 as the Mémorial pour la fortification permanente et passagére, and extracts published and used as text-books, the works of Cormontaigne remained in MS. till the beginning of the present ceutury. First published at Berlin in 1803, the Mémorial pour Vattaque des places was printed at Paris in 1806, as also was the Mémoire pour la défense des places. All three treatises were republished, with a preface, by Bousmard in 1809.

CORMORANT—tfrom the Latin corvus marinus, through the French (in some patois of which it is. still "cor mari," and in eertain Italian dialeets "corvo marin " or "corvo marino")—a large sea-fowl belonging to the genus Phalacrocorax? (Carbo, HHalieus, and Graculus of some ornithologists), and that group of the Linnzan Order Anseres, now partly

generally recognized by Illiger's term Stayanopodes, of which it with its allies forms a Family Phalacrocoracide.

The Cormorant (P. carbo) frequents almost all tne sea- coast of Europe, and breeds in societies at various stations, most generally on steep cliffs, but occasionally on rocky islands as well as on trees. The nest consists of a large mass of sea-weed, and, with the ground immediately sur- rounding it, generally looks as though bespattered with whitewash, from the excrement of the bird, which lives entirely on fish. The eggs, from four to six m number, are small, and have a thick, soft, calcareous shell, bluish-white when first laid, but soon becoming diseoloured. The young are hatched blind, and covered with an inky-black skin. They remain for some time in the squab-condition, and are then highly esteemed for food by the northern islanders, their flesh being said to taste as well as a roasted hare's. Their first plumage js of a sombre brownish-black above, and imore or less white beneath. They take two or threo years to assume the fully adult dress, which is deep black, glossed above with bronze, and varied in the breeding-season with white on the cheeks and flanks, besides being adorned by filamentary feathers on the head, and further set off by a bright yellow gape. Tho old Cormorant looks as big as a Goose, but is really much smaller ; its flesh is quite uneatable. :

Taken when young from the nest, this bird is easily tamed and can be trained to fish for its keeper, as was of old time commonly done in England, where the Master of

Tt ee 1 Some authors, following Caius, derive the word from corvus vorans

and spell it Corvorant, but doubtless wrongly. 2So spelt since the days of Gesner; but possibly Phalarocoras

would be more correct.

the Cormorants was one of the officers of the royal house- hold. Now-a-days the practice is nearly disused, though a few gentlemen still follow it for their diversion, When taken out to furnish sport, a strap is fastened

round the bird's neck so as, without impeding its breath, to hinder it from swal- lowing its captures.1 Arrived at the waterside, it is cast off. It at once dives and darts along the bottom as swiftly as an arrow in quest of its prey, rapidly scanning every hole or pool. A fish is generally seized within a few seconds of its being sighted, and as each is taken the bird rises to the surface with its capture in its bill. It does not take much longer to dispose of the prize in the dilatable skin of its throat so far as the strap will allow, and the pursuit is recommenced until the bird's gular pouch, capacious as it is, will hold no more. It then returns to its keeper, who has been anxiously watching and encouraging its move- ments, and a little manipulation of its neck effects the delivery of the booty. It may then be let Joose again, or, if considered to have done its work, it is fed and restored to its perch. The activity the bird displays under water is almost incredible to those who have not seen its perform: ances, and in a shallow river scarcely a fish escapes its keen eyes and sudden turns, except by taking refuge under a stone or root, or in the mud that may be stirred up during the operation, and so avoiding observation.?

Nearly allied to the Cormorant, and having much the same habits is the Shag, or Green Cormoraut of some writers (P. graculus). The Shag (which name in many parts of the world is used in a generic sense) is, however, about one-fourth smaller in linear dimensions, is much more glossy in plumage, and its nuptial embellishment is a nodding plume instead of the white patches of the Cormorant. The easiest diagnostic on examination will be found to be the number of tail-feathers, which in the former are fourteen and in the Shag twelve. The latter, too, is more marine in the localities it frequents, scarcely ever entering fresh or in- deed inland waters.

In the south of Europe a still smaller sp2cies (P. pygmeus) is found, This is almost entirely a fresh-water bird, and is not uncommon on the lower Danube, Other species, to the number perhaps of thirty or more, have been discriminated from other parts of the world, but all have a great general similarity to one another. New Zealand and the west coast of Northern America are particularly rich in birds of this genus, and the species found there are the most beautifully decorated of any. All, however, are remarkable for their curiously-formed feet, the four toes of each being connected by a web, for their long stiff tails, and for the absence, in the

~~adult, of any exterior nostrils. When gorged, or when the state of the tide precludes fishing, they are fond of sitting on an elevated perch, often with extended wings, and in this attitude they will remain motionless for a considerable time, as thongh hanging themselves out to dry, but hardly, as the fishermen report, sleeping the while. It was perhaps this peculiarity that struck the observation of Milton, and prompted his well- known similitude of Satan to a Cormorant (Parad. Lost, iv. 194); but when not thus behaving they themselves provoke the more homely comparison of a row of black bottles. Their voracity is proverbial. (A. N.)~~

~~CORN LAWS. Legislation on corn was early applied both to the home and foreign trade in this essential pro- duce. Roads were so bad, and the chain of home trade so feeble, that there was often scarcity of grain in one part, and~~

~~1 It was formerly the custom, as we learn from Willughby, to carry the Cormorant hooded till its services were required, by which means it was kept quiet. At the present time its bearer wears a wire-mask to protect his eyes and face from the bird's beak.~~

- ~~See Capt. Salvin's chapters on " Fishing with Cormorants," ap- pended to his and Mr Freenian's Falconry (London: 1859).~~

~~COR — plenty in another part of the same kingdom. Export by sea or river to some foreign market was in many cases more easy than the carriage of corn from one market to another within the country. the diversity and fluctuation of prices, were thus extreme, Tt was out of this general situation that the first corn laws arose, and they appear to have been wholly directed towards lowering the price of corn. and home merchandize in grain was in no repute or tolera- tion. domains of the Crown, was paid in kind, the sovereign, the barons, and other landholders had little interest in the price of corn different from that of other classes of people,~~

~~for re-sale or export.~~

~~| to realize the highest medium price in Engla~~

~~COR~~

The frequency of local dearths, and

Exportation was prohibited,

As long as the rent of land, including the extensive

the only demand for corn being for consumption, and not But as rents of land came to be paid in money, the interest of the farmer to be distinguished by a remove from that of the landowner, the difference between town and country to be developed, and the business of society to be more complex, the ruling powers of the state were likely to be actuated by other views ; and hence the force which corn legislation afterward assumed in favour of what was deemed the agricultural interest. But during four centuries after the Conquest the corn law of England simply was that export of corn was prohibited, save in years of extreme plenty under forms of state Jicence, and that producers carried their surplus grain into the nearest market town, and sold it there for what it would bring among those who wanted it to consume ; and the same rule prevailed in the principal countries of the Continent, This policy, though, as one may argue from its long continuance, probably not felt to be acutely oppressive, was of no avail in removing the evils against which it was directed. On the contrary it prolonged and aggravated them, 'The pro- hibition of export discouraged agricultural improvement, and in so much diminished the security and liberality even of domestic supply ; while the intolerance of any home dealing or merchandize in corn prevented the growth of a commercial and financial interest strong enough to improve the means of transport by which the plenty of one part of the same country could have come to the aid of the scarcity in another.

Apart from this general feudal germ of legislation on corn, the history of the British corn laws, as they $ have come down to recent times, may be said to have begun with the statute in the reign of HIenry VL, 1486, by which exportation was permitted without state licence, when the price of wheat or other corn fell below certain prices, 'The reason given in the preamble of the statute was that the previous state of the law had compelled farmers to sell their corn at low prices, which was no doubt true, but which also showed the important turn of the tide that had then set in. M'Culloch, in his elaborate article in the Commercial Dictionary, to which reference may be made for the most authentic details on this subject, says that the fluctuation

of the prices of corn 1m that age was so great, and beyond all present conception, that 'it 18 not easy to determine whether the exportation price of és, 8d. for wheat" [12s. 10d. in present money per quarter] "was above or below the medium price." But while the medium price of the kingdom must be held to be unascertainable in a remote time, when the medium price in any prin¢ market town of England did not agree with that of another for any year or series of years, one may readily perceive tha the cultivators of the wheat lands im the Si counties of England, for example, who could pe eae have sold their produce in that age to Dutch merchan : better advantage than in their own market towns, or ie in London, but were prohibited to export abroad, ane y

ae : ; snlies at home 8° had no means of distributing their supphes 7 pe até

CORN

felt aggrieved, and that their barony, and knights of the shire would have a common interest in making a strong effort to rectify the injustice in Parliament. This object appears to have been in some measure accomplished by this statute, and twenty-seven years afterwards (1463) a decided step was taken towards securing to agriculturists a monopoly of the home market by a statute prohibitory of importation from abroad, foreign import was to be permitted only at and above the point of prices where the export of domestic produce was prohibited. 'The landed interest had now adopted the idea of sustaining and equalizing the value of corn, and promoting their own industry and gains, which for four centuries, under various modifications of plan, and great changes of social and political condition, were to maintain a firm place in the legislation and policy of England, But there were many reasons why this idea, when carried into practice, should not have the results

anticipated from it.

The import of grain from abroad, even in times of dearth

. and high prices at home, could not be considerable as long as the policy of neighbouring countries was to prohibit ex- port; nor could the export of native corn, even with the | Dutch and other European ports open to such

supplies, be effective save in limited maritime districts, as long as the internal corn trade was suppressed, not only by want of The regulation of liberty of

roads, but by legal interdict. export and import by rates of price, moreover, had the same practical objection as the various sliding-scales, bounties, and other legislative expedients down to 1846, viz. that they failed, probably more in that age than in later times, to create a permanent market, and aimed only at a casual trade, When foreign supplies were needed, they were often not to be found; and when there was an excess of corn in the country a profitable outlet was both difficult and uncertain. It would appear, indeed, that during the Wars of the Roses the statutes of Henry VI. and Edward TV. had become obsolete; for a law regulating export prices in identical terms of the law of 1436 was re-enacted

in the reign of Philip and Mary (1554). In the preceding reign of Edward VIL, as well as in the succeeding long | reign of Elizabeth, there were unceasing complaints of the | decay of tillage, the dearth of corn, and the privations of the labouring classes ; and these complaints were met by the same kind of measures—by statutes encouraging tillage, forbidding the enlargement of farms, imposing severer re- strictions on storing and buying and selling of grain, and by renewed attempts to regulate export and import accord ing to prices. In 1562 the price at which export might take place was raised to 10s. per quarter for wheat, and 6s. 8d. for barley and malt. This only lasted a few years, and In 1570 the export of wheat and barley was permitted from particular districts on payment of a duty of 1s. 8d. per quarter, although still Hable to prohibition by the Govern- ment or local authority, while it was entirely prohibited under the old regulations from other districts. Only at the close of Elizabeth's reign (1603) did a spark of new light appear in a further statute, which removed the futile pro- "sions in favour of tillage and against enlargement of pas- toral farms, and rested the whole policy for promoting an equable supply of corn, while encouraging agriculture, on an allowed export of wheat and other grain at a duty of 2s. and 1s, 4d. when the price of wheat was not more than 20s., and of barley and malt 12s, per quarter. The import of com appears to have been much lost sight of from the period of the statute of 1463, The internal state of England, as well as the policy of other countries of Europe, was

unfavourable to any regular import of grain, though many parts of the kingdom were often suffering from dearth of 'orn. It is obvious that this legislation, carried over more than a century and a half, failed of its purpose, and that

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it neither promoted agriculture, nor increased tho supply of bread. So great a variance and conflict between the intention of statutes and the actual course of affairs might be deemed inexplicable, but for an explanation which a close economic study of the circumstances of the times affords.

Besides the general reasons of the failure already indicated, there were three special causes in active Operation, which, though not seen at the period, have become distinct enoughsince. (1) A comparatively free export of wool had been permitted in England from time immemorial. It was subject neither to conditions of price nor to duties in the times under consideration, was easier of transport and much less liable to damage than corn, and, under the extending manufactures of France and the Low Countries, was sure of a foreign as well as a domestic market. Here was one description of rural produce on which there was the least embargo, and on which some reliance could be placed that it would in all circumstances bring a fair value ; while corn, the prime rural produce, was subject as a commodity of merchandize to every difficulty, internally and externally, which meddling legislation and popular prejudice could im- pose. The numerous statutes enjoining tillage and discouraging pastoral farms—or in other words requiring that agriculturists should turn from what was profitable to what was unprofitable—had consequently no substantial effect, save in the many individual instances in which the effect may have been injurious. (2) The value of the standard money of the kingdom had been undergoing great depreciation from two opposite quarters at once. Tho pound sterling of England was reduced in weight of puro metal from £1, 18s. 9d. in 1436, the date of the first of the corn statutes, to 4s. 72d. in 1551, as far as can be esti- mated in present money, and to £1, 0s. 63d.

under the restoration of the coinage in the following year. At the same time the greater abundance of silver, which now began to be experienced in Europe from the discovery of the South American mines, was steadily reducing the in- trinsic value of the metal. Hence a general rise of prices remarked by Hume and other historians ; and hence also it followed that a price of corn fixed for export or im- port at one period became always at another period more or less restrictive of export than had been designed. (3) The wages of labour would have followed the advance in the prices of commodities had they been left free, but they were kept down by statute to the three or four pence per day at which they stood, when the pound sterling contained one-fourth more silver, and silver itself was much more valnable,—a refinement of cruelty, for which an excuse is hardly to be found in the prevailing ignorance of principles of political economy, great as that was. 'The feudal system was breaking up ; a wage-earning population was rapidly increasing both in the farms and in the towns; but the spirit of feudalism re- mained, and the iron collar of serfdom was rivetted round the necks of the labourers by these statutes many genera- tions after they had become nominally freemen.! The result was chronic privation and discontent among the common people, by which all the conditions of agriculture and trade in corn were further straitened and barbarized ; and an age, in some high respects among the most brilliant in the annals of England, was marked by an. enormous

1 Mr M'Culloch, to whose researches on this subject every subsequent writer must be much indebted, found from a comparison of the prices of corn and wages of labour in the reign of Henry VII. and the latter part of the reign of Elizabeth, that in the former period a labourer could earn a quarter of wheat in 20, a quarter of rye in 12, and a quarter of barley in 9 days ; whereas, in the latter period, to earn a quarter of wheat required 48, a quarter of rye 32, and a quarter of barley 29 days' labour. See the article Conn Laws in 8th edition of this work.

~~increase of pauperism, and by the introduction of the mer- ciful but wasteful remedy of the Poor Laws.~~

~~The corn legislation of Elizabeth remained without change during the reign of James, the civil wars, and the Commonwealth. But on the restoration of Charles I. a 1660, the question was resumed, and an Act was passed of a more prohibitory character. Export and import of corn, while nominally permitted, were alike subjected to heavy~~

~~duties—the need of the Exchequer being the paramount~~

~~consideration, while the agriculturists were no doubt pleased with the complete command secured to them in the home market, This Act was followed by such high prices of corn, and so little advantage to the revenue, that Parlia- ment in 1663 reduced the duties on import to 9 per cent. ad valorem, while at the same time raising the price at which export ceased to 48s., and reducing the duty on export from 20s. to 5s. 4d. per quarter. Ina few years this was found to be too much free-trade for the agricultural liking, and in 1670 prohibitory duties were re-imposed on import when the home price was under 53s. 4d., and a duty of 8s. between that price and 80s., with the usual make-weight in favour of home supply, that export should be prohibited when the price was 53s. 4d. and upwards. But complaints of the decline of agriculture continued to be as rife under this Act as under the others, till on the accession of William and Mary, the landed interest, taking advantage of the Revolution as they had taken advantage of the Restoration to promote their own interests, took the new and surprising step of enacting a bounty on the export of grain, which continued to infect the corn laws of the kingdom, varied, on one occasion at least, with the further complication of bounties on import, until a comparatively recent period. The duties on export being abolished, while the heavy duties on import were maintained, this is pro- bably the most one-sided form which the British corn laws ever assumed, but it was attended with none of the advan- tages anticipated. The prices of corn fell, instead of rising. There had occurred at the period of the Revolution a depreciation of the money of the realm, analogous in one respect to that which marked the first era of the corn statutes (1436-1551), and forming one of the greatest~~

difficulties which the Government of William had to encounter. 'The coin of the realm was greatly debased, and

as rapidly as the mint sent out money of standard weight

and purity, it was melted down, and disappeared from the circulation. 'The influx of silver from South America to Europe had spent its action on prices before the middle of the century ; the precious metals had again hardened in value ; and for forty years before the Revolution the price of corn had been steadily falling in money price. The liberty of exporting wool had also now been cut down before the English manufactures were able to take up the home supply, and agriculturists were consequently forced to extend their tillage. When the current coin of the kingdom became wholly debased by clipping and other knaveries, there ensued both irregularity and inflation of nominal prices, and the producers and consumers of corn found themselves equally ill at ease. The farmers com- plained that the home-market for their produce was unremunerative and unsatisfactory; the masses of the people complained with no less reason that the money wages of labour could not purchase them the usual necessaries of life. Lord Macaulay, in his Hestory of England, says of this period, with little exaggeration, that "the price of the necessaries of life, of shoes, of ale, of oatmeal, rose fast. The labourer found that the bit of metal which, when he received it, was called a shilling, would hardly, when he purchased a pot of beer or a loaf of rye bread, go as far as sixpence." The state of agriculture could not be pros- perous under these conditions, But when the Government

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of William surmounted this difficulty of the coinage, as they did surmount it, under the guidance of Sir Isaac Newton, with remarkable statesmanship, it necessarily followed that prices, so far from rising, declined, because, as one reason, they were now denominated in a solid metallic value. The rise of prices of corn attending the first years of the export bounty was consequently of very brief duration. The average price of wheat in the Winchester market, which in the ten years 1690-99 was £2, 10s., fell in the ten years 1716-25 to £1, 5s. 4d., and in the ten years 1746-85 to £1, 1s. 23d. These figures are enough to dispel much illusion as to the effect of promoting particular branches of industry by legislative and fiscal

protection. The system of corn law established in the reign of William and Mary was probably the most perfect to be conceived for advancing the agricultural interest of any country. Every stroke of the legislature seemed complete to this end. Yet it wholly failed of its purpose, because uo industrial interest whatever can by any artificial means prosper, save in harmonious cons nection with the progress of other interests. If the price of wheat again rose in 1750-60 and 1760-70 to £1, 19s. 31d. and £2, 11s. 33d., it was simply because many causes had meanwhile been at work, as invariably happens in such economic developments, the operation of which no statutes could embrace, either to control or to prevent. Between the reign of William and Mary and that of George III., the question of bounty on export of grain had, in the general progress of the country, fallen into the background, while that of the heavy embargoes on import had come to the front. Therefore it is that Burke's Act of 1773, as a deli- berate attempt to bring the corn laws into some degree of rea- son and order, is worthy of special mention. This statute permitted the import of foreign wheat at a nominal duty of 6d. when the home price was 48s. per quarter, and it stopped both the liberty to export and the bounty on export together when the home price was 44s. per quarter. There was probably an error in stopping export and cutting off bounty on export at the same point of price. But apart from this passing blemish, the statute of 1773 was worthy of the genius of Burke, and it would have been well for the country to have imbibed more fully its spirit and principles. Few questions have been more discussed or more differently interpreted than the elaborate system of corn laws dating from the reign of William and Mary. Even so careful an observer as Malthus was of opinion that the bounty on export had enlarged the area of subsistence. But a bounty on export is obviously liable to the same objection as a heavy duty on foreign import. It fails to create a natural, and therefore permanent, market for the favoured produce. The foreigner is induced at the expense of the exporting state to take the commodity at less cost than it can be pro- duced. A bounty on export consequently never adjusts itself to the real conditions either at home or abroad. That the bounty on export of com had large operation is sufficiently attested by the fact that, in the years from 1740 to 1751, bounties were paid out of the Exchequer to the amount of £1,515,000, and in 1749 alone they amounted to £324,000. But the trade thus forced was of no perma- nence, and the British exports of corn, which reached a maximum of 1,667,778

~~quarters in 1749-50, had fallen to' 600,000 quarters in 1760, and continued to decrease.~~

~~Burke's Act lasted long enough to introduce a regular 1791- import of foreign grain, varying with the abundance or 1846.~~

~~scarcity of the home harvest, yet establishing in the end a systematic preponderance of imports over exports. The period, moreover, was marked by great agricultural improve- ments, by extensive reclamation of waste lands, and by an increased home produce of wheat, in the twenty years from 1773 to 1793, of nearly 2,000,000 quarters. Nor had the course of prices been unsatisfactory. The average price~~

~~CORN~~

~~of British wheat in the twenty years was £2, 6s, 3d., and of the twenty was the price a fraction But the ideas in favour of greater freedom of trade, of which the Act of 1773 was an indication, and of which another memorable example was given in Pitt's were overwhelmed in the~~

~~in only three years under £2,~~

~~Commercial Treaty with France, extraordinary excitement caused by the French Revolution, and all the old corn law policy was destined to have a sudden revival. that an import of foreign grain at a nominal duty of 64, when the price of wheat was only 48s,, deprived them of the ascending scale of prices when it seemed due 3 and on this instigation an Act was passed in 17 91, whereby the price at which importation could proceed at the nominal duty of 6d. was raised to 54s., with a duty of 2s. 6d. from 54s, to 50s., and at 50s. and under 50s. of 24s, 3d. The bounty on export was maintained by this Act, but exportation was allowed without bounty till the price reached 46s, ; and the permission accorded by the statute of 1773 to import foreign corn at any price, to be re-exported duty free, was modified by a warehouse duty of 2s. 6d., in addition to the duties on import payable at the time of sale, when the corn, instead of being re-exported, happened to be sold for home consumption. The legislative Vigilance in this statute to prevent foreign bread from reaching the home consumer is remarkable. There were deficient home harvests for some years after 1791 » particu- larly in 1795~~

and 1797, and Parliament was forced to the new expedient of granting high bounties on importation. At this period the country was involved in a great war ; all the customary commercial relations were violently dis- turbed ; freight, insurance, and other charges on import and export were multiplied fivefold ; heavier and heavier taxes were imposed; and the capital resources of the king- dom were poured with a prodigality without precedent into the war channels. The consequence was that the price of corn, as of all other commodities, rose greatly ; and the Bank of England having stopped paying in specie in 1797, this raised nominal prices still more under the liberal use of bank paper in loans and discounts, and the difference that began to be established in the actual value of Bank of England notes and their legal par in bullion.

The average price of British wheat rose to £5, 19s. 6d. in 1801. So unusual a value must have led to a large extension of the area under wheat, and to much corn-grow- ing on land that after great outlay was ill prepared for it. In the following years there were agricultural complaints ; and in 1804, though in 1803 the average price of wheat had been as high as £2, 18s. 10d., an Act was passed, so much more severe than any previous statute, that its object would appear to have been to keep the price of corn some- where approaching the high range of 1801. A prohibitory duty of 24s. 3d. was imposed on the import of foreign wheat When the home price was 638s. or less ; and the price at which the bounty was paid on export was lowered to 40s., while the price at which export might proceed without bounty was raised to 54s. Judging from the prices that ruled during the remaining period of the French wars, this statute would appear to have been effective for its end, though, under all the varied action of the times on a rise of prices, it would be difficult to assign its proper place in the general effect. The average price of wheat rose to £4, 9s. 9d. in 1805, and the bank paper price in 1812 was as high even as £6, 6s. 6d. The bullion prices from 1809 to 1813 ranged from 86s. 6d. to 100s. 3d. But it was foreseen that when the wars ended aserious re-action would ensue, and that the rents of land, and the general condition of agriculture, under the warlike, protective, and monetary stimulation they had received, would be imperilled. In the brief peace of 1814 the average bullion price of British wheat fell to 55s.

The landowners and farmers complained

a prohibitory duty.

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8d. All the means of select committees of inquiry on agricultural distress, and new modifications of the corn laws, were again brought into requisition. The first idea broached in Parliament was to raise the duties on foreign im- ports, as well as the prices at which they were to be leviable, and to abolish the bounty on export, while permitting freedom of export whatever the home price might be. The latter part of the scheme was passed into law in the session of 1814 ; but the irritation of the manufacturing districts against the new scale of import duties was too great to be resisted. In the subsequent session an Act was passed, after much opposition, fixing 80s. (14s. more than during the wars) as the price at which import of wheat was to become free of duty. –

This Act of 1815 was intended to keep the price of wheat in the British markets at about 80s. per quarter ; but the era of war and great expenditure of money raised by public loans had ended, the ports of the Continent were again open to some measure of trade and to the equalizing effect of trade upon prices, the Bank of England and other banks of issue had to begin the uphill course of a resump- tion of specie payments, the nation had to begin to feel the whole naked weight of the war debt, and the idea of the protectors of a high price of corn was proved by the event to be an utter hallucination. The corn statutes of the next twenty years, though' Occupying an enormous amount of time and attention in the Houses of Parliament, may be briefly treated, for they are simply a record of the impotence of legislation to maintain the price of a commodity ata high point when all the natural economic causes in operation are opposed to it, In 1822 a statute was passed reducing the limit of prices at which importation could proceed to 70s, for wheat, 35s. for barley, 25s. for oats; but behind this apparent relaxation was a new scale of import duties, by which foreign grain was subject to heavy three-month duties up to a price of 85s., —17s, when wheat was 7 Os., 12s. when between 70s, and 80s., and 10s. when 85s., show- ing the grasping spirit of the would-be monopolizers of the home supply of corn, and their reluctance to believe in a lower range of value for corn as for all other com- modities. This Act never operated, for

the reason that, with the exception in some few instances of barley, prices never were so high as its projectors had contemplated, The corn trade had passed rapidly beyond reach of the statutes by which it was to be so painfully controlled ; and as there were occasional seasons of scarcity, particularly in oats, the king in council was authorized for several years to override the statutes, and do whatever the public interests might require.

In 1827 Canning introduced a new system of duties, under which there would have been a fixed duty of ls. per quarter when the price of wheat was at or above 70s., and an increased duty of 2s, for every shilling- the price fell below 69s. ; but though Canning's resolutions were adopted by a large majority in the House of Commons, his death and the consequent change of ministers involved the failure of his scheme of corn duties. In the following year Mr Charles Grant introduced another scale of import duties on corn, by which the duty was to be 23s, when the price was 64s., 16s. 8d. when the price was 69s., and only 1s. when the price was 73s. or above 78s. 'per quarter ; and this became law the same year. This sliding scale was more objectionable, as a basis of foreign corn trade, than that of Canning, though not following so closely shilling by shilling the variation of prices, because of the abrupt leaps it made in the amount of duties leviable. For example, a merchant who ordered a shipment of foreign wheat when the home price was 70s. and rising to 73s., instead of having a duty of 1s. to pay, should on a backward drop of the home price to 69s, have 16s. 8d. of duty to pay. The result was to

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Engrossing –

and fore-' stallingg'

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introduce wide and incalculable elements of speculation into all transactions in foreign corn. The prices during most part of this period were under the range at which import was practically prohibited. 'The average price of British wheat was 96s, 11d. in 1817, but from that point there was in succeeding years a rapid and progressive decline, varied only

by the results of the domestic harvests, till in 1835 the average price of wheat was 39s. 4d., of barley 99s. 11d., and oats 22s. The import of foreign grain in these years consisted principally of a speculative trade, under a privilege of warehousing accorded in the statute of 1773, and extended in subsequent Acts, by which the grain might be sold for home consumption on payment of the duties, or re-exported free, as suited the interest of the holders.

Tho Act of 1822 admitted corn of the British possessions in North America under a favoured scale of duties, and in 1825 a temporary Act was passed, allowing the import. of wheat from these provinces at a fixed duty of 5s. per quarter, irrespective of the home price, which, if maintained, would have given some stability to the trade with Canada. The idea of a fixed duty on all foreign grain, however, appears to have grown in favour from about this period. It was included in the programme of import duty reforms of the Whig Government in 1841, and fell with its propound- ers in the general election of that year. Sir Robert Peel, on succeeding to office, and commencing his remarkable carcer as a free-trade statesman, introduced and carried in 1842 a new sliding scale of duties somewhat better adjusted to the current values. But public opinion by this time had penetrated the imprudence of the whole system ; and the prime minister, convinced, as he confessed, by the argu- ments of Cobden and the Anti-Corn Law League, and stimulated into action by the failure of the potato crop in Ireland, put an effectual end to the history of the corn laws by the famous Act 9 and 10 Vict. c. 22. It was provided under this measure that the maximum duty on foreign wheat was to be immediately reduced to 10s. per quarter when the price was under 48s., to 5s. on barley: when the price was under 26s., and to 4s. on oats when the price was under 18s., with lower duties as prices rose above these figures ; but the conclusive part of the enactment was that in three years—on Ist of February 1849—these duties were to cease, and all foreign corn to be admitted at a duty of ls, per quarter, and all foreign meal and flour at a duty of 434. per cwt.—the same nominal imposts which were con- ceded to grain and flour of British possessions abroad from the date of the Act. Moreover, in 1860, even these nominal duties were abolished in a Customs Duties Act, and since that time corn and other provisions have been admitted into the United Kingdom free of all fiscal charge.

As has been remarked above more than once the distribu- tion of corn supplies in the kingdom was much impeded by laws directed against all dealing in corn as an article of ardinary merchandize, apart from questions of foreign import. or export. The theory was that when corn was plentiful in any district it should be consumed at what it would bring, without much respect to whether the next harvest might be equally abundant, or to what the imme- diate wants of an adjoining province of the same country might be. The first statute on the subject appears to have been passed in the reign of Edward VI. though the general policy had prevailed before that time both in popular prejudice and in the feudal custom ; and by this statute any one who bought corn to sell it again was made liable to two months' imprisonment with forfeit of the corn. A second offence was punished by six months' imprison- ment 'and forfeit of double the value of the corn, and a third by the pillory,'and utter ruin. Severe as this statute was, liberty was given by it to transport corn trom one

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part of the country under licence to men of approved probity, which implied that there was to be some buying of corn to sell it again and elsewhere. Practically " engrossing" came to be considered buying wholesale to sell again wholesale. '"'Forestalling" was different, and the statutes were directed against a class of dealers who went forward and bought or contracted for corn and other provisions, and spread false rumours in derogation of the public and open markets appointed by law, to which our ancestors appear to have attached much importance, and probably in these times not without reason. The statute of Edward VI. was modified by many subsequent enact- ments, particularly by the statute of 1663, by which it was declared that there could be no " engrossing " of corn when the price did not exceed 48s. per quarter, and which Adam Smith recognized, though it adhered to the variable and unsatisfactory element of price, as having contributed more to the progress of agriculture than any previous law in the statute book. In 1773 these injurious statutes were abolished, but the penal character of " engrossing" and "forestalling" had a root in the common law of England, as well as in the popular prejudice, which kept the evil alive to a later period. As the public enlighten- ment increased the judges were at no loss to give interpreta- tions of the common law consistent with

public policy. Subsequent to the Act of 1773, for example, one Waddington was convicted and punished for engrossing hops; but though this was deemed a sound and proper judgment at the time, yet it was soon afterwards overthrown in other cases, on the ground that buying wholesale to sell wholesale was not in "restraint of trade" as the former judges had assumed. Popular antipathy to corn-dealers and corn- dealing survived to still more recent times ; but meal riots, and violent interference with the stormg or move- ment of grain, may be said to have wholly disappeared from the United Kingdom since the repeal of the corn laws in 1846.

Freedom of export of corn from customs duties has Foreign become the general rule of nearly all foreign countries, ©™ laws,

The opening of so great a market as the United Kingdom for corn free of import duty, from every quarter alike, was calculated in itself to have considerable influence in dispel- ling the ancient prejudice against a free export of grain. It

is somewhat curious to remark that Spain, which has not Spain.

been forward in adopting modern ideas of trade, saw the advantage to her various splendid wheat-producing provinces of freedom of export of wheat as early as 1820, and three years afterwards extended this freedom to all "fruits of the soil" in Spain, which has since remained the policy of the country. But heavy duties on the import of cereal produce continue to be levied there, and must fall with very different effects on various parts of a kingdom in which the physical difficulties of interior transport are so great, and so little has hitherto been done to overcome them. Rice imported into any part of Spain is subject to a duty of 75s. per ton, wheat to 25s., dry pulse to 25s., oats to 21s. 8d., and barley, rye, and maize to 18s. 9d. per ton, The cereal produce of Portugal is exported free import of wheat and flour by sea, there are duties at the rate of 6 rees per kilo on wheat and 8 rees on flour ; inland, or through "dry ports," the duty is 2 rees on wheat and 4

rees on flour. Export and import of grain in France were France.

prohibited down to the period of the repeal of the British corn laws, save when prices were below certain limits in the one case and above certain

other limits in the other. But export of grain and flour from France has for many years been free of duty. On the import of grain and flour, on the other hand, France not only levies duties, but makes a distinction between countries within and beyond Europe. The duty on grain imported into France from countries

of duty, but on the Portugal.

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outside of Europe is 60 centimes, and on flour 1f, 20c., per 100 kilos, and from countries in Europe on grain 3f. 60c., and on flour 4f. 20c., per 100 kilos. These duties on import have accompanying drawbacks on export when the grain has been converted into flour, or the flour into biscuits. In Belgium the export and import of grain are alike free of duty, and, as far as we have ascertained, this remark applies also to flour and other manufactures of grain. The policy of the Netherlands, which was formerly favourable to import and export of grain from the advantages possessed by Rotterdam and Amsterdam as international entrepdts, has undergone some change in recent times. For some years prior to 1845 there was a moderate sliding scale of import duties on grain in Holland, and this gave place, on the ravages of the potato disease which fell on many parts of that country with only less severity than in Ireland, to a low fixed duty which proved satisfactory in its operation. At the present time the import duties on grain, beans, pulse, &c., are 1°50 guilders (2s. 6d.) per hectolitre, or 2°8 Winchester bushels, and on bread, biscuit, flour, 40c. (8d.) per 100 tb; these exhibit, more especially in the case of raw grain, a considerable increase on the duties which were deemed sufficient and expedient about the period of the repeal of the English corn laws. In Italy there are no duties on the export of grain, which, though extremely irregular in one season as compared with another, shows a remarkable progressive increaso within the last fifteen years. Flour does not figure largely in the list of Italian exports, and for this there may be some reason in the peculiar tax which the Italian Govern- ment levies on the milling of all grain, whether of domestic or foreign produce, and which can hardly be compensated even by drawbacks on export as long as tho domestic industry of flour-making is cramped by a

~~severe excise. This is the more worthy of being remarked, because the commerce of Italy includes a great portion of the very best qualities of wheat from the Black Sea ; and in her flour, and macaroni, and vermicelli preparations, so highly prized in her domestic consumption, she has a basis of what might become a considerable foreign trade. The duties on import of grain and flour in Italy are not high—75c. on wheat and other grain per 100 kilos, and 1-25f. on flour and 75c. on bran for the same quantity. The franc and centime, being received in the Italian custom-houses in the paper-money of the country, is of lower value than the franc and centime in France, though of the same denomination in metallic coinage. From Austria and Hungary the export of grain is also free of duty; and in the internal corn trade of the Austrian empire, important measures of improvement now pending are likely to be accomplished.~~

~~The great countries, famous for a production of raw materials much beyond their own means of consumption, are favourable, of course, to the utmost freedom of export. The empire of China itself was never unwilling to sell to foreigners tea, for which there was no domestic use. The United States promote transit and export of corn, internally and externally, with all the intelligence and resources of a civilized people. If the shareholders in railways and canals and steam-boat lines in the United States were consulted, they would probably say that this policy of freedom of export had been promoted beyond due bounds of equity. But on the other hand, the protective and prohibitive tariff of the United States on necessary supplies to agriculturists must be held to be equivalent to an embargo on the export of American corn, as well as cotton, tobacco, and other raw products of the soil, The same remark applies to Russia, which, while expediting her export of raw produce with help of borrowed capital, as much as possible, maintains a high tariff against foreign commodities, and lays the foundation even of her conquests in the interior~~

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~~of Asia, by decreeing that nothing shall be sold within her territories but what is of Russian manufacture or Russian merchandize.~~

~~The facility with which the soundest views of the The case of efficacy of freedom of trade in corn, as a permanent policy, famine. may be called in~~

question under circumstances of extremity, was shown in tlie course of the recent famine in Bengal. A cry arose in India for a prohibition of the export of rice, and was supported by some of the most enlightened organs of public opinion at home. The governor-general, Lord Northbrook, who had taken a different view of the situation, was subjected to severe rebuke ; but the more the reasons were examined the more clear it became that the wisdom was on his part and the imprudence on the other. Mau- ritius, for example, almost wholly tilled not only by subjects of Great Britain but by natives of India, would have been reduced by prohibition of export to almost as great starvation as the poor people in the districts where the harvest had failed. The rice of India, moreover, ex- ported to Europe, was of a quality seldom or never used by the common people of India, and its arrest could have been of the slightest possible utility in relieving the famished districts. Besides the whole internal trade and movement of rice in India had to be taken into considera- tion. There was extreme scarcity in several provinces of Bengal, but there was the usual abundance in many other parts of India, A decree prohibiting export would have stopped the customary movement of rice in Hindustan, diminished the supplies in all the central markets, and both aggravated the calamity and put difficulties in the way of its being overcome, The sound policy was to allow scope to all effective demand for rice in India accordivg tothe ordinary course of trade, and as there were some tens of thousands of people in a certain quarter of India who had no effective demand to offer, to bring the help of the Government to their relief. This was the policy pursued, and the result was that the famine in Bengal was relieved, as no famine in India had been before, with the least avoidable disturbance of the markets on which India is dependent for the sale of her surplus produce. (R. so.)

CORN TRADE. The effect of the opening of the ports of the United Kingdom freely to the agricultural produce of all parts of the world has been to extend the foreign trade in corn, both more rapidly in point of time and more largely in measure than could have been pre-conceived. This result was promoted by the more liberal policy which began at the same time to bo generally adopted with respect to the export and import of grain, and by the active efforts of the great corn-producing countries not only to extend their cultivation, but to increase the facilities of transport both inland and seawards. The consequence is that a commodity which, though

of the first necessity, had long been the most difficult to move under the prevailing laws and conditions of trade, has become one of the princi- pal articles of commerce. It is carried as far as any other article of merchandize, and yet is greater in bulk and in difficulty of transport than any other principal commodity with which it may be compared in value, It may be said, indeed, that if the immense imports of foreign grain into the United Kingdom, during the last thirty years, could have been foreseen when the British corn laws were repealed, the most ardent believer in the creative and compensatory resources of free trade could scarcely have reconciled tho figures with anything short of an overwhelming decline. of British agriculture, Yet the home production and trade of corn have not lost ground during this period, while agricul- tural improvement has made more progress, and the total value of the products of the soil been more signally increased than in eny provious thirty yoars that could be named, We propose in this notice to show the progress of the.

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foreign trade in corn, and the changes in the principal sources of foreign supply since 1846, as well as the effect of this unlimited competition on British agriculture and on the home trade in corn, and then to add some information as to the relation of home and foreign supply, expenses of transport, and other incidents of the trade in various prin- cipal centres.

Quantities and Sources of Foreign Supply of Corn im 1841-45 and 1871-75. —The following are the average annual quantities of corn and flour imported into the United Kingdom in the five years preceding 1846, by the various countries which were then importerst:—

Wheat

Wheat. Barley. Oats. Meal and Flour. Qis Qrs. Qrs, Nortruern HIvurorr. JRE STE abe esnopnepebeccenade + 145,601 7,188 | 99,569 SAV EUeT Incr ineicmceesiesesesies' 3,423 | 13,410 52,259 DNOVWO ...ecccersvene recon o 252 847) IDes0 ned epapenensennenpecencc 95,435 | 208,191 | 54,450 NEHGS steer ieieiceiseencriesisles 634,124 | 120,877 | 45, 879 GerMANY .....:sceeeeeeeeee 190,449 | 63,306] 68,195 1S le) nach Bpodpeeoodoeocmbeodn 14,784 1,448; 42,3389 Belgium

…...ccccesenecccceres 2,145} 1,287) 1,529 SouTHERN Evrore. IPRA douetuen ncoorticanorecce 119,686 | 19,080 3,575 Portugal …...cs.cscccccccccs 1,049 alaial ai Spall ..ccccccserseesnesvvescss 24,018 | 1,455 one THALY.. ccsccevescestteenssesoes 199,445 488 Wy MEDITERRANEAN. MOM. ccs ee ese 25,788) 4,706 Morea and Greek Islands. 2,999 ie PNW ICEY obiceaivsnun tbe eemen 8,958 4,968 il TOV Ai bi. oontas vba sine snes 15,867 | 1,276 JER SSHNIE spaonnodooacdacoa0a 196 = A | UPI abesnennondeonpeonnee 066 9 120 TRANSATLANTIC. British North America…) 27,342 Daa 3,183 | 487,920 United States.……..s…0 23,105 , 1,062 | 202,134 Rema ands Clini. rin. -metasetens 2,705 fae IRS aie JP lant Sp cabnooasccoouds 568 Be ses OTUER COUNTRIES. PATRIOT, oopagHgdsosaoaso0na 8,656 Bt ane Tasty 1bex0hlelnenngodeoooadeneoc iL ala 3 1 Channel Islands.…….. 1,906 1,118 185 Cape of Good Hope.…... 51 : ne

1,544,467 | 451,849 | 873,191 | 694,899 1,298,770 | 440,958 | 388,678 | 571,997

Average annual import…

Average annual duty- paid home consump- tion.

The most cursory observation of these figures will disclose results surprising to the present generation. It is to be remarked, for example, that down to 1846 Prassia and other countries of Germany supplied more than one- half the whole import of wheat into the United {Kingdom, that the little country of Denmark had greatly more traffic in export of grain to British ports than the whole Russian empire, and that the transatlantic trade in wheat and flour or other corn with the United Kingdom, apart from Canada, had barely begun to exist. Nor can it fail to be noticed how wide-spread the commerce in corn had become even in these circumstances, aud that it was usual to send cargoes of wheat and flour to England from places so distant as Chili and La Plata, and Australia and the East Indies.

The statistics of the corn trade have become much more voluminous since 1846, and it is necessary to give some distinction to wheat and wheat flour, and the sources of their supply. It has also followed from the great trade in

foreign grain that the measure should be weight, and not.

1 Compiled from the parliamentary returns of "Revenue, Popula-

tion, and Commerce," Sessions 1843-47.

CORN TRADE

quantity in local bushels or quarters. The Board of Trade for many years has thus given its returns of wheat and other raw grain, as well as meal and flour, in cwts. The cwt. would be equal to two bushels of 56 lb; but the weight of a bushel being usually 61 lb, the quarter (or eight bushels) is 448 tbh. The following are the average aunual quantities of corn and flour imported into the United Kingdom in the five years 1871-75 :—

AWheat, Wheat Meal and

Flour. Cwts. Cwts. IRTSSLEM ee aiines ssecoemnineaererct 11,755,591 sae IDeiianeidle n5 asaoguepopesnodueo0a0uD 304, 838 ae Germany (Prussia included).. 3,552,059 851,475 MERITS! "Snanceonananobonceoeonsnd CO 1,149,119 1,091,924 Austrian Territories ……. 68,997 bite Turkey and Roumania ……. 918,452 1) al og pagpamepnpanbemeanetar 07 1,373,947 Bo United States …...cccc0e. ee 17,658,329 1,936,599 Sal eee ruisihin neieetocones vonens 3,235,551 387,228 (CIIET, oghan oon cob anavoacensooodode 23eso9 ree Other! Countries|... -o.ueredne ss 2,397,787 1,105,425 Average annual import …..... 48,683,069 5,372,651 Average annual re-export….. 490,653 106,579 Other Grain from all Countries. Barley. Oats. Pease. Beans. inde

Cwts.…11,067,067 11,667,679 1,387,021 2,948,249 19,653,493

The import of foreign wheat and flour into the United Kingdom has increased more than sevenfold, and of all foreign grain nearly ten-fold, in the thirty years of free trade. The United States, from a small and unsteady commerce in grain, have risen to the first place, not only in wheat and flour, but in Indian corn, of which they contribute two-thirds of the supply. Russia stands second on the list, the great bulk of her export of wheat be- ing now received from the southern ports of the empire. Canada, while scarcely sustaining its former supply of flour, has increased its average annual export of wheat to the United l:ingdom from 110,000 cwts. to 3,230,000 cwts. The trade in corn has not only been extended over vast territories in

various quarters of the world which thirty years ago werecomparatively uncultivated or absolute deserts, but no former exporting country appears to have lost ground. All: have shared more or less in the general progress, though a decline in wheat is perceptible from Denmark and other countries on the northern verge of the wheat region, which now require more for home con- sumption. The increased import of barley, which is not so great as that of wheat, but still remarkable, comes chiefly from Northern Europe and France. It will be observed, from the figures denoting the ratio in which foreign supplies were taken up in the home consumption and the overplus sent to other markets in the two quinquennial periods above — compared, that the re-export of foreign grain and flour from the United Kingdom has not increased with the magnitude of the supplies, but on the contrary has much diminished. This result can only be attributed to the organization of the trade, and the intelligence with which this vast move- ment of grain is directed.

Effect of Foreign Competition on British Agriculture and Corn-Production. — The acreage of the various crops, and the numbers of live stock in the United Kingdom, are now given with all desirable accuracy in the annual agri- cultural returns, for which the country is indebted to a motion in the House of Commons in 1862 by Mr Caird,?

1 Mr Caird, afterwards M.P. for Stirling, a landowner and prac- tical agriculturist, travelled through Ireland on a tour of inquiry in the year immediately subsequent to the great failure of the potato crops, and in 1850-51 visited nearly every county in England as the commissioner of the Times. He has since pursued the same course of investigation with practised powers of judgment, which have been well verified in the actual results of the corn trade in the United

CORN TRADE

Previous to the adoption of free trade in corn, this in- formation was a subject, not of official inquiry from farm to farm, but of general estimate, which could not but err considerably. here is thus a difficulty in tracing the exact effect of a free and increasing import of foreign grain on the domestic tillage ; but the difficulty is not so great as might be supposed, nor is it of much impor- tance in view of the authentic data available during the

~~greater part of the period in question. M'Culloch, in his article on the Corn Trade, in the eighth edition of this work, estimated the acreage under wheat in England in 1852-53 at 3,000,000 acres, in Scotland 350,000, and in Ireland 400,000 acres—or 3,750,000 acres for the three kingdoms. The agricultural returns for 1867 gave 3,640,000 as the total wheat acreage of the United King- dom. M/'Culloch's estimate of the extent under barley in England, viz., 1,000,000 acres, was probably wider of the mark than his estimate of the area of wheat crops. The agricultural returns for 1867 at least gave 2,000,000 acres of barley in England ; it must be remembered, however, that in the intervening years British barley had been in increasing demand for malting, and had been commanding higher prices relatively to the prices of wheat. There is a medium authority, between M'Culloch's estimate and the undisputed agricultural returns, in the estimates of Mr Caird, who had peculiar advantages of ascertaining the acreage under every condition of crop in England as early as 1850. The result of his estimate of the agricultural arrangement in Jingland and the ascertained facts in the returns of 1867 was that, in the interval, there had been a diminution in wheat of 280,000 acres, in oats 450,000, in beans and pease 320,000, and in bare fallow 247,000— in all, under these heads, a diminution of 1,297,000 acres : but, on the other hand, an increase of barley 500,000 acres, of root crops 300,000, and of clover 20,000—in all an increase of 820,000 acres, leaving a net diminution under tillage of 477,000 acres, which may be supposed to have gone into permanent pasture. In Scotland and Ireland the effects on the area of tillage were more marked than in England. The production of wheat fell off in these countries about one-half. The loss in production of wheat in Scotland appears to have been recovered by a nearly equal increase in barley and oats; but in Ireland, besides the decrease in wheat, there was a decline of about one- sixth both in barley and oats. The returns conducted by the registrar-general of Ireland since 1848 show that the estimated yield of corn of all kinds fell from 13,500,000 quarters in 1857 to 8,800,000 quarters in 1866, and of potatoes from 3,509,000 to 3,000,000 tons in these ten years. But in the same period there was a great increase of live stock—120,000 head of cattle, 1,000,000 of sheep, and 278,000 swine. The growth of flax and of various green crops had also been extended; and the number of population depending upon agriculture had been diminished by a constant emigration to England and Scotland and abroad. There can be no doubt that the~~

~~greatest change under free trade in corn fell upon the agriculture of Ireland ; but there is no reason to believe that the total value of the produce of the soil in Ireland lost ground, while it is cer- tain that in the later development it has greatly increased. The annual produce of land is shown in one of Mr Caird's tables to be £52, 17s. in Ireland, £60, 12s. in England, and £66, 15s. in Scotland, per head of all persons owning, farming, or assisting in the cultivation of farms.~~

~~The diminution of tillage in the United Kingdom under~~

~~Kingdom. Mr Caird, at the request of the Statistical Society of London, prepared a paper on " Our Daily Food," which was published; and he contributed a second paper on the same subject, which appeared in the Journal of the Statistical Society, March 1869. Both of these papers contain valuable information,~~

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~~unlimited competition with foreign corn is so small as, when closely examined, to become almost imperceptible. For it must be borne in mind that the extension of large towns in these thirty years has occupied in building area alone what would form a considerable county, and has been spreading market gardens over always increasing spaces of what was formerly agricultural land. What has happened is that the poorer class of lands, from which crops of wheat and other corn were systematically taken, have been turned paitially into pasture, and in still larger proportion into a more various and profitable culture both of white and green crops, barley in some instances having the preference over wheat, and bare fallow in others being economized in favour of the general productive interests of the farms. Nor have the British farmers hesitated to extend greatly their wheat area from time to time, when the state of supply and the rate of prices gave a necessary stimulus. After deficient harvests and higher prices, the acreage under wheat was increased from 3,640,000 in 1867 to 3,951,000 in 1868, the harvest of which latter year was so bountiful that, what with the increased acreage, the larger average crop, and the greater weight per bushel of the finer grain, the total produce of wheat was 16,436,000 quarters of 488 ib as compared with 9,380,000 quarters in 1867. The increase of one harvest, indeed, was equal to one-third of the total annual~~

consumption of home and foreign wheat. The average price, which in May of that year, when it reached its maximum, was 78s. 8d., had fallen in December to 50s. ld. he acres under wheat in Great Britain have fallen from 3,630,300 in 1874 to 2,994,958 in 1876, but the acres under barley have increased in the same period from 2,287,987 to 2,533,106, and under oats from 2,596,384 to 2,789,583.

Tf the price of corn under free trade be considered, it will be seen, indeed, how little reason there could be for any material displacement of the domestic production ; for though there has been a small decline of the price of wheat, it has been more than met by the increase of the price of barley and oats, to the surprise of those alarmists who forget that corn can nowhere be produced without much cost, that nowhere is the average produce per acre so great as in England and Scotland, and that to its cost of produc- tion in the most fertile or distant regions there have to be — added freight and other charges, besides the ordinary rate of mercantile profit. This is clearly shown by a com- parison of the septennial average prices of grains, returned in the Gazette by the tithe commissioners. In the seven years ending Christmas 1846, the prices per imperial bushel were—

Wheat. Barley. Oats, is 0nd. 4s, 2s, Sid. 18s. 9d.

The average Gazette prices per imperial bushel in the

seven years ending 1875 were—

Wheat. Barley. Oats. 6s. 62d, 4s, 10d. os. 2hd. 14s,

When the various elements of agricultural improvement are taken into account — amelioration of the soil by drainage and manure, better methods, improved implements, and not least (since this has involved but little capital outlay) the greater economy, speed, and safety with which harvests are gathered, as well as sent to market—the production of wheat in England must be held to be as profitable now as it ever was, though the greater consumption and the rise in the price of barley have made that grain a more re- munerative crop than wheat on soils suited to the produc- tion of fine quality.

This would not in itself account, however, for what all are cognizant of, viz., a great increase of agricultural pros- perity since 1846; and the truth is that the free trade

id.

policy, and the general movement with which it was asso- ciated, opened an extraordinary demand for other farm produce than corn, of which our agriculturists were not slow to avail themselves, The estimate of live stock in the United Kingdom, antecedent to 1846, did not approach the accuracy to which M'Culloch, by his careful analysis, had reduced the estimate of acreage under corn and its produce. Conjectural enumerations of the various kinds of live stock were current which, on the first agricultural census, were found to have been almost double what could possibly have existed. The agricultural returns will reduce all uncertainty of this kind to a minimum in future. But there has been no uncertainty as to the increasing value of live stock and its produce on farms, or as to the remarkable degree in which this appreciation has tended to modify and enrich the agricultural system of the kingdom, during the whole period of freo trade. The price of meat, of dairy produce, and of wool, as well as other minor articles in the same category, has increased at least 50 per cent. ; nor has there been any sign of abatement in this rise of value, notwithstanding increasing imports of foreign live animals, and of preserved and more or less manufactured produce of foreign live stock. Mr Caird in 1863 estimated the annual value of home produce of corn consumed at £84,700,000 ; of the foreign supply of corn consumed at £25,000,000 ; of home beef and mutton, £47,200,000 ; of foreign supply, £6,500,000 ; of home butter and cheese, £30,100,000 ; of foreign supply, £8,400,000. And this does not include wool (£8,000,000), green crop not used on farms, and various other considerable articles of domestic farm produce, which have, and always must have, a great superiority in English markets.

Relation of Homs and Foreign Supply.—Since the home produce of corn stands in the general proportion to foreign supply of 84 to 25, the yield of the domestic harvests continues mainly to regulate price, and in conse- quence also the amount of import for home consumption. One or two

successive inferior harvests in the United Kingdom are accompanied with a rise of price, amounting in extreme cases to 20s. or 25s. per quarter of wheat. These higher prices bring out more extensively the surplus pro- duce of other countries than lower prices would do; but with fairly abundant domestic harvests, and the resulting lower range of prices, the import from abroad does not abruptly cease, but continues fully equal to the supply of the domestic consumption, on an equilibrium of value, which appears to have satisfied on the whole both domestic and foreign producers. According to all the authorities on the subject, the consumption of bread in the United Kingdom does not vary much from one year to another, aud certainly does not vary in the ratio of the price of bread. The difference, however, between a 6d. and 9d. quartern loaf is so considerable that it must have some effect in the house- hold economy. In 1868, when the price of bread was at the highest, the average annual consumption of 20,800,000 quarters of wheat in the previous six years fell to 19,780,000 quarters, which is about equal to a fall of 1 per cent. of consumption for 10 per cent. rise in price. It is difficult to give any mercantile problems of such magnitude a definite solution, but the necessary consumption of corn in the United Kingdom, under all variations of price, rests on a solid basis ; and given the number of acres under crop, and the average produce per acre in weight, it would not be impossible to determine the amount of foreign corn for which there would be an effective demand in the United Kingdom in any year within calculable ranges of value. The trade has been solving these questions in its own practical way. Many vessels laden with corn, from trans- atlantic and other distant countries to England, are stopped at Cork or Falmouth for orders from the consignees in

England as to what port in Western Europe they shall dis- charge at. It is necessary to read the markets to the latest points of time; and imports are made into the United Kingdom for re-export as well as home consumption. The great markets for import of corn in Western Europe exhibit little variation owing to the convenience with which supplies may be sent from one port to another ; but even in this limited though densely peopled sphere, there are elements of disturbance in supply and demand which have to be taken into account. France, for example, has pro-

bably the largest wheat area, in proportion to population, of any European country ; and yet the average produce of

wheat per acre in France is so low—15} bushels—that a bad harvest makes France a large importer, and an abundant harvest a large exporter, of wheat and flour. An increase of 1 bushel per acre in France is equal to 2,000,000 quarters. Were the average produce of wheat, by any better system of culture, to be increased in France from 15 to 18 bushels—a not immoderate attainment—she would be able alone to supply all the requirements, so far as they have been developed, of the United Kingdom.) This sur- prising effect of the difference of a bushel or two per acre in the average yield of any harvest applies equally to all the large exporting countries, such as Russia or the United

States. 'The latter country was even an importer of wheat

from England so late as 1859, but the great extension of

agriculture in the Western States and in California, and the extending practice in the Southern States of raising corn as

well as cotton, may be believed to have placed a similar abnormal occurrence at a great distance.

The question naturally arises how, from such widespread

sources and under such immense effects of good or bad

harvests in increasing or diminishing supply, the trade is so adjusted as to produce any equable degree of value and steady production of grain? Of this apparent difficulty there are two explanations—first, the regions favourable to the culture of wheat in both hemispheres are so extensive that it seldom or rather never occurs that there is a general abundance or general failure of harvests. Nature distributes this inequality so variously that the more tho commerce in corn is extended, the less is abundance or scarcity of harvest felt in any one part of the world. And secondly, the large corn-exporting countries, though they may have no market so extensive as the United Kingdom for their surplus produce, have many other markets,

not only in Western Europe, but within their own more im- mediate spheres —the ports of the Black Sea, for example, having the countries of the Mediterranean to supply, and the United States not only the inequalities of production within its own vast area, but parts of Canada, the West Indies, Mexico, and South America.

Cost of Transport.—Harbour dues, freight, and insuranco form an important elemeut in the transport of grain, Their amount affects directly the price accruing to the producers, while at the same time they require careful calculation on the part of the merchants or shippers. Where large crops have to be moved many vessels have to be chartered

1M. de Lavergne, whose valuable work on the Rural Economy of Great Britain and Ireland is well known, has given the following explanation, in a letter to Mr Caird, of the state of wheat culture in Frauce: —" The official returns give a mean yield of 144 hectolitres per hectare, the actual yield being more above than below the estimate. Eight departments—Le Nord, Oise, eAisne, Somme, Seine-ct-Oise, Seine-et-Marne, Seine, and Eure-et-Loire have a yield equal to the English average; but the forty-five departments which form the southern part of the territory do not yield more than 10 hectolitres to the hectare. This feeble yield is caused in many of the departments by bad cultivation, and in the south by the dryness of the climate in spring. The statistical returns also show 5,148,000 hectares of fallow (say 12,000,000 acres), which is in fact the third of the surface, sown with cereals.' The proportion of bare fallow in England is greatly less, and has been undergoing reduction.

beforehand, and if the rates fixed in the charters be lower or higher than what turn out to be available rates of freight in the ports, the charterers will experience an advantage or disadvantage in the price of the grain, and the sellers of corn wce versa. This difficulty is chiefly felt in the more distant voyages. From Antwerp, for example, the average expense of carrying corn to England is about 1s. to 1s. 6d. per quarter. From Spain, in addition toa difficult inland carriage, the average freight to England is about 4s. per quarter. In the United States, where corn is carried hundreds of miles by railways and canals, and over 3000 miles of sea, the cost of transport bears

~~a large proportion to the price at which the farmers can afford to sell or the merchants to buy—the latter being always ruled by the price to be realized in the great centres where corn, alike of near and distant production, finds a common level of value. At San Francisco, though the question of trans- port is almost wholly maritime, there is annually much speculation, turning chiefly on rates of freight. The harvests of California and Oregon yield a surplus produce of from 700,000 to 800,000 tons. An immense shipping is thus required at Sau Francisco every autumn and winter, and the rates of freight to Europe vary as much as from £2, 15s. to £3, 10s. per ton. . (R. SO.)~~

~~CORNARO, Luter (1467-1566), a Venetian nobleman, famous for his treatises on a temperate life. From some dishonesty on the part of his relatives he was deprived of his rank, and induced to retire to Padua, where he acquired the experience in regard to food and regimen which he has detailed in his works. In his youth he lived freely, but after a severe illness at the age of forty, he began under medical advice gradually to reduce his diet. For some time he restricted himself to a daily allowance of 12 oz. of solid food and 14 oz. of wine ; later in life he reduced still further his bill of fare, and found he could support his life and strength with no more solid meat than an egg a day. So much habituated did he become to this simple diet, that when he was above seventy years of age the addition by way of experiment of two ounces a day had nearly proved fatal. At the age of eighty-three he wrote his treatise on the The Sure and Certain Method of Attaining a Long and Healthful Ife; and this was followed by three others on the same subject, composed at the ages of eighty-six, ninety-one, aud ninety-five respectively. They are written, says Addison (Spectator, No. 195), 'with such a spirit of cheerfulness, religion, and good sense, as are the natural concomitants of temperance and sobriety." He died at the age of ninety-eight. His case is an evidence that those who have suffered the results of sensual excesses may,, not only with safety, but with advantage, adopt the opposite extreme of ascetic abstinence ; but it does not show that persons with unimpaired constitutions, living regular lives, would be the better for it. A proof of this is the rarity with which his system has been persisted in, compared with the frequency with which his books have been read.~~

~~The first three treatises were published during his life (Padua, 1558), and all four have since been frequently repriuted in the ori- ginal and other languages. An English translation of the Sure Method has gone through more than thirty editions.~~

~~CORNEILLE, Prerre (1606-1684), was born at Rouen, in the Rue de la Pie, on the 6th of June 1606. The house, which was long preserved, was destroyed a few years ago.~~

~~His father, whose Christian name was the same, was avocat du rot & la Table de Marbre du Palais, and also held the position of maitre des eaux et forets in the vicomté of Rouen. In this latter office he is said to have shown him- self a vigorous magistrate, suppressing brigandage and plunder without regard to his personal safety. He was ennobled in 1637 (it is said not without regard to his son's distinction), and the honour was renewed in favour of his~~

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~~sons Pierre and Thomas in 1669, when a general repeal of the letters of nobility recently granted had taken place. There appears, however, to be no instance on record of the poet himself assuming the "de" of nobility. His mother's name was Marthe le Pesant.~~

~~After being educated by the Jesuits of Rouen, Corneille at the age of eighteen was entered as avocat, and in 1624 took the oaths, as we are told, four years before the regular time, a dispensation having been procured. He was after- wards appointed advocate to the admiralty and to the "' waters and forests," but both these posts must have been of small value, as we find him parting with them in 1650 for the insignificant sum of 6000 livres. No other evidence of any professional employment on his part is forthcoming, though he seems to have discharged certain parochial func- tions. His first play, A/élite, was acted in 1629. by Fontenelle to have been inspired by personal experiences, and was extremely popular, either because or in spite of its remarkable difference from the popular plays of the day, those of Hardi. In 1632 Clitandre, a tragedy, followed ; in the following year La Veuve, and in 1634 the Galerie du Palais and La Suiwante, all the three last-named plays being comedies. In 1634, also, having been selected as the~~

composer of a Latin elegy to Richelieu on the occasion of the cardinal visiting Rouen, he was introduced to the sub- ject of his verses, and was soon after enrolled among the "five poets." These officers (the others being Colletet, Bois Robert, and De Etoile, who in no way merited the title, and Rotrou, who was no unworthy yokefellow even of Corneille) had for tasks the more profitable than dignified occupation of working up Richelieu's ideas into dramatic form. No one could be less suited for such work than Corneille, and he soon incurred his employer's displeasure by altering the plan of the third act of Les 7huwileries, which had been intrusted to him.

Meanwhile the year 1635 saw the production of two dramas—La Place Royale, a comedy of the same stamp as his preceding works, and Afédée, a grand but unequal tragedy. In the next year the singular extravaganza entitled L'illusion comique followed, and was succeeded by the Crd. The triumphant success of this, perhaps the most "epoch-making" play in all literature, the jealousy of Richelieu and the Academy, the open attacks of Scudéri and Mairet and others, and the pamphlet-war which followed, are among the best-known incidents in the history of letters. The trimming verdict of the Academy, when its arbitration was demanded by Richelieu, and not openly repudiated by Corneille, was virtually unimportant ; but it is worth remembering that Seudéri, a writer of at least temporary eminence and of some talent, gravely and apparently sincerely asserted and maintained of this great play that the subject was utterly bad, that all the rules of dramatic composition were violated, that the action was badly conducted, the versification constantly faulty, and the beauties as a rule stolen! Corneille himself was awkwardly situated in this dispute. The esprit bourru by which he was at all times distinguished, and which he now displayed in his rather arrogant Excuse &@ Ariste, unfitted him for controversy, and it was of vital importance to him that he should not lose the outward marks of favour which Richelieu continued to show him. Perhaps the pleasantest feature in the whole matter is the unshaken and generous admiration with which Rotrou, the only contemporary whose genius entitled him to criticise Corneille, continued to regard his friend, rival, and in some sense (though Rotrou was the younger of the two) pupil. Finding it impossible to make himself fairly heard in the matter, Corneille (who had retired from his position among the "five poets") withdrew to

Rouen and passed nearly three years in quiet there. In 1639, or at the beginning of 1640,

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appeared Jorace with a dedication to' Richelieu. The good offices of Madame de Combalet, to whom the Crd had been dedicated, and perhaps the satisfaction of the cardinal's literary jealousy, had healed what breach there may have been, and indeed the poet was in no position to quarrel with his patron, [Richelieu not only allowed him 500 crowns a year, but soon afterwards employed his omnipo- tence in reconciling the father of the poet's mistress, Marie de Lampériére, to the marriage of the lovers. These were years of considerable importance to Corneille. Not only Horace but Cinna appeared therein. A brief but very serious illness attacked him, and the death of his father increased his family anxieties by leaving his mother in very indifferent circumstances.

Towards the end of 1640 Polyeucte was produced ; and in the following year Corneille figured asa contributor to the Guirlande de Julie, a famous album which the marquis de Montausier, assisted by all the literary men of the day, offered to his lady love Julie d'Angennes. 1642 saw La Mort de Pompée and the memorable comedy of Le Menteur, which though adapted from the Spanish stood in relation to French comedy very much as Le Crd, which owed to Spain only its subject, stood to French tragedy. The sequel which followed it in 1644 was not popular, but Rodogune was a brilliant success. Théodore, a tragedy on a somewhat perilous subject, was the first of Corneille's plays which was definitely damned. Some amends may have been made to him by the commission which he received to write verses for the Zrcomphes poétiques de Louis XIII. Soon after (January 22, 1647) the Academy at last (it had twice rejected him on frivolous pleas) admitted the greatest of living French writers. Heraclius (1647), Andromede (1650), a spectacle rather than a play, Don Sanche d Aragon (1650), and Nicoméde (1651) were the products of the next few years' work ; but in 1653 Pertharite was received with decided disfavour, and the poet in disgust

resolved, like Ben Jonson, to quit the loathed stage. In this resolu- tion he persevered for six years, during which he worked at a, verse translation of the Imitation of Christ (finished in 1656), at his three Discourses on Dramatic Poetry, and at the Hxamens which are usually printed at the end of his plays. In 1659 Fouquet, the Meecenas of the time, per- suaded him to alter his resolve, and @dipe, a play which became a great favourite with Louis XIV., was the result. It was followed by Za Totson d'Or (1660), Sertorius (1662), and Sophonisbe (1663). In this latter year Corneille was included among the list of men of letters pensioned at the proposal of Colbert. He received 2000 livres. Othon (1664), Agésilas (1666), Attila (1667), and Tite et Bérénice (1670), were generally considered as proofs of failing powers,—the cruel quatrain of Boileau—

Apres l'Agésilas Hélas ! Mais apres l' Attila Hola! in the case of these two plays, and the unlucky comparison with Racine in the Bérénice, telling heavily against them. In 1665 and 1670 some versifications of devotional works addressed to the Virgin had appeared. The part which Corneille took in Psyché (1671), Molitre and Quinault being his coadjutors, showed signs of renewed vigour ; but Pulchérie (1672) and Suréna (1674) were allowed even by his faithful followers to be failures. He lived for ten years after the appearance of Suréena, but was almost silent save for the publication, in 1676, of some beautiful verses thanking Louis XIV. for ordering the revival of his plays. He died at his lodging in the Rue d'Argenteuil on the 30th of September 1684. Fornine years (1674-81), and again in 1683, his pension had, for what reason is unknown, been suspended, and he was in great straits, The story goes

the compliments of Boileau. as to his affection for his family and as to the harmony in which he lived with his brother Thomas who had married Marguerite de Lampériére, younger sister of Marie, and whose household both at Rouen and at Paris was practically one with that of his brother. better known than that which tells of the trap between the

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that at last' Boileau, hearing of this, went to the king and offered to resign his own pension if there were not money enough for Corneille, and that Louis sent the aged poet 200 pistoles. He might have said, with a great

~~English poet in like case, " I have no time to spend them." 'Two days afterwards he was dead.~~

~~Corneille was buried in the church of St Roch, where no monument marked his grave until 1821. He had six children, of whom four survived him. Pierre, the eldest son, a cavalry officer, left posterity in whom the name has continued ; Marie, the eldest daughter, was twice married, and by her second husband, M. de Farcy, became the ances- tress of Charlotte Corday. Repeated efforts have been made for the benefit of the poet's descendants, Voltaire, Charles X., and the Comédie Francaise having all borne part therein.~~

~~The portraits of Corneille (the best and most trustworthy Personal~~

~~of which is from the burin of Lasne, an engraver of Caen) appearance~~

~~represent him as a man of serious, almost of stern counten- and chaz~~

~~ance, and this agrees well enough with such descriptions as we have of his appearance and with the idea of him which we should form from his writings and conduct. His nephew Fontenelle admits that his general address and manuer were by no means prepossessing. Others use stronger language, and it seems to be confessed that either from shyness, from pride, or from physical defects of~~

~~utterance, probably from all three combined, he did not~~

~~attract strangers. Racine is said to have assured his son that Corneille made verses "cent fois plus beaux" than his own, but that his own greater popularity was owing to the fact that he took some trouble to make himself personally agreeable. Almost all the anecdotes which have been recorded concerning the greatest of French dramatists tes- tify to a rugged and somewhat unamiable self-contentment. "Je n'ai pas le mérite de ce pays-ci," he said of the court. 'Je n'en suis pas moins Pierre Corneille," he is said to have replied to his friends whenever they dared to suggest certain shortcomings in his behaviour, manner, or speech. " Je suis saoul de gloire et affamé d'argent " was his reply to Yet tradition is unanimous~~

~~*No story about Corneille is*~~

~~*two houses, and how Pierre, whose facility of versification*~~

~~*was much inferior to his brother's, would lift it when hard*~~

~~*bestead, and call out "Sans-souci, une rime!" Notwith- standing this domestic felicity, an impression is left on the reader of Corneille's biographies that he was by no means a happy man. Melancholy of temperament will partially explain this, but there were other reasons. He appears to have been quite free from envy properly so called, and to have been always ready to acknowledge the excellencies of his contemporaries. But, as was the case with a very different man—Goldsmith—praise bestowed on others always made him uncomfortable unless it were accompanied by praise bestowed on himself. As Guizot has excellently*~~

~~*said, "Sa jalousie fut celle d'un enfant qui veut qu'un*~~

~~*sourire le rassure contre les caresses que regoit son frére." Another cause of discomfort must have been the pressure of poverty. His pensions covered but a small part of his long life and were most irregularly paid. The occasional presents of rich men, such as Montauron (who gave him 1000, others say 200, pistoles for the dedication of Cinna) and Fouquet:(who commissioned @dipe), were few and far between, though they have exposed him to reflections which show great ignorance of the manners of the age. Of his professional earnings, the small sum for which, as*~~

~~*racter.*~~

~~*Popularity.*~~

~~*CORNEILLUE*~~

~~*we have seen, he gave up his offices, and the expression of Fontenelle that he practised "sans gofit et sans succés" are sufficient proof. His patrimony and his wife's dowry must liave been both trifling. On the other hand, it was during the early and middle part of his career impossible, and during the later part very difficult, for a dramatist to live decently by his pieces. It was*~~

~~not till the middle of the century that the custom of allowing the author two shares in the profits during the first run of the piece was observed, and even then revivals profited him nothing. Thomas Corneille himself, who to his undoubted talents united wonderful facility, untiring industry, and (gift valuable above all others to the playwright) an extraordinary knack of hitting the public fancy, died, notwithstanding his simple tastes, 'as pooras Job." We know that Pierre received for two of his later pieces 2000 livres each, and it would seem that this was the utmost he ever did receive.~~

~~But if his gains in money were small and insufficient, it must not be supposed that his reward in fame was stinted. Corneille, unlike many of the great writers of the world, was not driven to wait for " the next age" to do him justice. The cabal which attacked the Czd was a cabal of a purely cliquish character, and had, as we are assured on the amplest evidence, no effect whatever on the judgment of the public. All his subsequent masterpieces were received with the same ungrudging applause, and the rising star of Racine, even in conjunction with the manifest inferiority of the last five or six plays of the author of Cinna, with difficulty prevailed against the towering reputation of the latter. The great men of his time—Condé, Tureune, the maréchal de Gram- mont, the knight-errant duc de Guise—were his fervent admirers. Nor had he less justice done him by a class from whom less justice might have been expected, the brother-men of letters whose criticisms he treated with such scant courtesy. The respectable mediocrity of Chapelain might misapprehend him ; the Jesser geniuses of Scudéri end Mairet might feel alarm at his advent ; the envious Claverets and D'Aubignacs might snarl and scribble, But Balzac did him justice ; Rotrou, as we have seen, never failed in generous appreciation; Moliere in conversation and in print recognized him as his own master and the foremost of dramatists. We have quoted the informal tribute of Racine ; but it should not be forgotten that Racine, in discharge of his duty as respondent at the Academical reception of Thomas Corneille, pronounced upon the memory of Pierre perhaps the noblest and most just tribute of eulogy that ever issued from the lips of a rival, Boileau's testimony is of a more chequered character; yet he seems never to have failed in admiring Corneille when- ever his principles would allow him to do so. Of his con- duct in the poet's dire necessity we have spoken already, and tlicre is one story of the period of his extreme old age which must not be omitted.~~

Questioned as to the great men of Louis XIV.'s reign, he is said to have replied : " I only know three,—Corneille, Moliére, and myself." ** And how about Racine ?" his auditor ventured to remark. "Te was an extremely clever fellow whom I taught with great difficulty to write verse." It was reserved fur the 18th century to exalt Racine above Corneille. Voltaire, who was prompted by his natural benevolence to comment on the latter (the profits went toa relation of the poct), was not altogether fitted by nature to appreciate Corneille, and moreover, as has been ingeniously pointed out, was not a little wearied by the length of his task. HIs partially unfavourable verdict was endorsed earlier by Vauvenargues, who knew little of poetry, and later by La Harpe, whose critical stand-point has now been universally abandoned. Napoleon J. was a great admirer of Corneille ("s'il vivait je le ferais prince," he said), and under the Empire and the Restoration an approach to a sounder appreciation was

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made. But it was the glory of the romantic school, or rather of the more catholic study of letters which that school brought about, to restore Corneille to his true rank, that of the greatest writer of France,—perhaps the only oue who up to our own times can take rank with the Dantes and Shakespeares of other countries. So long, indeed, as a certain kind of criticism was pursued due appreciation was impossible. When it was thought sufficient to say with Boileau that Corneille excited, not pity or terror, but admiration which was not a tragic passion ; or that = D'un seul nom quelquefois le son dur ou bizarre

Rend un poéme cntier ou burlesque ou barbare ;" when Voltaire could think it crushing to add to his ex- posure of the " infamies" of Z'héodore—" aprés cela comment osons nous condamner Jes piéces de Lope de Véga et de Shakespeare ?" it is obvious that the Céd and Polyeucte, much more Don Sanche d'Aragon and Rodogune, were sealed books to the critic.

Almost the first thing which strikes a reader is the sin- Style and gular inequality of this poet. Producing, as he certainly has peculiari-

produced, work which classes him with the greatest names in literature, he has also signed an extraordinary quantity of verse which has not merely the

~~defects of genius, irregularity, extravagance, bizarreté, but the faults which we are apt to regard as exclusively belonging to those who lack genius, to wit, the dulness and tediousness of mediocrity. Moliére's manner of accounting for this is famous in literary history orlegend. " My friend Corneille," he said, "has a familiar who inspires him with the finest verses in the world. But sometimes the familiar leaves him to shift for himself, and then he fares very badly." That Corneille was by no means destitute of the critical faculty his Discourses and the Hxamens (often admirably acute) of his plays show well enough. But an enemy might certainly contend that a poet's critical faculty should be of the Promethean, not the Epimethean order. The fact seems to be that the form in which Corneille's work was cast, and which by an odd irony of fate he did so much to originate and make popular, was very partially suited to his talents. He could imagine admirable situations, and he could write verses of incomparable grandeur —-verses that reverberate again and again in the memory. But he could not, with the patient docility of Racine, labour at strictly propor- tioning the action of a tragedy, at maintaining a uniform rate of interest in the course of the plot and of excellence in the fashion of the verse. Especially in his later plays a verse and a couplet will crash out with fulgurous bril- liancy, and then be succeeded by pages of very second- rate declamation or argument. It was urged against hin also by the party of the Doucereusx, as he called them, that he could not manage, or did not attempt, the great passion of love, and that except in the case of Chiméne his prin- ciple seemed to be that of one of his own heroines :— '¢ Laissons, seigneur, laissons pour les petites ames Ce commerce rampant de soupirs et de flammes." (Aristie in Sertorius.)~~

~~There is perhaps some truth in this accusation, however much some of us may be disposed to think that the line just quoted is a fair enough description of the admired ecstasies of Achille and Bajazet. But these are all the defects which can be fairly urged against him; and in a dramatist bound to a less strict service they would hardly have been even remarked. On the English stage the liberty of unrestricted incident and complicated action, the power of multiplying characters and introducing prose scenes, would have exactly suited his somewhat intermit- tent genius, both by covering defects and by giving greater. scope for the exhibition of power.~~

How great that power is can escape no one. The splen-

The plays.

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did soliloquies of Medea which, as Voltaire happily says, 'annoncent Corneille," the entire parts of Rodrigune and Chimene, the final speech of Camille in Horace, the dis- covery scene of Cinna, the dialogues of Pauline and Sévére in Polyeucte, the magnificently-contrasted concep- tion and exhibition of the best and worst forms of femt- nine dignity in the Cornélie of Pompée and the Cléopatre of Rodogune, the singularly fine scene in Don Sanche d' Aragon, between the haughtiness of the Spanish nobles and the unshaken dignity of the supposed adventurer Carlos, and the characters of Aristie, Viriate, and Ser- torius himself, in the play named after the latter, are not to be surpassed in grandeur of thought, felicity of design, or appropriateness of language. Admiration may or may not properly be excited by tragedy, and until this impor- tant question is settled the name of tragedian may be at pleasure given to or withheld from the author of Lodogune. But his rank among the greatest of dramatic poets is not a matter of question. For a poet is to be judged by his best things, and the best things of Corneille are second to noue.

Itwas, however, some time before his genus came to perfection. It is undeniable that the first six or seven of his plays are of no very striking intrinsic merit. On the other hand, it requires only a very slight acquaintance with the state of the drama in France at the time to see that these works, poor as they may uow seem, must have struck the speetators as something new and surprising. The language and dialogue of Jfélite arc on the whole simple and natural, and though the construction is not very artful (the fifth act being as is not unusual in Corneille superfluous and elumsy) it is still passable. The fact that one of the characters jumps on another's back, and the rather promiscuous kissing which takes place, are nothing to the liberties usually taken in contemporary plays. A worse fault is the orixonv0la, or, to borrow Butler's expression, the Cat and Puss dialogue which abounds. But the eommon objection to the play at the time was that it was foo natural and too devoid of striking incidents. Corneille accordingly, as he tells us, set to work to cure these faults, and produced a truly

*wonderful work, Clitandre. Murders, combats, escapes and outrages of all kinds are provided ; and the language makes The Rehearsal no burlesque. One of the heroines rescues herself from a ravisher by blinding him with a hair-pin, and as she escapes the seducer apostrophizes the blood which trickles from his eye, and the weapon which has wounded it, in aspeech forty verses long. This, however, was his only attempt of the kind. HIs next four pieces were comedies. They are not particularly comic, and they labour under the same defect of construction as Afélite. But there is claimed for them the introduetion of some important improvements, sucli as the choos- ing for scencs places well known in actual life (as in the Galerie du Palais), and the substitution as a stock eomic character of the soubrette in place of the old inconvenient and grotesque nurse. It is certain, however, that there is more interval between these six plays and Médée than between the latter and Corneille's greatest drama. Here first do we find those sudden and magnificent lines which characterize the poet. The title role is, however, the only good one, andas a whole the play is heavy. Much the same may be said of its curious successor, L'il/usion comique. This is not only a play withina play, but in part of it there is actually a third involu- tion, one set of characters beholding another set discharging the parts of yet another. It contains, however, some very fine lines,—in particular, a defence of the stage and some heroics put into the mouth of a braggadocio. We have seen it said of the Cid that it is difficult to understand the enthusiasm it excited. But the difficulty can only exist for persons who are insensible to dramatic excellence, or who so strongly objeet to the forms of the French drama that they cannot relish anything so presented. 'To relish Jphigénie one must in some sort inake oneself of the age of its first spectators. But Rodrigune, Chimene, Don Diégue are not of any age but of all time. The conflicting passions of love, honour, duty, are here represented asthey never had been on a French stage, and no one who has ever felt either can be indifferent to their representation in the ** strong style" which was Corneille's own. Of the many objec- tions urged against the play, perhaps the weightiest is that which condemns the frigid and superfluous part of the Infanta. Horace, though more skilfully constructed, is perhaps less satisfactory. There is a hardness. about the younger Horace which might have been, but is not made, imposing, and Sabine's effect on the action is pies out of proportion to the space she occupies. The splendid*

eclamation of Camille, and the excellent part of the elder Horace, do not altogether atone for these defects. Cinna is perhaps gene- rally considered the poet's masterpiece, and it undoubtedly contains

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the finest single scene in all French tragedy, a scene which may take rank with any other perhaps ever written.

The blot on it is certainly the character of Emilie, who is spiteful and thankless, not

heroic. Polyeuete has sometimes been elevated to the same position.

There is, however, a certain coolness about the hero's affection for his

wife which somewhat detracts from the merit of his sacrifice; while the Christian part of the matter is scarcely so well treated as in

the Saint Genest of Rotrou or the Virgin Martyr of Massinger. On the other hand, the entire parts of Pauline and Severe are beyond praise, and the manner in which the former reconciles her duty as a wife with her affection for her lover is an astonishing success. In Pompée (for La Mort de Pompée, though the more appropriate, was not the original title) the splendid declamation of Cornélie is the chief thing to be remarked. Le Menteur, which in its English form is well known to play-goers on this side the Channel, fully deserves the honour which Moliére paid to it. Its continuation, notwithstanding the judgment of some French critics, we cannot think so happy. But Zhéodore is perhaps the most surprising of literary anomalies. 'he central situation, which so greatly shocked Voltaire and indeed all French critics from the date of the piece, does not seem to blame. A virgin martyr who is threatened with loss of honour as a bitterer punishment than loss of life offers points as powerful as they are perilous. But the treatment is thoroughly bad. From the heroine, who is in a phrase of Dryden's '¢one of the coolest and most insignificant " heroines ever drawn, to the undignified Valens, the termagant Marcelle, and the peevish Placide, there is hardly a good character. Immediately upon this in most printed editions, though older in representation, follows the play which (therein

agreeing rather with the author than with his critics) we should rank as his greatest triumph, Rodogune. Here there is hardly a weak point. The magnificent and terrible character of Cléopatre, and the contrasted dispositions of the two princes, of courso attract most attention. But the character of Rodogune herself, which has not escaped criticism, comes hardly short of these. Heraelius, despite great art and much fine poetry, is injured by the extreme complication of its argument and by the blustering part of Pulchérie. Andromédе, with the later spectacle piece, the Y'oison d' Or, do not eall for comment, and we have already alluded to the chief merit of Don Sanche, a play which, however, deserves both admiration and study. Nicoméde, often considered one of Corneille's best plays, is chiefly remarkable for the curious and unusual eharacter of its hero. Of Pertharite it need only be said that uo single critic has to our knowledge disputed the justice of its damnation. (£dipe is certainly unworthy of its subject and its author, but in Sertorius we have one of Corneille's finest plays. It is remarkable not only from its many splendid verses and for the nobility of its sentiment, but from the fact that not one of its charac- ters lacks interest, a commendation not generally to be bestowed on jts author's work. Of the last six plays we may say that perhaps only one of them, Agésilas, is almost wholly worthless. Its irregular verses make one very glad that they found few imitators. In the others, though the spectator would not be likely to appreciate them, yet the reader will find not a little verse of the brand which 'only Corneille could impose. Not a few speeches of Swréna and of Othon are of a very high order. As to the poet's non-dramatic works, we have already spoken of his extremely interesting eritical dissertations. His minor poems and poetical devotions are not likely to be read save from motives of duty or curiosity. The verse translation of 4 Kempis, indeed, which was in its day im- mensely popular (it passed through many editions), condemns it- gelf. Yet these, as well as his greater works, deserve honour as the instruments by which Corneille wrought, prehaps, a mightier change in his mother tongue than any one man ever effected. Of him much rather than of Dryden might it be said, Lateritiam invenit, reliquit marmoream. And in so saying it need not be forgotten that for some purposes brick is better than marble. The subject of the bibliography of Corneille has been recently Biblio- treated in the most exhaustive manner by M. E. Picot in his graphy. Bibliographie Cornélienne (Paris, 1875). Less elaborate but still ample information may be found in Taschereau's Vie and in M. Marty Laveaux's

edition of the Works. A short but useful list is given in Louandre's edition, vol. i. p. 47. The chief collected editions in the poet's lifetime were those of 1644, 1648, 1652, 166C (with important corrections), 1664, and 1682. In 1692 T. Corneille published a complete Théétre in 5 vols. 12mo. Numerous editions appeared in the early part of the 18th century, that of 1740 (6 vols. 12mo, Amsterdam) containing the Guvres diverses as well as the plays. Eight editions are recorded between this and that of Vol- taire (12 vols. 8vo ; Geneva, 1764, 1776, 8 vols. 4to), whose Commen- taires have often been reprinted separately. In the year IX. (1801) appeared an edition of the Works with Voltaire's commentary and criticisms thereon by Palissot (12 vols. 8vo, Paris). Since this the editions have been extremely numerous. Those chiefly to be remarked are the following. Lefévre's (12 vols. 8°, Paris, 1854), well printed and with a useful varioram commentary, lacks biblio- graphical information and is disfigured by hideous engravings. Louandre's (2 vols. 18mo, Paris, 1853), though entitled Gucres des

deux Corneitles, contains only twelve pieces with some miscellaneous works of Pierre. It is, however, very well edited, and good as far as it goes. Of Taschereau's, in the Bibliotheque Elzévirienne, only two volumes were published. Lahure's appeared in 5 vols. (1857-62) and 7 vols.(1864-66). The edition of Ch. Marty Laveaux in Regnier's Grands Ecrivains de la France (1862-1868), in 12 vols. 8vo, is likely for some time to remain the standard. In appearance and careful editing it leaves nothing to desire, containing the entire works, a lexicon, full bibliographical information, and an album of illustrations of the poet's places of residence, his arms, some title pages of his plays, facsimiles of his writings, &. Nothing is want- ing but variorum comments, which Lefévre's edition supplies. A handy edition of the plays appeared in 1873 (3 vols. 8vo Paris). Fontenelle's Life of His Uncle is the chief original authority on that subject, but Taschereau's Histoire dc la Vie et des Ouvrages de P. Corneille (1st ed. 1829, 2din the Bibl. Elzévirienne, 1855) is the standard work. Its information has been corrected and augmented in various later publications, but not materially. Of the exceedingly numerous writings relative to Corneille we can only mention the Recueil de dissertations sur plusieurs tragédies de Corneille et de Racine of the Abbé Granet (Paris, 1740), the criticisms already alluded

~~to of Voltaire, La Harpe, and Palissot, the well- known work of Guizot, Corneille et son temps, aud the essay of Sainte-Beuve. The best-known English eriticism, that of Hallam, is inadequate. The translations of separate plays are very numcer- ous, but of the complete 7édtre only one version (into Italian) is recorded by the French editors. Fontenelle tells us that his uncle had translations of the Cid in every European tongue but Turkish and Slavonic, and M. Picot's book apprises us that the latter want at any rate is now supplied. Corneille has suffered less than some other writers from the attribution of spurious works. Besides a tragedy, Sylla, the chief piece thus assigned is L'occasion perdue recouverte, a rather loose tale in verse. Internal evidence by no means fathers it on Corneille, and all external testimony (except a foolish story that the poet composed his devotional works as a yenance for its production) ascribes it to a contemporary poet antenac. It has never been included in Corneille's works. It is eurious that a translation of Statius (Thebaid, bk. iii.), an author of whom Corneille was extremely fond, though known to have been written, printed, and published, has entire y dropped out of sight. Three verses quoted by Ménage are all we possess. (G. SA.) CORNEILLE, Tuomas (1625-1709), was nearly twenty years younger than his brother, the day of his birth being August 20, 1625. His skill in verse-making seems to have shown itself early, as at the age of fifteen he composed a piece in Latin which was represented by his fellow pupils at the Jesuits' College of Rouen. He soon followed' his brother's steps, and his first piece, Les Engagements du Hasard, was acted in 1647. From this time forward he produced a constant series of plays, sometimes in collabora- tion, oftener alone. At his brother's death he succeeded to his vacant chair in the Academy. He then turned his attention to philology, producing a new edition of the Remarques of Vaugelas in- 1687, and'in 1694 a dictionary intended to supplement that of the Academy. A complete translation of Ovid's Afetamorphoses (he had published six books with the Heroic Epistles some years previously) followed in 1697. In 1704 he lost his sight and was con- stituted a "veteran," a dignity which preserved to him the privileges, while it exempted him from the duties, of an Academician. But he did not allow his misfortune to put a stop to his work, and soon produced a large G'eo- graphical and Historical Dictionary in 3 vols, folio. This was his last labour. He died on the 8th of December 1709, aged eighty-four. It has been the custom to speak of Thomas Corneille as of one who, but for the name he~~

bore, would merit no notice. This is by no means the case; on the contrary, he is rather to be commiserated for his con- nection with a brother who outshone him as he would have outshone almost any one. Of his forty-two plays (this is the utmost number assigned to him) the last edition of his complete works contains only thirty-two, but he wrote several in conjunction with other authors. Two are usually reprinted at the end of his brother's selected works. These are Ariane and the Comte d'Essex, in the former of which Rachel attained success. But of Laodice, Camma, Stilico, and some other pieces, Pierre Corneille himself said that "he wished he had written them," and he was not wont to

speak lightly. Camma especially deserves notice. Thomas Corneille is in many ways remarkable in the literary history of his time. His Zimocrate had the longest run recorded of any play in the century. For La Dévineresse he and his coadjutor De Visé received above 6000 livres, the largest sum known to have been thus paid. Lastly, one of his pieces (Le Baron des Foudrvéres) contests the honour of being the first which was hissed off the stage. (G. SA.)

CORNELIA, one of the greatest women in Roman history, was the younger daughter of Scipio Africanus the Elder, the conqueror of Carthage, and mother of the two great tribunes, Tiberius and Caius Gracchus, and of Cornelia, the wife of Scipio Africanus the younger. On the death of her husband, refusing numerous offers of marriage, including even one from King Ptolemy, she devoted herself to the education of her children, a task for which her lofty spirit and wide attainments rendered her admirably fitted, and which had the most extraordinary results. The only attack ever made upon her lofty reputa- tion was the charge that she was concerned in the death of her son-in-law, Scipio, which was, there is no reason to doubt, a mere baseless slander. On her death astatue was ereeted to her memory bearing the inscription—" Cornelia, mother of the Gracchi." She is said to have presented her sons to a Campanian lady, who asked to see her jewels, as the only jewels of which she could boast. After the murder of Caius, the second of her sons, she retired to Misenum, where she devoted herself to Greek and Latin literature, and to the society of men of letters. See Plutarch's Lives of Trb. and C. Gracchus.

CORNELIUS, Peter von, the leader of the German art revival, was born in Düsseldorf in 1784, and died in Berlin, March 6, 1867.

Cornelius, like other great painters, is reported to have manifested his artistic talent at a very early age. His father, who was inspector of the Düsseldorf Gallery, dying whilst the painter was yet a boy, the young Cornelius was stimulated to extraordinary exertions. The reasons for this he has himself pathetically expressed in a letter to the Count Raczynski. "I was in my sixteenth year," he writes, "when I lost my father, and it fell to the lot of an elder brother and myself to watch over the interests of a numerous family. It was at this time that it was attempted to persuade my mother that it would be better for me to devote myself to the trade of a goldsmith than to continue to pursue painting—in the first place, in consequence of the time necessary to qualify me for the art, and in the next, because there were already so many painters. My dear mother, however, rejected all this advice, and I felt myself impelled onward by an uncontrollable enthusiasm, to which the confidence of my mother gave new strength, which was supported by the continual fear that I should be removed from the study of that art I loved so much."

His earliest work of importance was the decoration of the choir of St Quirinus Church at Neuss. At the age of twenty-six he produced his designs from Faust. On October 14, 1811, he arrived in Rome, were he soon became one of the most promising of that brotherhood of young German painters which included Overbeck, Schadow, Veit, Schnorr, Pforr, Vogel, and Wachter,—a member of a fraternity (some of whom selected a ruinous convent for their home) who were banded together for resolute study and mutual criticism. Out of this association came the men who, though they were ridiculed at the time, were destined to found a new German school of art.

At Rome Cornelius participated, with other members of his fraternity, in the decoration of the Casa Bartoldi and the Villa Massimi, and while thus employed he was also engaged upon designs for the Nibelungenlied. From Rome he was called to Düsseldorf to remodel the Academy,

and to Munich by the then crown-prince of Bavaria, after- wards Louis I., to take the direction of those decorations which his royal highness had projected for the Glyptothek. Cornelius, however, soon found that attention to such widely separated duties was incompatible with the just performance of either, and most inconvenient to himself ; eventually, therefore, he resigned his post at Diisseldorf to throw him- self completely and thoroughly into those works for which he had been commissioved by the crown-prince. He there- fore left Diisseldorf for Munich, where he was joined by those of his pupils who elected to follow and to assist him. At the death of Director Langer, 1824-25, he became director of the Munich Academy.

The fresco decorations of the Ludwigskirche, which were for the most part designed and executed by Cornelius, are perhaps the most important mural works of modern times. The large fresco of the Last Judgment, over the high altar in that church, measures 62 feet in height by 38 feet in width. The frescoes of the Creator, the Nativity, and the Crucifixion in the same building are also upon a large scale.

Amongst his other great works in Munich may be in- cluded his decorations in the Pinakothek and in the Glyptothek ; those in the latter building, in the hall of the gods and the hall of the hero-myths, are perliaps the best Known. About the year 1839-40 he left Munich for Berlin to proceed with that series of cartoons, from the Apocalypse, for the frescoes for which he had been commissioned by Frederick William IV., and which were intended to decorate the Campo Santo, or Royal Mausoleum, forming one of the wings of the new cathedral. These were his final works.

It is difficult to convey to the English reader any adequate notion of the important position which this great designer and master spirit held in contemporary art ; for Cornelius, as an oil painter, possessed but little technical skill, nor do his works exhibit auy instinctive appreciation of colour. Even as a fresco painter his manipulative power was not great. And in critically examining the execution in colour of some of his magnificent designs, one cannot help feeling that he was, in this respect, unable to do them full justice. This criticism will even hold after making due allowance, in works of a high intellectual aim, for the claims of form over those of

colour. Cornelius and his associates formed their styles on the study of the great Italian masters, or rather, we should say, endeavoured to follow in their own works the spirit of the Italian painters. But as in family descent so in the works of genius we may sometimes detect the indications of several distinctformative influences. Thus in Cornelius the Italian strain is to a considerable extent modified by the Diirer heritage. This is true not only of Cornelius but of all the original members of the Munich school of thirty years since. This Direr influence is manifest in a tendency to overcrowding in composition, in a degree of attenuation in the proportions of and a poverty of contour in the nude figure, and also in a leaning to the selection of Gothic forms for draperies. These peculiarities are even noticeable in Corneclius's principal work of the Last Judg- ment, in the Ludwigskirche in Munich. The attenuation and want of flexibility of contour in the nude are perhaps most conspicuous in his frescoes of classical subjects in the Glyptothek, especially in that representing the conten- tion for the body of Patroclus. But notwithstanding these peculiarities there is always in his works a grandeur and nobleness of conception, as all must acknowledge who have inspected his designs for the Ludwigskirche, for the Campo Santo, &c.

The difficulty: which many have of understanding how a painter of such comparatively slight technical skill could materially influence the art of his age lies in their want of

first on the continent of Europe.'

practical knowledge of design.

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ability to estimate the value of a dominant or leading mind. They are alive only to those practical matters which come within the compass of their own understandings. Yet that mental calibre, that grasp of thought, that knowledge of principles, and that power of directing other men which Cornelius possessed, are the very qualities which are of the greatest value, since for one man who possesses them, there are thousands who have the capacity either for acquiring technical skill, for observing facts, or for administrative routine, Cornelius was a man of that far rarer order of regal

~~minds who transform wastes into kingdoms. If he were not dexterous in the handling of the brush, he could conceive and design a subject with masterly purpose. If~~

~~he had an imperfect eye for colour, in the Venetian, the~~

~~Flemish, or the English sense, he had vast mental foresight,~~

~~and could direct the German school of painting into those~~

~~paths which promise to make it, at no distant date, the He had great political prevision, too ; his favourite motto of " Deutschland tiber~~

~~'Alles" indicates the direction and the strength of his~~

~~patriotism. Carl Hermann was one of Cornelius's earliest and most~~

~~esteemed scholars, a man of simple and fervent nature, painstaking to the utmost, a very type of the finest'German student nature ; his valued scholars. that the vast importance of the practice of mural painting to the fine arts of a country consists in the necessity which it involves of obtaining the assistance of scholars in the carry- ing out, within reasonable time, of extensive mural works.~~

~~Kaulbach and Eberle were also amongst The reader may here be reminded~~

~~Hence the institution of scholarship in Germany as in the~~

~~great Italian art epoch. Every public edifice in Munich and other German cities which was embellished with frescoes, became, as in Italy, a school of art of the very best~~

~~kind; for the decoration of a public building begets a The development of this institution of scholarship in Munich was a work of time. The cartoons for the Glyptothek were all by Cornelius's own hand. In the Pinakothek his sketches and small drawings sufficed ; but in the Ludwigskirche the invention even of some of the subjects was intrusted to his scholar Hermann.~~

To comprehend and appreciate thoroughly the magnitude of the work which Cornelius accomplished for Germany, we must remember that at the beginning of this century Germany had no national school of art. Germany was in painting and sculpture behind all the rest of Europe. Yet in less than half a century Cornelius founded a great school, revived mural painting, and turned the gaze of the art world towards Munich. The German revival of mural painting had its effect upon England, as well as upon other European nations, and led to those famous cartoon com- petitions being held in Westminster Hall, and ultimately to the partial decoration of the Houses of Parliament. When the latter work was in contemplation, Cornelius, in response to invitations, visited England (November 1841). His opinion was in every way favourable to the carrying out of the project, and even in respect of the durability of fresco in the climate of England.

Cornelius, in his teaching, always inculcated a close and rigorous study of nature, but he understood by the study of nature something more than what is ordinarily implied by

1 There were, of course, other distinguished artists besides Cornelius who contributed to the success and the glory of the German art revival—notably Overbeck, who was his fast ally in that art-loving fraternity of his early manhood, Schnorr von Carolsfeld, Heinrich Hess, Wilhelm von Kaulbach, Veit, Schadow, &c.; also those scholars who assisted. in the execution of the great mural works -in Munich and elsewhiere, some of whom themselves became eminent, whilst others esteemed it a sufficient privilege to be permitted to help in the great and national work.

that expression, something more than constantly making studies from life; he meant the study of nature with an inquiring and scientific spirit. 'Study nature," was the advice he once gave, "in order that you may become acquainted with its essential forms."

The personal appearance of Cornelius could not but convey to those who were fortunate enough to come into contact with him the impression that he was a man of an energetic, firm, and resolute nature. He was below the middle height and squarely built. There was evidence of power about his

broad and overhanging brow, in his eagle eyes and firmly gripped attenuated lips, which no one with the least discernment could misinterpret. Yet there was a sense of humour and a geniality which drew men towards him; and towards those young artists who sought his teaching and his criticism he always exhibited a calm patience,

The reader may consult Mr Beavington Atkinson's excellent papers on German art, contributed to the Art Jowrnal in 1865, and Dr Forster's life of the painter, published at Munich. (W. C. T.)

CORNETO, a town of Italy with about 4000 inhabitants, in the province of Rome and district of Civita Vecchia, on the River Marta, two miles from the railway between Civita Vecchia and Leghorn. Dating probably from about the 8th century, and fortified in the 14th or 15th, it still presents a distinctly medizval aspect. Among its more interesting buildings are the now ruinous cathedral of St Maria di Castello, of the 12th century, the mansion of the Cardinal Vitelleschi, now used as a hotel, and the palazzo communale with its fresco-paintings. During the great Guelf and Ghibelline struggle Corneto adhered enthusias- tically to the Papal cause, and it was the first place in Italy that had the honour of welcoming back Gregory XI. from Avignon. Its interest to the archeologist and the traveller depends on its connection with a much earlier age; it occupies the western extremity of Montarozzi, a voleanic spur of the Ciminian Hills, which served as a necropolis for the old Etruscan city of Tarquinii, and the neigh bour- hood is rich in various kinds of Etruscan remains. The most interesting of these are the painted tombs, which, though referred to in a Latin poem of the 15th century, and the object of a commission by Innocent VIIL., were practically lost sight of till the present century. The largest, indeed, known as the Grotta del Cardinale, was discovered in 1669, but the discovery was again forgotten till 1780. General attention was drawn to the district by Mr Byres in 1842, and investigations have since beeu pro- secuted by Prince Lucien Bonaparte, Signor Avvolta, Baron Stackelberg, Kestner, and other archeologists. The subjects represented on the walls are of very miscellaneous character, and, according to the best authorities, the tombs belong to very different epochs. That known as the Grotta Querciola contains a banqueting-scene and a boar-hunt ; the Grotta del Morto, a picture of a dead man attended by mourners ; the Delle Bighe, a chariot

race; and the Del Barone, warlike games, horsemen, and similar subjects. These were all known before 1840, and several of them have become greatly decayed ; but the loss has so far been made good by more recent discoveries. Among these may be mentioned the Zomba Baietti, adorned with figures of gymnasts, dancers, and horsemen; the Del Cacciatore, with a variety of well-designed hunting scenes; and the Del Letto Funebre, with charioteers, pugilists, and other figures.

The first extant treatise on the tombs of Corncto is a manuscript of the year 1756, by an Augustinian monk, Padre Jeannicola For- livesi. See J. Byres, Hypogei, or The Sepulchral Cavernsof Tarquinia, 1842; Dennis, The Citics and Cemeteries of Etruria; and especially the Bollettino and Annali dell' Instituto di Corresp. Arch. di Roma,

which, in the earlier volumes, are full of details of the Corneto discoveries and continue to give information as occasion serves.

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CORNHERT, TuEopore (1522-1590), a Dutch writer on politics and theology, was born at Amsterdam cf a good Dutch family. While a child he was for some years in Spain and Portugal. On returning to Holland, having married a wife without fortune in defiance of the provisions of his father's will, he was obliged to accept a situation as major-domo to the father of the Henry Broderode who took SO prominent a part in the contest with Spain. Afterwards he settled in Haarlem as an engraver on copper. In 1562 he obtained the post of secretary to the city of Haarlem, and in 1564 that of secretary to the burgomasters of that city. He now threw himself into the struggle of his country against Spanish tyranny; and he was employed to draw up the famous manifesto which the prince of Orange published in 1566. Not long after he was seized and im- prisoned by the Government; but he escaped to Cleves, where he maintained himself by his art. When the States, however, obtained their freedom, Cornhert returned home, and became secretary of state ; but this position he did not long retain, on account, it is said, of the rigour with which he strove to repress military disorders. Cornhert was also famous as a theologian. At thirty years of age,

~~*having become interested in theology, and being desirous of con- sulting St Augustine, he commenced the study of Latin. He entered into controversy alike with Catholics and Reformers, with both of whom he refused to commuuicate. — Reformers, he said, were sadly wanted, but those who called themselves such were not the kind that the church required ; what was needed was apostles directly inspired from heaven. Till such were sent, he advised all churches to join together in an undogmatic communion.*~~

~~*He wrote a treatise against the capital punishment of heretics, a pamphlet defending the rebellion of the United Provinces, a preface to the Dutch grammar published by the Society of Rhetoricians of Amsterdam, and a number of poems, including, according to some, the popular song, Wilhelmus van Nassowwen, which, however, is*~~

~~*attributed by others to Philip van Mamix. His collected works appeared in 1630.*~~

~~*CORNUTUS, L. Anyaus, was a Stoic philosopher of great repute, who flourished in the reign of Nero. He was a native of Leptis, a city of Libya, but resided for the most part of his lifein Rome. He is best known as the teacher and friend of Persius, who dedicated his fifth satire to him, and in it describes in glowing terms his affection for him. The youthful poet at his death left a large sum of money and all his books to Cornutus. Cornutus took the books, but gave the money to the poet's sisters. He also revised the poems of Persius before their publication, but committed the task of editing them to Czesius Bassus, who requested the privilege of discharging that duty. He was well known to the famous men of the court of Nero and to Nero himself. Indeed, some have inferred from his name Anneus that*he was a freedman of that family, and thus connected with Seneca and Lucan. He was banished by Nero under the following circumstances. Nero intended to write a history of the Romans in heroic verse. Before beginning his work he consulted various persons, and amongst them Cornutus, as to the number of books of which it should consist. Some advised him to make his poem in 400 books, but Cornutus urged that the number was too great, and that nobody would read so long a poem, Whereupon some one said, " Chrysippus, whom you praise and imitate, wrote many more." "Yes," said Cornutus, "but these books are useful for the life of man." Nero was*~~

~~enraged, and thought of putting him to death, but contented himself with banishing him to some island. We hear nothing more of Cornutus. Cornutus seems to have been a voluminous writer, but considerable uncertainty hangs about the subject of his literary activity, owing mainly to the circumstance that we do not know how many of the writings attributed to authors of the name of~~

~~Plate IX,~~

~~424,~~

~~Cornutus are to be assigned to this one. certainty we may ascribe to him a Commentary or Notes on Virgil, which is frequently quoted by Servius. It also appears likely that he wrote notes on Persius, and that these notes form the nucleus of the Scholia which the inanuscripts attribute to Cornutus. Otto Jahn thinks that they are the production of a Cornutus who lived in the Middle Ages. He also wrote books on rhetoric, one of which, De Figuris Sententiarum, is mentioned by Aulus Gellius, and another, "Pytopucai réxvat, is noticed by Simplicius. Some have inferred from corrupt passages 11 ancient writers that he wrote tragedies and satires; but the inference is not warranted. Healso wrote ou philosophical subjects. The only work that has come down to us has appeared under the title De Natura Deorum. Theodoret and the Etymologicum Magnum speak of it as being wept 'EdAnvexs Oeodoyias, and this seems to have been its real name, It is an exceedingly interesting book, and deserves much more attention than it has received. It is~~

~~a manual of Greek theology for the use of Stoic boys. It.~~

~~is marred by many absurd etymologies, but it abounds in beautiful thoughts, worthy of the teacher of Persius. Fabricius (Bibl. Gree., vol. iii. p. 554, Harless) gives a list of the earlier editions. In this century it has been only once edited. Frederic Osanu edited it from the papers of Jean Bapt. Casp. d'Ansse de Villoison, Gottingen, 1844. Much information in regard to Cornutus will be found in Martini's Literaria Disputatio, Leyden, 1825, and in Otto Jahn's Prolegomena to Persius.~~

~~CORNWALL, the most westerly county in England, is also that which extends farthest to the south. The extreme western point of the mainland is the Land's End, 5° 41' 31" W, long.; the extreme southern pointis the Lizard Head, in 49° 57' 30" N. lat. It is bounded on all sides by the sea, except on the east, where it joins Devonshire. The River Tamar forms the general boundary between the two counties from its source in the parish of Morwenstow. At the source of the river the boundary turns westward to the sea, cutting off from Cornwall the point of Hartland. Cornwall is in effect a long promon- tory, which gradually narrows toward the Land's End, and has one deeply projecting spur ending in the Lizard. The breadth of the county is nowhere very great; and the two seas, the English and the British channels, are visible at once from several parts of the high land of the interior. The greatest length of the county, from the Tamar to the Land's End, is 80 miles. It covers an area, including the Scilly Islands, of 869,878 acres, or 1359 square miles ; contains 9 hundreds (16 divisions), 216 parishes, 28 market towns; and in 1871 had 362,343 inhabitants (169,706 males, 192,637 females). The population in 1861 numbered 369,390 persons, and in 1851 it was 355,559, showing an increase between 1851 and 1871 of 2 per cent. Cornwall] is included in the western circuit. Originally forming part of the diocese of Exeter, it was in 1876 disjoined therefrom and erected into a separate bishopric—that of Truro. The assizes for the county are held at Bodmin.~~

~~Rivers.—The rivers all flow towards the south, with the exception of the Camel and the Alan, which, uniting, fall into the sea at Padstow. Every northern coombe, however, has its streamlet. The rivers of the south coast are—the Tamar, by far the most important; the Lynher, which falls into it ; the Looe and the Fowey rivers, falling into creeks at those places; and the Fal, on which stands Falmouth. Except the Tamar none of these streanis are of great size or length of course.~~

~~Geology.—The Carbonaceous formations of North Devon extend into the north-western angle of Cornwall, but by far the greater part of the county belongs to the Devonian~~

~~COR—~~

~~With considerable | or grauwacke series of rocks, consisting of slates and~~

~~sometimes to more modern search for metals. miles from Launceston to Mount's Bay have been not untruly~~

~~high road." ground west of Mount's Bay, or in the " Meneage," or "rocky~~

~~COR~~

~~shales, which occupy much of South Devon, and occur again in North Devon and Somersetshire. From the Devonians four large patches of granite project at intervals. The Land's End district forms the most westerly of these granite patches, each one of which is of considerably less area than the granitic region of Dartmoor, east and north of which true granite does not occur in England except in Cumberland and Westmoreland. The highest point of the Dartmoor granite rises to 2050 feet. The highest point in Cornwall is Brown Willy, 1368 feet. This is in the most easterly patch of granite, and the height of each patch diminishes westward until the granite of the Scilly Isles, which lie beyond the Land's End, and belong to the saine system, reaches, at its highest, to no more than 140 feet. A large mass of serpentine occupies the district about the Lizard Head; and the Devonian rocks are traversed by numerous veins and outbreaks of trap and of " elvans,"—the name locally given to porphyries, granitic and felspathic. The most curious pile of weathered granite is the Cheese- wring, near Liskeard. Roche Rocks are formed by pro- truding trap. The mineral veins, for which Cornwall has so long been famous, occur in both the Devonian rocks and~~

~~the granitic.~~

~~Scenery.—The distinctive scenery of Cornwall is to be~~

~~observed on her coast line, which is much indented, and consists mostly of bold, rugged, and fantastically shaped rocks.~~

~~Soil.—The position of the county between two seas, and~~

~~the character of its geological formations, affect the cultiva-~~

tion of the soil, and the character of its climate. The soil of a great part of Cornwall is indifferent, and the interior,

where the ground rises to its greatest height, is so com-

pletely exposed to the sea-winds that sweep across it from

east and west, that it remains almost without cultivation.

The granite district west of Launceston is broken and picturesque, with rough ¢ors or hills and boulders. This is for the most part a region of furze and heather ; but

after passing Bodmin, the true Cornish moorland asserts itself,bare, desolate, and impracticable, broken and dug

into hillocks, sometimes due to primeval stream-works, The seventy

called "the dreariest strip of earth traversed by any English There is hardly more cultivation on the higher

country," the old Cornish name of the promontory which ends in the Lizard. Long coombes and valleys, however, descend from this upper moorland towards the coast on both sides. In them the soil is frequently rich and deep; there are good arable and pasture farms, and the natural oak wood which these coombes or gullies contain has been well cared for and increased by modern plantations. Hitherto, however, the wealth of Cornwall has lain not so much in the soil, but underground, and in the seas which beat against her coast. Hence the favourite Cornish toast,—" fish, tin, and copper."

The climate of Cornwall is peculiar. Snow seldom lies for more than a few days, and the winters are less severe than in any other part of England. The sea-winds, except in a few sheltered places, prevent timber-trees from attaining to any great size, but the air is mild, and the lower vegeta- — tion, especially in the Penzance district, is almost southern in its luxuriance. This is partly due tc the influence of the Gulf Stream, which passes but a short distance west of the Scilly Islands. Geraniums, fuchsias, myrtles, hy-drangeas, and camellias grow to a considerable size, and flourish through

the winter at Penzance and round Fal- mouth; and in the Scilly Isles a great variety of exotics may be seen flourishing in the open air, Stone fruit, and

CORNWALL

even apples and pears, do not attain the same full flavour as in the neighbouring county, owing to the want of dry heat. The pinaster, the Pinus austriaca, Pinus insignis, and other firs succeed well in the western part of the county. All native plants display a perfection of beauty hardly to be seen elsewhere, and the furze, including the double blossomed variety, and the heaths, among which Hrica vagans and ciliaris are peculiar to Cornwall, cover the moorland and the cliff summits with a blaze of the richest colour. On the whole the climate is healthy, though the constant west and south-west winds, bringing with them great bodies of cloud from the Atlantic, render it damp and showery.

Agriculture has not received so much attention here as the more remunerative although more speculative pursuit of mining. Barley, wheat, and oats are the principal corn crops, and the acréage under each of these is much the same inamount ; while of green crops one-half the acreage is occupied by turnips, a fifth by mangolds, and only a tenth by potatoes. arly potatoes, brocoli, and asparagus are grown extensively around Penzance, where the climate is very equable, and these products are sent off in large quantities to the London market. The stock of animals is considerable, and has recently been increased to sore extent. The cattle, which on some farms are used for ploughing, belong mostly to the Devon breed. The following tables, taken from the agricultural returns, show the acreage of crops and numbers of live stock in the years 1873 and 1876 respectively :—

Nonas Percentage under corn Green crops. cet = OEE ” cultivation.

1873 150,106 60,244 149,785 59 1876 143,211 60,281 138,721 60%

: Cattle. Sheep. Pigs. Horses,

1873 145,286 408,173 62,827 37,466 1876 155,950 437,440 62,206 30,613

With reference to the division of the land, according to the "Owners of Land" Return, 1873, the county was in that year divided among 13,866 separate proprietors, holding land estimated at a total value of £1,235,167. There were 8717 owners of less than 1 acre, and the largest separate holding amounted to 25,910acres. Of the whole proprietors 62 per cent. held less than 1 acre of land, which is a little under the proportion of small proprietors in the neighbouring county of Devon, and still more under thit of all England. The average size of the holdings was 54 acres, while that of all England was 34, and the average value per acre was £1, 12s, 6d. as against £3 the average of the whole country. The proprietors who in 1873 held more than 10,000 acres in the county were the following :— Viscount Falmouth, 25,910; Lord Robartes (Lanhydrock), 22,234; Hon. G. M. Fortescue (Boconnoc), 17,208; G. L. Bassett (Tehidy Park), 16,969; Earl of Mount Edgcumbe, 13,288; Duchy of Cornwall, 12,516; C.H. T. Hawkins (Probus), 12,119; and Lord John Thynne,

10,244.

Economic Geology and Mines.—The granite, the slate, and the serpentine of Cornwall are of the first importance. The mines are among the chief features of the county. Granite is largely quarried in various districts, especially at Luxulian, on the Liskeard moors, and at Penryn, and has served for the material of London and Waterloo bridges, the docks of Chatham, and many great public works. The granite of Cornwall is for the most part coarse-grained ; but in this respect it differs considerably in different places, and the coarse-grained rock is often traversed by veins of finer texture. From the Delabole quarries, in the Devonian series, near Tintagel, the best slate in the kingdom is extracted, and is largely exported; 120 tons are raised on

an average daily. These slates were in great repute in the 16th century and earlier. Serpentine is quarried in the Lizard district, where alone it is found, and, besides its use as a decorative stone, it is exported in small quantities to Bristol for the manufacture of carbonate of magnesia. China-clay is prepared artificially from decomposed granite, chiefly in the neighbourhood of St Austell, and is exported to an annual amount of about 80,000 tons. The

chief mineral productions of Cornwall, considered as objects of trade, are tin and copper, the former being found nowhere in the United Kingdom except in Cornwall and Devon. Both these metals occur most plentifully in the Devonian series, but for the most part in the neighbourhood of granite, or of its modification, elvan. The veins of ore are arranged in gronps as follows :—1. That of St Austell, chiefly stanni- ferous; 2. St Agnes, chiefly stanniferous ; 3. Gwennap, tedruth, and Camborne, chiefly cuprifcrous; 4. Breage, Marazion, and Gwinear, of mixed character; 5. St Just and St Ives, mainly stanniferous. Besides tin and copper, anti- mony ores are found where the Devonian rocks are much traversed by traps, as at Endellyon, Port Isaac, and St Germans. Manganese is also found under similar condi- tions. Some lead occurs, and some small mines are worked, but with no great results ; and iron, in lodes, as brown hematite, has been worked extensively near Lost- withiel and elsewhere. Metals occur in the lines of fault and fissure, which extend through the different geological formations of Devon and Cornwall. In Devon and in East Cornwall these lines run nearly N. and §., and are crossed by others running E. and W. In West Cornwall the lines are more bent, and the main fissures take a direction nearly parallel with the general range of land. Metallic fissures are locally termed lodes. Ores are not disseminated through all parts of the fissures in which they are found, but are gathered in patches known as "bunches of ore," the intervening portions containing strings and specks of metal, but in quantities too small to be profitably worked. It should be observed that in all lodes or fissures, whatever may be the nature of their produce, the parts most highly inclined are always the most productive. Tin occurs not only in lodes but in streams of stones and minute grains, carried from the head of the lode, where it neared the surface, apparently by some great force of water, which must have rushed from N. to §., since the great streams of tin are in all instances carried toward the S. coast. Stream tin is found immediately on the hard rocky surface of the country, and is covered by numerous tertiary deposits, which indicate that much of the coast line has been depressed and again raised, since the first deposit of the tin stones. Oxide of tin also generally occurs in the "gossan," or ochreous substance which forms the upper part of a good copper lode. The native ore from the mine or the stream-work is known as black tin. White tin is the metal after smelting. In the stream works tin pebbles are somctimes found of 10 or 12 bb weight, and great masses of rock richly impregnated with metal have

occurred weighing more than 200 ib. But the small or grain tin, as it is called, is of better quality.

Tin occurs in both granite and slate ; copper for the most part in granite. The most important Cornish copper ore is the sulphuret, commonly known as grey ore by the miners ; but copper pyrites, or the bisulphuret of copper, occurs far more frequently in both Cornwall and Devon. The tin of Cornwall has been known and worked from a period long before the dawn of certain history. Copper, which lies deeper in the earth, and consequently cannot be " streamed " for, was almost unnoticed in the county until the end of the 15th century, and little attention was paid to it until the last years of the 17th. No mine seems to have been worked exclusively for copper before the year

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1700 ; and up to that time the casual produce had been bought by Bristol merchants, to their great gain, at the rate of from £2, 10s. to £4 per ton. In1718a Mr Coster gave a great impulse to the trade by draining some of the deeper mines, and instructing the men in an improved method of dressing the ore. From that period the present trade in Cornish copper may be said to date its rise, the annual produce, with occasional exceptions, having until recent times progressively increased. In 1851 the mines of Devon and Cornwall together were estimated to furnish one- third of the copper raised throughout other parts of Europe and the British Isles (De la Beche). It has been calculated that the clear profits from fourteen of the most productive mines in Cornwall (both tin and copper), during the present century, have reached to £2,756,640, the value of the entire produce having been £13,158,203. From this gross sum the expenses of labour, materials, working costs, and "dues" or royalties have to be deducted. The number of years during which these fourteen mines have been worked varies from 5 to 66.

~~The underground wealth of Cornwall is, however, not only diminishing in quantity and quality, but the process of raising it is becoming too expensive to be continued. No copper lodes of great importance have been discovered of late years, while the surface or stream tin is nearly exhausted. Almost all the Cornish tin is now raised from deep mines at heavy expense, and has to compete with the vast supplies which arrive from foreign countries. The Cornish miners are an intelligent and independent body of men. 'They are in request in whatever part of the world mining operations are conducted ; and it may fairly be asserted that the solution of every intricate problem in mining geology is generally assigned to a Cornish agent, and every task requiring skill, resource, and courage in- trusted to a Cornish miner. About 28,000 persons used to be employed in the mines, but emigration to more remunerative fields abroad has recently reduced that number most materially. For many centuries a tax on the tin, after smelting, was paid to the earls and dukes of Cornwall, The smelted blocks were carried to certain towns to be coined,—that is, stamped with the duchy seal before they could be sold. By an Act of 1838 the dues payable on the coinage of tin were abolished, and a com- pensation was awarded to the duchy instead of them.~~

~~Stannary Courts.—By ancient charters, the tinuers of Cornwall were exempt from all other jurisdiction than that of the stannary courts, except in cases affecting land, life, and limb. The earliest charter is that of Edmund earl of Cornwall, but the freedom then assured was rather confirmed than given for the first time ; and it is probable that the customs of the stannary courts are of high antiquity. Twenty-four stannators were returned for the whole of Cornwall. Their meeting was termed a parlia- ment, and when they assembled they chose a speaker. In earlier times, the combined tinners of Devon and Cornwall assembled on Hingston Down, a tract of highland on the Cornish side of the Tamar. After the charter of Earl Edmund, the Cornish stannators met (apparently) at Truro ; those of Devonshire at Crockern Tor on Dartmoor. An officer was appointed by the duke of Cornwall or the Crown, who was Lord Warden of the Stannaries, and the parliaments were assembled by him from time to time, in order to revise old or to enact new laws. The last Cornish stannary parliament was held at Truro in 1752, Fora long series of years little or no business was transacted in the stannary courts; but the necessity for a court of peculiar jurisdiction, embracing mines and mining transac- tions of every description within the~~

county of Cornwall having become more and more apparent, a committee was appointed to report on the subject, and an Act of Parliament

was afterwards (1836) passed, suppressing the Jaw courts of the stewards of the different stannaries, and giving to the vice-warden their jurisdiction, besides confirming and enlarg- ing the ancient equity jurisdiction of that office. Several statutes have since been passed defining and amending the stannary laws. From the judgments of the vice-warden an appeal lies to the Lord Warden, and from him to the Supreme Court of Judicature. The court, thus renewed, has greatly benefited the mining interests of Cornwall.

Fisheries.—The fisheries of Cornwall and Devon are the most important on the south-west coasts. The pilchard is in great measure confined to Cornwall, living habitually in deep water not far west of the Scilly Isles, and visiting the coast in great shoals,—one of which is described as having extended from Mevagissey to the Land's End, a distance, including the windings of the coast, of nearly 100 miles. In summer and autumn pilchards are caught by drift nets ; later in the year they are taken off the northern coast by seine nets. Forty thousand hogsheads, or 120 million fish, have been taken in the course of a single season, requiring 20,000 tons of salt to cure them. The northern shoals are by far the largest. 'Twelve millions have been taken in a single day ; and the sight of this great army of fish passing the Land's End, and pursued by hordes of dog-fish, hake, and cod, besides vast flocks of sea-birds, is one of the most striking that can be imagined. The fishery gives employ- ment to about 10,000 persons, and a capital of nearly £300,000 is engaged in it. The headquarters of the fishery are Mount's Bay and St Ives, but boats are employed all along the coast. When brought to shore the pilchards are carried to the cellars to be cured. They are then packed in hogsheads, each containing about 2400 fish, These casks are largely exported to Naples and other Italian ports—whence the fisherman's toast, " Long life to the Pope, and death to thousands." Besides pilchards, mackerel are taken in great numbers on the southern coast. Conger eels of great size, weighing from 60 to 120 Ib, are found near the shores, and among other fish taken should be mentioned mullet and John Dory. Recently a brisk trade in "sardines" has been established—young pilchards taking the place of the real Mediterranean fish.

~~*History.—Although there can be no doubt that Cornwall and Devonshire are referred to under the general name of Cassiterides, or the "Tin Islands," it cannot be said that we have any authentic historical knowledge of either county until after the Roman conquest of Britain. It remains uncertain whether Pheenician or Carthaginian traders actually visited Cornwall, or whether they obtained their supplies of tin through Gaul. But we know that the tin of the district was largely exported from a very early period, and that the mines were still worked under the Romans. Cornwall formed part of the British kingdom of Damnonia, which long resisted the advance of the Saxons westward, and remained almost unbroken in power until the reign of Ine of Wessex (688-726). From that time the borders of the British Kingdom gradually narrowed, until, about the year 926, Athelstane drove the Britons from Exeter, and fixed the Tamar as the limit between them and the Saxons of Devon. At this period, and perhaps for some time after, the Britons of West Wales (the name given by the Saxons to the old Damnonian kingdom) retained their line of chiefs, though under some kind of subjection to the kings of Wessex. The British bishop, Conan, submitted to archbishop Wulfhelm of Canterbury after Athelstane's conquest, and was reappointed by him in 936. The Cornish see was afterwards merged in that of Crediton, and in 1050 the place of the united sees was transferred to Exeter, where it remained till 1876. But Cornwall, although the mass of the people remained Celtic, speedily received Saxon masters, and in the Domesday Survey the recorded names*~~

~~*CORNWALL*~~

~~*of the owners of land in the days of the Confessor are all Saxon. The conqueror bestowed nearly the whole county on his half brother, Robert of Mortain, and thus arose what Mr Freeman styles "that great earldom and duchy of Cornwall which was deemed "oo powerful to be trusted in the hands of any but men closely akin to the royal house, and the remains of which have for ages formed the apanage of the heir-apparent to the crown." Of the earls, the most important were the brother of Henry III., Richard, king of the Romans, and his son Edmund. In 1336 the earldom was raised to a duchy by Edward III. in favour of his son, the Black Prince, and of his heirs, eldest sons of the kings of England. Since that time the Prince of Wales has always been duke of Cornwall. When there is no Prince of*~~

Wales the revenues of the duchy are appro- priated by the Crown. When the duchy was first created by Edward III., the lands belonging to and dependent on it included, not only the great open moors of Cornwall, and Dartmoor forest in Devonshire, but 9 parks, 53 manors, 10 castles, 13 boroughs and towns, and 9 hundreds. Considerable changes and reductions have, however, been since made, and the income of the duchy is at present derived from lands in Somerset and Devon as well as in Cornwall itself. The history of the duchy is virtually that of Cornwall. There has been little to connect it with the general history of the country except during the Civil War, when Cornwall was for the most part royalist, and some sharp fighting took place within its bounds. Besides much skirmishing, there were two important battles, that of Braddock Down (Jan, 19, 1642-3), and that of Stratton, (May 15, 1643), both gained for the king.

Antiquities. —No part of England is so rich as Cornwall in antiquities of the primeval period. These chiefly abound in the district between Penzance and the Land's End, but they occur in all the wilder parts of the county. They may be classed as follows. (1.) Cromlechs. These in the west of Cornwall are called '"'quoits," with a reference to their broad and flat covering stones. The Jargest and most im- portant are those known as Lanyon, Caerwynen, Mulfra, Chin, and Zennor quoits, all in the Land's End district. Of these Chiin is the only one which has not been thrown down. Zennor is said to be the largest in the British Isles, while Lanyon, when perfect, was of sufficient height for a man on horseback to ride under. Of those in the eastern part of Cornwall, Trethevy near Liskeard and Pawton in the parish of St Breock are the finest, and have remained intact. (2.) Rude uninscribed monoliths are common to all parts of Cornwall. Those at Boleit, in the parish of Buryan, are the most important. (3.) Circles, none of which are of great dimensions, The principal are the Hurlers, near Liskeard ; the Boskednan, Boscawen-tin, and Tregeseal circles ; and that called the Dawns-tin, or Merry Maidens. All of these, except the Hurlers, are in the Land's End district. The other circles that may be mentioned are the "Trippet Stones," in the parish of Blisland, and one at Duloe. (4.) Long alignments or avenues of stones, resembling those on Dartmoor, but not so perfect, are to be found on the moors near Roughtor and Brown Willy. A very remarkable monument of this kind exists in the neighbourhood of St Columb, called the 'Nine Maidens." It consists of nine rude pillars placed

~~in a line, while near them is a single stone known as the "Old Man." (5.) Hut dwellings, Of these there are at least two kinds, those in the eastern part of the county resembling the beehive structures and enclosures of Dartmoor, and those in the west, comprising "hut-clusters," having a central court, and a surrounding wall often of considerable height and thickness. The beehive masonry is also found in connection with these latter, as are also (6.) Caves, or subterrancous structures, resembling those of~~

~~Scotland and Ireland. (7.) Clif castles are a characteristic feature of the Cornish coast, the chief being the " Little Dinas" near Falmouth, Trevelgue near St Columb, and Treryn, Mén, Kenedjack, Bosigran, and others in the west, These are all fortified against the land side. (8.) Hull castles, or camps, are very numerous. Castel-an- Dinas, near St Columb, is the best example of the earth- work camp, and Chin Castle near Penzance, of the stone.~~

~~Of early and medizval antiquities the most noticeable are crosses, scattered all over the county, and of various dates, from the 6th to the 16th century, many resembling the early crosses of Wales; inscribed sepulchral stones of the 7th and 8th centuries, of which the "mén scryffa" in Madron is a good example; and oratories of the early Irish type. St Pirans is the most important of these.~~

~~The Cornish churches, for the most part, belong to the Perpendicular style of architecture, and are generally low in the body, but with high and plain granite towers. The rich tower of Probus, however, is an exception, as well as the church of St Mary Magdalene at Launceston, the exterior of which is covered with sculpture. Within, the chief feature is the absence of a chancel arch. The castles of Launceston, Trematon, and Restormel seem to be of the time of Henry III., but the mounds which occur in the first two are no doubt much earlier,—possibly marking British strongholds. Tintagel has but a few shapeless walls. Of later castles there is Pendennis (built temp. Henry VIII); St Michael's Mount, although castellated at an early period, has nothing more ancient than the 15th century.~~

~~Languuge.—The old Cornish language survives in a few words still in use in the fishing and mining communities, as well as in the names of persons and places, but the last persons who spoke it died toward the end of the 18th century, It belonged to the Cymric division of Celtic, in which Welsh and Armorican are also included, The most important relics of the language known to exist are three dramas or miracle plays, edited and translated by Edwin Norris, Oxford, 1859. A sketch of Cornish grammar is added, and a Cornish vocabulary from a MS, of the 13th century (Cotton MSS. Vespasian A. 14, p. 7a). The best dictionary of the language (indeed the only one) is Williams's Leaicon Cornu-Britannicum, London, 1865. Some valuable remarks on this ancient language will be found in Max Miiller's Chips, vol. iii. See also Ceitic Lireraturg, vol. v. pp. 298, 323.~~

~~Parliamentary Representation.—The duchy returns 13 members to Parliament, 4 for the county (2 from the east division and 2 from the west division) and 9 from the following boroughs :—Truro, 2 (pop. 11,049); Penryn (pop. 3679) and Falmouth (pop. 5294), 2; St Ives, 1 (pop. 6965); Liskeard, 1 (pop. 4700) ; Bodmin, the assize town, 1 (pop. 4672); Helston, 1 (pop. 3797); and Launceston, 1 (pop. 2935). The only unrepresented town of importance is Penzance, which has a population of~~

~~10,414.~~

~~Gentleman's Seats.—The principal houses to be noticed in Cornwall are—Mount Edgecumbe (earl of Mount Edge- cumbe), originally Tudor of Queen Mary's time, but much altered; the grounds and gardens are, however, more important than the house; Cotele, on the Tamar (dowager countess of Mount Edgecumbe),—a most striking place, the house Tudor, temp. Henry VIII. and Elizabeth, and little changed; it contains the ancient furniture ; Antony, the seat of the Carews; Pentillie (A. Coryton, Esq.); Port Eliot (earl of St Germans); Trelawne (Sir John Trelawny); Menabilly (Jonathan Rashleigh, Esq.); Boconnoc (Hon. G. M. Fortescue), where are the finest woods in the county; Lanhydrock (Lord Robartes), built between 1636-1651, and containing a very picturesque gallery, with richly moulded roof; Glynn (Lord Vivian) ;~~

Pencarrow (dowager lady Molesworth); Heligan (John Tremayne, Esq.); Carclew (Col. Tremayne), where the gardens are fine aud interesting; Tregothnan (Viscount Falmouth) ; Clowance (Rev. A. H.M. S¢ Aubyn); and St Michael's Mount (Sir John St Aubyn), from its site one of the most remarkable places in Great Britain.

Bibliography.— Besides the works which have already been mentioned, the following are important :— Bibliotheca Cornubiensis, a catalogue of the writings, both MS. and printed, of Cornishmen, and of works relating to the county of Cornwall, by G. C. Boase and W. P. Courtney, London, 1874; A Glossary of Cornish Names,

by the Rev. J. Bannister, Truro, 1871; Report on the Geology of

Cornwall, Devon, and West Somerset, by H. T. de la Beche, Lon- don, 1839 (this report contains the most complete general view of the geology of Cornwall; valuable papers on the subject are scattered through the Transactions of the Geol. Soc., and the Journals and Reports of the Royal Institution of Cormvall, estab- lished in 1818); A Handbook to the Mineralogy of Cornwall and Devon, by J. H. Collins, 'Truro, 1871; Cornish Fauna, by J. Couch,

Truro, mm. d.} : : ; : Cornwall, established 1833. Of county histories the earliest is Carew's Survey of Cornwall, first published in 1602. The collec- tions of Hals and Tonkin were partly printed by Davies Gilbert in 1838, with additions of his own, under the title of Zhe Parochial Hist. of Cornwall. Lyson's Cornwall, 1814, remains the most use- ful and most accurate history of the county. Zhe Parochial and Family History of the Deanery of Trigg Minor, by Sir John Maclean, London, 1878, &c. (published in ae is exhaustive for that divi- sion. The folk lore of Cornwall is well illustrated in Popular Romances and Drolls of the West of England, by R. Hunt, London, 1865; and in Traditions and Hearthside Storics of West Cornwall, by W. Bottrell, Penzance, 1870-3. Murtray's Handbook for Corn- wall and Devon, 8th ed., 1872, is also a work well worth consulta- tion. On the antiquities of the county the following authorities are important :—Dr W. Borlase's Antiquities of Cornwall, 1754 and 1769; W.C. Borlase's Nenia Cornubie, 1872, and a paper by the same author in the Archwol. Journ., vol. Xxx., on " Vestiges of Early Institutions in Cornwall; " Blight's Ancient

Crosses of Corn- wall, 1858 ; Hadda and Stubbs' Councils, vol. i.; Blight's Churehes of West Cornwall, 1865. (Rad) CORNWALL, Barry. See Procter. CORNWALLIS, Cuartes, SEconD HARL AND First Marquis (1738-1805), was the eldest son of Charles, the first earl Cornwallis, Having been educated at Eton and St John's College, Cambridge, he entered the army. For some time he was member of Parliament for Eye ; in 1761 served a campaign in Germany, and was gazetted to a Heutenant-colonelcy in the 12th Foot. In 1762 he succeeded to the carldom and estates of his father ; in 1765 he was made aide-de-camp to the king and gentleman of the bedchamber; in 1766 he obtained a colouelcy in the 33d Foot ; and in 1770 he was appointed governor of the Tower. In public life, he was distinguished by inde- pendence of character and inflexible integrity; he voted without regard to party, and opposed the ministerial action against Wilkes and in the case of the American colonies. But when the War of Independence broke out, he accom- panied his regiment across the Atlantic, and served not without success as major-generl. In 1780 he was appointed to command the British forces in South Carolina, and in the same year he routed Gates at Camden. In 1781 he defeated Greene at Guilford, and made a destructive raid into Virginia ; and in 1782 he was besieged at York Town by French and American armies and a French fleet, and was forced to capitulate. With him fell the English cause in the United States. He not only escaped censure, however, but in 1786 received a vacant garter, and was appointed governor-general of India and commander-in-chief in Bengal. As an administrator he projected many reforms, but he was interrupted in his work by the advance of Tippoo Sahib. In 1791 he assumed in person the con- duct of the war and captured Bangalore; and in 1792 he laid siege to Seringapatam, and concluded a treaty with Tippoo Sahib, which stripped the latter of half his realm, and 'placed his two sons as hostages in the hands of the English. For the Permanent Settlement of the, Land

Revenue under his administration, see BancaL, vol. ili. He returned to England in 1793, received a marquisate and a seat in the Privy Council,

~~and was made master-general of the ordnance with a place in the Cabinet. Five years afterwards (21st June 1798) he was appointed to the viceroyalty of Ireland, and the zeal with which he strove to pacify the country gained him the respect and good-will of both Roman Catholics and Orangemen. On 17th July a general amnesty was proclaimed, and a few weeks afterwards the French army under Humbert was surrounded and forced to surrender. In 1801 Cornwallis was replaced by Lord Hardwicke, aud soon after he was appointed plenipotentiary to negotiate the treaty of Amiens (1802). In 1805 he was again sent to India as governor- general. He was in ill-health when he arrived at Cal- cutta, and while hastening up the country to assume com- mand of the troops, he died at Ghazepore, in the province of Benares, October 5, 1805.~~

~~CORO, or Santa-ANa DE Coro, a maritime town of Venezuela, South America, and capital of the province of Falcon, is situated in a sandy plain at the inner angle of a peninsula, dividing the Gulf of Venezuela from the Caribbean Sea, 155 miles W.N.W. of Valencia. It is ill built, the streets are unpaved, and there are no public buildings of consequence except two churches. The climate is hot but not unhealthy. The water-supply is brought by mules from springs at some distance from the town, About seven miles to the north-east is the port, near the mouth of the little Rio Coro. The export trade with the West Indies, in mules, goats, hides, cheese, pottery-ware, indigo, and cochineal, is considerably less than formerly. Coro is one of the oldest settlements of the Spaniards on the north coast of S. America. 'It was founded on the 26th July 1527 (St Ann's day), by Juan de Ampués, who named it Santa Ana de Coriana after the Indian tribe inhabiting the spot. It came also to be known as Venezuela (or Little Venice), which was the name given originally to an Indian village founded on piles in the water on the east side of the lake of Maracaibo. Tn 1578 Cardcas was made the seat of the government of the country instead of Coro, and in 1583 the bishopric of Coro, founded in 1536, was transferred thither. In 1815 Coro was made the chief town of a province. It suffered greatly in the Venezuelan war of independence. Popula- tion about 7000.~~

~~COROMANDEL COAST, the eastern seaboard of India between Cape Calimere, in 10° 17' N. lat. and 79° 56' E. long., and the mouths of the Kistnah or Krishnah. The shore, which is shallow, is without a single good~~

natural harbour, and is at all times beaten by a heavy sea. Communication with ships can be effected only by cata- marans and flat-bottomed surf-boats. The north-east mon- soon, which lasts from October till April, is exceedingly violent for three months after its commencement. [rom April till October hot southerly winds blow by day; at night the heat is tempered by sea-breezes. The principal places frequented by shipping are Pulicat, Madras, Sadras, Pondicherri, Cuddalor, Tranquebar, Nagore, and Nage-patnam. 'he name Coromandel is said to be derived from Cholamandal, the mandal or region of the ancient dynasty of the Chola.

CORONA, in astronomy, the name given to the phenomenon seen round the sun during a total eclipse. This phenomenon is doubtless a complex one, and com- prises effects due (1) to the sun's surroundings or the various layers of its atmosphere, (2) to the sunlight falling on something between us and the sun, and (3) to certain physiological effects in the eye. These effects will be dis- cussed under the heading Sun. In the meantime it may be stated that the solar part of the phenomenon 'comprises the

chromosphere, the layer of brightly incandescent hydrogen, with other included metallic vapours, which lies immediately over that interior part of the sun which we ordinarily see ; the promtnences or red flames, which are local uprisings of the chromosphere ; and outside all, the coronal atmosphere, which, consists, so far as is yet known, of hydrogen less brightly incandescent than that in the chromosphere, and of an unknown substance, the vapour density of which appears to be less than that of hydrogen.

CORONATION, literally a crowning, a placing of a crown on the head. 'The word is restricted, in use, to the ceremony or solemnity of placing a crown on the head of an actual or future king or emperor to signify his accession or his formal recognition as actual or future sovereign. The custom of marking the commencement of a king's reign by some special rite is avery ancient one. The Jewish kings, like the Jewish high priests, were anointed; but, as the crown was among the insignia of their new royalty, it is probable that they were also crowned, and in some cases certain that they were. We read, for example, of the crowning as well as of the anointing of

King Joash (2 Kings xi. 12), and when David,.or rather Joab, had sub- dued Rabbah, the crown which the king of Rabbah had worn was taken from him, and placed upon David's head. We find among the nations of modern Europe a tolerably exact counterpart of all these observances. After the de- struction of the western Roman empire, the tribal chiefs or kings among whom the Roman territory was divided appear generally to lave been crowned on their accession or elec- tion to office. This was customary, we know, among tle Franks, the Lombards, and the Burgundians, as it was also among our own Saxon ancestors. The revival of the empire by Charlemagne was marked by his solemn coronation at Rome by the Roman Pontiff. His successors in the empire for more than three hundred years were, without exception, imaugurated in the same way. 'The rule was followed, though not invariably, for some time afterwards, most of the emperors up to the time of Frederick IIT. (1440) being crowned, as Charlemagne had been, at Rome. On the day before the coronation, the Roman elders met the emperor- elect at the gate of their city, had their charters confirmed by him, and received an oath from him that he would pre- serve their good customs. On the next day the emperor went to Saint Peter's, and was there met by the Pope and his clergy, and was solemnly blessed and crowned. From Frederick JII. downwards, this custom, always distasteful to the Roman people, wholly ceased to be observed. Charles V. received the imperial crown at the Pope's hands, not at Rome but at Bologna, and at the same time with the Lombard or Italian crown. There were, besides the im- perial crown, three other distinct crowns, some or all of which were assunied by each emperor according to his re- spective rights. The German crown, which by the time of Charles V. had become the most important of the four, was taken at Aix-la-Chapelle ; the Lombard or Italian crown generally at Milan; and the Burgundian crown, of Iess importance than the other two, at Arles. Charlemagne, uniting in his own person what were always distinguishable and what became afterwards distinct sovereignties, took them all four. Charles V. took first the German crown at Aix-la-Chapelle. It was not until 1530 that he took his other two crowns at Bologna. From the time of Charles V., down to the close of the empire in 1806, every emperor bound himself at his accession that he would proceed to Rome, and receive the imperial crown from the Pope, but as a matter of fact no one of them complied with the obligation.

~~We have clear traces of the coronation of the English kings before the Conquest, thongh, as in the case of the Jewish kings, weread oftheir being anointed more frequently~~

~~than we read of their being crowned. Bath, Winchester, or Kingston-upon-Thames was the place commonly chosen for the rite. After the foundation of Westminster Abbey by Edward the Confessor, Westminster succeeded to the privilege to the exclusion of the others. Harold, we read, was made king at Westminster, and so was William I. Of the actual crowning of the kings before William there are sometimes precise notices by the chroniclers, and the ceremony itself is sometimes to be found represented on medals. That the king was hallowed or anointcd is, how- ever, the phrase generally employed; but that crowning also was an essential part of the rite we may infer from the case of William, I., of whom we are told that Archbishop Aldred hallowed him to king at Westminster, and also swore him, ere that he would set the crown on his head, that he would as well govern the nation as any king before him best did. For some time the archbishops of Canterbury claimed the sole right of crowning, personally or by deputy. Becket made it a cause of complaint against Henry II. that he had not been called in to crown Henry's son, and he even procured the excommunication of the archbishop of York and the bishop of Durham for having acted in the matter without his licence. It was usual with the early Norman kings to be crowned more than once, and also, as we have seen in Henry II.'s case, to have their sons crowned, and oaths of allegiance taken to them during their own lifetime. The reader will be reminded here of the case of David and Solomon, though he may refer the resemblance to nothing more than an accidental choice of the same obvious means to secure a disputable succession. He will find, how- ever, in some parts of the English coronation rite traces of its Jewish original not so easily to be explained away.~~

~~The coronation of Richard I. is the earliest of which we have a circumstantial account. The archbishop of Canter- bury officiated at it, and with him were the archbishops of Rouen, of Treves, and of Dublin, and all the bishops of the kingdom. The king was accompanied to the abbey Ly a graud procession of nobles, and among them came the earl of Chester bearing the royal crown. Whicn the crown had been laid on the altar, and the coronation oath had been taken by Richard, next came the actual~~

ceremony of coronation, or rather the long series of ceremonies of which the placing of the crown on Richard's head formed a part. After Richard had drawn near to the altar, his head was first covered with a sacred linen cap. He was then anointed in several places. The great crown was then brought to him, and was by him handed to the archbishop, who placed it on the king's head. After various further 'rites and prayers, the king left the altar and went back to his former seat, and there exchanged the great crown for a lesser crown, which he continued to wear when he left the abbey.

The doubtful title of Henry IV. was confirmed by a double ceremony. The already crowned king, Richard II., was brought to the Tower of London in his coronation robes, holding in his hands his crown and other royal insignia. These he resigned into the hands of Henry, then duke of Lancaster. The public assumption of them by Henry was made afterwards with great splendour. On the day appointed, after having confessed and heard three several masses, he went to Westminster Abbey with a vast procession of nobles and clergy. A high scaffolding was erected in the akbey, and on this Henry was displayed to the people, seated, and with his head bare. The archbishop of Canterbury then demanded of the assembly whether he should crown Henry, and was answered by general shouts of yes, yes. Henry then drew near to the altar, and was first anointed by the archbishop in six places. The crown of Edward the Confessor was then brought forward, blessed by the archbishop, and placed by him upon Henry's head. Mass was then again said, and the king «nd his attendants

left the abbey. Henry VI. was twice crowned while he was still a child, first at the abbey at Westminster, after- wards at Saint Denis near Paris. Representations of the

two ceremonies are to be found in Strutt's Janners and

Customs. The coronation of Richard III. has also been

very fully recorded. It does not differ materially from the The directions followed, both in these cases and subsequently, are taken from the Liber

~~instances already given.~~

~~Regalis, in the archives of Westminster Abbey; nor,~~

~~indeed, from the nature of the case is there much room for The anointing and crowning may be~~

~~variety in essentials. : accompanied by circumstances of more or less magnificence, but the acts themselves are likely to be done in much the same way at one time and at another.~~

~~Coronation Oath.—The imposition of some form of coro- nation oath appears to be as old as the ceremony of coron- ation. It is natural enough that, at the commencement of each new reign, the king and people should mutually give and receive pledges from each other, the people promising obedience to lawful commands, the king binding himself to act with justice and to observe the established laws. There are informal traces of this to be found in abundance in the histories of the Jewish kings. It was still more regularly the case among the tribal chiefs who broke up the western Roman empire, and established themselves upon its ruins. Hereditary title was far from absolutely recog: nized, and the will of the people had a most potent influence in determining the succession, There was thus room for something like an express bargain, the new chief or king receiving his dignity on conditions which his people imposed upon him. The custom thus established continued after the rules of succession had become settled. The election to the imperial office was marked in the same way. Before the time of Charles V. a verbal promise had been thought sufficient, but on Charles's election a formal " capitulation " of rights and liberties was drawn up in writing by the German electors, signed by the new emperor's ambassadors, and solemnly confirmed by himself on his coronation at Aix-la-Chapelle. From that time forward the same condi- tions were observed at each election, the attacks by Charles V. upon the rights of his German subjects not having con- vinced them of the intrinsic worthlessness of agreements of the kind. We have seen already the form of coronation oath prescribed to William J. of England, and we know, too, the amount of regard he paid to it. Richard I. was sworn to keep the holy ordinances of God, to exercise justice, to abolish grievous laws, and to put in practice all laws that were good. The Liber Regalis prescribes a series of similar oaths. The king is to grant and~~

~~to confirm the laws and customs of his predecessors, and especially those of the glorious king Saint Edward. He promises peace and agreement to God, the holy church, and the people, and swears further, with a vast amount of verbiage, to maintain law and justice, to uphold customs, and to perform rightly all the other duties of his office. The modern form of the coronation oath dates from the coronation of William and Mary in 1689, with some slight necessary alterations and additions made afterwards at the Unions with Scotland and with Ireland. The oath, in 1689, was made at every point more precise and explicit than before ; and, in particular, there was added an express engagement on the part of the sovereign to maintain " the laws of God, the true profession of the Gospel, and the Protestant reformed religion as it is established by law." It pro- vided, further, that the king should preserve to the bishops and clergy, and the churches committed to their charge, all their actual and future legal rights and privileges. Its intention, as the debates at the time prove, is to restrain the king in his administrative, not in his legislative, capacity. It binds him to observe the established law. It~~

~~does not and cannot bind him to refuse his assent to all subsequent changes of the law in ecclesiastical any more than in civil matters. The point, obvious enough in itself, deserves notice chiefly because the opposite view was taken by George III, fatally for Pitt's project of Catholic eman- cipation, a measure of relief to which it is difficult to see how the coronation oath, whatever force is given to it, could with any reason be thought opposed. In connection with the subject of coronation, see also Crown. (8. H. Bs~~

~~CORONELLI, Vincewzto (1650-1718), an Italian geographer, was born at Venice. Having by his skill in mathematics become known to the Count d'Estrées, Coronelli was employed by the count to make globes for Louis XIV. In 1685 he was appointed cosmographer to the republic of Venice, and four years afterwards public professor of geography. He founded an academy of cosmography at Venice, and died in that cityin 1718. He published about 400 geographical charts, an abridgement of cosmography,~~

~~*several books on geography, and other works. See Tiraboschi, Litteratura Italvana.*~~

~~*CORONER, an ancient officer of the common law, so called, according to Coke, because he had principally to do with pleas of the Crown. The lord chief justice of the Queen's Bench is said to be the principal coroner of the kingdom, and may in any place exercise the jurisdiction of the coroner. The duties of the office are now practically confined to holding inquests in case of violent or sudden death.*~~

~~The office is and always has been elective, the appointment being made by the freeholders of the county assembled in countycourt. By the Statute of Westminster the First it was ordered that none but lawful and discreet knights should be chosen as coroners, and in one instance a person was actually removed from office for insufficiency of estate. Lands to the value of £20 per annum (the qualification for knight- hood) were afterwards deemed sufficient to satisfy the requirements as to estate which ought to be insisted on in the case of a coroner. The complaint of Blackstone shows the transition of the office from its original dignified and honorary character to a paid appointment in the public service. " Now, indeed, through the culpable neglect of gentlemen of property, this office has been suffered to fall into disrepute, and get into low and indigent hands; so that, although formerly no coroners would condescend to be paid for serving their country, and they were by the afore- said Statute of Westminster expressly forbidden to take a reward, under pain of a great forfeiture to the king; yet for many years past they have only desired to be chosen for their perquisites ; being allowed fees for their attendance by the statute 3 Henry VII. c. 1, which Sir Edward Coke complains of heavily ; though since his time those fees have been much enlarged." The mercenary character of the office, thus deprecated by Coke and Blackstone, is now firmly established, without, however (it need hardly be said), affording the slightest ground for such reflections as the above. The coroner is in fact a public officer, and like other public officers receives payment for his services. The person appointed is almost invariably a qualified legal or medical practitioner, the duties of the office being supposed to require some acquaintance with the learning of both of these professions. The property qualification appears to be virtually dispensed with, the county being liable for any penalties that may be incurred by the coroner. The appointment is held for life, but is vacated by the holder being made sheriff. He may also be removed by the writ de coronatore exonerando, for sufficient cause assigned, as, for instance, that he is engaged in other business, or in- capacitated by old age or sickness, &c. By 23 and 24 Vict. c. 116, the lord chancellor may remove any coroner for "inability or misbehaviour in his office."~~

~~*The coroner is primarily an officer of the county, elected by the freeholders. In certain liberties and franchises, the appointment is made by the Crown, or lords holding a charter from the Crown. By the Municipal Corporations Act, in any borough having a separate quarter-sessions the council may appoint a coroner; in other boroughs the coroner for the county has jurisdiction,*~~

~~*The remuneration of the county coroner is now regulated by the Act 23 and 24 Vict. c. 116 above mentioned. The system of payment by fees, established by an earlier Act of the same reign, is abolished, and payment is to be made by salary calculated on the average amount of the fees, mileage, and allowances usually received by the coroner for a period of five years, and the calculation is to be revised every five years. The home secretary is to decide between the coroner and the justices when they cannot agree, Borough coroners under the Municipal Corporations Act are to be paid by fees.*~~

~~*The duties of the office are ascertained by the 4 Edward I, st, 2 :—" A coroner of our lord the king ought to inquire of these things, first, when coroners are commanded by the king's bailiffs or by the honest men of the county, they shall go to the places where any be slain, or suddenly dead or wounded, or where houses are broken, or where treasure is said to be found, and shall forthwith conimand four of the next towns, or five, or six, to appear before him in such a place ; and when they are come thither, the coroner upon the oath of them shall inquire in this manner, that is, to wit, if it concerns a man slain, if they know when the person was slain, whether it were in any house, field, bed, tavern, or company, and if any, and who, were there, &c. It shall also be inquired if the dead person were known, or else a stranger, and where he lay the night before. And if any person is said to be guilty of the murder, the coroner shall go to their house and inquire what goods they have, &c." Similar directions are given for cases of persons found drowned or suddenly dead, for attachment of criminals in cases of violence, &c. It is the duty of the township to give notice of violent or sudden death to the coroner; and the inquisition is held before him and a jury of not less than twelve persons, constituting a court of record. Their charge is to inquire how the party came by his death. The inquisition must be super visum corporis ; if the body be not recovered, the coroner can only*~~

sit in virtue of a special commission. By 6 and 7 Vict. c. 12, it was provided (in remedy of the inconveniences of the common law) that the coroner only within whose jurisdiction the body shall be lying dead, shall hold the inquest, although the cause of death may have-happened somewhere out of his jurisdiction. And in the case of any body found dead in the sea, &c., the inquest, in the absence of a deputy coroner for the admiralty, shall be held by the coroner of the place where the body is first brought to land.

At the inquest the evidence is taken on oath, and the Crown or any party suspected may tender evidence. The medical man attending the deceased, if any, may be ordered to attend, and the coroner may order a post mortem examination. If the jury are not satisfied they may name any properly-qualified practitioner, who shall be required to attend and give evidence, or make a post mortem examination. 'The verdict must be that of twelve at least of the jury. If any person is found guilty of murder or other homicide the coroner shall commit him to prison for trial; he shall also certify the material evidence to the court, and bind over the proper persons to prosecute or to give evideuce at the trial. HIe may in his discretion accept bail for a person found guilty of manslaughter. Since the abolition of public executions, the coroner is required to hold an inquest on the body of any criminal, on whom sentence of death has been carried into effect. The ques-

tion of reopening the coroner's inquests after verdict given was discussed in a recent case. The Queen's Bench, on a suggestion on the part of the Crown that there was a pro- bability of fixing the suspected crime by further inquisition, ordered the verdict to be quashed and a new inquest to be held.

There has been of late years much discussion on the subject of the coroner'soffice, and legislation at no distant time may be expected. The points on which reform is generally asked for may be briefly indicated. It is desirable that the qualification for the office should be fixed, and that it should be a legal and uot a medical qualification. The duties of the office are mainly judicial ; such medical information as may be necessary can be had from experts ; while of course a knowledge of the technical rules of evidence is essential to the efficient discharge of the coroner's duties. Again, that the election to a judicial office, wholly unpolitical in character, should be by vote of the freeholders of the county is generally felt to be an

anomaly. A county coroner recently declared that the expense of contesting the county amounted, in his own case, to several thousand pounds. Payment, depending directly or indirectly on fees, also produces unfortunate results. It leads occasionally to disputes between the coroners and the justices, and exposes the former to the suspicion of holding unnecessary inquests for the sake of increasing theirincome. In any circumstances the propriety of holding an inquest may be a question of great delicacy, and a slight mistake on either side may subject the officer to unmerited obloqguy. In some cases the present state of the law involves the great evil of too much inquiry. Besides the coroncr's inquest there are, in cases of a criminal character, the public examination before a magistrate, and the private examination by the grand jury. But it may also happen that not merely one but two or more inquests may be held in the same matter. In the case of a railway accident or a collision at sea, the victims may die in different jurisdictions, and if there is a suspicion of criminal negligence, the accused party must practi- cally stand his trial several times over. He may even be acquitted by one jury and condemned by another.

There is no corresponding office in Scotland. (E. R.)

COROT, Jean Baptiste Camrute (1796-1875), French landscape painter, was born at Paris in July 1796. He received an ordinary school education at Rouen, and was then apprenticed toa Faris draper. From childhood it was evident that he was a born artist; but prudential motives induced his father sternly to repress the strivings and utterances of his genius. He continued therefore to drudge at the draper's counter till his twenty-sixth year. He then finally escaped from the grip of trade, and his genius had its own way in the world. He entered the atelier of Michallon ; and on the death of his master the same year (1522) he passed to that of Victor Bertin. But he did not get on happily with, or learn much from either of these teachers. At length he made his escape from the town and the school with their oppressive conventionalities, and took refuge with nature in the fields of Italy. Here he studied, dreamed, and painted for several years. In 1827 he began to exhibit at the Salon, his first works being Vue prise & Narni and La Campagne de Rome. The public passed them by without much notice, but artists saw in them decisive proof that a new poet-painter was among them. From this time he worked on vigorously for nearly fifty years,

seldom failing to make his appearance at the Salon. Public recognition and "golden joys" were very slow to come; nor was it till he was nearly seventy that he became a wealthy man. He had obtained a medal of the second class in 1833, and medals of the first class in 1848 aud 1855. He received the cross of the Legion of Honour in 1846, and was promoted officer in 1867. Corot was one of the most original of painters. He was almost exclusively a landscape painter ; for although in a very few cases his pictures bear historical titles, landscape is even in these the predominant element. And with him it was always the poetry of landscape, never the topography. He stood in nature's presence, reverent, loving, enthusiastic, watching for the most delicate effects and changes of light, especially at early dawn and at dewy eve and in still moonlight, on cloud and sky, on tree and stream,—seeing thus what. but

few eyes do see, and ever striving to reproduce in his works his own impression of magical dreamy beauty. His works, like those of Millet, are mostly touched with sadness ; but while Millet is stern and almost savage, Corot is always tender and delicate. In his chosen field he stands alinost alone and unrivalled. Among his works are—Vue d'Italie (1834) ; Souvenir des environs de Florence (1839) ; La Danse des Nymphes ; Soleil couchant dans le Tyrol (1859) ; Effet de Matin; Dante et Virgile ; Macbeth; Agar au Désert ; Soleil levant; Souvenir (Italie; Le Repos; La Solitude (1866); Un Matin Ville d'Avray (1868) ; Une Danse Antique ; and Le Bicheron. The two last mentioned were exhibited, after his death, at the Salon of 1875. In the social circle Corot was one of the frankest and most genial of men. His favourite relaxation after a long day's work was the theatre, where to the last he is said to have followed the performance with the fresh delight of a child. Naturally of a generous disposition, he gave away with a large hand the wealth which flowed in on him in his later years; and many a touching tale is told of distress relieved and gad hearts comforted by his ministrations. The affec- tionate regard generally felt towards him is show in the designation "le Pere Corot" by which he was commonly known. In 1874 he lost a beloved sister ; and after this sharp blow he never recovered his former gaiety of heart. One of his last acts was the gift of a pension to the widow of his brother artist Millet, who had died not long before. In

~~December 1874 a gold medal designed for the occasion was presented to him by many French artists in token of honourand esteem. Corot died at Paris, aftera long period of failing health, February 22, VSr5.~~

~~CORPORATION. A corporation is au association of persons which the law treats in many respects as if it were itself a person. It has rights and duties of its own which are not the rights and duties of the individual members thereof, Thus a corporation may own land, but the individual members of the corporation have no riglis therein. A corporation may owe money, but the corpora- tors as individuals are under no obligation to pay the debt. The rights and duties descend to the successive members of the corporation. This capacity of perpetual succession is regarded as the distinguishing feature of corporations as compared with other societies. One of the phrases most commonly met with in law-books describes a corporation as a society with perpetual succession and a common seal. The latter point, however, is not conclusive of the corporate character.~~

~~The legal attributes of a corporation have been worked out with great fuluess and ingenuity in English law, but the conception has been taken full-grown from the law of Rome. 'The technical term in Roman law corresponding to our corporation is collegium,; a more general term is auniversitas. A collegium or corpus must have consisted of at least three persons, who were said to be corporatti—habere corpus. They could hold property in common and had a common chest. 'They might sue and be sued by their agent (syndicus or actor). There was a complete separation in law between the rights of the collegium as a body and those of its individual members. The col/egiwm remained in ex- istence although all its original members were changed. It was governed by its own by-laws, provided these were not contrary tothe common law. The power of forming collegia was restrained, and societies pretending to act as corpora- tions were often suppressed. Tu all these points the collegia of Roman closely resemble the corporations of English law. There is a similar parallel between the purposes for which the formation of such societies is authorized in English and in Roman law. Thus among the Roman collegia the following classes are distinguished :—(1) Public governing bodies, or municipalities, cimitates ; (2) religious societies, such as the~~

collegia of priests and Vestal Virgins ; (3) official societies, e.q., the scribe, employed in the administration of the statc ; (4) trade societies, ¢.9., fabri, pictores, naviculari, &c. This

class shades down into the societates not incorporated, just

as our own trading corporations partake largely of the character of ordinary partnerships. In the later Roman law the distinction of corporations into civil and ecclesias- tical, into lay and eleemosynary, is recognized. The latter could not alienate without just cause, nor take land without a licence—a restriction which may be compared with our statutes of mortmain. All these privileged societies are what we should call corporations aggregate. The corpora- tion sole (1.e., consisting of only a single person) is a refine- ment of our own, for although Roman law held that the corporation subsisted in full force, notwithstanding that only one member survived, it did not impute to the succes- sive holders of a public office the character of a corporation. When a public officer in our law is said to be a corporation sole, the meaning is that the rights acquired by him in that capacity descend to his successor in office, and not (as the case is where a public officer is not a corporation) to his ordinary lcgal representative. The best known instances of corporation sole are the king and the parson of a parish. The conception of the king as a corporation is the key to many of his paradoxical attributes in constitutional theory — his invisibility, immortality, &c.

The Roman conception of a corporation was kept alive by ecclesiastical and municipal bodies. When English lawyers came to deal with such societies, the corporation law of Rome admitted of easy application. Accordingly, in no department of our law have we borrowed so copiously and so directly from the civil law. The corporations known to the earlier English law weremainly the municipal, the ecclesiastical, and the educational and eleemosynary. To all of these the same principles, borrowed from Roman jurisprudence, were applied. The different purposes of these institutions Lrought about in course of time differences in the rules of the Jaw applicable to each. In particular, the great development of trading companies under special statutes has produced a new class of corpora-

tions, differing widely from those formerly known to the law. The reform of municipal corporations effected by the Act of 1837 has also restricted the operation of the principles of the older corporation law. These principles, however, still apply when special statutes have not inter- vened. But the extent and importance of Parliamentary legislation on corporations have withdrawn the attention of writers from corporation law pure and simple, and there has been no book on that subject since Mr Grant's, pub- lished in 1850. Two earlier treatises by Mr Kyd and Mr Willcocks may be mentioned. American lawyers have dealt more satisfactorily with corporations, and special reference may be made to Abbott's Digest of Corporation Law.

The legal origin of corporation is ascribed by Grant to five sources, viz., common law, prescription, Act of Parlia- ment, charter, and implication. Prescription in legal theory implies a grant, so that corporations by prescription would be reducible to the class of chartered or statutory corpora- tions. A corporation is said to exist by implication when the purposes of a legally constituted society cannot be carried out without corporate powers. Corporations are thus nltimately traccable to the authority of charters and Acts of Parliament, The power of creating corporations by charter is an important prerogative of the Crown, but in the present state of the constitution, when all the powers of the Crown are practically exercised by Parliament, there is no room for any jealousy as to the manner in which it may be exercised. The power of chartering corporations belonged also to subjects who had jura regalia, e.g., the

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bishops of [Durham granted a charter of incorporation to the city of Durham in 1565, 1602, and 1780, and the last was the charter in operation up to the passing of the Municipal Corporations Act. The charter of a corporation is regarded as being of the nature of a contract between the king and the corporation. It will be construed more favourably for the Crown, and more strictly as against the grantee. It cannot alter the law of the land, and it may be surrendered, so that, if the surrender is accepted by the Crown and enrolled in Chancery, the corporation is thereby dissolved. The use made of this power of the Crown in the reigns of Charles II. and James II, will be familiar to most readers, Chartered corporations were

~~*originally held to be ex necessitate immortal; only a statute could give a society corporate privileges to ensue for a limited time. But now, by 1 Vict. c. 77 § 29, the Crown may incorporate for any period.*~~

~~*Every corporation, it is said, must have a name, and it may have more names than one, but two corporations caunot have the same name. And corporations cannot change their name save by charter or some equivalent authority.*~~

~~*The possession of a common seal, though, as already stated, not conclusive of the corporate character, has been held to be an incident of every corporation aggregate. The inns of courts have common seals, but they are only voluntary societies, not corporations. Generally speaking, all corporate acts affecting strangers must be performed under the common seal ; acts of internal administration affecting only the corporators, need not be under seal. The rule has been defended by high judicial authority as following necessarily from the impersonal character of a corporation ; either a seal or something equivalent must be fixed upon so that the act of the corporation may be recognized by all. In the matter of contracts, however, the strict rule of law has been found untenable. A large exception has long been recognized by the courts. In cases of "convenience almost amounting to necessity," the use of the seal will not be necessary in order to bind a corpora- tion. Examples given in the old cases of such convenience are the retainer of an inferior servant, authority to make a distress, or drive away cattle damage feasant, &c. This exception has been extended in different degrees in different classes of corporations. In trading corporations it has been lately held that it will include all contracts entered into for the purposes for which the society was incorporated, and will not be limited to matters of constant occurrence or small importance. In other corporations the same latitude does not appear to be encouraged by the decisions. Goods of a kind which must have been necessary from time to time, and actually supplied to a corporation under a contract not sealed, may be sued upon. But an engagement as clerk to a workhouse was held not binding on a board of guardians because not under their seal. And where a municipal corporation caused some tolls to be let by auction, they were not allowed to recover on the contract because it was not under their seal. And work done for local im- provements, under an unsealed contract, was held*~~

~~to give no claim against a corporation. In such cases the fact of the contract being executed makes no difference as against the corporation, but where the corporation has executed an unsealed contract, it may recover thereon.~~

~~The somewhat unsatisfactory principles as to the dissolu- tion of corporations are not now of much practical import- ance. A corporation may of course be abolished by statute, but not by the mere authority of the Crown. It is held that a corporation may become extinct by the dis- appearance of all its members or of any integral part, or by surrender of charter if it is a chartered society, or by process of law for abuse of powers. In such cases, the real~~

~~property of the corporation will go to the heir of the founder, and the personal property as bona vacantia to the Crown. Corporations created by statute cannot surrender, nor will they be suffered to avoid elections so as to become extinct for want of members.~~

~~The power of the majority to bind the society is one of the first principles of corporation law, even in cases where the corporation hasa head. It is even said that only by an Act of Parliament can thisrule be avoided. The binding majority is that of the number present at a corporate meet- ing duly summoned. Votes given for an illegal purpose ora disqualified person are considered as thrown away, and in an election votes must be given for some particular candidate,—if they are merely against a candidate, they are void.~~

~~In corporations which have a head (as colleges), although the head cannot veto the resolution of the majority, he is still considered an integral part of the society, and his death suspends its existence, so that a head cannot devise or bequeath to the corporation, nor can a grant be made to a corporation during vacancy of the headship.~~

~~A corporation has power to make such regulations (by- laws) as are necessary.for carrying out its purposes, and these are binding on its members and on persons within its local jurisdiction if it has any. Such by- laws must not be at variance with the Jaw of the land, nor retrospective in their operation, nor unreasonable. They must further be in harmony with~~

the objects of the society, and must not infringe or limit the powers and duties of its officers. A by- law to compel the giving of a dinner was held to be invalid unless it could be shown that the interest of the corpora- tion was to be promoted thereby.

The power to acquire and hold land was incident to a corporation at common law, but its restriction by the statutes of mortmain dates from a very early period. The English law against mortmain was dictated by the jealousy of the feudal lords, who lost the services they would other- wise have been entitled to, when their land passed into the hands of a perpetual corporation. The vast increase in the estates of ecclesiastical corporations constituted by itself a danger which might well justify the operation of the restricting statutes. Accordingly, in Magna Charta (9 Hen. III. c. 36) there isa clause against the granting of land to religious houses. The statute 7 Edward I. st. 2, c. 1 (De Religiosis), and the Statute of Westminster the Second extended by 15 Richard II. c. 5, prohibited corporations from buying landin mortmain under penalty of forfeiture. The next lord might enter within a year, and each succeeding lord had half a year, and for default of intermediate lord the king should have the lands for ever. If the king and the lords waived their rights, the corporation could hold the land without question. Hence a practice grew up for the king to grant to a corporation a Jicence to hold the lands given to it; and this, although, strictly speaking, a waiving of the king's rights, was in course of time held sufficient to bar the mesne lord's right also. Its power to do so was expressly confirmed by 7 and 8 Will. IIL. c. 37, —not that there was any doubt about it in practice, but to avoid the hateful example of anything like a power in the Crown to suspend the laws. A licensed corporation can hold lands to the extent of its licence.—

The Mortmain Acts applied only to cases ef alienation inter vivos. There was no power to devise Jands by will until 32 Henry VIII: c. 1 (explained by 34 and 35 Henry VIII. c. 5), and when the power was granted corporations were expressly excluded from its benefits. No devise to a corporation, whether for its own use or in trust, was allowed to be good; land so devised went to the heir, either absolutely or charged with the trusts ion upon it in

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the abortive devise. A modification, however, was gradually wrought by the judicial interpretations of the Charitable Trusts Act 43 Elizabeth-c. 4, and it was held that a devise to a corporation for a charitable purpose devise, and would stand unless voided

corporation could take lands by devise, save for charitable purposes. Then came the 9 George ai improperly called the Mortmain Act. generally to make it impossible for land to be left by will for charitable uses, natural person. The new Wills Act does not renew the old provision against S fall under the general law of mortmain. simply that corporations cannot take land for any purpose

without a licence, and that neither corporations nor natural ; devise for charitable uses (see The policy of the law of mortmain may be compared with the rule against perpetuities—a rule which forbids the operation of settlements purporting to regulate The longest period for which the law will allow the future disposition of land to be tied up is a life or lives in being, and twenty-one

persons can take land by CHARITIES).

the devolution of land for ever.

years thereafter.

The power of corporations at common law to alienate

their property is a question of much greater difficulty, and

no satisfactory solution of it is to be found in the cases or text-books. Sutton's Hospital case that they have the power to alienate, but later authorities are sometimes quoted on the other side.

« Ajl civil corporations," says Kyd, " such as the corpora- tions of mayor and commonalty, bailiffs and burgesses of a cities and

town, or the corporate companies of trades in towns, &c., have and always have had an unlimited control

over their respective properties, and may alienate in fee, or

make what estates they please for years, for life, or in tail, as fully as any individual may do in respect of his own property." And he makes the same assertion as to the common law right of colleges and ecclesiastical corporations. Grant, however, argues that no civil corporation can be supposed to hold land otherwise than as " clothed with a public purpose," and that, therefore, there is no right of alienation. Recent judicial decisions, however, seem to favour it. In a case before the late master of the rolls (Evan v. Corporation of Avon, 29 Beavan 144), it was held that a municipal corporation, apart from the Municipal Corporations Act, has full power to dispose of all its property like a private individual, and in the more recent case of Riche v. Ashbury Company (Law Reports, 9 Exchequer, 224) Mr Justice Blackburn, quoting the opinion of Coke in Sutton's Hospital case, lays it down that at com- mon law a corporation might bind itself to anything to which a natural person could bind himself, and deal with its property as a natural person might, and that an attempt to forbid this by the king, even by express negative words, does not bind the law. When land is held by a corpora- tion for charitable or other fiduciary purposes the Court of Chancery will interfere to prevent any improper alienation.

In the case of ecclesiastical and college property, the datigers incident to unlimited power of alienation produced what are known as the restraining statutes in the reign of Elizabeth. The first of these, 1 Elizabeth c. 19, applies only to bishops, and forbids alienations whereby an estate should pass other than for the term of twenty-one years or three lives, with accustomed yearly rent or more reserved.

nT 1 Devises to colleges are excepted from the operation of the Act, but such devises must be for purposes identical with or closely resembling

the original purposes of the college; and the exception fiom this Act does not supersede the necessity for a licence in mortmiain.

~~*might be a good by the Mortmain Acts ;—so that no corporation could take land, without a licence, for any purpose or in any way ; and no licensed*~~

~~*II. c. 36, commonly lts effect is*~~

~~*whether through a corporation or a*~~

~~*devises to corporations, which therefore The result is*~~

~~*Coke is understood to say in his report of*~~

~~*CORPORATION*~~

~~*The 13 Elizabeth c. 10 extends this principle to other ecclesiastical persons and to colleges. The alienation of college and church property is now permitted by modern statutes, under the supervision of commissioners. The Municipal Corporations Act, 1835, deals with the alienation of municipal property in a similar spirit.*~~

~~*As already indicated, the more important classes of cor- porations are now governed by special statutes which ex- clude or modify the operation of the common law principles. The most considerable class of societies still unaffected by such special legislation are the Livery Companies ; for an account of which see Companies. Under the same head- ing will be found an account of the important enactments regulating joint-stock companies.*~~

~~*The question to what extent the common law incidents of a corporation have been interfered with by special legis- lation has become one of much importance, especially under the Acts relating to joint-stock companies. The most important case on this subject is that of Riche o. The Ashbury Railway Carriage Company before mentioned, in which, the judges of the Exchequer Chamber being equally divided, the decision of the court below was affirmed, The view taken by the affirming judges, viz., that the common law incidents of a corporation adhere unless expressly re- moved by the legislature, may be illustrated by a short ex- tract from the judgment of Mr Justice Blackburn :—*~~

‘Tf I thought it was at common law an incident toa corporation that its capacity should be limited by the instrument creating it, I should agree that the capacity of a company incorporated under the Act of 1862 was limited to the object in the memorandum of association. But if I am right in the opinion which I have already expressed, that the general power of contracting is an incident to a corporation which it requires an indication of intention in the legislature to take away, I see no- such indication here. If the question was whether the legislature had conferred on a corpora- tion, created under this Act, capacity to enter into contracts beyond the provisions of the deed, there could be only one answer. The legislature did not confer such capacity. But if the question be, as I apprehend it is, whether the legislature have indicated an intention to take away the power of contracting which at common law would be incident to a body corporate, and not merely to limit the authority of the managing body and the majority of the share- holders to bind the minority, but also to prohibit and make illegal contracts made by the body corporate, in such a manner that they would be binding on the body. if incorporated at common law I think the answer should be the other way.”

On the other hand, the House of Lords, agreeing with the three dissentient judges in the Exchequer Chamber, pronounced the effect of the Companies Act to be the opposite of that indicated by Mr Justice Blackburn. “It was the intention of the legislature, not implied but actually expressed, that the corporations should not enter, having regard to this memorandum of association, into a contract of this description. The contract in my judgment could not have been ratified by the unanimous assent of the whole corporation.” In such companies, therefore, objects beyond the scope of the memorandum of association are ulira vires of the corporation. The doctrine of wltra wres, as it is called, is almost wholly of modern and judicial creation. Its first emphatic recognition of it appears to have been in the ease of companies created for special pur- poses with extraordinary powers, by Act of Parliament, and, more particularly, railway companies. The funds of such companies, it was held, must be applied to the pur- poses for which they were created and to no other, Whether this doctrine is applicable to the older or, as they are sometimes called, ordinary corporations, appears to be doubtful. A recent author (Brice on Oléra Vires) writes :— .

~~*"Take, ag a strong instance, o university or o London guild. Either can undoubtedly manage, invest, transform, and expen tho corporate property 1n almost any way it pleases, but if they proposed to exhaust the same on the private pleasures of existing members, or to abandon the promotion, the one of education, the*~~

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~~*other of their art and mystery, it is very probable, if not absolutely certain, that the Court of Chancery would restrain the same, as being wltra vires."*~~

~~*Municipal Corporations.—The introduction of corpora. tions into cities and towns does not appear to date farther back than the reign of Henry VI, although they had long possessed what may be called a quasi-corporate character. By that time the corporate character of ecclesiastical and educational societies and even of guilds had been recog- nized, and the great convenience of corporate powers was, no doubt, the reason why they were demanded by the com- monalties of towns, The inhabitants of Plymouth appear to have petitioned for a corporation in 13 Henry IV., and the charter of Kingston-on-Hull in 18 Henry VI. is said to be the first charter of municipal incorporation in England. The ultimate effect of these charters was in general to re- duce the boroughs into close corporations, the members of which engrossed the municipal and political powers to the exclusion of the general body of the inhabitants, The legal dependence of such corporations on the charter of the king suggested the measures above referred to by which the Crown attempted to get the control of the corpora- tions. The reversal of the judgments obtained in the pro- ceedings against corporations formed one of the first acts of the people after the Revolution of 1688, and thereafter corporations shared with private persons the advantages of freedom from arbitrary interference on the part of the Crown. Freedom from state control, however, means in the case of corporations the growth of abuses. The Cor- porations Act of the reign of Charles II., one of the measures forced on the king by the jealousy of his Parlia- ment for the rights of the church, provided that no person should be elected to office in any corporate town, who should not within one year previously have taken the sacrament of the Lord's Supper according to the rites of the church, and this enactment, although after a time sus- pended by temporary statutes,*~~

was not finally abolished till 9 Geo. IV. c. 17, which substituted for the test a declara- tion not to injure or weaken the Church of England, The important powers, municipal, political, and judicial, possessed by town corporations, the large ascertained amount of property in their hands, their exclusiveness, secrecy, and almost total freedom from responsibility,—all these abuses were acquiesced in till the reform of the House of Commons in 1832 enabled Parliament to turn its atten- tion to the reform of other public institutions. The royal commissioners appointed in 1834 reported that " there prevails among the inhabitants of a great majority of the incorporated towns a general and in our opinion a just dis- satisfaction with the municipal institutions—a distrust of the self-elected municipal councils, whose powers are subject to no popular control, and whose acts and proceedings, being secret, are not checked by the influence of public opinion ; a distrust of the municipal magistracy, tainting with sus- picion the local administration of justice ; a discontent under the burthen of local taxation, while revenues are diverted from their legitimate use." The publication of this report was followed by the Municipal Corporations Act, 5 and 6 Will. IV. c. 26, by which, in all the boroughs named in the schedules to the Act, the laws, customs, charters, thereto- fore in force, are repealed where inconsistent with the pro- visions of the Act. Section 2 reserves all rights of property and beneficial exemptions to freemen, their wives and children; but freedom is not in future to be acquired by gift or purchase. The body corporate in such borough shall be called the mayor, aldermen, and burgesses of such borough, and by that name shall have perpetual succession, and shall be capable in law by the council hereinafter mentioned to-do and suffer all things which now lawfully they and their successors respectively may do and suffer

by any name or title of incorporation. It has been held that this Act does not create new corporations, although it alters the name, title, and constitution of the governing body. All corporate funds, after payment of debts,

'salaries, dvc., as specified in the Act, are expressly appro-

priated to public purposes. Advowsons in the possession of the body corporate are to be sold under the direction of the ecclesiastical

commissioners, and the proceeds invested in securities for the use of the corporation. The general regulations of municipalities under this and subsequent Acts not affecting them in their. character as corporations, belong to the subject of Municipal Government.

This beneficial Act was unfortunately limited in its operation. London and all its corporations were left out, and the municipal government of the metropolis is at this moment a medley of independent jurisdictions in striking contrast with the orderly corporations of other large towns. And on the other hand, many small boroughs were omitted in the original Act, which still exhibit in the mismanage- . ment of their property and powers the abuses against which that Act was directed. In 1875 and 1876 resolutions on the subject were laid before the Parliament, and from a return procured by Government, it appeared that the number of unreformed corporations was 102. Many of these were places of some importance, and in possession of considerable property. Government yielded to the general feeling that inquiry was desirable, and a royal commission Was appointed to consider the subject. (E. RB.)

CORPULENCE, or Osestry, is a condition of the body characterized by the over-accumulation of fat under the skin and around certain of the internal organs. In all healthy persons a greater or less amount of fat is present in these parts, and serves important physiological ends, besides contributing to the proper configuration of the body. Even a considerable measure of corpulence, how- ever inconvenient, is not inconsistent with a high degree of health and activity, and it is only when in great excess or rapidly increasing that it can be regarded as a morbid state. The extent to which obesity may proceed is illustrated by numerous well-authenticated examples recorded in medical works, of which only afew can be here mentioned. Thus Bright, a grocer of Maldon, in Essex, who died in 1750, in his twenty-ninth year, weighed 616 ib. Dr F. Dancel records the case of a young man of twenty-two, who died from excessive obesity, weighing 643

tb. In the Philosophical Transactions for 1813 a case is

recorded of a girl of four years of age who weighed 256 Ib. But the most celebrated case is that of Daniel Lambert of Leicester, who died in 1809 in his fortieth year. He is said to have been the heaviest man that ever lived,

his weight being 739 tb (52 st. 11 tb). Lambert had publicly exhibited himself for some years prior to his death, which occurred suddenly at Stamford. At the inn where he died two suits of his clothes were preserved, from which some idea of his enormous dimensions may be obtained, when it is stated that his waistcoat could easily inclose seven persons of ordinary size. Lambert ate moderately, drank only water, and slept less than most persons. He is said to have had an excellent tenor voice.

Health cannot be long maintained under excessive obesity, for the increase in bulk of the body, rendering exercise more difficult, leads to relaxation and defective nutrition of muscle, while the accumulations of fat in the chest and abdomen occasion serious embarrassment. to the functions of the various organs in those cavities, In general the mental activity of the highly corpulent becomes impaired, although there have always been many notable exceptions to this rule.

Various causes are assigned for the production of corpu- lence, but it must be admitted that in many cases it cannot

be accounted for. In some families there exists an hereditary predisposition to an obese habit of body, the manifestation of which no precautions as to living appear capable of averting. But beyond this it is unquestionable that certain habits favour the occurrence of corpulence. A luxurious, inactive, or sedentary life, with over-indulgence in sleep and absence of mental occupation, are well recognized predisposing causes. The more immediate exciting causes are over-feeding and the large use of fluids of any kind, but especially alcoholic liquors, Fat persons are not always great eaters, though many of them are, while again, leanness and inordinate appetite are not in- frequently associated. Still, it may be stated generally that indulgence in food, beyond what is requisite to repair daily waste, goes towards the increase of flesh, particularly of fat. This is more especially the case when the non- nitrogenous (the fatty, saccharine, and starchy) elements of the food are in excess. Although it is still undetermined whether the fat of the body is derived alone from these, or also from the nitrogenous (albuminous) elements of the food, it seems certain that while an excess of the latter constituents accelerates the oxidation and metamorphoses of the

fatty tissues, an excess of the non-nitrogenous retards these changes, and thus tends directly to the pro- duction of obesity (Parkes). The want of adequate bodily exercise will in a similar manner produce a like effect, and it is probable that many gases of corpulence are to be ascribed to this cause alone, from the well-known facts that many persons of sedentary occupation become stout, although of most abstemious habits, and that obesity frequently comes on in the middle-aged and old, who take relatively less exercise than the young, in whom it 1s com- paratively rare. Women are more prone to become corpu- lent than men, and appear to take on this condition more readily after the cessation of the function of menstruation.

For the prevention of corpulence and the reduction of superfluous fat many expedients have been resorted to, and numerous remedies recommended. It is unnecessary to allude to these in detail, further than to state that they embrace such regimen as bleeding, blistering, purging, starving, the use of different kinds of baths, and of drugs innumerable, most of which means have been found utterly to fail in accomplishing the desired object. The drinking of vinegar was long popularly supposed to be a remedy for obesity. It is related of the marquis of Cortona, a noted general of the duke of Alba, that by drinking vinegar he so reduced his body from a condition of enormous obesity that he could fold his skin about him like a garmeitt, Such a remarkable result was only a proof of the injury done to his health by the excessive use of-vinegar. There is no evidence, whatever, that this liquid has any power to remove fat, while its pernicious effects upon the health, when taken in large quantity, are well known to medical men. Another medicinal agent, which has been proposed on the high authority of Dr T. King Chambers, is the liquor potasse. This medicine, which is recommended on the ground of the chemical affinity of the alkalis for fats, is directed to be taken in teaspvonful doses in milk twice or thrice daily, at the same time that a restricted diet and abundant exercise is enjoined. But even this plan, although occasionally yielding good results, cannot be said to have been widely successful. The more rational and hopeful system of treatment appears to be that which is directed towards regulating the quality as well as the quantity of nutriment ingested. This method has of late years received much attention, chiefly in consequence of the publication, in 1863, of a pamphlet entitled Letter on Corpulence, Addressed to the Public by William

Banting, in which was narrated the remarkable experience of the writer in accomplishing the reduction of his own weight in a short

space of time by the adoption of a particular kind of diet. Mr Banting describes the condition of obesity in which he was in August 1862, and which, although certainly less than those examples above mentioned, appears to have been sufficient to prove a source of much discomfort and even of actual suffering. After trying almost every known remedy without effect, he was induced, on the suggestion of Mr Harvey, a London aurist, to place himself upon an entirely new form of diet, which consisted chiefly in the removal, as far as possible, of all saccharine, starchy, and fat food, the reduction of liquids, and the substitution of meat or fish and fruit in moderate quantity at each meal, together with the daily use of an antacid draught. Under this regimen his weight was reduced 46 ib in the course of a few weeks, while his health underwent a marked improve- — ment. Mr Banting's recorded experience, as might have been expected, induced many to follow his example, and in numerous instances the effects were all that could be desired, But in many cases the diminution in weight was found to be attended with such a serious impairment of health as to render the carrying out of this system impos- sible. It is probable that in some at least of these cases the unfavourable effects might have been avoided had the change in diet been more gradually brought about. There seems little reason to doubt that this method, founded as it is on well-recognized principles of physiological chemistry, is that Which is most likely to yield the best results in the treatment of corpulence. It evidently cannot, however, be safely adopted in all cases, and ought not to be attempted to be carried out except under medical advice and observa- tion ; for however desirable it be to get rid of superabundant fat, it would be manifestly no gain were this to be achieved by the sacrifice of the general health. An important ele- ment in the treatment of obesity is the due regulation of the amount of bodily exercise, and this, too, ought to be made the subject of the physician's careful attention.

Cursory Remarks on Corpulence, or Obesity considered as a Disease, by William Wadd, 3d ed., London, 1816 ; Corpulence or Excess of Fat in the

Human Body, by Dr. T. King Chambers, London, 1850 ; Traité théorique ct pratique de TV obésité, by Dr F. Dancel, Paris, 1863; Letter on Corpulence, addressed to the Public by William Banting, 3d ed., London, 1864; The Practice of Medicine, by Dr Tanner, London, 6th ed., London, 1869. (J. O. A.)

CORPUS CHRISTI, a festival of the Church of Rome observed on the first Thursday after Trinity Sunday, in honour of the doctrine of the Eucharist. It was instituted by Pope Urban IV., in 1264, and is still celebrated as one of the greatest feasts of the church.

CORREA DA SERRA, Jost Francisco (1750-1823), a Portuguese politician and man of science, was born at Serpa, in Alemtejo, in 1750. Having been educated at Rome, he took orders under the protection of the duke of Alafoes, uncle of Mary I. of Portugal. In 1777 he returned to Lisbon, where he resided with his patron, with whost assistance he founded the Portuguese Academy of Sciences. Of this institution he was named perpetual secretary, and he received the privilege of publishing its transactions without reference to any censor whatever. His use of this right brought him into conflict with the Holy Office; and consequently in 1786 he fled to France, and remained there till the death of Pedro IIJ., when he again took up his residence with Alafoés. But having given a lodging in the palace to a French Girondist, he was forced to flee to Eng- land, where he found a protector in Sir Joseph Banks, and became a member of the Royal Society. In 1797 he was appointed secretary to the Portuguese legation, but a quarrel with the ambassador drove him once more to Paris (1802), and in that city he resided till 1813, when he crossed over to New York. In 1816 he was made Portuguese minister- plenipotentiary at Washington, and in 1820 he was recalled home, appointed a member of the Financial

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Council, and lected to a seat in the Cortes, Three years after, and in the same year with the fall of the constiti- tional Government, he died. Correa da Serra ranks high as a botanist, though he published no great special work. His principal claim to renown is the Colecctéo de Livros ineditos da Historia Portugueza, 4 vols. (1790-1816), an invaluable selection of docuinents, exceedingly well edited.

~~CORREGGIO, or Correcto, is the name ordinarily given to Antonio Allegri (1494-1534), one of the most celebrated Italian painters, of the most vivid and impulsive inventors in expression and pose, and of the most con-Summate executants. The external circumstances of his life have been very diversely stated by different writers, and the whole of what has been narrated regarding him, even waiving the question of its authenticity, is but meagre.~~

~~The first controversy 1s as to his origin. Some say that he was born of poor and lowly parents; others, that his family was noble and rich. Neither account is accurate, His father was Pellegrino Allegri, a tradesman in comfort- able circumstances, living at Correggio, a small city in the territory of Modena; his mother Bernardina Piazzoli degli Aromani, also of a creditable family of moderate means, Antonio was born at Correggio, and was carefully educated. He was not (as has been often alleged) strictly self-taught in his art—a supposition which the internal evidence of his pictures must of itself refute. They showa knowledge of optics, perspective, architecture, sculpture, and anatomy. The last-named science he studied under Dr Giovanni Battista Lombardi, whom he is believed to have represented in the portrait currently named Il Medico del Correggio (Correggio's physician). Itis concluded that he learned the first elements of design from his uncle, Lorenzo Allegri, & painter of moderate ability at Correggio, and from Andrea Bartolotti, named Tognino, and that he afterwards went to the school of Francesco Ferrari Bianchi (named Frari), and perhaps to that of the successors of Andrea Mantegna in Mantua. He is said to have learned modelling along with the celebrated Begarelli at Parma; and it has even been suggested that, in the Piet executed by Begarelli for the church of Santa Margherita, the three finest figures are the work of Correggio, but, as the group appears to have been completed three years after the painter's death, there is very little plausibility in this story. Another statement connecting Begarelli with Correggio is probably true, namely, that the sculptor executed models in relief for the figures which the painter had to design on the cupolas of the churches in Parma. This was necessarily an expensive item, and it has been cited as showing that Correggio must have been at least tolerably well off,—an inference further supported by the fact that he used the most precious and costly colours, and generally painted cn fine canvases, or sometimes on sheets of copper.~~

~~The few certain early works of Correggio show a rapid progression towards the attainment of his own original style. Though he never achieved any large measure of reputation during his brief lifetime, and was perhaps totally unknown beyond his own district of country, he found a sufficiency of employers, and this from a very youthful age. One of his early pictures, painted in 1514 when he was nineteen or twenty years old, is a large altar-piece com- missioned for the Franciscan convent at Carpi, representing the Virgin enthroned, with Saints ; it indicates a predilec- tion for the style of Leonardo da Vinci, and has certainly even greater freedom than similarly early works of Raphael. This picture is now in the Dresden Gallery. Another painting of Correggio's youth is the Arrest of Christ. A third isan Ancona (or triple altar-piece—the Repose in Egypt, with Sts Bartholomew and John) in the church of the Conventuali at Correggio, showing the transition from~~

~~Between 1514 and 1520 Correggio worked much, both in oil and in fresco, for churches and convents. In 1520 he began his famous fresco of the Ascension or Assumption of Christ, on the cupola of the Benedictine church of St John in Parma ; here the Redeemer is surrounded by the twelve apostles and the four doctors of the church, supported by a host of wingless cherub boys amid the clouds. This he finished in 1524, and soon afterwards undertook his still vaster work on another cupola, that of the cathedral of the same city, representing the Assumption of the Virgin, amid an unnumbered host of saints and angels rapt in celestial joy. It occupied him up to 1530. The astounding boldness of scheme in these works, especially as regards their incessant and audacious foreshortenings—the whole mass of figures being portrayed as in the clouds, and as seen from kelow—becomes all the more startling when we recall to mind the three facts—that Correggio had apparently never seen any of the masterpieces of Raphael or his other great predecessors and contemporaries, in Rome, Florence, or other chief centres of art; that he was the first artist who ever undertook the painting of a large cupola ; and that he not only went at once to the extreme of what can be adventured in foreshortening, but even fore stalled in this~~

~~attempt the mightiest geniuses of an elder generation—the Last Judgment of Michelangelo, for in- stance, not having been begun earlier than 1533 (although the ceiling of the Sixtine Chapel, in which foreshortening plays a comparatively small part, dates from 1508 to 1512). The cupola of the cathedral has neither skylight nor windows, but only light reflected from below 3 the frescoes, some portions of which were ultimately supplied by Giorgio Gandini, are now dusky with the smoke of tapers, and parts of them, both in the cathedral and in the church of St John, have during many past years been peeling off. The violent foreshortenings were not, in the painter's own time, the object of unmixed admiration ; some satirist termed the groups a " guazzetto di rane," or hash of frogs. This was not exactly the opinion of Titian, who is reported to have said, on seeing the pictures, and finding them lightly esteemed by local dignitaries, "Reverse the cupola, and fill it with gold, and even that will not be its money's worth." Annibale Caracci and the Eclectics generally evinced their zealous admiration quite as ardently. Parma is the only city which contains frescoes by Correggio. For the paintings of the cupola of St John he received the moderate sum of 472 sequins; for those of the cathedral, much less proportionately, 350. On these amounts he had to subsist, himself and his family, and to provide the colours, for about ten years, having little time for further work meanwhile. Parma was in an exceedingly unsettled and turbulent condition during some of the years covered by Correggio's labours there, veering between the govern- mental ascendency of the French and of the Pope, with wars and rumours of wars, alarms, tumults, and pestilence.~~

~~Other leading works by Correggio arc the following :— The frescoes in the Camera di San Paolo (the abbess's saloon) in the monastery of S. Lodovico at Parma, painted towards 1519 in fresco,—Diana returning from the Chase, with auxiliary groups of lovely and vivacious boys of more than life-size, in sixteen oval compartments. In the National Gallery, London, the Ecce Homo, painted pro- bably towards 1520; and Cupid, Mercury, and Venus, the latter more especially a fine example. The oil-painting of the Nativity named Night, or La Notte, for which 40 ducats and 208 livres of old Reggio coin were paid; the nocturnal scene is partially lit up by the splendour pro- ceeding from the divine Infant. This work was undertaken at Reggio in 1522 for Alberto Pratoneris, and is now in the Dresden Gallery. The oil-painting of St Jerome,~~

termed also Day (Il Giorno), as contrasting with the above- named Night. Jerome is here with the Madonna and Child, the Magdalene, and two Angels, of whom one points out to the Infant a passage in the book held by the Saint. This was painted for Briseida Bergonzi from 1527 onwards, and was remunerated by 400 gold imperials, some cartloads of faggots and measures of wheat, anda fat pig. It 1s now in the gallery at Parma. 'The Magdalene lying at the entrance of her cavern: this small picture (only 18 inches wide) was bought by Augustus Ill. of Saxony for 6000 louis @or,and is in Dresden. In the same Gallery, the two works designated St George (painted towards 1532) and St Sebastian. In the Parma Gallery, the Madonna named "della Scala," a fresco which was originally in a recess of the Porta Romana, Parma ; also the Madonna « della Scodella" (of the bowl, which is held by the Virgin— the subject being the Repose in Egypt) : it was executed

for the church of San Sepolcro. Both these works date

towards 1526. Inthe church of the Annunciation, Parma, a fresco of the Annunciation, now all but perished. Five celebrated pictures painted or begun in 1532,—Venus, Leda, Danae, Vice, and Virtue : the Leda, with figures of charming girls bathing, is now in the Berlin Gallery, and is a singularly delightful specimen of the master. In Vienna, Jupiter and Io, In the Louvre, Jupiter and Antiope, and the Mystic Marriage of St Catharine. In the Naples Museum, the Madonna Reposing, commonly named La Yingarella, or the Madonna del Coniglio (Gipsy-girl, or Madonna of the Rabbit). On some of his pictures Cor- reggio signed ' Lieto," as a synonym of "Allegri." About forty works can be confidently assigned to him, apart from a multitude of others probably or manifestly spurious.

The famous story that this great but isolated artist was once, after long expectancy, gratified by seeing a picture of Raphael's, and closed an intense scrutiny of it by exclaiming " Anch' io son pittore" (I too am a painter), cannot be traced to any certain source. It has nevertheless a great internal air of probability ; and the most enthusiastic devotee of the Umbrian will admit that in technical bravura, in en- terprizing, gifted, and consummated

execution, not Raphael himself could have assumed to lord it over Correggio.

In 1520 Correggio married Girolama Merlino, a young lady of Mantua, who brought him a good dowry. She was but sixteen years of age, very lovely, and is said by tradition to have been the model of his Zingarella. They lived in great harmony together, and had a family of four children, She died in 1529. Correggio himself expired at his native place on the 5th of March 1534. His illness was a short one, and has by some authors been termed pleurisy. Others, following Vasari, allege that it was brought on by his having had to carry home a sum of money, 50 seudi, which had been paid to him for one of his pictures, and paid in copper coin to humiliate and annoy him ; he carried the money himself, to save expense, from Parma to Correggio on a hot day, and his fatigue and exhaustion led to the mortal illness. In this curious tale there is no symptom of authenticity, unless its very singularity, and. the unlikelihood of its being invented without any founda- tion at all, may be allowed to count for something. He is said to have died with Christian piety ; and his eulogists (speaking apparently from intuition rather than record) affirm that he was a good citizen, an affectionate son and father, fond and observant of children, a sincere and obliging friend, pacific, beneficent, grateful, unassuming, without meanness, free from envy, and tolerant of criticism. He was buried with some pomp in tho Arrivabene Chapel, in the cloister of the Franciscan church at Correggio.

Regarding the art of Correggio from an intellectual or emotional point of view, his supreme gift may be defined as suavity,—a vivid spontaneous lambent play of the

affections, a heartfelt inner grace which fashions the forms and features, and beams like soft and glancing sunshine in the expressions. We see lovely or lovable souls clothed in bodies of corresponding loveliness, which are not only physically charming, but are so informed with the spirit within as to become one with that in movement and gesture. In these qualities of graceful naturalness, not heightened into the sacred or severe, and of joyous anima- tion, in momentary smiles and casual living turns of head or

~~*limb, Correggio undoubtedly carried the art some steps beyond anything it had previously attained, and he remains to this day the unsurpassed or unequalled model of pre- eminence. From a technical point of view, his supreme gift—even exceeding his prodigious faculty in foreshortening and the like—is chiaroscuro, the power of modifying every tone, from bright light to depth of darkness, with the sweetest and most subtle gradations, all being combined into harmonious unity. In this again he far distanced all predecessors, and defied subsequent competition. His colour also is luminous and precious, perfectly under- stood and blended ; it does not rival the superb richness or deep intense glow of the Venetians, but on its own showing is a perfect achievement, in exact keeping with his powers in chiaroscuro and in vital expression. When we come, however, to estimate painters according to their dramatic faculty, their power of telling a story or impressing a majestic truth, their range and strength of mind, we find the merits of Correggio very feeble in comparison with those of the highest masters, and even of many who without being altogether great have excelled in these particular qualities. Correggio never means much, and often, in subjects where fulness of significance is demanded, he means provokingly little. He expressed his own miraculous facility by saying that he always had his thoughts at the end of his pencil; in truth, they were often thoughts rather of the pencil and its controlling hand than of the teeming brain. He has the faults of his excellences— sweetness lapsing into mawkishness and affectation, empty in elevated themes and lasciviously voluptuous in those of a sensuous type, rapid and forceful action lapsing into posturing and self-display, fineness and sinuosity of contour lapsing into exaggeration and mannerism, daring design lapsing into incorrectness. No great master is more dangerous than Correggio to his enthusiasts ; round him the misdeeds of conventionalists and the follies of con- noisseurs cluster with peculiar virulence, and almost tend to blind to his real and astonishing excellences those prac- titioners or lovers of painting who, while they can acknow- ledge the value of technique, are still more devoted to greatness of soul, and grave or elevated invention. as expressed in the form of art.*~~

~~*Correggio was the head of the school of painting of Parma, which forms one main division of the Lombardic school. He had more imitators than pupils. Of the latter one can name with certainty only his son Pomponio,*~~

who was born in 1521 and died at an advanced age; Francesco Capelli ; Giovanni Giarola ; Antonio Bernieri (who, being also a native of the town of Correggio, has sometimes been confounded with Allegri); and Bernardo Gatti, who ranks as the best of all. The Parmigiani (Mazzuoli) were his most highly distinguished imitators. (Ww. M. R.)

CORREZE, an inland department of France, formed from the southern portion of the old province of Limousin, is bounded N. by the departments of Haute-Vienne and Creuse, E. by Puy-de-Déme and Cantal, 8. by Lot, and W. by Dordogne, and lies between 44° 55' and 45° 40' N. lat. The surface of the country ic in general hilly, but in the south-west there are some plains. In the north an offshoot of the mountains of Auvergne separates the basins of the Dordogne and Loire. The soil is mostly poor and thin,

moderately fertile in the low, but heathy and unproductive in the high lands. In certain districts there are forests of oak, birch, beech, elm, and poplar. The average tempera- ture of Corréze is low, and the climate is damp, as several of the higher mountain summits are covered with snow for many months in the year; the summer heat in the valleys is, however, excessive. The principal rivers are the Dordogne and the Vezire, with its affluent the Corrdze. The chief productions are wheat and other cereals, hemp, flax, and wine of an inferior quality. Chestnuts are a staple article of diet with many of the people. Cattle, sheep, goats, horses, mules, and pigs are reared in consider- able numbers. The mineral resources, which are little developed, include ores of iron, copper, lead, tin, and antimony, besides coal, marble, slates, clay, millstones, grind- stones, granite, and porphyry. The manufactures are fire- arms, glass, bricks, leather, coarse woollens, paper, lace, wax candles, and nut oil. The department is divided into the arrondissements Tulle, Brive, and Ussel, containing 29 cantons and 286 communes. The chief town is Tulle, The total area is 2265 square miles, and the population in 1872 numbered 302,746.

CORRIENTES, or San JuAN DE CorrientEs, a town of the Argentine Republic, South America, and capital of the province of Corrientes, is situated on the left bank of the Parana, below its junction with the Paraguay, in 27° 27' 31" S. lat. and 58° 46' W. long. It has a college,

~~Government house, museum, several schools and churches, anda good quay; and is an emporium for the maté, sugar, cotton, and tobacco of Paraguay, and for the furs of the Chaco Indians. The exports are chiefly hides, wool, and timber. Population, 10,546. Corrientes was founded by Alonzo de Bera on the 3d April 1588.~~

~~CORRY, a city of 6800 inhabitants, in Erie County, Pennsylvania, which owes its existence and its prosperity to the petroleum wells discovered in 1861.- Besides the numerous establishments, connected with the oil-trade, it has engineering works, steam-mills, and tanneries ; and, favoured as it is by its position at a railway junction, it is rapidly developing a considerable traffic. Its incorporation as a city dates from 1866.~~

~~CORSEUL, or Corsrutt. See Cédres-pu-Norp.~~

~~CORSICA (Greek, Kvpvos; Latin, Corsus and Corsica ; French, Corse), a large island of the Mediterranean, belong- ing to France, is situated immediately to the north of Sardinia (from which it is separated by the narrow strait of Bonifacio), between 41° 20' and 48° N, lat., and 8° 30' and 9° 30' E. long. Population, 258,507. It lies within 54 miles west of the coast of Tuscany, 98 miles south of Genoa, and 106 miles south-east of the French coast at Nice. Tho extreme length of the island is 116 miles, and its breadth 52 miles; and it has an area of 3376 square miles—about one-third of the extent of Sardinia. The greater part of the surface of Corsica is occupied by a central range of lofty and rugged mountains, diverging in all directions, the highest peaks being Monts Cinto (8889 feet), Rotondo (8609), Pagliorba (8284), Padro (7846), and d'Oro (7841). On the west and south of the island the spurs of this range either terminate abruptly on the shore or run out to a great dis- tance into the sea, forming bays and gulfs, some of which afford excellent harbours. The prevailing rocks are of granite, gneiss, and mica slate, with occasional beds of syenite, porphyry, and serpentine. Minerals are not worked to any great extent, although lead is found in some quantity at Luri, antimony at Ersa, and copper at Bastia, Ponte Leecia, &. On the eastern side of the island, between Bastia and Porto Vecchio, there intervenes between the mountains and the sea a considerable tract of low country, where there are plantations of olive trees, almond~~

and fig trees, and vineyards. The oil produced is, however, not of the best quality, and much of the wine is exported to France in a raw state for the manufacture of liqueurs. Corsica is well watered with rivers, which, though short in their course, bring down large volumes of water from the mountains. The longest is the Golo (the Tavola of the Romans), which enters the sea on the east coast through the large salt-water lake of Biguglia; further south on the same side of the islan ie the Tavignano and the Rezzanese;

while on the east sfde is, Taravo. The other streams are all comparatively. From the rugged and in

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Island of Corsica.

dented outline of the coast there are an unusual number of bays and harbours. Of the former the most important on the western side of the island are Porto, Sagone, Ajaccio, and Propriano ; of the latter, St Florent, Ile Rousse, Calvi, and Ajaccio. On the eastern side, which is much less rugged and broken, the only harbours worth mentioning are Bastia and Porto Vecchio (the Portus Syracusanus of the ancients), and the only gulf that of Santa Manza. A% the extreme south are the harbour and town of Bonifacio, giving name to the strait which separates Corsica from Sardinia,

Of the internal resources of the island the most important consist of those vast forests that cover the summits of the hills, and which furnished timber for the navies of antiquity. Partly, however, from the indolence of the inhabitants, and partly from the difficulties of land carriage, this source of wealth is comparatively neglected. The mountain pastures are made available for the rearing of cattle, horses, asses, and mules. Sheep of a peculiar black breed, called mujflons, inhabit the more inaccessible parts of the mountains, and goats and pigs abound in the island. The uncultivated districts are generally over- grown with a thick tangled underwood,

consisting of arbutus, myrtle, thorn, laurel, broom, and other shrubs, and called by the natives maquis, which, however, is easily cleared off by burning. Throughout the island the growth of the cereal crops is generally abandoned for the easier cultivation of the olive and vine. Chestnuts constitute an important article of food, but wheat, maize, and barley are

passed into the hands of the Vandals. These barbarians were driven out by Belisarius, but after the death of that illustrious general, 565 A.D, the resistless hordes of Attila once more gained possession of the island. Since that period it has successively owned the dominion of the Goths, the Saracens, the Pisans, and the Genoese. The impress of the last is to be found in the style of the church architecture and notably in the patois of the people ; while the armorial crest of the island, 2 Moor's head, is ascribable to the Saracen occupation. Corsica was ceded by the Genoese to the French in 1768 ; and for a few years after the French Revolution of 1793 it was placed under the protection of Great Britain. Since 1814 it has been in undisturbed possession of the French. Corsica is famous as the birthplace of Pascal Paoli and of Napoleon Bona- parte.

also cultivated. The backward state of agriculture is caused principally by the minute subdivision of the land, a system which perpetuates the social evils of hereditary feuds and jealousies, ky which Corsica has long been distracted. A large proportion of the exports of the island consists of honey and wax, which are procured from the forests. 'The former of these has a somewhat bitter flavour, from the yew and box trees on which the bees feed. Beyond the making of oil, wine, soap, bricks, and coarse glass, the Corsicans are entirely destitute of manufacturing industry, and their commerce consists for the most part of the spontaneous produce of the island. The fisheries of tunny, pilchard, and anchovy are extensively prosecuted for the supply of the Italian markets ; but comparatively few of the native Corsicans are engaged in this department of industry. The Government have constructed 700 miles of excellent roads (Routes V ationales), round the entire island, and crossing it at various points, by which regular com- munication is maintained by means of diligences.

Corsica, which forms a department of France, is divided into five arrondissements, subdivided and peopled as follows :—

CORSSEN, Witwerm Pavt (1820-1875), a distin- guished German philologist, was born at Bremen, January 20, 1820, and received his school education in the Prussian town of Schwedt, to which his father, a merchant, had removed. After spending some time at the J oachimsthal Gymnasium in Berlin, where his interest in philological pur- suits was awakened by the Rector Meinike, he proceeded to the university, and there came especially under the in- fluence of Boeckh and Lachmann. HIs first important

Arrondiavemerits. Cantons. Communes. Population (1872). appearance in literature was as the author of Origines Poesis 1, Ajaccio……. —+--+- 12 a 66,701 Romane, by which he had obtained the prize offered by 2. Sartene…..sseeeees 8 46 33,495 the "philosophical" or "arts" faculty of the university. oe Bastia eel geleteeincs wieih i sisce 20 93 74,124 it 1846 h ll df St tti h h h df "| "Cr ere 6 34 24,516 . ewas called ironmSiet eS 6 le cig eens 16 110 59,671 two years held a post in the gymnasium, to occupy the ——— position of lecturer in the royal acadenty at Pforta (near Total……..+ + 62 355 258,507 Naumburg), and there he continued to labour for the next

Of this number 130,406 were males and 128,101 females ; and compared with the census of 1851, the total population has increased by 22,256 souls, or nearly 9 per cent. in twenty-one years.

The principal towns are Ajaccio (pop. 16,545), the capital and the seat of the bishop of the island (who is under the archbishop of Aix), the prefect, and the com- mander of the forces; Bastia (pop. 17,850), Corte (5430), and Sartene (4166). Education is very backward among the islanders, about 40 per cent. being returned as unable to read or write. There are, however, several colleges, such as the lyceum of Bastia, the Collége Fesch of Ajaccio, the Collége de Calvi, and the Ecole Paoli de Corte. The people are sober in their habits, but not enterprizing and without much knowledge of sanitary laws. 'Their prone- ness to agrarian outrages has brought upon them an evil repute, but thanks-to the strenuous efforts of the French Government this spirit of lawlessness has been greatly curbed. A great part

of the agricultural labour is per- formed by labourers from Tuscany and Lucca, who periodi- cally visit the island for that purpose.

History.—It is not known who the original inhabitants of Corsica were. The Phocians of Ionia were the first civilized people that established settlements in Corsica. About the year 560 B.c. they landed for the first time on the island, and founded the city of Aleria, which after a short occupation they were compelled to abandon. After an interval of a few years they again returned, rebuilt Aleria, which they fortified, and endeavoured to maintain their ground against the natives. After a struggle of some years they were again compelled to leave the island. The next foreign occupants of Corsica were the Tuscans, who founded the city of Nicxa, but they in their turn were compelled to give way before the growing mari- time power of the Carthaginians, whose jurisdiction in the island was unquestioned till the beginning of the first Punic war. On that occasion the Romans sent out a fleet, drove the Carthaginians from the island, and exacted at least a nominal homage from the native population. They did not, however, fully establish their power here till about thirty years later, and even then rebellions and revolts were of constant occurrence. The first step made towards the real subjugation of the island was the establishment of the two colonies on its eastern coast—that of Aleria by Sulla, and that of Mariana by Marius. In the time of the emperors, the island had fallen into disrepute among the Romans, by whom it was used chiefly as a place of banishment for political offenders. One of the most distinguished of these sufferers was the younger Seneca, who spent in exile here the eight years ending 49 A.D.

On the downfall of the Roman empire in the West. Corsica

twenty years. The philosophico-historical class of the Royal Prussian Academy of Sciences having, in 1854, offered a prize for the best work on the pronunciation and accent of Latin, he gained the day by means of a treatise which at once took rank, on its publication under the title of Ueber Aussprache, Vokalismus, und Betonung der Lateinischen Sprache (2 vols. Leipsic, 1858-59), as one of the most erudite and masterly works in its department. This was followed in 1863 by his Kritische Bewtrdge zur Lat. Formenlehre, which were supplemented—in 1866 by Kritische Nachtrige zur Lat. Formenlehre. In the discus- sion of the pronunciation of Latin he

was naturally led to consider the various old Italian dialects, and the results of his investigations appeared in miscellaneous communications to Kuhn's Zeitschrift fiir vergleichende Schriftforschung. The state of his health obliged him to give up his pro- fessorship at Pforta, and return to Berlin, in 1866; but it produced almost no diminution of his literary activity. In 1867 he published an elaborate archeological study entitled the Alterthiimer und Kunstdenkmale des Custercrenser- Llosters St Marien und der Landesschule Pforta, in which he gathers together all that can be discovered about the history of the establishment where he had taught so long ; and in 1868-69 he brought out a new edition of his work on Latin pronunciation. From a very early period he had been attracted to the special study of Etruscan remains, and had at various times given occasional expression to his opinions on individual points ; but it was not till 1870 that he had the opportunity of visiting Italy and completing his equipment for a formal treatment of the whole subject by personal inspection of the monuments. In 1874 appeared the first volume of Ueber die Sprache der Etrusker, in which with great ingenuity and erudition he endeavours, it cannot be said with complete success, to prove that the Etruscan language was cognate with that of the Romans. Before the second volume had received the last touches of his hand. he was cut off by a comparatively early death, which had in all probability been hastened by those long hours which he had spent "in damp grave-chambers," painfully deciphering by candle-light the faded and fragmentary inscriptions of forgotten days. Whatever may be the ultimate decision of cziticism on the great question at issue,

and however unfortunate his conjectures may be proved by later investigators, it cannot be denied that he has brought the matter one step nearer to a final conclusion, The posthumous volume appeared in 1875, having been edited by E. W. A. Kuhn.

CORT, Cornetius (1536-1578), was born at Horn in Holland, and studied engraving under Jerom Cockx of Antwerp. About 1565 he went to Venice, where Titian employed him to execute the well-known copper-plates of St Jerome in the Desert, the Magdalen, Prometheus, Diana and Acteon, and

Diana and Calisto. From Italy he wandered back to the Netherlands, but he returned to Venice soon after 1567, proceeding thence to Bologna and Rome, where he produced engravings from all the great masters of the time. At Rome he founded the well-known school in which, as Bartsch tells us, the simple line of Marcantonio was modified by a brilliant touch of the burin, afterwards imitated and perfected by Agostino Caracci in Italy and Nicolas de Bruyn in the Netherlands. Before visiting the Peninsula, Cort had been content to copy Coxcie, F. Floris, Hemskerk, Mostaert, Spranger, and Stradan, In Italy he gave circulation to the works of Raphael, Titian, Polidoro da Caravaggio, Baroccio, Giulio Clovio, Muziano, and the Zuccari. His connection with Jerom Cockx and Titian is pleasantly illustrated in a letter addressed to the latter by Dominick Lampson of Liége in 1567. Cort is said to have engraved upwards of 151

lates.

CORTE-REAL, the name of a noble Portuguese family. In 1500 Gaspard Corte-Real sailed from Lisbon, landed on the coast of Labrador, and, having named the country, returned home with some of the natives whom he had captured. In 1501 he undertook a second voyage to the Arctic seas, from which he did not return. In the following year his brother Miguel led an expedition for the purpose of discovering him, but he also never returned. The king, Emmanuel, sent out two ships to the assistance of the brothers, but no traces of either could be found. A third brother, Vasco, was only prevented from risking the fate of Gaspard and Miguel by the king's command. To the same family belonged the poet, Jeronymo Corte-Real. He also was a sailor; for the first fact in his life that has come down to us is that, about 1571, he was appointed captain- general of a fleet fitted out for explorations in the Indies. The invasion of Philip II. in 1580 found him in retirement at Evora ; but of the rest of his life there is nothing satis-factorily known except that he died before 1594. His Didi, an epic founded on the siege of Diu, and his Austriad, celebrating the victory won in 1571 by Don John of Austria over the Turks at Lepanto, have no great merit. His best work is the Vaufragio de Sepulveda (published in 1594), a poem describing the shipwreck and death of Lionor de Sa (the mother of his wife) and of Manoel de Sonza. An edition of this story, which has been translated into both French and Spanish, appeared at Lisbon in 1849.

~~See Ferdinand Denis, Chroniques chevaleresques de l Espagne et Portugal; and Sismondi, Littérature du midi de l Europe.~~

~~CORTES, a Spanish term literally signifying the "courts," and applied to the States, or assembly of the States, of the kingdom. See Spain and PorTUGAL.~~

~~CORTES, Hernan, or Hurnanpo (1485-1547), con- queror of Mexico, was born at Medellin, a small town of Estremadura, in 1485. He belonged to a noble family of decayed fortune, and, being destined for the bar, was sent, at fourteen years of age, to the university of Salamanca ; but study was distasteful to him, and he returned home in 1501, resolved to enter upon a life of adventure. He arranged to accompany Ovando, who had been appointed to the command of St Domingo, but was prevented from joining the expedition by an accident that happened to~~

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~~him in a love adventure. He next sought military service under the celebrated Gonsalvo de Cordova, but a serious illness frustrated his purpose. At last, in 1504, he set out according to his first plan, for St Domingo, where he was kindly received by Ovando. He was then only nineteen, and remarkable for a graceful physiognomy and amiable manners, as well as for skill and address in all military exercises. He remained in St Domingo, where Ovando had successively conferred upon him several lucrative and honourable employments, until 1511, when he accompanied Diego Velasquez in his expedition to the island of Cuba. Here he became alcalde of St Iago, and displayed great ability on several trying occasions, An opportunity was soon afforded him of showing his powers as a military leader in an enterprize of the first importance. Grijalva, lieutenant of Velasquez, had just discovered Mexico, but had not attempted to effect a settlement. This displeased the governor of Cuba, who superseded Grijalva, and in- trusted the conquest of the newly discovered country to Cortes. The latter hastened his preparations, and, on the 18th of November 1518, he set out from St Iago, with 10 vessels, 600 or 700 Spaniards, 18 horsemen, and some pieces of cannon. Scarcely had he set sail, however, when Velasquez, probably apprehensive that his lieutenant would carry off all the glory as well as the profit of the enterprize, recalled~~

~~the commission which he had granted to Cortes, and even ordered him to be put under arrest ; but the attachment of the troops, by whom he was greatly beloved, enabled him to persevere in spite of the governor ; and on the 4th of March 1519 he landed on the coast of Mexico. Advancing along the gulf, sometimes taking measures to conciliate the natives, and sometimes spreading terror by his arms, he took possession of the town of Tabasco. The noise of the artillery, the appearance of the floating for- tresses which had transported the Spaniards over the ocean, and the horses on which they fought, all new objects to the natives, inspired them with astonishment mingled with terror and admiration ; they regarded the Spaniards as gods, and sent them ambassadors with presents. Cortes here learned that the native sovereign was called Monte- zuma ; that he reigned over an extensive empire, which had lasted for three centuries ; that thirty vassals, called caciques, obeyed him ; and that his riches were immense and his power absolute. No more was necessary to inflame the ambition of the invader, who did not hesitate to undertake the conquest of this great empire, which could only bo effected by combining stratagem and address with force and courage. He laid the foundation of the town of Vera Cruz, caused himself to be elected captain-general of the new colony, and, like Agathocles, burned his vessels to cut off the possibility of retreat and show his soldiers that they must either conquer or perish. He then penetrated into the interior of the country, drew to his camp several caciques hostile to Montezuma, and induced these native princes to facilitate his progress. The republic of Tlascala, which was hostile to Montezuma, opposed him; but he routed its army, which had resisted all the forces of the Mexican empire, dictated peace on moderate terms, and converted the people into powerful auxiliaries. His further advance was in vain attempted to be checked by an ambus- cade laid by the inhabitants of Cholula, on whom he took signal vengeance. Surmounting all other obstacles he arrived, with 6000 natives and a handful of Spaniards, in sight of the immense lake on which was built the city of Mexico, the capital of the empire. Montezuma received him with great pomp, and his subjects, believing Cortes to be a descendant of the sun, prostrated themselves before him. The first care of Cortes was to fortify himself in one of the beautiful palaces of the prince, and he was planning how to possess himself of the riches of so opulent an empire, VI. — 56~~

~~when intelligence reached him that a general of the emperor, who had received secret orders, had just attacked the garrison of Vera Cruz and killed several of his soldiers. The head of one of the Spaniards was sent to the capital. This event undeceived the Mexicans, who had hitherto believed the Spaniards to be immortal, and. necessarily altered the whole policy of Cortes. Struck with the greatness of the danger, surrounded by enemies, and having only a handful of soldiers, he conceived and instantly executed a most daring project. Having repaired with his officers to the palace of the emperor, he announced to Montezuma that he must either accompany him or perish. Being thus master of the person of the monarch, he next demanded that the Mexican general and his officers who had attacked the Spaniards should be delivered into his hands ; and when this had been done he caused these unfortunate men, who had only obeyed the orders of their sovereign, to be burned alive before the gates of the imperial palace. During this cruel execution Cortes entered the apartment of Montezuma, and caused him to be loaded with irons, in order to force him to acknowledge himself a vassal of Charles V. The unhappy prince yielded, and was restored to a semblance of liberty ou presenting the fierce conqueror with 600,000 marks of pure gold, and a prodigious quantity of precious stones. Scarcely had he reaped the fruits of his audacity, however, when he was informed of the landing of a Spanish army, under Narvaez, which had been sent by Velasquez to compel him to renounce his command. In this emergency Cortes acted with his usual decision and courage. Leaving 200 men at Mexico, under the orders of his lieutenant, he marched against Narvaez, whom he defeated and made prisoner, and he then enlisted under his standard the Spanish soldiers who had been sent to attack him. On his return to the capital, however, he found that the Mexicans had revolted against the emperor and the Spaniards, and that dangers thickened around him. Montezuma perished in attempting to address his revolted subjects; upon which the latter, having chosen a new emperor, attacked the head-quarters of Cortes with the utmost fury, and, in spite of the advantage of fire-arms, forced the Spaniards to retire, as the only means of escaping destruction. Their rearguard, however, was cut in pieces, and they suffered severely during the retreat, which was continued during six days. Elated with their success, the Mexicans offered battle in the plain of Otumba. This was what Cortes desired, and it proved their destruction. Cortes gave the signal for battle, and, on the 7th of July 1520, gained a victory which~~

decided the fate of Mexico. Immediately afterwards he proceeded to Tlascala, assembled an auxiliary army of natives, subjected the neighbouring provinces, and then marched a second time against Mexico, which, after a gallant defence of several months, was retaken on the 13th of August 1521. These successes were entirely owing to the genius, valour, and profound but unscrupulous policy of Cortes ; and the account of them which he transmitted to Spain excited the admiration of his countrymen. The extent of his conquests, and the ability he had displayed, effaced the censure which he had incurred by the irregularity of his operations ; and public opinion having declared in his favour, Charles V., disregarding the pretensions of Velasquez, appointed him governor and captain-general of Mexico, at the same time conferring on him the valley of Guaxaca, which was erected into a marquisate, with a con- siderable revenue. But although his power was thus con- firmed by royal authority, and although he exerted himself to consolidate Spanish domination throughout all Mexico, the means he employed were such that the natives, reduced to despair, took arms against the Spaniards. This revolt, however, was speedily subdued, and the Mexicans were

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everywhere forced to yield to the ascendency of European discipline and valour. Guatimozin, who had been recognized as emperor, and a great number of caciques,

accused of having conspired against the conquerors, were publicly executed, with circumstances of great cruelty, by order of Cortes. Meanwhile the court of Madrid, dreading the ambition and popularity of the victorious chief, sent commissioners to watch his conduct and thwart his pro- ceedings ; and whilst he was completing the conquest of New Spain his goods were seized by the fiscal of the Council of the Indies, and his retainers imprisoned and put into irons. Indignant at the ingratitude of his sovereign,

Cortes returned in person to Spain to appeal to the justice

~~of the emperor, and appeared there with great splendour.~~

~~The emperor received him with every mark of distinction,~~

~~and decorated him with the order of St Iago. Cortes returned to Mexico with new titles but diminished~~

~~authority, a viceroy having been intrusted with the administration of civil affairs, whilst the military depart- ment, with permission to push his conquests, was all that~~

~~remained to Cortes. This division of powers became a source of continual dissension, and caused the failure of the~~

~~last enterprizes in which he engaged. Nevertheless, in 1536, he discovered the peninsula of California, and surveyed a part of the gulf which separates it from Mexico.~~

~~At length, tired of struggling with adversaries un worthy of him, whom the court took care to multiply, he returned to Europe, hoping to confound his enemies. But Charles V.~~

~~received him coldly. Cortes dissembled, redoubled the~~

~~assiduity of his attendance on the emperor, accompanied him in the disastrous expedition to Algiers in 1541, served as a volunteer, and had a horse killed under him. This was his last appearance in the field, and if his advice had been followed the Spanish arms would have been saved from disgrace, and Europe delivered nearly three centuries earlier from the scourge of organized piracy. Soon afterwards he fell into neglect, and could scarcely obtain an audience.~~

~~One day, however, having forced his way through the crowd which surrounded the emperor's carriage, and mounted on the door-step, Charles, astonished at an act of such audacity, demanded to know who he was. "Tama man," replied the conqueror of Mexico proudly, " who has given you more provinces than your ancestors left you cities." This haughty~~

~~declaration of important services ill- requited could scarcely fail to offend a monarch on whom. fortune had lavished her choicest favours; and Cortes,~~

~~overwhelmed with disgust, withdrew from court, passed the remainder of his days in solitude, and died, near Seville, on the 2d of December 1554, being then in the sixty-third — year of his age.~~

~~The only writings of Cortes are five letters on the subject of his conquests, which he addressed to Charles V., and which have fortunately been given to the world. The best edition of them is that of Don Francisco Antonio Lorenzana, archbishop of Mexico, entitled Historia de Nueva-Espaita escrita por su esclarecido con- quistador, Hernan Cortes, aumentada con otros documientos y notas (Mexico, 1770, 4to), a work the noble simplicity of which attests the truth of the recital it contains. An English translation of the letters, by George Folsom, was published at New York in 1843. The conquests of Cortes have been described with pompous elegance by Antonio de Solis in his Historia de la Conquista de Mejico, and with more truth and simplicity by Bernardo Diaz del Castillo in his workunder the same title. See also Robertson's History of America, Prescott's History of the Conquest of Mextco, and Sir Arthur Helps's Life of Hernando Cortes (2 vols. Lond. 1871).~~

~~CORTESE. See Courtots.~~

~~CORTONA, a city of Italy, in the province of Arezzo, and about thirteen miles suuth of the city of that name, occupying the summit and slope of a steep hill that, from a height of 2000 feet above the sea, overlooks the fertile valley of the Chiana or Clanis. Its ancient fortifi- cations, which are well preserved in almost their total~~

~~circuit, present not only portions of Roman and medieval works, but magnificent specimens of the so-called Cyclopean architecture. The cathedral, a building of the 15th century, but restored by Galilei in the 18th, contains a number of paintings by Luca Signorelli and Pietro Berettini, who were both natives of the town; the tomb of John Baptist Tommasi, the last grand-master of. the Order of Malta A and a large sarcophagus, adorned~~

with bas-reliefs of the Lapithz and Centaurs, in which, according to the fanciful hypothesis of the local antiquaries, were the remains of the Consul Flaminius, who perished in the battle of Lake Thrasymene against the Carthaginian invader. Among the other churches, which are almost all in posses- sion of paintings of interest to connoisseurs, the most important is Santa Margherita, a fine building of the 13th century by Nicola and Giovanni Pisano, which occupies the top of the hill and is embosomed in cypress trees. The Accademia trusca, founded by Ridolfino Venuti in 1726, has a museum in the palazzo pretorio, which numbers amongst its various treasures a bronze candelabrum of sixteen lights, ranked among the finest specimens of Etruscan art. In the same building is preserved the Bonbucci Library, which contains a fine MS. of Dante and a curious unpublished work called the Wott? Coritane, or Nights of Cortona. Outside of the town is an Etruscan tomb of some architectural interest, known as the Grotto of Pythagoras. The population of the commune {fs upwards of 26,000 ; that of the city is only 3973.

The origin of Cortona, or Corythus, as it is called by Virgil, is lost

1 remote antiquity ; and little light is thrown on the question by the statement of Dionysius that it was founded by the Umbrians, and passed from them to the Pelasgians. the most powerful of the twelve Etrurian cities, and continued to maintain its position under the Romans ; but probably from the fact that its supposed impregnability led the successive con- querors of Italy to pass it by, its name is rarely found in the ancient classics, and we are even ignorant of the date when it first fell into the hands of the Romans. It was colonized about the end of the 2d century 3.c., but as the colony was never renewed it is not mentioned in the lists of Pliny or Ptolemy. It was one of the first bishoprics of the Christian church; and after the barbarian invasions,,it reappears in the Middle Ages as a place of importance. Held for about a century by the Casale family, it was transmitted by them to King Ladislas of Naples, who, in his turn, in 1412 bestowed it on the Florentines.

CORUNNA (Spanish, Za Corufia; French, La Corogne ; English, formerly often The Groyue), a city and seaport of Spain, the capital at one time of Galicia, and now of a province of its own name, is situated on the north-

west coast, 43 miles north of Santiago de Com- postella, in 43° 23' N. lat. and 8° 27' W. long. It is of first rank both as a fortress and a port, and is the 'seat of a superior court and a commercial tribunal. There is an upper and a lower town, the former built on the east side of a small peninsula, and the latter on the isthmus connecting the peninsula with the mainland. The upper town is the more ancient, and is still surrounded by walls and bastions and defended by a citadel; but it has been gradually outgrown by the lower, which, though at first a mere Pescaderia, or fishing-village, is now comparatively well built, and has several broad and handsome streets. There is little remarkable in the public buildings, though they include six churches, of which Santiago dates from the 11th and the Colegiata from the 13th century, five convents, two hospitals, a palace for the captain-general of Galicia, a theatre, a school of navigation, an arsenal, and barracks. The harbour, though of rather difficult access, is perfectly secure, and it is defended by several forts, of which the most important are San Diego on the east and San Antonio onthe west. These fortifications are of little practical importance on the land side, as they are

commanded by a hill that overlooks the city. The so-called

Tower of Hercules to the north, supposed to have been

It was certainly one of

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originally built by the Romans, has been raised in modern times to a height of upwards of 360 feet, and is now crowned with a fine revolving light visible for a distance of twelve miles to sea. English, French, and Belgian steamers call here on their way to South America for mails or emigrants; and upwards of 300 merchant ships, mostly British, enter the port every year. The trade consists mainly in the export of fat cattle—20,000 of which were sent to England in 1873,—eggs, meats, fruits, and sardines; and in the importation of general grocery-goods and manufactured articles. Besides a large Government tobacco-factory, which employs about 3000 women, there are in the city two glass-factories, two cotton-factories, and several steam saw-mills and sardine- curing establishments ; and the herring and pilcuard fisheries give emplcyment to a number of the inhabitants.

~~According to the census of 1869, the population of the town and suburbs was about 30,000; in i874 it was estimated at 40,000.~~

~~Corunna, possibly at first a Pheenician settlement, is identified with the ancient Ardobrica, a seaport mentioned by Mela in tho country of the Artabri, from whom the name of Portus Artabrorum was given to the bay on which the city is situated. In the Middle Ages, and probably at an earlier period, it was called Caroniu-n, a name which is much more probably the origin of the present designation than the Latin Columna which is sometimes put for- ward. The harbour has always been of considerable importance, but it is only in comparatively modern times that it has made a figure in history. In 1588 it gave shelter to the Invincible Armada ; and in 1598 the town was captured and burned by the English under Drake and Norris. In 1747, and again in 1805, the bay was the scene of a naval victory of the English over the French; and in 1809 an action took place in the neighbourhood which has become one of the most celebrated in British military annals. The French under Marshal Soult attempted to prevent the embarkation of the English under Sir John Moore, but were successfully repulsed in spite of their numbers. Moore was mortally wounded in the engagement, and expired shortly after its termination. He was hastily buried on a bastion near the sea; and a monument in the Jardin de San Carlos raised by the British Government comme- morates his bravery and intrepidity. In 1820 the town joined the revolutionary movement and declared the constitution, but in 1823 it had to capitulate to Bourck, the French general.~~

~~CORVEY, a famous Benedictine abbey in Saxony, situated on' the Weser, in the neighbourhood of Héxter, with which it communicates by an avenue about three- quarters of a mile in length. It was founded by Louis the Pious in 813, and received its name from the fact that the first body of monks by whom it was held came from Corbie in Picardy. Raised to the rank of a bishopric in 1793, it was secularized in 1802, and bestowed on the Nassau Orange family; and since then it has passed through various hands to those of the present prince of Ratibor, who received it in 1840 by the will of Victor Amadeus of Hesse-Rothenberg. The abbey, or, as it is now called, the castle of Corvey, possesses a very extensive library, especially rich in old illustrated works; but the ancient collection due to the literary enthusiasm~~

~~of the Benedictines is no longer extant. Itat one time preserved the famous manuscript of Tacitus which contains the six books of the Annals. Widukind composed his history of the Saxons within the precincts of Corvey; and the Annales Corbejenses of the monks can still be read in Pertz's Monumenta Germanic Historica, vol. iii. The Chronicon Corbejense, published by Wedekind in 1824, has been proved a forgery. (See Wigand, Geschichte der~~

~~CORVISART-DESMARETS, Jzan Nicotas, Baron DE (1755-1821), French physician, was born at Vouziers, in Champagne. His parents intended him for the profes- sion of the law, but he turned aside to the study of medi- cine, in which he took an enthusiastic interest. He became parish doctor of Saint-Sulpice, and then obtained a post in the hospital of La Charité, where he founded a flourishing~~

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~~clinical school. He was next appointed professor in the Collége de France (in which position he was eminently successful), and member of the Academy of Sciences. But he was still struggling with debt when the Empress Josephine introduced him to Napoleon, by whom he was created baron and member of the Legion of Honour. | His only original work of importance is his Essay on Diseases of the Heart and the Great Vessels. : ;~~

~~CORVUS, M. Vauertus, one of the most illustrious generals of the early Roman republic, was born about 370 B.c. The legend which accounts for his cognomen of Corvus (the raven) tells how, while fighting with a gigantic Gaul, he was assisted by a raven, which baffled his enemy by fluttering in his face. He was twice dictator and six times consul, and he occupied the curule chair twenty-one times. In his various campaigns he defeated successively the Gauls, the Volsci, the Samnites, the Etrusceaus, and the Marsi. His most important victory was that which he won over the Samnites at Mount Gaurus (343 mc). He died a hundred years old about 270 B.c.~~

~~CORYATT, Tuomas (1577-1617), was born at Odeombe, Somersetshire, where his father, the Rev. George Coryatt, prebendary of York Cathedral, was rector. Educated in Westminster School and Gloucester Hall, Oxford, he entered the household of Prince Henry, the eldest son of James I. In 1611 he published a curious account of a walking tour, under the title of Coryatt's~~

~~Crudities hastily gobbled up in Five Months' Travels in France, Italy, &c. At the com- mand of Prince Henry, verses in mock praise of the author (afterwards published by themselves as the Odcombiun Banquet) were added to the volume, written in a number of languages, and some in a mixture of languages, by Ben Jonsou, Donne, Chapman, Drayton, aud many other of the literary men of the time. In the same year he published a second volume of a similar kind, Coryatt's Crambe, or his Coleworte twice Sodden. In 1612 he set out on another journey, which also was mostly performed on foot. He visited Greece, the Holy Land, Persia, and Agra, whence he sent home an account of his adventures. He died at Surat in 1617.~~

~~CORYBANTES, in Greek mythology, were associated with the Phrygian goddess Rhea Cybele as her first worshippers and priests. They were of the same class of beings as the Curetes, Cabiri, and Dactyls of Mount Ida in Crete, and were of the nature of dwmones, supposed by some to have sprung from the earth like trees (Sevdpopveis). The wild orgiastic dance with clangour of music, which was part of the worship of Cybele, was traced to them, and was called xopyBavriav, Whence a derivation of their name has been sought in a word to express this din of music and dance. An old derivation traced it to Képuoy, a hill said to be in Cyprus, but not otherwise known to bethere. Besides the power of music the Corybantes exercised also cures by magic and other arts of superstition. Of the other dwmones with whom the Corybantes were identified in antiquity the Cabiri have already been described (see Casini.) The Curetes were associated with the infancy of Zeus in Crete, where they kept guard over him, dancing and clanging their shields. They were thought of as having skill in working in metals and in finding them under the earth. They had also prophetic powers, and made a wild dance part of their ceremony of worshipping Zeus. Through being identified with the Corybantes they became associated with the goddess Cybele, and were found connected with her worship in its various centres in Asia Minor. The Dactyls of Crete were distinctly associated with Rhea Cybele, and were chiefly thought of as being possessed of metallurgic powers, as their naimes, Kelmis, Damnameneus, end Akmon, imply, though they were also skilled iv music**

~~ancient tragedy, was the leader of the chorus.~~

CORYPHIAUS (from xopypy, the top or the head), in

Hence coryphzeus passed into a general name for the chief or

leader of any company or movement.

COS (or Sranxko, or STaNncHIo, by corruption from és

vav K@), an island in that part of the Turkish archipelago

which was anciently known as the Myrtoan Sea, not far

from the south-western corner of Asia Minor, at the mouth

of the Gulf of Halicarnassus, or Bay of Budrum. Its total

length is about 25 miles, and its circumference about 74.

A considerable chain of mountains, known to the ancients

as Oromedon, or Prion, extends along the southern coast

with hardly a break except near the island of Nisyros ; so that the greatest versant and most important streams

turn towards the north. The whole island is little more

than a mass of limestone, and consequently unites great aridity in the drier mountain regions with the richest fertility in the alluvial districts. As the attention of the islanders is mainly directed to the culture of their vineyards, which yield the famous Sultana raisins, a considerable pro- portion of the arable land is left untouched, though wheat, barley, and maize are sown in some quarters, and melons and sesamum seed appear among the experts. Formerly one of the most valuable products of the island was its lemons and oranges, but since the destruction of the trees by a severe frost in 1850, these fruits hardly take any place in the market. The wild olive is abundant enough, but neglected ; and cotton, though it thrives well, is only grown in

small quantities. As the principal harbour, in spite of dredging operations, is only fit for smaller vessels, the island is not of so much commercial importance as it would otherwise be ; but since 1868 it has been regularly visited by steamers, and about fifty vessels annually enter the harbour. 'The only town in the island is Cos, or Stanko, at the eastern extremity, remarkable for its fortress, founded by the knights of Rhodes, and for the gigantic plane-tree in the public square. The fortress is supposed to occupy the site of the temple of Aisculapius so celebrated in antiquity, and it preserves in its wallsa number of inter- esting architectural fragments. The plane-tree has a cir- cumference of about 30 feet, and its huge and heavy branches have to be supported by pillars; of its age there is no certain knowledge, but the popular tradition connects it with Hippocrates. The town is supplied by an aqueduct, about four miles in length, with water from a hot chaly- beate spring, which is likewise named after the great physician of theisland. The villages of Pyli and Kephalas are interesting, the former for the Greek tomb of a certain Chamylos, and the latter for a castle of the knights of St John and the numerous inscriptions that prove that it occupies the site of an ancient city called Isthmos. The population of the island amounts to about 10,400 souls, of whom about a third are Mahometans, and the rest, with the exception of a dozen Jewish families, Christians.

Cos is said to have been colonized from Epidaurus, the great Peloponnesian centre of the worship of Asculapius, and it is certain that the Aésculapian cultus had a remarkable hold in the island. For a time the city was a member of the Dorian Pentapolis which held its federal assemblies in the Triopian headland ; but at a later date it became subject to the Athenians by whom it was fortified. The Emperor Claudius made it a free state, and to Antoninus Pius it was indebted for restoration from the effects of a great eartl – quake. During the Greek and Roman period the island was famous for its purple and its wines; the Coan robes were celc- brated by the poets for the delicacy and transparency of their texture ; and it also enjoyed a nobler celebrity as the birthplace of Hippocrates the physician and Apelles the artist. In modern times its history presents few details, the most interesting fact being its possession by the knights of St John.

~~See Clarke's Zyavels, vol. ii. 1812; Kiister, De Co Insula, Walle, 1833; Ross, Reisen nach Kos, Halicarnassus, &c., Halle, 1852; and Aeisen auf den Gricch. Insein; Leake's paper in the Transactions of the Row. Soc. of Lit., 1843; Cc. T. Newton, Travels and Discovertes in the Levant, 1865.~~

~~COS—COS~~

~~COSENZA, a city of Italy, the seat of an arch- bishopric, and the capital of the province of Calabria Citra, is situated in a deep glen at the junction of the Buseuto with the Crati, twelve miles east of the Mediter- ranean. It is intersected by the Busento, which is there crossed by two bridges. The streets are generally narrow and crooked, and the lower part of the town is said to be unhealthy. The ¢rzbunale, or palace of justice, one of the finest edifices in the kingdom, is on the eastern bank ; and an old castle, now used as barracks, crowns the summit of an eminence on the opposite side of the river. It has also a diocesan seminary, a royal college, a theatre, a foundling hospital, and academies of science and literature, manu- factures earthenware and cutlery, and trades in silk, rice,~~

~~wine, fruits, and flax. Population of the commune, 15,960; of the city, 12,613.~~

~~Cosenza is a place of great antiquity, having under the name of Consentia been the chief city of the Bruttii. It was possibly captured by Alexander of Epirus, and certainly became the place of his sepulture. After various vicissitudes during the Carthaginian war, it was finally reduced by the Romans about 204 3.c. ; and in the reign of Augustus it received a Roman colony. Alaric, king of the Goths, died while besieging the city in 410 a.p., and was buried in the bed of the Busento, which was turned from its course for hisinterment. During the Middle Ages the city retained its impor- tance, and in the 11th century it was raised to the rank of an arch- bishopric. In 1461 it was taken by Roberto Orsini, and suffered severely ; and in the beginning of the present century, it was the seat of the French commission which made itself so notorious by its sanguinary proceedings in Calabria. Among its celebrities may be mentioned the grammarian Parrhasius and the philosopher Telesio.~~

COSIN, Joun (1594-1672), bishop of Durham, was born at Norwich, November 30, 1594. From the grammar school of his native city he passed, at the age of sixteen, to Caius College, Cambridge, where he graduated B.A. Aftera few years he took holy orders and was appointed domestic chaplain to the bishop of Durham. At the close of 1624 he was made a prebendary of Durham, and in the following year archdeacon of the East Riding of Yorkshire, Before this time he had married, and in 1628 he took his degree of D.D. He first became known as an author in 1627, when he published his Collection of Private Devotions, a manual stated to have been prepared by command of the king, Charles I., for the use of the maids of honour to the queen. This book, in connection with his insistence on points of ritual in his cathedral church and his friendship with Bishop Laud, exposed him to the suspicion and hostility of the Puritans; and the book was rudely handled by Prynne and Burton (who both, nine years later, were set in the pillory and mutilated for their free speeches on other matters). In the year following this publication Cosin took part in the prosecution of Prebendary Smart for a sermon against Papistical bishops and priests and practices; and the prebendary was deprived. In 1634 Cosin was appointed master of Peterhouse, Cambridge; and in 1640 he became vice-chancellor of the university. In October of this year he was promoted to the deanery of Peterborough. A few days before his installation the Long Parliament had met ; and among the complainants who hastened to appeal to it for redress was the ex-prebendary, Smart. His petition against the new dean was considered ; and early in 1641 Dr Cosin was sequestered from his benefices. Articles of impeachment were, two months later, presented against him, but he was dismissed on bail, and was not again called for. He took part, in 1642, in sending the university plate to the king, and was for this offence deprived of the mastership of Peterhouse. He thereupon withdrew to France, preached at Paris, served as chaplain to some members of the household of the exiled royal family, and at the Restoration he returned to England. He was rein-

stated in the mastership, restored to all his church benefices, and in a few months raised to the see of Durham (December 1660). This dignity he enjoyed for about eleven years ; and during this time he applied a large

share of his revenues to the promotion of the interests of the church, of schools, and of charitable institutions. He died in London, January 15, 1672.

Among his writings are a Historia Transubstantiationts Papalis, Notes and Collections on the Book of Common Prayer, and a Scholas- tieal History of the Canon of Holy Scripture. A collected edition

of his works, forming 5 vols. of the Oxford Library of Anglo- Catholie Theology, was published between 1843 and 1855.

COSMAS, surnamed from his maritime experiences Indicopleustes, a writer of the 6th century. We know nothing of his history except what can be gathered from one of his works which has come down to us, a book which is in itself a mere bank of mud, but is remarkable on account of certain geographical fossils of considerable interest which are found imbedded in it. The first part of the work, embracing books i.v., can be shown to have been written soon after 535; to these seven more books appear to have been gradually added by the author. He was a monk when he wrote, but in earlier days apparently had been a merchant, and in that capacity had sailed on the Red Sea and the Indian Ocean, visiting Abyssinia and Socotra (Ai@oria and 4 vijcros 4 Kadounérn Avookopidovs), and apparently also the Persian Gulf, Western India, and Ceylon. The book, which was written at Alexandria, is called by the writer Xpiorriavcyh ToToypadia TEpLeKTLKy) mavtos tot Kdopov, A Christian Topography Embracing the Whole World, and the great object of it is to denounce the false and heathen doctrine of the rotundity of the earth, and to show that the tabernacle in the wilderness is the pattern or model of the universe. Thus the earth is a rectangular plane twice as long asit is broad. The heavens come down to the earth on all four sides like the walls of aroom, From the north wall tothe south wall, at an un defined level, a semi-circular waggon vault is turned, and at the same level stretches the " firmament " (crepéwpa) like a flat ceiling. All below the firmament is this world ; the story above is heaven, or the world to come. In fact, one of the huge receptacles in which female travellers of our own day carry their dresses forms a perfect model of the universe of Cosmas. Midway in the rectangular surfacc below lies the inhabited earth, encompassed by Ocean. Be- yond Ocean, bordering the edge, is the

unvisited transoceanic land on which, in the far east, les Terrestrial Paradise. Here, too, on a barren and thorny soil, without the walls of Paradise, dwelt man from the fall to the deluge. The ark floated the survivors across the great ocean belt to this better land which we inhabit. The earth rises gradually from south to north and west, culminating in a great conical moun- tain behind which the sun sets. Repeatedly the writer overflows with indignation against those who reject these views of his, " not built on his own opinions and conjec- tures, but drawn from Holy Scripture, and from the mouth of that divine man and great master, Patricius."! The wretched people who chop logic, and hold that the earth and heaven are spherical, are merc blasphemers, given up for their sins to the belief of such impudent nonsense as the doctrine of Antipodes, and so forth. Altogether the book is a kind of caricature type of that process of loading Christian truth with a dead weight of false science which has had so many followers and done so much mischief. Similar cosmography was taught by Diodorus of Tarsus, and other Nestorian doctors

1 This Patricius is stated by Cosmas to have heen afterwards Catholicos of Persia. This and other circumstances identify Patricius with Mar Abas, who ruled the Nestorian Church from 536 to 552 (see Assemani, Bibl. Orient. tom. ii. and ili.).

Among the curious pieces of information very sparsely found amid this stuff are notices of Lthzopra (Abyssinia) and its traffic for gold with Inner Africa, of Taprobane or Sielediba (Ceylon), Male (Malabar), and the products and animals of those regions. But the most interesting geographical circumstance is the fact that Cosmas is not only the first who mentions China by a name on which there can be no controversy, Z"zinista, t.¢., the Persian Chinistdn, but also that he had a very correct idea of its position as lying on the extreme eastern coast of Asia, and "compassed by the ocean running round it to the left just as the same ocean encompasses Barbary (i.¢., the Somali country beyond Abyssinia) round to the right." He knew also that a ship sailing to China, after running east for a long way, and leaving the Clove Country behind, had to turn north at least as far as a ship bound for Chaldea would have to run up the Persian Gulf, and thus it

~~was intelligible how Tzinista by the overland route lay much nearer Persia than might have been thought from the length of the sea voyage thither.~~

~~The work has been preserved in at least two MSS. One isin the Vatiean, a very fine uncial MS. of the 8th century, with figures apparently from drawings by Cosmas himself; the other a pareh- ment MS. of the 10th century, is in the Medicean. This last alone eontains the 12th book, and of that a leaf is lost. An aeeount of the work is given in the Bibliotheca of Photius, who speaks con- temptuously of the author. Some geographieal extraets were first published in Thévenot's Collection of Travels (1696). The whole work was edited by Montfaueon in his Collectio nova Patrum et Script. Greec., 1706 (vol. ii), and is republished in Bibl. Veterwm Patrum of P. Andrea Gallandi (vol. xi., Venice, 1776). It appears from allusions in the book itself that Cosmas also wrote a more detailed Topography of the Earth, a work on the motions of the stars, and a Commentary on Canticles. The loss of the first is to be regretted. (HY…)~~

~~COSMAS, of Prague (1045-1126), a Bohemian priest and historian, wrote a Chronicon Bohemorum, which con- tains the history and traditions of his country up to nearly the time of his death. This work was printed in 1602, and again among the Seriptores Rerum Bohemicarum (Prague, 1783).~~

~~COSMOGONY, a theory of the origin of the world and its inhabitants. Such a theory is never found on the lowest stage of human culture. Thus, " it never occurred to the Eskimos," says Dr Brinton, "that the earth had a begin- ning ;" and the Abipones of South America " never troubled themselves about what went on in the heavens" (Sir J. Lubbock). And even when a theory of the world's origin is formed, it is at first of the simplest character, Two ele- ments, no more, are necessary. With regard to the first, there is a consensus of opinion among primitive races that, before the present order of things, water held all things in solution. Thus the Accadians, whose mythology passed into that of the Semitic Babylonians, " considered the humid ele- ment as the vehicle of all life, the source of all generation " (Lenormant). To "make pregnant" this " vast abyss" a creator or organizer is necessary, who is educed, at least not unfrequently, from the abyss itself. Thus, in a Japanese myth reported by Mr Tylor (Journ. of Anthropol. Inst., July 1876), " while the earth is still soft like mud, or like~~

oil floating on the surface of water, there arises out of the mass the flag or rush called as, from which there springs the land-forming god." Some, content with throwing the speculative difficulty further back, imagine the present creation to be rather a re-creation. Hence the notion of world-ages " rounded off by sweeping destruc- tions," the last of which was the deluge. Thus, among the non-Aryan Santals of Bengal, '" the tradition of the creation is mixed up with one of the deluge, if indeed the creation with these less gifted races does not begin with the 06: ae The Santal legend describes rather the subsidence of waters than a creation" (Dr Hunter, Rural

Bengal, pp. 150-1). Some simple-minded tribes suppose the earth to have been fished up from the depths of the sea, that is, from the transparent depths of their own Pacific (Waitz and Gerland, Anthropologie der Naturvolker, vi. 241). The egg is another common mythic element. It is found in Pheenicia, Egypt, India, China, Polynesia, and Finland, associated with one or another of the ideas of mixture, generation, fragility, the dome-like appearance of the sky, and the form of the sun and the planets. The Creator himself assumes the most Protean shapes, ranging from the magnified man to the musk-rat. From this brief introduction we pass on to a few specimen cosmogonies of the more important races.

Until the year 1876 our materials for the Babylonian cosmogony were almost entirely confined to second-hand extracts from Berosus (? 280-260 Bc.) Many (Niebuhr

was not among them) doubted their trustworthiness. But the reign of scepticism is over.

The late talented decipherer, George Smith, has, it would seem, actually discovered some of the cuneiform tablets from which the priest of Bel compiled. No doubt Berosus was uncritical— he was an Euhemerist, like his contemporaries. But he was honest and learned in cuneiform, and enjoyed access to unmutilated documents, whereas the tablets in our possession are fragmentary, and their interpretation is only inchoate. We cannot, therefore, yet afford to ignore the Berosian narratives, which Syncellus and others have pre- served. (See Miiller's Fragmenta Histor. Grec., ii, 497, and with caution Cory's Ancient Fragments, by Hodges, pp. 58-60.) One of these contains a cosmogony, or rather two cosmogonies, the

latter of which is fragmentary, and fitted rather awkwardly into the former. Its resemblances to Gen. i. are obvious, such as the primeval flood, which Berosus calls Thauatth (= Tihavtu or Tihamtu),and creation by cutting or dividing. But the divergences are equally striking—-e.g., Berosus tells of certain composite beings who dwelt in the dark primeval water. This seems to indicate that the water means the «ther, which is in fact one of its mythic senses, and that the monsters are the constellations. Mr G. Smith compares this narrative with a tablet derived from the city of Cutha (Chaldean Account, &c., pp. 102-3), but the parallel is fallacious. Tiamat, the primeval flood, is only mentioned in the latter in- cidentally, and the monsters are placed on the earth, not in Tiamat. .

But there is a much more important cosmogony, for which we are indebted to the library of King Assurbanipal (673-626 z.c.). The tablets (probably twelve in number) are copies of much older originals, which Mr G. Smith would place near 2000 3.c., 2.¢., at the beginning of the literary period. This is perhaps too early, to judge from the absence of a statement in the colophon that the copy had an "old" original (Mr Sayce in Academy, ix. 4). But "late " in Babylonian history is still early from the point of view of Greek and Hebrew literary history. The frag- ments have been arranged by Mr Smith on valid internal grounds in an order corresponding to the cosmogony in Gen. i. The Babylonian parallels are very striking, and would probably be still more so if the tablets were complete. They are—(1) the general arrangement, (2) the introduc- tion of a god speaking, (3) the notion of the primeval flood, called tiamat (feminine) like the téhom (masculine) of Gen. i, (4) the repeated eulogy on the previous creative work as "delightful," and (5) the mention of the stars as placed to determine the year. The chief differences arise from the polytheism of Babylonia, and yet some have seen a survival of polytheistic language in Gen. i. 26.

The sacred archives, now lost, of the Phoenicians were known, it seems, to Sanchoniathon, who founda translator (') in Philo of Byblus (end of 1st century 4.D. 1). The origin

COSMOGONY

and value of Philo's work (only known from the extracts in Eusebius) have been discussed by Ewald and M. Renan, with a tolerably satisfactory result.

~~The latter, writing from the shores of Phoenicia, calls it "the admirably faith- ful mirror of that which I have under my eyes" (Rev. archéol., iii, 172). Distorted and discoloured as the myths in Philo may be, they are such as no forger could have invented. Among them are parts of two, if not three, cosmogonies (Miiller, Pragm. Hist. Gr., iii. 565, comp. with caution Cory's Anc. Fragments, pp. 1-5). The text is here and there corrupt, and its mythic meaning obscure. Movers and Bunsen are fantastic, nor can we accept Mr Sayce's theory (Academy, March 20, 1875), though he is right in seeking fora clue in Babylonia. The first part, however, is clear, with its chaos black as Erebus, and its wind (comp. Gen. i. 2) which became enamoured of its own elements. The explanation of this is due to M. de Vogiié (Mélanges, pp. 60, 61). The wind is the creating deity regarded as one; the dpyxaé are the two sides or persons of the deity when analyzed. In the inscriptions we find both Baal and Tanith "the Name, or Face, of Baal," a.¢., the male and female principles, the conjugal union of which produced creation. In another cosmogony we meet with the woman Baau, "which is interpreted Night," probably the hw, or chaos of Gen. i. 2 (a Babylonian parallel has also been found). On the whole these cosmogonies agree with the Babylonian and portions of the Hebrew, though laying a somewhat greater stress on the life-evolving power of matter (which may be due to the systematizers), and in one case ("Chysor, the opener" =the Egyptian domiurge Ptah) influenced from Egypt. The Semitic (and probably pre-Semitic) notion of creation by division is, however, no longer traceable.}~~

~~Such were the myths current among the near relatives of the Israelites. But what beliefs had the Israelites them- selves? The Old Testament contains three cosmogonies:— Gen. i.-ii, 4a; Gen. ii. 40-7; and Prov. iii. 19, 20, viii. 22-31 (with Job xv. 7, 8). Only the first is perfect. The second seems to be fragmentary, and adds but little to our knowledge. The third is poetical and speculative. All three apparently proceed from the lettered class, and have been attributed to an outburst of historic and prehis- toric study in the Babylonian and Persian period. It would be too much to say that the Israelites had no cosmogony before the exile, but the probability is that it was com- paratively undeveloped, and in the competition of beliefs had fallen into the background. 'The chief characteristic of Gen. i. is the union of two apparently inconsistent phraseo- logies, the supernaturalistic and the evolutionary. Thus the pre-existence of matter seems to be asserted in vv.~~

2G. "Now the earth was (ic, was involved in) chaos [Heb. toha va-bohii|, and darkness was upon the face of the flood Heb. fo and the wind of Elohim was hovering upon the face of the waters"'—this describes the circumstances under which the following act took place; "then Elohim said, Let light (the condition of life) be, and light was." The writer uses language common to other cosinogonies, but strives to accommodate it to his own high type of religion. It was not, he consciously or unconsciously implies, a blind force inherent in nature, which produced the first beginnings of life, nor was the Creator himself the offspring of chaos ; Avs demiurge was a supernatural being, whom some ortho- dox commentators have identified with the Logos of later writers, and who was from the first preparing the "rude mass" forits human inhabitants. The peculiar expression, "the wind of Elohim was hovering," suggests different comparisons ; thus, on a far lower stage of religious pro-

The writer regrets not to have received Graf Bandissin's Studien

eur semitischen Religionsgeschichte in time for this article, but finds nothing to alter in the ahove remarks,

"not favoured by the context in Genesis.

gress, the Polynesians often describe the heaven-and-air- god Tangaloa as a bird hovering over the waters (Wartz, vi. 241). In the earliest form of the narrative in Geu, i, it may have been "the bird of Elohim ;" "wind" seems to be an interpretation. Another peculiar form of expres- sion is the creation of the light before the sun (v. 3), which may be supposed to be paralleled by similar expressions elsewhere. The Egyptian god Thoth, the demiurge, is said to have " given the world light when all was darkness, and there was no sun;" and the Orphic light-god Phanes

is anterior to the sun. But it is the place of a com-

mentator to trace similar phenomena throughout the first

cosmogony, and also to exhibit the evidence of the various redactions through which the section has passed. For, as Dr Schrader (1863) and Mr R, Martineau (1868) have shown, the narrative in its original form did not divide creation into days, but merely gave a catalogue of divine works. We need only add that the word for "to create" in Gen. i. originally meant "to carve." The Hellenistic Jews, it is true, took it in the sense of "to create out of nothing," but many think this is The problem of the origin of matter seems not to have arisen among the Jews of the 6th century z.c.

The Egyptians have left us no ancient cosmogonical system, though speculation was early rife among them, They appear to have had three great creative deities. Ptah, " the opener " (of the world-egg 1), was probably the god of the cosmic fire, who prepared matter for Amen-Ra to organize. But it was to Ra that the honour of creation was chiefly ascribed (see the unsurpassable hymn in Records of the Past, ii, 129-136)—to Ra, ic., the sun-god, as the people supposed, or the anima mundi, as the priests. One of Ra's (later) manifestations was Chnum, the divine breath which stirred the primeval waters (as in Gen. i. 2, except that Chnum is never represented as a bird), and the fashioner of gods and men (see Records of the Past, ii. 145, and comp. Gen. ii, 7). Thoth, originally the moon-god, became the principle of creative intelligence, and with him were worshipped the eight cosmic forces called Sesennu. He is called "the tongue of Ra," though elsewhere Ra himself is said to create by a word, and this ascription of speech to the deity is, according to M. Naville, one of the most important points in common between the Egyptian and the Hebrew cosmogonies, to be added therefore to those we have already mentioned,—chaos, the divine breath, the creation of light before the sun, and the moulding hand of the deity.

We hasten on to the Aryan nations of the East. The Iranian parallels to the early chapters of Genesis have been greatly exaggerated. The only really valuable ones are those contained in the Avesta, which, though the date of its final redaction is uncertain, is probably in the main earlier than the return of the Jews from Babylon. The cosmogonical parallels are (1) the ascription of creation to the will of a supernatural deity, and (2) the ideal perfection attributed to the newly created world. Yet even here some deduction is necessary, For apparently the world is produced out of pre-

existent matter, according to Genesis (see above); out of nothing, according to the Avesta. And though Ahura-mazda (Ormuzd) is generally described in the Avesta as the sole creator, there is an ancient passage (Yasna, ch. xxx.) in which a good 'and an evil spirit are spoken of as joint-creators. Still, in the period of Darius and Xerxes (to which the first Hebrew cosmogony in its final form probably belongs) we have the best possible evidence for the sole creatorship of Ahura-mazda, for the great cuneiform inscription at Naksh-i-Rustam describes him as "the great

God of gods, who made heaven and earth, and made men,"

and similar language occurs in the royal inscriptions at Elvend, Van, and Persepolis.

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There is a well-known Vedic hymn (" Nor aught, nor naught existed," &c.), which has been adduced to prove the antiquity of the most refined speculations among the Hindus. But it seems unwise to adduce this as a typical racemyth, for it probably marks the end rather than the beginning of a theological stage (Goldstiicker's Panint, Pp. 144, comp. Max Muller's Anc. Sansk. Lit., pp. 559-565). Another hymn of the same Mandala (Rig Veda x. 90) embodies the comparatively naive conception of the world as the covering of the divinity, Purusha being represented as a prodigious body, from which the various parts of crea- tion proceeded. This is intermixed, however, with the much less simple theory of the sacrifice of the cosmogonic agent himself, the primitive unity parting into different forms as the limbs of the victim are severed on the altar. In the S'atapatha Brahmana we ieet again with the primeval waters and the world-egg, which according to one account produce Prajapati, and according to another are produced by him. Inthe same Brahmana we find the first mention of the tortoise-theory, the origin of which has been well pointed out by Mr Tylor (Early History of Mankind, p. 340). The cosmogony in Manu (Dr Muir's Sanskrit Texts, iv. 26) is still more deeply tinged with speculation. Here we meet with "thc self-existent Lord," who " with a thought created the waters, and deposited in them a seed," which becomes a golden egg, in which egg 'he himself is born as Brahma, the progenitor of all the worlds." Contrast this theory of the speculative Hindu, ascribing creation to a thought, with that of

~~*the more energetic Semites and Egyptians—" God said, Let it be, and it was so."*~~

~~*Turning to Africa, we find that Old Calabar and Zulu- land are among the few regions where cosmogonical spe- culation seems to have at least germinated (see Bastian, Callaway, Tylor). Even. the important myths of the American and Polynesian races must on this occasion be dismissed in a few lines. With regard to the former, Dr Brinton's Myths of the New World and Mr Bancroft's Native Races of North America will supply the reader with much food for thought. Let him not neglect the poetic narrative of the Quichés, with its Hurakan (comp. "hurricane"), the thunder-god, the Heart of Heaven, and the Creator, nor the still more important myth of the north-west Athapascas, nor, for its curiosity, the "Darwinian theory" of the Ahts of Vancouver Island. With regard to the latter, the sixth volume of Waitz and Gerland, and the works of Sir George Grey (Polynesian Mythology) and Mr Gill (Myths and Songs of the South Pacific), are full of suggestive material and remarkable parallels to the myths of more civilized races. The cosmogony, however, which opens Mr Gill's fascinating collection is too complicated and artificial to be ancient or even (perhaps) indigenous. Even Sir George Grey's delightful story of the rending apart of Heaven and Earth (comp. Gen. 1. 6-10) must be pronounced modern as compared with the simple stories of the heaven-god Tangaroa. It is only in the last stage of a religion that cosmogonies are systematized,—*~~

~~‘* Greek endings, each the little passing bell That signifies some faith’s about to die,” tnough the death-struggle may be prolonged, and may issue in a higher life.~~

~~Besides: the works already expressly cited see Bastian, (co- graphische Bilder (for a remarkable Old Calabar story); Naville, La litanie du soleil (translation from the Egyptian, with commen- tary); The Funeral Ritual (or Book of the Dead), by Dr Birch, in Bunsen’s Egypt, vol. vi. ; Spiegel’s Avesta, &c. (BK C5)~~

~~COSNE, a town of France in the department of Nitvre, at the head of an arrondissement on the right bank of the Loire, 35 miles N.N.W. of Nevers. It has a tribunal of primary instance, a communal college and an agricultural~~

~~society. Some ruins of its medixval walls, towers, and castle are still preserved. In the vicinity there are extensive forges for the making of anchors and other heavy iron articles. Cosne is mentioned in the Antonine Itinerary under the name of Condate, but it was not till the Middle Ages that it rose into importance as a military post. It was at Cosne that the arrest of Crussol took place which gave rise to the War of the Public Weal under Louis XI. COSSACKS, certain Russian tribes originally settled on the southern frontiers of Russia in Europe, but now dis- tributed through various parts of the enipire, and largely modified by successive intrusions of alien blood. ‘hey probably: derive their name, which in Russian appears as Kazak, from a word synonymous in Tartar with a free- booter and in Turkish with a light-armed soldier. Ethno- graphically and historically they are divided into two principal sections, the Cossacks of Little Russia, or of the Dnieper, and the Cossacks of Great Russia, or of the Don. The former or Malo-Russian branch seems to have grown up in the 13th and 14th centuries, and probably owed its existence to the confusion caused by the Tartar invasion. Bands of hardy refugees from the surrounding regions, mainly with Russian blood in their veins, gathered together~~

~~for mutual defence in the islands of the Dnieper, where —~~

the natural character of the situation of itself afforded them considerable protection. Their numbers were rapidly in- ercased, and before long they formed a strong and active community. In the 16th century they were enrolled among the vassals of Poland, but were permitted to retain a number of privileges which put them on a level with the Polish nobility. Their constitution was consolidated, their territory extended, and their valour utilized by the able policy of King Stephen Bathori. Meanwhile the more ardent adventurers amongst them were united into a strict military confederation, not unlike in many respects to those orders of knights which in similar circumstances sprung up in Western Europe for the defence of Christendom. They established their setcha, or fortified camp, on an island in the Dnieper, to the south of the Porogz, or cataracts, and from this circumstance acquired the name of Zaporogians, or Dwellers beyond the Cataracts. The members were bound by a vow of celibacy; but as every one was welcome to join the association who was willing to submit to its rules, so every one was free to depart as soon as he found it irksome to obey. Freedom and independence were of the first necessity to the Cossacks; their constitution was purely democratic ; their hetmans or leaders were chosen by popular election, and held their office only for one year. This independent spirit was abundantly displayed in their policy ; they lent their services now to the king of Poland, now to Russia, now to the Sultan, and now, it might be, even to the Tartar Khan himself. In 1571, when their leader was put to death by Bathori for having invaded Moldavia on his own authority, thousands of his followers left the country, and went to join their brethren on the Don ; and in the following century, the main body which had remained behind, after carrying on a successful war against Poland under the astute Khmelnicky, put themselves under the protection of Russia, whose right to the whole country of the Cossacks, with the exception of a small portion to the west of the Dnieper, was formally recognized by the peace of Radzine in 1681. In 1708 the famous Ivan Stevanovitch Mazeppa, who had succeeded in raising himself to the office of hetman, joined the standard of Charles XII. of Sweden; and this revolt brought down on the Cossacks the vengeance of Peter the Great, whio ultimately deprived them of all their privileges and abolished their military organization. The Zaporogians, who left the country after the capture of their setcha, were

ecalled by the .Empress Anne ; but they proved s0

obstinately obstructive to the civil settlement of the country that they had again to be expelled. They retired for the most part to the Crimea, and on the incorporation of that district with the Russian empire they were deported to Kuban to defend the frontiers against the Caucasian tribes, A small band which had migrated to the Balkan, was re- called in 1828 by the Emperor Nicholas, and sent to form a sort of coast-guard on the Sea of Azoff. The character of the Zaporogian fraternity which was thus destroyed has been the object of very divergent judgments,—some writers seeing in it little more than an organized band of ruffian adventurers, while others raise its members to the dignity of patriots and martyrs who fought and died in defence of national and religious liberty. The last view is well pre- sented by Kulish, one of the most recent of the historians of Little Russia, and it receives no small support from the popular songs in which their virtues and valour are still commemorated among the people of the Ukraine.

The Cossacks of the Don have all along had more direct connection with the empire than their brethren of the Dnieper ; and their insurrections, though numerous, have had less of the character of genuine revolt. About seven years after the foundations of their capital Cherkask had been fixed in the marshes of the Don, Ivan IV., irritated at their conduct, despatched against them his general Murashkine. At the approach of the formidable invader the Cossacks dispersed ; one band under Yermak pushed eastwards, and effected the conquest of Siberia; another company established themselves in the Ural Mountains and expelled the Tartars from Jaik (Uralsk); while a third probably found a refuge in the Caucasus, where their descendants are still known as the Grebenski, or Mountain Cossacks. In 1637 the portion still left on the Don expelled the Turks from the town of Azoff; and they managed to keep possession of it till 1642 without aid from the Russian Government. Exasperated by the execu- tion of some of their number, and by an attempt to introduce alterations in their religion, they were easily excited to rebellion by the freebooter Stenka (or Stephen) Razine ; but after it had risen to a formidable height, the insurrection was suppressed, and its leader executed at Moscow in 1671. In the following century another ad- venturer found in the discontent of the Cossacks a formid- able means of supporting his pretensions; but the success of

~~Pugacheff was as temporary as that of Razine, whom the local superstition imagined to have come to life in his person. The result to the Cossacks was a serious diminution of their privileges, and an extension of Russian control.~~

~~Gradually brought under a more rigid military discipline, this restless and warlike race has furnished the empire with one of the most valuable elements in its national army ; and their services in the protection of the frontiers from the Caucasus to China are almost incalculable. They form a first-rate irregular cavalry, and render excellent service as scouts and skirmishers ; but their steadiness can hardly be trusted in an important engagement. So great is their superstition, that in the midst of a conflict they have been known to give chase to a hare in order to avert the omen by its destruction, and they still retain a large measure of the freebooter's fondness for plunder.~~

~~According to their present distribution the Cossacks are distinguished as Cossacks of the Don, of the Azoff, of the Danube, of the Black Sea, of the Caucasus, of the Ural, of Orenburg, of Siberia, of the Chinese frontiers, and of Astrakhan. In their organization they retain the com- munistic habits of earlier times. The territory is the common property of the stanitza or township; the hay can only be cut after public notice by the Ataman; and no fish can be captured except at prescribed periods, when the whole community join in the enterprize.~~

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~~Among the privileges still retained by the Cossacks the most important are freedom from taxes, and the right of distilling, brewing, hunting, and fishing.~~

~~See Houpel, " Sur les Cosaques," in AMiscellanées du Nord, 1790: Lesur, Histotredes Kosaques, Paris, 1814; Bronevski, Zstoria Donskova Voiska, St Petersburg, 1834; Wagner, Der Kaukasus und das Land der Kosaken, 1850; Haxthausen, tudes sur la fiussie, Berlin, 1853, vol. iii.; Prosper Mérimée, Les Cosaques a'autrefois, dealing only with the insurrections of Chmielnicky, and Stenka Razine, and based on the works of N. Kostmaroff,~~

~~the Malo-Russian historian ; Alfred Rambaud, " L'Ukraine et ses chansons historiques,"' in Revue des Deux Mondes, 1877.~~

~~COSTA RICA, THe Repustic or, the most southern of the five states of Central America, occupies the isthmus between about 8° and 11° N. lat., and 82° and 86° W. long. It is bounded on the N. by Nicaragua, the frontier claimed on this side running from the Pacific coast at the stream called La Flor, immediately north of Salinas Bay, to the Lake of Nicaragua, and along its southern shore to the Rio San Juan, and thence down the right bank of the river to its most southerly mouth—but this line is disputed by the Nicaraguan Government; on the S. by the Colombian state of Panam4, the recognized boundary extending from the Golfo Dulce to the Chiriqui river south of the islet called Escudo de Veragua—this line also over- lapping a debatable borderland; on the N.E. by the Caribbean Sea; and on the S.W. by the Pacific Ocean.~~

~~Its area within these limits, officially stated at 26,040 English square miles, has been found by planimetric measurements, made at Gotha, to be more accurately 21,495 square miles, or not quite double that of Belgium.~~

~~The population, which consists mainly of people of Spanish descent, little mixed with foreign elements, is officially estimated at 175,000 (according to M. Belly it is 154,000), including about 5000 civilized Indians of pure blood, 1200 negroes, and 600 Chinese ; but besides these there are from 10,000 to 12,000 uncivilized Indians within the limits of the republic.~~

~~The Atlantic coastland is generally low, and is characterized by numerous lagoons which have been formed by the prevailing currents opposite the river mouths, the chief break in its extent being the great Lagoon or Gulf of Chiriqui; the Pacific coast rises higher and is marked by the two large peninsulas which inclose the Gulfs of Nicoya and Dulce. Inland the surface of the country is much diversified, but is chiefly occupied by mountains, plateaus, and valleys. In the northern portion a great volcanic range extends from north-west to south-east, from between the Lake of Nicaragua and the Pacific coast to the centre of Costa Rica, separating a narrower Pacific descent from the broader slope to the Atlantic; the peaks of Orosi (5200 feet), Rincon de la Vieja, Miravalles, Poas (8845 feet), Barba, Irazu (10,850 feet), and Turrialba, (10,330 feet) are the summits of this range.~~

The form of the southern half of Costa Rica is determined by the great range called the Montafia Dota, 7000 to 9000 feet in elevation, which extends from west to east nearly across the country, in about 9° 40' N. lat., and from which two branch range sxtends south-eastwards, the one close along the Pacific coast as far as the lower Terraba river, the other through the centre of the country, rising to its highest points in the Cerro Chiripé and Pico Blanco or Nemu, 11,740 feet above the sea. Between the northern and southern masses lie the broad table-lands of San José and Oartago, marked out on the Pacific side by the ridges called the Cerro del Aguacate and Cerro de Candelaria, and towards the Atlantic by the Cerro Mateo. This central plateau has an elevation of from 3000 to 4000 feet above the sea, and is the most important, and as yet almost the only cultivated region of the country.

The rivers which flow down the Atlantic slope in the

N.E., the Rio Frio, San Carlos, Sarapiqui, and Colorado, are tributaries of the boundary river San Juan, the outlet of Lake Nicaragua; the otliers of this slope from N. to S., the Reventazon, Pacuar, Chiripd or Matini, Sixaula or Estrella, Changuenola, and Chinqui, flow independently to the Atlantic lagoons. On the Pacific side from N. to 8 the chief rivers are the Tempisque and Las Piedras, flowing tu the head of the Gulf of Nicoya; the Rio Grande, from the high borders of the plateau of San Jose; the Rio de Pirris, Naranjo, and Rio Grande de Terraba.

In contrast to the south-western descent, the Atlantic slope is covered with dense impenetrable forest, and has remained almost closed to traffic and civilization from the earliest times of colonization. Indians still living in a savage state occupy some portions of this wild forest country. The former tribes of the Reventazon and Pacuar have been completely exterminated ; those remaining are the Pranzos or Guatusos Indians of the valley of the Rio Frio in the north, the Bizeita tribe on the Sixaula River, and the Terrbis on the Changuenola, in the south-east, sometimes collectively called the Talamanca Indians. The latter tribes have remained in hostility to each

other since the discovery of the country; they are perfectly uncivilized, hunters with bow and arrow, and independent of the Government ; they trade a little with adventurers from Jamaica, bartering sarsaparilla, hides, and turtle-shells for arms and powder, cotton stuffs, and tobacco. The Mosquito Indians come annually in canoes to the Atlantic coast in May and June to fish for turtle in the Lagoon of Chiriqui. The Pacific slope, on the other hand, is char- acterized by wide savannahs or Ilanuras, bordered by forest, and is much more accessible.

The climate varies with the elevation, from the tropical heat of the coast, which is often fever-stricken, to the tem- perate and healthy air of the plateau and the cold of the mountain heights. In the plateau of San José the north- east trade wind, prevailing from October to April, brings dry weather; from April to October the south-west mon- soon, blowing up from the Pacific, brings almost daily rain, excepting within a remarkable period of about a fortnight of dry weather in June, called the " Veranillo de San Juan." The rainfall at San José (3872 feet above the sea) averages from 40 to 60 inches annually; the average temperature here is about 68° Fahr.; rising to 76° in the hottest month of summer and falling to 55° Fahr. in the coldest. The country is subject to earthquakes; a very severe one occurring in 1841 destroyed the town of Cartago.

Costa Rica is exceedingly fertile, its forests being filled with an immense variety of timber trees and useful dye woods, such as mahogany, ebony, Indian-rubber, Brazil-

wood, and oak ; almost all the fruits of the tropical and

temperate zones are found to thrive, and flowering plants are in rich profusion. Coffee is the staple cultivated pro- duct of the country, and is grown chiefly on the plateau lands of San José and Cartago,—the special adaptability of these to the growth of this plant being attributed to the nature of the soil, which consists of layers of black or dark brown volcanic ash of from 1 to 6 yards in depth. Rice, maize, barley, potatoes, beans, bananas, and yucca are also cultivated to some extent in the interior; cocoa, vanilla, sugar-cane, tobacco, cotton, and indigo, on the warm coast lands, but as yet only for home cousumption. About 1150 square miles of the country are under cultivation.

~~In the forests the wild animals of Central America—-the tapir, jaguar, ocelot, puma, deer, and wild pigs—are numerous ; a multitude of birds, including the humming bird and the splendid quetzal or trogon, fill the woods; the reptiles include the alligator of the rivers, the iguana, and many other lizards, the boba, tuboba, black snake, rattle- snake, and corale. Among domestic animals oxen and~~

~~mules are the most valuable, almost all the traffic of the country being carried on by means of ox-waggons.~~

~~As yet the chief highway of Costa Rica is the waggon road from Punta Arenas on the Gulf of Nicoya virtually the only port of the country, to the capital San José, and thence to Cartago on the central plateau. Mule tracks lead north-westwards from Punta Arenas through the province of Guanacaste to Nicaragua, from San José north-east by the valley of the Sarapiqui to Grey Town on the Atlantic, from Cartago eastwards to Puerto Limon also on the Atlantic, and southward over the western spurs of the Montaiia Dota to the plains of Terraba. A railroad from Alajuela to the capital and through Cartago to Puerto Limon, part of a proposed inter-oceanic highway, was begun in 1871, and in December 1873 the portion between Alajuela and Cartago, 42 miles, had been completed. Owing to financial difficulties, however, the work ceased in 1874, and only sufficient hands were employed to keep the part finished in working order. Two hundred miles of telegraph line had been completed in 1875.~~

~~There are no manufacturing industries in Costa Rica. The country is rich in minerals—gold, silver, copper, iron, nickel, zinc, lead, marble—but up to the present time gold, silver, and copper are the only ores that have been worked. The principal gold mines are—(1) those of Trinidad, 4 leagues inland from Punta Arenas, 1200 feet above the sea, worked on a small scale by a Costa Rican company,—the quartz yields gold of a fineness of about 174 carats; and (2) the mines of the Cerro del Aguacate, one of which is worked by the native "Compania de la Montafia del Aguacate," also in an imperfect manner, but with good results. Another called the " Sacra Familia," lies a little north of the Aguacate mine, at an elevation of 3000 feet above the sea; it has two chief veins, one containing galena and zine~~

blend, with silver, and grey copper ore also yield- ing silver, and a second, with a lode of gold quartz similar to that of Trinidad. This mine is also worked on a small scale by private individuals, and gives gold of about 154 carats fine. Gold is said also to exist in the wild Indian country of the Atlantic slope, but the position of the sup- posed mines is uncertain.

Costa Rica is divided into six provinces, in which the population is distributed as follows according to the estimate of M. Belly —

San José, 45,000 Capital—San José, 15,000 Cartago, 36,000 — Cartago, 10,000 Hérédia, 30,000 5 Hérédia, 9,000 Alajuela, 29,000 5 Alajuela, 6,000 Guanacaste, 8,000 3 Liberia, 2,000

Punta Arenas, 6,000 + Punta Arenas, 1,800

The government is vested in a president elected for four years, and a first and second vice-president, aided by four ministers and the national congress of deputies also elected for four years. The present constitution, the seventh which has been in force in the republic, dates from 1871. All men between the ages of eighteen and thirty form the militia of the republic, and in 1874 numbered 16,380,— 900 being employed in active service. All men between the ages of thirty and fifty-five years form a reserve. The religion of the state is Roman Catholic, but full liberty for the public exercise of all religions is granted by the con- stitution. The revenue of the republic, derived from customs, monopolies of spirits and tobacco, from the national kank, sales of land, and various taxes, chiefly that on the exportation of coffee, amounted in 1875 to £517,605 ; the expenditure in the same year was £556,221, showing a deficit of £38,616.

In 1871 the Government contracted in London a loan of £1,000,000, and in 1872 another of £2,400,000 for the construction of an inter-oceanic railway. In 1875 the external debt from this source was £2,401,300, Of this

sum £1,116,000 had been spent on the railroad previous to the close of 1873, when the further execution of the work ceased. The interest and sinking fund of this loan are far in arrears; the country is bankrupt, and the

~~Government has made no attempt to pay even part of its liabilities. The value of the coffee exported in 1874 was estimated at £892,800; and that of hides, timber, &c., at £20,000. Imports are chiefly of Manchester goods, hardwares, flour, salt, and sugar, chiefly shipped from England; but trade with France, Germany, and the United States was increas- ing in 1875. Only about a fourth part of the trade of the~~

~~republic passes through Puerto Limon on the Atlantic, to~~

~~which there is a mule track, the bulk of goods being carried round to the Pacific port of Punta Arenas, whence there is a highway to the interior,~~

~~Costa Rica was one of the first discovered portions of the American continent; Columbus touched on its shores in his third voyage, and it is probable that Spanish adven- turers first established themselves within it after the fourth voyage of Columbus in 1502. In 1821, when all the pro- vinces which formed the kingdom of Guatemala declared their independence of the mother country, two parties, one desiring union with Mexico under the dynasty of Iturbide,~~

~~the other seeking to form a separate republic, divided~~

~~opinions in the revolted provinces. In Costa Rica the town of Cartago chose the former; San José the latter. The opposing factions met at a place called the Laguna de Ochomogo. The republicans were victorious, and the seat of government was transferred from Cartago to San José, In 1824 Costa Rica joined the federation of the Central American States, but on the dissolution of that union in 1839 became an independent republic. Internal disturb- ances and overturnings of the Government have been less frequent in Costa Rica than in the other states of Central America, and its progress has been correspondingly greater. Of recent years, however, the Government has been obliged to maintain an army to guard itself against smouldering revolutions, and at the present time (1877) angry dis- cussions are taking place with Nicaragua on the question of boundaries. On the other hand, an attempt is being made to induce the Central American republics to join agiin in forming one government.~~

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COSTANZO, ANGELO pi (about 1507-1591), an Italian historian and poet, was born at Naples about 1507. HIs great work is Le Istorie del Regno di Napoli dal 1250 Jino al 1489, which first appeared at Naples in 1572, and was the fruit of thirty or forty years' labour; but ten more years were devoted to the task before it appeared in its final form at Aquila (1582). It is still one of the best histories of Naples; and the style is distinguished by clearness, simplicity, and elegance. As a poet Costanzo is remark- able for finical taste, for polish and frequent beauty of expression, and for strict obedience to the poetical canons of his time.

COSTELLO, Duptey (1803-1865), a journalist, novel- ist, and miscellaneous writer, was born in Ireland in 1803. HIe was the son of Colonel J. F. Costello. and choos-

ing his father's profession, was educated at Sandhurst College, and served for a short time with his regiment in Canada and the West Indies. HIs literary and artistic tastes led him to quit the army, and he then passed some years (1822-1831) at Paris. During this period he was introduced to Baron Cuvier, and was employed by him as draughtsman in the preparation of his work on comparative anatomy. HIe next occupied himself in copying illuminated manuscripts in the Bibliothéque Royale; and to him and his

sister belongs the merit of being the first to draw general attention to the beautiful forgotten art, and of thus leading to its revival. About 1832 Costello became foreign correspondent to the Morning Herald, and from this time he was regularly occupied as journalist and con- tributor to periodical literature. During the last twenty years of his life he held the post of sub-editor of the Laxaminer. He wrote A Tour through the Valley of the Meuse (1845), and Italy, from the Alps to the Tiber (1861). Among his novels are Stories from a Screen (1855), The Millionaire (1858), Faint Heart never won Fair Lady (1859), and Holidays with Hobgoblins (1860). He died in London, September 30, 1865. A few years before his death a pension of £100 per annum was conferred on him.

COSTELLO, Lovisa Sruarr (1799-1870), an histori- cal and miscellaneous writer, elder sister of the preced- ing, was born in Ireland in 1799. Her father dying while she was young, during the occupation of France by the allies, she aided in the support of her mother and brother by her skill as an artist. At the age of sixteen she pub- lished a volume of verse entitled Zhe Maid of the Cyprus Isle, and other poems. This was followed in 1825 by Songs of a Stranger, dedicated to W. L. Bowles. Ten years later appeared her Specimens of the Early Poetry of France, which was illustrated by beautifully executed illuminations, the work of her brother and herself. It was dedicated to Moore, and procured her his friendship as well as that of Sir Walter Scott. Henceforth literature was the labour of her life. Her principal works are—A Summer among the Bocages and Vines (1840); The Queen's Poisoner (or Zhe Queen-Mother), an historical romance (1841); Béarn and the Pyrenees (1844) ; Memotrsof Eminent Englishwomen (1844); The Rose Garden of Persia (1845), a series of translations from Persian poets, with illuminations by herself and her brother ; The Falls, Lakes, and Mountains of North Wales (1845) ; Clara Fane (1848), a novel ; Memoirs of Mary of Burgundy (1853) ; and Memoirs of Anne of Brittany (1855), She died at Boulogne, April 24, 1870.

COSTER, Lavrencre. See Koster and PRINTING.

COSTS. Whena person brings an action in law against another and succeeds, it is only fair that the defendant, besides paying the sum which he ought to have paid, should also recoup the expenses incurred by the

~~plaintiff in prosecuting a rightful claim. On the other hand, when the action fails, the defendant is justly entitled to be repaid the expenses he has incurred in defending a wrongful claim. That costs should follow the event may therefore be taken as the first principle of the law relating to this subject; but there are many special circumstances which interfere to modify its application. The action, though successful, may be in its nature frivolous or vexatious, or it may have been brought into a higher court where a lower court would have been competent to deal with it; and on the other hand the defendant, although he has escaped a judgment against him, may by his conduct have rendered the action necessary, or otherwise justifiable. In such cases the rule that costs should follow the event would be felt to work an injustice, and exceptions to its operation have therefore to be devised. 'The law of England as to costs, simple as the subject may appear, is in reality highly complicated.~~

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~~At common law, costs were not given either to plaintiff or defendant, although the damages given to a successful plaintiff would include the expense he had been put to In taking proceedings. The defendant in a wrongful action could not even recover his costs thus indirectly, and the indirect costs given to a plaintiff under the name of damages were often inadequate and uncertain. Costs were first given under the Statute of Gloucester (6 Edward I, c.1), which enacts that " the demandant shall recover damages in an assize of novel disseisin and in writs of mort ancestor, cosinage, aiel, and beziel, and further that the demandant may recover against the tenant the costs of his writ purchased together with the damages abovesaid. And this Act shall hold in all cases when the party is to recover damages." The words " costs of his writ " were extended to mean all the legal costs in the suit. The clause gives costs, wherever daraages are recovered, and no matter what the amount of the damages may be, Costs were first given to a defendant by the Statute of Marlebridge in a case relating to wardship in chivalry (52 Henry IIL. ¢. 6) ; but costs were not given generally to successful defendants until the 23 Henry VIIL.c. 15, which provides that " if in the actions therein mentioned the plaintiff after appearance of the defendant be nonsuited, or any verdict happen to pass by lawful trial against the plaintiff, the defendant shall have judgment to~~

~~recover his costs against the plaintiff, to bo assessed and taxed at the discretion of the court, and shall have such process aud execution for the recovery and paying his costs against the plaintiff, as the plaintiff should or might have had against the defendant, in case the judg- ment had been given for the plaintiff." By the 4 James ic c, 3, this " good and profitable law" was extended to other actions not originally specified, although within the mis- chief of the Act, so that in any action wherein the plaintiff might have costs if judgment were given for him, the defendant if successful should have costs against the plaintiff. The policy of these enactments is expressed to be the discouragement of frivolous and unjust suits. This policy was carried out by other and later Acts. The 21 James I.c. 16 § 6 (the statute for the limitation of actions) orders that if the plaintiff in an action of slander recover less than 40s. damages, the plaintiff shall be allowed no more as costs than he gets as damages. By the 43 Elizabeth c. 6 it had been enacted that in any personal action not being for any title or interest in land, nor con- cerning the freehold or inheritance of lands nor for battery, where the damages shall not amount to 40s. no more costs than damages shall be allowed. By 3 and 4 Vict. c. 24 (Lord Denman's Act), where the plaintiff in an action of tort recovers less than 40s., he shall not be allowed costs unless the judge certifies that the action was really brought to try a right besides the right to recover damages, or that the injury was wilful or malicious. Not to speak of other enactments on this subject, the County Court Acts, 1867, laid down the following rule :—TIf in any action in any of the superior courts the plaintiff shall recover a sum not exceeding £20 if the action is founded on contract, or £10 if founded on tort, whether by verdict, judgment by default, or on demurrer, or otherwise, he shall not be en- titled to any costs of suit unless the judge certify on the record that there was sufficient reason for bringing such action in such superior court, or unless the court or a judge at chambers shall by rule or order allow such costs.~~

~~Costs in equity were subject to the discretion of tho court, but as a general rule the maxim of the civil law, victus victori in expensis condemnatus est, was followed. The successful party has a prima facie claim to costs, but the court might, on sufficient cause chown, not only deprive hin of his costs, but even in some rare cases order him to~~

~~pay the costs of his unsuccessful opponent. There was a class of cases in which the court generally gave costs to parties sustaining a certain character, whatever might be~~

~~the result of the suit (e.g., heirs-at-law, mortgagees, &c). A defendant would have been exempted from costs if he had made such a tender of payment as would have rendered a suit unnecessary—such teuder to be full and unconditional, and to include costs already incurred, as well as the principal claim.~~

~~The following rule as to costs is laid down in the Rules of Court appended to Judicature Act, 1875, order 95 :— "Subject to the provisions of the Act the costs of and incident to all proceedings in the HIgh Court shall be im the discretion of the court; but nothing herein contained~~

~~shall deprive a trustee, mortgagee, or other person of any~~

~~right to costs out of a particular estate or fund to which he would be entitled under the rules hitherto acted upon in courts of equity: provided that, where any action or issue is tried by a jury, the cost shall follow the event, unless upon application made at the trial, for good cause shown, the judge before whom such action or issue is tried, or the court, shall otherwise order." The provisions of the County Court Act, 1867, above referred to, still hold good, as well as those of Lord Denman's Act, depriving a plaintiff of costs when he recovers less than 40s. on an action of tort, unless the judge certifies ; and of 21 James I c. 16, making costs no more than damages in actions of slander where damages are assessed under 40s.~~

~~In the taxation of costs certain principles are observed which may be briefly adverted to. Thus in some cases costs are to be taxed as "between party and party," in others as between solicitor and client. '" No definite rules can be laid down with respect to the difference between the costs to be allowed upon one principle of taxation and those allowed upon the other. In general, however, in taxations as between party and party, only those charges will be allowed which are strictly necessary for the purposes of the prosecution of the litigation, or are contained in the table of fees annexed to the general orders and regulations of the court; while in taxations as between solicitor~~

~~and client the party will be allowed as many of the charges which he would have been compelled to pay his own solicitor, as being costs of suits, as fair justice to the other party will permit " (Daniel's Chancery Practice). Costs are taxed between party and party unless otherwise specially directed. Costs of interlocutory motions made in the course of a litigation are sometimes said to be "costs in the cause," that is, they abide the result of the principal issue. A party succeeding in an interlocutory motion, and paying the costs therein made costs on the cause, would recover the amount of such costs if he had a judgment for costs on the result of the whole trial, but not otherwise.~~

~~When one of the parties makes default, as in failing to proceed to trial according to notice at the time appointed, he becomes liable to the other for what are called the " costs of the day."~~

~~Regulations as to costs of proceedings in the Supreme Court of Judicature will be found in order vi. of the Addi- tional Rules of Court under the Judicature Act, 1875. Two scales of fees which may be charged by solicitors are printed—the lower to be the general charge for matters assigned to the different divisions of the court (except causes relating to sums over £1000 in the Chancery division) and actions for special injunctions. But a court or judge may in any case direct the fees in either scale to be allowed "to all or either or any of the parties and as, to all or any part of tho costs."~~

~~The court of appeal shall have power to make such order as to the whole or any part of the costs of the appeal as may seem just (Rules of the Judicature Act, 1875). (E. R.)~~

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~~COST~~

~~OSTUME, as defined for the present inquiry, is limited to personal attire, but with the exclusion of armour, which has been dealt with under a separate heading.~~

~~GREEK CosTuME.~~

~~The inquiry begins with Greek costume, as to which, so far as it consists of dress, the general remark may be made that its history is for the most part free from what is known as the changes of fashion, for this reason that the Greeks did not attempt to reconcile the two opyposite principles of covering and at the same time displaying the figure, that is to say, of cutting the dress to fit the body. There are changes which will be noted between the dress worn after 450 B.c. and that of an earlier date, when the material was heavier and the figure more closely enveloped, suggesting a difference of climate in these different periods.~~

~~Female Dress,—The chief and indispensable article of female dress was the chiton, consisting of one piece of ma- terial sewed together in the form of a sack open at top and bottom, in height reaching from the neck to the feet of the wearer, and in width equal to that of the extended arms. Within this stands the figure, and first it is girt round under the breasts, to keep it from falling, by a girdle (zoster).~~

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~~Fia. 1.—Bronze statuette (stand of mirror) wearing Chiton. From Athens. Brit. Mus.~~

~~Next, the upper edges are fastened together on the top of the shoulders by a brooch (fibula), and the arms are either left bare, pressing down into folds at each side the masses of material, or these masses may be gathered round each arm, and fastened down the outside with buttons and loops so as to form sleeves (chiton cheiridotos). The chiton could be left open down one side for convenience in dancing, and was then called chiton schistos. To secure greater warmth on the breast and shoulders the chiton was made long enough to be doubled back from the top, and this part reaching to the waist was called the diplois or diploidion. It could be also made of a separate piece. Underneath the chiton was worn a band of cloth (tenia) to support the breasts, and in addition to this a cord was sometimes crossed round the breasts outside the chiton to assist either in supporting~~

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them or in bringing out their form. Round the loins was worn, perhaps not always, either a short petticoat of thick woollen stuff or a sort of bathing drawers, @a Aovrpis, such as acrobats wore. So far we have nientioned all the dress that was necessary for indoor wear, which, also, since it had to be got into, was called éduuza, as opposed to other parts of dress, which were thrown round the body, and were called meiBrAynpata. 'To the latter class belongs the next article of importance in female dress, the himation, a garment worn also by men. While the chiton was generally made of linen, of which there was a variety of fabrics (e.g., those of Amorgos, Tarentum, Sicily, Crete, and Phrygia), or of caunabis (made from hemp), or of byssos (flax from India aud Egypt chiefly), or of silk (sericea), the himation consisted of woollen stuff, and was worn like a plaid. It was first thrown over the left shoulder, leaving the short end to hang down in front ; the long end was then gathered round the back with the right hand, brought under the right arm, and across the body in front, and finally held in this position by being thrown over the left fore arm. Or instead of being passed under the right arm it could be brought over the right shoulder so as to envelop the right arm, then carried closely round the neck, and finally thrown over the left shoulder with an end hanging down behind ; or again, it could be still further drawn up over the back of-the head to form a hood. As regards colours, it will be found, when we have taken away black for the use of mourners (ra 5€ pédAava ipdria dppaviwa éxaAovv), that the others were em- ployed in a great variety of com- binations. An important point was always to have a deep border round the foot of the chiton, either of some uniform colour which suggests solidity and heaviness, so as to weigh down the dress, or of some pattern which would . : suggest strength to prevent the Fic. 2.—Terracotta statuette, dress from being torn when strid- wearing Chiton and Hima- Strong contrasts of colours a4 — Pres Sap were used, such as a white chiton "·· with a pink himation, or a white chiton with a broad blue border round the foot. Besides embroidery, another kind of ornament consisted of designs beaten outin thin gold and stitched on the

dress. Great numbers of those have been found in tombs where the dress itself has entirely perished. Greek vases and sculptures represent Amazons and Persians wearing trousers (anaxyrides), but this article of dress did not come into use among the Greeks themselves. While the chiton and himation, as above described, con- tinued to be the standard dress from about 450 B.c. onwards, it is the rule to find in figures of an earlier date the himation worn as in fig. 3, where it has more of the appearance of a chiton, having like it a diploidion, and enveloping the greater part of the figure, so that the chiton proper appears as distinctly an under garment. It is a himation of this kind that the archaic figure of Athena wears, and since we know that the name for this garment of hers was peplos, it would perhaps be more correct to use this word instead of himation for the upper garment of the earlier period. Among otber reasons also for this is the

negative evidence that the word peplos does not occur in the inventory of female dresses on an inscription from Athens in the British Museum, in which the latest date given is 335 B.C. Pollux, it is true (vii. 47), cites it in his list of names for dresses worn by women.

Returning to the dress after 450 B.c., we find that the chiton could be tucked up under the girdle till the skirt reached only to the knees, as in the figures of Artemis. A short linen chiton, reaching half way down the thighs, was called kypassis. The diploidion, when once made of a separate piece, could have the form of a sleeve- less jacket reaching nearly to the knees. A diploidion worn only in front was called a hemidiploidion. A chiton worn to leave one breast bare was called heteromaschalos ; worn without a girdle, as by priests and old women, it was orthostadvos, or perhaps zoma. The ampechonion appears to have been a small shawl. The kimbarikon was a transparent under-chiton. The following names. of dresses are still undetermined — kandys or kandyke, epomis, pharos, aeusiag Euce Sak phoeenole, xystis (axyston), heanos, pavenna. Brit. Mus. mandye, ephestrides, and amphiestrides.

As regards the covering of the head, that was perhaps most generally accomplished by drawing the himation up over the back of the head like a hood; or, instead of this, a separate piece of cloth was made to perform this

service, the end of it falling under the himation. This was the kalyptra, or veil. A cap merely intended to cover in the hair and hold it together was called kekryphalos. When hats were worn they were of circular shape, and either of some stiff material, as the Thessalian or Beotian hat (cooaXis xvvn), observed in terra-cottas from Tauagra in Beeotia aud in Pompeian paintings, or of pliant material which could be bent down at the sides like the petasus worn by Atalanta. Similar to this seems to have been the kausia or Macedonian hat. The kyrbasia, or kidaris, was a high pointed hat of Persian origin, as was also the tiara, which served the double purpose of an ornament and a covering for the head. When the object was only to hold up the hair from the neck, the sphendone was used, which, as its name implies, was in the form of a sling; but in this case it was called more particularly opistho-sphendone, as a distinction from the sphendone when worn in the front of the head. The head ornaments include the diadema, a narrow band bound round the hair a little way back from the brow and temples, and fastened in the knot of the hair behind ; the ampyz, a variety of the diadem ; the stephane, a crown worn over the forehead, its highest point being in the centre, and narrowing at each side into a thin band which is tied at the back of the head. Different from this is the stephanos, which is a crown of the same breadth and design all round, as on the coins of Argos with the head of Hera, who is expressly said by Pausanias to wear a stephanos. This word is also employed for crowns of laurel, olive, or other plant, when the form would be the same all round the head. Crowns made of wicker-work (polot kalathot) were also worn (see Gerhard, Antike Bildwerke, pls. 303-305). When the hair, as was most usual, was gathered back from the temples and fastened in a knot behind, hair pins were required, and these were

Fic. 3.—Bronze statuette,

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mostly of bone or ivory, mounted with gold or plain. So also when the hair was tied in a large knot above the fore- head, as in the case of Artemis, or of Apollo as leader of the Muses. The early Athenians wore their hair so,

with a pin representing a grasshopper (rérrié), in allusion to their claim of having originally sprung from the soil (Thucyd. i. 6). Whether this knot was the krobylos is not determined. In archaic figures the hair is most frequently arranged over the brow and temples in parallel rows of small curls which must have been kept in their places by artificial means, probably by small spirals of gold wire, such as are found in early Etruscan tombs lying near the head of the skeleton. -Ear-rings (évria, €AAd Bia, EXixrypes) of gold, silver, or bronze plaited with gold, and frequently ornamented with pearls, precious stones, or enamel, were worn attached to the lobes of the ear. For necklaces (Spor), bracelets (6pets), brooches (7répova), and finger-rings (SaxrvAcot or oppayides) the same variety and preciousness of material was employed. The gold used was always very thin; the intrinsic value, for example, of the famous Milo necklace in the British Museum is very slight, while the extraordinary amount of skilled work- manship in it would represent a very high value in labour. This is the rule in the best period of Greek art, that the jewellery is of value according to its workmanship; but in Jater times preciousness of material determined the value. In the earliest jewellery, amber is conspicuous, alternating with pale gold or electrum. For the feet the sandal (cdvSarov, réSika) was the usual wear; in exceptional cases, as for the bath, shoes, and for hunting, high boots were worn, The hunting boot was laced up the front, and reached to the calves. Gloves (chetrides) were worn by the Persians, but apparently never by the Greeks unless to protect the hands when working (Odyssey, xxiv. 230). Male dress. —Fig. 4 represents the dress of a Greek citizen, such as it appears, for example, on the frieze of the Parthenon. It consists of nothing more than a hima- tion such as that already described for women, but worn differently ; and from the simplicity of this attire it may be seen in how ridi- culously awkward a position Blepyrus was placed by his wife's having carried off his himation aud shoes (Aris- toph., Hecles., 310 sqq.) But underneath the himation was sometimes also a short linen chiton similar to that worn

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by armed men under their ; f armour ; and with this chiton |, on, the himation could be A

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laid aside on occasion. Work- men of all kinds wore only a short chiton girt round the waist, and let loose from the right shoulder to leave the arm free. In this case the y) material varied according to En the necessary exposure to Fic, 4.—Bronze statuette, wearing cold,—a fisherman, for ex- Himation. From Greece. Brit. ample, having a chiton of Mus.

hide, as had also slaves; but the slave's chiton was more like a jacket with sleeves reaching to the wrist, and corresponding to the cvcepa as defined by Pollux (vii. 70), who mentions further the Batty and ctcovpa as garments of hide worn by peasants in the form of mantles. The same class of persons wore at other

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times the xarwvd«y, a mantle of woollen stuff with border of sheepskin. But among the citizen class where the himation, as in fig. 4, was the proper dress for a man of mature years, younger men and youths appear to have worn it only as a sort of undress to wrap round them when heated in the palzstra or at the bath. In public appear- ances they wore a linen chiton girt at the waist, and reaching half-way down the thighs, and on their shoulders 0 purple chlamys of woollen stuff fastened with a brooch on the right shoulder as in fig. 5. The chlamys was properly a military mautle, and is said to have been introduced from Macedonia, as was also the kausia, worn along with it by Athenian youth, a round hat with flat pliant brim resembling the petasus of Hermes. In winter a mantle of thick stuff, the chlena, was some- // times worn, while in sum- / mer the himation could be {\/ replaced by the thin linen chlanis. For official or priestly dignity an ungirt chiton reaching to the feet (chiton orthostadios) was worn, Sandals, shoes, or high boots were used as occasion required. The citi- zen of mature years wore no Fic. 5.—Terracotta figure, wearing covering for the head.

~~*That Chlamys and Chiton, From Tana- gra. Brit. Mus. was confined to youth, work- men, and slaves. His hair was cut short on the top, and lay on the head without parting. At the sides and round the neck it was allowed to fall a short way. His beard was of moderate size. Before Alexander's time only the Spartans shaved the upper lip, but after that shaving became more general, Except a finger ring, a brooch to fasten the chlamys, or on occasion a wreath, the citizens usually wore no ornaments. While with this class there was no limit to the display of limbs, it was on the other hand the object of the slave's dress to conceal the limbs as far as possible, and for this purpose he wore, besides the jacket with long sleeves already noticed, close- fitting hose reaching to the ankles. For his head he had, like fishermen and other workmen, a pointed cap (pelos).*~~

~~*The constancy to one fashion observed in the dress of the Greeks is not remarkable when we remember that the fashions with which they were familiar in other nations must have shared in their minds the association with servitude and lower civilization which attached to these nations. Yet if it is true that they entered Greece from the north, and had previously permanent settlements in that region, it is curious that they did not retain in their costume some evidence of the colder climate in which they had lived, unless, indeed, the hose relegated to slaves furnish such evidence. This same difficulty occurs with regard to the Etruscans, whose dress is peculiarly the natural one for an Oriental climate; and it is the more remarkable in their case since the cold of the north of Italy would, it might be supposed, have induced them to retain part of the dress peculiar to the north, had they, as is argued, been previously settled there.*~~

~~*MATT. WEBB.*~~

~~*ETRUSCAN.*~~

~~*The female dress of the Etruscans consisted, like that of the Greeks, in (1) a chiton poderes, reaching to the feet,*~~

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and girt at the waist ; (2) a himation, worn in the fashion of a shawl, as occasionally on early Greek figures, or as a plaid ; (3) a hat (¢utwlus) rising to a high point; and (4) pointed shoes. The chiton, with diploidion on the breast, which is so conspicuous in Greek art after 450 B.c., does not so far as we know occur in pure Etruscan representations of dress ; nor is the himation found wrapped round the body as in Greek figures of this period (see fig. 2 above). It seems to have been much nar- rower as used by the Etrus- cans, and more like a shep- herd's plaid. Instead of a himation a close-fitting jacket of thick stuff is worn by an archaic Etruscan female figure in the British Museum, fig. 6. The pointed hat (tutulus) re sembles the Persian kidaris, and from its Oriental appear- auce has been cited asasurvival of part of the national dress from the time when the Etrus- cans inhabited Lydia, On a celebrated terracotta sarco- phagus in the British Museum the female figure reclining on the lid wears a Greek chiton of a thin white material, with short sleeves fastened on the outside of the arm, by means : of buttons and loops; a hima- Zz

tion of dark purple thick stuff—'

is wrapped round her hips and Aff = legs; on her feet are sandals, Ca consisting of a sole apparently Fic. 6.—Bronze Etruscan figure. of leather, and attached to From Sessa. Brit. Mus. the foot and leg with leather straps; under the straps are thin socks which do not cover the toes; she wears a necklace of heavy pendants; her ears are pierced for ear-rings; her hair is partly gathered together with a ribbon at the roots behind, and partly hangs in long tresses before and behind; a flat diadem is bound round her head a little way back from the brow and temples. Purple, pale green, and white, richly embroidered, are favourite colours in the dresses represented on the painted tombs.

No less essentially identical with the Greek are the representations of male dress on works of Etruscan art dating from the period of national independence. The chief article of male dress was called the tebenna. On the other hand there are the statements of ancient writers that the toga pretexta, with its purple border (awrepurrdpdhupos tyBevva), as worn by Roman magistrates and priests, had been derived from the Etruscans (Pliny,

W. Z., ix. 63, praetexte apud Ktruscos originem envenere) ; and the Roman toga, though placed round the body much in the same way as the Greek himation, yet differed from it in shape so far that, while the latter was an oblong, the toga was a circular piece of stuff (toga rotunda), of which a large segment was doubled back so as to reduce the whole to little more than a semicircle. By this means a greater profusion of folds was obtained, and this at first sight is the characteristic difference between the Greek and Roman male dress. But though the toga, worn as it was by the Romans, does not occur in early Etruscan art, there is sufficient likeness between it and the tebenna which does occur, to justify the statement of the Roman toga being derived from the earlier costume of the Etruscans, It would have been equally, perhaps more, correct to have

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traced it to a Greek origin, the tebenna having been worn in Argos and Arcadia (Pollux, vii. 61) apparently from early times. Under the tebenna, or toga, which was necessary only for public appearance, the Etruscans wore a short tunic similar to the Greek chiton. For workmen and others of inferior occupation this appears to have been the only dress. Youths, when engaged in horsemanship and other exercises, wore a chlamys round the shoulders, just as the youths similarly engaged on the Parthenon frieze. But the Etruscan chlamys, again, is semicircular in cut, and was fastened on the breast by buttons and a loop, or tied in a knot, whereas the Greek chlamys was oblong and fastened on the shoulder by a brooch (perone). On public or festal occasions the Etruscan noble wore, besides the tebenna, a bulla, or necklace of bull, and a wreath, corona Etrusca. The bulla was a circular gold locket containing a charm of some kind against evil. On the later sarcophagi the male figures wear not only a wreath, or corona proper, but also a garland of flowers hung round the neck. The Roman manner of wearing occasionally the toga, with the end thrown over the left shoulder, and wrapped round the waist (Gabino cinctu), was derived, it was said, from Etruria. The upper fold of the tebenna could be drawn up over the head if needed. As a separate male head-dress there was the galerus, a hat of leather, said to have been worn by‘the Lucumos in early times, or the ape,

a pointed hat corresponding to the tutulus worn by females.

The fashion of shoes worn by Roman senators was said to have been derived from Etruria. Etruscan shoes were prized both in Greece and in Rome.

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Male dress. —Fig. 7 represents the full Roman dress of tunica and toga, the former being visible only on the right shoulder and breast. The toga as here worn is, when spread out, a nearly ellip- tical piece of cloth, its greatest length being three times the height of the person who wears it, aud its greatest breadth equal to at least twice the height of the wearer. It is, there- fore, correctly called toga rotunda. The first step is to double back a segment of this ellipse so that it may nearly resemble a semicircle, and thus also justify the other definition of the toga as semicircular (repiBororov — jpuxKALov). With the long straight edge so obtained, and with the smaller segment on the outside, the toga is thrown over the left shoulder, one end hanging down in front and over the left arm to the ground. 'The long end is then gathered round the back with the right hand, brought under the right Fis. 7.—Bronze statuette, wearing arm and across the body, Pose, Brit. Muy. and finally thrown again over the left shoulder so that it may hang down the back some distance. The segment which was doubled back may be drawn over the back of the lead like a veil, or, more generally, is drawn up as far as the neck and round the right shoulder, from which it

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COSTUME

[ROMAN,.

forms a sweep in front of the body resembling the curve of a bay, whence it is called the sinus. The end, at first allowed to fall down in front, is drawn up a little and hangs over the edge, which passes round the waist in front. This is perhaps what is called the wmbo. Instead of the loose end of the toga

being thrown over the left shoulder, as here, it was sometimes carried round under the left arm and tied tightly round the waist. 'This was called the cinctus Gabinus, and from having been once, it appears, a common fashion of citizens when engaged in war, was retained as the official form in certain ceremonies arising out of war, as at the opening of the temple of Janus. The toga was of a thin woollen stuff, and as to colour was always white for the ordinary burgesses. A white toga with a purple border (toga pretexta) was wom as a distinction by those holding public offices, entitling them to the curule chair and the fasces, by the great colleges of priests (Flamen Dialis, Pontifices, Augurs, Septemvirl, Quindecimviri, and Arvales), but in this case only during the act of performing their offices, and by boys up to their sixteenth year, when they assumed the toga virilis. The tribunes and zdiles of the plebs and the quzestors were denied the right to the pretexta. A purple toga (toga purpurea) was always the mark of high office, and as such was worn by the magistrates of republican times, though not except on public occasions, as well as by the emperors. The purple toga was sometimes embroidered with gold (¢oga picta), and it could only be worn with an under-dress of the same colour (tunica palmata). The pretexta, on the other hand, with its purple border, could only be worn along with a white tunic under it with a purple stripe (clavus). The pretexta was laid aside when the wearer retired from office, but the clavus, or purple' stripe on the tunic, was retained, and became in consequence the distinguishing mark of the senatorial order.

The tunica corresponds exactly to the Greek chiton, reaching, like it, half way down the thigh, and being girt round the waist, but with the apparent difference that the Greeks rarely brought the stuff pressed down by both arms up round the arms so as to form sleeves down to the elbows, as did the Romans frequently. Further, it was a custom of the Romans to wear two tunics,—Augustus is said to have worn four. Tle one next the skin was known as the subucula, and the other as the supparus, or intusium. Only the latter had sleeves (tunica manicata), and over it passed the girdle (cinctura). The tunic of the senatorial order had, as has been said, a broad purple stripe, /atus clavus, woven into it down the front, whence it was called tunica laticlavia. That of the knightly order had two narrow purple stripes and was known as tunica angusticlavia. Tunics with two narrow stripes, one passing over each shoulder before and behind, are seen on

Roman bronze statuettes of boys represented acting as Camilli at sacrifices. The tunic was usually of linen, just as the toga was of wool, and the national colour for ordinary purposes was white. Poor persons were doubtless content with the natural colour of the linen or wool, and when in mourning the higher classes wore a dark-coloured toga (toga palla or sordida), though this was not always the rule.

More convenient than the toga, but retaining a general likeness to it, was the palliwm, an adaptation of the Greek himation. Among other substitutes for the toga were (1) the trabea, which formed the official dress of the Augurs and Salii, resembling in shape the Etruscan tebenna, and being purple in colour; (2) paludamentum, an adaptation of the Greek chlamys, worn by the emperor as head of the army, purple in colour, thaugh white was also allowed ; (3) sagum, or sagulum, similar to the last, but worn only by soldiers; it differs from the chlamys in having the

corners rounded off so as to be nearly circular when folded out; (4) penwa, worn in rainy weather to cover the dress, and made of thick flaxen material (gausape) or leather, with or without a hood, and formed of an elliptical piece of stuff with a round hole in the middle for the head to pass through ; (5) lacerna, a sort of chlamys of expensive material and colours, worn in the theatre or circus in presence of the emperor. As regards covering for the head, there was the hood of the penula in rough weather (cucullus or cucullio), or the toga could be drawn up over the head, or there wasa separate article—the riciniwm—in the form of a veil, as worn by the Arval Brothers. Workmen and others wore hats or caps corresponding to the Greek pilus (piles) and petasus. As an ornament for the head the diadem was only occasionally used till the time of Constantine. It was declined by Cesar. After Caracalla the most usual mark of an emperor was a crown of ' radii. The heavy garments worn out of doors, or officially, were replaced at dinner by vestes cenatorie of thin material. Trousers (braccw) were not worn till after the Parthian and Celtic wars, and even then only by soldiers who were exposed to northern climates. The legs were protected by flat bands (fascze) laced round them up to the knees. Ou the feet senators wore shoes of red leather (mulleus, calceus senatorvus), ornamented with knobs

~~of ivory or brass, and having a high sole. The patrician order wore shoes of black leather (calceus patricvus), orna- mented with an ivory crescent, and hence called Junula. For unofficial occasions, and for persons not belonging to these orders, there were the sandals (solew). The compagus, said to have been introduced from Etruria by Romulus, appears to have been a high hunting boot laced up the front, while the caliga appears to have been' a sort of shoe. For personal ornament finger-rings of great variety in the material and design were worn, sometimes to the extent of one or more on each finger, many persons possessing small cabinets of them. But at first the Roman citizen wore only an iron signet ring. A gold ring was intro- duced for persons sent on foreign embassies, but by degrees the jus annuli auret was extended to all classes of citizens.~~

~~In the case of baldness, a wig (capillamentum) was allowed~~

~~to men as well as women during the empire. Till 290 B.c, it was the custom of men to let the hair and beard grow long. From that time shaving and short hair were the~~

~~fashion, till under Hadrian, when long beards were again~~

~~grown,~~

~~Female Dress.—The proximity of wealthy Greek towns in the south of Italy, and the extensive intercourse between the Romans and Greece and the East even in republican times, offered tempting facilities to Roman ladies for the supply of dress, and the result is that in artistic repre- sentations their dress does not differ in any important particulars from that of the Greeks as already de- scribed. Still the names for the main articles of dress remain Roman, from which it may be inferred that the differences between the original Roman and the imported Greek dress were not essential as regards shape. Next the skin was worn the tunica interior (intusium or interula), loose and without sleeves. Under the breasts passed the mammillare or strophium. Then came the tunica proper, generally called stola, girt at the waist, and with sleeves fastened down the arms as in the chiton. Over this was thrown for out-door wear the padlla, or plaid, identical with the Greek himation. A veil over the back of the head (fammeum or ricinium) was the mark of a well-to-do matron. In rainy weather a hood like the Etruscan~~

tutulus was worn. 'To cover or hold up the hair, nets were used (mitra calantica, calvatica), but this simple article was far from common among the Roman ladies, whose chief characteristic in works of art is the elaborateness of their

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manner of braiding and twining the hair. After the Germanic wars a blond colour of hair became fashionable, and to gef this dyeing was resorted to. Generally the eyebrows and eyelashes were painted ; even the veins on temples were sometimes touched with delicate blue colour. The complexion was improved by various powders and washes. The teeth were carefully looked after, false ones making up the deficiency of nature. For the feet sandals, but by preference shoes, were made use of, generally of bright colours and embroidered with gold or pearls ; socks or stockings were confined to ceremonial appearances. Personal ornaments consisted of brooches (fibula), bracelets (armille), armlets (bracchialia), ear-rings (inaures), neck- laces (monilia), wreaths (corone), and hair-pins (crinales), The tore (¢orgues), or cord of gold worn round the neck, was introduced from Gaul. A profusion of precious stones, and absence of skill or refinement in workmanship, distin- guish Roman from Greek or Etruscan jewellery ; but in the character of the designs there is no real difference.

EGYPTIAN AND ASSYRIAN.

Lgyptian.—The ordinary male dress of the Egyptians, previous to about 1600 3.c., consisted of a piece of linen cloth tied round the loins, with occasionally an upper garment or skin of a tiger or leopard thrown round the body, Though this continued even to much later times to be the dress of many, yet from the date just given distine- tions of grade in society began to be marked ky different ways of girding the loins, by greater size of the cloth, by twining it up round the body, and by wearing two or more loin cloths of different materials (Weiss, Kostdéimkunde, i. fig. 18, p. 33). The peculiarly Ethiopian dress was in the form of a sleeveless skirt with fringe round the lower edge, hanging loose except among poorer people, who. wore it fitting close to the body. The rule in early times was to go barefooted except on

occasions of ceremonial, when a sort of hose of network or greaves were worn. But under the new empire, after 1600 3.c., covering for both feet and head came into general use, the former consisting of sandals, the latter of a cap made of leather, or of what some call cotton. Magistrates and others of rank wore from the earliest times sandals, and on the head a square of cloth folded diagonally with its three ; points gathered together at the back of the neck, The dress of a king was distinguished by a triangular projecting skirt (fig. 8) of leather and ornamented with gold. Over this he wore a chiton and a sash round the waist. On his head was a crown, pshent, which could be of three kinds, either that of Lower or of Upper Egypt, or a combination of these two, the latter having nearly the appearance of a mitre. A queen wore a long, thin, and richly ornamented chiton, with sash round waist and shoulders (fig. 9), A broad collar round neck and over breast was worn both by men and women who could afford it. The taste for ornament was general, men wearing armlets, bracelets, anklets, and finger-rings, while women not only wore these articles in greater size, number, and richness, but also diadems, girdles, and bands of orna- ment round the breasts and hips. The national dress, however, for poorer women was a simple close-fitting

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Fic. 8.—An Egyptian King.

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skirt reaching up to the breast and held up by straps over the shoulders. Woollen garments were worn chiefly by the poor, and occasionally by the rich, or by priests, who were permitted an upper dress of this material. Next the skin it was unlawful : to wear it, nor could any one be buried in a dress of this material (Herod. ii. 81). A priest had to put off the wool- len part of his dress before entering a temple. Cotton (eiptovot Gard EvAov, Herod, ii.

~~47) appears to havé been manufactured in Egypt, but to have been less used than linen, or byblus, which was made from flax and cotton. Assyrian.—In weaving, em- broidery, and dyeing the Assy- rians surpassed the other ancient nations, as is known from tradition and may be seen in theirexistingsculptures. While the characteristic dress of an ordinary Egyptian was a cloth irt round the loins, that of z- f ai Assyrian was a long skirt eve: ant eae ee worn close round the body and with short sleeves. This was worn by all classes, and apparently by women as well as by men. Only royal and priestly persons were allowed an upper garment, at least during the early and flourishing period of Assyria. By the time of Herodotus a considerable variety of other dresses had beenintroduced among the different classes. The king's dress, as will be seen in fig. 10., consists of a long chiton, or skirt, with short sleeves, and above this a mantle with heavy fringes passing over one shoulder, or in other cases over both shoulders. The dress of a priest con- sisted of an under-chiton, and over it a sort of long narrow plaid with frings wrapped spirally round the Fie. 10.—An Assyrian King. figure (Weiss, i. fig. 119, a, p. 202). Diadems variously ornamented were worn by officers of the court and by certain priests, as were also sandals. Hose did not come into use till a late period, and then chiefly as part of the military dress, Necklaces, armlets, bracelets, and finger-rings were worn in abundance by Assyrians of rank. (A, 8. M.)~~

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~~Of the dress generally worn in ancient Israel there are known to exist no original authentic representations, nor is it possible to refer to any minute descriptions of it either in the one great source of Jewish history or in the pages of Josephus. Certain paintings and sculptures, it is true, in Egypt and Assyria, have been supposed to represent captive Israelites; but, even should this supposition be correct, in the figures thus represented there is nothing whatever which could be accepted as typical of national costume. On the other hand, while in certain details and accessories~~

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~~of the dress adopted by the different classes of the Israelite community, there doubtless arose from time to time both fresh modifications and decided changes of fashion and ad- justment, the general essential typical characteristics of dress may be assumed to have continued the same in Israel,—the same, also, as in no slight degree continue to distinguish the Oriental costume still worn in Palestine. The garments, certainly, were loose and flowing ; the girdle was in universal use; and a primary motive in the head- gear was protection for the wearer from the hot sunshine of the East. The garments, in whatever manner or degree they may have been affected by varieties of material and adornment, certainly may be divided into two distinct groups, the under and the outer garments,—the former being light and specially adapted to a hot climate, and the latter being of heavier materials and suited to the colder seasons. As in the case of their arts, so in their costume the Israelites must be considered to have been influenced by usages prevalent in Egypt and Phcenicia ; subseqnently, by those of Assyria; and, still later, by those of the Romans. Again, it is more than probable that local influences introduced fashions of their own into the costume of the dwellers in the more mountainous districts of Palestine. For peculiar classes among them the Israelites had costumes specially appointed. For the priest- hood there were their own official vestments, for which regulations were laid down with extreme minuteness, and en- forced~~

~~by supreme authority. The kings and princes had their "royal apparel," and for the warriors appropriate appointments were provided. Different ranks of persons, too, in various ways were distinguished by the richness, the costliness, the simplicity, or the meanness of their attire. So far as externals went, the episode in the Gospel of the rich man clothed in purple and fine linen with a Lazarus at his gate, so true a picture of Oriental life, would have been equally consistent had it found a place in some one of the earlier chapters in the same national history. Of thedistinctive characteristics of femalecostume in Israel nothing is known, beyond the general fact that it was rich and delicate as far as circumstances would admit, and that personal ornaments were highly prized. Thus much is certain that the veil, a modern fashion now so prevalent in the East, in its modern acceptation was unknown among the women of ancient Israel, with certain exceptions only that are altogether at variance with the uses and associations of the Oriental veil at the present day. Furs, used both for warmth and adornment, with cloth woven from camels' and from goats' hair, including the "sackcloth" of sorrow and humiliation, were in use from an early period ; so also, doubtless, was woollen cloth, the natural material for the clothing of a pastoral people. Familiarity with fabrics of linen, cotton, and silk, with those of various materials of foreign manufacture, may be considered to have been acquired by the Israelites in and from Egypt. There, too, they became familiar with the process of dyeing, and with the use of coloured threads, and of gold-thread or fine wire, for textile purposes ; and there they learned both to introduce various figures and devices into their woven fabrics, and to enhance their effectiveness with the needle. Needlework and embroidery, indeed, were extensively used by them in the production of various decorative fabrics. Whatever may have been the use in Israel of fabrics and decorations that were coloured, those that were white (the natural hue of any material, as well as actual whiteness, being understood to be implied by this term " white") were in general use by the Israelites for their dress, and also were held by them in the highest estimation. This preference possibly may be traced to the provision in the Mosaic law which, apparently with the view to impress on the mind of the Israelites the idea of~~

~~simplicity, and to protect them from the hurtful effects of Oriental luxury and extravagance, forbade the use of mixed textures such as would be produced by wool and flax in combination.~~

~~The particular garments of the Israelites, of which express mention is made, include the following :—~~

~~I. Under Garments—(1.) The sadin, a light wrapper, worn next to the person. (2.) The cetoneth, or under-tunic, either sleeveless or having open sleeves, moderately loose, varying in length, and adjusted about the waist in such a manner as to form a pocket from an overlapping fold. Corresponding with the modern kaftan, the cetoneth was habitually in use, worn either with or without the sadin, by both sexes, and by persons of all ranks. (3.) The mic, or over-tunic, made with sleeves, longer and somewhat thicker in substance than the cetoneth, and, like it, in general use. To both these garinents the term "coat" is applied in our version of the ancient Scriptures.~~

~~Il. Outer Garments.—To all these garments, alike in being designed only for occasional use or for use under exceptional conditions and circumstances, in their generic character the term "'cloak," as understood by ourselves, appears to have been appli- cable. Of these cloaks, robes, mantles, or wrappers there were several varieties, which differed from each other as well in form asin material, substance, and ornamentation ; fringes, however, seem to have been generally attached tothem; and they were worn with various modes of adjustment. The word malbush distinguished a robe of state. Express mention is made, but unattended with any~~

~~recise descriptive notices, of more than one variety of shawl, worn~~

~~y women, which might be so adjusted as to form a head-covering in addition to enveloping the person. To very light female robes also, which were long and flowing, occasional references are made. Of the mate head-dresses worn by Israelites, distinct from such coverings for the head as might act as hoods formed by wrapping the mantle or cloak about the head, we have no exact knowledge. Though no such relics are known to be still in existence, goldsmiths' work and jewellery certainly enjoyed a high degree of estimation in ancient Israel, as always has been the case with all Eastern~~

~~*races; and they constituted important elements in the decoration of Jewish costume.*~~

~~*The passages of chief importance ir the Old Testament, in which the vestments of the priesthood are enumcrated and described, occur in Exodus xxviii, xxix., and xxxix., and in Leviticus viii. and xvi. In the Apocryphal books also reference may be made to Ecclesiasticus xlv., and to 1 Maccabees x. 21, in which last passage the entire investi- ture of the high priest is designed to be understood. Very full descriptive notices of the sacerdotal vestments of the Jewish priesthood are given by Josephus, in his Antiquities, iii. 7, and in his Wars, v. v.7. Further illustration on the same subject is given in his Hpistle to Fabiola, ii. 574, written at Bethlehem by St Jerome, 396 a.p.*~~

~~*An "order" or "change of garments," for a man— always in the East highly esteemed as both an honourable and a valuable present—among the Israelites consisted of a cenoneth and a miel, with perhaps a sadin, and certainly one or more of the occasional outer robes, mantles, or cloaks: In presents of this kind, the number of the "' changes of garments," which from their loose and flowing character would not fail to adapt themselves to general use, was studiously adjusted to the degree of estimation in which the recipient was held, and not without an indirect and yct significant reference to the dignity of the giver. The expression "naked," when applied to an Israelite, denoted, not a condition of actual nudity, but the fact of being attired only in a single under garment, and con- sequently implied the being in readiness for active exercise or violent exertion, 'The strongly marked and comprehensive distinction between the East and the West receives a characteristic illustration in the Oriental usage of uncovering the feet and covering the head, in token of respect and even of adoration. The "rending the garments," generally the outer garment only, an act so strange to us in the West, to the Israelites, in common with other Orientals, was peculiarly significant of grief, indignation, humiliation, and despair.*~~

~~*Among the figures painted in the very ancient tomb at Beni Hassan, in Egypt, occurs a group of figures from*~~

which the annexed woodcut has been drawn (fig. 11), con- jectured to represent the arrival of Joseph's brethren when they went to pur- chase corn in the land of the Pha- raohs. Again, con- siderably later, but as early as the days of the Pha- raoh — Necho, by whom Josiah was

Fic. 11.—From Beni Hassan,

at Megiddo, among some figures sculptured in one of the tombs discovered by Belzoni, near Thebes, which represent captives of different nations brought before their Egyptian conqueror, four Jews are supposed to have been introduced after the manner shown in fig. 12. The fringe commanded by Moses, Num. xv. 38, to be worn by his people, and which probably was a relic of a still more ancient usage in the family of Jacob, may be gam considered to have been shown in both these groups. In the" almost total absence

of other not less improbable ancient examples, these figures may be accepted as contemporary representations of persons whose attire, such as it is shown to have been, at any rate may be considered to represent corresponding articles of dress in use in ancient Israel. Captive Jews, once more, are undoubtedly re- presented in the fine series of Assy- rian bas-reliefs com- memorating the capture of Lachish by Sennacherib, dis- covered and de- scribed by Mr ~< Layard (Nineveh and Babylon, p.) 152; and 2d series of Monuments of Ss Nineveh, plates xx. ——— — — — - toxxiv.) The phy- 777770 myo siognomy of these Jewish captives is i strikingly indicated Fic. 13.—Indoor Costume of modern Syrian

: Women.

in the sculptures

in question, but of their national costume but very little is shown; for "they had been stripped of their orna- ments and their fine raiment, and were left barefooted and half-clothed. From the women, too, had been removed the 'splendor of the foot ornaments, and the caps of net- work, and the crescents ; the ear pendents, and the bracelets, and the thin veils; the head-dresses, and the ornaments of the legs, and the girdles, and the perfume boxes, and the amulets; the rings and the jewels of the nose ; tle

embroidered robes, and the tunics, and the cloaks, and the satchels ; the transparent garments, and the fine linen vests, and the turbans, and the mantles ;' for they wore, 'instead of a girdle, a rope ; and, instead of a stomacher, a girding of sackcloth.'" (See Isa. iii. 18, &. ; and Ezek. xvi. 10, &c.) Upon the exceedingly interesting description of the dress worn in ancient times by the women of Israel, as given by the two great prophets, Mr Layard remarks that

Fic. 12.—From tombs near Thebes.

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« most of the ommaments enumerated, probably, indeed, the whole of them, if we were acquainted with the exact mean- ing of the Hebrew words, are still to be traced in the costumes of Eastern women inhabiting the same country. Many appear to be mentioned in the Assyrian inscrip tions among objects — of tribute and spoil brought to the king." With this reference to the dress and ornaments of the female inhabitants of Syria at the present day, of whom twogroupsare represented in figs. 13 and 14, the fol- lowing brief but graphic passage from the same writer's Nineveh and Baby- lon (p. 472) may consistently be asso- ciated. On approach- ing Baghdad, the low banks of the Tigris — the river itself gradually be- coming wider and wider, and its stream being almost motionless—were seen to "swarm with Arabs, —men, women, and naked children. Horsemen and riders on white asses were hurrying along the river side. Turks in flowing robes and broad turbans ; Persians in high black caps and close-fitting tunics; the Bokhara pilgrim in his white head-dress and way-worn gar- ments ; the Bedouin chief in his tasselled hefieh and striped aba ; Baghdad ladies, with their scarlet and white draperies

Women.

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Fig. 16.—Modern Syrians. Fic. 17.—Bedouin.

fretted with threads of gold, and their black horse-hair veils concealing even their eyes ; Persian women wrapped in their sightless garments ; and Arab girls in their simple blue shirts,—all were mingled together in one motley crowd." In the costume in common and constant use at the present day, as well by men—such as is exemplified in the groups shown in figs. 15 and 16—as by women in the towns and villages of Syria, may be discerned the transmitted representations of the general character and aspect of the attire of the same regions in remote centuries ; as, in like

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manner, the patriarchal dress of ancient Israel may be assumed to have had its primitive type in a great measure reproduced in our own times in the long coarse shirt, the ample striped aba of camels' hair (the coloured stripe that alternates with the white one, denoting the wearer's tribe), and the red and yellow keffieh, folded and tied in hereditary fashion about his swarthy face and over his neck and shoulders by the Bedouin Arab of the desert (fig. 17).

ORIENTAL.

If it may be said, as it may certainly be said with truth, of Oriental costume both in its general character and its specific details, that it is distinguished, in contrast to that of the ever-changing West, by the pervading and character- istic unchangeableness of the Hast, equally true it is that the vast populations which throng the wide expanse of the earth's surface included in "The East," comprehend in their numbers the inheritors and the wearers of costumes exhibiting in many peculiar and distinctive features an almost endless variety. At the same time, precisely as a distinct recognition as well of the range as of the appli- cability and the significance of the one term

“The Kast ” suggests no confusion of ideas respecting different Hastern realms and peoples, so also all Oriental costume so far bears the impress of Eastern requirement and association as in a certain degree to admit of a single general classi- fication. Thus, unlike to each other in not a few of their personal qualities as any two human beings well could be, and differing also in many decidedly marked particulars in regard to their costume, the nomad Bedouin of Arabia in every essential respect is no less a true and truly typical Oriental than the most gorgeously attired and, after his fashion, the most refined of the uative potentates of Hindustan. So, also, notwithstanding the points of difference between their costumes, the costume as well of the one as of the other is unmistakably Oriental. The same may be said of the dresses of the different races that inhabit Hindustan. And they all share an equally true Oriental brotherhood, and especially in exter- nals, in however decided a manner and degree each race may bear its own distinctive impress even in those very externals, with the natives of Japan and China and Burmah, of Persia, Arabia, Modern Egypt, Armenia, and Turkey, and with other Eastern races also that need not to be here particularized. Unless when circumstances reduce their attire to proportions so scanty as scarcely, if at all, to exceed that of the savage tribes who inhabit some tropical dis- tricts, or when influenced by some exceptional conditions, all Orientals are more or less inclined to wear loose and long and flowing garments ; their trousers, when any are worn, are very large and gathered in at the ankles; they have their heads habitually covered, whether with a turban, fez, or some variety of cap of a local hereditary style ; their feet, when not bare, are very lightly equipped; they delight in white fabrics, mingled with such as exhibit the most brilliant colours and the richest designs; and they indulge in an abundance and variety of personal ornaments. Also a general resemblance prevails between the costumes of the two sexes. ‘The decorative arts of China and Japan, always national both in the selection and the treatment of their subjects, in connection with certain universally esteemed varieties of their manufactures, bave familiarized the world with the typical characteristics of the costumes worn by all ranks and classes in those countries. Recent events have caused the more remarkable costumes of India to become well known through several popular publications ; and the same may also be said concerning the costumes of other Oriental nations, and those of them

~~more particularly which are nearest to Europe and have the closest relations~~

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~~ECCLESIASTICAL. |~~

~~with Europeans. In South-Eastern Europe itself, the costume of the modern Greeks exhibits semi-Oriental qualities,~~

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~~Without extending to any notice of the ordinary attire habitually worn in everyday life, at successive periods, by ecclesiastical personages of all ranks and orders in the Christian church, ecclesiastical costumes here may be considered to imply and consequently to include the vestments, distinctively official and ministerial in their character and use, which such personages would wear only when actually engaged in the functions of their respective offices, or on occasions of special state and solemnity. The habits, which with the advance of time came to be assumed by the members of the monastic orders, may most appropriately and advantageously be treated apart by themselves.~~

~~That ministering vestments, properly so called, and with them ecclesiastical insignia, were unknown among Christians of the apostolic age may be considered as un- questionably certain ; and, in like manner, in the three succeeding centuries only the faintest traces, if indeed any authentic traces whatever, of such vestments can be said either to exist, or to have left indications of ever having existed. The long and flowing garments, suggestive of peaceful repose and enjoyment, and always in some degree endowed with dignified associations, whenever the circum- stances of the times would permit, doubtless, were worn by the primitive Christian ministers when discharging their official duties ; but it also is no less certain that on the same occasions precisely similar garments were generally worn by Christian worshippers, whose condition justified their appearing in them. During the prolonged stormy period of the second group of four centuries in the Christian era the primitive ecclesiastical costume— the costume, be it remembered, at times of joyous festival and solemn cere-~~

monial adopted by all persons of comparatively high social standing—still was retained unchanged in its general style and aspect, and having experienced only such slight modifi- cations and additions as naturally would have their development with the course of events. As time passed on, keeping pace both with innovations upon primitive doctrine and with vicissitudes of political position, in various ways these modifications became modified, and to these additions fresh novelties gradually were added. Even at the commencement of the 9th century, when the true historic era of ecclesiastical costume may be defined to have commenced with it, the two most remarkable circumstances in connection with ecclesiastical costume were, on the one hand, its approximately unchanged character, and, on the other hand, its close general resemblance, amounting almost to identity, to the old civil costume, which in the state dresses of the Roman official dignitaries survived the sweeping changes. of barbarian revolution. It is worthy of especial remark that the earliest evidence of the introduc- tion of any insignia distinctive of rank and dignity in ecclesiastical costume is to be derived from the presence of two dark strips of varying width on the long white tunics in which certain early figures, certainly to be regarded as habited in ecclesiastical vestments, are represented ; and these strips can be considered in no other light than as adaptations from the clavi, some broad and others narrow, so well known in classic attire to distinguish the Roman senatorial and equestrian ranks. Equally remarkable is the fact that the Christian hierarchy should have derived the insignia of their rank in the church, through the high position of civil power in the state exercised by the early bishops of Rome, from the official decorations of the Roman magistracy as well of the republic as of the empire. It

will be borne in mind that all changes in ecclesiastical vestments, and all additions to those of early date, made by authority during the Middle Ages, were designed to be

suggestive of some symbolical motive and to convey some

doctrinal significance—considerations, however important in many respects in themselves, which it would be out of place here to discuss even superficially, when treating of all ecclesiastical vestments simply in their

capacity as "costume." In connection also with the full development in the 11th and 12th centuries of that type of vestments which, when once it had been formally established, has been maintained with but slight modifications in the Roman Church to the present time, no unimportant part was taken by the attempts, first contemplated in the 9th century, that were made to assimilate such vestments as might be dis- tinctive of the Christian ministry with those appointed in the Mosaic law for the priesthood in Israel. The idea that any such similitude might exist, or should be made to attain to existence, once baving arisen would naturally take a strong hold on the minds of the more ambitious and also of the more learned ecclesiastics of those times. So, when in the first instance the points of difference between the two types of vestments were found to be far more decided than those of resemblance, a process of deliberate assimilation was decreed, which brought about as close an approximation between the two types as was held to be desirable—an approximation, it scarcely is necessary to add, that removed the elaborate and ornate vestments of medieval Christendom as far as possible from retaining any affinity to the dignified simplicity of Christian ministerial costume in primitive times.

'VESTMENTS IN USE IN THE WEST.

1. The A/é.—In the Acts of the Council of Toledo, 638, the habits and insignia of the three orders of the clergy are thus defined :—of the bishop, the orariwm, the ring, and the staf'; of the presbyter, the orwriwm and the planeta ; and of the deacon, the orarium and the alba or alb. In this definition it may be assumed to have been implied that the ald was eomnion to the three orders, as the planeta was worn by bishops as well as by presbyters. Its name abbreviated from tunica alba, and at first the simple and yet dignified white linen tunic that in the primitive ages was held to be the costume appropriate for the Christian ministry, in the 9th century the a/b began to have its loose and flowing proportions contracted; and these changes were continued until the vestment was made to fit with comparative closeness about. the person of the wearer, when it was confined about the waist by a narrow girdle. The pure simplicity of the early white tunic also was superseded by the addition of rich "orfreys" (aurifrigia) of embroidery and goldsmiths' work. These "apparels" (parwrce), in the form of masses and stripes, were attached to the lower part of the alb and to the wrists of

~~its sleeves. In the second half of the 14th century the wrist-apparels of albs, instead of encircl- ing the sleeves as previously had been the custom, appear only upon the upper part of them.~~

~~2. The Stole, the name in the 9th century given to the ancient orariwm, itself as it would seem having its pro- totypes in the Roman cla, is a narrow scarf adjusted about the neck so as to have its extremities hanging dowu in front of the wearer. Originally white and without ornament, stoles after a time were made of various colours, were enriched with orfreys and fringed at their ends. Worn immediately over the alb, the stole is crossed upon the breast of the wearer, being retained in that | tg by passing under the girdle. When the chasuble is worn, and worn without the episcopal dalmatic and tunic, the ends of the stole appear issuing from beneath it. In some few early ecclesiastical effigies, which are without a chasuble, but in its stead have a cope open in front, the entire adjustment of the stole is distinctly shown,~~

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~~Fig. 18.—From brass at Horsham, showing Stole, &c,~~

as in fig. 18 drawn from a brass at Horsham. This effigy also shows in what manner the alb, amice, and maniple are worn, and it may advantageously be compared with fig. 20, also drawn from a brass to Peter de Lacy, rector of Northfleet, in Northtieet Church, in which the stole for the most part is covered by the chasuble. Its ancient name orariwm, equivalent to our "handkerchief," shows the medieval stole to have been designed as well to wipe the face as, in accordance with primitive usage, to cover it when offering prayer. For deacons it was appointed to wear the stole depending from over the left shoulder only, so as to show but one end of it on the front of their persons (fig. 19). The idea of a connection in the signifieance of the stole to denote dignity with the ribband worn as a knightly distinction is obvious.

3. The Maniple.—A short species of stole, the representative of the ancient mappula and its successor, the maniple, which is worn so as to hang from the left wrist, may be considered to have been substituted in the gee aad yurposes to which the stole itself originally hac eat baat applied. Like the stole, however, the Pe ee maniple, regarded as one of the ecclesiastical vestments as early as the 9th century, soon became merely a decorative accessory of the official costume of ecclesiastics (see figs. 18, 20).

4. The Chasuble.—This super-vestment, worn over the alb and the stole, and by ecclesiastics of episcopal rank also over the dalmatic and tunic, which in the 11th century was expressly associated with the ecclesiastical office, is identical with the caswla of the 9th century and, through it, derived from the plancta of still earlier times. Both plancta and casula, however, as over- garments furnished with a hood which would envelop the entire yerson, were worn by laymen, the chief if not the only distinction hesecen these two garments being that the former from its greater costliness was in use by persons of rank and wealth, while the latter was adopted by the humbler and poorer classes. In form and general character both the plancta and the casula appear to have resembled the ancient penula, an outer garment worn in Italy long before our era, and of which the memory still survives in the title of the ecclesiastical super-vestment of the East. Circular or oval in form, and having in the centre an aperture for the head of the wearer to pass through, the chasuble covers the arms as well as the body, so that when they are raised it falls over the arms both before and

behind. Made of various materials and of diffe- rent eolours, iu early representations of it this vestment is eonstantly found to have been elabo- rately adorned with embroideries and other decora- tive aeeessories, also with a profusion of orfreys in gold and silver work enriched with gems (fig. 20). A favourite form of chasuble-orfrey, evidently an imitation of the archiepiseopal pall, encireles the head-aperture and, passing over the shoulders of the wearer, falls in a straight line down both (f the baek and the front of his person. ;

5. The Amice.—First mentioned as a vestment in the 9th eentury, and from the following RA eentury enriched with apparels, when opened out the amice was square in shape, and it was adjusted preeisely after the manner of its present adjustment, beneath both alb and chasuble, about the throat and over the shoulders. In monu- mental effigies the apparel of this vestment is represented either falling baek from the throat of the wearer, or, in the later examples, standing BY. \ up somewhat stiffly around it ; and this position F 20 F over the chasuble sometimes lias suggested the 7 : tN 9 mistaken idea that the apparel of the amice pws oP, oeeee forms a collar to the chasuble itself. By holding eet, es it for a few moments over the head at the time Chseebia, ae: of putting it on, the amice in eourse of time was eonsidered to symbolize the Christian helmet (see fig. 20).

6. The Dalmatic, a full-sleeved tunic reaching about to the knees. Long after its adoption as an eeclesiastical vestment, the dalmatic continued in use in Rome as a garment appropriate for secular officials on oeeasions of eeremony and state; and at the present time it eontinues, as it continued through the Middle Ages, to be a royal robe as well in England as on the Con- tinent. Like the other aneient vestments, originally white and plain, in the 10th eentury the dalmatic assumed various eolours, and in the 12th and the sueeeeding eenturies it followed the colour of the chasuble. Appointed to be worn by deaeons over the alb as the distinetive vestment of their order, when made of costly materials and riehly adorned the dalmatic was added to their official eostume by prelates, by them to be worn immediately under the chasuble. In early episeopal effigies the lower part of the dalmatic is represented, appearing beneath the chasuble, richly

—9th century.

fringed and partially slit up at the sides, as in fig. 21, drawn from the corresponding part of the brass to Thomas Cranley, arch- bishop of Dublin, iu the chapel of New College, Oxford, 1417, Nearly a century earlier (1325), in the cathedral of St Nazaire at Carcassonne in France, the statue of Bishop Pierre de Roquefort, which is without the chasuble, shows with admirable distinctness the form and adjustment of the episcopal dal- matic, with the tunic appearing beneath it, the ends of the stole being visible issuing from beneath them both. The large sleeves of the dalmatic and the tight sleeves of the tunic are shown at the wrists, and from the left wrist the maniple hangs down (fig. 22). Over the other vestment (as in fig. 18) is a cope, fastened across the breast with a morse charged with an Agnus Dei. The prelate wears his mitre, and in his hand he holds his pastoral-staff. In England, in Norwich Cathedral, there is a similar example of the episcopal habit in the effigy of Bishop Goldwell (1498), which re- presents both dalmatic and tunic as shorter than in the French statue; the dalmatic also has a broad central vertical band of rich embroidery, and at the wrists the sleeves of the alb, tunic, and dalmatic are shown. Figures of deacons, rare in medieval art, when they occur generally profess to represent St Lawrence, with the instrument of his martyrdom. In fig. 23, reduced

Fic. 21.—From brass at Ox- ford, showing Dalmatic.

Fig. 23.—From vellum drawin at Lambeth, showing Dalmatic, Viollet-le-Duc.] &c.

Fic. 22. Showing Dal- matic, &c. (After

from a drawing on vellum in a MS. of the 13th century in the Lambeth Library, the dalmatic, which is nearly as long as the unusually short alb, is shown as it was ornamented and worn at that period. Another good example, much later in date, also a figure of St Lawrence, is sculptured in one of the canopied compartments of the monumental chantry of Prince Arthur Tudor in Worcester Cathedral. Fig. 19, from the Liber Pontificalis of Landolfus, a MS. of the 9th century, shows how the stole was disposed over the left shoulder by a deacon wearing an alb and a dalmatic.

7. The Tunic.—The vestment distinguished by this name, worn by prelates betweeu the alb and the dalmatie, is rather longer than the vestment last named, and its sleeves also are somewhat longer and not quite so full. As the vestments inereased in number, and at the same time became less simple and more splendid, the gradual addition of one tunic after another, to be traced from the 9th eentury downwards, was strictly in keeping with the spirit of the times. Early in the 14th eentury it had a remarkable parallel in the suecession of sureoats, with which, regardless of their palpable ineonvenienee, the knights eovered their armour. It is specially curious to observe how studiously the men-at-arms earried out their imitation of the eeclesiastieal vestments of their day, by making each one of their successive sureoats in front of their persons shorter than the one beneath it, so displaying them all. In the case of the ecclesiastical vestments, the tunie proper, become distinetively

MONASTIC AND ACADEMIC. |

the alb or under-tunic, was covered by the tunic, a rich and splendid vestment ; and the dalmatic, shorn of its ancient length in order to leave the second or middle tunic visible, followed, third in order, and became the super-tunie of tle group. The tunic, like the dalmatic, partially slit at its sides and generally fringed, is well represented in monumental effigies and other early works (see fig. 21).

"8. The Cope, a voluminous cloak or outer garment, originally furnished with a hood for covering and protecting the head, and of sufficient size to envelop the entire person of the wearer, would naturally admit of every possible variety in material, colour, and ornamentation, and it also would be used as well by laymen, as by ecclesiastics of all orders and by monks. Richly adorned copes, however, appear in medieval times to have been considered as almost exclusively ecclesiastical vestments of stately dignity, to be worn in processions and on those ceremonial occasions which would be distingnished from the service of the altar. Such copes, having splendid border-apparels into which canopied figures of sainted per- sonages frequently were introduced with heraldic and other devices, were fastened across the breast by a morse, often of costly material and highly artistic workmanship (see fig. 22).

9. The Almuce or Aumuce, a hood of fur, was apparently intro- duced in the 13th century, its object being to afford protection from cold in processions, &c., and in the 15th century a cape and pen- dants also of fur were added to it.

10. The Swrplice, an alb, almost of primitive form, ample and flowing, and closely resembling the surplice of the present day, was in use in the Middle Ages in processions and on certain occasions of ceremony. An excellent example of a surplice of the 15th century is given in the noble brass to Prior Nelond, at Cowfold, Sussex, 1433.

11. The Afitre.—First mentioned among ecclesiastical vestments about the middle of the 12th century, though some kind of dignified ae head-gear certainly had been in use considerably earlier, the mitre originally was made of linen embroidered; and it does not appear in its well-known double or cleft form until the 12th century had made a considerable advance, when it began to be con- structed of some rich material and to receive costly adornment. Previous to the 14th century, when they attained to the perfection of their form, mitres were very low, their contour then being con- cave. Subsequently they became more and more elevated, and their contour was changed from concave to convex. Two short bands of some rich material, fringed at the ends, form the infule of a mitre, and depend from it, one on either side.

~~12. The Crosier and the Pastoral-Staf.—The former, having a cross-head, is appropriated to archbishops; and the latter, the official pastoral-staff of bishops and abbots, has a crook-head, like the head of a shepherd's staff. Expressly mentioned as the ensign of the episcopal office in the first half of the 7th century, as early as the 10th century the pastoral-staff became enriched with elaborate and precious ornamentation, and was adorned with a vexillwm, or scarf, attached to the staff immediately below the cross or crook- head, The idea that some special signification is conveyed by the position in which in monumental effigics and in other cpiscopal figures the pastoral-staff is represented to be held appears to be without any foundation.~~

~~13. The episcopal Ring, Gloves, and Boots.—Early in the 7th century, and probably still earlier, a ring of large size, to be worn on the right hand, formed a regular part of the episcopal insignia ; and in the full development of the vestments which took place in the 12th century, embroidered gloves, made with an opening to display the ring, and corresponding boots or shoes were included as components of the full official attire of the hicrarchy.~~

~~14. The Pall (' Palliwm").—This remarkable vestment, sent by the Pope to prelates of archiepiscopal rank, and restricted to their order, being in fact a peculiar form of the orarium or stole, consists of a narrow band of white lamb's wool, forming a circle to rest on the chasuble around the throat and over the shoulders, from which cirele depend two other bands of the same fabric and width to hang down, the one on the front and the other on the back of the prelate, thus, whether seen in front or behind, presenting the appearance of the letter Y. The depending bands, which terminate in fringes and appear occasionally to have been fastened with golden pins to the chasuble, like the circular band, are charged with crosses pattée-fitchée of black or purple silk. This pall, constantly represented in early works of Christian art through successive centuries, and blazoned among ourselves in the armorial insignia of the archiepiscopal see of Canterbury, is seen to have varied but slightly in either its form or its adjustment from the 9th century to the 16th. An apparel, evidently designed to represent the pall, is found constantly to have been adopted for the ornamenta- tion of medizval chasubles. The pall still in use in the Roman~~

Church has the pendant bands considerably shorter than they .

appear in the early representations (sce fig. 21).

15. The Chimere and Rochet. —Of the former it will be sufficient to state it to be a modification of the cope ; while the latter, a long sleeveless robe representing a garment known as a colobium in

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ancient times, appears to have been assigned distinctively for episcopal use, and also after the Reformation to have been allied to the full lawn-sleeves well known at the present day, from being well suited to be worn under another vestment. By prelates of the Reformed Church a short cassock of black silk is wom with their ordinary attire. A long loose black cassock also was com- monly woru by ecclesiastics during tlic 17th and 18th centuries.

VESTMENTS IN USE IN THE East.—In its general bearing, what has been said of the vestments in use in Western Christendom, and particularly in reference to their use during the first eight centurics of our era, with compara- tively slight modifications, is also applicable to the official vestments of the church in the East,—the chief distinctions between the vestments of the East and the West, in addition to such as may in a great degree be traced to the influences of climate and to certain local associations, being a closer adherence in the former than in the latter to the earliest usages. The Greek Church also, being very tenacious in its own usages, to the present day retains everywhere its medizval vestments, their forms, names, and uses remain- ing uuchanged—the sticharion corresponding with the alb and the early dalmatic of the West; the phelonion, with the chasuble and its earlier predecessors, the casula and planeta ; the omophorion, with the pall; and the orarion, with the orarium and its successor the stole.

MonastTIC.

~~*The habits worn during the Middle Ages by the monastic orders may be briefly described as follows :—-*~~

~~*Benedictines.—Gown or cassock of black, white, or russet cloth, with white or black fur, and black cape and hood.*~~

~~*Cluniacs.—Habit entirely black.*~~

~~*Cistercians.—White cassock with cape and small hood ; over this when in the church a white gown, when abroad a black gown.*~~

~~*Carthusians.—Habit entirely white, except black cloak.*~~

~~*Augustines.—Black cassock under white full-sleeved tunic ; over all, black cloak and hood ; square black cap. ;*~~

~~*Premonstratensians, White Canons.—Cassock and tunic, long cloak and hood, and round cap,—all of them white.*~~

~~*Gilbertines.—Mouks.—Black cassock and hood, and white cloak lined with lamb's wool. Nuns.—Black tunic, cloak, and hood, the last lined with lamb's wool.*~~

~~*Dominicans, or " Black Friars,"".—Same habit as that worn by the Augustine monks,*~~

~~*Franciscans, or " Grey Friars."—Loose and long grey cassock girded with a cord ; hood or cowl and cloak of the same.*~~

~~*Carmelites, or '* White Friars."—Habit white throughout ; but from about 1240 to about 1290, their cloaks were party-coloured, white and red. ; .*~~

~~*Austin Friars, or " Eremites."—White cassock girded with a leather thong, with short tunic and hood ; and over these, long, black gown with wide sleeves and hood. ;*~~

~~*Crossed (" Crutched") Friars.—Blue habit, with plain red cross.*~~

Maturines, or " Trinitarian Friars." —Habit entirely white, with eight-pointed cross of red and blue. .

The monastic garment named "scapulary,"' the exact character of which has not been decidedly determined, appears to have been a short super-tunic, sleeveless, but having a hood or cowl.

ACADEMIC.

In the Middle Ages, professors or doctors and bachelors of divinity, and graduates of the universities above the rank of bachelor in the faculties of arts and law, in addi- tion to the customary costume of their time and station, in connection with their academic rank wore long flow- ing gowns having slits at the sides for their arms to pass through, with large capes or tippets and hoods, the latter having pendant streamers, these capes and hoods in many instances forming parts of the same article of dress. Graduates of the highest rank also wore round caps, pointed in the crown, and of a dark colour. In the 15th century, when distinctions appear first to have been introduced into the costumes of masters and bachelors of arts, the gowns of the latter were shorter than those of masters, and had

full sleeves reaching to the wrists and pointed at the back. The capes and hoods of bachelors also were bordered with white fur or wool. By various peculiarities of form, colour, and lining, the gowns, capes, and hoods of graduates of all the higher ranks certainly were distinguished ; but in the comparatively rare examples of monumental effigies repre- sented in academic habit, which almost without exception are destitute of colour, these distinctions are not shown in any regular or marked and decided manner. Throughout the last two hundred years, if not for a still longer period, the academic habits of the University of Oxford have retained their forms unaltered. They may generally be classified in two groups— ecclesiastical and civil. The gowns of the former, worn by all graduates in both divinity and arts, and also by all members on the foundation of any college, have loose sleeves, are destitute of collars and gathered in in small plaits at the back, and bear a general resemblance to what is known of the more ancient habits, the sleeves of the masters' gowns still having slits

(now cut horizontally, instead of vertically) for the passage of the arms, On the other hand, the gowns of graduates in law and the other faculties, and of undergraduates who are not on the foundation of any college, besides being of less ample proportions, have falling collars and closer sleeves, which latter in the undergraduates' gowns have dwindled into mere strips ; and they evidently derive their origin from parts of the ordinary dress of civilians in the 16th and 17th centuries. The gowns of graduates of the University of Cambridge for the most part are the same as those worn in the sister university ; but at Cambridge the undergraduates, not being on the foundation, of almost every college have a gown appropriated to their own college. The hoods of their degrees worn by graduates in the faculties of divinity and arts are distinguished as follows :— D.D., Oxford scarlet cloth, lined with black silk ; Cambridge, scarlet cloth, lined with lilac blossom or pink silk ; M.A, Oxford, black, lined with cherry-colour or crimson ; Cambridge, black, lined with white ; Dublin, lined with blue ; Durham, lined with purple ; London, lined with brown. B.A. hoods are black and bordered with white fur

EARLY EUROPEAN AND MEDIAZVAL.

For the purpose of the present article the terms " early European" and " médisval" may be considered to apply to the period ranging from the withdrawal of the Romans from Britain to the accession of the Stuarts to the throne of Great Britain—that is, from about the close of the first quarter of the 5th century to the commencement of the 17th century ; and the latter term, "' medizeval," may date the commencement of its application from the establish- ment of his Anglo-Saxon dynasty by Egbert at the opening of the 9th century.

A prolonged period of total darkness having passed away, at first, and for a considerable time, in addition to written descriptions and indirect notices which frequently are far from being intelligible, and to such actual relics as origin- ally were deposited with the remains of the dead without any view either to monumental commemoration or to his- torical illustration, the authorities are restricted to the illuminated compositions which so happily are associated with early MSS. After a while, the earliest seals and some ivory carvings lend such aid as may lie within the compass of their power

Next follow those invaluable illustrators of costume, monumental effigies of every class, with which may be allied figures represented in architec- tural sculpture. and painting, upon seals also and coins. Actual relics throughout the era of monumental effigies gradually increase in both number and variety, until at

[MEDIEVAL,

length the ages of personal portraiture, properly so called, are duly reached. It will be borne in mind that until some years after the close of the 15th century, defensive armour occupied a most important position in what strictly was the "costume" of the men of the higher classes, whose effigies, with rare exceptions only, appear sculptured, en- graven, or painted in their armour, precisely as the men themselves had been armed and equipped when in life. In the Middle Ages in Europe, costume, considered as dress distinct and distinguished from armour, was affected in no slight degree by the prevailing character of the armour of each successive period, so long as a defensive equipment of any kind continued to be generally adopted. Dresses that had been devised expressly to be worn, some of them under defences of mail or plate, and others over them, suggested much in the way of garments that never would have any direct connection with armour. Again, when not armed, nobles, knights, and men-at-arms naturally would adopt such loose and flowing garments as would combine the greatest degree of ease with a dignified aspect ; and their example in this respect would be certain to be very widely followed. The feudal system, also, powerfully aided by the heraldic sentiment that at once grew up in the feudal era and gave to it its tone and colour, exercised a powerful influence upon the costume of the various classes who, under varying conditions, were dependent upon

a common feudal superior. And this influence, while

adapting itself in matters of detail to personal considera-

tions, in its general bearing acted with uniform effect upon the entire community. Of the extravagance of so many

of the diverse costumes that followed each other in rapid succession during the 14th and 15th centuries, munch may

be directly traced to the development of heraldry in those

ages, and to the enthusiastic delight in armorial devices and insignia then universally prevalent. The singular resemblance in many marked particulars between the dresses of the two sexes, observable in the Middle Ages, undoubtedly was stimulated by the science and art of the contemporary heralds; as the strange and often wildly

fantastic crests and the mantlings displayed upon their

helms and basinets by the one sex were parodied, and sometimes were fairly outdone, by the equally strange and no less wildly fanciful head-gear adopted by the other sex, with a view either to conceal or to enhance the natural glory of their hair. . Medieval costume, once more, would experience both changes and modifications arising out of the introduction of fresh manufactures, and necessarily resulting from the constantly expanding range of the foreign commercial relations of different countries. Costume, moreover, would be certain to be attracted by the progres- sive phases of national civilization, culture, and refinement, even though it might not consistently keep pace with them. Fashion, too, always arbitrary and often inexplicable, would not fail to do its work effectually, under the diversi- fied conditions and aspects of advancing centuries, among races by whom to costume it is assigned, not merely to

adorn the human figure. It will be observed that, in all countries among civilized races, in the degree that climate is more temperate, in that

tions, and more completely under the sway of fashion. In regions that are very hot or very cold, fashion, however quaint and eccentric, is long-lived and tenacious of its hold, so that the costume of one generation for the most part is

permanent among mountaineers. The history of costume, it must be added, approximately complete and explicit as it may be, can contain but little more than scant notices of

clothe the persons of both sexes, but also to display and |

same degree is costume more liable to changes and fluctua—

reflected in that of itssuccessor. In like manner, costume, ~ -and especially in its general character, is comparatively

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ANGLO-SAXON. |

the unavoidably simple or even rude attire of a considerable proportion of the laborious population in every country and at every period.

Subjugation by the Romans in the first centuries of the Christian era naturally was followed by a general con- formity among the conquered populations to the costume of their more civilized as well as more powerful rulers, so that after a while Roman dress may be considered to have become European. And, as Rome herself through her Eastern connections had yielded in no slight degree to Oriental influences in matters connected with costume, so also Roman influence in the West carried with it much that was strongly marked with the characteristics of the Kast. This singular association also in after times derived fresh impulses, as well in peaceful costume as in armour and other military matters, through the direct agency of the crusades, acting in concert with an artistic current flowing westwards continually in the Middle Ages from Byzantium.

ANGLO-SAxon.—Generally simple in its character and designedly adapted both to the tastes and sentiments and to the usages and requirements of a hardy and temperate race, the prevailing costume of the Anglo-Saxons consisted of a sleeved tunic, varying in length, but generally com- paratively short, partly open at the sides, and confined about the waist by a girdle. Over this tunic, which was made of various colours, and both plain and occasionally enriched with varied ornamentation, a short cloak was worn by the young, while in its stead a mantle of ampler dimensions and greater length was adopted by persons more udvanced in age. Similar mantles, not assumed as wrappers for extra warmth or protection against the weather, were in general use at ceremonies and festivals. Trews or

drawers, continued to form hose for the lower limbs, with shoes or low boots, completed the ordinary attire of the men, who wore their beards, and delighted in having long and flowing hair. Ornaments, many of them of gold and remarkable for beauty of design and excellence of work- manship, were freely used by the Anglo-Saxons of both sexes; and the numerous fibule, brooches, armlets, and other personal ornaments that have been discovered in their graves attest the attainment of the Anglo-Saxons to an advanced condition of civilization and refinement. A peculiarity in the dress of the men of all ranks was the cross-gartering of their hose, or their simply covering their legs below the knee with crossed swathing bands fastened at the knee. The females wore long tunics or gowns, made loose and high, and girt in about the waist. Over these they had shorter tunics, often much enriched, and with sleeves, unlike the close-fitting sleeves of their under tunics, that were very wide, and widest at the wrist. Over all, mantles of ample size and provided with hoods to cover the head were thrown, and disposed with effective gracefulness. Coverchefs also were habitually in use, to cover the head when the mantle would not be assumed; and they often were so adjusted as to encircle the face and to cover both the throat and the shoulders; so that they may correctly be regarded as prototypes of the wimple, so popular in somewhat later times. The girdle, it may be added, as worn by both sexes, was rather a swathing band, folded for doing girdle duty, than a girdle proper. The costume of the princes, the nobles, and tlhe wealthy, while in its general character the same as that already described, was distin- guished by greater richness of material and more costly adornment. As if to parody the universal fashion of cross bandages for the legs, the Anglo-Saxons habitually wore upon their arms twisted bracelets or torques, or, in their stead, a number of simple bracelets—a custom common to them and all their kindred of Scandinavian descent.

CosTUMES (ESPECIALLY ENGLISH) FROM THE 11TH TO THE 17TH CENTURY.

Century XI,—During the brief rule of the Danes, the national cos- tume does not appear to have experienced any change in England. The adventof

~~the Normans brought with it to England the establish- ment of that luxury in dress, with which the Anglo-Saxons previously had become in some degree acquainted, and which was destined to so great an extent to supersede the still prevailing simplicity of their hereditary attire. The Norman conquerors, however, with their short cloaks and shaven faces, were not slow to adopt so much of the Saxon style of dress as led them to wear tunics of ample propor- tions, and in many ways to assume whatever in that dress was most graceful and dignified. Still, as in other things, so in costume, until the 12th century had made a considerable advance the powerful and wealthy Anglo-Normans preserved an external visible distinction between themselves and their Anglo-Saxon fellow-sub- jects. And yet, the ordinary costume of the people of England appears to have undergone no characteristic change during the second half of the 11th century, seeing that short tunics and capes, cloaks with hoods, cross-bandaged chausses or hose, shoes or low boots, and caps pointed in the crown continued in general use. But it was not so with the nobles, who speedily indulged in every species of ostentatious display upon their persons, covering their rich dresses with ornamenta- tion, introducing gorgeous novelties in fabrics, with costly furs, lengthening their garments till they swept the ground, and widening their sleeves till they hung down open-mouthed from their wrists. To these wide and open- mouthed sleeves the Norman ladies speedily added long pendant lappets, in which extrava- gant form this portion of their dress was com- memorated in the heraldic "maunche" of later times (fig. 24). Tunics richly adorned, made to fit closely about the figure, but with p14 94 «Maunche" long and loosely flowing skirts, and having Bskve the "maunche" sleeves, with splendid mantles ' of ample size which were fastened on one of the shoulders and were furnished with hoods, enjoyed the highest favour with the Norman ladies, who also wore their hair in heavy and long braids, when the century of the Conquest came to its termination.~~

~~Century XII.—Like their armour—if to their defensive equipment the term armour may be applicable—and weapons, the costume of the Normans when they established themselves in England, while exhibiting significant tokens of affinity to that worn by their own Scandinavian contemporaries, had become assimilated to the dress prevalent among the races with whom they were familiar more to the south. As a matter of course, also, through what remained of the 11th century, and until the succeeding century had far~~

advanced, the distinctive characteristics of Anglo-Saxon and Anglo-Norman attire were retained, and appeared simultaneously in use ; nor can they be considered to have become blended in what might claim to be accepted as a single national costume before the reign of Henry III. Many circumstances appear to have combined to have caused the same general character of costume, unless under special local circumstances, to have prevailed throughout Europe during the period of medieval armour—from the second half of the 12th century, that is, till the end of the 16th—the same general uniformity in essentials being further observable in the armour itself. It may here be remarked, that both the armour and the costume represented in the monumental effigies of the Middle Ages are alike in being distinguished by a pervading simplicity and an absence of excesses, which in a signal degree qualify them to be accepted as typical rather than as exceptional examples and autho- rities. This is especially the case with the monumental effigies of various kinds, second to none as works of medieval art, that abound throughout England. It but too frequently happens, however, that in forming their estimate of costume, reversing the judicious and sound principles adopted by the monumental artists of the Middle Ages, writers permit themselves to select as their types the occasional eccentricities and vagaries of fashion or of individual extravagance.

The first sculptured representations of English sovereigns that are known to exist in England appear at the sides of the great west doorway-arch of Rochester Cathedral, and they show the costume worn by Henry I. and his queen Matilda of Scotland. The king, in whose reign beards and long hair again came into fashion, has gathered about his person a flowing tunic, worn under a dalmatic and a mantle; his queen also wears corresponding garments, the sleeves of her dalmatic (or over-tunic) being even wider than those of her consort. Her hair she wears in two very long braids, one of them hanging down on either side on the front of her person. Under and upper tunics, girdles, and mantles, both with and without hoods, pointed caps and low hats with wide.

~~brims, and leggings and shoes, are represented in the various illuminations of this era, which convey very clear and well-defined ideas of the costume then in use by various classes and both sexes. Towards the close of this century the costume of Henry II. and of his Queen Eleanor, as represented in their effigies, may be accepted as characteristic illustrations of a period in which considerable luxury in dress was becoming generally prevalent. The king is attired in an under-tunic reaching to his feet, and a blue tunic almost of the same length, both garments having comparatively tight sleeves reaching to the wrists; over the upper-tunic Is a dal- matic of crimson enriched with a floral pattern in gold, long but not very full, and without any front-opening being apparent, its full sleeves shorter than those of the tunic; over all, a purple mantle, fastened with a morse on the right shoulder, covers the left arm, and is drawn up on the right side so as partly to cover the figure also on the right side below the girdle. The gloves are jewelled, and the boots, green in colour, enriched with gold and armed with golden spurs, are broad and slightly pointed. Over a white under-tunic, visible only at the throat where it is fastened by a circular brooch, the queen wears a long tunic or gown, loose throughout, its sleeves tight at the wrists and enlarging upwards to the shoulders, which is secured about the waist by a buckled girdle. The pattern upon this dress, which is represented to have been worn uncovered by a dalmatic, and is white, consists of golden crescents in pairs, set reversed and contained within the meshes of an interlaced lozenge-work also golden. The mantle of blue, studded with golden crescents, is secured across the breast with a cord, and, falling back from the shoulders, it is gathered up on both sides and drawn partly across the figure in front. About her face the queen has a plain wimple; and beneath her crown her head is covered with a coverchef, which falls in folds on either shoulder. The king also is crowned; but his sceptre has been broken away from his right hand. In her illuminated portraits, Eleanor of Aquitaine is represented with a wimple, which is fastened with a circlet of gems; her under-tunic, or cote-hardi, fitting closely and having tight sleeves, is gathered into a rich collar about her throat; over this dress is a loose tunic, long and flowing, guarded with fur, its full and open sleeves also being lined with fur; and, over all, there is the ever-preseut mantle, generally of some light material, so adjusted that at the pleasure of the wearer it might be drawn over the head. Henry II. is not known to have been represented wearing the short cloak of Anjou, familiarly associated~~

with his name. A few years later the same royal attire is represented in the effigy of Richard I. Here, over a white under-tunic, the long tunic and the almost equally long crimson dalmatic are shown to be slit up at the sides; the latter garment has very full sleeves, which hang down from a little above the wrists, and the rich girdle, covered by the mantle in his father's effigy, is shown. The mantle, of royal blue and gold, has a dif- ferent adjustment, being fastened in the centre over the chest by a large morse, from which it falls back over the right shoulder, but on the left side it is drawn forward so as partly to cover the person and to hang down in folds over the arm ; and on the right side also this mantle is drawn forward below the girdle. The king is crowned ; he wears gloves, jewelled at the back of the hand; and to his enriched boots, which in their form and adornment resemble his father's, his spurs are attached by buckled straps. In all these royal effigies it is certain that a faithful representation is given of the remaius, attired as had been the custom of these personages in life, when lying in state beforeinterment. In that warlike and turbulent age, when the possession of good arnis and armour and the means of effecting improvements in them were objects of supreme importance, the peaceful population appear to have been content to retain the system and style of dress in use shortly after the establishment of the Norman dynasty. A tunic, worn over some under-garment, generally made to reach about to the knees, but sometimes very short, constantly made with a cape and occasionally also with a hood, loose chausses or trews and light hose and pointed boots or shoes, with some kind of cap for head-gear, and a hood to the favourite cloak or mantle, formed the prevalent male dress. The nobles and other men of rank, when not in their armour, aspired to rival the princes in the richness of their attire; and, in addition to such costumes as might be habitual to them when engaged in active occupations, wealthy citizens were not slow to follow the higher and perhaps still richer classes as closely as might be per- mitted to them, by indulging in long and flowing gown-like tunics when in repose or on occasions of ceremony and festivity. The long tunics which came into use by men early in the century at first had long sleeves very wide at the wrists; and at the same time the sleeves of their tunics were worn of extravagant length and proportions by ladies of rank. This extravagance, particu- larly in the male attire, however, had almost disappeared before the close of the century. On the whole, the female attire may be said in its common use to have been subjected to but little of

decided change, except that in its general aspect it exhibited some- what less of an Oriental character than it had done at the con- mencement of the century. The powerful influence exercised by

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the East through the crusades on the armour and military appoint- ments of the warriors of the West, did not take effect till the next century in matters connected with Western female fashions and usages.

Century XIIT.—As in the century next succeeding, in both the first and the second half of the 13th century, royal costume, which may be accepted as the most perfect example of the dress of the higher and wealthier classes, is happily exemplified with the highest contem- porary authority. King John, upon whose monument (itself a work of the Tudor era) in Worcester Cathedral rests the earliest of the royal portrait effigies that are in existence in England, is attired in a loose tunic reaching from the throat almost to the ankles, having tight sleeves, and its colour being golden. Over this is a loose full-sleeved crimson dalmatic, shorter than the tunic, bor- dered about the throat-opening and at the very wide extremities of the sleeves with richly gemmed gold embroidery, and secured about the waist by a buckled girdle having a long pendant end. The mantle, worn over all, which hangs down the back of the figure, is gathered up on the right arm in a manner long as well as very generally adopted by both sexes. The king, who has red hose with black boots and golden spurs, is crowned, a circlet of jewels which binds his hair appearing on his brow from beneath his crown. In his gloved hands, the gloves being gemmed, he holds his sword and what remains of his sceptre. Among notices of King John's costume, he is recorded to have appeared at a certain Christmas festival in a white damask tunic with a jewelled girdle and gloves, his mantle being of red satin embroidered with sapphires and pearls. Over a white under-tunic fastened with a circular brooch at the throat, Qneen Isabel of Angoulême appears in her effigy habited in a long blue tunic covered with single golden crescents ; this robe, which is loose and flowing throughout, has its full sleeves gathered in at the wrists, and it is adjusted about the waist by a rich girdle secured by a buckle. The queen wears a wimple and on her

~~coverchef rests her crown ; her mantle, which hangs from her shoulders and on her right side is drawn partly over her figure, is yellow covered with red roses and green leaves. Berengaria, the widow of Richard I., who died about 1235, is attired in the same fashion ; but her tunic, of ampler proportions, is more gracefully disposed; her large brooch is elaborately enriched ; from her gemmed girdle on her left side an anmoniere, or purse, is suspended ; her mantle, secured by a narrow cord across her breast, is not drawn forward; she wears no wimple, and her coverchef is so adjusted about her crowned head as to permit her wavy hair to be visible. The effigy of this royal widow displays no tokens of any such style or accessories of costume as might have reference to her condition of widowhood.~~

~~The crowned effigy of Henry III. (1272), a noble work, is remarkable for the classic grace and dignity of the adjustment of the ample mantle about the king's person, over his long tunic and dalmatic ; this mantle is fastened by a large morse on the right shoulder. The king's boots, which are elaborately embroidered with small gold lions enclosed in lozenge-work, are without spurs. During the long reign of this weak prince but few decided changes appear to have taken place to affect what gradually had settled down into becoming the national costume in England. New varieties, however, of rich and costly fabrics continued to be intro- duced, and they were eagerly adopted as materials for their dress by both sexes of the wealthier classes. Eleanor of Provence is represented clad in an embroidered mantle having an ermine collar, fastened with a small brooch over a close-fitting and wide-skirted tunic of gold brocade, having its sleeves so cut as nearly to cover the hands. At this time furs of various kinds were greatly in request. The fashion, too, which had been introduced in the time of Rufus and was long prevalent, of cutting the borders of dresses into fantastic patterns became more general, and often was carried to excess. Sleeveless tunics, which would show the sleeves as well as the lower parts of the longer under-tunics, began to assume a recognize position in the female attire of the time; and, no longer braided in long tails, ladies' hair was arranged within network of gold or silver filagree or of silk, the wimple and coverchef, now constantly of very rich inaterials, being retained in use, and often so adjusted as to display the conntenance in a triangular form after the manner of the mail coif of the knights. Of this fashion the effigy of Aveline, first countess of Lancaster, in Westminster Abbey, affords a truly~~

~~characteristic illustration (fig. 25). At this same period the diapered patterns and rich tissues of pq 95 —-Head-dress from Ypres attained to a great celebrity, and Effigy a aauines. te heraldic devices began to appear as de- Tabpalier corative accessories of dress. No effigy " of the warlike Edward I. exists, to show him either in his mail, or in such attire as it pleased him to assume when not fully armed ; but, doubtless, the fine effigy of Fair Rosamond's son, Earl William~~

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~~Longespée, in Salisbury Cathedral, may be accepted as a sufficiently accurate illustration of the military uniform of the first Edward after the Conquest, who also may be assumed to have been attired, when his mail had been laid aside, much after the fashion of his father. Itis well known that in his day princes and nobles arrayed themselves in flowing robes, worn over comparatively closely fitting tunics or doublets, these garments being made of silk damasks and satins of brilliant colours, with adornments of goldsmiths' work and furs, in the use of which they were freely followed by the knights and the wealthy classes as well as by the ladies of their era. Not content with the triangular adjustment of the wimple, towards the close of this century the ladies adopted the strange and unsightly gorget to cover their throats, thus still more closely adapting the aspect of their own head-gear and its accessories to the mail coifs and the helms of their martial lords. The beautiful effigy of Eleanor of Castile, which rests upon a massive plate of bronze gilt and dia- pered with the armorial castles and lions of Castile and Jeon, is remarkable as well for the dignified simplicity of the costume as for the sweet expression of the countenance. " Secured by a narrow band which she holds in her left hand, the queen's long and ample mantle for the most part envelops her person, disclosing only the upper part of her wide-sleeved tunic and the close-fitting sleeves of the dress worn beneath it; she wears neither wimple nor cover- chef, but allows her luxuriant hair to fall in rich waves from be- neath her diadem upon her shoulders.~~

~~Century XIV.—The royal attire represented in the two halves of this century in the effigies of Edward II. and Edward III. is a tunic (the under-tunic not being visible) descending to the feet and having tight sleeves; a dalmatic,~~

open in front to midway between the knees and the waist, of the same length; anda long flowing mantle, secured across the breast bya broad band of rich workman. ship. The dalmatic of the father, who is crowned and in his ungloved hands holds a sceptre and an orb, has full sleeves reaching only to the elbows, but prolonged in broad lappets of moderate length, while that of the son has its sleeves tight and but little shorter than those of his tunic. In both cases the mantle, covering the shoulders but not drawn across the chest or covering any part of the front of the person, falls at the back of the wearer. The boots of Edward I1I., richly embroidered, are acutely pointed at the toes, but not of extravagant length ; the aged monarch is bare- headed, with long flowing hair and beard ; his two sceptres have been broken away. One of the crowned statuettes upon the monu- ment of her younger son, John of Eltham, duke of Cornwall, apparently represents Isabelle of France, queen of Edward Il., ina tunic and mantle, having her throat and head enveloped in a com- bination of a wimple with a gorget, after a fashion equally strange and unbecoming, but which, nevertheless, in her time was preva- lent. This queen, who delighted in splendid extravagance, is re- corded to have habitually worn, richly embroidered and adorned with jewels, dresses of cloth of gold or silver, with others of velvet of various colours and of shot taffeta, and with others also of green cloth of Douay and of rose satin. The inventories of wardrobes and jewellery that still exist show, ina significant manner peeuliar to themselves, the extent, variety, and unbounded extravaganee of the costumes of both sexes, with their costly accessories and orna- ments. In strong contrast to the tales thus told, the costume of the effigy of Queen Philippa is simply a gown or tunic, quite tight to the figure and laced down the front ; the sleeves tight, traversed from the shoulder onwards by a close-set row of small buttons, and prolonged from the wrists so as partly to eover the hands ; and the skirt being very full and falling in rich folds over the feet. A narrow girdle encircles the royal person, adjusted, not as in earlier times somewhat tightly around the waist, but loosely and about the hips, precisely as the military belt had begun to be worn by the other sex. Over this tunic, the only other garment visible, a mantle, falls from the shoulders down the back. The queen's hair, confined within a reticulated covering of goldsmith's work beneath her diadem, is bound by a circlet and made to project prominently on each side of the face. At the close of the century, the effigies of Richard Il. and Anne of Bohemia show the same costume to be re- peated

in the case of both royal personages, the whole being covered with the royal heraldic badges; and the queen's hair falls uncon- fined and naturally over her shoulders. Other effigies of ladies of different ranks, notably a fine one of Lady Stapleton at Ingham in Norfolk, give similar examples of the costume worn by the two queens, Established in use early in the century, the display of heraldic insignia blazoned upon articles of dress rose into the highest favour and popularity during the brilliant reign of Edward IIL, and they also were lavishly adopted in the luxurious times of his grandson. Indeed, with the progress of this century, medieval costume both attained to its highest splendour, and also exhibited much of its extreme extravagance. It became the fashion, for example, for both sexes to wear hanging from their sleeves long lappets, sometimies prolongations of the actual sleeves, and at other times mere strips, and their hoods were prolonged in points to corre- spond with them. Dresses, some very long, others very short, having their edges cut and jagged in a most bizarre manner, often

were worn partycoloured, the colours in many cases having been chosen expressly with a view to produce the most vivid contrast — boots and shoes had their pointed toes made twice or even thrice the length of the wearer's foot; and head-gear, exhibiting no little diversity of fantastic forms, was universally prevalent. The fashions of England corresponded with those of France, though apparently they were not carried here quite to the same excess that they were on the Continent. The singular aim of each sex, not only to emu- late the other in the sumptuous style and profuse adornment of their dress, but also to imitate the form and fashion of each other's attire, obtained in both countries. The consistent adjustment of the knightly surcoats and jupons over armour, enhancing its effect while partly covering it, suggested to the ladies to adopt kirtles or cotes-hardi, that from being merely sleeveless became sideless also. This form of garment, so well adapted for the display of what was worn under it, assumed several varieties of treatment. Sometimes it was little more than the front and back of a jacket, as in fig. 26 ; and at other times it became a complete dress, with the exception of sides and sleeves, in which case it was either made to

fit closely about the person both before and behind, and then was continued to form a loose and flowing skirt of ample proportions and great length, or with a similar skirt the upper part of the dress also hung loosely about the figure, as in fig. 27. In the next century this same dress

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Fic. 27.—From MS., 1430. (After Viollet-le-Duc.)

Fic. 26.—Part of Statue of Jean de Bourbon, from St Denis, 1379.

at times was worn cut off at the knees, so as to leave the lower part of the under-tunic visible as well as its sides and sleeves. This dress constantly was richly guarded and sometimes lined with costly furs, and it generally was also adorned down the front with a continuous series of massive studs or other goldsmiths' work. It appears also to have been a never-failing usage in connection with this fashion of a sideless kirtle to display the girdle of the under- tunic, which rested loosely on the hips, as it passed under the side- less garment both before and behind. Found to have been in use, in the form at first of a long and flowing sleeveless robe or gown, early in the 14th century, this sideless kirtle or cote-hardi continued to enjoy unabated favour for not much less than twoeenturies. It appears, certainly not later than 1320, in effigies at Bedale, Selby, and Staindrop—the Selby lady having the flowing skirt of her sideless dress blazoned with armorial insignia; in her effigy at Oxford, Lady Montacute is represented in this dress, 1354; and it is repeated in the effigies of Lady Beauchamp, at Worcester, 1384 ; of Queen Joanna of Navarre, at Canterbury, 1407; of Lady Harcourt, at Stanton Harcourt, 1471; and of the Duchess of Suffolk, at Ewelme, 1474: the two ladies last named, whose husbands were K.G., wear the garter of the order, the former as an armlet and the latter as a bracelet. Still later, 1500, in her beautiful effigy in Westminster Abbey, Elizabeth Arundel, wife of Sir Giles Daubeney, K.G., treasurer to Henry VIL., is represented in this same sideless over-tunic which reaches only about to the knees, se lisplaying the lower part of the long and flowing under-vunic as well as its sides and sleeves. M. Viollet-le- uc nas shown the sideless kirtle to have been no less fashionable and no less capable to maintain its position in France, than we possess abundant evidence to prove it tohave been in England. The same fashion also prevailed at the same period in

other parts of Europe. At Worcester a closely wimpled effigy illustrates in a remarkable manner the usage, at the commencement of the century, to attach small enamelled shields of arms in profusion upon the

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dresses of ladies of rank, a mode. of decoration shown again in a brass at Trotton, 1810. Throughout this century the wimple and coverchef continued to be worn, or the hair was confined within bands of fretwork, or had some light and delicate covering which did not extend to the face and throat. In the second half of the century the hair appears to have been worn partly within the favourite fretwork, and in part falling on the shoulders ; the cover- chef also then assumed the forms of a variety of caps, and some of the more extravagant head-dresses of the following century began to make their appearance. For protection from the cold and wet the hoodsof mantles always were available, and hats wide in the brim were also worn. The hip-belt was universal. Pocket-holes, into which the hands of the wearers often are represented to have been iuserted, are shown to have been made in the outer-tunics and robes. Throughout the era of splendid armour, men of distinction so constantly are represented in their armour that the typical and specially characteristic male costume of the Middle Ages is commonly considered to have been identified with what in reality ought to be distinguished as the military equipment of the period. Rarely, however, as we see the more accessible and popular of their "counterfeit presentments" in peaceful guise, the warriors of those days when circumstances permitted gladly pee

laid aside basinet and hauberk and panoply of plate, in order to assume some less weighty and uneasy garb. Under the — armour close-fitting doublets and hose were worn, made either of leather or of some quilted fabric. When without their armour, the dress of nobles and knights in many ~¢ respects was assimilated to the garments FR7= assumed by them over their armour. The . general costume of men of all classes at the same period was closely in accord with the style prevalent with their contempora- ries of exalted rank, the essential distinc- tions of different classes being comparative costliness and splendour of adornment. It will be observed that garments fitting Rul closely to the person were in constant use, as

~~*is well exemplified in fig. 28, and also such Fig. 28.—(c. 1830 a..) others as were Oriental in their length and flowing looseness. Early in the 14th century two- or three surcoats were worn over the armour; but later the short jupon, generally jagged at the edges and sleeveless, but sometimes plain and having sleeves reaching only to the elbows, superseded them, when a similar jupon made of some rich material and often having a hood, was adopted to be worn with a hip-belt, withont the armour, The hip-belt, as was the case — the other sex who borrowed it from the men, was uni-versal.*~~

~~*The hose, shoes, boots or buskins, always sharply pointed, became very long as the century advanced. Rows of buttons, also, some of them very small and closely set, were in great favour. Heraldic devices, assumed as military insignia, became the favourite ornaments of the dress of peace. The military camail, again, the representative of the mail-coif of earlier times, found a parallel in*~~

~~*Frc. 29.—The Black Prince.*~~

~~*Fig. 30.—Lionel, duke of arence.*~~

~~*the hood when resting on the shoulders, and in the cape which so frequently was associated with the peaceful attire of this eceutury. See fig. 28, which also gives a characteristic illustration of the pro- longed slceve-lappets that still held their ground with resolute*~~

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~~*tenacity. senting two of the daughters and four of the sons of Edward III., which still remain iz sitw on the south side of that monarch's monument in Westminster Abbey, form a group so happily*~~

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~~*Six of the original beautiful bronze statuettes, repre-*~~

~~*illustrative of both male and female costume in the second half of the 14th century before it had degenerated into the extra-*~~

vagancies of the reign of Richard 11., that it has appeared desirable

here to introduce the accompanying sketches of the entire group (figs. 29-34). One of these statucttes (fig. 29) is especially

Fia. 82.—Son of Edward III.

Fic, 31.—Son of Edward III.

interesting, since it is a contemporary portrait of the Black Prince when. he was not armed, which consequently may be agreeably associated with his noble armed effigy upon his own monument at Canterbury. The doublet and hose, doubtless worn by the Black Prince under his voluminous mantle with its deeply jagged lower border, is effectively shown in the statuettes of two of his brothers, Lionel, duke of Clarence (fig. 30), who also wears his mantle ; and a younger brother (fig. 31), nut now to be identified in consequence of his shield of arms having long been lost. The effigy of the fourth brother (fig. 32), enveloped like the Black Prince in his mantle, has also lost the armorial shield which would have declared his name and title. With the costume of these royal

Fic. 33.—Danghter of Edward III.

Fie. 34.—Daughter of Edward III.

brothers may be compared the habit of a civilian, who lived at the same time with them, as it is shown in his monumental brass at Shottesbroke (fig. 35). The corresponding French costume of a few years earlier, which continued in fashion till the close of the century, is well exemplified in figs. 28 and 36. The effigies of the two royal sisters (figs. 38, 34) speak for themselves as expressive and authoritative typical illustrations of the female dress of their era in its simplest and most characteristie forms, as the entire group 10 which they appear attests the dignified simplicity which the artists of the Middle Ages, with such excellent taste, have shown that they held to be appropriate for the costume, in itself always accurate

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ard historically true, to be represented in monumental sculpture. Without introducing much of actual novelty, except in the case of some of the head-dresses which from this time continued in use under the fourth, fifth, and sixth Henries, the concluding quarter of the 14th century was distinguished—as we learn from contemporary illuminations—by the pervading love of lavish extravagance in dress in all classes, and by the excess to which the more fanciful devices and fashions of earlier times were carried. Thus, the jagged borders

Fic. 36.—Lancelot du Lac, c. 1360. From Viollet-le-Duc.

Fia, 35.—Civilian, 6 Asia

of tunics and mantles became more than ever fantastic; the tunics and mantles themselves attained to a larger size, and the hanging sleeves commonly attached to them drooped to the very ground. Hoods, from being merely pointed, were prolonged in pipe-like extensions ("liripipes"), and the points of boots and shoes were made sharper, and the boots and shoes were made longer than ever. The singularly quaint and bizarre usage of making dresses party- coloured, the colours being selected in the majority of instances with a view to decided contrast, derived doubtless from heraldic impale- ments and quarterings with fields of different tinctures, and carried out in the livery colours assumed by the retainers and dependants of great houses,—a fashion whick had established itself during the palmy heraldic days of Edward I11.,—became general in the rei, of Richard I1., and then it was carried out in every variety of the details, accessories, and ornaments of costume.

Century XV.—Remarkable for a sustained succession of impor- tant changes in armour, and also from the fact that after about 1405, and until about 1475, the panoply of steel was worn uncovered by any surcoat or jupon, this turbulent century also witnessed a variety of changes in costume—changes that maintained a general uniformity throughout the greater part of Europe—which in their turn led in the succeeding century to the equally general estab- lishment of the Tudor fashions. Heraldic devices continued to constitute favourite accessories and ornaments of dress, and in no slight degree determined both its character and its aspect. To the crests of the knightly helms, and to the contoises or scarves and the mantlings displayed

from them by the knights, may be assigned, as being the sources whence they were suggested, the more extravagant and quaint varieties of the female head-gear which prevailed at this period. And, in like manner, the "livery colours" of the nobles and other persouages of distinction, introduced during the preceding century, together with their armorial badges, all of them worn by their partisans, adherents, and dependants, imparted a heraldic character to the costume of the middle and even of the humbler classes. The only royal monumental effigies of this century are those of Henry IV. and of his second wife, Joanna of Navarre, at Canterbury. The king's dalmatic, of ample proportions and ungirt by any girdle, falls to his feet, completely covering his tunic, except at the wrists of its tight sleeves, which have an under row of small buttons set in contact; over these sleeves are the large and open sleeves of the dalmatic itself, which is remark- able from having at each side a very large opening to give access to the pockets of the tunic. About the shoulders and covering the chest is a cape or tippet ; and, over all, there isa mantle, its hood adjusted about the neck of the wearer, which is secured by a broad and rich hand, with morses, cords, and tassels. Upon his head the first Lancastrian king wears a crown of elaborate splendour. The effigy of Queen Joanna, from which, as also is the case with the com- panion effigy of her royal husband, the hands and the greater part of the arms have been broken away, represents her attired in u close-fitting tunic with a narrow very rich hip-girdle, undera long

sleeveless and sideless cote-hardi, cut low and fitting tightly in the body, but having a loose, long and flowing skirt, and adorned with a row of rich circular studs down the front. The mantle, which falls over the back of the figure and is not gathered up at the arms, is secured by a cordon attached to two lozenge-shaped studs. As a necklace the queen wears the Lancastrian collar of SS. ; and her hair, which is plaited in bands within golden network, is sur- mounted by a truly beautiful crown. Thus the costume of this royal lady shows no change from the ruling fashion of the pre- vious century. At this same time female dresses were worn made full, and either

gathered into a kind of close collar about thie throat, or having a broad collar falling over the shoulders, their sleeves very large and full and sometimes quite open, while at other times they also were gathered in (but not closely) at the wrists ; these dresses, often having a row of small buttons from the throat downwards, were so adjusted by a belt as to have very short waists. At this period also, and till the middle of the century, the tunic commonly worn by men, with the exception of being shorter, in form was almost identical with the full-sleeved kirtle also in common use by the other sex. Among characteristic examples of the ordinary costumes of the first half of the 15th century are effigies, some sculptured and some engraved, at Chip- ping Campden, Willoughby, Northleach, Kingston-on-Thames, Great Tew, Higham Ferrers, and Bedington. In the third quarter of the century the male dress in general use underwent but little change, the very long tunics of earlier times still remain- ing in favour ; but the female kirtles are seldom seen with very full sleeves, the sleeves of the under-tunic being continued in the form of mittens so as partly to cover the hands, the outer sleeves ending in cuffs that are turned back. While the costume of the commonality thus was at any rate comparatively simple and sober, throughout the turbulent period that succeeded the death of Henry V. till the establishment of the Tudors, it would appear as if the fierce excitement and the terrible vicissi- tudes of a prolonged civil war had impelled the nobility and others of the upper classes in England—encouraged in such a conrse, as it would seem, and still further stimulated to pursue it by the con- temporaneous fashions of France—to have sought a not altogether inconsistent kind of relief in both the revival and the invention of almost every conceivable extravagance and absurdity in dress and personal ornament. Long and loose robes having immense drooping sleeves had as their contemporaries close-fitting tunics reaching down not quite to the knees, with others of looser make which descended midway between the knee and the ankle, and also with jerkins cut short only a few inches below the hips, made very full, and gathered in with a belt about the waist. Of these tunics and jerkins the sleeves assumed an endless variety of form and decoration, being sometimes made to fit tightly, but more generally being large and open, and at their extremities either jagged or bordered with fur. These large sleeves enabled the wearers to display the sleeves of their under garments, and in so doing to emulate the ladies with their sideless cote-hardis and kirtles. Mantles of the richest materials and splendidly adorned, which were made to reach about to the

knees, were worn as parts of the regular dress. The half-boots or shoes distinguished as poulaines continued to be long and very sharply sein ge and men of rank and fashion actually walked about in clogs, pointed like their poulaines, and exceeding them in length by several inches. The excesses in attire characteristic of this period culminated (in every acceptation of that word) in the femaie head-dresses, that appear literally to have exhausted the inventive faculties both of the ladies themselves and of those persons who ministered to their tastes and wishes. From their more decidedly characteristic features, some of the more popular of these strange varieties of head-gear

Fia. 37.—"Horned Head-dress, c. 1475.

have been distinguished as the "horned," the "mitre,' the "steeple"—in France known as the " henniu,—" and the "' butterfly" (figs. 37-40). Examples of all these head-dresses in their various modi- fications of contour, size, accessories, adornment, and adjustment,

Fie. 38.—" Mitre" Head-dress, c. 1475.

abound in the monuments and illuminated MSS. of both France 'and England ; also, as in the general character of the costume of each era, the same fashions of head-gear are found to have prevailed about the same period in other European countries. 'The most remarkable example of the " horned" head-dress that has been observed either in France or England, is represented in the efligy of Beatrice of Portugal, who married one of the earls of Arundel in the time of Henry V., which remains in good preservation in Arundel church in Sussex; fig. 37, from the brass to Lady Hals- ham in the same county, shows a simpler and more moderate form of the same head-dress. Fig. 38 is drawn from a portrait of Elizabeth of York when young, in stained glass at Little Malvern. The "'hennin," fig. 39, is a French example, reproduced from the always effective pages of Viollet-le-Duc. The " butterfly," shown in fig. 40, is another example in which the type of a particular head- gear is exhibited with no less of moderation than of accuracy. In every case, to these head-dresses-veils, generally of ample proportions and often of great length or depth, and always of some light

and delicate material, were attached, and from the actual structure worn in connection with the hair upon the head they either were expanded by wires or were permitted to fall drooping freely.

Fra. 39.—" Steeple" Head-dress (" Hennin"'). From Viollet-le- Duce.

Fic. 40.— Butterfly Head-dress.*

Extravagancies in head-gear, however, were not restricted to the fashions of one sex only ; on the contrary, at this same period, among other strange eccentricities and fancies, a kind of cap, in form somewhat resembling a turban, was introduced and generally worn by men, which on one side had attached to it a cluster of very large bows or puffs (the prototype of the " cockade" of later times), while on the other side a broad band or scarf of the same material as the cluster of bows hung down to the ground, or even trailed along upon it, unless it should be the pleasure of the wearer to tuck it up in his girdle, or to wind it round either his head or his throat and shoulders. This strange male head-gear, of which a French example is given in fig. 41, showing the upper part of the scarf when hanging down, often was treated asa hood for occasional use only, when it rested on one of the shoulders of the wearer, its cluster of bows drooping over his back, and the long band or lappet pei in front of his person, his

ead, meanwhile, if not bare, being covered with a cap, round or square or peaked, or by a brimless hat adorned with an upright feather and a jewel. In the 13th and 14th centuries the knightly surcoats and jupons, worn over armour, had their counterparts in the robes and tunics of peaceful attire; and so, in like manner, the shortened tunics and still shorter jerkins, that were in common use when the 15th cen- tury was bringing the great civil struggle to its termination in the accession of the Tudors, may be considered to have been suggested by the short "tabard"' with its short and full sleeves and its heraldic ; blazonry, at that time worn by men- Fig, 41.— Head-dress with Scarf. at-arms over their plate-armour. At the same time and till the end of the century, the long tunics still in use, which some years earlier had been slit up in front and had their full sleeves somewhat gathered in at the wrists, were made still longer, and had collars either close- fitting or open and falling back; they also were made open in front throughout their entire length, and their loose sleeves were of a uniform size

from the shoulder to the wrist. At this same time also rosaries, and gypciéres or purses, were worn attached to their girdles by both sexes. About the year 1480 the long and acutely pointed poulaines were superseded by coverings for the feet of both

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*sexes which exhibited the opposite extreme of being short, very broad, and rounded or sometimes almost square at the toes. In the concluding quarter of this century, the super-tunic or gown of the ladies, made to fit closely and having a long and flowing skirt, the sleeves also close-fitting and with cuffs either turned back or drawn over the hands, was open above the short waist, the collar falling back over the shoulders and showing the under-tunic either carried up to fit closely at the throat, or sometimes cut square and low. Rich and broad necklaces were worn, and belts of goldsmiths' work with long pendants. The '*horned ' head-dress became either sharper in its points, or con- siderably less pointed and more graceful. The " butterfly" head- dress increased in favour, and was worn with the hair drawn back into an enriched caulor cap. About 1490 an angular or "diamond " head-dress superseded the "butterfly;" it hada ridge, after themanner of a gabled roof of a house, over the head, and forming an angle above the centre of the forehead, from which it descended with a slope on each side of the face; then, another angle having been formed slightly below each eye, this head-gear, which inclosed the back of the head in a species of cap, was continued as a broad lappet falling over each shoulder in front of the person of the wearer; occasionally, also, two other similar lappets depended behind (see fig. 42).*

Early Painted Glass.—Upon the costume, always without doubt in a signal degree characteristic of the period in which it was executed, of the various figures introduced by medieval artists into their numerous pictures executed in glass, Winston has made the following concise remarks :—

Early English Gothic, 1175 to 13800.—" Robes, whether lay or ecclesiastical, are generally short, in male figures hardly reaching to the ankles, and in females scarcely more than touching the ground. The female dress usually consists of a close garment with tight sleeves and a loose robe and shoes; the head is sometimes bare, but more commonly draped. The

~~male dress, usually appropriated to dignified persons, also consists of a close garment confined at the waist, and furnished sometimes with tight and sometimes with loose sleeves, a robe or mantle, and long hose, to which is often added a cap greatly resembling the Phrygian bonnet. The costume of ordinary persons is generally a short tunic, confined at the waist and reaching nearly to the knees, and sometimes a short cloak ; when this is used, the legs of the figure are generally represented encased in hose, or in a loose sort of stocking setting in folds about the leg, and with or without shoes."~~

~~Decorated English Gothic, 1800 to 1880.—" The draperies of this period are much more flowing and ample than those of the last; and in ecclesiastical and female figures the robe is generally long and envelops the feet. The secular emale costume usually consists of a garment fitting tightly to the arms and body, and having a wide long skirt trailing along the ground; upon it sometimes are depicted the armorial bearings of the wearer. A cloak or mantle is often loosely thrown over it. The wimple is a frequent adjunct to the head-dress, and the hair is usually plaited down on each side of the face and inclosed in a net or cowl. The ordinary costume of dignified laymen consists of a long robe and loose cloak,—the hair and beard being arranged in loose and wavy locks, The usual secular dress is a short jerkin or tunic reaching about half-way down the thighs, and tight hose and shoes, upon which model the armour of this period was formed."~~

~~Perpendicular English Gothic, 1880 to about 1550.—" Greater repose was given to the figures in this than in either of the former styles, and the draperies are generally disposed in very broad and grand folds. The female dress in general consists either of a close- bodied dress with long skirts and tight sleeves, or of a looser dress with sleeves wide at the shoulders and tight at the wrists. A cloak is often added, upon which armorial bearings, when used, are emblazoned more frequently than on the other garment. The variety of the head-dresses is great, especially towards and during the reign of Edward IV. The secular male costume, until almost the end of Edward IV.'s reign, appears usually to have con- sisted of a furred gown of tunic-like forin, reaching rather below the knees, slit nearly half-way up the middle, and confined round the waist with a girdle ; it had either wide sleeves narrowing toward the wrist, or small at the shoulder and wide at the wrist~~

like those of asurplice. The legs were inclosed in pointed-toed hose. The hair, until the latter part of the reign of Edward IV., appears to have been cropped closely all round, and after this time to have been cut straight across the forehead, but allowed to grow long behind and at the sides of the face, and to have been smoothed down like a club. In the reign of Henry VII. long furred gowns reaching to the feet and obtusely-toed shoes were used ; they continued in fashion during the next reign also." f ie

Century XVI—"We find," says M. Paul Lacroix, writing specially with reference to the costume prevalent in France, " that a distinct separation between ancient and modern dress took place as early as the 16th century. In fact, our present fashions may be said to have taken their origin from about that time. It was during this century that men adopted clothes closely fitting to

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- the body,—overcoats with tight sleeves, felt hats with more or less wide brims, and closed boots and shoes. 'The women also wore their dresses closely fitting to the figure, with tight sleeves, low crowned hats, and richly trimmed petticoats. These garments, which differ altogether from those of antiquity, constitute, as it were, the common type from which have arisen the endless varieties of modern male and female dress ; and there is no doubt that fashion thus will continually be moving backwards and forwards from period to period, sometimes returning to its original model, and sometimes departing from it." Before arriving, however, at the useful and generally cousistent and becoming dress of the present day, the fashions of both male and female attire had to pass on from the 16th century through a series of changes in every respect no less strange and extravagant, and yet always more or less directly tending in the same direction, than those which the earlier centuries had witnessed and then had carried away with themselves. And even now more than a little remains to be accomplished, before the ordinary costume in general use can be considered to have realized what ought to be its true aim—the most perfect attainable applicability, that is, to the condition and the

requirements of the wearer, due but not excessive attention at the same time being bestowed upon appropriate effectiveness of appearance.

At the commencement of this century in England, there are the royal effigies of Henry VII. and his queen, Elizabeth of York. The king himself is represented as having his person entirely enveloped in a loose fur-lined robe or gown of ample size, reaching from its close fur collar about his neck to his feet, and so adjusted as to disclose but little of the garments : worn beneath it. On his head he has the square cap that came into use and was generally worn during his reign. The queen wears a richly adorned angular head-dress (fig. 42), from beneath which her hair falls unconfined over her shoulders ; and the adjustment of her royal mantle is such as to dis- play the upper part of her tunic, which is cut square and does not quite reach to her throat. The countess of Richmond, the mother of Henry VIL, in her effigy appears wrapped from head to foot in a

loose mantle, her tunic having e plain and tight sleeves ; and on her Wier Gene a bs head she has a plain angular head ' 7

dress with a plaited wimple, over which the lappets fall. This costume may be regarded to have been designed to denote the widowhood of this four times married lady. Thus it appears that in their costume the effigies of these royal personages exhibit none of the distinctive insignia of royalty, and conse- quently they may be accepted as typical of the costume of their era. Neither of Henry VIII. nor of any one of his queens is there any inonumental effigy ; but this deficiency is more than com- pensated by the portraits painted by Holbein, made familiar to all by engravings ; while other artists have left no less charac- teristic pictures representing personages of different ranks and classes who at the same period lived in France and England. Armour, which in the course of this century gradually became less esteemed for purposes of defence, and in a corresponding degree came to be more and more regarded as but little more than a splendid component or accessory of dress, in its form and aspect was closely assimilated to certain garments made of textile materials and in fashion among the armour-wearing classes. Much of curious and suggestive mutual illustration, accordingly, is to be obtained by a comparison between the aspect of a man of rank of this century in his armour, and the same

person when in his customary attire. In the time of the first of the Tudor princes men wore two distinct varieties of dress. The one was a long and loose gown, having wide open sleeves, girt about the waist with a belt or scarf, above which it was open, its broad collar falling back over the shoulders ; thus an under-tunic or vest was displayed, that in its turn allowed the shirt to be visible both at the throat and the wrists; the hose were tight, and the shoes very broad at the toes. The other form of dress consisted of a short tunic or vest, tight and close-fitting as the hose, worn under an open doublet with long sleeves made throughout very large and loose; hats, low in the crown and broad in the brim and having plumes of feathers, were either worn on the head over a small and closely-fitting cap or coif, or they were carried hanging from over one of the shoulders down the back. The angular cap represented in the royal effigy also was constantly worn, and the cap (fig. 41) with the cluster of bows and the long pendant sash continued in use. Under Henry VIII., in men's attire, from midway between the knee and the hip, or from the knee itself, downwards to the wide and easy shoes, all was tight, while about the upper part of the lower limbs and the

body all was loose, capacious, and broad, the entire costume at the same time being distinguished by decided stiffness and formality. At the line of junction between the tight and the loose portions of the dress, the trunk hose, at the time in question universally worn, were gathered in closely either at the middle of the thigh or at the knee, and then they were widely puffed out as they rose to meet the jerkin or jacket, which was open in front and reached only to the hips. These jerkins sometimes were closed at the thrvat, when a small falling white collar or band was worn; or the jerkin was spread open to display a sleeveless vest, and an embroidered shirt having large sleeves and small ruffles at the wrists. The doublets, or coats, worn over the other garments were very short and very full, an especial object being to give to the figure, and particularly about the shoulders, the appearance of as much breadth and square- ness as possible. A cloak, as short as the doublet, was suspended from the shoulders, rather for display than for use; the head- covering was a round cap, low and flat, adorned with a jewel and a single small waving feather; and, attached to the belt, with a gypeiére or purse, a dagger was carried horizontally in front of the wearer. The sword, when worn, was a rapier. It was at this period a

peculiar and universally prevalent fashion, varying in degrees of eccentricity and extravagance, to slash the garments, so as either simply to show glimpses of some under-dress, or to have some different material of another colour drawn out in puffs through the slashes. This slashing and puffing was extended even to the broad shoes, the tight hose alone being exempted. Desides being frequently slashed and striped, the trunk hose were habitually made with a succession of alternate gatherings-in and puffings-out. All this display, made regardless of true taste and solely in order to accomplish as much of display as possible, naturally was attended with a prevalent indulgence in the use of rich and costly fabrics and splendid decorations. Of King Henry himself it is recorded, at his famous meeting with Francis I. in 1540, that he was apparelled in "a garment of cloth-of-silver damask, ribbed with cloth-of-gold, as thick as might be; the garment was large and plaited very thick, of such shape and make as was marvellous to behold." The French king was attired in a splendour quite equal to that of his royal English guest ; and the nobles and courtiers of both countries took care to emulate their sovereigns in their attire, and in wearing several gorgeous costumes, all of them in the same style of fashion, every day. Thecostume of Henry

I]. of France, represented in the woodcut, fig. 43, from the original portrait by Clonet, is a charac- teristic example of the fashion prevalent in the middle of the 16th century, and it also shows how close was the resemblance between the fashions of male dress at that time in France and Eng- land. The costume of the middle and the humbler classes at this era, as naturally would be ex- pected, bore a decided general resemblance to the more elaborate and costly attire of the dignified and wealthy of their contempo- raries. They wore the same short close jerkin, the short doublet often with lappet sleeves, the short cloak, the flat round cap plainly made from simple mate- rials, and the tight leggings and broad shoes with the putfed upper hose. Or, instead of the short cloak, they wore a long gown, e

furred, ~ with hanging sleeves, a Fe

sometimes pierced midway for the arms to pass through; a coif tied under the chin also was commonly worn under the flat cap. The doublets of the men of the Elizabethan portion of this cen- tury, which were made long-

breasted and padded so as to fit the body tightly, were carried down in front to a prolonged peak, and so they closely resembled both the stomachers of the ladies and the breastplates of the military. The fashion of these grotesque doublets, apparently originally Venetian, travelled to England by way of France. The hose, if of the English " trunk" type, were puffed out immediately from the middle of the thigh, where they met the tight leggings or stockings that were carried up beneath them, as in fig. 44; but the French and Venetian hose, also in fashion in England, swelled out gradually from the knee, and the stockings sometimes were drawn overthem. These dresses constantly were puffed and slashed, padded and banded throughout, one long slash being carried down the entire length of each sleeve of the doublet. The contemporary portrait of the French king, Henry III., about 1575, from which the woodcut (fig. 45) has been drawn, shows very distinctly the tapering French hose and the long peaked doublet, with the treatment of those garments characteristic of that

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period. Very large circular ruffs, in their form and adjustment dif fering little, if at all, from those worn by the other sex, formed essential features of the male attire in the reign of Elizabeth, when very short cloaks also continued to be worn. At the same period, long gowns guarded with fur, having open collars falling back, and their sleeves comparatively tight and having puffs at the shoulders, were in common use, as were caps and hats greatly varying In form, celour, material, and adornment. It must be added, that amidst

Fra. 45.—From Portrait of Henry III. of France,

1576.

Fic, 44.—English Trunk-hose, .:@ 1550.

all this extravagance and eccentricity of attire, there also existed a taste for simplifying the fashions of the time so as to render them at least comparatively graceful and becoming. In connection also with the costume

of the 16th century, it will be kept in remembrance, as one of the most decided innovations ever introduced into male dress, that two distinct coverings were given to the lower limbs when the hose were worn in part tight and plain, and partly putfed out, slashed, and embroidered. The term " hose " then wi 3 applied, by way of distinction, to the upper portion, while to the lower the name of "stocking" was assigned. Towards the close of the century the hose of that period also became " breeches; " and so, in process of time, the old and long-used word " hose" came to be retained only as an equivalent for "stockings." Early in the 16th century noble ladies and gentlewomen introduced various modifications of the universal angular head-dress. Their dresses, fitting closely about the figure, and with long skirts open in front to display the under-dress, were made low and cut square about the neck; their sleeves, tight at the shoulder, suddenly became very large and open, disclosing the puffed sleeves of the under-dress ; sometimes, however, these dresses were worn high, with short waists, and a small falling collar. Necklaces and numerous other orna- ments of jewellery were in general use; chains also, with objects of various kinds for use or ornament attached to them, hung down from the universal girdles, or the girdles themselves had one long endant end that was elaborately enriched. By country ladies and ie the wives and daughters of citizens a similar style of dress, somewhat simplified, was generally adopted. Somewhat later, the sleeves of dresses had puffs at the shoulders, and when the dresses were made open above the girdle, a "' partlet," or kind of habit- shirt, was worn beneath them and carried up to the throat ; the head-dress at the same time, while generally retaining an angular contour, was small and made to fit almost closely to the head. At this same time, the general resemblance which all along may be traced between the dresses of the two sexes became universally de¢ided. After the accession of Queen Elizabeth in 1558, the well- known costume, associated with herself from about the middle till the close of her reign, gradually became established. Of the long, peaked, and tight stomachers of the ladies, and of the padded and quilted doublets of the men, it might be said with equal truth that cach garment was a parody of theother. Ruffs, often of exaggerated amplitude and of a painfubly severe stiffness, were worn by both sexes; sometimes open in front and rising like an expanded fan around the throat and head, more gencrally they completely encircled the throat, and rested, nearly at right angles to it, on the shoulders. In their puflfings and slashings the sleeves of the dresses of

both sexes were alike; nor was almost a corresponding re- semblance wanting between the trunk hose and the " petticoat- breeches'"' of one sex, and the skirts of the kirtles and gowns | and the veritable petticoats that were made to expand by enor- , mous wheel-like " farthingales," as in fig. 46, from the hips of the other sex. Ornaments of every kind abounded. The richest and most showy fabrics in endless variety were in great request, and were worn with abundance of lace, feathers, and embroidery. 'lhe monu-

Fic. 46.—Farthingale.

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mental effigy of Elizabeth herself, the last memorial of its class com- memorative of an English sovereign, represents the queen as attired at all points in the characteristic fashion, by herself set to her time, and identified with her name; and the sister effigy of Queen Mary Stuart, like that of Elizabeth, the work of James I. and in West- minster Abbey, gives another, but a somewhat simpler and a much more graceful, example of the same costume—the queen of Scots wearing the cap that bears her name. As at other periods, the general female costume in the Elizabethan era was a modification of the dress of the court, the circumstances and position of different classes and individuals determining the degree of resemblance.

In taking a retrospective glance at the numerons changes in costume which had taken place from ancient times to the 16th century, M. Lacroix remarks that "among European nations during the Middle Ages we find there to have been but one common standard of fashion, which varied from time to time according to the particular customs of each country, and in accordance also with the peculiarities of each race. In Italy, for example, dress always maiutained a certain character of grandenr, ever recalling the fact that the influence of antiquity had not been altogether lost. In Germany and Switzerland garments generally had a heavy and massive appearance, and in Holland still more so, England uniformly studied a kind of instinctive elegance and propriety. It is a curious fact that Spain invariably partook of the heaviness peculiar to Germany, either because the Gothic element still prevailed there, or that the Walloon fashions had an especial attraction to

her, owing to associations and general usage. France was then, as she is now, fickle and capricious, fantastical and wavering, not indeed from indifference, but because she always was ready to borrow from every quarter anything that pleased her. She, however, never failed to place her own stamp upon whatever she adopted, so making any fashion -essentially French, even though she had only just borrowed it from Spain, England, Germany, or Italy. In all these countries we have seen, and still see, entire provinces adhering to some ancient custom, causing them to differ altogether in character from the rest of the nation. This is simply owing to the fact of the fashions having become obsolete in the neighbouring places; for every local costume faithfully and rigorcusly preserved in any community at a distance from the centre of political action or government, must originally have been brought there by the nobles of the country. Thus, the head-dress of Anne of Brittany (1498-1514) is still that of the peasant-women of Penhoet and Labrevack ; and the tall conical 'hennin' (fig. 39) of Isabel of Bavaria (1400) is still the head-dress of Normandy." With the view "briefly to indicate the last connecting link between modern fashions and those of former periods," the same writer proceeds to point out how, "under Francis 1. (1515- 1547), the costumes adopted from Italy became almost stationary. Under Henry II. (1547-1559), and especially after the death of that prince, the taste for frivolities made immense progress, and the style of dress in ordinary use seemed day by day to lose the few traces of dignity which it previously had possessed. The fashion of ruffs had been introduced into France by Catherine de' Medici (1560); and at the beginning of the 17th century that of small collars. Dresses, tight at the waist, began to be made very full round the hips by means of large padded rolls; and these were still more enlarged by a monstrous arrangement of padded whalebone and steel, which subsequently became the ridiculous ' paniers' that were worn almost down to the present century. Under the last of the Valois (1500) men's dress was short, the jacket or jerkin was pointed and trimmed round with small peaks; the velvet cap was trimmed with aigrettes ; the beard was pointed ; a pearl hung from the left ear; and a small cloak or mantle, which reached only to the waist, was carried on the shoulder. The use of gloves made of scented leather became universal. Ladies wore their dresses 1ong, very full, and of costly materials, little or no change in these respects having taken place during the reign of Henry IV. (1589-1610). At this period the men's high hose were made longer and

fuller, especially in Spain and the Low Countries, and the fashion of large soft bocts, made of doeskin or of black morocco, became universal, For a long time, even in the towns, the costume of the bourgeois was almost unchanged. Never having adopted either the tight-fitting hose or the balloon breeches, they wore an easy jerkin, a large cloak, and a felt hat, which the English made conical and with a broad brim. Towards the beginning of the 17th century, the high hose, which were worn by the northern nations profusely trimmed, were transformed into the 'culottes,' which were full and open at the knees. A division thus was suddenly made between the lower and the upper parts of the hose, as if the garment which covered the lower limbs had been cut in two, and then garters were necessarily adoptea. Almost throughout Europe, the felt hat became a cap taking the exact form of the head, and having a wide and flat brim turned up on one side. To boots and shoes high heels were added, in place of those which before had been flat and had been accompanied with single soles. Two centuries later a terrible social agitation took place in Europe, after which male attire became plain, ungraceful,.

mean, and more paltry than ever; whereas female dress, the fashions of which were perpetually changing, became graceful and elegant, though often approaching the extravagant and absurd." Century X VII. —During the reign of the first Stuart sovereign of Great Britain the fashions of dress, which under his Tudor prede- cessor had culminated without undergoing any chan ges sufficiently marked to give to them a fresh character, attained to even an exaggerated extravagance. Notwithstanding the absence of any effigy of him, we are familiar with the personal appearauce and costume of James I. and VI., and in his costume we possess a true type of the dress prevalent during his reign. The long-waisted, peaked, and close-fitting slashed doublets of the days of Elizabeth, still longer in the waist, more acutely peaked, and as far as was possible more closely fitting than ever, habitually were kept in shape by means of stays worn under them. 'The trunk-hose mercilessly slashed, became larger than before, padded garments being specially congenial to the disposition and temperament of the king; and, having attained to a balloon shape, they tapered down to the knees of the wearer, where they were secured by sashes tied in bows at the

side. Cloaks and ruffs remained unchanged. Hats came into fashion that were tall in the crown, slightly conical in shape, with a narrow brim turned up on one side, and adorned with a jewel and a single feather, or with a rich band and a plume, Large rosettes were worn on the shoes, which retained their broad shape, and often had high red heels. Rapiers, worn without any belt crossing the person, were narrow and very long in the blade. In like manner, the female dresses underwent but little change, except in having their worst features and especially their farthin- gales, with the lavish profusion of their tasteless adornment, intensified. It was at this time, however, that the custom of painting the face began to prevail; and while ruffs or bands of immoderate size stretched forth from the ladies' necks, they wore the front of their dresses cut away immediately beneath them in a manner that exposed the bosom in defiance of all modesty. Less fashionable ladies, between 1615 and 1625, discarded the tight and pointed stomacher and farthingale, and wore over an easy jerkin and ample petticoat, a loose gown open in front, made high to meet the ruff, and with long hanging sleeves through which the tight sleeves of the jerkin were displayed; or they followed the fashion of their time, modified and without its more salient absurdities. The same may be said of the men who were content in some degree to follow the fashion, while altogether repudiating being leaders of it. With the costume of the reign of Charles I., on the whole more sober, and in more than a few respects really elegant, Vandyck has made the world happily familiar. At first the ruffs were retained, their size only having been diminished ; but all traces both of the angular head-dress ie of the Mary Stuart eap, and with them of the farthingale, disappeared; and after a while the ruffs followed then. The ladies wore the very full sleeves of their dresses tied in at the elbows as well as gathered in at the wrists ; their bodies, tightly fitting, sometimes were long and ointed, and at other times not longer than the natural waist; the ong petticoat of some rich material was displayed beneath a loose and open robe or gown, that was gathered up and had short loose sleeves with deep white cuffs, and a deep falling collar or "'band" was fasteued closely at their throat ; or they wore large kerchiefs over their bodies, and gowns having flowing skirts and comparatively tight sleeves, Coverchefs or hoods also were worn, from which descended long veils, often of such ample proportions as t> resemble mantles. Patches at this time began to make their apearance ; and notwithstanding their intrinsic absurdity and their strange faculty for disfigurement, they

continued in fashion throngh- out the century. Men's doublets or coats, the true prototypes of the frock-coats of the present day, having full sleeves made tight at the wrists, were rather longer and worn buttoned from the waist (where they showed the shiit) upwards to the falling white band ; plain white cuffs, sometimes supeiseded by others of lace, were also worn. The trunk-hose became loose breeches of uniform width aud open at the knees, where they were fringed or had a border of lace, and were fastened with sash-like garters; the stockings were tight ; the shoes had large roses; and the felt hat was large and wide in the brim. By the inen of fashion this costume, in itself really worthy of decided commendation, was easily made to assume a fantastic aspect, by the adoption of rich aud variously coloured fabrics and the addition of lace, bunches of ribbon, feathers, embroidery, and gold lace, and numerous " points" or laces to fasten the breeches to the stockings, with boots long in the foot, and having tops of enormous width that were turned down and lined with lace. These gentlemen, who delighted in having long hair, also wore or more frequently carried on their left arm a short cloak ; and they were provided with basket-hilted rapiers having blades of great length. Besides rejecting all bright colours, and every kind of ornamental accessory, a very different class of their contemporaries reduced this same costume to its simplest possible conditions, thns contrasting one extreme with another most opposed to it. These men, who to their elosely- cropped hair owed their famous designation as '* Roundheads,

with their sombre and plain garments wore their felt hats of exces- sive height, with a great breadth of brim, and perfectly plain. The buff-coats, adopted at this period as parts of the military uniform, conformed in their general character to the doublets worn as ordinary dress. While retaining the characteristic features of the fashions of their times, the dresses of the female members of the "'Roundhead" section of the English community were made with the plainest simplicity—a simplicity, however, which the taste.and ingennity of the wearers rarely failed to render graceful and becoming. On his restoiation, Charles HI. brought with him to England the fashions of dress with which he had been familiar in France ; and they suited well both his own character and that irresistible and widespread reaction from the stern and yet manly gloom of the Piotectoiate that burst out into a frenzy of national recklessness. Shortly after the king's return,

indeed, and for some little time afterthe re-establishment of the monarchy, in the families of graver citizens a quiet style of dress, not unlike what had been prevalent for several years, continued in use by both sexes. Men wore plain doublets of moderate length, full breeches slightly ornamented at the knees, large bands, shoes tied over the instep in bows of moderate size, and loose cloaks having long open sleeves ; pointed beards and moustaches continued to be worn also, and under their felt hats the men retained the coifs of past times, or they covered their heads with coifs orcapsonly. Plain and in the body closely fitting, the ample skirts of the ladies' dresses, open in front to display an equally umpretending under-dress, occasionally were partly covered by a no less plain apron; their bands or collars, fastened in front with formal bows, were very large and generally quite plain; aud their close hoods they wore tied under the chin, beneath flowing veils or mantles. The very different style of costume which Charles himself had learned to wear at the court of Louis XII. of France, and which he speedily taught his own subjects to assume, consisted of a comparatively long and loose doublet richly laced and embroidered, having large and pnffed ont sleeves turned back a little below the elbow, leaving the lower arm to be covered by the full sleeves of the shirt with their lace ruffles at the wrists. Under this doublet was a vest, sleeveless but other- wise resembling it, which was left open at the waist; in their turn, from beneath the vest the hreeches Silayed their expanded width, with their ornamental bunches of ribbon above the knees and lace ruffles below them. A falling band of the richest lace enveloped the throat, and was loosely tied with an equally rich scarf of which the ends hung down over the vest; an enormous periwig superseded the natural hair, its curls falling in abundance over the shoulders, the beard being close shaven and only a slight moustache permitted to remain. The hat, broad-brimmed and having its brim on oue side slightly turned up, was adorned with a rich band and a profusion of drooping feathers ; the stock-ings were tight to the leg, and the shoes, made very high over the instep, were tied with immense bows that extended horizontally ou either side of the foot ; and a short cloak, no less splendid in both material and enrichment than the other portions of this gorgeous attire, either was suspended from the left shonlder or carried on the left arm. The sword, a rapier long and narrow in the blade, was suspended from a very broad and elaborately enriched belt crossing the person over the right shoulder, It will be understood that in the production of this costume : the richest and most

showy fabrics were employed ; also that the men delighted in exhibiting in their dress every variety as well of colour and tint as of material, white, black, scarlet, and different shades of brown being in especial favour, with trim- mings of gold and silver lace, buttons and twist, and ribbons of all breadths and every hue. The accompanying woodcut, drawn from an original con- temporary authority (fig. 47), gives a correct geneial idea of the costume of the period of Charles II. In the autuinn of 1666, as we learn from the ever-observant Pepys, the king in council declared his purpose to set a more sober aud less costly fashion for dress, which he declared that he would not alter. Accordingly, under his doublet Charles appeared in a "vest," "'being a long cassock," as Pepys explains, "elose to the body, of black cloth aud pinked with white silk under it ; andacoat, or donblet, over it; and the legs ruffled with white ribbon, like a pigeon's leg; and upon the whole," adds the diarist, " 1 wish the king may keep it, forit is a very fine and handsome garment." The king kept it so far as after- wards it pleased him, and no further, This vest, or waistcoat, has

VI. — 60

Fic. 47.—Costume, temp. Charles IT.

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undergone many changes, indeed, but it never nas fallen into disuse since that 15th day of October 1666. In 1680 both vest and doublet became considerably longer, the latter reaching quite to the knees, and the} former being but little shorter. The doublet was worn open, a sash about the waist then confining the vest. The brims of tha hats at the same time became narrower, and bows of ribbon often were worn in place of feathers. The baudrick, or diagonal sword-belt, worn over the doublet was very broad, and allowed the hilt of the rapier to hang considerably below the left hip. About this time also, when jack-boots resembling those that had formed a part of the military appointments of the troopers in the civil war came into fashion, the sleeves of doublets were lengthened, and made with very broad cuffs which doubled back from the wrists. In the short reign of James Il. (1685-1688), when the moustache disappeared, doublets and vests still further increased in length, and the cuffs of the doublet-sleeves became extravagantly large; more prominence was given to the lace. cravats, which

were worn loosely about the throat and with their ends hanging down over the upper part of the vest ; the breeches and stockings remained without any change of form or adjustment; half- boots were worn, and buckles began at times to supersede roses and bows upon shoes ; and at this time the sword was occasionally carried thrust through the lower part of the doublet, and almost in a horizontal position. The costume of the ladies of the Charles II. era, represented with such grace and effectiveness in Lely's pictures, Planché thus describes: "A studied negligence, an elegant deshabille, is the prevailing character of the costume in which they are nearly all represented ; their glossy ringlets escap- ing from a bandeau of pearls, unveiled by even the transparent lawn of the band or of the partlet ; and the fair round arm reclines upon the voluptuous satin petticoat, while the gown of the same rich materials piles up its voluminous train in the background." During the early part of the reign, however, much of the Puritan

formality of then recent times lingered in female dress, as it did.

also in the attire of the male portionof the commonalty. Tightly laced bodices at no time lost favour with females of all ranks and classes. Hoods were worn, but generally only for protection from the weather, the prevailing usage being for females to wear their own hair in natural ringlets flowing over their shoulders, and with small curls over their foreheads ; false hair, indeed, was sometimes, but only sometimes, worn, and worn in an extravagant fashion. The custom of painting and placing patches on the face became more common as the second half of the century advanced ; and the immodest practice of exposing the bosom then attained to the extreme of indelicacy. As might have been expected at that era, the seldom dormant aim of theone sex to imitate the costume of the other was in full activity ; thus, Pepys says,—" Walking in the gallery at Whitehall (une 1, 1664), I find the ladies of honour dressed in their riding garbs, with coats and doublets with deep skirts, just for all the world like mine, and their doublets buttoned up the breast, with periwigs and with hats; so that only for a long petticoat dragging under their men's coats, nobody would take them for women in any point whatever ; which was an odd sight, and a sight that did not please me." Somewhat later, a similar "odd sight" excited a corresponding feeling, the disapproval being blended with perplexed surprise, in the mind of Sir Roger de Coverley (Spectator, June 2, 1711).

~~Whether worn by men or women, the ordinary dresses of the commonalty in their general character resembled those of the noble and wealthy, but were much simpler in both style and materials.~~

~~Accompanied by no other decided or marked innovation than the introduction of tight knee-breeches, which during the following century were worn by all classes, and still form no unimportant part of English costume, the reign of William I11. witnessed such modifications in the costume of the two preceding centuries as tended to make it more formal and appropriate, while at the same time leading the way to the tasteless frivolities and excesses of the next succeeding century. The doublets or coats of the gentlemen, their favourite colour some tint of claret when not scarlet or black, were longer, made to fit stiffly to the body, and laced and embroidered along the edges and seams and around the pocket-holes or the large flaps of the pockets in their skirts ; and their comparatively tight sleeves had enormous cuffs that were laced and adorned with buttons ; large shoulder-knots of ribbon were also worn. The vests, retaining their length, were left unbuttoned below the waist. Sashes occasionally were worn, and sometimes over the doublet. The breeches were made to fit tolerably closely to the limbs, and were quite tight at the knees, where the tightly-fitting stockings, if not gartered, were drawn over them in a roll. The shoes, very high in the heel and fastened with buckles, had flaps which covered the instep and rose in front of the legs for 3 or 4inches. The full shirt-sleeves with their lace ruffles were shown at the wrists; the loose neckcloth, had long pendant ends terminating in lace, if it was not entirely made of that material. The periwig, if possible more voluminous than ever, was abundantly powdered. The hat, sometimes triangular in form and with a narrow turned-up brim, was low in the crown, edged with gold-lace, and covered with~~

~~COSTUME~~

~~[ENGLISH.~~

~~feathers ; or, being wide-brimmed, its brim was slightly turned up at the sides, when it was adorned only with a laced band and a small tuft of ribbons or feathers. The cloak, when in use, was rather longer than the doublet. In winter, the men kept their hands warm in small muffs that were~~

suspended from ribbons about their necks ; and for summer wear they had gloves edged with lace. When not attached to a broad and elaborately enriched belt crossing the right shoulder over the doublet, the rapier was carried thrust through the left pocket-hole of the doublet itself, the weapon being to form an acute angle at the back of the wearer. A costume such as this, as a matter of course, would be subjected to various modi- fications, and would constantly be simplified in many particulars without any essential departure from the actual type. The accompanying figure (fig. 48), drawn from a contemporary French engraving which repre- sents an assemblage of the most illustrious personages in France in the year 1696, when com- pared with the numerous effigies and other portraits of the same era in this country, shows the typical dress to have been iden- tical in its essentials, and characteristic on both sides of the Channel at the close of the 17th century. Further com- parison, extending its range over the greater number of the countries of Kurope, would serve to demonstrate the comprehen- sive prevalence of this same typical dress, and at the same time to assign its various sub- ordinate local modifications tg the varying influences of climate f and of national character. 1n the

female dress of this period, asitis F16- 48.—French Costume, 1696.

exemplified in portraits of ladies of rank and fashion, stiffness and a formality of aspect were strangely blended with eccentricity and frivolous display. Bodices, very long in the waist and rather obtusely pointed both beliind and before, were very tightly laced over rigid corsets ; rich petticoats or under-dresses, partly covered with equally rich small aprons, were displayed from under full and flowing dresses that were gathered up in masses at the back of the wearer, or were drawn back and made to trail along on the ground behind her. At first very short and wide and edged with lace, from within which the delicate sleeves of the undergarment issued forth, the sleeves of the gowns after a while became tight and were prolonged to the wrists where they terminated in deep and wide upturned cuffs whence drooped a profusion of lace lappets or ruffles. Furbelows were introduced and worn in profusiou upon dresses of every kind, including scarves and cloaks ; and the fashion for adopting doublets and vests, with neckcloths, resembling those worn by men was prevalent in riding and walking costume. HIeavy head-dresses also succeeded to the flowing ringlets

~~and to the natural graceful- ness of the coiffure of the era of Charles 1].~~
~~The hair, combed up and with an inclination backwards from the forehead, was sur- mounted by strata of ribbon and lace, sometimes intermingled with feathers, and a kerchief or scarf of some very light material thrown over all was permitted to hang down to the waist over en below it. Structures so produced assumed various forms, some of them being made to project while others either rose vertically or expanded in a horizontal direction, height, however, being the special aim; but in every case the result was the reverse of graceful or becoming. Hats, low in the crown and with wide brims, were worn over hoods when cold or when protection from wet required their adoption.~~

~~MopERN CosTUME.~~

~~Century XVIII.—The 17th century having been treated as a period of transition in the matter of costume between the Middle Ages and modern times, the era of modern costume may be defined to commence with the 18th century—that is, fourteen years before the accession of the sovereigns of the House of Hanover to the crown of Great Britain. Until in the course of this century it fell into general disuse for regular military service, defensive armour must be considered to have maintained a claim to have been regarded, under certain conditions and to @ certain extent, as identified with the dress of an important and influential section of the community ; that claim, how-~~

~~ever, which lingered so long and with such tenacity, altogether ceased to exist shortly after the commencement of the era of modern costume. For a considerable time, indeed almost till the middle of the century, costume must be considered to have been modified rather than subjected to decided innovation. Men's dress remained the same in its general character, but became improved from being simplified and from having its decoration toned down. Planché says :—" Square-cut coats and long-flapped waist-coats with pockets in them, the latter meeting the stockings, still drawn up over the knee so high as entirely to conceal the breeches (then made to fit with comparative tightness to the limbs), but gartered below it ; Jarge hanging cuffs and lace ruffles ; the skirts of the coat stiffened out with wire~~

or buckram, from between which peeped the hilt of the sword, deprived of the broad and splendid belt in which it swung in preceding reigns; blue or scarlet silk stockings with gold or silver clocks; lace neckcloths ; square-toed short-quartered shoes, with high red heels and small buckles ; very long and formally curled perukes, black riding wigs, bag-wigs, and nightcap wigs; small three-cornered hats laced with gold or silver galloon, and sometimes trimmed with feathers,—composed the habit of the noblemen and gentlemen during the reigns of Queen Anne and George I." To this habit, the dress of the commonalty, according to custom, conformed in all characteristic essentials. Mean- while, when they did not wear such head-dresses as were very low, the ladies continued to elevate their strange and uncouth head-gear. About 1710, as if resolved that their figures should rival their heads in extravagance, they intro- duced the hooped petticoat, at first worn in such a manner as to give to the person of the wearer below her very tightly laced waist a contour resembling the letter V inverted—,. The hooped dresses, thus introduced, about 1740 attained to an enormous expansion ; and, being worn at their full circumference immediately below the waist, they in many ways emulated the most outrageous of the farthingales of the Elizabethan age. Sume few years also before the middle of this century the "saque" made its appearance : it was a loose gown, open in front, which was worn hanging from the shoulders quite free of the person of the wearer, and was gathered up over the hoop when not permitted to trail along on the ground ; in this unsightly garment any approach to "fit" was necessarily out of the question. At the same period, the men began to lay aside more of their Jace and of the other ornamental accessories of their garments ; their coats became longer, and their waistcoats somewhat shorter;·- the cuffs of their collarless coats increased in size until they reached their elbows; their stockings, when still drawn over their breeches above the knee, were so adjusted as to permit their breeches to be seen, but the breeches began to be made to fasten over the stockings, with buttons and buckles below the knee ; their wigs ceased to curl over their shoulders, and pigtails came into fashion. The costume of this era has been immortalized by Hogarth. During the forty years of this century that George III. was king, the fashions of dress passed through a remarkable variety of changes, each change contributing its own full share to the aggregate of extravagance and absurdity that was surpassed at no earlier period. About 1760 a passion for adorning the dress of both sexes

began to revive; andit soon exercised its influence, reckless of all true taste, with unsparing energy—the head-dresses of the ‘ ladies, which about 1780 attained to the culminating degree of extravagant unsightliness, being its specially favoured field for operations. Fig. 49, faithfully reproduced from a contemporary engraving, shows under one of its least extravagant and tasteless forms a fashionable head-dress of the period in question. As a matter of course, in the con- struction of every variety of head-gear such as this, which

in every instance necessarily obliterated all traces of the true form of the head and destroyed all proportion in the entire figure, false hair was used in abundance with a pro- fusion of objects of a so-called decorative order. Until about 1785 the type of men’s dress remained established without any essential change : the coat was made to fall back more than had been the usage a few years earlier, the object Gh being to display more effectively “ the long-flapped waistcoat with the pockets in its laced flaps ; the stockings always were gathered up below the knee under the breeches, which were fastened by buckles; the heels of shoes were lowered, and the buckles worn in them were com- paratively small; cocked-hats were worn, with laced ruffles and cravats, and bag-wigs, which generally were powdered ; and a broad black ribbon, called a “soli- F16. 49.—Head-dress, c. 1780. taire,” was placed about the throat and fastened behind. . This costume about 1785 gave way to the dress that in France wes developed with the advance of the Revolution. Men’s coats became very long, and sloped off from the waist, where they were buttoned, both upwards and downwards ; their sleeves were moderately tight with small close-fitting cuffs, and their collars either were high and doubled back stiffly, or made to spread upon the shoulders ; the flaps of their pockets were placed at the back and close together ; and all puffing and lace and embroidery were laid aside. The flaps of waistcoats, if retained at all, were short, and the garment itself was made open at the throat, the frill of the shirt appearing from under it. The breeches, fitting very tightly, either were cut short at the knee, or carried a few inches below it and there buttoned and tied with strings, knee-buckles

~~except for court-dresses having gone out of fashion ; the tight breeches also at this same time frequently were prolonged as pantaloons to the middle of the calf of the leg, where they were met by half top-boots. A rather large cravat was tied loosely in bows about the throat ; the hair, worn long generally, was powdered and tied in a queue ; and the hats, round in form, were either of moderate height in the crown, or tall and conical, and their nearly flat round brim was either narrow or moderately broad. The ladies delighted in tight bodices, furbelowed dresses, gorgeous petticoats, worn over hoops varying in size, and saques, which in reality were the mantles of early times revived, without a revival of their grace and ele- gance. About 1770, the sleeves of the ladies' dresses were tight on the upper arm, where they suddenly became very large, and, drooping at the elbow, they terminated in rich fringes of lace ruffles; a few years later the sleeves expanded from the shoulder, till they became a succession of constantly enlarging ruffles and lappets; and again, before 1780, they became tight throughout, with small cuffs and no lace at the elbows, when they were worn with long gloves, Influenced, doubtless, by the great portrait- painters of that time, about 1785 the female head-dresses gradually subsided, and their worst features for the most part disappeared. Hats having an immense expanse of brim grew into favour, and the natural hair was permitted to fall over the shoulders in ringlets. Small hoops were worn in 1788, with a dress open in front and trailing on the ground behind, their sleeves tight and frilled at the elbows. This dress often was worn with a tight and very low bodice, a white kerchief being gathered closely about the throat, and while entirely enveloping the bust, being~~

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~~476~~

~~puffed out from beneath the chin so as to resemble the breast of a pigeon. Round straw hats, with drooping edge- frills, bows of ribbon, feathers, and high crowns, completed this costume. Then in about five years came the era of short waists, that might be distinguished as the waistless era, when ladies' dresses, no longer distended by hoops, fell in straight loose folds to their feet. About 1795 open dresses were discarded; the saques ceased to~~

be; waists became longer, and when the present century dawned they regained their natural position and form. At this time bonnets were worn that incased the wearer's head, or were flat and projecting. They also were adorned with a taste that was comparatively simple and becoming; and, at the same time, the hair, free from powder, was dressed in curls about the face and neck. While thus in ordinary life costume at the close of the 18th century became approximately what might be desired, court-dress still exhibited the extravagancies that under other condi- tions had happily become obsolete, the hoop with all its really offensive mass of so-called decorative allies retaining their ground in defiance of all opposition, until the chief offender and its worst associates were banished by royal command when George IV. had become king.

BARONIAL.

The peers of the United Kingdom, on occasions of state aud ceremony, over their habitual dress wear robes of scarlet cloth, made long and of ample dimensions, which are adjusted on the right shoulder and are guarded with bands or rows of ermine, the robes of the different orders and ranks of the peerage being distinguished as follows — Barons, who now form the lowest order of British peers, on their scarlet robes have two bands of ermine; viscounts, whose order intervenes between the barons and the earls, have two and a half bands of ermine; the robes of earls have three bands; those of marquises have three and a half rows; and upon the robes of dukes, whose order is the highest, the ermine is in four rows.

For notices of the costume and insignia of members of orders of knighthood, see HERALDRY.

JUDICIAL AND FORENSIC.

Sg long as the highest offices in the law were held, in accordance with medieval usage, by dignified ecclesiastics, those eminent personages were represented in their monu- mental effigies, not as wearing judicial or other legal dress and robes, but as habited in the official vestments of their rank as churchmen; and that this practice con- tinued in force down to the time of the Reformation is shown in the brass in Ely Cathedral to Thomas Good- rich, bishop of that see, who also was lord high chan- cellor of England.

Monumental effigies of judges, however, and of other personages of note in the law, occasionally occur from the middle of the 14th century downwards, which give information as to the form and adjustment of legal robes that doubtless is authentic, and therefore valuable; but these authorities do not extend to any indications of colour. The actual dress of these legal personages evidently differed but little, if it differed at all, from the ordinary costume of their day; but over their dress they wore a tippet, and a robe which with rare exceptions was fastened on the right shoulder, and their heads were covered with a close-fitting coif, in addition to which in the 15th and 16th centuries they carried the hood with the long pendant scarf, so characteristic of those times, cast over one of their shoulders. It is probable, also, that the long and loose gown with wide sleeves in general use assumed at a comparatively early period the aspect of an

official robe by being made of the same material and colour as the unquestionably official mantle. In the second half of the 15th century and in the century following, the gowns worn by the judges when on the bench, and on all occasions of state and ceremony, certainly constituted parts of their official attire. Scarlet appears to have been the prevalent colour of judicial robes, with linings and trim- mings of miniver—the white skin of the ermine—until the 17th century, when on certain occasions the judges wore robes of black or violet ; but rvbes and gowns of a yellowish hue, and distinguished as " mustard-coloured," were also worn; and there isa record of an issue of " liveries " of both cloth and silk with fur from the great wardrobe, in the time of Edward IIL, to the justices, the colour of each fabric being green. Again, in similar allowances under Richard II. and Henry VI., " green " is a colour specially mentioned with "violet in grain," and fur of "miniver." In his fine sculptured effigy at Harwood in Yorkshire, Chief-Justice Sir William Gascoigne (died in

.1419) is represented having suspended from his girdle an

anlace or short sword, with a gypciére; and the same appendages also appear in several brasses to judges. In four illuminations, which have been

~~reproduced in fac-simile and published in the Archwologia (xxxix. 358), in which are represented sittings of the king's four superior courts in the time of Henry VI.—Chancery, King's Bench, Common Pleas, and Exchequer—the robes and costume of the lord chancellor, judges, serjeants, barristers, and officers of the courts are shown with minute attention to both colour and details. The chancellor and one judge who sits beside him, and all the judges of the three other courts, are alike in being attired in ample robes of scarlet, lined and trimmed with white fur; but the chancellor alone wears a scarlet robe which is not fastened on the shoulder and has open- ings pierced on each side to admit his arms passing through, so slowing the sleeves of his under garment to be white ; he is further distinguished by having about his shoulders and over his robe a tippet of scarlet, lined and bordered with white fur ; the white lining of his hood, also, stands up about his neck like a collar, and on his head he has a close-fitting dark brown cap. Under his scarlet robe, the judge sitting on the right of the chancellor, who holds in his hands a sealed document, is habited in a gown of the same colour ; bare-headed and tonsured, he also has the white lining of his hood adjusted about his neck after the manner of acollar. 'To the right and left, two on each side, their seats on the same level with the two central scarlet-robed figures, four other personages, who may have been masters in Chancery, are seated, habited in flowing "' mustard-colour " robes not adjusted on the shoulder, and ~ having falling over their shoulders large hoods of the same colour lined with white; they all are bare-headed, and three of their number certainly are tonsured. Five judges sit in the Court of King's Bench, robed alike in scarlet gowns, with tippets, and mantles worn over their tippets, and fastened on the right shoulder. All these robes are lined and bordered with white, and the mantles have scarlet hoods worn as collars closely encircling the throat. These five judges wear white coifs, as do the seven judges, all of them robed exactly like their brethren of the King's Bench, who preside in the Court of Common Pleas. Over the Court of Exchequer a baron presides, who is robed in the same manner as the judges of the two courts last named ; but he differs from them in wearing (doubtless over his coif, which is not shown) a large scarlet hood-like cap, of the fashion prevalent at his day. He sits with two other judges on each side of him, who wear "'mustard-colour" robes ~ of the same character; two of them also wear the large caps; while the two others, wearing coifs, hold similar caps in their hands; all these caps are " mustard-colour."~~

ENGLISH.

At the table in each court stand serjeants, counsel, notaries, clerks, and officers of various ranks, all of them in their proper official costume, All of them bare-headed, some of these persons wear full-sleeved gowns reaching to their feet, of blue, green, or mustard-colour; and their gowns, which have small black collars, are adjusted at the waist with narrow black girdles. Others, wearing similar girdles, are habited in gowns of the same fashion that are party-coloured, the division and junction of the two colours being vertical or per pale, and the colours being blue and green, blue or green and mustard-colour, green and murrey, and two tints of green. These gowns also are " rayed," or striped, either diagonally or vertically, with yellow, white, or blue. The notaries carry at their girdles their inkhorn and penner, The serjeants alone, who appear in each one of the four pictures, are habited in long and flowing gowns, worn without any belt, all of them party-coloured blue and green and rayed, with tippets and hoods of the same colours ; these learned gentlemen, also, have on their heads coifs similar to those worn by the judges (fig. 50). The use of party-coloured garments, un- doubtedly of heraldic origin, by persons of various classes and ranks, has already been noticed, In the absence of any express record of the source whence certain officers of the law derived their party-coloured gowns, it has been considered probable that these were livery gowns, presented to serjeants and barristers by their clients of high rank, with their retaining fees. How- ever this may be, it appears certain that their party- — — S — — coloured robes were worn by Fic. 50.—Serjeant-at-law (time serjeants long before the 15th of Henry VI.) century ; and, when giving his view as to their significance, in the following passage from a charge delivered to certain serjeants then newly created, in the thirty-sixth year of Queen Elizabeth, the lord chief justice suggested these party-coloured robes having been worn by the judges :— " By the party-coloured garments," said that learned person- age, "being both of deep colours, and such as the judges themselves in ancient times used (for so we receive it by tradition), is signified soundness and depth of judgment, an ability to discerne of causes, what colour soever be cast over them, and under or with what vail or shadow soever they be disguised." In the 15th century Sir John Fortescue said of a judge,—" Being a serjeant-at-law, he is clothed in a long priest-like robe, with a furred cape about his shoulders, and thereupon

a hood with two labels (such as doctors of the law wear in certain universities with their coif) ; but, being made a justice, instead of his hood he must wear a cloak closed upon his right shoulder, all the other ornaments of a serjeant still remaining, saving that his vesture shall not be party-coloured as a serjeant's may, and his cape furred with miniver, whereas the serjeant's cape is ever furred with white lambskin." Whatever at various periods may have been the usage with judges, the wearing of party-coloured by serjeants appears to have been finally discontinued about the commencement of the present century. In our own times, except on some special occasions when their robes are either purple or scarlet, serjeants wear a black silk gown, like that of queen's counsel. The robes of the junior members of the bar, made of black stuff instead of silk, are further distinguished by certain peculiarities of form. Reminiscences of the

coifs of earlier days, and of the caps with the pendants, still linger in the wigs worn by the entire learned brother- hood of the law, and in certain peculiar appendages attached to their robes. The large bands also, worn at the present day, may be considered to have had their prototypes in the labels already mentioned, which appear, dependent on his breast from his hood, in the brass to Thomas Rolf, barrister, 1440, at Gosfield, Essex. Fine and character- istic examples of judicial costume are preserved in various monumental effigies, some sculptured and others engraved, which include in their number the memorials of Judge Thomas Owen, 1598, and Lord Chief Justice Sir Thomas Richardson, 1634, both in Westminister Abbey ; the cfiigy of Judge Richard Harper, temp. Mary, at Swarthstone, Derbyshire ; and the brasses, ranging in date from 1400 to 1553, at Deerhurst, Watford, Gunby, Graveney, Latton, Dagenham, Cowthorpe, Norbury, Milton, and Narburgh. It may here be added that, in various representations of notaries of the 15th and 16th centuries, they appear in the ordinary civilian attire of their period with a pen-case and inkhorn suspended from the girdle of their tunic ; there is a good example in a brass in the church of St Mary's Tower, Ipswich; while several of these personages are introduced into the illuminations represeuting the courts of law described above.

NAVAL AND MILITARY.

Any attempt to notice in detail the naval and military uniforms in use at successive periods even in England would far exceed our present limits. At the same time, it appears desirable here to observe that the very decided distinction between "uniform," and especially military uniform, and contemporary civil costume now obtaining is of comparatively recent date. Throughout the armour era such distinction can scarcely be said to have existed, nor were the services afloat and on land distinguished by special and recognized peculiarities of dress. In the navy, the distinctive characteristics of uniform have become the cocked hat, epaulets of bullion, the crown-and-anchor button, and a by no means lavish application of gold-lace— the cloth, a dark blue with facings and lining of white, except during the reign of William]V., when the white was superseded by scarlet. Gradations of naval rank are indicated by the presence of a crown, a star or stars, and an anchor on the shoulder-strap of the epaulets, and by the size and comparative richness of the bullion; also by the number and the breadth of distinct strips of gold-lace that encircle the cuffs of coats and jackets ; all executive officers being further distinguished by a coil of the gold-lace attached to the uppermost of the cuff-circles. From the time that the stout " buff-coat " of the era of the Common- wealth succeeded to what still lingered of the plate panoply and the mail of earlier times, the uniform of the British army, for a while in many essential features conforming to the prevailing characteristics of the general costume of the day, has undergone a succession of changes for the most part more remarkable for variety and often for caprice, than expressive either of true taste in the consistent adornment of a soldier's person, or of considerate adjustment to tke exigencies of military service, the exceptions being the judicious innovations happily introduced early in the present century by the duke of Wellington. Scarlet obtains as the distinctive national British military colour, certain arms of the service being attired in blue or dark green; while the recent volunteer movement has brought with it a variety of uniforms expressly adapted for use by the reserved forces. For a com- prehensive, accurate, and copiously illustrated sketch of British military costume, readers are referred to the

~~COSTUME~~

~~History of the Dress of the British Soldier, by Captain John | a straight blade and a basket-hilt, attached to a broad~~

~~Luard.~~

~~HIGHLANDS OF SCOTLAND.~~

~~Without a rival in the picturesque individuality of its character, the national costume of the Highlands of Scotland is remarkable as well for the manner in which it has been made to distinguish the various clans or septs of the same race, as for a certain general uniformity that significantly intimates the brotherhood of the clans as alike sharing a single common nationality. It probably is due to 1ts own distinctive peculiarities that the Scottish Highland dress should have been inherited and transmitted from generation to generation almost without any change, and that at the present day it should be held in as high a degree of estima- tion as it ever enjoyed in past times. In early ages, having been influenced in a certain degree by the general fashions of dress prevalent at successive periods, a comparatively slight use of defensive armour having also for a while been adopted as a military accessory, shortly after the com- mencement of the 17th century this costume may be con- sidered to have assumed the character which since that time it has maintained, with scarcely any modification except in the style of the short tunic. Before the accession of James VL. of Scotland to the throne of Great Britain, the tunic and the " phillibeg," or kilt, formed a single garment, whereas apparently during the reign of the son of Queen Mary Stuart the kilt became a separate garment, to be adjusted about the waist, and reaching not quite to the knees after the manner of a short petticoat, a vest and tunic being separate garments also. Stockings, gartered below the knees, which thus would be left bare, with shoes, completed the equipment of the lower limbs. A cap or bonnet, without any peak, decorated with a spray of heather, was worn as a head covering, the bonnets of the chiefs being distinguished by the addition of eagles' feathers. In front of the person, and depending from a belt encircling the waist, was worn the "spleuchan," or pocket-purse, covered with fur ; and a " plaid," or scarf, of ample dimensions, generally adjusted across the person of the wearer, and having the ends hanging down from a brooch fastened on the~~

~~left shoulder, as iu fig. 52, com- pleted the costume ; occasionally, however, the plaid was~~

~~Be ut =)~~

~~Fic. 51.—Chief of the Clan MacDonell.~~

~~Fic. 52.—Piper of the Clan Gregarach.~~

~~gathered up so as to admit more free movement in the manner represented in fig. 51.~~

~~The weapons were a broadsword, or " claymore," having~~

~~baudrick which passed over the right shoulder, and a dirk worn on the right side, the sheath of the dirk being also provided with a hunting-knife. Before the general use of firearms by the Highlanders, they carried for defence a circular target on the left arm. The two accompanying figures, which show the different modes of adjusting the plaid, are also examples, the one of the tartan in which green is the prevailing colour, with narrow checks of red (fig. 51), a chief of the clan MacDonell, and the other (fig. 52), a piper of the clan Gregarach, of a tartan which is red with narrow black checks. 'The colours, and the " set" or patterns of the checks, of the tartans of the different clans, the Royal Stuart being the richest of all, have been deter- mined for a considerable time, the actual era of their original introduction not having been definitively deter- mined. The costume of each clan is fully and faithfully represented in M'Ian's volumes, referred to below.~~

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~~To compensate in some degree for unavoidable conciseness, as much space as possible is here assigned to references to publications which comprehend within their range the consideration and illus- tration of minute details, and which also treat of costume under widely varying conditions and regarded from very different points ef view. No attempt is made to give a list that is even ap- proximately complete, but attention is directed to a sclected series of works of a typical and authoritative character, in which is con- centrated direct, specific, and suggestive information. In its historical aspect, the~~

~~study of costume implies a systematic com- parison of the costumes of different races and countries. Refer- ence must also be made to those monumental works of art that have come down to our own times comparatively unmutilated, which are also of equal value as illustrations of armour. (See ARMS AND ARMOUR.)~~

~~Eeyptian.—The great and magnificent foreign works on the "monuments" of Egypt by Lepsius (Denkmdler aus Aigypten und Aithiopen, with 899 plates), Champollion, and Rosellini ; Lyypt and Nubia, by David Roberts, R.A. In the two series of Sir G. Wilkinson's Manners and Customs of the Ancient Egyptians (6 vols. with 600 illustrations) the subject is exhaustively treated ; see also the smaller work (2 vols. copiously illustrated) by the same author. Equally excellent is the companion work, Lane's Manners and Customs of the Modern Egyptians, 5th edition, illustrated. See also the British Museum Photographs, part ii., 118 plates.~~

~~AssYRIAN.—Layard's Monuments of Nineveh, two series ; and, by the same author, Nineveh and its Remains, and Nineveh and Babylon ; British Museum Photographs, part iii., 245 plates.~~

~~GREEK and Roman.—The best illustrators are the Brotish Museum Photographs, parts iv. and v., 175 and 97 plates; with other photographs of Greek and Roman draped statues and busts, and also others of certain gems and vases by ancient artists. The fac-simile representations will be advantageously associated with Smith's and Rich's Dictionaries of Greek and Roman Antiquities. See also Hope's Costumes of the Ancients (Egyptian, Greek, and Roman); Hamilton's Etruscan and Greek Vases ; Millingen's Ancient Unedited Monuments (Greek), and Inghirami's great work, Monu- menti Etruscht (14 vols., including the Vasi Fittzli).~~

~~ORIENTAL.—Simpson's India Ancient and Modern (2 vols., 50 illustrations) ; Forbes Watson and J.W. Kaye's I'eople of India (with photographs) ; Chinese Costumes, and the Employments of Chinese Traders, edited by Sir J. Bowring (8 vols.); and J. Thompson's illustrated volumes on China, the Straits of Malacca, &c. Also Audsley and Bowe's splendid Keramic Art of Jagan, and Sir R. Ker Porter's illustrated Travels in Persia, &c. For the costumes of Central Asia, Schuyler's Turkistan and Captain Burnaby's Khiva.~~

~~EccLEsIasTicaL.—Vestiarium Christianum, by Rev. W. B. Mar- riott, written with true historical impartiality, and illustrated with 63 excellent photographs and engravings, commencing from the earliest known examples of authority, and tracing the history of ecclesiastical vestments from its origin. The subject is further worked out in D'Agincourt's History of Art by its Monuments from 4th to 16th century (51 plates of sculpture and 204 of painting), and m Lee's Glossary of Liturgical and Ecclesiastical Terms. In its full development, from the 13th century downwards, effigies of eccle- siastics, which abound in England and in some parts of the Continent, are among the most perfect of the medieval exponents and illustrators of costume ; aud they themselves have been fully and faithfully illustrated in the following works on early monu- mental art:—Stothard's Monumental Effigies of Great Britain ; Waller's Monumental Brasses ; Cotman's Brasses of Norfolk and Suffolk ; Boutell's Monumental Brasses and Slabs, and Monumental~~

~~Brasses of Great Britain ; Hollis's Monumental Efigies (incomplete) ; Haines's Manual of Monumental Brasses.~~

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COTA, Ropriao, a Spanish poet of the 15th century, said to have been born at Toledo. Nothing is known of his life or death, saving that he was poor and of humble rank, To him is attributed the popular Coplas de Mingo Revulgo, an anonymous pastoral sitire against Henry IV. of Castile, which has been often edited and often imitated, and whicli is unquestionably one of the first attempts at dramatic poetry in Spanish literature. To him, too, is sometimes ascribed the authorship of asimilar piece, the Dialogo entre el amor y un viejo, Besides these, he is supposed to have written the first act of the celebrated novel-drama, the Celestina (1480), which was finished in twenty-one acts by Fer- nando de Rojas. For an account of the influence of the Celestina ou the Castilian drami, and of the numerous elitions, imitations, and translations of it, see Ticknor, History of Spanish Literature, vol. i. pp. 235-244.

COTE D'OR, a department in the east of France, formed of the northera region of the old provinces of Burgundy. It is bounded N. by the departm2nt of Aube, N.E. by Haute- Marne, E. by Haute-Sidne and Jura, S. by Saéne-et-Loire, and W. by Niévre and Yonne, and lies between 46° 55' and 48° 2' N, lat. The surface is mostly rugged. A chain of hills ruis from north-east to south-west through the centre of the departm nt, separating the basin of the Seine from that of the Sajne, and forminz the connecting-link between the Cévennes and the Vosges mountains. Extend. ing southwards from Dijon is a portion of this range which, on account of the excellence of its vineyards, bears the name Cote d'Or, whence that of the department. The rivers are numerous but small, the only one navigable being the Sadne. The Burgundy Canal, connecting the Rivers Sadne and Yonne, traverses the department from south-east to north-west. The soil is generally stony, but rich. Wine in large quantities, cereals, fruit, beetroot, rape-seed, mustard, honey, flax, hemp, and hops are produced; and good horses, sheep, and cattle are reared. The iron mines furnish large

quantities of ore ; and anthracite, marble, lithographic stone, gypsum, and potter's clay are worked, The manu- factures include iron, steel, nails, tiles, oil, leather, grind- stones, paper, cloth, sugar, beer, and spirits. The depart- ment is divided into the arrondissements of Dijon, Beaune, Chatillon, and Semur, containing 36 cantons and 717 communes. The cliief town is Dijon. The total area is 3382 square miles, and the population in 1872 was 374,510.

COTES, Rocrer (1682-1716), an English mathemati- cian and philosopher, born at Burbage, Leicestershire, of which place his father was rector. When only twenty-four years of age he was appointed Plumian professor of astio- nomy and experimental philosophy in the university of Cambridge. He took orders in 1713; and the same year, at the request of Dr Bentley, he published the secord edition of Newton's /rincipia with an original preface. He died June 5, 1716, at the age of thirty-three, leaviig unfinished a series of elaborate researches on optics, in

, reference to which Newton cbserved, "If Mr Cotes had

lived, we should have known something." With regard to pure mathematics, the principal discovery of Cotes consists in a theorem which still bears his

name, and which fur- nishes the means of integrating by logaritlims and arcs of the circle the rational fractions whose dencminator is a binomial. His papers were collected and published by his successor Dr Robert Smith,

COTES-DU-NORD, a maritime department of the north-west of France, formed from the northern part of the province of Brittany, is bounded on the N. by the English Channel, on the E. by the department of Ille-et-Vilaine, on the S. by Morbihan, and on the W. by Finistére, and is situated between 48° 3' and 48° 57' N. lat. To the north the country is flat, but to the south it is rugged and undulat- ing. A chain of granitic hills, the Monts du Menez, runs east to west through the department, dividing it into two unequal parts, of which the southern is the smaller.

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Towards its western extremity this chain bifurcates to form the Montagnes Noires, to the south-west of the department, and the Montagnes d'Arés in Finisttre. The rivers of the Channel slope are the Rance, Arguenon, Gouessan, Gouet, Trieux, Tréguier, and Léguer, while the Blavet, Meu, Oust, and Aulne belong to the southern slope. Off the coast, which is steep, rocky, and much indented, are the Sept-Lles, Bréhat, and other small islands. The principal bays are those of St Malo and St Brieuc. The rocks of the district are granite, porphyry, gneiss, schist, and allied rocks, and workable slate and marble. Many of the plains on both sides of the chain of hills are sandy and sterile, and much of the soil is stony. The more important products are hemp, flax, cereals, wax, honey, lead, and iron; the chief industries are the rearing of horses, sheep, goats, and cattle ; sea-fishing ; the manufacture of sail-cloth, linen, spun-wool, sugar, and paper ; and smelting and forging. The depart- ment is divided into the five arrondissements of St Brieuc, Dinan, Guingamp, Lannion, and Loudéac, which contain 48 cantons and 384 communes. The chief town is St Brieuc. Corseul, or Corseult, a small town of some 3000 inhabitants, six miles to the north-west of Dinan, is in- teresting for the Roman remains discovered there, and for its preservation of the name of the ancient Celtic tribe of the Curiosolitze. The total area of Cotes-du- Nord is 26533 square miles, and the population in 1872 was 622,295. Bas Breton is spoken in the

arrondissements of Guingamp and Lannion, and in part of those of Loudéac and St Brieuc.

COTOPAXI, a volcano of the Andes, in Eenador, 35 miles 8.S.E. of Quito, remarkable as the loftiest in the world. Theearliest outbursts on record took place in 1532 and 1533; and since then the eruptions have been both numerous and destructive. Among the most important are those of 1744, 1746, 1766, 1768, and 1803, In 1744 the thunderings of the volcano were heard at Honda on the Rio Magdalena, about 500 miles distant ; in 1768 the quantity of ashes ejected was so great that it covered all the lesser vegetation as far as Riobamba; and in 1803 Humboldt reports that at the port of Guayaquil, 160 miles from the crater, he heard the noise day and night like continued discharges of a battery. There were consi- derable outbursts in 1850, 1854, 1856 and 1864; and the escape of steam and smoke still continues. The appear- anc2 of the mountain is in the highest degree sublime,—its summit presenting the aspect of a perfect cone, which stands out against the sky in bold relief and splendour of snow. In 1802 Humboldt made a vain attempt to scale the cone, and pronounced the enterprize impossible ; and the failure of Boussingault in 1831, and the double failure of Wagner in 1858, seemed to confirm his opinion. In 1872, however, Dr Wilhelm Reiss succeeded on the 27th and 28th of November in reaching the top, and in the May of the following year the same feat was accomplished by Dr A. Stiibel. According to Dr Reiss the height of the north-west peak of Cotopaxi is 19,498 feet above the level of the sea, and that of the south-west peak 19,429, while the snow-line on the western side is at a height of 15,180 feet, and on the southern at 15,174.

See Dr. Reiss, "Uber eine Reise," &c., in Zettschrift der Deut- schen Geolog. Gesclischaft, 1873 ; Sttibel, in Bulletin de la Soc. de Géogr. de Paris, 1874 ; also article ANDEs, TOL ie 70 Ive

COTRONE, a town of Italy. See CroTona.

COTTA, a family intimately connected with the history of German literature.

JoHann Geora Cotta was the founder of the illustrious Cotta publishing-house. At the time of the Reformation the family (originally of noble Italian

~~blood) lived in Eisenach ; and we hear of them later as being settled in Dresden. Johann Georg started business at Tiibingen in~~

~~1640~~,

~~COT—COT~~

~~His son, Jowann Friepricu (1701-1779), born March 12, 1701, devoted himself to theological study, and began his public career as lecturer in Jena University. He then travelled in Germany, France, and Holland, and, after a stay of several years in London, became professor at Tiibingen in 1733. In 1736 he removed to the chair of theology in the university of Gottingen, which had been instituted as a seat of learning, two years before, by George IJ. of England, in his capacity as elector of Hanover. In 1739, however, he returned, as extraordinary professor of theology, to his Alma Mater, and, after succes- sively filling the chairs of history, poetry, and oratory, was appointed ordinary professor of theology in 1741. Finally he died, as chancellor of the university, on the 31st of December 1779. His learning was at once wide and accu- rate; his theological views were orthodox, although he did not believe in strict verbal inspiration. He was a volu- minous writer. His chief works are his edition of Johann Gerard's Loct Theologici, and the Kirchen Historie des Neuen Testaments.~~

~~The most famous member of the family was JoHANN FRIEDRICH FREIHERR CorTta voN CoTTEeNDoRF (1764—1832), a grandson of the theologian, who was born at Stuttgart April 27, 1764. He attended the gymnasium of his native place, and originally meant to study theology, but became greatly interested in the science of war. In 1782 he entered, as a student of mathematics, in the uni- versity of Tiibingen, and on the recommendation of Profes- sor Pfleiderer, was elected tutor of Prince Lubomirski in Warsaw. While engaged in tuition, he continued his own studies with great enthusiasm ; and, in his zeal for self-cul- ture, he spent a considerable time in Paris, studying French and natural science, and mixing with distinguished literary men. After practising as an advocate in one of the higher courts, Cotta, in compliance with his father's earnest desire, undertook to conduct the publishing business at Tiibingen, which, in the hands of subordinates, had very much declined. He started in December 1787, and laboured incessantly to acquire familiarity with all the details.~~

The house connections rapidly extended; and, in 1798, the Allgemeine Zeitung, of which Schiller was to be editor, was planned. Schiller was compelled to withdraw on account of his health; but his friendship with Cotta deepened every year, and wasa great advantage to the poet and his family. Cotta awakened in Schiller so warm an attachment that, as Doering tells us, when a bookseller offered him a higher price than Cotta for the copyright of Wallenstein, the poet firmly declined it, replying, '"' Cotta deals steadily with me, and I with him." In 1795 Schiller and Cotta founded the J/oren, a periodical very important to the student of German literature. The poet intended, by means of this work, to infuse higher ideas into the com- mon lives of men, by giving them a nobler human culture, and" to reunite the divided political world under the banner of truth and beauty." The Hoven brought Goethe and Schiller into most intimate relations with each other and with Cotta ; and Goethe, while regretting that he had already promised Wilhelm Meister to another publisher, contributed the Unterhaltung Deutscher Ausgewanderten, the Roman Elegies, and a paper on Literary Sansculottism. Fichte sent essays from the first ; and the other brilliant German authors of the time were also represented. In 1798 the Allgemeine Zeitung, which is still the leading daily paper in Germany, appeared at Tiibingen, being edited first by Posselt and then by Huber. It soon wielded a mighty influence, and must prove a valuable storehouse to the historian. In 1798 the editorial office was transferred to Stuttgart, and in 1803 to Augsburg, In 1799 Cotta entered on his political career, and was sent to Paris by the Wiirtemberg states as their representative,

where he made friendships which proved very advantageous for the Allgemeine Zeitung. In 1801 he paid another visit to Paris, in a political capacity, when he carefully studied Napoleon's policy, and treasured up many hints which were useful to him in his literary undertakings. He still, how- ever, devoted most of his attention to his own business, and, for many years, made all the entries into the ledger with his own hand. He relieved the tedium of almost ceaseless toil by pleasant intercourse with literary men. With Schiller, Huber, and Pfeffel he was on terms of the warmest friendship ; and he was also intimate with Herder, Schelling, Fichte, Richter, Voss, Hebel, Tieck, Therese Huber, Matthisson, the brothers

Humboldt, Johann Miiller, Spittler, and others, whose works he published in whole or in part. In the correspondence of Alexander von Humboldt with Varnhagen von Ense we see the familiar relations in which the former stood to the Cotta family. In 1795 appeared the Politischen Annalen and the Jahrbticher der Baukunde, and in 1798 the Damenalmanach, along with some works of less importance. In 1807 he issued the Morgenblatt, to which Schorn's Kunstblatt and Menzel's Literaturblatt were afterwards added. In 1810 he removed to Stuttgart; and from that time till his death he was loaded with honours. State affairs and an honourable commission from the German booksellers took him to the Vienna Congress ; and in 1815 he was deputy-elect at the Wiirtemberg Diet. In 1819 he became representative of the nobility; then he succeeded to the offices of member of committee and (1824) vice-president of the Wiirtemberg second chamber. He was also chosen Prussian privy court counsellor, Bavarian chancellor, and knight of the order of the Wiirtemberg Crown. Meanwhile such publications as the Polytechnische Journal, the Hesperus, the Wéirtember- gischen Jahrbiicher, the Hertha, the Ausland, and the Inland issued from the press. In 1828-29 appeared the famous correspondence between Schiller and Goethe. Coita was an unfailing friend of young struggling men of talent. In addition to his high standing as a publisher, he was a man of great practical energy, which flowed into various fields of activity. He was a scientific agriculturist, and promoted many reforms in farming. He was the first Wiirtemberg landholder who did away with servitude on his estates. In politics he was throughout his life a moderate liberal. In 1824 he set up a steam printing press in Augsburg, and, about the same time, founded a literary institute at Munich. In 1825 he started steam- boats, for the first time, on Lake Constance, and introduced them in the following year for the Rhine traffic. In 1828 he was sent to Berlin, on an important commission, by Bavaria and Wiirtemberg, and was there rewarded with orders of distinction at the hands of the three kings. He died on the 29th of December 1832.

His son, Fremferr Gora Corra von CoTTENDOoRF, who was born in 1796, and died in 1863, succeeded to the management of the business on the death of his father. He was materially assisted by his brother-in-law, Chamber- lain Freiherr von Reischach. He greatly extended the connections of the firm; and, in 1865, the house had establishments for different kinds of publications at Stuttgart, Augsburg, Leipsic, and Munich, The business is still in the hands of the Cotta family. (T. GI.)

COTTABUS (Greek, xérraBos, kdccaPos, or érraBos), a game of skill for a long time in great vogue in ancient Greece, frequently alluded to by the classical writers of the period, and not

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was expected to retain the recumbent position that was usual at table, and in flinging the cottabus, to make use of his right hand only. To succeed in the aim no small amount of dexterity was required, and unusual ability in the game was rated as high as corresponding excellence in throwing the javelin. Not only was the cottabus the ordinary accompaniment of the festal assembly, but at least in Sicily a special building of a circular form was sometimes erected so that the players might be easily arranged round the basin, and follow each other in rapid succession. Like all games in which the element of chance found a place, it was regarded as more or less ominous of the future success of the players, especially in matters of love ; and the excitement was sometimes further augmented by some object of value being staked onthe event. Various modifications of the original principle of the game were gradually introduced, and no fewer than nine different kinds, though some of these have no very striking individuality, have been described by Groddeck in his essay on the subject, published in his Antiquarische Versuche, 1800. In one variety a flotilla of shallow saucers was set swimming in a basin, and he was regarded as the victor who sank the greatest number by his casts ; in another the difficulty of the task was increased by setting up a small figure called a pavys, and requiring the jet of wine first to strike on this, and then to fall with a noise into the vessel beneath ; while in a third two scales were balanced in such a way that the weight of the liquid cast into either scale caused it to dip down, and touch the top of animage. In the boisterous mirth of convivial gather-

ings the players seem sometimes to have set a slave or one of their companions whom they wished to annoy, in the place of the dvys ; and from this ill-mannered custom the word dzokotraPi~ew is occasionally used in the sense of to insult, The game appears to have been of Sicilian origin, but it spread through Greece from Thessaly to Rhodes, and was especially fashionable at Athens, Dionysius, Alczus, Anacreon, Pindar, Bacchylides, A%schylus, Sophocles, Euripides, Aristophanes, Antiphanes, have frequent and familiar allusion to the xdrraBos ; but in the writers of the Roman and Alexandrian period such reference as occurs shows that the fashion had died out In Latin literature it is almost altogether unknown.

For ancient accounts see Athenzus, xv.; the Scholiast on Aristo- panes, Pac.; the Scholiast on Lucian's Lexiphrones ; Tzetzes, Chiliad, vi.; Suidas, s.v. xorraBl¢ew ; Nonnus, xxxiii.; and for modern investigation, Meursius, De ludis Greecorum; Becker, De ludicro cottaborum, Dresden, 1754-55 ; Fr. Jacobs, " Ueber den Kotta- bus," in Wieland's Attisches Museum, iii.; Osann, Beitrage zu griech. Litt. Geschichte, 1885; Panofka, Recherches sur les noms de vases grecques, 1827; Otto Jahn " Kottabos auf Vasenbildern," with illustrations, in Philologus, 1867 ; and Annali dell' Instituto di corresp. Arch. di Roma, 1868 and 1870.

COTTEREAU, Jean. See CHouans.

COTTIN, Sopuiz (1773-1807), née Restavup, was born at Tonneins, Lot-et-Garonne, and was educated at Bordeaux. . At seventeen she married a banker, who died three years after, When she removed to Paris. In 1798 she published anonymously her Claire d'Albe, to obtain money, it is said, for a friend who was proscribed and exiled. Her second romance, Jalvina (1800), was also anonymous; but the success of Amélie Mansfield (1802) induced the authoress to reveal her identity, In 1805 appeared Mathilde, a crusading story, sentimental and extravagant to a degree ; and in 1806 she produced her last story, the famous Elisa- beth, ow les exilés de Sibérie. At the date of her death — Madame Cottin was engaged on an educational novel, and on a treatise entitled La réligion prowée par le sentiment. Her worst fault is a tendency to exaggerate the virtues of her characters. A complete edition of her works was published, in two volumes, in 1847, a ae

~~COTTON~~

~~OTTON, an indigenous product of all intertropical regions, consists of the down or fine cellular hair attached to the seeds of plants belonging to the genus Gossypium, natural order Malvacee. The plants which supply the raw material for one of our greatest industries, and for the clothing of all nations, may claim to be ranked amongst the most valuable of nature's productions. The genus has occasioned no small degree of perplexity~~

~~Fria. 1.—Cotton Plant.~~

~~to botanists, and the genealogy of the different varieties is still involved in much uncertainty. Linnzeus admitted five species of Gossypium, an estimate which by some subse- quent botanists has been more than quadrupled. The in- vestigations of Professor Parlatore, who, in a handsome folio with coloured plates, described the cottons which he had seen cultivated in Italy, led him to the conclusion that there were seven species of cotton only, the rest being merely varieties. These are :—~~

~~1. Gossypium arboreum, Linn., found in Ceylon, the Moluccas, Arabia, Senegal, &c.~~

~~2. G. herbaceum, Linn., growing in Siam, China, India, Italy, &c.~~

~~3. G. sandwichense, Parl., indigenous to the Sandwich Islands.~~

~~4. G. hirsutum, Linn., including Siamese, Bourbon, Upland Georgia, and Louisiana cottons.~~

~~5. G. barbadense, Linn., comprising Sea Island and Barbadoes cotton, with long staple.~~

~~6. G. tahitense, cottons from the Society Islands, Tahiti, &c., in the Pacific.~~

~~7. G. religiosum, Linn., including Peruvian and other cottons, principally with seeds in adherent files.~~

~~Some authorities have enumerated ten species, and the cultivators of cotton have been still more extravagant in the multiplication of species or~~

~~varieties. Not regarding the effects produced by soil, climate, or culture, they have given new or provincial names to the different sorts of the same species, and have invented a nomen clature which has only produced additional confusion. In Dr Royle's exhaustive work entitled The Culture of Cotton an India the reader will find a trustworthy source of in- formation upon the botanical part of the subject.~~

~~The cottons of the New and those of the Old World constitute the two great typical divisions of the kinds most known to commerce—these are the Oriental and the Occi- dental, the Indian and the American cottons. The bota- nical characteristics, though slight, are sufficiently marked~~

~~to prevent the one being mistaken for the other,—the seed of the Eastern plant is never black or naked, and the curvature at the base of the leaf lobes is compounded of two opposite curves, and not purely heart-shaped as in the case of the Western plant. Numerous varieties of each type are to be found constituting distinct races of the same species, and affording ample scope for experimenters in their efforts for the improvement of the plant.~~

~~Oriental, Asiatic, or Indian Cottons.—All these, although the several varieties may be distinguished from one another, belong to the species designated by Linnseus Gossypium herbaceum. There is one exception, however, to be made, and that is the singular purple-blossomed cotton-tree, the Gossypium arboreum, Linn., held sacred by the Hindus, known also as Gossypium religiosum, grown about the temples in India, which supphes the material for the sacer- dotal tripartite thread of the Brahmans, the emblem of their Trinity. The plant has dark-green leaves, bears handsome red-purple blossoms, and produces silky cotton. Attempts have been made to improve its cultivation by hybridizing, and to bring it into general use, but hitherto without success, and it remains almost entirely unknown to commerce. With the exception, then, of this curious species, the numerous varieties of Indian cottons are but different forms of Gossy- pium herbaceum. One of these is cultivated to a con- siderable extent in the Levant, and is known in the market as Smyrna cotton. The different kinds of Indian cotton are usually included in the generic term Surats. The principal sorts are Hingunghdat, Oomrawuttee, Broach, Dhollera, and Dharwar. The Hingunghat, which may per- haps be said to possess the highest qualities,~~

~~stands at the head of the different descriptions grown in the Central Provinces and the Berars. . The staple is of moderate length and strength, white, soft, and silky, and well adapted for spinning. Dharwar, in the southern part of the Bombay Presidency, is the only district in India where exotic cotton has been successfully cultivated ; the variety grown is chiefly acclimatized American cotton, from seed of the New Orleans species, Gossypium hirsutum. In the North- Western Provinces, Assam, and other parts of India, various kinds of cotton are grown, but none of them is of so much importance to the manufacturer as any of those already enumerated. The cottons produced in China and Central Asia also belong to the same species, but little or no supply is furnished for export to other countries.~~

~~The Occidental or American Cottons.—These, which have become known to the civilized world only since the discovery of America, consist of two great divisions— the Barbadensian or black-seeded cottons, bearing pure yellow blossoms, with a reddish-purple spot at the base of the petals, and the Hirsute or hairy cotton, more or less covered with a distinct clothing of hairs, bearing white or faintly primrose-coloured blossoms. The two cannot always be distinguished from each other by the appearance of the seed, as the black-seeded cottons are occasionally found with a tuft of short hairs or fuzz at one or both ends, and the hairy, though generally downy all over, are also sometimes found with seeds black or naked. On this account some authorities have concluded that the two kinds belong to the same species— the Barbadensian ; but carefully conducted experiments show that the variation in the seeds may be attributed to peculiarities of soil or cultivation, and that the specific characteristics of the two kinds remain unaltered generation after generation. The 'cottons most in demand among manufacturers are those of the Western world, viz., the Sea Island and~~

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~~New Orleans or Uplands, varieties which are alto- gether unequalled by the products of any other part of the globe. The Sea Island plant in the soft maritime climate of the low-lying islands off the coast of Georgia, where frost is scarcely known, has surpassed all other descrip- tions of cotton in the strength, length, and beauty of its staple. The "Georgian Uplands" cotton, sometimes called " Boweds," is the result of attempts to culti- vate~~

~~Sea Island cotton on the uplands of Georgia. Sea Island cotton has also been successfully introduced into Queensland, the Fiji Islands, Tahiti, and Egypt. Of the other great Western cotton, the New Orleans, which is probably of Mexican origin, there are two principal varieties— one with green seeds and hardy constitution, the other with white, tawny, or greyish seeds, longer and more silky in staple. The New Orleans and Boweds cottons constitute the great production of the United States, and are known in English and European markets as " American cottons," The sowing time is March and April, and the crop is gathered from August to the end of the year, or even later in the absence of frost. There are several forms of this Hirsute or Orleans type, such as the Cuba Vine, a large and showy plant, another bearing yellow or brown stapled cotton used for nankeen cloths, and a third kind, producing the " Bourbon " cotton; but all these are more remarkable than useful. The fine Venezuela aud the West Indian green-seeded cottons belong to the same race, the latter differing only by a faint blotch of purple at the base of the pale yellow petals. The black-seeded, long- stapled cottons (G. barbadense), though of the Sea Island type, are found in such diversified forms, and so widely spread over the different parts of the globe, that some of them have been classed as separate species. The Peruvian and the Brazilian may be adduced as instances ; the latter, known by the name of " kidney" cotton, is remarkable for the curious arrangement of its seeds, eight or ten of which adhere together in compact kidney-shaped masses, but there is little else to distinguish it from other forms of black or naked seeded cottous. The various black-seeded' cottons cultivated in Brazil, together with the Peruvian and some other descriptions, constitute the Gossypium acuminatum of Royle. Colonel Trevor Clarke has made the cotton plant his special study with a view to its improvement by hybridization, and it is to be hoped that ere long he may be induced to publish the results of his investigations. Cotton Ginning.—The lobes in every boll of cotton contain seeds which, except when covered with down, resemble the coffee-berry, and which have to be sepa- rated from the fibre, by a process called "ginning." When this is done there remains of the bulk, as gathered from the tree, about one-third of clean cotton fit for manufacturing purposes, and two-thirds of seed. The separation of the seed from the lint is accomplished by different methods. The most primitive as well as the most rude and simple machine employed is the churka used by the Chinese and Hindus, and known in Italy under the name of manganello,~~

It consists of two wooden rollers fixed in a frame and revolving in con- tact, between which the cutton is drawn to the exclusion of the seeds. Though various attempts have been made to increase the efficiency of the churka, which is still extensively used in India, there has been but little real improvement, and it is found impossible to clean cotton rapidly by means of it. Hence ginning establish- ments with machines worked by steam power have now been introduced into the principal cotton districts of India. In the year 1792 Eli Whitney, an Ameri- can, produced his saw gin, the machine which, under various modifications, is still employed for cleaning the greater proportion of the cotton grown in the Southern

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States. It consists of a series of saws revolving between the interstices of an iron bed upon which the cotton is placed so as to be drawn through whilst the seeds are left behind. As the fibre of the long-stapled cottons was found to be injured by the action of the saws, and to be more ur less cut or "nepped," another more recent American in- vention, the Macarthy gin, has come into use for cleaning Sea Island, Egyptian, and Brazilian cotton. 'The fibre is drawn by a leather roller between a metal-plate called the "doctor," fixed tangential to the roller, and a blade called the beater, which moves up and down in a plane immediately behind and parallel to the fixed plate. As the cotton is drawn through by the roller the seeds are forced out by the action of the movable blade, which in some machines is made to work horizontally instead of verti- cally. Attempts continue to be made so to improve both the saw gin and the roller gin as in the one case to prevent injury to the staple, and in the other to increase the efficiency or capability of the machine to clean large quantities of cotton quickly. The "needle" saw gin is a recent invention intended to prevent the fibre from being cut. It consists of steel-wire set in block tin with the bottom of the teeth rounded or made smootli. On the other hand the double-action Macarthy gin, with two movable blades or beaters, the " knife-roller " gin, the "lock-jaw " gin, and others have appeared as rivals to the saw gin. The machine which will clean the largest quantity in the shortest space of time is naturally preferred, unless such injury is occasioned as materially to diminish the market value of the cotton. This has sometimes been the case to the extent of 1d. or 2d. perib, and even more as regards Sea Island or long-stapled

cottons. The produc- tion, therefore, of the most perfect and efficient cotton cleaning machinery is of importance alike to the planter and the manufacturer, and although considerable improve ment has already been effected, there is still room for further efforts in the same direction. The seed obtained in ginning that is not required for sowing, comprising many thousands of tons, is pressed for oil, which when refined is in some cases used to mix witli olive oil, or is converted into cake for feeding cattle, or into a material for making paper, whilst the ultimate residuum, or refuse, is made into soap. Even the stalks of the cotton plant are made to answer some valuable purposes. Besides being usedfor thatch and baskets, a fibre is obtained that can be converted into gunny and other kinds of cloths, equal to those manufactured from jute. They furnish also a material that can be used for the manufacture of the com- mon kinds of paper. The cotton when cleaned or separ ated from the seed is pressed, chiefly by hydraulic power, into bales varying in weight in different countries, and in this state it is ready for market and for the various pro cesses of manufacture.

Cotton Supply.—The capability of the world to furnish in sufficient abundance the raw material required by the vast and ever-expanding cotton industry has from time to time, and under the pressure of dire necessity, been well ascertained. Happily it has been found possible to cultivate cotton over almost the whole of the intertropical and in many of the temperate portions of the globe, so that if from any cause there should be a deficiency in one part this may be compensated by the superabundance in others.

The most ancient cotton-growing country is probably India, India.

Tor five centuries before the Christian era cotton was largely used in the domestic manufactures of India; and the clothing of the inhabitants then consisted, as now, chiefly of garments made from this vegetable product. More than two thousand years before Europe or England had conceived the idea of applying modern industry to the manufacture of cotton, India had matured a system of

China,

hand-spinning, weaving, and dyeing which during that vast period received no recorded improvement. The people, though remarkable for their intelligence whilst Europe was in a state of barbarism, made no approximation to the mechanical operations of modern times, nor was the cultiva- tion of cotton either improved or considerably extended. Possessing soil, climate, and apparently all the requisite elements from nature for the production of cotton to an almost boundless extent, and of a useful and acceptable quality, India for a long series of years did but little towards supplying the manufacturers of other countries with the raw material which they required. Between the yeirs 1788 and 1850 numerous attempts were made by the East India Company to improve the cultivation and to increase the supply of cotton in India, and botanists and American planters were engaged for the purpose. One great object of their experiments was to introduce and acclimatize exotic cottons. Bourbon, New Orleans, Upland Georgia, Sea Island, Pernambuco, Egyptian, &c., were tried but with little permanent success. The result of these and similar attempts, more recently made, has been to establish the conclusion that efforts to improve the indigenous cottons are most likely to be rewarded with success. As will be seen from the table showiug the imports of cotton into Great Britain, on a subsequent page, the largest supply obtained from India srior to the American civil war was in 1857, being upwards of 680,000 bales, of the value of £5,458,426 ; but in 1866, owing to the efforts employed to increase the production of cotton, the import from India had reached a total of 1,847,760 bales, of the value of £25,270,547. The quantity now obtained from India averages something over one million of bales annually, beiug the largest supply pro- cured from any one country with the exception of America. The cultivation of cotton is not of so remote a date in China as in India. In the accounts of the revenues and of the arts of China during the period of the celebrated dynasty which commenced about 1100 years before the Christian era, and lasted for some centuries, no mention is made of the cottou plant; nor, indeed, is there any notice of cottou in these records uutil about 200 years before the Christiau era ; from which period to the 6th century the cotton cloth, whick was either paid in tribute, or offered in presents to the emperors, is always mentioned as a thing rare and precious. The annals record as a singular circum- stance that the Emperor Ou-ti, who ascended the throne in 502, had a robe of cotton. In the 7th century we find the cotton plant mentioned, but its cultivation appears to have been then

~~confined to gardens ; and the poems and romances of that period are occupied in celebrating the beauty of its flowers. It was in the 11th century that the cottou plant was first removed from the gardens to the fields, and became an object of common culture ; and it is only from this peziod that we can date the commencement of the manufacture in China. The cotton tree was intro- duced into that country ai the time of its conquest by the Mongol Tartars in the year 1280; after which period every encouragement was given by the Government to the cul- ture and manufacture of cotton. Considerable difficulties, however, were at first encountered through the prejudices of the poeple and the opposition of those engaged in the manu- facture of woollen and linen; and it was not until the year 1368 that they were altogether surmounted, After that date rapid progress was made, and cotton has ever since supplied the material manufactured for the clothing of a large proportion of the population of China. The Chinese, in addition to their own growth of cotton, obtain large imports from India and the Burmese territories. A famine which happened in China about the close of the 18th century induced the Government to~~

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~~direct, by an imperial edict, that a greater portion of the land should be devoted to the cultivation of grain. then the importation of cotton from India has been con- siderable, though but a small part of that which is consumed in their manufactures. of supply to other countries, excepting to a small exteut and for a brief period, when the whole world was ran- sacked to meet the exigencies of the cotton famine.~~

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~~China, indeed, was never a source~~

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~~Mexicans was found to consist chiefly of In Peru raw cotton and cotton fabrics have~~

In the time of the Incas, in 1532, there is

largely for four or five years, and may bs

The Gossypium peruvianum or acuminatum, cultivated

in the coast valleys of Peru, is an arborescent kind growing to 10 or 15 feet in height.

It produces the cotton of Brazil, Pernambuco, Maranhio, Peru, &c. The Anguilla cotton, better known as Sea Island, is represented to be a native of Honduras; it spread thence to the West Indies, and was carried to the United States shortly after the revolution. 'The West Indies, before the present century, was the chief souree from which England derived the cotton then required. The finest ever brought to the English market, or probably ever grown, Was raised in the island of Tobago between the years 1789 and 1792 upon the estate of Mr Robley. The West Indian cottons have generally been highly esteemed, but the cultivation has been neglected for the sake of sugar, which was found to be a more profitable crop.

Amongst the countries which in more recent times have become prominent for the supply of cotton, Egypt deserves to be specially mentioned, furnishing a staple which for quality and length holds a high rank and comes next to Sea Island. Cotton was doubtless grown in Egypt at a very remote period, but was cultivated only to a small extent, and chiefly for home consumption, before the early part of the present century, when the inferior indigenous was superseded by the present exotic plant, the produce of which has obtained a high reputation. Its introduction was due to Mahd Bey, who had been governor of Dongola and Sennaar, and had brought seed of the plant with him from Ethiopia. In his garden at Cairo it was discovered about the year 1820, by a French- man named Jumel, in the service of Mehemet Ali. That sagacious ruler saw the advantages likely to accrue from the cultivation of a product suited to the soil and climate of the country, and which was in great and growing demand. His measures were carried out with such energy, and upon such a scale, as to enable him so early as 1823 to export to England 5623 bales of this new descriptioh of cotton. Jumel, who had resided for some years in America, and had some acquaintance with cotton, after some not very satisfactory first essays ju

~~cotton-growing, assocl- ated himself with a Cairo merchant, and commenced a small plantation near the obelisk of Heliopolis. His efforts proving highly successful, he was at length entrusted~~

~~now but comparatively insignificant sources of supply, demas were formerly of much greater importance. ¥ quest of Mexico, in 1519, it is said that Cortes received garments of cotton as presents from the natives of Yucatan, as well as cotton cloths for coverings to his huts ; and the clothing of the cotton. long been known to exist, and specimens from the ancient Peruvian tombs were at an early period brought to Europe for exhibition. evidence that the plant was successfully cultivated ; and the tree-cotton of Peru has often attracted attention, and beer made the subject of examination for the purpose of deter- mining whether it is the veritable Gossypium arboreum of Linneus. It is represented to be not only exceedingly beautiful, but valuable on account of its abundant crops. It yields maintained for eight or ten years without being renewed,~~

~~Egypt.~~

~~Turkey.~~

~~Brazil.~~

~~COTTON~~

~~with the control of the viceroy's cotton plantations, which became immensely profitable under his direction. The new description of Egyptian cotton has since been known by the name 'Jumel" in France, and "Maho," or "Mako," in England. Its cultivation has rapidly extended throughout Lower Egypt, the soil as well asthe climate being found to be specially favourable. The scantiness of the population, and the difficulty of providing adequate supplies of food, seem the only causes likely to curtail the production of cotton. The thickly populated inverted alluvial delta of the Soudan, between the Blue and the White Nile, is saidsto be even more favourable to the growth of cotton than the lower parts of the valley, and to afford room for the plantation of ten times the area obtainable in Egypt proper. It is not, perhaps, too much to say that Egypt is the finest cotton-growing country in the world ; it is not surpassed in productiveness even by~~

the Southern States of America, So firmly is the growth of cotton established, and so fully are both the Government and the people alive to its importance and advantages, that there is no reason to apprehend that it will be allowed to decline, or that Egypt will ever lose its position as a source of supply. It will be seen from the table of imports on page 486 that the Egyptian supply, which in 1859-60 was only about 100,000 bales, has since become nearly 300,000. The bales, too, have been increasing in size, and now contain six cantars, or about 600 tb each.4

The growth of cotton in Turkey, as elsewhere, was greatly stimulated and increased during the time of scarcity, but it has since declined largely on account of the feebleness of the Government and the corruption of its agents, and the expectations once entertained have not been fulfilled. The country possesses, however, splendid cotton- growing capabilities, and might be made a very prolific source of supply. Much of the cotton produced is taken by Continental manufacturers. From Brazil cotton of excellent quality has long been obtained, and in various provinces of that vast empire its cultivation has for many years been a favourite and profitable branch of agriculture. The plant thrives in all the varied climates from Para in the north down to Rio Grande in the south, and requires scarcely any care to guard it either from sun or frost. Owing to the demands occasioned by the cotton famine, cotton was for the first time grown for export in the province of Sao Paulo; and the experiments commenced in 1861, with some New Orleans seed sent out from England by the Cotton Supply Association, and freely distributed, became the means of procuring from this one province a quantity as large as had been received from the whole of Brazil in any year previous to the American civil war. This cotton, known as "Santos" in the market, has been steadily growing in favour with the manufacturer. The rank which Brazil holds amongst the countries from which cotton is imported may be ascertained by reference to the table already mentioned. From several other sources, such as Italy, the Cape of Good Hope, Natal, and other parts of Africa, Queensland, Australia, Fiji, Tahiti, éc., smaller supplies of cotton are obtained, but they are all of minor importance.

These and all others, whether large or small, dwindle into insignificance when compared with America, which is par excellence the great cotton-

~~producing country of the world. About the year 1770? the planters in the Southern~~

~~1 The discovery of a new variety of cotton plant said to be much more prolific than any previously known in Egypt, has just been reported from that country. :~~

~~? It is related that in the year 1764 William Rathbone, an extensive American merchant in Liverpool, received from one of his correspondents in the Southern States a consignment of eight bags of cotton, which on its arrival in Liverpool was seized by the custom-house officers, on the allegation that it could not have been grown in the United States, and that it was liable to seizure under the Shipping Acts, as not being~~

~~States of the American Union began to turn their atten- tion to the production of cotton; and besides carrying the cultivation to a great extent, they introduced qualities before unknown. 'The supplies continued to be small up to the end of the century. In 1792 the quantity exported from the United States was only 138,324 ib, but by the year 1800 it had increased to nearly 18,000,000 tb. At the close of the war in 1815 the revival of trade led to an increased demand, and the progress of cotton cultivation in America became rapid and continuous, until at length about 85 per cent. of the raw material used by English manufacturers was derived from this one source. With a capacity for the production of cotton almost boundless, tho crop which was so insignificant when the century began had in 1860 reached the enormous extent of 4,824,000 bales. This great source of supply, when apparently most abundant and secure, was shortly after suddenly cut off, aud thousands were fora time deprived of employment and the means of subsistence. In this period of destitution the cotton-growing resources of every part of the globo were tested to the utmost; and in the exhibition of 1862 the representatives of every country from which supplies might be expected met to concert measures for obtaining all that was wanted without the aid of America. The colonies and dependencies of Great Britain, including India, seemed well able to grow all the cotton that could be required, whilst numerous other countries were ready to afford their co-operation. A powerful stimulus was thus given to the growth of cotton in all~~

directions; a degree of activity and enterprise never witnessed before was szen in India, Egypt, Turkey, Greece, Italy, Africa, the West Indies, Queensland, New South Wales, Peru, Brazil, and in short wherever cotton could be produced; and there seemed no room to doubt that in a short time there would be abundant supplies independently of America. But ten years afterwards, in the exhibition of 1872, which was specially devoted to cotton, a few only of the thirty-five countries which had sent their samples in 1862 again appeared, and these for the most part only to bear witness to disappointment and failure. America had re-entered the field of competition, and was rapidly gaining ground so as to be able to bid defiance to the world. True, the supply from India had been more than doubled, the adulteration once so rife had been checked, and the improved quality and value of the cotton had been fully acknowledged, but still the superiority of the produce of the United States was proved beyond all dispute, and American cotton was again king. Slave labour has disappeared, and under new and more promising auspices a fresh career of progress has been commenced. With a rare combination of facilities and advantages, made available with remarkable skill and enterprise, the production of cotton in America seems likely for a long series of years to continue to increase in magnitude and importance.

Table I. (page 486) shows the quantity of the raw material annually furnished to English manufacturers dur- ing the past three-quarters of a century by the chief sources of supply. The table also contains a statement of the exports, the annual consumption, the average prices, and the stocks at the end of each year, as well as details of the American produce, exports, &c.

The statement embodied in Table II. (p. 487), issued under the authority of the Liverpool Cotton Brokers' As- sociation, shows the total American crop (including Sea Island produce), the stock in the ports, and the total supply from 1826-27 to 1875-76. Table III. gives the appro- priation of the American crops.

imported in a vessel belonging to the country of its growth. When afterwards released, it lay for many months unsold, in consequence of the spinners doubting whether it could be profitably worked up,

Taste I.—IJmport, Export, and Stocks of Cotton in Great Britain in Thousands of Bales during the present Century ; with the Annual Consumption in Millions of lbs., and the Weekly Average in Bales ; also the Average Prices, ce.

Import. Exrr. cry CoNsUMPTION. onsae | AMERICAN Crops, Exports, Erc : M. fe. 4 Consumr- g gsl4s8| 4 Ss 2 oe au| £ ood lesl.g| 2 lla. eo TION. 3 3 as z 3 Sz 3 | 8 53 | 52 3 $54 34 BE 3 a Great Conti-! | Sia |e "| Ze = 3\iSS || & |< a Eas ||So| &| & Britain. | nent, es North. South Dp. dD. D 84, 70 92| 14) 260,215 8 199|| 225)215| 48°4| 4,380 |/18 |32 {16 107| 75 91| 8] 281/215] 16 154| 240/215) 51°6| 4,610||16 /30 |14 107| 76 46| 10| 239/225] 7 146) 240/225| 54:0| 4,610 |124 |26% |113 she 104| 48 g6| 4) 242) 255 2 141|| 245/255) 62°4| 4,710 |14 (26 [11% a hg gel cme d pea gt 124! 51 75 2) 252) 235 4 ||... | 189]| 250 235 58-7 | 4,810 |\164 |263 14 1821, and of exports earlier than 125) 51 73| 8 2621217) 3 || 40} 129), 269,217; 58-6 | 5,170 \18% [22 144 Ant ee moll sees ae 171| 19 81| 11) 282 264|| 10 || 50, 121] 280/264) 73°9| 5,380 |143 [21 13 — Unite 3s} 50 sr! ia 163\260| 8 || 28) 71) 210\260| 54-6| 4040/22 [23/19 oh ge a Re 160,141 103| 86 440 211 19 || 80 192)| 300/211! 68:3) 5,770 ||\20 25 183 40,000,000 Ib, that of 1811 at 247\148 92| 79) 561)286)) 44 (150) 375 334) 236 78°8| 6,420 ||15$ |22 {15 Spee ie ies of 1821 at 128,118 65| 15, 226, 280 6 135 355|| 350; 280] 98:0] 6,730 |125 19 [12 cahaae ieee rohsats mei 95) 99 64 3) 261| 232 8 | 85, 280) 328) 232 76°1| 6,310 ||16$ |22 |14 1801, 62,000,000 fb in 1811, and 38/137 73| 2 250/205 31 || 56| 165 344/205| 70°5| 6,610 |23 27 |173 125,000,000 fb in 1821, including 1814) 49151 75| 18| 288210} 26 || 82, 114| 813, 210| 65-7) 6,000 |/293 323 |21 piven War cane 203) 91 53| 22) 369) 259 36 || 70; 118! 334) 246) 82-2} 6,420 20% [28 |17 93,000,000 1b in 1821. In 1815, 1816] 166/123 49| 31, 369/256 29 || 47| 116) 337|263| 88-7] 6,490]]18% |26 j155 according to a report published 1817} 200/114 45| 120 4791266} 27 || 64| 161| 407/263] 107-0| 7,820 |/20g [25 17 ee ce © aaah aes 1818| 208 162 51 | 248| 669/268) 55 ||146| 352| 423/260| 109-9] 8,180 /}20 [25 /15$ Gmounted to 27,000,000 1, or 1819} 205/126 31| 184| 546/264) 67 |127| 397| 434/252] 109-5] 8,350 |13% [185 | 9s 90,000 bales of 300 1b cach, In 1820} 303/180 31| 58) 572\/249|| 28 |167| 473), 467; 258| 120°3/ 8,980 |\113 [152 Se] ee esti-

~~1821) 300121 41{ 301 492/262|| 53 |/167| 413| 499,258] 129-0] 9,600] 94 [125 | 7% || 670 ee ee 1822} 330143 41| 19) 538/267|| 59 (1581 342/ 545|267| 145°5 | 10,480 || 8 [115 | 6§ |) 5.9 19931 452145, 6| 28| 38) 669/281] 35 |261) 416) 560/275) 154° 10,770 || 84 [12 | 6% |) 588 igod| 2821143] 88| 26| 51) 540/266|) 54 "|121| 297} 605) 273) 1652 | 11,680 83 (115 | 68 || 509 igos| 423194/111| 32] 61| 821/270], 78 |811) 446) 600/278) 166-8 | 11,580 118 [154 | 8% || 569 ig2¢| 396| 55| 48} 18| 65] 582/295|| 95 |238| 499| 511) 294) 150-2) 9,820 $ 1103 | 54 || 720)... | ... | 653) ... 1897| 647120] 22| 31] 74| 894/303 | 69 1848) 572) 675/297) 197°2 12,980 || 64 1 || 957| €46| 208 | 854) 103 1g28| 4441671 33] 20| 85) 749/298) 64 ||295 526, 732/297] 217-9 | 14,080 6% 48 || 721| 425| 175 | 600) 121 1829| 463160] 25] 19| 80| 747|/297|| 118 203 409) 745) 204 219-2 | 14,880 || 5% 4 ||.g58| 498] 251 | 749| 92~~

~~12| 35| 871/300|} 38 |[258) 415) 11| 77| 903|310|| 75 |\212| 886) 858, 306] 262-7 | 16,500 || 6 8] 109) 902,319) 67 |,198) 330| $91; 311} 276°9 | 17,140 || 6s 13) 95] 9380) 327 68 |181) 300| 880) 326} 287-0 | 16,920 || 8% |10;~~

~~17|.g9| 9511337]| 87 |145, 246| 919/880! 303-4 | 17,670 || 8s 11Z | 68 1205} 756! 272 |1028' 196~~

~~93 | 118/1091| 331|| 108 |185| 280) 954) 383) 318-1 | 18,350 ||104 13% | 74 ||\1254| 728 | 800 |1023) 217~~

~~33 | 21911201| 342|| 106 |205| 3864/1011) 348) 347-4 | 19,450 gz |12% | 64 |\1361] 771 | 346 1117) 287~~

~~98 | 1451176/ 347 | 123 171) 359|1057| 346] 365-7 | 20,3830 || 7 10 | 48 |1425] 851] 317 |1168) 222~~

~~99 | 107|1429| 350 || 103 |248, 471'1207| 846] 416-7 | 28,200 7 | 94 | 4% '11805) 1165 | 411 |1576) 249~~

~~36| 1331116| 348|| 117 |206) 3551114 343) 381-7 | 21,430 7% |10 | 5% |\1368) 798 | 277 |1075| 276~~

99) 216(1599| 365 || 120 |366| 5$4)1251) 367) 458-9 | 24,060 | 6 g | 42 |2182| 1247 | 629 |1876) 295

33 | 274‘1344| 365 || 116 ||430| 619/192) 367| 438-1 | 22,930 || 64 84 | 48 11639 859 | 454 1313) 297

17| 256113931379 || 184 |/457| 6741160) 875, 435-1 | 22,310 3 | 74 | 4 111689] 936 | 529 [1465) 277

18| 19917441 382|| 120 |)654) 921/1367| 379| 517-8 | 26,290 || 45 1 | 32 ||2394| 1470 | 540 |2010) 325 | ... 17| 238|1682| 388|| 187 |750|1087)1429| 381] 544-0 | 27,470 4% | 64 | 38 ||2109| 1202 | 427 |1629) 336 | 71 155/1856| 386 || 123 88511195 /|1574| 385 | 606°6 | 30,280 || 45 4911134! 386 || 194 |439| 659)1586| 387) 614°3 30,500 || 4% 92311933) 377 || 222 |363) 5121158) 381) 441-4 228117401 395 || 190 |‘398) 599, 1464/ 394] 576-6 | 28,110 43 1905{ 396 || 254 ||468! 659 |1590| 896 | 629°9 30,550 || 54 30817491 392 | 272 |455| 6292/1514 888) 588-2 | 29,120 32911904] 399 || 268 |424) 594 1663| 396] 658-9 | 31,990 99119357) 392 || 283 |/578) 807 |1861| 897 | 739° | 35,790 485‘2964| 398 || 350 ||597| 8171904! 400] 760-9 | 36,610

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1858/1863)106) 106 1859/2086) 1860, 2581)103) 109 1861)1841/100 1862) 72134) 147

1868] 182,138) 248

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6% | 84 | 54 |‘3239| 1810 | 780 |2590| 452 | 142 63 | 84 | 5 ||3994| 2019 |1002 |8021| 760 | 156 64 | 8%| 5 |4824| 2669 {1105 |3774| 786 | 178 8,°,| 93 | 63853826] 2175 | 952 |8127| 650 | 189

3612449] 420 || 349 1/349} 4622175] 417 | 905°6 | 41,820 51112830] 421 || 436 |442) 559|2297|424| 976°6 | 44,170 | 563/3366| 424 || 608 |546| 794 2523] 429 | 1088°6 | 48,520 | 987,3036| 415 || 677 ||628| 7892864] 426 | 1007°4 | 45,450

1445| 369 | 565 |392| 494|/1185]381| 451-7 | 22,790 1391119391 358’| 661 |281| 377\1878] 370| 508-4 | 26,490 [234 24% [193 |) No record of crops or shipments kept osaberl 346 || 732 lec] eoolisee| 354| 558°6 | 30,120 1274 [28 [214 || fhewe. one eee

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1865| 462340) 414 | 181 [14082755] 357 || 891 ||370) 495) 2035] 355 793°2 | 39,130 ||19 |194 |143 1866 1163/407| 200 | 112 [1867/3749] 361 |] 1137 ||517| 722,2386) 369 881°1 | 45,890 |\15$ [17 |12 |2814 1262 | 292 |1554| 605 | 106 1867/1226 437 129 115113501) 364 || 1015 |447| 635 2573, 376| 966°7 49,470 ||10% |11$ | 8 ||2204 1216 | 341 |1557| 696 | 148 1868|1269.637] 201 | 101 |1452‘8660) 853) 915 |352 578|‘2802) 354) 991-8 | 58,880 |103 |113 8 ||2499| 1229 | 428 |1657 822) 60 1869,1040/514 106 11496 3382! 354 || 792 |388| 540/2628) 357| 938°9 50,550 |\12% (125 | 9$ |2439 990 | 458 |1448| 957 | 60 1870|1664 403 112 |1063/3462| 380 || 658 |379| 547|2797| 386 | 1078-2 53,790 || 948)11% | 8% |/8155 1475 | 704 2179| 834 | 90 1871)2249 515) 272 | 133 |12386 4405| 381 || 910 |/567| 927/3115) 388 | 120771 | 59,900 8325| 95%! 549)|4852 2367 | 799 31661044 | 91 187211404,717| 305 | 166 |1288 3880] 854 || 743 ||421| 799) 3266) 362 1181°0 | 62,800 |10,|10$ | 74 |!2974 1454 | 503 |1957| 946 | 120 1873/1898 471| 828 | 138 |1069,3904] 386 |) 591 5938 928)‘3184) 391 | 1244°8 61,220 || 9 & | 6,3,|3931; 1906 | 774 2680/1075 | 138 7 1874\1958‘497| 300 | 118 10423915] 887 | 684 |\685| 911) 3248) 393 1277°4 | 62,460 || 8 + | 58/4170) 1868 | 973 2841/1184 | 129 1859/424 89 110553708] 393 || 706 |\617| 8083105] 396 | 1228°5 | 59,710 7 | 738| 5/3838 1894 | 791 |2685,1060 130 2075 331 70 775 3588 407 || 524 1534) 7733095) 414| 1280°3 | 59,520 1 | 64 | 4% 1/4669 2081 |1172 3253 1217 145

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COT re N 487 Tasie Il.—Total American Crops (in Bales) from 1826-27 to 1875-76.

Hsing in the Years. Total Crop. eee Total Supply. Scason.

1826-27 957,281 —

~~1827-28 720,593 ix ee | 1828-29 857,744 * 857,744 | 1829-30 976,845 16,562 993,407 1830-31 | 1,038,847 20,898 | 1,059,745 1831-32 987,477 119,423 | 12106,900 1832-33 | 1,070,438 41,599 1,112,037 1833-34 | 1,205,394 48, 205 1,253,599 1834-35 | 1,254,328 29,617 1,283,945 1835-36 | 1,360,725 4], 623 1,402, 348 1836-37 | 1,425,575 43,341 1,468, 916 1837-38 | 1,804,797 75,820 1,880,617 1838-39 | 1,363,403 40, 305 1,403, 708 1839-40 | 2,181,749 52,244 2,233 993 1840-41 | 1,639,353 58,442 1,697,795 1841-42 | 1,688,675 82, 068 1,770,743 1842-43 | 2,394,203 31,807 2. 426, 010 1843-44 | 2,108,579 94,486 2,203,065 1844-45 | 2,484 662 159,772 2,644, 434 1845-46 | 2,170,537 94.126 2,264,663 1846-47 | 1,860,479 107,122 1,967,601 1847-48 | 2.434.113 214,837 2,638,950 1848-49 | 2,808,596 171,468 2,980,064 1849-50 | 2,171,706 154,753 2, 326, 459~~

~~Stock in the~~

~~Years. Total Crop. Be ecer at Total Supply. Season.~~

~~1850-51 DRA ONeeil 167,930 2,583,187~~

~~1851-52 8,098,029 128,304 3, 218, 333~~

~~1852-53 Srousooe 91,176 3, 444,058~~

~~1853-54 8,035,027 135,643 3,170,670~~

~~1854-55 2,932, 339 135, 603 8,067,942 °~~

~~1855-56 8,645,345 143,336 8,788,681 1856-57 3,056,519 64,171 8,120,690 1857-58 8, 238, 962 49,258 8,288, 220 1858-59 8,994,481 102,926 4,097,407 1859-60 4,823,770 149,237 4,973,007 1860-61 8,826, 686 227,708 4,053,794~~

~~1861-65 toe a6 ee~~

~~1865-66 2,314,476 248,125 2,562,601 1866-67 2,204,089 282,439 2,486,528~~

~~1867-68 2,498, 895 80,216 Fano uelel~~

1868-69 2,439,039 38,130 2,477,169 1869-70 3,154,946 12,3438 3, 167,289 1870-71 4,302,317 59,747 4,412,064 1871-72 2,974,351 104,814 3,079,165

Ie 78} 38,930,508 54,521 3, 985,029 ilsysiare! 4,170,388 90,989 4,261,377

1874-75 3, 832,991 108,152 8,941,143 1875-76 4,669,388 66,059 4,735,347

TABLE III.—Showing the Appropriation of the entire Crop of Cotton raised in America.

DisTRIBUTION IN AVERAGE PERIODS OF FIvE YEARS. PROPORTIONAL DISTRIBUTION. Taken by en neae paken by Exront, Arereny Great North Other Neu and Deliveries Gr Y SH ee a Britain. aoe. Europo. Poe, Total. Seti. Britain, Franiee. Bee, ea sis? Peon ..| 856,668 | 163,822 42,374 762,859| 122,188] 885,042 |'62:90/18-51| 4:79 | 86-20| 18°80 | 1826-31 708,690 | 229,962 38,641 | 13,154| 985,447] 204,099 |1,189,546 | 59°16 | 19-33 3-25 | 1-10 | 82°81 | 17-16 | 1831-36 336-41..| 983,978 | 324,137 | 54,113 | 39,376 1,401,604 | 268,080 1,669,684 | 58-94 |19-41 | 3-24 | 2°36 | 83-95 | 16-05 | 1836-41 1841-46… 1,229,908 | 349,203 | 97,599 | 94,380 1,771,085 | 390,324 '2,161,409 | 56-90 |16-16| 4°51 | 4-37 | 81-94 | 18-06 | 1841-46 1846-51.. 1,243,632 | 295,980 | 112,629 | 129,007 |1,781,288| 548,583 |2,329,821 | 53°37 | 12°70 | 4-84 | 5°53 | 76-44 | 23°56 | 1846-51 1851-56..|1,696,092 | 422,546 | 188,886 | 190,478 2,498,002 | 720,686 |3,218,688 | 52-70 | 13°13 | 5°86 | 5-91 | 77-60 | 22-40 | 1851-56) 1856-61../2,020, 549 | 483,141 | 260,455 | 189,106 2,953,251 | 826,825 |3,780,076 | 53-45 | 12-78| 6-89 | 5-00 | 78-12| 21°88 | 1856-66 1866-70../1, 234,359 | 237,634 | 144,107 | 63,084 [1,679,134 | 874,860 [2,553,994 | 48-34 9°30| 5°64 | 2-46 | 65-74 | 34-26 | 1866-70 1870-75. 1,807,883 | 261,245 393,696 | 113,172 2,665,946 [1,183,548 |3, $49, 489 | 49°30 | 6°79 | 10-22 | 2°94 | 69°25 | 30-75 | 1870-75 S75-76 } 9,080,711 | 456,872 | 498,249 | 217,162 3,252,004 '1,362,389 |4,615,383 | 45-08 | 9-90 | 10°80 | 4-70 | 70°48 | 29°52 |(1875.76

Cotton MANUFACTURE AND TRADE.

~~The manufacture of cotton had its origin in the East, where the cotton plant is indigenous, and where the climate renders a light and absorbent fabric a suitable clothing for the people. It has in consequence been long established over every part of Asia, although it was ouly in India that the fabric was manufactured extensively with a view to foreign exchange.~~

~~Arrian mentions cotton cloth among the commodities which the Romans brought from India ; but the quantity imported by them was inconsiderable, from the preference which they gave to woollen clothing. The difference between ancient and modern Indian imports appears to have arisen, not from any diversity in the nature of the goods produced in that country, but from variety in the tastes or in the 'wants of the nations with which it has traded.~~

~~The implemeuts used by the Indians in the different processes of the cotton manufacture, from the cleaning of the wool to its conversion into the finest muslin, may be purchased for the value of a few shillings, and are of so rude and simple a construction as to be evidently the invention of a very early period. With the exception of the loom, none of them deserves the name of a machine, or displays the slightest mechanical ingenuity. They spin ile yarn upon the distaff; and yet, with all the advantages Which we in this country derive from machinery, we have~~

~~ouly recently been able to equal, either in fineness or quality, the yarn which is produced by means of this primitive instrument. The well-managed use of the finger and thumb of the Indian spinner, patiently and carefully applied in the formation of the thread, and the moisture at the same time communicated to it, are found to have the effect of incorporating the fibres of the cotton more perfectly than can be accomplished by our most improved macliines,~~

~~The loom is composed of a few sticks or reeds, which the Indian carries about with him, and puts up in the fields under the shade of a tree, or at the side of his cottage. HIe digs a hole large enough to contain his legs and the lower part of the " geer," and fastens the balances to some convenient branch overhead. Two loops underneath the geer, in which he inserts bis great toes, serve as treadles ; and he employs the shuttle, formed like a large netting needle, but of a length somewhat exceeding the breadth of the~~

cloth, as "battoon," using it alternately to draw through the weft and strike it up. The reed is the only part of the weaving apparatus which approaches, in the perfection of its construction, to the instruments we use. The loom has no beam, and the warp is laid out upon the ground the whole length of the piece of cloth, The weavers live entirely in villages, as they could not, if shut up in towns, work in this manner.

It is probable that the whole of the implements which have just been described existed as we now find them before

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the people of India were divided into castes. The trans- mission of the same employment from father to son (which is the invariable practice in India), while it has the effect of conveying unimpaired the knowledge acquired in any art, tends to check its farther advancements To the same cause, however, which thus prevented improve- ment in India, is to be attributed that dexterity in his particular employment which the Indian artizan possesses. From the earliest age he learns to spin and weave under the direction of his father; and having no hope or desire of advancement in any other line, he gains, through constant practice, that wonderful skill which may thus be considered almost as a family inheritance. To be able to manage his ill-constructed loom, even in the pro- duction of ordinary fabrics, he is obliged to acquire such a sleight of hand, that it is not surprising if, out of the multitude trained in this manner, a few should be found capable of producing those muslins which are said, when spread upon the grass, to appear like the gossamer web. From the superiority of these goods, aud from their retaining the beauty of their appearance longer than European muslins, it has been supposed that the cotton of which they arc made is of better quality than any known to the European manufacturers. This, however, 18 a mistake ; there is no cotton in India of a quality superior to the best Sen Islands.

'As the largest country in the world producing cotton, it was reasonable to expect that India would also at an early period engage in its manufacture, and to such a degree of perfection was this branch of industry carried, that some of the fabrics produced have never been equalled, and have attained a world-wide celebrity. The kind of manufacture for which Manchester is

~~famous bears a name which indicates its Eastern origin, and Calicut has supplied the designation of our English calico. Formerly the East India Company was in the habit of making a great part of its remittances in manufactures, and actually advanced, through its resident, the funds required to enable the workmen to pro- duce the goods. The resident, when not engaged in providing goods for the Company's investment, was authorized to employ the weavers on his own account. This state of things, which was often attended with abuses, has disappeared, anc for a long period British manufactured cottons have been largely imported into India. Common muslings were made in every village throughout the Peninsula. Orme says, " When not near the high road or a principal town, it is difficult to find a village in which every man, woman, and child is not employed in making a piece of cloth." The very fine muslins made at Dacca, and which were of such exquisite texture as to be poetically designated "webs of woven wind," were intended chiefly for the use of the potentates of the country, who kept agents to superintend the workmen employed in the manu- facture; but since the assumption by Government of the territories of these Indian princes, the demand has fallen off, and a considerable part of the population have betaken themselves to the cultivation of indigo. The cotton from which the Dacca muslins are woven grows in a district of not more than forty miles in length by three in breadth, and in so limited a quantity as never to have become an article of commerce.! Long cloths and fine pullicats were~~

~~1 The wool is equal in fineness to the very best Sea Islands, and of still stronger staple, but so short as to preclude the possibility of its being spun by our machinery. The district in which the cotton is grown is stated to be periodically overflowed. The yarn is of different grists, the coarsest greatly finer than the highest number spun in England (No. 250), while the finest has been rated by an experienced spinner to be not under 350. How this yarn can be spun by the distaf and spindle, or woven afterwards by any machinery, is almost beyond con- ception. Machine-spun cotton yarn has, however, more recently been produced in Manchester which very greatly exceeds in fineness any yarn ever known to have been produced by the hand labour of India.~~

~~has to some extent been realized.~~

~~*eo T TOR*~~

~~*made in the Madras Presidency, coarse piece goods and pullicats in Surat, the finest calicoes at Masulipatam, and table-cloths of a superior quality at Patna.*~~

~~*The apprehension often expressed that the inhabitants of India, in possession of the raw material, would, by the introduction of machinery, and by their cheaper labour and superior manual dexterity, be enabled some day to undersell us so as greatly to injure, if not to ruin, and put an end to the Indian demand for English manufactures, The most important industry in the Bombay Presidency is now the manufacture of cotton cloth and yarn. Whilst this has always existed*~~

~~*in nearly every village, it is only in recent years that steam spinning and weaving mills have been introduced. first factory was started in 1863 at Kurla, Bombay, and in*~~

~~*The*~~

~~*1874 the number had increased to thirteen in the town and*~~

~~*island, employing 60,000 spindles and 848 looms. These, together with other mills at Surat, Broach, and Ahmedabad, with an aggregate of 405,000 spindles and 4500 looms, had furnished employment for 10,000 people. number has been still further increased both in Bombay and other parts of the country, as well as in the presidencies of Bengal and Madras, cnd in some of the native states. It is probable that at present thereare nearly 1,250,000 spindles and upward: of 10,000 looms employed in the various mills scattered over different parts of the country. Encouraged by the protective import duty on foreign manufactures the number of mills is English trade in certain heavy goods has consequently sustained import duty on English manufactures has been repeatedly*~~

~~*Since then the*~~

~~*constantly on the increase, and the and coarse descriptions of serious injury. The*~~

condemned by Government, and its abolition has been expressly promised, but it is still retained for the convenient season when the Indian treasury shall be able to dispense with this small source of revenue. Meanwhile new mills, supported to a large extent by English capital, and fitted with English machinery, such as that recently estab- lished at Nagpore, are constantly springing up, which will doubtless, under all changes, obtain a share of the trade of the country, and will not probably be seriously injured by the free importation of English manufactures. They have an advantage both in their proximity to the raw material and in the cheapness of native labour. The

"manufacture of cotton cloth has long been diffused all

over the Central Provinces, hand-looms may be found at work in every considerable village, and the agricultural and labouring classes have hitherto preferred the home manu- factures toany other. The increase of foreign importations, however, has led to a growing taste for English piece-goods, and the productions of Indian mills have materially affected the local industry.

The cotton manufacture in China is of immense extent, China. and is carried on almost entirely for home consumption. Almost the only cotton goods exported from Cliuna are nankeens. Owing to greater encouragement on the part of the Government, and a less rigid adherence to an- cient usages by the people, there has been considerable 'nerease in native manufactures in China; and it will be seen from the table of exports that there has been a remarkable increase in the extent and value of English trade with that country during recent years, In this trade we have now to encounter American competition, which, however, is less formidable than it might be, on account of the protective policy of the United States.

In the interior of Africa, Clapperton and Landers found Africa, that cotton was not only grown but also spun and made into cloth. It would be interesting to know the methods which the natives have adopted, and from what source they obtained their acquaintance with the art of weaving. The settlers in Liberia appear to have established

First manu- facture in Europe.

[ntroduc- tion into England.

COTVRON

a communication across the country with Timbuctoo, and to have found there a market for cotton cloths. Increased commercial intercourse with the interior of Africa, and the opening up of markets there for British manufactures, are still objects to be earnestly pursued.

The manufacture of cotton goods in Europe is said to have been first attempted by the commercial states of Italy, before the discovery of the passage to India by the Cape of Good Hope. These enterprizing communities were the entrepots through which the cotton fabrics of India passed to the different markets of the West ; and being situated in the neighbourhood of countries where cotton was grown, and familiar with manufacturing processes, it is supposed that they were led to attempt the imitation of articles so much valued, and bringing so high a price. Another account assigns the introduction of the cotton manufacture into Europe to a later date, and gives to the people of the Low Countries the honour of having been the first manu- facturers of these articles, in imitation of the cotton fabrics which the Dutch, about the beginning of the 17th century, began to import from India. be correct ; for Guicciardini in 1560, in a very full list which he gives of the different articles annually imported into and exported from Antwerp,' then the greatest com- mercial mart in Europe, specifies fustians and dimities of many fine sorts among the manufactured articles imported from Milan, and mentions cottons generally among those brought from Venice. But in the articles exported from Antwerp, although we find linens sent to almost every country, cotton cloth is not once mentioned. Italy, there- fore, at that time had a cotton manufacture, which, it is probable, soon after made its way to the Netherlands ; for we know it was brought from the latter country to Britain by Protestant refugees about the close of the 16th or early in the 17th century.

That this manufacture was carried on in England at a pretty early period of the 17th century we know on good authority. Lewis Roberts, in his Treasures of Trafic, published in the year 1641, says, " The town of Manchester buys linen yarn from the Irish in great quantity, and weaving it, returns the same again in linen into Ireland to sell. Neither does her

industry rest here; for they buy cotton wool iu London that comes from Cyprus and Smyrna, and work the same into fustians, vermilions, and

dimities, which they return to London, where they are sold,

and from thence not seldom are sent into such foreign parts, where the first material may be more easily had for that manufacture." These goods were woven chiefly about Bolton, and were purchased there at the weekly market by the Manchester dealers, who afterwards finished

them, and either sent them to London for export, or sold

them to their customers over the country.

At this period, and for a long time after, the weaver provided his own warp, which was of linen yarn, and the cotton wool for his weft; but as much time was lost in seeking these materials, agents for their sale were estab- lished in the different villages by the Manchester purchasers. Each weaver's cottage formed a separate and independent little factory. The yarn for his warp was bought by him in a prepared state, the wool for his weft was carded and spun by the female part of his family, and the cloth was woven by himself and his sons.

It would be impossible to enumerate all the descriptions of cotton goods which, in succession, were brought forward from the commencement of the manufacture.? The pattern

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1 See Macpherson's Annals of Commerce.

2 The fustians that were made at this early period of the manufacture were those denominated herring-bone, pillows for pockets and outside wear, strong cotton ribs and barragon, broad-raced linen thickset and tufts, with whitened diaper, striped dimities, and jeans. At some

But this last account cannot

cards of the principal houses in the trade, which were cir- culated from time to time through the kingdom, and over the continents of Europe and America, exhibited specimens of nearly two thousand kinds.

For the introduction and after improvement of many Wilson of of these articles England is indebted to John Wilson of Aisworth.

Ainsworth, This gentleman was originally a manufacturer of fustians at Manchester, but had early engaged in the manufacture of cotton velvets. HIs improvements in the mode of dressing, of finishing, and particularly of dyeing these goods acquired for them so high a character, that both in the home and foreign market his articles sold in preference to those of every other manufacturer. HIs plan for cleaning off the loose and uneven fibres was by the use of razors. HIe afterwards successively employed, for this end, singeing by spirits of wine and the applica- tion of a hot iron resembling a weaver's drying iron. At a later period he effected his object by drawing the goods rapidly over a cylinder of cast-iron heated to red- ness, by which they were in a superior manner cleared of the down or pile which had been raised upon them in the various operations of weaving, washing, bleaching, or dye- ing. Wilson, having a turn for chemical inquiries, investi- gated the different known processes of dyeing; and by the improvements he introduced in the application of them to his own manufacture, materially advanced that art. The many valuable improvements introduced by Wilson into the different processes connected with the cotton manu- facture had the effect not only of establishing it more firmly, but of rapidly enlarging its extent.

A considerable share of the calico-printing business was Lancashir

transferred, about the year 1760, from London to Lanca- ™@™ufac- ures.

shire, in consequence of the cheaper accommodation for carrying on the work, and the lower wages of the workmen. A fall in prices thereupon took place, which produced an increased demand for calicoes. These goods were at that time niade of linen warp and cotton weft, it having been found impracticable, before Sir Richard Arkwright's dis- covery, to spin cotton warp of sufficient strength.

~~At this period the dealers from Manchester, in place of buying fustians and calicoes from the weaver, as had been the practice before, began to furnish him with materials for the cloth, and to pay him a fixed price per piece for~~

~~the work when executed. Along with the portion of linen —~~

~~warp, they gave him out a portion of cotton .wool, which he was obliged to get spun iuto the weft he was to use. But so fast was the manufacture by this time outstripping the process of spinning, that it frequently happened that the sum which the master weaver was allowed by his employer was less than what he found himself obliged to pay to those whom he employed to spin it. He durst not, however, complain, much less abate the spinner's price, lest his looms should be unemployed. In this state of things, the further progress of the manufacture must have been stopped, if a more productive mode of spinning had not been discovered.~~

~~It has been said that the yarn produced at this time in England, by the one-thread wheel, the only spinning machine known, did not exceed in quantity what 50,000 spindles of our present machinery can yield. To have reared and trained hands sufficient to have doubled this quantity, had it been possible, must have been the work of a length of time, and the amount of the manufacture would still have been insignificant. A change in the system, therefore, had become indispensable ; and we find that different ingenious individuals had already begun to employ themselves in contriving a better mode of spinning.~~

~~meee ee UL Lee distance of time there were added to these, cotton thicksets, goods figured in the loom, and, ata still later date, cotton velvets, velveteens, and strong and fancy cords.—(Aiken's Iistory et Manchester.)~~

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~~Har- greaves~~

~~490 COT~~

~~When we contrast the splendid inventions connected with the cotton manufacture, which from this period burst forth in rapid succession, with~~

~~the passive acquiescence 1n the use of imperfect machinery during the long period which preceded, we are apt to ascribe these improvements to the circumstance alone of a number of men of genius having at that moment arisen, and to forget that the ultimate cause existed in the times calling their energies into action.~~

~~Already, about the year 1750, the fly-shuttle had been invented by Kaye of Bury—one of the most important steps in the progress of the art of weaving; and in the year 1760 improvements had begun to be made in the carding process.~~

~~James Hargreaves, a weaver at Stanhill, near Church, in Lancashire, an illiterate man, possessed of no great mechanical knowledge, had adapted the stock cards used in the woollen manufacture to the carding of cotton, and had besides greatly improved them. By his invention a person was able to do double the work, and with more ease than by hand carding. In the stock cards, one of the cards is fixed, whilst the other, being suspended by a cord over a pulley, is worked by the carder; and in this way two or three cards can be applied to the same stock.~~

~~This contrivance was soon succeeded by the cylinder~~

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~~cards, or carding engine. It is not ascertained who was the inventor of this valuable machine, but it is known that the father of the late Sir Robert Peel was among the first who used it, and that, so early as 1762, he, with the assistance of Hargreaves, erected a carding engine with cylinders at Blackburn. This machine did not differ materially from that now in use, except that it had no con- trivance for detaching the cotton from the cards, an opera- tion which was performed by women with hand cards.~~

~~There had been several unsuccessful attempts to improve Spinning the mode of spinning before 1767, when Hargreaves in- jenny.~~

vented the "Spinning Jenny," patented in 1770. The idea of this machine is said to have been suggested to him by seeing a common spinning wheel, which had been accidentally overturned, continue its motion while it lay on the ground. After several unsuccessful attempts to carry into execution the conception he had formed, he succeeded in producing a rudely-constructed "jenny" of eight spindles, turned by bands from a horizontal wheel. In it the eight rovings were passed between two pieces of wood laid horizontally the breadth of the machine ; and these, being grasped in the spinner's hand, and drawn out by him, formed the rovings into threads, The structure of this jenny was soon afterwards greatly improved, and it was

at last brought to work as many as eighty spindles. This machine, although of limited powers when compared with the beautiful inventions which succeeded it, must be con- sidered as the first and leading step in that progress of discovery which carried improvement into every branch of the manufacture. The jenny of Hargreaves was very similar in its mode of working to the present "hand twiner" or mule-doubler, the spindles being mounted on a stationary carriage, and the "slide," or lock, receding from the spindles during the twisting of the threads, and returning to the spindle again during the winding on of the yarn. These hand twiners are being rapidly replaced by self- acting twiners; but the type of Hargreaves's remains sub- stantially the same as at first. His principle of drawing the fibre is still in universal use for carded wool. Hargreaves's invention occasioned great alarm among those who earned their subsistence by the old mode of spinning, and even produced popular commotion. A mob broke into his house and destroyed his machine ; and some time after, when a better knowledge of its advantages had begun to bring his spinning jenny into general use, the people rose a second time, and, scouring the country, broke to pieces every carding and spinning machine they could find. The jenny in a short time put an end to the

Fic. 2,—Opener.

spinning of cotton by the common wheel ; and the whole wefts used in the manufacture continued to be spun upon that machine, until the invention of the "mule jenny," by which it was in its turn superseded.

While Hargreaves was producing the common jenny, Ark- Arkwright was employed in contriving that wonderful piece Wright's of mechanism, the spinning frame, called first the water- inven

frame, and afterwards the throstle, which, when put into motion, performs of itself the whole process of spinning, leaving to the workmen only the office of supplying the roving or prepared material, and of joining or piecing the thread when it breaks. See ARKWRIGHT, vol. i. p. 540. On Arkwright's removal to Nottingham he obtained. from Messrs Wrights, bankers there, and afterwards from Mr Need of Nottingham and Strutt of Derby the assistance necessary to enable him to perfect his inventions and turn them to advantage, and in the year 1769 he obtained his patent for spinning with rollers. In 1772 his patent was contested, but a verdict was given in his favour, and his right to the exclusive use of the discovery remained after- wards undisturbed. Soon after his removal to Cromford, he followed up his first great discovery with other inven- tions for preparing the cotton for spinning, for which he took out another patent in the year 1775.- But in 1781

his right to this patent was disputed ; and judgment was finally given against him in November 1785, and the patent cancelled. Arkwright's inventions for preparing the cotton, which are sometimes spoken of as the most wonderful parts of the process of spinning, do not appear so striking as the first effort of his genius. Although only to have been conceived by an original and fertile mind, they are still but improved arrangements of a machine previously in use, or suitable adaptations of his own spinning machine. But

the power of Arkwright's mind was perhaps marked by nothing more strongly than the judgment with which, although new to business, he conducted the great concerns to which his discovery gave rise, and tlie systematic order and arrangement which he introduced into every depart- ment of his extensive works. His plans of management were universally

adopted by others; and after long expert- ence, they have not yet in any material point been im- proved.

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Fia. 3,—Three-cylinder Opener, Beate:, and Lap Machine,

Machinery.

The principal machines used in cotton spinning, taking them in the order in which they are employed, are the following :—The opener, scutcher and lap machine, card ing engine, combing machine, drawing frame, slubbing frame, intermediate frame, and roving frame ; the throstle, the self-acting mule and hand mule, doubling frame, and mule doublers or twiners. The first two are employed in

the process of cleaning the raw cotton, and separating its matted flocks. In the lap machine it is fashioned into flat folds; in the carding machine it is carded and further cleaned and the fibres straightened; and in the drawing frame it is formed into a loose rope the fibres of which are laid parallel. In the slubbing frame it is slightly twisted ; and in the intermediate and

finishing frames it is still farther twisted, particularly in the higher numbers;

for coarse warps; whilst upon the self-acting and hand mules both coarse and fine yarns are spun.

The Orener.—In this machine the raw cotton is spread uniformly on a feeding table; from this it is taken by a pair of feeding rollers, and by them subjected to the action of a beater. The beater consists of a cylinder bearing at intervals four or six rows of projecting teeth. It is 18 inches in diameter over the teeth, with an average of 40 inches in width, and when in motion makes 1400 revolu- tions ina minute. By an ingenious contrivance a strong draught of air is made to play through the newly-opened

Fic. 4,—Singie Scutcher and Lap Machine.

cotton, carrying away the dust and other foreign particles which adhere to it. This machine is capable of opening up about 15,000 fb of cotton in 56 hours. The cotton is carried forward between two perforated zinc or wire cylinders connected with the draught, the cotton being taken from another pair of feed rollers and a beater with two or three blades, and from this beater the cotton passes through a second pair of perforated cylinders, from which it is taken off by a pair of rollers and delivered to calender rollers, and formed into laps for the scutcher. Various kinds of openers have been patented which differ in some

and that of Lord Brothers (see fig. 2), which possesses an

respects from one another, each claiming to have some arrangement for drawing the cotton by means of a vacuum

special advantage; of these Crichton's may be mentioned,

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Fia, 5.—Self-stripping Flat Carding Machine.

up 25,000 ib per week of 56 hours. In this machine an

from places situated at long distances from the blowing ingenious contrivance presents the cotton to the cylinder by

room, and claims among other advantages that it will open

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Fic. 6.—Roller and Clearer Carding Machine.

fibre, and at the same time by moving a horizontal bar con-

one roller working in a trough formed by a series of nected with a pair of cones acting upon the feed roller so

weighted levers. ‘These reduce the risk of breaking the

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In some cases it is fed with cotton in a loose fleece, and in others, instead of the loose cotton, three or four laps are placed upon the feeder, and the

beater or beaters are used in place of the cylinder. The cotton is further cleaned

regulate the supply of the cotton as to dispense with the

necessity of weighing it, and make a more uniform lap. The ScutcHER, which has also a lap machine combined

with it (fig. 4), in many respects resembles the opener.

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Fic, 7.—Combing Machine,

and carried forward in the same manner as in the opener, taking laps for the second or. finishing scutcher, which is of similar construction to the first, the laps going from this machine to the carding engine.

The Carpine Enarnx (figs. 5 and 6) consists of one large

or main cylinder covered with cards, a smaller one called the doffer, and a stil] smaller one called the taker in. The main cylinder is surmounted with small ones, called rollers, covered in like manner with cards, by whose revolu- tions in opposite directions to those of the large cylinder,

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Fia. 8.—Drawing Frame.

and with different velocities, the cotton is carded and put on the second cylinder or dofr. In some cases the main cylinder is furnished with what are technically termed "flats,"—a series of flat cards revolving to form an endless travelling lattice. The third cylinder, or taker in, which is really the first to act upon the cotton,. is usually

covered with a stronger wire; it receives the cotton from a pair of feed-rollers, striking out the heavier part of the dirt remaining from the scutching, and delivering the cotton to the main cylinder. The cotton is taken from the doffer in a very light fleece by means of a vibrating comb, and this fleece is drawn together into a funnel

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which forms it into a narrow web; then passing through two pairs of calender rollers, it is coiled intoa can. The carding engines are often made with two main cylinders

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and a connecting cylinder called the tummer, but in all other respects they resemble those already described. The cans with the slivers are next taken to the

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Fie, 9.—Slubbing Frame.

Drawine Frame (fig. 8), where the processes of elonga- | upper one is neatly covered with leather to give the two a

tion or attenuation are carried on through the successive

proper hold of the cotton. There are generally four pairs

pairs of rollers with which it is provided. The lower roller | or rows of rollers in each drawing frame, and three heads, of each pair is furrowed, or fluted longitudinally, and the | each head containing five or six deliveries. Six ends or

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slivers are, as a rule, put up to each box, and drawn down into one by each line of rollers going at an accelerated speed, the front roller revolving about six times faster than toe back roller. The first doubling being 6 into 1, the uext will be 36, and the third 216. Tine spimners will some times have four heads of drawings and double 8 ends

Fie, 10.—Roving Frame.

~~into 1 at the first head, and 8 into 1 afterwards, which makes the total number of doublings in the drawing frame 4096.~~

~~SLuBpine Frame (see fig. 9).—The operation which suc- ceeds that of the drawing frame is slubbing, where the~~

~~sliver has a certain amount of twist imparted to 1t, and is wound on a bobbin. In this process the end or sliver from~~

~~COTTON~~

~~the last head of the drawing frame is drawn out by means of three pairs of rollers, and this is twisted asit emerges from the front line of rollers by the action of vertical spindles and flyers, which at the same time wind the ends upon bob- bins in successive layers. As the bobbins fill and increase in diameter their rate is gradually made slower at each layer by a very ingenious piece of mechanism known as "the sun and planet motion," consisting of a large wheel within which two other wheels are made to work, the interior one having aregular motion, and the sun wheel being driven from a pair of cone drums with a rate of speed constantly decreas- ing. Thus the slubbing frame answers three purposes,—it draws out the cotton, twists it, and winds it upon a bobbin; the first is done by the rollers, the second by the spindles, and the third by the flyers and pressers. Following this is~~

~~The INTERMEDIATE FRAME, of similar construction, but having a larger number of spindles and sometimes smaller- sized bobbins. Instead of having cans put at the back it~~

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~~has what are termed creeds, in which the slubbing bobbins are put so as to be drawn off through the rollers of the frame and doubled two into one. It is called intermediate because it comes between the slubbing and roving frames. Spinners of low numbers or counts sometimes omit this frame, and set the slubbing frame bobbins into the "creels" of the roving frame.~~

The Rovine Frame (fig. 10).—This, which is the last required before the operations of spinning, strictly so called,

commence, resembles in principle the slubbing and inter-

mediate frames. It has a greater number of spindles than either, seldom less than 100, and often 164; and these spindles are set closer together, and the bobbins are shorter and smaller than in the intermediate frame.

For medium counts, from 60's to 100's, the cans are taken to a lap machine or doubler, where from 80 to 120 ends or slivers are formed into a lap, which is placed at the back of the finisher card ; this machine has the main

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Fra, 11,—Throstle with Spindles and Flyers.

cylinder surmounted with flats (see fig. 5) instead of rollers and clearers. From this finisher card the cans are taken to the drawing frame in the way already described. For the higher numbers this card, the finisher card, is used as a breaker or first card; and from it the cans are taken — to the lap machine, where from 15 to 30 ends are formed into a small lap for the combing machine (fig. 7), and the cans from the comber are taken to the

drawing frame. The degree of elongation completed by the roving frame is technically described by the number of hanks roving per ‘ pound, each hank consisting of 840 yards ; for instance, the hank roving usual for the lower counts up to 30’s would be 23 to 4 hanks in the pound. For the medium counts four frames are generally used to reduce the roving to the necessary degree of fineness, say 12 to 14 hanks roving, for the mule, viz. slubbing, intermediate, roving, and fine jack frames. For the higher counts sometimes a fifth frame is used, called a second roving frame, reducing the finished roving to from 30 to 35 hanks. The first preparation goes to the throstle or to the self-acting mule, the second to the self-acting mule chiefly, and the third or higher numbers to the hand mule.

The TurostLe.—The spinning frame, or throstle (see figs. 11 and 12), is made with two sets of drawing rollers, one on each side. Between these the roving bobbins are placed, and the rove is drawn through them to the requisite fineness, and formed into thread by the action of the spindles and flyers, which are placed in front of each set of rollers, at such distances apart from one another as may be required for the different-sized bobbins and counts of yarn to be spun ; the latter vary from 6’s up to 60’s. The number of spindles commonly put into the throstle is from 100 to 150 on each side, being a total of between 200 and 300 in a frame. The twist is put into the yarn by the revolutions of the spindles and flyer, and the yarn is wound on to the bobbin by the friction of a piece of woollen cloth extending along the rail upon which the bobbins rest ; the amount of friction required for the varying counts of yarn is regulated by the differing weights and the shape of the bottom of the bobbins, and also by the fineness or coarseness of the cloth placed underneath.

An improvement on the throstle, which was thought to be very promising, was made by Mr Danforth, an American spinner of Scotch birth. HIs object was to obviate

the vibration of the spindle (caused by the flyer being placed on the top of it, with nothing to keep it steady), whereby it is prevented from being driven with advantage beyond a certain limited speed. ‘To remedy this, Danforth introduced into his throstle a stationary spindle, on the top of which he fixed

an inverted conical cup. In this improved throstle the bobbin revolves on the spindle with great rapidity, and by a transverse motion 18° raised and depressed so as to be, when at the highest point, entirely within the cup, and when at the lowest entirely below it. The edge of the cup, passing thus along the whole length of the bobbin, builds the yarn equally on every part while it ig receiving the necessary twist, and gives also the drag required to wind the yarn upon the bobbin. Danforth's improvement gives & great increase of quantity, but the waste it causes is such as to form, in the opinion of many spinners, an insuperable objection to its use, though as

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regards the stronger material of worsted it is still exten- sively used. The throstle frame is now exclusively used for the production of warps. In the most approved machines of this kind the spindles make 5500 revolutions a minute, each spindle producing twenty-seven hanks per week of 56 hours when spinning 32's. The Danforth frame is now entirely out of use except for worsted.

The ring and traveller frame is also an American in- vention. It was introduced into England under the name of the "Niagara Throstle" by Sharp, Stewart, & Co., but found very little favour amongst English cotton spinners. In America, however, it is very extensively used, and owing to some important recent improvements it is beginning again to attract attention in England, Its

peculiarities are that instead of a flyer on the top of the spindle there is a small steel traveller working in a ring placed in a third rail, commonly called the ring rail, and

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Fria. 12.—Throstle.

passing over the bobbin, which moves up and down the full length of the bobbin ; the twist is given by the revolu- tion of the spindle, the drag or winding of the thread on the bobbin (fixed to the spindle and carried round with it) being effected by the friction of the traveller in its revolu- tions round the ring. The travellers are of varying weights and sizes to suit the different counts of yarn. The spindles generally make about 6000 to 7000 revolutions per minute.

Messrs John Elce & Co. claim to have introduced an improvement in the throstle, in which two tin cylinders are employed instead of one for driving the spindles, whereby a longer band is obtained, and a saving of friction and power is said to be effected.

The Mute (fig. 13).—Probably no inventive con- tribution has been offered to the cotton trade more important than the mule, Samuel Crompton of Bolton

completed in 1775 his invention of the "mule jenny," in contriving which he had been engaged for several years. But this machine, possessing great merit and advantages, did not come into general use, nor was its value known, until after the expiration of Arkwright's patent,—the spinner till then being confined to the rove prepared for common — jenny spinning, which was unsuitable to the mule jenny. After the spinner was allowed to make use of Arkwright's fine process of preparation, by his patent being cancelled, the power of this machine became known; and its intro- duction forms an important era in the history of the cotton manufacture. Being fitted to supply those counts Or " grists " and qualities of yarn which the other machines could not produce, it enabled the manufacturer to enter upon fabrics which otherwise it would have been in vain to attempt. Warps of the finest quality are spun upon the mule ; while on the throstle yarn of a finer grist than No.

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40 could not without the combing machine be spun to advantage. Since the introduction of the latter, throstles have been constructed to spin yarns as fine as Nos. 80 or 100, The reason is that the fine thread has not strength to stand the drag required for winding the yarn upon thebobbin, —the

difficulty being occasioned by each thread having its own drag regulated separately. In Crompton's mule and Hargreaves's jenny this difficulty was avoided by the spinner putting the required tension or drag on the yarn by the '"faller," which operating on all the threads at once, and being controlled by the hand of the spinner, allowed the tension of the yarn during the winding on to be easily governed, All wefts, from the lowest to the highest num- bers, are now spun upon Crompton's machine, the use of Hargreaves's jenny having been almost entirely superseded by it as regards cotton, though not as regards woollen. It was some time, indeed, after the mule came into use before it was ascertained that the finest yarn required for the manufacture could be produced from it. But in the year 1792, Jonathan Pollard of Manchester succeeded

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in spinning yarn of 278 hanks to the pound, from cotton wool grown by Mr Robley, in the island of Tobago, This yarn was sold at twenty guineas per pound to the muslin manufacturers of Glasgow.

The mule, in its structure and operation, is a compound of the spinning frame and of Hargreaves's jenny; from which circumstance it probably received its name. It contains a system of rollers like that belonging to the throstle; but the attenuated roving, as it issues from between the rollers, is twisted by the action of the spindles, which, in the mule, are mounted on a movable carriage that recedes from the rollers a little faster than the roving is delivered by them. The mode of putting the twist in by means of the spindles is exactly the same as in the jenny, and in fact resembles the most ancient method of using a spinning spindle. When a sufficient length of yarn or a "stretch" had been spun the rollers and spindles were stopped, the yarn coiled round the bare spindles was unwound, or " backed off," as it is technically called, the faller was put down by the spinner and the " nose" of the

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Fig, 18, Hand Mule,

cop, and the spindles turned during the run in of the carriage with sufficient quickness to wind the spun yarn on the top of the yarn already wound on the spindles. When the spindle points have been brought by the running in of the carriage within a short distance of the delivery rollers, the rollers and spindles are again set in motion for another stretch. 'The manner of backing off and winding the spun yarn on the spindles is exactly the same as that used in Hargreaves's jenny. Crompton's great merit con- sisted in the adaptation of the best features of the throstle nd the best principles of Hargreaves's jenny, so as to obtain from the combination of the two the principal élements of a perfect spinning machine. The motive power being manual, the work was rendered more fatiguing as the mules became longer, and thus the size of the machine was restricted by the strength of the spinner. In spinning the finer counts of yarn it became customary to continue the outward movement of the carriage, and the rotation of the spindles, a short time after the rollers were stopped; the movement of the carriage was then arrested, but the rotation of the spindles continued until

the proper amount of twist had been put in the yarn. This last operation resembles that performed by the comnion jenny, and produces a similar effect.

In 1792 William Kelly of Glasgow, at that time manager of the Lanark mills, obtained a patent for moving the mule by power, in order to relieve the spinner of the most laborious part of his work, and thus enable him to attend to' a longer mule and spin the yarn at a reduced cost. Kelly's machinery was contrived so as to move every part of the mule, even to the returning of the carriage into its place, after the draught was finished. Had it come into full operation, fewer men need have been employed as spinners, and children would have been able to do a great part of the duty required, But, after a short trial, it was discovered that this invention,

~~though intended to bring out the carriage, and return it again during the winding on of the yarns, was found to be valuable only for bringing out the carriage. A spinner could, however, serve two mules, the one carriage moving out during the time that the other was returning.~~

~~Tt was next found unnecessary to confine the mule to 144 VL — 63~~

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~~spindles, the largest number it had till then contained ; for, with the assistance of the above mechanical 1m- — provement, the spinner could manage two mules of 300 or 400 spindles each. The process of mule spinning continued to be conducted upon this plan till several proprietors of large cotton works restored the part of Kelly's machinery which returns the carriage into its place after the draught 1s completed, thus further lessening the fatigue to the spmner. All that is to be done by the spinner in this case 1s, with a slight touch of the hand, to shift the belt, so as to allow the carriage to be moved back into its resting position, and, as this takes place, to manage the guide for building the cop, regulate the motion of the carriage as it recedes, and govern the speed of the spindle for windmg on the yarn. Some improvements were from time to time made 1n the headstocks, which either rendered the mule more automatic or else enabled the spinner to work a larger pair of machines; but notwithstanding the work still required the greatest attention and care, as well as an amount of skill that could only be attained by long practice. Spinners~~

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~~thus became a very important and powerful class, demand- ing and obtaining a high rate of wages, and sometimes occasioning to their employers more trouble than any other class. 'This, doubtless, contributed to the introduc- tion of the self-acting mule. At the same time, it must be observed that great improvements were introduced, and still continue to be made, in the construction of the hand . mule, perfecting and extending its~~

operative powers, and enabling it to do its work almost automatically with the aid of the most delicate control of the spinner, who has no longer to use his strength to drive the various parts, but is required chiefly to regulate or reduce the velocity of the backing off and winding on, though the same unre- mitting attention and care are as necessary as before. The hand mule, as it is designated, is therefore quite as complex a machine as the modern self-acting mule. Srnr-actinc Mute (fig. 14).—In 1818 Wilham Eaton obtained a patent for a self-acting mule, in which the opera- tions ordinarily performed by the spinner were effected by automatic means, and this machine, though not exten- sively adopted, contained several ingenious arrangements.

Fia. 14, Self-acting Mule.

His faller lock, after a lapse of thirty-six years, was said to be re-invented, and still continues to be the best in use at the present day. His apparatus for governing the formation of the cop was founded on correct principles, and was a beautiful contrivance, much superior to many that have been since introduced. Mr Smith of Deanston, Scotland, was also the anthor of several valuable inven- tions, and others might be named who made efforts, more or less successful, to provide the desired machine.

About 1824 Richard Roberts directed his attention to the best means of rendering the hand mule self-acting, and in 1825 a patent was taken out for his invention. In the mule now introduced the governing power was exercised by what was then and has ever since been called a "'cam shaft," by which all the movements were 8) regulated as to succeed each other in their proper order, the termination of one operation being the initiation of the next. In 1830 Roberts took out another patent for his "quadrant" windmg apparatus, and thus completed his self-acting mule, which in its chief essential features remains the same at the present day; for though as regards the headstock there have been improvements, yet the

whole combination still bears indelible marks of his genius. Many improvements have of late years been introduced and patented, and the self-acting mule now in use is superior in its manner of working to the one made by Roberts. It is now employed for spinning all sizes of yarns up to 100's, and in a few cases as high as 160s, and in the manufacture of these

numbers a great saving is effected by its use. It has now almost entirely superseded the hand mule, which only retains its position for the pro- duction of the finest yarns, and in a few years will un- doubtedly have to give place altogether to the self-actor, on which yarn up to 160's, or even 200's, has already been successfully spun.?

Effects of Machinery, d:c., on Production and Cost.

About the year 1790 the average product of yarn No. 40 was little more than a hank per spindle per day; but

1 Fuller details of cotton machinery may be found in a work entitled the Science of Modern Cotton Spinning, &c., by Evan Leigh, C.E.; ina paper by Mr John Platt, on machinery for the preparing and spinning of cotton, published in The Proceedings of the Institution of Mechanical Engineers ; and in Spon's Dictionary of Engineering. –

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by the year 1812 it had advanced to two hanks per day, and in 1830 to 23. 'The effect of this increase of produc- tion upon the cost of the article was very great, as will be seen by the following statement of the reduction of the cost of spinning, and in the price of yarn.

We have already noticed that, until the cancelling of Arkwright's patent, by which the mule spinner became at liberty to use his improved mode of preparation, the few fine wefts required were spun on Hargreaves's jenny. In the year 1786 this yarn was sold in Glasgow and Paisley at 31s. per pound for No. 90, 7s. per pound being the price of spinning it; the warp, spun upon the water or throstle frame, was sold at 47s, 6d. the pound for No. 90.

It was stated by Crompton that, immediately upon

completing his invention of the mule in the year 1775, he

obtained 14s. per pound for the spinning and preparation of No. 40 ; that a short time after he got 25s. per pound for No. 60 ; and that to show that it was not impossible to spin yarn of so fine a grist, he then manufactured a

small quantity of No. 80, for the spinning and preparation of which he got 42s. per pound. For some little time after the mule came into general use, in the year 1786, it was the practice in many places for the spinner to purchase the wool in a prepared state ; and separate concerns for preparing cotton were established and carried on. At that time 10s. per pound was paid for spinning No. 100; but soon afterwards the cost for this number was reduced, first to 8s. and then to 6s. 8d. In 1790 the price of spinning No. 100 was 4s. per pound. In 1792 it was brought to 3s. ld., and in 1793 to 2s. 6d., at which price it continued till 1795, when, the mule coming to be worked by machinery, and an increase being made in the number of spindles, the spinner was enabled so to extend the quantity of his produce as to admit of another considerable reduction in cost. The price of spinning No. 100 was in the course of a few years brought down to 8d. per pound, and continued so until 1826, when it was further reduced to 63d. per pound. Notwithstanding this extraordinary diminution of the price of spinning, such have been the effects of the improvements in machinery, in the selection and preparation of wool, and in the skill and tact brought to bear on the work, that the spinner is able to earn niore money now than he did when the wages were at the highest. —

The sale prices of the yarn during this period were as follows :—

In 1786, for No. 100 … 38s. Ve) "117/2)/eReeeee scene 19s. NS Sh seen aNaccatascees 35s, al OD) ara eerer 10s. 11d. WOME sores wcueeese cement 298. 9d. SES OM ote sievssaiels tee sie sein 8s. 9d. AU AER GeOE TOE cn 15s, 1d. IRS Simeesires cite teens 8s. 4d. 1795, spun from Bour- US Osh sepa ncononreeeent 7s. 10d.

bon cotton wool…. 19s. NS Ob Mitre seeetomaaaicesys 6s. 9d.

After 1807 the price of yarn underwent various fluctua- tions; it fell in 1829 to 3s. 2d., and in 1831 to 2s, 11d., at which price it remained in 1832. Since 1832 the fluctua- tions have not been extreme, the price never rising -above 5s. 6d., at which it stood in 1836, nor falling below 2s. 9d., as in 1842. Prices for No. 100 at the close of 1876 were warp-twist 2s. 10d., medium 2s. 6d., and weft 1s. 10d.

But the benefits of improved machinery have not been confined to the reduction of the cost of the yarn; they have at the same time considerably increased the quantity which a workman can produce in the same hours of labour.

Application of Steam Power.—During the time that the machines for the different processes of cotton spinning were advancing towards perfection, James Watt had been employed in maturing and reducing to practice his concep- tions for extending the powers of the steam-engine. ;

Among the engines erected by Bolton and Watt in

1785 was one for Messrs Robinsons, at Papplewick, in Nottinghamshire, for spinning cotton,—the first instance of the application of steam to this manufacture. In 1787 they put up one for the Messrs Peel, at Warrington, for cotton spinning, and three others for the same pur- pose at Nottingham. No rotative engine had yet been erected at Manchester; and it was seven years after Bolton and Watt had received their patent that they constructed for Mr Drinkwater the first engine used there for spinning cotton. In 1790 they erected one for spinning cotton at Nottingham for Sir Richard Arkwright, another at Man- chester for Mr Simpson, and a third at Papplewick for Messrs Robinsons. Some time before this Sir Richard Arkwright and others, from an ill-judged economy in the first cost, had introduced into their spinning factory atmo- spherical or Newcomen's engines, with rotative motions applied to them, But quickly perceiving their error, they abandoned them ;—and Bolton and Watt's engines soon came to be universally used among cotton spinners and all other manufacturers,

Cotton Supply Improved.—In an account of the means which contributed to the fall in the price of spinning we must not overlook the progressive improvement in the cultivation of the raw material which has taken place, and in the application of its different qualities to their most profitable uses. Previous to the year 1793, the cotton used in the coarser articles of the manufacture, with the exception of a small quantity imported from India and from the Levant for the fustian trade, was wholly the growth of the British and French West India Islands. That for the better kind of goods was

raised in Demerara, Surinam, and Berbice. The wool for fine goods was grown in the Brazils ; and that for the few very fine muslins then manufactured, in the isle of Bourbon.

In 1787 the descriptions of cotton imported into Britain appear to have been as follows :—

From the British West Indies …... .....-..6065 6,800,000 Tb From the French and Spanish colonies …... ..... 6,000,000 From the Dutch ON sees. ae 1,700,000 From the Portuguese COME asses 2,500,000 From the Isle of Bourbon, by Ostend ……. 100,000 Smyrna and Turkey ……..:.:scsseeseeeeceesereeeeeenes 5,700,000

22,800,000

Had we continued to derive our sole supply of cotton from these countries, the progress of the manufacture would have been greatly retarded, not only from the difficulty of making the production keep pace with the increasing consumption, but from the impossibility of obtaining the qualities suited to the finer descriptions of goods, which the improved machinery enabled us to undertake. But as we have already seen, more abundant supplies were pro- cured from America, and of qualities before unknown. It was soon found that the Sea Island cotton grown in the small islands extending along the American coast from Charleston to Savannah was so exquisitely fine, long, and strong in staple as to surpass any cotton previously obtained from any part of the globe. After a succession of trials its superiority was fully admitted, and it soon came into use for the purposes for which Bourbon cotton had been em- ployed before 1796, and in a short time entirely sup- planted it.

Progress of Cotton Manufacture im England.

Nottingham, where Arkwright commenced operations, Stocking was the seat of the stocking manufacture, in which more- yarn.

over his partner Need was largely engaged, and the whole produce of his spinning was therefore at first devoted to that industry. The cotton yarn for stockings requires to be particularly smooth and equal; and to secure these

Cotton used as warp.

Calicoes.

Muslins.

Power- loom weaving.

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qualities, it is spun by a process differing a little from that employed for ordinary twist. Being from two roves in place of one, it is called double-spun twist. The introduc- tion of this article produced a great change In the stocking manufacture. Hand-spun cotton was entirely laid aside; and stockings made of twist were of so superior a quality, that in a short time they wholly supplanted those made from thread. ;

About the year 1773 Need and Strutt made the important discovery, that the yarn produced by the spinning frame had sufficient strength to fit it for warp, although its firmness and hardness rendered it less suitable for weft. The weft, therefore, continued to be spun by Hargreaves's jenny; and from this time the calicoes, and other articles in imitation of India goods, which had hitherto been manu- eactured with linen warp, came to be made wholly of cotton ; and the progressive increase of these manufactures, particularly of calicoes, after this time, was unexampled.

After having made a considerable quantity of those goods, Need and Strutt discovered that, when printed, they were subject to double the duty charged upon calicoes woven with linen warp, and that their sale was even pro- hibited in the home market. After a long and expensive application to the legislature, they succeeded in procuring the repeal of those impolitic laws. Nearly about the same period, calicoes entirely of cotton were begun to be made at Blackburn, and also at Preston,—which places soon became the seat of their manufacture, and for a long time the great market to which the printers from all parts of the kingdom resorted for their supplies. This branch went on increasing for many years in a most extraordinary degree. About the year 1805, it was calculated that the number of pieces sold annually in the Blackburn market was not less than a million ; and by that

time the manu- facture of this article was not confined to the country around Blackburn, but had spread into the north-west district of Yorkshire, principally about Colne and Bradford, from which part of the country 20,000 pieces weekly are said to have been sent to Manchester.

The first attempts to make muslins in Britain com- menced simultaneously in Lancashire and at Glasgow about the year 1780, but were without success, There was no yarn fitted for the weft of these goods, except that spun upon Hargreaves's jenny ; and when made of this, it was found they were not of a marketable quality. Recourse was then had to wefts brought from India ; and although a better article than the former was by this means produced, it was still not of a quality to compete successfully with Indian muslin. As soon, however, as the invention of the mule jenny enabled the spinner to produce yarns suited to such fabrics, the manufacture of the finest cotton articles became an important branch of trade in this country. That machine, as has been mentioned, came into use at the end of the year 1785, upon Arkwright's patent being cancelled ; and it is from that period we ought to date the commence- ment of this part of the manufacture. So rapid was its increase, that in 1787 it was computed that 500,000 pieces of muslin were in that year manufactured in Great Britain.

Power Loom Weaving.—The credit of the invention of the power loom is due to the Rev: E. Cartwright of Hollander House, Kent. The circumstances of his discovery, which will be found fully detailed in the following letter, are curious, and of interest in the history of inventions. Mr Cartwright says —

' Happening to be at Matlock in the summer of 1784, I fell in company with some gentlemen of Manchester, when the conversation turned on Arkwright's spinning machinery. One of the company observed, that as scon as Arkwright's patent expired, somany mills would be erected, and so much cotton spun, that hands never could*

be found to weaveit. To this observation I replied, that Arkwright must then set his wits to work and invent a weaving mill. This

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brought on a conversation on the subject, in which the Manchester gentlemen unanimously agreed that the thing was impracticable ; and, in defence of their opinion, they adduced arguments which I certainly was incompetent to answer, or even to comprehend, being totally ignorant of the subject, having never at that time seen a person weave. I controverted, however, the impracticability of the thing, by remarking that there had lately been exhibited in London an automaton figure which played at chess.

'Some little time afterwards, a particular circumstance recalling this conversation to my mind, it struck me that, as in plain weaving, according to the conception I then had of the business, there could only be three movements, which were to follow each other in suc- cession, there would be little difficulty in producing and repeating them. Full of these ideas I immediately employed a carpenter and smith to carry them into effect. As soon as the machine was finished, I got a weaver to put in the warp, which was of such materials as sail-cloth is usually made of. 'To my great delight a picce of cloth, such as it was, was the produce. As I had never before turned my thoughts to anything mechanical, either in theory or practice, nor had ever seen a loom at work, or knew anything of its construction, you will readily suppose that my first loom must have been a most rude piece of machinery. The warp was placed perpendicularly, the reed fell with a force of at least half a hundred- weight, and the springs which threw the shuttle were strong enough to have thrown a Congreve rocket. In short, it required the strength of two powerful men to work the machine at a slow rate, and only fora short time. Conceiving in my great simplicity that I had accomplished all that was required, I then secured what I thought a most valuable property by a patent, 4th April 1785. This being done, 1 then condescended to see how other people wove ; and you will guess my astonishment when I compared their easy mode of operation with mine. Availing myself, however, of what I then saw, I madea loom, in its general principles nearly as they are now made; but it was not till the year 1787 that I completed my invention, when I took out my last weaving patent, August Ist of that year."

But the idea of weaving by machinery was not new, although it had never been carried into practice, About the close of the preceding century, a drawing and a description of a similar loom (a circumstance unknown to

~~Cartwright) had been presented to the Royal Society of London, 'The movements, too, in both are the same in principle with those of the inch or tape loom, a machine which had long been in use. Cartwright, after obtaining his second patent, erected a weaving factory at Doncaster, which he filled with looms. This concern was unsuccessfnl, and was at last abandoned. But still the invention was considered so important to the country, that some years after, upon an application from a number of manufacturers at Manchester, Parliament granted Cartwright a sum of money as a remuneration for his ingenuity and trouble. About the year 1790, Grimshaw of Manchester, under a licence from Cartwright, erected a weaving factory, which was to have contained 500 looms, for weaving coarse sack- ing cloth. He intended also to attempt the weaving of fustians. But after a small part of the machinery had been set agoing, the work was destroyed by fire ; and as the concern during the short trial that had been made did not promise to be successful, the mill was not rebuilt. Weaving by power, in fact, could never have succeeded but for the discovery, by Mr Radcliffe of Stockport, of a process for dressing the web before it is put into the loom. The stoppage of the work from time to time for dressing the web made it impossible to do more than attend to one loom; but owing to the introduction of this process, one person was soon enabled to attend to two looms, and can now attend even to four.~~

~~The contrivances for "dressing" are very ingenious, the Dressing.~~

~~machinery employed in it deriving its movement from the power which gives motion to the looms. The yarn is first wound from the cop upon bobbins by a winding machine. These are then taken to the warping mill and made into warps of such number of ends and such lengths as may be required by the manufacturer. The warp is taken to the beaming machine to be wound on to beams, and. then to the dressing machine, and passed through strong starch liquid, &c. Where the manufacturer is also a spinner~~

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~~he can dispense with the warping mill, the bobbins being taken at once to the beaming machine. The warp is then compressed between two rollers, to~~

~~free it from the mois- ture it had imbibed with the dressing, and drawn over a succession of tin cylinders heated by steam, to dry it. During the whole of this last part of its progress, it is lightly brushed as it moves along, and fanned by rapidly revolving fanners.~~

~~Peter Marsland of Stockport, who for many years had a large factory for weaving cotton cloth of a superior quality, was the inventor of an improvement upon the power-loom, by means of the double crank, for which, about the year 1807, he obtained a patent. The operation of the crank is to make the lathe give a quick blow to the cloth on coming in contact with it, and by that means render it more stout and even. .~~

~~The weaving of calicoes- by power did not succeed in Lancashire so early as it did in Scotland. In 1817, the number of power-looms in Lancashire was estimated to be about 2000, of which only about 1000 were said to be then in employment. The cause of this was that the price paid at the time we refer to for weaving by the hand had been forced down to the very lowest degree by the depressed state of trade, and the pressure of an overgrown population bearing upon the means of employ- ment. Wages had fallen below the rate at which the goods could be produced by machinery. This struggle for existence between the two processes terminated, how- ever, as might have been expected. The hand-weavers, finding it impossible to go on with the reduced wages, gradually gave way. Their numbers ceased to increase ; and the extraordinary addition to the amount of the manu- facture since that time has been the product of the power- loom. Goods of very low and fine qualities are still woven by the hand.~~

~~There is a branch of the cotton manufacture yet to be noticed,—a branch not derived from the East, like muslin, but one that has had its origin in England,—namely, the bobbinet or Nottingham lace manufacture, which now furnishes employment for a large amount of labour and capital, See Lacs.~~

~~Cotton Manufacture in Scotland.~~

~~Previous to 1778 there were no pure cotton fabrics woven in Scotland, and the only form in which the fibre was used to any considerable extent was in the manufacture of blunks, a coarse kind of handkerchef having linen warp~~

~~and cotton weft. The first cotton-mill in Scotland was erected at Penicuik, and the second at Rothesay in 1779. These were succeeded by others at Barrhead, Johnstone, and other localities where a suitable supply of .water could be obtained, as, excepting horses and oxen, it was at that period the only power available. The name of David Dale is closely associated with the early progress of cotton spinning and weaving in Scotland. In 1785 Dale began, with Arkwright, who that year had been beaten out of his patent rights by the Lancashire spinners, to erect cotton- mills at New Lanark. These mills were the most extensive of their period ;.and they at a later time acquired a very wide notoriety by being made the scene—in conjunction with his establishment at Orbiston in the parish of Bothwell—of the attempt of Robert Owen, Dale's son-in-law, to commence the regeneration of society by a practical exemplification of the virtues of socialism. Owen's fidelity to his convictions cost him a princely fortune, and the mills passed in 1827 into the hands of a firm with, perhaps, less lofty but more practical views. By the year 1787 there were nineteen cotton spinning-mills in Scotland. a.~~

~~Although all the great inventions which revolutionized the spinning trade were of English origin, many adaptations~~

~~O01~~

~~which greatly facilitated the working of spinning machinery were devised by the ingenuity of Scotch manufacturers. Cartwright's power-loom was introduced into Glasgow in 1793, by James Lewis Robertson, who, when on a visit to London, had seen it in operation in the hulks. He obtained and brought away two, which he had fitted up in a cellar in Argyle Street, the motive power being a large Newfoundland dog which walked inside a revolving drum orcylinder. Inthe following year about forty power-looms were fitted up in a factory at Milton, near Dumbarton, for weaving printing-calicoes, and in 1801 John Monteith erected a factory for the accommodation of 200 looms at Pollokshaws. The looms were subsequently adopted in 1805 by Archibald Buchanan for the Catrine Mills; and as the apparatus improved in efficiency its progress became rapid, new power-loom factories being erected almost every year thereafter in Glasgow, till in 1817 there existed fifteen factories containing 2275,looms.~~

Glasgow and Paisley manufacturers having been from very early times engaged in the linen, cambric, and lawn trade, to which in the latter town in the year 1760 the manufacture of silk gauzes was added, it was natural that on the introduction of cotton spinning the attention of weavers should be directed to the finer and more delicate fabrics into which cotton fibre can be wrought. Muslins, therefore (plain for the most part in Glasgow, and fancy ornamented in Paisley), were among the earliest and principal cotton fabrics produced on the looms of the west of Scotland. About the year 1780 James Monteith, the father of Henry Monteith, the founder of the great print- works at Barrowfield, and of the spinning and weaving mills at Blantyre, warped a muslin web, the first attempted in Scotland ; and he set himself resolutely to try to imitate or excel the famous products of Dacca and other Indian muslin-producing centres. As the yarn which could then be produced was not fine enough for his purposes, he procured a quantity of "bird-nest" Indian yarn, "and employed James Dalziel to weave a 6-4th 12°° book with a hand- shuttle, for which he paid him 21d. per ell for weaving. It is worthy of remark that the same kind of web is now wrought at 23d. per ell. The second web was wove with a fly shuttle, which was the second used in Scotland. The Indian yarn was so difficult to wind that Christian Gray, wife of Robert Dougall, bellman, got 6s. 9d. for winding each pound of it. When the web was finished Mr Monteith ordered a dress of it to be embroidered with gold,'which he presented to Her Majesty Queen Charlotte."?

Once fairly established, the muslin trade and various other cotton manufactures developed with extraordinary rapidity, and diverged into a great variety of products which were disposed of through equally numerous channels. Among the earliest staples, along with plain book muslins, came mulls, jacconets or nainsooks, and checked and striped muslins. Ginghams and pullicats formed an early and very important trade with the West Indian market, as well as for home consumption. Thesearticles for a long period afforded the chief employment to the hand-loom weavers in the numerous villages around Glasgow and throughout the west of Scotland. The weaving of sprigged or spotted muslins and lappets was subsequently introduced, the latter not having been commenced till 1814. Although the weaving of ordinary grey calico for bleaching or printing purposes has always held and still retains an important place among Glasgow cotton manufactures, it

has never been a peculiar feature of the cotton industry ; and the very extensive bleaching and print-works of the locality have always been supplied with a proportion of their material from the great cotton manufacturing districts of Lancashire.

1 Cleland's Former and Present State of Glasgow, 1840.

Thread.

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About the end of last century the ornamentation of plain muslins with hand-sewed patterns began to be practised as a domestic industry in the west of Scotland; and by rapid degrees it rose into high reputation, many manufacturers having realized large fortunes from the trade during its palmy days. The trade continued to flourish till the great commercial crash of 1857, which compelled many to retire from it, and others thereafter gradually withdrew, till it dwindled down to its present comparatively humble pro- portions. When in its zenith it afforded home-employ- ment to large numbers of females not only throughout the west of Scotland, but across the Irish Channel. Elabor- ate and artistic patterns were prepared for embroidering by specially trained designers ; these patterns were printed, from engraved cylinders of wood, on the surface of suit- able pieces of muslin, on which also was printed the number of the pattern, the length of time allowed for sewing it, and the price to be paid by the agent or manu- facturer on the work being satisfactorily performed.

Thread Manufacture, a branch of trade very intimately related to ordinary textiles, is carried on on a large scale in Glasgow, and is the outstanding feature in the indus- tries of Paisley. From that town there are probably sent out a greater length and weight of sewing thread than from all the other thread factories of Great Britain combined. Within a comparatively recent period, what constituted the staple trade of the town from thirty to forty years ago— shawl weaving—has greatly decreased, whilst the manu- facture of cotton thread has considerably extended, prin- cipally through the almost universal introduction of sewing machines for dressmaking and other purposes. These machines, by requiring for the most part double

~~threads, and by increasing the sewed work while lessening the cost of dressmaking, have very greatly increased the demand for thread.~~

~~The process of thread-making is so well known that few words are required to describe it. It is chiefly carried on by twisters, who purchase the yarn needed from cotton- spinners. To spin from the raw cotton, and twist yarn into thread, in the same factory, would require premises of much greater extent than any hitherto employed; or the spinning and twisting would need to be confined to a small range of numbers. The manufacture of sewing cotton is, therefore, generally understood as confined to the twining or doubling of yarn previously obtained from the spinner, When the yarn is received it is tested by being reeled from the cops, and having a certain length of hank weighed. This is called sizing. The next pro- cess is cop-winding—that is, winding it from the cop on bobbins—two or three ply as required. These bobbins are taken to the twisting frame and twisted first two ply, then this is doubled or tripled for four or six cord as required. Each number of yarn has its own twist, that is, the number of turns it gets per inch. When finished the thread is taken from the twisting frames, and according to the size so 'much of it is wound upon a large bobbin, from which it is reeled into hanks for bleaching or dyeing. After bleaching it is given out in bundles to the 'hank- winder, who winds it on a large bobbin, and that in its turn is handed to the spooler, who fills the bobbin with a certain length of. thread—say 100, 200, or 300 yards, and upwards. The largest portion of thread made is sold on spools, which contain a great variety of lengths. After spooling the bobbins are labelled on each end; they are then arranged in dozens and grosses, papered and stringed, and finished for the market. The qualities principally used are 3, 4, and 6 cord—the greatest portion of the sewing- machine thread being 6-cord. A large quantity of thread is now polished, and is known in the trade as glacé. Of late there has been an increasing demand for crotchet**

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~~thread, the manufacture of which is somewhat similar to the process for ordinary sewing cotton.~~

~~The spools are made of birch or ash—preferably the Spools.~~

former—and the wood is obtained chiefly from the Higli- lands of Scotland. Finished spools are made in large quan- tities by wood turners in various localities, particularly in the Lake districts in the north of England, and find their way to those thread manufacturers who are unable to turn the whole of the spools they require. The birch, to be in proper condition, is cut when the sap is out of it, and partially rinded at once to prevent souring. After remaining in stock till perfectly dry it is sawn up into cross sections, from which are blocked out the various diameters of spools wanted. The blocking machines now in use over the whole country were invented at Ferguslie Works, Paisley (Messrs J. & P. Coats), and by their employment a great saving in both wood and labour is effected. These blocks are placed on the self-acting lathe, which turns them out finished spools with great rapidity. .

Statistics of Scotch Cotton Trade.—In the year 1787 there were only nineteen cotton mills in the whole of Scotland, of which Lanarkshire and Renfrewshire each possessed four. In the report of Leonard Horner as one of the Factory Commissioners, dated 1834, it is stated that "in Scotland there are 134 cotton mills; with the exception of some large establishments at Aberdeen and one at Stanley near Perth, the cotton manufacture is almost confined to Glasgow and the country immediately adjoining, to a distance of about 25 miles radius ; and all these cotton mills, even including the great house at Stanley, are con- nected with Glasgow 'houses or the Glasgow trade. In Lanarkshire, in which Glasgow is situated, there are 74 cotton factories ; in Renfrewshire, 41 ; Dumbartonshire, 4 ; Buteshire, 2; Argyleshire, 1; Perthshire, 1. In these six counties there are 123 cotton mills, nearly 100 of which belong to Glasgow. .... In Lanarkshire there are 74 cotton mills, 2 woollen and 2 silk factories; 78 steam- engines and 5 water wheels ; total horse-power, 2914, of which steam 2394, water 520. Total persons employed in factories, 17,969." In 1838, according to the report on hand-loom weavers by Mr Symons, there were more than 37,000 hand-looms in the west of Scotland directly con- nected with cotton weaving. According to a Parliamentary return the cotton industries of Lanark, Ayr, and Renfrew in 1850 were distributed in 146 factories, of which 94 were in Lanark, 51 in Renfrew, and 4 in Ayr. These establishments had jointly 1,410,054 spindles and 21,575 power-looms, the whole of which gave occupation to 31,710 persons. In 1861 the same counties possessed 143 fac- tories, with an aggregate of 1,577,584 spindles and 28,085 power-

looms, in all employing 36,903 hands. In the year 1875 the three counties possessed 84 cotton factories, in which there were 1,526,980 spinning and doubling spindles and 27,489 power-looms, the whole cotton industry giving occupation to 33,276 individuals. The total number of factories in Scotland in the same year was 96, containing 1,711,214 spindles and 29,171 power-looms, giving employ- ment in all to 35,652 persons, of whom nearly 30,000 were females above thirteen years of age.

It may be gathered from this table that the Glasgow district has still a practical monopoly of the Scotch cotton trade, not more than 10 per cent. of the work being dis- tributed among counties other than the three above named. On the other hand Scotland, taken altogether, does not employ in cotton factories more than one-thirteenth part of the number of operatives in the enormous cotton indus- tries of England, while Scotch spindles are only as one to twenty-five of the English, and power-looms are as one to about fourteen.

In some of the Glasgow establishments the only fabrics

C OFT manufactured are printers' cloths, grey calicoes, jacconets, and fancy textures, which are subsequently prepared for the market by calico-printing. In the case of others exclusive attention is bestowed on the weaving of coloured goods, such as ginghams, Oxford and other fancy shirtings, dress stripes, &c., and several devote their attention peculiarly to the weaving of muslins and similar delicate fabrics.

Cotton Manufacture in Ireland. Little notice has been taken of the cotton manufacture

in Ireland, the great seat of the once rival flax manufacture 7

but it may be observed that cotton has not furnished any considerable employment for capital and labour in that island. Some attempts to introduce the manufacture of cotton goods in Ireland were made as early as 1770, but the manufacture continued on a very limited scale until the year 1790. After this period the progress was more con- siderable, although out of all comparison with what took place during the same time in Great

Britain ; indeed, its products have never been such as to enter into competi- tion with those of England.

The chief seat of this manufacture in Ireland is Belfast, and the district of country situated within twenty miles of that town. But a good many calicoes, fustians, and cotton checks are made in Dublin, Balbriggan, Bandon, and Cork. All these goods are consigned to factors in Dublin for sale, except a part of the calicoes, which the manufacturers sometimes dispose of to printers on the spot.

The cotton trade of Ireland is, as already indicated, at the present day of limited extent, embracing only 8 factories, aud giving employment to about 3000 persons.

Statistics of Progress of the Cotton Manufacture.

The enormous increase which has taken place in the pro- duction and consumption of cotton, as shown in the accom- panying tables, implies a corresponding increase in the 1aanufacture and consumption of yarn and cloth. It would be difficult to find any trade which has exhibited so rapid a development, or which has attained such vast proportions, as the British cotton manufacture. It has for three quarters

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of a century gone on extending from year to year, working up all the cotton which the world could supply, and produc- ing goods in enormous quantities which have found their way into every part of the globe. At the beginning of the century less than a hundred thousand bales of cotton were sufficient for the requirements of Great Britain, and now about three and a half millions of bales are required. The quantity of yarn and piece goods produced for home and foreign consumption amounted in 1863 to 404,979,000 ib in weight, and in value to £59,795,000; but in 1875, a year of great stagnation in the cotton trade, the production had reached 1,088,890,000 ib in weight, and £95,447,000 in value. Notwithstanding protracted periods of depres- sion, and increased competition on the part of other nations, England at the present time employs more spindles than all the rest of the world combined.

Tables IV. and V. subjoined show the quantities of yarn produced, and the principal markets to which yarn and goods are consigned, for the years stated. From Table VI. (page 504) it appears that the value of the production of the cotton manufacture of Great Britain in 1875° exceeded £95,000,000 sterling, of which upwards of £77,000,000 was the value of goods and yarn made for exportation. Table VIL. (page 505) presents a synoptical view of the cotton industry of Great Britain.

In the year 1812, when Crompton applied to Parlia- ment for a remuneration for his invention, he found by as accurate an investigation as he could make that the number of mule spindles in the country was between four and five millions ; and Kennedy, in his memoir of Crompton, has stated that the number in 1829 had increased to seven millions. In 1817, he estimated the number of persons employed in the spinning of cotton in Great Britain at 110,763, and the number of spindles in motion at 6,645,833, and the quantity of yarn produced at 99,687,500 tb. The quantity of cotton yarn spun in 1832 was 222,000,000 tb, of which 132,000,000 tb was manufactured into cloth, giving employment to 203,373 looms; but in 1853 the yarn spun was 685,440,000 tb.

A tolerably accurate estimate of the capital now invested in the cotton trade and of the persons dependent upon its

TaBLe [V.—The quantities of Cotton Yarn spun, and the quantities exported and worked up at home, from 1819 to 1876,

Years. Yarn Produced. Exported. Consumed at

Home.

Consumed at

y tb tb Tb

1819 98,566, 200 18,085,410 80,480,790 1820 108, 238, 500 23,032,325 85,206,175 1821 116,126,100 21,526,369 95,599,731 1822 130,948, 700 26,595,468 104,348, 232 1823 188, 731,400 27,378,986 111,352,414 1824 148,656,600 33,605,510 115,051,090 1825 150,147,900 32,641,604

117,506,296 1826 135,191,700 42,179,521 98,012,179 1827 177,480,000 43,346,632 134,133,368 1828 196,074,000 43,242, 882 152,831,118 1829 197,280,000 60,562,189 136,717,811 1830 222, 840,000 63,678,116 159,161, 884 1831 236,430,000 61,561,154 174,868,846 1832 246,935,124 75,667,150 171,267,974 1833 251,757,600 70,626,161 181,131,439 1834 270,186,876 76,478,468 198,708,408 1835 281,435,222 83,214,198 198,221,024

. 1836 298,064,496 88,191,046 204,873,450 1837 324,031,851 103,455,138 220,576,718 1838 379,486,510 114,596,602 264, 889, 898 1839 342,826,571 105,686,442 237,140,129 1840 406, 864,913 118,470,223 288,394,690 1841 370,768,077 123,226,510 247,541,567 1842 372,754,144 137,466,892 235,277,252 1843 437,589,441 140,321,176 297,268,265 1844 445,577,480 138,540,079 307,037,401 1845 494,766,487 135,766, 487 359,621,622 1846 552,870,000 160,554,673 392,315,327 1847 397,260,000 119,489, 554 277,770,446

Years. Yarn Produced. Exported. Tae Ib Ib Tb

1848 518,840,000 131,500,141 387,439,859 1849 566,910,000 148, 275, 885 418,634,115 1850 529,380,000 124, 241,100 405,138,900 1851 593,010,000 131,587,577 461,422,423 1852 665,190,000 129, 385,924 535,804,076 1853 685,440,000 129,190,507 556,249, 495 1854 698,659,000 147,128,000 546,531,000 1855 750,278,000 165,493,000 584,785,000 1856 797,800,000 181,495,000 616,305,000 1857 738,400,000 176,621,000 561,779,000 1858 812,513,000 200,017,000 612, 496, 000 1859 874,982,000 192, 206,000 682,776,000 1860 965,993,000 197,343,000 768,650,000 1861 899,902,000 177,848,000 722,054,000 1862 373,352,000 88,554,000 284,798, 000 1868 404,979,000 70,678,000 334,301,000 1864 432,629,000 71,951,000 360,678,000 1865 618,040,000 98,563,000 519,477,000 1866 774,928,000 134,835,000 640,093,000 1867 839,984,000 164,276,000 675,708,000 1868 876,653,000 174,538,000 702,115,000 1869 816,949,000 169,518,000 647,431,000 1870 942, 460,000 186,078,000 756,382, 000 1871 1,072, 850,000 198, 480,000 879,370,000

1872 | 1,040,380,000 211,940,000 828,440,000 1873 | 1,077,920,000 214,687,000 863, 233,000 1874 | 1,120,525,000 220,599,000 899, 926,000

1875 1,088, 890,000 215, 490,000 873, 400,000

1876 | 1,131,056,000 232,150,000 898, 906,000

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TABLE V.—This Table, prepared by Messrs Ellison and Co., gies the chief markets to which the cotton yarn and goods produced have been exported in the years quoted (the figures representong millions of yards and pounds).

1830 1835 1840 1845 1850 1855 1860 1865 1870 1875

ee ee

PrEcE Goons. Yards. Yards. Yards. Yards. Yards. Yards. Yards. Yards. Yards. Yards. To Germany and Holland.……..- 54:3 65°3 70°9 69°8 al 98°0 102°0 oom 85°5 115°9 Portugal, Azores, and Madeira.. BOD 36°1 38°9 426 50-0 60°3 62°9 43°6 64°5 70°6 Gibraltar and Malta. ……..+++ 7°6 19°0 ile, 33°5 23°9 49°4 42°3 30°2 3/7°8 Bul o7 Italy and Austria. ……..+++-++++ Be} 347 58°9 52°4 en 80°4 93°3 63°7 758 |.101°7 fee woes, wd Bayet…| 835 | 8r8 | Bee ee ee 0 | 313-9 | 685:4 | 356-2, West and South Africa.……..- 6°5 8-0 16°6 21:0 28°3 39°9 45°8 20°1 35°1 38°4 British North America.…….. 11°4 16°9 241 33:0 853 17°4 37 °4 30°6 76°2 48-2 : eee Stele nn. 403 | 78 leeeat 9) eee ee eS ee ee f W. Indies and Central America.| 56°9 18°2 104°2 112°5 146°9 168°3 158°0 191°9 27 195°9 Brazils.…...ccccee cee ceeeee ter see eee ees 46°2 58°8 76°8 87:0 103°0 125°0 156°2 111°5 149°2 196°8 ; Other South American States.…. 26°3 39°6 TED ORB [52 103°4 175°5 86°2 156°4 11571 British East Indies.……..66 52-2 51°8 145°1 229 °3 814-4 467°4 825‘1 553°2 923°3 | 1231-4 China and Hong Kong…….. Was 13°5 108°4 ER 74:0 223°0 136°0 417°3 436°0 Java and Philippine Islands….. 4°7 11°6 16°4 25:9 31:1 44:8 } 101°2 58:1 60°9 90°6 WNarstralisiee esc cesscsesecssceeeee s+ enes 12 Dee 52 10°5 157 13°4 22°4 2555 27°9 46°3 Other Countries.……..-.:...] 19°0 16°8 oy Ler 25°3 43°2 52°8 192°3 153°4 191°5 395°3 | OVE Ljapeeeenoeeees]oosmoes Yards) 444°6 557°5 790’°6 |1091°7 | 1858°2 | 1937°7 2776°2 | 2081°4 | 8252°8 | 3559°9 Total value……. eewea eee) ae

fall 15:2 16°3 18°0 20°5 26°1 40°3 45-2 52°5 536 tb Gl ilay IPYTISENIgN eR Rononedeaes "oo ce aeocaase occ 18°5 Pieri : 18°2 4°8 i Ball Le 2°8 4:0 Germany and Holland..... 29-1 41°7 63°5 654 70°8 781 92°4 45°8 72°7 761 Italy and PATUIG UIT: <0 steerer 8-4 70 11°5 13°0 15°6 23 °6 20°5 15°5 18°2 23°6 Turkey .. .ecccccceseses ene senser ees , 1°5 16 3°35 5:8 LLo7) 9°0 19°6 Se 14:2 15°9 British East Indies..... ... 49 5°4 16:0 16°8 21°0 28°9 30°7 15:2 31°0 S210 China and Hong Kong..... 28 1°8 2°6 3:1 2°8 8°8 1:2 20°8 29°4 (Ovgbvere (Cawanitael.4 gabders cooaoocdece 22 3°6 5'4 13°3 11°9 19°1 2252 15°6 28°0 29°0 Tatalan: oe ece Th) 64°6 83°2 118°4 1385'1 131°4 165°5 197°3 103°2 187°7 215°5 Util ag Wut) a6 ecoosameorecese ée 4-1 5:7 al 6°9 6°4 TB 9°9- 10°3 14°8 1332

Taste VL—An Estimate of the Weight and Value of the Total Production of Cotton Manufactures in Great Britain, with the Cost of Cotton Consumed, and the Balance remaining for each of the past Ten Years.

1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 | th tb tb 1b tb Ib Ib tb Ib | Cotton consumed..... ↑- 954,517,000 | 996,197,000 | 939,019,000 |1,071,770,000 | 1,205,450,000 | 1,175,345,000 | 1,246,150,000 1,266,129,000 | 1,280,388,000 | 1,274,376,000

Less waste in spinning.... | 114,533,000; 119,544,000 122,070,000} 129,310,000] 182,600,000 134,965,000 | 168,230,000 145,604,000 | 141,498,000 | [143,320,000

Yarn produced .....0.- $39,984,000 | 876,653,000 | 816,949,000) 942,460,000 1,072,850,000 | 1,040,380,000 | 1,077,920,000 1,120,525,000 | 1,088,890,000 | 1,131,856,000 Exported in yarn.....- ↑] 164,276,000 (174,538,000 | 169,518,000 186,078,000) 198,480,000; 211,940,000) 214,687,000 220,599,000 ; 215,490,000) 282,150,000

735,000,000

apparel, &c.....

Retained for home con- } | 159 196,000 | 158,487,000 | 112,286,000| 140,150,000] 199,850,000 129,600,000 | 175,000,000 | 173,926,000)

~~160,400,000~~

~~sumption and stock… 163,906,000~~

~~ac 528,582,000 | 548,628,000 |585,195,000| 616,232,000) 679,520,000 698,840,000 | 688,283,000 726,000,000 | 713,000,000~~

~~Total a8 AbOVE …. — e + se<| 839,984,000 | 876,653,000 | 816,949,000) 942,460,000 | 1,072,850,000 ; 1,040,880,000 | 1,077,920, 000 1,120,525,000 | 1,088,890,000 | 1,181,056,000 F 3 2 £ £ £ £ £ £ £ ee 13,690,000] 14,709,000| 14,157,000 14,671,000} 15,055,000) 16,710,000) 15,876,300 14,516,090 | 18,170,000| — 12,788,000~~

~~Declared value of piece goods, apparel, &c.,ex- +) 57,382,000 57,348,000 | 57,660,000) 61,424,000 63,382,000 69,900,000 POTEET ....ccccereeseeseeeeees~~

~~Estimated value of home consumption, mot 19,363,000] 19,665,000; 14,380,000 17,050,000 23,520,000 15,660,000~~

~~68,135,700 | 65,934,480] 68,965,000 | 59,296,000~~

~~17,777,000~~

~~20,600,000 20,110,000 18,312,000~~

~~Total value of go0ds}) 90,435,000] 91,717,000} 86,197,000) 98,145,000) 101,957,000 102,270,000 | 104,612,000 | 100,560,520 | 95,447,000) 89,856,000~~

PTOCUCE «..ceeeeeeeseee

Jost of cotton consumed…) 41,262,000| 40,989,000) 43,772,000| 42,145,000} 40,810,000| 48,054,000 | 45,441,000 | 40,225,900 36,526,000 | 32,855,000

other expenses, inter-

est of capital, and pro- §9,171,000 60,334,620 58,921,000

†

prosperity may be formed from the following particulars | spindles, and 463,118 power looms. The total number of taken from the reports of the factory inspectors. In 1871 | persons employed was 479,515,—of these 440,336 being the cost of the buildings and machinery employed in the | in England, 36,104 in Scotland, and 3075 in Ireland. Of trade was £57,000,000, whilst the floating capital was | the total number 115,391 were adult males, 258,667 were not less than £30,000,000, making together at least | females above thirteen years of age, 38,557 were males £87,000,060, sterling. From a Parliamentary return issued | between thirteen and eighteen, and the remainder were half- in August 1875, it appears that in that year there were in | time boys and girls in about equal numbers. Probably the the United Kingdom 2655 factories employed in spinning, | number of persons directly or indirectly dependent on the weaving, and other industries connected with the manufac- | cotton trade in the United Kingdom is not much under two ture of cotton. Of that number 2542 were in England and | millions.

Wales, 105 in Scotland, and only 8 inIreland. These fac- As successive mechanical inventions came to be applied tories contained 71,166 carding machines, 2901 combing | to the manufacture, they changed the principle of produc- machines, 37,515,772 spinning spindles, 4,366,017 doubling | tion, and made what had been nearly wholly a product of

Balance left for wages,

57,001,000

49,173,000! 50,728,000 | 42,485,000] 51,000,000} 61,047,000 | 54,216,000

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labour become almost entirely a product of capital. Important results flowed from this change. It enabled Great Britain, the principal holder of these machines, to become the furnisher of a commodity which up to that time had been brought at a great expense from India. It further enabled her to reduce its cost, and render what till then had been accessible only to the rich, and of limited

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sale, an article of general wear. During the long struggle which took place between machinery and hand labour, this country continued to be the nearly exclusive possessor of the machines by which the reduction of cost was effected. Having in consequence, in a great measure, a monopoly of the supply, she was enabled to reap that harvest of prosperity which so unusual a combination of circumstances was

TaBLE VIL—A Comparative Statement of the Quantities of Yarns and Piece Goods, and the Aggregate Value of these and other Cotton Products Hxported to the various Countries of the World, with the Population of each Country, and the value of British: Cotton Products Consumed by each per Head, tn the Years 1851, 1861, 1871.

Yarn exported, in

Population in 1000's, 1000's of tb

Value of Yarn and all kinds of Cotton Goods Exported.

Value of Exports

Picce Goods Exported, in per Head.

1000's of Yards.

1851 | 1861 | 1871 | 1851 | 1861 | 1871 | 1851 | 1861 | 1871 | 1851 1861 1871 | 1851 | 1861 | 1871 EUROPE. ae £ £ a | a | a. Russia, European and Asiatic.) 67,995 3,347, 8,261] 3,478). 1/569| 4,797] 3,761! 225,117| 855,948] 556,649 °78 1:12) 1:63 Sweden and Norway ws. | 4,890 1,464, 968! 2,241] 2,217) 3,548, 5,423] 95,305, 125,771] 39,541] 4°67, 5°61] 13°30 Denmark ….scsceseeer at | 2,402 11988; 2,145) 2‘534| 3,421| 5,413} 2,599} 121,126| 169,068| 305,832| 12°10' 15°19 26-29 Germany and Holland… | 36,104 67.471, 90,336] 85.427] 76,185| 105,538) 107,410} 5,034,761) 6,756,059)10,925,963| 33°46) 41°08} 62-29 Austrian possessions …. | 29,650 4,852| 4,815| 3,084| 20,879| 18,901] 14,049} 443,879} 500,172] 426,217; 3°59, 3°68] 2°84 POEM. ..<4.0sneaseensstss «4,426 1,979} 962] 1,994} 2,122] 6,354} 6,401} 206,708} 214,390) 629,788] 11:20) 11°12) 29°71 France and Switzerland : 69} 1,702] 4,521} 3,928) 31,381) 86,854) 158,962] 749,109) 2,386,739] 99) 4°51) 14°03 Channel Islands.....ss.sseeseeeeees a ‘it 996 ea ae 34,800} 11,648]... 5840) 19°41] Spain, Gibraltar, &C.....s000 163) 632) 410] 27,812) 31,571| 48,224] 471,895] 666,829) 926,659) 7°31} 9°66] 13°34 Portugal, the Azores, &¢. ..... 918) 402} 143] 49,746) 69,416] 59,130] 674,971] 949,520] 891,811) 43°65) 57°48] 503 Italy and Italian Islands…..... 17,821} 24,383] 17,120} 85,528] 114,198} 85,581] 1,935,074] 2,855,893] 2,449,197} 19°93, 27°41) 22°00 GSE CE eer seeer rete ee ceeo vetoes : Se ed ee Peels wee ene 361,179] 352,090) 515,536] 71°57) 63°15 eas ; y : 77 : 130] 1,743,720] 2,132,026] 3,427,506! 26°60, 32°28] 51°30 sora on 7: on se Pe Oe Ase) 109,008] 139,100] 137,161] 400,741, 537,699] 590,621/11,507,497|15,838,528)23,771,438, 11°35) 14°43) 30°35 ASIA. — = — ae ae i | Turkey in Asia… 1,317] 2,812] 4,811] 22,179; 91,927] 74,687] 334,046] 1,164,058] 1,424,656] 4:99 17-19] 20-76 lene ght ne ces ae i eco 1 ee 443 29) = 22,605 6,454) «6 16) 04 ochin China, Siam, &c.…..... one 674) 2,850] ae 44,527] 71,458) a 719,804] 1,228,384 8°22) 13°40 Chima svernstnetnnennnein 4,919] 6,734) | 81929] 114,975) 248,654] 409,080 1,598,829) 9,486,822) 7,030,858| 1°02, 2-00] 8°83 BPAN .crecccccescescecccces ggonc one 28 are ’ oes 86,556] 1,049,701] «+. “2 2 Indian IslandS….cssssssseseseeeee 846| 811| 1‘049| 49.206] 82/569| 44,892| 792,523] 1,444‘183| ‘891/0G9| 9°51} 15°75] 8°55 {ndia, Burmah, and Ceylon.… 25,726| 28,183} 22,193] 360,667) 753,631) 950,382) 5,628,925 10,907,494/13,601,968 — re b oa 7°56| 12°25) 16°74 Egypt and Abyssinia.…..... 1.311} 1,061} 6,352 45,119, 77,249| 269,071) 673,849|

926,508] 4,124,241) f °°” Total for Asia and Egypt….. 83,529| 36,610] 55,401! 592,147/1,296,919)1,917,354) 9,028,201)/18,708,030/29,857,331| 3°13) 5°94) | 8”52 BY) 7 y i) AFRICA. i > leans BP is 28] 1,995 6,967| 13,187] 82,567| 104,990] 211,944] 94) 2°82] 4°67 West Coast and Islan 3 6 24| 17,626] 35,765] 48,885] 282,294) 581,435] 830,346 30°79] 55°81) 73°80 PRM OSes sass ccaceesnMacseoes Gi Bi 10.496] 14,938] 18,815} 154,730, 306,745} 476,296] 10610] 147-23) 120°32 East Coast and Islands…….+ ie as 5,306] 16,477| 15,680] 79,771| ° 217,136} 238,010] 4°03] 10:21) 10°38 ntcrior of Continent……00 on 7 cee . sae bn aise – 20 tee eee Total (except Egypt, &.) ... 14 6 52| 35,423) 74,147| 96,567| 549,362] 1,210,306] 2,756,596, 2°77) 5:47) 7°02 AMERICA, ——a CC a rr a 2 a! North America… 831] 256 i 38,476 aA ican inc iteoeee «014,488 oe ee a e MUFC BPABON,.....ssscvuessscateesed TH) ase 78| 76,580| 74,680} 129,701) 1,977,295] 1,539,096] 5,109,063) 20° 74] 32° io ae si 135 71) 10,555] 18,780] 36,121) 248,495) 357,445] 645,662| 7°62) 10°34) 16°88 ee man eeiish 194] 267/ ... | 27,981] 15,135] 13,015] 399,184] 214,388] 195,641/ 47°90) 22°86) 17°16 io. Indics and 19\| o, ; 37,709] 88,545] 39,102] 553,423] 586,910] 677,720) 125°42] 11876] 127-57 BEET ceeeaesracnie Phen ee | i se 7,269| 9,465] 8,140] 144,486] 172,875] 179,728| 63-40] 74-08) 75:41 Foreign West Indics…... a 26 eo 51,893| 53,163; 71,870| 765,407| 848,149, 1,326,501! 106-80) 105-46 151°60 Mew Granada «sss. OT) eae 161} 11471 361572} 92,001] 185,746; 535,152] 1,613,555! 19°38] 50°86 183°53 SUSHI a0. snccersnsvarceeseore 8 : 14,527] 19,512] 18,683) 211,109) 807,978) 241,802) ora gee Ee OM et ee coils ig tlaavaves in 3 11943 8,055 762| 32,314] 119,296) 12,910, 1034) 31: otal—Mexico, West Indics, &c. 243} 402| 2321 163,298] 199,227] 274,694] 2,535,254) 3,142,193) 4,893,519) 35°15) 39°69) 55°22 BEAZHG ..-..ccceoneese Re ctiaae: 3 Pr | peta al). 169,008) 105,820) 2,018,200) 2,900 ee eC We Uruguay, La Cl a es 14,137] 53,976} 75,283, 237,800) 866,712] 1,381,421) 17°26) 56°98 82°88 Chili, Peru, Bolivia, &¢...5.s+ + 32 71,988] 77,799] 86,143] 1,151,803) 1,216,739] 1,886,729) 55°54) 47-87| 51°61 Total for South America …. 44 220,546} 300,073] 326,656] 3,405,362) 4,643,442) 5,840,729, 53°48 62°65] 68°99 aN Ae deal. cckkcss. 1,202 658) 1,863] 499,900] 613,466] 773,728) 8,638,098|10,010,346,16,857,799, 85°56) 33°54 48°17 oo AND SOUTH a 208] . By 15,947} 41,170) 32,738) 364,778) 1,015,479 935,7811 187°86)

192°50; 121°39 251,934] 143,961, 176,374) 193,077/1,548,158,2,563,411 3,411,008 50,088,836 46,782,684)72,678,945, 6-93) 9°81 13°93

Total for the World,,,..cssesooe

calculated to produce; an improvement in

the coudition

of every class of the community followed the advance of

the manufacture,

To preserve the pre-eminence gained by this great branch

of British industry against all the competitors which it has had to encounter, has tasked to the utmost the inventive genius and energies of all connected with it. The rival manufacturers in India, Europe, and America have put forth all their resources to impair or destroy the supremacy

which England has established in the markets of the world. In almost all cases, not even excluding our own colonies and dependencies, these rivals, in addition to any natural advantages which they might possess, have been aided by the establishment of high protective tariffs.

Fears have often been expressed that the lower wages for which the labourers of some other countries can work, may ultimately enable them to take the manurfac ture out of our hands, Iu reply to this, it may perhaps

VI. — 64.

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be sufficient to recall to our readers the small part of the cost of the commodity which now belongs to the labour of the hand, and the daily diminution which is taking place even of that part, by the introduction of new mechanical substitutes. Thus, for example, in 1767 each spindle required a person to work it ; but now one man, with the aid of two piecers to take up and join his broken ends, can work two thousand spindles. In

speaking on this subject in 1874 Mr Hugh Mason, then president of the Manchester Chamber of Commerce, endeavoured to reassure some of his timid colleagues by such facts as these, viz., that in 1850 the export from this country of cotton cloth had attained forthe first time the amount of 1,000,000,000 yards; that in 1860 the exports for the first time had reached 2,000,000,000 yards ; and that in the year 1870 the export of manufactured cotton goods from this country had amounted for the first time to 3,000,000,000 yards. Although foreign competitors are able in common with ourselves to buy the best machinery that can be made, and have free and cheap imports of the raw material, in addi- tion to any special advantages as to cheaper labour and longer hours or otherwise which they may possess, and although great advances have taken place in the wages of the operatives employed in our factories, while there has been great diminution in the hours of labour during these two decades, and these are now still further reduced, we have still almost undisputed possession of the home trade, and our foreign trade has at the same time increased from 1,000,000,000 yards to 3,000,000,000 yards of our manufactured cotton cloth. The quantity of cotton piece goods exported from the United Kingdom in 1876 exceeds that ever exported before in any one year, and amounts to 3,668,582,100 yards, an average of more than 10,000,000 yards a day.

The following table presents a summary of the cotton industry of Great Britain for the year 1876 :—

TaBLe VIII.—Details of Cotton Industry.

Ningnber of factories. 0. geene. ete ee ee 2,655 Number of spindles (including doubling) 41,881,789 Number of power looms.…….0000 463,118 Number of persons employed ……. 479,515

Hstimated capital imvested. .... y.stt….nne Quantity of eotton consumed (in bales of 400 Tbs. each)..... Be enstevcomea sees 3, 185,942

Cost ‘of cotton consumed. .....0…cn0-8 £32, 855,000 Quantity of yarn produced.…….ccc0ee 1,131,056, 000 ib Quantity of cloth manufactured.…..... 898,906, 000 ib Quantity of yarn and goods made for HGMMe CONSUMPLIOLin. ..Mc…... creme. «8

£90,000, 000

163,906,000 Ib

Quantity of yarn and piece goodsexported 967,150,000 tb Annual value of home consumption of pyarnstantd clothivcccen, cee. . eee. see £17,777,000

Annual value of exports of yarn and cloth £72,079,000 Total annual value of cotton manufactures £89,856,000

The rapid growth and enormous extent of the cotton industry, the numerous vicissitudes through which it has passed, the elasticity which it has shown in periods of deep depression, and the vitality and latent power which, not-withstanding all past development and progress, it still possesses, may well excite astonishment and admiration. It is a proud memorial of the genius, and energy, and enterprise of the men who have conducted it from its small beginnings to its present gigantic proportions. Whilst at home the consumption of cotton goods has been steadily increasing, the export trade with all its fluctuations re- mains more than double that in any other article of com- merce. The free-trade policy of Britain promotes an in- terchange of commodities with all other countries. We are as ready to purchase what they can offer as we are to sell them our goods, and even in the same branch of inanufacture there are often shades of difference in the fabrics produced, upon which taste, or fashion, or caprice

COTTON

has fixed an arbitrary value, which may make the ex- change of goods by rivals mutually beneficial. This example and influence are beginning to lead other coun- tries to perceive and understand that isolation and rigid protection can confer but little real benefit even upon themselves, and must eventually injure those who thus stand aloof from the commercial comity of nations.

Cotton Industry on the Continent.

The progress and present state of the cotton industry on the continent of Europe have been carefully ascertained by Messrs Ellison & Co., from their

~~own special correspondents in all the manufacturing centres. The statistics furnished by them, in their review of the cotton trade for the season 1875-76, are as follows :—~~

~~Russia and Poland.—Spindles in Russia, 2,300,000; in Poland, 200,000 ; total, 2,500,000. Average consumption of cotton 60 Ib per spindle per annum.~~

~~Sweden and Norway.—Spindles in Sweden, 245,000; in Norway, 60,000; total, 305,000. Average consumption of cotton 65 Ib per spindle per annuin.~~

~~Germany.—The estimates vary, but the following is the nearest approximation attainable:—~~

~~Spindles.~~

~~JN bie OCCT gn RAR AR esto IEC COE coc s.ss..1,650,000 BAR TET Ox PRR. AUR. oom sco oa ac de onttade 875,000 [EARS S 1 Avene smn + ccccaaceee sense: 700,000 aK OMY Meet RMARM sees… chee 500,000 AGRE one Ron eo One aaron mea atencreh artes 350,000 DEBI TEE 20 recor 315,000 Hanover, Oldenburg, &.....000 260,000~~

~~otal), + We PU WE sc seen 4,650,000~~

~~Some estimates exceed this, and make the total 5,000,000 or 5,200,000. Average consumption of cotton for all Germany about 55 Ib per spindle per annum.~~

~~Austria.—Spindles in Austria, 1,555,000, including 740,000 in Bohemia, and 500,000 in the Vienna district. Average rate of con- sumption of cotton 67 Ib per spindle per annum.~~

~~Switzerland.—According to a recent Government estimate, made in view of negotiations for a new treaty of commerce, the number of spindles is 1,854,091. Average consumption of cotton, used chiefly for the production of fine goods, about 25 tb per spindle per annum.~~

Holland.—The estimated number of spindles is 230,000. Average consumption of cotton about 60 1b per spindle per annum.

Belgium.—Estimated spindles, 800,000. Average consumption of cotton about 50 1b per spindle per annum.

France.—The total number of spindles is about 5,000,000, and the average consumption of cotton 42 Ib per spindle per annum.

Spain.—Estimated number of spindles, 1,750,000. Average consumption of cotton about 46 Ib per spindle per annum.

Haly.—The total number of spindles is about 800,000. The consumption of cotton averages 56 Ib per spindle per annum.

The total number of spindles at work in the various manufactur- ing countries of Europe is 19,440,000, to which must be added 9,500,000 in the United States, and 39,000,000 in Great Britain, making a total of 67,940,000, requiring not less than 7,000,000 bales of cotton of 400 tb each, or at least 2,800,000,000 Ib, to keep them in operation.

Cotton Manufacture in the United States.

The Government of the United States at an early period evinced great anxiety to promote the establishment of the cotton manufacture in the northern part of the Union. In tracing the rise of the American cotton manufacture, we shall refer chiefly to the public documents, in which its growth is studiously detailed, and the difficulties it has had to struggle with are anxiously dwelt upon.

Before the year 1791, America possessed no manufacture except for domestic production and family use. But it appears from a report of the secretary to the American treasury, drawn up in 1810, that a cotton-mill was erected in the State of Rhode Island in that year; that another mill was erected in the same State in 1795, and two more in the State of Massachusetts in 1803 and 1804; that during the three succeeding years ten more were erected in Rhode Island, and one in Connecticut, making together fifteen mills, working about 8000 spindles, and producing

about 300,000 pounds of yarn in the year; that by a return which was made at the date of the report, eighty-seven additional mills had been erected by the end of the year 1809, which with others soon to be in operation, would, it was estimated, work more than 80,000 spindles at the commencement of 1811. The capital required to carry on the manufacture was believed to be at the rate of sixty dollars per spindle, each producing annually from forty-five pounds of cotton about thirty-six pounds of yarn, of the average worth of one dollar twelve and a half cents per pound, Eight hundred spindles employed forty persons, viz., five men and thirty-five women and children.

We learn the farther progress of this manufacture from a report of the House of Representatives, presented in the spring session of 1816. The report states that the quantity of cotton manufactured in the year 1815 was 90,000 bales, a quantity nearly equal to that used in the cotton manufacture of France; and that the quantity used in 1810 was 10,000 bales; in 1805, 1000 bales; and in 1800, 500 bales; and gives the following statement of the condition of the cotton industry in the United States :—

Pa MOND OV CO c. aeencct econ onsen saa svi’s.. 40,000,000 dollars. Males employed from the age of seventeen

BTLGMUNATOS. . ccomerseriss «jeer seis ecle es nnosanone 10,000 Women and female children ……6 66,000 Boys under seventeen years of age ……. 24,000 Cotton manufactured, 90,000 bales.…... ... 27,000,000 ib Cotton cloth of various kinds manufactured 81,000,000 yards, (QO St ERT ier tnacne ccauaatissipinasetis cactus eens aa 24,000,000 dollars,

At the date of this report the duty upon cotton goods imported into the United States was 15 per cent; but before charging it, 10 per cent. was added to the invoice, and the duty thus raised to 164 per cent. Upon the recommendation of the committee, 10 per cent. more was imposed ; and the whole being charged upon £110 for every £100 of net value brought it up to 274 per cent, Besides this, it was ordered that all cotton goods below 134d. per yard should be rated at 133d., and the difference added to the amount of the invoice before calculating the duty.

New tariff Acts were successively passed in 1824, 1828, 1832, and 1854, in each of which the duty upon cotton goods imported was declared to be 25 per cent. ad valorem, the coarser fabrics being rated as in 1816.

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The manufacture, under this protection against foreign competition, rapidly increased. Power-loom works were erected; the most approved processes both in spinning and weaving were adopted ; and the business was generally successful. 'The manufacture is no longer confined to the States of New York and Rhode Island, and the New England States, though in these it has been greatly extended. In other Northern States, such as New Jersey, Pennsylvania, Delaware, Maryland, Ohio, and Indiana new mills have been erected; whilst in the Southern States, especially in Alabama, Georgia, North and South Carolina, Mississippi, Virginia, &c., the manufacture as well as the growth of cotton has become an important industry. The

following statement (Table IX.) shows the progress already made :—

' bg r é | 4 §&a 3S a fs g.| 2s! of :? cya) a pt a on ane | sf {eel} eeel| 82 be 2 2e ial gov 29 24 Ill BB |e |.gg 5 5 1% me 4 qs io & 1869 No. tb. Ib, Bales. North …! ... 6,538,494) 28 | 60°70 South … 225,063| 12% | 18812 Total… 6,763,557| 274 | 64°88

1870

North …| ... | 6,851,779} 28% | 50:87 Be South … 962,221; 12} | 124:23 – Total… 7,114,000) 288 | 52°93

1874

North …! ... | 8,927,754) 28°56 | 56°86 | 507,790,099] 1,094,387 South … 487,629] 12°5 | 122°53| 59,793,774] 128,526 Total…| ... | 9,415, 283 27°73 | 60°29 | 567,583,873) 1,222,913

1875

North …! 694 | 9,057,543) 28°42 56°25 | 509,009,613] 1,097,001 South …/181] $481,821) 12°67 | 140°57| 67,738,140] 145,079 Total…| 875 | 9,589,364| 27°60 | 60°46 | 576,742,758

Under the influence of protecting duties the prosperity of the American cotton manufacture has continued to

TABLE X.—Showing the kinds and quantities of Cotton Goods manufactured in the United States—From the Financial Review (American.)

New England States,

| Year ending July 1, 1874, Threads, yarns, and twines……. … Ga eetine Bs Tb Sheetings, shirtings, and similar plain goods.. yards

—

32,000,000 520,000,000 204,000,000

pI (MCL OU esas s «cv» ataereaneeas oft Meaivecerena yards | 481,000,000 Og ge ssc uer sense vn ccta roduc occ vee etagpies yards} 80,000,000 TV UOIES Beis c thsRe ganas A ROE co ron noc … yards 14,000,000 NN sli. cries aOR ns ina ag ums enw Ra number 5,000,000 Yeur ending July 1, 1875. TUNTO@QS, Yarns, ANG, EWINES. 5.00160… .0.cccsseeeetacses Th] 45,000,000 Sheetings, shirtings, and similar plain goods..yards | 540,000,000 Twills and fancy goods, osnaburgs, jeans, &c.. yards | 180,000,000 Were tts os. gs esas/Sswael' daggers « cages eames eve yards} 640,000,000 ACT Aes « a glaaPO cela gg ng 06s mare scanner cg yards} 30,000,000 SRR cen cons eee yards 12,000,000 rete n Gees errs cee ses sass vee 00 number 8,000,000

increase, until the anticipated condition has at length been reached when the product exceeds the demand for the home consumption. As the surplus could not be disposed of in foreign markets, the manufacturers have had to ex- perience similar distress to that which befell the cotton manufacturers of France in the years from 1827 to 1832,

Total United States,

Total Southern States.

Total Southern States.

Middle and Western States.

— a

29,000,000 61,000,000 | 18,000,000 9,000,000 90,000,000 610,000,000 | 97,000,000 | 707,000,000 80,000,000 | 284,000,000 | 22,000,000 | 306,000,000 107,000,000 | 588,000,000 a 588,000,000

3,000,000 33,000,000 33,000,000 16,000,000 30,000, 000 30,000,000 1,000,000 6,000,000 6,000,000

19,000,000 64,000,000 | 19,000,000) 83,000,000 94,000,000 | 684,000,000 | 92,000,000 | 726,000,000 46,000,000 | 226,000,000 | 21,000,000 | 247,000,000 109,000,000 | 749,000,000 " 749,000,000

5,000,000 35,000,000 35,000,000 16,000,000 28,000,000 28,000,000 2,000,000 10,000,000 10,000,000

nn i en'

Owing, however, to the different circumstances of the two countries, this state of things in America may be expected to be of a more temporary character. The depression exist- ing in the cotton industry since the crisis of 1873, has excited the desire for a wider field for American enterprize, a successful competition with other countries in the markets

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of the world. But all aspirations of this kind must be doomed to disappointment so long as the protectionist policy of the States is upheld— the very means which they adopt to shut out all other manufactures from their markets

~~COTTON~~

~~Overseer, Weavers, ro 5°61 The hours of labour are from 60 to 66 per week.~~

~~WORVING ©... s.52seeenee~~

~~The following is about the present rate of wages paid in~~

~~must have the effect of shutting out their own from the | English cotton mills :—~~

~~markets of the world—they cannot sell freely to other nations from which they refuse to buy. Although, there- fore, much is from time to time spoken and written by alarmists of the danger to be apprehended by the cotton-manufacturing interests of England from American competl- tion, we believe the fears entertained to be without any real foundation. The addition of 50 per cent., more or less, made by the tariff to the cost of English-made goods would be unnecessary to prevent competition, if the American manufacturer could produce those goods as cheaply as his foreign rival. If America be thought to possess any supe- riority over England in the greater facility and cheapness with which the raw material can be provided—and even this may be doubtful—such advantage is more than counterbalanced in other respects, and especially as regards labour, Wages in the States have been gradually declin- ing, and are probably now 20 per cent. lower than in 1869, but they are still about 40 per cent. higher than in 1860. The following isa statement of the weekly wages in cotton mills :—~~

~~Overseer, — GAUGE soc secssneseos ses $21-00 Picker tende irre Seren eos ae 6°74 Grinders, Spm Sudechascbdesosanachodoe 8°28 Strippers, AMEE cos Ospareeaccecanmccuads 6°84 Overseer, — spinning 21°00 Mule spinners, 5] | weosnboodacoadeonasUStoane 9°12 Mule backside piecers, 4, ...:.s-sssseeseeeee ceeeeee 2°40 Frame spinners, Po gee cenneucbornowepabeaden 4°62 Overseer, — CUGBSID GS oe)..nccnmocceaser ses: 21°00 Seeond hand, Nc haere 11°88 Spoolers, ppt aoooub hoe ssanceemadoe 5:94 Warpers, of 5°70 Drawers and twisters, 5, eoe-ereeccereneersseeers 5°52 Dressers, Rel abocéccdoconngndeodeane 10°92~~

~~COTTON, Cuarxes (1630-1687), an English translator, poet, and wit, was born at Beresford in Staffordshire. He was educated at Trinity College, Cambridge, and after- wards spent some time on the Continent. At the age of twenty-eight he succeeded to an estate greatly encumbered through his father's extravagance, and the rest of his life was that ofa country gentleman. He gained the friendship of Izaak Walton, whose fishing expeditions to the Dove he was privileged to accompany ; and to the Complete Angler he added Instructions how to angle for a Trout or Grayling in a Clear Stream. Ardglass, had a jointure of £1500 a year, but it was secured from his extravagance, and at his death in 1687 he was insolvent. Cotton is the author of a good deal of verse, much of which is jocular. Though his love songs are frequently quaint and frigid, they are sometimes exceedingly gay and spirited, as are also most of his baechic verses.~~

~~His chief works are—Translations of the Horace of Corneille, the Life of the Duke @ Espernon, and the Fair One of Tunis, and above all his farnous and often published translation of Montaigne (1683, 1869, &c.); the Scarronides, or Virgil Travestie, a coarse parody of the first and fourth books of the Avncid, which ran through fifteen editions ; a humorous poem, the Voyage to Ireland ; and a serious poem of small merit, the Wonders of the Peak.~~

~~COTTON, Greorcr Enwarp Lynox (1813-1866), head- master of Marlborough School and bishop of Calcutta, metropolitan in India. and Ceylon, was born at Chester, October 29, 1813. He was the son of an officer who was killed at the battle of the Nivelle, a fortnight after his son's birth, and grandson of Dr Cotton, formerly dean of Chester.~~

~~His second wife, the countess of~~

~~CaTder…….ccccccceeseeeeeeseeeeoe OOS. bOM0s. permrtck Wndertearderin.Jstcecesessceeooae-. MIs, FOZ Ge Gand ers eyyscssssentaceeesexemeeee: B58, 5,235: Fs Ward sPembersics «nese aati.) Teg UST 53 PD rawiMe COMO vecccsees- er laes Hes: melcse ase Slubbing tenters…… ……. 163.,, 188 ,, Intermediate tenters…… GSH, MSS: 3 Ronan gy berabens memeeeeeyas ess ciate NGS. HSS: cose Backetemitens eescenc-sataatetiectisis1 Doo MOSS ss Spinning. Mule~~

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The hours of labour (524 per week) are shorter than those in America. If the artificial barriers which are at present kept up to exclude English manufactures from the United States were thrown down, they would probably even there be able to maintain a successful competition, whilst as regards all neutral markets, where they can meet on equal terms, English manufacturers need never be afraid of the issue. Past progress and success furnish the means and the motive for further exertions, both to extend their manu- factures and to open out new channels of trade. (I. w.)

He received his education at Westminster Schoo, whence he passed in 1832 to Trinity College, Cambridge. Here he became an adherent of the Low Church party, and at the same time the intimate friend of several disciples of Dr Arnold, among whom were Dr Vaughan of Harrow, W. J. Conybeare, and Dr Howson. Theinfluence of Arnold was powerful enough to determine the character and course of his whole life. He graduated B.A. in 1836, and was forth- with appointed by Dr Arnold to an assistant-mastership at Rugby. Here he worked steadily and devotedly for fifteen years, inspired with the spirit and heartily entering into the plans and methods of his beloved master. He became master of the fifth form about 1840. He made himself the sympathizing companion and friend of his pupils ; and by the force of his character and the geniality of his disposi- tion gained their unbounded esteem and love. In 1852 he accepted the appointment of head-master of Marlborough College, which was then in a state of serious financial em-

/ barrassment and of almost hopeless disorganization ; but,

giving himself to the task of reforming it with all his heart, in his six years' of rule he rescued it from impending dissolution and raised it to a high position. In 1858 Cotton was offered the see of Calcutta, vacant by the death of Dr Daniel Wilson ; and this high post, after much hesitation about quitting Marlborough, he accepted. For its peculiar duties and responsibilities he was remarkably fitted by the simplicity and solidity of his character, by his large toler- ance, by his capacity of sympathy with other men, and by the experience which he had gained as teacher and ruler at Rugby and Marlborough. It was natural that the cause of

education should especially engage his attention in his new sphere; and through his zealous endeavours a large number of schools were established, the working of which must be among the most beneficent influences of English rule in India. Bishop Cotton endeared himself to men of all parties, and his sudden death was mourned as a loss throughout his vast diocese. On his return journey from a visitation tour in the autumn of 1866, he slipped while passing in the twilight, October 6, along the plank from his barge towards the shore at Kooshtea, on the Ganges, and was drowned. The body was borne away by the current and never seen again. A memoir of his hfe, with selections from his journals and correspondence, edited by his widow, was published in 1870.

COTTON, Sir Rozert Bruce (1570-1631), the founder of the Cottonian Library, born at Denton in Huntingdon- shire in 1570, was a descendant, as he delighted to boast, of Robert Bruce. He was educated at Trinity College, Cambridge, where he took his B.A. degree at the age of fifteen. His antiquarian tastes were early displayed in the collection of ancient records, charters, and other manu- scripts, which had been dispersed from the monastic libraries in the reign of Henry VIII.; and throughout the whole of his life he was earnestly engaged in gathering materials for his library and museum of antiquities from all parts of England and the Continent. Perhaps his first pamphlet is that maintaining the right of the English ambassador to precedence over the envoy of Spain, which was written at the request of Elizabeth. On the accession of James I. he was knighted, and soon after he was employed in drawing up a Memorial on Abuses in the Navy, in

~~consequence of which a navy commission was appointed, of which he was made a member. He also presented to the king an historical Inquiry into the Crown Revenues, in which he speaks freely about the expenses of the royal household, and asserts that tonnage and poundage are only to be levied in war time, and to " proceed out of good will, not of duty." In this paper he proposed the creation of the order of baronets, each of whom was to pay the Crown £1000 ; and in 1611 he himself received the title. In 1615 Cotton, as the in- timate of the earl of Somerset, whose innocence he always maintained, was placed in confinement on the charge of being implicated in the murder of Overbury ; nor did he obtain his release till he had paid £500 for a pardon. Shortly before he had been examined before a royal com- mission, being suspected of having made known to Gon- domar, the Spanish ambassador, the intentions of the English court. The charge is supported by the despatches of Gondomar to Madrid, though probably Cotton deserves no serious blame. From Charles I. and Buckingham Cotton received no favour; he was the intimate friend of Sir John Eliot, Sir Symonds d' Ewes, and John Selden. In 1626 he gave advice before the council against debasing the standard ; and in January 1628 he was again before the council, urging in courtly language the summons of 4 Parliament. His arguments on the latter occasion are con. tained in his tract entitled Ze Danger in which the Kingdom now standeth and the Remedy. In October of the next year he was arrested, together with the earls of Bedford, Somerset, and Clare, for having circulated a tract known as the Proposition to bridle Parliament, which had been addressed some fifteen years before by Sir Robert Dudley to James I, advising him to govern by force ; the circula- tion of this by Parliamentarians was regarded as intended to insinuate that Charles's government wis arbitrary and unconstitutional. Cotton was himself !released the next month; but the proceedings in the Star Chamber con- tinued, and, to his intense vexation, his library was sealed up bythe king. The pain caused by a base attempt to éxtort money by attacking his character further weakened~~

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~~his already failing health ; and on the 6th of May 1631 he died. He was buried in Conington Church, where a monument is erected to his memory. His son, Sir Thomas, added considerably to the Cottonian library; and Sir~~

~~*John, the fourth baronet, presented it to the nation in 1700. In 17831 the collection, which had in the interval been removed to the Strand, and thence to Ashburnham House, was seriously damaged by fire, In 1757 it was transferred to the British Museum.*~~

~~*See the article LipraAries, and Edwards's Lives of the Founders of the British Museum, vol. i. Several of Cotton's papers have been printed under the title Cottoni Posthuma ; others have been published by Thomas Hearne.*~~

~~*COTYS, a name common to several kings of Thrace, Of these the most important began to reign in 382 B.c. He was notorious both for cruelty and for drunkenness, Almost the whole of the information we possess of his reign is connected with his quarrels with the Athenians. The first of these was for the Thracian Cheronese, in which Cotys was assisted by the Athenian Iphicrates, to whom he had given his daughter in marriage. On the revolt of Ariobarzanes from Persia, Cotys opposed him and his ally, the Athenians. In 358 he was murdered by the sans of a man whom he had wronged, and the Athenians rewarded his assassins with golden crowns.*~~

~~*COULOMB, Cuartes AvaustIN (1736-1806), a dis- tinguished French natural philosopher, was born at An- gouléme, June 14, 1736), and belonged to a noble family of Montpellier. He chose the profession of military engineer, spent three years, to the decided injury of his health, at Fort Bourbon, Martinique, and was employed on his return at Aix, Rochelle, and Cherbourg. He gained great distinction in 1773 by his Statical Problems Applied to Architecture, which he presented to the Academy of Sciences in 1779 ; he shared with Van Swinden the prize for improvements in the construction of compasses, and two years later he obtained the prize of the Academy by his Theory of Simple Machines, comprehending the Effects of Friction and the Stiffness of Ropes. In 1781 he was stationed permanently at Paris. There being a proposal for the construction of a system of canals in Brittany, Coulomb was sent as royal commissioner to the estates of that province. He expressed decided disapproval of the scheme, and his opinion caused him to be thiown into prison. He remained firm, however, and refused to give any other verdict, and at length he succeeded in convincing the estates, who showed their appreciation of his candour by making him handsome offers, and presenting*~~

him with a seconds watch, adapted for scientific experiments. Coulomb was also appointed intendant-general of waters and fountains, chevalier of St Louis, member of the legion of honour, and member of the Academy of Sciences, On the outbreak of the revolution he gave up his offices, and retired from Paris to a small estate which he possessed at Blois. He was recalled to Paris for a time in order to take

art in the new determination of weights and measures, which had been decreed by the Revolutionary Government. Of the National Institute he was one of the first members ; and he was appointed inspector of public instruction im 1802, But his health was already very feeble, and four years later he died of slow fever. His fame rests chiefly on his most elaborate and important investigations in elec- tricity and magnetism, and on his invention of the torsiow balance,

Coulomb's chief works, besides those already mentioned, are— Methods of executing without Water all Kinds of Hydraulic Works ; Observations on the Daily Labour of Men ; On Heat ; Experiments on the Circulation of Sap; On the Cohesion of Fluids, and their Resistance to Slow Motions; Theoretical and Experimental Ie- searches on the Force of Torsion; pnd several treatises on electricity and magnetism, cn

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COUNCIL. Early in its history the Christian church gave outward expression to a sense of the mutual depen- dence of its members by summoning Councils, or Synods, where on common ground the spokesmen of the Christian community sought, with zeal and acumen, but often not with- out passion, prejudice, and diplomacy all toe human, to dis- cover the mind of the Spirit. There prevailing practices were approved or reprehended, and the dim persuasions of the few or the many were sharpened into dogmatic state- ment binding on all. On the great movements of Chris- tian thought, much has ever been reserved for individuals to accomplish, the collective church gradually and unoffi- cially recognizing the indefeasible power of some one spiritual or ecclesiastical genius; but the councils have deeply left their mark on the doctrine and on the constitution of the church. The minor synods, forming a well-balanced system of regularly recurring assemblies, served as an important organ for

~~the administration of ecclesiastical business; and the greater councils, summoned to meet pressing emergencies, often proved turning-points in the church's history. At them the pulse of the visible church beat high. The councils have not inaptly been called "the pitched battles of church history;" but while they have at times caused the forces of the heretics to draw more closely together, and have more than once precipitated schism, or rendered it more determined and persistent, it is not the less true that the synods of the church universal have been her great legislative assemblies, when discussion and deci- sion, more or less full and deliberate, have restored into one channel the main stream of ecclesiastical life, and have brought home, alike to those within and to those without the pale, a sense of the church's corporate oneness.~~

~~It is characteristic of the church of Christ that it was left free to mould its constitution according to its circum- stances. The founders of Christianity left no detailed con- stitutional code. And as in other regards, so it was here; neither Christ nor the apostles prescribed a synodal system for the infant church, or enacted when and where councils should assemble, how they should be constituted, and what they should determine. Much zealous labour has been spent in proving that the councils, even as a developed organiza- tion, are a divine institution,—a difficult task certainly, if it be necessary to agree that what is human is therefore not divine, but accidental and "invented." The most various Christian parties have with one consent sought the prototype of all Christian councils in that assembled at Jerusalem under the apostles; and from its scanty record in Acts xv. (the other apostolic assemblies reported in Acts 1, vi., xxi, being passed by as irrelevant) the advocates of the most divergent systems have extracted precise rules for the con- vening and the guidance of ecclesiasticaliassemblies. But even if we fully accept the historical accuracy of the report, it is impossible to decide with certainty the relation of the apostles to the "'presbyters," and of both to the "brethren;" and the decree embodying the decision of the Jerusalem Council contains rather a practical compromise, the arrangement of a modus vivendi in the spirit of peace and mutual forbearance, than a final settlement on grounds of principle of the grave and long-lasting problem as to what should be the relations between the new Christian church and the old Jewish law. It~~

~~points to temporary concession, not to the formulation of a permanent creed.~~

~~It is not till after the middle of the 2d century that we find the example of Jerusalem followed, and councils called to solve questions that threatened the unity and well-being of the Christian church and community. The earliest councils historically attested are those convened in Asia Minor against the Montanists; though it is by no means unlikely that at a much earlier period the Christian Greeks gave scope, in ecclesiastical affairs, to their instinct for~~

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~~organization, for taking common action in regard to matters affecting the public good. Near the end of the 2d century again, varying views as to the celebration of Easter led to councils in Palestine, at Rome, in Pontus, Gaul, Mesopotamia, and at Ephesus. These councils were all specially called to consider particular questions, But before the middle of the 3d century, it seems that in Asia Minor at least the councils or synods had become a standing institution, and met yearly. About the same time we find councils in the Latin Church of North Africa. Before the end of this century there were councils meeting regularly in almost every province in Christendom, from Spain and Gaul to Arabia and Mesopotamia; and by extension and further organization, there was soon formed a system of mutually correspondent synods that gave to the church the aspect of a federative republic.~~

~~The developing episcopal system suggested plainly enough a gradation of rank and functions for the various synods, A synod composed of all the clergy under one bishop, with their bishop as president, stood at the bottom of the scale, and is commonly named the diocesan synod. The metropolitan synod, or provincial council, met under the presidency of the metropolitan, and included all the bishops of his ecclesiastical province. Such metropolitan synods the Council of Nicaea recommended to be held twice a year. When all the bishops of a patriarchate met under the patriarch, or all those of a nation under its primate or first metropolitan, the council was patriarchal or na- tional or primatial (not infrequently termed conczlvwm generale or plenarium). Occasionally the bishops of adjoining provinces~~

~~met, the senior metropolitan presid- ing, for the consideration of matters common to @ district of wider area than the one ecclesiastical province. The ovvodo. évdnuodcar held at Constantinople by the metropolitan, who invited as many bishops to meet him as chanced to be then in the city, though not irregular, corresponded to no territorial division of the church. Concilia mixta, held chiefly during the Middle Ages in Germany, England, Spain, and Italy, were constituted not less of temporal than of spiritual princes, and resolved questions not solely ecclesiastical. General synod was usually the name for an assembly of the bishops from all portions either of the Western or of the Oriental division of the church. Such a synod was that of Arles, whither, in 314 a.p., Constantine summoned the bishops of the Western Church. But the minor councils were soon over- shadowed by the ecumenical councils, at which the whole of Christendom was held to be represented, and which by universal agreement came ultimately to be regarded as having authority for the whole church.~~

~~At the diocesan synods, presbyters were members as well as the bishop, but they had only a votum consuliativum. The regular members of the higher synods were the bishops alone or their representatives, and exercised the votwm decisivum. But other clergy, deacons, doctors of theology and of canon law, and abbots, were invited to assist the bishops with their advice, and it seems that sometimes at least the abbots were permitted to give a decisive vote. Laics, especially emperors, kings, and their commissioners, were often present, and to some English councils even abbesses were admitted. Save at the Councils of Constance and Basel, the voting was by count of heads ; but at Con- stance the voting was according to nations, in order to counteract the numerical predominance of the Italian Bishops. A similar method was adopted at the Council of Basel.~~

~~It has never been settled beyond dispute which of the councils are to be regarded as truly and authoritatively re- presentative of the Christian oixoupévy. And of those that may fairly be called cecumenical, one differs widely from~~

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~~another not merely in its catholicity of spirit and in the abiding interest of the questions discussed, but in the width of area from which its members~~

were drawn, and the extent of territory throughout which its authority was at the time recognized, At the earliest universal councils the representatives of the Western Church were a small minority; at Niceea hardly 10 of the 318 (?) bishops were of the Latin- speaking church. 'The council at Constantinople in 381 was at first only a general synod of the Oriental church ; and it was not till the 6th century that it was recognized as cecumenical in the West. Some councils, such cs these summoned to Pavia and Siena, were desizned to be cecumenical, but led to no such result. The whole Greek Church acknowledges still but seven cecumenical councils, The English Church after the Reformation practically re- cognized the first five. The doctrinal definitions of the first four councils became the common property of the churches of the Reformation, but Protestant authors rarely refer to the later councils save polemically. The Latins even are not entirely agreed amongst themselves. The claims of the council at Sardica in 393 to universal authority have been asserted but seldom sonceded. Some Catholics have protested against the cecumenicity of the synod in 1311 at Vienne, generally reckoned the 15th cecumenical. Most Catholics, including some of those most anxious to promote reforms, refused to admit the Gallican claim in favour of the council summoned to Pisa in 1409; and its rank a8 a universal council has never been allowed by the most approved Catholic theologians. The Gallicans wished to have the Council of Constance recognized as cecumenical throughout ; good Catholics acknowledge only the sittings held after Pope Martin V. was chosen, or such earlier decrees as were afterwards sanctioned by this Pope. Some Gallicans regard the Council of Basel as cecumenical from beginning to end ; most insist on regarding it as legitimate ouly till it was transferred to Ferrara; many Catholics, amongst others Bellarmine, decline to admit the cecumenicity of any of its decrees. The Council of Ferrara- Florence, a Papal continuation of that at Basel, was at first protested against by the Gallican party, but is fully accept- ed by most Catholic theologians and canonists. The Gallicans were also slow to admit the binding authority of the 5th Lateran synod, the 18th cecumenical council.

The question as to the number of councils is naturally of most consequence to the only section of the church that still assumes the right to summon councils and to call them ceecumenical. The view that prevails in the Roman Catholic Church may best be shown by giving a list of the councils

accepted as cecumenical by Hefele (Conciliengeschichte, 2d ed. vol. i. pp. 59, 60).

A.D.

1. The Council at Nicwa.…….000 825 2. The 1st Council at Constantinople.… 381 8. The Council at Ephesus.…... …….. 431 4, The Council at Chalcedon.……. 45] 5. The 2d at Constantinople..,……. 553 m, 'Fic oc Mt ComevaMtirople w.…... .... 680 We MDDS at ANC Bw sccemnews. aamaes. cove 787 8. The 4th at Constantinople ……. 869 9, The Ist Lateran Gouncil.……. 1128 10. The 2d Lateran Counetl.……. 1139 WT, "Phre*Ba"Watenan Council,……..00+ neg 1 "The 4th laterah) Councths eis. ..0.… 1215 18. 'The Ist Council at Iiyons.……. 1245 14, The 2d Council at Lyons ……. 1274 #5. The Council at Vienne.……. + 1311

16. The Council of Constance (partially) 1414-1418

. The Council of Basel (partially)…... 1431-1438

. The Council of Ferrara-Florence (a continuation of that at Basel).... 1438-1442

18. The 5th Lateran Council.……. . 1512-1517 19, "Nies@ounmel Of Tremt.……..0.0: cosees 1545-1563 DO; "Waiivean "COUGH, cin oe. eee. caer. vee 1869-1870

These cecumenical councils fall naturally into several

different from that of the other patriarchs.

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groups or series. The first eight, including that at Con- stantinople in 869, were summoned by the emperors, all the later ones by the popes,—and this though the analogy of the inferior councils seems to demand that the represen- tative assemblies of the universal church should be summoned by the head of the church alone. Catholics always assert that no council can be

~~cecumenical unless called by the Pope, or by a temporal prince with and by the Pope's assent obtained before or after ; and Catholic authors have been at pains to attempt a proof that, even at the councils undoubtedly summoned by the emperors, the bishop of Rome stood to the calling of them in a relation In the case of the 3d cecumenical council, for example, Hefele contends that the Pope did not merely, like the other bishops, passively assent, but actively sanctioned the summons.~~

~~The exclusive right of the popes to preside was unhesi- tatingly admitted at all the later councils; but at the earlier ones, where manifestly emperors, empresses, or their commissioners were the formal presidents, Catholic canonists have persuaded themselves that such presidency was merely in regard to external matters, and that the true president was alwaysepiscopal. Even at the Council of Nicaea, they argue, Hosius and the two Roman presbyters who signed the decrees first must have done so as deputies of the Roman bishop, and as such must have been the true presidents.~~

~~The first eight councils differed from the rest in that, whereas all others met within the bounds of the Western Church, they were all held in the East. Further, the great majority of those who attended them were Greeks, and spoke Greek alone; and the chief subjects of debate at several turned on distinctions not safely translatable into the Western tongues. The first six of these eight councils were occupied mainly, though by no means exclu- sively, with aspects of the great trinitarian and christo- logical controversies, and their decrees are accordingly cf high dogmatical interest.~~

~~Of councils held in the West a well-defined sub-group includes the 9th (the Ist Lateran) to the 15th (at Vienne in 1311). The first of these is significantly enough con- cerned with the dispute about the right of investiture ; and though some of this series of seven discussed or defined dogmas, as did the brilliant 4th Lateran Council, they were for the most part busied with matters pertaining to the rights and dignity of the popes and with questions con- cerning their election. Indeed several of them have less the aspect of free and independent councils than of assera- blies gathered for the official ratification of the proceedings of Pope and Curia. —~~

~~The reasons for the calling of universal synods are of various kinds. When a serious heresy or schism has arisen, when it is doubtful which of two~~

opposing popes is legitimate, when it is proposed to undertake some grand design against the enemies of the church, when the Pope is accused of heresy or other grave fault, when the cardinals will not or cannot elect a Pope, and when a root and branch reformation of the church is in view,—councils may or must be summoned. It was the last of these grounds for assembling the universal church that led to the 16th, 17th, and 18th cecumenical councils; and the 19th, that of Trent, though the sufficiency of the reforms agreed to by it was unanimously denied by Protestant reformers, must also be reckoned amongst the reforming counciis.

The Vatican Council is the last of those claiming to be cecumenical ; and in decreeing the infallibility of the Pope, it has appeared to many that the 20th council has shown cause why, for all essential purposes, there needs never bo another. The very institution of councils seems in itself an admission that apart from them there was no source cf

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accessible and infallible authority on disputed points. If

the assembly at Jerusalem was really a council, then even where Paul and at least one of the original twelve apostles were present, the settlement of a question with vast doctrinal and practical issues was arrived at by means of open debate

amongst the members of the synod. Unhesitating belief in frequent and miraculous manifestations ef the divine will was universal for centuries ; yet. when the illumination of the Holy Spirit was most urgently needed for the establish- ment of Christian truth, recourse was had to the collective opinion of assembled representatives, to discussion more or less calm and candid, and to the counting of votes,—a most

noteworthy feature in the development of the church. And it deserves to be remarked that thus,

individual freedom, a measure of independence such as could not fail to keep alivea feeling hostile to the extension of imperial, though Christian, tyranny into at least one of the provinces of thought and action.

The infallibility of universal councils, ultimately admitted by the whole Catholic Church, was early claimed. "It seemed good to the Holy Ghost and to us," words occurring in the Jerusalem decree, could not but suggest to the successors of the apostles that the synods assembled under them were favoured by the special superintendence of the Holy Ghost ; and this was distinctly asserted by Cyprian. But the sanction of the Pope has always been held by modern Catholics as necessary to the infallibility of any council ; and the decrees even of the minor councils attain to infallibility if approved by the Pope and accepted by the church at large. A limitation of synodical authority that merely recognized the Pope as an integral part of the church might be agreed to even by those who asserted that cecumenical councils are superior to the popes, a theory long and vehemently contended for and against in the church. That the councils are above the popes was

the view of the Councils of Constance and Basel, and was

formulated as one of the four Gallican propositions; whereas at the 5th Lateran Council Pope Leo X. roundly asserted the authority of the Pope over all councils.

Yet the infallibility of universal councils was most con- fidently accepted by the very parties in the church which were least disposed to concede absolute authority to any other ecclesiastical institution,—notably by the Gallicans aud by the German Reformers in the early stages of the Reformation. And the institution of councils, both of occasional councils called for special purposes and of those meeting statedly, was inherited by the Protestant churches. The Synod of Dort is an instance of a general council of churches adhering to the Reformed confessions ; the West- minster Assembly was designed to be a national council. It is of course in the Presbyterian churches that councils have received their most systematic development, and, without claiming infallible authority, retain the most extended powers as legislative, administrative, and judicial. In the Church of Scotland the regular gradation of kirk sessions, presbyteries, provincial synods, and general assem- bly of representative ministers and elders supervises and regulates all the functions of the church, and forms a com- pact and balanced system of constitutional government. In non-presbyterian churches synods have various degrees of deliberative or decisive authority.

Even now the re- organization of the synodical system of the United Pro-testant Church of Prussia is regarded both by churchmen and by statesmen in Germany as one of the ecclesiastical questions of the day.

The chief collections of the Acts of the Councils of the Catholic Church are that by Hardouin, published at Paris in 1715 in 12 olios and the still more complete one by Mansi (Florence and

in times of all- embracing despotism, the church secured for the representa-tives of the Christian community one side of corporate and

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Venice, 1758-1799) in 31 foho vols. but extending only to the 15th century. By far the most elaborate recent work on the Councils is the Conciliengeschichte of Dr Hefele, bishop of Rottenburg (7 vols., 1st ed. 1855-1874 ; 2d ed. 1873, sqq.). (ery

COUNCIL BLUFFS, a town of the State of Iowa, United States, near the left bank of the Missouri, opposite to Omaha in Nebraska, and on the line of the great con- tinental railroad from Chicago to San Francisco, It is a rapidly growing place, and in 1870 had 10,020 inhabitants. Open prairie surrounds it on all sides. A mile west of the town the Missouri is spanned by a great iron bridge, one of the finest in the country.

COUNSEL. See Apvocats, vol. 1 p. BARRISTERS, vol. ili. p. 394.

COUNT, COUNTESS (Latin, Comes, Comitissa). In the peerage of Great Britain and Ireland the Continental title count, when its highest and most dignified acceptation, is represented by earl,—an earl's wife, however, being styled countess. In the times of the Roman commonwealth, personages of different degrees of rank, who in various capacities officially accompanied the proconsuls and pro- prietors into the provinces, bore the common designation of comites, either a comitando or a commeando. At a later period, the comztes, as personal companions and counsellors of the prince, whose name they always added to the title of their office, became lords of the palace, whence the origin of their style as counts palatine. At a considerably later era, this same title implied princely rank, dignity, and

~~power enjoyed by the bearer under a supreme imperial sovereign. By Constantine the title comes was first established as a definite dignity; but this same title, within a short time after its first formal establishment, was conferred indiscriminately upon various classes of public officers, of whom a long list, specifying the capacity in which each one served, is given by Du Cange. After the fall of the Roman empire the governors of provinces and cities who commanded in war and during peace presided over the administration of the laws retained the titles of duces and comites (dukes and counts) ; occasionally also the distinction between these titles failed to be observed, and some counts became governors of provinces. Under the last king of the second royal dynasty of France, the dignity of the counts of the highest rank was rendered hereditary, when they even aspired to independent sovereignty. From the inability of Hugh Capet to maintain the supremacy of the Crown against their encroachments, these great peers assigned to his reign their first assumption of coronets with their arms, to denote their enjoyment of sovereign power in their particular counties or territories. In after times, the dignity of count, hereditary in the male line, was granted by a sovereign upon his erecting a territory into a county, with a reserve of sovereignty and jurisdiction to the Crown, and also with reversion to the Crown in default of heirs male. At the present day, from the custom of styling all the sons of a count also counts, the titular bearers of this designation on the Continent are very numerous, while their rank is little more than nominal. In Germany the equivalent for count is Graf, and the several orders of these German counts are distinguished by the formation of com- pound titles, as "landgraves," "palsgraves," &c, See Ear.~~

~~COUNTY is the chief of the administrative areas into which England is divided. This is an ancient division, and, according to the popular manner of accounting for the origin of social institutions, is attributed to the wisdom of our early kings, and more particularly of King Alfred. It is tolerably clear, however, that this theory is a reversal of the natural process, and that, instead of counties having been formed by the division of the country, the country itself was formed by the aggregation of counties. The county, in fact, is the representative of an independent~~

kingdom or community, now long merged in the larger unity of the English kingdom. 'The same mistake that has been made as to the historical relations of the county and the kingdom is repeated in the popular accounts of the subdivisions of the county itself. Alfred the Great, it is said, divided the county into hundreds, and these again into tithings. The truth is exactly the contrary—the sub- division of the county being an earlier aggregate than the county itself. The parish, the manor, and the township all appear to be traceable to the independent tribal settle- ment—the village community—of the early Saxons. They appear in history with their political and judicial organism complete. A combination of these units forms the district of the hundred ; and a combination of hundreds forms the county. All of these groups have the same kind of organ- ization. They all have their moots or meetings, partly judicial partly political in character, and their head-man or reeve. The Witenagemot of the Saxon kingdom is the folk-moot for the whole kingdom, corresponding to the folk-moot for the shire or county.

In the period preceding the Norman Conquest two officers appear at the head of the county organization. These are the ealdorman or earl and the scirgerefa or sheriff. The latter was more particularly the representative of the king ; the former represented, in dignity at least, the head of the county before it had ceased to be an independent community. After the Conquest the sheriff became a purely royal officer (vice-comes or ballivus). He held an annual court (the sheriff's tourn or leet) to which the vassals of the king were suitors. These were the judicial tribunals for the people within the jurisdiction of the county. An appeal lay from them tothe king, and the growth of the king's court, in its three developments—King's Bench, Common Pleas, and Exchequer—tended to draw suits at the first instance away from the county court into the higher tribunal. The county court, moreover, arranged the assessment of rates, and the sheriff was, in fact, the financial representative of the Crown within his district. When the principle of representation came into existence, the county court was the assembly which elected the knights of the shire. The ancient offices of coroner and verderer were also filled up by the same assembly. The county organization thus in many points retained the features of an independent political society.

~~From the time of the Plantagenets its importance in the constitution declined.~~

~~The office of sheriff in England has lost all its financial and nearly all its judicial duties. He is now chiefly a ministerial officer—he arrests or imprisons, summons and returns the jury, carries the judgment or sentence of the court into effect, dc.~~

~~The military functions of the sheriff were in the reign of Henry VIII. (or, according to some, Edward VI.) handed over to a new officer, the lord-lieutenant, who is now more prominently associated with the headship of the county than the sheriff is. The office is honorary, and is held during royal pleasure, but virtually for life. The Government of the day invariably appoints one of its own supporters,— generally a person of high position in the county. He is the chief conservator of the peace and keeper of the records of quarter sessions. He is also commander of the militia and yeomanry of the county, whose officers he appoints.~~

~~In the United States of America the county forms the section into which the State is divided; it is again sub- divided into townships. The financial affairs of the county are superintended by county officers, and each county is provided with a court of inferior jurisdiction. Louisiana is the only State which is divided into parishes, instead of counties.~~

~~The Counties Palatine are three in number, viz., Durham, Chester, and Lancaster, The counts palatine (earl of~~

~~513~~

~~Chester, bishop of Durham, and duke of Lancaster) exercised royal rights within their districts. Chester was united with the Crown under Henry III., but the palatinate jurisdictions survived in the other two cases. The Court of Common Pleas at Lancaster and the Court of Common Pleas at Durham are among the courts whose jurisdiction is transferred to the High Court of Justice by the Judicature Act, 1873. The palatine authority of the bishop of Durham was vested in the Crown by 6 and 7 Will IV.c. 19. The duchy of Lancaster has still its own chancellor, in whose name a chancery court is held, presided over by a vice- chancellor, and the courts of the lord~~

~~chancellor of England do not run in the districts. The chancery court is not affected by the Judicature Act. Section 99 of that Act, provides that, from and after the commencement of this Act, the counties palatine of Lancaster and Durham shall respectively cease to be counties palatine, so far as respects the issue of commissions of assize, or other ike commis- sions, but not further or otherwise.~~

~~Counties of cities, or counties corporate, are cities which have acquired the privileges of counties. The officers of the counties in which these towns are situated have no jurisdiction within them. Among them are London, York, and Bristol.~~

~~County Court.—The jurisdiction of the ancient County Court has within recent years been revised and extended with the view of making justice cheaper and more accessible, especially in disputes about small amounts. The 9 and 10 Vict. c. 95 (County Courts Act, 1846), reciting various Acts, the provisions of which should be amended, and that one rule and manner of proceeding for the recovery of small debts and demand, should prevail throughout England ; that the County Court is a court of ancient jurisdiction, having cognizance of all pleas of personal actions to any amount by virtue of a writ of justices issued in that behalf; that the pro- ceedings in the County Court are dilatory and expensive, and that it is expedient to alter and regulate the manner of proceeding in the said courts for the recovery of small debts and demands; that the courts established under the said recited Acts of Parliament, or such of them as ought to be continued, should be holden after the passing of this Act as branches of the County Court under the provi- sions of this Act,—enacts that "it shall be lawful for her Majesty, with the advice of her Privy Council, to order that this Act shall be put in force in such county or counties as to her Majesty, with the advice aforesaid, shall seem fit." By section 2 her Majesty, with the advice aforesaid, may divide the whole or part of any such county, including all counties of cities and counties of towns, cities, boroughs, towns, ports, and places, liberties and franchises therein contained into districts, and may order that the County Court shall be holden under this Act in each of such districts. Courts under this Act are to have "all the jurisdiction and powers of the County Court for recovery of debts and demand as altered by this Act," and shall be courts of record. For all other~~

purposes the County Court shall be holden as if this Act had not passed. Judges, treasurers, registrars, high bailiffs, and their assistants were to be appointed for each district. The 21 and 22 Vict. c. 74 § 3 limits the number of judges to sixty. The salary of a County Court judge was originally fixed at £1200, but as a rule he now receives £1500. He must be a barrister-at-law of seven years' standing ; after appointment he cannot sit as a member of Parliament, or practise at the bar. The appointment is made by the lord chancellor, with whom also rests the power of dismissal for sufficient cause shown, Lawyers of considerable repute have in many cases accepted these appoint- ments.

The jurisdiction of the County Courts was at first confined to pleas in personal actions, when the sum claimed was not more than £30, but it has since been considerably enlarged. The limit was raised to £50 by the 18 and 14 Vict. c. 61. A jurisdiction in ejectment, where the annual rent or value of the land was not more than £20, was conferred by the County Courts Act, 1867. Up to 1865 the jurisdiction of the County Courts was with a few trifling exceptions a common law jurisdiction, but the County Courts Act of that year conferred an equitable jurisdiction, limited as to the value of the amount at stake to £500. This Act, and the power to set up equitable defences to actions under the Common Law Procedure Act, 1854, are noticeable in the history of English law, as anticipations of the fusion of law and equity now being carried out under the recent Judicature Act. Jurisdiction in probate (up to £200), in admiralty, in bankruptcy, and certain powers in aid of the jurisdiction of other courts have also been conferred by separate Acts. By the consent of parties the court may have jurisdiction in any action, Jn certain cases (¢.9., recovery of penalties for

bribery at municipal elections, &c.) the County Courts have exclu- sive jurisdiction. Otherwise they have jurisdiction concurrently with the superior courts, but when a case which a County Court might have tried is brought into a superior court, the costs will not in general be granted. 'The Connty Courts Act, 1867, dealing with this subject enacts (§ 5) that costs shall not be recoverable by the plaintiff in any action in the supe- rior

courts, when the amonnt recovered does not exceed £20 in a case of contract, or £10 in a case of tort (civil injury)—nnless the judge certify that there was a good reason for bringing the action inasuperior court. By § 8 when any action of contract 1s brought in a superior court for a sum in dispute not exceeding £50, the judge may on the application of the defendant order the case to be sent to the County Court. By § 8 proceedings In equity may be trans- ferred to the County Court which might have commenced therein ; and by § 10 in actions for tort, the judge may, on an affidavit by defendant that the plaintiff has no visible means of paying costs if unsuccessful, send down the case to the County Court. These provisions, which it will be observed only indirectly compel suitors to resort to the County Courts in cases of minor importance, are embodied in the Judicature Act, 1878, by section 67 :—'*The pro- visions contained in the fifth, seventh, eighth, and tenth sections of the County Court Act, 1867, shall apply to all actions commenced or pending in the said High Court of Justice on which any relief is sought which can be given in a County Court."

A County Court judge may determine all matters of fact as well as law, but a jury may be summoned at the option of either plaintiff or defendant when the amount in dispute exceeds £5, and the judge may at his discretion summon a jury in any case. Counsel as well as attorneys may appear in the County Courts, but as the object of the legislature was to establish a cheap tribunal, costs are in the discretion of the judge, and the remuneration for professional services recoverable as costs is paid on a reduced scale. By the Judicature Act, 1873, appeals from County Courts and other inferior courts are heard in divisional conrts of the High Court of Justice, consisting of such judges as may be assigned for that purpose, and the decision of any such divisional court shall be final, unless it gives special leave to appeal to the Court of Appeal. The Acts relat- ing to County Courts are now numerous, and through frequent amendinent and repeal arc in a state of great confusion. A Con- solidation Act is much to be desired. E. R.)

COURAYER, Prerre Francois Le (1681-1776), a Roman Catholic theological writer, was born at Vernon, in Normandy, in 1681. While canon regular and librarian of the abbey of St Geneviéve at Paris, he conducted a correspondence with Archbishop Wake on the subject of Episcopal

~~succession in England, which supplied him with material for his work Ox the Validity of English Ordina- tions, published in Holland in 1727, in which he tries to prove that there has been no break in the line of ordination from the apostles to the English clergy. His opinions, however, having exposed him to a prosecution in his native country, he took refuge in England, where he was presented by the university of Oxford with a doctor's degree. In 1736 he published a French translation of Father Paul Sarpi's History of the Council of Trent, and dedicated it to Queen Caroline, from whom he received a pension of £200 a year. Besides this he translated Sleidan's History of the Reformation, and wrote several theological works. Courayer died in 1776, after two days' illness, and was buried in the cloister of Westminster Abbey. In his will, dated two years before his death, he declared himself still a member of the Catholic Church, although dissenting from many of its opinions,~~

~~COURIER, Paut Louis (1773-1825), French Hellenist and political and miscellaneous writer, was born at Paris, January 4, 1773. His father, Jean Paul Courier, was owner of the estate of Meré in Touraine, to which he retired when, in consequence of a serious quarrel with a duke, he was compelled to leave Paris. The son, still in his child- hood, imbibed a bitter aversion to the nobility, which seemed to strengthen with time. He would never take the name "de Méré," to which he was entitled, lest he should be thought a nobleman. At the age of fifteen he was sent to Paris to complete his education; and there he studied chiefly mathematics and Greek. or Greek literature he had a passionate fondness, and attained in it so remarkable~~

~~a proficiency that he was complimented by German scholars,~~

~~Destined by his father for the army, he entered the school of artillery at Chalons, and received his appointment as sub- lieutenant in September 1792. He served in various cam- paigns of the Revolutionary wars, especially in those of Italy in 1798-1799 and 1806-1807, and in the German campaign of 1809. He attained the rank of chef d'escadron in 1803. Meanwhile, whenever circumstances left him at leisure, he devoted himself to his favourite studies, He made his first appearance as an author in 1802, when he contributed to the Magasin Encyclopédique a critique on~~

Schweighiuser's edition of Athenzus. In the following year appeared his Loge d'Héléne, a free imitation rather than a translation from Isocrates, which he had sketched in 1798. Courier quitted the army after the battle of Wagram (1809), the savage independence of his nature rendering subordination and obedience irksome and intoler- able to him ; while his superiors found it hard to bear the chastisement of his satirical humour, which he freely indulged without respect of persons. After leaving the army he went to Florence, and was fortunate enough to discover in the Laurentian Library a complete manuscript of Longus's Daphnis and Chloe, an edition of which he pub- lished in 1810. In consequence of a misadventure—blot- ting the manuscript—he was involved in a quarrel with the librarian, and was compelled by the Government to leave Tuscany. He retired to his estate at Veretz (Indre-et- Loire), but frequently visited Paris, and divided his atten- tion between literature and his farm. After the second restoration of the Bourbons the career of Courier as political pamphleteer began. He had before this time waged war against local wrongs in his own district, and had been the adviser and helpful friend of his neighbours. He now carried the war into a larger field,and by his letters and pamphlets made himself one of the most dreaded opponents of the Government of the Restoration. In 1817 le was a candidate for a vacant seat in the Institute ; and failing, he took his revenge by publishing a bitter Lettre a Messieurs de Académie des Inscriptions et Belles-Lettres (1819), This was followed (1819-1820) by a series of letters published in Le Censeur, which by the extraordinary power displayed in them gives him a place in literature only second to the author of the Lettres Provinciales. 'The proposal, in 1821, to purchase the estate of Chambord for the duke of Bordeaux called forth from Courier the Simple Discours, one of his most powerful and successful pieces. For this he was tried and condemned to suffer a short im- prisonment and to pay a fine. Before he went to prison he published a Compte Rendu of his trial, which had a still larger circulation than the Discours itself, In 1823 appeared the Livret de Paul Louis, the Gazette de Village, and other pieces, which were followed in 1824 by his famous Pamphlet des Pamphlets, called by his biographer, Armand Carrel, his swan-song. Courier projected a trans- lation of Herodotus, and published a specimen, in which he attempted to imitate archaic French ; but he did not live to carry out his plan. In the spring of 1825, on a Sunday afternoon (April 10), Courier was found shot in a wood near his house. The murderers

remained undis- covered for five years. 'The writings of Courier, dealing with the facts and events of his own time, are valuable sources of information as to the condition of France before, during, and after the Revolution. Their literary merits are thus set forth in the Hdinburgh Review (vol. xlix.) :—

"They abound in plain, strong, masculine sense, illustrated with classical allusions, naturally and happily introduced, and seasoned with wit more brilliant than is almost anywhere else to be found ; for it has the keen edge of Swift's satire, with a style of more pointed epigram, and the easy playfulness of Voltaire, without his pertness and flippancy. HIs statements and narratives are short, and so clear as to present a sudden and lively picture ; his arguments aro models of conciseness and force,"

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A Collection Complete des Pamphlets Politiques et Opuscules Lit- tératres de P. L. Cowrier appeared in 1826. An edition of his works, with an essay on his life, &c., by Armand Carrel, was published in 1834.

COURLAND, or KurLanpD, one of the Baltic provinces of Russia, lying between 56° and 57° 45' N. lat. and 21° and 27° E. long., is bounded on the N.E. by the River Diina, separating it from the governments of Vitebsk and Livonia, N. by the Gulf of Riga, W. by the Baltic, and 8. by the government of Kovno. 'The area is 10,535 square miles, of which 101 square miles are occupied by lakes. Popula- tion (1870), 619,154. The surface is generally low, and the coast-lands, which run out northwards, inclosing the Gulf of Riga, by a broad promontory to the Domes-nis, opposite the island of Oesel, are flat and marshy. The in- terior is characterized by wooded dunes, covered with pine, fir, birch, and oak, with swamps and lakes and fertile patches between. Usmaiten, the largest lake, is 24 miles in circuit. The highest point of the province, called the HItiningsberg, in the neighbourhood of the capital, is scarcely 700 feet above the sea. 'The Windau, Aa, and the frontier river Diina pass through the province from the south-east. Owing to the numerous lakes and marshes the climate is damp and foggy, and the winter is severe, though less rigorous than that of

Livonia. Agriculture is the chief occupation of the inhabitants, the principal crops being rye, barley, and oats ; flax, hemp, and a little tobacco are also grown. Fisheries, cattle-rearing, and hunting are also carried on to some ex- tent. Except in the making of tiles and in distillation manufactures are insignificant. Iron and limestone are the chief minerals of the province ; amber is found on the coasts, The peasantry of Courland are partly the Letts of Courland, or Kures, mixed with Polish and Russian blood ; partly Esthonian Letts, with German, Swedish, and Finnish admixture, such as the Livs of the north-west coast of the promontory of Courland, and the ‘“ Krevinnes, “4 Krivingians, living in the district of Bauske, in the interior. The prevailing religion is the Lutheran,—only a small pro- portion of the people belonging to the Greek Church. Mitau, centrally placed, and in railway communication with Riga, is the capital of the province and its largest town; but Libau and Windau on the Baltic coast are its busiest places. Anciently Courland was an independent possession of the Teutonic knights, who also owned Livonia, and it comprised the two duchies of Kurland and Semgall. As Russian power continued to extend, and the knights could uo longer hold their own in Livonia, the duchies were placed, in 1561, under the feudal government of Poland. By the marriage of Duke Frederick William of Kurland to the Russian Princess Anna, daughter of Czar Ivan, in 1710, Courland came into close relation with Russia, and remained for a long period an object of contention between that country and Poland. Ultimately, in 1795, the assembly of nobles in Courland resolved to place the country under the Russian sceptre. The Baltic provinces—Esthonia, Livonia, and Courland—ceased to form collectively a general govern- ment of the Russian empire by ukase of January 1876 ; their separate administration is now based on the same general system as that of the other governments of the em- pire, modified by some local and special dispositions.

COURSING may be defined as the hunting of game by dogs solely by means of the organs of sight. From time to time the sport has been pursued by various nations against various animals, but the recognized method has generally been the coursing of the hare by greyhounds. Such sport is of great antiquity, and is fully described by Arrian in his Cynegeticus about 150 a.D., when the leading features appear to have been much the same as

~~in the present day, Other Greek and Latin authors refer to the sport ; but during the Middle Ages it was but little heard~~

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~~of. It may be divided into private and public coursing, The former is more pursued for the sake of filling the pot with game than with the view of affording tne exhilarat- ing sport furnished by the latter. The private sportsman seldom possesses good strains of blood to breed his grey- hounds from, or has such opportunities of trying them as the public courser. The first known set of rules in England for determining the merits of a course were drawn up by Thomas, duke of Norfolk, in Queen Elizabeth's reign; but no open trials were heard of until half a century later, in the time of Charles I. The oldest regular coursing club whereof any record exists is that of Swaffham, in Norfolk, which was founded by Lord Orford in 1776. During the next seventy years many other large and influential societies sprang up throughout England and Scotland, but the first open champion meeting was held at Glasgow in 1835, and since then they have spread rapidly throughout the country. The chief followers of the sport are to be found amongst the yeoman and middle classes, who prefer coursing to horse-racing on account of its being more economical and devoid of the chicanery connected with the latter. Several noblemen, however, keep large kennels of greyhounds, are enthusiastic patrons of coursing, and further the sport by preserving hares and providing coursing grounds. The season lasts about six months, commencing at the end of September. During 1875-76 the value of the stakes and other prizes coursed for in the United Kingdom was upwards of £40,000. It was not until 1858 that a coursing parliament, so to speak, was formed, and a universally accepted code of rules drawn up. In that year the National Coursing Club was founded. It is composed of representatives from all clubs in the United Kingdom of more than a year's standing, and possessing more than twenty-four members. 'Their rules govern meetings, and their committee adjudicate on matters of dispute. It must be borne in mind that a comparative trial of two dogs, and not the capture of the game pursued, is the great distinctive trait of modern coursing. Clubs either rent grounds to course over or are allowed the use of land by large proprietors who are supporters of the sport ; but in either case a good stock of strong hares must be maintained by preserving or~~

otherwise. The chief breeds of coursing greyhounds now in vogue are the Newmarket, the. Lanca- shire, and the Scotch. 'The breeding and training of a successful kennel is a precarious matter; and the most unaccountable ups and downs of fortune often occur in a courser's career. A club meeting is managed by the society's own members, and an open or champion one by whoever may be appointed secretary, assisted in both cases by a committee. An agreed on even number of entries are made for each stake, and the ties drawn by lot. After the first round the winner of the first tie is opposed to the winner of the second, and so on until the last two dogs left in compete for victory. A staff of beaters drive the hares out of their coverts or other hiding-places, whilst the slipper has the pair of dogs in hand, and slips them simul- taneously by an arrangement of nooses, when they have both sighted a hare promising a good course. The judge accompanies on horseback, and the six points whereby he decides a course are—(1) speed ; (2) the go-bye, or when a greyhound starts a clear length behind his opponent, passes him in the straight run, and gets a clear length in front ; (3) the turn, where the hare turns at not less than a right angle; (4) the wrench, where the hare turns at less than a right angle; (5) the kill; (6) the trip, or unsuccessful effort to kill. He may return a "no course," as his verdict, if the dogs have not been fairly tried together, or an " un- decided course " if he considers their merits equal. The open Waterloo meeting, held at Altcar near Liverpool, every spring, is now the recognized fixture for the decision

of the coursing championship, and the Waterloo cup is the "Blue Riband " of the leash.

Rabbit coursing is much pnrsued in the suburbs of Lancashire manufacturing towns. It is conducted more artificially than hare coursing, the rabbit being dropt by hand some twenty yards in front of the dogs, and the victor being the first that catches and holds the game.

The chief works on coursing are—Arvian's Cynegeticus, trans- lated by the Rev. W. Dansey, 1831 ; T. Thacker, Cowrser's Com- panion and Breeder's Guide, 1835; Thacker's Courser's Annual Remembrancer, 1849-1851; D. P. Blaine, Encyclopedia of Rural Sports, third edition, 1870; J. H. Walsh, The

Greyhound, third edition, 1875, and British Rural Sports, twelfth edition, 1875; and the Coursing Calendar, edited by J. H. Walsh. (H. F. W.)

COURT. This name is now usually restricted to judicial tribunals, almost the only exception being the household of the king, which is still called the Court. All courts are not even now purely judicial in character ; the County Court, for instance, is still the assembly of the free- holders of the county in which representatives and certain officers are elected. Such assemblies in early times exer- cised political and legislative as well as judicial functions. But these have now been almost entirely separated every- where, and only judicial bodies are now usually called courts. In every court, says Blackstone, there must be three parts,—an actor or plaintiff, rews or defendant, and judex, or judge.

The language of legal fictions, which English lawyers in- variably use in all constitutional subjects, makes the king the ultimate source of all judicial authority, and assumes his personal presence in all the courts.

"As by our excellent constitution," says Blackstone, " the sole executive power of the laws is vested in the person of the king, it will follow that all courts of justice, which are the medium by reich he administers the laws, are derived from the power of the Crown. For whether created by Act of Parliament or letters patent, or subsisting by prescription (the only methods by which any court of judicature can exist), the king's consent in the two former is ex- pressly, in the latter impliedly given. In all these courts the king is supposed in contemplation of law to be always present ; but as that is in fact impossible, he is then represented by his judges, whose power is only an emanation of the royal prerogative."

These words, which are still printed in modern editions of the commentaries, might give a false impression of the his- torical and legal relations of the courts and the Crown, if it is not remembered that they are nothing more than the expression of a venerable fiction. 'The administration of justice was, indeed, one of the functions of the king in early times; the king himself sat on circuit so late as the reign of Edward IV., and even after regular tribunals were established, a reserve of judicial power still remained in the king and his council, in the exercise of which it was pos- sible for the king to participate personally. The last judicial act of

~~an English king, if such it can be called, was that by which James I. settled the dispute between the Courts of Chancery and the Court of Common Law. Since the establishment of Parliamentary government the courts take their law directly from the legislature, and the king is only connected with them indirectly as a member of the legislative body. The king's name, however, is still used in this as in other departments of state action. The courts exercising jurisdiction in England are divided by certain features which may here be briefly indicated.~~

~~1. We may distinguish between courts exercising general and those exercising special jurisdiction. The latter are the Admiralty Keclesiastical, and University Courts, the limits of which are sufii- ciently indicated by their names. These administer principles of justice founded on the canon and civil law, but the extent of their jurisdiction is ascertained by the Common Law Courts. 2. Superior and inferior courts. The former are the Courts of Com- mon Law at Westminster, and the Court of Chancery, now High Court of Justice. The latter are the local or district courts, County Courts, &c. 3. Courts of record and courts not of record. 'A court of record is one whereof the Acts and judicial proceedings are~~

~~enrolled for a perpetual memory and testimony, which rolls are called the records of the court, and are of such high and superemi- nent authority, that their truth is not to be called inquestion. For it is a settled rule and maxim that nothing shall be averred against a record, nor shall any plea or even proot be admitted to the con- trary. Andif the existence of the record shall be denied it shall be tried by nothing but itself; that is, upon bare inspection whether there be any suchrecord or no; else there would be no end of disputes. All courts of record are the courts of the sovereign in right of the Crown and royal dignity, and therefore any court of record has authority to fine and imprison for contempt of its authority'? (Stephen's Blackstone). 4. Courts may also be distin- guished as civil or criminal. 5. A further distinction is to be made between courts of first instance and courts of appeal. In the former the first hearing in any judicial proceeding takes place; in the latter, the judgment of the first court is brought under review. Of the superior courts, the High Court of Justice in its various divisions is a~~

court of first instance. Over it is the Court of Appeal, and over that again the House of Lords. The High Court of Justice is (through divisional courts) a court of appeal for inferior courts. 6. There is a special class of local courts, which do not appear to fall within either the first or second of the classes above-mentioned. Some, while administering the ordinary muni- cipal law, have or had jurisdiction exclusive of their superior courts ; such were the Common Pleas of Durham and Lancaster (now trans- ferred to the High Court of Justice), and such still is the Chancery Court of the duchy of Lancaster. Others have concurrent jurisdic- tion with the superior courts ; such are the Lord Mayor's Court of London, the Passage Court of Liverpool, &c.

The distribution of judicial business among the various courts may be exhibited as follows.

Criminal Courts.—1. The lowest is that of the justice of the peace, sitting singly, but more usually in petty sessions of two or more, tode- termine in a summary way certain specified minor offences. In popu- lous districts, such as London, Manchester, &c., stipendiary magis- trates are appointed, generally with enlarged powers. Besides punishing by summary conviction, justices may commit prisoners for trial at the assizes. 2. The justices in Quarter Sessions are commissioned to determine felonies and other offences. The 5 and6 Vict. c. 38 contains a list of offences of triable at Quarter Sessions —treason, murder, forgery, bigamy, &c., (see QUARTER SESS10NS). The corresponding court in boroughs is presided over by the recorder. %. The more serious offences are reserved for the judges of the superior courts sitting under a commission of oyer and terminer or gaol delivery for each county. The Assize Courts, as they are called, sit in general in each county twice a year, following the division of circuits ; but winter assizes are now held under 39 and 40 Vict. c. 57, which permits several counties to be united together for that purpose. London, which occupies an exceptional position in all matters of judicature, has a high criminal court of its own, established by 4 and 5 Will. IV. c. 36, under the name of the Central Criminal Court. Its judges usually present are a rota selected from the superior judges of common law, the recorder, common sergeant, and the judge of the City of London Court. The Court of Queen's Bench (now Queen's Bench Division) has a general superintendence over

all other courts of criminal juris- diction, and criminal cases may be moved into the Queen's Bench by the writ of certiorari. By 11 and 12 Vict. c. 78, the Court for Crown Cases Reserved was established, to which any question of law arising on the trial of a prisoner may after con- viction be rentitted by the judge in his discretion.

Civil Courts.—In certain special cases, civil claims of 'small importance may be brought before justices or stipendiaries. Other- wise, and excepting the special and peculiar jurisdictions above mentioned, the civil business of the country may be said to be divided between the County Courts (taking small cases) and the High Court of Justice (taking all others). Before the constitution of the High Court of Justice the judges of the common law courts sat separately with a jury to try cases at Nisi Prius, the sittings being at Westminster for Middlesex, at Guildhall for the City of London, and according to circuits for the rest of the country ; and this arrangement is still followed by the divisions corresponding to the coinmon law courts.

The effect of the recent Judicature Acts on the constitution of the superior courts may be briefly stated. There is now one Supreme Court of Judicature, consisting of two permanent divi- sions called the High Court of Justice and the Court of Appeal. The former takes the jurisdiction of the Court of Chancery, the three Common Law Courts, the Courts of Admiralty, Probate, and Divorce, the Courts of Pleas at Lancaster and Durham, and the courts created by commissions of assize, oyer and teiminer, and gaol delivery. The latter takes the jurisdiction of the Court of Appeal in Chancery (including Chancery of Lancaster), the Court of the Lord Warden of the Stannaries, and of the Exche- quer Chamber, and the appellate jurisdiction in admiralty and heresy matters of the judicial committee; and power is given to tho

Queen to transfer tne remaining jurisdiction of that court to the Court of Appeal. By the appellate Jurisdiction Act of 1876, the House of Lords is now enabled to sit for the hearing of appeals from the English Court of Appeal and the Scotch and Irish courts during the prorogation and dissolution of Par- liament. The lords of appeal, of whom three must be present, are the lord chancellor, the lords of appeal in ordinary, and peers who have held " high judicial office" in Great Britain or Ireland. The-lords

~~*in ordinary are an innovation in the con- stitution of the House. They hold the rank of baron for life only, have a right to sit and vote in the House during tenure of office only, and a salary of £6000 per annum.*~~

~~*Among obsolete or decayed courts, besides those incidentally men- tioned above, the following are the most noticeable :—*~~

~~*The Cowrt Leet, an old loeal court described as the most ancient known to the law. It was a court of reeord, and exercised civil as well as criminal jurisdiction. Its origin and nature are fully discussed in Scriven On Copyhold.*~~

~~*Court Baron, the court of a manor, presided over by the lord, and of which the free tenants of the manor are suitors.*~~

~~*Court of Pié Poudre (pedis pulverisati), having jurisdiction in fairs and markets.*~~

~~*Court of Chivalry, or Knizhts' Court, held by the lord high constable, in matters relating to jousts and tournaments.*~~

~~*The Court of the Marshalsea of the Household of the Kings of England, and the Court of our Lady the Queen, of the Palace of the Queen at Westminster, and Her Majesty's Court of Reeord for the Honour of Peveril are abolished by the 12 and 13 Vict. ce. 101.*~~

~~*The history of English courts affords a remarkable illustration of the continuity that characterizes our institu- tions. It would hardly be too much to say that all the courts now sitting in England may be traced back to a common origin, and at any rate the higher courts are all offshoots from the same original judicature. Leaving out of account the local courts, we find the higher jurisdiction after the Conyuest concentrated along with all other public functions in the king and council. The first sign of a separation. of the judicial from the other powers of this body is found in the recognition of a Curia Regis, which may be described as the king's council, or a portion of it, charged specially with the management of judicial and revenue business. In relation to the revenue it became the Exchequer, under which name a separate court grew up whose special field was the judicial business arising*~~

~~out of revenue cases. By the Great Charter, the inconvenience caused by the curia following the king's person was remedied, in so far as private litigation was concerned, by the order that common pleas (Communia Placita) should be held at some fixed place; and hence arose the Court of Common Pleas. The Curia Regis, after having thrown off these branches, is represented by the Queen's Bench, so that from the same stock we have now three courts, differing at first in functions, but through competition for business, and the ingenious use of fictions, becoming finally the co-ordinate Courts of Common Law of our later history. In one line of development the council becomes, by the addi- tion of representatives from counties and boroughs, the Par- liament in its two Houses of Lordsand Commons. But an inner circle of counsellors still surrounded the king, and in his name claimed to exercise judicial as well as other power ; hence the chancellor's jurisdiction, which became, partly in harmony with the supra-legal power claimed from which it sprang, and partly through the influence of the ecclesi- astical chancellors by whom it was first administered, the Equity.of English law. Similar developments of the same authority were the Court of Requests (which was destroyed by a decision of the Common Pleas) aud the Court of Star Chamber,—a Court of Criminal Equity, as it has been called, which, having been made the instrument of tyranny, was abolished in 1841. Even then the productive power of the council 'was not exhausted; the judicial committee of the Privy: Council, established by 2 and 3 Will. TV…c5 92, superseding the previous Court of Delegates, exercises the jurisdiction in appeal belongiiig to the king in council.~~

~~The appellate jurisdiction of the Lords rests on their claim to be the representatives of the ancient great council of the realm. (E. RB.) COURT-MARTIAL. Courts-martial have inherited part of the jurisdiction of the old Cwra Militaris, or Court of the Chivalry, in which a single marshal and at one time the High Constable proceeded "according to the customs and usages of that court, and, in cases omitted according to the civil law, secundum legem armorum" (Coke, 4 Ins. 17). The modern form of the courts was adopted by ordinance in the time of Charles I., when English soldiers were studying the "articles and military laws" of Gustavus Adolphus and the Dutch military code of Arnhem ; it is first recognized by statute in the first Mutiny Act, 1 Will. and Mary c. 5. The royal prerogative of issuing commis- sions under the sign-manual for holding courts-martial,~~

although superseded as regards the United Kingdom by the express power to make certain articles of war which the Mutiny Acts confer on the sovereign, still exists as regards courts-martial held abroad. But the Mutiny Acts also provide for the issue to commanders abroad of warrants to convene courts-martial, or to authorize field-officers to con- vene them, and even make it lawful in special cases beyond sea for any officer to convene a detachment general court-martial without warrant or commission. The trial of the militia, yeomanry, and volunteers is provided for by "The Volunteer Act, 1863," and "The Regulation of the Forces Act, 1871." In India the punchayats, or native military tribunals, are frequently employed. All commis- sioned officers on full pay, officers of the general staff, although on half staff pay, and officers on brevet rank, are eligible as members of a court-martial. The president of the court is necessarily the senior combatant officer present, unless it has been his duty to investigate the charges against the prisoner ; and it isa general rule that the members should be of equal, or superior, rank to the prisoner. Im- partiality is secured by the system of " roster ;" ze., the " tour of duty " is from the senior downwards. The juris- diction of courts-martial is not confined to purely military offences, but, as regards felonies and misdemeanours mentioned in the Mutiny Act or the Articles, is concurrent with, though subordinate to, the jurisdiction of the ordinary criminal courts. The Mutiny Act, indeed, directs that soldiers charged with common offences against the peace should be delivered up to the magistrate. Officers tried in an ordinary court can be punished afterwards by court-martial only by cashiering or reduction. There is a wholesome regulation against sending home for trial accused officers or men, except in cases of unavoidable necessity, but the jurisdiction extends to offences wherever committed. No court-martial can sit in one of H. M. ships in commis- sion, but the "' Naval Discipline Act, 1866," subjects land forces on board to its provisions. Half-pay officers are not subject to martial law, but it is thought they ought to be made so, as they derive advantage from retaining their commissions. Even the licensed sutlers, who follow the autumn manceuvres, are under the Mutiny Act. So are paid recruiting officers, though not themselves enlisted, and, to a certain extent, the "army reserve." But a prisoner of war on parole cannot be brought to trial, and all mili- tary offences prescribe in three years. From the adminis- tration of martial law must carefully be distinguished the procedure by court-martial authorized by the 143d Article of War in places

where there is no "form of civil judicature in force," and with regard to civil crimes. In such case, the court-martial applies the civil law, but its jurisdiction is ousted wherever there is a competent civil court under the royal authority, although that court may itself administer not British law, but French, or Ronian- Dutch, or any other form of colonial law, and may do so

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by machinery of procedure quite unfamiliar to British soldiers. This special jurisdiction of courts-martial in non- military offences would also exist where the ordinary courts had been closed by a declaration of martial law (see case of Rev. John Smith of Demerara, June 1824, 2 Hansard xi.

976).

ie old form of field or drum-head court-martial (in which no notice was given, no oath administered, and no written record kept) being now happily extinct, there remain three forms—(1) general and detachment general courts-martial, (2) district and garrison courts-martial, and (3) regimental and detachment courts-martial, which are distinguished by their powers of awarding punishment, and by the dress of the officers attending them—viz., review order, marching order, drill order. The two latter are called minor courts, and commissioned officers are not amenable to their jurisdiction. A great many offences are, by the Articles of War, made appropriate to the different courts, the general rule being that the general court is not to be resorted to except in aggravated cases, punishable by penal servitude or death. By permission of a general officer the regimental court may try an offence expressly assigned to a higher court, but in no case may it try desertion. To a certain extent these rules are set aside on the line of march or on board ship, but there is always a maximum of punishment which each court is bound to observe. In 1868 the number of members required for a general court at home was reduced from thirteen to nine, a judge-advocate being in attendance. The general court can try all military offences in whatever regiment under the command committed, and it is the only martial court which takes cognizance of civil offences; it also hears appeals from regimental courts. The detachment general court which is since 1860 only competent "beyond seas," where it is impracticable to hold a general

court, was introduced by Wellington, "to repress the spirit of plunder and outrage which had broken out in the army after the battle of Vitoria" (Supp. Desp. viii. 104). It consists of three commissioned officers, summoned without royal warrant, to investigate any offence against the person or property of an inhabitant of the country where the detachment is. The sentence must be confirmed by the general officer. The district or garrison court, which superseded in 1829 the older general regimental court, consists of seven members, the president doing the work of a judge-advocate in summoning witnesses, administering oaths, and transmitting the proceedings to the judge- advocate-general in London. The power of this court to imprison non-commissioned officers and privates was in 1864 extended from six months to two years ; and in 1869 it received additional power to impose forfeitures and to discharge with ignominy. Another form of district court was that formerly called detachment court for the trial of warrant officers (i.¢., officers appointed by warrant under the signature of colonels or commandants of corps). The regimental court, summoned by the colonel, consists of five or three members, with power to inflict limited sentences of imprisonment, corporal punishment, solitary confinement, and also fines, stoppages, and other punishments not peculiar to this court. There are also courts or boards of inquiry, called by an exercise of the royal prerogative to inquire into such questions as the failure of an expedition, or the necessity for an armistice or convention, often in order to determine whether or not a court-martial should be held. It was found in the well-known cases of Lord Bentinck (1820) and Lieutenant-Colonel Dawkins (1873) that the Crown may withhold the proceedings of these courts from the courts of law, and that military witnesses are protected from actions of damage in respect of their evidence before such a court. Where an officer is called before the court of inquiry he is not pub on oath, or even bound to answer

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questions which he thinks may be prejudicial to him ; and in connection with the celebrated Simla court-martial (1867) this rule was extended to the production of documents, The Articles of War of 1860 introduced a regimental court of inquiry for the purpose of hearing the complaints and redressing wrongs of non-commissioned officers "and soldiers in any

matter respecting their pay or clothing." This court, which is generally held by the captain, also inquires into cases of maiming and mutilation, and all its judgments may be appealed against to a general court. Smaller courts of inquiry examine cases of illegal absence, loss of medals, and the return of officers who may have been taken prisoner by the enemy by their own neglect.

All members of a court-martial take an oath not only to try according to the evidence, but to keep the sentence of the court secret until approved, and to keep secret the votes and opinions of particular members. Even a peer, if serving on a court-martial, cannot use his privilege of giving judgment on honour. As might be expected, the army has a very varied experience in the forms of swearing witnesses. Besides the ordinary Protestant mode of kissing the Bible or Testament, and the ordinary Catholic mode of marking a cross on the closed book, Mahometans are sworn by kissing or placing on their head the Koran, Sikhs upon the Grinth, Hindus upon the Vedas, or by touching the Brahman's foot ; and, according to caste custom, Indian © witnesses sometimes insist on the oath being administered bya Brahman. But in India affirmations are now generally taken. While a Jew insists on wearing his hat, as in the synagogue, all soldiers, though bound to remain covered before the court, remove their caps in swearing, just as a Protestant witness ungloves his hand. Kaffir witnesses before a court-martial have sworn by their own chief, and a Kaffir chief by the king of England. The colonial legislatures, however, have generally made provision for receiving unsworn evidence of barbarous and uncivilized people who have no religious belief. The judge-advocate is a legal assessor and clerk, but in no sense the prosecutor, although the judge-advocate-general still frames and sanc- tions the formal charges in the indictment. The latter is a Parliamentary officer appointed on change of ministry, and a member of the Privy Council. He advises the Crown as to the legality of courts-martial, reviews proceedings brought under his notice, confidentially advises the com mander-in-chief, and is the custodier of the court records, The prosecutor is a staff officer, or the prisoner's command. ing officer, or a field-officer of the regiment, or an adjutant. The prisoner is generally entitled to have legal assistance, and also a private interpreter as a check on the translation of the interpreter for the prosecution. He has no peremptory challenges; but he may challenge on the grounds fof defect of

rank, inexperience, prejudice, or malice. Jormerly, if the prisoner "stood mute," the court-martial entered a verdict of guilty, but this is now altered in conformity with common sense. Where he does not adduce evidence in defence, the prisoner (contrary to the rule under Denman's Act in criminal courts) has a right to the last word. The judgment of the court is by simple majority, except in capital charges, which require the concurrence of two-thirds, The same distinction holds in the subsequent voting on the sentence. Since 1868 the word "honourably" has disappeared from verdicts of acquittal ; and the finding "that the charge has not been proved" has been discontinued. Capital punishment awarded for military offences is generally carried out by shooting, but hanging is also competent. In trifling cases between officers the court frequently dictate the terms of a written or verbal apology ; and in separate remarks they often observe on the conduct of the prosecutor, on the frivolous or groundless nature of the charges, or the

iutemperate defence of a prisoner whom they acquit. Such remarks are acted on at headquarters, Asa general rule the sovereign's confirmation is required to the decision of a general court, Officers commanding abroad (except in India) have a limited power of confirmation depending on the nature of the sentence. The commander-in-chief in India may confirm all sentences ; and this absolute power was also given to Lord Raglan in the Crimea. Even in India, however, a capital sentence by court-martial for a civil offence requires the approval of the governor-general. When a decision, not of acquittal, comes up for approval, it is indispensable that the judge-advocate-general should have a personal audience with the queen. Her Majesty may not only disapprove, but may also order revision of the proceedings ; and where the conviction is sustained, the sentence may be remitted or mitigated, but the profes- sional penalties which martial law attaches to couviction cannot be remitted. The members of courts-martial and those who carry out their sentences are of course liable for illegal sentences or irregularities. Thus in 1861, owing to a defect in the Acts regulating the transfer of colonial prisoners, Lieutenant Allen recovered £200 from H.R.H. the duke of Cambridge for false imprisonment.

~~*Tn conclusion, it may be stated that treason and other non- military offences, which, if committed in England, would be punishable in the ordinary criminal courts, are tried by a general court-martial, if committed on service at Gibraltar, or in India, 120 miles distant from any of the three presidencies ; or elsewhere in the queen's dominions, where there is no competent civil court, or out of the queen's dominions.*~~

~~*Naval Courts Martial.—The administration of the bar- barous naval law of England was long entrusted to the dis- cretion of commanders acting under instructions from the lord high admiral, who was supreme over both the royal and merchant navy. It was the leaders of the Long Par- liament who first secured something like a regular tribunal by passing in 1645 an Ordinance and Articles concerning Martial Law for the Government of the Navy. Under this ordinance Blake, Monk, and Penn issued instructions for the holding general and ship courts-martial with written records, the one for captains and commanders, the other for subordinate officers and men. Of the latter the mate, gunner, and boatswain were members, but the admirals reserved a control over the more serious sentences. Under the Act 13 Car. II. c. 9, the high admiral again received power to issue commissions for holding courts martial—a power which continues to be exercised by the Board of Admiralty. During the 18th century, under the auspices of Anson, the jurisdiction was greatly extended, and the Consolidation Act of 1749 was passed in which the penalty of death occurs as frequently as the curses in the commination service. The Naval Articles of War have always been statutory, and the whole system may now be said to rest on the Naval Discipline Acts of 1860 and 1866. The navy has its courts of inquiry for the confidential investigation of charges "derogatory to the character of an officer and a gentleman." Under the Act of 1866 a court-martial must consist of from five to nine officers of a certain rank, and must be held publicly on board of one of H.M. ships of war, and where three such ships are together. The rank of the president depends on that of the prisoner. A judge-advocate attends, and the procedure resembles that in military courts, except that the prisoner is not asked to plead, and the sentence, Ti not one of death, does not require the confirmation of the commander-in-chief abroad or of the Admiralty at home. The court-has a large and useful power of finding the prisoner guilty of a less serious offence than that charged, qhich might well be imitated in the ordinary criminal*~~

courts. The death sentence is always carried out by hanging at the yard arm; Admiral Byng, however, was shot in 1757. The Board of Admiralty have, under the Naval Discipline Acts, a general power of suspending, annulling, and modifying sentences which are not capital. The jurisdiction extends to all persons belonging to the navy, to land forces and other passengers on board, ship- wrecked crews, spies, persons borne on the books of H.M. ships in commission, and civilians on board who endeavour to seduce others from allegiance. The definition of the jurisdiction by locality includes harbours, havens, or creeks, lakes or rivers, in or out of the United Kingdom ; all places within the jurisdiction of the Admiralty; all places on shore out of the United Kingdom ; the dockyards, barracks, hospitals, &c., of the service wherever situated ; all places on shore in or out of the United Kingdom for all offences punishable under the Articles of War except those specified in section 38 of the Naval Discipline Act, 1860. Under the Marine Mutiny Acts the royal marine forces are, while on board, or borne on the books of H.M. ships, subject to naval courts martial. In other circumstances the Articles of War made by the Lord High Admiral for the government of the royal marines are carried out by general courts-martial, district or garrison courts-martial, divisional and detachment courts-martial, courts-martial on the line of march or in transport ships, all held under the authority, mediate or immediate, of the lord high admiral, The regulations of these different courts in the Marie Mutiny Act are very much the same as in the case of courts martial for the land forces. Officers of both services often sit together.

See Simmons On the Constitution and Practice of Courts-Martial, 7th ed. 1875; Clode, Military and Martial Law, 1872; and Thring's Treatise on the Criminal Law of the Navy, 1861. The earlier writers on courts-martial are Adye (1796), M'Arthur (1818), Maltby (1818, Boston), James (1820), D' Aguilar (1843), and Hough, Preecdents in Military Law (1855). See also the annual Mutiny Acts and the Articles of War, and the articles Minirary Law and Navy.

COURT, ANTOINE (1696-1760), who has been de- signated the "Restorer of Protestantism in France," was born at the village of Villeneuve-de-Berg,

in the province of the Vivarais, in 1696. His parents were poor, belonging to the peasant class, and were unable to give him what was considered a good education. But they were pious folk, adherents of the Reformed Church, against which the most ruthlessly cruel persecution was so long directed by the French Government. Brought up in the fear of God, and early acquainted with the Holy Scriptures, he began to show in his boyhood the signs of a high calling. He was eight years old when the Camisard revolt was finally snppressed, and nineteen when the infamous decree of Louis XIV. was published, declaring that all who professed the Reformed faith should be punished as relapsed heretics. Antoine, taken to the secret meetings of the persecuted Calvinists, held " in dens and caves of the earth," often in darkness, no pastor nor "prophet" present to teach or cousole, began, when only seventeen, to speak and exhort in these congregations of " the desert." The desire naturally arose in him to deliver the people, and to build up on solid foundations the church which was threatened with extinction. For this purpose he proposed four things as essential :— regular religious meetings for teaching and worship ; sup pression of the fanaticism of the "inspired," and of the disorders to which it gave rise; restoration of discipline by the establishment of consistories, conferences, and synods ; and the careful training of a body of pastors. To the execution of this vast undertaking he devoted his life. The scene of his labours for fifteen years was Languedoc, the Vivarais, aud Dauphiny. His beginnings were very small prayer-meetings in "the desert," attended by some half,

dozen or dozen persons only. But the work progressed under his wise direction, and after forty years' labour he addressed on one occasion a meeting of 10,000 on the spot where at first he could scarcely gather fifty. In 1724 another heavy blow was struck at Protestantism in the edict of Louis XV., which again assuming that there were no Protestants in France, prohibited the most secret exer- cise of the Reformed religion, and imposed monstrous penal- ties. It was impossible fully to carry out its menaces. But persecution raged, especially against the pastors. Many of them were executed, and many fied. A price was set on the life of Antoine Court; and in 1730 he quitted France and took up his abode at Lausanne. He had seen

that it was necessary to have a theological college, and Lausanne appeared to be a fitting place for it. He there- fore, with the aid of some of the Protestant princes, established the college, and during the remaining thirty years of his life he filled the post of director. He had the title of deputy-general of the churches, and was really the pillar of their hope. He carried on a very extensive correspondence ; and, through the often repeated persecu- tions of his fellow-religionists, fought their battle man- fully. The college of Lausanne sent forth all the pastors of the Reformed Church of France till the days of the first French empire. Court formed the design of writing a history of Protestantism, and made large collections for the purpose; but this he did not live to carry out. His character has been thus drawn by M. de Végobre :—he possessed sound straightforward sense, wonderful facility of expression, intrepid courage joined with consummate prudence, astonishing vigour to support the greatest fatigues of body and mind, purity and integrity ever beyond suspicion, and unshaken devotion to the holy cause to which he had consecrated himself. Antoine Court died at Lausanne in 1760. He was the father of the more gener- ally known Court de Gebelin. He hardly finds a place in biographical dictionaries ; indeed, for a long time his name and work were almost ignored even by French writers on the history of the Reformed Church.

For details of his life see Peyrat's Histoire des Pastewrs du Deésert, Coquerel's work bearing the same title, and De Felice's Histoire des Protestants de France. The first special biography of Court appears to be that by M. Edmond Hugues, entitled Antoine Court, Histoire de la Restauration du Protestantisme en France au X VILL. Siécle, published in 1872.

COURT DE GEBELIN, Anrorns (1725-1784), a ccle- brated French scholar, was the son of the preceding, and was born at Nimes in 1725. He received a good educa- tion, and became, like his father, a pastor of the Reformed Church. This office, however, he soon relinquished, to devote himself entirely to literary work. He had con- ceived the project of a work which should set in a new light the phenomena, especially the languages and mytho- logies, of the ancient world; and, after his father's death, he took up his abode at Paris for the sake of being within reach of the necessary books for his intended researches. After long years of studious

devotion, he published in 1775 the first volume of his vast undertaking under the title of Le Monde Primitif, analysé et comparé avec le monde moderne. The ninth volume appeared in 1784, leaving the work still unfinished. The literary world marvelled at the encyclopedic learning displayed by the author, and supposed that the Forty of the Academy, or some other society of scholars, must have combined their powers in its production. Now, however, the world has well-nigh for- gotten the huge quartos. These learned labours did not prevent Gebelin from pleading earnestly the cause of religious tolerance. In 1760 he published a work en- titled Les Toulowsaines, advocating the rights of the Protestants ; and he afterwards established at Paris an

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agency for collecting information as to their sufferings, and for exciting general interest in their cause. He co-operated with Franklin and others in the periodical work entitled Affaires de V Angleterre et de 0 Amérique (1776, sqq.), which was of course devoted to the support of American indepen- dence. He was also a supporter of the principles of the economists, and Quesnay called him his well-beloved disciple. In the last year of his life he became acquainted with Mesmer, and published a Lettre sur le magnétisme animal, He was impesed upon by speculators in whom he placed confidence, and was reduced to destitution by the failure of a scheme in which they engaged him. He died at Paris, May 10, 1784.

COURTOIS, JAquzs anD GuittaumE (1621-76 and 1628-79). The two French painters who bore these names are also called by the Italian equivalents Giacomo (or Jacopo) Cortese and Guglielmo Cortese. Each of the brothers is likewise named, from his native province, Le Bourguignon, or 11 Borgognone.

Jaques Courtois was born at St Hippolyte, near Besan- con in 1621. His father was a painter, and with him Jaques remained studying up to the age of fifteen. To- wards 1637 he came to Italy, was hospitably received at Milan by a Burgundian gentleman, and entered, and for three years remained in, the French military service. The sight of some battle-pictures revived his taste for fine art. He went to Bologna, and studied under the friendly tutelage of Guido; thence he went to Rome, where he painted, in

the Cistercian monastery, the Miracle of the Loaves. Here he took a house, and entered upon his own characteristic style of art, that of battle-painting, in which he has been accounted to excel all other old masters ; his merits were cordially recognized by the celebrated Cerquozzi, named Michelangelo delle Battaglie. He soon rose from penury to ease, and married a painter's beautiful daughter, Maria Vagini; she died after seven years of wedded life. Prince Matthias of Tuscany employed Courtois on some striking works in his villa, Lappeggio, representing with much historical accuracy the prince's military exploits. In Venice also the artist executed for the senator Sagredo some remarkable battle-pieces. Returning to Florence, he entered the Society of Jesus, taking the habit in Rome in 1655 ; it was calumniously rumoured that he adopted this course in order to escape punishment for having poisoned his wife. As a Jesuit father, Courtois painted many works in churches and monasteries of the society. He lived piously in Rome, and died there of apoplexy on 20th May 1676 (some accounts say 1670 or 167 1). His battle-pieces have movement and fire, warm colouring, and great command of the brush,—those of moderate dimensions are the more esteemed. They are slight in execution, and tell out best from a distance. Courtois etched with skill twelve battle subjects of his own composition. The Dantzic painter named in Italy Pandolfo Reschi was his pupil.

Guillaume Courtois, born likewise at St Hippolyte, came to Italy with his brother. He went at once to Rome, and entered the school 6f Pietro da Cortona. He studied also the Bolognese painters and Guercino, and formed for him- self a style with very little express mannerism, partly re- sembling that of Maratta. He painted the Battle of Joshua in the Quirinal Gallery, the Crucifixion of St Andrew in the church of that saint on Monte Cavallo, various works for the Jesuits, some also in co-operation with his brother. His last production was Christ admonishing Martha. His draughtsmanship is better than that of Jaques, whom he did not, however, rival in spirit, colour, or composition. He executed some etchings, moreover. Guillaume Courtois died of gout on 15th June 1679.

COURTRAI, in Flemish Korrryx, a manufacturing and fortified town of Belgium, capital of the arrondissement

of Courtrai, province of West Flanders, 26 miles south- west of Ghent. It is a neat well-built town, situated on both sides of the Lys or Leye, and connected by railways with most of the principal places in Belgium. Among its remarkable public buildings are the hétel de ville, a Gothic edifice, built in 1526, and containing two singularly-carved chimney-pieces, representing the Virtues and Vices, and events in the early history of the town, and the church of Notre Dame, a Gothic structure, founded in 1238 by Baldwin, count of Flanders and emperor of Constantinople, but, except a small portion on one side, modernized and lined with marble. 'This church contains Vandyck's cele- brated painting of the Raising of the Cross. In St Martin's Church is a beautiful tabernacle of carved stone work in the richest Gothic style, erected probably atout the end of the 15th century ; this church, which dates from about 1390, was rebuilt in the 15th century, and again after being burned in 1862. Courtrai has also an exchange, a college, an academy of design, two orphan asylums, and a public library. A great part of its inhabitants are employed in the spinning of flax and the weaving of plain and damask linens ; 5000 to 6000 women are employed in lace-making, besides which cotton and woollen goods, paper, sugar, tobacco, leather, soap, &c., are manufactured. The vicinity is highly cultivated, producing large quantities of the finest flax for supplying the manufactories of the town and for exportation. Courtrai existed in the time of the Romans under the name of Cortoriacum, which was after- wards changed to Curtricum. In the 7 th century it was a municipal city, and in 1302 was fought under its walls the famous battle of the Spurs, in which 20,000 Flemings, chiefly weavers from Ghent and Bruges, routed and put to flight a French army of 7000 knights and noblemen, and 40,000 infantry. About 700 gilt spurs were gathered on the field of battle, and hung up as a trophy in the church of the convent of Groenangen, now destroyed. The town was taken by the French in 1793, and made the capital of the department of Lys. Population (1874) 27,076. COUSIN, Victor (1792-1867), was, like another Birth and eminent Frenchman, Jean Jacques Rousseau, the son of a education. watchmaker. He was born in Paris, in the Quartier St Antoine, on the 28th November 1792. The year of his birth was a critical one for France and for Europe. The ruins of the Bastille, which adjoined the place of his birth, already symbolized the wreck of the ancient order of things. The

National Assembly had in the autumn decreed the deposition of the king ; the National Convention had been appointed to try him as Louis Capet (21st September), and three days later France was declared a republic. While the childhood of the future philosopher was passing in the Quartier St Antoine, the king was guillotined in the neigh- bouring Place de la Révolution ; Christianity was deposed, like the monarch himself, and the worship of reason solemnly inaugurated ; Marie Antoinette passed through her bitter humiliations to execution. Before the boy was old enough to be sent to the secondary school of the Quartier, Danton and Robespierre had risen, tyrannized, and fallen; the Girondists had gone down before the Jacobins, and Bonaparte had been proclaimed consul. A youth whose predilections were towards letters or philo- || sophy had his lot cast in especially troubled times. Atthe | m the faculty of letters. Cousin was very speedily age of ten young Cousin was sent to the secondary or | attracted by him, and the teaching of Royer-Collard grammar school of the Quartier St Antoine, named Lycée formed the second great philosophical impulse of his life, Charlemagne, a seminary of a rank analogous to the This teacher, as he tells us, " by the severity of his logic, Prussian gymnasium. Here he studied until he' was the gravity and weight of his words, turned me by degrees, eighteen. This embraced the time of the Consulate and | and not without resistance, from the beaten path of Con- the First Empire,—the period of the power of Bonaparte | dillac into the way which has since become so easy, but down to very near the commencement of its decline. "The | which was then painful and unfrequented, that of the Lycée had a connection with the university, aud when Scottish philosophy." In 1815-16 Cousin attained the Cousin left the secondary school, he was crowned in the | position of suppléant or assistant to a in the

ancient hall of the Sorbonne for the Latin oration delivered by him there, in the general concourse of his school com- petitors. This juvenile distinction may be taken as the sign and promise of that fervid oratorical power for which in after years he was so remarkable. Curiously enough, it was this very hall of the Sorbonne which afterwards witnessed the greatest oratorical triumphs of his manhood, and it was in a suite of rooms under the same roof that he passed in quiet reflective seclusion the latter years of his long and active intellectual life. The careful: classical training of the Lycée had at this early period strongly dis- posed him toliterature. He was

already known among his compeers for a decided superiority in Greek and familiarity with the best Greek authors. From the Lycée he passed to the Normal School of Paris,—an institution of the higher educational order corresponding very much to the faculty of arts in our Scottish universities. It was destined to train the best youths of the secondary schools for teachers in the more advanced departments. At first simply a pupil, he very soon became a monitor or mattre-répétiteur in Greek, His impulse at this time was entirely towards parly phi- letters. But it was now bis fortune to meet with a power- losophical ful influence in a somewhat opposite direction. This was influences. the teaching of Laromiguitre, who was then lecturing on philosophy in the Normal School. Cousin was through life essentially open. to and impressible by outward influences ; and the earnestness and striking power of intellectual analysis displayed by the thinker in France who first opened up to him the questions of philosophy, and first, though only slightly, broke up the beaten path of Condillacism, were very certain to modify his character and studies. In the second preface to the Fragmens Philosophiques, in which he manfully and candidly states the varied philo- sophical influences of his life and their relation to his own opinions, he speaks of the grateful emotion excited by the memory of the day in 1811, when as a pupil in the Normal School destined to letters, he heard Laromiguiére for the first time. "That day decided my whole life. Laromi- guiére taught the philosophy of Locke and Condillac, happily modified on some points, with a clearness and grace which in appearance at least removed difficulties, and with a charm of spiritual boxhomie which penetrated and sub- dued." Cousin was set forthwith to lecture on philosophy, and he speedily obtained the position of master of confer- ences (mattre de conférences) in the school. It was the practice of his pupils, who were usually in the third year of their course, to take notes and make a summary of the lectures delivered, and thereafter to meet in conference, the master presiding, for the purpose of discussing the principal points contained in them. This was the revival of a process very much akin to the medieval practice of determining as it was called. Cousin in the first preface to the Fragmens refers with great pleasure to the cherished memories of this period, when, he himself young and ardent and surrounded by sympathetic pupils, they together, for- getful of all else, essayed " the eternal problems" of speculative philosophy.

The youthful thinker very soon, however, passed beyond the point of view of Laromiguiére. Royer-Collard was lecturing in the chair of the history of modern philosophy

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chair of the faculty of letters. But there was still another mind which influenced the young and susceptible philo- sopher at this early period. This was Maine-de-Biran,— the expounder of the volitional theory of cause, and the upholder of a highly spiritual philosophy. Cousin regarded Maine-de-Biran as the unequalled psychological observer of his time in France, alike in the delicacy and the depth of his analysis. All these men strongly influenced both the method and the matter of his philosophical thought. To Laromiguiére he himself attributes the lesson of decom- posing thought, even though the reduction of it to sensation was inadequate: Royer-Collard taught him that even sensation is subject to certain internal laws and principles which it does not itself explain, which are superior to analysis and the natural patrimony of the mind. De Biran made a special study of the phenomena of the will. He taught him to distinguish in all cognitions, and especially in the simplest facts of consciousness, the fact of voluntary activity, that activity in which our personality is truly revealed, It was through this "triple discipline," as he calls it, that Cousin's philosophical thought was first developed, and that in 1815 he entered on the public teaching of philosophy in the Normal School and in the faculty of letters'. But the energy and impressibility of the young professor were not to be limited by the philo- sophical thought of his own country. He betook himself to the study of German, worked at Kant and Jacobi, and then sought to master the Phalosophy of Nature of Schelling. By this he was at first greatly attracted. The influence of Schelling became manifest in his teaching, and it may be observed very markedly in the earlier form of his philo- sophy. He sympathized with the principle of faith of Jacobi, but regarded it as arbitrary so long as it was not recognized as grounded in reason. In 1817 he went to Germany, and met Hegel at Heidelberg. In this year appeared Hegel's Hncyclopedia of the Philosophical Sciences, of which Cousin had one of the earliest copies. He thought Hegel not particularly amiable ; but

the two became friends. The following year Cousin went to Munich, where he met Schelling for the first time, and spent a month with him and Jacobi, obtaining a deeper insight into the Philosophy of Nature. His contrast of Hegel and Schelling is interesting. No two people, he tells us, can be more unlike than the master and the disciple. " Hegel lets fall words few and profound, and somewhat enigmatic ; his speech is strong but embarrassed; his immovable countenance, his clouded forehead, seem the image of thought which turns back on itself. Schelling is thought developed. His language is like his look, rapid, full of éclat and life. He is naturally eloquent."

Cousin's future course in life as a professor of philosophy seemed now to be determined. But the political troubles of the country were to. interfere for a time with this promising career. In the events of 1814-15 Cousin took the royalist side. He at first adopted the views of the party of which Royer-Collard was the philosophical chief, known as doctrinaire. He seems then to have gone further than this party, and even to have approached the extreme Left or Carbonari section of politicians. This has been alleged, though it is not in accordance with the usual moderation of his character and political views. Then came a reaction against liberalism, and in 1821-22 Cousin was deprived of his offices alike in the faculty of letters and in the Normal School. The Normal School itself was swept away. He simply shared at the hands of a narrow and illiberal Government, influenced mainly by the priest- hood, the fate of Guizot, who was ejected from the chair of history. Such was the spirit which actuated the first a ee

1 Vragmens Philosophiques, — Préface Deuxiéme, —

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restoration and the Government of Louis XVIII. This enforced abandonment of public teaching was not wholly an evil to the young speculator. He again set out for Germany with a view to further philosophical study. And here there ogcurred a curious episode in his life. While at Berlin in 1824-25 he was arrested and thrown into prison, either on some ill-defined political charge at the instance of the French police, or on account of certain incautious expressions which he had let fall in conversation. This imprisonment was in fact the result of the-persistent persecution of the man

who exercised free thought and preached toleration, at the hands of the priestly party in France, who, ruling a weak king, had already deprived the professor of his public offices. Cousin was liberated at the end of six months,—having thus for an abstract philosopher had a tolerable taste of political martyrdom. He continued under the suspicion of the French Government for three years longer. It was during this period, however, that he thought out and developed what is distinctive in his philo- sophical doctrine. His eclecticism, ontology, and his philosophy of history were declared in principle and in

most of their salient details in the Fragmens Philosophiques Fragmens of 1826. The preface to the second edition (1833) and Philoso- the Avertissement to the third (1838) aimed at a vindi- P%ques.

cation of his principles from hostile contemporary criticism, Even the best of his later books, the Philosophie Lcossaise, the Du Vrai, du Beau, et du Bien, and the Philosophie de Locke were simply, matured revisious of his lectures during the period from 1815 to 1820. The lectures on Locke were first sketched in 1819, and fully developed in the course of 1829,

During the seven years of forced abandonment of teach- ing, he produced, besides the /ragmens, the edition of the works of Proclus (6 vols. 1820-27), and the works of Des- cartes (11 vols., 1826). He also commenced his 7'ranslation of. Plato (13 vols.), which occupied his leisure time from 1825 to 1840.

We seein the Fragmens very distinctly the fusion of the different philosophical influences of his life to which we have referred, and by which his opinions were finally moulded and matured. For Cousin was as eclectic in cast of thought and personal habit of mind, as he was in philo- sophical principle and system. It is with the publication of the /ragmens of 1826 that the first great widening of his reputation is: associated. In 1827 followed the Cours de U Histoire de la Philosophie.

In 1828 popular feeling forced the king (Charles X.) to a change of ministry, and M. Martignac returned to the constitutional Charter of 1814, which sought to conciliate liberty and order, but which had been most unfaithfully worked under the restoration. A more enlightened and tolerant

~~spirit seems to have arisen, and M. de Vatimesnil, minister of public instruction, recalled Cousin along with Guizot to their professorial positions in the university. Cousin's re-appearance in the chair, "on the occasion," as he said, "of the return of the constitutional hopes of France," was marked by an enthusiastic demonstration on the part of students and auditors. The professoriate in~~

~~. Paris reached its golden age, at least in this century, when~~

~~Guizot, Villemain, and Cousin were now colleagues in the faculty of letters.~~

~~The three years which followed 1828 was the period ot Career as Cousin's greatest distinction and triumph as a lecturer, a lecturer~~

~~He re-appeared in sympathy with the national feeling of the time; he had suffered for his adherence to popular principles ; his return to the chair was at once a compensa tion for what he had undergone, and the symbol of the triumph of constitutional ideas. This prepared a ready sympathy for him. The hall of the Sorbonne was crowded with auditors as the hall of no philosophical teacher in~~

~~Influence of his teaching.~~

~~Disciples and followers.~~

~~COUSIN~~

~~Paris had been since the days of Abelard. The lecturer had a singular power of identifying himself for the time~~

~~'with the system which he expounded, and the historical~~

~~character he pourtrayed. Clear and comprehensive in the grasp of the general outlines of his subject, he was at the same time exceedingly methodical and vivid in the repre- sentation of details. In exposition he had the rare art of unfolding and aggrandizing. Beginning with the simple~~

~~or particular, he proceeded readily and easily to complete~~

~~the listener's grasp of the matter in hand. There was a rich deep-toned resonant eloquence mingled with the speculative exposition ; his style of expression was clear,~~

~~elegant, and forcible, abounding in happy turns and striking To this was joined a singular power of His philosophy exhibited in a striking~~

~~antitheses. rhetorical climax. manner the generalizing tendency of the French intellect,~~

~~and its logical need of grouping details round central The pretension even to grasp and formulize the history of philosophy was dazzling to the imagination of a~~

~~principles.~~

~~Parisian auditory, however little ground it might have in fact or reason.~~

~~There was withal a moral earnestness and elevation in his spiritual philosophy which came home to the hearts of his hearers, and which seemed to afford a ground for higher development in national literature and att, and even in politics, than the traditional philosophy of France had appeared capable of yielding. It was thus not to be wondered at that the philosophical orator was received with enthusiasm, and that his lectures produced more ardent disciples, imbued at least with his spirit, than it has been the fortune of any other professor of philosophy in France to gather round him in this century. Tested by the power and effect of his teaching influence, Victor Cousin occupies a foremost place in the rank of professors of philosophy, who like Jacobi and Schelling in Germany and Dugald Stewart in Scotland, have united the rare gifts of speculative, ex- pository, and imaginative faculty. Tested even by the strength of the reaction which his writings have in some cases occasioned, his influence is hardly less remarkable, and the degree of petulant detraction to which he himself and his philosophy have been subjected even in France may be taken as the tribute of envy tohis power. The taste for philosophy,—especially its history,—was revived in France to an extent unknown since the 17th century.~~

~~Among the more distinguished men who were influenced~~

~~by the teaching and example of Cousin, and who have carried on philosophical work in his manner and spirit, we may note Jouffroy, Damiron, Garnier, Barthelemy St Hilaire, Ravaisson, Rémusat, Jules Simon, and Franck. Jouffroy and Damiron were first fellow students, and then auditors and disciples. Jouffroy, however, always kept~~

~~firm to the early—the French and Scottish—impulses of The best research in the history of philosophy, and the best thought of France during the period from 1830 to 1848, were doubtless due to the teaching and In fact, for fully fifty years of the philosophical life of France, Cousin has been the greatest He continued to lecture regularly for two years and The three bloody days of July 1830 led to the flight of Charles X. This was followed by the accession of Louis Philippe, "by the will of the people,"—which meant very much the bourgeoise of Cousin entirely with the revolution of July, and he was at once recognized by the new Government as a friend Writing in his philosophical and his~~

~~Cousin's teaching.~~

~~writings of Cousin.~~

~~ower. a half after his return to the chair.~~

~~Paris and the middle class of the country. sympathized~~

~~of national liberty'and constitutional rights. June 1833 he explains both political position :—~~

~~'I had the advantage of holding united against me for many and the theological school. In 18380~~

~~years, both the sensational~~

~~both schools descended into the arena of politics. school quite naturally produced the demagogic party, and the theo- logical school became quite as naturally absolutism, safe to borrow from time to time the mask of the demagogue in order the better to reach its ends, as in philosophy it is by scepticism that it under- takes to restore theocracy. any exclusive~~

~~*struction in 1840 under Thiers.*~~

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~~*The sensational*~~

~~*On the other hand, he who combated principle in science was bound to reject also any*~~

~~*exclusive principle in the state, and to defend representative government."*~~

~~*The Government was not tardy in honouring his public*~~

~~*services as a professor and his contributions to the philo- sophical literature of the country. He was induced by the ministry of which his friend Guizot was the head to take a part in national administration. retained the title of professor of philosophy. He became a member of the council: of public instruction and coun- sellor of state, and in 1832 he was made a peer of France.*~~

~~*He ceased to lecture, but*~~

~~*Finally, he accepted the position. of minister of public in- He was besides director of the Normal School and virtual head of the university,*~~

~~*and from 1840 a member of the Institute (Academy of the Moral and Political Sciences). his official position at this period gave him great power in the university and in the educational arrangements of the country. In fact, during the seventeen and a half years of*~~

~~*His character and*~~

~~*the reign of Louis Philippe, Cousin mainly moulded the philosophical and even the literary tendencies of the culti- vated class in France. Relation*~~

~~*But the most important work he accomplished during this primary period was doubtless the organization of primary instruction education in the country. It wasto the efforts of Cousin that France 2 France. owed her advance, in primary education, from 1830 to 1848. Prussia and Saxony had*~~

set the national example, and France was guided into it by Cousin. Forgetful, as has been well said, of "national calamity and of personal wrong," he looked to Prussia as affording the best example of an organized system of national education ; and he was persuaded that 'to carry back the education of Prussia into France afforded a nobler (if a bloodless) triumph than the trophies'of Austerlitz and Jena." In the summer of 1831, commissioned by the Government, he proceeded to Germany, visiting Frankfort and Saxony, and spending some time in Berlin. 'The result was a series of reports to the minister, afterwards published as Rapport sur P Etat | Instruction Publique dans quelques pays de Allemagne et particuliérement en Prusse. (Compare also De I' Instruction Publique en Hollande, 1837.) His views were readily accepted on his return to France, and soon afterwards through his influence there was passed the law of primary instruction. (See his Lxposé des Motus et Projet de Lot sur P Instruction Primaire, présentés & la Chambre des Députés, Séance du 2 Janvier 1833.)

In the words of a reviewer at the time (Edinburgh Review, July 1833), these documents " markj an epoch in the progress of national education, and are directly con- ducive to results important not only to France but to Europe." The Report was translated by Mrs Austin in 1834. The translation was frequently reprinted in the United States of America. The legislatures of New Jersey and Massachusetts distributed it in the schools at the expense of the States. Cousin remarks that, among all the literary distinctions which he had received, "' None -has

touched me more than the title of foreign member of the — American Institute for Education."

To the enlightened views of the ministries of Guizot and Thiers under the citizen-king, and to the zeal, energy, and ability of Cousin in the work of organization, France owes what is best in

her system of primary education,—a national interest which had been neglected under the Revolution, the Empire, and the Restoration (see Lxposé, p. 17). In the first two years of the reign of Louis Philippe more was done for the

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education of the people than had been either sought or accomplished in all the history of France. France since then has, perhaps, owing to political troubles and ecclesi- astical obstacles, followed but falteringly in the steps of Prussia ; but some considerable progress has been made on the lines laid down by Cousin in a spirit of far-seeing patriotism. If, in 1866, about 30 per cent. of the military conscripts were unable to read, yet we must put alongside of this the fact that, while in 1824, the year of the accession of Charles X., out of the 44,000 communes of France 25,000 were without schools, in that same year of 1866 there were 41,000 free and public schools for boys, and 14,000 for girls. In connection with his services to education we ought not to omit a notice of his noble and eloquent defence of university studies in the Chamber of Peers in 1844, when he stood manfully forth against the clerical party on the one hand, and the levelling or Philistine party on the other. His speeches on this occasion were afterwards published in a most interesting tractate entitled Défense de Université et de la Philosophie. :

This period of ofticial life from 1830 to 1848 was spent by him, so far as philosophical study was concerned, in revising his former lectures and writings, in maturing them for publication or re-issue, and in research into certain periods of the -history of philosophy. In 1835 appeared De la Métaphysique Aristote, suivi un Essai de traduc- tion des deux premiers livres ; in 18386, Cours de philo- sophie professé & la faculté des lettres pendant année 1818, and Ouvrages inedits d'Abélard. This Cours de Philosephie appeared later in 1854 as Du Vrai, du Beau, et du Bien. From 1825 to 1840 appeared Cours de U' Iistoire de la Philo- sophie ; in 1839 Manuel de I' HIstoire de la Philosophie de Tennemann, translated from the German. In 1840-41 we have Cours @'HIstoire de la Philosophie Morale au XVIII° Siecle (5 vols), In 1841 appeared his edition of the CGiuvres Philosophiques de Maine-de-Biran ; in 1842, Lecons de Philosophie sur Kant, and in the same year Des Pensées de Pascal. The Nowveaux Fragments were gathered together and republished in 1847, Later, in 1859, appeared Petri Abeelardi Opera.

~~During this period also he seems to have turned with fresh interest to those literary studies which in his youth he had abandoned for speculation under the influence of Laromiguiére and Royer-Collard. To this renewed interest we owe his studies of meu and women of note in France in the 17th century. This was an epoch of the national history whose spiritualism, alike in philosophy and religion, had a special attraction for him. He turned to it with increasing regard in his latter years, as best representing his own personal convictions and feelings. As the results of his work in this line, we have, besides the Des Pensées de Pascal, 1842, already noticed, Wtwdes sur les Femmes et la Société du XVIT° Siecle, 1853. He has sketched Jacqueline Pascal, Madame de Longueville, Madame de Sablé, Madame de Chevreuse, Madame de Hautefort. There is as yet no complete edition of his numerous works, which is a great desideratum,~~

~~When the reign of Louis Philippe came to a close through the opposition of his ministry, with Guizot at its head, to the demand for electoral reform and through the disgrace- ful policy of the Spanish marriages, Cousin, who was opposed to the Government on these points, lent his sympathy to Cavaignac and the Provisional Government. He published a pamphlet entitled Justice e¢ Charité, the purport of which showed the moderation of his political views. It was markedly anti-socialistic. But from this period he passed almost entirely from public life, and ceased to wield the personal influence which he had done during the preceding years. After the coup d'état of the 2d December, he was deprived of his position as permanent~~

~~SIN~~

~~member of the superior council of public instruction. From Napoleon and the empire he stood essentially aloof. A decree of 1852 placed him along with Guizot and Villemain in the rank of honorary professors. Hig sympathies were apparently with the monarchy, under certain constitutional safeguards. Speaking in 1853 of the political issues of the spiritual philosophy which he had taught during his lifetime, he says,—' It conducts human societies to the true republic, that dream of all generous souls, which in our time can be realized in Europe only by constitutional monarchy."!~~

During the last years of his life, he occupied a suite of Lae rooms in the Sorbonne, where he lived very simply and years.

unostentatiously. The chief feature of the rooms was tho noble library, the cherished collection of a lifetime, which was spread over the walls of each apartment. Besides Latin and Greek classics, representing the studies of his youth, it was rich in philosophical literature, especially historical. The compartments for Italian and English literature and philosophy were especially full and interest- ing; and the whole was so carefully and methodically arranged that its learned possessor could quite readily lay his hand on any volume of his treasures. The present writer may perhaps be pardoned for saying that he well recollects a forenoon spent with him in these rooms, some twelve years ago. 'The kindliness of his manner, the rich- ness of his talk, his wonderful acquaintance with British literature, politics, and philosophy, the massive head with hair slightly turned to grey, and the kindling dark brown eyes, are elements in the picture of a very pleasant memory.

M. Cousin died at Cannes on the 13th January 1867 Death.

in his sixty-fifth year. In the front of the Sorbonne, below the lecture-rooms of the faculty of Ictters, is a tablet recording an extract from the will of Victor Cousin, in which he appropriately bequeathes his noble and cherished library to the halls of his professorial work and triumphs.

There are three distinctive points in the philosophy of yj; philo- M. Cousin. These are his method, the results of his method, sophy.

and the application of the method and its results to his- tory,—especially to the history of philosophy. It is usual to speak of his philosophy as eclecticism. It.is eclectic only ina secondary and subordinate sense. All eclecticism that is not self-condemned and inoperative implies a system of doctrine as its basis,—in fact, a criterion of truth, Otherwise, as Cousin himself remarks, it is simply a blind and useless syncretism. And Cousin saw and proclaimed from an early period in his philosophical teaching the necessity of a system on which to base his eclecticism. This is indeed advanced as an illustration or confirmation of the truth of his system,—as a proof that the facts of history correspond to his analysis of consciousness,

~~These three points—the method, the results, and the philosophy of history—are with him intimately connected ; they are developments ina natural order of sequence. They become in practice Psychology, Ontology, and Eclecticism in history.~~

~~First, as to method. strongly and frequently insisted than the importance of the method which philosophy may adopt. That which he adopts, and the necessity of which he so strongly proclaims, is the ordinary one of observation, analysis, and induction. This may seem commonplace enough, but it is really not so; it makes all the difference in the world as to the char acter of a philosophy whether we follow the reflective analysis of experience, or a deductive method of the con struction of notions. The observational method Cousin~~

~~1 Du Vrat, Du Beau, Du Bien,—Preface,~~

~~On no point has Cousin more Method.~~

~~Results.~~

~~Spontan- eity in will.~~

~~COUSIN~~

~~regards as that of the 18th century,—the method which Descartes began and abandoned, and which Locke and Condillac applied, but applied imperfectly, aud which Reid and Kant used with more success, yet not completely. HIe insists that this is the true method of philosophy as applied to consciousness, in which alone the facts of experience appear. But the proper condition of the application of the method is that it shall not through prejudice of system omit a single fact of consciousness. If the authority of consciousness is good in one instance, it is good in all. Tf not to be trusted in one, it is not to be trusted in any. Previous systems have erred in not presenting the facts of consciousness, %.¢., consciousness itself, in their totality. The observational method applied to conscious- ness gives us the science of psychology. This is the basis and the only proper basis of ontology or metaphysics—the science of being—and of the philosophy of history. To the observation of consciousness Cousin adds induction as the~~

~~complement of his method, by which he means inference as to reality necessitated by the data of consciousness, and regulated by certain laws found in consciousness, ViZ., those of the reason. By his method of observation and induction as thus explained, his philosophy will be found to be marked off very clearly, on the one hand from the deductive construction of notions of an absolute system, as represented either by Schelling or Hegel, which Cousin regards as based simply on hypothesis and abstraction, illegitimately obtained ; and on the other, from that of Kant, and in a sense, of Hamilton, both of which in the view of Cousin are limited to psychology, and merely relative or phenomenal knowledge, and issue in scepticism so far as the great realities of ontology are concemed. What Cousin finds psychologically in the individual consciousness, he finds also spontaneously expressed in the common sense or universal experience of humanity. In fact, it is with him the function of philosophy to classify and explain universal convictions and beliefs; but common sense is not with him philosophy, nor is it the instrument of philosophy; it is simply the material on which the philosophical method works, and in harmony with which its results ,; must ultimately be found.~~

~~The three great results of psychological observation are Sensibility, Activity or Liberty, and Reason.~~

~~These three facts are different in character, but are not found apart in consciousness. Sensations, or the facts of the sensibility, are necessary ; we do not impute them to ourselves. The facts of reason are also necessary, and reason is not less independent of the will than the sausibility. Voluntary facts are alone marked in the eyes of consciousness with the characters of imputability and personality, The will alone is the person or Me. The me is the centre of the intellectual sphere without which con- sciousness is impossible. We find ourselves in a strange world, between two orders of phenomena which do not belong to us, which we apprehend only ou the condition of our distinguishing ourselves from them. Further, we apprehend by means of a light which does not come 'from ourselves. All light comes from the reason, and it is the reason which apprehends both itself, and the sensibility which envelopes it and the will which it obliges but does not constrain. Consciousness then is composed of these three integrant and~~

inseparable elements. But Reason is the immediate ground of knowledge, and of con- sciousness itself.

But there is a peculiarity in M. Cousin's doctrine of activity or freedom, and in his doctrine of reason, which enters deeply into his system. This is the element of spontaneity in volition and in reason. This is the heart of what is new alike in his doctrine of knowledge and being. Liberty or freedom js a generic term which means

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a cause or being endowed with self-activity. This is to itself and its own development its own ultimate cause. Free-will is so, although it is preceded by deliberation and determination, 7.e., reflection, for we are always conscious that even after determination we are free to will or not to will. But there is a primary kind of volition, which has not reflection for its condition, which is yet free and spontaneous. We must have willed thus spontaneously first, otherwise we could not know, before our reflective volition, that we could will and act. Spontaneous volition is free as reflective, but it is the primary act of the two. This view of liberty of will is the only one in accordance with the facts of humanity; it excludes reflective volition, and explains the euthusiasm of the poet and the artist in the act of creation; it explains also the ordinary actions of mankind, which are done as a rule spontaneously and not after reflective deliberation.

But it is in his doctrine of the Reason that the distinc- tmperson- tive principle of the philosophy of Cousin lies. The reason ality of given to us by psychological observation, the reason of our "45°.

consciousness, is impersonal in its nature. We do not make it; its character is precisely the opposite of in- dividuality ; it is universal and necessary. The recognition of universal aud necessary principles in knowledge is the essential point in psychology ; it ought to be put first and emphasized to the last that these exist, and that they are wholly impersonal or absolute. The nuniber of .these principles, their enumeration and classification, is an important point, but it is secondary to that of the recogni- tion of their true nature. This was the point which Kant missed in his analysis, and this is the fundamental truth which Cousin thinks he has restored to the integrity of

~~*philosophy by the method of the observation of conscious- ness. And how is this impersonality or absoluteness of the conditions of knowledge sought to be established? The answer is in substance that Kant went wrong in putting necessity first as the criterion of those laws. This brouglit them within the sphere of reflection, and gave as their guarantee the impossibility of thinking them reversed; and led to their being regarded as wholly relative to human intelligence, restricted to the sphere of the phenomenal, incapable of revealing to us substantial reality—necessary, yet subjective. But this test of necessity is a wholly secondary one ; these laws are not thus guaranteed to us; they are each and all given to us, given to our conscious- ness, in an act of spontaneous apperception or apprelien- sion, immediately, instantaneously, in a sphere above the reflective consciousness, yet within the reach of knowledge. And "all subjectivity with all reflection expires in the spontaneity of apperception. The reason becomes sub- jective by relation to the voluntary and free self; but in itself it is impersonal ; it belongs not to this or to that self in humanity ; it belongs not even to humanity. We may say with truth that nature and humanity belong to it, for without its laws both would perish." But what is the number of those laws?*~~

~~*classification, and may be legitimately reduced. According to Cousin, there are but two primary laws of thought, that of causality and that of suvstance. From these flov naturally all the others. 'In the order of nature, that of substance is the first and causality second. In the order of acquisition of our knowledge,' causality precedes sub- stance, or rather both are given us in each other, and are contemporaneous in consciousness.*~~

~~*These principles of reason, cause and substance, giver thus psychologically, enable us to pass beyond the limits of the relative and subjective to objective and absolute reality,—enable us, in a word, to pass from psychology, or*~~

~~*Kant reviewing Laws of the enterprize of Aristotle in modern times has given 4 reason. 'complete list of the laws of thought, but it is arbitrary in*~~

~~*The in- finite or absolute.*~~

~~the science of knowledge, to: ontology, or the science of being. These laws are inextricably mixed in consciousness with the data of volition and sensation, with free activity and fatal action or impression, and they guide us in rising to a personal being, a self or free cause, and to an impersonal reality, a not-rme—nature, the world of force— lying out of us, and modifying us. As I refer to myself the act of attention and volition, so I cannot but refer the sensation to some cause, necessarily other than myself, that is, to an external cause, whose existence 1s as certain for me as my own existence, since the phenomenon which suggests it to me is as certain as the phenomenon which had suggested my reality, and both are given in each other. L thus reach an objective impersonal world of forces which corresponds to the variety of my sensations. The relation of these forces or causes to each other is the order of the universe.~~

~~But these two forces, the me and the not-me, are reciprocally limitative. As reason has apprehended these two simultaneous phenomena, attention and sensation, and led us immediately to conceive the two sorts of distinct causes, correlative and reciprocally finite, to which they are related, so, from the notion of this limitation, we find it impossible under the same guide not to conceive a supreme cause, absolute and infinite, itself the first and last cause of all. This is relatively to self and not-self what these are to their proper effects. This cause is self-sufficient, and is sufficient for the reason. This is God; he must be con- ceived under the notion of cause, related to humanity and the world. He is absolute substance only in so far as he~~

~~is absolute cause, and his essence lies precisely in his~~

~~Charge of pantheism.~~

~~History of philo- sophy.~~

~~creative power. He thus creates, and he creates necessarily.~~

~~This theodicy of Cousin laid him open obviously enough to the charge of pantheism, This he repels, and his answer may be summed up as follows. Pantheism is pro- perly the deification of the law of phenomena, the universe God. But I distinguish the two finite causes self and not-self from~~

each other and from the infinite cause. They are not mere modifications of this cause or properties, as with Spinoza,—they are free forces having their power or spring of action in themselves, and this is sufficient for our idea of independent finite reality. I hold this, and I hold the relation of these as effects to the one supreme cause. The God I plead for is neither the deity of Pan- theism, nor the absolute unity of the Eleatics, a being divorced from all possibility of creation or plurality, a mere metaphysical abstraction. The deity I maintain is creative, and necessarily creative. The deity of Spinoza and the Eleatics is a mere substance, not a cause in any sense. As to the necessity under which Deity exists of acting or creating, this is the highest form of liberty, it is the free- dom of spontaneity, activity without deliberation. His action is not the result of a struggle between passion and virtue. He is free in an unlimited manner, the purest spontaneity in man is but the shadow of the freedom of God. He acts freely but not arbitrarily, and with the consciousness of being able to choose the opposite part. He cannot deliberate or will as we do. His spontaneous action excludes at once the efforts and the miseries of will and the mechanical operation of necessity.

The elements found in consciousness are also to be found in thé history of humanity and in the history of philosophy.

-In external nature there are expansion and contraction

which correspond to spontaneity and reflection. External nature again in contrast with humanity expresses spon- taneity ; humanity expresses reflection. In human his- tory the East represents the spontaneous stage ; the Pagan and Christian world represent stages of reflection.

This was afterwards modified expanded. and more fully

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expressed by saying that humanity in its universal development has three principal moments, First, in the spontaneous stage, where reflection is not yet developed, and art is imperfect, humanity has thought only of the immensity around it. It is preoccupied by the infinite. Secondly, in the reflective stage, mind has become an object to itself. It thus knows itself explicitly or reflec- tively. Its own individuality is now the only or at least

~~the supreme thing. This is the moment of the finite. Thirdly, there comes an epoch in which the self or me is subordinated. Mind realizes another power in the universe. The finite and the infinite become two real correlatives in the relation of cause and product. the third and highest stage of development, the relation of the finite and the infinite. As philosophy is but the highest~~

~~This is –~~

~~expression of humanity, these three moments will be repre- .~~

~~sented in its history. The East typifies the infinite, Grecce the finite or reflective epoch, the modern era the stage of relation or correlation of infinite and finite. In theology, the dominant philosophical idea of each of these epochs results in pantheism, polytheism, theism. In politics we have in correspondence also with the idea, monarchy, democracy, constitutionalism.~~

~~Eelecticism thus means the application of the psychologi- Eclecti- cal method to the history of philosophy. Confronting the "™-~~

~~various systems co-ordinated as sensualism, idealism, scep- ticism, mysticism, with the facts of consciousness, the result was reached "that each system expresses an order of phe- nomena and ideas, which is in truth very real, but which is not alone in consciousness, and which at the same time holds an almost exclusive place in the system ; whence it follows that each system is not false but incomplete, and that in reuniting all incomplete systems, we should have a complete philosophy, adequate to the totality of conscious- ness." Philosophy, as thus perfected, would not be a mere aggregation of systems, as is ignorantly supposed, but an integration of the truth in each system after the false or incomplete is discarded.~~

~~Such is the system in outline. of the system lies in its relations to Kant, Schelling, and Hegel. Cousin was opposed to Kant in asserting that the unconditioned in the form of infinite or absolute cause was but a mere unrealizable tentative or effort on the part of the mind, something different from a mere negation, yet not equivalent to a positive thought. With Cousin the absolute as the ground of being is grasped positively by the intelligence,~~

~~and it renders all else intelligible ; it is not as with Kant a certain hypothetical or regulative need.~~

~~With Schelling again Cousin agrees in regarding this supreme ground of all as positively apprehended, and as a source of development, but he utterly repudiates Schielling's method. © The intellectua] intuition either falls under the eye of consciousness, or it does not. If not, how do you know it and its object which are identical? If it does, it comes within the sphere of psychology ; and the objections to it as thus a relative, made by Schelling himself, are to be dealt with. Schelling's intellectual intuition is the mero negation of knowledge.~~

~~Again, the pure being of Hegel is a mere abstraction,— an hypothesis illegitimately assumed, which he has nowhere sought to vindicate. The very point to be established is the possibility of reaching being pev se or pure being; yet in the Hegelian system this is the very thing assumed as a starting-point. Besides this, of course, objections might be made to the method of development, as not only sub- verting the principle of contradiction, but as galvanizing negation into a means of advancing or developing the whole body of human knowledge and reality. The intellectual intuition of Schelling, as above consciousness, the pure being of Hegel, as an empty abstraction, unvindicated,~~

~~The historical position Relations~~

~~to Kant, Schellirg, and Hegel,~~

~~Hamilton's criticims.~~

~~Criticism of his philo- sophy. Imperson- ality of reason.~~

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~~illegitimately assumed, and arbitrarily developed, are equally useless as bases of metaphysics. This led Cousin, still holding by essential knowledge of being, to ground it in an analysis of consciousness,— in psychology.~~

~~The absolute or infinite—the unconditioned ground and source of all reality—is yet apprehended by us as an im- mediate datum or reality ; and it is apprehended in con- sciousness,—under its condition, that, to wit, of distinguish- ing subject and object, knower and known. The doctrine of Cousin was, as is well known, criticised by Sir W. Hamilton in the Hdinburgh Review of 1829, and it was animadverted upon about the same time by Schelling. The latter Cousin calls the greatest thinker, and the former the greatest critic of the age. Hamilton's objections are as fol- lows. 'The correlation of the ideas of infinite and finite does not necessarily imply their correality, as Cousin sup- poses; on the contrary, it is a presumption that finite is simply positive and infinite negative of the same,—that tho finite and infinite are simply contradictory relatives. Of these " the positive aloue is real, the negative is only an abstraction of the other, and in the highest generality even an abstraction of thought itself." A study of the few sentences under this head might have obviated the trifling criticism of Hamilton's objection which has been set afloat recently, that the denial of a knowledge of the absolute or infinite implies a foregone knowledge of it. How can you deny the reality of that which you do not know? The answer to this is that in the case of contradictory statements,—A and not A,—the latter is a mere negation of the former, and posits nothing; and the negation of a notion with positive attributes, as the finite, does not ex- tend beyond abolishing the given attributes as an object of thought. The infinite or non-finite is not necessarily known, ere the finite is negated, or in order to-negate it ; all that needs be known is the finite itself ; and the con-tradictory negation of it implies no positive. Non-organized may or may not correspond to a positive,—7.e., an object or notion with qualities contradictory of the organized ; but the mere sublation of the organized does not posit it, or suppose that it is known beforehand, or that anything exists corresponding to it, This is one among many flaws in the Hegelian dialectic, and it paralyzes the whole of the Logic. Secondly, The conditions of intelligence, which Cousin allows, necessarily excludé the possibility of know- ledge of the absolute,—they are held to be incompatible with its unity. Here Schelling and Hamilton argue that Cousin's absolute is a mere relative. Thirdly, It is objected that in order to deduce the conditioned, Cousin makes his absolute a relative; for he makes it an absolute cause, 4.¢., 2 cause existing absolutely under relation. As such it is necessarily inferior to the sum total of its effects, and dependent for reality on these—in~~

~~a word, a mere potence or becoming. Further, as a theory of creation, it makes creation a necessity, and destroys the notion of the divine. Cousin made no reply to Hamilton's criticism beyond alleging that Hamilton's doctrine necessarily restricted human knowledge and certainty to psychology and logic, and destroyed metaphysics by introducing nescience and uncertainty into its highest sphere,—theodicy.~~

~~The attempt to render the laws of reason or thought impersonal by professing to find them in the sphere of spontaneous apperception, and above reflective necessity, can hardly be regarded as successful. It may be that we first of all primitively or spontaneously affirm cause, sub- stance, time, space, &c., in this way. But these are still in each instance given us as realized in a particular form. Tn no single act of affirmation of cause or substance, much less in such a primitive act, do we affirm the universality of their application. We might thus get particular instances or cases of these laws, but we could never get the~~

~~laws themselves in their universality, far less absolute impersonality, And as they are not supposed to be mere generalizations from experience, no amount of individual instances of the application of any one of them by us would~~

~~give it a true universality. The only sure test we havo of their universality in our experience is the test of their reflective necessity. We thus after all fall back on reflec- tion as our ground for their universal application ; mere spontaneity of apprehension is futile ; their universality is grounded in their necessity, not their necessity in their universality. How far and in what sense this ground of necessity renders them personal are of course questions still~~

~~to be solved.~~

~~But if these three correlative facts are immediately given, it seems to be thought possible by Cousin to vindicate them in reflective consciousness. He seeks to trace the steps which the reason has spontaneously and consciously, but irreflectively, followed. And here the question arises—Can we vindicate in a reflective or mediate process this spontaneous apprehension of reality ?~~

The self is found to be a cause or force, free in its action, on the ground that we are obliged to relate the volition of consciousness to the self as its cause, and its ultimate cause. It is not clear from the

analysis whether the self is immediately observed as an

acting or originating cause, or whether reflection working on the principle of causality is compelled to infer its exis- tence and character. If self is actually so given, we do not need the principle of causality to infer it; if it is not so given, causality could never give us either the notion or the fact of self as a cause or force, far less as an ultimate one. All that it could do would be to warrant a cause of some sort, but not this or that reality as the cause. And further, the principle of causality, if fairly carried out, as universal and necessary, would not allow us to stop at personality or will as the ultimate cause of its effect,—voli- tion. Once applied to the facts at all, it would drive us beyond the first antecedent or term of antecedents of voli- tion to a still further cause or ground,—in fact, land us in an infinite regress of causes.

The same criticism is even more emphatically applicable to the influence of a not-self, or world of forces, corres- ponding to our sensations, and the cause of them. Starting from sensation as our basis, causality could never give us this, even though it be allowed that sensation is impersonal to the extent of being independent of our volition. Causality might tell us that a cause there is of sensation somewhere and of some sort; but that this cause is a force or sum of forces, existing in space, independently of us, and corresponding to our sensations, it could never tell us, for the simple reason that such a notion is not supposed to exist in our consciousness. Causality cannot add to the number of our notious,—cannot add to the number of realities we know. All it can do is to necessitate us to think that a cause there is of a given change, but what that cause is it cannot of itself inform us, or even suggest to us, beyond implying that it must be adequate tothe effect. Sensation might arise, for aught we know, so far as caus- ality leads us, not from a world of forces at all, but from a will like our own, though infinitely more powerful, acting upon us, partly furthering and partly thwarting us. And indeed such a supposition is, with the principle of causality at work, within the limits of probability, as we are already

~~supposed to know such a reality,—a will—in our own con- sciousness. When Cousin thus set himself to vindicate those points by reflection, he gave up the obvious advantage of his other position that the realities in question are given us in immediate and spontaneous apprehension. The same criticism applies equally to the inference of an absolute cause from the two limited forces~~

~~Velition,~~

~~Genera] estimate,~~

~~528~~

~~which he names self and not-self. Immediate spontaneous apperception may seize this supreme reality; but to vindicate it by reflection as an inference on the principle of causality is impossible. This isa mere paralogism ; we can never infer either absolute or infinite from relative or finite.~~

~~The truth is that M. Cousin's doctrine of the spontaneous apperception of impersonal truth amounts to little more than a presentment iu philosophical language of the ordinary convictions and belicfs of mankind. This is important as a preliminary stage, but philosophy properly begins when it attempts to co-ordinate or systematize those convictions in harmony, to conciliate apparent contradiction and opposition, as between the correlative notions of finite and infinite, the apparently conflicting notions of personality and iufinitude, self and not-self ; in a word, to reconcile the various sides of consciousness with each other. And whether the laws of our reason are the laws of all intelli- gence and being,—whether and how we are to relate our fundamental, intellectual, and moral conceptions to what is beyond our experience, or to an infinite being,—are problems which Cousin cannot be regarded as having solved. These are in truth the outstanding problems of modern philosophy.~~

~~Cousin's doctrine of spontaneity in volition can hardly be said to be more successful than his impersonality of the reason through spontaneous apperception. Sudden, un pre- meditated volition may be the earliest and the most artistic, but itis not the best. Volition is essentially a free choice between alternatives, and that is best which is most deliberate, because it is~~

most rational. Aristotle long ago touched this point in his distinction between BovAnow and mpoaipeots. The sudden and unpremeditated wish repre- sented by the former is wholly inferior in character to the free choice of the latter, guided and illumined by intel- ligence. In this we can deliberately resolve upon what is in our power ; in that we are subject to the vain impulse of wishing the impossible. Spontaneity is pleasing, sometimes beautiful, but it is not in this instance the highest quality of the thing to be obtained. 'That is to be found in a guiding and illumining reflective activity.

Eclecticism is not open to the superficial objection of pro- ceeding without a system or test in determining the com- plete or incomplete. But it is open to the objection of assuming that a particular analysis of consciousness has reached all the possible elements in humanity and in history, and all their combinations. It may be asked, Can history have that which is not in the individual con- sciousness? In a sense not; but our analysis may not give all that is there, and we ought not at once to impose that analysis or any formula on history. HIstory is as likely to reveal to us in the first place true and original elements, and combinations of ele- ments in man, as a study of consciousness, Besides, the tendency of applying a formula of this sort to history is to assume that the elements are developed in a certain regular or necessary order, whereas this may not at all be the case : but we may find at any epoch the whole mixed, either crossing or co-operative, as in the consciousness of the individual himself. Further, the question as to how these elements may possibly have grown up in the general con- sciousness of mankind is assumed to be non-existent or impossible.

It was the tendency of the philosophy of Cousin to out- line things and to fill up the details in an artistic and imaginative interest. This is necessarily the case, especially in the application to history of all formulas sup- posed to be derived either from an analysis of conscious- ness, or from an abstraction called pure thought. Cousin

was observational and generalizing rather than analytic and discriminating.

COU—

~~His search into principles was not profound, |~~

~~CR~~

~~and his power of rigorous consecutive development was not remarkable. These qualities are essential to the formation of a lasting body of philosophic knowledge. He has left no distinctive principle of philosophy which js likely to be permanent. But he has left very interesting psychological analyses, and several new, just, and true expositions of philo- sophical systems, especially that of Locke and the philo- sophers of Scotland. He was at the same time a man of impressive power, of rare and wide culture, and of lofty aim,—far above priestly conception and Philistine narrow- ness. He was familiar with the broad lines of nearly every system of philosophy ancient and modern. His eclecticism was the proof of a reverential sympathy with the struggles of human thought to attain to certainty in the highest pro- blems of speculation. It was eminently a doctrine of comprehension and of toleration. In these respects it formed a marked and valuable contrast to the arrogance of absolutism, which really means a supreme egoism, to the narrow dogmatism of sensationalism, and to the not less narrow doctrine of church authority, preached by tho theo- logical school of his day. His spirit, while it influenced the youth of France, saved them from the effects of all these lowering influences. As an earnest educational reformer, as a man of letters and learning, who trode "the large and impartial ways of knowledge," and who swayed others to the same paths, as a thinker influential alike in the action and the reaction to which he led,—in some cases the petulant detraction which may pass as a tribute to power,—Cousin stands. out conspicuously among the memorable Frenchmen of the 19th century.~~

~~We might be inclined to modify the strength of some of the following expressions, but we cannot help feeling that they are in the main trne :—" A profound and original thinker, a lucid and eloquent writer, a scholar equally at home in ancient and in modern learning, a philosopher superior to all prejudices of age or country, party or pro- fession, and whose lofty eclecticism, seeking truth under every form of opinion, traces its unity even through the most hostile systems." Such was the estimate of Victor Cousin~~

~~by the acutest critic and most resolute opponent of his philosophy in this century.) (5. Vv.)~~

~~COUSTOU, the name of a famous family of French sculptors. Nicholas Coustou (1658-1733) was the son of a wood-carver at Lyons, where he was born. At eighteen he removed to Paris, to study under Coysevox, his uncle, who presided over the recently-established Academy of Painting and Sculpture ; and at three-and-twenty he gained the Colbert prize, which entitled him to four years education at the French Academy at Rome. He afterwards became rector and chancellor of the Academy of Painting and Sculpture. He wasremarkable for his facility ; and though he was specially influenced by Michelangelo and Algardi, his numerous works are among the most typical specimens of his age now extant. The most famous are the Union of the Seine and Marne and the Berger Chasseur in the gardens of the Tuileries, and the Descent from the Cross placed behind the choir-altar of Notre Dame 3 he also supplied a large number of statues to Versailles and Marly.~~

~~His younger brother, Guillaume Couston (1678-17 46), was a sculptor of still greater merit. He also gained the Colbert prize; but refusing to submit to the rules of the Academy, he soon left it, and for some time wandered houseless through the streets of Rome, At length he was befriended by the sculptor Legros, under whom he studied for some time. Returning to Paris, he was in 1704 admitted into the Academy of Painting and Sculpture, of which he afterwards became director ; and,~~

~~1 Sir W. Hamilton, Discussions, p. 541,~~

~~like his brother, he was employed by Louis XIV. His finest works are the famous group of the Horse Tamers in the Champs Elysées at Paris, the Ocean and Mediterranean at Marly, the bronze Rhone which formed part of the statue of Louis XIV. at Lyons, the facade of the Chateau d'Eau, and the bas-reliefs of the entrance of the Hotel des Invalides. His work is specially distinguished by its fire and energy.~~

~~Guillaume Coustou, the younger (1716-1777), the son~~

~~of Nicholas, also studied at Rome, as winner of the Colbert~~

~~prize. While toa great extent a copyist of his predecessors,~~

~~he was much affected by the bad taste of his time, and~~

~~produced little or nothing of permanent value.~~

~~COUTANCES, a town of France, capital of an arron- dissement of the department of La Manche, and the seat of a bishop, is built on a granite ridge which rises between the canalized River Soulle and the stream called the Bul-~~

~~sard, 16 miles W.S.W. of St L6 and 7 miles from the sea.~~

~~From the hill, up the sides of which the crooked streets of the town are built, a fine panorama of the surrounding country is obtained. The cathedral of Notre Daine on the height, with two lofty towers terminating in spires, was inaugurated by William the Conqueror in 1056, and is one of the finest specimens of ecclesiastical architecture in~~

~~Normandy. 'he churches of St Nicolas and St Pierre, dating from the 14th and 15th centuries, are also fine.~~

~~The palais de justice, lycée, episcopal palace, and halle aux grains are among the chief buildings. Some manufactures of woollen and cotton goods, marble working, and traffic in~~

~~corn, poultry, cattle, and horses are the industries of the~~

~~town. Coutances is the ancient Roman Cosedia in the~~

~~country of the Unelli. Towards the end of the 3d century~~

~~its name was changed to Constantia. Many traces of Roman~~

~~work are still to be. seen in its environs. An aqueduct, between the town and a hill on the east, was constructed about the middle of the 13th century on the site of one which was built by the Romans ; originally it had sixteen~~

arches, but eleven of these are now ruined. In the Middle Ages Coutances was capital of the vice-county of Coutentin or Cotentin, a district noted for its breed of cattle. It was held by the English from 1417 to 1449. Population (1872),

14,557.

COUTHON, Guorcus (1756-1794), one of the most notorious actors in the Reign of Terror, was born at Orsay (Orcet), a village in the district of Clermont in Auvergne, in 1756. He studied law, and was admitted advocate at Clermont in 1785. At this period he was noted for his integrity, gentle-heartedness, and charitable disposition. His health was feeble, and his body was half paralyzed from

a recent misadventure. In 17 87 he was a member of the'

provincial assembly of Auvergne. When the Revolution began Couthon avowed the most liberal sentiments, but at the same time spoke with great moderation He became very popular, and was appointed chief magistrate of * Clermont and president of the tribunal of the town. With the progress of events, however, his feelings rose to a higher pitch, and his sympathies were with the van of the Revolu- tionary army. In 1791 he was elected deputy to the legislative assembly ; and here he soon took his place among the most violent of the Jacobins. He advocated extreme measures against the king. A visit to Flanders for the sake of health brought him into close intercourse and sympathy with Dumouriez. In September 1792 Couthon was elected member of the National Convention, and voted the death of the king without appeal. He soon attached himself to Robespierre, for whom at first he felt only aversion ; and he was the first to demand the arrest of the proscribed Girondins. In July 1793 he became a member of the Committee of Public Safety, and in the following month he was sent as commissioner of the army

to conduct the siege of Lyons. Impatient at the slow pro- gress made by the besieging force he collected a body of 60,000 men, and having stormed the place resolved on its destruction. He made a beginning with a kind of state ceremonial. Carried on a litter, with a silver hammer in his hand, he struck the doors or walls of the houses doomed to be demolished, and his army of satellites then executed his orders. The demolition was carried on for six

months, and the cost of it wasenormous. Couthon's rage, however, chiefly vented itself on the buildings ; the slaughter of the inhabitants was the work of his successor Collot @'Herbois. Couthon returned to Paris, where Robespierre felt the need of his assistance. He was one of the promoters of the infamous law of the 22d Prairial, which shortened the proceedings before the Revolutionary Tri- bunal by depriving the accused of the aid of counsel or of witnesses for their defence. This was not long before the 9th Thermidor. Couthon had become one of the Trium- virate, with Robespierre and St Just, and alarmed at the opposition which was rising against their power and projects, declined to make the visit which he had promised to Auvergne. He was arrested at the same time with his colleagues, and after being subjected to indescribable suffer- ings and insults, was taken on the same car with his master to the scaffold. There, amidst the exultations and execra- tions of the fierce crowd, he wept with terror, and died by the guillotine (9th Thermidor) July 28, 1794.

COUTTS, Tuomas, an eminent banker, head of the London house of Coutts & Co., was born probably about 1731. He was the fourth son of John Coutts, who carried on business at Edinburgh as a corn factor and negotiator of bills of exchange, and who in 1742 was elected lord provost of the city. The family was originally of Montrose, but one of its members had settled at Edinburgh about or before 1696. Soon after the death of John Coutts, the ex- provost, the business was divided into two branches, one carried on at Edinburgh, the other in London. The London branch was in the hands of Patrick and Thomas Coutts, the eldest and the youngest sons of J ohn Coutts. From the death of his brother in 1788, Thomas, as surviv- ing partner, became sole head of the firm ; and under his direction the banking house rose to the highest distinction. His ambition was to establish*his character as a man of business and to make a fortune ; and he lived to succeed in this aim and long to enjoy his reputation and wealth. A gentleman in manners, hospitable and benevolent, he counted amongst his friends some of the literary men and, the best actors of his day. Of the enormous wealth which came into his hands he made munificent use. His private life was not without its romantic elements. Soon after his settlement in London he married Elizabeth Starkey, a young woman of humble origin, who was in attendance on the daughter of his brother James. They lived happily together, and had three daughters,—Susan, married in 1796 tothe

third earl of Guildford ; Frances, married in 1800 to the first marquis of Bute ; and Sophia, married in 1793 to Sir Francis Burdett, Baronet. Mrs Coutts dying in 1815, her husband soon after married the popular actress, Harriet Mellon ; and to her he left the whole of his immense fortune. He died in London, February 24, 1822. His widow married in 1827 the duke of St Albans, and died ten years later, having bequeathed her property to Angela, youngest daughter of Sir Francis Burdett, who then assumed the additional name and arms of Coutts. She was created Baroness Burdett-Coutts in 1871. COVENANTERS, in Scottish history, the name applied. to a party, embracing the great majority of the people, who during the 17th century bound themselves to establish and maintain the Presbyterian doctrine and polity as the sole religion of the country, to the exclusion of Prelacy and

Popery. An account of the covenanting cause as a religious and political movement belongs to the history of Scotland, There were several successive Covenants, similar in spirit and expression, the most important historically being the National Covenant of 1638 and the Solemn League and Covenant of 1643. These were both based upon earlier documents. In 1581 the General Assembly of Scotland adopted a confession of faith, or national cove- nant, drawn up by John Craig, condemning Episcopal government, under the name of hierarchy. This covenant was signed by James I. and enjoined on all his subjects. It was again subscribed in 1590 and 1596. The subscription was renewed in 1638, and the subscribers engaged by oath to maintain religion in the same state in which it existed in 1580, and to reject all innovations introduced since that time. This oath annexed to the confession of faith of 1581 received the name of the National Covenant. The additional matter was prepared by Johnston of Warriston and Alexander Henderson, and was intended to suit the document to the special circumstances of the time. It was adopted and signed by a large gathering in Greyfriars' Churchyard, Edinburgh, on the 28th February, and copies were seut next day throughout the country for additional signatures. The Solemn League and Covenant was estab- lished in the year 1643, and

~~formed a bond between Scotland, England, and Ireland for the united preservation of the Reformed religion in the Church of Scotland, the re-formation of religion in England and Ireland " according to the Word of God and the example of the best Reformed churches," and the extirpation of Popery and Prelacy. It was sworn and subscribed by many in both nations, approved by the Parliament and Assembly at Westminster,~~

~~'and ratified by the General Assembly of Scotland in 1645.~~

~~King Charles I. disapproved of it when he surrendered himself to the Scottish army in 1646 ; but in 1650 Charles II. by a solemn oath declared his approbation both of this and of the National Covenant ; and in August the same year he made a further declaration at Dunfermline to the same purpose, which was renewed on the occasion of his coronation at Scone in 1651. In the same year also the covenant was ratified by Parliament, and subscription to it required from every member,—it being declared that without such subscription the constitution of the Parliament was null and void. It was afterwards renounced by Charles, and declared illegal by 13 and 14 Car. IL c. 4~~

~~1662).~~

~~(The a Covenants are usually published along with the West- minster Confession of Faith, though they are not now included among the authoritative symbols of any Presbyterian church. See M'Crie's Sketches of Scottish Church HIstory, Cunningham's Church fistory of Scotland, Grub's Ecclesiastical HIstory of Scotland, and Burton's HIstory of Scotland.~~

~~COVENTRY, an ancient city and municipal and parlia- mentary borough of England, in the county of: Warwick, 18 miles E.S.E.of Birmingham. It stands on a gentle eminence, and is watered by the Sherbourne and the Rad- ford Brook, which unite within the town. Of its ancient fortifications two gates and some portions of the wall are still extant, and several of the older streets present a picturesque appearance, from the number of half-timbered houses projecting over the footways. In the course of the present century, and more especially since 1850, great improvements have been made in various quarters.~~

The most remarkable buildings are the churches ; and of

these the oldest are St Michael's, one of the finest specimens of Perpendicular architecture in England, with a beautiful steeple rising toa height of 303 feet ; Holy Trinity Church, a cruciform structure in the Later English Style, with a steeple at the intersection 237 feet high ; and St John's, or Bablake Church, which is nearly a parallelogram

on the ground plan, but cruciform in the clerestory, —

with a tower in the centre. All three have been restored under the direction of Sir G. Gilbert Scott. Christ Church only dates from 1832, but it is attached to the ancient spire of the Grey Friars' Church. Of secular edifices the most interesting is St Mary's Hall, erected by the united guilds in the early part of the 15th century. The principal chamber, situated above a fine crypt, is 76 feet long, 30 feet wide, and 34 feet high ; its roof is of carved oak, and in the north end there is a large

-window of old stained glass, with a curious piece of tapestry

beneath nearly as old as the — ae Ty building. In the treasury is e ug

preserved a valuable collection (Sy of ancient muniments, Among the other public buildings of the city may be mentioned the new corporate offices and police court, the county hall, the ¢ drapers' hall, the hospital, the § corn-exchange, the market hall, the self-supporting dispensary, the free library, the institute, the baths, the theatre, and the barracks. The cemetery is one of the most beautiful in the

Arms of Coventry.

kingdom, The educational institutions include a well-en- ~

dowed free grammar school, founded in the reign of Eliza- beth, and held in the disused church of the hospital of St John, a school of art, seven endowed charity schools, and a county reformatory for girls; and among the charitable foundations, which are numerous and valuable, Bond's hospital for old men and Ford's hospital for old women are remarkable as fine

specimens of ancient timber work. Coventry was early celebrated for its manufactures, and had numerous guilds or trading companies. It was noted for its woollens in the 15th century, and subsequently acquired such a reputation for its dyeing that the expres- sion "as true as Coventry blue" became proverbial. The weaving of tammies, camlets, shalloons, &c., succeeded ; but these branches of industry no longer exist, At present the staple trades are ribbon and trimming weaving, elastic web manufacturing, dyeing, and watchmaking ; to which may be added the weaving of woollens, carpets, and carriage-lace, the spinning of cotton, the manufacture of sewing machines and bicycles, art metal-work, and iron- founding. The fairs are numerous and well attended, The borough returns two members to Parliament. In 1871 the population of the municipal borough was 37,670 (17,750 males, and 19,920 females), and of the parliamentary borough, which comprises an area of 6448 acres, 41,348, Coventry derives its name (Conventre, or convent town), from a Benedictine priory, founded in 1043 by Earl Leofric and his wife Lady Godiva, who were afterwards buried within the priory church. According to a well- known popular tradition, exquisitely related in Tenny-

son's poem, the inhabitants were freed from the earl's-

excessive taxation by the romantic devotion of the lady, who rode through the streets of the city "clothed on with chastity," and thus compelled her husband to keep his oath. A procession, instituted in the time of Charles II. in com- memorative imitation of the event, continued for many years to be annually celebrated ; and an eftigy called. Peeping Tom is still pointed out projecting from an upper window at the corner of Smithford Street, popularly reputed to represent an inquisitive tailor, who was struck blind for having peered at the lady as she passed, while every other eye was averted in thankful reverence, Car- melite, Franciscan, and Carthusian monasteries were early established in the city, which was not Jong in acquiring a high position in the country. Gosford Green, outside its eastern walls, waa chosen in 1897 for that great wager

of battle between the dukes of Hereford and Norfolk, which was interrupted by Richard I1., and formed such an import- ant episode in the tragic history

~~of the time. During the Wars of the Roses the citizens adhered to the Lancastrian party, and were consequently rewarded by Henry VI, whose charter, constituting the city and certain adjacent villages a separate county, continued in force till 1842. In the course of the 15th century several Parlia- ments were held in the town ; and in 1569 it afforded for a short time a prison-house to Mary, Queen of Seats. During the troubles of the commonwealth the citizens espoused the cause of the Parliament ; and on the restoration of Charles II. their fortifications were dismantled asa penalty for their disloyalty. To the student of English literature Coventry has a special interest on account of its mystery-plays, full details in regard to which will be found in Thomas Sharp's Dissertation, 1825. Various explana- tions of the popular ~phrase "to send to Coventy" have been suggested,—none of them particularly satisfactory. Soe Reader's History of Coventry, 1810; B. Poole's History of Coventry, 1869 ; and Sharp's Antiquities of Coventry, ed. by Fretton, 1871. COVERDALE, Mites (1488-1569), the celebrated translator of the first complete English Bible, was born in Yorkshire in 1488. He was educated at Cambridge in the house of the Augustine friars, and, after having been ad- mitted into that order, was ordained priest at Norwich in 1514, On the promulgation of the Reformed opinions at Cambridge, Coverdale was amongst the first to abandon his allegiance to the Church of Rome ; and probably finding it unsafe,to remain in England, he went abroad, and according to Foxe assisted Tyndale in translating the Bible. There seems, however, to be some reason to doubt Foxe's statement, which is entirely unsupported by corroborative evidence. Coverdale remained in total obscurity until 1535, when he published his own translatiou, with a dedication to Henry VIII, who had now come to an irreparable breach with the Pope. This was the earliest translation of the whole Bible in the English language, and the Psalms in it are those which are now used in the Book of Common Prayer. Although it is not an immediate version of the original (the title bearing that it is " truly translated out of Douche and Latyn"), it has many merits. Much of the rhythmical flow and finely-balanced cadence of the author- ized version may be traced back to Coverdale. With the sanction of the king, Coverdale went to Paris in 1538 to superintend the publication of a new edition ; but a decree of the Inquisition broke up the printing-establishment, and consigned the sheets already finished to the flames. A few copies, however, having been sold as waste-paper, were preserved ; and these, with the presses~~

~~which were trans- ported to England, were used in printing Cranmer's or the Great Bible, under the superintendence of Coverdale, which was published in 1539. After 1540 Coverdale seems to have again resided for some time abroad. He returned to England after the death of Henry (1547), and was appointed almoner to the queen dowager, Catherine Parr. In 1551 Coverdale was appointed to the see of Exeter ; aud in consideration of his poverty the customary payment of first-fruits was remitted to him. On the accession of Mary he was thrown into prison, and released only on con- dition of leaving his native country. He received the grace of exile instead of execution through the urgent intercession of the king of Denmark, whose chaplain Mac Alpine was his brother-in-law. On the invitation of the latter, he repaired for a time to the court of Denmark, but afterwards retired to Geneva, where he was associated with other English exiles in executing the Geneva translation. On his return to England, after the death of Mary, he was not reinstated in his bishopric ; and in 1563 he declined the~~

~~the occasion. of St Magnus, to which they were removed when St Bartholomew's Church was taken down in 1840.~~

~~on the Holly system. Covington was and received incorporation as a city in 1834 In 1840 its population was 2026 ;~~

~~Roman Catholics.~~

~~del~~

~~see of Llandaff. He held for some time the rectory of St Magnus, London Bridge, but resigned it in 1566. The rest of his life was spent in translating from the works of the Continental Reformers, and in the publication of tracts for the spread of the Reformation. The date of Coverdale's death is uncertain, but he was buried in the chancel of the church of St Bartholomew, February 19, 1569. centenary of the publication of Coverdale's Bible was held,~~

~~The third~~

~~October 4, 1835, when a medal was struck to commemorate Coverdale's remains now lie-in the church~~

~~*See Writings and Translations of Coverdale, edited for the*~~

~~*Parker Society by Pearson (1844) 5 Remains of Coverdale, edited for the Parker Society by Pearson (1846). phical notice.*~~

~~*The latter includes a biogra- See also Westcott's General View of the History of the English Bible (1868), and Eadie's The English Bible (1876).*~~

~~*COVILHA, a town of Portugal, in the province of Beira-*~~

~~*baixa, on the south-eastern slope of the highest part of the*~~

~~*Serra da Estrella, where it descends to the upper valley of*~~

~~*the River Zezere, 30 miles northof Castello-Branco, to which district it belongs. The town, which is perched on the declivity in the form of an amphitheatre, has been compared to a collection of swallows' nests, and is 2180 feet above the sea.*~~

~~*Tt has several churchesand convents. Population (1864), 9022. The people are chiefly employed in the*~~

~~*manufacture of the brown cloth called saragoga, which is worn throughout Portugal. { Serra, five miles W.S.W., there are noted sulphurous baths.*~~

~~*At the village of Unhacs-da-*~~

~~*COVINGTON, a city of the United States, in Kenton'*~~

~~*County, Kentucky, on the Ohio, at its confluence with thé vu ae and directly opposite Cincinnati (see plan, p. 783 of vol. v.). United States court house, the high school, the Oddfellows' hall, the hospital of St Elizabeth, the 'priory of St Joseph's, and the Benedictine nunnery of St Walburga; and its industrial establishments comprise numerous tobacco and cigar factories, and several iron- mills, distilleries, glass-works, silk factories, &c. ton, as well as the contiguous town of Newport, is practically a suburb of Cincinnati, with which they have communication by a bridge and steam ferries.*~~

Its principal buildings are the city hall, the

Benedictine Coving-

Since 1871 it has been supplied with water by water works founded in 1812,

in 1860, 16,471; and in 1870, 94,505. A considerable proportion of the inhabitants. are There isa German orphan asylum about 4 miles from the city under Catholic management

COWELL, Dr JouNn (1554-1611), jurist, was born at Ernsborough, Devonshire. He was educated at King's College, Cambridge, and ultimately became professor of civil law in that university, and master of Trinity Hall. In 1607 he compiled a law dictionary, in which he exalted the king's prerogative so much that he was prosecuted before the House of Commons by Sir Edward Coke, and saved from imprisonment only by the interposition of James I. Cowell also wrote a work entitled Jnstitutiones Juris Anglicant.

COWES, Wexst and East, two towns of England, in the county of Hants, on the estuary of the Medina, on the north coast of the Isle of Wight, directly opposite to the mouth of Southampton Water. The port between them is the chief one of the island, and is the head- quarters of the Royal Yacht Squadron (founded in 1815); ·t isin constant steam communication with Ryde, and with Portsmouth and Southampton, each eleven miles distant. A steam ferry across the Medina, here 600 yards broad, unites the towns. Behind the harbour the houses rise

picturesquely on gentle wooded slopes, and numerous villas adorn the vicinity. The towns owe their origin to two forts or castles, built on each side of the mouth of the Medina by Henry VIII: in 1540, for the defence of the coast ; the eastern one has disappeared, but the west castle still stands and is used as the club-house of the Yacht Squadron. The marine parade of West Cowes, and the

public promenade called the Green, are close to the castle. —

Within the town the streets are narrow; there are no buildings of architectural pretensions ; and the place is quiet excepting in the yachting and bathing season from May to November. The resident population is chiefly employed in the ship-building yards, where yachts of the finest models and smaller naval vessels are built, and in ship provisioning. West Cowes is in railway communica- tion with Newport and Ryde. Population (1871), 5730. On the opposite side of the Medina a broad carriage way leads to East Cowes Castle, a handsome edifice built by Nash, the favourite architect of George IV., in 1798, and immediately beyond it are the grounds surrounding Osborne House, the residence of the queen, completed in 1845. Norris Castle, on the rising ground above the shores of the Solent, built in 1799, and Whippingham Church on the right bank of the Medina, are other build- ings of interest in the neighbourhood of East Cowes, the population of which in 1871 was 2058.

COWLEY, Apranam (1618-1667), the most popular English poet during the lifetime of Milton, was born in the city of London late in 1618, HIs father, a wealthy citizen, who died shortly before his birth, is believed to have been a grocer. HIs mother was wholly given to works of devotion, but it happened that there lay in her parlour a copy of The Faery Queen. This became the favourite reading of her son, and he had twice devoured it all before he was sent to school. As early as 1628, that is in his tenth year, he composed his Z'ragicall History of Piramus and Thisbe, an epical romance written in a six-line stanza of his own invention. It is not too much to say that this work is the most astonishing feat of imaginative precocity on record : it is marked by no great faults of immaturity, and by con- structive merits of a very high order. 'Two years later the child wrote another and still more ambitious poem, Con- stantia and Philetus, being sent about the same time to Westminster School. HIere he displayed the most extra- ordinary mental precocity and versatility, and wrote in his

thirteenth year yet another poem, the Elegy on the Death

of Dudley, Lord Carlton. These three"poems of consider- able size, and some smaller ones, were cellected in 1633, and published in a volume entitled Poetical Blossoms, dedicated to the head-master of the school, and prefaced by many laudatory verses by schoolfellows. The author at

once became famous, although he had not, even yet, com-'

pleted his' fifteenth year. His next composition was a pastoral comedy, entitled Zove's Riddle, a marvellous pro- duction for a boy of sixteen, airy, correct, and harmonious in language, and rapid in movement. The style is not without resemblance to that of Randolph, whose earliest works, however, were at that time only just printed. In 1636 Cowley was elected into Trinity College, Cambridge, where he betook himself with enthusiasm to the study of all kinds of learning, and early distinguished himself as a ripe scholar, It was about this time that he composed his scriptural epic on the history of King David, one book of which still exists in the Latin original, the rest being super- seded in favour of an English version in four books, called the ?avideis, which he published a long time after. This his most grave and important work is remarkable as having Suggested to Milton several points which he afterwards made use of.. This epic, written in a very dreary and turgid, manner, but in good rhymed heroic verse, deals with

the adventures of King David from his boyhood to the smiting of Amalek by Saul, where it abruptly closes. In 1638 Love's Riddle and a Latin comedy, the Vaufragium Joculare, were printed, and in 1641 the passage of Prince Charles through Cambridge gave occasion to the production of another dramatic work, The Guardian, which was acted before the royal visitor with much success, During the civil war this play was privately performed at Dublin, but it was not printed till 1650. It is bright and amusing, in the style common to the "sons" of Ben J onson, the university wits who wrote more for the closet than the public stage. The learned quiet of the young poet's life was broken up by the civil war ; he warmly espoused the royalist side. Cambridge became in 1643 too hot to hold him, and he made his way to Oxford, where he enjoyed the friendship of Lord Falkland, and was tossed, in the tumult of affairs, into the personal confidence of the royal family itself, After the battle of Marston Moor he followed the queen to Paris, and the exile so commenced lasted twelve years. This period was spent almost entirely in the royal service, "' bearing a share in the distresses of the royal family, or labouring in their affairs. To this purpose he performed several

dangerous journeys into Jersey, Scotland, Flanders, Holland, or wherever else the king's troubles required his attendance. But the chief testimony of his fidelity was the laborious service he underwent in maintaining the constant correspondence between the late king and the queen his wife. In that weighty trust he behaved himself with indefatigable integrity and unsuspected secrecy ; for he ciphered and deciphered with his own hand the greatest part of all the letters that passed between their majesties, and managed a vast intelligence in many other parts, which for some years together took up all his days, and two or three nights every week." In spite of these labours he did not refrain from literary industry. During his exile he met with the works of Pindar, and determined to reproduce their lofty lyric passion in English. At the same time he occupied himself in writing a history of the civil war, which he completed as far as the battle of Newbury, but unfortunately afterwards destroyed. In 1647 a collection of his love verses, entitled The Mistress, was published, and in the next year a volume of wretched satires was brought out under his name, with the composition of which he had nothing todo. In spite of the troubles of the times, so fatal to poetic fame, his reputation steadily increased, and when, on his return to England in 1656, he published a volume of his collected poetical works, he found himself Without a rival in public esteem. This volume included the later works already mentioned, the Pindarique Odes, and some AMiscellanies. Among the latter are to be found Cowley's most vital pieces. This section of his works opens with the famous aspiration — What shall I do to be for ever known, And make the coming age my own?

It contains elegies on Wotton, Vandyck, Harvey, and Crashaw, the last two being among Cowley's finest poems, brilliant, sonorous, and original ; the amusing ballad of The Chronicle, giving a fictitious catalogue of his supposed amours ; various gnomic pieces ; and some charming paraphrases from Anacreon, The Pindarique Odes contain weighty lines and passages, buried in irregular and inharmonious masses of moral verbiage. Not more than one or two are good throughout, but a full posy of beauties may easily be culled from them. The long cadences of the Alexandrines with which most of the strophes close, continued to echo in English poetry from Dryden down to Gray, but the Odes themselves, which were found to be obscure by the poet's contemporaries, immediately fell into disesteem. Zhe Mistress was the most popular poetic

reading of the age, and is now the 'least read of all Cowley's

works. It was the last and most violent expression of the amatory affectation of the 17th century, an affectation which had been endurable in Donne and other early writers because it had been the vehicle of sincere emotion, but was unendurable in Cowley because in him it represented nothing but a perfunctory exercise, a mere exhibition of literary calisthenics. He appears to have been of a cold, or at least of a timid, disposition; in the face of these elaborately erotic volumes, we are told that to the end of his days he never summoned up courage to speak of love to asingle woman in-real life. Soon after his return to England he was seized in mistake for another person, and only obtained his liberty on a bail of £1000. In 1658 he revised and altered his play of The Guardian, and prepared it for the press under the title of The Cutter of Coleman Street, but it did not appear until 1663. Late in 1658 Oliver Cromwell died, and Cowley took advantage of the confusion of affairs to escape to Paris, where he remained until the Restoration brought him back in Charles's train. Wearied with the broils and fatigues of a political life, Cowley obtained permission to retire into the country; through his friend, Lord St Albans, he obtained a property near Chertsey, and here, devoting himself to the study of botany, and buried in his books, he lived in comparative solitude until his death, which occurred on the 28th of July 1667, a period otherwise famous for the publication of Paradise Lost. On the 3d of August he was buried in Westminster Abbey beside the ashes of Chaucer and Spenser, where in 1675 the duke of Buckingham erected a monument to his memory. Throughout their parallel lives the fame of Cowley completely eclipsed that of Milton, but posterity instantly and finally reversed the judgment of their con- temporaries. The poetry of Cowley rapidly fell into a neglect as unjust as the earlier popularity. had been. As © prose writer, especially as an essayist, he holds, and will not lose, a high position in literature ; as a poet it is hardly possible that he can enjoy more than a very partial revival. The want of nature, the obvious and awkward art, the defective melody of his poems destroys the interest that their ingenuity and occasional majesty would otherwise excite. He had lofty views of the mission of a poet and an insatiable ambition, but his chief claim to poetic life is the dowry of sonorous lyric style which he passed

~~down to Dryden and his successors of the 18th century. The works of Cowley were not collected till 1688, when Thomas Sprat, afterwards bishop of Rochester, brought out a splendid edi- tion in folio, to which he prefixed a graceful and elegant life of the poet. There were many reprints of this collection, but since the early part of the 18th century no good edition of Cowley's poems has appeared. The Essays, on the contrary, have frequently been revived with approval. (E. 'W. G.) COWPER, Wixtt1am (1731-1800), the best of English letter-writers and the most distinguished poet of his day, was born on the 26th of November 1731, at Great Berkhamstead, Hertfordshire. His father, who held the living of the parish, was chaplain to George Il He married Ann, daughter of Roger Donne, of Ludham Hall in Norfolk. 'This lady, after giving birth to several children who died in infancy, expired in childbed in 1737, leaving two sons—William (the poet) and John. Cowper, who retained the most affectionate remembrance of his mother, embalmed her memory in one of the most affecting tributes that ever came from the heart of a son. At the age of six years Cowper was placed at Dr Pitman's school, in Market Street, Bedfordshire. His health was delicate, and he was in consequence exposed to the laughter and ridicule of his rude companions. One boy seems especially to have been the object of his terror. "His savage treatment of me," he says, " impressed such a dread of his figure on my mind, that I well remember being afraid to lift my eyes upon him higher than his~~

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~~knees, and that I knew him better by his shoe-buckle than by any other part of his dress."~~

~~The cruelty of this boy's conduct was such that on its being discovered he was expelled the school, and Cowper was removed. The mental anguish he endured at this time aggravated, no doubt, the constitutional tendency to despondency which throws such a peculiar interest over much of his after-life. At the period of his removal from Dr Pitman's school he was afflicted with inflammation in the eyes ; specks appeared in both of them, and it was feared that blindness would ensue. He was in consequence placed at the house of an eminent oculist, where he remained two years, deriving little benefit from his residence there, his cure being slow and imperfect.~~

At ten years of age Cowper was placed at Westminster School. In after-life he lamented that his' learning at this time consisted entirely of Latin and Greek, to the exclusion of the more important matter of religion. Surrounded by strangers, and unable from his unconquerable shyness to mingle with them on easy terms, his fits of depression grew darker and more frequent ; and those unhappy views of his spiritual condition, which afterwards produced such deplorable results, began to oppress his mind. In his memoir he relates some of his religious experiences. Crossing St Margaret's churchyard late in the evening, his curiosity was excited by a glimmering light, and he went to see whence it proceeded. A gravedigger was at work with a lantern; and just as Cowper came to the spot a skull was thrown up which struck him on the leg. This circumstance gave an alarm to his conscience, and he after- wards considered it one of the most valuable religious impressions he 'received at Westminster. HIs mental excitement was followed by the notion that he was exempted from the penalty of death, which in its turn was displaced by lowness of spirits and intimations of a con- sumptive tendency. At thirteen he was seized with small- pox, which completely restored his eyesight. Although threatened by consumption he seems to have excelled at cricket and football, and to have distinguished himself in his studies. It is curious to know that Warren Hastings, Churchill, Lloyd, and Colman were his fellow-students in Westminster.

Cowper was taken from Westminster at eighteen years of age; and, after spending a few months at home, was articled to Mr Chapman, an attorney in London. He seems to have most poetically disliked his new position and duties. Thurlow, afterwards lord chancellor, was engaged in the same office ; and Cowper describes their leisure as being spent in "giggling and making giggle, instead of studying thelaw." The following is related of his intimacy with Thurlow a few years later. One evening, in the presence of ladies, Cowper playfully said, "Thurlow, I am nobody, and shall always be nobody, and you will be chan- cellor, Youshall provide for me when you are." Thurlow replied with a smile, "I surely will." 'These ladies," re-joined Cowper, " are our witnesses." ' Let them be so," answered the future chancellor, still smiling, " for I will certainly do it." After completing his three years' articles with Mr Chapman, he removed to the Middle Temple in 1752. The solitariness of his life at this time was productive of the most pernicious results. In his melan- choly memoir he describes the dejection

~~and unrest, the horror and despair, he underwent during these miserable months. Atlengthreliefcame. Sitting with a few friends by the sea near Southampton, the cloud of misery which had overshadowed his spirit so long rolled away, and so happy did he feel that he could have wept for transport had he been alone. Returning to London, and actuated by what he afterwards considered the instigation of Satan, he burned his prayers, and plunged into pleasure and~~

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~~gaiety. In 1754 he was called to the bar, but, instead of following his profession, he seems to have yielded himself up to the charms of literature and social intercourse. About this time his father died, leaving him a small patri- mony. In 1759 he removed to the Inner Temple, where law was still deserted for literature. He devoted much of his time to the 'study of Homer, and, in conjunction with his brother, translated some of the books of the Henriade, This appears to have been the gayest part of Cowper's life. He had formed literary acquaintances amongst whom were many of his old schoolfellows ; he became a member of the Nonsense Club, and occasionally contributed prose and verse to the periodicals of the day. ;~~

~~While in Mr Chapman's office, Cowper was a frequent visitor at the house of his uncle, Mr Ashley Cowper, in Southampton Row,—the attraction being his fair cousin. Miss Theodora Jane Cowper was the younger of two daughters (the elder of whom, afterwards Lady Hesketh, is well known as the poet's constant correspondent for many years), and by her brilliant beauty and fascinating manners won the heart of her shy relative, Excited by her presence and sparkling spirits, Cowper became cheerful and even gay, his bashfuluess began to wear off ; he mixed in company, and occasionally attempted to shine in conver- sation. He became fastidious in his attire, a critic in ruffles, a haunter of looking-glasses. Seeing how matters were tending, Mr Cowper opposed their contemplated union on prudential considerations. His daughter pooh-poohed his fears. He asked what she would do if she married her cousin 4 "Do, sir," answered the high-spirited girl, '* Wash all day, and ride out on the great dog at night." Mr Cowper afterwards changed his position, and objected to their marriage on the score of nearness of connection, The lovers pled, but he was~~

~~inexorable. Miss Cowper thought it her duty to obey her father. They parted and never met again,~~

~~During this courtship, Cowper addressed several poems to his cousin, which exhibit all the gentleness and tender- ness of his nature. They are unlike the love-poems of every other poet. They have no fervour, no emotion, no fire. Perhaps Cowper's nature was incapable of strong and devouring passion. The memory of his love and his disappointment seems to have been soon and paiulessly effaced. With the lady it was different ; she could not so easily forget. The little poems which, in his brief dream of passion, he had addressed to her, she carefully treasured up. Unknown to him, her hand was unwearied in its kind and delicate attentions. She never forgot him, and although surviving his death many years, died unmarried.~~

~~Cowper's pecuniary resources being at this time slender, he became naturally anxious to obtain suitable employ- ment. An influential kinsman presented him with the lucrative office of clerk to the committees of the House of Lords. Some difficulty, however, being raised as to his relative's right of appointment, an examination at the bar of the House was demanded to test Cowper's fitness for the performance of his duties. Although the prospect of such a public appearance must have been exceedingly painful to him, he resolved to prepare for the ordeal. He attended regularly at the office, and thus describes the result :— "The journal books were thrown open to me—a thing which could not be refused, and from which, perhaps, a man in health and with a head turned to business might have gained all the information he walited ; but it was not so with me; I read without perception, and was so distressed that had every clerk in the office been my friend it could have availed me little, for I was not in a condition to receive instruction, much less to elicit it out of manu scripts without direction." The dreadful trial that awaited him filled his days, and re-appeared in dreams, He found~~

~~he attempted self-destruction,~~

~~1783 and published in 1785.~~

~~COWPER~~

~~no rest. At a tavern he met some miserable men, and suicide became the subject of conversation. new to him, and held him with a horrid fascination from~~

~~The idea was~~

~~which he could not escape. He was pursued and goaded by imaginary voices, until at last in a paroxysm of madness The garter by which he was suspended broke, and he fell heavily to the ground,~~

~~His laundress hearing the fall, and thinking him in a fit, tan to his assistance ; but by the time she reached him he~~

~~had crept into bed. His mind now became a prey to the keenest remorse. The wrath of God seemed hanging over him on account of his sin. In these circumstances, every~~

~~thought of his official employment was, of course, abandoned ; measures were adopted for his security, and in~~

~~1763 he was Albans.~~

~~After remaining two years at St Albans he removed to Huntingdon. Here he first met the Unwins, and so charmed was he with their society, that in a short time he became the inmate of their home. On the death of Mr Unwin in 1767 the family removed to Olney ; and on the recommendation of Mr Newton, the, curate of the parish, Cowper accompanied them, About this time his brother died; and in the winter of 1773 his malady returned. Through his long illness he was attended by Mrs Unwin with the most affectionate care. To beguile the tedium of recovery, he occupied himself with carpentry and gardening, and in domesticating his famous hares, Up till this time he had only written a few hymns; he now, at Mrs Unwin's suggestion, commenced a poem on the Progress of Error. Composition, once begun, was so ardently pro- secuted that in a few months his first volume, consisting, with the poem already mentioned, of Zable Talk, Conversa- tion, Truth, Expostulation, Hope, Charity, and Retirement, was ready for the press. It attracted little attention. One critic declared that " Mr Cowper was certainly a good pious man, but without one spark of~~

poetic fire." In 1781 he met Lady Austen, and the casual acquaintance soon ripened into the warmest intimacy. Her lively spirits chased from his mind the demon of melancholy. He wrote songs which she set to music and sang to the harpsichord. It is said that observing him one evening in a fit of depression, she related the story of John Gilpin, with which he was so delighted that after retiring to rest he turned it into verse, and repeated it with great glee when they met next morning at the breakfast-table. The Task, undertaken at the suggestion of his new friend, was begun in the winter of Its success was complete, and his reputation was at once established. Never, perhaps, in England had poetry been at so low an ebb as at this time. The brilliant point and antithesis of Pope had degenerated into the inflated diction of Darwin and. the feeble sentimentalities of Hayley. Cowper's hearty and natural verse extinguished these weaklings for ever. Although Cowper cannot be placed in the first rank of English poets, yet few are attended with such retinues of love and blessing. His verse is a transparent medium through which you look into a gentle and most lovable human spirit, and you come to know him as thoroughly as if you had lived in the same house with him for years. His muse does not sit apart in sublime seclusion—sho comes down into the ways of men, mingles in their every-day concerns, and is interested in crops and rural affairs. You see by the slight tan on her cheek that she has been much in the harvest-fields. Cowper rather talks than sings. His blank verse makes no pretensions to majesty ; it is colloquial sometimes in its bareness, yet in its artless flow is ever delightful as the conversation of a beloved and gifted companion. .

Cowper brought back nature to poetry, and his influence

placed under the care of Dr Cotton of St

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has been extensive and lasting. He is, to a certain extent, the prototype of Wordsworth. Indeed, many passages in the Hacursion read like extracts from the Task. It is curious also to observe in Cowper's verse that subjectivity which is supposed to be the characteristic of more recent times. His ailings, his walks, his musings, his tamed hares, his friends, his indignation at slavery, his peculiar

~~views of religion, are the things he delights to portray—the.~~

~~Task is a poem entirely about himself.~~

~~On Lady Austen leaving Olney, her place was filled by the Throgmortons, whose acquaintance Cowper had made on the occasion of a fête which they gave to the surround- ing gentry. He was delighted with his new friends and spent much time in their society. During this period he was not idle; he had commenced his translation of Homer, and in the winter of 1785 had advauced as far as the 20th book of the Ziad. Owing to the rigorous care he bestowed upon his work it did not advance so rapidly as he at first anticipated, and was not published till 1791. Cowper was now in the zenith of his reputation, Rumours of his fame were wafted to the quiet residence of Olney from that world which he had so long forsaken, he was hailed the first poet of the day, and his old friend Thurlow (whose greatness he had foreseen) opened a correspondence with him and thanked him for his translation, To the mild spirit of Cowper the last circumstance must have been peculiarly grateful. While engaged upon Homer, his dreaded malady returned, but was happily driven away by the charms of society and constant literary occupation. He well knew that if he remained inactive the dark spirit would regain his throne; and no sooner was Homer given to the world than we find him engaged on an edition of Milton. But the labour was too much ; his brain sunk beneath the incessant demands made on its energies, and 80 great was his distress that he was obliged to relinquish the undertaking. The clouds were now closing dark and heavy over the evening of Cowper's life. Mrs Unwin was an invalid; he was ever by her bedside, and nursed her with a tenderness, if possible, deeper than her own, Beneath the tension of sorrow the cord snapped. His malady returned, which was never destined in this life to be rolledaway. -Mrs Unwin died on the 17th of December 1796. Cowper, with wandering brain and feeble as a child, was led into the room ; the presence of the dead drew from him one wild passionate exclamation, he then relapsed into silence, and it is said never more uttered her name, The deepest dejection, alternating with fits of spiritual despair, hung over him to the end. Dropsy appeared in his limbs ; and after being reduced to the last stage of feebleness, he died peacefully on the 25th of April 1800. (A. 8.)~~

The posthumous writing of Cowper, with a life by his friend Hayley, appeared in 1803-4. The best life, that by Southey, with an excellent edition of his works, was published in 1833-37, and with additional letters, in Bohn's Standard Library (1853-54). Other editions of his works, with memoirs, are those of Grimshawe (1835), Dr Memes (1852), and George Gilfillan. Lives have also been written by H. F. Cary, M'Diarmid, and Thomas Taylor. See, besides a study by Sainte-Beuve in the Monitewr (Nov. 13, 20, 27,

and Dec. 4, 1854), Stopford Brooke's Theology in the English Poets, and Léon Boucher, Welliam Cowper, sa correspondence et ses poésies.

COWRY, the popular name of the shells of the Cyprexda, a family of mollusks. Upwards of 100 species are re- cognized, and they are widely distributed over the world,— their habitat being the shallow water along the sea-shore. The best known is the money cowry or Cyprea moneta, a small shell about half an inch in length, white and straw- coloured without and blue within, which derives its dis- tinctive name from the fact that in various countries it has been employed as a kind of currency. It is most abundant in the Indian Ocean, and is collected more particularly in

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the Maldive Islands, in Ceylon, along the Malabar coast, in Borneo and other East Indian Islands, and in various parts of the African coast from Ras Hafun to Mozambique. It was formerly in familiar use in Bengal, where, though it required 3840 to make a rupee, the annual importation was valued at about £30,000. In the countries of Further India it is stil] in use; and in Siam, for example, 6400 cowries are equal to a tzcal or about Is. 6d. In Western Africa— Congo, Yoruba, &c.—it is the usual tender, and before the abolition of the slave trade there were large shipments of cowry shells to some of the English ports for reshipment to the slave coast. As the value of the cowry was very much greater in Western Africa than in the regions from which the supply was obtained, the trade was extremely lucrative, and in some cases the gains are said to have been 500 per cent, The use of the cowry currency has gradually spread inland in Africa, and Barth found it fairly recognized in Kané, Kukawa, Muniyoma, Gando, and even Timbuktu, In Muniyoma he tells us the king's revenue was estimated at

~~30,000,000-shells, every full-grown man being required to pay annually 1000 shells for himself, 1000 for every pack-ox, and 2000 for every slave in his possession. In the countries on the coast the shells are fastened together in strings of 40 or 100 each, so that fifty or twenty strings represent a dollar; but in the interior they are laboriously counted out one by one, or, if the trader be expert, five by five. The districts mentioned above receive their supply of kurdt, as they are called, from the west coast ; but the regions to the north of the Land of the Moon, where they are in use under the name of szmbi, are dependent on Moslem traders from Zanzibar. Among the Niam-Niam and other tribes who do not recognize their monetary value, the shells are in demand as fashionable decorations, just as in Germany they were in use as an ornament for horses' harness, and were popular enough to acquire several native names, such as Brustharnisch or breastplates, and Otterkopf- chen or little adders' heads. Besides the Cyprea moneta various species are employed in this decorative use. The Cyprea aurora is a mark of chieftainship among the natives of the Friendly Islands; the Cypraa annulus is a favourite with the Asiatic islanders; and several of the larger kinds have been used in Europe for the carving of cameos. The tiger cowry, Cyprea tigris, so well known as a mantelpiece ornament in England and America, is commonly used by the natives of the Sandwich Islands to sink their nets; and they have also an ingenious plan of cementing portions of several shells into a smooth oval ball which they then employ as a bait to catch the cuttle-fish. While the species already mentioned occur in myriads in their respective habitats, the Cyprea princeps and the Cyprea umbilicata are extremely rare. Of the former, indeed, perhaps not more than two or three specimens are known,— one of them being in the British Museum, and another having drawn £40 at the sale of the collection of the earl of Mountnorris,~~

~~COX, Davin (1783-1859), The remarkable develop- ment of the English school of landscape-painting during the first half of the present century gives importance to the name of David Cox. He is, indeed, to use a phrase now sufficiently common, a representative man, having practised his art through the entire period, outliving and overcoming public indifference, and reaping at last a harvest of appreciation that astouished himself. Besides, he dedicated his life to home scenery and its atmospherical conditions exclusively, so that his productions are truly English, while their artistic~~

mastery, and their power to convey the impressions he intended, are unsurpassed, perhaps unequalled, by the works of any of his contempo- raries, even those of higher genius-and much more general culture. It must be remembered also, that in Cox's works

we see our native art of water-colour painting in its purest condition, expressing only a direct, general, and honest sentiment by the simplest means, before the doctrine of " art for art's sake " had made our painters determined to show on their canvas more than they see in nature.

In a small house attached to the forge of his father, a .

hardworking master smith, in a mean suburb of Birming- ham, Cox was bom, 29th April 1783. Turning his hand to what he could get to do, Joseph Cox, the father, was both blacksmith and whitesmith, and wheu the war began took to the making of bayonets and horse shoes, on wholesale commission, and immediately the boy David was thought able to assist he was taken from the poor elementary school in the neighbourhood, and set to the anvil. The attempt to turn the boy to this kind of labour had, however, been made too early ; it was too heavy for his strength, and he was sent to what was called by the cyclops of Birmingham a "toy trade," making lacquered buckles, painted lockets, tin snuff boxes, aud other "fancy" articles. Here David very soon acquired some power of painting miniatures, and his talents might have been misdirected had his master, Fieldler by name, not released him from his apprenticeship by dying,—dying by his own hand; and David found an opening as colour-grinder and scene-painter's fag in the theatre then leased, with several others, by the father of Macready, the tragedian,

This obscure step, not one of promotion at the time, was really the most important incident in the uneventful career of Cox. It may be remembered that scene-painting has been to our landscape-painters what the goldsmith educa- tion was to the masters of the Italian renaissance, and we are safe in saying that the habits of hard work on a large scale, and the rough and ready self-dependence thus culti- vated, can never be too much commended. The boy, who had inherited a:rather weakly body, and had been trained

with care by a pious mother, while intellectually negative and uuable to cope with any kind of learning whatever, had endless perseverance, great strength of application, and all through life remained genial, gentle, simple-minded, aud modest, his penetration and self-reliance being wholly pro-fessional, inspired by his love of nature and his knowledge of his subject. Not very quick, and with little versatility, he went step by step in oue line of study from the time he began to get the smallest remuneration for his pictures to the age of seventy-five, when he painted large in oil very much the same class of subjects he had of old produced small in water-colours, with the same impressive and unaffectedly noble sentiment, only increased by the mastery of almost infinite practice. He was never led astray by fictitious splendour of any kind, except once indeed in 1825, when he imitated Turner, and produced a classic subject he called Carthage, Aineas, and Achates. He never visited Venice or Egypt, or crossed the Channel except for a week or two in Belgium and Paris, and never even went to Scot- land for painting purposes. Bettws-y-Coed and its neigh- bourhood was everything to him, and characteristics most truly English were beloved by him with a sort of filial instinct. So completely did he love the country, that even London, where it was his interest to live, had few attrac- tions, and did not retain him long.

This residence in the metropolis which began in 1804 was, however, of the most essential educational advantage to him. The Water-Colour Society was established the year after he arrived, and was mainly supported. by land-scape-painters. He was not, of course, admitted at first into membership, not till 1813, before which time an attempt to establish a rival exhibition had been made. In this Cox joined, the result being very serious to him, an entire failure entailing the seizure and forced sale of all the pictures. At that time the tightest economy was the

rule with him, and to save the trifling cost of new strainers or stretching boards, he covered up one picture by another. When these works were prepared for re-sale, fifty years afterwards, some of them yielded picture after picture, peeled off the boards like the waistcoats from the body of the gravedigger in Hamlet !

While lodging near Astley's Circus he married his land-

lady's daughter, and then took a modest cottage at Dulwich,

where he gradually left off scene-painting and became teacher, giving lessons at ten shillings a lesson. This entailed walking to the pupils' homes, and the gift of the paintings done before the pupils. These have since been frequently sold for 30 or 40 guineas, but his own price, when lucky enough to sell his best works, was never over a few pounds, and more frequently about fifteen shillings, Sometimes, indeed, he sold them in quantities at two pounds a dozen to be resold to country teachers, By and by he resisted the leaving of the work done to the pupil, but with little advantage to himself, as he saw no end to the accumulation of his own productions, and actually tore them up, and threw them into areas, or pushed them into drains during his trudge homeward. A number of years after he pointed out a particular drain to a friend, and said, "'Many a work of mine has gone down that way to the Thames !" /

Shortly after he had turned thirty, his stay in London suddenly ended. He was offered the enormous sum of £100 per annum by a ladies' college in 'Hereford, and thither he went, This sum he supplemented by teaching in the Hereford grammar school for many years, at six guineas a year, and in other schools at better pay, but still, and up to his fortieth year, we find his prices for pictures from eight to twenty-five shillings. Cox has no history apart from his productions, and these particulars as to his remuneration possess an interest almost dramatic when we contrast them with the enormous sums realized by his later works, and with the "honours and observance, troops of friends," that accompanied old age with him, when settled down in his own home at Harborne, near his native town, where he died on June 7, 1859, aged seventy-six.

Cox's second short residence in London, dating from 1835 to 1840, marks the period of his highest powers. During those years, and for twelve years after, his produc- tiveness kept pace with his mastery, and it would be difficult to overrate the impressiveness of effect, and high feeling, within the narrow range of subject displayed by many of these works. He was now surrounded by dealers, and wealth flowed in'upon him. Still he remained the same, a man with few wants and scarcely any enjoyments except those furnished by his brush and his colours. The home at Harborne was a

pleasant one, but the approach to the front was useless as the door was kept fastened up, the only entrance being through the garden at the back, and the principal room appropriated as his studio he was content to reach by a narrow stair from the kitchen. Neither in it nor elsewhere was there any luxury or even taste visible :— no bric-a-brac, no objects of interest, few or no books, no pictures except landscapes by his friends. When in winter, after his wife's death, the fire went out, and the cold at last surprised him, he lifted his easel into the little dining- room and began again. A union of hisfriends was formed in 1855 to procure a portrait of him, which was painted by Sir J. Watson Gordon ; and an exhibition of his works was opened in London in 1858 and again another in 1859. This was actrally open when the news of his death arrived.

The number of David Cox's works, great and small, is enormous. He produced hundreds annually for perhaps forty-five years. This being the case, it has been the interest of dealers to force their price. Mr Flatou, himself an adept, used to boast that it took six horse-dealers to

make one picture-dealer, so that it is difficult to say what is their intrinsic or permanent value. Before his death and for ten years thereafter, their prices were remarkable, as witness the following, obtained at auction—Going to the Mill, £1575; Old Mill at Bettws-y-Coed, £1575; Out- skirts of a Wood, with Gipsies, £2305 ; Peace and War, £3430. (W. B. SC.)

COX, Ricwarp (1499-1581), born at Whaddon, Buck- inghamshire, was educated at Eton, and afterwards at King's College, Cambridge, of which he became a fellow in 1519. He was invited to Oxford by Cardinal Wolsey ; but having adopted the Reformed opinions, he was stripped of his preferment, and thrown into prison. On his release, however, he was appointed master of Eton School, and in 1541 he was made prebendary of Ely Cathedral. Through the influence of Cranmer he was chosen tutor to Prince Edward ; and on the accession of that prince he was sworn of the Privy Council, and made king's almoner. Under Mary he was stripped of his preferments, and committed to the Marshalsea; he escaped, however, to Strasburg, where he resided with Peter Martyr. By Elizabeth he was ele- vated to the see of Ely. Cox was a man of considerable learning. He was

~~distinguished by the violence of the measures which he recommended for the extirpation of Popery and dissent.~~

~~He translated the four gospels, the Acts of the Apostles, and the Epistle to the Romans, in the Bishops' Bible, and had a consi- derable share in compiling and revising the liturgy; and he wrote Two Latin Orations on the Dispute between Dr Tresham and Peter Martyr, London, 1549, and Resolutions of some Ques-~~

~~tions concerning the Sagrament, printed in the Collection of Records at the end of Burnet's History of the Reformation.~~

~~COXCIE, Micwarn (1499-1592), was born at Malines, and studied under Bernard van Orlay, who probably in- duced him to visit Italy. At Rome in 1532 he painted the chapel of Cardinal Enckenvoort in the church de Anima; and Vasari, who knew him personally, says with truth "that he fairly acquired the manner of an Italian." But Coxcie's chief business in Italy was not painting, His principal occupation was designing for engravers; and the fable of Psyche in thirty-two sheets by Agostino Veneziano and the Master of the Die are favourable speci- mens of his skill in this respect. During a subsequent residence in the Netherlands Coxcie greatly extended his practice in this branch of art, But his productions were till lately concealed under an interlaced monogram M.C.O.K.X.LN. Coxcie, who married in Italy, displayed the peculiar bias of his taste by christening his eldest son Raphael. He returned in 1539 to Malines, where he matriculated, and painted for the chapel of the guild of St Luke the wings of an altar-piece now in Sanct Veit of Prague. The centre of this altar-piece, by Mabuse, represents St Luke pourtraying the Virgin; the side pieces contain the Martyrdom of St Vitus and the Vision of St John in Patmos. At Van Orlay's death in 1541 Coxcie succeeded to the office of court painter to the regent Mary of Hungary, for whom he decorated the castle of Binche. He was subsequently patronized by Charles V., who often coupled his works with those of Titian ; by Philip IT., who paid him royally for a copy of Van Eyck's Agnus Dei; and by the duke of Alva, who once protected him from the insults of Spanish soldiery at Malines. There are large and capital works of his (1587-88) in St Rombaud of Malines, in Ste Gudule of Brussels, and in the museums of Brussels and Antwerp. His style is Raphaelesque grafted on~~

~~the Flemish, but his imitation of Raphael, whilst it distantly, recalls Giulio Romano, is never free from affectation and stiffness. Coxcie was working at a picture in Antwerp when he met with a fall. He was taken in an ailing state to Malines, where he died on the 5th of March~~

~~1592.~~

~~COXE, Wiittam (1747-1828), archdeacon of Wilts, traveller, and historian, was born at London in 1747. He was elected fellow of King's College, Cambridge, in 1768, and afterwards went abroad on a visit to the different Continental states, where he prosecuted the researches which were afterwards incorporated into his historical works, On his final return to England he was appointed to the rectory of Bemerton, and in 1808 was preferred to the archdeaconry of Wilts. Towards the close of his life his vision became seriously impaired, and for nearly seven years before his death he was totally blind. He died at Bemerton in 1828.~~

~~Of his numerous works the most important are—Sketches of the Natural, Civil, and Political State of Switzerland (1779) ; Private Correspondence of Charles Zalbot, Duke of Shrewsbury (1821) ; Travels in Switzerland (1789); Travels in Poland, Russia, Sweden, and Denmark (1784) ; Histories of the House of Austria, and of the Kings of Spain of the House of Bourbon ; Memoirs of John, Duke of Marlborough; Memoirs of Sir Robert Walpole; Memoirs of the Adnrinistration of Henry Pelham (posthumous, 1889) ; Literary Life and Sclect Works of B. Stillingfleet.~~

~~COYPEL, the name of a French family of painters. Noel Coypel (1628-1707), also called, from the fact that he was much influenced by Poussin, Coypel le Poussin, was the son of an unsuccessful artist. Having been employed by Edward to paint some of the pictures required for the Louvre, and having afterwards gained considerable fame by other pictures produced at the command of the king, in 1672 he was appointed rector of the French Academy at Rome, to which he is said to have done good service. After four years he returned to France; and not long after he became director of the Academy of Painting. The Martyrdom of St James in Notre Dame is perhaps his finest work. His son, Antoine Coypel, was still more famous. Antoine studied under his father, with whom he spent four years at Rome. At the age of eighteen he was admitted into the Academy of~~

Painting, of which he became professor and rector in 1707, and director jn ~ 1714. In 1716 he was appointed king's painter, and he was ennobled in the following year. Antoine Coypel received a careful literary education, the effects of whicli appear in his works; but the graceful imagination dis-played by his pictures is marred by the fact that he was not superior to the artificial taste of his age. He was a clever etcher, and engraved several of his own works, His Discours prononcés dans les Conférences de ? Académie royale de Peinture, &c., appeared in 1741, His half- brother, Noel Nicolas (1691-1734), was also a popular artist; and his son, Charles Antoine (1694-1752), was painter to the king and director of the Academy of Paint- ing. The latter published interesting academical lectures in Le Mercure and wrote several plays which were acted at court, but were never published,

COYSEVOX, Anrorne (1640-1670), one of the most able and famous of French sculptors, born at -Lyons in 1640, belonged to a family which had emigrated from Spain. He was only seventeen when he produced a statue of the Madonna of considerable merit ; and having studied under Leranbert, and trained himself by taking copies in marble from the Greek masterpieces (among others from the Venus de Medici and the Castor and Pollux), he was engaged by the bishop of Strasburg, prince and cardinal Fiirstenberg, to adorn with statuary the palace of Saverne. After four years spent on this work, he returned to Paris in 1671, having gained very considerable fame. He was now employed by Louis XIV. in producing a large number of statues for Versailles; and he afterwards worked with no less facility and success for the palace at Marly. His works are far too numerous to mention; but among them are the Mercury and Fame, placed first at Marly and afterwards in the gardens of the Tuileries:

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Neptune and Amphitrite, in the gardens at Marly ; Justice and Force, at Versailles ; and statues, in which the likenesses are said to have been remarkably successful, of most of the celebrated men of his age, including Louis XIV., Louis XV., Colbert (at Saint-Eustache), Mazarin (in the church des Quatre-Nations), Condé the Great, Maria Theresa of Austria, Luvois,

~~Turenne, Vauban, Cardinals de Bouillon and de Polignac, Fenelon, Racine, Bossuet, Comte d'Harcourt, Prince de Fiirstenberg, and Charles Lebrun.~~

~~CRAB, a name common to all the species of short-tailed Decapod Crustaceans (Brachyura), as well as to the forms intermediate between the short-tailed and long-tailed groups (Anomoura), and derived from the Latin Carabus, the name by which the common edible species was known to the Romans. The abdomen in the true crabs is short, and is completely folded beneath the breast. In the female this part is broad and rounded, and bears certain leafy appendages to which the ova are attached before spawning ; in the male the abdomen is much narrower and is somewhat triangular in shape. Like all other Decapod Crustaceans crabs are furnished with ten legs, of which the anterior pair are modified so as to form nippers—powerful prehensile organs and principal weapons of offence. These are largest in the male, and the right claw is generally larger than the left. The other limbs usually end in a single claw, which in the posterior pair in swimming-crabs is more or less flattened and paddlelike (Plate X. fig. 2). Their eyes, which are compound, are placed upon stalks, measuring In some instances an inch in length (Plate X. fig. 3), and these when not in use fit into cavities in the carapace or shell which covers the entire upper surface, Crabs, like insects, undergo metamorphosis. On emerging from the egg they are provided with long tails, swimming appendages, and sessile eyes, and bear so little resemblance to the parent form that until half a century ago their con- nection with the crab was altogether unsuspected. They were then known as zoéas. After moulting, the eyes appear on stalks and nippers on the anterior pair of legs, but this form is still sufficiently uncrablike to have deceived early zoologists, who described it as forming a distinct genus (Jfegalops), and it is not till a further casting of the skin that the creature assumes the perfect form. As its internal parts continue to grow its external shell soon becomes too small, and is cast off,—the crab generally con- cealing itself until its new and greatly enlarged covering gets sufficiently hardened. This process of moulting takes place very frequently in the young crab, and gradually becomes rarer as the creature approaches its full growth, crabs being often found with oysters attached to the cara- pace which from their size must have grown there for three or four years. A still more remarkable power is that possessed by crabs of reproducing limbs which have been voluntarily thrown off, or have been lost by accident. This~~

~~renewal only takes place when the limb has been severed at the second articulation; but when broken at any point nearer the extremity the creature generally succeeds in throwing off the part between, 2~~

~~Among the numerous species of crabs which abound everywhere on or near the sea-coast the following may be noticed.~~

~~(1) The Great or Edible Crab (Cancer pagurus), the Carabus of the Romans and the Partan of Scotland, This is one of the largest, and as an article of food is certainly the most valuable, of the short-tailed Decapods, being everywhere esteemed for the delicacy of its flavour. It abounds chiefly on the rocky parts of the coasts of Europe, and often measures 12 inches across the carapace, weighing in the larger specimens fully 12 Ib. The principal British crab-fisheries are off the north-east coast of Scotland, in the Firth of Forth, and off the coast of Corn-~~

~~wall; and the home produce is largely supplemented by imports from Norway. In the capture of this crustacean "crab-pots," made of wicker-work, with the entrance at the top, and baited with dead fish, are employed. These are sunk in the proper localities, and their position indicated by a piece of cork attached to a line connected with the wicker trap. In the sheltered bays of the west of Scotland this crab is also caught in calm weather by poking it from behind with a long pole, which the crustacean immediately seizes, and which is then gently shaken, making the crab adhere all the more tenaciously, and giving the fisherman the opportunity he seeks of hoisting it into his boat. When caught, crabs are kept alive till wanted by being placed in perforated boxes which are then sunk at some convenient spot in the sea. Those caught off Lizard Point are con- veyed to Falmouth Harbour, where they are individually branded, and put in boxes which are then placed under water. Recently it was stated on good authority, that one of those cases having gone to pieces, thus liberating the im- prisoned crabs, many of them were shortly after caught again on their old feeding-ground—a distance of eleven miles from the place where they had been confined. As they had been conveyed to Falmouth by boat, it is impos- sible with our present knowledge to say by what sense they were thus unerringly guided on their return journey.!~~

(2) The Shore Crab (Carcinus meenas) is the species most commonly met with on all parts of the British coast. Although found in deep water, its favourite haunts are beneath the stones that lie between low and high water mark, and its awkward sidelong gait as it sidles off to its place of concealment must be familiar to the most casual observer of shore life. It is a shy creature, eluding obser- vation beneath stones or buried in the sand, its telescopic eyes alone visible, and feigning death when unable otherwise to cope with danger. — Unlike the former species, its legs, especially the posterior pair, are flattened and ciliated so as to form swimming organs. Owing probably to the small size of this species, it has obtained little prominence as an article of food, although in flavour it is said to rival the Great Crab. Large numbers, however, are eaten by the poorer classes in seaport towns, and they are also to be had in the London fish markets. They feed chiefly on the spawn of fish and the smaller crustaceans.

(3) Pea Crabs (Pinnotheres, Plate X. fig. 5) are small crustaceans in which the sexes so differ that the males and females were at one time described as separate species. The female is larger than the male, and its external covering is softer ; and they are further remarkable in taking up their vesidence in the shells of living bivalve mollusks, especially in the pinna, the cockle, and the mussel. The soft-bodied female is never found outside of its adopted shell, although the harder cased male is thus occasionally met with. The Pinna Pea Crab, (Pinnotheres veterum), which abounds in the Mediterranean, makes its home in the pinna shell, and ancient writers have given highly imaginative descriptions of the object. of this alliance between crustacean and mollusk. It was believed that on the entrance of food

1The male erab is generally larger than the female, especially in its elaws, and is more sought after as a table delicaey ; the flesh of both sexes immedi- ately after the casting of the shell is watery and unwholesome. During moult- ing the female is generally guarded by a male, which if removed is shortly re- placed by another, and it is after the completion of the moulting proeess in the female that the union of the sexes takes place. The spawn is earried for a con- siderable time on the abdominal appendages before being deposited, an operation which takes place in spring and summer. Reeently fears were entertained that through over- fishing the stock of erabs in British waters was being seriously diminished,

~~and a commission at present (1877) sitting was appointed to take evidence on this matter at the principal seats of the crab fishery. From the evi- dence already collected it appears that these fisheries are now much less produc- tive than formerly, and that the size of the crabs has greatly diminished, while their cost has enormously increased; for while forty years ago a dozen of the largest crabs could be had for 10d., the same number of medium sized specimens now costs 3s, Those who have given evidence are generally in favour of a 5-inch gauge in order to prevent the wanton destruction of young crabs; and also of at close time; but great diversity of opinion exists as to the best season for thie, although the period from the beginning of June to the end of August is that~~

~~- most generally recommended.~~

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~~"within the gaping circuit of the shell," the active little crab pricked the tender sides of its sluggish partner, who understanding the hint closed its shell upon the prey 'Thus fed by mutual aid, the friendly pair Divide their gains, and all the plunder share."~~

~~(4) The Inachus Kempferi, found in Japanese waters, is the largest of known crabs. It measures 10 feet between the tips of its nippers, each of which is 5 feet in length. The body, however, is comparatively small and triangular in shape. It is said to be eaten by the Japanese.~~

~~(5) Land Crabs occur in various parts of the tropical world, and are especially abundant in the West Indies. The Violet Land Crab (@ecarcinus ruricola, Plate X. fig. 1) of Jamaica lives in cominunities and forms burrows in the ground, often two or three miles from the sea. These crabs are provided with powerful pincers, which they are not loath both to use and to lose, for when attacked they fix upon the enemy with their great claw, which is then thrown off, and as the muscles connected with it retain their tension for some time after the severance, the creature seeks to make its escape while pain is still being inflicted by the now independent claw. 'They remain in their burrows by day, and come forth at night in search of food, running about with great speed and retiring, when possible, to their holes, in the presence of danger. 'They renew their connection with the sea once a~~

~~year, visiting it in order to deposit their spawn. They travel by night, directed by a powerful instinct which causes them to march straight for their destination, surmounting whatever difficulties may be in their way. At this season they ars taken in great numbers, and their flesh is regarded as one of the chief delicacies of the island. Like their marine congeners they cast their shell, but unlike these, it 15 immediately after the moulting process that they are 1) best condition for the table. The Calling Crab (Gelasiemus tetragonon) of Ceylon has its left claw exceedingly small, while its fellow is larger than all the rest of the body, and this it carries aloft as if brandishing a weapon (see CRus- TACEA, fig. 65); while the Racer Crab (Ocypoda ceratoph- thalma) digs deep burrows in the sandy roads of that island, sufficient to render them dangerous for horsemen, were the holes not regularly filled up by a band of labourers.~~

~~(6) The Robber Crab (Birgus latro) belongs to that divi- sion (Anomoura) of the Decapod Crustaceans which forms a connecting link between crabs and lobsters, the abdominal segments not being folded beneath the breast as in true crabs, It is an inhabitant of the islands in the Indian Ocean, and makes its burrows under the cocoa-nut trees, the fruit of which forms its principal food. It was~~

~~formerly supposed to ascend these trees and break off the~~

~~nuts, but the researches of Darwin, Bennet, and others seem to prove that they only make use of the nuts which they find already fallen. In order to get at the edible contents of these, they strip off the fibrous envelope so as to lay bare the eye-spots, into one of which they insert the sharp-edge of a claw, and by working this backward and forward they gradually scoop out the substance of the nut. According to another authority, after inserting the claw, they sometimes proceed to crack the hard shell by beating it against a stone. 'The fibre which they remove from the nut is employed by them in lining their burrows; it is also gathered by the natives and made into mats, &c. 'The Robber Crab attains a length of 2 feet, and has usually a mass of fat under the tail which, according to Darwin, often yields when melted as much as a quart of limpid oil.~~

~~(7) In the Hermit Crabs (Paguride, Plate X. fig. 7) the abdomen is soft and pulpy and destitute of protecting plates, the safety of this defenceless part~~

being provided for by the entrance of those creatures into univalve shells to which

they become so closely attached by means of certain hooked appendages of the abdomen, that it is impossible to drag a Hermit Crab from its adopted shell without tearing the body asunder. 'The mouth of the shell is guarded by the claw, the larger pincers of some of these crabs being, says Darwin, "most beautifully adapted when drawn back to form an operculum to the shell nearly as perfect as the proper one." The most common and the largest of the British species is the Soldier Crab(Pagurus hernhardus, Plate X. fig. 4), to be seen at all seasons on our coasts, inhabiting a great variety of univalve shells from the tiny natica to the largest whelk, the latter being the shell usually chosen by the adult crab. It changes its residence so soon as it has outgrown the dimensions of the place, and its new premises seem to be generally selected with a view to the future growth of the creature. 'Dead shells appear in some cases to be thus employed, but it is believed that in most instances the crab kills the mollusk in order to secure its shell, Hermit Crabs are largely used as bait. See CRUSTACEA.

CRABBE, Grorce (1754-1832), was born at Ald- borough, in Suffolk, December 24, 1754, and was the son of an officer of the customs. He appears to have been designed by his father first for an employment similar to his own, and afterwards for the medical profession. He was apprenticed to an apothecary, and received an educa- tion merely sufficient to qualify him for such an occupation, and by no means to advance him in that literary career in which he became eventually distinguished. His poetical taste was first elicited by the casual perusal of some verses in the Philosophical Magazine, which his father, who was a mathematician and averse to poetry, had separated from the scientific portions of that periodical, and thrown aside as unworthy. The spark thus kindled burnt steadily ; and even while a schoolboy he versified much, and made sundry ambitious attempts in the highest walks of composition. The attainment of a prize offered by the editor of the Lady's Magazine for a poem on Hope, although a humble species of success, sufficed to encourage him to renewed exertions ; and in 1778 he quitted the profession of medicine, which he had always disliked, and repaired to London, determined to apply himself to literature. His early efforts in his new career were attended with

disheartening circumstances. The first poem he offered for publication could find no

publisher. — From the first that was printed he obtained no profit, in consequence of the publisher's bankruptcy. It

was entitled The Candidate, a Poetical Epistle to the Authors of the Monthly Review, and appeared anonymously in 1780. Soon afterwards he became acquainted with Burke, an acquaintance from which may be dated the dawn of his

literary rise. Without an introduction, and impelled by

distress, he applied to Burke, who kindly took him by the hand, afforded him the advantage of his criticism and advice, recommended him to Dodsley the publisher, invited him to his house, and made him known to many distinguished men of that time, among whom were Reynolds, Johnson, and Fox. Crabbe's first published poems, after the commencement of his acquaintance with Burke, were The Library and The Village, both of which received the benefit of Burke's observations, and the second of which was ina great measure composed at Beaconsfield. In 1781 Crabbe, who by the recommendation of Burke had been qualifying himself for holy orders, was ordained a deacon, and he took priest's orders the following year. After serving a short time as curate at Aldborough, through the influence of this generous and distinguished friend he was introduced to the duke of Rutland and became his domestic chaplain. Nor did Burke's kindness stop here ; for he obtained for him from Lord Thurlow, in 1783, a presentation to the rectory of Frome St Quintin, in Dorsetshire, which he held

for six years. About this time he married, and resided

for some time at Swefling, county of Suffolk, officiating as curate to the minister of Great Yarmouth. About 1789 he was presented, through the instrumentality of the duchess of Rutland, to the rectories of Muston in Leicestershire and West Allington in Lincolnshire. In 1813 he was preferred to the rectory of Trowbridge, county of Wilts, which, together with the

smaller living of Croxton Kerrial, in Leicestershire, he held to the time of hisdeath. After Zhe Village, published in 1783, which had received the correc- tions and commendations of Dr Johnson, Crabbe next pro- duced The Newspaper, published in 1785. After this time his poetical labours were long suspended, owing probably to the dedication of his time to domestic affairs and the duties of his profession, or, as he himself ascribes it, to the loss of those early and distinguished friends who had given him the benefit of their criticism. He had, however, the satisfaction of seeing his next work, The Parish Register, published in 1809, read and approved by Fox. The suc- cess obtained by these poems, which far exceeded that which had attended his earlier efforts, encouraged him to write again ; and in 1810 he published one of his best poems, The Borough, and in 1812 Tales ix Verse. His last pub- lication was entitled Zales of the Hall, and appeared in 1819. The latter years of his life he spent in the tranquil and amiable exercise of his domestic and clerical duties, at his rectory of Trowbridge, esteemed and admired by his parishioners, among whom he died, after a short illness, on the 8th February 1832, aged seventy-seven. He was buried in the chancel of Trowbridge Church. Crabbe's only prose publications were a Puneral Sermon on Charles, duke of Ieutland, preached at Belvoir, and an essay on the natural history of the vale of Belvoir, written for Nichols's LMistory of Leicestershire, in which it is thankfully acknow- ledged. His fame rests solely on his poems, of which The Parish Register and The Borough are destined to a reputa- tion, if not as brilliant, yet probably as enduring as that of any other contemporary productions.

Crabbe is one of the most original of our pocts ; and his originality is of that best kind, which displays itself not in tumid exaggeration or flighty extravagance—not in a wide departure from the sober standard of truth—but in a more rigid and uncompromising adherence to it than inferior writers venture to attempt. He is pre-eminently the poet of reality in humble life ; and to its representation he has applied himself with a rigorous fidelity which startled the timid fastidiousness of many readers. He discarded the aid of those pleasing illusions with which humble life had previously been enveloped; condemned as fictitious the prevalent representations, and in their stead fearlessly exhibited the stern, harsh, naked truth, and determined to rely for popularity on the fidelity and vigour of his delinea- tions. His chief characteristics are force and accuracy ; and through these,

~~and the originality of his style, he com- pels us to bestow our attention on objects that are usually neglected. His poetry, unlike that of others, directs our sympathy where it is well for the cause of humanity that it should be directed, but whence the squalidness of misery and want too frequently repels it. Much of his success arises from his graphic delineation of external objects, but more from his knowledge of the human heart, and his powerful treatment of the passions. Both the milder and the more violent emotions are portrayed with ability, but in the latter he is most strikingly successful. Despair and remorse are exhibited with a tragic strength that has been rarely equalled ; and madness has been seldom drawn with a more powerful hand than in his poem of Sir Fustace Grey. He has been called the satirist of the poor; but we must be careful lest we attach to this expression too harsh an acceptation. It is true he discountenances those romantic day-dreams which associate virtue inseparably~~

~~with poverty, and an Arcadian innocence with rural life, He shows that demoralization is the attendant of distress, and that villagers may be equally dissipated, and moro dishonest than the profligates of a wealthier class ; but hic shows this in a spirit rather of pity than of anger; and whilst he denounces and exposes crime, he makes us interested not so much in its punishment, as, what is still~~

~~better, in its prevention. He spares not the vices of tho poorer classes; but at the same time he does more justice to their virtues, and renders them more important objects of consideration than perhaps any other imaginative writer.~~

~~With many sterling merits as a poet, Crabbe has numerous defects. His descriptions are forcible and exact, but they are too detailed. They have too much of the minuteness of a Dutch picture; and it is a minuteness exhibited in the representation of disgusting objects. He never shrinks from the irksome task of threading the details of vice and misery. Abject depravity is a too favourite subject of his pen; and he does not seem sufficiently aware that there is a species of wickedness which counteracts our sympathy with suffering, and a degree of insignificance which extinguishes our interest in guilt. His skill in displaying the morbid anatomy of our moral nature has rendered him too prone to that unpleasing exercise of his talents; and his~~

habit of tracing tho deformities of character has given to his expositions too much the appearance of invective. His taste is very inferior to his other powers. Even with subjects naturally pleasing he is apt to blend disagreeable images. His descriptions of natural scenery, graphic as they are, havo little in them of elevation. There is no genial glow about them, as if the contemplation of nature had warmed and inspired him. His deficiency cf taste displays itself also sometimes in his humour, which is apt to verge upon buffoonery. His style is little to be commended. It is too often clumsy and ungraceful,—diffuse without freedom, homely without being easy, and antithetical without being pointed. His diction is frequently harsh and quaint, and compels us to feel that the merit of his works resides rather in their ideas than in the dress in which he clothes them. His lines are deficient in refinement and polish, and frequently offend the ear by something uncouth and prosaic in the sound, and the absence of musical rhythm. Such are the defects which have conduced to deprive him of that popularity which his merits would otherwise have obtained for him. (T. H. LL)

A complete edition of Crabbe's works was published in 1834, in 8 volumes 12mo, the first volume containing his Life by his son,

the Rev. George Crabbe. A reprint, in one volume roval 8vo, was issued in 1867.

CRACOW (Polish, Krakov; German, Krakau), a city of the crownland of Galicia, Austria, the capital anciently of Poland, and more recently of a small Polish republis which bordered on the Prussian, Austrian, and Russian dominions where they meet. The city stands ina fertilo plain on the left bank of the Vistula, where the stream of the Rudowa joins it, nearly 200 miles north-east of Vienna in latitude (of observatory) 50° 3' 50" N., longitude 19° 57' 30" E., and at an elevation of 650 feet above the sea. The main railway line of Galicia, called the Carl Ludwig's Bahn, uniting the system of Germany along the outskirts of the Carpathian range with the lines about the Lower Danube, crosses the Vistula at Cracow. A line of detached forts has been built round the city, and a castle ona height commands the town. Promenades occupying the place of the old walls, planted with trees, divide the old town from the seven extensive suburbs of Stradom, Ribaki, Kleparz, Piasek, Wesola, Smolensk, and Wielopole; and

an arm of the Vistula cuts off the Jewish quarter of Kasimierz. In the old town the extensive castle of the Polish kings on the

rock of Wawel, dating from the 14th century, has been for the most part rebuilt to serve as barracks and for a hospital. The Stanislas Cathedral (Lady Church), built in 1359, contains 'many interesting antiquities relating to the kingdom of Poland ; the monarchs were crowned in this edifice, which also holds the mausoleum of the Sigismunds, the silver coffin of the holy Stanislas, and the remains of John Sobieski, of Poniatowski, and of Kosciusko ; it is adorned by sculptures by Thorwaldsen, and a wooden carved altar (1472-1481) by Veit Stoss, who was a native of

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]. Floriane Gate. 8. Bishop's Palace. 2. Cloth Hall. 9. St Peter's.

3. St Mary's. 10. New Theatre.

4. St Barbara's. 11. Summer Theatre. 5. University. 12. Observatory.

6. Dominican Church. 13. Cathedral.

7. St Francis's. 14, Military Hospital.

Cracow. 'There are forty churchesin the city, with twenty- three convents of monks and nuns. In the Ringplatz stand the old Gothic cloth booths and the ancient Rathhaus with a fine tower. A relic of the old wall remains in the Floriane gate on the esplanade. The university of Cracow, founded by Casimir the Great, and carried out by Jagellon in 1401, has sixty-nine professors and about 450 students, and possesses a library of 140,000 volumes and numerous MSS. Attached to it are an observatory, botanic gardens, natural, historical, and medical museums, a laboratory, and medical schools. Cloth, leather, and agricultural imple- ments are manufactured to some extent in Cracow, and a busy traffic in grain, wood,

salt, wine, linen, and pigs is carried on by the Vistula. In the neighbourhood there are coal and zinc mines. Besides a bridge over the old Vistula, the Franz Joseph Bridge on five stone piers and the railway bridge cross the river to the villages of Podgorze and Stawisko on the opposite bank. Three miles north- west of Cracow a huge mound 125 feet in height was raised in 1824 to the memory of Kosciusko, and this has now been utilized as the site of a fort. The village of Krzezowice in this direction is a favourite resort of Cracow people, and has a fine castle, a Gothic church, sulphur baths, and iron and zinc mines, Light miles south-east of Cracow;

united to it by a branch railway, are the village and famous salt-mines of Wieliczka ; about 1000 miners are constantly employed here, and the annual yield of salt amounts to more than a million cwts. Population (1869), 49,835, including about 10,000 Jews.

Cracow takes its name from the Polish Prince Krak or Krakus, and dates from about the year 700. Perhaps no city has suffered greater vieissitudes. It was taken in 1039 by the Bohemians, in 1241 by the Mongols, by the Swedes in 1655 and in 1702, and by the Russians in 1768. 1t remained the capital of Poland from 1320 till 1609, when the seat of government was transferred to Warsaw, but the kings of Poland were crowned in it till 1764. On the third partition of Poland in 1795 Austria took possession of this portion ; but in his campaign of 1809 Napoleon wrested it from that power, and incor- porated it with the duchy of Warsaw, which was placed under the tule of Saxony. In the eampaign of 1812 the Emperor Alexander made himself master of this and the other territory which formed the duchy of Warsaw. At the general settlement of the affairs of Europe by the great powers in 1815, it was agreed that Cracow and the adjoining territory should be formed into a free state ; and, by the General Treaty of Congress signed at Vienna in 1815, " the town of Cracow, with its territory, is declared to be for ever a free, independent, and strictly neutral city, under the protection of Russia, Austria, and Prussia." In February 1846, however, an insur- rection broke out in Cracow, apparently a ramification of a widely-spread conspiracy throughout Poland. The senate and the other

authorities of Cracow were unable to subdue the rebels or to maintain order, and, at theirrequest, the city was oecupied by a corps of Austrian troops for the protection of the inhabitants. The three powers, Russia, Austria, and Prussia, made this a pretext for extinguishing this independent state; and having established a conferenee at Vienna (November 1846) the three courts after due deliberation, contrary to the assurance previously given, and in opposition to the expressed views of the British and French Governments, eame to the conclusion to extinguish the state of Cracow and to incorporate it with the dominions of Austria.

CRAIG, Joun (c. 1512-1600), one of the Scottish Reformers, was born about 1512. He was educated at the university of St Andrews, and entered the Dominican order. But, being suspected of heresy, he was cast into prisun. Retiring to the Continent, he obtained the patronage of Cardinal Pole, and for some years taught in Dominican schools, and performed, other services for the order. He was converted to Protestantism by the Institutes of Calvin, and, having made a brave confession of his heresy before the Inquisition, he was condemned to be burnt. But on the eve of his execution Pope Paul IV. died, and the mob broke open the prisons. Craig fled to Vienna, and the emperor, Maximilian IJ., refused to surrender him to the Inquisition. He now returned to his native country, and after preaching for some time in Edinburgh became coad- jutor to Knox. It was he who proclaimed the banns of marriage between Queen Mary and Bothwell, but he openly denounced their union. On the death of Knox in 1672 he naturally succeeded to the leadership of the Scottish Church. He took the most prominent part in drawing up the Second Book of Discipline, and he was the author of the First Covenant, otherwise called the King's Confession (1581), and of Craig's Catechism (1592), which was for half a century in general use in Scotland. But though he was bold enough to rebuke the king in his sermons, he yielded to his commands, and signed a declaration, promising obedience to the bishops and submission to an Act that had been passed forbidding the assembling of church courts without royal licence. Craig's coadjutor and suc- cessor was Andrew Melville.

CRAIG, Sir Tuomas (c. 1538-1608), of Riccarton, one of the earliest and one of the ablest writers on the law of Scotland, and a poet of some note, was born about the year 1538. Itis probable that le was the eldest son of

~~William Craig of Craigfintray, or Craigston, in Aberdeenshire, but beyond the fact that he was in some way related to the Craigfintray family nothing regarding his birth is known with certainty. He is first heard of as a student at St Andrews, where he was entered at St Leonard's College in~~

~~1552, and where he took the B.A. degree in 1555. From St Andrews he went to France, like most of his countrymen of that day who were destined for the bar, to study the canon and the civil law. He himself makes more than one allusion in his works to what he had learned at Paris, but as the civil law was not at that time publicly taught there, it is more than probable that he attended the lectures of the great civilians of some of the other French schools. He returned to Scotland about 1561, and, after spending some time in acquiring a practical acquaintance with the forms of court procedure, was admitted advocate in February 1563. In 1564 he was appointed justice-depute by the justice- general, Archibald, earl of Argyll; and in this capacity he presided at many of the criminal trials of the period. He ig not mentioned as deputy of the justice-general after 1573; and in the course of the following year he appears as sheriff of Edinburgh, so that he probably resigned the one office on being nominated to the other. In 1606 he is described as procurator for the church ; and this com- pletes the list of his. regular preferments, although his name is found in more than one commission of importance, He never became a Lord of Session, a circumstance that was unquestionably due to his own choice. His extensive practice, added to the emoluments of his various offices, no doubt, much exceeded what he would have had as a judge ; but in truth he probably felt that his studious and retiring disposition unfitted him for the rough work, diplomatic and military as well as judicial, that was in those days expected of a Scotch judge. In this respect he presents a striking contrast to his contemporary Balfour, who was implicated in every conspiracy of his time, and to whom no office, judicial, ecclesiastical, or military, came amiss. Craig even, it is: said, refused the honour of knighthood which the king wished to confer on him in 1604, when he came to London as one of the Scottish commissioners regarding the union between the kingdoms—the only political object he seems to have cared about; but in accordance with James's commands he has always been styled and reputed a knight. Craig was married to Helen, daughter of Heriot of Trabroun in Haddingtonshire, by whom he had four sons and three daughters. His eldest son, Sir Lewis~~

~~Craig, was raised to the bench in 1604, and among his other descendants are several well-known names in the list of Scotch lawyers. He died on the 26th February 1608.~~

~~The greatest of Craig's literary labours is his treatise on the feudal law. 'The object of the Jus Feudale was to assimilate the laws of England and Scotland, but instead of this, it is the first, and by no means the least, in the series of works which has built up and solidified that of Scotland into a separate system. Craig's anxiety to promote the union of the kingdoms led him to prepare two other elaborate treatises,—the De Unione Regnorum Britannie Tractatus, and the De Jure Successionis Regnt Angle. But while he was alive to the benefits of union, his De Hominio Disputatio, in which he combats the assertion that Scotland was a fief of the English crown, shows that he was no less determined to maintain the historical independence of his country. Craig's first poem appeared in 1565. It isan Zpithalamium in honour of the ill-fated marriage of the Queen and Darnley. It contains passages of real poetic feeling, but asa whole it is laboured and heavy 3 and this fault, as perhaps might be expected of a learned feudal lawyer, more or less disfigures all Craig's subsequent efforts,~~

~~Except his poems, none of Craig's works appeared during his lifetime, and some of them exist even now only in manuscript. The first edition of the Jus Feudale was not published until 1655, nearly fifty years after its author's death. It was edited by Robert~~

~~Burnet of Crimond, afterwards a judge in the Court of Session, who had married Craig's granddaughter, and was the father of the famous~~

~~age of twenty-five, to devote himself to literature.~~

~~bishop of Salisbury. was published at Leipsie, in 1716 ; while the last and best edition~~

~~A second edition, edited by Menckenius,~~

~~appeared at Edinburgh in 1732, with a short life by the editor, James Baillie. Manuscripts of the De Jure Successionis belong to the Advocates' Library and to the Edinburgh University Library, but the book itself has~~

never been published. A translation of it by James Gatherer, afterwards a Scotch bishop, appeared in 1703. The De Unione exists only in manuscript, in 'the Advocates' Library ; and the same is true of the De Hominio, although a trans- lation of it, under the title Scotland's Sovereignty asserted, was published by George Ridpath, London, 1695. Most of the poems have been reprinted in the Delitie Poetarwm Seotorum. There is an excellent life of Craig by Mr Fraser Tytler, Edinburgh, 1823.

CRAIK, Grorer Litre (1799-1866), professor of English literature at Queen's College, Belfast, was the son of a schoolmaster in Fifeshire. He studied at the uni- versity of St Andrews with the intention of entering the church, but altering his plans, removed to London, at the He became connected with a short-lived literary paper called the Verulam; in 1831 he published his Pursuit of Knowledge under Difficulties among the works of the Society for the Diffusion of Useful Knowledge ; he contributed a consi- derable number of biographical and historical articles to the Penny Cyclopedia; and he edited the Pictorial History of England, himself writing much of the work. In 1844 he published his Listory of Literature and Learning in England from the Norman Conquest to the Present Time, illustrated by extracts, and in the same year his History of British Commerce from the Earliest Times. In the next year appeared his Spenser and his Poetry, an abstract of Spenser's poems, with historical and biographical notes and frequent quotations; and in 1847 his Bacon, his Writings and his Philosophy, a work of a similar kind. The four last- mentioned works appeared among Knight's Weekly Volumes. 'Two years later Craik obtained the chair of history and English literature at Queen's College, Belfast, a position which he held till his death, which took place on the 23d February 1866. Besides the works already noticed, Craig published the Romance of the Peerage, Out- line of the History of the English Language, and The English of Shakespeare.

CRAIL, formerly Carrait, a royal and parliamentary burgh and seaport of Scotland, in the county of Fife, nine miles south-east of St Andrews. It is said to have been a town of some note as early as the 9th century ; and its castle, of which there are hardly any remains, was the resi- dence of David I. and others of the early Scottish kings. It was constituted a royal burgh by a charter of Robeit Bruce in 1306, and had its privileges confirmed by

Robeit IL. in 1371, by Mary in 1553, and by Charles I. in 1635, Of its priory, dedicated to St Rufus, a few ruins are to be seen below the east end of the town; its principal church is of great antiquity, and was raised to the collegiate rank in 1517; and many of the ordinary houses are of a massive and antique description. It unites with St Andrews and other burghs in returning 9 member to Parliament. Popula- tion of borough, 1112.

CRAKE, a genus of birds belonging to the order Gralla of which the Corn Crake (Ortygometra crex) 1s the mest familiar example. This bird isa summer visitor to Britain and to Northern Europe generally, where its migrations extend as far north as Iceland. It reaches Britain in April, and leaves in October, having meanwhile raised a brood of young. It frequents rich meadows and green corn-fields in the neighbourhood of water, where its presence is made known by the peculiar creaking sound emitted by the male as a call note to the female. After mating their crek-crek, not unlike the noise made by pass- ing the nail of the finger over the teeth of a small comb, 's much seldomer heard, and the work of building the nest, which is a simple structure formed of dried plants placed

on the ground, is proceeded with. The eggs, from seven to fourteen in number, are about 14 inches in length and an inch in breadth, and are of a slightly reddish-white colour spotted and speckled with reddish-brown. The young crakes are covered at first with a black down, but soon assume their feathers, and are able to fly in six weeks, The upper plumage of the male is for the most part a yellowish-brown, each feather being marked with a central streak of a darker colour, and the under surface a pale buff transversely barred with reddish-white. The Corn Crake, or Land Rail, as it is sometimes called, feeds on snails, slugs, worms, and seeds. It is a shy and timid bird, seeking safety in concealment among the rank herbage which it frequents, and through which it runs with amazing rapidity ; its note may thus be heard in quick succession proceeding from the most diverse parts of the same field, a circum- stance which seems to have suggested the idea that the crake possessed for protective purposesa certain ventriloquial power. It seldom takes wing unless driven to it, and then flies slowly, with its legs hanging down, to the nearest place of concealment, and is thus much

~~oftener heard than seen. In common with many other animals it is said to feign death as a means of avoiding a threatened danger, As an article of food the Corn Crake is regarded as a great delicacy. The Spotted Crake (Ortygometra porzana), a smaller and more aquatic species, is much less common in Britain than the former, from which it is readily distin- guished by the numerous white spots on the upper surface of its plumage. It breeds on marshy ground, frequently at the water's edge. The Little Crake and Baillon's Crake both occur in Britain as rare summer visitors.~~

~~CRAMP, a painful spasmodic contraction of muscles, most frequently occurring in the limbs, but also apt to affect certain internal organs. This disorder belongs to the class of diseases known as local spasms, of which other varieties exist in such affections as spasmodic asthma and colic. The cause of these painful seizures resides in the nervous system, and operates either directly from the great nerve centres, or, as is generally the case, indirectly by reflex action, as, for example, when attacks are brought on by some derangement of the digestive organs.~~

~~In its most common form, that of cramp in the limbs, this disorder comes on suddenly, often during sleep, the patient being aroused by an agonizing feeling of pain in the calf of the leg or back of the thigh, accompanied in mmany instances with a sensation of sickness or faintness from the intensity of the suffering. During the paroxysm the muscular fibres affected can often be felt gathered up into a hard knot. The attack in general lasts but a few seconds, and then suddenly departs, the spasmodic contrac- tion of the muscles ceasing entirely, or, on the other hand, relief may come more gradually during a period of minutes or even hours. A liability to cramp is often associated with a rheumatic or gouty tendency, but occasional attacks are common enough apart from this, and are often induced by some peculiar posture which a limb has assumed during sleep. Exposure of the limbs to cold will also bring on cramp, and to this is probably to be ascribed its frequent occurrence in swimmers. Cramp of the extremities is also well known as one of the most distressing accompaniments of cholera. It is likewise of frequent occurrence in the process of parturition, just before delivery.~~

~~This painful disorder can be greatly relieved and often entirely removed by firmly grasping or briskly rubbing the affected part with the hand, or by anything which makes an impression on the nerves, such as warm applications. Even a sudden and vigorous movement of the limb will often succeed in terminating the attack,~~

~~Whiat is termed cramp of the stomach, or gastralgia, usually occurs a3 a symptom in connection with some form~~

~~of gastric disorder, such as aggravated dyspepsia, or actual organic disease of the mucous membrane of the stomach, and must be dealt with in reference to those particular ailments.~~

~~The disease known as Writer's Cramp, or Scrivener's Palsy, is a spasm which affects certain muscles when en- gaged in the performance of acts, the result of education and long usage, and which does not occur when the same muscles are employed in acts of a different kind. This disorder owes its name to the relative frequency with which it is met with in persons who write much, although it is by no means confined to them, but is liable to occur in in- dividuals of almost any handicraft. It has been termed by Dr Duchenne Functional Spasm.~~

~~The symptoms are in the first instance a gradually increasing difficulty experienced in conducting the move- ments required for executing the work in hand. Taking, for example, the case of writers, there is a feeling that the pen cannot be moved with the same freedom as before, and the handwriting is more or less altered in consequence. At an early stage of the disease the difficulty may be to a large extent overcome by persevering efforts, but ultimately, when the attempt is persisted in, the muscles of the fingers and occasionally also those of the forearm, are seized with spasm or cramp, so that the act of 'writing is rendered impossible. Sometimes the fingers instead of being cramped move in a disorderly manner and the pen cannot be grasped, while in other rare instances a kind of paralysis affects the muscles of the fingers, and they are powerless to make the move- ments necessary for holding the pen. It is to be noted that it is only in the act of writing that these phenomena present themselves, and that for all other movements the fingers and arms possess their natural power. The same symptoms are observed and the same remarks apply mutatis mutandis in the~~

case of musicians, artists, compositors, seamstresses, tailors, and many mechanics in whom this affection may occur. Indeed, although actually a rare disease, no muscle or group of muscles in the body which is specially called into action in any particular occupa- tion is exempt from liability to this functional spasm. Hence the cause has been ascribed to over-use of the parts concerned, although this is regarded as doubtful by many high authorities, since cases have been observed where there had been no excessive strain upon the function of the affected muscles, while again in persons who pursue their special occupation, even to the utmost possible amount of fatigue, the symptoms of this disorder are exceedingly rare. It is, however, difficult to account for the phenomena on any other theory, and at all events the complaint is greatly aggravated by over-exertion of the parts.

In the treatment of this complaint the only effectual remedy is absolute cessation from the work with which the attack is associated. It is sometimes reccommended that the opposite hand or limb be used so as to afford the affected part entire rest, but this is generally followed with the extension of the disease to that locality also, Peculiar forms of penholder and other mechanical contrivances have been suggested so as to enable the occupation to be carried on, but they do not afford any relief to the disease, for the cure of which the only means that can be relied on is entire rest. Go 2

CRANACH, Lucas (1472-1553), one of the represen- tative painters of Germany at the time of the Reformation, was born at Cronach in Upper Franconia, and learnt the art of drawing from his father. It has not been possible to trace his descent or the name of his parents. We are not informed as to the school in which he was taught, and it is a mere guess that he took lessons from the South German masters to whom Mathew Grunewald owed his education. But Grunewald practised at Bamberg and Asclaffenburg,

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and Bamberg is the capital of the diocese in which Cronach lies. According to Gunderam, the tutor of Cranach's chil- dren, Cranach sigualized his

talents as a painter before the close of the 15th century. He then drew upon himself the attention of the elector of Saxony, who attached him to his person in 1504. The records of Wittenberg confirm Gun- deram's statement to this extent that Cranacl's name appears for the first time in the public accounts on the 24th of June 1504, when he drew 50 gulden for the salary of half a year, as pictor ducalis. The only clue to Cranach's settlement previoas to his Wittenberg appointment 1s afforded by the knowledge that he owned a house at Gotha, and that Barbara Brengbier, his wife, was the dvighter of a burgher of that city. Of his skill as an artist we have sufficient evidence in a picture dated 1504 (Fiedler collection at Berlin), preserved till lately in the Sciarra Colonna Palace at Rome. But as to the develop- ment of his manuer prior to that date we are altogether in ignorance. In contrast with this obscurity is the light thrown upon Cranach after 1504, We find him active in saveral branches of his profession, —sometimes a mere house- piinter, more frequently producing portraits and altar- pieces, a designer on wood, an engraver of copper-plates, aud draughtsman for the dies of the electoral mint. arly in the days of his official employment he startled his master's courtiers by the realism with which he painted still life, game, and antlers on the walls of the country palaces at Coburg and Lochau ; his pictures of deer and wild boar were considered striking, aud the duke fostered his passion for this form of art by taking him out to the hunting field, where he sketched " his grace " running the stag, or Dake John sticking a boar. Before 1508 he had painted several altar-pieces for the Schlosskirche at Wittenberg in competition with Diirer, Burgkmair, and others; the duke and his brother John were portrayed in various attitudes, and a number of the best woodcuts and copper-plates were published. Great honour accrued to Cranach when he went in 1509 to the Netherlands, and took sittings from the Emperor Maximilian and the boy who afterwards became Charles V. Till 1503 Cranach signed his works with the initials of his name. In that year the elector gave him the winged snake as a motto, and this motto or Kleinod, as it was called, superseded the initials on all his pictures after that date. Somewhat later the duke conferred on him the monopoly of the sale of inedicines at Wittenberg, and a printer's patent with exclusive privileges as to copyright in Bibles. The presses of Cranach were used by Luther. His chemist's shop was open for centuries, and ouly perished by fire in 1871. Relations of friendship united the painter with the Refor- mers ata very early period; yet it is difficult to fix the time of his first

acquaintance with Luther. The oldest notice of Cranach in the Reformer's correspondence dates from 1520. In a letter written from Worms in 1521, Luther calls him his gossip, warmly alluding to his "Gevatterin," theartist's wife. His first engraved portrait by Cranach represents an Augustine friar, and is dated 1520. Five years later the monk dropped the cowl, and Cranach was present as "one of the council" at the betrothal festival of Luther and Catherine Bora. The death at short intervals of the Electors Frederick and Jobn (1525 and 1532) brought no change in the pros- perous situation of the painter ; he remained a favourite with Johan Frederick I, under whose administration he twice (1537 and 1540) filled the office of burgomaster of Wittenberg. But 1547 witnessed a remarkable change in these relations. John Frederick was taken prisoner at the battle of Miihlberg, and Wittenberg was subjected to stress of siege. As Cranach wrote from his house at the corner of the market-place to the Grand-Master Albert

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of Brandenburg at Koénigsberg to tellhim of John Frederick's capture, he showed his attachment by saying, "T cannot conceal from your Grace that we have been robbed of our dear prince, who from his youth upwards has been a true prince to us, but God will help him out of prison, for the Kaiser is bold enough to revive tle Papacy, which God will certainly not allow." During the siege Charles bethought him of Cranach, whom he remembered from his childhood, and summoned him to his camp at Pistritz. Cranach came, reminded his majesty of his early sittings as a boy, and begged on his knees for kind treat- ment to the Kurfiirst. Three years afterwards, when all the dignitaries of the empire met at Augsburg to receive commands from the emperor, and when Titian at Charles's bidding came to take the likeness of Philip of Spain, John Frederick asked Cranach to visit the Swabian capital ; and here for a few months he was numbered amongst the house- hold of the captive elector, whom he afterwards accompanied home in 1552. He died at Weimar, in October 1553, The oldest extant picture of Cranach, the Rest of the Virgin during the Flight in Egypt, marked with the initials L.C., and the date of 1504 (Mr Fiedler, Berlin), is by far the most graceful creation of his pencil. It is enlivened by a host of angels ministering in the pleasantest way to the wants of the infant Saviour. The scene is laid on the

margin of a forest of pines, and discloses the habits of a painter familiar with the mountain sceuery of Thuringia. There is more of gloom in landscapes of a later time; and this would point toa defect in the taste of Cranach, whose stag hunts (Moritzburg, Madrid, Labouchere collection) are otherwise not unpleasing. Cranach's art in its.prime was doubtless influenced by causes which but slightly affected the art of the Italians, but weighed with potent consequence on that of the Netherlands and Germany. The business of booksellers who sold woodcuts and engravings at fairs and markets in Germany naturally satisfied a craving which arose out of the paucity of wall-paintings in churches and secular edifices. Drawing for woodcuts and engraving of copper-plates became the occupation of artists of uote, aud the talents devoted in Italy to productions of the brush were here monopolized for designs on wood, or on copper. We have thus to account for the comparative unproduc- tiveness as painteis of Diirer and Holbein, and at the same time to explain the shallowness apparent in many of the later works of Cranach; but we attribute to the same cause also the tendency in Cranach to neglect effective

colour and light and shade for strong contrasts of flat tint.

Constant attention to mere contour and to black and white appears to have affected his sight, and caused those curious transitions of pallid light into inky grey which often charac- terize his studies of flesh; whilst the mere outlining of form in black became a natural substitute for modelling and chiaroscuro. There are, no doubt, some few pictures by Cranach in which the flesh-tints display brightness and enamelled surface, but they are quite exceptional. As a composer Cranach was not greatly gifted. HIs ideal of the human shape was low; but he showed some freshness in the delineation of incident, though he not unfrequently bordered on coarseness. HIs copper-plates and woodcuts are certainly the best outcome of his art ; and the earlier they are in date the more conspicuous is their power. Striking evidence of this is the St Christopher of 1506, or the plate of Elector Frederick praying before the Madonna (1509). It is curious to watch the changes which mark the development of his instincts as an artist during the struggles of the Reformation. At first we find him painting Madonnas. HIs first woodcut (1505) represents the Virgin aud three saints in prayer before

a crucifix. Later on he composes the marriage of St Catherine, a series of mar- tyrdoms, and scenes from the Passion. After 1517 he illus-

trates occasionally the old gospel themes, but he also gives expression to some of the thoughts of the Reformers. Ina picture of 1518 at Leipsic, where a dying man offers " his soul to God, his body to earth, and his worldly goods to his relations," the soul rises to meet the Trinity in heaven, and salvation is clearly shown to depend on faith and not on good works. Again sin and grace become a familiar subject of pictorial delineation. Adam is observed sitting between John the Baptist and a prophet at the foot of a tree. To the left God produces the tables of the law, Adam and Eve partake of the forbidden fruit, the brazen serpent is reared aloft, and punishment supervenes in the shape of death and the realm of Satan, To the right, the Conception, Crucifixion, and Resurrection symbolize redemp- tion, and this is duly impressed on Adam by John the Baptist, who points to the sacrifice of the crucified Saviour. There are two examples of this composition in the Galleries of Gotha and Prague, both of them dated 1529. One of the latest pieces with which the name of Cranach is connected is that which Cranach's son completed in 1555, and which is now in the cathedral of Weimar. It represents Christ in two forms, to the left trampling on Death and Satan, to the right crucified, with blood flowing from the]ance wound. John the Baptist points to the suffering Christ, whilst the blood stream falls on the head of Cranach, and Luther reads from his book the words, " The blood of Christ cleanseth from all sin." Cranach sometimes composed gospel subjects with feeling and dignity. The Woman taken in Adultery at Munich is a favourable specimen of his skill, and various repetitions of Christ receiving little children show the kindliness of his disposition. But he was not exclusively a religious painter. He was equally successful, and - often comically naive, in mythological scenes, as where Cupid, who has stolen a honeycomb, complains to Venus that he has been stung by a bee (Weimar, 1530, Berlin, 1534), or where Hercules sits at the spinning-wheel mocked by Omphale and her maids. Humour and pathos are combined at times with stroug effect in pictures such as the Jealousy (Augsburg, 1527, Vienna, 1530), where women and children are huddled into telling groups as they watch the strife of men wildly fighting around them. Very realistic must have been a lost canvas of 1545, in which hares were catching and roasting sportsmen. In 1546, possibly under Italian influence, Cranach

~~composed the Fons Juventutis of the Berlin Gallery, executed by his son, a picture in which hags are seen entering a Renaissance fountain, and are received as they issue from it with all the charms of youth by knights and pages.~~

~~Cranach's chief occupation was that of portrait-painting, and we are indebted to him chiefly for the preservation of the features of all the German Reformers and their princely adherents. But he sometimes condescended to depict such noted followers of the Papacy as Albert (Kur-Mainz) of Brandenburg, Anthony Granvelle, and the duke of Alva. A dozen of likenesses of Frederick III. and his brother John are found to bear the date of 1532. It is character- istic of Cranach's readiness, and a proof that he possessed ample material for mechanical reproduction, that he received payment at Wittenberg in 1533 for " sixty pairs of portraits of the elector and his brother" in one day. Amongst existing likenesses we should notice as the best that of Albert, elector of Mainz, in the Berlin museum, and that of John, elector of Saxony, in the museum of Weimar.~~

~~Cranach had three sons, all artists :—John Lucas, who died at Bologna in 1536; Hans Cranach, whose life is obscure; and Lucas, born in 1515, who died in 1586. General von Cranach, now commanding the fortress of Cologne, is one of the last descendants of the painter of Wittenberg.~~

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~~See Heller, Leben und Werke Lukas Cranachs (1821), and Schuchard, Lukas Cranachs des diltern Leben und Werke (8 vols. 1851-71). (J~~

~~CRANBERRY, the fruit of plants of the genus Oxy- coccus, natural order Vacciniacee. O. palustris, the com- mon cranberry plant, is found in marshy land in northern and central Europe and North America. Its stems are wiry, creeping, and of varying length ; the leaves are ever- green, dark and shining above, glaucous below, revolute at the margin, ovate, lanceolate, or elliptical in shape, and not more than half an inch long; the flowers, which appear in May or June, are small and pedunculate, and have a four- lobed, rose-tinted corolla, purplish filaments, and anther-cells forming two long tubes ; the berries ripen in August and September ; they are pear-shaped and about the size of cur- rants, are crimson in colour, and often spotted,~~

~~and have an acid and astringent taste. 'The American species, O. macrocarpus, is found wild from Maine to the Carolinas. It attains a greater size than O. palustris, and bears bigger and finer berries, which are of three principal sorts, the cherry or round, the bugle or oblong, and the pear or bell-shaped, and vary in hue from light pink to dark purple, or may be mottled red and white. It was first cul- tivated in England for the sake of its fruit by Sir Joseph Banks. 0. erectus is a species indigenous to Virginia and California, and is remarkable for the excellent flavour of its berry.~~

~~Air and moisture are the chief requisites for the thriving of the cranberry plant. It is cultivated in America on a soil of peat or vegetable mould, free from loam and clay, and cleared of turf, and having a surface layer of clean sand. The sand, which needs renewal every two or three years, is necessary for the vigorous existence of the plants, and serves both to keep the underlying soil cool and damp, and to check the growth of grass and weeds. The ground must be thoroughly drained, and should be provided with a supply of water and a dam for flooding the plants during winter to protect them from frost, and occasionally at other seasons to destroy insect pests; but the use of spring- water should be avoided. The flavour of the fruit is found to be improved by growing the plants in a soil enriched with well-rotted dung, and by supplying them with less moisture than they obtain in their natural habitats. Pro- pagation is effected by means of cuttings, of which the wood should be wiry in texture, and the Jeaves of a greenish-brown colour. In America, where, in the vicinity of Cape Cod, Massachusetts, the cultivation of the cranberry commenced early in the present century, wide tracts of waste land have been utilized for that pur- pose,—low, easily flooded, marshy ground, worth originally not more than from $10 to $20 an acre, having been made to yield aunually $200 or $300 worth of the fruit per acre. The yield varies between 50 and 400 bushels an acre, but 100 bushels, or about 35 barrels, is estimated to be the average production when the plants have begun to bear well. In 1871 there were in New Jersey about 2000 acres in fruiting, which in the previous year had produced 150,000 bushels of cranberries, and 4000 acres more had been prepared and planted. A total of 75,000 barrels was obtained in 1869 in the States and Territories of America, Cranberries should be gathered when ripe and dry, otherwise they do not keep well. The darkest-coloured berries are those which are most esteemed. The picking of the fruit begins in New~~

Jersey in October, at the close of the blackberry and whortleberry season, and often lasts until the coming in of cold weather. From 3 to 4 bushels a day may be collected by good workers. New York, Philadelphia, Boston, and Baltimore are the leading American markets for cranberries, whence they are exported to the West Indies, England, — yere in great

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quantities. England was formerly supplied by Lincolnshire and Norfolk with abundance of the common cranberry, which it now largely imports from Sweden and Russia. The fruit is much used for pies and tarts, and also for making an acid summer beverage. The Mount Ida berry, cowberry, or red whortleberry, Vaccinium Vitis zdea, is sometimes sold for the cranberry. The Tasmanian and the Australian cranberries are the produce respectively of Astroloma humifusum and Lissanthe sapida, plants of the order Epacridacee.

See Trowbridge, Zhe Cranberry Culturist, Newhaven, U.S., 1869 ; Report of the Commissioner of Agriculture for 1869, Washington, 1870; Report of the American Institute of New York for 1869-70, Albany, 1870.

CRANBROOK, a town of England, in the county of Kent, six miles south of the Staplehurst station, on the South-Eastern Railway. It has a fine church dedicated to St Dunstan, which is remarkable for a baptistery in which the ceremony used to be administered by immersion. As the central town of the agricultural district called the Weald of Kent, it carrieson a pretty extensive trade in malt, hops, and general goods ; but its present condition is in striking contrast to the activity it displayed from the 14th to the 17th century, when it was one of the principal seats of the broadcloth manufacture. In the neighbourhood are the ruins of the old mansion house of Sissinghurst, or Saxen- hurst, built by Sir John Baker in the time of Edward VL, and interesting as the birthplace of Sir Richard Baker the chronicler. Population of the parish in 1871, 4331.

CRANE (in Dutch, Kraan; Old German, Areen ; cognate, as also the Latin Grus, and consequently the French Grue and Spanish Grulla, with the

Greek yépavos), the Girus communis or G. cinerea of ornithologists, one of the largest Wading-birds, and formerly a native of England, where Turner, in 1544, said that he had very often seen its young (" earum pipiones sepissime vidi"). Notwith- standing the protection afforded it by sundry Acts of Parliament, it has long since ceased from breeding in this country. Sir T. Browne (0d. 1682) speaks of it as being found in the open parts of Norfolk in winter. In Ray's time it was only known as occurring at the same season in large flocks in the fens of Lincolnshire and Cambridgeshire ; and though mention is made of Cranes' eggs and young in the fen-laws passed at a court held at Revesby in 1780, this was most likely but the formal repetition of an older edict ; for in 1768 Pennant wrote that after the strictest inquiry he found the inhabitants of those counties to be wholly unacquainted with the bird, and hence concluded that it had forsaken our island. The Crane, however, no doubt then appeared in Britain, as it does now, at uncertain inter- vals and in unwonted places, showing that the examples occurring here (which usually meet the hostile reception commonly accorded to strange visitors) have strayed from the migrating bands whose movements have been remarked from almost the earliest ages. Indeed, the Crane's aerial journeys are of a very extended kind ; and on its way from beyond the borders of the Tropic of Cancer to within the Arctic Circle, or on the return-voyage, its flocks may be descried passing overhead at a marvellous height, or halting for rest and refreshment on the wide meadows that border some great river, while the seeming order with which its ranks are marshalled during flight has long attracted attention. 'The Crane takes up its winter-quarters under the burning sun of Central Africa and India, but early in spring returns northward. Not a few examples reach the chill polar soils of Lapland and Siberia, but some tarry in the south of Europe and breed in Spain, and, it is supposed, in Turkey. The greater number, however, occupy the in- termediate zone and pass the summer in Russia, North Germany, and Scandinavia. Soon after their arrival in

these countries the flocks break up into pairs, whose nuptial ceremonies are accompanied by loud and frequent trumpet- ings, and the respective breeding-places of each are chosen.

~~The nest is formed with little art on the ground in large open marshes, where the herbage is not very high—a toler- ably dry spot being selected and used apparently year after year. Here the eggs, which are of a rich brown colour with dark spots, and always two in number, are laid. The young are able to run soon after they are hatched, and are at first clothed with tawny down. In the course of the summer they assume nearly the same grey plumage that their parents wear, except that the elongated plumes, which in the adults form a graceful covering of the hinder parts of the body, are comparatively undeveloped, and the clear black, white, and red (the last being due to a patch of papillose skin of that colour) of the head and neck are a3 yet indistinct. During this time they keep in the marshes, but as autumn approaches the different families unite by the rivers and lakes, and ultimately form the enormous bands which after much more trumpeting set out or their southward journey.~~

~~The Crane's power of uttering the sonorous anu peculiar trumpet-like notes, of which mention has been made, is commonly and perhaps correctly ascribed to the formation of its trachea, which on quitting the lower end of the neck passes backward between the branches of the furcula and is received into a hollow space formed by the bony walls of the carina or keel of the sternum. Herein it makes three turus, and then runs upwards and backwards to the lungs. The apparatus on the whole much resembles that found in the Whooping Swans (Cygnus musicus, C. buceinator, and others), though differing in some not unimportant details ; but at the same time somewhat similar convolutions of the trachea occur in other birds which do not possess, so far as is known, the faculty of trumpeting. The Crane emits its notes both during flight and while on the ground. In the latter case the neck and bill are uplifted and the mouth kept open during the utterance of the blast, which may be often heard from birds in confinement, especially at the beginning of the year.~~

~~As usually happens in similar cases, the name of the once familiar British species is now used in a general serse, and applied to all others which are allied to it. Though by many systematists placed near or even among the Herons, there is no doubt that the Cranes have only a superficial resemblance and no real affinity to the Ardeide. In fact the Gruide form a somewhat isolated group. Professor Huxley has included them together with~~

the Rallide in his Geranomorphe ; but a more extended view of their various characters would probably assign them rather as relatives of the Bustards—not that it must be thought that the two families have not been for a very — long time distinct. Gus, indeed, is a very ancient form, its remains appearing in the Miocene of France and Greece, as well as in the Pliocene and Post-pliocene of North America. In France, too, during the " Reindeer Period " there existed a huge species—the G. primigenea of M. Alphonse Milne-Edwards—which has doubtless been long extinct. At the present time Cranes inhabit all the

'great zoogeographical Regions of the earth, except the

Neotropical, and some sixteen or seventeen species are dis- criminated. In Europe, besides the G. communis already mentioned, we have as an inhabitant that which is generally known as the Numidian or Demoiselle-Crane (G. wrgo), distinguished from every other by its long white ear-tufts. This bird is also widely distributed throughout Asia and Africa, and is said to have occurred in Orkney as a straggler. The eastern part of the Palearctic Region is inhabited by four other species that do not frequent

| Europe (@. antigone, G. japonensis, G', monachus, and G.

lewcogeranus), of which the last is perhaps the finest of the family, with nearly the whole plumage of a snowy white. The Indian Region, besides being visited in winter by four of the species already named, has two that are peculiar to it (G. torquata and G. imdica—both commonly con- founded under the name of G, antigone). The Australian Region possesses a large species known to the colonists as the " Native Companion " (. australis) ; while the Nearctic is tenanted by three species (G. americana, G. canadensis, and G, fraterculus 1), to say nothing of the possibility of a fourth (: schlegelt), a little-known and somewhat obscure bird, finding its habitat here. In the Ethiopian Region we have two species (G. paradisea and G. carunculata) which do not occur out of Africa, as well as two others forming the group known as " Crowned Cranes " differing much from other members of the family, and justifiably placed in a separate genus, Balearica. One of these (B. pavonina) inhabits Northern and Western Africa, while the other (B. regulorum) is confined to the eastern and southern parts of that continent.

~~With regard to the literature of this species, a paper "On the Breeding of the Crane in Lapland" (Zd:s, 1859, p. 191), by the late Mr John Wolley, is one of the most pleasing contributions to natural history ever written, and an admirably succinct account of all the different species was communicated by the late Mr Blyth to The Field newspaper in 1878 (vol. xl. p. 631, vol. xli. pp. 7, 61, 136, 189, 248, 884, 408, 418), which it is much to be regretted has not since been published in a more accessible form ; while a beautiful picture representing a flock of Cranes, resting by the Rhine, during one of their annual migrations, is to be found in Mr Wolf's Zoological Sketches. (A. N.)~~

~~CRANE, a machine for raising and lowering heavy weights, and removing them from one place to another. Its chief parts are the jib, an inclined or horizontal beam at the end of which the weight is suspended; the upright crane post or stalk, on which the crane turns ; the stay, beneath and supporting the jib; the barrel, round which the chain attached to the weight is coiled; and the winch, pinion, and handles. In place of a stay, chains or tension- bars above the jib are commonly employed ; the latter at their upper end form eyes for the pivot of the sheave, or are pinned to the socket of the jib; below they are fixed to the cast-iron framing that carries the wheel-work. To prevent the acceleration of the movement of descending weights brakes are employed, in one form of which a lever causes friction by bringing a piece of wood, strengthened with iron, into contact with a plain wheel attached to the barrel of the crane. The winch handle has given it a radius of about 18 inches, and its centre is placed at 3 feet or 3 feet 2 inches from the ground; the limit of the average stress on it to be allowed for each labourer, working constantly at the rate of 220 feet a minute, has been found to be 15 ib. The length of the journals of the axles is made 14 to 9 times their diameter, which must be proportionate to the torsion of the wheels to be resisted. The diameter of the axles of the crane-barrel, if of cast-iron, should be pro- portional to the cube root of the strain upon them in cwts; if of wrought iron, to +°,ths of the same. The chain or rope ought not to be worked with more than one-half the weight which it is estimated to be capable of bearing. The strength of the jib varies almost directly as the fourth power of its diameter, and inversely as the square of its length. In cranes for lifting great weights the jib may be made to rest against a circular rail let into masonry, instead of bearing against the crane post. The~~

~~ends of the jib should not be rounded, but should be cut square, go as to lie evenly against the iron sockets into. which they fit. In iron cranes the post is a hollow pillar of cast-iron, fixed by means of cross-shaped framings of~~

~~sien anette~~

~~1 'There is, however, some doubt whether this be not a form of the preceding.~~

~~the same material into a block of masonry; the jib is of iron, or of wood with terminal sockets of that metal. A craue at Earl Grey's Dock, Dundee Harbour, when worked by eight men, is capable of lifting 30 tons; it can be moved round by one man by the application of horizontal gearing ; its total weight is not above 60 tons. The double crane for wharfs and pier-heads is framed and braced so as to balance exactly when turned on its pivot. In another double crane, used in the building of breakwaters, one jib is employed in laying, while the other lifts a stone. The derrick is a temporary crane consisting of a spar supported by guys or stays; in this crane the iron beam or derrick can, by raising or lowering, be set at any required angle. The cranes in general use in the earlier part of the last century were primitive contrivances worked by means of a large hollow wheel, within which a man walked forwards or backwards according as goods were to be raised or lowered ; the jib of the crane was fixed on a pivot, so as to turn round about 3ths of acircle. After this a simpler form, still in use, was introduced, with the wheel fixed on a portion of the jib projecting behind the crane post. One of the first examples of traversing cranes was erected by Mr Renuie in the Mahogany Sheds at the West India Docks, For this kind of crane a railway is constructed on parallel frames of timber reaching across the roof of a building, and on this isa carriage supported on wheels, and capable, therefore, of being moved backwards or forwards by means of the machinery attached to it. The chain that bears the weight is connected with the carriage, and hangs down between the two lines of rails. By making the framework supporting the railway movable, as well as the carriage, goods can be transported in any required direction. The frames of railway traversing cranes are composed of two triangular timber structures, mounted on strong wheels; these by toothed wheels and pinions are caused~~

~~to move along the railroad ou which they are placed. At one time vacuum cranes were employed, to work which small oscillating cylinders, similar to those of high-pressure steam engines, were put in communication with a receiver exhausted of air by steam pumps. Afterwards steam came to be applied immediately as the motive power of cranes. In the direct-acting steam crane, the crane post itself is the steam cylinder, and the steel wire rope for lifting the load constitutes the piston-rod ; to turn the crane round, steam is admitted to a cylinder beneath and forming part of the bed-plate. The first crane worked by pistons acted on by water-power was established at Newcastle-on-Tyue in 1846. Reservoirs at great heights for providing water-pressure can be dispensed with by the use of Sir W. Armstrong's accumulator, an apparatus consisting of a cast-iron cylinder in which the water supplied by an engine is pressed upon by a loaded plunger. The excess of water pumped into the accumulator at any time is employed in raising the plunger ; this, on reaching a certain height, begins to close a throttle-valve in the steam-pipe of the engine, and thus lessens its rate, until fresh demands are made upon the contents of the accumulator. The water discharged by the cranes may be led by a return-pipe to a cistern over the engine room, in order again to supply the force-pumps. To avoid jerks and concussions owing to the momentum of thejib after the closing of the water passages, a clack-valve is provided which opens up into the supply-pipe whenever the pressure in the cylinder of the hydraulic press becomes greater than that in the accumulator. The tubular cranes of Fairbairn are made of wrought-iron plates rivetted together. The jib, which is curved, is rectangular in cross- section, and tapers upwards to its extremity, and below the ground to a considerable depth, where it terminates in a shoe of cast-iron on which the crane revolves. The plates forming the edges of the jib are connected by means~~

~~of angle iron, and those of its convex or upper side by chain rivetting. The curvature of the jib allows of the raising of weights to its highest point. The chain-barrels and the spindles for the wheel-gearing are preferably inclosed within the jib.~~

See Mechanic and Engineer's Magazine, vol. ii. 2d ser. pp. 169, 190; Glynn, Rud. Treatise on the Construction of Cranes and Machinery, 1865 ; Laboulaye, Dictionnaire des Arts et Manuf, 8.V. "Grue;" Cresy, Ency. of Civil Engineering.

CRANMER, Tuomas (1489-1556), archbishop of Canterbury, was born at Aslacton in Nottinghamshire on the 2d July 1489. 'The second son of Thomas Cranmer and of his wife Anne Hatfield, he belonged to a family that had been settled in Nottinghamshire from the time of the Norman Conquest. He received his early education, according to Morice his secretary, from '"'a marvellous severe and cruel schoolmaster," whose discipline must have been severe indeed to deserve this special mention in an age when no schoolmaster bore the rod in vain. The same authority tells us that he was initiated by his father in those field sports, such as hunting and hawking, which formed one of his recreations in after life. To early training he also owed the skilful horsemanship for which he was conspicuous. At the age of fourteen he was sent by his mother, who had recently become a widow, to Cambridge, where he entered at Jesus College. Little is known with certainty of his university career beyond the facts that he became a fellow of his college in 1510 or 1511, that he had soon after to vacate his fellowship, owing to his marriage to "Black Joan," a relative of the landlady of the Dolphin Inn, and that he was reinstated in it on the death of his wife, which occurred in childbirth before the lapse of the year of grace allowed by the statutes, During the brief period of his married life he held the appointment of lecturer at Buckingham Hall, now Magdalene College. The fact of his marrying would seem to show that he did not at the time intend to enter the church, and there are indications that the profession of his choice was the law. It has been conjectured with some plausibility that the death of his wife caused him to change his intention and qualify himself for holy orders, He was ordained in 1523, and soon after he took his doctor's degree in divinity. According to Strype, he was invited about this time to become a fellow of the college founded by Cardinal Wolsey at Oxford; but Dean Hook shows that there is some reason to doubt this. If the offer was made. it was declined, and Cranmer continued at Cambridge filling the offices of lecturer in divinity at his own college and of public examiner in divinity to the university. It is interesting, in view of his later efforts to spread the know- ledge of the Bible among the people, to know

that in the capacity of examiner he insisted on a thorough acquaintance with the Holy Scriptures, and rejected several candidates who were deficient in this qualification.

It was a somewhat curious concurrence of circumstances that transferred Cranmer, almost at one step, from the quiet seclusion of the university to the din andj bustle of the court. In 1528 the plague known as the sweating sickness, which prevailed throughout the country, was specially severe at Cambridge, and all who had it in their power forsook the town for the country. Cranmer went with two of his pupils named Cressy, related to him through their mother, to their father's house at Waltham in Essex, The king (Henry VIII.) happened at the time to be residing in the immediate neighbourhood, and two of his chief counsellors, Gardyner, secretary of state, afterwards bishop of Winchester, and Fox, 'the lord high almoner, afterwards bishop of Hereford, were lodged at Cressy's house. Meet- ing with Cranmer, they were naturally led to discuss what was the absorbing question of the day, the king's meditated

divorce from Catherine of Aragon. The opinion of the future archbishop was given with the modesty that befitted an unknown man. He professed not to have studied the cause as the others had done; but it seemed to him that if the canonists and the universities should decide that marriage with a deceased brother's widow was illegal, and if it were proved that Catherine had been married to Prince Arthur, her marriage to Henry could be declared null and void by the ordinary ecclesiastical courts. Tle necessity of an appeal to Rome was thus dispensed with, and this point was at once seen by the king, who, when Cranmer's opinion was reported to him, ordered him to be summoned in these terms :—"TI will speak to him. Let him be sent for out of hand. This man, I trow, has got the right sow by the ear."

At their first interview Cranmer was commanded by the king to lay aside all other pursuits and to devote himself to the question of the divorce. He was to draw up a written treatise, stating the course he proposed, and defending it by arguments from scripture, the fathers, and the decrees of general councils. 'There is reason to believe that he entered upon the task somewhat reluctantly, but in the reign of Henry VIII. it was emphatically true that the

king's will was law, and no refusal was possible. His material interests certainly did not suffer by compliance. He was commended to the hospitality of Anne Boleyn's father, the earl of Wiltshire, in whose house at Durham Place he resided for some time; the king appointed him archdeacon of Taunton and one of his chaplains; and he also held a parochial benefice, the name of which is unknown. When the treatise was finished Cranmer was called upon to defend its argument before the universities of Oxford and Cambridge, which he visited, accompanied by Fox and Gardyner. Immediately afterwards he was sent to plead the cause before a more powerful if not a higher tribunal, An embassy, with the earl of Wiltshire at its head, was despatched to Rome in 1530, that " the matter of the divorce should be disputed and ventilated," and Cranmer was an important member of it. He was received by the Pope with marked courtesy, and was appointed "Grand Penitentiary of England ;" but lis argument, if he ever had the opportunity of stating it, did not lead to any practical decision of the question. Return- ing home through France and Germany, he had interviews in the latter country with the elector of Saxony and other Protestant princes.

It is usual to attribute to the influence of this Con- tinental visit a further recoil in Cranmer's mind from Roman Catholicism and an advance to what is now known as Protestantism. Now there are, it is true, indications that he was dissatisfied with much that he saw at Rome, and it is a probable conjecture that his intercourse with the German princes had some effect in modifying his doctrinal views. But it must be remembered that the modern idea of Protestantism and Roman Catholicism as two broadly marked, clearly divided, and antagonistic systems was only forming in Germany, and was all but unknown in England in Cranmer's day. It would be unnecessary to state so obvious a truth, were it not for the seemingly ineradicable tendency of hasty thinkers to throw back familiar distinc- tions in religion and politics to a period when such distinc- tions had not come into existence. The fact that Cranmer is persistently described as the " first Protestant archbishop of Canterbury," which, if true at all, is true only in a very modified sense, shows the necessity for this caution.

Cranmer had only been a few months in England when he received a second commission from the king appointing him " Conciliarius Regius et

ad Czesarem Orator." In the summer of 1531 he accordingly proceeded to Germany as soleambassador to the emperor, withthe design of furthering

the divorce. His mission was fruitless, but he did not at ouce return to England. At Nuremberg he had become acquainted with Osiander, whose somewhat isolated theological position he probably found to be in many points analogous to his own. Both were convinced that the old order must change ; neither saw clearly what the new order should be to which it was to give place. They had frequent interviews, which had doubtless an important influence on Cranmer's opinions. But Osiander's house had another attraction of a different kind from theological sympathy. His niece Margaret won the heart of Cranmer, and early in 1532 they were married. In the case of a strong character like Luther, marriage implied an express practical rejection of the authority of Rome to impose celibacy upon priests ; no such inference can safely be made in the case of Cranmer, whose character was weak and whose action was generally determined by the influences of the moment. Hook finds in the fact of the marriage corroboration of Cranmer's statement that he never expected or desired the primacy ; and it seenis probable enough that, if he had fore- seen how soon the primacy was to be forced upon him, he would have avoided a disqualification which it was difficult to conceal and dangerous to disclose.

Expected or not, the primacy was forced upon him within a very few months of his marriage. In August 1532 Archbishop Warham died, and the king almost im- mediately afterwards intimated to Cranmer, who was still in Germany, his nomination to the vacant see. Cranmer's conduct was certainly consistent with his profession that he did not desire, as he had not expected, the dangerous promotion. He sent his wife to England, but delayed his own return in the vain hope that another appointment might be made. How long he ventured to wait 1s uncertain, but when he arrived in England he found the arrangements matured for his consecration, his ' nolo episcopari " being unavailing against the king's command, The papal bulls of confirmation were dated February and March 1533, and the consecration took place on the 30th March. One peculiarity of the ceremony has occasioned considerable discussion. It was the custom for the

archbishop elect to take two oaths, the first of episcopal allegiance to the Pope, and the second in recognition of the royal supremacy. 'The latter was so wide in its scope that it might fairly be held to supersede the former in so far as the two were inconsistent. Cranmer, however, was not satisfied with this. He had a special protest recorded, in which he formally declared that he swore allegiance to the Pope only in so far as that was consistent with his supreme duty to the king. The morality of this course has been much canvassed, though it seems really to involve nothing more than an express declaration of what the two oaths implied. It was the course that would readily suggest itself to a man of timid nature who wished to secure himself against such a fate as Wolsey's. It showed weakness, but it added nothing to whatever immorality there might be in successively taking two incompatible caths.

In the last as in the first step of Cranmer's promotion Henry had been actuated by one and the same motive. The business of the divorce had now become very urgent, and in the new archbishop he had an agent who might be expected to forward it with the needful haste. The celerity and skill with which Cranmer did the work intrusted to him must have fully satisfied his master. During the first week of April Convocation sat almost from day to day to determine questions of fact and law in relation to Catherine's marriage with Henry as affected by her previous marriage with his brother Arthur. Decisions favourable to the object of the king were given on these questions, though even the despotism of the most despotic of the Tudors failed to secure absolute unanimity. The next step

was taken by Cranmer, who wrote a letter ta the king, praying to be allowed to remove the anxiety of loyal subjects as to a possible case of disputed succession, by fimally deter- mining the validity of the marriage in his archiepiscopal court. There is evidence that the request was prompted by the king, and his consent was given as a matter of course. Queen Catherine was residing at Ampthill in Bedfordshire, and to suit her convenience the court was held at the priory of Dunstable in the immediate neighbourhood, Declining to appear she was declared contumacious, and on the 23d May the archbishop gave judgment declaring the marriage null and void from the first, and so leaving the king free to marry whom he pleased. In the whole proceeding, which had as much of the form as it had little of the

spirit of justice, the archbishop's subserviency was pitiful, and it is difficult to acquit him of the graver charge of knowingly pronouncing an unrighteous sentence.

The coronation of the new queen, Anne Boleyn, at which Cranmer officiated, took place ou the 1st June, little more than a week after the sentence which deprived her predecessor of her rights. During that interval it is asserted by some authorities that the king and Anne were publicly married by the archbishop. 'This, however, seems unlikely. A private marriage had taken place in the previous November, or more probably in January. Hook conjectures that the later ceremony was not a repetition of the marriage, but merely an official and public recognition of it.

The splendid pageantry of the coronation made the inarriage popular for a few days with the citizens of London, but a deeper current of feeling in the opposite direction soon set in. The deliberate judgment of the country was undoubtedly one of indignant disapproval, and it speedily found utterance through the pulpit—the chief organ of public opinion in the days when there was no press. So outspoken were the preachers in their denuncia- tion of the king's conduct that it was deemed necessary to silence them by an arbitrary exercise of authority. Cranmer's very first act of episcopal jurisdiction was to prohibit all preaching within his own diocese, and to arrange for its restriction by the other bishops of his province. His conduct in this can, of course, only be fairly judged by the standard of his own time, but the forcible suppression of all preaching was a curiously incon- sistent measure to be adopted, even from motives of political urgency, by the "first Protestant archbishop of Canter- bury."

Cranmer was little at court during the three years of Anne Boleyn's ascendency there. The period was eventful, and he found abundant occupation in his ecclesiastical and parliamentary duties. He was an active promoter of the measures which led to the final breach with Rome. These included the appointment of bishops by the king alone without bulls or licences from the Pope, the prohibition of the payment of Peter's pence or other contributions to Rome, and the renunciation by the archbishop of the title of legate. 'The independence of the Church of England was finally asserted by the two Houses of Convocation in the declaration that "the

bishop of Rome has no greater jurisdiction given him in this realm of England than any other foreign bishop," and this statement may be held to embody the general result of Cranmer's ecclesiastical policy as shown in the details just mentioned. It is to be noted to his credit that he pled for More and Fisher even after he had failed to persuade them to admit the royal supremacy.

Cranmer's share in the divorce of Anne Boleyn in 1536 is perhaps less obscure than most things connected with that very mysterious transaction. When the king had made up his mind, the archbishop was summoned frei

Kent to Lambeth, where he was kept a virtual prisoner |

until he had indicated that he would be compliant. Ins letter to Henry he pled generously for the queen, but the plea was robbed of whatever force it might have had by a closing sentence in which he stated his willingness to obey the king's commands, The proceedings were gone through with the same hypocritical show of judicial formality as in the case of Queen Catherine, and on the 10th June 1536 the archbishop fulfilled his promise of obedience by declar- ing the marriage he had himself sanctioned to have been null and void from the first. It is urged in his favour that before doing so he had received from Anne a confes- sion of some impediment existing before her marriage with the king which rendered the marriage invalid, but it does not appear in what the impediment consisted, and the plea cau scarcely be accepted. Even if it could, few would be inclined to question the judgment of Hook that "of Cranmer's conduct in the affair the less that his admirers say, the greater will be their discretion." And this was not the last time in Henry's reign that the archbishop stooped to act the same degrading part. In 1540 he presided over the Convocation that disannulled the marriage with Anne of Cleves, which he had celebrated almost immediately before. To his next and last interposition in the matrimonial affairs of the king no discredit attaches itself. When he was made gognizant of the charges against Catherine Howard, his duty to communicate them to the king was obvious, though painful ; and his choice of the time and manner of his fulfilling it was both delicate to his royal master and considerate to the accused. Meanwhile Cranmer was actively carrying out the policy which

has associated his name more closely, perhaps, than that of any other ecclesiastic with the Reformation in England. Its most important feature on the theological as distinct from the political side was the endeavour to promote the circulation of the Bible in the vernacular, by encouraging translation and procuring an order in 1538 that a copy of the Bible in English should be set up in every church in a convenient place for reading. Only second in importance to this was the re-adjustment of the creed and liturgy of the church, which formed Cranmer's principal work during the latter half of his life. The progress of the archbishop's opinion towards that middle Protestantism, if it may be so called, which he did so much to impress on the formularies of the Church of England, was gradual, as a brief enumeration of the successive steps in that progress will show. In 1535 he corrected a second edition of the book known as the King's Primer, the original composition of which has been attributed to him, and which was in several points Protestant in doctrine. In 1538 an embassy of German divines visited England with the design, among other things, of forming a common confession for the two countries. This proved impracticable, but the frequent conferences Cranmer had with the theologians composing the embassy had doubtless a great influence in modifying his views. He had not strength of conviction enough, however, to oppose out and out the reactionary statute of 1538, known as the Six Articles, or " whip with the six strings." Foxe and others following him have indeed asserted that he did so, but Hook shows that the archbishop was present at the first and secoud readings of the bill, and also when it received the royal assent, while the only method of opposing it was to have absented himself. No doubt he had and urged strong objections to it, but these raust have been overcome in the end by the arguments or the authority of the king. During the period between 1540 and 1543 the archbishop was engaged at the head of a commission in the revision of the "' Bishop's Book," or Znstz- tution of a Christian Man, and the preparation of the WVeces- sary Erudition, known as the " King's Book," which was

a modification of the former work in the direction of Roman Catholic doctrine. In 1543 was issued his translation of the Litany, which was substantially the same as that now in use, and shows his mastery of a rhythmical English style. In 1547 appeared the Homilies prepared under his direc- tion. Four of them are attributed to the archbishop himself—those on

Salvation, Faith, Good Works, and the Reading of Scripture. His translation of the German Catechism of Justus Jonas, known as Cranmer's Catechism, appeared in the following year. Important, as showing his views on a cardinal doctrine, was the Defence of the True and Catholic Doctrine of the Sacrament, which he published in 1550. It was immediately answered from the side of the "old learning" by Gardyner. From these and other works which need not be mentioned it is not difficult to fix Cranmer's theological position. It may be best described in general tens as that of the historical High Church party in the Church of England, of which indeed Cranmer may be regarded as one of the chief founders. Tran- substantiation was the discriminating doctrine between Romanists and Protestants in England, just as justification by faith was the discriminating doctrine in Germany ; and it is to be noted that Cranmer did not renounce the dogma until after the death of Henry VIII. Ultimately, after much thought and controversy, he rested content with the acceptance of the fact of real presence apart from any theory, whether of transubstantiation or consubstantiation ; and this course has proved satisfactory to the most eminent theologians of his school in the Church of England down to the present day. If it be added that, on the questions on which they differ from the Roman see, he would have found himself in substantial harmony with the Old Catholics of Germany, his views of ecclesiastical polity will be understood by most readers.

In what may be called the external work of the English Reformation, Cranmer's part was secondary, the principal agent being naturally Cromwell. The dissolution of the monasteries was the work of the minister, not of the arch- bishop ; but the latter showed a laudable zeal in trying to secure as much as possible of the confiscated monastic property for the benefit of religionand learning. Although the relations of Cranmer with Cromwell had never been very intimate, he was generous enough to intercede for the minister after his fallin June 1540. But with his usual weakness he did not persist in his intercession after he saw that the king was determined. In fact he was present in Parliament when the bill of attainder was read, and 60 consented to it.

The course taken by Cranmer in promoting the Reformation exposed him to the bitter hostility of the reactionary party or "men of the old learning," of whom Gardyner and Bonner were leaders, and on two occasions— in 1543

and 1545 —conspiracies were formed in the council to effect his overthrow. The king, however, remained true to him, and both conspiracies signally failed. It illustrates a favourable trait in the archbishop's character that he forgave all the conspirators, though he might doubtless have secured their punishment through his influence with the king. He was, as his secretary Morice testifies, "a man that delighted not in revenging."

Cranmer was present with Henry VIII. when he died (1547), and did his duty as spiritual adviser faithfully and kindly. By the will of the king he was nominated head of a council of regency composed of sixteen persons, but he acquiesced in the arrangement by which Somerset became lord protector. He officiated at the coronation of the boy king Edward VI., and instituted a significant change in the order of the ceremony, by which the right of the monarch to reign was made to appear to depena upon inheritance alone, without the concurrent consent of the people. The

fact deserves mention, as there are other indications that the archbishop was a firm believer in the doctrine of the " divine right."

During this reign the work of the Reformation made rapid progress, the sympathies both of the protector and of the young king being decidedly Protestant. Cranmer was therefore enabled without let or hindrance to complete the preparation of the church formularies, on which he had been for some time engaged. The first prayer-book of Edward VI. was finished in November 1548, and received legal sanction in January 1549 ; the second was completed and sanctioned in April 1552. The archbishop presided over the commissions that compiled them, and much of the work was done by himself personally. The forty-two articles of Edward VI. published in 1553 were based upon a German source, but they owe their form and style almost entirely to the hand of Cranmer. The last great under- taking in which he was employed was the revision of his codification of the canon law, which had been all but com- pleted before the death of Henry. The task was one eminently well suited to his powers, and the execution of it was marked by great skill in definition and arrange- ment. It never received any

~~authoritative sanction, Edward VI. dying before the proclamation establishing it could be made, and it remained unpublished until 1571, when a Latin translation by Dr Walter Haddon and Sir John Cheke appeared under the title Reformatio Legum Ecclesiasticarum. That it was never authorized is matter for satisfaction in view of the fact that it laid down the lawfulness and necessity of persecution to the death for heresy in the most absolute terms. That Cranmer in this matter practised what he preached, his conduct in the cases of Frith, Hewat, and others sufficiently testifies. If, how- ever, he was a persecutor both in theory and practice, it must be remembered that no one of any party in his day had grasped the principle of religious toleration.~~

~~Cranmer stood by the dying bed of Edward as he had stood by that of his father, and he there suffered himself to be persuaded to take a step against his own convictions which may be said to have sealed his doom. He had pledged himself to respect the testamentary disposition of Henry VIIL by which the succession devolved upon Mary, and now he violated his oath by signing Edward's " device" of the crown to Lady Jane Grey. On grounds of policy and morality alike the act was quite indefensible ; but it is perhaps some palliation of his perjury that it was committed to satisfy the last urgent wish of a dying man, and that he alone remained true to the " twelfth day queen," when the others who had with him signed Edward's device deserted her. On the accession of Mary he was summoned to the council, reprimanded for his conduct, and ordered to con- fine himself to his palace at Lambeth until the queen's pleasure was known. With a firmness unusual to his character he refused to follow the advice of his friends and avoid the fate that was clearly impending over him by flight to the Continent. Any chance of safety that lay in the friendliness of a strong party in the council was more than nullified by the bitter personal enmity of the queen, On the 14th September 1553 he was sent to the Tower, where Ridley and Latimer were also confined. The immediate occasion of his imprisonment was a strongly worded declara- tion he had written a few days previously against the mass, the celebration of which, he heard, had been re-established at Canterbury. He had not taken steps to publish this, but by some unknown' channel a copy reached the council, and it could not be ignored. In March 1554 he and his two illustrious fellow-prisoners were removed to Oxford, where they were confined in tlie Bocardo or common prison. Ridley and~~

~~Latimer were unflinching, and suffered bravely at the stake on the 16th October 1555; it was fated that~~

~~Cranmer was to reach the same end by a longer and Jess honourable path. It is impossible to give all the details of the intricate process against him, which at first involved the double charge of treason and heresy. Against the former of these he emphatically protested, and it was on the latter alone that he was ultimately condemned. The pontifical authority having been restored in England his case was tried by a Papal commissfon. At his first appearance before the court he protested against the jurisdiction of the bishop of Rome, both by a formal declaration and by the significant action of putting on his hat and standing upright before the Pope's commissioner, the bishop of Gloucester, after having bowed respectfully to the representative of the queen. On the expiration of eighty days from the issue of a summons to Rome, which of course it was not in his power to obey even had he been willing, he was excommunicated by a Papal consistory, and a commission was sent to England to degrade him from his office of archbishop. This was done with the usual humiliating ceremonies in Christ Church, Oxford, on the 14th February 1556, and he was then handed over to the secular power. But before the secular power did its last and worst, Cranmer was to inflict upon himself a degrada- tion deeper far than any that could be inflicted on him from without. The story of his recantations is so notorious as to be known to many who know almost nothing else of his life. Under the pressure of delusive promises by various agents, whose conduct cannot be too strongly condemned, he was induced to sign no less than six of these, each ampler and more abject in its terms than that which had gone before. The last was dated the 18th March. On the 20th Dr Cole, the provost of Eton, visited Cranmer in his prison with the view of ascertaining whether he remained steadfast in his new purpose, and he received what seemed a satisfactory answer. Next day, Saturday, the 21st March, he was taken to St Mary's Church, and asked to repeat his recantation in the hearing of the people as he had promised. To the surprise of all he declared with dignity and emphasis that what he had recently done troubled him more than anything he ever did or said in his whole life; that he renounced and refused all his recanta- tions as things written with his hand, contrary to the truth which he thought in his heart; and that as his hand had offended, his hand should be first burned when he came to the~~

fire. If, as Hook is inclined to think, he made this statement in the belief that his life wonld be spared if he persisted in his recantation, he seems all but entitled to the crown of martyrdom; if, as Macaulay maintains, he made it after learning that he was to die in any case, and that a lie would therefore serve him as little as the truth, then, as Macaulay says, he was no more a martyr than Dr Dodd. The question is important, but there are no materials for settling it definitely.

Immediately after his unexpected declaration he was led to the stake at the same place where Ridley and Latimer had sutfered a few months before. As he had said, his right hand was steadfastly exposed to the flames, and several times during the burning he was heard to exclaim with a loud voice, "This hand hath offended—this unworthy hand." The calm cheerfulness and resolution with which he met his fate show that he felt that he had cleared his conscience, and that his recavtation of his recantations was a repentance that needed not to be repented of.

It was a noble end to what, in spite of its besetting sin of infirmity of moral purpose, was a not ignoble life. He was often pitiably, sometimes criminally, weak, and never so much both as in his last days. The key to his character is well given in what Hooper said of him in a letter to Bullinger, that he was "too fearful about what might

happen to him." This weakness made him the tool of Henry in the most scandalous transactions of his reign, and the tool of Edward in what he knew to be an unjust alteration of the succession, aiid it robs him of his undis- puted claim to rank among the uoble army of martyrs. But while one may not admit that claim, there is a grandeur in the circumstances of his death, and especially in the incident of the voluntary burning of the right hand, which the popular instinct has not failed to appreciate as all but redeeming him from disgrace. It is only, however, a hero in life who can be in the true sense a martyr in death ; and the archbishop was as little the one as the other. And so 't is that brave old Latimer wears the crown, while the timid Cranmer passed through the same fiery gates into the city without the martyr's glory, though also without the apostate's shame.

See Foxe's Acts and Monuments (The Book of Martyrs), Strype's Memorials of Cranmer (1694), Anecdotes and Character of Arch- bishop Cranmer, by Ralph Morice, and two contemporary biographies (Camden Society's publications), Remains of Thomas Cranmer, by Jenkyns (1833), Lives of Cranmer by Gilpin (1784), Todd (1831), and Le Bas, and Hook's Lives of the Archbishops of Canterbury, vols. vi. and vii. (1868). (W. B.S.)

CRANNOGS (Celtic, crann, a tree), the term applied in Scotland and Ireland to the stockaded islands so numer- ous in ancient times in the lochs of both countries, The existence of these lake-dwellings in Scotland was first made known by Mr John Mackinlay, a fellow of the Society of Antiquaries of Scotland, in a letter sent to George Chalmers, the author of Caledonia, in 1813, describing two crannogs, or fortified islauds in Bute. The crannog of Lagore, the first discovered in Treland, was examined and described by Sir William Wilde in 1840, But it was not until after the discovery of the pile-villages of the Swiss lakes, in 1853, had drawn public attention to the subject of lake-dwellings, that the crannogs of Scotland and Ireland were systematically investigated. The results of these in- vestigations show that they resemble the Swiss lake-dwell- ings in nothing, except that they are placed in lakes. The crannog is a type of stronghold peculiar to Celtic countries. No example is known in England, although over a hundred have been examined and described in Ireland, and perhaps about half that number in Scotland. As a rule they have been constructed on islets or shallows in the lochs, which have been adapted for occupation, and fortified by single or double lines of stockaded defences drawn round the margin. To enlarge the area, or raise the surface level where that was necessary, layers of logs, brushwood, heather, and ferns were piled on the shallow, and consoli- dated with gravel aud stones. Over all there was laid a layer of earth, a floor of logs, or a pavement of flagstones. In rare instances the body of the work is entirely of stones, the stockaded defence and the huts within its inclosure being the only parts constructed of timber. Occasionally a bridge of logs, or a causeway of stones, formed a com- munication with the shore, but often the only means of getting to and from the island was by canoes. One or two of these hollowed out of a single tree are usually found in connection with a crannog. The stockade was commonly of piles of oak, but occasionally of pine, yow, or alder. Remains of huts of logs, or of wattled work, are often found within the inclosure.

~~Three crannogs in Dowalton Loch, Wigtonshire, examined by Lord Lovaine in 1863, were found to be constructed of layers of fern and birch and hazel branches, mixed with boulders, and penetrated by oak piles, while above all there was a surface layer of stones and soil. The remains of the stockade round the margin were of vertical piles mortised into horizontal bars, and secured by pegs in the mortise holes. The crannog of Cloonfinlough in Connaught had a triple stockade of oak piles connected by horizontal stretchers, and inclosing an~~

~~succeeding centuries.~~

~~area 130 feet in diameter, laid with trunks of oak tree . In the crannog of Lagore there were about 150 cartloads of bones, chiefly of oxen, deer, sheep, and swine, the refuse of the food of the occupants, The implements, utensils, and weapons found in the Scottish and Irish crannogs are usually of iron, or, if objects of bronze and stone are found, they are commonly such as were in use in the Iron age, differing in form and ornamentation from the relics of the Stone and Bronze ages. Stone celts are said in one or two instances to have occurred in Trish crannogs, but such in- stances are rare and exceptional, and no object of stone or bronze similar to those usually assigned to the Stone or Bronze age has been found in any crannog in Scotland. The objects usually found in the Irish crannogs are swords, spears, javelins, dagger-blades, knives, and axes of iron, mostly of the forms which are characteristic of the period of the Scandinavian invasions from the 9th to the 12th century. Besides these there are cauldrons, basins, and other utensils of thin hammered bronze; pins, brooches, and horse-trappings of cast-bronze; combs, pins, handles of im- plements, ornaments, and other objects of bone; pots, dishes, and bowls of coarse, unglazed, and hand-made pottery, often ornamented with zig-zag lines and rude im- pressed or incised patterns of crossed or parallel lines and triangular markings ; quernstones, whetstones, pestle-stones, round stone balls, &c. Few objects have been found in the Scottish crannogs except at Dowalton, which yielded basins of thin bronze, sorely clouted, part of a large cauldron, beads of glass and amber, and bracelets of vitre- ous paste, iron slag, crucibles, large hammer-heads of iron, quernstones, whetstones, and a~~

shoe of stamped leather. A saucepan of Roman make was found in the loch in the neighbourhood of the crannogs, but it is not certainly con- nected with any of them, Crannogs are frequently referred to in the Irish annals. Under the year 848 the Annals of the Four Masters record the burning of the island of Loch

| Gabhor (the crannog of Lagore), and the same stronghold

destroyed by the Danes in 933. Under is recorded that Turlough O'Connor from the crannog of Lough Leisi, and Many other entries occur in the In the register of the Privy Council of Scotland, April 14, 1608, it is ordered that "the haill houssis of defence, strongholds, and crannokis in the Yllis (the western isles) pertaining to Angus M'Conneill of Dunnyvaig and Hector M'Cloyne of Dowart sal be delyverit to His Majestie." Judging from the historical evidence of their late continuance, and from the character of the relics found in them, the crannogs of Scotland and Ireland may be regarded as the very latest class of prehis- toric strongholds, reaching their greatest development in early historic times, and surviving through the Middle Ages. In Ireland Sir William Wilde has assigned their range approximately to the period between the 9th and 16th centuries. See Lake DWELLINGs. ;

Wilde's Descriptive Catalogue of the Antiquities in the Museum

of the Royal Irish Academy, Article ""Crannogs," pp. 220, 238; Wakeman on " the Crannogs of it

Fermanagh" in the Journal of 1 Historical and Archeological Association of Ireland, 4th en 4, pais 305-314, 360-370 and 558-554 sea Notice of two Crannogs in Bute," by John Mackinlay, 1n the Proceedings of the Society of Antiquaries of Scotland, vol. 1. pp. 43-46 ; 'Scottish Artificial Islands or Crannogs," by John Stuart, Secretary of the Society of Antiquaries of Scotland, in their Proceedings, vol. vi. pp. 114-178 ; Catalogue of Antiquities ™m the National Museum of the Society of Antiquaries of Scotland, p. 60. (J. AN.) CRANTOR, a Greek philosopher of the Old Academy, famous as the first commentator on Plato, was born, probably about the middle of the 4th century, at Soli in Cilicia, and was a fellow pupil of Polemo in the school of Xenocrates at Athens. His poems, which are said to have been deposited in the temple of Athena at Soll, have

is noticed as again the year 1246 it made his escape

drowned his keepers.

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entirely perished ; but of his celebrated work On Grief numerous extracts have been preserved in Plutarch and in Cicero D Consolatione.

CRAPE is a silk fabric of a gauzy texture, having a peculiar crisp or crimpy appearance. It is woven of hard spun silk yarn 'in the gum" or natural condition. There are two distinct varieties of the textile—lst, soft, Canton, or Oriental crape, and 2d, hard or crisped crape. The wavy appearance of Canton crape results from the peculiar manner in which the weft is prepared, the yarn from two bobbins being twisted together in the reverse way. Tho fabric when woven is smooth and even, having no crepé appearance, but when the gum ia subsequently extracted by boiling it at once becomes soft, and the weft, losing its twist, gives the fabric the waved structure which constitutes iis distinguishing feature. Canton crapcs are used, either white or coloured, for ladies' scarves and shawls, bonnet trimmings, &c. The Chinese and Japanese excel in the manufacture of soft crapes, The crisp and elastic structure of hard crape is not produced either in the spinning or in the weaving, but is due to processes through which the gauze passes after it is woven. What the details of these processes are is known to only a few manufacturers, who so jealously guard their secret that, in some cases, the different stages in the manufacture are conducted in towns far removed from each other. Commercially they are dis- tinguished as single, double, three-ply, and four-ply crapes, according to the nature of the yarn used in their manufac- ture. They are almost exclusively dyed black and used in mourning dress, and among Roman Catholic communities for nuns' veils, &c. In Great Britain hard crapes are made at Braintree in Essex, Norwich, Yarmouth, Manchester, ond Glasgow.

CRASHAW, Ricaarp (1613-1650), the poet, styled 'the divine," was born in London in 1613. HIe was the son of a strongly anti-papistical divine, Dr William Crashaw, who distinguished himself, even in those times, by the exces- sive acerbity of his writings against the Catholics. Richard Crashaw

was originally put to school at Charter House, but in July 1631 he was admitted to Pembroke College, Cambridge, where he took the degree of B.A. in 1634, The publication of Herbert's Z'emple in 1633 seems to have finally determined the bias of his genius in favour of religious poetry, and next year he published his first book, Epgrammatum Sacrorum Inber, a volume of Latin verses. In March 1636 he removed to Peterhouse, and was made a fellow of that college in 1637. It was about this time that he made the acquaintance and secured the lasting friendship of Cowley. In 1641 he is said to have gone to Oxford, but only for a short time; for when in 1643 Cowley left Cambridge to seek a refuge at Oxford, Crashaw remained behind, and was forcibly ejected from his fellow- ship in1644 In the confusion of the civil wars he escaped to France, where he finally embraced the Catholic religion, towards which he had long been tending. During his exile his religious and secular poems were collected by an anony- mous friend, and published under the title of Steps to the Temple and The Delights of the Muses, in one volume, in 1646. Thissame year Cowley found him in great destitu- tion at Paris, and induced Queen Henrietta Maria to extend towards him what influence she still possessed. At her introduction he proceeded to Italy, where he became secretary at Rome to Cardinal Palotta. In 1648 he pub- lished two Latin hymns at Paris. He reinained until 1649 in the service of the cardinal, to whom he had a great personal attachment ; but his retinue contained persons whose violent and licentious behaviour were a source of ceaseless vexation to the seusitive English mystic. At last

| his supposed Mistress.

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his denunciation of their excesses became so public that the animosity of those persons was excited against him, and in order to shield him from their revenge, he was sent by the cardinal in 1650 to Loretto, where he was made a canon of the Holy House. In less than three weeks, how- ever, he sickened of fever, and died, not without gravo suspicion of having been poisoned. He was buried in the Lady Chapel at Loretto. A collection of his latest religious poems, entitled Carmen Deo Nostro, was brought out in 1652, dedicated at the dead poet's desire to the faithful friend of his sufferings, the countess of Denbigh. Crashaw excelled in all mauner of graceful accomplishments ;

besides being an excellent Latinist and Hellenist, he had an intimate knowledge of Italian and Spanish; and his skill in music, painting, and engraving was no less admired in his lifetime than his skill in poetry. Cowley embalmed his memory in an elegy that ranks among the very finest in our language, in which he, a Protestant, well expressed the feeling left on the minds of contemporaries by the charac- ter of the young Catholic poet : —

His faith, perhaps, in some nice tenets might

Be wrong ; his life, I'm sure, was in the right :

And J, myself, a Catholic will be,

So far at least, dear saint, to pray to thee !

The poetry of Crashaw will be best appreciated by thoso who can with most success free themseives from the bond- age of a traditional sense of the dignity of language. The custom of his age permitted the use of images and phrases which we now justly condemn as incongruous and unseemly, and the fervent fancy of Crashaw carried this licence to the most rococo excess. At the same time his verse is studded with fiery beauties and sudden felicities of language, unsurpassed by any lyrist between his own time and Shelley's. There is no religious poetry in English so full at once of gross and awkward images and imaginative touches of the most etherial beauty. The temper of his intellect seems to have been delicate and weak, fiery and uncertain; he has a morbid, almost hysterical, passion about him even when his ardour is most exquisitely ex- pressed, and his adoring addresses to the saints have an effeminate falsetto that makes them almost repulsive. The faults and beauties of his very peculiar style can be studied nowhere to more advantage than in the //ymn to Saint Theresa. Among the secular poems of Crashaw the best are ALusic's Duel, which deals with that strife between the musician and the nightingale which has inspired so many poets, from Strada down to Coppée, and Wishes to In his latest sacred poems, tho Carmen Dio Nostro, sudden and eminent beauties are not wanting, but the mysticism has become more pronounced, and the ecclesiastical mannerism more harsh and repellant. The themes of Crashaw's verse are as distinct as possible from those of Shelley's, but it

may, on the whole, be said that at his best moments he reminds the reader more closely of the author of Lpipsychidion than of any earlier or later

oet. Crashaw's works were first collected, in one volume, in 1858 by W. B. Turnbull. In 1872 an edition, in 2 vols. was printed for private subscription by the Rev. A. B. Grosart. (E, W. G.)

CRASSUS, Lucius Licinius (140-91 B.c.), a celebrated Roman orator most highly praised by Cicero. He com. menced his political career, at the age either of nineteen or of twenty-one, by bringing a charge against Carbo the friend of the Gracchi, who in consequence took poison. He took part in more than one of the most famous cases in the annals of Roman law, and attained a wonderful reputation. In 95 3.c. he became consul, and at the ex-piration of his term of office proconsul in Gaul. He was almost as much distinguished for his wealth and the

elegant luxury in which he indulged as for his eloquence and wit, jL=2

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CRASSUS, Maxcus Lictinivs, the triumvir, surnamed the Rich on account of his wealth, which he acquired by educating slaves and selling them at a high price, by work- ing silver mines, and by skilful purchases of land and houses. The proscription of Cinna obliged him to flee to Spain ; but after Ciuna's death he passed into Africa, and thence to Italy, where he ingratiated himself with Sulla, Having been sent against Spartacus, he gained a decisive victory, in which 12,000 of the rebels were killed, and was honoured with an ovation at his return. Soon afterwards he was elected consul with Pompey, 72 B.c., and he dis- played his opulence by entertaining the populace at 10,000 tables. He was afterwards censor, and he joined Pompey and Cxsar in forming the first triumvirate. As his love of riches was greater than his love of glory, Crassus was satisfied with the province of Syria, which promised to be an inexhaustible source of wealth. Having crossed the Euphrates he hastened to make himself master of Parthia ; but he was defeated and taken prisoner by Surena, the Parthian general, who put him to death by pouring molten gold down,his throat. His head was then cut off and sent to Orodes. See Roman History.

~~CRATES, of Athens, an Athenian actor and author of comedies of the 5th century B.c. He acted in the comedies of Cratinus ; and his own pieces are distinguished chiefly, first, by the fact that they did not depend for their interest upon political references, and secondly, by the fact that he introduced drunkards on the stage,—a class of characters that had never appeared there before, although very frequently after his time.~~

~~CRATES, of Mallus in Cilicia, a Greek grammarian and Stoic philosopher of the 2d century B.c., was leader of the literary school and head of the library of Pergamus. Almost the only event of his life with which we are acquainted is the visit which he made to Rome about 157 B.c. as ambassador of Attalus ITI., king of Pergamus, and which is said to have given an impulse to the study of Latin grammar. Crates wrote many works —commentaries on the Zheogony, Euripides, and Aristo- phanes, a treatise on the Attic dialect, and works on agriculture and geography,—but some suppose the geo- grapher to have been a different person.~~

~~CRATES, of Thebes, a Cynic philosopher of the 4th century B.c., was a pupil of Diogenes, whose extreme cynicism he rivalled. He gave up his large fortune, directing the banker to whom he intrusted it to give it to his sons if they should prove fools, but to the poor if bis sons should prove philosophers. He besides attacked all who did not follow his example, not scrupling to force himself into their houses, and thus he gained the nickname of the "door-opener." Poor and ugly as he was, he gained the affection of a young woman of good family, Hip- parchia, who refused to marry the most eligible suitors, for his sake threatened to commit suicide, and at last was allowed by her parents to become his wife. Crates was the author of a number of philosophical letters; but those published under his name among the Aldine classics and by Boissonade are not genuine.~~

~~CRATINUS (519-423 3.c.), one of the greatest of the Athenian masters of comedy. Our knowledge of his personal history consists of only one or two facts :—he was the son of a certain Callimedes ; he was triarch of the fEnean tribe ; he died in 423 B.c., at the age (Lucian tells us) of ninety-seven ; and the end of his life was devoted to drinking. His comedies also are now lost, with the~~

~~exception of small fragments; but as to their character |~~

his contemporaries are in general agreement. They were distinguished by their direct and vigorous political satire, a marked exception being the burlesque Odvoceis, which was probably written while a law was in force forbidding

all political references on the stage, and which is also remarkable for the absence of the chorus. Persius calls their author "the bold ;" and even Pericles, when at the height of his power, did not escape their vehement attacks. Of his last comedy the plot has come down to us. It was occasioned by the sneers of Aristophanes and others who declared that he was no better than a doting drunkard. Roused by the taunt Cratinus put forth all his strength, and in 423 B.c. produced the Ilurivy, or Bottle, which so completely vindicated his powers that he gained the first prize, and triumphed over the Clouds of Aristophanes. This victory, however, was very possibly determined partly by other than artistic considerations, for Aristophanes would have to struggle against the influence of the sophists, the rhetoricians, and the disciples of Socrates. In this comedy, good-humouredly making fun of his own weakness, Cratinus represents the comic muse as the faithful wife of his youth. His guilty fondness for a rival —the bottle—-has aroused her jealousy. She demands a divorce from the archon; but her husband's love is not dead, and he returns penitent to her side. The style of Cratinus has been likened to that of Aischylus; and Aristophanes, in the Knights, compares him to a rushing torrent. He appears to have been fond of lofty diction and bold figures, and he was most successful in the lyrical parts of his dramas, his choruses being the popular festal

| songs of his day. Cratinus is said to have been the first to fix the number of actors at three; but the statement is

very doubtful, for Aristotle says that in his time the author of the rule was not known.

CRATIPPUS, a Peripatetic philosopher, belonging to Mytilene, was contemporary with Cicero, whose son he taught at Athens, and by whom he is praised in the Do Ofciis as the greatest of his school. He was also the friend of Pompey, whose flight after the battle of Pharsalia he shared, for the purpose, it is said, of convinc- ing him of the justice of providence ; and Brutus, while at Athens after the assassination of Cesar, attended his

lectures. The only work attributed to Cratippus is a treatise on divination. His view of the subject is given by Cicero in the De Devinatione (i. 32). He seems to have held that, while motion, sense, and appetite cannot exist apart from the body, thought reaches its greatest power when most free from bodily influence, and that divination is due to the direct action of the divine mind on that faculty of the human soul which is not dependent on the body.

CRATIPPUS, a coutemporary of Thucydides, to whose history he made considerable additions, filling in omissions and continuing it to the time of Conon,

CRAUFORD, Quentin (1743-1819), an English author. In early life he went to India, where he entered the British army, and on the conclusion of peace devoted himself to commerce. Returning to Europe before the age of forty with a handsome fortune, he settled at Paris, where he gave himself to the cultivation of literature and art, and formed a good library and collection of paintings, coins, and other objects of antiquarian interest, and where he remained till his death, with the exception of ten years from the out- preak of the Revolution to the Peace of Amiens.

He wrote, among other works, The History, Religion, Learning, and Manners of the Hindus (London, 1790), Researches Concerning the Laws, Theology, Learning, and Commerce of Ancient and Modern India (1817), History of the Bastille (London, 1792), On Pericles and the Arts in Greece, Essay on Swift and his Influence

on the British Government, Notice sur Marie Antoinette, with whom,

he had personal acquaintance (Paris 1809), Mémotres de Mme. du Lausset.

CRAWFORD, Tuomas (1814-1857), American sculptor, was born of Irish parents at New York, March 22, 1814. He showed at an early age great taste for art, and learnt to draw and to carve in wood. In his nineteenth year he

entered the studio of a firm of monumental sculptors in his |

~~native city ; and at the age of twenty he went to Rome and became a pupil of Thorwaldsen. The first work which made him generally known as a man of genius was his group of Orpheus entering Hades in Search of Eurydice, executed in 1839. 'This was followed by other poetical sculptures, among which were the Babes in the Wood, Flora, Hebe and Ganymede, Sappho, Vesta, the Dancers, and the Hunter. Among his statues and busts are especially noteworthy the bust of Josiah Quincy, executed for Harvard University (now in the Boston Athenxum), the equestrian statue of Washington at Richmond, Virginia, the statue of Beethoven in the Boston music hall, statues of Channing and Henry Clay, and the colossal figure of Armed Liberty for the Capitol at Washington. For this building he executed also the figures for the pediment and the bronze doors. The groups of the pediment symbolize the progress of civilization in America. Crawford's works include a large number of bas-reliefs of Scriptural subjects taken from both the Old and the New Testaments. He made Rome his home, but he visited several times his native land,—first in 1844, in which year he married, next in 1849, and lastly in 1856. His studio at Rome was very attractive to visitors, and for some time he ranked as sculptor next after Gibson. His works always bore the stamp of original invention and freshness of thought, although in execution they were open to criticism. During his last years he suffered from a tumour on the brain, which deprived him of sight; and he was compelled to leave many works unfinished. He sought relief at Paris and in London, but in vain, and died in London on the 10th of October 1857.~~

~~CRAWEURD, Jonn (1783-1868), a Scottish author, was born in the island of Islay, Scotland. After studying at~~

~~Edinburgh he became surgeon in the East India Company's—~~

~~service. He afterwards resided for some time at Penang, and he was from 1811 to 1817 British representative at Java. In 1821 he served as envoy to Siam and Cochin- China, and in 1823 became governor of Singapore. In 1861 he was elected president of the Ethnological Society.~~

~~He wrote a History of the Indian Archipelago (1820), Deseriptive Dictionary of the Indian Islands and Adjacent Countries (1856), Journal of an Embassy to the Court of Ava in 1827 (1829), Journal of an Embassy to~~

~~the Courts of Siam and Cochin-China, cahibiting a view of the actual State of these Kingdoms (1830), Inquiry into the System of Taxation in India, Letters on the Interior of India, an attack on the newspaper stamp-tax and the duty on paper entitled Taxes on Knowledge (1836), and a valuable Malay grammar and dictionary (1852).~~

~~CRAYER, Gasparp DE (1582-1669), was born at Antwerp, and learnt the art of painting from Raphael Coxcie. He matriculated in the guild of St Luke at Brussels in 1607, resided in the capital of Brabant till after 1660, and finally settled at Ghent. Amongst the numerous pictures which he painted in the last of these cities, one in the town museum represents the Martyrdom of St Blaise, and bears the inscription A° 1668 zt. 86. Crayer, one of the most productive yet one of the most conscientious artists of the later Flemish school, was second to Rubens in vigour and below Vandyck in refinement; but he very nearly equalled both in most of the essentials of painting ; and it is probably true, as stated by modern critics, that his fame was unfairly overshadowed by that of two great con- temporaries with whom he was on terms of intimacy. He was well known and always well treated by Albert and Isabella, governors of the Netherlands. The Cardinal-Infant Ferdinand made him a court-painter. His pictures abound in the churches and museums of Brussels and Ghent; and there is scarcely a country chapel in Flanders or Brabant that cannot boast of one or more of his canvases.~~

~~and some important pictures of his composition are to be found as far south as Aix in Provence, and as far east as Amberg in the Upper Palatinate. His skill as a decorative artist is shown in the panels executed for a triumphal arch at the entry of Cardinal Ferdinand into the Flemish capital, some of which are publicly exhibited in the museum of Ghent. Crayer died at Ghent. His best works are the Miraculous Draught of Fishes in the Gallery of Brussels, the Judgment of Solomon in the Gallery of Ghent, and Madonnas with Saints in the Louvre, the Munich Pinakothek, and the Belvedere at Vienna. His portrait by Vandyck was engraved by P. Pontius.~~

~~CRAYON, a coloured material for drawing, employed generally in the form of pencils, but sometimes also as a powder, and consisting of native earthy and stony friabie substances, or of artificially prepared mixtures of a base~~

of pipe or China clay with Prussian blue, orpiment vermilion, umber, and other pigments. Calcined gypsum, talc, and compounds of magnesium, bismuth, and lead are occasionally used as bases. The required shades of tints are obtained by adding varying amounts of colouring matter to equal quan- tities cf the base. The ingredients of crayons or 'pastils are niade into a paste with gum, turpentine, or alcoholic solution of shellac, and pulverized as finely as possible in a mill, which subjects them repeatedly to the action of a revolving cast-iron grinder. 'The paste is introduced into a copper cylinder, closed at one end bya plate picrced with holes of the diameter of the crayons to be made. Through these it is forced by means of a piston, and the vermicular pieces obtained are then cut into the required lengths, and dried in a furnace at a gentle heat. Black crayons may be manufactured from a mixture of one part of lamp-black with about two-thirds of its bulk of clay ; red crayons from powdered and clutriated hematite worked up into a paste with gum arabic and a little soap. White crayons are commonly formed by sawing chalk of good quality into convenient shapes. Mixtures of soap, wax, and lamp- black are employed for lithographic crayons or chalks. The late well-known zoological lithographer, George Ford, employed chalks made after the following receipt :—

Yellow wax, 32 0z. Curd soap, 9 2a Mutton tallow, : : : Ae Washing soda (dissolved in 7 oz.

water), . A . ibe

Paris black (sifted), . : : ao. The wax is gradually incorporated with the melted soap by heating, and as the resultant mass begins to burn, the suda is added ; afterwards the black is by degrees stirred in. The melted tallow may be added at any stage in the operation.

Crayons are valuable to the artist in enabling him to make groupings of colours and to secure landscape and other effects with ease and rapidity. The outline as well as the rest of the picture is drawn in crayon. The colours are softened off and blended by the finger, with the assistance of a stump of leather or paper ; and shading is produced by cross-hatching and stippling. The paper employed is of loose but not soft or spongy texture, and is of various tints, warm grey or yellowish being generally preferred. or portraits

pumice-paper and red or brown crayons are cou- sidered most suitable. The colours are fixed by the pro- cess known as transudation. The drawing is supported face downwards by its edges or corners, and a solution of isinglass is applied to the back with a brush in quantity sufficient to penetrate to the coloured surface of the paper, which may then be turned upwards to dry. The fixing solution is prepared as follows :—three-quarters of an ounce of isinglass is infused for a day in 2} ounce of pure vinegar; a pint of hot water is added, and the solution of

But he was equally respected beyond his native country: | isinglass is filtered and mixed with an equal volume of

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spirits of wine, The art of painting in crayons or pastils is supposed to have originated in Germany in the 17th century. By Johann Alexander Thiele (1685-1752) it was carried to great perfection, and in France it was early practised with much success. Amongst celebrated crayon- painters may be mentioned Carriera Rosalba (1675-1757), W. Hoare (1707-1792), F. Cotes (1726-1770), J. Russell (1744-1806), and the late Mr Bright.

CREAM OF TARTAR, acid potassium tartrate, or "bitar- trate of potash," HKC,0,H,, is obtained from argol or crude tartar, the crust or deposit formed by wines in bottles and casks in which they are undergoing fermentation. Red are usually richer in argol than white wines. A ton of grapes yields, according to the nature of the fruit, quantities vary- ing between 1 and 2 Ib of argol, of which, in good samples, an average of about 83 per cent. is cream of tartar. French red wines examined by M. Fauré contained from '06664 to '19728 per cent. by weight of this salt, and white wines from '09172 to '15208 per cent. ; M. Jacob found from '7 to 1:201 grammes per litre in the wines of Tonnerre. The manufacture of cream of tartar is conducted as follows. Ground granulated argol is wetted and then dis- solved in water at a temperature of 100° C. ; after two or three days, during which insoluble impurities subside, the clear liquid is drawn off into earthen vessels. The crystals it deposits are re-dissolved in boiling water holding finely comminuted pipe-clay and auimal-charcoal in suspension.

The solution after standing till a thin film of crystals appears on its surface is run into conical coolers, the sides of which become in eight or nine days coated with fine clear crystals, colouring matters having been precipitated by the clay and charcoal. The crystals are then bleached and dried by exposure to sunlight and air. In Venice the impurities of the crude tartar are separated by repeated crystallizations, and finally by adding white of egg and wood-ashes to the boiling solution, and removing the scum formed. The name " cream of tartar " was originally given to the crust of minute pure white crystals formed on the surface of cooling solutions. Cream of tartar is a colour- less, transparent salt, crystallizing in four-sided prisms belonging to the trimetric system, and having a specific gravity of about 1:96. Itis precipitated when a potassium salt is added to a solution of free tartaric acid. It is soluble in alkalies, alkaline carbonates, and mineral acids, but insoluble in acetic acid and alcohol. Its insolubility in the last-mentioned is the cause of its separation from wines as they mature. One part by weight of the salt is soluble at 0° C. in about 416 (Chancel), and at 100°C. in about fifteen parts of water. The solution has an acid reaction, and dissolves many metallic oxides, furnishing double tartrates. When heated, "ream of tartar is decom- posed, with the formation of potassium carbonate (the sal

Jizum tartarv of the older chemists) and carbon, inflammable

gases possessing an odour of burnt bread being at the same time evolved. Potassium carbonate is produced also when the salt is kept moist or in solution for some years. Cream of tartar—potasse tartras acida—is used in medicine as a refrigerant, diuretic, and mild purgative; in dyeing as a mordant for wool; in the manufacture of tartaric acid and potassium carbonate ; and with powdered chalk and alum for cleaning silver. Jtochelle salt, KNaC,0,H,, is made by ueutralizing cream of tartar with sodium carbonate; tartar emetic, K(SbO)C,O,H,, by boiling it with three-fourths of its weight of antimony trioxide, filtering the hot solution, and crystallizing. Black flux, the result of the incineration of tartar is much employed in assaying, and may be prepared by deflagrating two or three parts of the salt with one of nitre; for white flux equal weights of the two salts are required. 'Tartars, even those intended for the manu- facture of tartaric acid, should be free from any considerable

quantity of calcium tartrate, as the moisture of the air soon converts that salt into calcium carbonate. The substances most used to adulterate cream of tartar are calcium chloride and sulphate, and the chloride and acid sulphate of potassium.

CREASOTE, Creosote, or KREAsove (xpéas, flesh, and cole, to save), isa product of the distillation of wood-tar, more especially that made from beech-wood ; tar from the wood of conifers contains it in but small quantity. Tho distillation of the tar is carried on till only a thick pitchy substance is left. From the lowermost layer of the distillate is obtained by the action of sodium carbonate a yellowish oil, the heavier part of which is isolated by rectification in a glass retort, and mixed with potash solution to dissolve out itscreasote. The creasote is separated from the filtered potash solution by sulphuric acid, is distilled with alkaline water, and again treated with potash and acid, till its purification is effected ; it is tlen distilled at 200° C. (392° Fahr.), and dried by means of calcium chloride. Creasote is a highly refractive, colourless, oily liquid, first obtained by Reichenbach, in 1832, from beech-wood tar. It con- sists mainly of a mixture of the compounds—phenol, C,H,.OH, cresol, C,H,.CH,.0OH, phlorol, C,H.(CH,),.OH, guaiacol, C,H,.OCH,.OH, andcreosol, C,H;.CH;.0CH,.OH. The so-called coal-tar creasote is more or less impure carbolic acid, containing paracresol and other bodies, Creasote has a strong odour and hot taste, is a non-con-ductor of electricity, and burns with a smoky flame. Its specific gravity is 1037 at 20° C. ; its boiling point is 203° C. (397° Fahr.); and it is still liquid at-27° C. (16°6° Fahr.) Rhenish creasote can be distilled for tho most part between 199° and 208° C., giving a liquid of specific gravity 1077 at 14°C. Creasote dissolves sul phur, phosphorus, resins, and many acids and colouring matters ; and is soluble in alcohol, ether, and carbon disulphide, and in 80 parts by volume of water. It is distinguished from carbolic acid or pheno] by the following qualities :—it turns the plane of a ray of polarized light to the right, forms with collodion a transparent fluid, and is nearly insoluble in glycerine; whereas carbolic acid has no effect on polarized light, gives with about two-thirds of its volume of collodion a gelatinous mass, and is soluble in all proportions in glycerine; further, alcohol and ferric chloride produce with creasote a green solution, turned brown by water, with carbolic acid a brown, aud on the addition of water a blue solution. Creasote, like carbolic acid, is a powerful antiseptic, and readily

coagulates albuminous matter ; wood-smoke and pyroligneous acid or wood-vinegar owe to its presence their efficacy in preserving animal and vegetable substances from putrefaction. Creasote is given in medicine combined with acetic acid, syrup, spirit of juniper, and water. In small quantities it acts as a sedative of the stomach, but in over-doses it is a violent poison, causing severe pain in the abdomen, nausea, headache, giddiness, and stupor. It is administered in cases of vomiting, diarrhœa, cholera, intestinal bleeding, and chronic gleet, and to assuage hunger and thirst in diabetes ; in the form of a gargle it is of service m excessive salivation, and its vapour, mixed with that of water, is sometimes recommended for inhalation. Externally it is applied as a stimulant and styptic, and for the treatment of decayed teeth ; and an ointment containing it is used as a remedy for ring-worm. Creasote is also employed for preserving timber from dry-rot, and for the curing of fish and hams. The principal supplies of creasote are brought from Arch- angel, Stockholm, and America.

CREBILLON, Criauve Prosper Jotyor (1707-1777), a French novelist and wit of the 18th century, was the only son of Crébillon, the tragic poet. His life was spent at Paris, except about five years, during which, on account

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of certain politicai references made in his novels, he was first imprisoned and afterwards forced to live in exile in England and elsewhere. He married an English lady of noble family, Lady Stafford, who is said to have been captivated by his person and his books, and to have offered herself as his bride. Their life is said to have been passed in much affection and mutual fidelity ; and it would be unjust to judge Crébillon's private life from his novels, the immorality of which is not surpassed in literature. For some years Crébillon held the incongruous office of c

ensor.

CREBILLON, Prosper Jozyot pe (1674-1762), a famous French tragic poet, was born at Dijon, where his father was notary-royal. Having been

~~educated at the Jesuits' school of the town, and at the Collége Mazarin, he became an advocate, and was placed in the office of a lawyer named Prieur at Paris. The encouragement of his master, an old friend of Scarron's, induced him to continue with more serious intention his youthful habit of rhyming, and he soon produced a Mort des Enfants de Brutus, which, how-ever, he failed to bring upon the stage. But in 1705 he succeeded with IJdoménée, the representation of which gained him considerable fame ; in 1707 his Atrée et Thyeste was repeatedly acted at court; and in 1711 he produced his finest play, the Rhadamiste et Zénobie, which is one of the masterpieces of the French classical tragedy. But his Xerxes (1714) was only once played, and his Sémiramis was an absolute failure. Meanwhile, in 1707, Crébillon had married a girl without fortune, who had since died, leaving him an infant son. HIs father also had died, in- solvent. HIs three years' attendance at court had been fruitless. Envy had circulated innumerable slanders against him. Oppressed with melancholy, he removed to a garret, where he surrounded himself with a number of dogs, cats, and ravens, which he had befriended ; he became utterly careless of cleanliness or food, and solaced himself with constant smoking. But in 1731 he was elected raember of the French Academy ; in 1735 he was appointed royal censor; and in 1745 Mme. de Pompadour, in her enmity to his rival Voltaire, presented him with a pension of 1000 francs and a post in the royal library. In 1748 his Clatilina was played with great success before the court ; and in 1754, eight years before his death, appeared his last tragedy, Le Triumvirat. Such was the rivalry of Voltaire, that to prove his own superiority he took the subjects of no less than five of Crébillon's tragedies —Sémiramis, Electre, Catilina, Le Triumvirat, Atrée—as subjects for tragedies of his own. For vigour and passion Creébillon is unsur- passed in the French classical drama ; his faults are want of culture and the consequent absence of classical correct- uiess, and a want of care which displays itself in his style and even in the mechanism of his verse.~~

~~See D'Alembert, Zloge de Crébillon; La HIarpe, Littérature ; L'Abbé de la Porte, Biographie de Crébillon. There are numerous editions of his works.~~

~~CRECY, or Cressy, a town of France, department of Somme, on the Maye, 12 miles N. by E. of Abbeville ; though an ancient place it has now only about 1300 inhabitants. It is famous in history for the great victory gained~~

here on the 26th of August 1346 by Edward III, with about 30,000 men, over the French of Philip of Valois, said to be 100,000 strong, commanded by the Comte d'Alengon. of Bohemia, fighting for France, were slain in the battle. Here it was that the Black Prince gained his spurs, and that he adopted the triple feather crest of the fallen Bohemian king, with the motto Zch Dien, still worn by our princes of Wales. This battle was one of the earliest in which cannon were used by the English. This Crécy must not be mistaken for another small town of the same name

The flower of French chivalry, and the king |

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in the department of Seine-et-Marne, on the Grand Morin, 25 miles east of Paris, also an ancient place formerly forti- fied with double ramparts and towers.

CREDI, Lorenzo pi (1459-1537), was the least gifted of three artists who began life as journeymen with Andrea del Verrocchio at Florence. Though he was the companion and friend of Leonardo da Vinci and Perugino, and closely allied in style to both, he had neither the genius of the one nor the facility of the other. We admire in Da Vinci's heads a heavenly contentment and smile, im his technical execution great gloss and smoothness of finish. Credi's faces disclose a smiling beatitude ; his pigments have the polish of enamel. But Da Vinci imparted life to his creations and modulation to his colours, and these are qualities which hardly existed in Credi. Perugino displayed a well-known form of tenderness in heads, moulded on the models of the old Umbrian school. Peculiarities of movement and attitude become stereotyped in his com- positions ; but when put on his mettle, he could still ex- hibit power, passion, pathos. Credi often repeated himself in Perugino's way ; but being of a pious and resigned spirit, he generally embodied in his pictures a feeling which is yielding and gentle to the verge of colduess. Credi had a respectable local practice at Florence. He was consulted on most occasions when the opinion of his profession was required on public grounds, eg., in 1491 as to the fronting, and in 1498 as to the lantern of the Florentine Cathedral, in 1504 as to the place due to Michelangelo's David. He never painted frescoes ; at rare intervals only he produced large ecclesiastical pictures. The greater part of his time was spent on easel

pieces upon which ho expended minute and patieut labour. But he worked with such industry that numbers of his Madonnas exist in European galleries. 'The best of his altar-pieces is that which represents the Virgin and Child with Saints in the cathedral of Pistoia. A fine example of his easel rounds is in the gallery of Mayence. Credi rivalled Fra Bartolommeo in his attachment to Savonarola; but he felt no inclination for the retirement ofa monastery. Still, in his old age, and after he had outlived the perils of the siege of Florence (1527), he withdrew on an annuity into the hospital of Santa Maria Nuova, where he died,

CREDIT FONCIER anp CREDIT MOBILJER are finance institutions, which had their origin in the joint-stock speculation and sanguine promotion of public works which marked many years of the second empire in France, and to which the introduction of limited liability in England had given a great stimulus on the British side of the Channel. The parent institutions in Paris were followed by similar establishments in some other capitals. As tho terms imply, the crédit foncier contemplates loans and advances on real securities, and the crédit mobilier on what is called with us personal or movable estate. Whether such limits and distinctions have been ever strictly observed in the practical working of these credit banks is doubtful. The crédit mobilier of France has had a more unfortunate experience than the crédit foncier, though the latter has by no means sustained the promise of its early years. While the mania of launching new projects continued, enormous profits were made, which could only be the result of heavy promotion charges, and the shares rose in value with the extraordinary liberality of the dividends. But the system of business pursued had the result of mixing the credit banks very closely with the various companies and undertakings they were promoting, and of throwing back upon them a growing mass of depreciated or unsaleable securities ; while the abatement or eollapse of speculation restricted the business from which the main part of the former income had been derived, 'The rates of dividend and the value of the

shares consequently fell as rapidly as they had risen. This has been the practical experience of the crédit foncier and the crédit mobilier of France,

which were the first, and remain the greatest examples of the finance companies so named, The crédit foncier of England (there has been no crédit mobilier in London) has had much the same course as the French companies; large profits for a few years were followed by increasing difficulties, and the locking up of large amounts of capital in hopeless undertakings. The Imperial Land Company of Marseilles has absorbed £260,000, the Santiago and Carril Railway £193,000, and both are failures. The directors in these circumstances have been applying the annual profits to a reserve fund, and addressing themselves to a class of loans and advances on securities differing little from that of ordinary bankers and many finance companies under various names.

CREDITON, a market town of England, county of Devon, on the Creedy, near its junction with the Exe, eight miles north-west of Exeter. Population (1871), 4222. It is situated in a narrow vale, between two steep hills, and is divided into two parts, the east or old town, and the west or new town. The church, formerly collegiate, is a noble edifice, in the later Pointed style, with a fine tower 100 feet in height springing from the centre. There are places of worship for Baptists, Independents, Metho- dists, and Unitarians, a free grammar school with exhi- bitions to both universities, blue-coat, national, and infant schools, a mechanics' institution, a public library, and a newsroom. There were formerly extensive woollen and serge inanufactories there, but the inhabitants are now chiefly engaged in shoemaking and agriculture. Crediton was the birthplace, about 680, of the Anglo-Saxon Winfrid, better known as St Boniface, "the Apostle of Germany." It returned two members to the Parliament at Carlisle in the reign of Edward L., and from 909 to 1049 was the seat of a bishopric, which was afterwards removed to Exeter. Fairfax with Cromwell took possession of Crediton in 1645. The present modern appearance of the town is mainly due to the removal of the old houses by fires which occurred in 1743 and 1769.

CREECH, Tuomas (1659-1701), an English translator from the classics, was born at Blandford near Sherborne in Dorsetshire. He studied at Wadham College, Oxford, and obtained a fellowship first in that college and after- wards at All Souls', In 1699 he received a college living, but not more than two years after he hanged himself. The immediate cause of the

act was not improbably a money difficulty, though according to some it was a love disappointment ; but Creech was naturally of a melancholic temper. Creech's fame rests on his translation of Lucre- tius, in which, according to Otway, the pure ore of the original " somewhat seems refined." But in truth the commonplace equability of its rhymed heroic couplets, the chief merit of which is their straightforward simplicity, is very far from being an adequate translation of the powerful poetry of Lucretius ; and even the easy mechanism of the rhyme is faulty in innumerable cases, Creech's version of Horace, which is still less adequate, was a failure from the first. He also translated the Zdylls of Theocritus, the Thirteenth Satire of Juvenal, the Astronomicon of Manilius, and parts of Plutarch, Virgil, and Ovid. Creech's edition of the text of Lucretius, with notes borrowed from Lamtinus and Faber, has been much used.

CREEDS, or ConFEssions oF Farry, may be defined as authorized formularies of Christian doctrine. The three ancient or, as they are sometimes called, cecumenical creeds are the most important, although the briefest, of such documents, and mairly call for attention in such an article as this. The more detailed confessions since the time of the Reformation will also be enumerated. But

their special description belongs to the history of theology, or what the Germans call "Symbolik." Our aim is not to deal with the substance or theological import of the creeds, but only to present to the reader the most recent and satisfactory information as to their origin, history, and acceptance by the church.

Creeds are a gradual growth in the history of the Christian church, but their rudiments may be said to have existed from its first foundation,—from the answer of St Peter to our Lord, when asked " Whom do men say that I am?" 'Thou art the Christ" (Mark viii. 27-29) ; or the statement of St Paul in the Epistle to the Romans (x. 9), "Tf thou shalt confess with thy mouth the Lord Jesus, and shalt believe in thine heart that God hath raised HIm from the dead, thou shalt be saved." All subsequent confessions of faith are in fact more or less expanded developments of the original baptismal formula, derived from the cominission given by Christ to the apostles in the conclusion of St Matthew's Gospel (xxviii. 19):—"Go ye therefore and

~~teach (make disciples of) all nations, baptizing them an the name of the Father, and of the Son, and of the Holy Ghost." ¥rom this simple acknowledgment of the threefold Name, possibly from the still simpler acknow- ledgment of Jesus as "the Christ" or Messiah, have sprung all the more elaborate credenda of the Christian church.~~

~~I. Writers on the creeds have professed to find in the later writings of the New Testament traces of a more definite summary of belief: as in the allusions of the 2d Epistle to Timothy (i. 18) toa "form of sound words;" and "the deposit," or "good deposit," which was to. be kept (1 Tim, vi. 20; 2 Tim. i. 14); also in the "faithful words" or "sayings" enumerated in the first and second of these epistles (1 Tim. i. 15; ii 1; iv. 8,9; 2 Tim. ii, 11), and a remarkable passage in the opening of the sixth chapter of the Epistle to the Hebrews. But it may be questioned how far any of these passages have anything beyond a general meaning. It must certainly be held doubtful whether, supposing they did point to any articles of faith beyond the original statement of the baptismal formula, they could be held to apply to the first apostolic age. All such inferences are two-edged,—the presuimption of arti- culated dogma in any part of the New Testament Scriptures being one of the strongest evidences of the later or non- apostolic origin of these Scriptures.~~

~~It is not till a much later age—the age of Irenzeus and Tertullian (175-200)—that we meet with any definite summaries of Christian belief. We may presume, and rightfully presume, that such summaries existed before, and were even rendered to the candidates for baptism under the form of Vraditio Symbolc ; but no such summaries are traceable in Christian literature before this period. Not to speak of the doubtful genuineness of the writings appealed to—such as the alleged Epistle of Ignatius to the Trallians (c. iv)—it is admitted by those most anxious 'to demonstrate that from the earliest times there existed some form of words in the church of the character of a creed," that the passages quoted either from the writings of the Apostolic Fathers or of Justin Martyr, "do not seem to have been meant to be used in this way, if we take them in conjunction with their context" (Lumby's History of the Creeds, p. 12). "Some fancy," says Bingham (Origines, b. x. c. iv), "that the creed may be found in the writings of Ignatius, Clemens Romanus, Polycarp, and Justin Martyr. But Bishop Pearson has rightly~~

~~observed that these writers, however they may incidentally mention some articles of faith, do not formally deliver any rule of faith used in their times."~~

~~It is not, then, till a good deal more than a century after the death of St Paul and only somewhat less than a~~

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~~century after the death of St John, that we meet with any definite summaries of dogmatic belief in Christian literature, and even then there is no evidence that these summaries had any authoritative character. They expressed, no doubt, the belief of the churches to which the writers belonged ; but half a century after the time of Irenzus (250), it is evident from the statements of Cyprian, then bishop of~~

~~Carthage, that the baptismal creed of the North African |~~

~~Church, which was at this period more dogmatic in its tendencies than any other church in the East or the West, was of a comparatively brief character. The passage of Cyprian is found in one of his letters (Zp. 76), addressed "to Magnus, his son," on baptizing the Novatians, and implies plainly that the only addition to the original baptismal formula which had then obtained any authority in the Church of Carthage, was a clause as follows—" Dost thou believe in the remission of sins and eternal life through the holy church?" 1—a clause of interrogation which, he adds, they (the Novatians) could not honestly answer "because they have no church."~~

~~The creed which is found in the well-known treatise of Trenzeus against Heresies (Adv. Hcereses) in three different forms (i. 10, iii. 4, iv. 33) is of a far more elaborate character even in its simplest form, which is all that can be quoted here. It particularizes on the part of the true or spiritual disciple a "complete faith (aéoris 6AéKAypos) in one God Almighty, of whom are all things; and in the Son of God, Jesus Christ our Lord, by whom are all~~

things, and His dispensations by which the Son of God became man ; also a firm trust in the Spirit of God, who hath set forth the dispensations of the Father and the Son, dwelling with each successive race of men, as the Father willed" (iv. 33, §7). The creed of Tertullian is also found in three several forms in his writings—(1) De Preescript. Heeret., c. xiii. ; (2) De Virg. Veland., c. i.; (3) Adv. Prax., c. ii.),—in the first mentioned of these writings in a more detailed form than in the others. The shortest of the three, or the creed in the treatise De Virginibus Velandis, may be held to be the most primitive in form. We give it as an abbre- viated specimen of the others. "' Therule of faith is indeed altogether one, irremovable, and irreformable—the rule, to wit, of believing in one only God omnipotent, the Maker of the universe, and His Son Jesus Christ, born of the Virgin Mary, crucified under Pontius Pilate, raised again from the dead on the third day, received in the heavens, sitting now at the right hand of the Father, about to come to judge the quick and the dead through the resurrection of the flesi as well [as of the spirit]."

In the preface to Origen's great work De Principws there is also a summary of articles of faith professing to have been "clearly delivered in the teaching of the apostles," which, no doubt, fairly represents the faith of the Alexandrian Church in his time. The amplified and explanatory language of the creed, however, bears clearly the trace of Origen's own hand, and gives it even less a character of general authority than those previously mentioned.

Turning to the Church of Rome in the second half of the 3d century, we meet with the fragments of a creed in a treatise of Novatian (De T'rin., Migne, iii. 886) of a more simple and popular character, and corresponding, therefore, more nearly to the form which the creed ultimately assumed in the West. It only requires faith "in God tbe Father and Lord omuipotent, tlie most perfect Maker of all things; .. . also in the Son of God, Christ Jesus. our Lord God, but Son of God; . . . also in the Hely Spirit." Novatian, at first a presbyter of the Church of Rome,

1 Credis remissionem peccatorum et vitam xternam per sanctam ecclesiam ?

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~~was afterwards a schismatic bishop, whose followers, we have seen, were placed by Cyprian beyond the pale of the church, but there seenis no reason to doubt that his "Regula Veritatis" (the same form of expression, it deserves to be noticed, as that used by Tertullian) represents the Roman creed of his time.~~

~~These may be said to represent all the distinctive author-~~

~~ities in creed literature before the formation of an authorized creed at Nicea in 325. There is sometimes~~

~~also quoted a creed of Gregory Thaumaturgus, who was a pupil of Origen at Cesarea in Palestine—a creed both more elaborate and precise in its theological terms than that of his great teacher; but besides that its form is rather oratorical than confessional, this creed cannot be said to present any distinctive features. It is sufficiently evident that "confessions of faith," or "rules or standards of truth," existed in the Ante-Nicene Church from the age of Irenzus, or the last quarter of the 2d century, and there is every reason to conclude that they existed even before this, although we get no trace of them in Christian literature. Candidates for baptism were, no doubt, always required to profess their belief in the name of the Father, the Son, and the Holy Ghost. But it is equally evident that there was no rule of faith universally accepted by the church, or authoritatively imposed by any Catholic body up to the time of the Nicene Council. Each church seems to have had its own "regula veritatis," or " confessio fidei," identical in substance, but varying in form and language, and varying even in the same church in completeness. The simpler, less detailed, or less theological forms are plainly at once the more original and the more generally or popularly accepted forms.~~

~~There is further supposed to be a marked distinction between the creeds of the Eastern and the creeds of the Western Church, although the division of Latin or Western Church is only beginning to emerge at the period we have reached. Irenzus, although a bishop of the West, was an Oriental Greek in language and theology. Hippolytus, who was bishop in or near Rome in the second half of the 3d century, still wrote and taught in Greek. Tertullian and Cyprian of the North African Church are the only re- presentatives of Latin theology. Even thus early, however, the creeds of the Oriental Church are~~

supposed to show a ten- dency to theological expansion or dogmatic adaptation which is not observable in the Western—the creed of Novatian, for example, which has been already quoted. " The Eastern creeds, while they have all along retained their characteristic notes, were at first by far the more flexible, readily adapting themselves to meet the exigencies of the church, in her maintenance of the faith once delivered to the saints against the perversions of heretics, with which the East, owing to the genius of its subtle-witted people, was infested much more than the West. .... The case of the Western creeds was widely different. With them no council ever interfered. They were left to the custody of the several churches, while at the same time each church seems to have felt itself at liberty to make additions or alterations to some extent where occasion required." These remarks of Professor Heurtly in his Harmonia Symbolica (1858) point mainly to a later period than the end of the 3d cen- tury, and to a classification which he himself makes of the creeds into a Western group typified by the " Apostles' Creed," and an Eastern represented by the creed of Nicwa. But the distinction, to some extent, underlies the inchoate creeds of the Ante-Nicene Church as well, and helps us to understand the true historical order of the creeds, which has been disturbed by the traditionary prestige assigned to what is known asthe Apostles' Creed. There was no such creed as yet, nor till long afterwards, in the familiar form in which it is now held by the Western churches. In

simplicity of structure and of thought the Apostles' may, indeed, be called the oldest of the creeds. It takes us back to the most primitive stratum of Christian belief. But as a matter of fact and chronology, what is now known as the " Apostles' Creed" is not found in anything like its present form, till four centuries after the faith of the Hastern Church was definitely settled in the Nicene Symbol. It is to this latter creed, therefore, that we must first turn our attention in historical order.

IL. The circumstances in which the Council of Nica was assembled have already been briefly sketched in the articles Anrus and ArHanasius, The opinions of Arius promulgated in the commencement of the 4th century made such commotion in th; church as to call forth not only the admonition

of bishops, but the intervention of the imperial government in the hands of Constantine, who had professed himself a Christian, and become the patron of the peace and prosperity of the church. The distractions of the Donatist schism on the one hand, and of the Arian heresy on the other, were subjects of grave anxiety to a prince, one of whose motives in joining the rapidly increasing influence of the Christian church, as he himself professes in a letter addressed to Alexander (bishop of Alex- andria) and Arius jointly, was the establishment through- out his dominions " of some one definite and complete form of religious worship." In the same letter he gave some very good advice on the subject of the prevailing religious contentions. ' My advice," he says, "is neither to ask nor answer questions which, instead of being scriptural, are the mere sport of idleness or an exercise of ability ; at best keep them to yourselves and do not publish them. You agree in fundamentals (cept tod Kopydaiov)." (Euseb., Vit. Const. iii. 66). The epistolary efforts of Constantine, however, had no effect in allaying the theological dis- sensions of the Church of Alexandria, which, on the contrary, with the banishment of Arius spread widely throughout all the Eastern churches, The conclusion was accordingly formed of convoking a general council of bishops in which the Catholic doctrine should be formally declared. This the first ceeumenical council met at Nicsea in Bithynia in the summer of the year 325. It contained about 300 bishops. The traditionary number is 318; but there is no clear evidence of the actual number, which has been varioasly estimated from 218 to 320. Besides prelates there was a large number of pres- byters and attendants. Hosius, bishop of Cordova, the chief counsellor of Constantine in the Western Church, who had been the bearer of his letter to Arius and Alexander, is supposed to have acted as president, although others probably shared this office. Eusebius, in speaking of the presidency, uses the plural number. Among the most renowned of the assembled bishops may be mentioned Alexander of Alexandria (attended by his more celebrated deacon, and subsequently his successor in the Alexandrian bishopric, Athanasius), Eustathius of Antioch, Eusebius of Cesarea in Palestine, his namesake, and some suppose his brother, of Nicomedia, Macarius of Jerusalem, Leontius of Caesarea in Cappadocia, Cecilian of Carthage, Marcellus of Ancyra, Spyridion of Cyprus, and other known although less distinguished names.

~~There is no detailed record of the proceedings of the council, Eusebius of Caesarea and Athanasius both wrote about it ; but it is impossible to trace out in any continuous form the actual proceedings of the council, from anything that they say. 'We know not," Dean Stanley says, 'whether it lasted weeks or days" (Hastern Church, p. 129). So far as can be gathered, however, there was much discussion untrammelled by the exercise of any external authority. Arius himself, being only a presbyter, had no seat in the conclave, but he appears to have been frequently~~

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~~called upon or allowed to express his opinions, his chief opponent in argument being Athanasius. At first the Arian party seem to have made a bold defence of their opinions, and to have found considerable support in the council ; but ultimately they formed but a small mino- rity. After an unsuccessful effort on their part to submit the draft of a erced, which, only called forth violent disapprobation, and was in fact torn in pieces by the excited assemblage, Eusebius of Caesarea produced a con- fession of faith which he had been taught in his youth as the confession of the Church of Palestine. It was favoured by the emperor, and would have been accepted by the Arians, But the very fact that the Arians were disposed to accept the creed introduced by Eusebius, indisposed the orthodox party to its adoption. An expression, used by his namesake of Nicomedia with the view of characterizing unfavourably the extreme orthodox position—the expres- sion Homoousion ('Opooverov)—at length became the battle-ground betwixt the parties. The Arians violently condemned it; the Eusebians or semi-Arians also at first strongly disapproved of it; but to the majority it became the very term they were in search of, in order to dis- criminate their view of the relation of the Father and Son from Arianism; and accordingly it was adopted. The assent of the emperor was gained; Hosius of Cordova announced the creed of the church at length settled; and even the two Eusebii after a time gave in their adhesion to the expression, although reluctantly, and in the case of Eusebius of Nicomedia apparently with an amount of reserve which led to future difficulties.~~

~~The following are the terms of the creed as issued by the council :—~~

‘¢We believe in one God, the Father Almighty, maker of all things, both visible and invisible ; and in one Lord, Jesus Christ, the Son of God, begotten of the Father, only begotten, that is to say of the substance of the Father, God of God and Light of Light, very God of very God, begotten, not made, being of one substance with the Father (éuootctov 76 marpt), by whom all things were made, both things in heaven and things on earth ; who, for us men and for our salvation, came down and was made flesh, made man, suffered and rose again on the third day, went up into the heaveus, and is to come again to judge the quick and the ,dead; and in the Holy Ghost.”

Then followed the clauses anathematizing the several assertions of the Arians, that “there was a time when He (Jesus Christ) was not”—‘“ before He was begotten He was not,”—“ He came into existence from what was not,” and that He is of a different “person” or “substance” (érépas irootdcews 7) dvoias).

This the original form of the Nicene Creed, it will be observed, differs considerably from what is popularly known as the Nicene Creec. Afterwards certain clauses (which we have marked in italics) were omitted, and others of more importance added, especially the present conclusion of the creed, following the simple statement in the original of belief in the Holy Ghost.

‘

The history of the addition of these clauses is involved in some obscurity. They have been often attributed to the Council of Constantinople which, in 381, followed that of Niewa, and the existing creed has been consequently called by the special title of the Niceeno-Constantinopolitan Creed. But, on the one hand, the enlarged creed is found in a work written by Epiphanius seven years before the date of this council (Migne, xliii. col. 232), and on the other hand there is nothing said in the canons of the Con-stantinopolitan Council respecting the enlargment of the

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creed. On the contrary, it is said in the first canon of the council that “the creed of the 318 bishops assembled at Nicsea shall not be made void, but

~~*remain for ever." The probable explanation is that the original Nicene Creed became gradually enlarged in the East, as the dogmatic instinct of the church developed under the pressure of the varying forms of Arian, Apollinarian, and semi-Arian heresy. It was deemed necessary to meet the growth of heretical opinions by additional growths of authoritative Catholic opinion, and as the additions to the creed were really expansions of its implied thought—and not in any sense arbitrary external supplements—they came to be identified with the original creed, and to pass under its name. This view of the matter is favoured by the fact that the third cecumenical council, held at Ephesus in 431, chiefly for the condemnation of the Nestorian heresy, which was supposed to separate not only the natures but the person of Christ, enjoined in its seventh canon " that no person shall be allowed to bring forward, or to write, or to compose any other creed besides that which (was settled by the Holy Fathers who were assembled in the city of Nicea." Ags the fuller creed was almost certainly weil known by this time (it having been already in existence before 381), such a statement seems only consistent with the idea that the two creeds were regarded by the Ephesine fathers as virtually identical. For the first time, at the Council of Chalcedon, which was held twenty years later, or in 451, the enlarged creed is found following the original and simpler form of the creed. It is appended as forming a ratification of "the same faith," and is distinctly attributed to "the 150 fathers who afterwards assembled in the great city of Constantinople" (in 381). The shorter form, or the exposition (&ec.s) of the 318, is assigned the first place, but the other is added,—" that those things also should be maintained which were defined by the 150 Holy Fathers of Constantinople for the taking away of the heresies which had then sprung up, and the confirmation of the same, our Catholic and apostolic faith."*~~

~~*At the same time there is evidence, from what took place at the council, that there was still a large number of bishops who greatly preferred the creed in its original and simpler form, and it appears long to have maintained its ground alongside of the others in the Eastern churches. In the same churches the clause " God of God" which, appearing in the original, had dropped out of the expanded creed, was restored in course of time, although the real date of the restoration is unknown; and in addition to this clause the well-known " filioque " clause was added by the Western churches at*~~

~~the Council of Toledo in the year 589. From this date no changes have been made in the " Nicene" Creed. It has remained without the " filioque " clause the cecumenical creed of the Eastern Church; and with the addition of this clause it has taken its place amongst the three great creeds of the Western Church.~~

~~IIL What is knownas the " Apostles' " Creed claims our notice next as the second of the three cecumenical creeds in chronological order. The growth of this creed is involved in considerable obscurity. The tradition which ascribes it to the apostles themselves, it is needless to say, has no authority, and does not reach beyond the Sth century, if it can be carried back so far. The definite source of the legend is supposed to be two sermons spuriously attributed to St Augustine, and found in the appendix to his works. In point of fact, as we have already seen, the creeds prevalent in the Roman and North African Churches, the original representatives of Latin Christendom, were of the briefest character up to the end of the 3d century. The creeds of Cyprian and Novatian already quoted are specimens. The first example of a more expanded creed~~

~~after the manner of the " Apostles'" is to be found singularly |~~

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~~enough in a Greek writer, Epiphanius, who in the 72d book of his Treatise on Heresies quotes the confession of faith presented by Marcellus, bishop of Ancyra in Galatia, to Julius, bishop of Rome, as follows—" TI believe in God the Father Almighty; .. . . and in Jesus Christ, His only begotton Son, our Lord, who was born of the Holy Ghost and the Virgin Mary, who under Pontius Pilate was crucified and buried, and on the third day rose from the dead, ascended into heaven, and sitteth at the right hand of the Father, whence He is coming tv judge the quick and the dead; and in the Holy Ghost, the Holy Church, the remission of sins, the resurrection of the flesh, everlasting life" (Epiphan., Her, 52).~~

~~Marcellus had been one of the most active of the orthodox party at the Council of Nica, and on his return to his diocese had distinguished himself with such zeal against the Arians that he was accused of having fallen into the opposite error of the Sabellians. He was accord- ingly deposed from his~~

see by a synod held at Constan- tinople in 336, and betook himself to Rome. It was while there, and with the view of exhibiting his orthodoxy, that he addressed to Julius the above profession of faith, which he describes as the faith which he "learnt and was taught from the Holy Scriptures." As he was himself a Greek he pro- bably expressed himself in the Greek language. In any case, it is in Greek that the creed has been preserved to us.

It has been doubted from this circumstance, as well as from the position of Marcellus himself, whether his creed can be taken as representing the Roman creed of the time to which it belongs. It has been supposed too expanded for this, as it is beyond question that "' the Roman Church used at baptism, and still uses, a much less elaborate form." It is not improbable, however, that while the earlier and briefer form was retained in the baptismal service, a larger formulary of faith had also grown up from the original simplicity of this form, in obedience to the general growth of the dogmatic sentiment in the West as in the East. It is certain that within half a century from this date, or about the year 390, there is to be found a creed equally detailed—the creed not merely of the Church of Aquileia of which Rufinus was a presbyter, but of the Church of Rome, with which he compares the other, pointing out the differences betwixt the two. Still in neither of these creed- forms, nor yet in those found in the writings of St Augustine, do we approach the complete detail presented by the Apostles' Creed as now received. The chief clauses awanting are those relating to the descent into hell and the communion of saints. Generally also, the expression descriptive of the church is simply " The Holy Church," instead of the " Holy Catholic Church." " The earliest creed to be met with entirely identical with the present formula occurs in a short treatise published by Mabillon from an ancient manuscript entitled 'Libellus Pirminii de singulis libris canonicis Scarapsus (scriptis?)? ..... — "The creed occurs twice in Pirminius's treatise. In the first instance the story is repeated of the several articles having been contributed each by a several apostle, and each article is assigned to its supposed contributor. The other creed, which is identical with the former, is given as it was used in the baptismal service " (Heurtly, Harmonia Symb. pp. 70-71). There is little known of the life of Pirminius, but he seems to have been active as a missionary in France and Germany in the 8th century, and the date of his death is "about the year 758." Although the "Apostles'" Creed was no doubt substantially in existence long before

this probably from the end of the 4th century, there is no his- torical evidence of its reception ia its completed form till this period, or about the middle of the 8th century, or more than four centuries later than the original form of the Nicene Creed.

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IV. The history of the " Athanasian" Creed, or the " Symbolum Quicunque," as it is often called, opens up a more doubtful inquiry than that of either of the preceding creeds, The evidence before us is of an entirely different character. " Here," as it is said by a recent writer on the subject (Lumby, in his Hist. of the Creeds, p. 186), " 18 neither the synodical authority of the former, nor the gradual growth of the latter ; but when the composition appears for the first time as a document of authority, 1t 1s cited in its completeness, and as the work of the father whose name it has since for the most part borne, although it was not brought to light for many centuries after his death."

Tn one opinion all investigators are now agreed,—that the so-called " Athanasian" Creed is not the production of the famous father of the 4th century whose name it bears. The conclusive reasons against this supposition may be stated as follows :—(1) There is no trace of such a creed in any of the older MSS. of the works of Athanasius; (2) Athanasius himself (Zp. ad Antioch, 1. 2.), in consis- tency with the prevailing church sentiment of his time, expressly disclaims as superfluous the use of any creed except the Nicene; (3) the original language of the « Athanasian " symbol is clearly Latin and not Greek , (4) the symbol was entirely unknown to the Greek Church up to the year 1000; and (5) there is no evidence of its exist- ence even in the Latin Church before the end of the 8th or the commencement of the 9th century.

This last and all-important fact has been completely established by recent investigations, Dr Swainson particu-

larly, in his elaborate volume on the Creeds (1875), has»

~~exhausted all the historical evidence on the subject, and, while not venturing to assign the creed to a definite author, has proved in the most conclusive manner that the existence of the creed cannct be traced before the age of Charlemagne, and that its origin is almost certainly to be ascribed to the demand then existing for a more detailed exposition of the faith than was to be found in the Apostles' Creed. Nor does he hesitate to ascribe its origin toa deliberate purpose of imposture similar to that which led in the same age to the forgery of the famous "false Decretals," and the equally famous " Donation of Constantine." He expresses himself as follows :—' We have four or five independent lines of witnesses agreeing in bringing forward the Quicunque into notice within five and twenty years before or after the death of Charlemagne :—i. the testimony of quotation ; ii. testimony of canons; iii. testimony of literary collections of creeds or rules of faith ; iv. testimony of psalters; v. testimony of versions. . That the production of this work under the name of Athanasius was an intentional and deliberate attempt to deceive, no reasonable person can question. It was analogous to the production of the forged Decretals. And it is doubtless to the skill with which the imposture was wrought out that we owe the difficulty that has been felt in discovering the author" (Swainson, pp. 380-381). Other writers, such as the Rev. E. S. Ffoulkes (Ox the Athanasian Creed), and Mr Lumby, whose compact and interesting volume on The History of the Creeds has been already quoted, come virtually to the same conclusion as to the date of the Athanasian symbol. Mr Ffoulkes has formed, indeed, a peculiar theory as to its authorship by Paulinus, bishop of Aquileia, in the end of the 8th century,—a conclusion which is repudiated by Dr Swainson. They agree, however, that there is no evidence of its existence before this time. It may ke useful to give a brief summary of the reasons for this con- clusion.~~

~~And first a distinction must be made. What these writers, of course, mean is that there is no satisfactory evidence of the existence of the Athanasian symbol as~~

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~~constituting a distinct creed before the time to which they~~

refer its origin. Many of the dogmatic expressions or formule of the creed by themselves must be admitted to have been in existence long before. The expressions were, in fact, current in the schools of che Western Church, mors or less from the time of Augustine, to whose famous treatise De T'rinitate, not a few of them have been specially attributed. 'This is the real explanation of the supposed traces of the Athanasian symbol in these earlier times. Language, similar to that which it ultimately embodied, had been accumulating for centuries as the natural result of the study of Augustine and the increasing pressure of Arian modes of thought from many quarters. This process of theological definition had been advanced by such men as Hilary, bishop of Arles (429), Vicentius of Lerins (434), and Vigilius of Thapsus (500), to whom severally the authorship of the Quicunque has been ascribed. The ascription rests in each case on certain plausibilities arising, among other things, out of a common stratum of dogmatic phraseology. But such phraseology had really become a common property of the church of that time, and is to be found in the confessions of synods and collections of sermons and books of devotion from the 5th century down- wards. Nothing definite as to the authorship of the Quicunque can be rested on such resemblances, or even on the use of the name of Athanasius. The fact remains that during all this time, and long afterwards, there is no evidence of such a erced being in ewistence or having any authority.

The first traces of such a creed are reached in the 8th century. Then in distinct quarters there come before us the two parts of the creed now in use. The first part, down to the end of the 26th clause, which specially deals with the doctrine of the Trinity, seems then to have existed by itself under the general title of " Fides Sanctz Trinitatis," and " Fides Catholica Sanctze Trinitatis." The second part, which treats of the incarnation of our Lord, is in 4 similar manner found by itself in a MS. known as the Colbertine MS., which cannot be placed earlier than

730. But the two parts are not as yet found in combina-

tion, nor as claiming any distinctive symbolic authority. They seem rather put forward as expositions or explana- tions of the original Nicene doctrine than as new creeds having any authority by themselves. The two documents

not only exist apart, but they are evidently regarded by those who use them as separately independent and com- plete.

That there was no authoritative " Athanasian Creed, such as we now have, even at the end of the 8th century, is held to be clearly proved by what occurred at the several councils of the church, which were held both in the East and the West at this time. In 787 there was held once more at Nicaza what is reckoned by the Church of Rome the seventh cecumenical council, At this council there were recited three several confessions amplifying in several details what is known as the Niceno-Constantinopolitan Creed. These amplified confessions, attributed to different bishops, all indicate the prevailing need that was felt for some more detailed exposition of the doctrine of the Trinity ; but the fact, not only that the " Athanasian " symbol does not make its appearance amongst them, but that, when the synod at last comes to recite its own belief, it does so in a form quite distinct from the " Athanasian," and finally falls back wpon the old Creed of Constantinople, to which it refuses to make any addition, plainly serve to show that this symbol or exposition could not even have been known to the Eastern Church at this time, and still less have acquired any authority.

But the Councils of Frankfort (794) and of Friuli (796) are still more decisive. For here in the West and in the

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centres of ecclesiastical activity which marked the age of Charlemagne, the Quicunque, if known anywhere, may be supposed to have been known and recognized, All the prominent characters of Western Christendom—the Emperor Charles himself, and his two chief counsellors Alcuin and Paulinus of Aquileia—took part more or less in these councils. Paulinus was "the episcopal soul of the Council of Frankfort, and president as well as soul of that of Friuli. No movement could have taken place in Italy, France, or Germany in matters ecclesiastic, nor any document have been set forth of such importance as the Quicunque, that could have escaped the knowledge of Paulinus and Alcuin." In these circumstances the absence of all allusion to the Quicunque in the records of these councils is fatal to the

idea of its authoritative acceptance as a creed at that time. Not only so, but a form of faith which is found in the records of the Council of Frankfort, and which is supposed to have been composed either by Paulinus himself or under his guidance, shows by its language that he could not have been familiar with any such document as the Quicunque, for the obvious reason that it would have served his purpose better than the form which he uses. In this document "he deals both with the doctrine of the Trinity and the Incarnation, and puts his expressions on one occasion into the exact language used in the Athanasian Creed, which language was, no doubt, current in a separate form long before ; but he never attains to anything like the precision which is exhibited in the creed, and which, had it been known to him, must have commended that work to his use. And there is not to be found the slightest notice of Athanasius in the whole proceedings of the council." From a further document of the same council, a synodical letter which the bishops of Gaul and Germany addressed to those of Spain, it is also evident that they were equally with Paulinus ignorant of any such authoritative exposition of the Gatholic faith as the Quicunque. And to complete the evidence on the subject there is a letter of Charlemagne himself to the bishops of Spain, which indicates with equal clearness that, while his mind was full of many expressions similar to those in the creed, he yet had no knowledge of such an authoritative document to which he could appeal in advising them as to the details of the Trinitarian doctrine.

In summing up the subject we cannot do better than quote the words of Mr Lumby, whom we have already so far quoted :—

'The evidence which presents itself two years later seems to make it more clear that the Quicunque was unknown to the great minds of the West. The Council of Friuli met 796 a.p., and, as we have before said, its assembly was for the discussion of the doe rines of the Trinity and the Incarnation. The president and summoner of the council was Paulinus, and it is with his speech that we are concerned. After some preamble, in which he observes that his first idea is to set forth ' the very text of the creed ' as a law and rule for the direction of their proceedings, he goes on to consider whatthe next step is to be. And he would first clear away some objec- tions. ' For I believe,' says he, ' that in the records of some synods it is laid down… that no one may lawfully teach or frame another symbol of our faith. Far be it

~~from us, as far be it from every faithful heart, to frame or teach another symbol or faith, or in another manner than they (the holy fathers of Niczea) appointed. But according to their meaning we have decreed to deliver in expost- tion these matters which haply on account of the brief statement of the truth are less understood by the simple and unlearned than they ught to be.' ;—~~

~~Here then is the definite confession of a want which the Quicunque would have supplied. The symbol by itself is too com- pendious—it needs exposition—the unlearned and simple do not sufficiently understand it; and for their sakes a longer and more explanatory treatise is to be prepared, adhiering to the meaning of the fathers, who put forth the full creed. Jn half a century or little more after these words were uttered, it can be shown that our form of the Athanasian Creed was known and used and looked upon as a most satisfactory exposition of the doctrines in debate at Friuli.~~

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~~Can it be believed, that if it had been known to Paulinus and the fathers there assembled, they would not have welcomed it as a most excellent comment on the Trinity and the Incarnation, and as the most opportune solution of all their difficulties ¢"~~

~~The address or exposition with which Paulinus followed up his announcement is then given. It is too long to insert here, but it lays down the lines on which the Quicunque may be said to have been fashioned. "Many attributes and qualities are predicated of the Father, then a repetition of the same, and their predication of the Son and of the Holy Ghost,—not indeed in the detached way in which each separate predication is dealt with in the Quicunque, but yet evidently a step in the direction of that greater elaboration and distinctness."~~

~~The results, therefore, of the most recent investiga- tions into the subject may be stated as follows. In the very end of tbe 8th century the Quicunque is unknown as a creed-document. It is nowhere men- tioned at synods whose special business was to discuss the subject matter which it afterwards sets forth with such elaborate and authoritative detail, But during this century there are found in separate forms two documents which, when combined,~~

constitute the framework of our present creed. The discussions of the time had a tendency to bring forward all contributions towards the explanation or fuller settlement of the doctrines of the Trinity and the Incarnation. Addresses like those of Paulinus, and the correspondence betwixt him and Alcuin and Charlemagne himself, all point to the necessity of some authoritative exposition of the old and simpler creed. The demand seems to have created the supply; and accordingly, before the end of the following century, in its third quarter there is evidence of the existence of the Athanasian symbol in the very words as nearly as possible which are now used. This evidence is found in a prayer- book of Charles the Bald, written about 870. " The Quicunque then had not only been compiled, but had by this time made itself reputation enough to be included in the service-book. If twenty years be allowed for the gaining of acceptance, the date is carried back to the middle of the century, or 850 a.p." But there are two earlier MSS., showing more variations from the present form than is presented by the copy in the prayer-book of Charles the Bald. These point to an earlier stage of growth in the document, and the limits of the period during which the two parts of the Quicunque, previously, as we have seen, in separate existence, were probably combined and moulded into a creed claiming general acceptance, may be therefore carried back to the first quarter of the century, 800-825. The creed, in short, appears to have been the response of the Christian consciousness of the age immediately follow- ing that of Charlemagne to the necessity for such an authoritative exposition of the faith to which this age everywhere testifies. So far, of course, there is no question of imposture in its origin, Imposture is not the name to give to such a natural and inevitable result of the working of the mind of the Western Church towards a more elaborate and detailed confession of its Trinitarian faith. The imposture consists not in the rise of the creed, nor yet in the acceptance of its ambitious formule, but in the ascription of it, probably not without the concurrence of the heads of the church, to a name with which it must have been known to have nothing to do. This was done, no doubt, with the view of securing to it credit and authority, and was supposed to be justified by its special doctrinal import, but it was none the less an assumption, the fictitious character of which could hardly have been unknown to those who first used the creed and gave it currency in the church.

~~With the adoption of the ‘ Athanasian” symbol the creed-~~

~~formations of the early and medieval church terminate. Nor is it to be forgotten of the three so-called “‘ Catholic ” creeds, that only one of them is in the broadest sense “Catholic” or “Cicumenical.” Neither the “ Apostles’ ” nor the “ Athanasian” Creed is known to the Greek or Oriental Church, which remained faithful to the faith “settled by the Holy Fathers” at Nicsea, or at least to the faith as subsequently enlarged to its present form (with the exception of the “filioque” clause). No doubt, in the East as well there were in circulation many expositions of the Nicene doctrine, called forth by the same doctrinal necessities as prevailed in the West. The proceedings of the Second Council of Niewa (787), to which we have already adverted, sufficiently show this. But none of these expositions ‘attained to any general acceptance, or rose as in the West to the same authoritative level as the ancient creed. Itremained alone in its eminence, protected by the denunications which the third council, which assembled at Ephesus in 431, directed against clergymen or laymen “who shall dare to compose any other creed.” Of all Christian creeds, therefore, the Nicene or Niceno-Constan- tinopolitan is the only really “Catholic” or cecumenical creed, deliberately discussed and adopted by the represen- tatives of the universal church. The two others associated with it im the services of the Western Church have not only never had acceptance beyond the range of that church, but are very gradual growths within it, without any definite parentage or deliberate and consultative authority. They emerge graduallyduring many centuries from the confusions and variations of Christian opinion, slowly crystallizing into definite shape; and such authority as belongs to them is neither primitive nor patristic. It is the reflected assent of the later church in the West, and the, uncritical patronage of a comparatively ignorant age, which have alone elevated them to the same position as the faith defined at Nicea, which is the only truly Catholic or universal symbol of the universal church.~~

~~V. After the Reformation a new era of creed-formations, or confessions of faith, set in. The process of exposition out of which we have seen the “ Athanasian” symbol to have gradually risen, became once more urgent, not~~

~~only in the 'disrupted branches of the church, which were called into existence by the activity of the several Reformers, but also in the Roman Church, from which the churches of the Re- formation were broken off. As we said at the outset, we cannot do more here than present a summary of the many confessions which then sprung up. And here, as in the previous part of this article, the best principle of arrange- ment will be the chronological, not merely because this order is most suitable to our plan, but because it really sheds most light on the formation of the several documents, and alone brings them into rightly intelligent relation to one another. We will hardly be able to do more than enumerate the titles and the dates of the multiplied confes- sions of the Reformed churches. But even this will be more than the English reader can readily find elsewhere in a complete form.~~

~~1, The confessions of the Lutheran Church claim the first attention in chronological order. The first of these is the Confessio Augustana, or Confession of Augsburg, compiled by Melanchthon, and presented in German and Latin to the Emperor Charles V., in 1530, in the name of the evangelical states of Germany. It consists of twenty-one articles, beginning (1) De Deo ; (2) De Peccato Originis ; (3) De Filio Dei; (4) De Justificatione, &c. ; and ending (21) De Cultu Sanctorum. The articles are terse and sig- nificant, and express with clearness and brevity the doctrinal position of the Lutheran Church. In addition to the twenty-one more positive articles, there are seven of a more controversial character, treating of the ecclesiastical abuses~~

~~CREEDS~~

~~which Lutheranism had corrected, or, as they are called, Abusus mutatos, viz., (1) De Utraque Specie ; (2) De Con- jugio Sacerdotum ; (3) De Missa ; (4) De Confessione; (5) De Discrimine Ciborum ; (6) De Votis Monachorum ; and (7) De Potestate cclesiastica. Secondly, immediately following the Confession of Augsburg appeared the Apologva Confessionis Augustane, also prepared by Melanchthon, in reply toa professed confutation of the original document by certain Roman Catholic divines. The Apology follows the order of the confession, but sometimes several articles are grouped together when referring to one main topic; and the~~

~~Apology is thus divided into only sixteen sections, although greatly more extended, nearly five times larger, in fact, than the Confession itself. To these two primary documents were afterwards added, thirdly, the Articles of Smalkald— Articult Smalcaldici—prepared by 'Luther himself in 1536, and signed at Smalkald by an assembly of evan- gelical theologians, and, fourthly, the Formula Concordic, composed in 1576 after considerable doctrinal divisions had broken out in Lutheranism. This latter document was not so universally accepted as the others by the Lutheran churches, but it has always been reckoned along with them as of confessional authority. To these remain to be added Luther's two catechisms, which have also a confessional position among the Lutherans. The Catechismus Major and the Catechismus Minor were both issued in 1529, and take their place in the list of symbolic books betwixt the Smalkald Articles and the Formula Concordia, The collective documents are issued as a Concordia, or Leber Concordie, printed with the three older creeds in advance, and together they sum up the confessional theology of Lutheranism.~~

~~2. The course of the Reformation, as is well known, evoked not only the ecclesiastical but the dogmatic activity of the Roman Catholic Church,and the Council of Trent, reckoned by that church as the eighteenth cecumenical council, was summoned in the end of 1545, in order to formulate more distinctly the doctrinal position of Roman Catholicism in opposition to Protestantism. This council sat at intervals for eighteen years, from the 13th December 1545 to the 4th December 1563, sometimes at Bologna, but chiefly at Trent. Its results are arranged in the forms of twenty-five sessions, each session generally dealing with an important head of doctrine in the shape of a 'decretum," followed, but not always, by a series of "canons," "ut omnes sciant, non solum quid tenere et sequi, sed etiam quid vitare et fugere debeant," Hence the title under which the results of the synod are known— ** Canones et Decreta Sacrosancti Gicumenici Concilii Tridentini." The Professio Fidei Tridentine, which was drawn up under Pius IV. (1564), and the Catechismus Romanus, published under the authority of his successor Pius V. (1566), are considered iby the Roman Catholic Church as symbolical writings of the second rank,~~

~~3. Passing to the confessions of the Reformed churches, we encounter more symbolic documents than there are churches, Nimeyer's Collectio~~

Confessionwm in Ecclesiis Reformatis Publicatarum contains twenty-eight confes- sions, the most important of which may be classified as follows :—(a) Pre-Calvinian: the Confessio Tetrapolitana, or the confession of the four cities,—Strasburg, Constance, Meiningen, and Landau,—composed by Martin Bucer in twenty-three articles, and presented to the Emperor Charles V. in 1530, the same year as the Augsburg Confession was presented; the Confessco Basiliensis, supposed to be drawn up by Myconius at Basel in 1534; and the Con- fessio Helvetica, prepared in the same city by a company of theologians, amongst whom were Bullinger and My- conius, and presented to the Lutheran divines assembled at Smalkald in 1537; and (6) Post-Calvinian; the

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Presbyterianism, but for the large Presbyterian churches in America and Australia which have sprung from it or own connection with it.

Consensus Tiqurinus, and the Confessiones Gallicana, Belgica, and Helvetica II. The Confesso Tigurinus, or "Consensio mutua" in re sacramentaria ministrorum Tigurine Ecclesie et D. J. Calvini" was intended, as its title bears, to mediate betwixt the Zwinglian and the Genevese or Calvinian doctrine of the Sacraments. It was drawn up in 1549, and consisted of twenty-six articles. The Confessio Gallicana has been attributed, although doubtfully, to Calvin himself. Tt was accepted by a Reformed synod in France in 1559, and presented in the following year to Francis TI. It was confirmed at a synod in Rochelle in 1571, and remained up to modern times the confession of the French Reformed Church. The Confessio Belgica is said to have been composed originally as a private document by Guido of Bres in 1562. First printed in French, it soon appeared in Dutch, and gradually gained such general acceptance among the con- gregations in the Netherlands that it was confirmed at the Synod of Dort, 1618, as the confession of the Dutch Reformed Church. The Confessio Helvetica II. was drawn up by Bullinger in 1564, and held in great esteem not only by the Swiss churches but by the Reformed congregations of Poland, Hungary, and Scotland. The well-known Decrees of the Synod of Dort, printed in 1619, also claim to be added to the series, and a host of

~~Catechisms, which also possessed more or less confessional authority—the famous Heidelberg Catechism and the Genevese Catechism, amongst others, The Arminians had their Confessio or Declaratio, composed by Simon Episcopius about 1622, and the Socinians their Racovian Catechism, adopted, as the name bears, at Racow in Poland in 1605.~~

~~4. To this long series of Protestant confessions there remain to be added the Thirty-nine Articles of the Church of England, and the Westminster Confession of Faith, which is the doctrinal standard, not only of the Church of Scotland, but of the chief Presbyterian churches both in Britain and iu America. The former were gradually prepared, chiefly it is said by Cranmer, and passed through various phases, beginning with the ¢en articles of 1536, and attaining the number of forty-two in 1552, till they were finally settled as thirty-nine (1562-1571). To this series of confessional documents also belong what are known as the Lambeth Articles, composed by Archbishop Whitgift.in 1575, but which were never accepted as authoritative, and the /rish Articles, supposed to have been chiefly composed by Arclibishop Ussher in 1615.~~

~~The Irish Articles form an appropriate transition to the Westminster Confession of Faith, which is said to have borrowed from the former some of its special phraseology. The Westminster document was the outcome of the great Puritan agitation of the 17th century, and as it is the last, so it is one of the most elaborate and finished of the long series of Protestant confessions. 'The Westminster Assembly met in the autumn of 1643, and sat for upwards of five years. The Confession of Faith was completed in the third year of~~

~~ment in the same year. It never attained to any position of legal authority in England. But in Scotland it was accepted in the year following its composition by the General Assembly of the Kirk, as " agreeable to the Word of God, and in nothing contrary to the received doctrine, worship, discipline, and government of this Kirk," aud two years afterwards, on the 7th February 1649, it was ratified and approved by the Estates of the Scottish Parliament. The Westminster Confession thus took the place in Scotland of the old Scoticana Confessio Fidei of John Knox. It retained this position of authority in 1690, when Presby- terianism was finally~~

established in Scotland, and possesses, as we have said, symbolical authority, not only for Scottish

its existence in 1646, and laid before the English Parlia-.

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The Confession of Faith extends to thirty-three chapters, ranging over the most abstruse topics of theology; and along with it are generally printed the

Larger and Shorter Catechisms, which have also been

approved by the General Assembly of the Church of Scotland, but which do not possess the legal or statutory authority of the Confession.

The study of creeds and confessions in their theological import is known as the study of symbolical theology, a name familiar to all students of German theological litera- ture. Winer's Confessions of Christendom (translated in Clark's Foreign Theological Library, 1873) and Aather's Comparative Symbolik (Leipsic, 1853) are specimens of this branch of theological study. For the literature of the creeds with which the article has chiefly dealt, the student may be recommended to Lumby's History, more than once quoted, but above all to Dr Swainson's elaborate volume, to which we have also referred. A forthcoming work by Dr Schaff, in three volumes, entitled Zhe Creeds of Christendom, with a History and Critical Notes, will probably contain the most exhaustive discussion of the subject in English literature. (ery)

CREEK INDIANS. See Inprans.

CREFELD, or Kreretp, a town of Germany, capital of acircle of the same name, in the province of Diisseldorf, twelve miles north-west of the town of that name, 125 feet above the sea. This town is one of the finest in Rhenish Prussia, being well and regularly built, while the surround- ing fertile district is almost entirely laid out in gardens. It is the most important seat of the silk and velvet manu- factures in Germany, and in this industry the greater part of the population of town and neighbourhood is employed. There are upwards of 200 silk factories, and large quantities of silk goods

are exported, chiefly to the United States. The other industries of the town, especially cotton and woollen weaving, are very considerable, and about 2000 gardens in the neighbourhood give employment to a large number of workers. The manufactures to which Crefeld owes its prosperity were introduced by religious refugees from the neighbouring duchy of Juliers about the close of the 17th century. Population (1875), 62,905.

CREM A, an ancient town of Lombardy, in the province of Cremona, on the right bank of the Serio and on the rail- way from Bergamo to Cremona, twenty-five miles E.S.E. of Milan. Population (1871), 8154. It is well built in the midst of a rich agricultural district, is inclosed by a ditch and old fortifications and has a castle, a cathedral (of date about 1400) and numerous other churches, and several palaces. It has manufactures of lace, hats, thread. and silk; and the vicinity produces excellent flax.

CREMATION, or the burning of human corpses, may be said to have been the general practice of the ancient world, with the important exceptions of Egypt, where bodies were embalmed, Judea, where they were buried in sepul- chres, and China, where they were buried in theearth. In Greece, for instance, so well ascertained was the law that only suicides, unteethed children, and persons struck by lightning were denied the right to be burned. At Rome, one of the XII. Tables said, "' Hominem mortuum in urbe ne sepelito, neve urito ;" and in fact, from the close of the republic to the end of the 4th Christian century, burning on the pyre or rogus was the general rule' Whether, in

any of these cases, cremation was adopted or rejected for sanitary or for superstitious reasons, it is difficult to say. Embalming would probably not succeed in climates less

+ Macrobius says it was disused in the reign of the y i -amalarcen gn of the younger Theodosius.

warm and dry than the Egyptian. The scarcity of fuel might also be a consideration. The Chinese are influenced by the doctrine of Feng-Shui, or incomprehensible wind water ; they must have a properly placed grave in

their own land, and with this view corpses are often sent home from California. Even the Jews used cremation in the vale of Tophet when a plague came; and the modern Jews of Berlin and the Spanish and Portuguese Jews at Mile End Cemetery have been among the first to welcome the lately revived process. Probably also, some nations had religious objections to the pollution of the sacred principle of fire, and therefore practised exposure, suspension, throwing into the sea, cave-burial, desiccation, or envelopment.! Some at least of these methods must obviously have been suggested simply by the readiest means at hand. Cremation is still practised over a great part of Asia and America, but not always in the same form. Thus, the ashes may be stored in urns, or buried in the earth, or thrown to the wind, or (as among the Digger Indians) smeared with gum on the heads of the mourners, In one case the three processes of embalming, burning, and burying are gone through ; and in another, if a member of the tribe die at a great distance from home, some of his money and clothes are nevertheless burned by the family. As food, weapons, é&c., are sometimes buried with the body, so they are sometimes burned with the body, the whole ashes being collected.? The Siamese have a singular institution, according to which, before burning, the embalmed body lies in a temple for a period determined by the rank of the dead man,—the king for six months, and so downwards. If the poor rela- tives cannot afford fuel and the other necessary prepara- tions, they bury the body, but exhume it for burning when an opportunity occurs. There can be little doubt that the practice of cremation in modern Europe was at first stopped, and has since been prevented in great measure, by the Christian doctrine of the resurrection of the body ; partly also by the notion that the Christian's body was redeemed and purified. Science has shown that burning merely produces quickly what putrefaction takes a long time to accomplish ; but the feeling of opposition still lingers among the clergy of more than one nation. Some clergy- men, however, as Mr Haweis in his Ashes to Ashes, a Cremation Prelude, London, 1874, have been prominent in the reforming movement. The objection was disposed of by Lord Shaftesbury when he asked, " What would in such a case become of the blessed martyrs?" The very general practice of burying bodies in the precincts of a church in order that the dead might take benefit from the prayers of persons resorting to the church, and the religious ceremony which precedes both European burials and Asiatic cremations, have given the question a religious aspect. It is

~~really asanitary one. The disgusting results of pit-burial made cemeteries necessary. But cemeteries are equally liable to overcrowding, and are often nearer to inhabited houses than the old churchyards. 'There is indeed a dis-position to build villas near ornamental cemeteries. It is possible to make a cemetery safe approximately by selecting a soil which is dry, close, and porous, by careful drainage, and by rigid inforcement of the rules prescribing a certain depth (8 to 10 feet), and a certain superficies (4 yards) for graves, But one has only to read such a work as Baker's Laws Relating to Burial to see how many dangers burial legislation has to contend with. A certain amount of irre- ' spirable gas will escape into the air, or into sewage drains,~~

~~1 The Colchians, says Sir Thos. Browne, made their graves in the air, z.e., on trees.~~

~~2 In the case of a great man there was often a burnt offering of animals and even of slaves (See Cesar, De Bell. Gail. iv.)~~

~~3 A temple of the Holy Ghost (see Tertullian, De Anwma, c. 51, cited in Miiller, Lex. des Kirchenrechts, s.v. °' Begribniss"').~~

~~and thus reach houses, or will percolate so as to contaminate water which is afterwards used. The great Paris cemeteries inflict headache, diarrhoea, and ulcerated sore throat on their immediate neighbours ; and a great mass of similar well-authenticated facts may be brought against even recent cemeteries in various countries, A dense clay, the best soil for preventing the levitation of gas, is the worst for the process of decomposition. The danger is strikingly illustrated in the careful planting of trees and shrubs to absorb the carbonic acid. Vault-burial in metallic coffins, even when sawdust charcoal is used, is still more dangerous than ordinary burial. It must also be remembered that the cemetery system can only be temporary. The soil is gra- dually filled with bones ; houses crowd round ; the law itself permits the re-opening of graves at the expiry of fourteen years. We shall not, indeed, as Browne says, "be knaved out of our graves to have our skulls made drinking bowls and our bones turned into pipes!" But on this ground of sentiment cremation would certainly prevent any interruption of that " sweet sleep and calm rest " which the old prayer that the earth might lie lightly has associated with the grave. And in the meantime we should~~

escape the horror of putrefaction and of the "small cold worm that fretteth the enshrouded form."

For the last ten years many distinguished physicians and chemists in Italy have warmly advocated the general adop- tion of cremation, and in 1874, a congress called to consider the matter at Milan resolved to petition the Chamber of Deputies for a clause in the new sanitary code, permitting cremation under the supervision of the syndics of the com- mune. In Switzerland Dr Vegmann Ercolani is the champion of the cause (see his Cremation the most Rateonal Method of Disposing of the Dead, 4th ed., Zurich, 1874), and there are two associations for its support. So long ago as 1797 cremation was seriously discussed by the French Assembly under the Directory, and the events of the Franco- Prussian war have again brought the subject under the notice of the medical press and the sanitary authorities. The military experiments at Sédan, Chalons, and Metz, of burying large numbers of bodies with quicklime, or pitch and straw, were not successful, but very dangerous. The matter was considered by the municipal council of Paris in connection with the new cemetery at Méry-sur-Oise ; and the prefect of the Seine in 1874 sent a circular asking information to all the cremation societies in Europe. The municipality of Vienna has actually made cremation permissive. There is a propagandist society, called the "'Urne," and the main difficulty for the poor seems to be the cost of conveying the bodies five miles. To overcome this a pneumatic tube has been proposed. Dresden, Leipsic, and Berlin are the centres of the German move- ment, and Professor Reclam's De la Crémation des Cadavres seems to be the most important work. In Britain the subject has slumbered for two ceuturies, since in 1658 Sir Thomas Browne published his quaint Hydriotaphia, or Urn- burial (see edition by St John, London, 1838), which was mmainly founded on the De Funere Romanorum of the learned Kirchmannus. In 1817 Dr J. Jamieson gave a sketch of the "Origin of Cremation" (Proc. Royal Soc. Edin., 1817), and for many years prior to 1874 Dr Lord, medical officer of health for Hampstead, continued to urge the practical necessity for the introduction of the system. It was Sir Henry Thompson, however, who first brought the question prominently before the public, and started in 1874 the Cremation Society of London. Its object is to introduce through the agency of cemetery companies, and parochial and municipal authorities, and burial boards, some rapid process of disposing

~~of the dead, " which cannot offend the living and shall render the remains absolutely innocuous." Thompson's problem was— Given a dead body, to re~~

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~~solve it into carbonic acid, water, and ammonia, rapidly, safely, and not unpleasantly." Relying on the evidence which suggested recent burial legislation (see Jeport to the General Board of Health on a General Scheme for Extra- mural Sepulture, Clowes and Son, 1850, signed by Lord Shaftesbury, Chadwick, and Southwood Smith; also Walker On Graveyards, Longmans, 1839), he pointed out that in the neighbourhood of cemeteries there is a con- stantly increasing risk of contaminated air and water. The problem he solved by the Siemeus process of cremation, which, when generally employed, would effect a great saving in the cost of funerals, and would also leave a quantity of bone earth equal in value to the bones imported into this country chiefly for manure. The British authorities in India have already had much practical experience of cremation. Poor Hindus often did not supply wood and oil (ghee) enough for the total consump- tion of the body, and hence Sir Cecil Beadon at Calcutta, and the sanitary commissioner of Madras, both found it necessary in the public interest to erect cinerators on the burning ghat or ground (Latin, ustrina), which might be used on payment of afee. So also at Poonah, Colonel Martin, struck with the high cost (above 12 rupees) of even a poor funeral, constructed in 1864 a pentagonal cinerator for the use of Brahmans and the other Hindu castes. The idea is spreading rapidly in New York.**

~~Among the practical methods of cremation which have recently been attempted, we may mention, injthe first place, the experiments of Dr Polli at the Milan gas works, which have been fully described in Dr Pietra Santa's book, La cremation des morts en France et & Uétranger, and those of Professor Brunetti, who exhibited an appar- atus at the Vienna Exhibition of 1873, and who states his results in La Cremazione det Cadaveri, Padua, 1873. Polli obtainced complete incineration or calcination of dogs by the use of coal-gas mixed with atmospheric air, applied toa cylindrical retort of refracting clay, so as to consume the gaseous products of combustion. The process was complete in two hours, and the ashes weighed about 5 p.c. of~~

~~the weight before cremation. Brunetti used an oblong furnace of refracting brick with side-doors to regulate the draught, and above a cast-iron dome with movable shutters. a metallic plate suspended on iron wire. The gas generated escapes by the shutters, and in two hours carbonization is complete. The heat is then raised and concentrated, and at the end of four hours the operation is over; 180 Ib. of wood costing 2s. 4d. sterling was burned. In the reverberating furnace used by Sir Henry Thompson a body, weighing 144 Ib., was reduced in fifty minutes to about 4 tb of lime-dust. The noxious gases, which were undoubtedly produced during the first five minutes of combustion, passed through a flue into a second furnace and were entirely consumed. In the ordinary Siemens regenerative furnace (which has been adapted by Reclam in Germany for cremation, and also by Sir Henry Thompson) only the hot-blast is used, the body supplying hydrogen and carbon ; or a stream of heated hydrocarbon mixed with heated air is sent froma gasometer supplied with coal, charcoal, peat, or wood,—the brick or iron-cased chamber being thus heated to a high degree before cremation begins. In one arrangement both gas and air are at a white heat before they meet and burst into flame in the furnace. The advantages of the Siemens furnace and gas producer (which would cost about £800 in construction) are that the heat of the expended fuel is nearly all retained by the regene- rators, and that the gas retort admits of the production being stopped without much loss. Some difficulty has been felt about keeping the ashes free from foreign material. The Greeks used a shroud of asbestos, the Egyptians one of amianth. Mr Eassie suggests a zinc coffin,—that metal being volatile. It is also suggested that the ashes might be deposited in urns, and these placed in a columbarium which might be in the church or at home.~~

~~See Eassie, Cremation of the Dead, London, 1875,—a valuable book in which nearly every source of information on the subject is indicated. (W. Cis:)~~

~~CREMONA, a province of Lombardy, Italy, lying between the Rivers Oglio and Adda, north of the Po, which separates it from Parma and Piacenza. It is conterminous along the Oglio on the north-east with Mantua and Brescia, oud with Bergamo on the north; the Adda separates it from Milan on the west. It is about fifty miles in extreme length from north-west to~~

south-east, and fifteen miles in Width, containing 632 square miles, and (in 1871) 300,595

The body was placed on.

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inhabitants. The surface is level, and the soil very fertile, producing abundant crops of wheat, rice, maize, and flax. Horses and black cattle are numerous, and silk is an exten- sive production, but the sheep are few. There are no im- portant manufactures carried on except the spinning of silk.

Cremona, the capital of the above province and the seat of a bishop, is situated on the north bank of the Po, crossed there by a bridge, 46 miles south-east of Milan ; lines of railway unite it north and westward with Brescia, Bergamo, Pavia, and Milan, and eastward with Mantua. It is well built, of an oval shape, about six miles in circumference, and surrounded by walls flanked with towers and wet ditches. It possesses many good buildings, principally churches, richly adorned with frescoes and paintings by native artists. The cathedral is an ancient structure, begun in 1107 and completed in 1606, thus including very various styles of architecture. The interior is composed of a nave, with two aisles, divided by eight immense pillars, and is gorgeously coloured and gilded. Near the cathedral is the great tower, the Z'orazzo, erected 1261-1284, the highest in northern Italy, being 396 feet in height. In the third story is an enormous astronomical or astrological clock. The Palazzo Pubblico, also a relic of old Cremona, begun in 1206, contains a few paintings by old masters. Cremona has also civil, criminal, and commercial tribunals, a lyceum, a gymnasium, a theatre, a public library, hospitals, asylums, and other charitable institutions, and numerous schools. Its manufactures include silks, cottons, porcelain, earthen- ware, and chemical products. It has a considerable trade by the Po, which is navigable thence to the Adriatic, in agricultural produce, oil, wax, honey, and silk; and [the surrounding district is noted for its superior flax. It was formerly celebrated for its violins and other musical instru- ments, but the manufacture of these has now declined. Violins of Cremona have been known to sell at from 100 to 200 guineas each. Population, with suburbs (1871), 30,508. The site of Cremona was taken by the Romans from the Gallic Cenomani, and colonized by them at various

periods. The town suffered in the invasions of the Goths and Lombards, and subsequently in the conflicts of the Guelphs and Ghibellines. In 1799 the Austrians defeated the French at Cremona.

CREOLE (Spanish, Criollo), is a term which primarily was used to denote an inhabitant of the Spanish colonies who was descended from the European settlers, as distin- guished from the aborigines, the negroes, and mulattoes. It is now more loosely employed, the name being frequently applied to a native of the West Indies, whose descent is partly but not entirely European. A part of the coloured population of Cuba are at times designated creole negroes, in contradistinction to those who were brought direct from Africa. The creole whites, owing to the enervating influence of the climate, are not a robust race, but exhibit an ele- gance of gait and a suppleness of joint that are rare among Europeans.

CREON, in Greek fable, son of Lycethus, king of Corinth and father of Glauce, who was beloved by Jason, and whose tragical fate he shared. See Jason and Mrpza,

CREON, in Greek fable, son of Menceceus, became king of Thebes at the death of Laius, the husband of his daughter Jocasta. Thebes was then trembling before the cruelty of the Sphynx, and Creon offered his crown and his daughter to whoever should solve the fatal enigma proposed by the monster. (E&dipus, the son of Laius, ignorant of his ~ parentage (see (Epirus), having accomplished the task, re ceived the reward, and married Jocasta, his mother. By her he had two sons, Eteocles and Polynices, who mutually agreed after their father's death to reign in alternate years. Eteocles first ascended the throne, being the elder, but at the appointed time he refused to resign, and his brother

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attacked him at the head of an army of Argives. The war was to be decided by a single combat between the brothers, but both fell. Creon, now resuming the govern- ment during the nonage of Leodamus, the son of Eteocles, commanded that the Argives, and above all Polynices, the cause of all the bloodshed, should not receive the rites of sepulture, and that any one who infringed this decree should be buried alive. Antigone, the sister of

Polynices, refused to obey, and sprinkled dust upon her brother's corpse. The threatened penalty was inflicted ; but Creon's crime did not escape unpunished. His son, Hoemon, the lover of Antigone, killed himself on her grave ; and Thebes was attacked by Thescus, by whose hand Creon fell. See ANTIGONE.

CREOSOTE. See CreasorE.

CRESCIMBENT, Giovanni Mario (1663-1728), critic and poet, was born at Macerata in 1663. Having been educated by a French priest at Rome, he entered the Jesuits' College of his native town, where he produced a tragedy on the story of Darius, and versified the Pharsalia. In 1679 he received the degree of doctor of laws, and in 1680 he removed again to Rome. The study of Filicaja and Leonio having convinced him that he and all his contemporaries were working in a wrong direction, he resolved to attempt a general reform. In 1690, in conjunction with fourteen others, he founded the celebrated academy of the Arcadians, and began the contest against false taste and its adherents. The academy was most successful; branch societies were opened in all the principal cities of Italy; and the influence of Marini, opposed by the simplicity and elegance of such models as Costanzo, soon died away. Crescimbeni offici- ated as secretary to the Arcadians for thirty-eight years. In 1705 he was made canon of Santa Maria; in 1715 he obtained the chief curacy attached to the same church ; and about two months before he died (1728) he was admitted a member of the Order of Jesus.

His principal work is the Istoria della volgar Poesia, Rome, 1698, an estimate of all the poets of Italy, past and contemporary, which may yet be consulted with advantage. The most important of his

numerous other publications are the Commentary, 5 vols., Rome, 1702-1711, and La Bellezza della volgar Poesia, Rome, 1700.

CRESPI, Daniete (1590-1630), an Italian historical painter, born at Milan, studied under Giovanni Battista Crespi and Procaccini. He was an excellent colourist ; his drawing was correct and vigorous, and he grouped his compositions with much ability. His best work, a series of pictures from the life of Saint Bruno, is in the monastery of the Carthusians at Milan.

~~Among the most famous of his paintings isa Stoning of St Stephen at Brera, and there are several excellent examples of his work in the city of his birth and at Pavia.~~

~~CRESPI, Giovanni Barrista (1557-1663), an Italian painter, sculptor, and architect, was born at Cerano. He was a scholar of considerable attainments, and held a position of dignity in his native city. He was head of the Milanese Academy founded by Cardinal Frederick Borromeo, and he was the teacher of Guercino. He is most famous as a painter; and, though his figures are neither natural nor graceful, his colouring is good, and his designs full of ideal beauty.~~

~~CRESPI, Giuseppe Maria (1665-1747), an Italian painter, called "11 Spagnuolo" from his fondness for rich apparel, was born at Bologna, and was trained under Angelo Toni, Domenico Canuti, and Carlo Cignani. He then went through a course of copying from Correggio and Baroccio; this he followed up with a journey to Venice for the sake of Titian and Paul Veronese ; and late in life he proclaimed himself a follower of Guercino and Pietro da Cortona. He was 2 good colourist and a facile executant, and was wont to employ the camera cbscura with great success in the~~

~~judgment, was his decision reversed.~~

~~treatment of light and shadow ; but he was careless and uncouscientious. He was aclever portrait painter and a brilliant caricaturist ; and his etchings after Rembrandt aud Salvator are in some demand. His greatest work, a Massacre of the Innocents, is at Bologna ; but the Dresden Gallery possesses twelve examples of him, among which is his celebrated series of the Seven Sacraments. CRESSWELL, Sir Cresswett (1793-1863), the first~~

~~judge of the English Divorce Court, was a descendant of an~~

~~old Northumberland family, and was born in 1793, He was educated at the Charter House and at Emmanuel College, Cambridge, the latter of which he entered in 1810. He graduated B.A, in 1814, and M.A. four years later.~~

~~Hav- ing chosen the profession of the law he studied at the Middle Temple, and was called to the bar in 1819, He~~

~~joined the northern circuit, and was not long in earning~~

~~a distinguished position among his professional brethren. Jn 1837 he entered Parliament as Conservative member for Liverpool, and he soon gained a reputation as an acute and learned debater on all constitutional questions, In January 1842 he took his seat on the bench of the Com- mon Pleas, being knighted at the same time; and this post he occupied for sixteen years. When the new court for probate, divorces, and matrimonial causes was established (1858), Sir Cresswell Cresswell was requested by the Liberal Government to become its first judge and undertake tho arduous task of its organization, Although he had already earned a right to retire, and possessed large private wealth, he accepted this new task, and during the rest of his life devoted himself to it most assiduously and conscientiously, with complete satisfaction to the public. In one case only, out of the very large number on which he pronounced His death was sudden. By a fall from his horse, July 17, 1863, his knee cap was injured. He was recovering from this when on the 29th of the same month he died of disease of the heart.~~

~~CRESSY. See Crécy.~~

~~CREST. See Heratpry.~~

~~CREST, a town of France, in the department of Dréme and arrondissement of Die, situated on the right bank of the River Dréme, there crossed by a fine stone bridge. It carries on the manufacture of woollens, cotton, and beetroot sugar. On the curious rock which commands the town there are some remains of the aucient castle to which it was indebted for its importance in the Middle Ages. It ranked for a time as the capital of the duchy of Valentiuois, and in that capacity belonged before the Revolution to the prince of Monaco. The communal charter, dating from the 12th century, is preserved in the public archives, Population in 1872, 5568.~~

~~CRESWICK, Tsomas, an English landscape painter (1811-1869), was born at Sheffield, and educated at Hazelwood, near Birmingham. At Birmingham~~

he first began to paint. His earliest appearance as an exhibitor was in 1897, at the Society of British Artists in London ; in the ensuing year he sent to the Royal Academy the two pictures named Llyn Gwynant, Morning, and Carnarvon Castle. About the same time he settled in London; and in 1836 he took a house in Bayswater. He soon attracted some attention as a landscape-painter, and had a career of uniform and encouraging, though not signal success, In 1842 he was elected an associate, and in 1850 a full member of the Royal Academy, which, for several years before his death, numbered hardly any other full members representating this branch of art. In his early practice he set an example, then too much needed, of diligent study of nature out of doors, painting on the spot all the sub- stantial part of several of his pictures. English and Welsh streams may be said to have formed his favourite subjects,

and generally British rural scenery, mostly under its cheerful, calm, and pleasurable aspects, in open daylight. This he rendered with elegant and equable skill, colour rather grey in tint, especially in his later years, and more than average technical accomplishment ; his works have little to excite, but would, in most conditions of public taste, retain their power to attract. Creswick was industrious and extremely prolific; he produced, besides a steady outpouring of paintings, numerous illustrations for books. He was personally genial,—a dark, bulky man, somewhat heavy and graceless in aspect in his later years. He died at his house in Bayswater, Linden Grove, De- cember 28, 1869, after a few years of declining health. Among his principal works may be named England, 1847; Home by the Sands, and a Squally Day, 1848; Passing Showers, 1849; the Wind on Shore, a First Glimpse of the Sea, and Old Trees, 1850; a Mountain Lake, Moonrise, 1852; Changeable Weather, 1865; also the London Road, a Hundred Years ago; the Weald of Kent; the Valley Mill (a Cornish subject); a Shady Glen; the Windings of a River; the Shade of the Beech Trees ; the Course of the Greta; the Wharfe; Glendalough, and other Irish subjects, 1836 to 1840; the Forest Farm. Mr Frith for figures, and Mr Ansdell for animals, occasionally worked in collaboration with Creswick.

CRETE, or CanpiA, one of the largest islands in the Mediterranean, situated between 34° 50’ and 35° 40’ N. lat., and between 23° 30’ and 26° 20’ E. long. It is thus the most southerly portion of Europe. By its position south of the Augean Sea or Archipelago, extending to the north-west to within 60 miles of Cape Malea in the Peloponnesus, while its north-east angle is distant only about 110 miles from Cape Krio in Asia Minor (a great

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Island of Crete.

part of which interval is filled up by the large islands of Carpathus and Rhodes), it forms the natural limit between the Archipelago and the Mediterranean, as well as one of the chief lines of natural connection between the southern shores of Europe and Asia. The island is of a very elon- gated form, being not less than 160 miles in length, while its breadth does not anywhere exceed thirty-five miles, and is in some places narrowed to only ten or twelve miles. Mountains.—By far the greater part of the surface of the

island is occupied by ranges of mountains, some of which —

attain to a very considerable height. Nearly in the centre of the island rises the lofty group, of rather mass, of Mount Ida, now called Psiloriti (a corruption of iynAoperrior, “ the high mountain”), which is not less than 8060 feet in height, forming a nearly isolated mass, separated by tracts of comparatively low elevation from the mountain ranges to the east and west of it. In the western portion of the island is found the range of the White Mountains (called by the natives Madara Vouna), the central group of which is nearly if not quite as elevated as Mount Tda, rising to a height of atleast 3000 feet, and of considerably greater extent, sending down spurs to the west and north-west, which fill up almost the whole of that portion of the island, while the main mass abuts directly upon the south coast

for a space of twenty-five to thirty miles, and is then con-

tinued by a ridge of inferior elevation, but still ranging

from 5000 to 6000 feet in height, till it sinks into the plain of the Messara nearly due south of Mount Ida, from which it is separated only by the valley of Sulia. The eastern half of the island is less mountainous, and none of the summits attain so great an elevation; but the central group of the Lasethe Mountains rises to the height of 7100 feet, and its summits, like those of Mount Ida and the White Mountains, are covered with snow throughout the greater part of the year. The range of Mount Kophino, which separates the plain of the Messara from the south coast, rises abruptly from the sea to a height of 3750 feet, while the subordinate ranges, that fill up the extreme eastern portion of the island, nowhere attain to the eleva- tion of 4000 feet. The isolated peak of Mount Luktas, nearly due south of the city of Candia, though not exceed- ing 2700 feet in height, has attained great celebrity from its being reputed in ancient times to contain the burial- place of Zeus, which continued to be regarded with venera- tion by the Cretans till after the time of Constantine.

The intervals between these mountain groups are filled up for the most part by undulating tracts, consisting of hills of Tertiary formation and comparatively low elevation, but still rising occasionally to a height of from 2000 to 3000 feet. Such a tract is that which extends across the island from the neighbourhood of Candia to the plain of Messara in the south ; and a similar one, though of less extent, between Hierapytna on the south and the Gulf of Mirabella on the north, forms a kind of isthmus not more than seven miles across by which the easternmost portion of Crete is united with the rest of the island. Very few plains of any considerable extent occur. Much the largest of these is that called the plain of Messara, in the south of the island, which extends inland from the sea at the foot of Mount Ida, between the slopes of that mountain and the range of Mount Kophino, which, as already stated, separates it from the sea. It is about thirty-five miles in length, with a breadth of from six to ten miles. The plain which adjoins the city of Canea is of great fertility but of small extent, not exceeding seven or eight miles in width.

~~One leading characteristic of the mountain regions of Crete is the occurrence of depressed valleys or basins at o considerable height above the sea, forming crater-like hollows without any outlet for their waters, and containing plains of considerable extent, which afford admirable pasturage in spring and early summer. The most remark- able of these upland basins (which appear to answer precisely to the Yailahs of the Lycian Taurus) are that called Nida, on the flanks of Mount Ida, at an elevation of between 5000 and 6000 feet ; the more extensive one called Omalo, in the White Mountains, at a height of about 4000 feet ; and one in the Lasethe Mountains about 3000 feet above the sea, which is the most extensive of the three, and incloses a beautiful plain, containing no less than fifteen villages, with a population of between 3000 and 4000 souls.~~

~~Rivers.—From its peculiar conformation it naturally results that Crete contains no rivers of any importance. The most considerable stream is that called the Ieropotamo (the ancient Electra), which flows through the plain of the Messara and falls into the sea on the south coast. The Mylopotamo (the ancient Oaxes), which traverses the fertile district north of Mount Ida, is the most important of those on the north coast ; while the Platania, a small stream which falls into the sea a few miles west of Canea, deserves notice chiefly as being mentioned by Homer under the name of Jardanus.~~

~~Coast-line.—The coasts of Crete, in consequence of its mountainous character, present a very broken, and varied outline. In the west especially they form a number of~~

~~rugged and lofty promontories, of which the north-west. extremity is the headland now called Cape Busa, the ancient Corycus, and the south-west angle is formed by Cape Krio, the Kriu Metopon of ancient geographers. ast of Cape Busa the lofty mountain headland of Cape Spada projects more than twelve miles from the general coast-line ; and again, beyond Canea, the mountainous peninsula called Akrotiri bounds the Bay of Sudha, which constitutes a naturally sheltered harbour of sufficient size to afford pro- tection to all the fleets of Europe. The north coast 15 again deeply indented,~~

~~in the eastern portion of the island, by the Gulf of Mirabella, beyond which the coast runs out far to the north-east, ending in the narrow and rocky promontory of Cape Sidaro, the Sammonium of the ancients. The south coast is less broken and irregular, and contains few good harbours,—the mountains in many parts rising almost like a wall directly from the sea. There is, how- ever, one small but well-sheltered bay, about five miles east of Cape Littinos, still called Kaloi Limencs, or "the Fair Havens," under which name it is mentioned in the voyage of St Paul.~~

~~Islands.—The islands which are found around the coasts of Crete are for the most part mere rocks, unworthy of notice. The largest is that of Gavdo, the ancient Clauda, which is also mentioned in the Acts of the Apostles, and (probably on that account) became in the Middle Ages the see of a bishop, though it is only about five miles long by three in breadth, and contains at the present day only about seventy families. The small island of Dia, now called Standia, which lies about eight miles north of the city of Candia, has a good port, and in consequence bore an important part during the memorable siege of that city. The isolated rock of Grabusa, off the north-west angle of the island, has obtained celebrity from its having been converted by the Venetians into a fortress, long reputed impregnable, which did not fall into the hands of the Turks until long after the capture of Candia. For the same reason it became a stronghold of the Greeks during the war of independence, and at that period afforded shelter to a considerable population.~~

~~Vegetation.—Though so large a part of Crete is occupied by mountains, the rest of the island is of great fertility, and there can be no doubt that, under a better system of government, it would become one of the richest and most productive islands in the Mediterranean. The forests which once covered the mountains have indeed for the most part disappeared, but the cypress still grows wild in the higher regions, while the lower hills are covered with olive woods. Oranges and lemons also abound, and are of excellent quality, so as to furnish almost the whole supply of continental Greece and Constantinople. Chestnut woods, as in Greece itself, are local and exceptional; the same is the case with the valonia oak; while in some districts the carob tree is so abundant as to form an important article of consumption. Pears, apples, quinces, mulberries, and other fruit-trees~~

~~*flourish in abundance, as well as vines, though the Cretan wines no longer enjoy the reputation which they possessed in the time of the Venetians. Tobacco and cotton succeed well in the plains and low grounds, though not at present cultivated to any great extent.*~~

~~*Animals.—Of the wild animals of Crete, the only one that deserves special notice is the wild goat, which is still found in considerable numbers on the higher summits of Mount Ida and the White Mountains. It is the same species (Capra cegagrus) which is found in the Caucasus and Mount Taurus, and is distinct from the ibex or bouguetin of the Alps. Crete enjoys the same immunity which is possessed by several other large islands from the presence of serpents of all kinds,—a privilege ascribed by*~~

popular belief to the intercession of Titus, the companion of St Paul, who according to tradition was the first bishop of the island, and became in consequence its patron saint, previous to its conquest by the Venetians. Wolves also are not found in the island, though so common in Greece and Asia Minor.

History.—The earliest history of Crete, like that of most parts of continental Greece, is to so great an extent mixed up with mythology and fable as to render it impossible to arrive at any clear conclusions concerning it. The Cretans themselves claimed for their island to be the birthplace of Zeus, as well as the parent of all the other divinities usually worshipped in Greece as the Olympian deities. But passing from this region of pure mythology to the semi- mythic or heroic age, we find almost all the early legends and traditions of the island grouped around the name of Minos, one of those personages of the earliest Greek history of whom it is impossible to say whether any element of truth underlies the mass of mythical and poetical fable by which it has been surrounded. According to the received tradition, Minos was a king of Cnossus in Crete, who was a son of Zeus, and enjoyed through life the privilege of habitual intercourse with his divine father. It was from this source that he derived the wisdom which enabled him to give to the Cretans the excellent system of laws and governments that earned for him the reputation of being the greatest legislator of antiquity. At the same time he was reported to have been the first monarch who established a naval power, and acquired what was termed by the Greeks the 7halassokraty, or dominion of the sea.

Whatever truth there may have been in this last tradi- tion (which was received as an undoubted fact both by Thucydides and by Aristotle), it is certain that when we first hear of the Cretans, in the Homeric poems, they appear as a seafaring race, and apparently the only Greek people who at that early period attempted to compete with the Pheenicians as bold and adventurous navigators. The position of their island was moreover such as to give them great natural facilities for the command of the Aigean and the surrounding islands, as well as for communication with Phoenicia and Egypt.

Even at the earliest period when we have any informa- tion concerning it, the population of Crete was of a very mixed character, and we are told in the Odyssey (xix. 175) that besides the Eteocretes, who, as their name imports, must have been the original inhabitants, the island contained Achans, Pelasgians, Dorians, and Cydonians. Subsequently the Dorian element became greatly strength- ened by fresh immigrations from the Peloponnesus, and during the historical period all the principal cities of the island were either Dorian colonies, or had adopted the Dorian dialect and institutions. It is certain that at a very early period the Cretan cities were celebrated for their laws and system of government,. the origin of which was of course attributed to Minos, but which had mnch in common with those of the other Dorian states, as well as with those of Lycurgus at Sparta, which were, indeed, according to one tradition, copied in great measure from those already existing in Crete.!

It is certain that whatever merits the Cretan laws may have possessed for the internal regulation of the dif-

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1 Among the features common to the two were the syssitia, or public tables, at which all the citizens dined in common. Indeed, the Cretan system, like that of Sparta, appears to have aimed at training up the young, and controlling them, as well as the citizens of more mature age, in all their habits and relations of life. The supreme governing authority was vested in magistrates called Cosmi, answering in some measureto the Spartan Ephori, but there was nothing corre- sponding to the two kings at Sparta. These Cretan institutions were much extolled by some writers of antiquity, but receive only qualified praise from the judicious criticisms of Aristotle (Polit. ii. 10).

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CRETE

terent cities, they had the one glaring defect, that they made no provision for any federal bond or union among them, or for the government of the island as a whole. It was owing to the want of this that the Cretans scarcely

~~figure in Greek history as a people, though the island, as observed by Aristotle, would seem from its natural posi- tion calculated to exercise a preponderating influence over Greek affairs. Thus they took no part either in the Persian or the Peloponnesian war, or in any of the subse- quent civil contests in which so many of the cities and islands of Greece were engaged. At the same they were so far from enjoying tranquillity on this account that the few notices we find of them in history always represent them as engaged in local wars among one another; and Polybius tells us that the history of Crete was one con- tinued series of civil wars, which were carried on with a bitterness of animosity exceeding all that was known in the rest of Greece.~~

~~In these domestic contests the three cities that generally took the lead, and claimed to exercise a kind of hegemony or supremacy over the whole island, were Cnossus, Gor- tyna, and Cydonia. But besides these three, there were many other independent cities, which, though they gene- rally followed the lead of one or other of these more powerful rivals, enjoyed complete autonomy, and were able to shift at will from the alliance of one to the other. Among the most important of these were—Lyttus or Lyctus, in the interior, south-east of Cnossus ; Rhaucus, between Cnossus and Gortyna; Pheestus, in the plain of Messara, between Gortyna and the sea; Polyrrhenia, near the north-west angle of the island; Aptera, a few miles inland from the Bay of Sudha; Eleutherna and Axus, on the northern slopes of Mount Ida; and Lappa, between the White Moun- tains and the sea. Phalasarna on the west coast, and Chersonesus on the north, seem to have been dependencies, and served as the ports of Polyrrhenia and Lyttus, Elyrus stood at the foot of the White Mountains, just above the south coast. In the eastern portion of the island were Preesus in the interior, and Itanus on the coast, facing the east, while Hierapytna on the south coast was the only place of importance on the side facing Africa, and on this account rose under the Romans to be one of the principal cities of the island.1~~

~~Though it was continually torn by civil dissensions,~~

- ~~the island maintained its independence of the various Macedonian monarchs by whom it was surrounded ; but having incurred the enmity of Rome, first by an alliance with the great Mithridates, and afterwards by taking active part with their neighbours, the pirates of~~

Cilicia, the Cretaus were at length attacked by the Roman arms, and, after a resistance protracted for more than three years, were finally subdued by Q. Metellus, who earned by this success the surname of Creticus (67 B.c.). The island was now reduced to a Roman province ; but by a very singular arrangement was united for administrative purposes with the district of Cyrenaica or the Pentapolis, on the opposite coast of Africa, a disposition which continued un- changed till the time of Constantine. Thenceforth Crete

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1 But besides these there were many small towns, which still enjoyed or claimed the privileges of autonomy. In the earliest times, indeed, Crete was said to have contained a hundred cities, and though this was doubtless a mere poetical exaggeration, the existing remains show that the whole island was studded with numerous fortified strongholds, each of which may at times have asserted its independence. Such petty fortresses were well suited to a people of the predatory habits which distinguished the Cretans in all ages, notwithstanding the boasted ex- cellence of their government. Throughout the flourishing period of Greece, indeed, the Cretans were principally known as furnishing mercenary troops, whu were distinguished for their skill in the use of the bow, so that a force of Cretan archers became almost a necessary addition to every Greek army.

of Canea. they laid siege to the capital city of Candia. This was the longest siege on record, having been protracted for more than twenty years; but in 1667 it was pressed with renewed vigour by the Turks under the grand vizier Achmet Kiuprili, and the city was at length compelled to surrender (September 1669). submission of the whole island.

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constituted a separate province under a governor of consular rank, and continued to form part of the Byzantine empire till the 9th century, when it fell into the hands of the Saracens (823). It then became a formidable nest of pirates, but defied all the efforts of the Byzantine sovereigns to recover it till the year 960, when it was reconquered by Nicephorus Phocas. In the partition of the Greek empiro after the capture of Constantinople by the

~~Latins in 1204, Crete fell to the lot of Boniface, marquis of Mont- ferrat, but was sold by him to the Venetians, and thus passed under the dominion of that great republic, to which it continued subject for more than four centuries.~~

~~Under the Venetian Government Candia, a fortress origi- nally built by the Saracens, and called by them " Khandax," became the seat of government, and not only rose to be tho capital and chief city of the island, but actually gave name to it, so that it was called in the official language of Venice " the island of Candia," a designation which from thence passed into modern maps, where it retained its position down to our own days. 'Theancient name of Krete or Kriti was, however, always retained in use among the Greeks, and is gradually resuming its place in the usage of literary Europe. The government of Crete by the Venetian aristo- ctacy was, like that of their other dependencies, very arbi- trary and oppressive, and numerous insurrections were the consequence. But with all its defects their administration did much to promote the material prosperity of the country, and to encourage commerce and industry; and it is probable that the island enjoyed during this period a more prosperous condition than it has done at any subsequent time. Their Venetian masters at least secured to the~~

~~islanders external tranquillity, and it is singular that the~~

~~Turks were content to leave them in undisturbed posses- sion of this opulent and important island for nearly two centuries after the fall of Constantinople. It was not till 1645 that the Turks made any serious attempt to effect its conquest; but in that year they landed with an army of 50,000 men, and speedily reduced the important city Retimo fell the following year, and in 1648~~

~~Its fall was followed by tlie (See Daru, Histoire de Venise, chap. xxxili.)~~

~~From this time the island continued subject to the Ottoman rule without interruption till the outbreak of the Greek revolution. After the conquest a large part of the inhabitants embraced Mahometanism, and thus secured to themselves the chief share in the administration of the island. But far from this having a favourable effect upon the condition of the population, the result was just the contrary, and according to the testimony of an intelligent~~

traveller, Crete was the worst governed province of the Turkish empire. The regular authorities sent from Con- stantinople were wholly unable to control the excesses of the janissaries, who exercised without restraint every kind of violence and oppression, Hence, when in 1821 the revolution broke out in continental Greece, the Cretans, headed by the Sfakiot mountaineers, at once raised the standard of insurrection, and carried on hostilities with such success that they soon made themselves masters of the whole of the open country, and drove the Turks and Mahometan population to take refuge in the fortified cities, 'These, however, defied all the efforts of the insur- gents ; and the contest was prolonged without any decisive result, until in 1830 the ailied powers (France, England, and Russia) who had intervened in the contest between

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Greece and Turkey, transferred the island of Crete to the government of Mehemet Ali, viceroy of Egypt. This change of masters brought some relief to the unfortunate Cretans, who at least exchanged the licence of local misrule for the oppression of an organized despotism ; and the government of Mustafa Pasha, the ruler of the island for a considerable period, was more enlightened and intelligent than that of most Turkish governors. ;

In 1840 Crete was again taken from Mehemet Ali, and replaced under the dominion of the Turks, as it has continued eversince. Great improvement has undoubtedly taken place in the administration, and the island is said to be now the best governed and the most lightly taxed of all the provinces of the Turkish empire. But the strong desire of the Cretans for freedom and union with the Greek monarchy has given rise to two successive revolts ; the first of which in 1859 was speedily repressed; but the second, in 1866, lasted for a considerable period, and required great exertions on the part of the Porte to put it down. It was followed by the concession of additional privileges to the Christian inhabitants, and a kind of constitutional government, which has placed the island in quite an exceptional position among Turkish provinces,

In all these insurrections, as well as in those against the Venetians in former days, a leading part has been borne by the people known as Sfakiots, a race of hardy mountaineers inhabiting the highlands and upland plains of the

~~*White Mountains, and who, from the rugged and inaccessible nature of their country, have always enjoyed a condition of semi-independence, while their active and warlike habits have rendered tliem formidable neigh- bours to the inhabitants of tle plains, There is, however, no ground for supposing them to be in any respect a distinct race from the other population of the island ; they appear to be, on the contrary, the lineal representatives of the ancient Cretans, who have preserved comparatively unimpaired the character and manners of their forefathers. A curious proof of this is found in their still wearing high boots, a fashion noticed by ancient writers as characteristic of the Cretans, and which was then, as now, wholly unknown to the Greeks of the mainland. It is mentioned also by Venetian writers, that as late as the 17th century the Sfakiots retained that skill in the use of the bow for which the Cretans were so celebrated in antiquity, and were with difficulty induced to lay it aside for the more civilized firearms of their rulers.*~~

~~*Population.—The inhabitants of Crete under the Vence- tians were estimated at about 250,000 souls. After the Turkish conquest the population was for a time greatly reduced, but afterwards gradually rose, till it was supposed again to have attained to about 260,000 at the time of the outbreak of the Greek revolution in 1821, of whom about half were Mahometans, The ravages of the war from 1821 to 1830, and the emigration that followed, produced a great diminution, and the population of the island was estimated by Mr Pashley in 1836 at only about 130,000. Since then it has again materially increased ; it was calculated by Captain Spratt in 1865 as amounting to 210,000, and this nearly agrees with the latest official estimate which gives 200,000 inhabitants in all, of whom less than 40,000 are Mahometans. It must be observed that very few of these are Turks,—the Mussulman popula- tion being almost entirely of native Cretan origin. Hence the Greek language is the only one spoken throughout the island, even in the towns and among the Mahometans,*~~

~~*Touns.—The only considerable towns in Crete are Candia, so long the capital of the island; Canea, which has succeeded to that dignity since the reucwal of the Turkish dominio in 1840; and Retimo, or Rhithymno, also on the north coast, a small fortified town, with a good*~~

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Museum of Classical Antiquities, vol. ii. pp. 263-803,

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port and about 10,000 inhabitants. TIerapetra, on the south coast, on the site of the ancient HierapytnA, though reckoned the fourth city of the island and the capital of the eastern district, is a very poor place, with not more than about 2000 inhabitants.

Crete has of late years been carefully examined and explored. The older descriptious of the island by Tournefort, Pococke, Olivier, and other travellers may now be considered as obsolete, and super- seded by the more recent works of Pashley (Travels in Crete, 2 vols. 8vo, London, 1837), and Captain Spratt (Zravels and Luscarches in Crete, 2 vols. 8vo. London, 1865), which between them contain a full description of the whole island. At the same time its geography has been placed on a satisfactory basis by the amirable survey executed, under the orders of the British admiralty, by Captain Graves and Captain (now Admiral) Spratt. A curious and interesting addition to its archeology has been also made by the publication of a description of the island, drawn up under the Venetians (about 1538), and preserved in manuscript in the Library of St Mark, whence it has been published by Mr Falkener in the From this treatise we learn how many architeetural remains of the ancient cities were still visible in the 16th century, which have long since dis- appeared, All that can be gathered from ancient authors concern- ing the mythology and early history of the island is brought together by Meursius (Creta, &c., in the 3d vol. of his works) and Hoeck (Xreta, 8 vols. 8vo, Gottingen, 1823-29), but the latter work was published before the recent rescarches which have thrown so much light on the topography and antiquities of the island. (E. H. B.)

CRETINISM may be defined as an endemic idiocy, of which the characteristic is an arrested development of bedy es wellas mind, The origin of the word is doubtful. Its southern French form Chrestiaa suggested to Michel a derivation from eresta (eréte), the goose foot of red cloth worn by the Cagots of the Pyrenees. The Cagots, however, were not cretins. Again Christianus (which appears in the Lombard cristanet, and

the Savoyard tanocents and gens du bon dieu) is merely a translation of the older cretin, which is probably connected with creta (crate)—a sall »w or yellow-earthy complexion being a common mark of cretin- ism. Many other symptoms show that the whole org..wism is stunted. We quote the vivid picture by Beanpré (2s- sertation sur les Crétins, translated in Blackie on Cretinism, Edin, 1855) :—

**T see a head of unusual form and size, a squat and bloated figure, a stupid look, bleared hollow and heavy eyes, thick projecting eyelids, and a flat nose. HIs face is of a leaden hue, his skin dirty, flabby, covered with tetters, and his thick tongue hangs down over his moist livid lips. HIs mouth, always open and full of saliva, shows teeth going to decay. HIs chest is narrow, his back curved, his breath asthmatic, his limbs short, misshapen, without power. 'The knees are thick and inclined inward, the feet flat, es large head drops listlessly on the breast; the abdomen is like a

ag.

Generally the cretin is deaf and dumb, or able to utter only a hoarse cry. HIe is indifferent to heat, cold, blows, and even the most revolting odours. Some appear to want intelligence altogether, and even the power of articulation, Others acquire the rudiments of language, and are able to perform simple tasks. There are, indeed, several distinct varieties of cretinism which have been noticed by Abercrombie, founding on the descriptions of Fodéré and De Saussure (De Fatuitate Alpina, Edin. 1803), Wenzel (Ueber d. Cretinismus, Vienna, 1802), and Guggenbiihl of the Abendberg at Interlaken. The abnormal cranial deve- lopment has been studied by Virchow (Der Cretinismus in Unterfranken, Wiirzburg, 1852) and Vogt (Mémoires sur les Microcéphales, Geneva, 1867). Many cretins are hydrocephalic; but more frequently the skull is microce- phalic, with premature ossification of the sutures and in- duration of portions of the brain matte:. The anterior lobes are said to be much lighter than in healthy brains, but this difference does not extend to the cerebellum. Vogt maintains that the microcéphale has a pithecoid skull at the crown, and a human skull at the base andcrown. But his suggestion that this is a case of atavism, and that cretins

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represent a stage through which the human race passed in its evolution from the ape is generally repudiated. (See the Laces of Man by Oscar Peschel, London, 1867, p. 66, and a paper by Dr Ireland of Larbert on the Reports of Drs Lombroso and Valeuti of Bologna, Hdin. Med. Journal, xx. p. 109). It is said too that the respiration of cretins reaches only 15 instead of the normal 18 per minute.

Many die very young in epileptic convulsions, and survival |

to old age is extremely rare. But the most striking sign of cretinism is the govtre, variously known as bronchocele and struma, kropf (German), wen or derby neck (English), mumps or branks (Scotch). From this must be distin- guished the weaver's goitre, caused by the emanations from steeped flax ; the exophthalmic goitre, also called Grave's disease, which is marked by palpitations of the heart and prominence of the eyeballs ; and the smaller goitre which is sometimes connected with uterine affections, We should also mention the epidemic goitre, such as that which attacked Captain Cook's crew in 1772, when they drank water from a melting iceberg. The endemic goitre is a tumour of the thyroid gland of varying size, sometimes filled with a viscous fluid, sometimes coutaining pus cysts and calcareous deposits. There isa large body of evidence to the effect that goitre and cretinism are causally related,— that they are at least effects of the same causes ; or, as Maffei expresses it, " goitre is the beginning of that degener- ation of which cretinism is the end." No doubt, perfectly sane and healthy persons have goitres. For instance Fodéré, an eminent man of science who published an Zssai sur le Gottre at Turin in 1792, himself suffered from this deformity when a boy, and re-caught it when lecturing at Strasburg. But these cases are few, and the statistical inquiries of Rocsch in Wurtemberg (Ueber d. Cretinismus, Erlangen, 1844), and of Niepce in Dauphiné (7raité du Cottre et du Crétinisme, Paris, 1852) have established that the great mass of cretins have goitres, and that goitre generally appears at the age when development is arrested, that is, seven or eight years. Of Aosta, the home and centre of cretinism, Malacarne wrote in 1789, Un mente- catto senza gozzoe una cosa rarissima. The two things have been observed together in Africa and both Americas by Park, Richardson, Humboldt, and other distinguished travellers. Again eretinism is found in certain districts ; it is in these districts also that the non-

cretinous cases of goitre are for the most part found. Healthy parents, coming to an endemic district, produce children with goitres, or cretins; parents with goitres, removing to an untainted neighbourhood, often lose their own goitres, and seldom produce children subject to the deformity. Nor does intermarriage with a healthy stranger avert the danger, if the household remain subject to the endemic conditions. It may be added that in both Europe and the United States deaf mutism, a form of arrested development, is found in local contact with cretiuism and goitre. Deaf-mutes are often found in families of which the other members are cretins, and they are found as a class in the neighbourhood of a eretin district. What then are the causes of cretinism, of which we shall take goitre as a symptom ? In the first place, the phenomenon is not con- fined to any one race. The whites, the Indians, the negroes, and the half breeds of Central and South Africa all exhibit the disease {in certain localities. So do the Malays and the Dyaks of Borneo, the Mongolians of Nepaul, Siberia, and the Kwang Tung Mountains in China, the Berbers of Mount Atlas. Nor is it confined to one elevation or character of surface. It appears on the sea shore, as at Viborg, and at the mouth of the St Lawrence ; on inland plains, like those of Lombardy and Alsace; at the moderate elevations of La Barthe and Luz in the

O73 the Himalayan vaiiey of the Jumna. Nor can any thermic conditions be laid down ; for the symptoms range trom the deserts of Algeria to Irkutsk in Siberia, from an average temperature of 80° Fahr. to one of 14° Fahr. The idea of Fodéré that cretinism is caused by a humid atmosphere does not receive much encouragement from the facts. Peru has a very dry climate, and goitre is the principal endemic ; the British Isles with much rain and fog have little or nocretinism ; at Cuzco, where it rains, as the inhabitants say, thirteen mouths in the year, the disease is unkuown. Morel, Virchow, and Koeberlé (in his Essat sur Crétinisme, Strasburg, 1862) have maintained that cretinism is caused by a special form of marsh-fever, malaria, or even a special] organic. poison-germ in tho atmosphere. The maximum of miasmic fever, however, has a geographical habitat very different from that of cretinism, which frequently occurs in a rare atmosphere, impregnated with ozone. Hygienic regulation, too, suc- cessfully resists cretinism, while respiration is sufficient to let in the atmospheric poison. The favourite explanation of De Saussure, that

cretinism is caused by the stagnation of air in the deep valleys «f the Alps and Pyrenees, over- looks the well-known fact that morning and evening winds regularly ventilate these valleys. Proceeding on this error, the Sardinian commission recommended that trees near dwelling-houses should be cut down (see Ltapport de la Commission Sarde, Turin, 1848). Milk and vege- table diet, various kinds of farinaceous food, and defective lrygiene have also been made responsible for the disease. But it 1s not only the poor, the ill-fed, and ill-clad who coutract goitre and become idiots; persons in comfortable circumstances, living with every regard to cleanliness, in a fertile country under a fine climate, are subject to the ailment. In Piedmont, for instance, it was calculated that less than three-fifths of the cretins belonged to the poor people ; of course poverty aggravates every disease. The general result of these abortive theories is that some local telluric conditions must be ascertaincd. There are fragments of evidence showing the persistence of cretinism in particular localities, the inhabitants of which have changed from time to time. Every one knows Juvenal's line—" Quis tumidum guttur miratur in Alpibus?" and Shakespeare's " mountaineers, dewlapped like bulls, whose throats had hanging at 'em wallets of flesh." Catholic legends tell how in the 5th and 7th centuries Champagne aud Liége were condemned for some sacrilege to have women with goitres. The Life of Charlemagne states that in 772 his soldiers caught the goitre on the banks of the Rhine. It has always been a popular as well as a scientific belief that water is the vehicle of the poison. 'Struma oritur ex metallicis et mineralibus aquis, " says Paracelsus, Endemic goitre has been observed to increase when the summer heats altered the chemical character of the water used for drinking and cooking ; and it sometimes disappears before modern arrangenients for water supply. Coitre has in fact been artificially produced by the use of water, for the purpose of evading the conscription. But the question remains what is the poison thus conveyed ? One opinion was that there might be too little iodine. The old practice of eating the ashes of sea-sponge led Coindet of Geneva to apply iodine to goitre with success. It was also maintained that there might be a deficiency of the phosphates of lime and magnesium. These views apparently proceeded on the principle that the human body required a certain normal proportion in the chemical elements which it consumed. The whole subject has been elaborately treated by M. St Lager in Ltudes sur les causes du crétinisme et du goitre endémique, Paris,

1867. He takes the pathology of cretinism as illustrating the wider question of the depen-

Pyrenees ; and on the high Peruvian plateau of Pasco, and in | dence of the human organism on the chemical constitution.

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of the soil. He has made an inquiry into the geological features of the districts in which cretinism is endemic, conl- pared with the statistics of the cretin population. 'He finds that cretinism is confined to metalliferous districts, and occurs most frequently where iron pyrites and copper pyrtites predominate.

Although dogs, pigs, and probably also horses, oxen, and sheep have been affected by goitre, there 1s no reliable evi- dence of a connection between goitre and feeble or stunted organization in any of the lower animals. "

Pronounced cretinism seems to be incurable. Dr Guggenbiihl's treatment at the Abendberg was chiefly psychological, and belongs to the general theory of the treatment of idiots. But the Swiss commission, who reported on the Abendberg on 15th May 1849, say that the greater part of the inmates were not cretins at all, but merely scrofulous children. Accordingly on Guggenbiihl's death the Bern Government declined any longer to support the establishment. Similar establishments have been founded at Marienberg in Wiirtemberg by Dr Roesch, at Aosta in Piedmont, Basseno in Savoy, at Abbiategrasso in Lombardy, at Albany, Utiea, and other places in the United States. (See, for a list of idiot schools, Die Heil wad Pflege Anstalten fiir psyehisch. Kranke, by Dr H. Laehr, Berlin, 1875.) An institution at Highgate, London, was founded in imitation of the Abendberg. It may be interesting to note the places in which cretins have been found in the United Kingdom. In England these are Oldham, Sholver Moor, Cromp- ton, Duffield, Cromford (near Matlock), and other points in Derby- shire ; endemic goitre has been seen near Nottingham, Chesterfield, Pontefract, Ripon, and the mountainous parts of Staffordshire and Yorkshire, the east of Cumberland, certain parts of Worcester, Warwick, Cheshire, Monmouth, and Leicester, near Horsham in Hampshire, near Haslemere in Surrey, and near Beaconsfield in Buckingham. There are cretins at Chiselborough in

Somerset. In Scotland cretins and cases of goitre have been seen in Perthshire, on the east coast of Fife, in Roxburgh, the upper portions of Peebles and Selkirk, near Lanark and Dumfries, in the east of Ayrshire, in the west of Berwick, the east of Wigtown, and in Kirkcudbright.

See Inglis, Treatise of English Bronchocele, 1844; Cretinism in Scotland, by Coldstream, 1847; Mitchell on the Nithsdale neck or goitre in Scotland, in Med. and Chir. Review 1862. See also Virchow, Pathologie des Tumeurs, Paris, 1863; Maffei, Der Cret.in den Norischen Alpen, Erlangen, 1844; Morel, Traité des Dé- généresceences, Paris, 1857; Report of Royal Commission of Cretinism in Lombardy, Milan, 1864; Report of Austrian Commission, Vienna, 1861. (W. C.S.)

CREUSE, a department of central France, comprising the greater portion of the old province of Marche, bounded N. by the departments of Indre and Cher, E. by Allier and Puy- de-Dome, S. by Corréze, and W. by Haute-Vienne, with an area of 2150 square miles. The surface is hilly, with a general inclination north-westward in the direction of the valley of the Creuse, sloping from the mountains of Auvergne and Limousin, which rise southward and branch into the department. The highest point within its limits is in the forest of ChAteauvert, 3050 feet above the sea. Rivers, streams, and lakes are numerous, but none are navigable ; the principal is the Creuse, which rises on the north side of the mass of Mount Odouze on the border of the department of Corréze, and passes through the depart- ment, dividing it into two nearly equal portions, receiving the Petite Creuse from the right, and afterwards flowing on to join the Vienne. The valleys of the head-streams of the Cher and of its tributary the Tardes occupy the eastern side 5 those of the heads of the Vienne and its tributary the Thorion, and of the Gartempe joining the Creuse, are in the west of the department. The climate is in general cold, moist, and variable ; the rigorous winter covers the higher cantons with snow ; rain is abundant in spring, and storms are frequent in summer, but the autumn is always fine. Except in the valleys the soil is poor and infertile, so that agriculture is not in an advanced state, and the produce of corn, chiefly rye, oats, and buckwheat or "sarrasin," is not sufficient for home consumption. The chestnut abounds in the north and west, and its fruit is largely used. Cattle rearing and sheep breeding are the chief industries of the department. Creuse

supplies Poitou and Vendée with draught oxen, Coal is mined to some extent, chiefly in the basin of Ahun, but though iron ore, antimony, and kaolin

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are known, they are not worked, Millstones are quarried at Lésigny. 'There are thermal springs at Evaux in the east of the department. A railway uniting the systems of the Loire and Garonne basins crosses the department from east to west, and a branch line leads up the valley of the Creuse to Aubusson. With Haute-Vienne Creuse forms the diocese of Limoges. The department is divided into the four arrondissemcuts of Guéret, the capital (population, 4899), Aubusson, the largest place (population, 6034), Bourganeuf, and Boussac, and further into twenty five cantons. Population of department (1872), 274,633. Homie labour is not sufficient for the support of the popu- lation, and from 20,000 to 25,000 of the inhabitants of the department go yearly to other parts of France in search of employment.

CREUTZ, Gustrar Puitip, Count, a Swedish poet, was born in Finland in 1729. After concluding his studies in Abo he received a post in the Court of Chancery at Stockholm in 1751. Here he met Count Gyllenborg, with whom his name is as firmly united as Beaumont's with Fletcher's. Their friendship woke the poetic vein in each of the young men, and they formed, in unison, the one great figure in the poetic literature of Sweden in the 18th century. Under the patronage of the eminent poetess, Fru Nordenflycht, the volumes they published together became widely admired; to their own generation they seemed equal in fame, but posterity has given the palm of genius to Creutz. His greatest work is contained in the 1762 volume, the idyll of Atzs and Camilla ; the exquisite little pastoral entitled Daphne was published at the same time, and the generous and loving Gyllenborg was the first to proclaim and to delight in the supremacy of his friend. In 1763 Creutz practically closed his poetical career ; he went to Spain as ambassador, and after three years to Paris in the same capacity. In France he enjoyed the friendship of all the great literati of the day, especially of Marmontel. In 1783 Gustavus III. recalled him and heaped honours upon him, but he died soon after, on the 30th of October 1785. Atis and Camilla was long the most

~~admired poem in the Swedish language ; it is written ina spirit of pastoral which is now to some degree faded, but in comparison with most of the other productions of the time it is freshness itsclf, Creutz introduced a melody and grace into the Swedish tongue which it lacked before, and he has been styled "the last artificer of the language."~~

~~CREUZER, Geore Friepricu (1771-1858), a German philologist and archeologist, born on March 10, 1771, at Marburg, was the son of a bookbinder of that town. Having studied at Marburg and Jena, he for some time lived at Leipsic as a private tutor; but in 1802 he was appointed professor at Marburg, and two years later pro- fessor of philology and ancient history at Heidelberg. The latter position he held for nearly forty-five years, with the exception of ashort time spent at the university of Leyden, where he was unable to remain on account of the injurious effect produced upon his health by the Dutch climate. He had the honour of being one of the principal founders of the Philological Seminary established at Heidelberg in 1807, The Academy of Inscriptions of Paris appointed him one of its members, and from the grand-duke of Baden he received the dignity of privy councillor. He died at the age of eighty-seven, February 16, 1858. Creuzer's first and most famous work was his Symbolik und Mythologie der alten Vélker, besonders der Griechen (Leipsic, 1810-1 2), in which he maintained that the mythology of Homer and Hesiod came from an Eastern source through the Pelasgians, and was the remains of the symbolism of an ancient revelation. This work was vigorously attacked by Hermann, in his Briefen wiber Homer und Hesiod, and his letter, addressed to Creuzer, Ueber das Wesen und die Be-~~

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~~handlung der Mythologie ; by Voss, in his Antisymboltk ; and by Lobek, in his Aglaophamos. Of Creuzer's other works the principal are an edition of Plotinus ; a partial edition of Cicero, in preparing which he was asssisted by Moser ; Die Historische Kunst der Griechen (Leips. 1803) ; Epochen der Griech. Interaturgeschichte (Marburg, 1802) ; Abriss der rémischen Antiquitdten (Leips. 1824); Zur Geschichte altrémischer Cultur am Oberrhein und Neckar (Leips. 1833); Zur Gemmenkunde (Darmstadt, 1834)~~

~~; Das Mithreum von Neuenheim (Heidelberg, 1338) ; Zur Galerie der alten Dramatiker (Heidelberg, 1839); Zur Geschichte der classischen Philologie (Leips. 1854).~~

~~See the autobiographical Aus dem Leben eines alten Professors (Leips. and Darmstadt, 1848), to which was added in the year of his death Paralipomena der Lebenskizze etres alten Professors (Frankfort, 1858) ; also Starck, Friederich Kreuzer, sein Bildungs- gang und seine bleibende Bedeutung (Heidelberg, 1875).~~

~~CREUZOT, Lz, a town of France, department of Sadne- et-Loire, 12 miles S.S.E. of Autun, on the high ground which extends between the Cevennes and Céte d'Or, 1355 feet above the sea. Situated in a district which is rich in coal and iron, it has the most extensive iron works in France, rivalling those of Birmingham, Essen, or Liége, and since 1837 has gathered round these a population amount- ing in 1872 to 21,408. Three distinct though connected industries are in full activity about Creuzot,—the mining of coal in the Creuzot-Blanzy basin, the smelting of iron ore, and the manufacture of all kinds of machinery. The factories occupy about 300 acres, of which 50 are covered with workshops, where locomotives and marine engines are constructed for all parts of the world. About 100,000 tons of rails are turned out annually. Besides its immediate supply Creuzot draws to it a large part of the coal taken from the central basin of France ; excepting the mineral from Change near Epinac, little native French iron is used in the factories, which are chiefly provided from Elba and Algeria. Railways connect Creuzot with the Canal due Centre and the Saéne, and westward with the navigation of the Loire.~~

~~CREVIER, Jean Bartiste Lovis (1693-1765), a French author, was born at Paris, where his father was a printer. He studied under Rollin, and held the professor- ship of rhetoric in the college of Beauvais for twenty years. He completed Rollin's Histoire Romaine by the addition of eight volumes ; he also published two editions of Livy, with notes; L'Histoire des Empereurs des Romains, jusqw a Constantin, 1749, 12 vols. 12mo; Histoire de ? Université de Paris,7 vols. 12mo; and a Rhétorique Frangowse, which enjoyed much popularity.~~

CREWE, a town of Cheshire, and an important station on the London and North-Western Railway, to which it is altogether indebted for its importance. It is the centre of six lines of railway, connecting it with Manchester, Chester, Birmingham, and other large towns, and is 21 miles east by south of Chester, and 54 miles north-west of Birmingham. It is inhabited principally by persons in the employment of the railway companies, and is well laid out. Crewe is not only one of the busiest railway junctions in the world, but possesses an enormous establishment for the manufacture of everything used in railways, steelworks, and engine and carriage factories on a great scale. It hasa mechanics' institute, library, schools, baths, &c. The country round is flat and uninteresting. The town was built on an estate called Oak Farm in the parish of Monk's Coppenhall, and takes its name from the original stations having been placed in the township of Crewe, in which the seat of Lord Crewe is situated. Population (1871),

17,810.

CRIBBAGE, a game at cards, of uncertain etymology. A very similar game called noddy was formerly played : the

game was fifteen or twenty-one up, marked with counters, occasionally by means of a noddy board. Cribbage seems to be an improved form of noddy.

A complete pack of fifty-two cards is required, anda cribbage board and four pegs. The board is drilled with sixty holes for each player (see diagram), and one hole

Cribbage Board.

(called the game hole), common to both. The divisions into spaces of ten holes each are to facilitate counting. The game is marked by inserting the pegs in the holes, commencing with the outer row at the game-hole end, and going up the board. When the thirtieth hole is reached the player comes down the board, using the inner row of holes. The pegs belonging to one player should differ in colour from those belonging to the other. When one peg has been used, and another score is made by the same player, the second peg of the same colour is asserted ahead of the first, according to

~~the number of holes to be scored. This peg is called the foremost peg, the other the hindmost peg. When a fresh score accrues the hindmost peg is taken out and placed ii front of the foremost (which now becomes the hindmost), and so on until one player scores sixty-one holes or more, when he wins, and places his foremost peg in the game hole. If the losing player fails to ottain thirty holes his adversary wins a double when so agreed.~~

~~The game may be played by two players, five or six cards being dealt to each, and each putting out two for crib; or by three players (with an extra board), five cards being dealt to each, each putting out one for crib, and a card from the top of the pack being dealt to complete the crib; or by four players (two being partners against the other two, sitting and playing as at whist, and one partner scoring for both), five cards being dealt to each, and each putting out one card for crib. Two-handed five-card cribbage is the most scientific game. It is played in the following manner.~~

~~The players cut for deal. In cutting, whether for deal, to the dealer, or for start, at least four cards must be cut, and at least four left in the bottom packet. The player who cuts the lower card deals. The cards rank king (highest), queen, knave, ten, down to the ace (lowest). At the two-handed five-card game only, the non-dealer is entitled to score three holes (called three for last) at any time during the game. Three for last is usually scored while the dealer is dealing the first hand.~~

~~The non-dealer cuts the pack; the dealer re-unites the packets, and gives one card to his adversary, and then one to himself, and so on alternately until each has five cards. The undealt portion of the pack is placed face downwards on the table.~~

~~The players then look at their hands and Jay owt, each putting two cards face downwards on the table, on the side of the board nearest to the dealer. The four cards so laid out are called the crib. A player must not take back into his hand a card he has laid out, nor must the crib be touched during the play of the hand.~~

~~After laying out, the non-dealer cuts the pack (when more than two play, the player to the dealer's left) and the dealer turns up the top card of the lower packet, called the start. If the start is a knave the dealer marks two (called~~

~~two for his heels). The score is forfeited if not marked before the dealer plays a card.~~

~~The hands are then played. The non-dealer lays face upwards on the table on his side of the board auy card~~

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~~from his hand he pleases ; the dealer then does the same on his side of the board, and so on alternately. When more than two play, the player to the leader's left plays the second card, and so on round to the dealer. As soon as the first card is laid down the player calls out the number of pips on it ; if a picture card, ten. When the second card is laid down, the player calls out the sum of the pips on the two cards played, and so on until all the cards are played, or until neither player has a card which will come in, %.e., which can be played without passing thie number thirty-one. If one player has a card or cards that will come in and the other has not, he is at liberty to play them ; at the six-card game he is bound to play as long as they can come in. When more than two play, the player next in rotation is bound to play, and so on until no one can come in. At the two-handed five-card game, when neither cau come in the play is at an end; but at the other games the cards already played are turned face down, and the remainder of the hands are played in rotation, and so on until all the cards are played out.~~

~~The object of the play is to make pairs, fifteens, sequences, or the go, or to prevent the adversary from scoring. Flushes formerly counted in play ; but now they do not.~~

~~Pairs.—If a card is put down of the same denomination as the one last played, the player pairing is entitled to seore two holes. Ifa third card of the same denomination is next played a pair royal is made, and the maker of the pair royal is entitled to score six holes. If a fourth eard of the same denomination is next played, twelve holes are similarly seored for the double pair royal. Kings pair only with kings, queens with queens, and so on with knaves and tens, notwithstanding that they are all tenth ecards in play, i.¢., that the number called when playing any of them is ten. ;~~

~~Fifteens.—If either player during the play reaches fifteen exactly, by reckoning the pips and tens of all the played cards, he is entitled to mark two.~~

~~Scquenes.—If during the play of the hand three or more cards are consecutively played which make an ascending or deseending sequence, the maker of the sequence marks one hole for each eard forming the sequence or rum. King, queen, knave, and ten reekon in sequenee in this order, notwithstanding that they are all tenth cards in play. The other cards reekon in sequenee aceording to the number of their pips. The ace is not in sequenee with king, queen. If one player obtains a run of three, and his adversary puts down a card that is in sequenee, he marks four, and so on. And, be it observed, if there is a break in the sequenee, and the break is filled up during the play, without the intervention of a card not in sequeneé, the player of the eard that fills the break scores a run. An example will render this clear. The cards are played in this order (A playing the first card, B the second, and so on alternately), AB :~~

~~4, 2. an ace. Had B Ss last card been a five he would similarly have scored a run of four, as there is no break. Had B's last card been a four, he would have seored arun of three. The cards need not be played in order ; it is sufficient that the card last played completes a sequenee, although it may Pa an intermediate eard. Thus the cards being played in this order; " 4 . . ad B marks a run of four for his last eard played,~~

~~Aarun of five. But suppose the cards played thus, 1 F a : q e B takes a run of four for the fourth eard played, but there is no Tun for any one else, as the second five (which forms no part of the sequence) intervenes. Again, if the eards at six-eard eribbage are fer BABABAS m ee, 3 aces, 4, od, aec, takes a run-of three, B arun of four, A arun of five. B then playing the deuce has no run, as iy rely played intervenes. A then makes a run of five, and last nas no run, the ace previ blocking the three. — ; — The go, end hole, or last eard is scored by the player who approaches most nearly to thirty-one during the play, and entitles toa score of one. If thirty-one is reached exactly, it is a go of two instead of one. Compound Seores.—lf often happens that more than one of the above scores are made at the same time, when the player reckons both. Thus a player pairing with the last eard that~~

~~will come in scores both pair and go. Similarly a pair and a fifteen, or a sequenee and a fifteen, can be reckoned together.~~

~~A gets a run of three, B a run of four.~~

~~thus playe~~

~~CRIBBAGE~~

~~When the play is over, the hands are shown and counted aloud. The non-dealer has first show, and scores first ; the dealer afterwards counts and scores what he has in hand and then what he has in crib. In counting the hands and crib, the start is made use of by both players to assist in forming combinations.~~

~~The combinations in hand or crib which entitle to a score are fifteens, pairs or pairs royal, sequences, flushes, and his nob.~~

~~Fifteens.—Allthe different cards that, taken together, make fifteen exactly, without counting all the same cards twice over in one fif- teen, entitle the holder to a seore of two. Tenth eards eount ten towards a fifteen. For example a tenth card and a five reckon two, or fifteen-two as it is often called. Another five in the hand or turned up, would again eombine with the tenth card, and entitle to another fifteen, or jifécen-four, if the other cards were a two and a three, two other fifteens would be counted,—one for the combina- tion of the three and two with the tenth card, and one for the combination of the two fives with the three and two. Similaily, two tenth eards and two fives reckon fifteen-eight ; a nine and three threes give three different combinations, and reckon fifteen- six ; and so on for other eards.~~

~~Pairs.—Pairs are reckoned as in play.~~

~~Sequenees.—Three or more cards in sequence count, asin play one for each card. If one sequence card can be substituted for an- other of the same denomination, the sequence reekons again. For example 3, 4, 5, and a 3 turned up, reckon two sequences of three. At the six-card game or in crib, with another 3 there would be thice sequences of three, and so on for all cards that can make a fresh combination.~~

Flushes.—If all the cards in hand are of the senie suit, one is reckoned for each card. If the start 1s also of the same suit, one is reckoned for that also. In crib, no fiush is reckoned, unless the start is of the same suit as the eards in crib.

His nob.—If a player holds the knave of the suit turned up he counts one for his nob.

A couple of examples will render the counting clear. Say the crib consists of 6, 7, 7, 8, 8. The score would be four fif- teens (eight), two pairs (four), four sequenees of three (twelve) ; total twenty-four. Again, a hand of 4, 5, 6 (same suit) and a 5 turned up counts two fifteens (four), a pair (two), two sequenees 'of three (six), and a flush (three) ; total fifteen.

The points accrue in the following order :—two for his heels; points made in play as soon as declared; non- dealer's show ; dealer's show (hand and crib).

After the points in hand and crib are reckoned, the cards are put together and shuffled, and the opponent of the last dealer deals, and so on alternately until the game is won.

Hints to Priayers.—In laying out, the non-dealer should discard such cards as are not likely to score in crib ; the dealer should put out good cards fer his own crib. It is so important to bauwlk the crib that the non-dealer should often sacrifice scores in his own hand. 'Thus with queen, knave, ten, four, acc, the dealer should put out the four and the ace; the non-dealer the queen and ten. But towards the cnd of the game, if the non-dealer has cards that will probably take him out, the consideration of baulking the crib need not influence him. The best Laulks are a king or an ace, as those cards only reckon one way ui. sequences. King with ten, nine (best baulk), eight, seven, six, or ace, are good baulks ; so is queen, with any of these cards except the ten. Next to these wide even cards are good baulks (even cards being less likely to score in fifteens than odd ones); and lastly cards that are not in sequence. Two cards of the same suit should not be put out by the non-dealer if there is as good a discard of cards of different suits. The best cards for the dealer to put out (and therefore those to be avoided by the non-dcaler), are fives, five and six, five and a tenth card, three and two, seven

~~and eight, four and one, nine and six, pairs (especially low pairs), and close cards. It is generally right to keep a sequence in hand, as if the start is of the same denomina- tion as one of those kept, the dealer reckons eight at least. A pair royal is a good hand to keep.~~

~~In playing, the best card to begin with is ace, two, three, or four, as the only chance of an adverse score is by pairing,~~

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~~and pairing is always dangerous on account of the possibility of its being capped by a pair royal. Pairing is often declined, as it is common to open the play with a card of which a duplicate is held (except with two fives). When leading from a sequence, the middle card should not be led. If a close card is played to the one led it often happens that the adversary wishes a run of three to be made against him, he holding a card that will complete a run of four. HIaving the choice of pairing or of making fifteen, prefer the latter ; but if a seven or eight is led, and a fifteen is made, the adversary has the chance of a run of three. During the play, a four should not be added to a call of seven (making eleven), as if paired the opponent scores four. All similar combinations should be avoided, as twelve made with a three, twenty-seven with a four, twenty-eight with a three, and twenty-one with any card, as then a tenth card (of which there are sixteen) comes in for two. It is very desirable to win the go, as this makes a difference of at least two to the score in each deal. The best chance of winning the go with two low cards and a high one is to begin with a low card, with two high cards and a low one to begin with a high one. 'The dealer has the best chance of making the go,~~

~~The most important guide to the play isthe score. 'The player who is ahead in the game should endeavour to keep so by playing wide cards, declining pairs, and declining to make fifteen with close cards. This is called playing of. The one who is behind in the game should play on, t.., score whenever he can, running the risk of a larger score being made against him. 'To calculate whether to play on or play off, the average points scored should be kept in mind. Each player ought to reckon slightly over six in hand and play and five in crib, or seventeen and a half in two deals to be at home. A player who scores more than the average and leaves his adversary six or~~

~~seven points in arrear is safe at home. When at home it is best to play off ; when the adversary is safe at home it is best to play on.~~

~~Near the end of the game and wanting points in play to play out, it is advisable to keep two low cards and one high one.~~

~~At six-card cribbage it is not so important to baulk the crib as at five-card. The average scores are twelve for the non-dealer, seventeen for the dealer. At the end of the second deal a player is at home at twenty-nine holes, In the first deal it is an advantage to exceed the average, con- sequently both players with fair hands should play on ; but with poor hands they should play off.~~

~~Laws.—Cutting.—1. There must be a fresh cut for deal after every game, unless rubbers are played. 2. If in cutting for deal or start. more than one card is exposed, adversary may choose which card he pleases. 38. Errors in cutting to the dealer neces- sitate afresh cut. Dealing.—4. Cards must be dealt by one at a time. If two are dealt together, error may be rectified, if it can be done by moving one card only; otherwise non-dealer marks two holes, and there must be a fresh deal. 5. If dealer exposes his own cards, no penalty. 6. Faced card in pack necessitates a fresh deal. 7. Player dealing out of turn, error can be recti- fied prior to start being turned up ; otherwise not. 8. Non- dealer marks two holes, and has the option of a fresh deal—(@) if dealer exposes any of non-dealer's cards, and (0) if dealer gives too many or too few cards to either player. In 6 cases non-dealer may look at his hand before electing ; if he elects to stand the deal when he has a'surplus card he returns a card unshown to the pack ; if, when the dealer has a surplus ecard, he draws one and looks at it; if when either has too few cards, imperfect hand is com- pleted from pack. Laying out.—9. If either player lays out when he holds too many cards, adversary marks two holes, and has option of afresh deal. If he stands the deal he draws surplus card from offender's hand and looks at it. 10. Ifeither player lays out with too few cards he must play with his hand short. 11. Ifa player takes back a card laid out, adversary marks two holes, and has option of fresh deal. 12. Crib must not be touched before hand is played. Playing.—13. Player playing with too many cards, same penalty as in law 9. Playing with too few cards, no penalty. 14, Card ouce played that will come in cannot be taken~~

| up again. Card that will not come in shown in play, no penalty.

15. If two cards are played together the one counted is deemed to be played. 16. Ifa player at six-card cribbage or at three or four handed cribbage neglects to play a card that will come in, adver- sary may require it to be played, or may mark two holes. 17. Miscounting during play no penalty. Showing and scoring.— 18. When reckoning, cards must remain exposed until adversary is satisfied. Ifa player mixes his cards with the pack, or hand and crib together, before adversary is satisfied, he forfeits score. 19. If a player scores more than he is entitled to, adversary may correct his score, and add points overscored to his own. This law applies also to placing peg in game hole in error. Scoring two few, no penalty. Player is not entitled to any assistance in reckoning. 20. If a player touches his opponeut's pegs except to correct an overscore, or touches his own pegs when he has no score to make, his adversary marks two holes. 21. If a player displaces his fore- most peg he must put it behind the other. If he displaces both, adversary may place hindmost peg where he believes it to have been, and the other peg behind it. (H. J.)

CRICHTON, James (1560-1582), commonly called 'the Admirable Crichton," was the son of Robert Crichton, lord-advocate of Scotland in the reign of James VI., and was born at Eliock, in Dumfriesshire. He was sent when ten years old to Saint Salvator's College, St Andrews, where he took his master's degree at fifteen. In 1577 he was still living in Scotland ; some time after that date, however, a quarrel with his father, who had become a Protestant, drove him to France. In Paris his dialectics and his sword-play are said to have gained him equal admiration ; and, according to Urquhart's very doubtful story, a contest in twelve languages resulted in an easy victory over the whole staff of the Sorbonne. His Parisian triumphs were followed by a couple of years of obscure campaigning in the French army, but in 1580 he appeared at Venice. A Latin poem addressed to Aldus Manutius laid the founda- tion of a lasting friendship with the great printer, who dedicated his edition of Cicero's Paradoxa to Crichton, and, according to some, conferred on him still more substantial favours; he also became intimate with Sperone Speroni, and with Lorenzo Massa and Giovanni Donati. His first public display was the delivery of an address to the doge and senate, whom he astonished with his eloquence and oratorical grace ;

~~and he followed this up with a series of disputations on mathematical, theological,.and philosophical subjects, which so extended his fame that it was reckoned the highest honour to Mazzoni, a famous dialectician, thrice to have met and vanquished him in argument. But these exertions produced an illness which held him prostrate for four months. At Padua, the scene of his next exhibition, he astonished the assembled professors by extemporizing in succession a Latin poem, a daring onslaught on certain Aristotelian errors, and an impassioned oration in praise of ignorance. HIs return to Venice was signalized by the publication of the challenge preserved by Aldus Manutius, in which he undertook not only to refute innumerable errors in Aristotelians, mathematicians, and schoolmen, but to meet his opponents on any ground, and to conduct the dispute either logically, or according to the secret doctrine of numbers, or in a hundred sorts of verse ; and in the cburch of San Paolo and San Giovanni the young Scotsman held his own for three days against all comers. HIe then seems to have quitted the republic for Mantua, where he had been appointed tutor to Vincenzo Gonzaga, heir to the dukedom. There he distinguished himself, according to Urquhart, by killing a professional duellist, who had challenged and vanquished many of the best swordsmen of Italy, and by playing before the court some fifteen characters in succession, keeping the stage for five hours. HIs brilliance made men envious, and he is said to have sup- planted the prince in the affections of his mistress. One July evening in 1582 he was attacked by three masquers in the streets of Mantua. But he fought so well that their leader to save his life was forced to discover himself. It~~

~~was Vincenzo Gonzaga himself. The tutor fell on his knee, and presenting his sword, asked pardon; but the prince basely run him through the body.~~

~~The standard biography is that of Patrick Fraser Tytler, — Life of James Crichton of Cluny, 1819. See also David Irving's notice in earlier editions of the present work, and " The Discovery of a Most Exquisite Jewel," in the~~

~~*Works of Sir Thomas Urquhart of Cromarty (Maitland Club), Edinburgh, 1834.*~~

~~*CRICKET (Achetede), a family of saltatory Orthopterous Insects, characterized by the great length and slenderness of the antennz, and by the horizontal position of the wings and wing-covers when atrest. The wings when folded form long slender filaments, which often reach beyond the extremity of the body, and give the appearance of a bifid tail, while in the male they are provided with a stridulating apparatus by which the well-known chirping sound, to which the insect owes its name, is produced. The abdomen of the female ends in a long slender ovipositor, which, however, is not exserted in the Mole Cricket. The House Cricket (Acheta domestica) is of a greyish-yellow colour marked with brown. It frequents houses, especially in rural districts, where its lively, if somewhat monotonous, chirp may be heard nightly in the neighbourhood of the fireplace. It is particularly fond of warmth, and is thus frequently found in bakeries, where its burrows are often sunk to within a few inches of the oven. In the hot summer it goes out of doors, and frequents the walls of gardens, but returns again to its place by the hearth on the first approach of cold, where, should the heat of the fire be withdrawn, it becomes dormant. It is nocturnal, coming forth at the evening twilight in search of food, which con- sists of bread crumbs and other refuse of the kitchen. The Field Cricket (Acheta campestris) is a larger insect than the former, and of a darker colour. It burrows in the ground to a depth of from 6 to 12 inches, and in the evening the male may be observed sitting at the mouth of its hole noisily stridulating until a female approaches, "when," says Bates, "the louder notes are succeeded by a more subdued tone, whilst the successful musician caresses with his antennz the mate he has won." The musical apparatus in this species consists of upwards of 130 transverse ridges on the under side of one of the nervures of the wing cover, which are rapidly scraped over a smooth, projecting nervure on the opposite wing. The female deposits her eggs—about 200 in number—on the ground, and when hatched the larvee, which resemble the perfect insect except in the absence of wings, form burrows for themselves in which they pass the winter. The Mole Cricket (@ryllotalpa vulgaris) owes its name to the striking analogy in its habits and structure to those of the common mole. Its body is thick and cylindrical in shape, and it burrows by means of its front legs, which are short and*~~

~~*greatly flattened out and thickened, with the outer edge partly notched so as some- what to resemble a hand. It prefers loose and sandy ground in which to dig, its burrow consisting of a vertical shaft from which long horizontal galleries are given off ; and in making those excavations it does immense injury to gardens and vineyards by destroying the tender roots of plants, which form its principal food. It also feeds upon other insects, and even upon the weak of its own species in the absence of other food. It is exceedingly fierce and voracious, and is usually caught by inserting a stem of grass into its hole, which being seized, is retained til] the insect is brought to the surface, The female deposits her eggs in a neatly constructed subterranean chamber, about the size of a hen's egg, and sufficiently near the surface to allow of the eggs being hatched by the heat of the sun.*~~

~~*CRICKET is the national game of Englishmen. 'The prevalent love of the pastime may perhaps be cited as an instance of the development of the national character,*~~

~~*CRI—CRI*~~

~~*requiring, as it does, such a combination of intellectual and physical qualities—broad and open shoulders, stout arms and quick legs, with patience, calculation, and prompt- ness of execution,*~~

~~*In the infancy of the game stumps did not exist. A circular hole in the turf supplied their place, and it is surmised that the batsman was put out either by being caught, or, when running, by the outside returning the ball into the cavity ere the striker placed the base of his bat therein. This led to unseemly tussles between the batsman and fielders, often to the detriment of the latter's hands. It is surmised from the old records of the Hambledon Club that the first description of wicket com- prised one stump only, 18 inches high, which was displaced with the ball, in lieu of "holing" the same, in order to put the runner out, but absolute proof on this point is wanting. The date of a second stump being added is buried in obscurity. It is only known that they were placed 2 feet apart, with a connecting cross-bar on the top, the height being 1 foot; and a large hole for putting the ball into was excavated between the stumps. The dimen- sions of 22 inches by 6 inches were adopted in 1702, and thus, as far asis known, matters remained till, in 1775, at a Hambledon Club match, the ball was observed to pass thrice*~~

between the two stumps without dislodging the cross-bar. To obviate this a third stump was added in the middle, and the moder bails were substituted for the cross-bar, The next alteration was to 24 inches by 7 inches in 1798, and in 1817 another inch was added to the height ; at which dimensions, viz., 27 inches by 8 inches, the wicket remains in 1877. It is possible that there were other intermediate alterations from time to time; but, as each year's laws have not been pre- served, this is uncertain. From the earliest days, how- ever, the wickets, have always been placed one chain or 22 yards apart.

Cricket bats were at first made with a sweeping curve at the base, which made them available for hitting only. They were broader, and far more cumbersome than the lithe spring-handled implements of the present day,—the shape now in use appearing to have become prevalent about 1825, when round arm bowling came permanently into vogue. A sketch of the various shapes in use from early times downwards, will be found in the frontispiece of Mr Frederick Gale's Echoes from the old Cricket Fields. No evidence exists as to the size and weight of the first balls used. At the end of the 18th century they were much of © the same dimensions as now, but both materials and workmanship have vastly improved even since the first "treble sewn" was manufactured.

Cricket is divided into single and double wicket, and it is a moot point which of the two was the parent game. Judging, however, from the earliest evidence extant, it seems probable that single wicket was the first instituted, as it is less complicated and requires fewer players. In their pavilion at the Kennington Oval the Surrey County Cricket Club possesses the earliest known picture of the game in anything like its present form. The date is 1743, and the stumps are aptly described by Mr Frederick Gale as "a skeleton hurdle of about 2 feet wide and 1 foot high." The bat is of the old-fashioned curved shape, and the score was kept by notching each individual run on a stick. With the exception that all play was evidently forward of the wicket (the same is the case now in single wicket matches with less than five a side), the leading features of the game are identical with those of the present day. Single wicket, however, was never muchi practised after a knowledge of the game became thoroughly diffused, except by great players

~~for a large stake or 4 championship. It is with the double wicket game that we~~

~~CRIGKET~~

~~are more immediately concerned, that being the now universally accepted form.~~

~~The most radical change that has ever taken place in the development of the game is the introduction of round or straight arm bowling in lieu of the underhand. That the new style was first discovered (about 1785) by Tom Walker, a professional of the old Hambledon Club, is now generally admitted; but the dogged conservatism of the day pronounced it to be unfair, and successfully repressed the innovation. About 1805 the style was revived by Mr John Willes, a great Kentish amateur. It was not, how- ever, until 1825, when Mr G. T. Knight of Alton strenuously took up the cudgels on behalf of the so-called "throwing bowling," that it became a permanent institu- tion, and then only after many bickerings and much con- troversy. The new style created a great revolution in cricket, as it afforded the bowlers much greater command over their delivery both in strength and in direction. From time to time various other new points have arisen requiring special legislation, and changes have taken place in the mode of conducting the game.~~

~~Much labour and careful attention are required in laying out a good cricket ground and maintaining the same in proper order. Asa general rule the shorter and more level the turf can be got the better. Double wicket requires two sides of eleven players each, the choice of first innings being decided by lot. Two strikers go in, one at~~

~~ae 16: Il 4 A pul, bg es U end ro) Qa 'eb a o s rs oO rs m o A2. 8 Q-------- a S. alls A U. x, 5~~

~~10.~~

~~Diagram of Cricket-field. S, S, Batsmen. 6. Long Slip. U, U, Umpires. 7. Cover Point. a, a, Popping Creases. 8. Mid On (sometimes placea at 12 db 6, Bowling Creases. and termed Mid Off). 1. Bowler. 9. Long Field Off. 2.~~

~~Wicket Keeper. 10. Long Field On. 8. Long Stop. 11. Leg. 4. Slip. 12. See 8. 5, Point.~~

~~each wicket, and the object of the fielders is to dislodge them according to the rules of the game. The other strikers go in by rotation as arranged by their captain. When a ball is hit the striker may, if possible, score a run by reaching the opposite hopping crease ere the wicket is put down, each time he successfully traverses the distance between the two popping creases counting as one run. When sufficient time is available each side has two innings, and that scoring the largest number of runs is the winner. Otherwise both sides may agree to decide the issue on the result of one innings apiece, and it is sometimes arranged to allow six balls in each over, instead of four.~~

~~O79~~

~~each over, the whole of the outside change their positions ; another bowler delivers an over from the opposite wicket, and so on alternately. A general idea of the position of the players may be formed from the accompanying diagram, but variations take place according to the description of bowling in use.~~

~~A captain is chosen on each side, who has the entire management of his eleven. In conjunction with the opposing captain he makes the necessary arrangements for the match. He should be a thorough judge of all points of the game, and able to place the field to the best advantage according to the description of the bowling and peculiarities of the striker. Constant practice is necessary to beceme a good bowler, and obtain such a thorough command of the ball as to vary the pace and pitch as well as to impart twist. The two chief varieties of balls are "lengths" and "not lengths," according as their pitch deceives the striker's eye as much as possible or not. A batsman's first rule is to play with a straight bat, as he thereby gains most protection for his stumps ; and he should make the most of his stature. Batting is divided into " forward" and " back play," according as the batsman stretches forward to meet the ball, or keeps the body perpendicular or slightly inclined backwards, 'The fielders should ever be on the alert, their business being to stop or catch the ball, and return it to one of the wickets with all possible haste. For further details of each player's duties~~

~~and full instructions how to play the game correctly, we must refer our readers to the Rey. James Pycroft's excellent work, Zhe Cricket Field. Single wicket is sufficiently explained by the laws, the only material difference being that the batsman has to reach the bowling stump and return to the popping crease— a distance of 44 yards in place of 22 yards—for every run he scores. The laws of the game as now constituted by the Marylebone Cricket Club are as follows :—~~

~~1. The ball must weigh not less than 54 nor more than 53 ounces. It must measure not less than 9 nor more than 94 inches in circumference. At the beginning of each innings, either party may call for a new ball.~~

~~2. The bat must not exceed 4} inches in the widest part; it must not be more than 38 inches in length.~~

~~3. The stumps must be 3 in number, 27 inches out of the ground ; the bails 8 inches in length ; the stumps of equal and of sufficient thickness to prevent the ball from passing through.~~

~~4. The bowling crease must be in a line with the stumps, and 6 feet 8 inches in length, the stumps in the centre,—with a return crease at each end towards the bowler at right angles.~~

~~5. The popping crease must be 4 feet from the wicket, and parallel to it, unlimited in length, but not shorter than the bow]- ing crease.~~

~~6. The wickets must be pitched opposite to each other by the umpires, at the distance of 22 yards.~~

~~7. Itshall not be lawful for either party during the match, with- out the consent of the other, to alter the ground by rolling, water- ing, covering, mowing, or beating, except at the commencement of each innings, when the ground shall be swept and rolled unless the next side going in object to it. This rule is not meant to prevent the striker from beating the ground with his bat near to the spot where he stands during the innings, nor to prevent the bowler from filling up holes with saw-dust, &c., when the ground shall be wet.~~

~~8. After rain the wickets may be changed with the consent of both parties.~~

~~9. The bowler shall deliver the ball with one foot on the ground behind the bowling-crease, and within the return crease, and shall bowl one over before he change wickets, which he shall be permitted to do twice in the same innings, and no bowler shall bowl more than two overs in succession.~~

~~10. The ball must be bowled. shall cali " no ball."~~

~~11. The bowler may require the striker at the wicket from which he is bowling to stand on that side of it which he may direct.~~

~~12. If the bowler shall toss the ball over the striker's head, or bowl it so wide that, in the opinion of the umpire, it shall not be fairly within the reach of the batsman, he shall adjudge one run to the party receiving the innings, either with or without an appeal, which shall be put down to the score of wide balls ; such ball shall~~

~~If thrown or jerked the umpire~~

~~Atthe end of | not be reckoned as one of the four balls ; but if the batsman shall~~

~~580~~

~~by any means bring himself within reach of the ball, the run shall not be adjudged.~~

~~18. If the bowler shall deliver a "no ball," or a "wide ball," the striker shall be allowed as many runs as he can get, and he shall not be put out except by running out. In the event of no run being obtained by any other means, then one run shall be added to score of "no balls" or " wide balls" as the case may be. All runs obtained for 'wide balls" to be scored to "wide balls." The names of the bowlers who bowl 'wide balls," or "no balls," in future to be placed on the score, to show the parties by whom either score is made. If the ball shall first touch any part of the striker's dress or person (except his hands), the umpire shall call " leg bye. df~~

~~14, Atthe beginning of each innings the umpire shall call "' play;" from that time to the end of each innings no trial ball shall be allowed to any bowler.~~

~~15. The striker is out if either of the bails be bowled off, or if a stump be bowled out of the ground ;~~

~~16. Or if the ball from the stroke of the bat or hand, but not the wrist, be held before it touch the ground, although it be hugged to the body of the catcher ;~~

~~17. Or if in striking, or at any other time while the ball shall be in play, both his feet shall be over the popping crease, and his wicket put down, except his bat be grounded within it ;~~

~~18. Or if in striking at the ball he hit down his wicket ;~~

~~19. Or if, under pretence of running or otherwise, either of the strikers prevent a ball from being caught, the striker of the ball is~~

~~out ;~~

~~20, Or if the ball be struck and he wilfully strike it again ;~~

~~21. Or if in running the wicket be struck down by a throw, or by the hand or arm (with the ball in hand), before his bat (in hand) or some part of his person be grounded over the popping crease ; but if both bails be off, a stump must be struck ont of the ground ;~~

~~92. Or if any part of the striker's dress knock down the wicket ;~~

~~23. Or if the striker touch or take up the ball while in play, unless at the request of the opposite party ;~~

~~24. Or if with any part of his person he stop the ball, which in the opinion of the umpire at the bowler's wicket, shall have been pitched in a straight line from it to the striker's wicket and would have hit it.~~

~~25. If the players have crossed each other, he that runs for the wicket which is put down is out.~~

~~26. A ball being caught, no run shall be reckoned.~~

~~27. The striker being run out, the run which he and his partner were attempting shall not be reckoned.~~

~~28. If a lost ball be called, the striker shall be allowed six runs, but if more than six shall have been run before lost ball shall have been called, then the striker shall have all that have been run.~~

~~29. After the ball shall have been finally settled in the wicket- keeper's or bowler's hand, it shall be considered dead ; but when the bowler is about to deliver a ball, if the striker at his wicket go outside the popping crease before such actual delivery, the said bowler may put him out, unless (with reference to the 21st law) his bat in hand, or some part of his person, be within the popping crease.~~

~~30. The striker shall not retire from his wicket and return to it to complete his innings after another has been in, without the con- sent of the opposite party.~~

~~31. No substitute shall in any case be allowed to stand out or run between the wickets for another person without the consent of the opposite party ; and in case any person shall be allowed to run for another, the striker shall be out if either he or his substitute be off the ground in manner mentioned in laws 17 and 21, while the ball is in play.~~

~~32. In all cases where a substitute shall be allowed, the consent of the opposite party shall also be obtained as to the person to act as substitute, and the place in the field which he shall take.~~

~~338. If any fieldsman stop the ball with his hat, the ball shall be considered dead, and the opposite party shall add five to their score. If any be run they shall have five in all.~~

~~34, The ball having been hit, the striker may guard his wicket with his bat, or with any part of his body except his hands, that the 23rd law may not be disobeyed. ;~~

~~35. The wicket-keeper shall not take the ball for stumping until it have passed the wicket ; he shall not move until the ball be out of the bowler's hand; he shall not by any noise incommode the striker ; and if any part of his person be over or before the wicket although the ball hit it, the striker shall not be out. :~~

~~36. The umpires are the sole judges of fair and unfair play ; and all disputes shall be determined by them, each at his own wicket ; but in case of a catch which the umpire at the wicket bowled from [cannot see sufficiently to decide upon, he may apply to the other umpire, whose opinion shall be conclusive.~~

~~37. The umpires in all matches shail pitch fair wickets ; and the parties shall toss up for choice of innings. The umpires shall change wickets after each party has had one innings.~~

~~38, They shall allow two minutes for each striker to come in and~~

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~~ten minutes between each innings. When the umpire shall call "play" the party refusing to play shall lose the match.~~

~~39. They are not to order a striker out unless applied to by the adversaries.~~

~~40. Butif one of the bowler's feet be not on the ground behind the bowling crease and within the return crease when he shall a the ball, the umpire at his wicket, unasked, must call "n3~~

~~all.~~

~~41. If either of the strikers run a short run the umpire shall call '* one short."~~

~~42. No umpire shall be allowed to bet.~~

~~43. No umpire is to be changed during the match, unless with the consent of both parties, except in case of violation of 42d law, then either party may dismiss the transgressor.~~

~~44, After the delivery of four balls the umpire must call "over," but not until the ball shall be finally settled in the wicket-keeper's or bowler's hand ; the ball shall then be considered dead ; never- theless, if any idea be entertained that either of the strikers is out, a question may be put previously to, but not after, the delivery of the next ball.~~

~~45. The umpire must take especial care to call "no ball" instantly upon delivery, " wide ball" as soon as it shall pass the striker.~~

~~46. The players who go in second shall follow their innings if they have obtained eighty runs less than their antagonists, except in all matches limited to one day's play, when the number shall be limited to sixty instead of eighty.~~

~~47. When one of the strikers shall have been put out, the use of the bat shall not be allowed to any person until the next striker shall come in.~~

~~Note.—The committee of the Marylebone Club think it desirable that previously to the commencement of a match, one of each side should be declared the manager of it; and that the new laws with respect to substitutes may be carried out in a spirit of fairness and mutual concession, it is their wish that such sub- stitutes be allowed in all reasonable cases, and that the umpire should inquire if it is done with consent of the manager of the opposite side.~~

~~Complaints having been made that it is the practice of some players when at the wicket to make holes in the groundZfor a footing, the committee are of opinion that umpires should be empowered to prevent it.~~

~~Single Wicket.~~

~~1. When there shall be less than five players on a side, bounds shall be placed twenty-two yards each in a line from the off and leg stump.~~

~~2. The ball must be hit before the bounds to entitle the striker toa run, which run cannot be obtained unless he touch the bowling stump or crease in a line with it with his bat, or some part of his person, or go beyond them, returning to the popping crease as a double wicket, according to the 21st law.~~

~~3. When the striker shall hit the ball one of his feet must be on the ground and behind the popping crease, otherwise the umpire shall call "no hit."~~

~~4. When there shall be less tlian five players on a side neither byes nor overthrows shall be allowed, nor shall the striker be caught out behind the wicket, nor stumped out.~~

~~5. The fieldsman must return the ball so that it shall cross the play between the wicket and the bowling stump, or between the bowling stump and the bounds; the striker may run till the ball be so returned.~~

~~6. After the striker shall have made one run, if he start again he must touch the bowling stump, and turv before the ball cross the play to entitle him to another.~~

~~7. The striker shall be entitled to three runs for lost ball, and the same number for ball stopped with hat, with reference to the 28th and 33d laws of double wicket.~~

~~8. When there shall be more than four players on a side there shall be no bounds. All hits, byes, and overthrows shall then be allowed.~~

~~9, The bowler is subject to the saine laws as at double wicket.~~

~~10, No more than one minute shall be allowed between each ball.~~

~~Bets.~~

~~1. No bet upon any match is payable unless played out or given~~

~~up. ; a If the runs of one player be betted against those of another, the bet depends on the first innings unless otherwise specified.~~

3. If the bet be made on both innings, and one party beat the other in one innings,-the runs of the first innings shall determine it.

4. If the other party go in a second time, then the bet must be determined by the number on the score.

County Cricket. The following laws of county qualification were established at a meeting held in the Surrey County Pavilion, Kennington Oval, on June 9, 1873 :—

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1. That no cricketer, whether amateur or professional, shall play for more than one county during the same season.

2. Every cricketer born in one county and residing in another shall be free to choose at the commencement of each season for which of those counties he will play, and shall, during that season, play for that county only.

3. A cricketer shall be qualified to play for any county in which he is .residing and has resided for the previous two years; ora cricketer may elect to play forthe county in which his family home is, so long as it remains open to him as an occasional residence.

4, That, should any question arise as to the residental quali- fication, the same should be left to the decision of the committee of the Marylebone Club.

History.—The name cricket is cognate to the Saxon cric oreryc, a crooked stick. This germ of the modern bat is seen in the earliest representation of the pastime about the middle of the 13th century. In a MSS. in the King's Library, 14 Bv, entitled Chronique d Angleterrc, depuis Lthelberd jusqwa Hen. III., there is found a grotesque delineation of two male figures playing a game with a bat and ball. This is undoubtedly the first known drawing of what was destined to develop into the scientific cricket of modern times. The left hand figure is that of the batsman, who holds his weapon perpendicularly in the right hand with the handle downwards. The right hand figure shows the catcher, whose duty is at once apparent by the

~~extension of his hands. In another portion of the same MSS., however, there is a male figure pointing a bat, with the base curved like a leopard's head, towards a female figure in the attitude of catching, but the ball is absent. On p. 126 of King Edward I.'s wardrobe account for the year 1800, there occurs the following entry, viz., "Domino Johanni de Leek capellano Domini Edwardi fil' Regis, pro den' per ipsum liberat' eidem Domino suo ad ludendum ad creag', et alios ludos per vices, per manus proprias apud Westm', 10 die Marcii, 100s. Et per manus Hugonis camerarii sui apud Newenton mense Marcii, 20s—summa, £6." Here is found the earliest allusion to the game as designated by a term analogous to the modern word "cricket," as well as indisputable proof that even in these early times the game was followed by the first personages in the realm, who of course spoke French. Ina Bodleian Library MSS., No 264, dated 18th April 1344, and entitled Romance of the Good King Alexander, fielders for the first time appear in addition to the batsman and bowler. All the players are monks with their cowls up and down alternately, the former having been erroneously taken for female figures by Strutt in his Sports and Pastimes. On the extreme left of the picture, the bowler, with his cowl up, poises the ball in the right hand with the arm nearly horizontal. The batsman comes next with his cowl down, a little way only to the right, stand- ing sideways to"the bowler with a long roughly-hewn and slightly- curved bat, held vertically, handle downwards in the left hand. On the extreme right come four figures—with cowls alternately down and wp, and all having their hands raised in an attitude to catch the ball should it be missed by the batsman, or be tipped in their direction. Judging, however, from the positions of bowler and batter, the out players are not placed so as to field a direct but a side hit. But the want of perspective in the composition renders any estimate of their object uncertain. It is evident, however, that the bat was always held in the left hand at this date, since on the opposite page of the same MSS. a solitary monk is figured with his cowl down, and so holding a somewhat elongated oval-shaped imple- ment. The close roll of 89 Edw. III. (1365), Men. 23, disparages certain games on account of their interfering with the practice of archery, where the game of cricket is probably included among the pastimes denounced as "ludos inhonestos, et minus utiles aut valentes." In this instance, cricket was clearly considered fit for the lower orders only. Judging from the drawings, it can only be conjectured that the game consisted of bowling, batting, and field- ing,~~

~~though it is known that there was an inside and an outside, for sometime during the 15th century the game was called " Hond- yn or Hondoute," or '* Hand in and Hand out.'"' Under this title it was interdicted by 17 Edw. IV. ¢. 3 (1477-78), as one of those ilegal games which still continued to be so detrimental to the practice of archery. By this statute, any one allowing the game to be played on his premises was liable to three years' imprisonment and £20 fine, any player to two years' imprisonment and £10 fine, and the implements to be burnt. The inference that hand in and land out was analogous to cricket is made from a passage in the Hon. Daines Barrington's Observations on the more Ancient Statutes from Magna Charta to 21 James I. cap. 27." Writing in 1766, he comments thus on the above statute, viz: "This is, perhaps, the most severe law ever made against gaming, and some of these for- bidden sports seem to have been manly exercises, particularly the handyn and handoute which I should suppose to bea kind of cricket, as the term hands is still retained in that game."~~

~~The word "cricket" first occurs about the year 1550. In Russell's History of Guildford (p. 208), it appears there was a piece of waste land in the parish of Holy Trinity in that city, which was~~

~~581~~

~~enclosed by one John Parish, an innholder, some five years before Queen Elizabeth came to the throne. In 35 Elizabeth (1598), evidence was taken before a jury and a verdict returned, ordering the garden to be laid waste again and disinclosed. Amongst other witnesses John Derrick, gent., and one of H. M.'s coroners for Surrey, etat. fifty-nine, deposed he had known the ground for fifty years or more, and " when he was a scholler in the free school of Guild- ford, he and several of his fellowes did runne and play there at crickett and other plaies." In the original edition of Stow's Survey of London (1598), the word does not occur, though he says, " The ball is used by noblemen and gentlemen in tennis courts, and by people of the meaner sort in the open fields and streets." It might justly be surmised that such a national game as cricket would soon be introduced at public schools. Accordingly, the first trace of it is found at Winchester College in1650, since Lisle Bowles, writing of the good Bishop Ken, who was admitted to Winchester, 18th January 1650-51, says, " On the fifth or sixth~~

~~*day our junior… . is found for the first time attempting to wield a cricket bat." In 1688 we find a "ram and bat" charged in an Etonian's school bill. Two other noteworthy references to the game are found during the last quarter of the 17th century. The first is in a somewhat ribald poem (1658), entitled The Mysterics of Love and Eloquence, or the Arts of Wooing and Complimenting, by Edward Philips, John Milton's nephew, who, ina dialogue between a country bumpkin and his mistress going to a fair, makes the latter say, '"' Would my eyes had been beat out of my head with a cricket ball ihe second occurs in the diary of the Rev. Henry Teonge, a naval chaplain to H. M. ship "Assistance," and states that during a visit to Antioch on 6th May 1676, several of the ship's company, accompanied by the consul, rode out of the city early, and amongst other pastimes indulged in "krickett." During the first half of the 18th century the game became popular, and is repeatedly noticed by writers of the time, such as Swift, D'Urfey, Pope, Soame Jenyns, and Strype in his edition of Stow's Survey of London.*~~

~~*In 1748 it was decided that cricket was not an illegal game under the well-known statute 9 Anne cap. 19, the Court of King's Bench holding " that it was a very manly game, not bad in itself, but only in the ill use made of it by betting more than ten pounds on it; but that was bad and against the law." In these early times even, the pastime was followed by all classes, and Frederick, prince of Wales, died in 1751 from internal injuries caused by a blow from a cricket ball whilst playing at Cliefden House. 'Nevertheless, this commingling of aristocrats and plebeians on the cricket sward was viewed with apprehension, and repeatedly discountenanced by writers of the day. Games were played for large stakes. Ground proprietors and tavern keepers farmed and advertised matches, the results whereof were not always above suspicion. The old artillery ground at Finsbury appears to have been the earliest scene of action of this class of matches. But the true birthplace of the game in its developed state was no cockney inclosure, but the broad open downs of the southern counties of England, and more especially in the great hop-growing districts. The large hop fairs, notably that of Weyhill, were the rendezvous for all comers from the southern counties, and it is probable that the great county matches were arranged on these occasions. The first record preserved of a match is between Keut and All England, which, judging from an advertisement in the General*~~

Advertiser of the day, was played on August 4, 1746, at the Artillery Ground, the score being kept in the modern fashion.

The old Hambledon Club was the first founded in England, and lasted from 1750 to 1791. Its playing fields were Broad Half Penny and Windmill Downs. When at its zenith the club frequently contended with success against All England. Their great players were more or less retained by noblemen and wealthy patrons of the game, and this club remained invincible for some forty years. Though a cricket club existed at Hambledon down to 1825, the original society was broken up in 1791, owing to the distance from the metropolis. A dispersion of its famous players through neighbouring counties took place, and was naturally accom- panied with a diffusion of the precepts of the game, which gradually extended northward and westward, till, at the end of the 18th century, cricket had become established as the national game of England. The famous Marylebone Cricket Club now justly ranks as the leading club of the world, frames the laws governing the game, and arbitrates on all disputes connected therewith. This society sprang out of the old Artillery Ground Club, which played at Finsbury till about 1750, when they moved to White Conduit Fields, and became the White Conduit Cricket Club. In 1787 they were remodelled under their present title, and moved to Old Lords' Ground, on the site of Dorset square, thence in 1824 to Middle Lords' Ground at South Bank on the site of the Regent's Canal, and finally in 1827 to the present Lords' Ground, which in 1864 became their freehold property. The Surrey County Club, with the Kennington Oval as their headquarters, was formed in 1845. In the same year the famous I Zingari Club, confined exclusively to amateurs—first saw light, and commenced its Bohemian wanderings throughout Great Britain, and often into foreign

countries. In 1846 an 'All England Eleven," under the captaincy of Clarke, 'The Nottingham Bowler," commenced playing matches against odds in various parts of the country. Since then several professional elevens annually play what may be termed exhibition matches, in all parts of Great Britain, Such contests are often detrimental to the professionals engaged in them, but on the other hand they have done much to diffuse a zeal for

~~cricket, and at the present time there is not a county, large city, university, or public school, town or village, ,in England, which does not possess its cricket club, without mentioning the British colonies, and wherever Englishmen assemble abroad in sufficient numbers.~~

~~The chief works on cricket are—H. Bentley's Scores from 1786 to 1822, published in 1823: John Nyren's Young Cricketer's Tutor, 1833; N. Wanostrocht's Felix on the Bat, various editions, 1845-1855: Cricket Notes, by W. Bolland (Hon. S. Ponsonby), 1851; F. Lillywhite's English Cricketers' Trip to Canada and the Uniled Staies, 1860; F. Lillywhite's Cricket Scores and Biographies, 1746 to 1840, 1862; Rev. J. Pycroft's Cricket Tutor, 1862; Rev. J. Pycroft's Cricket Field, various editions, 1862-1873; Rev. J. Pycroft's Cricketana, 1865; Jerks in from Short Leg, by Quid (R. A. Fitzgerald), 1866; G. H. Selkirk's Guide to the Cricket Ground, 1867; C. Box's Theory and Practice of Cricket, 1868; F. Gale's Echoes from Old Cricket Fields, 1871; Cricketers in Council, by Thomsonby (H. P, Thomas), 1871; R. A. Fitzgerald's Wickets in the West, 1873; Jfarylebone Cricket Club Scores and Biographies, 1876, a continuation of Lillywhite"s Scores and Biographies; and C. Box's English Game of Cricket, 1877. (CH. F. W.)~~

~~CRICKLADE, a town and parliamentary borough of England on the northern borders of the county of Wilts, situated in a flat stretch of country on the right bank of the Thames, not far from the Thames and Severn Canal. The town consists of one rather mean-looking street ; and its principal buildings are St Sampson's Church restored in 1864, St Mary's with a fine Gothic cross in the church- yard, and public chambers built in 1861. The trade is purely agricultural and local. The position of the town at the passage of the Thames gave it some little importance in the Saxon period, and it sent representatives to Parliament as early as the reign of Edward I. The present parlia- mentary borough, which extends partly into Gloucester-shire, and includes no fewer than fifty-two parishes or parts of parishes, with an area of 26,694 acres, had in 1871 a population of 43,622, of whom less than 2000 were in the town.~~

~~CRIEFF, a town in Perthshire, Scotland, on the north bank of the Earn, seventeen miles west of Perth by rail. It is situated on a declivity rising from the river, which is here crossed by a bridge. It consists of a main street with~~

narrower streets branching off at right angles, and con- tains several churches, an endowed academy for boys, an in- dustrial institution, and a mechanics' institute. The town is comparatively modern, but an ancient sculptured stone still stands in the High Street and also the old town cross. Crieff owes its growth mainly to the central position it occupies in the district of upper Strathearn, which is noted for its beauty and salubrity. Strathearn House, a large hydropathic establishment on the slope of a hill above the town, attracts many visitors. Population in 1871, 4027.

CRIME is a word which, in every-day speech, is some- times made to include more and sometimes less than the subject of the present article. On the one hand, the breach of a moral principle, with which the law has never con- cerned itself, is sometimes loosely described as criminal ; on the other hand, a distinction is sometimes drawn between crimes and minor offences, though the law prescribes a punishment for minor offences as well as for crimes. But if moral theories and slender shades of difference in guilt are disregarded, crime is simply conduct (either in commission or in omission) of which the state disapproves, and for which it demands a penalty.

Though, however, it is possible to give a definition of crime which may hold good for all times and for all countries, it by no means follows that crime is;always and everywhere the same. On the contrary, the 'growth and the changes of criminal laws are among the most curious monuments of revolutions in public opinion as displayed by legislation. Nor can the study of morals be altogether dissociated from the study of crime, because the moralist may and frequently does influence the legislator, and that

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which is but a moral lapse in one generation may become a criminal offence in another. So also deeds which have been considered praiseworthy at one period, may at another be punishable ; and new conditions of society may cause penalties to be exacted for action or for negligence which would be altogether inconceivable to the savage.

It is obvious that no moral philosopher or legislator, no one even uniting in himself the functions of both, would be able to devise a penal code which would be all-sufficient, and which would be applicable to every possible

~~detail in the development of an ever-expanding civilization. New circumstances demand new laws ; and the adaptation oi new laws to new circumstances is not the least interesting feature in the history of any country. Religious beliefs, religious and other tlieories of ethics, the attacks of foreign enemies, the growth of commerce, the progress of science, everything which affects the condition of the community, may affect its criminal legislation.~~

~~In very primitive tribes murder, robbery, and rape are not crimes—not, at least, in the modern sense. For one tribe to attack another by surprise, to slaughter its men, to appropriate its land, and to ravish or enslave its women was, and in some places still is, very meritorious conduct. The first approach towards the reprobation of murder is to be found in the ancient blood-feud which, however, resembles quite as much the ferocity of the wild beast deprived of its young as the indignation of the civilized~~

~~'human being at an attack upon the general security of daities~~

~~The family of the slain assumed the right to exact vengeance of the slayer and his kin if members of the same tribe as themselves ; and the earliest form of vengeance was bloodshed. This was not modified until men had arrived at the notion of property distinguishable from that which was held in common by the tribe—a very important stage in the progress of human affairs.~~

~~Tt is well established that the tenure of land in severalty is of later date than tenure by the tribe or community at large ; and as soon as the claim of any individual to any particular piece of land was recognized, in any form, the right of property in movables must have been recognized also, if indeed the latter did not precede the former. Sooner or later the ownership of certain families was ad- mitted in the case of plots of ground and flocks and herds, the ownership of particular persons in the case of arms and armour and the implements of agriculture. Hence arose the practice of compounding with the avengers of blood. The relatives of the slain agreed to accept cattle, or any movable goods of which they might stand in need, as an equivalent for the life of the kinsman whom they had lost. But Governments which had advanced very little on the path of civilization perceived that the loss of a tribesman was a loss to the community, because—if for no other reason—it~~

represented a diminution of force in a conflict with a rival tribe. When a fine was paid for murder, therefore, a portion of it only was allotted to the kin of the person murdered, and the remainder to the king or other governing power.

As soon as the state had thus claimed a share of the blood-fine, wer, or wowy, the foundation of the criminal law had been laid—a distinction had been drawn between injuries affecting the individual alone and injuries affecting the community also. It was perhaps only natural that, when movables were accepted as compensation for a life held to be forfeited for murder, the wrongful appropriation of movables should be punishable by death—a not uncommon penalty in many primitive laws. Extreme severity of punishment for all offences (except homicide) committed within the boundaries of the tribe is indeed the characteristic of all the earliest attempts to deal with crime. The idea of the uncivilized man is that the most

ferocious chastisement is the most certain deterrent; and as he has won most of that which he possesses by taking it forcibly from others, he is not disposed to attribute to his fellow tribesmen any very high respect for property in the abstract.

Nevertheless, with the tenure of land-in severalty, and the acquisition of some personalty, was necessarily developed, in one form or other, the idea of protection for life and property in general. But small tribes continued to be engaged in frequent conflicts with their neighbours ; and the principles of right and wrong which were applied to the various individuals composing any one tribe were in practice, if not in theory, long disregarded in dealings with the stranger. Outside a certain circle of no very great exteat killing was still no murder, taking no theft or robbery, capture or violation of a woman no rape, in the modern sense. When tribes became united into nations, the rivalry of clan against clan was not immediately extin- guished; and the sentiments of the robber chieftain co- existed with governments which sanctioned laws for the repression of robbers and their deeds of violence. National growth out of these discordant elements is to be traced, with the greatest clearness, in the marvellously complete series of records

~~*preserved in the English Public Record Office, and not least in those which concern the Scottish and Welsh borders.*~~

~~*The law of development is not restricted to one island, or to races speaking one particular language. Its range appears to be as wide as history, and is sometimes to be detected even where history can hardly be said to exist. If, for instance, we compare the Latin word wrtus, the Greek word dvSpefa, and the Cymric word gwroldeb, with the English word virtue, we find a curious light thrown upon the progress of human opinion. The first three all had originally the same meaning—" virility ;" and all three acquired precisely the same secondary signification— "courage." The reason, of course, was that in the most primitive times courage was the one great quality which above all others commanded approbation. The want of a moral attribute so universally approved was in those days a crime, and the imbelles, or cowards, were, if Tacitus is to be believed, subjected by the Germans to a punishment sufficiently horrible. They were thrown under a hurdle and smothered in filth, But now the word virtue, which once had the special meaning of strength of muscle and nerve in the man, has (if any special meaning at all) that of chastity in the woman.*~~

~~*Brave law-breakers, in past times, have not only believed themselves to be good men and true, but have also had the sympathy of great numbers of their fellow-countrymen. Indeed, if we regard the history of criminal legislation and of crime in England, we find the ideas of the primitive tribesman steadily resisting the advance of civilization, retreating very slowly from position to position, and rarely yielding one without a long and desperate struggle. A most prominent example of this tenacity was in the crime of forcible entry, which hardly ceased to be common before the 18th century. When valour was the greatest or only virtue, one clan took land by force from another, and clansinan differed from clansman only in the greater or less vigour and courage shown in making the appropriation. Long after this half-savage condition of society, it remained a maxim of the English law that there was no legal possession of land without actual seisin. The law, indeed, would not allow its right hand to know that which was done by its left. It forbade forcible entries in the reign of Richard IL, while forcible entries were an essential part of its theory. As late even as the reign*~~

~~*of William IV. tlie fiction of a forcible entry continued to be one of the chief implements of the conveyancer's art. Without the*~~

“common recovery” he would have been unable to carry on the ordinary routine of his business ; and the basis of that fictitious action at law was that one person had wrongfully disseised another of his land.

The much abused Court of Star-Chamber owed its definite constitution under the Tudors to a very laudable desire for the repression of forcible entries and certain other kindred offences. Nor was it altogether unsuccessful in attaining the object for which it was established. Those private feuds in which the nobles, like the heads of tribes, had previously delighted, began to die out when private armies could no longer be kept on foot under the name of retainers, or supplied with uniforms under the name of liveries and tokens, Yet the fact that the Star-Chamber did not entirely put an end to forcible entries is a proof that even the most vigorous legislation is not all-powerful against the human nature and the surrounding circum- stances with which it may have to deal. Those circum- stances, and even that nature, may to some extent be changed, for were it otherwise the British empire and British civilization could now have no existence. But there is a reciprocal action and reaction of laws upon society and of society upon laws. No edict or statute ever made a sudden and complete alteration in the manners of a whole nation, though the growing wisdom of a nation may frequently have suggested a law, and though a well- devised law may have gradually fostered the growth of national wisdom. If it is true that xemo repente furt turpissimus it is no less true that nemo repente futt honestissimus.

The modern security of life and property of every description represents the triumph of new ideas over old. There is or was a popular delusion that the savage was noble, that while his manners were simple his nature was honest, and that he abhorred all such mean arts as those commonly attributed to the huckster and the trader. The truth is that his misdeeds were limited to his own parti- cular sphere of action, which was excessively small, and that if he did not commit some of the offences known in our own time it was because he had not the opportunity. Fraud has never increased in equal proportion with the increase of trade and civilization. It infected commerce at the very beginning, and existed during the darkness of the Middle Ages in every form then possible. It may and it sometimes does

assume new shapes as society groups itself anew, as occupations and the relations of man to man are changed. But force is its near relative and ally, and it flourishes in times of violence and anarchy. It made itself conspicuous throughout the age of chivalry, though poets and romance writers have attempted to hide it away. With infinite difficulty has civilized mankind so far gained the victory over its own primitive nature as to concur, with some approach to unanimity, in reprobation of the forger-monk, the brigand-knight, and the man who regarded a woman as a chattel and a tempting object for appropria- tion.

It is most necessary to bear in mind the contrast between the habits or ideas of one period and of another, if we wish to estimate correctly the position of the criminal in modern society, or the alleged uniformity of human actions to be discovered in statistics. There is, no doubt, some truth in the statement that in a modern civilized country—Great Britain, for example—the statistics of one year bear a very strong resemblance to the statistics of another in many particulars. But a little reflection leads to the conclusion that there is nothing at all marvellous in such coincidences, and that they do not prove human nature to be unalterable, or circumstances to be unchangeable. They only show what might have been predicted beforehand, that human beings of the same race, remaining in circumstances

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approximately the same, continue to act upon nearly the same motives and to display nearly the same weaknesses.

The statistics of a quarter of a century, of half a century, even of a whole century (if we had them complete for so long a period), could tell us but little of those subtle changes in human organization which have come to pass 1n the lapse of ages, and the sum of which has rendered life in Britain in the 19th century so different as it is from life in the 6th. Some of the earliest statisticians, indeed (and their science is of very recent origin), did an injustice both to themselves and to their favourite study through their own enthusiasm. They were eager to claim for numbers all and more than all that had been claimed by the Pytha- goreans of old. Not content with praising the virtues of numbers in general, they appeared to believe that the par- ticular numbers of a particular period would suffice for the discovery

of social and political principles of universal application. They found certain uniformities in an area so bounded, and a time so short, as to bear to the previous existence of the whole earth and its inhabitants about the same proportion that a drop of water bears to the ocean ; and they assumed that they had found a law or laws of a range co-extensive with human existence. But this exag- geration does not impair the real value of the statistical method or of some of the facts which it has brought to light. It has supplied us with some generalizations which are demonstrably true within certain limits, and which con- stitute useful elements of comparison with others discover- able elsewhere. It has not established that human conduct, regarded as a great whole, is absolutely invariable, but it has supplied a powerful instrument for an inquiry into the conditions by which variation may be determined.

If, for instance, we look at the statistics of homicide and. suicide in England during any ten recent years we perceive that the figures of any one year very little exceed or fall below the generalaverage. Yet no inference could be more erroneous than that homicide has always borne the same proportion to population in England as at present, for in the reign of Edward IIT. there were in proportion to popu- lation at least sixteen cases of homicide to every one which occurs in our own time. On the other hand, according to modern statistics, the number of male suicides is far greater than the number of female ; and the inference that the number of male suicides always has been greater is at least supported by records as early as the middle of the 17th century. Again, the homicides in one country may be and are far more numerous than in another, among equal populations; but nowhere does there exist any exception to the rule that there are more male suicides than female. Thus it is clear that any suggestion of uniformity offered by statistics requires the most careful verification before being accepted as even approximately true; but it is also clear that the suggestion may be of the highest value in leading us to distinguish those cases in which uniformity really exists from those in which uni- formity is only apparent.

The criminal statistics of any one country and period should be carefully examined by the light of history, and of any relevant details which can be procured from other parts of the world. Only by the aid of the adequate information thus to be acquired can criminal legislation ever be wise and

effective, no matter what definition of crime may be accepted by the legislators. A knowledge of human nature in the widest sense, not excepting, indeed, some of the principles of physiology, may give some power of discriminating between the mutable and the immutable, the possible and the impossible, in human affairs. Without it, well-meaning efforts to improve the condition of society may be not only unsuccessful but even mischievous. With- out it, disappointment is apt to follow upon the failure of

England since the year 1851.

CRIME

some apparently well-conceived law to effect the purpose for which it was devised, The disposition inherited from past ages can (in some fields of action and in some individuals at least) as little be changed by the fiat of a Government, as the ebb and flow of the sea can be con- trolled by the word of a king. But, nevertheless, there is good reason to believe that judicious lawgivers may gradu- ally effect a salutary change in the manners of a people. One of the most: remarkable illustrations of uniformity in the phenomena of crime is one which may be regarded also as an illustration of the influence of past conditions of society upon the present. As the human embryo passes through sundry stages of an inferior state of existence, so, after birth, the human being is before the age of thirty

'more apt to fall into courses which we now regard as

criminal (but which the savage considered laudable) than the human being of more advanced years. 'This, like the rule of the sexes in suicide, isa rule having no exception at any time or in any country concerning which it is possible to obtain information. But even here the proportions are not absolutely invariable, though the general law holds universally good. From various causes, of which one is the abolition of transportation, another the establishment of reformatories, the criminal age has perceptibly risen in So also, although the general law that men are more prone to commit suicide than women is altogether beyond dispute, the proportions of the sexes vary considerably in suicide and in various crimes in different countries, and apparently also at different times in the same country. Hence we may infer

~~that there is hardly any social change of which the human species need absolutely despair, though some changes may~~

~~be far more easily brought about, and may more reasonably~~

~~be the subject of legislation, than others. But all legisla- tion should be adapted to the possibilities of the existing generation.~~

~~A very curious feature of crimes in the modern sense, though one susceptible of very easy explanation, is the . effect upon them of the seasons. Those which are prompted by the animal passions are most common in the summer months; larceny, and offences wholly or partly prompted by want, in the winter months. As might also have been predicted a priori, theft increases in times of adversity, and various minor offences, such as drunkenness, in times of prosperity. The metropolitan police returns, indeed, show a very complete descending scale of drunkenness, beginning with a maximum on that day of the week on which wages are paid, and ending with a minimum six days afterwards.~~

~~Insanity, in its relation to crime, is a subject which might appropriately be considered in connection with the tendencies inherited by each human being at birth, but cannot be adequately discussed here. Suffice it to say that as youth, when the instincts and passions are at their strongest, is the period at which the human being is most inclined to commit crimes in general (as now understood), so old age, when both the bodily powers and the intellect are decaying, is the period at which one particular class of sexual offences is most frequently committed ; and there is good reason to suppose that persons committing them in earlier years are weak-minded also. Kleptomania and homicidal monomania are asserted by medical theorists to be forms of mental aberration. 'This doctrine, however, though perhaps sufficiently well-founded, can hardly be established upon the basis of a very wide induction, but only by a subtle reasoning from particular instances upon which it is now impossible to enter.~~

~~With regard to the very complex subjects of the preven- tion and punishment of crime, it may be suggested that the broader the view taken by legislators the more likely is~~

~~) Physical features.~~

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~~their legislation to be successful. Crime, as defined at any period, may be considered a recognized disease of the body social. But as well might the physician concentrate his whole attention upon each individual pustule of an eruptive fever, one after the other, as the criminal legislator upon actual criminals alone. The symptoms of a malady are of course not to be neglected, and it is necessary to be careful in the treatment of persons who have already fallen into crime. Prison management and every form of punish- ment areimportant subjects ; but the preservation from guilt of the great majority who are as yet guiltless is of an importance infinitely higher. There is one golden rule taught by history with respect to punishments—let them not afford an evil example of cruelty to the spectators. There is one great preventive of crime, one great antidote to instincts inherited from the past, and that is education. But the education which is effectual is not simply that of the schoolroom; it is the sum of the external circumstances which can inany way affect the character of any individual in the state. So far, therefore, as legislation has the power of diminishing crime, it can exercise its power by indirect means quite as much as by direct—indeed far more. Ifthe crimes of the English in the 19th century are different both in quantity and in kind from those of the 14th, the difference, we may be quite sure, is not wholly nor even principally caused by changes in the criminal law.~~

~~See various passages in the books of Numbers, Deuteronomy, and Joshua, in Homer's Jliad (especially book xviii.), in Cesar De Bello Gallico, in the Germania of Tacitus, in the Codex Theodosianus (especially lib. ix.), in the Ancient Laws and Inslitutes of England, and the Ancient Laws and Institutes of Wales, (both published by the Record Commission), in the Anctent Laws and Institutes of freland, Senchus Mor (published by commissioners), in Maine's Ancient Law and Village Communities, in M'Lennan's Primitive Marriage, in Savigny's Geschichte des vémischen Rechts in Mittelalter, and (so far as natura] or inherited tendencies are concerned) in Darwin's Descent of Man and Herbert Spencer's Principles of Psychology.~~

See also the Rotulit Curice Regis (published in part by Palgrave), the Records of the Court of Queen's Bench and of the Star Chamber, the State Papers relating to the Scottish Border, the Criminal Papers, and various other Records and State Papers preserved in the Public Record Office in London, the Records of the various circuits, the Statvles relating to criminal affairs, the Yeas Books and other legal Reports, various collections of Criminal Trials, the Criminal Tables (England and Wales, 1810—1855), the Judicial Statistics of England and Wales, of Scotland, and of Ireland, the Reports of the Inspeclors of Prisons for England and Wales, for Scotland, and for Ireland, the Reports of the Directors of Convict Prisons, the Compte général deladminisiralion de la juslice criminelle en France (published annually), the Statistik der preussstschen Schwurgerichte, Quetelet Sur Homme, Guerry's Slalislique morale dela France and Slalislique morale del? Anglelerre com- parée avec la slaltsligue morale de la France, various papers in the Journal of the Slalislical Society, and in the Transactions of lhe Associalion for lhe Promolion of Soctal Science, Beccaria's Dei Delitti e delle Pene, Bentham's works, Livingstone Systéme de legislation criminelle, the Indian Penal Code, Taylor's Medical Juris- prudence, Chevers's Indian. Medical Jurisprudence, Maudsley's Responsibility in Mental Disease, and other sources indicated in Pike's Mislory of Crime in England. (L. O. P.)

CRIMEA, the ancient Tauric Chersonese, called by the Russians by the Tatar name Krym, or Crim, a peninsula in the Black Sea forming part of the Russian government of Taurida, with the mainland of which it is connected by the Isthmus of Perecop, about six miles wide. It is situated between 44° 22' and 46° 10' N. lat. and 32° 30' and 36° 40' E. long. ; is rhomboid in form, the angles being directed to the cardinal points ; measures 125 miles from N. to 8. and 200 miles from W. to the E. extremity of the peninsula of Kertch, at the east angle of the quadrilateral ; and con- tains an area of between 9000 and 10,000 English square miles, Its coasts are washed by the Black Sea, except to the north-east, where is the Sivash, " Putrid Sea," a shallow lagoon connected with the Sea of Azoff by a very narrow opening, and separated from it by a low sandy tongue of Jand called the Tonga or Arabat Spit.

Three parts of the Crimea are a continuation of the steppe of South Russia, the remainder on the south and south-east coast consisting of hills and

mountains of calcare- ous rocks that have been disturbed by volcanic agency, and exhibit in various parts diorite, melaphyre, aphrite, diabase, amygdaloid, and diorite porphyry. The volcanic eruptions are more manifest near Cape St George, and at Cape Laspy, Kastropolo, Aloupka, Yalta, and Byouk Lambat, and have formed the eminences at Ayou-dagh, Kastel, Ouragou, and

Kara-dagh, and to the south of Sympheropol and Kara-sou- bazar. The mountains rise almost abruptly from the sea to an altitude in some parts of fully 4000 feet, the highest, called by the ancients Trapezus, '" the Table Mountain" from the flatness of its summit, and now called by the Tatars Tchadyr-dagh, " Tent Mountain," being 4800 feet above the level of the sea. Stalactite and stalagmite caverns are numerous, two of the most remarkable being on the Tchadyr-dagh. Criumetopon, the "ram's head" of Strabo, was at the south part of the range, and may have been Cape Aia to the east of Balaclava, or the range of cliffs that extends from that promontory to Aitodor. The coast of the mountainous region is exceedingly picturesque, and numerous vineyards have been formed along its sunny slopes ; the soil consists of decomposed rock, the chief com- ponent part being slate clay. The mud baths on the sea shore at Saky are celebrated for the relief they afford in cases of rheumatism, paralysis, skin diseases, &c.; there is a hospital for nava] and military patients, and a private bathing establishment. In the peninsula of Kertch are clusters of mud volcanoes near the town of Kertch and village of Yeny-Kaleh, where the mud, quite cold and black, bubbles actively but silently out of the earth ; it is not utilized.

The principal rivers are the Salghyr, its tributary the Kara-sou, the Belbeck, Katcha, Alma, and Boulganack. They all rise on the northern slopes of the mountain range ; their beds are almost dry in autumn, but they become rapid and dangerous torrents in spring.

The general climate from the end of March to December Climate.

is most salubrious and delightful, the heat being moderate and the nights cool and serene ; but the summers are irregular, the thermometer sometimes rising to 90° and 100° Fahr. in the shade—the mean annual temperature at Sympheropol being 50°, at Sevastopol 55°, and at Yalta 58°. The weather in

~~the steppe and mountainous parts differ, the former being subject to high winds, hailstorms (sometimes destructive), snowstorms, and frost. In summer long droughts prevail, completely parching up the verdure, which in July and August is quite burnt up. In some winters the mountain tops are covered with snow, which continues on the higher summits until May, yet their tem- perature is moderate. Ice is rarely seen on the south slopes, and snow seldom falls, the winters throughout being mild, though rains are heavy and winds variable. The greater heats, which last from May to September, are en- durable owing to sea and land breezes, the prevalent winds being 8.E and E., when the weather is clear and dry; 8S. and 8. W. winds are invariably accompanied with rain. The autumn, particularly in August and September, is unhealthy on the sea-shore of the south coast, fever and ague being prevalent but not dangerous ; an altitude, however, of 40 feet or 50 feet is security against attack. Dense fogs occur in March, April, and May, sometimes lasting many hours, but they seldom overspread the land.~~

~~In ancient times the Crimea, the Tauric Chersonese, Vegetable produced a great quantity of corn, which was exported to products.~~

~~various parts of Greece; we read that 2,100,000 medimnt (a medimnus=12 gallons) were sent in one year from Theodosia to Athens by Leucon, king of the Bosphorus (393-353 B.c.). The population is now in some measure supplied with corn from Russia, the drought that has prevailed for many years preventing the district from being a grain-producing country ; but where the land is capable of irrigation it is grown, and there is rich pasturage; much good land, however, remains uncultivated from a dearth of manual labour. The grains sown are wheat, barley, oats, rye, maize, millet, and peas; flax and tobacco are also planted. The vine overspreads the declivities of the south coast, from the valley of the Boulganack to — and again at 1, — 74~~

~~586 C84 Mie~~

~~Soudak and Theodosia, 13,500 acres yielding annually about 3,050,000 gallons of wine, sold new at 4s, 10d, to 5s. 6d. the vedro (2°86 gallons). A small proportion is exported. Orchards are interspersed with the vineyards, but the best apples are the produce of the valleys of the Alma, Belbeck,~~

Katcha, and Salghyr, the estimated value of the supply sent yearly into Russia being £150,000. The more common indigenous trees and shrubs are the Tauric pine, juniper, yew, oak, beech, which is abundant and attains a large size, elm, wych elm, maple, ash, poplar, and fir; the last vrows well on the highlands and on the south slopes, where ig reaches a great height; the Babylonian willow and tamarind grow thickly by the side of streams ; there is also the hide sumach (Rhus coriaria), hawthorn, honey-suckle, barbariss, and the dog-rose, which becomes quite a tree, bearing white, pink, and yellow blossoms. The wild fruit- bearing trees are the mountain ash, kyzyl, a small red plum, the apple, pear, and vine; it is said that the wild olive is occasionally to be found. In the gardens of the south coast large numbers of plants have been acclimatized, and trees of all kinds grow to perfection, especially the cypress and magnolia, Wild flowers, such as the white and violet crocus and sweet-scented violet, appear as early as February, lilies of the valley and white and sweet peas being plentiful in May, and in summer the woods are filled with peonies, Asphodelus tawrica, veronica, geranium, and orchids. In the highlands the vegetation is always vigorous. In July they are covered with Thymus, Sideritis, Galium, Myosotis, and Odontarrhena, Gentiana cruciata, and Symphytum tauricum, In the gardens are cultivated the following fruits :—melons, Larpowz, "water-melon," large, of excellent flavour, and greatly consumed ; strawberries, gooseberries, raspberries, and currants ; pomegranates, pears, figs, plums, peaches, apricots, cherries, mulberries, quinces, walnuts, almonds, hazel-nuts, and chesnuts; also many sorts of vegetables.

taken a few months after the promulgation of the owkas on the new system of general conscription, in which the Tatars were included. There are also Russians, Armenians, Gypsies, Greeks, Jews, and some Germans. The Nogai of the steppe have long since disappeared as natives, and are replaced by Tatars of almost pure Turkish descent, and speaking a language closely assimilating the Turkish. The Tatars on the south coast are a mixed race, largely alloyed with Greek, Italian, and Ottoman blood, and greatly despised by the former ; but all are Mahometans, and strict observers of the Koran. The Tatars are extremely indolent, and never think of learning a trade; they busy themselves about their fields and gardens from the end of May to about the third week in August, but remain quite idle throughout the rest of the year. They are most hospitable to strangers, every Tatar of means

keeping an 6da, or house of call for travellers, the first duty of a Tatar being the exercise of hospitality, on which he prides himself. Their cottages are constructed, when possible, on the slopes of rising ground, the rock forming the back of the habitation, which is usually whitewashed and kept scrupulously clean, ensconced by fruit trees and verdure. The Tatars are very abstemious, drinking milk and bowza, a fermented liquor made of millet ; Loumyss, "mare's milk," is much employed by them medicinally. The men wear baggy trowsers, @ short embroidered jacket,and a cap of lamb skin; the women colour their nails, eyebrows, and frequently their hair, made up into numerous thin plaits, with kna, a mineral dye, and wear loose trowsers tightened at the ancles, a loose coat, and a red cap ornamented with numerous coins ; they tie a kerchief round the waist, the opposite corners hanging down behind. The females, more especially on the south coast, have quite given up wearing the yashmak, "veil," since the occupation of the country by the allies in 1854-56. The mourzas, "nobles," live in retirement, shunning intercourse with Christians, but their women are

Auimals. Wolves, foxes, weazels, and hares are about the steppe | not kept in seclusion , every village has its molla, who is and in the mountains, where are also the Persian and roe | also the "elder," and responsible to the authorities. The deer ; while the steppe is infested with the souslyk (Sper- | Armenians and Greeks hold the trade, as do also the Jews anophilus). The forests of Tchadyr-dagh are preserved for | who are Karaims, "readers" of the Holy Scriptures, the crown, but permission to shoot, from June 29 (July adhering strictly to the text of the Old Testament, and 11), may be obtained. Domesticated animals include | rejecting all oral traditions and rabbinical writings, keeping double-humped camels, buffaloes, beeves, and several kinds | themselves quite apart from the Talmudists, to whom they of sheep, one sort being distinguished by short curly hair of | are most odious. There are about 5000 Karaims in the a bluish-grey colour ; the merino sheep was introduced in | peninsula. Russians and Germans are chiefly engaged in 1804, and the breed is well maintained. The horses are agriculture, while the gypsies are the artificers. The small, hardy, and intelligent, but uncouth in appearance. Russian language is very general throughout the peninsula. The birds consist of eagles, vultures, hawks, ospreys, storks, Sympheropol, the chief town and seat of government Towns. herons, and some other birds

~~of prey ; partridges, which on (population, 17,000), is situated on the Salghyr, where the steppe are strong on the wing by the end of July ; the | was Ak-mesjyd, the second capital of the khanate. Like ordinary, double, and jack snipe, quails, pigeons, bustards, | all Russian towns, it has fine broad streets at right angles swans, geese, bitterns, and wildfowl of every description, | to each other, and the usual whitewashed churches with especially on the Sivash and north-west coast ; also crows, | green domes. Baghtchasarai and Kara-sou-bazar were owls, thrushes, blackbirds, king-fishers, &c, Serpents that | given up by Catherine II. to the exclusive occupation of are harmless, lizards, and frogs are abundant, The the Tatars, and have remained purely Oriental towns. scorpion, mentioned by Pallas, is now very rare, but Baghtchasarai, "garden palace," was the capital of the tarantula spiders and scolopendra, both noxious, frequently | khans after the destruction of Solkhat, now Esky-Crim ; make their appearance in dwellings. Caterpillars and the their palace is preserved to this day. Kertch, at the east mole cricket (Gryllo Valpa vulgaris) are very destructive | end of the peninsula, is a fairly thriving port of transit for in gardens. Bees are abundant, and produce excellent | produce from ports in the Sea of Azoff, and imports into honey and a great deal of wax. In the rivers are taken | Russia of cattle and horses from the plains of the Kouban trout, roach, dace, and cray-fish, and at their estuaries the | and of Circassia. It is a military station of some impot- sturgeon is sometimes found, and the salmon is speared. | tance, the entrance to the straits of Kertch, or Yeny-Kaleh, A great variety of fish haunt the coast, such as red and | the ancient Cimmerian Bosphorus, being protected by the grey mullet, herring, mackerel, turbot, soles (at Eupatoria), | formidable Pavlovsky fortress, a combination of masked plaice, whiting, bream, haddock, pilchard, soudak (the pike | batteries and covered ways over an extent of two miles. perch), whitebait, eels, anda variety of shell-fish, crabs, &c., | Theodosia, formerly Caffa, where a small export and import but no lobsters. trade is carried on, thrives as a favourite watering-place.~~

~~ae The Tatar population, the largest in the peninsula, | Sevastopol, in the superb harbour that bears its name,~~

~~amounted in 1874 to 127,682, according to the census~~

created a military port and fortress by Catherine IT., was

Commerce.

History.

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bombarded and occupied by the Allies in September 1855. Eupatoria, formerly Khezlevé and Kozloff, is the great emporium for salt, and during Turkish occupation was the principal port in the Crimea; its inhabitants are chiefly Karaims, who have here a "spiritual institution" under their Gahan. Balaclava, the Symvolon limen of Strabo, Cembalo of the Genoese, is a small Greek fishing village in a splendid land-locked harbour to the east of Sevastopol, remarkable as being occupied by the British during the war. Yaltaisasmall but fashionable watering-place on the south coast, with excellent hotels and many inducements to visitors, the season lasting from May to September. Near Yalta is Livadia, the residence of the empress, and other imperial properties.

The most valuable commercial production is salt, of which the yearly supply is 15,000,000 pouds (a poud = 36 ib English). Salt entering Russia is excised at 30 copecks (9d.) per poud, and the entire revenue to the Government from the salt-lakes in the Crimea is estimated at £1,785,714. There are no manufactures, but the principal articles of export are wine, Ail ('.¢., fuller's earth), honey, wax, hides, lambskins, and wool, A reddish marble from quarries near Tchadyr-dagh is exported in smal] quantities. Com- munications in the peninsula are maintained by excellent post-roads and bridle-paths ; and a railroad which connects Sevastopol, Baghtchasarai, and Sympheropol with the south of Russia was opened for traffic in January 1875.

The earliest known inhabitants of the Crimea were the Cimmerians, who were driven out by the Scythians about 680-631 3.c., and fled into Asia Minor, leaving only a remnant, who took refuge in the mountains and were after- wards known as the Tauri. 'These appear to have been a savage people, from the fact that all strangers that landed, or were cast on their coast, were sacrificed to the virgin goddess Iphigenia, afterwards

apparently identified with a goddess of their own mythology by the Grecians, who named the country the Tauric peninsula after their pre-decessors, whence the Russian name Taurida. The numerous crypts existing about the rocky heights were in all probability the troglodyte caves of the Tauri; in some parts they were converted into hermitages and retreats by the Greeks during Byzantine occupation, and were again so utilized by their successors in the last century ; these caves are to be seen at Ak-Kaya, Tepe-Kerman, Katch-Kalen, Tcherkess-Kerman, Mangoup, Mangoush, Tchyfout-Kaleh, Inkerman, &c.

In the year 658 3.c. the Heracleotes crossed the Axine, as the Black sea was then called, and founded a colony near where is now Sevastopol, the territory they occupied becoming known as the Heracleotic Chersonese, to distin- guish it from the Tauric Chersonese. The city of Chersonesus flourished under its own free institutions dur- ing the space of 1000 years, and even longer, though it became a dependency of the Eastern empire ; it was taken in 988 by the Russian grand-prince Vladimir, who there received baptism. and was completely destroyed in 1363, by Olgerd, grand prince of Lithuania. In the 7th century B.c., other Grecians, the Milesians, settled at Theodosia, and later at Nymphzeum and Panticapzeum (Kertch), which last city became their metropolis under the authority of an archon, and afterwards of a king, whose dominion, the kingdom of the Bosphorus, included Phanagoria on the eastern shore of the Cimmerian Bosphorus, a city founded with others at the same time as Panticapeum, and the emporium of the people on the Asiatic shores of the strait. Parisades, sovereign in 115 B.c., being hard pressed by the Scythians, voluntarily ceded his dominion to Mithridates, king of the Pontus, whose son Pharnaces, after his own downfall, was permitted by Rome to assume the sovereignty of the Bosphorus, a sovereignty that continued until a late

period under the protection of the Koman empire. The peninsula was overrun successively by the Alans (62 4.D.), the Goths, whose descendants, peaceably employed in agri- culture, remained until the early part of the 14th century, the Huns in 376, the Khozars in the 8th century, expelled by the Byzantines in 1016, and the Kiptchaks, who possessed themselves, about

1050, of Khazary, by which name the peninsula was called, after the Khozars, they being in their turn expelled by the Mongols, about 1237. Penticapzeum, or Cerchio (Kertch), was for a time (1343), occupied by the Venetians, their successsors being the Genoese, who had established themselves at Caffa (Theodosia) in 1263-67, and to whom the seaboard known as Gothia, extending to Cembalo (Balaclava), was ceded in 1315. Cembalo, Soldaia (Soudak), and Caffa were strongly fortified by them, Caffa being the centre of an extensive Asiatic trade that included Persia, India, and China. The ruins of the Genoese fortifications still remain.

After the destruction of the Golden Horde by Tamerlane, the Tatars of the Crimea elected, about 1428, a khan for themselves, a descendant through Toktamish of Jinghis Khan, one Hadgy, who assumed the name of Ghyrey, his capital being at Solkhat, now Esky-Crim. This khanate continued independent until the conquest of Crim by Mahomet II. (1475), who made the khan prisoner, and sent the Genoese and other Christians into servitude and slavery. The khans, thenceforth the vassals of the sultans, were ut the head of a warlike race, by whom the Russian provinces were being continually devastated until the year 1777, when Suwaroff dispersed the troops of Dyvlett Ghyrey, who fled to the Caucasus, and the usurper Selim Ghyrey ascended the throne under the protection of Catherine IT. He was, however, forced to appeal to Russia for succour against revolt amongst his own subjects, and the Crimea was eventually annexed to the Russian empire by order of the empress, August 1, 1783, the treaty for its cession by the Porte being signed January 9, 1784.

The Crimea was occupied by the allied forces of Great Britain, France, and Sardinia during the Russo-Turkish war of 1853-56. The British and French troops landed near Eupatoria, September 14, 1854, and did not evacuate the peninsula until July 12, 1856, during which period were fought the battles of the Alma, Tchornaya, Balaclava, and Inkerman, and the formidable fortress of Sevastopol was reduced by siege.

See Dubois de Montpéreux, Voyage antour du Caucase, &c., 6 vols., Paris, 1839; Kohl, Reisen en Sudrussland, 2 vols., Dres- den, 1841; Bossoli, Scenery of the Crimea (52 large drawings), 1855; Ph. Brunn, Notices Hist.

et Top. concernant less colonies Ttaliennesen Gazariec, St Petersburg, 1866; Commr. J. Buchan

Telfer, R.N., Zhe Crimea and Transcaucasia, 2 vols. London, 1876. (J.B. TH.)

CRIMINAL LAW. A crime is an offence which the law punishes directly, as distinguished from an offence which it punishes indirectly by giving an action for damages to the person injured. The criminal or penal law is that portion of the law which deals with crimes. Sometimes it is attempted to distinguish crimes fom civil injuries by saying that the former are offences against the state, the latter offences against individuals, or again by saying that the former are prosecuted by the state, the latter by private persons, But all illegal acts are offences against the state, and in England the state is not, nominally at least, the prosecutor of criminal offences. Civil injuries, or torts, as they are called in the law of England, are offences for which the injured person may sue in a court of justice. Torts and crimes do not therefore necessarily exclude each other, for the same act may be both a tortand a crime in the sense that the injured person may sue for damages, and the offender may likewise be prosecuted and punislied. Further, it should be observed

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directly punishable, concerned, far removed from the class of crimes. allow your chimney to go on that it is punishable by fine,

sense of the preceding article, or in the ordinary accepta-

tion of the term. The law of England rest of the law, composed ofa large number of enactments,

resting on a basis of common law. Its leading definitions derived from the common law, modified

and distinctions are by judicial interpretation and by statute. A few of the general principles of the criminal law of England will be

Stated here; for information as to the law relating to

specific crimes reference should be made to the respective heads. ;

The absence of systematic arrangement and of any precise definition of crimes is due to the historical character of the criminal law. "It is founded," says a high authority, "on a set of loose definitions and descriptions of crimes, the most important of which are as old as Bracton. Upon this foundation there was built, principally in the course of the 18th century, an entire and irregular superstructure of Acts of Parliament, the enactments of which were for the most part intended to supply the deficiencies of the original system. These Acts have been re-enacted twice over in the present generation—once between 1826 and 1832 and once in 1861 ; besides which they were all amended in 1837. Finally, every part of the whole system has been made the subject of judicial com- ments and constructions occasioned by particular cases, the great mass of which have arisen within the last fifty years." (View of the Criminal Law of England, by J. Fitzjames Stephen).

A crime being defined as an action specifically forbidden under penalty of direct punishment, it may be stated, without entering into a minute analysis, that to render a person liable to punishment he must have a guilty inten- tion, or, as it is called in English law, malice. This malice will be inferred from the fact that the forbidden action has been done; a man will be presumed to have intended the natural consequences of his own acts. The inference, however, may be rebutted by evidence showing that the criminal intention required to constitute a crime was not asa matter of fact present. And there are certain conditions from which the law will infer the impossibility of any such intention. A child under seven is held to be incapable of committing a crime. If a married woman commits an alleged crime in presence of her husband, she will be held to have acted under his compulsion. The state of mind described as insanity, also excludes the possibility of criminal intention.

Crimes are divided into treasons, felonies, and mis- demeanours. The first class includes offences against the state, e.g., violence to the person of the king, or resistance to the authority of the sovereign power. 'The distinction between felonies and misdemeanours is not so easily drawn, and is founded

if anything on the nature of the punishment and not of the crime in such case. In the definitions of crime in Bracton, misdemeanours appear as a less serious class of crimes, after the graver crimes of treason, crimen falsi, homicide, mayhem, arson, rape, and theft have been described. They are " minor or lighter crimes, prosecuted civilly as in personal actions for injuries." They are regarded as of the nature of wrongs done to the sovereign power. In a trial for felony the jury are required to make true deliverance between the queen and the prisoner at the bar. In atrial for misdemeanour they are to try the issue joined between the queen and the defendant. The principal com- mon law misdemeanours—libe] conspiracy, and nuisance—

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that many offences which are crimes in the sense of being are, so far as the morality of the act 1s To

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have an obviously direct reference to the public peace, and may without much violence be regarded as grievances to the sovereign power itself. In Russell On Crimes, a mis- demeanour is said to be the name generally applied to offences for which the law has not provided a particular name. But so many crimes have been created misdemean- ours by statute which do not differ in character from felonies, that no distinction founded on the nature of the crime can be drawn between them. Nor can they be dis- tinguished by the greater or less severity of the punishment, for some misdemeanours are punished more severely than felonies. Besides, however, the differences in the mode of trial noted above, felonies differed from misdemeanours inas- much as they involved a forfeiture of property—a distinc- tion which no longer exists, since forfeiture for felony was abolished by 33 and 34 Vict. c, 23. And in general there are greater facilities for arresting the criminal in case of felony than in misdemeanours.! It is unfortunate that a distinction so fundamental should

~~*be so utterly vague. All the crimes known to the law may be divided into felonies and misdemeanours, for treason is after alla case of felony, but it is impossible to say what felony is or what a misde- meanour is without an enumeration of the specific crimes which are ranked under each head. The Consolidation Acts form a classification of crimes which is more easily understood, although it does not cover the whole of the criminal law. Thus the Acts of 1861 (24 and 25 Vict. cc. 96, 97, 98, 99, and 100) relate respectively to larceny, malicious injuries to real property, forgery, coinage, and offences against the person.*~~

~~*The definitions of particular crimes are still to be sought in the common law and the decisions of the judges. The Consolidation Acts for the most part leave them as they stood, eg., the Larceny Act does not define the crime of larceny. The consequence is that exact definitions are very difficult to frame, and the technical view of a crime some- times includes more, sometimes less, than it ought. Thus the crime of murder, as settled by the existing law, would include offences of such very different moral gravity as killing a man deliberately for the sake of robbing him, and killing a man accidentally in an attempt to rob him. On the other hand, offences which ought to have been criminal were constantly set aside by the judges as not being within their definition of the particular crimes alleged, and the legislature has constantly had to interfere. In this way the penalties of larceny were gradually extended to embezzle- ment, frauds by trustees, &c.*~~

~~*Attempts to commit crimes are themselves crimes. It is laid down in Russell On Crimes (vol. i. p. 189) that " an attempt to commit a felony is a misdemeanour, and an attempt to commit a misdemeanour is a misdemeanour, whether the offence be so by common law or by statute. An attempt to murder was at common law no more than a misdemeanour punishable by two years' imprisonment. This was the case until 1861; but now by the 24 and 25 Vict. c. 100 (Offences against the Person Act), any person attempting by the means specified therein, or by any other means, to commit murder, is guilty of felony and punish- able by penal servitude for life or for any term not less than three years, &c., or to be imprisoned for not less than two years with or without hard labour or solitary confinement.*~~

Persons accused of a crime may be either principals or accessories, and these are further distinguished into princi- pals of the first and second degree, and accessories before

1 Any one who has obtained a drove of oxen or a flock of sheep by false pretences may go quietly on his way and no one, not even a peace officer, can apprehend him without a warrant, but if a man offers to sell another a bit of dead fence supposed to have been stolen, he not only may but is required to be apprehended by that person (Greaves, Criminal Law Consolidation Acts).

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and after the fact. Principals in the first degree are those who have actually and with their own hands committed the fact. Principals in the second degree are those who were present acding and abetting at the commission. An acces- sory before the fact is one who, being absent at the time of the offence committed, doth yet procure, counsel, com- mand, or abet another to commit a felony. And an acces- sory after the fact is one who, knowing a felony to have been committed by another, receives, relieves, comforts, or assists thé felon. Participation in the commission of a felonious act in any of these ways is a felony (Russell On Crimes, vol i. p. 156). By the Accessories and Abettors Act (24 and 25 Vict. c. 94) accessories before the fact may be tried and punished as principals, and accessories after the fact may be indicted as such or as substantive felons.

Criminal procedure in England is distinguished by several special features, the most remarkable of which is its close similarity to procedure in ordinary civil cases. Crimes are left, like civil injuries or breaches of contract, to be prosecuted by the persons injured, and the nature of the trial, the character of the tribunal, and the rules of evidence are the same as in an ordinary litigation at common law. Mr J. F. Stephen, in the excellent treatise already quoted, aptly distinguishes the English system as "litigious" from the "inquisitorial" system prevailing in France and other countries.

Preliminary jurisdiction in criminal cases is possessed by the justices of the peace, who may also under special Acts convict in a summary manner for offences of minor importance, When the justices are satisfied that there is a

prima facie case they commit the prisoner for trial either at the quarter sessions or at the assizes. (See Courts.) The following cases are not liable at quarter sessions :—Misprision of treason; offences against the queen's person, prerogative, &c., or against Parliament ; offences subject to the penalties of premunire ; blasphemy; unlawful oaths (administering or taking); perjury and false affirmation ; setting fire to crops of grain, wood, heath, &c.; bigamy ; abduction ; concealment of birth; bankruptcy offences ; blasphemous libels ; bribery ; conspiracies for offences not triable at sessions; stealing records or documents, &c. A trial at quarter sessions or assizes begins by the presenta- tion of an indictment to the grand jury, who are selected for the occasion, to the number of from twelve to twenty- three, from the gentlemen of standing within the district for which the court is sitting. The judge delivers a charge to the grand jury, shortly pointing out the nature of their duties, and directing their attention to any peculiarities in the cases that are to come before them. The grand jury discuss each case seriatim, and hear witnesses in private (in general only those for the prosecution), and if they are satisfied that there is a prima facie case against the prisoner they return a true bill, and the case goes to trial before the judge and a common jury. If the grand jury do not return a true bill, the case is at an end, unless there has been a verdict on a coroner's inquisition, or unless it is a case which may be proceeded on by way of information. A criminal trial in open court now differs in very few points from any ordinary civil cause. For a long time prisoners were not allowed to have the benefit of professional advocacy except in cases of high treason, and the privilege was not conceded until the Prisoners' Counsel Act of 1836. Sir J. Stephen fixes at the same date the entire exemption of prisoners from interrogation, —a practice which would appear to be connected, in legal reason, with the rule which made a party to a cause an incompetent witness. In this respect the contrast between a criminal trial in England and a criminal trial in France is very striking. The constant interrogation and browbeating of the prisoner by the judge, consistent as it may be with the inquisitorial

theory of their procedure, is always revolting to English- men, accustomed to see in every criminal trial a fair fight between the prisoner and the prosecution. Confessions, which are the object of many proceedings in a French inquisition, are regarded with suspicion by the English law. During the spring assizes of 1877 a prisoner was charged with having committed a

murder twenty years ago, and the counsel for the prosecution, with the consent of the judge, withdrew from the case because the only evidence, besides the prisoner's own confession, was that of persons who either had never known him personally or could not identify him. Although a prisoner may have counsel to defend him if he can afford to pay the customary fee, no provision is made by law for his being so represented. But the custom of the courts has imposed upon judges excep- tional care for the prisoner's interests, and on the prosecut- ing counsel exceptional forbearance when the prisoner 1s undefended. It was often said before the Prisoners' Counsel Act (and it is still true) that the judge is the prisoner's counsel, In exceptional circumstances the judge will call on some member of the bar to undertake tho prisoner's defence.

As there is no provision made by law for the prisoner's defence, so there is no public prosecutor. The absence of such an officer has long been an admitted defect in the English system, but no successful attempt has yet been made to deal with it. It is generally agreed that an official staff of prosecuting counsel would not be desirable. But there certainly ought to be some public officer charged with the preparation, if not of all criminal cases, at least of those which the injured person does not wish to conduct himself. At present a private person is bound over by the magistrates to prosecute at his own expense, and the con- sequence often is that many persons will forego an injury yather than submit to the trouble and risk of a prosecution. The prosecutor can recover his costs from the county, unless they are disallowed by the judge. The county again is entitled to be recouped by the Treasury, and between these two bodies there has been a standing feud on the subject of criminal costs for some years.

Properly speaking there is no appeal in criminal trials. The verdict of the jury is fina]. Any substantial defect or informality in the procedure may be taken before the Queen's Bench by writ of error, but such cases are not now of frequent occurrence. And if any question of law arises at the trial, the judge may reserve it for the opinion of the court for the consideration of crown cases reserved, by whom the conviction may be either quashed or con- firmed.

Punishments under the common law were excessively severe, but their operation was mitigated by the singular privilege of Benzrir or Cierey (q.v.). Blackstone laments that "among the variety of actions which men are daily liable to commit, no less than 160 have been declared by Act of Parliament to be felonies without benefit of clergy, or, in other words, to be worthy of instant death." The more atrocious punishments have disappeared from the law, and the penalty of death is now practically restricted to murder. Fine, imprisonment with or without hard labour and with or without solitary confinement, and penal servi- tude,? are the most usual punishments, and a wide discretion is left to the judges.

1 "No confession made by the prisoner is admissible which is made in consequence of any inducement of a temporal nature, having refer- ence to the charge against the prisoner, held out by a person in author- ity" (Roscoe's Digest of Criminal Evidence). Notwithstanding the general bearing of the law against confessions, it is held that a con- fession obtained by artifice or by spiritual solicitation may be used in evidence.

2 By 16 and 17 Vict. c. 99, all sentences of transportation were con verted into penal servitude.

enal servitude for an offence committed after the passing of the Act is five years, and where any previous Act had fixed a maximum of less than five years, the period of five years is to be substituted for such shorter term. The same Act gives the form of licence under which a convict may be allowed to be at large during the remaining portion of his time, subject to the condition of abstaining from crime and from association with criminal characters, é&c., and of preserving and producing his licence when called upon by a, magistrate or officer. By the Prevention of Crimes Act, 1871, every holder of a licence under the Penal Servitude Acts must notify his residence and any change of residence to the police (section 6). The Prevention of Crimes Act, 1871, likewise repeals the Habitual Criminals Act of 1869, and substitutes new provisions, of which the following are the most important. Section 5 provides for the registering and photographing of criminals.! Section 7 specifies circum- stances under whicha person who has been twice convicted on indictment may, within seven years of the expiration of

the last of the two sentences, subject himself to imprison- ment with or without hard labour for a term not exceeding one year,—e.g., if it appears to a magistrate that "there are reasonable grounds for believing that he is getting his livelihood by dishonest means ;" or if he refuses to give his name and address when charged with an offence before the magistrates; or if he is found in any place public or private under circumstances which satisfy the court that he was about to commit, or waiting for an opportunity to commit, an offence; or if he is found in a dwelling-house, &c., without being able to give a satisfactory account of his presence. By section 8, " where any person is convicted on indictment of a crime, and a previous conviction of a crime is proved against him, the court having cognizance of such indictment may, in addition to any other punish- ment which it may award to him, direct that he is to be sub- ject tothe supervision of the police for a period of seven years, or such less period as the court may direct, commencing immediately on the expiration of the sentence passed on him for the last of such crimes." Persons subject to police supervision, like convicts out on ticket-of-leave, must notify their residence to the police, and males must report themselves once a month. The Larceny Act of 1861 had made a previous conviction for felony or indictable misde- meanour, or two summary convictions, matter of aggravation on a charge of simple larceny ; and section 116 of that Act provides for the trial of the question whether there has been such a previous conviction. It is only after the prisoner has been found guilty of the subsequent offence that the question whether he has been previously convicted can be gone into, unless he offers evidence of good character in the trial for the offence, in which case the prosecutor may prove the previous conviction. This section is adopted in the Prevention of Crimes Act, 1871. The prerogative of pardon, as exercised by the Home

1 A Register of Habitual Criminals in England and Wales for the years 1869-76 has recently been printed in the printing works of Her Majesty's prison, Brixton. "The list," says the Times of March 7, 1877, "has been framed by separating from the great mass of returns those which refer to persons who have been convicted on indictment of a crime, and thereupon have had a previous conviction proved against them. It is thus a complete register of habitual and professional criminals, and has been printed for circulation among the police and the authorities of prisons, in order to enable them to identify persons who come undertheir charge." The

proportion of habitual criminals born in different localities gives some curious results. Thus the town of Stafford heads the list with 1°881 to every 1000, followed closely by Worcester, Taunton, and Lancaster, all of them towns with under 20,000 inhabi- tants. On the other hand, London, which produces the largest number (1503), stands at the rate of only *461 to the 1000. Of the

habitual criminals on the list 1082 come from Ireland, and 158 from Scotland.

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By the Penal Servitude Act, 1864, the shortest period of

Secretary, occasionally has the-effect of a rehearing of the case, ¢.g., when new evidence is discovered after the trial, or the verdict of the jury gives dissatisfaction to the public. In such cases the Home Secretary, after consultation with the judge, or if necessary with such skilled persons as he may select, decides on his own responsibility to grant or withhold a pardon.? This is not perhaps the most satisfac- tory way of reviewing the sentence of a criminal court. The distinguishing feature of Scotch criminal law is the existence of a public prosecutor. At common law persons injured have the right to prosecute, but " private prosecu- tion, except in the most trifling summary complaints, is now wholly unknown in practice " (Macdonald's Criminal Law of Scotland). The lord advocate and his deputies are the public prosecutors in the Supreme Court; in the inferior courts the procurator-fiscal prosecutes, The public prose- cutor cannot be compelled to prosecute, nor can he be prevented from prosecuting. (E. RB.) CRIMMITZSCHAU, or KrimmitzseHav, a manufactur- ing town of Saxony, in the circle of Zwickau, and seven miles N.N.W. of the town of that name, on both banks of the Pleisse, and on the Saxon Western State Railway, 760 feet above the sea. Brewing was formerly the most important industry, but woollen weaving and cotton weav- ing have now taken the chief place; the manufacture of machinery has also become very considerable. Lime-burning is carried on in the neighbourhood, and the surrounding district is noted for its wheat growing. Population (1875), 17,649. ' CGRISPIN anp CRISPINIAN, two saints whose festi- val, as marked in the calendar, is on the 25th of October. According to the tradition they were brothers, born at

Rome, whence they travelled in company with St Denis to Soissons, in France, towards the close of the 3d century, to propagate the Christian religion; and that they might not be chargeable to others for their maintenance, they exercised at night the trade of shoemakers, while preaching during the day. The shoes they made were sold at a low price to the poor, an angel miraculously furnishing the leather. According to another version of the story, the saints stole the leather so as to enable them to benefit the poor. When it was known that they were Christians, the governor of the town, after subjecting them to cruel tortures, ordered them to be beheaded. The date of their martyrdom is usually given as 287, though the Roman legend gives 800. They are regarded as the tutelary saints of shoemakers. CRISSA, or Crisa, in ancient geography, one of the oldest cities of Greece, was situated in Phocis, at the foot of one of the spurs of Mount Parnassus. Its name occurs both in the Zééad and in the Homeric ymns, where it is described as a powerful place, with a rich and fertile territory, reaching to the sea, and including within its limits the sanctuary of Pytho. As the town of Delphi grew up around the shrine, and the seaport of Cirrha arose on the Crissean Gulf, Crissa gradually lest much of its importance. By the ancients themselves the name of Cirrha was so often substituted for that of Crissa, that it soon became doubtful whether these names indicated the same city or two differ- ent cities, The question was practically settled by the investigations of Ulrichs, who unravelled with much care the history of the towns. 'From its position Cirrha com- manded the approach to Delphi, and its inhabitants became obnoxious to the Greeks from the heavy tolls which they exacted from the devotees who thronged to the shrine. The Amphictyonic Council declared war against the Cirrheans in 595 z.c., and having taken the town, razed it to the ground, and consecrated its territory to the temple

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2 A good example will be found in the case of Smethurst, reported at length in Stephen's View of the Criminal Law.

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at Delphi. The plunder of the town was sold to defray the expenses of the Pythian games. In 339 the people of Am- phissa began to rebuild the city,

~~and to cultivate the plain. This act brought on the second Sacred War, the conduct of which was intrusted by the Amphictyons to Philip of Macedon, who took Amphissa in the following year. Cirrha was afterwards rebuilt, but never regained its former im- portance. Crissa is probably represented by the modern Chryso, and the ruins of Cirrha, including extensive remains of its port, are to be seen in the neighbourhood of the Pleistus.~~

~~CRITIAS, an Athenian orator and poet, and one of the thirty tyrants. In his youth he habitually listened to the conversations of Socrates, but his manhood was devoted to selfish political intrigues. He stirred up the Penestz of Thessaly against their masters, and made himself so trouble- some at home that he was banished by the people. Return- ing to Athens he was made ephor by the oligarchical party ; and he was the most cruel and unscrupulous of the thirty tyrants who in 404 B.c. were appointed by the Lacedemonians, See GREECE.~~

~~CRIVELLI, Carto, CAVALIERE, a Venetian painter, was born in the earlier part of the 15th century. The only dates that can with certainty be given are 1468 and 1493 ; these are respectively the earliest and the latest years signed on his pictures—the former on au altar-piece in the church of San Silvestro at Massa near Fermo, and the latter on a picture in the Oggioni collection in Milan. Though born in Venice, Crivelli seems to have worked chiefly in the March of Ancona, and especially in and near Ascoli ; there are only two pictures of his proper to a Venetian building, both of these being in the church of San Sebastian. He is said to have studied under Jacobello del Fiore, who was painting as late at any rate as 1436; at that time Crivelli was probably onlyaboy. The latter always signed as "Carolus Crivellus Venetus;" from 1490 he added " Miles," having then been knighted by Ferdinand IL. of Naples. He painted in tempera only, and is seen to most advantage in subject pictures of moderate size. He intro- duced agreeable landscape backgrounds ; and was parti- cularly partial to giving fruits and flowers (the peach is one of his favourite fruits) as accessories, often in pendent festoons. The National Gallery in London is well supplied with examples of Crivelli; the Annunciation, and the Beato Ferretti (of the same family as Pope Pius IX.) in religious ecstasy, may be specified. Another of his principal pictures is in San Francesco di Matelica; in the Vatican Gallery is a Dead Christ, and in the Brera of Milan the painter's~~

own portrait. Crivelli is a painter of marked individuality,— hard in form, crudely definite in contour ; stern, forced, energetic, almost grotesque and repellent, in feature and expression; simply vigorous in his effect of detachment and relief, and sometimes admitting into his pictures objects actually raised in surface ; distinct and warm in colour, with an effect at once harsh and harmonious. His pictures gain by being seen in half- light, and at some little distance ; under favouring con- ditions, they grip the spectator with uncommon power. Few artists seem to have worked with more uniformity of purpose, or more forthright command of his materials, so far as they go. It is surmised that Carlo was of the same family as the painters Donato Crivelli (who was working in 1459, and was also a scholar of Jacobello) and Vittorio Crivelli. Pietro Alamanni was his pupil.

CROATIA anp SLAVONIA, a crown-land of the Hungarian kingdom, which extends from 14° 25' to 20° 25 E. long., and is bounded on the N.W. by Carniola and Styria, N. by Hungary, S. by Servia, Bosnia, and Dalmatia, and W. by Dalmatia and the Adriatic, on which it has a coast-lineof about 88 miles, Inclusiveof the districts belong-

ing to the Military Frontier, it has a total area of about 16,785 English square miles; and according to the census of 1869 its total population amounted to 1,864,021, of whom 695,997 are assigned to the military portion.

Mountains.—The whole country may be divided into two

great natural sections, of which the more important belongs to the basin of the Danube, and is mainly defined by that river and its two extensive tributaries, the Drave and tho Save, while the other consists of the highlands of the Adriatic coast. The mountains are partly outrunners of

the Alpine system, and partly prolongations of the Karst ; but the line of demarcation has not as yet been clearly defined. The former, known chiefly as the Warasdin Mountains, stretch eastward with gradually diminishing elevation through more than half the length of the country to the neighbourhood of Diakovar, and attain their greatest height of 3483 feet in Mount Ivancica. The latter consist of three more or less distinct chains running north-west and south-east :—the Velebit or Velebitch, with a mean

height of 3318 feet, which gives its steep and barren character to the southern part of the coast ; the Kapela, with a mean height of 2488 feet, lying further inland, and connecting itself with the mountains of Carniola; and the Plisevica, with a mean height of 3214 feet, which forms the boundary between Bosnia and Croatia. The mean height of the whole of the plateau to which these ranges belong is esti- mated at 2074 feet. Many parts of the mountain regions are richly wooded with pine, beech, and chestnut, and many of the smaller valleys and glens are abundantly fertile. The richest part of Croatia, indeed, is not the valley of the Drave or the Save, but the hilly district between the Kostel, the Ivancica, and the Agram Mountains, called by the natives Zagorye, or the Land behind the Hills. A small group known as the Vrdnik Mountains rises in the east of Slavonia.

Rivers, &éc.—From the point where it begins to form the Croatian boundary, to its junction with the Danube below Esseg, the Drave receives ouly one important tributary, the Bednya; but the Save is the recipient of a large number of considerable affluents :—the Sotla, the Krapina, the Zelina, the Lonya, the Ilova, the Pakra, and the Olyava from the Warasdin Mountains ; and the Kulpa, the Korana, and the Unna from the Karst. The Recina falls into the sea ; the Gaska loses itself in swampy hollows ; and the Lika plunges into a rocky abyss not far from Gospich. Exten- sive marshes occur along the main rivers in Slavonia; and there is an interesting cluster of seven lakes—called the Lakes of Plitvica, in connection with the Korana. Warm mineral springs rise at Krapina, at Toplice near Warasdin, at Stubica near Agram, at Daruvar, and at Topusko near Glina ; and there is a sulphurous spring at Lipik near Pakrac.

Climate.—The climate of the lowlands is equable and temperate ; but the Karst district is exposed to very violent and sudden changes. The mean temperature throughout the year for Agram is 52° Fahr., and throughout the hottest month 72°. At Fiume it is very much warmer. The rain comes mainly with the south-west wind, and the annual fall varies from 23 inches in the lowlands to 51 in the Karst. The coast districts are exposed to the violent wind called the Bora, which while it lasts is strong enough to render all locomotion impossible.

Agriculture.—About 16 per cent. of the whole country is unproductive, and in the eastern districts a considerable proportion of the rest is assigned to pasture. The chief crops are wheat, oats, rye, potatoes, flax, and hemp; tobacco is also grown; and a good deal of attention is bestowed on tho vine, though the national beverage is pre- pared from the damson plum. Horses are raised in Slavonia ; the oak and beech wocds furnish food to great

herds of swine ; and the heath districts give excellent op- portunity for the keeping of bees.

Manufactures and Commerce.—With the exception of a few establishments for silk-spinning, two or three glass- works, and the distilleries which are scattered throughout the country, the only manufactories are at the seaport towns of Fiume, Buccari, and Porto Re. Iron-ore 1s worked at Rude, Ruyevac, and Brod, sulphur at Radoboy, and coal at Pregrada; but none of the mines are of great importance. The traflic of the country is furthered not only by its 580 miles of navigable river, but by upwards of 2000 miles of regular road and several lines of railway meeting at Agram. Among the roads the most famous are the Maria Louisa, which connects Carlstadt with Fiume, and the Josephina, which passes inland from Zengg.

Divisions.—The territory of Croatia and Slavonia is divided into eight comitats named after their respective administrative centres,Agram, Fiume, Kreutz, Warasdin, Bellovar, Esseg, Pozsega, and Bukovar. The city of Agram or Zagrab is the capital of the crown-land, and is rapidly rising in importance. Of the other towns it is sufficient to mention, in Croatia, Sissek, with its grain-trade, Karlstadt, the seat of a Greek Church bishop, Kopreinitz, Buccari, with its free port, St Georgen, and Zengg ; and in Slavonia, Diakovar, the seat of the famous bishop Stross- mayer, and Semlin, one of the most valuable military and commercial ports on the Danube, Sluin, Glina, and Petrinya were respectively the centres of the Ist, 2d, and 3d banal regiments; and Brod, Gradiska, Likka, Ogulin, Ottocsan, and Peterwardein give their names to the other military districts.

Government.—The united kingdom of Croatia and Slavonia is represented by a separate minister, without a portfolio, and in the Hungarian diet by

~~thirty-four members on the table of deputies, and two envoys from the national diet on the table of magnates. The national diet is composed of the Roman Catholic bishop, the Greek Catholic bishop, the prior of Aurana, the magnates, counts, and barons, and seventy-seven deputies of towns, districts, &c, The kingdom is autonomous in domestic affairs, public worship, education, and justice; and by the law of November 1874 the administrative and the judicial depart- ments are to be kept completely distinct. Atthe head of the Government is the Ban or Banus, who also ranks as a privy councillor. The highest court is the so-called septemviral table at Agram; and next in order is the banal table. According to a law of 1873, 55 per cent. of the taxes of the kingdom fall to the Hungarian treasury, and the remainder is assigned to domestic expenses.~~

~~The Croats proper form about 74 per cent. of the total population, Serbs about 23 per cent., and the small remaining portion is composed of Germans, Magyars, Jews, Italians, and Albanians. The Croats are Catholics, and employ the Latin alphabet for their Slavonic language, which is closely connected with the Serbian, and breaks up into two main dialects—the Sloveno-Croatian and the Serbo-Croatian. 'The Serbs are members of the Greek Church, and employ the Cyrillic alphabet,~~

~~The principal educational institution in the country is the university established in 1874 at Agram, where there is also the South Slavonian Academy of Sciences and Arts, founded in 1866, as well as a Society of Agriculture, Literature, and History. Diocesan seminaries for Catholic theologians are maintained at Agram, Diakovar, and Zengg ; and the priests of the Greek Church have institutions at Carlowitz, Pakrac, and Plaski. General education is still much neglected, and about six-sevenths of the population can neither read nor write.~~

~~History.—Croatia and Slavonia were, for the most part at least, included in the ancient Pannonia ; and remains dating from the~~

~~Roman period are still to be seen at Mitrovitz, Illok, Sotin, and Tovarnik. After the Ostrogoths and the Avars had come and gone, the territory was in 640 taken possession of by the Slavonic races to which it owes its name—~~

~~the Chrovats, Chorvats, or Horvats, and the Slavs. Temporary recognition of the Frankish kings, and the Byzantine emperors, was ollowed by the establishment of a more independent kingdom, which included not only Croatia and Slavonia, but also Dalmatia. In 1075, Zwonimir Demetrius, to whom the national party looks back as to the national hero, formally rejected the Byzantine overlordship, and received from Gregory VII. of Rome the title of king. In the 12th and 13th centuries the land was the object of frequent contest between the Byzantines and the Hungarians ; and in the 14th and 15th it was still more harassed by the rivalry of Hungary with Venice. In 1524 the whole country fell into the hands of the Turks; but in 1526, after the battle of Mohacs, the districts of Agram, Kreutz, and Warasdin were attached to the Austrian crown, and by the Carlowitz peace of 1699, the whole of the country to the north of the Unna was resigned by the sultan. In 1767 the, three kingdoms of Croatia, Dalmatia, and Slavonia were united under the name of Illyria, but the union was broken in 1777. Croatia and Slavonia continued to be regarded as part of the Hungarian king. dom ; but a strong national reaction took place in 1848-9 against the Magyar supremacy, and in reward for the service rendered against the Magyar revolt by the ban Jellalich, Austria declared the country independent of Hungary. In 1860, however, the policy of Vienna was altered, and Croatia and Slavonia were again obliged, in spite of the strong opposition of a large party, to resume their former connection with Hungary, which was not recognized by the national diet till 1868, and then only after the central administration had interfered with the elections in a most arbitrary manner.~~

~~See Csaplovicz, Slawonten und Kroatien, 1819; Paton's Highlands and Islands of the Adriatic, 1849; Neigebaur, Die Siidslawen und deren Ldnder, 1851; A. O. Zeithammer, " Zur physicalischen Geographie Kroatiens and Slawoniens" in Petermann''s Mittheilungen, 1859, and " Die Wagrechte und Senkrechte Gliederung Oesterreichisch-Kroatiens,"' ditto, 1861; "Sugli antichi ghiacciaj della Drava," in Atti di Accademia di Milano, 1871; Steinhauser, Geogruphie von Oesterreich- Ungarn, 1872; Dr P. Matkovic, Krottien-Slavonien nach seinen physischen und geistigen Verhdltnissen, Agram, 1873; and a paper from the same authority on "Die Orographische Gruppirung der Siid-Croatischen Hochebene," in Peter-mann's Mitth., 1873.~~

CROCODILE (Crocodilia), an order of Reptiles which, in the possession of a four-chambered heart, and of distinct sockets for the teeth, and in the traces of a diaphragm, differs from the other reptilian orders, and shows an approach in organization to warm-blooded animals. The presence of a four-chambered heart does not prevent that commingling of venous and arterial blood previous to its entrance into the system, which is common to all reptiles, as this is effected in the present order by means of a com-munication between the main arterial and venous tubes, immediately outside the heart. Crocodiles are further characterized. by the presence of a partial dermal skeleton, developed in the leathery integument, consisting of numerous square bony plates, keeled in the centre, and forming a complete dorsal shield, The vertebre of the neck bear upon each other by means of rib-like processes, the neck being thus deprived to a great extent of its mobility ; hence the difficulty experienced by crocodiles in turning. The limbs are short and insufficient to support its entire weight ; it consequently drags its body somewhat along the ground, The toes, of which there are five on each of the posterior limbs, and four on the anterior pair, are more or less webbed, while the three inner ones only are provided with claws. The nostrils, eyes, and ears have lids or valves by which they can be closed at will, and the nostrils do not open into the cavity of the mouth, but are carried back to the pharynx, which can also be shut off from the outside by means of a valvular apparatus—an arrangement of the greatest possible service to those reptiles in prevent- ing suffocation while seizing and holding their prey beneath the surface of the water. 'The tongue is attached all round to the bottom of the mouth, and for this reason the croco- dile was formerly supposed to be destitute of that organ. The teeth, which are numerous, sharp, and conical, are arranged in a single row in both jaws, each tooth having its own socket, and the hollow at its base containing the germ of a larger one, which by its growth gradually dis-

places the other. Three and even four generations of teeth, incased within each other, are often thus contained in a single socket, but the number of teeth above the surface remains the same at all ages. The fourth tooth on each side of the lower jaw is larger than the others, and fits into a notch or pit in the upper surface. As in snakes, the lower jaw is attached to a process

connected with and ex- tending backwards from the skull, which greatly adds to the animal's gape, while giving it the appearance, in opening its mouth, of moving both jaws. Beneath the lower jaw are two orifices connected with glands which secrete a musky substance.

Crocodiles are amphibious, leaving the water to bask in the sun on the mud-banks of rivers and marshes, or to devour the prey they have previously drowned. They are oviparous, depositing their eggs—from twenty to sixty in

number, and inclosed in a calcareous shell—in holes made ©

in the sand or mud of the river side, where they are left to be hatched by the heat of the sun, or as is the case with certain American species, in hillocks formed by themselves, which they hollow out and fill with leaves and other decay- ing vegetable matter, where the eggs are hatched by the heat generated in the decomposing mass. On quitting the ege the young crocodiles are led to the water by the female parent, who feeds them for some time with food which she herself disgorges, and otherwise shows the greatest solicitude for their safety. 'The male takes no part in rearing the young, but is said on the contrary to attack and devour them when not prevented by his mate. Large numbers also fall victims to the rapacity of fishes and turtles, while the smaller Carnivora and certain birds destroy great quan- tities of the eggs. The eggs, which in the common croco- dile are nearly as large as those of a goose, are in spite of their musky flavour held in great estimation as an article of food in the regions where they occur, and this leads to a still further diminution of the crocodilian progeny. During the first year the young are said to feed on the larve of insects and on small fishes. Crocodiles are inhabi- tants of the rivers and marshy lagoons of tropical and sub- tropical regions, a few only frequenting the brackish water of estuaries. One species—the Alligator of North America—has a range sufficiently north of the tropics to encounter ice in winter, while one of the Indian crocodiles ascends the courses of the rivers it frequents to such a height above the sea that the water it occupies is often frozen. During the dry season these reptiles bury themselves in the mud and remain dormant until the return of moister con- ditions, and they have thus been known to exist without food for a whole year. Tennent states that in Ceylon he has met with the mud case from which the Marsh Crocodile of that island

had recently withdrawn, and he also tells of an officer who, camping out one night, was disturbed by a strange motion of the earth beneath his bed—a phenomenon explained in the morning by the emergence of a crocodile. They also bury themselves in the mud on the approach of danger, and wlien taken unawares they feign death as a means of escape. The writer above alluded to states that on one occasion his party came upon a sleeping crocodile, which on being struck, after it had awakened and seen itself surrounded, lay perfectly quiet and apparently dead ; in a little while it was seen to glance furtively about, and then make a rush towards the water. On receiving a second blow it again feigned death, and this time noamount of poking could elicit the slightest sign of life, until a lad by gently tickling it under the fore leg caused the reptile so far to forget itself as to draw up its limb. They resort to a somewhat similar stratagem in order the more readily to reach their prey. Lowering their head and tail they allow themselves to be carried down by the current of the stream, and in this position are said to bear the closest

resemblance to floating logs of wood—a disguise well fitted to allay suspicion in the animal they are seeking to approach. They feed on fishes, and on the numerous quadrupeds which visit theirhaunts in order todrink. The latter they seize and drag into the water, holding them under the surface till life is extinct, and afterwards con- veying the dead body to the nearest sand-bank or river island, where it is often hidden until putrefaction has rendered it sufficiently digestible. Although timid they do not hesitate to attack man, when off his guard, and bathing in tropical rivers is rendered dangerous by their presence.

There are three families of living crocodiles—Gavials, True Crocodiles, and Alligators. The Gavials are readily distinguished by their greatly elongated and narrow snout, and by the uniform size of their teeth (the five or six front pairs excepted), of which the Gangetic species has fifty-two or fifty-four above, and fifty or fifty-two below. It inhabits the lower parts of Indian rivers, especially the Ganges, where it performs the useful office of devouring the carcases of animals that otherwise would pollute the sacred river. It attains a length of over 17 feet, and the male is furnished with a large and prominent swelling in front of the nostrils.

The true Crocodiles have the so-called canine tooth of the lower jaw fitting into a notch or furrow in the upper surface ; the hind legs are bordered by a serrated fringe, and the toes are almost completely webbed. Of these there are twelve species, four of which are Asiatic, occurring eastward from the rivers and estuaries of India to Australia ; three are African, one ranging from Egypt to the Cape, the others confined to the rivers of West Africa; while four belong to the Neotropical Region of Central and South America. The Common Crocodile (Crocodilus vulgaris) may be taken as typical of the family. It inhabits the chief rivers of Africa, but is best known as a denizen of the Nile, where in ancient times the Egyptians regarded it as a divinity. At Memphis and other cities temples were raised in its honour, in which live crocodiles were kept,— these sacred reptiles being reared with the greatest care, fed luxuriously, and adorned with costly trinkets, They were thus rendered perfectly tame, and took part in the religious processions and other ceremonies performed in their honour. When dead their bodies were embalmed, and extensive grottoes have been discovered at Maabdeh containing large numbers of those reptilian mummies. The inhabitants of several Egyptian cities, however, regarded the crocodile with entirely opposite sentiments, considering it to be the incarnation of Typho, the genius of evil; and among these the ichneumon, as the deadliest foe of the crocodile, was thought worthy of divine honours. Once a year the people of Apollinopolis had a solemn hunt, in which they killed as many crocodiles as possible, casting the dead bodies before the temple of their god; and so expert had they grown in this sport that they did not hesitate to enter the Nile, and bring the crocodile ashore by force. Crocodiles appear to have been formerly abundant in all the known parts of the Nile, but have now disappeared from the delta, and according to a recent authority are rarely seen to the north of Beni Hassan, and are evidently receding from below the second cataract. This is largely owing to the constant persecution they arc subjected to by the passengers on board the Nile steamers, to which also must be attributed their exceeding wildness, for it is now almost impossible to come within rifle shot of them. A small black-headed plover (Charadrius melanoce- phalus) may often be seen perched on the reptile's back, attracted by the numerous insects which find a con- genial residence there; and this activo little bird, by rising in the air and uttering a shrill cry, gives its bulky patron timely warning of the approach ss aie Towards

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the sources of the Nile the crocodile is still abundant. Sir Samuel Baker states that when navigating the Albert Nyanza he observed every basking place covered with them, the creatures lying parallel to each other like trunks of trees prepared for shipment, and that on one bank he counted twenty-seven of large size. The flesh of this species is eaten by the natives, but it does not seem suited to the European palate. "To my taste," says the authority just referred to, "nothing can be more disgusting than crocodile flesh. I have eaten almost everything, but although I have tasted crocodile I could never succeed in swallowing it. The combined flavour of bad fish, rotten flesh, and musk is the carte de diner offered to the epicure." In Siam the flesh of another species is regularly sold in the market as human food. The Common Crocodile usually measures about 15 feet in length.

Alligators differ from the preceding group in having the canine tooth fitting into a pit in the upper jaw; the hind legs are also destitute of fringe, and the toes are less com- pletely webbed. They are found in America only, and with one exception are confined to its tropical parts. The Alligator (Alligator mississippiensis) occurs in the rivers and swamps of Mexico and the United States, where it is a source of danger to all animals venturing to enter the water. In winter this species retires into holes on the river banks, and there hybernates. While thus dormant it is often got at by the negroes, who unearth it for the sake of the tail, which they reckon a delicacy. It is said to attain a length of 15 to 18 feet. The remaining eight species of alligators are found chiefly in South America, where they are known as Caymans and Jacarés, They abound in the Amazon and the Orinoco, the silence of whose lonely banks is seldom broken except by their nocturnal bellowings. According to Humboldt they re- semble their Old World allies in lying basking in the sun- shine, wherever a shallow in the river discloses a sand-bank, "with open jaws, motionless, their uncouth bodies often covered with birds."

Fossil "remains referable to the order Crocodilia occur for the first time in the Trias, and continue to appear in allied forms during succeeding periods. These have been very fully investigated, and Professor Huxley has given a

~~remarkably complete sketch of the life-history of the entire order, recent and fossil. This he divides into three'sub-orders. I. In the Parasuchia, among other characters, both pterygoid and palatine bones are destitute of bony plates to prolong the nasal passages, and the centra of the vertebrae are amphiccelian, as in fishes. To this group belongs the earliest of the crocodiles—the Triassic Stagonolepis of the Elgin sandstone, which somewhat resembled a cayman, with the snout of a gavial. Il. In the Afesosuchia, the bony plates of the palatine bones prolong the nasal passages and give rise to posterior nares, and the vertebral centra are amphicelian. This group includes such forms 'as Telcosaurus and Stencosaurus, ranging from the Liassic to the Cretaceous formations. III. In the Husuchia, both pterygoid and palatine bones give off plates which prolong the nasal pas- sages, and the centra of the vertebra are mostly procelous. 'The species contained in this group make their appearance in the Greensand of North America and in the Eocene of Europe, and to it belongs all the existing crocodiles. This group was at one time much more generally distributed than itis at present, representatives of gavials, crocodiles, and alligators, now so widely apart, and altogether absent from Europe, being found together in the Eocene beds of the south-west of England. The greatly restricted range which characterizes their present distribution seems to mark the crocodiles as a declining group. (Tale)~~

~~CRESUS, king of Lydia, was the son and successor of Alyattes. It was supposed by Clinton and Bahr that for fifteen years he shared the throne with his father; however that may be, he became sole king on the death of Alyattes, about 568 3B.c. (according to the computation of Rawlinson), when, Herodotus tells us, he was thirty-five years old. He speedily reduced all the Greek cities in Asia Minor, and soon most of the tribes to the west of the River Halys (the Kizil Irmak) were subject to him. The wealth, meanwhile, which he had inherited from his father~~

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~~had been enormously increased, until it far surpassed that of any other sovereign with whom the Greeks were acquainted, He was therefore to them the type of human prosperity ; and the bitter contrast of his fall powerfully impressed itself on their imagination, which became in part the creator of~~

the vividly dramatic story so finely told by Herodotus. The most famous incident in that story was the visit of Solon. After ostentatiously displaying all his treasures, the king asked the sage who was the happiest man he had ever known. Tellus of Athens, was the reply, for he lived while his country was prosperous ; he was surrounded with children and children's children, who were both beautiful and good ; and he died upon the field of battle after having gained a gallant victory over the enemy. And next to him Solon counted two Argive youths, Cleobis and Bito, whose strength and skill won prizes at the games, who, when the oxen failed to appear from the fields in time, piously drew their mother's car forty- five furlongs to the festival of Juno, and as reward received the praises of all men, and were allowed to die in the very temple of the goddess, after offering their sacrifices and feasting at the holy banquet in her honour. For two reasons, added the wise man, Croesus with all his fortune was not to be held so fortunate as these,—the gods are

jealous of human prosperity, and no man can be called fully

happy till a happy death has closed a happy life. Soon after misfortunes began to thicken about Croesus. His son, despite all the care with which, being warned in a dream, he drew him from the dangers of battle, and sought to shield him even from accident, was unintentionally slain at a boar-hunt by Adrastus. News came also of the conquests of Cyrus, who had overcome Astyages, the brother- in-law of Cresus. 'The oracle of Delphi prophesied that if Croesus went to war he would " destroy a mighty empire," and that he was to flee whena "mule" sat on the throne of Media; and, secure in what appeared to him the most unambiguous of prophecies, Croesus invaded Cappadocia. But the mighty empire he was to destroy proved to be his own; he was repulsed, and soon Sardis was stormed and taken by Cyrus. Croesus, careless of life, was about to be slain, when one of his sons, hitherto dumb, in his fear over- came his infirmity, and made known his father's rank. Croesus was therefore spared to be taken as a prisoner before Cyrus. He was placed on a funeral pyre, and, as he watched the rising flames, he thought of Solon, whose name burst from his lips. When questioned, he repeated the warning of the sage, which so powerfully affected the mind of Cyrus that he ordered the flames to be extinguished, The efforts of the soldiers, however, were in vain ; but, as Herodotus

narrates, the prayers of Croesus prevailed upon Apollo, whose temples he had formerly enriched with costly gifts, to send a heavy fall of rain which quenched the fire. The wisdom of Crcesus gained the friendship of Cyrus, who also made him minister to his son, Cambyses. But, having ventured to reprove Cambyses for an act of cruelty, Croesus was forced to seek safety in flight; and here ends the story of his life. It is said that, when he reproached the oracle which had led to his fall, he received the convincing answer that Cyrus was the " mule " foretold, as he was the son of a Median princess and a Persian subject. Apollo, it was added, had done what he could by prevail- ing on the fates to delay the fall of Croesus full three years. |

See Herodotus (bk. i.), in Rawlinson's edition of which (1875) there is a discussion of the historical facts of the story, an ampli- fied version of which is given in Damascenus.

CROFT, Witram (1677-1727), doctor of music, was born in 1677, at Nether Eatington in Warwickshire. He received his musical education in the Chapel Royal under Dr Blow. He early obtained the place of organist of St

Anne's, Westminster, and in 1700 was admitted a gentleman extraordinary of the Chapel Royal. In 1707 he was appointed joint-organist with Blow ; and upon the death of the latter in 1708 he became sole organist, and also master of the children and composer of the Chapel Royal, besides being made organist of Westminster Abbey. In 1715 he obtained his degree of doctor of music in the university of Oxford. In 1724 he published an edition of his choral music, in 2 vols. folio, under the name of ALusica, Sacra, or Select Anthems in score, for two, three, four, five, six, seven, and eight voices, to which 1s added the Burial Service, as it is occasionally performed in Westnunster Abbey. This handsome work was the first of the kind exe- cuted on pewter plates and in score. John Page, in his Harmonia Sacra, published in 1800 in 3 vols. folio, gives seven of Croft's anthems. Of instrumental music, Croft published six sets of airs for two violins and a bass, six sonatas for two flutes, six solos fora flute and bass. He died in August 1727, and was buried in the north aisle of West- minster Abbey, where a monument was erected to his memory by his friend and admirer Humphrey Wyrley Birch. Burney in his Wistory of Music devotes several

pages of his third volume (pp. 603-612) to Dr Croft's life, and criticisms of some of his anthems.

CROKER, Jouy Witson (1780-1857), statesman and author, was born in Galway on the 20th December 1780. He belonged to a respectable family of English origin that had been settled in freland for several generations, being the only son of John Croker, well known and popular as the surveyor-general of Ireland. He was educated at Trinity College, Dublin, where he graduated in 1800. Immediately afterward; he was entered as a student of Lincoln's Inn, and in 1802 he was called to the Irish bar. In 1803 he published anonymously Familiar Epistles to J. F. Jones, Esquire, on the State of the Irish Stage, a series of witty and caustic criticisms in verse on the leading dramatists of the day, which passed through several editions ina short time. Equally successful was the Intercepted Letter from China (1805), also anonymous, a satire on Dublin society. In 1807 he published a pamphlet on The State of Ireland, Past and Present, in which he advocated Catholic emancipation. In the following year he entered Parliament as member for Downpatrick, obtaining the seat on petition, though he had been unsuccessful at the poll. he notorious case of the duke of York furnished him with an opportunity of obtaining patronage and place of which he skilfully availed himself. The speech which he delivered on the 14th March 1809, in auswer to the charges of Colonel Wardle, was generally regarded as the most able and ingenious defence of the duke that was made in the debate ; and to the gratitude of the latter for this service was probably due Croker's appointment in the close of the year to the office of secretary to the Admiralty, which he held without interruption under various administrations for more than twenty years. In 1827 he became the re- presentative of the university of Dublin, having previously sat successively for the boroughs of Athlone, Yarmouth, and Bodmin. He was a determined opponent of the Reform

Bill, and vowed that he would never sit in a reformed –

Parliament ; his parliamentary career accordingly terminated in 1832, 'Two years earlier he had retired from his post at the Admiralty on a pension of £1500 a year. Many of his political speeches were published in a pamphlet form, and they show him to have been a vigorous and effective,

though somewhat unscrupulous and often virulently per- sonal, party debater. The same character attaches to him in his capacity as a political writer. He was one of the founders of the Quarterly Review, and for many years was one of its leading contributors on political and historical gubjects. 'The rancorous spirit in which many of his articles

founders of the Athenseum Club.

were written did much to embitter party feeling, and to cause men on both sides of greater eminence than himself to stoop to unworthy controversy. It also reacted unfavourably on Croker's reputation as a worker in the department of pure literature by bringing political animosities into literary criticism. No reply is possible to the majority of the criticisms which Macaulay il his unsparing review brings against Croker's magnum opus, his edition of Boswell's Life of Johnson (1831), but with all these defects the work had merits which Macaulay was of course not concerned to point out. It certainly possessed whatever evidence of excellence is afforded by the fact of a very extensive circulation. Its success in this respect led the publisher to propose to Croker the preparation of an annotated edition of Pope's works, on which he was occupied for several years. It was left unfinished at the time of his death, but it has since been completed by Peter Cunningham and the Rev., W. Elwin, and published. A list of Croker's other chief works is given below. Special mention, however, may be made of his Stories frem the History of England for Children, not only because it had a very large circula- tion, but because it was taken by Scott as the model for his Tales of a Grandfather. In an amusing letter to Croker accompanying a presentation copy of the latter work, Sir Walter speaks of it as 'a sample of the swag."

Croker did good service to the cause of literature and art by other means besides his pen. He was one of the In his place in Parlia- ment he advocated the claims of the fine arts upon state recognition and aid at a time when these claims had fewer supporters than they have now. In his later years his house at West Molesey near Hampton Court was the resort of many eminent literary men, chiefly of his own party. He died at St Albans Bank, Hampton, on the 10th August 1857.

The chief works of Croker not already mentioned were his Letters on the Naval War with America ; A Reply to the Letters of Malacht Malagrowther ; Military Events of the French Revolution of 1830 ; a translation of Bassompierre's Embassy to England ; and several lyrical pieces of some merit, such as the Songs of Trafalgar. He also edited the Suffolk Papers, Hervey's Memoirs of the Court of

George II., the Letters of Lady Hervey, and Walpole's Letters to Lord Hertford.

CROKER, Tuomas Crorton (1798-1854), an antiquary and humourist, was born in Cork in 1798. He was apprenticed to a merchant, but in 1819, through the interest of John Wilson Croker, who had been a friend of his father, he became a junior clerk in the Admiralty, where he afterwards obtained one of the first clerkships. In 1825 he produced his most popular book, the Fairy Legends of the South of Ireland (reprinted in 1834), which he followed up by the publication of his Legends of the Lakes, his Adventures of Barney Mahoney, and an edition of the Popular Songs of Ireland. Inu 1827 he was made a member of the Irish Academy; and in 1839 and 1840 he helped to found the Camden and Percy Societies, for the former of which he published (1841) an edition of certain Narratives Illustrative of the Contests in Ireland in 1641 and 1690, and for the latter his Revolution in Ireland in 1688, and several other works. He was also a member of the Hakluyt, Archeological, and Antiquarian Societies. He died in London, August 8, 1854.

CROLY, Grorcs (1785-1860), a distinguished literary divine of the Church of England, was born in Dublin about 1785, and received his education at Trinity College there. Croly, although a staunch unbending Tory, owed to Lord Brougham his promotion to the living of St Stephen's, Walbrook, London. The appointment conferred honour on Brougham, as the presentee was a keen partisan, and had zealously served his political friends with his pen. He was

neglected by the Tories very much as Sydney Smith was by the Whigs. Croly was a great pulpit orator, and continued, not unworthily, the illustrious

school of Irish eloquence, which boasts such names as Burke, Sheridan, and Grattan. He was also a ripe classical scholar, and in early life showed no common aptitude for music. He died on No- vember 24, 1860. Croly was a man of restless energy, and won laurels in many fields. It is as a literary man, however, that he claims attention. And here the first thing that strikes us is his extraordinary versatility. Poems, biographies, dramas, sermons, novels, satires, magazine articles, newspaper leaders, and theological works were dashed off by his facile pen; and, according to Hogg, the Ettrick shepherd, he was great in conversation. While a young man, Croly wrote dramatic criticism for a short-lived paper called the Wew 7imes. His genuine satinc vein was seen in one of his earliest works, Zhe Times, and in one of his latest, the Modern Orlando, which appeared in 1854. His' poems were first issued in a collected form by Henry Colburn and Richard Bentley, in 1830. The principal are—Paris in 1815, which embodies a description of the works of art then to be found in the Louvre; Zhe Angel of the World, an Arabian tale ; a collection of short poems, with corresponding engravings, entitled Gems from the Antique; Catiline, a tragedy; and Sebastian, a Spanish tale. Pride shall havea Fall, a comedy, is not included in this edition. His poetry, although of a high order, suffered from being contemporaneous with that singularly rich outburst of song in virtue of which the early years of the present century almost rival the Elizabethan era. The pieces, too, are remarkable rather for fine passages than for sustaining the interest of the reader throughout. Paris in 1815, however, achieved a temporary popularity ; some of his lyrics inspire enthusiasm; and he is particularly successful in his conception of Catiline's character. Croly's prose writings cover a wide field. He was one of the earliest coutributors to Blackwood's Magazine; he edited the Universal Review, and wrote a number of leaders for the Britannia, a Conservative organ, which supported the system of protection. To theology he contributed, in 1827, The Apocalypse of St John, a new Interpretation ; and volumes of sermons were issued by him from time to time. He is the author, too, of a number of sketches, a Life of Edmund Burke, a character of Curran, a history of King George IV., and an able review of Napoleon's career. Croly, however, was most successful as a novelist. His chief fictions are—Tales of the Great St Bernard ; Marston, or the Soldier and Statesman, and his masterpiece, Salathiel, The Immortal. Salathiel is the character better known as the Wandering Jew. This legend has been treated poetically by various writers,

including A. W. von Schlegel, Schubert, Goethe, and Mrs Norton, and is the subject of Eugene Sue's famous work, Le Juif errant. Croly's book gives us vivid pictures of scenery in the East, and is full of striking imagery and noble bursts of eloquence. Indeed the language, as well as the scenery, is Asiatic in character ; and its Oriental luxuriance sometimes passes into extrava- gance. Croly's works, as a whole, exhibit strong sense, a fertile imagination, and a genuine, if somewhat too showy, eloquence. He isa signal instance of-great professional success, joined to high distinction in other fields. CROMARTY, a county in the north of Scotland, consist- ing of eleven detached portions scattered throughout Ross- shire, with which county it is for most purposes incorpor- ated. One of these portions, that which is situated on the south shore of the Cromarty Firth (from which it takes its name cromachty, or crooked bay), is the original county ; and this district still preserves for Cromarty a separate lord- lieutenancy and commission of supply. As a county, it was originally very inconsiderable in extent ; but by the

additions which were made to it towards the end of the 17th century it was increased to fifteen times its former size. Of these additions, one is a small district surround- ing Tarbat House, on the northern shore of Cromarty Bay; and a second runs from the south side of Tain Firth to the Moray Firth, cutting off that portion of the county of Ross which terminates in Tarbat Ness, the extremity of which also belongs to Cromarty. Two more fragments lie on the south of the River Carron, in the parish of Kincardine; the sixth extends northward from the burgh of Dingwall, situ- ated chiefly in the parish of Fodderty, and occupied in great part by the peak and slopes of Ben Wyvis ; the seventh lies to the north of Loch Fannich in the parish of Contin, at some distance to the north-west of which a triangular morsel is found to the north of Loch Nid; the ninth is that which stretches along the southern shore of Little Loch Broom ; and the tenth is the district of Ullapool and Coygach, with the adjacent islets, lying between the northern shore of Loch Broom and Sutherlandshire. This district, which is the largest portion of the county, occupies an area of about 20 miles in length by 9 in breadth, The straggling arrangement of Cromarty was produced by the influence of George, Viscount Tarbat, afterwards earl of Cromarty, who,

wishing to have all his various lands included in one shire, got them annexed to his own county in 1685 and 1698. The total extent of the county is esti- mated at 220,800 acres, or 345 square miles, equal to about a tenth of the area of the united county of Ross and Cromarty. The Cromarty Firth forms one of the finest harbours on the east coast of Scotland, securely sheltered at its mouth by two remarkable crags called the ‘“Soutars.” See Ross.

Cromarty, the county town, is situated near the mouth of the firth of that name on its southern shore, 16 miles N.N.E. of Inverness, It is a small irregularly built town, and carries on some trade in herring and white fish, The corporation consists of a provost and nine coun- cillors, and the town forms one of the Wick group of burghs, which returns one member to Parliament. Population,

1476.

CROME, Joun (1769-1821), English landscape painter, founder and chief representative of the “ Norwich School,” often called Old Crome, to distinguish him from luis son, was born at Norwich, December 21, 1769. His father was a weaver, and could give him only the scantiest education. His early years were spent in work of the humblest kind; and at a fit age he became apprentice to a house-painter. To this step he appears to have been led by an inborn love of art and the desire to acquaint himself by any means with its materials and processes. During his apprenticeship he sometimes painted signboards, and devoted what leisure time he had to sketching from nature. Through the influence of a rich art-loving friend he was enabled to exchange his occupation of house-painter for that of drawing-master; and in this he was engaged throughout his life. He took great delight in a collection of Dutch pictures to which he had access, and these he carefully studied. About 1790 he was introduced to Sir William Beechey, whose house in London he frequently visited, and from whom he gathered additional knowledge and help in his art. In 1805 the Norwich Society of Artists took definite shape, its origin being traceable a year or two further back. Crome was its president’ and the largest contributor to its annual exhibitions. Among his pupils were Stark, Vincent, Thirtle, and Bernay Crome, his son. Cotman too, a greater artist than any of these, was associated with him.

Crome continued to reside at Norwich, and with the exception of his short visits to London had little or no communication with the great artists of his own time. He first exhibited at the Royal

Academy in 1806; but in this and the following twelve years he exhibited there only fourteen of his works. With very few exceptions Crome's subjects are taken from the familiar scenery of his native county. Tidelity to nature was his dominant aim. " The bit of heath, the boat, and the slow water of the flattish land, trees most of all—the single tree in elaborate study, the group of trees, and how the growth of one affects that of another, and the characteristics of each,"—these, says Mr Wedmore, are the things to which he is most constant. He still remains, says the same critic, of many trees the greatest draughts- man, and is especially the master of the oak. His most important works are—Mousehold Heath, near Norwich, now in the National Gallery ; Clump of Trees, Hautbois Common; Oak at Poringland; the Willow ; Coast Scene near Yarmouth; Bruges, on the Ostend River; Slate Quarries ; the Italian Boulevards ; and the Fishmarket at Boulogne. He executed a good many etchings, and the great charm of these is in the beautiful and faithful repre- sentation of trees. Crome enjoyed a very limited reputation during his life, and his pictures were sold at low prices ; but since his death they have been more and more appreciated, and have given hima high place among English painters of landscape. He died at Norwich after a few days' illness, April 22,1821. A collection of his etchings, entitled Norfolk Picturesque Scenery, was published in 1834, and was re-issued with a memoir by Dawson Turner in 1838, but in this issue the prints were retouched by other hands, Fora genial and appreciative critique on this attractive painter, see Mr Frederick Wedmore's Studves in English Art (1876).

CROMLECH (Gaelic or Welsh crom, curved, vaulted, and leac or llech,a monumental stone) is the name given in Britain to those megalithic monuments exclusively which consist of a great stone supported on three or more stones set on end in the ground. In France, however, and on the Con- tinent generally, it is exclusively employed to denote a totally different class of monument, for which in this country we only use the descriptive names of

“stone circles,” or “ circles of standing stones.” This application of the term in different countries to different classes of monuments has given rise to much confusion. ‘The earliest known use of the word occurs in Bishop Morgan’s transla- tion of the Bible into Welsh (1588), where “the clefts of the rocks” of our translation is rendered by cromlechydd y creigiau. Its earliest occurrence in the special sense in which it has continued to be used by antiquaries is in a description of some ancient remains by Rev. John Griffith of Llanddyfnan (1650), in which he says, ‘“ There is a crooked little cell of stone not far from Alaw, where according to tradition Bronwen Leir was buried; such little houses, which are common in this country, are called by the apposite name cromlechaw.” The restricted sense in which the term has been applied in recent times in this country has given rise to the notion that a cromlech, or great stone supported on props of smaller size, is a species of structure complete in itself, and distinct from the dolmen or chambered cairn. Mr Fergusson, in his recent work on Rude Stone Monuments, has described the monuments usually known by the term cromlech as “ free-standing dol- mens,” and maintains that they were never intended to be covered with a mound or cairn. It is evident that the removal of the loose stones of the enveloping cairn would leave its megalithic chamber exposed as a cromlech, and undeniable that many of the examples adduced as “ free- standing dolmens ” in England do exhibit traces of such removal. Buton the other hand the steendysser or “ Giants’ Graves” of Denmark and Sweden, which are perfectly analogous to the cromlechs of this country, are uever wholly hidden in the mounds which envelop their bases. The

present tendency is towards the entire disuse of the term cromlech, and the adoption of the term dolmen for all the varieties of tombs with megalithic chambers, whether “ free-standing” or partially or wholly enveloped in mounds of stones and earth.

CROMPTON, Samvet (1753-1827), the inventor of the spinning-mule, was born at Firwood near Bolton- le-Moors, Lancashire, of poor parents. While yet a boy he lost his father, and removed with the rest of his family to Hall-in-the-Wood, near Bolton, where he educated him- self as well as circumstances would allow, maintaining himself by working as a cotton-spinner. His musical capacity—he had sufficient taste and knowledge to

compose several hymn-tunes—enabled him to earn a little money by playing the violin at the Bolton Theatre. Meanwhile he was working hard to perfect his invention for spinning yarn for the manufacture of muslin, and he had brought it into working order before his marriage, which took place in 1780. The expense of a patent proving too costly for his limited means, he was glad to make known the con struction of his machine to a few manufacturers for very small sums of money. Several refused to fulfil their agree ment, and all he received was about £60. The use of luis invention spread rapidly, and he constantly made improve- ments uponit; but though in 180] he had, with the aid of £500 lent him by a friend, extended his business by employing a number of hands besides his own family, he was nearly sixty years of age before he obtained any important pecuniary recompense. Urged by the monetary difficulties in which he had involved himself through his somewhat shy and unbusiness-like tempera- ment, he drew up a paper showing how marvellously extensive and useful was the employment of the mule, and £5000 was allowed him by Parliament. In 1826, how- ever, his business had again failed, and another attempt was made to obtain a second Government grant, but without success. He died on the 26th June 1827. (See his Life by G. French.)

CROMWELL, Ottver, Lord Protector of the British Commonwealth, was born at Huntingdon, 25th April 1599. His father, Robert Cromwell, was the second son of Sir Henry Cromwell of Hinchinbrook, surnamed, for his munificence, Zhe Golden Knight. His mother,! Elizabeth Steward, was the daughter of a gentleman of some property in the city of Ely. The connection of the Cromwell family with that of the celebrated Thomas Cromwell, earl of Essex, and of tle Stewards with the royal line of Scotland, is not without interest.2. The stories of Cromwell's youthful visions and adventures, his violence and profligacy, are derived from the most questionable authority, and are little worthy of serious notice. The authentic facts of his early history seem to be confined to these :—that he was educated at Huntingdon grammar-school, under a rigid and pious iustructor, Dr Thomas Beard ; on 22d April 1616 he was admitted a fellow-commoner of Sidney Sussex College, Cambridge; on his father's death in June 1617 he left the university, carrying away at least as much Latin as enabled him in after years to make occasional use of that language ; and soon after he proceeded to London to gain some knowledge of law. There is no proof that

he ever attended any of the inns of court ; and regarding his life in London, and the

1 The character of Cromwell, in some of its noblest aspects, seems to have been inheritedfrom his mother. She diedat Whitehall, November 16, 1654, in her ninetieth year. "A little before her death," says Thurloe, 'she gave my lord her blessing in these words :—" The Lord cause His face to shine upon you, and comfort you in all your adversities, and enable you to do great things for the glory of your Most HIgh God, and to be a relief unto His people. My dear son, 1 leave my heart with thee. A good night !'"

2See the proofs adduced in Foster's British Statesmen, vi. 2 ;

| Carlyle's Letters and Speeches of Cromuell, i. 32, 40.

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limits of his residence there, we are equally destitute of 'nformation. On 22d August 1620 he was married at St Giles's Church, Cripplegate, to Elizabeth, daughter of Sir James Bourchier of Felsted, in Essex, 9 woman of very amiable and prudent character, whose gentle virtues sweet- ened his domestic life to its close, amid all outward vicis- situdes.! He now returned to Huntingdon, and assumed the management of his patrimonial estate ; and in the quiet routine of a farmer's life fulfilled for nearly ten years, without any incident chronicled in history, the ordinary duties of a country gentleman. We are left to imagine, so far as we can, the silent and unnoticed growth of a great soul, limited as yet in its outgoings to the cares of a farm, the thoughts that struggled and sank to rest in the still- ness of home,—the powerful religious convictions, the " splenetic fancies," the deep fits of melancholy, that ulti- mately resulted in an open profession of Christianity, and a steady adherence thenceforward to that strict and earnest form of it which had received from its enemies the derisive name of Puritanism. The house of Oliver Cromwell became from this time a resort of "godly men; " and in their prayers and preachings, their interests and their griev- ances, he took a zealous and active part. On 17th March 1628 he took his seat in the House of Commons as mem- ber for Huntingdon. 'The increasing

influence of Puritan- ism, reacting against the arbitrary and ceremonious tendencies of the king, was powerfully exhibited in the transactions of this brief but memorable Parliament. On llth Feburary 1629, a few weeks before the close of its second session, Cromwell made his first recorded speech, — calling the attention of the House to the scandalous fact "that Dr Alablaster had preached flat popery at Paul's Cross," and even been encouraged therein by his diocesan ; while " Mainwaring, so justly censured by this House for hig sermons, was by the same bishop's means preferred to a rich living." "If these," he said, "are the steps to church preferment, what are we to expect?" " It is amusing," remarks Mr Hume, " to observe the first words of this fanatical hypocrite, corresponding so exactly to his character." The correspondence is remarkable enough ; but those who have formed a different estimate of Cromwell from that of the sceptical historian may find more than amusement in this first sound of "the imperial voice" which in after days "arrested the sails of the Libyan pirates and the persecuting fires of Rome."

About two years after this Cromwell sold his lands in Huntingdon, and stocked a grazing farm at St Ives, where he resided for five years. In 1636 he removed to Ely, where he had succeeded to the property of his uncle, Sir Thomas Steward. Events meantime were tending to a great crisis. His first cousin, John Hampden, had on the 11th January in this year refused to pay his " ship-money ;" in the streets of London, in the midst of pale crowds, good men were being mutilated, branded, and pilloried; Scotland

1 She died in the house of her son-in-law Claypole, October 8, 1672. The following letter from her husband, penned the day after the battle of Dunbar, may be taken as a specimen of his private correspondence. 'Por my beloved wife,, Elizabeth Cromwell, at the Cockpit ; these. Dunbar, 4th September 1650 : — My Dearest, — I have not leisure to write much. But I could chide thee that in many of thy letters thou writest to me, that I should not be unmindful of thee and thy little ones. 'Truly, if I love you not too well, I think 1 err not on the other hand much. Thon art dearer to me than any creature; let that suffice. The Lord hath showed us an exceeding mercy ; who can tell how great itis? My weak faith hath been marvellously upheld. I have been in my inward man marvellously supported ; though, I assure thee, I grow an old man, and feel infirmities of age stealing uponme. Would

~~my corruptions did as fast decrease ! The particulars of our late success Harry Vane or Gilbert Pickering will impart to thee. My love to all dear friends. I rest thine, Oliver Cromwell." (Letters and Speeches, iii. 67.)~~

- ~~Macaulay, Essay on Ilailam's Constitutional History.~~

~~CROMWELL~~

~~patience of England was drawing near exhaustion. In April 1638 sentence was delivered against Hampden. The spirit of resistance rose with each new check. In his own district Cromwell had now some opportunity for its exercise, and that victoriously. The great work of draining the fens and completing the Bedford Level had proceeded successfully, till the interference of royal commissioners excited a general outcry of dissatisfaction. Cromwell took an active part in the opposition; and his successful zeal in the business procured him the popular title of " Lord of the Fens." In April 1640 a new Parliament met, in which he took his seat as member for Cambridge. In three weeks it was dissolved. Another was summoned for the 3d November, which became ever memorable in history as the "Long Parliament." Cromwell again sat for Cambridge. Of his share in its proceedings for about two years there is little record. That he was an active member there can be no question. One interesting glimpse we obtain from the graphic narrative of Sir Philip Warwick. It brings before us a Monday morning, early in November 1640, when the writer, then "a courtly young gentleman," came into the House, "well clad," and found'a remarkable figure in possession of the House, "a gentleman whom I knew not, very ordinarily apparelled," his linen "plain and not very clean," his stature "of a good size, his sword stuck close to his side, his countenance swoln and reddish, his voice sharp and untunable, and his eloquence full of fervour." This personage was pleading, amid considerable attention, on behalf of a troublesome young man of the uame of Lilburne, amanuensis to Mr Prynne, "who had disperst libels against the queen for her dancing and such like innocent and courtly sports." The impression made on the gay young courtier was anything but favourable. "T sincerely profess," he says, "it lessened much my reverence unto that great council, for this gentleman was very much hearkened unto."~~

~~The inevitable rupture at length took place, and the king and Parliament made their appeal to the sword. On 12th January 1642 Charles left Whitehall to return no more till the day of his execution. Military preparations on both sides began ; and now, at the mature age of forty-three, Oliver Cromwell girded on his armour, and, with his eldest son Oliver? by his side, left his quiet home and farm to fight for England's liberty. With no knowledge of the art of war, but much of himself, of men, and of the Bible, this stout English squire had made up his mind in no hasty or factious spirit to draw the sword against his king, and venture his life for what he believed with his whole heart and soul to be the cause of "freedom and the truth in Christ." Out of his moderate fortune he subscribed £500 'for the service of the commonwealth ;" £100 more he~~

~~3 We may here subjoin a brief notice of Cromwell's family, gathered from a note by Mr Carlyle. Oliver (born in 1623) entered as a cornet in the same division of cavalry with his father, who seems to heve regarded him with deep affection and hope. He was killed shortly before the battle of Marston Moor. The Protector, on his death-bed, alludes to this Oliver's death : "It went to my heart like a dagger, indeed it did." Richard was born in 1626, and died in 1712, a man of mild and indolent character, unfit for any office requiring strong powers of mind. Henry, born in 1628, died in 1674. He entered the army at sixteen, and greatly distinguished himself by his courage, prudence, and resolution, He accompanied his father to Ireland in. 1649, and in 1657 was appointed lord deputy there. He governed with great ability. "He isa governor," said Cromwell, "of whom I my- self might learn." Of the daughters, the eldest, Bridget, born 1624, died 1681, was married first to Ireton, afterwards to Fleetwood. Elizabeth, born 1629, died 1658, was married to Mr Claypole, who became Master of the Horse to the Protector. Mr Carlyle calls her "a graceful, brave, and amiable woman." Mary, born 1637, died 1712, was married to Lord Fauconberg. Dean Swift called her 'handsome and like her father." Frances, born 1688, died 1721, was married first to Mr Rich, again to Sir John Russel. Charles Il. at one time entertained the idea of allying himself with Cromwell by marrying her,~~

~~CROMWELL~~

expended on arms ; and during the summer he was actively engaged in raising volunteers. His first exploit was to seize the magazine in the castle at Cambridge, and prevent the carrying away of the university plate to help the royal exchequer. In September he received his commission as captain of a troop of horse. In the first campaign the royal troops generally had the advantage. Cromwell already knew in his own person wherein lay the strength of Puritanism, and the secret of its success. He spoke on the subject to his cousin Hampden. 'Old decayed serving men and tapsters," and such " base mean fellows," he said, "could never encounter gentlemen and persons of quality." To match "men of honour" they must have "'men who had the fear of God before them," and would " make some conscience of what they did." 'A few honest men," he elsewhere said, "are better than numbers." Mr Hampden thought his cousin "talked a good notion, but an im- practicable one." To turn " good notions" into facts, how- ever, was the characteristic work of Cromwell,—" impractic- able" being a word for which we maysuppose him to have had as little tolerance as Napoleon. On this principle of selec- tion accordingly he gradually enlisted around him a regiment of 1000 men, whose title of "Tronsides " has become famous in history. "They never were beaten." '" Had his history," says Mr Forster, "closed with the raising and disciplining of these men, it would have left a sufficient warrant of his greatness to posterity."

During the winter associations for mutual defence were formed among the counties. Of these the "Eastern Association " alone, through the prompt and indefatigable activity of Cromwell, proved really efficient. During the spring of 1643, having now attained the rank of colonel, he employed himself in quelling all royalist attempts throughout the association, giving them the final blow by the capture of Lowestoft, with a considerable body of influential royalists and a large supply of warlike stores. His services were next devoted to Lincolnshire, and with similar success. Towards the end of July the marquis of Newcastle, after his victory at Atherton Moor, advanced with a large army against Gainsborough, which was gar- risoned by a small Parliamentary force under Lord Willoughby. Cromwell threw himself between the town and the enemy's van, under General Cavendish, forced his way up a sandy eminence, in the face of a body three times superior in number to his own, and drove them in total rout down the other side. Their commander, an accomplished young nobleman, was killed on the spot. "

~~This victory," says Whitelocke, "' was the beginning of Cromwell's great fortunes, and now he began to appear in the world." The other Parliamentary leaders, meantime, had met with a series of humiliating reverses, and at the close of the summer the popular cause seemed in imminent peril. In August the earl of Manchester took the command of the Eastern Association, with Cromwell as one of his colonels. On 9th October they effected a junction with Fairfax at Boston, and on the 11th Cromwell and Fairfax encountered the royal force under Sir John Henderson on the field of Winceby, near Horncastle. Cromwell led the van, which advanced to the battle singing psalms. His horse was killed in the first charge, and fell upon him. As he rose he was again struck down, but recovering himself he mounted a "sorry horse" belonging to a trooper, and mingled in the fight. The enemy gave way at the first onset, and were pursued with terrible slaughter for many miles. During the remainder of this season Cromwell was occupied in attending to the security of the Eastern Asgo- ciation, in raising funds, and settling public affairs in Ely, of which he had some months previously been appointed governor.~~

~~On 10th April 1644 the Scotch Covenanted army of~~

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~~21,000 men under Lesley, earl of Leven, united with Fairfax at Wetherby, and proceeded to invest York. They were presently joined by Manchester and Cromwell, now lieutenant-general and second in command, On hearing of this, Prince Rupert hurried from Lancashire at the head of 20,000 men, and relieved York. The Parliamentary army raised the siege, drew out to meet tlhe enemy on Marston Moor, and on the evening of the 2d July gave a death- blow to the royal cause in the north of England. To Cromwell belonged the chief glory of the victory. While the right wing under Fairfax was overpowered by the furious onset of Prince Rupert, Cromwell carried all before him on the left, and, suddenly wheeling round, charged the victorious cavalry of Rupert with such overwhelming force that they were "swept off the field,'—"' God made them as stubble to our swords." In the west, on the other hand, Essex and Waller succeeded only in losing their armies, The Parliament, still confiding in these generals, granted them fresh forces, and summoned Manchester and Crom well to join them. On~~

27th October they met the king at Newbury, and a sanguinary conflict ensued, with dubious success, During the night the king effected a safe retreat. Cromwell urged Manchester to pursue him, but in vain. Twelve days thereafter, the king and Prince Rupert returned, re- victualled Dennington Castle, and carried off their artillery. Cromwell again pressed Manchester to attack them, but the timid earl was immovable. The fruit of these disagree- ments was a rupture, ending in important results. On 25th November Cromwell, having been called upon to give an account of the affair at Newbury, charged Manchester in the House of Commons with neglect of the Parliamentary interests; and on the 9th December openly urged the necessity of remodelling the army. The "self-denying ordinance," discharging members of Parliament from military offices, and permitting enlistment without the signing of the Covenant, was finally passed on 3d April 1645. Meantime Fairfax had been nominated general, the "new model " was passed, and the raising of troops and remodelling of the old army proceeded with activity.

The wisdom of these changes was proved by the triumphant result of the next campaign. Cromwell's services were by this time felt to be indispensable. He accordingly received a dispensation from the self-denying ordinance, and was hastily despatched (April 23) to intercept a force of 2000 men sent by Rupert to convoy the king from Oxford to Worcester. On the second day he attacked and routed them at Islip Bridge, took Bletchington House on the same day, and on the 26th gained another victory at Radcot Bridge. On 31st May the king suddenly stormed Leicester ; the southward move- ment of his army exposed the eastern counties to imminent danger ; and Fairfax, appealed to for help, immediately solicited the appointment of Cromwell as his lieutenant- general. The request was granted, and Cromwell, collecting 6000 chosen horse, joined the camp at Northampton with- out the loss of an hour, amid the acclamations of the whole army. Decisive action attended his presence ; on the very day following, June 14, 1645, the royal army was beaten to pieces on the field of Naseby, and the first civil war

virtually brought! to an end. Cromwell and his Ironsides

decided as usual the fate of the day. Proceeding victoriously south-westward, the Parliamentary army encountered the "Clubmen," a newand somewhat formidable party in the royal interest. At Shaftesbury Cromwell dis- persed a large body of them, after which they appeared no more. On llth September Bristol was stormed ; and again turning southward the army took every town and stronghold in its way. Cromwell particularly distinguished himself by his sieges. Basing House, the residence of the : raarquis of Winchester, had for four years defied all

besiegers, and was regarded by the royalists as impregnable. On 14th October Cromwell wrote to the speaker—" I thank God I can give you a good account of Basing." He had stormed it that morning at 6 o'clock, having, says Hugh Peters, "spent much time with God in prayer the night before." A few more such successes ended the campaign and the war. On 22d April 1646 Cromwell returned to his place in Parliament, and was received with the most distinguished honours.

During the next two years he resided for the most part in London, taking a due share in the negotiations with the king, and in the important contest between the Presbyterians and Independents, represented respectively by the city and army, which ended in the triumph of the latter. On the one side the support of the army was felt to be now an unnecessary burden, while the fact that so many of the soldiers had never taken the Covenant was displeasing to the strict Presbyterians, especially to those who had held commands in the old army. On the other side it was regarded as a most hazardous policy to disband the army without any surer guarantee for the nation's peace than the promises of the king. The formal claims of the soldiers, however, were forty-three weeks' arrears of pay, indemnity for acts done in the war, and discharge according to con- tract. After much unsatisfactory negotiation, the celebrated rendezvous or army convocation took place (June 10, 1647) on Triploe Heath near Cambridge. The Parliamentary commissioners were saluted in every regiment with the cry " Justice | Justice !" On the same day a letter signed by the general (Fairfax) and chief officers was despatclied to the mayor and corporation of London. It expressed in moderate language their desires, containing at the same time

~~the significant intimation that "for the obtaining of these things we are drawing near your city." A succession of events, varied by the advance and retreat of the army as the Parliament resisted or yielded, ended in the entry of the army into London, August 6, after having received full satisfaction of all its demands. On 12th November the king escaped from Hampton Court, leaving the Parliament- ary leaders convinced, after months of fruitless negotiation, of the hopelessness of further treating with him. On 3d January 1648 it was decided that there should be no more addresses to his Majesty. In March news came from Scot- land that a royalist army under the duke of Hamilton was preparing to invade England. The smouldering elements ofinsurrection now broke out. In London an alarming riot was only crushed by "a desperate charge of cavalry." Similar risings in Norwich, Canterbury, Exeter, &c., were put down by Fairfax. A more formidable revolt took place in Wales, and thither Cromwell was ordered to hasten. On 11th May he took the town of Chepstow, and after a pro- tracted siege Pembroke Castle was surrendered to him on llth July. Having settled Wales, Cromwell now hastened nortliwards and joined Lambert in Yorkshire. Hamilton, with 17,000 Scots,and Sir Marmaduke Langdale, with 4000 Yorkshiremen, were advancing in loose combination into Lancashire. Cromwell, marching westward at the head of 8600 men, attacked them at Preston on 17th August. The rout and chase extended over three days, at the end of which Hamilton's army was a total wreck. 2000 men were slain, and 10,000 (the duke himself in the number) made prisoners. So rapid and unexpected had been the move- ment of Cromwell, that Hamilton did not know till the close of the first day with what enemy he had been engaged. Following up this amazing success, Cromwell proceeded northward by Durham and Berwick across the border. On 4th October he entered Edinburgh, where he was welcomed with enthusiasm. During two days he lodged in "the earl of Murrie's house, in the Cannigate," receiving visits from persons of distinction ; and on the day of his departure**

~~lord-licutenant for Ireland.~~

~~mained to be done at home. Levellers, propagated mainly through the restless activity of John Lilburne, had made dangerous way in the army. The flame of discontent soon broke out into open mutiny at the various headquarters. By prompt activity, and a just exercise of "vigour and~~

~~clemency," Cromwell and Fairfax quelled this alarming insurrection ; two or three of the ringleaders were shot; the rest were admonished and submitted. On 10th July Cromwell left London in great state, and after some weeks spent in preparations at Bristol, embarked at Milford Haven, August 13,—" followed," as~~

~~prayers of all good men."~~

~~but met with a vigorous repulse.~~

~~CROMWELL~~

~~he was entertained to a sumptuous banquet in the castle. Having received satisfactory guarantees of future amity, he took his departure on the 7th October, leaving Scotland 'in a thriving posture," and "like to be a better neighbour than when the great pretenders to the Covenant, and religion, and treaties, had the power in their hands." Returning by Carlisle, which was delivered up according to agreement with the Scots, he laid siege to Pontefract Castle. It held out stubbornly. On 6th December, the day of "'Pride's Purge," having left Lambert to conduct the siege, Cromwell arrived in London, and on the morrow re- ceived the thanks of the House for his services. During the following month he sat assiduously in the High Court of Justice for trying the king; and after the execution was nominated to the new council of state.~~

~~The critical state of Ireland now demanded the most vigorous measures,—the whole country, with the exception of Dublin and Derry, having, through the exertions of Ormond, been roused into open war against the Common-wealth. On 15th March 1649 Cromwell was nominated Some work, however, still re-~~

~~The wild doctrines of the~~

~~Milton tells us, "by the well-wishes of the people, and the He landed in Dublin on the 18th, and was received with the most lively demonstrations~~

~~of joy. On 3d September he appeared before Tredah (Drogheda), which Ormond had garrisoned with 3000 of his best troops. to play, and the~~

~~governor received a summons to surrender. It was rejected, and the bombardment proceeded. Next~~

~~On the 10th Cromwell's batteries began~~

~~day a breach was made, and the storming party entered, Cromwell, witnessing this from the batteries, hastily headed a second assault, drove in the enemy, and, "being in the heat of the action," put the whole garrison without mercy to thesword. "Iam persuaded," he wrote in his despatch, "that this is a righteous judgment of God upon these barbarous wretclies, who have imbrued their hands in so much innocent blood ; and that it will tend to prevent the effusion of blood in the future. Which are the satisfactory grounds to such actions, which otherwise cannot but work regret and remorse." "The execrable policy of that regicide," says Carte, " had the effect he proposed, It spread abroad the terror of his name." Towns and garrisons were yielded up in rapid succession ; and, with the exception of Wexford, where a similar slaughter took place (October 11), the subsequent effusion of blood in Ireland was comparatively small. The arm of resistance had been thoroughly paralyzed. On 2d December Cromwell retired to winter-quarters. Before resuming the campaign, he issued, in answer to a manifesto from an assembly of the Popish hierarchy at Clonmacnoise, a " Declaration for the Undeceiving of Deluded and Seduced People." In this remarkable document Cromwell, with rude but masterly hand, tears up the sounding pretences of the hierarchy, points to the true causes of Treland's miseries, rebuts the charges of " massacre " and " extirpation," and invites the inhabitants of Ireland to submit peaceably to. the Commonwealth, with assurance of inviolate protection in their just rights and liberties. These promises were no empty words; the results of Cromwell's conquest and**

~~government in Ireland were a general peace and prosperity, admitted, even by his bitterest enemies, to be without example in the previous history of that misgoverned country. On 29th January 1650 he again took the field. Success everywhere attended lim and his lieutenants. At Clonmel 2000 men of Ulster made a last desperate effort in the royal cause. After a fierce and gallant resistance the place was stormed, and surrendered on 9th May. Cromwell had some time previously received orders to return to Englarid;~~

and having thus, within the brief space of nine months, reduced a hostile kingdom to com- parative obedience, he sailed for England, leaving Ireton as his deputy, and entered London in triumph on 31st May. The threatening aspect of affairs in Scotland had hastened his recall, Charles, willing " to sign anything," had taken the Covenant, and forces were being raised against the Commonwealth. The command of the northern expedition was offered to Fairfax, but he declined to act against the Scottish Presbyterians, save in the event of their invading England; and on 26th June Cromwell was nominated captain-general of all the forces of the Commonwealth, He made his preparations with his usual promptitude, and on the 29th marched from Loudon,—Lambert, Fleetwood, Whalley, Monk, Pride, and Overton commanding under him. On 23d July he crossed the border at Berwick. The inhabitants everywhere 'fice a his approach, the clergy having represented the English invaders as "sectaries and blasphemers," " monsters of the world," who would " put all the men to the sword, and thrust hot irons through the women's breasts." By dint, however, of encouraging proclamations, combined with the extreme discipline pre- served in the army, the confidence of the people was gradually restored. On 28th July Cromwell encamped at Musselburgh. The Scotch army, commanded by David Lesley, as superior to the English in numbers as it was inferior in discipline, lay strongly fortified between Edinburgh and Leith. On the second day after the arrival 'of Cromwell the enemy made a vigorous sally, but were repulsed with loss. ' This," wrote Cromwell to the president of the council, "is a sweet beginning of your business, or rather the Lord's." Lesley, however, was not to be drawn into an open encounter. Fabius himself was not more skilful in wearing out by cautious manceuvring the patience of an enemy. During a whole month Cromwell marched and countermarched round Edinburgh, in vain attempting to provoke a battle, his supplies failing, the season advancing, and sickness reducing his men 'beyond imagination." Declarations and responses, with no satisfaction on either side, had meanwhile passed between him and the Scotch commissioners. On 3lst August he left Musselburgh, and fell back upon Dunbar, where his ships lay. Lesley immediately hastened to cut off his retreat, and, pressing closely in the rear, took possession of the heights above Dunbar, and the only pass that left a southward opening to the enemy. Thus hemmed in, the sea behind, the enemy encircling him on the hills, 23,000 -strong, his own men reduced by sickness from 14,000 to

11,000, Cromwell's good fortune seemed, on the 2d September 1650, to have at length forsaken him. "Before the fight," he afterwards wrote to Ireton, ' our condition was made very sad, the enemy greatly insulted and menaced us." Not even then, however, did his strong trust in God and in himself for a moment desert him. "He was a strong nian," said one who knew him; "in the dark perils of war, in the high places of the field, hope shone in him like a pillar of fire, when it had gone out in all the others." 'In the mount the Lord would be seen; He would find outa way of deliverance and salvation."! On the afternoon

1 Letters and Speeches, iii. 40, 59.

of that gloomy day, Cromwell, reconnoitring the enemy's position, saw that Lesley was moving his forces to the right, and "shogging" " down his right wing to more open round, At once recognizing the advantage this offered for "attempting upon the enemy," he decided, after con- sulting his officers, to begin the attack on the morrow before dawn. 'The battle, however, did not begin till six. The " dispute " was hot on the right for about an hour, when Cromwell's own regiment came to the charge, and "at the push of pike " drove in " the stoutest regi- ment " of the enemy, At that moment the sun's beams broke out through the morning mist, over the hills and the sea, and the flashing lines of steel. Then was Oliver heard to say, in the words of the Psalmist, " Let God arise, let his enemies be scattered !" Horse and foot now charged resistlessly on every side; the Scottish ranks fell back in wild confusion, wrecked and scattered in tumultuous flight. Before © o'cloc': 3000 of them were slain, and 10,000 prisoners, wit all their baggage, train, and artillery, were in the hands of the English, who 'lost not thirty men."

He now took possession of Edinburgh, where he spent the most of the winter and spring. The city clergy had shut themselves up in the castle, and refused on his invita- tion to rctura tc their flocks. Some correspondence ensued, in the course of which the general showed himself rather more than c match for the theologians even on their own ground. In I'cbruary a deputation from Oxford came to inform him of his election as chancellor of the university. Shortly after, we find him pleading in behalf of a " pious and laudable scheme" for establishing a college at Durham. About this time he

was seized with a dangerous illness, brought on by exposure to wet and cold, which, after a temporary convalescence, broke out in several severe relapses. The Council of Stateexpressed their consideration by sending two physicians from London to attend him. In the interval he spent ten days in Glasgow, where he held a friendly conference with some of the leading Presby- terlan ministers. The Scotch army meantime lay intrenched at Torwood near Stirling. Towards the end of June, Cromwell, having recovered from his illness, moved west- ward. Finding the enemy too strong to be dislodged, he sent a portion of his army under Lambert across the Firth. At Inverkeithing they defeated a large body of the enemy, killing about 2000 men. Inchgarvie and Burntisland soon after surrendered to Monk; and Cromwell, crossing with his army to Fife, marched upon Perth, which surrendered on the second day. Charles, finding his supplies thus cut off, determined on a bold stroke, and, breaking up his camp, marched into England. Cromwell, leaving Monk behind him, sent his light horse in advance, under Lambert, joined by Harrison, and followed at some distance. The tidings of the royal movement excited great alarm in London, and it was even suspected that the general had betrayed the Commonwealth. Cromwell, not unaware that such fears would arise, wrote to the Parliament simply

of

.Telating the facts, and expressing full confidence of success.

The militia flocked to his standard all along his march ; and by the time he reached Worcester he found himself at the head of upwards of 30,000 men. There, on the 3d of September 1654, the anniversary of Dunbar, after a fierce and unequal contest, the Scotch army was shivered into ruin, and the last hope of royalism auuedl "The dimensions of this mercy," said Cromwell in bis despatch, "are above my thoughts. It is, for aught I know, crowning mercy."

At this point Cromwell's career as a soldier ends, and the events of his life become identified with the general history of Britain. After the battle of Worcester, the management of Scotland, where his deputy Monk had been completely successful in crushing royalism, naturally fell

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under the chief direction of Cromwell. That country was now united to the Commonwealth by Act of Parliament ; 2 small army distributed in garrisons preserved the peace of the country ; justice was strictly administered ; the affairs of the church were committed to a commission of pious and judicious ministers ; and during the whole period of Cromwell's government Scotland prospered under a strict but beneficent rule. In the interval between the battle of Worcester and the dismissal of the "Rump" Parliament, Cromwell took no continuously visible part in public affairs. The general opinion among historians seems to be that during these nineteen months the ambitious general was busily occupied in the course of profound dissimula- tion and intrigue which had marked his whole career, and that as the premeditated result of the selfish scheme of usurpation which had lurked darkly in his bosom even on the banks of the Ouse, he entered the House of Commons on 20th April 1653, expelled the Parliament, and assumed the reins of power. These views may be left untouched ; certain it is that the great assembly that moulded the Com- monwealth had now, at the end of twelve years, exhausted its vitality, and dwindled intoanumerical fragment ofa Par- liament, and a mere mockery of representative government. Tt had become in fact an oligarchy, which absorbed to itself not merely the whole administration of public affairs, but the control of many private interests. Their " only serious occupation to maintain themselves in power, and defend themselves against theirenemies,"! these men wasted months in debating questions of mere technicality, and prolonged time after time the duration of their power, after the voice of the nation, so far as it was capable of being interpreted, had pronounced it intolerable. After months of discussion atid delay, they had completed their measure for electing a new Parliament, professedly with the view of laying down their power into the hands of their successors, when it was found that by this act the members of the existing Parliament were to be de jure members of the new, and to constitute a committee for deciding

~~on the admission of their successors! On the morning of 20th April, Cromwell, being informed that this measure was getting hurried through the House, entered with his troopers, and dissolved the Parliament. By that daring act he became the sole head of power in the nation, and nothing was left him but to use it as wisely and firmly as he could. The consequences of that act left him thenceforth no honourable retreat had le desired it. Onestrong hand was needed to give consist- ency and unity to the action of the state, alike in its inter- nal and its foreign relations ; and, from the hour that Cromwell seized the helm, the ship of the Commonwealth rode the waves, if not without straining or accident, yet with a proud and steady march. Few tears were shed for the departed " statesmen ;" the nation quietly submitted, if it did not positively approve ; the business of the state went on without interruption; the leaders of the army and navy, many of them ardent republicans, continued at their posts, sinking their private opinions in their concern for the country's good. As soon as possible, summonses were: issued in Cromwell's name to 140 "persons of approved fidelity and honesty," selected from the nation by himself and his council to act as a Parliament in the exist- ing emergency. This extraordinary assembly met on the 4th of July. The old and vulgar charge against them, as a herd of mean and contemptible fanatics, is of a piece with the general run of historic portraitures of Cromwell himself, and has been sufficiently answered even by writers who have little favour for him. They were in fact a body of most sincere and earnest men, only too eager and compre- hensive in their efforts to accomplish a national reformation.~~

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~~1 Guizot, History of Cromwell and the English Commonwealth.~~

~~CROMWELL~~

~~They attempted too much ; they aroused a storm of hos-~~

~~tility from the classes whose interests they threatened ; they bowed before it; internal dissensions and intrigue hastened their fall ; and on 12th December they resigned their power into the hands of Cromwell, who now found himself in the solemn position of being the uncontrolled arbiter of the peace and safety of Britain, Earnestly desirous, as he throughout evinced~~

himself, of giving his country a stable and constitutional government, he was willing now, rather than that England should sink into the abyss of anarchy, to brave the dangers and the odium that attach to the name of a usurper. Four days after the resignation of the "Little Parliament," it was openly pro- claimed that Oliver Cromwell had been invested with the office of supreme governor of the British Commonwealth under the title of "Lord Protector;" and on 16th Decem ber 1653 he was solemnly installed in Westminster Hall. All the chief courts of Europe sent their congratulations to the new sovereign, and soon they were made to feel and bow to his power. A Parliament was summoned for the 3d of September 1654; and in the meantime Oliver and his council proceeded with vigour in the settlement of domestic and foreign affairs. 'In less than nine months," says M. Guizot, "eighty-two ordinances, bearing upon almost every part of the social organization of the country, bore witness to the intelligent activity and to the character, at once conservative and reformatory, of the Government." Of these it is sufficient to mention the partial reform of the Court of Chancery, and the settlement of ecclesiastical affairs by the commission of "Triers," a body of able and pious men who, by. the impartial testimony of Baxter, "did abundance of good to the church." A plot, the first of many, to assassinate the Protector, was discovered in the month of July. The principal conspirators, Gerard and Vowel, were executed; and on the same day, as a terrible example to Europe of British justice, Don Pantaleon Sa, brother of the Portuguese ambassador, was publicly beheaded for his share in the murder of an English citizen. On the 3d September the Parliament met. The Protector had already concluded peace with the Netherlands, Sweden, Denmark, and Portugal; and a treaty with France was proceeding hope- fully towards settlement. The Parliament began business by deliberating whether they should approve the newly established frame of government—in other words, by calling in question the authority which had called them together. Oliver at once hastened to set them right. "JT told you," he said, "that you were a 'free Parliament,' but I thought it was understood withal that I was the Protector, and the authority that called you!" He con- cluded an earnest and powerful address by requiring them to sign a document pledging themselves to acknow- ledge the existing Government. One hundred and fifty of the republican members refused to sign, and withdrew. The rest resumed their sitting; but their subsequent pro- ceedings were scarcely more satisfactory than their in-

auspicious commencement. Instead of accepting as a fact the power of the Protector, and aiding him in the work of government, they occupied themselves in interposing as many checks as they could to his influence. Deeply grieved at the failure of each successive attempt to govern by constitutional means, Cromwell was not therefore discouraged. If Parliaments would not help him, he was determined to govern without them. His scheme of "Major-generals" followed,—'"a little poor invention," as he called it, for preserving order in the country, and crushing the now imminent attempt at a combination between the Royalists and the Levellers. Though arbitrary, and in many instances . oppressive, this scheme accomplished the great end of its establishment—the preservation of the country's peace. But while the enemies of peace and order at home were

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made to feel the invincible power of his government, it was in his relations with foreign states that the commanding genius of Oliver was most conspicuously displayed. No monarch ever so sustained in the eyes of Europe the majesty of the British power. The grand object of his foreign policy was to unite the Protestant states, with Britain at their head, in a defensive league against Popery, then as now the enemy of civil and religious liberty. Spain, "the great underpropper of the Roman Babylon," the "natural enemy of the honest interest," he determined to humble, and in due time he did. With France, less

subject to the yoke of Rome, he allied himself, making

such terms as he pleased, extorting from the crafty Mazarin,) a prince of the Church of Rome, protection for Rome's

enemies, and full pardon for offences committed against

her in the heart of France itself! In the summer of 1655 the persecution of the Protestants in the valleys of Piedmont afforded an occasion for displaying in the noblest light the greatness of the Protector and of the uation which he represented. The tidings of these cruel oppressions affected the stern conqueror to tears. The treaty with France was ready to be signed that day. He refused to put his name to it until he received assurance of

protection for the persecuted Piedmontese; and immediately wrote, not only to the duke of Savoy himself, but to Louis XIV., to Cardinal Mazarin, the kings of Sweden and Denmark, the States-General, the Swiss cantons, and even to Ragotzki, prince of Transylvania, pleading for their interposition. Had his remonstrances proved unsuccessful, he had fully prepared to exact compliance at the point of the sword. 'A Protector not of the British realms only, but of the Protestantism of Europe, this "usurper" might claim, without fiction the title "Defender of the Faith." Meantime the supremacy of England on the seas was upheld by Blake, whose guns thundered along the shores of the Mediterranean, exacting justice and submission from every hostile power. The duke of Tuscany, the Pope, the deys of Tunis, Tripoli, and Algiers, each in succession, were forced to make reparation for injuries to English commerce and liberty. The Mediterranean was cleared of pirates, and the con- fidence of peaceful merchants was restored. "By such means as these," said Cromwell, "we shall make tlie name of Englishman as great as that of Roman was in Rome's most palmy days."

After a lapse of nearly two years, Cromwell, still clinging to tho wish of restoring the ancient constitution, now made another experiment at governing with a Parliament. Is met on 17th September 1656. About a hundred of the inveterate republicans were excluded, and the House, now tolerably in harmony with the Protector's views, proceeded to a settlement of the nation. The major-generals were abolished early in spring; the form of a new constitution, with two Houses of Parliament, and one governing person, with the title of "King," was proposed; and during three months the subject was discussed amidst the intense expectation of the whole people. That Cromwell was willing and even desirous to add this element of stability to his government there can be no doubt; but seeing that the dangers that threatened to accompany the assumption of the title were likely to overbalance its advantages, he finally declined it. The remaining points of the constitution were agreed on, and on 26th June 1657 he was again, with additional solemnity and increased power, invested with the Protectorate. The new Parliament assembled on 20th January 1658. The Commons refused to acknowledge the Protector's House of Peers, and on 4th February he dissolved them, concluding his last speech with the solemn a

1 It wag said that Mazarin "feared Oliver more than the devil," and changed colour at the mention of his name, ,

words — God be judge between me and you!" Tho whole weight of government again rested on his shoulders, and with unabated energy he went on with his work, crushing the designs of domestic enemies, and maintaining abroad the full prestige of his power. HIs struggles were now drawing to an end. "HIe being compelled," says Maidston,? "to wrestle with the difficulties of his place, so well as he could, without parliamentary assistance, in ib met with so great a burthen as (Idoubt not to say) it drank up his spirits, of which his natural constitution yielded a vast stock, and brought him to his grave ; his interment being the seed-time of his glory and England's calamity." On the 6th August his favourite daughter, Elizabeth, died after a lingering illness, during which the Protector had watched unremittingly by her side. HIs health, already declining, now visibly broke down. On Friday, the 3d of September 1658, the anniversary of his Fortunate Day, the spirit of Cromwell was released from its earthly toils, — Nature herself seeming to prophesy, in the voice of the tempest that had swept over England, that a great power was passing away. .

"Tt has often been affirmed," says Lord Macaulay, " but apparently with little reason, that Oliver died at a time fortunate for his renown, and that, if his life had been prolonged, it would probably have closed amidst disgraces and disasters. It is certain that he was to the last honoured by his soldiers, obeyed by the whole population of the British Islands, and dreaded by all foreign powers, that he was laid among the ancient sovereigns of England with funeral pomp, such as London had never before seen, and that he was succeeded by his son Richard as quietly as any king had ever been succeeded by any prince of Wales." ?

HIstorians, till within a comparatively recent period, have been nearly unanimous in their judgment on the character of Cromwell. That he was a man of extraordinary abilities was a necessary and universal admission, but served for the most part only " to point the moral " as an aggravation of his crimes. The only question concerning so terrible a prodigy seemed to be, how far a selfish and unscrupulous ambition may have been modified in

~~him by a blind fanaticism, how far in deceiving others he may gradually have fallen into deception of himself. That his history should have been so interpreted admits of easy explanation. The recoil of sentiment that followed the death of~~

~~'Cromwell, and with him of Puritanism as a visible power,~~

~~was great in proportion to the intensity of the previous strain ; and a man who attempted to realize Christianity as a practical element in the government of nations, and addressed armies and parliaments in the language of tho Bible, was not likely to be looked upon with sympathy in the age of Bolingbroke and Hume. Had Cromwell been less of a Christian and more of a Pagan, historians might have accorded to him some of that leniency with which they have spoken of the vices of a Cesar or a Peter the Great. But the same office which cowardly hands had done for his bones, servility, ignorance, and prejudice did for his memory ; and during most part of two centuries, the name Beenie ee is eT~~

~~2 Letter to Winthrop, governor of Connecticut (Thurloe, i, 763). From the same source we take this description of the Protector's personal appearance and character. " His body was well-built, com- pact, and strong, his stature under six feet (I believe about two inches), his head so shaped as you might see in it a storehouse and shop both of avast treasury 'of natural parts. His temper exceedingly fiery, as I have known, but the flame of it kept down for the most part or soon allayed with those moral endowments he had. He was naturally com- passionate towards objects in distress, even to an effeminate measure ; though God had made him a heart wherein was left little room for any fear, but what was due to Himself, of which there was a large proportion, yet did he exceed in tenderness towards sufferers. A larger soul I think hath seldom dwelt in a house of clay than his was."~~

3 History of England, vol. i. p. 139.

of the greatest man of his own age, and one of the noblest of any age, has been associated with all the infamy that belongs to @ life-long career of unmitigated hypocrisy and insatiable ambition. Truth, however, at length begins to prevail, and Cromwell's own prophetic hope is attaining fulfilment —" I know God has been above all ill reports, and will in his own time vindicate me." " In speaking," said Milton, "of a man so great, and who has deserved so signally of this commonwealth, I shall have done nothing if I merely acquit him of having committed any crime, especially since it concerns, not only the commonwealth, but myself individually, as one so closely conjoined in the same infamy, to show to all nations and ages, as far as I can, the supreme excellence of his character, aud his supreme worthiness of all praise." . The most eloquent of English historians has defended, in pages read by all the world, both the Puritans and their king ; and another historian, with still deeper love and ad- miration, has paid his " tribute to the memory of a hero," in a work which will henceforth enable posterity to know what kind of man Oliver Cromwell really was.

There is no severer test of a man's character than the uso he makes of absolute power. Tried by this test Cromwell bears comparison favourably with any of the greatest names in history. Elevated into supremacy, regal save only in name, he still preserved the plain simplicity of his former life. Armed with more than regal power, he limited himself within the strict bounds of necessity. Personally he cared little for the outward shows of royalty, tut he stinted no pomp or ceremony so far as it seemed to involve the nation's dignity. Too great to be jealous or vin- . dictive for himself, he was swift and stern in crushing the enemies of public tranquillity. HIe was truly a terror. to evil-doers, a praise to them that did well. HIe fostered learning, though himself not learned, and allied with some to whom learning was profanity. 'If there was a man in England who excelled in any faculty or science, the Protector would find him out, and reward him according to his merit." The head of a triumphant cause, he was so little of a fanatic that he tolerated all sects, so long as they meddled not to disturb the state. HIs large and healthy spirit was bound by no party sympathies,

~~but yearned towards all good men, of whatever name. At an era when toleration was looked upon by many as foolish in politics and criminal in religion, he stood out in glorious prominence as the earnest advocate of the rights of conscience, and pro- claimed all men answerable to God alone for their faith. Popery and prelacy he proscribed, on grounds political rather than religious; to the adherents of both he showed private lenity; under his rule men no more suffered at the stake or the pillory. So far did his thoughts reach beyond his age, that he desired, and earnestly attempted, to extend the rights of citizenship to the outcast and perse- cuted Jews. Himself the greatest, "the most English of Englishmen"—he was determined that England should be the greatest of states. He encouraged trade, planted colonies, made wise peace with whom he would, or waged just and successful war. All Europe trembled at his voice, and the flag of Britain thenceforth waved triumphant over every sea. In fine, considering the comparative position of Britain in the times that preceded and followed him, the~~

~~i«The collection of all his speeches, letters, and sermons," says Hume, "would make a great curiosity, and, with a few exceptions might pass for one of the most nonsensical books in the world." How the Letters and Speeches of Oliver Cromwell, with Elucidations by Thomas Carlyle, reply to this remarkable verdict, readers must judge for themselves. No such noble service was ever rendered to the memory of a great man by a single hand. For an able biography in which a very opposite view is taken of the character of Cromwell,~~

~~the reader is referred to Mr Forster's Statesmen of the British Commons qwealt, vols. vi. vil.~~

~~CROMWELL~~

~~circumstances of, his life, and the difficulties with which he had to contend, making all allowance for his errors and his failings, he was a man for all ages to admire, for all Britons to honour in proud remembrance. No royal name, at least since Alfred's, is more worthy of our veneration than that of the * Usurper," Oliver Cromwell. (a. NI.)~~

~~CROMWELL, or Crumwe tt, THomas, earl of Essex. Of the life of Thomas Cromwell before he entered the service of Henry VIII., crowded with stirring incident as we know it was, the accounts that we possess are meagre and far from authentic Even the year of his birth is unknown, but 1490 has been fixed upon as a probable approximate date. His childhood was passed near London—perhaps, as Foxe says, close by Putney—where his father, according to Foxe, and also according to the stronger evidence of Chappuys, the ambassador from Charles V.,? carried on the trade of a blacksmith. During his boyhood he lost his father, and his mother then married a fuller, whence Pole's assertion, " pater ejus pannis verrendis victum queritabat."? It has been conjectured that, as a boy, Cromwell entered the household of Cecily, marchioness of Dorset, and that therefore his family must have possessed some influence ; but the letter referred. to by Sir Henry Ellis as the only evidence of connection with the house of Dorset belongs in all probability to the period when he was engaged in the cloth trade.'~~

~~While still in his teens Cromwell made his way to Italy, where he was to read Machiavelli, and acquire those views of conduct and statesmanship which determined his career. He first passed over to Flanders, and obtained a situation as clerk in the English factory at Antwerp. He then took service, there is good reason to believe,as a soldier in Italy ; but the story narrated by Foxe, that he was one of~~

~~. the duke of Bourbon's followers at the siege of Rome in~~

~~May 1527, is extremely doubtful. The inaccuracy of Foxe is notorious, and there is evidence in letters of his own that Cromwell was in England in January 1527, and again in 1528. It nevertheless remains possible that during the interval he was at Rome on some diplomatic mission. Some time also he spent in the office of a merchant at Venice, with whom Pole claims to have had personal acquaintance ; and Foxe asserts that, subsequently to his return to England, he paid another visit to Italy, being engaged by the leading merchants of Boston in Lincoln- shire to procure certain privileges from the Pope. The well-known story of the kindly help which he received while in distress from the Florentine banker Fresco- paldi, and the noble gratitude which he displayed in his prosperity, rests apparently on no more~~

certain authority than a novel of Bandello and the statement of Foxe, though it is an interesting illustration of the fame which he acquired as a man who never failed to remember a kindness.

From his signature on the titledeed of a manor in Buckinghamshire, dated 1512,° it appears that Cromwell was then practising, as we know he afterwards practised, as a scrivener—a combination of attorney and money-lender. Ho also for a time followed his step-father's trade of cloth-merchant. In 1523 he obtained a seat in Parliament ; and he had most likely already entered the service of Cardinal Wolsey. 'That he had done so within two or three years after there is positive evidence to prove.® His (ae

2 Quoted by Froude, History, vol. i. p. 585.

3 Apologia R. Poli ad Carolwm V. p. 126. ;

4 Ellis, Original Letters, 1st series, vol. i, p. 218. It is made up of directions to Cromwell concerning a bed and certain other articles of furniture.

5 Brewer, Calendar vol. i. p. 446.

6 The signature of Cromwell as witness ig affixed to a paper drawn up to prove the transfer of certain letters from Sir W Gascoyne, the

© State Papers of the Reign of Henry VIII.

principal employment was to collect the confiscated property of the monasteries granted by the Pope to Wolsey for the endowment of his colleges at Ipswich and Oxford; and the manner in which he performed this task, while it added very considerably to his purse, aroused numerous and vehement complaints. Indeed, many expected to see him mount the scaffold when his master's protection ceased "to be of avail.

Among the followers of Wolsey, however, he had made himself of the first Importance ; and when ruin overtook the cardinal, it was on Cromwell that he leant. There are

~~letters. extant in Wolsey's handwriting, addressing Cromwell –~~

~~as a familiar friend, and earnestly begging his presence and advice; and there is one in the handwriting of Cromwell, containing such counsel as might have been given by an equal, and, with an air that savours somewhat of hypocrisy, congratulating the fallen minister on being now "at liberty to serve God," and " banish and exile the vain desires of this unstable world." or his fidelity, and especially for his defence of Wolsey in the House of Commons,! Cromwell received from his contemporaries the highest praise. His conduct appears to have been simply that of a man who, not forgetful of his own interests, was honourably desirous of serving a patron to whom he was deeply indebted. At first he remained with the cardinal, whom he accompanied to his uncomfortable exile at Esher. But he was not long content to serve in unprofitable obscurity, and he was besides in some alarm for his personal safety. New and aspiring projects began to fill his mind. Cavendish, Wolsey's gentleman-usher and biographer, tells how on All- Hallows day he found him gazing out of a window at Esher, with his primer in his hand, employed, unlike his wont, in saying his matins. He complained with tears to Cavendish that, while he had received no promotion from the cardinal, he was like to share his fall, and announced his intention of riding to the court that very afternoon to stake his for- tunes on an interview with the king. An account of that interview has been given by Pole,? who asserts that he re- ceived his information from some of the courtiers present. Trusting in Henry's love of power and his bitter irritation against the Pope, Cromwell ventured to reveal the daring policy which he had conceived. The authority of the Papacy in England was to be altogether abolished ; and thus, not only was the painful question of the divorce to be easily settled, but the allegiance of the clergy, then divided,~~

~~treasurer of Wolsey's household, to John Higden, dean of Cardinal College, and dated the 29th October of the seventeenth year of Henry VIII. t.2. 1525. (See Brewer, Calendar, dec. vol. iv. part 1, p. 768). And there are extant two letters written in 1526, and addressed to Cromwell as " one of my Lord Cardinal's Council," and "counsellor to my Lord's Cardinal's grace" (Brewer, Calendar, vol. iv. part 1, pp. 1048-9). Sir Henry Ellis (Original Letters, 2nd ser. 2nd vol. p. 117) expresses the opinion that "he must have been in Wolsey's service at least as early as 1524."~~

1 Cavendish (Life of Wolsey, p. 276), says that a bill had been passed in the House of Lords to " have my Lord Cardinal condemned of treason, . . . against which Master Cromwell inveighed so dis- cretely, with such witty persuasions and deep reasons that the same would take there no effect." But Herbert quotes the articles of the bill, because, he says, "our vulgar chronicles misreport them," and proves that it was not a bill of impeachment, but one intended to disqualify Wolsey from being restored to office (Life of Henry VIII. pp. 408-16, Murray's ed.). He adds, '* These articles were presented to the Lords, and then sent down to tlhe Lower House, where Thomas Cromwell (obtaining the place"of a burgess) so wittily defended his master that no treason could be laid to his charge. And upon this honest beginning Cromwell obtained his first reputation." Mr Brewer (Calendar, dic. vol. iv. Introd. p. 553), however is inclined to believe that Cromwell risked nothing by his defence of Wolsey. The bill was dated Ist Dec., when Cromwell was already in the king's service ; and there is no reason to believe that Henry was in favour of the measure, which, on the contrary, was likely to be distasteful to him as intended to limit his prerogative.

- Apologia ad Carolum V. pp. 120-121, quoted by Tytler, Life of Henry VIII. p. 308

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as Cromwell proved by reference to the bishops' oaths, between their sovereign and their spiritual head, was all to be claimed by the former. And, besides, Cromwell appealed to the king's cupidity by showing that all the wealth of the clergy was at the disposal of the king, since they (in common, indeed, with the whole nation) had, by receiving Wolsey as Papal legate, fallen under the penalties of premunire. The boldness and originality of this advice, and the reputation for ability, address, and fidelity which ho had gained, pointed Cromwell out to Henry as likely to prove a minister of no ordinary value; and he was at once taken into favour. The way, however, had been previously prepared. The duke of Bedford, whose life Cromwell had saved in Italy, spoke in his behalf; and he had recently laid several of the other courtiers under obligations. Ho had advised the cardinal to advance his interest at court by conferring handsome presents on those who

had the greatest influence with the king, and had himself undertaken to fix the amounts, and choose the recipients, of these gifts.

Thus Cromwell gained entrance into the king's service. His rise was rapid, for he possessed qualities which admir- ably fitted him for success as a minister of Henry VIII. He was capable of carrying on a strong and arbitrary government with a hand that shrank from no measure that seemed necessary, aud an eye that never failed in its vigilance ; and, whenever the king chose to act indepen- dently, he was supple enough to bend, and to bend grace- fully, to the inevitable. In him also the king found a servant who did not scorn to offer the flattery which he expected, who performed with zeal and care any service, however trivial, and who was ever ready to join heartily in the hunting, gambling, and other pastimes in which he delighted. That, with these qualities, he was of obscure birth was a circumstance in his favour; for the policy of humbling the nobility, which had been steadily pursued by Henry VII., had not been reversed by his son. Immediately, or almost immediately, after his interview with the king, Cromwell was appointed privy councillor. One more service he rendered to Wolsey, as the bearer of the king's gift of a thousand pounds ; but his fortunes were no longer linked with those of the cardinal. 'By 1532 he had obtained the posts of master of the jewels and clerk of the hanaper ; in 1533 he was raised to the office of chan- cellor of the exchequer for life. By 1535 he had become master of the rolls, secretary of state, and, most important of all, had been appointed to the highest office in the church as vicar-general in ecclesiastical affairs,—a title which was afterwards changed (with what change of power, if any, is now unknown) for that of vicegerent. In 1536 he was made lord privy seal. In 1537 he received the Order of the Garter. And, besides these dignities and offices, he held those of great chamberlain, dean of Wells, chancellor of the university of Cambridge, justice of the forests north of tho Trent, and Baron Cromwell of Oke- ham. On the 17th April 1540 he was created earl of Essex. '

To narrate the details and trace out the effects of Cromwell's policy belongs to history. In this biography it is sufficient to consider the general character of the measures for which he was responsible, to estimate his aims and motives, and discuss the means which he employed.

A great scheme, consistently carried out, is manifest throughout the whole of his political career. All power was to be centralized in the hands of the king, or in those of the ministers whom he appointed ; for the present, that is, in the hands of Cromwell himself. In secular affairs this centralization was already almost complete. Parlia- ment voted, and the judges decided, as the king wished ; and juries could be readily frightened into abject submis- sion. The power of the nobles, which of old had been the

national safeguard against despotism, had been laid in the dust by the Wars of the Roses and the successful policy of Henry VII. The church alone retained a species of independence. That independence it was therefore Cromwell's first aim to destroy. The momentous con- temporary events which suggested his scheme gave him the opportunity of effecting its accomplishment. It was the support of the Papacy which alone enabled the English clergy to make any stand against their sovereign ; and on the Continent that authority had been repudiated by several states. In England the king's mind was ripe for a breach with Rome ; and the new learning had spread a general desire for ecclesiastical reform. Henry was soon persuaded to sever every bond that united England with Rome. Parliament complied with its usual facility. The clergy were forced, as the price of escape from the penalties of premunire, to acknowledge the king's headship of the church. And all Cromwell's foreign policy was directed to support this great revolution; England was to be placed at the head of a Protestant league which should defy the emperor and the Pope.

Such being Cromwell's policy, it was natural that he should make himself the recognized protector of Pro- testant heretics. He was unable to offer the slightest resistance to the passing of the Six Articles, by which Henry sought to fix the faith of England and terrify all parties into order, but he allowed no Lutheran to pay the penalties which the Articles enacted. He was the putron of Coverdale ; and to him was due that version of the English Bible known as the Great Bible, the first edition of which has taken his name. In 1539 he obtained the office of licenser of Bibles; and he distributed copies all over England, commanding that in every parish church whoever desired to read should have free opportunity. Whether he had any sympathy with

doctrinal Protestantism is very doubtful. Foxe is a most insufficient authority for the statement that he abjured the errors of Rome on the perusal, while in Italy, of the Latin New Testament of Erasmus ; it may, nevertheless, be true that he did read the New Testament, not without after results. But his stay in Italy, while it would tend to make him the enemy of the Papacy, would equally tend to make hun altogether anti-theological in his habits of thought. Dis- tress, however, seems to have driven him to the consolations afforded by the doctrines of the old religion, In his perplexity at Esher, he is gaid to have betaken himself to the repetition of prayers to the Virgin ; and his will, dated 1529, also goes to show that he was doctrinally no heretic. Iu it he orders the appointment of a priest at a salary of £6, 13s. 4d. per annum, to sing masses for his soul; for the same object he saddles a bequest to his brother-in-law aud sister with £8 a year, and leaves 20s. to each of the five orders of friars in London; and he directs £20 to be divided among poor householders that they may act as his beadsmen. It is possible, however, that this may merely hive been a politic deference to custom. Both the last speech of Cromwell, which announces his return to Catho- licism, and his last prayer, which is Protestant in its tone, are of very doubtful authenticity.

The work for which Cromwell is popularly re- membered, that which earned him his distinctive title of "malleus monachorum," was the abolition of the

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1 Dean Hook (Lives of the Archbishops of Canterbury, vol. 1. p. 120) asserts of Cromwell that it is "more than doubtful whether he ever understood Latin at all." But the evidence points decidedly in the opposite direction. Latimer writes to him partly in Latin (Strype, vol. i, pt. i. p. 512); ina letter to Henry VIII. he quotes in that language part of a letter from Melanchthon which he had received (Strype, vol. i. pt. ii. p. 403); and Coverdale addresses him in terms which could not have been applied in those days except as an insult to any man ignorant of so common an accomplishment,

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monasteries. The means he employed to accomplish this measure were characteristic. Commissioners were sent to visit the monks and nuns, and give reports of whatever irregularities could be discovered in their conduct. The juggleries of pretended miracles were exposed; rough farces in ridicule of the priests, and even of the sacraments, were allowed to be acted in place of the mysteries or miracle-plays. Every shrine was destroyed, all its costly gifts being seized by the king. The bones of St Thomas » Becket, the hero of a signal triumph of the Papacy over the Crown, were dug up and burnt as those of a traitor ; his name was removed from the service-book ; his festival ordered to be neglected; every window erected to his memory ruthlessly destroyed ; Cromwell even thought if worth while to publish a proclamation giving an official account of his treasons. A grant of the nionastic property to the king was obtained from the Commons, who expected that the pressure of taxation would thus be relieved. And the nobles and wealthier commoners were conciliated by

the chances that offered of cheap purchases of land.

For seven years Cromwell was supreme 1 the royal council, and supreme in all the departments of the administration. He was not altogether independent ; every measure of importance had to be approved, and many were modified, by the king, who, moreover, often chose to act for himself in matters of the greatest moment, with- out even seeking his minister's advice. Yet during the period of his ministry Cromwell was certainly responsible for the general character of the government. The servant of a master who spared no life that endangered his authority or even disturbed his tranquillity, living in an age when to allow any to escape whose acts or avowed opinions were 'nconsistent with the policy of the Government would have been considered mere weak-minded lenity, he carried out the principles of his master, he followed the practice of his age, with stern and unvarying regularity. A position of unparalleled danger, both from traitors at home and from foreign attacks, had been assumed by the Government. The greatest promptitudle and vigour were essential to safety. But during Cromwell's ministry vigour and promp- titude were carried to an extreme. Laws never equalled for severity in the history of England were enacted. No opposition was allowed to endure for a moment. It is true that the blood of More and Fisher, of the marquis of Exeter, Lord Montague, and the countess

~~of Salisbury (the last of whom, indeed, was executed ten mouths after the death of Cromwell) was shed in no private quarrel. Cromwell's policy had been adopted by the king ; and in some cases he was no more than the king's official agent. Yet that he fully sympathized with these severities is past a doubt. The condemnation of Exeter, Montague, and the couritess of Salisbury by attainder without trial was due to his suggestion. It was he, as numerous memoranda of his remain to prove, who enforced the execution of the laws of treason upon minor offenders. It was he who doomed "the Abbott Redyng to be sent down to be tryed and executed at Redyng with his complycys,"—" the Abbott of Glaston to be tryed at Glaston and also to be executed there with his complycys," and who ordered "that the evydens be well sortyd and the indytmentts well drawn against the said abbotts and their complycys," and " to send Gendon to the Towre to be rakkyd."? He also—all attempts at persuasion proving futile—superintended the trial of the seven uoble Carthusians of the Charterhouse, whom, breaking through the hitherto unbroken custom, he hanged in their clerical garb, that it might be vividly~~

~~2 Bllis, Original Letters, 2a series, vol. ii. p. 121. Such entries, it must in fairness be remembered, do not imply that the cases had~~

~~been prejudged ; az to the facts of the charges there was nO doubt,~~

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~~impressed upon the. imagination of the people that there was no longer any law in England higher than loyalty. And that he had not visited Italy in vain is proved by a very characteristic letter! written in August 1537 to Michael Throgmorton, once a spy of his own, now a follower of Cardinal Pole's, in which, after hinting that both master and servant may yet obtain mercy by submission, he breaks into a threat—' There may be found ways enough in Italy to rid a traitorous subject. — Surely let him not think but, when justice can take no place by process of law at home, sometimes she may be enforced to take new means abroad." In private matters Cromwell's temper was equally arbitrary. Stowe's father, for instance, as the chronicler himself narrates, had his house removed upon rollers, without his consent or even knowledge, to make room for Cromwell's buildings in Throgmorton Street, London; and Foxe, partisan as he was, gives other instances.~~

Such a career could not fail to surround Cromwell with numerous and implacable enemies, and to afford many real grounds of accusation. His private expenditure had been splendid ; he was fond of adding house to house ; and two hundred poor persons were daily fed at his door. The cost of the system by which he supported his power had been enormous. Presents had been freely lavished upon men of influence, and an army of spies and agents had been maintained and generously rewarded. Such expenses his private fortune and the grants he had received from the king were quite inadequate to support ; and it was easy to prove, not only that he had been in the regular habit of receiving gifts from suitors and others who desired his favour, but that much of the public money had been used by him without passing through the public treasury. He was the patron of heretics. His promises of a full treasury and relieved taxation had not been fulfilled; taxation, indeed, had been increased; and, for that and many other reasons, his government was now extremely un- popular. The nobles, almost to a man, and most of the clergy, were his foes; but perhaps his deadliest enemy was his old companion in the service of Wolsey, Stephen Gardyner, bishop of Winchester, whom he had in vain attempted to crush under the Act of Supremacy. That part of his policy of which the accomplishment was desired by Henry was completely achieved, and Henry had no longer any interest in supporting him. He had, besides, committed a fatal mistake. His enemies had potent means in their possession for kindling against him all the fury of which Henry's nature was capable. It could be proved, bayond the possibility of doubt, that he had been long engaged in negotiations with the German Protestant princes without the knowledge of the king, whom, besides, to further his plans, he had involved in the hateful marriage with Anne of Cleves. His danger had not been unforeseen ; and two years before his fall he is said to have arranged his affairs, so that his family, and his servants, to whom he was always a thoughtful and generous master, should not be left unprovided for. But the blow fell unexpectedly. On the 10th of June 1540 at the council table, the duke of Norfolk rose and accused him of high treason. Witnesses were present to swear that he had declared that he would fight in support of his opinions, " sword in hand, against the king and all others," and that in a year or two he would have so far carried out his policy that the king should no longer be able to resist it. In vain he passionately exclaimed against the absurdity of charging him with treason. His enemies had attained their revenge. In rude triumph the duke of Suffolk

stripped him of his George ; the earl of Southampton tore the Garter from his knee, He was immediately removed to the Tower. That

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3 Froude, History, vol. iii. p. 44-48.

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night in the city the bells of the churches rang out peals of joy, bonfires blazed, and many of the citizens held exultant revel. His friend Cranmer alone uttered a word in his favour. A bill of attainder, accusing him of pecula- tion, extortion, bribery, contempt for the nobility, heresy, and treason, was passed with acclamation. Twice in vain he appealed to the king for mercy in terms of the most pitiful entreaty. Having drawn up a statement concerning Henry's relations with Anne of Cleves, adapted to facilitate her divorce, he took the opportunity to protest against the in- justice and illegality of condemning him unheard, and con- cluded with a pitiful cry for " Mercy! mercy! mercy— And again, in a letter which he contrived to convey to the king by the hands of his old servant, Sir Ralph Sadler, he attempted to defend himself, especially against the charge— which he well knew would be one of the most fatal brought against him—of having divulged certain of the royal secrets, and once more, in humble but passionate language, besought pardon. Henry was moved, but remained inexor- able ; and, on the 28th July 1540, Thomas Cromwell was beheaded.

Original. information concerning the career of Thomas Crom- well is to be found in Brewer, Calendar of State Papers of the Reign of Henry ViTT.; Sir Henry Ellis, Original Letters ; Reginald Pole,

'Apologia ad Carolum V. ; and Strype, Ecclesiastical Memorials, and

Memorials of Abp. Cranmer. Foxe and Burnet, on one side, and Lingard, on the other, are partisans ; and even their statements of fact are most inaccurate. (T. M. W.)

CRONSTADT, or Kronstant, a strongly fortified sea- port town of Russia and the great naval station of the Russian fleet in the northern seas, the seat

of the Russian adiniralty and of a military governor, is situated on the island of Kotlin, near the head of the Gulf of Finland, twenty miles west of St Petersburg, of which it is the chief port, in 59° 59’ 30” N. lat., and 29° 46’ 30” E. long. The island of Kotlin, or Kettle (Finn., Retusari, or Rat Island) is of calcareous formation, and in general outline forms

Environs of St Petersburg, showing position of Cronstadt.

an elongated triangle, seven miles in length by about one in breadth, with its base towards St Petersburg and the mouths of the Neva, and its apex extending obliquely seawards. The eastern or broad end is occupied by the town of Cronstadt, and shoals extend for a mile and a half from the western point of the island to the rock on which the Tolbaaken lighthouse is built. The island thus divides the approach by sea to St Petersburg into two channels ; that on the northern side is obstructed by shoals which extend across it from Kotlin to Lisi-ness on the mainland, and is only passable by vessels drawing less than 15 feet; the southern channel, the highway to the capital,

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is narrowed by a spit which projects from opposite Oranienbaum on the mainland, and, lying close to Cronstadt, has been strongly guarded by batteries. The town of Cronstad’ is built on level ground, and is thus exposed to inundations, from one of which it suffered in 1824, Its streets are regular and well paved ; the houses, with the exception of those belonging to the Government, are chiefly of one story. On the south side of the town there are three harbours—the large western or merchant harbour, capable of containing 1000 ships, the western flank of which is formed by a great mole joining the fortifications which traverse the breadth of the island on this side, the middle harbour used cluefly for fitting out and repairing vessels, and the eastern or war harbour for vessels of the Russian navy. The Peter and Catherine Canals, communicating with the merchant and middle harbours, traverse the town. Between them stood the old Italian palace of Prince Menschikoff—the site of which is now occupied by a large building used as a school for pilots. Among other public buildings may be mentioned the extensive naval hospital, the British seamen’s hospital established in 1867, the civic hospital, admiralty, arsenal, dockyards and foundries,

custom-house, barracks, exchange, several Greek churches, a Lutheran church, and English and Roman Catholic chapels. Defending the navigable passages are Forts Alexander, Risbank, Constantine, Peter the Great, Menschikoff, and Cronslott, all built of granite and armed with heavy guns. During the Russian war of 1854-55 Cronstadt was considered impregnable. Almost all vessels bound for St Petersburg touch at Cronstadt, and those drawing more than 8 to 10 feet of water load and unload here, the goods being conveyed to and from the capital in lighters. The port is ice-bound during the winter months from November till April; but in other months about 3000 vessels enter and clear. 'There is regular steam communication with St Petersburg, Peterhof and Oranienbaum, Revel, Helsingfors, Stockholm, Stettin, Lubeck, and Havre. The exports consist chiefly of tallow, corn, hemp, and flax, brought from the surrounding districts of the mainland. A very large proportion of the inhabitants are sailors, and large numbers of artizans are employed in the dockyards. The ironclad turret ship "Peter the Great" (9600 tons) and the "Duke of

Edinburgh " were built at Cronstadt in 1874-75. Cronstadt |

was founded in 1710 by Peter the Great, who took the island of Kotlin from the Swedes in 1703. The popula- tion at the census of 1867 was 45,115, but this varies very considerably at different times of the year, the town being very full in summer and partially deserted in winter.

CRONSTADT, Kronstapt, or Kritnen (Romanic, Brasiovu, Magyar, Brassé), a town of 'Transylvania, Austria, situated on the slope of the Transylvanian Alps, near the south-eastern corner of the principality, at an elevation of 1830 feet above the sea. Itis the capital of a district of the same name, also known as Burzenland, from the stream of the Burze, a tributary of the Alt, which waters it, a rich agricultural and pastoral country, though high-lying and with a cold climate, inhabited by an industrious population of Germans, Hungarians, Wallachs, Armenians, and Greeks. The town stands in a narrow valley, shut in by mountains, and consists of a well-built inner town dating from the 13th century and surrounded by walls, with suburbs named Altstadt, Blumenau, and Bulgarei. Cronstadt is the most populous centre of Transylvania; three-fifths of the people of the inner town are Germans ; the suburbs are chiefly inhabited by Magyar Szeklers, and by

Wallachs. Its principal buildings are the Gothic Protestant church, the finest in the principality, Other Lutheran churches, a Gothic Catholic church, the

Rathhaus with high tower, and a market-house built in 1545. On a height over the town rises a strong old castle of the German knights. After Hermannstadt this is the most important manufacturing and trading town of Transylvania. Iron and copper working, paper manu- facture, and printing (Cronstadt was the first place in Transylvania at which a printing press was established), wax bleaching, turkey-red dyeing, wool spinning, linen weaving, leather and bottle making are. its chief industries, and it possesses at least sixty large trading houses. Its communications are kept up by a railway uniting it with the Hungarian system, and by passes over the mountains into Wallachia. The nearest of these passes are those of Témésch, nine miles south, with a summit elevation of 3645 feet, and that which leads through the village of Térzburg, 20 miles south-west of the town. Population of commune (1869), 27,766.

CROQUET, Fr. from croc, a crook, or crooked stick (Du Cange, Glossarium). 'The game has been derived by some writers from pazlle-maille (mall), which was played in Languedoc at least as early as the 13th century. Mall was fashionable in England in the time of the Stuarts. It was played with a ball (pila), and a mallet very similar to the mallets now in use, and with two hoops, or a hoop and a peg, the game being won by te player who ran the hoop or hoops and touched the peg under certain conditions in the fewest number of strokes. Croquet certainly has some resemblance to paille-maille, played with more hoops and more balls.

It is said that the game was brought to Ireland from the south of France by the eldest daughter of Sir Edward Macnaughten some twenty-five years ago ; but Mr Dickson, an ivory turner, of Gracechurch Street, London, remembers, having made a set of croquet implements for Ireland over forty years ago. At all events, the re-introduction of the game by Miss Macnaughten, under whose auspices it was first played on the lawn of the late Lord Lonsdale, in 1852, marks the time when it became of sufficient im- portance to find a regular maker of croquet implemeuts in London. Shortly afterwards, in 1856, Mr Jaques of Hatton Garden, London, saw the game in

Ireland, and commenced manufacturing it in England, where it soon became very popular.

One of the first symptoms that the game had taken root was the playing of a public match on the bowling green at Evesham in Worcestershire in 1867. In 1868 the first all-comers' meeting was held on the cricket ground at Moreton-in-Marsh. In the same year the All England Croquet Club was formed, and on the grounds of this club at Wimbledon the annual contest for the championship takes place. The laws of the game, which are used in all public matches, were settled by a conference of delegates from the principal croquet clubs in 1869, 1870, and 1873 (Conference Laws, De la Rue and Co.). In addition to these, laws for the regulation of prize-meetings (Horace Cox) were issued by the A. E, C. C., which are the authority for the management of such meetings. Accord- ing to these laws, match games are played on a ground measuring 40 yards by 30, with four balls, two forming a side against the other two,—one player owning two balls, or four players each taking one ball. In match play the hoops and pegs are set and run as in the diagram mg. 1).

We hoops are of 4-inch round iron, painted blue, and are 4 inches in width (inside measurement) for handicaps, and for ladies and ordinary matches, and 3? inches wide, steel braced, with oak sockets, for championship matches for gentlemen. They and the pegs are thus named. im order— 2.¢., in the order in which they are to be run or made. First hoop, second, third ; three to peg, two to peg, one to

peg; turning peg; first, second, and third back; three, two, and one to go out or last hoop ; winning peg.

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~~Fie. 1, —Croquet Ground—Setting of Hoops.~~

~~Distances on a full-sized ground.—Pegs in centre line of ground, 8 yards from nearest boundary. Hoops up centre line of ground 8 yards apart and 8 yardsfrom pegs. Corner hoops 7 yards from centre and in a line with pegs. Starting spot 1 foot from left-hand corner hoop and opposite its centre.~~

~~The height of the hoops and pegs and various minor matters have been also settled by the same authorities. The balls are of boxwood, 33 inches in diameter, and should weigh not less than 144 oz. There is no restriction as to the size, weight, number or material of the mallets employed; in striking, the cue and mace strokes are not allowed, and the head of the mallet only must be used. The most approved mallets have box- wood heads and ash handles; they weigh from 3 ib to 4 h, and are from 32 inches to 35 inches in length. The patterns vary considerably.~~

~~In playing the game, the objects are to make all the points (hoops and pegs) of the balls belonging to one side, in the order shown in the diagram, and to prevent the adversaries from doing the same. The side that first succeeds in making all its points in order wins the game. The striker is entitled to another stroke, or to continue his turn so long as he succeeds in making his next point, or in causing his ball by a stroke of the mallet to hit another ball (called making a roguet), when he must place his ball in contact with the one roqueted, and striking his own ball with the mallet he must move the two balls which are in contact, sending them in any directions he pleases, called taking croquet. If in his stroke after taking croquet he hits another ball or makes his next point, he similarly continues until he fails to do either, when itis his adversary’s turn. Each ball can only be roqueted once during each turn, unless a point in order is made, when each ball can again be roqueted as at first. This rule does not apply to the winning peg, as when that is hit in order the ball is out of the game.~~

~~The striker should stand with the feet about 15 inches apart, with the toe of the right foot at right angles to the line of aim, the other being somewhat turned out. The body should be inclined over the ball, so that the player can~~

~~look down upon it. The mallet should be grasped with both hands, and the striking face placed close to the ball, so that a line drawn through the mallet head and centre of the ball gives the line of aim. The striker, having taken his aim, should keep his eye on Ais own ball, and should then lift the mallet, and strike the ball quietly and without hurry, in the line of aim. For gentle strokes the wrist is mainly used ; harder strokes are played more from the arm and shoulder.~~

~~When able to make a roquet at several yards with tolerable certainty, the learner should next practise rushing, 4.¢., roqueting with such force as to move the ball aimed at some distance, and cutting, which is a rush played fine instead of full. To avoid accidentally jumping over in~~

~~playing rushes, care must be taken not to hit down on the striker's ball; this is effected by carrying the mallet up towards the left shoulder after striking, — just the stroke that would be called badly hit at cricket.~~

~~When able to rush, the strokes made in taking croquet, viz., splitting, taking off, rolling, passing, and stopping, should be practised.~~

~~The split, which sends the two balls in different given directions, may be made to a certainty by dividing the angle, as in the half push at billiards. G Thus, if the striker wishes to croquet his own ball in the direction A (fig. 2), and~~

~~the other ball in the direc- Mas (~-)~~

~~tion B, he must aim in the direction C, and strike, not push his ball. a~~

~~The take of'is merely a thin Fic. 2.—Illustrating the " split"' split, in which the roqueted PM ball is moved slightly. If an imaginary line is drawn through the balls and another at right angles to it, as in diagram, and the aim made a little to the right of the second line. viz. at A (fig. 3), the striker's ball will travel in~~

~~Fic. 3.—Illustrating the " take off" at croquet.~~

~~the direction required, viz., to B, and the other ball to C. When taking off from the side of the ball furthest from tho striker, the aim must be slightly to the left of the line of aim.~~

~~Rolling croquet, in which the balls are sent together in nearly the same line, is made by trailing the mallet after the balls as soon as the stroke or tap is made. Care must be taken not to make a second tap, or the stroke is foul.~~

~~Passing croquet is a sort of roll, The front ball must be placed about 30 degrees out of the line along which it is intended to pass the striker's ball, in order to avoid a kiss, and, after the stroke, the mallet must remain in contact with the striker's ball, and its rate of going must be accelerated by a push. If the ball is hit twice the stroke is foul.~~

~~The stop stroke is made by means of a sharp clean tap, the mallet being arrested in its onward course as soon as it has struck the ball. For stop strokes, where it is desired to move the striker's ball very little and to send the other ball a considerable distance, a light mallet (called a stop mallet) is required.~~

~~In addition to the mastery of these strokes and also of the jump stroke, which is played by striking down on the ball, and is very useful for running narrow hoops at an angle, strength has to be learned in order to obtain position. Judging strength is mainly a matter of practice.~~

~~When the above strokes can be played with tolerable certainty, they should be made use of in practising breaks. A break is made when two or more points are scored in order. To practise the break, place the striker's ball on the starting spot (see diagram of setting); place a bal! several feet on the other side of the first hoop, a ball near the second hoop, and one in the middle of the ground. Make the first hoop, and then roquet the ball placed near. Drive this ball by a medium roll near the third hoop, and leave the striker's ball near the ball in the middle of the~~

~~¥i ==~~

~~ground. Roquet this ball and take off to the second hoop. Use the ball placed there to make that hoop; then roquet it after running the hoop and send it to the hoop three to peg, going to the middle of the ground with the striker's ball, Take off to the third hoop, make it with the ball placed there to help, and then send it to the hoop one to peg, going with the striker's ball to the one in the middle of the ground. Then rush it to hoop two to peg, and take off to the hoop three to peg, OF failing a rush, roll or split it to two to peg, and the striker's ball to three to peg. Make that hoop, and split, roll, or rush the ball placed there to help to hoop second back, going to ball placed near hoop two to peg. Px~~

~~By judicious repetition of these or similar tactics there is no limit to the number of points that can be made. The practice should be continued until, on good ground, with 4-inch hoops and three balls to help, the break of fourteen points becomes a feat easy of accomplishment.~~

~~In order to become an adept at the game, judgment must be added to mere execution. Judgment cannot be taught in writing, further than by laying down certain principles of play. They are briefly as under :—~~

~~1. Keep the partner balls together, the adverse balls apart.~~

~~It is clear, from the remarks on the break, that at most one or two points can be made without a ball or balls to help; hence going to the next hoop in order is very poor tactics, if we regard the advantages gained by helping partner by keeping near him, and by separating the adversaries, or at least giving partner the opportu- nity of separating them.~~

~~5. When out of the break, it is often a nice point whether to go to partner, or to finesse to the boundary, or to take a shot at the oppo- nents. As a rule a long shot should not be attempted if failure would leave the ball in the adversary's game, where it may be brought into play to help him in his break. Also the question often arises whether to separate the adversaries at once or to con- tinue the break. The answers to these questions must depend on the striker's estimate of his ability and of his adversary's ability, and on the state of the game.~~

~~The principal exception to playing to partner's ball is when the ball played with is a rover and the adversary is also a rover, and has a fair probability of making a roquet next time. For, under these circumstances, the opponent will take off to the tio adverse balls and rush the rover up to the winning peg, and very probably peg it out.~~

~~3. Keep the last player in your game.~~

~~The object of this is to prevent the adversaries from combining at their next stroke. It compels the next player either to take an uncertain shot which may bring him into the game, or to finesse.~~

~~The last player may be kept, either by sending him to partner during or at the end of the turn, or by putting him near partner's hoop and then going to partner.~~

~~The striker should, if the opportunity offers during his break, pick up the last player for the reasons already given.~~

~~When sending the next player away, choose such part of the~~

~~ground to send him that if he takes a shot it brings him into partner's~~

~~game. f 4. Make the break with two or three balls to help, in preference 0 one.~~

~~The reason is obvious to those who have practised the break. Skilful players endeavour to keep all the balls in the break ; but the safe plan for novices is to dismiss the next player and to make the break with two balls to help. ae When in the break do not play uncertain strokes on the next~~

~~ayer. For any mistake made then gives the break to the adversary. It is, however, a matter of judgment how farrisks may be run, varying with the amount of skill and nerve of the striker.~~

~~When partner's ball is a long way off, using the last player to help is just as dangerous as using the next player.~~

~~6. At the end of the break play partner's game.~~

~~This is accomplished by leaving him the last player's ball to help and going to his hoop, or vice versa, or by leaving him a rush to his hoop and a ball at his next hoop but one, and in several other ways, which will be apparent to any thoughtful player.~~

~~See Walter Jones Whitmore, Croquet Tactics, London, 1868 ; Arthur Lillie, Zhe Book of Croquet, London, 1872; R. C. A. Prior, M.D., Croquet Notes, London, 1872; James Dunbar Heath, The Complete Croquet Player, London, 1874. (H. J.)~~

~~CROSS (Latin, crux ; Greek, aravpés). In its simplest aspect, a figure produced by the intersection of two lines at~~

~~which may consistently be rendered~~

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~~right angles, understood to punishment, or a gibbet formed of two pieces of wood fixed together cross-wise without any reference to their~~

~~the cross in its primary signification is denote an instrument for inflicting capital~~

~~relative proportions. Metaphorically,the term cross implies death thus inflicted, and so it becomes synonymous with crucifixion, and is often used to denote any exceptionally severe pain or heavy trial. The manner in which Christ~~

~~suffered has caused the cross, as the instrument for cruci-~~

~~fixion, either to be associated directly or indirectly with His death, or to be regarded as having a reference to that fundamental fact of Christian history. And the same fact may be assumed to be symbolized by the cross in every modification of form and variety of adornment in use, for whatsoever purpose, throughout Christendom.~~

~~The ancient practice of execution by hanging criminals on trees apparently led to the adoption of crosses con- structed for a similar purpose. Hence,~~

hanging from some part of a tree and the being fixed to a cross appear to have conveyed to the Romans the same import ; accordingly the expressions infelix arbor and infelex lignum, each ot 'the accursed tree," alike denoted crucifixion (Cicero, Pro Rabir., 3; Seneca, Ep., 101; Tertull., Ap. viil. 16).

The barbarous execution by crucifixion, of which traces

are to be found from remote times among the nations of the East and North, was carried into effect in two forms

—(1) when the sufferer was left to perish bound to a tree

or an upright stake, sometimes after being impaled ; and

(2) when by nails driven through his hands and feet, his limbs also sometimes further secured by cords, the sufferer was fixed with outstretched arms to a cross having a horizon- tal bar as well asa vertical stake. The terms employed in the Gospel narratives render it certain that Christ thus was crucified. According to Lipsius (De Cruce, i. 5-9) and Gretser (De Cruce Christi, vol. i. ce. 1), a single upright stake was distinguished as crux semplex, while to the actual cross, formed of two pieces of wood, the name crux composita or compacta was applied. The crua composita, compound cross, or " cross" properly so called, appears under the following modifications of form :—Crux immissa or capitata, formed as in this figure [5 crux commissa or ansata, thus formed, JT; and crux decussata, when the cruciform figure is set diagonally after the manner of the Roman letter X. It was upon a crux immissa that Christis generally believed to have died. This cross is a "Latin cross," when the shaft below the transverse bar is longer than that part which rises above the transverse bar, as |; and when the four limbs are of equal length, as in +, it 1s a " Greek cross." The X, or crux decussata is further distinguished as the "St Andrew's cross," in consequence of the apostle Andrew, according to a tradition, having been crucified on a cross of this form. The crux commussa, T, is also entitled the "Cross Tau," from the Greek capital T'; and in the Middle Ages it was distinguished as the " cross of St Anthony."

The gratuitous barbarity of scourging as a prelude to crucifixion, and of compelling the condemned sufferer to carry his cross, or one of the parts of

~~it, to the place of execution, were but too strictly in keeping with the cruel character of the Romans. Crucifixion with the head downwards, of which Seneca speaks (Consolat.ad Mare., c. xx.), the mode in which St Peter is said to have chosen to suffer, was a refinement on the barbarity of the cross no less consistent with Roman cruelty.~~

~~The well-known legend of the " Invention of the Cross" (commemorated on the 3d of May), or the finding the actual cross on which Christ had suffered, by the Empress Helena, the mother of Constantine the Great rests on the~~

~~concurrent testimony of four Byzantine ecclesiastical historians (Rufinus, i. 7 ; Socrates, i. 13 ; Theodoret, i. 18; and Sozomen, ii. 1), who all wrote between 75 and 100 years after the incidents related, and whose story was accepted and supported by Cyril of Jerusalem, Ambrose, and Chrysostom (seealso Tillemont, Mem. Hccles.,the chapter on Helena, and Jortin's. Remarks, vol. iii.). The story is to the effect that the empress, when visiting the scenes hallowed by the Saviour's ministry and sufferings, in the seventy-ninth year of her age (326), was guided to the site of Calvary by an aged Jew who had treasured those local traditions which the anti-Christian animosity of the heathen conquerors of Jerusalem had not been able to obliterate. On excavation at a considerable depth three crosses were found ; and with them was the title placed by Pilate's command on the cross of Christ, lying apart by itself. The cross of Christ was identified by a miracle, one only of the three crosses found having proved to be endowed with the power of instantaneous healing conveyed by atouch. This test by miracle was applied at the suggestion of Macarius, bishop of Jerusalem ; and its result, of course, was held to be con- clusive. Having built a church over the site of the '" Invention," where she deposited the greater part of the supposed real cross, Helena took the remainder to Byzan- tium, whence a portion of it was sent by Constantine to Rome, where it was placed in the church of Santa Croce in Gerusalemme, built expressly to receive so precious a relic. A festival to commemorate the discovery of this relic soon was established ; pilgrimages, undertaken in order to obtain a sight of it, next followed ; then fragments of the sacred wood were sold at high prices to wealthy votaries ; and, after a while, in order to meet the exigencies of**

~~the case, the Roman ecclesiastical authorities assured the increasing crowds of anxious purchasers that the wood, if no longer working miracles of healing, exercised a power of miraculous self-multiplication, wt detrimenta non sentiret, et quasi intacta permaneret (Paulinus, Hp. xi. ad Lev.). In the 13th century, what remained of the portion of the cross taken by Helena to Constantinople is said to have been removed, during the reign of St Louis, to Paris, and to be still preserved in the Sainte Chapelle.~~

~~After the capture of Jerusalem by the Persians, in 614, the remains of the cross were taken to his capital by Chosroes II.; but, having been recovered by Heraclius (628), they were brought by him to Constantinople, and after. wards to their former resting-place in Jerusalem, where their re-appearance was said to be hailed with a miraculous welcome. In after times this restoration was comme- morated by the festival of the " Exaltation of the Cross," held on the 14th of September. The transient revival of the Christian power in Jerusalem was speedily followed (637) by the conquest of the Holy City by the Saracens, by whom the cross relic may be assumed to have been destroyed; at all events, after the Saracen conquest nothing more is heard of that relic in connection with Jerusalem. A subterranean chapel, however, said to have been built upon the site of Helena's church, and which bears the title of the "' Chapel of the Invention of the Cross," still exists, and is connected by a flight of steps with the so-called Church of the Holy Sepulchre.~~

~~The piece of wood supposed to have been inscribed with the title placed upon the cross of Christ, and found with the three crosses by Helena, and retaining traces of Hebrew and Roman letters, is said to be still preserved at Rome, whither it was sent by Constantine. After having been long lost to sight and apparently to remembrance also, this relic—so goes its history—was accidentally discovered in the leaden chest in which it had been deposited by Constantine ; and both the fact of its discovery and the genuineness of the relic itself were attested by a Bull of Pope Alexander III. The earliest writers are silent as to the kind of wood of which the title-board and also the three crosses were made ; but a tradition, which notwith-~~

~~*standing its extreme improbability may be traced toa very early era, represents the true cross to have been formed either of cypress, pine, and cedar, or of cedar, cypress, palm and olive. (See facsimile reproduction, 1863, 4to, by J. P. Berjeau, of the History of the Holy Cross, originally printed by J. Veldeuer in 1483.)*~~

~~*In connection with the discovery of the cross itself and its attendant title, the nails used at the crucifixion, and asserted to have been included in the "Invention" by Helena, have a legendary history of their own. One of the original four is declared to have been thrown by the empress herself into the Adriatic when agitated by a violent storm, with the effect of producing an instanta- neous calm. A second nail after having been placed either in his crown or in his helm by Constantine, is said to have been found in a mutilated state in the church of Santa Croce. The Duomo of Milan claims the possession of the third nail, and Treves that of the fourth. It must be added that some early traditions limit the number of the nails to three; while, on the other hand, certain writers have raised the number of the nails as high as fourteen, for the safe keeping of each one of which places have been found. In the illustrations of the crucifixion given by 'Lady Eastlake (History of our Lord, vol. ii.), sometimes we find a single nail, and at other times two nails, used for the feet. That accomplished lady seems to consider the separa- tion of the feet with a nail for each to be characteristic of the earlier conceptions of the crucifixion, which present Christ after He had been nailed on the cross as still "alive and erect, and apparently elate; His feet always separate, and with two nails upon the footboard, or swp- pedaneum (a Greek feature), to which they were attached ; the arms at right angles with the body, the hands straight, the eyes open." The swppedanewm is supposed to have been a piece of wood projecting slightly from the shaft of the cross beneath the feet of the sufferer, with a view to afford some support to his body. It is in the later representations that one of Christ's feet appear placed over the other, the ankles being crossed, when a single nail pierces both the feet, or both the ankles. For many curious particulars concerning representations of the crucifixion and its attendant incidents in early and medixval art, readers are referred to Lady Eastlake's volume ; also to Mrs Jameson's Legends of the Madonna, and Sacred and Legendary Art. Early writers all incline to the more probable opinion that Christ was attached to the cross while it lay on the ground; Bonaventura, however*~~

(born 1221), states that he ascended a ladder, and was nailed to the cross standing, after the cross itself had been erected and fixed in its position. " The impress of each opinion is seen in art," writes Lady Eastlake (Hest. of our Lord, ii. pp. 130-133), " that of our Lord ascending the ladder on the cross being the earliest, that of His extending himself on the ground being the most frequent." A remarkable example of the latter opinion occurs in the sculpture of one of the bosses in the vaulting of the twelfth bay of the nave of Norwich Cathedral, where the figure of Christ is further represented as having the extremities of the limbs drawn by cords to the shaft and the ends of the transverse beam of the cross, as a preliminary to the driving the nails. The cross, when raised and fixed erect, doubt- less elevated the sufferer to no unnecessary height, his feet then probably being not more than 18 or 20 inches above the surface of the ground. In comparatively late medieval heraldry the cross, with the other instruments connected with crucifixion—as the hammer, nails, ladder crown of

thorns, spear, hyssop, scourge, seamless coat, and dice—were often blazoned on shields introduced in Gothic edifices and upon monumental memorials, as " Symbols of the Passion." Be:

The name crucific is applied to a Latin cross, in size either small or large, to which a human figure, designed to represent the body of Christ when suffering crucifixion, 18 affixed. :

As a symbol of the Christian faith at once pre-eminently characteristic and significant, the cross in varlous modifica- tions of its form would naturally be adopted on very many occasions, and used in a diversity of ways throughout the Christian world. Scarcely less natural also was it that from an early era Christian writers should have treated the symbolism of the cross with fanciful and even extravagant refinement, and endowed it with mysterious attributes ; while superstition, which as time advanced threw so baneful a shadow over Christianity itself, would not fail to deal after its own fashion with the sign of the cross. It is curious, on the other hand, that a cruciform device having diverse significations should have occupied a prominent position among the many sacred and mystic figures and symbols connected with the mythologies of heathen antiquity. Such certainly was the

~~case in Egypt, Assyria, Persia, and India, and also among the Scandinavian races of the North. Possibly the cross figure sometimes may have found its way among heathen symbols in early Christian times; and, again, the presence of the great symbol of Christianity in such an alliance on other occasions may have suggested an early Christian influence that never had any real existence. In the Middle Ages the cross sign was universally held to be the special and distinctive symbol of Christianity, as, to the present day, the cross and the crescent are symbols which distinguish the faith of the Christian from that of the Moslem.~~

~~In the great art of Christian architecture, and throughout the entire range of medieval decorative art, the cross sign has exercised a most powerful influence. The ground on which the grandest churches, as well as many others of a less aspiring order were erected, was made to assume a cruciform plan, so that the very walls from their foundations upwards might carry with them, as they rose, the image of the sacred sign, to receive its crowning figure displayed in the ridge-lines of their roofs. * Crosses, exhibiting an endless variety of form, proportion, and adornment, surmounted the loftiest and most important architectural members of cathedrals and churches; and here and there upon the masonry they attested the consecration for Christian wor- ship of the buildings which bore them; five crosses, in like manner (their number determined by the five wounds of the crucified Christ) gave similar witness to the consecra- tion of every altar slab ; and monumental stones of every kind in the pavements of the churches repeated the same great sign, to proclaim that each one of the dead who rested there had died in the faith. With the triumph of Christianity, the cross at once was recognized as a universal symbol of the highest dignity and honour. It was made of the most precious materials, enriched with the most costly gems, and adorned with most exquisite art. The cross became the proudest ensign upon royal diadems ; and it gave both their form and their name to the noblest insignia of knightly rank. The cross crowned the sceptres of princes ; and the greatest warriors were proud to see the cross as well in the hilts of their swords as in the banners under which they fought. In private life also the cross was held in corresponding estimation ; and, accordingly the most beautiful and most highly prized personal orna ments appeared in some cruciform type. Thus~~

~~was art taught to aid in realizing the enthusiastic sentiment of Justin Martyr, when he said (Apol. i. 72)—‘ The sign of~~

~~CROSS~~

~~the cross is impressed upon the whole of nature. There is hardly a handicraftsman, also, but uses the figure of it among the implements of his industry. It forms a part of man himself, as may be seen when he raises his hands in prayer.”~~

~~The simplest treatment of the plain rectangular cross (fig. 1), with a view to its enrichment, may be assumed to have consisted either in expanding each limb from the point of their common intersection, and so forming a “ Maltese~~

~~Shop OG~~

~~Fries. 1-6.—Varieties of Cross,~~

~~cross ” (fig. 2), or by giving some ornamentation to each limb at its extremity (fig. 3). The expanded cross, when of Greek proportions (fig. 2), would readily suggest having its extremities bounded by curved lines, and then the inclosure of such a cross within a circle would naturally follow (fig. 4), The next step would be either to place a circular disc upon the cross, as at Iona (fig. 5), or to extend the limbs of the cross beyond the circle, as in fig. 10, the west gable cross of Washburn Church in Worcestershire, or in fig. 6,~~

~~Fig 6.~~

~~Fig. 7. Fig. 8.~~

~~Fig. 9. In any of these cases the addition of a shaft~~

~~also at Iona. would produce a Latin cross. The circular band, again, thus associated with a cross would naturally lead to the in- troduction of decorative accessories specially connected with itself, as in fig, 11, from the gable cross of the nave of the church at Castleacre, Norfolk. The~~

combination of an erect cross with a diagonal one would be another modification, producing a cross of eight points, easy of attainment, and one that in its turn would suggest and lead to a variety of further modifications of constrac- tion, with many diversified enrichments. From known examples still in existence, and in fair if not perfect preservation, it is evident that the medizval artists delighted to expatiate in the wide field opened out before them for designing the cross sign under fresh conditions of both form and decoration. 'They wrought leaves and flowers into cruciform figures, and adorned their crosses with foliage in every degree of richness. They made the cross both simple and compound ; they introduced it in combination with other figures and devices ; and they composed it from figures and devices, each one of them having some definite motive or significance of its own.

Market and other Crosses.—In addition to acting as 2 finial to gables, as in figs. 10 and 11, and in fig. 12 from the east gable of the nave of Hethersett Church in Norfolk, and also to various other architectural members of edifices, the symbol which surmounted them gave its name in the Middle Ages to certain structures well known as " crosses." These include market-place crosses, open arched and vaulted structures, sometimes of considerable size ; churchyard crosses, usually consisting of a tall shaft raised on steps and often much enriched, and either surmounted by a bold cruciform figure, or having a canopied head with statuettes and a cross finial; and wayside crosses, in their general character resembling those erected in churchyards, designed to commemorate some memorable incident on the spot

| where it took place. Many of these crosses still exist in

CROSS

different parts of England, and some are of very early date; the Irish crosses, also, are eminently curious and

Fics. 10-12.—Finial Crosses.

interesting. Upright architectural crosses of memorial, erected with a view to their being expressly associated with sepulchral commemoration, may be

~~considered to form a distinct class. Such are the beautiful and justly famous Eleanor crosses, originally nine in number,—- at Lincoln, Nor- thampton, Stony Stratford, Woburn, Dunstable, St Alban's, Waltham, and Cheap and Charing in London. From the accounts of the executors of Queen Eleanor it appears that the whole of these crosses, designed to mark the places where the funeral procession of the first Edward's first consort halted for rest, were executed and erected between 1291 and 1294. The cross at Geddington, generally considered one of the "Eleanor" series, is not recorded in the roll; and of the nine therein specified two only now are standing,—those at Northampton and Waltham~~

~~Monumental crosses upon stone coffin lids or sepulchral | ? : P 3 | sometimes was called '"' Gammadion."~~

~~slabs, which in England first appear at the close of the 11th~~

~~century, and from that period gradually become general, |~~

~~are executed either in low relief or by incised lines; in | the formidable cross-formed hammer of Thor, and is~~

~~| accordingly known by the third title of " Thor's hammer."~~

~~some instances the two methods of treatment are com- bined. Occasionally repeated in the same example, the cross sign, exhibiting a truly wonderful variety of design, at first appears alone, the shaft or stem almost always con- siderably elongated, and often enriched with sprouting foliage or some other ornamentation. Fig. 13, from Strad- sett church, Norfolk, and fig. 14, from Bosbury, Here-~~

~~[1 Fig. 13. Fig. 14.~~

~~Fics. 13 and 14.—Monumental Crosses.~~

~~fordshire, are characteristic examples of enriched monu- mental crosses. When the elongated shaft of a cross on a slab rises from two or more steps at its base, it is said to be a Calvary cross. After a while, a brief inscription~~

is found to have been added. Then the further addition appears to have been introduced of some

device or figure, which might symbolize the profession, occupation, rank, or office of the person commemorated,— such as a pastoral staff for a prelate, a chalice for a priest, a sword for a knight, a trumpet for a trumpeter, a bell for a bell-founder, a hammer and pincers with a sword for an armourer, a horse-shoe and hammer for a smith, d&c. Ina few instances, a knightly sword placed erect in the centre of a slab either acts as the shaft of a cross, or with its cruciform guard to the hilt the figure of the weapon itself becomes the cross symbol. There are also occasionally found early monumental stones, upon which both a cross and the head or bust and the feet of a human figure are so treated as to form a single composition. Kneeling figures, again, are sometimes introduced either at the foot of a monumental cross, or on each side of the shaft of such a cross ; and full length figures, and sometimes half figures, in other examples appear placed within the expanded floriated heads of monumental crosses. (See Walter's and Boutell's Monumental Brasses ; Boutell's Christian Monu- ments ; and Cutts's Manual of Sepulchral Slabs.)

In the heraldry of the Middle Ages the cross, its form and enrichment treated in many ways, as a charge is second to none in rank and estimation (see HERALDRY). The English cross of St George is a plain red cross set erect on a white ground; the Scottish cross of St Andrew is a plain diagonal white cross on a blue ground; and the Trish cross of St Patrick is a plain diagonal red cross on a white ground. The "Tau" cross, which occasionally is found in English heraldry, is blazoned as in fig. 7. Another form of cross, shown in fig. 8, bears the name of "Fylfot," and is one of the most singular, as it is one of the most ancient, of the many forms and modifications of this symbol. Considered by some writers to be composed of four Greek capital "Gammas" conjoined, this mystic figure, which was in high favour with carly secret societies, In the mythology of the North, again, it was held to symbolize " Mjolnir,"

It occurs in both Scandinavian and Roman relics ; and it was in frequent use as a decorative device in the Middle Ages, especially as a mark upon

bells. On the monument of Bishop Bronescomb, 1281, in Exeter Cathedral, the fylfot has its limbs alternately yellow and red. .

Initial crosses were placed in the Middle Ages at the commencement of inscriptions, and occupied a similar position in written documents of all kinds. The initial cross of the inscrip- tion to Abbot Thomas Delamere, upon his brass at St Alban's (1360), is an interesting example, since it is formed of a delicate erect cross floriated at its extremities, which surmounts a bolder diagonal cross, or cross saltire, the armorial ensign of the abbey of &t Alban.

Knightly crosses.—The cross worn, as distinctive of their order, by the Knights Templars, was a red cross of eight points (fig. 9) upon white. The cross of the Knights Hospitallers, or Knights of St John, was of similar form, but white and worn on a black ground ; from the years 1278 and 1289, however, when engaged with military duties, the Knights of St Johu wore a plain straight white cross upon red. (For the crosses of the monastic orders, see Costumz, p. 463). The cross of the Danish order of the Dannebrog (fig. 15), a white cross surmount- ing a red one, with the royal crown, the cipher of reigning sovereign, and the motto "For God and the King," is a

Fic. 15.—Cross of the Dannebrog.

characteristic example of the use of the great Christian symbol in the insignia of the knighthood of the present day. In the highest class of British insignia, the cross appears on the circlets only of the imperial crown and of the

coronets of princes and princesses of the blood royal.

A pectoral cross, formed of rich and costly materials, was worn at times by ecclesiastics of the highest rank, In the East pectoral crosses were worn, suspended about the breast, as both imperial and Characteristic examples of the pectorale occur in the effigies of Bishops Kilkenny, 1255, at Ely ; Giffard, 1301, at Worcester; and Langton, 1321, at Lichfield. This same

~~term " pectorale " may consis- tently be applied to all crosses, worn under similar condi- tions by personages of exalted rank. Of such crosses & specimen of singular interest and great beauty, now well known from fac- simile reproductions of it as the ' Dagmar cross" (fig. 16 shows both sides of it), was found~~

~~neck and resting on the episcopal ornaments.~~

~~Fria, 16.—Dagmar Cross.~~

~~about 1690 (when her tomb was opened), lying on the breast of the remains of Dagmar, " the bright day," the queen of Waldemar II., king of Denmark, who died in 1213. This jewel, certainly of Byzantine design and workmanship, is of gold, enamelled, having on one side a crucifix, and on the other side portraits of Christ (in the centre), of St Basil, St John Chrysostom, St Mary the Virgin, and St John the Apostle- Evangelist.~~

~~Crosier or Crozier is the title given to the official staff of an archbishop, which has a cross-head, and so is distinguished from the " pastoral staff" of bishops and abbots, the head of which is curved and resembles that of a shepherd's crook. Examples of the crosier occur in the brasses to Archbishops de Waldeby, 1397, in Westminster Abbey, and Cranley, 1417, in New College Chapel, Oxford ; the latter example has a crucifix for its head, which is the case also in a remarkable drawing of an archbishop in the Lambeth Psalter (c. 1300) in the library at Lambeth. The fine effigy of Archbishop Walter de Gray at York, 1255, has a crook- head staff of geeat beauty; in his brass, too, at Chigwell, Essex, Archbishop Harsnett, 1631, is represented, not with a crosier, but with a pastoral staff. Instead of having crook-heads, the crosiers of the prelates of the Greek Church have heads of the "Tau" form, and the extremities of the horizontal bar are curved upwards. 'The staff of a patriarch has a double cross-head ; and the head of the pontifical staff of the Pope has a triple cross. Good examples of the pastoral staves of bishops and abbots abound in their monumental effigies, of which one of the most admirable isin the brass to Abbot Delamere (c. 1360), at St Alban's. The magnificent enamelled staff of Bishop William of Wykeham, as is well known, is still preserved at New College, Oxford. (c. B.~~

~~CROSSBILL (Fr. Bee-croisé, Germ. Kreuteschnabe), the name given to a genus of birds, belonging to the family /ringillide, or Finches, from the unique~~

~~peculiarity they possess among the whole class of having the horny sheaths of the bill crossing one another obliquely,! whence the appellation Lowia (Aog¢s, obliquus), conferred by Gesner on the group and continued by Linneus. At first sight this singular structure appears So like a deformity that writers have not been wanting to account it such,? ignorant of its being a piece of mechanism most beautifully adapted to the habits of the bird, enabling it to extract with the greatest ease, from fir-cones or fleshy fruits, the seeds which form its usual and almost invariable food. Its mode of using this unique instrument seems to have been first described by Townson (Z'racts on Nat. Hist., p. 116, London: 1799), but only partially, and it was Yarrell who, in 1829 (Zool. Journ., iv. pp. 457-465, pl. xiv. figs. 1-7), explained fully the means whereby the jaws and the muscles which direct their movements become so effective in riving asunder cones or apples, while at the proper moment the scoop-like tongue 1s instantaneously thrust out and withdrawn, conveying the hitherto protected seed to the bird's mouth. Without going into details it may be observed that in the Crossbills the articulation of the mandible to the quadrate-bone is such as to allow of a very considerable amount of lateral play, and, by a parti- cular arrangement of the muscles which move the former, it comes to pass that so soon as the bird opens its mouth the point of the mandible is brought immediately opposite to that of the maxilla (which itself is movable vertically), instead of crossing or overlapping it—the usual position when the mouth is closed. The two points thus meeting, the bill is inserted between the scales or into the pome, but on opening the mouth still more widely, the lateral motion of the mandible is once more brought to bear with great force to wrench aside the portion of the fruit attacked, and then the action of the tongue completes the operation, which is so rapidly performed as to defy scrutiny, except on very close inspection. Fortu- nately the birds soon become tame in confinement, and a little patience will enable an attentive observer to satisfy himself as to the process, the result of which at first seems almost as unaccountable as that of a clever conjuring trick.~~

The Common Crossbill of the Palearctic Region (Loma curvirostra) is about the size of a Skylark, but more stoutly built. The young (which on leaving the nest have not the tips of the bill crossed) are of a dull olive colour with indistinct dark stripes on the lower parts, and the quills of the wings and taildusky. After the first moult the differ- ence between the sexes is shown by the hens inclining to yellowish-green, while the cocks become diversified by orange-yellow and red, their plumage finally deepening into a rich crimson-red, varied in places by a flame-colour. Their glowing hues are, however, speedily lost by examples which may be kept in confinement, and are replaced by a dull orange, or in some cases by @ bright golden-yellow, and specimens have, though rarely, occurred in a wild state exhibiting the same tints. The cause of these changes is at present obscure, if not unknown, and it must be admitted that their sequence has been disputed by some excellent authorities, but the balance of evidence ig certainly in favour of the above statement. Depending mainly for

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1 As an accidental malformation, however, the peculiarity has been many times observed in other groups of birds, and especially in the Crows (Corvide). Such cases may be well compared to the monstrosity often seen in Rabbits and other members of the Order Glires, wherein the incisor teeth grow to inordinate length. ; i

2 The special animosity of De Buffon on this point may perhaps be

| explained by the existence of a medizval legend (of which, however,

be it said, he takes no notice), best known to English readers by Mr Longfellow's pretty version of M osen's poem, to the effect at the bird acquired its peculiar conformation of bill and coloration of p er recognition of the pity it bestowed on the suffering Saviour at the crucifixion

food on the seeds of conifers, the movements of Crossbills are irregular beyond those of most birds, and they would seem to rove in any direction and at any season in quest of their staple sustenance. But the pips of apples

are also a favourite dainty, and it stands recorded by the old chronicler Matthew Paris (Hist. Angl. MS. fol. 252), that in 1251 the orchards of England were ravaged by birds, "pyomorum grana, & non aliud de eisdem pomis comedentes," which, from his description, " Habebant autem partes rostri cancellatas, per quas poma quasi forcipi vel cultello dividebant," could be none other but Crossbills. Notice of a like visitation in 1593 was published by Wats (Vit. 2 Offar. &c., 1640, p. 262), but of late it has become evident that not a year passes without Crossbills being observed in some part or other of England, while in certain localities in Scotland they seem to breed annually. The nest is rather rudely constructed, and the eggs, generally four in number, resemble those of the Greenfinch, but are larger in size. This species ranges throughout the con- tinent of Europe,! and occurs in the islands of the Mediter- ranean and in the fir-woods of the Atlas. In Asiait would seem to extend to Kamtschatka and Japan, keeping mainly to the forest-tracts.

Three other forms of the genus also inhabit the Oid World—two of them so closely resenitbling the common bird that their specific validity has been often questioned. The first of these, of large stature, the Parrot-Crossbill (Z. pityopsittacus), comes occasionally to Great Britain, presumably from Scandinavia, where it is known to breed. The second (LZ. himalayana), which is a good deal smaller, is only known from the Himalaya Mountains. The third, the Two-barred Crossbill (Z. tenioptera), is very distinct, and its proper home seems to be the most northern forests of the Russian empire, but it has occasionally occurred in Western Europe and even in England.

The New World has two birds of the genus. The first (ZL. americana), representing our common species, but with a smaller bill, and the males easily recognizable by their more scarlet plumage, ranges from the northern limit of coniferous trees to the highlands of Mexico, or even further. The other (Z. leucoptera) is the equivalent of the Two- barred Crossbill, but smaller. It has twice occurred in England. : (A. N.)

CROTCH, Wiu11am (1775-1847), doctor of music, was born at Norwich, on 5th July 1775. When only three years and a half old, he was able to play tunes with their basses on the organ with great correctness. Dr Charles Burney, the English historian of music, gave an interesting account of the

~~infant Crotch in the Philosophical T'ransac- tions of the Royal Society (vol. lx. pt. i. for 1779). Crotch also exhibited in his childhood a talent for drawing, which he afterwards cultivated so far as to become a very respectable amateur painter of landscapes. At the early age of twenty-two he was appointed professor of music in the university of Oxford, and there in 1799 he took his degree of doctor in that art. In 1800 and the four following years he read lectures on music at Oxford. Next he was appointed lecturer on music to the Royal Institution, and subsequently, in 1822, principal of the London Royal Academy of Music. His last years were passed at 'Taunton in the house of his son, the Rev. W. R. Crotch, where he died suddenly on the 29th December 1847. He published a number of vocal and instrumental compositions, of which the best is his oratorio of Palestine. In 1831 appeared an 8vo volume containing the substance of his lectures on music, delivered at Oxfordand in London. Previously, he~~

~~1Dr Malmgren found a small flock on Bear Island (lat. 743° N.), but to this barren spot they must have been driven by stress of weather.~~

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~~had published three volumes of Specimens of Various Styles of Music, referred to in his lectures. Among his didactic works is Llements of Musical Composition and Thorough- Bass (London, 1812). He arranged for the pianoforte a number of MHandel's oratorios and operas, besides symphonies and quartetts of Haydn, Mozart, and Beethoven. The great expectations excited by his infant precocity were © not fulfilled ; for he manifested no extraordinary genius for musical composition. But he was a hard student and a sound musician, and justly holds a high place among English cultivators of his art.~~

~~CROTON OIL (Crotonts Olewm) is prepared from the seeds of Croton Tiglium, a euphorbiaceous tree indigenous to the Malabar coast and Tavoy, and grown in many parts of the East Indies. The tree is from 15 to 20 feet in height, and has few and spreading branches; alternate, oval-oblong leaves, acuminate at the point, and covered when young with stellate hairs, and small, downy, greenish- yellow, monceecious flowers. The male blossoms have five petals and fifteen stamens; the females are apetalous, but bear three bifid styles. The fruit or capsule is obtusely three-cornered, and 2ths~~

of an inch long ; it consists of three carpels each inclosing a seed. The seeds resemble those of the castor-oil plant; they are about half an inch long, and 2ths of an inch broad, and have a cinnamon-brown, brittle integument ; between the two halves of the kernel lie the large cotyledons and radicle. The kernels contain from 50 to 60 per cent. of oil, which is obtained by press- ing them, when bruised to a pulp, between hot plates. Croton oil is a transparent and viscid liquid of a brownish or pale-yellow tinge, an acrid, peculiar, and persistent taste, a disagreeable odour, and acid reaction. It is soluble in volatile oils, carbon disulphide, and ether, and to some extent in alcohol. It contains acetic, butyric, and valeric acids, with glycerides of acids of the same series, and a volatile body, C;H,O,, metameric with angelic acid, termed by Geuther and Frohlich tiglic acid, and considered by them as possibly identical with Frankland and Duppa's methylerotonic acid, C(C,H,)"CH,.CO.OH. According to the chemists before-mentioned the crotonic acid of Schlippe, C,H,0,, is not present in croton-oil. 'To what the oil owes its medicinal properties has not yet been certainly deter- mined. It is arapidly-acting and strong purgative. A single drop is a sufficient dose, and need only be placed on the tongue to insure its action. It is employed in cases of obstinate constipation, paralysis, apoplexy, and dropsy. It may be added to castor-oil to increase the effect of that drug. Nausea and vomiting sometimes follow its adminis- tration, and over-doses are extremely poisonous, and bring on intestinal inflammation. The best antidote is an emetic of copper sulphate. Applied to the skin croton oil produces pustulation. It is used externally in gout, neuralgia, rheumatism, and tumours; and with oil of cajeput and rectified spirit it is employed as a liniment in lung and laryngeal diseases. Croton oil has long been known in India as a medicine, and has been in use in England since 1813. Seeds for manufacturing it are imported mostly from Cochin and Bombay. It is occa- sionally adulterated with olive, castor, and nut oil.

CROTONA, or CROTON, now Corronz, a celebrated city of Magna Grecia, at the mouth of the small river Asarus, in the country of the Bruttii, on the western shore of the Ionian Sea. It was founded in the year 710B.c. by a colony of Achzans under the command of Myscellus, in accordance with a decree of the oracle at Delphi. The first well-established fact in its history is its friendship with Sybaris; and till the arrival of Pythagoras the two cities continued advancing in material prosperity and cultivating the arts of war

and peace with much success, The Crotoniats regarded Hercules as their tutelary divinity,

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and were renowned for their skill in all athletic exercises ; the Sybarites were distinguished by luxury and effeminacy. The government of Crotona, oligarchical in form, had hitherto been confined to the council of 1000, who traced their descent from the Achzan founders of the city. But a secret society of 300 of the disciples of Pythagoras con- trived to guide and even overawe the supreme council, till the people, who were excluded from all share in the government, expelled the Pythagoreans from the city, and established a democracy. Before this revolution, however, the Crotoniats, under the command of the celebrated athlete Milo, had marched against Sybaris, and, though opposed by an army three times their own in number, had taken it and levelled it with the ground. This event is usually dated 510 3c. Before thirty years had elapsed, the Crotoniats themselves sustained a still more disgraceful defeat from the united forces of the Locrians and Rheggians, which, however, was not attended with such disastrous consequences to their city. During the Athenian invasion of Sicily, Crotona remained neutral , it supplied the Athenians with provisions, but refused to allow them a passage through its territory. In 389 B.c. the city fell into the hands of the elder Dionysius; but on his death in 377 it recovered its independence. Its prosperity, however, was greatly impaired by intestine feuds and the growing power of external foes. Being hard pressed by the Bruttians, Crotona sought and received assistance from the Syracusans, but had ultimately to conclude a treaty with the enemy, as it was now in danger from its own exiles. Menedemus, their general, defeated the exiles, and established a tyranny which lasted for some time. In the beginning of the 3d century B.c., the city was held for some years by Agathocles ; and in the wars of the Romans with Pyrrhus it suffered so severely that more than half the area within its walls ceased to be inhabited. In the absence of Pyrrhus in Sicily, it was seized by the Roman consul Cornelius Rufinus (277 3.c.); but during the latter years of the second Punic War it was the headquarters of Hannibal for three successive winters. This completed the ruin of the town, which, though colonized a few years after from Rome, sank into obscurity, and is not again mentioned in history till the wars of Narses and

~~Belisarius against the Goths. "After that it remained subject to the Byzantine emperors till it passed into the hands of the Normans.~~

~~The medical school of Crotona was, in the days of Hero- dotus, and long after, the most renowned in Greece,—its proudest name being that of Alemezon. It is not known whether there was anything remarkable about the architec- ture of Crotona ; but the temple of the Lacinian Juno, six miles from the city, was the most sacred and magnificent work of the kind in the whole of Magna Grecia, and con- tained, among other ornaments, the " Helen" of Zeuxis. One column of this great edifice still stands amid a mass of shapeless ruin.~~

~~About a mile from the site of the old Crotona is the modern town of Cotrone, in the Bay of Tarento, with a small but excellent harbour. It is the seat of a bishop, and retains the castle and walls that were erected in the time of Charles V. It surrendered to the English in 1806, but was again occupied by the French. Population, 7700.~~

~~CROUP (synonym, Cynanche trachealis), a common and dangerous form of disease, occurring chiefly in young children. Its essential nature is an acute inflammation of the air passages, particularly the larynx and trachea, accompanied with the exudation of a fibrinous material or "false membrane " which spreads over the interior of the tube, narrowing its calibre, and thus obstructing respiration.~~

~~Croup occurs most frequently in the second and third years of life, although it may affect children of any age. It is exceedingly rare in aduits.~~

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~~'The attack sometimes comes on suddenly in the night without previous warning, but in general some premonitory symptoms exist in the shape of the phenomena of a common cold or catarrh, which may precede the onset of the croup for several days. There is a slight hoarseness of the voice and an occasional cough of a peculiarly harsh or brassy sound, together with a feeling of pain in the throat and~~

~~breast, and a high degree of feverishness and general~~

disturbance. The disease soon assumes its characteristic features. The loud croupy cough comes on in frequent paroxysms, and is attended with an increasing difficulty of breathing, the respirations partaking of the shrill metallic noise of the cough, while the voice is reduced to a hoarse whisper, The child lies with the head thrown back, making strong efforts to breathe, the countenance indicating intense suffering and anxiety. At first little or nothing is expectorated with the cough, but as the latter increases, fragments of the so-called false membrane are brought up into the mouth, with the effect of affording some temporary relief to the breathing. The power of swallowing is not much impaired. Should the attack undergo no abatement, symptoms of asphyxia soon make their appearance, Whe surface of the body becomes livid, the respiration long drawn out aud laboured, while the cough continues to recur in fits which threaten instant suffocation. Drowsiness or coma succeeds ; and death takes place, either gradually froxa exhaustion, or suddenly in the midst of a suffocative paroxysm, Throughout the whole course of the disease remissions in the severity of the symptoms are common, and generally occur during the daytime, the attack re- turning with all its violence as night approaches. In favourable cases the symptoms undergo gradual abatement, and there is a speedy return to health, but it is to be borne in mind that one attack of croup appears to predispose to another, and relapses are not uncommon.

The inflammatory product, or false membrane formed in the air passages in the course of an attack of croup, varies both as to its amount and the extent of its distribution. It may consist merely of a thin white film covering portions of the windpipe, or on the other hand it may have the character of a tough compact membrane of several lines in thickness, and may extend from the upper part of the larynx down to the ramifications of the bronchial tubes. It ad- heres closely to the mucous surface, and although large portions are occasionally detached by coughing or vomiting, the false membrane appears to be reproduced with great rapidity. It is the chief source of danger in the disease, and where it has spread downwards into the bronchial tubes death by asphyxia is the rapid result.

Croup is apt to be complicated with other serious diseases, such as bronchitis and inflammation of the lungs, and it may also be accompanied with many of the pheno- mena of diphtheria, in which case it has been

~~named diphtheritic croup. This latter form of the disease is some- times observed when croup occurs in connection with some of the infectious diseases, such as measles, scarlet fever, or small-pox. On this point it ought to be stated that much discussion has from time to time taken place respecting the relation of croup to diphtheria, not a few eminent authorities holding that in all essential points they a.» one and the same disease. The generally prevailing opmion, however, among physicians who have had extensive oppor- tunities of observation, is, that while many points of similarity exist betwen croup and diphtheria they cannot be regarded as identical. See DIPHTHERIA.~~

~~Croup has sometimes appeared in an epidemic form. This was the case in the year 1805-7, when it spread over a large portion of the continent of Europe. In the last- named year an inquiry into the nature of the disease by the faculty of medicine of Paris was ordered by Napoleon L,,~~

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~~whose nephew, the crown-prince of Holland, had fallen a victim to the epidemic, and who offered a prize for the best essay on the subject. Besides the two prize essays of MM. Jurine and Albers, many valuable treatises were written, and it is to the information thus obtained that much of our present knowledge of this malady is due.~~

~~Croup is a disease of northern climates, and of low-lying, damp, and cold localities. The exciting cause of an attack is generally exposure to cold, particularly cold winds, such as prevail in winter and spring. There appears to be in some families a special liability to this disease, as shown in the readiness with which the children are attacked on slight exposure. Male children appear to be more fre- quently affected than female. Croup is not contagious.~~

~~The mortality from croup is very great, and it has been computed that about one-half of those in whom the attack is developed die. Its course is in general rapid, seldom exceeding three or four days. It sometimes proves fatal in less than one day, while again recovery may take piace after several days' severe suffering.~~

~~*With respect to the treatment of croup, it may be stated that in few acute diseases are greater vigilance and more prompt and energetic measures requisite. 'The disease in inany cases hastens on with such rapidity that as regards treatment the loss of a few hours may be fatal to the pitient. In the earlier or premonitory stage, when the only symptoms present are hoarseness and some amount of croupy cough, it is essential that the child should be kept in a warm temperature, while warm baths and medicines to promote perspiration, such as small doses of antimonial or ipecacuanha wine should be administered. The abstrac- tion of blood by one or two leeches over the upper part of the breast-bone is recommended by many physi- cians when the child is robust and the attack violent. When the breathing becomes embarrassed the adminis- tration of emetic doses of the above-named medicines, or of the sulphate of zinc or of copper, are of great use, as in the act of vomiting portions of false membrane may be dislodged and expelled from the air passages. The child should be surrounded with an atmosphere of steam (see BRONCHITIS), and fomentations, by means of a sponge or piece of flannel dipped in hot water, applied to the neck. Abundance of liquid nutriment may be given, thirst being always present. When remedies such as those now indicated fail to afford relief, and the child threatens to die from asphyxia, the questiou of tracheotomy has to be con- sidered as a last resource. This operation has so often succeeded in croup as to justify its being resorted to in the circumstances now described. Indeed, in the opinion of many competent authorities, more lives might be saved were the operation performed earlier im the course of the attack than is commonly the case. However this may be, it is certain that not only are many children thus rescued from death, but even where the operation fails to accomplish this, suffering is greatly mitigated and death rendered easier.*~~

~~*What is known as Spasmopic Croup (synonyms, Jalse Croup, Laryngiemus stridulus, Spasm of the Glottis, Chald- Crowing) bears some resemblance to the disease above described as regards its chief symptom, but differs from it entirely as toits pathology. This affection occurs mostly in young infants during dentition, and manifests itself by a sudden and violent interruption to the breathing, during which the attempts to inspire are accompanied with a noise resembling the crowing of a cock. Unlike true croup this disease is unattended with fever or inflammation of the air passages, and is a purely nervous ailment depending on the irritation of the nerves which regulate the*~~

closing of the aperture of the glottis (the upper part of the larynx). 'This irritation is usually of reflex origin, being

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due to some disturbance at some distance from the part, as teething or disorders of the stomach or bowels, all of which, as first shown by Dr Marshall Hall, have the effect of bringing on attacks of this kind. The attack is sometimes precipitated in a child liable to it by exposure to a cold wind, or by its being violently tossed in the arms of a nurse, The nervous origin of the seizure is further proved by the fact that the child-crowing is often accompanied by marked contraction of the muscles of the fingers and toes, and also sometimes by convulsions. During the spasm all the symptoms of asphyxia are rapidly developed, and unless relief is speedily obtained death may suddenly take place. The attack often passes off with a forcible expiratory effort, after which the child lies quite exhausted. The paroxysm, however, is apt to return. Like croup, a liability to this disease may run in families, and sometimes with disastrous results. The treatment must bear reference to any cause likely to have given rise to the attack. For relief during the paroxysm efforts to make a sudden impression on the nervous system should be used, such as warm baths or cold affusion to the surface of the body. Artificial respiration ought to be tried where death threatens from asphyxia, and tracheotomy performed, if time be sufficient to make the attempt. Je Osed)

CROUSAZ, Jean Pierre DE (1663-1748), professor of philosophy and mathematics, was born at Lausanne, of a noble Protestant family. He was destined by his father for the profession of arms, but his tastes were literary. Instead of joining the army, he went to study at Geneva, especially devoting himself to mathematics and the Cartesian philosophy, which he adopted. After some time spent in travelling, he returned to his native place, where he was successively appointed pastor, professor of philosophy, and rectoroftheacademy. In 1724 he was called to Groningen to teach mathematics, and appointed governor to the young Prince Frederick of Hesse-Cassel. The king of Sweden also conferred upon him the title of counsellor of embassies

~~His works are exceedingly voluminous, but seldom rise above mediocrity. The most important are Systéme des Réflextons qui peuvent contribuer & la netteté et a Pétendue de nos Connoissances, ou nouvel Essai de Logique; Traité du Beau, in which he maintains the view that beauty entirely consists of unity in diversity ; De ?Edu- cation des Enfans; Examen du Traité de la Liberté de Penser d An- toine Collins ; Géomeétrie des Lignes et des Surfaces reetilignes et cir-culaires ; Examen du Pyrrhonisme ancien et moderne, an attack chiefly on Bayle; Quvres diverses; Traité de l Esprit Humain; Réfle- sions sur la belle Wolfienne; and an attack on the Leibnitzian theory of Pope's Essay on Man.~~

~~CROW (Holland, Kraai, Germ. Kréhe Fr. Corbeau, Lat. Corvus), a name most commonly applied in Britain to the bird properly called a Rook (Corvus frugilegus), but perhaps originally peculiar to its congener, now- a-days usually distinguished as the Black or Carrion-Crow (C. corone). By ornithologists it is also used in a far wider sense, as under the title Crows, or Cormde, is included a vast number of birds from almost all parts of the world, and this family is probably the most highly developed of the whole Class Aves. Leaving out of account the best known of these, as the Raven, Rook, Daw, Pie, and Jay, with their immediate allies, our attention will here be con fined to the Crows in general; and then the species of the Family to which the appellation is more strictly applicable may be briefly considered. Of the limits and subdivisions of this Family it is at present desirable to speak with great caution, if not doubt. All authorities admit that it is very extensive, and is capable of being parted into several groups, but scarcely any twoagree on either head. Espe- cially must reserve be exercised as regards the group Streperine, or Piping Crows, belonging to the Australian Region, and referred by some writers to the Shrikes (Laniide): and the Jays too have been erected into a VI. — 78~~

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~~distinct Family (@arrulide), though it seems hardly possible to separate them even as a Subfamily from the Pies (Pca and its neighbours), which lead almost insensibly to the typical Crows (Corvine.) Dismissing these subjects for the present, it will perhaps be most convenient to treat of the three groups which are represented by the genera Pyrrhocorax or Choughs,~~

Nucerfraga or Nutcrackers, and Corvus or True Crows in the most limited sense.

Pyrrhocorax comprehends at least two very good species, which have been needlessly divided generically. The best known of them is the Cornish Chough (P. graculus), formerly a denizen of the precipitous cliffs of the south coast of England, of Wales, of the west and north coasts of Ireland, and some of the Hebrides, but now greatly reduced in numbers, and only found in such places as are most free from the intrusion of man or of Daws (Corvus monedula), which last seem to be gradually dispossessing it of its sea-girt strongholds, and its present scarcity is probably in the main due to its persecution by its kindred. In Britain, indeed, it would appear to be only one of the survivors of a more ancient fauna, for in other countries where it is found it has been driven inland, and inhabits the higher mountains of Europe and North Africa. In the Himalayas a larger form occurs, which has been specifically distinguished (P. himalayanus), but whether justifiably so may be doubted. The general colour is a glossy black with steel-blue reflections, and it has the bill and legs bright red.1 The remaining species (P. alpinus) is altogether a mountaineer, and does not affect a sea-shore life. Otherwise it frequents much the same kind of localities, but it does not occur in Britain. The Alpine Chough is somewhat smaller than its congener, and is easily distinguished by its shorter and bright yellow bill. Remains of both have been found in French caverns, the deposits in which were formed during the " Reindeer Age." Com- monly placed by systematists next to Pyrrhocoraz is the Australian genus Corcorax, represented by a single species (C. melanorhamphus), but osteologists must be further con- sulted before this assignment of the bird, which is chiefly a frequenter of woodlands, can be admitted without hesita- tion.

Nucifraga is another very distinct form of Corvdea, peculiar to the Old World, and best exemplified by tbe European Nuteracker (1. caryocatactes), while in the New World it is somewhat remotely represented by the genus Picicorvus, of which only one species (P. columbianus), until lately very rare in collections, and only inhabiting the western slopes of the Rocky Mountains, is known. The Common Nuteracker has a wide range in the Palearctic Region, chiefly keeping to subalpine or subarctic pine-forests, and feeding on the seeds of one or another species of fir. It seems nowhere

~~to be numerous, though roving bands of seventy or a hundred have been occasionally observed. It has long been known as a rare straggler to the British Islands, but little was ascertained of its economy till some fifteen years ago. It has now been discovered to breed, though in small numbers, in some of the denser forests of Middle Sweden, on the island of Bornholm, and in the Bavarian and Tyrolese mountains. It appears to build its nest and lay its eggs very early in the year, long before the snows have disappeared, and this fact, coupled with that of its becoming in the breeding season one of the most silent of birds, when at other times it is rather noisy than not, will account for the mystery which enwrapped its domestic arrangements not having been sooner dispelled.~~

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~~1 Hence the "russet pated choughs" of Shakespeare, an expression which has much exercised many of his commentators, who did not see that "pated" meant "patted" or footed (gf the heraldic croix patée), instead of having anything to do with the bird's head, which is as black as that of a Raven. See Nature, v. p. 160.~~

~~CROW~~

~~Considerable difference has been observed in the form and size of the bill of examples of this species, but this is now supposed to depend on the sex—that of the cock being stout and short, while in the hen it is long and thin.2 The bird is about the size of a Jay, and of a dark sooty-browa colour spangled with white, nearly each body-feather ending in a tear-shaped patch of that colour. Besides the European species, which also extends into Northern or Central Asia, three others, very nearly akin to it, have been described from the Himalayas. Of their American cousin, Clarke's Crow, as it is called (Pececorvus columbianus), an excellent account has been given by Dr Coues (Jbis, 1872, pp. 52-59).~~

~~Coming now to what may be literally considered Crows, attention must be mainly directed to the Black or Carriou- Crow (Corvus corone) and the Grey, Hooded, or Royston Crow (C. corniz). Both these inhabit Europe, but their range and the time of their appearance are very different. Without going into minute details, it will suffice to say that the former is, speaking~~

generally, a summer visitant to the south-western part of this quarter of the globe, and that the latter occupies the north-easterm portion—an irregular line drawn diagonally from about the Firth of Clyde to the head of the Adriatic roughly marking their respective distribution. But both are essentially emigrants, and hence it follows that when the Black Crow, as summer comes to an end, retires southward, the Grey Crow nioves downward, and in many districts replaces it during winter. Further than this, it has now been incontestably proved that along or near the boundary where these two birds march they not infrequently interbreed, and it is believed that the hybrids, which sometimes wholly resemble one or other of the parents and at other times assume an interme- diate plumage, pair indiscriminately among themselves, or with the pure stock. Hence it has of late seemed to many ornithologists who have studied the subject, that these two birds, so long unhesitatingly regarded as distinct species, are only local races of one and the same dimorphic species. No structural difference—-or indeed any difference except that of range (already spoken of) and colour—can be detected, and the problem they offer is one of which the solution is exceedingly interesting if not important to zoologists.in general.' The mode of life of the Crows needs not to be described. Almost omnivorous in their diet, there is little edible that comes amiss to them, and, except 1 South America, they are mostly omnipresent. The number of species described is considerable, but doubtless should and will be ruthlessly curtailed when a revision of the group is undertaken by any ornithologist working with proper materials. The Fish-Crow of North America (C. ossifragus) demands a few words, since it betrays a taste for maritime habits beyond that of other species, but our own Crows of Europe are not averse on occasion to prey cast up by the waters, though they will hardly draw it thence for themselves. The so-called " Hooded Crow" of India (C. splendens) is not very nearly allied to its European namesake, from which it can be readily distin- guished by its smaller size and the lustrous tints of its darkest feathers, while its confidence in the human race has been so long encouraged by its intercourse with an unarmed and inoffensive population, that it becomes a plague to the European abiding or travelling where it is abundant, Hardly a station or camp in British India is

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~~2 An exactly similar sexual distinction is observable in the Huia of New Zealand (Heterolocha), which was for a long time included among the Corvide, but is now referred to the Starlings (Sturnidee.)~~

~~3 As bearing upon this question may be mentioned the fact that the Crow of Australia (C. australis) is divisible into two forms or races, one having the irides white, the other of a dark colour, It is stated that they keep apart and do not intermix.~~

~~free from a crowd of feathered followers of this species, ready to dispute with the Kites and the cooks the very meat at the fire; and when any lengthened settlement is established the Crows will build their nests of the wire from the Englishman's soda-water bottles. (A. N.)~~

~~CROWE, Eyre Evans (1799-1868), joumalist and historian, was born about the year 1799. He commenced his work as a writer for the London newspaper press in connection with the now defunct Jforning Chronicle, and he afterwards became a leading contributor to the Zxaminer and the Daily News. Of the latter journal he was principal editor for some tine previous to his death, The depart- ment he specially cultivated was that of Continental history and politics, with which he made himself intimately acquainted by means of study, travel, and correspondence with leading public men abroad. To permanent literature he made contributions of considerable value in his Lzves of Foreign Statesmen (1830), The Greek and the Turk (1853), and Reigns of Louis XVIII. and Charles X. (1854). These were followed by his most important work, the History of France (5 vols., 1858-68), which is full, impartial, and laborious, and written in a clear though somewhat colourless and unimpassioned style. It is founded upon original sources, in order to consult which the author resided for a considerable time in Paris. He died in London on the 25th February 1868.~~

~~CROWLAND, or CroyLanp, an ancient town and parish of Lincolnshire, situated in a low flat district, about eight miles north-east from Peterborough. It stands at the confluence of the Welland and the Catwater drain; and at their junction there is a curious triangular bridge (figured in art. Bripcss, vol. iv. p. 331), passable only on foot. The origin of Crowland~~

was in a hermitage founded in the 7th century by St Guthloc; an abbey was founded in 714 by King Ethelbald, which was burnt in 870 by the Danes, restored by Ethelred I., burnt again in 1091, and again rebuilt in 1112. Of this there are still some interest- ing remains. Among its abbots was the historian Ingulphus. Weekly markets are held at Crowland, and there are three fairs annually. Population (1871), 2459.

CROWN, a circular ornament worn around the head. The name is applied, at present, only to the head-dress worn by kings or emperors as a badge of their dignity. Originally it was of much wider meaning. The simplest and earliest form of the crown appears to have been a fillet or band, tied about the head, and serving for use, as well as ornament, by keeping up the hair. The name of crown is also given to garlands of leaves or branches, worn by the guests at private banquets, and on almost any occasion of more than common festivity. It was natural that those who wished to mark a distinction between themselves and their fellow-men should adopt a head-dress differing from that in general use, just as they adopted different and distinctive garments. In countries governed by a king, a special head-dress was, at a very early period, one of the recognized symbols of royalty. A very simple form' of the royal crown was a diadem or fillet of gold fstened round the head and tied behind. This by degrees bacame more and more elaborate in its structure and ornament, and assumed a variety of forms, in most of which the original diadem is to be traced, just as the diadem itself is a clear advance of the original ribbon or garland.

Crowns are often mentioned in Scripture ; but the term was applied to other ornaments for the head besides those worn exclusively by royal personages. For example, the head-dress of the Jewish high-priest—a linen band with a plate of gold fastened in front—is also called a crown.

Among the kings of Egypt and of the East crowns were in common use. The crowns of the Ptolemies were, in general, plain fillets of gold encircling the head, but we

find them sometimes making use of the more ornate radiated crown. The Seleucide of Syria used the plain golden fillet. But the crowns of the Oriental kings have usually been much more ornate, sometimes of very massive construction,

and profusely adorned with pearls and gems.

In the republics of historical Greece and Rome the crown long continued in use in its first and most simple form. There is no mention made by Homer of the crown as a royal distinction, nor does he seem to have known it at all except as an ornamental wreath or garland. The most celebrated crowns among the Greeks were the wreaths gained at the great inter-Hellenic games, by the victors in the races and athletic contests. In the course of later Athenian history, we find crowns of gold frequently bestowed in recognition of distinguished public services. It was by Alexander the Great, and the successors of Alexander, that the crown was first worn in Greece as the symbol of royal rank. The form used was generally that of a simple band of gold.

The early Roman kings are commonly represented with plain bands of gold encircling their heads. During the historical period of Roman history, besides the crown in private use at feasts and funerals, there were several kinds of crowns bestowed for public services, and indeed in recognition of almost any kind of honourable distinction. These were frequently so designed in shape or material as to be symbolical of the service they commemorated. The corona muralis, for instance, was a crown of gold, decorated with turrets, given to him who had first scaled the walls of a besieged place ; the corona vallaris, decorated with pales, to him who had first forced an intrenchment ; the corona navalis, decorated in general with little figures of the prows of ships, to him who had gained a signal victory at sea. The corona obsidionalis, given to a general who had delivered a Roman army from. blockade, was a crown of grass or herbs plucked at the spot where this important service had been rendered. The crowns of the Roman emperors were of several forms, regulated by the fancy of the wearer, from the simple golden fillet to the radiated crown which marked an admitted claim to divine honours.

In the nations of modern Europe crowns have always been in general use among personages of the highest rank. The most remarkable are the papal and the iinperial crowns. The papal crown is a lofty uncleft mitre, encircled by three coronets rising one above the other, surmounted by a ball and cross, and with ribbons at each side, similar to those of the mitre of an

Italian bishop. This form of crown was first assumed by Pope Benedict XII, 1344.

The crowns that are most celebrated in connection with the imperial dignity are the Imperial crown proper, the German crown, and the Italian or Lombard crown. The first of these was of gold, rising into a semicircle above the head, surmounted by a small cross, and adorned with pearls and precious stones. The second is always spoken of as the silver crown, but it appears from the evidence of eye- witnesses that its material was, in fact, gold. The third was known as the iron crown, though it appears that the only iron in it was one of the nails used or said to have been used at the crucifixion, and that in this case too the rest of the material was gold. It was with this, or with a later imitation of it, that Napoleon I. was crowned as king of Italy at Milan in 1805, The Imperial crown, now in use in the empires of the Continent, in its form is very remarkable, being cleft somewhat after the manner of a mitre, having also the general contour of a modern convex mitre in its elevated part which rises above the golden leafage that heightens the gemmed circlet. In the open space between the two divisions formed by the cleft a single arch rises, surmounted by a mound and cross.

The English royal crown has gradually grown up

from its early simple form into various aspects of elabo- rate splendour. Before the Norman Conquest the head- dress which appears to have been habitually worn by the Anglo-Saxon princes: was a fillet of pearls; their coins, however, and illuminations in MSS. of their era, show them to have been by no means unfamiliar with a nearer approach to a true crown, in the form of a radiated diadem. The great seals, the coinage, monumental effigies, and various other contemporary representations, supply a complete series of examples of the crown in Its varieties of design and enrichment, from the time of the Conqueror.

In addition to several modifications in both the treatment and the grouping of the adornments of the regal circlet, the English crown has undergone a complete change im the character of the figures with which the circlet has

been heightened ; and it also has had its original aspect of an open crown completely altered by its enriched circlet being arched over with jewelled bands of gold, when the diadem thus inclosed was surmounted by a mound and cross.

The crown worn by William I. and his successors was @ plain circlet heightened with four spikes having trefoil- heads (fig. 1). Henry I. appears to have enriched the circlet with gems (fig. 2), and on his great seal the trefoils

Fras. 1-6.—Royal Crowns— William I. to Henry IV. of his father's crown assume a form resembling that of

fleurs-de-lys. The effigies of Henry IL, Richard I., John, and their queens, show the crown to have made such an advance in the dignity of its aspect as is shown in fig. 3. The crowns of Richard and Berengaria, however, have four large leaves only heightening the circlets, while the crowns of Henry, Alianore, John, and Isabella have four smaller leaves alternating with the four larger ones. The crown of Henry III. has a plain circlet heightened with trefoils, a slightly raised point intervening between each pair of the leaves (fig. 4). A similar crown was worn by Edward I., the trefoil-leaves being alternately large and comparatively small. The truly beautiful crown of Edward II. (fig. 5), as it is represented in his effigy, was formed of four large and as many smaller leaves of a deeply serrated type, rising with graceful curves from the jewelled circlet, and having eight small flowers alternating with the leaves. This form of crown appears to have remained unchanged during the reigns of Edward IIT. and Richard II.

It would seem from the crown, fig. 6, sculptured with elaborate care upon the head of his effigy at Canterbury, that Henry IV. determined to distinguish the accession of a Lancastrian prince by displaying an unprecedented magnificence in the emblem of his sovereignty. The splendidly jewelled circlet of this crown is heightened with eight large and rich leaves, and as many true fleurs- de-lys—their first appearance on an English crown,—the whole alternating with sixteen small clusters of pearls, three in each. The famous " Harry crown," of which this may be assumed to be a faithful representation, was broken up and employed as security for the

loan required by Henry V., when he was about to embark on his expedition to Yrance ; but the costly fragments are recorded to have

CROWN

been redeemed in the 8th and 9th years of Heury VI. The arched crown in its earliest furm (tig. 7), was intro- duced by Henry V.; and, with the arches crosses, which from the time of Henry VI. always have been crosses patées, appeared to supersede the earlier foliage upon the circlet. The arches at different periods have varied both in number and in contour. At first they were elevated almost to a point; then they were somewhat depressed at their inter- section ; still later this depression was increased, the arches themselves thus having an ogee contour, as in fig. 13; and finally, in the coronation crown of Queen Victoria (fig. 16), the arches, which bend over almost at right angles, are flattened where the mound rests on them at their inter- section. The crown of Henry VI. appears to have had three arches, or six semi-arches; and there are the same number in the crown that ensigns the hawthorn-bush badge of Henry VII. The crown of Edward IV. had two arches, or four semi-arches; and a crown arched in the same manner (fig. 9) appears on the great seal of Richard III. Both arched and open crowns are represented in sculpture, illuminations, and other works, until the close of the reign of Edward IV. ; and, occasionally, as late as the reign of Henry VIII. a royal shield displays an unarched crown. Whatever other changes or modifications the English crown may have experienced since the time of Henry V., the circlet has always been heightened with alternate crosses patées and fleurs-de-lys, with some minor accessories of jewels ; also, when the crown has two arches, each of the four semi-arches always has risen from within one of the crosses upon the circlet. Edward IV. sometimes has his royal shield of arms ensigned with an open crown, its circlet heightened with eight crosses and eight fleurs-de-lys. Upon his seal as earl of Chester, the same sovereign has the circlet of his open crown heightened with fleurs-de-lys only, alternating with small clusters of pearls (fig. 8). The crown actually worn by Henry VII. appears, from his monument at Westminster, to have had two arches, its circlet being heightened with four crosses and four fleurs- de-lys. A similar crown (fig. 9) appears on the great seal of Henry VIII. During the reigns of Edward VI., Mary, and Elizabeth, the crown

experienced no change; but in her great seal Elizabeth is represented wearing a small diadem having eight semi-arches, In fig. 11, drawn from

Fics. 7-12.—Royal Crowns—Henry V. to Charles I.

the royal achievement of Henry VII., sculptured with great spirit above the south entrance to King's College Chapel, Cambridge, the royal motto is inscribed upon the circlet. The interior of the same noble building is enriched with numerous other splendid crowns executed in full relief. In these examples of the crowns of Tudor sovereigns there are four crosses and as many fleurs-de-lys; it must be added, however, that eight crosses and the same number of fleurs- de-lys are commonly represented, though certainly only as variations from the more authoritative number, on Tudor

crowns, The form of arches shown in fig. 12 for the first time appears upon the great seal of Edward VI.

The crown of the Stuart sovereigns, the first kings of Great Britain, James I. and Charles I, had four arches, each of the eight semi-arches springing from the alternating crosses and fleurs-de-lys of the circlet (fig. 10). This crown, described to have been formed of massive gold, weighing 7 ib 6 oz., and valued at £1110, was in 1649

Fros. 18-15.—Recent forms of the English Crown.

broken up and defaced, with other royal insignia. The crown made for Charles II. (fig. 13), and also worn by James IL, William III., and Anne, closely resembled an earlier type ; and, indeed, it differed only in its proportions from the crown of more recent times (fig. 14),—-the crown of Her Majesty's immediate pre- decessors on the throne, which still forms a part of the re- galia of the British empire. The crown (fig. 16), made for the coronation of Queen Vic- toria, has its entire surface completely covered with jewels,—its circlet, crosses, fleurs-de- lys, arches, and mound being alike in displaying varieties of the same precious constructive Fede materials. This coronation Fi. 16.—Coronation Crown of crown is lined with a cap of iets violet velvet, in accordance with a usage that first

appeared upon the great seal of Henry VIII; but in all the earlier crowns the caps were of crimson or purple velvet. It only remains to direct attention to the form, fig. 15, under which, with Her Majesty's sanction, the crown of Queen Victoria is represented, happily for its effective appear- ance without any cap or lining, on all occasions of the ordinary use of the symbol of regal dignity and power. The crown introduced into the English coinage by Henry VIII. in both gold and silver, bears a crowned rose and crowned shield of arms, with the royal cipher. The silver crown of Edward VI. has the king on horseback and the royal shield; but that of Elizabeth substitutes a crowned bust for the equestrian figure. In both these silver coins the royal shield is charged in pretence with a floriated cross, which, extending beyond the shield, divides the legend into four parts. The crown of Charles II. has four crowned shields of England, Scotland, France, and Ire- land in cross. 'The crown of recent years, that bears the device of St George and the dragon, strangely represents the Christian champion under the aspect of a nude classic warrior armed with a sword, instead of his appearing in medizval armour, and piercing his adversary with a lance. See HERALDRY. (c. B.) CROYDON, a town, parish, and district of England in the north-east of the county of Surrey, nine miles south of London, with stations on several lines of railway. It stands near the sources of the River Wandle, under Banstead Downs, and is a place of great antiquity. The original site, further west than the present town, is supposed to have

been that of the Novomagus of the Antonine Itinerary, and it is the Croindone (French, crore dune, chalk-hill) of the Domesday Book. In the neighbourhood there are distinct traces of Roman occupation, and several gold coins bearing the stamp of the later emperors have been found, A cluster of twenty-five tumuli between the town and Addington Park, and a circular encampment with a double moat, form the most interesting portion of the remains. The manor of Croydon was presented by William the Conqueror to Archbishop Lanfranc, who is believed to have founded the archiepiscopal palace there, which was the occasional residence of his successors till about 1750, and of which the chapel and hall still remain. The newer town of Croydon consists principally of a well-built street extend- ing along the high road to Brighton with branch streets. The principal buildings are the parish church, close to the palace, a large and handsome structure in perpendicular style, with an ancient flint and stone

tower ; several newer churches ; the town hall, a semi-classical edifice built in 1809 ; a public hall built in 1862, and the market-house, water-works, and prison, Considerable weekly corn and cattle markets are the chief business of the town. The summer assizes for Surrey are held alternately there and at Guildford. Its site is remarkable for the number of springs which issue from the soil. One of these, called the " Bourne," bursts forth a short way above the town at irregular intervals of from one to ten years or more ; and after running as a torrent for two or three months, it as quickly vanishes. This phenomenon seems to arise from rains which, falling on the chalk hills, sink into the porous soil and reappear after a time from crevices at lower levels. Population (1871), 55,652.

CRUCIFIX anp CRUCIFIXION. See Cross.

CRUDEN, AtexanpER (1701-1770), author of the well-known Concordance to the English Bible, was born at Aberdeen in 1701. He studied at Marischal College with the intention of entering the church, and took his M.A. degree after the usual curriculum of four years. He was prevented from fulfilling his purpose, however, by an attack of insanity, caused by a disappointment in love. After being for some time in confinement he partially recovered, and removed to London, where he employed himself as a private tutor and a corrector of the press. In 1732 he opened a bookseller's shop near the Royal Exchange, but met with little success. His Concordance, a laborious, comprehensive, and accurate work, which has been of the utmost service to biblical students, was commenced in 1733. The first edition appeared in 1737, and was dedicated to Queen Caroline, who died a few days after the work was presented to her, leaving its author without the acknowledgment he had been led to expect. A second and revised edition appeared in 1761. In the interval between the publication of the two editions he was twice confined in a lunatic asylum, where he seems to have been treated with great cruelty. His chief delusion was that he had received a special divine commission to reform all manner of abuses, and he accordingly assumed the title of Alexander the Corrector. He was in the habit of carrying a sponge with which he effaced all inscriptions that seemed to him contrary to good morals, and in particular he showed his detestation of Wilkes by obliterating the number 45 (the offensive number of the North Briton) wherever he found it. Besides labouring constantly at the

~~improvement of his Concordance, he prepared a number of other works, including a Brief Compendium of the Buble, a Scripture Dictionary, and an elaborate index to Newton's edition of Milton. He also wrote a curious autobiography, in which his delusions are very apparent, under the title Adventures of Alexander the Corrector. He was found dead in the attitude of prayer on the Ist November 1770.~~

~~Belief in~~

~~622~~

~~CRUSADES~~

~~HE Crusades were a series of wars undertaken pro- fessedly for the purpose of delivering the Holy Land~~

~~from the dominion of the infidel, and so named from the cross worn as a badge by those who devoted themselves to the enterprize. These wars, it was held, were rendered neces- sary, not only by the profanation involved in the fact of Mahometan rule over the country which had been the birth-place and cradle of Christianity, but by the insults and injuries constautly inflicted on Christian pilgrims. From~~

~~the duty of age to age the belief had been growing that no work could~~

~~pilgrimage. 2~~

~~Teaching of Augus- tine and Jerome.~~

~~onduce more to the soul's health than a visit to the holy~~

~~places of Palestine, In proportion to the rapidity with which this belief had spread over the Christian world, a feeling of vehement indignation was awakened by the likelihood, if not the certainty, that the Saracen conqueror would put his ban on the performance of that which was deemed to be an act of the highest Christian duty.~~

~~It is scarcely necessary to say that this was not a notion which can be traced back to the earliest ages of the Christian church, and that the creed~~

of the first believers was in this respect in complete antagonism with the idea which brought the Jews year by year to Jerusalem for the celebration of the Passover. The local ritual which belonged to the only temple known to the Jews had for them been displaced by a purely spiritual worship, which proclaimed that men were as near to God in one place as iu another. In whatever channel their feelings might otherwise have run, the circumstances of the Christian church in the first century left absolutely no room for the development of local association. Yet a few years, and the history of this weary world would be closed by the return of the Son of man to judgment, and by the summons which should call the dead from their graves. But the course of events which led to the establishment of Christianity as the religion of the Roman empire insured the growth of a sentiment far more nearly allied to that of the Jewish pilgrims, when gathered for the great annual feast in the city of David. 'The Christian converts in Rome and Corinth, in Athens and Alexandria, had been worshippers of the Capitoline Jupiter, or the Olympian Zeus, of Isis and Osiris, of Phoebus, Artemis, or Mitliras. That these converts had undergone a vast change for the better we need not and we caunot doubt ; but the framework of their old associations had not been broken, and the men who had followed the journeyings of Phoebus from his birthplace in Delos to his final home in Delphi, might now with feelings immeasurably deeper and more earnest move from spot to spot noted in the gospel narratives, until the pilgrimage begun in the grotto of Bethlehem ended on the mount of the ascension. The whole of Palestine thus became sacred soil, but for a time the rapid crowth of this local veneration called forth something like remonstrance or warning. 'Teachers like Augustine could remind their hearers that they were not to seek righteous- ness in the East, nor mercy in the West, and that a voyage to the Holy Land was a useless task for men whose faith placed them at once in the immediate presence of their Lord. But the practice of some among them was not alto- gether consistent with their precepts. Jerome could insist that heaven was not more easily approached from Palestine than from Britain ; but the saint had crossed the sea to take up his abode in a cave at Bethlehem, and had no re- buke to offer to the Roman ladies who followed him, partly to feast upon his eloquence, and in part to derive strength and comfort from contemplating the scenes of the Saviour's ministry. Such feelings seldom fail to provide their own

nourishment. of Calvary would impart a priceless value to that instrument of punishment which by bearing the body of Jesus had become veritably a tree of life; and in due time the yearning for this relic was rewarded by its discovery. Its genuineness had been attested by the healing of a dying woman who derived no benefit from touching the crosses to which the two thieves had been fastened ; and the great churches built by the first Christian emperor and his mother over the HIoly Sepulchre and the Cave of the Nativity became sanctuaries which the Christians regarded with a devotion immeasurably more passionate than that which the Jews felt for the temple at Jerusalem. The stream of pilgrims, which probably had long been gather- ing volume, now swelled into something like the propor- tions of a flood; and each man found not merely that he could worship on spots which brought him nearer to heaven, but that the devotion of the faithful had done or was doing much to smooth the difficulties or lessen the dangers of his journey. It was not wonderful that the enthusiasm thus fostered should give birth to convictions which no calami- ties could destroy or even shake. According to this new belief the shirt which the pilgrim wore when he entered Jerusalem would, if used as his winding-sheet, carry him straight to heaven. HIs death, if it happened duriug his sojourn in Palestine, made him an object of envy to his kinsfolk and friends. If he returned home, he was treated as one whose sins had been washed away, and perhaps as the bearer of relics whose virtues were so potent as to

make the weary journey to Jerusalem a work of superero-

gation.

The tide of pilgrimage thus flowing steadily onwards was first arrested by the armies of the Persian king, Khosru HL, the grandson of Nushirvan. Jerusalem was taken, 611 a.v. ; 90,060 Christians, it is said, were slaughtered ; and the disaster was crowned by the carrying away of the true cross into Persia. Marching .on into Egypt, Khosru received a letter from a citizen of Mecca, charging him to acknowledge Mahomet as the prophet of the one God. HIe tore the letter into shreds. Mahomet replied only by warning him that his treatment of the letter was a sign of the way in which his kingdom would be treated by-and-by. The punishment of Khosru was to come, however, not from Mahomet, but from the Emperor HIeraclius, who,

waking from the sluggish inactivity of the earlier part of his reign, defeated the Persians in the passes of Mount Taurus, and destroyed the birthplace of Zoroaster. In the end Khosru was murdered by his son Siroes, from whom Heraclius recovered the true cross by a treaty which also delivered those of his subjects who had been taken prisoners by the Persians. In the following year, 629, Heraclius himself knelt among the worshippers in the church of the Holy Sepulchre. Eight years later, 637, the disciples of Mahomet, now lords of Damascui, laid siege to Jeru- salem ; but after a blockade of four months a treaty made with the caliph Omar in person secured to the Christians not merely the safety of their persons and goods, but the free exercise of their religion, subject only to the conditions that Mahometans should have the right of admission to their churches at all hours; that the cross should not be seen on the exterior of any building, or be carried about the streets; and finally, that the Christians should be disarmed, and should show respect to their conquerors by wearing a distinguishing dress and by rising up at the approach of true believers. The hardships thus imposed may have been sensibly felt ; but pilgrims and merchants

The vehement devotion stirred by the sight Discovery

of the true cross.

Capture of Jerusalem by Khosru Ill,

The caliph Omar at Jerusalem.

Revival of 'pilgrimage after the 10th century.

Efforts of

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still came and went practically without let or hindrance ; aud eveu the attack of the Fatimite caliph Hakem, four cen- turies later, 1010, scarcely changed things for the worse. The rule of his predecessorsin Egypt had for the Christians been lighter than that of the Abbasside caliphs of Baghdad; but the object on which the mad Hakem had set his heart was nothing less than the destruction of the great Chris- tian sanctuary. Such persecution as

there was fell on the Jews only, and the tax imposed on each pilgrim and levied on his entering Jerusalem was probably not resented as a wrong. To the wealthier Christians it brought an opportunity for securing a higher degree of merit by pay- ing the charge for their poorer brethren ; while the comple- tion of the first Christian millennium removed a burden which had Jain with increasing heaviness on the spirits and energies of men, aud gave a fresh impetus to the feeling which carried the devout to the Holy Land. The endof the 10th century, it was almost universally believed, would be the end of the world. The beginning of a new age relieved them of this mental incubus, and the stream of pilgrims became larger than ever. The path followed by these devotees was not always strewn with roses, Incle- ment seasons, poverty, and sickness proved fatal to many ; but these disasters were not caused by the attack of open enemies, and the conversion of Hungary removed a formid- able obstacle for those who had to traverse the heart of Europe in order to reach Palestine.

A few years later these fairer prospects were permanently clouded by the advance of the Seljukian Turks, who in their inroads into the Eastern empire found themselves effectually aided by the subjects of the emperor. Thecauses of discontent were indeed many and deep. Extortion and tyranny, both secular and ecclesiastical, had alienated thousands, while the population was seriously lessened by the accumulation of land in the hands of a few owners. Before the close of the J1th century, 1076, Jerusalem had opened her gates to the Seljukian Toucush ; and in place of a legal toll the pilgrims found themselves subjected henceforth to indefinite extortion, to wanton insult, and to massacre. The sanctuaries of the Christians were profaned, their worship was interrupted, their patriarchs were thrown into dungeons. The effect of these changes was felt not by the devout only. The supplying of their wants had called forth the energies of merchants; and the fleets of Genoa, Pisa, aud Amalfi hurried to the ports of the Holy Land for the great Easter fair at Jerusalem. All these were now driven away, and there remained only the miserable train of pilgrims, who returned to Europe, if they returned at all, with tales of dire indignities done to meu, women, and children alike.

The recital of these wrongs went far towards fanning

|\Hildebrand into flame the feelings which the popes had hitherto failed

to waken in sufficient strength. The idea of an armed host which should inflict summary vengeance on the oppressors of the Christians had already dawned on the mind of the great Hildebrand, Gregory VII. ; it had been vehemently urged by his successor Victor III. ; but neither had struck the right chord. Such enterprizes can never be set in motion, with any solid results, except when the flood tide of popular feeling gives its own weight to the sanction of religious authority. Nor was this result more satisfactory when, in 1081, Robert Guiscard set out from Brundusium (Brindisi) with a fleet of 150 ships and a force of 30,000 men. Guiscard himself besieged Dyr- rhachium (Durazzo) iu vain; under his son Bohemond his fleet was miserably defeated. Four years later Guiscard made another attempt, which was frustrated by his death at Cefalonia (Kephallenia). But Hildebrand had been dead only ten years when a vast throng of clerks and laymen was gathered to meet Urban II. at Piacenza

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(Placentia). In Italy, however, Urban felt that he could not look for the enthusiasm which would justify him in making the final venture. From Piacenza he made his way to his old home in the great abbey of Cluny, and in the autumn of 1095 appeared at Clermont, in the territories of the connt of Auvergne.

Here he found that there was no longer any need of holding back. To the north of the Alps the indignation of the people had been roused to fever heat by the preaching of Peter the Hermit. With the stature and ungainliness of a dwarf, emaciated by the austerities of his self-imposed discipline, this man, who had forsaken his wife and abandoned his military standard under the counts of Boulogne, had returned from the Holy Land with his heart on fire, not so much from the memory of the hard- ships which he had himself undergone as for the cruelties and tortures which he had seen inflicted on his fellow- Christians. Simeon, the patriarch of Jerusalem, to whom he first betook himself, could only bewail the weakness of the emperor and of his government. "The nations of the West shall take up arms in your cause," was the reply of the hermit, who soon afterwards, armed with the special blessing of Urban IL., mounted his ass, and with bare head and feet,

carrying a huge crucifix, traversed the Teutonic lands, rousing everywhere the uncontrollable indignation which devoured his own soul. His vehemence carried all before him, none the less, perhaps, because he bade them remember that no sins were too heinous to be washed away by the waters of the Jordan, no evil habits too deadly to be condoned for the one good work which should make them champions of the cross. Urban, however, and his counsellors, knew well that before the fatal die could be prudently cast a serious task lay before them. The system of feudalism substituted personal ascendency for the dominion of law; and wherever the personal bond failed, the resort was inevitably to private war. The practice of such wars had become virtually an organized trade ; and if a large proportion of the population should be drawn away to fight against the infidel in Palestine, those who remained at home would be without defence. Such wars were therefore formally condemned ; the women and the clergy, merchants and husbandmen, were placed under the special protection of the church, and the Truce of God was solemnly confirmed. The nearer and more immediate dangers being thus guarded against, Urban from a lofty

Preaching of Peter the Hermit.

Speech of PopeUrban

scaffold addressed the assembled multitude, dwelling in the A

first place, and perhaps not altogether prudently, on the cowardice of the Turks, and on the title to victory which birth in a temperate climate conferred on the Christians. They were thus sure of success, and sure, too, to win an infinitely higher blessing—the remission of their sins. Sufferings and torments more excruciating than any which they could picture to themselves might indeed await them ; but the agonies of their bodies would redeem their souls. "' Go then," he said, " on your errand of love, which will put out of sight all the ties that bind you to the spots which you have called your homes. Your homes, in truth, they are not. For the Christian all the world is exile, and all the world is at the same time his country. If you leave a rich patrimony here, a better patrimony awaits you in the Holy Land. They who die will enter the mansions of heaven, while the living shall pay their vows before the sepulchre of their Lord. Blessed are they who, taking this vow upon them, shall obtain such a recompense; happy they who

are led to such a conflict, that they may share in such rewards." With the passionate outburst, " It is the will of God, it is the will of God," the vast throng broke in upon the Pontifi's words. "It is, indeed, HIs will," the Pope went on, " and let these words be your war-cry when you find yourselves in presence of the enemy.

Clermont.

Motives of pilgrims.

Results of the cru- sacdes.

Increased power of the Pope and clergy.

The first crusade.

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You are soldiers of the cross; wear then on your breasts or ou your shoulders the blood-red sign of HIm who died for the salvation of your souls."

So was sanctioned the mighty enterprize which hurled the forces of Latin Christendom on the infidels who had crushed the East under the yoke of Islam; and so it received its name, Of the thousands who hastened to put on the badge the greater number were animated probably by the most disinterested motives, while some had their eyes fixed on the results of more politic calculations. For the multitude at large there was the paramount attraction of an enterprize which the abbot Guibert boldly put before them as a new mode of salvation, which en- abled the layman without laying aside his habits of wild licence to reach a height of perfection scarcely to be attained by the most austere nionk or the most devoted priest. Nay more, the assumption of the cross set the debtor free from his creditor so long as he wore the sacred badge, opened the prison door for the malefactor, annulled the jurisdiction of the lord over the burgher or the peasant, and enabled the priest and the monk to escape from the monotony of the parish and the cloister. It might be thought that these privileges would tell hardly on the creditor, the capitalist, and the usurer ; but these reaped the most solid

benefits. The princes who bound themselves by the vow must provide equipments for themselves and their followers, and carry with them sums of money sufficient for their needs. These sums must be raised by loan or mortgage ; and as all wished to get horses, arms, and money in exchange for lands, the former became inor- dinately dear, the latter absurdly cheap. Thus the real gain lay on the side of the merchant and the trader, or of the landowner who was prudent enough to add to his own domains by availing himself of the necessities of his neigh- bour. All this, however, had been effected by the authority and sanction of the Holy See, which had taken under its protection the dominions of all crusading princes. It was for the Pope to decide whether those who had taken the vow should set off at once, whether some grace time should be allowed, or whether the vow should be remitted altogether. 'The Pope became therefore possessed of a dis- pensing power which placed him virtually above all other sovereigns. His gains, moreover, were immediate. The crusades tended, beyond doubt, to merge the smaller into larger fiefs, which again were absorbed into the royal domain, thus largely promoting that growth of the sovereign power which in the end broke up the feudal system. Those results belonged to the distant future ; but the Pope was enabled, rather he was constrained, to send his legates into every land, both to enlist soldiers under the standard of the cross, and to collect money for their support. He be- came thus at once the administrator of vast revenues which were raised partly by subsidies imposed as a necessary obli- gation on the clergy, and in part by the voluntary contribu- tions of the laity. With the Pope the ecclesiastical body generally acquired enormous power. 'The lands of the church, though money might be borrowed upon them, could not be alienated; but it was only in comparatively a few instances that it was necessary to burden them at all. The monastic houses might send some of their members to the Holy Land ; the rest remained at home, and became mortgagees or trustees of estates belonging to the crusaders. Tf these died without heirs, the guardians became absolute owners; and of those who returned not a few withdrew into the cloister, and endowed with their worldly goods the community which they joined.

In the enterprize sanctioned by the Couucil of Clermont, no nation, as such, took any part ; and this fact serves per- haps to explain the measure of its

~~success and its failure. Had it been necessary to wait for strictly national action,~~

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~~the work perhaps would never have been done at all; but~~

~~had it been a national undertaking some attempt must~~

~~have been made to establish a commissariat, and to insure something like harmonious and efficient generalship. As~~

~~it was, the crusading army was simply a gathering of individual adventurers who depended on their own resources, or of reckless pilgrims who neither possessed nor~~

~~cared to provide any. The contributions made to this~~

~~army by the different countries of Europe varied largely.~~

~~From Italy, where the charm was in great part dispelled General by the struggle between Pope and anti-Pope, few came condition besides the Normans who had fought under the standards of Europe. of Robert Guiscard. The Spaniards were fully occupied with a crusade nearer home, which was to turn the tide of Mahometan conquest that had once passed the barriers of the Pyrenees and threatened to flow onwards to the shores of the Baltic. In Germany there was no great eagerness among partisans of emperors whom popes had sought to humble, to undertake a difficult and dangerous pilgrimage. In England the condition of things which followed the victory of William over Harold prevented both the con- querors and their subjects from committing themselves to distant enterprizes, while the Red King was more anxious to have the duchy of his brother Robert in pledge than ready to run the risk of losing his own kingdom. Thus the task of reconquering Palestine fell to princes of the second order, Foremost among these was Godfrey of Bouillon in The chiefs the Ardennes, duke of Lothringen (Lorraine), whose high of the first personal character brought to his standard, we are told, not T#*4® less than 10,000 horsemen and 80,000 infantry, and who~~

was accompanied by his brothers Baldwin and Eustace

count of Boulogne. Next to him, perhaps, may be placed

(1) Hugh, count of Vermandois, surnamed the Great, according to some, as being the brother of Philip I., the French king, or as others would have it, simply from his stature ; (2) Robert, duke of Normandy, who had pawned

his duchy to his brother the English king, and who was destined to eud his days in the dungeons of Cardiff castle ;

(3) Robert, count of Flanders, celebrated by his followers

as the Sword and Lance of the Christians ; (4) Stephen,

count of Chartres, Troyes, and Blois ; (5) Adhemar (Aymer),

bishop of Puy, the first of the clergy who assumed the

cross, and rewarded as such with the office of Papal legate; (6) Raymond, count of Toulouse, lord of Auvergne and Languedoc, the leader, it is said, of 160,000

horse and foot, and widely known for his haughtiness and

his avarice not less than for his courage and his wisdom ;

(7) the politic and ambitious Bohemond, son of Robert Guiscard, who had lett to him, not his Apulian domains,

but only the principality of Tarentum, to which Bohemond

was resolved to add a kingdom stretching from the Dalmatian coast to the northern shores of the Aigean Sea ;

(8) Tancred, son of the Marquis Odo the Good and of Emma, the sister of Robert Guiscard, the hero who beyond

~~all his colleagues appears as the embodiment of those peculiar sentiments which gave rise to the crusades, and who approaches nearest to the idea of Chaucer's "' very perfect gentle knight." .~~

~~The Feast of the Assumption, August 15, 1096, had Departure been fixed at the Council of Clermont as the day on which of the pil- the crusaders should set off for Constantinople ; but little peter the more thau half the interval had gone by, when the hermit Hermit. Peter undertook the task of leading to Palestine a motley crowd of men and women. Peter was accompanied as far as Cologne by Walter the Pennyless, who thence led his followers to Hungary, while another multitude marched under Emico, count of Leiningen, and a fourth followed the guidance of the monk Gotschalk. Behind those came, we are told, a throng of men, women, and children, amounting to 200,000, under standards on which were~~

~~Chewy F2D i 5~~

~~painted a goose and a goat, symbols of the mysterious faith of Gnostics and Paulicians. These undisciplined multitudes turned fiercely upon the Jews, who were massacred in the streets of Verdun, Treves, and the great Rhenish cities, until the emperor interfered and took them under his protection. Of the followers of Peter 7000 only, it is said, reached Constantinople. These by the orders of the Emperor Alexius were at once conveyed across the Bosphorus, and there, with the bands of Walter the Pennyless, fell into a trap laid for them by the Seljukian Sultan David, surnamed Kilidj Arslan, the Sword March of Of the Lion. A heap of bones alone remained to tell the the main story of their destruction, when the hosts under Godfrey body under came thither on their march to Palestine. These had Godfrey. advanced unopposed as far as the Hungarian border, where three weeks were lost in negotiations with the Hungarian king, who dreaded a repetition of the violence which his people had suffered at the hands of the rabble led by Peter and the moneyless Walter. With Stephen of Chartres, Robert of Flanders, and Robert of Normandy, Hugh of Vermandois had set out to make his way through Italy, and taken ship at Bari. Wrecked on the coast between Palos and Durazzo, he was detained at the latter place until the pleasure of the Emperor Alexius should be known. Alexius at once ordered that he should be brought to Constantinople, and so charmed his prisoner~~

~~by the gracious manner which he could put on or off at will, that Hugh not only paid him homage and declared himself his man, but promised so -far as he could to get his colleagues to follow his example.~~

~~The tidings of Hugh's detention roused the wrath of Godfrey, who, having in vain demanded his release, marched from Philippopolis, and appeared before the walls of Constantinople at Christmas 1096. Alexius saw before him a mighty host ; another not less formidable was on its way, he was told, under Bohemond and Tancred; and Bohemond, as he knew, claimed by right of inheritance no small part of his empire. These swarms he had brought upon his land by his appeals for the aid of Western Christendom, and he was now anxious at one moment to rid himself of their presence, at another to win the submis- sion of the crusading chiefs, and so obtain a hold on their future conquests. At length a compact was made by which they gave him their fealty so long only as they remained within his borders, and pledged themselves to restore those of their conquests which had been recently wrested from the empire, while on his part he promised to supply them with food and to protect all pilgrims passing through his dominions. Bohemond, on reaching Constan- tinople, was indignant when he learnt that his colleagues had become vassals of the emperor ; but he soon found that he must at least appear to follow their example, and he was repaid by a splendid bribe from Alexius, who adopted dodfrey as hisson, With Raymond of Toulouse Alexius had a harder task. This chief, who scarcely regarded himself as the vassal even of the French king, refused to do more than be the emperor's friend on equal terms, even though Bohemond threatened that, if the quarrel came to blows, he should be on the side of Alexius. The latter, however, soon saw through the temper of Raymond; and the harmony which followed this dispute was so thorough that Anna Comnena could speak of him as shining among the barbarians as the sun among the stars of heaven.~~

~~It was not until the Feast of Pentecost, 1097, that the last of the bands of Latin pilgrims was conveyed to the Asiatic shore. During the whole interval the risk of conflict between the Latins and Greeks had been great. Between them there was in truth a radical opposition. The crusading chiefs hated the idea of a central authority, and clung to the right of private war as the dearest of their~~

The emperor Alexius and the crusaders.

The Latins and the Greeks,

privileges. Of public law they could scarcely be said to know anything. The Greeks, on the other hand, were ready to put up with a large amount of corruption in their rulers so long as these secured to them the protection of person and property. Among the Latins, again, the clergy, having been brought by Hildebrand and Damiani under the yoke of celibacy, had become a close order or caste, which shrunk from the notion of allegiauce to any temporal master. Asa rule the Greek priests were married ; and as they owned the authority of the emperor, they were despised by their Western brethren for their cowardice. In short, there was nothing to bring the two peoples together, and everything to exasperate the suspicion and hatred which had grown up between them.

Whatever may have been the numbers of the crusaders Battle of (and the chaplain of Count Baldwin could speak of them Doryleum. as six millions), they found themselves on the eastern shore of the Bosphorus confronted by a formidable adversary in Kilidj Arslan, who, retreating with his horse-men to the mountains, swooped down upon the Christians, by whom his capital city of Nice (Nikaia) was vainly invested for seven weeks. At length the city was sur: rendered, not to the crusaders but to Alexius, and the former, advancing on their eastward march, were again confronted by the Turks near the Phrygian Doryleum. The battle, desperately contested, ended in the complete defeat of the latter ; but the son of Kilidj Arslan, hasten- ing on before the crusaders as they marched to Cogni, Erekli, and the Pisidian Antioch, gave out before the gates of each city that he was come as a conqueror. On his way he had ravaged the land ; in the towns the houses had been plundered and the granaries emptied ; and the crusaders had to journey through a country which could supply nothing. The burning heat caused fatal sickness ; and as if these miseries were not enough, the acquisition of Tarsus was followed by an attempt at private war between Tancred and Baldwin, owing to a dispute for the precedence of their banners. The remissness of the enemy, which might easily have cut them off in the passes of Mount Taurus, allowed them to march safely through the

defiles ; and Baldwin, Godfrey's brother, was enabled to comply with a request for help made by the Greek or Armenian ruler of Edessa. Welcomed into the city Baldwin made Matin prin- himself master, and the Latin principality of Edessa thus cipality of established lasted for fifty-four or, as some have supposed, ""°*** forty-seven years.

In the Syrian Antioch the crusaders hoped to win a Siege of splendid prize at the cost of little effort or none. Its Antioch. walls were mostly in ruins; but the Seljukian governor, Baghasian, had resolved on determined resistance. The siege which followed has no interest for the military historian. At no time was the blockade complete, and it was brought to a successful issue only by treachery. Three mouths had already passed when the crusaders found themselves in desperate straits for want of food. They had wasted with frantic folly the cattle, the corn,' and the wine which had fallen into their hands ; and when this first famine was relieved by a foraging expedition under Tancred, the supplies so brought in were wasted with equal recklessness. A second famine drove away not only Taticius, the lieutenant of the Greek emperor, but William of Melun, whose sledge-hammer blows dealt in battle had won him the surname of the Carpenter, and even the hermit Peter. Taticius made his way to Cyprus; the other two were caught and brought back to the camp by Tancred. It was at this time, when the general prospect seemed so discouraging, that envoys from the Fatimite caliph of Egypt offered to guarantee to all unarmed pilgrims an unmolested sojourn of one month in Jerusalem, and to aid the crusaders on their march to the Holy City, if they

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Méraculous discovery of the Holy Lance.

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would acknowledge his supremacy within the bounds of his Syrian empire. The reply of the crusaders was brief and definite. God had destined Jerusalem for Christians ; if any others held it, they were invaders who must be cast out. This defiance was followed by a victory won over some reinforcements which were hastening from Czsarea and other cities to the aid of Baghasian. But the time went on; the siege was still protracted ; and

there were rumours that a Persian army was approaching. To Bohemond it seemed that there was no hope of success except from fraud, and that from fraud he might reap a goodly harvest. In a renegade Christian named Phirouz he found a traitor ready to do his work ; and he was able now to announce in the council that he could place the city in their hands, and that he would do so if they would allow him to rule in Antioch as Baldwin ruled in Edessa. In spite of a protest from Raymond of Toulouse the compact was accepted, 1098; and on the same night Bohemond with a few followers.climbed the wall, and having seized ten towers, of which they killed all the guards, opened a gate, and admitted the Christian hosts. Tn the confusion which followed their entrance some of the besieged shut themselves up in the citadel. Of the rest 10,000, it is said, were massacred. Baghasian escaped beyond the besieger's lines ; but he fel) from his horse, and a Syrian Christian, cutting oft his head, carried it to the camp of the crusaders, who now passed from famine to plenty, from extreme hunger to wild riot. They were committing a blunder as well as a sin. The Persians were at hand; and the Turks in the citadel found that the crusaders lay between themselves and the hosts of Kerboga, prince of Mosul, and Kilidj Arslan. The Latin camp was again wasted with famine. Stephen of Chartres, who had deserted it before the betrayal of the city to Bohemond, had on his westward journey met the Emperor Alexius, who was marching to the aid of the crusaders with a large body of pilgrims from Europe. Stephen's tidings were followed by an order for retreat, and the pilgrims were compelled to turn back with their companions. Protesting in vain against this shameful breach of his duty and his vow, Guy, a brother of Bohemond, said in the vehemence of his rage that if God were all-powerful He would not suffer such things to be done.

In Antioch the desperation of the crusaders made them listen eagerly to stories of dreams and revelations from heaven. A Lombard priest had learnt in a vision that the third year of the crusade should see the conquest of Jerusalem ; and those who had heard from the lips of the Saviour Himself a rebuke of the vices which had caused all their disasters, had also been assured that in five days the needful help would be granted to them. The impulse, once given, gained strength. Peter Barthelemy, the chaplain of Raymond of Toulouse, related a revelation made to him by St Andrew. 'The steel head of the spear which had pierced the side of the Redeemer as He

~~hung on the cross had been hidden, according to this tale, in the church of St Peter; and the recovery of this lance would be followed by immediate and decisive success. Two days were to be spent in special devotion ; on the third they were to search for the long-lost weapon. The night had come, and their toil had thus far gone for nothing, when the priest stepped down into the pit. After some strokes of his spade he came upon the holy relic, which was care- fully wrapped in a cloth of silk and gold. The priest dis- played the lance head ; and in a few minutes the wonderful tidings had been spread through the city. A few months later Arnold, the chaplain of Bohemond, publicly denied the genuineness of the relic, and charged the chaplain of Raymond with deliberate imposture. Barthelemy appealed to the ordeal of fire, and passed it, to all appearance,~~

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~~successfully. 'The bystanders were loud in their exulta- tion; but Peter had been fatally injured, and in a few days he died.~~

~~Adhemar, had effectually aided the crusaders in the decisive struggle with Kerboga, before whom Peter the Hermit had appeared as an envoy charged to submit to him the alternative of baptism or of retreat from a land which St Peter had bestowed upon the Christians. answer was a curt refusal, and a battle followed in which Bohemond was severely pressed by Kilidj Arslan, and Kerboga was bearing down the forces of Godfrey and Hugh of Vermandois, when some knights, clothed in white armour and mounted on white horses, were seen riding along the slopes of the neighbouring hills. are come to our help," cried the Papal legate, and the imagination of the people at once beheld in these strangers the martyrs St George, St Theodore, and St Maurice. irresistible. was followed by the surrender of the garrison in the citadel, and Bohemond remained lord of Antioch.~~

~~Meanwhile the holy lance, borne by the Papal legate Defeat of~~

~~. Kerboga and fall of Antioch,~~

~~The~~

~~"The saints~~

The impulse imparted by this conviction was The complete defeat of Kerboga and Arslan

Sufferings of the crusaders,

The crusaders as a body wished to set off at once on their march to Jerusalem; but their leaders shrank from the danger of traversing waterless wastes at the end of a Syrian summer. While some of the crusaders were busied with expeditions against neighbouring cities, many more were pressed by more anxious cares, arising from an out- break of plague which proved fatal, among others, to the Papal legate Adhemar.

Ten months after the fall of Antioch the crusaders, March of having become masters of Laodicea, were bidden by the the er Emperor Alexius to await his coming in June. But with oa him their forbearance had reached its limit, and they bade him remember that, having broken his compact, he had no longer any claim on their obedience. Marching across the plain of Berytus and along the narrow strip of country once celebrated for the wealth and splendour of the great Pheenician cities, the army at length reached Jaffa, and thence turned inland to Ramlah, a town only sixteen miles distant from Jerusalem. Two days later they came in view of the holy city. At the sight of the distant walls and towers all fell on their knees, in an outburst of thankfulness which could express itself only in sighs and tears, while they stooped to kiss the sacred soil. The rest of the march they performed with bare feet and in the garb of pilgrims; but their armour was again put on, when Raymond of Toulouse with his followers invested the city from the western side, while Godfrey and Tancred, with Robert of Normandy and Robert of Flanders, blockaded it from the north. On the fifth day a desperate attempt was Siege and made to storm the walls, with a single ladder and with no conquest siege instruments. It was no wonder that in spite of all the hell their efforts the assailants should be beaten back and ae hurled from the ramparts. Thirty days more passed away, while Gaston of Bearn was busily occupied in directing the construction of siege engines of timber brought from the woods of Shechem. During the whole of this time the besiegers were in the greatest distress from lack of water.

All the cisterns and receptacles of any kind had been care- fully destroyed by the enemy, whose horsemen harassed or cut off the parties of Christians

who were sent about the country to search for it. Nor was the discipline of the camp by any means what it should be ; and the phantom of Adhemar of Puy appeared, it was said, to denounce the licence which was provoking the divine judgments. But if there was wild riot in some quarters, there was devotion and enthusiasm in others. Tancred generously made up his quarrel with Bohemond, and like the Levites round the walls of Jericho, the clergy moved round the city in

Slaughter of the infidels.

Latin king dom of Jerusalem,

Assize of Jorusalem,

Deaths of the chief crusaders,

CRUSADES

procession singing hymns and followed by the laity. The Saracens, it is said, insulted them from the walls by throwing dirt upon crucifixes. On the second day of the final assault, when it seemed that in spite of almost superhuman efforts the crusaders must fail, a horseman was seen, or supposed to be seen, waving his shield on Mount Olivet. "St George the Martyr has again come to help us," shouted Godfrey, and the cry, taken up aud carried along the ranks, banished every feeling of weariness, and sent them forth with overwhelming strength for the supreme effort. It was Friday; and at the moment in the afternoon when the last cry was uttered by the Saviour on His cross Letold of Tournay, it is said, stood on the walls of Jerusalem, followed first by his brother Engelbert, and then by Godfrey. The gate of St Stephen was stormed by Tancred ; the Provengals climbed up the ramparts by ladders ; and the city was in the hands of the Christians. So terrible, it is said, was the carnage which followed that the horses of the crusaders who rode up to the mosque of Omar were knee-deep in the stream of blood. Infants were seized by their feet and dashed against the walls or whirled over the battlements, while the Jews were all burnt alive in their synagogue. In the inidst of these horrors Godfrey entered the church of the Sepulchre, clothed in a robe of pure white, but bare-footed as well as bare-headed, and knelt at the tomb to offer his thanksgiving for the divine

goodness which had suffered them to realize the yearning of their hearts. In the pro- found enthusiasm and devotion of the moment his followers beheld the dead take part in the solemn ritual, and heard the voice of Adhemar rejoicing in the prayers and resolu- tious of penitence offered by the prostrate warriors of the cross. Among the living, too, there were those who called forth the deepest gratitude ; and the vast throng fell at the feet of the hermit Peter, who thus saw the consummation of the enterprize which was mainly his work, and of whom after the completion of his task we hear no more. On the next day the horrors of that which had preceded it were deliberately repeated on a larger scale. Tancred had given a guarantee of safety to 300 captives. In spite of his indignant protest these were all brought outand killed ; and a massacre followed in which the bodies of men, women, and children were hacked and hewn until their fragments lay tossed together in heaps. The work of slaughter ended, the streets of the city were washed by Saracen prisoners.

So ended the first and the most important of the crusades, Its history shows us clearly the nature of these religious wars and.the mode in which they were carried on. Those which follow may be more briefly noticed, as they tend generally to assume more and more of a political character. The first crusade had to all appearance fully attained its object. Godfrey was really king of Jerusalem, although he would not bear the title in a city where his Lord had worn the crown of thorns. HIs reign lasted barely one year, and this year was signalized less by his victory over the Fatimite caliph of Egypt than by the promulgation of the code of laws known as the Assize of Jerusalem, 'These laws embodied the main principles of feudalism, while they added a new feature in the judicial courts, the king presiding in the court of the barons, his viscount in that of the burgesses. On Godfrey's death his brother Baldwin was summoned from his principality of Edessa, 1100, and crowned king by the Patriarch Daimbert. During his reign of eighteen years most of the old crusading chiefs passed away. Stephen of Chartres was slain at Ramlah in 1101. Four years later Raymond died on the sea coast. In 1112 Tancred was cut off in the prime of manhood, three years after Bohemond had ended his stormy career at Antioch. The Emperor Alexius, the

only man who derived lasting benefit from these expedi-

tions, outlived them all. If his empire was to last, the

Turks must be drawn off from the nearer regions of Asia

Minor. This result the crusades accomplished, and thus prolonged the existence of the empire for three centuries

and a half. The second successor of Godfrey was his kinsman Baldwin du Bourg, in whose reign, 1118-31,

Tyre became the seat of a Latin archbishopric. After Baldwin II., the uneventful reign of Fulk of Anjou (1131-44) was followed by that of his son Baldwin IIL, a

boy thirteen years of age (1144-—62), in whose days the fall

of Edessa called forth again the religious enterprize of the

West. Of this second crusade St Bernard was the apostle, Preaching as the hermit Peter had been of the first. In the Council of the of Vezelai, 1146, Louis VIL, the French king, put on Sond | the blood-red cross, and his example was reluctantly er: followed some months later by the Emperor Conrad. The

story of this expedition brings before us a long series of disasters. Conrad lost thousands in an attempted march

across Asia Minor; Louis took ship at Attaleia and succeeded in making his way to Jerusalem. Conrad at

length reached Ptolemais; and the two sovereigns, abandoning the project of rescuing Edessa, resolved to

turn their arms against Damascus, 1148. The siege was a miserable failure, brought about, it is said, by the treachery

~~of the barons of Palestine. Bernard himself was for Failure of the moment overwhelmed by the completeness of the the enter catastrophe ; but the conviction of the reality of his own?" mission soon assured him that the fault lay in the sinfulness~~

~~of the pilgrims—an idea which, having fixed itself in~~

~~some minds, had its issue in the pathetic and awful tragedies called the Children's Crusades. None butThe innocent hands, it was thought, could accomplish the work eas of conquest in the Holy Land; and in 1212 the great ; experiment was tried, with 30,000 children, so the tale~~

~~went, under the boy Stephen, and 20,000 German boys~~

~~and girls under the peasant lad Nicholas, to end in death~~

~~by sea or on land, or in the more fearful horrors of the slave-market. For the present this notion was only in embryo; and the monk John had more success in reviving~~

~~old feelings by declaring that the places of the fallen angels~~

~~had been filled by the spirits of those who had died as champions of the cross in Bernard's crusade. In 1162 Baldwin III. died at the early age of thirty-three. The~~

~~great aim of his brother Amalric, who succeeded him, 1162,~~

~~was to obtain possession of Egypt and thus to prevent Noureddin, the sultan of Aleppo, from establishing himself~~

~~in a country which would enable him to attack the Latin kingdom from the south as he already could from the~~

~~north. It may be said that nothing but his own greed for Suppres- money stood in the way of his success; and Saladin, the sion of the nephew of Noureddin, was thus enabled to rise to power in pot Egypt, and finally, by setting aside the Fatimite caliph, to es put an end to a schism which had lasted 200 years, Nor~~

was this all. Amalric's son and successor, Baldwin IV.,

was a leper, who, being obliged by his disease to appoint

another as his delegate, fixed on Guy of Lusignan, the husband of his sister Sibylla. For the time the arrange-

ment came to naught; but when in 1186 the death of Baldwin IV. was followed in a few months by that of Baldwin V., the infant son of Sibylla by her first marriage,

Guy managed to establish himself by right of his wife as

king of Jerusalem. Over his kingdom the storm was now

ready to burst. The army of Saladin assailed Tiberias ; Battle of and Raymond, count of Tripolis, the son of Raymond of Tiberias. Toulouse, although he had refused to own his allegiance to

Guy, hastened to Jerusalem to beg the king to confine

himself to a defensive warfare, which could not fail to be crowned with success. His advice was rejected ; and the

fatal battle of Tiberias, 1187, almost destroyed the

army which should have defended the capital, true cross fell into the hands of the conquerors.

while the Against

Conquestof the comparatively defenceless city Saladin now advanced ;

Jerusalem

by Saladin. ould provide for the

~~Causes leading to the fall of the Latin kingdom.~~

~~The third crusade.~~

~~but he pledged himself that, if it were surrendered, he inhabitants new homes in Syria, and would supply them with the money which they. might need. His offer was refused, and Saladin made a vow that he would take ample vengeance. But when at length the issue was seen to be inevitable and the besieged threw themselves on his mercy, Saladin agreed that the nobles and fighting men should be sent to Tyre, and that the Latin inhabitants should be reduced to slavery, only if they failed to pay a ransom fixed according to age and sex. Having entered the city Saladin advanced to the mosque of Omar. As he approached, the cross, which still flashed on its summit, was hurled to the ground and trailed through the mire. Thus fell the Latin kingdom eighty-eight years after Godfrey became the Defender of the Holy Sepulchre. At no time had it exhibited any signs of real stability. Resting on the rule that no faith was to be kept with the unbeliever, it justified treachery. It recognized no title to property except in the Christians, and the tempta- tion thus held out to robbery went far to demoralize the people. It kept up constant irritation by petty forays, while it did little to promote military science or discipline. Tis leaders were for the most part devoid of statesmanship. As banded together rather for a religious than a political purpose, they could withdraw from the enterprize as soon as they had fulfilled their vows, and thus the cohesion needed for its permanent success was unattainable. More than all, it had to put up with, if it did not sanction, the growth of societies, each of which claimed independent jurisdiction over its own members. The great military orders of the Hospital and the Temple had come into existence as fraternities devoted to works of mercy in behalf of poor pilgrims. But under the conditions of their sojourn in Palestine it was necessary to bear arms; the bearing of arms involved the need of discipline; and the military discipline of a brotherhood animated by monastic enthusiasm became formidable. These orders wére further strengthened by privileges and immunities conferred, some by the kings of Jerusalem, some by the popes. Their freedom from tithe brought them into direct antagonism witlythe clergy, and the clergy in their turn complained that these orders gave shelter to excommunicated persons, while the fiercest enmity of the Templar was reserved for his~~

brother of the order of the Hospital of St John. Ona kingdom composed of such elements as these the old curse of the house divided against itself cannot fail to descend.

It may have been something like the insight of a states- man which led King Amalric to fix his thoughts on the conquest of Egypt, as the means, not only of preventing the co-operation of hostile powers to the north and the south of the Latin kingdom, but of opening a country of vast resources to the merchant and the trader. There can be no doubt that these considerations prompted the Lateran Council, 1179, to declare that the first object of evéry crusade should be the conquest of Damietta ; but with this determination these enterprizes ceased to be strictly crusades, and the old spirit is seen again only in the royal saint, Louis IX. For the time the fall of Jerusalem seemed to waken again the impulse which had stirred the hearts of Godfrey and Tancred. On the plain between Gisors and Trie the pleadings of William, archbishop of Tyre, prevailed with Henry I. of England and Philip Augustus of France to assume the cross, 1188. Having thus far shown a marked reluctance to the undertaking, Henry may now have really meant to fulfil his promise; but the quarrels and treachery of his sons interposed a fatal hind- rince, and soon brought him to his grave. For his son

and successor, Richard, the idea of rescuing the holy city from the Turk had an irresistible attraction, and his whole mind was bent on raising money for the purpose. This task done, he met the French king at Vezelai, where forty-four years ago Louis VII. had listened to the vehement eloquence of Bernard. The two sovereigns made their way to Sicily, while the Emperor Frederick I. (Barbarossa) was advancing with his host to Constantinople. Frederick

himself was drowned in a Cilician river, 1190, and of Death of those whom he had broughtacross the Bosphorus not a tenth, Frederick

it is said, reached Antioch. ‘The efforts of the Latins of I. Palestine were now directed chiefly against Acre, which had been besieged for two years before Richard and Philip set foot on the Holy Land. The former was prostrated with fever; but his fiery zeal proved stronger than his sickness,

and Saladin was compelled, 1191, to assent to a com- pact which bound him to surrender the true cross, and to give hostages for the payment of 200,000 pieces of gold within forty days. 'The money was not paid in time, and the hostages, numbering 3000 or more, were all, it is said, slaughtered on the summit of a hill from which the tragedy might be seen in the camp of Saladin. 'The sequel of the story tells us of battles won and lost to little purpose. The

victory of Richard at Azotus opened the road to Jaffa and Fruitless

Jerusalem, and the army had advanced as far as Ramlah, victories of tal Richard I.

when the men of Pisa, with the knights of the Hospi and the Temple, insisted that the troops could never be kept together after the recovery of Jerusalem, and thus that its re-conquest would really be fatal to the crusade, In June 1192 Richard again led his forces towards the holy city, and was again foiled by the lack of a commissariat and the destruction of the wells and cisterns which for miles round had been shattered by the enemy. HIs prowess was signally shown in the relief of Jaffa; but in the issue he obtained from Saladin simply a truce for three years and eight months, which in- sured to pilgrims the right of entering Jerusalem untaxed ; and thus, leaving the HIoly Land, he set out on the home- ward journey which was to be interrupted by a long cap- tivity in a Tyrolese castle as the prisoner of HIenry WA, Although this third crusade had been marked by the woful waste of splendid opportunities, it had still secured to the Christians the possession of a long strip of coast, bounded by two important cities, which might serve as a base of operation in future enterprizes, while it had also done much to neutralize the results which Saladin had looked for from his earlier victories.

The fourth crusade may be dismissed in a few words. It was an enterprize set on foot by the knights of St John, 1193, seconded by Pope Celestine III. in the hopes of getting rid of the Emperor HIenry VI., the son of Barbarossa, who claimed the island of Sicily, and encour- aged by HIenry as a means for promoting his own designs. HIenry had no intention of going on the errand himself ; but his barons with their followers defeated the Turks be- tween Tyre and Sidon, 1196, recovered Jaffa which had been taken after Richard's

departure, obtained possession of Berytus, and lost all that they had gained by their folly and disunion in the siege of the castle of Thoron, 1197. Jaffa was again taken by the Saracens; and the Latin kingdom became little more than a title with which Isabella, the sister of Baldwin IV., linked that of Cyprus on her marriage with Amalric of Lusignan, who had succeeded his brother Guy as sovereign of that island.

The fifth ernsade was an undertaking of vastly greater importance. Innocent III, who now sat in St Peter's chair, was a man of incomparably loftier genius than Urban II., and he was raised to the Pontifical throne, LISS, at a time when the European world generally seemed in a state of dissolution, He saw at once how in such a state

of things the crusades had served and would serve to promote the Papal power. But if the popes had thus the nieans and the justification for interfering in the affairs of every kingdom, and acquired the power of demanding con- tributions, levying subsidies, and dispensing with or enforcing vows, the niode in which the revenues so raised had been administered had roused a wide and deep suspicion which might more than counterbalance all the gains. Hence it came to pass that Innocent, even in the plenitude of his spiritual pretensions, was compelled to defend him- self against charges of personal corruption; and when in Fulk of Neuilly he had found an apostle not less devoted and only less eloquent tlian Bernard, the same suspicion came in to chill enthusiasm and lead men to criticise rather than to worship, Nevertheless, a goodly company prepared for the great work was at length brought together, 1201, the most prominent among the leaders being Simon of Montfort, Walter of Brienne, and Geoffrey of Villehardouin, the historian of the crusade. But the story of previous crusades had at least opened men's eyes to the fearful risks of a march across Asia Minor, and the army wholly lacked the means of transport by sea. In this strait whither could they betake themselves but to Venice? For 85,000 silver marks the doge, Henry Dandolo, covenanted to convey them to the Holy Land; but when the fleet was ready, 51,000 marks only were forthcoming, although the counts of Flanders and St Pol had sold all their plate and strained their credit to the utmost. To the amazement of the

crusaders the doge announced that the 34,000 marks would be remitted if they would conquer for the republic the town

Conquestof of Zara, which had been unjustly taken from her by the

Zara.

The crusaders invited to Constanti- nople,

Hungarian king. To Venice at this time came Alexius, the son of the Byzantine Emperor Isaac Angelus, whom his brother Alexius had blinded and thrust into a dungeon. The pleadings of the younger Alexius may have wakened in the mind of Dandolo some thought of what was soon to be achieved at Constantinople ; but for the present he stuck to his bargain about Zara with inflexible pertinacity. Zara was taken, November 15, 1202 ; and the crusaders expressed their wish to hasten at once to the Holy Land. Dandolo replied that the new conquest must be guarded against the king of Hungary, and that famine in Western Asia rendered the eastward voyage during the winter impracticable. Euvoys from Byzantium were also earnest in insisting that the ends of the crusade would be best promoted by placing Alexius on the imperial throne, and that the crusaders' mission was rather the establishment of right everywhere than the wresting of a particular spot from the grasp of the Infidel. They added that the first care of Alexius would be to bring the Eastern Church into submission to the Roman See, while his second would be to provide 400,000 marks for the service of the crusaders, and to accompany them himself to the Holy Land. On hearing these tidings Innocent professed amazement and indignation; but Dandolo was resolved that neither threats nor interdicts should interfere with the execution of his will. The Venetian fleet at length, 1203, reached Scutari, where they received a message from the usurper Alexius promis- ing help if during their stay they would do his subjects no harm. The reply was a summons to come down from his throne ; and the appeal lay only to the sword. With ordinary courage Alexius must have carried the day ; by giving the order for retreat he sealed his own doom, and on his flight from the city the blinded Isaac Angelus, drawn from his prison, was again wrapped in the imperial robes, and his son Alexius raised to share his dignity. But fresh disappointments were in store for the crusaders. Alexius gave them to understand that the winter must be Spent in Constantinople ; and Dandolo

effectually supported him by saying that until the spring the Venetian fleet should

not move. In the meantime feuds and factions were doing their old work in Constantinople. The young Alexius, offended at the plainness of speech which told him that solemn compacts must be adhered to, sent a squadron of fire ships against the Venetians. The project failed ; and in a little while his throne was filled by Alexius Ducas, called Mourzoufle from the darkness and shagginess of his eye-brows. Dandolo insisted on the restoration of Alexius; and Mourzoufle had him killed in prison. placing a Latin emperor on the Byzantine throne; and

1204 Constanti-

this task was achieved after a second siege, ; which was followed by riot and carnage altogether dis- graceful to Western chivalry. Innocent JIT. might well ask how the return of the Greek Church to ecclesiastical unity was to be looked for when they saw in the Latins only works of darkness for which they might justly loathe them worse than dogs. The committee of twelve—half French, half Venetian—charged with the election of an emperor, fixed their choice on Dandolo; but the old man, who had well-nigh completed his tale of a hundred winters, cared little for the office, while the Venetians had no wish to see one man at once doge and emperor. Two only remained who could well be made competitors for the throne—the marquis of Montferrat, and Baldwin of Flanders. was a descendant of Charles the Great, and a cousin of the French king; and Baldwin was crowned by the Papal legate in the great church of Justinian.

The crusaders had thus done great things, although not precisely the things which at the outset Innocent would have had them do. The old schism of the Greek Church had been brought to an end, and the dominion of the Holy

See vastly enlarged. But the benefits secured to Venice HffectofIhe were at least more enduring. The conquest of Zara was Crusade on

the first step only toward the establishment of a great maritime empire ; the factories at Pera were exposed only to attacks by sea, and here her ships could guard them. Her settlements were seen in the' richest islands of the

Afigean ; and this development of her greatness seemed to foster a spirit of independence which Innocent JII. regarded with instinctive suspicion. It was the fault of the Venetians, he said, that the whole enterprize had not been brought already to a brilliant consummation. What might not an army which had done so much at Zara and Byzantium have achieved in the Holy Land?

The Latin empire thus set up was not more durable than

the kingdom of Jerusalem. Baldwin, as emperor, was it Constan-

really nothing more than a chief among his peers; and although he thus lacked the authority of the sovereigns whose title he bore, he attempted tasks which even they must have failed to accomplish. By the crusaders the Greek people were regarded as barbarians or heathens, and their clergy as the ministers of a false faith. The former were excluded from all offices and dignities; the Assize of Jerusalem was substituted for the Code of J ustinian ; and no native was allowed to take part in the administration of this law. Such changes could portend nothing but future evil; nor were other signs of speedy downfall wanting. The conquerors began to quarrcl, and Baldwin found him- self at open war with Boniface of Montferrat, now lord of Thessalonica. Like Boniface, the other chiefs of the crusade had been splendidly rewarded. The count of Blois received the dukedom of Nice; and the Venetian Dandolo became the sovereign of Romania, with Geoffrey of Villehardouin as his marshal. But the power of the Eastern Cvesars was rather divided than crushed, New empires sprung up at Nice, Trebizond, and Durazzo; and the Latins encountered an enemy stil! more formidable in the Bulgarian Calo-John, who ordered a massacre of the

This deed was held to justify the crusaders in Latin con-

quest of

nople.

Baldwin

The choice of the electors fell on the latter, who emperor of

~~the East.~~

~~the power of Venice.~~

~~Latin rule~~

~~tinople. .~~

~~Wise policy of Henry I.~~

~~Fall of the Latin em- pire of the East.~~

~~The sixth crusade.~~

~~630~~

~~Latins in Thrace, 1205. Eager for vengeance, Baldwin marched against him; but he was taken prisoner, and the army was saved only by the skill and heroism of Villehardouin, who has left us a narrative of the campaign. The liberation of Baldwin was demanded by the Pope ; the reply was that he had died. The cause was never known ; and for a year his brother Henry, who was elected to succeed him, refused to take the title of emperor. The ten years of Henry's reign, 1206-1216, stand out in pleasant contrast with the lives of the emperors who were to follow him, Henry at the least saw that his brother had made a fatal mistake in confining the work of government exclu- sively to the Latins. Greeks were again admitted to public offices and honours ; to the imposition of a foreign liturgy or of a foreign dogma Henry offered a passive resistance, while his throne, placed on the right hand of the patriarch's chair in the church of Sancta Sophia, was significant of his thoughts on the question of Papal snpremacy. With his death the male line of the counts of Flanders came to an end. Ina fatal moment the offer of his crown was accepted by Peter of Courtenay, count of Auxerre, the husband of Henry's sister Yolande. Like Baldwin, Peter fell into the hands of his enemies on his eastward journey, and died without seeing the city of which he was the sovereign, 1218. During thie reign of his successor Robert, the second son of Yolande, the range of Latin dominion was rapidly narrowed, When Robert died, Baldwin, Yolande's youngest son, was still a child only seven years old; and John of Brienne, the titular king of Jerusalem, was~~

raised to the imperial throne. At length, after his death, the second Baldwin became emperor; but the twenty-five years of his reign he spent chiefly in distant lands, begging for help in money. In vain the Pope proclaimed a crusade in his behalf. The end was drawing nigh. The envoys sent by him to Michael Paleologus were bidden to tell their master that he might have peace on the payment of an annual tribute amounting to the whole revenue from customs and excise at Constanti- nople. A few years later, 1261, Baldwin was driven from the imperial city, and spent the rest of his days wandering over Europe and telling the story of his misfortunes. So fell the Latin empire, having dealt the death-blow to the hopes which were dearest to the heart of Pope Innocent III. The reconcilement of the Eastern with the Western Church would, he knew, be best achieved by a close union between the subjects of the Eastern and the Western empires. The policy of the Latin emperors had opened a gulf of separa- tion which has not to this day been closed, and had con- verted the dislike and suspicion of former generations into vehement jealousy or furious hatred.

When the Latin empire fell the era of the crusades was fast drawing to its close ; and of the expeditions which had been undertaken before its dowufall one only was prompted by the spirit which had animated the hearers of Urban 'let, at Clermont. The conditions of the conflict were widely changed ; and the course adopted by the Christian leaders showed their conviction that the surest road to Jerusalem was by way of Egypt. Again and again this plan might have been carried out successfully ; and again and again the crusaders threw the chance away. Thus, in the year 1219, the Syrian Sultan Coradin had offered peace to the besiegers of Damietta, pledging himself to surrender not merely the true cross but the whole of Palestine, with the exception of two forts for the protection of pilgrims bound to Mecca. The offer was rejected ; Damietta was taken and plundered ; and in the spring of 1220 the army insisted on attempting the conquest of Egypt. The Sultan Kameel offered them terms as favourable as those of Coradin, and these were also refused. The Nile rose ; and the Egyptians inundated the camp of their enemies, who in their turn were

strictly kept, and the injuries

compelled to sue for peace by surrendering Damietta. This disaster made the Pope Honorius III., who had beeu elected on the death of Innocent, still more anxious for the fulfil- ment of the crusading vow which had long since been taken by the Emperor Frederick IJ., the grandson of Assump- Barbarossa. In a conference at Ferentino, 1223, it was tion of the agreed that Frederick should marry Iolante, the daughter 4 y k of the titular king of Jerusalem, and thus go forth as his iL — heir to recover his own inheritance. Two years were allowed for preparation; but it was found necessary at San Germano to grant two more. When at length Frederick married Jolante in 1225, be declared that his father-in-law, John of Brienne, was king only by right of his wife, on whose death the title had passed to her daughter, and that thus Frederick was now king of Naples, Sicily, and Jerusalem. Still the months rolled away, and the vow of Frederick remained unfulfilled. Houorius had already been obliged to remonstrate; his successor Gregory Relations IX,, 1227, found himself constrained to use sharper of Fre- weapons, The contrast between the two men was marked sci indeed, In Gregory IX., chosen Pope at the age of four- ne i score years, the ascetic severity of Gregory the Great was united with the iron will of Gregory VII. Frederick was a young man of thirty-three, born and bred in Sicily, steeped in the luxury of a gorgeous and voluptuous court, where the charms of art and the refinements of literature and philosophy in some measure redeemed the sensuous indulgence at which Gregory would have stood aghast. The Pope had indeed enough to disquiet him in the reports which came from this Sicilian paradise. Frederick was spending his days amongst a motley company gathered from all the countries of Europe,—a company in which Christians, Jews, and Saracens mingled freely. A society such as this could exist only in an atmosphere of tolerance, and tolerance in Gregory's eyes was ouly another name for indifference, and indifference of heresy. The spell, therefore, must be broken ; and Frederick must be sent forth to do battle in distant lands with the Infidels to whom he showed so dangerous a liking in his own. At length his forces were gathered at Brindisi, 1228, but fever broke out among them ; and Frederick, having embarked, was compelled after three days to put into the harbour of Otranto. Gregory could endure no more. Frederick was solemnly exconl- Excommt municated, and the excommunication was followed by nication of interdict. Papal messengers forbade him now to leave Frederick Italy until he had made satisfaction for his offences against

the church. Frederick retorted by sending his own envoys to demand the removal of the interdict, and then sailed to Ptolemais. Here he found friends in the Teutonic Knights and their grand-master Herman of Salza ; and although he was ready to fight, he was still more willing to gain his ends without bloodshed. At length a treaty signed by Frederick the Sultan Kameel, 1229, surrendered to Frederick the and the whole of Jerusalem with the exception of the mosque of Sa Omar, and restored to the Christians the towns of Jaffa, Nazareth, and Bethlehem. Success thus achieved exasper- ated rather than appeased the Pontiff. The interdict followed him to the holy city, and when he went to his coronation as king of Jerusalem in the Church of the Sepulchre, not a single priest took part in the rite, and. Frederick was compelled to crown himself. The letters which he wrote to announce a success which he regarded as splendid roused only a storm of indignation. Gregory charged him with a monstrous attempt to reconcile Christ and Belial, and to set up the impostor Mahomet as an object of veneration or worship.

The treaty with Kameel, which closed the sixth crusade, Thesevent! was for ten years. On neither side, prebably, was it crusade, done to pilgrims on their

way froni Acre to Jerusalem were alleged as a sufficient reason for sending out the expedition headed by Richard, earl of Cornwall (brother of the English Henry ITI., and afterwards king of the Romans). This expedition may be regarded as the seventh in the list of the crusades, and deserves notice as having been brought to an end, like that of Frederick, by a treaty, 1240. The terms of the later covenant were even more favourable to the Christians ; but two years later the Latin power, such as it was, was swept away by the inroad of Korasmians, pushed onwards by the hordes of Jenghiz Khan. The awful havoc thus

broke out.

~~enter Thy house, O Lord ; I will worship in Thy sanctuary, The arrival of the English Edward, who was soon to succeed to the throne on the death of Henry TIL, brought about no immediate change in the circumstances of the crusaders. In the following year Edward reached Acre, took Nazareth—the inhabitants of which he massacred—fell sick, and during his sickness narrowly escaped being murdered by an assassin sent by the emir of Joppa. Having made a peace for ten years, he returned to Europe; and~~

~~The saintly king was among the victims ; and Death of~~

~~this truest of all crusaders died uttering the words, " J] will st Louis at y Lunis,~~

~~the ninth and last crusade was at an end. An earnest Decay of attempt to renew the struggle was made in the Council = ee of Lyons, 1274, by Gregory X., Edward's friend; and "8 **P**"™~~

~~caused was alleged by Pope Innocent IV. asa reason for again summoning Christendom to the rescue of the Holy Land. But nearly seven years passed away before the~~

~~The eighth crusade.~~

~~—French king, Louis IX., was able to set sail for Egypt on~~

~~the eighth crusade. This royal saint, who lives for us in the quaint and graphic chronicle of his seneschal Joinville, may with truth be said to have been animated by a spirit~~

~~Rodolf of Hapsburg pledged himself to join the expedition then decreed ; but in less than two years Gregory died, and the scheme fell to the ground. Of the attempts made in succeeding years to rekindle the old enthusiasm it is~~

~~of devotion and self-sacrifice which no other crusading leader manifested in anything like the same measure. Intolerant in theory, if he could be said to have any theory,~~

enough to say that all proved abortive. The Holy Land Suppres- could no longer, as it seemed, furnish a home even for the sion of the

military orders. The Teutonic Knights made their way to rose

Captivity of St Louis.

and bigoted in language, Louis had that true charity which would make him succour his enemies not less readily than his friends. Nor was his bravery less signal than his gentleness. It was displayed not only on the battle-field, but during the prolonged miseries of a captivity in which he underwent keener pain for the sufferings of others than for his own. He had, indeed, the highest virtues of the monk, the most ardent love of justice and truth, the most vehement hatred of wrong ; but as he laid no claim to the qualities of a general, so most assuredly it cannot be said that he possessed them. His dauntless courage saved his army from complete destruction at Mausourah, 1249 ; but his offer to exchange Damietta for Jerusalem was rejected, and in the retreat, during which they were com- pelled to fight at desperate disadvantage, Louis was taken prisoner, With serene patience, with unwavering firmness, and with an unclouded trust in God, he underwent sufferings for which the Saracens, so Joinville tells us, frankly confessed that they would have renounced

Lithuania and Poland, the Hospitallers to Cyprus and to Rhodes. The Templars fell victims to a plot as iniquitous and treacherous as any that has disgraced the annals of mankind. When their services had ceased to be useful in Palestine the French king found that much benefit might be derived from a confiscation of their vast possessions. The proceedings against the order in England are scarcely to be compared with the surpassing horrors of the proscrip- tion in France which ended in the burning of the grand- master Du Molay ; but in both countries the power of falsehood in compassing the destruction of men innocent of the particular crimes laid against them was seen as perhaps it had never been seen before. The fury with which they were persecuted was indeed a legitimate result of the crusades, for which the unbelief of the enemy supplied the primary motive. The theory of putting down error by force had received a sanction which was applied in the dealings of the popes with Albigensian and other heretics.

The narrative of the crusades brings out with sufficient General re-

Mahomet; and when the payment of his ransom set him free, he made a pilgrimage in sackcloth to Nazareth, 1250. With a firmness which nothing could shake he denied himself the solace of looking on the holy city. His sense of duty would not allow him to reap the fruits of an

clearness both their causes and their consequences. We View of thie have seen that, while the popular impulse which led to f'8"s antl them could not issue in vigorous action without the quences of sanction of religion, the mere authority even of the popes the eru-*

was wholly powerless to set Latin Christendom in motion ses.

The ninth crusade,

enterprize in which he had failed, and so to set an evil example to others. As a general he had achieved nothing, but his humiliation involved no dishonour; and the genuineness of his faith, his devotion, and his love had been fully tested in the furnace of affliction.

The crusading fire was now rapidly burning itself out. In the West there was nothing to awaken again the enthusiasm which had been stirred by Peter the Hermit and by Bernard; while in Palestine itself almost the only signs of genuine activity were furnished by the antagonism of the religious military orders. There was, in truth, disunion and schism everywhere. 'The relations between the Venetians and the men of Genoa and Pisa were at best those of a hollow truce; and the quarrels of the Templars and Hospitallers led in 1259 to a pitched battle, in which almost all the Templars were slain. Some eight years later the tidings that Antioch had been taken by the Infidels revived in St Louis the old yearning for the rescue of the holy places ; but he modestly expressed his fear that his sins might again bring on the Christian arms the disasters of his Egyptian expedition. Cheered by the sympathy of the Pope Clement IV., he embarked with an army of 60,000 men, 1270; but a storm drove his ships to Sardinia, and thence they sailed for Tunis. They had encamped, it is said, on the site of Carthage, when a plague

~~until popular indignation had reached the fever heat. We have been able to watch the effect of these enterprizes in changing the face not only of the East but of the West, securing to the popes the exaction and administration of vast revenues and of a dispensing power still more moment- ous in its issues, strengthening and extending royal authority by the absorption of fiefs, but for the moment increasing in incomparably larger measure the wealth and influence of the clergy. We have seen the introduction of feudal principles into Jerusalem and Constantinople, and have marked the effects which followed the substitution of the Assize of Jerusalem for the Code of Justinian. The story has shown us that the contact of Western with Eastern Christendom brought about in some respects — results precisely opposite to those which were anticipated from it, and that the establishment of the Latin empire of Constantinople rendered hopeless that union of the churches which Innocent III. had regarded as its certain fruit. But if the crusades thus disappointed the expectations of their promoters, they achieved some results the benefits of which have been felt from that day to the present, They failed, indeed, to establish the permanent dominion — of Latin Christendom, whether in New Rome or in Jerusalem ; but they prolonged for nearly four centuries the life of the Eastern empire, and by so doing they arrested~~

~~the tide of Mahometan conquests as effectually as it was arrested for Western Europe by Charles Martel on the plain of Tours. They saved the Italian and perhaps even the Teutonic and the Scandinavian lands from a tyranny which has blasted the fairest regions of the earth; and if they added fuel to the flame of theological hatred between the Orthodox and the Latin churches, if they intensified the feelings of suspicion and dislike between the Eastern and the Western Christians, they yet opened the way for an interchange of thought and learning which had its result in the revival of letters and in the religious reformation which followed that revival. If, again, of their leaders some showed themselves men of merciless cruelty and insatiable greed, there were others who like Tancred approached the ideal of the knightly chivalry of a later generation, and others again whose self-sacrifice, charity, and heroic patience furnish an example for all time. The ulterior results of~~

~~the crusades were the breaking up of the feudal system, the abolition of serfdom, the supremacy of a common law over the independent jurisdiction of chiefs who claimed the right of private wars; and if for the time they led to deeds of miquity which it would be monstrous even to palliate, it must yet be admitted that in their influence on later ages the evil has been assuredly outweighed by the good.~~

~~Gibbon, History of the Decline and Fall of the Roman Empire ; Michaud, Histoire des Croisades ; Mills, History of the Crusades ; William of Malmesbury ; Joinville, Memoirs of the Crusades of St Louis ; Richard of Devizes ; Geoffrey of Vinsauf ; Geoffrey of Ville- hardouin; Wilken, Geschichte der Kreuzziige ; Haken, Gemélde der Kruezziige; Milman, Latin Christianity, book vii. ch. vi.; Hallam, Middle Ages, ch. i. part 1.; Mainbourg, Histoire des Croisades ; Finlay, History of the Byzantine and Greek Empires, from 1057 to 1453 ; James de Vitry, Historia Orientalis ; Choiseul d' Aillecourt,~~

~~Mémoires sur les Croisades ; Heeren, Essay on the Influence of the Crusades. (G. W. C.)~~

~~CRUSENSTOLPE, Macnvs Jaxos,a Swedish historian, was born in 1795. He became early famous both as a political and an historical writer. His first important work was a History of the Early Years of the Life of King Gustavus IV, Adolphus, which was followed by a series of monographs and by some politico-historical novels, of which The House of Holstein-Gottorp in Sweden is considered the best. He obtained a great personal influence over King Karl Johan, who during the years 1830-33 gave him his fullest confidence, and sanctioned the official character of Crusenstolpe's newspaper J'déderneslandet. In the last- mentioned year, however, the historian suddenly became the king's bitterest enemy, and used his acrid pen on all occasions in attacking him. In 1838 he was condemned, for one of these angry utterances, to be imprisoned three years in the castle of Waxholm. He continued his literary labours until his death in 1865. Few Swedish writers have wielded so pure and so incisive a style as Crusenstolpe, and it is by virtue of the elegance of his writings that he will~~

~~survive, for his historical worth is injured by the passionate bias of his political and personal antipathies.~~

~~CRUSIUS, Curistian Avcust (1715-1775), after Buddeeus the most distinguished theological opponent of the Wolfian philosophy and critical methods, was born on the 10th of January 1715, at Leuna, in Merseburg, a division of Prussian Saxony, and passed to the university of Leipsic im 1734, After attending the usual classes, he became extraordinary professor of philosophy in Leipsic in 1744, professor of theology in 1750, and theological principal in 1755. He died on the 18th of October 1775. "Two of the great objects of his life were to place philosophy on a thoroughly satisfactory basis for the future, and to bring philosophical conclusions into harmony with orthodox theology. The university was divided by the disputes that were rife into two parties—the " Ernestianer" and the "Crusianer." The former contended for a purely grammatical interpretation of Scripture, and carried out their theory to its logical consequences. They thus~~

~~subjected the sacred writings to the same laws of exposi- tion as are applied to other ancient books. Ernesti, adopting the principles he had employed in dealing with the classics, looked at the Bible from a purely philological stand-point. Crusius, on the other hand, explaimed Scripture in the light of the labours of the church and the usually received theological system. This had great influence on his philosophical position. He had inherited a bias against the Wolfian views from his teacher Riidiger ; and numerous works were issued by him on logic, meta- physics, psychology, and moral philosophy—all with a direct controversial bearing. The system of Crusius was not successful, but it had a few very enthusiastic supporters. His mysticism and sincere religious spirit endeared him to the Pietists and the followers of Zinzendorf, who would naturally regard him as an able opponent of the extreme rationalizing tendencies (Aufklirung) of the time. His views of prophecy, too, and of its important connection with the Christian economy, had considerable influence on Hengstenberg and Delitzsch. The principal works of Crusius are Hypomnemata ad theologiam propheticam and his Moral Theology. 'The latter is in two parts. In the first, taking revelation as his starting point, he combats the Wolfian idea of human perfection, and treats of the depravity, conversion, and sanctification of man. He seems to have held, like Dr Wardlaw, that natural,~~

as distinguished from Christian, ethics are not legitimate. The second part is devoted more specially to morals. The book, although prolix, is animated by genuine religious feeling. Although Crusius had great influence on many of his contemporaries, he unfortunately outlived his reputation. He was a profound, subtle, and original thinker, and was, perhaps, drawn into mysticism by his attempts to reconcile theology and philosophy. His works have fallen into the background ; but he is still remembered for his profound learning, unfeigned piety, and purity and earnestness of character. Few controversialists have left behind them so stainless a name.

CRUSTACEA

(is probably no class among the Invertebrata which

offers so many striking family and individual peculi- arities as are to be met with among the Crustacea. Having a special type of structure, and possessed of numerous characteristics in common, they nevertheless put on such diverse appearances both in the young and adult stages of their existence as frequently to have baffled the most able

investigators, whilst many of the vagrant members of the class still challenge further research.

The masterly and exhaustive labours of Charles Darwin on the Cirripedia have rescued that aberrant group from obscurity, and many of the parasitic forms have been relegated to the various orders of which they are in reality only degenerated members, their crgans having suffered

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atrophy, and frequently their entire structure having undergone modification, in consequence of the peculiar existences which they lead. But our advance towards a more correct knowledge of the class, as a whole, has been mainly derived from the accumulated store of embryological and developmental studies which—commenced in 1823 by Vaughan Thompson—have in these later years been so successfully prosecuted by Audouin and Milne-Edwards, Darwin, Spence Bate, Van Beneden, Claus, Anton Dohrn,

A. 8. Packard, O. F. Miiller, Fritz Miiller, and very many other naturalists. Much, however, still remaius to be accomplished.

The Crustacea belong to the sub-kingdom ANNULOSA, and to the division ARTHIROPODA, in which are also included the Insrcra, the Myrrapopa, and the ARACHNIDA; they are known also as ArTicuLatTa, from the body being composed of a series of distinct rings or segments, each segment usually possessing a pair of jointed appendages or limbs articulated to it. They may be defined to be those Articulata which, whenever respiratory organs are specially developed, possess branchia# and not trachez. By this definition they are at once separated from all insects and myriapods, which invariably possess trachez. But it remains a difficulty, if it be not altogether impossible in the present state of science, to frame any definition which shall similarly include all Crusracza and exclude all ARacHNIDA. In both classes, in fact, there are fornis which possess no special respiratory organs ; and if in these cases we resort to other characters, none which are of universal application have as yet been discovered.

It may be said, however, that as a rule these exceptional Crustacea possess more than four pairs of locomotive appendages, have two pairs of antennary organs, and possess a simple alimentary canal ; while the Arachnida generally have not more than four pairs of locomotive appendages, possess at most one pair of antennary organs, and have their alimentary canal produced into cceca (Huxley).

EXTERNAL StTRUcTURE.—The skin of the Crustacea is more or less completely hardened by a horny deposit

Fic. 1.—Diagram figure of Gammarus locusta, Fabr. (after Spence Bate and J. O. Westwood).

C= cephalon or head; Th= thorax; Ab—=abdomen. (See Table of Appendages, next page.) called "chitine," with or without the addition of lime,} thus forming a defensive covering to the softer tissues of the animal. This hardened envelope serves also as an external skeleton, giving rigidity and support to the

1 Chevreul gives the following analysis of the shell of the common crab ;—

AMMA) MALLET 00.25… vercereewne des 28°6 Phosphate of lime …..... 6°0 Carbonate of lime …..... Pe A 62°8 Phosphate of magnesia …..... 1:0 POUR BAltS, G6Gg ate csnGe dtd cadences 1°6

100°0

internal organs ; and to its inflections, projections, and rugosities the muscles and membranes of the body and appendages are attached.

Bopy-SecmMEnts.—The crustacean exo-skeleton consists of a series of rings, usually a repetition of each other, and differing only in modification according to the necesgiggwof the various portions of the animal. Each of thesggj¥isions is called a somate (Huxley).

The normal number of somites, or segments, 18 twenty- one ;? but instances occur among the extinct Trilobita and the recent Phyllopoda and Branchiopoda, in which a larger number of segments than twenty-one are to be met with. On the other hand, many recent and fossil forms offer examples of Crustacea in which cone or more segments are never developed ; but this apparent absence is generally due to their coalescence, and we shall not unfrequently find indications of this if we bear in mind the theory of Oken, that each pair of appendages indicates a separate segment.

Although the segments of the Crustacea are greatly modified in the different orders, yet they can nevertheless be shown to be all composed of two lateral moieties resembling each other; we can also distinguish two arcs, the one superior, the other inferior, as shown in the annexed figure (fig. 2).

The superior central pair united constitute the tergum (t, ¢), and the lateral are called the epimera (ep, ep).

t The inferior arc is composed 7 Ns of the same numker of

pieces. The two median as , s Ys pieces unite to form the =a sternum (s, s), and the latero-inferior pair are called the episternum (es,es). They are always united at the sternum; but there generally exists, between the inferior arc and the epimera situated above, a wide space destined for the articulation of the corresponding appendage (Milne- Edwards).

Mr C. Spence Bate, in his " Report on the British Edriophthalmia" (Brit. Assoc. Repts., 1855), differs from Milne-Edwards and other previous writers who had con- sidered the series of scale-like plates at the sides of the body-segnients of the Amphipoda as representing the "epimeral pieces" of each somite; on the contrary, he considers them to be the dilated coxal joint (or protopodite) of each limb. This view he adheres to in his chief work? (1863, p. 3) on the sessile-eyed Crustacea, and reiterates in his Report® (1875, p. 47), where he writes the epimera as sectional pieces in a theoretical construction of a somite cannot exist ; they are really portions of the integument of the appendages. That they are present in the Amphipoda

Fic. 2.—Ideal segment.

attached to the coxal joint of seven pairs of the limbs is

2 In allthe higher Crustacea the body is normally composed of twenty-one segments, but, of these, the last never bears true ap- pendages, and is developed subsequently to the others from the dorsal surface of the body. Hence we are justified in regarding it, not as a somite or primitive typical segment of the body, but as a peculiar median appendage, to which the special name of "telson'" (Spence Bate) may be applied. Thus the number of somites becomes reduced to twenty, each bearing its pair of appendages (Huxley, Afedical Times and Gazette, 1857, p. 507). Professor Bell considers the extremely minute and movable points attached to the extremity of this segment in Paleinon serratus to be a pair of rudimentary appendages (Hist. Brit. Stalk-eyed Crustacea, p. xx., 1853).

3 As, for instance, the larval stages of Limulus polyphemus.

4 History of British Sessile-eyed Crustacea, 2 vols., Spence Bate and J. O. Westwood, 1863.

5 British Association Reports, Bristol, 1875, published 1876.

readily seen; but in the Decapoda, Stomapoda, and Isopoda it cannot by any means be so easily demonstrated. " We know of no example of a ring in which we are able to distinguish all the pieces that we desire to enumerate. In some there is an absence of certain pieces from the places they should occupy ; sometinies they are very intimately soldered together, so that we cannot detect even a trace of separation; but in studying each of them form a clear idea, and recognize its character in spite of its union with its neighbouring pieces. Moreover, although this analysis of the ring may not be always practicable, it ig none the less true that it facilitates much the study of the exterior skeleton of articulated animals, and that it will permit us often to establish analogies where the greatest difference would at first sight appear to exist" (Milne-

separately, where it is most distinct, we shall be able to.

Edwards). i Professor Huxley in his lectures! has somewhat simplified Milne Edwards's view of the crust- t

acean segment. Taking for his type one of the body rings, or somites, of the common lobster (fig. 3), he points out that it con- sists of a convex upper part, called the tergum (t), and a flatter in- ferior side, the sternwm (s), the angle of junction on each side of the tergum and sternum being produced downwards, forming what is termed the pleuron (or epimera) (pl.) For ordinary studies this view of a somite will be found sufficiently clear and simple. From the inner surface of these tegumentary rings in the Crustacea various plates are given off which project into the internal cavity, constituting in some in- stauces cells and canals. According to Milne-Edwards, these processes are always developed at the points of union of two rings or of two neighbouring pieces of the same segment ; and this dis- Kis' ice es, ee position has obtained for iar oan iP eduass mMmar- them the name of apodema mores). (fig. 4). They are the result @, 4,4, the epimera; 6, 6,6, the sternum; of a fold of the integument. %.c,furend separating the Insertions ary membrane which pene- ° the legs. trates more or less deeply between the organs, and which is strengthened with calcareous matter like the rest of the external structure, and always formed of two thin plates soldered together. They serve the office fulfilled by the bones in the Vertebrata, viz., that of affording solid surfaces to which the muscles are

attached. Divisions OF THE Bopy IN THE CrRusTACcEA.—By general consent and usage the body of a crustacean is divided into three regions, namely, head (or cephalon), thorax, and abdomen (see figs. 1 and 6), to each of which divisions seven out of the twenty-one segments are attributed. These terms are used as a matter of convenience, and are not assumed to be homologous with the grand divisions of head, thorax, and abdomen, in the Vertebrata.2 All writers

a

Pl p

Fig. 3,

1 Medical Times and Gazette, 1857.

2 Mr C. Spence Bate, F.R.S., has, since 1855, earnestly advocated the adoption of the terms "pereion"' and "pleon" as less objection- able and more expressive than thorax and abdomen for the second and third divisions of the body (the term cephalon for the head being, of course, generally adopted). In his recent paper "On the Anatomy of the American King-Crab (Limulus polyphemus)," Trans. rsh dade ph 1872, vol. xxviii. pp. 462-3, Prof. Owen has proposed the terms " cephaletron" and " thoracetron" for the anterior and posterior divisions of the body in Limulus, and "'pleon" for the " tail-spine."

| (see fig. 5).

GRUSTACHS

agree in considering the last seven® segments to be abdominal. The only difference of opinion is as to the division of the first fourteen,—how many are cephalic and how many thoracic.

Dr Dana is of opinion that Crustacea have no distinct head, but only a cephalothorax composed of the fourteen anterior segments, yet he admits that in the Edrioph- thalmia the seven most anterior pairs of appendages

are devoted to the mouth and organs of sensation, and in the extinct Pterygotus and in the Trilobita a distinct head certainly exists.

Professor Huxley considers that the division in the Podophthalmia is indicated by the cervical fold and by the sudder chanze in the character of the appendages between the sixth and seventh somites, and an equally marked similarity between the latter and those of the eighth and ninth pair. So that according to this view we should have six cephalic, eight thoracic, and six abdominal somites (for Professor Huxley regards the ¢elson as not being a true somite but a median appendage, like the post-oral plate in Pterygotus). But, as Dana well observes, the mouth organs may become legs, or the legs may become mouth organs by slight variations, therefore this line of division can hardly be maintained on the character of the appendages alone, seeing it does not hold govd for other groups equally entitled to consideration, as is the Podophthalmia.*

The subjoined table may serve to show these several views more clearly :—

Arrangement and Nomenclature of the Somites or Body- rings of the Crustacea, with their Appendages.

lst. Somite bearing the eyes. Aish 3m % 2 » bearing antennules, or 1st (inter- 33. 2 P = nal) antenne. Sees as 4 3. », bearing antenn, or 2nd (exter- |; BSS, eis Ss 5 nal) antenne. BZ ;826 2% 3 4, » bearing mandibles. P(SESs (ee 3 5. » bearing 1st maxille. EE>n ay a 6. » bearing 2d maxille. ano J8 o‘4 e 5 bearing 1st maxillipeds. ae ~ z i) q 8. + bearing 2d “ Se ny x i 2 S 9. » bearinge3d a % aS 2 2 oS Pg A ro) 10. age” 3 se la lL. pearing organs of prehension, 7 est 5 i= oA 8 12, ambulatory legs, or natatory ae a 2° g 5 8 13. appendages. RBA” BS 3 14. 782s | : 15 aa) > J : of a. 16. } Each somite furnished with a pairof |SE%. | Sed log Lis appendages, usually natatory, but Ss g $ 2 E29 = g 18. variously modified, oft.n branchi- Sons ooo Esa 19 ferous Sasa ase $3 elt dled gx \a75q \e: 2 5 aaa [be Ba ogee o 2 Pte S32 Issa 168 aa Exo Vg In irs Lar] A] 1.) Caudal somite destitute of appendages, os § ge sun i: : “telson,” or median appendage. i SOR

Tur APPENDAGES.—Just as we find a typical number of

| twenty-one body spgments to prevail among the Crustacea,

so also in the appendages the type number of joints is seven, any departure from which is disguised by fusion of one or more joints together, the obsolete condition of others, or the depauperization of the limb into numerous articulr At the coxal joint, or protopodite, each limb usually bifurcates ; firstly, there arises the external Jimb proper, or exopodite, which is normally seven-jointed ; and. secondly, the internal branch, or endopodite, which may serve as a mouth organ, a branchial appendix, a swimming organ, or a protection for the ova or the young. The appendages

SS As other carcinologists are not agreed in regarding the long ensiform tail-spine of Zimulus as representing the abdomen, we are still left in doubt, and have come to the conclusion that any satisfactory revision of the existing nomenclature must comprehend not one class only but the entire group of the Arthropoda, in the several classes of which the terms proposed to be altered are now in general use. —

3 That is—reckoning the ¢elson as the twenty-first segment.

4 In the Edriophthalmia the normal arrangement mostly is mair- tained, the fourth to the seventh pairs being epistomial appendages, and the eighth to the fourteenth ambulatory organs.

belonging to the three divisions of the body differ from | which are never diverted from their normal use, though sometimes

each other in a greater or less degree in proportion to the higher or lower grade which we examine. Thus among the Decapoda (crabs and lobsters) the cephalic, thoracic, and abdominal somites all possess appendages with well marked

Names of Joints . Coxa,

Basos.

~~. Ischium.~~

~~. Meros,~~

~~. Carpus.~~

~~. Propodos,~~

~~Aa SP oe FF SO DS~~

~~- Dactylus.~~

~~Fie. 5.—(1.) Walking of Lobster (Homarus vulgaris), Edw.; (2.) Swimming~~

~~Jaw-foot of Pterygotus. characters, each series being highly differentiated for the functions to be performed by it. Among the Entomostraca, the appendages of the anterior cephalic somites alone are — highly specialized, the others being either mere vegetative repetitions of one another, or else altogether wanting.~~

~~Fia. 6.—Diagram of the segments and appendages of the Common Lobster (Homarus vulgaris). =~~

~~C=cephalon; 18, Th=thorax, showing the apodemata ; Ab = abdomen. 1, Eyes; >, antennules ; 3, antenne ; 4, mandibles; 5, first maxille ; 6, second maxille; 7, first maxillipedes; 8, second maxillipedes; 9, third pair maxillipedes. 10, One of the antepenultimate pair of thoracic legs of female; p, protopodite ; ep, epipodite; g, gill. 11, One of the last pair of thoracic limbs in male; p, pro- topodite. 14, Third abdominal somite; ez, exopodite; en, endopodite. 7= labrum; m=metastoma. 15-20, abdominal segments; T, 2lst segment, or telson.~~

~~First pair.—The first cephalic somite supports the eyes, the most constant of all the organs, and probably the only pair of appendages~~

~~atrophied. In the more highly cephalized forms, the Decapoda- Brachyura (crabs), the eyes are placed on the outer side of the two pairs of antenne, but the anatomical evidence shows that the most anterior pair of nerves, in~~

~~this as in all other orders of Crus- tacea, is that which is connected with the ophthalmic organs.~~

~~Second pair.—The second somite bears the first pair of antenne (or antennules), called the inner pair in the higher forms, and the upper pair among the lower Crustacea. Ordinarily they are slender, tapering, freely-moving, multi-articulate organs. In the lobster both the endopodite and exopodite are equally developed from a common basal-joint or protopodite (see 2 in fig. 6).~~

~~Third pair.—The third somite supports the second or posterior pair of antennew, sometimes called the outer pair in the higher, and the inferior pair in the lower forms of Crustacea. In the lobster these are represented by a basal-joint or protopodite, and a long filamentary, multi-segmented endopodite, to the outer base of which a small scale is attached representing the exopodite. In all the higher Crustacea the three most anterior somites are always preoral, being in front of the buccal orifice, and in most genera, moreover, they are specially set apart as bearing the organs of sense. Generally they are so closely blended together, both in the earlier stages of development and also in the adult forms, as 'to defy separation, the presence of three somites being only demonstr- able by dissection, and by a knowledge of the fact that each pair of appendages, wherever it exists, presupposes a segment or ring to which it belongs. The genus Sqwilla affords, perhaps, the best evidence of the separate existence of these cephalic rings, In it the first, or ophthalmic somite, is quite distinct from the second and third antennary, which are also separable from one another, although the latter blends with the next somite, and the succeeding ones can only be distinguished by dissection. Usually the antenne or feelers are constant appendages; but still, the number and dis- position of these organs varies extremely. Some of the lowest forms are wholly without antenne, or are furnished with them ina merely rudimentary state. Some species have only a single pair, the normal number, however, as we have already rs out, is two pairs. In position they are inserted on the superior or inferior surface of the head, according to the development of the somites composing the cephalon. Ordinarily they are slender flexible multi- articulate appendages, but even among the higher forms they are subject to extraordinary modifications ; thus in the Seyllaride, the external pair are developed into~~

~~broad flat organs of natation, and probably also for burrowing. In Arcturus, an Isopod, they are the nursery for the young; in the Entomostraca' they are usually natatory organs ; in Plerygotus and Limulus they are chelate, serv- ing, as in the Copepoda, as clasping organs for the male. In the last free condition of the Cirripedia and Rhizocephala they serve as the organs for attachment, —being converted into cement-ducts in the former, and into root-like organs of nutrition in the latter. The second pair of antennee and sometimes even the first pair become mouth organs in the Merostomata.~~

~~Fourth to Ninth pairs. Epistomial or Mouth Organs.—In the Decapoda the six succeeding pairs may be called mouth-organs or epistomial appendages, being all engaged in duties subservient to nutrition. 'The fourth somite bears the actual jaws or mandibles proper with their palpi, outside which lie two pairs of maxille, followed by three pairs of maxillipeds or jaw-feet. In each succes- sive somite, these organs become less highly specialized mouth- organs, and betray the fact that they are after all only simple feet modified. Thus in Squilla (a Stomapod) the eighth somite (first thoracic) bears a pair of robust claws, the terminal joint of which is furnished with long and sharp teeth, these forming the principal organs of prehension ; whilst the ninth somite bears a pair of ordi- nary feet like the two following pairs (see fig. 71).~~

~~In most of the Edriophthalmia the mouth-organs extend only to the seventh somite, the eighth and ninth being included with the ambulatory members.~~

~~In the Decapoda we can detect the more or less rudimentary endopodite and exopodite in the fifth pair of appendages, and in each succeeding pair to the ninth ; the eighth and ninth pairs also bear a third organ called an epipodite, and a gill or branchial organ.~~

~~Tenth to Fourteenth Pairs.—In the higher forms the five somites which follow (and which might be termed the postoral somites) bear the true walking limbs (peretopoda, Spence Bate), the first pair of which in the Decapoda are usually developed into powerful chele, and serve as the chief organs of prehension.~~

~~These podites are usually seven-jointed, and each bears a gill on its basal- joint. They are formed by the endopodite, the exopodite being present only~~

in the larval-limb of the Decapoda ; but in the adult Jfysis (Stomapoda), eight pairs of limbs (that is to say, the five pairs of pereiopodites or "walking-feet,"' and the three pairs of maxillipeds or " jaw-fect,") are all furnished with two branches, one the endopodite, the other the exopodite, as in the larval Decapod.

Fifteenth to Twentieth pairs.—The next six somites bear each a pair of swimming-feet (or pleopodites). In the Decapoda-Brachyura these remain (like the segments on which they are borne) as ex-

tremely rudimentary organs furnished with hairs which serve for the protection of the eggs after extrusion. In the Macroura they assist in swimming, and are composed of a simple exopodite and endopodite. The sixth pair are developed into broad plates, forming the lateral lobes to the tail.

The Twenty-first or caudal segment is destitute of appendages, and has therefore been considered by Prof. Huxley and others as a 'median appendage," and not as a somite.! It varies in form, being sometimes a broad flat plate in the Decapoda, or a minute terminal one in the Amphipoda, or greatly developed as a roof to the branchix in some Isopoda, or forming a long terminal spine 1m the Xiphosura.

INTERNAL STRUCTURE.—NERVOUS Sysrem.— The typical form of the nervous system in the — young of all the Articulata is a chain of ganglions placed along the ventral surface of the body, and traversed in front by the gullet. This typical ar- rangement, however, undergoes great modifications in the several orders of Crustacea. Taking the Edriophthal- mia, for example (fig. 7), we find the nervous system tq consist of two parallel chords traversing the length of the body, each having its own ganglionic enlarge- ment in each somite in juxtaposition, but not confluent; so that there is a distinct pair of ganglions for each seg- ment. These are again united by trans- verse commissures, and each ganglionic knot gives off nervous filaments to the limbs of its particular somite.

In the lobster (Decapoda-Macrura), the nervous system consists of a longi- tudinally disposed series of different- sized ganglions connected together by commissural cords (fig. 8).

Primitively there is a pair of gang- lions to each somite, but the three first pairs are fused together in the adult so as to form a large cerebral ganglion placed in front of the mouth, and called the supra-cesophageal ganglion. From this a nervous chord passes back on

Fig. 7a.—Nerves of Tuli- trus.

each side of the gullet to the large post- F1¢. 7 Nerves a OP-

mothoa. Fie. 8. marus.

orat ganglion, which is made up of six pairs of primitive ganglions fused to- gether. Then follow five pairs of thoracic and six abdomi- nal ganglions all distinct, but connected one with another by a nervous band formed of the primitive commissural chords which have coalesced along the middle line.?

No solid internal skeleton separates this nervous axis from the alimentary system, though reflections of the external integument (apodemata) pass inwards, and more

Nerves of Ho-

1 Prof. Bell writes :—" Normally there are twenty-one pairs of appendages or limbs; generally speaking, even in the higher forms, twenty only are perceived, as the terminal joint of the abdomen, which forms the central piece of the fan-like fin, has none which are per- ceptible. I have, however, observed them frequently in the common prawn, Palemon serratus, in the form of extremely minute points attached to the very extremity of the segment, and movable." Mr A. H. Garrod, F.R.S., is also of opinion that the telson should be regarded as the twenty-first segment, having its appendages modified by cohesion and adhesion. See Humphrey's Journal of Anatomy and Physiology, vol. v. p. 271 (1871).

2 This double ganglionic chain of the lobster was found by Newport to be composed of two orders of fibres, forming distinct and superposed fasciculi or columns, which the author designates columns of sensation and of motion, analogous to the fasciculi of the anterior and posterior columns of the spinal chord of the higher animals. These fasciculi are but indistinctly discernible in the interganglionic chords, but become extremely apparent in the ganglions themselves, for these enlargements belong exclusively to the inferior or sensitive fasciculi, and

the superior or motor fascienli pass i i : ass over their dorsal surf: penetrating their substance at all. Segoe eos

compound eye.

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or less protect it. From this nervous axis all the nerves are given off, but none arise by two distinct roots like the spinal nerves of man.

In the prawn (Palemon) and spiny lobster (Palinurus) the thoracic ganglia coalesce to form a long, elliptical, perforated nervous mass. In the hermit-crab (Pagurus) the cephalic ganglion presents a transversely quadrate form, sending off the usual nerves to the eyes, antenne, &c. The lateral cesophageal chords, after supplying the digestive system with the stomato-gastric nerves, unite below to form the ganglion which distributes nerves to the maxillary apparatus and pharynx. This is succeeded by a large oblong ganglion situated at the base of the great nippers, and of the second pair of feet, both of which pairs it supplies. The lateral chords, diverging for the passage of the artery, re-unite to forma third thoracic ganglion, smaller than the second, supplying the third pair of thoracic feet, and sending off three pairs of nerves posteriorly. Of these the lateral pair goes to the fourth diminutive pair of feet ; the median pair supplies the fifth pair of feet ; the two remaining dorsal nerves, which are of minute size, form the continuations of the abdominal chords, and pass along the under or concave side of the soft, membranous, and highly sensitive abdomen to the anus, anterior to which the last small ganglion is situated; this supplies the nerves to the muscles of the caudal plates, here converted into claspers for enabling the animal to adhere to the columella of. the spiral shell which it

may have selected to protect the portion of its body undefended by the usual dense and insensible crustaceous covering (Owen).

The general progress of the development of the nervous system in the Crustacea has been, as we have seen, attended with increased size and diminished numbers of its central or ganglionic masses. The divisions of each pair of ganglions first coalesce by transverse approximation ; distinct pairs of ganglions approximate longitudinally, conjoining as usual from behind forwards ; confluent groups of ganglions are next found in definite parts of the body, as on the thorax of those species which have special developments and uses for particular legs. In the crab, in which the general form of the body attains most compactness, the ventral nervous trunks are concentrated into one large oval ganglion, from which the nerves radiate to all parts of the trunk, the legs, and the short tail.

A corresponding structure of the nervous system is also well displayed in Maia (fig.9.) An === 2e—ay analogous concentration, but not Ss an homologous one, obtains in | Limulus. Here the nervous sub- stance is chiefly massed round the cesophagus, the fore part of the) ring expanding into a pair of | ganglions, from which the nerves | are sent off to the small median | ocelli and the large lateral eyes ; [i the nerves to the latter are of great length, wind round the | anterior apodemata, and bend back | to their termination, breaking up into a fasciculus of minute fila ments before penetrating the large] Two stomato- SCL 3 gastric nerves arise from the upper Fic. 9.—Nerves of Afaia and fore part of the ring. From—squinado, Latr. the under surface of the fore part pyre den La rat of the ring, a small pair of nerves pete nerve aanyndennd

3S 5 gastric nerves; 8, medul pass to the first short pair of forci- lary cords uniting C and T; m, pated antennules; five large nerves pope rah goers yer proceed from each side of the ring to the five succeeding jaw-feet. A pair of slender nerves

of the flanks: J,/, nerves of the legs; ab, abdominal nerves.

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~~pass to the spiny-edged lamelliform appendage. The posterior part of the nervous ring is prolonged backwards in the form of a chord having four ganglionic enlargements on its ventral surface, and terminates opposite the penulti- mate post-abdominal plate in a fifth slight ganglionic enlarge- nient which bifurcates ; each division sends off a few nerves as it proceeds to the caudal appendage, on entering which it is resolved into a plexus or kind of cauda equina. Besides the principal nerves above mentioned many smaller nerves are given off to other parts of the body. The sides of the great cesophageal ring are united by two transverse com- missural bands; but the most remarkable feature of the nervous axis of this crustacean is its envelopment by an arterial trank. A pair of aorta from the fore part of the heart arch over each side of the stomach, and seem to terminate by intimately blending with the sides of the cesophageal nervous ring. They, in fact, expand upon, and seem to form its neurilemma ; a fine injection thrown into tliein coats the whole central mass of the nervous system with its red colour (Owen, Lectures—Invertebrata, 1855).~~

~~Tracing the nervous system in the Crustacea from its simplest type, a vermiform cord with a series of independ- ent nerve centres, we see these becoming successively con- joined in a greater and greater degree, as if in obedience to some law of attraction, until in the crab the maximum centralization of the class is attained. But in whatever form it exists in this section of the Arthropoda we may beir in mind the conclusion that~~

~~"the nervous system of the Crastacea consists uniformly of medul- lary nuclei (ganglions) the normal number of which is the same as that of the members or rings of the body, and that all the modifi- cations encountered, whether at different periods of the incubation, or in different species of the series, depend especially on the approxi- mation, more or less complete, of these nuclei (an approximation which takes place from the sides towards the median line, as well as in the longitudinal direction), and to an arrest of development occurring in a variable number of the nuclei." — (Milne-Edwards.)~~

~~Divisions or THE NERVES IN THE Crustacea.—Three principal divisions have been recognized in the nervous system of the Crustacea :—~~

(1.) All those nervous filaments which take their rise in, and are exclusively connected with, the supracesophageal nerve-centre, form- ing the true sensori-volitional system. (2.) Other ganglions super- added to the abdominal columns with their nervous filaments, serving for the automatic reception and reflection of stimuli, forming the motor system. (3.) The stomato-gastric nerves, connected partly with the brain and partly with the cesophageal columns (analogous to the great sympathetic or organic nerves of the Vertebrata), form- ing a third group, the ganglionic system.

Szat or THE SENSES IN THE CrusTacea.—Although, as regards the relative size of the several ganglions in the nervous chain of the Crustacea generally, there is little difference between the anterior and posterior masses, and often a disparity between the supra- as compared with the infra-cesophageal ganglions,! yet, nevertheless, it is gener- ally admitted that in these animals there is an evident tendency observable towards a centralization of the nervous functions in the anterior portion of the ganglionic chain, viz., the supra-cesophageal ganglion. But still there is a wide interval between this first indication and the concen- tration of the faculties of perception and of will in a single organ—the brain—of which every other portion of the ner- vous system then becomes a mere dependency.

Orcans or FerLinc.—As regards the development of the individual senses, one may reasonably conjecture that the sense of touch can be but feebly exercised by the com- mon integument of the Crustacea, if indeed it can be said to exist at all, except in those parts of the body which remain soft and undefended by a calcareous crust, such as

1 In Maia squinado, for example, although the supra-cesophageal or cephalic ganglion is large, yet, in consequence of the union of the cephalo-thoracic somites, the thoracic ganglion is fully three times its size. See supra, fig. 9.

the under side of the abdomen or the soft body of the hermit-crabs. The hairs with which many of the Crustacea are indued may to some extent compensate for this low endowment of the tactile sense.

There can be no doubt, however, that the sense of touch is mainly concentrated in the two puirs of long, many- jointed, and highly flexible antennz with which numbers of this class are provided. These special organs of touch are directly connected with the cephalic ganglion, and are well adapted, both by actual exploration and as media for conveying vibratory sensations, to furnish to the brain most correct and rapid ideas of surrounding objects.

The smaller but similarly-formed flabelliform appendages attached to the maxille and maxillipeds doubtless perform a similar office in the testing of all objects brought near to the mouth; these latter, however, are not directly connected with the supra-cesophageal, but with the mandibular ganglion.

OrGANs oF SicHT.—The eyes of Crustacea present a greater variety in their gradation than is to be found in any other class of the Arthropoda.

Commencing with only a median fixed (bifid 1) eye-spot in the larval and simpler forms, we see these orgaus advance progressively, through all the stages of sessile-eyed development in | the Merostomata and Edriophthalmia, ™@ to the highest condition in the Podoph « thalmia, that of two distinct compound eyes, endowed with all the essentia: optical apparatus, and placed on mov- able peduncles.

It has been doubted by some natu- ralists whether the eyes are organs of so much importance in the economy of the Crustacea as are the antenne or organs of touch; but experiments per- formed on the eye of the living Jobster, when out of water, or even in a shal. low aquarium, can hardly be deemed as either a conclusive or a satisfactory test of the sensitiveness of the cornea in an eye accustomed to convey im- pressions of surrounding objects to the optic nerve when at a depth of several fathoms beneath the water.

If the open-air experiments as to the sensitiveness of the lobster's eye had

Fig. 10.

Fig. 10.—Structure of Eye of Lobster (Homarus vulgaris). After

~~Newton. :~~

~~la. Longitudinal and horizontal section of a right eye seen by reflected light (X 4). a, cornea; 6, first band of pigment, beneath which are the crystalline cones; c, a broad band of radiating fibres free from pigment; d, second black band composed of the pigmented spindle-shaped bodies, the lower ends of these bodies are covered with an opaque white pigment which forms ¢, the first white band; A, bundles of radiating fibres; ¢, enlarged end of the optic nerve, z. The museles and connective tissue which naturally fill the cavity have been omitted in this figure.~~

~~10. A group of elements showing the relation of the pigment to the cones. The cornea is not present. @, substance intermediate between cornea and cone; 8, crystalline cone; c, nerve rod; p, pigment.~~

~~lc. A partly diagrammatic view of one of the elements of the eye from the cornea to the optic ganglion. a, cornea; b, substance between cornea and cone; 8', lower end of ciystalline cone; c, nerve rod, around which is seen the investing membrane with its nuclei; d, spindle-shaped or transversely striated body ; 7, perforated membrane at surface of optic ganglion; p, pigment.~~

~~1d. A portion of cornea as seen by reflected light, showing the cross and central spot.~~

~~le. Perpendicular section from the middle of the cornea, showing the smooth outer and slightly convex inner surfaces. ;~~

~~been made instead on a living shore or land crab, of the genus Grapsus, Gelasimus, Gecarcinus, or Ocypoda, it would speedily have been found that in point of rapidity of per- ception and movement, guided by sight, these shore and land crabs are quite equal to the most sharp-sighted insect, or the most agile of lizards.~~

~~As already stated, the eyes are the most constant and persistent organs possessed by the Crustacea as a class ;~~

~~indeed, if we except certain parasitic Isopodous forms and the Cirripedia and Rhizocephala, we shall find that the faculty of sight is possessed by the whole class.' Even in those exceptional cases in which the eyes are aborted, we find that in the earlier and larval stages of their existence the parasitic and sedentary forms possessed eyes, and it is only as an effect of a kind of retrograde metamorphosis which the animal undergoes that the organs of vision dis- appear in the adult.2 Two forms of visual organs are met with in the Crustacea, namely, smooth or simple eyes (ocella or stemmata) and compound eyes ; but though there are some few forms in which (as in Apus and Limulus) both ocelli and compound eyes are present, the latter form of eyes is that most generally met with in the class.~~

~~The structure of the semple eye does not differ greatly from that observed amoug higher animals. There is, firstly, a transparent cornea, smooth and rounded, which is, in fact, only a part of the general tegumentary covering modified. Immediately behind the cornea is the crystalline lens, generally of a spherical form ; this is again followed by a gelatinous mass analogous to the vitreous humour, and this mass is, in its turn, in contact with the extremity of the optic nerve. A layer of pigment of a deep colour envelops the whole of these parts, lining the internal wall of the globe of the eye up to the point at which the cornea begins to be formed by the thinning of the tegumentary envelope rendering it transparent. The number of these simple eyes does not exceed two or three.~~

~~In the Branchiopoda (Nebalia, Branchipus, Daphnia) behind a simple cornea, undivided externally, we find a variable number of distinct crystalline lenses and vitreous humours, each included in a pigmentary cell, and ter- minating by contact with the optic nerve. These are, no doubt, an aggregation of stemmata under a common cornea.~~

~~In some of the Edriophthalmia a still further advance to a true conipound eye is met with. In these the cornea appears to consist of two transparent lamine, the external layer being smooth and the internal one facetted, each facet being a distinct cornea resting on a separate crystalline lens of its own. In the compound eye, properly so called, the two membranes, external and internal, constituting the cornea, are both divided into facets, euch facet seemingly being equivalent to a distinct ocellus, furnished with its own~~

crystalline cone (or lens) and nerve rod ; each invested with its own pigment coating, which, being darker at intervals, gives to a section through the compound eye as a whole the appearance of pigment-bands repeated at various depths beneath the cornea, and in front of the expanded termination of the optic nerve (retina). Although these facets are always hexagonal in the eye of an insect, they are variable in form among the Crustacea. Thus in Homarus, Astacus, Peneus, Galathea, and Scyllarus, the facets are square ; whilst in Pagurus, Squilla, Gebia, Cal- lianassa, and the crabs, they are hexagonal. In Limulus and the Trilobites the lenses are round, not being in actual close contact with each other. Milne-Edwards mentions that in Jdotea each facet has a kind of supplemental lens of a circular shape set within the cornea in'front of each

1 The fact that Niphargus, Crangonyx, and some other dwellers in subterranean waters, as well as Callianassa Macandrei, a burrowing marine crustacean, are blind, is certainly the result of their habitats, not a normal state of the organs of vision. In the Mammoth Cave, Kentucky, and the caves of Carniola and Adelsberg, Crustacea, insects, and other animals have been met with, all blind or with but imperfect organs of vision.

- In the Cirripedia the individuals arc hermaphrodite, fixed when adult, and all blind (unless the complemental male of Jbla Cumingit be an exception,—see Darwin's Mon. Cirripedia, Ray Soc., p. 196), but in the parasitic Isopoda, and in many of the Copepoda, it is the female alone which is so remarkably transformed, whilst the male retains his powers of sight, his freedom, and his normal aspect.

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proper crystalline lens, and equal in size to the corneal facet, and apparently evolved in the substance of the cornea itself, but under favourable circumstances capable of being detached from it. In Phacops caudatus the small circular lenses of the external compound eyes drop out, leaving a corresponding concavity beneath.

Emmerich long since proposed to use the external characters of the eyes of Trilobites as a means of classifica- tion, dividing them into " hyaline "-eyed and "facetted"-eyed groups; but he does not seem to have been aware

of the perfect analogy which the struc- ture of the eyes of the modern Edri- ophthalmia afford in illustration of this ancient and extinct group.

Stemmata or ocelli are always im- Fic. 11.—Eye of Trilo- movable and sessile; the compound bite (Phacops cau- eyes with smooth cornem, although ney Baska usually sessile, are, however, occasion- g the entire eye; g, the ally supported on pedicles,as in Vebalia genal border of head; and Branchipus. pa all Age

The compound facetted eyes are "sed. subject to the same variations,—genera being found with hyaline and facetted cornez in the same order. In some of the compound sessile eyes the facets are round; but in all the pedunculated compound eyes they are either square or hexagonal.

The peduncles supporting the eyes in the Stomapoda and Decapoda vary greatly in length, but every considera- tion tends to the conclusion that these movable eye-stalks are really the pair of appendages of the first cephalic ring. Indeed, in Squtlla one is actually able to separate the eye-stalks with the segment upon which they are borne from the cephalic shield.

In Macrophthalmus and some other crabs the eye-stalk is of very considerable length (see fig. 65), extending even to the outer angle of the front of the carapace, which is furnished with a long groove or furrow into which the eye can be folded down, and so placed out of reach of injury when not in active use. This furrow is called the orbital fossa.

Orcan or Heartinc.—Milne-Edwards, Owen, Bell, and others consider the external organ connected with the sense of hearing to be situated on the first joint of the outer and larger antenne in the lobster and other Macroura, and to consist of a conical process beneath which is a cavity having a round orifice closed by a membrane. Behind the process, and connected with the cavity, is a large sac filled with a clear liquor; a nerve arising in common with the external antennal nerve is spread upon the delicate walls of the supposed acoustic sac.

In Maia and other crabs the membrane is replaced by a movable calcareous disc pierced by a small oval opening, over which is stretched a thin elastic

~~membrane (which might be termed the internal auditory mem- brane), near to which the auditory nerve appears to ter- minate. :~~

~~The auditory apparatus of the Crustacea consequently consists essentially of a cavity full of fluid, over which a nerve adapted to perceive sonorous impulses is distributed, assisted by an elastic membrane, and placed near the base of the antenne which, like a rigid stem, assists in rendering certain vibrations perceptible.~~

~~In both the lobster and the crab a gland filled with a greenish substance is connected with the membranous sac. This structure and the absence of otolites has led Farre to suggest that the organ may be olfactory ; but the chief~~

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~~parts of the structure bear a close correspondence with an auditive vesicle and a tympanic membrane.!~~

~~Organ oF SMELL.—Professor Owen? refers the sense of smell to a small sac, fringed with fine hairs, opening externally by a narrow cleft in the basal joint of the first or median antenna. A branch of the antennal nerve terminates in a small prominence at the bottom of this sac. From the presence of some minute siliceous particles within the cavity (although it is admitted that these must have found their way in from the exterior fortuitously) Dr Farre® has been led to suggest that the small antennz are acoustic organs, and that the grains of sand may act as otolites.~~

~~Milne-Edwards admits as indubitable the presence of well-developed organs of smell, but considers we are reduced to conjecture when we are required to point out the precise seat of those organs.*~~

~~OreGans oF Taste.—Like almost all other animals the Crustacea select their food, showing decided preference for particular kinds; this selection is doubtless actuated by two senses, smell and taste. Whether we are correct in assigning to the inner pair of antennz the duties of the olfactory organ or not, it cannot be doubted that the sense of taste is distributed over that portion of the tegumentary mem- brane which lines the interior of the~~

mouth and cesophagus, but there is no modification of these parts which needs to be specially noticed here.

Orcans oF Nurrition.—In the larval stages of the higher Crustacea, andalso among the adult lower andsimpler forms, fewer of the somites have their paired appendages differentiated to perform special offices. Thus in the larval Decapod the chief natatory organs are the maxillipeds; this is also the case in the Merostomata. In Limulus (fig. 12) all the locomotory organs are also subservient to the

? ye ry "7 A { } . m» f | if '

Fia. 12.—Underside of Limulus polyphemus, Latr. 9

C=cephalon; Th=thorax; A, rudimentary abdomen; T=telson. (The eyes i, cannot be seen in this figure, being on the upper surface of head-shield.) 2, The chelate antennules; 3a, antennz (fa' detached antenna of male); 4-7, mandibles, maxilla, and maxilliped; m, the mouth; &, operculum, bearing on its inner and upper surface the ovaries and reproductive organs; 9-13, branchi- gerous feet,

duties of nutrition, being organs of locomotion at their distal, and mandibles and maxille at their proximal extremity.

In fact, as already stated, we have abundant evidence to

1 Spence Bate marks this organ as " olfactory" iu the crab (Brit. Assoc. Reports, Bristol, 1875, pl. i. fig. 10, and explanation). Mivart calls the green gland the kidney of the lobster, and says "no organ of smell has been determined " (Pop. Sci. Rev., vol. vii., 1868, p. 350) See Fritz Miiller's suggestions as to this green gland, p. 652.

- Lectures Comp. Anat. 1855, 2nd edition, p. 311. 3 Phil. Trans., 1848. * Milne-Edwards, in Todd's Cyclopedia of Anatomy, vol. i. p. 788.

prove that the maxillary organs of the Malacostraca are but niodifications of entire limbs, translated from the locomotive series and set apart as special mouth-organs. By far the larger proportion of the Crustacea have a proper normal mouth furnished with suitable organs of mastication, but among the parasitic Copepoda and certain aberrant parasitic Isopods, &c., they become merely organs of attachment, the mouth being suctorial ; or (as in the Rhizocephala) it may be altogether wanting, and the limbs completely lost, and from the point of attachment root-like tubes may be developed, which, sinking deep into the body of the host, convey to the parasite its nutriment ready digested and prepared.

If instead of these latter we examine the Decapoda we shall find the mouth placed centrally near the front and upon the under side of the cephalon. It is provided with a small simple median piece, called a labrum, or upper lip, in front, and a bifid metastoma, or lower lip, behind ; the paired appendages (mandibles, maxille, &c.) being placed on either side of the buccal orifice.

The food, whether living or dead, being first seized by the forcipated thoracic feet, is brought near to the maxillipeds, and by the help of these external organs of prehension portions are sepa- /) rated and introduced by the { maxillz to the trenchant and \ powerful mandibles, when having undergone furthersub- division they are swallowed.

No organ corresponding to a tongue exists in the Crustacea, the niouth being only the anterior and outward expansion of the cesophagus, which is short, rises verti- cally, and terminates directly in the stomach.

The wall of the stomach is composed of twomembranous layers, separated by one of muscular fibres, which in- crease in thickness at the openings leading from the

Fic. 18.—Gastric Teeth of Crab and Lobster.

la, Stomach of common crab, Cancer pagurus, laid open, showing 8, 6, b, some of the calcareous plates inserted in its muscular coat; g, g, the gastric teeth, which when in use are brought in contact with the sides of the smooth fixed plate m; c, c, the muscular coat;

~~‘ 10’ and 10”, the gastric teeth enlarged Ce (sy ’ A sophagus and into the to show their grinding surfaces; 2, intestine. gastric teeth of common lobster, Ho-~~

~~marus vulgaris; 3a and 3b, two crusta- cean teeth (of Dithyrocaris) from the Carboniferous series of Renfrewshire.~~

~~The stomach is globular in form and of great capacity, and may be divided into an anterior or “ cardiac ” part, and a posterior or “ pyloric” region. The food on reaching the “cardiac” region of the stomach is subjected to a further~~

~~| process of mastication, by means of a complex apparatus~~

~~composed of several calcareous pieces, moved by appropriate~~

~~| muscles, inserted in the membranous wall of the stomach~~

~~(fig. 13, 1@), armed with a smooth median plate and two lateral molar-like-organs, having a singular mimetic and superficial resemblance to the molar teeth of some small marsupial rodent. Two smaller points (bicuspid in the lobster, tricuspid in the crab) complete the calcareous apparatus ; in the pylorus a series of fine hairs are placed, which, doubtless, act like a strainer, preventing the escape of the coarser particles of the food until they have repeatedly been subjected to the molar-like action of the gastric teeth. A long and straight intestine continues from the stomach backwards, and terminates beneath the telson.~~

~~Two ceecal salivary glands of a greenish colour are situated on either side of the cesophagus.~~

~~The liver in the Decapoda is of large size, and bilaterally symmetrical ; its structure is highly ramified, not solid like the human liver. The secreted fluid or bile is poured by two openiugs into the pylorus.~~

~~This organ, so large in the crab, undergoes great modifications in the various orders ;~~

~~insects, remain. which the chyle or nutritious~~

~~with the walls of the intestines.~~

~~CrrcuLatory SystemM.—In most of the Crustacea the circulation is of the same simple character as that~~

~~observed in the aquatic larve of insects, save that in the Crustacea the blood is conveyed to the gills for the purpose of oxygenation ; but organs are developed, the fine hairs and filamentous appendages attached to the feet doubtless subserve that office, or in some the entire surface of the body. The heart consists of an elongated contractile dorsal vessel, larger behind than before, connected anteriorly and posteriorly by several branches with the inferior or return- ing vessels, which running along the whole body receive the blood from the anterior extremity, and carry it into the posterior extremity of the dorsal vessel.~~

~~In the male Zntoniscus Cancrorum the heart (fig. 14). is situated in the third abdominal segment. In the Cassidina the heart (fig. 15) is likewise short and furnished with two pairs of fissures, and is situated in the last segment of the thorax and the first of the abdomen. Lastly, in the young Anilocra the heart (fig. 16) extends~~

~~Fig. 15.~~

~~Fig. 16.~~

~~¥1¢. 14.—Abdomen of the male of Entoniscus cancrorum, h, heart ; /, liver. (Fritz Miiller).!~~

~~Fic. 15.—Heart of a young Cassidina. (Fritz Miiller.) Fig. 16.—Heart of a young male Anilocra. (Fritz Miiller.)~~

~~through the whole length of the abdomen, and is furnished with four or five fissures which are not placed in pairs, but alternately to the right and left in~~

successive segments (Fritz Miiller, Pir Darwin, pp. 41-42).

In the Decapoda the heart is placed near the dorsal surface of the cephalic shield immediately beneath the integument above the intestinal tube, and is retained in its place by lateral pyramidal muscles. It consists of a single chamber or ventricle, suspended in a large sac, called the pericardium, but wholly distinct from the part so named

1 By the kindness of his friend, Mr Charles Darwin, M.A., F.R.5., &c., &c., the present writer has been permitted to use a large number of the illustrations from the English edition of Fritz Miiller's admir- able little book, entitled Facts and Arguments for Darwin, translated from the German by W. S. Dallas, F.L.S., Assistant Secretary Geol. Soc. Lond. From Fritz Miiller's store of interesting facts and observa- tions the writer has also largely drawn, especially in regard to his researches in the larval development of the Crustacea, and he takes occasion at once to acknowledge the same with thanks.

in the Edriophthalmia only three pairs of biliary vessels, analogous to those of No vessels have as yet been detected by fluid elaborated by the diges- tive processes is taken up, as it passes along the intestinal canal, and transferred to the circulatory system ; we can only, therefore, conclude that it is transferred by absorption to the irregular venous receptacles which are in contact

where no special respiratory

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in man. The structure of the heart is made up of the interlacement of numerous muscualr fibres fixed by their extremities to neighbouring parts, and passing for some dis- tance over the aggregate at each end, the whole structure reminding one of a number of stars superposed on each other, the rays of which do not cor- respond (Milne — Edwards). The ventricle has three pairs of apertures so closed by valves as to readily allow the entrance of blood from the pericardium, but to hinder its regurgitation. It has three other pairs of openings, each of which is the commencement of an arterial trunk convey- ing blood all over the body. These arteries have valves at

their origin, and ramify and end ultimately in capillaries, which open into what are called venous sinuses, because they are channels without any definite shape. The venous blood collects in a great sternal sinus, and thence passes up into the gills to be oxygen- ated, after which it proceeds to the pericardium to find its way into the ventricle (fig. 17). From the researches of MM. Audouin and Milne- Edwards,? it had been consid- "er Arey =o of vulval 1 oO obster Oomarus AUS)s ce a ne Grae her Alen Toon) H=heart. The aortic heart consisting tacean only aerated or arterial of a single ventricular cavity, and blood found its way into the sito rovache. ohisid, givew off ix heart, to be distributed by it ser amet on over the general system. But organs of the body and to the liver Professor Owen has shown' (0… venous, Mand re orng that in addition to the two collected on the lower surface of the : : body into sinuses (V, V), from which great branchial trunks which he branchial aiteries «B, B) take pour their streams of aerated Tis ougin the benshal rs © blood into the heart from the through the gills to the heart. See gills, four other valvular ori- ites fices, two connected with the series of caudal, and two with the series of lateral sinuses, communicate with the ventricle, and return a portion of carbonized or venous blood to the heart; the circulation is, therefore, to some extent mixed, and as both venous and arterial blood reach the ventricle, they are propelled thence through the system (see fig. 18). The returning blood is not redistributed through the liver, as in man, %.e., there is no portal circula- tion. There are no lymphatic vessels. The blood is a slightly dusky fluid, containing numerous nucleated corpus- cles, which change their form with remarkable rapidity. Resprratory Orcans.—As the type upon which the Crustacean class is constructed is specially fitted for aquatic existence, branchial organs or gills in some form are essential for the aeration of the blood. The appendages which fulfil this office are attached either to the thoracic or abdominal members or to both. Where they are most highly developed, as in the crab and lobster, they assume

2 Recherches Anatomiques et Physiologiques sur la Circulation daus les Crustacés, Ann. des Sciences Nat., t. ii. 3 Lectures on Comp. Anatomy and Physiology of the Invertebrata, 2d edition, 1855, p. 318.

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the form of pyramidal bodies, each consisting of a central ascending stem, with numerous horizontal branches or plates folded close together through which the blood circu- lates. There are twenty-two such structures in the lobster, eleven on each side of the thorax, attached to the basal joints of the thoracic limbs,! each pair of gills being fur- nished with its epipodite, or upper footlet, which serves to keep'the gills apart from each other. In their most simple form they consist of a mere sac-like appendage held by a small neck pendant from the coxal joint, and exposed in the water without protection.

In the Decapoda they become more complex in structure and more voluminous, and would be extremely liable to injury if not protected by some means. But, as Spence Bate* truly observes, being external to it, they could not be covered or protected by their own somite, as, if it had passed over them, the branchial appendages would have become internal, their character and constitution would therefore be changed ; they would cease to be ex- ternal; in fact, they would

@ oO

cease to be branchiz. These appendages, however, exist as branchiz, and are neverthe- less securely covered and PTO- Fre, 18.—Heart of Homarus vul- tected; not, indeed, by their garis, Edw., laid open. (Copied own somite, but by the great from Owen's Lectures, p. 318.) development of the mandibu- ¢, the ophthalmic artery; a, a, the an- lar and posterior antennal me ee ipuicotis tees somites incorporated together, a Le os oer a forming the carapace so char- arterial blood from the branchiz acteristic of the typical Crus- Which iateral sinusce 'condone, tacean. blood to the heart ; s, sternal artery ;

The branchial appendages {aterdl pyramidal nenetee Bt Mal are thus external in relation NB Bristlos tains passed through of the body of the animal, but the orifices v', v', to indicate their

covered over and protected Posto. '

—by the lateral walls of the carapace. To complete this so as effectually to protect these organs without pressing on them or interfering with their

~~functions, a very considerable amount of lateral development has taken place, and a peculiar reflection so as to bring the margin of the cara- pace below the branchial appendages, and to protect them from rude contact with the limbs. Externally, the cara- pace covers and protects both the hepatic and branchial organs ; but, internally, a calcareous wall of demarcation exists between the two. This wall, which Milne-Edwards terms the apodema, is continued into a thin membranous tissue that makes a distinct and well-defined separation be- tween the branchial appendages and the internal system, so that the aqueous element so necessary for the aeration of the blood as it passes through the branchiz may have full power to play upon the gills, and yet leaving no passage that would admit it to the internal viscera so as to derange i i~~

~~1 "The number of branchial pyramids," says Milne-Edwards, " varies greatly, especially in the Macroura; at the most it is twenty-two, as in Astacus, and nearly allied species ; in other Macroura the number is eighteen, as in Palinurus, Scyllarus, Penceus; fifteen in Gebia ; twelve in Pandalus; ten in Callianassa ; eight in Palemon ; seven only in Crangon, Hippolyte, Sergestes. In the Anomoura the num- ber also varies very much. In the Brachyura we ean almost always reckon nine branchiw on each side ; two of this number are, however, merely rudimentary. Sometimes one or more of the last, or last but one, are entirely wanting" (Todd's Zncyclop. vol. i. p. 781).~~

~~? Report on the present state of our knowledge of the Crustacea, part i., British Assoc. Reports, Bristol, 1875, p. 49.~~

~~the general economy of the animal (Spence Bate). The gills are not ciliated, and thus they require that the water within the branchial cavity in which they are placed should be incessantly renewed by other means. Jn the crabs two passages communicate with the branchial chamber, one for the entrance, the other for the exit of the water necessary to respiration. The efferent orifice always opens on each side in front of the mouth under the posterior maxilliped. The afferent opening varies greatly in position in the different groups.~~

~~In the Macroura (lobsters), and in some of the Anomoura (her- mit-crabs), the margin of the carapace is not accurately fitted to the thorax along its lower lateral border; the branchial cavity is thus open along the whole extent of its inferior edge, and so the water finds its way readily into the respiratory chamber.~~

~~In the Brachyura (crabs), the afferent orifice is more circumscribed, but varies in a still greater degree. In nearly all it exists as a cleft of considerable breadth in front of the base of the first pair of am- bulatory appendages between the carapace and the thorax.~~

~~In the Ocypoda, the third and fourth pair of feet are more closely approximated than the rest, and their margins bear a dense border of long silky peculiarly-formed hairs. Between the basal-joints of these feet, Fritz Miiller has discovered a round orifice opening into the branchial cavity, and he finds this to be a true incurrent orifice for the admission of air or water into the branchial echamber.?~~

~~Tn the genus Ranina, according to Milne-Edwards, the ordinary anterior entrant orifice to the gill-cavity is altogether wanting ; it is placed instead at the origin of the abdomen.~~

~~In Grapsus, Fritz Mier 4 has observed that, when under water, the respiratory in-current enters near the front in the usual manner, but when air is breathed, the anterior incurrent orifice being closed, and the hinder border of the carapace elevated, a wide fissure is opened upon each side above the last pair of feet leading directly into the branchial chamber.~~

~~In Leucosia the two apertures are close together, the incurrent opening being situated in front of the mouth, and the water pass- ing in by a conduit parallel to the excurrent canal. The circula- tion of the medium within the respiratory atrium is brought about partly by the movements of the legs to which the branchie are attached, and partly by the epipodites which ascend between the gills. The main agent, however, is the * scaphognathite," a flabelli- form appendage of the second pair of maxillipeds, which, rising and falling continually, occasions a rapid current from behind forwards in the water, filling the branchial chamber.~~

Branchie such as we have deseribed, enclosed beneath the over- arching lateral walls of the carapace, are specially chatacteristic of the Decapoda (erabs and lobsters).

In the Amphipoda the head shield is smal], and no longer covers thé thoracie somites, as in the Decapoda. The branchiz, however, are still borne on the eoxal joint of the thoracie legs, but they de- pend unprotected from each limb, and are bathed in the surround- ing medium, which is made to pass rapidly over them by the action of the abdominal flabelle.

In Squilla we find the appendages of the first five pairs of abdo- minal somites devoted to the office of aerat- ing the blood; the branchie, however, are not included in a cavity, but float freely in the water which bathes the entire surface of the animal.

In the Isopoda the abdominal appendages are all devoted to respiration, the anterior and outer pair in Jdotea (fig. 19) being specially modified into a strong operculum (op), opening laterally and shutting over the five pairs of delicate branchial appendages within.

In Limulus five pairs of thoracic feet are modified into broad lamelle, to the inner and upper surfaces of which the gills are attached, whilst the most robust and anterior Fra. 19.—Brauchiz of pair is modified into a broad opereulum ecover- Idotea. ing the succeeding five branchigerous pairs, and op, operculum; br, bran- also the reproductive organs (see fig. 12), chia. The numbers in-

In Apus (Branchiopoda), save the antennae 'dicate the segments. and oral appendages of the head, all the other somites bear simple lamelliform gill- feet, of which there are, according to Baird, about sixty pairs, affording an excellent illustration of mere vegetative repetition of parts.

Although the act of respiration by gills seems a peculiarly aquatic method of aerating the blood, yet in both the

3 Facts and Arguments for Darwin, by Fritz Miiller. Translated by W. 8S. Dallas (Murray), 1869, p. 34. 4 Op. cit,,. ps BY, VI. — 81

Podophthalmia and the Edriophthalmia we meet with numerous amphibian and terrestrial forms. No Macrouran Decapod, so far as ascertained, voluntarily quits the water, although the common lobster, the river crayfish, and the spiny lobster, all display great tenacity of life when removed from their native element. Their inability to leave the water is, no doubt, due to the fact that the carapace is less acurately fitted to the thorax than in the crabs. Certain of the Anomoura, or hermit-crabs, however, find no difficulty in adapting themselves to ter- restrial conditions. The writer has kept the Cenobita Diogenes from the Antilles, tenanting an Achatina shell, alive in a Wardian case for three months, during which period he displayed great activity and most remarkable powers as @ climber. These West Indian crabs are not infrequently brought over alive to England with cargoes of guano and other natural products (fig. 20).

Fig. 20.—Hermit-Crab (Cenobita) in shell. (After Morse.)

Darwin refers to the abundance of hermit-crabs on Keeling Island in the Indian Ocean (Voyage of the Beagle, p. 544), all living on the cocoa-nut, and each ensconced in some shell obtained from the neighbouring beach. On the same island is found another most remarkable and very large terrestrial Anomourous Crustacean, the Birgus latro, living in burrows at the base of the cocoa- nut trees, upon the fruit of which it subsists. This large hermit-crab seeks no artificial covering for its fleshy body, the integument of which is chiefly membranous, but has the tergal pieces of its abdominal somites calcified. It is said (by Darwin) to visit the sea nightly for the purpose of moistening its gills, and the young are hatched in the water, and pass there their earlier stages of exist- ence.

Many of the shore-crabs, as Grapsus, and the freshwater crab, Thelphusa, are not only able to leave the water temporarily; the former habitually lives out of that element, whilst many sub-tropical forms, as Gecarcinus, Gelasimus, &c., frequently live at a distance from the sea, and certainly possess the power of breathing air. But in all land-crabs it seems essential that the gills should, if not immersed in water, at least have the air surrounding them saturated with movrsture. Milne-Edwards found that Gecarcinus (fig. 21) has the membrane lining the walls of the respiratory

cavity modified in a manner analogous to that observed in fishes of the order Acanthopterygiz. Sometimes this provision consisted of folds and lacune serving as reservoirs for the water; sometimes, as in Birgus, of a spongy mass well calculated to store up the fluid necessary to keep the branchiz sufficiently moistened to enable them to perform their functions.

The swift-footed sand-crabs (Ocypoda) are exclusively terrestrial, and can scarcely live for a single day in water ; in a much shorter period, a state of complete relaxation occurs, and all voluntary movements cease. In fact, these lond-dwelling crabs'are as truly asphyxiated by immersion

in water, as the aquatic species of Cancer become when

taken from that element and left in the air.

Fra. 21.—Gecarcinus ruricola, Land-crab of Montserrat, West Indies.

Among the Amphipoda, Yalitrus and Orchestia both live out of the sea, the former making a burrow for itself, the latter choosing moist places under sea-weed, or hiding in the damp sand. With us Orchestia lives within reach of the sea spray, but in the southern hemisphere species have been met with many miles inland, choosing terrestrial plants for their abode, sometimes at an elevation of 1500 feet above the sea. ©

Among the Isopods Spheroma is quite a littoral form, ranging from the equator to the colder temperate shores. The genus Ligia also lives above high-water mark, but never far away from the sea.

All the Oniscidz are terrestrial in their habits, livingunder stones, moss, or decaying wood, and in similar damp situa- tions ; they breathe air (which, however, must be saturated with moisture) by the aid of a series of respiratory branchial plates ou the under side of the abdominal soniites, in the same manner as in Jdotea (already noticed), and in addition to this by the inspiration of air by means of certain spiracular orifices on several of the basal pairs of these same appendages (fig. 22).

~~In a large number of the lower and wogaiouse, Oniscus simple forms, including also the parasitic asellus. Crustacea and the Cirripedia, no special organs of respira- tion exist, and we are led to conclude that this office is performed by the surface of the body and its appendages generally.~~

~~Muscuar System.—All the muscles of the body, even those of the intestine, are composed of striated fibres.~~

~~Repropuctive Orcans.—The organs of generation are easily to be discerned in most of the Crustacea, but the analogy between these parts in the male and female is so great In many genera as to need the most careful examina- tion in order to discriminate between the two. Generally, however, the males may be discerned by their having cne or more pairs of limbs especially modified to assist in the marital act.~~

~~With the exception of the Cirripedia the two sexes appear never to exist together in the same individual among the Crustacea.~~

~~The small size and great dissimilarity of the males of some of the parasitic genera caused them to remain long unknown, and led to the error of supposing the females to be hermaphrodite, as Darwin has shown to be really the case in the Cirripedes. But even in this division~~

~~Fig. 22.—-Common~~

~~CERUVUAT 2 BA~~

~~Darwin has found small 'males parasitic on the female which he has named "complemental males." They are destitute of a mouth, and appear to exist only for the per- formance of this one function of reproduction (Darwin, Cirripedia, Ray Soc. 1851).~~

~~Bilateral symmetry generally prevails among the mem- bers of this class, and as a consequence we find always a pair of these organs arranged one on either side of the body, perfectly distinct, and often wholly independent of each other. The male is provided with a paired gland or testes, and two excretory ducts, by which the sper- matozoa are discharged on reaching the efferent open- ings, usually situated on either side in the basal joints of the~~

seventh pair of thoracic appendages, or the first pair of abdominal limbs. In both the Crab and Lobster the first pair of abdominal appendages of the male are specially modified to take part in the process of fecundating the female.

Milne-Edwards denies that these appendages have any claim to be considered as fulfilling the office of conveying the fecundating fluid to the body of the female, but Spence Bate has frequently taken Carcinus mœnas with these styliform appendages deeply inserted within the vulve of the female. He has also shown the existence of a vas deferens in these false feet (Ann. and Mag. Nat. Hist., 2nd series, vol vi., p. 109).

The ovaries in the crab resemble four cylindrical tubes placed longitudinally in the thorax, and divided into two

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Fé, 23.—Side view of Crab (Morse), the abdomen extended and carrying a mass of eggs beneath it; e, eggs.

symmetrical pairs, each opening into a distinct oviduct, yet communicating with each other by a transverse canal and by the intimate union of the two posterior tubes. The oviducts and ovaries are of a whitish colour, and become united to a kind of sac! on each side, the neck of which opens externally in the sternal pieces of the fifth thoracic somite, which bears the third pair of walking appendages.

In the Anomoura and Macroura there are no copulatory pouches, and the vulvze open on the basal joint of the third pair of ambulatory legs. It is possible, therefore, that in these forms the fecun- dation of the ova does not take place until the eggs are actually ex- truded, which we know

to be the case in Limu- Fic. 24.—A,— eggs of the Se che

e enlarged; B,a single egg greatly enlarged,

lus, and probably in once more plainly the hardened thread (¢)

by which they are attached to each other,

viagra other forms, and This egg also shows the commencement of as is also the case in

fishes,

the development of the embryo. (Morse's If we except Gecarcinus, certain other land-crabs, and

A

Zoology.)

1 The copulatory pouches of Milne-Edwards,

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Limulus, the female does not abandon her eggs after their extrusion. Those of the Decapoda when extruded are coated with a viscous secretion which thickens into threads, and causes the eggs to adhere to each other and to the fine hairs with which the swimmerets of the abdomen of the lobster and the female crab are fringed (fig. 23). Fig. 24 shows the method of attachment of the eggs. Here they are retained securely until the period of hatching has arrived, when the brood in most cases is dispersed.

This is not, however, always the case, for whilst examin- ing a female Dromia from Australia, the writer discovered more than a dozen young ones adhering to the false abdominal feet of the parent,—the young, except in size, agreeing perfectly with the parent.

In Mysis the two endopodites of the hinder pair of thoracic feet in the female are developed into a broad plate on either side, and bent under the sternum, thus forming together an incubatory pouch or marsupium, in which the eggs are first deposited, and within which the young are secluded during their minority. In Thysan- opoda the eggs and young are contained

in a pair of oval sacs de- pendent from the posterior feet, forcibly reminding one of the ovarian sacs in Cyclops.

In the Amphipoda the ova are nurtured by the female within a pouch formed by a series of foliaceous plates, one of which is at- tached to each of the four anterior pairs of legs of the thorax. In the genus Podocerus the parent builds a nest in a very bird-like manner, amid the branches of the submarine zoophyte forests, and in one of these Mr Spence Bate met with two broods of different ages, clearly demonstrating that the maternal care for their young is continued long after birth.? Similar ac plates are devel- oped in the fore-legs of females of the Isopoda. In all these sessile- eyed forms the parent seems specially solicitous for the safety of its young. In Asellus, Talitrus, and Gammarus, they appear to quit the maternal pouch and return to it as to a place of safety. Cap- rella carries its young attached to its body; the female Arcturus supports them adhering to her large antenne.

In Daphnia, besides the several groups of ova which are succes- sively hatched within the bivalved shell, and excluded during the spring and summer, giving rise to fertile females, there is formed each autumn an opaque layer within the incubatory cavity of the female, which hardens in two pieces like a small bivalved-shell, and is called the ephippiwm or saddle, and is placed on the dorsal surface of the Daphnia, but within the shell of the parent. Another structure, similar to the ephippiwm, and called the "internal ephip- pium," placed within it, is found to contain two bivalved capsules, in each of which a fertilised egg is lodged, which remains in a pas- sive state through the winter, but hatches by the first warmth of spring, giving rise to females only (uo males being hatched till autumn), these females in turn giving rise also to as many as six generations of fertile females. Their fecundity is so preat as to be almost beyond the power of figures to express.

DEVELOPMENT OF THE CrustTacEA.—In nearly all the Crustacea, the young undergo a series of metamorphoses after quitting the egg. This rule appears to apply more constantly among the truly marine forms. Among the stalk-eyed Crustacea some few species at least quit the egg in the form of their parents, with the full number of jointed appendages to the body. 'This is the case, according to Rathke, with Astacus fluviatilis, the common river*

cray- fish (fig. 25), and according to Westwood> in a West Indian land crab (Gecarcinus). The present writer has

2 Spence Bate, 1858, Annals and Mag. Nat. Hist.,and Bate and Westwood, Sessile-eyed Crustacea, vol. i. pp. 448-4.

3 Baird, British Entomostraca, p. 78.

4 Rathke, Untersuchungen iiber die Bildung und Entwickelung des Flusskrebses, fol. 1820.

5 J. O. Westwood in Phil. Trans. 1835, vol. exxv. p. 311. Fritz Miiller remarks, in reference to Westwood's paper—This is a solitary exception of a single species investigated by Westwood. In the same genus Vaughan Thomson found zoéa-brood, which has also been met with in other terrestrial crabs (Ocypoda and Gelasimus), The mode of life is in favour of Thomson. . 'Once a year," says Troschel, "they migrate in great crowds to the sea in order to deposit their eggs, and afterwards return, much exhausted, towards their dwelling-places, which are reached only by a few." -For what purpose would be these destructive migrations in species whose young quit the egg and the mother as terrestrial animals? – Fritz Miiller, Facts and Arguments for Darwin, translated by W. 8. Dallas, F.L.8., 1869,

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also found an Australian Droméa protecting its brood on its false abdominal feet, the young differing from the parent only in point of size.

Fic. 25.—Freshwater Cray-fish from the Mississippi River. (Morse.) The young of theterrestrial Isopoda (Oniscus, Porcellio, and Armadillo) likewise nearly resemble their parents at birth. In the king-crabs (Limulus) the young undergo their principal moults before quitting the egg, when they differ

but little in aspect from the adult. The metamorphosis undergone by the common lobster appears to be but slight. The young, according to Van Beneden, are distinguished from the adult by having their feet provided like those of Mysis with a swimming branch projecting freely outwards, whilst the abdominal and caudal appendages are undevel- oped. In nearly all the marine Crustacea the young quit the egg in the condition of zoéa. We are acquainted with many examples in all three divisions of the Decapoda.

But we are indebted to Mr C. Spence Bate for the most complete series of observations on the development of one species, the common shore-crab, (Careiwus meenas) from the zoéa to the sexually mature animal.)

He has shown that in this species the metamorphosis is a perfectly gradual one, and that, dissimilar as is the zoéa when it quits the egg from the adult animal, yet neverthe-

less the change at each moult is so small that it is only by "a comparison between the earliest and the last stages that we perceive the amount of the change which has actually taken place.

"The most important peculiarities," writes Fritz Miiller, " which distinguish this zoéa-brood from the adult animal are as follows. The middle body (thorax), with its appendages, those five pairs of feet to which these animals owe their name of Decapoda, is either entirely wanting, or scareely indicated; the abdomen and tail are destitute of appendages, and the latter consists of a single piece (fig. 26). The mandibles, as in the Insecta, have no palpi. The maxillipeds, of which the third. pair is often wanting, are not yet brought into the service of the mouth, but appear in the form of biramose natatory feet. Branchie are wanting, or where their first Fic. 26—Zota of Common Shore- rudiments may be detected as smal] crab, Carinus mxnas, Penn. sp, in verruciform prominences, these are its first stage. Cpe Ree? dense eell-masses through which the blood does not yet flow, and which have therefore nothing to do with respiration. An inter-change of the gases of the water and the blood may (and no doubt does) occur all over the thin-skinned surface of the body; but the lateral parts of the carapace may unhesitatingly be indicated as the chief seat of respiration.

~~“They consist, exactly as described by Leydig in the Daphnia, of an outer and inner lamina, the space between which is traversed by numerous transverse partitions dilated at their ends ; the spaces between these partitions are penetrated by a more abundant flow of blood than occurs anywhere else in the body of the zoéa. A con- stant current of water passes beneath the carapace from behind forwards, maintained as in the adult animal by a foliaceous appen- dage from the second pair of maxille.~~

~~IOn the development of Decapod Crustacea, Phil. Trans., 1858, pl. xl.—xlvi. p. 589.~~

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~~“The zoée af the crabs are usually distinguished by long, spini- form processes of the carapace (fig. 27). One of these projects up-~~

~~Fic. 27.—Zota of Common Shore-Crab in its second stage. r, rostral spine; s, dorsal spine; m, maxillipeds ; ¢, buds of thoracic fect; a, abdomen, (Spence Bate.) wards from the middle of the back, a second downwards from the forehead, and frequently there is a shorter one on each side near the~~

~~Fig. 28. Fig. 30. Fic. 28.—Zoéa of Porcellana stellicolla, F. Miill., mag. 15 diam, Fig. 29.—Zoéa of Hippa eremita, mag. 45 diam. Fig. 30.—Zoéa of Hermit-Crab, magn. 45 diam. (Fritz Miiller.)~~

~~posterior inferior angles of the carapace. But in the zoéa of Maia,~~

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~~Eurynome, and an allied genus to Achceus, the spines are wanting in the first two genera, and but of inconsiderable size in the last- named genus.~~

~~‘The following are the more important peculiarities in the zoéa of the erabs, although less striking than these processes of the earapace, which, in combination with the large eyes, often give them so singular an appearance. The anterior (inner) antenne are simple, not jointed, and bear two or three olfactory filaments at the extremity ; the outer anteunz~~

~~frequently form a long spine-like process, and bear a minute squamiform process like the antennal scale in prawns. Of the natatory feet (afterwards mazillipeds) only two pairs are present, the third is entirely wanting, or present, like the five following pairs of feet, only as minute buds. The tail in zoéa is very variable in form, but nearly always bears three pairs of sete upon its hinder margin."~~

~~When the young zoéa first eseapes from the egg, it is enveloped by a membrane veiling the spinous processes of the carapace, the sete of the feet, and the antenne; but this is east off in a few hours. The zoéz of Porcellana (fig. 28) seem to differ widely from true crabs, but really approach them very closely. The dorsal spine is wanting, but the frontal and lateral spines are of extraordinary length, and direeted straight forward and backward. The tail bears five pairs of sete.~~

~~The zoéa of Hippa eremita also resembles that of the crab in general appearance and in mode of locomotion (fig. 29). The eara- pace has only a short broad frontal process; and the caudal plate is edged with numerous short sete. The zvée of hermit-erabs (fig. 30) have simple antennules like those in the Brachyuran zoée. The antenne bear a scale-like appendage on the outside analogous to that in the prawn. 'There are ouly two pairs of well-developed natatory feet (maxillipeds), but the third pair cre present in the form of two-jointed rudimentary appendages destitute of sete. The hinder border of the tail bears five pairs of sets.~~

~~The zoée of the shrimps and prawns agree closely with the Anomoura. They have a small median eye between the large com- pound ones. The third pair of maxillipeds are always present.?~~

~~In investigating the development of the spiny lobster, Claus found embryos in the ova with completely segmented bodies, but wanting the abdominal and caudal appendages and the last two thoracic somites. They have a single median eye, the anterior antennz are simple, the posterior have a small secondary branch ; the maxillipeds are divided into two branches.?~~

~~The most singular example of lowly development recorded by Fritz Muller is that of a prawn of the genus Pencus.~~

Fria. 31.—Nauplius of a Prawn. Magn. 45 diam. (Fritz Mliller.)

The young appear to quit the egg with an unsegmented ovate body, a median frontal eye, and three pairs of natatory feet, of which the anterior pair are simple and the others biramose, agreeing with the larval form common to the

*1 Fritz Miiller, Facts and Arguments for Darwin, pp. 49-52, * Fritz Miiller, op. cit., pp. 538-55.*

' 8 Coste asserts that he has bred young Phyllosoma from the ova of Palinurus vulgaris, a statement, says Fritz Miiller, that requires further proof, especially as the more recent investigations of Claus upon Phyllosoma by no means favour this conclusion (Fritz Miiller, op. ett.

57).

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lower Crustacea, to which O. F. Miiller has given the name of nauplius. In this stage there is no trace of a carapace, no trace of paired eyes, no trace of masticating organs, and the mouth itself is overarched by a helmet-like hood. © In one of these species the interme- diate forms which lead from the naup- lius to the prawn have been discover- ed by Fritz Miiller in a nearly continu- ous series (op. cit. p. 57)*

After successive moults the nauplius gives place to the zoéa period, during which the paired eyes, the segments of the thorax and abdomen, and the various appendages are produced in bud- like succession. The z0éa next passes into the mysis-stage ; the antennge -cease to serve for locomotory organs, and their place is taken by the thoracic feet clothed with setze (fig. 34). The abdomen, furnished with powerful muscles, jerks the animal through the water in a series of lively jumps.

In the case of those Crustacea in which the young, as in Mysis, are retained within the incubatory pouch of the parent after quitting the egg, the larva emerges from the egg ina far more rudi- mentary and destitute con- dition than in those genera in which no such protective arrangement exists. Van

Beneden, whose description of the development of Mysis is confirmed by Fritz Miiller, mentions the very curious fact that the first segment that makes its appearance is the tail. In other stalk-eyed Crustacea the embryo has the ventral surface of the anterior and posterior halves of the body folded together, and the dorsal surface forms the external convexity of the young animal within the egg; but in Mysis the ventral surface is external and convex. The tail soon acquires the furcate form characteristic of the zoéa of the prawn; two thick ensiform appendages next anterior end of the body;

82.—Young Zoéa of the same Prawn. Magn. 45 diam. (Fritz Miiller.)

Fic. 83.—Youngest observed Zoéa of another Prawn. The minute. buds of a third pair of maxilipeds are visible. The formation of the abdominal segments has commenced. Paired eyes stili want- ing. Magn. 45 diam. (Fritz Miiller.)

make thir appearance at the and behind these a pair of

4 Compare fig. 31 with the nauplii of Apus and Artemia, 5 and 6 of fig. 57, and with that of Balanus, fig. 60, A, and fig. 61.

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tubercles ; these are the antenne and mandibles, At this immature stage of its development the egg-membrane bursts before any internal organ, or even any tissue except the cells of the cutaneous layer, is formed. The young animal may now be said to be in its nauplius-stage, but its nauplius-skin resembles more nearly a second egg-membrane within which its further development proceeds. The ten pairs of appendages of the cephalic and thoracic divisions

Fic. 34,—Older larva produced from Zoéa represented in fig. 33. The last seg- ment and the last two pairs of feet of the middle-body are wanting. Magn. 20 diam. (Fritz Miiller.)

of the body make their appearance simultaneously, and at

~~a later period the five abdominal feet. Soon after the~~

~~young Mysis has cast its nauplius envelope, it leaves the~~

~~brood-pouch of its mother.~~

~~In Squilla mantis the eggs do not adhere to the abdominal feet of the parent (which in this genus are tranchiferous), but are (says Fritz Miiller) deposited in the form of thin, round, yellow plates within its submarine burrow, The spawn is consequently difficult to procure, and quickly dies when removed from its natural hatching- place. In the embryo of Sqquilla the heart is short; the body is long and segmented, but without appendages ; the tail is bilobate, and there are indications of the rudiments of six pairs of limbs. If it acquires more limbs before exclusion, the youngest larva must be on a par with the youngest of Hawphausia observed by Claus. Only two larval forms of Sqquilla are mentioned by Fritz Miiller ; the elder of these zoéa (fig. 35) resembles the mature Sguilla,~~

~~Fig. 35.—ZoY8a of a Stomapod, probably Sqquilla. Magn. 15 diam. (Fritz Miiller.)~~

~~particularly in the structure of the great raptorial thoracic feet and of the last cephalic pair ; but the six pairs of feet which follow these are still wanting, although their somites we clearly seen. The abdomen shows rudiments of four pairs of branchial feet and one or two pairs of biramose natatory feet, but the tail has no appendages and still appears as a simple lamina.~~

~~CRUSTACHA~~

~~The investigations of Goodsir, in 1843,! made us acquainted with a most singular family of Crustacea, the Diastylide, or Cumacee, which have been placed in the Podophthalmia near to Mysis. In general aspect the adult animal presents the most larval and embryonic characters, and might with propriety have been treated as a larval form, had not Goodsir, and subsequently Kroyer, actually taken the young from the brood-pouch of the parent. The antennz are very small, the thoracic feet are, in most, furnished with sete ; in Cuma and Alauna the abdominal segments are moniliform~~

~~and destitute of appendages. The caudal segment bears two long bifurcated styles. In Bodotria (fig. 36) five of the abdominal somites~~

~~Magn. 10 diam. (Fritz Miiller.)~~

~~Fia. 86.—Male of Bodotria.~~

~~bear finlets. The young examined by Kroyer, taken from the brood-pouch of the female (which resembles that in Mysis), were already one-fourth the length of the parent, which they resembled in every respect. Whether or not there is a considerable development of the young of Cumacec within the brood-pouch of the parent is not cer- tainly known. In the embryo the caudal portion is bent upwards as in the Isopoda, and the last pair of thoracic feet are wanting.~~

~~The development of the Edriophthalmia, or sessile-eyed Crustacea, is more simple than that of the stalk-eyed forms. In the "rock-slater," Ligia (fig. 37), the embryo~~

~~is bent wpwards within the egg, as in Mysis, and has also, like Mysts, a larval membrane within which the young Ligia is developed. In Mysis this larval skin may be compared to a nauplius; in Ligia, however, it is desti- tute of appendages, and resembles a maggot with a long simple tail (fig. 37).~~

~~The dorsal surface of the young~~

~~Fic. 87—Maggot-like larva of Ligia. Magn. 15 diam. R, remains of egg- mem- brane. We see on the lower surface, from before packwards, the anterior and posterior antenne, the mandibles, the anterior and posterior maxille, maxillipeds, six ambulatory feet, the last segment of the middle- body destitute of appendages, five abdominal feet, and the eaudal feet. (Fritz Miiller.)~~

~~Ligia is united to the larval skin a little behind the head. A foliaceous appendage is produced at this point, but exists only for a short time, and disappears before the young slater quits the brood-pouch of the mother. The young animal, when it commences to take care of itself, resembles the~~

parent, save that it has only six, instead of seven pairs of ambulatory feet, and the last thoracic somite. is but slightly developed and is destitute of appendages. The sexual peculiarities in this as in the young of other Crustacea are not developed at this early period; thus the males lack the hand-like enlargements of the anterior ambulatory feet, and the copulatory appendages are also absent.

The eggs and early stages of Asellus aquaticus have

1 Bdinb. New Phil. Journ. 1843. See also Bell, Pritish Stalk-eyed Crustacea, 1853, pp. 321-833, and Fritz Miiller, Fir Darwin, Engl,

trans. p. 81-4

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been investigated by numerous observers, De Geer, Rathke,! Spence Bate,? and Anton Dohrn? have made careful observations ou the embryology and development of this abundant freshwater Isopod. As in Ligia the embryo is bent upwards within the egg. It quits the egg in a most imperfect state, more so, says Rathke, than any other articulated or vertebrated animal. It is furnished in its earliest stages with two lateral external appendages, which probably are homologous with the foliaceous ap- pendage observed by Fritz Miiller at the back of the head in Zigia. These zoéal appendages are subsequently moulted. Moreover in the young Ase/us there are only six leg-bearing segments, and six, instead of seven, pairs of legs asin the adult. The curvature of the embryo upwards, instead of downwards, seems to have been generally ob- served by Rathke, Dohrn, Fritz Miiller, and others. The larval skin is in some genera so closely applied to the egg itself as possibly to be mistaken for an inner egg-membrane. The absence of the last pair of thoracic feet seems also a constant character; all the other limbs are usually well developed in the young of normal Isopods ; but in the remark- able and aberrant genus Tanais (fig. 38) all the abdominal feet are wanting, but not the caudal appendages; they make their appearance, however, simultaneously with the last pair of the thoracic feet.

~~Among the many interesting facts relative to the develop- ment of the Crustacea not the least remarkable are the series of retrograde metamorphoses which certain Isopods undergo as a consequence of their assuming a parasitic mode~~

~~Fig. 88.—Tanais dubius (?) Kr. 9, magnified 25 times, showing the orifice of entrance (x) into the cavity overarched by the carapace in which an appendage of thesecond pair of maxille (f) plays. On four feet (7, &,1,m) are the ments of the lamellz which subsequently form the brood-eavity. (Fritz~~

~~iiller.)~~

~~of life when adult. Thus the Cymothoa, or " Fish-lice," which in the adult state live parasitic on fishes, clinging firmly by means of their short recurved hook-like feet, are~~

~~Fic 39.—Bopyrus squillarum, Latr. a, male; 6', female (underside); 6, the same (dorsal view). (After Spence Bate.)~~

~~Fic. 40.—Phryrus abdominalis, a, the male; 6, female (ventral aspect). Spence Bate.)~~

~~Fic.41.—cCryptothiria Balani.~~

~~(After (After Spence Bate.)~~

~~lively free-swimming Crustacea in the larval state. Still greater is the metamorphosis which the adult female under-~~

~~a, male; 6, female; c¢, larva.~~

~~Abhandlungen zur Bildungs und Entwickelungs Geschichte des Menschen und der Thiere (Leipsic, 1832).~~

~~? Spence Bate and Westwood, Hist. Sessile-eyed Crustacea (1868, vol. ii. p. 346-347).~~

3 'Die embryonale Entwickelung des Asellus aquaticus" (a reprint from Zeitsch. f. wissensch. Zoologie, xvii. Bd. ii. Heft 1, Jena, 1866).

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goes in Bopyrus (fig. 39), Phryxus (fig. 40), Tone, G'yge, and several other allied genera, which are parasitic on crabs and lobsters, taking up their abode within the branchial cavity. The adult is usually quite destitute of eyes; the antenne are rudimentary ; the broad and flat body is fre- quently unsymmetrically developed in consequence of the confined space in which it lives; its segments are more or less amalgamated together ; the feet are stunted, and the abdominal appendages transformed into foliaceous or highly branched gills. The males are diminutive in size, but usually they have their eyes, antenne, and feet better preserved than the females; the abdomen is, however, rudi- mentary, and not unfrequently altogether destitute of ap- pendages.

Among the Isopoda, in the remarkable genera Crypto- thiria, Cryptoniscus, and Entoniscus, we meet with forms even still more debased in their adult parasitic condition than Bopyrus.

In the case of Cryptothiria Balani * (fig. 41), first noticed as a male cirripede by Goodsir in 1843, but not rightly determined until 1851, by C. Spence Bate, the female is a large inert seven-lobed fleshy mass, destitute of exserted antennze, jaws, legs, or branchial appendages, lying within the shell, and attached to the base of the animal of Balanus balanoides. The male is free and resembles the male in the Bopyride ; its body is long and slender, and is furnished with seven pairs of legs; it has been met with by Spence Bate, Dana, and other observers within the body-cavity of Balant. Here then we have a Crustacean belonging to a higher order, viz., the Isopoda, living parasitic within the shell and deriving its nourishment from one belonging to a lower order, viz., the Cirripedia.

The history of Cryptothiria pygmea (Rathke, sp.) and

(Wt

Fig. 42. Fig. 43.

Magn. 3 times, (Fritz Miiller.)

Fic. 42.—Cryptoniscus planarioides, female.

Fic. 43.—Embryo of the same. Magn. 90 diam. (Fritz Miiller.)

Cryptoniscus planariocides (F. Miiller) is perhaps still more remarkable. Professor Bell had long ago noticed the frequent presence of a singular parasite on the inner surface of the abdomen of Portunus and Carcinus on our coasts, having prima facie the aspect of a bag of immature eggs. This had keen described by Rathke in 1841 as an Entozoarian, but has since been proved by its transforma- tions to be a Cirripede, and was named Peltogaster. In 1858 Lilljeborg found what he deemed to be a female Peltogaster with an egg-sac; but a careful dissection led to the discovery that another parasite of a higher order, namely a Cryptothiria, had become parasitic upon the parasite, The most curious part of this super-parasitic history is, that the roots of Sacculina and Peltogaster (two forms of rhizocephalous Cirripedia parasitic on crabs and hermit-crabs) seem constantly to be made use of by two parasitic Isopods, namely, a Bopyrus and the before-men- tioned Cryptoniscus planaricides. These take up their abode beneath the Sacculina, and cause it to die away by inter- cepting the nourishment conveyed by the roots ; the roots, however, continue to grow, even without the Sacculina, and frequently attain an extraordinary extension, especially when a Bopyrus obtains its nourishment from them (Fritz Miller, op. cit. p. 94). The free males and the young of Cryptothiria and Cryptoniscus are unlike young Cirripedes,

4 C. Spence Bate and J.0. Westwood, British Sessile-eyed Crustacea (1868, 8vo. vol. ii. p. 267).

but resembie the young of Bopyrus; they are, in fact, larval Isopods.

The female of Zntoniscus (fig. 44) resides within the body of a species of Porcel- lana, lying in a thin-walled sac between the liver, intestine, and

heart of its host, the head being destitute of eyes or antenne ; the thorax has become an irregular wih moa 4 beset ~ Ry with enormous brood lamine ; AO the long vermiform and ex- Bee Oe a NG tremely mobile abdomen has yy 44, — Entoniseus cancrorum, fe- sword-shaped legs : and swell- male. Magn. 3times. (Fritz Miler.) ing out above it in a globular form, as if in a hernial sac, the heart lies at the base of the first segment.. The young of this singular parasite closely resembles that of Bopyrus and Cryptothiria.

The embyro of the Amphipoda can be distinguished from that of the Isopoda at a very early period; the former being bent downwards with the dorsal surface external, whilst the latter is bent backwards with the ventral surface external, The embryo in all the genera which have been examined is attached on the anterior part of the back to the inner egg-membrane by a peculiar structure—reminding one of the union of the young Isopoda with the larval membrane, and of the unpaired " adherent organ" on the nape of the Cladocera, so remarkably developed in Zvadne, and persistent through its life in that genus; but though present in the young of Duphnia, it disappears in the adult (Fritz Miiller).

The metamorphosis of the young Amphipod after it quits the egg seems greatly reduced and simplified, for before quitting the egg it acquires its full number of seg- meutsand limbs.) In those instances in which certain of the segments are amalgamated together, or where one or more segments are deficient in the adult, we find the same fusion and the same deficiencies in the young animals taken from the brood-pouch of their mother. The development of the Hyperiida, an oceanic group of Amphipods found only in the gill-cavities of the Meduse, is very exceptional and re- markable. Thus,in Hyperia the youngest larve, taken by Fritz Miiller from the brood-pouch of the mother, already possessed the whole of the thoracic feet; on the other hand, those of the abdomen were not as yet developed. All the feet are at first simple, but soon become converted into highly denticulated prehensile feet. In this state they remain for a very long time,—the abdominal appendages growing into powerful natatory organs, whilst the eyes, at first want- ing or very minute, expand into large hemispheres occupying the entire lateral, and even encroaching upon the dorsal and frontal walls of the head. The females (Hyperia) are dis- tinguished by a very broad thorax, and the males (Lestrigonus) by their long antenne. The

youngest larve cannot swim, but are provided with chelate feet (as shown by Spence Bate) by which they cling firmly to the swim- ming-lamine of their host. The feet of the adults are simple, but they are then excellent swimmers, and are not unfre- quently met with free in the open sea, The diversity in structure of the antenne in the adult male and female Hyperiide is so great as to have led naturalists to place them in separate genera or even families; but this differ- ence is developed only when the animals are full-grown. Up

1 "Even peculiarities in the structure of the limbs, so far as they are common to both sexes, are usually well marked in the newly-hatched young, so that the latter generally differ from their parents only by their stouter form, the smaller number of the antennal joints and olfactory filaments, and also of the sete and teeth with which the body or feet are armed, and perhaps by the comparatively larger size of the secondary flagellum" (Fritz Miiller, Fir Darvin, Engl. trens. p. 76)

CRUSTACEA

to this period the young of both sexes resemble the females. In the male shore-hoppers (Orchestia) the second pair of the anterior feet is provided with a powerful hand (fig. 45), as

Fic. 45.—Onches'ia Darwintt, n. sp. male.

(Fritz Mtiller.)

in the majority of Amphipoda, but quite different from the female ; the young nevertheless resemble the female. This is also the case in the adult male in Zimulus, in which the second pair of appendages (antennz) are peculiarly modified (see 3a in fig. 12 above); but in the young male they exactly resemble those of the adult female. According to Spence Bate and Fritz Miiller, this second pair of antenne are absent in the females of Brachyscelus, although the male possesses them, like other Amphipods.

In the foregoing brief sketch of the evolution of the young in the Malacostraca, it will be perceived that certain lines of development are followed, but these are subject to great diversity, and often vary greatly in the same order.2 Thus we have :—

I. The larval metamorphosis undergone within the egg.®

*II. The larval metamorphosis undergone within the incubatory pouch of the mother.**

III. The young first appearing as free-swimming zoé«.®

IV. The young first appearing as nawpii.®

These four stages in the larval development of the Crustaceze, it will be perceived, are not by any means strictly confined to particular orders of the Malacostraca, nor do they hold good for all the members of the group in which they have been observed to occur. There is, in fact, no 'hard and fast." rule in the class, but on the contrary, there would appear to be numerous exceptions and varia- tions in every group.

In considering the larval development of the Entomos- traca, we shall find that their early history, when compared with that of the Malacostraca, is greatly simplified, and that the first or nauplius form of the young, which Fritz Miiller exceptionally met with in Pencus,' has now become the rule almost without exception.

Embryology of Limulus.—Starting with that remark- able representative of a most ancient and now almost extinct order, the Merostomata, we find in Limulus a genus in which the young may be said to undergo all their earlier metamorph oses within the egg, thusat once offering an excep- tion to the general rule as regards the Entomostraca. The embryology of Limulus has been investigated by Dr Anton

2TIn the normal Isopoda, as we have seen, the development of the young is one of progress to the adult ; but in the parasitic forms the young animal before attaining the adult state actually has to undergo a retrograde metamorphosis.

3 An instance of this occurs in the Decaroda-Brachyura, viz., Gecarcinus (J.0. Westwood); in the Anomonra, Dromia (H. Woodward ; in the Macroura, Potamobius (Astacus) fluviatilis (Rathke). In the Amphipoda the

~~young appear to have always acquired their full number of segments and appendages before quitting the egg (Fritz Miiller, Spence Bate, &c.)~~

~~4 In the Stomapoda by Mysis, and Cumacee (?); in the Isopoda by Asellus, Ligia, &c.~~

~~5 In the Decapoda-Brachyura by Carcinus (Spence Bate), by Cyclo-grapsus and many other crabs and lobsters (Fritz Miiller).~~

~~6 In the Decapoda-Brachyura by a prawn near to Peneue (Fritz Miiller).~~

~~7 It is very desirable that this remarkable and isolated case in the development of the Macrouran Decapod should be confirmed by others.~~

~~CRUSTACEA~~

~~Dohrn ' and Dr A. 8, Packard.? The natural history of the king-crab has been studied by the Rev. Samuel Lockwood,? and its anatomy has quite recently formed the subject of two elaborate memoirs by Professor Owen, and by Dr Alphonse Milne-Edwards.®~~

~~We can only very briefly notice these important contribu- tions to our knowledge of the Xiphosura here.~~

~~The female Limulus of the north-east American coast spawns twice every year during the months of May, June, or July,® at the great high tides. It comes up to near high-water mark, spawning under water ; thus the eggs are~~

~~Via. 46,'—Egg of Limulus polyphemus : a, protoderm; 6, the chorion (after Dohrn).~~

~~Fie. 47.—Third stage in the embryo of Limulus: a, protoderm ; b,chorion (after Packard).~~

~~Fig, 48.—Fourth stage (?) in the embryo of Limulus (after Dr. Packard's figure).~~

~~Fic. 49.—Fourth stage (?).in the embryo of Limulus: 1, antennule; 2, antenna ; 3-6, maxillipedes ; 7 and 8, thoracic plates afterwards bearing the branchie; m,the mouth; 2, the ovarian apertures (?); a, the abdomen (after Dohrn).~~

~~daily exposed to the sun's warmth for a short time at low water. Great numbers arrive in pairs, the male grasping the sides of the shield of the female with his strong and peculiarly modified chelate antennez. The eggs are deposited by the female in a hole in the sand, and are fecundated by the male after deposition, and are then left to hatch. Only one other similar case is on record, namely, that of the common freshwater cray-fish, in which, according to M. Chantran, the eggs are fecundated after expulsion from the oviducts. The eggs occupy from fifty to seventy days in hatching, according to the favourable or unfavour- able conditions under which they are deposited ; some which Dr Lockwood set aside in a jar of sea-water in a dark place hatched after 350 days!~~

~~The egg has two membranes, a dense inelastic chorion and an inner elastic protoderm.® This chorion remains entire so long as development is arrested or is sluggish, but~~

- ~~"Zur Embryologie und Morphologie des Limulus polyphemus," in Jenatschen Zeitschrift, Band vi. Heft 4, Taf. xiv. and xv., 1871.~~

~~2" The Development of Limulus polyphemus," by A. S. Packard, in Aemoirs of Boston Soc. Nat. Hist. 1871, vol. ii. pp. 155-202, pl. 3-5.~~

~~3 "The Horse-Foot Crab," by the Rev. S. Lockwood, in American Naturalist, 1870, vol. iv. p. 257.~~

~~4" Anatomy of the American King-Crab," by Prof. Owen, in Trans. Linn, Soc. 1872, vol. xxviii. pp. 459-506, pl. 36-39.~~

~~° Etudes sur les Xiphosures et les Crustacés de la Region Mexicaine, par Alph. Milne-Edwards (Paris, 1873, folio. pp. 43. pl. 1-12).~~

~~5 These investigations are confined to the American king-crab, and were made at Raritan Bay, New Jersey. Van der Hoeven's memoir ou Limulus~~

was written on the East Indian Limulus moluccanus (Rech. sur VHist. Nat. et Anatom. des Limules, fol. 1838, Leyden, p. 48, plates 1-7), '

7 Figs. 46-55 are from H. Woodward's paper on the " Relationship of the Xiphosura to the Eurypterida, &c.," Quart. Journ. Geol. Soc. 1872, vol. xxviii. p. 50.

8 Dohrn calls the inner membrane in the egg of Limulus the "chorion" and the outer the exochorion, but Paeckard's term "protoderm" appears preferable for the former,

as soon as the embryo increases in size, the tough chorion splits asunder, and the inner elastic protoderm enlarges, becomes dense, and vicariously fulfils the duties of the former (fig. 46).

A similar splitting of the external egg-membrane has been noticed in Apus. Fritz Miiller points out that in some Isopoda (as for instance Philoscia) the larval skin is

not only without any folds or sac-like diverticula, but is

closely applied to the egg-membrane. This second egg- membrane in Limulus may perhaps therefore correspond to this first larval skin. Certainly, when the embryo first appears, its position is the same as in Asellus, Ligia, LPhaloscia, and other Isopods, ze., with its ventral sur-

Fra. 50.—Fifth stage (?) of embryo of Zimuius (after Dohrn). At this stage the chorion is split, and the protoderm is expanded by the admission of water by endosmose, in which the embryo is seen to revolve. wee

Fic. 51.—Ninth stage (?) of embryo, "just before hatching" (after Packard) ; dorsal aspect.

Fig. 52.—The same: side view of embryo.

Fig. 53.—Larva of Limulus recently hatched (after Packard).

Fig. 54.—Larva of Limulus on hatching (the "Trilobitenstadium" of Dohrn).

Fig. 55.—Trinucleus ornatus, Sternb.; adult specimen with six thoracic segments and fully-developed genal spines.

face convex (figs. 47 and 48). In its first stage the larval Limulus has six bud-like indications on each side of the mesial line, where the paired cephalic appendages will be developed (fig. 47). In later stages (figs. 48-52) we have first two, then more, up to six pairs, of thoracic natatory feet (which in the adult become branchiferous), and traces of as many as nine post-cephalic somites, but the last three never attain appendages. As the young Lvmulus increases in size, the yolk gradually becomes absorbed, and the larva assumes the position of an Amphipod in the egg, having its dorsal surface convex, instead of its ventral, which is now concave (fig. 52). There appears to be no stage seen in larval Limulus which can be compared with the nauplius stage of Apus (as Dr Packard has supposed).? The

9 Packard, op. cit. p. 168. VI.—82

rotundata from the Coal-measures far more than any known

Trilobite. Packard has figured an earlier (?) stage of

Limulus than Dohrn's "Trilobiten-stadium," which much more nearly resembles Z'rinucleus? (compare figs. 51 and

55).

te its earlier stages the young Limulus can roll its posterior segments under its head-shield, and when it at last leaves the egg it can swim well, and has been captured by Alexander Agassiz, swimming freely on the surface of the ocean, three miles from Naushon Island, Buzzard's Bay. At this period it has no caudal spine or telson. this is acquired only at a later moult, whilst a year or more elapses before the young males can be distinguished by their modified antennz from the females (see 3a in fig.

~~12).~~

~~te the shield-bearing, naked, and bivalved Phyllopoda, represented by Apus, Nebalia, Branchipus, and Estheria,~~

~~L 8~~

~~B~~

~~Fiq 56.—Estheria, sp. D, from Dubuque, Towa; (e) the eye. ZL, from Lynn, Massachusetts (nat. size). S presents a highly magnified section of one of the valves to show the successive moults, 8, an enlarged portion of the edge of the shell along the back, showing the overlap of each growth. (Morse's Zoology).~~

~~the embryological development is no doubt analogous,~~

~~though less is known in regard to Estherva (fig. 56).~~

~~In Apus the male is not certainly known, all the progeny observed being fertile females. Probably, however (as is the case in Daphnia), males appear at a particular season of the year, and these suffice to render fertile several gener- ations of females. The females let their eggs fall to the hottom of the water, where they remain until hatched by the sun's warmth. The eggs of Apus occupy from two to there weeks in hatching ; the chorion splits, as in Limulus, revealing a semi-transparent inner egg-membrane. This also soon after bursts, giving freedom to a simple nauplius like that exceptionally met with by Fritz Miiller in a prawn allied to Penwus. The large cephalic shield, so character- istic of the adult Apus, is not seen in these early stages, and when it first appears, it closely resembles that of Peltocaris, an extinct Silurian form (4 in fig. 57). The nauplius, being short-bodied, does not display those graceful undulatory motions in the water observed in the adult, but progresses rather by a series of jerks like the adult Cyclops. At the end of eight or ten days the young Phyllopod has acquired considerable size. The body-seg-~~

~~1 Dohrn, op. cit. p. 639, Taf. xv. fig. 4.~~

~~2 Salter supposes (Quart. Journ. Geol. Soc., vol. iii., 1847, p. 252) that the membranous margin of the head-shield of Trinucleus was once entire, "then became plicate, then perforate, and lastly separated into linear processes."" It seems more probable that the margin of the head-shield was originally digitate, then gradually closed up, leaving only perforations along the sutures in some, and only plicee in others. We have an analogous case in Haliotis, Scissurella, and Plewroto- maria amongst the Mollusca, in which a slit becomes partially or wholly closed up, leaving perforations at intervals. In the Mollusca it is connected with the respiratory functions, but in Limulus, Hemias- pis, and Trinucleus it is probably a remnant of the margins of the~~

~~primitive segments which have coalesced to form the cephalic shield. ° Packard, op. cit. p. 155.~~

~~GCRUSTACHA~~

~~Trilobiten stadiwm of Dohrn ! resembles Prestwichia~~

~~ments and feet, so numerous in Apus, Artemia, and Branchipus (5a in fig. 57), are formed gradually (in repeated moults) from before backwards, without any sharply-defined regions of the body being discernible either by the time of~~

~~:~~

~~——l Af~~

~~iq. 57.—Puytnoropa.—1, Ceratiocaris papilio, U. Silurian, Lanark; 2, Nebavia~~

~~bipes (one side of carapace removed to show bran chial feet), Marine British ; 3,~~

~~Lepidurus Angassi: a, dorsal aspect; 6, ventral aspect of head showing the~~

~~hypostome and mandibles ; hab. freshwater, Australia; 4, larva of Apus cancri-~~

~~Sormis; 5, Branchipus stagnalis : a, adult female; b, fiist larval stage; c, second larval stage; 6, larva of Artemia salina. their appearance or their form. All the feet are of the same pattern, and resemble the maxille of the higher Crustacea.*~~

~~The young animal exuviates about twenty times during the first two or three months ; it is then full grown, and in every respect resembles the parent.~~

~~Nebalia (2 in fig. 57) presents a remarkable exception to the rest of its order, the young apparently (like Daphnia) undergoing no metamorphosis after they quit the egg. Metschikoff, who has recently studied the development of Nebalia, states that he has observed that it passes through both a nauplius and a zoéa stage within the egg,° and he therefore regards Nebalia as a Phyllopediform Decapod. We hardly see sufficient grounds at present for assigning Nebalia toa higher order than that in which it is now placed.~~

~~The Cladocera do not afford any additional aid in embryological research. They appear to quit the egg only smaller than the parent, but with their full number of limbs.~~

~~Of the developmental history of the Ostracoda but little is known. Zenker states that their anterior limbs are developed first, and the youngest stages, according to Claus, are shell-bearing nauplius-forms.~~

In the Copepoda (3-7 in fig. 58), the buckler doesnot cover more than the head and thorax, the abdominal segments, which are nearly cylindrical, extending beyond it. They are met with both in fresh waters and in the sea all over the world, and are most numerously represented both in a free state and as parasites. The larvee of the non-parasitic forms (3b-d in fig. 58), all possess at the earliest period the three anterior pairs of limbs, @.e., the future antenne and

een

4¢ The maxilla of the Decapod larva is a sort of Phyllopodal foot" Claus). "We might," says Fritz Miiller, "regard the Phyllopoda as zoe which have not arrived at the formation of a specialized thorax or abdomen, but have instead repeatedly reproduced the appendages which first follow the nauplius limb." 'The present writer has com- pared the Decapod larva in which the maxille serve temporarily as organs of natation and locomotion with the similar appendages which persistently fulfil this office in Pterygotus, Stylonurus, and Limulus (H. Woodward, Mon. Pal. Soc. Merostomata).

5 The greatest caution should be exercised in instituting comparisons between the so-called "nauplius" and " zoéa " stages of any one Crus- tacean, when such stages are passed within the egg, and those of any other Crustacean whose young actually pass through such stages after they have quitted the egg. In the Decapoda we at present know of only one instance in which the young appears as a free-swimming nauplius ; in the majority we see only the zotal and larval stages ; in some even the zoéal stage is overleaped, and the young appears as a larva differing but littie, if at all, from the parent.

——o. SS —- eS Powe a 4 f

CRUCTATCE 2

mandibles,—the anterior pair with a single joint, the two following pairs being bifurcate. The eye is single, and the labrum and mouth already occupy their permanent posi- tions. The hinder body is short, the abdominal segments not being yet developed. In subsequent moults these posterior

segments appear, and new limbs sprout forth. In the second stage a fourth pair of extremities is added ; these are the future maxille ; then follow three new pairs of limbs, the maxillze, and two anterior pairs of natatory feet. The three anterior pairs of appendages still represent rowing-feet. At the next moult the first cyclops-stage is arrived at, when there is a resemblance to the adult in the structure of the antenne and buccal organs, but the number of body-segments and appendages is

Fra. 58,—(1) CLapocera, (2) Osrracopa, (8-7) CoprPopa. 1, Daphnia pulezx, freshwater, near London. 2, Candona hispida, freshwater, near London. 3, Cyclops quadricornis: a, 9 , adult with eggs; 6, ¢, d, three stages of develop- ment of nauplius. 4, Cetochilus septentrionalis, Firth of Forth, 5, Sapphirina ovatolanceolata, Dana, 9 , Atlantic, off harbour of Rio Janeiro. 6, Nicothoe astact, ¢ , with egg-sacs (from gills of eommon Lobsters, London Market). 7, Nauplius of Copepod. (After Fritz Miiller.)

still much less than in the parent. Only the rudi- ments of the third and fourth pairs of natatory feet are seen, and the body is made up of an oval cephalo- thorax, the second, third, and fourth thoracic seg- ments, and an elongated terminal joint. In the Cyeclo- pide the posterior antenne have lost their secondary branch, and the mandibles have completely thrown off the previously existing character of natatory feet; whilst in other families these appendages are persistent, although more or less altered. Many of the parasitic Copepoda do not pass beyond this stage of free development. Such forms as Lernanthropus and Chondracanthus never acquire the third and fourth pairs of limbs, nor does the fifth thoracic somite separate from the abdomen. Others, such as Achtheres, even fall to a still lower grade, by the subsequent loss of the two pairs of natatory feet. But all free Copepoda and most of the parasitic Crustacea pass through a longer or shorter series of stages of development, in which the limbs acquire a higher degree of division into joints in continuous sequence, the posterior pairs of feet are de- veloped, and the last thoracic segment and the different abdominal segments are successively separated from the common terminal portion (Claus). Some parasitic Cope- pods, such as Achtheres percarum, certainly quit the egg like the rest in the nauplius-stage ; the oval astomatous body bears two pairs of simple rowing feet, and behind these are two inflations marking the third pair, each having a long seta. Beneath this nauplius-skin

~~a very different larva lies concealed, which in a few hours bursts its clumsy envelope, and makes its appearance in a form which agrees both in the segmentation of its body and the development of its extremities with the first cyclops-stage. The entire series of nauplius-stages which are passed through by the free Copepods are in this case completely overleapt. Although the parasitic species of Copepoda are all more~~

~~or less permanently fixed when adult, they pass their youth- ful stages as freely locomotive larve. To this rule there is a singular exception in the genus Caligus. The young animal (described by Burmeister as a peculiar genus, Chalimus) lies at anchor upon a fish by means of a cable springing from its forehead, and having its extremity firmly seated in the skin of the fish. When sexual maturity is attained the cable is cut, and the adult Caligus, which is an admirable swimmer, is not unfrequently captured swim- ming freely in the sea (Fritz Miller).~~

~~The animals belonging to the last division comprise two orders, the Rhizocephala and the Cirripedia. They have long been kept distinct from the Crustacea, and, together with various parasitic forms of Copepoda, whose develop- mental history was not known, classed as Epizoa and Cirripedia.~~

~~By later zoologists the Rhizocephala have been placed with the Pcecilopoda, but as this division includes many genera which prove to be merely parasitic forms of~~

~~Fra. 59.—A, Balanus (young), side view with eirri protruded. 3, upper surfac of same; valves closed. C, highly magnitied view of one of the cirri. (Morse,) Copepoda, it will be more convenient to separate them. All the animals of this last division, which for convenience we would designate under the general name of Anchora- cephala, are attached when adult ;—in the Cirripedia by means of cement ducts which deposit calcareous matter, forming in the adult Balanide (figs. 59-60) a broad shelly~~

~~Fre. 60.—Early stages of Balanus. A, Nauplius; e, eye. B, Larva with a bivalve shell and just before becoming attached (represented feet upwards~~

for compaii- son with EZ, where it is attached). C, After becoming attached, side views. D, Later stage, viewed from above. Z, Side view, later stage and with cirriextended. The dots indicate the actual size. (After Spence Bate.),

base, anda simpleattachment in the pedunculated Lepadide,;

in the Rhizocephala by ramifying nutritive roots, which sink

deep into the interior of the body of the animal upon which they become parasitic (see figs. 82 and 83, p. 665). In all the members of this division the young appear as naupliform larvee) which speedily moult their first coat. The body is unsegmented and pyriform, having a median eye," a first ie SS eee EE ee Se

1 See Mr C. Spence Rate's Memoir, Annals and Mag. Nat. Hist.

1851, 2d series, vol. viii. p. 324, plates 6, 7, 8.

2 In Sacculina purpurea and in some species cf Lepas the median eye is wanting.

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pair of minute antennz, two anterior horas, which inclose the second pair of antennz,! one pair of uniramous and two pairs of biramous natatory legs, a forked terminal projection to the body, and a posterior point to the carapace (see fig. 60a, and fig,

61).

The nauplii of the Anchoracepha- la are distinguished from the Copepoda by possessing a dorsal shield or ca- rapace, which some- times, as in Saccu- lina purpurea, pro- jects far beyond the body all round. They are also further distinguish- ed by possessing a pair of so-called

Fra. 61.—Nauplius of Tetraclita porosa after the first

« . moult. Magn. 90 diam. The brain is seen surround-

olfactory fi | a ing the eye, and from it the olfactory filaments ments, w hich mene. Ren it are some delicate museles passing spring dined tly feats o the buccal hood. (Fritz Miiller.)

tae head. These filaments, or horns of the carapace (which are interpreted as the second pair of antenne by Darwin), are believed by Fritz Miiller to be the homologue of the so-called "green gland," which opens at the end of a conical process at the base of the inferior antennz in the Decapoda, and of the conical process, with an efferent duct eo ya it, seen on the inferior antennz of the Amphi- poda.

Tue abdomen of the young Cirripede is produced into a long tail-like furcate extremity, that of the young in Rhizocephala into a movable caudal fork.

The young Cirripedes have a mouth, stomach, &c., and their posterior pairs of limbs are fitted for organs of prehension and manducation. In the young of Rhizocephala all these organs are wanting. The young Cirripede, having to undergo several moults as a nauplius, is provided with organs to sustain its life. The young Rhizocephalon being astomatous, cannot sustain life in its nauplius state for long, and must therefore more rapidly pass through its transformations. They both at length arrive at an equally astomatous pupa-stage. In this stage we see the young animal with its carapace folded together like a bivalved shell ; the foremost limbs become << transformed into very peculiar ok adherent feet, and the two fol- lowing pairs, like the frontal horns, are cast off with the nauplius-skin. Behind these are six pairs of powerful biramose natatory feet, with long sete hy and two short setigerous caudal the shell (Ente Miller) nite appendages. The young pup of the Rhizocephala and Cirripedia agree in every particular, save that the latter possesses a pair of composite eyes ; sometimes also traces of the frontal horns seem to persist.

When the proper time arrives the pupe of the Cirripedia attach themselves by means of their prehensile antenne to rocxs, shells, turtles, cetacea, drift-wood, ships, &c.; the carapace becomes converted into the peculiar sessile-shell of the Balanus, or the pedunculated Lepas; the natatory feet grow into long cirri by which nourishment is whirled to the mouth, now open and furnished with mandibles and

~~Fia. 62.—Pupa of a Balanide (Chtha- malus?). Mazzi, 50 diam. The adherent feet are retracted within~~

~~1 " Olfactory filaments" (Fritz Miiller).~~

~~CRUSTACEA~~

~~maxilla. The pupx of Rhizocephala in like manner attach. themselves to the abdomen of crabs, Porcellane, and hermit- crabs ; but they remain astomatous, lose all their limbs completely, and appear as sausage-like, sack-shaped, or discoidal excrescences upon their host, filled with ova (figs. 82 and 83); from the point of attachment closed tubes, ramifying like roots, sink deep into the inte- rior of the host, twisting around the intestine, or are diffused among the sac-like tubes Fig. 63.—Pupa of Sacculina purpurea, Magn. 180 diam, of the liver. The The filaments on the adherent feet may be the com- only manifeska- mencements of the future roots. (Fritz Miiller.) tions of life which persist in this most retrogressively meta- morphosed Crustacean are powerful contractions of the roots and alternate expansion and contraction of the body, causing water to flow into the brood-cavity, to be again expelled through a wide orifice (Fritz Miiller).~~

~~Darwin has recorded various anomalous cases of development in the Cirripedia ; amongst others, that of Cryptophialus minutus (which forms a separate section Abdominalia, Darwin), parasitic in the shell of Concholepas peruviana, The egg, at first elliptical, becomes broader anteriorly, then acquires three club-shaped horns, one at each anterior angle and one behind. Subsequently the posterior horn disappears, and the adherent feet may be re- cognized within the anterior ones. From this " egg-like larva" the pupa is directly produced. Its carapace is but slightly compressed laterally, and is hairy as in Sacculinu purpurea ; the adherent feet are large, the natatory feet wanting, as are also the corresponding cirri in the adult animal. Mr Spence Bate mentions a similar case in a Rhizocephalon, in which the nauplius-stage is overleaped and the young quits the eggs as a pupa-form larva.:~~

~~EXUVIATION IN THE ADULT AND REPARATION OP Ingurizs.—-As we have already seen, the young Crustacean, on quitting the egg, usually undergoes a series of larval metamorphoses more or less numerous, and~~

subject to con- siderable. variation even among closely-allied forms. Eventually, whether. by a direct or an indirect route, a form is attained in all, which, save in size, closely agrees with the adult. ;

Amongst the Insecta the larva usually undergoes repeated moults during its growth, from the time when it first quits the egg untif it reaches the pupa-stage, a period of rest in most, but not in all insects,? and an astomatous stage in some larval Crustacea.? From the pupa springs the fudd- grown and perfect insect, when no further moult or change takes place—indeed, in some insects the parent only lives to deposit its eggs, and then dies. The immature Crusta- cean, in passing through its nauplial and zoéal stages, may moult its skin seven or eight times, or even more; never- theless, when it reaches the imago stage, it has not nearly attained the size of the adult parent, but continues to grow and cast its calcareous envelope as often as its "nereased size necessitates its so doing. When adult, it

A A ee

2 The aquatic pupa of the dragon-fly is active and predaceous.

3 The pupx of Rhizocephala and Cirripedia are both astomatous.

4 Imago.—Darwin has applied the term " pupa-stage'"' to the free-swimming astomatous larva in the Cirripedia previous to its settling down, casting off its pupa-coat, and becoming adult. The writer has Jong doubted if the Crustacea ever really arrive at this highest or imago condition, and whether they are not always in a '* pupa-period " all their lives. The larval Aphis—the branchiated Agolotl—are but arrested stages of development of more advanced forms, but they deposit eggs, and in the case of the Aolotl they possess all the attributes of the perfect animal, save the persistent external larval branchiz.

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still continues to moult probably through its entire | membrane of the shell and the many-jointed cirri are

~~lifetime, even to extreme old age.}~~

~~In casting its shell a crab not only parts with every joint and plate of its limbs and carapace, of its long and slender antenne, its external eyestalks, the plates of the tail, the appendages of the mouth, the lining of its gills, but even its stomach, with the gastric teeth and the slender apode. mata, which give support to the muscles of the limbs and body—so that when the crab has escaped from its old suit, the cast-off shell seems nearly as perfect as the animal itself~~

~~When exuviating, the crab and lobster both escape from their old shells by a line of dehiscence which opens between the posterior border of the carapace and its union with the abdomen. Professor Bell also states that in the great crab (Cancer pagurus) and some other forms, the carapace divides at the junction of the epimera with the dorsal piece or tergum.~~

~~In Limulus the carapace splits all round the anterior border, at the union of the dorsal and ventral walls. Iimulus sheds its shell five to six times during the first year, and probably once annually after that period.~~

~~Sir John Dalyell, Mr Couch, Mr Gosse, Mr Spence Bate, Mr Warrington, and others, have given excellent accounts of the process of moulting of various Crustacea. An accu- rate observer, Mr Harper, states? that he confined six small specimens of the common shore-crab (Carcinus mœnas) in separate glasses, and fed them daily, until one of them showed that something was amiss by refusing food. Soon after it cast its shell, an operation which only occupied five minutes. When very young this crab moults frequently. The same author registered the dates, and preserved the exuvie of one which moulted on April 11, 1858, and on May 22, July 3, August 30, and September 26 of the same~~

~~year; the acceleration of the last moult is attributed to the |~~

~~creature having been fed daily, "like a prize beast," on pur- pose to try the effect on its growth. Some of these little crabs had lost part of their limbs, but after a moult new limbs appeared of very diminutive size; after a second moult each new limb had increased to one-half as large as the rest, and in the third moult it had reached to its proper bulk and form. Hermit-crabs~~

shed their hard shell before pulling off the exuvize of the tail; their increase at each moult is much less rapid than in the common crab, Prawns exu- viate more frequently. Mr Warrington saw the change occur with much regularity every twelve days in the summer season. With the exception then of certain parasitic forms of Crustacea, which, like the Rhizocephala, have undergone such a complete retrograde metamorphism that no trace of articulations or appendages remain, all the Crustacea periodically exuviate their dermal covering, whether calcareous, chitinous, or membranaceous. In the Cirripedia it would not be possible to exuviate the adherent sliell of the adult Balanws, or the peduncle of Lepas or Scalpellum, but, even in this aberrant division, the lining

1 Prof. Bell observes, "There is no doubt that exuviation in many of the higher forms takes place annually with great regularity until the growth is completed, which in many species is not the case before the animal is many years old. This is proved by the extent to which the size increases at each moult, compared with the difference between the young and the old animal ; and it is evident that after the growth has reached its maximum, the crust ceases to be changed, from the fact which I have seen in several instances, as in the common crab, the lobster, and some others, where the carapace of the still living creature was the seat of barnacles so large, that several years must probably have been required for attaining their existing size" (British Stalk- eved Crustacea, Introduction, xxxiv.). The young male of Limulus, according to Packard, does not attain to the period of puberty before it is four years old. Many Entomostraca infested with bell-animalcules depend on the moulting of their carapace as their only chance of sur- viving and escaping these prolific parasites.

? Glimpses of Ocean Life (1860).

*regularly moulted.**

It has long been known that Crustacea possess the power of voluntarily casting their limbs, and of restoring such as have thus been lost by the animal's will or by accident. If one or more distant phalanges of a limb be torn off, the animal has the power to throw off the remain- ing part of the limb also. This separation always occurs near the basal extremity of the first phalanx. When tho limb is thrown off, the blood-vessels and nerve

retract, thus leaving a small cavity ; from this the germ of the futuro leg springs, and is at first seen as a nucleated cell. A cicatrix forms over the raw surface caused by the separa- tion, which afterwards forms a sheath for the young leg.

PRINCIPAL DIVISIONS OF THE CRUSTACEA.

The subjoined table is intended to give only a general outline of the Crustacean class, with the sub-classes, legions, and orders.

Of the thirteen orders enumerated two only (printed ia italics in the table) are extinct, namely the Zrilobita and Eurypterida, These two lost orders disappeared in tho Carboniferous epoch.

Table of Classification of the Crustacea. Crass CRUSTACEA. Sub-Class 1. ZHORACIPODA (or Afalacostraca). Legion I. PoDOPHTHALMIA.

Order 1, DEcAPoDA. Sub-Order (a) Brachyura, Crabs. (6) Anomoura, Hermit-erabs. (c) Macroura, Lobster, Prawn. . Sromaropa, Sguilla, Mysis, Diastylid«. Legion II. EDRIOPHTHALMIA.

. Isopopa, Oniscus, Idotea, Spheroma. . Tritoprté, Phacops, Asaphus, Calymene, &e . AMpHIPODA, Talitrus, Gammarus, &c. Sub-Class 2. GNATHOPODA (or Entomostraca). Legion III. Mrrosromara. 6. XrtpnosurA, Limulus, Bellinurus, de. », @. Hurypreprpa, Lurypterus, Pterygotus. Legion IV. BRANCUIOPODA », & Puytiopopa, Apus, Nebalia, Artemia. CLADOCERA, Daphaia, Lynceus, de.

Legion V, LopPHYROPODA. OstracopA, Cypris, Candona, Cythere. Coperopa (a) Liberata: Cyclops, Cetochilus, Diaptomats. (5) Parasita : Lernanthropus, Caligus, Nicothve. Legion VI. ANCHORACEPHALA. Ruizoceriaa, Sacculina, Pcltogaster. CikRIPEDIA, (2) Balanide, &c. (6) Lepadide, &c. If the old definition between the two great groups, tho Matacostraca and the Enromostraca, be maintained, namely, that the former shall consist only of forms having

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3 The frequency with which they exuviate, together with the dura- bility of the cast-off integuments, explains the astonishing masses of exuvie which Mr C, W. Peach observed annually off the coastof Cornwall, especially in the months of April and May ; but he has seen quantities also in September. He could easily have filled several quart-measures with them (Darwin’s Balanide, p. 157).

In connection with the exuviation of the Cirripedia Darwin mentions a most remarkable fact (op. cit. p. 15): “In regard to the female organs, the ovarian tubes and ceca inosculate together ; there are no oviducts ; the ova, connected together by membrane, and so forming the ovigerons lamell, become exposed by the exuviations of the lining tunic of the carapace or sack, and by the formation of a new tunic on the underside of these lamellee,—a process unknown in other Crustaceans.”

4It is a well-authenticated fact that the roll of thunder and the discharge of artillery over that part of the sea where lobsters resort will cause them to throw off their great claws. The same effect is also produced by the infliction of any sudden injury. If Porcellana platycheles be seized by the claw it immediately casts it off and beats a retreat without it.

5 IL. Goodsir, Ann. and Mag. Nat. Hist., vol. xiit. p. 67.

more than twenty-one segments, the introduction of the Trilobita among these may be looked upon as inappropriate. If, however, we admit that the Trilobita had (as there seem good grounds for allowing) true special locomotory appendages other than gill-feet or jaws, as in the Malacos- traca generally, then we submit that they are appropriately classed. The

~~main characteristic of the Malacostraca seems to be, not so much the possession of twenty-one segments, an inheritance really common to the whole class, but~~

~~Estimated thickness of strata~~

~~in feet.~~

~~Formations.~~

~~—$$~~

~~250 | Recent……—+++ 2,825 | Tertiary …….. ~ 2,170 | Cretaceous …….. | @ | 2,750 | Jurassic …….. ley | wes 7 1,800 | Triassic ……..++++ ren 600 | Permian…….+.. et 15,000 | Carboniferous… ere ol 6,000 | Devonian….. : ERLE es ame 30,000 | Cambrian…….. Be a~~

~~30,000~~

~~Explanation.—The letters at the top of each column represent the several orders and sub-orders of Crustacea,—one family of the Arachnida, the Scorpionide, being placed beside the Eurypterida to show its range in time and probable derivation from the Crustacea. The vertical lines show the actual range in time, the black dots denote the strata in which remains of each order have been met with. The curved lines, uniting order to order, are intended to show the probable evolution of the class from a common great ancestor; but numerous as are the indications of affinities afforded by the Crustacea, the group is too ancient to be certainly traced back in time to a common parent; even the lowest Cambrian rocks have yielded evidence of two orders, namely, the Trilobita and Ostracoda, whilst the Middle Cambrian furnishes a Phyllopod Crustacean (Hymenocarits). As the branches of this genealogical tree of the Crustacea are not arranged in a circular manner, they cannot of course be made to show the affinities which each order presents to every other order or branch, any more than does the dried plant show the natural verticillate arran gement of its leaves and branches when pressed out flat upon the page of a Hortus Siccus.~~

~~L=the Lopayrorova. Of this legion, the order Ostracoda is well represented throughout the entire series, from the Cambrian to the Tertiary and also in the seas and fresh-waters of to-day.~~

~~C=the Crrrtpep1a.—l=the Lepadide, or pedunculated Cirripedes, appear first jn the Wenlock Limestone (U. Silurian); represented by a single form (Turrilepas Wrightianus, H. Woodw.). Numerous forms occur in the Secondary and Tertiary strata, and they are abundantly distributed throughout the warmer seas of the world. d0=the Balanidz, or sessile Cirripedes, are represented by a single form, the Pyrgoma cretacea, H. Woodw., in the Chalk, abundantly in the Tertiary rocks, and in recent deposits, and are distributed in the seas all over the world at the present day.~~

~~B=the BRANCHIOPODA.—Of this division the order Phyllopoda appears in the Cambrian rocks, and is well represented in Silurian and Carboniferous strata; they are also met with in the Secondary and Tertiary formations, and living in fresh, brackish, and marine waters, widely distributed over the globe.~~

~~P A=the AMPHIPODA.—This order has a single representative in the Upper Silurian, Necrogammarus Salweyt, H. Woodw.; it is represented by Gampsonyx ? in the Coal, by Prosoponiscus in the Permian, and by several forms in the Secondary and Tertiary formations, and abundantly in recent freshwater and marine localities.~~

~~the terms Malacostraca! and Entomostraca,? which convey no idea of any structure or function common to either division to which they are applied, the adoption of the terms Thoracipoda? and Gnathopoda,* which embody the silient character in each sub-class.~~

~~1Fyom uadaxds, soft, and 8erpaxov, a shell,—a term not specially appropriate or applicable to crabs and lobsters.~~

~~2 From Zvyrouos, an insect, and Sorpaxov, a shell,—a name quite applicable to the Ostracoda, but not to all the sub-class.~~

~~3 From @épat, the thorax (or middle body), and movs, Todds, a foot, in allusion to the prevalent use in the Malacostraca of the thoracic seties of appendages as special organs of locomotion.~~

~~4 From -yrd0os, the jaw, the mouth,and mods, 70dds, a fovt, in allusion~~

~~Evolution and Range in Time of the Orders of the Crustacea.~~

~~Fic. 64.—Diagram showing the probable evolution and actual range in time of the several orders of Crustacea.~~

~~CRUSTACEA~~

~~the presence of the seven anterior (cephalic) appendages especially set apart for the senses and nutrition, with separate post-cephalic organs of locomotion ;—whereas the peculiarity of the Entomostraca seems to be that the seven anterior (cephalic) organs are not specially set apart as organs of sense and nutrition, but are employed in nearly all the class as the chief locomotory organs, the posterior feet being branchial or ovarian lamelle, or altogether want- ing. The writer ventures to propose therefore, instead of~~

~~tel tle tBtas~~

~~T=the Trrronira. This extinct order appears in the Cambrian, attains its » —- development in the Silurian, and terminates in the Carboniferous period.~~

~~—the Isopopa.— This order is represented in the Devonian by a single species, Prearcturus gigas, H.Woodw., and by remains in the Carboniferous strata. Many species occur in the Secondary and Tertiary strata. It is largely represented to- day by land, freshwater, and marine types,~~

~~—Sromapopa.—Pygocephalus Huxleyt, H. Woodw., from the Coal-measures, probably belongs to this division, True Squillas and Mysis-like Crustacea occur in the Jurassic rocks (Secondary). Forms of this order are abundant in our modern seas.~~

M=the MAcrouray division of Decapopa. A single species, Anthrapalemon Grossartti. Salter, appears in the Coal-measures, This order is well represented from the Trias to the present day, and is now one of the prevalent types, occurring both in fresh and salt water.

Aa=the ANomoura, or irregular-tailed DEcAPoDA. This sub-order embraces forms related both to the Crabs (eg. Dromia, Porcellana, Dorippe) and to the Lobsters (eg. Pagurus, Galathea, Munida). Their earliest appearance is in the Cretaceous period; there are numerous living forms, both terrestrial and marine.

Ba=the Bracnrura.—The oldest known crab isthe Palwinachus longipes, H. Woodw., from the Gt. Oolite. Crabs are well-represented from the Upper Secondary to the present day, when they attain their maximum within the warmer latitudes, being represented by land, freshwater, and marine forms.

X=the XrpHosura, or king-crabs. These are remarkable for their longevity; they appear first in the Upper Silurian (Neolimulus falcatus, H. Woodw.); again in the Coal-measures, next in the Oolite and Tertiaries, and living to-day in the Old and New Worlds.

E=Ecrypreripa.—this extinet order contains some of the largest kiown members of the Crustacean class (e.g., Pterygotus anglicus, Devonian). It ranges from the Upper Silurian to the Coal-measures. On morphological grounds there is good reason to conclude that the Eurypterida are the ancestors of the Scorpionide, to which they present the strongest affinity.

A=ARACHNIDA. S=ScorPIoNID#.—The scorpions range from the Coal-measures, apparently unaltered, to the present day.

eS ee

The Trilobita are probably represented to-day by the Isopoda, to which doubtless they are closely related. There is reason to believe the members of the other extinct order, the HurypterIda, to have been the aquatic branchi-ferous ancestors of the terrestrial tracheated air-breathing Scorpionide; nevertheless they need not on that account be removed from their present position in the Crustacean

to the prevailing character in the Entomostraca, in which the head and mouth-organs are also mainly used in locomotion. We should of course have preferred to use the term Cephalopoda for this sub-class, had not that designation been already appropriated for the cuttle-fishes, &c,

——_ —_ * = ~ ..:

CGCHUS EACH A

class;1 and the Scorpiontde should of course still form a part of the class Arachnida, which may, however, be conveniently placed beside the Crustacea, asin the annexed diagram (fig. 64), in which their probable morphological ard ancestral relationship is indicated.

TyYpEs oF EXISTING CRUSTACEA. Sub-class 1. THoracrpopa (or JJalacostraca),

I. PopopatHatmia : (1.) Decaropa—(a) Bracuyura. —Crabs are certainly the highest representatives ,of the Crustacean class, and in this ten-footed order? are included some of the most active and intelligent members of the community,—the " land-crabs," and " shore-crabs," and also the largest living representative of the class, the Jnachus Kempfert from Japan.

Crabs furnish the best illustration among the Crustacea of that concentration of organs around a single nerve- centre, which Professor Dana aptly terms cephalization.

Instead of a long vermiform body composed of a large nuinber of annuli, each having its own nerve-ganglion, we have in the crab one large cephalo-thoracic ganglion repre- senting nearly the entire nerve force of the body, the supra- cesophageal ganglion only giving rise to the nerves of sense and volition. (See fig. 9, nerves of Maza.)

This highest cephalized type is exemplified by Maia, but asa matter of fact the triangular crabs, of which Jara squinado and Jnachus Kempfert are examples, do not embrace, by any means, the liveliest and most intelligent of the order; on the contrary, we should decidedly award the highest place for intelligence to the quadrangular land and shore-crabs; indeed, it is

amongst such genera as Grapsus, Gelasimus, Ocypoda, Gecarcinus, &c., that we find the most rapidly moving terrestrial forms of Crustacea. Most of the land-crabs retreat to burrows in the ground during the heat of the day, and issue forth at dusk to feed on the growing crops of sugar-cane, rice, or maize. The Gecarcinus ruricola (see ante, fig. 21) is peculiarly destruc- tive to the young sugar-canes in the West Indies. In the highlands of the Deccan land-crabs are most abundant. Gecarcini are found at Mahableshwar at an elevation of 4500 feetabove the sea. These Jand-crabs probakly do not visit the sea at all, as do the Jamaica land-crabs, but de- posit their eggs, when near the time of hatching, in the freshwater streams, the banks of which they are known to frequent. Many of the land-crabs have the chelate limbs largely developed, usually more strongly so in the males, ¢.9., the male of Macrophthalmus Latreilli ; in others one claw only is very disproportionately enlarged, as in the males of

1 In a paper on the structure of the Xiphosura and their relationship with the Eurypterida (Quart. Journ. Geol. Soc., 1866, vol. xxiii. p. 35), the writer first suggested the probable genealogico-morphological rela- tionship between Pterygotus and Scorpio ; and ina subsequent com- munication (op. cit. 1871, p. 46) he combated the proposal of Dr Anton Dohrn to remove the Trilobita, Eurypterida, and Xiphosura from the Crustacea, and to combine them with Scorpio as a new class beside the Crustacea ; he also pointed out wherein the evidence relied upon by Dohrn for establishing such an order fails. The classification of the Eurypterida and Xiphosura proposed in his monograph (Pal. Soe. Mon. Merostomata, Pt. i.-iv., 1866-72) has been adopted by Pro- fessors Owen and Huxley both, and has received the sanction of many eminent carcinologists. The writer has given his views as to the close affinity between the extinct Trilobita and the modern Isopoda in — Assoc. Reports, Edinb., 1871, and Geol. Mag. 1871, vol. viii. p- 289, pl. 8.

"The crabs belong to the legion Podophthalmia, all the members of which are distinguished by having their compound eyes placed on movable eye- stalks (hence called " stalk-eyed Crustacea"). They also have the gills covered by the carapace, forming, in fact, a more or less completely enclosed branchial chamber. Only one other Crustacean Viz., Tanais (fig. 38), an Isopod, has such an arrangement —in Tanats also the eyes are pedunculated. In Nebalia (2 in fig. 57), a Phyllopod, the eye is

~~pedunculated, butin these instances the peduncle is not articulated. In the Trilobita several species occur with compound peduneulated eyes, but the eye-stalk has no articulus.~~

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~~the " calling-crab" (Gelasimus), which are said in running to carry this claw elevated as if beckoning with it. Fritz Miiller says, however, that the species common in Brazil (a small Gelasimus with one claw very large) always holds it~~

~~Fig. 65..—The " Calling-Crab" (Gelasimus), § a land-crab common in the cassava- fields, Brazil.~~

~~closely pressed against its body. Vast numbers of land- crabs are met with on the sea-shore and among rocks along the coast, especially in the warmer temperate and sub-tropi- cal regions of the earth, Of the genus Thelphusa one freshwater species (7. fluviatilis) is a native of the rivers of southern Europe. It is eaten by Catholics during Lent, and hence called " Lenten crab." This crab is also common to the rivers of India.~~

~~Although some land-crabs are certainly vegetarians in diet, the class, as a whole, are carrion feeders, greedily devouring animal matter even in a putrescent state. The Portunide and Carcinide perform the duties of sanitary police around our coasts between tide-marks, being assisted by swarms of " sand-hoppers" (Yalitrus locusta) ; whilst below low-water mark the prawns, JJazas, great crabs, and lobsters share the task. Many sea-side resorts would be extremely unwholesome were it not for the labours of these useful but unpaid scavengers.~~

~~The swimming-crabs are mostly predaceous ; forms like Portunus pelagicus and Polybius Henslowvi (fig. 66) have exceedingly thin shells, and all the feet, save the great chelate claws, are modified into oars. They are thus en- abled to live and hunt at their ease, often hundreds of miles from land. The writer has seen Henslow's swimming-crab in~~

~~the middle of the Fre. 66.—Henslow's Swimming-crab, Polybius Henslowii,~~

~~Leach, coast of Cornwall.~~

~~Bay of Biscay far out of sight of land. Crouch, the Cornish naturalist, states that they fasten upon pilchards and mackerel with their knife-like claws, and never relax their hold until the ter- rified victim floats exhausted on the surface.~~

~~Two genera of Tertiary Land-crabs have been described from English localities (Goniocypoda? and Litoricola).* Macrophthalmus occurs fossil in China, where it is prized as a valuable materies medica.> Ranina,“ the frog-crab ” of the Indian Ocean and Japan, occurs in Tertiary rocks® in Bunde and Ebenda, Germany, in San Stefano, Italy, and~~

~~3 Goniocypoda Edwardsti, H. Woodw., L. Eocene, High Cliff, Hampshire Geol. Mag., 1867, vol. iv. pl. 21. fig. 1, p. 529.~~

~~4 Litoricola glabra, H. Woodw., and ZL. dentata, H. Woodw., L. Eocene, Portsmouth, Quart. Journ. Geol. Soc., vol. xxix. pl. 2, p. 29.~~

~~5 Notes on Chinese Materia Medica by D. Hanbury, F.L.8., Pharm. Journ. 1862, p. 43.~~

~~6 See Woodward and Salter’s Chart of the Fossil Crustacea, engraved, by J. W. Lowry ; Stanfords, Charing Cross, 1865.~~

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~~in Malta. Rumphius says, “It loves to climb upon the roofs of houses. ”~~

~~More than fifty genera of fossil Crustacea, referable to the Decapoda-Brachyura, have been described by Milne- Edwards, Bell, Reuss, M‘Coy, H. Woodward, and others The oldest known crab is the Paleinachus longipes, Hi. Woodw., from the forest marble, Wilts (Quart. Journ. Geol. Soc., 1866, vol. xxii. Pl. xxiv. p. 493).~~

~~L PoporuTHAtmia: (1.) Decaropa—(b.) ANOMOURA.— The irregular-tailed or Anomourous Crustaceans, of which the hermit-crab is a type (figs. 20 and 67), are excellent~~

~~ecsepssaverosmaneas~~

~~Fic. 67.—Hermit-Crab removed from its shell (see ante, fig. 20). r, hardened ridge which bears against the columella of snail-shell; a, a, the~~

~~appendages to which the eggs are attached. (Morse)~~

~~examples both of arrested development and retrograde meta- morphosis in the adult, resulting from disuse and consequent atrophy of particular parts or organs.~~

~~We have seen among the Isopoda the females of the Bopyride, which live parasitic within the branchial chamber of other Crustaceans, or under their abdomen, or within the parietes of a Balanus, or actually within the body of a Porcellana. In the Rhizocephala we have seen the free- swimming pupa become attached to the soft body of the Pagurus, cast off its shell, lose all its limbs, and appear as a sausage-like, sack-shaped, or discoidal excrescence, without even a mouth, its body, filled with ova, attached by its antennee, which are modified into roots, that anchor it and at the same time bring it ready prepared nourishment from the juices of its hosts (see figs. 82 and 83). After such extreme retrogression, the depauperization of certain parts and organs observable in the Anomoura is easily to be understood and admitted.~~

~~If we bring together for study a series of Anomourous Crustacea, we shall be at once able superficially to divide~~

~~them into two sections, the Macrourous and the Brachyurous Anomoura.~~

~~1 (Fritz Muller, Fiir Darwin, p. 30). This statement of the old Dutch naturalist seems most extraordinary, and needs further investigation. All the feet in Ranina seem adapted for digging, and an allied but much smaller form (Raninoides) from Trinidad, a truly marine species, isa most expert burrower into sand or mud, going down tail foremost. According to Milne-Edwards, in Ranina the ordinary entrant orifice to the branchial cavity is altogether wanting, and the entrance is by a canal which opens beneath the abdomen. Such an arrangement seems rather to favour the notion of its fossorial habits.~~

~~CO BU 8. T Aer~~

~~(A.) Irregular Bracnyura. | (B.) Irregular MacrouRa.~~

~~1. Lithodes. 1. Galathea.~~

~~2. Porcellana (fig. 68.) 2. Munida.~~

~~8. Dromia. 3. Paguri (fig. 67.) 4. Dortppe. 4, Birgus.~~

~~5. Homola.~~

~~We have also burrowing forms which obviously are near to these, although not actually classed with them, viz.,~~

~~1. Ranina. 1. Callianassa. 2. Corystes. 2. Gebia. 3. Axius.~~

~~In both these sections of the Anomoura we find the same peculiarity, namely, that the fifth pair of (thoracic) legs, and sometimes indeed the fourth and fifth hinder pairs, are not formed for walking, but are minute and rudimentary, and are placed above the level of the other legs.~~

~~In Porcellana and Lithodes, in Galathea and Munida, the posterior legs are simply rudimentary. In Dorippe and Dromia, in Pagurus and Birgus, though still disproportionately small, they are modified into organs for holding on with. This VW rudimentary condition of the (7% posterior thoracic feet in the An. "24 omoura at once recalls the last larval stages of nearly all the Malacostraca,? in which the hinder thoracic somites are not yet developed, or if so, are either destitute of appendages, or have only rudimentary ones.~~

~~The chelate form of the two posterior pairs of feet in Dromia and Dorippe, in Homola and Birgus, being a vari- able characteristic, and not present in all Anomoura, is doubtless developed as an individual specific modification, like the chelate penultimate feet in Brachyscelus and the ante-penultimate pair in Phronima.®~~

~~Some Anomoura have chelate terminations to a pair of their rudimentary feet, others have both pairs simple.' This is at once elucidated when we~~

~~inquire into their economy. Dromia does not carry about a turbinated shell like Pagurus, but clothes itself with the skin of its victim, a "sea-lemon " (Doris) for example, or encourages a para- sitic sponge of showy colour to grow upon its back, holding it in its place with its two hind pairs of rudimentary feet, just as the other true hermits hold their shells on over their soft-skinned bodies (Gosse).~~

~~Professor Verrill has described a Dorippe (D. facchino), which always carries an Actinia (the Cancrisocia expansa, St.) upon itsback. Like most other cases of commensalism this friendly association of the crab and sea-anemone Was begun long ago and has been regularly adhered to. When young the Dorippe carries a small shell (/ the half of a bivalve), which it holds in position by means of its two hind pairs of legs. The Actznza fixes itself when young to the shell, and afterwards by its growth completely conceals the carapace of the crab, replacing the shell which is, no~~

~~NS TAR — Ne : Bh~~

~~Fic. 68.—Porcellana pilatycheles, Penn, sp. British. Mabitat under stones at low-water.~~

~~a 2 In Paleemon and Penceus (Macroura), in Dulichia, Caprella, Ligia, and Asellus (Isopoda), in Lestrigonus (Amphipoda), and even in the Brachyura where the young apparently undergo little transformation when compared with the less cephalized forms, the thoracic somites are developed last, and then from before backwards. (See Spence Bate on the Development of Decapod Crustacea, 1857, Phil. Trans. 1858,~~

~~. 595.)~~

~~2 3 In Cenibota Diogenes, one of the land-hermits, the penultimate pair of feet are furnished with curious rasp-like surfaces to their ex- tremities, to enable it to hold on to the smooth inner surface of the spiral shell it has chosen for a habitation.~~

~~4 In the HIyperie the youngest larve cannotswim ; they are helpless little animals which cling firmly by their chelate feet to the swimming laminz of~~

~~the Meduse in the gill-cavity of which they live when adult ; the adults lose the prehensile character of the feet and acquire the power of swimming.~~

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~~doubt, after a time either disintegrated or abandoned when the Dorippe moults. A Sagartia, associated with a hermit- -crab on our own coasts, is said entirely to dissolve away the Buccinum in which the Pagurus is lodged, and to supply its place, as in the case of Dorippe, with its expanded foot.~~

~~Several specimens of a small species of Pagurus, common on the French coast, have been brought to the writer, each crab tenanted in what appeared to be the shell of a small Buccinum or Nassa ; but the whole was so completely encrusted by a sponge as to leave no part visible externally. On cutting one open vertically the spiral form of the interior cavity of the shell was very distinctly seen, but the shell itself had been entirely dis- solved away by the sponge.~~

~~A Zoanthus has been described by Duben and Koren under the name of Mammalifera incrustata, which is commonly found para- sitic on shells that are tenanted by a species of Pagurus. In all cases the shell is destroyed after a while, not by the hermit-crab, but by some process of disintegration or absorption, the diffused basal crust of the Zoophyte forming a perfect cast of it, and affording shelter to the crab. This form occurs in Shetland and in the North of England, as well asin Norway, and is regarded by Mr Hincks as distinct from Zoanthus Couchii, Gosse (Rev. 'T. Hincks, Ann. and Mag. Nat. Hist. 1862, p. 304).~~

~~The Adamsia palliata always selects shells tenanted by Pagurus Prideauxii, but instead of adhering to the spire the "cloak-anemone" fixes itself to the smooth inner lip of the shell, so that when the hermit is feeding, the mouth of the anemone is just below that of the crab, and ready to receive any fragment he may let fall. When the Adamsia is very young, less than half-an-inch in diameter, its outline is circular ; but as it grows older it expands laterally, form- ing two lobes, which creep along the mouth of the shell, until they meet and coalesce on its outer lip. The base of the cloak-anemone is then perforated, and through this opening the hermit puts out or retracts his head and legs.~~

~~In all the Anomoura the abdomen is more or less modified ; for instance, in the Brachyurous type, it is not closely bent under the body, as in ordinary crabs, some Porcellane (fig. 68) carrying it extended straight out ; whilst in the long-tailed forms, like Galathea, the epimera are shorter, and the segments are less arched than in the lobster. The caudal plates are also more rudimentary. In Pagurus (fig. 67), the abdomen is naked, only a mere trace of the shelly plates remaining. In Birgus latro the sternal portion only of the abdominal somites remains.~~

~~If we turn for an instant to the Thalassinide, a family of burrowing Macroura, we find the hard and shelly epimeral pieces of the body-segments are not properly developed, and the lobes of the tail are in like manner rudimentary ; the integument of the body is extremely thin and soft (approaching that of the hermit-crabs, which like themselves live concealed in various foreign substances living and dead, e.g., shells, sponges, Actinic, é&c.).8 There can be no doubt that both in the case of the true hermit-crabs, and in that of the burrowing Crustacea, the~~

~~1 i ; f Devon Fia. 69.—Callianassa subterranea, Leach, a burrowing Crustacean; coast 0 (other species are found fossil in the Chalk, Greensand, London Clay, &c.).~~

~~non-development of the hard calcareous covering to the abdomen (in Callianassa extending to the whole body except the legs and chelz) is due to the same cause, ViZ., Sn oan~~

~~1 They are found tenanting shells covered by Cellepora edax and by Hydractinia. The hermit-crabs are known to break out the spiral columella of the shell they inhabit to give themselves more room.—~~

~~2 Gosse, Glimpses of Ocean Life ; see also Professor Verrill's article, American Naturalist, vol. iii. . .~~

~~3 We may compare the differences of their tests to that which exists between a lady's white and delicate hand, encased from infancy in a kid glove, and the hand of a primitive savage who uses his digits con- stantly for delving in the ground for roots. In the one the covering~~

1.

disuse of the abdomen and caudal fin for natation, and to their constant habit of living in concealment.

In the case of Birgus latro, when quite young it pro- bably conceals itself in some shell, but as it grows to such a large size and becomes so enormously fat, from feeding upon the cocoa-nut, it must abandon its early disguise and conceal itself within a burrow instead. The writer has received a small hermit-crab very like Birgus, the abdomen of which was concealed in a sponge.

If then the Anomoura be the descendants of certain Crustacea in which an arrested stage of development in the young has become a persistent character in the adult, or in which organs atrophied by disuse have at last come to be suppressed or greatly modified, the conclusion seems obvious that we are dealing not with a distinct sub-order equivalent to the Brachyura or the Macrura, but with a group com- posed of various irregular forms at present placed inter- mediate to, but originally belonging to doth these divisions.

Forms allied to Homola and Dromia—Homolopsis and Dromilites—occur fossil, the former in the Gault and the latter in the London Clay (in fig. 70); no other Anomourous forms have been met with, save some legs and chelz in the Chalk, which have been attributed to a Pagurus.

Remains of Callianassa are very abundant in the Cretaceous and Tertiary rocks of Europe, and have been found fossil even as far off as Japan. It is always the hands which are preserved, the body being usually too delicate for fossilization.

Fig. 70.4—1, Dromilites Lamarckii, Desm.; London Clay, Sheppey. 2, Paleo- corystes Stokesti, Gault; Folkestone. 3, Eryon arctyformis, Schl.; Lithographic stone, Solenhofen. 4, Mecocheirus longimanus, Schl.; Lithographic stone, Solen- hofen. 5, Cypridea tuberculata, Sby.; Weald, Sussex. 6, Loricula pulchella, Sby.; L. Chalk, Sussex.

I. PopoputHatmia: (1.) Decaropa—(c.) Macroura. —tThe common lobster and prawn are excellent examples of the Macroura. In this truly aquatic type the abdomen is no longer rudimentary, as in the crabs, but is developed into a powerful organ for leaping and swimming. The body-segments are of nearly equal growth, and being compressed at the sides, or cylindrical in form, they present a well-marked contrast to the crabs, or Brachyura, in which the segments are expanded laterally. The abdomen is terminated by a broad swimming tail. The Macroura are numerically very abundant in both marine and fresh water.

The lobster prefers a rocky coast, and being somewhat of a gourmand in his tastes is tempted by the fisherman on our shores to such good purpose, that as many as 25,000 live lobsters are often delivered at Billingsgate in aday. If only as many are eaten in the whole of England as in London, this would be at the rate of 50,000 per day, or

membrane is thin and soft, in the other hard and horny. One might even go further and imagine that, by continued disuse, the nails would be no longer developed ; certainly they have in civilized life become less powerful as offensive weapons, and the toe nails on the feet have really in most persons commenced to become atrophied. 4 From Professor Owen's Paleontology, p. 50, a 10. : fen oe

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18,250,000 annually. March to August is the period of greatest catch.!

The river cray-fish, Astacus fluviatilis (fig. 25), also common to the rivers of Europe, is largely caught, and when fresh boiled is not to be despised. It is largely imported into London, and is used by the chefs at the West End to garnish dishes. The writer with a friend caught as many as 900 cray-fish in a single evening from 8 till 12 (with a series of simple scale-like nets baited with liver), along the bank of the Thames and Severn Canal, Gloucestershire. The Murray river cray-fish from Australia (Potamobius serratus) is as large as a fine sea-lobster, and has its segments ornamented with spines, reminding one of the spiny lobster? (Hnoploclytia sussextensis) from the chalk of Sussex and Kent.

More than fifty genera of fossil Macroura have been met with and described; the earliest known is the Anthra- palcemon Grossartii from the Lower Carboniferous series near Glasgow. Similar forms have been obtained from the Coal-measures in England; from Illinois, U.S.; from Bohemia, &c.

I. PopoputTHaLMia: (2.) Stomaropa.—All the members embraced within the three divisions of the preceding order (Decapoda) were cryptobranchiate, in this order they are nudibranchiate, ¢.¢., the gills are composed of plates or simple filaments attached to the feet, whilst the carapace, so largely developed in the order Decapoda, is here both shorter and nar- 7

rower, and the body less com- | Y Vy pact. Taking Squilla (fig. 71) AS Wee

as an example, the segments are SS oe much less coalesced than in the Gm at ANS lobster. Those bearing the (7! ™ a)

eyes and the antennules are readily separable from the front of the head, and are not covered by the carapace, which only con- ceals eight segments, whereas in the lobster it covers fourteen, and in the crab twenty-one. — The gills are borne by the eb- f/} Vig dominal swimming feet, free %)] and uncovered. The first pair of thoracic limbs are developed 44 lim into a pair of large and formid- able claws, the terminal joint of which bears a row of long, sharp, and recurved teeth; these double back upon the edge of the penultimate joint which has a groove to receive them, like a pocket-comb.

In Jfysis, "the opossum shrimp," another member of this order, the two posterior pairs of feet only are branchi- ferous ; all the feet are biramous and flagellate; in the female the hinder feet are modified into broad plates which, uniting beneath the body, form a pouch or marsupiwm in

Fig. 71.—Squilla mantis, Rondel. ; south coast of England and Medi- terranean,

1 Lobsters are sent alive to the London market, packed in damp sea- weed, moss, or heather, from Stornoway in the Island of Lewis, from Ireland, Scotland, the Orkneys, the south coast, and Channel Islands, and from

~~Norway. Fishermen and salesmen are said to know the south coast, Cornish, Scotch, Irish, or Norwegian lobsters at sight, just as cattle salesmen know a " Hereford" or " Devon," a "Scotch" or "Trish" beast. The largest common lobsters weigh from 8 to 12 1b. But the great lobster of the American coast (largely imported in tins into Europe) weighs more than twice as much.~~

~~2 Dixon's Geology of Sussex, tab. 38, figs. 6, 7.~~

~~3 For the numerous species of Palemonidce belonging to this division, we must refer the reader to Bell's British Stalk-eyed Crustacea, to Dana's magnificent volumes and atlas on the Crustacea found during the United States exploring expedition, and to De Haan's Fauna Japonica, and Milne-Edwards's Hist. Nat. des Crustacées,~~

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~~which the eggs are protected and the young pass through their infancy.*~~

~~These opossum-shrimps, which are pelagic in their habits, are frequently met with in countless myriads towards the surface of the Greenland Sea, and, though small, they form the chief part of the food of the common whale (Balena mysticetus).°~~

~~Some forms of Zrichthys are included in this divi- sion; these, like Mysis, are also pelagic, and occur abundantly on the surface of the Indian and Atlantic Oceans, where, together with the larve of Cirripedes and many other oceanic cosmopolites, they may be taken with the towing net in abundance.~~

~~Numerous specimens of true Squilla (Sculda pennata, Miinst) and of a Mysis-like Crustacean have been found fossil in the Solenhofen limestone, of Oolitic age, in Bavaria. With the Stomapoda are also placed a group of very anomalous and larval-looking Crustacea (the Diastylide) originally noticed in 1843 by Mr Harry Goodsir, who obtained them from the Firth of Forth. They closely re- semble Copepoda in aspect, and might readily be confounded with the larval stages of some Decapod. They have, however,~~

been found with their eggs borne by the female in an incubatory pouch beneath the thorax, as in Mysvs.

The branchiz are situated on each side of the thorax im- mediately above the insertion of the legs, and approach in their comb-like appearance to those of the higher Crustacea,

Three genera have been established for these singular forms, namely, Cuma, Alauna, Bodotria (see fig. 36).

II. EpriopaTHAtmia :(3.)Isopopa.—From the stalk-eyed Podophthalmia we pass now to the sessile-eyed Edrioph- thalmia, in which the eyes with one exception are fixed immovably on the surface of the head. As iu the higher forms, the eyes are compound, consisting in the young of some ten or twelve lenses only, but in the adult of as many as sixty to eighty. In nearly all, the body is distinctly divisible into three parts—the head usually very small, the seven thoracic segments well and evenly developed, the ab- dominal somites more or less coalesced. The general con- formity in size and function of the thoracic somites and their seven pairs of legs characterizes the majority of the Isopoda. These legs are nearly uniform, and are fitted either for walking or for swimming, or as powerful hook- like organs to enable them to adhere to the fishes on which they are parasitic. The branchiz in this order are trans- ferred from the thoracic legs to the abdominal appendages, which are converted into special organs of respiration.

One group of Isopods, the Onescide (forming Spence Bate's and Westwood's family /£rospirantia), familiar in our gardens under the names of " woodlouse, " " sow-bug," and " armadillo " (fig. 22), are all air-breathers, incapable of existing in water, but breathing air which, however, it is necessary must be saturated with moisture. Several of the species which inhabit caves are destitute of eyes (¢9., Titanethes albus, Schrodte). The "great sea-slater" (Ligea oceanica) is common on all our coasts, running with agility and feigning death when attacked. The genus Armadillo, found commonly in our gardens and woods, and so called from the perfect way in which the segments roll together, forcibly reminds one of "the great Barr Trilobite " (Ii/anus Barriensis), from the Silurian of Staffordshire (7 in fig.

73)

very interesting little Isopod (presented to the British Museum by Dr Milligan of Tasmania), from Flinders Island, Bass's Straits, and named in MS. by

4 An allied species to Mysis, Thysanopoda (obtained in myriads by Couch on the Cornish coast from the stomachs of mackerel), carries its eggs, as does Cyclops quadricornis, in two bag-like ovaries depending from the posterior thoracic somite (Bell's Brit. Stalk-eyed Crust.)

5 Otho Fabricius, Fauna Groenlandica, p. 245.

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Mr Adam White Ceratocephalus Grayanus, offers many points of: analogy with the extinct Trilobites. The fragile mode of articulation of its walking legs, and their entire

Fia. 72.—Ceratocephalus Grayanus ; Flinders island, Bass's Straits. A, the dorsal aspeet. B, front view of the head showing the curvature of the three

spines. C, side view. D, ventral aspeet: g, the glabellal spine; 7,7, the two lateral

or genal spines of the head; e, the eye; a/ the antennule; a", the antennre thelegs

are seen folded up beneath the body. E, the mouth enlarged, showing ep, the

epistoma or upper lip plate, m', the mandibles, m", the pectinated maxilla, a;

the antenna; the epistoma is set in the base of the glabellal spine g. concealment beneath the body-segments, are very suggestive. This Isopod is

~~near to the Spheromide, but will form a dis- tinct family, as the antenne are inserted beneath and within the margin of the head-shield ; apparently it does not roll itself into a ball.~~

~~The Spheromide are very littoral in their habits; they~~

~~range from the equatorial latitudes to the colder temperate.~~

~~zones, but are not found in Polar regions. They are veget- able feeders, and some (like Zimnoria) are guilty of destroy- ing timber. When molested or alarmed they roll themselves up into a ball. The Spheromide present many points of analogy, if not of affinity, with the extinct Trilobites.~~

~~In this order we find the Limnoria terebrans (or the " gribble," as it is called by the fishermen). It is one of the most destructive creatures, attacking all woodwork below tidemarks ; the only wood which it cannot destroy is teak. Although its ravages had gone on for ages, it was only made known to the scientific world and described by Dr Leach in 1811.~~

~~In the aberrant genus Zanais (fig. 38) the first pair of thoracic legs are converted into chelz, and the head-shield is covered by a carapace, abundantly traversed by currents of blood, beneath which a stream of water passes, main- tained as in the zoée and adult Decapoda by a flabelliform appendage of the second pair of maxillz, which is wanting in all other Edriophthalmia. The abdominal feet, which in other Isopoda act as respiratory organs, are simple natatory feet in Zunais. These characters, together with the pedunculated eyes and the great chelate hands, give to Tanais a very decapod-like aspect (see fig. 38).~~

~~The Jdoteide contain representatives of some of the largest known Isopoda, some of which are above 4 inches in length. '~~

~~The Agide! and Cymothoide have all the feet furnished with a robust finger, sharp at the tip, for seizing and holding on to fishes upon which they are parasitic. Another family, the Bopyride (fig. 39) are parasitic chiefly on members of their own class, frequently occupying the branchial chamber of the common prawn, and distorting the carapace~~

1 Qne species, Hurydice pulchra, common in the Dee, Cheshire, actually attacks bathers. " If you remain a moment still in the water dozens will fasten on you and nip most unpleasantly. I have had to jump into the water again after coming out from bathing, and splash violently to get rid of the hosts that had stuck to me while clinging to the side of the boat preparatory to getting in. They con- tinue to bite after you are out of the water."—Extract of letter from Mr Walker to Mr C. Spence Bate.

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on one side. A fossil Bopyrus is observed lying in the branchial cavity of a crab (Paleocorystes) from the Gault and Greensand.? We have already referred to these and other parasitic forms in the earlier part of this article. Isopoda are met with as far back as the Old Red Sand- stone, where remains of a gigantic species allied to Arcturus have been discovered; others occur in the Carboniferous and Oolitic periods. The Purbeck beds of Swanage, Dorset, also yield abundance of a freshwater form, the Archwoniscus Brodiet ; species of Oniscus and Spheroma are found fossil in the Cretaceous, the Eocene, and the Miocene of Europe. IJ. EpriopHtHaLmiA : (4.) TRiLoprra.—So long ago as 1821 Audouin placed the Trilobites with the Isopoda, whilst Macleay assigned them a distinct order between the Isopoda and the Phyllopoda. Later researches by Milne-Edwards

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Fic. 73—1, Leperditia Baltica, Wahl.; U. Silurian, Gothland. 2, Entomoconchus Scoulerit, M.C.; Carbonifs. L. Ireland. 3, Beyrichia complicata, Salter; Lr. Silurian, Wales. 4, Dithyrocaris Scouleri, M'Coy; Carbonifs. L. Ireland. 5,Ptery- gotus anglicus, Ag.; Old Red, Forfarshire. 6, Prestwichia rotundata, MV. Woodw.; Carbonifs., Coalbrookdale. 7, Zllenus Davisii, Salter; L. Silurian, Bala. 8, Phacops caudatus, Brunn.; U. Silurian, Dudley. 9, Calymene Biumenbachit, Br.; U. Silurian, Dudley. 10, Trinucleus ornaius, Sternb.; L. Silurian, Britain. 11, Agnositus trinodus, Salter; Lr. Silurian, Britain.

and others have caused the Trilobita to be referred to the

Entomostraca, on account of the very variable number of

body-rings observed in the several genera (from six to

twenty-six) evidencing a much lower type of structure than the Isopoda, in which the thorax is composed of seven free and movable segments with a head-shield and anchylosed caudal somites. Moreover, until the discovery of pre- sumed ambulatory appendages in an Asaphus from the

Trenton Limestone in 1870, the only appendage previously

observed was the hypostome or lip-plate. There seems,

however, no good reason to urge against the conclusion that the Trilobita were an earlier and more generalized type of Crustacea, from which the later and more specialized

Isopoda have arisen,—a view which the writer is glad to say

he shares with the distinguished carcinologists, Professor

Dana in America, and Mr ©. Spence Bate in England,*

although at present more evidence is needed as to the

nature of the locomotory appendages in this extinct group.

If we range the characters of Trilobita and Isopoda side by

2 Mr James Carter, F.G.S., lately showed the writer a Paleocorystes from the Cambridge Greensand, having a Bopyrus lodged in each of its branchial chambers.

3 Billings, Quart. Journ. Geol. Soc., vol. xxvi. p. 479.

*4 Professor Dana writes, '*The Trilobita probably belong with this second type" (the Edriophthalmia, or Tetradecapoda, as Dana names them) "rather than with the Entomostraca. Yet they show an aberrant character in two important points. First, the segments of the body are multiplied much*

beyond the normal numter, as in the Phyllopoda among the Entomostraca ; and Agassiz has remarked upon this as evidence of that larval analogy which characterizes in many cases the earlier forms of animal life. In the second place, the size of the body far transcends the ordinary Isopodan limit. This might be considered a mark of superiority ; but it is more probably the reverse. It is an enlargement beyond the normal and most effective size, due to the same principle of vegetative growth which accords with the (occasional) inordinate multiplication of the segments in the body" (American Journ. Science, July, 1856, vol. xxii. p. 11).

great work) the gradual development of the Trilobite from-

side, we shall find there are sufficiently good grounds for the earliest form on quitting the egg to the adult. We

placing them in the Edriophtha] mia together *

Trilobita (Fossil, extinct). [sopoda (Fossil and living). give seven of] the earliest stages of Z'rinucleus ornatus and 1. Eyes sessile, compound. 1. Eyes sessile, compound. seven of Sao hirsuta, copied from M. Barrande's monograph, | 2. No ocelli visible. 2. No ocelli. visible. 3, (Appendages partly oral, partly! 3, Appendages partly oral, part- ambulatory, arranged in ly ambulatory, arranged in pairs). pairs. 4, Thoracic segments variable in) 4. Thoracic segments wsually number, from 6 even to 26, seven, free and movable, ani- free and movable, animal mal sometimes rolling in a sometimes rolling in a ball. ball. = 5. Abdominal somites coalesced,| 5. Abdominal somites coalesced, (at forming a broad caudal shield forming a broad caudal / (bearing the branchie be- shield, bearing the bran- ——— > aa " neath ?). chie beneath. ess — basal 6. Lip-plate, well-developed. 6. Lip-plate, small. e= = — 4 . = ————s Perhaps no investigator of fossil forms has devoted so eS ——— much careful research to any group as M. Barrande has ex- Cesy = S ——

~~pended upon the extinct Trilobita. Writing recently upon the divisions of their body he arranges them in four groups, according to the number of their free movable thoracic segments. ;~~

~~The Ist, of 2 genera, has from 1 to 4 free thoracic segments.~~

~~it i)~~

~~Fic. 75.—Sao hirsuta, Barrande (copied from pl. 7 of Barrande's work above cited). Barrande figures twenty stages of this trilobite, of which seven are: reproduced here.~~

~~1. First stage. A young individual in which the limit of the head-shield is not~~

~~Qnd ., 24 5 to 9 indicated as separating it from the pygidium.~~

~~" d " " 10 to 13 of 2, Second stage. Young individual with the head-shield separated, and having » od ,, 32 "? 0 " indications of three soldered segments to the pygidium.~~

~~»» Ath ,,) 16 « 14 to 26 96 3, Third stage, in which the genal angles of the head and the spiny border of~~

~~the pygidium are well seen, 'and four or five soldered segments indicated.~~

~~4. Fourth stage, in which two free thoracic segments are developed pehind the head, and two or three soldered segments represent the pygidium.~~

~~5. Fifth stage, in which the thoiax is longer than the head, and is composed of three movable segments and three soldered segments in the pygidium.~~

~~6. Sixth stage, in which four free segments succeed the head, and three or four soldered segments form the pygidium.~~

~~7.Tenth stage, in which eight free segments sueceed the head, and three soldered segments form the pygidium.~~

~~In the tweutieth stage figured by Barrande the adult has seventeen free thoracico-abdominal segments and two soldered ones (the pygidium).~~

~~*We thus perceive that the number of those forms of Trilobites which have a great excess of free seyments is not large when we consider the group as a whole.*~~

~~*In the higher and more specialized forms of Isopoda of the present day, we do not find the number of segments*~~

~~*One most striking feature in the Trilobita is the remark- able development of their compound eyes (fig. 11), a subject ably discussed and illustrated long ago by Dr Buckland in his Bridgewater Treatise (1836).*~~

~~*Perhaps the eye of the Trilobite may be best compared with that of Limulus, but there are forms like Zglona in which the eyes are enormously developed, occupying nearly the entire head-shield with their facetted surfaces.*~~

~~*We have an analogous development of the organs of vision amongst some of the pelagic Amphipoda, the Hyperiide, and in a very singular form brought home by the "Challenger," the Z'haumops pellucida (Phil. Trans. 1873). The "facial suture" in the head-shield of the Trilo- bita, which separates the lateral genal portion from the glabella, was for a long time considered as peculiar to Trilobites and Limuli, but C. Spence Bate has ably shown that it homologizes with the suture which traverses the inferior surface in the carapace of the Brachyurous Decapod and the cervical suture in the Macrouran type (Reports Brit. Assoc., Bristol, 1875, p. 46.)*~~

~~*The Trilobita are the chief representatives of the Crust- acean class in Cambrian times.*? More than 500 species have been described; out of these 350, representing 42 genera, have been recorded from the Lower Palzozoic rocks of Bohemia alone by Barrande.*~~

~~*About 51 genera and 304 species are British in Cambrian? and Silurian rocks; ten are Devonian, and four Carboniferous. A gigantic Paradoaides, nearly two feet in length, occurs in the Middle Cambrian, and large forms of Asaphus, Homalonotus, Lichas, &c., are met in the Bala group. Phacops, Spherexochus, Encrinurus, Calymene, Illenus, and Acidaspis are among the Upper Silurian forms,—some, like Acidaspis, being extravagantly orna- mented with spines and tubercles. The Devonian has*~~

Fig. 74.—Trinucleus ornatus, Sternb. sp. (copied from Barrande's Systeme Silurten du Centre de la Bohéme, Prague, 1852, 4te, plate 30). Specimens ar- ranged in series according to their supposed age. (All the stages figured by Barrande are not given here.)

J, Young individual, destitute of thoracte segments, composed of head-shield and pygidium only.

9. Anotherof the same stage, in which the genal or cheek spines are developed.

3. Individual with one thoracie segment developed, but without the genal spines.

4. Another of the same stage, with the genal spines.

5. Individual with two thoracic segments, and with the genal spines present.

, Individual with three thoracic segments, and possessing the genal spines.

7. Individual with five thoracic segments, but without genal spines.

absolutely adhered to without any variations ; on the con- trary, we constantly meet with individuals in which more or fewer segments are welded together, so as to conceal the normal number of seven thoracic somites between the head and the abdomen. Such being the case, we cannot be surprised to find considerable variation in a group like the Trilobita, which, if they really are the remote ancestors of the recent Isopoda, must, according to the views suggested above, be the prototypes of the larve rather than of the adult stage of the living Isopoda.?

In his researches among the Trilobites of Bohemia M. Barrande has discovered forms which, there is every reason to believe, exhibit (as he has so admirably shown in his

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1H. Woodward, Report on Structure and Classification of Fossil Crustacea, Brit. Assoc. Edinburgh, 1871.

~~2 The larve of Bopyrus, Cryptothiria, and Asellus, and the adult Aigide, Idoteide, Spheromide, and Oniscide offer many points of analogy with the extinct Trilobita (see the History of the British Sessile-eyed Crustacea by C. Spence Bate, F.B.S,, and J. 0. Westwood M.A., in 2 vols, 1863-68, 8vo.)~~

~~8 Agnostus, the earliest genus met with, reminds one of the larval forms of Sao and Trinucleus.~~

~~4 The large accession in late years to the fauna of these Cambrian rocks has resulted from the labours of Mr Henry Hicks, F.G.5.~~

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~~fewer and less varied forms of Trilobites. Those in the Carboniferous belong nearly all to two genera (Phillipsia and Griffithides), both small, neat, and simple forms. None are met with in rocks of later date.~~

~~II. EpriopHTHatmia : (5.) AMPHIPODA.—This order, as Spence Bate has well observed, constitutes a group among the Edriophthalmia, parallel with the Macroura among the Podophthalmia, whilst the Isopoda may represent the broad and flattened Brachyura, the Capredle offering a kind of parallelism with Squwilla and its allies. As in the Isopoda, the head is small and carries only the organs of sense and nutrition ; the sessile eyes! are generally small, yet in a few instances they are extremely large (e.g., Lestri-gonus and Thaumops), covering the entire sides of the head.~~

~~The seventhoracic segments, constituting the middle-body, are well developed and nearly equal in size; all the seg- ments are compressed laterally as in the Palemonide.~~

~~The two anterior pairs of the seven thoracic legs (see Th. 8, 9 in fig. 1), which are jaw-feet in the Podoph- thalmia, are here developed into arm-like legs, having an enlarged penultimate joint or hand, against which the seventh and terminal joint doubles back, like a finger against the palm, and so forms a prehensile organ similar in form to the claws in the Crangonide. The best-formed claws are seen in Orchestia Darwinit (fig. 45), and in Melita exilit (fig. 76).~~

Fic. 76.—Melita exilit, n. sp., male, enlarged five times. The large branchial lamellz are seen projecting between the legs. (Fritz Miiller.)

The ova are nourished within a pouch formed by a series of foliaceous plates attached to the four anterior pairs of legs; except in the Hypertide, which are parasitic on Medusz, as already mentioned. The males in the Amphipoda closely resemble the females (save in those forms in which the hands are enlarged in the male), but contrary to the general rule the females are much smaller than the males.

This division, like the preceding one, has its ter- restrial representatives, Zalitrus and Orchestia, the "sand- hoppers," living out of the sea, but choosing moist places. Orchestia with us loves to live within reach of the sea spray, but some species in the southern hemisphere (0. tahitrensis, telluris, and sylvicola) live many miles inland, some under plants at an elevation of more than a thousand

1 The outer integument of the eyes is never divided into facets, except in the Hyperiide. In many of the Phomwides the eyes appear to be wanting ; but this is probably caused by the absence of any colouring pigment. In Niphargus the eyes are obsolete or rudimentary. In Ampelisca they appear like four simple organs resembling the ocelli of true insects (Spence Bate and Westwood, Brit. Sess. Crust. vol. i.

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? It is in the summer months that they eccur in such vast myriads upon our sandy shores. At Whitsand Bay Mr Twain saw "not millions, but cartloads," of one species (Talitrus locusta) lying piled together along the margin of the sea. They devour offal of every description, including dead carcasses of animals, which they rapidly assimilate and remove. In their turn they afford a repast to the ring- plover, the common wood-pigeon, and numerous shore-birds which rapidly devour them, as well as some coleopterous insects (the Cidlenum laterale and Broscus cephalotes (Bate and Westwood).

feet above the sea. But by far the largest section aro natatorial in their habits, being most active and untiring swim- mers. One form, Gammarus pulex (fig. 77), is most com- mon in our freshwaters, two other genera, both dlind, Niphargus, with three species, and Crangonyx, with one : species, are found in wells in England,' and from their struc- ture there is every reason to conclude they are as truly indigenous to these underground water-courses in the Chalk, Oolite, or Carboniferous Limestone, as are the numerous species of blind Crustacea met with in the waters flowing through the Mammoth Cave, Kentucky.

A curious subdivision of Amphipods is formed by the Podocerides (Amphithoé and Podocerus), all the species of which invariably construct nests in which they take shel- ter and nourish their young. These abodes are built of wood or stones, mud, clay, &c., united together by a cement

xcreted by the animals themselves. Some closely resemble niiniature birds'-nests, others are in the form of tubes.

This division includes another most destructive wood- borer, the Chelura terebrans, so devastating to piles and submarine timber all round the shores of Europe, but not record- ed from other lands. Finally, we come to the minute aberrant forms of Dulichiidee and Ca- prellide (fig. 78), in which the body is reduced to a slender elongated cylindrical Fig. 78.—Caprella tuberculata, Guerin; south form, the thorax hav: coast. (Spence Bate.) ing only about six somites (one being absent and two soldered together), and the abdomen being quite rudi- mentary. They have long antennz and feet, all fitted for climbing and holding on by. Their singular appearance has caused them to be called " spectre shrimps."

With these aberrant forms are associated the Cyamide (fig. 79), a family which affix themselves by their strong recurved legs to the rough portions of the Cetacea upon which they feed. The feet are all prehensile; the third and fourth somites bear the branched or simple branchiz. The abdomen, as in the Ca- prellide, is rudimentary ; the % eggs and young are sheltered pj, 794 3 by four broad lamellar plates, developed from the append- ages on the under side of the body of the female. Spence Bate and Westwood have figured five species. They approach in many respects to the Pycnogonidx, which also live parasitic on Cetacea (see ARACHNIDA, vol. ii. p. 276-77),

but we must not attempt to discuss their affinities here. A fragment of a presumed Amphipodous Crustacean has been described by the writer from the Upper Silurian (the Mecregammarus Salweyi) another, the Gampsonyx jimbriatus, occurs in the Coal- measures of Germany, Bohemia, and America. Mr Spence Bate has described one from the Permian of Durham, the Prosoponiscus problematicus, its modern living representa- tive, the Sulcator, making peculiar tracks upon our shores to- day like those met with upon the surfaces of slabs of

Fic. 77.—Gammarus, sp., fresh water

1 Das

Cyamus Gosse found attached to Hyperoodon bidens, Portland Roads. 2, 9 Cyamus ovalis, Vauzeme; found attached to

Thompsont,

common whale. (Spence Bate.)

3 Spence Bate and Westwood (Sessile-eyed Crustacea,

vol. iii. p. 311-528). R

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Paleozoic rocks. Several other Amphipod-like forms occur in the lithographic stone of Bavaria. The world-wide distribution of the Amphipoda accords well with their range in time, which was as great or even greater than the Isopoda.

Sub-class 2, GNATHOPODA (or Lntomostraca).

Ill. Merostomata: (6.) XrpHosuRA.—The king-crab (Limulus) is a remarkable type of crustacean closely related to the extinct Eurypterida. Found living in the seas of China and Japan and on the north-east coast of North America, it exemplifies a peculiar and most ancient order, the affinities of which are not at first readily recognized because its nearest allies have passed away. The head-shield is enormously expanded so as to

shelter all the anterior appendages beneath it; and the succeeding segments are so soldered together as to appear like one piece, although all the hind-segments are free and movable in the larva. The eyes are fixed on the head-shield ; the antennules are chelate, and placed in front of the mouth. The antenne, mandibles, maxillz, maxillipeds, are all con- verted into walking legs, forming also chelate appendages and, at their bases, jaws; thus serving admirably to illus- trate the most prominent characteristic of the sub-class GNaTHopoDA, ' mouth-footed."

The thoracic feet are flattened out into broad bilobed plates which cover the branchi and the egg-pouches, The abdomen is rudimentary, being partly represented by the

Fie. $0.—1, Limulus polyphemus, adult (dorsal aspect). 2, Limulus polyphemus, young (dorsal aspect). 8, Prestwichia rotunaata, Coal M., Shropshire. 4, Prest- wichia Birlwelli, Coal M., Lancashire. 5, Neolimulus falcatus, U. Silurian, Lanark. 6, Hemiaspis limuloides, L. Ludlow, Leintwardine, Shropshire. 7, Pseudoniscus aculeaius, U. Silurian, Russia.

posterior portion of the hinder shield, and partly by the

long ensiform tail-spine (1) (See Owen's Memoir, Z'rans.

Linn. Soc., vol. xxxviii., 1873.) But in the larvee, as has

been already shown, these post-cephalic somites are free

and unanchylosed, and the tail-spine is undeveloped, thus

connecting the modern king-crab with its far-off ancestors in the Coal and Silurian periods, The oldest species known is the Veolimulus faleatus, H. Woodw. (5 in fig. 80), from the Upper Silurian of Lanarkshire, in which the segments are apparentiy all free and unanchylosed

In the Coal-measures no fewer than three genera and eight species of small Limuloid Crustaceans have been met with, viz. Bellinurus (four species), Prestwichia (three species), and Huproops (one species),—the last named an American form. Many of these closely resemble young larval Limuli. The

~~Oolitic Zimuli found in the lithographic stone of Solenhofen agree closely with existing species, one form even equalling in size the living Limulus polyphemms from the American coast (1 in fig. 80 ; see also fig. 12).~~

~~Ill. Merosromata: (7.) Eurypreripa.—In this order we become acquainted with the second extinct type of the Crustacean class, and by far the most interesting, be- cause all the append- ages as well as the body- rings have been preserv- ed to us, whereas in the Trilobita the former are remarkable by their almost entire absence.~~

~~Unlike Limulus, in which all the segments in the adult are soldered together into a fore and hind body and telson, in the Eurypterida the body is long and well adapted for swimming, the segments being quite distinct and well developed ; the feet are also fitted for natation (see 5 in fig. 73, and Fro. 81. —Underside of Pterygotus Anglicus,~~

~~Ag. (restored), c, Cephalon; m, Metastoma fig. 81). or post-oral plate. 1, The compound eyes;~~

~~) 2, Chelate antenne; 3, The mandibles; 4, We again observe the 4,0) maxilla; 5, Second maxille; 6, Maxil-~~

~~reiteration of the same lipeds; 7,The operculum or thoracic plate, well-marked charactoris- 1 ft cosely agains the rental see tics in the legion Meros- 8-14, Thoracic somites; 15-19, Abdominal tomata—already noticed "08s 7 Telson.~~

~~in the Edriophthalmia and Podophthalmia ; namely, the division into Brachyuran and Macrouran forms which exemplify the crawling and swimming types, by the soldering together of the body-segments in the one and the retention of free movement in the somites in the other. The characters of these two orders of the Merostomata are~~

~~summarized in the subjoined table.? Limulus (Fossil and living). Pterygotus (Fossil, extinct).~~

~~1. Eyes sessile, compound. 1. Eyes sessile, compound.~~

~~2. Ocelli distinctly seen. 2. Ocelli distinctly seen.~~

~~3. All the limbs serving as | 3. All the limbs serving as mouth-organs. mouth-organs.~~

~~4, Metastoma rudimentary. 4, Metastoma large.~~

~~5. All the thoracic segments | 5. Anterior thoracic segments~~

~~bearing branchie or repro- bearing branchiz or repro- ductive organs. ductive organs.~~

~~6. Other segments destitute of | 6. Other segments destitute of any appendages. any appendages.~~

~~7. Thoracic segments anchy- | 7. Thoracic segments unanchy-~~

~~losed. losed. 8. Abdominal segments anchy- | 8. Abdominal segments free and losed and rudimentary. well developed.~~

~~Numerous species of these ancient extinct long-bodied Merostomata have been met with and described by Hall in~~

~~reer a 1 Taken from H. Woodward's Report on the structure and classifica- tion of the fossil Crustacea (Brit. Assoc. Reports, Edinburgh, 1871).~~

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~~America, by Fischer in Russia and Sweden, and by Huxley, Salter, and Woodward in Britain (see H. Woodward's monograph in Pal. Soc., 4 parts, 1865-1872).~~

~~The most perfect specimens of the genera Slimonia, Pte- rygotus, and Lurypterus have been obtained by Dr J. Sli- mon of Lesmahagow, Lanark. The largest known remains, representing specimens from 5 to 6 feet in length, are from the Devonian of Forfarshire, belonging to the great Pterygotus anglicus and to Stylonurus scoticus obtained by Mr James Powrie, F.G.S., Reswallie, Forfar.~~

~~In the Upper Silurian we have one English genus, Hemaaspis (6 in fig. 80), and three Russian forms, Exapinu- rus, Pseudoniscus (7 in fig. 80), and Bunodes, which, like the Anomoura, serve to bridge over the interval between the Lamuli and Pterygoti, the hind-body being partially deve- loped. The best illustration of the Eurypterida is to be found in the zoéa of the common shore-crab, Carcinus menas (figs. 26 and 27), in which the principal locomotory organs are the maxillipeds, and the abdominal somites are destitute of all appendages. The latest representative of this extinct order has been found in the Lower Carboni- ferous series of West Lothian, the Lurypterus Scoulert, which however differs greatly from all the other forms.~~

~~IV. Brancuiopopa : (8.) PHynuopopa.—This order in- cludes not only the bivalved Estheria and Nebalia, and the shield-bearing Apus, but two forms of naked gill-footed Crus- tacea, Branchipus and Artemia (5 in fig. 57). Of the shield- bearing forms the fresh-water Apus may serve as a good example. The eyes are placed in front on the dorsal surface of the carapace and are nearly confluent. The first pair of feet (maxillipeds) are long and branching; to these succeed about sixty pairs of branchial feet. The thoracic and ab- dominal somites are nearly cylindrical and are composed of about thirty articulations, terminated by two long, many- jointed tail-spines.~~

~~Probably Apus has more articulations to its appendages and body than any other Crustacean. Schaffer tabulated them, and found they numbered 1,802,604; Latreille puts them down at not-less than 2,000,000. Apus affords an excellent illustration of a form in which the mere vegetative repetition of parts is carried to an extreme distance beyond the normal number of body-rings so characteristic of the class,~~

~~In Nebalia, the marine type (1 in fig. 57), the carapace or head-shield has a well-marked rostrum, and is more compressed laterally than in Apus, covering the head and thorax and even a part of the abdomen. The eyes in Nebalia are placed on peduncles beneath the carapace; the number of segments is not excessive as in Apus.~~

~~In Estheria (fig. 56), the carapace is composed of two valves, subovate in outline, like a bivalve molluscan shell, which it also resembles in being~~

~~*united by the umbones of each valve on the anterior dorsal border, and in each valve being marked by regular concentric lines of growth.*~~

~~*Branchipus (5 in fig, 57) and Artemia are destitute of any carapace, so that the elegant wave-like motion of their many-jointed transparent bodies and branchial feet can be freely observed, The former inhabits our fresh waters, the latter is marine, being peculiarly prolific in the brine-pans at Lymington, where the workmen firmly believe that the "brine-shrimp " aids in some way the rapid deposit of salt, through the constant agitation caused by such myriads of these minute and restless Entomostraca in the water.*~~

~~*Chirocephalus or Branchipus is believed to be only a variety of Artemia, resulting from change of conditions be- tween a fresh and an extremely saline fluid medium.)*~~

~~*.1 See M. W. J. Schmankewitsch's paper on the transformations of ae and Branchipus, Ann. and Mag. Nat. Hist. vol. xvii. March*~~

~~*876,*~~

~~*663*~~

~~*In Professor T. Rupert Jones's monograph on fossil Listherice, out of thirty-eight localities recorded for that genus living, three only were met with in brackish water.*~~

~~*Mr John Arthur Phillips, F.G.S., states that the Artemia fertilis is exceedingly abundant in the highly-saline waters ? of Mono and Owen's Lakes, California. These little Crustacea congregate in such dense serpentine or annular masses in the water that a breeze sufficient to ruffle the surface of the lake scarcely affects the water filled by the Artemia, which remains perfectly smooth. 'The only other inhabitant of these salt-lakes is the larva of a dipterous insect, the Hphydra californica, Torrey, which is collected by the Indians, and, when dried in the sun, forms an important article of food. Myriads of gulls and other aquatic birds visit these lakes in summer to feed upon the Artemice and larval Ephydre.*~~

~~“Webalia, at the present day, seems but the puny and degenerate representative of the once giant pod-shrimps of Silurian times, the caudal somites of one of which measured 8 inches and the tail spines 6 to 7 inches in length, the carapace not being preserved.? The ancestors of Webalia date back to the Menevian group, Hymenocaris major being the earliest known. Ceratiocaris papilio is so abundant in the Upper Silurian of Lesmahagow, Lanark, as to cover entire beds with its remains.~~

~~‘Many fossil forms, as Dithyrocaris, Discinocaris, Apty-~~

~~chopsis, and Peltocaris, carried their head-shield flat and~~

~~expanded like Apws at the present day ; one of these, a Discinocaris from Moffat, Dumfriesshire, had a carapace 7 inches in diameter. These formis occur in all the Paleo- zoic rocks, stherie@ are found in the various strata from the Carboniferous Limestone to the Tertiary. Although Branchipus or Chirocephalus is destitute of any head-shield, its fossil remains have just been transmitted to the writer together with numerous Dipterous and Coleopterous~~

~~. insects from a freshwater deposit, associated with plant remains, at Gurnet Bay, in the Isle of Wight,~~

~~IV. Brancutoropa: (9.) CLapocera.—In the Cladocera are placed a number of minute animals furnished with branching natatory antennz and five or six pairs of short foli- aceous feet ; the body (except the head which is distinct and projecting) is entirely inclosed within a carapace, formed of two valves joined together on the back ; the eye is single and very large. The Cladocera are chiefly freshwater, and are distributed over the whole world. Of this order the Daphnia pulex (1 in fig. 58),so abundant in our fresh waters, is a good example. So numerous are they in our ponds in summer as frequently to impart a blood-red hue to the water for many yards in extent. In order to realize. the wonderful fecundity of this and allied genera,‘ it is necessary to realize that when a Daphnia is only ten days old, eggs commence to be formed within the carapace, and under favourable conditions of light and temperature, it may have three broods a month or even a greater number,—the larger species having as many as forty or fifty eggs at once. No males appear until the autumn, so that all the earlier~~

broods are derived from females, whose parent was fertilized, and died after depositing its eggs, the year before, and these continue to reproduce fertile female offspring throughout the summer.

2 In 1866 Mr Phillips found that the weters of Owen's Lake had a specific gravity of 1076, and contained 7128°24 grains of solid matter per gallon, This solid matter held in solution consisted of chloride, sulphate, and carbonate of sodium, 6813°28 ; sulphate, phosphate, and silicate of potassium, 298°02; and organic matter, 16°94 grains per imperial gallon.

3 See Geol. Mag. 1866, vol. iii. pl. 10. fig. 8, p. 203 ; and Geol. Afag. 1871, vol. viii. pl. 3. fig. 3, p. 104.

4 See Memoir by Professor Leydig, Naturgeschichte der Daphniden, 4to. Tiibingen, 1860; Sir John Lubbock in Phil. Trans. 1&57; Baird's British Entomostraca (Ray cieSoty),

F, Goldenberg has lately described a fossil form belong- ing to this division (Lyneites ornatus) from the Coal- measures of Saarbruck.!

V. Lopuyropopa: (10.) Ostracopa.—In the Ostracoda, of which Cypris, Candona (2 in fig. 58), and Cythere are examples, the body is entirely enclosed in a carapace com- posed of two nearly equal parts like a bivalve shell. Two pairs of antenne, one pair long, with hairy filaments, one pair short, stout, and recurved (like feet), and three pairs of short feet, may be seen protruded from the carapace, which is compact and brittle, yet is capable of protecting the living animal during long periods of drought, buried in the dried-up mud of pools. Cypris frequents stagnant water, living on dead animal matter. Cythere is found in pools along the sea-shore.

Like the Phyllopoda, the Ostracoda are of immense geological antiquity, Primitia prima occurring in the Lower Cambrian of St David's. There is abundant evidence, in almost every stratum, of the former existence of these little bivalved Crustacea, often in vast numbers ; their size in early times was much larger, Leperditie as big as large horse-beans being found in Silurian strata, but the living forms are all microscopic. M. Ch. Brongniart

~~*has just described a fossil Ostracod, Palaocypris HIdwardst, inclosed in silex from tho coal of St Etienne, in which all the organs are most perfectly preserved." It closely resembles the modern form. 'The Ostracoda help with other micro- scopic organisms to build up the Chalk. They make up the great mass of the Cypris shales of the Wealden, Isle cf Wight, and many Tertiary beds aro largely composed of*~~

~~*their remains.*~~

~~*V. Lopayropopa: (11.) Coprrpopa—(a.) Lipzrata.— Tho free Copepods, of which Cyclops, Canthocamptus, and Cetochilus may serve as examples, have the head and thorax closely enveloped in ® carapace with which the front rings of the thorax aro confluent. Tho abdominal somites are much diminished in size and cylindrical. The single or paired external ovisacs are attached to two of the posterior somites, which are usually welded together. The single sessile median eye is situated near the front of the head ; in the males of Diaptomus and Anomalocera the eye is pedunculated. Tho antennz are very long and powerful natatory organs (in Cetochilus, 4 in fig. 58, and Diaptomus equalling the entire length of the animal's body) ; in the males one or both of the antenne have a swelling near the centre or towards the extremity, followed by a movable joint which acts like a hinge and serves asa clasper to detain tho female. 'here are five pairs of rowing feet, one pir of which are usually rudimentary.*~~

~~*The species belonging to this family are to be found in both fresh water and the sea. In the muddiest and most stagnant pools and in the clearest springs Cyclops abound (3a in fig. 58). Tho marine species frequent the pools along shore and the open ocean in equal abundance. They assist in producing that luminous appearance in the sea called " phosphorescence ," for want of a better name (5 in fig. 58).*~~

~~*The fecundity of this order is truly surprising. Cyclops guadricornis is often found with thirty or forty eggs on each side; and though those species which have but a single ovisac do not carry so many, their number is still very considerable. Jurine isolated female specimens of Cyclops, and found them to lay eight to ten times within three months,—each time about forty eggs. At the end of a year one female would have produced 4,442,189,120 young!*~~

Cetochilus (4 in fig. 58) is so abundant, both in the Northern Seas and in the South Atlantic, as to serve for food to such an immense animal as the whale. They colour

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1 Giebel und Siewert's Zeitschrift, 1870, vol. i. p. 524. 2 Ann. des Soc. Geol. France, t. vii. pt. vi.

jaws

CcCRUS TACE®S

the sea for many miles in extent, and when the experienced whaler sees this ruddy hue upon the ocean he knows he has arrived at the " pasture of the whales." They are to be seen in vast quantities off the Isle of May in the Firth of Forth during the summer months ; many Cetacea are attracted thither, and vast shoals of fish also come to feed upon them. One anomalous type of free Copepods is the Wotodelphys acidicola, described by Allman, which is found swimming freely in the branchial sac of the Ascidia communis. In this species the female has the fourth anterior segment of the body peculiarly modified, so as to form on its dorsal surface a marsupium for receiving and retaining the ova until they are hatched, when they escape by an opening between the sac and the upper surface of the body-ring.

We have no positive records of Copepoda occurring in a fossil state.

V. Lopuyropopa: (11.) Copzrpopa—(d.) ParasiTa.— The parasitic Copepods are divisible into two groups, the first comprising the peripatetic genera, in which the male and female both retain their organs of locomotion in the adult state, and can change their habitat whenever needful ; this division would include the fresh-water

Almost every fish has some form of these Copepod parasites, either on its skin, it· eyes, or its gills.

Argulus foliaceus is of a rounded oval shape, the carapace inclosing the thoracic somites in a deep notch behind, and the body terminating with a

bilobed telson. The antenn are formed into recurved hooks for holding on by, when the animal shifts its position. The second pair of foot- are converted into powerful suckers by which it attaches itself to its host. The mouth is tubular, and has a sharp styliform organ within it, affording good evidence of its suctorial habits. There are four pairs of biramose natatory feet. The animal, when detached, swims with extreme rapidity and elegance, and no fish, however rapid, can escape from its adherence.

The female is much larger than the male. She leaves the fish on which she is parasitic when desirous to deposit her eggs, which she fixes to a stone or other inorganic body at the bottom of the water. As many as 400 are deposited at one time by a single female. Argulus catostomé is said to lay 1500 eggs at once. The young are hatched in thirty-five days, and after about three moults as free Copepod larve they put on the adult form.

Tt would be impossible to give a detailed account of all tho varied forms of Copepoda in an article like the present ; we therefore must refer the reader to the works of Baird, Claus,? and others for fuller information.

VI. ANcHORACEPHIALA : (12.) Ruizocrpaata.—These have been referred to under Metamorphosis, so that we need not allude to them further here, save only to give illustrations of two genera, Peltogaster (fig. 82) and Sacculina (fig. 83).

VI. AncHoracEPHIALA: (13.) CrrripEpIA.—Forty years

3See Dr C. Claus, Die Frei Lebenden Copepoden mit Besonderer

Berücksichtigung der Fauna Deutschlands der Nordsee und des Mittlemeeres, 87 plates, Leipsic, 1863, 4to. ad ic

ago the Cirripedia were still arranged as Mollusca in many public museums ; nor is this surprising, considering tbe

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Fia. 82.——Young of Peltogaster socialis on the abdomen of a small hermit-crab ; in one of them the fascieculately ramified roots, 7, in the liver of the erab are shown. The animal and roots are deep yellow. (Fritz Miiller.)

Fig. 83.—Young of Sacculina purpurea with its roots; the animal purple-red, the roots dark grass green. Magn. 5 diam. (Fritz Miiller.)

fixed condition of their shells and the degree of external resemblance between Lepas and Z'eredo on the one hand, and Balanus and a compound of a Patella and a Chiton shell on the other. Strauss in 1819 first affirmed that Cirripedes were Crustacea. But this view was disregarded until J. Vaughan Thompson's capital discovery in 1830 of their metamorphosis, since which time they have been almost universally placed with the Crustacea.

The Cirripedia are classed by Darwin in three great divisions :—(1) Taoractea (limbs thoracic) ; (2) Appomi- NALIA (limbs abdominal); (3) Apopa (appendages want- ing). In the first division are embraced the Balanide, the Verrucide, and the Lepadide , in the second a single , genus, Cryptophialus minutus; the third is also repre- sented by one form, the Proteolepas bivincta.

(1) THoractea.—Cirripedes ordinarily are bisexual,! in which respect they differ from all other Crustacea,—the male (where it exists distinct) being minute and rudimentary in structure and 'permanently epizoic on the female. In these latter facts we find an analogy in the Copepoda Parasita just noticed. The male has the excretory organ single, median, and proboscifom, and placed at the extremity

Fia. 84—1, Scalpellum rostratum, Darwin, Philippine Islands; 2, Pollictpes cornucopte, Leach, European Seas; 3, Tubicinella trachealis, Shaw, attached to whales; 4, Acasta sulcata, Lamk., in sponges, New South Wales (4', tergum; 4%, seutum); 5, Balanus tintinnabulum, Linn., Atlantic; 5', Section of Balanus, Linn.; 6, Coronula diadema, Linn., attached to whales. =

of the abdomen,—in all these respects differing from other

~~Crustacea in which the male organ is laterally double. In~~

~~the female organs the ovarian tubes and cca inosculate~~

~~together ; there are no oviducts, the ova connected together by membrane, and so forming the " ovigerous lamelle," become exposed by the exuviation of the. lining tunic of the carapace or sack, and by the formation of a new tunic on the under side of the lainelle, a process unknown in any other Crustacean. The Thoracica are mainly divided~~

~~into Balanide and Lepadide ; in the former, the animal.~~

~~1 All the Balanide are bisexual and hermaphrodite, no males or com- plemental males having been found in any of them.~~

~~when adult is inclosed in the parietes of its shell, and~~

~~fixed to some living or dead object by a broad shelly~~

~~basis, the aperture being protected by the opercular~~

~~valves. In the Lepadide the animal is attached by the extremity of a more or less long muscular peduncle, and its body is lodged within the shelly valves of the capitulum. In some species, as in Pollicipes and Scalpellum, the peduncle is covered with more or less numerous rows of scales or squamz. This peduncle in Podllicipes and Scal- pellum corresponds with the basis in Balanus, as may clearly be seen if a Pollicipes with a short peduncle and a Balanus with a deep cup-formed or cylindrical basis be com- pared, the animal being in part lodged in both, as in Jbla and Lathotrya. The scales - which surround the base of the valves in Pollicipes correspond with the parietes of the walls of Balanus, the valves of the capitulum of the former being homologous with the opercular valves in the latter (fig. 84). The body consists of six, perhaps of seven, posterior thoracic somites. In the division Thoracica the abdomen is undeveloped.? The thoracic segments support six pairs of cirri. Each cirrus consists of a two-jointed pedicel, carrying two multi-articulated rami. The mouth has a labrum, palpi, mandibles, and two pairs of maxille ; within the sack a folded membrane forms the branchie. Darwin concludes that in the Cirripedia the body may be said to be~~

~~composed, at most, of bat seventeen segments. In order to indicate the homologies which still exist between the parts of an adult Cirripede and an ordinary free~~

~~85.—Theoretical view of the homologies of the Cirripedia with other Crustacea. A, Leucifer (a Stomapod) ; B, Lepas. a, antenn; e, é, the eyes; mm, the mouth; p, the penis. (After Darwin.) : Crustacean, we give the accompanying illustrations from Darwin (fig. 85). The upper figure is a Stoma- pod Crustacean (Leucifer); the abdomen, being rudi- mentary in the adult Cirripedia, is only shown in faint outlines. The lower figure is of a mature Lepas with the antennz and eyes, which are actually present in the larva, retained for the sake of completing the comparison. " All that we externally see of a Cirripede, whether pedunculated or sessile, is the three anterior segments of the head of a Crustacean, with its anterior end permanently cemented to a surface of attachment, and with its posterior end project- ing vertically from it" (Darwin).~~

~~The thoracic appendages of the. Cirripedia present us with yet another wonderful modification of the Crustacean type; these biramous multi-articulated cirri are neither natatory, nor ambulatory, nor branchial, but " captorial," or fitted for sweeping the water, and thus catching prey,— their alternate extensile and retractile wave-like movements bringing all floating particles and minute organisms within reach Of the inclosed mouth.?~~

~~2 In the pupa, however, of this order, and in the mature animal of the two other orders (the Abdominalia and Apoda), it is formed of three segments. —~~

~~' 3 Mr Gosse mentions that the little crab, Porcellana platycheles (fig. VI. —84~~

~~666~~

~~(2) AspominaL1a.—The single Cirripede, the Crypto- phialus minutus, forming this section is the smallest known, being less than y,th of an inch in length. It is met with imbedded in vast numbers in the living shell of Con- cholepas Peruviana, the crypts almost touching each other. The three abdominal somites bear three pairs of cirri, the thoracic somites being~~

apodal. The sexes are distinct, the minute almost globular male being lodged within the crypt occupied by the female. Darwin found from one or two up to seven males attached to the same female.

(3) Aropa.—This section, like the Jast, contains only a single form, the Proteolepas bivincta, resembling the larva or maggot of a fly attached by two threads ; the mouth is suctorial ; it has no limbs ; its body is shell-less, and it lies parasitic within the sack of Alepas cornuta.

Cirripedia occur attached to the most varied objects, living and dead, throughout the seas of the globe. Sessile forms like Tubdicinella, Coronula, Platylepas, Chelonobia, d&c., are found attached to, and imbedded in, the epidermis of the whale, and on the shell of the turtle, &c. Peduncu- lated forms are similarly widely distributed. Fritz Miller calls attention to one anomalous form described by Darwin, the Anclasma squalicola, parasitic upon sharks in the North Sea, which seems to offer a remarkable analogy to the Rhizocephala. This Lepadide, he says, seems in a fair way to lose its cirri and buccal organs altogether. " The widely- cleft shell-less test is supported upon a thick peduncle, which is imbedded in the skin of the shark. The surface of the peduncle is beset with much-ramified hollow filaments, which penetrate the shark's flesh like roots." Cement glands and cement were not visible. '* It seems to me," says Fritz Miller, " hardly doubtful that the ramified hollow filaments are themselves nothing but the cement ducts converted into nutritive roots, and that it is in consequence of the development of this new source of nourishment that the cirri and buccal organs are in the highest degree aborted." All the mouth organs are minute and rudimentary ; the cirri thick, inarticulate, and desti- tute of bristles; the muscular tissue without transverse striation, and the stomach perfectly empty.*

"The Lepadide," writes Darwin, "include a much greater range of forms than the Balanide, and this is what might have been expected, for it is the most ancient family, and extinction has done its work in separating genera which, according to analogy, were once more nearly connected by intermediate forms."

The most ancient sessile Cirripede found fossil is the Pyrgoma. cretacea, H. Woodw., from the Chalk. Previous to 1865 the oldest-known pedunculated

~~Cirripede was the Pollicipes rhceticus, Moore. In that year the writer described a curious and most anomalous form of Cirripede, from the Upper Silurian of Dudley, with imbricated calcareous plates (fig. 86), under the name of Turrilepas Wrighti, previously described as a Chiton. The fossil form with which it has been compared is more perfect and equally bizarre, viz., the Loricula pulchella (see 6 in fig. 70), originally discovered in the Chalk of Rochester and since in that near Norwich. It affords evidence of a most aber- rant form of Lepadide, in which the capitulum is very small; the body of the animal was lodged in a broadly- expanded peduncle, clothed in five rows of smooth lori- cated calcareous scales, which, if both sides were perfect, would have possessed ten rows and the plates would have~~

~~68), which lives concealed, holding tightly to the under side of flat stones at low water, does exactly the same thing with its maxillipeds as the barnacles do with their cirri; it keeps up a semicircular sweeping movement, so that a constant current conveys all the small living and dead objects within reach of its mouth. ;~~

~~ee oo Miiller, op. cit. p. 140, and Darwin, op. cit. p, 170, Pl. 4,~~

~~CRUSTACEA~~

~~exceeded 200 in number. In Bate and Westwood's Sessile- eyed Crustacea (vol. ii. p. 268) is figured a larval form of Cryptothiria Balani (reproduced in fig. 41 above), which~~

~~Fic. 86.—Turrilepas Wrightti, H. Woodw. (Chiton Wrightti, De Kon.); U. Silurfan, Dudley. The detached figures, a, b, ¢, indicate the three forms of plates of which the peduncles are composed in 1, 2, and 3 which bear the corresponding letters. The opercular valves are not known.~~

~~seems to afford evidence of a:similar arrangement of plates. Possibly Loricula was parasitic like Bopyrus.~~

~~In conclusion, sufficient evidence has been adduced to show that the normal development of the Crustacean class has been one of progressive advancement, the forms of to-day, when viewed as a whole, being more highly developed and more differentiated than those which the geological~~

record has preserved to us. But in any large community or class it is only the few that outstrip the many in the struggle for existence. Thus the Podoph- thalmia and Edriophthalmia present numerous examples of high advancement, both in intelligence and in attaining to a terrestrial life, especially in the Decapoda-Brachyura. The Ostracoda, Phyllopoda, and Xiphosura are good instances of merely persistent forms. They are orders the members of which have branched out long since into by, ways of their own, where, being checked from further progress, they have, by their great tenacity of life and large powers of reproduction, held their ground through the long lapse of ages from Silurian times to the present day, whilst higher orders have been modified or swept away.

But the history of some Crustacea has been retrogresswe, probably in a few instances from arrested larval develop- ment, as, for example, in the case of the imperfectly- developed fifth pair of legs in Porcellana, Galathea, and Munida ; in most instances, however, retrogression seems clearly traceable to the parasitic or sedentary mode of life which the members have adopted. We have examples of—this in the loss of eyesight in Crustacea passing their lives in subterranean caverns, wells, and streams ; the loss and atrophy of a part of the defensive armature of the body in the burrowing Zhalassinide ; the complete loss of the abdominal calcareous covering in Pagurus ; the general atrophy of limbs and loss of symmetry of the body in the Bopyride through residence within the branchial chambers of other Crustacea ; and the complete or partial loss of all or nearly all recognizable Crustacean characters in the adult female, or in both sexes, by parasitism on Crus- acea, fishes, d&c., in certain of the Bopyride, in the Cope- poda, in the Rhizocephala, and in the Cirripedia.

Viewed as a whole, the Crustacea probably offer the best illustration of a class constructed on a common type, retain- ing its general characteristics, but capable of endless modi- fications of its parts, so as to suit the extreme requirements of every separate species. .

The outline of this great class here attempted necessarily lacks many important details ; these must be filled in by the reader from the various works referred to throughout the article. (a. W.)

CRU—CRY

CRUVEILHIER, Jean (1791-1874), a French anatomist, was born at Limoges. Having been educated at the university of Paris, where he received his doctor's degree in 1816, he practised for some years in his native town, at Paris, and at Montpellier. In 1825 he became professor of anatomy in the university of Paris, and ten years later he was the first occupant of the recently founded chair of pathological anatomy. He was also created Commander of the Legion of Honour.

The chief works of Cruveilhier are his Anatomie pathologique du corps humain (1st vol., 1829, 2d vol., 1842), Traité d Anatomie pathologique genérale (1849-64), Anatomie du Systeme nerveux de U Homme (1845), Traité d Anatomie descriptive (1851).

CRUZ, Juan ve wa (1542-1591, a Spanish mystic, whose family name was Yepes, was born at Ontiveros, in Old Castile. He took the vows at twenty-one, and soon became the faithful and ardent follower of Santa Teresa in her plans for the reform of the Carmelite order, to which he belonged. His zeal drew upon him the wrath of his brethren, through whose influence he was imprisoned for nine months. His release was procured by Santa Teresa, under whom he worked with fervent devotion for many years; but in 1591, having ventured to oppose his superiors, he was sent to a monastery in the Sierra Morena. His health, however, gave way, and he was allowed to change his residence to the monastery of Ubeda, where he died in 1591. In 1675 he was beatified, and in 1726 he was cionized. The poems and prose works of San Juan de la Cruz, which are chiefly devotional and never secular, though rhapsodical and mystical and often obscure, are distinguished by much passionate eloquence and beauty of diction.

Since 1619, the date of the first edition, they have been fre- quently reprinted. They have been several times translated into French, and a Latin version appeared at Cologne in 1639. A complete edition forms volume xvii. of the Biblioteca de Autores Lspaiioles, where is also contained an interesting treatment of his character ; and his poems are published in Depping's Floresta de Rimas Castellanas, and in an edition by Storck (Munster, 1854), who has also published a German version. See, besides, the highly laudatory and popular life published in 1625, and the lives by Joseph de Jesu-Maria and by Sainte-Alexis.

CRUZ, Ramon DE LA, Spanish dramatist, was born at Madrid in 1731. Nothing is known of his life, save that he was an employé in the ministry of finance, that he was a member of the Academy of Seville and of the Roman "Arcadians," and that between 1786 and 1791 he pub- lished some ten volumes of plays. Among his 300 pieces he is remembered only by his sazvetes, little farcical sketches of city life, written to be played between the acts of a greater play, or as afterpieces.

Specimens are to be found in Ochoa, Tesoro del Teatro Espafiol, vol. y.; and seventeen of the best of them have been translated into French, and published, with an introduction, by Antoine de Latour, in his Sainetes de Ramon de la Cruz, Paris, 1865. A complete edi- tion, comprising upwards of 110, was issued by Don Agostino Duran in 1848. See Ticknor's Spanish Literature, iii. 249-251.

CRYOLITE, so named from xpvos, ice, and AiGos, stone, on account of its ready fusibility, is a massive, usually granular or indistinctly crystalline, cleavable, translucent to transparent, brittle mineral, of a snow-white (sometimes reddish or brownish) colour, vitreous lustre, hardness 2°5, and specific gravity 2°9-3:077. Its transparency is increased by immersion in water. Before the blowpipe it fuses easily to an opaque white enamel. It is a double fluoride of aluminium and sodium, with the percentage composition —aluminium 13, sodium 32°8, fluorine 54:2, answering to the formula Al,F,,6NaF. Cryolite is used in the manufacture of soap, soda, aluminium sulphate, alum, and cryolite glass ; and, till superseded by bauxite, was the chief source of aluminium. That metal was first obtained from it, early in 1855, by Allan Dick, who fused the mineral with alternate layers of small pieces of sodium in

of a catacomb, or for the catacomb itself.

a magnesia-lined crucible. Rose, in September of the same

year, published a method of producing aluminium by heat-

ing together cryolite, potassium chloride, and sodium. According to M. Gauduin a mixture of equal parts of cryolite and barium chloride forms a flux superior to borax for soldering iron, or brazing copper, brass, and bronze. Cryolite was discovered and named by Abildgaard about the year 1800, and was subsequently described by

D'Andrada and Karsten, and accurately analyzed by

Klaproth. Giesecke in 1822 first made known its occur- rence at Ivigtot, in the colony of Frederikshaab, South Greenland. It is found there associated with galena, pyrites, and chalybite, and forms a vein 80 feet in thick- ness, At Miask in the Urals it occurs with chiolite, lepidolite, and fluor. In 1875 thirty-three cargoes of the mineral, representing a total of 5076 cubic yards, were shipped from the mine at Ivigtot, where the number of labourers employed during the summer was 136. The tax on the mine yielded to the revenue of Greenland in twenty years, or from 1853 to 1874,.the sum of £46,402. CRYPT (Latin, crypta, from the Greek xpi'xrrw, I hide), a vault or subterranean chamber, especially under churches. In classical phiaseology " crypta " was employed for any vaulted building, either partially or entirely below the level of the ground. It is used for a sewer (crypta Subure, Juvenal, Sat. v. 106) ; for the "carceres," or vaulted stalls for the horses and chariots ina circus (Sidon. Apoll., Carm. xxii. 319); for the close porticoes or arcades, more fully known as "cryptoporticus," attached by the Romans to their suburban villas for the sake of coolness, and to the theatres as places of exercise or rehearsal for the performers (Phn., Lpist. ii. 15, v. 6, vii. 21 ; Sueton., Calig. 58 ; Sidon. Apoll., lib. ii, epist. 2); and for underground receptacles for agri- cultural produce (Vitruv. vi. 8, Varro de re Rust. i. 57). Tunnels, or galleries excavated in the living rock, were also called crypte. Thus the tunnel to the north of Naples, through which the road passes to Puteoli, familiar to tourists as the "Grotto of Posilipo," was originally designated crypta Neapolitana (Seneca, Epist. 57). In early Christian times crypta was appropriately employed for the galleries Jereme calls them by this name when describing his visits to them as a schoolboy, and the term is used by Prudentius (CaTacomss). A crypt, as a portion of a church, had its origin in the subterranean chapels known as " confessiones," erected around the tomb of a martyr, or the place of his martyrdom. This is the origin of the spacious crypts, some of which may be

called subterranean churches, of the Roman churches of St Prisca, St Prassede, St Martino ai Monti, St Lorenzo fuori le Mura, and above all of St Peter's,—the crypt being thus the germ of the church or basilicasubsequently erected above the hallowed spot. When the martyr's tomb was sunk in the surface of the ground, and not placed in a catacomb chapel, the original memorial]-shrine would be only partially belcw the surface, and consequently the part of the church erected over it, which was always that containing the altar, would be elevatedsome height above the ground, and be approached by flights of steps. This fashion of raising the chancel cr altar-end of a church on a crypt was widely imitated long after the reason for adopting it ceased, and even where it never existed. The crypt under the altar at the basilica cf St Maria Maggiore in Rome is merely imitative, and the same may be said of many of the crypts of our early churches in England. The original Saxon cathedral of Canterbury had a crypt beneath the eastern apse, containing the so-called body of St Dunstan, and other relics, " fabri- cated," according to Eadmer, " in the likeness of the confes- sionary of St Peter at Rome" (Bastzica). St Wilfrid con- structed crypts still existing beneath the churches erected by him at the latter part of the 7th century at Hexham

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and Ripon. These are peculiarly interesting from their similarity in form and arrangement to the catacomb chapels with which Wilfrid must have become familiar during his residence in Rome. The cathedral, begun by Athelwold and finished by Elphege at Winchester, at the end of the 10th century, had spacious crypts " supporting the holy altar and the venerable relics of the saiuts " (Wulstan, Life of St Asthelwold), and they appear to have been common in the earlier churches in England. The arrangement was adopted by the Norman builders of the 11th and 12th centuries, and though far from universal is found in many of the cathedrals of that date. The object of the construction of these crypts was twofold,—to give the altar sufficient elevation to enable those below to witness the sacred mysteries, and to provide a place of burial for those holy men whose relics were the church's most precious possession. But the crypt was "a foreign fashion," derived, as has been said, from Rome, " which failed to take root in England, and indeed elsewhere barely outlasted the Roman- esque period"

(Essays on Cathedrals, p. 331). Of the crypts beneath our Norman cathedrals, that under the choir of Canterbury is by far the largest and most elaborate in its arrangements. It is, in fact, a subterranean church of vast size and considerable altitude, and in consequence of the elevation of the floor of the upper church is scarcely, if at all, below the level of the soil, and is therefore fairly well lighted. The whole crypt was dedicated to the Virgin Mary, and contained two chapels especially dedicated to her,—the central one beneath the high altar, enclosed with rich Gothic screenwork, and one under the south transept. Thislatterchapel was appropriated by Queen Elizabeth to the use of the French Huguenot refugees who had settled at Can- terbury in the time of Edward VI. There were also in this crypt a large number of altars and chapels of other saints, some of whose hallowed bodies were buried here. At the extreme east end, beneath the Trinity Chapel, the body of St Thomas (Becket) was buried the day after his martyrdom, and lay there till his translation, July 7, 1220. The cathedrals of Winchester, Worcester, and Gloucester have crypts of slightly earlier date (they may all be placed between 1080 and 1100), but of similar character, though less elaborate. They all contain piscinas and other evidences of the existence of altars in considerable numbers. They are all apsidal. The most picturesque is that of Worcester, the work of Bishop Wulstan (1084), which is remarkable for the multiplicity of small pillars supporting its radiating vaults. Instead of having the air of a sepul chral vault like those of Winchester and Gloucester, this crypt is, in Professor Willis's words, "a complex and beauti- ful temple." Archbishop Roger's crypt at York, belonging to the next century (1154-1181), was filled up with earth when the present choir was built at the end of the 14th century, and its existence forgotten till its disinterment after the fire of 1829. The choir and presbytery at Rochester are supported by an extensive crypt, of which the western portion is Gundulf's work (1076-1107), but the eastern part, which displays slender cylindrical and octagonal shafts, with light vaulting springing from them, is of the same period as the superstructure, the first years of the 13th century. This crypt, and that beneath the Early Englsh Lady Chapel at Hereford, are the latest of our existing cathedral crypts. That at Hereford was rendered necessary

'by the fall of the ground, and is an exceptional case.

Later than any of these crypts was that of St Paul's, London. This was a really large and magnificent church of Decorated date, with a vaulted roof of rich and intricate character resting on a forest of clustered columns. Part of it served as the parish church of St Faith. A still more exquisite work of the Decorated period is the crypt of St Stephen's chapel at Westminster, than which it is difficult

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to conceive anything more perfect in design or more elaborate in ornamentation. Having happily escaped the conflagration of the Houses of Parliament in 1834—before which it was degraded to the purpose cf the Speaker's state dining-room—it has been restored to its former sumptuousness of decoration, and is now one of the most beautiful architectural gems in England.

Of Scottish cathedrals the only one that possesses a crypt is the cathedral of Glasgow, rendered celebrated by Sir Walter Scott in his novel of Rob Roy (ch. xx.). At the sup- posed date of the tale, and, indeed till a comparatively recent period, this crypt was used as a place of worship by one of the three congregations among which the cathedral was partitioned, and was known as "the Laigh or Barony Kirk." It extends beneath the choir transepts and chapter-house ; in consequence of the steep declivity on which the cathedral stands it is of unusual height and lightsomeness. It belongs to the 13th century, its style corresponding to our Early English, and is simply constructional, the building being adapted to the locality. In architectural beauty it is quite unequalled by any crypt in the United Kingdom, and can hardly anywhere be surpassed. It is au unusually rich example of the style, the clustcred piers and groining being exquisite in design and admirablé in execution. The bosses of the roof and capitals of the piers are very elaborate, and the doors are much enriched with foliage. ' There is a solidity in its architecture, a richness in its vaulting, and a variety of perspective in the spacing of its pillars, which make it one of the most perfect pieces of architecture in these kingdoms " (Fergusson). The care that is taken of this beautiful architectural gem, and the lavish outlay with which its windows have been decorated with stained glass, area gratifying proof that the citizens of Glasgow fully appreciate the treasure they possess.

~~*In the centre of the main alley stands the mutilated effigy of St Mungo, the patron saint of Glasgow, and at the south-east corner is a well called after the same saint.*~~

~~*Crypts under parish churches are not very uncommon in England, but they are usually small and not characterized by any architectural beauty. A few of the earlier crypts, however, deserve notice. One of the earliest and most remarkable is that of the church of Lastingham near Pickering in Yorkshire, on the site of the monastery founded in 648 by Cedd, bishop of the East Anglians. The existing crypt, though exceedingly rude in structure, is of considerably later date than Bishop Cedd, forming part of the church erected by Abbot Stephen of Whitby in 1080, when he had been driven inland by the incursions of the northern pirates. This crypt is remarkable from its extend- ing under the nave as well as -the chancel of the upper church, the plan of which it accurately reproduces, with the exception of the westernmost bay. It forms a nave with side aisles of three bays, and an apsidal — chancel, lighted by narrow deeply splayed slits. The roof of quadripartite vaulting is supported by four very dwarf thick cylindrical columns, the capitals of which and of the responds are clumsy imitations of classical work with rude volutes. Still more curious is the crypt beneath the chancel of the church of Repton in Derbyshire. This also*~~

~~*consists of a centre and side aisles, divided by three arches*~~

on either side. The architectural character, however, is very different from that at Lastingham, and is in some respects almost unique, the piers being slendér, and some of them of asingular spiral form, with a bead running in the sunken part of the spiral. Another very extensive and curious Norman crypt is that beneath the chancel of St Pcter's-in- the-East at Oxford. This is five bays in length, the quadripartite vaulting being supported by eight low, some- what slender, cylindrical columns with capitals bearing grotesque animal and human subjects. Its dimensions are

36 by 20 feet and 10 feet in height. This crypt has been commonly attributed to Grymboldt in the 9th century ; but it is really not very early Norman. Under the church of St Mary-le-Bow in London there is an interesting Norman crypt not very dissimilar in character to that last described. Of a later date is the remarkably fine Early English crypt groined in stone, beneath the chancel of Hythe in Kent, contaiuing a remarkable collection of skulls and bones, the history of which is quite uncertain. There is also a Decorated crypt beneath the chancel at Wimborne Minster, and one of the same date beneath the southern chancel aisle at Grantham.

Among the more remarkable French crypts may be mentioned those of the cathedrals of Auxerre, said to date from the original foundation in 1085 ; of Bayeux, attributed to Odo, bishop of that see, uterine brother of William the Conqueror, where twelve columns with rude capitals support a vaulted roof ; of Chartres, running under the choir and its aisles, frequently assigned to Bishop Fulbert in 1029, but more probably coeval with the superstructure ; and of Bourges, where the crypt is in the Pointed style, extending beneath the choir. The church of the Holy Trinity attached to Queen Matilda's foundation—the "Abbaye aux Dames" at Caen—has a Norman crypt where the thirty-four pillars are as closely set as those at Worcester. The church of St Eutropius at Saintes has also a crypt of the 11th century, of very large dimensions, which. deserves special notice; the capitals of the columns exhibit very curious carvings. Earlier than any already mentioned is that of St Gervase of Rouen, considered by Mr E. A. Freeman " the oldest ecclesiastical work to be seen north of the Alps." It is apsidal, and in its

walls are layers of Roman brick. It is said to contain the remains of two of the earliest apostles of Gaul—St Mellon and St Avitianus.

Space forbids our particularizing the numerous crypts of Germany. One at Gottingen may be mentioned, where cylindrical shafts with capitals of singular design support " vaulting of great elegance and lightness " (Fergusson), the curves being those of a horseshoe arch. The crypts of the cathedrals or churches at Halberstadt, Hildersheim, and Naumburg, also deserve to be noticed; that of Lubeck may be rather called a lower choir. It is 20 feet high and vaulted.

The Italian crypts, when found, as a rule reproduce the "confessio " of the primitive churches. That beneath the chancel of St Michele at Pavia is an excellent typical example, probably dating from the 10th century. It is apsidal and vaulted, and is seven bays in length. That at St Zeno at Verona (c. 1138) is still more remarkable ; its vaulted roof is upborne by forty columns, with curiously carved capitals. It is approached from the west by a double flight of steps, and contains many ancient monu- ments. St Miniatoat Florence, begun in 1013, has a very spacious crypt at the east end, forming virtually a second choir. It is seven bays in length and vaulted. The most remarkable crypt in Italy, however, is perhaps that of St Mark's, Venice. The plan of this is almost a Greek cross. Four rows of nine columns each run from end to end, and two rows of three each occupy the arms of the cross, supporting Jow stunted arches on which rests the pavement of the church above. This also constitutes a lower church, containing a chorus cantorwm formed by alow stone

screen, not unlike that of St Clement at Rome (see BAsIica,

vol. iii, p..417), inclosing a massive stone altar with four low columns. 'This crypt is reasonably supposed to belong to the church founded by the doge P. Orseolo in 977. There are also crypts deserving notice at the cathedrals of Brescia, Fiesole, and Modena, and the churches of St Ambrogio and St Eustorgio at Milan. The former was unfortunately

~~modernized by St Charles Borromeo. The crypt at Assisi is really a second church at a lower level, and being built on the steep side of a hillis welllighted. The whole fabric is a beautiful specimen of Italian Gothic, and both the lower~~

~~and upper churches are covered with rich frescoes. The crypts at Rome have been already mentioned. Domestic crypts are of frequent occurrence. Mediaeval~~

~~houses had as a rule their chief rooms raised above the level of the ground upon vaulted substructures, which were used as cellars and storerooms, 'These were sometimes partially underground, sometimes entirely above it. The underground vaults often remain when all the superstruc- turc has been swept away, and from their Gothic character are frequently mistaken for ecclesiastical buildings, All our older towns are full of crypts of this character, now used as cellars. They occur in Oxford and Rochester, are very abundant in the older parts of Bristol, and, according to Mr Parker, "nearly the whole city of Chester is built upon a series of them with the Rows or passages made on the top of the vaults" (Domestic Architecture, iii. p. 91). The crypt of Gerard's Hall in London, destroyed in the construction of New Cannon Street, figured by Mr Parker (Dom. Arch., ii. 185), was a very beautiful example of the lower story of the residence of a wealthy merchant of tho time of Edward I. It was divided down the middle by a row of four slender cylindrical columns supporting a very graceful vault. The finest example of a secular crypt now remaining in England is that beneath the Guildhall of London. The date of this is early in the 15th century, 1411. It is a large and lofty apartment, divided into four alleys by two rows of clustered shafts supporting a rich lierne vault with ribs of considerable intricacy. 'There is a fine vaulted crypt of the same date and of similar character beneath St Mary's Hall, the Guildhall of the city of Coventry. B. V.~~

~~CRYPTOGRAPHY (from xpvrrew, to hide), or writing in cipher (from Arabic cfr, empty, void), called also steganography (from oreydvyn, a covering), is the art of writing messages, &c., in such a way as to be understood by those only who possess the key to the characters employed. The unravelling of the writing is called deciphering. Cryptography having~~

become a distinct art, Bacon classed it (under the name ciphers) as a part of grani- mar. Secret modes of communication have been in use from the earliest times. The Lacedemonians, according to Plutarch, had a method which has been called the scytale, from the staff (ckvrédy) employed in constructing and deciphering the message. When the Spartan ephors wished to forward their orders to their commanders abroad, they. wound slantwise a narrow strip of parchment upon the oxutéAyn so that the edges met close together, and the message was then added in such a way that the centre of the line of writing was on the edges of the parchment. When unwound the scroll consisted of broken letters ; and in that condition it was despatched to its destination, the general to whose hands it came deciphering it by means of a oxutddy exactly corresponding to that used by the ephors. Polybius has enumerated other methods of crypto- graphy.

The art was in use alsoamongst the Romans. Upon the revival of letters methods of secret correspondence were in- troduced into private business, diplomacy,, plots, &c. ; and as the study of this art has always presented attractions to the ingenious, a curious body of literature has been the result.

John Trithemius, the abbot of Spanheim, was the first important writer on cryptography. HIs Poligraphia, published in 1500, has passed through many editions, and has supplied the basis upon which subsequent writers have worked, It was begun at the desire of the duke of Bavaria ;

but Trithemius did not at first intend to publish it, on the

ground that it would be injurious to public interests. The next treatises of importance were those of John Baptist

Porta, a Neapolitan mathematician, who wrote De furtwis

literarum notis, 1563; and of Blaise de Vigenere, whose Traité des chiffres appeared in Paris, 1587. Lord Verulam proposed an ingenious system of cryptography on the plan of what is called the double cipher ; but while thus lending to the art the influence of his great name, he gave an intima- tion as to the general opinion formed of it and as to the classes of men who

~~used it. For when prosecuting the earl of Somerset in the matter of the poisoning of Overbury, he urged it as an aggravation of the crime that the earl and Overbury "had cyphers and jargons for the king and queen and all the great men,—things seldom used but either by princes ant their ambassadors aud ministers, or by such as work or practise against or, at least, upon princes." Othereminent Englishmen were afterwards con-nected with the art. John Wilkins, subsequently bishop of Chester, published in 1641 an anonymous treatise entitled Mercury, or The Secret and Swift Messenger,—a small but comprehensive work on the subject, and a timely gift to the diplomatists and leaders of the civil war. The deciphering of many of the royalist papers of that period, such as the letters that fell into the hands of the Parliament at the battle of Naseby, has by Henry Stubbe been charged on the celebrated mathematican Dr John Wallis (Athen. Oxon., iii. 1072), whose connection with the subject of cipher- writing is referred to by himself in the Oxford edition of his mathematical works, 1689, page 659 ; as also by John Davys. Dr Wallis elsewhere states that this art, formerly scarcely known to any but the secretaries of princes, &c., had grown very commou and familiar during the civil com- motions, 'so that now there is scarce a person of quality but is more or les3 acquainted with it, and doth, as there iz occasion, make use of it." Sabsequent writers on the subject are John Falconer (Cryptomenysis Patefacta), 1685 ; John Davys (An Essay on the Art of Decyphering: in which ts inserted a Discourse of Dr Wallis), 1737 ; Philip Thicknesse (A T'reatise on the Art of Decyphering and of. Writing in Cypher), 1772; William Blair (the writer of the comprehensive article "Cipher" in Rees's Cyclopedia), 1819 ; and G. von Marten (Cours Diplomatique), 1801 (a fourth edition of which appeared in 1851). Perhaps the best modern work on this subject is the Kryptographik of J. L. Klitber (Titbingen, 1809), who was drawn into the investigation by inclination and official circumstances. this work the different methods of cryptography are classified. Amongst others of lesser merit who have treated on this art, may be named Gustavus Selenus (7.e., Augustus, duke of Brunswick), 1624; Cospi, translated by Niceron in 1641 ; the marquis of Worcester, 1659; Kircher, 1663 ; Schott, 1665 ; Hiller, 1682 ; Comiers, 1690 ; Baring, 1737 ; Conrad, 1739, &c.~~

~~Schemes of cryptography are endless in their variety. Bacon lays down the following as the "virtues" to be looked for in them :—"that they be not~~

~~laborious to write and read; that they be impossible to decipher; and, in some cases, that they be without suspicion." These principles are more or less disregarded by all the modes that have been advanced, including that of Bacon himself, which has been unduly extolled by his admirers as "one of the most ingenious methods of writing in cypher, and the most difficult to be decyphered, of any yet contrived" (Thicknesse, p. 13).~~

~~The simplest and commonest of all the ciphers is that in which the writer selects in place of the proper letters certain other letters in regular advance. This method of transposition was used by Julius Cesar. He "' per quartam elementorum literam," wrote d for a, e for b, and so on.~~

~~'ideas.~~

~~mn:~~

~~CRYPTOGRAPHY~~

~~There are instances of this arrangement in the Jewish rabbis, and even in the sacred writers. An illustration of it occurs in Jeremiah (xxv. 26), where the prophet, to conceal the meaning of his prediction from all but the initiated, writes Shkeshach instead of Babel (Babylon), the place meant ; ze, in place of using the second and twelfth letters of the Hebrew alphabet (6, 4, 1) from the beginning, he wrote the second and twelfth (sh, sh, ch) from the end. To this kind of cipher-writing Buxtorf gives the name Athbash (from a, the first letter of the Hebrew alphabet, and th the last; b the second from the beginning, and ' the second from the end), Another Jewish cabalism of like nature was called Albam; of which an example is in Isaiah vii. 6, where Tabeal is written for Remaliah, In .- its adaptation to English this method of transposition, of~~

~~which there are many modifications, is comparatively easy~~

~~to decipher. A rough key may be derived from an~~

~~examination of the respective quantities of letters in a type-~~

~~founder's bill, or a printer's "case." The decipherer's first'~~

~~business is to classify the letters of the secret message in~~

~~the order of their frequency. The letter that occurs. oftenest is e ; and the next in order of frequency is t. The~~

~~following groups come after these, separated from each other~~

~~by degrees of decreasing recurrence :—4@, 0,. ; 4 798 leged, lt;~~

~~cw, u,m; frp, 0; % hs x, 9,9, % All the single'~~

~~letters must be a, J, or O. Letters occurring together are~~

~~ee, 00, ff, Ul, ss, &c. The commonest words of two letters are (roughly arranged in the order of their frequency)~~

~~of, to, in, i, ts, be, he, by, or, as, at, an, 80, &c. The~~

~~commonest words of three letters are the and and (in great~~

~~excess), for, are, but, all, not, &c. ; and of four letters—~~

~~that, with, from, have, this, they, &c. Familiarity with the~~

~~composition of the language will suggest numerous other~~

~~points that are of value to the decipherer. He may obtain~~

~~other hints from Poe's tale called The Gold Bug. As to~~

~~messages in the Continental languages constructed upon~~

~~this system of transposition, rules for deciphering may be~~

~~derived from Breithaupt's Ars decifratoria, 1737, and~~

~~other treatises. .~~

~~Bacon remarks that though ciphers were commonly in letters and alphabets yet they might be in words. Upon: this basis codes have been constructed, classified words taken from dictionaries being made to represent complete In recent years such codes have been adapted by merchants and others to communications by telegraph, and have served the purpose not only of keeping business affairs' private, but also of reducing the excessive cost of telegraphic. messages to distant markets. Obviously this class of ciphers presents greater difficulties to the skill of the decipherer.~~

~~Figures and other characters have been also used a3 letters ; and with them ranges of numerals have been com-. bined as the representatives of syllables, parts of words, words themselves, and complete phrases. Under this head: must be placed the despatches of Giovanni Michael, the. Venetian ambassador to England in the reign of Queen Mary,—documents which have only of late years been: deciphered. Many of the private letters and papers from the pen of Charles I. and his queen, who were adepts in- the use of ciphers, are of the same description. One of— that monarch's letters, a document 6f considerable interest, consisting entirely of numerals purposely complicated, was in 1858 deciphered by Professor Wheatstone, the inventor. of the ingenious crypto-machine, and printed by the Philobiblon Society. Other letters of the like character have been published in the First Report of the Royal Commission on Historical Manuscripts, 1870, In the second and subsequent reports of the same commission, several keys to ciphers have been catalogued, which seem to refer themselves to the methods of cryptography under,~~

~~CRY—CRY~~

~~notice. In this connection also should be mentioned the "characters," which the diarist Pepys drew up when clerk to Sir George Downing and secretary to the earl of Sand- wich and to the Admiralty, and which are frequently mentioned in his journal. Pepys describes one of them as 'a great large character," over which he spent much time, but which was at length finished, 25th April 1660 ; "it being," says he, "very handsomely done and a very good one in itself, but that not truly alphabetical."~~

~~Shorthand marks and other arbitrary characters have also been largely imported into cryptographic systems to repre- sent both letters and words,~~

~~but more commonly the latter. This plan is said to have been first put into use by the old Roman poet Ennius. It formed the basis of the method of Cicero's freedman, Tiro, who seems to have systematized the labours of his predecessors, A large quantity of these characters have been engraved in Gruter's Jzscriptiones. The correspondence of Charlemagne was in part made up of marks of this nature. In Rees's Cyclopedia specimens were engraved of the cipher used by Cardinal Wolsey at the court of Vienna in.1524, of that used by Sir Thomas Smith at Paris in 1563, and of that of Sir Edward Stafford at Madrid in 1586 ; in all of which arbitrary marks are introduced. The first English system of shorthand— Bright's Characterie, 1588—almost belongs to the same category of ciphers, A favourite system of Charles I, used by him during the year 1646, was one made up of an alphabet of twenty-four letters, which were represented by four simple strokes varied in length, slope, and position. This alphabet 1s engraved in Clive's Linear System of Shorthand, 1830, having been found amongst the royal manuscripts in the British Museum. An interest attaches to this cipher from the fact that it was employed in the well-known letter addressed by the king to the earl of Glamorgan, in which the former made concessions to the Roman Catholics of Ireland.~~

~~Complications have been introduced into ciphers by the employment of " dummy " letters,—'" aulls and insignifi cants," as Bacon terms them. Other devices have been introduced to perplex the decipherer, such as spelling words backwards, making false divisions between words, &c. The greatest security against the decipherer has been found in the use of elaborate tables of letters, arranged in the form of the multiplication table, the message being constructed by the aid of preconcerted key-words, Details of the working of these ciphers may be found in the treatises uamed in this article. 'The deciphering of them is one of the most difficult of tasks. A method of this kind is ex- plained in the Latin and English lives of Dr John Barwick, whose correspondence with Hyde, afterwards earl of Clarendon, was carried on in cryptography. In a letter dated 20th February 1659-60, Hyde, alluding to the skill of his political opponents in deciphering, says that " nobody needs to fear them, if they write carefully in good cyphers." In his next he allays his correspondent's apprehensiveness as to the deciphering of their letters.~~

“T confess to you, as | am sure no copy could be gotten of any of my cyphers from hence, so I did not think it probable that they could be got on your side the water. But I was as confident, till you tell me you believe it, that the devil himself cannot de- cypher a letter that is well written, or find that 100 stands for Sir H. Vane. I have heard of many of the pretenders to that skill, and — have spoken with some of them, but have found them all to be mountebanks ; nor did I ever hear that more of the King’s letters that were found at Naseby, than those which they found decyphered, or found the cyphers in which they were writ, were decyphered. And I very well remember that in the volume they published there was much left in cypher which could not be understood, and which I believe they would have explained if it had been in their power.” ’ ,

An excellent modification of the key-word principle was ‘Constructed by the late Admiral Sir Francis Beaufort; it

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has been recently published in view of its adaptation to telegrams and post-cards. .

Ciphers have been constructed on the principle of alter- ing the places of the letters without changing their powers. The message is first written Chinese-wise, upward and downward, and the letters are then combined in given rows froin left to right. In the celebrated cipher used by the earl of Argyle when plotting against James IL, he altered the positions of the words. Sentences of an indifferent nature were constructed, but the real meaning of the message was to be gathered from words placed at certain intervals. This method, which is connected with the name of Cardan, is sometimes called the trellis or cardboard cipher.

The wheel-cipher, which is an Italian invention, the string-cipher, the circle-cipher, and many others are fully explained, with the necessary diagrams, in the authorities named above, — more particularly by Kliiber in his Krypto-graphtk. (J. BE. B.)

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~~peculiar forms, bounded by smooth, even surfaces meeting in straight lines. Fused metals: consolidating in certain favourable conditions appear as similar bodies. And in nature also, in cracks or fissures of the rocks, or imbedded in their mass, minerals resembling these in form are~~

~~frequently found. These regular polyhedric, or many-sided Definition bodies, whether natural or artificial, are named crystals, of crystals.~~

~~and the science naming and describing the forms they assume, and pointing out the relations that exist among them, is termed crystallography. In a theoretical point of view this sclence may be regarded as a branch of mathe- matics, and might be studied independent altogether of the fact of any material bodies existing inthe forms described. Practically, however, its chief interest and value is as a mean of distinguishing many salts, ores, and other substances, either formed artificially or, more especially, occurring uaturally as minerals, At present no particular system of crystallography has found general acceptance, and referring for the details of the one adopted in the description of mineral specics to MINERALOGY, we propose in this place to give an account of the history of the science, pointing out the more remarkable steps in its progress, the chief general results attained, and some of the best works from which further information in regard to it may be obtained.~~

~~The term crystal, found in most modern European Origin of languages, is derived from the Greek word xpvo7zadΛos, name.~~

~~meaning ice or frozen water, and subsequently transferred to pure transparent stones cut into seals, and, as was thought, only produced in the extreme cold of the lofty passes of the Alps. Pliny, who notices this rock-crystal in his Natural HIstory (book xxxvii.), points out clearly enough the hexagonal form of the crystals, remarking that it is not easy to give any reason why they grow in this form, more especially as the points have not the same appearance (¢o magis quod neque mucronibus eadem species est), and the polish of the sides is such that no art can equal it. The forms of other minerals are also noticed by him, but the term crystal still had regard to the ice-like transparency and purity of the stone, a reference entirely lost in the modern scientific use of the word.~~

It isnot wonderful that these bodies, often so remarkable Early his-

for the beauty of their forms, colours, and other physical properties, attracted considerable attention even in the so- called dark ages. But these notices rather amuse us by their quaint absurdity, as we should now regard it, than throw light on the progress of the science. Thus Albertus Magnus in the middle of the 13th century tells how the

cold in the lofty mountains makes the ice so dry that it congeals into crystal (ex «lo sicco coagulat glaciem im crystallum). Agricola, three centuries later, knew little more, though affirming that crystallus was not ice but rather succus frigore densatus. Still he indicates some simple forms of crystals, and notes the fissile structure of some stones, as the lapis specularis (probably gypsum or mica), a property which as cleavage soon exercised much influence. Nicolaus Steno, the Dane, born in 1638 at Copenhagen, but for atime resident at Florence, amidst his well-known studies in anatomy, found leisure also to speculate on questions concerning the structure of the earth and the nature of gems and precious stones, As his treatise De solido intra solidum naturaliter contento, published in 1669, anticipated in geology some modern speculations and theories subsequently confirmed, so it also contains the germs of important facts in crystallography. It was still the wondrous rock-crystal with the polished sides of the middle prism and the terminal points of the pyramids, joined by the central axis of the crystal, that formed the starting-point of his speculations, and led him to introduce some new notions and terms into the science. How these crystals originated was doubtful, but they evidently grew, not from within like plants, but from without, by the addition of new layers of minute particles carried to the crystal by a fluid, and laid down specially at the ends, as shown by the fine striz that are never wanting on the middle planes. His rejection of extreme cold as the causa eficiens, for something similar to magnetic power, is again a suggestive idea, and not less his conclusion that crystals therefore were not formed only at the first beginning of things, but continue to grow even at the present day. Still more important asa step in the progress of the science would be his assertion that the number and length of the sides in the plane of the axis may vary widely

without change in the angles (in plano amis, laterum et numerum et longitudinem varie mutari non mutatis angulis), could we regard it as having a wider application than to the case in hand. It was perhaps more a deduction from the mathe-

matical form of the body than a generalization from |

observed facts. But some of his other descriptions show great powers of observation, and in his notice of the cleavage of calespar, and its division into other rhomboidal bodies, we have again a fact that in other hands was to bear important fruits.

Erasmus Bartholinus, another Dane (born 1625, died 1698), made known, in his Hxperimenta Crystallr Islandict disdiaclastici (1670), another property of the same mineral, very remarkable in itself and its results to science. This was the double refraction of the beautifully transparent variety sent from the Rédefiord in Iceland to Copenhagen. In the same tract, it may be mentioned in passing, occurs the first reference to the blowpipe as a mean of applying heat to minerals. But the optical fact, turning the atten- tion of mathematicians to crystals, had more direct influence on our science. The celebrated Huyghens described the -game miranda refractio, and pointed out its laws; he also measured the angles of the rhomboids with a close approximation to truth, and remarked the occurrence of a less distinct double refraction in quartz—n crystallo duplex esset refractio. He likewise observed the peculiar cleavage of calespar, which he tried to explain by building up the crystals of spheroids. Leeuwenhoek also, in his Arcana Nature (1695), mentions cleavage in gypsum and Muscovy glass, and tried to estimate the thickness of the lamina, which Newton in his Optics in 1706 showed could be calculated from his doctrine of the colour of thin plates. In the same work Newton gives an account of the double refraction of Iceland spar and the Jaws it follows, and, observing the changes to which the rays were subject, asks

if these rays of light may not have different sides, with different properties—the first anticipation of the polariza- tion of light, so important in this science. Returning to Leeuwenhoek, we find him showing salts of various

forms, growing up in solutions under his microscopes. About this time too Guglielmini in his treatise on these bodies, De Jalibus Dissertatio Epistolaris (1707), tried to prove that they could all be divided into molecules of a few regular forms, and affirms as a consequence that the inclination of the planes and angles is always constant. At a somewhat earlier period the celebrated Robert Boyle had published a treatise on precious stones, in which he describes many

- properties of crystals and their peculiar forms which he

compares to those of salts. He also pointed out the crystallization of bismuth from fusion by heat—a fact often overlooked by later observers.— The attention of men of science was now thoroughly directed to the forms and origin of these bodies, and many curious observations might be collected from the writings of De la Hire, Woodward, Cappeller, Henckel, and others. But we pass on to Linnzus, whose Systema Nature formed, in this as in other departments of natural science, the com- mencement of a new period in its history. In his first edition in 1736 he gave a classification which, as he says himself, though far from perfect and often blamed, had enabled others mounted on his shoulders to see wider. Some of these successors he enumerates in the twelfth edition of his System (1768)— among them Wallerius, Swab, and Cronstedt. He admits in the preface that he had laid aside the study of stones in which he once delighted, and therefore could not boast of his knowledge of lithology. Lithologia mihi cristas non eriget, lapides enim guos quondam in deliciis habut, tradita demum alias dis- ciplina, seposui, are his characteristic words Still there is much that was important in his work. Thus he distin- guishes figured stones from those that are amorphous, and notes the difference of the ¢essellata or cubical from the prisma or long columnar and the pyramis or pointed forms. — Then he figures rudely, it may be, and describes some forty common forms of crystals, and gives examples of minerals in which they occur. His table of "A finitates crystallorum" is even more suggestive, and could scarcely fail, if followed out, to lead to further advances. The use he made of these forms as important characters in describing and classifying minerals was well calculated to promote their study. Even the fact that he cut out models in wood of the forms he saw, shows in what a truly practical manner he regarded the subject. His notions regarding the formation of

crystals were, however, very imperfect. Salt, he affirms, is the only known natural cause of crystallization, and con- sequently the forms of the crystals of other substances were determined by the salts in union with them. 'This is the more remarkable, as he refers to an anonymous author in his own country, to whom he applies the words of Isaac, vox Swabiit, manus Cronstedti, as refuting this theory from the fact that crystals of metals were produced by fusion. The advanced character of these views of Linnzus appears more strongly when we contrast them with those of his great rival Buffon. According to him crystals are only a result of organization, so that the prisms of rock crystal, the rhombs of calcspar, the cubes of sea salt, the needles of nitre, and others are produced by the motions of organic molecules, and specially of those derived from the remains of animals and plants found in calcareous masses, and in the layer of vegetable earth covering the surface of the globe. Hence he takes no note of crystallization among the characters of minerals. Very different was the influence. of Linneeus on Romé Delisle (born 1736, died 1790), whose Essai de Cristallographie appeared first in 1772, and in an enlarged form in 1783. Working in the spirit of his

Bergman.

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master, he formed a large collection of mineral crystals which he examined with great care, comparing the forms of the faces and measuring the angles. In doing this he soon found that the same mineral assumed various forms,—calespar, for instance, sometimes that of a six-sided prism, at others of a rhomboid, and fluor-spar in some cases form- ing cubes, in others octahedrons. In trying to explain this fact, he assumed that in each species there was a certain original form, generally the most simple he could find, from which all the others might be derived when cut in a parti- cular manner. Thus by cutting off the angles of the cube, it may be converted into an octahedron. Werner in his treatise On the External Character of Minerals had used

the terms truncation, bevelling, acumination (Abstumpfung,

~~Zuschirfung, Zuspiteung) for similar changes on the fundamental forms, but Delisle probably had no knowledge of this fact, and in other respects could borrow little from Werner, who in crystallography scarce went beyond Linneus. The progress Delisle made in the ten years between his first and second work (Cristallographie ou Description des formes propre a tous les corps du régne minéral, 1783) is truly remarkable. He now affirms in clear and distinct terms "that amidst all the innumerable variations of which the primitive form of a salt or crystal is susceptible, there is one thing that never varies and remains constantly the same in each species,—that is, the angle of incidence, or the respective inclination of the faces to each other." Hence these angles are truly characteristic of each species, but only of the primitive forms, from which others, which he names secondary, are derived by various modifications. Of these principal primitive forms he assumes six; but these are less skilfully chosen and, as now seen, not always truly distinct. But many defects were compensated for by the great labour he expended on figuring aud his superior accuracy in measuring crystals. This he was able to secure by the use of the goniometer recently invented by Carangeau, the new instrument, as it were, transforming the science. Then his observation of twin crystals, or macles, as he named them,—which he showed were characterized by their re-entering angles as made up of two crystals, or two halves of one crystal, in a reversed position,—was also a noteworthy step. How much he accomplished may be judged from the fact that he gives figures of more than 500 regular forms, in place of the forty described by Linneus. He had probably carried his system as far as it could go, and not merely familiarized the forms of crystals to mineralogists, but also suggested the possible connections that might exist among them.~~

~~Delisle seems to have assigned little value to cleavage, and in his preface speaks contemptuously of the crystal- loclastes (brise-cristaux) as innovators in the science. But even earlier, in 1773, Bergman, the well-known Swedish chemist, had shown its importance, and used this peculiar structure to explain the relations of the different forms of crystals observed in the same mineral. Starting from the rhombohedron of calespar, he placed it witli the chief axis upright, and then building up other similar rhombs on it, formed a six-sided prism with rhombic ends. By stopping at a certain stage, it became a dodecahedron, or body with twelve rhombic faces, which he assumed, not quite accurately, to be the same as that proper to garnet.~~

~~Again, placing this garnet-form in proper position and adding other rhombs, he showed how it easily changed into another characteristic of the hyacinth (in aliam facile migrat), whilst by other changes different crystals were produced. But he did not proceed far in the direction thus indicated, and deeper views, with more accurate facts and measure- ments, were required before this could be done.~~

~~These were found in the works of Réné Just Haiiy (born~~

~~1723, died 1822), who seems to have been led almost by accident to his theory. Curiously it is still the same niineral that with him, as with so many of his predecessors, forms the starting-point. When looking over the cabinet of Citizen Defrance a hexahedral prism of calespar was accidentally broken from a group to which it belonged, and given him in a present. This crystal showed at the base, where it had been detached, a broken corner with the peculiar brilliant lustre, "'poli de la Nature," of the cleavage faces. Haiiy's attention was arrested by the fact, and he tried to obtain similar faces on other corners, but he only succeeded on the three alternate edges at each end of the prism. Continuing the process further, he found that he could remove slice after slice, till no vestige of the original prism was left, but in place of it a rhomboid per- fectly similar to the Iceland spar and lying in the middle of the prism. The fact struck him with surprise, mingled with the hope that it was not isolated, and this, he says, served to " develop my ideas regarding the structure of crystals, and has been, as it were, the key of the theory " (et a été comme la clef de la théorte). Following it out on differently formed crystals of this mineral he found they could all be reduced toa similar internal nucleus. But when the mineral was distinct the nucleus had a different form. 'Thus in fluor-spar the nucleus was an octahedron ; in heavy spara right prism with rhombic bases ; in galena, or sulphate of lead, a cube ; and so of other substances. In each also these forms were constant, relative to the entire species, so that its angles were subject to no appreciable variation. Even where crystals cannot be thus mechanically divided, Haiiy stated that theory aided by certain indica- tions might serve to discover the primitive form.~~

On these and other similar facts, Haiiy erected his cele- brated theory of the structure of crystals. there exists what he calls its integrant molecules,—solid bodies incapable of further division and of invariable form, with faces parallel to the natural joints indicated by the mechanical division of the crystals, and with angles and dimensions given by calculation and observation combined. These molecules are marked in different species by distinct and determinate forms, except in a few regular bodies, such as the cube, which do not admit of variations. From these primitive or integrant molecules all the various crystals found in each species are built up according to certain definite laws, and thus the secondary crystals, as he names them, are produced. Of primitive forms only six were known from observation. These were the parallelopiped, the octahedron, the tetrahedron, the regular hexahedral prism, the dodecahedron with equal and similar rhombic faces, and the dodecahedron with triangular faces, consist- ing of two regular six-sided pyramids joined base to base. In order to produce those secondary crystals which covered over the primitive form, so as to disguise it in so many different ways, he supposed the enveloping matter to be made up of a series of laminz, each decreasing in extent either equally in all directions, or only at certain parts. This decrease takes place by the regular subtraction of one or several ranges of integrant molecules in each successive layer ; and theory, determining by calculation the number of these ranges, can represent all the known results of crys- tallization, and even anticipate discoveries, and indicate hypothetical forms which may one day reward the research of naturalists. He thus claims for his theory that greatest proof of its truth and value which a scientific theory can present,—the power to anticipate observation and to foretell future discoveries. As an example of this process Haiiy showed how by applying successive layers of integrant molecules, each less by one row all round, to the faces of the primitive cube, a rhombic dodecahedron was necessarily formed. In other cases he assumed that the decrease was

In each mineral theory of structure of

crystals,

~~Law of symmetry.~~

~~Relation to chemical composi- tion.~~

~~Zs~~

~~Criticisms of Haiiy's system.~~

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~~of departure, and thus was parallel to a diagonal. In the case above supposed the decrease took place by two ranges in breadth for one in height or thickness, but other less simple ratios might be supposed, as of two in breadth to three in height, and to these the name mixed decrements were given, There were other possible modes of decrease also distinguished, to which it is needless now to refer. But by these and other modes of procedure Hatiy showed how the various secondary crystals could arise from his assumed primitive forms or molecules.~~

~~The great advance secured by this theory of Haiiy's was the firm establishment of the idea that the forms of crystals were not irregular or capricious, but definite and based on fixed and ascertainable laws. Hence he showed that, whilst certain secondary forms may be deduced froma given nucleus, there are other forms that cannot occur. Further he pointed out what he named " the law of symmetry," in consequence of which, when any change of a crystal form took place by its combination with other forms, all similar parts—angles, edges, faces—were modified in the same way at the same time. All these changes too, he said, could be indicated by rational coefficients or commensur- able numbers.~~

~~A not less important principle, which Haiiy endeavoured to establish, was the intimate relation of the crystalline~~

~~. form to the chemical composition of minerals, so that even~~

~~prior to analysis the real diversity of species formerly con- joined might be inferred from differences in the angles. As an example of this may be mentioned his discovery of the difference of the angles in crystals classed~~

together as "heavy spar," a difference only explained when Vauquelin showed that those with the larger angle from Sicily con- tained the new earth strontia, discovered by Klaproth, instead of the baryta found in those from Derbyshire. The modifications which this view has had to undergo from wider observations will be noticed afterwards, but even its enunciation by Haiiy formed a great stimulus to research both as to the forms and the composition of minerals. Taken in connection with the perspicuous and elegant style of his work, its clear arrangement and full illustration by figures, its influence on the progress of the science may be readily understood. Many deficiencies in his system are now easily seen, and some of the most fatal were soon brought to light by the very stimulus his works gave to the science. Thus one of the first to criticise the system was Weiss, who translated Haiiy's work into German in 1804. He not only pointed out that the primitive forms erred both in excess and defect, but struck deeper at the theory by showing that the integrant molecules might better be entirely laid aside. They were not wanted to explain the observed facts, and the so-called planes built up of them would not reflect the light. Bernhardi, a medical man in Erfurt, attacked the theory from other poiuts of view. Thus he objected to the prisms which Haiiy had chosen as primitive forms that their dimensions could not be deter- mined from themselves, their height depending on another form, and therefore that octahedrons or double pyramids were preferable. Then he showed that various crystals were more readily explained from other forms than those taken as their primaries by Haiiy, and that in the regalar formsit wasquite indifferent whether the cube or regular octa- hedrou was chosen, whilst among the irregular forms other divisions might be established, more conformable to nature. It is needless to specify further criticisms on Haiiy's theory, as its very merits soon led to its being replaced by more profound views. Thus the importance it ascribed to the angles of the faces and cleavages of crystals for the true determination of minerals formed a strong motive for their more accurate determination. The discovery also of the

not parallel to the edges, but took the angles as its point |

reflecting goniometer in 1809 by Wollaston (born 1766, died 1829) enabled this to be done with a degree of accuracy previously impossible. The writings of Dr Wollaston himself, of Mr Brooke, and especially the Introduction to Mineralogy (1816) of William Phillips (born 1773, died 1828) were specially rich in material of this kind. The influence of this accumulation of facts was shown less in the correction of Haiiy's data than in the necessity it involved of some new and more. workable theory for connecting the facts than that adopted by the French miueralogist.

For this science is chiefly indebted to Weiss, already Weiss. mentioned as the translater and critic of Hatiy's great work. Born at Leipsic in 1780, and educated in its university, where he began to teach in 1803, he inaugurated his appointment as ordinary professor of physics in 1808 by the publication the following year of a dissertation, De indagando formarum crystallinarum charactere geometrico principalt. In this he pointed out for the first time the im- portance of the axes of crystals, towhich, however, Haiiy had referred. 'The axis," he says, "is truly the line governing every figure (omnis figure dominatrix) round which the whole is uniformly disposed. All the parts look to it, and by it they are bound together as by a common chain and mutual contact." But the axes are not mere geometric lines physically dead and powerless. It is in reference to them that the forces work which have formed the crystals. Hence the importance of the inclination of the faces to the axes as characterizing forms, and the simpler numbers by which the relations of these faces might be expressed. He further points out various distinctions in the forms of crystals, in which his followers have traced the germs of the systems of crystallization he subsequently established. This was done in his memoir, " Uebersichtliche Darstellung der verschiedenen natiirlichen Abtlicilungen der Krystallisationssysteme," published in 1815 in the Transactions of the Academy of Berlin, to which city he had been transferred in 1820. In this memoir the terms regular system, four-membered system, two-and-two-membered system, and others afterwards used first appear. In other memoirs in the same series, of which the more important were those on the crystallization of felspar, epidote, gypsum, and quartz, his views were more fully developed. Along with these views of the general relations of crystals Weiss also introduced important improvements in the mode of designating the faces of crystals, so as to render it more'easy to calculate their angles.

Haiiy had already done this in conformity to his theory of decrements, but the expressions were complex and the numbers large. But here as elsewhere, Weiss says, the mechanical atomistic views by which Haiiy was led must be laid aside, in order to allow the ascertained knowledge of the mathematical laws and relations of crystalline structure to come out purely. Leaving out of view, therefore, the supposed primitive forms, and looking only to what was above and beyond them, Weiss referred all to the essential relations of the axes or the co-ordinates of the faces, and thus gave at once far more precision and simplicity to the symbols, and facilitated the necessary calculations.

It often happens in periods of intellectual activity that Mohs. several inquirers are engaged on the same subject, and, following it out in similar directions, come to results that more or less coincide. Such seems to have been so far true in regard to crystallography, and these discoveries of Weiss have been claimed for Mohs. Born in the Hartz in 1773, he studied at Halle, turning his attention specially to mining. In 1812 he became professor in Gritz, and in 1818 succeeded Werner in Freiberg, which a few years later he left for Vienna, where he taught with great success. He died in 1839. The dates of their publications leave no

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doubt that Weiss preceded him in promulgating these new views, but also show that Mohs wrought them out in a more systematic form, and made them more generally known. In 1820 he published his Charakteristik des naturhistorischen Mineralsystemes, followed in 1822 by his Grundriss der Mineralogie. Both these treatises were translated into English, the second by the well-known Haidinger, then residing in Edinburgh. The clearness and precision with which he marked out and defined the various terms and new ideas required, and followed out the Jaws regulating combinations, had a great effect in giving a wider currency to his writings. The thorough mode in which he traced out the series of forms in the systems and explained these also added to their popularity. Professor Jameson too gave it a higher authority and wider accept- ance, describing it "as eminently distinguished by its originality and simplicity." Its success was further promoted by the

remarkable discovery made about the same time by Sir David (then Dr) Brewster. In connection with his observations on the polarization of light, this dis- tinguished optician had endeavoured to point out the con- nection between Haiiy's nuclei or primitive forms of crystals and the number of their axes of double refraction, and even shown that Haiiy had in some cases chosen erroneous forms, as they did not agree with their optical characters. The appearance of Mohs's views threw unex- pected light on the fact, as his system of crystallography harmonized in a most remarkable manner with the arrange- ment proposed on optical grounds. In reality, as now well known, all minerals crystallizing in the regular system of Weiss and Mohs with equal and uniform axes show only single refraction ; those belonging to the two and one axial and three and one axial systems of Weiss, the pyramidal and rhombohedral of Mohs, have double refraction with only one optical axis ; whilst those in the three other systems show double refraction and two optical axes. As Whewell has well remarked, " Sir D. Brewster's optical experiménts must have led toa classification of crystals into the above systems, or something nearly equivalent, even if the crystals had not been so arranged by attention to their forms."

The establishment of this system, whether due to Weiss

or Mohs, or in part to both, gave to crystallography as a

pure science essentially its present form. Taken in connection with the law that the indices marking the relative dimensions of the parameters are always rational numbers, and seldom large, with the symmetry of forms, and the grouping of the faces in zones, we have the leading principles on which it depends, The subsequent progress of the science has been rather directed to working out and completing the structure, and showing the mutual relations of its essential principles, than to modifying the foundations on which it rests. These researches have taken two chief directions, the one explaining the geometrical properties of crystals, and the systems under which in consequence of these properties they necessarily fall to be classed, while the second has regard to the physical properties of crystals, that is, of the various bodies, especially the native minerals, assuming these forms. Before noticing these we must refer to another point

in which Haiiy's views were also about the same time remarkably modified and extended.

Haiiy, we have seen, maintained that a very close connec-

. tion always existed between the crystalline character and the

chemical composition of minerals, so that from diversity in the angular measurement of two crystals we might infer a difference in their chemical composition, or the reverse. More accurate analyses soon showed that this law had not that universal application which Haiiy assumed, and even in 1815 Fuchs had pointed out that certain elements were

what he named vicarious, so that in compounds a certain

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amount of one could replace so much of some other. The remarkable theories and researches of Berzelius soon rendered some change in this respect inevitable, and it was carried out by the discovery of isomorphism by his pupil Mitscherlich in 1822. The subject, however, belongs less to crystallography than to chemistry or mineralogy, and we can only mention the general principle. Mitscherlich showed that there are certain substances which crystallize in forms closely resembling each other, and with the corresponding angles only differing by one or two degrees, or even less. Thus the carbonates of iron and manganese, or lime and magnesia, agree nearly in form and dimensions. Such substances were named isoniorphous, and were found to have the tendency to replace or be substituted for each other in compound bodies, with very slight modification of the forms or angles of the crystals. Though at first denied by Haiiy and lis followers, this truth is now fully established, and has had vast influence in the determination and classification of minerals. As modifying the same conclusion of Haiiy, but in an opposite direction, we must also mention Mitscherlich's further discovery of dimorphism, according to which the same element (as sulphur), or the same compound (as carbonate of lime), when crystallizing under different conditions, especially as regards tempera- ture, may assume two distinct forms of crystals belonging even to different systems. Instances are even known of trimorphism and

~~polymorphism, in which the same sub- stance may occur in three or more forms of crystalliza- tion.~~

~~The mode of formation of crystals, and the powers that are active in their formation, were, as we have seen, favourite subjects of speculation with the earlier writers on crystallography, and are closely connected with the chemical composition of minerals to which we have just referred, This subject continues to attract many inquirers, and has given occasion to some remarkable speculations; but it can hardly be affirmed that much progress has been made in this direction. Crystals may still be seen, asin the time of Leeuwenhoek, springing out of solutions under the microscope, and continuing to increase insize, but the powers that are active escape our notice, and we are still left almost in the same region of speculation as our predeces- sors. Such discussions, in truth, concern ratner the general constitution of matter than the special corner whose history we have been following, so that the words of Brewster still hold true :—"In whatever way crystallographers shall~~

~~succeed in accounting for the various secondary forms of~~

~~crystals, they are then only on the threshold of their subject. The real constitution of crystals would be still unknown ; and though the examination of these bodies has been pretty diligently pursued, we cau at this moment form no adequate idea of the complex and beautiful organization of these apparently simple bodies."~~

~~Returning .to the more special subject of pure or geometric crystallography, one great object of recent inquiry has been to discover some method of designating the forms or faces of crystals by numbers or symbols, that would at once point out their general relations to each other, and facilitate the calculation of their angles so as to check or control observation. HaiIy had already attempted to do this in his great work, by means of his theory of decrements, but his materials were still too imperfect, and his symbols are often very complex. Still the weight of his name retains great influence in France, where a system founded on his, but modified by the more recent views, prevails. It is generally associated with the name of Armand Lévy (born 1794, died 1841), who in 1837 published an important work on Mr~~

Heuland's collection (Description dune collection des Minéraux formée par M. H. Heuland), illustrated by numerous plates of crystals, He

Powers operating still un- known.

Crystallo- graphic symbols,

assumes six prisms or parallelopipeds as primary forms, and designates the faces, angles, and edges by letters, as was done by Haiiy. This system is adopted and explained by Dufrénoy in his Zraité de Minéralogie (Paris, 1844-56), and by Des Cloizeaux in his Manuel (Paris, 1862-74.)

In Germany also various methods have appeared. Weiss himself only published special papers, but his views have been wrought out by several of his many followers. Thus one of his favourite pupils, F. E. Neumann, in his "Contri- butions" (Beitrdge zur Krystallonomie) in 1823, showed how crystals might be represented not so much by the faces as by their normals, that is, by lines drawn from the centre of the system vertical to the faces. Cleavage, he says, and the reflection of light, d&c., all indicate a force acting vertical to the faces, or in the normal. He further brought clearly out the arrangement of the faces in zones, and showed how they could be represented to the eye either by lines on a plain surface, or by great circles on the circumscribing sphere. Quenstedt of Tiibingen, another pupil of Weiss, made known a similar method in 1835, which he has since illustrated in his Jlethode der Krystallo- graphie in 1840, in his Mineralogie, 1855 (2d ed. 1863), and more fully in his Grundriss der bestimmenden und rechnenden Krystallographie, 1873. The truest representa- tive of Weiss, however, is generally regarded as Gustaf Rose, who laid the foundation of his reputation by his ac- count of the "crystallization of sphene and titanite" in 1820. His Hlemente der Krystallographie first appeared at Berlin in 1833, and in a third edition in 1873.

Mohs's method was expounded in his works already noticed, and became better known in Britain by Haidinger's translation of his Z'reatise on Mineralogy, published at Edin- burgh in 1825 ; and is further explained in Mohs's Anfangs- griinde der Naturgeschichte des Mineralreichs (1832, 2d

edi- tion by Zippe, 1839). Haidinger, besides many memoirs, has also published a separate work in which the method is fully explained (Handbuch der bestimmenden Mineralogie, 1845). But wider success and more general adoption has attended the method of Dr Carl Naumann, in which the faces are represented by means of their co-ordinates, and thus in an easily understood form. Born in 1797, Naumann began his studies under Werner, and completed them under Mohs, and has been regarded as carrying out the system of his teacher, whilst trying to mediate between him and Weiss. His Lehrbuch der reinen und angewandten Krystallographie appeared in 1830; his Anfangsgriinde der Krystallographie in 1841, 2d edition, 1855, and his Theoretische Krystallo- graphie in 1856. His LHlemente der Mineralogie, first published in 1846, and of which a ninth edition appeared in 1874, has still further extended his method and nomen- clature. His system, occasionally in slightly altered form, has wide prevalence in Germany, and has been introduced into this country in Nicol's Mineralogy, 1849, and in the article on Mrneratoey in the eighth edition of the present work. Dana in his Mineralogy, 1854, has given it wide currency in America; he has endeavoured to simplify the mode of representing the faces. Another method, which in Germany in great measure divides the field with Naunrann's, may be said to have had its origin in Britain. In 1825 Dr Whewell published in the Philosophical Transactions a memoir on "A General Method of Calculating the Angles of Crystals," in which he referred only to Haiiy's views, and in 1826 another "On the Classification of Crystalline Combinations," founded on the methods of Weiss and Mohs, especially of the latter, with which he had in the meantime become acquainted. The author himself states that his method.had little value as a method of calculating the angles of crystals. But in 1839 Professor Miller of Cambridge, partly adopting his views, and partly aiding himself by the suggestions of Neumann

and of Grassmann, who, without any knowledge of what his predecessor had done, had re-invented the method of representing the position of the faces of crystals by corres- ponding points on the surface of a circumscribing sphere, brought out his Treatise on Crystallography. In his edition of Phillips's Mineralogy, 1852, the same system was also employed.

~~In Germany this system has found many followers, and is used in several of the best text-books, among which may be mentioned the Lehrbuch der Krystallographie of Karsten, 1861, and the works with the same title of Von Lang, 1866, and Dr A. Schrauf, 1866.~~

~~The relative merit of the methods mentioned cannot be discussed in this place. The system of Naumann is, perhaps, the one now most generally prevalent, and most easily understood by beginners, as giving the most graphic picture of the various forms and their combinations. Miller's system, on the other hand, is regarded as better adapted for the various calculations needed in the higher portions of the science, and is therefore often preferred by those who make a special study of the subject. How closely their merits are balanced is shown by the fact that Groth, in his recent valuable work, Physikalische Krys- tallographie, Leipsic, 1876, whilst preferring Naumann's, deems it necessary to explain Miller's also to his' readers, and to give a comparative table of the symbols employed by Naumann, Miller, and Lévy, so that the one may be, as it were, translated into the other. Similar tables may also be found in Des Cloizeaux's Mineralogie and in Schrauf's Ailas.~~

~~Many very interesting facts have also been recently ascertained, showing the intimate relation that exists~~

~~between the various physical properties of crystals and their Physical crystallographic characters, proving very distinctly that the properties~~

~~systems of crystals are not mere artificial arrangements of speculative men, but have a real foundation in the structure of the bodies observed. We saw already how Brewster proved this connection in reference to their optical properties. He continued his researches on this subject for many years, and it was also pursued by many of his contemporaries, among whom Biot, Sir John Herschel, and Haidinger may be uamed. More recently the stauroscope, invented by Von Kobell, and the polarizing microscope of Norremberg have proved valuable aids in investigating these properties. In France M. des Cloizeaux has specially directed attention to the optical properties of crystals and their value in mineralogy (De l'emploi des propriétés optiques biréfringentes en Minéralogie, 1857, and Sur Pemplor du microscope, in 1864), and in his Manuel de Minéralogie records many~~

remarkable observations made both by him- self and others. In Britain and in Germany these investigations have recently been conjoined with the examination with the microscope. of thin slices of minerals and rocks. The method of preparing such transparent sectious was first described by William Nicol of Edinburgh, to whom is also due the discovery in 1828 of the peculiar prisms of Iceland or calcareous spar which are now known by his name, and which form an almost indispensable part of apparatus for such researches. It is scarcely possible to avoid noticing the important influence which this one mine- ral with its marked properties has had on the progress of the science whose history we are describing. In this country a new impulse was given to the study by Mr Sorby's memoir "On the Microscopical Structure of Crystals," published in the Journal of the Geological Society in 1848. In Germany the workers in this field are so numerous that we cannot specialize individuals, but shall only refer to the works of Zirkel (Mvkroskopische Gresteimsstudien, 1863, Mikroskopische Beschaffenheiten der Mineralien, 1873, &c.), Schrauf (Lehrbuch der physikalischen Mineralogie, 1868), and Rosenbusch (Mtkroscopische Physwographie der

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Mineralien, 1873), both for further information on the subject generally, and for lists of the more important recent publications. How valuable it has become may be seen from the fact that these transparent sections, examined between two Nicol's prisms, from the phenomena of the interference of light, readily enable the observer to deter- mine to which of the six systems of crystallization the mineral interposed belongs, and thus to fix one of its most essential characters. In this way the exact composition of many fine-grained crystalline rocks can be determined, and much light thrown on their history.

In regard to the other physical properties of crystals, it must suffice to say that they all indicate a similar close dependence on tlieir geometric character. The same systems shown by their mathematical forms and optic

properties reappear in reference to their relations to heat, magnetism, electricity, and other properties. The regular or tesseral minerals, with simple refraction of light, are shown by Senarmont's researches also to conduct heat uniformly in all directions, and their magnetic and electric peculiarities are similar. The tetragonal and hexagonal crystals with one chief axis, as they show double refraction of light with a single optic axis, have also analogous modes of conducting heat, of expanding under its influence, and of transmitting IMagnetism and electricity. And again, the three other systems with unequal axes, as they show two optic axes, exhibit also corresponding peculiarities in respect to the other properties mentioned. In this we have a remarkable instance of connection of the various physical sciences, and a strong proof of the sound basis that crystallography attained by the discoveries of Weiss and Mohs.

A great deal has been recently done in improving the instruments employed in determining the forms and dimensions of crystals. Though for first and rough approximations to the angles the early form of the hand goniometer may still be used, even the reflecting goniometer of Wollaston no longer meets the requirements of modern accuracy. In 1820 the Royal Academy of Sciences at Berlin offered a prize for the best methods of measuring these angles, which was gained by Dr Kupffer. Malus added a telescope to Wollaston's goniometer, and other methods of increasing its accuracy have been proposed, as by Babinet and Mitscherlich. Frankenheim, Haidinger, and others have also endeavoured to perfect the methods or means of observation which now, as tested by comparison with the results of calculation, seem fully adequate to the wants at least of determinative mineralogy.

The forms of crystals that occur in native minerals are described more or less fully in several of the works already mentioned. The Atlas der Krystal-Formen des Mineralreiches of Dr A. Schrauf, 1865-1873, is intended to form a complete collection of all the forms observed in the mineral kingdom,—estimated as exceeding 10,000 in number, described in very many separate treatises and memoirs, and every day becoming more numerous. The arrange- ment is alphabetical, and the work, from its accuracy and rich material, is highly valuable but stillunfinished. The forms of salts and artificial crystals are described in Rammelsberg's Handbuch

~~*der krystallographische Chemie, 1855, and supplement, 1857, and many of them also in Groth's Krystallographie.*~~

~~*The history of crystallography is related in C. M. Marx's Geschichte der Krystallkunde, 1825 ; Whewell's HIstory of the In- ductive Sciences, vol. iii.; Von Kobell's Geschichte der Mineralogie, 1864 ; Kenngott's Uebersicht der Resultate der Mineralogische For- schungen, 1844-1865; Quenstedt's Grundriss, 1873, &c., from which further information may be obtained. (J. NI.)*~~

~~*CSOKONAI, Mimary Virez (1773-1805), an Hunga- rian poet, was born at Debrecsin in 1773. Having been educated in his native town, he was appointed while still very young to the professorship of poetry there; but soon after he was deprived of the post on account of the immor- ality of his conduct. The remaining twelve years of his short life were passed in almost constant wretchedness, and he died in his native town, and in his mother's house, when*~~

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~~*only thirty-one years of age. Csokonai was the author of a mock-heroic poem called Dorottya, two or three comedies or farces, and a number of love-poems. Most of his works have been published, with a life, by Schedel (1844-47).*~~

~~*CSOMA DE KOROS, Atzxanprr (c. 1790-1842), or as the name is written in Hungarian, Kérési Csoma Sandor, an Hungarian traveller and philologist, born about 1790 at Kors in Transylvania, belonged to a noble family which had sunk into poverty. He was educated at Nagy- Enyed and at Gottingen; and, in order to carry out the dream of his youth and discover the origin of his country- men, he divided his attention between medicine and the Oriental languages. In 1820, having received from a friend the promise of an annuity of 100 florins (about £10) to support him during his travels, he set out for the East. He visited Egypt, and made his way to Tibet, where he spent four years in a Buddhist monastery studying the language and the Buddhist literature. To his intense dis- appointment he soon discovered that he could not thus obtain any assistance in his great object ; but, having visited Bengal, his knowledge of Tibetan obtained him employment in the*~~

library of the Asiatic Society there, which possessed more than 1000 volumes in that language; and he was afterwards supported by the Government while he published a Tibetan-English dictionary and grammar (both of which appeared at Calcutta in 1834). He also contributed several articles on the Tibetan language and literature to the Journal of the Asiatic Society of Bengal, and he published an analysis of the Kah-Gyur, the most importaut of the Buddhist sacred books. Meanwhile his fame had reached his native country, and procured him a pension from the Government, which, with characteristic devotion to learning, he devoted to the purchase of books for Indian libraries. He spent some time in Calcutta, studying Sanskrit and several other languages ; but, early in 1842, he commenced his second attempt to discover the origin of the Hungarians. He had only reached Darjiling when he died on the 11th April 1842. An oration was delivered in his honour before the Hungarian Academy by Kotrés, the novelist.

CTESIAS, a Greek physician and historian, who flourished in the 5th century p.c. He was born of an Asclepiad family at Cnidus in Caria, and was in the early part of his life physician to Artaxerxes Mnemon, having, according to Diodorus Siculus, been taken prisoner of war. He was the author of a treatise on rivers, another on the Persian revenues, a history of India, which is only of value as recording the beliefs of the Persians about India, and, most famous of all, a history of Persia—the Persica, written in opposition to Herodotus, and professing to be founded on the Persian royal archives. Of his two histories we possess abridgments by Photius, which have been published by Stephens (Paris, 1557-1594). As to the worth of the Persica there has been much controversy, both in ancient and modern times. Its chief modern de- fenders have been Freret, in the Mémotres de l Académie des Inscriptions, vol. v., and Bahr, in his Prolegomenon to his edition of what has come down to us of the works of Ctesias (Frankfort, 1824). Aristotle rejected the testimony of Ctesias, which is opposed to that of the Jewish Scrip- tures, of the Persian historan Berosus, and of recently discovered cuneiform inscriptions. See Rawlinson's Hero- dotus (vol. i. pp. 71-74).

CTESIPHON, an ancient city in the south of Assyria, situated on the left bank of the Tigris, about twenty-five miles south-east of Baghdad. It is

reported by Ammianus to have been founded by a Parthian, Varanes by name, of whose history nothing is known ; it rose into importance when the city of Seleucia on the opposite bank began to decline ; and under the Parthian kings, who originally

selected it as a winter residence, it ultimately acquired the rank of the sole capital of their dominions. On the fall of the Parthian empire it naturally declined ; but on the establishment of the Persian dynasty of the Sassanids it recovered somewhat of its prosperity, and was occasionally chosen as the residence of royalty on account of the pleasure-grounds and hunting-parks in the vicinity. At the time when it fell into the hands of the Roman emperor Severus (232 A.D.) its population must have been very great, as it furnished no fewer than 100,000 prisoners of war. About 263 it was besieged by Odenathus, king of Palmyra; and in the minority of Sapor II. it was taken by storm by a Mesopotamian chieftain named Thair. Though the emperor Julian gained the day in a great battle before the city, and its capture seems to have been one of the chief objects of his manœuvres, he retired without attempting an investment. In 637 it was abandoned by Yezdejird, the last of the Sassanids, and seized by Sa'ad, the Arabian general, who found within its walls so extensive and costly a booty that, after the works of art and a fifth of the whole were set apart for the caliph, he was able to bestow 12,000 dirhems, or upwards of £300, on each of his 60,000 soldiers. After this date the destruction of the city seems to have been rapidly accomplished ; and in the present day the site is marked by desolate ruins which, instead of preserv- ing the ancient name of Ctesiphon or the more modern name of. Maidan, are known to the people of the district as the burial-place of Soliman Pak, the barber of Mahomet. Amid the mounds of sun-dried bricks, one building still remains sufficiently entire to give some authentication to the glowing descriptions of the Arabian writers. This is the Takht-i-Khesra (throne of Chosroes), Tak-i-Khesra (arch of Chosroes), or, using the other form of Chosroes's name, the arch of Nushirvan, which consists of the great central hall of the palace, built in all probability by the monarch whose name it perpetuates. According to Tabari, the edifice when

complete was 450 feet in length, 180 feet in breadth, and 150 feet in height : adorned in front by a portico of twelve marble pillars of the noblest dimensions ; aud the vaulted hall, which had a height of 85 feet and a width of 72, was decorated with the signs of the zodiac in golden stars, The whole building appears from the remains to have been composed of baked bricks covered with a coating of plaster ; but the Arabian writers speak of it as consisting of polished stone. See Flandin, Voyage en Perse ; Rawlinson, The Seventh Oriental Monarchy. CUBA, the largest and richest of the West India Islands, and the most important colony of Spain, was dis- covered by Columbus on 28th October 1492, during his first voyage. It was first called Juana in honour of Prince John, son of Ferdinand and Isabella ; but after Ferdinand's death it received the name of Fernandina. It was sub- sequently designated Santiago, from the patron saint of Spain ; and still later Ave Maria, in honour of the Virgin. Its present name is that by which it was known among the natives at the time of its discovery. It was then divided into nine independent principalities, under as many caceques. The aborigines are described as living in a state of happy tranquillity among themselves, and possessing a religion devoid of rites and ceremonies, but inculcating a belief in the existence of a great and beneficent Being and in the immortality of the soul. Cuba was twice visited by Columbus after its discovery—in April 1494, and again in 1502. In 1511 his son Diego Columbus, for the purpose of colonizing the island, fitted out an expedition, consisting of above 300 men, under Diego Velasquez, who had accompanied his father on his second voyage. Their first settlement was Baracoa, and in 1514 they founded Santiago and Trinidad. In July 1515 was planted a town called San Cristoval de la Havana, which name was transferred

in 1519 to the present capital, the first-named place being now called Batabano, In 1538 Havana was reduced to ashes by a French privateer; and to prevent a similar disaster in future the Castillo de la Fuerza, a fortress which still exists, was built by Fernando de Soto, governor of Cuba, afterwards famous for his explorations in the southern and western regions

of the United States, as well as for the discovery of the Mississippi. In 1554 the French again attacked and destroyed Havana. The early settlers devoted themselves principally to the rearing of cattle ; but about 1580 the cultivation of tobacco and the sugar-cane was commenced, and this led to the introduction of the system of negro slavery. Previous to 1600 two other fortresses were built for the defence of Havana—the Moro and the Punta, which are still in existence. For about a century and a half after this period the island was kept in a state of almost perpetual fear of invasion from the French, English, Dutch, or the pirates infesting these seas ; and several ineffectual efforts were made to reduce it. About 1665 the walls of Havana were commenced. In 1762 Havana was taken by an English fleet and army under Lord Albemarle, the former consisting of more than 200 vessels of all classes, and the latter of 14,041 men, while the Spanish army numbered 27,610 men. The defence was exceedingly obstinate. The English commenced operations on the 6th of June; but it was not until the 30th of July that the Moro Castle surrendered; and on the 14th August the city capitulated. The spoil divided among the captors amounted to £736,185. By the treaty of Paris, in February of the following year Cuba was restored to the Spaniards, and from that time its progress has been rapid; indeed, this restoration is regarded by native writers as the true era whence its importance and prosperity are to be dated. The administration of Las Casas, who arrived as captain-general in 1790, is represented by all Spanish writers as a brilliant epoch in Cuban history. He promoted with indefatigable perseverance a series of public works of the first utility, introduced the culture of indigo, extended the commercial importance of the island by removing as far as his authority extended the trammels imposed upon it by the old system of privilege and restriction, and made noble efforts to effect the emancipation of the enslaved native Indians. By his judicious administration the tranquillity of the island was maintained uninterrupted at the time of the revolution in San Domingo; although, as is generally believed, a con- spiracy was formed at the instigation of the French among the free people of colour in Cuba. In 1795 @ number of French emigrants arrived from San Domingo. In 1802 Jesu Maria, a populous suburb of Havana, was destroyed by a fire, which deprived 11,400 people of their habita- tions. On the deposition of the royal family of Spain by Napoleon (the news of which arrived in July 1808) every member of the Cabildo took oath to preserve the island for the deposed sovereign, and

declared war against Napoleon. Since that time the island has been ruled over by a succes- sion of governor-captain-generals from Spain, armed with almost absolute authority, some of whom have conducted themselves honourably, while the names of others are . loaded with infamy, the office having been frequently sought and bestowed only as the means of acquiring a fortune. The deprivation of political, civil, and religious liberty, and exclusion from all public stations, combined with a heavy taxation to maintain the standing army and navy, have resulted in a deadly hatred between the native Cubans and the mass of officials sent from Spain. This has manifested itself in frequent risings for greater privileges and freedom. Of this kind were the conspiracy of the "Black Eagle" in 1829, the insurrection of the black population in 1844, the conspiracy of Narciso Lopez in

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1848, his landing with 600 men from the United States in 1850, and his third attempt in 1851, which cost his life and that of many of his followers, Soon after this a reformist party sprang up, desirous of coming to a settle- ment which should insure the rights of the colony without impairing the interests of Spain, and after protracted efforts this party succeeded in obtaining an inquiry at Madrid on the reforms needed by Cuba; but the only alteration decreed was that of a new system of taxation, more oppressive than the former. Great sympathy had long been shown for the Cubans by the people of the United States, and in 1848 President Polk had gone the length of proposing through the American ambassador at Madrid a transference of the island to the United States for asum of $1,000,000. A similar proposal was made ten years afterwards in the senate—the sum suggested being $30,000,000—but after debate it was withdrawn. When the Spanish revolution of 1868 broke out, the advanced party in Cuba at once matured their plans for the liberation of the island from the military despotism of Spain, rose in arms at Yara in the district of Bayamo, and made a declaration of independence, dated at Manzanillo, on the 10th of October of that year. This insurrection soon assumed formidable

dimensions in the eastern portion of the island ; on the 18th of October the town of Bayamo was taken, and.on the 28th the jurisdiction of Holguin rose in arms. Early in November the patriots defeated a force which had been sent against them from Santiago de Cuba, and the greater number of the Spanish-A merican republics hastened to recognize the Cubans as belligerents. During subsequent years, in spite of the. large and continued increase of the number of troops sent from Spain, and organized by the Spanish authorities in the island, the yearly campaigns up to the present time have shown that in the eastern interior the Cuban invincible, and that by maintaining a guerilla warfare they can attack and harass and even defeat their enemies who may be bold enough to act on the aggressive.

In a debate on Cuban affairs in the Cortes of Madrid in November 1876 it was stated that, during the past eight years, in attempting to crush the insurgents, Spain had sent to Cuba 145,000 soldiers and her most favoured commanders, but with little or no result. hand Cuba, under the perpetual apprehension of the rebellion, has seen her trade decrease, her crops reduced, and her creoles deserting to the United States and Spanish republics; and her taxes have been trebled in vain to meet the ever-increasing expenses and floating debts.

The island of Cuba is long and narrow, somewhat in the form of an irregular crescent with its convex side towards the north, It divides the entrance to the Gulf of Mexico into two passages, that to the north-west being 130 English miles wide at the narrowest part, between the points of Yeacos in Cuba and Sable on the Florida coast, and the south-west passage of nearly the same width, between the Cabo de San Antonio of Cuba and the Cabo de Catoche, the most salient extremity of the peninsula of Yucatan. On the north-east, east, and south-east, narrower channels Separate it from the Bahamas, Hayti, and Jamaica. Cuba lies between 74° and 85° W. long., and 19° and 23° N. lat. Its length, following a curved line through its centre, is 730 miles, and its average breadth is 80 miles. The area of Cuba is 43,319 English square miles; the neighbouring island of Pinos, 1214 square miles; and the smaller coastal islands, 1350 square miles ;—in all 45,883- square miles. The coast of Cuba is generally low and flat, and is surrounded by numerous islands and reefs, which render the approach both difficult and

dangerous to 'those not acquainted with the proper channels. The low nature of the shore subjects it to frequent floods and

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inundations ; and especially on the north side of the island there are many large lagoons, from which a considerable quantity of salt is obtained. No island, however, in pro- portion to its size, has a greater number of excellent

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Cuba and adjacent islands.

harbours, many of them accessible even to ships of the line. Of these the chief are the ports of Bahia, Honda, Mariel, Havana, Matanzas, Cardenas, Nuevitas, and N ipe on the northern side, and Guatanamo, Santiago de Cuba, Trinidad, and Cienfuegos on Xagua Bay on the southern.

The highest part of the island is in the range extend- Mountains. ing in the south-east from the Punta de Maysi to Cape Cruz, called the Sierra or Montafios de Maestra or Cobre, the summits of which are the Pico de Tarquino, 7670 feet, the highest point of the whole island; Gran Piedra, 5200 feet ; Yunque and Ojo del Toro, 3500 feet. From this sierra a ridge of much smaller general elevation follows nearly the central line of the island westward throughout its extent, rising to form a more marked range in the extreme west of Cuba, on which the Pan de Guajaibon attains 2530 feet, An almost isolated mass, of which the Pico de Potrerillo is the summit, 2990 feet above the sea, rises immediately behind the harbour of Trinidad, near the centre of the southern coastland. The south-eastern sierra is one great

calcareous mass, resting on a schistose formation. The summits are for the most part rocky and naked, occasionally interrupted by more gentle undulations. The central and western parts of the island contain two formations of com- pact limestone, one of clayey sandstone, and another of gypsum. Caverns abound in the limestone formations. The secondary formations, east of Havana, are pierced by syenitic and euphotide rocks united in groups. The syenite strata are intercalated with serpentine, and inclined to the north-west. In some places petroleum runs out of rents in the serpentine ; and abundant springs of this fluid are also found in the eastern part of the island.

The rivers are necessarily short, and flow toward the north Rivers, and south. The largest is the Cauto, rising in the Sierra del Cobre, and falling into the Bay of Buena Esperanza on the southern coast, after a course of fifty leagues, for twenty of which it is navigable by boats, though at low water obstructed by bars. The Sagua la Grande rises in the Sierra del Escambray, and falls into the sea in front of the Boca de Maravillas, being navigable for five leagues. The principal of the other rivers are the Sagua le Chica, the North and South Iatibonica, the Cuyaguateje, Sasa, Agobama, and Hanabana. North-east of Guantanamo the hills of the south-eastern sierra are known as those of Quibijan and Baracoa, and in the hill of Moa in this range there is formed a huge cavern in which the River Moa descends from a height of 100 yards, forming a superb cascade.

Situated within and near the border of the northern Climate. tropical zone the climate of the low coastlands of Cuba is

Minerals.

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that of the torrid zone, but the higher interior of the island enjoys a more temperate atmosphere. As in other lands on the border of the tropics, the year is divided between a hotter and wetter season, corresponding to the northern declination of the sun, and a cooler and drier period. The months from the beginning of May to October are called the wet season, though rain falls in every month of the year. With May spring begins in the island, rain and thunder are of almost daily occurrence, and the temperature rises

high with little daily variation. The period from November to April is called the dry season by contrast. On a mean of seven years, the rainfall at Havana in the wet season has been observed to be 27°8 inches, of the dry months 12°7 or 40°5 inches for the year. At Havana in the warmest months, those of July and August, the average temperature is 82° Fahr., fluctuating between a maximum of 88° aud a minimum of 76°; in the cooler months of December and January the thermometer averages 72°, the maximum being 78°, the minimum 58°; the average temperature of the year at Havana, on a mean of seven years, is 77°. But in the interior, at elevations of over 300 feet above the sea, the thermometer occasionally falls to the freezing point in winter, hoar frost is not uncommon, and during north winds thin ice may form, though snow is unknown in any part of the island. The prevailing wind is the easterly trade breeze, but from November to February cool north winds (los nortes, or ‘ northers”), rarely lasting more than forty-eight hours, are experienced in the western portion of the island, to which they add a third seasonal change. From 10 to 12 o’clock are tke hottest hours of the day; after noon a refreshing breeze (la virazon) sets in from the sea. Hurricanes may occur from August to October, but are less frequent than in Jamaica or Hayti, and sometimes five or six years may pass without such astorm. Slight shocks of earthquake are occasionally felt. There are no diseases specially indigenous to the island ; the yellow fever, which breaks out with renewed virulence regularly with the wet season in the coastlands and seaports of Cuba, annually causing great loss of life, is quite unknown in the interior.

The mineral riches of the island have not yet been ex- plored to any considerable extent. Though gold and silver have undoubtedly been found in the island, the quantity has never been sufficient to repay the labour of search. Gold was sent to Spain from this island by the early settlers, but it was more probably the accumulated wealth of the aborigines in previous centuries, wrested from them by tyranny and rapine at the period of the conquest, than the product of honest labour on the part of the colonists. Traces of auriferous sand are found in the rivers Holguin, Escawbray, &c. Some specimens of the finest gold have been obtained from the workings of Agabama and Sagua la Grande, but at an expense of time and labour that could not remunerate the parties engaged in it. In 1827 silver and copper were discovered in the jurisdiction of Villa Clara, and the first ores gave no

less than 7 oz. of pure silver to the quintal (=107? ib) of ore; but they have become less productive, probably from not being properly worked. The Cobre copper mines, twelve miles from Santiago, in the eastern part of the island, are of great extent, and very rich; a village of 2000 inhabitants has formed on their site, and a railroad unites them with the shipping port of Punta de Sal. As much as 50 tons of ore are taken out daily, the richest part of which, being broken up, is shipped to Europe ; while the poorer part is smelted at the works, yielding about 14 per cent. of metal. These mines were wrought with some success during the 17th cen- tury, and had been abandoned for more than 100 years. Coal of a highly bituminous character, affording a strong heat, and leaving very little solid residue in the form of ashes or

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cinders, is very abundant. In some places it degenerates into a form resembling asphaltum, and near the coast it is often found in a semi-liquid state like petroleum or naphtha. In the quarries near Havana a thick slate is found, fit for floors and pavements. Marbles and jaspers, of various colours, and susceptible of a high polish, are found in many parts of the island, and particularly in the Isle of Pines. It is generally believed that iron exists in various districts of Cuba, and many parts‘of the great Cordillera undoubtedly contain rocks of a ferruginous nature; but from the difficulty of access, the scarcity of fuel, and the want of capital, no extensive mining operations have been engaged in. Native loadstone, however, has been found in various parts, and chalybeate springs are numerous,

The only peculiar quadruped known in the island is the Animals,

jutia or hutia, an animal shaped like a rat, and from 12 to 18 inches in length exclusive of the tail. It is of a clear black colour, inhabits the hollows and clefts of trees, and feeds on leaves and fruits. Its flesh is insipid, but is sometimes eaten. A few deer are found about the swamps, but they are supposed to have been introduced from the continent. The woods abound in wild dogs and cats, sprung from these animals in a domestic state, and differ- ing from them only in habits and size. They are very destructive to poultry and cattle. Of domestic animals, the ox, the horse, and the pig are the most valuable, and form a large proportion of the wealth of the island;

the sheep, goats, and mules, are less numerous. The manati frequents the shores. The domestic fowls include geese, turkeys, peacocks, and pigeons. The indigenous birds are distinguished by the beauty of their plumage, and are very numerous, including upwards of 200 species. Birds of prey are few. The vulture and turkey-buzzard are pro- tected by law and custom, on account of their services in the removal of offal. The rivers, bays, and inlets are well supplied with fish. Oysters and other shell-fish are numerous, but of inferior quality. The reefs and shallows, and the sandy portion of the beach, abound in turtle ; and the crocodile, cayman, and iguana are common. Large numbers of land-crabs are frequently seen; they cross the island from north to south every spring, when the rains commence. Snakes are not numerous; the maja—12 or 14 feet in length, and 18 or 20 inches in circumference—is the largest, but is harmless; the juda, which is about 6 feet long, is venomous. Among the insects may be specially noticed the bee and the phosphorescent fly. These flies are very numerous, and much used among the poorer inhabitants. Fifteen or twenty of them confined in a calabash pierced with holes frequently serve during the night as a sort of lantern. 'The noxious insects are the chigoe or jigger, a species of ant called vivajagua, the mosquito, the sand-fly, the scorpion (less poisonous than that of Europe), and spiders whose bite is malignant enough to produce fever.

The forests of Cuba are of vast extent, and so dense as Vegetable It is estimated that of nearly products

to be almost impenetrable. 20,000,000 acres of land still remaining perfectly wild and uncultivated, nearly 13,000,000 are uncleared forest.: Mahogany and other hard woods, such as the Cuban ebony, cedar, sabicei, and granadilla, valuable for manufactures, cabinet work, and ship-building, are indigenous, and are exported to a considerable extent. The palm is the queen of the Cuban forests, and the most valuable tree on the island. 'The most common species, the Palma Real (Oreodoxa regia), is found in all parts, but especially in the west. The fruits of Cuba are those common to the tropics, of which the pine-apple and orange are the most esteemed. Of the alimentary plants, the plantain is by far the most important. Next in order come the sweet and bitter cassava—the sweet root being eaten

| Imports,

CUBA

institution which has for its object the advancement of education and popular industry. At Havana is the royal university with a rector and thirty professors and medical and law schools, as well ay an institution called the Royal College of Havana. Puerto Principe, in the eastern interior; and both at Havana and Santiago de Cuba there is a college in which the branches of ecclesiastical education are taught, together

as a vegetable, and the bitter converted into bread after its poisonous juice has been extracted. The sweet potato, and other farinaceous roots, are also common. Indian corn is indigenous, and rice is extensively culti- vated ; cocoa or chocolate is also grown.

The chief agricultural products of Cuba are, however, sugar, coffee, and tobacco. The "ingenios" or sugar estates, with large buildings and mills for sugar-refining and distillation of rum, are the most important industrial establishments of the island, varying in extent from 500 to as much as 10,000 acres. Of late years, partly from the effects of the insurrection, and partly from the rapidly extending cultivation of beet-root sugar in other countries, the demand for Cuban sugar has been diminishing, and the sugar estates have not flourished. The United States take about 70 or 80 per cent. of the sugar grown in Cuba, the greater part of the remainder passing to Europe. The quantity exported in 1873 from the ports of Havana, Matanzas, Cardenas, Sagua la Grande, Remedios, Nuevitas, Santiago de Cuba, Trinidad, and Cienfuegos exceeded 600,000 tons, of a value of about £12,000,000. Besides this 242,000 tons of molasses were exported. After the "ingenios" the "cafetales" or coffee estates are the most important establishments. They vary in extent from 100 to upwards of 1000 acres, or even more in the mountain districts,—the number of hands employed being as high as 100 in the low country, but generally averaging fifty or sixty negroes to 1000 acres. The first coffee plantation was established in 1748, the seeds having been brought from San Domingo. Though at one time coffee was sent out from Cuba in enormous quantities, it does not now figure largely in the exports. Tobacco is indigenous to Cuba, and its excellent quality is celebrated in all parts of the world. The estates devoted

~~to its cultivation are scattered over the greater part of the island, but the finest~~

~~qualities of tobacco are those grown in the country west of~~

~~Havana, known as the "vuelta abajo." In 1873, 224,765,000 cigars were exported, besides nearly 13,500,000 ib of leaf, to the United States, Great Britain, Hamburg and Bremen, Holland, France, and Spain. Among the other industrial establishments of Cuba may be mentioned the numerous cattle farms, cotton plantations, fruit and vegetable farms, chocolate plantations, and " colmenaries " or farms devoted to the production of honey and wax.~~

~~The imports consist mainly of jerked beef from South America, codfish from the British North American pro- vinces, flour from Spain, rice from Carolina, Spain, and the East Indies, wine and olive oil from Spain, boards for boxes and barrels from North America, coals from Europe and North America, and petroleum from the United States, besides large quantities of British, German, and Belgian manufactures and hardwares. Heavy differential duties in favour of goods imported into Cuba in Spanish ships are in force, so that the greater part of the imports arrive in these. Cattle are imported from Florida and the coasts of the Mexican Gulf. ing industries of importance in the island.~~

~~Education is in a remarkably backward state in Cuba. In the absence of recent statistics, it is estimated that of perhaps 100,000 children of free parents, not a tenth part receive lettered education of any kind; and even among the higher classes of society liberal education is very far from being universally diffused. A few literary and scientific men, wherever educated, are however to be found both in the higher and middle ranks, and, previous to the disturbances which began in 1868, the question of public instruction excited much interest among the creole popula- tion, an impetus to this having been given by the same liberal portion of the population which originated the Sociedad Economica of Havana and Santiago de Cuba, an~~

~~jurisdictions of Cuba.~~

~~There are no manufactur-~~

There is a similar establishment at

with the humanities and philosophy. Besides this there

are several private schools, but none are accessible to the

masses. The inhabitants of Havana can scarcely be said to have any literature—a few daily and weekly journals, under a rigid censorship, supply almost all the taste for

letters in the capital.

The Roman Catholic is the only religion tolerated by Government. At first there was but one diocese, which included not only the whole island, but also Louisiana and the two Floridas, all under one bishop. In 1788 Cuba was divided into two dioceses, each embracing half the island. The eastern diocese, or that of Santiago de Cuba, was in 1804 erected into an archbishopric, while that of Havana still remains under a bishop.

Politically the island is a province of Spain ruled over Divisions. directly by a governor-captain-general of the class of lieutenant-general of the Spanish army, whose authority for the time being is despotic. He is appointed by the Crown, the term of office being generally from three to five years, is responsible only to the sovereign of Spain, and is supreme head of the civil, military, and ecclesiastical The captain-general is assisted by governors of departments, who have under their orders the lieutenant-governors, commanders of the thirty-two juris- dictions of the island, each of which is subdivided into "partidos" or captaincies. In each city or town a municipal body termed the aywntamento, or town council, is at the head of affairs, but municipal representation exists only in appearance. The military division is into two departments—that of the west with Havana for its capital, and that of the east with Santiago de Cuba for its head-quarters. The boundary between these departments, which is also the limit of the dioceses, starts from the brook Yana in front of the eastern part of the island of Yuriguano, and terminates near Sabana-la-Mar.

The judicial division comprises the whole island, as the

territory of the "Real Audiencia Pretorial," or supreme court. In each of the twenty-six judicial districts into which this is subdivided there is an "alcalde mayor," having for auxiliary delegates the ordinary "alcaldes," or Jocal judges. The "Real Audiencia," holding session at Havana, is a species of council of state which the captain- general consults on all difficult matters of administration, The maritime division is subject to a commander-general, and consists of five stations or provinces, with their centres at Havana, Trinidad, San Juan de los Remedios, Nuevitas, and Santiago de Cuba.

In popular language the different portions of the island are distinguished as the Vuelta Abajo, or the portion extending from the meridian of Havana to the western extremity of the island; the Vuelta Arriba, from the meridian of Havana towards the east as far as Cienfuegos ;

Las Cinco Villas from the meridian of Cienfuegos to that of Santo Espiritu; and Tierra Adentro from that of Santa Espiritu to Holguin and the extreme east of the island.

The Crown revenues of the island are the ventas Finance. maritimas, including duties on imports, exports, and tonnage, and the local or municipal duties levied at some of the custom-houses ; the impuestas interiores, including the tax on home manufactures, the sale of stamped paper, the profits derived from the lottery, and the im post on cock-fights ; deductions from the rentas ecclesiasticas,

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particularly those called the royal ninths and the con- solidated fund, the sinking fund, the media annata, and the annual and monthly revenues of the

clergy; personal deductions, such as from the pay of public func- tionaries, and the price of exemption from military service ; miscellaneous receipts, as the produce of the sale of royal lands, the rents of vacant livings and of unclaimed estates, the produce of vendible offices; and casual receipts, 1n- cluding deposits, confiscations, donations, and the recovery of arrears.

Previous to the outbreak of the insurrection of 1868 the total revenue of Cuba had reached nearly to 26,000,000 dollars, of which sum about 6,000,000 dollars was annually remitted to Spain, leaving the remainder to cover the ex- penses of the army, navy, and civil service of the island. Since 1868 the imposts have been much increased, but have not been sufficient to cover the enormous increase of expen- diture consequent on the rebellion. The Government of the island has thus been compelled to borrow large suins for its war funds. Public finances are specially under the manage- ment of the Government bank called the Banco Espafiol, and have fallen into an unsatisfactory and confused state consequent on the steps taken by the island Government for obtaining funds by the emission of large amounts of notes without additional security, and without a special guarantee for each issue from the Madrid Government, resulting in a depreciation of the paper, or a premium on gold and silver.

The coins in use are chiefly the old Spanish " doblon," or " onza de oro," worth about £3, 4s., or 16 silver dollars of Spain, but it is legal tender for 17 dollars in the island. Gold coins of half a doblon, " media onza," of 8 dollars 50 cents, and of half and quarter that amount, and the " peso," or dollar in gold or silver, are also in circulation. There is scarcely any smaller silver currency in Cuba, excepting the American 10 cent piece or dime, called the " real sencilla."

The roads of Cuba are generally in a very wretched condition. Several railways have been established. The oldest, opened in 1838, extends from Havana to Guines, a distance of forty-five miles, and has branches to Batabano, San Antonio, and Los Palos. There are lines in operation from Matanzas to Sabanilla, Cardenas to Bamba and Jucaro, and thence to unite with the line which crosses the island between Sagua la Grande and Cienfuegos, as well as from Puerto Principe to Nuevitas. The whole length of lines in operation is nearly 400 miles. Coastal communication is kept up

~~by steamers which ply regularly between the different ports. Numerous lines of steamers run between Havana and New York, New Orleans, Key West, Philadelphia, and Baltimore ; and with Europe communica- tion is maintained by English mail as well as French and German lines of ocean steamers. The island is connected by telegraph with the mainland and with Jamaica.~~

~~Conflicting accounts render it impossible to arrive at anything like certainty as to the number of inhabitants on the island at the time of its conquest; but it may be esti- mated at from 300,000 to 400,000. There is little doubt, however, that before 1560 the whole of this population had disappeared from the island. The first census of Cuba was taken in 1774, when the population was 171,620. In 1791 it was 272,300. The following table gives the population since that period :—~~

~~Year, Whites. Free Blacks. Slaves. Total.~~

~~1811…) 274,000 114,000 212,000 600,000 1817…) 290,021 115,691 225,268 630,980~~

~~1827…| 311,051 106, 494 286,942 704,487 1841…] 418,291 152,838 436, 495 1,007,624~~

~~1846…) 425,769 149, 226 323,759 898,752 1849…) 457,183 164,410 328,897 945,440~~

~~1860…| 604,610 207,735 367,370 1,179,715~~

~~CUBA~~

~~Owing to the disturbed condition of the island, no census of the inhabitants has been taken since that of 1861. The results of the enumeration of that year made the total population 1,396,530, distributed thus :—~~

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766,775

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603,046

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26,709

An estimate, based on this census, made in 1869 gives the total population as 1,414,508, including 50,000 coolies.

The following statement appears in The Times, March 16, 1877 :—

'*The American press despatch from Havana states that the official figures show that in the year 1870 there were in the island 363,000 slaves ; in 1878, 287,000 ; and 1876, 199,000.

The numbers of free blacks in the island in 1873 was 26,000 ; in 1874, 50,000 ; in 1875, 75,000; and in 1876, 84,000. The free blacks in the four jurisdictions in which no census could be taken are estimated at 6000."

Writing in 1872, Mr Gallenga quotes an official state- ment of the population, giving a total of 1,359,437; or 1,034,616 in the western division of which Havana (population, 230,000) is the chief city; 75,725 in the central districts round Puerto Principe (population, 31,000); and 249,096 in the eastern division, the chief town of which is Santiago de Cuba (population, 37,000). The only other town of importance is Matanzas with a popu- lation of 36,000.

The inhabitants of Cuba are divided into four classes,— the native Spaniards, who occupy nearly all the offices of power and trust ; the creoles, who are mostly planters, farmers, or lawyers, and are generally looked upon with contempt by the Spaniards ; the third class, composed of free mulattoes and free negroes in about equal parts, who are excluded by

law from all civil offices ; those under ser- vitude, constituting the fourth class, divided into the bozales, those recently brought from Africa,—the ladinos, those im- ported before the law of 1821 prohibiting the slave trade, — and the criollos, those born on thie island. Cuba was long notorious for the extent to which the slave trade was carried on there, and the ineffectual efforts made to suppress it. The English Government succeeded, however, in 1853 in inducing the Spanish Government to pledge itself to adopt measures for its suppression ; and the importation of African slaves has consequently ceased for a number of years. In their place Asiatic coolies have been introduced in consider- able numbers, and the plan has worked well for the planters, though it is almost certain death in a short time to the coolies, who are slaves in almost every sense.

Under a better and more liberal system of government, there can be no doubt that Cuba would speedily attain a much higher state of prosperity and importance than it has yet enjoyed. Great as is its productiveness at present, some writers assert that under good government it would be increased five-fold ; its mineral resources would then be fully developed, and it would be able fully to take advan- tage of its admirable position to develop its trade.

The following authorities may be consulted—Ramon de la Sagra, Historia fisica, polit., y natural de la I, de Cuba, 13 vols., Madrid, 1849-1861, and Cuba en 1860, Paris 1862 ; Cuba and the Cubans, comprising a History of the Island of Cuba, New York, 1850; Jegor von Sivers, Cuba, die Perle der Antillen, Leipsic, 1861 ; Fernandez de Castro, Estudios sobre las minas de oro en la I. de Cuba, Havana, 1865; Jac. de la Pezuela, Dict. geogr. estadistico-

historico de la I. de Cuba, Madrid, 1864; Emilio Blanchet, Com- pendio de la Hist. de Cuba, Matanzas, 1866 ; R. Ferrer, " Estudios fisicos, geogr., y geologicos de Cuba," in Revista de Espatia, t. xxii, 1871; 8. Hazard, Cuba with Pen and Pencil, London, 1873 ; A. Gallenga, The Pearl of the Antilles, London, 1873 ; Hippolyte Piron, L'lle de Cuba, Paris, 1876. (K. J.)

CUBEBS (Arabic, Labdbah), the fruit of species of plants belonging to the genus Cubeba, natural order Piperacee. The cubebs of pharmacy are produced by C. officinalis (Piper Cubeba, Linn.), a climbing woody shrub indigenous to South Borneo, Sumatra, Prince of Wales Island, and Java. It has round, ash-coloured, smooth branches f oblong, or ovate-oblong, coriaceous, shining leaves, 4 to 64 inches long, and 14 to 2 inches broad ; and dicecious flowers. The fruits are small, globose, about 1th inch in diameter, and not so large as white pepper ; their contracted bases or pedicles are between 4 and 4 inch in length ; and from forty to fifty of them are borne upon a common rachis. Com- mercial cubebs consist of the dried ripe berries, usually with their pedicles attached ; the pericarp is greyish-trown, or blackish and wrinkled ; and the seed, when present, is hard, white, and oily. The odour of cubebs is agreeable and aromatic; the taste, pungent, acrid, slightly bitterish, and persistent. About 15 per cent. of a volatile oil, poly- meric with oil of turpeutine, is obtained by distilling cubebs with water ; after rectification with water, or on keeping, this deposits rhombic crystals of camphor of cubebs or hydrate of cubebene, Cz,H4g,2H,O ; cubebene, the liquid portion, has the formula C3)H4.. Cubebin is a crystalline substance existing in cubebs, discovered by Soubeiran and Capitaine in 1839 ; it may be prepared from cubebene, or from the pulp left after the distillation of the oil. The drug, along with gum,

fatty oils, and malates of magnesium and calcium, contains also about 1 per cent. of cubebic acid, and to this and to a resin Bernatzik and Schmidt attribute its therapeutic effects. Cubebs are administered for arrest- ing excessive mucous urethral discharges, also as a gentle stimulant, carminative, and stomachic. They are most safely employed in gonorrhœa when the inflammation is confined to the mucous membrane of the urethra. The introduction of the drug into medicine is supposed to have been due to the Arabian physicians in the Middle Ages. Cubebs were formerly candied aud eaten whole, or used ground asa seasoning for meat. Their modern employment in England as a drug dates from 1815. ‘“Cubebe ” were purchased in 1284 and 1285 by Lord Clare at 2s. 3d. and 2s. Id. per ib respectively ; and in 1307 1 tb for the King’s Wardrobe cost 9s., a sum representing about £3, 12s. in present value (Rogers, Hist. of Agriculture and Prices, i. 627-8 ; ii. 544). The plant Cubeba Clusii produces the African cubebs or West African black-pepper, the berry of which is smoother than that of common cubebs, and usually has a curved pedicle. It is said by Stenhouse (Ann. Ch. Pharm., xev. 106) to contain piperin and not cubebin. In the 14th century it was imported into Europe from the Grain Coast, under the name of pepper, by merchants of Rouen and Lippe.

CUBITT, Tuomas (1788-1855), who attained distine- tion as a builder and capitalist, was born at Buxton, near Norwich. Few men have exhibited greater self-reliance in early life in the pursuit of a successful career. In his nineteenth year, when he was working as a journeyman carpenter, his father’s death quickened the desire to reach an independent position, and induced him to undertake a voyage to India, as captain’s joiner. On his return to London, two years after, in the possession of a small capital, he began business as a carpenter, and the growth of his establishment was steady and rapid. He was one of the first to unite the many trades, until then more or less separate, which are now comprised in a “ builder’s” busi- hess; and this amalgamation very much increased his

success, One of the earlier works which gave him reputa- tion was the London Institution, Moorfields; but it is from 1824 that the vast building operations date which identify his name with many splendid ranges of

London houses, such as Tavistock, Gordon, Belgrave, and Lowndes Squares, and the district of South Belgravia. While these and similar extensive operations were in progress, a mone- tary panic, which proved ruinous to many, was surmounted in his case by a determined spirit and his integrity of character. He took great interest in sanitary measures, and published, for private circulation, a pamphlet on the general drainage of London, the substance of which was afterwards embodied in a letter to the Z'mes; the plan he advocated was subsequently adopted by the conveyance of the sewage matter some distance below London. He regarded with the eye of a philanthropist the provision of open spaces in the environs of London as places of public recreation, and was one of the originators of Battersea Park, the first of the people's parks. At a late period he received profes- sionally the recognition of royalty, the Palace at Osborne being erected after his designs, and under his superinten- dence ; and in the Life of the Prince Consort he is de- scribed by the Queen as one "than whom a better and kinder man did not exist." In 1851, although he was not identified with the management of the Great Exhibition, he showed the warmest sympathy with its objects, and aided its projectors in many ways, especially in the profit- able investment of their surplus funds. Asa capitalist he regarded as inseparable the interests of employers and employed, and he always had the elevation of his work- people at heart. He was elected president of the Builders' Society some time before his death, which took place at his seat of Denbies, near Dorking, in 1855.

CUBITT, Str Winzr1am (1785-1861), a distinguished English engineer, was born at Dilham in Norfolk, where his father was a miller. He received his early education at the village school, and subsequently profited greatly by the access he had to a clergyman's library. While still very young he worked in his father's mill, and served an apprenticeship of four years (1800-1804) as a joiner and cabinetmaker at Stalham. After working for a short time with his father, he became associated with an agricul- tural machine-maker, named Cook, who resided at Swanton. He now showed great talent in making accurate and highly finished patterns for the iron castings of horse threshing- machines and other implements. He turned his attention to windmills, which were, at that time, encumbered with sails so large that they proved exceedingly difficult to manage during a storm. His investigations led him to the invention of self-regulating windmill sails,

which were patented in 1807, and are now universally used. In 1812 he entered the important works of Messrs Ransome of Ipswich, of which he goon became chief engineer. He improved the port and gasworks of Ipswich, and ultimately became a partner of the Messrs Ransome, and remained with them till 1826, when his increasing in- terest in great engineering undertakings led to his removal to London. Meanwhile, the subject of the employment of criminals had been much in his thoughts ; and the result was his invention of the treadmill, which he meant to be used for grinding corn, puniping water, &c., and did not contemplate as an instrument of punishment. Shortly after 1818 all the principal jails in the kingdom introduced the invention. In 1822 an account of the treadmill, "invented by Mr William Cubitt of Ipswich," was issued by the Society for the Promotion of Prison Discipline. Mr Cubitt had been very busy, while in Ipswich, having issued reports in 1814, 1820, and 1822 on the Norwich navigation, In 1822 he first became intimate with Telford. After his re- moval to London he was almost constantly engaged in im-

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portant engineering works, and was often requested to give his opinion and evidence on the improvement of canals, harbours, ports, and rivers, the making of railways, and designs for bridges. His face was well known in the com- mittee rooms at Westminster. Among his works may be mentioned the Oxford canal, the Birmingham and Liverpool Junction Canal, the improvement of the River Severn, the Bute docks at Cardiff, the Black Sluice drainage and its outfall sluice at Boston harbour, the Middlesborough docks and coal drops in the Tees, and the South-Eastern Railway, of which he was chief engineer. His advice was often asked about proposed alterations on the Thames, Tees, Tyne, Ouse, Weaver, Nene, Witham, and Welland ; and he submitted important reports on these rivers. He was a member of commission for the improvement of the Shannon, in which capacity he did good service. On the Croydon Railway he applied the atmospheric system of traction ; and on the Great Northern Railway, constructed by his son Mr Joseph Cubitt, he effected many valuable improvements. On the Continent, too, his opinion was much valued. The Hanoverian Government consulted him about the harbour and docks at Harburg; the water-works of the city of Berlin were constructed under his

~~immediate superin- tendence ; his report on the proposed Paris and Lyons railway had much weight in determining what offer was to be accepted ; and he was consulting engineer for the line of railway from Boulogne to Amiens. Among his later works we may mention two large floating landing stages at Liverpool, and the bridge for carrying the London turnpike across the Medway at Rochester.~~

~~In 1850 he was consulted by Sir Robert Peel in regard to a building in Hyde Park for the International Exhibition. His name is identified with the orzginal plan ; and he gave such high satisfaction that Her Majesty was graciously pleased to confer the honour of knighthood on him in 1852. Ultimately Sir Joseph Paxton's plan was adopted, with the approval of Mr Cubitt. Public recognition, sometimes withheld in the case of literary men, is generally ample in the case of those who devote themselves to practical useful- ness. Cubitt accordingly was chosen a fellow of the Royal Society in 1830 ; he was also a fellow of the Royal Irish Academy, a member of the Society of Arts, and of the In- stitution of Civil Engineers, of which he became successively a member of council in 1831, vice-president in 1836, and president in 1850 and 1851. In 1858, after a singularly arduous and successful career, he retired from public business ; but he never ceased to take an interest in engineering work till his death, which took place on the 13th October 1861, at his house on Clapham Common, London,~~

~~CUCA, or Coca (Erythroxylon Coca), is a plant of the natural order Hrythroxylacee, the leaves of which are used as a masticatory in the western countries of South America.! It resembles a blackthorn bush, and grows to a height of 6 or 8 feet. The branches are straight, and the leaves, which have a lively green tint, are thin, opaque, oval, tapering at the extremities, and similar to tea-leaves ; on each side of the strong mid-rib is a longitudinal vein. Good samples of the dried leaves are uncurled, are of a deep green on the upper, and a grey-green on the lower sur- face, and have a strong tea-like odour ; when chewed they produce a sense of warmth in the mouth, and have a pleasant, pungent taste. Bad specimens have a camphora- ceous smell and a brownish colour, and lack the pungent ee ee ee eee eee~~

~~1 Garcilasso de la Vega, writing of the plant, says that it is called cuca by the Indians, coca by the Spaniards ; and Father Blas Valera states that the leaves are called cuca both by Indians and Spaniards. (The Royal Commentaries of the Y: neas, 1609-1617 ; trans. by C. R. Markham, Hakluyt Soc., 1871). See also, on the name cuca, Christison, Brit. Med. Journ., April 29, 1876, p. 527.~~

~~taste. The flowers are small, and disposed in little clusters on short stalks ; the corolla is composed of five yellowish- white petals, the anthers are heart-shaped, and the pistils are three in number. The flowers are succeeded by red berries. The seeds are sown in December and January in small plots (almacigas) sheltered from the sun, and the young plants when from 14 to 2 feet in height are placed in holes (asp7), or, if the ground is level, in furrows (wachos) in carefully-weeded soil. The plants thrive best in hot, damp situations, such as the clearings of forests ; but the leaves most preferred are obtained in drier localities, on the sides of hills. The leaves are gathered from plants varying in age from one and a half to upwards of forty years. 'They are considered ready for plucking when they break on being bent. The first and most abundant harvest isin March, after the rains; the second is at the end of June, the third in October or November. The green leaves (matu) are spread in thin layers on coarse woollen cloths and dried in the sun; they are then packed in sacks, which, in order to preserve the quality of the leaves, must be kept from damp.~~

~~It has been estimated that cuca is used by about 8,000,000 of the human race, being consumed in Bolivia, Peru, Ecuador, Colombia, and Rio Negro. In Peru the Indians carry a leathern pouch (the chuspa, or huallqut) for the leaves, and a supply of pulverized unslaked lime, or a preparation of the ashes of the quinoa plant (Chenopodium quinoa), called llipta or llucta. Three or four times a day labour is suspended for chacchar or acullicar, as the mastication of cuca is termed. 'The leaves, deprived of their stalks, are chewed and formed into a ball (acullico) in the mouth; a small quantity of the lime or llipta is then applied to the acullico to give it a proper relish. Two or three ounces of cuca are thus daily consumed by each Indian.~~

Cuca is a powerful stimulant of the nervous system ; it enables fatigue to be borne with less nourishment and greater ease than ordinarily, and diminishes the difficulty of breathing in ascending mountains ; when used externally it is said to be a remedy for rheumatism and headache.

The poet Cowley represents the Indian " Pachamma" as addressing Venus thus :—

- Our Varicocha first this Coca sent, Endow'd with Leaves of wondrous Nourishment, Whose Juice suce'd in, and to the Stomach tak'n Long Hunger and long Labour can sustain ; From which our faint and weary Bodies find More Succour, more they chear the drooping Mind, Than can your Bacchus and your Ceres join'd. Three Leaves supply for six days march afford, The Quitoita with this Provision stor'd Can pass the vast and cloudy Andes o'er."

(Plants, bk. v. p. 121, Works, 9th ed. Lond. 1700.)

Dr Péppig (Z'ravels in Chili and Peru) considers the habit of cuca-chewing to be as dangerous to the health as opium-eating, and in the highest degree pernicious, and Mr J. A. Lloyd alludes to cuca as a " poisonous narcotic " (Journ. R. Geog. Soc., 1854, p. 260). It does not, however, appear from the writings of Garcilasso that he observed any ill results among the Peruvian Indians from the practice of cuca-chewing. Von 'Tschudi refers to numerous instances of their longevity and good health, notwithstand- ing the habit, almost from boyhood, of masticating cuca three times a day. Markham regards cuca as the least injurious, and the most soothing and invigorating of all the narcotics used by man; and Dr Archibald Smith (Peru as aw vs, London, 1839) states that cuca when fresh and good, and used in moderate quantity, increases nervous energy, removes drowsiness, enlivens the spirits, and enables the Indian to bear cold, wet, great bodily exertion, and even want of food, to a surprising degree, with apparent ease and impunity. Though it is said, if taken to excess, to

occasion tremor in the limbs, and even a gloomy sort of mania, such dire effects, he considers, must be of rare occurrence, since, after living for

years in constant inter- course with persons accustomed to frequent cuca plantations, and with Indian yanacones or labourers, all of whom, whether old or young, masticated the favourite leaf, he never witnessed a single instance in which the chewer was affected with mania or tremor.

Cuca was used by the Peruvian Indians in the most ancient times. It was employed as an offering to the sun, or to produce smoke at the great sacrifices ; and the priests, it was believed, must chew it during the performance of religious ceremonies, otherwise the gods would not be propitiated. Cuca is still held in superstitious veneration among the Peruvians, and is believed by the miners of Cerro de Pasco to soften the veins of ore, if masticated and thrown upon them.

Cocaine, the alkaloid to which cuca owes its special properties, was discovered by Niemann in 1859. The formula assigned to it is Cis5HyyNO,, or C,,H,,NO, (Lossen). It is highly poisonous, and its logical action is apparently identical with that of theine, caffeine, guaranine, and theobromine, which all, as

has been shown by Dr A. Bennet, "induce a series of

symptoms affecting the nervous, respiratory, circulatory, vaso-motor, and glandular systems" (din. Med. Journ, October 1873, p. 323).

Tschudi, Travels in Peru, &c., 1838-42 (Lond. 1847); OC. R. Markham, Travels in Peru and India, p. 282 (Lond. 1862).

CUCKOO, or Cuckow, as the word was formerly and more correctly spelt—changed without any apparent warrant

except that accorded by custom, while some of the more scholarly English ornithologists, as Montagu and Jenyns,

have kept the older form—the common name of a well. known and often-heard bird, the Cuculus canorus of

Linneus. In some parts of the United Kingdom it is more frequently called Gowk, and it is the Greek KOKKUE, the Italian Cuculo or Cucco, the

French Coucou, the German Kuckuk, the Dutch Koekkoek, the Danish Kukker or Gjég, and the Swedish Gok. The oldest English spelling of the name seems to have been Cuccu.

No single bird has perhaps so much occupied the atten- tion both of naturalists and of those who are not naturalists, or has had so much written about it, as the common Cuckow, and of no bird perhaps have more idle tales been told. Its strange and, according to the experience of most people, its singular habit of intrusting its offspring to foster-parents is enough to account for much of the interest which has been so long felt in its history ; but, as will presently appear, this habit is shared probably by many of its Old-Word relatives, as well as in the New World by birds which are not in any near degree related to it. In giving here a short account of this species, there will be no need to refute much of the nonsense about it which has found access to works even of respectable authority; but, besides the known facts of its economy, there are certain suppositions in regard to parts of its history that are unknown, which suppositions are apparently probable enough to deserve notice.

To begin with the known facts. The Cuckow is a sum- mer-visitant to the whole of Europe, reaching even far within the Arctic circle, and crossing the Mediterranean from its winter-quarters in Africa at the end of March or beginning of April. Its arrival is at once proclaimed by the peculiar and in nearly all languages onomatopeeic cry of the cock—a true song in the technical sense of the word, Since it is confined to the male sex and to the season of love. In a few days the cock is followed by the hen, and amorous contests between keen and loud-voiced suitors are to be commonly noticed, until the respective pretensions of the rivals are decided Even by night they are not silent ;

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but as the season advances the song is less frequently heard, and the Cuckow seems rather to avoid observation as much as possible, the more so since whenever it shews itself it is a signal for all the small birds of the neighbourhood to be up in its pursuit, just as though it were a Hawk, to

~~which indeed its mode of flight and general appearance give it an undoubted resemblance—a resemblance that misleads some beings, who ought to know better, into confounding it with the Birds-of-prey, instead of recognizing it as a harmless if not a beueficial destroyer of hairy caterpillars. Thus pass away some weeks. Towards the middle or end of June its "plain-song" cry alters; it becomes rather hoarser in tone, and its first syllable or note is doubled. Soon after it is no longer heard at all, and by the middle of J uly an old Cuckow is seldom to be found in these islands, though a stray example, or even, but very rarely, two or three in company, may occasionally be seen for a month longer. This is about as much as is apparent to most people of the life of the Cuckow with us. Of its breeding comparatively few have any personal experience, Yet there are those who know that diligent search for and peering into the nests of several of our commonest little birds—more especially the Pied Wagtail (Motacilla lugubris), the Titlark (Anthus pratensis), the Reed-Wren (Acrocephalus streperus), and the Hedge-Sparrow (Accentor modularis)—will be rewarded by the discovery of the egg of the mysterious stranger which has been surreptitiously introduced therein, and waiting till this egg is hatched they may be witnesses (as was the famous Jenner in the last century) of the murderous eviction of the rightful tenants of the nest by the intruder who, hoisting them one after another on his broad back, heaves them over to die neglected by their own parents, of whose solicitous care he thus becomes the only object. In this manner he thrives, and, so long as he remains in the country of his birth, his wants are anxiously supplied by the victims of his mother's dupery. The actions of his foster-parents become, when he is full grown, almost ludicrous, for they often have to perch between his shoulders to place in his gaping mouth the delicate morsels he is too indolent or too stupid to take from their bill, Early in September he begins to shift for himself, and then follows the seniors of his kin to more southern climes.**

~~Of the way in which it seems possible that this curious habit of the Cuckow may have originated something has been already said (see Brrps, vol. iii. p. 77 2). But in connection with its successful practice a good deal yet remains to be determined, most of which, however probable, is still to be proved. So much caution is used by the hen Cuckow in choosing a nest in which to deposit her egg that the act of insertion has been but seldom witnessed. The nest selected is moreover often so situated, or so built, that it would be an~~

absolute impossibility for a bird of her size to lay her egg therein by sitting upon the fabric as birds com- monly do; and there have been a few fortunate observers who have actually seen the deposition of the egg upon the ground by the Cuckow, who, then taking it in her bill, introduces itintothe nest. Of these, so far at least as this country is concerned, the earliest seem to be two Scottish lads, sons of Mr Tripeny, a farmer in Coxmuir, who, as recorded by Macgillivray (Brit. Birds, iti. pp. 130, 131), from information communicated to him by Mr Durham Weir, saw most part of the operation performed, June 24, 1838. But perhaps the most satisfactory evidence on the point is that of Herr Adolf Miller, a forester at Gladenbach in Darmstadt, who says (Zoolog. Garten, 1866, pp. 374, 375) that through a telescope he watched a Cuckow as she laid her egg on a bank, and then conveyed the egg in her bill toa Wagtail's nest. Cuckows too have been not unfrequently shot as they were carrying a Cuckow's egg, presumably their own, in their bill, and this

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has probably given rise to the vulgar, but seemingly groundless, belief that they suck the eggs of other kinds of birds. More than this, Mr Rowley, who has had much experience of Cuckows, declares (/6zs, 1865, p. 186) his opinion to be that traces of violence and of a scuffle between the intruder and the owners of the nest at the time of introducing the egg often appear, whence we are led to suppose that the Cuckow ordinarily, when inserting her egg, excites the fury (already stimulated by her Hawk- like appearance) of the owners of the nest by turning out one or more of the eggs that may be already laid therein, and thus induces the dupe to brood all the'more readily and more strongly what is left to her. Of the assertion that the Cuckow herself takes any interest in the future welfare of the egg she has foisted on her victim, or of its product, there is no evidence worth a momeut's attention. But a much more curious assertion has also been made, and one that at first sight appears so incomprehensible as to cause little surprise at the neglect it long encountered, To this currency was first given more than a hundred years ago by Salerne (L'Hist. Vat. &c., Paris: 1767, p. 42), who was, however, hardly a believer in it, and it is to the effect, as he was told by an inhabitant of Sologne, that the egg of a Cuckow resembles in colour that of the eggs normally laid by the kind of bird in whose nest it is

placed. In 1853 the same notion was prominently and indepen- dently brought forward by Dr Baldamus (Naumanmia, 1853, pp. 307-325), and in time became known to English ornithologists, most of whom were sceptical as to its truth, as well they might be, since no likeness whatever is ordinarily apparent in the very familiar case of the blue- green egg of the Hedge-Sparrow and that of the Cuckow, which is so often found beside it.1 Dr Baldamus based lis notion on a series of eggs in his cabinet,? a selection from which he figured in illustration of his paper, and, however the thing may be accounted for, it seems impossible to resist, save on one supposition, the force of the testimony these specimens afford, This one supposition is that the eges have been wrongly ascribed to the cuckow, and that they are only exceptionally large examples of the eggs of the birds in the nests of which they were found, for it cannot be gainsaid that some such abnormal examples are occasionally to be met with. But it is well known that abnormally-large eggs are not only often deficient in depth of colour, but still more often in stoutness of shell. Apply- ing these rough criteria to Dr Baldamus's series, most of the specimens stand the test very well, and, though no doubt more precise and delicate examination, than any to which they seem to have been submitted, were desirable, there are some other considerations to be urged. For instance, Herr Braune, a forester at Greiz in the principality of Reuss (Naumannia, tom. cit. pp. 807, 313), shot a hen Cuckow as she was leaving the nest of an Icterine Warbler (iTypolats icterina). In the oviduct of this Cuckow he found an egg coloured very like that of the Warbler, and on looking into the nest he found there an exactly similar egg, which there can be no reasonable doubt had just been laid by that very Cuckow. Moreover Herr Grunack (Journ. fiir Orn., 1873, p. 454) has since found one of the most abnormally-coloured specimens, quite unlike the ordinary ege of the Cuckow, to contain an embryo so fully formed as to show the characteristic zygodactyl feet of the bird, thus proving unquestionably its parentage. Now these being both of them extreme cases, Dr Baldamus may fairly claim attention to his assertion ; for 'short of absolutely disbeliev- ing his word we must admit that he has ground for it.

1 An instance to the contrary has been recorded by Mr A. C. Smith (Zoologist, 1873, p. 3516) on Mr Brine's authority. # This series was seen in 1861 by the writer.

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~~On the other hand, we must bear in mind the numerous instances in which not the least similarity can be traced—as in the not uncommon case of the Hedge-Sparrow already mentioned, and if we attempt any explanatory hypothesis it must be one that will fit all round. Such a one then seems to be this. We know that certain kinds of birds resent interference with their nests much less than others, and among them it may be asserted that the Hedge-Sparrow will patiently submit to various experiments. She will brood with complacency the egg of a Redbreast (L7vithacus rubecula), so unlike her own, and for aught we know to the contrary may even be colour-blind. In the case of such a species there would be no need of anything further to insure success—the terror of the nest-owner at seeing her home invaded by a Hawk-like giant, and some of her treasures tossed out, would be enough to stir her motherly feelings so deeply that she would without misgiving, if not with joy that something had been spared to her, resume the duty of incubation so soon as the danger was past. But with other species it may be, nay doubtless it is, different. Here assimilation of the introduced egg to those of the rightful owner may be necessary, for there can hardly be a doubt as to the truth of Dr Baldamus's theory (the only theory, by the way, he has put forth), as to the object of the assimilation being to render the Cuckow's egg "less easily recognized by the foster-parents as a substituted one." But in this place it is especially desirable to point out that there is not the slightest ground for imagining that the Cuckow, or any other bird, can voluntarily influence the colour of the egg she is about to lay. Over that she can have no control, but its destination she can determine. It would seem also impossible that a Cuckow having laid an egg, should look at it, and then decide from its appearauce in what bird's nest she should put it. That the colour of an egg-shell can be in some mysterious way affected by the action of external objects on the perceptive faculties of the nother is a notion too wild to be seriously entertained. Consequently, only one explanation of the facts can here be suggested. Every one who has sufficiently studied the habits of animals will admit the tendency of some of those habits to become hereditary. That there is a reasonable probability of each Cuckow mostcommonly putting her eggs in the nest of the same species of bird, and of this habit being transmitted to her posterity, does not seem to be a very violent supposition. Without attributing any wonder- ful~~

sagacity to her, it does not seem unlikely that the Cuckow which had once successfully foisted her egg on a Reed-Wren or a Titlark should again seek for another Reed- Wren's or another Titlark's nest (as the case may be), when she had another egg to dispose of, and that she should con- tinue her practice from one season to another. It stands on record (Zoologist, 1873, p. 3648) that a pair of Wagtails built their nest for eight or nine years running in almost exactly the same spot, and that in each of those years they fostered a young Cuckow, while many other cases of like kind, though not perhaps established on authority so good, are believed to have happened. Such a habit could hardly fail to become hereditary, so that the daugliter of a Cuckow which always put her egg into a Reed-Wren's, Titlark's, or Wagtail's nest would do as did her mother. Furthermore it is unquestionable that, whatever variation there may be among the eggs laid by different individuals of the same species, there is a strong family likeness between the eggs laid by the same individual, even at the interval of many years, and it can hardly be questioned that the eggs of the daughter would more or less resemble those of her mother. Hence the supposition may be fairly regarded that the habit of laying a particular style of egg is also likely to become hereditary. Combining this supposition with that as to the Cuckow's habit of using the nest of the same:

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species becoming hereditary, it will be seen that it requires but an application of tlie principle of " Natural Selection " to show the probability of this principle operating in the course of time to produce the facts asserted by the anony- mous Solognot of the last century, and by Dr Baldamus and others since. The particular gens of Cuckow which inherited and transmitted the habit of depositing in the nest of any particular species of bird eggs having more or less resemblance to the eggs of that species would prosper most in those members of the gens where the likeness was strongest, and the other members would (ceteris paribus) in time be eliminated. As already shewn, it is not to be supposed that all species, or even all individuals of a species, are duped with equal ease. The Operation of this kind of natural selection would be most needed in those cases where the species are not easily duped,—that is, in those cases which occur the least frequently. Here it is we find it, for observation shows that eggs of the

~~Cuckow deposited in nests of the Red-Backed Shrike (Lanius collurio), of the Bunting (Zmberiza miliaria), and of the Icterine Warbler approximate in their colouring to eggs of those species—species in whose nests the Cuckow rarely (in comparison with others) deposits eggs. Of species which are more easily duped, such as the Hedge-Sparrow, mention has already been made.~~

~~More or less nearly allied to our Cuckow are many other forms of the genus from various parts of Africa, Asia, and their islands, while one even reaches Australia. How many of these deserve specific recognition will long be a question among ornithologists which need not be discussed here. In some cases the chief difference is said to lie in the diversity of voice—a character only to be appreciated by those acquainted with the living birds, and though of course some regard should be paid to this distinction, the possibility of birds using different "dialects" according to the locality they inhabit (see Birps, vol. iii. p. 771, note 1) must make it a slender specific diagnostic. All these forms are believed to have essentially the same habits as our Cuckow, and, as regards parasiticism, the same is to be said of the large Cuckow of Southern Europe and North Africa (Coccystes glandarius) which victimizes Pies (Pica mauritanica and Cyanopica cooki) and Crows (Corvus cormx). True it is that an instance of this species, commonly known as the Great Spotted Cuckow, having built a nest and hatched' its young is on record, but the later observations of Dr A. E. Brehm, Canon Tristram, Stafford Allen, and others tend to cast doubt on the credibility of the ancient report. It is worthy of remark that the eggs of this bird so closely resemble those of one of the Pies in whose nest they have been found, that even expert zoologists have been deceived by them, only to discover the truth when the Cuckow's embryo had been extracted from the supposed Pie's egg. This species of Cuckow, easily distinguishable by its large size, long crest, and the primrose tinge of its throat, has more than once made its appearance as a straggler in the British Isles. Equally parasitic are many other Cuckows, belonging chiefly to genera which have been more or less clearly detined as Cacomantis, Chrysococcya, Eudynamis, Oxylophus, Pheni- cophaes, Polyphasia, Surniculus, and Zanclostoma, aud inhabiting parts of the Ethiopian, Indian, and Australian Regions ;1 but there are certain aberrant forms of Old-World Cuckows which unquestionably do not shirk parental responsibilities. Among these especially are the birds placed in or allied to~~

the genera Centropus and Coua—the former having a wide distribution from Egypt to New

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1 Evidence tends to show that the game is to be said of the curious Channel-bill (Scythrops nove-hollandice), but absolute proof seems to be wanting.

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South Wales, living much on the ground and commonly called Lark-heeled Cuckows (an obvious misnomer)—the latter bearing no English name, and limited to the island

of Madagascar. These build a nest, not perhaps in a highly-

finished style of architecture, but one that serves its end.

Respecting the Cuckows of America, the evidence, though

it has been impugned, is certainly enough to clear them from the calumny which attaches to so many of their brethren of the Old World. There are two species very

well known in parts of the United States and some of the West-Indian Islands (Coccyzus americanus and (, erythrophthalmus), and each of them has occasionally visited Europe. They both build nests—remarkably small

structures when compared with those of other birds of

their size—and faithfully incubate their delicate sea-green eges. In the south-western States of the Union and thence into Central America is found another curious form of Cuckow (Geococcyx)—the Chapparal-cock of northern and Paisano of southern settlers. The first of these names it takes from the low brushwood (chapparal) in which it chiefly dwells, and the second is said to be due to its Pheasant-like (facsan corrupted into paisano, which is properly a countryman) appearance as it runs on the ground. Indeed, one of the two species of the genus was formerly described as a

Phasianus. They both have short wings, and seem never to fly, but run with great rapidity. Returning to arboreal forms, the genera Neomorphus, Diplopterus, Saurothera, and Piaya (the last two commonly called Ruin-birds, from the belief that their cry portends rain) may be noticed—all of them belonging to the Neotropical Region ; but perhaps the most curious form of American Cuckows is the Ani (Crotophaga), of which three species inhabit the same Region. The best-known species C. ant) is found throughout the Antilles and on the Opposite continent. In most of the British colonies it is known as the Black Witch, and is accused of various malpractices—it being, in truth, a perfectly harmless if not a beneficial bird. As regards its propagation this aberrant form of Cuckow departs as much in one direction from the normal habit of birds as do so many of our familiar friends of the Old World in the other, for several females unite to lay their eggsin one nest. Full details of its economy are wanting, but it is evident that incubation is carried on socially, since an intruder on approaching the rude nest will disturb perhaps half a dozen of its sable proprietors, who, loudly complaining, seek safety either in the leafy branches of the tree that holds it, or in the nearest available covert, with all the speed that their feeble powers of flizht permit. (A. N.) CUCUMBER (Cucumis), a genus of the natural order Cucurbitacec, represented by indigenous species in most warm regions of the globe, and distinguished by the following characters :—plants, annual or possessing a perennial thick root ; stems, rarely if ever climbing ; leaves, heart-shaped, sometimes reniform, with three to seven lobes, and crenulate or denticulate margin ; flowers, moncecious and yellow, having tubular campanulate calices, petals but slightly adherent, three free stamens, and a tripartite, obtuse, and spheroidal stigina; fruits or pepones, three to six celled, smooth or echinate ; and seeds, more or less compressed, ovate, sharp-edged, aud of a yellow or dirty-white colour. Cucumis sativus, the common cucumber, is an annual, indigenous probably to tropical Asia ; the branches ramify little ; the leaves are hairy aud have three to five sharply-pointed lobes ; the ovary is often fusiform ; the fruits are for the most part oblong, obscurely trigonal or cylindrical, and except in one variety contain three carpels, and their flesh is white, firm, and of an agreeable sub-acid taste. In its characters it is one of the most uniform species of its genus. The principal

varieties are (1) the small Russian cucumber, the fruit of which is ovoid, smooth, scarcely larger than a hen's egg, and when ripe of a dull orange colour; (2) the common long cucumber; (3) the white cucumber, with fruits usually shorter and proportionally thicker than in the preceding kind ; (4) the Sikkim cucumber, the leaves of which may be seven or even nine-lobed, while its fruits are long-oval in shape, have the skin marbled with yellowish- white and reddish-brown, and regularly contain five placente.

The cucumber usually trails on the ground, but it can be made to grow well in an upright position, supported by its tendrils. It thrives best in deep, loose, and rich earth, but if supplied with liquid manure it may be cultivated in old tan or brick-rubbish. An excellent soil is a sandy loam with a fourth part of rotten dung inter- mixed. A damp atmosphere and a temperature of from 75° to 80° Fahr., with plenty of light, are the conditions best suited to the cucumber; but it can be grown at so low a temperature as 50,° and will bear fruit at 60°; in the presence of abundant moisture a heat between 90° and 110° may be borne. Exposure to the air on cold nights is highly injurious to the plants, rendering them sickly, and rapidly producing mildew. In England cucumbers are cultivated in dung and hot-beds, also in pots, and during summer in the open fields. At Sandy in Bedfordshire the temperature of the soil of cucumber plantations is in a week or ten days raised 8° or 10° above that of the neighbouring soil by turning in the surface-earth, and covering the ground with litter at the close of every sunny day. To promote the formation of fruit the young shoots of the cucumber should be nipped off occasionally between the thumb and finger, and should be allowed to proceed no further than the second joint beyond the fading fruit- blussom. The plants are raised from both seeds and cuttings. For procuring good seed the following method has been given. A strong plant is chosen, and allowed to bear only one fruit, which, when ripe and yellow, is cut and laid by in a dry place ; when it begins to rot, it is cut in pieces, the pulp is allowed to ferment, and the seeds are then washed from it with water, those which float being rejected. The seed retains its vitality for a considerable period, and that which has been kept for some years is said to produce the best fruit-bearing plants. The seed-bed for cucumbers is made 3 feet high at the back, and 6 inches less in front. After its preparation eight or nine days are allowed to elapse before the seed is sown. The tops of the young plants are kept at a distance of 6 or 8 inches

from the glass of the frame by lowering from time to time the pots in which they grow. By pinching off the leading shoot that rises at the base of the petiole, fresh shoots are made to proceed from the base of the seed-leaves ; these are in their turn nipped back when the length of two joints. Plants grown in winter in frames and hot-houses are given as much light and air as possible, and care is taken not to supply them with very cold water. On account of their expense, dung-beds have been generally superseded by hot-beds for the growth of cucumbers. The cucumber is a common vegetable in all parts of India; in the cold season it is cultivated in the grain fields, and in Summer in the sandy beds and islands of rivers. In Cashmere, as in China and Persia, cucumbers and melons are grown in the lakes on floats formed by cutting through, at about 2 feet under the water, the roots of sedges, reeds, and other aquatic plants, which, being pressed together, are made to form a bed about 2 yards in breadth, and of indefinite length. The heads of the plants are next cut off, laid upon its surface, and covered with a thin coat of mud. The float is moored in its place by a stake of willow driven through it at each end, and confervee and weeds

from the bottom of the lake are piled on it in conical mounds about 2 feet in height, and 2 feet broad at the base, and having a hollow at the top filled with soft mud, in which the young cucumber and melon plants are placed. No further labour is requisite save that of gathering the fruit (Moorcroft, Journ. R. Geog. Soc., ii. p. 258).

The varieties of the common cucumber are exceedingly numerous, and constantly changing. Among the longer sorts may be mentioned Dale's Conqueror, Blue Gown, and Hamilton's Invincible. Though generally eaten as a salad or pickled, the cucumber is used in the preparation of various cooked dishes, and is occasionally preserved. The juice is said to be an ingredient in some pomades and cosmetics. For pickling, the young unripe fruit, or gherkins, and the Russian variety are employed. Cucumbers were much esteemed by the ancients. According to Pliny (xix. 23), the Emperor Tiberius was supplied with them daily, both in summer and winter. Naudin enumerates thirteen well-determined and eight doubtful species of the genus Cucumis. Of one of these, C. Pigarei, he describes five, and of another, C.

~~JJelo, or the melon, no less than thirty varieties. Among the latter is the C. Chate of Linnzus, the fruit of which is supposed to be the same as the kishuim or " cucumbers " of the Scriptures (Num. xi. 5 ; Isa. i. 8 ; Baruch vi. 70). Forskal describes the plant as follows :—" Stalks smooth, with rigid bristles ; leaves lobed, scabrous on both sides, with obtuse angles ; fruit, hairy when young, smooth when old, attenuated at both ends." The fruit, he tells us, is common in Egypt, where it is grown in the open fields. By many a dnnk is prepared from it when ripe. The pulp is broken and stirred by means of a stick thrust through a hole cut at the umbilicus of the fruit ; the hole is then closed with wax, and the fruit, without removing it from its stem, is buried in alittle pit ; after some days the pulp is found to be converted into an agreeable liquor (flora dgyptiaco- Arabica, p. 168, 1775). Various species of Anguria, Citrullus, Coccinia, Cucurbita, Ecbalium, Luffa, Melothria, Mukia, Sicyos, Telfairia, and Trichosanthes have been referred to the genus Cucumis. The squirting cucumber, Ecbalium elaterium, the Xixvos dypios of Theophrastus, furnishes the drug elaterium. Owing to the exmosis of the juice of the fruit through the strong cortical tissue that lines its central cavity, a pressure is accumulated sufficient to cause the severance of the fruit from its peduncle, and the consequent sudden ejection of its con- tents. The Cucumis serotinus of Turkey and C. Conomon of Japan are varieties of C. Melo; the "serpent cucumber" of Central America is the species 7'richosanthes colubrina.~~

~~Watkins, Art of Promoting the Growth of the Cucumber and Melon, 1824; Weeden, Practical Treatise on the Growth of Cucumbers, 1832; Royle, Himalayan Botany, vol. i. p. 218, 1840 ; Duncan, Treatise on the Culture of the Cucumber, 1841; Ayres, Cultiva- tion of Cucumbers in Pots, 1850 ; Naudin, in Annal. des Sct. Nat., 4e. ser. Bot. t. xi. p. 5, 1859 ; Loudon, Horticulturist, ed. Robinson, 1871.~~

~~CUDDALOR, or Gupatur, a municipal town of British India, in the Madras Presidency and the district of South Arcot, situated on the western shore of the Bay of Bengal at the estuary of the River Panar, 102 miles 8.S.W. from Madras, and 15 S.S.W. from Pondicherry. It lies low, but is regarded as exceptionally healthy, and serves as a kind of sanatorium for the surrounding district. The principal trade is the export of cotton ; but some attention is also given to the fisheries and the manufacture of paper, sugar,~~

and salt. In the neighbourhood are the ruins of the fort of St David. The English East India Company obtained a grant of the town from the rajah of Gingee in 1681; and their factory was, in consequeuce of the increasing trade, wholly rebuilt and fortified in1702. The town was taken by the French in 1758 ; but two years

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later it was recaptured by Sir Eyre Coote. In 17 82, after the destruction of Colonel Braithwaite's detachment by Tippoo, it was forced to surrender to the combined forces of the French and Hyder Ali, when the works were greatly strengthened, and a strong garrison sent to defend them. In 1783 it was besieged by the British, who were repulsed, with the loss of 942 killed and wounded, in a desperate attempt to storm the works. It finally passed into British possession by the treaty of 1795. Population in 1871, 40,290.

CUDDAPAH, or Kapapa, a district of British. India in the presidency of Fort St George or Madras, situated between 13° 12' and 16° 19' N. lat. and 77° 52' and 79° 48' E. long. It is bounded on the N. by Karnaul, on the E. by Nellor, on the S. by North Arcot and Mysore ; and on the KE. by Balldri. The district is io shape an irregular parallelogram, divided into two nearly equal parts by the range of the Eastern Ghats which intersects it throughout its entire length. The two tracts thus formed possess totally different features. The first, which constitutes the north, east, and soutli-east of thie district, is a low-lying plain; while the other, which comprises the southern and south-western portion, forms a high table-land from 1500 to 2500 feet above sea-level. The chief river is the Penaur, which enters the district from Ballart on the west, and flows eastwards into Nellor, Though a large and broad river, and in the rains containing a great volume of water, in the hot weather months it dwindles down to a very inconsiderable stream. Its principal tributaries are the Kundaur, Saglair, Cheyair, and Papagni rivers. The total area of the district is 8367 square miles, of which 2728 were returned as under cultivation in 1874-75. Cuddapah is subdivided into eleven tdluks or sub-districts, and contains 1062 villages, The population in 1872 was returned as follows :—Hindus, 1,242,317; Mahometans, 103,676; Native Christians, 4068; Europeans and Eurasians, 202; Buddhists, 4;

others, 387 ; total, 1,351,194. The principal town and the administrative head-quarters of the district is Cuddapah, situated on the banks of the Boga River in 14° 32' N. lat, and 78° 54' E. long. Population—Hindus, 10,611 ; Ma- hometans, 5338; Christians, 222; others, 104; total, 16,275. The total revenue of Cuddapah district in 1874-75 amounted to £245,222, of which £200,987 was derived from the land assessment.

CUDWORTH, Ratpy (1617-1688), the most learned and philosophical of the Cambridge Platonists, was born at Aller, Somersetshire, in 1617. His father, rector of Aller, and an editor of Perkins's works, died in 1624. His widow married a second time Dr Stoughton, under whose care young Cudworth was well grounded in school learning. In 1630 he was entered a pensioner in Emmanuel College, Cambridge, of which his father had been a fellow. He commenced residence in 1632, took the degree of M.A. in 1639, was soon after chosen fellow, and became so eminent asa tutor as to have at one time twenty-eight pupils) He was next presented to the rectory of North Cadbury in his native county, and in 1642 he published a Discourse concerning the true Notion of the Lord's Supper, and a treatise entitled, Zhe Union of Christ and the Church, ama Shadow. In 1644 he took the degree of B.D., and in the same year was chosen master of Clare Hall. In the following year he was appointed professor of Hebrew, and for some time devoted himself with special zeal to the study of Jewish antiquities. Two years after (March 31, 1647) he preached before the House of Commons on 1 John ii. 3, 4, and his discourse on this occasion was published, along with another sermon following out the theme. For some time it appeared as if the insufficiency of his income would force him to leave Cambridge, but

this loss to the university was averted by his appointment to the mastership of Christ's College in 1654. He was one of the persons named by a committee of Parliament in 1657 for the revision of the English translation of the Bible. Through his intimacy with Thurloe, the secretary of state for Cromwell and his son Richard, he was con- fidentially consulted on various occasions by the Protectors in regard to university and Government appointments, In 1659 we find him engaged with discourses in defence of Christianity against Judaism, Like so many others, he published Latin

verses on the restoration of King Charles iI. in 1660. He was presented to the rectory of Ashwell in Herefordshire in 1662, and installed prebendary of Gloucester in 1678. He had a design in 1665 to publish a treatise concerning moral good and evil, and as he had been encouraged to do so by Dr Henry More, the latter's Enchiridion Ethicum appears to have almost occasioned a rupture of friendly relations between them. Cudworth's magnum opus, the True Intellectual System of the Universe, where all the Reason and Philosophy of Atheism is refuted, and ws Impossibility demonstrated, appeared in 1678, This marvellously learned work, bulky as it is, is merely a fragment, the first of three parts,—the Z'reatise on Kternal and Immutable Morality, published in 1731 by Bishop Chandler, and a Discourse on Liberty and Necessity, belong ing to the same whole. Its publication had been delayed for seven years, owing to the opposition of some parties at court, probably admirers of Hobbes. It was flatteringly received in the learned world, but offended the narrowly orthodox as well as the sceptics against whom it was written. ;Some persons were even so thoughtless or malicious as to construe the candour with which its author stated the arguments of atheists as a device to lead his readers to believe that the atheist had the best of the reasoning. If Warburton inay be credited, misrepresenta- tions of this kind deterred Cudworth, a peaceable man, averse to theological polemics, from publishing the rest of his work. He died at Cambridge on the 26th of June 1688, and was buried in the chapel of Christ's College. He left behind him a daughter, Damaris, a lady of considerable genius, known, under the name of Lady Masham, as the intimate and valued friend of John Locke. Several of Cudworth's MSS. are preserved in the British Museum. It is not to the national credit that, with the exception of A Lreatise of Freewill, edited by the Rev. Mr Allen in 1838, they have not only not been published, but no adequate account or summary has been given of them.

The Z'rue Intellectual System, to justify its general title and fulfil its author's plan, should have contained two other parts, each on the same scale as the part which we possess, There appeared to Cudworth to be three systems which deny liberty and involve necessity,—three sorts of fatalism. The first is materialistic fatalism, which suppresses with the idea of liberty every idea of God and spirit, and, explains all phenomena, even those of thought and feeling, by mechanical laws, and the formation of all beings by

the combination and concourse of atoms; the second is a theological or religious fatalism, advocated by various scholastic and later divines, which makes good and evil, right and wrong, the creation of the will of God, and thus destroys liberty by destroying its condition and its law ; and the third is Stoical fatalism, which, although not denying the Divine existence or the rectitude of the Divine nature, affirms that all that happens is determined by an eternal and unchangeable necessity. These are the three chief false systems of the universe, according to Cudworth, and he would oppose to them three great principles, the fundamentals or essentials of religion :—to the first the existence of God and of a spiritual world ; to the second the eternal and immutable distinction of right and wrong ;

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and to the third the freedom and responsibility of man. The proof of these three truths with the refutation of the opposite errors seemed to him to be the establishment of a system of the universe entitled to be called, in opposition to those refuted, ¢rwe, and, in distinction from physical systems, like the Ptolemaic, Tychonic, and Copernican, intellectual. The first of these forms of fatalism is the only one with which his principal work deals. It includes four species of materialistic atheism, namely,—the atomic, adopted by Democritus, Epicurus, and Hobbes, which recognizes no other substances than material atoms and no other forces than their 'movements; the hylopathic, maintained by Anaximander, which makes infinite matter, devoid of understanding and life, form all things by " a secretion or segregation " which takes place according to inherent law ; the hylozoic, asserted by Strato of Lampsacus, which explains everything by the supposition of an inward, self- organizing, plastic life in matter ; and the cosmoplastic, perhaps held by Seneca and the younger Pliny, which represents the universe as an organized being, like a plant, with a spontaneous and necessary but unconscious and un- reflective development. They are, however, reducible to two—the atomic and hylozoic,—the one best represented by Democritus, the other by Strato; the one explaining everything by matter and movement, the other everything by matter endowed with life; the one mechanical, the other dynamical.

The history of the atomic philosophy is narrated by Cudworth at great length and with vast erudition, but no one will now be found to accept the view which he gives of its development as even in the main accurate. Like his friend, Henry More, he derives the atomic theory, in so far as it is a purely physical speculation, from Moses, and his conclusions as to its transmission are in many respects not less untrustworthy. He would make it out to have been taught by Pythagoras, Empedocles, and, in fact, nearly all the ancient philosophers, and only to have been mutilated and perverted by Leucippus and Democritus. He had the merit, however, of seeing very clearly that the atomic theory in itself, or what he calls the atomic physiology, had no natural or even necessary connection with the atomic atheism. He contends that 'so far from being either the mother or nurse of atheism, or any ways favourable thereto (as is vulgarly supposed), it is indeed the most opposite to it of any, and the greatest defence against the same." He states with great fulness and fairness the arguments which have been urged in support both of the atomic and hylozoic atheism. He refutes them, although in a cumbrous and discursive manner, with "great strength of reason. It is in connection with the refutation of hylozoic atheism that he brings forward the celebrated hypothesis, which he held in common with More, of a plastic nature,—a substance intermediate between matter and spirit,—a power which prosecutes certain ends but not freely or intelligently,—an instrument by which laws are able to act without the immediate agency of God. He argues that to refer the life and motion of the universe immediately to God renders Divine Providence "operose, solicitous, and distractious," implies that all things are done miraculously and none of them by an inward principle of their own, and is incon- sistent with the slow and gradual development of nature and with its "errors and bungles." It is not wonderful that few should have been convinced by such arguments. Nothing can be toilsome to omnipotence or perplexing to omniscience. It is not more difficult to believe the life and motions of the universe due to the immediate action of God than the life and motions of the secondary agent which Cudworth imagined to animate nature and "drudg- ingly to execute a part of the work of Providence." An unconscious and "necessitated plastic power" cannot remove

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from the creator of it the blame of any "errors or bungles" it may commit. Cudworth's hypothesis became in 1703-4 the subject of an interesting controversy between Bayle and Leclerc,—the former maintaining, and the latter denying, that it was favourable to the atheistical inference. It has been recently reproduced by Joseph John Murphy in his work on Llabit and Intelligence. What Cudworth designated "plastic nature" is almost identical with what Murphy calls "unconscious intelligence." It was descended from the anima mundi of Plato, and is still represented in tne Unbewusste of Von Hartmann.

After the three chapters which describe and refute atomic aud hylozoic atheism, there comes a fourth which "swells," as Cudworth himself says, "' into a disproportionate bigness." Its aim is to prove that the belief in one supreme God has been generally entertained even throughout the pagan world ; that only a few men, darkened in mind and depraved in heart, have discarded and denied it ; and that polytheism was the worship of many gods subordinate to the One God, of the One God under many names, and of the One God and subordinate gods in images and symbols, but not the exclusion of the worship of 'one sovereign and omnipotent Deity from which all their other gods were generated or created." Nowhere does our author show more learning nor more elevation and breadth of thought than in the survey of religions which this discussion involves. He carefully searches in the heathen religions which he reviews for features of truth, traces of the presence of God, evidences of His having never left himself without a witness in human hearts. At the same time, his reason- ing is, on the whole, far from satisfactory. It is at many points perverted by the unconscious desire to establish a foregone conclusion ; and the testimonies brought forward have as often meanings imposed on them as educed from them. The lengthened discussion of the Platonic and Christian Trinities contained in this chapter gave great dissatisfaction to various persons. Cudworth was accused by some, in consequence of it, with being a Tritheist, and by others of being an Arian. He could not possibly be both; he undoubtedly meant to be neither. He wished to be orthodox, and believed that he was so. He erred chiefly by representing Plato as having come far nearer to the Christian doctrine than he really did.

What is of most interest, perhaps, in the last chapter is the attempt at a positive demonstration of the existence of God. This, he explains, cannot be accomplished a priori, as if from anything antecedent to the Divine exist- ence, but may nevertheless be necessarily inferred from undeniable principles of reason. He refutes the assertion of Descartes that we can be certain of nothing, not even of mathematical reasoning and truth, till certain that there is a God, good and holy, who cannot and will not deceive us. He shows that although this hypothesis bears a resemblance of piety it really leads to universal scepticism. He then adduces three metaphysical proofs of the Divine existence. The first is substantially that of Anselm and Descartes, drawn from the idea of an absolutely perfect being. Cudworth modifies it, however, in the same way which Leibnitz soon afterwards also did. He does not, that is to say, conclude at once the Divine existence from the idea of a perfect being, but shows before doing so that this idea is accordant with reason, 7.e., involves in it no contradiction, The second proof, instead of thus proceed- ing from the idea of perfection to that of necessary existence, proceeds from the idea of existence to that of perfection. Theists and atheists, materialists and spiritual- ists, agree that something certainly existed of itself from all eternity. They differ only as to whether that something be a perfect or animperfect Being. But that which existed

| from all eternity must have done so naturally and

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necessarily, including necessary and eternal self-existence in its own nature. There is nothing, however, it is argued, which contains necessary eternal existence in its own nature or essence, but only an absolutely perfect Being,— all imperfect things being in their nature contingently possible, either to be or not to be. Hence a perfect Being, or God, existed of himself from eternity. The third argu- ment is founded on the very nature of knowledge. It is that knowledge is possible only through ideas which must have their source in an eternal reason. Sense is not only not the whole of

knowledge, but is in itself not at ail knowledge ; it is wholly relative and individual, and not knowledge until the mind adds to it what is absolute and universal. Knowledge does not begin with what is individual but with what is universal. The individual js known by being brought under w universal instead of the universal being gathered from a multitude of individuals, And these universals, voruara, or ideas, which underlie all the knowledge of all men, which originate it, and do not originate in it, have existed eternally in the only mode in which truths can be said to be eternal, in an eternal mind. They come to us from an Eternal Mind, which is their proper home, and of which human reason is an emanation, "From whence it cometh to pass, that all minds, in the several places and ages of the world, have ideas or notions of things exactly alike, and truths indivisibly the same. Truths are not multiplied by the diversity of minds that apprehend them ; because they are all but ectypal partici- pations of one and the same original or archetypal mind and truth. As the same face may be reflected in several glasses, and the image of the same sun may be in a thousand eyes at once beholding it, and one and the same voice may be in a thousand ears listening to it, so when innumerable created minds have the same ideas of things, and understand the same truths, it is but one and the same eternal light that is reflected in them all ('that light which enlighteneth every man that cometh into the world '), or the same voice of that one everlasting Word, that is never silent, re-echoed by them." In different forms and with different references this argument is to be found in Plato, Augustine, Aquinas, Malebranche, Bossuet, Fenelon, Cousin, and Ferrier.

The 7'reatise concerning Eternal and Immutable Mc orality deals with the second form of fatalism. Over against the assertion that all moral good and evil is arbitrary and fac- titious, not by nature but by law, there is placed the directly contradictory proposition, nothing is morally good or evil by mere will without nature. Whatever is at all must be what it is not by will but by nature. Omnipotence itself cannot set aside this condition, cannot do what is contra- dictory ; and contradictory it is that things should be what they are uot, should be indifferently anything, either this or that, round or square, white or black, according to mere will and pleasure. And " things may as well be made white or black by mere will without whiteness or blackness, equal and unequal without equality and inequality, as morally good and evil, just and unjust, honest and dishonest, by mere will, without

~~any nature of goodness, justice, honesty." The existence of merely positive duties,—the fact that certain commands carry with them an obliga- tory force, and that it is often wrong to do a thing which has been forbidden although it would have been otherwise quite legitimate,—is argued to be no exception to this truth, since in all such cases the obligation springs not from mere will but from a deeper source, from an underly- ing natural justice or equity, which is the true foundation both of the right in a superior to command and of obliga- tion in an inferior to obey. Cudworth is thus led to dis- criminate precisely natural from positive right. Things naturally good are those which the reason obliges us to~~

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~~immediately, absolutely, and perpetually, and on no con- dition of any voluntary act that may be done or omitted intervening ; things positively good are those which the reason obliges to only through the intervention of some such act bringing them under some rule of natural justice. But even the things which thus pass from being indifferent to being positively right or wrong are strictly speaking only brought into a new relation to us, and have not a new nature bestowed on themselves. They remain in themselves what they were,—indifferent, neither good nor evil, And any moral character which may be ascribed to the doing of them consists not in what is done, but in a regard to the natural right which dictates fidelity to engagements and submission to just authorities. Will" thus carries with it no creative moral force,—as mere will, indeed, no moral force whatever. Cudworth completes his proof of this position by a refutation of the opinion that rectitude, although not dependent on the will of the creature, depends on the mere will of the Creator. He argues that it represents what is really a contradiction to be the object of divine power. He further insists that there is in God a wisdom superior to His will and a good- ness superior to His wisdom ; that the perfection of will is to be thus twice determined, first by wisdom and then by goodness, first by truth and then by righteousness. That moral distinctions are arbitrary, grounded not in reality but in will, Cudworth saw was the necessary consequence of a belief that all cognizable distinctions are arbitrary, that all being and knowledge are relative, having no real existence in themselves but only an existence of appearance relative to something else. He perceived with perfect clearness that unless there is an~~

absolute in knowledge there can be no absolute in morals. The larger portion of his treatise is, in consequence, an examination into the nature of sense and knowledge, desigued to prove that sense is not knowledge; that sense is a confused percep- tion obtruded on the soul from without, whereas knowledge is an inward native energy of the mind, not arising from things acting from without; that even simple corporeal things, passively perceived by sense, are known or under- stood only by the active power of the mind; that some ideas of the mind proceed not from outward sensible things, but arise from the inward activity of the mind itself ; that the intelligible notions of things, though existing only in the mind, are not figments of the mind, but have an immutable nature ; that science or knowledge is the only firm thing in the universe. Among the ideas not drawn from sense but imposed by reason on particular acts, Cudworth places the conceptions of moral good and evil. These, like other noemata, are necessary, eternal, and immutable, They are not created by reason but essential to reason. Reason does not find them, but brings them With it. Reason, however, and not sense or feeling of any kind, is their organon. Sense apprehends in the imperfect way it does only through the working of reason ; feeling is ever varying and individual. Sense is altogether blind to whatever partakes of the necessary ; feeling is in no direct contact with what really and absolutely is. Adam Smith and many others have pronounced this conclusion absurd and unintelligible, without attending to the cir- cumstance that Cudworth has at least endeavoured, and laboriously endeavoured, to show by his examination of sense and knowledge that what is really altogether absurd and unintelligible is that mere sense should give us any knowledge whatever,—that sense should ever rise to the rank of perception until reason has brought its object under some universal category. ;

In the tractate on free-will he endeavours to establish that man possesses a contingent or fortuitous liberty of self- determination when there is a perfect equality of objects.

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He rests this conclusion on two arguments :—first, that otherwise were a second world created exactly like the present it would have an exactly similar history ; and, secondly, that otherwise the mind could make no

~~choice in the many cases where several objects precisely alike were presented to it. He sees clearly, at the same time, that this power is not the free-will which is the condition of praise and blame. In every conceivable case where two objects of choice perfectly equal are presented to the mind, praise or blame for the preference of the one to the other is unreasonable. It is only the preference of the better to the worse that is praiseworthy ; only the preference of the worse to the better that is blameworthy. Accordingly he argues. that man has also a power of determining himself better or worse. In the prosecution of this argument he finds it requisite to maintain that there are not two separates faculties in the soul, the one confined to will and the other to understanding, but that there is a soul which wills~~

~~understandingly and understands willingly. Its first motive principle is the desire of good in general, Its free- will is distinctive of a rational imperfect being. A perfect~~

~~being, essentially good and wise, cannot have such a power, it being impossible it should ever improve, much less impair itself. He endeavours to refute not only the argu- ments designed to show freedom impossible, but those intended to prove it confined to Deity.~~

~~Vast erudition was combined in Cudworth with remark- able speculative power. 'The extent and obtrusiveness of his erudition and his discursiveness in argumentation have caused him to get much less credit for philosophical ability than he deserves. It is only the real student of his writ- ings who can be expected to recognize it; and, although he may be often consulted, he is probably now seldom studied.~~

~~Thomas Birch's Account of the Life and Writings of Ralph Cud- worth, D.D., is the chief, but very inadequate, biographical authority. In all respects the best view of Cudworth, as a man and a philosopher, is that given by Principal Tulloch in Rational Theology, &c., vol. ii. There is a good special dissertation on " the plastic nature" by Janet, and an excellent estimate of Cudworth as~~

~~a Platonist in Prof. v. Stein's Sieben Bucher zur Geschichte des Platonismus, B. vi. (R. F.)~~

~~CUENCA, a province of New Castile, Spain, lying between 39° 20' and 40° 40' N. lat., and 1° 10' and 3° 10' W. long,, with the provinces of Guadalajara and Teruel on the N., Valencia on the E., Albacete and Ciudad Real on the S., Toledo on the W., and Madrid on the N.W. Area, 6726 square miles. It occupies the eastern part of the ancient kingdom of New Castile, and slopes from the Sierra de Cuenca (highest point, the Cerro de San Felipe, on the N.E. border of the province, 5905 feet) down into the great southern Castilian plain watered by the upper streams of the Guadiana. The rocky and bare highland of Cuenca on the north and east includes the upper valley of the Jucar or Xucar and its tributary streams, but in the north-west the province is watered by tributaries of the Tagus. The forests are proverbial for their pine timber, and rival those of Soria; considerable quantities of timber are floated down the Tagus to Aranjuez, and thence taken to Madrid for building purposes. Excessive droughts prevail ; the climate of the hills and of the high plateaus is rude and cold, but the valleys are excessively hot in summer. 'The soil where well watered is fertile, but little attention is paid to agriculture, and three-fourths of the area is left under pasture. The rearing of cattle, asses, mules, and sheep is the principal employment of the people; olive oil, nuts, wine, wheat, silk, wax, and honey are the chief products of the province. Mining of iron, copper, alum, and saltpetre is carried on to a small extent ; jasper and agates are found.~~

~~Manufactures are limited to the coarsest stuffs. Population In 1870, 238,731.~~

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~~CuENcA, the capital of the above province, and the seat of a bishop, is finely placed on a rocky eminence girt about with hills, beside the river Jucar at its confluence with the stream of the Huecar, at an elevation of 2960 feet above the sea, and distant about eighty-five miles E.S.E. from Madrid. It was once a flourishing town, cele- brated in arts and literature, and the focus of the pro- vincial wool-trade, but has now a population of barely 7400. Its cathedral was founded by Alphonso VIII. in 1177, and is one of the most remarkable in Spain.~~

CUENCA, an inland town of the Andes of Ecuador, §. America, about 190 miles 8. of Quito and 60 miles S.E. of the port of Guayaquil. It stands on a plain at an elevation of about 8640 feet above the sea, near the hill of Farqui, chosen by the French astronomers as their meridian in 1742. It is a cathedral city, and contains several mon- asterics, besides a college and other educational institutions. Cuenca has an extensive trade in cheese, oats, grain, and other agricultural produce. The population, which is esti- mated at 25,000, is in great part Indian. In the re- division of the republic into 11 provinces, which took place in 1875, the former province of Cuenca ceased to bear that name.

CUIRASS, or Corstzt, the plate armour, whether formed of a single piece of metal or other rigid material or com- posed of two or more pieces, which covers the front of the wearer's person. In a suit of armour, however, since this important piece would be worn in connection with a corre- sponding defence for the back, the term cwerass commonly is understood to imply the complete body-armour, in- cluding both the breast and the back plates. Thus this complete body-armour appears in the Middle Ages frequently to have been described as a " pair of plates." The corslet, a comparatively light cuirass, is more strictly a breast-plate only. As parts of the military equip- ment of classic antiquity, cuirasses and corslets of bronze, and at later periods also of iron or some other rigid substance, were habitually in use; but while some special kind of secondary protection for the breast had been worn in earlier times by the men-at-arms in addition to their mail hauberks and their "cotes" armed with splints and studs, it was not till the 14th century that a regular body-defence of plate can be said to have become an established component of medieval armour. As this century continued to advance, the cuirass is found gradu- ally to have come into general use, in connection with plate defences for the limbs, until, at the close of the century the long-familiar interlinked chain-mail is no longer visible in knightly figures, except in the camail of the basinet and at the edge of the hauberk. The prevail- ing, and indeed almost the universal, usage throughout this century was that the cuirass was worn covered. Thus, the globose form of the breast-armour of the Black Prince, in his effigy in Canterbury Cathedral, 1376, intimates that a cuirass as well as a hauberk is to be con- sidered to have been covered by the royalty-emblazoned jupon of the Prince. The cuirass, thus worn in the 14th century, was always made

of sufficient length to rest on the hips ; otherwise, if not thus supported, it must have been suspended from the shoulders, in which case it would have effectually interfered with the free and vigorous action of the wearer. Early in the 15th century, the entire panoply of plate, including the cuirass, began to be worn without any surcoat; but in the concluding quarter of the century the short surcoat, with full short sleeves, known as the tabard, was in general use over the

armour. At the same time that the disuse of the surcoat

became general, small plates of various forms and sizes (and not always made in pairs, the plate for the right or sword-arm often being smaller and lighter than its com- panion), were attached to the armour in front of the shoulders, to defend the otherwise vulnerable points where the plate defences of the upper-arms and the cuirass left a gap on each side. About the middle of the century, instead of being formed of a single plate, the breast-plate of the cuirass was made in two parts, the lower adjusted to overlap the upper, and contrived by means of a strap or sliding rivet to give flexibility to this defence. In the second half of this L5th century the cuirags occasionally was superseded by the " brigandine Jacket," a defence forned of some textile fabric, generally of rich material, lined throughout with overlapping scales of metal, which were at- tached to the jacket by rivets, having their heads, like studs, visible on the outside. In the 16th century, when occasionally, and by personages of exalted rank, splendid surcoats were worn over the armour, the cuirass—its breast. piece during the first half of the century globular in form— was constantlyreinforced by strong additional plates attached to it by rivets or screws. About 1550 the breast-piece of the cuirass was characterized by a central ridge, called the "tapul," having near its centre a projecting point ; this projection, somewhat later, was brought lower down, and eventually the profile of the plate, the projection having been carried to its base, assumed the singular form which led to this fashion of the cuirass being distinguished as the " peascod cuirass." Corslets provided with both breast and back pieces were worn by foot-soldiers in the 17th century, while their mounted comrades were equipped in heavier and stronger cuirasses ; aud these defences

continued in use after the other pieces of armour, one by one, had gradually been laid aside. The cuirass and the corslet also at last ceased to be worn, until their revival in modern armies, in which mounted cuirassiers, armed as in earlier days with breast and back plates, in some degree have emulated the martial splendour of the body-armour of the era of mediaval chivalry. Cuirasses had been worn for some years by the modern soldiers of France before they were introduced into the British army. It was after the era of Waterloo that certain historical cuirasses were taken from their repose in the Tower of London, and adapted for service by the Life Guards and the Horse Guards.

CUJAS, or Cusactus, J ACQUES, or, as he called himself, JACQUES DE Cusas (1520-1590), one of the greatest of jurisconsults, was born at Toulouse, where his father, whose name was Cujaus, was a fuller. Having taught himself Latin and Greek, he studied law under Arnoul Ferrier, then professor at Toulouse, and rapidly gained a great reputation as a lecturer on Justinian. He was an unsuccessful candidate for the chair of law at his native place in 1554, but in the same year he was appointed to a similar position at Cahors, aud about a year after L' Hopital called him to Bourges. Duaren, however, who also held a professorship at Bourges, stirred up the students against the new professor, and such was the disorder produced in consequence that Cujas was glad to yield to the storm, and accept an invitation he had received to the university of Valence. Recalled to Bourges at the death of Duaren in 1559, he remained there till 1567, when he returned to Valence, where he gained a European reputation, and collected students from all parts of the Continent, among whom may be mentioned Joseph Scaliger and De Thou. In 1573 Charles IX. appointed Cujas counsellor to the Parliament of Grenoble, and in the following year a pension was bestowed on him by Henry IIL. Margaret of Savoy induced him to remove to Turin; but after a few

months (1575) he once more took his old place at Bourges. But the religious wars drove him thence. He was called by the king to Paris, and permission was granted him by the Parliament to lecture on civil law in the university of the capital. A year after, however, he finally took up his residence at Bourges, where he remained till his death in 1590, in spite of a handsome offer made him by Gregory XIII. in 1584 to attract him to Bologna.

The life of Cujas was altogether that of a scholar and teacher. In the religious wars which filled all the thoughts of his contemporaries he steadily refused to take any part. Nihil hoe ad edictum prectoris, " this has nothing to do with the edict of the preetor," was his usual answer to those who spoke to him on the subject. His merit as a jurisconsult, which has been surpassed by noue, arose from the fact that he turned from the ignorant commentators on Roman law to the Roman law itself. He consulted a very large number of manuscripts, of which he had collected more than 500 in his own library ; but, unfortunately, he left orders in his will that his library should be divided among a number of purchasers, and his collection was thus scattered, and in great part lost. His emendations, of which a large number were published under the title of Observations and Corrections, were not confined to law- books, but extended to many of the Latin and Greek classical authors. In jurisprudence his study was far from being devoted solely to Justinian ; he recovered and gave to the world a part of the Theodosian Code, with explana- tions ; and he procured the manuscript of the Basilica, a Greek abridgment of Justinian, afterwards published by Fabrot (see Bastnica). He also composed a commentary on the Conswetudines Feudorum, and on some books of the Decretals. In the Paratitla, or summaries which he made of the Digest, and particularly of the Code of J ustinian, he condensed into short axioms the elementary principles of law, and gave definitions remarkable for their admirable clearness and precision. His lessons, which he never dictated, were continuous discourses, for which he made no other preparation than that of profound meditation on the subjects to be discussed. He was impatient of interrup- tion, and upon the least noise he would instantly quit the chair and retire. He was strongly attached to his pupils, and Scaliger affirms that he lost more than 4000 livres by lending money to such of them as were in want,

In his lifetime Cujas published an edition of his works (Neville, 1577). It is beautiful and exact, but incomplete ; it is now very scarce. The edition of Colombet (1634) is also incomplete. Fabrot, however, collected the whole in the edition which he published at Paris (1658), in 10 vols, folio, and which was re- printed at Naples (1722, 1727), in 11 vols, folio, and at Naples and at Venice (1758), in 10 vols, folfo, with an index forming an eleventh volume. In the editions of Naples and Venice there are some

additions not to be found in that of Fabrot, particularly a general table, which will be found very useful, and interpretations of all the Greek words used by Cujas.

See Papire-Masson, Vie de Cujas (Paris, 1590); Terrasson, Histoire de la Jurisprudence Romaine, and Mélanggs d' Histoire, de Litté. rature, et de Jurisprudence; Bernardi, Liloge de Cujas (Lyons, 1775) ; Hugo, Civilistisches Magazin ; Berriat Saint Prit, Mfémoires de Cujas, appended to his Histoire du Droit Romain ; Biographie Universelle ; Gravina, De Ortu et Progressu Juris Civilis.

CULDEES. On no subject connected with the early ecclesiastical history of the British Islands has there been more discussion than on that of the Culdees. Their very name has furnished matter for dissertations, and their

doctrines, mode of life, and peculiar institutions have beer

the fruitful source of controversy. There is still room for doubt as to details, but in all-important points the truth has been sufficiently ascertained by the learned Scottish and Irish antiquaries who have devoted their attention to the question. The discussion may now be held ag practically settled in Britain, though Continental scholars

- of some mark are still disposed to carry it on,

, It is of no consequence whether the word Culdee is of Latin or Celtic origin. The name is equally significant and of similar meaning in both languages. It is not precisely ascertained at what time that name was first used. It was unknown to Bede and the biographers of St Columba, but seems to have been established early in the 10th century as the title of an order of ecclesiastics possessing numerous establishments in Scotland and Ireland, and a very few also in England and Wales. The Culdees resided in monasteries, but were not tied down by monastic rules so strict as those of the followers of Columba or Columbanus, or of the Benedictine order and its various branches. Their institute bore some resemblance to the rule of the canons- regular of St Augustine, but still more to that of the secular

canons so well known in the history of England during the 10th and 11th centuries. They were not united in one great community like the Columbites and Cistercians, or the orders of the Mendicant Friars, but resided in their separate monasteries or colleges, each of which was governed by its abbot, and was practically independent of the others. The Scottish monasteries are the best known, and it is in connection with them that the history of the order is most important. Their chief houses in that country were St Andrews, which numbered among its superiors King Con- stantine, who in earlier years had fought against the HInglish sovereign Athelstan at Brunanburh; Dunkeld, of which Crinan, grandfather of Malcolm Canmore, was one of the lay abbots ; Lochleven, famous as giving us the oldest of Scottish library catalogues; and Abernethy and Brechin, remembered chiefly in connection with their round towers.

It was long fondly imagined by Protestant writers that the religious belief and worship of the Culdees supplied complete evidence of primitive truth having been preserved free from Roman corruptions in one remote corner of Western Europe. It is now certain that this opinion is entirely opposed to historical evidence. In doctrine, ritual, and government there was no difference between the Culdees and the monastic communities in the Latin Church, except that the former, as was to be expected in a remote and uncivilized country distracted by repeated invasions of the Northmen, and by almost uninterrupted civil dissen- sions, were more superstitious and corrupt than their brethren on the Continent. In ecclesiastical discipline and morals there was the same inferiority. The 'pure Culdees" are familiar in poetry and legend, but are unknown to history. At no time distinguished above their fellows for learning or piety, they gradually became still more remiss. The chief endowments of their monasteries were seized by nebles, who called themselves abbots, but were neither ecclesiastics nor discharged any ecclesiastical functions, and who transmitted their titles and estates to their families in hereditary descent. In one respect these nobles were better than the corresponding class who, as priors of St Andrews and abbots of Arbroath and Paisley, or the like, fought on either side in the civil wars of the 16th century ;—they gave up a portion of their revenues to ecclesiastics, who, under the name of priors, discharged the spiritual functions of superiors of the monasteries.

Such a system naturally tended to become more corrupt as time went on. We need not believe all that is told to the prejudice of the Culdees by the chroniclers of a later age; but it is certain that the changes introduced into the Scottish Church by the influence of Queen Margaret and her son King David effected a great and beneficial revolu- tion. The Culdees in general conformed to the stricter discipline enforced by these sovereigus. The lay abbots had to resign their titles if not their estates; the chief houses of the old rule reappeared as Benedictine and Augustinian monasteries ; and, in one case at least, that of Brechin, the Culdees became for a time the chapter of the

new cathedral. The last appearance of the Culdees in Scottish history is in connection with the unsuccessful attempts of the prior and brethren of the order at St Andrews, in the beginning of the 14th century, to maintain their ancient privilege of assisting at the election of a bishop of the primatial see.

The best and fullest account of the Culdees is to be found in Dean Reeves's Culdees of the British Islands as they appear in History, with an Appendix of Evidences, Dublin, 1864.

CULLEN, Witiiam (1710-1790), an eminent physi- cian and medical teacher, was born at Hamilton, Lanark- shire, on 15th April 1710. His father, who was a writer by profession, was factor to the duke of Hamilton, and was owner of a small estate in the parish of Bothwell. William received his early education at the grammar school of Hamilton, and he appears to have subsequently attended some classes at the university of Glasgow. He commenced his medical career as apprentice to Mr John Paisley, surgeon in Glasgow, who was a man of learning and possessed a valuable medical library, and under whom Cullen prosecuted his studies with great ardour. After completing his apprenticeship at Glasgow Cullen became surgeon to a merchant vessel trading between London and the West Indies. On his return to Scotland in 1732 he settled as a practitioner in the parish of Shotts, Lanark- shire, where he resided for about two years. He thereafter proceeded to Edinburgh to pursue his studies at the university, which was then rapidly rising into fame as a medical school. Here he spent two winter sessions, and was one of the founders of what is now known as the Royal

Medical Society, a students' association which meets weekly for the discussion of subjects of medical and scientific interest. Leaving Edinburgh in 1736, Cullen commenced practice in Hamilton, where he rapidly acquired a high reputation, and was employed by many of the families of distinction in the locality, including that of the duke of Hamilton. About this time he became acquainted with the celebrated Dr William Hunter, who resided with him as his pupil for nearly three years. Hunter was about to enter into partnership with Cullen, when, an opening occuring, he removed to London to engage in those anatomical and obstetric pursuits with which his name will ever stand associated. Cullen took the degree of M.D. at the university of Glasgow in 1740; and, resolving to confine his attention to the practice of physic, took into partnership Thomas Hamilton, surgeon, who undertook the surgical part of the work. While at Hamilton Cullen was twice elected a magistrate of the town, and in this capacity he displayed great ability, and was of great service to the community. In 1741 he married Miss Johnston, daughter of a clergyman in the neighbourhood, a lady of beauty and accomplishment, by whom he had a large family. He continued to practise in Hamilton till 1744, when he was induced to settle in Glasgow. During his residence at Hamilton, besides the arduous duties of medical practice, Cullen found time to devote to the study of the natural sciences, and especially of chemistry, for which he seems to have had special predilections. On coming to Glasgow he appears to have begun to lecture in connection with the university, the medical school of which was as yet imperfectly organized. Besides the subjects of theory and practice of medicine, Cullen lectured systematically on botany, materia medica, and chemistry. His great abilities, enthusiasm, and power of conveying instruction on the most difficult subjects made him a successful and highly popular teacher, and his classes increased largely in numbers. At the same time he diligently pursued the practice of his profession. Chemistry was the subject which at this time seems to have engaged the greatest share of Cullen's attention, and there can be

CULLEN

no doubt that to him was due the credit of placing that science on a more philosophical basis than it had hitherto occupied, while at the same time he laboured to render it specially subservient to agriculture and other useful

arts. He was himself a diligent investigator and ex- perimenter, and he did much to encourage original research among his pupils, one of whom was Dr J oseph Black, who became the most celebrated chemist of his time. In 1751, a vacancy having occurred in the professorship of medicine, Cullen, through the influence of the duke of Argyll, was appointed by the king to the chair, but he still continued to lecture on chemistry. In 1756 he was elected by the town council of Edinburgh joint professor of chemistry in the university of that city, along with Dr Plummer, on whose death in the following year the sole appointment was conferred on Cullen. This chair he held for ten years—his classes always increasing in numbers. He also practised his profession as a physician with eminent success. About this time he delivered, along with some of his colleagues, lectures on clinical medicine in the Royal Infirmary, which he continued to do till near the close of his career. This wasa work for which Cullen's experience, habits of observation, and scientific training peculiarly fitted him, and in which his popularity as a teacher, no Jess than his power as a practical physician, became more than ever conspicuous. During the winter session of 1760-61 the professor of materia medica, Dr Alston, died, and the students presented a petition to Cullen to undertake the work of finishing the course of lectures on that subject,—a request with which he readily complied. He delivered an entirely new course of lectures, in which the subject was treated in such a masterly and scientific as well as interesting and practical manner as to gain the high commendations of his students and of the medical profession generally, by whom copies of his pupils' notes were in great request. An incorrect edition of the lectures was ten years afterwards published in London without Dr Cullen's knowledge, and widely circulated throughout Europe.

On the death of Dr Whytt, the professor of the institutes of medicine, in 1766, the patrons offered the chair to Dr Cullen, who accepted it, resigning that of chemistry, in which he was succeeded by Dr Black, who was then professor of chemistry in Glasgow. In the same year Dr John Gregory was appointed professor of practice of physic on the death of Dr Rutherford. For this chair Cullen was likewise a candidate, and a strong effort was made to induce the patrons to confer the appointment on him, but without success. In 1769 an arrangement was, however, entered into between Drs Gregory and Cullen, by which they agreed to deliver alternate courses on

~~the theory and practice of physic. This arrangement proved eminently satisfactory in the hands of these two distinguished men, but it was brought to a close by the sudden and pre- mature death of Gregory in 1773. CQullen was then appointed sole professor of the practice of physic, and he continued in this office till a few months before his death, which took place on 5th February 1790.~~

~~Cullen's fame rests on his great power and influence as a teacher, and on his important contributions to theoretical and practical medicine.~~

~~As a lecturer Cullen appears to have stood unrivalled in his day. HIs clearness of statement and power of impart- ing interest to the most abstruse topics were the con- spicuous features of his teaching, and in his various capacities as a scientific lecturer, a physiologist, and a practical physician, he was ever surrounded with large and increasing classes of intelligent pupils, to whom his eminently suggestive mode of instruction was specially attractive. The grasp and vigour of his mind were shown~~

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~~in the facility with which he mastered the many different branches of medical knowledge which he taught; while his scientific spirit equally appears in his refusal to accept~~

~~what he describes as the "false facts" so prevalent in his~~

~~day, and by the zeal with which he pursued original~~

~~observation and experimental research both as a chemist and~~

~~as a physician, with the view of arriving at truth. Cullen has been frequently represented as a purely speculative physician ; but this view is far from just. borne in mind that in his time medicine was to a large~~

~~It is to be~~

~~extent mixed up with metaphysical speculation, that its ascertained facts were few, and that the science of physiology was then in its infancy. If,~~

therefore, in opposing what he held to be false theories he was led to advance new views and speculations of his own, still no one who attentively reads the works of this great physician and teacher can fail to perceive that his constant aim was in the direction of disengaging his science from the hypothetical mazes in which it was involved, and placing it upon the solid basis of fact.

Previous to the days of Cullen, and during his early life, the medical philosophy or medical doctrines of Boerhaave were universally taught in the schools. Boerhaave attempted to combine into one system the vital philosophy of Hippocrates (the vis medicatrix nature), the chemico-humoral principle of Paracelsus, the mechanical doctrines of Bellini, and a few of the other doctrines taught by former medical philosophers. He attributed, however, more to the chemical and mechanical forces than to the powers of life, and of course embraced a large portion of the doctrine of the humoral pathologists. Cullen, seeing that many of the facts then known were irreconcilable with Boerhaave's doctrines, became their warm opponent, especially taking offence at those doctrines which attributed almost every disease toa vitiation of the fluids of the body. Indeed, he might almost be said to have adopted as his motto the celebrated aphorism of Hoffmann, " Universa pathologia longe rectius atque facilius ex witio motuum microcosmicorum in solidis, quam ex variis affectionibus vitiosorum humorum, deduci atque explicari possit, adeoque omnis generis nervosi affectionibus sint referende." Living at the time he did, when the doctrines of the humoral pathologists were carried to an extreme extent, and witnessing the ravages which disease made on the solid structures of the body, it was not surprising that he should oppose a doctrine which appeared to him to lead to a false practice, and to fatal results, and adopt one which attributed more to the agency of the solids, and very little to that of the fluids of the body. The Cullenian system was certainly an immense improvement on those which pre- ceeded it, and has served as a valuable stepping-stone for the rational doctrines which now prevail, more especially those which relate to the influence of the nervous system alike in healthy and morbid action. He was obliged to introduce the doctrine of a spasm in the extreme vessels in order to account, on his theory, for many of the phenomena of disease ; still we cannot refuse to him the honour of having been an able and successful improver in medical science. His classification

~~of diseases was remarkable for its simplicity and clearness. He divided diseases into four great classes—Ist, Pyrexie, or febrile disease, as typhus fever ; 2d, Neuroses, or nervous diseases, as epilepsy ; 3d, Cachexiz, or diseases resulting from bad habit of body, as scurvy ; and 4th, Locales, or local diseases,as cancer. His nosological arrangement has served to a considerable extent~~

~~as the groundwork of modern nosologies, and was a great improvement, both in simplicity and clearness, on the involved productions of his predecessors.~~

~~Cullen's chief works are—First Lines of the Practice of Physic, Edin. 1774, 4 vols, 8vo; second edition, 1788 ; Institutions of~~

~~Medicine, Edin. 1770, 12mo ; Synopsis Nosologice Methodiew, Edin. 1785, 2 vols. 8vo ; Treatise on the Materia Medica, Edin. 1789, 2 vols. 4to. The first volume of an account of Cullen's Life, Lectures, and Writings was published by Dr John Thomson in 1832, and was reissued with the second volume (completing the work) by Drs W. Thomson and D. Craigie in 1859.~~

~~CULLERA, a walled seaport-town situated on the left bank of the River Jucar, near its mouth, in the province and 20 miles south of the capital of Valencia. It stands on the southern slope of the hill called Zorras, which terminates in Cape Cullera, on the outskirts of a fine agricultural district noted for its rice, and carries on a considerable coasting trade with France and the Mediter- ranean. Its strects are irregularly built, but clean, and there are three small plazas. An old castle, extensive barracks, churches, convents, and a hospital are its chief buildings. Agriculture and fishing are the chief industries. Population about 8000.~~

~~CULLODEN, a desolate tract of moorland, otherwise known as Drummossie, about five iniles south-east from Inverness in Scotland, celebrated as the scene of the battle of April 16, 1746, by which the fate of the house of Stuart was decided. A mile to the north is Culloden House, which at the time of the rebellion belonged to Duncan Forbes, the president of the Court of Session, and has since furnished the historical student with a~~

~~valuable "collection known as the Culloden Papers, ranging from 1625 to 1748. Discovered in 1812, they were published in 1815 by Duncan George Forbes, at that time the representative of the Culloden family.~~

~~CUM, Cuma, or in Greek Kvn, the oldest and one of the most important of the Greek colonies in Italy, was situated on the shore of Campania, between the lakes Acherusia and Liternus, and about six miles north of Baie. The most generally received opinion is, that Cum was founded by a joint colony, partly from the Aolian Cum or Cyme and partly from Chalcis in Eubcea, who agreed that they should call the city by the name of one of the parent states, while it should take rank as a colony of the other. The date of its foundation is unknown; but it is certain that Cume had attained a high degree of prosperity while Rome was still struggling into existence. Inthe 8th century Bc. it had extended its power on every side into Campania; and, like Sybaris and Crotona, had begun to plant flourishing colonies, and establish itself besides as a maritime power. Of its colonies the most prosperous was Neapolis, destined to survive as the modern Naples ; and among its maritime stations were the harbours of Diceearchia (Puteoli) and Misenum. The first event which led to the decline of Cumze was the establishment of the supremacy of the Etruscans by sea; but a severer blow still was the invasion of Campania by that people and their allies about the year 522 B.c. This attack was re- pelled, though at a great loss to the Cumeans, chiefly by the ability of Aristodemus, who overthrew the existing government, and established a tyranny, which endured for twenty years. Atthe end of that period he was driven out of the city by the nobles, who had once more become powerful. Twenty-two years later the Cumzans, unable any longer of themselves to resist the growing power of the Tuscans, called in the aid of Hero of Syracuse, and with his assistance defeated their opponents. In 520 B.c. the Samnites, a more formidable foe, made themselves masters of Cume, put the male citizens to the sword, and established a colony of their own in the city. Admitted to the Roman franchise in 338 3B.c. Cumz ever after continued faithful to its alliance with Rome ; aud in the second Punic war, though by that time it had greatly declined, it held out against Hannibal. In the later ages of the republic it attained a kind of reflected prosperity from the neighbourhood of Baie, and other favonrite~~

~~retreats of the Roman nobility ; but it is mentioned as '* Vacue Cume," " Quieta Cuma," with reference to its half-deserted appearance. In the wars of the Goths and Romans, Cumze once more became for a short time important, as the last stronghold of the Gothic kings in Italy. In 552 it surrendered to the victori- ous arms of Narses; in the 9th century it was burned by the Saracens; and in the 13th, having become a rendezvous for robbers and pirates, it was destroyed by the people of Naples. Some remains of Cume are still to beseen. Of these the principal are a ruinous amphitheatre, a brick arch, supposed to be one of the old gates of the city, and several temples named respectively after Apollo, Diana, the Giants, and Serapis. Bronze statues and vases have at different times been dug up. Not the Icast interesting spot at Cume was a great cavern in the rock on which the citadel stood, regarded by the Cumeans as the place whence the Sibyl propounded her enigmas. This cavern existed unimpaired till the time of Narses, who availed himself of it to undermine the walls of the town ; and the remains are still pointed out to the traveller.~~

~~CUMANA, a city of Venezuela, capital of a province of the same name, stands on the Gulf of Cariaco, at the mouth of the Manzanares, 180 miles east of Caracas. It is the oldest European city in South America, having been founded by Diego Castellon in 1523, It was almost totally destroyed by the terrible earthquake of 1766, and has since repeatedly suffered from earthquakes. The houses are generally low and flat, and have a poor appearance ; but the style of building has recently been much improved. Cumana possesses a capacious roadstead, and presents great facilities for obtaining provisions. The principal trade is in cattle, smoked meat, dried fish, coffee, cotton, sugar, tobacco, salt, and petroleum. Population (1873), 9427.~~

~~CUMBERLAND, a county of England, at its north- Plate XI. west extremity, situated between 54° 6' and 55° 73' N, lat. and 2° 13' and 3° 30' W. long., and bounded on the N. by the Solway Firth and Scotland, on the E. by Northumberland and Durham, on the 8. by Westmoreland and North Lancashire, and on the W. for about 70 miles by the Irish Sea, It is at a medium about 50 miles long and 30 miles broad, within a bounding line of 215 miles, of which 75 are sea coast ; and it contains an area of 1516 square miles, or 970,161 acres, of which the mountainous district comprises~~

more than a third, and the lakes and waters 8000 acres, the remainder consisting of inclosed and cultivated land with a few commons still uninclosed, but capable of great improvement. 'The principal divisions are locally termed "wards." These wards are five in number, viz., Cumberland ward, Eskdale, Leath, Allerdale-above- Derwent, and Allerdale-below-Derwent. The ward of Allerdale-above-Derwent was formerly included in the diocese of Chester ; but since 1856 it has been joined to the rest of the county for ecclesiastical purposes, and all the county is now in the diocese of Carlisle, with the exception of the parish of Alston, in the extreme east, which belongs to the diocese of Durham. The county is embraced in the northern circuit, the assizes being held at Carlisle, and there is a court of quarter sessions. Cumberland contains the city of Carlisle, 19 market-towns, and 112 parishes.

The population in 1871 was found to be 220,253 (males, 109,079 ; females, 111,174), having increased during the .

preceding ten years to the extent of 14,969 souls, or 72 per cent. The number of inhabitants to a square mile 18

exceptionally small, being 145, while that of all England , is 3894.

Cumberland presents every variety of surface. The south-western district is generally mountainous, rugged,

and sterile, yet contains several rich though narrow valleys, with numerous fine lakes, islands, rivers, cascades, and

woodlands, which, combined or contrasted with the gigantic masses around them, exhibit many remarkable scenes of grandeur, desolation, and beauty, Scawfell, Skiddaw, and Helvellyn, rising to the height of more than 3000 feet, belong to this quarter. The highest part of that immense ridge known as the Pennine chain, and not inaptly termed the "backbone" of England, which, rising in Dertyshire, extends in a continuous chain into the Lothians of Scotland, forms the eastern boundary ; the culminating point of this ridge is Crossfell, nearly 3000 feet high; it is surrounded with other lofty and

bleak eminences, which retain the snow upon them for more than half the year.

The following are the loftiest heights, with their respec- tive elevations :—

Feet. Feet. Scawfell Pike……3210 BONEN ese intscsceseceseh ..2960 Sco Cll ee 3162 Great Gable ……. 2949 BVCIVCNIVM ……06008 e000 BILLS TENE ese oncoseva sie 5 MONE DRIMAaW > ...0:essesecevers 3058 Blencathra ….. ……. 2847 Great End.…….. eee 2984 Grisdale Pike.……2593

The north and north-eastern part of the county consists of the vale of the Eden, which separates the Pennine chain from the mountainous system of the south-west, and gradually expands into the great Cumbrian plain, extend- ing north and north-west to the shores of the Solway. A tract of low land, varying froni two to five miles in breadth, and consisting generally of a gravelly or sandy soil, extends along the coast-line.

[G'eology.—The oldest rocks known in this county are the Skiddaw slates, representing ancient marine deposits of clay and sand formed during a long period of subsidence, and containing a few fossils (graptolites, trilobites, phyllopod crustacea, &c.). These old mud rocks have been much contorted, cleaved, and metamorphosed, the metamorphosed portions, including chiastolite slate, spotted schist, and mica schist (rarely gneissic), being specially developed around the granite of Skiddaw Forest. The quiet marine condi- tions under which these slates were formed seem to have given way toa long series of volcanic outbursts, at first sub-marine in character, but soon becoming sub-aerial. Thus, above the Skiddaw slates are piled up great thicknesses of volcanic ashes and lavas—the volcanic series of Borrowdale (or green slates and porphyries). Then must have followed a renewed period of depression beneath the waters of the sea, and upon the denuded sur- face of volcanic rocks the great series of sedimentary strata known as the Coniston limestone and the overlying Upper Silurian (Westmoreland, about Windermere and Kendal) was deposited.

The next geological epoch (the Devonian or Old Red) is unrepresented in Cumberland by any sedimentary deposi tion, except quite towards it close; but during the long lapse of time between the Upper Silurian and the

~~commencement of the Carboniferous, that mighty but pro- bably slow elevation and denudation of all the previously formed rock-groups took place, which resulted in the first appearance of the Cumberland mountain district, the rough- hewn block out of which, during long succeeding ages, mountain and valley were carved, Around this early nucleus was formed the conglomerate so well shown in Mell Fell and at the foot of Ullswater, and then the thick series of Carboniferous rocks, the limestones, sandstones, shales, and coal-seams, which form so admirable a framework to the mountain country.~~

~~In Carboniferous times there must have been frequent alternations of marine and low-lying land conditions over large parts of Cumberland. At the close of this period the conditions around the mountain nucleus, whether' marine or partly fresh-water, allowed of the deposition of great thicknesses of sandstones (mostly red) and marls, together~~

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~~with some breccias and magnesian limestone, which make up the geological formations known as the Permian and New Red (or Trias). With the exception of a small area occupied by Liiassic rocks, near Carlisle, no newer formations are known in Cumberland ; but during that great length of time represented by the Secondary and Tertiary rocks of the rest of England, the area which is now our lake district seems to have been dry land, and to have been sculptured and moulded by atmospheric denudation into its present form. Within comparatively recent times this district has been the home of glaciers, which have left abundant traces of their former existence in the ice-scratched and rounded rocks, perched blocks, and glacial moraines.~~

~~Besides these various rock-groups, there are several large masses of granite and granitoid rocks in the area of the mountain district. Granite occurs in Skiddaw Forest and in Eskdale. Syenitic and quartz-felsitic rocks occur in Buttermere and Ennerdale (closely associated with the Eskdale granite), in St John's Vale, and in other smaller masses. Bosses and dykes of diorite and dolerite are of frequent occurrence among the older Silurian rocks, but the basalt known as the Whin Sill is the only instance of intrusive igneous rocks yet recognized among the post- Silurian strata.~~

~~The mineral resources are extensive. Among the Lower Silurian rocks (Skiddaw slates and volcanic series) are veins of iron (but little worked), lead, and copper, while the cele- brated plumbago mine occurs in the midst of some intrusive dioritic and diabasic masses among the volcanic rocks of Borrowdale. The valuable deposits of hematite are found in connection with the Carboniferous limestone, and the Whitehaven coal-field furnishes a large supply of valuable fuel. Lead veins of much value occur in the limestone area in the east of the county, and specially in the neigh- bourhood of Alston.~~

~~Slates are worked in the volcanic series, in which case they consist of cleaved ash-beds, and flags are largely wrought among the Coniston series in the Upper Silurian. Building stone of more or less value is found in the various formations developed in the county. (J. ©. WA.)~~

~~The climate necessarily corresponds with the variety of surface, Along the shore-level it is mild and temperate, though subject to an excess of moisture compared with the eastern part of the country; among the mountains the winters are sometimes very rigorous, but more frequently subject to heavy and almost incessant rain for days at a time. The average yearly rainfall, as shown by careful observation for several years back, is as follows :— Carlisle, 30 inches; Wigton, 34; Whitehaven, 50; Keswick, 59 ; while at Seathwaite, in Borrowdale, 420 feet above the sea- level, it amounts to about 140 cubic inches. On the Sty- Head Pass, at an elevation of 1077 feet, the rain-guage showed in the year 1872 the enormous fall of 243-98 cubic inches, which, as far as has yet been ascertained, marks this region as the wettest spot in Europe. Black peaty earth is the most prevalent soil in the mountainous districts, and is found, too, in the moors and commons of the eastern parts of the county. About one-half the cultivated land consists of dry loams, excellently adapted for the growth of turnips, potatoes, grain, and herbage. Fertile clays occupy only a small portion, but clay, wet and sterile, forms the subsoil in many parts. The principal rivers are the Eden, Irthing, Derwent, Greta, Caldew, and Esk. The Eden has its source in Westmoreland, near the borders of Yorkshire, and, pursuing a north- westerly direction through Cumber- land, passes Kirkoswald and Carlisle, falling into the Solway Firth near Rockliffe Marsh, where it forms a fine estuary. Te land on its banks is for the most part very narrow, and in some~~

places the high grounds approach to the water's edge. On this river there are several valuable

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salmon-fisheries belonging to different owners. The Derwent rises among the picturesque crags at the head of Borrowdale, in the south-west group of mountains, whence it dashes from rock to rock until it reaches Derwentwater Lake, from which it again flows onward through the vale of Keswick, thence through Bassenthwaite Lake, and, after being joined by the Cocker, near Cockermouth, falls into the sea at Workington. The basin of the Derwent includes within its area six lakes and about a dozen mountain tarns, all of which lie embosomed in the midst of scenery unsur- passed in loveliness and grandeur in Great Britain. The Caldew rises on the south-east side of the Skiddaw and enters the Eden near Carlisle after a course of 24 miles, in which it gives motion to many corn and cotton mills. The vale through which it flows in its lower part is very beautiful and well-wooded. The Esk enters Cumberland from Scotland near a place called the Moat, and, flowing westerly by Longtown, falls into the Solway Firth. The Liddel, another Scottish river, which in one part separates Cumberland from Scotland, joins the Esk after the latter has passed into England.

Landed property is much divided in this county, and the smaller holdings were formerly generally occupied by their owners, who were known as "statesmen," z.¢., " estates- men," a class of men long noted for their sturdy indepen- dence and attachment to routine husbandry. Most of these estates were held of the lords of manors under customary tenure, which subjected them to the payments of fines and heriots on alienation as well as on the death of the lord or tenant. According to the Agricultural Survey printed in 1794, about two-thirds of the county was held by this tenure, in parcels worth from £15 to £30 rental. On large estates, also, the farms were in general rather small, few then reaching £200 a year, held on verbal con-

tracts, or very short leases, and burdened like the small estates with payments or services over and above a money rent ; but a great change has taken place in all these respects within the last forty years, The "'statesmen" have been gradually becoming extinct as a class, and many of the sraall holdings have fallen into the hands of the larger landed proprietors. According to the Owners of Land Return, 1873, the county was divided among 15,513 separate proprietors, the total value of the land being estimated at £1,201,980. There were 9617 owners of holdings which did not exceed 1 acre in extent, 1764 owners of holdings from 1 to 10 acres, 1061 owners of 10 to 50 acres, and 3071 owners of 50 acres and upwards, the largest possessing 47,730 acres. From the above-mentioned return it appears that 62 per 'cent. of the total proprietors in Cumberland hold less than 1 acre ; while in the neigh- bouring county of Westmoreland only 39 per cent. belonged to this class, and in all England the average is 71 per cent, The average extent of the holdings in Cumberland was 47 acres against 34 acres in all England, and the value per acre was £1, 12s. 11d. as against £3, Os. 2d. throughout the whole country. There were five proprietors in the county owning more than 10,000 acres, viz., the earl of Carlisle (Castle Howard), 47,730 acres; earl of Lonsdale (Lowther Castle), 28,228; Sir F. U. Graham (Netherby) 25,270; Henry Howard (Greystoke Castle), 13,008; and Lord Leconfield (Cockermouth Castle), 11,147.

Farms are commonly let upon leases of seven or fourteen years, and the farmers can compare favourably with those of neighbouring counties in intelligence and skill in husbandry. The live stock consists of horses of rather a small size; the longhorned breed of cattle, for which Cumberland was noted, has been entirely supplanted by the improved shorthorns, of which the stocks of several of the large proprietors include animals from the best blood in the kingdom; Galloways, Ayrshires, and cross-breeds are

also kept on dairy-farms. The sheep on the lowland farms are generally of the Leicester class or cross-bred between the Leicester and Herdwick, with a few South-downs. Throughout the mountainous districts the Herdwick has taken the place of the smaller black-faced heath variety of sheep once so

~~commonly met with on the sheep farms. They are peculiar to this part of England; the ewes and wethers and many of the rams are polled, the faces and legs are speckled, and tlie wool is finer and heavier in fleece than that of the heath breed. They originally came from the neighbourhood vf Muncaster in the Duddon and Esk dis- trict, and are said to be sprung from parents that escaped from a wrecked ship of the Spanish Armada. In general they belong to the proprietors of the sheep-walks, and have been farmed out with them from time immemorial in herds of from 300 to 1000, and from this circumstance it is said they have obtained the uname of ‘ Herdwicks.” From the agricultural returns for the years 1873 and 1876 it will be seen that the numbers of live stock remain pretty stationary, with the exception of sheep, which have apparently decreased latterly—these returns, however, are not so complete as they might be.~~

~~Cattle. Sheep. * Pigs. Horses, UV /Bkscooee 128,538 561,513 © 28,229 19,071~~

~~1876…... 128,409 516,305 27,178 19,838~~

~~Grain is not so much grown as formerly, a great propor- tion of the land being laid down in grass for the breeding and rearing of cattle ; butter and bacon are largely exported to the populous districts of Lancashire and Yorkshire.~~

~~Acreage Under Grass Under all Percentage Under Green Crops under rota- kinds of of area~~

~~Corn Crops. tion. cultivation, of county.~~

~~1873…100,704 50,676 99,958 541,681 55% 1876… 94,794 48,207 96,317 549,590 564~~

~~Nearly three-fourths of the corn crops consist of oats, and about one-fifth wheat, while two-thirds of the green crops are turnips, and a fifth potatoes. That excellent variety of oats called the potato-oat was first dis- covered in Cumberland in 1788, whence it has now spread over every part of the United Kingdom. Among the farm implements the single-horse cart deserves to be noticed, as being almost exclusively used, and with great~~

advantage, as it is not only the most convenient and economical carriage for the farmer, but is much less in- jurious to the public roads than the waggons and heavily- loaded carts used in many other English counties, which could not easily travel the hilly roads of many parts of Cumberland.

The principal manufactures of this county are calicoes, ginghams, corduroys, and other cottou fabrics, established at Dalston, Carlisle, Warwick Bridge, and a few other places. Cotton printing is carried on to some extent in Carlisle. Cockermouth possesses a large new mill for the manufacture of tweeds, and also an old established thread manufactory. A manufactory of coarse earthenware near Dearham, pencil mills at Keswick, and paper mills at Egremont, with breweries, tanneries, soap and biscuit manufactories at Carlisle, comprise all the other chief manufacturing establishments of any note in Cumberland. Coal is found at different places in the eastern mountains, and also near Brampton in the northern part of the county, but in greatest abundance on the west of the Calder, and thence through the Maryport, Workington, and Whitehaven districts ; in 1871, 4596 persons were employed in the pits. Owing to the development of the iron trade in the west of the county the consumption of coal is very considerable ; but a large export trade is still carried on from the Cumber- land seaports to Ireland. Mining operations have taken a new direction in recent years. The discovery and opening out of immense beds of iron ore in the Cleator district have given increased employment to the population. This ore is of

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the quality known as hematite ; and, being exceedingly rich and well adapted for the manufacture of Bessemer steel, it is largely exported to the Cleveland and other districts to mix with ore of an inferior quality. In 1871 thirty-three iron mines were registered for Cumberland in tlie Mining Record Office, employing 3771 miners ; but since that date many new mines have been opened, and all the mines have been worked on a more extensive scale than before. Furnaces for smelting the ore are established at Working- ton, Maryport, Seaton, Parton, and Harrington ; and at Workington are established large works for the manufac- ture of iron and Bessemer steel.

~~The famous black-lead mines are situated at the head of Borrowdale, in the south-west range of mountains, The mineral is found in the green slate, generally lying in nodules or irregular granular kidney-shaped masses. These masses are as a rule small; but early in the present cen- tury an extraordinary mass was found which, it is said, yielded 70,000 tb of pure plumbago. With the exception of a couple of trials made at an interval of twenty years by different companies, this " wad-mine" has been practi- cally closed for more than thirty years. The lead now used for pencils is an imitation of the plumbago, made chiefly from Mexican lead mixed with antimony and other ingredients.~~

~~The principal lead-mines are at Alston Moor, on the south-east border of the county, in the Caldbeck fells, and in the mountains around Keswick. The ore is found in veins nearly perpendicular, and not unfrequently contains a con- siderable proportion of silver. Copper was formerly raised from the mines of Caldbeck, Hesket-New-Market, and Newlands near Keswick, but these mines have not been wrought for many years. 'The ore is a sulphuret, and usually contains both iron and arsenic. In 1871, 1082 persons were employed in lead-mining.~~

~~The most considerable towns in Cumberland are Carlisle (population, 31,074), Penrith (8317), Whitehaven (13,298), Workington (7979), Maryport (6938), Wigton (3425), Cockermouth (5115), Keswick (2777), Brampton (2617), and Egremont (2377). The seaports are Whitehaven, Workington, Maryport, Harrington, and Silloth. White- haven was ainong the first ports in the kingdom to embark in the East India trade after it was thrown open, and possessed a fair share of the trade with America and the West Indies long before the Mersey and the Clyde; the first Clyde ventures to the West Indies were made in Whitehaven bottoms.~~

~~The lakes and mountains of Cumberland have long attracted the admirers of the wild and beautiful in natural scenery. The lakes, including the mountain tarns, are thirty-four in number ; of these Ullswater is the largest, and Derwentwater the most beautiful. Ullswater is partly situated in Cumberland, and partly in Westmoreland ; it is 9 miles in length and from) mile to ? mile in breadth. Winding round the base of vast rocky mountains in its upper part, it is only seen in the successive portions,—the scenery on~~

~~its margin presenting new and striking objects at every successive stretch. Derwentwater is of an irregular figure, approaching to an oval, about 3 miles in length and from } mile to 14 miles in breath. It is seen at one view, expanding within an amphitheatre of mountains, rocky but not vast, broken into many fantastic shapes, opening by narrow valleys the view of rocks which rise immediately beyond and which are again overlooked by others. Its shores are well wooded, and its bosom spotted by well-wooded islands, of which Lord's Island, Derwent Isle, and St Herbert's are the principal. Lord's Island was the residence of the ill-fated Derwentwater family, the last earl of which was beheaded for participation in the rebellion of 1715. St Herbert's Isle receives its~~

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~~name from the fact of its having been the abode of a holy man of that name mentioned by Bede, as contemporary with St Cuthbert of Farne Island in the 7th century. Derwent Isle, about 6 acres in extent, contains a handsome sumnier residence surrounded by tastefully laid-out lawns, gardens, and timber of large growth. The celebrated Falls of Lodore, at the upper end of the lake, consist of a series of cascades which rush over an enormous pile of protruding crags from the height of nearly 200 feet. What is called the "Floating Island " appears occasionally at intervals of from two to five years, on the upper portion of the lake in front~~

~~. of the Lodore Falls. This somewhat singular phenomenon~~

~~is supposed to owe its appearance to an accumulation of gas, formed by the decay of vegetable matter, detaching and raising to the surface the matted weeds which con- stitute the floor of the lake at this point.~~

~~The following table shows the extent of the lakes and their elevation above the sea-level, dc. :—~~

~~Greatest~~

~~Length. | Breadth. | Elevation. Depth,~~

Miles, Miles, Feet. Feet, Ullswater……..0.+- iece: 3 477 218 Bassenthwaite……..) 4 3 226 78 Derwentwater…….. 3 13 238 81 CHM MOC Ec ..6.550c 00% 00 3 3 321 132 Wastwater,……..ces000 3 4 204 aie ARO O o5.55o¥eaccennses 3 3 533 108 BUMerdales. ccccsvescacost Oh 3 369 80 Buttermere…….. 14 % 331 93 Loweswater…….. ae 1 4 429 60

The present county of Cumberland was formed by the addition of a portion of the old English kingdom of York- shire to the southern part of the old British kingdom of Strathclyde. It first became a portion of the kingdom of England in the reign of William Rufus, who rebuilt Carlisle which the Danes had destroyed 200 years before. At a conference held at York, Henry HL., in full satisfaction of the claims of the Scots, who considered Strathclyde to be a tributary kingdom to Scotland, agreed to assign lands to them of the yearly value of £200 within the counties of Northumberland and Cumberland, if lands of that value could be found therein, without the limits of the towns where castles were erected. But after this arrangement there still remained a tract between the two kingdoms called the' debateable ground," the resort of the worst characters of both, who continued to disturb the borders, down to the union of the two crowns. Of the ancient British antiquities of Cumberland the most re- markable is a circle of stones, about three miles from Kirkoswald, called Long Meg and her Daughters ; and there is a unique little circle of 48 stones between Threlkeld and Keswick, called the Druid's Temple, scarcely two miles from the latter place—the stones are porphyritic greenstone. The Roman wall may still be traced across the country from the Solway to Northumberland. A great many coins, altars, and other vestiges of antiquity have been discovered from time to time at the Roman stations on its line. In the mountainous parts the manners of the people were down to a recent period somewhat peculiar, and in some of the secluded dales the native inhabitants still lead a primi- tive kind of existence ; but increased intercourse with the outside world, induced by the extension of railways and the spread of education, is doing much to bring them on a level with the peasantry of more favoured parts of the kingdom.

Cumberland sends eight members to Parliament :—two for the Eastern Division, two for the Western Division, two for Carlisle, one for

Whitehaven, and one for Cocker- mouth. It is governed by a lord-lieutenant, high-sheriff, deputy lieutenant, and magistrates, (Haieua)

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CUMBERLAND, a city of the United States, capital of Alleghany county, Maryland, on the north bank of the Potomac river, 179 miles west of Baltimore. It contains a court-house, a county prison, a market-house, and several handsome churches; and as the western terminus of the Chesapeake and Ohio Canal and the seat of a railway junc- tion, it enjoys excellent opportunities for trade. There are flour-mills and iron-furnaces in the neighbourhood ; and an extensive factory for the manufacture of steel rails is main- tained by the Baltimore and Ohio railway company. A few niles to the west is the commencement of the great Cumberland coal region. Population in 1870, 8056.

CUMBERLAND, Ricuarp (1632-1718), bishop of Peterborough, was the son of a respectable citizen of London, and was born in the parish of St Ann, near Aldersgate. He was educated in St Paul's school, and at Magdalene College, Cambridge, where in due time he took his degrees in arts, and obtained a fellowship. He took the degree of B.A. in 1653; and, having proceeded M.A. in 1656, he was next year incorporated to the same degree in the university of Oxford. For some time he applied himself to the study of physic; and although he did not adhere to this profession, he retained his knowledge of anatomy and medicine. Payne informs us that "he dis- tinguished himself, whilst he was a fellow of the college, by the performance of his academical exercises. He went out batchelor of divinity at a publick commencement ; and tho' it was hardly known that the same person performed those great exercises twice, yet such was the expectation he had raised, that he was afterwards sollicited to keep the act at another publick commencement for his doctor's degree." He took the degree of B.D. in 1663, and that of D.D. in 1680. Among his contemporaries and intimate friends were Dr Hezekiah Burton, Sir Samuel Moreland, who was distinguished as a mathematician, Sir Orlando Bridgeman, who became keeper of the great seal, and Samuel Pepys.

~~To this academical connection he appears to have been in a great nieasure indebted for his subsequent advancement in the church. When Bridgeman was appointed lord keeper, he nominated Cumberland and Burton as his chaplains, nor did he afterwards neglect the interest of either. Cumberland's first preferment was the rectory of Brampton, in Northamptonshire, which was bestowed upon him in 1658 by Sir John Norwich. He then quitted the university, and went to reside on his benefice, where he zealously devoted himself to the duties of his sacred office, and to the prosecution of those abstruse studies to which he had long been addicted. In 1661 he was appointed one of the twelve preachers of the university. His character was very remote from that of a preferment-hunter; and in this un- ambitious retirement he might have spent the remainder of his life, if the lord keeper, who obtained his office in 1667, had not invited him to London, and soon afterwards bestowed upon him the rectory of Allhallows at Stamford. In his new situation he acquired new credit by the fidelity with which he discharged his important functions. In addition to his ordinary duties, he undertook the weekly lecture, and thus was obliged to preach thrice every week in the same church. This labour he constantly and assiduously performed, and in the mean time found sufficient leisure, as well as inclination, to prosecute his scientific and philological studies.~~

~~At the mature age of forty he published his earliest work, entitled De Legibus Nature Disquisitio Philosophica, in gua earum Forma, summa Capita, Ordo, Promulgatio, et Obligatio e Rerum Natura investigantur ; quin etiam Llementa Philosophie Hobbiane, cum moralis tum civilis, considerantur et refutantur, London, 1672, 4to. It is dedicated to Sir Orlando Bridgeman, and is prefaced by an 'Alloquium ad Lectorem," contributed by the authors'~~

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~~friend Dr Burton. It appeared during the same year with Puffendorf's De Jure Nature et Gentium. This work of the English divine was highly commended in a subsequent publication of the German lawyer, and his weighty suffrage must have had the effect of making it known on the Continent. The book was reprinted at Liibeck in 1683, and again in 1694. It was~~

likewise reprinted at Dublin. As the work was printed in London while the author was residing at Stamford, the first edition contains many typo-graphical errors ; nor are they removed in the subsequent editions. Bentley afterwards undertook to revise the entire text, and, according to his grandson's account, he most effectually performed this task ; but Barbeyrac, who had the use of the corrected copy, and who was a more competent judge of its value, entertained a less favourable opinion. This copy is now in the library of Trinity College, Cambridge. The author's family intended to publish a splendid edition of the work, but their laudable design was never executed.

Tyrrell, who was the grandson of Archbishop Ussher, and is himself well known as a writer on history and politics, digested Cumberland's doctrines into a new form, and published a considerable volume under the following title : A brief Disquisition of the Law of Nature, according to the Principles and Method laid down wm the Reverend Dr Cumberland's (now Lord Bishop of Peterborough's) Latin Treatise on that subject; as also hts Confutations of Mr Hobbs's Principles put into another method : with the Right Reverend Authors approbation, London, 1692, 8vo. Another edition appeared in 1701. A complete English version of the original work was published by John Maxwell, M.A., prebendary of Connor, under the title of A Treatise of the Laws of Nature, &c., London, 1727, 4to. A French translation was executed by Barbeyrac, and published at Amsterdam in 1744.

Having thus established a solid reputation, Dr Cumberland next prepared a work on a very different subject,—An Hssay towards the Recovery of the Jewish Measures and Weights, comprehending their Monies ; by help of aicrent standards, compared with ours of England: use- ful also to state many of those of the Greeks and Romans, and the Eastern Nations, London, 1686, 8vo. This work, which is dedicated to his friend Pepys, obtained a copious notice from Leclerc, and was translated into French.

About this period he was greatly depressed, like many other good men, by apprehensions respecting the growth of Popery; but his fears were at length dispelled by the Revolution, which likewise brought along with it another material change in his circumstances. In the course of the year 1691, he

~~went, according to his custom on a post-day, to read the newspaper at a coffee-house in Stamford, and there, to his great surprise, he read that the king had nominated Dr Cumberland to the bishopric of Peterborough. The face of the bishop elect was scarcely known at court, and he had resorted to none of the usual methods of advancing his temporal interest.~~

~~' Being then sixty years old," says his great-grandson, "he was with difficulty persuaded to accept the offer, when it came to him from authority. The persuasion of his friends, particularly Sir Orlando Bridgeman, at length overcame his repugnance ; and to that see, though very moderately endowed, he for ever after devoted himself, and resisted every offer of translation, though repeatedly made and earnestly recommended. To such of his friends as pressed an exchange upon him he was accustomed to reply, that Peterborough was his first espoused, and should be his only one; and, in fact, according to his principles, no church revenue could enrich him ; for I have heard my father say that, at the end of every year, whatever overplus he found upon a minute inspection of his accounts was by him distributed to the poor, reserving only one small deposit of £25 in cash, found at his death in his bureau, with directions to employ it for the dis-charge of his funeral expenses,—a sum in his modest calculations fully sufficient to commit his body to the earth."~~*

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~~To the duties of his new station he applied himself with great assiduity. His charges to the clergy are described as plain and unambitious, the earnest breathings of a pious mind. His old age was fresh and vigorous, nor did he dis- continue his episcopal visitations till after he attained his eightieth year. When Dr Wilkins published the New Testa. ment in Coptic, he presented a copy to the bishop, who began to study the language after he had completed the age of eighty-three. "At this age," says his chaplain, " he mastered the language, and went through great part of this version, and would often give me excellent hints and re- marks, as he proceeded in reading of it." He diedin Lite: in the eighty-seventh year of his age: he was found sitting in his library, in the attitude of one asleep, and with a book in his hand. The great-grandson of Bishop Cumber- land was Richard Cumberland, the dramatist, the subject of the following notice.~~

Bishop Cumberland was eminently distinguished by his gentleness and humility. He was of a temper so cool and sedate that it could not be roused to anger, and through the whole course of his life his soul is represented as having been in a constant state of calmness and serenity, hardly ever ruffled by any passion. The theory which he main- tains in his principal work is founded on benevolence, and it naturally flowed from the habitual temperament of the author's mind. He was a man of a sound understanding, improved by extensive learning, and bas left behind him several monuments of his talents aud industry.

The care of Cumberland's posthumous publications devolved upon his domestic chaplain Payne, who soon after the bishop's death edited "Sanchonitatho's Phenician History, translated from the first book of Eusebius, De Preparatione Evangelica: with a continuation of Sanchoniatho's history by Eratosthenes Cyreneus's Canon, which Dicearchus connects with the first Olympiad. These authors are illustrated with many historical and chronological remarks, proving them to contain a series of Pheenician and Egyptian chronology, from the first man to the first Olympiad, agreeable to the Scripture accounts," Lond. 1720. The preface contains an account of the life, character, and writings of the author, which was likewise published in a separate form, and exhibits a pleasing picture of his happy old age. A German trans- lation appeared under the title of Cumberland's Phinizische Historve des Sanchoniathons, tibersetet von Joh. Phil. Cassel, Magdeburg, 1755, 8vo. The sequel to the work was likewise published by Payne,—Origines Gentium antiquissine / or Attempts for discovering the Times of the first Planting of Nations : in several Tracts, Lond. 1724, 8vo.

[The philosophy of Cumberland is expounded in the treatise De Legibus Nature. The merits of the work are almost confined to the general character and substance of the speculation it contains, for its style is destitute of both strength and grace, aud its reasoning is diffuse and Immethodical toa trying degree. Its main design is to combat the principles which Hobbes had promulgated as to the constitution of man, the nature of morality, and the origin of society, and to prove, in opposition to what he had maintained, that self-advantage is not the chief end of man, that force is not the source of personal obligation to moral conduct nor the foundation of social rights,

~~and that the state of nature is not a state of war. The views of Hobbes seem to Cumberland utterly subversive of religion, morality, and civil society, and he endeavours, as a rule, to establish directly antagonistic propositions. He refrains, however, from denunciation ; he uses only calm and moderate language, and is a uniformly fair opponent up to the measure of his insight.~~

~~Laws of nature are defined by him as " immutably true propositions regulative of voluntary actions as to the choice of good and the avoidance of evil, and which carry with them an obligation to outward acts of obedience, even apart from civil Jaws and from any considerations of com- pacts constituting governments." This definition he says will be admitted by all parties. Some deny that there are~~

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~~any such laws, but they will grant as readily as their Opponents that this is what ought to be understood by them. There is thus common ground for the two opposing schools of moralists to join issue. The question between them is, Do such laws exist or do they not? In reasoning thus Cumberland obviously forgot what the position main- tained by his principal antagonist really was. Hobbes must have refused to accept the definition proposed. He did not deny that there were laws of nature, laws antecedent to government, laws even in a sense eternal and immutable. The virtues as means to happiness seemed to him to be such laws. They precede civil constitution, which merely perfects the obligation to practise them. He expressly denied, however, that "they carry with them an obligation to outward acts of obedience, even apart from civil laws and from any consideration of compacts constituting govern- ments." And many besides Hobbes must have felt dis- satisfied with the definition. It is the reverse of unambigu- ous or luminous. In what sense is a law of nature a "' proposition?" Is it as the expression of a constant rela- tion among facts, or is it as the expression of a divine com- maudment? A proposition is never in itself an ultimate fact although it may be the statement of such a fact. And in what sense is a law of nature an " immutably true " proposition? Is it one which men always and everywhere accept and act on, or merely one which they always and~~

everywhere ought to accept and act on? The definition, in fact, raises various doubts and difficulties, and can scarcely be said to clear away any.

The existence of such laws as are defined may, according to Cumberland, be established in two ways. The inquirer may start either from effects or causes. The former method had been taken by Grotius, Sharrock, and Selden. They had sought to prove that there were universal truths, entitled to be called laws of nature, from the concurrence of the testimonies of many men, peoples, and ages regarding them, through collecting the opinions of persons widely removed in space and time from one another, and through generalizing the operations of certain active principles. Cumberland admits this method to be valid, but he prefers the other, that from causes to effects, as showing more con- vincingly that the laws of nature carry with them a divine obligation. It not only establishes laws of nature as uni- versal, but as having been meant to be ; 1t shows that man has been constituted as he is in order that they might be. In the prosecution of this method he expressly declines to have recourse to what he calls "the short and easy expedient of the Platonists," the assumption of innate ideas of the laws of nature. He has not, he says, been so happy as to learn the laws of nature by so simple a way. He thinks it ill-advised to build the doctrine of natural religion and morality on an hypothesis which many philosophers, both Gentile and Christian, had rejected, and which could not be proved against Epicureans, the principal impugners of the existence of laws of nature. He cannot assume, he says, without proof that such ideas existed from eternity in the divine mind, but must start from what sense and ex- perience furnish, and thence by search into the nature of things discover what their laws are. It is only through nature that we can rise to nature's God. His attributes are not to be known by direct intuition. He did not think, then, that the ground taken up by More, Cudworth, and the other members of the Cambridge Platonic school was such as they could hold against an adversary like Hobbes or from which they could successfully assail him. His sympathies, however, were all on their side. He wished success to their efforts, and he would do nothing to diminish their chances of success. He would not even oppose the doctrine of innate ideas, because it looked with a friendly eye upon piety and morality. He granted that

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it might, perhaps, be the case that ideas were both born with us and afterwards impressed upon us from without. All the laws of nature, Cumberland maintains, may be reduced to one,—the law of universal benevolence, of effort to promote the happiness of all rational agents. This, he thinks, is the root and source of the entire world of moral good. "No action can be called morally good which does not in its own nature contribute somewhat to the happiness of men." The theory of Cumberland implies as an ante- cedent the system of Hobbes. Had there not been a theory of selfishness, a doctrine which made self-love the universal principle of conduct, we should not have had the whole nature of virtue resolved into a principle of benevolence as it was by Cumberland. His opinion was evidently a reac- tion from the oppesite. In his dislike of the selfish theory he was tempted to carry his refutation of it to the uttermost and maintain the negative in the directest terms of antithesis. There was no other so forcible mode of denying the obnoxious theory as by positively affirming and defending its contrary,—that no virtuous action whatever is self-regarding, or, in other words, that the only principle of right conduct is benevolence. The principle, therefore, which he lays down as fundamental is that to pursue to the utmost of our power the general good of the whole system of rational beings is to contribute to the utmost of our power to the good of each of its parts, our own individual happiness inclusive, and that to pursue an opposite end is to entail opposite results, and among others our own individual misery. It is just the opposite of the central idea of Hobbes. The happiness of the whole community, according to Hobbes, will be best promoted if each man looks to himself and attends to his own interests. The happiness of each individual, according to Cumberland, will be best promoted if each man begius by endeavouring to promote the happiness of the whole society. Both were right and both were wrong. Man is to a great extent ruled by selfishness ; the uncivilized man almost wholly. In savages and in children selfishness is a decidedly stronger principle than benevolence. The human being is keenly susceptible to its own sensational pleasures and pains when almost incapable of entertaining any wide or elevated con- ceptions of general good. Benevolence as a steady and vigorous principle of action does not manifest itself early in the history either of the individual or of the race. Then, there is a good deal of sense

~~and truth in saying, Let the individual take care of himself and the common good will be thereby best secured. It is far from certain that if every man were setting the common good before him as his direct and immediate object the great majority of them would not do more harm than good. If the selfishness of the ignorant be bad, there is danger of their benevolence being worse. On the other hand, Hobbes was wrong in affirming that man is governed solely by self-interest, and Cumberland was right in maintaining that disinterested benevolence is a principle of human nature. It exists from the first in the human constitution, although only in germ, and moral progress is marked throughout by its growth in strength. History shows us the obstacles inter- posed by the narrowness and darkness of the human understanding, the coldness and selfishness of the human heart, the jealousies of classes, and the antipathies of nations continuously, if slowly, yielding in favour of universal benevolence, benevolence to all rational and even sentient beings. Thus far the truth is with Cumberland. His error is when he asserts that benevolence is the sole principle of virtue. This clearly is an error, although it is one in which he was followed by Hutcheson and some other philosophers. Benevolence cannot be legitimately made to include love to God and the exercises of piety nor what have been called the personal virtues. It is only itself~~

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~~virtuous when brought under conformity to the moral law.~~

~~In attempting to prove that all the virtues are forms or varieties of benevolence Cumberland never appeals to history, although he believed that the law of universal benevolence had been accepted by all nations and genera- tions ; and he carefully abstains from arguments founded on revelation, feeliug that it was indispensable to establish the principles of moral right on nature as a basis. There was another line of reasoning open to him, viz., deduction of the propriety of certain actions from the consideration of the character and position of rational agents in the universe ; and this is that which he follows. He argues that all that we see in nature is framed so as to avoid and reject what is dangerous to the integrity of its constitution ; that the human race would be an anomaly in the world had it not for end its conservation in its best estate ; that~~

benevolence of all to all is what in a rational view of the creation 1s alone accordant with its general plan; that various peculiarities of man's body indicate that he has been made to co-operate with his fellow men and to maintain society ; and that certain faculties of his mind explicitly aud positively show the common good to be more essentially connected with his perfection than any pursuit of private advantage. The whole course of his reasoning proceeds on, and is pervaded by, the principle of final causes.

To the question, What is the foundation of rectitude! he replies, the greatest good of the universe of rational beings. He may be regarded as the founder of the utili- tarian school in Eugland, which numbers a Hume, Bentham, the Mills, and Bain among its adherents. His utilitarian- ism is quite distinct from what is known as the selfish system ; it errs by going to the contrary extreme, by almost absorbing individual good in universal good. Nor does it look merely to the lower pleasures, the pleasures of sense, for the constituents of good, but rises above them to include especially what tends to perfect, strengthen, and expand our true nature. Existence and the extension of our powers of body, thought, and feeling are held to be good for their own sakes without respect to enjoyment. Cum- berland's views on this point were long abandoned by utilitarians as destroying the homogeneity and self-consis- tency of their theory; but J. S. Mill and some recent writers have reproduced them, without recognition of their paternity, as necessary to its defence against charges not less serious then even inconsistency.

The answer which Cumberland gives to the question, Whence comes our obligation to observe the laws of nature? is that happiness flows from obedience, and misery from disobedience to them, not as the mere results of a blind necessity, but as the expressions of the divine will—the reward attached by that will to obedience, and the punish- ment attached by it to disobedience. This reward and punishment, supplemented by future retribution, the happy immortality which awaits the good and the misery coming on the wicked, are, in his view, the sanctions of the laws of nature, the sources of our obligation to obey them. To the other great ethical question, How are moral distinctions apprehended ? he replies that it is by means of reason, of right reason. But by right reason he means merely the power of rising to general laws of nature from particular facts of

~~*experience. It is no peculiar faculty or distinctive function of mind ; it involves no original element of cogni- tion ; it begins with sense and experience ; it is gradually generated and wholly derivative. This doctrine lies only in germ in Cumberland, but will be found in full flower in Hartley, Mackintosh, and later associationists. (R. F.)]*~~

~~CUMBERLAND, Ricnarp (1732-1811), a dramatic and miscellaneous writer, was born in the Master's Lodge of Trinity College, Cambridge, on the 19th of February~~

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~~1732. He was the great-grandson of his namesake, the bishop of Peterborough ; and his father, Dr Denison Cumberland, became successively bishop of Clonfert and of Kilmore. His mother was Joanna, the youngest daughter of the great Bentley, and the heroine of John Byrom's once popular little eclogue, Colin and Phebe. Of the great Master of Trinity his grandson has left a kindly account ; he afterwards collected all the pamphlets bearing on the Letters of Phalaris controversy, and piously defended the reputation of his ancestor in a Letter to Bishop Lowth, who had called him " aut caprimulgus aut fossor." Cumberland was in his seventh year sent to the grammar- school at Bury St Edmunds ; and he relates how, on the head-master Arthur Kingman undertaking, in conversation with Bentley, to make the grandson as good a scholar as the grandfather himself, the latter retorted: « Pshaw, Arthur, how can that be, when I have forgot more than thou ever knewest?" Bentley died during his grandson's Bury school-days; and in 1744 the boy, who, while rising to the head of his school, had already begun to "try his strength in several slight attempts towards the drama," was removed to Westminster, then at the height of its reputation under Dr Nicholls. Among his schoolfellows here were Warren Hastings, George Colman (the elder), Lloyd, and (though he does not mention them as such) Churchill and Cowper. From Westminster Cumberland passed, in his fourteenth year, to the familiar Trinity, where at first he was, according to custom, left to study on his own account. Afterwards, however, under the advice of the master, Dr Smith, he applied himself closely to mathematics, and in 1750 he took his degree as tenth wrangler. His account of his degree examination, as well as that for a fellowship at his college (part of which he underwent in the " judges' chamber," where he was born), is curious ; he was (by virtue of an alteration in the statutes) elected to his fellowship in the second year of his degree. Meanwhile his projects of work as a classical scholar had been interspersed with attempts at imitating Spenser— whom, by his mother's~~

advice, he "laid upon the shelf "— and a dramatic effort (unprinted) on the model of Mason's Hfrida, called Caractacus, He had hardly abandoned these pursuits in order to read for his fellowship, when he was offered the post of private secretary by the earl of Halifax, First Lord of Trade and Plantations in the duke of New- castle's ministry. His family persuaded him to accept the office, to which he returned after his election as fellow. It

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left him abundant leisure for literary pursuits, which.

included the design of a poem in blank verse on India. He was fortunate enough to obtain a lay fellowship at Trinity, but this he not loug afterwards resigned on his marriage—in 1759—to Miss Elizabeth Ridge, to whom he had paid his addresses on receiving through Lord Halifax "a small establishment as crown-agent for Nova Scotia." In 1761 he accompanied his patron (who had been appointed lord-lieutenant) to Ireland as Ulster secretary ; and in acknowledgment of his services was afterwards offered a baronetcy. By declining this he thinks he gave offence ; at all events, when in 1762 Halifax became secretary of state, Cumberland in vain applied for the post of under-secretary, and could only obtain the clerkship of reports at the Board of Trade under Lord Hillsborough. While he takes some credit to himself for his i neorruptibility when in Ireland, he showed zeal for his friends, and obtained a bishopric for his father. On the accession to office of Lord George Germaine (Sackville) in 1775, Cumberland was appointed secretary to the Board of Trade and Plantations, which post he held till the abolition of that board in 1782 by Burke's economical reform. Before this event he had, in 1780, been sent on a confi- dential mission to Spain, to negotiate a separate treaty of

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peace with that power ; but though he was well received by King Charles III. and his minister Floridablanca, the question of Gibraltar proved a stumbling-block, and the Gordon riots at home a most untoward occurrence, He was recalled in 1781, and was refused repayment of the expenses he had incurred, and for which only £1000 had been advanced to him. He thus found himself £4500 out of pocket ; in vain, he says, " I

wearied the door of Lord North till his very servants drove me from it 77 ae memorial remained unread or unnoticed either by the prime minister or by secretary Robinson,through whom the original promise had been made. Soon after this experience he lost his office, and had to retire on a compensation allowance of less than half-pay. He now took up his residence at Tunbridge Wells ; but during his last years he mostly lived in London, where he died May 7, 1811.

Cumberland's literary productions are spread over the whole of his long life ; they are very numerous, but it is only by his contributions to the drama, and perliaps by his Memoirs, that he is likely to be remembered. In the latter, however, he dwells with more or less of paternal fondness on a great number of other productions. Among these should in the first instance be mentioned the collection of essays and other pieces entitled The Observer (2 vols., 1785 ; afterwards republished in 5 vols, and in 6, including a translation of The Clouds of Aristophanes). This collection found a place, as the author complacently points out, among The British Essayists. For the accounts given in The Observer of the Greek writers, especially the comic poets, Cumberland availed himself of Bentley's MSS. and annotated books in his possession ; his translations from the Greek fragments, which are not inelegant but lack closeness, are republished in Bailey's Comicorum Gracorum (part i, 1840) and Hermesianactis, Archilochi, et Pratince Fragmenta. Cumberland also produced Anecdotes of Eminent Painters in Spain (2 vols., 1782); with a Cate- logue of the King of Spain's Paintings (1787) ; two novels, Arundel (2 vols., 1789,—a story in letters " hastily put together during a few idle weeks at Brighthelmstone ") and Henry (4 vols., 1795,—a " diluted comedy " on the con- struction and polishing of which he seems to have expended great care) ; and a religious epic, Calvary, or the Death of Christ, in 8 books (1792) ; and (as his last publication) a poem entitled Retrospection. He is also said to have been concerned in an epic, the Hwodiad (with Sir James Bland Burges) and in John de Lancaster, a novel in 3 vols. Besides these he wrote the Letter to the Bishop of O[afor|d in vindication of Bentley; another to the Bishop of Llandaff on his proposal for equalizing the revenues of the Established Church (1783) ; a Character of Lord Sackville, whom in his Memotrs he vindicates from the stigma of cowardice ; and an anonymous pamphlet, Curtius rescued Jrom the Gulf, against the redoubtable Dr Parr, He was also the author of a version of fifty

of the Psalms of David ; of a tract on the evidences of Christianity ; and of other religious exercises in prose and verse, the former in- cluding "as many sermons as would make a large volume, some of which have been delivered from the pulpits.' Lastly, he edited a short-lived critical journal called The London Review, conducted on a principle to which Cum- berland doubtless attached high importance,—that the articles should bear the names of the contributors.

Cumberland's Memoirs, which he begun at the close of 1804 and concluded in September 1805, were published in 1806, and a supplement was afterwards added. This sufficiently ample narrative of his public and private life (which includes a long account of his Spanish mission) contains some interesting reminiscences of several persons of note,—more especially Bubb Dodington, Single-Speech Hamilton, and Lord George Sackville among politicians,

and of Garrick, Foote, and Goldsmith ; but the accuracy of some of the anecdotes concerning the last-named is not beyond suspicion. In general the book exhibits its author as an amiable egotist, careful—though not arrogantly so—of his own reputation, given to prolixity, and little remarkable for wit, but a good observer of men and manners. The uneasy self-absorption which Sheridan immortalized in the character of Sir Fretful Plagiary in The Critic is apparent enough in this autobiography, but presents itself there in no offensive form. The comparative estimates of the author's own works and the development of their designs are harmless if uninteresting; the long quotations from unpublished or forgotten productions almost ask to be skipped ; on the other hand the incidental criticisms of actors have been justly praised, for Cumberland was possessed of theatrical instinct, though not of dramatic genius. Lastly, his morality and piety are here at least free from affectation in their expression, though not less effusive than in his comedies themselves.

Cumberland was hardly warranted in the conjecture that no English author had yet equalled his list of dramas in point of number; but as the plays, published and unpublished, which he produced have been computed to amount to a number exceeding by four that of the sons of Priam, he must be

allowed to have been fairly prolific as a dramatist. About 35 of these are regular plays, to which have to be added 4 operas and a farce ; and about half of the whole list are comedies. Among these again the best-known, upon which the literary reputation of their author virtually rests, belong to what he was pleased to term " legitimate comedy," and to that species of it known as "sentimental." The two terms are in point of fact mutually contradictory ; but this was precisely the proposition Cumberland was at so much pains to disprove, though his most successful works remain among the most striking illustrations of its truth. He asserted, with some show of reason, that in his senti- mental comedy he was following in the footsteps of the new comedy of the Greeks ; he was less willing to confess that he was in truth an imitator of native models ; for he was by no means the creator in our dramatic literature of the species he so assiduously cultivated. The essential characteristic of these plays is the combination of plots of domestic interest with the rhetorical enforcement of moral precepts, and with such comic humour (and it is usually but little) as the author possesses. These comedies are primarily, to borrow Cumberland's own phraseology, designed as " attempts upon the heart;" and British hearts are "hearts that feel." He takes great credit to himself for weaving his plays out of " homely stuff, right British drugget," and for eschewing " 'the vile refuse of the Gallic stage ;" on the other hand, he borrowed (often perhaps unconsciously) from the sentimental literature of his own country, including Richardson, Fielding, and Sterne. The favourite theme of his plays is virtue in distress or danger, but safe of its reward in the fifth act; their most constant characters are men of feeling and young ladies who (to quote a retort of Goldsmith upon the sentimental dramatists) are either prudes or coquettes. Cumberland's comic power—such as it was—lay in the invention of comic characters taken from the 'outskirts of the empire," and professedly intended to vindicate from English prejudice the good elements in the Scotch, the Irish, and the colonial character. For the rest, patriotic sentiment (such as became one who in his old age was a major of volunteers) liberally asserts itself by the side of general morality. If Cumber- land's dialogue never approaches the brilliancy of Sheridan's, and if his characters have about them that air of unreality which in his Retaliation Goldsmith satirized with so ex- quisite a grace, the construction of the plots is as a rule skilful, and the situations are contrived with what

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Cumberland indisputably possessed—a thorough insight into the secrets of theatrical effect. In this respect at all events he was the "Terence of England," that there is hardly one of his principal plays in which the audience is not allowed to enjoy that most thrilling of theatrical emotions which is produced by a meeting between parent and child after long years of separation or ignorance of one another's existence. It should be added that, though Cumberland's sentimentality is often wearisome, his morality is generally sound ; that if he was without the genius requisite for elevating the national drama, he did his best to keep it pure and sweet ; and that if he borrowed much, as he undoubtedly did, it was not the vicious attrac- tions of other dramatists of which he was the plagiary. After making his début as a dramatic author with a tragedy, The Banishment of Cicero (of which the plot, though inspired by Middleton, rather strikingly deviates from history), published in 1761 after its rejection by Garrick ; and producing in 1765 a musical drama, The Summer's Tale, which was performed for a few nights and afterwards compressed into an afterpiece, Amelia (1768), Cumberland first essayed sentimental comedy in The Brothers (1769). This comedy has more vigour than some of its author's later works ; its theme is inspired by Zom Jones ; its comic characters are the jolly old tar Captain Tronsides, and the henpecked husband Sir Benjamin Dove, © whose progress to self-assertion is perhaps as genuinely comic a notion as Cumberland ever executed, though, as he confesses, not altogether an original one. The epilogue paid a compliment to Garrick, who accordingly interested himself in the production of Cumberland's second and by far most successful comedy, The West-Indian (1771). The hero of this comedy is a young scapegrace fresh from the tropics, " with rum and sugar enough belonging to him to make all the water in the Thames into punch,'—a libertine with generous instincts, which in the end prevail. The chief comic character is Major O'Flaherty, an honest Irish adventurer, in whom Cumberland took no little pride, but who is in truth neither particularly Irish nor particularly humorous. This comedy was received with the utmost favour ; it was afterwards translated into German by Boden, and Goethe acted in it at the Weimar court. The next play of some importance was The Fashionable Lover (1772), a sentimental comedy of the most pronounced type, with an ill-used heroine and a man of feeling exhibiting the very prurience of

sentimentality ; "who dreams," he exclaims, "that I am the lewd fool of pity, and thou my pandar, Jarvis, my provider?" The comic characters are an honest Scotch steward, whose Scotch is if anything more doubtful than O'Flaherty's Irish, and an antiquarian Welsh tutor Doctor Druid, less creditable to the " outskirt of the empire" represented by him. Zhe Choleric Man (1775), founded on the Adelphi of Terence, but not, as the author in his long " dedication" protests, on Shadwell's Square of Alsatia, is of a similar type, the comic element rather pre- dominating, but philanthropy being duly represented by a virtuous lawyer called Manlove. Among subsequent comedies may be meutioned The Natural Son (1785), in which Major O'Flaherty, now divested of all humour, makes his reappearance ; Z'he Impostors (1789), a comedy of intrigue noteworthy for the absence of sentiment, but marred in one of the scenes by an indelicacy of feeling which is unlike Cumberland,—the heroine, "a pleasant child of nature," must have admirably suited Mrs Jordan ; The Bou Lobby Challenge (1794), a mere protracted farce, where there is likewise no sentiment, except in Lindamira's novel; The Jew (1794), an essentially serious play creditable to Cumberland's good feeling, and highly effective when the character of Sheva is played as it was by the great German actor Déring ; The Wheel of For-

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tune (1795), which has a vague resemblance 'to Kotzebue's

Stranger (not produced on the English stage till 1798), and

in which the character of the misanthropist Penruddock, who cannot forget but learns to forgive, was a celebrated part of John Kemble, while the lawyer Timothy Weasel was made comic by Suett ; First Love (17 95); The Last of the Family (1795) ; False Impressions (1797), in which, as the hero instead of the heroine is the injured innocent, the sentimentality is less formidable,—the diction of the apothecary Scud will startle readers of Dickens by its striking resemblance to that of Mr Alfred Jingle ; The Sailor's Daughter (1804) ; and a Hint to Husbands (1806), which, unlike

~~the rest, is in blank verse. These appear to be all the comedies by Cumberland printed in his lifetime,~~

~~during which were also published his farce of The Note of~~

~~Hand (1774) ; the songs of his musical comedy, The~~

~~Widow of Delphi (1780) ; his tragedies of The Battle of~~

~~Hastings (1778) ; and The Carmelite (1784), a romantic domestic drama in blank verse, in the style of Home's Douglas, furnishing some effective scenes for Mrs Siddons and John Kemble as mother and son, but ill-constructed, inasmuch as the hero reveals himself several times in succession ; the domestic drama (in prose) of The Mysterious Husband (1783), in which the chief character, the bigamist Lord Davenant, is, for so incredible a scoundrel, prematurely remorseful, and is ultimately got rid of by suicide, but the intricate plot is cleverly contrived ; and some minor pieces. His posthumously printed plays include the comedies of The Walloons (acted 1782—Henderson, who afterwards performed Lord Davenant, achieving a great success as the villainous father Sullivan) ; The Passive Husband (acted as A Word for Nature, 1798) ; The Eccentric Lover (acted 1798) ; and Lovers' Resolutions (once acted in 1802); the serious quasi-historic drama Confession ; the drama Don Pedro (acted 1796) ; and the tragedies of Alcanor (acted as The Arab, 1785); Lorrendal ; The Sibyl, or The Elder Brutus (afterwards amalgamated with other plays on the subject into a very successful tragedy for Edmund Kean by Payne) ; Tiberius in Capree ; and The False Demetrius, the last on a theme already treated by an earlier English dramatist, and destined to be the last which occupied the genius of Schiller. Beside these and other dramatic pro-ductions of more or less originality, Cumberland, as already stated, translated the Clouds of Aristophanes (1797), and altered for the stage Shakespeare's Timon of Athens (1771), "engrafting on the original the part of Evanthe for the purpose of writing up the character of Alcibiades," and in- serting other " new matter," of which he has preserved a specimen in his Afemoirs, as well as Massinger's The Bond- man and The Duke of Milan (both 1779). — (a. w. w.) CUMBERLAND, Witiiam Avaustus, DuKE or, son of George II. and Queen Caroline, was born on the 15th of April 172]. When five years of age he was created duke of Cumberland ; and when still~~

very young he gave interesting amusement to his grandfather and the London public by the ability with which he drilled and manceuvred a company of boy soldiers under his own charge. HIs education was well attended to, and his courage and capacity in outdoor exercises were notable from his early years. In 1740 he sailed as a volunteer in the fleet under the command of Sir John Norris; but he quickly became dis- satisfied with the navy, and early in 1742 he began the military career in which he was destined to play so pro- mineut a part. ; The importance for England of the European struggle Which began with the death of Charles VI. was that France had declared against the young Hungarian queen. The war on the part of Britain was begun by a force of over 16,000 men being despatched to Flanders under the com- mand of the earl of Stair. The English troops were

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reinforced by HIessians and HIanoverians in British pay; and in 1743 George IL. and the "martial boy " shared in the glory of Dettingen (27th June). The duke of Cumberland, who led the left of the victorious army, and was wounded in action, displayed an energy and valour on the report of which in England that tide of his popularity began to flow which was in flood at Culloden, and which steadily ebbed thereafter till his death.

In 1745 the duke was again in Flanders, and on this occasion he was in full command, having under him British, HIanoverian, Austrian, and Dutch troops to the number of 50,000. Advancing to the relief of Tournay, which was besieged by Marshal Saxe, he engaged the greatest general of the age at Fontenoy on the 11th of May. It cannot now be doubted that, had the duke beeu supported by the allies in his marvellously courageous attack on the superior positions of the French army, Fontenoy would not have been recorded as a defeat to the British arms. Three times renewing his attack in spite of repulse, he was at last forced to yield, which he did by effecting a dogged and masterly retreat.

Notwithstanding a severity of discipline which would astonish soldiers of the present day, the young duke had the power to inspire his men with a strong attachment to his person and a very lively esprit de corps. Asa general his courage and resolution were not sufficiently tempered with

sagacity and tact; but he displayed an energy and power in military affairs which pointed him out to the British people as the jone commander upon whom they could rely to put a decisive stop to the marvellous successes of Prince Charles Edward in the rebellion of

1745-46.

He was accordingly recalled from Flanders, and immedi: dately proceeded with his preparations for quelling the insurrection. He joined the midland army under Sir John Ligonier, and was at once in pursuit of his swift-footed foe. But the retreat of Charles Edward from Derby disconcerted his plans; and it was not till they had reached Penrith, and the advanced portion of his army had been repulsed by Lord George Murray on Clifton Moor, that he became aware how hopeless an attempt to overtake the retreating Highlanders would then be. Carlisle having been retaken, he retired to London, till the news of the defeat of Hawley at Falkirk roused again the fears of the English people, and centred the hopes of Britain on the royal duke. He was appointed commander of the forces in Scotland.

Having arrived in Edinburgh on the 30th of January 1746, he at once proceeded in search of the young Pre- tender. (See CHartes Epwarp.) He diverged, however, to Aberdeen, where he usefully and energetically employed his time in training the well-equipped forces now under his command for the peculiar nature of the warfare in which they were about to engage. What the old and ex- perienced generals of his time had failed to accomplish or even to understand, the young duke of Cumberland, as yet only twenty-four years of age, effected with simplicity and ease. He prepared to dispose his army so as to with- stand with firmness that onslaught on which all Highland successes depended ; and he inspired his men with courage by directing each, on the fierce assault being made, to transfix with his bayonet not his immediate opponent but the kilted warrior on his right.

On 8th April 1746 he set out from Aberdeen on that expedition so fruitful in disaster to his enemies, and so fatal to the last hopes of Jacobitism. To his astonishment he was not opposed on the Spey. To his great advantage the attempt of Lord George Murray to surprise his troops as they Jay encamped near Nairn proved worse than futile to the exhausted and starving foe,

~~*whom on the morrow he engaged and defeated at Culloden. This battle, fought on*~~

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~~*the 15th of April, resulted in the total overthrow of the Highland army. It is vain to deny that the men wounded in battle were deliberately despatched by orders of the duke, and that his hard and unsparing nature, coupled with his firm and unfeeling resolve to treat the vanquished merely as rebels, induced him to deny to those whom he had con- quered the privileges of war or their rights as fellow-country- men. His excesses have been over-estimated, but it cannot be gainsaid that they were unconstitutional and most cruel. The relief occasioned to Britain by the duke's victorious efforts was acknowledged by his being voted an income of £40,000 per annum in addition to his revenue as a prince of the royal house.*~~

~~*Henceforth, however, the career of Cumberland was to be one of signal defeat. In 1747 he was again on the Continent opposing the still victorious Marshal Saxe; and at Lauffeld, near Maestricht, the Dutch, Austrian, and English allies under the joint command of the duke and his brother-in-law Prince William of Nassau received a notable defeat. 'Ten years afterwards Cumberland soured his popu- larity both as a soldier and a statesman by the affair of Closterseven. When Frederick the Great was suffering the terrible defeats of Prague and Kolin, at the hands of the Austrians, the duke of Cumberland was attempting to defend Hanover at the head of a motley army, raised chiefly in Brunswick, Prussia, and the Electorate. But it was quite in vain; and at Hastenbeck, near Hameln, on the 26th of July 1757, he was defeated by the superior forces of D'Estrees. In September of the same year his defeat had almost become disgrace. Driven from point to point, and at last hemmed in by the French under Richelieu, he capitulated at Closterseven on the 8th of the month, abjectly agreeing to disband his army and to evacuate Hanover, which he had undertaken to defend. His disgrace was completed on his return to England by the king's re- fusal to be bound by the terms of the duke's agreement. In chagrin and disappointment he retired into private life, after having formally resigned the public offices he held.*~~

It was not till shortly before his death that he again appeared on the stage of public affairs. In 1765, when the debates on the regency bill were agitating the people of England, George III., dissatisfied with Grenville and his ministry, applied to his royal uncle the duke of Cumber- land, who was now in failing health, to open negotiations with Pitt for a return to power. On Pitt's declinature, and symptoms of violence becoming evident among the populace, Cumberland again attempted to extricate the king from his unfortunate position by a second negotiation with the great and popular statesman, This too was, however, unsuccessful. On 31st October 1765 the duke died. His statue stands in Cavendish Square.

See, in addition to the histories of the time and the literature of the Rebellion, Historical Memoirs of the Duke of Cumberland; A Journey through part of England and Scotland along with the Army under the command of H.R.H. the Duke of Cumberland; and

especially William Augustus Duke of Cumberland, by A. N. Campbell-Maclachlan, 1876. (7. S:)

CUMBRAE ISLANDS. See Burr.

CUMIN, or Cummin (Cuminum Cyminum), is an annual, umbelliferous, herbaceous plant, indigenous to Upper Egypt, but early cultivated in Arabia, India, and China, and in the countries bordering the Mediterranean. Its stem is slender and branching, and about a foot in height ; the leaves are multifid, with filiform segments ; the flowers are small and white. The fruits or achenes, the so-called seeds, which constitute the cumin of pharmacy, are fusiform or ovoid in shape, and compressed laterally ; they are two lines long, are hotter to the taste, lighter in colour, and larger than caraway seeds, and have on each half nine fine ridges, overlying as many oil-channels or vitte. Their strong aromatic smell and warm bitterish

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taste are due to the presence of about three per cent. of att essential oil. The tissue of the seeds contains a fatty oil, with resin, mucilage and gum, malates, and albuminous matter ; and in the pericarp there is much tannin.

The volatile oil of cumin, which may be separated by distillation of the seed with water, is mainly a mixture of cyinol or cymene, C,,H,,, and cuminic aldehyde,C,H,(C,;H,)COH. Cumin is mentioned in Isaiah xxviii. 25, 27, and Matthew xxili. 23, and in the works of Hippocrates and Dioscorides. From Pliny we learn that the ancients took the ground seed medicinally with bread, water, or wine, and that it was accounted the best of condiments as a remedy for squeamishness. It was found to occasion pallor of the face, whence the expression of Horace, exsangue cuminum (Zpist. i. 19), and that of Persius, padlentis grana cumant (Sat. v. 55). Pliny relates the story that it was employed by the followers of Porcius Latro, the celebrated rhetorician, in order to produce a complexion such as bespeaks applica- tion to study (xx. 57). In the Middle Ages cumin was one of the commonest spices of European growth. Its average price per pound in England in the 13th and 14th centuries was 2d., or, at present value, about 1s. 4d. (Rogers, Hist. of Agric. and Prices, i. 631). It is stimulant and carminative, and is employed in the manufacture of curry powder. The medicinal use of the drug is now almost confined to veterinary practice. Cumin is exported from India, Mogador, Malta, and Sicily.

CUMMING, RovaLzeyn Gorpon, Scottish traveller and sportsman, generally known as "the Lion Hunter," was born March 15, 1820. "He was the second son of Sir William G. Gordon Cumming, baronet, of Altyre and Gordonstown, North Britain. In his early years a strong love for nature in her wildest forms and a passion for sport displayed themselves in him, at once foreshadowing and determining his future career. He was educated at Eton, and at the age of eighteen passed the examination at Addiscombe and entered the Indian army (Madras Light Cavalry). In consequence of the injurious effects of the climate on his health he did not remain long in India, but retired from the service and returned to Scotland. During his stay, however, he had laid the foundation of his large and interesting collection of hunting trophies and specimens of natural history. After indulging for a time in his favourite pursuits in his native land, he resolved to visit the prairies and mountain solitudes of the Far West. This project, however, was relinquished in favour of a visit to South Africa. He joined the Cape Riflemen, and in 1843 began his five years' hunter's life, the story of which is told in his well-known work, published in 1850. He did not remain long in the army ; but for the sake of absolute freedom sold out and set forth to

explore the unknown regions of interior Africa. His waggon was his only home; and even this he often quitted for the sake of bolder ventures either alone or attended only by savages. His collection, the South African Museum, was exhibited in London in 1851, at the time of the Great Exhibition, and was illustrated by a lecture delivered by the famous hunter himself. 'The museum was afterwards exhibited in various parts of the country. During the last eight years of his life he resided at Fort Augustus, where his collection attracted many visitors. He died there, March 24, 1866.

CUNARD, Sir Samuen (1787-1865), baronet, civil

| engineer, founder of the Cunard line of Atlantic steam-ships,

was born at Halifax, Nova Scotia, in 1787. He was the son of a merchant, and was himself trained for the pursuits of commerce, in which, by his abilities and enterprizing spirit, he attained a conspicuous position. When, in the early years of steam navigation, the English Government made known its desire to substitute steam vessels for the sailing ships then employed in the mail service between

England and America, Cunard heartily entered into the scheme, came to England, and accepted the Government tender for carrying it out. A company was formed, the members of which were Cunard, Messrs Burns of Qlas- gow, and Messrs MacIver of Liverpool, these two firms being then proprietors of rival lines of coasting steamers between Glasgow and Liverpool. For the first contract with the Government four steam-vessels were built, and the first voyage was successfully made by the " Britannia " from Liverpool to Boston, U.S., between July 4 and 19, 1840. Such was the small beginning of an undertaking which in the course of thirty-seven years has grown into one of the vastest of private enterprizes, and may even rank in importance, as to the extent of interests involved in it, and the number of hands employed, with railway and other public companies. In 1852 the company began to substi- tute iron screw steamers for the wooden vessels with paddle- wheels in use up to that time. The Cunard fleet has always borne the highest character for the build, manning, management, and provisioning of the ships ; and the reward of the scrupulous care exercised

has been a rare immunity from what are called "casualties." In acknowledgment of his energetic and successful services Cunard was, in 1859, created a baronet. He died in London, April 28, 1865. CUNEIFORM WRITING. The cuneiform or " wedge- shaped " system of writing takes its name from the wedge- like form of its characters, which were once extensively used over Western Asia, It has sometimes been called " arrow-headed " from the supposed resemblance of the' several strokes which compose a character to the head of an arrow. The characters were originally hieroglyphics, each denoting an object or idea, and, like the Chinese, were gradually corrupted into the forms we see on the Assyrian monuments, They were invented by the primitive Accadian population of Chaldea, who spoke an agglutinative language, and were borrowed from them by their Semitic conquerors, the Babylonians and Assyrians. The characters had come to be used phonetically as well as ideographically even in Accadian times; but they were not redacted into a systematic syllabary until the Semites changed the Accadian words they represented into as many phonetic values. The abundance of clay in Babylonia caused this material to be largely employed for writing purposes, and the impress of the metal style upon it gave the characters their wedge-like appearance. The Semites carried the new syllabary with them into Assyria, and, as in Babylonia, continued to employ it both as a syllabary and as a collection of ideographs ; that is to say, a character might not only denote a mere unmeaning syllable, but an idea as well, As each character had answered to several different Accadian words, the Assyrian syllabary by changing these words into phonetic values became necessarily polyphonous. In the 9th century B.c. the Alarodian tribes of Arinenia borrowed a selected number of characters and ideographs from the Assyrian syllabary, giving to each character one value only. At a subsequent date the " Turanian " population of Media and northern Susiania did the same, producing the syllabary of the Protomedic transcripts which accompany the Persian and Babylonian inscriptions of the Achzmenian kings. The Persian cuneiform alphabet of 40 characters was itself taken from the same source under the reign of Darius; the meaning of each character, when used as an ideograph, being expressed in Persian, and the initial letter of the Persian word being then assigned to it asa value. The cuneiform system of writing had been in use in southern Susiania in very early times, and accordingly the forms of the characters employed there agree with those found in the oldest Chaldean inscriptions.

Indeed it is probable that it was invented by the Accadians before they had descended into Babylonia from the mountains of Elam,

about 3000 B.c. As employed in Babylonia and Assyria, the cuneiform writing tended to become more and more simplified, unnecessary wedges being discarded, and we may therefore divide it into Archaic, Hieratic, Assyrian, and Later Babylonian. See Inscrrprions,

CUNITZ, Marta, a celebrated astronomer, born about the beginning of the 17th century, was the eldest daughter of a doctor of medicine in Silesia, and the wife of a Dutch physician, Elias de Loewen, whom she married in 1630. She is said to have understood Polish, German, French, Italian, Latin, Greek, and Hebrew, and to have had an extraordinary general culture, but her principal study was mathematics and astronomy. Her tables, published under the title Urania Propitia, sive Tabulee Astronomice, which gained for her a great reputation, were composed in a Polish convent, where, with her husband, she had taken refuge at the outbreak of the Thirty Years' War. They were 'printed in Latin and German (Oels, 1650, and Frankfort, 1651), and dedicated to the Emperor Ferdinand eT '

CUNNINGHAM, Atraw (1784-1842), a Scottish poet and prose writer, was born at Blackwood, in Dumfriesshire, and began life as a stone mason's apprentice. He com- menced literary work as collector of ballads for Cromek's Remains of Nithsdale and Galloway Song ; but, instead of collecting ballads, he sent in poems of his own, which the editor inserted without suspicion, In 1810 he repaired to London, where he supported himself partly by working in the studio of Bubb the statuary, and partly as a newspaper reporter, till 1814, when he obtained the situation of clerk of the works in the studio of Francis Chantrey, in which he continued till the sculptor's death in 1841. He mean- while continued to be busily engaged in literary work, Cunningham's prose is often spoiled by its misplaced and too ambitious rhetoric ; his verse also is often over-ornate ; and both are full of mannerisms. Some of his songs, how- ever, from their brightness, vigour, and warmth of feeling, hold a high place in our lyrical literature.

His chief works are Lives of the Most Eminent British Painters, Sculptors, and Architects (1829-1833), Sir Marmaduke Maxwell, a dramatic poem, T'raditionary Tales of the Peasantry, several novels (Paul Jones, Sir

Michael Scott, Lord Roldan), the Maid of Elwar, a soit of epic romance, the Songs of Scotland (1825), Biographical and Critical History of the Literature of the Last Fifty Years (1833), an edition of The Works of Robert Burns, with notes and a life containing a good deal of new material (1834), Biographical and Critical Dissertations aflixed to Major's Cabinet Gallery of Pictures, and Life, Jowrnals, and Correspondence of Sir David Wilkie, finished two days before his own decease, and published in 1848. An edition of Pocms and Songs was issued by his son, Peter Cunningham, in 1847, :

CUNNINGHAM, Perrr (1816-1869), topographical and antiquarian littérateur, was born in London, April 7, 1816. He was the son of the Scottish poet Allan Cunningham, and was educated at Christ's Hospital. He led a singularly uneventful life ; for at the age of eighteen he was appointed by Sir Robert Peel, in recognition of his father's genius and reputation, to a junior clerkship in the audit office, and after twenty years' faithful and efficient service he was promoted to a chief clerkship. This post he filled till 1860, when he retired from the public service. His literary career began before his official, and his first published work was The, Life of Drummond of Hawthornden, with large selections from his poetical works. This volume. appeared in 1833. His most important topographical work is the Handbook of London, the first edition of which was published in 2 vols. in 1849, and the second in 1 vol. in 1850, It bears a high character for fulness and accuracy of information, and is made particularly attractive by the intermingling of authentic anecdote and incident with the necessary details of names and dates. Among Cunningham's other publications are,—Songs of England

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and Scotland (1835),* Handbook of , Westminster Abbey (1842), a Life of Inigo Jones for the old Shakespeare Society (1848), Modern London (1851), The Story of Nell Gwynn (1852), and a "Memoir of J. M. W. Turner," prefixed to Burnett's Turner and his Works (1852). In 1854 he edited, for Mr Murray's " Library of British Classics," the works of Oliver Goldsmith and Johnson's Lives of the Poets, with additional lives. He was a contributor to the Athenceum, The Illustrated London News, Fraser's Magazine, and other

~~periodicals. He was also engaged as collaborateur with Croker on a new edition of Pope's works. He died at St Alban's, May 18, 1869.~~

~~CUNNINGHAM, Wittram (1805-1861), a Scottish theologian and ecclesiastic, was born at Hamilton, in Lanarkshire, on the 2d October 1805. After the usual course of study at the university of Edinburgh, in which he acquitted himself with distinction, he was licensed to preach in 1828. Two years afterwards he was ordained to a collegiate charge in Greenock, where he remained for three years, refusing during that time a presentation offered him to a parish in Glasgow. In 1834 he was transferred to the charge of 'Trinity College parish, Edinburgh. His removal thus coincided with the com- mencement of the period known in Scottish ecclesiastical history asthe Ten Years' Conflict, in which he was destined to take a leading share. In the stormy discussions and controversies which preceded the Disruption the weight and force of his intellect, the keenness of his logic, and his firm grasp of principle made him one of the most powerful advocates of the cause of spiritual independence ; and he has been generally recognized as one of three to whom mainly the existence of the Free Church is due, the others being Chalmers and Candlish. On the formation of the Free Church in 1843 Cunningham was appointed professor of church history and divinity in the New College, Edinburgh, of which he became principal in 1847 in succession to Chalmers. His career as a professor was very successful, his controversial sympathies combined with his evident desire to be rigidly impartial qualifying him to be an interesting delineator of the more stirring periods of church history, and a skilful disentangler of the knotty points in theological polemics. His logical faculty and his total lack of imagination perhaps made him too ready to seek to compress all spiritual truth within the rigid limits of intellectual forms. These qualities are re- flected in two able works published posthumously in 1862, his Historic Theology in the Christian Church and his Reformers and the Theology of the Reformation. In 1859 the church marked its sense of obligation to him by appointing him moderator of the General Assembly. He had received the decree of D.D. from the university of Princeton in 1842. He died on the 14th December 1861. Though impulsive and unsparing and sometimes apparently a little unscrupulous in debate, Cunningham was like many great controversialists of his class distinguished for the amiability, simplicity, and integrity of his character. His intellectual rigidity was~~

balanced by a considerable breadth of sympathy, as is evidenced by the fact that he was one of the founders of the Evangelical Alliance. A Lafe of Cunningham by Rainy and Mackenzie appeared in 1871.

- Cunningham lectureship.

CUPAR-FIFE, so called to distinguish it from Coupar- Angus in Perthshire, is a royal and parliamentary burgh of Scotland, and the principal town of the county of Fife. It stands on the left bank of the Eden, in the centre of the Howe or Hollow of Fifeshire, about 6 miles from the sea, and is about 32 miles distant by railway and ferry from Edinburgh. The town-hall, the county hall, and the corn-

exchange are the chief public buildings , and the principal educational establishment is the Madras Academy, originally founded in 1823 by a joint-stock company, but extended and modified in keeping with the will of Dr Bell, the well- known originator of the " Madras System," who left it a valuable endowment. 'The staple trade of Cupar has long been the manufacture of linen; and it also possesses breweries, corn-mills, and tan-yards. There are several collieries in the neighbourhood ; and a stone quarry and a considerable pottery exist at Cupar Muir, about a mile and a half to the west of thetown. The parliamentary burgh is a member of the St Andrews district; its population in 1871 was 5105. Cupar received its municipal freedom about 1356 by charter from David II. It was early remarkable for its castle, which occupied the height to the east of the town now crowned by the academy buildings, and was one of the principal strongholds of the Macdutfts, the earls or thanes of Fife. Being situated between Falk- land and St Andrews, the town was frequently visited by the Scottish kings; and in 1583 it was for a time the residence of the court of James VI. The estate of Sir David Lindsay of the Mount was within three miles of Cupar ; and ona green esplanade in front of Macduff Castle, still called the Play-field, the satirical drama of the 7hree Estates and the Tragedy of the Cardinal were first performed. From the press of Mr Tullis in Cupar there appeared about the beginning of the present century edi- tious of Virgil, Horace, and other classical authors, by Dr Hunter of St Andrews, which obtained high reputation for their accurate typography. The Scotch

~~proverb, "They that will to Cupar maun to Cupar," owes its origin to the fact that Cupar was the seat of a court of justice, and refers originally to the obstinacy of persons determined to appeal to the law.~~

~~CUPID (Amor, "Epws), in classical mythology, was the god, first, of the principle of love as it was seen to exist throughout nature, and, secondly, of love as a human pas- sion. In the former and earlier phase of his character, he resembled Hermes, and like him was probably a deity of the primitive Pelasgians, since the worship of him at Parion on the Hellespont was connected with the Pelasgic religion of Samothrace, one of the deities of which is named *Agi-epos. The same primitive character appears at Thespise, where the symbol of his worship was an unhewn stone (dpyés AiGos). He was the oldest of the gods, being the son of Chaos, or of night and day, or of heaven and earth, with a variety of other poetic parentages. But as god of human love he was the son and constant companion of Aphrodite (Venus); yet even in this respect his earlier character is partly visible, since she was goddess of spring- time, and brought him up in the fields till spring burst from the beautiful island of Cyprus, and spread fertility over the earth. In his ethical capacity he was regarded as the most recent of the gods, and was represented as a beautiful winged youth with bow and arrows or with a torch. The fact of his having wings would preclude him from being classed with the great deities. But as messenger of Venus he would have the same right to them that Iris derived from her office as messenger of the gods. At Thespix gymnastic and musical contests (Erotidia) were held in his honour every four years ; and generally in Greece his statue was to be found beside those of Hermes and Hercules in the palestra. The statue of Cupid by Praxiteles at Thespie was greatly celebrated. The Spartans and Cretans sacrificed to him before battle. In later works of arts Cupid assumed simultaneously a number of forms ("Epwres), each identical with the other, as if to indicate his presence at many points at once. We have also Eros and Anteros, or love and its opposite. The story of Cupid and Psyche, as given by Apuleius and as illustrated in later art, is a figura-~~

tive explanation of the course of human love. The great beauty of Psyche, a king's daughter, excites the jealousy of Venus, who sends Cupid to her to inspire her with love for some ordinary person. But he is caught by her charms and lives with her happily in a fairy palace, she being under a vow not to look on him with her mortal eyes. Taunted for this by her sisters she breaks the vow and Cupid vanishes. Venus now imposes on her many sore troubles. At last she must fetch a box for her from Hades, which curiosity makes her open on the way, and the scent escaping from it overpowers her,

with Cupid.

CUPPING. The operation of cupping is one of the methods adopted by surgeons to draw blood from an inflamed part in order to relieve the inflammation. The

apparatus required is a spirit lamp and a glass cup with a

rounded edge. The skin is washed and dried; the air is rarefied in the cup by the flame of the lamp ; the cup is then firmly applied to the skin,

a special instrument, before the cup is applied ;

of the cup. The result of both methods is namely, a withdrawal of blood locally from the inflamed

part. The former is called moist cupping, the latter dry

cupping. Moist cupping is inapplicable on exposed surface, as the mark of the small skin wounds is indelible. CURACOA, or Curacao, an island in the Caribbean Sea, lying off the north coast of Venezuela, in 12° N, lat., 69° W. long. It is 40 miles in length from N.W. to S.E.,, and 10 in average breadth ; the area is 212 square miles.

The island is hilly and deficient in water, being wholly yet, owing to the industry of

dependent upon the rains ; the Dutch planters, considerable quantities of sugar, cotton, indigo, tobacco, and maize are raised. A peculiar variety of

orange, the Citrus Aurantium CUTASSULIENSIS, ZTOWS abundantly, and furnishes the distinguishing ingredient in the liqueur which takes its name from the island. The principal export is salt. The shores, which are bold, are in some places deeply indented, and present several har- bours, the chief of which is Santa Anna, on the south-west side of the island. The entrance to this, which is narrow, is protected by Fort Amsterdam and other batteries ; but the harbour itself is large and secure, and is the port of the chief town Curacoa, or Willemstad. The population in 1875 amounted to 23,972, about one-third being eman- cipated negroes. All belonged to the Roman Catholic Church, except about 2000 Protestants and 1000 Jews. The island was settled by the Spaniards about 1527, and was captured by the Dutch in 1634. It was taken by the English in 1798 and again in 1806, but was restored in 1814 to the Dutch, in whose possession it has since remained,

CURASSOW (Cracinc), a group of gallinaceous birds forming one of the sub-families of Cracida, the species of Which are among the largest and most splendid of the game birds of South America, where they may be said to repre- Sent the pheasants and grouse of the Old World. They are large, heavy birds, many of them rivalling the turkey in size, with short wings, long and broad tail, and strong bill. Incommon with the family to which they belong, they have the hind toe of the foot placed on a level with the others, thus resembling the pigeons, and unlike the majority of gallinaceous birds.

Cupid comes to her aid, implores Jupiter in her behalf, and with his con- sent she is removed to Olympus, where she lives for ever

A partial vacuum forms within the cup as the air cools, and the blood rushes from the neighbouring parts to the skin under the cup. HIther the blood is drawn from the patient's body through a number of small wounds which are made in the skin, with or the cup is simply applied to the unbroken skin and the blood drawn into the subcutaneous tissue within the circumference. the same,—

With the exception of a single species'

~~found north of Panama, the curassows are confined to the tropical forests of South America, east of the Andes, and not extending south of Paraguay; They live in small flocks, and are arboreal in their habits, only occasionally descending to the ground, while always roosting and build- ing their nests on the branches of trees. Their nests are neat structures, made of slender branches interlaced with stems of grass, and lined internally with leaves, They feed on fruits, seeds, and insects, They are said to be domesticated in several parts of South America, and Bates States that when journeying up the Amazon he was amused "at the excessive and almost absurd tameness of a fine curassow turkey (Mitua tuberosa)," which ran about one of the planter's houses in which he happened to stay. Large numbers of these birds were, according to Temminck, brought to Holland from Dutch Guiana towards the end of last century, and got so completely acclimatized and domesticated as to breed in confinement like ordinary poultry ; but the establishments in which these were kept were broken up during the troubles that followed on the French Revolution. Their flesh is said to be exceedingly white and delicate, and this, together with their size and the beauty of their plumage, would make the curassows an important gain to the poultry yards of Europe, should they yet be successfully reared. The sub-family of curassows contains four genera and twelve species, all confined to South America, with the exception of Crax globicera—a Central American species, which extends northward into Mexico. This bird is about 3 feet in length, of a glossy black colour, with green and purple reflections over the whole body, excepting the abdomen and tail coverts, which are white. In common with the other species of this genus its head bears a crest of feathers curled forward at the tips, which can be raised or depressed at will. The female is of a reddish colour, although varying greatly in this respect, and was until lately described as a separate species—the Red Curassow. In another species, Crax tcommoda, the greater part of the black plumage is beauti- fully varied with narrow transverse bars of white. The Galeated Curassow (Pauwi galeata) is peculiar in having a large blue tubercle, hard and stony externally, but cellular within, and resembling a hen's egg in size and shape, situated at the base of the bill. It only appears after the first moulting, and is much larger in the male than in the female.~~

~~CURATE (from the Latin curare, to take care of), properly a presbyter who has the cure of souls within a parish, being the Latin equivalent of the~~

Greek parochus. The term curate is used in this general sense in certain rubrics of the Anglican Prayer Book, in which it is applied equally to rectors and vicars as to perpetual curates. In a more limited sense it is applied in the Church of England to the incumbent of a parish who has no endowment of tithes, as distinguished from a perpetual vicar, who has an endowment of small tithes, which are for that reason sometimes styled vicarial tithes. The origin of such un- endowed curacies is traceable to the fact that benefices were sometimes granted to religious houses pleno jure, and with liberty for them to provide for the cure 5 and when such appropriations were transferred to lay persons, being unable to serve themselves, the appropriators were required to nominate a clerk in full orders to the ordinary for his licence to serve the cure. Such curates, being not remov- able at the pleasure of the appropriators, but only on due revocation of the licence of the ordinary, came to be entitled perpetual curates. The term "curate" in the present day is almost exclusively used to signify a clerk who is assistant to an incumbent; and a clerk in deacon's orders is competent to be licensed by a bishop to the office of such assistant curate, The consequence of this misuse

published several sermons, among which was one entitled The Doc- trine of the Trinity not Speculative but Practical. After his death Dr W. Wight of the British Museum edited with a preface the Anetent Syriae Doewments relative to the earliest Establishment of Christianity in Edessa and the neighbouring Countries, from the year of our Lord's Ascension to the beginning of the fourth Century ; discovered, edited, and annoted by the late W. Cureton.

CURFEW, Currev, or CouvRE-FEU, a signal, as by toll- ing a bell, to warn the inhabitants of a town to extinguish their fires and lights and retire to rest. This was a common practice throughout the various countries of Europe during the Middle Ages, especially in cities taken in war. In the law Latin of those times it was termed ignitegium, or pyritegium. The curfew is commonly said to have been introduced into England by William the Conqueror, who ordained, under severe penalties, that at the ringing of the curfew-bell at eight o'clock in the evening all lights and fires should be

extinguished. It seems probable, however, that be merely enforced an existing and very) common police regulation to that effect. The absolute prohibition of lights after the ringing of the curfew-bell was abolished by Henry I. in 1100. The practice of tolling a bell at a fixed hour in the evening, still extant in many places, is a survival of the ancient curfew. The common hour was at first seven, and it was gradually advanced to 'eight, and in some places to nine o'clock. In Scotland ten was not an unusual hour. As a precaution against conflagrations, the curfew was a most useful regulation, at a period when it was the custom to place the fire in a hole in the middle of the floor, under an opening in the roof to allow the escape of thesmoke. When a family retired to rest for the night, the fire was extinguished by covering it up; and hence the term couvre-feu, or curfew. But this salutary regulation served another important end, since by obliging people to keep within doors, nocturnal brawls in the streets were in a great measure prevented. There is a popular tradition, for which no historical authority can be assigned, that the severity exhibited by William the Conqueror in enforcing obedience to the curfew, was more particularly designed to prevent the English from assembling in secret to plan schemes of rebellion against himself. The ringing of the " prayer-bell," as it is called, which is still practised in some Protestant countries, originated in that of the curfew-bell.

CURIA, the name of the ten divisions into which a tribe was divided by the constitution of Romulus. There being three tribes, there were thirty curi#, a number which was not altered when the number of the tribes was increased to thirty-five. This division was a division of the populus, to the exclusion of the plebs; and hence the assembly of the populus was called the comitia curiata. But when Servius Tullius instituted the comitia centuriata as the sovereign assembly of the republic, the comitia curtata lost almost all power other than ecclesiastical, except that of conferring upon magistrates the mperium and the privilege of taking auspices ; and even this remnant of their political authority became a mere form, which was sometimes neglected. But the curis retained all their ecclesiastical functions ; each elected a chief priest, or curto, and a subordinate priest, called the curtalis jlamen, while together they elected the curio maximus, who presided over the curiones. The comitia curiata alone could sanc- tion adregatio, or the adoption of a man who was su? juris, or not under the control of parents.

~~The building in which a curia met was also called a curia ; and the name was given, besides, to the buildings in which a senate met, and even toa senate itself, though never to the senate of Rome.~~

~~Under the later empire the "curiales" exercised many important and very diversified functions, which Jacobus Gothofredus gives a catalogue of under twenty-two heads (see Animad. in Cod. Theod., lib. xii. tit. i). Bingham speaks of these offices of the "curiales" as synonymous~~

~~of the term "curate" has been that the title of " perpetual curate " has fallen into desuetude in the Anglican Church, gome incouvenience being found to result from the indis- criminate application of the term " curate," in the case of perpetual curacies, both to the incumbent of the parish and to his assistant curate, and an Act of Parliament (31 and 32 Vict.c. 117) has accordingly been passed to authorize such incumbents to style themselves vicars. The Act provides~~

~~as follows :—~~

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~~CURES, an old town of the Sabines, not far from the left bank of the Tiber, about 25 miles from Rome. It was renowned in Roman story as the birth-place of Tatius, the colleague of Romulus, and of Numa the second king of Rome; and, according to the belief of the ancients, the term Quirites, the distinguishing epithet of the Roman people, was derived from its name. If it be true, as Strabo asserts, that Cures was at one time a large city, it early fell into decay. About 100 B.c. it was colonized by Sulla, and continued to prosper till about the 4th century of the Christian era. It was finally destroyed by the Lombards before the end of the 6th century. Remains of the town have been discovered at the modern village of Correse.~~

~~CURETON, Witi1am, D.D. (1808-1864), a famous English Orientalist, was born at Westbury, in Shropshire. After being educated at the Free Grammar School of Newport, and at Christ Church, Oxford, he took orders in 1832, became chaplain of Christ Church College, sub- librarian of the Bodleian, and, in 1837, assistant keeper of MSS. in'the British Museum. He was afterwards appointed select preacher to the university of Oxford, chaplain~~

~~in ordinary to the queen, rector of St Margaret's, Westminster, and canon of Westminster. He was elected fellow of the Royal Society, corresponding member of the German Oriental Society and of the Institute of France, and foreign associate of the Institute, member of the French Asiatic Society and of the Historico-Theological Society of Leipsic, and trustee of the British Museum. He died in 1864.~~

~~Cureton's most remarkable work was the edition with notes and an English translation of the Epistles of St Ignatius to St Polycarp, the Ephesians, and the Romans, from a Syriac MS., found in the monastery of St Mary Deipara, in the desert of Nitria, near Cairo. He held that the MS. he used gave the truest text, that all other texts were inaccurate, and that the epistles contained in the MS. were the only genuine epistles of St Ignatius that we possess—a view which received the support of F. C. Baur, Bunsen, and many others, but which was opposed by Dr Wordsworth and by several German scholars. Cureton supported his view by his Vindieww Tgnatiane and his Corpus Ignatianwm,—a Complete Collection of the Ignatian Epistles, genwine, interpolated, and spurious. He also edited a partial Syriac text of the Festal Letters of St Athanasius, which was translated into English by Henry Burgess (1854), and published in the Library of Fathers of the Holy Catholic Church; Remains of a very Ancient Reeension of the Four Gospels in Syriae, hitherto unknown in Europe ; Spieilegium Syriaeum, containing Remains of Bardesan, Meliton, Ambrose, Mara Bar Serapion ; The third Part of the Eeclesiastieal History of John, Bishop of Ephesus, which was translated by Payne Smith ; Fragments of the Iliad of Homer from a Syriae Palimpsest ; an Arabic work known as the Thirty-first Chapter of the Book entitled The Lamp that guides to Salvation, written by a Christian of Tekrit; The Book of Religious and Philosophieal Seets, by Muhammed al Sharastani ; a Commentary on the Book of Lamentations, by Rabbi Tanchum ; and the Pillar of the Creed of the Sunnites. Cureton also~~

~~with " municipal" offices. The holders of them were by special ecclesiastical constitution made incapable of receiv- ing holy orders. And, on the other hand, clerks—or at least such as had no property of their own~~

~~apart from that derived from any ecclesiastical benefice—were exempted from the duty of accepting the office of 'curialis."~~

~~Papal Court.—At a later period, probably not earlier than the 12th century, the phrase curia Romana came to be syno- nymous with corte omana, and wasused to signify the entire body of persons employed in attendance on the Pope and in transacting the business of the Roman see. It seems indeed to have been at that time occasionally used in a sense equivalent to the "Holy See," comprising, in the idea signified, the Pontiff himself.~~

~~In process of time, however, a distinction seems to have established itself between the "corte Romana" and the "curia Romana." The former phrase is declared by Lunadoro in his Relazione della Corte di Roma, first published in 1641, to mean the whole body of cardinals, bishops, and prelates of all ranks who hold office in the Papal court and government ; whereas at that period and for some time previously the curia Romana had come to signify what we should call "the bar" practising in the Papal courts of justice. But it is curious that the old wider and less precise signification of the term is found surviving Jong afterwards in the writings of Lutherans and Jansenists, who found its larger signification convenient to them in attacking and satirizing the Roman Papal system. Thus in modern writings the phrase "'curia Romana" will be found very ordinarily to mean different things, according to the sympathies and in some degree to the country of the writer using it. In the mouth of a Lutheran, a Calvinist, a Jansenist, or even perhaps of a Gallican, it will mean the whole ecclesiastical and administrative system of Rome. In the mouth of the friends of the Papacy, especially of the Italians, it will be found to signify the body of lawyers practising in the Roman courts. The latter is of course, at all events in recent times, the more correct use of the term; and it will probably be found that in the mouth of a learned writer, even among Protestants, this will be the sense attached to it. Thus Bingham, in a curious passage illustrating the change in the signification of the word "curia," where he is treating of the meaning of the phrase "curiz tradi" as an ecclesiastical punishment (Orig. Eccl., lib. 17, ch. 2, sec, 8), shows that the more accurate significance of the word was an entirely legal one. The celebrated coutroversialist Bergier, on the other hand, in his Theological Dictionary, defines "corte Romana" as 'a phrase used in our days by~~

modern newfangled writers in contempt of the dogmatic constitutions and pontifical briefs of the holy Roman apostolic see. If I remember rightly this phrase was first used by Calvin and his followers." Now all the writers thus twitted by the French theologian would have used "curia" as synonymous with "corte." And modern anti-ecclesiastical Italian writers will be found using the word similarly. But the proper present ecclesiastical sense of the term is most accurately rendered in English by the 'Roman bar"—the body of those privileged to practise in the different pontifical courts of justice.

It will be seen, in short, that the use of the term has been shifting and uncertain to a singular degree,—shifting toth, as the meaning of other words shifts, by lapse of time, and also not only according to the nationality but according to the views and prejudices of the person using it.

It may be added that the building now occupied by the Italian Chamber of Deputies, was called the Curia Innocenziana, having been built by Innocent XII. for the reuniting of the various "curize" before existing in the bity,

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For a detailed account of the officials who were at different times comprised in the idea of the Curia, of the duties, orders, and hier- archical distinctions and privileges of these, of the story of the pious confraternity into which they formed themselves under the patronage of St Ivo the Briton, &c., the curious inquirer must be referred to Lunadoro, Corte di Roma ; Compendio Istorica del pio istitauto, congregazione, e venerad. arciconfraternita sotto I'invocazione dell?' Immacolata Concezione, ¢ di 8. Ivo avocato de' poveri oppressi ; Bernini, Del tribunale della Rota ; Cancellieri, Possesse de' Pontifici ; and Moroni, Diet. de Erudit. Eceles.

CURLEW, in French Courlis or Corlieu, a name given to two birds, of whose cry it is an imitation, both belong- ing to the group Limicole, but possessing very different habits and features.

1. The Long-billed Curlew, or simply Curlew of most British writers, the Vumenius arquata of ornithologists, is one of the largest of the family Scolopacide, or Snipes and allied forms, It is common on the shores of the

United Kingdom and most parts of Europe, seeking the heaths and moors of the interior and more northern countries in the breeding-season, where it lays its four brownish-green eggs, suffused with cinnamon markings, in an artless nest on the ground. In England it has been ascertained to breed in Cornwall and in the counties of Devon, Dorset, Salop, aud Derby—though sparingly. In Yorkshire it is more nume- rous, and thence to the extreme north of Scotland, as well as throughout Ireland, it is, under the name of Whaup, familiar to those who have occasion to traverse the wild and desolate tracts that best suit its habits. So soon as the young are able to shift for themselves, both they and their parents resort to the sea-shore or mouths of rivers, from the muddy flats of which they at low tide obtain their living, and, though almost beyond any other birds wary of approach, form an object of pursuit to numerous gunners. While leading this littoral life the food of the Curlew seems to consist of almost anything edible that presents itself. It industriously probes the mud or sand in quest of the worms that lurk therein, and is also active in seeking for such crustaceans and mollusks as can be picked up on the' surface, while vegetable matter as well has been found in its stomach. During its summer-sojourn on the moorlands insects and berries, when they are ripe, enter largely into its diet. In bulk the Curlew is not less than a Crow, but it looks larger still from its long legs, wings, aud neck. Its bill, from 5 to 7 inches in length, and terminating in the delicate nervous apparatus common to all birds of its family, is especially its most remarkable feature. Its plumage above is of a drab colour, streaked and mottled with very

dark brown ; beneath it is white, while the flight-quills are

of a brownish black.

Nearly allied to the Curlew, but smaller and with a more northern range, is the Whimbrel (4. phceopus), called in some parts Jack-Curlew, from its small size—May-fowl, from the month in which it usually arrives—and Titterel from one of its cries! This so much resembles the former in habit and appearance that no further details need be given of it, In the countries bordering on the Mediterranean occurs a third species (V. tenwirostris), the home of which has yet to be ascertained, Some fifteen other species, or more, have been described, but it is probable that this number is too great,

~~The genus Vumenius is almost cosmopolitan. In North America three very easily recognized species are found—the first (WV. longirostris) closely agreeing with the European Curlew, but larger and with a longer bill; the second (1. hudsonicus) representing our Whimbrel ; and the third (V. borealis), which has several times found its way to Britain, very much less in size—indeed the smallest of the genus. All these essentially agree with the species of~~

~~1 The name Spowe (cf. Icelandic Spbi) also seems to have been anciently given to this bird (see Stevenson's Birds of Norfolk,~~

~~vol. ii. p. 201,)~~

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~~the Old World in habit ; but it is remarkable that the American birds can be easily distinguished by the rufous colouring of their axillary feathers—a feature which is also presented by the American Godwits (Zimosa).~~

~~2. The Curlew of inlanders, or Stone-Curlew—called also, by some writers, from its stronghold in this country, the Norfolk Plover, and most wrongly and absurdly the Thick-Knee, or Thick-Kneed Bustard—is usually classed among the Charadriide, but it offers several remarkable differences from the more normal Plovers. It is the Charadrius cedicnemus of Linneus, the C. scolopax of Sam. Gottl. Gmelin, and the @dicnemus crepitans of Temminck. With much the same cry as that of the~~

~~Yumenti, only uttered in a far sweeter tone, it is as fully entitled to the name of Curlew as the bird most commonly so called. In England it is almost solely a summer-visitor, though an example will occasionally linger throughout a mild winter ; and is one of the few birds whose distribution is affected by geological formation, since it is nearly limited to the chalk-country—the open spaces of which it haunts, and its numbers have of late years been sensibly diminished by their inclosure. The most barren spots in these dis- tricts, even where but a superficial coating of light sand and a thin growth of turf scarcely hide the chalk below, supply its needs ; though at night (and it chiefly feeds by night) it resorts to moister and more fertile places. Its food consists of snails, coleopterous insects, and earth-worms,~~

but larger prey, as a mouse or a frog, is not rejected. Without mak- ing the slightest attempt at a nest, it lays its two eggs on a level spot, a bare fallow being often chosen. These are not very large, and in colour so closely resemble the sandy, flint-strewn surface that their detection except by a practised eye is difficult. The bird, too, trusts much to its own drab colouring to elude observation, and, on being disturbed, will frequently run for a considerable distance and then squat with outstretched neck so as to become almost invisible. In sucha case it may be closely approached, and its large golden eye, if it do not pass for a tuft of yellow lichen, is perhaps the first thing that strikes the searcher. As autumn advances the Stone-Curlew gathers in large flocks, and then is as wary as its namesake. To- wards October these take 'their departure, and their survivors return, often with wonderful constancy, to their beloved haunts (see Brirps, vol. ili. p. 766). In size this species exceeds any other European plover, and looks even still larger than it is. 'The bill is short, blunt, and stout; the head large, broad, and flat at the top. The wings and legs long—the latter presenting the peculiarity of a singular enlargement of the upper part of the tarsus, whence the name dicnemus has been conferred. The toes are short and fleshy, and the hind toe, as in most Charadriide, is wanting. This Curlew seems to have been an especial favourite with Gilbert White, in whose classical writings mention of it is often made. Its range extends to North Africa and India. Five otherspecies of dienemus from Africa have also been described as distinct : whether there are so many may be doubted. Australia, however, possesses a very distinct species (. grallarius), and the genus has two members in the Neotropical Region (Z. bistriatus and CG. superciliaris). The analogy of all these birds to the Bustards (Ot¢dide) is manifest, but that they have any really close affinity to that family is questionable. An exaggerated form of dienemus is found in dsacus, of which two species have been described, one (&. recurvirostris) from the Indian, and the other (#. magnirostris) from the northern parts of the Australian

Region. (A. N.)

CURLING, a game in which the players throw large rounded stones upon a rink or channel of ice, towards a mark called the tee. Where the game

originated is not

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precisely known; but as it has been popular in North Britain for the last three centuries at least, and down till our own day been practised chiefly by natives of that country, it may correctly be spoken of as a Scottish pastime. Some writers, looking to the name and technical terms of the game, trace its invention to the Low Countries : thus " curl" may have been derived from the German kurz werl,a game; "tee" from the Teutonic tighen, to point out ; " bonspiel," a district curling competition, from the Belgic bonne, a district, and spel, play ; though the supposi- tion that "rink" is just a modification of the Saxon Arink, a strong man, seems scarcely tenable. Then, it is further stated that, as curling is called " kuting" in some parts of Lanarkshire and Ayrshire, and very much resembles quoiting on the ice, the name may have some connection with the Dutch coete,a quoit; while Kilian in his Zeutonve Dictionary represents the term khuyten to mean a pastime in which large globes of stone are thrown upon ice like the quoit or discus. Possibly enough some of the Flemish merchants who settled in Scotland towards the close of the 16th century may have brought the game to the country. Unfortunately, however, for the theory that assigns to it a far-away origin, we find no early mention of it in the literature of the Continent ; while Camden, when describ- ing the Orkney Islands in 1607, tells us that one of them supplies " plenty of excellent stones for the game called curling ;" and incidental references to it as a game played in Scotland are made by several authors during the first half of the same century. If the game be not indigenous to Scotland it certainly owes its development to that country, and in the course of time it has come to be nearly as much the national sport of the Caledonians as " the rough bur thistle " their heraldic emblem.

With very rude engines it was played at first,—random whin boulders fashioned by the finger of nature alone, or misshapen granite blocks, bored through to let in the thumb of the player, having been the channel-stones used by the primitive curlers of the country. Even before Bannockburn was fought the ice of the Scottish lochs may have been employed as the arena of a bloodless strife ; though it is only as a piece of pardonable witticism that Ossian has been quoted as follows to show that curling was practised by his

~~somewhat mythical heroes—“ Fly, son of Morven, fly ; amid the circle of stones Swaran, bends at the stone of might.” In course of years the rough block of the game was superseded by a symmetrical object usually made of whinstone or granite, beautifully rounded, brilliantly polished, and supplied with a convenient handle ; so that the curling stone now used is as great an improvement on its remote predecessor as the Martini rifle is on the old matchlock which figured at Marston Moor and Culloden. It is circular in form, its weight from 35 to 50 hi, its circum- ference from 30 to 36 inches, and the height is about one- eighth of the girth. With engines of such shape and bulk, costing with handles from £2 to £2, 10s. per pair, all the societies, 472 in number, connected with the Royal Cale- donian Curling Club play their spiels when “ cauld cauld frosty weather” supplies the required arena. Most of these societies are located in the Land of Cakes and Curlers ; but many of them are transatlantic, no fewer than 37 belonging to the Ontario province branch alone; while there are many hundreds of independent curling fraternities north of the Tweed, who play for their own hand, under arrangements of their own, though the rules and usages of the Caledonian Curling Club form a code which largely regulates “ the roaring game,” as Burns calls it, all over the world,~~

~~On arink 42 yards long, or so, with a tee at each end, the stone is hurled, the hurler, or curler, when deliver- ing it standing on one side of the goal or tee, so as to~~

~~CURLING~~

~~bring the stone over the tee when delivering it ; or, accord- ing to another arrangemeut, he occupies a small circle a foot in diameter behind a ring of 7 feet radius drawn To cover this goal or lie close to it is the player’s chief object; but often when he has realized his aim, a rival stone “ up the rink like Jehu roars,” driving his stone nowhere, settling down in its pride of place, but only to be served perhaps in a similar way itself before the match is at an end. No stones that lie outside the large~~

~~round the tee.~~

~~Diagram of Curling Rink.~~

circles of 7 feet radius round the tee are allowed to count, and all laggard stones that manifest a pig- like indolence, and do not pass the well-named hog score, which is drawn at a distance of one-sixth the rink from each tee, are removed as obstructive cumberers of the channel. Games can be played by two persons, but usually matches are arranged for with numerous competitors formed into rinks of four players a side, two stones being used by each player. It is customary for the parish clubs of a district, marshalled by their respective skips, or captains, to try their skill'against each other once a year or so ; while annually (when weather permits) a great contest, which is at least semi-national, is waged between the curlers north and south of the River Forth.

At first the game is remarkably simple, the leader, as we have said, endeavouring to top or closely neighbour the tee, and his immediate opponent having a similar object in view. When, during the progress of the game, one, two, or more stones have been well»planted, the supporters of those who placed them there are usually directed by their skip rather to guard the winning stones than venture too near them at the risk of injuring their position. On the other hand the tactics of the opposing party will consist in efforts to knock off the guards, dislodge the well-planted stones, or get their own still better placed where that is possible. It sometimes happens that the stone nearest the tee—the winner, as it is called—is so well protected that it cannot be touched directly, and defies removal unless it be assailed by an ingenious master-stroke technically termed wicking or inringing, whereby a stone is sent in an oblique direction so as haply to hit the winner; and, if it not only does that, but becomes the winner in its stead, the man who throws it is sure to be hailed by his exulting comrades as a prince among curlers, if not " the king 0' a' the core." " Wicking, or inringing," says the late Sir Richard Broun, Bart., in his admirable work Memora- bilia Curliana (published in 1830), "the prettiest and most scientific point in the game by far, is to take the shot and leave yourself behind the rampart of your adversary's barricade, when to all appearance their winner was impreg- nable ;" and this is done "by taking an inner angle off a side shot in such a manner as to change and direct the course of your stone upon the one tobe projected." When, however, science fails, and the ice is so blocked up as almost to hide the tee, an effort of strength and hazard is resorted to in the hope of some benefit "turning up." This, by the

curlers of the south of Scotland, is called "rebutting." The player in such cases is usually told by his skip to "put plenty of powder in the horn," and the stone is delivered with tremendous force, so as to go ' crashing through guards and double guards, sometimes doing more harm than good, and sometimes also changing in a moment the whole fortunes of the game.

Many fine songs have been written, about curling, from which lines might be quoted descriptive of all its leading

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points, its implements, "channel stones, crampets (flat pieces of iron with spikes below fastened on the sole of the shoe to keep the 'player from slipping), and besoms so green," with which the rink is swept ; also in praise of the game as a promoter of mental enjoyment, bodily health, and the best of good-fellowship. The late Dr Henry Duncan's song on the subject has never been excelled ; and he succeeds in packing into a single stanza some of its chief characteristics :—

"'There draw a shot ; there lay a guard ; And here beside him lie, man ; Now let him feel a gamester's hand ; Now in this bosom die, man.

There fill the port, and block the ice ; We sit upon the tee, man!

Now take this in-ring sharp and neat, And make this winner flee, man."

The Ettrick Shepherd also ranks among the Jaureates of the rink.

The following rules of the game are abridged from the Annual of the Royal Caledonian Curling Club :—

1, The tees shall be set down 40 yards apart; and in an exact alignment with the tees aline shall be drawn on the rink. Seven feet behind each tee a circle 6 inchesin diameter shall be also drawn on the ice on the left-hand side of said line (looking to the tee to be played to), the inner side of which shall be distant from said line 6 inches. Upon this cirele, and as near as may upon the centre of it, every player, whether standing on the ice or{on a board or other rest, shall, in the delivery of his stone, place, or in stepping out, put

~~down his left or fore foot, if he be a right hand player. , a left- hand player, another such circle shall be placed in like manner, and for the like purpose on the right hand side of said line. And in the event of a hack, hatch, trigger, &c., being used, it shall be right behind said circle, and not less distant therefrom than 2 feet, nor greater in length than 12 inches.~~

~~A circle of 7 feet radius to be described from each tee asa centre, and every stone to count which is either within, or resting on, this circle. All played stones passing the tee, and going beyond the 7 feet radius, shall be put off the ice. The hog-score' to be distant from each tee one-sixth part of the length of the whole rink played on. Every stone to be a hog which does not clear this score ; but no stone to be such which has struck another stone lying over the hog-score. A line shall be drawn on the ice, at a right angle to the rink, half-way betwixt the tees, called 'the middle line." In no case shall the rink be less than 32 yards.~~

~~2. All matches to be of a certain number of heads, to be agreed on by the clubs, or fixed by the umpire, before commence- ment ; or otherwise, by time, or shots, if mutually agreed on.~~

~~3. Every rink to be composed of four players a side, each using two stones. The rotation of play observed during the first head of a match shall not be changed.~~

~~4, The skips opposing each other shall settle by lot, or in any other way they may agree upon, which party shall lead at the first head, after which the winning party shall do so,~~

~~5. All curling stones shall be of a circular shape. No stone shall be of a greater weight than 50 tb imperial, or of greater circumference than 86 inches, or of less height than one-eighth part of its greatest circumference.~~

~~6. No stone, or side of a stone, shall be changed after a match has been begun, or during its continuance, unless by consent.~~

~~7. Should a stone happen to be broken, the largest fragment shall be considered in the game for that end—the player being entitled afterwards to use another stone, or another pair.~~

~~8. If a played stone rolls over, or stops, on its side or top, it shall be put off the ice. Should the handle quit the stone in delivery, the player must keep hold of it, otherwise he shall not be entitled to replay the shot.~~

~~9. Players, during the course of each end, to be arranged along the sides of the rink, anywhere skips may direct; and no party, except when sweeping according to rule, shall go upon the middle of the rink, or cross it, under any pretence whatever. Skips alone to stand at or about the tee—that of the playing party having the choice of place, and not to be obstructed by the other.~~

~~10. If a player should play out of turn, the stone so played may be stopped in its progress, and returned to the player. Should the mistake not be discovered till the stone be at rest, or has struck another stone, the opposite skip shall have the option of adding one to his score, allowing the game to proceed, or declaring the end null and void. But if a stone be played before the mistake has been discovered, the head must be finished as if it had been pro- perly played from the beginning.~~

~~11. The sweeping shall be under the direction and control of the skips. The player's party may sweep the — anywhere from the~~

~~I. — go~~

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~~centre line to the tee, and behind it,—the adverse party having liberty to sweep behind the tee, and in front of any of their own stones when moved by another, and till at rest. Skips to have full liberty to clean and sweep the ice behind the tee at any time, execpt when a player is being directed by his skip.~~

~~12. If in sweeping or otherwise, a running stone be marred by any of the party to which it belongs, it may, at the option of the opposite skip, be put off the ice; if by any of the adverse party, 1t may be placed where the skip of the party to which it belongs shall direct. If otherwise marred, it shall be replayed.~~

13. Every player to be ready to play when his turn comes, and not to take more than a reasonable time to play. Should he

lay a wrong stone, any of the players may stop it while running ; ut if not stopped till at rest, the one which ought to have been played shall be placed instead, to the satisfaction of the opposing skip.

14. No measuring of shots allowable previous to the termination ofthe end. Disputed shots to be determined by the skips, or, if they disagree, by the umpire, or, when there is no umpire, by some neutral person chosen by the skips. All measurements to be taken from the centre of the tee, to that part of the stone which is nearest it. No stone shall be considered without a eircle, or over a line, unless it elear it ;—and in every ease, this is to be determined by placing a square on the ice, at the circle or line.

15. Skips shall have the exclusive regulation and direction of the game for their respective parties, and may play last stone, or in what part of it they please ; and, when their turn to play comes, they may name one of thcir party to take charge for them.

16. If any player shall speak to, taunt, or interrupt another, not being of his own party, while in the act of delivering his stone, one shot shall be added to the seore of the party so interrupted. * 17. If from any change of weather after a match has been begun, or from any other reasonable cause, one party shall desire to shorten the rink, or to change to another one, and, if the two skips can- not agree, the umpire shall, after seeing one end played, determine whether the rink shall be shortened, and how much or whether it shall be changed, and his decision shall be final. (W. M'D.)

CURRAGH, a level stretch of open ground in the county of Kildare, in Ireland, famous for its race-course and its military camp. It has an area of upwards of 4800 aeres ; and its soft natural sward, which has never been broken by the plough, affords excellent pasture for sheep. From the peculiarity of its herbage, the district is known in the neighbourhood as " the short grass ;" and the young men of Kildare are jocularly distinguished as the " boys of the short grass." The land is the property of the Crown, which appoints a special officer as the ranger of the Curragh ; but the right of pasturage is possessed. by the landowners of the vicinity. The oldest

~~mention of the Curragh occurs in the Liber Hymnorum (the manuscript of which probably dates from the 10th century) in connection with St Bridget, who is said to have received a grant of the district from the king of Leinster, and is popularly credited with the honour of having turned it into a common. It is evident, however, that long before the days of the saint the downs of Kildare had afforded a regular place of assembly for the people of the south of Ireland, and the turf had already become familiar with the hoofs of the race-horse. The~~

~~CURRAN, Jonn Purtror (1750-1817), Master of the Rolls in Ireland, and one of the most brilliant wits and~~

~~CU R—~~

~~CUR~~

~~orators of his day, was born on the 24th July 1750, at Newmarket, Cork, where his father, a descendant of one of Cromwell's soldiers, was seneschal to the manor-court. Pleased with his bright boyish vivacity and wit, the rector of his native place, the Rev. Nathaniel Boyse, first gave him lessons and then sent him to school at Middleton, At the age of nineteen he became a sizar of Trinity College, Dublin; and in 1773, having taken his M.A. degree, he entered the Middle Temple. During his residence in London he gave some little attention to the study of law, but gained far more by his assiduous attendance at the students' debating societies. In 1774 he married a lady who brought him a small dowry ; but the marriage proved most unhappy, not without fault on the part of Curran, and Mrs Curran finally eloped from her husband.~~

~~In 1775 Curran was called to the Irish bar, where he very soon obtained a practice. On his first rising in court, excessive nervousness prevented him from even reading dis- tinctly the few words of a legal form, and when requested by the judge to read more clearly he became so agitated as to be totally unable to proceed. But, his feelings once roused, all nervousness disappeared. HIs effective and witty attack upon a judge who had sneered at his poverty, the success with which he prosecuted a nobleman for a disgraceful assault upon a priest, the duel which he fought with one of the~~

witnesses for this nobleman, and other similar exploits, gained him such a reputation that he was soon the most popular advocate in Ireland.

In 1783 Curran was appointed king's counsel; and in the same year he was presented toa seat in the Irish House of Commons. His conduct in connection with this affair displays his conduct in a most honourable light ; finding that he differed radically in politics from the gentleman from whom he had received his seat, he offered to buy another to replace that which he occupied. In his parliamentary career Curran was throughout sincere and consistent. He spoke vigorously in behalf of Catholic emancipation," and strenuously attacked the ministerial bribery which prevailed. His declamations against the Government party led him into two duels—the first with Fitzgibbon, then attorney-general, afterwards Lord Clare; the second with the secretary of state, Major Hobart, afterwards Lord Buckingham. The Union caused him the bitterest disappointment ; he even talked of leaving Treland, either for America or for England.

Curran's fame rests most of all upon his speeches in

behalf of the accused in the state trials that were so numerous between 1794 and 1803 ; and among them may be mentioned those in defence of Hamilton Rowat, the Rev. William Jackson, the brothers Shears, Finnerty, Lord Edward Fitzgerald, Tone, and Kirwan. Another of his most famous and characteristic speeches is that against the mar- quis of Headfort, who had eloped with the wife of a clergy- man named Massey. On the arrest of Emmett, who had formed an attachment to his daughter, Curran was himself under suspicion; but, on examination before the Privy Council, nothing was brought forward to implicate him in the intended rebellion. In 1806, on the death of Pitt and the formation of the Fox ministry, Curran received the post of Master of the Rolls, with a seat in the Privy Council, much to his dis- appointment, for he had desired a position of greater political influence. For eight years, however, he performed the distasteful duties of this office. He then retired on a pension of £3000; and the three remaining years of his life were spent in London, where he became one of the most brilliant members of the brilliant society which in- cluded Sheridan, Erskine, Thomas Moore, and William Godwin. He died at his house in Brompton on the 14th October 1817.

Curran's legal erudition was never profound 3 aad though he was capable of the most ingenious pleading, his appeal was always to the emotions of his audience. HIs best speeches are one fiery torrent of invective, pathos, national feeling, and wit. HIs diction was lofty and sonorous. 'To his personal presence he owed nothing ; for he was short, slim, and boyish-looking, and his voice was thin and shrill.

See Curran and his Contemporaries, a most entertaining work,

by Charles Phillips, a personal friend of Curran's (1818), and the |

Life of Curran by his son, W. H. Curran (1819, and with additions by Dr Shelton Mackenzie, New York, 1855), both of which con- tain numerous samples of Curran's eloquence. See also Curran's Speeches (1805, 1808, 1845), Memoirs of Curran, by Wm. O'Regan (1817), Letters to Rev, H. Weston (1819).

CURRANTS, the dried seedless fruit of a variety of the grape-vine, Vitrs vinifera, cultivated principally in Zante, Cephalonia, and Ithaca, and near Patras, in the Morea. Currants were brought originally from Corinth, whence their name; in the 13th and 14th centuries they were known as raisins de Corauntz. In the Ionian Islands the currant-vine is grown on the sides of the lower hills, or in the valleys, the grape-vine occupying the higher and less open and rich ground. Gypseous marls, or calcareous marls containing a little gypsum, are preferred to limestone soils, as they allow of the deep penetration of the roots of the vines. The most favourable situations are those where a good supply of water can be obtained for the irrigation of the plantations. This is carried on from the end of October to the close of the year, after which all that is necessary is to keep the ground moist. The vines are planted in rows 3 or 4 feet apart. Propagation is effected by grafting on stocks of the grape-vine, or by planting out in spring the young vigorous shoots obtained at the end of the previous year from old currant-vines that have been cut away below the ground. The grafts bear fruit in three years, the slips in about double that time. The vine-stock for grafting is cut down to the depth of a foot below the surface of the soil ; two or three perpendicular incisions are made near the bark with a chisel; and

into these are in- serted shoots of the last year's growth. The engrafted part then receives an application of moist marl, is wrapped in leaves and bound with rushes, and is covered with earth, two or three eyes of the shoots being left projecting above ground. In December the currant plantations are cleared of dead and weak wood. In February the branches are cut back, and pruned of median shoots, which are said to prevent the lateral ones proceeding from the same bud from bearing fruit. In order effectually to water the trees, the earth round about them is in February and March hoed up so as to leave them in a kind of basin, or is piled up against their stems. In May, when the leaves begin to show, the ground is thoroughly turned, and if requisite manured, and is then re-levelled. By the middle of April the leaves are fully out, and in June it is necessary to break back the newly-formed shoots. The fruit begins to ripen in July, and in the next month the vintage takes place. At this season rain is greatly dreaded, as it always damages and may even destroy the ripe fruit. The planta- tions, which are commonly much exposed, are watched by dogs and armed men. In Cephalonia the currant-grape is said to ripen at least a week earlier than in.Zante. To destroy the oidium, a pest that severely injures the plantations, the vines are dusted, at the time the fruit is maturing, with finely-ground brimstone. The currants when sufficiently ripe are gathered and placed on a drying ground, where they are exposed to the sun in layers half an inch thick ; from time to time they are turned and swept into heaps, until they become entirely detached from stalk. They are then packed in large butts for exportation. The wine

made from the currant-grape is inferior in quality, but |

is said to be capable of much improvement. The fresh fruit is luscious and highly flavoured, but soon cloys the palate. In 1834 the duty on currants was made 22s. 2d. per cwt., or one-half what it had previously been ; in 1844 it was reduced to 15s., and in 1860 to 7s. per cwt. In 1874 the imports of currants into the United Kingdom were :—

Cwts Value. From Austrian territories….. 6978 £ 8,606 MG GON GCCOM ete tdccceasnesneecns GOSS DS 1,278,974 », Other countries……. 2,119 2,994 Motel. cae ncemeeeran 972,455 £1,290,574

~~The currants of British kitchen-gardens are the produce of Lebes nigrum and R. rubrum, deciduous shrubs of the natural order Grossulariacece, indigenous to Britain, North- ern and Central Europe, Siberia,and Canada The former species bears the black, the latter the red currant. White currants are the fruit of &. album, a cultivated variety of ie. rubrum. Both red and black currants are used for making tarts and pies, jams, jellies, and wine; the latter are also employed medicinally in lozenges, and in the preparation of a gargle for sore throat, are occasionally preserved in spirits, and in Russia are fermented with honey to produce a strong liquor. The leaves as well as the roots of the black currant have been recommended for their therapeutic virtues. A kind of black currant, bearing poor and acid fruit, is indigenous to Tierra del Fuego. Royle mentions three Himalayan species of currants ; their fruit he found to contain less saccharine matter than that of their cultivated European congeners.~~

~~CURRENCY. See Money.~~

~~CURRIE, Jamus (1756-1805), a Scotch physician and an editor of Burns, wasthe son of theminister of Kirkpatrick Fleming, in Dumfriesshire, where he was born. He was destined for business, and while still very young was sent out to Virginia. The outbreak of the first American war, however, changed his prospects considerably ; he had a long and dangerous illness ; and he still further damaged his chance of success by contributing a series of letters to an American journal, under the signature of " An Old Man," in defence of the mother country. At last he found it necessary to leave America, and reaching home at the age of twenty, he applied himself with energy to the study of medicine. In 1780, with the object of procuring military service in Jamaica, he took his degree at Glasgow ; but not obtaining the post he had in view, he settled at Liverpool, where in 1783 he was elected physician to the infirmary. The fatigues of his professional work, acting upon a hereditary tendency to pulmonary disease, forced him in 1804 to give up practice, and retire to the south of England, where he died in the following year. Among Currie's works may be mentioned a Tory pamphlet signed " Jasper Wilson" and entitled A Letter, Commercial and Political, addressed to the Right Honourable William Pitt, which ran quickly through several editions; and Medical Reports on the Effects of Water, Cold and Warm, as a Lemedy in Fevers and other Diseases. But he is~~

best known for the edition of Burns, with an introductory criticism and an essay on the character and condition of the Scottish peasantry, which he undertook in behalf of the family of the poet, whose personal acquaintance he had enjoyed.

CURRY, a name applied to a great variety of seasoned dishes. In India the following are employed as ingredients in curries :—anise, coriander, cumin, mustard, and poppy seeds ; allspice, almonds, asafœtida, butter or ghee, cardamoms, chillies, cinnamon, cloves, cocoa-nut and cocoas nut milk and oil, cream and curds, fenugreek, the tender unripe fruit of Buchanania lancifolia, cheroonjie nuts (the produce of another species, B. latifolia), garlic and onions,

ginger, lime-juice, vinegar, the leaves of Bergera Kanigii (the curry-leaf tree), mace, mangoes, nutmeg, pepper, saffron, salt, tamarinds, and turmeric. The annexed table shows the composition of four kinds of Indian curry powder :—

Lbs. Oz Black qieppere…..—.5.- 2 1 il 8 Candamoms).;..c0:7.6 +s: 2 hs re 4 WHIM ESS .ccsseereeecenseses 1 2 1 6 CINMMAMON seccsice ce ceeses 2; ee sa 4 Coriander seeds…….. 20 ie 3 8 Cumin seeds……..0.055 i 2 4 Ree IN@NNOTERlG ys)... 6-0 cescecces 1 1 4 2 (GfoTH Ie oGanenenscpercocosngace 2 ii – 6 (CiaaHA cg epenocenonoobooens 2 2 $ 8 Mustard seed ……. 1 1 4 mA MATIMIOVIC™ nese ce sceegeucent 4 % il 9 Poppy 66d. z…..:.ss0s000. 2 2 ef 6

The cumin and coriander seeds are generally used roasted The various materials are cleaned, dried, ground, sifted, thoroughly mixed, and bottled. Upwards of forty different methods of preparing curry are given in the Indian Domestic Economy and Receipt Book, 2d ed. Madras, 1850.

CURRYING. See Learuer.

CURTIUS, Mettvs or Metivs, the hero of two legends connected with the part of the Roman forum called the Lacus Ourtius, which appears to have once been a marsh,

and where sacrifices were regularly offered. The first legend makes him the leader of the Sabine army in a battle with the Romans under Tullus Hostilius. To escape from the attack of the Romans he was forced to ride into a swamp which occupied the spot, hence called the Lacus Curtius. The second legend, which is dated 362 z.c., tells how a gulf suddenly appeared in the forum, according to one account riven by a thunder-bolt, and the aruspices declared that it would never close till what was dearest to Rome was thrown therein. At this announcementa noble youth, Mettus Curtius, came forward, declaring that her citizens were the most valuable possessions of the city ; and, armed and on horseback, he leapt into the chasm, which forthwith closed over his head.

CURTIUS, Quintus Rurvs, the celebrated biographer of Alexander the Great. Of his personal history) nothing whatever is known with certainty, some fixing his epoch in the Augustan, others as far down as the medieval age, but most critics in the time of Vespasian. Niebuhr held him to be a contemporary of Septimius Severus. His work originally consisted of ten books, but the first two of these are entirely lost, and the remaining eight are incomplete. The best modern editions of the text are those of Zumpt, Baumstark, and Miitzell.

See Niebuhr, Kleine Schriften, vol. i.; Buttmann, Ucber das Leben des Geschichtschreibers Q. Curtius Rufus ; Pinzger, " Ueber das Zeitalter des Q. Curtius Rufus," in Seebode's Archiv. fiir Philologie.

CURVE

TTIHIS subject is treated here from an historical point of

view, for the purpose of showing how the different leading ideas in the theory were successively arrived at and developed.

A curve is a line, or continuous singly infinite system of points. We consider in the first instance, and chiefly, a plane curve described according to a law. Such a curve may be regarded geometrically as actually described, or kinematically as in course of description by the motion of a point ; in the

former point of view, itis the locus of all the points which satisfy a given condition ; in the latter, it is the locus of a point moving subject to a given condi- tion, Thus the most simple and earliest known curve, the circle, is the locus of all the points at a given distance from a fixed centre, or else the locus of a point moving so as to be always at a given distance from a fixed centre. (The straight line and the point are not for the moment regarded as curves.)

Next to the circle we have the conic sections, the inven- tion of them attributed to Plato (who lived 430 to 347 B.c.); the original definition of them as the sections of a cone was by the Greek geometers who studied them soon replaced by a proper definition 7 plano like that for the circle, viz., a conic section (or as we now say a "conic ") is the locus of a point such that its distance from a given point, the focus, is in a given ratio to its (perpendicular) distance from a given line, the directrix; or it is the locus of a point which moves so as always to satisfy the foregoing condition. Similarly any other property might be used as a definition ; an ellipse is the locus of a point such that the sum of its distances from two fixed points (the foci) is con- stant, &c., dc.

The Greek geometers invented other curves; in parti- cular, the "conchoid," which is the locus of a point such that its distance from a given line, measured along the line drawn through it to a fixed point, is constant; and the "cissoid" which is the locus of a point such that its dis- tance from a fixed point is always equal to the intercept (on the line through the fixed point) between a circle passing

through the fixed point and the tangent to the circle at the point opposite to the fixed point. Obviously the number of such geometrical or kinematical definitions is infinite. In a machine of any kind, each point describes a curve; a simple but important instance is the " three-bar curve," or locus of a point in or rigidly connected with a bar pivotted on to two other bars which rotate about fixed centres respectively. Every curve thus arbitrarily defined has its own properties ; and there was not any principle of classifi- cation.

The principle of classification first presented itself in the Géométrie of Descartes (1637). The idea was to represent any curve whatever by means

~~of a relation be- tween the coordinates (x, y) of a point of the curve, or say to represent the curve by means of its equation.~~

~~Descartes takes two lines xz', yy', called axes of co- ordinates, intersecting at a point O called the origin (the~~

~~y~~

~~y~~

~~axes are usually at right angles to each other, and for the present they are considered as being so); and he determines the position of a point P by means of its distances OM (or~~

~~—~~

~~CURVE ral~~

~~NP) =«, and MP (or ON) =y, from these two axes respec- tively ; where x is regarded as positive or negative according as it is in the sense Ox or Oz' from O; and similarly y as positive or negative according as it is in the sense Oy or Oy' from O; or what is the same thing—~~

~~In quadrant wy', or N.E., we have 3) xy a3 N.W. a)~~

~~ey SW |, Any relation whatever between (., y) determines a curve,~~

~~l+1+e~~

~~gy~~

~~+~~

~~ao~~

~~and conversely every curve whatever is determined by a~~

~~relation between (x, y).~~

~~Observe that the distinctive feature is in the exclusive use of such determination of a curve by means of its equa-~~

~~tion. The Greek geometers were perfectly familiar with the property of an ellipse which in the Cartesian notation~~

~~2 2~~

~~. & .~~

~~is =the 1, the equation of the curve ; but it wasas one~~

~~of a number of properties, and in no wise selected out of~~

~~the others for the characteristic property of the curve.!~~

~~We obtain from the equation the notion of an algebraical or geometrical as opposed to a transcendental curve, viz., an algebraical or geometrical curve is a curve having an equation F(x, y)=0, where F(a", y) is a rational and integral function of the coordinates (x, y); and in what follows we attend throughout (unless the contrary is stated) only to such curves. The equation is sometimes given, and may conveniently be used, in an irrational form, but we always imagine it reduced to the foregoing rational and integral form, and regard this as the equation of the curve. And we have hence the notion of a curve of a gwen order, viz., the order of the curve is equal to that of the term or terms of highest order in the coordinates (x, Y) conjointly in the equation of the curve 3 for instance, ay ~1=0 is a curve of the second order.~~

~~It is to be noticed here that theaxes of coordinates may be any two lines at right angles to each other whatever ; and that the equation of a curve will be different according to the selection of the axes of coordinates ; but the order is independent of the axes, and has a determinate value for any given curve,~~

~~We hence divide curves according to their order, viz., a curve is of the first order, second order, third order, &c., ac- cording as it is represented by an equation of the first order, aa + by +c=0, or say (*fa, y, 1)=0; or by an~~

equation of the second order, ax? + 2hxy + by? + 2fy + 24gz+¢=0, say (*Ya, y, 1)?=0; or by an equation of the third order, &c ; or what is the same thing, according as the equation is linear, quadric, cubic, é&c.

eee

1 There is no exercise more profitable for a student than that of tracing a curve from its equation, or say rather that of so tracing a considerable number of curves. And he should make the equations for himself. The equation should be in the first instance a purely numeri- cal one, where y is given or can be found as an explicit function of x; here, by giving different numerical values to x, the corresponding values of y may be found ; and a sufficient number of points being thus deter- mined, the curve is traced by drawing a continuous line through these points. The next step should be to consider an equation involving literal coefficients ; thus, after such curves as y=23, y= (x —1)(x— 2), y=(a-1)¥ "2-2, &c., he should proceed to trace such curves as y=(x-a)(a-b)(x-c), y=(a- a)Vn—6, &c., and endeavour to as- certain for what different relations of equality or inequality between the coefficients the curve will assume essentially or notably distinct forms. The purely numerical equations will present instances of nodes, cusps, inflexions, double tangents, asymptotes, &c., ——specialities which he should be familiar with before he has to consider their general theory. And he may then consider an equation such that neither coordinate can be expressed as an explicit function of the other of them (practically, an equation such as 2344? —8ay=0, which requires the solution ofa cubic equation, belongs to this class); the problem of tracing the curve here frequently requires special methods, and it may easily be such as i. require and serve as an exercise for the powers of an advanced alge-

Taist. ,

A curve of the first order is a right line; and conversely every right line is a curve of the first order.

A curve of the second order is a conic, or as it is also called a quadric; and conversely every conic, or quadric, is a curve of the second order.

A curve of the third order is called a cubic ; one of the fourth order a quartic ; and so on.

A curve of the order m has for its equation (*fx, y, 1) = 0; and when the coefficients of the function are arbitrary, the curve is said to be the general curve of the order m. The number of coefficients is $(m+1)(m+2); but there is no loss of generality if the equation be divided by one coefficient so as to reduce the coefficient of the corre- sponding term to unity, hence the number of coefficients may be reckoned as $(m + 1)(m+2)—1, that is, dan(m + 3) ; and a curve of the order m may be made to satisfy this number of conditions; for example, to pass through 4m(m + 8) points.

It is to be remarked that an equation may break up ; thus a quadric equation may be (aa + by + c)(a'u+b'y+ eo) =0, breaking up into the two equations axz+by+c=0, az+by+c =0, viz, the original equation is satisfied if either of these is satisfied. Each of these last equations represents a curve of the first order, or right line ; and the original equation represents this pair of lines, viz. the pair of lines is considered as a quadric curve. But it is an wmproper quadric curve; and in speaking of curves of the second or any other given order, we frequently imply that the curve is a proper curve represented by an equa- tion which does not break up.

The intersections of two curves are obtained by combining their equations ; viz, the elimination from the two equa- tions of y (or x) gives for x (or y) an equation of a certain order, say the resultant equation ; and then to each value of » (or y) satisfying this equation there corresponds in general a single value of y (or x), and consequently a single point of intersection ; the number of intersections is thus equal to the order of the resultant equation in x (or 7).

Supposing that the two curves are of the orders m, n, respectively, then the order of the resultant equation is in general and at most = mz ; in particular, if the curve of the order » is an arbitrary line (x=1), then the order of the resultant equation is=m ,; and the curve of the order m meets therefore the line in m points. But the resultant equation may have all or any of its roots imaginary, and it is thus not always that there are m real intersections.

~~The notion of imaginary intersections, thus presenting itself, through algebra, in geometry, must be accepted in geometry—and it in fact plays an all-important part in modern geometry. As in algebra we say that an equation of the m-th order has m roots, viz., we state this generally without in the first instance, or it may be without ever, distinguishing whether these are real or imaginary ; so in geometry we say that a curve of the m-th order is met by an arbitrary line in m points, or rather we thus, through algebra, obtain the proper geometrical definition of a curve of the m-th order, as a curve which is met by an arbitrary line in m points (that is, of course, in m, and not more than m, points).~~

~~The theorem of the m intersections has been stated in regard to an arbitrary line ; in fact, for particular lines the resultant equation may be or appear to be of an order less than m ,; for instance, taking m = 2, if the hyperbola wy — 1 =0 be cut by the line y=Q, the resultant equation in w is Bx —1=0, and there is apparently only the intersection~~

~~Ge : » y=8); but the theorem is, in fact, true for every~~

~~line whatever : a curve of the order m meets every line whatever in precisely m points, We have, in the case just referred to, to take account of a point at infinity on the~~

~~line y=/8; the two intersections are the point (a= 5»~~

~~y = 8), and the point at infinity on the line y=8,~~

~~It is moreover to be noticed that the points at infinity may be all or any of them imaginary, and that the points of intersection, whether finite or at infinity, real or imaginary, may coincide two or more of them together, and have to be counted accordingly; to support the theorem in its universality, it is necessary to take account of these various circumstances.~~

~~The foregoing notion of a point at infinity is a very im- portant one in modern geometry ; and we have also to consider the paradoxical statement that in plane geometry, or say as regards the plane, infinity is a right line. This admits of an easy illustration insolid geometry. If with a given centre of projection, by drawing from it lines to every point of a given line, we project the given line on a given plane, the projection is a line, z.e., this projection is the intersection of the given plane with the plane through the centre and the given line. Say the projection is always a line, then if the figure is such that the two planes are parallel, the projection is the intersection of the given plane by a parallel plane, or it is the system of points at infinity on the given plane, that is, these points at infinity are regarded as situate on a given line, the line infinity of the given plane.~~

~~Reverting to the purely plane theory, infinity is a line, related like any other right line to the curve, and thus intersecting it in m points, real or imaginary, distinct or coincident.~~

~~Descartes in the Géométrie defined and considered the remarkable curves called after him ovals of Descartes, or simply Cartesians, which will be again referred to. The next important work, founded on the Géométrie, was Sir Isaac Newton's Hnumeratio linearum tertii ordinis (1706), establishing a classification of cubic curves founded chiefly on the nature of their infinite branches, which was in some details completed by Stirling, Murdoch, and Cramer ; the work contains also the remarkable theorem (to be again referred to), that there are five kinds of cubic curves giving by their projections every cubic curve whatever.~~

~~Various properties of curves in general, and of cubic curves, are established in Maclaurin's memoir, "De linearum geometricarum proprietatibus generalibus Tractatus " (posthumous, say 1746, published in the 6th edition of his Algebra). We have in it a particular kind of correspond- ence of two points on a cubic curve, viz., two points corre- spond to each other when the tangents at the two points again meet the cubic in the same point.~~

~~The Géométrie Descriptive by Monge was written in the year 1794 or 1795 (7th edition, Paris, 1847), and in it we have stated, in plano with regard to the circle, and in three dimensions with regard to a surface of the second order, the fundamental theorem of reciprocal polars, viz., "Given a surface~~

of the second order and a circumscribed conic surface which touches it , . then if the conic surface moves so that its summit is always in the same plane, the plane of the curve of contact passes always through the same point." The theorem is here referred to partly on account of its bearing on the theory of imaginaries in geometry. It is in Brianchon's memoir " Sur les surfaces du second degré " (Jour. Polyt., t. vi. 1806) shown how for any given position of the summit the plane of contact is determined, or reciprocally ; say the plane XY is deter- mined when tke point P is given, or reciprocally ; and it is noticed that when P is situate in the interior of the surface the plane XY does not cut the surface ; that is, we

, i More generally, in solid geometry infinity is a plane,—its intersec- tion with any given plane being the right line which is the infinity of this given plane.

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have a real plane XY intersecting the surface in the imaginary curve of 'contact of the imaginary circumscribed cone having for its summit a given real point P inside the surface.

Stating the theorem in regard to a conic, we have a real point P (called the pole) and a real line XY (called the polar), the line joining the two (real or imaginary) points of contact of the (real or imaginary) tangents drawn from the point to the conic; and the theorem is that when the point describes a line the line passes through a point, this line and point being polar and pole to each other. The term "pole" was first used by Servois, and "polar" by Gergonne (Gerg., t. i. and iii, 1810-13); and from the theorem we have the method of reciprocal .polars for the transformation of geometrical theorems, used already by Brianchon (in the memoir above referred to) for the demonstration of the theorem called by his name, and in a similar manner by various writers in the earlier volumes of Gergonne. Weare here concerned with the method less in itself than as Jeading to the general notion of duality. And, bearing in a somewhat similar manner also on the theory of imaginaries in geometry (but the notion presents itself in a more explicit form), there is the memoir by Gaultier, on the graphical construction of circles and spheres (Jour. Polyt., t. ix., 1813), The well-known theorem as to radical axes may be stated as follows. Consider two

circles partially drawn so that it does not appear whether the circles, if completed, would or would not intersect in real points, say two arcs of circles; then we can, by means of a third circle drawn so as to intersect in two real points each of the two ares, determine a right line, which, if the com- plete circles intersect in two real points, passes through the points, and which is on this account regarded asa line pass- ing through two (real or imaginary) points of intersection of the two circles. The construction in fact is, join the two points in which the third circle meets the first arc, and join also the two points in which the third circle meets the second arc, and from the point of intersection of the two joining lines, let fall a perpendicular on the line joining the centre of the two circles; this perpendicular (considered as an indefinite line) is what Gaultier terms the "radical axis of the two circles;" itis a line determined by a real construc- tion and itself always real; and by what precedes it is the line joining two (real or imaginary, as the case may be) intersections of the given circles.

The intersections which lie on the radical axis are two out of the four intersections of the two circles. The question as to the remaining two intersections did not present itself to Gaultier, but it is answered in Poncelet's Traité des propriétés projectives (1822), where we find (p. 49) the statement, "deux circles placés arbitrairement sur un plan… ont idéalement deux points imaginaires communs 4 V'infini;" that is, a circle gua curve of the second order is met by the line infinity in two points; but, more than this, they are the same two points for any circle what- ever. The points in question have since been called (it is believed first by Dr Salmon) the circular points at infinity, or they may be called the circular points; these are also frequently spoken of as the points I, J; and we have thus the circle characterized as a conic which passes through the two circular points at infinity; the number of conditions thus imposed upon the conic is = 2, and there remain three arbitrary constants, which is the right number for the circle. Poncelet throughout his work makes continual use of the foregoing theories of imaginaries and infinity, and also of the before- mentioned theory of reciprocal polars.

Poucelet's two memoirs "Sur les centres des moyennes harmoniques," and "Sur la théorie générale des polaires réciproques," although presented to the Paris Academy in

| 1824, were only published (Crelle, t. in, and iv., 1828,

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1829), subsequent to the memoir by Gergonne, " Consider- ations philosophiques sur les élémens de la science de l'étendue" (Gerg., t. xvi., 1825-26). In this memoir by Gergonne, the theory of duality is very clearly and explicitly stated ; for instance, we find "dans la géométrie plane, & chaque théordme il en répond nécessairement un autre qui sen déduit en échangeant simplement entre eux les deux mots powts et droites; tandis que dans la géométrie de lespace ce sont les mots points et plans qu'il faut échanger entre eux pour passer d'un théoréme & son corrélatif By? and the plan is introduced of printing correlative theorems, opposite to each other, in two columns. There was a reclamation as to priority by Poncelet in the Bulletin Unwwersel reprinted with remarks by Gergonne (Gerg., t. xix., 1827), and followed by a short paper by Gergonne, " Rectifications de quelques théorémes, &c.," which is im- portant as first introducing the word class. We find in it explicitly the two correlative definitions :—" a plane curve is said to be of the mth degree (order) when it has with a line m real or ideal intersections," and " a plane curve is said to be of the mth class when from any point of its plane there can be drawn to it m real or ideal tangents."

It may be remarked that in Poncelet's memoir on recip- rocal polars, above referred to, we have the theorem that the number of tangents from a point to a curve of the order m, or say the class of the curve, is in general and at most = m(m — 1),and that he mentions that this number is subject to reduction when the curve has double points or cusps.

The theorem of duality as reyards plane figures may be thus stated :—two figures may correspond to each other in such manner that to each point and line in either figure there corresponds in the other figure a linc and point respectively. It is to be understood that the theorem ex- tends to all points or lines, drawn or not drawn ; thus if in the first figure there are any number of points on a line drawn or not drawn, the corresponding lines in the second figure, produced if necessary, must meet in a point. And we thus see how the

theorem extends to curves, their points and tangents : if there is in the first figure a curve of the order m, any line meets it in m points ; and hence from the corresponding point in the second figure there must be to the corresponding curve m tangents; that is, the corre- sponding curve must be of the class m.

Trilinear coordinates (to be again referred to) were first used by Bobillier in the memoir, " Essai sur un nouveau mode de recherche des propri¢tés de I'étendue " (Gerg., t. xviil., 1827-28). It is convenient to use these rather than Cartesian coordinates. We represent a curve of the order m by an equation (*%x, y, z)"=0, the function on the left hand being a homogeneous rational and integral func- tion of the order m of the three coordinates (ty U2): clearly the number of constants is the same as for the equa- tion (*tx, vy, 1),,=0 in Cartesian coordinates.

The theory of duality is considered and developed, but chiefly in regard to its metrical applications, by Chasles in the " Mémoire de géométrie sur deux princeipes .généraux de la science, la dualité, et VPhomographie," which forms a sequel to the "Apercu Historique sur Vorigine et le développement des méthodes en Géométrie" (Mem. de Bruz., t. xi, 1837),

We now come to Pliicker ; his " six equations " were given in a short memoir in C'relle (1842) preceding his great work, the Theorte der Algebraischen Curven (1844).

Pliicker first gave a scientific dual definition of a curve, viz., "A curve is a locus generated by a point, and en- veloped bya line,—the point moving continuously along the line, while the line rotates continuously about the point a the point is a point (ineunt) of the curve, the line is a tangent of the curve. ee

And, assuming the above theory of geometrical imaginaries,

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a curve such that m of its points are situate in an arbitrary line is said to be of the order m ; acurve such that 2 of its tangents pass through an arbitrary point is said to be of the class x ; as already appearing, this notion of the

order and class of a curve is, however, due to Gergonne. Thus the line is a curve of the order 1 and class 0 3 and corre- sponding dually thereto, we have the point as a curve of the order 0 and class 1.

Pliicker moreover imagined a system of line-coordinates (tangential coordinates). The Cartesian coordinates (x,) and trilinear coordinates (", ¥, 2) are point-coordinates for determining the position of a point ; the new coordinates, say (& 7, ¢) are line-coordinates for determining the posi- tion of a line. It is possible, and (not so much for any application thereof as in order to more fully establish the analogy between the two kinds of coordinates) important, to give independent quantitative definitions of the two kinds of coordinates ; but we may also derive the notion of line-coordinates from that of point-coordinates ; viz., taking ge -+yy+=0 to be the equation of a line, we say that (g, », £) are the line-coordinates of this line. A linear relation a€+by+c£=0 between these coordinates deter- mines a point, viz., the point whose point-coordinates are (a, b,c) ; in fact, the equation in question af +b + cf =0 expresses that the equation €x + ny +fz2=0, where (a, y, 2) are current point-coordinates, is satisfied on writing therein x Y, 2 = a, b,c; or that the line in question passes through the point (a, 6, c). Thus (, 7, €) are the line-co- ordinates of any line whatever ; but when these, instead of being absolutely arbitrary, are subject to the restriction ag+bn+c£=0, this obliges the line to pass through a point (a, b, c) ; and the last-meutioned equation aé + by + cf = 0 is considered as the line-equation of this point.

A line has only a point-equation, and a point has only a line-equation; but any other curve has a point- equation aud also a line-equation ; the point-equation (**Sa**, y, 2)"=0 is the relation which is satisfied by the point-coordinates (a, y, z) of each point of the curve ; and similarly the line-equation (%E, 7, £)"=0 is the relation which is satisfied by the line-coordinates (& », © of each line (tangent) of the curve.

There is in analytical geometry little occasion for any explicit use of line-coordinates ; but the theory is very important ; it serves to show that in demonstrating by point-coordinates any purely descriptive theorem whatever, we demonstrate the correlative theorem ; that is, we do not demonstrate the one theorem, and then (as by the method of reciprocal

~~polars) deduce from it the other, but we do at one and the same time demonstrate the two theorems ; Sen (x, y, 2) instead of meaning point-coordinates may mean line-coordinates, and the demonstration is then in every step of it a demonstration of the correlative theorem.~~

~~The above dual generation explains the nature of the singularities of a plane curve. The ordinary singularities, arranged according to a cross division, are~~

~~Proper, Improper. Point-singu- } 1. The stationary point, 2. The double point, larities— cusp, or spinode ; or node ; Line-singu- (8. The stationary tan- 4. The double tan- larities— gent, or inflexion ; gent —~~

~~arising as follows :—~~

~~1. The cusp: the point as it travels along the line may come to rest, and then reverse the direction of its motion.~~

~~3. The stationary tangent: the line may in the course of its rotation come to rest, and then reverse the direction of its rotation.~~

~~2. The node: the point may in the course of its motion come to coincide with a former position of the point, the two positions of the line not in general coinciding.~~

~~4. The double tangent : the line may in the course of its motion come to coincide with a former position of the line, the two positions of the point not in general coinciding,~~

~~It may be remarked that we cannot with a real point and~~

~~line obtain the node with two imaginary tangents (con- jugate or isolated point, or acnode), nor again the real double tangent with two imaginary points of contact ; but this is of little consequence, siuce in the general theory the distinction between real and imaginary is not attended to.~~

~~The singularities (1) and (3) have been termed proper singularities, and (2) and (4) improper ; in each of the first- mentioned cases there isa real singularity, or peculiarity in the motion; in the other two cases there is not; in (2) there is not when the point is first at the node, or when it is secondly at the node, any peculiarity in the motion ; the singularity consists in the point coming twice into the same position ; and so in (4) the singularity is in the line coming twice into the same position. Moreover (1) and (2) are, the former a proper sincularity, and the latter an improper singularity, as regards the motion of the point and similarly (3) and (4) are, the former a proper singu- larity, and the latter an improper singularity, as regards the motion of the line.~~

~~But as regards the representation of a curve by an equa- tion, the case is very different.~~

~~First, if the equation be in point-coordinates, (3) and (4) are in a sense not singularities at all. The curve (*tx, y, 2)" = 0, or general curve of the order m, has double tangents aud inflexions; (2) presents itself as a singu- larity, for the equations d,(*de, y, z)"=0, d,y(hx, y, z)"=0, d($x, y, 2)"=0, implying (*h, y, 2)"=0), are not in general satisfied by any values (a, b, c) whatever of (a, y, 2), but if such values exist, then the point (a, 6, c) is a node or double point; and (1) presents itself as a further singularity or sub-case of (2), a cusp being a double point for which the two tangents become coincident.~~

~~In line-coordinates all is reversed :—(1) and (2) are not singularities ; (3) presents itself as a sub-case of (4).~~

~~The theory of compound singularities will be referred to further ou.~~

~~In regard to the ordinary singularities, we have~~

~~m, the order, ya Class: », number of double points, " cusps, double tangents, re 5 inflexions ; and this being so, Pliicker's ' six equations" are (1) n= m(m—-1)—-28- 38k, (2) 1= 8m (m-2)- 68- 8k, (3) + =4m (m—2) (m? - 9) — (m2 — m — 6)(25 + 8x) + 28(5 — 1) + 63x +31 («—1), (4) m= n(n —-1)-27- 81, (5) x=8n (n— 2) — 67 — 81, (6) 5=4n (n— 2)(n? — 9) — (n® —n — 6)(27 +31) + Qr(7 -1)+ 671~~

~~+1 (1-1).~~

~~It is easy to derive the further forms— (7) 3(u—m), (8) 2(r-8) (n—m) (n+m-9), (9) 4$m(m+8)—8— 2« 4 n(n+3)—7- 21, (10) 3(m-1)(m-2)—8-K =4 (n-1) (n-2)-7-4 (11, 12) m?- 28-34 =n? — 2% — 31, =mM+2;— the whole system being equivalent to three equations only ; and it may be added that using a to denote the equal quantities 3m+.eand 32+ everything may be expressed in terms of m,n, a. We have K=a~38n, 1=a—3m, 25=m2—m+8n — 38a, Qr=n? —n +8m— - 3a.~~

~~It is implied in Pliicker's theorem that, m, n, 5, «, 7, « signifying as above in regard to any curve, then in regard to the reciprocal curve n, m, 7, t, 8, « Will have the same significations, viz., for the reciprocal curve these letters denote respectively the order, class, number of nodes, cusps, double tangents, and inflexions.~~

~~The expression 4 m(m-+8)—8-2« is that of the number of the disposable constants in a curve of the order m with 6 nodes and « cusps (in fact that there shall be a node is 1 condition, a cusp 2 conditions) and the equation (9) thus expresses that the curve and~~

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~~its reciprocal contain each of them the same number of disposable constants.~~

~~For a curve of the order m, the expression 4m (m—1)—8-—« is termed the "deficiency" (as to this more hereafter) ; the equation (10) expresses~~

therefore that the curve and its reciprocal have each of them the same deficiency.

The relations m? — 28 — 8x=n? — 27 — 31, =m+7,present themselves in the theory of envelopes, as will appear further on.

With regard to the demonstration of Pliicker's equations it is to be remarked that we are not able to write down the equation in point-coordinates of a curve of the order m, having the given numbers 6 and « of nodes andj cusps. We can only use the general equation ({x, y, z)"=0, say for shortness «=0, of a curve of the mth order, which equation, so long as the coefficients remain arbitrary, represents a curve without nodes orcusps. Seeking then, for this curve, the values n, 1,7 of the class, number of inflexions, and number of double tangents,—first, as regards the class, this is equal to the number of tangents which can be drawn to the curve from an arbitrary point, or what is the same thing it is equal to the number of the points of contact of these tangents. The points of contact are found as the intersections of the curve u=0 by a curve depending on the position of the arbitrary point, and called the "first polar" of this point; the order of the first polar is =m-—1, and the number of intersections is thus =m(m-1). But it can be shown, analytically or geometrically, that if the given curve has a node, the first polar passes through this node, which therefore counts as two intersections, and that if the curve has a cusp, the first polar passes through the cusp, touching the curve there, and hence the cusp counts as three intersections. But, as is evident, the node or cusp is not a point of contact of a proper tangent from the arbitrary point; we have, there- fore, for a node a diminution 2, and for a cusp a diminu- tion 3, in the number of the intersections ; and thus, for a curve with 8 nodes and « cusps, there is a diminution 28+ 3x, and the value of n is n=m(m— 1)— 28- 3x.*

Secondly, as to the inflexions, the process is a similar one; it can be shown that the inflexions are the intersec- tions of the curve by a derivative curve called (after Hesse who first considered it) the Hessian, defined geometrically as the locus of a point such that its conic polar in regard to the curve breaks up into a pair of lines, and which has an equation H=0, where H is the determinant formed with the second differential coefficients of «~ in regard to the variables (x, y, z); H=0 is thus acurve of the order

3(m—2), and the number of inflexions is = 3m(m — 2). But if the given curve has a node, then not only the Hessian passes through the node, but it has there a node the two branches at which touch respectively the two branches of the curve; and the node thus counts as six intersections ; so if the curve has a cusp, then the Hessian not only passes through the cusp, but it has there a cusp through which it again passes, that is, there is a cuspidal branch touching the cuspidal branch of the curve, and besides a simple branch passing through the cusp, and hence the cusp counts as eight intersections. The node or cusp is not an inflexion, and we have thus for a node a diminution 6, and for a cusp a diminution 8, in the number of the intersections; hence for a curve with 6 nodes and « cusps, the diminution is = 68 + 8x, and the number of inflexions is «= 32(m — 2) — 66 — 8k.

Thirdly, for the double tangents ; the points of contact of these are obtained as the intersections of the curve by a curve IZ=0, which has not as yet been geometrically defined, but which is found analytically to be of the order (m —2)(m?—9) ; the number of intersections is thus = m(m — 2)(m?— 9) ; but if the given curve has a node then there is a diminution = 4(m? — m — 6), and if it has a cusp then there is a diminution = 6(m?-m-—6), where, how-

ever, it is to be noticed that the factor (m?—m — 6) is in the case of a curve having only a node or only a cusp the number of the tangents which can be drawn from the node or cusp to the curve, and is used as denoting the number of these tangents, and ceases to be the correct expression if the number of nodes and cusps is greater than unity. Hence, in the case of a curve which has 3 nodes and K cusps, the apparent diminution 2(m?— - — m — 6)(28 + 3x) is too great, and it has in fact to be diminished by 2{28(8 — 1) + 63x + 2x(« — 1)}, orthe half thereof is4 for each pair of nodes, 6 for each combination of a node and cusp, and 9 for each pair of cusps. We have thus finally an ex- pression for 2r, = m(m — 2)(m?—9) — &c.; or dividing the whole by 2, we have the expression for r given by the third of Pliicker's equations.

It is obvious that we cannot by consideration of the equation «=0 in point-coordinates obtain the remaining three of Pliicker's equations; they might be obtained in a precisely analogous manner by means of the equation v= 0 in line-coordinates, but they follow at once from the principle of duality, viz., they are obtained by the mere interchange of m, 6, x with n, 7, 1 respectively;

To complete Pliicker's theory it is necessary to take account of compound singularities; it might be possible, but it is at any rate, difficult to effect this by considering the curve as in course of description by the point moving along the rotating line ; and it seems easier to consider the compound singularity as arising from the variation of an actually described curve with ordinary singularities. The most simple case is when three double points come into coincidence, thereby giving rise to a triple point; and a somewhat more complicated one is when we have a cusp of the second kind, or node-cusp arising from the coincidence of a node, a cusp, an inflexion, and a double tangent, as shown in the annexed figure, which represents the

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singularities as on the point of coalescing. The general couclusion (see Cayley, Quart. Math. Jour., t. vii., 1866, "On the higher singularities of plane curves ") is that every singularity whatever may be considered as compounded of ordinary singularities, say we havea singularity = 0' nodes, « cusps, 7' double tangents, and «' inflexions. So that, in fact, Pliicker's equations properly understood apply to a curve with any singularities whatever.

By means of Pliicker's equations we may form a table—

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1 0 0 0 — a:

2 2 0 0 0 0

~~3 6 0 0 0 9~~

~~" 4 1 0 0 P34 " 3 0 1 0 1~~

~~4 12 0 0 28 24~~

~~hs 10 1 0 16 18 > 9 0 1 10 16 " 8 2 0 8 12 " i 1 1 4 10~~

~~9 6 0 2 1 8~~

~~" 6 3 0 4 6~~

~~9 5 2 1 2 4~~

~~a 4 1 2 1 2~~

~~3 0 3 1 0~~

~~The table is arranged according to the value of m, and we have m=0, n=1, the point; m=1,n=0, the line ; m=2, n=2, the conic; of m=3, the cubic, there are~~

~~three cases, the class being 6, 4, or 3, according as the curve is without singularities, or as it has 1 node, or] cusp ;~~

~~and so of m=4, the quartic, there are nine cases, where observe that in two of them the class is =6, the re-~~

~~duction of class arising from two cusps or else from three nodes. The nine cases may be also grouped together into four, according as the number of nodes and cusps (8+ k) is~~

~~=0, 1, 2, or 3. The cases may be divided into sub-cases, by the con-~~

~~sideration of compound singularities ; thus when m=A,~~

~~n= 6, = 3, the three nodes may be all distinct, which is the~~

~~general case, or two of them may unite together into the singularity called a tacnode, or all three may unite together into a triple point, or else into an oscnode.~~

~~We may further consider the inflexions and double tangents, as well in general as in regard to cubic and quartic~~

~~curves,~~

~~The expression for the number of inflexions 3m(m — 2) for a curve of the order m was obtained analytically by Pliicker, but the theory was first given in a complete form by Hesse inthe two papers " Ueber die Elimination, u.s. W.," and " Ueber die Wendepuncte der Curven dritter Ordnung " (Crelle, t, xxviii, 1844); in the latter of these the points of inflexion are obtained as the intersections of the curve u=0 with the Hessian, or curve A=0, where A is the determinant formed with the second derived functions of wu We have in the Hessian the first instance of a co- variant of a ternary form. The whole theory of the in- flexions of a cubic curve is discussed in a very interesting manner by means of the canonical form of the equation + y> +23 + 6leyz=0; and in particular a proof is given of Pliicker's theorem that the nine points of inflexion of a cubic curve lie by threes in twelve lines,~~

~~It may be noticed that the nine inflexions of a cubic curve are three real, six imaginary ; the three real inflex- ions lie in a line, as was known to Newton and Maclaurin. For an acnodal cubic the six imaginary inflexions disappear, and there remain three real inflexions lying ina line. For # erunodal cubic, the six inflexions which disappear are two of them real, the other four imaginary, and there remain two imaginary inflexions and one real inflexion. For a cuspidal cubic the six imaginary inflexions and two of the real inflexions disappear, and there remains one real inflexion.~~

~~A quartic curve has 24 inflexions; it was conjectured by Salmon, and has been verified recently by Zeuthen, that at most 8 of these are real.~~

~~The expression 4m(m—2)(m?—9) for the number of double tangents of a curve of the order m was obtained by Pliicker only as a consequence of his first, second, fourth, and fifth equations. An investigation by means of the curve If=0, which by its intersections with the given curve determines the~~

points of contact of the double tangents, is indicated by Cayley, "Recherches sur]'élimina tion et la théorie des courbes" (Celle, t. xxxiv., 184 7),and in part carried out by Hesse in the memoir "Ueber Curven dritter Ordnung" (Credle, t. xxxvi., 1848). A better process was indicated by Salmon in the " Note on the double tangents to plane curves," Phil. Mag., 1858; consider- ing the m—2 points in which any tangent to the curve again meets the curve, he showed how to form the equation of a curve of the order (m—~2), giving by its intersection with the tangent the points in question; making the tangent touch this curve of the order (m—2), it will be a double

| tangent of the original curve. See Cayley, "On the

Double Tangents of a Plane Curve" (Phil. Trans., t. exlviii. ; 1858), and Dersch (Math, Aun., t. vii., 1874). The solution IV. — g1

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is still in so far incomplete that we have no properties of the curve I1=0, to distinguish one such curve from the several other curves which pass through the points of con- tact of the double tangents.

A quartic curve has 28 double tangents, their points of contact determined as the intersections of the curve by a curve IT=0 of the order 14, the equation of which in a very elegant form was first obtained by Hesse (1849). Investigations in regard to them are given by Pliicker in the Theorie der Algebraischen Curven, and in two memoirs by Hesse and Steiner (Credle, t. xlv., 1855), in respect to the triads of double tangents which have their points of contact on a conic, and other like relations. It was assumed by Pliicker that the number of real double tangents might be 28, 16, 8,4, or 0, but Zeuthen has recently found that the last case does not exist.

The Hessian A has just been spoken of as a covariant of the form uw ; the notion of invariants and covariants belongs rather to the form w than to the curve ~=0 represented by means of this form ; and the theory may be very briefly referred to. A curve ~=0 may have some invariantive property, viz.,

~~a property independent of the particular axes of coordinates used in the representation of the curve by its equation ; for instance, the curve may have a node, and in order to this, a relation, say A=0, must exist between the coefficients of the equation ; supposing the axes of coordi- nates altered, so that the equation becomes w' = 0, and writ- ing A'=0 for the relation between the new co-eflicients, then the relations A= 0, A'=0, as two different expressions of the same geometrical property, must each of them imply the other; this can only be the case when A, A' are func- tions differing only by a constant factor, or say, when A is an invariant of vw. If, however, the geometrical property requires two or more relations between the coefficients, say A=0, B=0, &c., then we must have between the new coefficients the like relations, A'=0, B'=0, &c., and the two systems of equations must each of them imply the other ; when this is so, the system of equations, A= 0, B=0, &c., is said to be invariantive, but it does not follow that A, B, &c., are of necessity invariants of vu. Similarly, if we have a curve U=0 derived from the curve w=0 in a manner independent of the particular axes of co-ordinates, then from the transformed equation w' = 0 deriving in like manner the curve U'=0, the two equations U=0, U'=0 must each of them imply the other ; and when this is so, U will be a covariant of w. The case is less frequent, but it may arise, that there are covariant systems U=0, V=0 d&c., and U'=0, V'=0, &c., each implying the other, but where the functions U, V, &c., are not of necessity covariants of w,~~

~~The theory of the invariants and covariants of a ternary cubic function wu has been studied in detail, and brought into connection with the cubic curve w=0 ; but the theory of the invariants and covariants for the next succeeding case, the ternary quartic function, is still very incomplete.~~

~~In further illustration of the Pliickerian dual generation of a curve, we may consider the question of the envelope of a variable curve. 'The notion is very probably older, but it is at any rate to be found in Lagrange's Théorie des Fonctions analytiques (1798) ; it is there remarked that the equation obtained by the elimination of the para- meter a froni an equation f (x, y, a)=0 and the derived equation in respect toa is a curve, the envelope of the series of curves represented by the equation f (x, y,a)=0 in question. 'Todevelop the theory, consider the curve corre- sponding to any particular value of the parameter; this has with the consecutive curve (or curve~~

~~*belonging to the con- secutive value of the parameter) a certain number of inter- sections, and of common tangents, which may be considered as the tangents at the intersections; and the so-called envelope is the curve which is at the same time geue-*~~

~~*rated by the points of intersection and enveloped by the common tangents; we have thus a dual generation. But the question needs to be further examined. Suppose that in general the variable curve is of the order m with 8 nodes and « cusps, and therefore of the class n with r double tangents aud « inflexions, m, n, 6, x, t, « being connected by the Pliickerian equations,— the number of nodes or cusps may be greater for particular values of the parameter, but this is a speciality which may be here disregarded. Con- sidering the variable curve corresponding to a given value of the parameter, or say simply the variable curve, the consecutive curve has then also § and x nodes and cusps, consecutive to those of the variable curve; and it is easy to see that among the intersections of the two curves we have the nodes each counting twice, and the cusps each counting three times; the number of the remaining inter- sections is=m?—26-3x. Similarly among the common tangents of the two curves we have the double tangents each counting twice, and the stationary tangents each counting three times, and the number of the remaining common tangents is=n?—27-3. (=m?—28-3k, inas- much as each of these numbers is as was seen=m-+7). At any one of the m?—26—3x points the variable curve and the consecutive curve have tangents distinct from, yet infinitesimally near to each other, and each of these two tangents is also infinitesimally near to one of the n?—27—34 common tangents of the two curves; whence, attending only to the variable curve, and considering the consecutive curve as coming into actual coincidence with it, the n?—27—3. common tangents are the tangents to the variable curve at the m?—26—3x points respectively, and the envelope is at the same time generated by the m?—25—3x points, and enveloped by the n?- 27-3, tangents; we have thus a dual generation of the en- velope, which only differs from Pliicker's dual generation, in that in place of a single point and tangent we have the group of m?—28—3x points and n?—27—3: tangents.*~~

~~*The parameter which determines the variable curve may be given as a point upon a given curve, or say as a para- metric point; that is, to the different*~~

~~positions of the par- metric point on the given curve correspond the different variable curves, and the nature of the envelope will thus depend on that of the given curve; we have thus the envelope as a derivative curve of the given curve. Many well-known derivative curves present themselves in this manner; thus the variable curve may be the normal (or line at right angles to the tangent) at any point of the given curve ; the intersection of the consecutive normals is the centre of curvature; and we have the evolute as at once the locus of the centre of curvature and the envelope of the normal, It may be added that the given curve is one of a series of curves, each cutting the several normals at right angles. Any one of these is a "parallel" of the given curve; and it can be obtained as the envelope of a circle of constant radius having its centre on the given curve. We have in like manner, as derivatives of a given curve, the caustic, catacaustic, or diacaustic, as the case may be, and the secondary caustic, or curve cutting at right angles the reflected or refracted rays.~~

~~We have in much that precedes disregarded, or at least been indifferent to, reality ; it is only thus that the concep- tion of a curve of the m-th order, as one which is met by every right line in m points, is arrived at ; and the curve itself, and the line which cuts it, although both are tacitly assumed to be real, may perfectly well be imaginary. For real figures we have the general theorem that imaginary intersections, &c., present themselves in conjugate pairs ; hence, in particular, that a curve of aneven order is met by a line in an even number (which may be = 0) of points ; a curve of an odd order in an odd number of points, hence~~

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~~in one point at least ; it will be seen further on that the~~

~~theorem may be generalized in a remarkable manner,~~

~~Again, when there is in question ouly one pair of points or lines, these, if coincident, must be real ; thus, a line meets a cubic curve in three points, one of them real, the other two real or imaginary ; but if two of the intersections coincide they must be real, and we havea line cutting a cubic in one real point and touching it in another real point. It may be remarked~~

~~that this is a limit separating the two cases where the intersections are all real, and~~

~~where they are one real, two imaginary.~~

~~Considering always real curves, we obtain the notion of a branch ; any portion capable of description by the continuous motion of a point is a branch ; and a curve Thus the curve of the first order or right line consists of one branch pebutein curves of the second order, or conics, the ellipse and the parabola consist each of one branch, the hyperbola of two A branch is either re-entrant, or it extends both regard it as consisting of two legs (crwra, N ewton), each extending one way to infinity, but without any definite separation. Tlie branch, whether re-entrant or infinite, may have a cusp or cusps, or it may cut itself or another branch, thus having~~

~~consists of one or more branches.~~

~~branches. ways to infinity, and in this cage, we may~~

~~or giving rise to crunodes ;~~

~~an acnode is a branch by itself,—it may be considered~~

~~visible counection with the curve.~~

~~we may thus speak of a once indented, twice indented oval, &c., or even of a cuspidate oval.~~

~~be used when required ; thus, in the last-mentioned case a~~

~~simple form is that of a figure of eight; such a form may break up into two ovals, or into a doubly indented oval or~~

~~hour-glass. A form which presents itself is when two ovals, one inside the other, unite, so as to give rise toa crunode—in default of a better name this may be called, after the curve of that name, a limagon. Names may also be used for the different forms of infinite branches, but we have first to consider the distinction of hyperbolic and parabolic. The leg of an infinite branch may have at the extremity a tangent; this is an asymptote of the~~

curve, and the leg is then hyperbolic; or the leg may tend to a fixed direction, but so that the tangent goes further and further off to infinity, and the leg is then parabolic ; a branch may thus be hyperbolic or parabolic as to its two legs ; or it may be hyperbolic as to one leg, and parabolic as to the other. The epithets hyperbolic and parabolic are of course derived from the conic hyperbola and parabola respectively. The nature of the two kinds of branches is best understood by considering them as pro- jections, in the same way as we in effect consider the hyperbola and the parabola as projections of the ellipse. If a line © cut an arc aa', so that the two segments ad, ba' lie on opposite sides of the line, then projecting the figure so that the line Q goes off to infinity, the tangent at 6 is projected into the asymptote, and the arc ab is projected into a hyperbolic leg touching the asymptote at one extremity ; the arc ba' will at the same time be projected into a hyperbolic leg touching the same asymptote at the other extremity (and on the opposite side), but so that the two hyperbolic legs may or may not belong to one and the same branch. And we thus see that the two hyperbolic legs belong to a simple intersection of the curve by the

as an indefinitely small re- entrant branch. A branch may have inflexions and double tangents, or there may be double tangents which touch two distinct branches ; there are also double tangents with ima- ginary points of contact, which are thus lines having no A re-entrant branch not cutting itself may be everywhere convex, and it is then pro- perly said to be an oval ; but the term oval may be used more generally for any re-entrant branch not cutting itself ; and

Other descriptive names for ovals and re-entrant branches cutting themselves may

line infinity. Next, if the line © touch at 8 the arc aa' so that the two portions ad', ba lie on the same side of the line Q, then projecting the figure as before, the tangent at 6, that is, the line Q itself, is projected to infinity ; the arc ab is projected into a parabolic leg, and at the same time the arc ba' is projected into a parabolic leg, having at infinity the same direction as the other leg, but so that the two legs may or may not belong to the same branch. And we thus see that the two parabolic legs represent a contact of

~~the line infinity with the curve,—the point of contact being of course the point at infinity determined by the common direction of the two legs. It will readily be understood how the like considerations apply to other cases,—for instance, if the line Q is a tangent at an — inflexion, passes through a crunode, or touches one of the branches of a crunode, &c.; thus, if the line Q passes through a crunode we have pairs of hyperbolic legs belong- ing to two parallel asymptotes. The foregoing considera- tions also show (what is very important) how different branches are connected together at infinity, £ud lead to the notion of a complete branch, or circuit.~~

~~The two legs of a hyperbolic branch may belong to different asymptotes, and in this case we have the forms which Newton calls inscribed, circumscribed, ambigene, &c. ; or they may belong to the same asymptote, and in this case we have the serpentine form, where the branch cuts the asymptote, so as to touch it at its two extremities on opposite sides, or the conchoidal form, where it touches the asymptote on the same side. The two legs of a parabolic branch may converge to ultimate parallelism, as in the conic parabola, or diverge to ultimate parallelism, as in the semi-cubical parabola y? =x, and the branch is said to be convergent, or divergent, accordingly ; or they may tend to parallelism in opposite senses, as in the cubical parabola y=2*. As mentioned with regard to a branch generally, an infinite branch of any kind may have cusps, or, by cutting itself or another branch, may have or give rise to a crunode, &c.~~

~~We may now consider the various forms of cubic curves, as appearing by Newton's HInwmeratio, and by the figures belonging thereto. The species are reckoned as 72, which are numbered accordingly 1 to 72; but to these should be added 10%, 13%, 22% and 22% It is not intended here to consider the division into species, nor even completely that into genera, but only to explain the principle of classifica- tion. It may be remarked generally that there are at most three infinite branches, and that there may besides be a re-entrant branch or oval.~~

~~The genera may be arranged as follows :—~~

~~1,2,3,4 redundant hyperbolas 5,6 defective hyperbolas 7,8 parabolic hyperbolas 9 hyperbolisms of hyperbola~~

~~1 3 As ellipse ie 5 parabola 12 'trident curve~~

~~18 divergent parabolas~~

~~14 cubic parabola ; : and thus arranged they correspond to the different relations of the line infinity to the curve. First, if the three intersections by the line infinity are all distinct, we have the hyperbolas; if the points are real, the redundant hyperbolas, with three hyperbolic branches; but if only one of them is real, the defective hyperbolas, with one hyperbolic branch. Secondly, if two of the intersections coincide, say if the line infinity meets the curve in a onefold point and a twofold point, both of them real, then there is always one asymptote: the line infinity may at the twofold poiut touch the curve, and we have the parabvlic hyperbolas; or the twofold point may be a singular point,—viz., a crunode giving the hyperbolisms of the hyperbola ; an acnode, giving~~

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~~the hyperbolisms of the ellipse ; or a cusp, giving the hyper- bolisms of the parabola. As regards the so-called hyperbolisms, observe that (besides the single asymptote) we have in the case of those of the hyperbola two parallel asymptotes ; in the case of those of the ellipse the two parallel asymptotes become imaginary, that is, they disappear ; and in the case of those of the parabola they become coincident, that is, there is here an ordinary asymptote, and a special asymptote answering to a cusp at infinity. Thirdly, the three intersections by the lime infinity may be coincident and real; or say we have a threefold point: this may be an inflexion, a crunode, or a cusp, that is, the line infinity may be a tangent at an inflexion, and we have the divergent parabolas ; a tangent at a erunode to one branch, and we have the trident curve ; or lastly, a tangent at a cusp, and we have the cubical parabola.~~

~~It is to be remarked that the classification mixes together non-singular and singular curves, in fact, the five kinds presently referred to: thus the hyperbolas and the divergent parabolas include curves of every kind, the separation being made in the species ; the lhyperbolisms of the hyperbola and ellipse, and the trident curve, are nodal; the hyperbol- isms of the parabola, and the cubical parabola, are cuspidal. The divergent parabolas~~

are of five species which respec- tively belong to and determine the five kinds of cubic curves; Newton gives (in two short paragraphs without any development) the remarkable theorem that the five diver- gent parabolas by their shadows generate and exhibit all the cubic curves.

The five divergent parabolas are curves each of them symmetrical with regard to an axis. There are two non- singular kinds, the one with, the other without, an oval, but each of them has an infinite (as Newton describes it) campaniform branch ; this cuts the axis at right angles, being at first convex, but ultimately concave, towards the axis, the two legs continually tending to become at right angles to the axis. The oval may unite itself with the infinite branch, or it may dwindle into a point, and we have tho crunodal and the acnodal forms respectively ; or if simul- cancously the oval dwindles into a point and unites itself to the infinite branch, we have the cuspidal form. Draw- ing a line to cut any one of these curves and projecting the line to infinity, it would not be difficult to show how the line should be drawn in order to obtain a curve of any given species, We have herein a better principle of classi- fication; considering cubic curves, in the first instance, according to singularities, the curves are non-singular, nodal (viz., crunodal or acnodal), or cuspidal ; and we see further that there are two kinds of non-singular curves, the complex and the simplex. There is thus a complete division into the five kinds, the complex, simplex, crunodal, acnodal, and cuspidal, Each singular kind presents itself as a limit separating two kinds of inferior singnlarity ; the cuspidal separates the crunodal and the acnodal, and these last separate from each other the complex and the simplex.

The whole question is discussed very fully and ably by Mobius in the memoir "Ueber die Grundformen der Linien dritter Ordnung" (Abh. der K. Sachs. Ges, zw Leipzig, t. i. 1852), The author considers not only plane curves, but also cones, or, what is almost the same thing, the spherical curves which are their sections by a concentric sphere. Stated in regard to the cone, we have there the fundamental theorem that there are two different kinds of sheets ; viz., the single sheet, not separated into two parts by the vertex (an instance is afforded by the plane considered as a cone of the first order generated by the motion of a line about a point), aud the double or

~~twin-pair sheet, separated into two parts by the vertex (as in the cone of the second order.) And it then appears that there are two kinds of non-singular~~

~~-A non-singular cubic is simplex,~~

~~CURVE~~

~~cubic cones, viz., the simplex, consisting of a single sheet and the complex, consisting of a single sheet and a twin- pair sheet ; and we thence obtain (as for cubic curves) the crunodal, the acnodal, and the cuspidal kinds of cubic cones. sort of wavy form, having upon it three lines of inflexion, and which is met by any plane through the vertex in one or in three lines ; the twin-pair sbeet has no lines of~~

~~It may be mentioned that the single sheet is a~~

~~inflexion, and resembles in its form a cone on an oval base. In general a cone consists of one or more single or twin- pair sheets, and if we consider the section of the cone by~~

~~a plane, the curve consists of one or more complete branches,~~

~~or say circuits, each of them the section of one sheet of the cone ; thns, a cone of the second order is one twin-pair sheet, and any section of it is one circuit composed, it may be, of two branches. But although we thus arrive by pro-~~

~~jection at the notion of a circuit, it is not necessary to go~~

~~out of the plane, and we may (with Zeuthen, using the shorter term circuit for his complete branch) define a circuit as any portion (of a curve) capable of description by the continuous motion of a puint, it being understood that a passage throngh infinity is permitted. And we then say that a curve consists of one or more circuits ; thus the right line, or curve of the first order, consists of one circuit ; a curve of the second order consists of one circuit; a cubic enrve consists of one circuit or else of two circuits.~~

~~A circuit is met by any right line always in an even number, or always in at odd number, of points, and it is said to be an even circuit or an odd circuit accordingly ; the right line is an odd circuit, the conic an even circuit. And we have then the theorem, two odd circuits intersect in an odd number of points; an odd and an even circuit, or two even circuits, in an even number of points, An even circuit not cutting itself divides the plane into two parts, the one called the internal part, incapable of contain- ing any odd circuit, the other called the external part, capable of containing an odd circuit.~~

~~We may now state in a more convenient form the fundamental distinction of the kinds of cubic curve. consisting of one odd circuit, or it is complex, consisting of one odd circuit and one even circuit. It may be added that there are on the odd circuit three inflexions, but on the even circuit no inflexion; it hence also appears that from any point of the odd circuit there can be drawn to the odd circuit two tangents, and to the even circuit (if any) two tangents, but that from a point of the even circuit there cannot be drawn (either to the odd or the even circuit) any real tangent ; consequently, in a simplex curve the number of tangents from any point is two ; but in a complex curve the number is four, or none,—four if the point is on the odd circuit, none if it is on the even circuit. It at once appears from inspection of the figure of a non-singular cubic curve, which is the odd and which the even circuit. The singular kinds arise as before; the crunodal and the cuspidal kinds the whole curve 18 au odd circuit, but in the acnodal kind the acnode must be regarded as an even circuit. i~~

~~The analogous question of the classification of quartics (in particular non-singular quarties and nodal quartics) 8 considered in Yeuthen's memoir "Sur les differentés formes des courbes planes du quatri¢me ordre" (Math.~~

~~Ann. t. vit, 1874).~~

~~external to each other, or two cirewts one internal . the other, and in this last case the internal ye has no double tangents or inflexions. A very ree theorem is established as to the double tangents : mm quartic :—distinguishing as a double tangent of the am kind a real double tangent which either twice touches~~

the same circuit, or else touches the curve in two imaginary points, the nunber of the double tangents of the first kind of a non-singular quartic is = 4 ; it follows that the quartic has at most 8 real inflexions, The forms of the non- singular quartics are very numerous, but it is not necessary to go further into the question.

We may consider in relation to a curve, not only the line infinity, but also the circular points at infinity ; assuming the curve to be real, these present themselves always con- jointly ; thus a circle is a conic passing through the two circular points, and is thereby distinguished from other conics. Similarly a cubic through the two circular points is termed a circular cubic; a quartic through the two points is termed a circular quartic, and if it passes twice through each of them, that is, has each of them for a node, it is termed a bicircular quartic. Such a quartic is of course binoda] (m=4, §=2,«=0); it has not in general, but it may have, a third node, or a cusp. Or again, we may have a quartic curve having a cusp at each of the circular points: such a curve is a "Cartesian," it being a complete definition of the Cartesiau to say that it is a bicuspidal quartic curve (m= 4, 6=0, x= 2), having a cusp at each of the circular points. The circular cubic and the bicireular quartic, together with the Cartesian (being in one point of view a particular case thereof), are interesting curves which have been much studied, generally, and in reference to their focal properties.

The points called foci presented themselves in the theory of the conic, and were well known to the Greek geometers, but the general notion of a fucus was first established by Pliicker (in the memoir " Ueber solche Puncte die bei Curven einer hdheren Ordnung den Brennpuncten der Kegelschnitte entsprechen " (C'ref/e, t. x.. 1833). We may from each of the circular points draw tangents to a given curve ; the intersection of two such tangents (belonging of course to the two circular points respectively) is a focus. There will be from each circular point » tangents (A, a number depending on the class of the curve and its relation to the line infinity and the circular points,=2 for the general conic, 1 for the parabola, 2 for a circular cubic, or bicircular quartic, kc.) ; the X tangents from the one circular point and those from the other circular point intersect in A real foci (viz., each of these is the only real point on each of the tangents through it), and in A2—A imaginary foci ; each pair of real foci determines a pair of imaginary foci

~~(the so-called antipoints of the two real foci), and the 42 (A — 1) pairs of real foci thus determine the A? — A imagin- aryfoci. 'There are in some cases points termed centres, or singular or multiple foci (the nomenclature is unsettled), whichare the intersectionsof improper tangents from the two circular points respectively ; thus, in the circular cubic, the tangents to the curve at the two circular points respectively (or two imaginary asymptotes of the curve) meet in a centre.~~

~~The notions of distance and of lines at right angles are connected with the circular points; and almost every con- struction of a curve by means of lines of a determinate length, or at right angles to each other, and (as such) mechanical constructions by means of linkwork, give rise to curves passing the same definite number of times through the two circular points respectively, or say to circular curves, in which the fixed centres of the construction present themselves ag ordinary, or as singular, foci. Thus the general curve of three bar-motion (or locus of the vertex of a triangle, the other two vertices whereof move on fixed circles) is a tricircular sextic, having besides three nodes (m=6,8=34+343, = 9), and having the centres of the fixed circles each for a singular focus ; there is a third Singular focus, and we have thus the remarkable theorem (due to Mr S. Roberts) of the triple generation of the curve by means of the three several pairs of singular foci.~~

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~~Again, the normal, gua line at right angles to the tangent, 1s connected with the circular points, and these accordingly present themselves in the before-mentioned theories of evolutes and parallel curves,~~

~~We have several recent theories which depend on the notion of correspondence : two points whether in the same plane or in different planes, or on the same curve or in different curves, may determine each other in such wise that to auy given position of the first puint there correspond a positions of the second point, and to any given position of the second point a positions of the first poiut; the two points have then an (a,a') correspondence ; and if a,a' are each =1, then the two points have a (1, 1)~~

or rational correspondence, Connecting with each theory the author's name, the theories in question are—lRiemann, the rational transformation of a plane curve ; Cremona, the rational transformation of a plane; and Chasles, correspondence of points on the same curve, and united points, The theory first referred to, with the resulting notion of Geschlecht, or dejiciency, is more than the other two an essential part of the theory of curves, but they will all be considered.

Riemann's results are contained in the memoirs on " Abelian Integrals," &c, (Credle, t. liv., 1857), and we have next Clebsch, " Ueber die Singularititen algehraischer Curven" (Credle, t. Ixv., 1865), and Cayley, "On the Transformation of Plane Curves" (Proc. Lond. Math. Soc., t. L, 1865). The fundamental notion of the rational transformation is as follows : —

Taking wu, X,Y,Z to be ratioual and integral functions (X,Y,Z all of the same order) of the coordinates (x,y,z), ad wu', X',Y',Z' rational aud integral functions (X',Y',Z' all of the same order) of the coordinates (2',7/,2), we transforin a given cnrve0, by the equations 2 :a/:/=X:Y:Z, thereby obtaining a transformed curve w'=0, and a converse set of eqnations a: y:e= {X':Y':Z'; viz., assuining that this is so, the point (z,y,z) on the curve w=0 and the point (4,7/,2') on the curve w"=0 will be points having a (1,1) correspondence. To show how this is, observe that to a given point (2,y,2) ou the curve w=0 there corresponds a single point (x,y,2) determined by the equations 2:y:2"=X:Y:2; from these eqnations and the eqnation w=0 eliminating z,y,2, we obtam the equation w'=0 of the trausformed curve, 'To a given point (x',y',7) not on the cnrve w'=0 there corresponds, not a single poiut, but the systenr of points (x,y,z) given by the eqnations wz yi w= X:Y:4Z, viz., regarding 2',y/',z as constants (and to fix the ideas, assunting that the curves X=0,Y=0,Z2=0 have no common inter- sections), these are the points of intersection of the curves X:Y:Z =x':y:2, bunt no one of these points is sitnate on the curve w=0. If, however, the point (2',7/,2') 18 situate on the cnrve u'=0, then one point of the systenr of points in question Is sttuate on the curve w=0, that is, to a given point of the curve u'=0 there corresponds a single poit of the curve w=0; and hence also this point must be given by a systeim of eynations such as w:y :2=X'2Y": 2',

~~It is an old and easily proved theorem that, for a curve of the order m, the number 6+. of nodes and cusps is at most =4(m—1)(m—2); for a given curve the deficiency of the actual number of nodes and cusps below this~~

~~maximum number, viz. 4(m—1)(m—2)—8-K, is the "'Geschlecht," or "deficiency," of the curve, say this is =D. When D=0, the curve is said to be unicursal, when =1, bicursa], and so on.~~

~~The general theorem is that two curves corresponding rationally to each other have the same deficiency. [In particular a curve and its reciprocal have this rational or (1, 1) correspondence, and it has been already seen that a curve and its reciprocal have the same deficiency.]—~~

~~A curve of a given order can in general be rationally transformed into a curve of a lower order ; thus a curve of any order for which D=0, that is, a unicursal curve, can be transformed into a line; a curve of any order having the deficiency 1 or 2 can be rationally transformed into a curve of the order D+ 2, deficiency D ; and a curve of any order deficience = or >3 can be rationally transformed into a curve of the order D + 3, deficiency D.~~

~~Taking 2',y',z as coordinates of a point of the transformed curve,~~

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~~and in its equation writing 2': :7=1:0: we have @ a certain irrational function of 6, and the theorem is that the coordinates x, 7/,% of any point of the given curve can be —, as proportional to rational and integral functions of 6,., that is, of 6 and n certain irrational function of 6. ;~~

~~In Ss if D=0, that is, if the given curve be unicursal, the transformed curve isa line, is a mere linear function of 6, anid the theorem is that the coordinates x,y,z of a point of the unicursal curve can be expressed as proportional to rational and integral functions of ; it is easy to sve that for a given enrve of the order m, these functions of @ must be of the same order 7.~~

~~If D=1, then the transformed curve isa cubic; it can be shown that in a cubie, the axes of coordinates being properly chosen, ¢ can be expressed as~~

~~the square root of a quartic function of 6; and the theorem is that the coordinates x,y,z of a point of the bicursal curve can be expressed ns proportional to rational and integral functions of @, and of the square root of a quartic function of 6.~~

~~And so if 1) =2, then the transformed curve is a nodal quartic ; ¢ can be expressed as the square root of a sextic function of 6, and the theorem is, that the coordinates x,y,z of a point of the tricursal curve can be expressed as proportional to rational and integral functions of 6, nnd of the square root of a sextic function of 6, But D=8, we have no longer the like law, viz. is not expressible as the square root of an ovtic function of :~~

~~Observe that the radical, square root of a quartic func- tion, is connected with the theory of elliptic functions, and the radical, square root of a sextic function, with that of the first kind of Abelian functions, but that the next kind of Abelian functions does not depend on the radical, square root of an oetic function.~~

~~It is aform of the theorem for the case) =1, that the evordinates x, y, 2 of a point of the bieursal curve, or In particular the coordinates of a point of the cubic, can be expressed as proportional to rational and integral functions~~

~~of the elliptic functions snw, cnu, duu ; in fact, taking the radical té#be Ji - @.1-6, and writing 6=snw, the radical becomes =cnu. dnw ; and we have expressions of the form in question.~~

~~It will be observed that the equations 2': 7 :2°=X:Y:Z before-inentioned do not of themselves lead to the other system of equations a: y:z=X':Y':'Z, and thus that the theory does not in anywise establish a (1, 1) correspondence between the points (x, y, 2) and (2', y', 2') of two planes or of the same plane ; this is the correspondence of Cremona's theory.~~

~~In this theory, given in the memoirs " Sulle Trasformazioni geome- triche delle Figure piani,"" Mem. di Bologna, t. ii. (1868) und t. v. (1865), we have a system of equations a 27:7 =X :Y: Z which does lead toa system x: y:2=X': Y': Z', where, ns before, X,Y,Z denote rational and integral functions, all of the same order, of the coordinates x,y,z, and X',Y',Z' rational and integral functions, all of the same order, of the coordinates~~

x’,7/,z’, and there is thus a (1,1) correspondence given by these equations between the two points (x,y,z) and (2’,y,2). To explain this, observe that starting from the equations 2 :7:X:Y:Z, to a given point (+,y,2) there corresponds one point (2’,y/,2), but that if » be the order of the functions X,Y,Z, then toa given point 2’,y/,2° there would, if the curves X=0, Y=0, Z=0 had no common interseytions, cor- respond 27 points (x,y,z). If, however, the functions are such that the curves X=0, Y=0, Z=0 have & common intersections, then among the »? points are ineluded these & points, which are fixed points independent of the point (27,7); so that, disregarding these fixed points, the number of points (z,y,z) corresponding to the given point (2’,y/,7) is=n?—k; and in particular if k=n*—-1, then we have one corresponding point; and hence the original system of equations x :7/:7=X:Y:Z must lead to the equivalent system a:y:2=X’:Y’:Z’; and in this system by the like reasoning the functions must be such that the curves X’=0, Y’=0, Z’=0 have n-1 common intersections. The most simple example is in the two systems of equations 2 :y:2=yz:ex:ay and x iyiz= of? ivi afy ; where yz=0, 2x=0, xy=0 are conics (pnirs of lines) having three conunon intersections, and where obviously either system of equations leads to the other system. In the ease where X,Y,Z are of an order exceeding 2 dw required number 2? 1 of common intersections can only oceur by reason of common multiple points on the three curves; and assuming that the curves X=0, Y=0, Z=0 have a, +a,+a,...+a@n—1 common intersee tions, where the a, points are ordinary points, the a, points are double points, the a; points are triple points, &c., on cach curve, we have the condition

a, + 4a, + 9a34-...(%—-1)?an-1 = 2? -1;

CURVE

but to this must be joined the condition ” a, + 8a, + Gay… + 4(n—1)(— 2) an; = kn(n+ 3) — 2, (without which the transformation would be illusory); and the conelusion is that a, a,..-an-1 may be any numbers satisfyi these two equntions, It imay be added that the two equations together give ag + Bag… + 4(m—1)(2 — 2) any = 4 (n- 1)(n — 2),

which expresses that the curves X=0, Y=0, Z=0 are unicursal, Yhe transformation may be applied to any curve w=0, which is

thus marvel transformed into a curve w'=0, by a rational trans- furmation such as is considered in Riemann's theory : hence the two

curves have the same deficiency;

Coming next to Chasles, the principle of correspondence

is established and used by him in a series of memoirs

relating to the conics which satisfy given eunditions, and to other geometrical questions, contained in the Comptes Rendus, t. lviii. et sey. (1864 to the present time). The theorem of united points in regard to points in a might line was given in a paper, June-July 1864, and it was extended to unicursal curves in a paper of the saine series (March 1866), 'Sur les courbes planes ou & double courbure dont les points peuvent se déterminer individuellement—applica- tion du principe de correspondence dans la théorie de ces courbes."

The theorem is as follows: if in a unicursal enrve two points have an (a,8) correspondence, then the number of united poimts (or points cach corresponding to itself) isea+ A. In fact im a wnienrsal curve the coordinates of a point are given as proportional to rational and integral functions of a parameter, so that any point of the curve is determined uniquely by ineans of this ile go that is, to each point of the curve corresponds oue value of the parameter, and to each value of the parameter one poiut on the curve; antl the (a, 8) correspondence between the two points is given by an equntion of the form (**66,1**) (~,1)F =0 between their parameters Gand ; ata united point ¢=6, and the value of is given by an equation of the order a+ 8, The extension to curves of any given de- ficiency D was made in the memoir of Cayley, 'Ou the correspondence of two points on a curve,"—/roc. Lond. Math, Soe., t. i.(1866),—viz., taking P,!" as the corresponding points in an (a,a) correspondence ona enrve of deficieney D, and supposing that when P is given the corresponding points I" are found as the intersections of the curve by a curve © containing the coordinates of P as parameters, and having with the given curve & intersections at the point P, then the number of united points is@=a+a'+2kD; and more generally, if the curve © intersect the given enrve in a set of points P each p times, n set of points Q' each q times, &c.,

~~in such manner that the points (I, I') the points (P,Q') &c., are pairs of points corresponding to each other according to distinct laws ; then if (P,P) are points having an (a,a') correspondence with a number =a of united points, (P,Q') points having a (8,6') correspondence with a number=0 united points, and so on, the theorem is that we have~~

~~p (a-a-a)+q(b- B-B) +... =2kD.~~

~~The principle of correspondence, or say rather the theorem of united points, is a most powerful instrument of investigation, which may be used in place of analysis for the determination of the number of solutions of alnost every geometrical problem, We can by means of it in- vestigate the class of a curve, number of inflexions, &¢.,— in fact, Pliteker's equations ; but it is necessary to take account of special solutions: thus, in one of the most simple instances, in finding the class of a eurve, the cusps present~~

~~themselves as special solutions.~~

~~Imagine a curve of order m, deficiency D, and let the corre- cy points P,P" be such that the line joming them . through a given point O; this is an (m— 1,m— 1) correspondenc®, and the value of & is=1, hence the number of united pt — 2m— 242D; the united points are the points of contact ae tangents from O and (as special solutions) the cnsps, and we 4 thus the relation 2 + «= 2m - —2+42D; or, writing D = 4(m—1)(m= ~3-—x«, this is n= m(m — 1) — 28 -3«, which is right.~~

~~The principle in its original form as applying to ® right line was used throughout by Chasles in the investigations on the number of the conics which satisfy grven conditions, and on the number of solutions of very many other geo inetrical problems. Aves~~

~~'There is one application of the theory of the (a, ee respondence between two planes which it is proper to nou~~

~~OR VY i~~

~~Imagine a curve, real or imaginary, represented by an equation (involving, it may be, imaginary coefficients) between the Cartesian coordinates u,2';~~

~~then, writing w=a+iy, u' =a! +12 , the equation determines real values of (x,y), and of (Coane corresponding to any giveu real values of (x',y/') and (x,y) respectively; that is, it esta- blishes a real correspondence (not of course a rational one) between the points (x,y) and (a',y'); for example in the imaginary circle wv? +12 =(a+bi)?, the correspondence is given by the two equations a — y+ 22 — 7/2 =a? b?, xy+2'y'=ab. We have thus a means of geometrical representation for the portions, as well imaginary as real, of any real or imaginary curve. Considerations such as these have been used for determining the series of values of the inde- pendent variable, and the irrational functions thereof in the theory of Abelian integrals, but the theory seems to be worthy of further investigation.~~

~~The researches of Chasles (Comptes Rendus, t. lviii., 1864, et seg.) refer to the conics which satisfy given con- ditions. 'There is an earlier paper by De Jonquieres, "Théorémes généraux concernant les courbes géométriques planes d'un ordre quelconque," Ziowv., t. vi. (1861), which establishes the notion of a system of curves (of any order) of the index N, viz., considering the curves of the order 2 which satisfy n(n+3)—1 conditions, then the index N is the number of these curves which pass through a given arbitrary point. But Chasles in the first of his papers (February 1864), considering the conics which satisfy four conditions, establishes the notion of the two characteristics (4, v) of such a system of conics, viz., » is the number of the conics which pass through a given arbitrary point, and v is the number of the conics which touch a given arbitrary line. And he gives the theorem, a system of conics satisfying four conditions, and having the characteristics (4, v) contains 2y — p line-pairs (that is, conics, each of them a pair of lines), and 2 —v point-pairs (that is, conics, each of them a pair of points,— coniques infiniment aplaties), which is a fundamental one in the theory. The characteristics of the system can be determined when it is known how many there are of these two kinds of degenerate conics in the system, and how often each is to be counted. It was thus that Zeuthen (in the paper Vyt Bydrag, " Contribu- tion to the Theory of Systems of Conics which satisfy four Conditions," Copenhagen, 1865, translated with an addi- tion in the Vouvelles Annales) solved the question of finding the characteristics of the systems of conics which satisfy four conditions of contact with a given curve or curves ; and this led to the solution of the further problem of finding the number of the conics which satisfy five con- ditions of contact with a given~~

curve or curves (Cayley, Comptes Rendus, t. \xiii., 1866), and "On the Curves which satisfy given Conditions" (Phil. Trans., t. clviii.,

1868).

It ep be remarked that although, as a process of in- vestigation, it is very convenient to seek for the character- istics of a system of conics satisfying 4 conditions, yet what is really determined is in every case the number of the conics which satisfy 5 conditions ; the characteristics of the system (4p) of the conics which pass through 4p points are (5p), (4p, 1/), the number of the conics which pass through 5 points, and which pass through 4 points and touch 1 Jine: and so in other cases. Similarly as regards cubies, or curves of any other order: a cubic depends on 9 constants, and the elementary problems are to find the number of the cubics (9p), (8p, 12), &c., which pass through 9 points, pass through 8 points and touch 1 line, é&c. ; but it is in the investigation convenient to seek for the charac- teristics of the systems of cubics (8p) é&c., which satisfy 8 instead of 9 conditions.

The elementary problems in regard to cubics are solved very completely by Maillard in his Thése, Recherche des charactérisques des syst?mes élémentaires des courbes planes du troisiéme ordre (Paris, 1871), Thus, considering the several cases of a cubic

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2. ,, cusp on given line 0.00000… eeccececccceeees 5 6 Oo es mCP MCN canietsMOUS OMPPIVEN TING cccrijiccae sey RCI IRR i co 8 (7 kor 377 00 JE" Ase sree 9

he determines in every case the characteristics (u, v) of the corresponding systems of cubics (4p), (3p, 12), &c. The same problems, or most of them, and also the elementary problems in regard to quartics are solved by Zeuthen, who in the elaborate memoir " Almindelige Egenskaber, dc.,"

Danish Academy, t. x. (1873), considers the problem in reference to curves of any order, and applies his results to cubic and quartic curves,

The methods of Maillard and Zeuthen are substantially identical ; in each case the question considered .is that of finding the characteristics (u, v) of a system of curves by consideration of the special or degenerate forms of the curves included in the system. The quantities which have to be considered are very numerous. Zeuthen in the case of curves of any given order establishes between the char- acteristics p, v', and 18 other quantities, in all 20 quantities, a set of 24 equations (equivalent to 23 indepen- dent equations), involving (besides the 20 quantities) other quantities relating to the various forms of the degenerate curves, which supplementary terms he determines, partially for curves of any order, but completely only for quartic curves, It is in the discussion and complete enumeration of the special or degenerate forms of the curves, and of the supplementary terms to which they give rise, that the great difficulty of the question seems to consist ; it would appear that the 24 equations are a complete system, and that (subject to a proper determination of the supplementary terms) they contain the solution of the general problem.

The remarks which follow have reference to the analytical theory of the degenerate curves which present themselves in the foregoing problem of the curves which satisfy given conditions.

A curve represented by an equation in point-coordinates may

break up: thus if P,,P,,,.. be rational and integral functions of the coordinates (x,y,z) of the orders M,Mzq. . respectively, we have the curve P,"1P,%2,. =0, of the order m, =a,m, a,m,.., composed of the curve P, =0 taken a, times, the curve P,=0 takeu a, times, &c.

Instead of the equation P,"1P,%, -=0, we may start with an equation w=0, where w is a function of the order m containing a parameter , and for a particular valuc say 6=0, of thc parameter reducing itself to P,"1P,%2.. . Supposing indefinitely small, we have what may be called the penultimate curve, and when @=0 the ultimate curve. Regarding the ultimate curve as derived from a given penultimate curve, we connect with the ultimate curve, and consider as belonging to it, certain points called

~~"summits" on the component curves P,=0, P,=0, respectively ; a summit = is a point such that, drawing from an arbitrary point O the tangents to the penultimate curve, we have OX as the limit of one of these tangents. The ultimate curve together with its summits may be regarded as a degenerate form of the curve w=0. Observe that the positions of the summits depend on the penultimate curve u=0, viz., on the values of the coefficients in the terms multiplied by 6,6°,..; they are thus in some measure arbitrary points as regards the ultimate curve P,1 P,, .=0.~~

~~It may be added that we have summits only on the component curves P,=0, of a multiplicity a, >1,; the number of summits on such a curve is in general=(a,2—a,) m2. Thus assuming that the penultimate curve is without nodes or cusps, the number of the tangents to it is=m?—m,=(am,+ amt. . P= (ayy + agm,+. .). taking P,=0 to have 8, nodes and ky, cusps, and therefore its class m, to be=m,® — m, — 28, — 8x, &c., the expression for the number of tangents to the penultimate curve is~~

~~= (0? = a) m4? + (a9? — a) M2+.. + 200, Mgt.. LL -!~~

~~+ (14 + 28) + Bit) + o9(70g + 235+ Ba) +... 5 where a term 2a,a,m ym, indicates tangents which are in the limit the lines drawn to the intersections of the curves P, =0,P,=0 each line 2a,a, times ; a term a, (1, + 28, + 8x,) tangents which are in the limit the proper tangents to P,)=0 each a times, the lines to its nodes each 2a, times, and the lines to its cusps each 3a, times ;.~~

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~~CUR—CUS~~

~~the remaining terms (a?-a,) mj° +(a,?—o2) m,? +.. indicate | time rotates about the point in a plane which at the same time rotates about the line ; the point is a point, the line~~

~~tangents which are in the limit the lines drawn to the several summits, that is, we have (a,2—0,) m,? summits on the curve P,=0, &c.,~~

~~There is of course a precisely similar theory as regards line- coordinates; taking M,, M1, &c., to be rational and integral func- tions of the co-ordinates (t,7,¢) we connect with the ultimate curve 11,111,. .=0, and consider as belonging to it certain lines, which for the moment may be called "axes" tangents to the component curves I1,=0, M,=0 respectively. Considering an equation in~~

~~oint-coordinates, we may have among the component curves right ines, and if in order to put thes? in evidence we take the equation to be L,71. . Py"... =0, where L,=0 is a right line, P}=0 a curve of the second or any higher order, then the curve will contain as part of itself summits not exhibited in this equation, but the corresponding line-equation will be A,. 11,%.=0, where A,=0,.. are the equations of the summits in question, 1,=0, &c., are the line-equations corresponding to the several point-equations P,=0, &c. ; and this curve will contain as part of itself axes not exhibited by this equation, but which are the lines L,=0, .. of the equation in point-coordinates.~~

~~In conclusion a little may be said as to curves of double curvature, otherwise twisted curves, or curves in space. The analytical theory by Cartesian coordinates was first con- sidered by Clairaut, Recherches sur les courbes & double courbure (Paris, 1731). Such a curve may be considered as described by a point, moving in a line which at the same~~

~~CURZOLA (Slavonic, Aarkar), a city of Dalmatia, Austria, the capital of an island of the same name in the Adriatic, which is situated between 42° 50' and 43° 1' N.~~

~~a tangent, and the plane an osculating plane, of the curve ; moreover the line is a generating line, and the plane a tangent plane, of a developable surface or torse, having the curve for its edge of regression. Analogous to the order and class of a plane curve we have the order, rank, and class, of the system (assumed to be a geometrical one), viz.,~~

~~| if an arbitrary plane contains m points, an arbitrary line~~

~~lat. and 16° 40' and 17° 20' E. long, and has a length of |~~

~~about 25 miles, with an average breadth of 4 miles. The city is about 55 miles north of Ragusa. It is regularly built, and, besides the old cathedral, the loggia or council chambers, and the palace of its former Venetian governors, it possesses the noble mansion of the Arnieri, and other specimens of the domestic architecture of the 15th and 16th centuries, and still retains the massive walls and towers that were erected in 1420. Its principal industry is the building of the boats for which it is famed throughout the Adriatic. Originally, as it would seem, a Pheenician settlement, Curzola was afterwards colo- nized by Greeks from Cnidus; but nothing is known of its earlier history. The present name is a corrup- tion of Corcyra Nigra, or Képxvpa MéAauwa, the designa- tion by which it was known to the Greeks and Romans. In 997 it came under the suzerainty of Venice, and it was~~

~~one of the earliest cities in Dalmatia to receive municipal |~~

~~rights. In 1571 it defended itself so gallantly against the Turks under Uluch Ali of Algiers that it obtained the de- signation jfidelissma. Population, 2200.~~

~~CUSA, Nicotas De [Nicotaus Cusanas] cardinal~~

~~(1401-1464), was the son of a poor fisherman named — that assembly. Some time before his death he had founded~~

~~Krypffs or Krebs, and derived the name by which he is known from the place of his birth, Cues or Cusa, on the Moselle, in the archbishopric of Treves. In his youth he was employed in the service of Count Ulrich of Manderscheid, who, seeing in him evidence of exceptional ability, sent him to study at the school of the Brothers of the Common Life at Deventer, and afterwards at the uni-~~

~~meets 7 lines, and an arbitrary point lies in 2 planes, of the system, then m, 7, are the order, rank, and class respec- tively. The system has singularities, and there exist be- tween m, r, n and the numbers of the several singularities equations analogous to Pliicker's equations for a plane curve. It is a leading point in the theory that a curve in space cannot in general be represented by means of two equations U=0, V=0; the two equations~~

~~represent surfaces, inter- secting in a curve ; but there are curves which are not the complete intersection of any two surfaces ; thus we have the cubic in space, or skew cubic, which is the residual in- tersection of two quadric surfaces which have a line in common; the equations U=0, V= 0 of the two quadric surfaces represent the cubic curve, not byitself, but together with the line. (A. CA.)~~

~~position, and zealously defended the supremacy of the Pope. He was intrusted with various missions in the in- terests of Catholic unity, the most important being to Con- stantinople, to endeavour to bring about a union of the Eastern and Western churches. In 1448 he was raised by Pope Nicolas V. to the dignity of cardinal; and in 1450 he was appointed bishop of Brixen against the wish of the Archduke Sigismund, who opposed the reforms the new bishop sought to introduce into the diocese. In 1451 he was sent to Germany and the Netherlands to check ecclesi- astical abuses and bring back the monastic life to the original rule of poverty, chastity, and obedience,—a mission which he discharged with well-tempered firmness. Soon afterwards his dispute with the Archduke Sigismund in his own diocese was brought to a point by his claiming certain dues of the bishopric, which the temporal prince had appropriated. Upon this the bishop was imprisoned by the archduke, who, in his turn, was excommunicated by the Pope. These extreme measures were not persisted in ; but the dispute remained unsettled at the time of the bishop's death, which occurred at Lodi in Umbria on the 11th August 1464. In 1459 he had acted as governor of Rome during the absence of his friend Pope Pius II. at the assembly of princes at Milan; and he wrote his Crebratio Alcorant, a treatise against Mahometanism, in support of the expedition against the Turks proposed at~~

~~a hospital in his native place for thirty-three poor persons,~~

~~the number being that of the years of the earthly life of~~

~~Christ. To this institution he left his valuable library. The interest of Cusa for later times lies in his philosophi-~~

~~cal much more than in his political or ecclesiastical activity.~~

~~| As in religion he is entitled to be called one of the " Refor-~~

~~versity of Padua, where he took his doctor's degree in law |~~

~~in his twenty-third year.~~

~~church. After filling several subordinate offices he became archdeacon of Liége. He was a member of the Council of Basel, and dedicated to the assembled fathers a work entitled De Concordantia Catholica, in which he main- tained the superiority of councils over popes, and assailed the false decretals and 'the story of the donation of Con- stantine. A few years later, however, he had reversed his~~

~~Failing in his first cause he : abandoned the legal profession, and resolved to enter the |~~

~~mers before the Reformation," so in philosophy he was one of those who broke with scholasticism while it was still the orthodox system. In his principal work, De docta ignorantia (1440), supplemented by De Conjecturis libri duo published in the same year, he maintains that all human knowledge is mere conjecture, and that man's wisdom 1s to recognize his ignorance. From scepticism he escapes by~~

~~accepting the doctrine of the mystics that God can be~~

~~apprehended by intuition (¢ntuitzo, speculatio), an exalted state of the intellect in which all limitations disappear.~~

~~CUS—CUS~~

~~God is the absolute maximum and also the absolute minimum, who can be neither greater nor less than He is, and who comprehends all that is or that can be (" deum esse omMia, ut non possit esse aliud quam est"). Cusa thus laid himself open to the charge~~

~~The works of Cusanus were published in a complete form by Henri Petri (1 vol. fol. Basel, 1565). See Hartzheim's Vita Nicolaus de Cusa (Treves, 1730), Martini's Das Hospital Cues und dessen Stifter (Treves, 1841), and Scharpff's Der Cardinal und Bischof Nic. von Cusa als Reformator in Kirche, Reich, und Philos. des 15 Jahrhund. (Tiibingen, 1871).~~

~~CUSH, the eldest son of Ham, from whom seems to have been derived the name of the Land of Cush, which is comnionly rendered by the Septuagint and by the Vulgate Ethiopia. The locality of the land of Cush isa question upon which eminent authorities have been divided; for while Bocliart maintained that it was exclusively in Arabia, Schulthess and Gesenius held that it is to be sought for nowhere but in Africa. Others again, such as Michaelis and Rosenmiiller, have supposed that the name Cush was applied to tracts of country both in Arabia and Africa—a circumstance which would easily be accounted for on the very probable supposition that the descendants of the primitive Cushite tribes emigrated across the Red Sea from the one continent to the other. The existence of an African Cush cannot reasonably be questioned, though the term is employed in Scripture with great latitude, sometimes denoting an extensive but undefined country (Ethiopia), and at other times one particular kingdom (Meroé). It is expressly described by Ezekiel as lying to the south of Egypt beyond Syene; Mizraim and Oush (i.e., Egypt and Ethiopia) are often classed together by the prophets ; the inhabitants are elsewhere spoken of in connection with the Lubim and Sukkiim, which were certainly nations of Africa, for they belonged to the vast army with which Shishak, king of Egypt, "came out" against Rehoboam, king of Judah; and, finally, in the ancient Egyptian inscriptions the country to the south of Egypt is called Keesh, or Kesh. Though there is a great lack of evidence to show that the name of Cush was ever applied to any part of Arabia, there seems no reason to doubt that a portion of the Cushite race did early settle there. In the dth century the Himaryites, in the south of Arabia, were styled by Syrian writers Cusheans and Ethiopians, By modern scholars the name Cushites has been adopted~~

~~as the designation of the early non-Semitic language of Baby- lonia; and the reasoning of Canon Rawlinson goes to Show that there was a close connection between Babylon and Egypt.~~

~~CUSTARD APPLE, a name applied to the fruit of various species of the genus Azona, natural order Anonacee. The members of this genus are shrubs or small trees having alternate, exstipulate leaves, and flowers with three small Sepals, six petals arranged in a double row, and numerous stamens. The fruit of A. reticulata, the common custard~~

~~apple, or "bullock's heart" of the West Indies, is dark brown in colour, and marked with depressions, which give it a quilted appearance ; its pulp is reddish-yellow, sweetish, and very soft; the kernels of the seeds are said to be poisonous. The sour-sop, the fruit of 4. muricata, grows in the West Indies, and in the neighbourhood of Bombay ; it is covered with soft prickles, is of a light-greenish hue, and has a peculiar but agreeable sour taste, and a scent resembling that of black currants. The sweet-sop, which is cultivated in both the Indies, is produced by @&. squamosa ; it is an ovate fruit, with a thick rind and luscious pulp. According to Royle, an acrid principle, fatal to insects, is contained in its seeds, which, powdered and mixed with the flour of gram (Cicer arietinum), are used by the natives of India in washing the hair. A. Cherimolia furnishes the Peruvian Cherimoyer, which is held to be of very superior flavour, and is much esteemed by the Creoles. .4. palustris is valued in Jamaica for its wood, which serves the same purposes as cork ; the fruit, commonly known as the alligator-apple, is not eaten, being reputed to contain a dangerous narcotic principle.~~

~~CUSTOMS DUTIES are taxes on the import and export of commodities, and rank among the most ancient, as they continue to prevail as one of the most common modes, in all countries, of levying revenue for public purposes. In an insular country like the United Kingdom customs duties came in process of time to be levied only or chiefly in the seaports, and thus applied only to the foreign commerce, Where they may be brought under the control of fair and reasonable principles of taxation. But this simplification of customs duties was only reached by degrees; and during a long period~~

special customs were levied on goods passing between England and Scotland ; and the trade of Ireland with Great Britain and with foreign countries was subjected to fiscal regulations which could not vow stand in the light of public reason. The taxes levied, on warrant of some ancient grant or privilege, upon cattle or goods at a bridge ora ferry or other point of passage from one county or province to another, of which there are some lingering remains even in the United Kingdom, and those levied at the gates of cities on the produce of the immediate country—a not uncommon form of municipal taxation on the European continent—are all of the nature of customs dues. It is from the universality of this practice that our English term of "customs" appears to have been derived. In countries of extensive land frontiers the system of taxation by duties on foreign commodities becomes still more com- plicated. Custom-houses have to be established along the land borders and at particular points on the rivers or the railways ; and the foreign and domestic tax-collectors are brought into immediate contact. Some European Govern- ments distinguish in their rates of duty between "dry" or land ports and " wet" or sea ports; and others vary their dues on foreign commodities according to the zones of the globe from which the commodities come. Nothing has consequently been more perplexing to the merchant than customs duties. They are a labyrinth through which he has had to steer with caution and circumspection ; while, at the same time, it has offered to the more unscrupulous traders temptations tofraud. The smuggling which proceeds under customs duties is only to be checked by the most careful administration, by a system proceeding as far as possible on the simplicity of generally recognized principles, aud by duties so moderate in amount as to reduce to a minimum the temptation of fraud.

A customs duty on the import of commodities has to be paid by the domestic consumers of the commodities. The foreign producer will not sell them at less than they cost, and the importing merchant will not bring them in unless he obtain this cost, his own fair profit, and the import duty

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over and above these essential constituents of the transac- tion. An import duty is thus in some cases a tax which consumers may pay lightly or heavily

as they choose, and has accordingly a flexibility that is not unimportant in taxation. But if the commodity be one of domestic as well as foreign supply, the effect of the customs duty is to raise the price of the domestic supply in some proportion to the duty ; and the consumer, in so far as the commodity is one of necessity to him, has no choice. He has to pay the tax, with the further dissatisfaction of knowing that it goes to no public purpose, but only into the pockets of some of his own private neighbours. A customs duty on the export of commodities, on the other hand, has to be paid by the foreign consumers, one of the most agreeable forms of taxa- tion to be conceived. But this desire of taxing foreigners for domestic revenue is met by the competition of general commerce, and nations have to be chary of levying duties on the export of the products of their own industry. It is only where they have some special monopoly of the product that they can enter upon such a course without the gravest disadvantage to themselves.

Wherever the principle of free trade is recognized, these distinctions have to be strictly observed ; and in the past thirty years' regime of free trade in the United Kingdom, the whole system of customs duties, in its principles, its rates of duty, and its administration, has undergone a complete revolution, Of many hundreds of articles on which cus- toms duty was levied in the seaports, only five or six, of exclusively foreign origin, now remain to yield the customs revenue of the kingdom. Yet this revenue has never declined. It is much larger than when the whole elaborate system of customs duties wasin force. The best literature of this interesting subject, apart from the standard works of British, French, and German economists, is to be found in the Budgets of the British Parliament since 1842; in the Acts consolidating and reforming the custom-house admin- istration, particularly the Act of 1853 drawn by Mr Wilson, editor of The Heconomist, and then secretary of the treasury ; in the reports of the Hon. David Wells, late commissioner of revenue in the United States ; and in the annual reports of the British custom-house commissioners, in which alone there is a magazine of the most valuable facts. Of recent years the only controversy of the British public with the custom-house relates to what has been deemed the too careless admission of adulterated or worthless commodities, in respect to which there may have to be a further reform in the future. In the case of commodities on which a duty is levied, and must be paid before they pass into consump- tion, there would seem to be a responsibility on the part

~~*of the duty-levying power to ascertain that the commodity is what it is professed to be.*~~

~~*CUSTOS ROTULORUM, in England, is one of the justices of the peace, and keeper of the records for the county. He nominates the clerk of the peace. He is described by Lambard as a 'man for the most part especially picked out either for wisdom, countenance, or credit." He is nominated by the royal sign-manual.*~~

~~*CUTCH, or Kacuy, a native state in the south-western*~~

~~*extremity of Hindustan, situated between 68° and 72° E. .*~~

~~*long. and 22° and 25° N. lat. It isa peninsular tract of land, inclosed towards the W. by the eastern branch of the Indus, or the Koree, on the S. by the Indian Ocean and the Gulf of Cutch, and on the N. and E., towards the interior, by the great northern Ran, or Runn, an extensive salt morass or lake, which from May to October is flooded with salt. water, and communicates in its greatest extent with the Gulf of Cutch on the west and the Gulf of Cambay on the east, these two gulfs being united during the monsoon.*~~

~~*The interior of Cutch is studded with hills of consider-*~~

~~*able elevation, and a range of mountains runs through it from east to west, many of them of the most fantastic shapes, with large insulated masses of rock scattered in all directions. In the intervening valleys the country is not deficient in fertility and verdure, and is sufficiently pro- ductive in all cases where the nature of the government permits the cultivator to enjoy the fruits of his labour. But this very seldom happens. Many of the hills are covered with jungle, and with the strongholds and dens of petty chiefs, who sometimes protect, but more frequently issue forth to plunder the lower country. The general appearance of Cutch is barren and uninteresting. The greater part is a rock destitute of soil, and presenting the wildest aspect ; the ground is cold, poor, and sterile ; the rains are generally scanty, and often fail altogether; and the whole face of the country bears marks of*~~

volcanic action. From the violence of tyranny, and the rapine of a disorderly banditti, by which this district has from time immemorial been infested, as well as from shocks of earth- quakes, the villages have a ruinous and dilapidated appear- ance; and, with the exception of a few fields in their neighbourhood, the country presents a rocky and sandy waste, with in many places scarcely a show of vegetation. Water is scarce and brackish, and is chiefly found at the bottom of low ranges of hills, which abound in some parts ; and the inhabitants of the extensive sandy tracts suffer greatly from the want of it. Owing to the uncertainty of the periodical rains in Cutch, the country is liable to severe famines, which, along with the internal broils by which it has been harassed, have greatly obstructed cultivation, and thinned the inhabitants, many of whom have been induced to emigrate to Bombay and Gujarat; and, in addition to all these evils, an uncommonly violent earthquake, which occurred on the 16th of June 1819, nearly destroyed Bhuj, the capital, and greatly injured the towns of Anjar, Mandavi, and Moondria or Mundra. The soil of Cutch produces grain, cotton, tobacco, ghee, &c. ; and iron and coal have been discovered, the latter near the surface of the ground, on the banks of one of the rivers, seven miles north-east of Bhuj, but it is not in general use as fuel.

The Ran, or Runn, which communicates with the Gulf of Cutch, and sweeps round the northern side of that province, is a very extensive salt morass, varying in breadth from five to eighty miles across, and during the rains nearly impassable for horsemen. The total area of this immense morass may be estimated at about 8000 square miles, without including any portion of the Gulf of Cutch, which is in many parts so shallow as to resemble a marshy fen rather than an arm of the sea. The Runn is said to be formed by the overflow of the rivers Pharan, Lunf, Bands, and others, during the monsoon; but in December it is quite dry, and in most places hard. The wild ass is very common on the borders of this lake, being seen in herds of from 60 to 70 at a time.

The temperature of Cutch during the hot season is high, the thermometer frequently rising to 100° or 105°; and in the months of April and May, clouds of dust and sand, blown about by hurricanes, envelop the houses, the glass windows scarcely affording any protection. For nine months of the year the climate is comparatively temperate and agreeable; but the

~~approach of October is equally dreaded by the native and European population as extremely unhealthy, and at the close of the monsoon the oppression of the atmosphere is described as being intoler- able. The influence of the monsoon is greatly moderated before it reaches this region, and the rains sometimes fail altogether ; but although in this case the necessary conse- quences are want and misery to the great body of the people, these dry seasons are far more favourable to the health of Europeans. The monsoon generally sets in with~~

~~CU PCH~~

~~great violence from the north-east before it settles in the south-west. The prevailing wind is westerly, and it blows west by south and west by north ten months in the year, The easterly winds, which do not blow more than a month in the year, are always unhealthy and unpleasant, and bring with them, if they continue long, epidemics and locusts. Cutch is considered unhealthy by the natives of other parts of the country; and Dr Burnes, who was stationed there, and. gives an account of its medical topography, mentions that he has known many persons from Bombay, especially servants, who were perfectly useless from con- tinued sickness in Cutch, but who recovered their health the moment they left it. He also adds, that he never was at any station where recoveries from fever were so tedious and incomplete. The hospital returns do not, however, he adds, show any extraordinary sickness. Cholera has made no progress in Cutch. The most common diseases among the natives are fever and rheumatism ; and fever is also the prevailing disease among Europeans, the first attacks of which are always the most dangerous. These, however, are not ordinarily severe, and easily yield to the remedy of sulphate of quinine without any serious injury tu the con- stitution. There are some stations at Cutch particularly noxious, such as Narrona, a village in a marsh 24 miles north-east of Bhuj, near the Runn, and Lakshpat Bandar, remarkable for the badness of its water.~~

~~The principal towns are Bhuj, Anjar, Jharra, Kantkot, and Kataria. The principal seaports are Mandavi and Mundra. The town best known to Europeans is Bhuj, which is situated inland, and is surrounded by an amphi- theatre of hills, some of which approach within three or four miles of the city. The hill of Bhuja, on which the fort is situated, and under the~~

south-west angle of which is the cantonment of the Cutch brigade, rises to the height of 500 feet in tle middle of the plain, and is detached from other high ground. The residency is four miles distant in a westerly direction. There are many mountain streams, but no navigable rivers. They scarcely contain any water except in the rainy season, when they are very full and rapid, and discharge themselves into the Runn, all along the coast of which the wells and springs are more or less im- pregnated with common salt, and other saline ingredients,

Various causes have contributed to thin the population of this country. In 1812 it was ravaged by a famine and pestilence, which destroyed a great proportion of its inhabitants,—according to some accounts, nearly one-half. This, joined to the tyranny and violence of the Government until the year 1819, and more lately to a succession of un- favourable seasons, has forced many of the cultivators to remove to Sind and other countries. The inhabitants may be estimated at 500,000, of whom one-third are Mahometans and the remainder Hindus of various castes. The Jharija Rajputs form a particular class, being the aristocracy of the country ; andall are more or less connected with the family of the Rao, or prince. There are in Cutch about 200 of these Jharijé chiefs, who all claim their descent from Sacko Goraro, a prince who reigned in Sind about 1000 years ago. From him also the reigning sovereign is lineally descended, and he is the liege lord of whom all the chiefs or nobles hold their lands in feu, for services which they or their ancestors had performed, or in virtue of their relationship to the family. They are all termed the brotherhood of the Rao, and supposed to be his hereditary advisers, and their possessions are divided among their male children. To prevent the breaking down of their properties, the necessary consequence of this law of inheritance, there is no doubt that infanticide is commion among them, and that it extends to the male as well as the female progeny. The Jharijas consider it unlawful to marry any female of their own tribe, being all descended from a common parent. They

distinct races.

~~accordingly niarry into the families of other Rajputs; and to this unfortunate regulation may be chiefly ascribed the destruction of all the female children. The J harijas have a tradition that when they entered Cutch they were Mahometans, but that they afterward adopted the customs and religion of the Hindus. It is certain, indeed, that they still retain many Mahometan customs. They take oatlis equally on the Koran or on the Shastras ; they employ Mus- sulman books ; they eat from their hands; the Rao, when he appears in public, alternately worships God in a Hindu pagoda and a Mahometan mosque; and he fits out annually at Mandavi a ship for the conveyance of pilgrims to Mecca, who are maintained during the voyage chiefly by the liberality of the prince. The Mahometaus in Cutch are of the same degenerate caste with those usually found in the western parts of India. The Midnds forms a par- ticular class, who claim the same descent as the J harijas, and boast of their constancy to the Mahometan creed, while the latter apostatized ; but they have now entirely degener- ated, and are little better than banditti, always ready to commit outrages, and to sally out in disorderly bands to plunder the defenceless country. Such has been the weakness and tyranny of the rulers of Cutch, that they have frequently had recourse to these wretched auxiliaries in order to aid them in their inordinate exactions, while at other times they recruited the army from the same race. 'They were nearly extirpated under the rigor- ous rule of Fathi Muhammad, but of late years they have returned in considerable numbers to their villages among the hills. In the seasons of scarcity of 1823 and 1824, many of them emigrated to Sind, where, joining with other adventurers, they formed disorderly bands, who made forays into Cutch, several villages of which they plundered and burned. The natives are in general of a stronger and stouter make, and even handsomer, than those of Western India; and the women of the higher classes are also handsome. The peasants are described as intelligent, and the artizans are justly celebrated for their ingenuity and mechanical skill. The palace at Mandavi, aud a tomb of one of their princes at Bhuj, are fair specimens of their architectural skill. In the manufacture of gold and silver ornaments they display great taste and nicety. The natives of this country are in general peace- able and obedient subjects, for robberies and murders are seldom committed except by the Midnds. The quantity of opium which they use is enormous; its effects, accord- ing to Dr Burnes, are less deleterious to their constitution than might be supposed.~~

History.—The country of Cutch was invaded about the 9th century by a body of Mahometans of the Summa tribe, who under the guidance of five brothers emigrated from Sind, and who gradu- ally subdued or expelled the original inhabitants, consisting of three The descendants of these five leaders assumed the name of Jharija, from a chief named Jharra, who set an example of female infanticide by putting to death his seven daughters in one day. Cutch continued tranquil under their sway for many years, until some family quarrel arose, in which the chief of an elder branch of the tribe was murdered by a rival brother. His son fled to Ahmadabad to seek the assistance of the viceroy, who was married to his sister, and who reinstated him in the sovereignty of Cutch, and Murvi in Kathiawar, in the title of Rado, or Rawul, in the year 1519.

The succession continued in the same line from the time of this prince until 1666, when a younger brother, Pragji, murdered his elder brother and usurped the sovereignty. This line of princes continued till 1760 without any remarkable event, when, in the reign of Rao Gor, the country was invaded four times by the Sinds, who wasted it with fire and sword. The reign of this prince, as well as that of his son Rao Rahiden, by whom he was succeeded in 1778, was marked by cruelty and blood. The latter prince was dethroned, and, being in a state of mental derangement, was during his life- time confined by Fathi Muhammad, a native of Sind, who continued, with a short interval (in which the party of the iegal heir, Bhaiji Bawa, gained the ascendency), to rule the country until his death in 1813. It wasin the reign of Fathi Muhammad that a comnruni-

cation first took place with the British Government. During the contests for the sovereignty between the usurper and the legal heir, the leader of the royal party, Hansraj, the governor of Mandavi, sought the aid of the British. But no closer connection followed at that time than an agreement for the suppression of piracy, or of inroads of troops to the eastward of the Runn, or Gulf of Cutch. But the Gulf continued notwithstanding to swarm with pirates, who were openly encouraged or connived at by thie son of Hansraj, who had succeeded his father, as well as by Fathi Muhammad. The latter left several sons by different wives, who were competitors for the vacant

throne. Husain Miyan succeeded to a considerable por- tion of his father's property and power. Jugjevan, a Brahman, the late minister of Fathi Muhammad, also received a considerable

share of influence ; and the hatred of these two factions was em- |

bittered by religious animosities, the one being Hindu and the other Mahometan. 'The late Rao had declared himself a Mahometan, and his adherents were preparing to inter his body in a magnificent tomb, when the Jharijas and other Hindus seized the corpse and consigned it to the flames, according to Hindu custom.

The administration of affairs was nominally in the hands of Husain Miyan and his brother Ibrahim Miyan. Many sanguinary broils now ensued, in the course of which Jugjevan was murdered, and the executive authority was much weakened by the usurpations of the Arabs and other chiefs. In the meantime Ibrahim Miyan was assassinated ; and after various other scenes of anarchy, the Rao Bharmulji, son of Rao Rahiden, by general consent, assumed the chief power. But his reign was one continued scries of the grossest enormities ; his hostility to the British became evident, and accordingly a force of 10,500 men crossed the Runn in November 1815, and were within five miles of Bhuj, the eapital of the country, when a treaty was concluded, by which the Rao Bharmulji was coufirmed in his title to the throne, on agreeing, among other stipulations, to cede Anjar and its depen- denciés in perpetuity to the British. He was, however, so far from fulfilling the terms of this treaty that it was determined to de- pose him; and an army being sent against him, he surrendered to the British, who made a provision for his maintenance, and elevated his infant son to the throne.

In 1822 the relations subsisting between the ruler of Cutch and the British were modified by a new treaty, under which the terri- torial cessions made by the Rao in 1816 were restored in considera- tion of an annual payment. The sum fixed was subsequently thought too large, and in 1832 the arrears, amounting to a consi- derable sum, were remitted, and all future payments on this account relinquished. From that time the Rao has paid a subsidy of £20,000 per annum to the British for the maintenance of the mili- tary force stationed within his dominions. Suttee has been prohi- bited in Cutch ; and,

~~under British influence, various other mea- sures of a salutary and beneficent character have been adopted.~~

~~CUTCH GUNDAVA, a district in the province of Baluchistan, situated at the bottom of the mountains lying south-east of Khelat, between 27° 40' and 29° 50' N. lat. and 67° 20' and 69°17' E. long. It is about 150 miles in length, and measures nearly an equal distance in its greatest breadth. The Hala range of mountains extends along its western frontier, and forms the eastern wall or face of the elevated table-land of central Baluchistan. Through this range are two great passes,—the celebrated Bolan Pass in the north leading in a north-westerly direction, and the Mula Pass, which, more to the south, takes an extensive circuit, the two extremities pointing towards the north, and the convexity towards the south. The soil is rich, black, and loamy, and produces every spices of grain, as also cotton, indigo, madder, and other commodities. The rains are heavy in June, July, and August ; it rains also, but not so heavily, in the spring months. The climate during the summer is unhealthy, owing to the simoom or pestilential wind which blows at that time, causing the death of many of the inhabitants. Great quantities of grain are exported from this district to the seaports of Kurrachee and Son- miani. Cutch Gundava is the- most populous part of Baluchistan, and constitutes the most valuable portion of the dominions of the Khan of Khelat, who during winter resides at the chief town.~~

~~CUTHBERT, Sr (...-687). The precise date and place of the birth of Cuthbert are unknown. Some writers assert that he was born in Ireland. It is much niore probable, or rather it is almost certain, that he was of English descent, and born in that part of the kingdom~~

~~of Northumbria which lay north of the Tweed, and was afterwards included in the Scottish kingdom. The original abbey of Melrose—to be distinguished from the later Cistercian foundation of that name, which lies higher up the Tweed—had been founded before the middle of the 7th century. The first abbot was Eata, one of the twelve English disciples of the Scottish Aidan; and under him Cuthbert, then probably in early youth, became a monk. He accompanied LEata on the latter being appointed superior of the monastery at Ripon, founded by Alchfrid, son of Oswy, king of Northumbria. When the~~

dispute arose between the English and Scottish ecclesiastics as to the proper time of keeping Easter, Eata, rather than cou- form to the English usage, returned to Melrose along with Cuthbert, who soon afterwards was appointed prior of that monastery. Kata having subsequently adopted the English rule was appoiuted abbot of Lindisfarne by king Oswy, and Cuthbert, still accompanying him, held the office of prior. Under the influence of that intense desire to lead a life of absolute solitude by which the Scottish monks of the school of St Columba were so frequently impelled, Cuthbert, after a residence of considerable duration at Lindisfarne, resigned his office and retired to the neighbouring island of Farne. From this seclusion Egfrid, king of Northumbria, endeavoured to recall him. Cuthbert at first resisted the king's entreaties, but was at last induced to comply and to become bishop of Lindisfarne. He was consecrated at York during the Easter festival of 685 by Theodore, arch- bishop of Canterbury. After exercising his episcopal office for two years he again retired to his solitude of Farne, where he died on the 20th of March 687.

During his lifetime Cuthbert had been reverenced as a saint, a reverence which his holy life and faithful discharge of all his duties had well deserved. His austere and secluded mode of living added greatly to the estimation in which he was held, and as usual at that period the per- formance of miracles was freely ascribed to him. Two accounts of his life were written within a short time after his decease, one by an unknown author, the other by the most distinguished ecclesiastic of the age—the Venerable Bede. They give an interesting account of Cuthbert wlule prior of Melrose. His labours were not confined to his monastery. He went about the country, sometimes on horseback, but more frequently on foot, preaching to the rude people, and instructing them in their religious duties, following in all respects the example of St Aidan and the other early Scottish missionaries. When bishop of Lindisfarne he continued to act in the same manner, as well knowing, to use the words of Bede, that "He who said, Thou shalt love the Lord thy God, also said, Thou shalt love thy neighbour as thyself."

The fame of Cuthbert increased as time went on, and excelled that of all the saints of the north. His remains were preserved at Lindisfarne as the most precious treasure of the church; and, when the island towards the end of the 9th century was attacked by the heathen Danes, the monks fied carrying the

relics with them, which were finally deposited at Durham, when that city became the seat of the Northumbrian bishopric. During the Middle Ages his shrine at Durham was almost as famous as that of St Thomas at Canterbury, and attracted the visits of innumerable pilgrims. The English army rallied round the banner of St Cuthbert at the battle of Neville's Cross, and it is said to have been carried for the last time at the rising known as the Pilgrimage of Grace in the reign of Henry VIII. When the whole medieval system was beginning to crumble and after its entire overthrow, the popular reverence for his name did not cease in his own northern region. The last Roman Catholic bishop of Durham, and not the least famous of his line, was Cuthbert Tunstall ; and in the

present century one of our most renowned seamen was Cuthbert Collingwood, the friend and colleague of Nelson.

The original authorities for the life of St Cuthbert are the two biographies already referred to and the notices in Bede's Keclesias- tical History. Bede mentions that what he wrote, whether in the history or in the life, was derived from the records of the monastery of Lindisfarne, or from the testimony of those to whom Cuthbert was personally known. (G. G.)

CUTLERY (French, couillerie, from the Latin culter, a knife) is a branch of industry which originally embraced the manufacture of all cutting implements of whatever form or material. The progress of manufacturing industry has, however, detached from it the fabrication of several kinds of edge-tools, saws, and similar implements, the manufacture of which is now regarded as distinct branches of trade. On the other hand modern cutlery includes a great number of articles which are not strictly cutting im- plements, but which, owing to their more or less intimate relation to table or pocket cutlery, are classed with such articles for convenience sake. A fork, for example, is an important article of cutlery, although it is not a cutting tool, and silver or German silver forks in no way answer to the common definition of cutlery, as " cutting implements made of steel."

The original cutting instruments used by the human race consisted of fragments of flint, obsidian, or similar stones, rudely flaked or chipped to a

cutting edge; and of these tools numerous remains yet exist. Stone knives and other tools must have been employed for a long period by the prehistoric races of mankind, as their later productions show great perfection of form and finish. In the Bronze period, which succeeded the Stone age, the cutlery of our ancestors was fabricated of that alloy. The use of iron was introduced at a later but still remote period; and it now, in the form of steel, is the staple article from which cutlery is manufactured.

From the earliest period in English history the manu- facture of cutlery has been peculiarly associated with the town of Sheffield, and at the present day that town not only practically monopolizes the ordinary cutlery trade of Great Britain, but undoubtedly remains the chief centre of the industry for the whole world, The prominence of the manufacture in his own age is attested by Chaucer, who says of the whittler of Trompington—

'fA Shefeld thwytel bare he in his hose."

The thwytel or whittle of that period was a very poor rude implement, consisting of a blade of bar steel fastened into a wooden or horn handle. It was used for cutting food as well as for the numerous miscellaneous duties which now fall to the pocket knife. To the whittle succeeded the Jack knife, —the Jacques-de-Lidge, or Jock-te-leg of the Scottish James VI., —which formed the prototype of the modern clasp knife, inasmuch as the blade closed into a groove inthe handle. This improved form was probably introduced to Sheffield by Protestant refugees from the Low Countries who came to England during the reign of Queen Elizabeth. Shortly thereafter, about the beginning of the 17th century, the pocket knife with spring back was intro- duced, and no marked improvement thereafter took place till the early part of the present century. In 1624, two centuries after the incorporation of the Cutlers' Company of London, the cutlers of Hallamshire—the name of the dis- trict of which Sheffield is the centre—were formed into a body corporate for the protection of the " industry, labour, and reputation " of the trade, which was being disgraced by the "deceitful and unworkmanlike wares of various persons." The Act of incorporation specifies the manufacture of "knives, scissors, shears, sickles, and other cutlery," and provides that all persons engaged in the business shall "make the edge of all steel implements manufactured by

them of steel, and steel only, and shall strike on their wares such mark, and such only, as should be assigned to them by the officers of the said company." Notwithstand- ing these regulations, and the paius and penalties attached to their infringement, the corporation was not very successful in maintaining the high character of Sheffield wares. Most manufacturers made cutlery to the order of their customers, on which the name of the retailer was stamped, and very inferior malleable or cast iron blades went forth to the public with "London made," "best steel," and other falsehoods stamped on them to order. The corporate mark and name of a few firms, among which Joseph Rodgers & Sons stand foremost, are a guarantee of the very highest excellence of material and finish ; and such firms decline to stamp any name or mark other than their own on their manufactures. In foreign markets, however, the reputation of such firms is much injured by impudent forgeries ; and so far was this system of fraud carried that inferior foreign work was forwarded to London to be transshipped and sent abroad ostensibly as English cutlery. To protect the trade against frauds of this class the Trades Mark Act of 1862 was passed chiefly on the instigation of the Sheffield Chamber of Commerce.

Sword cutlery, which embraces the manufacture of all military cutting weapons, has always been a distinct branch of trade; and it attained great perfection long before much attention was bestowed upon the tools appertaining to the arts of peace. Damascus blades, with their peculiar variegated watered appearance and their unequalled excellence of metal, have possessed from an early period the highest reputation; and the method by which its structure was produced was long a matter of speculation. The following remarks by Dr Percy (Metallurgy—Iron and Steel) explain the method of which Damascus or damask work is produced :—

"The damasked portion is due to the difference in coloration, resulting from the action of acids on iron and steel, the surface of the former being left with a metallic tissue, and that of the latter being left coated with a black firmly adherent car- bonaceous residue. By suitably piling together bars of steel and iron, welding them, and then drawing them out under the ham- mer, or otherwise, patterns of various kinds may be produced, just as is

done in the case of glass, by heating together variously coloured pieces of glass, and drawing them out into rods."

The sword blades of Toledo, and the workmanship of Andrea de Ferrara in the 16tl century, were also triumphs of metal-work. While Sheffield is now the great centre of the manufacture of ordinary cutlery, Birmingham occupies the leading place in the sword cutlery department ; but the sword and its cogeners do not now hold the important position either in civil or in military life which they occupied in earlier ages.

The variety of materials which go to complete any single article of cutlery is very considerable ; and as the stock list of a cutler cmbraces a vast number of articles different in form, properties, and uses, the master cutler must have a practical knowledge of a wide range of substances. The leading articles of the trade may be classed under—lst, domestic cutlery, which includes carving and table knives and forks, pocket or clasp knives, razors, scissors, and sunilar articles; and 2d, tool cutlery, under which head may be arranged surgical knives and lancets, butchers' and shoemakers' knives, gardeners' pruning-knives, é&c., sickles, scythes, and a vast number of other allied cutting imple- ments. The blades or cutting portious of a certain number of these articles are made of shear steel, and for others cast steel only is employed. Sometimes the cutting edge alone is of steel, backed or strengthened with malleable iron, to which it is welded. Tangs on which handles are fastened, and other non-cutting portions, are also very often of malleable iron. Brass, German silver, silver, horn, tortoise-

shell, ivory, bone, mother-of-pearl, and numerous fancy woods are all brought into requisition for handles and other parts of cutlery, each demanding special treatment according to its nature. The essential processes in making a piece of steel cutlery are—lst, forging ; 2d, hardening and tempering; 3d, grinding; and 4th, polishing ; aud to these of course are added the diverse operations of fitting aud handling of various kinds.

The following outline of the stages in the manufacture of a razor will serve to indicate the sequence of operations in making an article which, though simple in form, demands the highest care and skill in the departments which

strictly appertain to cutlery. The first essential of a good razor is that it be made of the finest quality of cast steel. A razor must further, according to Mr Ebenezer Bhodes, a practical cutler who writes an Lssay on the Manufacture of a Razor, present 'due proportion, form, temperature, fitness, and regularity of cuncavity." The steel for razors is obtained in bars half an inch in breadth, and the thickness of the back of the instrument. Such a bar the forger takes, and, heating one end of it to the proper forging temperature, he, with great dexterity, fashions it upon his anvil, giving it roughly the required form, edge, and concavity. It is then separated from the remainder of the bar, leaving only sufficient metal to form the tang, if that is to be made of steel; sometimes a tang of malleable iron is welded to the blade. The tang of the '"' mould," as the blade in this condition is termed, is next drawn out, and the whole " smithed" or beaten on the anvil to compact the metal and improve the form and edge of the razor. At this stage the razor is said to be " forged in the rough," and so neatly can some workmen finish off this operation that a shaving edge may be given to the blade by simple whetting. The forged blade is next " shaped " by grinding on the dry stone, in which opera- tion it is considerably reduced in weight, and the oxidized scale is removed, which allows the hardening and temper- ing to be done with certainty and proper effect. The shaped razor is now returned to the forge, where the tang is file-cut and pierced with the joint-hole, and into the blade is stamped either the name and corporate mark of the maker, or any mark and name ordered by the tradesman for whom the goods are being manufactured. The harden- ing is accomplished by heating the blade to a cherry-red heat and suddenly quenching it in cold water, which leaves the metal excessively hard and brittle. To bring it to the proper temper for a razor, it is again heated till the metallic surface assumes a straw colour, and upon plunging it into water, it is ready for the process of wet grinding. The wet grinding is done on stones which vary in diameter from 4 to 12 inches according to the concavity of surface desired. The stones recommended by Mr Rhodes are from 6 to 8 inches in diameter, which produce, he says, "razors sufficiently hollowed or ground out for any service, however hard, to which they may be applied; and they combine a desirable strength and firmness of edge, with a requisite degree of thinness." " Lapping," which is the first stage in polishing, is performed ona wheel of the same diameter as the wet-grinding stone. The lap is built up of segments of wood having the fibres towards the periphery, and

~~covered with a metallic alloy of tin and lead. The lap is fed with a mixture of emery powder and oil. ‘ Glazing” and “polishing,” which follow, are for perfecting the polish on the surface of the razor, leather- covered wheels with fine emery being used ; and the work is finished off with crocus. The finished blade is then rivetted into the scales or handle, which may be of ivory, bone, horn, or other material; and when thereafter the razor is set on a hone it is ready for use.~~

~~The processes employed in making a table knife do not~~

~~differ essentially from those required for a razor. Kuife blades are made from shear steel, and, after forging the blade, a piece of malleable iron sufficient for the bolster or shoulder and tang is welded to it. The bolster is formed witb the aid of a die and swage called “ prints,” and the tang is drawn out. The tang is variously formed, according to the method by which it is to be secured in the shaft, and the various processes of tempering, wet grinding, and polishing are pursued as described above. Steel forks of an inferior quality are cast and subsequently cleaned and polished, but the best quality are forged from bar steel, and the prongs are cut or stamped out of an extended flattened extremity called the mould or “mood.” In the United States of America machinery has been extensively adapted for per- forming the various mechanical operations in forging and~~

~~’ fitting table cutlery, and to some extent machines have been~~

~~introduced in Sheffield. In the making of a common pocket-knife with three blades not fewer than one hundred separate operations are involved, and these may be per- formed by as many workmen. ‘The diversity of quality aud workmanship is probably greater in the cutlery trade than in any other, although differences are not readily apparent to the unskilled critic, and the range of prices is correspondingly wide.~~

~~In the cutlery trade the division of labour is carried out to such an extreme degree as to exercise a very baneful influence on the operatives—who, as a class, are socially and morally inferior to many of their fellows. Cutlery grinding, which is one of the most important and distinc- tive departments of the trade, possesses the bad eminence of being one of the most unhealthy and deleterious of all occupations. Grinders are divided into three classes—~~

dry, wet, and mixed grinders, according as they work at dry or wet stones. This branch of trade is, in Sheffield, con- ducted in distinct establishments called ‘ wheels,” which are divided up into separate apartments or “ hulls,” dry grinding being as much as possible separated from the wet grinding. Dry grinding, such as is practised in the shaping of razors described above, the “ humping,” or rounding of scissors, and other operations, is by far the most injurious and fatal process. Red-hot particles of steel fly off, injuring and sometimes blinding the eyes, unless they are protected ; and the atmosphere is loaded with fine dust of silica and steel, inducing inflammation of the lungs, pleurisy, and grinders’ asthma. ‘The men work in a peculiarly con- strained position, and under highly unsanitary conditions ; and although a fan has been invented and extensively in- troduced which, placed behind the stones, by suction draws away a large proportion of the grinding dust, and renders the atmosphere comparatively pure, many grinders still neglect to keep it working or positively refuse to have it. In a communication to the Social Science Association (Sheffield meeting, 1865) Dr John C. Hall stated that there were then 3090 men and 1073 boys employed in grinding,— wet, dry, and mixed. “The average ages of all the fork grinders living,” he says, “does not exceed 29 ; scissors grinders, 32 ; edge tool and wool-shear grinders, 33 ; table- knife grinders, 35….. On taking down the ages of all the grinders —wet, mixed, and dry—at one of our largest wheels, I found the average 34 ; boys under: 21 were excluded from this calculation.” Dr Hall gives the accompanying table of the ages of 290 men over 21 years of age employed in razor grinding :—

Ages. Persons. Ages. Persons, 21 to 25 83 45 to 50 29

25 ,, 30 57 50 ,, 55 9 30 ,, 35 36 55 ,, 60 8 35 ,, 40 35 60 ,, 65 8 40 ,, 45 29 65 ,, 75 1

The operation of the Factories and Workshops Acts has, in recent years, exercised a beneficial influence on the

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—health of the grinding trade; and the more general use of the fan in dry grinding has considerably reduced the excessive mortality among the operatives, (J. PA.)

CUTTACK. See Carrack.

CUTTLE-FISH. The cuttle-fishes are the " Dinten-

fische " of the Germans and the " Seiches " of the French, and they constitute the most highly organized members of the class of the Cephalopoda. The great class of animals now known to naturalists under the name of Cephalopoda was fully recognized by Aristotle as a well-marked division of animals, under the name of Malakia. Even at the early period at which he lived (384-322 B.c.), this acute observer recognized at least nine species of Cephalopods—including the Argonaut and the Pearly Nautilus ; and he also recorded

the singular phenomena of reproduction, phenomena which were not scientifically confirmed and fully established till the year 1850, by the researches of Verany and H. Miiller, The other classical writers (e.g., Pliny) added nothing to Aristotle's observations, The next contribution of import-ance to the elucidation of the history of the Cephalopods was made by Rumph (1705) in his Rariteit-Kamer, describing the curiosities of Amboyna. The old Dutch naturalist gives in this work an account of the structure and habits of the Pearly Nautilus, which, though long dis- credited, is now known to be in the main correct, and which is accompanied by a fair figure of the soft parts of the animal. The relations of various fossil forms (such as Ammonites) to the Cephalopoda were first recognized in the earlier portion of the 18th century; and Breynius (1732) detected the true affinities of the Belemnite. \ Lin- zeus gives a summary of the knowledge of his time as to these animals, but separates the naked from the testaceous forms. The first establishment of the class Cephalopoda, however, as a definite natural group, is due to the genius of Cuvier (1798), to which we also owe this now universally accepted name. Cuvier's researches on this subject are

~~contained in his Legons d'Anat. Compareé (1799-1805), and were subsequently republished in an enlarged form in his Mémoire sur les Céphalopodes et leur Anatomie (1817). Since the appearance of this classical work, our knowledge of the natural history of the Cephalopods has been immensely increased by the researches of Delle Chiaje, Meckel, Von Siebold, De Blainville, Owen, Van Beneden, Peters, Van der Hoeven, Gray; Huxley, A. Hancock, Milne- Edwards, Kdlliker, H. Miiller, Leuckart, Steenstrup, Keferstein, Férussac, D'Orbigny, é&c. ; and, as regards fossil forms, by Buckland, D'Orbigny, Quenstedt, Oppel, Owen, Huxley, Phillips, Von Buch, Minster, Barrande, Von Hauer, Von Meyer, Hyatt, Hall, Meek, and many other palzontologists. One of the principal steps in advance upon the knowledge possessed by Cuvier was taken in 1835, when Dujardin showed that the Foraminifera,~~

~~. Previously included by Plancus, Soldani, Fichtel, Linneus, and others in the Cephalopoda, were in reality of a much lower grade of organization, and were not systematically related to the true Mollusca,~~

~~The class Cephalopoda comprises Mollusca in which there is a distinct head, and a toothed "tongue" or " odontophore," whilst the hinder extremity of the body is inclosed in a muscular mantle-sac, which may or may not secrete an external shell. The mouth is placed near the centre of the "foot," and the margins of this structure are split up into 8 (Octopod Cuttle-fishes), 10 (Decapoe Cuttle-fishes), or numerous (Pearly Nautilus) muscular pro- cesses, or "arms." The lateral margins of the foot ("epipodia") constitute, by apposition or fusion, a muscular tube (the "funnel ") through which the effete water of respiration is expelled.~~

~~The class Cephalopoda is divided into the two great orders of the Tetrabranchiata and the Dibranchiata,~~

~~The Zetrabranchiate order comprises only the living Species, or varieties, of the Pearly Nautilus (Vautdlus pom- pilius), along with a vast number of fossil forms, and is characterized by the possession of an external, many-cham- bered, siphunculate shell ; by the presence of numerous arms, which are devoid of suckers ; by the possession of four branchiz ; by the absence of an ink-sac ; and by the fact that the " funnel " does not form a complete tube.~~

The order Dibranchiata, with which alone we are con- cerned here, comprises the true cuttle-fishes, in which there are either 8 or 10 arms, provided with suctorial discs ; there is no external shell, or, in the single case in which such a structure is present (the female Argonaut), it is single-chambered, and is not secreted by the mantle ; there are only two branchiz ; an ink-sac is present ; and the " funnel " forms a complete tube.

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Fig. 1.—A, Loligo vulgaris; a, arms; ¢, tentacles. B, pen of the same reduced in size; C, side-view of one of the suckers, showing the horny hooks surrounding

the margin; D, view of the head from in front, showing the arms (a), the tentacles (¢), the mouth (m), and the funnel ().

The body of a cuttle-fish is symmetrical, and is divisible into an anterior cephalic portion (prosoma) and a posterior abdominal portion (metasoma). The former of these is developed into a distinct head, furnished on its sides with large and prominent eyes, and having the mouth in the centre of its anterior surface, surrounded by eight or ten "arms." The latter incloses the various viscera, and is en- veloped in an integumentary sac, which corresponds to the "mantle" ("palliwm ") of the Gasteropods and Lamelli-branchs. The mantle-sac is formed by the coalescence of the two pallial lobes along the ventral surface of the body, and it is attached directly to the

metasoma along the dorsal surface, whilst it is free inferiorly, and incloses a space (the "pallial chamber ") which contains the gills, and into which the intestine and the ducts of the generative organs and ink-sac open.

The integument of the cuttle-fishes consists of several layers, of which the most important is one which corre- sponds to the lowermost layer of the epidermis, and which

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is distinguished by the possession of numerous large-sized cells filled with pigment-granules (' chromatophores "). These pigment-cells are capable of expanding and contract- ing in their dimensions, and of altering in shape, and below them are other flattened nucleated refracting cells, which co-operate with the former in the production of the mar- vellous play of changing colours which the cuttle-fishes exhibit under excitement or irritation.

The muscular system of the cuttle-fishes is well developed, the fibres being long and spindle-shaped, and only in certain situations (e.g., in the branchial hearts) transversely striated. The mantle is in all highly muscular, but the most important muscular organs are the "arms," the "tentacles," the " fins," and the "funnel." The "arms" are long processes produced by the splitting up of the antero-lateral margins of the foot, and the mouth is placed in the centre of their bases. In all the cuttle-fishes eight arms are present, but the so-called Decapods have in addition the "tentacles," whilst the Octopods are devoid of these supplementary processes. The arms are longer or shorter pointed processes, formed principally of longitudinal muscles, with well-marked radial bundles of fibres, and having a nerve and an artery occupying the axis of each. They are placed symmetrically round the mouth, forming a dorsal pair, a ventral pair, and two lateral pairs on each side ; and their bases are connected by an inter-brachial membrane, which in some instances (Cirrhoteuthis) extends nearly to their points. On the inner surface of the arms are placed the suckers ("acetabula"), in the form of muscular cup-like discs, which may be sessile or stalked, and which are arranged generally in one or two, or rarely in four, rows. Each acetabulum consists of a cup, the margin of which is formed by a muscular ring, sometimes strengthened by a horny girdle (which may be smooth or

~~may be pro- duced into teeth), whilst its centre is occupied by an elevated papilla composed mainly of radial muscular fibres. When the sucker is applied to any object, the contraction of the muscular fibres causes the depression of this muscular papilla, and creates a partial vacuum, thus enabling each sucker to act as a most efficient organ of prehension—their action being sometimes supplemented (as in Onychoteuthis) by the conversion of the central papilla into a horny hook. The so-called "tentacles" of the Decapod Cuttle-fishes resemble the true arms in structure, but are very much longer, and only carry suckers on their swollen and club- shaped extremities. They are placed on the ventral surface of the animal, between the third and fourth pairs of arms (counting from the middle line of the back); they may or may not be retractile into pouches placed below the eyes ; and they may attain a length many times greater than that of the body itself. The tentacles are organs of prehension, and the arms are, in addition, employed by the animal in locomotion, enabling it to walk head downwards, at the bottom of the sea, or, when webbed, to swim through the water ina retrograde manner. One of the arms of the male cuttle-fishes, as will subsequently appear, is also more or less largely engaged in the work of reproduction, and may for this reason be greatly modilied.~~

~~The sides of the body in all the Decapod Cuttle-fishes, and in a few of the Octopods (e.g., Pinnoctopus), are more or less extensively produced into muscular expansions or fins, supported internally by a cartilaginous basis. These fins are employed by the animal in swimming head fore- most, and they may extend along the whole length of the metasoma (as in Sepia), or they may be confined to the hinder end of the body (as in Loligo, Cheiroteuthis, Onychotcuthis, &c.)~~

~~The "funnel" of the cuttle-fishes is a muscular tube, formed by the union of the " epipodia," and placed on the lower surface of the body, with its anterior extremity pro-~~

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~~jectiug beyoud the mantle, whilst it opens posteriorly into the pallial chamber. It serves for the extrusion (by means of the outgoing respiratory currents) of the undigested portions of the food and of the excretions of the~~

kidneys and ink-sac; whilst the water which has passed over the gills is expelled through it in a succession of jets, subserv- ing in this way the secondary purpose of driving the animal backwards through the water.

As regards the digestive system, the mouth is placed centrally, surrounded by the bases of the arms; and it conducts into a powerfully muscular buccal cavity, in which are contained two strong horny jaws and a well- developed "tongue." The jaws, or "mandibles," are purely horny (not partially calcareous, as in the Pearly Nautilus), and they have very much the form of a parrot's beak, working vertically, the lower one projecting most and receiving the upper mandible within it in the act of biting. The so-called "tongue " is a muscular organ, part of which is covered with numerous papille, and is apparently an organ of taste ; whilst another portion is developed into a lingual ribbon essentially similar in its structure to the "odontophore" of the Gasteropoda, The cesophagus— sometimes simple (Decapoda), sometimes provided with proventricular or crop-like dilatations (Octopoda)—con- ducts from the buccal chamber to the stomach, the latter organ being of large size, highly muscular, of a generally rounded shape, and having appended to its pyloric ex- tremity a capacious diverticulum, into which the bile-ducts open. Into the cesophagus open the ducts of one or two pairs of salivary glands; and the liver is of large size and highly developed, whilst certain glandular structures which pour their secretion into the bile-ducts are believed to re- present the pancreas. The intestine is usually short, mostly of nearly uniform calibre, straight or slightly con- voluted, and terminates in an anal aperture placed in the median line of the pallial chamber close to the base of the funnel.

The excretory organs of the cuttle-fishes are the kidneys and the ink-sac; and the integumentary sinuses in connection with the so-called " aquiferous pores " may possibly also have an excretory function. The kidneys (7, 7, fig. 2) are spongy, cellular, tufted, or massive organs appended to the two posterior branches of the vena cava, and sometimes developed on others of the principal veins, just before they open into the branchial hearts. They are contained, along with the veins to which they are attached and the corre- sponding branchial heart on each side, in two serous sacs, which are separated centrally by the chamber containing the systemic heart, and which open by distinct apertures into the pallial chamber. The renal

appendices are in direct communication with the veins on which they are situated, and have the form of membranous, often plicated sacs, covered externally with a layer of glandular cells which secrete a yellowish fluid. This fluid escapes into the serous sacs surrounding the kidneys, and is thence expelled into the mantle-cavity by the apertures before mentioned. The identity of this fluid with the renal secretion of the higher animals is shown by its containing uric acid (as proved by Harless).

The ink-sac is a glandular organ, present in all known Dibranchiates, generally of a pyriform shape, situated in different portions of the visceral chamber, but communicat- ing by a longer or shorter duct either with the terminal portion of the intestine, or, more commonly, directly with the pallial cavity by a special aperture of its own, situated close beside the anus and at the base of the funnel. The ink-sac has strong fibrous walls, often with a silvery lustre, and its secretion is a brown or black fluid, containing @ large amount of a carbonaceous pigment ("sepia "), along with various mineral salts. It is employed by the cuttle-

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fishes as a means of protection against their enemies, as they have the power of at will expelling jets of it into the surrounding water, and thus raising a cloud under cover of which they make their escape. The colouring matter of the ink is highly indestructible, is often found preserved in fossil Dibranchiates, and was formerly employed in the manufacture of the paint " sepia,"

Fic. 2.—Central] organs of the circulation, gills, and renal organs of Sepia offct- nalis (after John Hunter). a, aorta; v, vena cava; v', v', visceral veins; c, systemic heart; d, d, dilatations of branchial veins on entering the heart; e, e, branchial hearts; 6, 6, branchiz ; r, 7, renal organs,

The circulatory organs of the cuttle-fishes consist of arteries, veins, generally an intermediate system of capillaries, a more or less extensively developed system of sinuses or lacunz: amongst the tissues, a central systemic heart, and two accessory or " branchial " hearts, whereby the venous blood is propelled through the breathing organs, The general course of the circulation is as follows. The venous blood returned from the arms,

the anterior portion of the body and mantle gen erally, and the funnel is collected into a main ventrally-placed vein (the vena cava). This is reinforced by a great vein (canalis venosus), which brings the blood from a venous sinus surrounding the buccal chamber, the gullet, stomach, and liver in the Octopods, but which is of comparatively small dimensions in the Decapods. The great venous channel thus formed splits into two branches (the so-called "branchial arteries", which further receive the venous blood returned from the posterior viscera and hinder portion of the mantle by special vessels (the "visceral veins"). The branchial arteries then pour their contents by valvular apertures into two special muscular contractile chambers, which are termed the "branchial hearts," and are situated, one on each side, at the bases of the gills. The branchial hearts drive the blood through the gills, where it is aerated, and whence it issues, as arterial blood, by the so-called "branchial veins," which convey it to the true systemic heart. This organ is placed in the middle line of the body, between the renal sinuses on each side, and below the bifurcation of the vena cava, The two branchial veins open into it by contractile dilatations, which may be regarded as auricles, and it con- sists of a single muscular cavity, which propels the blood into the systemic aorta. By this vessel the aerated blood

-is distributed to the tissues generally, finding its way back

to the

organs. 'The blood contains microscopic corpuscles, and is remarkable in containing a notable amount of copper.

The respiratory organs of the cuttle-fishes consist of two gills or branchiew, one of each side of the body, placed in the cavity of the mantle-sac. The branchie are of an elong- ated pyramidal figure, and each consists of a central stem, attached below to the visceral mass and along one side to the mantle, the other side being free. The central stem bears a larger or smaller number of triangular lamine, in turn supporting similar secondary laminz, which finally carry still smaller tertiary laminz ; and the blood is thus minutely distributed through the gill. In the absence of a ciliated branchial surface, the necessary respiratory currents are maintained by the alternate

~~contractions and expansions of the muscular walls of the pallial chamber. As the mantle dilates, the water from the exterior makes its way into the mantle-cavity by the opening between the rim of the mantle and the neck. The water, after passing over the gills, is then expelled through the funnel by the contraction of the mantle. The course of the out-going current through the funnel is determined either by the presence of suitable valves at the base of this organ, which permit the egress of water, but do not permit its ingress, or by the articulation of the sides of the funnel with the rim of the mantle-sac, in such a manner that the opening into the mantle-cavity is completely closed during the exspiratory act, the funnel alone remaining open, Ag before remarked, the outgoing respiratory currents serve to take with them the excrementitious portions of the food and the secretions of the kidneys and ink-sac ; and they are also concerned in swimming, as the animal can by their means propel itself backwards through the water. |~~

~~The nervous system of the cuttle-fishes consists of the three principal pairs of ganglia characteristic of the Lamelli- branchs and Gasteropods—namely, the cephalic, pedal, and parieto-splanchnic. These form an cesophageal collar, which consists of a smaller dorsal mass (the cephalic ganglia), and a larger ventral mass (the pedal and parieto- splanchnic ganglia), united by commissures, The central organs of the nervous system are protectéd by a cartilage, foreshadowing the cranium of the vertebrate animals ; and the cerebral ganglia supply the nerves to the buccal mass and eyes, whilst the pedal ganglia supply nerves to the auditory organs, funnel, and arms, and the nervous supply of the mantle and viscera generally is derived from the parieto-splauchnic ganglia. The organs of sense of the cuttle-fishes are highly developed, and consist of the eyes, auditory sacs, and perhaps of an olfactory apparatus. Space will not permit of a description of these, and it must suffice to say that the orgaus of vision are of large size, and more highly developed than in any other inverte- brate animals, consisting of a sclerotic, choroid, retina, vitreous humour, aqueous humour, and crystalline lens ; the organs of hearing are two chambers hollowed out of the cartilage of the cranial plate, each containing a membranous sac with an otolith; and the organs of smell have been doubtfully sought in certain cavities which open by small apertures behind the eye, and are supplied with filaments from the cephalic ganglia.~~

~~Of the skeletal structures which these animals possess, some are integumentary and exoskeletal, whilst others may be regarded as constituting a true endoskeleton. In the latter category are the various internal cartilaginous structures which are found in the cuttle-fishes, protecting vital organs, or serving as a base of insertion for muscles, Some of these, such as the cartilages which strengthen the anterior rim of the mantle-sac, and serve for its articulation in some forms with the funnel, and the cartilages of the fins (when present) need no further notice ; but the cranial cartilage is of greater importance. This latter forms a~~

~~plate, which surrounds the gullet, and incloses and protects the great cesophageal nerve-collar, and which sends off prolongations which strengthen and protect the eye, thus discharging the functions of the orbits of higher animals.~~

~~Fic. 3.—a, Internal skeleton ("sepiostaire ") of Sepia ornata, Rang.; 0. Internel skeleton ('\pen,") of Histioteuthis Bonelliana, D'Orb.; ¢, Internal skeleton C. phragmacone") of Spirula fragilis, Lamarck; d, Animal of Spirula~~

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~~The entegumentary skeleton of the cuttle-fishes consists of an external shell only in the Paper Nautilus (Argonavuta), but in all others in which it is present at all it is composed of certain horny or calcareous structures, which are lodged in the substance of the mantle, and are therefore concealed from view. This internal skeleton, so characteristic of the Dibranchiates, is well developed in all the Decapods, but is either absent or rudimentary in the Octopods, in which it never consists of more than " two short rudimental styles encysted in the dorso-lateral parts of the mantle" (Owen). In the typical Decapods (such as Loligo, Sepioteuthis, Enoploteuthis, Histioteuthis, &c.), the skeleton is horny, and consists of a feather-shaped "pen" (0d, fig. 3) composed of a central shaft and two more or less extensively developed lateral expansions or wings, the whole~~

imbedded in the mantle in the middle line of the back. In some cases (Ony-choteuthis, Ommastrephes, Loligopsis) the hinder end of the pen is developed into hollow conical appendix or cup, form- ing a rudimentary ‘“splanchnoskeleton.” In the genus Sepia, the internal skeleton (a, fig. 3) consists of a horny oval plate, strengthened by calcareous matter, which is deposited principally on its internal surface, and consists of numerous thin plates separated by vertical fibres. The “cuttle- bone,” or “ sepiostaire,” is of a porous, spongy consistence, and is concave on its inner surface behind, terminating posteriorly in a small cone (“ mucro”), from which a thin, wing-like margin is prolonged forwards on both sides, In the singular genus Spirwa the internal skeleton (c, fig. 3) has the form of a calcareous and nacreous tube, coiled up into a flat spiral, the coils of which are not in contact. The internal cavity of the shell is partitioned off by a succession of pearly septa, which are perforated on the ventral or con- cave side of the shell by a tube (“siphuncle ”) running the whole length of the spiral. In its general construction, the skeleton of the Spirula is very like the shell of the Pearly Nautilus; but it is quite certain that its relations to the animal are quite different. Though the shell itself Is exceedingly abundant in certain regions, the animal is at present only known by some very imperfect examples, and its connection with the shell is not precisely clear. The last chamber of the shell, however, is little or not at all

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larger than those behind it, and it is certain that the animal in no sense lives in the shell. On the contrary the last chamber simply lodged the extremity of the visceral sac, and the shell is to all intents and purposes an internal one, though possibly it is only partially concealed from view by folds of the mantle, and is not absolutely encysted.

Of the three types of internal skeleton characteristic of living cuttle-fishes—namely, the horny pen of the Calamaries, the calcareous “bone” of the Sepic, and the spiral cham- bered and siphuuculate shell of Spirula—two appear under various forms in the Secondary and Tertiary rocks, whilst the third, comprising the Spirule, is so far unknown in the fossil condition. Thus, we find fossil “ pens,” in all essential respects identical with those of the ordinary living Decapods, to be by no means very rare in ‘deposits of

Secondary age, and such genera as Z'eudopsis, Leptoteuthis, Geoteuthis, and Beloteu- this have been founded on these remains, Similarly, the calcareous "cuttle-bones" from the Tertiary rocks, upon which are founded the genera Spirulirostra, Beloptera, and Belemnosis, appear to be referable to the Sepiade. In Spirulirostra, however, the skeleton consists partly of a spirally bent, chambered, and siphonate " phragmacone," protected by a pointed calcareous " guard," and it thus reminds us {on the one hand of the living Sprula, and on the other hand of the extinct Be- lemnites. By far the most import- ant of the fossil cuttle-fishes, how- ever, are those which form the family of the Belemnitide, a gronp wholly Secondary in its distribution, which has a type of skeleton peculiar to itself. This skeleton consists of a conical chambered py¢. 4. Diagram of Belemnite shell—the "phragmacone "—which (after Phillips). r, horny pen a ats pro-ostracum;"' a, coni is partitioned off by calcareous cal cavity or "alveolus," septa into distinct air-chambers, yee ee. ee eon pierced ventrally by a tube or tained; g," guard," or "ros- "siphuncle." The conical phrag- " "™ macoue is placed in a corresponding excavation in the anterior end of a longer or shorter, sub-cylindrical, calcareous, and fibrous structure, which is known as the " ouard," or "rostrum," and which protects the delicate phragmacone from injury. The guard is the part of the skeleton which is most frequently found in the fossil condi- tion, and in perfect specimens it is prolonged forwards anteriorly into a longer or shorter horny or shelly plate, which corresponds with the front portion of the " pen" of the Calamaries, and is known as the " pro-ostracum." The various genera of the Belemnitide—Belemmnites, Belemnitella, Xiphoteuthis, Conoteuthis, Acanthoteuthis, Belemnoteuthis—are founded on differences in the nature of the internal skeleton. We know, however, from specimens preserved in such fine-grained deposits as the Oxford clay, that the cuttle-fishes of, this family possessed lateral fins, and two "tentacles" in addition to the eight proper "arms;" that the suckers were provided with horny hooks ; and that there was an ink-sac.

As before remarked, the only known Dibranchiate

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CUTTLEFISH

~~Cephalopod in which an external shell is present is the Paper Nautilus (Argonauta). The shell, moreover, is only possessed by the female Argonaut—the male being shell- less—and it is in no way comparable as regards its mode of origin and its morphological sig- nificance with the shell of the ordi- nary testaceous Mollusks in gene- ral, or of the Tetra- branchiate Cepha- lopods in particu- lar. The shell of the Argonaut is in- volute, one- cham- bered, and calcare- ous, of most grace- ful outlines and ornamentation. It is not secreted by the mantle, nor is the animal attach- ed to it by any organic connection—hence the long~~

~~controversy as to~~

~~! Fie. 5.—Argonauta argo, the "Paper Nautilus," whether the Argo female. The animal is represented in its shell, naut truly owned but the webbed dorsal arms are separated from the the shell it inha-~~

~~shell, which they ordinarily embrace,~~

~~bited, or had not rather simply obtained it by plunder, as the Hermit-Crab seizes any empty shell' which may be suitable for its temporary habitation. It is, however, now known that the shell of the Argonaut is secreted by the two dorsal arms of the female, which are expanded or webbed, and closely embrace the shell which they produce. These two arms, in their natural position, are bent backwards, so as to allow the animal to inhabit the shell. The animal sits in the shell, with its funnel turned towards the keel, and the apex of the shell is empty, and is used simply as a receptacle for the clustered eggs.~~

~~The processes of reproduction and development in the cuttle-fishes are of great interest. The males and females are generally more or less unlike externally—this difference being most marked in the Argonaut, in which the male is very much smaller than the female, and in addition possesses no shell. © The reproductive organs of the female consist of a single ovary, situated at the hinder end of the body, and inclosed in a pouch of the peritoneum, from which one or two oviducts are continued to open into the mantle-cavity, generally near the base of the funnel. The eggs are discharged into the peri- toneal sac surrounding the ovary, and are then taken up by the ovi- ducts and conveyed into the mantle-cavity. When finally~~

extruded, the impregnated eggs are found to be inclosed, singly or many together, in special capsules, which are usually attached in bunches to some foreign body. These egg-capsules are produced by the so-called '* nidamental glands," which in some genera (¢.g., Sepia and Loligo) are of large size, and are appended to the proper gene- rative organs. The reproductive organs of the male cuttle-fishes consist of a testis placed at the hinder extremity, like the ovary of the female, andinclosed in a peritoneal sac. The spermatozoids are discharged into this sac by the rupture of the secreting tubes, and are conveyed to the exterior by a tubular "vas deferens,"' which is dilated in its course into a " vesicula seminalis," and ulti- mately opens into the mantle-cavity by a papilliform ' penis " situated close to the anus. Before the vas deferens finally termin- ates in this way, it is usually expanded into a special dilatation ("bursa spermatophorum "), in which are packed away the so-called "spermatophores," or "moving filaments of Needham." These singular bodies are whitish filaments, 6 or 8 lines in length, composed of aggregations of spermatozoids inclosed in a covering originally of an albuminous nature, but ultimately becoming deve- loped into two membranes which have a complicated arrangement. When set free and moistened, the spermatophores exhibit active ver- micular movements, and under suitable circumstances rupture and discharge their contained spermatozoa.

The reproductive act in the cuttle-fishes is only imperfectly known ;

but true intromission is certainly impossible. According to the observations of Aristotle, the poulpes and calamaries perform this act by clinging to each other, mouth to mouth, with the suckers of the arms in mutual apposition, the former seeking the bottom, whilst the latter move freely in the water. It is known now, in this connection, that one of the arms of the male cuttle-fishes is pecu- liarly modified, the arm thus affected being said to be 'hecto- cotylized." In some forms, this hectocotylized arm—differing in its position in different cases—is not so conspicuously altered as to attract immediate attention, and it does not appear clear that it plays necessarily any part in the reproductive act, though the alteration of form is undoubtedly primarily sexual. In certain forms, however (viz. Argonauta argo, Lremoctopus

violaceus, T. Quoyanus, and Octopus carena) the hectocotylized arm is the efficient agent in the act of reproduction. It is longer and thicker than the other arms, prolonged at its extremity into a long filament, and possessing posteriorly a sac which is filled with spermatophores. During the act of reproduction, the hectocotylized arm is detached by the male, and is deposited, with its freight of spermatophores, within the mantle-cavity of the female. The terminal filament is perforated by a tube, by which the spermatophores are conveyed to the ova, and impregnation is thus effected. When thus detached, the hectocotylized arm is capable of independent movement, and when first found in this free condition within the mantle-sac of the female Argonaut it was regarded as a parasitic worm. Under this belief Delle Chiaje described it as the T'richocephalus acetabularis, and Cuvier called it (in the Octopus) the Hectocotylus Octopodis, Both these names are in allusion to the suckers which the arm carries, and the name of "hectocotylus" is still applied to the detached arm, whereas the arm,'if not detached, is simply said to be '* hectocotylized." As before remarked, it is not abatiilel certain that the hectocotylized arm is invariably employed as a repro- ductive agent ; and certainly it is only occasionally detached. According to Steenstrup, however, the hectocotylized arm, when not detached, is employed by the male to transfer the spermato- phores to the female during the act of reproduction, the spermatic filaments being either placed within the mantle-cavity, or fixed to

FiG.6.—a,Male of Argonauta argo, with the hectocotylized arm still contained in its enveloping cyst, four times enlarged (after H. Miller). 0, Hectocotylus of Tremociopus violaceus (after Kolliker).

the internal surface of the buccal cavity of the females. How the spermatophores are transferred from the seminal ducts of the male to the sac contained in the interior of the hectocotylized arm is still uncertain ; but Leuckart has shown that the sac in question does actually communicate with the surface by a distinct aperture.

The development of the cuttle-fishes can be barely touched upon here. After fertilization the ovum undergoes a partial segmentation, as in birds and reptiles, and there is formed at one pole a germinal disc ("blastoderm"), which is at first divided into two parts by a primitive furrow, then into four

~~by a secondary furrow intersecting the first at right angles, and then into eight. An inner germinal layer is then formed (according to the researches of Ray Lankester on Loligo) quite independently of the outer one 3, and the two layers then grow over the entire yolk and completely inclose it. The un- segmented portion of the yolk is gradually absorbed by the grow- ing embryo, but obtains no direct connection with the alimentary tube, the latter originating from the primitive invagination of the outer layer of the blastoderm, instead of being formed, as in verte- brates, by its inner layer.~~

~~As regards their distribution in space, the cuttle-fishes are all marine, active, rapacious, and carnivorous in their habits, swim- ming vigorously by means of the jets of water emitted from the funnel, or in an opposite direction by means of fins, and creep- ing about the sea-bottom by means of the prehensile arms,~~

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~~Some forms (such as the Octopodide and Sepia) are essen- tially littoral animals, frequenting shallow seas, living in the vicinity of the land, and specially affecting rocky bottoms. Others (such as Tremoctopus, Sepiola, Argonauta, Spirula, Archi- teuthis, Onychoteuthis, &c.) are pelagic animals, living in the open ocean, often far from land, and swimming at or near the surface. Though more varied as regards their specific and generic types in the warmer seas of the globe, cuttle-fishes are found in almost all seas, and are sometimes extremely numerous individually even in the colder oceans. It seems also certain that our present knowledge as to the pelagic forms is only very imperfect. As to their dimensions, none are extremely minute, and some attain truly gigantic dimensions. Not to speak of the fabulous accounts of colossal cuttle-fishes given by many of the older writers, such as Pontoppidan and Olaus Magnus, we are now acquainted through the observations and descriptions of scientific witnesses, such as Banks and Solander, Quoy and Gaimard, Steenstrup, Verrill, &c., with various huge cuttlefishes, inhabiting both the Atlantic and Pacific Oceans. Some of these, though only known by imperfect specimens, certainly attain a length of 15 feet or upwards to the body and head, and from 30 to 40 feet or upwards in the long ten- tacles. All these giant cuttlefishes appear to belong to the sub- order of the Decapoda. 5~~

As regards their distribution in time, the order of the Dibranchiate Cephalopods does not seem to have come into existence during the Paleozoic period. And in this case the negative evidence is of considerable value, seeing that so many members of the order are provided with structures capable of preservation in the fossil state. During the Mesozoic period the Dibranchiates attained a high deve- lopment, being principally represented by the exclusively Secondary family of the Belemnitide, which began to exist in the Trias and sur- vived to the Chalk. The genus Belemmites itself extends from the Upper Trias to the Upper Greensand, and its place is taken in the Chalk by the nearly allied Belemnitella, distinguished by a fissure in the side of the alveolus of the guard. The Secondary rocks have also yielded the pens of Teuthide (Teudopsis, Beloteuthis, &c.), and of Sepiade (Sepia itself, and Coceoteuthis). In the Tertiary rocks, the three curious extinct genera Belosepia, Spiruli- rostra, and Belemnosis appear to be referable to the Sepiada, and Sepia itself still continues to exist ; whilst the Tewthide are not wholly unrepresented. The family of the Spirulidw has no certain fossil representative; but two species of Argonaut have been detected in the later Tertiaries. | With this last-mentioned exception, no remains certainly referable to the sub-order of the Octopoda have hitherto been met with.

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memory. His higher education was carried out at the

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*Academy of Stuttgard—the school of Schiller and other men of eminence—to which collegiate institution he had received a nomination from Prince Charles of Wiir- temberg. Devoting a year to the*study of " philosophy," he was enrolled as a student in the faculty of political economy ("*

~~Administration," ""' Cameralwissenschaft ") ; and after a brilliant university career he was thrown upon the world at the age of eighteen. A short interlude was passed as sub-lieutenant in the Swiss regiment of Chateauvieux, but this corps being disbanded, and his family being poor, he accepted the position of tutor in the family of the Comte d'Héricy, residing near Caen, in Normandy. He here spent the years from 1788 to the end of 1794—including the terrific epoch of the "' Reign of Terror "—peacefully occupy- ing his leisure in the ardent pursuit of his favourite sciences. About this time he attracted the attention of the Abbé Tessier, who was sheltering himself from the fury of the Revolution at Fécamp, and who wrote strongly in favour of his protégé to his friends in Paris,—with the result that Cuvier, after corresponding with the well-known naturalist Geoffroy Saint-Hilatre, was appointed in 1795 assistant to Mertrud, the aged professor of comparative anatomy at the Museum d'Histoire Naturelle.~~

~~The pre-eminent abilities of Cuvier as a naturalist and scientific observer were at once recognized in Paris, and the National Institute being founded this year (1795), he was elected a member, and was associated with Lacépede and Daubenton as the nucleus of the section of zoology. Detached memoirs on various zoological subjects had already been published by him, one of the most important being a joint memoir with Geoffroy on a new classification of the Mammalia. In this year he also published a number of researches, dealing with a very wide range of subjects, such as descriptions of new species of insects, the anatomy of Helix pomatia, the internal ear of the cetaceans, the circulation of the invertebrates, the classification of the invertebrates, &c. One of the most important of these, published in the '" Décade philosophique " of the JLemozrs of the Natural Listory Society of Paris, dealt with the internal and external structure and systematic affinities of the miscellaneous assemblage of lower invertebrates at that time grouped together under the name of " Vermes." In 1796 Cuvier commenced his course of lectures in the Ecole Centrale du Panthéon, and published a number of contributions to comparative anatomy. He also read his first paleontological paper at the opening of the National Institute inthe April of this year, which was subsequently published in 1800 under the title Mémoires sur les Hspéces @ Eléphants vivants et fossiles. Throughout the years 1797 and 1798 his scientific activity continued unabated, as is implied by the production of various memoirs upon such subjects as the~~

nutritive processes in insects, the structure of the ascidians, the anatomy of the bivalve mollusks, the nostrils of the cetaceans, the different species of rhinoceros, the fossil bones of the Gypseous series of Montinartre, ce. In 1798, also was published his first separate work, namely the Tableau Hlémentaire de Vhistotre naturelle des Animaux. This volume was an abridgment of his course of lectures at the Ecole du Panthéon, and may be regarded as the foundation and first general statement of that natural classification of the animal kingdom, which his genius originated, and which is universally accepted by modern zoologists.

In 1799, by the death of Daubenton, the chair of natu- ral history in theCollége de France was rendered vacant ; and Cuvier was appointed to this responsiblepost. In this year an important memoir on the blood system of the leeches appeared from his pen. In 1800, in addi- tion to various scattered contributions to zoology and palzontology, embracing observations on the Siren lacertina,

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the crocodilians of the Old and New Worlds, the fossil tapirs of France, the ornitholithes of Montmartre, &c., appeared the Legons d'Anatomie Comparée, a classical work, in the production of which Cuvier was assisted by Dumeril in the first two volumes, and by Duvernoy in three later ones. In 1802 Cuvier became titular professor at the Jardin des Plantes; and in the same year he was appointed commissary of the Institute to accompany the inspectors-general of public instruction. In' this latter capacity he visited the south of France ; but he was in the early part of 1803 chosen perpetual secretary of the National Institute in the department of the physical and natural sciences, and he consequently abandoned the appointment just mentioned and returned to Paris. Shortly thereafter he married the daughter of M. Duvancel, a con- tractor for the public taxes, by whom he had four children, all of whom predeceased him,

Cuvier's scientific publications during the period posterior to the year 1801 covered a vast area, and can be but briefly alluded to here. In addition to memoirs on the teeth of fishes, on the " Vermes " with red blood (Annelides), on the crabs known to the ancients, on the Egyptian ibis, &c., Cuvier now devoted himself more especially to three lines of inquiry, one

dealing with the structure and classification of the Mollusca, a second treating of the com- parative anatomy and systematic arrangement of the fishes, and the third concerned with fossil mammals and reptiles primarily, and secondarily with the osteology of living forms belonging to the same groups. As regards the first of these fields of investigation, Cuvier published a long series of papers on the mollusca, which began as early as 1792, and dealt with almost all the groups now admitted into this sub-kingdom, with the exception of the Polyzoa. Most of these memoirs were published in the Annales du Museum between 1802 and 1815, and they were sub- sequently collected into the well-known and invaluable Memowres pour servir & UHistoire et a UV Anatomie des Mollusques, published in one volume at Paris in 1817. In the department of fishes, Cuvier's researches, begun in 1801, finally culminated in the publication of the [Histoire Naturelle des Poissons. This magnificent work contained descriptions of 5000 species of fishes, and was the joint production of Cuvier and Valenciennes, its publication (so far as the former was concerned) extending over the years 1828-31. Palzontology was always a favourite study with Cuvier, and the department of it dealing with the Mammalia may be said to have been essentially created and established by him. Jn this region of investigation he published a long list of memoirs, partly relating to the bones of extinct animals, and partly detailing the results of observations on the skeletons of living animals specially examined with a view of throwing light upon the structure and affinities of the fossil forms. In the second category must be placed a number of papers relating to the osteology of the Fhinoceros Indicus, the tapir, Hyrax Capensis, the hippopotamus, the sloths, the manatee, &c. In the former category must be classed an even greater number of memoirs, dealing with the extinct mammals of the Eocene beds of Montmartre, the fossil species of hippopotamus, the Didelphys gypsorum, the Megalonyx, the Megatherium, the cave-hyzna, the extinct species of rhinoceros, the cave- bear, the mastodon, the extinct species of elephant, fossil species of manatee and seals, fossil forms of crocodilians, chelonians, fishes, birds, &c. The results of Cuvier's principal paleontological and geological investigations were ultimately given to the world in the form of two separate works. One of these is the celebrated Recherches sur les Ossemens fossiles de Quadrupedes, in four volumes quarto, published in Paris in 1812, with subsequent editions in 1821 and 1825; and the other is his Discours sur les

Révolutions dela surface du Globe, in one volume octavo, published in Paris in 1825.

Apart from his own original investigations in zoology and palontology Cuvier carried out a vast amount of work as perpetual secretary of the National Institute, and as an official connected with public education generally ; and much of this work appeared ultimately in a published form. Thus, in 1808 he was placed by Napoleon upon the council of the Imperial University, and in this capacity he presided (in the years 1809, 1811, and 1813) over commissions charged to examine the state of the higher educational establishments in the districts beyond the Alps and the Rhine which liad been annexed to France, and to report upon the means by which these could be affiliated with the central university. Three separate reports on this subject were published by him. In his capacity, again, of perpetual secretary of the Institute, he not ouly prepared a number of éloges historiques on deceased members of the Academy of Sciences, but he was the author of a number -of reports on the history of the physical and natural sciences, the most important of these being his celebrated Rapport historique sur le progres des sciences Physiques depuis 1789, published in 1810.

No work of Cuvier, however, has attained a higher reputation than his famous Régne Animal distribué dapres son Organisation. The first edition of this appeared in four octavo volumes in 1817 ; the second, in five volumes, was published in 1829-30. In this classical work, Cuvier embodied the results of the whole of his previous researches on the structure of living and fossil animals, as giving con- firmation and fixity to that system of classification of which he was the originator, and the main features of which still subsist. The whole of this work was his own, with the exception of the Insecta, in which he was assisted by his friend Latreille.

The rest of Cuvier's life, apart from his scientific labours, must be very briefly told. By the unanimous consent of the learned world, he was now regarded as the most eminent of living naturalists, and the scientific honours which he received are beyond enumeration. Nor did he fail to meet amongst his own countrymen—always ready to recognize ability, genius, energy, and persever- ance—with that public acknowledgment of his merits

which he had so richly deserved. Prior to the fall of Napoleon (1814) he had been admitted to the Council of State, and his position remained unaffected by the restora- tion of the Bourbons. He was elected chancellor of the university, in which capacity he acted as interim president of the Council of Public Instruction, whilst he also, as a Lutheran, superintended the faculty of Protestant theology. In 1819 he was appointed president of the Committee of the Interior, which office he retained until his death. In 1826 he was made grand officer of the Legion of Honour ; and in 1831 he was raised by Louis Philippe to the rank of peer of France, and was subsequently appointed president of the Council of State. In the beginning of 1832, he was nominated to the Ministry of the Interior, but the end was now near. On the 13th of May in this year, after a brief illness, commencing in paralysis of the throat, and rapidly implicating the respiratory organs, Cuvier passed away, his last surviving child having preceded him no less than five years.

Eminent as he was in various departments of adminis- tration, it will be as a naturalist and paleontologist that the memory of Cuvier will be preserved. The results which he accomplished in the sciences of zoology and palxontology were, however, so vast and varied that it is only possible to indicate ina general manner the more important of them. These results fall naturally under three heads.

In the first place, as regards systematic zoology, he effected

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an entire revolution in the classification of the animal king- dom as previously understood, and as explicitly formulated in the system of Linneus. For an artificial and arbitrary classification he substituted a natural arrangement, and he for the first time indicated the true principles upon which a natural classification is possible. He established the empirical laws of correlation of growth and the subordina- tion of different systems of organs, and he showed that the primary laws of all sound classification are to be found only in the anatomical examination of tle animals compared. In other words, for the loose, formal, and physiological analogies, which had previously been used as the basis of classification, he substituted the fundamental resemblances of morphological type and

~~homology, and relegated the former to a subordinate place. In no department of systematic zoology were the reforms instituted by Cuvier more conspicuous than in the invertebrates. Linneus classified the invertebrates simply by-dividing them into the two classes of the Jnsecta and the Vermes. Cuvier divided the invertebrates into the three sub-kingdoms ("embranchements ") of the Mollusca, the Articulata, and the Radiata or zoophytes, and split up these again into a number of natural groups or classes. Itis true that modern zoologists have almost unanimously agreed on the partition of the Cuvierian " Radiata" into the two sub-kingdoms of the Coelenterata and Protozoa ; though some modern views would almost obliterate any line of demarcation between these, and would thus, in effect, re-establish the Radiata. It is also true that considerable changes have been made in the classes of the lower invertebrates as instituted by Cuvier. It is impossible, however, not to recognize the immense step in advance made by the Cuvierian system of classification upon that of Linnzeus.~~

~~Cuvier's contributions to comparative anatomy, in the second place, can be merely glanced at here. Apart from the impulse given to the study of this science by the pub- lication of his Lecons d' Anatomie Comparée, it may almost be said that we owe to Cuvier the general recognition that the really essential portion of scientific zoology is compara- tive anatomy. As regards special departments, his con- tributions to the comparative anatomy of the Mollusca and fishes, and to the osteology of the Mammalia, may be particularly mentioned. As an instance, further, of the manner in which Cuvier employed comparative anatomy as a guide in zoological classification, the sub- kingdom of the Mollusca may be specially singled out, or, if we prefer to a take a minor group, the class of the Cephalopoda.~~

~~Lastly, in the department of paleontology, Cuvier effected a great and notable advance upon his predecessors. The notion that fossils were merely /usus nature had been already formally abandoned by such men as Leibnitz, Buffon, and Pallas. Daubenton, and subsequently Fallas and Camper, compared the fossil bones of quadrupeds with those of living forms, and the last of these declared his opinion that some of these fossil bones belonged to extinct species of quadrupeds. It is to Cuvier, however, that the world owes the first systematic application of that science of comparative~~

anatomy, which he himself had done so much to place upon a sound basis, to the study of the bones of fossil animals. It is to him that we owe the first complete demonstration that extinct animals could be "reconstructed" from fragmentary remains by availing ourselves of the law of the "correlation of growth ;" though it is true, as pointed out by Professor Huxley, that he rested more implicitly and securely upon this law than its empiric nature and its now proved exceptions would justify at the present day. Cuvier, as a paleontologist, devoted himself principally to the study of the fossil Mammalia of the Tertiary period, and especially to those of the Eocene basin

of Paris ; and the flood of light which he was enabled to throw upon the structure and affinities of these lost forms was mainly derived from a careful and laborious comparison of the extinct types with their nearest living congeners. Whatever new victories may be in store for the science of palzontology, the Ossemens Fossiles will remain an im- perishable monument of the genius and industry of one of the first and of the greatest of the pioneers in this region of human investigation.

BiBilocraPny.—LHloge historique de G. Cuvier, by M. Flourens, published as an introduction to the Eloges Historiques of Cuvier. Histoire des Travaux de Georges Cuvier, by M. Flourens, 3d ed. Paris, 1858. " Mort de G.Cuvier," by De Candolle, a notice in the Bibliotheque Universelle, t. xlix. p. 442, Geneva, 1882; Article "Cuvier" in Biographie Universelle, supp. t. lxi. p. 588, Paris, 1836, by Laurillard. Memoirs of Cuvier, by Sarah Lee, London, translated into French by Lacordaire in 1833. (TH, Amis)

CUXHAVEN, or KuxuaFEN, a small seaport-town of Northern Germany, at the mouth of the Elbe, on its left bank, 58 miles W.N.W. of Hamburg, in the detached bailiwick of Ritzebiittel, which forms part of the territory belonging to Hamburg. It has nearly 3900 inhabitants, chiefly pilots and fishermen. The harbour is good and secure, aud is much frequented by vessels delayed in the Elbe by unfavourable weather; it is also the starting point of the Hamburg steamers when the river is frozen over, There is regular communication by diligence with Bremerhafen, and by river with

Hamburg. Though lying ona bare strand, the town is much frequented as a bathing- place by Hamburgers.

CUYABA, or CuraBA, the capital of the Brazilian inland province of Matto Grosso, in 15° 20'S. lat. and 56° W. long., or almost in the heart of the South American continent. It lies about a mile from the left bank of the Cuyaba river, one of the head streams of the Paraguay, at 250 miles by river from the confluence with the main stream, and about 2400 miles from the estuary of the Plata. Its churches, public buildings, and dwelling-houses are generally well- built of brick or of adobe, or of blocks of a conglomerate of pebbles and red clay, plastered and tiled. It is the seat of a bishop, and has a military station and depét, and an arsenal for the construction of small vessels for the protec- tion of the rivers. As early as 1722 a number of Portuguese, attracted by the discevery of gold, formed the settlement of Senhor Bom Jesus de Cuyaba, and two years later, such was the influx of population, it was raised to the rank of a city by the governor of Sao Paulo. Its prosperity dates, however, from 1856, when the navigability of the upper tributaries of the Paraguay had been demonstrated, and when the outlet by the rivers took the place of the former toilsonie caravan passage overland to the Atlantic towns aud ports. Now a regular fortnightly line of Brazilian steamers unites Monte Video and Rio with Curumba on the Upper Paraguay, whence, after the collec- tion of custom duties, the goods are transshipped in smaller steamers and boats to Cuyabdé. The chief import trade is in manufactured goods, hardwares, and salt; the exports are hides, cattle, ipecacuanha, vanilla, and some diamonds. Other products of the district of Cuyabé are manioc, rice, maize, sugar, cotton, tobacco, coffee, and beaus. The popu- ation is estimated at from 18,000 to 20,000,

The Cuyaba river is navigable from 14° 49 S., and from its proximity at this point to the navigation of the Tapajos by its tributary the Arinos, is probably destined to form part of a great future highway between the Amazon and La Plata. Proof of the practicability of this route was atforded by the portage of large canoes, laden with merchandize from Pard, across the water-parting to the Cuyabda river in

1846,

CUYP, the name of a Dutch family which produced two generations of painters. The Cuyps were long settled

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at Dort, in the neighbourhood of which they had a country house, where Albert Cuyp was born and bred. The eldest member of the family who acquired fame was—

JacoB GERRITSZ Cuyp (1575 1—1649), born, it is said, at Dort, and taught by Abraham Bloemaert. of Utrecht, It is difficult to find a greater contrast than that which marks the styles of these two painters, one of whom learned to imitate the mannerisms of the French school, whilst the other persistently clung to the sober reality of nature. J. G. Cuyp's pictures are little known, and are therefore said to be scarce. But he produced portraits in various forms, as busts and half-lengths thrown upon plain back-grounds, or groups in rooms, landscapes, and gardens. Solid and clever as an imitator of nature in its ordinary garb, he is always spirited, sometimes rough, but generally plain, and quite as unconscious of the sparkle conspicuous in Frans Hals as incapable of the concentrated light-effects peculiar to Rembrandt. In portrait busts, of which there are signed examples dated 1624, 1644, 1646, and 1649, in the museums of Berlin, Rotterdam, Marseilles, Vienna, and Metz, his treatment is honest, homely, and true ; his touch and tone firm and natural. In portraying children he is fond of introducing playthings and pets—a lamb, a goat, or a roedeer ; and he reproduces animal life with realistic care. In a family scene at the Amsterdam Museum we have likenesses of men, women, boys, and girls, with a cottage and park. In the background is a coach with a pair of horses. These examples alone give us a clue to the influences under which Albert Cuyp grew up, and explain to some extent the direction which his art took as he rose to manhood.

AtBert Cuyp (1605-1691), the son of Jacob Gerritsz by Grietche Dierichsdochter (Dierich's daughter), was born at Dort. He married in

1658 Cornelia Bosman, a widow, by whom he hadan only daughter. By right of his posses- sions at Dordwyck, Cuyp was a vassal of the county of Holland, and privileged to sit in the high court of the province. As a citizen he was sufficiently well known to be placed on the list of those from whom William Lhe, stadtholder of the Netherlands, chose the regency of Dort in 1672. HIs death, and his burial on the 7th of November 1691 in the church of the Augustines of Dort, are historically proved. It has been said that Albert was the pupil of his father. The scanty evidence of Dutch annalists to this effect seems confirmed by a certain coin- cidence in the style and treatment of father and son, It has been likewise stated that Albert was skilled, not only in the production of portraits, landscapes, and herds, but in the representation of still life. HIs works are supposed to be divisible into such as bear the distinctive marks C. or A. C. in cursive characters, the letters A. C. in Roman capitals, and the name "A. Cuyp" in full. A man of Cuyp's acknowledged talent may have been versatile enough to paint in many different styles. But whether he was as ver- satile as some critics of this generation think is a question not quite easy to auswer. It is to be observed that pieces assigned to Cuyp representing game, shell-fish, and fruit, and inscribed A. C, in Roman capitals (Rotterdam, Amster- dam, and Berlin museums), though cleverly executed, are not in touch or treatment like other pictures of less dubious authenticity, signed either with C. or A. C. or "A. Cuyp" in cursive letters. The panels marked C. and A. C. in cursive are portraits or landscapes, with herds, and interiors of stables or sheds, in which there are cows, horses, and poultry. The subjects and their handling are akin to those which strike us in panels bearing the master's full signature, though characterized, as productions of an artist in the first phase of his progress would naturally be, by tones more uniform, touch more flat, and colour more deep than we find in the delicate and subtle compositions of the

painter's later time. Generally speaking the finished examples of Cuyp's middle and final period all bear his full signature. They are all remarkable for harmonies attained by certain combinations of shade in gradations with colours in contraposition.

Albert Cuyp, a true child of the Netherlands, does not seem to have wandered much beyond Rotterdam on the one hand or Nimeguen on the other. His scenery is that of the Meuse or Rhine exclusively ; and there is little variety to notice in his views of water and meadows at Dort, or the bolder undulations of the Rhine banks east of it, except such as results from diversity of effect due to change of Weather or season or hour. Cuyp is to the river and its banks what Willem Vandevelde is to calm seas and Hobbema to woods. There is a poetry of effect, an eternity of distance in his pictures, which no Dutchman ever expressed in a similar way. His landscapes sparkle with silvery sheen at early morning, they are bathed in warm or sultry haze at noon, or glow with heat at eventide. Under all circum- stances they have a peculiar tinge of auburn which is Cuyp's and Cuyp's alone. Biirger truly says Van Goyen is gray, Ruysdae] is brown, Hobbema olive, but Cuyp " is blond," The utinost delicacy may be observed in Cuyp's manner of defining reflections of objects in water, or of sight from water on ship's sides. He shows great clever- ness in throwing pale yellow clouds against clear blue skies, and merging yellow mists into clive green vegetation. He is also very artful in varying light and shade according to distance, either by interchange of cloud-shadow and sun. gleam or by gradation of tints. His horses and cattle are admirably drawn, and they relieve each other quite as well if contrasted in black and white and black and red, or varied in subtler shades of red and brown. Rich weed-growth is expressed by light but marrowy touch, suggestive of detail as well as of general form. The human figure is given with homely realism in most cases, but frequently with a charming elevation, when, as often occurs, the persons represented are meant to be portraits. Whatever the theme may be it remains impressed with the character and individuality of Cuyp. Familiar subjects of the master's earliest period are stables with cattle and horses (Rotterdam, Amsterdam, Petersburg, and Brussels museums). Occasionally he painted portraits in the bust form familiar to his father, one of which is dated 1649, and exhibited in the National Gallery in London. More frequently he produced like- nesses of ladies and gentlemen on horseback, in which the life and dress of the period and the forms of horses are most vividly represented (Buckingham Palace, Bridgewater Gallery, Louvre, and Dresden Museum). Later on we find hint fondest of expansive scenery with meadows and cattle and flocks, or rivers and barges in the foreground and dis- tances showing the towers and steeples of Dort. Cuyp was more partial

~~to summer than to winter, to noon than to night, to calm than to storm. But some of his best groups are occasionally relieved on dark and gusty cloud (Louvre and Robarts's collection). A few capital pieces show us people sledging and skating or netting ice-holes (Yarborough, Neeld, and Bedford collections). A lovely Night on the Banks of a River, in the Grosvenor collection, reminds us that Cuyp's friend and contemporary was the painter of moonlights, Aart van der Neer, to whom he was equal in the production of these peculiar effects and superior in the throw of figures. Sometimes Cuyp composed fancy subjects. His Orpheus charming the Beasts, in the Bute collection, is judiciously arranged with the familiar domestic animals in the foreground, and the wild ones, to which he is @ comparative stranger, thrown back into the distance. One of his rare gospel subjects is Philip baptizing the Eunuch (Marchmont House, Berwickshire), described as a fine work by Waagen. The best and most attractive of~~

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~~Cuyp's pieces are his Meuse and Rhine landscapes, with meadows, cattle, flocks, and horsemen, and occasionally with boats and barges. In these he brought together and displayed—during his middle and final period—all the skill of one who is at ouce a poet and a finished artist ; grouping, tinting, touch, harmony of light and shade, and true chords of colours are all combined. Masterpieces of acknowledged beauty are the Riders with the Boy and Herdsman in the National Gallery; the Mense, with Dort in the distance, in three or four varieties, in the Bridge- water, Grosvenor, Holford, and Brownlow collections ; the Huntsman (Ashburton) ; Herdsmen with Cattle, belonging to the marquis of Bute ; and the Piper with Cows, in the Louvre. It is well known that the prices paid for Cuyp's pictures in his own time were comparatively low. In 1750, 30 florins was considered to be the highest sum to which any one of his pancls was entitled. At the sale of the Clewer collection at Christie's in 1876 a small Hilly Landscape in Morning Light was sold for £5040, and a View on the Rhine, with cows on a bank, for £3150. Smith bas catalogued 335 of Cuyp's works. It would be difficult now to find more than a third of them. (J. 4. c.)~~

~~CUZCO, a city of southern Peru, the capital of a province of the same name, the ancient capital of the empire of the Incas, and still one of the~~

most important cities of the republic, in 13° 31'S. lat. and 73° 3° W. long., 11,380 feet above the sea, aud 350 miles E.S.E. of Lima. It stands at the head of a fertile valley, nine miles in length, running from south-east to north-west, and bonnded by mountains of considerable elevation. Over the city on the north side rises the famous hill of Sacsahuaman, crowned with the old fortress of the Incas, and separated from the nountains by the deep ravines of the streams called the Huatanay and Rodadero. The chief portion of the city is built between the two streams, with its great placa in the centre. To westward of the Huatanay are two more fine squares, these of the Cabildo and of San Francisco. The houses of the city are built of stone, the lower portion of massive masonry of the times of the Incas, with a light modern superstructure roofed with red tile ; the streets are at right angles, and afford fine vistas. The principal build- ings are the cathedral, the convent of San Domingo (on a part of the site of the ancient Inca temple of the Sun), the Cabildo or Government house, a university founded in 1598, the College of Science and Arts, the Library and Museum of Incarial Antiquities, and various churches. The trade of Cuzco is chiefly in linen, wool, cotton, gold and silver work, leather, and sugar. The population, esti- inated at about 50,000, is chiefly Indian, The roads from Cuzco to other parts of Peru, especially that one which leads towards Quito, are most remarkable for their frail suspension bridges over the deep chasms of the Andes. A railroad is projected to unite Cuzco with the line which has been completed from the coast through Arequipa towards Puno on Lake Titicaca.

The province of Cuzco, the limits of which were some- what curtailed in the formation of the new province of Abancay in 1873, lies partly on the eastern cordillera of the Andes, and slopes thence into the forest plains of the in- terior, along the tributaries of the Ucayali and Maration, to the frontier of Brazil and Bolivia.

CYBELE, or Ruka Cynene,in Greek inythology, was the mother of Zeus and the order of deities of which he was the head. As such she was styled "mother of gods" (Ocdv pajrnp), and her temple called Metroéu. But though thus made to fit into the general system of deities, her worship was originally peculiar to Crete and Phrygia im Asia Minor, in both which places it was accompanied by wild orgiastic dances and iusie on the model of the rites which her first priests and attendants, the Curetes,

~~and panthers.~~

~~crown, and connected~~

~~> lie belonging to Turkey.~~

~~CUZ=CFE~~

~~Corybantes, and Dactyls had held in her honour. It was in Crete that the infant Zeus was secluded and brought up in the guardianship of the Curetes, and there also he was said to have been buried. But the belief in the death of Zeus in this case may have arisen from the tendency of her worship to dwell on the opposites of birth and death as seen in the Phrygian story of Atys, which again, like that of Adonis, seems to illustrate the change in nature from the bloom of spring to the decay of winter. (See ATYs). In Phrygia she was on the one hand the goddess of moun- tains, caves, and haunts of wild animals. Her name Cybele was the Phrygian word for caves. Her proper name there was Agidistis, and she was thought of as attended by lions On the other hand she was a goddess of vine-growing, agriculture, and town-life, wearing a mural in early legends with Midas, Giordins, and Marsyas, who belong also to the cycle of Bacchus, whose nurse she is sometimes called. Marsyas~~

~~perfected the flute which she had invented. Midas and Gordias owed their great wealth to her. worship in Phrygia, and the most sacred place to her any-~~

~~The centre of her~~

~~where, was Pessinus, where in a cave in Mount Dindymon was an image of her in the form, as was said, of a meteoric~~

~~stone, which was afterwards removed to Rome. There also was the grave of Atys. been built, according to tradition, by king Midas. In later~~

~~Her first temple at Pessinus had~~

~~times it was kept up by the kings of Pergamus and the Romans. From Phrygia her worship passed to Lydia, where she was called Cybebe and had a temple in Sardes,~~

~~thence to the coast of Asia Minor, to the mainland of Greece, and lastly to Nome.~~

~~She was figured seated on a throne witb a lion on her lap or under her feet, or with a lion at~~

~~each side, or drawn in a chariot by lions, with a mural~~

~~crown on her head, and in ber hands a sceptre and a cymbal.~~

~~CYCLADES, the southern group of islands in the Aigean Sea belonging to Greece, as distinguished from the northern Sporades of the Greek archipelago, and the southern Sporades of the Asiatic portion of the archipelago, They were originally twelve in number, and derived their name from the fact of their lying in a eirele round the sacred isle of Delos, which was the smallest of the group. The twelve were Andros (the modern Andro), Ceos (Zea), Cythnos ('Thermia), Delos (Mikra Dili), Rhenea (Megali Dili), Myconos (Mykono), Naxos (Naxia), Paros (Paro), Seriphos (Serpho), Siphnos (Sipheno), Syres (Syra), and Tenos (Tino). The modern Creek nomarehy of the Cyclades includes the above islands and - those Amurgo (theancient Amorgos), N io(Ios), Antiparo (Oliaros), Iraklia (Heraclea), Kimolo (Kimolos), Milo (Melos), Polykandro (Pholegandros), Sikino (Sicinos), Santor (Thera), Anaphi (Anaphe), and many other islets and rocks between these, forming together an area of 927 square miles, and having a population in 1870 of 128,299. The islands are generally high, several exceeding 2000 feet mm altitude, and one or two points, as the summits of Andro and Naxin, exceeding 3200 feet ; they have a varied climate and fertile soil, producing corn and fruits, wine and oil. Many of the inhabitants, who are less mixed in race than those of the mainland, are seamen and traders. Hermopolis, on the island of Syra, is the capital of the nomarehy.~~

~~CYCLONE. See ATMosrHERrE, CLIMATE, and METEOR- OLOGY.~~

CYCLOPES (KvxAwmes), Tite, in Greek mythology; worked with Vulcan at his forge in the heart of burning moun tains, especially in Mount tna, the Lipara islands, 22 Lemnos. Their names, Brontes, Steropes, and Arges, a dicate the noise and flash of a volcanic eruption. ee: them dangerous to his rule by their enormous — 4 Kronos had confined them in the centre of the earth, 1

the war between the gods and Titans they were set free by Zeus, and furnished him with his thunder and lightning. Next they appear as the builders of walls of hnge stones, such as those of Mycenex, to build which they had been brought from Lycia, a volcanic country. But here they are seven in number, and seein to be of a different race, Different also are the Cyclopes of the Odyssey, in which they appear as a race living individually in caves,—with large herds of sheep and goats,—having only one eye, in the centre of the forehead, of enormous 'strength, and fearless of gods or men. The great strength and the one large round eye, from which their name is derived, they have in common with the volcanic Cyclopes, but as a race they seem to be connected with Neptune and the forces of the sea. Polyphemus was a son of the sea god.

CYNICS, a Greek sect, whose name is derived either

from the fact that they originally met in the gymnasium called Cynosarges, or, in scorn of their habits and temper, from the word «vwy, a dog. The founder of the sect was Antisthenes, a disciple of Socrates, who, adopting the Socratic doctrines that the sole aim of philosophy is to attain the knowledge of right conduct, and that the summum bonum is not to be found in pleasure but in virtue, pushed them to an extreme, teaching that both pleasure and theoretical knowledge are to be wholly despised, and that to be independent of outward circumstances is the highest good. All that is artificial was condemned ; and the Cynic was marked by his intense scorn of all other men, and the insolence with which he expressed it. The later Cynics, losing the Cynic virtue of self-control, but retaining the Cynic maxim of living according to nature, sank into mere beggars and brutal sensualists. From the time of Socrates the succession of Cynic teachers was unbroken for about a century ; and in the Ist century a.p. Cynicisin re-vived. The leading earlier Cynics were Antisthenes, Dio- genes of Sinope,

Crates, and Zeno ; and the chief later Cynics were Demetrius the friend of Seneca, and Ginomaus and Demonax, who were both alive in the time of Hadrian. For further details, see the biographies of the principal Cynics. — CY-PRES a principle adopted by the Court of Chancery in dealing with trusts. When the charitable purpose Intended by a testator cannot be carried into effect, the court will apply the funds to some other purpose, as near the original as possible. For instance, a testator having left a fund to be divided into four parts—one-fourth to be used for " the redemption of British slaves in Turkey and Barbary," and the other three-fourths for various local charities—it was found that there were no British slaves in Turkey or Barbary, and as to that part of the gift therefore the testator's purpose failed. Instead of allowing the por- tion of the fund devoted to this unpossible purpose to lapse to the next of kin, the court devoted it to the purposes Specified for the rest of the estate. This doctrine is only applied where "a general intention of charity is manifest " In the will, and not where ono particular object only was present to the mind of the testator. Thus a testator, having left money to be applied in building a church in a Particular parish, and that having been found to be impos- sible, the fund will not be applied cy-prés, but will go to the next of kin.

CYPRESS (Cupressus), a genus of the sub-order Upressinece, natural order Clonifere or Pinacew, represented Y evergreen aromatic trees and shrubs indigenous to the

South of Europe, the Kast Indics, China, California, Mexico, Guatemala, and North America. 'The leaves of the cypresses are scale-like, overlapping, and generally in our rows; the female catkins are roundish, and fewer than the male ; the cones consist of from 6 to 10 peltate Woody scales, which terminate in a curved point, and open

when the seeds are ripe; the seeds are numerous and winged. All the species exude resin, but no turpentine. C. sempervirens, Linn., the common cypress, 1s a native of the Levant and Persia. It is a tapering, flame-shaped tree resembling the Lombardy poplar ; its branches arc thickly covered with

small, imbricated, shining-green leaves; the male catkins are about 3 lines in length; the cones are between 1 and 14 inches in diameter, sessile, and generally In pairs, and are made up of large angular scales, slightly convex exteriorly, and mucronate.in the centre. In Britain the tree grows to a height of 40 feet, in its native soil to 70 or 90 feet. In thrives best on a dry, deep, sandy loan, on airy sheltered sites at no great elevation above the sea, It was introduced into Great Britain before the middle of the 16th century. In the climate of the south of England its rate of growth when young is between 1 and 14 feet a year. The seeds are suwn in April, and come up in three or four weeks ; the plants require protection from frost during their first winter. The timber of the cypress is hard, close-grained, of a fine reddish hue, and very durable. Among the ancients it was in request for poles, rafters, juists, aud for the construction of wine-presses, tables, and nisical instruments ; and on that account was so valuable that a plantation of cypresses was considered a sufficient dowry for a daughter. Owing to its durability the wood was cployed for mummy cases, aud images of the gods ; a statue of Jupiter carved out of cypress is stated by Pliny to have existed 600 years without showing signs of decay. The cypress dvors of the ancient St Peter's at Rome, when removed by Eugenius IV., were about 1100 years old, but nevertheless in a state of perfect preservation. Laws were engraved on cypress by the ancients, and objects of value were preserved in receptacles made of it; thus Horace speaks of poems levi servanda cupresso. The cypress, which grows no more when once cut down, was regarded as a symbol of the dead, and perhaps for that reason was sacred to Pluto; its branches were placed by the Grecks and Romans on the funeral pyres and in the houses of their departed friends. Its supposed ill-boding nature is alluded to in Shakespeare's Henry VZ., where Suffolk desires for his enemies " their sweetest shade, a grove of cypress trees. ' The cypress was tlie tree into which Cyparissus, a beauti- ful youth beloved by Apollo, was transformed, that he might grieve to all time (Ovid, Afet., x. iii.). In Turkish cemeteries tle cypress— "Dark tree, still sad when others' grief is fled, The only constant mourner o'er the dead '"— is the most striking feature, the rule being to plant one for each interment. The tree grows straight, or nearly so, and has a gloomy and forbidding, but wonderfully stately aspect. With advancing age its foliage becomes of a dark, almost black, hue. Gilpin calls the cypress an architectural trec ; "no Italian scene," says he, " is perfect without its tall spiral form, appearing as if it

were but a part of the picturesquely disposed edifices which rise from the ie ground against the distant landscape. Phe cypress) Somma, in Lombardy, is believed to have been in existence in the time of Julius Cesar; it is about 121 feet in height, and 23 feet in circumference. Napoleon, in making the rvad over the Simplon, deviated from the straight line in order to leave it standing. The cypress, as the olive, is found everywhere in the dry hollows and high eastern slopes of Corfu, of the scenery of which it is a Its superior luxuriance in that island is attribute y Professor Ansted to the calcareous nature of the soil. As an ornamental tree in Britain the cypress is useful to break the outlinc formed by round-headed low shrubs and trees. The berosh, or beroth, of the Hebrew Scriptures, translated | "fr" in the authorized version, in | Kings v. Sand vi. 15, 2 Chron. i. 8, and many other aati is supposed to

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signify the cypress, which, according to Pococke, is the only tree that grows towards the summit of Lebanon. The conimon or tall variety of C. sempervirens is known as C. fastigiata ; the other variety, C. hortzontalis, which is little planted in England, is distinguished by its hori- zontally-spreading branches, and its likeness to the cedar. The species C. torulosa of North India, so called from its twisted bark, attains an altitude of 150 feet ; its branches are erect or ascending, and grow so as to form a perfect cone. In the Kulu and Ladakh country the tree is sacred to the deities of the elements. It has been introduced into England, jbut does not thrive where the winter is severe. The wood, which in Indian temples is burnt as incense, is yellowish-red, close-grained, tough, hard, readily worked, durable, and equal in quality to that of the deodar. Another East Indian species, C. lusitanica, or glauca, the "Cedar of Goa," is a handsome tree, 50 feet in height when full-grown, with spreading branches drooping at their extremities ; it has been much planted in Portugal, especially in the neighbourhood of Cintra. The species C. Lawsoniana, a native of the Shasta and Scott valleys in North California, where it attains a, height of 100 feet, was introduced into Scotland in 1854; it is much grown for ornamental purposes in Britain. Other Californian cypresses are C.

~~macrocarpa, which is 60 feet high when mature, and C. attenuata, C. Goveniana, and C. Macnabi- ana, shrubs varying from 6 to 10 feet in height. The Mexican species, C. Knightiana, grows to 120 feet. C. funebris is a native of the north of China, where it is planted near pagodas. C. Nutkaensis, the Nootka Sound cypress, was introduced into Britain in 1850, It is a hardy species, reaching a height of from 80 to 100 feet. See Gordon's Pinetum, 1875. (F. H. B.) CYPRIAN [Tuascius Cacinius Cyprianus] (c. 200-258), bishop of Carthage in the 3d century, is one of the most illustrious names in the early history of the church, and one of the most notable of its early martyrs. He was born about the year 200; or, at least, this is the most reasonable conjecture as to the date of his birth, for there is no clear evidence on the subject, nor as to his age at the time of his martyrdom, which took place on the 14th Sep- tember 258. He was of patrician family, and highly edu- cated, and for some time occupied as a teacher of rhetoric in Carthage, in the neighbourhood of which he was born. He had either inherited or acquired considerable wealth. Of an enthusiastic temperament, accomplished in classical literature and the rhetorical art which he taught, he seems while a pagan to have courted discussion with the converts to Christianity. Confident in his own powers, he entered ardently into what was no doubt the great question of the time at Carthage as elsewhere. He sought to vanquish, but was himself vanquished by, the new religious force which was making such rapid inroads on the decaying paganism of the Roman empire. Cecilius, a presbyter of Carthage, is supposed to have been the instrument of his conversion, and he assumed this name accordingly at his baptism, which seems to have taken place about 245 or 246. Cyprian carried all his natural enthusiasm and brilliant powers into his new profession. He devoted his wealth to the relief of the poor and other pious uses ; and so, accord- ing to his deacon Pontius, who wrote a diffuse and vague account of his 'life and passion," " realized two benefits— the contempt of the world's ambition, and the observance of that mercy which God has preferred to sacrifice." The result of his charity and activity as a Christian convert was his unanimous call by the Christian people to the head of the church in Carthage. "His reluctant diffidence was overpowered by the acclamations of the whole city, who euvironed his house aud compelled him by their friendly violence to assume the distinguished and, it might be,~~

dangerous office. He yielded to preserve the peace of the city.

The time was still one of fierce persecution directed against the Christians according to the-temper or caprice of the Roman emperors ; and the head of the church at Carthage became a prominent object of attack. During the persecution of Decius in 250 he was exposed to imminent danger, and was compelled for a time to seek safety in retreat. Under Gallus, the successor of Decius, the perse- cution was relaxed, and Cyprian returned to Carthage. Here he held several councils for the discussion of the affairs of the church, especially for grave questions as to the rebaptism of heretics, and the re-admission into the church of the Japsi, or those who had fallen away through fear during the heat of the Decian persecution. Cyprian, although inspired by lofty notions of the prerogatives of the church, and inclined to severity of opinion towards heretics, and especially heretical dissentients from the divine author- ity of the episcopal order and unity of Christendom, was leniently disposed towards those who had temporarily fallen from the faith. He set himself in opposition to Novatian, a presbyter of Rome, who advocated their permanent exclusion from the church; and it was Cyprian's in- fluence which probably guided the tolerant measures of the Carthaginian synods on the subject. This question plunged him into controversy, of which, as well as many other matters, we have an interesting glimpse in the numerous letters which he wrote during his episco- pate, and which have been preserved to our time.

Among the early documents of church history there are few more interesting memorials then these letters of Cyprian, addressed to a great variety of friends, particularly to two bishops of Rome, Cornelius and Stephen, and dealing with many points of church discipline and doctrine. They show clearly the substantial equality of all Christian bishops at the time, who all equally received the name of "pope" (papa), and addressed each other as colleagues. The bishop of Carthage, for example, speaks of "his brother " the bishop of Rome, and does not hesitate to dis- pute his opinion whenit does not seem to hima good or sound one. Stephen of Rome had espoused the cause of one Basilides, a bishop of Spain, who had been deposed from his see; but Cyprian manfully defends (Zpist. lxvii.) the sentence

pronounced against the latter, and does not hesitate to say in the same epistle that Basilides had gone to Rome and deceived there his colleague Stephen (Stephanum collegam nostrum fefellit). Some of the letters were written during his retirement under the Decian persecution—the forty, or nearly that number, which stand first in the series,—- others belong to the later period of his life, and a few to a still earlier period. It is by no means easy to determine their several dates, as the first of the series (according to Migne's order, that usually followed), which is one of the most interesting of the whole, is without any chronological indication. We give a sentence or two from this letter, as showing the more human, poetical, and pleasing aspect of Cyprian's character. It is the vintage time when he writes to his "dearest Donatus," and both the season and the place, he says, invite to repose. "The pleasant aspect of the gardens harmonizes with the gentle breezes of a mild autumn in soothing and cheering the senses; . . . . the neighbouring thickets insure us solitude; and the vagrant trailings of the vine branches, creeping in pendant mazes among the reeds that support them, have made for us a leafy shelter. Pleasantly here we clothe our thoughts in words."

Valerian followed Gallus upon the imperial throne in 253, and the persecutions of the Christians were soon renewed. Cyprian was at first banished from Carthage, but found refuge in a pleasant retreat at Ceribis, " near the sea-shore, in a spot shaded with verdant groves, beside a

clear and healthful stream of water." But soon he was recalled, taken into custody, and finally condemned to death. The severity of Valerian spared the mass of the Christian people, and vented itself chiefly on the bishops, who refused to sacrifice to the emperor. When brought before the proconsul, the great bishop of Carthage was briefly interrogated: " Art thou Thascius Cyprian, the bishop of so many impious men? The emperor com- mands thee to sacrifice." Cyprian replied, 'I will not sacrifice ;" and, persisting in his refusal notwithstanding remonstrances, he was condemned to death. On hearing his sentence Cyprian only said, "God be thanked ; " and, being conducted to a neighbouring field, he was beheaded. Besides his letters, various brief treatises of Cyprian have descended to modern times, on such

~~subjects as '* The Lapsed," "The Unity of the Church," "'the Lord's Prayer," '"Works and Alms." But the characteristics of his time and of his own mind are chiefly to be sought in his letters. A general account of him will be found in any of the larger church histories, as those of Milman, Neander, Schaff, . (J. T.) CYPRUS, one of the largest islands in the Mediterranean, situated in the easternmost basin of that sea, at nearly equal distance from the coasts of Asia Minor to the~~

~~C.Kormakiti==.~~

~~Island of Cyprus,~~

~~north and of Syria to the east. The headland of Cape Kormakiti in Cyprus is distant about 46 miles from Cape Anamur in Cilicia, and its north-east point, Cape St Andrea, is about 60 miles from Latakieh in Syria. It lies between 34° 30' and 35° 40' N. lat., and between 32° 15' and 34° 35' E. long., so that it is situated in almost exactly the same latitude as Crete. Its great- est length is about 145 miles, from Cape Drepano in the west to Cape St Andrea in the north-east, and its greatest breadth, from Cape Gata in the south to Cape Kormakiti in the north, reaches nearly 60 miles; while it retains an average width of from 35 to 50 miles through the greater part of its extent, but narrows suddenly to less than 10 miles in about 34° long., and from thence sends out a long narrow tongue of land towards the E.N.E. for a distance of more than 45 miles, terminating in Cape St Andrea. It is the third largest island in the Mediterranean, considerably exceeding in area both Corsica and Crete. Mountains.—Great part of the island is occupied by two mountain ranges, both of which have a general direction from west to east. Of these the most extensive, as well as the most lofty, is that which fills up almost the whole southern portion of the island, and is generally designated by modern geographers as Mount Olympus, though that name appears to have been applied by the ancients only to one particular peak. The highest summit is known at the present day as Mount Troédos, and attains an elevation of 6590 feet. It sends down subordinate ranges or spurs, of considerable altitude, on all sides, one of which extends to Cape Arnauti (the ancient Acamas), which forms the north-west extremity of the island, while others descend on both sides quite to the northern and southern coasts.**

~~The main range is continued eastwards by the lofty summits~~

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~~known as Mount Adelphi and Mount Machera (both. of them, however, considerably inferior to Troddos) until it ends in the somewhat isolated peak called Oros Stavro, or Hill of the Holy Cross. This mountain, which is evidently the one designated by Strabo as Mount Olympus, is only 2300 feet high, but is a conspicuous object from Larnaca, from which it is only 12~~

~~miles distant, and is well known from being frequented as a place of pilgrimage.~~

~~The northern range of mountains, which is not known by any collective name, begins at Cape Kormakiti (the ancient Crommyon) and is continued from thence in an unbroken ridge to the eastern extremity of the island, Cape St Andrea, a distance of more than 100 miles, It is very inferior in elevation to the southern range, its highest summits not attaining to more than about 3200 feet, while in the eastern portion they but rarely exceed 2000 feet. But it is remarkable for its continuous and unbroken character—consisting throughout of a narrow, but rugged and rocky ridge, descending abruptly to the south into the great plain of Lefkosia, and to the north to a narrow plain bordering the coast.~~

~~The Messaria.—Between these two mountain ranges lies a broad tract of plain, extending quite across the island from the Bay of Famagosta to that of Morphu on the west, through a length of nearly 60 miles, with a breadth vary- ing from 10 to 20 miles. It is known by the name of the Messaria, and is watered by two streams, both of which descend from the mountains on the south; but, on reaching the plain, the one turns eastward and flows into the Bay of Famagosta, @ose to the ruins of Salamis ; the other flows westward into the Bay of Morphu. The greater part of this plain is open and uncultivated, and presents nothing but barren downs; but corn is grown in considerable quantities in the northern portions of it, and there is no doubt that the whole is readily susceptible of cultivation. It is remarkable that Cyprus was celebrated in antiquity for its forests, which not only clothed the whole of its mountain ranges, but covered the entire central plain with a dense mass, so that it was with difficulty that the land could be cleared for cultivation. At the present day the whole plain of the Messaria is utterly bare and treeless,~~

~~and it is only the loftiest and central summits of Mount~~

~~Olympus that still retain their covering of pine woods. The disappearance of the forests has naturally affected the rivers, which are mostly mere torrents, dry in summer. The most considerable is that called in ancient times the Pedizeus, which, as already mentioned, traverses the plain of the Messaria, and falls into the sea near Salamis. But even this does not reach~~

the sea in summer, and its stagnant waters form marshes which contribute much to the unhealthy character of the plain.

Minerals.—Next to its forests, which long supplied the Greek monarchs of Egypt with timber for their fleets, Cyprus was celebrated among the ancients for its mineral wealth, especially for its mines of copper, which were worked from a very early period, and continued to enjoy such reputation among both Greeks and Romans that the modern name for the metal is derived from the term of Hs Cyprium or Cuprium by which it was known to the latter. According to Strabo the most valuable mines were worked at a place called Tamasus, in the centre of the island, on the northern slopes of Mount Olympus, but their exact site has not been identified, and no miues are at present worked in Cyprus. Besides copper, according to Strabo, the island~ produced considerable quantities of silver ; and Pliny records it as producing various kinds of precious stones, among which he mentions diamonds and emeralds, but these were doubtless nothing more than rock crystal and beryl. But the mineralogy and geology of Cyprus have as yet been very imperfectly explored. Salt,

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which was in ancient times one of the productions for which the island was noted, is still made in large quantities, and there are extensive salt works in the neighbourhood of Larnaca and Limasol.

Vegetable Products.—Cyprus was noted among the ancients for its fertility and beauty ; and under the Venetian rule it carried on an extensive trade in its various natural productions ; but this has greatly declined in modern times. Besides corn, however, the island exports considerable quantities of wine, oil, madder, the fruit of the carob tree, silk, and wool. Tobacco and cotton are also grown in small quantities, and their cultivation might doubtless be largely increased. The small plains at the foot of the range of Mount Olympus, between the underfalls of the mountains and the sea, as well as the narrow strip of level land along the north coast, though limited in extent, are districts of great fertility ; the latter especially is described by Colonel Leake as one of the most beautiful and best cultivated districts in Turkey. The great central plain, on the contrary, is in many parts marshy and unhealthy ; and indeed the whole interior of the island suffers much

~~from unhealthiness, and is subject to fevers of a peculiarly dangerous description.~~

~~Harbours.—One of the greatest disadvantages of Cyprus is the want of ports, there not being a good natural harbour in the whole island. Larnaca and Limasol, which are the chief places of trade at the present day, have nothing but mere roadsteads ; and Salamis, which was the chief port of the island in antiquity, as well as Famagosta, which held that position under the Venetians, were only artificial har- bours upon an open sandy coast. 'Tzerinia, on the north coast, which serves as the place of direct communication with the mainland of Asia Minor, has a very small and bad port, which, bad as it is, is the only one on this side of the island.~~

~~Towns.—The only towns in Cyprus worthy of notice are the following. 1. Lefkosia, or, as it is more commonly called, Nicosia, has since the time of the Lusignan kings been the capital of the island. 2. Famagosta, on the east coast, near the ruins of Salamis, also first rose to importance under the Lusignan dynasty, by whom it was fortified, and continued under the Venetians to be the chief~~

~~port, as well as the strongest fortress in the island. It~~

~~became celebrated by its heroic defence against the Turks in 1571. It still retains its external walls, but is a very poor and decayed place, with only a few hundred inhabi- tants. 3. Larnaca, on the south-east coast, on the site of the ancient Citium, is now the chief place of trade, and the most rising and flourishing town in the island. It con- tains from 5000 to 6000 inhabitants, and consists of two portions—the old town, a short distance inland, and the Marina, immediately facing the sea, where the foreign con- suls reside, and foreign steamers touch, which gives a degree of life and activity to the place unknown to the rest of Cyprus. Recent excavations have discovered here many interesting remains of the ancient city of Citium. 4, Limasol, on the south coast, some miles west of the site of Amathus, is still a place of considerable trade, though partially eclipsed by the rising prosperity of Larnaca. It is the principal place of export of the wines of Cyprus, which enjoy a high reputation throughout the Levant. 5. Baffo, or Papho, on the site of the ancient Paphos, called for distinction's sake New Paphos, at the south-west angle of the island, has a small but insecure port, and is a very~~

~~small place, though still the seat of a Greek bishop. 6. Tzerini or Tzerinia (the ancient Kerynea) has been already mentioned. It retains its old Venetian fortifications, and has therefore still the air of a town, but is a very inconsider- able place. >~~

~~The population of the island, which is said to have~~

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~~amounted under the Venetians to not less than 1,000,000 (probably, however, a great exaggeration), is now estiniated at about 135,000 souls, of whom about two-thirds are Greeks, the rest principally Turks.~~

~~History.—The early history of Cyprus is very obscure and imperfectly known. It is certain, indeed, that it was colonized at a very early period by the neighbouring Pheenicians, who introduced the worship of the goddess Ashtaroth (called by the Greeks Astarte, and identified by them with their own Aphrodite), for which the island always continued to be celebrated in ancient times. But nothing is historically known of the period or extent of these Pheenician settlements. Equally uncertain is the history of the Greek colonies in the island, which are found in historical times existing side by side with the Phcenicians., Their foundation was ascribed by popular legend and tradition to the heroic ages—Salamis, for instance, being supposed to liave been founded by Teucer, the brother of Ajax—but there can be little doubt that they were in reality posterior to the Phcenicians. Of the relations between the two we know little, except from conjecture or inference ; but it seems probable that the Greeks gradually established a political supremacy, while the Phcenicians continued to form an important element in the population, and exercised an influence over the manners and customs, arts, and religious rites of the inhabitants in general, wholly different from anything found in Crete, Rhodes, or the other islands of the Augean. The first positive fact in the history of Cyprus is its conquest by the Egyptian king Amasis in the 6th century B.c. (Herodot., ii. 182). It did not, however, long continue subject to the Egyptian monarchy, having revolted on occasion of the invasion of Egypt by Cambyses (525 B.c.), when it declared in favour of the Persians, and became thenceforth a tributary province of the Persian empire.~~

~~On occasion of the Ionian revolt in 500 B.c. the Cyprians were persuaded to take part in the insurrection, but after a year's interval were again reduced to subjection, and contributed a contingent of not Jess than 150 ships to the Persian fleet under Xerxes (Herod., vii. 90)—a striking proof of the power and prosperity they at this time possessed. During the subsequent wars between the Greeks and Persians Cyprus was frequently the scene of hostilities; and after the peace of Antalcidas (387 3.c.), Evagoras, king of Salamis, succeeded in extending his authority over the greater part of the island, as well as in rendering himself independent of the Persian monarch. This state of things, however, did not last long; and after the death of Nicocles, the son and successor of Evagoras, the island again became tributary to the Persian empire. But after the battle of Issus, when Alexander advanced into Phcenicia, all the cities of Cyprus declared in his favour, and sent their fleets to assist him in the siege of Tyre.~~

~~During this period, though the island was subject, with brief intervals, to Persia, the several cities enjoyed the privi- lege of local self-government. Their institutions, however, presented one marked difference from those of other Greek cities, that they were always governed by kings, of whom there were not less than nine in the island. The cities which were the seats of these petty monarchies were :—1. Salamis, on the east coast, the most important of the Greek colonies, which often held a kind of supremacy over the whole island; 2. Citium, on the same site as the modern Larnaca, originally a Pheenician settlement, and which always retained a predominant Pheenician character, and became only partially Hellenized; 3. Amathus, on the south coast, near Limasol, also a Phcenician colony; 4. Curium, some miles further west, at a spot now called Episkopi; 5. Paphos, at the south-west angle of the~~

~~CYPRUS~~

~~island, sometimes called New Paphos, inforder to dis tinguish it from the more ancient Phcenician city of the name, called in the days of Strabo Pale Paphos, which was one of the principal seats of the worship of Astarte, the Phoenician Venus; 6. Marium, afterwards called Arsinoé, on the north coast, at a short distance from the promontory of Acamas ; 7. Soli, on the same coast, further east; 8. Kerynea, which still retains its ancient site and~~

~~name as Tzerinia ; 9. Lapathus, or Lapethus, on the same coast, intermediate between the two cities last mentioned. Others, however, assign this ninth place to Chytri, a town of the interior, on the road from Salamis to Kerynea, and it is likely that the sovereign cities were not always the same. Several other towns are mentioned by Strabo and Ptolemy, which were apparently in earlier times subject to those above enumerated. Idalium and Golgos, the names of which are celebrated from their connection with the worship of Venus, seem to have been merely sanctuaries or holy places, which had grown up around the temples of the goddess, and, in Greek times at least, were never towns of importance.~~

~~After the death of Alexander, the possession of Cyprus, so important from its position and on account of its inexhaustible forests, became an object of contention among his successors. After various vicissitudes it passed into the hands of Ptolemy, king of Egypt; but in 306 B.C. a great effort to recover it was made by Demetrius, the son of Antigonus, who reduced the whole of the rest of the island and laid siege to the capital city of Salamis. The attempt of Ptolemy, who arrived with a great fleet, to raise the siege, led to one of the most memorable naval battles in all antiquity, in which Ptolemy was utterly defeated ; and Salamis, with all the rest of Cyprus, passed into the power of Demetrius. He did not, however, long retain his new acquisition; the island was recovered by Ptolemy in 295 B.c., and continued thenceforth to form one of the most valuable possessions of the Greek monarchs of Egypt. It was generally placed under the government of a man of the highest rank, who was often a kinsman of the Egyptian king ; and, during the dissensions of the royal family which marked the declining period of the Ptolemaic dynasty, Cyprus was more than once held by one of the rival candidates as an independent sovereignty. In this manner it was governed as a separate kingdom by Ptolemy Lathyrus for not less than 18 years (from 107 to 89 3B.c.), and it was held by a younger brother of Ptolemy Auletes, in 58 B.c., when it was determined by the Romans to dis-possess him,—an act of shameless aggression, which was proposed by the tribune Clodius, and reluctantly carried into effect by Cato. From this time Cyprus became a Roman province; it was at first united with Cilicia, but afterwards was constituted as a separate government.~~

The most remarkable event in the history of Cyprus, while it was under the Roman empire, was a great revolt of the Jews, who had established themselves there in large numbers, in which they are said to have destroyed not less than 240,000 of the other inhabitants GF aap.). Christianity, which had been introduced into the island by St Paul, quickly rose to a flourishing condition, and not Jess than thirteen bishoprics were established in the island. After the division of the Roman empire Cyprus naturally passed, with all the neighbouring countries, into the hands of the Eastern or Byzantine emperors, to whom it continued subject, with brief intervals, for more than seven centuries. In 646 the Arabs under the caliph Othman made them- selves masters of the island, and destroyed the city of Salamis, which had until that time continued to be the capital. But.it was recovered by the Greek emperors two years afterwards ; and, though again conquered..by- the Arabs under the reign of Haroun el Raschid (802), it

did not long remain in their hands, and lapsed again into the power of the Byzantine empire. In 1184 Isaac Comnenus, the nephew of the reigning emperor, established himself in possession of Cyprus as an independent sovereignty ; but during the third crusade (1195) it was wrested from his hands by Richard L, king of England, who bestowed it upon Guy de Lusignan, the titular king of Jerusalem, as some compensation for the loss of the holy city.

From this time Cyprus was governed for nearly three centuries by a succession of kings of the same dynasty, who introduced into the island the feudal system and the other institutions of Western Europe. During the latter part of this period, indeed, the Genoese made themselves masters of Famagosta—which had risen in place of Salamis to be the chief commercial city in the island—and retained possession of it for a considerable time ; but it was recovered by King James II., and the whole island was reunited under hisrule. His marriage with Catherine Cornaro, a Venetian lady of rank, was designed to secure the support of the powerful republic of Venice, but had the effect after a few years, in consequence of his own death and that of his son James IIL, of transferring the sovereignty of the island to his new allies. Catherine, feeling herself unable to con- tend alone with the

increasing power of the Turks, was induced to abdicate the sovereign power in favour of the Venetian republic, which at once entered into full possession of the island (1487). ©

The Venetians retained their acquisition for about eighty years, notwithstanding the neighbourhood of the Turks. It was not till 1570 that the latter, under Selim IT, made a serious attempt to conquer the island, in which they landed an army of 60,000 men. The greater part of the island was reduced with little difficulty ; N icosia, the capital, was taken aftera siege of 45 days, and 20,000 of its inhabitants put to the sword. Famagosta alone made a gallant and protracted resistance, and did not capitulate till after a siege of nearly a year's duration (August 1571). The terms of the capitulation were shamefully violated by the Turks, who put to death the governor Bragadino with the most cruel torments. Since that time Cyprus has remained in the hands of the Turks, and its history has been almost ablank. A serious insurrection broke out in 17 64, but was speedily suppressed ; another in 1823 became the occasion of a frightful massacre of the Greek population. Mean- while the prosperity of the island was continually declining, it is only of late years that the increasing commerce of the western nations of Europe with the Levant has given some stimulus to trade, and encouraged the cultivation of the natural productions of an island which, under more favour- able circumstances, might be one of the richest in the Mediterranean.

Though Cyprus has been visited and described by several travellers—among others by Dr Pococke (Description of the Hast, Lond. 1743), by Mariti (Viaggi per Visola Cipro, 1769), and more recently by M. Seiff (Recsen in der Asiatischen Turker, 8vo, Leipsic, 1875)—there is no full and com- prehensive account of it, such as we possess of Crete and many parts of Asia Minor. The work of Engel (Kypros: ene Monographie, 2 vols. 8vo, Berlin, 1841) is a diligent compilation of all that could be gathered from ancient authorities concerning the geography, history, and mythology of the island, but was not based upon any original researches. Its geology and natural history are still very imperfectly known, and its antiquities had, until lately, been almost entirely neglected. But within the last few years extensive excavations have been carried on in different parts of the island—especially at Golgos, Idalium, and Curium—by Mr Lang and General de

Cesnola, which have brought to light a vast number of statues and other works

of art of the highest interest, as throwing light on the re- ligion and mythology of the inhabitants—which appear to have always presented a singular mixture of the Hellenic and Oriental elements—as well as displaying a peculiar style of art, in some degree intermediate between that of Assyria and continental Asia on the one hand and the early Greek sculptures on the other. Unfortunately these collections have been removed to New York, while no detailed description of them has yet been published. It is, however, announced that General de Cesnola is engaged in a compre- hensive work giving an account of his researches and their results, which will doubtless throw much light on the ancient geography and history of Cyprus.! (E. H. B.) CYRENAICA, or PENTAPOLIS, in ancient geography, a district of Africa, on the shores of the Mediterranean Sea, lying exactly opposite to Greece, at the distance of about 250 miles. It received the name of Cyrenaica from Cyrene, its chief city ; and that of Pentapolis from the fact of its containing five principal cities, Berenice or Hesperus, Barce, Cyrene, Apollonia, and Arsinoé or Teucheira, now identified respectively with Benghazi, El] Merdj, Grennah or Shahat, Marsoe, Sousah, and Tocra. The district extended inland about 80 miles, and included that portion of the African continent which stretched from the frontier of Egypt on the east to the borders of Africa Propria on the west which were marked by the tumuli of Ars Phile- norum, On its southern frontier Cyrenaica is protected from the scorching winds of the Sahara by a range of lofty moun- tains which descend in gradual slopes to the sea, and pro- duce within a small compass a great variety of climate and temperature. Its vegetable products consequently comprised all the more important species to be found in the tropical and temperate zones ; and, as its position was admirably adapted for commerce, nothing was wanting but an enter- prizing population to make it one of the most valuable countries in the world, The people of Thera, under Battus, a native of that island, were the first to colonize Cyrenaica, After a slight opposition from the native tribes, they estab- lished themselves in the country, and founded Cyrene in 631 B.c. There soon sprang up in advantageous situations other cities which, while

~~acknowledging Cyrene as the capital of the country, were really independent, and at length threw off its yoke altogether. After the invasion of Cambyses the regal form of government was entirely abolished, and the republican substituted in its room. Under the Ptolemaic dynasty of Egypt (with which country Cyrenaica was incorporated in 321 B.¢.), Cyrenaica rose into~~

~~'In 1868 Mr R. H. Lang discovered the site of a temple at Idalium (Dali), containing a large number of statues in calcareous stone, of which a selection was acquired by the British Museum along with a bilingual inscription—in Phenician and Cypriote—found there also. From this inscription Mr George Smith obtained the key to the Cypriote language, which had not previously been deciphered, and which now proves to be a dialect of Greek written in a local character. With this key Dr Birch has published a reading of the Duc de Luynes tablet, known as the 'tablet of Dali" in the Transactions of the Soc. of Bib. Archeology, vol. i. pt. ii. 1872. Dr Brandis in the Mon- atsbericht of the Berlin Academy, 1873, has given a full list of all the words of Cypriote that are now fairly made out, and since then a collection of Cypriote inscriptions (Sammlung Kyprischer Inschriften, Jena, 1876) has been published by Moritz Schmidt. An account of Mr Lang's excavations, and the sculptures discovered by him, will be found in the Transactions of the Roy. Soc. Bits, 2d ser. xi: pt. i. At the same time excavations were being carried on at the various ancient sites of Cyprus by the American consul, General de Cesnola, and were continued up to 1876, the result being the discovery of an enormous quantity of sculpture, inscriptions, pottery, gold ornaments, gems, and other articles of treasure stored up in temples or in tombs. Those antiquities have been acquired by the Museum of New York. The most interesting part of his discovery was the treasure from the underground chamber of a temple at Curium, includ- Ing a pair of solid gold~~

~~great importance from the extent and value of its commerce. In 96 B.c. it was bequeathed by will to the Romans by Apion, the last lineal representative of the Ptolemies. Soon afterwards, but at what date is not absolutely fixed, it became a Roman province, and along with the island of~~

Crete was governed by a Roman proconsul. The commer- cial prosperity of Cyrenaica, however, continued unimpaired till the revolt of the Jews in the province during the reign of Trajan. This revolt was quelled only after the most bloody atrocities had been perpetrated on both sides ; and the population was so much diminished in the contest, that the native tribes recommenced their incursions, and overran the province up to the walls of the principal cities. In the middle of the 7th century the whole country passed into the hands of the Saracens. From that time till the present the country has been occupied by tribes of wandering Arabs, nominally subject to the pasha of Tripoli.

See Thrige, Historia Cyrense, 1819 ; in which all the pas- sages of the ancient writers about Cyrene are brought together ; Gottschick, Geschichte der Griindung und Blite des Hellen. Staats in Cyrene, 1858; Falbe and Lindberg's Numismatique de l' Ancienne Afrique ; and Grote's History of Greece, vol. iv.

CYRENAICS, a Greek school of philosophers, so called from Cyrene, the birth-place of their founder Aristippus, who was a disciple of Socrates. They held that the one aim in life is to enjoy as many moments of as intense pleasure as possible. The pleasures of sense are to be pre- ferred as the most intense, for duration and intensity are the only qualities in which pleasures really differ. For the wise choice of pleasures intellectual cultivation is needed ; and there must also be self-control and power of resisting desire. According to Aristippus, what each is to seek is his own present pleasure, though he modified this teaching by his doctrine of self-control. But his follower Theodorus held, like the Epicureans, that permanent tranquillity and cheerfulness are to be sought rather than passing pleasures. The position of Hegesias, the advocate of suicide, who is counted among the Cyrenaics, is far apart from that of Aristippus ; with him avoidance of trouble is the highest attainable good. Anniceris the younger differed from Aristippus in declaring that selfish pleasures are to be some- times sacrificed to sympathetic. Other members of the school were Arete the daughter of Aristippus, Aristippus her son, Bio, and Euhemerus.

See, besides the histories of philosophy, and works on the various members of the school separately, Diog. Laert.; Wendt, De Philo- sophia Cyrenaica;

~~H. v. Stein, De Philosophia Cyrenaica; Mullach, Fragmenta Phil. Grec., vol. ii.~~

~~CYRENE, the capital of Cyrenaica, was situated on the northern slope of a lofty table-land nearly 2000 feet above the level of the sea, from which it was ten miles distant. It was the first town of Cyrenaica founded by Battus and his Therian followers (see CYRENAICA), and very soon rose into great importance as a commercial mart. The policy of Battus led him to conciliate the aboriginal tribes of Libya, with whom his subjects began at an early period to form matrimonial alliances. The natives, however, as in all colonies formed on the principles of Spartan policy, were scrupulously excluded from any participation fin the government of the state. For eight generations, as had been foretold by the Delphic oracle, Cyrene continued to be governed by the original dynasty, whose kings ruled under the names of Battus and Arcesilaus alternately ; and it maintained its prosperity till the time of the Ptolemies, who, carrying out their usual policy, fostered Apollonia, the port, to such an extent that the inland city soon fell into decay.~~

~~Cyrene was noted among the ancients for the intellectual life of its inhabitants. Its medical school was famous, and it numbered among its celebrities Callimachus the poet, Carneades, the founder of the New Academy at~~

~~CYR-CY nh~~

~~Athens, Aristippus, a pupil of Socrates and the founder of the so-called Cyrenaic school, Eratosthenes the polyhistor, and Synesius, one of the most elegant of the ancient Christian writers.~~

~~The ruins of the town cover a great extent of ground, but have been sadly defaced by the various races which have overrun the country. Cyrene and the district to the east, the north, and the west, is called Shahat by the Arabs ; while the ancient designation, under the modified form of Ghrennah, is applied to the district to the south. The first account of the site in modern times seems to be~~

~~that of M. Lemaire, who was French consul at Tripoli in~~

~~*the time of Louis XIV. Paul Lucas visited the spot in*~~

~~*1710, and again in 1723, and Dr Thomas Shaw in 1738 ; an*~~

~~*Italian, Dr Cavelli, who was there in 1812, furnished some information to the Société de Géographie de Paris; aud Della Cella published an account of his visit in his Travels, translated into English in 1822, In 1821-2 important explorations were made by Lieutenant Beechey, R.N. ; and*~~

~~*he was almost immediately followed by a French artist, M.*~~

~~*Pacho, whose pencil preserved a number of interesting*~~

~~*monuments that have since disappeared. M. Delaporte, French consul at Tangier, and Vattier de Bourville come next in orderof time. Barth, the famous African traveller,*~~

~~*published an account of his investigations in his Wander.*~~

~~*ungen durch die Kiistenléndder des Mittelmeers, 1849. In*~~

~~*1861 excavations were made on the site of the city by*~~

~~*Captain Murdoch Smith, R.E., and Commander Porcher, R.N., the results of which are detailed in their valuable Discoveries in Cyrene, London, 1864, The principal*~~

~~*buildings of which the plan can be more or less clearly*~~

~~*distinguished are three theatres, a small Doric temple of Bacchus, a temple of Apollo (Beechey's temple of Diana), two temples hypothetically assigned to the worship of Venus, and a large many-chambered structure, supposed to be the palace of the Roman governor. All are composed of a friable yellow sandstone, containing a great number of shells. The temples are remarkable for the eastern position of the main entrance. Of the ancient sculpture of the city several fine specimens were exhumed and conveyed in safety to the British Museum—a statue of Bacchus, a colossal statue of Apollo playing on the Lyre, a bust of Cneus Cornelius Lentulus Marcellinus, the first Roman propreetor of Cyrene, a fine portrait-head in bronze, &c.*~~

~~Far more imposing than the remains of its buildings are the long lines of tombs which occupy the scarped fronts of all the hill sides, and stretch out along the various roads leading from the city. These consist of two kinds—the excavated and the constructed,—the former being the best preserved, and, it would seem, the most spacious and elaborate. Many of the finer examples have large temple-like entrances with Doric columns cut out of the tock, and bear 'traces of internal decoration of the most costly and brilliant kind. On the walls of one which still preserved its colours at the time of its discovery in 1861 was depicted a procession of thirty-six individuals in various costumes, as well as hunting scenes and games. A favourite sepulchral ornament appears to have been a large scallop- shell sculptured in marble and placed above the sarco- phagus recess. The city was furnished with water by means of a perennial fountain now known to scholars as the fountain of Apollo, and to the Arabs as 'Ain Shahat, remarkable for the artificial tunnel through which it passes. In 1864 Mr George Dennis, vice-consul at Benghazi, pro- ceeded to examine the tombs of the Cyrenaica, and obtained a fine series of painted Greek vases of the red-figure and polychrome styles, which are now in the British Museum. An account of his excavations will be found in the Transactions of the Royal Soc. of Literature, 2d ser, ix. p. 135.~~

~~751~~

~~CYRIL [Cyritivs], saint and bishop of Jerusalem. He was born probably at Jerusalem about 315, and died about 386. He was ordained a presbyter in 345, and had the instruction of the catechumens confided to him. In 350 he was elevated to the see of J erusalem, and became deeply involved in the dogmatic controversies of his time. His metropolitan, Acacius of Czsarea, inclined to Arianism, while Cyril strongly espoused the Nicene creed. The result was the temporary deposition of Cyril. On the death of the emperor Constantine, however, he wag restored ; but again, on the accession of Valens, an Arian emperor, he had once more to resign his post till the accession of Theodosius permitted him to return finally in peace in 379, He attended the second cecumenical council held at Constantinople in 381, where he was received with grateful acclamations for his sufferings in defence of orthodoxy. Cyril has left one important work — his 23 Catecheses (Karyyyces) or lectures mainly addressed to those who were~~

~~preparing for baptism ; the last 5, under the name of the Mystagogic Catacheses, were addressed to newly baptized persons. These lectures are said to be "the first example of a popular compend of religion," and are parti- cularly interesting for the insight which they give us both into the creed-forms of the early church and the various ceremonies of initiation constituting baptism in the 4th century. Other tracts and homilies have been ascribed to Cyril of Jerusalem, but they are of doubtful genuineness, The Catecheses of Cyril have been translated in the Oxford Library of the Fathers, vol ii.~~

~~CYRIL, of Alexandria (376-444), isa more distinguished father of the church than his namesake of Jerusalem. He was born in 376, and died in 444, Becoming patriarch of Alexandria about 412, he soon made himself known by the violence of his zeal against Jews, pagans, and heretics or supposed heretics alike. He had hardly entered upon his office when he closed all the churches of the Novatians and seized their ecclesiastical effects. He assailed the Jewish synagogues with an armed force, drove the Jews in thousands from the city, and exposed their houses and property to pillage. The prefect of Egypt, Orestes, who endeavoured to withstand his furious zeal, waS in turn denounced himself, and had difficulty in maintaining his ground against the fury of the Christian multitude. It was during one of the violent commotions kindled by the strifes of these parties in Alexandria that the illustrious Hypatia, famed for her beauty and her eloquent advocacy of the Neo-Flatonic philosophy in opposition to Christianity, was murdered. Her murder has been attributed to the direct instigation of the patriarch himself ; but this charge is held unsupported by others, although there can be no doubt that "the perpetrators were officers of his church," and undoubtedly drew encouragement from his own violent proceedings. Hypatia was a friend of Orestes, and the hostility betwixt the prefect and the patriarch overflowed towards her, and undoubtedly led to her destruction.~~

~~But Cyril's violence was not merely confined to those who might be considered enemies of the church. He inherited from Theophilus, his uncle and predecessor in the see of Alexandria, a strong aversion to John Chrysostom, the noble bishop of Constantinople, and even after his death opposed for a time all attempts to remove the unjust sentence of~~

~~condemnation which had been passed upon him, Afterwards he so far yielded to remonstrances, and allowed the name of Chrysostom to appear in the list of distinguished martyrs and bishops mentioned in the prayers of his church. These names were inserted in what were called "diptychs" (Strrvxa vexpdv), or two-leaved tablets preserved in the churches—a usage which the Greek Church has preserved to this day. Nestorius, a succesor of Chrysostom in the see of Constantinople, received a still larger share of Cyril's~~

~~intemperate opposition. Nestorius had refused to apply the title " Mother of God" to the Blessed Virgin. 'The patriarch of Alexandria denounced this heresy to Nestorius himself, to the emperor (the feeble Theodosius II.), and to the empresses, the mother and sister of Theodosius. The altercation grew in bitterness as it advanced, until at length Nestorius was excommunicated and driven from his see in 430. The two opponents met at the cecumenical council summoned at Ephesus in the following year to dispose of the intricate question raised by the use of the terminology in dispute. Each came "accompanied by a rabble of followers—Cyril by the-bath men and a multitude of women from Egypt, Nestorius by a horde of peasants and some of the lower populace of Constantinople " (Milman's Latin Christ., i. 160). The result was the condem- nation of Nestorius, although Cyril also incurred the charge of heresy from the Oriental bishops. Satisfied, however, with the deprivation and exile of his opponent, he returned to Alexandria in triumph as the great champion of the faith, and thence continued, by the "unscrupulous use of all the means at his command," the theological strife for years.~~

~~Altogether Cyril presents a character not only unamiable, but singularly deficient in all the graces of the Christian life. He may, as Milman says (Latin Christ., i. 145), be a hero or even a saint to those " who esteem the stern and uncompromising assertion of certain tenets the one para- mount Christian virtue; but, while ambition, intrigue, arrogance, rapacity, and violence are proscribed as unchris- tian means—barbarity, persecution, bloodshed, as unholy and unevangelic wickednesses, posterity will condemn the orthodox Cyril as one of the worst of heretics against the spread of the~~

~~Gospel." Baur, however, says that Cyril must be placed high as a theologian, and that he sought upon the whole to preserve faithfully the spirit of the Alexandrian school. He has left, besides commentaries, and homilies and letters chiefly relating to the Nestorian controversy, a treatise on the Trinity and the Incarnation, and an apologetic work in defence of Christianity against the attack of the Emperor Julian, also a definite treatise against Nestorius — Kara rév Neorwpiov dvodypidv wevTaBiBros avrippyros.~~

~~CYRIL, a celebrated professor of the ancient law college of Berytus, and one of the founders of the cecumenical school of jurists (rs otxoupévys diddoKador) which preceded the succession of Anastasius to the Eastern empire (491 A.D.), and paved the way for Justinian's legislation. His reputation as a teacher of law was very great; and from the fragments of his works which have been preserved it may be inferred that his merit as a teacher consisted in his going direct to the ancient sources of law, and in interpret- ing the best writers, such as the Commentary of Ulpian on the Edict and the Responsa Papiniani. He wrote a treatise on definitions (tadpuvnya trav Sepuvirwr), in which, according to a statement of his contemporary Patricius, the subject of contracts was treated with superior precision and great method, and which has supplied the materials for many important scholia appended to the first and second titles of the eleventh book of the Basilica, He is generally styled "the great Cyril," to distinguish him from a more modern jurist of the same name, who lived after the reign of Justinian, and who compiled an epitome of the Digest.~~

~~CYRUS tue Exper. Like other national heroes, Cyrus, the founder of the Persian empire, has been surrounded with an atmosphere of myth. Already in the time of Herodotus (i. 95) four different stories were current among the Persians concerning his origin and his relation to the last king of Media. The one preferred by Herodotus is probably the most legendary of all four; at any rate it has the same source as the tales told of Perseus or Romulus,~~

~~or other popular heroes who survived exposure and obscurity to revenge themselves upon the tyrant, and be restored to the royal dignity. Cyrus, Herodotus states, was the son of Cambyses, a Persian prince, and~~

~~Mandane, a daughter of the Median king Astyages, in whose name we may see the Azhi dahdka ("the biting snake,") of Zend mythology, the Ahi or "serpent" of darkness of the Veda, the Zohak of Firdusi's epic; and of whom Moses of Chorene declared in the 4th century of our era that popular songs still spoke as Ajdahak, the wicked serpent. In consequence of a dream Astyages delivered Cyrus to Harpagus to be put to death. Harpagus transferred the order to the king's herdsman Mitradates, whose wife Cyno, "the bitch," persuaded him to bring up the child as his own instead of exposing it, and a still-born infant was sent to Harpagus in its place. At the age of ten Cyrus was discovered and recognized by Astyages, who punished Harpagus by making him eat the flesh of his own son. Cyrus returned to Persia; and some years afterwards Harpagus, who had never forgotten the injury he had suffered, induced him to raise the standard of revolt. Harpagus, appointed commander of the Median forces, went over to the enemy, the Medes were defeated, and Astyages taken prisoner. He was kept in prison till his death, while Cyrus made the Medes subservient to the Persians.~~

~~Xenophon in the Cyropedia, where the life of a model priuce rather than of the historical Cyrus is depicted, agrees with Herodotus in making Cyrus the grandson of Astyages, though he calls his father Cambyses an independent king. Cyrus received, we are told, the simple and hardy education~~

~~of a Persian up to the age of twelve, when he visited the~~

~~luxurious and effeminate court of Media, and while there gained the admiration of his grandfather by*repelling an unprovoked attack of Evil-Merodach, the son of Nebuchad- nezzar. Astyages was succeeded by his son Cyaxares II, on whose death the Median empire passed peaceably into the hands of Cyrus, now forty years old. :~~

~~A third account is given by Nicolas of Damascus. According to this Cyrus was the son of the Persian satrap Atradates, and spent the greater part of his youth in the court of Astyages at Ecbatana. Having escaped by a stratagem and evaded the pursuit of the Medes, he led the Persians into revolt, and attempted to stem the attack of the Median monarch. The Persians, however, were defeated~~

~~.in four great battles, in one of which Atradates was slain,~~

~~and Pasargade, the Persian capital, was besieged. Here the tide of fortune turned, the insignia of royalty fell into the hands of Cyrus, and Astyages was overtaken and captured during his flight. The whole of Media at once submitted to the conqueror.~~

~~The version of Ctesias is totally unlike either of the preceding three. Like Nicolas of Damascus he denies that Cyrus was in any way related to Astyages, whose daughter Amytis was the wife of Spitaces, or Spitamas, a Mede. Cyrus, after his escape from Media, invaded the country and defeated Astyages, who fled to Ecbatana and was there concealed by Amytis. The Persian C#baras, however, discovered his hiding-place; but Astyages was well treated by Cyrus, and died a natural death. Cyrus put Spitaces to death and married Amytis.~~

~~None of these versions can be regarded as satisfactory. The cuneiform inscriptions have proved that Persia could not have been a mere dependency of Media, as Darius declares that his eight ancestors had been kings like him- self, while Cyrus calls himself, on a brick from Senkereh, "the son of Cambyses, the powerful king." The Persian conquest of Media, moreover, must have been a slow process. Xenophon (Anab., iii. 4) describes Larissa and Mespila on the Tigris as strongly-fortified cities which had~~

~~been built by the Medes after the overthrow of N ineveh, but Mespila~~

~~ruined by the Persians during the Median war, had afforded refuge to a wife of the Median monarch.~~

~~The conquest of Media and the consequent establishment of the Persian empire is fixed somewhat doubtfully at 559 B.c, According to Strabo (xv. p. 729) the earlier name of Cyrus was Agradates ; if so, he must have changed it about this period, borrowing his new title perhaps from the River Cyrus, near Pasargade. In any case the name Cyrus (Old Persian, Awrus) cannot be connected with the later Persian Khor or Khorshéd, "the sun," which~~

would be wara in the Persian of the Achemenian epoch (Zend, hware). The reduction of Media must have occupied a considerable time, as it was not until 546 Bc. that Cyrus found himself strong enough to face Croesus of Lydia, who had entered into alliance with Egypt and Babylonia. Without waiting for his allies, however, Croesus crossed the Halys, and a drawn battle was fought in Pteria. The Lydian king returned to Sardis and disbanded his forces, believing that Cyrus would not undertake a winter campaign. This belief proved illusive ; Cyrus followed the enemy, defeated the Lydian army in spite of its bravery, besieged Sardis, and took it within fourteen days. A Greek legend accounted for the preservation of Croesus and his future position as confidential counsellor in the Persian court,

The conquest of the Greek cities of Ionia followed, and a revolt that broke out in Sardis under Pactyes during the absence of Cyrus caused the general disarmament of the Lydians and the reduction of Lycia and Caria.

Cyrus now turned his attention to the East—Parthia, Sogdiana, Arachosia, and the neighbouring countries being added to the empire. According to Ctesias, Bactria had submitted on the marriage of Cyrus with Amytis ; and the most formidable campaign Cyrus had to undertake in the East was against the Sacew. According to one story, Cyrus was taken prisoner in this campaign ; according to another, Sparetha, the queen of the Sace, gained important advan- tages over the Persians, Pliny states that Kapisa (perhaps the modern Kafshan), near the Upper Indus, was destroyed by Cyrus; and Arrian's assertion that a Persian army was lost in the desert of Gedrosia is confirmed by the fact that this country formed part of the Persian empire in the reign of Darius.

In 539 B.c. Babylonia was attacked. Nabonidus, the Babylonian king, called Labynetus by Herodotus, had been preparing for the invasion for years. Cyrus carried with him the water of the Choaspes for drinking, and delayed a whole summer and autumn on his march in order to dissi- pate the River Gyndes, in which one of the sacred white horses had been drowned. The Jews settled in Babylonia hailed the Persians as deliverers and monotheists, and it was doubtless in return for'the assistance they had afforded that Cyrus permitted them to return to their country and restore Jerusalem and the temple. Nabonidus,!defeated in the field, took refuge in

~~Borsippa, while the Persians laid Siege to Babylon, where Belshazzar, the son of N abonidus, was in command. Babylon was taken during a feast ; Nabonidus surrendered and was sent to Carmania, and the sceptre of Nebuchadnezzar passed to Persia.~~

~~Instead of reducing Pheenicia, which had resumed its freedom, Cyrus led his troops across the Araxes against the Massagete. At first victorious, he was afterwards defeated and slain (538 B.c.) by the Massagetic queen Tomyris, the double of Sparetha, after a reign of twenty-nine years (Herod. i. 208-214). According to Ctesias, however, this campaign was against the Derbices and their Indian allies, and Cyrus died of a wound received in battle three days after gaining a complete victory over them. The conquest of Egypt was left to a successor, Cyrus having made this side of his empire secure by restoring the Jews to Palestine.~~

~~tears and entreaties.~~

~~753~~

~~. The tomb at Murghab cannot be that of Cyrus, as is often supposed. Murghab, like Persepolis, is on the Araxes, — while Pasargade (Persian, Paisiyduvadd, "valley of springs "), where Cyrus was buried, was on the Cyrus (Kur). The cuneiform inscription at Murghab points to a period subsequent to the accession of Darius, as does also the Egyptian head-dress of the figure below it. Andreas suggests that the Cyrus Achzmenides mentioned in the inscription is the viceroy of Egypt, brother of Xerxes, called Achemenides by Ctesias, whose corpse was brought to Persia to be buried there. Pasargadee, and the real tomb of Cyrus, must be looked for near Darabjerd, in south- eastern Farsistan. (A. H. 8.)~~

~~CYRUS rue Youncer was the son of Darius Nothus, and of Parysatis, and the brother of Artaxerxes Mnemon. He was sent by his father at the age of sixteen to assist the~~

~~Lacedemonians against the Athenians. Artaxerxes suc- ceeded to the throne on the death of Nothus; and Cyrus, who deemed himself, as born after his father's accession to the throne, the legitimate successor, sought to~~

~~dispossess him. His attempt would have been punished by his death, had not his mother Parysatis saved him by her This circumstance did not in the~~

~~least check his ambition, He was appointed satrap of~~

~~Lydia and of Asia Minor, where he secretly fomented~~

~~rebellion, and levied troops under various pretences, At last he took the field with an army of 100,000 barbarians and 13,000 Greeks, under the command of Clearchus jand Artaxerxes met him near Cunaxa with a force said to have numbered 900,000 (401 B.c.). The battle was long and bloody, and Cyrus might perhaps have obtained the victory, had not hisrashness proved hisruin. The two royal brothers met in person, and Cyrus was slain. Artaxerxes was so anxious to have it believed that his brother had fallen by his hand, though this does not seem to have been the case, that he put todeath two of his subjects for boasting that they had killed Cyrus. The Greeks who were en- gaged in the expedition obtained much glory in the battle, and after the death of Cyrus they remained victorious in the field without acommander. Their homeward march in face of the vastly superior numbers of the enemy is known in history as the Retreat of the Ten Thousand, and forms the subject of Xenophon's most popular work, the Anabasis,~~

~~CYTHERA. See Crrtco.~~

~~CYZICUS, an ancient town of Mysia, in Asia Minor, on the coast of the Propontis or Sea of Marmora, occupying the narrowest part of a peninsula which was at one time an island, and was said to have been joined to the mainland by Alexander the Great by moles and bridges. During the Peloponnesian war, Cyzicus was subject to the Athenians and Lacedamonians alternately, as the power of either state predominated ; and at the peace of Antalcidas, like the other Greek cities in Asia, it was made over to Persia. The greatness and prosperity of the town did not commence till about 74 3B.c., when the Cyzicenes, under circumstances of great difficulty, repelled Mithridates from their walls, and kept the town till relieved by Lucullus. For their bravery and devotion at this time they were rewarded with peculiar honours and privileges by the Romans, and pre- sented with a large tract of the rich land adjoining their city. Seriously~~

injured by an earthquake in the reign of Antoninus Pius, Cyzicus from that period gradually declined. The ruins of Cyzicus, which once boasted a very large number of splendid temples and public buildings, are still to be seen among the cherry-orchards and vineyards that have overgrown its site. They are known by the Turkish name of Balkiz, which is probably a corruption of Tlahaia Kvéicos. The principal buildings still clearly dis- tinguishable are a Roman amphitheatre and a temple dedicated to Hadrian; but there are also remains of the

city-walls and towers. Great damage has been inflicted within modern times by the spoliation of the Turks, who have carried off the ancient materials for the erection of public edifices in Constantinople. The coins of Cyzicus have been found in large numbers, and are of great interest to the numismatist for the light they furnish on the history of ancient coinage. They were current at Athens and other parts of Greece ; and the device by which they were frequently distinguished probably gave rise to the proverb about bribery—There is an ox on his tongue, Bods emt yAdoor.

CZACKI, Taprusz (1765-1813), a Polish statesman and author, who did much for the spread of education in Poland, was born at Poryck in Volhynia, of good family. After being educated at Cracow, he went to court and gained the favour of the king, Stanislas Augustus Poniatowski, by whom he has appointed to several high dignities. In the diet which sat from 1788 to 1792 he took a prominent place, and he was oue of the advocates of the constitution which was passed in May 1791. Con- sequently his property was confiscated by the Czarina Catherine II. It was, however, restored by her successor Paul I. ; and Alexander I. appointed him councillor. The great aim of Czacki's life was now to further education in Poland. In 1805 he opened a school at Krzemienietz, which was soon filled by about 600 pupils of both sexes, and he effected the establishment of a very large number of schools in other parts of the country. He also assisted in the foundation of the Scientific Society of Warsaw, and the Polish Commerical Society. He was twice examined by Russian commissions on a charge of having disseminated views hostile to Russia, but on both occasions he was

~~acquitted. His chief school, that at Krzemienietz, was destroyed by the French invasion of 1812. In the February of the next year Czacki died at Dubno. A statue was raised to his memory, and placed in the library at Krzemienietz.~~

~~Among the works of Czacki, the 'treatise' on Polishand Lithuanian law, which is full of valuable information on many subjects con- nected with these' countries (Warsaw, 1801, Breslau 1835), and those on the Jews, gypsies, and the statistics of Poland, deserve special mention. See the lives of Czacki by his friends Polacki and Motowski (the latter of which appeared in the supplement to the Biographie Universelle), which, however, differ considerably as to the facts of~~

~~his life; that by Osinski(Krzemienietz, 1816); and the Dictionary of Learned Poles, by Chokodynicki (1823).~~

~~CZARTORYSKI, Prince Apam Grorcx (1770-1861), a principal actor in the Polish revolution of 1830, was born at Warsaw, January 14,1770. He was the eldest son of Prince Adam Casimir Czartoryski; and, after receiving a careful education in his father's house, he completed his studies in France and Great Britain, spending some time at Edinburgh University and in London. On his return to Poland he entered the public service, and in the war occasioned by the second partition of Poland he fought bravely against the Russians. In 1795 he was sent, with his brother Constantine, as a hostage to St Petersburg. Here he became the intimate friend of the grand duke (afterwards emperor) Alexander; and in 1797 he was appointed ambassador to the court of Sardinia. This office he held about five years ; and in 1802 Alexander I. named him assistant at the ministry of foreign affairs. In this capacity he was present at the battle of Austerlitz, sub- scribed a treaty with Great Britain, and accompanied the czar in the campaign of 1807 and at the conferences of Tilsit. He then retired from public life ; but in 1812 was again by the side of the emperor, and accompanied him to Paris in 1814. Prince Adam George had been named curator of the new university of Wilna in 1803, a post which he held for nearly twenty years; and during this period, while outwardly loyal to the Russian Government,~~

his influence powerfully contributed to keep alive and in- tensify the patriotic spirit of hiscountrymen. In 1815 he was named senator palatine of the kingdom. He attended the first diet, and spoke bravely and hopefully in favour of constitutional government ; but his efforts were fruitless, and his hopes vanished.

In 1821 charges of disaffection and sedition were made

against the students of Wilna, and very severe measures —

were taken, — many being imprisoned, and others sent to Siberia, or compelled to serve in the army. Prince Adam George interceded forthe young men, but was not listened to. He consequently resigned his office of curator, and for the next nine years he remained in retirement. The revolution of 1830 once more brought him to the front. He became president of the provisional government of Poland, convoked the diet, and when the throne was declared vacant was chosen head of the national govern- ment (January 1831). He continued to hold the presidency till the terrible and decisive days of August (15th and 16th), and then served as a common soldier in the final struggles, in which once more, by the overwhelming forces of Russia and the disintegrating forces of internal dissen- sion, Poland fell. The prince patriot escaped to Paris. He was excluded by name from the amnesty of 1831, and his estates in Poland were confiscated. The large revenue of his Gallician estates, however, enabled him to maintain the position of a noble of the highest rank. He enjoyed the unbounded esteem of his countrymen, and was the recog- nized head of Polish society at Paris. In 1848 he granted freedom to the peasants on his estates in Gallicia, and gave them their lands in fee. He died at Paris, July 15, 1861.

CZASLAU, or Castau, a town of Bohemia, the chief place of the circle of the same name, situated near the left bank of an affluent of the Elbe, in a fertile plain 48 miles E.S.E. of Prague, on the North-west Railway from Vienna. The church is surmounted by a lofty spire, the highest in Bohemia, and contains the tomb of the celebrated Hussite leader Ziska, who died in 1424. Here (or more accurately at the village of Chotusitz, 24 miles north of this) Frederick the Great defeated the Austrians, May 17, 1742. Population in 1869, 5998, chiefly agriculturists.

CZECHS, or)phonetically Z'chekhs, a large branch of the Slavonic race, which includes the Bohemians or Ozechs proper, the Hannacks or Moravians, and the Slovacks, Besides forming the predominant element in Bohemia and Moravia, where they are estimated respectively at 2,930,000 aud 1,352,000, they contribute 614,000 to the population of Hungary, where they are mainly settled on the N.W. frontiers, 93,000 to Austrian Silesia, 60,000 to Prussian Silesia, and a considerable percentage to Austria proper, Bukowina, and Slavonia. See BoHEMIA.

CZEGLED, a market town or large village of Hungary, in the district of Pesth, and 38 miles south-east of that city, situated on the bare sandy and infertile plain which extends between the Danube and Theiss. Some parts of the sur- rounding country yield large quantities of red wine, and this, with the cultivation of maize and millet and beer brew- ing, gives the occupation and trade of the place. Popula- tion of commune in 1869, 22,216.

CZENSTOCHOVA, or TscHENSTocHoW, OLD and NEw, two small contiguous towns of Poland, in the circle of the same name and the government of Piotrkov, on the left bank of the Warta, 130 miles S.W. of Warsaw, and on the railway between that city and Cracow. Population of the two (1867), 14,167. The towns derive their importance from a celebrated monastery situated on the eminence called the Jasno Gura above them. This monastery, which is sur- rounded by a small fortress, has a fine church with a chapel dedicated to the Virgin, containing a famous and much-vener- ated picture of the mother of Christ, which according to

legend was painted by St Luke. Pilgrims from all parts of Poland visit the shrine in large numbers. In 1655 the monastery withstood a siege by the Swedes in the War of

Succession, and another by the Russian troops in 1771, dur-

ing the War of Independence.

CZERNOWITZ, or Czzrnfuz, the capital town of the Austrian duchy of Bukowina, in 48° 26' N. lat. and 95° 57' E. long., picturesquely situated on

a height above the right bank of the river Pruth, 140 miles S.E. of Lemberg, 720 feet above the sea. The line of railway from Cracow and Lemberg to Galatz on the lower Danube passes by Czernowitz. It is a clean, pleasant town, possessing for its chief buildings a Greek cathedral, a theological seminary, and several schools ; and it is the seat of an archbishop, of an Oriental Greek patriarch, and of the metropolitan of Bukowina. A fine bridge of 720 feet in length crosses the Pruth, with six spans. There are manufactures of machinery and bronze work, and a considerable trade is carried on with Moldavia and Bessarabia in grain, brandy, cattle, hides, wood, wool, and potashes. Population with suburbs (1869), 33,884.

CZERNY, Kart (1791-1857), pianist and composer, was born at Vienna on the 21st February 1791. His father, who was a teacher of the piano, trained him for that instrument from an early age with such success that he performed in public at the age of nine, and commenced his own career as a teacher at fourteen. He was brought under the notice of Beethoven, and was his pupil in the sense in which the great master had pupils. It is perhaps his greatest claim to distinction as a performer that he was selected to be the first to play Beethoven's celebrated Emperor concerto in public. He soon became the most popular teacher of his instrument in a capital which abounded in pianists of the first rank. Among his pupils he numbered Liszt, Dohler, and many others who after- wards became famous. Asa composer he was prolific to an astonishing degree, considering the other demands on his time. His works, which included every class of com- position, numbered 849 at the time of his death. Com- paratively few of them possess high Merit, and none are destined to the immortality that belongs to the productions of genius. He had considerable skill in devising variations for the piano of the display type, and in this and other ways helped to develop the executive power which in the modern sensational school of pianoforte playing seems to have reached the limits of the possible. His various books of exercises, elementary and advanced, of which the best known are the Etudes de la Vélocité, have probably had a wider circulation than any other works of their class, To the theory of music he contributed a translation of Reicha's Lraité de Composition, and a work entitled Umriss der ganzen Musikgeschichte. Czerny died on the 15th J uly 1857 at Vienna, which he seldom left, one of the few ex- ceptions being a visit paid to England in

1836. Having no family, he left his fortune, which was considerable, to the Vienna Conservatorium and various benevolent in- stitutions,

CZERNY GEORGE (71766-1817), or Karpsorpsz, or Black George, as he is always called, though his name was properly George Petrovitch, a Servian who' freed his country from the domination of the Turks, born about 1766, was the son of a Servian peasant. He was about twenty when, having killed a Turk in some wild adventure, he was forced to flee into Austria. It said that he forced his father, or his stepfather or father-in-law, to accompany him ; but the old peasant could not be persuaded to leave his country, and, to prevent his falling into the pitiless hands of the Turks, Czerny George put him to death with a pistol- shot. In the Austrian army Czerny George fought against

school education, and was never able to write. he was moody and taciturn, though, when excited, he was

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the Turks from 1788 to 1791, and rose to the rank of ser- geant; but, either unwilling to submit to discipline or disgusted by some slight, he left the service for the life of a heyduc, or bandit who preyed only upon the Mahometans. He afterwards, however, is said to have held an appointment as inspector of forests to a monastery in Austria.

For a time Servia was under the mild rule of Hadji Mustapha, and Czerny George lived on his farm in peace. But the Janissaries overran the country, killed the Pasha, and began to murder the Servian chiefs, Many escaped, however, and, headed by Ozerny George, who was chosen commander-in-chief, summoned every male Servian to arms. The sultan sent troops against the Janissaries, who were overwhelmed, and their leaders executed. But the Servians now refused to receive again the yoke of the Turks, Russia supported their claim to independence, and war com- menced. Czerny George commanded his countrymen with fiery enthusiasm, rough vigour, and considerable ability, Several victories over the Turks were won 3 and, in October 1806, the independence of Servia was recognized by the Porte, a tribute only being exacted, and the sign of Turkish sovereignty maintained by the residence at Belgrade of a Turkish officer with a very small force.

The Turks refusing, however, to give up Belgrade and Schabaz, both towns were taken by Czerny George by assault, and the Janis saries and Turks in both were massacred in cold blood.

Czerny George, as commander-in-chief, now became the ruler of Servia ; and till 1813, despite strong opposition in the Servian senate and constant danger from the Turks, he maintained his position. His elevation made no change in his habits. He continued during peace to cultivate his

farm at Topola with his own hands, and he never laid

aside his coarse peasant's dress.) He had received no

In general,

fond of joining in the village dances, His passion was terrible ; he killed his warmest adherent in a fit of anger. His execution of justice was stern and prompt ; he hanged his own brother for assaulting a girl, and for- bade his mother to make any signs of mourning. In war he displayed marvellous energy and valour, and he had the power of inspiring his followers with the fierce enthusiasm by which he was himself animated.

In 1809, on the outbreak of war between Russia and Turkey, Czerny George, who had formed the scheme of achieving the independence of all the Slavonic countries under the rule of Turkey, took up arms against the Turks, and, after attempting to excite a revolt in Bosnia, marched on Herzegovina. The Turks at this juncture invaded Servia ; and Czerny George, though wishing to place the country under the protection of Austria, was forced to seek the aid of Russia. A vigorous attempt was now made to dis- possess him of the supreme power; but he forced his opponents to submit or flee the country. The treaty of Bucharest (May 1812), however, while depriving the Ser- vians of the protection of Russia, failed to claim for them sufficient guarantees from the Turks, in whose hands all the Servian fortresses were placed. In June 1813 the Turks again entered Servia, and Czerny George, in despair, with almost all the Servian chiefs, took refuge in Austria.

~~Four years after, having been persuaded that his country- men were only awaiting his signal to burst into revolt, he ventured to return in disguise into Servia He discovered himself to Vuitza, an officer who had served under him, b whom he was basely murdered (27th July 1817), at the instigation of Milosch Obrenovitch, a Servian senator, who had come to a compromise with Turkey and obtained the chief power, and was jealous of the popularity of the old chief. See Servra, and Ranke's Die Serbische Revolution,~~

~~in the English alphabet, the fourth letter, and the D. third consonant, represents the dental sonant sound, to which T is the corresponding surd (see B). It is the fourth letter also in the Hebrew, Chaldee, Samaritan, Syriac, Greek, and Latin alphabets. The form of our D is the same as that of the Latins; and the Latin D is no other than the Greek A ; in old Latin, and in several of the Greek alphabets, including those of South-Western Italy, from which the Roman alphabet.was borrowed, we find the form p: the right hand corner was rounded for convenience of writing. The Greek symbol, again, is borrowed from the ancient Phcenician character, called in Hebrew Daleth. D is found in English (according to Grimm's law) where 6 will be found in Greek, and f in Latin : thus our deer is the Greek Oyp, and Latin fera. In Old High German the corresponding word was rightly spelt with a ¢ (tior); but this is now spelt thier, though the sound is the same. By the same law d appears in Greek and Latin where we find ¢ in English and z in High German : thus we have dvo, duo, two, zwer. D sometimes became / in Latin; thus Ulysses represented 'Odvoveis ; sometimes it became 7, as in arbiter for ad-biter. In prenomens D stood for Decimus, and in the titles of emperors for Divus. It is alsoa numeral letter, represent- ing jive hundred. This may arise from the circumstance that the letter D is analogous in form to IO, the half of CIO, which is the Roman numeral expression for a thousand. With a dash placed on the top thus, D, its value is increased tenfold, or, in other words, it stands for jive thousand. Used as an abbreviation, D has various significations, for which see the article ABBREVIATIONS. DACCA [Duaxa], the principal district in the division of~~

the same name,! in Bengal, British India, situated between 24° 20’ 12” and 23° 6’ 30” N. lat., and between 89° 47’ 50” and 91° 1‘10” E. long. It is bounded on the N. by Maiman- sinh, on the E. by Tipperah, and on the 8. and W. by Bakar- ganj and Jaridpur. The district consists of a vast level plain, divided into two sections by the Dhaleswari river. The northern part, again intersected by the Lakshmia river, contains the city of Dacca, and as a rule lies well above flood-level. The soil is composed of red ferruginous kankar, with a stratum of clay in the more elevated parts, covered by a thin layer of vegetable mould, or by recent alluvial deposits. The scenery along the Lakshmia is very beauti- ful, the banks being high and wooded. About 20 miles north of Dacca city, small ridges are met with in the Madhupur jungle, stretching into Maimansinh district. These hills, however, are mere mounds of from 20 to 40 feet high, composed of red soil containing a considerable quantity of iron ore; and the whole tract is for the most part unproductive. ‘Towards the city, the red soil is inter- sected by creeks and morasses, whose margins yield crops of rice, mustard, and tz! seed; while to the eastward of the town, a broad, alluvial, well-cultivated plain reaches as far as the junction of the Dhaleswari and Lakshmia rivers. The country lying to the south of the Dhaleswari is the most fertile part of the district. It consists entirely of rich

1 The Division or Commissionership of Dacca is under the Lieu- tenant Governor of Bengal, and comprises the districts of Dacca, Maimansinh, Bakarganj, Faridpur, and Tipperah (transferred from the Chittagong to the Dacca Division in 1875). It is bounded on the N. by the Garo Hills, on the E. by Silhet and the state of Hill Tipperah, on the S. by the Bay of Bengal, and on the W. by Jessor, Pabna, Bogra, and Rangpur. The Division contains a total area of 18,276 square miles, with a population of 9,126,868 souls.

alluvial soil, annually inundated to a depth varying from 2 to 14 feet of water. The villages are built on artificial mounds of earth, so as to raise them above the flood- level.

Rivers.—Dacca is watered by a network of rivers and streams, ten of which are navigable throughout the year by native cargo boats of four tons burthen. (1) The Meghna forms the eastern boundary of the district, separating it from Tipperah. (2) The Ganges, or Padma river, marks the

~~western and south-western boundary, separating the district from Faridpur and Bakarganj. This river, here from three to four miles in width, is liable to frequent and extensive changes in its course; the old channel is now almost dry in the hot months. (3) The Lakshmid, a branch of the Brahmaputra, flows through the north of the district and empties itself into the Dhaleswari. (4) The Jamunda, or main stream of the Brahmaputra, only touches on the north-western corner of the district, where it joms the Ganges. (5) The Mendi-Khalf, a large branch of the Meghna, communicates with the old Brahmaputra. (6) The Dhaleswari, an offshoot of the Jamuna, intersects the district from west to east, and falls into the Meghn4 at Munshiganj. It has two large navi- gable branches, both of which reunite with the parent- stream, viz., (7) the Ghazi-khali and (8) the Buriganga.~~

~~The wild animals comprise a few tigers, leopards, and wild elephants, deer, wild hog, porcupines, jackals, foxes, hares, otters, &c. The green monkey is very common ; porpoises abound in the large rivers. Among birds are vultures, crows, several varieties of eagles, fish eagles, kites, falcons, owls, swallows, kingfishers, woodpeckers, sydémas, green paroquets, spooubills, sdrus, mdnikjors, herons, pelicans, shill ibis, adjutants, bulbuls, gulls, cormorants, coots, plovers, snipe, pigeons, doves, partridges, wild geese and ducks, &c. A trade is carried on in bird feathers, principally in those of the kingfisher tribe. The common fisbes are the shark, ray, saw-fish, anwéri or mullet, tapst mdchh or mango fish, hilsd, chitdl, katlé, rui, mirgal, kat, khalisd, crabs, cray-fish, prawns, &c. Crocodiles are found in most of the Jarge rivers. Among snakes are the cobra, sanda, girgit, bamdnt, gosémp, python, &c., and several varieties of tree and water snakes.~~

~~Agriculture.—Rice forms the staple product of the district. It is divided into three great classes :—boro, or spring rice, sown from December to February, and} reaped in April and May ; dws, or autumn rice, sown from March to May, and reaped from July to September; and dman, or winter rice (the great crop of the year), sown from March to May, and reaped in November and December. Wheat and barley are cultivated to a small extent ; pulses are largely grown; also oilseeds, such as mustard, ¢2/, and linseed. Cotton was formerly a staple product, cut since the decline of the fine Dacca muslins, due to the intro- duction of Manchester goods, its cultivation has almost entirely ceased. Jute.cultivation has enormously~~

extended of late years. The other crops raised are indigo, sugar-cane, pan or betel leaf, cocoa-nut, turmeric, ginger, tobacco, and safflower. Of the area of the district in 1870 (viz, 3217 square miles) 2245 are returned as cultivated, 24 as fallow land, 672 as cultivable waste land, and 276 as uncultivable. No statistics exist showing the cultivation of each kind of crop. But roughly speaking, it may be said that in the rains three-fifths of the cultivated area is under rice, one-fifth is fallow or uncultivated, and one-fifth under jute; and that in the dry season, two-fifths is under oil seeds

DA wee &

and pulses, two-fifths fallow or uncultivated, and one-fifth under other crops.

The manufactures consist of weaving, embroidery, gold and silver work, shell carving, and pottery. The weaving industry and the manufacture of fine Dacca muslins have greatly fallen off, owing to the competition of European piece goods, Forty different kinds of cloth were formerly manufactured in this district, the bulk of which during many years was made from English twist, country thread being used only for the finest muslins. Those of the most delicate texture were known by the name of db-rawdn, or "running water," and shabnam, or "evening dew." It is said that, in the time of the Emperor J ahangir, a piece of ab-rawdén muslin, 15 feet by 3, could be manufactured, weighing only 5 sikkds, or 900 grains, its value being £40. In 1840, the finest cloth that could be made of the above dimensions weighed about 9 sikkds, or 1600 grains, and was worth £10. Since then the manufacture has still further decayed, and the finer kinds are not now made at all except to order. The manufacture of indigo is largely carried on with European capital. The great trading centres are Nardinganj and Madanganj, at the confluence of the Lakshmia and Dhaleswari rivers, on opposite banks. Naréinganj may be termed the port of Dacca, from which it is distant about 9 miles by land, and 16 or 18 by water. It constitutes the great south-eastern mart on the J amuna, and has regular steam communication with Calcutta and the Assam districts. The general revenue of the district increased from £86,926 in 1860-61 to £111,620 in 1870-71 ; and the civil expenditure in the same period from £44,666 to £49,803. The land tax contributes about one-half of the general revenue,

~~and amounted in 1870-71 to £53,672. There are 8 magisterial and 25 civil and revenue courts, besides 1 honorary magistrate's court, situated in the district, The regular police consists of a force of 430 officers and men, besides a municipal and rural police, For educational purposes, there is a Govern- ment college at Dacca city, together with 148 Government or aided schools, attended in 1871 by a total of 7155 pupils, besides numerous unaided village schools, for which no statistics exist.~~

~~Diseases.—Cholera and small-pox occasionally visit the district in an epidemic form. The principal endemic diseases are—intermittentand remittent'fever, elephantiasis, bronchocele, enlargement of the spleen, dysentery and diarrhoea, rheumatism, catarrh, whooping cough, bronchitis, ophthalmia, cutaneous diseases, and intestinal worms. Cattle disease isalsocommon. Five charitable dispensaries are maintained in the district, one of which, the Mitford Hospital, is the largest institution of the kind in Bengal out of Calcutta. There are also a lunatic asylum and an almshouse for indoor paupers.~~

~~Population,—The Bengal census of 1872 returned the population of Dacca district at 1,852,993 persons (males, 905,775 ; females, 947,218), distributed over 2897 square miles, and residing in 5016 villages or towns, and 290,593 houses. The population is thus clas- sified according to religion :—Hindus, 793,789, or 42°9 per cent. ; Muhammadans, 1,050,131, or 56°7 per cent. ; Buddhists, 4; Christians, 7844, or °4 per cent. ; "others," 1225. The proportion of males in the district population was 48-9 per cent. Six towns contain a population of over 5000, viz. :—(1) Dacca city (q.v.) population 69,212; (2) Manikganj, population: Hindus, 6381; Muhammadans, 5159; and "others," 2—total, 11,542 ; (3) Nara- inganj, population: Hindus, 5200; Muhammadans, 5694; and Christians, 17—total, 10,911 ; (4) Sholaghai, population: Hindus, 4478; Muhammadans, 2047—1total, 6525 ; (5) Hasara, popula- tion: Hindus, 4807; Muhammadans, 900—total, 5707 8 () Narishé, population: Hindus, 2030; Muhammadans, 3570; Christians, 37—total, 5645. The material condition of the people particularly of the cultivating classes, has greatly improved of late~~

~~yoars owing to the increased prices of produce, and the cultivation of more valuable crops.~~

Dacca Crry, the principal place in the above district, is

situated on the left or north bank of the Buriganga river, in 23° 43’ 20” N. lat. and 90° 26’ 10’ E. long. The city is bounded on the E. by a low alluvial plain stretching to the Lakshmié river, and on the N. and N.W. by a tract of jungle interspersed with Muhammadan cemeteries, deserted gardens, mosques, and ruined houses. The streets, bdzdrs, and lanes extend four miles along the bank of the Burigang4, the breadth of the town being about 14 miles, The chauk, or market-place, lies at the west end, near the river bank. It is a square of considerable dimensions, surrounded by mosques and shops. The numerous streets which intersect the town are extremely crooked ; and only a few are wide enough for wheeled conveyances. In parts of the city, inhabited by particular castes, such as the Weavers’ and shellcutters’ bdzdérs, where building ground lets at a high rent, many four-storied houses have a frontage of only 8 or 10 feet, while the side walls run back to a distance of twenty yards. The opposite ,ends of these buildings are roofed in; the middle part is left open, and constitutes asmall court. The ruins of the English factory, St Thomas’s church, and the houses of the European residents lie along the banks of the river, and give the town a rather imposing appearance when viewed from the south. In the Armenian quarter are several large brick houses, for the most part now falling into decay. Of the old fort erected by Nawab Islam Khan, in the reign of the Emperor Jahangir, no vestige remains ; but the jail is built on a portion of its site. The principal Muhammadan public buildings, erected by subsequent governors and now in ruins, are the Katra and the Lal-bagh Palace,—the former built by Sultan Muhammad Shujé in 1645, in front of the chauk, or market place. Its extensive front faced the river, and had a lofty central gateway, flanked by smaller entrances, and by two octagonal towers rising to some height above the body of the building. The Lal-bagh Palace was commenced by Sultén Muhammad Azim, the third son of the Emperor Aurangzeb. It originally stood close to the Burigangé river; but the channel has shifted its course, and there is now an intervening space covered with trees between it and the river. The walls on the western side, and the terrace and battlement towards the river, are of a considerable height, and present 1 command- ing aspect from the water. These outworks,

with a few gateways, the audience hall, and the baths, were the only parts of the building that survived in 1840. Since then, their dilapidation has rapidly advanced ; but even in ruin they show the extensive and magnificent scale on which this princely residence was originally designed. It appears never to have been completed ; and when Tavernier visited Dacca, cure. 1666, the Nawab was residing in a temporary wooden building in its court. The English factory was built about that year. The central part of the old factory continued to be used as a court-house till the present century, but owing to its ruinous state it was pulled down in 1829 or 1830; in 1840 the only portion that remained was the outward wall. The French and Dutch factories were taken possession of by the English in the years 1778 and 1781 respectively.

The trade of Dacca, which formerly was considerable, has steadily declined since the beginning of this century. In 1800 the population of the city was estimated at 200,000, while a census in 1830 returned only 66,989 ix-habitants. The city still continued to decline, and in 1867 its population was estimated at 51,636 only. The rise, however, of the jute trade in late years, and increased prices for country produce, have now begun to compensate for the loss of its cotton manufactures. The census of 1872 showed that the population of the city had increased to 69,212 souls (males, 37,395 ; females, 31,817) made up as follows:—Hindus, 34,433; Muhammadans, 34,275 ;

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Christians, 479 ; "'others," 25. Sanitary improvements are being carried out ; and a wealthy Muhanunadan gentleman lately gave a donation of £5000 for the purpose of provid- ing the city with a pure water-supply, and in 1875 it was proposed to light the main thoroughfares with gas. The principal local institutions are the Mitford Hospital and the Dacca Government College. "wo English and several vernacular newspapers are published in the town,

History.—Dacca first attained political importance between 1608 and 1612. In order to check the depreda- tions of Magh pirates from Chittagong, and the rebellions of the Afghans, it was found necessary to remove the seat of government of Bengal from Rajmahal to Dacca, where the Naw4b Istm4

Khan erected a fort and increased the strength of the fleet and artillery, and changed ,the mame of the town to JahAngirnagar. Subsequently, in 1704, the capital of Bengal was removed to Murshidabad, and the government of Dacca and the eastern districts made over to a deputy of the Nawab Nazim. Dnring the time of the Mughul government, the city was under the jurisdiction of a magistrate (faujddr) and six amins, who, with the police, were maintained by rent-free grants of land. 'The fleet consisted of 700 war boats and state barges. Dacca was also a depdt for the Mughul artillery in [astern Bengal, and possessed a mint. On the establishment of the British power the old officers and representatives of the native rulers were pensioned, but the title of Nawab was continued in the family until 1845, when it became extinct on the death of the last incumbent without heirs. 'The only event of historical impurtance in late years was the mutiny of 1857, when two companies of the 73rd Native Infantry, which were stationed in the town, joined in the revolt, but were overpowered by a small European force and dispersed. (w. W. H.)

DACE, Dare, or Dart (Leuciscus vulguris), a fresh- water fish belonging to the family Cyprinide. It is an inhabitant of the rivers and streams of Europe north of the Alps, but is most abundant in those of France and Germany. It prefers clear streams flowing over a gravelly bottom, and deep, still water, keeping close to the bottom in winter but disporting itself near the surface in the sun- shine of summer. It is preyed upon by the larger predaceous fishes of fresh waters, and owing to its silvery appearance isa favourite bait in pike-fishing. The dace is a lively, active fish, of gregarious habits, and exceedingly prolific, depositing its eggs in May and June at the roots of aquatic plants or in the gravelly beds of the streams it frequents. Its flesh is wholesome, but is not held in much estimation. In appearance it closely resembles the roach, usually attaining a length of 8 or 9 inches, with the head and back of a dusky blue colour and the sides of a shining silvery aspect, with numerous dark lines running along the course of the scales. 'I'he pectoral, ventral, and anal fins are white, tinged with pale red ; and the dorsal yellowish, darkly clouded at its anterior edge. 'The dace feeds on worms, maggots, and other soft bodies. It is abundant in inany of the streams of the south of Lngland, but is unknown in Scotland and Ireland. See ANGLING, vol. 11. p. 42.

DACIA, or the country of the Daci, the ancient name of that district of Europe which lies to the N. of the Danube between the Theiss on the W. and the Dniester on the KE. It thus comprehended the modern provinces of 'Transylvania, Wallachia, and Moldavia, the Bukowina, the banat of 'Temeswar and other parts of ILungary, as well as the southern portions of Galicia.

The first occupants of the district with whom we are

made acquainted by history are the Getw, a rude tribe of

Thracian extraction, originally settled on the right bank of the Danube. They first appear in connection with the

and extensive influence under their leader Burvista. been usual to identify the Getw and Daci as one, but though

DACH=DAC

Scythian campaign of Darius, which nominally attached them for a moment to the Persian empire. Macedon their friendship was considered of importance, and he married Medopa, the daughter of their king Cothelas ; but they afterwards tuok part in the confederation of the Scythian tribes against the invasion by which Alexander the Great sought to secure his northern frontiers. About forty years later Lysimachus, king of Thrace, made an attempt to subdue them, but he was defeated and obliged to give his daughter in marriage to their chief; and a second expedition, by which he hoped to retrieve his fortunes, left hima prisoner in their hands, and brought him under obligation to his Dacian son-in-law, Dromichetes,

sy Philp of

for the restoration of his liberty. We next hear of the

Getw as being defeated by the Gauls, by whom many of

them were sold as slaves to the Athenians and other Greeks. 'Tho Getw gradually retire from the foreground of history,

and give place to the Daci, or Daoi, as they were called in

Greek, a cognate race, who seem to have migrated from Rhodope, and about 90-57 B.c. attained a stable settlement It has

they continued to occupy the same country, and were, at least fur a time, politically united, the allusions of the ancient writers seem to point to an essential difference. At the time

of the war between Octavius and Antony, the Gete sided

with the former and the Daci with the latter; and during the fifty years after the formation of the province of Mosia the Getx continued to disturb the Roman frontiers, while the Dacians kept peacefully at home. After 73, however, the Getw almost completely disappear, and the Dacians come forward as one of the most powerful enemies of Rome. Their reputation was heightened by the submission which they exacted from the tyrant Domitian, and the tribute by which be was obliged to purchase immunity from their attacks. In 101 a.v. Trajan, who had succeeded to the purple, set out against them in person, and defeated them with great slaughter at a place which is still called Prat de Trajan (Pratum Trajani), or Crossfield, near Thorda, in 'Transylvania. This was followed in 104 by another invasion, in which he advanced to the Dacian capital Sarmizegethusa (now Varhely), and routed Decebalus, who soon after committed suicide. The country was reduc

tv a Roman province, under the jurisdiction of a legate of pretorian rank ; and colonists were brought from other parts of the empire, and more especially from southern Italy. In honour of the campaign of 104 the famous column of Trajan was erected at Rome ; and to secure his conquests the victor constructed three great military roads and the bridge over the Danube, which ranked as one of the architectural wonders of the world. Under Hadrian (129 a.v.) the province was divided into two parts—-U pper Dacia, which probably included the Banat and the moun- tain region of 'Transylvania ; and Lower Dacia, situated im the Wallachian lowlands. Under Antoninus Pius te division became three-fold—Dacia Apulensis, 80 called from Apulum, the modern Carlsburg ; Porolissensis, from Porolissum ; and Malvensis, a name of unknown derivation, Dacia remained a Roman province till 272, when Aurelian adopted the line of the Danube as the

~~frontier of the empire. The Roman legions and colonists retired to the southern side of the river and settled in the eastern part of Upper Masia and the district of Dardania ; while their former territory was relinquished to the Goths and other Germanic tribes, The name of Dacia, sometimes with t 1e addition of Nova or Ripensis, was applied to the new region along the Danube, and Dardania was distinguished as Dacia Mediterranea, or Inland Dacia. After the time 0 Constantine the designation, in its wider use, includec Dacia Ripensis, Dacia Mediterranea, Mosia Prima,~~

~~narrower use it comprehended only the first two.~~

~~on Trajan's pillar. W. Froehner, La Colonne trajune, Paris, 1865 ; Romdnische Studien, 1871.~~

~~and was born in that town in 1651.~~

~~he kept Dacier for another entire year. Lefevre, Dacier removed to Paris ;~~

~~Delphin series of the classics.~~

~~old teacher, took place in 1683. in a letter to the king, the conversion of himselfand his wife to Roman Catholicism.~~

~~his wife one of 500 livres.~~

~~keeper of the library of the Louvre. after his wife, on September 18, 1722.~~

~~possessed great erudition. mulet chargé de tout le~~

~~and Valerius Flaccus, and his translations of Horace, with notes,~~

~~Hippoerates, and of Plutarch.~~

~~DACIER, Ayyu Lerkvre (1654-1720), a famous French Scholar and translator from the classics, was born at Saumur, probably in 1654. She was the daughter of Tanneguy Lefévre, a self-educated scholar belonging to the Huguenots, who taught classics aud edited classical authors with a liveliness aud enthusiasm which brought him some degree of fame. At the age of eighteen Anue Left-vre lost her father. She then removed to Paris,~~

carry- ing with her part of an edition of Callimachus, which she afterwards published, and which obtained for her au €ngageinent as one of the editors of the serics of classical authors then being prepared ad usum Delphini. In this series she edited Florus, Dietys Cretensis, Aurelius Victor, and Eutropius. In 1681 appeared her prose version of Anacreon and Sappho, which, though it was successful at the time, is waiting in the delicate taste, the gaicty, aud fire essential to a true translation. Within the next few years she also published prose versions of Terence and some of the plays of Plautus and Aristophanes, for the last of whom especially she cherished the most intense admiration. Tn 1683 Anne Leftvre married André Dacier, once her father's favourite pupwl. In the following year she accom- panied her husband to his native town of Castres, whither they retired with the professed object of devoting themselves to theologieal studies. In 1685 the result was "anounced in the conversion to Roman Catholicism of both — 4nd Mine. Dacier, and of many of the townsfolk of Castres besides. The sincerity of this eonversion, though tt brought With'it court favour, it would be uncharitable to

DAC—DAG

Preevalitana, and a part of Macedonia Salutaris ; in its Numer- ous traces of Roman occupation are found throughout the region, and in Roumenia the people pride themselves on their supposed descent from the Roman colonists, and usea dialect which bears a strong similarity to Latin. In features they are said to have a resemblance to the Dacians figured See Dierauer, Geschichte T'rajan's ; Roesler,

DACIER, Anpré& (1657-1722), a French classical scholar, was the son of a Protestant advocate at Castres, His father resolved to give him a learned edueation, and accordingly sent him first to the academy of Puy Laurens, and afterwards to Saumur, to study under Tanneguy Lefévre, who at that time enjoyed a considerable reputation as a teacher of classics. Such rapid progress did the young scholar make that, when Lefévre sent away all his other pupils, On the death of and he had the + fortune to be appointed one of the editors of the His marriage with the

far more famons Anne Leftvre, the daughter of his In 1685 he announeed,

~~As a reward Louis bestowed on him a pension of 1500 livres, and on In 1695 Dacier was elected member of the Academy of Inscriptions, and also of the~~

~~rench Academy (of which in 1713 he became secretary) ; and not long after, as payment for his share in the Histoire de Louis le Grand par médailles, c., he was appointed He died, two years~~

~~Though endowed with none of the higher literary faculties, Dacier He was, as was wittily said, 'un gros~~

~~bagage de T'antiquité." The most important of his works were his editions of Pompeius Festus~~

~~of Aristotle's Poetics, of the Electra and Cdipus of Soplroctes, of~~

~~759~~

~~doubt ;~~

~~3 Indeed the tastes of Mme. Dacier and her husband were such as would render such a step most natural. In 1711 appeared the prose translation of the tad (followed five years later by a similar translation of the Odyssey) which, through the spirit and enthusiasm which she brought to the work, and the direct and simple strength of her some- times honiely language, gained her the position she occupies in French literature. The appearance of this version, which nade Homer known for the first time to many French men of letters, and among others to La Motte, gave rise to a famous literary coutroversy. La Motte published a poetical version of the Zliad, which he look the liberty of greatly abridging and altering to suit his own taste, together with a Discours sur Homére, stating the reasons why Homer failed to satisfy his eritical taste (1714), Mme. Dacier replied, in her work Des Causes de la Corruption de la Gott (1714), maintaining her opinions with a thorough enthusiasm for the ancients which allowed no merit to the moderns, and with occasional flashes of not unhappy banter. La Motte carried on the discussion with light gaiety and badinage, and had the happiness of seeing his views supported by the indispntable erndition of the Abbé Terrasson, who in 1715 produced two volumes, entitled Dissertation~~

critique sur UIliade, in which he inaintained that science and philosophy, and especially the science aud philosophy of Descartes, had so cultured the human mind that, without doubt, the poets of the 18th century were immeasurably superior to those of ancient Greece. 'The reply to this treatise was undertaken by M. Dacier. In 1715 the dispute was settled. In that year, Pere Buftier published Jomeére en arbitrage (two letters to Mme. Lambert, with a reply from her) in which he con- cludes that both parties are really agreed as to the essential point that Homer was one of the greatest geniuses the world has seen, and that, as a whole, no other poem can be preferred to his; and, soon after, in the house of M. de Valincourt, Mme. Dacier and La Motte met at supper, and drank together to the health of Homer. Nothing of importanee marks the rest of Mme. Dacier's life. She assisted her husband, for whom she seems to have cherished a high admiration, in lis editions and translations, and spent part of her latter years in writing notes on the Scriptures, which were never published. She died at the Louvre, where her husband was keeper of the library, on the 17th August 1720.

Sve Sainte-Benve, Cuuseries de Lundi, vol. ix ; Bodin, Recherches historiques sur la ville de Saumur ; Burette, Eloge sur Mme. Dacier ; Mémoires de Mme. de Staal, A mémoire containing stories to the prejudice of Mme. Dacier's character appeared a few years after her death, and may be found in the Histoire littératre de la France (vol, i.) ; some of the stories are also repeated by Bayle. The scandal is with great probability attributed by Sainte-Beuve to the ranconr of some Hugnenot.

DA COSTA, Isaax (1798-1860), a Dutch poet and theologian, was born at Amsterdam on the 14th January 1798. His father was a Jew of Portuguese descent, through whom he claimed kindred with the celebrated Uriel D'Acosta. He studied at Amsterdam, and afterwards at Leyden. where he took his doctor's degree in law in 1818. Before this he had given evidence of poetical talent, and had become acquainted with Bilderdijk, who exercised the strongest influence over him both in poetry and in theology. He was in fact the imitator as well as the scholar of Bilderdijk. In 1822 he became a convert to Christianity, and immediately afterwards asserted him- self as a champion of orthodoxy in his DBezwaren tegen den Geest der Heuw (1823), which was an attack upon the prevalent latitudinarianism in

doctrine. He took a lively interest in missions to the Jews, aud towards the close of his life was a director of the seminary established at Amsterdam in connection with the mission of the Free

Church of Scotland. He died at Amsterdam on the 28th April 1860. Da Costa ranked first among the poets of Holland after the death of Bilderdijk. His principal poetical works were Alphonsus J. (1821), a tragedy ; Poesji (1821); God met ons (1826), Festliedern (1828) ; Vajf- en-twintig Jaren (1840) ; Hagar (1852) ; De Slag van Nrew- poort (1857), aud De Mensck en-de Dichter. He also translated the Prometheus of AEschylus, and edited the poetical works of Bilderdijk in 16 volumes. He was the author of a number of theological works, chiefly in connec- tion with the criticism of the gospels.

DACOTAH. See Dakota.

DACTYLS. See CoryBANTES.

DAZDALUS, from the identity of his name with SaddAAev, "to carve," and daidada, "carved images," appears to have been, not a real person, but a legendary representative of the art of carving and sculpture in Greece in the time before Homer, who speaks of him (Jizad, xviii. 590) as having made a "chorus" for Ariadne in Crete, which Hephaestus took as the model of his "chorus," or dance, on the shield of Achilles. Works of art of an extremely early date, but especially wooden images of deities, were ascribed to Daedalus or his descendants, and there were many traditions of the wonders he had done in sculpture. Most of the tools used in wood carving and sculpture were believed to have been invented by him. He was the first to open the eyes of statues, so that they seemed to look at the spectator, and to separate the legs so that they seemed to walk. A statue of Heracles by him had to be tied to prevent its running away, when the hero, angry at its resemblance to himself, threw a stone at it. The greater freedom which early Greek artists introduced into their figures was always contrasted with the stiffness of Egyptian statues, and hence it was necessary for the legend to represent Deedalus as having been some time in Egypt. Two of the earliest centres of art in Greece were Crete and Attica, and in-the legends of both,

~~Daedalus is involved, the story being that he had fled from Athens after killing his skilful nephew Talus, had gone to Crete in the time of Minos, had there constructed the famous labyrinth, and made a "' chorus " for Ariadne and a cow for Pasiphaé, and had been then thrown into prison, but escaped along with his son Icarus by means of wings. Icarus, however, fell into the sea and perished. Dzedalus reached Sicily, where, protected by the king against Minos, who pursued him, he is said to have constructed several important works.~~

~~DAFFODIL, the name of a group of plants of the genus Varcissus, and natural order Amaryllidacee, The common daffodil, V. Psewdo-narcissus, is common in woods and thickets in most parts of the N. of Europe, but is rare in Scotland. Its leaves are 5 or 6 in number, are about a foot in length and an inch in breadth, and have a blunt keel and flat edges. The stem is about 18 inches long, and the spathe single-flowered. The flowers are large, yellow, scented, and a little drooping, with a corolla deeply cleft into 6 lobes, and a central bell-shaped nectary, which is crisped at the margin. They appear early in the year, or, as Shakespeare says, "come before the swallow dares, and take the winds of March with beauty." The stamens are shorter than the cup, the anthers oblong and converging ; the ovary is globose, and has three furrows ; the seeds are roundish and black. Double and other varieties of the flower are commonly cultivated in gardens. The bulbs are large and orbicular, and have a blackish coat; they, as well as the flowers, are reputed to be emetic in properties. The Peruvian Daffodil and the Sea Daffodil are species of the genus [smene.~~

~~DAGGER, a weapon which, in relation to its compara- tively short blade, may be considered a diminutive of the~~

~~sword. Specially designed to inflict wounds by the act of stabbing, the dagger is sharp at the point, but it is equally adapted for cutting purposes with its keen edge. All savage races have highly valued the dagger in some modifications of its simplest type ; while at certain periods it has been included among the military weapons of civilized nations, and, in our own time, is well known as the dirk. Early in the 14th century a dagger straight in the blade, and called a misericorde—either because the sight of it caused~~

the vanquished to cry out for mercy, or from its use in mercifully ending the sufferings of the hopelessly wounded—became a companion weapon to the sword among the knights of Europe; and, accordingly, from about 1330 till the end of the succeeding century, in many knightly effigies it is often represented as attached on the right side by a cord or a chain to the sword-belt. The misericorde varied in size, the length of the blade sometimes causing it to appear almost like a second sword, while at other times the blade and the hilt were nearly of equal length, This weapon and its sheath were often elaborately adorned. It was customary to secure it from accidental Joss by a guard-chain fastened to a mamelliére of the breast-armour, of which chain the other end was secured to the hilt of the weapon by a ring either fixed on the apex of the pommel or travelling along the grip. Occasionally the misericorde was fixed to the body-armuur by a staple ; or, more rarely, it was connected with a gypcitre or pouch. A similar weapon, with a longer blade than the ordinary misericorde, was habitually worn by civilians, including judges, during the Middle Ages; such weapons bore the name of anlace or basilarde. By nobles and knights the misericorde was worn when they had exchanged their armour for (the costume of peace. It is recorded, besides, that when they appeared at a tournament, and on some other occasions, ladies at that time wore daggers depending, with their gyp- ciéres, from their girdles. Thus, writing of the year 1348, Knighton speaks of certain ladies who were present at jousts as "habentes cultellos, quos daggervos vulgariter dicunt, in powchiis desuper impositis." A sword having a blade much shorter than the principal knightly weapon of the same class, and distinguished as an estoc, which, like the civilian anlace or basilarde, may be considered to be a variety of the dagger, occasionally formed a part of the equipment of the medieval man-at-arms; and it is the scabbard of such a weapon that hangs as a characteristic memorial above the tomb and the effigy of the Black Prince in Canterbury Cathedral. Much ingenuity and skill have been lavished on the adornment of daggers, and in render- ing the blades more capable of inflicting severe wounds. Daggers also were sometimes made to poison as well as wound. Some Italian daggers, of stiletto type, have the blade made to expand laterally, by the action of delicate and powerful springs. Others, like the cris of the Malays, have wavy blades.

~~DAGHESTAN, a government in Asiatic Russia, on the eastern slopes of the Caucasus, bounded by Circassia, Grusia or Georgia, and the Caspian. As its name implies, it is of a very rugged and mountainous character, with the exception of a narrow strip along the sea-coast. It is watered by the tributaries of the Sulak and other streams that find their way to the Caspian. The district is geolo- gically of great interest, and its strata have been investi- gated by Abich in his Sur la structure et la géologie du Daghestan, 1862. Lead, iron, and sulphur are worked to some extent. The chief townisDerbent. See Caucasts, vol. v. p. 254.~~

~~D'AGINCOURT, Jzan Baptiste Louis Guorai Serovux (1730-1814), archeologist and historian, was born at Beauvais on the 5th April 1730. HIe belonged to a~~

~~good family, and in his youth served as an officer in a regiment of cavalry. Finding it necessary to quit the army in order to take charge of his younger brothers who had been left orphans, he was appointed a farmer-general by Louis XV. In 1777 he visited England, Germany, and HIolland ; and in the following year he travelled through Italy, with the view of exploring thoroughly the remains of ancient art. HIe afterwards settled at Rome, and devoted himself to preparing the results of his researches for publication. HIe died on the 24th September 1814, leaving the work, which was being issued in parts, unfinished ; but it was carried on by M. Gence, and published complete under the title L'Zistoire de CArt par les Monuments, depuis sa décadence au quatriéme siecle jusqu' a son renouvellement au seizidme (6 vols. fol. with 325 plates, Paris, 1823). An English translation by Owen Jones was published in 1847. Ip the year of his death D'Agincourt published at Paris a Recueil de Fragments de Sculpture antique, en terre cuite (1 vol. 4to).~~

~~DAGON, a national god of the Philistines, spoken of in Judg. xvi. 23; 1 Sam. v. 2; 1 Chron. x. 10; 1 Mace. x. 83. The name is derived from Dag, a fish, with the suffix of endearment,—the older etymology from Dagan, corn, suggested by Philo Byblius, being generally regarded as untenable. The principal temples of the god were at Ashdod (1 Sam. v. 1), and Gaza (Judg. xvi. 1, 23), and the former existed until the time of the Maccabees, when it~~

was destroyed (148 Bc.) by Jonathan, the brother of Judas (1 Macc. x. 84). Dagon was a fish-god of the male gender, as the form of the name indicates, the correspoud- ing female deity being Atargatis. From 1 Sam. v. 4. it appears that his image was composed of the head and hands of a man and the tail of a fish, The words "the stump of" at the close of the verse are an interpolation of the translators ; the original reads " only Dagon (?.e., the fish) was left." Selden and Niebuhr identify the Philistine Dagon with the Dagon (Q8dkwv) of the Babylonian mythology ; but Rawlinson considers it " extremely doubt- ful" whether the two had any connection (Rawlinson's Herodotus, 3d ed. i, 614). The fish was worshipped as the symbol of fertility, both on account of its own fecundity and as representing water, the life-giving and fertilizing element.

DAGUERRE, Lovis Jacques Manp¥ (1789-1851), a French paiuter and physicist, was born at Cormeilles, in the department of Seine-et-Oise, and died July 12, 1851, at Petit-Brie-sur-Marne, near Paris, He was at first occupied as an inland revenue officer, but soon betook himself to scene-painting for the opera, in which he ere long surpassed his predecessors Bibiena and Munich, and his teacher Degoti, more especially in his remarkable power of representing light and shade. Among the most admired of his productions were the Chapel of Glenthorn, at the Ambigu, and the Rising of the Sun in "Les Mexicains." He assisted M. Prévost in the execution of panoramic views of Rome, Naples, London, Jerusalem, and Athens, and subsequently (July 11, 1822), in conjunction with Bouton, he opened at Paris the Diorama (dés, double ; dpaua, View), an exhibition of pictorial views, the effect of Which was heightened by changes in the light thrown upon them. As an example of these may be instanced the Midnight Mass at the Church of Saint-Ftienne du Mont. An establishment similar to that at Paris was opened by Daguerre in the Regent's Park, London. On the 3d — March 1839 the Diorama, together with the work on which Daguerre was then engaged, the Interior of Sainte-Marie- Majeure, was destroyed by fire. This reverse of fortune was soon, however, more than compensated for by the dis- tinction he achieved as the inventor of the daguerreotype photographic process. Nicéphore Niepce, who since 1814

had been seeking a means of obtaining permanent pictures by the action of sunlight, learned in 1826 that Daguerre was similarly occupied. In the following year le con- municated to Daguerre particulars of his method of fixing the images produced in the camera lucida by making use of metallic plates coated with a@ composi- tion of asphalt and oil of lavender ; this where acted on by the light remained undissolved when the plate was plunged into a mixture of petroleum and oil of lavender, and the development of the image was effected by the action of acids and other chemical reagents on the exposed surface of the plate. The two investigators laboured together in the production of their " heliographic pictures " from 1829 until the death of Niepce, July 3, 1833, Daguerre, continuing his experi ments, discovered eventually the process connected with his name. This, as he described it, consists of five operations : — the polishing of the silver plate ; the coating of the plate with iodide of silver by submitting it for about 20 minutes to the action of iodine vapour ; the projection of the image of the object upon the golden-coloured iodized surface ; the development of the latent image by means of the vapour of mercury ; and,

lastly, the fixing of the picture by immersing the plate in a solution of sodium " hyposulphite " (sodium thiosulphate).

On January 9, 1839, at a meeting of the Academy of Sciences, Arago dwelt on the importance of the discovery of the daguerreotype ; and, in consequence of the repre- sentations made by him and Gay Lussac tu the French Government, Daguerre was on the 15th of June appointed

an officer of the Legion of Honour. On the same day a bill was presented to the Chambers, according to the provisions of which Daguerre and the heir of Niepce were to receive annuities of 6000 and 4000 francs respectively, on the condition that their process should be made known to the Academy. The bill having been approved at the meetings of the two Chambers on the 9th of July and the 2d of August, Daguerre's process, together with his system of transparent and opaque painting, was published by the Government, and soon became generally known. The first great improvement upon it, due to Mr Towson of Devonport, was the use of enlarged lenses, with which Mr Draper of New York was the first to secure portraits from the life. Then followed Mr Goddard's introduction, in 1840, of bromine for increasing the

sensi- tiveness of the plates, and Fizeau's method of strengthen- ing the lights and shades by the application of chloride of gold in the fixing operation. Previous to the time of Daguerre both Wedgwood and Sir H. Davy had attempted, but in vain, to prevent the unshaded portions of "pictures taken by means of the solar rays from becoming coloured by exposure to diffused light ; this result Daguerre secured by the use of sodium thiosulphate, and 'thus became the chief pioneer of the modern art of photography.

Daguerre's H istorique et description des procédés du Daguerréotype et du Diorama (Paris, 1839), passed through several editions, and was translated into English. Besides this he wrote an octavo work, entitled Nouveaw moyen de préparer la couche sensible des plaques destinécs a recevoir les images photographiques (Paris,

1844).

D'AGUESSEAU, Henrr Frangots (1668-1751), chan- cellor of France, illustrious for his virtues, learning, and talents, was born at Limoges on the 27th of November 1668. Under the careful supervision of his father, a man of great worth and ability, who held the posts of intendant of Languedoc and councillor of state, D'Aguesseau devoted himself to study with great ardour and with extraordinary results. When little more than twenty-one years of age he was, through his father's influence with the king, appointed one of the three advocates-general ; and the eloquence and learning which he displayed in his first speech gained him a very lofty reputation, which was alae cag by his

subsequent career. The chosen companions of his leisure hours were Racine and Boileau, the latter of whom frequently mentions him with high praise.

In 1700 he was appointed procurator-general ; and in this office, which he filled for seventeen years, he gained the greatest popularity by his lenity in criminal cases, and by his care of the public hospitals. In 1717 he was made chancellor by the Regent Orleans ; but it was only a year after that he was deprived of the seals, and exiled to his estate, on account of his steady opposition to the projects of the famous John Law, which had been adopted by the regent and his ministers. In 1720, however, on the failure of these schemes, he was recalled ; and he contributed not a little, by the firmness and sagacity of his counsels, to calm the public disturbance and repair the mischief which had been committed. Law himself had acted as the messenger of his recall ; and it is said that D'Aguesseau's consent to accept the seals from his hand greatly diminished his popularity. But his reputation was much more severely shaken by his conduct in connection with the bull "Unigenitus," a measure which, with distinguished bravery, he had himself opposed during the life of the late king. He allowed the Great Council to assume the power of registration, which legally belonged to the Parliament alone ; and he assisted Dubois, the favourite of the regent, in his endeavour to force the Parliament to register the bull, though he refused to sanction the extreme measure of exiling the Parliament, which Dubois had contemplated. Dislike of the Jansenists, and desire to put an end to the religious controversies which were raging so bitterly, were probably the motives which, in part at least, influenced D'Aguesseau ; but the people unjustly attributed his con- duct to a base compliance with the favourite. He certainly opposed Dubois in other matters; and when Dubois became chief minister, D'Aguesseau was deprived of his office.

He retired to his estate at Fresnes, where he passed five years, of which he always spoke with delight. The Scrip- tures, which he read and compared in various languages, and the jurisprudence of his own and other countries, formed the subjects of his more serious studies ; the rest of his time was devoted to philosophy, literature, and gardening.

From these occupations he was recalled to court, by the advice of Cardinal Fleury, in 1727; but the seals were not restored to him till ten years later. During these years he endeavoured to mediate in the disputes between the court and the Parliament. When he was at last reinstated in office, he completely withdrew from all political affairs, and devoted himself entirely

~~to his duties as chancellor, and to the achievement of those reforms which had long occupied his thoughts. Besides some important enactments regarding donations, testaments, and successions, he intro- duced various regulations for improving the forms of pro- cedure, for ascertaining the limits of jurisdictions, and for effecting a greater uniformity in the execution of the laws throughout the several provinces. These reforms constitute an epoch in the history of French jurisprudence, and have placed the name of D'Aguesseau in the same rank with those of L'H6pital and Lamoignon. As a magistrate also he was so conscientious that Saint-Simon has complained that he spent too much time over the cases that came before him.~~

~~In 1750, when upwards of eighty-two years of age, D'Aguesseau retired. from the duties without giving up the rank of chancellor. He died on the 9th February of the following year.~~

~~The published writings of D'Aguesseau form a collection of thirteen volumes quarto, of which the first was published at Paris in 1759, and the last in 1789. The far greater part relates to matters connected with his profession, but they also contain an~~

~~DAH—DAH~~

~~elaborate treatise on money ; several theological essays; a life of his father, which is interesting from the account which it gives of his own early education ; and Metaphysical Meditations, written to prove that, independently of all revelation and all positive law, there is that in the constitution of the human mind which renders man a law to himself.~~

~~See Histoire des hommes tllustres des regnes de Louis XIV. et de Lowis X V. by the Duc de Saint-Simon ; Mémoires secretes, by Duclos ; Les loisirs dun ministre d'état, by D' Argenson; Hloges by Antoine Thomas (1760), by Marthon (1760), and by Boinvilliers (1848) ; and Discours sur la vie de M. @ Aguesseau, by his son, Aguesseau de Fresnes (1812).~~

~~DAHL, Jonann Curistian (1778-1857), a landscape painter, born in Bergen, Norway, on the 24th February 1778. He began painting in his native town, and formed his style without much tuition, remaining there till he was twenty-four, when he left for the better field of Copen- hagen, and ultimately~~

settled in Dresden in 1818. He is usually included in the German school, although he was thus close on forty years of age when he finally took up his abode in Dresden, where he was quickly received into the Academy and became professor. German landscape- painting was not greatly advanced at that time, and Dahl contributed to improve it. He continued to reside in Dresden, though he travelled into Tyrol and in Italy, painting many pictures, one of his best works being that of the Outbreak of Vesuvius, 1820. What his works want is the careful expression of nature in its normal conditions. He was fond of extraordinary effects, as seen in his Winter at Munich, and his Dresden by Moonlight; also the Haven of Copenhagen, and the Schloss of Friedrichsburg, under the same condition. At Dresden may be seen many of his works ; a large picture called Norway may be mentioned, and a Storm at Sea. He was received into several academic bodies, and had the orders of Wasa and St Olaf sent him by the king of Norway and Sweden. His death took place in 1857.

DAHL, Micuarn (1656-1743), the only celebrated Scandinavian portrait painter of his time, was born at Stockholm in 1656. He received his first professional education from Ernst Klocke, who had a respectable posi- tion in that northern town, which, however, Dahl left in his twenty-second year. His first destination was England, where he did not long remain, but crossed over to Paris, and made his way at last to Rome, there taking up his abode for a considerable time, painting the portraits of Queen Christina and other celebrities. In 1688 he returned to England, with an established character, and became for some years a dangerous rival to Kneller. His portraits still exist in many houses, but his name is not always preserved with them. Nagler (Aiinstler-Lewxicon) says those at Hampton Court and at Petworth contest the palm with those of the better known and vastly more employed painter. Some of his pictures have been engraved. He died in 1743, in his eighty-seventh year.

DAHL, or Date, VuApImiIR Ivanovirch (1802-1872), a Russian author and philologist of high reputation, was born of Scandinavian parentage in 1802, and received his education at the Naval Cadets' Institution at St Petersburg. He joined the Black Sea fleet in 1819; but at a later date he entered the military service, and was thus engaged in the Polish campaign of 1831, and in the expedition against Khiva. He was afterwards appointed to a medical

~~post in one of the Government hospitals at St Petersburg, and was ultimately transferred to a situation in the civil service. The latter years of his life were spent at Moscow, and he died there on November 3 (October 22), 1872. Under the name of Kossack Lugansky he obtained con- siderable fame by his stories of Russian life,— Zhe Dream and the Waking, A Story of Misery, Happiness, and Truth, The Door-Keeper (Dvernik), The Officer's Valet (Denshchik). His greatest work, however, was a Dictionary of the Living~~

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~~Hiussian Longue (Tolkovyi Slovar Zhivago Velikorusskago Yasika), which appeared in four volumes between 1861 and 1866, and is of the most essential service to the student of the popular literature and folk-lore of Russia. "Tt is impossible," says Mr Ralston, "to praise too highly this magnificent work—one to which he devoted during a great part of his lifetime what was truly a labour of love." It was based on the results of his own investigations throughout the various provinces of Russia,— investigations which had furnished him with no fewer than 4000 popular tales and upwards of 30,000 proverbs. Among his other publications may be mentioned Bemerkungen zu Zimmer- mann's Entwurf des Kriegstheaters Russlands gegen Khiwa, published in German at Orenbur Botany, Moscow, 1849. A collected edition of his works appeared at St Petersburg in 8 volumes, 1860-61.~~

~~DAHLGREN, Kart Freprrx (1 791-1844), the Swedish poet, was born at Stensbruk in Ostergétland June 20, 1791. At the time when literary partizanship ran so high in Sweden, and the writers divided themselves into "Goths" and " Phosphorists," Dahlgren came over to the Iter body, and made himself indispensable by his polemical activity. In the mock-heroic poem of Murkalls sémulésa ndtter (Markall's Sleepless N ights), in which the Phosphorists bitterly, and with eminent success, ridiculed their opponents, Dallgren, who was a genuine humourist, took a very prominent part. In 1825 he published 7'he Tower of Babel, a satire, and in the same year, a comedy, Argus in Olympus. In 1828 he collected the scattered poems of his youth into two volumes. In 1829 he was appointed to an ecclesiastical post in Stockholm, which he held until his death. In a series of odes and~~

~~*dithyrambic pieces, entitled Mollbergs Epistlar (1819, 1820), he strove to emulate the wonderful lyric genius of Bellman, of whom he was a student and follower. From 1825 to 1827 he edited a critical journal entitled Kometen ('The Comet), and he is also the author of a comic novel, Nahum Fredrik Bergstrém's Chronicle, which is said to be extremely witty. In company with Almqvist he founded the celebrated Mauhems-férbund, a society of agricultural socialists, which had but a short tenure of existence. In 1834 he collected his poems in one volume 3; and in 1837 appeared his last book, a volume entitled Steamboat Songs. On the Ist of May 1844 he died at Stockholm. Dahlgren is one of the best humorous writers that Sweden has produced; but it was perhaps in realistic and idyllic description that his peculiar talents displayed them- selves to most advantage. His little poem of Zephyr and the Girl, which is to be found in every selection from Swedish poetry, is a good example of his sensuous and ornamented style, as well as of his ease and vivacity. His works were collected and published after his death by A. J. Arwidsson.*~~

DAHLIA, a genus of herbaceous plants of the natural order Composite, so called after Dr Dahl, a pupil of Lin. neus. The dahlia is indigenous to Mexico, where it flourishes in sandy tracts at a height of 5000 feet above sea-level. Two cultivated species are distinguished by some botanists, D. frustranea and D. superflua, the outerinvolucre

in the former being spreading, in the latter reflexed. The

flowers have a chaffy receptacle, a double involucre, and no pappus. The roots or tubers are spindle-shaped, and grow in bundles; they were at one time used as food in France; but their acrid flavour occasioned their rejection as an esculent. They may be stored in winter in the same manuer as potatoes. The flowers, at the time of the first introduction of the plant, were single, with a yellow dise and dull scarlet rays ; under cultivation, since 1802 in France and 1804 in England, flowers of numerous brilliant hues, with the elements of the disc converted into ray-

, and a Handbook of

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florets, have been produced. The flower has been modified also from a flat to a globular shape, and the arrangement of the florets has been rendered quite distinct in the ranunculus and anemone-like kinds, The ordinary natural height of the dahlia is about 7 or 8 feet, but one of the dwarf races grows to only 18 inches. With changes in the flower, changes in the shape of the seed have been brought about by cultivation; varieties of the plant have been produced which require more moisture than others : and the period of flowering has been made considerably earlier. In 1808 dahlias were described as flowering from September to November, but some of the dwarf varieties at present grown are in full blossom in the middle of June, The nature of the season has a marked effect upon certain kinds of dahlia, so that those which are good in one year may become decidedly bad in the next. In 1842 it was noted by one observer that every dahlia with a tendency to become of a scarlet hue had its petals deeply notched, in some cases to the depth of half an inch. A fine colour is an important requisite for a good flower; there should also be nu sinking of the centre or eye, and the backs of

~~the petals should not be visible, Dahlias may be grown in almost any kind of soil, but flourish best in a rich loam; on a light sandy mould they arrive early at maturity, and become dwarfed. The plants should be protected from north and east winds, and when watered the whole of their foliage should be wetted, They are propagated by cuttings and seed as well as by tubers. Experience has shown that the best plants obtained from cuttings are those planted in soil different from that on which the parent plants grow. The seeds are sown in pots early in March, under the protection of a hotbed frame or in a hothouse.~~

~~DAHLMANN, Frmpricu Curistian (1785-1869), a distinguished German historian and politician, was born on the 13th May 1785, at Wismar. He studied philology at the universities of Copenhagen and Halle, and at the age of twenty-five took his doctor's degree in that subject. He had already delivered lectures at Dresden ; and in 1812 he was appointed professor of history at Kiel. His devotion to historical study had been caused by his wish to take a useful and intelligent part in contemporary politics. In 1815 he was made secretary to the permanent deputation of the prelates and nobles of Schleswig Holstein, in which posi- tion his influence was exerted against the policy of the Danish Government, and he henceforth took a prominent place among moderate liberals. In 1829 he was chosen professor of the science of politics in the university of Gottingen, Two or three years later he was engaged in drawing up the Hanoverian constitution of 1833. In 1837, when that constitution was abolished by Ernest Augustus, Dahlmann so strongly opposed the king's policy that he was banished from Hanover. He retired to Leipsic, and then to J ena, where he gave his time to the study of history and the pro- duction of his most important works. In 1842 Dahlmann became professor of history and the science of politics at Bonn. In 1848 he was chosen a member of the committee of seventeen which was appointed to draw up a new German constitution ; and he was elected member of the National Assembly of Frankfort. He distinguished him- self as an advocate of the election of the king of Prussia as emperor of Germany. He was indeed so much regarded as a leader that he was requested to form a ministry ; but his attempt was unsuccessful. In March 1849, when the Parliament rejected the constitution, Dahlmann, who had been opposed to the armistice of Malmoe, retired, with many of his followers, from the Parliament, and joined the assembly of Gotha, in which~~

~~he still advocated the unifica- tion of Germany under the king of Prussia. He also worked in the same cause in the assembly of Erfurt and~~

~~the Prussian diet. When that cause appeared hopeless, he retired from politics; and the rest of his life was spent in study, and in fulfilling the duties of the chair which he still held at Bonn. He died on the 5th December 1860.~~

~~'The chief works of Dahlmann are a valuable Geschichte Déinemarks (3 vols. 1840-8), Geschichte des Englischen Revolution (1845 and 1853), Geschichte des Franzésischen Revolution (1844 and 1853), Forschungen auf dem Gebiete der deutschen Gesehichte (1822-3), Chronik von Dithmarsen (1827), Politik auf den Grund und das Musz der gegebenen Zustinde zuriickgefihrt (1835 and 1847) ; Quel- lenkunde der deutschen Geschichte (1830 and 1875).~~

~~See Springer, Friedrich Christian Dahlmann (1870-2).~~

~~DAHLSTJERNA, Gunno (1661-1709), whose original | surname was EvRELIUS, the Swedish poet, was born | September 7, 1661, in the parish of Ohr, in Dalsland, where |~~

~~his father was rector. He entered the university of Upsala in 1677, and after gaining his degree, entered the Govern-~~

~~ment office of land-surveying. He was sent in 1681 on |~~

~~professional business to Livonia, then under Swedish rule, and after some time took thence a scientific journey into Germany, in the course of which, being at Leipsic, he published and publicly read, in 1687, a dissertation, De Electro, which caused such a sensation that he was offered a professorial chair at the university of that city. He refused this honour, however, and busied himself, on his return to Sweden, with carrying out the numerous commis- sions in land-surveying directed by King Charles XI, and in 1699 he became head of the whole department. In 1702 he was ennobled under- the name of Dahlstjerna. He spent his life in travelling, and wandered over the whole of the coast of the Baltic, Livonia, Riigen, and Pomerania,~~

preparing maps which still exist in the office of Public Land-Surveying in Stockholm. He died in Pomerania on his forty-eighth birthday, September 7, 1709, just after the disastrous news of the lost battle of Pultowa had reached him. Dahlstjerna's life was, as it might seem, fully occupied with those practical mathematical studies in which he laboured so conscientiously for his country ; but it is indisputable that his passion for poetry was still more absorbing. His patriotism was touching in its pathos and intensity, and during his long periods of professional exile he comforted himself by the composition of songs to his beloved Sweden. His genius was most irregular; at his best he surpasses all the Swedish poets of his time, and that with ease ; but no writer of that country has sunk to lower depths of bombastic puerility. He formed his style after two thoroughly bad models, —the so-called Second Silesian School, of which Lohenstein was the leader, and the florid Italian pastoralists, Marini and Guarini. His best known original work is Kwngaskald, an elegy on the death of Charles XI., published in 1697. It is written in alexandrines, arranged in ottava rima. The poem has faults enough ; it is pompous and allegorical, but there are passages full of melody and high thoughts. The whole bearing of the work, judged from a national point of view, is noble and even sublime, and could only have been conceived at such a time, when Sweden was a great power in Europe. Dahlstjerna was a reformer in language, and it has been well said by Atterbom, that in this poem 'the treats the Swedish speech just as dictatorially as Charles XI. and Charles XII. treated the Swedish nation." In 1706 he printed a volume of poems celebrating the victories of Charles XII., which, to the serious loss of Swedish lite- rature, has unaccountably disappeared. In 1690 was printed at Stettin his translation or rather paraphrase of the Pastor Fido of Guarini, which was very much admired and often reprinted. But of all the works of Gunno Eurelius the one that has attainéd most living popularity is The Goth's Battle Song concerning the King and Master Peter, published in 1701, The king is Charles XII. and Master Peter is, of course, the czar of Russia. There is a

proud maiden whom Peter will ravish from the king, and her name is Narva Castle. It is an exceedingly spirited and felicitous ballad, and lived almost until our own days on the lips of the people as a folk-song. In a more

~~*tasteful age, and with more leisure for poetic study, there can be no doubt that the vivid genius of Dahlstjerna would have produced works of a far higher order. As it is, there is no Swedish writer of his age who has approached him in his sublimer moments. The works of Dahlstjerna have been collected by Hansellius,*~~

~~*¢ Atakpoms INDEPENDE*~~

~~*i a*~~

~~*ENGLISH MILES*~~

~~*θ*~~

~~*2°|EAST OF GREENWICH*~~

~~*Chart of Dahomey.*~~

~~*DAHOMEY, a kingdom on the west coast of Africa, extending inland from the Slave Coast, in the Gulf of Guinea, and second only to Ashantee in power and impor- tance. 'The territory of Dahomey has been described as extending from the Volta to the Niger, and from the Kong Mountains to the sea; but recent investigation has shown that the true limits of the state are much more closely circumscribed, Dahomey proper being probably not more than 120 miles from north to south, and the same, or perhaps less, from east to west, lying between 6° 15' and 7° 30' N. lat. and 1° 30' and 2° 30' E. long. or thereby. On the W. and N.W. are the semi-independent races of Aja and Atakpamé; on the N. the Mahees or Makhis, now completely subjugated; and on the N.E. and E. the Eyos and the Egbas, both the hereditary enemies of the Dahomans. On the S.E. is the kingdom of Porto Novo, a nation of kindred race, over which the king of Dahomey claims suzerainty. The southern portion of Dahomey is confined to the narrow tongue of dry land which lies between the Avou and the Denham lagoons and the swamps to the north of them, while the actual coast- line included in the dominion extends only from Mount Pulloy (near Great Popo) on the west to Cotonau on the east. The frontier is said to be marked for some distance inland by the River Agomey on the west and the Denham water and its tributary, the Ouellon or Whemi river, on the east. The seaboard is*~~

~~about 35 miles long, and forms a portion of the 120 miles of coast which intervene between the British possessions of the Gold Coast proper and Lagos. Between the Gold Coast and the Dahoman frontier occur several independent townships or coast settlements of mixed race, each under a separate chief. The principal centre of trade with the interior in this debateable land is the town of Gridgi, where a market is held every few days.~~

~~Physical Features.—The physical geography of Dahomey possesses some peculiarities. The ancient limit of the con- tinent now lies about 50 miles inland, and the low ground intervening between the former coast-line and the' present shore is protected from the ocean by a natural bank of~~

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~~sand, varying in width and height, but sufficient to prevent the incursions of the sea except at a few points, of which the channels of Great Popo and Lagos are well defined. 3ehind the sand-bank rnns a lagoon affording carriage along almost the whole coast. A line drawn from the coast at Appi northwards to Abomey would represent roughly the almost imperceptible water-shed of the country, dividing the two systems of drainage which communicate with the sea at Great Popo and Lagos respectively. Recent charts show two vast lakes, the Avon and the Denham waters, extending many miles inland, and communicating with the lagoon which skirts the coast-line, but it is now certain that the extent of these lakes has been much exaggerated, and that the greater portion of what has been considered as navigable water is really low-lying land, more or less marshy according to the season of the year, and intersected by rivers and streams. The steamer "Eko" from Badagry ascended the Whemi river for a considerable distance in the autumn of 1876, and found plenty of water; while M. Guil- levin, a French naval officer, who some years ago penetrated to the same river at Kassa near Abomey, not many miles further up in the month of April, that is during the dry season, reported that there was then little water in the stream The whole question of the geography of this coast is very fully discussed by the Abbé Borghero in a letter explaining the discrepancies between the English maps and his own. The letter is published in the Bulletin de la Société de Géographie of July 1866. The subject has considerable interest~~

in connection with recent events on the Slave Coast, and in regard to the possible extension of the British protectorate over the interval of coast-line which now Separates the two sections of the Gold Coast Colony. The sketch which illustrates this article is based upon M. Borghero's map, but it differs from it in the important particular of the position of Abomey. The latitude now assigned has been determined by a careful comparison of the itineraries of all the principal travellers, and the length of the route is found to correspond exactly with that given by Commodore Wilmot in 1862. It is a singular fact that the distance of Abomey from the coast, according to the accounts of successive travellers, has been gradually diminishing from 200 miles in 1724 to the present esti- mate. The longitude of Abomey is undetermined, but preference has been given to the English accounts which place it slightly more to the west than the French map. Communication.—The interior of Dahomey is traversed by road a extending from Whydah to Abomey, the capital, a distance of 65 miles. The road, for the first 40 miles, lies through forest, gradually increasing in density to the edge of the Agrimé, or Great Swamp. Round the villages, and here and there in the forest, clearings are met with, cultivated in places, but in others now partially overgrown, The soil is naturally fertile, and there is evidence of former prosperity, but everywhere the process of depopulation is apparent, and the country is described as a luxuriant wilderness. The swamp which is supposed to connect the marshes at the head of the Avon and Denham waters is seven or eight miles broad. It is covered with stunted trees and its surface is rough and uneven. So far as any movement of its waters has been observed, it drains towards the west. The passage is attended by considerable difficulties during eal aml eiadinaidede—)

1 More recently Mr Dumaresq, the late administrator of Lagos, who was on board the "Eko," when it explored the Whemi after the rains of 1876, has again ascended the river for 20 miles in an open boat for the purpose of ascertaining the depth of water during the dry season. He is reported to have found it to average 2 fathoms, but with a depth ef 34 feet only on the bar at the entrance of the river. The breadth was 150 yards, and the stream was free from swam ps. It must, however, be remarked that the character of the river in the latitude of the Agrimé swamp remains still undetermined.

~~sists of a rich clay of a deep red colour. quartz and yellow mica are met with, denoting the deposit~~

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~~the rainy months, but in dry seasons it is scarcely distin- guishable from the rest of the route. tracks across the swamp. The right is the more direct of the two ; it passes through Akpwé and Agrimé, The left road, said to be slightly longer owing to the obligation unposed upon all travellers to halt at Cana, branches off at Henvi, and enters the marsh at Toffo ; it is used in the rainy season, the passage of the swamp being less difficult at this point. The "koh," or swamp, once passed, the difficulties of the journey are left behind, and the character of the country undergoes a complete change ; instead of dense forest and dismal swamps,~~

~~There are two known~~

~~a vast and gently~~

~~undulating plain, with a gradual ascent towards the Kong~~

~~Mountains, stretches out as far as the eye can reach. The approach to Cana has been described by several travellers~~

~~as one of much beauty,~~

~~Port and Towns.—The principal seaport is Whydah. It is situated on the north bank of the coast lagoon about two miles from the sea. There is no harbour at the beach, and landing is effected in boats made expressly to pass through the surf, which is here particularly heavy. The~~

~~town is two miles long and halfa mile deep, and has about~~

~~12,000 inhabitants. There are five quarters, the English, French, Portuguese, Brazilian, and native, and the three first have the remains of once formidable forts,~~

~~Cana is the country residence of the king ; the town Straggles over three miles of ground, but the precincts include more field than habitation, the~~

~~population being from 4000 to 5000. The distance from Cana to Abomey is eight miles; the road, apparently level, has an imper- ceptible rise the whole way ; it is 20 yards broad and is kept carefully clear of grass.~~

~~Abomey.—The site of the capital is a rolling plain, nearly surrounded by marsh, and terminating in short bluffs to the north-west, where it is bounded by a long depression. Scattered over this hollow are the principal pans which scantily supply the city with water. For some reason visitors are not permitted to approach this quarter, and it was only by infringing the royal commands that Captain Burton, setting out at 4 o'clock one misty morning, was able to explore it. The city is about eight miles in cir- cumference. 'The enceinte consists of a ditch 5 feet deep, filled with a dense growth of prickly acacia, the usual defence of West African strongholds. 'It is entered by six gates, which are simply clay walls, with two apertures, built across the roads leading into the town. Within the walls are several royal palaces, a market-place, a large square containing the barracks, &c., many cultivated farms and several large wastes ; and outside the gates on the south there is a suburb with three other palaces. Notwithstand- ing the great area ocenpied by the habitations, the popula- tion is estimated by Burton at not more than 12,000, or about the same as that of Whydah, which only covers one- sixth of the area.~~

~~Mahee country.—From Abomey a road leads across a marsh northwards into the Mahee country, which is entered about 30 miles from the capital, and extends in a series of gradually rising terraces to the heart of the Kong Moun- tains. It is a rugged country of varied surface, and pro- duces iron ore, which is smelted and worked up into agricultural and other implements. The mahogany tree and the African oak abound, and the much esteemed shea- butter tree is met with; the cotton plant is indigenous. The towns are built on the level summits of the hills with~~

~~a view to defence.~~

~~Productions.—The soil of Dahomey proper is naturally fertile, and is capable of being highly cultivated. It con- Finely powdered~~

~~of dis'ntegrated granite from the interior, The principal~~

product is palm-oil, which is made in large quantities throughout the country. The district of Toffo is particularly noted for its oil-palm orchards ; these are chiefly owned by the officials of the capital, many of whom have houses and grounds there. Palm-wine, said to be superior to the finest cider, is also made, but the manufacture is pro- hibited excepting in the bush, as the process destroys the tree. Next to palin-oil the principal vegetable products are maize, guinea-corn, cassava (the substitute for bread), yams, sweet potatoes, plantains, cocoa-nuts, oranges, limes, and the African apple, which grows almost wild. The country also produces ground-nuts, Kola-nuts, pine-apples, guavas, spices of all kinds, ginger, okros (//zbiscus), sugar-cane, onions, tomatoes, and papaws. Cattle, sheep, aud goats are scarce, and fowls are not plentiful.

The medium of exchange is the cowrie, which is imported from Zanzibar by the European merchants. At Whydah fifty cowries make a string, and fifty strings one "head ;" a dollar is worth four heads; the head is ls. 14d., and a string therefore aboutafarthing. Inland, the value of the cowrie is enhanced by reducing the number in the string.

The climate of this part of the Slave Coast is the same as on the remainder of the Bight of Benin. Whiydah is considered slightly more healthy than either Lagos or Badagry. Near the sea the heat is not excessive, the average temperature being about 80° Fahr. The year may be divided into four seasons :—summer, the rains, autumn, and the harmattan. During the summer, which continues from March to May, the heat is greatest, and dysentery prevails, The rains are ushered in by violent thunder- storms, and they last from May until August, with a break of fine weather in June ; at the close of the rains thunder- storms are again prevalent. This is the coolest season of the year, but mosquitoes and sandflies abound. The autumn months are from September to November; thunderstorms and tornadoes occur at intervals; the climate assumes a more unhealthy phase, and Guinea worm is troublesome. The harmattan, so called owing to the prevalence of a cold dry wind which blows from the north and north-east, continues from December to February. It prevails for several days in succession, and alter- nates with winds from the south and south-west ; its approach is generally foretold by a thick white fog known as "the smokes," During its continuance the thermometer falls about 10°, there is not the

slightest moisture in the atmosphere, vegetation dries up or droops, the skin parches and peels, and all woodwork is liable to warp and crack with a loud report. This season is considered healthy, but in the intervals of the harmattan wind, when it is usually hot, mild fever may be expected. Tornadoes occur occasionally. During nine months of the year the climate is tempered by a sea-breeze, which is felt as far inland as Abomey. It generally commences in the forenoon, and in the sumer it often increases to a stiff gale at sundown.

The history of Dahomey before the last 200 years is un- known. The country now occupied by Daliomey and Porto- Novo was, at the commencement of this period, comprised in the extensive kingdom of Ardrah, of which the capital was the present town of Allada, on the road from Whydah to Abomey. About the beginning of the 17th century the state became dismembered on the death of a reigning sovereign, and three separate kingdoms were constituted under his three sons. One state was formed by one brother round the old capital of Alladd, and retained the name of Ardrah ; another brother migrated to the east and formed a state also called Ardrah, but now known under the name of Porto Novo; while the third brother travelled northwards, and after some vicissitudes established the kingdom of Dahomey. The Western Ardrah, or Allada, ajpears to have been subsequently further subdivided by

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| the formation of the separate kingdom of Whydah to the

south. About 1724-28 Dahomey, having become a power- ful state, invaded and conquered successively Allad4 and Whydah. 'Towards the north it was unable to extend its power, being hemmed in by the Mahees and the still more powerful Eyos or Oyos. The people of Whydah who escaped massacre or capture retreated along the coast to the west, and established themselves in the islands of the lagoon about Great Popo. The Whydahs from time to time made several attempts to recover their country, but without success, while on the other hand the Dahomans failed in all their expeditions against Popo. It is related that the repulses they met with in this quarter led to the standing order that no Dahoman warrior is to enter a canoe. The Dahomans have at several times penetrated along the beach towards the

east as far as Badagry, but the king of Porto Novo became jealous of their incursions, and invoked the aid of the Eyos to put a stop to them. This was the state of affairs at the accession of Gezo about the year 1818. This monarch, who reigned forty years, raised the power of Dahomey to its highest pitch. He boasted of having first organized the amazons, to which force he attributed his successes. In 1825 he attacked the Eyos at Cana and abolished the tribute, thus freeing his country from the incubus on the north-east. He next (1840) overran Atakpamé on the west, and subjugated the Mahees on the north. Shortly after this began the quarrels with Abbeokuta, which continue to this day, and have proved one of the main causes of the decline of the Dahoman power. In 1848 Gezo fell unexpectedly on Okiadan and completely destroyed it. In 1851] he attacked Abbeokuta, the centre of the Egba power, but was beaten back. Gezo never recovered from this blow ; he died in 1858, and was succeeded by his son Gelelé.

Gelelé's principal exploit was the capture of the Egba town of Ishagga in 1862. He slew the chief and carried off amongst the prisoners some native Christian converts and a native scripture-reader called William Doherty. This unfortunate man was crucified on a tree at Abomey, and his body was seen in this position by M. Euschart, a Dutch merchant of Whydah. In 1864 Gelelé attacked Abbeokuta and received an exemplary defeat, which will probably be sufficient to prevent him from again seriously attempting the capture of the place. Abomey has been frequently visited by representatives of the British Government. The later missions have had a threefold object—the suppression of the slave trade, the abolition of human sacrifices, and the dissuasion of the king from attacking Abbeokuta. Little result has ever been obtained from any of these visits.

From the time of Captain Burton's visit in 1863 there was little change in the political situation of Dahomey, until the spring of 1876, when in an evil moment Gelelé caused an Englishman resident in Whydah tv be treated ignominiously. Brought to task by the commodore on the station the king refused to pay the fine of palm-oil awarded, and defied the British flag. Accordingly, for the fourth time in the history of Dahomey, a blockade of the coast was proclaimed.

~~*Throughout the history of Dahomey, with very few exceptions, Europeans appear to have been treated with kindness, but they have often felt the inconvenience of placing themselves within the power of an uncivilized despot. It has always been an object with the king to secure the presence of white men at his "customs," and even casual visitors to Whydah have found themselves compelled to accept an invitation to visit the capital. Once there the length of their stay has depended on the caprice of the king, and even the envoys of European powers have*~~

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~~*found it impossible to break through the tedious etiquette of the savage court. Asa notable instance of vexatious delay, Mr Skertchley, who visited Whydah in 1871, was induced to go to Abomey under promise of return to the port in eight days, and was compelled to remain eight months.*~~

~~*The "customs" consist of an annual festival which takes place about October, and lasts several weeks, During the saturnalia many human victims are put to death with great barbarity. At one stage of the customs the unfortunate wretches,, chiefly captives taken in war, are dressed in white shirts and long white night-caps and tied into baskets. They are then taken to the top of a high platform, and paraded on the heads of amazons, together with an alligator, a cat, and a hawk in similar baskets. The king now makes a speech explaining that the victims are sent to testify to his greatness in spirit-land, the men and the animals each to their kind. They are then hurled down into the middle of a surging crowd of natives, and meet with ahorrible death. At another stage of the festival human sacrifices are offered at the shrine of the king's ancestors, and the blood is sprinkled on their graves. The skulls are used to adorn the palace walls, and the king's sleeping-chamber is paved with the heads of his enemies. The skulls of the conquered kings are turned into royal drinking cups, and their conversion to this use is esteemed an honour.*~~

~~*Amazons.—But the most singular institution of. this Strange race is found in the treatment of the female sex. About one-fourth of the whole are said to be married to the fetish, many even before their birth, and the remainder are*~~

entirely at the disposal of the king. The most favoured are selected as his own wives or enlisted into the regiments of amazons, and then the chief men are liberally supplied. Of the female captives the most promising are drafted into the ranks as soldiers, and the rest become amazonian camp followers and slaves in the royal households,

With such an appropriation of the women it is not surprising that the population of Dahomey is found to be decreasing. No estimate can be formed of the number of inhabitants, but evidences of depopulation strike the traveller. It is a mistake to ascribe the diminution to human sacrifices, for the number of these is compara- tively insignificant, and the victims are principally foreign captives,

The army of Dahomey was formerly held in high repute, but its prowess was probably overrated. The amazons form the flower of the army. They are marshalled in regiments, each with its distinctive uniform and badges, and they take the post of honour on the flanks of the battle line. Their number has been variously Stated. Captain Burton had a good opportunity of judging, as he saw the army marching out of Cana on an expedition in 1862, and he computed the wholé force of women troops at 2500, of whom one-third were unarmed or only half armed. Their weapons are blunderbusses, flint muskets, and bows and arrows. Whether their arrows are poisoned or not is a point on which there is difference of opinion,

A recent writer estimates the number of amazons at 1000, and the male soldiers at 10,000. The system of warfare is one of surprise. The army marches out, and, when within a few days' journey of the town to ke attacked, silence is enjoined and no fires are permitted. The regular highways are avoided, and the advance 1s by a road specially cut through the bush. The town is surrounded at night, and just before daybreak a rush is made and every soul captured if possible ; none are killed except in self-defence, as the first object is to capture, not to kill. The season usually selected for expeditions is from January

to March, or immediately after the annual customs. The |

amazons are carefully trained, and the king is in the habit of holding "autumn manceuvres " for the benefit of foreigners. Many visitors have witnessed a mimic assault, and they are agreed in ascribing a marvellous power of endurance to the women troops. Lines of thorny acacia are piled up one behind the other to represent defences, and at a given signal the amazons, barefooted and without any special protection, charge and disappear from sight. Presently they emerge within the lines torn and bleeding, but apparently insensible to pain, and the parade closes with a march past, each warrior leading a pretended captive bound with a rope.

It is said that at the death of the king a horrid Scene ensues ; the wives, after the most extravagant demonstrations of grief and breaking and destroying everything within their reach, attack and murder each other, and remain in an uproar until order is restored by the new sovereign. The throne descends rightfully to the eldest son, but, as in the case of the present monarch, a younger brother is not unfrequently preferred, should the chiefs consider the heir unfitted to assume the reins of government. (W. K. EB.)

DAILLE [Datizvs], Jean (1594-1670), oneof the most learned Protestant divines of the 17th century, was born at Chatellerault, in January 1594, and received his education at Poitiers and Saumur. For seven years from 1612 he was tutor to two of the grandsons of the illustrious M. du Plessis Mornay, and in 1619 he accompanied them in a tour through Italy, Switzerland, Germany, Flanders, Holland, and England, which lasted for two years. Having been ordained to the ministry in 1623, he preached for some time in the family of M. du Plessis Mornay ; and on the death of his patron he devoted himself to the grateful task of drawing;up his Memoirs. In 1625 Daillé was appointed minister of the church of Saumur, and in 1626 he removed to Paris. Of his works, which are principally controversial, the most important is the celebrated treatise De vrai Emplo. des Peres (1631), translated into English by Thomas Smith under the title On the Use of the Fathers (1651). In 1656 it appeared in Latin. The work is a most effective attack on the views of those who made the authority of the fathers conclusive on matters of faith and practice. Daillé shows that their text is often corrupt, and that even when the text is correct their reasoning is often weak and inconsequent. He was greatly esteemed, even by his antagonists; and his mild and amiable disposition, united to his learning and genius, led

Balzac to exclaim, "Cum talis sis, utinam noster esses." In his famous Sermons on the Philippians and Colossians, Daillé has vindicated his claim to be ranked as one of the first of preachers, as well as one of the most able of polemics. Daillé was president of the last national synod held in F rance, which met in 1659. In the discussions which occurred he defended the universalism of Amyraut. HIs Apologie des Synodes d'Alengon et de Charenton (1655) was devoted to the same object. Among his other works were an Apologie pour les Lglises Reformées and La Loy fondée sur les Sainte Ecritures. Dailld's life was written by his son Adrien, who retired to Zurich at the revocation of the Edict of Nantes.

DAIMIEL, a town of Spain, at the head of a depart- ment of the province of Ciudad Real, and about 20 miles north-east of the town of that name, with which it is con- nected by rail. It is situated in a fertile plain on the Azuer, and is regarded as one of the most flourishing places in the La Mancha district. Linens and woollens are manufactured, and a purgative salt known as Sal de Inghilterra is extracted from the neighbouring marshes. Being of comparatively modern foundation, the town presents nothing very remarkable in its architecture. Population about 12,000.

DAIRY. Milk, either in its natural state, or in the form of butter and cheese, is an article of diet so useful, wholesome, and palatable, that dairy management, which includes all that concerns its production and treatment, constitutes a most important branch of husbandry. The physical conditions of the different countries of the world have determined in each case the most suitable animal for dairy purposes. The Laplander obtains his supplies of milk froin his rein-deer, the roving Tartar from his mares, and the Bedouin of the desert from his camels. In the temperate regions of the earth many pastoral tribes subsist mainly upon the milk of the sheep. In some rocky regions the goat is invaluable as a milk-yielder ; and the buffalo is equally so amid the swamps and jungles of tropical climates. The milking of ewes was once a common practice in Great Britain ; but it has fallen into disuse because of its hurtful effects upon the flock. A few milch asses and goats are here and there kept for the benefit of infants or invalids ; but with

these exceptions the Cow is the only animal now used for dairy purposes in this country.

Breeds.—Cows of every kind are used for the dairy ; but there are several of our native breeds of cattle which are called par excellence " the dairy breeds." An account of these has already been given in the article AGRICUL- TURE, vol. i, page 388. Whatever the breed, the quality is much influenced both by the age of the cow and by the way in which she is fed. So clearly is it ascertained that the milk of cows not exceeding four years of age yields a larger proportion and richer quality of curd than the milk of older animals, that it is customary in some of the cheese-making districts of England to draft off the cows to the grazier after they have borne two or at most three calves each.1 Cows that are prized for their pedigree, however, are of course kept for longer periods, and few will part with a good cow so long as she continues to yield abundance of milk. In large well-conducted dairies, especially where, as in a yearly increasing number of cases, shorthorns are kept, the cows are fed so well that they are sold to the butcher at very nearly their original cost as milch cows.

Food.—The influence which the food of the cow exerts upon the amount and qualities of her milk has always been recognized ; but at one timea large yield of milk, free from any unpleasant taste, was made the chief object of regard. It was accordingly the practice in new-milk dairies to feed the cows principally with soft sloppy food, such as boiled turnips, brewers' grains, and distillery wash. The milk produced from such food contains an undue propor- tion of serum, and is deficient in butter, caseine, sugar, and phosphates—the very elements which give to milk its value as an article of food, and fit it so peculiarly for build- ing up the frame of young animals. When these elements are wanting in the cow's food they are to a certain extent supplied to her milk from her own system; and hence it is that cows which give a very large quantity of milk generally lose the fat and flesh which they had accumulated before calving. In order, therefore, to maintain the condition of the cow, and enable her to give milk of the best quality, it is necessary that her food contain an adequate supply of the requisites for good milk. Her food, in short, must be substantially the same as that found most useful in feeding cattle for the butcher. It is now pretty well ascertained that the fattening process is accomplished most economically

by giving a moderate allowance of linseed or other cake, and of the meal of beans, Indian corn, and other grains in

1Jn those districts it is usual to rear one heifer calf for each three cows, and to have the heifers to calve for the first time at 3 years old,— so that the young stock of all ages are equal in number to the cows. As many pigs are kept as suffice to consume the whey,—the proportion, in summer, being one pig to two cows. :

addition to the pasturage, green forage, roots, and fodder, which constitute the bulk of the food of such animals, The following approved dietary for milch cows is taken from a Report on Harvey's Dairy Company, Glasgow, by H. M. Jenkins, F.G.8., published in the Journal of the Royal Agricultural Society of England in 1871.

" During the seven winter months, when the cowsremain entirely in the byre, the daily food commences with draff (distillery refuse) about four or five o'clock in the morning, mixed with bean, pea, or Indian meal, preferably the first-named, unless beans are too dear, when mixed kinds of meal are substituted. Linseed cakc is occasion- ally given at this time to cows beginning to run dry, and also in spring to those that require a little laxative. After the first milking, viz., about seven in the morning, as much distillcry refuse as they can take is freely given, and at eight o'clock either oat-straw or hay (if possible). The latter is generally rye-grass hay of the irrigated fields which are held by the Company. 'he next feed consists of raw turnips or cabbages, given about ten o'clock, and at eleven the cows are milked for the second time. The afternoon meal is given at two o'clock, and consists of steamed meal, turnips, and draff. At four o'clock some fodder, generally straw, is placed in the mangers, and between four and five more draff is run in. Some turnips are always put in the steamed food. At five o'clock the cows are milked for the third time, and are afterwards made up for the night.

'During the summer the cows get nothing in the byres but a little draff in the morning, when they come in to be milked, except towards the fall of the year. They are then allowed some fodder at mid-day ; and in a bad season they get a little meal with their draff in the morning. They are kept on the

pastures all day, but are brought up to the steading to be milked about eleven o'clock, as well as at night,"

The ordinary management of cows in the cheese manu- facturing districts is of a much more simple and less expensive nature than the above. In Ayrshire the cows generally begin to calve early in March, and they are all giving milk by the time when the pasture is ready for them. That time varies in ordinary seasons from the middle of April on fine early land to the middle of May on the colder soils of the uplands. The female calves from the best cows are reared on most farms. The calved cows get two meals of cooked food daily. The cooked food con- sists of chaff and turnips or mangold, boiled together, with bean and Indian corn meal added. The other food con- sists of hay or straw produced on the farm. The chaff and meal are frequently given, especially in backward seasons, for some time after the cows are on the pasture. On bare inland farms good managers use meal of some kind during a considerable part of the summer. In hot days, or cold boisterous nights, the cows are sometimes kept in the house and supplied with a little food. In August, when young grasses are failing, the cows are fed partly on second clover, or on vetches, and later in autumn cabbages and soft turnips come in to supplement the pas- tures. When the weather becomes inclement the cows are kept in at night, and get hay or straw with good supplies of turnips. The turnips are reduced in quantity when the cows are put dry, which may be from one to two months before the expected time of calving, and the dietary is improved again when that time approaches. Where butter is made, mangold or turnips have to be given in a judicious manner, on account of the flavour. With the turnips given soon after milking, and a little nitre put into the shallow vessels in which the milk is cooled, there is little danger of unpleasant flavour. Mangold is most valuable in the latter part of spring. Its feeding quality is then at the best, and turnips are not so good. But for quality of milk, carrots are the best food of all the so- called root crops.

Gorse, bruised and chopped, has been found a suitable kind of green winter forage for milch cows. On the large dairy farm of F. Leser & Co., near St Louis, Missouri, the daily winter food of a cow consists of about half a bushel of brewers' grains, 6 gallons of distillery slop, mixed with from 2 to 5 lb of ship stuff, malt sprouts, bran, and Indian or cot-

tou-seed meal, and 6 to 10 tb of good hay, chiefly Hungarian, | Tye-gréss is at once the cheapest and best forage that can

On another American farm, at Cumberland, Rhode Island, each cow receives in summer 2 quarts of cotton-seed meal daily in addition to pasturage, and in winter 4 quarts of cotton-seed meal, and from 2 to 4 quarts of Indian meal, with English and swale hay; neither Indian meal nor wheat shorts can be substituted for the cotton-seed meal without lessening the produce of a cow by a quart per diem.

The best pasturage for cows is that afforded by good old grass land, in sheltered inclosures of moderate size, where there is a constant supply of pure water. To have dairy produce of the best quality, the grass must be so stocked as to keep it always fresh grown and sweet, This is most easily secured by frequently changing the cows from one field to another ; and hence the advantage of having small inclosures, one of which can be rested, while another is keeping the stock. When soiling is resorted to, Italian

be used ; but it can be varied, as circumstances dictate, with clover, sainfoin, vetches, or green rape. When cows are kept entirely at pasture during the summer, from 1} to 2 acres of grass land is required for each animal 3 and if hay alone is given in winter (as is the practice in Gloucestershire), the produce of another 1} acre of meadow is required to supply their winter keep. As from 1 to 12 ewt. of green forage is an ample daily allowance for a cow, and as two cuttings of clover or Italian rye-grass, averaging 8 tons each per acre, can with suitable manuring be easily obtained, it is obvious that by soiling in summer and feeding on roots and cooked food in winter, half as much land will suffice to maintain a cow on the latter system as on the former. And, above all, the produce in milk, besides being of richer quality, is greater in quantity by

‘ fully one-fourth, The average yield per annum of milk of

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Elevation and Plan of Dairy Farm-steading.

a cow in Gloucestershire is estimated at 525 gallons, and in Ayrshire ati about 425 gallons. Under a generous house-feeding system an average of 680 gallons may be obtained. Salt ought always to be a constituent of the food of the dairy cow; to cows at grass it should be given daily, and in May and June it may be advantageously supplied twice per diem. * Withholding it for five days has been found to occasion a loss of 2 per cent. in the quantity and 7 per cent. in the quality of the milk. All changes of diet must be made with caution, The utmost vigilance must also be used to insure regularity in the times of feeding and milking, in seeing that the latter process is thoroughly performed, and in guarding the cows from exposure to extremes of heat or cold. Through inattention to these particulars the flow of milk may easily be so diminished as to render the keeping of a dairy a profitless business. Buildings.—The accompanying plan shows the general arrangement and dimensions of the different portions of a

modern dairy farm steading for fifty cows. It has been drawn by Mr James Cowie, of Sundridge Hall, after the model introduced by him and approved

~~of by the Highland and Agricultural Society of Scotland, an engraving of which was given in the last edition of this work. The interior of the steading is intended to have two roofs, and is so constructed as to facilitate with the least possible labour the supplying of the cattle with straw and roots, which latter are wheeled on a tramway. The dung, which is also removed by tramway, is deposited in an adjacent covered yard, where, if need be, cattle and pigs can be kept for treading down the dung. Sufficient ventilation can be obtained by very simple methods, and must be provided for in the course of erection. It is necessary only to add, that the principle on which the steading is constructed can be ap- plied to either larger or snialler establishments as required.~~

~~Dairies are of three kinds, viz—new-milk, butter, and cheese dairies.~~

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~~1. New-Milk Dairies.— These, in or near towns, or amidst the dense population of mining and manufacturing districts, are to a large extent kept by persons who, with the aid of their families, undertake the management of from one to a dozen cows, and the delivery of the milk to customers. In our large towns there are also to be found gigantic establishments, in some of which as many as a thousand cows may be seen at one time. In these town dairies the cows are usually purchased when they have newly calved, or are at the point of calving, and they are retained till they cease to give a remunerative quantity of milk. The cows are commonly milked twice a-day, but sometimes thrice, as in the case of those owned by Harvey's Dairy Company, Glasgow. To ensure successful milking, quietness, com- fort, and kindly treatment are essential to the animals. The udders and teats should be thoroughly cleansed before the commencement of the operation, The more expedi- tious the milker, the better the result. The left arm should be kept firmly pressed against the cow's right leg, in order to protect the pail. Towards the close of the process the hand should reach a little above the teat, and pull down gently upon it at each delivery of the milk, so as com- pletely to empty the udder. The milk is conveyed at once to the milk-room, where it is strained, measured, and delivered over to retailers, or to servants of the establishment, by whom it is distributed to the customers. A~~

~~portion, in some cases half, of the new milk is, however, retained in the dairy for twelve hours. It is then skimmed, and the cream either retailed or made into butter. This business requires the employment of a large capital, and is attended with much risk; but when well managed, is a remunerative one to those engaged in it.~~

~~Railways have occasioned the introduction of important changes in this branch of dairy business. Instead of the cows being kept in or near cities, where housing, food, and litter are costly, it has become a common practice to keep them on farms near railway stations, and to forward the new milk in suitable vessels twice a-day to retail trades- men, It is obviously easier to carry the milk to the place where it is consumed, than first to convey thither the cows and their litter and food, and then to remove to the country the manure which they produce. There can be no doubt, also, that the air and pasturage of the country are of advan- tage to the cows.~~

~~2, Butter Dairies—Wherever cows are kept some portion of the milk is used for the production of butter. The dairies, however, of extensive districts both in England and Scotland, on account of the attention given to this particular product, are appropriately spoken of as " butter-dairies." In the midland and western counties of England, where the breeding of cattle is extensively carried on, the calves, two or three weeks after birth, are fed upon skimmed milk and a gruel of bruised linseed and oatmeal, so that the greater part of the new milk can be converted into butter. When the calves are all weaned, the skim milk is employed in fattening pigs. In many parts of the country buttermilk is much relished by the labouring classes. Wherever churned milk can be readily disposed of, dairy farmers direct their attention chiefly to the produc- tion of butter.~~

~~When new milk is allowed to settle, the fat globules, being lighter than the general mass, gradually rise to the surface in the form of cream. In the process of churning, these globules are broken by the mechanical agitation, aided by the action of the lactic acid which is formed from the sugar of the milk, and the contents cohere to form butter. The usual practice is to allow the cream, whether sepa- rated from the milk or not, to stand until it begins to become acid.~~

~~Butter is made either from cream only or from milk and~~

~~cream together. The best butter is obtained from the cream which rises during the first twelve hours after milking, and the next best by churning the whole milk. In the former case the new milk, after being carefully strained, is poured into shallow vessels of glazed earthenware, glass, tinned iron, wood, lead, or zinc, of which the three first-named sorts are the best. Wooden vessels are objectionable from the difficulty of cleaning them thoroughly, and lead and zinc on account of the noxious salts produced by the action of tlie acid of the milk on the metal. Pans of about 10 quarts capacity, made, without seams, of well-tinned sheet iron, are in common use. Where milk is cooled by means of water the pails are made round, and about 18 inches in depth, or shallow and rectangular, with an ex- terior pan for containing the water. The deeper vessels are found to be most suitable in a cold, the shallower in a warm atmosphere. To obtain as much butter from the milk as possible, the first skimming takes place at the end of twenty-four hours, and one or more skim- mings are made at further intervals. The cream is stored in jars, which should be kept in a place separate from the milk-room, that the milk in the coolers may not be too early acidulated by the proximity of the sour cream. The latter is either stirred repeatedly, or poured from one vessel to another, to prevent the formation of a tough. coat upon it before enough is accumulated for a churning. In large dairies it is usual to churn daily. Three days is as long as the cream can ordinarily be kept for butter of good quality. In the New York butter factories the milk rooms are thoroughly ventilated, and are provided with tanks sunk in the ground, and having a depth of 18 inches of flowing water for cooling the milk whilst it is throwing up its cream. The temperature of the water should be between the limits of 48° and 56° Fahr. The uniform temperature of the cream is said to have a favourable effect on the churning. When a cow has recently calved, her milk is comparatively rich in butter and poor in curd; but by and by the relative proportions of these constituents are reversed, the cream diminishing and the milk becoming thicker. A very sensible change in the quality usually takes place when a cow becomes pregnant, so that in not a few cases double or treble the ordinary length of time is required to churn the cream, and the butter produced is of inferior quality. If cows are flurried and heated, either by gadding in the pasture, or by being overdriven in bringing them home for milking, their milk becomes peculiarly liable to~~

~~corrupt, the yield of butter is sensibly lessened, and its quality is impaired. 'The success of the process of churn- ing depends much on the temperature of the cream being nicely regulated. Experiments have shown that a tem- perature of from 54° to 59° Fahr., both of the air and of the cream, is the best for churning. The temperature of the cream usually rises about 10° during this process. Advantage is derived from rinsing the churn with cold water in summer and with warm water in winter. The addition to the cream of small quantities of cold or hot water, as the case requires, is also found beneficial. Box or barrel churns are preferred when the cream only is churned, the former being best adapted for small dairies, and the latter for large ones. When the whole milk and cream are churned together, it is indispensable that acidulation and coagulation should first take place, and the churnings should not be at longer intervals than every second day. When the milk is gathered for more than two days some of it is past the proper stage of acidulation at the time of churning, or part of it has not reached that stage, The time required to produce butter from whole milk is much longer than with cream alone, three hours being an average period. The plunge churn is most appreciated for this prac- tice; and in large dairies it is usually worked by steam,~~

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~~water, or horse-power. Forty strokes of the piston per minute has been found a good rate of working, but, accord- ing to a report on American butter factories, the best rate is fifty strokes per minute. The most suitable dasher for the barrel churn is either circular or cross-shaped with broad wings, and should have a diameter equal to about three. fourths of that of the central portion of the churn. The speed of working is kept slow until the cream is thoroughly mixed ; it may then be increased to the normal rate. When the butter begins to come, the speed, if rapid, should be slackened. The residual buttermilk is removed from the butter by kneading either with or without water. The water should be entirely free from sediment, and not very hard. Generally brine is preferable to water alone for washing. The method of churning introduced into America by Mr John Higgins of Speedsville, New York, consists in adding cold water twice or thrice at short intervals to the contents of the churn, so as to lower the temperature to about 55° Fahr. The dasher, which now does not rise above the surface of~~

~~the cream, is worked at half speed, and the butter is produced quite pure, in large-sized, hard, and compact granules; the adherent buttermilk can be readily separated by rinsing a couple of times in water, and the butter is then ready for salting,~~

~~Clotted Cream.—In Devonshire a method of treating the milk has long been in use for the production of what is called clotted or "'clouted" cream. The new milk is strained into shallow earthenware pans, in each of which half a pint of water has previously been placed to prevent the milk from adhering to the pan in the subsequent process of scalding; after twelve hours the pans are placed over a charcoal fire, or on a hot plate, or are immersed in cold water in a shallow boiler, which is then heated until the temperature of the milk rises to 180°, after which they are again replaced in the milk-room (great care being taken to preserve the surface of cream unbroken), and allowed to stand the usual time. The scalding effects the separation of the whole of the cream from the milk, and greatly facilitates its conver- sion into butter. This is readily accomplished by placing the cream in a small tub, and working it with the hand or a piece of flat wood. The butter made from it is said by some persons to be altogether superior to that made without scalding, and also to keep better ; whereas others assert, and with good show of truth, that it contains an undue proportion of cheesy matter, and in consequence is more liable to rancidity than other butter.~~

~~Lancashire Method—aA mode of procedure in use in some Lancashire dairies has been much commended. The first drawn and larger portion of the new milk is set aside, and the cream obtained from it is mixed, at the time of churning, with the strippings or afterings, which contain the greater part of the butter obtained at milking. The labour of churning the whole of the milk is thus obviated, and a larger yield of butter is said to be obtained than when the cream only is churned.~~

~~The separation of the butter from the milk is not so com- plete as to secure the absence of some oily matter in the whey, and, on the other hand, of a portion of caseous matter in the butter. Cheese, being a nitrogenous substance, is peculiarly susceptible of putrefaction, and hence even the smallest portion of it present in butter is sure in a very short time to corrupt the whole mass and to impart to it a rancid flavour. Besides this liability to~~

taint, butter, like other fatty substances, readily absorbs odours of all kinds ; and if cream or butter is kept in the same apartment with tainted meat, or other decaying matter, or is stored in vessels that have previously contained any rancid substance, or is exposed to the exhalations of dung-heaps and stables, it is Sure to become contaminated. By washing the newly- churned butter repeatedly in' cold water, and at the same

time working a little salt into it, not only the whey, but the greater part of the caseous matter above referred to, can be removed, and the tendency to rancidity is overcome. If the butter is to be used fresh, it is immediately made into rolls or pats ; but if it is to ke cured, half an ounce of fine salt is added for each pound of the butter, and thoroughly incorporated with it; and the mass, after lying a day, is again worked over, and then packed into a perfectly clean air-tight vessel. In domestic use the most convenient vessels are jars of glazed earthenware. Market butter is put into casks called half-firkins, firkins, and tubs, contain- ing respectively 28 ib, 56 tb, and 84 tb. These should be of well-seasoned oak, and made perfectly tight, as otherwise the butter is sure to become tainted, Large quantities of butter are also now disposed of in sealed tins. From the facilities which railways afford for cheap and rapid carriage, a very great proportion of our home-made butter is sent to market in a fresh or only slightly salt state.

The average yearly product of butter per cow in the butter dairies is usually estimated at from 170 to 200 tb. This is in addition to the new milk used in rearing the heifer calves required to keep up the stock, and to the butter consumed in the farmer's family.

3. Cheese Dairies.—Cheese-making is by far the most difficult department of dairy management. Although the art is universally practised, and the raw material is every- where substantially the same, there is perhaps no equally common product which varies so much in its quality and market value, from mere diversity in the skill with which itis made. The difficulty of producing really good cheese arises from the peculiar susceptibility of milk to be in- fluenced by a great variety of external causes, and the extreme facility with which its component parts undergo chemical changes.

Casein, the chief ingredient of cheese, is held in solution in milk by means of an alkali. The effect of neutralizing this alkali is to produce insoluble casein, which when dried forms cheese. When milk is allowed to stand, coagulation takes place on account of the formation of lactic acid, There are various substances which, when added to new milk, promote speedy coagulation. The preparation which is invariably used for this purpose in British dairies is rennet, provincially called steep or yearning, which is made from the stomachs of sucking calves. To cure them, the stomachs, usually termed bags or vells, as soon as taken from the animal, are turned inside out, carefully freed from all impurities, and salted. They are then packed one upon another, with layers of salt between, into a deep earthen-ware vessel, and are covered over with salt, the air being excluded by a close-fitting lid. In the best English dairies the skins are invariably kept for a year previous to use. About a month before the rennet is needed, a sufficient number of the skins are taken out of the jar, and when the brine has drained from them, they are spread out upon a table, powdered on both sides with fine salt, rolled with a paste roller, distended with asplint of wood, and hung up todry. The rennet is made the day before use by putting into a cup with half a pint of lukewarm water and a tea-spoonful of salt a square inch of the bag for each 10 gallons of milk to be curdled. The power of effecting coagulation is attributed to the minute globular germs existing in prodigious quantities in the steep. The production of these appears to be connected with a kind of decay in the skin, which, however, if it goes too far, causes the cheese made to corrupt prematurely, and renders it unwhole-some. In some dairies as much of the rennet is infused at one time as serves for several weeks, or even months ; but the practice of the best dairies is in favour of its daily or at most weekly preparation. To produce cheese of the best quality it is indispensable that the rennet be sweet and

good, that only so much of it be used as will suffice to effect perfect coagulation, and that this take place at a proper temperature. Too much rennet makes a tough curd and a poor ill-flavoured cheese. The time the milk takes to coagulate varies with different modes of churning.

The cheese dairy comprises a milk-room, working-room, salting and drying room, and cheese-rroom. The working- room is provided with two boilers—a smaller one for heating water, and a larger one for heating whey. There are also lead tanks for containing the fresh whey, and a cistern in which, after being scalded, it is stored for the pigs. The cheese-tub is of wood or tinned iron—the latter being best, as it admits of being thoroughly washed, whereas a wooden vessel, being porous, is exceedingly apt to retain minute particles of milk or whey, which, souring in the wood, become a source of mischief to the future contents. The other utensils are lever presses, cheese vats of elm, turned out of the solid and hooped with wood, pans of tinned iron or brass for heating milk by immersion in hot water, a cheese ladder, a curd-breaker, a curd mill, and a thermometer.

In England the cows are milked twice a-day, at 5 a.m. and 5 P.M. The whole available hands are engaged at this work, that it may be accomplished speedily. Usually each person has seven or eight cows to his share, and occupies about ten minutes in the milking of each of them. The milk is carried to the dairy as fast as it is drawn from the cows, and is there consigned to the care of the dairy-maid, who proceeds in her treatraent of it according to the variety of cheese to be produced. The kinds of cheese in best esti- mation and of greatest market value are Stilton, Cheddar, Cheshire, and Gloucester. The first variety is made in Leicestershire, and contains the cream of one milking, added to the new milk of the next. The Cheddar and Cheshire cheeses are made from new milk, or rather from milk in which all its own cream is retained. Gloucester cheese is usually deprived of a small portion of its cream. Double and single Gloucester differ only in the former being twice the thickness and weight of the latter, and consequently taking longer to ripen. The Scotch variety called Dunlop and the Gouda of Holland are full-milk cheeses. Cheddar cheese is now generally made in Ayr- shire and the other cheesemaking counties in Scotland. The following is an abstract of a report presented by Mr Drennan to the Ayrshire Agricultural Association in 1854, describing the method followed in Mrs Harding's dairy in Somersetshire :—

Immediately after the morning milking, the milk is mixed with that of the preceding evening, the whole being brought to the temperature of from 80° to 82° Falir. by heating a sinall quantity of the evening milk. In spring and

towards winter a smal] quantity of arnotto is used to improve the colour of the cheese. It is put into the milk along with the rennet at 7 o'clock. After the rennet is added, au hour is requisite for coagulation. At 8 o'clock the curd is partially broken and allowed to subside a few minutes, in order that a small quantity of whey may be drawn off to be heated. This whey is put into a tin vessel and placed on a boiler in a separate apartment, to be heated in hot water. The curd is then most carefully and minutely broken with utensils called shovel breakers, and as much of the heated whey is mixed with it as suffices to raise it to the temperature at which the rennet was added. Soon after 9 o'clock the work is resumed. A few pailfuls of whey are drawn off and heated to a higher temperature than at 8 o'clock. The curd is then broken as minutely as before ; and after this several pailfuls of heated whey are poured into the mass. During the pouring in of the whey the stirring with the breakers is actively continued, in order to mix the whole regularly, and not to allow any portion of the curd to become overheated. The temperature at this time is raised to 100°, as ascertained by the thermometer, and the stirring is continued until, at length, the minutely broken pieces of curd acquire a certain degree of consistency. The curd is then left half an hour to subside. At the expiry of the half hour it has settled at the bottom of the tub. Drawing off the whey is the next operation. The greater proportion of the whey is lifted in a large tin bowl, and poured through a hair sieve into the

adjoining coolers. When the whey above the mass of curd is re- moved, a spigot is turned at the bottom of the tub, and the re- mainder is allowed to drain off without the application of pressure. To facilitate this part of the work the tub is made with a convex bottom, and the curd is cut from the sides of the tub and heaped up on the elevated centre, and left for an hour with no other pressure than its own weight. It is then cut across in large slices, turned over once on the centre of the tub, and left in a heap as before for half an hour. The whey drips away toward the sides of the tub, and runs off at the spigot ; and, no pressure being applied, it continues to come away comparatively pure. After undergoing this treatment the curd is ripe for the application of pressure. If, as is usual, it be warmer than 60°, it is broken a little by the hand and thrown upon a lead cooler to bring it down to the desired tem- perature. It is then put into vats, and subjected to moderate pressure for about an hour ; after which it is broken finely in a simple curd

mill, mixed with salt, and made up into cheeses. From 2 to 23 Ib of salt may be given to one ewt. of curd. The cheese is put into the lever-press at from two to three o'clock of the day on which it is made ; next morning it is reversed in the vat, witha calico cloth upon it to give it a smooth surface ; on the following morning another fine cloth is put upon it ; and after another day of the press it is laid upou the shelf.

Skilful management during the ripening of the cheese is now regarded as indispensable to complete success. To enable a cheesemaker to come to the front rank, he must have a good cheese-room, with means of regulating heat and ventilation. Great attention is now paid to this important matter in many of the Scotch dairies, and still more in the cheese factories of America.

New-milk cheese, when skilfully made, consists not of the casein only, but includes nearly all the butter of the milk. A portion of the latter is, however, carried off in the whey, from which it is recovered by a simple process. The whey is heated in a boiler to 180°, at which point a small quantity of sour buttermilk is stirred into it, which has the instantaneous effect of causing all the buttery matter to rise to the surface, from which it is skimmed off and put into a jar. As soon as the buttermilk is put in, the fire is withdrawn to prevent the whey from reaching the boiling point. The whey thus deprived of its cream is run into a cistern, whence it is dealt out to the pigs. The whey-cream is kept for three or four days until it thickens, and is then churned like ordinary cream. About half a pound of this whey butter is obtained weekly from each cow. Its value is about three-fourths of that of cream butter.

According to the reports of 43 New York factories in 1869, from 9°14 to 10°11 Ib of milkis requisite to make 1 Ib of cured American cheese.

In the province of Parma, in Italy, the annual quantity of milk used in cheese-dairy farms was about the year 1872 estimated, in round numbers, at 1,540,700 gallons, yielding 855,400 tb of "grana" or Parmesan cheese, 253,530 tb of butter, and 524,700 tb of "ricotta," a fresh common cheese made after the butter and cream have been for the most part removed from the milk, In the hill district 1000 litres of milk will produce 18 kilo-grammes more butter, cheese, and ricotta than in the plain. In the majority

~~of the dairy-farms work is carried on during only six or eight months in the year.~~

~~The following is an estimate of the amount, description, and cost of the year's food of an average Ayrshire milch cow on a good farm in the cheese and butter producing districts, and the value of the produce :—~~

~~1. Keep.—34 to 4 tons of roots during 200 days in winter, given raw or cooked, at 12…….. ae 40 to 50 stones of meal, cake, and bran, &c. 2 SUD CES TROD 6 oan. .34.0 pecan eee ee 5~~

~~Straw given as fodder and litter over and dbovetvaluefol dunt, ..ccsasneneeccec eee 2 Expenses of attendance, feeding, and milking, as well as deterioration of value of cow, interest on its price, and various risks, estimated at……..~~

~~i) Sic~~

~~Making outlay about……0066~~

~~DAI—DAK 7~~

~~Outlay, carried forward……0…cc0000. £16 0 0 2. The produce of a cow treated as above may be esti- mated for the year at say from 500 to 600 gallons of milk, which if disposed of as new milk from the cow would give, at 9d per Cs PCURE OS aoc: m0 0 6 cess. « vaesiinsni seve you saveielerin~~

~~When hay is used, as in Ireland in the neighbourhood of Cork, and in many districts where roots are not grown, the quantity estimated for the winter's keep of a cow is 14 tons.~~

~~If made into butter the milk would produce about 220 ib, which at 1s, 5d. a Ib would amount to £15, 11s. 8d., to which must be added the value of buttermilk sold or used for feeding pigs, say £3, making in all as the pro- duce of the year, £18, 11s. 8d. Again, if converted into cheese, the produce may be estimated at 550 tb at 74d. per tb, or about £17—which, with perhaps 25s. as value of whey, gives £18, 5s. as the result of this system.~~

~~‘These calculations are made on the recognized standard that 1 gallon of milk produces 1 Ib of cheese, aud that 23 gallons produce 1 tb of butter,~~

~~DAISY, the name applied to the plants constituting the genus Bellis, of the natural order Cumposite, and sub-order Corymlifere. The flowers in this genus have a small, hemispherical, erect calyx ; florets of the disk numerous and tubular; phyllaries strap-shaped and slightly notched ; filaments hair-like and very short ; anthers forming a cylindrical notched tube ; achenes obovate and compressed ; and no pappus. The common daisy, Z. perennis, is the only representative of the genus in Britain and Ireland. It is a perennial abundant everywhere in pastures and on banks in Europe, except in the most northerly regions, where, as in America, it isa garden-plant. The stem of the daisy is short ; the leaves are numerous, crenate or crenate-serrate, slightly hairy, obovate-spathulate, and arrauged in a rosette ; and the rootstock is creeping, and of a brownish colour. The flowers are to be found from March to November, and occasionally in the winter months, Their scapes bear single blossoms, with phyllaries in one row, and often red externally or at the tips ; the florets of the disk are short and yellow. The size and luxuriance of the plant are much affected by the nature of the soil in which it grows, The cultivated varieties, which are numerous, bear finely-coloured flowers, and make very effective borders for walks, What is known as the “ hen- and-chicken” daisy has the main blossom surrounded by a brood of sometimes as many as 10 or 12 small flowers, formed in the axils of the scales of the involucre. The daisy (Ang. Sax., deges eage, day’s eye) rolls up its florets on the approach of rain, and unfolds them once more on the return of bright weather ; and, like the marigold, it “goes to bed wi’ the sun, and with him rises weeping.” Chaucer writes—~~

~~‘The daisie, or els the eye of the daie, The emprise, and the floure of flouris alle ;” and again— “To seen this floure agenst the sunne sprede Whan it riseth early by the morrow, That blissful sight softeneth all my sorrow ;” and the flower is often alluded to with admiration by the other poets of nature. To the farmer, however, the daisy is a weed, and a most wasteful one, as it exhausts the soil and is not eaten by any kind of stock. In French the daisy is termed la marguerite (wapyopiryns, a pearl), and “herb margaret” is stated to be an old English appellation for it. In Scotland it is popularly called the gowan, and in Yorkshire it is the bairnwort, or flower~~

beloved by children. The Christmas and Michaelmas daisies are species of aster; the ox-eye daisy is the species Chrysanthemum Leucanthemum.

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DAKOTA, a territory of the United States of North America, bounded on the N. by the Dominion of Canada, E. by Minnesota and a small part of Iowa, S. by Nebraska, aud W. by Montanaand Wyoming. It is situated between

| 42° 28' and 49° N. lat. and 96° 20' and 104° W, long.,—thns

extending about 400 miles from E. to W. and about as much from N. to S., with an area estimated at 150,932 square miles. With the exception of a small portion drained by the Red River aud the Minnesota, Dakota belongs to the basin of the Missouri, which enters at the N.W. corner as a navigable river, and proceeds with considerable meandering for upwards of 1000 miles in a SE. direction across the territory, receiving from the right the Little Missouri, the Big Knife, the Cannon Ball, the Grande River, the Owl, the Big Sheyenne, the Bad River, and the White River, and from the left, besides a large number of small tributaries, one con- siderable affluent known as the James or Dakota River, which traverses nearly the whole length of the territory with a predominant southern direction, and joins the larger stream at the S.E. corner. There are no mountains uf any importance in the territory except the Black Hills on the western frontiers, which attain a height of 6700 feet ; but a plateau called the Coteau des Prairies, with a mean elevation of 1450 feet above the level of the sea, occupies a considerable area on the eastern borders, and another known as the Coteau du Missouri stretches south between the Missouri and the Dakota. A large district in the south-west between the White River and one of the main branches of the Big Sheyenne bears the descriptive designation of the Mauvaises Terres. In the Coteau des Prairies and several other parts of the territory there are a large number of lakes, the most extensive of which is the Minniwakan or Devil's Lake, a sheet of salt water 40 miles long by about 12 miles in breadth. Dakota has hitherto been only partially explored, but the inilitary expedition of 1874 under the command of General Custer reports very favourably of the soil and the climate of the virgin districts, A large part of the surface consists of open prairie-land finely adapted for the raising of stock, and most of the river-valleys appear suitable for the

plough. The experience of the settlers shows that Indian corn, wheat, barley, oats, and potatoes, as well as apples, plums, grapes, and hops can be successfully cultivated. The hills are covered with timber, mostly pine and spruce; while the banks of 'the rivers are in many places bordered with ash, elm, poplar, maple, and other trees. The mineral wealth of the region includes deposits of iron ore, extensive beds of limestone, gypsum, and sandstone, and a certain amount of plumbago and gold. Coal, lead, and petroleum have also been discovered. Buffaloes, bears, antelopes, and elks are still abundant in the remoter districts; and the beaver still builds his dam in many of the streams, The population of Dakota is mainly aboriginal, —the principal tribes being the Sioux in the south, who number about 26,000, and the Arickarees, the Gros-Ventres, and the Mandans in the north-west. The chief settlement of the whites, Yankton on the Missouri, had in 1870 a popula- tion of 737 ; and the whole amount of land under cultiva- tion at the same date was 42,645 acres. The northern Pacific railroad passes through the territory from east to west, entering at Fargo on the Red River, crossing the Missouri at Burleigh City, and proceeding onwards to cut the Yellowstone River at Wolf Rapids in Montana. The territory is administered in the same way as the other territories of the United States. Dakota belongs to the ancient French district of Louisiana, which was purchased by the United States in 1803. It was not till 1861 that ib was separated from Minnesota and received a separate organization ; and its present boundaries only date from 1868, when it surrendered 89,665 square miles for

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the formation of the territory of Wyoming. It began to be colonized in 1859, and its first legislature met in

1862.

DALBERG, Cuartres THEopoR ANToN Marta, PRINCE or (1744-1817), was the son of a prince of Dalberg who was one of the chief councillors of the elector of Mainz. Having attended the universities of Gdottingen and Heidelberg, he devoted himself to the study of canon law, and entered the church. In 1772 he was appointed coun- sellor and governor of Erfurt by the elector of Mainz, the duties of which position he fulfilled in the most

exemplary manner, displaying the highest conscientiousness, and doing all that he could to promote the interests of his people. After other advancements, he became in 1802 archbishop and elector of Mainz. Being obliged by the terms of the peace of Lunéville to give up Worms and Constance, he received Ratisbon, Aschaffenburg, and Wetzlar. In 1804 he visited Parisin order to discuss with Pius VII. the affairs of the Catholic Church of Germany. The result was that he gave way to the wishes of Napoleon, and thereby considerably diminished his popularity at home. The emperor did not fail to reward him ; and, on the for- mation of the Confederation of the Rhine, though he was forced to resign his post as archchancellor of the emperor, he received more than compensating dignities. These, however, on the fall of Napoleon, he was forced to resign ; and he died, holding no other office than that of archbishop of Ratisbon (10th February 1817). The friend of Goethe, Schiller, and Wieland, Dalberg was himself a

scholar and author.

He produced several works on art and philosophy, including Grundsitze der Aisthetik, Betrachtung tiber das Universum, Von dem Bewusztsein als allgemeinem Grunde der Weltweisheit, and two works on the social influence of art. See Krimer, Karl Theodor von Dalberg (Leip. 1821).

D'ALEMBERT, Jean te Ronp (1717-1783), French mathematician and philosopher, was born at Paris in November 1717. He was a foundling, having been exposed in the market near the church of St Jean le Rond, Paris, where he was discovered by a commissary of police on the 17th November. It afterwards became known that he was the illegitimate son of the Chevalier Destouches and Madame de Tencin, a lady of somewhat questionable repu- tation, Whether by secret arrangement with one or other of the parents, or from regard to his exceedingly feeble state, the infant was not taken to the foundling hospital, but intrusted to the wife of a glazier named Rousseau who lived close by. He was called Jean le Rond from the church near which he was found ; the surname D'Alembert was added by himself at a later period. HIs foster-mother brought him up with a kindness that secured his life-long attachment. When, after he was beginning to be famous, Madame Tencin sent for him and acknowledged the relation- ship

between them, he said that she was only a step-mother, and that the glazier's wife was histrue mother. HIs father, without disclosing himself, recognized his natural claims by settling upon him while still an infant an annuity of 1200 francs. Furnished in this way with enough to defray the expense of his education he was sent at four years of age to a boarding school, where he had learned all the master could teach him ere he was ten. In 1730 he entered the Mazarin College under the care of the Jansenists, who soon perceived his exceptional talent, and, prompted perhaps by a commentary on the epistle to the Romans which he pro- duced in the first year of his philosophical course, sought to direct it to theology. They checked his devotion to poetry and mathematics, and in the science in which he was to achieve his greatest distinction he received no instruction at college beyond a few elementary lessons from Caron. HIs knowledge of the higher mathematics was acquired by his own unaided efforts after he had left the

college. This naturally led to his crediting himself with the discovery of many truths which he afterwards found had been already established, often by more direct and elegant processes than his own.

On leaving college he returned to the house of his foster- mother, where he continued to live for thirty years. On the advice of his friends he made two successive efforts to add to his scanty income by qualifying himself for a pro- fession. HE studied law, and was admitted as an advocate in 1738, but did not enter upon practice. HE next devoted himself to medicine, and in order to detach himself effectu- ally from his favourite subject, sent all his mathematical books to a friend, who was to retain them until he had taken his doctor's degree. HIs natural inclination, however, proved too strong for him ; within a year the books had all been recovered, and he had resolved to content himself with his annuity and give his whole time to mathematics. HE led a simple regular life in the house of the glazier, whose circumstances he contrived somewhat to better out of his limited means. HIs foster-mother continued to show a warm attachment to him, though she took no interest in his pursuits, and professed something like contempt for his fame. ‘“‘ You will never," she said, " be anything but a philosopher. And what is a

~~*philosopher? A fool who plagues himself during his life that men may talk of him after his death."*~~

~~*In 1741 D'Alembert received his first public distinction in being admitted a member of the Academy of Sciences, to which he had previously presented several papers, includ- ing a Mémorre sur le calcul integral (1739). In this he pointed out some errors in Reinau's L' Analyse démonstrée, which was regarded as a work of high authority. In his Mémoire sur la réfraction des corps solides (1741) he was the first to give a theoretical explanation fof the familiar and curious phenomenon which is witnessed when a body passes from one fluid to another more dense, in a direction not perpendicular to the surface which separates the two fluids. Two years after his election to a place in the Academy he published his Traité de Dynamique. The new principle developed in this treatise, known as D'Alembert's Principle, may be thus stated—" If from the forces impressed on any system of bodies, connected in any manner, there be subtracted the forces which, acting alone, would be capable of producing the actual accelerations and retardations of the bodies, the remaining forces must exactly balance each other." The effect of this is greatly to simplify the solution of complex dynamical problems by making them problems of statics.*~~

~~*So early as the year 1744 D'Alembert had applied this principle to the theory of the equilibrium and the motion of fluids ; and all the problems before solved by geometri- cians becaine in some measure its corollaries. The discovery of this new principle was followed by that of a new calculus, the first trials of which were published in his Réflexions sur le cause générale des Vents, to which the prize medal was adjudged by the Academy of Berlin in the year 1746, and which was a new and brilliant addition to his fame. He availed himself of the favourable circum- stance of the king of Prussia having just terminated a glorious campaign by an honourable peace, to dedicate his work to that prince in the following Latin lines :—*~~

~~*Hee ego de ventis, dum ventorum ocyor alis*~~

~~*Palantes agit Austriacos Fredericus, et orbi, Insignis lauro, ramum preetendit olive.*~~

~~*Swifter than wind, while of the winds I write,*~~

The foes of conquering Frederick speed their flight ; While laurel o'er the hero's temple bends,

To the tir''d world the olive branch he sends.

This flattering dedication procured the philosopher a polite letter from Frederick, anda place among his literary

D'ALEMBERT

friends. The king made repeated attempts to induce him to settle in Berlin without success. In 1754 he induced D'Alembert to accept a pension of 1200 francs a year, and in 1763 the philosopher visited Berlin, where he was received with great respect. He finally refused on that occasion the office of president of the Academy of Berlin, which had been already offered to him more than once. In 1747 D'Alembert applied his new calculus of partial differences to the problem of vibrating chords, the solution of which, as well as the theory of the oscillation of the air and the propagation of sound, had been given but incom- pletely by the geometricians who preceded him, and these his masters or his rivals, In 1749 he furnished a method of applying his principles to the motion of any body of a given figure ; and he solved the problem of the precession of the equinoxes, determined its quantity, and explained the phenomenon of the nutation of the terrestrial axis, discovered by Dr Bradley. In 1752 he published a treatise on the Resistance of Fluids, to which he gave the modest title of an Essay, but which contains a large number of original idess and new observations. About the same time he published, in the Memoirs of the Academy of Berlin, '" Researches concerning the Integral Calculus," a branch of mathematical science which is greatly indebted to him for the rapid progress it has made in the present century. In his Kecherches sur différents points im- portants du systéme du monde (175 4-6) he perfected the solution of the problem of the perturbations of the planets, which he had presented to the Academy some years before.

While the studies of D'Alembert were confined to geometry, he was little known or celebrated in his native country. His connections were limited to a small society of select friends; he had never seen any man in high office except the Marquis d'Argenson. Satisfied with an income which furnished

him with the necessaries of life, he did not aspire after opulence or honours 3 nor had they been hitherto bestowed upon him, as it is easier to confer them on those who solicit them than to look out for men who deserve them; His cheerful conversation, his smart and lively sallies, a happy knack at telling a story, a singular mixture of malice of speech with goodness of heart, and of delicacy of wit with simplicity of manners, rendered him a pleasing and interesting companion; and his com- pany, consequently, was much sought after in the fashion- able circles. His reputation at length made its way to the throne, and rendered him the object of royal attention and

beneficence. He received also in 1756 a pension from Government, which he owed to the friendship of M. d'Argenson,

D'Alembert's association with Diderot in the preparation of the celebrated Dictionnaire Encyclopédique led him to take a somewhat wider range than that to which he had hitherto confined himself. He wrote for that work the Discours préliminaire on the rise, progress, and affinities of the various sciences, which he read to the French Academy on the day of his admission as a member, the 19th December 1754. Condorecet, in his Zloge, charac- terizes it as one of those works which only two or three men in a century could produce. Comprehensive in its plan, and clear in its Statement, it deserves this often quoted praise ; but it is open to the criticism that the fundamental principle, adopted from Bacon, on which it classifies the sciences is untenable. D'Alembert distin- guishes the human faculties into memory, reason, and imagination, and following out that distinction classifies all science under the three heads of history or the science of memory, philosophy or the science of reason, and poetry or the science of iniagination. Now, it is obvious that even if these are in each case the faculties primarily

concerned, which is not beyond question, no science is the product of any one faculty exclusively. D'Alembert wrote several literary articles for the first two volumes of the Encyclopedia, after which the work was suppressed for a time. To the remaining volumes he contributed mathe- matical articles chiefly. One of the few exceptions was the article on " Geneva," which

involved him in a some- what keen controversy in regard to Calvinism and the suppression of theatrical performances within the town. During the time he was engaged on the Encyclopedia he wrote a number of literary and philosophical works, which extended his reputation and also exposed him to criticism and controversy, as in the case of his Mélanges de Philo- sophie, d Histoire, et de Littérature. His Essai sur la société des gens de lettres avec les grands was a worthy vindication of the independence of literary men, and a thorougli exposure of the evils of the system of patronage. He broke new ground and showed great skill as a translator in his Traduction de quelques morceaua chowsis de Tacite. One of his most important works was the Eléments de Philo- sophie, published in 1759, in which he discussed the principles and methods of the different sciences. He maintained that the laws of motion were necessary, not con- tingent. The work furnished occasion for a renewal of his correspondence with Frederick the Great. A treatise Sur la destruction des Jésuttes (1765) involved him in a fresh controversy, his own share in which was rendered very easy by the violence and extravagance of his adversaries, The list of his more noteworthy literary works is completed by the mention of the Histoire des membres de l Académie

frangaise, containing biographical notices of all the mem-

bers of the Academy who died between 1700 and 1772, the yearin which hehimself became secretary. D'Alembert was much interested in music both as a science and as an art, and wrote Eléments de Musique théorique et pratique, which was based upon the system of Rameau with important modifications and differences,

D'Alemtert's fame spread rapidly throughout Europe and procured for him more than one opportunity of quitting the comparative retirement in which he lived in Paris for more lucrative and prominent positions. The offer of Frederick the Great has already been mentioned. In 1762 he was invited by Catherine of Russia to become tutor to her son at a yearly salary of 100,000 francs. On his refusal, the offer was repeated with the additional inducement of accommodation for as many of his friends as he chose to bring with him to the Russian capital, D'Alembert persisted in his declinature, and the letter of Catharine was ordered to be engrossed in the

minutes of the French Academy. A foreign honour of a different kind had previously been bestowed upon him, In 1755, on the recommendation of Pope Benedict XIV., he was admitted a member of the Institute of Bologna. A legacy of £200 from David Hume showed the esteem in which he was held by that philosopher.

D'Alembert continued to the end to lead the quiet and frugal life which his limited means, as well as his simple tastes, dictated. He was abstemious in his habits, and never tasted any alcoholic beverages. His later years were saddened by circumstances connected with a romantic attachment he had formed for Mademoiselle de)Espinasse. He made the lady's acquaintance at the house of Madame du Deffand, a noted resort of literary men and savans. She nursed him assiduously during an illness he had in 1765, and from that period till her death in 1776 they lived in the same house without any scandal attaching to their intimacy. On her part there seems to have been from first to last nothing more than warm friendship, but his feelings towards her were of a stronger kind, and her death deeply affected him. He never recovered his elasticity of

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spirits, though he continued to occupy himself with his (favourite pursuits, and to frequent the society of his brother philosophers. After the death of Voltaire (1778), | whose friend and correspondent he had been for more than thirty years, he was regarded as the leader of the philo- sophical party in the Academy. He died on the 29th October 1783.

The chief features of D'Alembert's character were benevolence, siraplicity, and independence. Though his income was never large, and during the greater part of his life was very meagre, he contrived to find means to support his foster-mother in her old age, to educate the children of his first teacher, and to help various deserving students during their college career. By his practice as well as by the work above referred to (Hssaz sur la société des gens de lettres, &c.) he did much to destroy the unworthy subserviency of literary and scientific men to the socially great and the politically powerful. If his manner was sometimes plain almost to the extent of rudeness it probably set all the better an example of a much needed reform to the class to which he belonged. 'The controversy as to the nature

of his religious opinions, arising as it did chiefly out of his connection with the Encyclopedia, has no longer any living interest now that the Encyclopedists gencrally have ccased to be regarded with unqualified suspicion by those who count themselves orthodox. It is to be observed, moreover, that as D'Alembert confined himself chiefly to mathematical articles, his work laid him less open to charges of heresy and infidelity than that of some of his associates. The fullest revelation of his religious convictions is given in his correspondence with Voltaire, which was published along with that with Frederick the Great in Bossange's edition of his works.

The scientific works of D'Alembert have never been published in acollected form. The most important of them have been mentioned above, with the exception of the Opuscules mathématiques (1761-80, 8 vols. 4to). His literary and philosophical works were collected and edited by Bastien (Paris, 1805, 18 vols. 8vo). A better edition by Bossange was published at Paris, in 1821 (5 vols. 8vo). The best account of the life and writings of D'Alembert is contained in Condorcet's Eloge, presented to the Academy and published in 1784.

DALGARNO, Grorex (c. 1626-1687), an ingenious but now almost forgotten writer, born at Old Aberdeen about 1626. He appears to have studied at Marischal College ; and.in 1657 he went to Oxford, where, according to Wood, 'he taught a private grammar-school with good success for about thirty years," aud where he died on August 28, 1687. In his work entitled Dedascalocophus, or the Deaf and Dumb Man's Tutor, printed at Oxford in 1680, he has the merit of anticipating some of the most useful modern discoveries as to the education of the deaf and dumb, in- cluding the hand-alphabet. "' In prosecution of his general idea," says Dngald Stewart in his ' Account of a Boy Born Blind and Deaf " (J'rans. of Royal Soc. of Edinb, vol. vii.) "he has treated, in oue short chapter, of a Deaf Afan's Dictionary, and, in another, of a Grammar for Deaf Persons, both of them containing a variety of precious hints, from which useful practical lights might be derived by all who have any concern in the tuition of children during the first stage of their education." 'Twenty years before the publication of his Didascalocophus, Dalgarno had given to the world a very ingenious piece entitled Ars Signorum, from which, says Mr Stewart, it

~~appears indisput- ably that he was theprecursor of Bishop Wilkinsin his speeu- lations concerning "a real character and a philosophical language." It is alleged that, although Wilkins docs not refer to Dalgarno, it was from him that he took the hint of his celebrated work. Leibnitz on various occasions alluded to the Ars Signorum in commendatory terms. The works of Dalgarno, which had become exceedingly rare, have been reprinted by the Maitland Club.~~

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~~DALHOUSIE, James ANDREW Broun-Ramsay, Mar- quis oF (1812-1860), in the peerage of the United King- dom, the great administrator who was the last of the his- toric governors-general under the East India Company, and may be ranked with his two most distinguished predecessors, Warren Hastings and the Marquis Wellesley. The family was founded by Sir John Ramsay, who rescued James VI. in the Gowrie outrage ; but there is mention in 1140 of Simon de Ramsay as witness to the grant of Livingston Church in West Lothian; and Sir Alexander Ramsay, whom David If, made sheriff of Teviotdale, was starved to death by the Douglas. The grateful King James made Sir John Lord Ramsay of Barns and Viscount Haddington, and his son obtained a change of the title to Baron Ramsay of Dalhousie. His son was created earlof Dalhousie. The ninth earl was a distinguished Waterloo officer, held high command in Canada, was commander-in-chief in British India previous to 1832, and was created a peer of the United Kingdom as Baron Dalhousie of Dalhousie. He nmiarried Miss Broun, the heiress of Cvalstoun near Haddington, a woman of remarkable ability and force of character, which she transmitted to her distinguished son, who closely resembled her in features also. He was their third son, but the early death of his brothers, followed by that of their father, made him the tenth earl while yet a youth, For his long and brilliant services in India he received the thanks of Parliament, and the Crown made him marquis, a dignity that passed away with him, his only issue being two daughters, the Lady Susan, married to the Honourable R. Bourke, M.P., brother of the sixth earl of Mayo, and the Lady Edith, first wife of Sir James Fer- gusson.~~

Born in 1812, the boy was educated at Harrow, and entered at Christ Church, Oxford, where he gave bright promise of his future career, The two most remarkable of his fellow-students were Lord Canning and Lord Elgin, who both succeeded their younger rival in the viceroy's seat, and more than once in their public career alluded to the friendship that had united the three, When Lord Ramsay, he attempted, as a follower of Sir Robert Peel, to snatch the representation of Edinburgh from Sir John (afterwards Lord Chancellor) Campbell, and James Aber- cromby, afterwards Speaker and Lord Dunfermline. He was afterwards elected for the county of Haddington, which represented for a short time till called to the House of Lords on his father's death. The duke of Wellington was soon attracted by the industry and ability of the young peer, in whom, moreover, he felt an interest for his father's sake. When the Whigs went out of office under Lord Melbourne, Sir Robert Peel came into power with three colleagues who were successively to be governor-general,—Lord Ellen- borough as president of the Board of Control, Sir H. Har- dinge as secretary at war, and Lord Dalhousie as vice-presi- dent of the Board of Trade under Mr Gladstone, and in 1844 as president. It was in the Board of Trade that he sowed the seeds of that disease which carried him off in the prime of life. The time was that of the corn-law struggle and, still more to him, of the railway mania. Night and day the president had to work. Iu 1845 he organized that railway department of the Board of Trade, through which in one year he passed, after detailed personal study, 332 projects, involving a capital of £271,000,000, besides many foreign schemes which appealed to the English money-market. At the last honr of November for lodging applications no fewer than 609 schemes were deposited on his table. To him, more than any other man, Great Britain owes its railway system, and if the experienced warning of the over-worked president had been heeded, the disasters of 1847-48 would never have taken place. At the same time the duty of leading

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the corn-law debates in the House of Lords fell upon the wearied official, The defeat of Sir Robert Peel at the end of June 1846 gave him no respite, for Lord John Russell asked him to remain in office, and again the Whig premier offered the young Conservative peer the office of governor- general of India, from which Lord Hardinge was returning after the first Sikh war.

Never, since Clive, had any man so young been called to bear such vast responsibilities, and yet, like Clive, he nearly doubled the empire, and adorned his rule with the blessings of peaceful and material reform. Lord Dalhousie was only thirty-five years of age when, on the 12th January 1848, he assumed at Calcutta that high office which he held for upwards of eight years, or almost as long as the period during which Lord Hastings had been led by troublous times to fill it. Had he remained a cabinet minister, it is not difficult to predict what he might have become in the annals of British statesmanship, but he had even higher work to do in India. Lord Hardinge, guided throughout his policy by the good and great Henry Law- rence, had left the Punjab nominally at peace under a Sikh regency, but really seething with discontent and con- fusion. To use Lord Dalhousie's own words in reviewing the situation, the spirit of the whole Sikh people was influenced by the bitterest animosity against us, chief after chief deserted our cause, nearly the whole army and council of regency were openly arrayed against us, the Sikhs courted an Afghan alliance, and the question was no longer one of policy but of national safety. Moolraj, at Mooltan had, in April, murdered the British officers Vans Agnew and Anderson'; Herbert Edwardes had in June shown how disaster could be retrieved ; by September General Whish was before Mooltan with an avenging force ; and on the 5th October the governor-general announced, at a military ball at Barrackpore, a general war against the Sikh Sirdars. Proceeding to the spot like another Clive he conquered, annexed, and reorganized the Punjab in six months. The crowning victory of Gujerat, on the 21st February 1849, followed by the fall of Mooltan, avenged the drawn battle of Chillianwalla, and on the 29th March the Punjab became a British province. Borrowing from administra- tive experiments on a small scale in Tenasserim and Sind, the governor-general created that non-regulation system, under which military officers and civilians combined have ever since brought up to the ordinary level of our civilized administration the warlike peoples of Northern and the more savage tribes of Central and Eastern India. In the brothers Henry and John Lawrence, assisted by Sir Robert Montgomery and Sir Donald Macleod, Lord Dalhousie found men to work out his plans with such success as to convert the Punjab into the base from which, in 1857, Delhi was taken and the empire was reconquered. He returned to the capital by Bombay, the Straits Settlements, and Burmah, surveying the coast-line of the magnificent dependency which he had thus

carried up to its natural boundaries, to the Himalayas from the sea. The experience he thus gained was soon to be used. The king of Upper Burmah violated the treaty of Yandaboo by a gross outrage on certain British traders inthe portof Rangoon, and refused atonement. Quoting Lord Wellesley's maxim, that an in- sult offered to the British flag at the mouth of the Ganges would be resented as promptly and as fully as at the mouth of the Thames, after every peaceful effort had failed, the Government of India fought the second Burmese war ; and, as reparation was still scorned, took possession of the king- dom of Pegu, thus uniting the territories of Arakan and Tenasserim taken in the first war into what is now the compact and prosperous coast province of British Burmah.

From that time, in 1852, the completed empire has been at peace, save for the Mutiny and little frontier campaigns.

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Its consolidation now became the great work of the young and triumphant governor-general, who showed on as great a scale as history can present, in a few years, that peace has greater victories than those of war. While in the minute review of his 84 years' administration Lord Dalhousie devotes 177 paragraphs to these, he records in only 3 the conquest of territories and populations as large as those of France. With the foresight and caution that marked all his statesmanship he thus closes the narrative of his wars :—" Experience—frequent, hard, and recent experience—has taught us that war from without or rebellion from within may at any time be raised against us, in quarters where they were the least to be expected, and by the most feeble and unlikely instruments." The rising of the tribe of Sonthals, a non-Aryan race of simple and now half-Christianized savages in the Rajmahal hills, due to the oppression vf Hindu usurers and landlords, illustrated this, But the mutiny, to which we shall afterwards allude, has still more light thrown on it by this warning.

Lord Dalhousie made additions to those portions of the empire under direct British administration, however, not only by conquest but by annexing native states which lapsed to the suzerain power on the failure of natural and even adopted heirs, or, as in the case of Oudh, for outrage- ous and hopeless misrule. No part of his policy has been more misrepresented than

~~this. His own narrative of it, written as simple history and long before it was attacked, bears the stamp of the unflinching honesty which was the basis of his nature,—the sympathy with the people and horror of oppression which influenced all his career, and the strict regard for justice which made his Government the strongest India ever had, before or since. He has been charged with the lack of imagination ; but he had that as Cromwell had it, where he cared for the many rather than for the self-seeking and self-pleasing few. The question is twofold—Is it the duty or the right of the paramount power (1) to escheat states the chiefs of which persist in anarchy that not ouly ruins their own people but threatens their neighborrs, or (2) to allow states to lapse when the chiefs leave no natural heirs and have refused to adopt a successor? The first was illustrated in the case of the kingdom of Oudh, which for the crimes of its kings, committed in spite of all warnings, was ordered to be annexed by the British Cabinet contrary to the recom- mendation of Lord Dalhousie, who would have again tried the policy that failed after the first Sikh war. The second is the real point at issue in his case. Now the despatch of the 30th April 1860, in which Lord Canning urges the concession to the 153 Hindu and Mahometan princes who actually govern their estates of a distinct law of adoption and feudatory right, is based on the fact that no such law or certain usage was in existence before. Lord Dalhousie acted for the good of the natives and for the interests of the British Government, solely as their trustee, when he annexed states according to what has been called the doc- trine of lapse. His regard for purely historic claims which could not affect the happiness of the people for evil is shown by his refusal to carry out the consent of the court of directors to extinguish the dynasty of Timur on the death of the king of Delhi. He rather perpetuated the titular sovereignty by recognizing the grandson of the king as heir-apparent, on the two conditions that he should reside at the Kootub palace, outside Delhi, and "should as king receive the governor-general at all times on terms of perfect equality." To the two kingdoms of the Punjab and Pegu, won by conquest, and to the kingdom of Oudh, annexed for misrule worse than that of the Ottoman Turks, Lord Dalhousie hence added the fourth of Nagpore, "in the absence of all legal heirs," refusing to bestow the territory in free gift upon astranger. So also he al the province~~

of Berar, ceded by the Nizam for the permanent main- tenance of the Hyderabad contingent. In Nagpore and Berar, one day to be united to Bombay, he gave Lancashire the finest cotton field under the British Crown. So also the principality of Sattara and the chiefship of Jhansi reverted to the Indian Government. Writing in 1856 he showed that these four kingdoms and three provinces had raised the revenue of India from 26 to 30 millions sterling a year. In the twenty years since, no revenue-paying addition has been made to the empire as Dalhousie left it, for he reached the boundaries fixed by nature. But the income of the 12 provinces of British India, with the 153 native states, which cost the rest of India far more than the small tribute they pay and spend nothing on the people, has risen to 52 millions sterling a year. It has doubled since Lord Dalhousie landed at Calcutta. But, while caring for the people, he was not indifferent to the welfare and good-will of theirchiefs. Himself a sincere Christian, while singularly reticent as to his personal faith, and strictly neutral as the ruler of millions of alien and opposed creeds, he thus wrote of the adoption of Christianity by Maharaja Dhuleep Singh, the last of the rulers of the Punjab :—' The act was voluntary on the part of the boy, and, under the guidance of God's hands, was the result of his own uninfluenced convictions. It is gratifying to be able to state that his life hitherto has been strictly con- sistent with the injunctions of the faith he professes." So he records the baptism of the Queen's ward, the princess of Coorg, at the desire of her father the ex-raja. And in his time there was passed the Toleration Act,which, completing the good work begun by Lord William Bentinck, removed from the statute book the last traces of the persecution of converts to Christianity, who had suffered the loss of all their goods as a penal consequence.

The catalogue of Lord Dalhcusie's reforms is as interest- ing as it is long, but we must be content with a mere state- ment of those which remind us of Clive's work in his third visit to India, The Civil Service was opened to the com- petition of all the natural-born subjects of the Crown, black and white, and at the same time the civil and military services were reorganized in India itself to supply the new territories. In Bengal, the boards which had acted as "screens " for inefficiency were abolished or simplified, and

~~*personal government was introduced in a way which made the force of the governor-general's energy and influence felt throughout the empire. The Public Works Department, separated from the military administration, was organized in a style which has enabled it to grapple with the vast needs of the whole Peninsula. A legislative council was created which, far more effectually than the sham introduced by Lord Halifax afterwards, promised to represent both British and native opinion. Bengal, with its sixty millions, received a lieutenant-governor for itself. In a thousand details life was substituted for apathy or obstructiveness, till among all classes the genius and force of the "boy" governor-general were gratefully eulogized as had never before happened in the history of India. There was not a hostile critic. But these were small matters compared with the introduction of the four potent forces of the railway and the telegraph, cheap postage and the primary school. The triumph of physical and educational progress went hand in hand. The quondam president of the Board of Trade felt himself at his old work, but on a vaster scale, and with far more magnificent results. Every word he spoke or wrote, every act that he ordered or sanctioned, told on the civilization of the country. His it was, too, to push on and open the great Ganges Canal which has since saved Hindustan from famine; his to make roads from Delhi through the Punjab, from Simla and the frontier to Tibet, from Assam to Pegu. 'lrade and agriculture were ever*~~

~~*before him as if he had no other work to do; cotton and tea, iron and coal, salt and other resources were carefully developed by him; and he created a forest department. When he did not think it politically expedient to make female education a care of the state, any more than even the early missionaries were prepared to attend to it, he supported the Bethune school out of his own pocket. Suttee in native states, and thuggee or strangling in our own, he kept down with an iron hand ; female infanticide, and meriah or human sacrifice, he vigilantly suppressed ; slavery and the slave-trade he made treaties from the Somalee coast of Africa to the Euphrates and the Irawaddy to put down. Finally, his care for the British soldier in a tropical climate was matched only by the improvement which he cansed in the physical condition of the sepoys. No less a military than a civil administrator, his last act was to send home a series of minutes pressing for*~~

~~a reorganization and an in- crease of the army, in language not only unheeded, but deliberately repelled, with consequences which the mutiny soon displayed.~~

~~Such work as this, following the still greater strain of the Board of Trade during the railway mania, began to show itself even before Lord Dalhousie had completed the usual five years' term of service. He recorded, at the time, the bitter pang it was to him to be so ill as not to be able to accompany the first railway train which he officially sent forth in its course Bombay-wards from Howrah, the suburb opposite Calcutta. In 1855 the physicians solemnly warned him to leave, but as Her Majesty's Government laid on him the duty of annexing Oudh, he deliberately accepted the responsibility. "The ministry have asked me to stay, and I will do my duty," he replied to all remon- strances. He had, too, lost his wife, to whom he was devotedly attached—a daughter of the marquis of Tweeddale, who had been governor ,of Madras—and was soothed by the arrival of his eldest daughter. The hot season of 1855 he spent in the Neilgherry hills… It was on the 6th March 1858 that he left Calcutta, amid the tears of many, both natives and Europeans, who accompanied the great proconsul, as he was lovingly called, to the Ghaut. He knew he had no more health to look for. Sadly did he write, in his formal reply to the citizens of Calcutta— "Nearly thirteen years have passed away since first I entered the service of the Crown. Through all those years, with but one short interval, public employment of the heaviest responsibility and labour has been imposed upon me. I am wearied and worn, and have no other thought or wish than to seek the retirement of which I stand in need, and which is all I now am fit for."**

~~Lord Dalhousie retired not only amid the regrets of the people he had ruled so well, and of the services, civil and military, which he had attached to himself at once by the splendour of his administrative génius and by the kingly fascination of his personal character. He was honoured by Parliament and the Crown, while the press exhausted the terms of eulogy in reviewing the career of one who, like Clive, had proved jequally great in peace and in war, The many months spent in Malta before he could brave the rigours of his native climate he devoted to a defence of his whole administration, which, unfortunately, is not now to be found. For already~~

~~the outburst of the Bengal mutiny had led thoughtless or prejudiced and certainly ignorant persons to demand a victim, and they sought it in the dying governor-general. He could not take his place in the House of Lords and explain his acts and policy~~

~~1 The appointment, as his successor, of Lord Canning, his old college companion, gave him great pleasure; and when, soon after, he was dying and was told of the eulogy that viceroy had passed on him when opening an extension of the railway to Rajmahal, he smiled say? — ing, "I always knew Canning was a gentleman,"~~

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~~to unthinking and excited critics who personally knew nothing of either. In India itself, where the facts were known and he was known, he was defended as, on much less and lower grounds, Warren Hastings had been. So, appealing from his contemporaries to posterity, and moved at the same time by the unauthorized publication of other family papers, he dictated the following addition to his will, which we are permitted to publish for the first time —~~

~~Secondly, It is my wish that on my decease the whole of the letters and private papers of every description, wherever found, belonging to me, and not being legal documents connected with the Dalhousie family, should be delivered to my daughter Susan. T enjoin that at her decease, or sooner if she should think fit, all documents, journals, and letters illustrating the history of the Dalhousie family, or the career of those who have been successively its head, shall be delivered to the holder of the title of Dalhousie. —And as it has been the practice of my father and of myself to keep a full private journal during our lives, and to preserve papers of personal interest, and as there prevails in these days a mania for giving publicity to the correspondence of public men, however slight may have been their real importance in the annals of the period, or however valueless may be their written remains, I desire if possible to preserve these papers in privacy within the family to which they refer.—I direct, therefore, that when these documents shall be delivered to him who shall then be Lord Dal-housie, the delivery of them shall be accompanied by a request from me (to which I am confident he will conform, as to a request issuing from the~~

~~grave) that no portion of the private papers of my father or of myself shall be made public until at least fifty years shall have passed after my death."~~

~~The papers are carefully preserved in Coalstoun till the year 1910. Lord Dalhousie retired to his old boy home, in Dalhousie Castle, to die, affectionately tended by his daughter, and on the 19th December 1860 he passed peacefully away. He was not forty-nine years old, an age when in England statesmen only begin their career, yet in England and India he had done a life-work surpassed by none, if equalled by any of his contemporaries. His marble statue, long opposite Wellesley's in the hall of Government House, Calcutta, now adorns the public institute in the public square, which both bear his name. His portrait by Sir John Watson Gordon, at Coalstoun, recalls the fine head, the brow of massive breadth and height, the large and lustrous eyes, the flexible and sensitive lips, the commanding attitude which made his middle-size look like the tallness of bigger men.~~

~~The panic which sought to fasten on Lord Dalhousie re- sponsibility for the mutiny has long since been pronounced unreasonable, All the charges against the last of the Com- pany's governors-general may be summed up in two, political and military,—he conquered and annexed many states ; he ignored or misunderstood the condition of the sepoy army. As to the first, the despatch of Lord Canning, already alluded to—and he is identified with the opposite, or non- annexation policy, which Lord Dalhousie alone made possible for his successor—shows that there was no law or regular usage on the subject. Lord Dalhousie had certainly no passion for annexation, as the Oudh case proves, and each instance must be dealt with on its own merits. It is difficult to obtain reliable evidence to support any statement as to native opinion or feeling, even after the event, and we have none for the assertion that the series of acquisitions of territory had alarmed the native chiefs. But even if it had, we may maintain that it was the governor-general's duty to complete the empire, to care for the people, and to do this at all fair risks. To all such assertions we may reply that it was conquests like the Punjab that saved the empire when the crisis came, that it was annexations like Nagpore and Sattara which removed centres of discontent. Oudh, for which he was not responsible, and little J hansi, which had a mad ranee, were the only malcontents. All the other native chiefs were loyal,~~

actively or passively. The military argument js still less defensible, and has been abandoned ever since Sir Charles Jackson exposed it,

Lord Dalhousie foresaw trouble in India as much as any man has ever done in a country where it is the unforeseen that happens. We have already quoted an instance of this. But these words in his farewell to India might, as has been said, have been written after the mutiny. ‘“ We have learned by hard experience how a difference with a native power, which seems at first to be but the little cloud no bigger than a man’s hand, may rapidly darken and swell into a storm of war, involving the whole empire in its gloom. We have lately seen how, in the very midst of us, insurrection may rise like an exhalation from the earth, and how cruel violence, worse than all the excesses of war, may be suddenly committed by men who, to the very day in which they broke out in their frenzy of blood, have been regarded as a simple, harmless, timid race, not by the Government alone but even by those who knew them best, who were dwelling among them, and were their earliest victims. Remembering these things, no prudent man will venture to give you assurance of continued peace.”

The first authority on the subject, Lord Lawrence, pro- nounced the cause of the mutiny purely military, and found it in the greased cartridges. It was social, not political,—an assault on caste, not on princes, though doubtless Mahometau and other intriguers took advantage of the mutinous spirit. But the opportunity for the mutiny was found in the reduction of the British garrison, already too low, to a point of danger which had led to Lord Dal- housie’s alarmed but unheeded protests. When he wanted more troops to meet the increase of territory he found him- self denuded of two cavalry and two infantry regiments for the Crimea. The strength of the white garrison was thus reduced to 22 regiments, That reduction completed what the Afghan policy of the home authorities had begun, by placing success within the grasp of the native army. In 1854 Lord Dalhousie thus wrote :—“We are perfectly secure so long as we are strong and are believed to be so : but if European troops shall now be withdrawn from India to Europe, and if further we should be called on to despatch an army to the Persian Gulf… .. then, indeed, I shall no longer feel, and can no longer express, the same

con- fidence as before that the security and stability of our position in the East will remain unassailed." That is prophetic enough. But it is nothing to the nine minutes which, on the last day of his office, he laid before his council and sent home, all of which were pigeon-holed, and two of which cannot be found in the records, In spite of these admirable and earnest state papers, the two infantry regiments sent to the Crimea were not replaced, and five or six of the minimum of thirty-one on the India establishment were in the Persian war, as his excellency had feared. He sought to raise the number to thirty-seven, and to reduce the sepoy force by upwards of 14,000 men, but in vain. Had he been able to carry out his own military policy as he did in the case of purely political and administrative affairs, is it too much to say that there would have been no mutiny? In spite of the passing away of the school of political and military officers whom Lord Dalhousie created, represented now only by the venerable Lord Lawrence, every year's progress in the history of India reveals new reasons for recalling with gratitude and admiration the eight or nine years' administration of the last of the gover- nors-general.

The detailed events of this period will be found in the volumes of the Friend of India and the Calcutta Review from 1848 to 1856 in- clusive, Other and more compact sources are Marshman's History of India, volume iii., Sir Charles Jackson's Vindication of the Marquis of Dalhousie's Indian Administration, and the Duke of Argyll's India under Dalhousie and Canning. The 'Minute by the Most Noble the Governor-General of India," dated the 28th of February 1856, was published as No. xiv. of the Selections from the Records of

the Government of India in the Home Department in 1856. Those Who are interested in that controversy with Sir Charles Napier,

in which the Duke of Wellington supported the Marquis of Dal- housie, will find the facts in Minutes of the Resignation of the late General Sir Charles Napier of the Command of the Army in India, (John Murray, 1854). (G. SM.)

DALIN, Otor von (1708-1763), a Swedish poet, was born August 29, 1708, in the parish of Vinberg, in Halland, being the son of the incumbent. His mother was the daughter of a Dr Ausén, to whom Queen Christina had offered, during her exile in Rome, a cardinal's hat if he joined the Romish Church. He was also nearly related to a still more remarkable man, Rydelius, the philosophical bishop of Lund, and the young Dalin was sent at a very early age to be instructed by him, Linnzus being one of his fellow-pupils. The quick instinct of Rydelius instantly perceived the boy's extraordinary genius, and he assisted its development in every possible way. While studying deeply at Lund, Dalin had visited Stockholm in the year 1723, and in 1726 he proceeded thither for the purpose of entering one of the public offices. Under the patronage of Baron Ralamb he rapidly rose to preferment, and his skill and intelligence won him golden opinions. It was at the age of twenty-four that he commenced his literary career by the publication cf a work that was entirely new at that time in Sweden, namely the famous Argus, a weekly journal, founded on the model of Addison's Spectator. For the two years 1733, 1734, Dalin issued his brilliant paper; at the end of 1733 he had thought to give it over, but he was forced to continue by the impor- tunity of the public. It was not till 1736 that the secret was known, and Dalin confessed that he had been the writer of Argus. His reputation thereupon became immense. His next work was Tankar om Kritiker (Thoughts about Critics), the first really zsthetic book brought out in Sweden. With the avowed purpose of enlarging the horizon of his cultivation and tastes, Dalin set off, in com- pany with his pupil, Baron Ralamb's son, on a tour through Germany and France, in 1739-40. On his return the shifting of political life at home caused him to write his famous satiric allegories of The Story of the Horse and Apru-Work, which were very popular, and provoked countless imitations. He now set himself to work on the most considerable of his writings, his didactic epos of Svenska Friheten (Swedish Liberty), which first appeared in 1742, Hitherto Addison and Pope had been his models ; in this work he draws his inspiration from Thomson, whose poem of Liberty it emulated. In 1751 Dalin received the honourable post of tutor to the crown prince, afterwards Gustavus III., and gained the friendship of the literary Crown Princess Louisa Ulrika. His position at court gave rise to many personal inconveniences, and separated him to a vexatious degree from the studies in which he had hitherto been absorbed. He held the post of tutor to the crown prince until 1756, when he

was arrested on suspicion of having taken part in the attempted revolution of that year, and tried for his life, He was acquitted, but was forbidden on any pretence to show him- self at court. This period of exile, which lasted until 1761, Dalin spent in the preparation of his great historical work. He had been ennobled in 1751, and made privy counsellor in 1753; and now, in 1761, he once more took his place at court. During his exile, however, his spirit and his health had been broken; in a fit of panic he had destroyed soine packets of his best unpublished works, and this he constantly brooded over. On the 12th of August 1763 he died at his house in Drottningholm. In the year 1767 his writings in belles lettres were issued in six volumes, edited by Békman, his half-brother. Amid an enormous mass of occasional verses, anagrains, epigrams, impromptus, and the like, his satires and serious poems were almost buried. But some of these former, even, are found to be songs of

remarkable grace and delicacy, and many display a love of natural scenery and a knowledge of its forms truly remark- able in that artificial age. His dramas also are of interest, particularly his admirable comedy of The Envious Man ; he also wrote a tragedy, Brynhilda, or the Unfortunate Love, and a pastoral in three scenes on King Adolphus Frederick's return from Finland. During the early part of his life he was universally admitted to be facile princeps among the Swedish poets of his time ; in his later days the extravagant reputation of the poetess Hedvig Nordenflycht somewhat eclipsed his glory. He possessed a singular mixture of the literary qualities which we attribute severally to Pope, to Voltaire, and to Thomson. As a prose writer, Dalin is chiefly memorable for his History of the Swedish Kingdom, which proceeds to the end of the reign of Charles IX.

DALKEITH, a burgh of barony and market-town of Scotland, in the county of Edinburgh, situated between the North and South Esk, 64 miles south-east of Edinburgh. The town is for the most part clean and well-built. The principal church, an old Gothic edifice, was originally the castle chapel; in 1406 it was raised to the dignity of a collegiate church, and after the Reformation it became the parish kirk. A new church in the Early English style, with a steeple 167 feet high, was built by the duke of Buccleuch in

1840; and there is an Episcopal chapel within the palace grounds. Dalkeith has one of the largest corn-markets in Scotland, held every Thursday. There are extensive corn-mills, breweries, iron-foundries, a brass- foundry, brickworks, and tanneries. In the vicinity is Dalkeith palace, the principal seat of the duke of Buccleuch. surrounded by an extensive park. It was the temporary residence of Charles I. in 1633, of George IV. in 1822, and of Queen Victoria in 1842. Population in 1871,

6386.

DALLING AND BULWER, Baron (1801-1872). William Henry Lytton Earle Bulwer, better known during the chief part of his long and brilliant career in diplomacy, politics, and literature as Sir Henry Bulwer, was born in Baker Street, Portman Square, London, on Friday the 13th February 1801. Upon both sides Lord Dalling's line- age was illustrious; his father's house traced back their ancestry to the Vikings of the North, and his mother's claimed descent from the Tudors and Plantagenets. Gene- ral Bulwer, when colonel of the 106th Regiment, had been married to Elizabeth Barbara Lytton, who—as the only offspring of Richard Warburton Lytton, of Knebworth Park, in the county of Hertford—was sole heiress of the family of Norreys-Robinson-Lytton of Monacdhu in the island of Anglesea and of Guersylt in Denbighshire. Her father, Warburton Lytton, was noteworthy in his generation. As an Oriental linguist he became the intimate friend of Sir William Jones ; he was besides the favourite pupil of Dr Samuel Parr, who used to brag of him as inferior only to himself and perhaps Porson in classical erudition. Three sons were the fruit of General Bulwer's marriage with the heiress of the Lyttons. The second of those three sons, Henry, afterwards Lord Dalling, having been amply provided for by his selection as heir to his maternal grandmother, while the paternal estates in Norfolk went in due course, by right of primogeniture, to his elder brother William, the maternal property in Herts passed into the possession of the youngest of the three brothers, Edward, known first as Bulwer the novelist and dramatist, and afterwards as the first Baron Lytton of Knebworth.

Lord Dalling's father was so far notable in his military capacity that, as brigadier-general of volunteers, he was one of the four commanding

~~officers to whom was intrusted the defence of England in 1804, when threatened with invasion by the great Napoleon. Three years afterwards,~~

~~DALLING~~

~~on the 7th July 1807, General Bulwer died prematurely at fifty-two at Heydon Hall. His young widow had then devolved upon her not only the double charge of caring for the estates in Herts and Norfolk, but the far weightier responsibility of superintending the education of her three sons, then in their earliest boyhood. She at once devoted herself with earnest solicitude to their instruction, and her qualifications for the duties of home instructress were certainly exceptional, For, besides having great natural gifts and instinctive refinement, she was a woman of cultured intel- lect and rare accomplishments, Henry Bulwer's first school was that of Dr Curtis in Sunbury, Middlesex. Thence, while yet a stripling, he was removed to Harrow, then presided over by Dr George Butler. His tutor there was the Rev. Mark Drury, a younger brother of the previous head master. At eighteen, Henry Bulwer was enrolled as an undergraduate at Trinity College, Cambridge, removing thence soon afterwards to Downing College, where his university career was completed. At that turning-point in his history his maiden work was published. It was issued from the press in 1822 as a tiny volume of verse, commenc- ing with an ode on the death of Napoleon. It is chiefly interesting now for its fraternal dedication to Edward Lytton Bulwer, then a youth of nineteen, an iuiscription couched in terms of affectionate admiration,~~

~~On leaving Cambridge in the autumn of 1824, Henry Bulwer signalized his entrance into public life by an adven- ture. As emissary of the Greek Committee then sitting in London, he started for the Morea, carrying with him no less a sum than £80,000 sterling, which, immediately on his arrival at his destination, he handed over to Prince Mavrocordato and his colleagues, as the responsible leaders of the War of Independence. He was accompanied on this expedition by Mr Hamilton Browne, who, a twelvemonth before, had been despatched by Lord Byron to Cepha- lonia to treat with the insurgent Government. Shortly after his return to England in 1826, Bulwer published a record of this romantic excursion, under the title of An Autumn in Greece. Meanwhile, bent for the moment upon following in~~

his father's footsteps, he had on the 19th October 1825, been gazetted as a comet in the Second Life Guards. Within less than eight months, however, he had exchanged from cavalry te infantry, being enrolled on the 2d June 1826 as an ensign in the 58th Regiment, That ensigncy he retained for little more than a month, obtaining another unattached, which he held until the Ist January 1829, when he finally abandoned the army. The court, not the camp, was to be the scene of his successes ; and for thirty-eight years altogether—from the August of 1827 to the August of 1865—he contrived, while maturing from a young attaché to an astute and veteran ambassador, to hold his own with ease, and in the end was ranked amongst the subtlest intellects of his time as a master of diplomacy. HIs first appointment in his new profession, at the date just mentioned, was as an attaché at Berlin. In the April of 1830 he obtained his next step through his nomination as an attaché at Vienna. Thence, exactly a year afterwards, he was employed nearer home in the same capacity at the Hague.

As yet, ostensibly, no more than a careless lounger in the salons of the Continent, the young ex-cavalry officer veiled the keenest observation under an air of indifference. HIs constitutional energy, which throughout life was exceptionally intense and tenacious, wore from the first a mask of languor. When in reality most cautious, he was seemingly most negligent. No matter what he hap- pened at the momeut to take in hand, the art he ap- plied to it was always that highest art of all, the ars celare artem. HIs mastery of the lightest but most essential weapon in the armoury of the diplomatist, tact, came to

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him as it seemed intuitively, and from the outset was con- summate. Talleyrand himself would have had no reason, even in Henry Bulwer's earliest years as an attaché, to write entreatingly, "Pas de zéle," to one who concealed so felicitously, even at starting, a lynx-like vigilance under an aspect the most phlegmatic. Endowed thus highly both in intellect and in temperament, he had hardly reached his new post in the capital of the Netherlands when he found and immediately seized his opportunity. The revolutionary explosion of July at Paris had been echoed on the 25th August 1830 at Brussels by an equally startling outburst of insurrection.

During the whole of September a succession of stormy events swept over Belgium, until the popular rising reached its climax on the 4th October in the declaration of Belgian independence by the Provisional Government. At the beginning of the revolution, the young attaché was despatched by the then foreign secretary at Whitehall, Lord Aberdeen, to watch events as they arose and report their character. When he reached Ghent in the midst of the civil conflict, the com- missionaire of his hotel was shot down at his elbow on the Grande Place. In the execution of his special mission he traversed the country in all directions amidst civil war, the issue of which was to the last degree problematic. Under those apparently bewildering circumstances, he was enabled by his sagacity and penetration to win his spurs as a diplomatist. Writing almost haphazard in the midst of the conflict, he sent home from day to day a series of despatches which threw a flood of light upon incidents that would otherwise have appeared almost inexplicable. Scarcely a week had elapsed, during which his predictions had been wonderfully verified, when he was summoned to London to receive the congratulations of the Cabinet. He returned to Brussels no longer in a merely temporary or informal capacity. As secretary of legation, and afterwards as chargé d'affaires, he assisted in furthering the negotiations out of which Belgium rose into a king- dom, and in so rising established for the first time on the European continent the adjusted fabric of a moderate con- stitutional sovereignty. Scarcely had this been accom- plished when he wrote what may be called the first chapter of the history of the newly created Belgian kingdom, It appeared in 1831 as a brief but luminous paper in the January number of the Westminster Review. And as the events it recorded had helped to inaugurate its writer's career as a diplomatist, so did his narrative of those occur- rences in the pages of the Radical quarterly signalize in a remarkable way the commencement of his long and consist- ent career as a Liberal politician. Shortly before his appear- ance as a reviewer, and immediately prior to the carrying of the first Reform Bill, Bulwer had won a seat in the House of Commons as member for Wilton, afterwards in 1831 and 1832 sitting there as M.P. for Coventry. Nearly two years having elapsed, during which he was absent from the legislature, he was in 1834 returned to Westminster as the representative of the metropolitan borough of Maryle- bone, which, as it happened, was his birthplace. That position he retained during four sessions, winning consider- able distinction as a debater by his undoubted gifts of wit and

oratory. Within the very year in which he was chosen by the Marylebone electors, he brought out in two volumes, entitled Prance—Interary, Social, and Political, the first half ofa work which was only completed upon the publica- tion, two years afterwards, of a second series, also in two volumes, under the title of The Monarchy of the Middle Classes, Through its pages he made good his claim to be regarded not merely as a keen-witted okserver, but as one of the most sagacious and genial delineators of the generic Frenchman, above all of that supreme type of the race, with whom all through his life he especially delighted to hold

familiar intercourse, the true Parisian. Between the issuing from the press of these two series, Henry Bulwer had prefixed an intensely sympathetic Life of Lord Byron to the Paris edition of the poet's works published by Galignani,—a memoir republished sixteen years afterwards. A political argument of a curiously daring and outspoken character, entitled Zhe Lords, the Government, and the Country, was given to the public in 1836 by Bulwer, in the form of au elaborate letter to a constituent. At this point his literary labours, which throughout life were with him purely labours by-the-way, ceased for a time, and he disappeared during three decades from authorship and from the legislature. It was within that interval of thirty years, however, that he succeeded in building up what has ever since constituted the sum and substance of his reputation, securing to him his eminent and now historical name as a diplomatist. During the period of his holding the position of chargé d'affaires at Brussels, Bulwer had seized every opportunity of making lengthened sojourns at Paris, always for him the choicest place of residence. It was in the midst of one of these dolce far niente loiterings on the Boulevards that, on the 14th August 1837, he received his nomination as secretary of embassy at Constantinople. Although he held that position for little more than a year, he contrived within that brief period to make his mark upon the Ottomau empire. He did this by opening up single-handed its resources to Western Europe, through the negotiation of a commercial treaty that has ever since proved of the greatest importance, not to England alone, but in a more or less considerable way to all Christendom. Until then the mercantile relations subsisting between the Sublime Porte and the outer world were not merely

unsatis- factory, they were simply intolerable. Recognizing, imme- diately upon his advent, the exceptional abilities of the new secretary, Lord Ponsonby, then ambassador at Stam- boul, devolved upon Bulwer the responsibility of dis- covering some solution for this apparently insoluble problem. Dexterously overcoming difficulties which had heretofore appeared insuperable, the young diplomatist succeeded within an astonishingly brief interval in removing the barriers which hampered trade at the Golden Horn. So triumphant in their result were his negotiations that Lord Palmerston, in writing his con- gratulations to him from Windsor Castle, on the 13th September 1838, pronounced his treaty a capo dopera, adding that without reserve it would be at once ratified. Shortly after this achievement he was nominated secretary of embassy at St Petersburg. Illness, however, compelled him to delay his northern journey—almost opportunely, as it happened, for in the June of 1839 he was despatched, in the same capacity, to the more congenial atmosphere of Paris. At that juncture the affairs of the Levant were threatening to bring England and France into armed collision. In 1839 and 1840, during the temporary absence of his chief, Lord Granville, the secretary of embassy was gazetted ad interim chargé d'affaires at the court of France. Opportunities were thus afforded him, of which he availed himself, for winning new distinction as a diplomatist. The reward earned by his devotion to his profession came to him at last towards the close of 1843. On the 14th November he was appointed ambassador at the court of the young Spanish Queen Isabella II. Upon his arrival at Madrid signal evidence was afforded of the estimation in which he was then held as a diplomatist. He was chosen arbitrator between Spain and Morocco, then confronting each other in deadly hostility. As the result of his mediation, a treaty of peace was signed between the two powers in 1844, their antagonistic interests having through his negotiations been adroitly reconciled. Two years had hardly elapsed after Bulwer's success in this

way as a peacemaker when, in 1846, a much more formid- able difficulty arose,—one which, after threatening war between France and England, led at last to a diplomatic rupture between the British and Spanish Governments.

The dynastic intrigues of Louis Philippe were the imme- -

diate cause of this estrangement, and those intrigues found their climax in what has ever since been discreditably known in European annals as the Spanish Marriages. The storm sown in the Spanish marriages was reaped in the whirlwind of the February revolution. And the ex- plosion which took place at Paris was answered a month afterwards at Madrid by a similar outbreak. Marshal Narvaez thereupon assumed the dictatorship, and wreaked upon the insurgents a series of reprisals of the most pitiless character. These excessive severities of the marshal-dicta- tor the British ambassador did his utmost to mitigate. When at last, however, Narvaez carried his rigour to the length of summarily suppressing the constitutional guarantees, Bulwer sent in a formal protest in the name of England against an act so entirely ruthless and unjustifiable. This courageous proceeding at once drew down upon the British envoy a counter-stroke as ill-judged as it was unprecedented, Narvaez, with matchless effrontery, denounced the am- bassador from Eugland as an accomplice in the conspiracies of the Progressistas ; and despite his position as an envoy, and in insolent defiance of the Palmerstonian boast, Civis Britannicus, Bulwer, on the 12th June, was summarily required to quit Madrid within twenty-four hours. Two days afterwards M. Isturitz, the Spanish ambassador at the court of St James's, took his departure from Lon- don. Diplomatic relations were not restored between the two countries until years had elapsed, nor even then until after a formal apology, dictated by Lord Palmerston, had been signed by the prime minister of Queen Isabella. Before his return the ambassador was gazetted a Knight Companion of the Bath, being promoted to the Grand Cross some three years afterwards. Inaddition to this mark of honour, he received the formal approbation of the ministry, and with it the thanks of both Houses of Parliament. Before the year of his return from the peninsula had run out Sir Henry Bulwer was married to the Hon. Georgiana Charlotte Mary Wellesley, youngest daughter of the first Baron Cowley, and niece to the duke of Wellington. arly in the following year, ou the 27th April 1849, he was nomi- nated ambassador at Washington. During his sojourn in the United States in that capacity he acquired immense popularity. Though possessing few popular qualifications as a speaker, he frequently roused American audiences to enthusiasm by his generous sentiments and impressive address. His principal success, as ambassador at Washing- ton, was the compact known equally in the Old World and in the New as the Bulwer-Clayton treaty, which was in the main

~~the fruit of his sustained labour as a diplomatist. This convention, ratified in May 1850, pledged the con- tracting Governments to respect the neutrality of the meditated ship canal through Central America, bringing the waters of the Atlantic and Pacific into direct com- munication. If it did no other good, it unquestionably for the time being allayed the jealousies which so often before then had sprung up between the two countries in regard to the British right of protection on the Mosquito Coast and in the Bay of Honduras. After having been accredited as ambassador to the United States for three years, Sir Henry Bulwer, early in 1852, was despatched as minister plenipotentiary to the small but stately court of the grand duke of Tuscany at Florence. Shortly after his retirement from that post in the January of 1855, he was intrusted with various diplomatic missions of an almost nomadic character, in one of which he was empowered as commissioner under the 23d article of the Treaty of~~

~~Dah Wyo~~

~~Paris, 1856, to investigate the state of things in the Danubian principalities, with a view to their definitive reorganization. Finally, as the crowning incident in his diplomatic career, he was installed, from May 1858 to~~

~~August 1865, as the immediate successor, after the close of .~~

~~the Crimean war, of the " Great Eltchi," Viscount Strat- ford de Redcliffe, as ambassador extraordinary to the Otto- man Porte at Constantinople. In that capacity he fully sustained the high reputation he had acquired as a diplo- matist.~~

~~When in the winter of 1865 Sir Henry Bulwer returned home from the Bosphorus it was to retire upon his pension to the lettered ease he had so well earned, and to revive for a brief space in the evening of his life the recollection of his earlier successes as an advanced liberal reformer in the House of Commons. He was elected member for Tamworth on the 17th November 1868, and retained his seat until gazetted as a peer of the realm on the 21st March 1871, under the title of Baron Dalling and Bulwer of Wood Dalling in the county of Norfolk. Upon the eve of his return to his old haunts as a debater and a politician he had asserted his claim to literary distinction by giving to the world in two volumes his four masterly sketches~~

~~of typical men, entitled Historical Characters, This work, dedicated to his brother Edward, in testimony of the writer's fraternal affection and friendship, portrayed in luminous outline Talleyrand the Politic Man, Cobbett the Contentious Man, Canning the Brilliant Man, and Mackintosh the Man of Promise. Two other kindred sketches, those of Sir Robert Peel and Viscount Melbourne, having been selected from among their author's papers, have since been published posthumously. Another work of ampler outline and larger pretension was begun and partially issued from the press during Lord Dalling's life- time. The luxury of completing it, however, was denied to the hand of its author. This was the elaborately planned and vigorously opened Life of Viscount Palmerston, the first two volumes of which were published in 1870. A third volume appeared four years afterwards. Even then it left the story of the English statesman broken off so abruptly that the work remained at the last the merest fragment. Within little more than one year from the date of his elevation to the peerage Lord Dalling, on the 23d May 1872, breathed his last quite unexpectedly at Naples, whither he had gone to all appearance on a mere holiday excursion. Although he had been for some time a confirmed valetudinarian, his death occurred so suddenly that it came at last almost as a surprise. Yet he had by that time entered upon his seventy-second year, more than half his life having been passed in the service of hiscountry. In his public career he enjoyed a three-fold success—as ambassador, as politician, and as man of letters. Winning his way in each character with a seemingly careless ease, he still improved the gifts of nature and fortune by personal effort, and bore his honours with an air of distinction expressive half of fatigue, half of indifference. HIs popularity in society was at all times remarkable, mainly no doubt from his mastery of all the subtler arts of a skilled conversationalist. The apparent languor with which he related an anecdote, flung off a bon mot, or indulged in a momentary stroke of irony imparted interest to the narrative, wings to the wit, and point to the sarcasm in a manner peculiarly his own. If as envoy he helped to mould the events of his time, he left among those who came within the range of his social influence the memory of one of the most gifted aud charming of companions. (c. K.)~~

~~DALMATIA, a crownland of the Austrian empire, stretching in a narrow strip along the eastern shores of the Adriatic from Austrian Croatia on the N. to Albania in the &., and bounded towards the interior by Turkish~~

~~DAL 783~~

~~Croatia, Herzegovina, and Montenegro. It has an area of 4937 square miles, and its population in 1869 was~~

~~456,961.~~

~~The boundary towards Austrian Croatia is marked by the Velebitch Mountains, which trend to the east and reach a height of 5350 feet in Vizeruna and 5774 in Sveto-Brdo, or the Holy Mountain ; and the Turkish frontier coincides with the line of the Dinarian Alps, which run parallel with the Adriatic and attain an elevation of 5940 feet in Mount Dinara. The highest mountain in the country is Orjen, in the district of Cattaro, 6225 feet. The coast is for the most part steep and rocky, and fronted by a large number of islands. Towards the north, opposite the Croatian coast, are. Pago and Arbe, of which the former rises to a height of 885 feet and the latter to 1338 ; next come Isola Grossa, Ugliana, Isola Incoronata, and others of less importance ; then to the south of the promontory of Osorich, Brazza, with Monte St Vito, 2574 feet high ; Lesina, with Monte St Nicola, 2078 ; and Curzola, with a maximum elevation of 1879, forming a prolongation of the promontory of Sabioncello, To the south of Curzola lies Lagosta, and to the south of Sabioucello, Meleda. The chief natural harbours are Tajer, Zara, Sebenico, Lesina, Lissa, Curzola, Sabioncello, Meleda, Gravosa, and Cattaro.~~

~~Dalmatia is not well supplied with water. The lakes are for the most part temporary rain-pools, and the only streams of importance are the Kerka (Zutiws) and the Cettina (Zilurus), which rise in the Dinara mountains. The former constitutes the boundary between Croatia and Dalmatia, and is interesting for its falls and the wildness of its scenery. The Narenta (Varo), which belongs mainly to Herzegovina, disembogues between the peninsula of Sabioncello and the mainland, and forms an extensive marsh. .~~

The climate is warm and health , the mean temperature at Zara being 57° Fahr., at Lesina 62°, and at Ragusa 63°, The prevailing wind is the sirocco, or S.E. ; but the terrible Bora, or N.E., may blow at any season of the year. The average annual rainfall is about 28 inches, but a dry anda wet year usually alternate. The greater proportion of the surface is devoted to pasture,—only 18 per cent. being under the plough, 54 per cent. in vineyards, and 22 per cent, in forest. Barley, wheat, maize, oats, rye, millet, beet-root, hemp, and potatoes are all grown, but in small quantities, Asses are largely used as beasts of burden 3 goats are strikingly numerous ; and sheep are reared for the sake of their mutton, which is almost the only animal food freely consumed in the country. Asphalt, lignite, and bay-salt from Dernis and Sign are now the only mineral products of commercial importance ; and there is no manufacturing industry except the distillation of liqueurs, oil-pressing, and tile-burning. The peasant still grinds his corn with his own hands, weaves his own cloth, and prepares his own furniture, The principal exports are olive-oil, wine, salt, and rosoglio,

Dalmatia is sparsely peopled, the neighbourhoods of Cattaro and of Ragusa being the areas of maximum density. About 89 per cent. of the inhabitants are the so-called Morlacks, or Dalmatians proper, who belong to the Servian race,and speakaSlavonic dialect usually distinguished as the Illyric ; about 103 per cent. are of Italian origin ; and the remainder consist mainly of Albanians and Jews, The pre- vailing religion is Roman Catholicism, to which no fewer than 82 per cent. of the population are attached ; and the Greek Church comprises almost all the rest. The Roman Catholic archbishop has his seat at Zara; and Spalato, Ragusa, Sebenico, Lesina, and Cattaro are bishoprics. Education is still in a backward state, but has made considerable ad- vances since 1862. The political constitution is based on the law of the 26th February 1861. The diet is composed of 43 members, including the Roman Catholic archbishop, the Greek bishop of Zara, and representatives of the chief

tax-payers, the towns, and the communes. To the imperial diet Dalmatia furnishes five delegates. Zara is the capital of the country ; and Benkovacz, Cattaro, Curzola, Imoski, Knin, Lesina, Macarsca, Ragusa, Sebenico, Sign,

aud Spalato give names to the administrative districts. With the excep- tion of Zara, Spalato, and Sebenico, most of the towns are very small, and the great proportion of the population is distributed in petty hamlets.

History. —The history of Dalmatia may be said to begin with the year 180 B.c., when the tribe from which it takes it name declared their independence of Gentius the king of Illyria, and established a republic with its capital at Delminium or Dalminium, which was probably situated in Dalen in the Herzegovina. In 156 B.c. the Dalmatians were for the first time attacked by the Romans, and coinpelled to pay tribute, but it was not till the reign of Augustus that their country was made a Roman province. A formidable revolt was suppressed by Tiberius in 9 A.D. Under the later empire Dalmatia was thoroughly Romanized, and it had the honour of giving to the world an emperor in the person of Diocletian, who retired, after resigning the purple, to Salona, the new Dalmatian capital, where he erected those buildings which still bear witness to his magnificence. (See SpauATo). After the fall of the Western Empire, in which it was included, Dalmatia was successively in the hands of Odoacer, Theodoric, and Justinian; and in the 7th century it received the dominant element of its present population by the immigration of the Slavs, who had been invited by Heraclius. In the 9th century we find Croatian influence at its height, and Croatian princes recognized as kings of Dalmatia ; but in the course of the 10th Venice extended her power over most of the towns, and about 1018 the doge took the title of duke of Dalmatia. During the 11th century the struggle went on between Croatia and Venice, till in 1091 the Hungarians took the place of the Croatians. Meanwhile the maritime cities Zara, Trau, Ragusa, &c., had each almost a separate history of its own, and, like the free cities of Northern Italy, attained no small prosperity through commerce and industry. As was natural from their posi- tion aud affinities, they rather sided with Venice, and in fact were sometimes really under Venetian control; but the treatment they received from the great republic alienated their affection, and in 1357-8 they opened their gates to Louis of Hungary, who became for a time miaster of all Dalmatia. Venetian authority was, how- ever, again restored through most of the country, and it was not till the treaty of Campo Formio, in 1797, that Dalmatia was finally incorporated with the Austrian dominions. Since that date, with the exception of the Napoleonic period from 1805-1814, the Austrian supremacy has never been

~~questioned, though during a considerable time the feeling of the country towards its masters was extremely hostile, and in 1869 an insurrection had to be put down by force of arms.~~

~~The literature relating to Dalmatia is very extensive. See Lucius of Trau, De vegno Dalmatic et Croativ, 1668; Gio. Louvich, Det Costumi det Morloecki, 1776 ; Uattalinich, Memorie degli Avvenimenti successiin Dalmazia; A. Fortis, Travels in Dalmatia, 1778; Schmidl, Das Kénigreich Dalmatien, 1843; Cusani, Dalmazia, 1846; Wilkinson, Dalmatia and Montenegro, 2 vols.{1848; Paton, Highlands and Islands of the Adriatic, 1849; Kohl, Reisen in Isirten, Dalmatien, &c., 1850; Neigebauer, Die Siidslaven, 1851; Petter, Compendio geograsico della Dalmazia, and Dalmatien in seinen verschiedenen Verziehungen dargestellt, Gotha, 1857; W. F. Wingfield, Tour in Dalmatia, 1859; Hecquard, "' Géographie pol. et. phys. de la Dalmatia," in Bulletin dela soc. de géogr. 1862; Noe, Dalmatien und seine Inselwelt, 1870; Maschek, Manuale del regno di Dalmazia per Vanno 1875; Schiff, Culiur- bilder aus Dalmatien, Vienna, 1875.~~

~~DALRYMPLE. See Srair and Haitezs.~~

~~DALTON, Joun (1766-1844), the celebrated physicist, and founder of the atomic theory of chemistry, was born September 5, 1766, at Eaglesfield, 2% miles south-west of Cockermouth, in Cumberland. His grandfather, Jonathan Dalton, was a member of the Society of Friends, and Dalton as well as his parents belonged to that body. His father, Joseph Dalton, who in 1755 married Deborah Greenup, had three children,—Jonathan, John, the subject of this sketch, and Mary. The occupation in which he was engaged, namely, that of weaving woollens, was not a lucrative one, and Mrs Dalton assisted in the support of the family by the sale of stationery. John received his early education from his father and from a Mr Fletcher, the teacher of the Quakers' school at Eaglesfield. At the age of twelve he himself began the work of school-teaching, in which he continued for two years; then, for a year or more, he worked vecasionally on his father's farm. His principal study was mathematics, in which he received aid from a distant relative, a gentleman of the name of Robinson, living in the vicinity of Eaglesfield. In 1781 Dalton left his native~~

village to become assistant to his cousin George Bewley, the master of a school for boys and girls at Kendal ; and there he spent the next twelve years of his life in teaching, and in studying Latin, Greek, mathematics, and natural philosophy. During that period he became acquainted with the blind philosopher, Mr Gough, to whose influence and help his progress in scientific knowledge was in no small measure due. In 1785 Dalton became, through the retirement of his cousin, joint-manager with his brother of the school at Kendal, and in addition to his ordinary teaching he, in 1787 and 1791, gave courses of lectures in natural philosophy. The school was not generally popular, for its young masters were uncouth in manners, and kept aloof from society. Discipline was strict, and the elder brother Jonathan is said to have been stern and severe; John being milder and gentler, and continually preoccupied with mathematics, allowed faults to escape his notice, and was consequently preferred by the scholars. About the year 1790 Dalton appears to have been desirous to secure a larger sphere for his abilities by entering on the profession of law or of physic ; but his projects meeting with no encouragement from his relations, he continued to live at Kendal, till in the spring of 1793 he obtained, mainly through Mr Gough, the appointment of teacher of mathematics and natural philosophy in the New College, Moseley Street, Manchester. That position he retained up to the time of the removal of the College to York in 1799, when he became a private tutor. .In 1794 the number of his pupils at the College, in mathematics, mechanics, algebra, geometry, book-keeping, natural philosophy, and chemistry, was 24, It was in 1792 that he first visited London, which he described as "a surprising place, and well worth one's while to see once; but the most disagreeable place on earth for one of a contemplative turn to reside in constantly."

During his residence at Kendal Dalton had con- tributed solutions of problems and questions on various topics to the Gentleman's and Ladies' Diaries ; but his first separate publication was his Meteorological Observations and Essays, published September 1793, a result of the study of natural phenomena during upwards of seven years previously. The book contained much: original matter, but met nevertheless with only a limited sale, for, having been printed exclusively for the author, it never found its way in any large numbers into the hands of publishers. Another work by Dalton, entitled Zlements of Lnglish Grammar, was published in 1801. On

October 3, 1794, Dalton became a member of the Manchester Literary and Philosophical Society, before which, on the 31st, he read a communication entitled " Extraordinary Facts relating to the Vision of Colours." In this paper he gives the earliest account of that ocular peculiarity known as dyschromatopsis, chromato-pseudopsis (false vision of colours), Daltonism, parachromatism, or colour-blindness, and sums up its characteristics as observed in himself and others.! When a boy, being present at a review of troops, and hearing those around him expatiating on the gorgeous effect of the military costume, he asked in what the colour of a soldier's coat differed from that of the grass on which he trod ; and it was the derisive laugh and the exclamations of his companions which this question called forth that first made him aware of the defectiveness of his eye-sight. Besides the blue and purple of the spectrum he was able to recognize but one colour, yellow ; or, as he states in his paper, "That part of the image which others call red appears to me little more than a shade or defect of light ; after that the orange, yellow, and green seem one colour, which descends pretty uniformly from an intense to a rare

1 The subject is fully treated of in Dr G. Wilson's Researches om Colour-Blindness, 1855.

yellow, making what I should call different shades of

ellow."

On March 1, 1799, Dalton read to the Manchester Society @ paper on rain and dew, and the origin of springs, which was

subsequently followed by various disquisitions—on heat, the colour of the sky, steam, the auxiliary verbs and participles of the English language, and the reflectibility and re- frangibility of ight. In May 1800 he was elected to the secretaryship of the society, an office which he held until 1808, when he became vice-president in the place of Dr Roget. In 1817 he became president, and remained so till the time of his death. On July 31, 1801, was read the first of four important essays by Dalton, 'On the Constitution of Mixed Gases ;" " On the Force of Steam or Vapour from Water and other

~~*Liquids in different Temperatures, both in a Torricellian Vacuum and in Air;" "On Evaporation ;" and "On the Expansion of Gases by Heat." In the second of these he makes the striking remark,—" There can scarcely be a doubt entertained respecting the reducibility of all elastic fluids, of whatever kind, into liquids ; and we ought not to despair of effecting it in low temperatures, and by strong pressures exerted upon the unmixed gases ; " further, he describes experiments to ascertain the tension of aqueous vapour at different points between 32° and 212° Fahr., and concludes, from observations on the behaviour of the vapour of six different fluids, "that the variation of the force of vapour from all liquids is the same for the same variation of temperature, reckoning from vapour of any given force." In the fourth essay he observes—"I see no sufficient reason why we may not conclude that all elastic fluids under the same pressure expand equally by heat, and that for any given expansion of mercury, the corresponding expansion of air is proportionally something less, the higher the temperature. . , . . It seems, therefore, that general laws respecting the absolute quantity and the nature of heat are more likely to be derived from elastic fluids than from other substances." Dalton thus both enunciated the law of the expansion of gases, stated six months later by Gay-Lussac, and indicated the future employment of the air-thermometer.*~~

~~*But the most important of Dalton's numerous investi- gations are those concerned with the atomic theory of chemistry, The subject of chemisty seems to have first occupied his attention about the year 1796. In 1802 he had already arrived at some conception of the law of the multiple combining proportions of the ele- ments, which was afterwards developed by him. 'Thus, in a paper "On the Proportion of the Several Gases or Elastic Fluids constituting the Atmosphere," read on the 29th of October in that year, he says—though, as it happened, his conclusions were based upon the incorrect supposition that the size of the vessels he employed affected the nature of the chemical union of the gases they con- tained—* The elements of oxygen may combine with a certain portion of nitrous gas, or with twice that portion, but with no intermediate quantity. In the former case nitric acid is the result, in the latter nitrous acid." '*~~

~~*Dr Thomson states (History of Chemistry, vol. 1i.)— "'Mr Dalton informed me that the atomic theory first occurred to him during his investigations of*~~

olefiant gas and carburetted hydrogen gas." In 1850, however, in a notice of Wollaston, read before the Glasgow Philosophical Society, he remarks, —' Mr Dalton founded his theory on the analysis of two gases, namely, protoxide and deutoxide Giveeote. .. . .. The first of these he considered as a com- pound of one atom of azote with one atom of oxygen, and

the second of one atom of azote united with two atoms of Inasmuch as from the recognition of the law of

oxygen." definite and multiple combining proportions of the elements originated the establishment of that of their relative, Dalton

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may be said to have received assistance in the foundation of his atomic theory from the researches here alluded to by Thomson ; but the latter part of the statement is manifestly erroneous, for the two gases referred to were invariably represented by Dalton as compounds respectively of two atoms and one atom of azote (nitrogen) with a single atom of oxygen. It is doubtless the earlier of Thomson's observa- tions that is to be regarded as correct, more especially as Dalton himself says, in 1810, in his New System of Chemical Philosophy, with respect to carburetted hydrogen, — "No correct notion of the constitution of the gas about to be described seems to have been formed till the atomic theory was introduced and applied in the investigation. It was in the summer of 1804 that I collected, at various times and in various places, the inflammable gas obtained from ponds." As a matter of fact, the first germs of the atomic theory were Dalton's views of the separate existence of aqueous vapour in the atmosphere, which necessitated the assumption that gases were constituted of independent atoms ; indeed they are represented as such, each atom having its distinguishing symbol, in the plate accompany-

ing the paper "On the Constitution of Mixed Clases,"

Dalton appears already in 1803 to have pictured to himself the form of atoms, for in a paper "On the Absorption of Gases by Water" we read— A particle of gas pressing on the surface of water is analogous to a single shot press- ing on a square pile of them ;" and five years later, he writes in his

~~Vew System,—“ Whatever, therefore, may be the shape or figure of the solid atom abstractedly, when surrounded by such an atmosphere [of heat] it must be globular ; but as all the globules in any small given volume are subject to the same pressure, they must be equal in bulk, and will, therefore, be arranged in horizontal strata like a pile of shot.” At the end of the paper on “ Absorption” just alluded to, Dalton gives the following first table of the relative weights of the ultimate particles of gaseous and other bodies, which was constructed, he tells us, in order to test whether the solubility of gases in water was dependent upon the weight of their particles:—~~

~~TAY OM yee sce vanvneccosss 1 HCPOUS ORME? 5. ciscescaves 13‘7 20m ogoagenbodduepusgood6a68er 422) |GSulpHttisen,catseccesevestnere 14°4 CHROOT es occ nc erscicnss 4°35 | Wattie cid)... 3.0 0.c.00s 15°2 Ammonia . 5°2 | Sulphuretted hydrogen.. 15°4 Oxygen — b>) | Carbonicraend « ...ssss.00es 15°3 Banas cancte sensi 12 nes (oo. 010 | Ee ea 151 PH GSPNOMIS «650. si0eeases 7°2 | Sulphureous acid……. 199 Phosphuretted hydrogen. 8:2 | Sulphuric acid…… 25°4 INdibrouIStsastaesens. commerce: 9°3 | Carburetted hydrogen dE Geencecton semrncneeterree 9°6 from stagnant water… 6°3 Gaseous oxide of carbone, 9° Oletant sasr. cco wee 5:3~~

~~As this table contains the results of the analyses of olefiant gas and carburetted hydrogen made in the summer of 1804, it must have been completed after that date, and possibly was not added to the paper containing it till shortly before the printing of the latterin November 1805. It was in 1803, as we are informed in the preface to the New System, that Dalton “was gradually led to those primary laws which seem to obtain in regard to heat and to chemical combination ;” and in a letter to his brother in that year he writes that he has been fully engaged in all his leisure hours in the pursuit of chemicaland philo- sophical inquiries, “having got into a track that has not been much trod in before.” Dr Bryan Higgins, in a little pamphlet composed about the year 1775, had treated of “atoms” which united with one another ; but the fixity of the constitution of chemical substances had apparently formed no part of his ideas. “ The matter of fire,” accord | ing to him, “limits the quantity in which aeriform fluids, and bodies containing it, can combine chemically,” and it “1 The figures for nitrous gas (nitric oxide) and nitrous oxide should~~

have been 9°7 and 13°9, 7.¢., 5‘54+4°2 and 5°5+4:2×2, VI. — 99

is his belief that the forces of atoms measure the attraction of matter, yet he ventures on no deduction as to the com- parative numbers of the attracting atoms. Upon these views we find an advance in the writings of William Higgins, who not only held that atoms combined to form molecules of compound bodies, but reasoned that they must unite singly or by twos and threes, there being no inter- mediate division of atoms; nowhere, however, does he attempt to elevate his conclusions into a general law. Next Richter, and after him Fischer, showed the existence of definite quantitative relations between the constituents of bodies, but for these relations they assigned no cause ; and it wasreserved for Dalton to give to the world a theory which linked together and reduced to order and simplicity the previously disconnected and unexplained phenomena of chemical combination. Till 1811 Dalton, who drew his deductions from his own rough experimental work, was un- acquainted with the observations of William Higgins ; and although Richter’s determinations may have aided him in the proving of his laws, still, as Dr R. A. Smith has remarked, “ they,could never have given him fundamental ideas.” Dalton makes the following clear distinction between his own researches with respect to the ultimate constitution of matter and those of other chemists (Vew System, pt. i. p. 218, 1808) :—

‘*Tn all chemical investigations, it has justly been considered an important object to ascertain therelative weights of the simples which constitute acompound, But unfortunately theinquiry has terminated here ; whereas from the relative weights in the mass, the relative weights of the ultimate particles or atoms of the bodies might have been inferred, from which their number and weight in various other compounds would appear, in order to assist and to guide future investigations, and to correct their results. Now, it is one great object of this work to show the importance and advantage of ascertaining the relative weights of the ultimate particles, both of simple and compound bodies, the number of simple elementary par- ticles which constitute one compound particle, and the number of less compound particles which enter into the formation of one more compound particle.

If there are two bodies, A and B, which are disposed to com- bine, the following is the order in which the combinations may take place, beginning with the most simple, namely :—

latom of A+l atom of B=1 atom of C binary}

latom of A+2 atoms of B=1 atom of D ternary.

*2 atoms of A+1 atom of B=1 atom of E ternary. **

latom of A+3 atoms of B=1 atom of F quaternary.

3 atoms of A+1 atom of B=1 atom of G quaternary, &c., &c."

In 1810 appeared the second part of volume i. of the New System, in which the chemical elements are described. The first part of volume ii, was not published till 1827 ; it by no means represents the advanced state of chemical science at that time, and the appendix, giving Dalton's latest views, is the only portion of it that is of any special interest. A history of the development of the atomic theory since its first promulgation will be found under CHEMISTRY, vol. v. p.465. By Dr Thomson, its first advo- cate, by Wollaston, and by Dr Henry, it was ably supported, and the analyses of Berzelius placed it on a stable footing. "The theory of multiple proportions," wrote Berzelius, 'is a mystery without the atomic hypothesis." Strange to say, the conclusions of Gay-Lussac with regard to the combining volumes of gases, which afforded the strongest evidence in favour of the atomic theory, were distrusted, and perhaps never fully accepted by Dalton. The tenacity with which he clung to opinions once formed is further exemplified by his unwillingness to recognize chlorine as a chemical element, and his persistent use of the atomic weights first adopted by him, in spite of the later and more trustworthy deter- minations of other chemists. The memoirs of Dalton read before the Manchester Literary and Philosophical Society were in all 116. In one of these, read in 1814, he lays down the principles of the volumetric method of analysis, of which he is undoubtedly to be regarded as the originator,

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~~although its wide practical application is the result of the labours of numerous after-chemists, The earlier of Dalton's papers are the most important and complete; one of his latest, however, "On a New and Easy Method of Analyzing Sugar," describes a discovery of much interest, viz., that the volumes of highly hydrated salts when dissolved are equal to those of their volumes of water, the volume of the salt itself disappearing. Before Dalton had become known ag the propounder of the atomic theory, he had already attained a considerable reputation by his scientific labours, and in 1804 he was chosen to give a course of lectures on natural philosophy at the Royal Institution in London, Subsequent discourses were delivered by him at the same place in the winter of 1809-10. HIe was, it would seem, deficient in many of those qualities that go to form an attractive public lecturer, HIs voice is said to have been harsh, indistinct, and unemphatic, and hig manner of dealing with his subject ineffective ; he is described, more- over, as an indifferent experimenter, and as "singularly wanting in the language and power of illustration." An imaginative or brilliant style of diction, it is to be supposed, can scarcely have been at the command of one whose hours of leisure from the routine of tuition were unceasingly devoted to laboratory work, and who eschewed, and even to some extent discouraged, literary pursuits. HIs library, he was once heard to declare, he could carry on his back, and yet he had not read half the books which constituted it. In the autumn of 1805 Dalton went to live in George Street, Manchester, with his friend the Rev. W. Johns, and with him and his family he continued to reside, in the greatest harmony, for the next twenty-six years. Engaged in his favourite studies, he passed a quiet and almost uneventful life, interrupted only by occasional visits to London and other cities, and by annual excursions to the Lake country. Into society he rarely went, and amusement he had none, with the exception of a game at bowls on Thursday afternoons. In 1810 he was asked by Davy to offer himself as a candidate for the fellowship of the Royal Society, but he declined, possibly from pecuniary considera- tions. In 1822 he was proposed without his knowledge, was elected, and paid the usual fee. Four years later he received the king's medal of the society, "for the development of the chemical theory-of Definite Proportions usually called the Atomic Theory, and for his labours and discoveries in physical and chemical science."~~

~~In the summer of 1822, in company with Mr Benjamin Dockray and Mr W. D. Crewdson, Dalton spent a short time at Paris, where he met Ampére, Arago, Berthollet, Biot, Bréquet, Cuvier, Fourier, Gay-Lussac, Laplace, Thénard, Vauquelin, and other distinguished men of science. Six years previously he had been made a corresponding member of the Academy of Sciences; and in 1830 he was elected by that body to fill the place of Davy as one of its eight foreign associates. Dalton was present at the first meeting of the British Association, held at York in 1831. On the occasion of the second meeting, at Oxford in 1832, the honorary degree of D.C.L. was conferred upon him, The scarlet hue of his doctor's gown was to him, he said, "that of nature," the colour of "green leaves."~~

~~In June 1833, Lord Grey's Government conferred upon Dalton an annual pension of £150, which in 1836 was raised to £300, In the former year a subscription list was opened in Manchester to obtain funds for providing that city with a lasting memorial of its great chemist; and the sum of £2000 having been raised, Chantrey was intrusted with the execution of a bust, which was eventually placed in the entrance hall of the Manchester Royal Institution. During his stay in London, whither he had gone in 1834 to sit to the sculptor, Dalton was presented at court, and in the autumn he received from the university of Edinburgh~~

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~~the degree of LL.D. He officiated as vice-president of the chemical section of the British Association at Dublin in 1835, and at Bristol in 1836. On the 18th April 1837, he was seized with an attack of paralysis, a disease of which his brother had died in December 1834. In the following year, on the 15th February, he had a second attack, after which, though still able to make experiments, he was manifestly much enfeebled, both physically and mentally, and required constant medical attendance On May 20, 1844, he suffered from another fit. On the 26th of July 1844, he recorded, with trembling hand, his last meteorological observation, and on the morning of the 27th he fell from his bed, and was found lifeless by his attendant. He was publicly buried on the 12th of August at Ardwick cemetery, about a mile and a half from Manchester.~~

~~In person Dalton was robust and muscular, and his countenance was open, and expressive of the earnestness, simplicity, and truth of his character. His height was about 5 feet 7 inches; he stooped slightly ; and his gait was stiff and awkward, but rapid. In dress he adhered to the mode of the Quakers. His manners were singularly free from pedantry and ostentation, and he had a grave, quiet demeanour. Generally he enjoyed excellent health. His medical attendant, finding him ouce greatly recovered from an attack of catarrh, attributed the improvement to a dose of James's powder prescribed on the previous day. "Ido not well see how that can be," said Dalton, "as T kept the powder until I could have an opportunity of analyzing it." Dalton was somewhat silent in general company, but with his familiar friends he would often indulge in active con- versation. His letters to his acquaintances evince no small power of observation. On religious topics he appears to have been peculiarly reserved, and his friends found it difficult to gain an idea of his doctrinal views. He "never had time" to get married, he said ; but his correspondence, and the testimony of those who knew him, show that he delighted in the society of women of education and refine- ment ; his pinched circumstances in early life were perhaps the chief cause why he remained single. He liked tobacco, and remarked of Davy, "the principal failing in his character as a philosopher is that he does not smoke." Dalton was careful, though not parsimonious, in his expenditure, and left at his death a small fortune; when occasion required he could show himself remarkably open- handed. Davy wrote of Dalton in 1829 :—" He was a very coarse experimenter, and almost always found the results he required, trusting to his head rather than to his hands. Memory and observation were subordinate qualities in his mind ; he followed with ardour analogies and inductions ; and however his claims to originality may admit of question, I have no doubt that he was one of the most original philosophers of his time, and one of the most ingenious." Superadded to his natural talents, and " his almost intuitive skill in tracing the relations of material phenomena," there was in Dalton, to use the words of Professor Sedgwick, "a beautiful moral simplicity and singleness of heart, which made him go on steadily in the way he saw before him, without turning to the right hand or to the left, and taught him to do homage to no authority before that of truth."~~

~~Henry, Life of Dalton, Cavendish Society, 1854; Robert Angus Smith, Memoir of John Dalton and History of the Atomic Theory, 1856. A list of Dalton's papers and other publications is given on~~

~~pp. 253-63 of the latter work. See also Roscoe, "On Dalton's First able of Atomic Weights," in Nature, Nov. 19,1874. (F. H. B.)~~

~~DAMAGES, the compensation to which a person is by:~~

~~law entitled who has been injured by another. The principle of compensation in law makes its first appearance as a substitute for personal retaliation. In primitive law something of the nature of the Anglo-Saxon were-geld, or~~

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~~the wouy of the Iliad, appears to be universal.) It is a~~

~~payment due from the offender to the person he has offended, or to his family or kin. The system relates to personal injuries, It marks out with great minute- ness the measure of the compensation appropriate to each particular case. And there is sometimes a resemblance between the legal compensation, as it may be called, and the compensation which an injured person, seeking his own remedy, would be likely to exact for himself. In such a system the two entirely different objects of personal satis- faction and criminal punishment are not clearly separated, and even in modern law damages are still occasionally penal.~~

~~The object. of legal compensation should be to place the injured person as nearly as possible in the situation in which he would have been but for the injury. In the law of England the two historical systems of common law and equity viewed this problem from two different points of view. The principle of the common law was that the amount of every injury might be estimated by pecuniary valuation. The object of equity was to place the injured party in the actual position to which he was entitled, This difference comes out most clearly in cases of breach of con- tract. The common law, with a few partial exceptions, would do no more than compel the defaulters to make good the loss of the other party, by paying him an ascertained sum of money~~

as damages. Equity, recognizing the fact that complete satisfaction was not in all cases to be obtained by mere money payments, compelled the defaulter to specifically perform his contract. Again, in those injuries which do not fall under the head of breach of contract, equity, on satisfactory proof that a wrong was contemplated, would interfere to prevent it by injunction ; while at com- mon law no action could be brought until the injury was accomplished, and then only pecuniary damages could be obtained. Common law and equity are now so far fused by the Judicature Act of 1873 that the appropriate remedy can be awarded in any of the divisions of the High Court of Justice.

The assessment of damages is peculiarly the business of the jury, and the court will only interfere with their decision on strong cause being shown. Thus a verdict may be set aside on the ground that damages are excessive, or that they are palpably insufficient. And if it appear that the result was arrived at by mere hazard, as, for instance, by each juryman naming a sum and an average being struck, that would be an impropriety which would invalidate the verdict. There are, moreover, certain prin- ciples according to which the damages must be ascertained,

To take, first, cases of breach of contract. Here, it is said, the motive of the defendant is an irrelevant considera- tion. He has broken his contract, and all that has to be done is to fix the amount of the loss occasioned thereby. So wherever there has been a breach of contract, some damages, though they should be merely nominal, are recoverable. And when the contract was for a payment of a fixed sum of money, the damages recoverable for a breach thereof would be that sum with interest. Where, in other cases, the parties themselves have fixed the sum which should be due as damages in case of the contract not being fulfilled, such sum will be the proper damages to be awarded by a jury. On this point, however, the cases run rather fine. When a contract provides that a fixed sum shall be payable for breach, the law will ask whether it has been fixed as a penalty or as liquidated (i.e., ascer- tained) damages. In the former case it will not allow the fixed sum to be awarded, but will require evidence to show what the amount of loss actually was. In Kemble »,

~~) The were was the price of a man's life—the fine a murderer had to pay to the family or relations of the deceased, as the wite was the fine paid to the magistrate.~~

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~~Farren (6 Bingham, 141), a contract between a manager aud an actor provided that for a breach of any of the stipulations therein the sum of £1000 should be payable by the defaulter, not as a penalty, but as liquidated and ascertained damages. Yet even here, the court observing that under the stipulations of the contract the sum of £1000, if it were taken to be liquidated damages, might become payable for mere non-payment of a trifling sum, held that it was not fixed as damages, but as a penalty only. On the other hand, when the damage caused by a breach of contract is of its own nature uncertain, and the parties have positively fixed a sum as liquidated damages, that sum will be the proper damages, Where no such arrangement is made, the general rule for the assessment of damages is that the aggrieved party is to be placed in the same position, so far as money can do it, as if the contract had been performed, 'Thus, in a contract for the sale of goods when the vendor makes default in delivery, the proper measure of damages is the difference between the contract price and the market price of the goods on the day when they ought to have been delivered ; so that if the price has not risen in the interval, the vendor can only get nominal damages. If be has in the meantime resold the goods to a sub-vendor, he cannot claim against his own vendor any damages which the sub-vendor may recover against him for breach of contract, because he ought to have gone into the market and purchased other goods, Again, if a buyer refuses to accept the goods when tendered to him, the measure of damages will be the difference between the contract price and the market price at the time of his refusal, if the latter is lower than the former. But in such cases the trouble and expense of finding a new purchaser or other goods may be taken account of in asses- sing the damages. It has been held that in a breach of contract to replace stock lent, the measure of damages will be the price of the stock on the day when it ought to have been delivered or on the day of trial, at the plaintiff's option. Where goods~~

~~inferior in quality to those contracted for are delivered, the difference between the value at the time of delivery of the goods contracted for and the value of those actually delivered will be the proper damages. The con- trolling principle, in fact, is that compensation should be determined by the amount of the actual loss. In an American case, where a person had agreed with a boarding- house keeper for 'a year, and quitted the house within the time, it was held that the measure of damages was not the price stipulated to be paid, but only the loss caused by the breach of contract. In contracts to marry, a special class of considerations is recognized, and the jury in assessing damages will take notice of the conduct of the parties. The social position and means of the defendant may be given in evidence to show what the plaintiff has lost by the breach of contract.~~

~~It is not every loss caused by the act or default complained of which can be taken in estimating the proper amount of damages. 'The remoteness of the consequences is a bar to their being recognized in the assessment, and it is a question of no little difficulty what damages are and what are not excluded for remoteness, The leading English case on this point is Hadley v. Baxendale (9 Exch., 341), in which damages were sought for the loss of profits caused by a steam mill being kept idle, on account of the delay of the defendants in sending a new shaft which they had con- tracted to make. The court held the damage to be too remote, and stated the true rule to be that~~

~~"' Where two parties have made a contract which one of them has broken, the damages which the other party ought to receive in respect of such breach of contract should be -either such as may fairly and substantially be considered as arising naturally, 7.¢.,~~

~~according to the usual course of things, from such breach of con- tract itself, or such as may reasonably be supposed to have been in~~

~~contemplation of both parties at the time they made the contract; as the probable result of the breach of it."~~

~~So also in cases of trust, the general rule is that the damages must be restricted to the " legal and natural con- sequences of the wrongful act imputed to the defendant." In an action by the proprietor of a theatre, it was alleged that the defendant had written a libel on one of the plaintiff's~~

singers, whereby she was deterred from appearing on the stage, and the plaintiff lost his profits ; such loss was held to be too remote to be the ground of an action for damages. The line of remoteness cannot probably be drawn with much greater precision than in the rule in Hadley v. Baxendale quoted above, vague and ambiguous as the language may seem tobe. A subsequent case shows the limitations of the rule on the other side. In Smead v. Foord (1 Ellis and Ellis, 602), the defendant cun- tracted to deliver a thrashing-machine to the plaintiff, a farmer, knowing that it was needed to thrash the wheat in the field. Damages were sought for injury done to the wheat by rain in consequence of the machine not having been delivered in time, and also for a fall in the market before the grain could be got ready. It was held that thefirst claim was good, as the injury might have been anticipated, but that the second was bad. When, through the negli- gence of a railway company in delivering bales of cotton, the plaintiffs, having no cotton to work with, were obliged to keep their workmen unemployed, it was held that the wages paid and the profits lost were too remote for damages, On the other hand, the defendant having failed to keep funds on hand to meet the drafts of the plaintiff, so that a draft was returned dishonoured, and his business in con- sequence was for a time suspended and injured, the plaintiff was held entitled to recover damage for such loss, The great difficulty of framing a rule which shall meet all cases is acknowledged by judges and legal writers. One judge declared that no rule could be made in the matter. Another declared that the rule in the majority of cases could have no application, because parties never con- template the consequences of a breach of contract. The cases probably do not go beyond this, that, when from facts known to everybody, or from special facts proved to be known to the defendant, he ought to have anticipated the consequences of the breach of contract, he will be liable for them.

The rule that the contract furnishes the measure of the damages does not prevail in the case of unconscionable, %.¢., unreasonable, absurd, or impossible contracts. The old school-book juggle in geometrical progression has more than once been before the courts as the ground of an action, Thus, when a man agreed to pay for a horse a barley-corn per nail, doubling it every nail, and the amount calculated as 32 nails was 500 quarters of barley, the judge directed the jury to disregard the contract, and give as damages the value of the horse. And when a defendant had agreed

~~for £5 to give the plaintiff two grains of rye on Monday, four on the next Monday,) and so on doubling it every Monday, it was contended that the contract was impossible, as all the rye in the world would not suffice for it; but one of the judges said that, though foolish, it would hold m law, and the defendant ought to pay some: thing for his folly. And when a man had promised £1000 to the plaintiff if he should find his owl, the jury were directed to mitigate the damages.~~

~~Interest is recoverable as damages only when an agree- ment that it should be paid can be proved or inferred (as in the case of bills of exchange), and under the statute 3 and 4 Will, IV. c. 42.~~

~~1 Quolibet alio die lunce, which was translated by some every Monday and by others every other Monday. The amount in the latter cast would have been 125 quarters, in the former 524,288,000 quarters.~~

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~~In American law interest is in the discretion of the court, and is made to depend on the equity of the case. In both England and America compound interest, or interest on interest, appears to have been regarded with the horror that formerly attached to usury. Lord Eldon would not recognize as valid an agreement to pay compound interest. And Chancellor Kent, and American lawyers generally, hold that compound interest cannot be taken except upon a special agreement made after the simple interest has become due. See InTEREST,~~

~~In actions of tort the discretion of the jury is not so strictly limited as in cases of breach of contract. The cases we have referred to show a general tendency to make the amount of damages a matter of legal certainty, and the jury can do little more than find the facts. If they travel beyond the contract the court will revise their verdict, But in estimating the damages for a civil injury, matter of aggravation may be taken into account. This position was strengly asserted in the cases arising out of the celebrated "General Warrants" in the time of Lord Camden, who is reported in one case to have said, " damages are designed not only as a satisfaction to the~~

injured person, but as a punishment to the guilty, and as a proof of the detestation in which the wrongful act is held by the jury." In another case he mentioned the importance of the question at issue, the attempt to exercise arbitrary power, as a reason why the jury might give exemplary damages. Another judge, in another case, said, "I remember a case when the jury gave £500 damages for knocking a man's hat off; and the court refused a new trial." And he urged that exemplary damages for personal insult would tend to prevent the practice of duelling, 'The right of the jury to give exemplary or vindictive damages has been repeatedly cc..firmed in recent cases, and the same doctrine prevails generally throughout the United States. In Scotch law the distinction between compensation and punishment has been more carefully maintained. In Eaillie v. Bryson (1 Murray's Reports), Lord Chief Commissioner Adams said that Lord Kenyon had " introduced into cases of this sort a principle as to damages extremely dangerous in its con- sequences, He considered such questious not merely as calculated to repair the injury done to the one party, but as a punishment of the other, and as intended to correct the morals of the country. The morals of the country have not been improved, and I am afraid its feeling has been much impaired, A civil court in matters of civil injury is a bad corrector of morals; it has only to do with the rights of parties,"

When both parties are in fault, if the plaintiff's conduct has contributed to the injuries, his claim for damages will not be sustained. This has been carried so far that it has been held that, when a person in one carriage receives injuries from the management of another carriage, he can- not recover damages if any negligence, either on his own part or on the part of the owner or managers of the carriage in which he was, has contributed to the accident. (See NzcuicEnce.) In the Court of Admiralty, where the question constantly arises in cases of collision, a different rule has been adopted. When both vessels are in fault the whole amount of loss is divided between them. And by a section of the Judicature Act, 1873, the Admiralty rule in such cases is to be adopted in all the courts.

In the old action of criminal conversation, exemplary damages might be given, and now the petitioner in a divorce suit may be awarded exemplary damages by the Jury against a co-respondent, In this case, however, the disposition of the sum awarded as damages is in the discretion of the judge,

who may apply it to the maintenance and education or otherwise to the benefit of children of the marriage,

Damages are said to be either general or special. The

former are given for loses implied by law as the necessary consequences of the wrongful act. 'The latter are not im- plied by law, but are compensation for stich loss as may be proved to have been in fact caused by the wrongful act. Thus, in an ordinary slander, special damage must be alleged and proved to entitle the plaintiff to pecuniary compensation. But if a slander touches a person in the way of his trade, the law will presume that it caused loss to the plaintiff, with- out calling on him to show what the loss actually was,

When a person was injured by the negligence of another, and died, the benefit of an action for damages did not sur- vive to his representatives. But by the 9 and 10 Vict. ¢. 93 (commonly called Lord Campbell's Act), it is enacted that wherever the wrongful act is such as would have entitled the injured person to recover damages (if death had not ensued), the person who in such case would have been liable " shall be liable to an action for damages notwith- standing the death of the person injured, and although the death shall have been caused under such circumstances as amount in law to felony." Every such action shall be brought for the benefit of the husband, wife, parent, and child of the deceased. "Child" includes grandchild and step-child, but not illegitimate child.

Loss caused by an act which is not wrongful (damnum absque injurta) cannot be the ground of an action for damages; e.g., if A's business is injured by his neighbour B starting the same business, this is not an actionable loss.

Reference may be made to Sedgwick on The Measure of Damages, or Mayne on the same subject. (E. R.)

DAMAN, or Damavy, in Portuguese DAMAo, a town of India. See Damaun,

~~DAMASCENUS, Jonanyzs, an eminent theologian of the early Greek Church, derives his surname from Damascus, where he was born about the close of the 7th or the beginning of the 8th century. HIs Arabic name was Mansur, and he received the epithet Chrysorrhoas (gold-pouring) on account of his eloquence. The principal account we have of his life is contained in a narrative of the 10th century, much of which is obviously legendary. HIs father Sergius was a Christian, but notwithstanding held a high office under the Saracen caliph, in which he was succeeded by hisson. Damascenus owed his education in philosophy, mathematics, and theology to an Italian monk named Cosmas, whom Sergius had redeemed from a band of captive slaves. About the year 730 he wrote several treatises in defence of image-worship, which the Emperor Leo, the Isaurian, was making strenuous efforts to suppress. Leo in revenge is said to have forged a treasonable letter, purporting to be from Damascenus, and to have sent it to his caliph, who ordered the traitor's right hand to be cut off. According to the narrative Damascenus immediately proceeded to prostrate himself before an image of the Virgin Mary, implored her intercession, and had the severed hand miraculously restored. 'The caliph was con- vinced by the miracle, and offered to replace Damascenus in his office, but the latter resolved to forsake the world, divided his fortune among his friends and the poor, and betook himself to the monastery of St Sabus, near Jerusalem, where he spent the rest of his life. After the customary probation he was ordained priest by the patriarch of Jerusalem. In his last years he travelled through Syria contending against the iconoclasts, and in the same cause he visited Constantinople at the imminent risk of his life during the reign of Constantine Copronymus, The date of his death is uncertain ; the last notice of him is in 754. Damascenus is a saint both in the Greek and in the Latin Church, his festival being observed in the former on 29th November and 4th December, and in the latter on the 6th May. The works of Damascenus give him a foremost place among the theologians of the early Eastern Church, and,~~

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~~according to Dorner, he " remains in later times the highest authority in the theological literature of the Greeks." Several treatises have been attributed to him that are probably spurious, but his undoubted works are numerous~~

~~and embrace a wide range. The most important contains three parts under the general title IInyj yvdoews (the fountain of knowledge). 'The first part, entitled Ke®dAara ptAocoprxd, is an exposition and application to theology of Aristotle's Dialectic. The second, entitled Ilepi aipéccewv (of heresies), is a reproduction of the earlier work of Epiphanius, with a continuation giving an account of the heresies that arose after the time of that writer. The third part, entitled "Exdoots dxpiBys rhs épO0ddgou micrews (an accurate exposition of the orthodox faith), is much the niost important of the three, containing as it does a com- plete system of theology founded on the teaching of the fathers and church councils, from the 4th to the 7th century. It thus embodies the finished result of the theological thought of the early Greek Church. Through a Latin translation made by Burgundio of Pisa in the 12th century, it was well known to Peter Lombard and Aquinas, and in this way it influenced the scholastic theology of the West. Damascenus himself has sometimes been called the "Father of Scholasticism," and the '"' Lombard of the Greeks," but these epithets are appropriate only in a limited sense. On the disputed question of Damascenus's authorship of the interesting Christian romance, Barlaam and Josaphat, see note to the article BARLAAM AND JOSAPHAT, vol. iii. p. 375. The works of Damascenus were edited by Le Quien, and published with a valuable introduction in 2 vols. fol., Paris, 1712.~~

~~DAMASCENUS, Nicotaus, a Greek historian and philosopher, born at Damascus, from which he is named. He flourished in the time of Augustus and Herod the Great, with both of whom he was on terms of friendship. Ile enjoyed the intimate confidence of Herod, who studied philosophy along with him, and employed him on an important political mission to Augustus. Nicolaus survived Herod, and it was through his influence that the succession was secured for Archelaus ; but the date of his death, like that of his birth, is unknown. Of bis principal work, a universal history in 144 books, composed at the request of Herod, only a few fragments remain. He wrote also an autobiography, of which a good deal has been preserved, a life of Augustus, a life of Herod, and several philosophical works, which are known to us only through a few extracts in other writers. The first edition of the fragments of Nicolaus in a Latin version appeared at Geneva in 1593. The standard edition is that of Orelli (Leipsic, 1804) with a supplement~~

~~(1811). The volume published in 1804 contains a notice of the life of Nicolaus by the Abbé Sevin.~~

~~DAMASCIUS, a celebrated Neo-Platonic philosopher, who was born at Damascus about the middle of the 5th cen- tury. HIe studied at Alexandria, and thence removed to Athens, where he taught philosophy till the close of the heathen schools during the reign of Justinian. Of his works, which consisted chiefly of commentaries on Plato and Aristotle, and of a biography of his teacher Isidorus, some fragments exist in the writings of Photius. What has been preserved of his work entitled Difficulties and Solutions of the First Principles has been published by J. Kopp (Frankfort, 1828), and is of considerable value for the account it contains of several ancient philosophers. See Kopp's preface to his edition.~~

~~DAMASCUS (Arabic, Dimeshk esh-Sham), the capital of Syria, and of a pashalik of the same name, an ancient town, 57 miles from the seaport of Beyrout, in 33° 30' N. lat. and 36° 18' E. long. It occupies a site of singular beauty, On the eastern side of the range of Antilibanus~~

~~is a plain of vast extent, reaching far out into Arabia, and having an elevation of 2200 feet above the sea. The River Barada, the Abana of the Bible, rises in the centre of the mountain range, descends through a sublime ravine, enters the plain, flows across it eastward for 20 miles, and empties itself into a lake, which in the heat of summer becomes a morass. On the banks of the Abana, about a mile from the mouth of the ravine, stands Damascus. The river intersects the city, in a deep rapid current, averaging 50 feet wide. On its northern bank is a large and com- paratively modern suburb; but the whole of the ancient walled city, and the principal buildings, are spread over the plain on the south. The Abana is the life of Damascus, and has made it perennial. By an admirable system of channels and pipes, many of them apparently of high antiquity, its waters are not only conveyed through every quarter, but into almost every house, supplying that first requisite of Eastern life and luxury. The river is also~~

~~'extensively used for irrigation. Canals are led off from it~~

~~at different elevations above the city, and carried far and wide over the surrounding plain, converting what would otherwise be a parched desert~~

into a paradise. The orchards, gardens, vineyards, and fields of Damascus cover a circuit of at least 60 miles, and they owe their almost unrivalled beauty and luxuriance to the Abana. The area irrigated and rendered fertile by it is upwards of 300 square miles in extent, and the River Awaj, the ancient Pharpar, irrigates nearly 100 more. There was truth, therefore, in the boastful words of Naaman (2 Kings v. 12), " Are not Abana and Pharpar, rivers of Damascus, better than all the waters of Israel ?"

The view of Damascus from the crest of Antilibanus is scarcely surpassed in the world. The elevation is about 500 feet above the city, which is nearly two miles distant. The distance lends enchantment to the view ; for while the peculiar forms of Eastern architecture do not bear close inspection, they look like an Arabian poet's dream when seen from afar. Tapering minarets and swelling domes, tipped with golden crescents, rise above the white-terraced roofs ; while in some places their glittering tops appear among the green foliage of the gardens. In the centre of the city stands the Great Mosque, and near it are the gray battlements of the old castle. Away on the south the eye follows a long suburb, while below the ridge on which

-we stand is the Jferj, the Ager Damascenus of early

travellers—a green meadow extending along the river from the mouth of the ravine to the city. The gardens and orchards, which have been so long and so justly celebrated, encompass the whole city, sweeping the base of the bleak hills, like a sea of verdure, and covering an area more than 30 miles in circuit—not uniformly dense, but with open spots here and there. Beyond this circuit are large clumps of trees, dotting the plain almost to the horizon. The varied tints of the foliage greatly enhance the beauty of this picture. |

The population of Damascus is estimated at 150,000. Of these about 19,000 are Christians, 6000 Jews, and the rest Mahometans. Of the Christians 8000 belong:to the Greek or Eastern Church, and an equal number to the Catholic ; and there are besides small communities of Syrians, Maronites, Armenians, and Protestants. In the plain round Damascus, watered by the Abana and Pharpar, there are 140 villages, with an aggregate population of

50,000, of whom about 1000 are Christians, and 2000

~~Druzes.~~

~~Until the capture of the city by Ibrahim Pasha of Egypt, in 1832, no foreign consul was permitted to enter it, and no Christian or Jew was suffered to ride through the streets.~~

~~. The massacre of 1860 showed that the spirit of the people~~

~~had not changed, and was only kept in check by Turkisk~~

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~~troops.~~

~~The manufactures of the city consist principally of silks, which are exported to Egypt, Baghdad, and Persia 3 coarse woollen cloth for the abbas, or cloaks, worn by the peasants of Syria ; cotton cloths, chiefly for home use 3 gold and silver ornaments, arms, and household utensils. An exten- sive trade is carried on with the Bedouins of the Arabian desert. The bazaars are always crowded; and on Friday, the market day, it is difficult to pass through them. On the arrival of the great pilgrim caravan, in going to or returning from Mecca, the city presents a gay and animated appearance. Vast multitudes of Persians, Circassians, Anatolians, and Turks throng the streets, and each pilgrim is a merchant for the time being, buying or selling as the case may be. –~~

~~The bazaars have long been celebrated, and are among the best in the East. They are narrow covered lanes, with ranges of open stalls on each side. Each department of trade has its own quarter or section, where may be seen Manchester prints, Persian and Turkish carpets, French silks, Sheffield cutlery, amber mouth-pieces for pipes, antique China, Cashmere shawls, Mocha coffee, Dutch sugar, Damascus swords, and tobacco from Lebanon and Bagh- dad.~~

~~The khans of Damascus are spacious, and some of them splendid buildings. They are public marts where the leading merchants meet, and expose their wares for sale. The largest is Khan Asad Pasha, situated in the Bizurtyeh, or "Seed Bazaar." It was erected about 125 years ago, and bears the name~~

~~of its founder. The gate is a noble specimen of Moorish architecture. The interior is a quadrangle, with a gallery, and a domed roof supported on massive piers. Round it are ranges of small chambers, like cells, in which the goods are stored. All the khans are upon the same plan.~~

~~The private houses are the admiration of every visitor. No contrast could be greater than that between the exterior and interior ; the rough mud walls give poor promise of splendour within. The entrance is usually by a low door, and through a narrow winding passage which leads to the outer court, where the master has his reception room. From this another winding passage leads to the;harem, which is the principal part of the house. The plan of all is the same—an open court, with a tesselated pavement, and one or two marble fountains ; orange and lemon trees, flowering shrubs, and climbing plants give freshness and fragrance. All the apartments open into the court ; and on the south side is an open alcove, with a marble floor, and raised dais round three sides, covered with cushions 3 the front wall is supported by an ornamented Saracenic arch. The decoration of some of the rooms is gorgeous, the walls being covered in part with mosaics and in part with carved work, while the ceilings are rich in arabesque ornaments, elaborately gilt. A few of the modern Jewish houses have been embellished at an enormous cost, but they are want- ing in taste.~~

~~Antiquities.—Although Damascus is one of the oldest cities in the world, its antiquities do not present such a striking appearance as those of many other places of far less note. This is in some measure owing to the fact that the old materials have been largely used in the erection of modern houses, The walls which inclosed the old city are~~

~~dominion endureth throughout all~~

~~about three miles in circuit, and their foundations are probably of the age of the Seleucidw. Some of the Roman gateways are in tolerable preservation. Through the centre of the city, from the east to the west gate, ran the Via Recta, "the street called Straight," lined on each side with a double colonnade. Itis now mostly built over, but many fragments of columns remain in situ,~~

~~The castle, which stands at the north-west corner, on the bank of the river, is a quadrangle 280 yards long by 200 wide, surrounded by a moat. The exterior walls are in good preservation, but the interior is a heap of ruins. It is not easy to determine the date of its erection, or to say whether Romans, Byzantines, or Saracens contributed most to it. The foundations are not later, and may be earlier, than the Roman age. A few vaults beneath the exterior battlements are used as magazines, and contain some pieces of old armour, with bows, arrows, and other weapons.~~

~~The Great Mosque is the most important building in the city. It stands near the castle, and is now, unfortunately, so closely hemmed in with bazaars' and houses that its exterior is concealed from view. It occupies a quadrangle 163 yards long by 108 wide, facing the cardinal points. Along the north side is an open court surrounded by cloisters, resting on pillars of granite, marble, and lime- stone. The mosque itself extends along the whole southern side, and its interior dimensions are 431 feet by 125 feet. It is divided into three aisles of equal breadth, by two ranges of Corinthian columns 22 feet high, supporting round arches. In the centre is a dome resting on four massive piers. Underneath is said to be a cave in which the head of John the Baptist is 'preserved in a golden casket. The mosque has three minarets, one of which is 250 feet high, and upon it, according to Moslem tradition,~~

~~Jesus will descend on the day of judgment.~~

~~The style and workmanship of three periods are distin- guishable in the building. There are the massive founda- tions and exterior colonnades of a Greek or Roman temple. There are next the round-topped windows and ornamented doorway of an early Christian church. Over the door is an inscription in Greek to the following effect :—* Thy kingdom, O Christ, is an everlasting kingdom, and thy generations." Then there are the minarets, dome, and arcades of Saracenic origin.~~

~~Round the mosque are traces of a court, 1100 feet' long by 800 feet wide, encompassed by colonnades similar to those of the temple of Herod in Jerusalem, and the temple of the sun at Palmyra, It seems highly probable that this was the site of the temple of Rimmon, mentioned in 2 Kings v. 18, and that it became in after times the seat of the worship of Jupiter. In the~~

4th century it was con- verted into a church, and dedicated to John the Baptist ; and in the beginning of the 8th century it was seized by the Mahometans.

There are many other mosques in the city, some of them large and beautiful. Among them are the Tekiyeh, on the bank of the Abana at the western end of the city, founded by Sultan Selim, in 1516, for the accommodation of poor pilgrims, the graceful dome of which, flanked by two slender ininarets, is seen from afar, and the Senantych, in the centre of the city, distinguished by a minaret coated with green tiles, for the manufacture of which Damascus was once celebrated. It was built by Senan Pasha in 1581, and has a splendid cloistered court. There are also small and richly decorated chapels, connected with the tombs of Saladin, Bibars, and some other great princes. Among the traditional holy places of Damascus are the sanctuary of Abraham, at Burzeh, three miles north of the city ; the house of Naaman, now a leper hospital ; the scene of Paul's

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conversion, near the east gate; the house of Ananias; and the spot where the apostle was let down from the wall.

The Haj, or pilgrim caravan, is one of the great sights of Damascus. It starts for Mecca each year on the 15th of the month Shawall. The muhmil, a canopy of green silk containing the new covering sent by the sultan for the Kaabah, is carried on the back of a dromedary, and is followed by the pasha, and great dignitaries of the city, escorted by the military. The streets and house-tops along the line of the procession are crowded with people. The caravan returns after an absence of four months. It is rapidly declining in numbers and importance.

The history of Damascus reaches far back into the mists of antiquity. Josephus says the city was founded by Uz, the son of Aram; and the name of its territory, as given in the Bible, namely, Avram Damesk (2 Sam. viii. 6), is almost identical with its modern Arab name, which means 'Damascus of Syria." It was already a noted place in the days of Abraham, whose steward was " Eliezer of Damascus " (Gen. xv. 2). Some centuries later, it became, under the rule of the Hadads, the rival of Israel (1 Kings xv., xx., and xxil.).

During that period it was the scene of the romantic story of the leper Naaman (2 Kings v.). A change of dynasty took place in the time of the prophet Elisha, when Hadad was murdered by Hazael (2 Kings viii.) ; but it was soon afterwards captured by Tiglath-pileser, aud its people carried away to Assyria (2 Kings xvi. 9 ; Isa. xvii. 1-3). Colonies from Assyria were then placed in the city, and it continued for many centuries a dependency of that empire. It was taken by Alexander the Great, and after his death was attached to the kingdom of the Seleucide. In 643.c. the Romans under Pompey captured it, and under their rule it remained till 37 a.p., when Aretas, king of Arabia, taking advantage of the death of the Emperor Tiberius, seized and held it during tle time of St Paul's visit (2 Cor xi. 32 ; Acts ix.).

Christianity appears to have spread rapidly in and around Damascus, as its metropulitan, with seven of his suffragans, was present at the Council of Nice in 325 a.p. About seventy years later the great temple was converted into a Christian church. In 634 the city fell into the hands of the Mahometans; and a few years later it became for a short period the capital of the Mahometan empire. The caliphs who ruled it adorned the city with many splendid buildings, and changed the cathedral into a mosque. A stormy period of four centuries now passed over Damascus, and then an unsuccessful attempt was made to capture it by the crusaders under Baldwin. The reigns of Noureddin, and his more distinguished successor Saladin, form bright epochs in the history of the city. Two centuries later came Tamerlane. Arab writers call him "the Wild Beast," and he deserves the name. After the city had surrendered to him, and every male had paid the redemption money which he himself had assessed, he urged his soldiers to an indis- criminate massacre, Never had the city so fearfully experienced the horrors of conquest. Its wealth, its stores of antiquities, and rich fabrics were seized ; its palaces were pillaged and left in ashes ; its libraries, filled with the litera- ture of the period of the caliphs, and with the writings of the fathers of the Eastern Church, were destroyed. Tra- dition says that of the large Christian population only a single family escaped.

A century later Damascus fell into the hands of the Turks under Sultan Selim, and has since acknowledged their supremacy. In' 1832 it was taken by the Egyp- tians under Ibrahim Pasha, the celebrated general and son of

Mehemet Ali, and this conquest is chiefly remark- able for the effect it produced on the inhabitants. The city was then opened for the first time to the representatives of

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foreign powers. The British consul entered it mounted, and in full costume, escorted by Egyptian soldiers ; and the first effectual chéck was given to Moslem fanaticism. In 1841 the Egyptians were driven out by the English, and Damascus with the rest of Syria reverted to the direct sway of the Sultan.

A Protestant mission was established in Damascus in 1848, and has succeeded, chiefly by its schools and the distribution of books, in greatly advancing the cause of education in and around the city.

The only incident worthy of record since that time is the massacre of 1860. The Moslem population, taking advantage of disturbances among the Druzes in Lebanon, rose against the Christians on the afternoon of Monday the 9th of July, and on that and the two following days burned the whole Christian quarter, and massacred in cold blood about 3000 adult males. But no estimate of the numbers actually murdered can give any adequate idea of the terrible results of the massacre. 'Thousands who escaped the sword died of wounds, or famine, or subsequent privation. The Christian quarter has been mostly rebuilt, but many of the most eminent and enterprizing Christian merchants removed to Beyrout and Egypt. Yet notwithstanding the fanaticism of its people, and the misgovernment of the Turks, Damascus is progressing, Schools have been established; the streets have been cleared of rubbish, and widened ; sanitary regulations are enforced ; and the fine new road recently made by a French company over Lebanon to Beyrout has given a great impetus to trade and manufacture. (GLB

DAMASK is a technical term applied to several distinct manufactures or manufacturing operations, from the fact that such products or operations were intimately connected with Damascus when that city was a great manufacturing centre. The principal application of the term is to variegated textile manufactures; and at the present day it generally indicates a twilled linen texture richly figured in the weaving with flowers, fruits, or

ornamental scrolls, or with large designs of any description. The texture to which the name, however, was originally applied was of silk, with patterns elaborately woven in colours and sometimes in gold thread.

"China, no doubt," says Dr Rock (Catalogue of Textile Fabrics, South Kensington Musewm), *' was the first country to ornament its silken webs with a pattern. India, Persia, and Syria, then Byzan- tine Greece followed, but at long intervals between, in China's footsteps. Stuffs so figured brought with them to the West the name 'diaspron' or diaper, bestowed upon them at Constantinople. But about the twelfth century the city of Damascus, even then long celebrated for its looms, so far outstripped all other places for beauty of design, that her silken textiles were in demand every- where ; and thus, as often happens, traders fastened the name of Damasceen or Damask upon every silken fabric richly wrought and curiously designed, no matter whether it came or not from Damascus,"

Linen damasks, which are employed principally for table-cloths, napkins, and towels, are manufactured at Dunfermline, Kirkcaldy, and some other places in Fife- shire, Scotland; at Lisburn and Belfast, in Treland ; and in Holland, Belgium, and Russia. The fabric is usually woven in from four to eight leaf twills, that is with the weft intersecting the warp from every fourth up to every eighth thread ; and the pattern is produced by varying the intersections on principles which will be explained under Wzavine. Cotton damasks, in imitation of the linen manufactures, are now much woven and used for toilet covers and for similar purposes. Colours are fre- quently introduced in cotton damasks, manufactured in Glasgow and Paisley for dress purposes, and sent to the Indian and West Indian market. Silk damasks are manu- factured for curtains and for other upholstery uses in all the great silk-weaving centres.

DAM—DAM

DAMASK STEEL, or Damascus Srnet, has a peculiar watered or streaked appearance, as seen in the blades of fine swords and other weapons of Oriental manufacture, Several methods of producing the damask grain may be pursued

successfully, one of which is described under CUTLERY.

~~The art of producing damask steel has been generally~~

~~practised in Oriental countries from a remote period, the most famous blades having come from Ispahan, Khorasan,~~

~~aud Shiraz in Persia. With great brightness and ductility~~

~~the metal combines peculiar elasticity, and a capacity for taking and retaining a very fine edge.~~

~~DAMASKEENING, or DAMASCENING, is the art of incrusting wire of gold (and sometimes of silver) on the surface of iron, steel, or bronze. The surface upon which the pattern is to be traced is finely undercut with a sharp instrument, and the gold thread by hammering is forced into and securely held by the minute furrows of the cut surface. This system of ornamentation is peculiarly Oriental, having been much practised by the early gold- smiths of Damascus. It is still eminently characteristic of Persian metal work.~~

~~DAMASUS, the name of two Popes.~~

~~Damasus I. stands thirty-ninth in the roll of bishops of Rome. Every one of the first fifty-six Popes has been canon- ized; and the subject of this notice is entitled to the style of St Damasus. It is stated that he was by birth a Spaniard; but the more authentic account is that he was born at Guimaraens, in Portugal, in or about the year 304. Other writers have maintained that, though of Portuguese extraction, he was born in Rome. It seems certain that he went thither at an early age ; and, though he was forty-eight years old when deacon's orders were conferred on him, he had at an early age been admitted to the ecclesiastical career asa "reader" and secretary of the church. And he is said in that capacity to have compiled the "Acts" of the martyrs Petrus and Marcellinus. The writer in the Bio-graphie Universelle says that he succeeded St Liberius on the Papal throne, but this is anerror. On the death of St Liberius, St Felix II. succeeded him, and reigned one year and three months; and on his death Damasus was elected, in 366. When St Liberius was exiled from Rome, Damasus accompanied him to Milan. He received priest's orders, was made cardinal~~

during the pontificate of Felix II., and in 366 was elected by the Roman clergy to the Papacy in the sixty-second year of his age. He died in 384,

The most important event of his papacy was the publica- tion of the law made by the Emperor Valentinian in 370, to restrain the clergy from influencing their penitents to enrich them. This law of 370 is most important and note- worthy from having been the first of the long series of attempts to effect the same object, which, revived by Frederick II. and by Edward I. of England, have occupied the attention of the legislators of so many generations from the time of Damasus even to the present day. Valentinian ordered that ecclesiastics and monks should not frequent the houses of widows and single women. Confessors were prohibited from receiving any gift or legacy from their penitents, and all donations or bequests made in contra- vention of this law were declared to be null and void. Catholic writers represent this law as having been suggested to the emperor by the Pope. Anti-Catholic authors say that it was imposed on the Pope by the emperor ; and it is impossible to avoid feeling that the latter is by far the more probable statement. In any case the law in question furnishes a highly curious and suggestive picture of the church as it was under St Damasus. And St Jerome him- self, who had been invited to come to Rome by Damasus, and acted as his secretary, confesses that the clergy had by their conduct merited a law which placed them under

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restraints such as were not found necessary for mimes, charioteers, and comedians.!

Damasus had to go through a severe struggle for his throne with an Anti-pope named Ursinus or Urasinus. Of course the ecclesiastical writers represent the successful one of the antagonists to have been animated by the most sin- cere and heavenly-minded desires for peace and concord, But the pagan historian Ammianus, as quoted by Gibbon, as well as another authority cited by him, would go to show that the two competitors for the position of vicar of Christ were equally savage and ferocious; and that the 137 dead bodies found in the Liberian Basilica (the church of St Maria Maggiore), aftera struggle between the parties, were due to the ferocity of the orthodox Pope's adherents rather than to those of the Anti-pope.

~~Gibbon says that Damasus " had the good sense or the good fortune to engage in his service the zeal and abilities of the learned Jerome, and the grateful saint has celebrated the merit and purity of a very ambiguous character." The official ecclesiastical writers tell us nothing about the 137 dead bodies in the Liberian Basilica, but much of the sainted Pope's decisions as to the nature of the Trinity, and inquire learnedly whether or no it were he who first ordered the Hallelujah to be sung in the Roman churches at Easter, It seems more certain that it was to him that the pagan pre- fect of Rome, Praetextatus, replied, that he would become a Christian to-morrow if they would make him a bishop !~~

~~Damasus IT. was a native of Bavaria, of the name of Papon, who became bishop of Brixen in Tyrol, and was elected the 155th Pope on the death of Clement IT. in 1047, mainly by the influence of the Emperor Henry III. He reigned but twenty-three days, having died on the 8th of August at Palestrina, whither he had gone to escape the heat of Rome. The shortness of his reign, and the fact that previously to his election he was an obscure stranger, have been the causes that very little is known about him.~~

~~DAMAUN, a seaport town of Western India, in the Surat district, is a Portuguese settlement, although included within the geographical limits of the presidency of Bombay, in 20° 24' N. lat. and 72° 53'E. long. It is situated on the Damaungang4 river, which rises in the Western Ghats, about 40 miles to the eastward. The river has a bar at its mouth, with only 2 feet of water at low spring tides and 18 or 20 feet inside. Outside the bar is a roadstead in which vessels may anchor in 8 fathoms. A rampart with 10 bastions and 2 gateways surrounds the town. The surrounding country is fruitful and pleasant except in the rainy season, when it is extensively inundated. Damaun was sacked and burnt by the Portuguese in 1531. It was subsequently rebuilt, and in 1558 was taken from the Indians by the Portuguese, who converted the mosque into a Christian church. From that time it has remained in their hands. The Portuguese territory surrounding the town is about ten miles in length from north to south, and about five in breadth.~~

~~D'AMBOISH, Grorce (1460-1510), a French cardinal and minister of state, was born in the year 1460. He belonged to a noble family possessed of~~

considerable influence, and he was only fourteen when his father procured for him the bishopric of Montauban, and Louis XI. appointed him one of his almoners. On arriving at manhood D'Amboise attached himself to the party of the duke of Orleans, in whose cause he suffered imprisonment, and on whose return to the royal favour he was elevated to the archbishopric of Narbonne, which after some time he

1 Pudet dicere, sacerdotes idolorum, mimi, et aurigæ hereditates capiunt. Solis clericis ac monachis hac lege prohibetur. Et non prohibetur a persecutoribus, sed a principibus Christianis. Nec de

| lege queror, sed doleo cur meruerimus hanc a VI. — 100

changed for that of Rouen. On the appointment of the duke of Orleans as governor of Normandy, D'Amboise became his lieutenant-general ; and he has the credit of having freed the province from the bandits which infested it, and of having diminished the oppression of the nobles, who consequently (during his absence in Italy) petitioned the king against him. In 1494 the duke of Orleans mounted the throne as Louis XII.; and D'Amboise was suddenly raised to the high position of cardinal and prime minister. His administration was, in many respects, well- intentioned and useful. Having the good fortune to serve a king who was both} economic and just, he was able to diminish the imposts, to introduce order among the soldiery, to establish the Great Council for the trial of cases in which one of the parties possessed authority that overawed the ordinary courts, and otherwise to improve the execution of justice. He was also zealous for the reform of the church; and it is greatly to his credit that he did not avail himself of the extremely favourable opportunities he possessed of becoming a pluralist. He regularly spent a large income in charity, and he Jaboured strenuously to stay the progress of the plague and famine which broke out in 1504. His foreign policy was animated by two aims—to increase the French power in Italy, and to seat himself on the Papal throne; and these aims he sought to achieve by diplomacy, not by force. He, however, sympathized with, and took part in, the campaign which was commenced in 1499 for the conquest of Milan. Soon after he was made legate a latere ; and on the death of Alexander VI. he aspired to the Papacy. He had French troops at the gates

~~of Rome, by means of which he could easily have frightened the conclave, and induced them to elect him ; but he was persuaded to trust to his influence ; the troops were dismissed, and an Italian was appointed as Pius ITI. ; andagain, onthe death of Pius within themonth, another Italian, Julius IT., was chosen. In 1508 France, still under the ministry of D'Amboise, joined the League of Cambray against Venice ; and it was on his journey into Italy that he was seized at the city of Lyons with a fatal attack of gout in the stomach. He died there at the age of fifty on the 25th May 1510.~~

~~DAMIENS, Rozert Frangots (1715-1757), whoattained notoriety by his attack on Louis XV. of France in 1757, was born in a village near Arras in 1715, and early enlisted in the army. After his discharge, he became a menial in the College of the Jesuits in Paris, and was dismissed from this as well as from other employments for misconduct. Indeed his conduct was such as to earn for him the name of Robert le Diable. During the disputes of Clement XI. with the Parliament of Paris, the mind of Damiens seems to have been excited by the ecclesiastical disorganization which followed the refusal of the clergy to grant the sacra- ments to the Jansenists and Convulsionnaires; and he appears to have thought that peace would be restored by the death of the king. He, however, asserted, perhaps with truth, that he only intended to frighten the king with- out wounding him severely. In January 1757, as the king was entering his carriage, he rushed forward and stabbed him with a knife, inflicting only a slight wound. He made no attempt to escape, and was at once seized. He was condemned as a regicide, and sentenced to be torn in pieces by horses in the Place de Gréve. Before being put to death he was barbarously tortured with red-hot pincers, and molten wax, lead, and boiling oil were poured into his wounds. After his death his house was razed to the ground, his brothers and sisters were ordered to change their names, and his father, wife, and daughter were banished from France.~~

~~DAMIETTA, or, as it is called by the natives, Damzat, a town of Lower Egypt, on the great eastern branch of the~~

~~Nile, about six miles from its mouth (the ancient Ostium Phatniticum), and nearly 100 miles from Cairo, with which it is connected by rail. After the~~

metropolis and Alex- andria, Damietta is the largest town in Egypt, and contains a population of about 29,000, consisting for the most part of Egyptians, with a few Greeks and Syrians. The town, as a whole, is ill-built and straggling, and is only redeemed from meanness by the presence of some handsome mosques, bazaars, and public baths. The houses of the better classes are brick edifices situated on the water-edge, and furnished with terraces, on which the inmates enjoy the cool river- breezes of the evening. The general trade of Damietta was at one time considerable, but has in great part been absorbed by Alexandria. It has still, however, a consider- able coasting trade with Syria and the Levant, and forms the outlet for the rice and flax grown in the surrounding country. 'The lake Menzaleh yields large supplies of fish, which are dried and salted, and furnish an important article of export trade. Coffee and dates are the other articles most largely exported. Mehemet Ali established a military school in the town with accommodation for 400 pupils, as also a cotton factory and an extensive rice-mill, Damietta is a corruption of the word Zhamiatis. The original town was four miles nearer the sea than the modern city, and first rose into importance on the decay of Pelu- sium. When it passed into the hands of the Saracens it became a place of great wealth and commerce, and was therefore frequently attacked by the crusaders. The most remarkable of these sieges lasted eighteen months, from June 1218 to November 1219 ; another in 1249 was conducted in person by Louis IX. of France, who, however, was soon after taken prisoner and compelled to purchase his freedom by restoring the city to its Saracenowners. To obviate these attacks the Egyptian Sultan Bibars blocked up the Phatnitic mouth of the Nile (about 1260), razed old Damietta to the ground, and transferred the inhabitants to the site of the modern town. From this circumstance large ships can- not now sail up the Nile, and are obliged to discharge their cargoes outside the bar. The French took possession of the town in 1798, and in the following year beat the Turks in the neighbourhood; but they were expelled by the English under Sir Sydney Smith.

DAMIRI (1341-1405), sometimes spelt Domatri, or, with the Arabic article, AD-Damiri, is really an adjective of relation applied to a person or thing belonging to one of the two contiguous towns of North and South Damirah, near Damietta, in Egypt. Under this name is usually understood a well-known Arabian writer on canon law, who is at the same time the author of a

treatise on natural history, which in the East has attained considerable celebrity. HIs full name and title is Kemal ud-den Abul Bagi Muhammed Ben Musa Ben Isa ad-Damirt Ash- Skafel. HIe was born in Cairo in the year 742 of the HIegira (1341 a.p.), and died there in the year 808 (1405), Damiri's reputation, so far as the Western nations are concerned, is not based upon his work as a jurist, but wholly upon his natural history, which is entitled The Life of Animals (HIayat'ul HIaiwén). In this treatise the author gives the names of 931 beasts, birds, fishes, and insects with which he was (probably rarely by personal knowledge) acquainted, arranging these alphabetically, and giving a longer or shorter account of their nature and peculiarities, according as the data, actual or fabulous, in his possession would allow him. As might have been anticipated, he is more especially copious and minute when he comes to treat of animals like the lion and the camel ; but in all cases he defines the orthography and vocalization of the name, gives the forms of the plurals and feminines, and supplies the local or vernacular titles by which the animals were known. It is unnecessary to say that Damirt does not treat natural

history in the exact and systematic manner of the modern zoologist. Not only would that have been impossible at the time at which he lived, but he himself did not profess to be a scientific observer, and he was induced to prepare his work on natural history in consequence of the gToss ignorance of this subject which was exhibited by many of the theologians of the period. HIs exposition of the natural history of his country is essentially the result of his interest in theological and legal matters, and his wide acquaintance with the learned culture of the Arabic language, and there-fore is from a scientific point of view a mere compilation ; and at the same time his literary knowledge induced him to interrupt the scientific continuity of lis narrative by disquisitions of a totally irrelevant character. Thus, in the middle of his article on the Goose, he inserts a con- secutive sketch of the history of the Caliphate, from the death of Ali to the accession of Al-Muktafi—a period of nearly 800 years—at the end of which historical interlude he resumes his article, as if it had not been interrupted, In spite, however, of Animals has an interest of its own and a permanent value to scholars. All references in the Sunna to any particular animal are mentioned, anecdotes

~~relating to it are intro- duced, its uses in supplying articles of the materia medica are pointed out, the means to counteract its noxious qualities are indicated, the lawfulness of using its flesh as food is discussed, the proverbs which allude to it are recounted, and citations from the poets who have noticed it are quoted. The amount of discursive reading shown in the work is very great, as it contains quotations from 560 prose authors, and from the divans, or collected editions, of 199 poets. Upon the whole, therefore, the literary value of the treatise to scholars is by no means small, as it exhibits the natural history of his age and country surrounded by the associations with which the experience and literature of the Arabs had invested it,~~

~~After finishing his work on natural history, Damiri reproduced it in a compendious form, and it has thus come down to us in a large and a smaller recension. Others, moreover, (such as Al-Usyfiti) formed abridgments of it. Manuscript copies of the work exist in many public libraries, and the larger edition has been printed, in the original language, at Cairo, in 2 vols. folio, in 1278 a.n. (1861 a.p.) The European scholar who made the first and amplest use of this work was §, Bochart, in his Hierozoicon, which first appeared in 1663, .~~

~~The other works of Damifri have not obtained, even in the East, the popularity accorded to his Life of Animals. His most prominent work on legal subjects is a commentary in four volumes on the Minhdj of An-Nawawi.~~

~~Haji Chalfa, ed. Fluegel, vol. iii. p- 122; Nicoll, Biblioth. Bodlet. MSS. Orient. Cat. ; Fluegel's Arabische Hass. der K. K.2 Bibliothek ku Wien ; Wuestenfeld's Arabische Aerzte und Naturforscher, &c.~~

~~DAMIRON, Jean Puitiserr (1794-1862), a French writer on philosophy, was born at Belleville in 1794. At nineteen he entered the normal school, where he studied under Burnouf, Villemain, and Cousin. After teaching for several years in provincial towns, he came to Paris, where he lectured on philosophy in various institutions, and finally became professor in the normal school, and titular professor at the Sorbonne. In 1824 he took part with Dubois and 'Jouffroy in the establishment of the Globe ; and he was also a member of the committee of the society which took for its motto Aide-toi, le Ciel taidera. In 1833 he was appointed chevalier of the Legion of~~

~~Honour, and in 1836 member of the Academy of Moral Sciences. Damiron died at Paris on the 11th January~~

~~1862~~,

~~The chief works of Damiron, of which the best are his accounts of Yrench philosophers, are the following :—An edition of the~~

~~its deficiencies, the Life of~~

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~~Nouveaux Mélanges Philosophiques de Jouffroy (1842), with a notice of the author, in which Damiron softened and omitted several expressions used by Jouffroy, which were opposed to the system of education adopted by the Sorbonne, an article which gave rise to a bitter controversy, and to a book by Pierre Leroux, De la Mutilation des Manuscrits de M. Jouffroy (1843) ; Essai sur [histoire de la~~

~~philosophie en France au XIX. siécle (1828, 8rd ed. 1834) ; Hssaz sur~~

~~Uhistoire de la philosophieen Franceau XVII. siécle (1846) ; Mémoires a servir pour Vhistoire de la philosophie en France au XVIII. sidcle (1858-64) ; Cours de philosophic ; De la Providence (1849, 1850).~~

~~DAMMAR, or Dammer, a resin, or rather series of resins, of the copal kind, obtained from various trees in India and the islands of the Eastern Archipelago. The resin known as dammar in British commerce is the produce of a huge pine tree, Dammara orventalis, which grows in Java, Sumatra, Borneo, and other Eastern islands. It oozes in large quantities from the tree in a soft viscous state, with a highly aromatic odour, which, however, it loses as it hardens by exposure. The resin is much esteemed in Oriental communities for incense burning, Dammar is imported into England by way of Singapore ; and as found in British markets it is a hard, transparent, brittle, straw-coloured resin, destitute of odour. It igs readily soluble in ether, benzole, and chloroform, and with oil of turpentine it forms a fine transparent varnish which dries clear, smooth, and hard. The Kaurie gum, or Dammar of New Zealand, is closely allied, both in source and~~

~~properties, being produced by Dammara australis, Much of the New Zealand resin is found fossil in cir- cumstances analogous to the conditions under which the fossil copal of Zanzibar is obtained, Dammar is besides a generic Indian name for various other resins, which, how- ever, are little known in western commerce. Of these the principal are Black Dammar (the Hindustanee Kala-damar), yielded by Canarium strictum, and White Dammar, or Piney Varnish (Sufed-damar), the produce of Vateriu indica. Sal Dammar (Damar) is obtained from Shorea robusta , Hopea micrantha is the source of Rock Dammar (the Malay Dammer-batu) ; and other species yield resins which are similarly named, and differ little in physical properties,~~

~~DAMOCLES, one of the courtiers of Dionysius, tyrant of Syracuse. When he spoke in extravagant terms of the happiness of his sovereign, Dionysius is said to have placed him at a sumptuous banquet, with a naked sword suspended over his head by a single hair.~~

~~DAMON, a Pythagorean, celebrated for his disinterested affection for Pythias, or Phyntias, a member of the same sect. Condemned to death by Dionysius I. of Syracuse, Pythias begged to be set at liberty for a short time that he might arrange lis affairs. Damon pledged his life for the return of his friend ; and Pythias faithfully returned before the appointed day of execution. The tyrant, to express his admiration of their fidelity, released both the friends, and begged to be admitted to their friendship.~~

~~DAMPIER, Witt1am (c. 1652-c. 1712), an English navigator, was born at East Coker, Somersetshire, about 1652. Having early become an orphan, he was removed from the Latin school, and placed with the master of a ship at Weymouth, in which he made a voyage to New- foundland. On his return he engaged himself as a common sailor in a voyage to the East Indies. He served in 1673 in the Dutch war under Sir Edward Sprague, and was present at two engagements ; but the declining state of his health induced him to come on shore, and remove to the country, where he remained some time. In the year follow- ing he became an under-manager of a Jamaica estate, but continued only a short time in this situation. He after- wards engaged in the coasting trade, and thus acquired an accurate knowledge of all the ports and bays of the island. He made two voyages to the Bay of~~

Campeachy, and remained for some time with the logwood-cntters, as a com-

mon workman. Of this residence he published an interest- ing account in the work noted below.

Satisfied with the knowledge which he had obtained of the nature of the trade and country, he returned to Jamaica, and thence proceeded to England, where he arrived in 1678. About the beginning of the year following he went out to Jamaica as a passenger, with the intention of revisiting the Bay of Campeachy ; but he was persuaded to join a party of buccaneers, with whom he crossed the Isthmus of Darien, pent the year 1680 on the Peruvian coast, and was occa- sionally successful in plundering the towns. After serving with another privateering expedition in the Spanish Main, he engaged with a captain named Cook for a privateering voyage against the Spaniards in the South Seas. They sailed in the month of August 1683, touched at the coast of Guinea, and then proceeded round Cape Horn into the Pacific Ocean. Having fallen in with a ship from London, which had sailed on a similar expedition, they joined com- pany ; and, touching at the island of Juan Fernandez, they made the coast of South America, cruising along Chili and Peru. They took some prizes ; and with these they pro- ceeded to the Mexican coast, which they fell in with near Cape Blanco. While they lay here Captain Cook died, and the command devolved on Captain Davis. ated from the London ship, they were joined by another commanded by Captain Swan. An attempt to plunder the town of Guayaquil was unsuccessful, but at the mouth of the river they took some vessels which had about 1000 slaves on board. They next attacked a Spanish fleet which was laden with the treasure of the Peruvian mines, but were unsuccesful, being ill supported by some French ships which had joined them.

The English ships, afterwards cruising along the coast of Mexico, landed, took the town of Puebla Nova, and burnt two others. Dampier, leaving Davis, went on board Swan's ship, and proceeded with him along the northern parts of Mexico, as far as the southern part of California. During this expedition they frequently landed for the purpose of plunder ; but the

loss. of fifty of the party during one of these incursions so discouraged them that they relinquished all further attempts on these coasts. Swan then proposed to run across the Pacific Ocean, and return by the East Indies ; and, in hopes of a successful cruise off the Manillas, the crew were persuaded, with a very slender stock of provisions, to risk this long passage. They started on the 31st March 1686. On reaching Mindanao the majority mutinied, and Dampier, joining them, sailed with the ship, leaving Swan and some others on the island. After cruising some time off Manilla, and having careened their vessel at Pulo Condore, in 1687, they were driven to the Chinese coast, made the circuit of Luzon and Mindanao, passed through the group of Spice Islands, and reached the coast of Australia in the beginning of 1688.

In March they cruised along the west coast of Sumatra, ©

and touched at the Nicobar Islands, where Dampier, at his own request, and two other Englishmen, a Portuguese, and some Malays, were set on shore. Dampier's object was to establish a trade in ambergris, He and his companions contrived to navigate a canoe from Achin to Sumatra; but the fatigues and distress of the voyage proved fatal to several of them, who were carried off by fever, while Dampier himself had scarcely recovered at the end of a twelvemonth. After making several voyages to different places of the East Indies, he acted for some time as gunner to the English fort of Bencoolen. In 1691, wishing to revisit his native country, he embarked on board a ship bound for Englaud, where he arrived in September.

It appears that afterwards Dampier was engaged in the king's service. He had the command of the " Roebuck," a sloop of 12 guns and 50 men. This vessel was believed

Having separ-

DAN—DAWN

to have been fitted out for some voyage of discovery, for she had twenty months' provisions on board. He sailed from Britain in 1699, touched at the coast of Brazil, and then ran across to the coast of Australia, arriving there on lst August, somewhere about 26° lat. Proceeding northwards along the

coast, he explored the country in different places where he landed. To procure provisions he found it necessary to direct his course towards Timor ; and thence he sailed to the coast of New Guinea, where he arrived December 3. By sailing along to its easternmost extremity he discovered that it was terminated by an island, which he circumnavigated, and named New Britain.

Here it would appear from his own journal that he was prevented from prosecuting his discoveries by the small number of hismen, and their eager desiretoreturn home, In May he was again at Timor, and thence he proceeded homeward by Batavia and the Cape of Good Hope. In February 1701 he arrived off the island of Ascension, when the vessel sprung a leak and foundered; and it was with much difficulty that the crew reached the island. They remained at Ascension till they were taken away by an East Indiaman, and conveyed to England. This closes the account of Dampier's life and adventures as it is detailed by himself. It appears, however, from the preface to the third volume, that he was preparing in 1703 for another voyage. It is mentioned also in Woodes Rogers's Voyage Round the World, that Dampier had the command of a ship in the South Seas about the year 1705, along with Captain Stradling, whose vessel foundered at sea. Dampier accompanied Woodes Rogers in his voyage round the world in the years 1708-11 in the capacity of pilot. During this expedition Guayaquil was taken, and Dampier had the command of the artillery. The place and time of his death are unknown.

The works of Dampier are well known, and have been often reprinted. They consist of—A Voyage round the World, 3 vols. 8vo (1847); A Supplement to it, describing the countries of Tonquin, Malacca, de. ; Two Voyages to Campeachy ; A Discourse of Trade- winds, Seasons, Tides, dc., in the Torrid Zone (1707); and a Voyage to New Holland (1709). His observations are curious and important, and are conveyed in a plain manly style. His nautical remarks show a great deal of professional knowledge. His know:

ledge of natural history, though not scientific, appears to be accurate and worthy of trust as a record of facts.

DAN, a town of ancient Judea, near the head-waters of the Jordan, inhabited at the time of the Israelitish conquest by a peaceful and

commercial population whose name for their city was Laish, or Leshem. It appears to have been even at this early period a sacred city, and hence it was naturally chosen long after by Jeroboam as the seat of one of his golden calves. The Jewish name, which it derived from the tribe to whose lot it fell, became proverbial in the expression "from Dan to Beersheba." The town was plundered by Benhadad of Damascus, and appears from that time to have gradually declined. Its site is probably marked by the mound called Tell-el-Kady, " the hill of the judge," or " the hill of Dan."

DANA, the name of an American family of which several members have attained eminence. Richard Dana (1699-1772) was a leading barrister of Boston, and a prominent opponent of the Stamp Act. His son, Francis Dana, born in Charlestown in 1743, also began life as a barrister. In 1774 he was chosen to represent Cambridge in the first provincial congress of Massachusetts ; and in the following year he visited England, bearing letters to Dr Franklin from several of the patriot leaders. From 1776 to 1780 he was a member of the Massachusetts council ; and in 1777 and 1778 he represented Massachusetts in the National Congress. He was also one of the committee appointed to administer military affairs. In 1779 he

Was appointed secretary of legation to John Adanis, the ambassador to England; and for two years (1781-83) he was envoy to St Petersburg. He took an active part in politics till 1791, when, being appointed chief-justice of Massachusetts, he devoted himself to his judicial duties, He died at Cambridge, April 25,1811. Francis Dana was the father of Richard Henry Dana, born in 1787, the author of The Buccaneer and other Poems, and a number of essays, many of which first appeared in the Worth American Review, of which Dana was one of the founders, His son, also named Richard Henry Dana, is an authority on maritime law, and the author of the popular novel Two Years before the Mast, which is founded on personal experience, and of The Seaman's Friend, or The Seaman's Manual.

DANAE, in Greek legend, is known only in connection with her son Perseus (Jiiad, xiv. 319), and in particular from the circumstances of his birth. Her father Acrisius, king of Argos, having been warned by an oracle that his daughter would bear a sou who would put him to déath and rule in his

stead, sought to prevent this by confining Danae in an underground chamber lined with bronze like the underground treasuries still visible at Mycene. But Zeus descended to her in a shower of gold, and she gave birth to Perseus, upon which Acrisius placed her and her infant in a wooden box and consigned them to the sea. After long floating about they were picked up by Dictys, a fisherman who lived with his brother Polydectes on the small island of Seriphus. There she remained till her son had grown up and returned from his expedition of cutting off Medusa's head, when, finding his mother persecuted by Polydectes, Perseus first turned her tormentor and those with him into stone byexhibiting Medusa's head, and then set out with her for Argos. From this point she has no more part in the Greek legend. In Latin legend she goes to Italy and marries Pilumnus or Picumnus, It has been pointed out that Perseus was a solar hero, and his birth in the dark chamber has been compared with the birth of Apollo from Leto, a goddess of the darkness of night. The wooden box in which mother and son floated safely is also com- pared with the boat of Helios, and the golden rain of Zeus may be the beams of sunlight.

DANAUS, in Greek legend, was the founder of Argos and of the race of Danai, by which name the Argives are designated in Homer. A local, feature of Argos was the drought which in summer sealed its numerous small springs, and with this feature Danaus was identified as having made the first well, while his fifty daughters (Danaides), seem to represent the many springs of the district. In the lower world they had to carry water in broken vases. It was in searching for water that his daughter Amymone was pursued by a satyr and rescued by Poseidon, the god of that element, who struck out a spring for her with his trident. But while the legend of Danaus thus seems to have been of native Argive origin, he was, in accordance with the tendency at one time of tracing genealogies to Egypt, described as a son of Belus, king of Egypt, and Anchirrhoe, a daughter of the Nile, having a brother Agyptus. This brother had fifty sons, while Danaus had fifty daughters, and because the latter would not marry their cousins, they were obliged to escape from Egypt with their father Danaus. The sons of Aigyptus pursued them to Argos and besieged them there, till it was agreed by Danaus that they should marry his daughters. But to each of his daughters he gave a knife with injunctions to slay her husband on the marriage night. Except Hypermnestra they all obeyed, and it was for this

~~that they had to carry water in the lower world. Afterwards he gave them in marriage to the noblest youths of the district who could prove their claims by the greatest speed in the race course;~~

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~~DANBURY, a town of the United States, in Fairfield county, Connecticut, situated on the Still river, a tributary of the Housatonic, about 53 miles N.N.E. of New York, with which it is connected by rail. Besides the county buildings, it has two national banks, nine churches, a public library, and a high school capable of accommodating 600 pupils. There is a monument, erected in 1854 to the memory of General Wooster, who was mortally wounded in 1777, when the town was burned by the English under General Tryon, and another, of more recent date, to commemorate the other citizens who perished on the same occasion. The principal industry is the manufacture of hats, which was introduced in 1780, and is carried on by ten separate companies ; shirts are also largely produced, and sewing machines are constructed. The town, which was incorporated in 1696, had in 1870 a population of 8753. Its Indian name was Pahquioque.~~

~~DANBY, Francis (1793-1861), a painter of poetical landscape, who possesses some significance and importance in the English school, was born in the south of Ireland, November 16, 1793, His father farmed a small property he owned near Wexford, and Francis began life in the country, but the death of his father caused the family to remove to Dublin, while he was still a schoolboy, and there his bias to art very quickly developed itself, and superseded any other education, He began to practise drawing at the Royal Dublin Society's schools ; and under a Mr O'Connor; an erratic youth of his own age with national peculiarities, he began painting landscape. The capital of Ireland has never shown very much interest in the arts, but there was a youth then rising who afterwards made his mark in archeology, if not in his profession of landscape painting, George Petrie, with whom Danby formed an acquaintance; and all three left for London together in 1813, This expedition, undertaken with very inadequate funds, and no aid, quickly came to an end, and they had to get home again by walking all the way. At Bristol they made a pause, and Danby finding he could get trifling sums for water-colour drawings, remained there working diligently and sending to~~

the London exhibitions pictures of importance. There his large pictures in oil quickly attracted attention. They were very powerful in effect and imaginative in invention; and, had his Upas Tree and the Delivery of the Israelites from Egypt been produced before a greater man, Johu Martin, had shown the way to express multitude, vastness, and fabulous wonders in architecture, Danby would be properly con- sidered one of the great men in modern painting. The Upas Tree (1820), his most independent and original picture, is, however, a very noble work, not only in invention but in execution ; the poison tree, surrounded by the remains of slaves who have been sent to gather its gum, grows alone in a valley of rocks lit by a ghastly moonlight, which is itself a triumph of art. The Delivery of the Israelites (1825) is much more strictly a derivation from Martin. 'The Royal Academy, however, elected him into their body on the strength of it, thinking by his means to checkmate that master, who did not aspire to Academie honours. He now left Bristol for London, and in 1828 exhibited his Opening of the Sixth Seal at the British Institution, receiving from that body an honorary premium of 200 guineas; and this picture, which was admirably painted, was followed by two others from the Apocalypse, both productions of surprising {power, though certainly indebted to the works of a similar species of inven- tion appearing a few years earlier. 'These were the last of his important and large pictures. He suddenly left London, declaring that he would never live there again, and that the Acadeniy, instead of aiding him, had, somehow or other, used him badly. Some insurmountable domestic

difficulty overtook him also, and for eleven or twelve years he lived on the Lake of Geneva, a Bohemian with boat-building fancies, painting only now and then. He returned to England in 1841, when his sons James and Thomas, who have both followed the art with considerable advantage, were growing up. The only additional pictures it is necessary to mention are the Golden Age, and the Even- ing Gun, the first begun before he left England, the secoud painted after his return, when he had taken up his abode at Exmouth, where he died February 9, 1861, in his sixty- eighth year. His Upas Tree is nowinthe South Kensington National Collection by the Townshend bequest; and is held in general respect, but such of his other works as have been lately seen have not maintained his reputation, They

have the hot tone and opacity of bronze, and reveal the secret that they have been produced in a darkened studio, and irrespective of the facts and even of the sentiment of living nature. Notwithstanding these drawbacks they must be always interesting from their imaginative motives, and undoubtedly play a noticeable part in the history of English landscape art.

DANCE, The term dancing in its widest sense iucludes three things :—(1) the spontaneous activity of the muscles under the influence of some strong emotion, such as social joy or religious exultation; (2) definite combinations of graceful movements performed for the sake of the pleasure which the exercise affords to the dancer or to the spectator ; (3) carefully trained movements which are meant by the dancer vividly to represent the actions and passions of other people. In the highest sense it seems to be for prose-gesture what song is for the instinctive exclamations of feeling. Pantomime in the emphatic form of dancing scarcely exists in this century, but it has had an important history. Regarded as the outlet or expression of strong feeling, dancing does not require much discussion, for the general rule applies that such demonstrations for a time at least sustain and do not exhaust the flow of feeling. The voice aud the facial muscles and many of the organs are affected at the samie time, and the result is a high state of vitality which among the spinning Dervishes or in the ecstatic worship of Bacchus and Cybele amounted to something like madness. Even here there is traceable an undulatory movement which, as Mr Spencer says, is "habitually generated by feeling in its bodily discharge." But it is only in the advanced or volitional stage of dancing that we find developed the essential feature of measure, which has been said to consist in "the alter-nation of stronger muscular contractions with weaker ones," an alternation which, except in the cases of savages and children, "is compounded with longer rises and falls in the degree of muscular excitement." In analyz- ing the state of mind which this measured dancing pro- duces, we must first of all allow for the pleasant glow of excitement caused by the excess of blocd sent to the brain. But apart from this, there is an agreeable sense of uniformity in the succession of muscular efforts, and in the spaces described, and also in the period of their recurrence. If the steps of dancing and the intervals of time be not precisely equal, there is still a pleasure depending on the gradually increasing intensity of motion, on the undulation which uniformly rises in order to fall, As Florizel says to

Perdita, ‘“‘ When you do dance, I wish you a wave of the sea” (Winter’s Tale, iv. 3). The mind feels the beauty of emphasis and cadence in muscular motion, just as much as in musical notes. Then, the figure of the dance is fre- quently a circle or some more graceful curve or series of curves;—a fact which satisfies the dancer as well as the eye of the spectator. the use of music, which not only brings a perfectly distinct set of pleasurable sensations to dancer and spectator, but

But all such effects are intensified by |.

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by the control of dancing produces an inexpressibly sweet harmony of sound and motion, This harniony is further enriched if there be two dancing together on one plan, or a large company of dancers executing certain evolutions, the success of which depends on the separate harmonies of all the couples. The fundamental condition is that through- out the dance all the dancers keep within their bases of gravity. This is not only required for the dancers’ own enjoyment, but, as in the famous Mercury on tiptoe, it is essential to the beautiful effect for the spectator. The idea of much being safely supported by little is what proves attractive in the modern posturing ballet. But tlis is merely one condition of graceful dancing, and if it be made the chief object, the dancer sinks into the acrobat. These psychological principles have still to be applied to the phenomena presented by the dances of different nations, (See Read’s Characteristic National Dances, 1853).

We shall first consider the varieties of dance which without any apparent minietic object seem to be suggested by the mere pleasure of movement felt by the performer or by the spectator. In Tigré the Abyssinians dance the chass¢e step in a circle, and keep time by shrugging their shoulders and working their elbows backwards and forwards. At intervals the dancers squat on the ground, still moving the arms and shoulders in the same way. The Bushmen dance in their low-roofed rooms supporting themselves by sticks ; one foot remains motionless, the other dances in a wild irregular manner, while the hands are occupied with the sticks, The Gonds, a hill-tribe of Hindustan, dance generally in pairs, with a shuffling step, the eyes on the ground, the arms close to the body, and the elbows at an angle with the closed hand. Advancing to a point, the dancer suddenly erects his head,

~~*and wheels round to the starting pcint. The women of the Pultooah tribe dance in a circle, moving backwards and forwards in a bent posture. The Santal women, again, are slow and graceful in dance ; joining hands, they form themselves into the are of a circle, towards the centre of which they advance and then retire, moving at the same time slightly towards the right, so as to complete the circle in an hour. The Kukis of Assam have only the rudest possible step, an awkward hop with the knees very much bent. The national dance of the Kamchadale is one of the most violent known, every muscle apparently quivering at every moment. But there, and in some other cases where men and women dance together, there is a trace of deliberate obscenity ; the dance is, in fact, a rude representation of sexual passion. It has been said that some of the Tasmanian corrobories have a phallic design. The Yucatan dance of nazal may also be mentioned. The Andamans hop on one foot and swing the arms violently backwards aud forwards. The Veddahs jump with both feet together, patting their bodies, or clap- ping their hands, and make a point of bringing their long hair down in front of the face. In New Caledonia the dance consists of a series of twistings of the body, the feet being lifted alternately, but without change of place. The Fijians jump half round from side to side with their arms akimbo. The only modulation of the Samoan dance is one of time—a crescendo movement, which is well-known in the modern ball-room. The Javans are perhaps unique in their distinct and graceful gestures of the hand and fingers, At a Mexican feast called Huitzilopochtli, the noblemen and women danced tied together at the hands, and embracing one another, the arms being thrown over the neck. This resembles the dance variously known as the Greek Bracelet or Brawl, "Oppos, or Bearsfeet ; but all of them! probably are to a certain extent symbolical of the relations between*~~

- ~~*Compare the Chica of South America, the Fandango of Spain, and the Angrismene or la Fachée of modern Greece. See alse*~~

~~*| Romaunt de la Rose, v. 776,*~~

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~~*DANCE*~~

the sexes. Actual contact of quite intelligible as matter of pure dancing; for, apart altogether from the pleasure of the embrace, the harmony of the double rotation adds In a very old Peruvian dance of ceremony before the Inca,

and the whole body moving steps at a time as they approached the throne. In this, as in the national dance of the Coles of Lower Bengal, there was perhaps a suggestion of "union fait hy force." In Yucatan stilts were occasionally used for dancing.

It seldom happens that dancing takes place without accompaniment, either by the dancer or by others. This is not merely because the feelings which find relief in dancing express themselves at the same time in other forms ; in Some cases, indeed, the vocal and instrumental elements largely predominate, and form the ground-work of the whole emotional demonstration, Whether they do so or not will of course depend on the intellectual advancement of the nation or tribe, and upon the particular development of their zsthetical sensibility. A striking instance occurs among the Zulus, whose grand dances are merely the acconipaniment to the colloquial war and hunting songs, in which the women put questions which are answered by the men. So also in Tahiti there is a get of national ballads and songs, referring to many events in the past and present lives of the people. The fisherman, the woodsman, the canoe-builder, has each his trade song, which on public occasions at least is illustrated by dancing. But the accompaniment is often consciously intended, by an appeal to the ear, to regulate and sustain the excitement of the muscles. And a close relation will be found always to exist between the excellence of a nation's dancing and the excellence or complexity of its music and poetry. In some cases the performer himself sings or marks time by the clanking of ornaments on his person. In others the accompaniment consists sometimes of a rude chant impro- vised by those standing round, or of music from instru- ments, or of mere clapping of the hands, or of striking one stick against another or on the ground, or of "marking time," in the technical sense. The Tasmanians beat on a rolled up kangaroo-skin. The Kamchadales make a noise like a continuous hiccough all through the dance. The Andamans use a large hollow dancing-board, on which one man is set apart to stamp. Sometimes it is the privilege of the tribal chief to sing the accompaniment while his

people dance. The savages of New Caledonia whistle and strike upon the hip. '

The rude imitative dances of early civilization are of extreme interest. In the same way, the dances of the Ostyak tribes (Northern Asiatic) imitate the habitual sports of the chase and the gambols of the wolf and the bear and other wild beasts, the dancing consisting mainly of sudden leaps and violent turns which exhaust the muscular powers of the whole body. The Kamchadales, too, in dancing, imitate bears, dogs, and birds. The Kru dances of the Coast Negroes represent hunting scenes ; and on the Congo, before the hunters start, they go through a dance imitating the habits of the gorilla and its movements when attacked. The Damara dance is a mimic representation of the move- ments of oxen and sheep, four men stooping with their heads in contact, and uttering harsh cries. The canter of the baboon is the humorous part of the ceremony. The Bushmen dance in long irregular jumps, which they com- pare to the leaping of a herd of calves, and the Hottentots not; only go on all-fours to counterfeit the baboon, but they have a dance in which the buzzing of a swarm of bees is represented. The Kennowits in Borneo introduce the mias and the deer for the same purpose. The Austra-

lians and Tasmanians in their dances called corrobories imi- tate the frog and the kangaroo (both leaping animals), The hunt of the emu isalso performed, a number of men passing slowly round the fire and throwing their arrows about so as to imitate the movements of the animal's head while feeding. The Gonds are fond of dancing the bison hunt, one man with skin and horns taking the part of the animal, Closely allied to these are the mimic fights, almost universal among tribes to which war is one of the great interests of life. The Bravery Dance of the Dahomans and the Hoolee of the Bhil tribe in the Vindhya Hills are illustrations. The latter seems to have been reduced to an amusement conducted by professionals who go from village to village,— the battle being engaged in by women with long poles on the one side, and men with short cudgels on the other. There is here au element of comedy, which also appears in the Fiji club-dance, This, although no doubt originally suggested by war, is enlivened by the presence

of a clown covered with leaves and wearing amask. The monotonous song accompanying the club-dance is by way of commentary or explanation. So also, in Guatemala there is a public baile or dance, in which all the performers, wearing the skins and heads of beasts, go through a mock battle, which always ends in the victory of those wearing the deer's head. At the end the victors trace in the sand with a pole the figure of some animal ; and this exhibition is Supposed to have some historical reference, But nearly all savage tribes have a regular war-dance, in which they appear in fighting costume, handle their Weapons, and go through the movements of challenge, conflict, pursuit or defeat. The women generally supply the stimulus of music, There is one very picturesque dance of the Natal Kaffirs, which probably refers to the departure of the warriors for the battle. The women appeal plaintively to the men, who slowly withdraw, stamping on the ground and darting their short spears or assegais towards the sky. In Madagascar, when the men are absent on war, the women dance for a great part of the day, believing that this inspires their husbands with courage. In this, however, there may be some religious significance. These war- dances are totally distinct from the institution of military drill, which belongs to a later period, when social life has become less impulsive and more reflective! There can be little doubt that some of the characteristic movements of these primitive hunting and war-dances survive in the smooth and ceremonious dances of the present day. But the early mimetic 'dance was not confined to these two subjects ; it embraced the'other great events of savage life-~ the drama of courtship and marriage, the funeral dance, the consecration of labour, the celebration of harvest or vintage; sometimes, too, purely fictitious scenes of dramatic interest, while other dances degenerated into games. For instance, in Yucatan one man danced in a cowering attitude round a circle, while another followed, hurling at him bohordos or canes, which were adroitly caught on a small stick, Again, in Tasmania, the dances of the women describe their " clamber for the opossum, diving for shell- fish, digging for roots, nursing children, and quarrelling with husbands." Another dance, in which a woman by gesture taunts a chieftain with cowardice, gives him an opportunity of coming forward and recounting his cour- ageous deeds in dance. The funeral dance of the Todas (another Indian hill tribe), consists in walking backwards and forwards, without variation, to a howling tune of "ha ! hoo!" The meaning of this is obscure, but it can

1 The Greek xapzela represented the surprize by robbers of a warrior ploughing a field. The gymnopedic dances imitated the sterner sports of the paleestra.

- The Greek Lenaia and Dionysia had a distinct reference to the seasons.

scarcely be solely an outburst of grief. In Dahomey the blacksmiths, carpenters, hunters, braves, and bards, with their various tools and instruments, join in a dramatic dance. We may add here a form of dance which is almost precisely equivalent to the spoken incantation. It is used by the professional devil-dancer of the wild Veddahs for the cure of diseases. An offering of eatables is put on a tripod of sticks, and the dancer, decorated with green leaves, goes into a paroxysm of dancing, in the midst of which he receives the required information. This, how- ever, rather belongs to the subject of religious dances.

It is impossible here to enumerate either the names or the forms of 'the sacred dances which formed so prominent a part of the worship of antiquity. A mystic philosophy found in'them a resemblance to the courses of the stars. This Pythagorean idea was expanded by Sir Jobn Davies, in his epic poem Orchestra, published in 1596. They were probably adapted to many purposes,—to thanks- giving, praise, supplication, and humiliation. It is only one striking illustration of this wide-spread practice, that there was at Rome a very ancient order of priests especially named Salii, who struck their shields and sang assamenta as they danced, The practice re-appeared in the early church, special provision being made for dancing in the choir. Scaliger, who astonished Charles V. by his dancing powers, says the bishops were called Preswles, because they led the dance on feast days. According to some of the fathers, the angels are always dancing, and the glorious company of apostles is really a chorus of dancers. Dancing, however, fell into discredit with the feast of the Agape. St Augus- tine says, "' Melius est fodere quam saltare;" and the practice was generally prohibited for some time. No church or sect has raged so fiercely against the cardinal sin of dancing as the Albigenses of Languedoc and the Waldenses, who agreed in calling it the devil's procession. After the middle

~~of the 18th century, there were still traces of religious dancing in the cathedrals of Spain, Portugal, and Roussillon,—especially in the Mussarabian Mass of Toledo. An account of the numerous secular dances, public and private, of Greece and Rome will be found in the classical histories, and in Mr Weaver's Essay towards a History of Dancing, London, 1712, which, however, must be revised by more recent authorities. The Pyrrhic (derived from the Memphitic) in all its local varieties, the Bacchanalia, and the Hymenza were among the more important. The name of Lycurgus is also associated with the Trichoria. Among the stage dances of the Athenians, which formed interludes to the regular drama, one of the oldest was the Delian dance of the Labyrinth, ascribed to Theseus, and called Tépavos, from its resemblance to the flight of cranes, and one of the most powerful was the dance of the Eumenides. A farther development of the art took place at Rome, under Augustus, when Pylades and Bathyllus brought serious and comic pantomime to great perfection. The subjects chosen were such as the labour of Hercules, and the surprise of Venus aud Mars by Vulcan. The state of public feeling on the subject is well shown in Lucian's amusing dialogue De Saltatione. Before this Rome had only very inferior buffoons, who attended dinner parties, and whose art traditions belonged not to Greece,' but to Etruria! Apparently, however, the Romans, though fond of ceremony and of the theatre, were by temperament not great dancers in private. Cicero says, "' Nemo fere saltat sobrius, nisi forte insanit." But the Italic Dance of the imperial theatre, supported by music and splendid dresses, supplanted for a time the older dramas. It was the policy of Augustus to cultivate other than political interests for the people ; and he passed laws for the protection and~~

~~; ? The Pantomimus was an outgrowth from the canticum or choral singing of the older comedies and fabule Atellane.~~

~~DANCe~~

~~privilege of the pantomimists. They were freed from the jus virgarum, and they used their freedom against the peace of the city. Tiberius and Domitian oppressed and banished them; Trajan and Aurelius gave them such titles as decurions and priests of Apollo; but the pantomime stage soon yielded to the general corruption of the empire,~~

The modern ballet seems to have been first produced on a considerable scale in 1480, at Tortona, before Duke Galeazzo of Milan. It soon became a common amusement on great occasions at the European courts. The ordinary length was five acts, each containing several entrées, and each entrée containing several quadrilles. The accessories of painting, sculpture, and movable scenery were employed, and the representation often took place at night, The allegorical, moral, and ludicrous ballets were introduced to France by Baif in the time of Catherine de' Medici. Balthasar of Beaujeu appears also as a director of court ballets, in which amusement the royal families of France continued for long to take an active part. The complex nature of these exhibitions may be gathered from the title of one played at Turin in 1634—La verita nemica della apparenza, sollevata dal tempo. Of the ludicrous, one of the best known was the Venetian ballet of La verita raminga. Now and then, however, a high political aim may be discovered, as in the " Prosperity of the Arms of France," danced before Richelieu in 1641, or " Religion uniting Great Britain to the rest of the World," danced at London on the marriage of Princess Elizabeth to the Elector Frederick. Outside the theatre, the Portuguese revived an ambulatory ballet which was played on the canonization of Carlo Borromeo, and to which they gave the name of the Tyrrhenic Pomp. During this time also the ceremonial ball (with all its elaborate detail of cowrante, minuet, and saraband) was cultivated. The fathers of the church assembled at Trent gave a ball in which they took a part. Masked balls, too, resembling in some respects the Roman Saturnalia, became common towards the end of the 17th century. In France a ball was sometimes diversified by a masquerade, carried on by a limited number, of persons in character-costume. Two of the most famous were named "au Sauvage" and " des Sorciers." In 1715 the regent of France started a system of public balls in the opera- house, which did not succeed. Dancing, also, formed a leading element in the Opéra Francais introduced by Quinault. His subjects were chiefly marvellous, drawn from the classical mythologies ; and the choral dancing was not merely divertissement, but was intended to assist and enrich the dramatic action of the whole piece. The ideas of military evolution and of magic incantation reappear. Although Lully wrote the music, and the representation was supported by splendid decoration and mechanical effects, the success of this new "tragedy " was short-lived, and since then the modern ballet has never been more than a lyrical interlude.

~~In this humbler function, however, it was greatly improved by La Mottc, whose plece DP Hurope Galante (1697) is a sparkling and elegant production. The lyrical ballet draws much from Fairyland and Arcadia, The possibility of theatrical dance has been strenuously main- tained by M. de Cahusac in his La Danse, Ancienne et Moderne, 3 vols., 1754; by M. de Noverre in his Lettres sur les Arts Imitateurs ; and by Diderot in the Hneyclopédie Méthodique, 1786. It was illustrated by the performance of Pygmalion by Malle. Sallé in London (1732).?~~

~~Among the antiquities of this subject chorography, or orchesography, the art of dancing notation, deserves a place. The idea is as old as 1598; but about 1700 M. Feuillet published a complicated system, which was twice translated Tp Rm~~

~~2 Among the last demi-caractére ballets may be mentioned the Fille mal gardée of Dauberval ; among the anacreontic, the Dansomanve of Gardel.~~

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~~into English at the beginning of the 18th century by Mr Weaver and Mr Essex. A separate sign was used for each position, bend, rising, step, leap, cabriole, falling, slide, turn, and cadeuce ; and the track of the dance was repre- sented by curved lines, These were sometimes printed along with the music. Such diagrams as still exist are interesting enough as visible history of extinct dances ; but as a practical aid in teaching or composing dances chorography was entirely thrown aside as too cunibrous by Noverre, and by Sir John Gallini, the proprietor of the ancient concert rooms in Hanover Square, who wrote on this subject in 1726. The difficulty of the process may be seen by applying it to so comparatively simple a dance as the Scotch reel, which contains no less than 10 single steps—the ceum-siubhaile (forward step), the ceum-coisiche (footing step), the leum-trasd (cross-spring,—French, sissonne), the siabadh-trasd (chasing step), the aiseag-trasd (cross-passes), the fosgladh (open step), the cuartag (turn- ing step), and others. As may be seen from the technical language of dancing (assemblée, jetée, chassée, glissade, contre-danse, contre-temps, coupé, entrechat, bourrée, gaillarde, fleuret, &c.) it has undoubtedly been brought to greatest perfection in France. But space does not permit us to explain the steps or to describe the picturesque forms of dance which are still practised~~

~~in town and country, One sentence in conclusion upon dancing or musical gymnastics as an important branch of physical education. Long ago Locke pointed out (Zducation, secs. 67 , 196) that the effects of dancing are not confined to the body ; it gives to children, he says, not mere outward gracefulness of motion, but manly thoughts and a becoming confidence. Only lately, however, has the advantage been recognized of making gymnastics attractive by connecting it with what Homer calls "' the sweetest and most perfect of human en- joyments." The practical principle against heavy weights and intense monotonous exertion of particular muscles is thus stated by Mr Smiles (Physical Education, p. 148) :— " The greatest benefit is derived from that exercise which calls into action the greatest number of muscles, and in which the action of these is intermitted at the shortest in- tervals." It required only one further step to see how, if light and changing movements were desirable, music would prove a powerful stimulus to gymnastics. It touches the play-impulse, and substitutes a spontaneous flow of energy for the mechanical effort of the will. The force of imitation or contagion, one of the most valuable forces in education, is also much increased by the state of exhilaration into which dancing puts the system. This idea was embodied by Froebel in his Kindergarten plan, and has been developed by Jahn and Schreber in Germany, by Dio Lewis in the United States, and by Ling (the author of the Swedish Cure Movement) in Sweden. It is of course not merely on esthetic grounds (though these are sufficient) that musical gymnastics, as distinguished from the process of manufacturing a shell of muscle, are invaluable, They are, according to the testimony of all competent persons, indispensable to complete development and general health.**

~~For the old division of the 47s Gymnastica into palestrica and sal- tatoria, and of the latter into cubistica, sphecristica, and orchestica, see the learned work of Hieronymus Mercurialis, De arte Gymnastica, Amsterdam, 1572. Cubistic was the art of throwing somersaults, and is described minutely by Tuccaro in his T'rots Dialogues, Paris, 1599. Spheristic included several complex games at ball and tilting—the Greek kdépuxos, and the Roman trigonalis and paganica. Orchestic, divided by Plutarch into Jatio, Jigura, and indicatio, was really imitative dancing, the "silent poetry" of Simonides. The importance of the Xetpovoula or hand-movement is indicated by Ovid :—" Si vox est, canta ; si mollia brachia, salta."" For~~

further information as to modern dancing, see Rameau's Le Mattre a Danser, 1726, and Querlon's Le Triomphe des Graces, 1774. In the earlier part of this article considerable use has been made of the " Hsthetic Products" of Mr Herbert Spencer's Sociological Tables.

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DANCE, the name of a family group important in English art, at least in architecture, during the latter half of the last century.

GEORGE Dancg, SENIOR, the father of the two others, was born early in the century, at a time when neither Gothic nor classic architecture was properly studied in Eng- land, the former being looked upon simply as a barbarism, and the latter known only through the Italian. On his return from the continent, after a short period of study, he obtained the appointment of architect to the city of London, and immediately had a chance of distinction by building the Mansion-house. This was in 1739, and his plans gave great satisfaction. It was followed by the churches of St Botolpb, Aldgate, and St Leonard, Shoreditch, and by other city works of some importance. He continued to practise till his death, January 11, 1768, at which time the former excise offices, Broad Street, were approaching completion, and his son George was installed in his place, both his sons being already in considerable repute. Of these the eldest was

NatwaniEt Dance, bornin 17 34, wholeft his father's office and was placed under Hayman, the genre-historical painter. Here he showed great quickness, but principally in portraits, and after a few years he left that painter and went abroad. His residence in Italy, which was prolonged for many years, brought him in contact with Angelica Kauffmann, among whose devoted admirers he long remained, at first following her about in all her changes of abode, travelling as she did under the protection of her loving old father. From Italy he sent home historical pictures occasionally, of the quasi- classic sort,—Dido and Aineas in 17 63, for example. These he continued to produce all through his career,—Paris and Helen (1771), Orpheus lamenting Eurydice (1774), Death of Mark Antony (1776),—all of which have long ago utterly disappeared. He was settled in London in 17 68, as his name appears among the founders of the Royal Academy, and must have been in the country some time, as he exhibits two full-length

portraits of George III. and the queen in the first exhibition of that body. These are now existing at Up Park, Sussex; and in the Greenwich Hospital picture gallery is a portrait of Captain Cook by him. Many of his pictures are known in family collections throughout the country, and some of his works, now lost sight of, are known by engravings. At the age of fifty-six, when he had himself made a large fortune, he married a widow possessing a jointure of £15,000 a year, entirely dropt his profession, and became a member of Parliament, representing East Grinstead. He even changed his name, and when made a baronet in 1800 he appeared as Sir N. D. Holland. He now lived at Carnborough House, near Winchester, his only practice in art being occasional landscapes in the manner of the day ; and at that place he died suddenly on the 15th October 1811, leaving a private fortune of £200,000. His brother,

GEORGE DaNncz, JUNIOR, by far the ablest of the three, was born in 1740, and remained his father's pupil, succeed- ing him as city surveyor and architect in 1768. At that time the office, then as now somewhat lucrative, was purchasable, and it was in that way he acquired the appoint- ment. Hewas then onlytwenty-eight, and had spent several years abroad, most of the time with his brother in Italy, yet he had already distinguished himself by designs for public works, particularly that for Blackfriars Bridge. He was associated with his brother in the foundation of the Royal Academy, and, living till 1825, he was for a number of years the last survivor of the original members, Knowing every one connected with art in London for a long period, he must have outlived a great many changes in taste, and seen many novelties pass away in all the divisions of art. In his own sphere the revolution from

his father's style tothe study of Gothic by the elder Pugin and others, following the period of Stuart and Revett, showed a wonderful development, especially in the preciseknowledge of ornamental details. In sculpture, the passage from Carlini to Flaxman was even more rapid, and in painting he must have known all the important professors from Hogarth to Wilkie. That he was much interested in all these changes is proved by the series of portraits of his friends, principally artists, he drew from the life, which are now preserved in the library of the Academy. Seventy- two of these, engraved in imitation of chalk, were published in 1808-14, and form a very interesting collection. In his own profession his time was mainly occupied by his duties as city architect, and his principal works are such as came to him in that way. Of these, the prison of Newgate, rebuilt in 1770, a building unique in design, is the most conspicuous and able. The front of Guildhall is also his. He died January 14, 1825, and was buried in St Paul's.

DANCOURT, Fiorent Carton (1661-1725), French dramatist and actor, was born at Fontainebleau on the 1st November 1661. He belonged to a family of rank, and his parents intrusted his education to Father De la Rue, a Jesuit, who made earnest but fruitless efforts to induce him to join the order. Preserving his freedom he studied law, became an advocate, and engaged for a short time in the practice of his profession. HIs marriage to the daughter of the celebrated comedian La Thorillicre led him to adopt the career of an actor, and in 1685, in spite of the strong opposition of his family, he appeared on the stage of the ThéAtre Francais. HIs power of facial expression, vivacity

of manner, and fluency of utterance gave him immediate

and marked success, both with the public and with his fellow actors. The latter chose him for their spokesman on occasions of state, and in this capacity he frequently appeared before Louis XIV., who treated him with great favour. Asa dramatic author Dancourt was exceedingly prolific, and as an almost necessary consequence somewhat unequal. HIs first play, Le Wotazre obligeant, produced in 1685, was so well received as to lead its author speedily to repeat the experiment. La Désolation des Jouenses

(1686) was still more successful; and Le Chevalier a la Mode (1687) is generally regarded as his best work, though his claim to original authorship in this and some other cases has been disputed. These were followed by others in constant succession till 1718, when he terminated his career both as an actor and as-an author. Retiring toa chateau at Courcelles le Roi, in Berry, he employed himself in making a poetical translation of the psalms and in writing a sacred tragedy. He died on the 6th December 1725, and was buried in a tomb he had caused to be con-structed during his lifetime in the chapel of his chateau. The plays of Dancourt are true in the main to nature. The characters have a vraisemblance tliat has led to his being styled the Teniers of comedy. He is most success- ful in his delineation of low life, and especially of the peasantry. The dialogue is sparkling, witty, and natural. Many of the incidents of his plots were derived from actual occurrences in the " fast" and scandalous life of the period, and several of his characters were drawn from well-known personages of the day. Most of the plays incline to the type of farce rather than of pure comedy.

The complete works of Dancourt were published in 1760 (12 vols. 12mo). An edition of his Guwvres Choisies in 5 vols. appeared in 1810.

DANDELION (Taraxacum Dens Leonis), a perennial herb belonging to the sub-order Crchoracee, of the natural order Composite. The plant has a wide range, being found in Europe, Central Asia, North America, and the Arctic regions. The leaves are smooth, of a bright shining green,

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sessile, and tapering downwards. The name dandelion is derived from the French dent-delion, an appellation given on account of the tooth-like lobes of the leaves. The long tap-root has a simple or many-headed rhizome ; it is black externally, and is very difficult of extirpation. The flower-stalks are smooth, brittle, leafless, hollow, and very numerous. The flowers bloom from April till August, and remain open from 5 or 6 in the morning to 8 or 9 at night. The flower-heads are of a golden yellow, and 14 inches in width ; the florets are strap-shaped, and longer than the phyllaries. The achenes

are olive or dull yellow in colour, and are each surmounted by a long beak ; on this rests a pappus of white and delicate hairs, which occasions the ready dispersal of the seed by the wind. The globes formed by the plumed seeds are nearly 2 inches in diameter, The involucre consists of an outer spreading (or reflexed) and an inner and erect row of bracts. In all parts of the

plant a milky juice is contained, the principle of which, taraxacin, has diuretic properties. On exposure to the air the juice coagulates, deposits caoutchouc, and turns of a violet-brown colour. The leaves are bitter, but when blanched are sometimes eaten asa salad ; they serve as food for silkworms when mulberry leaves are not to be had. The root is roasted as a substitute for coffee, and its infusion, decoction, and extract are employed medicinally as a tonic and aperient, especially in disorders of the digestive organs and liver. Several varieties of the dandelion are recognized by botanists, in the commonest of which the leaves are broad and runcinate, and the outer bracts of the involucre have a downward flexure. The variety 7'. palustre, which affects boggy situations, and flowers in late summer and autumn, has nearly entire leaves, and the outer bracts of its involucre are erect. DANDOLO is the name of one of the most illustrious patrician families of Venice. But the first doge of the name, Enrico Dandolo, who ruled the republic from 1192 tv 1205, occupies the largest space in history of any of the name. IIe is the "blind old Dandolo" of Byron, whose passing mention of the well-nigh forgotten hero, in Childe ITarold, has rendered the old name familiar to a larger

number of ears than it ever was, even in the day when the — prowess of the octogenarian doge changed the face of Europe. Enrico Dandolo was born of a family already illustrious, which had ruled in Gallipoli, Andros, Riva, and — other places in Greece ; and his uncle was patriarch of Grado. The story goes that he lost his sight from having been subjected by Manuel, the emperor of Constantinople, to whom he had been sent by Venice as ambassador, to the ancient punishment of "abbasination,"—to adopt a foreign word for a thing which, happily, is nameless in our language. This torture consisted in compelling the victim | to gaze into a polished metal basin, which concentrated the rays of the sun till the excess of light destroyed the eye. Some of the Venetian historians, however, deny this story,

‘and represent his blinduess as having resulted from a wound received in fight. When he-was elected doge, at the | age of seventy-two, Venice was involved ina war with Pisa, which he brought in two naval battles to a successful con- i clusion. But the events which have made his name a marked one in history occurred yet nearer to the end of his long career. In 1201 the chivalry of Christendom was -about to embark in the 4th crusade, —by some historians reckoned the 5th, —and a request was made to Venice to give the crusaders passage, and furnish them with vessels for transport. Dandolo received the messengers who came with those demands favourably. There is reason to think that the Venetian was not moved by any great degree of crusading enthusiasm ; but Zara had thrown off the yoke

of Venice ; and, as Venetian writers add, the old doge had not forgiven the infamous treatment he had received at the

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hands of the Greeks. There does not, however, seem to be any necessity for supposing that any persoual considera-

tions of such a kind were needed to impel him to a policy |

which was doubtless animated by far larger and wider views. The old doge made a hard bargain with the emissaries of the crusaders for the use of the galleys of the republic ; and when, at the moment of departure, it turned out, as he had expected, that they had not money enough to pay the stipulated price, he insisted that, in lieu of it, the expedition should first reduce Zara, Dandolo himself, on this being with some difficulty agreed to, took the cross and assumed the command of the fleet. Zara was besieged, taken, pillaged, and restored to the domain of the republic, The expedition then proceeded to the greater enterprize of attacking Constantinople, in which, led by Dandolo, it was equally successful. But it was not till the young Emperor Alexis had been murdered in a revolt of the Greeks of Constantinople that Dandolo opened to the crusading ex- pedition a proposal that they should sieze on the city and on the Greek empire. The counsel was accepted, with a success due in a great measure to the conduct and valour of the blind octogenarian doge. Constantinople was pillaged, and booty to an incredible amount was divided among the Venetians and the

French! Dandolo might have been crowned enmiperor instead of Baldwin of Flanders. Whether he declined in accordance with his own judgment, or whether Venice would not permit a citizen of hers to become an emperor, is uncertain. At all events the old doge showed himself once again as good at a bargain as at a fight. He obtained for Venice a very full share of the plunder, both of dominions and of movable property, as well as of useful privileges exacted, with as hrewd and far-seeing eye, to future advantages. Among the booty secured for Venice

were the celebrated four horses, now once more, after their |

journey to Paris, on the west front of the church of St Mark. Enrico Dandolo, first doge of the name, died in 1205, one year after the establishment of the Latin empire at Constantinople. (See Gibbon, Decline and Fall, ch. 60).

The eldest son of this Extrico, Fantino, was patriarch of Constantinople; and the second, Rainieri, was pro- curatore di St Marco. He was killed in Candia in 1213, Giberto, known in Veuetian history as successful in naval warfare against the Genoese in 1260, was the son of Rainieri, and his son Giovanui, elected doge in 1280, ruled the republic till 1289, and was the father of that Andrea Dandolo of whom it is related, that having been unsuccess- ful in a naval fight against the Genoese, and being prisoner on board one of the enemy's galleys, he kuocked his brains out by beating his head against the mast.

The Dandolo family' gave two other doges to the republic. Francisco was elected in 1318, and died in 1339, and is known in history as Dandolo " Cane," " Dog Dandolo," not from having humiliated himself before Clement V., when imploring the pontiff to become recon- ciled to Venice, as Sismondi writes in the Liographie Unaverselle, but from " Cane" having been an old family name. Andrea Dandolo was elected doge in 1342 at the exceptionally youthful age of thirty-six, and ruled the republic till 1354. This Andrea was a student and a man of letters, and an intimate friend of Petrarch, some of whose letters to him are extant. He wrote two chronicles of Venice, one of which was published in the 12th volume of the Rerum Italicarum Scriptores of Muratori, while the other is extant in MS. He is

said to have died of a broken heart, caused by the successes of Paganino Doria and the Genoese fleet in the Adriatic.

1 The account of the taking of the city given by Ville Hardouin, who was one of the crusaders, is a very one-sided narrative. A more correct notion of the terrible details may be obtained by comparing the Frenchman's account with that of Nicetas Acominatus, the Greek historian,

DANDOLO, Vrxcewzo, Count (1758-1819), an Italian scientist, was born at Venice in 1758, of good family, though not vf the same house as the doges above noticed, and commenced life as a physician in his native city. He was @ prominent opponent of the oligarchical party in the revolution which took place on the approach of N apoleon ; and he was one of the envoys sent to seek the protection of the French, When the request was refused, and Venice was placed under Austria, he removed to Milan, where he was made member of the great council, In 1799, on the invasion of~ the Russians and the overthrow of the Cisalpine republic, Dandolo retired to Paris, where, in the same year, he published his treatise Les Hommes nouveaux, ou moyen Vopérer une régénération nouvelle. But he goon after returned to the neighbourhood of Milan, to devote himself to scientific agriculture. In 1805 N apoleon made him governor of Dalmatia, with the title of provéditeur général, in which position Dandolo distinguished himself by his efforts to remove the wretchedness and idleness of the people, and to improve the country by draining the pestilential marshes and introducing better. methods of agriculture. When, in 1809, Dalmatia was re-annexed to the Illyrian provinces, Dandolo returned to Venice, having received as his reward from the French emperor the title of count and several other distinctions. He died in his native city on the 13th December 1819.

Dandolo published in Italian several treatises on agriculture, Vine-cultivation, and the rearing of cattle and sheep; a work on silk-worms, which was trauslated into French by Fontanelle; a work on the discoveries in chemistry which were made in the last

quarter of the 18th century (published 1796); and translations of several of the best French works on chemistry. ;

~~DANIEL, wecording to the book which bears his name, was a Jew carried captive in the reign of Jehoiakim to~~

~~'Babylon, where, by his preternatural wisdom, and as the~~

~~reward of his fidelity to his religion, he attained the highest rank in the state, and the presidency of the wise men of Babylon.~~

~~DANIEL, Boox or, The controversy as to the origin and significance of this book has passed through so many phases, and the collateral arguments are so apt to obscure those on which the question really hinges, that a simpler mode of treatment than is customary in theological works seems to be here desirable. Instead of beginning with the second part of Daniel (vii.—xii.), which professes to contain circumstantial predictions, and is consequently difficult to treat without some reference to "burning questions" of theology, we shall first survey the narrative-portion (i.-vi.) from an historical point of view, and inquire how far the names, ideas, customs, and historical allusions in it agree with the facts known to us from other sources. Our chief guide will be a critical study of the cuneiform inscriptions.~~

~~(1.) As to the names, The writer of Daniel evidently supposes that Belteshazzar is compounded with the name of Bel, or Merodach, the favourite god of Nebuchadnezzar (see iv. 8). It appears, however, that the word has no connection with Bel, and it is most probably a corruption of Balatsu-usur, "his life protect." Ashpenaz, Shadrach, and Meshach are quite out of keeping with Babylonian scenery ; they cannot be explained at all. Arioch, on the other hand, may be from the primitive Accadian name Ert- aki (Lenormant), though the revival of such a name is rather surprizing. Hamelsar (i. 11) may perhaps be a corrupt form of a Babylonian name, as Abed-nego (from Abed-nebo) certainly is. The form Nebuchadnezzar, for Nebuchadrezzar, is not peculiar to Daniel, and can hardly be used in argument. (2.) Traces of Babylonian ideas have been most industriously sought for by Mr Fuller, but they are too uncertain to be of any appreciable value. Who can believe that that fine appellation, "the Ancient of days" (vii. 22), is derived from the eternally self-begotten Hea (the~~

god of the waters), when there is so obvious a source for the phrase in-the second part of Isaiah, or that " like a son of the gods" (iii, 25) means, "like the divine fire-god Bar ?" supposed: 'discovery of a reference to Nebuchadnezzar's equally supposed recognition of one supreme deity. The fact is that the greater gods of Babylonia at this period were two in number, viz., Maruduk (Merodach) and Nabu (Nebo), who are coupled, for instance, by Nebuchadnezzar in the great inscription translated by M. Oppert. (3.) There are in Daniel' tliree undoubted points of agreement with Babylonian custom, viz., the purishment of burning alive (iii. 6), the description of the dress of the courtiers (iii. 21), and the mention of the presence of women at feasts (v. 2). On the other hand, there is (a) a striking inaccuracy in the use of the term " Chaldeans" for "astrologers." This use is directly opposed by the cuneiform inscriptions, and it is useless (in the face of Hebrew etymology) to meet this fact by an imaginary correspondence of the three names for the wise men in the book of Daniel to the three leading classes of magicians, &c., mentioned in the inscriptions. (b) There is also (as M. Lenormant has observed) an error in the use of the Assyrian saknu (reproduced in the Aramaic of ii. 48), which really means "a high civil officer," but is used in Daniel in the sense of arch-magician. (4.) The points of disagreement between the book of Daniel and Babylonian history have probably been exaggerated. It is true the former tells us many strange things of .Nebuchadnezzar, who is only known in history as a great warrior, a great builder, and a great patron of learning. HIs lycanthropy is not mentioned in any historical documents as yet dis- covered ; to quote Berosus (ap. Josephus, contr. Ap. i. 20) is entirely beside the mark, as Hilgenfeld and Mr Fuller have convincingly shown. The statements respecting Belshazzar have been in part confirmed. Bilu-sarra-usur is the name of the eldest son of Nabu-nahid or Nabonadius, and a dated tablet in the British Museum, recently obtained from Babylon, proves that the last king of Babylon was Maruduk-sarra-usur, which may be the same name as Belshazzar, since Maruduk is identical with Bel-Merodach. Jt must be confessed, however, that Belshazzar was not the son of Nebuchadnezzar, as appears to be stated in Dan. v. 2,11, 18, 22. This has been met by the assertion that "son" in Dan. v. means " grandson;" but that Belshazzar was even the grandson of Nebuchadnezzar is still unproved, not to mention the strangeness of interpreting " thy father" in v. 11 as=" my father" (on the hypothesis that Belshazzar's mother was daughter of Nebuchadnezzar).

~~The most puzzling discrepancy, however, relates to the name of the Medo-Persian king, who " received " from God's hands the " distributed " Babylonian empire (v. 28, 31). The book of Daniel states (v. 31) that this was Darius the Mede ; profane history asserts that it was Cyrus the Persian. Many attempts have been made to reconcile these opposing statements. Some think that Darius the Mede was Astyages, but there is a chronological difficulty ; others, Cyaxares IL, but we are not certain that such a king existed ; while Des Vignoles and-M. Lenormant would make him a Median prince, rewarded by Cyrus for his fidelity with tlie vassal kingship of Babylon. Unfortu- nately this Median prince is at present even more shadowy than Cyaxares II. " The inscriptions," remarks Mr G. Sinith, "have as yet afforded no information on this point." But this is not the only difficulty about Darius the Mede. In ix. 1 we are told that he was the son of Ahasuerus, who on philological*grounds must be identified with Xerxes. This, when taken in conjunction with the facts concerning Belteshazzar, suggests that the author or editor fell into three errors, by supposing (1) that the con- queror of Babylon was not Cyrus but Darius I. ; (2) that~~

~~Nor is-M. Lenormant much more fortunate in his |~~

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~~Darius I. came after, instead of before, Xerxes ; and (3) that he was son, whereas he was really father, of that monarch. There are two " undesigned coincidences," to be men- tioned presently, which appear to confirm this view.~~

~~Thus far the evidence preponderates against the theory that the narratives in the book of Daniel—or, to be quite safe, let us say the narratives in their present form—were written by a resident in Babylon. Two other historical inaccuracies ought not to be slurred over, though they are certainly unfavourable to the authorship of Daniel. One is the chronological statement in i 1. It may fairly be urged (a) that, if the battle of Carchemish took place in the fourth year of Jehoiakim (Jer. xlvi. 2), Jerusalem cannot have been captured in the third; and (0) that our one certainly contemporary authority, the prophet Jeremiah, nowhere alludes to a captivity at this period. The other is the statement (vi. 1) that Darius the Mede appointed 120 satraps (so in the Hebrew), whereas Darius Hystaspis~~

~~only mentions 23 satrapies (Records of the Past, vii. 88). A similar apparent confusion between satrapies and inferior governments appears in the Alexandrine translation of 1 Kings x. 15. This translation was made in the Greek period ; presumably, therefore, the book of Daniel was written (or edited) in the Greek period. This, it should be added, is one of the " undesigned coincidences " which con- firm a view mentioned above respecting " Darius the Mede."~~

~~We now go on to a class of arguments, which, even more obstinately than those based upon history, refuse to lend themselves to theological prepossession. From the Hebrew of the book of Daniel no important in- ference as to its date can 'safely be drawn. It is true, Aramaisms abound, but this feature is common to all the later books of the Old Testament. Nor, in spite of the assertions of controversial writers on both sides, can any argument be based on the fact (strange as it' seems) that the book of Daniel is written in two languages or dialects, i. 1-il. 4a and viii.—xil. being in Hebrew, and ii. 46—vii. 28 in Aramaic (miscalled Chaldee). The philological data (which will be found collected in Dr Pusey's Daniel the Prophet, pp. Ixvii. 44-57) have been most variously interpreted. Hitzig inferred that the Aramaic of Daniel was later than that of Ezra; Hengstenberg, Dr Pusey, and especially: the late Professor McGill, that Ezra's was later than Daniel's. But the truth seems to be that the evidence is insufficient to determine the question. The Massorites aimed at making the language of the Old Testament (Aramaic as well as Hebrew) uniform, though they didnot carry out their plan thoroughly, and allowed not a few vestiges of older stages of the language to remain. It is impossible therefore to decide ex cathedra that the later forms in Daniel or Ezra have not arisen from this levelling procedure of the Jéwish critics. A similar controversy has arisen as to the relation of the Aramaic of the Old Testament to that of the Targums, Dr Pusey and others maintain that they are separated by a wide interval of time ; but recent researches have shown that the official Targum, or Aramaic translation, of the Pentateuch, the earlier historical books, and the prophets, was thrown into its present form at Babylon on the basis of a work composed in Palestine. Now the Aramaic of Babylon was different from that of Palestine ; still, on the whole, as Noéldeke rightly says, the Aramaic of the official Targum is only a rather later development of the Aramaic of Daniel and Ezra, which is therefore presumably Palestinian. It~~

~~does not, however, follow that the whole book was written in Palestine. The correct translation of Dan. ii. 4 seems to be—" And the Chaldeans spoke unto the king (Aramaic);" 7e., that which follows from this point to the end of chap. vii. is extracted from an Aramaic document. Now, considering the careless treatment~~

~~extended to the book of Daniel (see the Septuagint version of it), it is quite possible, as M. Lenormant suggests, that the original Hebrew of Dan. ii. 4—vii, 28 was lost, and its place supplied by the Aramaic translation. There is an exact parallel (not mentioned by M. Lenormant) in Jer. x. 11, which appears only to exist in an Aramaic version, The remaining linguistic evidence is supplied by éertain Persian and Greek words in the book of Daniel. This will retain its importance, even if we adopt M. Lenormant's theory of a substituted Aramaic translation, for a translator writing in a kindred dialect, would be tolerably precise in reproducing technical terms, —at any rate, would not succeed in expunging all traces of the original. ~ (1) The book contains (see Mr Fuller's second excursus) at least nine words which are referred, in most cases with certainty, toa Persian origin. It must be remembered that~~

~~no Persian words occur in Daniel's supposed contemporary—|~~

~~Ezekiel, nor even in Haggai, Zechariah, and Malachi. There are some, it is true, in Ezra and in Esther, but those books were written long after the beginning of the Persian rule. (2) The three Greek words in Daniel admitted by Delitzsch are all names of musica] instruments—xéOapis, Wartyproy, cvppwvia. The reproduction is (philologically) so exact that they must have been taken from the lips of a Greek, and this, according to M. Lenormant's presentation of the facts, was impossible before the age of the Seleucid, since the commercial intercourse between (reece and Babylonia was not "considerable nor consecutive enough " to admit of it at an earlier period. The third class of facts to be reckoned with are the in- ternal difficulties in the admission of the authorship of Daniel. Putting aside those which raise questions of the- ology, we may mention the two following as specimens :—(a) In ii. 25 Arioch speaks of Daniel as merely ' one of the captives of Judah," and as personally unknown to the king. This seems inconsistent~~

with chap. i, and conse quently unlikely to have been written by Daniel. (b) No subsequent mention is made of the offices to which Daniel and his three friends, according to ii. 48, were promoted, not even in the narrative in chap. iii. The former of these seems the more important. An exact parallel occurs in 1 Sam. xvii. 55-6, where Saul professes himself entirely un-acquainted with David, and this after the latter had been constantly playing the harp before him (chap. xvi. 23). Now, critics of such opposite opinions as Thenius and Nagelsbach agree that the solution of the difficulty in 1 Sam. is the reference of the respective passages to different documents. It has been urged, therefore, that the same theory will at once account for the inconsistencies in Daniel, and that the narratives at any rate were most likely written at different times, possibly by different authors, and certainly not by Daniel himself (as Mr Russell Martineau has cogently shown). These various narratives would natu- rally be connected by an editor, and to this editor we may be indebted for the second of the " undesigned coincidences " referred to above as confirming the supposition of a mistake as to the date and the acts of Darius the Mede ; for the name of Cyrus only occurs in three passages L 21; vie28; = 1), and may have been inserted by the editor (who knew that Cyrus, not Darius, conquered Babylon) with the object of bringing the book into some- what closer accordance with profane history. It is gratify- ing to state that the fundamental principle of this theory has been conceded by such orthodox writers as Mr Fuller and M. Lenormant. "In its present form," says the former, "the book possesses peculiarities of an internal character which seem to suggest a certain extraneous aid perfectly compatible with the recognition of its unity and authority" (Speaker's Commentary, vi, 229). M. Lenormant's view has already been mentioned; we need

only add that he puts down all the errors of the narrative. chapters in Daniel to the copyists or translators, and that .

he finds a truthfulness of Babylonian colouring piercing through the injuries of time, which can omly be accounted for by ascribing the original work to the prophet Daniel, Colder and more critical students will naturally go further.

They will not perhaps deny the unity of authorship. ~· The . Inconsistencies of the narratives are at most a proof of their

Separate origin; and the 12th chapter of Enoch (an

apocalyptic work like Daniel) supplies a parallel which has'

been hitherto overlooked to the transition from the third person to the first in Dan. vii. 1; 28. There is, further, a

gerteral similarity of style between the Hebrew and the'

Aramaic portions, and (especially) a marked parallelism of contents between chaps. vii. and ii., which is not favourable toa diversity of authorship, But there isa growing feeling that the narratives in the book before us could not have been the work of a resident in Babylon. There may, it is allo wed, be an element of historical tradition in them ; but, if so, we have not at present the means of detecting it. The narratives, however, have quite sufficient merit regarded from the point of view of edification. If we only place ourselves in the position of the later J ews, we shall perhaps faintly realize the stirring effect they must have produced. We shall then no longer be surprized at the improbability of many of the details, which has given rise to so much unnecessary ridicule. Admiration will be our only feeling, when we consider the author's comparative success in reproducing a distant past. It is possible, no doubt, that he derived some part of these narratives from Jewish or Babylonian popular stories, for we finda Daniel already celebrated for his wisdom in Ezekiel (xxviii. 3, of. xiv. 14, 20), and the Babylonian Abydenus has a legend distantly resembling Dan. iv. But even if we admit this conjecture, the historical setting, the moral purpose, and the skill in presentation are all his own, and reflect dimly as it may be the spirit and the power of the writers of the Pentateuchal histories.

We may now proceed to the next stage in the argument, and inquire which is the earliest period to which the narratives of Daniel can apply? The third chapter of the book suggests an answer. There (see ver, 5) we meet with a Greek musical instrument called symphonia (probably a kind of bag-pipe ; A. V., wrongly "dulcimer"), which, as we learn from Polybius (Athen., x. 52), was a special favourite of Antiochus Epiphanes, king of. Syria, the

notorious persecutor of the Jews. If, therefore, the period of this king (175-164 3.c.) suits the remainder of the work, the -clue to the book of Daniel has been found, One reserve must, however, be made. If any historical evidence should be forthcoming in favour of M. Lenormant's view stated above,—if, in a word, an earlier recension of the book of Daniel should be discovered, —it will become necessary to revise or abandon the foregoing argument.

The difficulty of the second part of Daniel (vii.—xii.) ig greatly increased by the necessity of making some assump- tions with a view to its interpretation. Those of one class of critics are based upon a tradition, reaching back as far as the Christian era (see Josephus, Antig., x. 11, 7), that the statements of the book of Daniel are literally true ; those of another class upon the theory, resulting from the study of the undisputed prophecies on the one hand and of the apocalyptic literature on the other, that the prominence of minute circumstantial prediction, and the absence of a moral, hortatory element, are the distinguishing marks of an artificial, apocalyptic imitation of prophecy. (See Apocatypric Lrrerature.) The latter class of critics hold that the " analogy of prophecy " is an exegetical argument equal in importance to that of the " analogy of faith" indogmatics. The ouly attempt to mediate between

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the two positions is that of Zickler, who, while believing that the book as a whole is the work of Daniel, is of opinion that the most circumstantial passage (xi. 5-39) has been in some parts interpolated by a contemporary of Antiochus Epiphanes. theory as to the narrative-chapters held by M. Lenormant. The second part of Daniel is occupied with a series of visions and angelic communications, chiefly descriptive of the stages:through which the empire of the world had passed, or was about to pass, between Nebuchadnezzar and the latter days. Of these visions, the last (x.-xil.) is the most important. In the form of prediction, the angel who discourses with Daniel communicates the history of the kingdoms to which Palestine was attached from the time of Cyrus to that of Antiochus Epiphanes. This is followed by a description of the deliverance and glorification of the Israelites in the Messianic period (using the word in a wide sense), which is

here represented as immediately supervening on the Syrian persecution, The second vision (chap. viii.) has an equally clear reference to Antiochus Epiphanes (the "little hom"). What the writer can have meant by "2300 evening-mornings" is confessedly most obscure ; and the statement that the 'shameless king" (Antiochus, ver. 23) should fall by a sudden divine interposition (ver. 25, cf. Job xxxiv. 20) is one of those inconsistencies with pro- fane history which mark the second as well as the first part of Daniel. To the second " beast" of the second vision corresponds, by its description, the fourth beast of the first (chap. vii.) ; consequently both signify the Greek empire of Alexander and his successors. This is now becoming the prevalent view ; itis that of Delitzsch and Dr Westcott, no less than of Ewald and Bleek, but is opposed by the "traditional " theory still upheld by Dr Pusey, which makes the fourth empire that of Rome. Of the dream of the image in chap. ii., the interpretation of which depends on that of chap. vil., our limits preclude us from speaking. The 9th chapter is as instructive as it is difficult. At the very outset it suggests a very late origin for the book by the way in which the prophets are looked back upon (ver. 6, 10); and the minute study of the works of the prophets described in ver. 2 seems to many to point to a time when prophetic inspiration had ceased, and the prophetic writ- ings (here called "the books") were already collected. Meditating, like one of the later scribes; over the letter of Scripture, Daniel (or the writer who assumed his name) came to the conclusion that the seventy years appointed by Jeremiah for "the desolations of Jerusalem " must have meant seventy weeks of years, @.e., 490 years. The point from which and to which these "weeks" are to be reckoned is, however, keenly debated. Hengstenberg, following most of the fathers, takes the terminus a quo to be the 20th year of Artaxerxes (445 B.c.), and the terminus ad quem the public appearance of Christ. Dr Pusey prefers for the one the return of Ezra to Jerusalem, in 457 B.c., and for the other the martyrdom of St Stephen, 33 4.D. Dr Kuenen reckons the seventy weeks from the date of Jeremiah's prediction of the rebuilding of Jerusalem (604 B.c.) to the murder of the high priest Onias HT. (170 B.C.). It is true that this does not produce exactly the required number of years, but we ought not, contends Dr Kuenen, to assume that the author was a perfect master of chronology. We need not, however, dwell further on this " perplexed subject," as it is more than probable that the Hebrew text is unsound. Our view of the second part of the book must be determined by the distinct, not by the obscure, passages. These show that

~~the real centre of the thoughts of the author is Antiochus Epiphanes, and exoner- ate those critics from the charge of wilfulness, who suppose the book to have been written in the reign of that king. For why, these critics ask, should one of the Jewish exiles~~

~~He thus unintentionally supplements the |~~

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~~at Babylon single out the episode of Antiochus in prefer- ence to the far more important crisis of the struggle with Rome? And how is it that the revelation of future events ceases to be in accordance with history precisely when we come to the passage (xi. 40-45) which relates to the closing years of the Syrian king ?~~

~~It would be unjust, however, to writers of the school of Dr Kuenen to slur over the fact that they can offer plausible historical proofs, unconnected with exegesis, which appear to favour a late date for the book of Daniel. Just as in reviewing the first part of the book we found philolo- gical evidence of a post-Babylonian origin, so in the second part there are (according to this school) references to beliefs confessedly post-Babylonian. The doctrine of angels in Daniel is developed to a degree which, it is said, implies a long continuance of Persian influences. In Zechariah we see this doctrine in a less advanced stage. Even the "accuser" angel in Zechariah is still an appellative ("the Satan "), whereas the book of Daniel not only contains a full system of " first princes" or angels, to whom the government of the world is intrusted, but gives names to two of them (Michael and Gabriel), which, as Dr Kohut has shown, correspond to those of the two Persian archangels, Vohumané and Graosh6. The book of Daniel, too, contains the first distinct prediction of a resurrection of the dead (See Cheyne's Book of Isaiah Chronologically Arranged, p. 130, par. 5), and the researches of Windisch- mann, Haug, and Spiegel appear to have shown that this is a genuine Zoroastrian doctrine, traces of it being found in the earliest portions of the Avesta. Now, it is both natural and right to look with suspicion on theories of the importation of foreign ideas among the Old Testament writers, for experience shows that they will rarely stand a critical examination. Still the evidence for a Persian origin (or share in the origin) of the doctrine of the resurrection is so strong as to unite the suffrages of**

~~the most opposite writers. Mr Fuller, itis true, has tried to make Babylonian influences equally plansible in the development of this doctrine. But his authority, M. Lenormant, candidly admits that the Babylonian literature only contains the " first germ " of the doctrine which in Daniel has attained an advanced degree of development (Za Ifagie chez les Chaldéens, pp. 155-6),~~

~~We have thus endeavoured to give the leading facts on which the criticism and interpretation of this most interest- ing book depend. In the present phase of the controversy, two positions only would appear to be philologically tenable. One is that so confidently maintained by M. Lenormant, the eminent Assyriologue, for the first part, and to some extent by Dr Zéckler for the second part, which consists in assuming that the original book of Daniel has been interpolated by later hands. The other, that the work is still mainly in the form in which it was written, that its date is in the Maccabean period, and that, as in the case of Deuteronomy (according to most critics) in earlier times, and the apocalyptic writings which preceded and followed the rise of Christianity, the author, in the service of truth, assumed a name which would more than his own command the respect of hiscountrymen. 'Such a writer," thought the late Professor Weir, " however much we may disapprove his procedure, yet, regarding him in the light of his age, we cannot so unhesitatingly condemn, It was not unnatural that the cessation of the voices of the old prophets should have been followed by what may be described as echoes waked up frora time to time, and chiefly at critical periods of the national history, in the breasts of sympathizing and enthusiastic disciples " (Academy, vol. 1. p. 70). From this point of view, we may perhaps say that the book of Daniel is in part an attempted echo of Jeremiah (see Dan. ix. 2).~~

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~~Still if we accept this as the more natural alternative, we must not suppose that every detail in the narratives of the first part was planned with reference to the Syrian persecution,—Nebuchadnezzar is not a mere double of Antiochus. There is a parallelism, it is true, between the circumstances of the persecuted Jews and the pious friends at Babylon, but it must not be pressed too far. Nor need We suppose thatthe book was circulated at once~~

as a whole or among all classes of the Jews. The two parts of the work are separable, and the former part displays perhaps

too much antiquarian research to be perfectly suitable for

general circulation. The " wise men, " who formerly sat "in the gate," had withdrawn since the time of the Captivity to the student's chamber; and in the author of Daniel we behold the prototype of the scholar-wartyrs and confessors of the Christian church.

Among the more important modern works on Daniel are Hitzig, Das Buch Daniel, 1850 ; Delitzsch, article " Daniel" in Herzoy's Real-Eneyclopidie, Bd. iii. 1855 ; Hilgenfeld, Die jiidische Apoka- lyptik, 1857 ; Ziindel, Kritische Untersuchungen, &c., 1861; Pusey, Daniel the Prophet, 2nd ed., 1868; Perowne, review of Pusey, in Contemporary Review, vol. i. ; R. Martineau, " Daniel," in Theo- logical Review, 1865 ; Zockler, ' Der Prophet Daniel," in Lange's Bibelwerk, 1870; Lenormant, La divination, &c., chez les Chal. déens, (pp. 169-227), 1875 ; Fuller, "'Commentary on Daniel " in Speaker's Commentary, vol. vi., 1876 ; Kuenen, Zhe Prophets and Prophecy in Israel, 1877. (Tm C.)

DANIEL, Gapriet (1649-1728), a Freuch Jesuit historian, was born at Rouen in 1649. He was educated by the Jesuits, entered the order at the age of eighteen, and became superior at Paris. He is best known by his Z/is-toure de France depuis Vétablissement de la Monarchie Fran- ¢aise, which appeared first in 1713, and has since been pub- lished in 1758 and in 1755-60, the last edition with notes by P. Griffet. Daniel published an abridgment in 1728 ; and another abridgment was published by Dorival in 1751. Though full of prejudices, which affect his accuracy, Daniel had the advantage of consulting valuable original sources, and his book has been praised by such authorities as Henri Martin and Thierry. Daniel also wrote a by no means successful reply to Pascal's Provincial Letters, entitled Entretiens de Cléanthe et d'Eudoxe sur les Lettres Provinct- ales sa Histoire de la Milice francaise depuis Vétablissement de la monarchie francaise jusqu'd la fin de la réegne de Louis le Grand (1721) ; two treatises on the Cartesian theory as to the intelligence of the lower animals, and other works.

~~DANIEL, Samvuet (1562-1619), an English poet and historian, was the son of a niusic-master, and was born near Taunton, in Somersetshire, in 1562. In 1579 he was admitted a commoner of Magdalen College, Oxford, where he remained for about three years, and then gave himself up to the unrestrained study of poetry and philo- sophy. He succeeded in being appointed tutor to Anne Clifford, daughter of the earl of N orthumberland, and thus commenced a life of not ignoble dependence on several of the great houses of that day. He was first encouraged and, if we may believe him, taught in verse, by the famous couutess of Pembroke, whose honour he was uever weary of proclaiming. His first known work, a translation of Paulus~~

~~Jovius, to which some original matter is appended, was |~~

~~printed in 1585, His first known volume of verse is dated 1592; it contains the cycle of sonnets to Delia and the romance called Zhe Complaint of Rosamond. It has been plausibly conjectured that an earlier edition of the latter at one time existed ; if so, it seems to be lost beyond allhope. Several editions of the sonnets appeared in 1592, and they were very frequently reprinted during Daniel's lifetime. We learn by internal evidence that Delia lived~~

~~on the banks of Shakespeare's river, the Avon, and that the |~~

~~sonnets to her were inspired by her memory when the poet was in Italy. To an edition of Delia and Rosamond, in~~

~~1594, was added the tragedy of Cleopatra, a severe study |~~

~~| one of the first writers of the time.~~

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~~in the manner of the ancients, in alternately rhyming heroic verse, diversified by stiff choral interludes. The First Four Books of the Civil Wars, an historical poem in ottava rime, appeared in 1595. The bibliography of Daniel's works is attended with great difficulty, but as far as is known it was not until 1599 that there was published a volume entitled~~

Poetical Essays, which contained, besides the "Civil Wars," "Musophilus," and "A letter from Octavia to Marcus Antonius," poems in Daniel's finest and most mature manner, On the death of Spenser, in the same year, Daniel received the somewhat vague office of poet-laureate, which he seems, however, to have shortly resigned in favour of Ben Jonson. In 1601 he published his Epistles to Great Personages in verse. Whether it was on this occasion is not known, but about this time, and at the recommendation of his brother-in-law John F lorio, he was taken into favour at court, and published, in 1602, a Panegyric offered to the King at Burleigh Harrington in Lutlandshire, written in ottava rima, @ second edition of which, in 1603, contained an elegant prose essay called A Defence of Rime, as against the classic measures proposed by Webbe and Gosson. In 1603, moreover, Daniel was appointed Master of the Queen's Revels, In this capacity he brought out a series of masques and pastoral tragi- comedies,~—of which were printed A Vision of the Twelve Goddesses, in 1604; The Queen's Arcadia, in 1606; and Hymen's Triumph, in 1615. Meanwhile had appeared, in 1605, Certain short poems, with the tragedy of Philotas, which latter was a study in the same style as Cleopatra. In 1604 the Ciwl Wars had been completed in eight books. In 1612 Daniel published a prose Zistory of England, from the earliest times down to the end of the reign of Edward III. This work was afterwards continued, and published towards the close of Daniel's life, without a date. He was made a gentleman-extraordinary and groom of the chamber to Queen Anne, sinecure offices which offered no hindrance to an active literary career. He was now acknowledged as Shakespeare, Selden, and Chapman are named among the few intimates who were permitted to intrude upon the seclusion of a garden-

house in Old street, St Luke's, where, Fuller tells us, he

would "lie hid for some months together, the more retiredly to enjoy the compauy of the Muses, and then would appear in public to couverse with his friends." Late in life Daniel threw up his titular posts at court and retired to a farm-house, which he rented at Beckington, in his native county of Somerset, where he died on the 14th of October 1619. The poetical writings of Daniel are very numerous, and, in spite of the eulogies of all the best critics, they have never yet been collected or reprinted, This is the more

singular since, during the last century, when so little Elizabethan literature was read, Daniel retained his poetical prestige. In later times Coleridge, Charles Lamb, and others have expended some of their most genial criticisms on this poet. Of his multifarious works the sonnets are now, perhaps, most read. As second in date to none but

| Sidney's, they possess a special interest ; they mark the

first legalization of the great error of our sonneteers, in closing with a couplet, but they have a grace and tender- ness all their own. Of a higher order is Zhe Complaint of Rosamond, a soliloquy in which the ghost of the murdered woman appears and bewails her fate in stanzas of exquisite pathos. Among the Lpistles to Distinguished Persons will be found some of Daniel's noblest stanzas and most polished verse. The epistle to the countess of Bedford is

remarkable among those as being composed in genuine

terza rima, till then not used in English. Daniel was particularly fond of a four-lined stanza of solemn alternately rhyming iambics, a form of verse distinctly misplaced in his dramas. These, inspired it would seem by like

attempts of the countess of Pembroke's, are hard and frigid ; his pastorals are far more pleasing ; and //ymen's Triumph is perhaps the best of all his dramatic writing. In elegiac verse he always excelled, but most of all in his touch- ing address Zo the Angel Spirit of the Most Huxcellent Sir Philip Sidney. We must not neglect to-quote Musophilus among the most characteristic writings of Daniel. It is a general defence of learning, and in particular of poetic learning, addressed to Fulk Greville, and written, with much sententious melody, in a sort of ¢erza rima or, more properly, ottava rima with the couplet omitted. Daniel was a great reformer in verse, and the introducer of several valuable novelties. It may be broadly said of his style that it is full, easy, and stately, without being very animated or splendid. It attains a high average of general excellence, and is content with level flights. As a gnomic writer Daniel approaches Chapman, but is far more

musical and coherent. He is wanting in fire and passion, but he is pre-eminent in scholarly grace and tender, mournful reverie. (BE. W. G.)

DANIELL, Joun FrepDERicK (1790-1845), an eminent chemist and physicist, was born in London on the 12th March 1790. From his father, a barrister, he received an excellent classical education ; but having from his early years displayed a preference for natural science, he entered a sugar refinery, where he soon effected important improve- ments in the process. He studied chemistry under Professor Brande, in conjunction with whom he started in 1816 the journal which, shortly after its commencement, became favourably known to scientific men as the Quarterly Journal of Science and Art. To this he contributed numerous articles on chemistry and meteorology, including, under the latter head, an interesting account of the ingenious and delicate dew-point hygrometer which is known by his name. In 1823 he collected and published his Afeteorological Essays, which excited much interest as one of the first attempts to explain the phenomena of the weather on the broad and sure basis of physical science. In 1824 he published an Essay on Artificial Climate con- sidered in tts Applications to Horticulture, which was the means of effecting a radical change in the treatment of tropical plants in colder regions, by showing the necessity of a humid atmosphere in hothouses. As managing director of the Continental Gas Company he interested himself in the manufacture of gas for illuminating purposes, | and invented a method of extracting it from resin, which was in practical use for a time. He was one of the founders of the Society for Promoting Useful Knowledge, for which he wrote a treatise on chemistry. In 1831 he was appointed first professor of chemistry in the newly founded King's College, London. During the succeeding years he was engaged in a series of investigations on heat and electricity, which were of great value in their practical applications. For his register pyrometer, devised to | measure high temperatures, he was awarded in 1832 the Rumford medal of tle Royal Society. Soon afterwards he received the Copley medal for his invention of the sulphate of copper or constant battery, which, as a substitute for Wollaston's, effected an immense improvement in the apparatus of voltaic electricity. The Royal medal, the only other honour of the kind in the gift of the society, was bestowed upon him in 1842. In 1839 appeared his Jztro- duction to the Study of Chemical Philosophy, which dealt very ably with the theory of molecular forces. Four years later the

~~honorary degree of D.C.L. was conferred upon him by the university of Oxford. He had received in 1839 another honour of a different kind in being chosen foreign secretary of the Royal Society. He died suddenly of apoplexy while attending a meeting of the council of the society on the 13th March 1845.~~

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~~DANIELL, Tuomas, Witz1am, and Samvust. This family of landscape painters forms a group which has left one record, so to speak, in our annals of art, not by their pictures exactly, but by the three having been all travellers in the East, and publishing, by means of engrav- ing, works illustrating the scenery of the countries they visited.~~

~~-THomas Danrety (1749-1840), to whom the others were indebted for everything, was a man of versatile ability and enormous energy. He was the maker of his own fortune, having been born at the Chertsey inn, kept by his father, in 1749, and apprenticed to an heraldic painter, a trade then dying ont, like that of stay-maker or perukier ata later time. However profitable it had been, probably Daniell would not have adhered to it, as he was animated, at a time when the representation of natural scenery under atmospheric conditions of effect was merely struggling into existence, with a love of the romantic and beautiful in architecture and nature. The sentimental affectation for landscape, so cleverly satirized by Lord Macaulay, did not indeed influence him; his bias was towards archeology and botany, and led him at last to India. Up to 1784 he painted topographical subjects and flower pieces. By this time his two nephews had come under his influence, the youngest being apprenticed to Medland the landscape engraver, and the elder, William, was under his own care. In this year (1784) he embarked for India accompanied by the boy, and found at Calcutta ample encouragement. Here he remained ten years, and on returning to London he published his largest work, Oriental Scenery, in six large volumes, not completed till 1808. From 1795 till 1828 he continued to exhibit Eastern subjects, temples, jungle- hunts, &c., and at the same time continued the publication of illustrated works. These are—Views of Calcutta; Oriental Scenery, 144 plates; Views in Egypt ; Excavations at~~

~~*Ellora ; Picturesque Voyage to China. These were for the most part executed by an engraving process now almost forgotten, called aquatint, and, although they do not show the accuracy of detail now understood, are valuable authorities, He was made Royal Academician in 1799, fellow of the Royal Society about the same time, and at different times member of several minor societies. His nephews both died before him; his Indian period had*~~

~~*| made him independent, and he lived a bachelor life in*~~

~~*much respect at Kensington till the age of ninety-one,*~~

~~*| dying 19th March 1840.*~~

~~*Witt1AM Daniety (1769-1837), nephew of Thomas, was born 1769, and was therefore fourteen when he accom- panied his uncle to India. His own publications, engraved in aquatint, were— Voyage to India ; Zoography ; Animated Nature ; Views of London; Views of Bootan, a work prepared from his uncle's sketches; and a Voyage Round Great Britain, which occupied him several years. The British Institution made him an honorary award of £100 for a Battle of Trafalgar, and he was elected R.A. in 1822. He turned to panorama painting before his death, beginning in 1832 with Madras, the picture being enlivened by the Hindu mode of taming wild elephants. He died 16th August 1837.*~~

~~*SamueEL DanteEx, William's younger brother, born 1775, was brought up as an engraver, and first appears as an exhibitor in 1792. A few years later he went to the Cape and travelled into the interior of Africa, with his sketching materials in his haversack. The drawings he made there were published, after his return, in his African Scenery. He did not rest long at home, but left for Ceylon in 1806, where he spent the remaining years of his life, publishing The Scenery, Animals, and Natives of Ceylon. Camping out and malaria from the swamps cut him off after a few days illness in December 1811.*~~

~~*Dean =*~~

DANNECKER, Jonann Herricy von (1758-1841), one of the best German sculptors. He was born at Stuttgart, where his father was employed in the stables of the duke of Wiirtemberg, 15th October 1758. The boy was entered in the military school at the age of thirteen, and continued there two years, when, his bias and his | talent having raanifested themsélves, he was allowed to — take his own way, although there had been some idea of making him a dancer. Once freed from his juvenile difficulties his success was pretty secure, and we find him at once associating with the young sculptors Scheffauer and Le Jeune, the painters Guibal and Harper, and also with Schiller, and the much-admired musician Zumsteeg. His busts of some of these are good ; that of Schiller is well known. In his eighteenth year he carried off the prize at the Concours with his model of Milo of Crotona, the strong man who died by having his hand caught in the rent stump of a tree, a favourite subject with young sculptors, On this the duke made him sculptor to the palace (1780), and for some time he was employed on child-angels and caryatides for the decoration of the reception rooms. This work did not please him very much, and in 1783, in his twenty-fourth year, he left for Paris with Scheffauer, and placed himself under Pajoufor a time. His Mars, a sitting figure sent home to Stuttgart, marks this period; and we next find him, still travelling with his friend, at Rome in 1785, where he settled down to work hard for five years, during which his position in the future art history of his native land was securely made. Goethe and Herder were then in Rome and became his friends, as well as Canova, who was the hero of the day, and who had undoubtedly a great authoritative influence on his style. His marble statues of Ceres and Bacchus were done at this time. These are now to be seen in the Residenz-schloss, at Stuttgart. While in Rome his study of the antique was very careful and intelligent, although Canova was so much admired by him, and on his return to Stuttgart, which he never after- wards quitted except for short trips to Paris, Vienna, and Zurich, the double influence of these opposite forces is apparent in his works. We may mention some of these, The first was a Girl Lamenting her Dead Bird, which pretty light motive was much admired, Afterwards, Sappho, in marble for the Lustschloss, and two Offering-bearers for the Jagdschloss; Hector, now in the museum, not in marble ; the Complaint of Ceres, from Schiller's poem ; a Statue of Christ, worthy of mention for its nobility, which has been skilfully engraved by Amsler; Psyche ; Kneeling Water Nymph ; Love, a favourite he had to

repeat. These stock subjects with sculptors had freshness of treatment ; and the Ariadne, done a little later, especially had a charm of novelty which has made it a European favourite in a reduced size. It is perhaps the contrast between the deli- cacy of the female human form and the subdued rude force of the panther she rides that attracts our admiration ; but it is probable that this group, like Canova's Graces, will always retain its popularity. It was repeated for the banker Von Bethman in Frankfort, where it now appears the ornament of the Platz. Many of the illustrious men of the time were modelled by him. The original marble of Schiller is now at Weimar ; after the poet's death it was again modelled in colossal size. Lavater, Metternich, Countess Stephanie of Baden, General Benkendorf, and others are much prized. Dannecker was director of the Gal- lery of Stuttgart, and received many academic and other dis- tinctions. So far his life had been prosperous, but as the evening drew on his mind became troubled and at last obscured. His health had suffered while working very closely on a large monumental statue, and long before his final year he was altogether prostrated. During this sad period he rallied, but his memory and power of observation

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faded again, and his death place at last in 1841, in his

DANTE. Dante (or Durante) Alighieri (1265-1321) was born at Florence about the middle of May 1265. He was descended from an ancient family, highest rank. His biographers have slight grounds to deduce his origin from the Frangipani, one of the oldest senatorial families of Rome. We can affirm with greater certainty that he was connected with the Elisei who took part in the building of Florence under Charles the Great. -Dante himself does not, with the exception of a few obscure and scattered allusions, carry his ancestry beyond the warrior Cacciaguida, whom he met in the sphere of - Mars (Par. xv, 87, foll.) Cacciaguida there tells his descendant that he was born in. the year 1106, that he married an Aldighieri from the valley of the Po, that he had two brothers, Moronte and Eliseo, and that he accompanied the Emperor Conrad IIT. upon his crusade ~ into the Holy Land, where he died among the infidels, From Eliseo was descended the branch of the Elisei; from Aldighiero, son of Cacciaguida, the branch of the Alighieri.

Bellincione, son of Aldighiero, was the grandfather of Dante. His father was a second Aldighiero, a lawyer of some reputation. By his first wife, Lapa: di Chiarissimo Cialuffi, this Aldighiero had a son Francesco ; by his second, Donna Bella, whose family name is not known, Dante and a daughter, Thus the family of Dante held: a most respectable position among the citizens of his beloved city ; but had it been: reckoned in the very first rank they could not have remained in Florence after the defeat of the Guelfs at Montaperti in 1260. It is clear, however, that Dante's mother at least did so remain, for Dante was born in Florence in 1265. The heads of the Guelf party did not return till 1267,

Dante was born under glorious stars pregnant with genius such as it is." tion as favourable to Latini, his instructor,

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was long expected. This took eighty-third year, .

virtue, to whom he owes his Astrologers considered this constella- literature and Science, and Brunetto tells him in the Inferno (xv, 25, foll.) that, if he follows its guidance, he cannot fail to reach the harbour of fame. Boccaccio relates that before his birth his mother dreamed that she lay under a very lofty laurel, growing in a green meadow, by a very clear fountain, when she felt the pangs of childbirth,—that her child, feeding on the berries which fell from the laurel, and on the waters of the fountain, in a very short time became a shepherd, and attempted to reach the leaves of the laurel, the fruit of which had nurtured him,—that, trying to obtain them he fell, and rose up, no longer a man, but in the guise of a peacock. We know little of Dante's boyhood except that he was a hard student and a pupil of Brunetto Latini, Boccaccio tells us that he became very familiar with Virgil, Horace, Ovid, and Statius, and all other famous poets ; and that, "taken by the sweetness of knowing the truth of the things concealed in heaven, and finding no other pleasure dearer to him in life, he left all other worldly care and gave himself to this alone, and, that no part of philosophy might remain unseen by him, he plunged with acute intellect into the deepest recesses of theology, and so far succeeded in his design that, caring nothing for heat or cold, or watchings or fastings, or any other bodily discomforts, by assiduous study he came to know of the divine essence and of the other separate

~~intelligences all that the human intellect can comprehend." Leonardo Bruni says that " by study of philosophy, of theology, astrology, arithmetic, and geometry, by reading of history, by the turning over many curious books, watching and sweating in his studies, he acquired the science which he was to adorn and explain in his verses." Of his teacher Brunetto Latini, of whom he speaks with the most loving VI. — 102~~

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~~Political life.~~

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~~gratitude and affection, but whose gross vices he does not hesitate to brand with infamy, Giovanni Villani has left us a graphic picture: —" He was a great philosopher, and a consummate master of rhetoric, not only in knowing how to speak well, but how to write well. He it was who explained the rhetoric of Tully and made the good and useful book called Zesoro, and the 7'esoretto and the Chiave del Tesoro, and other works in philosophy and of vices and virtues, and he was secretary of our communes. He was a worldly man; but we have made mention of him because he both began and directed the growth of the Florentines, both in making them ready in speaking well and in knowing how to guide and direct our republic according to the rules of politics." Under this guidance Dante became master of all the science of his age at a time when it was not impossible to know all that could be known. He was a skilful draughtsman, and tells us that on the anniversary of the death of Beatrice he drew an angel on a tablet. He was an intimate friend of Giotto, who has immortalized his youthful lineaments in the chapel of the Bargello, and who ig recorded to have drawn from his friend's inspiration the allegories of Virtue and Vice which fringe the frescoes of the Scrovegni Chapel at Padua. Nor was he less sensible to the delights of music. Milton had not a keener ear for the loud uplifted angel trumpets and the immortal harps of golden wires of the cherubim and seraphiin; and our English poet was proud to compare his~~

own friendship with Henry Lawes with that between Dante and Casella, "met in the milder shades of purgatory." Most dear to him of all were the companions Cino di Pistoia, Lapo Gianni, Guido Cavalcanti, and others, similarly gifted and dowered with like tastes, who lived in the lively streets of the city of the flowers, and felt with him the first warm flush of the coming renaissance. He has written no sweeter or more melodious lines than those in which he expresses the wish that he, with Guido and Lapo, might be wafted by enchantment over the sea wheresoever they might list, shielded from fortune and evil times, and living in such contentment that they should wish to live always, and that the good enchanter should bring Monna Vanna and Monna Bice and that other lady into their barque, where they should for ever discourse of love and be for ever happy. It is a wonderful thing (says Leonardo Bruni) that, though he studied without intermission, it would not have appeared to any one that he studied, from his joyous mien and youthful conversation. Like Milton he was trained in the strictest academical education which the age afforded; but Dante lived under a warmer sun and brighter skies, and found in the rich variety and gaiety of his early life a defence against the withering misfortunes of his later years. Milton felt too early the chill breath of Puritanism, and the serious musing on the experience of life, which saddened the verse of both poets, deepened in his case into grave and desponding melancholy.

We must now consider the political circumstances in which lay the activity of Dante's manhood. From 1115, the year of the death of Matilda countess of Tuscany, to 1215, Florence enjoyed a nearly uninterrupted peace. Attached to the Guelf party it remained undivided against Atself. Butin 1215 a private feud between the families of Buondelmonte and Uberti introduced into the city the horrors of civil war. Villani (lib. v. cap. 38) relates how Buondelmonte de Buondelmonti, a noble youth of Florence, being engaged to marry a lady of the house of Amidei, allied himself instead to a Donati, and how Buondelmonte was attacked and killed by the Amidei and Uberti at the foot of the Ponte Vecchio, close by the pilaster which bears the image of Mars. " The death of Messer Buondelmonte was the occasion and beginning of the accursed parties of Guelfs and Ghibellines in Florence."

DANTE

Of the seventy-two families then in Florence thirty-nine became Guelf under the leadership of the Buondelmonte, and the rest Ghibelline under the Uberti. parties was for a while allayed by the war against Pisa in

The strife of

1222, and the constant struggles against Siena ; but in 1248

Frederick II. sent into the city his natural son Frederick,

prince of Antioch, with 1600 German knights. The Guelfs were driven away from the town, and took refuge, part in Montevarchi, part in Capraia. The Ghibellines, masters of Florence, behaved with great severity, and destroyed the towers and palaces of the Guelf nobles. At last the people became impatient. They rose in rebellion, deposed the podesta, elected in his place a captain of the people, established a more democratic constitution, and, encouraged by the death of Frederick in December 1250, recalled the exiled Guelfs. Manfred, the bastard son of Frederic, pursued the policy of his father. He stimulated the Ghibelline Uberti to rebel against their position of subjection. A rising of the vanquished party was put down by the people, in July 1258 the Ghibellines were expelled from the town, and the towers of the Uberti razed to the ground. The exiles betook themselves to the friendly city of Siena. Manfred sent them assistance, The Florentines, after vainly demanding their surrender, despatched an army against them. On September 4, 1260, was fought the great battle of Montaperti, which dyed the Arbia red, and in which the Guelfs were entirely defeated. The hand which held the banner of the republic was sundered by the sword of a traitor. or the first time in the history of Florence the Caroccio was taken. Florence lay at the mercy of her enemies. A parliament was held at Empoli, in which the deputies of Siena, Pisa, Arezzo, and other Tuscan towns consulted on the best means of securing their new war power. They voted that the accursed Guelf city should be blotted out. But Farinata of the Uberti stood up in their midst, bold and defiant as when he stood erect among the sepulchres of hell, and said that if, from the whole number of the Florentines, he alone should remain, he would not suffer, whilst he could wield a sword, that his country should be destroyed, and that, if it were necessary to die a thousand times for her, a thousand times would le be ready to encounter death. Help came to the Guelfs from au unexpected

quarter. Clement IV., elected Pope in 1265, offered the crown of Apulia and Sicily to Charles of Anjou. The French prince, passing rapidly through Lorabardy, Romagna, and the Marches, reached Rome by way of Spoleto, was crowned on January 6, 1266, and on February 23 defeated and killed Manfred at Benevento. In such a storm of conflict did Dante first see the light. In 1267 the Guelfs were recalled, but instead of settling down in peace with their opponents they summoned Charles of Anjou to vengeance, and the Ghibellines were driven out. The meteor passage of Conradin gave hope to the imperial party, which was quenched when the head of the fair-haired boy fell on the scaffold at Naples. Pope after Pope tried in vain to make peace. Gregory X. placed the rebellious city under an interdict ; Nicolas III. in 1280 patched up a hollow truce. In 1282 the constitution of Florence received the final form which it retained till the collapse of freedom. From the three arti maggiori were chosen six priors, in whose hands was placed the government of the republic. They remained in office for two months, and during that time lived and shared acommon table in the Public Palace. We shall see what influence this office had upon the fate of Dante. The success of the Sicilian Vespers, the vacancy of the Holy See, the death of Charles of Anjou, roused again the courage of the Ghibellines. They took possession of Arezzo, and threatened to drive out the Guelfs from Tuscany. The historian Ammirato has left us a lively

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account of the skirmishes against Arezzo in the year 1288,

a prelude to the great battle of Campaldino in the follow. Then it was that Dante saw "horsemen

ing sunimer. moving camp and commencing the assault, and holding rauster, and the march of foragers, the shock of tournaments, and race of jousts, now with trumpets and now with bells, with drums and castle signals, with native things and foreign " (Inf. xxii. 1, foll.) On June 11, 1289, at Cam- paldino near Poppi, in the Casentino, the Ghibellines were utterly defeated. They never again recovered their hold on Florence, but the violence of faction survived under other names. Dante fought with distinction at Cam- paldino, was present shortly afterwards at the battle of Caprona (Inf. xxi. 95, foll.), and returned in September 1289 to his studies

and his love. His peace was of short duration. On June 9, 1290, died Beatrice, whose mortal love had guided him for thirteen years, and whose immortal spirit purified his later life, and revealed to him the mysteries of Paradise.

Dante had first met Beatrice Portinari at the house of her father Folco on May-day 1274. In his own words, "already nine times after my birth the heaven of light had returned as it were to the same point, when there appeared to my eyes the glorious lady of my mind, who was by many called Beatrice who knew not what to call her. She had already been so long in this life that already in its time the starry heaven had moved towards the east the twelfth part of a degree, so that she appeared to me about the beginning of lier ninth year, and I saw her about the end of my ninth year. Her dress on that day was of a most noble colour, a subdued and goodly crimson, girdled and adorned in such sort as best suited with her tender age. At that moment I saw most truly that the spirit of life which hath its dwelling in the secretest chamber of the heart began to tremble so violently that the least pulses of my body shook therewith ; and in trembling it said these words, ' Ecce deus fortior me qui veniens domin- abitur mihi.'" In the Vita Nouva is written the story of his passion from its commencement to within a year after the lady's death. He saw Beatrice only once or twice, and she probably knew little of him. She married Simone de' Bardi, But the worship of her lover was stronger for the remoteness of its object. The last chapter of the Vita Nuova relates how, after the lapse of a year, "'it was given me to behold a wonderful vision, wherein I saw things which determined me that I would say nothing further of this blessed one until such time as I could discourse more worthily concerning her. And to this end I labour all I can, as she in truth knoweth. Therefore if it be His pleasure through whom is the life of all things that my life continue with mea few years, it is my hope that I shall yet write concerning her what hath not before been written of any woman. After the which may it seem good unto Him who is the master of grace that my spirit should go hence to behold the glory of its lady, to wit, of that blessed Beatrice who now gloriously gazes on the counte- nance of Him qui est per omnia secula benedictus." In the Convito he resumes the story of his life. " When I had lost the first celight of my soul (that is, Beatrice) I remained so pierced with sadness that no comforts availed)! me anything, yet after some time my

mind, desirous of i health, sought to return to the method by which other dis- | consolate ones had found consolation, and I set myself to | read that little-known book of Boetius in which he con- ‘ soled himself when a prisoner and an exile. And hearing — that Tully had written another work, in which, treating of . friendship, he had given words of consolation to Llius, I) set myself to read that also.” He so far recovered from

the shock of his loss that in 1292 he married Gemma, ‘daughter of Manetto Donati, a connection of the celebrated

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Corso Donati, afterwards Dante’s bitter foe. It is possible that she is the lady mentioned in the Vita Nuova as sitting full of pity at her window and comforting Dante for his sorrow. By this wife he had seven children, and although he never mentions her in the Divina Commedia, and although she did not accompany him into exile, there is no reason to suppose that she was other than a good wife, or that the union was otherwise than happy. Cer- tain it is that he spares the memory of Corso in his great poem, and speaks kindly of his kinsmen Piccarda and Forese.

Dante now began to take an active tics. Spezxiali, which made him eligible as one of the six priori to whom the government of the city was intrusted in 1282, Documents still existing in the archives of Florence show that he took part in the deliberations of the several councils of the city in 1295, 1296, 1300, and 1301. Filelfo says that he served on fourteen embassies, a statement not only unsupported by evidence, but impossible in itself. Filelfo does not mention the only embassy in which we know for certain that Dante was engaged, that to the town of San Gemignano in 1299. From June 15 to August 15, 1300, he held the office of prior, which was the source of all the miseries of his life. The spirit of faction had again broken out in Florence. The two rival families were the Cerchi and the Donati,—the first of great wealth but recent origin, the last of ancient ancestry but poor. A quarrel had arisen in Pistoia between the two branches of the Cancellieri,—the Bianchi

~~and Neri, the Whites and the Blacks. ~ The quarrel spread to Florence, the Donati took the side of the Blacks, the Cerchi of the Whites, Pope Boniface was asked to mediate, and sent Cardinal Matteo d'Acquasparta to maintain peace. He arrived just as Dante entered upon his office as prior. The cardinal effected nothing, but Dante and his colleagues banished the heads of the rival parties in different directions to a distance from the capital. The Blacks were sent to Citth della Pieve in the Tuscan mountains ; the Whites, among whom was Dante's dearest friend Guido Cavalcanti, to Serrezzano in the unhealthy Maremma. After the expira- tion of Dante's office both parties returned, Guido Cavalcanti so ill with fever that he shortlyafterwards died. The Blacks sought for vengeance. The journey of Charles of Valois to Rome gave them an opportunity. At a meeting held in the church of the Holy Trinity the Whites were denounced as Ghibellines, enemies of France and of the pope, and the French prince was invited to the town as peacemaker, to defend the Guelfs against their machinations, The priori sent at the end of September four ambassadors to the Pope, one of whom was Dante. He never again saw the towers of his native city. Charles of Valois marchea from Pavia and took up his abode in the Oltr' Arno. Corso \Lonati, who had been banished ; second time, returned in force and summoned the Blacks to arms. The prisons were broken open, the podesta driven from the town, the Cerchi confined within their houses, a third of the city was destroyed with fireand sword. By the help of Charles the Blacks were victorious. They appointed Cante de' Gabrielli of Gubbio as podesta, a man devoted to their interests. More than 600 Whites were condemned to exile and cast as beggars upon the world. On January 27, 1302, Dante with three others was condemned to pay a fine of 5000 lire of small florins. If the money was not paid within three days their property was to be destroyed and laid waste ; if they did pay the fine they were to be exiled for two years from Tuscany; in any case they were never again to hold office in the republic. On March 10 Dante and fourteen others were condemned to be burned alive if they should come into the power of the republic. Similar~~

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Dante's Ghibel- linism,

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sentences were passed in September 1311 and October 1315. The sentence was not formally reversed till 1494, under the government of the Medici.

Dante received the news of his banishment in Siena. The exiles met first at Gargonza, a castle between Siena and Arezzo, and then at Arezzo itself. They joined them- selves to the Ghibellines, to which party the podesta Uguccione della Faggiuola belonged. The Ghibellines, however, were divided amongst themselves, and the Green Ghibellines were not disposed to favour the cause of the White Guelfs. They found a more sympathetic defender in Scarpetta degli Ordelaffi at Forli. From this place Dante probably went to Bartolommeo della Scala, lord of Verona, where the country of the great Lombard gave him his first refuge and his first hospitable reception. Can Grande, to whom he afterwards dedicated the Paradiso, was then a boy. Bartolommeo died in 1304, and it is possible that Dante may have remained in Verona till his death. In September 1303 the fleur-de-lis had entered Anagni, and Christ hada second time been buffeted in the person of his vicar. Boniface VIII. did not survive the insult long, but died in the following month. He was succeeded by Benedict XL, who did his best to give peace to his dis- tracted country. Immediately after his accession he sent the Cardinal da Prato to Florence, who arrived there in March 1304. The people received him with enthusiasm ; ambassadors came to him from the Whites; and he did his best to reconcile the two parties. But the Blacks resisted all his efforts. He shook the dust from off his feet, and departed leaving the city under an interdict. Foiled by the calumnies and machinations of the one party, the cardinal gave his countenance to the other. It happened that Corso Donati and the heads of the Black party were absent at Pistoia. Da Prato advised the Whites to attack Florence, deprived of its heads and impaired by fire. An army was collected of 16,000 foot and 9000 horse. Communications were opened with the Ghibellines of Bologna and Romagna. But the forces of the exiles, badly led, reached the gates of the city only to find themselves unsupported from within. They were driven to retreat, all hope of return became

impossible, and Dante felt for the first time the full bitter-

ness of exile. It was after the failure of this ill-conceived attempt that Dante's wanderings really began. Filled with

'contempt at the baseness and incapacity of his fellow-

sufferers, he wished that, disdaining the support of their companionship, he had stood alone and made a party by himself. This, indeed, we must consider Dante to have done, if we would understand the real nature of his Ghibellinism. Dante had been born and bred a Guelf, and it was only under the pressure of inevitable necessity that he and his friends allied themselves with the other side. If we rise beyond the limits of mere local quarrels, we find in Italian history that the Guelf party was generally speaking The municipal privileges of the great Italian cities rose under the protection of the Popes, while the emperors only crossed the Alps to crush their

'ancient independence, and depress them beneath the yoke

of some feudal representative. The horse of Barbarossa trampled upon the ashes of Milan, whereas the straw-built fortress of the Lombard league bore the name of Alexander. Had it not breathed the air of freedom the life of Florence could not have survived the period of its infancy, stifled as it afterwards was by the preponderance of the Medici. Dante could not have been indifferent or ungrateful to the cause which had given to his beloved Italy all that made it valuable to the world. But he saw that the conditions of the time were altered, and that other dangers menaced the welfare of his country. There was no fear now that

Florence, Siena, Pisa, Arezzo should be razed to the ground

in order that the castle of the lord might overlook the

humble cottages of his contented subjects ; but there was danger lest Italy should be torn in sunder by its own jealousies and passions, and lest the fair domain bounded by the sea and the Alps should never properly assert

the force of its individuality, and should present a contemptible contrast to a united France and a confederated Germany. Sick with petty quarrels and dissensions Dante strained his eyes towards the hills for the appearance of a deliverer, who should hush the jar of discord, discipline into effec- tiveness the luxuriant forces of the peninsula, and, united in spiritual harmony with the vicar of Christ, show for the first time to the world an example of a government where the strongest force and the highest wisdom were inter- penetrated by all that God had given to the world of piety and justice. In this sense and in no other was Dante a Ghibelline. The vision was never realized—the hope was never fulfilled. Not till our own day has Italy become united and the "greyhound of deliverance" has chased from city to city the " wolf" of the papacy. But is it possible to say that the dream did not work its own realization, or to deny that the high ideal of the poet, after inspiring a long succes- sion of minds as lofty as his own, has become after five hundred years embodied in the constitution of a state which acknowledges no stronger bond of union than a common worship of the exile's indignant and impassioned verse ?

It is very difficult to determine with exactness the order Wander Many cities and ings.

aud the place of Dante's wanderings, castles in Italy have claimed the honour of giving him shelter, or of being for a time the home of his inspired muse. He certainly spent some time with Count Guido Salvatico in the Casentino near the sources of the Arno, probably in the castle of Porciano, and with Uguccione in the castle of Faggiuola in the mountains of Urbino. After this he is said to have visited the university of Bologna ; and in August 1306 we find him at Padua. Cardinal Napoleon Orsini, the legate of the French Pope Clement V., had put Bologna under a ban, dissolved the university, and driven the professors to the northern city. In May or June 1307 the same cardinal collected the Whites at Arezzo and tried to induce the Florentines to recall them. The name of Dante is found attached to a document signed by the Whites in the church of St Gaudenzio in the Mugello. This enterprize came to nothing. Dante retired to the castle of Moroello Della Spina in the Lunigiana, where the marble ridges of the Apennines descend in precipitous slopes to the Gulf of Spezzia. From this time till the arrival of the emperor Henry VII. in Italy, October 1310, all is

~~uncertain. His old enemy Corso Donati had at last united himself with Uguccione della Faggiuola, the leader of the Ghibellines. Dante thought it possible that this might lead to his return. But in 1308 Corso was declared a traitor, attacked in his house, put to flight, and killed. 'Dante lost his last hope. He left Tuscany, and went to Can Grande della Scala at Verona. From this place we may believe that he visited the university of Paris, studied in the Rue Fouarre, became acquainted with the Low Countries, and not improbably crossed the Channel and went to Oxford, and saw where the heart of Prince Harry was worshipped upon London Bridge. The election of Henry of Luxembourg as emperor stirred again his hopes of a deliverer. He left Paris and returned hastily to Italy. At the end of 1310, in a letter to the princes and people of Italy, he proclaimed the coming of the saviour ; at Milan he did personal homage to his sovereign. The Florentines made every preparation to resist the emperor. Dante wrote from the Casentino a letter dated March 31, 1311, in which he rebuked them for their stubbornness and obstinacy. Henry still lingered in Lombardy at the siege of Cremona, when Dante, on April 16, 1311, ina celebrated epistle, upbraided his delay, argued that the crown of Italy~~

~~Old age and death.~~

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~~was to be won on the Arno rather than on the Po, and urged the tarrying emperor to hew the rebellious Florentines like Agag in pieces before the Lord. Henry was as deaf to this exhortation as the Florentines themselves. After reducing Lombardy he passed from Genoa to Pisa, and on June 29, 1312, was crowned in Rome. Then at length he moved towards Tuscany by way of Umbria. Leaving Cortona and Arezzo, he reached Florence on September 19. He did not dare to attack it, but returned in N ovember to Pisa. In the summer of the following year he prepared to invade the kingdom of Naples ; but in the neighbourhood of Siena he caught a fever and died at the monastery of Buonconvento, August 24,1313, The hopes of Dante and his party were buried in his grave.~~

~~After the death of the emperor Henry (Bruni tells us) Dante passed the rest of his life in great poverty, sojourning in various places throughout Lombardy, Tuscany, and the Romagna, under the protection of various~~

lords, until at length he retired to Ravenna, where he ended his life. Very little can be added to this meagre story. There is reason for supposing that he stayed at Gubbio with Bosone dei Rafaelli, and tradition assigns him a cell in the monastery of St Croce di Fonte Avellana in the same district, situated on the slopes of Catria, one of the highest of the Apennines. After the death of Pope Clement V. he addressed a letter, dated July 14, 1314, to the cardinals in conclave, urging them to elect an Italian Pope. About this time he came to Lucca, then lately conquered by his friend Uguccione, completed the last cantos of the Purgatory, and became enamoured of the courteous Gentucca, whose name had been whispered to him by her countryman on the slopes of the Mountain of Purification. In August 1315 was fought the battle of Monte Catini, a day of humiliation and mourning for the Guelfs, Uguccione made but little use of his victory; and the Florentiues marked their vengeance on his adviser by con- demning Dante yet once again to death if he ever should come into their power. In the beginning of the following year Uguccione lost both his cities of Pisa and Lucca. At this time Dante was offered an opportunity of returning to Florence. The conditions given to the exiles were that they should pay a fine and walk in the dress of humiliation to the church of St John, and there do penance for their offences. Dante refused to tolerate this shame ; and the letter is still extant in which he declines to enter Florence except with honour, secure that the means of life will not

fail him, and that in any corner of the world he will be

able to gaze at the sun and the stars, and meditate on the sweetest truths of philosophy. He preferred to take refuge with his most illustrious protector Can Grande della Scala of Verona, then a young man of twenty-five, rich, likeral, and the favoured head of the Ghibelline party. His name has been immortalized by an eloquent panegyric in the seventeenth canto of the Paradiso. Whilst at the court of Verona he maintained in the neighbouring city of Mantua the philosophical thesis De Aqua et Terra, which is included in his minor works. The last two years of his life were Spent at Ravenna, under the protection of Guido da Polenta. In his service Dante undertook an embassy to the Venetians. He failed in the object of his mission, and, returning disheartened and broken in spirit through the unhealthy lagoons, caught a fever and died in Ravenna, September 14, 1321. His bones still

repose there. His doom of exile has been reversed by the union of Italy, which has made the city of his birth and the various cities of his wanderings component members of a common country. His son Piero, who wrote a commentary on the Divina Commedia, settled in Verona. His daughter Beatrice lived as a nun in Ravenna. His direct line

became extinct in 1509; but the blood still runs in the

veins of the Marcheri Serego Alighieri, a noble family of the city of the Scaligers,

Dante may be said to have concentrated in himself the Character ; Whatever there was of piety, of Dante's of philosophy, of poetry, of love of nature, and of love of 8°™"*

spirit of the middle age.

knowledge in those times is drawn to a focus in his Writings. He is the first great name in literature after the night of the dark ages. The Italian language in all its purity and sweetness, in its aptitude for the tenderness of love and the violence of passion, or the clearness of philosophical argu- ment, sprang fully grown and fully armed from his brain. The Vita Nuova is still the best introduction to the study of the Tuscan tongue; the astronomy and science of the Divine Comedy are obscure only in a translation. Dante's reputation has passed through many vicissitudes, and much trouble has been spent by critics in comparing him with other poets of established fame. Read and commented upon in the Italian universities in the generation immedi- ately succeeding his death, his name became obscured as the sun of the renaissance rose higher towards its meridian, In the 17th century he was less read than Petrarch, Tasso, or Ariosto ; in the 18th he was almost universally neglected, His fame is now fully vindicated. 'Translations and com- mentaries issue from every press in Europe and America. Dante societies are formed to investigate the difficulties of his works. He occupies in the lecture-rooms of regenerated Italy a place by the side of those great masters whose humble disciple he avowed himself to be. The Divine Comedy is indeed as true an epic as the Zned, and Dante is as real a classic

~~as Virgil. His metre is as pliable and flexible to every mood of emotion, his diction as plaintive andas sonorous. Like him he can immortalize, by a simple expression, a person, a place, or a phase of nature. Dante is even truer in description than Virgil, whether he paints the snow falling in the Alps, or the homeward flight of birds, or the swelling of an angry torrent. But under this gorgeous pageantry of poetry there lies a unity of con- ception, a power of philosophic grasp, an earnestness of religion which to the Roman poet were entirely unknown. Still more striking is the similarity between Dante aud Milton, This may be said to lie rather in the kindred nature of their subjects, and in the parallel development of their minds, than in any mere external resemblance, In both the man was greater than the poet, the souls of both were "like a star and dwelt apart." Both were academi- cally trained in the deepest studies of their age; the labour which made Dante lean made Milton blind. The " Doricke sweetnesse" of the English poet is not absent from the tender pages of the Vita Nuova. The middle life of each was spent in active controversy; each lent his services to the state ; each felt the quarrels of hisage to be the " business of posterity," and left his warnings to ring in the ears of a later time. The lives of both were failures. "On evil days though fallen and evil tongues," they gathered the conceu- trated experience of their lives into one immortal work, the quintessence of their hopes, their knowledge, and their sufferings. But Dante is something more than this, Milton's voice is grown faint to us—we have passed into other modes of expression and of thought. But if we had to select two names in literature who are still exercising their full influence on mankind, and whose teaching is still developing new sides to the coming generations, we should choose the names of Dante and Goethe. Goethe preached a new gospel to the world, the pagan virtue of self-culture, a sympathy which almost passed into indiffer- ence, There is no department of modern literature or thought which does not bear upon it the traces of the sage of Weimar. But if we rebel against this teaching, and yearn once more for the ardour of belief, the fervour of self- sacrifice, the scorn of scorn and the hate of hate which is~~

~~Vita Nuova.~~

~~Convito~~

~~Minor poems,~~

~~‘Beatrice.~~

~~B14 the meed of the coward and the traitor, where shall we find them but in the pages of the Florentine? The religion of the future, if it be founded on faith, will demand that faith be reconciled with all that the mind can apprehend of know- ledge or the heart experience of emotion. ‘The saint of those days will be trained, not so much on ascetic counsels of Imitation, or in Thoughts which base man’s greatness on the consciousness of his fall, as on the verse of the poet, theologian, and philosopher, who stands with equal right in the conclave of the doctors and on the slopes of Parnassus, and in whom the ardour of study is one with the love of Beatrice, and both are made sub- servient to lift the soul from the abyss of hell, along the terraces of purgatory, to the spheres of paradise, till it gazes on the ineffable revelation of the existence of God himself, which can only be apprehended by the eye of faith.~~

~~It only remains now to give a short account of Dante’s separate works. The Vita Nuova, or Young Lrfe, of Dante contains the history of his love for Beatrice. Like the Jn~~

~~‘Memoriam of our own poet it follows all the varying~~

~~phases of a deep and overmastering passion from its com- mencement to its close. He describes how he met Beatrice as a child, himself a child, how he often sought her glauce, how she once greeted him in the street, how he feigned a false love to hide his true love, how he felt ill and saw in a dream the death and transfiguration of his beloved, how she died, and how his health failed from sorrow, how the tender compassion of another lady nearly won his heart from its first affection, how Beatrice appeared to him in a vision and reclaimed his heart, and how at last he saw a vision which induced him to devote himself to study that he might be more fit to glorify her who gazes on the face of God for ever. This simple story is interspersed with sonnetti, ballate, and canzoni, chiefly written at the time to emphasize some mood of his changing passion. After each of these, in nearly every case, follows an explanation in prose, which is intended to make the thought and argument intelligible to those to whom the language of poetry was not~~

familiar. The book was probably completed in 1307. It was first printed by Sermartelli in Florence, 1576. The latest and best edition is that by Witte, pub- lished by Brockhaus, Leipsic, 1876.

The Convito, or Banquet, is the work of Dante's manhood, as the Vita Nuova is the work of his youth. It consists, in the form in which it has come down to us, of an intro- duction and three treatises, each forming an elaborate com- mentary in a long canzone. It was intended, if completed, to have comprised commentaries on eleven more canzoni, making fourteen in all, and in this shape would have formed a tesoro or hand-book of universal knowledge, such as Brunetto Latini and others have Jeft to us. It is perhaps the least well known of Dante's Italian works, but crabbed and unattractive as it is in many parts, it is well worth reading, and contains many passages of great beauty and elevation. Indeed a knowledge of it is quite indis- pensable to the full understanding of the Divina Commedia. The time of its composition is uncertain. Dante mentions princes as living who died in 1309; he does not mention Henry VII. as emperor, who succeeded in 1310. There are some passages which seem to have been inserted at a later date. The canzoni upon which the commentary is written were clearly composed between 1292 and 1300, when he sought in philosophy consolation for the loss of The present text is very defective. The Convito was first printed in Florence by Buonaccorsi in 1490.

Rime di Dante.—Besides the smaller poems contained in the Vita Nuova and Convito there are a considerable number of canzoni, ballate, and sonnetti bearing the poet's name,

Of these many undoubtedly are genuine, others as un-

doubtedly spurious. Some which have been preserved under the name of Dante belong to Dante da Maiano, a poet of a harsher style; others which bear the name of Aldighiero are referable to Dante's sons Jacopo or Pietro, or to his grandsons; others may be ascribed to Dante's contemporaries and predecessors Cino da Pistoia and others. Those which are genuine secure Dante a place ainong lyrical poets scarcely if at all inferior to that of Petrarch. The best edition of the Canzoniere of Dante is that by Fraticelli

~~published by Barbéra at Florence. His collection includes seventy-eight genuine poems, eight doubtful, and fifty-four spurious. 'To these are added an Italian paraphrase of the seven penitential psalms in terza rima, and a similar paraphrase of the Credo, the seven sacraments, the ten commandments, the Lord's Prayer, and the Ave Maria.~~

~~The Latin treatise De Monarchia, in three books, De Mona~~

~~contains the creed of Dante's Ghibellinism. In it he pro- #4~~

~~pounds the theory that the supremacy of the emperor is derived from the supremacy of the Roman people over the world, which was given to them direct from God. As the emperor is intended to assure their earthly happiness, so does their spiritual welfare depend upon the Pope, to whom the emperor is to do honour as to the first-born of the Father. The date of its composition is almost universally admitted to be the time of the descent of Henry VII. into Italy, between 1310 and 1313, although attempts have been made to assign it to a much earlier period. The book was first printed by Oporinus at Basel in 1559.~~

~~The treatise De Vulgari Eloguio, in two books, also in DeVul-'~~

~~Its object was first to 94"! Eloguio.~~

~~Latin, is mentioned in the Conwto. establish the Italian language as a literary tongue, and to distinguish between the noble speech which might become the property of the whole nation, at once a bond of internal unity and a line of demarcation against external nations ; and secondly, to lay down rules for poetical composition in the language so established, The work was probably intended to be in four books, but only two are extant. The first of these deals with the language, the second with the style and with the composition of the canzone. The third was probably intended to continue this subject, and the fourth was destined to the laws of the ballata and sonnetto. This work was first published in the Italian translation of Trissino at Vicenza in 1529, The original Latin was not published till 1729 at Verona. The modern editions both of this work and of the De Afonarchia by Fraticelli are very admirable. The work was probably left unfinished in consequence of Dante's death.~~

~~Boccaccio mentions in his life of Dante that he wrote two Eclogues.~~

~~eclogues in Latin in answer to Johannes de Virgilio, who invited him to come from Ravenna to Bologna and compose a great work in the Latin language. The most interesting passage in the work is that in the first poem, where he ex- presses his hope that when he has finished the three parts of his great poem his grey hairs may be crowned with laurel on the banks of the Arno. Although the Latin of these poems is superior to that of his prose works, we may feel thankful that Dante composed the great work of his life in his own vernacular. These eclogues have also been printed with notes by Fraticelli.~~

~~The Letters of Dante are among the most important Letters.~~

~~materials for his biography. Giovanni Villani mentions three as specially remarkable—one to the Government of Florence, in which he complains of undeserved exile; another to the Emperor Henry VII., when he lingered too long at the siege of Brescia ; and a third to the Ttalian car- dinals to urge them to the election of an Italian Pope after the death of Clement V. The first of these letters has not come down to us, the two last are extant. Besides these we have one addressed to the Cardinal da Prato, one to a~~

~~Florentine friend refusing the base conditions of return from exile, one to the princes and lords of Italy to prepare them for the coming of Henry of Luxembourg, another to the Florentines reproaching them with the rejection of the emperor, and a long letter to Can Grande della Scala, containing directions for interpreting the Divina Com- media, with especial reference to the Paradiso. Of less importance are the letters to the nephews of Count Alessandro da Romena, to the Marquis Moroello Malaspina, to Cino da Pistoia, and to Guido da Polenta, There are many other letters mentioned by early biographers which may yet be lying hidden in Italian archives,~~

~~A treatise De Aqua et Terra has come down to us, which Dante tells us was delivered at Mantua in J anuary 1320 (perhaps 1321) as a solution of the question which was being at that time much discussed—whether on any place in the earth's surface water is higher than the earth. There is no doubt~~

~~about its genuineness, and it affords us a valuable insight into Dante's studies and modes of thought.~~

~~We have reserved all mention of the Divina Commedia 4. till the last. It would be useless in this place to attempt any account of the contents and scope of this wonderful poem. Those who would learn what it is without studying the poem itself could have no better guide than the Shadow of Dante by Maria Rossetti. a few words about the date of its composition. The time of the action is strictly confined to the end of March and the beginning of April 1300. It is not improbable that it was commenced shortly after this date. In the Znferno, xix. 79, there is an allusion to the death of Pope Clement Y., an event which occurred in 1314. This probably marks the date of the completion of this cantica. 'The Purgatorio was completed before 1318, as we learn from the Latin~~

~~poem addressed to Johannes de Virgilio, which speaks of~~

~~the Inferno and Purgatorio as completed, the Paradiso as yet to be written. The date of the poem is 1318. The last cantos of the Paradiso were probably not finished until just before the poet's death.~~

~~A complete bibliography of Dante literature would require an article to itself. Of the many separate works on this subject perhaps the most coniplete is that in the fourth volume of the Manuele Dantesco by Professor Ferrazzi Bassano, 1871. The chief secondary authorities for the preceding biography have been the article in Ersch und Gruber's Encyclopédie by Blanc, the Vita di Dante by Fraticelli, Dante Alighieri, seine Zeit, sein Leben, und seine Werke ; by Scartazzini, and the excellent treatise of Dr Theodor Paur Ueber die Quellen zur Lebensgeschichte Dante's, Gorlitz, 1862. The edition of Dante, with Italian notes by Scartazzini published by Brockhaus at Leipsic, of which only two volumes have as yet appeared, promises to supersede all others. Grave doubts have of late years been thrown on the authenticity of the chronicle of Dino Com- pagni, which has hitherto been regarded as one of the chief authorities for the life of Dante. A summing up of the evidence by W. Bernhardi, who concludes against the genuineness of the book, is to be found in Von Sybel's Mistorische Zeitschrift, the first number for 1877. A more copious bibliography of~~

~~Dante literature is subjoined, taken mainly from Scartazzini's German work.~~

~~Lditions of Dante's Works.—Divina Commedia con Tespositione di Chr. Landino e di Aless. Velutello, 1 vol. fol., Venet., 1564 The same, Giunta la lczione del Codice Bertoliniano, 4 vols., Udine, 1823-27. The same, l'ottimo Commento, 3 vols., Pisa, 1827-29. The same, col. comm. di G. Bagioli, 3 vols., Mil. 1829. The same, colla prefazione degli editort della Minerva, 1 vol. 4to, Fir., 1838. The same, col. comm. di Fr. da Buti, 3 vols., Pisa, 1858-62. The Saine, ricorretia sopra quattro dei pi autorevoli testi a penna da Carlo Witte, 1 vol. 4to, Berl., 1862. The same, nuovam. riv. nel testo e dichiarata da Brunone Bianchi, 1 vol., Fir., 1863. The same, col. comm. di P. Fraticelli, 1 vol., Fir., 1864. The same~~

~~published ; a fourth~~

~~It will be enough here to say~~

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~~wd codice Cassinese, 1 vol. fol., Monte Cassino, 1865. The same, col. comm. di Anonimo Fiorentino, ed. P. Fanfani, 1 vol., Bologna, 1866. The same, col. comm. di G. A. Scartazzinit, Brockhaus, Leipzig. [The volumes containing the Inferno and Purgatorio are volume is to contain the life of Dante and Prolegomena.]~~

~~Opere Minori, con le Annotaz. di A. M.~~

~~Friscioni, 2 vols., Ve- nez., 1741. The same, con note~~

~~e ulust. di P. Fraticelli, 3 vols.,~~

~~Fir. 1861-62. Vita Nuova e Canzoniere, commentati da G. R. Giu- liant, 1 vol., Fir., 1868. Monarchia (Liber i.), Carl Witte, 4to, Halis 1863. The same (Liber ii.), Carl Witte, 4to, Halis, 1867.~~

~~Epistole ed. e ined. per cura di Aless. Torri, 1 vol., Livorno, 1842. Anvri e Rime di Dante, 1 vol., Mantova, 1823.~~

Translations. —The principal translations into English are those of Carey (1806), Dayman (1843), F. Pollock, J. A. Carlyle (the Inferno only, 1849), and Longfellow, 1867. The best German trans- lation is by King John of Saxony, under the name of Philalethes. Those of Witte, Blanc, and Kannegiesser are also to be recom- mended.

Of Illustrative Writings the principal are—the article by L. G. Blanc on Dante Allighieri in Ersch and Gruber's Encyclopedia ; Vocabolario Dantesco, 1 vol., Leipzig, 1852; Versuch einen blos philol. Erkl. mehrere dunklen Stellen d. Géttl. Kom., 2 vols., Halle, 1861-65; Dante ¢ il suo secolo, 1 vol. fol., Fir., 1865; Fraticelli, Storia della Vita di Dante A., 1 vol., Fir., 1861; Giuliani, G. B., Metodo di comm. la Comm. di D. A. , Fir., 1861; Ozanam, Dante et la philosophic catholique au treizieéme stécle, Par., 1845; Paur, Th., Veber die Quellen zur Lebens Geschichte Dantes, Gorlitz, 1862; Wegele, Fr. X., Dante Al.'s Leben und Werke, 1 vol., Jena, 1865; the various writings of Carl Witte, Ucher Dante, Breslau, 1831; Quando e da chi sia composto Uottimo commento a Dante, Lips., 1847; De Bartolo a Saxoferrato Dante A llig. studioso, Halis, 1861; Dante und die Ital. Fragen, Halle, 1861; Dante-For- schungen, Halle, 1869 ; Scartazzini, Dante Allighieri, seine Zeit, sein Leben, und seine Werke, Biel, 1869. To these must be added the Jahrbuch of the Dante Gesellschaft founded in 1865. (0. B.)

DANTON, Gerorce Jacquzs (1759-1794), one of the most conspicuous actors in the decisive episodes of the first French Revolution. He was born at Arcis-sur-Aube in 1759. His family was of respectable quality, though of

very moderate means. 'They contrived to give him a good

'education, and he was launched in the career of an advocate

at the Paris bar. When the Revolution broke out, it found Danton following bis profession with apparent success, leading a cheerful domestic life, and nourishing his intelli- gence on good books. He first appears in the revolutionary story as president of the popular club or assembly of the district in which he lived. This was the famous club of the Cordeliers, so called from the circumstance that its meetings were held in the old convent of the order of the Cordeliers, just as the Jacobins derived their name from the refectory of the convent of the Jacobin brothers. It is an odd coincidence

that the old rivalries of Dominicans and Franciscans in tle democratic movement inside the Catholic Church should be recalled by the names of the two factions in the democratic movement of a later century away from the church. The Cordeliers were from the first the centre of the popular principle in the French Revolution carried to its extreme point ; they were the earliest to suspect the court of being irreconcilably hostile to freedom; and it was they who most vehemently proclaimed the need for root and branch measures. Danton's robust, energetic, and impetu- ous temperament made him the natural leader in such a quarter. We find no traces of his activity in the two great insurrectionary events of 1789—the fall of the Bastille, and the forcible removal of the court from Versailles to the Tuileries. In the spring of 1790 we hear his voice urging the people to prevent the arrest of Marat. In the autumn we find him chosen to be the commander of the battalion of the national guard of his district. In the beginning of 1791 he was elected to the post of administrator of the department of Paris. This interval was for all France a barren period of doubt, fatigue, partial reaction, and hoping against hope. It was uot until 1792 that Danton came into the prominence of a great revolutionary chief.

In the spring of the previous year (1791) Mirabeau had died, and with him had passed away the only man who

was at all likely to prove a wise guide to the court. In June of that year the king and queen made a disastrous attempt to flee from their capital and their people. They were brought back once more to the Tuileries, which from that time forth they rightly looked upon more as a prison than a palace ora home. The popular exasperation was intense, and the constitutional leaders, of whom the fore- most was Lafayette, became alarmed and lost their judg- ment. A bloody dispersion of a popular gathering, known afterwards as the massacre of the Champ-de-Mars (July 1791), kindled a flame of resentment against the court and the constitutional party which was never extinguished. The Constituent Assembly completed its infertile labours in September 1791. Then the elections took place to its successor, the short-lived Legislative Assembly. Danton was not elected to it, and his party was at this time only strong enough to procure for him a very

subordinate post in the government of the Parisian municipality. Events, however, rapidly prepared a situation in which his influence became of supreme weight. Between January and Augnst 1792 the want of sympathy between the aims of the popular asseinbly and the spirit of the king and the queen became daily more flagrant and beyond power of disguise. In April, war was declared against Austria, and to the confusion and distraction caused by the immense civil and political changes of the past two years was now added the ferment and agitation of war with an enemy on the frontier. The distrust felt by Paris for the court and its loyalty at length broke out in insurrection. On the memorable morning of the 10th of August 1792, the king and queen took refuge with the Legislative Assembly from the apprehended violence of the popular forces who were marching on the Tuileries. The share which Danton had in inspiring and directing this momentous rising is very obscure. Some look upon him as the head and centre of it. documents, support is given to this view by the fact that on the morrow of the fall of the monarchy Danton is found in the important post of minister of justice. This sudden rise from the subordinate office which he had held in the commune is a proof of the impression that his character had made on the insurrectionary party. To passionate fervour for the popular cause he added a certain broad stead- fastness and an energetic practical judgment which are not always found in company with fervour. Even in those days, when so many men were so astonishing in their eloquence, Danton stands out as a master of commanding phrase. One of his fierce sayings has became a proverb. Against Brunswick and the invaders, "7a nous faut de Paudace, et encore de Vaudace, et toujours de laudace,"—we must dare, and again dare, and for ever dare. The tones of his voice were loud and vibrant. As for his bodily presence, he had, to use his own account of it, the athletic shape and the stern physiognomy of the Liberty for which he was ready to die. Jove the Thunderer, the rebel Satan, a Titan, Sardanapalus, were names that friends or enemies borrowed to describe his mien and port. He was thought about as a coarser version of the great tribune of the Constituent Assembly ; he was called the Mirabeau of the sans-culottes, and Mirabeau of the markets.

In the executive Government that was formed, on the king's dethronement, this strong revolutionary figure found himself the colleague of the virtuous Roland and others of the Girondins. Their strength was speedily put to a

~~terrible test. The alarming successes of the enemy on the frontier, and the surrender of two important fortresses, had engendered a natural panic in the capital. But,in the breasts of some of the wild men whom the disorder of the time had brought to prominent place in the Paris Com- mune this panic became murderously heated. Some hundreds of captives were barbarously murdered in the~~

~~Apart from'~~

~~prisons. There has always been much dispute as to Danton's share in this dreadful transaction. At the time, it must be confessed, much odium on account of an imputed direction of the massacres fell to him. On the whole, how- ever, he cannot be fairly convicted of any part in the plan. What he did was to make the best of the misdeed, with a kind of sombre acquiescence. He deserves credit for insisting against his colleagues that they should not flee from Paris, but should remain firm at their posts, doing what they could to rule the fierce storm that was raging around them.~~

~~The elections to the National Convention took place in September, when the Legislative Assembly surrendered its authority. The Convention ruled France until October 1795. Danton was a member; resigning the ministry of justice, he took a foremost part in the deliberations and proceedings of the Convention, until his execution in April 1794. This short period of nineteen months was practically the life of Danton, so far as the world is concerned with him,~~

~~He took his seat in the high and remote benches which gave the name of the Mountain to the thoroughgoing revolutionists who sat there. He found himself side by side with Marat, whose exaggerations he never counte- nanced ; with Robespierre, whom he did not esteem very highly, but whose immediate aims were in many respects his own; with Camille Desmoulins and Phelippeaux, who were his close friends and constant partisans. The foes of the Mountain were the group of the Girondins,— eloquent, dazzling, patriotic, but unable to apprehend the fearful nature of the crisis, too full of vanity and exclusive party-spirit, and too fastidious to strike hands with the vigorous and stormy Danton. The Girondins dreaded the people who had sent Danton to the Convention ; and they insisted on seeing on his hands the blood of the prison massacres of September. Yet in fact Danton saw~~

~~much more clearly than they saw how urgent it was to soothe the insurrectionary spirit, after it had done the work of aboli- tion which to him, as to them too, seemed necessary and indispensable. Danton discerned what the Girondins lacked the political genius to see, that this control of Paris could only be wisely effected by men who sympathized with the vehemence and energy of Paris, and understood that this vehemence and energy made the only force to which the Convention could look in resisting the Germans on the north-east frontier, and the friends of reaction in the interior. "Paris," he said, "is the natural and constituted centre of free France. It is the centre of light. When Paris shall perish, there will no longer be a republic."~~

~~Danton was among those who voted for the death of the king (January 1793). He had a conspicuous share in the creation of the famous revolutionary tribunal, his aim being to take the weapons away from that disorderly popular vengeance which had done such terrible work in September. When all executive power was conferred upon a Committee of Public Safety, Danton had been one of the nine mem- bers of whom that body was originally composed. He was despatched on frequent missions from the Convention to the republican armies in Belgium, and wherever he went he infused new energy into the work of national liberation. He pressed forward the erection of a system of national education, and he was one of the legislative committee charged with the construction of a new system of govern- ment. He vainly tried to compose the furious dissensions between Girondins and Jacobins. The Girondins were Ir reconcilable, and made Danton the object of deadly attack. He was far too robust in character to lose himself in merely personal enmities, but by the middle of May (1793) he had made up his mind that: the political suppression of the Girondins had become indispensable. The position of the~~

~~country was most alarming. Dumouriez, the victor of Valmy and Jemmappes, had deserted. The French arms were suffering a series of checks and reverses, A royalist rebellion was gaining formidable dimensions in the west. Yet the Convention was wasting time and force in the vindictive recriminations of faction, There is no positive evidence that~~

~~Danton directly instigated the insur- rection of May 3] and June 2, which ended in the purge of the Convention and the proscription of the Girondins, He afterwards spoke of himself as in some sense the author of this revolution, because a little while before, stung by some trait of factious perversity in the Girondins, he had openly cried out in the midst of the Convention, that if he could only find a hundred men, they would resist the oppressive authority of the Girondin Commission of Twelve. At any rate, he certainly acquiesced in the violence of the commune, and he publicly gloried in the expulsion of the men who stood obstinately in the way of a vigorous and concentrated exertion of national power. Danton, unlike the Girondins, accepted the fury of popular passion as an inevitable incident in the work of deliverance. Unlike Billaud de Varennes, or Hébert, or any other of the Terrorist party, he had no wish to use this frightful two- edged weapon more freely than was necessary. Danton, in short, had the instinct of the statesman. His object was to reconcile France with herself; to restore a society that, while emancipated and renewed in every part, should yet be stable ; and above all to secure the independence of his country, both by a resolute defence against the invader, and by such a mixture of vigour with humanity as should reconcile the offended opinion of the rest of Europe. This, so far as we can make it out, was what was in his mind.~~

~~The position of the Mountain had now undergone a com- plete change, In the Constituent Assembly its members did uot number more than 30 out of the 578 of the Third Estate, In the Legislative Assembly they had not been numerous, and none of their chiefs had a seat. In the Convention for the first nine months they had an incessant struggle for their very lives against the Girondins. They were now (June 1793) for the first time in possession of absolute power. It was not easy, however, for men who had for many mouths been nourished on the ideas and stirred to the methods of opposition, all at once to develop the instincts of government. Actual power was in the hands of the two committees—that of Public Safety and of General Security. Both were chosen out of the body of the Convention. The drama of the nine months between the expulsion of the Girondins and the execution of Danton turns upon the struggle of the committee to retain power—first, against the insurrectionary commune of Paris, and second, against the Convention, from which the committees derived an authority that was regularly renewed on the expiry of each short term.~~

*Danton, immediately after the fall of the Girondins, had thrown himself with extraordinary energy into the work to be done. The first task in a great city so agitated by anarchical ferment had been to set up a strong central authority. In this genuinely political task Danton was prominent. He was not a member of the Committee of Public Safety when that body was renewed in the shape that speedily made its name so redoubtable all over the world. This was the result of a self-denying ordinance which he imposed upon himself. It was he who proposed that the powers of the committee should be those of a dictator, and that it should have copious funds at its disposal. In order to keep himself clear of any personal suspicion, he announced his resolution not to belong to the body which he had thus done his best to make supreme in the state. His*position during the autumn of 1793 was*

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that of a powerful supporter and inspirer, from without, of the Government which he had been foremost in setting up. Danton was not a great practical administrator and con- triver, like Carnot, for instance. But he had the gift of raising in all who heard him an heroic spirit of patriotism and fiery devotion, and he had a clear eye and a cool

judgment in the tempestuous emergencies which arose in

such appalling succession. His distinction was that he accepted the insurrectionary forces, instead of blindly denouncing them as the Girondins had done. After these forces had shaken down the throne, and then, by driving away the Girondins, had made room for a vigorous Government, Danton perceived the expediency of making all haste to an orderly state. Energetic prosecution of the war, and gradual conciliation of civil hatreds, had been, as we have said, the two marks of his policy ever since the fall of the monarchy. 'The first of these objects was ful- filled abundantly, partly owing to the energy with which he called for the arming of the whole nation against its enemies. His whole mind was now given to the second of them. But the second of them, alas, was desperate,

It was to no purpose that, both in his own action and in the writings of Camille Desmoulins (Le Vieua Cordelier), of whom he was now and always

~~*the intimate aud inspirer, he worked against the iniquities of the bad men,*~~

~~*like Carrier and Collot d'Herbois in the provinces, and against the severity of the revolutionary tribunal in Paris,*~~

~~*The black flood could not at a word or in an hour subside*~~

~~*from its storm-lashed fury. The commune of Paris was*~~

~~*now composed 'of men like Hébert and Chaumette, to whom the restoration of any sort of political order was for the time indifferent. They wished to push destruction to limits which even the most ardent sympathizers with the Revolu- tion condemn now, and which Danton condemned then, as extravagant and senseless, These men were not politicians, they were fanatics; and Danton, who was every inch a politician, though of a vehement type, had as little in com- mon with them as John Calvin of Geneva had with John of Leyden and the Miinster Anabaptists. The committee watched Hébert and his followers uneasily for many weeks, less perhaps from disapproval of their excesses than from apprehensions of their hostility to the committee's own power. At length the party of the commune proposed to revolt against the Convention and the committees, Then the blow was struck, and the Hébertists were swiftly flung into prison, and thence under the knife of the guillotine (March 24, 1794). The execution of the Hébertists was the first victory of the revolutionary Government over the extreme insurrectionary party. But the committees had no intention to concede anything to their enemies on the other side. If they refused to follow the lead of the anarchists of the commune, they were none the more inclined to give way to the Dantonian policy of clemency. Indeed, such a course would have been their own instant and utter ruin. The Terror was not a policy that could be easily transformed, A new policy would have to be carried out by new men, aud this meant the resumption of power by the Convention, and the death of the Terrorists. In Thermidor 1794 such a revolution did take place, with those very results. But in Germinal, feeling was not ripe. The committees were still too strong to be overthrown. And Danton seems to have shown a singular heedlessness. Instead of striking by vigour in the Convention, he waited to be struck. In these later days a certain discouragement seems to have come over his spirit. His wife had died during his absence on one of his expeditions to the armies ; he had*~~

now married again, and the rumour went that he was allowing domestic happiness to tempt him from the keen incessant vigilance proper to the politician in such a crisis. He must have known that he had enemies. When VI. — 103

the Jacobin club was "purified" in the winter, Danton's name would have been struck out as a moderate, if Robes- pierre had not defended him. The committees had deliber- ated on his arrest soon afterwards, and again it was Robes- pierre who resisted the proposal. Yet though he had been warned of the lightning that was thus playing round his head, Danton did not move. Hither he felt himself power- less, or he rashly despised his enemies, At last Billaud de Varennes, the most prominent spirit of the committee after Robespierre, succeeded in gaining Robespierre over to his designs against Danton. Robespierre was probably actuated by motives of selfish policy, which soon proved the greatest blunder of his life. The Convention, aided by Robespierre and the authority of the committee, assented with ignoble unanimity. On March 30 Danton, Desmoulins, and others of the party were suddenly arrested. Danton displayed such vehemence before the revolutionary tribunal, that his enemies feared lest he should excite the crowd in his favour. The Convention, in one of its worst fits of cowardice, assented to a proposal made by St Just that, if a prisoner showed want of respect for justice, the tribunal might pro- nounce sentence without further delay. Danton was at once condemned, and led, in company with fourteen others, including Camille Desmoulins, to the guillotine (April 5, 1794). "I leave it all in a frightful welter," he said; "not a man of them has an idea of government. Robespierre will follow me; he is dragged down by me. Ah, better be a poor fisherman than meddle with the govern- ment of men!"

Events went as Danton foresaw. The committees presently came to quarrel with the pretensions of Robes- pierre. 'Three months after Danton, Robespierre fell. His assent to the execution of Danton had deprived him of the single great force that might have supported him against the committee. The man who had "saved France from Brunswick" might perhaps have saved her from the White reaction of 1794. (3. Mo.)

~~DANTZIC (or, according to the German form, which is often used, DANnziq), an important seaport of Prussia, the capital of West Prussia, is situated on the left bank of the Vistula, about three miles from its mouth, 253 miles north- east of Berlin, in 54° 21' N, lat. and 18° 41' E. long. In 1875 the inhabitants, most of whom are Protestants, num. bered 98,181. The town is traversed by the Mottlau, a small branch of the Vistula. It ranks as a fortress of the first class, the fortifications including ramparts, bastions, wet ditches, and works for laying the surrounding country under water. 'There is a harbour in the town, but the principal port is at Neufahrwasser, at the mouth of the Vistula.~~

~~Dantzic is entered by four gates, one of which dates from the 16th century, and another from the 17th. The streets are narrow and winding, but in the Langgasse, the chief street, reaching from the Hohe Thor to the Langenmarkt, there are many interesting specimens of ancient architec- ture. The high gables, often elaborately ornamented, give the houses a very picturesque aspect. There are 13 Protestant churches, 5 Catholic churches, and 2 syna- gogues. Of these the most important is St Mary's, one of the largest Protestant churches in existence, begun in 1343, completed in 1503. It possesses a famous painting of the Last Judgment, known as the Dantzic picture, formerly attributed to Jan van Eyck, but probably by Memling. The town hall, founded in 1379, is a fine Gothic structure, the interior of which has recently been restored. Among other noteworthy buildings are the exchange, built in the 14th century, the citadel, built in 1605, and the theatre, of recent date. 'To the west of the town is a suburban dis- trict of considerable extent, with wide, pleasant streets.~~

~~The Government of West Prussia, and a Board of Com- merce and of Admiralty, have their seat in Dantzic. It is~~

~~also a naval station, with docks, magazines, and a marine depét. The educational institutions of the town, besides providing amply for elementary education, include a gymnasium, founded in 1558, two real-schools of the highest class, a commercial academy, a technical school,~~

Plan of Dantzic.

1 Library. 7. Government Buildings. 2. St Bartholomew's Church, 8. St Barbara's Church. 3. St Bridget's Church. 9. Town Hall.

4, St Catherine's Church, 10. Barracks,

5. Old Armoury. 11. New Armoury,

6.

. St Mary's Church.

and a school of navigation. There are a public library, containing 50,000 volumes, a collection of paintings, chiefly modern, and several societies for the promotion of science, art, and literature. The manufacture of arms and artillery is carried on to a large extent, and the imperial and private docks give employment to a great number of work- men. 'The town is still famous for its amber, beer, brandy, and the liqueur known as Danziges Goldwasser ; and its transit trade makes it one of the most important commercial towns in the north of Europe. Its harbours are visited annually by about 2000 sea-going vessels, besides an immense number of smaller craft employed in river naviga- tion. The chief exports are grain, especially wheat, which comes for the most part from Poland and is of excellent quality, and timber. The principal imports are herring, coal, petroleum, salt, and wine. The annual value of the imports by sea is from £2,500,000 to £3,000,000, by river about £2,250,000, by railway from £2,400,000 to £2,750,000 ; that of exports by sea from £2,500,000 to £2,750,000, by river from £750,000 to £1,250,000, by railway about £2,500,000.

History.—The origin of Dantzic is unknown, but it is mentioned in 997 as animportant town. At different times it was held by Pomerania, Poland, Brandenburg, and Denmark, and in 1308 it fell into the hands of the Teutonic knights, under whose rule it long prospered. It was one of the four chief towns of the Hanseatic

Leagite. In 1455, when the Tentonic Order had become thoroughly corrupt, Dantzic shook off its yoke and submitted to the king of Poland, to whom it was formally ceded, along with the whole of West Prussia, at the Peace of Thorn. Although nominally subject to Poland, and represented in the Polish dicts and at the election of Polish kings, it enjoyed the rights of a free city, and governed a considerable territory with more than thirty villages. It suffered severely through various wars of the 17th and 18th centuries, and in 1734, having declared in favour of Stanislas Lesezinski, was besieged and taken by the Russians and Saxons. At the first partition of Poland, in 1772, Dantzic was separated from that king- dom ; and in 1793 it came into the possession of Prussia. In 180 during the war between France and Pussia, it was bombarded and captured by Marshal Leftbvre, who was rewarded with the title of duke of Dantzic ; and at the Peace of Tilsit N apoleon declared it a free town, under the protection of France, Prussia, and Saxony, restoring to it its ancient territory. A French governor, however, remained in it, and by compelling it to submit to the Continental — almost ruined its trade. It was given back to Prussia in DANUBE (German, Donau ; Hungarian, Duna > Latin, Danubius, or Danuvius, and in the lower part of its course, Ister), the largest river of Europe next to the Volga, traversing the southern part of Germany, Austria, Hun- gary, and the northern part of Turkey, and falling into the Black Sea after a course of about 1750 (or, including its windings, 2000) miles, Its basin, which comprises a territory of nearly 300,000 square miles, is bounded by the Black Forest, some of the minor Alpine ranges, the Bohe- mian Forest, and the Carpathian mountains on the north, and by the Alps and the range of the Balkan on the south, The Danube is generally considered to be formed by the union, at Donaueschingen, of the Brigach and the Brege, two mountain streams from the Black Forest ; though a third Stream, originating in a spring in the palace garden of Donaueschingen, at a height of about 2850 feet above the sea, is by some held to be the true source. It seems probable, according to the investigations of Professor Knop of Carlsruhe, that at Immardingen the infant river loses a good part of its waters in the fissures of the soil, and thus gives rise to the Aach, which flows south and joins the Rhine. After passing N.E. through the kingdom of Wiirtemberg and part of Bavaria to Ratisbon, it turns to the S.E., and maintains that direction till it approaches Lintzin Austria. From this town its course is in the main easterly to Hungary, which it enters a little above

Presburg. From Presburg it flows S.E. through the lesser Hungarian plain to its confluence with the Raab, whence it runs E. to Waitzen, At Waitzen it turns S., and flows with a slow current and numerous windings through the greater plain of Hungary for nearly 24 degrees of latitude. After its Junction with the Drave it again takes a general S.E. direc- tion to Orsova, where it leaves the Austrian territories by the famous pass of the Iron Gate, with once formidable rapids. From Orsova, its course is generally S. by E. to Kalafat, thence mostly E. by 8. to Sistova ; it there takes an E, by N. direction to Rassova, then turns N. to Galatz, and finally eastward to the Black Sea. Among its 400 tributaries, of which upwards of 100 are navigable, the principal are—on the right, the Iller, Lech, Iser, Inn, Ens, Raab, Drave, Save, Morava, Timok, Isker, Vid, and Jantra ; and on the left, the Altmiihl, Nab, Regen, March, Waag, Gran, Theiss, Temes, Chyl, Aluta, Jalomnitza, Sereth, and Pruth. The Danube communicates with the Rhine by means of the Ludwigs-Canal, which unites the Altmiihl with the Main, with the Elbe by means of the Moldau and other canals, and with the Theiss, its own tri- butary, by means of the Franzens-Canal. The upper course of the river is regularly frozen over all winter ; and even the lower reaches are usually closed for a considerable period. According to a British consular report in 1873, the river at Galatz during the thirty-seven years from 1837 to 1873 remained open all winter only eight times, namely, in 1839, 1846, 1852, 1853, 1854, 1860, 1867, and 1873;

the date of the complete freezing over varied from Dec. 7 to Feb. 14; and the breaking up of the ice occurred as early as Jan. 18, and as late as March 21. This last event always causes great anxiety to the inhabitants 3 for, if the thaw begins in the upper part of the stream, the waters rush down with tremendous fury, and frequently do incalculable damage. When such a catastrophe is appre- hended, watchmen are stationed on eminences along the banks of the river, to give notice by alarm guns when the ice is broken.

At Ulm the Danube receives the Iller, and thus, at a height of 1400 feet above the sea, becomes navigable for flat-bottomed boats of 100 tons, From Donauwérth to Passau it traverses the Bavarian plain, leaving which it intersects a mountainous region till it reaches Vienna. At Passau it is 800 feet above the level of the sea, and at Vienna 450. From Vienna to the mouth of the Drave it flows through an expanse of plain country, broken only in a

few places, as at Presburg, Buda, and Waitzen. At Isakcha the channel is 1700 feet broad and 50 feet deep. At extreme low water the total current is 70,000 cubic feet per second, at ordinary low water 125,000, at ordi- nary high water 324,000, and during extraordinary flood 1,000,000, and thus, on a general average from the obser- vations of 10 years, 207,000 feet per second. The total amount of alluvium annually carried down by the river is calculated at 67,760,000 cubic feet ; and, according to M. Desjardins, the advance of the coast thus produced during the Christian era is about 9 or 10 miles, About 15 miles below Isakcha the river breaks up into two branches, of which the northern or Kilia branch forms an irregular network of channels on its way to the sea, and, after re- uniting into one, gives rise to a secondary delta with nine or ten arms; while the southern or Tultcha branch sub- divides before long into the central or Sulina branch and the southmost or St George's. The delta thus formed com- prises an area of about 1000 square miles, almost totally destitute of cultivation, and broken in all directions by swamps and fresh-water lakes. Of the total burden of the river it was calculated in 1857 that the Kilia branch carried down seventeen twenty-sevenths, the Sulina branch two twenty-sevenths, and the St George's eight twenty- sevenths; but since that date the Tultcha St George's branch has grown shallower, and the volume of the Kilia has increased to about eighteen twenty-sevenths, or two- thirds of the whole discharge,

In the course of the present century a good deal has been done to render the Danube more available as a means of communication, In 1816 Austria and Bavaria made ar- rangements for the common utilization of the river ; and since then both Governments have been liberal in their outlays for its improvement. In 1830 steam-boats were introduced between Vienna and Pesth, under the en- couragement of Count Szechenyi, a steam-boat company having been started in 1828 by two Englishmen, Andrews and Prichard. In 1834 the boats descended as far as Orsova, and in 1835 they began to reach Galatz. About the same time the draining of the Donaumoos, between Neuburg and Ingolstadt, which had been commenced in 1791, was successfully prosecuted. In 1844 the Ludwigs- Canal was completed at a cost of 400,860,000 dollars ; and in 1845 and 1853 the removal of the rocks which still, in spite of the labours of Joseph II., obstructed the river below Grein was finally achieved. In 1866 an imperial commission was

established for the rectification of the river bed in the neighbourhood of Vienna ; and the proposal to construct a new channel, supported by the engineers Abernethy and Sexauer, was ultimately chosen as the most promising scheme. In terms of the Peace of Paris, March 1856, the river not only was placed under

the protection of international law, and declared free to tbe ships of all nations, but a commission was constituted in November of that year for the purpose of putting the deltaic portion in the best possible state for navigation. It took the title of 'European Commission of the Danube," and consisted of the following representatives of the seven powers who had signed the treaty :—the Chevalier de Becke for Austria, Major Stokes, R.E., for England, Mon- sieur Engelhardt for France, Herr Bitter for Prussia, Baron d'Offenburg for Russia, the Marquis d'Aste for Sar- dinia, and Omar Fetzi Pasha for Turkey. Sir Charles Hartley was appointed engineer-in-chief. The commission fixed its seat at Galatz, and began its labours by estab- lishing an engineering factory and depét at Tultcha, and constructing a telegraph line between Sulina, Tultcha, and Galatz ; but, after a discussion which lasted from Decem- ber 1857 to April 1858, the delegates could not come to an agreement in regard to the relative claims of the St George's and the Sulina mouths, and had to refer the question to their respective Governments.

DAN=DAWN

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scheme) ; Sir C. A. Hartley, Description of the Delta of the Danube, 1874 ; Carte du Danube entre Braila ef la Mer, Leipsic, 1874, published by the European Commission ; Peters, Die Donau und thr Gebiet, 1876. (H. A. W.)

DANVERS, a town of the United States, in the county of Essex, in Massachusetts, about two miles from Salem and fifteen miles N.N.E. of Boston, with which it is con- nected by rail. The principal industry is the manufacture of boots and shoes, which employs a large proportion of the inhabitants, and annually puts into the market upwards of a million pairs; there are also brickyards, tanneries, and a carpet factory. The most interesting building ig the Peabody Institute, with its library and art-collections, founded in 1852 by George Peabody, the philanthropist, who was born at Danvers in 1795. Population in 1870,

5600.

DANVILLE, a town of the United States, the admin- istrative centre of Montour county, Pennsylvania, is situated on the north branch of the Susquehanna river, fifty miles north-east of Harrisburg. 'To its position in the neighbourhood of Montour Ridge, with its abundant supplies of iron-ore, anthracite, and limestone, it owes its prosperity as one of the principal seats of the iron trade, The railroad iron of the Montour Iron Works is specially celebrated. The town was founded about 1780. Its popu- lation in 1870 was 8436.

DANVILLE, a city of the United States, the adminis- trative seat of Vermilion county, Illinois, on the Vermilion river, a tributary of the Wabash, about 125 miles south of Chicago. Situated in a rich and populous district, in the vicinity of an extensive coal-field, and well supplied with building materials and water, it forms a flourishing manu- facturing centre with foundries, waggon works, locomotive works, and various other industrial establishments. It was founded in 1828, and in 1873 had about 7000 inhabitants,

D'ANVILLE, Jean Baptiste Bourcuianon (1697- 1782), a French geographer of the highest eminence, was born at Paris on the 11th July 1697. His passion for geographical research displayed itself from his earliest years. At the age of twelve, while reading the Latin authors at

~~*college, he amused himself with drawing maps of the countries which they described. While he was thus busily employing himself one day in the class, his master observed and was about to punish him ; but upon casting*~~

~~*his eye upon the performance, he immediately judged him*~~

~~*to be deserving rather of encouragement. After leaving college he derived much instruction from intercourse with the Abbé Longuerue, the celebrated antiquarian. D'Anville from this time devoted himself entirely to geography, particularly that of the ancient world. His first map, that of Ancient Greece, was published when he was fifteen, and at the age of twenty-two he was appointed one of the king's geographers, and began to delineate maps which attracted the attention of the most eminent authorities.*~~

~~*The course of study on which D'Anville entered was of great extent. Works professedly geographical formed the least part of it; those of all the ancient and modern historians, travellers, narrators of every description, were assiduously examined. He studied also the philosophers, orators, and poets, but only for the sake of the occas*~~

~~*PAP = py AR*~~

~~*sional geographical lights which they afforded, for it was remarked that in perusing their works he was totally indifferent to everything which did not tend to fix a geographical position. The object of this immense labour was to effect a complete reform in the science of geography by banishing the system of copying blindly from preceding maps, and never fixing a single position without a careful examination of all the authorities upon which it rested. By this process he detected many serious errors in the works of his most celebrated predecessors, while his own accuracy was soon attested on all sides by the travellers and mariners who had taken his works as their guide. His principles led him also to another innovation, which was that of omitting every name for which there existed no sufficient authority. Vast spaces, which had before been covered with countries and cities, were thus suddenly reduced to a perfect blank; but it was speedily perceived that this was the only accurate course, and that the defect lay in the science, not in the geographer.*~~

D'Anville was at first employed in the humbler task of illustrating by maps the works of different travellers, such as Marchais, Charlevoix, Labat, and Duhalde. For the history of China by the last-named writer he was employed to make an atlas, which was published by itself at the Hague in 1737, The question respecting the figure of the earth coming to be much agitated, he published in 1735 and 1736 two treatises, with a view to illustrate it. But this attempt to solve a geometrical problem by historical materials was eminently unsuccessful. Maupertuis having gone to measure a degree within the polar circle, the result was found directly opposite to D'Anville's prediction. Any loss of reputation which this failure might have occasioned was completely retrieved by his map of Italy, published in 1743, It was marked by a method of investigation often employed by D'Anville with peculiar success, which con- sisted in the application of ancient materials to correct the existing geography. By the diligent study of the Latin authors he was enabled to trace numerous errors which had crept into the delineation of that country, A trigono- metrical survey which Pope Benedict XIV. almost immediately after caused to be made in the States of the Church confirmed, in a surprizing degree, all these altera- tions, On this occasion he first set the example of accompanying the map with a memoir exhibiting the data on which it had been constructed.

He now applied himself to ancient geography, always his favourite department, the aspect of which, under his hands, was soon completely changed, He illustrated succes- sively, by maps, all the countries known to the ancients, among which Egypt attracted his peculiar attention. To render these labours more extensively useful, he published in 1768 his Géographie Ancienne Abrégée, of which an English translation, entitled Compendium of Ancient Geography, appeared in 1791. His attention was finally turned to the Middle Ages, which were illustrated by his Etats formés en Hurope apres la Chute de 0 Empire Romain en Occident (1771), and by some other works equally learned. Entirely devoted to geographical inquiries, the appearance of his successive publications formed the only events by which his life was diversified. From causes which are not explained, he was late in being admitted into the literary societies. In 1754, at the age of sixty, he became a member of the Academy of Inscriptious and Belles Lettres, whose transactions he enriched with many papers. In 1775 he received the only place in the Academy of Sciences which is allotted to geography ; and in

the same year he was appointed, without solicitation, first geographer to the king. But these honours came too late to gladden a life which was now drawing to its utmost verge. His last employment consisted in arranging his

his life,

imbecility both of mind and body, which continued for two years, and ended only with his death in J anuary 1782.

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collection of maps, plans, and geographical materials. It was the most extensive in Europe, and had been purchased by the king, who, however, left him the use of it during This task performed, he sunk into a total

D'Anville's published memoirs and dissertations amounted to 78, and his maps to 211. Acomplete edition of his works was an- nounced in 1806 by De Manne in 6 vols, quarto, only two of which had appeared when the editor died in 1832. See Dacier's Eloge de D' Anville (Paris, 1802).

DAPHNE, in Greek mythology, was the daughter of a river-god, usually the Arcadian Ladon, sometimes the Thessalian Peneus, her mother being Gea, the goddess of the earth. As usual with nymphs of springs or rivers she was pursued by lovers,—first by Leucippus, a son of Cinomaus, who disguised himself ag a girl to be able to follow her better, but was discovered and killed by the nymphs with Daphne, and secondly by Apollo, from whom she escaped, being transformed into a laurel tree (Sadvy).

DAPHNEPHORIA, a festival held every nine years at Thebes, in Beeotia, in honour of Apollo, consisting of a procession in which the chief figure was a boy chosen on each occasion for his beauty and strength, who at the same time was of a good family and had both parents alive. He was styled Daphnephoros, "Jaurel-bearer." In front of him walked one of his nearest relatives, carrying an olive branch hung with laurel and flowers and having on the upper end a bronze ball from which hung several smaller balls. Another smaller ball was placed on the middle of the branch or pole, which was then twined round with purple ribbons, and at the lower end with saffron ribbons. 'hese balls were said to indicate the sun, stars, and moon,

while tho ribbons referred to the days of the year, being 365 in num- ber. This object was called the Kopo. The Daphnephorus, wearing a golden crown, or, as Pausanias (ix. 10, 4) says, a wreath of laurel, richly dressed and partly holding the Kopo, was followed by a chorus of maidens carrying sup- pliant branches and singing a hymn to the god. The Daphnephoros dedicated a bronze tripod in the temple of Apollo, and Pausanias (/oc. cit.) mentions the tripod dedi- cated there by Amphitryon when his son Hercules had been Daphnephoros.

DARABJIRD, or DaRaB-GHERA, a city of Persia in the province of Farsistan, 140 miles south-east of Shiraz. It is situated in a very fertile district at the foot of mountains, and is embellished by luxuriant orchards of orange, lemon, and date trees. Though greatly fallen from its former prosperity, it is still one of the most important cities of the province. Its name signifies the city or residence of Darius, and by Von Hammer it was identified with the ancient Pasargadz. In the neighbourhood there are various remains of antiquity, the most important of which, 34 miles to the south, is known as the Khaleh-Dardb, or citadel of Darius, and consists of a series of earthworks arranged in a circle round an isolated rock, N othing remains, however, to fix the date or explain the history of the fortification. Another monument of the vicinity is a gigantic bas-relief carved on the vertical face of a tock, apparently representing the victory of Sapor I. of Persia over the Emperor Valerian. A full description of both will be found in Flandin, Voyage en Perse, vol. ii.

DARANG. See Durana.

D'ARBLAY, Mapamz (1752-1840). Frances Burney, daughter of Charles Burney, D.Mus., was born at Lynn Regis, in Norfolk, 1752. Her mother was a Miss Esther Sleepe, distantly of French descent. In 1760 the Burneys moved to London ; and in 1761 Mrs Burney died, leaving six children, of whom Fanny, the third, was but nine years old. Her sisters were sent to school, but she, as she tells

us herself, 'never was placed in any seminary, and never was put under any governess or instructor whatsoever." At ten years old she had taught herself

~~to read and write, and became an incessant scribbler both of prose and verse, and ardently fond of reading. Six years after his wife's death Dr Burney married again ; and from her fifteenth year onwards Fanny lived in the midst of an exceptionally brilliant social circle, gathered round her father in his house in St Martin's Street, Leicester Fields, which included the chief musicians, actors, and literary men of the day, and not a few of his aristocratic patrons. Her father's drawing-room was in fact Fanny's only school, and not a bad one. Her stepmother, although a spirited and sensible woman, did not encourage Fanny's habits of scribbling, which she considered dangerously unfeminine. Fanny, therefore, when she was fifteen, solemnly burnt all her manuscripts,—among them The History of Caroline Livelyn, a story of which her first published novel, Hvelina, was the sequel. At the same time she began her famous Diary, which extended over seventy-two years of her life. She was not much more than fifteen when she planned the story of "velina ; but it was not written till some years later, and was not published till the year 1778, when its authoress was six-and-twenty. Having, she tells us, an "'odd inclination" to see her work in print, she confided her secret to her sisters, copied out part of her manuscript in a feigned hand, and persuaded her younger brother Charles to be her agent with the booksellers, the interviews being held at a cotfee-house in the evening, and young Charles being disguised in a big cloak and hat for the purpose. Dodsley refused her MS. as anonymous, but Lowndes, after its completion, accepted it, and gave her £20 for it. Dr Burney was told of what was going on, and good-naturedly favoured his daughter's whim, without so much as asking the name of her book. velina, or a Young Lady's Entrance into the World, was therefore published quite clandestinely, and Miss Burney herself knew the; event only through an advertisement in the papers ; while it had been six months in print, and had been reviewed and praised everywhere, before her father held the three little volumes in his own hand. Dr Burney proudly told Mrs Thrale the secret of the authorship, and Miss Burney was at once taken to Streatham, and admitted into a coterie of which Johnson was the great centre. Her fame spread. Johnson had declared that there were passages in Lvelina which might do honour to Richardson ; Sir Joshua Reynolds could not be persuaded to eat till he had finished the story; and Burke had sat up all night to read it. Miss Burney was introduced to Mrs Montagu and the Bas-bleus, to Sheridan, who wanted her to write for the stage, and to her special admirers Mrs Cholmondely and the beautiful Mrs~~

~~Bunbury. But the chief feature in her early literary life was Dr Johnson's friendship for her, which excited the jealousy of Boswell, and ended only with Johnson's death. 'The second story, Cecilia, or Memoirs of an Heiress, in five volumes, 1782, greatly increased her popularity, and brought her a letter from Burke, in which he said, "In an age distinguished by having produced extraordinary women, I hardly dare to tell you where my opinion would place you amongst them." In 1786, through the influence of the good old Mrs Delany, known as the correspondent of Swift and Young, Miss Burney obtained the post of second keeper of the robes to Queen Charlotte, consort of George III., with a salary of £200. For five years (from her thirty-fourth to her thirty-ninth year) it was her duty to attend at the Queen's daily totlettes, to take care of her lap-dog and her snuff-box, to read to her now and then, and to preside over the tea- table of the equerries. Her Diary and Letters of this time~~

~~abound in amusing court gossip ; but the post was an uncon-~~

~~DAR—DAR~~

~~genial one, jand she resigaed it in 1791 on account of ill. health. The queen allowed her a pension of £100 a year, the king saying, "It is but her due ; she has given up five years of her pen." In1793 Miss Burney became the wife of M. D'Arblay, a French officer of artillery, who, with Madame de Staél, Talleyrand, and other refugees, lived at "Juniper Hall," Dorking. In the same year she published a pamphlet on the emigrant French clergy. Her only child, afterwards the Rev. A. D'Arblay, was born in 1794; and in 1795 appeared her third novel, Camilla, or a Picture of Youth, in five vols. This book was published by subscrip- tion, aud brought her more than £3000. From 1802 to 1812 Madame D'Arblay was in France with her husband and son, and in 1814 she published Zhe Wanderer, or Hemale Difficulties, another five-volumed story, a compara- tive failure, though at the time it realized £1500. Madame D'Arblay was in France and Belgium through the war 1814-15, her husband having regained the post of maréchal de camp, which he had formerly held under Louis XVI. They returned to England, and General D'Arblay died at Bath in 1818.~~

~~In Sir Walter Scott's diary for November 18, 1826, he describes his being taken to see Madame D'Arblay by Mr Rogers, and says, "I have been~~

~~introduced to Madame D'Arblay, the celebrated authoress of Hvelina and Cecilia, —an elderly lady with no remains of personal beauty, but with a simple and gentle manner, and pleasing expression of countenance, and apparently quick feelings." In 1832, when she was eighty years of age, Madame D'Arblay pub- lished the memoirs of her father, who died in 1814. This book, the rambling recollections of an old lady, is full of imperfections and extraordinary affectations of style. Madame D'Arblay died at Bath, 1840, aged eighty-eight, and her Journal and Letters were edited by her niece, and published in seven volumes, 1842-6.~~

~~Madame D'Arblay was not remarkable for personal beauty. She was small, retiring, and rather prudish, delight- ing to be lionized, while she dreaded nothing more than to be thought unfeminine or eccentric. Her style in writing was considered remarkable for its sprightliness and humour. Some of her most vivid characters were extremely popular. "You are a perfect Dranghton," exclaimed Dr Johnson when Boswell was about to quit Mrs Thrale's table before the guests had finished eating. And Miss Burney tells us how '"'the Doctor" was one day seen laughing to himself, and suddenly turned to her, quoting from Zvelina, with " Only think, Polly, Miss has danced with a lord!" Her best character sketches and most spirited dialogues are, however, to be found, not in her novels, but in her Journal and Letters. The drawback of everything which she wrote of an autobiographic kind was her painful self-conscious- ness and astounding egotism. It was her great ambition to write for the stage. She made three attempts to write a play; and her tragedy, entitled Hdwy and Ligiva, was acted by Mrs Siddons and Kemble at Drury Lane in 1799, but had to be withdrawn as a failure, and was never printed. F, M.)~~

~~DARBOY, Grorces (1813-1871), archbishop of Paris, was born at Fayl-Billot in Haut Marne on the 16th January 1813. He studied with distinction at the seminary at Langres, and was ordained priest in 1836. After filling a charge at St Dizier, near Vassy, he was appointed in 1839 professor of philosophy at Langres, and in 1841 he was transferred to the chair of dogmatics. A change in the direction of the seminary caused him to leave for Paris, where in 1846 he was appointed almoner of the college of Henry IV. and honorary canon of Notre Dame. The confidence thus shown in him~~

~~by Archbishop Affre was continued by Archbishop Sibour, who appointed him editor of the Moniteus Catholique. In November 1854 the~~

~~archbishop took Darboy with him to Rome and presented him to the Pope, who gave him the rank of protonotary apostolic. In 1855 he became titular vicar-general of Paris, and inspector of religious instruction in the various schools of the diocese. He was appointed bishop of Nancy in 1859, and in January 1863 he was raised to the arch- bishopric of Paris. The favour of the court was indicated by his appointment to the post of grand almoner to the emperor in 1866, and to that of grand officer to the Legion of Honour in 1868. The archbishop was a strennous upholder of episcopal independence in the Gallican sense, and involved himself in a controversy with Rome by his endeavours to suppress the jurisdiction of the Jesuits and other religious orders within his diocese. At the Vatican Council he vigorously maintained the rights of the bishops, and offered a decided opposition to the infallibility dogma, against which he voted as inopportune. When the dogma had been finally adopted, however, he was one of the first to set the example of submission. Immediately after his return to Paris the war with Prussia broke out, and his conduct during the disastrous year that followed was inarked by a devoted heroism which has secured for him an enduring fame. He was active in organizing relief for the wounded at the commencement of the war, remained bravely at his post during the seige, and refused to seek safety by flight during the brief triumph of the commune. On the 4th April 1871 he was arrested by the communists as a hostage, and confined in the prison at Mazas, from which he was transferred to La Roquette on the advance of the army of Versailles. On the 27th May he was shot within the prison along with several other distinguished hostages. He died in the attitude of blessing and uttering words of forgiveness. His body was recovered with difficulty, and having been embalmed was buried with imposing ceremony at the public expense on the 7th June. It is a noteworthy fact that Darboy was the third arch- bishop of Paris who perished by violence in the period between 1848 and 1871. Darboy was the author of a number of works, of which the most important are a Vie de St Thomas Becket (1859), a translation of the works of St Denis the Areopagite, and a translation of the Imitation of Christ.~~

DARDANELLES, the ancient Hellespont, and in Turkish Bahr-Sefed Boghasi, the strait uniting the Sea of Marmora with the Agean, so called from the two castles by which the narrowest part is protected, and which pre- serve the name of the city of Dardanus in the Troad, famous for the treaty between Sulla and Mithridates in 84 B.c. Its shores are formed by the peninsula of Gallipoli on the N.W. and by the mainland of Asia Minor on the S.E. ; and it extends for a distance of about 47 miles with an average breadth of 3 or 4 miles. At the ffigean ex- tremity stand the castles of Sedil Bahr and Kum Kaleh, the former in Europe and the latter in Asia 3 and near the Marmora extremity are situated the important town of Gallipoli (Kallipolis) on the northern side, and the les3 im- portant though equally famous Lamsaki, or Lampsacus, on the southern. The two castles of the Dardanelles par ex- cellence are Chanak-Kalesi, Sultanieh-Kalesi, or the Old Castle of Anatolia, and Kilid-Bahr, or the Old Castle of Rumelia, which were long but erroneously identified with Sestos and Abydos, now located farther to the north. The strait of the Dardanelles is famous in history for the pas- sage of Xerxes by means of a bridge of boats, and for the similar exploit on the part of Alexander. Nor is its name less widely known from the story of Hero and Leander, and from Lord Byron's successful attempt to rival the ancient swimmer. The passage of the strait is easily defended, but in 1807 the English Admiral Duckworth made his way past all the fortresses into the Sea of Marmora.

In terms of the treaty of July 1841, confirmed by the Paris peace of 1856, no foreign ship of war may enter the strait except by Turkish permission, and even merchant vessels are only allowed to pass the castle of Chanak-Kalesi during the day. For details regarding the currents of the Dar- danelles, see Buack SEA, vol. iil. p. 797,

Greek mythology, is said to have crossed over from Samothrace to the Troad by swimming on an inflated skin, and to have there founded the kingdom of Dardania previous to the existence of Troy. Apparently this was invented to account for the existence in the Troad of a worship of the Cabiri similar to that of Samothrace, Dardanus is called a son of Zeus and the

~~Pleiad Electra, and in the Jliad (xx. 304) Zeus is said to have loved him more than his other sons,~~

~~DARES, a Trojan priest of Hepheestus, who lived at the time of the Trojan war, and to whom was attributed an ancient account of that war which was extant in the time of Alian. A work in Latin, purporting to be a translation of this account, and entitled Daretés Phrygit de Excidio Troje Historia, was much read in the Middle Ages, and was then ascribed to Cornelius Nepos ; but the language is extremely corrupt, and it belongs to a period much later than the time of Nepos. It ig commonly published together with the work of Dictys Cretensis, See the edi- tion (which has an essay upon Dares) by A. Dederich, who is inclined to ascribe the work to a Roman of the 5th, 6th, or 7th century (Bonn, 1837).~~

~~DARFUR, or Darror, 2, the land of the Fur or For, a country of the Soudan in Africa, formerly an independent kingdom, but in 1874 conquered and incorporated by Egypt. It extends from 9° to 16° N, lat., and from 22° 30' to 28° 30' E. long, thus including an area of about 105,000 square miles, with a population roughly estimated at four millions. On the W. it would be conterminous with Wadai were it not for a strip of independent territory; on the N. it passes off into the desert of Sahara ; on the FE. it is separated from Kordofan by a barren steppe; and on the S. it is bounded by Darfertit and several petty states,~~

~~The centre of the country is occupied by the Marra Moun- tains, which lift. their granite peaks to a height of 3500 or 4000 feet, and extend about 180 miles from north to south, with an average breadth of 70 miles. The northern portion of the range is also known as the Kerakeri Moun- tains, on account of the huge boulders with which their flanks are strewn; the southern portion turns to the west and takes the name of Jebel Zerlai. On all sides this mountain-mass is channelled by numerous wadis, which for the most part dry up in the hot season, but in many cases measure from 200 to 300 paces in breadth. Of these the most important (as the Sunot, and the Azum, with their numerous affluents) have a south-west direction, and ultimately contribute their waters to the Bahar-es-Salaiat, which passes westward through Wadai. Some of those that rise in the eastern slopes seem~~

~~to find their way to the Bahr-el-Arab ; but the greater number are absorbed or stop short in their course.~~

~~The climate, except in the south, where the rains are unusually heavy and the soil isa damp clay, is regarded as healthy. The rainy season lasts for three months, from the middle of June to the middle of September. In the neighbourhood of the wadis the vegetation is fairly rich, but elsewhere it is rather scant and steppelike. The prevailing trees are the acacias—more particularly the hazara and the Acacia nilotica—the hachub, the sayal, the kittir, the hommed, the jakjak, and the makhit ; while the sycamore, the ochar, the hadjlidj, and, in the Marra Mountains, the Zuphorbia candelabrum are also to be found. In the highlands the culture of wheat, elsewhere so rare in Central Africa, is pretty extensive 3 but doukhn~~

~~(Penicillaria) and durra are the usual cereals. In the south | principles essentially different from those of the Koran. His grand-~~

~~and west onions, pepper, bananas, citrons, and various fruits are grown freely; and in several places an indi- genous kind of tobacco of great strength is cultivated. The deleb palm is abundant in the south, and on the eastern frontiers the monkey-bread or baobab compensates for the deficiency of water.~~

~~Copper is obtained in sufficient quantity to make ita matter of export ; antimony was worked in the time of Mohammed-el-Fadhl ; lead occurs in Gebel Kuttum in the Dar el Gharb; iron is wrought in the south-west province; and. deposits of rock-salt are met with in various places.~~

~~Cattle, sheep, and camels are both numerous and of excellent breeds. Horses are comparatively rare ; and, with the exception of those imported from Dongola, they belong to a small but sturdy native race, The elephant has been exterminated ; but the ostrich is common in the east in the country of the Hamr Arabs.~~

~~The population of Darfur is of very varied origin. The Fur occupy the central highlands and part of the Dar Dima and Dar Uma districts, speak a~~

special language, and are subdivided into numerous tribes, of which the most influential are the Dugunga, the Kanjara, and the Kera. They are of middle height, have rather irregular features, and display a disagreeable character. Dr Nachtigal found them proud, treacherous, and very ill-disposed to strangers ; but it must be remembered that he had to encounter not only the religious antipathy of Mahometan bigotry against a Christian, but also the political antipathy of irritated national feeling against a supposed Egyptian. The Mas- sabdt are a tribe which, breaking off from the Fur some centuries back, are now largely mingled with Arab blood, and use the Arabic language ; while, on the contrary, the Tunjur are an Arab tribe which must have arrived in the Soudan at a very early date, as it has incorporated a large Furian element, and no longer professes Mahometanism. The Dadjo formerly inhabited Mount Marra, but they have been driven to the south and west, where they maintain a certain independence in Dar Sula, but are treated as inferiors by the Fur. The Zoghawa, who inhabit the northern borders, are on the contrary regarded by the Fur as their equals, and have all the prestige of a race that at one time made its influeuce felt as far as Boruu. As holding a less important place in the popula- tion may be mentioned the Berti, the Birgirid, the Beraunas, the Fellatas, the Jellabas, and immigrants from Wadai, Baghirmi, &c. Genuine Arab tribes are numerous, and they are partly nomadic and partly fixed. The country was divided under the "Sultan" into the five provinces of Dar Tokofiavi or the northern province, Dar Dali or the eastern, Dar Uma or the southern, Dar Dima or the south-western, and Dar el Gharb or the western, each governed by a separate chief with the exception of the last, which stood directly under the authority of the king. Each province was subdivided into so many departments, and each department was under the control of a shertaya (plural, sherati). The central district of the Marra Mountains, called Dar Torra, was under a special shertaya, dependent on the king; and the western slopes, which form the most fertile tract in the whole country, belonged to the king and the members of the royal family. The most important towns are Kobe and Kabkabia, on the caravan-route across the north of the country.

History.—Of the Dadjo dynasty, which appears to have been dominant in the Marra mountains, no history has been left except a list of royal names. Next succceeded the Tunjur dynasty— Ahmed-el-Magur, Saref, Kuni, Baté,

Rufa'a, and Shaou. From the marriage of Rufa'a with the daughter of the chief of the Kera tribe sprang Dali or Dalil, who founded the Furian kingdom, divided the country into provinces, and established'a penal code, which, under the title of Kitab Dali or Dali's Book, is still preserved, and shows

son Soleiman (usually distinguished by the Furian epithet Solon, the Arab or the Red) reigned from 1596 to 1637, and was a great warrior and a devoted Mussulman. Soleiman's grandson Ahmed Bokr (1682-1722) made Islam the religion of the state, and increased the prosperity of the country by encouraging immigration from Bornu and Baghirmi. His'rule extended as far east as the Nile, or even to the banks of the Atbara. The next occupant of the throne, Daura or Darut, is infamous for his cruelty; and the capture of his suc- cessor Omer Lele during a war with Wadai saved the country from an equally detestable tyrant. Abu-el-Ghassem, the next monarch, wag lost in a battle against the same enemy, and when after a time he reappeared amougst his people, he was put to death by Mohammed Tirab, who had meanwhile ascended the throne. Abd-er-Rahman, surnamed el-Raschid or the Just, a poor priest of great learning and piety, was chosen king instead of 'Tirab's son Ishaga, and though revengeful and fond of intrigue, he proved himself on the whole not unworthy of the choice. It was during his reign that Napoleon was campaigning in Egypt; and the European potentate responded in 1799 to the congratulatory address of his barbarian ally by an order for the despatch of 2000 black slaves upwards of 16 years old, strong and vigorous. To Abd-er-Rahman likewise is due the

resent situation of the Fasher, or royal towuship, near the Rahat lor Lake) Tendelti. Mahommed-el-Fadhl, his son, was for some time under the control of an energetic eunuch, Mahommed Kurra ;

but he ultimately made hiniself independent, and his reign lasted till

1839, when he died of leprosy, leaving behind him the fame of a violent and blood-thirsty tyrant, who had been disgraced by the loss of the important province of Kordofan, Of his 40 sons the third, Mahommed Hassin, was appointed his successor. He is described as a religious but avaricious man. The chief events of his reign were his fourteen expeditions against the Razagat Arabs, the whole result of which was that the last years of his life

~~were spent in fairly peaceful terms with that restless tribe. He died in 18738, blind and advanced in years, and the succession passed to his youngest son Brahim, who soon found himself engaged in a conflict with Egypt, which resulted in the destruction of the king. dom. He was slain in the battle of Menovatchi, in the autumn of 1874, and his uncle Hassab Alla, who sought to maintain himself, was captured in 1875 by,the troops of the Khedive, and removed to Cairo with his family.~~

~~Exploration.—The first European traveller who visited Darfur was James Browne, who spent two years at Kobeyh or Cobbe, at that time the capital. The next addition to our knowledge was due to the Sheikh Mahommed-el-Tounsy, who travelled in 1803 through the north of Africa in search of Omar, his father, and afterwards gave to the world an account of his wanderings,twhich was trans- lated into French in 1845 by M. Perron. Dr Nachtigal in 1873 spent some months at Tendelti; and since the incorporation with~~

~~gypt, the country has been reconnoitred by Purdy and other Egyptian generals.~~

~~See Count D'Escayrac de Lauture, Notice sur le Darfur, 1859; Nachtigal's communications to the Bulletin de la Société de Géographie, March 1846, and to Petermann's Afitthetlungen, 1875; Behm''s Geographisches Jahrbuch, 1876.~~

~~DARIEN, a district of South America, of special interest in the history of geographical discovery, which gives its name to the great inlet of the Colombian coast otherwise known as the Gulf of Uraba, and to the great neck of land more familiarly designated the Isthmus of Panama. It was first reconnoitred in the first year of the 16th century by Rodrigo Bastidas of Seville ; and the first settlement was Santa Maria del Antigua, situated on the small Darien river, north-west of the mouth of the Atrato. In 1513 Vasco Nufiez Balboa stood " silent upon a peak in Darien, " and saw the Pacific at his feet stretching inland in the Gulf of San Miguel ; and ever since that date this narrow stretch of terra-firma has alternately seemed to prof- fer and refuse a means of transit between the two oceans. The first serious attempt to turn the isthmus to permanent account as a trade-route dates from the beginning of the 18th century, and forms an interesting chapter in~~

Scottish history. In 1695 an Act was passed by the Scottish Par- liament for a company trading to Africa and the Indies ; and this company, under the advice of one of the most re- markable economists of the period,—William Paterson, a Scotchman, and the founder of the Bank of England,—determined to establish a colony on the Isthmus of Darien as a general emporium for the commerce of all the nations of the world. The project was taken up in Scotland with the enthusiasm of national rivalry towards England, and

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the "subscriptions sucked up all the money in the country." On the 26th of July 1698 the pioneers set sail from Leith amid the cheers of an almost envious multitude ; and on the 4th of November, with the loss of only fifteen out of 12,000 men, they arrived at Darien, and took up their quarters in a well-defended spot, with a good harbour and excellent outlook. The country they named New Cale- donia, and two sites selected for future cities were desig- nated respectively New Edinburgh and New St Andrews, At first all seemed to go well; but by and by lack of provisions, sickness, and anarchy reduced the settlers to the most miserable plight; and in June 1699 they re-embarked in three vessels, a weak and hopeless company, to sail whithersoever Providence might direct. Mean- while a supplementary expedition had been prepared in Scotland ; two vessels were dispatched in May, and four others followed in August. But this venture proved even more unfortunate than the former. The colonists arrived broken in health; their spirits were crushed by the fate of their predecessors, and embittered by the harsh fanati- cism of the four ministers whom the General Assembly of the Church of Scotland had sent out to establish a regular presbyterial organization, The last addition to the settle- ment was the company of Captain Campbell of Finab, who arrived only to learn that a Spanish force of 1500 or 1600 men lay encamped at Tubacanti, on the River Santa Maria, waiting for the appearance of a Spanish squadron in order to make a combined attack on the fort. Captain Campbell, on the second day after his arrival, marched with 200 men across the isthmus to Tubacanti, stormed the camp in the night-time, and dispersed the Spanish force. On his return to the fort on the fifth day he found it besieged by the Spaniards from the men-of-war; and, after a vain attempt to maintain its defence, he succeeded with

~~a few companions in making his escape in a small vessel. A capitulation followed, and the Darien colony was no more. Of those who had taken part in the enterprize only a miserable handful ever reached their native land.~~

~~See J. H. Burton, The Darien Papers (Bannatyne Club, 1849), and History of Scotland, vol. viii., also the article "CANAL," vol. iv. pp. 793-4,~~

~~DARIUS I., the son of Hystaspes, was the true consoli- dator of the Persian empire. His administrative ability founded a new type of government, and organized the crude mass of conquered states bequeathed him by his predeces- sors. His military talents, though considerable, have been thrown into the shade by his legislative and financial ones. The originator of imperial centralization and unity, the inventor of a well-regulated system of taxation, and the introducer of an alphabetic system of writing, he found a half-dissolved amalgamation of discordant populations on his accession, and left a firmly-welded empire at his death.~~

~~In the great inscription on the rock of Behistun, where he has recorded his struggles and victories, Darius traces his descent from Achzemenes, through four ancestors all kings like himself. He seems to have stood next to the line of Cyrus in succession to the throne ; and Cyrus, when setting out on his campaign against the Massagete, already suspected him of aiming at the crown. He accompanied Cambyses to Egypt, but was recalled by his father to the capital at the time the conspiracy was being formed against the Magian usurper Gomates, who professed to be Bardes (Smerdis in Herodotus), the brother of Cambyses. With six other Persian nobles Darius succeeded in over- throwing the Magian usurpation, and pursued the pseudo- Smerdis to Sikhyuvatis, a fortress in Niswa, where he was put to death, April 2,521 8.0. The friends of Gomates were massacred, the yearly festival of the Magophonia instituted, and the religion of Zoroaster, which had been suppressed in favour of the idolatrous worship of the~~

~~Turanian (as opposed to the Aryan) Medes, was solemnly restored. Darius, now twenty-eight years old, was pro- claimed king.~~

The first six years of his reign were occupied in sup- pressing the revolts which broke out throughout the empire, occasioned partly, perhaps, by the zeal with which the new monarch maintained the Zoroastrian faith, and which led him to look with special favour on the monotheistic Jews. Pretender after pretender appeared—Atrines and after- wards Martes, in Susiania ; N idintabel, who called himself Nebuchadrezzar son of N: abonidus, in Babylonia; Phraortes, who claimed to be Xathrites son of Cyaxares, in Media and Parthia; Tritantachmes, in Sagartia ; Phraates, in Margiana ; CEosdates, a second pseudo-Smerdis, in Persia itself; and an Armenian, Aracus, in Babylon; but they were all successively crushed by Darius or his generals. The most serious of these revolts were those in Media and Babylonia, and it was probably during the first Babylonian revolt that the long siege of Babylon mentioned by Herodotus took place, resulting in the attempted plunder of the image of Bel (518 z.c.) This siege may have introduced the otherwise unknown "Darius the Mede" into the book of Daniel (see article on DaniEL). The Median Phraortes, who probably belonged to the Turanian part of the population, proved more than a match for three generals of Darius, and the king had to leave Babylon, which he had just succeeded in capturing, and take the field in person, before the war was finished by the seizure and crucifixion of Phraortes at Ecbatana. The second capture of Babylon was followed by the execution of the Behistun inscription, 515 3.c., in which Darius declares that he had translated "the Ancient Book," "the Text of the Divine Law (Avesta) and a Commentary of the Divine Law and the Prayer (Zend)" from Bactrian into the old Persian, and had restored it to the nations of the empire (see Oppert's trauslation of the Median version of the Behistun inscription in Records of the Past, vol. vii.) t must have been for the sake of this translation that the Assyrian cuneiform syllabary was simplified into an alphabet of forty characters. A revolt of Iskunka, a chief of the Sacee, was suppressed shortly after the inscription was engraved. Before this, Orcetes, governor of Sardis, who had murdered Polycrates of Samos, and aimed at making himself independent, had been put to death, as well as Aryandes, satrap of Egypt, who had issued a silver coinage of his own. "

Darius now set about consolidating and organizing his empire. An elaborate bureaucratic system was instituted, and the empire divided into a varying number of provinces, each under a governor or satrap

(Ahshatrapdva), appointed by the king for an indefinite time, and responsible for a fixed tribute. The power of the satrap was checked by "' royal clerks," who sent annual reports of the satrap and his actions to the king, by retaining the old chiefs or kings of the province by the side of the satrap wherever possible, and by sending members of the royal family to the satrapies. Except in the border satrapies, the military power was intrusted to a separate officer, and it was only in the border provinces, accordingly, that a revolt was to be feared, It is said that the chief fortresses had each an independent commander, while in Persia proper " royal judges " went on circuit. The satrap represented the king, and had the power of life and death. The money tribute, raised probably by a land-tax, amounted, according to Mr Grote's calculation, to £4,254,000,—7740 talents (£2,964,000) being paid in silver, and the rest in gold. The Indian satrapy contributed by far the most, and Persia proper paid nothing. Part of the tribute was paid in kind, Babylonia and Assyria fur- nishing one-third. 'There were, besides, water-rates, and

taxes for the use of such crown property as fisheries and the like, but the amount to be paid to the imperial treasury was in all cases fixed. It was otherwise, however, with the exactions the satraps were allowed to make on their own account, and which must have pressed heavily on the people. The tribute enabled Darius to issue a coinage of extreme purity, and his gold darics were worth about 22s. of our money. An incised bar was the imperial stamp. The satrapies were connected with one another by high- roads and posting-stations, at which relays of horses were kept for the royal messengers.

After building a palace at Susa, the new capital of the empire, and founding the Chehl Minar at Persepolis, Darius overran the Punjaub, and had the Indus navigated by a naval expedition under Scylax of Caryanda, Under the guidance of Democedes, a physician of Crotona, the Greek seas were also explored as far as Magna Grecia, and the northern frontier was strengthened by a campaign against the Scythians. Ariamnes of Cappadocia first examined the northern shores of the Black Sea, after which Darius,

with 600 ships and the aid of the Asiatic Greeks, crossed the Bosphorus by a bridge constructed by the Greek Mandrocles, conquered the Getz, and threw a bridge of boats across the Danube. Leaving the defence of the bridge to the Greeks, he pursued the Scythians as far as the 50th parallel, burning Gelonus (perhaps the modern Voronej), and recrossed the bridge in safety, thanks to the fidelity of Histizeus of Miletus. Megabazus, or Megabyzus, next reduced Thrace and made Amyntas of Macedou tributary (506). In the following year Otanes subjugated Byzantium, Chalcedon, Antandros, Lemnos, and Imbros.

In 500 B.c. the Ionic revolt broke out. Theallies of the Tonians from Athens and Eretria landed in Asia Minor and burnt Sardis, an event which led the Greeks of the Helles- pont, as well as the Carians and the Cyprians, to join the insurrection. The revolt was crushed in 495 B.c. by the battle of Lade and the sack of Miletus; and a terrible punishment was taken upon the Greek cities on the coasts and islands of the Zgean. Miltiades, the tyrant of the Chersonese, escaped with difficulty to Athens, while Darius prepared to avenge the burning of Sardis. His son-in-law, Mardonius, was accordingly sent against Athens and Eretria with a powerful force. But after establishing democracies in the place of tyrants in various Greek cities, and captur- ing Thasos and its gold mines, Mardonius lost 300 ships and more than 20,000 men in a storm off Mount Athos, and, being further surprized by the Thracian Bryges, returned to Asia Minor. Two years afterwards (490 3.c.) Darius sent another expedition under Datis, which destroyed Eretria, but was ingloriously defeated at Marathon by the Athenians under Miltiades. Darius now made preparations for an attack upon a scale which the Greeks would have found it hardly possible to withstand while an able prince like Darius was at the head of the empire; but in the fourth year of the preparations (487 B.c.), just before everything was ready, Egypt broke out into revolt. Before the revolt could be put down Darius died, 486 B.c., in the sixty-third year of his age according to Herodotus, or the seventy- second according to Ctesias, who, however, curtails his reign by three years. Darius had already nominated Xerxes, his son by Atossa, the daughter of Cyrus, as his successor,—his eldest son, Artobazanes, whose mother was a daughter of Gobryas, being set aside as born before his father was king.

~~Long before his death Darius had excavated a richly- ornamented tomb with four pillars and other sculptures out of the rocks of Naksh-i-Rustam, about four miles from Persepolis. In an inscription on the facade of the tomb he enumerates 28 different countries or satrapies, including India and " the Scythians beyond the sea," over which he~~

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~~bore sway. His name Déaryavush is rendered épéetys, "worker" or ' organizer," by Herodotus; but the true meaning of the word is rather "the maintainer," from darj (Sanskrit, dhri, " conservare "). (A. H. 8.)~~

~~DARIUS IL, called Ochus before his accession, and Nothos after it (on account of his being one of the 17 bastard sons of Artaxerxes Longimanus), was ninth king of the Persian empire. He was made satrap of Hyrcania, and married to Parysatis, the daughter of Xerxes I., by whom he had several children, amongst them two daughters, Amestris and Artosta, as well as Arsaces or Arsicas, who succeeded him under the name of Artaxerxes (Mnemon), and Cyrus the younger. Sogdianus or Secydianus, the murderer of Xerxes II., was defeated in battle by Darius, through the desertion of the two satraps of Egypt and Armenia, and afterwards put to death, Darius assuming the diadem (424 B.c.). Darius was completely 'under the power of three eunuchs and his wife Parysatis, and his reign of 19 years was characterized by little except insur- rections and revolts. The first of these was raised by his brother Arsites and Artyphius the son of Megabyzus, with the help of Greek mercenaries, and was only put down by a liberal employment of gold, the leaders of the insurrection being betrayed by their followers and burned alive. The next was raised by Pissuthnes, sartap of Lydia (414 B.c.), but was also crushed by the bribes offered to his Athenian mercenaries by his antagonist Tissaphernes. Amorges, the son of Pissuthnes, however, continued to maintain himself as a kind of independent monarch in Caria for many years afterwards. Another plot was formed by the chief eunuch, Artoxares, but quickly suppressed. In 411 3.c. Egypt rebelled under Amyrtzus, and Darius was compelled to recognize Pausiris the son of the latter as his successor in 401 p.c. Media, which revolted about the same time, according to Xenophon, was not so fortunate as Egypt~~

~~in recovering its independence. With the revolt of Media may be connected the rebellion of Terituchmes, a son-in- law of the king. The latter part of the reign of Darius was occupied in supporting Sparta against Athens by means of Persian gold.~~

~~DARIUS III, surnamed Codomannus, the last of the Persian monarchs, succeeded Artaxerxes III. (Ochus) 336 B.c., after a short interval during which Arses was nominally king. He was the son of Arsames, a nephew of Artaxerxes I]. according to one account, and his wife Sisygambis was a daughter of the same monarch, His powers in the war against the Cadisii had been rewarded by Artaxerxes III. with the satrapy of Armenia. The eunuch Bagoas had poisoned Artaxerxes, and placed his creature Arses on the throne, in order that he might rule in his name, but after two years he deposed him and put Darius in his place. Darius, however, soon got rid of Bagoas, whom he suspected of conspiracy, by making him drink poison. The character of Darius was mild and amiable, and he was famed for his personal beauty, but he did not possess the qualities necessary for the struggle with Alexander of Macedon which commenced shortly after his accession. In 343 3n.c, Alexander crossed the Hellespont, and defeated the Persians, first at the river Granicus (now Ustvola), and then at Issus in Cilicia, where the mother and family of Darius fell into his hands. The death of the 'Rhodian Memnon, the best of the Persian generals, the conquest of Pheenicia, and the dissipation of the Persian fleet sealed the fate of Darius. He engaged in person, however, in the battle at Gangamela (or Arbela), October 331 3.c., but was defeated with immense slaughter, and fled to Ecbatana, while Babylon, Susa, and Persepolis opened their gates to the conqueror. In the following year Alexander marched into Media, where Darius had collected a new force. He fled towards Bactria, however, at the~~

~~approach of the Macedonians, and was being pursued through the deserts of Parthia when he was murdered by Bessus, the satrap of Bactria, and his associates, in the 50th year of his age. His body was sent to Persepolis by Alexander, to be buried with the other monarchs of Persia, while Bessus,~~

who had assumed the royal title, was taken prisoner, and barbarously put to death.

DARJILING, or Danrseetine, a district of British India, in the Rajsh4hi Kuch-Behar commissionership, under the lieutenant-governor of Bengal, is situated between 26° 30' 50" and 27° 13' 5" N. lat., and 88° 2' 45" and 88° 56' 35" E. long. It is bounded on the N. by independent Sikkim, on the E. and 8. by Jalpdigurf district, and on the W. by Nepal, and has an area of 1234 square miles. Danjiling consists of two well-defined tracts,—viz., the lower Himalayas to the south of Sikkim, and the tardi, or plains, which extend from the south of these ranges as far as the northern borders of Purniah district. The plains from which the hills take their rise are only 300 feet above sea level; the mountains ascend abruptly in spurs of from 6000 to 10,000 feet in height. The scenery throughout the hills is picturesque, and in many parts magnificent. The two highest mountains in the world, Kanchanjanga in Sikkim, and Everest in Nepal, are visible from the town of Darjiling. The principal peaks within the district are— Phalalum (12,042 feet), Subargum (10,430), Tanglu (10,084), Situng, and Sinchél Pahdr (8607). The chief rivers are the Tistd, Great and Little Ranjit, Ramman, Mahdnand4, Baldsan, and Jaldhak&. None of them are navigable in the mountain valleys; but the Tist4, after it debouches on the plains, can be navigated by cargo boats of considerable burthen. Bears, leopards, and musk deer are found on the higher mountains, deer on the lower ranges, and a few elephants and tigers on the slopes nearest to the plains, In the lowlands, tigers, rhinoceroses, deer, and wild hogs are abundant. A few wolves are also found. Of small game, hares, jungle fowl, peacocks, partridges, snipe, woodcock, wild ducks and geese, and green pigeons are numerous in the tardi, and jungle fowl and pheasants in the hills, The mahsir fish is found in the Tista.

Population.—The Bengal census of 1872 returned the population of the district at 94,712 persons (males, 53,057 ; females, 41,655), thus classified :—Hindus, 69,831; Mahometans, 6248; Buddhists, 1368; Christians, 556 ; others, 16,709. The inhabitants of the hilly tract consist toa large extent of Nepali immigrants and of aboriginal highland races ; in the tardz the people are chiefly Hindus and Mahometans. The Lepchds are considered to be the aboriginal inhabitants of the hilly portion of the district. They are a

fine, frank race, naturally open-hearted and free-handed, fond of change and given to an out-door life; but they do not seem to improve on being brought into con- tact with civilization. It is thought that they are now being gradually driven out of the district, owing to the increase of regular cultivation, and to the Government con- servation of the forests. They have no word for plough in their language, and they still follow the nomadic form of tillage known as jim cultivation. This consists in selecting a spot of virgin soil, clearing it of forest and jungle by burning, and scraping the surface with the rudest agricul- tural implements. The productive powers of the land become exhausted in a few years, when the clearing -is abandoned, a new site is chosen, and the same operations are carried on de novo. The Lepchds are also the ordinary out-door labourers on the hills. They have no caste dis- tinctions, but speak of themselves as belonging to one of nine septs or clans, who all eat together and intermarry with each other. In the upper or northern tard, along the base of the hills, the Mechs form the principal ethnical feature, This tribe inhabit the deadly jungle with

impunity, and cultivate cotton, rice, and other ordinary crops, by the jum process described above.

The agricultural products consist of rice, cotton, pulses, oil seeds, and jute, principally grown in the tardi, and Indian corn, mdrua, and rice in the hills. Tea cultivation 1s the great industrial feature of Darjiling district, — con- ducted almost entirely by means of English capital, and under European supervision. This industry dates from about 1856. The first planters did not meet with success; but the past ten years have been a period of steadily increasing prosperity. In 1866 there were 39 tea gardens in Darjiling, with a total cultivated area of 10,392 acres, and an out-turn of 433,715 ib of tea. In 1874 the gardens had increased to 113, the area under cultivation to 18,888 acres, and the out-turn of tea to 3,927,911 ib. The cultivation of cinchona was introduced by Government about 1862, and the under- taking has now attained a point which promises success. The Government reserved forest extends to 44,800 acres, scattered over an area of about 700 square miles. India- rubber of excellent quality is obtained from these forests,

Coal of good quality seems to exist, but the supply has not hitherto been utilized. A little iron is manufactured, and copper mining is carried on to a some- what greater extent ; but the methods adopted by the natives are of a very primitive kind. Lime is obtained in large quantities, building stone is abundant, and slate is found. The principal line of communication is the imperial cart road to Darjiling, which has a course of 48 miles through the district. The Northern Bengal State Railway, now (1877) in course of construction, will bring the dis- tricti in closer connection with Calcutta, and materially promote the development of its resources,

In 1870-71 the Government revenue of the district amounted to £18,797, and the civil expenditure to £23,869. Three magisterial and three civil and revenue courts are at work in the district; the strength of the police force in 1872 was 213 men. The principal educational institution is St Paul's school, intended to provide good education at a moderate cost for the sons of Europeans and East Indians. The higher elevations of the district may be pronounced free from endemic disease of every kind except goitre, and this is by no means widely spread. In the tardz, however, and in the lower valleys, malarious fevers, often of a severe and fatal type, prevail.

The British connection with Darjiling dates from 1816, when, at the close of our war with Nepal, we made over to the Sikkim raj4 the tardi tract, which had been wrested from him and annexed by Nepal. In 1835 the nucleus of the present district of British Sikkim or Darjiling was created by a cession of a portion of the hills by the raja of Sikkim to the Britishasa sanatorium. A military expedi- tion against Sikkim, rendered necessary in 1850 by the imprisonment of Dr Campbell, the superintendent of Dar- jiling, and Dr Hooker, resulted in the stoppage of the allow- ance granted to the r4j4 for the cession of the hill station of Darjfling, and in the annexation of the Sikkim tardi at the foot of the hills and of a portion of the hills beyond. In August 1866 the hill territory east of the Tista, acquired as the result of the Bhutdn campaign of 1864, was added to the jurisdiction of Darjiling.

DdArsftinc Town, the well-known sanatory station, is situated in 27° 2' 48" N. lat. and 88° 18' 36" E. long., near the northern boundary of the district, and is 7167 feet above the sea-level. It contains an ordinary population of about 4000 souls, but being a great summer resort from the heat of the

plains, the number fluctuates according to the season of the year. Thc mean temperature of the place is about 24° below that of Calcutta, and only 2° above that of London. (Ww. W. H.)

DARLINGTON, a parliamentary and municipal borough, parish, and township of England, in the southern division of the county of Durham, is situated on the main line of the North-Eastern Railway, 39 miles south of Newcastle and 235 miles north of London. The town extends east and west to a considerable distance from the River Skerne, a sinall tributary of the Tees, which traverses it from north to south.

The traditional history of Darlington commences about 1000 years ago, when, as is asserted, the monks who fled with the body of St Cuthbert from the invading Danes rested for a short time on the site of the present town. This circumstance led Styr the son of Ulphus, prince of Deira, to bestow upon St Cuthbert, early in the llth century, " Dearnington with its appendages." At this early date Darlington pussed into the hands of the church, and from that time till the middle of the 19th century its history and its government were closely con- nected with the see of Durham. The bishop appointed a borough bailiff to manage the affairs of the town until 1867, when the office was abolished by the Act of Incor- poration, Towards the close of the 11th century a collegiate church was established in Darlington by Bishop Carilepho, and nearly 100 years later Bishop Pudsey built St Cuthbert's Collegiate Church, which is still deservedly esteemed the most notable ecclesiastical edifice in the county after the cathedral at Durham. The bishop of the diocese had a manor house at Darlington, and a deanery was established in connection with the church by Bishop Neville. So closely identified was the town with the church that it is not surprizing that its inhabitants looked with a scant sympathy upon the Reformation. In both the ill- fated attempts to restore the ancient rites, which filled the north with bloodshed, Darlington sided with the rebels. Apart from ecclesiastical affairs there is little of general interest in the early history of the town. Its later history is closely associated with that of the small but enthusiastic sect, in whose eyes all war is criminal. Under the later Stuarts, the Society of Friends, which had effected a settle- ment here, was subjected to an

intermittent persecution ; but after the Revolution the Friends laid the foundations of that prosperity which has enabled them for more than a century to occupy the most prominent position in Darling- ton. To them, and especially to Edward Pease, Darlington owes the distinction of having been the birthplace of the modern railway. The Stockton and Darlington Railway, a short line of twenty-seven miles in length, seven of which were worked by stationary engines on the summit of inclines, and the other twenty by locomotives and by horses, was prim- arily constructed to cheapen the cost of carrying coal from the Auckland pits to Stockton and Darlington. This rail- way, of which George Stephenson was the engineer, was pro- jected in 1818, and opened on the 27th of September 1825. The latter date marks the new birth of Darlington. Prior to 1825 it was a small market town, chiefly remarkable for the manufacture of linen, worsted, and flax. After that date it rapidly increased in population and importance, and became the centre of the industrial district of south Durham, which it did much to develop. At the census of 1821, when the construction of the railway was commenced, the population of Darlington, including some outlying villages, was re- turned as 6551. Twenty-five years thereafter the popula- tion had nearly doubled, the return being 12,452. At the census of 1871 the population was 27,730, and when the fiftieth anniversary of the opening of the railway was celebrated in 1875, it was estimated that the population had increased to 34,000. 'The rateable value of property showed an even greater proportionate increase, having risen from £26,137 in 1829 to £125,017 in 1875. The government of Darlington—after having been vested in

the hands of a borough bailiff, appointed by the bishop, a board of commissioners, and a local board of health—-was in 1867 transferred by the Charter of Incorporation to a town council composed of 6 aldermen and 18 councillors, The streets of the borough are wide and well laid out. The gas and water supply are both in the hands of the corporation. The covered market, with the town hall and clock tower, occupies part of the spacious market place, where markets are held every Monday for the sale of agri- cultural produce, live stock, &c., and on Friday afternoon for butter. There are two spacious and tastefully laid-out cemeteries and a public park in the possession of the muni- cipality, which also owns the public baths and the fever hospital. The union workhouse is situated in Darlington, Among the educational establishments may be mentioned a new grammar school,

erected at a cost of £10,000 ona foundation which dates from the reign of Elizabeth, and the British and Foreign School Society's training college for female teachers. A mechanics' institute, a small theatre, a subscription library, and reading rooms are among the other local institutions. Including St Cuthbert's Collegiate Church already mentioned, the Church of England has five places of worship in the town, and there are numerous chapels belonging to the nonconformist denominations. Petty sessions are held here weekly, and the county courts monthly. In antiquities the town is not rich. Excepting the collegiate church, which dates from the beginning of the 13th century, almost the only relic of the past is the engine ' Locomotive No. 1," the first that ever ran on a public railway, which stands on a pedestal of stone at the North Road station. There is a monument in the town erected to Joseph Pease, "the first Quaker mem- ber of Parliament." Before 1825 the Pease family were wealthy mill-owners, and they still own mills containing 270 looms and employing 700 hands; but their mining undertakings, which were not commenced until after that date, throw the mills completely into the shade. They employ 6500 workmen, and raise more than 3,000,000 tons of minerals per annum. The Darlington Iron Com- pany, with a nominal capital of £350,000, employs 2000 hands, and turns out 90,000 tons of iron rails per annum. The Skerne Iron Company manufactures iron plates for shipbuilding, boilermaking, bridge construction, and other purposes. The South Durham Iron Works, with a capital of £130,000, are exclusively smelting works, producing from their three furnaces about 40,000 tons of pig-iron per annum, Among other industries of the town may be mentioned waggon-building, malting, and tanning. DARMSTADT, the capital of the grand duchy of Hesse- Darmstadt, in the province of Starkenburg, is situated on the River Darm, fifteen miles south of Frankfort-on-the- Maine. It is the residence of the grand duke, and the seat of the Government of the province and of the grand duchy. In 1875 there was a population of 37,253 ; including the neighbouring village of Bessungen, it was 44,088. Darmstadt consists of an old and a new town, the streets of the former being narrow and gloomy. 'The latter, which includes the greater part of the city, contains broad streets and several fine squares, in one of which is a column surmounted by the statue of the grand duke Louis I., the founder of the new town. 'There are four churches, the Roman Catholic church being the most imposing, and a synagogue, recently built. Of the remaining buildings the most noteworthy are the two grand ducal palaces, the arsenal, and the

~~theatre. The Grand Ducal Museum includes a library of nearly 500,000 volumes, with. 4000 MSS., a gallery of 700 pictures, a valuable natural history collection, besides coins, drawings, engravings, &c. In the Cabinet Museum there is a library of 60,000 volumes. The town possesses a gymnasium, two Real schools, and a technical school ;~~

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~~and there are various societies, such as the Agricultural Society, the Historical Society, the Middle Rhine Geological Society, and tle Society of Architects. Among the chief manufactures are carpets, hats, jewellery, and tobacco ; and there is a considerable trade in seeds of different kinds,~~

~~Plan of Darmstadt.~~

~~1. Infantry Barracks. 9. Stiindehaus,~~

~~2. Theatre. 10. Town Hall.~~

~~8, Armoury. 11. Town Church.~~

~~4. Grand Duke's Stables, 12, Gymnasium.~~

~~5. Chancery, 13. Polytechnium,~~

~~6. Prince Alexander's Palace, 14, Palace of Prince Louts. 7. Statue of Grand Duke Louis L. 15. Catholic Church.~~

~~8. Grand Ducal Palace, Muscum, and | 16. Palace of Prince Char'cs.~~

~~Library. 17. Cavalry Barracks,~~

~~and in wine. There are many pleasant walks in the neighbourhood, which is well wooded, and several of the palace gardens are open to the public.~~

~~Darmstadt is mentioned in the 11th century, but in the 14th century it was still a village, held by the Counts of Katzenellnbogen. It came by marriage into the possession of the house of Hesse in 1479, the male line of the house of Katzenellnbogen having in that year become extinct. The imperial army~~

~~took it in the Schmalkaldic war, and destroyed the old castle. © In 1567 , after the death of Philip the Magnanimous, his youngest son George received Darmstadt and chose it as his residence. He was the founder of the line of Hesse-Darmstadt.~~

~~DARNETAL, a town of France, in the department of Seine-Inférieure, and 23 miles east of Rouen, on two small streams called the Aubette and the Robec. It has a fine Gothic church, and manufactures woollens, flannels, cottons, and paper. Population in 1871, 5636.~~

~~DARTFORD, an English market-town, parish, and local board district of West Kent, 16 miles east of London, on the Darent, which enters the Thames about 24 miles north of the town. The town lies low, flanked by two chalky eminences, called East and West Hills, and consists of one main street, crossed by two or three smaller streets. It possesses a town hall, a grammar school, and a county court-house. The most noteworthy building, however, is the parish church, repaired and restored, which contains a curious old fresco and several interesting brasses. The~~

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~~prosperity of the town depends on the important public works in its immediate vicinity, including powder works, paper mills, and engineering works. One of the first attempts at the manufacture of paper in England was made here by Spilman, who was jeweller to Queen Elizabeth, and that industry has been identified with the place ever since. Dartford was the Scene, in 1235, of the marriage, celebrated by proxy, between Isabella, sister of Henry IIL. and the Emperor Frederick II.; and in133la famous tournament was held in the place by Edward III. The same monarch established an Augustinian nunnery on West Hill in 1355, of which, however, almost no remaing now exist. It was here also that Wat Tyler's outbreak occurred in 1377, and the house he resided in is pointed out by the townspeople. The area of the parish is 4251 acres ; the population (1871), 8298,~~

~~DARTMOOR FOREST. See Devonsurre.~~

~~DARTMOUTH, an ancient municipal borough and sea- port town of England, in South Devon, 31 miles south of Exeter and 229 miles south-west of London by rail, is situated ncarly opposite the town of Kingswear, at the mouth of the Dart, which here forms a secure harbour in the English Channel. The town stretches along the shore of the harbour, overhung by steep acclivities, and presents a picturesque appearance. — Many of the houses belong to the Elizabethan period, Its principal building is St Saviour Church, a cruciform edifice of ancient date, con- taining a graceful rood-screen, a stone pulpit, and some in- teresting monuments. Dartmouth castle stands at the entrance of the harbour. Asa seaport Dartmouth is now little used, but it occupied an important place in the early history of Eugland. It was the rendezvous of tlie crusaders' fleet in 1190 ; and in 1346-47 it contributed 31 ships to the siege of Calais under Edward III. In later times several expeditions left its harbour for the exploration of the New World ; and during the civil wars of the 17th century its occupation was hotly contested. The borough is governed by a mayor, 4 aldermen, and 12 councillors, It contains an area of 1847 acres (including part of the parish of Stokedeming), and in 1871 had a population of 5338 persons. Formerly it returned a member to Parlia- ment, but it was disfranchised in 1868,~~

~~DARU, Prerre-AnTorns, Comte pg (1767-1829), a distinguished author and statesman of France, was born at Montpellier, where his father held the office of secretary to the intendancy of Languedoc. From the Oratorians of the military school at Tournon he imbibed an enthusiasm for study, and an admiration of the master-pieces of ancient literature, which remained with him for life. At the age of sixteen he entered the army ; and in the following year, though under the legal age, he obtained the rank of commissary. In 1791, in spite of his attachment to the principles of the Revolution, he was accused before the "Club" of treasonable relations with the marquis of Bouzol; but the eloquence of his defence secured his acquittal. In the following year, however, while he was serving in Brittany, the senseless suspicion of the times was such that his usc of the ironical expression nos amis les Anglais caused him to be thrown into prison. The eighteen months of durance spent at Rennes and Orleans were mainly devoted to the study and transla- tion of Horace, in imitation of whose style he also pro- duced an Lpitre & mon Sans-Culotte, as he designates the keeper to whom he was intrusted. After his release he served under Pétiet and Massena in several~~

important situations in the commissariat and in the office of the ministry of war. His generous love of justice was strik- ingly displayed by the appeal which he made in favour of Ferrand, whom he believed to have been wrongfully removed from a post to which he himself was appointed.

The first consul made him secretary to the ministry at war ; and, the day after the battle of Marengo, nominated him one of the commissioners for the execution of the conven- tion concluded between General Bertbier and General Melas. In 1805 he was made a counsellor of state and intendant-general of the emperor's military household. In the following year he received the appointment of intendant- general of the Brunswick territory, and subsequently of commissioner for the execution of the treaties of Tilsit and Vienna, as well as minister plenipotentiary at Berlin. In 1806 he was elected a member of the Institute, and in 1808 an honorary member of the Berlin Academy. In 1811 he was appointed minister secretary of state ; and shortly afterwards he received the portfolio of the war department. He accompanied Napoleon in his Russian campaign. When the retreat from Moscow had commenced, he had to assume the functions of intendant-general of the army ; and his iron constitution, and capacity for labour, enabled him to fulfil, with apparent ease, duties which might have killed several men of ordinary strength. C'est un lion pour le travail, said Napoleon himself. After the restoration of the Bourbons he was made intendant-general to the king, an appointment which he received in December 1814. But on the return of Napoleon from Elba he joined the standard of his old master, subscribed a considerable sum for the purpose of arming the Parisian fédérés, and in his capacity of counsellor of state attached his signature to the celebrated declaration of the 25th March. His conduct towards the emperor displays a frank and simple independence of char- acter combined with a genuine devotion to Napoleon's cause. ' They don't speak well of my are de triomphe," said Napoleon one day. ' There are two persons whom I have heard praise it," replied Daru,— your majesty and his architect." The second restoration found him com- promised by his connection with the Government of the Hundred Days ; and he retired for a time into private life, and devoted himself to literary pursuits. But in 1819 he was summoned by royal ordinance to the Chamber

of Peers, where his rectitude of judgment and administrative knowledge signalized him as one of the most powerful defenders of the national liberties. In 182] he pub- lished his Z/istowre de Venise, which is by far the most important of his works, and is regarded as the most com- plete and impartial history of that singular republic equally remarkable for its strength and duration. His sub- sequent work, the //istoire de Lretagne (3 vols. 1826), dis- plays great labour and accuracy, but is devoid of interest except to historical antiquaries. His other productions consist of a poetical translation of Horace, which, in spite of the malicious epigram of Le Brun, Je ne lis point Daru, jaime trop mon Llorace, has enjoyed in France a well-merited reputation; a variety of occasional poems, discourses, and éloges pronounced in the Academy ; and speeches delivered in the Chamber of Peers. He died at his residence near Meulan, September 5, 1829, aged sixty-two. His remains were deposited in the Cimiti¢re Montmartre, and five discourses were pronounced over his tomb by MM. Mirbel, Cuvier, Silvestre de Sacy, Ternaux, and Leroy.

See the " Notice" by M. Viennet prefixed to the fourth edition of the Histoire de Venise, 9 vols. 1853, and three articles by Sainte- Beuve in Causeries du Lund, vol. ix.

DARWIN, Erasmus (1731-1802), man of science and poet, was born at Elton, in Nottinghamshire, on the 12th December 1731. Having studied at St John's College, Cambridge, and at Edinburgh, and taken the degree of M.D. at the latter university, he settled as a pliysician at Lichfield, and gained a large practice. While here he is said to have done much, both by his own example and by 'more direct effort, to diminish drunkenness among the

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lower classes. In 1781 he removed to Derby, where he remained till his death, which took place on the 18th April 1802. 'The fame of Erasmus Darwin as a poet rests upon his Botanic Garden, though he also wrote Zhe Temple of Nature, or the Origin of Society, a Poem, with Philo- sophical Notes (1803), and Zhe Shrine of Nature (posthumously published). The Botanic Garden (the second part of which—TZhe Loves of the Plants—wag published anonymously in 1789, and the whole of which appeared in 1791)

~~*is a long poem in the decasyllabic rhymed couplet. Its merit lies in the genuine scientific enthusiasm and interest in nature which pervade it; and of any other poetic quality—except a certain, sometimes feli- citous but oftener ill-placed, elaborated pomp of words— it may without injustice be said to be almost destitute. It was for the most part written laboriously, and polished with unsparing care, line by line, often as he rode from one patient to another, and it occupied the leisure hours of many years. The diction is artificial to a degree which renders it in emotional passages stilted and even absurd, and which makes Canning's clever caricature—The Loves of the Triangles—often remarkably like the poem it satirizes ; in some passages, however, it is not without a stately appropriateness, Gnomes, sylphs, and nereids are introduced on almost every page, and personification is carried to an extraordinary excess. Thus he describes the Loves of the Plants according to the Linnean system by means of a most ingenious but misplaced and amusing personification of each plant, and often even of the parts of the plant. It is significant that botanical notes are added to the poem, and that its eulogies of scientific men are frequent. Darwin's mind was in fact rather that of a man of science than that of a poet. scientific work is lis Zoonomea (1794-6), which contains a system of pathology, and a treatise on generation, in which Darwin, in the words of his famous grandson, " anticipated the views and erroneous grounds of opinions of Lamarck." The essence of Darwin's views is contained in the follow- ing passage, which he follows up with the conclusion " that one and the same kind of living filaments is and has been the cause of all organic life :'—*~~

~~***Would it be too bold to imagine that, in the great length of time since the earth began to exist, perhaps millions of ages before the commencement of the history of mankind,—would it be too bold to imagine that all warm-blooded animals have arisen from one living filament, which the great First Cause endued with animality, with the power of acquiring new parts, attended with new propensities, directed by irritations, sensations, volitions, and associations, and thus possessing the faculty of continuing to improve by its'own inherent activity, and of delivering down these improvements by generation to its posterity, world without end!"*~~

Observations on the Zoonomia were published by Thomas Brown, the psychologist (Edinburgh, 1798). In 1799 Darwin published his Phytologia, or the Philosophy of Agriculture and Gardening (1799), in which he states his opinion that plants have sensation and voli- tion. A paper on Female Education in Boarding Schools (1797) completes the list of his works. A slight account of Darwin's life was published by Anna Seward in 1804.

DASHKOFF, CatHEerINA RomMANoFNA WORONZOFF, Princess (1744-1810), was the third daugliter of Count Roman Woronzoff, a member of the Russian senate, distin- guished for his intellectual gifts. She received an excep- tionally good education, having displayed from a very early age the masculine ability and masculine tastes which made her whole career so singular, She was;well versed in mathe- matics, which she studied at the university of Moscow, and in general literature her favourite authors were Bayle, Montesquieu, Boileau, Voltaire, and Helvetius. While still a girl she was connected with the Russian court, and became one of the leaders of the party that attached itself to the Grand Duchess (afterwards Empress) Catherme. Before she was sixteen she married Prince Dashkoff, a prominent Russian nobleman, and went to reside with hip

His most important —

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at Moscow. In 1762 she was at St Petersburg and took a leading part, according to her own account the leading part, in the coup @état by which Catherine was raised to the throne. (See Catnerine IL, vol v. p. 233). Another course of events would probably have resulted in the eleva- tion of the Princess Dashkoff's elder sister, Elizabeth, who was the imbecile and unfortunate emperor's mistress, and in whose favour he made no secret of his intention to depose Catherine ; but this fact, by inflaming the princess's jealousy, rather impelled her to the action she took than deterred her from it. Her relations with the new empress were not of a cordial nature, though she continued devotedly loyal. Her blunt manners, her unconcealed scorn of the male favourites that disgraced the court, and perhaps also her sense of unrequited merit, produced an estrange- ment between her and the empress, which ended in her asking permission to travel abroad. The cause of the final breach was said to have been the refusal of her request to be

appointed colonel of the imperial guards. Her husband having meanwhile died, she set out in 1768 on anextended tour through Europe. She was received with great consideration at foreign courts, and her literary and scientific reputation procured her the entrée to the society of the learned in most of the capitals of Europe. In Paris she secured the warm friendship and admiration of Diderot and Voltaire. She showed in various ways a strong liking for England and the English. She corresponded with Garrick, Dr Blair, and Principal Robertson ; and when in Edinburgh, where she was very well received, she arranged to intrust the education of her son to Principal Robertson. In 1782 she returned to the Russian capital, and was at once taken into favour by the empress, who strongly sym- pathized with her in her literary tastes, and specially in her desire to elevate Russ to a place among the literary languages of Europe. Immediately after her return the princess was appointed " directeur" of the St Petersburg Academy of Arts and Sciences ; and in 1784 she was named the first president of the Russian Academy, which had been founded at her suggestion. In both positions she acquitted herself with marked ability. She projected the Russian dictionary of the Academy, arranged its plan, and executed a part of the work herself. She edited a monthly magazine ; and wrote at least two dramatic works, The Marriage of Fabian, and a comedy entitled Toissiokof. Shortly before Catherine's death the friends quarrelled over a tragedy which the princess had allowed to find a place in the publications of the Academy, though it contained revolutionary principles, according to the empress. A partial reconciliation was effected, but the princess soon afterwards retired from court. On the accession of the Emperor Paul in 1796 she was deprived of all her offices, and ordered to retire to a miserable village in the govern- ment of Novgorod, " to meditate on the events of 1762." After a time the sentence was partially recalled on the petition of her friends, and she was permitted to pass the closing years of her life on her own estate near Moscow, where she died on the 4th January 1810. The Memoirs of the Princess Dashkoff written by herself were ublished in 1840 in London in two volumes. They were edited " Mrs W. Bradford, who, as Miss Wilmot, had resided with the Princess between 1803 and 1808, and had suggested their preparation. DASS, Perrer (1647-1708), styled the Father of modern Norwegian poetry, was the son of Peter Dundas, a Scotch merchant of Dundee, who left his country about 1630 to escape the troubles of the Presbyterian church. He settled in Bergen, and in

~~1646 married a Norse girl of good family. Petter Dass was born in 1647 on the island of Nord Herd, on the north coast of Norway. Seven years later his father died, and his mother placed him with his aunt, the wife of the priest of another little island-parish.~~

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~~In 1660 he was sent to school at Bergen, in 1665 to the university, and in 1667 he began to earn his daily bread asa private tutor. In 1672 he was ordained priest, and remained till 1681 as under-chaplain at Nesne, a little parish near his birth-place ; for eight years more he was resideut chaplain at Nesne ; and at last in 1689 he received the living of Alstahoug, the most important in the north of Norway. The rule of Alstahoug extended over all the neighbouring districts, including Dass's native island of Herd, and its privileges were accompanied by great perils, for it was necessary to be constantly crossing stormy firths of sea. Dass lived here in quietude, with something of the honours and responsibilities of a bishop, brought up his family in a God-fearing way, and wrote endless reams of verses. In 1700 he asked leave to resign his living in favour of hisson Anders Dass, but this was not permitted ; in 1704, however, Anders became his father's chaplain. About this time the old poet refreshed himself by a visit to Bergen, where he made the acquaintance of the poetess Dorothea Engebretsdatter, the most admired writer of the day, with whom he had been for many years in corre-spondence. He continued to write till 1707, and died in August 1708. The materials for his biography are very numerous ; he was regarded with universal curiosity and admiration in lis life-time ; and, besides, he left a garru- lous autobiography in verse. A portrait, painted in middle age, now in the church of Melhus, near Trondhjeim, represents him in canonicals, with deep red beard and hair, the latter waved and silky, and a head of massive proportions. The face is full of fire and vigour, His writings passed in MS. from hand to hand, and few of them were printed in his life-time. Nordlands Trompet (The Trumpet of N ordland), his greatest and most famous poem, was not published till 1739 ; Den norska Dale-Vise (The N orwegian Song of the Valley) appeared in 1696; the Aandelig Tidsfordriv (Spiritual Pastime), a volume of divine pieces, was published in 1711. The Trumpet of Nordland remains, after nearly two centuries, as fresh as ever in the memories of the inhabitants of the north of Norway ; boatmen, peasants,~~

priests will alike repeat long extracts from it at the slightest notice, and its popularity is unbounded. It is a rhyming description of the province of Nordland, its natural features, its trades, its advantages, and its drawbacks, given in dancing verse of the most breathless kind, and full of humour, fancy, wit, and quaint learning. The other poems of Petter Dass are less universally read; they abound, however, in queer turns of thought, and fine homely fancies. The collected writings of Dass have lately been published at Christiania in a very handsome form, edited by Dr A. E. Eriksen. .

DATE PALM. The dates of commerce are the fruit of a species of palm, Phenix dactylifera, a tree which ranges from the Canary Islands through Northern Africa and the south-east of Asia to India. It has been cultivated and much prized throughout most of these regions from the remotest antiquity. In Arabia, indeed, it is the chief source of national wealth, and its fruit forms the staple article of food in that country. The tree has also been introduced along the Mediterranean shores of Europe ; but as its fruit does not ripen so far north, the European plants are only used to supply leaves for the festival of Palm Sunday aniong Christians, and for the celebration of the Passover by Jews. The date palin is a beautiful tree, growing toa height of from 60 to 80 feet, and its stem, which is strongly marked with old leaf-scars, terminates in a crown of graceful shining pinnatisect leaves. The flowers spring in branching spadices from the axils of the leaves, and as the trees are unisexual, it is necessary in cultivation to fertilize the female flowers by artificial means. The fruit is an oblong drupe, which varies as much in size,

colour, and quality, under cultivation, as does the apple in

temperate regions, while the recognized and named varieties | of the one fruit are quite as numerous as those of thie |

other. Regarding this fruit Mr W. G. Palgrave (Central and Eastern Arabia) remarks—' Those who, like most Europeans at home, only know the date from the dried specimens of that fruit shown beneath a label in shop-windows, can hardly imagine how delicious it is when eaten fresh and in Central Arabia. Nor is it, when newly gathered, heating,—a defect inherent

~~to the preserved fruit everywhere; nor does its richness, however great, bring satiety ; in short it is an article of food alike pleasant and healthy." In the oases of Sahara, and in other parts of Northern Africa, dates are pounded and pressed into a cake for food; and it is said that there, the fruit is the food of man and beast, and is eaten by horses and camels, and even by dogs. The dried fruit used for dessert in European countries contains more than half its weight of sugar, about 6 per cent. of albumen, and 12 per cent. of gummy matter. All parts of the date palm yield valuable economic products. Its trunk furnishes timber for house-building and furniture ; the leaves supply thatch; their footstalks are used as fuel, and also yield a fibre from which cordage is spun,~~

~~Date sugar is a valuable commercial product of the East Indies, obtained from the sap or toddy of late sylvestris, a tree so closely allied to the date palm that it has been supposed to be the parent stock of all the cultivated varieties. The juice, when not boiled down to form sugar, is either drunk fresh, or fermented and distilled to form arrack, The uses of the other parts and products of this tree are the same as those of the date palm products. Date palm meal is obtained from a small species, HIate farinifera, growing in the hill country of southern India; it is occa- sionally resorted to in times of distress or famine.~~

~~DAUBENTON, Lovuis-JEan-Marie (1716-1800), a distinguished naturalist, was born at Montbar, in the department of the Cédte d'Or, in France, May 29, 1716. HIs father, Jean Daubenton, a notary, who destined him for the church, after putting him through a course of instruction under the Dominicans of Dijon, sent him to Paris to learn theology. The secret study of medicine, however, and the lectures of Baron, Mar- tineng, and Col de Villars, of Winslow, HIunault, and Antoine de Jussieu, were more attractive to young Daubenton. The death of his father in 1736 set him free to follow his own inclinations, and he accordingly in 1741 took the degree of doctor at Rheims, and returned to his native town with the intention of following the practice of medicine. But fortune destined him fora more brilliant career. It was about this time that Buffon, also a native of Montbar, had formed the plan of bringing out a grand treatise on natural history, and in 1742 he invited Daubenton to assist him by providing the anatomical descriptions for that work. The characters of the two philosophers were~~

opposed in almost every respect. Buffon was violent and impatient ; Daubenton, gentle and patient ; Buffon was rash in his judgments, and imaginative, seeking rather to divine than to discover truths; Daubenton was cautious, and believed nothing he had not himself been able to see or ascertain, From nature each appeared to have received the qualities requisite to temper those of the other ; and a more suitable coadjutor than Daubenton it would have been difficult for Buffon to obtain. In the first section of the natural history Daubenton gave descrip- tions and details of the dissection of 182 species of quad- rupeds, thus procuring for himself a high reputation, and exciting the envy of Réaumur, who considered himself as at the head of the learned in natural history in France.

services of Daubenton in the preparatien of the subsequent parts of his work, which, as a consequence, lost much in precision and scientific value. Buffon afterwards perceived and acknowledged his error, and renewed his intimacy with his former associate. The number of dissertations on natural history which Daubenton published in the memoirs of the French Academy is very great. Zoological descrip- tiors and dissections, the comparative anatomy of recent and fossil animals, vegetable physiology, mineralogy, experimeuts in agriculture, and the introduction of the merino sheep into France gave active occupation to his energies ; and the cabinet of natural history in Paris, of which in 1744 he was appointed keeper and demonstrator, was arranged and considerably enriched by him. From 1775 Daubenton lectured on natural history in the College of Medicine, and in 1783 on rural economy. He was appointed professor of mineralogy by the Convention at the Jardin du Roi; and he gave lectures at the Normal School during the ephemeral existence of that institution, He was likewise one of the editors of the Journal des Savans, and contributed to two encyclopedias. As a lecturer he was in high repute, and to the last retained his popularity. In the winter of 1799 he was appointed a member of the Conservative Senate, but at the first meeting which he attended he fell from his seat in an apoplectic fit, After a short iNness he died at Paris, January 1, 1800.

DAUBENY, Cuartes Gites Bripie (1795-1867), an English chemist, botanist, and geologist, was the third son of the Rev. James Daubeny, and was born at Stratton, in Gloucestershire, February 11, 1795, and died

December 12, 1867. In 1808 he entered Winchester School, and in 1810 he was elected to a demyship at Magdalen College, Oxford. The lectures of Dr Kidd at that university first awakened in him a desire for the culti- vation of natural science. In 1814 he graduated with second class honours, and in the next year he obtained the prize for the Latin essay. From 1815 to 1818 he studied medicine in London and Edinburgh ; and in the latter city he attended the lectures of Professor Jameson on natural science. At that time the rival theories of the Huttonians and Wernerians were occupying the attention of geologists. In 1819 Daubeny, in the course of a tour through France, made the volcanic district of Auvergne a special study. By subsequent journeys in Hungary, Transylvania, Italy, Sicily, France, and Germany he extended his knowledge of voleanic phenomena ; and in 1826 the results of his observations were given in a work entitled A Description of Active and Extinct Volcanoes, a second edition of which was printed in 1848. An earlier treatise was An Lssay on the Geology and Chemical Phenomena of Volcanoes, published at Oxford in 1824, Daubeny, in common with Gay-Lussac and Davy, held subterraneous thermic disturbances to be probably due to the contact of water with metals of the alkalies and alkaline earths. In November 1822 Daubeny succeeded Dr Kidd as professor of chemistry at Oxford, and twelve years later he was appointed to the chair of botany there. At the Oxford Botanic Garden he conducted numerous experiments upon the effect of changes in soil, light, and the composition of the atmosphere upon vegeta- tion. In 1830 he published in the Philosophical Transac- tions a paper on the iodine and bromine of mineral waters. In the following year appeared his Introduction to the Atomic Theory, which was succeeded by a supplement in 1840, and in 1850 by a second edition, In 1831 Daubeny represented the universities of England at the first meeting of the British Association, which at his request held their next session at Oxford. In 1836 he communicated to the Association a report on the subject of mineral and thermal waters. In 1837 he visited the United States, and acquired

A feeling of jealousy induced Buffon to dispense with the | there the materials for papers on the thermal springs and

~~the geology of North America, read in 1838 before the Ashmolean Society and the British Association. In 1856 he became president of the latter body at its meeting at Cheltenham. In 1841 Daubeny published his Lectures on Agriculture ; in 1857 his Lectures on Roman ITusbandry , and in 1865 an Hssay on the Trees and Shrubs of the Ancients, and a Catalogue of the Trees and Shrubs indigenous to Greece and Italy. HIs last literary work was the collec- tion of his miscellaneous essays, published in two volumes, in 1867. In all his undertakings Daubeny was actuated by a practical spirit and a desire for the advancement of knowledge ; and his personal influence on his contemporaries was in keeping with the high character of his various lite- rary productions,~~

~~D'AUBIGNE, Jzan-Hunrt Murie (1794-1872), was born 16th August 1794 at Eaux Vives, near Geneva, 'The ancestors of his father, Francois Merle, were French Protestant refugees; his paternal grandmother's name, D'Aubigné, which Jean-Henri Merle subsequently added to his own, was a name well known in the service of Henry IV. Jean-Henri was destined by his parents to a com- mercial life ; but the new interests awakened by his course at college led him to fix his choice on the office of the Christian ministry. The influence of Robert Haldane, a Scottish evangelist sojourning in Geneva, told powerfully and permanently on the divinity student, and kindled in him a hitherto unknown zeal for the distinctively evangeli- cal truths of the Christian faith, When in 1817 Merle went abroad to further his education, Germany was about to celebrate the tercentenary of the Reformation ; and thus early he conceived the ambition to write the history of that great epoch. At Berlin he received stimulus from teachers so unlike as were Neander and De Wette. After presiding for five years over the French Protestant church in Hani. burg, he was in 1823 called to become pastor of a congre- gation in Brussels, and preacher to the court, At the Belgian revolution, he preferred pastoral work at home to an educational post in the family of the Dutch king ; and, shortly after his return to Switzerland, events rendered it impossible for those like-minded with him in religious matters to remain in the national Genevese church. The separation took place finally in 1833, and Merle D'Aubigné became one of the founders of the new evangelical church ; and, whether as pastor or as professor of church history in its theological seminary, he continued to be till the last days of his life an unwearied and influential labourer in the~~

cause of his church and of evangelical Protestantism. In him the Evangelical Alliance found a hearty promoter. HIe made many friends in other lands, and repeatedly visited England ; he was made a D.C.L. by Oxford University, and received civic honours from the city of Edinburgh. HIs many labours never impaired his healthy frame. In his seventy-ninth year he still enjoyed perfect vigour of mind and body ; sudden death during the night of the 20th October 1872 removed him from the midst of academic and literary work.

It was as their historian that Merle D'Aubigné was most powerfully to serve the cause of the Protestant churches, The first section of his Lfistory of the 'Reformation, having for its central subject the earlier period of the work in Germany, gave its author at once a foremost rank amongst modern French ecclesiastical historians, was translated into most European tongues, and was much more widely read and admired in English-speaking lands than at home. It is said that 200,000 copies of the English translation were sold in Great Britain alone, and about twice as many in the United States. The second series of volumes, dealing with reform in the time of Calvin, was not less thorough than the former series, and had a subject hitherto less exhaus- tively treated ; but it did not meet with a success so marked.

This part of the subject, with which the Genevese professor was most competent effectively to deal, was all but com- pleted at the time of his death. Along with the great work of his life, he had written many minor treatises ou the themes he had most closely at heart. Of these the most Important are a vindication of the character and aims of Oliver Cromwell, and a sketch of the contendings of the Kirk of Scotland.

Dr Merle D'Aubigné was in many ways well fitted to be a powerful and popular expositor of history, and especially of that history to which he devoted the studies of a life- time. Indefatigable in exploring and sifting original documents, he had amassed a vast wealth of authentic information; but a desire to give everywhere a full and graphic picture, assisted by a gift of warm and genial imaginative power, betrayed him into aiming at fulness of picturesque detail concerning events and processes necessarily hidden from the eye of a strict historiographer. In a few cases le seems by inference from his knowledge of a later period to have filled up a narrative not

sustained by docu- mentary evidence. He was able in a marvellous manner to identify himself with the Reformers ; but while his sym- pathies enabled him to do justice to great aims of good men, he too frequently becomes their apologist. His expressed desire everywhere to trace the working of Géd's Spirit in the work of the Reformers leads him to pass too

lightly over secondary but weighty influences, and in his °

heroes' opponents continually to discover the foes of God ; and the devout purpose with which he confessedly wrote inspires his pages with much that is rather religious admonition than history, and causes a style otherwise simple and dignified to pass into fervid rhetoric, But his work remains a noble monument of painstaking sincerity and reverential love for a great subject. In the main it unquestionably brings us into direct contact with the genuine spirit of the most momentous period in the modern history of the Christian church.

Daubigné's principal works are—Discours sur U' Etude de ? His- totre de Christianisme (Gen. 1832); Le Luthéranisme et la Léforme (Par..1844) ; Germany, England, and Scotland, or Recollections of a Swiss Pastor (Lond. 1848) ; Trois Séeeles de Lutte eu Ecosse, ou deus Rois et deux Royaumes ; Le Proteeteur ou la République d' Angleterre aux jours de Cromwell (Par. 1848); Le Conctle et VInfaillibi- lité (1870) ; Listoire de la Réformation au XV Time Sivcle (Par, 1835-58; new ed, 1861-62in 5 vols.); and the Histoire de la Réfor- mation en Europe au temps de Calvin (8 vols., 1862-1877).

D'AUBIGNE, Tutopors Acrippa (1550-1630), French historian and poet, was born at St Maury, in Saintonge, on the 8th February 1550. In his childhood he showed a great aptitude for languages; according to his own account he knew Latin, Greek, and Hebrew at six years of age ; and he had translated the Cito of Plato before he was eleven. His father, a Huguenot who had been one of the conspirators of Amboise, strengthened his Protestant sym- pathies by showing him, while they were passing through that town on their way to Paris, the heads of the conspira- tors exposed upon the scaffold, and adjuring him not to spare his own head in order to avenge their death. After a brief residence he was obliged to flee from Paris to avoid persecution, but was captured and condemned to death. Escaping through the intervention of a friend, he went to Montargis. In his fourteenth

~~year he was present at the siege of Orleans, at which his father was killed. His guardian sent him to Geneva, where he studied for a cop-~~

~~siderable time under the direction of Beza. In 1567 he | made his escape from tutelage, and attached himself to the~~

~~Huguenot army under the prince of Condé, Subsequently~~

~~he joined Henry of Navarre, to whom he rendered valuable~~

~~service, both as a soldier and as a counsellor, in the wars~~

~~that issued in his elevation to the throne as Henry IV.~~

~~His career at camp and court, however, was a somewhat VI. — 105~~

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~~chequered one, owing to the roughness of his manuer and the keennessof his criticisms, which made him many enemies, and severely tried the king's patience. In his tragedy Circe, which was played before the court, he did not hesitate to indulge in the most outspoken sarcasm against the king and other members of the royal family. Though he more than once found it expedient to retire into private life, he never entirely lost the favour of Henry, who made him governor of Maillezais. After the conversion of the king to Roman Catholicism, D'Aubigné remained true to the Huguenot cause, and a fearless advocate of the Huguenot interests. The first two volumes of the work by which he is best known, his Histoire Universelle depuis 1550 jusqu' a Lan 1601, appeared in 1616 and 1618 respectively. The third volume was published in 1619, and, being still more free and personal in its satire than those which had preceded it, was immediately ordered to be burned by the common hangman. 'The work is a lively chronicle of the incidents of camp and court life, and forms a very valuable source for the history of France during the period it embraces. In September 1620 its author was compelled to take refuge in Geneva, where he found a secure retreat for the last ten years of his life, though the hatred of the French court showed itself in procuring a sentence of death to be recorded against him more than once. He devoted the period of his exile to~~

~~*study, and the superintendence of works for the fortifications of Bern and Basel, which were designed asa material defence of the cause of Protestantism. He died at Geneva on the 29th April 1630. He had two sons, one of whom, Constant D'Aubigné, was the father of Madame de Maintenon. /*~~

~~*The chief works of D'Aubigné besides those already mentioned are—Vers funebres sur la mort d'Etienne Jodelle (Paris, 1574), Les Tragiques donnes au public par le larein de Prométhée (1616),*~~

~~*Aventures du Baron de Feneste, and La Confession Catholique du Sieur de Sancy.*~~

~~*D'AUBUSSON, Pierre (1423-1503), a grand master of the order of St John of Jerusalem, celebrated for the zeal and ability with which he opposed the Turks, was born in 1423. He belonged to a noble French family, and early devoted hiniself to the career of a soldier ; but his his- tory is involved in obscurity till he entered the order of which he was to become the head. Having distinguished hunself greatly against the pirates of the Levant, in 1458 he was chosen to conduct an embassy to Charles VII., a duty which he performed with much success. He was after this appointed to the most important offices in the order, and, finally, in 1476, was by an almost unanimous vote elected grand-master. It was the period of the conquests of Mahomet IJ., who, supreme in the East, now began to threaten Europe. In December 1479 a large Turkish fleet, under Misach Palzologus, appeared in sight of Rhodes; a landing was effected, and a vigorous attack made upon the city. But in July of the next year, being reinforced from Spain, the knights forced the Mussulmans to retire. D'Aubusson had been dangerously wounded in one of the numerous and severe fights which had taken place; but in a few weeks he had so far recovered as to be able to address to the emperor of the East an account of the siege, which raised his renown to the highest point throughout Europe. Soon after, Mahomet II. died, leaving his kingdom to be disputed between his sons Bajazet and Zizim. The latter, finding himself unable to achieve success, sought the aid of D'Aubusson, who, in 1482, received him with great display, but took advantage of his confidence to detain him a prisoner. He was afterwards sent to France, and finally handed over to the Pope, who rewarded D'Aubusson with a*~~

cardinal's hat, and with the power of conferring all benefices connected with the order without the sanction of the papacy, and also suppressed the orders of St Sepulchre and St Lazarus, and bestowed their wealth on the order of

St John. For some years D'Aubusson devotea numself to regulating the affairs of his order, so that it might retain the spirit of lofty enthusiasm which originally animated it, and by which he was himself inspired, and defending its interests from the bad faith of the Popes; but in 1501, being appointed generalissimo of the Christian armies against the Turk, he sailed to attack Mitylene. The forces he commanded, however, he found it impossible to bring into agreement; and the expedition proved a failure. The measure to which the rest of his life was mainly devoted was an attempt to expel Judaism from Rhodes, by banish- ing the adult Jews and forcibly baptizing the children, He died in the summer of 1503.

See P. Bovhours, Histoire de Pierre d' Aubusson (1676) ; Rossio, Dell Istoria della Religione e Militia de S. Giovanni Gerosolimitano (1594-1602), translated by Baudouin and Naberat (1648) ; Villeneuve Bargemont, Monwments de Vordre de Saint Jean (1829).

DAUN, Leorotp Joser Maria, Count von (1705- 1766), field-marshal and commander-in-chief of the Austrian army during the Seven Years' War, was born at Vienna on the 25th September 1705. He was intended for the church, and studied in his youth at Rome ; but his natural inclination for the army, in which his father and grandfather had been distinguished generals, proved irresistible. In 1718 he served in the war in Sicily, in his father's regiment ; in 1734-5, having risen to the rank of major-general, he was engaged in the wars in Italy and on the Rhine. He continued to add to his distinctions in the war against the Turks (1737-9), and in the war of the Austrian succession. In 1745 he was placed in the supreme command of the artillery, and in the same year he confirmed himself in the favour of his sovereign, Maria Theresa, by marrying her protegé, the Countess Fuchs, In 1746-8 the held a command in the Netherlands. In 1754 he was elevated to the rank of field-marshal. During the interval of peace that preceded the Seven Years' War he was engaged in carrying out an elaborate scheme for

~~the reorganization of the Austrian army ; and it was chiefly through his instrumentality that the military academy was established at Wiener-Neustadt in 175i. During the Seven Years' War he was the most formidable opponent that Frederick the Great encountered. On the 18th June 1757 he inflicted a decisive defeat on the greatest general of the age at the battle of Kollin. In commemoration of this brilliant exploit the queen immediately instituted a military order bearing her name, of which Daun was nominated first grand cross. In December 1757 he succeeded Prince Charles of Lorraine as commander-in-chief, and he gained fresh fame by the victories of Hochkirchen (14th October 1758) and Maxen (20th November 1759). On the latter occasion he took General Fink and his whole army prisoners. These successes were counterbalanced by the defeat of Laudon at Liegnitz, which was attributed to the dilatoriness of Daun, and the defeat near Torgau (3d November 1760) by Ziethen's cavalry in a night surprize. In this engagement Daun was so severely wounded that he had to return to Vienna to recruit. He resumed his command in 1761, but did not again achieve any marked success. He retired finally in 1763, at the close of the war. In the previous year he had been appointed president of the Aulic Council. He died on the 5th February 1766. By the order of Maria Theresa a monument to his memory was erected in the church of the Augustinians, with an inscription styling him the Saviour of the State. As a general Daun has been reproached for the dilatoriness of his operations, but this was only the wariness required in opposing a general like Frederick, who was quick and unexpected in his movements beyond all precedent. A more indisputable fault was his inability to secure the full results of a victory.~~

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~~DAUPHINE, an ancient province of south-eastern Frauce, now forming the departments of Istre, Dréme, and Hautes Alpes. It was bounded on the FE. by Piedmont, N.E. by Savoy, 8. by Provence, S.W. by the Comtdé Venaissin, and N. and W. by the Rhone. The western portion was known as Lower, and the eastern portion as Upper Dauphiné,—the latter including the districts of Matesine, Champ-saur, Oisans, Diais, Gapengais, Embrunais, and Briangonnais ; and the former, Gresivaudan, Viennais, Valentinais, Royannez, the Baronies, and Tricastinais, When it first appears in history the district was inhabited by the Allobroges, the Caturiges, and other Celtic~~

tribes, who were gradually incorporated in the Roman Empire. It was afterwards successively comprised in the first Bur- gundian kingdom, the Carolingian empire, the second Burgundian kingdom, and the German empire. In the course of the 9th, 10th, 11th, and 12th centuries it was broken up into several small principalities, ecclesiastical and secular ; of which the most important proved that of the lords of Albon, who, first as counts and afterwards as dauphins of Viennais, gradually extended their influence and possessions. The Burgundian line dying out in 1281, the lordship passed to the house of La Tour du Pin, which in the person of Guiges VIII. was offered the royal dignity by Louis the Bavarian. Guiges's successor, Hubert II., having lost his only son in 1335, made over his lands to Charles of Valois, the grandson of Philip VI., in return for an annual payment, and on condition that the independence and the privileges of the countship should be maintained. From this time the eldest son of the king of France bore the title of Dauphin. The history of Dauphiné down to the Revolution consists mainly of the struggles of its inhabitants to maintain their liberties against the gradual encroachments of the Crown. Louis XI. was the first to demand the payment of an annual tax. Richelieu abolished their estates ; but the constitutional spirit of the people continued alive, and in 1788 displayed itself in violent resistance to the dissolution of the provincial parle- ment and in the convocation of the three orders in the castle of Vizille, where the popular rights were boldly asserted.

See Chappuis-Montlaville, Histoire du Dauphiné, 1827 ; Colomba de Batines, Bibliographie des patois du Dauphiné, 1835 ; Catalogue des Dauphinois dignes de mémoire, 1840, and J/élanges biogra- phiques relatifs & Uhistoire littéraire du Dauphiné, 1837-40 ;

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Raverat, A travers le Dauphiné ; Charles Lory , Deseription géologique du Dauphiné, 1861.

DAURAT, Jean (or Dorat; in Latin, AURATUS), French poet of the renaissance, and founder of the Pléiade, was born at Limoges in 1507. He was of illustrious family, and, after studying at the college of Limoges, came up to Paris to be presented to Francis I., who made him tutor to his pages. He rapidly gained an immense reputa- tion, especially for proficiency in

classical learning. As private tutor in the house of Lazare de Baif, he had J. A. de Baif, afterwards famous as a poet, for his pupil. His son, Louis, was of a marvellous precocity, and at the age of ten translated into French verse one of his father's Latin pieces ; his poems were published with his father's. Jean Daurat became the director of the Collége de Coqueret, where he had among his pupils, besides Baif, Ronsard, Remy Belleau, and Pontus de Thyard. Du Bellay was added by Ronsard to this group ; and these five young poets, under thie direction of Daurat, formed a species of society for the reformation of the French language and litera- ture. They increased their number to seven by the initia- tion of the dramatist Etienne J odelle, and thereupon they named themselves 'La Pléiade," in emulation of the seven Greek poets of Alexandria. The election of Daurat as their president proved the weight of his personal influence, but as a writer of French verse he is the least important of the seven. Meanwhile he collected around him a sort of

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Academy, and stimulated the students on all sides to a passionate study of Greek and Latin poetry. He himself wrote incessantly in both those languages, and was styled the Modern Pindar. In 1560 he was appointed professor of Greek at the Collége Royale, a post which he continued to hold until, in his extreme old age, he resigned it in favour of his nephew, Nicolas Goulu. Charles TX. gave him the title of pote regius. His flow of language was the wonder of his time ; he is said to have composed more than 15,000 Greek and Latin verses. What he considered the best of these were comprised in a volume of Poemata, published at Paris in 1586. He died at Paris on the Ist of November 1588, having survived all his illustrious pupils of the Pldiade, except Pontus de Thyard. He was a little, restless man, of untiring energy, rustic in manner and appearance. His unequalled personal influence over the most graceful minds of his age gives him an importance in the history of literature for which his own somewhat vapid writings do not fully account.

DAVENANT, Sir Wittram (1605-1668), poet and dramatist, was born in February 1605, at the Crown Inn, Oxford, where his father was a wealthy vintner. It was stated that Shakespeare always stopped at this house in

passing through the city of Oxford, and out of his known or rumoured admiration of the hostess, a very fine woman, there sprang a scandalous story which attributed Davenant's paternity to the greatest of poets, a legend which there is reason to believe Davenant himself encouraged, but which later criticism has cast aside as spurious. In 1621 the vintner was made mayor of Oxford, and in the same year his son left the grammar-school of All Saints, where his master had been Edward Sylvester, and was entered an undergraduate of Lincoln College. He did not stay at the university, however, long enough to take a degree, but was hurried away to appear at court as a page, in the retinue of the gorgeous duchess of Richmond. From her service he passed into that of Fulke Greville, Lord Brooke, in whose house he remained until the murder of that eminent man in 1628, This blow threw him upon the world, not altogether without private means, but greatly in need of a profitable employment. He turned to the stage for sub- sistence, and in 1629 produced his first play, the tragedy of Albovine. It was not a very brilliant performance, but it pleased the town, and decided the poet to pursue a dramatic career. The next year saw the publication of The Cruel Brother, a tragedy, and The Just Italian, a tragi-comedy. Inigo Jones, the court architect, for whom Ben Jonson had long supplied the words of masques and complimentary pieces, quarrelled with his great colleague in the year 1634, and applied to William Davenant for verses, The result was Zhe Temple of Love, performed by the queen and her ladies at Whitehall on Shrove Tuesday, 1634, and printed in that year. Another masque, The Triumphs of the Prince D' Amour, followed in 1635. The poet returned to the legitimate drama by the publication of three of his cleverest and most successful pieces, the tragi-comedy of Love and Lonour, in 1635, and the tragi- comedy of Zhe Platonic Lovers, and the famous comedy of The Wits, nm 1636. The masqueof Lritannia T'riumphans brought him into some trouble, for it was suppressed, as a punishment for its first performance having been arranged for a Sunday. By this time Davenant had, however, thoroughly ingratiated himself with the court; and on the death of Ben Jonson in 1637 he was rewarded with the office of poet-laureate, to the exclusion of May, who con- sidered himself entitled to the honour. It was shortly after this event that Davenant collected his minor lyrical pieces into a volume entitled Madagascar and other Poems, 1638 ; and in 1639 he became manager of the new theatre

in Drury Lane. The civil war, however, put a check upon this prosperous career ; and he was among the most active partisans of royalty through the whole of that struggle for supremacy. As early as May 1642, Davenant was accused before the Long Parliament of being mainly con- cerned in a scheme to seduce the army to overthrow the Commons. He was accordingly apprehended at Faversham, and imprisoned for two months in London; he then attempted to escape to France, and succeeded in reaching Canterbury, where he was re-captured. Escaping a second time, he made good his way to the queen, with whom he remained in France until he volunteered to carry over to England some military stores for the army of his old friend the earl of Newcastle, by whom he was induced to enter the service as lieutenant-general of ordnance. He acquitted himself with so much bravery and skill that, after the siege of Gloucester, in 1643, he was knighted by the king. After the battle of Naseby, he retired to Paris, where he became a Roman Catholic, and spent some months in the composition of his epic poem of Gondibert. In 1650 he took the command of a colonizing expedition that set sail from France to Virginia, but was captured in the Channel by a Parliamentary man-of-war, which took him back to the Isle of Wight. Imprisoned in Cowes Castle until 1651, he tempered the discomfort and suspense of his condition by continuing the composition of Gon- dibert. He was sent up to the Tower to await his trial for high treason, but just as the storm. was about to break over his head, all cleared away. It is believed that the personal intercession of Milton led to this result. Davenant, released from prison, immediately published Gondibert, the work on which his fame mainly rests, a chivalric epic in the stanza of Nosce Teipsum, the influence of which poem is strongly marked in its philosophical pas- sages. It is a cumbrous, dull poem, but is relieved with a multitude of fine and felicitous passages, and lends itself most happily to quotation. During the civil war one of his plays had been printed, the tragedy of The Unfortunate Lovers, in 1643. He found that there were many who desired him to recommence his theatrical career. Such a step, however, was absolutely forbidden by Puritan law. Davenant, therefore, by the help of some influential friends, obtained permission to open a sort of theatre at Rutland House, in Charterhouse Yard, where, on the 21st of May 1656, he began a series of representations, which he called operas, aS an inoffensive term. This word was then first

introduced into our language. The opening piece was his own Stege of Rhodes, printed the same year, which was per- formed with stage-decorations and machinery of a kind hitherto quite unthought of in England. He continued until the Restoration to produce ephemeral works of this kind, only one of which, The Cruelty of the Spaniards in Peru,in 1658, was of sufficient literary merit to survive. In 1660 he had the infinite satisfaction of being able to preserve the life of that glorious poet who had, nine years before, saved his own from a not less imminent danger. The mutual relations of Milton and Davenant do honour to the generosity of two men who, sincerely opposed in politics, knew how to forget their personal anger in their common love of letters. Under Charles IL, Davenant flourished in the dramatic world ; he opened a new theatre in Lincoln's Inn Fields, which he called the Duke's ; and he introduced a luxury and polish into the theatrical life which it had never before known in England. Under his management, the great actors of the Restoration, Betterton and his coevals, took their peculiar French style and appearance ; and the ancient simplicity of the English stage was completely buried under the tinsel of decoration and splendid scenery. Davenant brought out six new plays in the Duke's Theatre, The Rivals, The Man's the Master,

comedies translated from Scarron, Vews from Plymouth, The Distresses, The Svege, The Fair Favourite, tragi- comedies, all of which were printed after his death, and not one of which survived their author on the stage. He died on the 17th of April 1668, and two days afterwards was buried in Poet's Corner, Westminster Abbey, with the in- scription " O rare Sir William Davenant!" In 1672 his writings were collected in folio. His last work had been to travesty Shakespeare's 7'empest, in company with Dryden. The personal character, adventures, and fame of Davenant, and more especially his position as a leading reformer, or rather debaser, of the stage, have always given him a prominence in the history of literature which his writings hardly justify. His plays are utterly unreadable, and his poems are usually stilted and unnatural. With Cowley, he marks the process of transition from the poetry of the imagination to the poetry of the intelligence ; but he had far less genius than Cowley, and his influence on our drama must be condemned as wholly deplorable. (x,w.«.)
DAVENPORT, a city of the United States, capital of Scott county, Iowa, is situated on the west bank of the Upper Mississippi, opposite Rock Island,

about 110 miles above Keokuk (following the course of the river), and 160 miles west of Chicago. The city, which is regularly laid out, contains a city hall, a county court-house, an opera house, and a number of churches, Among the educa- tional institutions may be mentioned Griswold College, belonging tothe Episcopalian denomination, and the Catholic Academy of the Immaculate Conception. There is also an academy of natural science. The trade of Davenport is considerable, consisting chiefly of grain and domestic pro- duce, while its manufactures are not unimportant, compris- ing waggons, agricultural implements, joinery and cabinet work, tobacco, &c. The city is governed by a mayor and 12 aldermen. It was first settled in 1836, and was incorporated as a town in 1842 and as a city in 1851. Population in 1860, 11,267 ; and in 1870, 20,038. DAVID (Hebrew, 112 beloved), son of Jesse, second king of Israel, and founder of the dynasty which continued to reign at Jerusalem until the Babylonian captivity. According to the usual chronology, he reigned 1055-1015 B.C., but the computations which produce this date by counting back from the destruction of Jerusalem, 588 B.c., or the fall of Samaria, 722 3.c., contain numerous pre- carious elements, Ewald puts the date ten years earlier, but recent investigations on the contrary make it not improbable that David flourished as much as from thirty years to half a century later than is usually assumed.! David is the greatest of the kings of Israel, and his reign changed the whole face of Hebrew history. During the period of the Judges, the Hebrews were weakened by an exaggerated love of personal independence, divided by tribal jealousies, and oppressed by a succession of foreign enemies, of whom the latest and most dangerous were the Philistines, an immigrant people whose main settlements in the fruitful coastland of southern Canaan appear to have taken place after the Hebrews were established in the Jand. Forcing their way inland, the Philistines struck a decisive

1 The admitted confusion in the chronology of the books of Kings can hardly be cleared up without the aid of synchronisms with the history of foreign nations, Egypt and Assyria. The Assyrian syn- chronisms seem to bring down the date of Jehu, and hence of all who preceded him, by nearly forty years. This is at least not contradicted by the only available Egyptian synchronism, the war of Shishak with Rehoboam. (See Schrader, Keilinschriften und A. T., Giessen, 1872, and in control of his conclusions

Wellhausen in the Jahrbiicher fir Deutsche Theologie, 1875, p. 607, seq. and G. Smith's Assyrian Eponym Canon, 1875.) An additional. element of uncertainty lies in the forty years' reign ascribed to Solomon. Forty is often used as an indefinite number, and the marriage of Rehoboam to Absalom's daughter seems inconsistent with so long a reign, as Rehoboam came to the throne at the age of forty-one.

blow in the battle of Ebenezer (1 Sam. iv.), when the collapse of the ancient hegemony of Ephraim, and the destruction of the sanctuary of the ark at Shilo, left the Hebrews without national leaders and without a centre of national action. Then arose Samuel, whose prophetic activity rallied the Israelites around Jehovah God of Hosts, and brought about a great national and religious revival. The struggle with the Philistines was renewed with better success, though without decisive issue, and at length the election of Saul as king embodied in a permanent institu- tion the stronger sense of national unity which had grown up under Samuel. But Saul was not equal to the task set before him. He broke with the prophetic party, which was the mainstay of the national revival which the king was called to lead. He felt himself forsaken by Jehovah, and his last years were clouded by accesses of a furious melancholy which destroyed his vigour and alienated his subjects. When at length he was defeated and slain at Gilboa, the Philistines appeared to be absolute masters of the position. They even moved forward and occupied the cities in the plain of Jezreel and on the Jordan, which the Israelites forsook in terror—a movement which cut the country as it were in two, and apparently made it impos- sible for the Hebrews again to unite under a single head. From this humiliation David in a few years raised his country to the highest state of prosperity and glory, subduing his enemies on every side, and extending his suzerainty, as he expresses himself in Psalm xviii., even over nations that he had not known. 'To do this work other qualities than mere military capacity were required. David was not only a great captain,—he was a national hero, who united in his own person the noblest parts of Hebrew genius, and drew to himself by an unfailing personal attraction the best valour, patriotism, and piety of the nation ; while his political tact and inborn talent

~~for rule enabled him to master the old tribal particularism,.~~

~~and to shape at Jerusalem a kingdom which, so long as he lived, represented the highest conception of national life that was possible under the rude social conditions then existing. The structure erected by David was, in truth, too much in advance of the times, and too wholly the creation of unique genius to be permanent. Under a successor whose wisdom lacked the qualities of personal force and sympathy with popular feeling, the kingdom of David began to decay, and in the next generation it fell asunder, and lived only in the hearts of the people as the proudest memory of past history, and the prophetic ideal of future glory.~~

~~The books of Samuel, which are our principal source for the history of David, show how deep an impression the personality of the king, his character, his genius, and the romantic story of his early years had left on the mind of the nation. Of no hero of antiquity do we possess so life- like a portrait. Minute details and traits of character are preserved with a fidelity which the most sceptical critics have not ventured to question, and with a vividness which bears all the marks of contemporary narrative. But the record is by no means all of one piece. The history, as we now have it, is extracted from various sources of unequal value, which are fitted together in a way which offers con- siderable difficulties to the historical critic. In the history of David's early adventures the narrative is not seldom disordered, and sometimes seems to repeat itself with puzzling variations of detail, which have led critics to the almost unanimous conclusion that the First Book of Samuel is drawn from at least two parallel histories. It is indeed easy to understand that the romantic incidents of this period were much in the mouths of the people, and in course of time were written down in various forms which were not combined intc perfect harmony by later editors,~~

~~Who gave excerpts from several sources rather than a new and independent history. These excerpts, however, have been so pieced together that it is often impossible to separate them with precision, and to distinguish accurately between earlier and later elements. It even appears that some copies of the books of Samuel incorporated narratives which other copies did not acknowledge. From the story of Goliath the Septuagint omits many~~

~~*verses—1 Sam xvii. 12-31, Xvi. 55—xvili. 5. The omission makes the narra- tive consistent, and obviates serious difficulties involved in the Hebrew text. Hence some have supposed that the Greek translators arbitrarily removed passages that puzzled them. But this hypothesis does not meet the facts, and is inconsistent with what we know of the manner of this part of the Septuagint. There can be little doubt that both here and in other cases the shorter text is original, and that the disturbing additions came in later from some other docu- ment, and were awkwardly patched on to the older text.) So too the history of the gradual estrangement of Saul from David is certainly discontinuous, and in the opinion of most critics the two accounts of David sparing Saul's life are duplicate narratives of one event. Even in the earlier part of the history these minor difficulties do not affect the essential excellence of the narrative preserved to us ; and for the period of David's kingship the accounts are still better. All that relates to personal and family matters at the court of Jerusalem (2 Sam. xi.—xx.) seems to come from some writer who had personal cognizance of the events recorded. It does not appear that the plan of this author included the history of David's foreign campaigns, The scanty account of great wars in ch. viii. is plainly from another source, and in general our informa- tion is less adequate on public affairs than on things that touched the personal life of the king. The narrative is further enriched with poetical pieces, of which one at least (2 Sam. i. 19-27) is known to be extracted from an anthology entitled The Book of the Upright. Several brief lists of names and events seem also to have been taken from distinct sources, and sometimes interrupt the original context (¢.g., 2 Sam. iii, 2-5), Some important lists were still accessible to the author of Chronicles in a separate form. 1 Chron. xi. 10-47 is fuller at the end than the corresponding list in 2 Sam. xxiii; and 1 Chron. xil. contains; valuable matter altogether wanting in Samuel. See also 1 Chron, xxvii. Besides the books of Samuel (with 1 Kings i. ii.), and the parallel narrative of the Chronicler, we have a few hints for the history of David in 1 Kings xi. and in the titles of Psalms (especially Pss. vii. and lx.), and of course such psalms as can be made out to be really by David are invaluable additions to the Davidie poems incorporated in the books of Samuel.*~~

~~*J esse, the father of David,wasa substantial citizen of Beth- lehem. He claimed descent through Boaz from the ancient princes of Judah (Ruth iv.*~~

~~18, seg.), but the family connection was not of note in Israel (1 Sam. xviii. 18). As the youngest son of the house David spent his youth in an occupation which the Hebrews as well as the Arabs seem to have held in low esteem. He kept his father's sheep in the desert steppes of Judah, and there developed the strength, agility, endurance, and courage which distinguished him throughout life, and are referred to in Ps. xviii. 32, seg. (comp. 1 Sam. xvil. 34, xxiv. 2; 2 Sam. xvii.9). There, too, he acquired that skill in music which led to his first introduction to Saul. Then he became Saul's armour-bearer, and in this capacity, according to the shorter and more consistent form of the narrative, David took part in the campaign in which he slew the Philistine champion Goliath, and became by~~

~~1 The proof of this turns in good measure on arguments that cannot be reproduced here. But the discussion in Wellhausen's Text der Biicher Samuelis, Gottingen, 1871, appears to be conclusive,~~

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~~one exploit a popular hero, and an object of jealousy to Saul. According to the Massoretic text of 1 Sam., Saul's jealousy leaped at once to the conclusion that David's ambition would not stop short of the kingship. Such a suspicion would be intelligible if we could suppose that the king had heard something of the significant act of Samuel, which now stands at the head of the history of David in witness of that divine election and unction with the spirit of Jehovah on which his whole career hung (1 Sam. xvi. 1-13). But there is not the least trace in the history that even David and David's family understood at the time the meaning that underlay his unction by Samuel, which would naturally be taken as a special mark of favour and a part of the usual "consecration" of the guests in a sacrificial feast.1 The shorter text of 1 Sam. xviii, represented by the Septuagint, gives an account of Saul's jealousy, which is psychologically more intelligible.? According to this text Saul was simply possessed with such a personal dislike and dread of David as might easily occupy his disordered brain. To be quit of his hateful presence he gave him a military command. In this charge David increased his reputation as a soldier and became a general favourite. Saul's daughter Michal loved him; and her father, whose jealousy continued to~~

~~increase, resolved to put the young captain on a perilous enterprize, promising him the hand of Michal as a reward of success, but secretly hoping that he would perish in.the attempt. David's good fortune did not desert him; he won his wife, and in this new advance- ment continued to grow in the popular favour, and to gain fresh laurels in the field.~~

~~At this point it is necessary to look back on an episode which is found in the Hebrew text but not in the Greek— the proposed marriage of David with Saul's eldest daughter Merab, who at the time when the proposal was made was already the wife of a certain Adriel.? What is said of this affair interrupts the original context of chap. xvili., to which the insertion has been clumsily fitted by an interpolation in v. 21. We have here, therefore, a notice drawn from a distinct source, and of uncertain value. Meraband Michalare confounded in 2 Sam. xxi. 8, and perhaps the whole episode of Merab and David rests on a similar confusion of names.~~

~~As the king's son-in-law, David was necessarily again at court. He became chief of the body-guard, as Ewald rightly interprets 1 Sam. xxii. 14, and ranked next to Abner (1 Sam. xx. 25), so that Saul's insane fears were constantly exasperated by personal contact with him. On at least one occasion the king's frenzy broke out in an attempt to murder David with his own hand.* At an- other time Saul actually gave commands to assassinate his son-in-law, but the breach was made up by Jonathan, whose chivalrous spirit had united him to David in a covenant of closest friendship (1 Sam. xix. 1-7). The circumstances of the final outburst of Saul's hatred, which drove David into exile, are not easily disentangled. The narrative of 1 Sam. xx., which is the principal account of~~

~~1 The remarks of Samuel as the sons of Jesse passed before him were~~

~~presumably not audible. The words "unto Jesse" in ver. 10 are not in the LXX. It is not therefore necessary to conclude with some critics that this story is to be taken as a mere figurative embodiment of the idea of David's election by God. When the true sense of the act was divined it is not easy to determine. David appears still unconscious of his destiny in 1 Sam. xviii. 23, but Abigail, 1 Sam. xxv. 30, knows that the prophetic word has marked him out as king. Compare 2 Sam. iii. 9, v. 2. t 2 From ch. xviii. the LXX. omits ver. 1 to the middle of ver. 6 inclusive, the first and last clauses of ver.~~

~~8, verses 9 to 11 inclusive, the reason given for Saul's fear in ver. 12, verses 17-19 inclusive, the second half of ver. 21. It also modifies ver. 28, and omits the second half of ver. 29 and the whole of ver. 30.~~

~~3 This seems to be the true meaning of 1 Sam. xviii. 19.~~

- ~~4] Sam. xix. 9. The parallel narrative, ch. xviii. 10, 11, may refer to a different occasion. But as the text of ch. xviii. is disordered, and the verses are wanting in the Greek, this is not certain.~~

~~the matter, cannot originally have been preceded by chap. xix. 11-24, for in chap. xx. David appears to be still at court, and Jonatlian is even unaware that he is in any danger, while the preceding verses represent him as already a fugitive. It may also be doubted whether the narrative of David's escape from his own house by the aid of his wife Michal (chap. xix. 11-17) has any close connection with verse 10, and does not rather belong to a later period.' David's daring spirit might very well lead him to visit his wife even after his first flight. The danger of such an enterprize was diminished by the reluctance to violate the apartments of women and attack a sleeping foe, which appears also in Judges xvi. 2, and among the Arabs,é In any case it is certain that chap. xx. must be taken by itself ; and it seems safer to conclude that chap. xix. 11-24 are fragments which have been misplaced by an editor, than to accept the opinion of those critics who hold that we have two distinct and quite inconsistent accounts of the same events.~~

~~According to chap. xx. David was still at court in his usual position when he became certuin that the king was aiming at his life. He betook himself to Jonathan, who thought his suspicions groundless, but undertook to test them. A plan was arranged by which Jonathan should draw from the king an expression of his feelings, and a tremendous explosion revealed that Saul regarded David as the rival of his dynasty, and Jonathan as little better than a fellow conspirator. The breach was plainly irreparable. Jonathan sought out his friend, and after mutual pledges of unbroken friendship they parted, and David fled. His first impulse was to seek the sanctuary at Nob, where he had been wont to consult the priestly oracle (chap. xxii. 15), and where, concealing his disgrace by a fictitious story, he also obtained bread from the consecrated table and the sword of Goliath. It was perhaps after this that David made a~~

~~‘last attempt to find a place of refuge in the prophetic circle~~

~~of Samuel at Ramah, where he was admitted into the pro- phetic ccenobium, and was for a time protected by the powerful, and almost contagious influences, which the religious exercises of the prophets exerted on Saul’s emissaries, and even on the king himself. The episode now stands in another connection (chap. xix. 18, seq.), where it is certainly out of place. It would, however, fit excellently into the break that plainly exists in the history at xxi. 10 after the affair at Nob. Deprived of the protec- tion of religion as well as of justice, David tried his fortune among the Philistinesat Gath. But he was recognized and suspected as a redoubtable foe. Escaping by feigning madness, which in the East has inviolable privileges,’ he returned to the wilds of Judah, and was joined at Adullam® by his father’s house and by a small band of outlaws, of which he became the head. Placing his parents under the charge of the king of Moab, he took up the life ofa guerilla captain, cultivating friendly relations with the townships of Judah (1 Sam. xxx. 26), which were glad to have on their frontiers a protector so valiant as David, even at the expense of the blackmail which he levied in return.~~

~~clear conception of his life at this time, and of the respect which he inspired by the discipline in which he held his~~

~~5 The close of ver. 10 in the Hebrew is corrupt, and the words “ that night” seem to belong to next verse. So the Greek reads.~~

~~6 Wellhausen cites a closely parallel case from Sprenger’s Mohammed, vol. ii. p. 548.~~

~~7 An interesting parallel in Barhebrei Chron., ed. Bruns et Kirsch, p. 222,~~

~~8 The cave of Adullam is traditionally placed at Charatun, two hours’ journey south of Bethlehem. But the town of Adullam, which has not been identified with any certainty, lay in the low country of Judah (Josh. xv. 35). The “cave” is also spoken of asa “ hold’ or mountain fortress, and perhaps “ hold” is everywhere the true reading (Wellhausen, Noldeke). Compare Theodotion in 1 Sam. Oa sy, sem, Ie~~

~~men, and of the generosity which tempered his fiery nature, is given in 1 Sam. xxv. His force gradually swelled, and he was joined by the prophet Gad and by the priest Abiathar, the only survivor of a terrible massacre by which Saul took revenge for the favours which David had received at the sanctuary of Nob. He was even able to strike at the Philistines, and to rescue Keilah, in the low country of Judah, from their attack. Had he been willing to raise the standard of revolt against Saul, he might pro- bably have made good his position, for he was now openly pointed to as divinely designed for the kingship. But though Saul was hot in pursuit, and though he lived in constant fear of being betrayed,! David refused to do this. His blameless conduct retained the confidence of Jonathan (1 Sam. xxiii, 16), and he deserved that confidence by sparing the life of Saul.? But at length it became plain that he must either resist by force or seek foreign protec- tion, He went to Achish of Gath, and was established in the outlying town of Ziklag, where his troops might be useful in chastising the Amalekites and other robber tribes who made forays on Philistia and Judah without distinction?~~

~~At Ziklag David continued to maintain amicable relations with his friends in Judah, and his little army received accessions even from Saul's own tribe of Benjamin (1 Chron.xii. 1), At length, in the second year, he was called to join his master in a great campaign against Saul. The Philistines directed their forces towards the rich valley of Jezreel ; and Saul, forsaken by Jehovah, already gave himself up for lost. It may be doubted whether the men of Judah took part in this war ; and on his march David was joined by influential deserters from Israel (1 Chron. xii.). The prestige of Saul's reign was gone ; and the Hebrews were again breaking up into parties, each ready to act for itself. Under such circumstances David might well feel that loyalty to his new master was his first duty. But he was providentially saved from the necessity of doing battle with his countrymen by the jealousy of the Philistine lords, who demanded that he be seut back to Ziklag. He returned to find the town pillaged by the Amalekites; but pursuing the foes he inflicted upon them a signal chastise- ment and took a great booty, part of which he spent in politic gifts to the leading men of the Judean towns.~~

Meantime Saul had fallen, and northern Israel was in a state of chaos. The Philistines took possession of the fertile lowlands of Jezreel and the Jordan; and the shattered forces of Israel were slowly rallied by Abner in the remote city of Mahanaim in Gilead, under the nominal

sovereignty of Saul's son Ishbaal. The tribe of Judah, a ee

? 1 Sam. xxiii. 12, 19, Psalm vii.,1 Chron. xii. 17. 1 Sam. xxvi. 1 seems to refer to the same event as ch. xxiii. 19.

2 We have seen that this act of generosity either was repeated or is twice recorded, 1 Sam. xxiv. and xxvi. Neither narrative suggests the existence of the other, and the two are not more divergent than the two forms of the story of Goliath. But it is hard to coinprehend how Ewald can give the preference to ch. xxiv. The tour-de-force by which he changes Saul's cruse of water into a basin, and adduces legendary parallels, ignores obvious features of truthfulness in ch. xxvi. Compare 'Thomson's Land and Book, p. 367. The conversation in ch. xxvi. is full of antique and characteristic ideas wanting in ch. xxiv. That David is recognized by his voice is meaningless in xxiv. 16 (comp. ver. 8), but appropriate in xxvi. 17.

1 Sam. xxvii. 7-12, must be compared with ch. xxx. 14, 16. The Cherethites whom the Amalekites attacked were Philistines. It must not therefore be supposed, as ch. xxvii. might seem to imply, that David systematically attacked populations friendly to Achish, and then pretended that he had been making forays against Judah. Such a policy could not have been long kept secret, and as it is pretty plain that the Philistines acquiesced in David's sovereignty in Hebron, it is not easy to see that they ever had an interest in embroiling him with the men of Judah. They coveted the richer lands of northern Canaan (1 Sam. xxxi. 7), and it would be their wise policy to detach Judah from Israel. The details of the text and meaning of 1 Sam. xxvii. 7-12 are very obscure.

always loosely attached to the northern Hebrews, was in these circumstances compelled to act for itself, David saw his opportunity, and advanced to Hebron, where he was anointed king of Judah at the age of thirty, and continued to reign for seven years and a half. His noble elegy on the death of Saul and J onathan, and his message of thanks to the men of

~~Jabesh Gilead for their chivalrous rescue of the bodies of the fallen heroes, show how deeply he sympathized with the disasters of his nation 3 and even in northern Israel many now looked to him as their only helper (2 Sam. iii. 17). But David was not lacking in the caution and even craftiness proper to an Oriental hero ; and he appears to have been careful not to irritate the Philistines by any premature national movement. As he retained Ziklag we must suppose that he had some agree- ment with his former suzerain Achish, Abner gradually consolidated the authority of Ishbaal in the north, and at length his forces met those of David at Gibeon, A sham contest was changed into a fatal fray by the treachery of Ishbaal's men ; and in the battle which ensued Abner was not only defeated, but, by slaying Asahel, drew upon him- self a blood feud with Joab, The warcontinued. Ishbaal's party waxed weaker and weaker; and at length Abner quarrelled with his nominal master and offered the kingdom to David. The base murder of Abner by Joab did not long defer the inevitable issue of events. Ishbaal was assassinated by two of his own followers, and all Israel sought David as king.~~

~~The Biblical narrative is not so constructed as to enable us to describe in chronological order the thirty-three years of David's reign over all Israel. Let us look at (1) his internal policy, (2) his relations to foreign nations, (3) other events.~~

~~1. Under the judges all authority was at bottom local or tribal, and the wider influence wielded by the more famous of these rulers took' the form of a temporary pre- eminence or hegemony of the judge's own tribe. The kingdom of Saul was not radically different in character, There was no national centre. Saul ruled as a Benjamite from his paternal city of Gibeah (¢f. 1 Sam. xxii. 7). At the risk of alienating the men of Judah, who in fact appear as the chief malcontents in subsequent civil disturbances, David resolved to break through these precedents, and to form a truly national kingdom independent of tribal feel- ing. The success of so bold a conception was facilitated by the circumstance that, unlike previous kings, he was surrounded by a small but thoroughly disciplined standing army, having gradually shaped his troop of freebooters into an organized force of 600 " mighty men" (Gibborim), always under arms, and absolutely attached to his person. The king began the execution of his plan by a stroke which at~~

once provided a centre for future action, and gave the necessary prestige to his new kingdom. He stormed the Jebusite fortress of Jerusalem, which its inhabitants deemed impregnable, and here, in the centre of the country, on the frontier between Judah and Benjamin, he fortified the "city of David," the stronghold of Zion, and garrisoned it with his Gibborim. His next aim was to make Jerusalem the religious as well as the political centre of the kingdom. The ark of Jehovah, the only sanctuary of national signifi- cance, had remained in obscurity since its return from the Philistines in the early youth of Samuel, David brought it up from Kirjath-Jearim with great pomp, and pitched a tent for it in Zion, amidst national rejoicings. No action of David's life displayed truer political insight than this. (See ARK.) But the whole narrative (2 Sam. vi.) shows that the insight was that of a loyal and God-fearing heart, which knew that the true principle of Israel's unity and strength lay in national adherence to Jehovah (comp. Pss. xv. and xxiv., one or both of which may refer to this

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occasion). It was probably at a later period, when his kingdom was firmly established, that David proposed to erect a permanent temple to Jehovah. The prophet Nathan commanded the execution of this plan to be delayed for a generation; but David received at the same time a prophetic assurance that his house and kingdom should be established for ever before Jehovah.

In civil and military affairs David was careful to combine necessary Innovations with a due regard for the old habits and feelings of the people, which he thoroughly understood and turned to good account. The 600 Gibborim, and a small body-guard of foreign troops from Philistia (the Cherethites and Pelethites), formed a central military organization, not large enough to excite popular jealousy, but sufficient to provide offivers and furnish an example of discipline and endurance to the old national militia, exclu- sively composed of foot-soldiers.1 In civil matters the king looked heedfully to the execution of justice (2 Sam. viii. 15), and was always accessible to the people (2 Sam. xiv. 4). But he does not appear to have made any change in the old local administration of justice, or to have appointed a central tribunal (2 Sam. xv. 2, where, however, Absalom's complaint that the king was inaccessible is merely factious). A few great

~~officers of state were appointed at the court of Jerusalem (2 Sam. viii.), which was not without a splendour hitherto unknown in Israel. The palace was built by Tyrian artists. Royal pensioners, of whom Jonathan's son Mephibosheth was one, were gathered round a princely table. The art of music was not neglected (2 Sam. xix. 35). A more dangerous piece of magnificence was the harem, which, though always deemed an indispensable part of Eastern state, did not befit a servant of Jehovah, and gave rise to public scandal as well as to fatal disorders in the king's household. Except in this particular, David seems to have ventured ou only one dangerous innovation, which was undertaken amidst universal remonstrances, and was checked by the rebukes of the prophet Gad and the visitation of a pestilence. 'To us the proposal to number the people seems innocent or laudable. But David's con- science accepted the prophetic rebuke, and he tacitly admitted that the people were not wrong in condemning his design as an attempt upon their liberties, and an act of presumptuous self-confidence (2 Sam. xxiv.).~~

~~2. David's wars were always successful, and, so far as we call judge from the brief record, were never provoked by himself. HIs first enemies were the Philistines, who rose in arms as soon as he became king of all Israel. We read of two great battles in the valley of Rephaim, west ward from Jerusalem (2 Sam. v.); anda record of in- dividual exploits and of personal dangers run by David is preserved in 2 Sam. xxi. and xxiii. At length the Philistines were entirely humbled, and the "bridle" of sovereignty was wrested from their hands (chap. viii. 1, HIeb.) But the long weakness of Israel had exposed the nation to wrongs from their neighbours on every side ; and the Tyrians, whose commerce was benefitted by a stable government in Canaan, were the only permanent allies of David. Moab, an ancient and bitter foe, was chastised by David with a severity for which no cause is assigned, but which may pass for a gentle reprisal if the Moabites of that day were not more humane than their descendants in the days of King Mesha* A deadly conflict with the~~

~~Ammonites was provoked by a gross insult to friendly |~~

~~ambassadors of Israel; and this war, of which we have pretty full details in 2 Sam. x. 1-xi. 1, xii, 26-31,~~

1 For the manner in which this national force was called out com- pare 1 Chron. xxvii.

2 David destroyed two-thirds of the Moabites—presumably of their fighting men (2 Sam. viii. 2). Mesha destroys every inhabitant of cities captured in honour of his god Chemosh.

assumed dimensions of unusual magnitude when the Amnionites procured the aid of their Aramean neighbours, and especially of Hadadezer, whose kingdom of Zoba seems to have held at that time a pre-eminence in Syria at least equal to that which was afterwards gained by Damascus, The defeat of Hadadezer in two great campaigns brought in the voluntary or forced submission of all the lesser kingdoms of Syria as far as the Orontes and the Euphrates, The glory of this victory was increased by the simultaneous subjugation of Edom in a war conducted by Joab with characteristic severity. After a great battle on the shores of the Dead Sea the struggle was continued for six months, The Edomites contested every inch of ground, and all who bore arms perished (2 Sam. viii. 13; 1 Kings xi. 15-17; Ps. Ix., title). The war with Ammon was not ended till the following year, when the fall of Rabbah crowned David's warlike exploits. But the true culminating point of his glory was his return from the great Syrian campaign, laden with treasures to enrich the sanctuary ; and it is at this time that we may suppose him to have sung the great song of triumph preserved in 2 Sam, xxii. (Ps. xviii.). Before the fall of Rabbah this glory was clouded with the shame of Bathsheba, and the blood of Uriah.

3. As the birth of Solomon cannot have been earlier than the capture of Rabbah, it appears that David's wars were ended within the first half of his reign at Jerusalem, aud the tributary nations do not seem to have attempted any revolt while he and Joab lived (comp. 1 Kings xi. 14-25). But when the nation was no longer knit together by the fear of danger from without, the internal difficulties of the new kingdom became more manifest. The inveterate jealousies of Judah and Israel reappeared ; and, as has been already mentioned, the men of Judah were the chief malcontents. In this respect, and presumably not in this alone, David suffered for the very excellence of his impartial rule. In truth all innovations are dangerous to an Eastern sovereign, and all Eastern revolutions are conservative. On the other hand David continued to tolerate some ancient usages inconsistent with the interests of internal harmony. The practice of blood-revenge was not put down, and by allowing the Gibeonites to enforce it against the house of Saul, the king involved himself in a feud with the Benjamites (comp. 2 Sam. xxi. with chap. xvi. 8, which refers to a later date). Yet he might have braved all these dangers, but for the disorders of his own family, and his

~~deep fall in the matter of Bathsheba, from which the prophet Nathan rightly foresaw fatal consequences, not to be averted even when divine forgiveness accepted the sincere contrition of the king. That the nation at large was not very sensitive to the moral enormities which flow from the~~

~~system of the harem is clear from 2 Sam. xvi. 21. But.~~

~~the kingdom of David was strong by rising above the level of ordinary Oriental monarchy, and expressing the ideal of a rule after Jehovah's own heart (1 Sam. xiii. 14), and in the spirit of the highest teaching of the prophets. This ideal, shattered by a single grievous fall, could be restored by no repentance. Within the royal family the continued influence of Bathsheba added a new element to the jealousies of the harem. David's sons were estranged from one another, and acquired all the vices of Oriental princes, The severe impartiality of the sacred historian has concealed no feature in this dark picture,—the brutal passion of Amnen, the shameless council of the wily Jonadab, the black scowl that rested on the face of Absalom through two long years of meditated revenge,' the panic of the court when the a~~

~~3 Hadadezer is also mentioned in 2 Sam. viii. in the general sum- mary of David's wars, but we can hardly suppose that a different Syrian war is here meant. '~~

~~4 We owe this graphic touch to Ewald's brilliant interpretation of an obscure word in 2 Sam. xiii. 32.~~

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~~blow was struck and Amnon was assassinated in the midst Three years of exile and two of further~~

~~of his brethren. disgrace estranged the heart of Absalom from his father.~~

~~His personal advantages and the princely lineage of his mother gave him a pre-entinence among the king's sons, to~~

~~which he added emphasis by the splendour of his retinue,~~

~~*while he studiously courted personal popularity by a pre-*~~

~~*tended interest in the administration of kingly justice.*~~

~~*Thus ingratiated with the mass he raised the standard of*~~

~~*revolt in Hebron, with the malcontent Judeans as his first supporters, and the crafty Ahithophel, a man of southern Judah, as his chief adviser. Arrangements had been made for the simultaneous proclamation of Absalom in all parts of the land. The surprise was complete, and David was compelled to evacuate Jerusalem, where he might have been crushed before he had time to rally his faithful subjects. Ahithophel knew better than any one how artificial and unsubstantial was the enthusiasm for Absalom. He hoped to strike David before there was time for second thoughts ; and when Absalom rejected this plan, and acted on the assumption that he could count on the whole nation, he despaired of success and put an end to hisown life. David in fact was warmly received by the Gileadites, and the first battle destroyed the party of Absalom, who was himself captured and slain by Joab. Then all the people except the Judeans saw that they had been befooled; but the latter were not conciliated without a virtual admission of that prerogative of kinship to the king which David's previous policy had steadily ignored. This concession involved important consequences. The precedence claimed by Judah was challenged by the northern tribes even on the day of David's solemn return to his capital, and a rupture ensued, which but for the energy of Joab, might have led to a second and more dangerous rebellion, The remaining years of David's life appear to have been un- troubled, and according to the narrative of Chronicles the king was much occupied with schemes concerning the future temple. He was already decrepit and bed-ridden under the fatigues of seventy years, when the last spark of his old energy was called forth to secure the succession of Solomon against the ambition of Adonijah. It is noteworthy that, as in the case of Absalom, the pretensions of the latter, though supported by Joab and Abiathar, found their chief Stay among the men of Judah (1 Kings i. 9).*~~

~~*The principles that guided David's reign are worthily summed up in his last words, 2 Sam. xxiii. 1 seq., With which must be compared his great song of triumph, 2 Sam. xxii. The foundation of national prosperity is a just rule*~~

based on the fear of Jehovah, strong in His help, and swift to chastise wrong-doers with inflexible severity. That the fear of Jehovah is viewed as receiving its chief practical expression in the maintenance of social righteousness is a necessary feature of the Old Testament faith, which regards the nation rather than the individual as the subject of the religious life. Hence the influence upon his life of David's religious convictions is not to be measured by the fact that they did not wholly subdue the sensuality which is the chief stain on his character, but rather by his habitual recognition of a generous standard of conduct, by the un- doubted purity and lofty justice of an administration which was never stained by selfish considerations or motives of personal rancour,! and was never accused of favouring evil doers, and finally by the calm eourage, rooted in faith in Jehovah's righteousness, which enabled him to hold an even and noble course in the face of dangers and treachery.

' That Kuenen still follows Bayle in assigning revenge as the motive of David's charge to Solomon in 1 Kings ii. 5, 8, 9, can only be matter of surprise. A young and untried sovereign could not afford to continue the clemency which his father was strong enough to extend to dangerous enemies.

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That he was not able to reform at a stroke all ancient abuses appears particularly in relation to the practice of blood Tevenge ; but even in this matter it is clear from 2 Sam. i. 28, seg. xiv. 1-10, that his sympathies were against the barbarous usage. Noor is it just to accuse him of cruelty in his treatment of enemies. Every nation has a right to secure its frontiers from hostile raids; and as it was Impossible to establish a military cordon along the borders of Canaan, it was necessary absolutely to cripple the adjoining tribes. From the lust of conquest for its own sake David appears to have been wholly free,

The generous elevation of David's character is seen most clearly in those parts of his life where an inferior nature would have been most at fault,—in his conduct towards Saul, in the blameless reputation of himself and his band of outlaws in the wilderness of J udah, in his repentance under the rebuke of N athan, and in his noble bearing on the revolt of Absalom, when

calm faith in God and humble submission to His will appear in combination with masterly command over circumstances, and swift wisdom in resolu- tion and action. His unfailing insight into character, and his power of winning men's hearts and touching their better impulses, appear in innumerable traits of the history (e.g., 2 Sam. xiv. 18-20; iii, 31-37 ; xxiii. 15-17). His know- ledge of men was the divination of a poet rather than the acquired wisdom of a statesman, and his capacity for rule stood in harmonious unity with the lyrical genius that was already proverbial in the time of Amos (Amos vi. 5). To the later generations David was pre-eminently the Psalmist, The Hebrew titles ascribe to him 73 psalms ; the Septuagint adds some 15 more; and later opinion, both Jewish and Christian, claimed for him the authorship of the whole Psalter (so the Talmud, Augustine, and others). That the tradition of the titles requires careful sifting is no longer questionable, as is admitted in such cases as Pss, Ieeexvi.; Ixix., exli. even by the cautious and conservative Delitzsch. The biographer must therefore use the greatest circumspec- tion in drawing from the Psalter material for the study of David's life and character. On the other hand, the tradi- tion expressed in the titles could not have arisen unless David was really the father of Hebrew psalmody. Asa psalmist he appears in 2 Sam. xxii. xxiii, in two poems, which are either Davidic or artificial compositions written in his name. If we consider the excellent information as to David which appears throughout the books of Samuel, the intrinsic merits and fresh naturalness of the poems, and the fact that Ps. xviii. is an independent recension of 2 Sam. xxii, the hypothesis that these pieces are spurious must appear very forced, though it has received the support of some respectable critics, especially of Kuenen,? who main- tains that the religion of David is far below the level of the Psalter. If we reject this position, which can hardly be made good without doing great violence to the narrative of the books of Samuel, we cannot well stop short of the admission that the Psalter must contain Davidic psalms, some of which at least may be identified by judicious criticism, such as has been exercised by Ewald with singular insight and tact in his Dichter des Alten Bundes. Ewald claims for David Pss. iii., iv., vii., vili., xi., (xv.), XVill., XIX., XXiV., Xxix., xxxii, ci, and probably this list should rather be extended than curtailed. Compare Hitzig's Psalmen, Leipsic, 1863.

~~Literature.—The earliest notices of David in profane history are found in the fragments of Eupolemus preserved by Eusebius [Miiller, Fragm. Hist. Groce. iii, 225 ; Freudenthal, Alexander Polyhistor (Breslau, 1875), p. 120 p. 225] and in Nicolaus of Damascus as quoted by Josephus, Arch. vii. 5. 2. [Miiller].c. iii. 373]. Josephus, Arch. vi, 8—vii. 15, has no sources independent of the Bible. Modern discussion of the life of David was stimulated in the first instance Eee~~

- ~~Historisch-kritisch Onderzock (Leiden, 1865), vol. iii. § 140, VI. — 106~~

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~~by the unfavourable judgment passed on his character by Bayle, the English freethinkers, and Voltaire. Chandler's Life of David ismainly directed against Bayle (first edition 1766). The history of David is one of the best parts of Ewald's Geschichte. Stanley's pic- turesque narrative (Lectures on the Jewish Church, second series, 1865), and Dillmann's lucid article in Schenkel's Bibel-Leaikon, rest mainly on Ewald. Stahelins Leben Davids (Basel, 1866), is valu- able for the numerous parallels adduced from Oriental history. Compare also Griitz's Geschichte der Juden, vol. i., Leipsic, 1874, and Hitzig's Geschichte des Volkes Israel, Leipsic, 1869. (W. RB. 8.)~~

~~DAVID (Welsh, Dewt), St, the patron saint of Wales, flourished in the 6th century. Various dates have been assigned for his birth and death, the earliest being that of Geoffrey of Monmouth, who fixes his death in 542, and the latest that of the Annales Cambrie, which fixes it in 601. Many writers follow Ussher in stating that he died in 544, aged eighty-two; but the latest authorities, Jones and Freeman (History of St David's) and Haddan and Stubbs (Councils and Ecclesiastical Documents), accept the date of the Annales Cumbrie. The narrative of St David's life is overlaid with legendary matter to an unusual extent, and it is impossible to determine accurately what is historical aud what is fictitious. Such stories as that he possessed the power of working miracles, even before his birth, that he was eighteenth in descent from the Virgin Mary, and that he was attended by an angel in his infaucy, may obviously be referred at once to the latter category ; but there are many other details which, even though not~~

obviously improbable, must be regarded as extremely doubtful. According to the account given by Rice Rees (Welsh Saints) as historical, St David was the son of Saudde or Xantus, prince of Ceretica (Cardiganshire), and was born at Hen-Menen or Menevia (nowSt David's). After spending a number of years at the college of a celebrated teacher Paulinus, he founded a college or monastery in the Vale of Rhos, near his native place, which was distinguished for the severity of its rule. His fame as a theologian led to his being summoned to the synod of Brefi to confute the Pelagian heretics. So well did he acquit himself of this

. task that the synod elected him archbishop of Caerleon and primate of Wales,—Dubricius, the occupant of the see, having resigned to make room for him. Soon after his election St David found it necessary to convene another synod, which is styled in the annals the Synod of Victory, so complete was the triumph obtained over the Pelagians. Somewhat later the primate obtained leave to transfer his seat from Caerleon to Menevia (St David's). He died at an advanced age, and was buried in the church of St David's. His shrine is to be seen in the existing cathedral. Recent criticism, while admitting that St David founded a see at Menevia, and that he probably took an active part in the undoubtedly historical synod of Brefi, has discredited his archiepiscopal jurisdiction. This is almost certainly the invention of those in a later age who wished to maintain the independence of the Welsh church, and supremacy in that church of the see of St David's. It was the view that naturally commended itself to the author of the earliest life of St David, Rythmark, or Ricemarchus, bishop of St David's in the 11th century, who wrote at a time when the independence of the Welsh church was seriously threatened. His narrative is followed in the main by Giraldus Cambrensis and later authorities. St David was canonized by Pope Calixtus II., in the 12th century. His festival is celebrated on the Ist March.

DAVID, Fuiuicren Cisar (1810-1876), a French com- poser, was born at Cadenet, in the department of Vaucluse, March 8, 1810. As a child he exhibited proofs of un- usual precocity, and at the age of four had made considerable progress in his musical studies. Being early left an orphan, and totally unprovided for, he obtained, through the influence of relatives, admission to the choir of Saint-Sauveur at Aix. Subsequently he entered into the

~~*employment of an attorney, but quitted his service to become successively chef d'orchestre in the theatre at Aix, and chapel master of the church in which he had formerly appeared as a humble chorister. He next proceeded to Paris, where he subsisted for some time on a pittance of 50 francs a month, afforded him by a rich but miserly uncle. After pursuing diligently a course of studies at the Conser- vatoire under Fétis, Reber, and others, he cast in his lot with the Saint-Simonians, and on the dispersion of that sect in 1833 accompanied several of the brethren on a fruitless expedition tothe East. The immediate result of this tour was the publication, on his return to Paris, of the Aélodies Orientales, which met with little encouragement. Nine years after this, however, the musical world was suddenly startled by the production of the Désert,a work abounding in graceful melodies, and affording proof of an extensive acquaintance with orchestral effects. This ode-symphony, as it was called, rapidly gained for the composer a wide-spread reputation. It was, after some vexatious delays, first performed at the Conservatoire in 1844, and quickly found a hearing in every European capital. Enthusiasts were not slow to predict for David a brilliant career, but their hopes were scarcely realized. Nothing the com. poser afterwards wrote at all equalled the Désert. In the Christophe Colomb (1847) there are noble passages, and the comic opera of Zulla Rookh possesses numbers graced by a captivating delicacy of orchestration, but neither for these nor for his other principal works—Jfoise aw Mont Sinai (1846), La Perle du Brésil (1851), and Herculaneum (1859)—can a place be claimed in the foremost ranks of composition. They were of sufficient merit, however, to gain for him the biennial prize of the emperor, which was awarded by the French Institute in 1868. In the follow- ing year he was appointed to the post of librarian at the Conservatoire, vacated by M. Berlioz, whom he afterwards succeeded as a member of the Institute. He died on the 29th of August 1876, aged sixty-six.*~~

~~*DAVID, Jacques Louis (1748-1825), historical painter, was born in Paris in 1748. His father having been killed in a duel, a maternal uncle first placed him in the Collége des Quatre-Nations and afterwards in an architect's office. An accidental visit to the studio of his great-uncle, Boucher, led him to leave his adopted profession; and Boucher, observing the boy's distaste for his own erotic style, sent him to Vien, who, having succeeded to the directorship of the French Academy in Rome just at the time his pupil had*~~

taken the grand prize (1775), carried the youth with him to that city. At this time Winckelmann was writing, Raphael Mengs painting, and the taste for classic severity was a necessary reaction on what had gone before. This is shown by Carstens and the younger Germans very shortly after following a quite in- dependent movement of the same nature. David's classicism was directly derived from the antique, and easily under- stood, The spirit of the day made the first picture, " Date Obolum Belisario," painted according to his new principles, a complete success, and this was followed by others more perfect—The Grief of Andromache, The Oath of the Horatii, The Death of Socrates, and The Rape of the Sabine Women, now in the Louvre. In the French drama an unimaginative imitation of ancient models had long pre- vailed ; even in art Poussin and Le Sueur were successful by expressing a bias in the same direction ; and in the first years of the revolutionary movement, the fashion of imitat- ing the ancients even in dress and manners went to the most extravagant length. At this very time David returned to Paris ; he was now painter to the king, Louis XVI, who had been the purchaser of his principal works. It 1 not possible to overestimate the popularity of the young painter, who was himself carried away by the flood of

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enthusiasm that made all the intellect of France believe in | a demonstrative

— era of equality and emancipation from all the ills of ife,

Sent to the Convention in September 17 92, by the Section du Musée, he quickly distinguished himself by the defence of two French artists in Rome who had fallen into the merciless hands of the sbirri of the Inquisition ; and as the behaviour of the authorities of the French Academy in Rome had been in obedience to old slavish ideas, he had the influence to get it suppressed, In January follow- ing his election into the Convention his vote was given for the king's death. Thus the man who was so greatly indebted to the Roman Academy and to Louis XVI. assisted resolutely in the destruction of both. This line of action was no doubt a kind of self-sacrifice to him; it was in obedience to a principle, like the dreadful act of Brutus condemning his sons,—a subject he painted with all his powers. Cato and Stoicism were the order of the day. Hitherto the actor had walked the stage in modern

dress, Brutus had been upplauded in red-heeled shoes and culottes Jarretées » but Talma, advised by David, appeared in the toga and sandals before an enthusiastic audience. At this period of his life Mdlle. de Noailles thought to make a good impression upon him by insisting on his painting a sacred subject, with Jesus Christ as the hero. When the picture was done, the Saviour was found to be another Cato. "T told you so," he replied to the expostulations of the lady, —-" 'there is no in- spiration in Christianity now!" He accordingly developed the scheme of the Féte a' Etre Supréme, and he remained the master of pageants for a long period, escaping the guillotine only by the regard paid to his character as an artist. When Napoleon destroyed the new-found liberty, and ex- punged the novel gospel, David succumbed to the military spirit and well-nigh worshipped him. His picture of Napoleon on horseback pointing the way to Italy is now in Berlin.

We have mentioned the principal classic subjects painted by David. They are hard and dry in execution, painted on a white ground with opaque but splendid colour, which has, however, really little charm. Tlie other class of works which came from his easel was commemorative of the Re- volution. When Lepelletier was assassinated in the Palais Royal, after the vote for the death of the king, David painted the subject, and the picture was exhibited in the Convention with much emotion. Marat Dead in the Bath is a work of a very impressive kind. The Oath in the Tennis Court is another very important production, both historically and in relation to the artist. His exten- sive commissions from the emperor are still objects of attraction at Versailles, On the return of the Bourbons our painter was exiled with the other remaining regicides, and retired to Brussels, where he recommenced his classic series by the Loves of Parisand Helen. Here he remained till his death, 29th December 1825, at the age of seventy- seven, having rejected the offer made through Baron Hum- boldt of the office of minister of fine arts at Berlin. His eud was true to his whole career and to his nationality. While dying, a print of the Leonidas, one of his favourite subjects, was submitted to him. It was placed conveni- ently, and after vaguely looking at it a long time, 'I n'y a que moi qui pouvais concevoir la tête de Léonidas," he whispered, and died. His friends and his party thought to carry the body back to his beloved Paris for burial, but the Government of the day arrested the procession at the frontier, an act which caused some scandal, and

~~furnished the occasion of a terrible song of Beranger's. Gros, Girodet, and Gérard were David's best pupils.~~

~~DAVID, Jean Prerre (1789-1856), usually called David d'Angers, a much-admired French sculptor, and, like David the painter, to whom he was in no other way related,~~

~~several English acquaintances in Rome.~~

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~~partisan of advanced ideas in politics and religion, was born at Angers, 12th March 1789. His father was a sculptor, or rather a carver, but he had thrown aside the mallet and taken the musket, fighting against the Chouans of La Vendée. He returned to his trade at the end of the civil war, to find his customers gone, so that young David was born into poverty. As the boy grew up his father wished to force him into some more lucrative and certain way of life. At last he succeeded in surmount- ing the opposition to his becoming a sculptor, and in his eighteenth year left for Paris to study the art upon a fund of eleven francs. As far as we know his works, the genius on which he relied was not very great; but after struggling against want for a year and a half, he succeeded in taking the prize at the Ecole des Beaux Arts. Energy aud perse- verance stood in the place of natural ability, and now fortune aided him in the shape of an annuity of 600 frances (£24), granted by the municipality of his native town, by the name of which he was proud to be called ever after. This was in 1809, and in 1811 his Epaminondas gained the prize of Rome, where he spent five years, rather too much impressed by the works of Canova.~~

~~Returning from Rome about the time of the restoration of the Bourbous, he would not remain in the neighbourhood of the Tuileries, swarming with foreign conquerors and re- turned royalists ; he found his way to London, having made Here, if we are to. believe the statement in his biography, he was offered the commission to erect a monument commemorative of Water-loo, —more probably he received an invitation to offer a design for some such work, which he might misunderstand from his ignorance' of English, At the same time his resources were exhausted; and Flaxman and others visited upon him the sins of David the painter, to whom he was supposed to~~

be related. With great difficulty he made his way to Paris again, where a comparatively prosperous career opened upon him. His medallions and busts were in much request, and monumental works also came to him. One of the best of these was that of Gutenberg at Strasburg ; but those he himself valued most were the statue of Barra, a drummer boy who fell in the war in La Vendée, who con- tinued to beat his drum till the moment of death, and the monument to the Greek liberator Bozzaris. This was a young female figure he called "Reviving Greece," of which his friend Victor Hugo says rather absurdly, "It is difficult to see anything more beautiful in the world; this statue joins the grandeur of Phidias to the expressive inanner of Puget." His busts and medallions were very numerous, and among his sitters may be found not only the illustrious men and women of France, but many others both of England and Germany—countries which he visited pro- fessionally in 1827 and 1829, His medallions, it is affirmed, number 500. He died on the 4th of January 1856,

David d'Angers was respected for his consistency and benevolence. As an example of the latter may be mentioned his rushing off to the sickbed of Rouget de Lille, the author of the MJurseillaise Hymn, modelling and carv- ing him in marble without delay, making a lottery of the work, and possibly saving the poet's life by sending him the proceeds, £72, when in the extremity of need.

DAVID HA-COHEN, a learned Rabbin, was born at Lara, in Spain, about the beginning of the 17th century, and died at Hamburg in 1674, He was chief of the synagogue at Amsterdam, and he afterwards held the same office at Hamburg. From this he was deposed on a suspicion of an intention to become a Christian, which seems to have been unfounded. It probably originated in the fact that he held more liberal sentiments than those which prevailed in the Jewish community of his time. David was the author of several works of value in the

department of rabbinical literature. " The most important is the Corona Sacerdotum (Hamburg, 1667), a Talmudic and rabbinical dictionary, which was printed only as far as the letter Yod, though the author carried on the work to the letter Resh after forty years' labour. A small portion of the

~~dictionary was printed at Amsterdam in 1648 as a specimen, with the title Crvitas David.~~

~~DAVIDISTS, a name borne by two distinct sects in the history of the Christian church. 1. It is sometimes applied to the followers of David of Dinant, whose work entitled Quaternardi was condemned at the Synod of Paris in 1209, The works of Amalric of Bena were condemned at the same synod, but this is scarcely a sufficient ground for classing David of Dinant among his followers. Our information as to the views of the latter is derived from the Swmma of Albertus Magnus and the Summa of Thomas Aquinas. He founded upon the Platonists and the Arabian philosophers his fundamental doctrine that the Deity alone has any real existence, being the materia prima of all things. 2. The name Davidists, or David-Georgians, is more commonly applied to the followers of David George, or Joris, who was born at Delft in 1501. In 1530 he was punished by whipping, the boring of his tongue, and imprisonment for obstructing a Catholic procession in his native town. In 1534 he joined the Anabaptists, but soon afterwards he founded a sect of his own. In 1542 he published his Book of Wonders, containing an account of visions and revelations he professed to have had. Two years later he settled down as a merchant at Basel, where he lived in prosperity for twelve years under the assumed name of Johann von Briigge. After his death his son-in- law, offended probably at the disposition he made of his property, instituted a process of heresy against him; and his body was exhumed and burnt by order of the senate of Basel. The Davidists, under the leadership of Henry Nicolas, afterwards became known in Holland and England as the Familists. They interpreted the whole of Scripture allegorically, and maintained that as Moses had taught hope, and Christ had taught faith, it was their mission to teach love. The service of love was the highest and best of the dispensations. The result was an extreme Anti-nomianism in practice, which attracted the notice of the civil authorities in both countries. The sect was suppressed or absorbed in other sects early in the 17th century.~~

~~DAVIES, Str Jomn (1569-1626), philosophical poet of the age of Elizabeth, was baptized on the 16th of April 1569, at Tisbury, in Wiltshire, where his parents lived in the manor-house of Chicksgrove. He was sent first to Win-chester College, and afterwards to New College, Oxford. In 1585 he~~

became a commoner of Queen's College, Oxford, and in 1587 entered at the Middle Temple. LBereft of both his parents at a very early age, he seems to have plunged into all the dissipations that London could offer in those days toa rich young man of fashion. It is amusing to find the future attorney-general of Ireland, and grave Christian poet, connected, beyond all concealment, with one of the worst literary scandals of the period. One would be very glad to know what circumstances led to the publication of the notorious and now excessively rare little volume that bears the title All Ovid's Elegies, 3 Bookes, by C. M. Epigrams by J. D. At Middleburgh, in which Marlowe had a share, and which was condemned by the archbishop to be burned. The "pigrams are far from edifying or promising, and we may, in the absence of a date, be permitted to put the earliest possible, 1592 or 1593, on their unseemly boisterousness. In 1593 was ready for the printer, though not, it would seem, published till 1596, a far more worthy work, the charming and singular fragment called Orchestra, a little epic written in praise of dancing, in fifteen consecutive days. The poet

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seeks to prove that every harmonious movement of nature, every action of the elements, every motion in the firmament, is a conscious and well-ordered dance; also that plants in growing, men in all their familiar and noble exercises, the angels themselves, and all the mysterious translunary world effect a solemn dancing in their motion. Orchestra was dedicated to the: author's "very friend," Master Richard Martin, a riotous youth whom, in the winter of 1597, Davies, the friends having quarrelled, attacked witha cudgel in the hall of the Middle Temple. For this offence he was expelled and degraded. Rusticating at Oxford, he spent the first year after his expulsion in the composition of his great philosophical poem, MNosce Teipsum, which appeared in 1599. It is on this work that his fame mainly rests. The style was entirely novel in that age; and its force, eloquence, and ingenuity, no less than the modern and polished tone of the periods, made it at once extremely popular. It was to its own age all that Pope's HSsay on Man was to the Georgian period. In the same year, 1599, there saw the light a little book of exquisite lyrics from tlie same hand, HYmns to Astrea,

twenty-six acrostics on the words Elisabetha Regina, which all warble with the most delightful sweetness. In 1601 Davies was restored to his position at the bar, without loss of seniority. About the same time he satin Elizabeth's last Parliament, as member for Corfe Castle. At Elizabeth's death he was instantly received with great favour by James I., and sent to Ireland as solicitor-general in 1603. On December 18 of that year he was knighted at Dublin. From this time forth he abandoned poetry in favour of the most active statesman- ship. HIs activities in Ireland were almost ubiquitous. In 1606 he was further promoted to be attorney-general for Ireland, and created sergeant-at-arms. In the disordered condition of the country he was required to be stirring at all times, and his abilities seem to have been as conspicuous as his trustworthiness and uprightness. HIe married Eleanor, daughter of the earl of Castlehaven, but she unfortunately became insane. In 1612 Davies published his valuable prose work, A Discourse of the True Reasons why Ireland has never been entirely subdued. The same year he repre- sented the county of Fermanagh in the Irish Parliament, and was elected speaker. In 1614 he represented New- castle-under-Lyne in the English Parliament, and in 1619 he threw up his appointments in Ireland. In 1622 he issued a collected edition of his poetical works. In 1626 Davies was appointed lord chief justice of England, but ere he could enter on the office, he was found dead in his bed (December 8), the victim, it was supposed, of apoplexy.

The prose writings of this remarkable man were mainly posthumous, and no attempt was made to colleet them, until they were republished in four volumes by the Rev. A, B. Grosart, in 1876, with a full

and interesting biography. The poetical works have often been reproduced since the author's lifetime.

Sir John Davies is not to be confounded with JoHN Davies of Hereford, a contemporary author of a great quantity of verse, of which Zhe Holy Roode (1609), The Scourge of Folly (1611), and The Muses' Sacrifice (1612) are fair typical examples. Gifted with extraordinary volubility and self-confidence, but with no delicacy or taste, the writ- ings of this John Davies have survived more by reason of their bulk and their accidental interest of reference or dedication than from any intrinsic merit. '

~~DAVILA, Hznrico CatTertno (1576-1631), historian, was descended from a Spanish noble family. HIs im- mediate ancestors had been constables of the kingdom of Cyprus for the Venetian republic, from father to son, since 1464, But in 1570 the island was taken by the Turks ; and Antunio Davila, the father of the historian, had to leave it, despoiled of all he possessed. HIe travelled into Spain and France, and finally returned to Padua, where, in 1756. his youngest son was born, whom he named~~

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~~Henrico Caterino, in gratitude for the kindness received from Catherine de' Medici at the French court, At the age of seven the father took this son to France, where he became a page in the service of Catherine. In due time he entered the service, and fought through the civil wars till the peace in 1598. HIe then returned to Padua, where, and subsequently at Parma, he led a studious life, till on the breaking out of war he entered the military service of the republic of Venice, in which he served with distinction. But during the whole of this active life—many details of which are very interesting as illustrative of the life and manners of tho time,—he never lost sight of a design which he had formed at a very early period, of writing the history of those civil wars in France, in which he had borne a part, and had so many oppor- tunities of closely observing the leading personages and events. 'The manuscript of this work was completed in, or a little previous to, 1630, and was offered in vain by the author to all the publishers in Venice, and this city was then a great publishing centre. At last one Tommaso Baglioni, who had no work for his presses, undertook to print the manuscript, on condition that he should be free to leave off if more promising work offered itself. The printing of the Jstoria delle Guerre Civile di Francia, was, however, completed, and the suc- cess and sale of the work were immediate and enormous. Many other editions rapidly followed, of which perhaps the best altogether is that of Milan, in 6 vols 8vo, 1807. Davila was murdered, while on his way to take possession of the government of Crema for Venice in July 1631, by a ruffian, with whom some dispute seems to have arisen as to the furnishing of the relays of horses ordered for his use by the Venetian Government.~~

~~The Jstoria was translated into French by J. Baudouin, Paris, 1642 ; into Spanish by Varen de Soto, Madrid, 1651, and Antwerp, 1686 ; twice into English by W. Aylesbury, London, 1647, and by Charles Cotterel, London, 1666, and into Latin by Pietro Francesco Cornazzano, Rome, 1745. The best account of the life of Davila is that by Apostolo Zeno, prefixed to an edition of the history printed at Venice in 2 vols. fol. in 1733. Tirabaschi may also be consulted with advantage. Bayle is severe on certain historical inaccuracies of Davila. And it is true that Davila must be read with due remembrance of the fact that he was not only a Catholic but the especial protegé of Catherine de' Medici. Also it is not to be forgotten that Bayle was as strongly Protestant. As to the literary merits of Davila, his lucidity, purity of style, abundance of information, there has never been, and never can be, any difference of opinion.~~

~~DAVIS, Joun, a celebrated English navigator of the 16th century. The date of his birth is unknown; the place was Sandridge, about 3 miles N. of Dartmouth, in Devonshire. He made three voyages under the auspices of the English Government in search of the north-west passage to the Pacific. In the first, in 1585, he pushed his way round the southern end of Greenland, across the strait that now bears his name, and along the coast of what is now known as Baffin's Land, to the Cape of God's Mercy, which he thus designated in the fond belief that his task was practically accomplished; in the second (1586) he made but little further progress; in the third (1587) he reached the entrance to the strait afterwards explored by Hudson. Four years later he joined Cavendish in his second voyage to the South Sea; and after the rest of the expedition returned unsuccessful, he continued to attempt on his own account the passage of the Strait of Magellan; he was defeated, but became the discoverer of the Falkland Islands. The passage home was extremely disastrous, and he brought back only 16 of the 76 men whom he had taken with him. In 1598 he took a merchant fleet from Middelburg in Holland to the East Indies ; in 1601 he accompanied Sir James Lancaster as first pilot on his voyage in the service of the East India Company ; and in 1605 he sailed again for the same des-~~

tination along with Michelbourn. On his way home he was killed by pirates off the coast of Malacca.

A Traverse Book made by John Davis in 1587, an Account of his Second Voyage in 1586, and a Report of Master John Davis of his three voyages made for the Discoverie of the North West Passage were printed in Hakluyt's collection. Davis himself published Zhe Worlde's Hydrographical Description, whereby it appears that there is a short and speedie Passage into the South Seas, to China, de., by Northerly Navigation, London, 1595, and The Seaman's Secrets, divided into two Parts, London, 1595,

DAVY, Sir Humpury (1778-1829), the eminent natural philosopher, was born on the 17th of December 1778, at Penzance, in Cornwall. After receiving there the rudi- ments of his education, he was in 1792 sent for a year to the grammar school of Truro, then under the direction of the Rev. Dr Cardew. 'There is little to record of Davy in early life except his retentive memory, facility in versification, and skill in story-telling. At the age of nine he went to live with Mr John Tonkin, who had formerly adopted Davy's mother and her sisters. In 1794 Davy lost his father, and in the following year he was apprenticed to Mr Borlase, then a surgeon-apothecary, and afterwards a physician in Penzance. During his apprenticeship he spent much of his leisure in a systematic course of self-education. While yet young he had exhibited an inclination for devising ex- periments, and for examining natural products. At the end of 1797, when in his nineteenth year, he turned his attention to chemistry, and read Lavoisier's and Nicholson's treatises on that subject. His experiments were conducted in the garret of his friend Mr Tonkin, who, alarmed by unexpected explosions would exclaim, "This boy Humphry is incorrigible ! "—' Was there ever so idle a dog !"—" He will blow us all into the air!" One of his investigations at this time was the nature of the air contained in the vesicles of sea-weed. T'o supply the place of an air-pump in his experiments he had an old French injecting syringe, and this he actually employed in his first scientific paper "On the Nature of Heat and Light," published in 1799. Though Davy's natural talents would not have permitted him to remain long in obsourity, he was in some degree indebted for an early emergence into publicity to the accidental notice of Mr Davies Giddy Gilbert, who, learn- ing that the strange-looking boy, whom he observed hang- ing over the

hatch of Mr Borlase's house, was a son of Davy the carver, and fond of making chemical experiments, sought his acquaintance, and was ever afterwards his steady friend. Another early friend of Davy's was Mr Gregory Watt, who, having visited Penzance in 1797 for change of air, took lodgings at the house of Mrs Davy. By him and Gilbert he was introduced to the notice of Dr Beddoes, who in the autumn of 1798 engaged him to superintend a pneumatic medical institution, which he had just established at Bristol. Davy was now placed in a sphere where his genius could expand ; he was associated with men of edu- cation and scientific attainments, and was provided with excellent apparatus; thus he speedily entered upon that career of discovery which has rendered his name illustrious. He had intended, after the termination of his engagement with Dr Beddoes, to study medicine at Edinburgh, but the all-engrossing interest of his chemical discoveries caused him eventually to abandon this scheme.

In an essay "On Heat, Light, and Respiration," written before he left Cornwall, but published soon after his removal to Bristol, in Beddoes's West Country Contribu- tions, Davy endeavoured to prove the immateriality of heat, by showing its generation through the friction of two pieces of ice under an exhausted receiver. His first scientific discovery was that of the existence of silica in the epidermis of the stems of reeds, corn, and grasses. The intoxicating effects of nitrous oxide when respired were discovered by him on April 9, 1799; and in the following

year he published a volume entitled Researches, Chemical and Philosophical, chiefly concerning Nitrous Oxide and its Respiration. Whilst the impression created by this publication was still fresh on the public mind, Davy was recommended to Count Rumford by Mr Underwood and Dr Hope as a suitable person to succeed Dr Garnet as lecturer on chemistry at the Royal Institution recently established in London ; and accordingly, on February 16, 1801, he was chosen assistant lecturer to the Institution, and director of the laboratory; his appointment to the lectureship took place six weeks later. A minute on the records of the Royal Institution shows that he was ap pointed professor of chemistry on the 3lst of May 1802.

The ungainly exterior and peculiar manner of Davy on his first appearance in London prejudiced Rumford and others against him ; when, however, he began to lecture, he won the approbation of all. His ingenuity and happy facility of illustration gained him a high reputation ; his company was courted by the choicest society of the metropolis ; aud soon his presence was regarded as indis- pensable in the soirées of the fashionable world. His style of lecturing was well adapted to command attention—it was animated, clear, and impressive, notwithstanding the naturally inharmonious tones of his voice ; his experiments, moreover, were both ingeniously conceived and neatly exe- cuted. The young chemist was fortunate in the time in which he commenced his metropolitan career. Experimental chemistry was beginning to be the fashion of the day ; and the discovery of the decomposition of chemical substances by voltaic electricity had excited the greatest interest amongst the votaries of science. The liberality of the committee of the Royal Institution supplied to Davy what few private individuals could afford—a Pow of 400 five- inch plates, and one of 40 plates a foot in diameter. With these were conducted the brilliant investigations which resulted in his discovery of potassium and sodium,

The earliest of Davy's communications to the Royal Society, and the first of his contributions to electro-cheinis- try, was "An Account of some Galvanic Combinations formed by an arrangement of sezgle Metallic Plates and Fluids," read in June 1801. In all hitherto constructed piles, plates of two metals, or one plate of metal and another of charcoal, and some interposed fluid had been employed. Davy showed in this paper that a battery might be constructed of a single metal and two fluids, provided ane of the fluids was capable of causing oxidation on' one of the surfaces of the metal. In addition to the duties of his situation in the Royal Institution, ta which those of joint editor of the Jowrnal had been added, Davy for ten succes- sive years gave courses of lectures far the Roard of Agri- culture on the connection between agriculture and chemistry. In 1803 he was admitted a member of the Royal Society, of which he, in January 1807, became the secretary. The most valuable of all his scientific writings are his communi- cations to the Royal Society, scarcely one af which does not announce some new and important fact, or elucidate some principle of experimental philosophy. In February 1803 he read to the society an essay '" On Astringent Vege- tables, and their Operation in Tanning ;" and in 1805 "An

~~*Account of some Analytic Experiments on Wavellite," and a paper "On the Methad of Analyzing Stones contain- ing a Fixed Alkali, by Boracic Acid." This method 1s founded on the strong affinity of that acid for different substances at a high temperature, and on the ease with which borates are decomposed by mineral acids.*~~

~~*In his first Bakerian lecture, delivered to the Royal Society in November 1806, Davy showed that electro-chemical phenomena were explicable by one general law, and illus- trated his theory of voltaic action by numerous happily- devised experiments. After pointing out that in all*~~

~~*DAW*~~

~~*voltaic decompositions acids appeared at the positive and bases at the negative pole, he generalized his results by stating that hydrogen, the alkalies, earths, metals, and certain. oxides are attracted by negatively electrified and repelled by positively electrified metallic surfaces, and that oxygen and acids are attracted by positively and repelled by negatively electrified metallic surfaces. He then pro- ceeded to investigate the law of electro-chemical action, and concluded that electro-chemical combinations and decompositions are referable to the law of electric attractions and repulsions, and that both "chemical and electrical] attractions are produced by the same cause, acting in the one case on the particles, in the other on the masses." For these researches the French Institute awarded him the prize of 3000 francs offered by the first consul for the experiment most conducive to the progress of science. Davy's discovery of the production of potassium and sodium by the electrical decomposition of their alkalies was made in October 1807, and an account of the new metals was given to the Royal Society on the 19th of November in the second Bakerian lecture. On the 23d of that month a severe fever attacked him, and he was unable to resume his professorial duties at the Royal Institution till March 12, 1808. In the meanwhile barium and calcium, the existence of which had been predicted by Davy, were dis covered by Berzeliusand Pontin. In 1808 Davy announced to the Royal Society his discovery of magnesium and strontium, Alumina, silica, and zirconia he was unable to decompose, but he showed it to be highly probable that they contained metallic bases. Various opinions as to the nature of the new metals of the alkalies and alkaline*~~

~~earths were at first entertained, some chemists considering them to be compounds of hydrogen with unknown bases. In the third Bakerian lecture, read in December 1808, and its appendix of next spring, Davy adduced conclusive evidence of the elementary nature of potassium; he discussed also the nature of sulphur, phosphorus, and carbon, and described the preparation of boron, which he then regarded asa metal. The original galvanic batteries used by Davy having become unserviceable through wear, a liberal voluntary subscription among the members of the Royal Institution, in July 1808, put him in possession of a battery of 2000 double plates, with a surface equal to 128,000 square inches. HIs electro-chemical discoveries had, however, all been made before this new power was provided. The fourth Bakerian lecture, read in November 1809, brings forward proofs that oxymuriatic acid, contrary to Davy's previous supposition, is a simple body, termed by him chlorine (see vol. v. p. 678), and that muriatic acid is a compound of that element and hydrogen,~~

~~Davy's reputation had now reached its zenith ; and his audience in the theatre of the Royal Institution numbered little less than 1000. At the invitation of the Dublin Society he gave, in November 1810, a course of lectures on electro-chemiical science, and in the following year other courses on the elements of chemical philosophy and on geology. For the first of these he received £525, and for the two latter £750; and before he left Dublin, Trinity College conferred upon him the degree of LL.D. Onthe 8th April 1812 Davy was knighted by the Prince Regent ; on the next day he gave his farewell lecture at the Royal Institution ; and on the 11th he married Mrs Appreece, daughter and heiress of Charles Kerr of Kelso, with whom he had a considerable fortune. HIs usual employments were in great measure suspended during the winter of 1812 in consequence of an injury to an eye, resulting from an explosion of chloride of nitrogen, which he had begun to experiment upon after receiving intelligence of its discovery by Dulong. The first and, as it proved, the ouly volume of Davy's HIements of Chemical Philosophy~~

~~DA~~

~~appeared in 1812 ; and in 1813 he published his Elements of Agricultural Chemistry, the substance of his lectures delivered to the Board of~~

~~Agriculture.~~

~~Taving obtained from the French emperor permission to travel in France, Davy, on October 13, 1813, went thither with his wife and Faraday, the latter in the capacity of 'assistant in experiments and writing." Faraday had been engaged on the Ist of March previous to help Davy in the laboratory of the Royal Institution. On the 29th of October, after a detention of six or seven days at Morlaix, Davy arrived in Paris, where he stayed two months, and began the course of investigations on iodine which enabled him to prove its elementary character. This body had hitherto been regarded as a compound by the French chemists. On the 13th of December Davy was elected a corresponding member of the first class of the Imperial Institute at Paris. From Paris he proceeded, in the end of December, to Montpellier, and thence to Italy. At Genoa and Florence he continued his experiments on iodine ; and at the latter place he effected the combustion of the diamond by means of the great lens in the cabinet of natural history, and discovered that, when once ignited, it will continue to burn in pure oxygen. He next pro- ceeded by Rome to Naples, where he collected specimens of the colours used by the ancients in their pictures, which formed the subject of a memoir presented to the Royal Society. After spending the winter in Italy, he returned to London on April 23, 1815.~~

~~The year 1815 is memorable in the history of Davy, as that in which he turned his attention to the frequent occurrence of accidents from explosions of fire-damp in coal- mines. At his request specimens of the gas were sent from Neweastle to London for him to examine. He ascer- tained that it would not explode when mixed with less than six or more than fourteen times its volume of air, with one-seventh its volume of carbonic acid gas, or with one- sixth its volume of nitrogen ; that in tubes one-seventh of an inchin diameter explosive mixturesof air and fire-damp could not be fired; and that metallic tubes prevented explosions better. than glass tubes. On November 9, 1815, Davy made known to the Royal Society these results of his experi- ments ; and before the close of the year he had completed the invention of what has since been known as the Davy safety- lamp (see p. 72 of the present volume). In this a cage of wire-gauze, by its cooling action, prevents the flame from igniting an explosive atmosphere exterior to the lamp, even though the flame reach as faras the gauze. Of this invalu- able~~

aid to the miner the coal-owners of Newcastle and its vicinity were not slow in availing themselves; and on the 11th of October 1817 they testified their appreciation of the boon disinterestedly conferred upon them by Davy, who had taken out no patent for his invention, by present- ing him with a suitably inscribed service of plate. In the Succeeding year Davy was created a baronet. For his various communications to the Royal Society on the subject of fire-damp, and on the nature of flame, in 1815, 1816, and 1817, he received the Rumford medals.

In 1818 and 1819 he produced four memoirs, "On the Fallacy of the Experiments in which Water is said to have been produced by the Decomposition of Chlorine," "On some Combinations of Phosphorus," " Observations on the Formation of Mists over Lakes and Rivers," and "On Electro-Magnetism." British Government to examine the papyri of Herculaneum in the Neapolitan Museum, his remarks on which are con- tained in.a paper in the Philosophical Transactions for 1821. In 1820 Davy returned to England, and on the death of Sir Joseph Banks, in that year, he was elected president of the Royal Society ; in this position, however, it cannot be said that he always appeared to advantage, or on every occa-

vee

In 1818 he was sent by the.

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sion acted in a manner calculated to render himself popular amongst the members. In 1821 he busied himself with electrical experiments, and in 1822 with the investigation of the fluids contained in the cavities of crystals in rocks, In 1823 he read before the Royal Society a paper " On the Application of Liquids formed by the Condensation of Gases as Mechanical Agents." In the same year he in- vestigated the cause of the rapid destruction of the copper sheathing of sea-going ships. It occurred to him that, as sea-water acts only on positively electrified copper, the sheathing would be protected if he could render it slightly negative. He found that plates of copper having portions of iron or zinc attached remained unchanged after prolonged immersion In sea-water. In consequence of this discovery directions were given by the Government, after some prelim—

mary experiments, to apply plates of iron, or "protectors" as they were called, to several ships of the royal navy; many merchantmen also were supplied with them. Experience, however, showed that the bottoms of the protected ships soon became extremely foul—seaweed and shell-fish accumulating in such quantities as seriously to impede sailing; so that in June 1825, much to the mortification of the inventor, orders were issued for the removal of the protectors.

In 1826 Davy's health had so far declined that he was with difficulty able to indulge in his favourite sports of angling and shooting; and on returning to London from Somersetshire he was unable to attend the anniversary dinner of the Royal Society. InJ anuary 1827 he published his six anniversary discourses, delivered on awarding the Royal and Copley medals. Early in 1827 he was seized with an apoplectic attack, which rendered his removal to the Continent advisable. After some short stay at Ravenna he removed to Salzburg, whence, on account of the continuance of his illness, he sent in his resignation of the presidency of the Royal Society. At the end of autumn he returned to England, and in the winter he published his Salmonia, a book of some interest, written in imitation of Izaak Walton's Complete Angler.

In 1828 Davy quitted England, and spent most of the summer and autumn at Laybach. In the winter he fixed his residence at Rome, whence he sent to the Royal Society, "Remarks on the Electricity of the Torpedo," written in Illyria in October. This, with the exception of a posthumous work, entitled Consolations in Travel, or the Last Days of a Philosopher, was the final production of his pen. While at Rome, he was attacked by paralysis, from which he had already suffered. HIs wife and brother having hastened to his assistance, he left Rome for Geneva, where he died on the 29th of May 1829. HIs remains were deposited on the Ist of June in the burying-ground outside the walls of that city.

Davy was of a sanguine, somewhat irritable temperament. To all his pursuits he devoted himself with a characteristic enthusiasm and firmness of purpose. HIs tone of mind, as indicated by his poems, was highly imaginative. "TI attend Davy's lectures," said Coleridge, "to increase my stock of metaphors." The power and perspicacity of his intellect is

~~sufficiently attested by his numerous and brilliant discoveries. He was not. 21 years of age when he wrote —"It is only by forming theories, and then comparing them with facts, that we can hope to discover the true system of nature." As an experimenter he was remark- ably quick; "with Davy," it has been remarked, "rapidity was power." Of the minor observances of etiquette he was careless, and his great frankness of disposition sometimes exposed him to annoyances which the exercise of tact and caution might have obviated, His manner in society, which gave to many the impression of a haughty consciousness of superiority, is ascribed by~~

~~Dr Paris to "an ungraceful timidity, which he could never conquer." . '~~

~~See Dr J. A. Paris, The Life of 'Sir Humphry Davy, 1831 ; Dr J. Davy, Works of Sir Humphry Davy, 1839. The former (vol. ii. pp. 450-456) contains a list of Davy's publications. (F.H.B.)~~

~~DAWLISH, a watering-place of England, on the south coast of Devonshire, situated a little beyond the mouth of the Exe, twelve miles south of Exeter. It lies in a cove of the English Channel formed by two projecting cliffs, and is admirably sheltered from the weather.. A small stream, which flows through the town, is lined on both sides by pleasure grounds. The town is much resorted to during spring and early summer by the seekers after health. The parish contains an area of 5512 acres, and a population (1871) of 4241 persons, 2492 of whom are females.~~

~~DAX, formerly Ax,or Acqs, the ancient Aque Tarbellice, a town of France, at the head of an arrondissenient in the department of Landes, situated in a fertile plain on the left bank of the Adour, 28 miles north-east of Bayonne, and connected by a fine stone bridge with the suburb of Sablar. It is still partially surrounded by its old tower-flanked walls, which present if not a genuine specimen, at least an interesting medizval imitation, of Roman masonry ; and it has a cathedral (rebuilt in the 18th century, but preserving a sculptured doorway and porch of the 13th), an old episcopal palace, a court-house, a prison, a mineralogical museum, and a training college. It manufactures earthenware, pitch, oil, chocolate, salt, and liqueurs, and carries on cork- cutting, ham-curing, and a trade in wine, brandy, grain,~~

and timber. Its prosperity is further increased by its thermal springs, of which the most remarkable, rising in a great re- servoir 20 feet deep in the Central Square, has a temper- ature of 155-166° Fahr., and sometimes discharges such volumes of steam as to envelop the whole town in a mist. Dax, as its ancient name implies, was the capital of the Tarbelii; and during the Roman period it ranked as the second town of Novempopulonia. For some time it was the seat of a viscount, and its bishopric was preserved till the Revolution. The church of St Vincent derives its name from the first occupant of the see, and is interest- ing for its connection with the more famous St Vincent de Paul. Population in 1871, 8154.

DAY. See Astronomy and CALENDAR.

DAY, Joun, a lyrical dramatist of the age of Elizabeth, of whose life no particulars have been transmitted to us, except that he was a student of Caius College, Cambridge. The first work which he is known to have produced is 7'he Isle of Gulls, printed in 1606, a comedy founded upon Sir Philip Sidney's Arcadia. In 1607 he published a curious drama, written by him in conjunction with William Rowley and George Wilkins, The Travels of Three English Brothers, which detailed the adventures of Sir Thomas, Sir Anthony, and Robert Shirley. In the same year appeared The Parliament of Bees, the work on which Day's reputation mainly rests, This exquisite and unique drama, or rather

DAW—DAY

masque, is entirely occupied with "the doings, the births, the wars, the wooings" of bees, expressed in a Style at once most singular and most charming. In 1608 Day published two comedies, Law Tricks and dIumour out of Breath. In 1610 there was licensed by him a comedy of The Mad Pranks of Merry Moll, which has not survived. It is not known when he died, but his works were fre- quently reprinted before the civil wars, and as late as 1659 one of them, Zhe Blind Beggar of Bethnal Green, first saw the light. The six dramas by John Day which we possess testify to a talent somewhat out of sympathy with the main poetic current of his day. Except Z'he Parliament of Bees, which is all in rhyme, his plays are in prose, with occasional rhymed passages of great lyrical sweetness. HIe preserved, in a great measure, the dramatic tradition of John Lyly, and affected a kind of

subdued euphuism. It is, indeed, not impossible that the Mazd's Metamorphosis, 1600, wrongly supposed to be a posthumous work of Lyly's, may be attributable to the youth of Day. It possesses, at all events, many of his marked: characteristics. The beauty and ingenuity of Zhe Parliament of Bees were noted and warmly extolled by Charles Lamb ; but no effort has been made in our generation to revive his fame, and the works of this writer of very distinct and peculiar genius remain still unedited.

DAYTON, a city of the United States, the capital of Montgomery county, Ohio, situated on the east bank of the Great Miami, which is there jomed by the Mad, 46 miles north of Cincinnati, and 135 miles south of Toledo. The Miami canal, which connects the Ohio river with Lake Erie, passes by the town; and this means of communication, along with that of the railroads which converge here from different points, has contributed greatly to the prosperity of the place. The city is very regularly laid out, and the houses and public edifices are better than in many other western cities, partly owing to the compara- tively moderate price of the white limestone, or marble, which abounds in its neighbourhood. The principal public buildings are the county court-house—designed after the Parthenon at Athens, and erected at a cost of about £30,000—and the market-house, containing within its walls a city hall and the council chamber. There are, besides numerous churches, a high school, and the Cooper Academy, belonging to the Presbyterian body, for the instruction of females. Of charitable institutions the orphan asylum, the alms-house, and a lunatic asylum may be mentioned ;. and in the vicinity there is the Central National Soldiers' Home. A- considerable manufacturing industry is carried on, which is facilitated by a copious supply of water con- veyed from the Mad. There are several machine shops, and works for the manufacture of agricultural implements, railway carriages, paper, cotton, &c. The place, which was first settled in 1796, was incorporated as a town in 1805, and as a city in 1841. Population in 1850, 10,977 ; in 1860, 20,081 ; and in 1870, 30,473.

END OF VOLUME SIXTH.

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PLATE I

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PLATE I

Map of the COAL FIELDS

of GREAT BRITAIN

SHEWING THE AREAS OF EXPOSED AND CONCEALED COAL MEASURES

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VOL. VI COAL PLATE II FIG. 1 FOREST OF DEAN COAL BASIN N. Length about 1 miles Ss. New Bowson Pit

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eee Pos 2000 ££ below Sea Level ane oe e yee — e eer “€ FIG. 3 NORTH STAFFORDSHIRE COALFIELD Length 7% miles Ww Talk on the Hill E. Bunker’s Hill Colliery Golden Hill Ttidgeway

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ENCYCLOPHDIA BRITANNICA.

DEA—DEA

EACON (é:dkovos, minister, servant), the name given to the lowest order of minister in the Christian church. From the appointment of the seven Hellenic deacons (Acts vi.) we learn that their duty under the apostles was simply to distribute alms from the publicfund. In the early church, however, they soon came to discharge higher functions. They assisted the bishop and presbyter in the service of the sanctuary ; in the administration of the Eucharist they handed the elements to the people ; . they instructed the catechumens, and in some cases baptized ; and the archdeacons came to exercise in the 6th century the judicial power of the bishop over the inferior clergy.

In the Church of England the form of ordaining deacons declares that it is their office to assist the priest in the dis- tribution of the holy communion; in which, agreeably to the practice of the ancient church, they are confined to the administering of the wine to the communicants. A deacon in England is not capable of holding any benefice, yet he may officiate as a private chaplain, as curate to a beneficed clergyman, or as lecturer in a parish church. He may be ordained at twenty-three years of age, anno currente; but it is expressly provided that the bishop shall not ordain the same person a

priest and deacon on the same day. In Presbyterian churches, as in apostolic times, the deacons have charge only of the pecuniary affairs of the congregation. In the Roman Catholic Church it is the deacon's office to incense the officiating priest or prelate ; to lay the corporal on the altar ; to receive the patten or cup from the sub- deacon, and present it to the person officiating ; to incense the choir ; to receive the pix from the officiating prelate, and to carry it to the subdeacon ; and at a pontifical mass, when the archbishop gives the blessing, to put the mitre on his head, and to take off the archiepiscopal pall and lay it on the altar.

Deaconess.—This was the title of a ministry to which women were appointed in the early church, whose duty it was to perform certain functions towards female catechumens during the ceremony of baptism by immersion, which could not so well be performed by the deacons. Their age was at first fixed at sixty years, but it was after- wards reduced to forty years, and no married woman was eligible to the office. Abuses gradually became prevalent

amongst the deaconesses, which led to the suppression of:

in precipices of naked rock, from the water.

their ministry in the Latin church in the 6th century. The office was abolished in the Greek church in the 12th century.

DEAD SEA, the largest lake in Palestine, and phy- sically, as well as historically, among the most remarkable in the world. It is called in Scripture Zhe Salt Sea (Gen. xiv. 3), The Sea of the Plain, or more correctly of the Arabah. (Deut. iii. 17), and The Hast Sea (Ezek. xlvii. 18). Josephus calls it the Asphaltie Lake (B. J. iii. 10, 17), a name adopted by classic writers in allusion to the bitumen, or asphaltum, which abounds in its basin. Jerome gave it the name Dead Sea because its waters are fatal to animal life, and in the Talmud it is called the Sea of Sodom. ts common name among the inhabitants of Palestine is Baheiret Lit, " The Sea of Lot."

The sea is 46 miles long, and varies from 5 to 9 in breadth. Its bed is the lowest part of the great valley of the Jordan ; and its surface has a depression of no less than 1308 feet beneath the level of the ocean. The

Jordan valley itself, for a distance of about 80 miles to the north- ward and 30 to the southward, is also below the level of the ocean. The general contour of the sea is an elongated oval, with a number of bold promontories and deep bays along the western shore, and a large, low peninsula on the south-east. It is shut in on the east and west by parallel ranges of mountains which rise steeply, and in some places The western range is the mountain chain of Judah, and is composed of white limestone intermixed with yellow and reddish strata. Its whole eastern slopes are bare, rugged, and desolate, forming that wilderness in which David found an asylum, in which the Baptist preached, and in which our Lord was tempted. The average height of the cliffs along the shore is about 2000 feet; but they are deeply fissured by torrent beds, which are all dry in summer. There are, however, a few fountains in the glens and near the shore, the most celebrated of which is the Biblical Engedi. At the north-west curve of the sea are extensive salt marshes, and at the south-west isa range of hills of rock salt, 7 miles long and 300 feet high, called Khashm Usdom, “The ridge of Sodom.” On the south of the sea lies a low marshy plain, partially covered with jungles of reeds, tamarisk, and broom.

VII. — 1

» DEAD SEA

fhe mountain range along. the eastera side of the Dead Sea is the sustaining wall of the tableland of Moab, which has an elevation of about 2800 feet, and is therefore 4000 feet above the lake. At the southern end the range is composed of red sandstone, a continuation of the “ red” mountains of Edom. At the valley of Kerek the sandstone gives place to limestone ; but further north it again appears in thick strata below the limestone. The range is intersected by the deep and wild ravines of Kerak (the Kir-Moab of the Bible), Mojeb (the ancient Arnon), and Zerka Main (Maon). A few miles from the mouth of the latter are the warm springs of Callirrhoe, famous in Jewish and Roman times. A copious stream of warm sulphureous water flows into the lake between stupendous cliffs of sandstone. North of Zerka Main the cliffs along:the shore are sandstone, but higher up the limestone overlies the sandstone, while dykes and seams of old trap-rock also occur.

At the mouth of the ravine of Kerak, on the south-east of the sea, is the peninsula of Lisdn, “The Tongue.” Its neck is a strip of bare sand about 3 miles broad. In form the peninsula bears some resemblance to the human foot, the toe projecting northward up the centre of the sea. Its length is about 9 miles. It is a post-tertiary deposit of layers of marl, gypsum, and sandy conglomerate ; the surface is white and almost destitute of vegetation.

The Jordan enters the lake at the centre of its northern end, and has on each bank a low alluvial plain, now a desert, and mostly coated with a white nitrous crust. In fact the whole circuit of the lake is wild, dreary, and desolate. Ridges of drift mark the water-line, which rises a few feet in spring, when the Jordan, fed by the melting snows of Hermon, flows in full stream. The drift is com- posed of broken canes and willow branches, with trunks of palms, poplars, and other trees, half-imbedded in slimy mud, and covered with incrustations of salt. Lying in a deep cavity, shut in by naked white hills, exposed during the long summer to the burning rays of an unclouded sun, nothing could be expected on the shores of the Dead Sea but sterility. Yet here and there on the low plains to the north and south, and on the eastern and western sides, wherever a little fountain springs up, or a mountain streamlet flows, there are thickets of willow, tamarisk, and acacia, among which the birds ‘sing as sweetly as in more genial climes. The Arab also pitches his tent beside them, and sometimes cultivates a few patches of grain and tobacco. The heat causes such excessive evaporation that though the Jordan and other smaller streams fall into the lake the water seems to be gradually decreasing. The marshes along the shore, especially to the north and south, emit pestilential exhalations during summer and autumn which are fatal to strangers, and which make the inhabi- tants of Jericho, and the few poor tribes who pitch their tents in the surrounding territory, weak and sickly. They are degraded and immoral also, as were their progenitors in the “ cities of the plain.”

The only ruin of note close to the Dead Sea is the fortress of Masada, on a cliff on the western shore, opposite the peninsula of Lisan. It was the scene of the final struggle between the Jews and the Romans after the de- struction of Jerusalem by Titus At Engedithere are a few ruins; and also at Ain-el-Feshkhah on the north-west, and on a little peninsula near the mouth

of the Jordan. The ruins of Sodom and Gomorrah have entirely disappeared. Their site is disputed, for some hold that they stood near the northern end of the lake, while others affirm that they must have been situated at the southern end. gee ee hee Sea is divided into two sections ;

1 sr, extending from the north of the Jordan to the peninsula of Lisdn, is 33 miles long, and is a regular basin- shaped cavity, its sides descending steeply and uniformly

to a depth of 1308 feet. The southern section is shallow, the greatest depth of the channel between the peninsula and the western shore being only 13 feet, while no part of the lake soutn of the peninsula is more than 12 feet, and most of it only 3 or 4 feet deep.

The water is intensely salt and bitter, and its density is so great that the human body will not sink in it. The following is an analysis of water lifted by Captain Lynch from a depth of 1110 feet, the specific gravity of which was 1°227 :—

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The presence of so much saline matter is accounted-for by the washings of the salt range of Sodom, the numerous brackish springs along the shore, and the great evaporation. The reports of early travellers, however, regarding the Dead Sea were to a great extent fabulous. They represented: it as an infernal region, its black and fetid waters always emitting a noisome vapour, which being driven over the adjoining land destroyed all vegetation ; they also stated that no birds could fly over it. All this is untrue ; the water is as transparent as that of the Mediterranean, and a bath in it is both pleasant and refreshing.

The historical notices of the Dead Sea extend back nearly 4000 years. When Lot looked down from the heights of Bethel, he “beheld all the plain of the

Jordan that it was well watered, before the Lord destroyed Sodom, even:as the garden of the Lord" (Gen. xiii. 10). The region is further described as a " deep valley " (Hmek, Gen. xiv. 3, 8), dis- tinguished by " fertile fields" (Siddim). The aspect now is entirely different. There must have been a lake then as now; but it was smaller, and had a margin of fertile plain, especially on the southern end, "as thou comest unto Zoar." In the narration of the capture of the cities of the plain by the Eastern kings, it is said that they were situated in the " vale of Siddim,"' which was full of 'bitumen (slime) pits." When the cities were destroyed, "the Lord rained upon Sodom and upon Gomorrah brim- stone and fire from the Lord out of heaven ;" and Abraham from the mountain ridges " looked toward Sodom, and toward all the Jand of the plain, and, lo, the smoke of the country went up as the smoke of a furnace" (Gen. xix. 24, 28). The sacred writer further asserts regarding the vale of Siddim that it became the Salt Sea, or was submerged ; and consequently it now forms part of the bed of the lake.

These events entirely changed, as it would seem, both the political and physical condition of the whole region. Upon the plains originally existing round the sea Gentile and Jewish records combine in placing the earliest seat of Phoenician civilization. "The Tyrians," says Justin, " first dwelt by the Syrian lake before they removed to Sidon." Sodom and Gomorrah are mentioned as the first cities of the Canaanites ; and when Lot went down from Bethel " the cities of the plain " formed a nucleus of civilized life before any city, except Hebron and perhaps Jerusalem, had sprung up in central Palestine. The great catastrophe in the days of Abraham changed the aspect of the country, and gave a death-blow to its prosperity. With the exception of the village of Engedi, and the small town of Jericho, the circuit of the Dead Sea appears to have remained ever afterwards almost without settled inhabitants.

Recent researches, especially those of M. Lartet, the Duc de Luynes, and Canon Tristram, have contributed greatly to our knowledge of the physical geography of the Dead Sea basin. It is now shown from the geological

structure of the watershed in the valley of the Arabah to the south, and from the direction of the lateral ravines which fall into the great Jordan valley,

that the river Jordan could never have run into the Red Sea. The depression of the Dead Sea is 1308 feet, while the e/evateon of the watershed is 787 feet; and the action which upheaved the watershed occurred at the same geological period which gave to the whole of Palestine its present form. The formation of the Jordan valley M. Lartet ‘accounts for in this way. At some remote period a fracture took place in the upper strata in this region, extending north and south. In consequence of the unequal strength of the strata the western side of the fracture sank, occasioning the abrupt dip observable in the strata on the western side of the valley, and the great depression of the valley itself; while the eastern side of the fracture remained in stfu, showing at various places along the eastern shore of the Dead Sea a vertical section through the limestone and sandstone. ‘The basin of the Dead Sea has thus been since its foundation a reservoir for the rain-fall: while its saltness originally proceeded from the salt- spring and hills, and gradually increased by evaporation..

Deposits of great depth have accumulated in the whole valley since its formation, composed of beds of gypsum, marl, flint, and alluvium, similar to those now in process of formation at the bottom of the Dead Sca. They show that at one period the whole Jordan valley was under water; while the sides of the valley indicate successive stages in the fall of the water from the time when its sur- face was on the level of the ocean down to the present age. The hill-sides and strips of plain on both the eastern and western banks of the Dead Sca are marked by a series of terraces or shore-lines. The highest has an elcvation cor- responding to the level of the Mediterranean. About 230 feet above the present level of the lake there is another shore-line, marked by a strip of alluvial marl adhering to the rocks and cliffs, particularly at the north-west angle. The deposit is mixed with shells of existing species, layers of gypsum and gravel. ‘This line would correspond with the general level of the great valley northward, through which the river Jordan has cut a dcep channcl. There arc, besides, in the ravines which descend to the lake, compara- tively recent deposits, reaching up their sides in places tu a height of 400 feet, and then sloping down in a serics of terraces to the present level of the lakc, showing the gradual depression of the water. Tristram also remarked on the western shore “no less than eight low gravel terraces, the ledges of comparatively recent beaches, dis-

tinctly} marked. The highest of them was 44 fcet above the present sea-level.” ;

Many traces of volcanic action, both remote and recent, have been observed in the basin of tle Dead Sca, such as trap dykes, and hot sulphur and brackish springs. Tristram describes a valley at the northern end of the salt range of Sodom, in which there are

‘‘large masscs of bitumen mingled with gravel. These overlie a thick stratum of sulphur, which again overlies a thicker stratum of sand so strongly impregnated with sulphur that it yields power- ful fumes on being sprinkled over a hot coal. The bitumen, unlike that which we pick up on the shore, is strongly impregnated with sulphur. Above all, it is calcined, and bears the marks of having been subjected to extreme heat. So far asI can understand this deposit, if there be any physical evidence left of the catastrophe whieh destroyed Sodom and Gomorrah, or of similar occurrences, we have it here. The whole appearance points to a shower of hot sulphur, and an irruption of bitumen upon it, which would naturally be calcined and impregnated with its fumes , and this at a geological period quite subsequent to all the diluvial and alluvial action of which we have such abundant evidence. The catastrophe must have been since the formation of the valley, and while the water was at its present level,— therefore, probably during the historic period.” (Land of Israel, pp. 355, sq.)

Tristram applies the above-observed facts to the solution

of the great historical question about the destruction of the cities of the plain in the following manner :—

‘* Setting aside all preconceived notions, and taking the simple record of Genesis xix. as we find it, let us see whether the existing eondition of the country throws any light on the Biblical narrative. Certainly we do observe by the lake sulphur and bitumen in abund- ance. Sulphur springs stud the shores, sulphur is strewn, whether in layers or in fragments, over the desolate plains ; and bitumen is ejected in great floating masses from the bottom of the sea, oozes through the fissures of the rocks, is deposited with gravel on the beaeh, or appears with sulphur to have been precipitated during some convulsion. We know that at the time of earthquakes bitumen

seems to be detached from the bottom of the lake. LHvery- thing leads to the conclusion that the agency of fire was at work. The kindling of such a mass of combustible material, either by lightning from heaven, or by other electrical ageney, combined with an earthquake ejecting other bitumen or sulphur from the lake, would soon spread devastation over the plain, so that the smoke of the country would go up as the smoke of a furnace." (Land of Isracl, p. 359).

Here we have to do only with physical facts and appearances, A mass of burning sulphurous matter might be ejected from some open crater, as is often the case with Vesuvius; and this, falling upon the cities and the bituminous plain around them, would produce just such a form of conflagration as Abraham is stated to have seen. The valley may then have sunk a few feet, and become submerged. 'This, it is true, is mere theory ; it is a theory, however, suggested, and to a large extent confirmed, by the physical aspect of the country, and the careful observations of travellers around the lake Thc subject is not one for

vague speculation, and much less for dogmatic assertion.

The problems which the Dead Sea present must be-solved, if they are ever to be solved, by scientific research.

It is not strange that the Dead Sea has never been navigated to any extent. It scems probable from the statement of Josephus (Ant. ix. 1, 2) that the Moabites crossed it to invade Judah; and he tells us the Romans used boats against the fugitive Jews (B. J. iv. 7, 6). Costigan was the first in modern times to navigate it, going from the mouth of the Jordan to the peninsula of Lisdn in the boat by which he had came from Tiberias. He after- wards died of fatigue and exhaustion. In 1837 Moore and Beck conveyed a little boat from Joppa, and visited some points. 'Ten years later Lieutenant Molyneux took a boat to the peninsula, and his life was also sacrificed. The expedition of Lynch was far more successful, and he was the first thoronghly to examine the shores, and to determine the depths by soundings. Several of his party took the fever which is so fatal, and one died. Winter is the proper season for such researches, Rain seldom falls; and the air during the depth of winter is fresh, and cold almost unknown.

The following are the leading works which treat of the Dead Sea :— Robinson, Physical Geography of Palestine; De Saulcy, Voyage autour de la Mer Morte ; Lynch, Official Report to United States Government ; Ritter, Comparative Geography of Palestine, vol. iii. appendix i. (Go Ie, ley)

DEADLY NIGHTSHADE. See BELLADONNA.

DEAF anp DUMB. It is a not uncommon’supposition that deaf mutes are dumb on account of some vocal or organic defect, whereas the dumbness arises, with very rare exceptions, from the deprivation of hearing caused by some natural or accidental disease. Where partial or total dumbness exists with the sense of hearing perfect, it will be generally found to proceed either from great nervous debility or from some mental derangement, and not, as iS often supposed, from some defect in the vocal organs, which in the congenitally deaf, with hardly an exception, are in their normal condition. Many children who are enumerated as congenitally deaf have the sense of hearing to a greater or less degree, but not to such an extent as to be of service to them in the acquisition of language. It is remarkable that the defect of hearing is not generally dis-

covered till an advanced period of childhood, and though the child remains mute the real cause is neither readily acknowledged nor properly attended to. Children who have lost their hearing after the acquisition of the power of speech cannot be included in the class of deaf mutes ; the impression which language has made on their minds gives to them a marked superiority over those who aredeaf from birth.

Such a calamity as the deprivation of hearing must be productive of great and varied disadvantages, as it totally excludes the’ mind from an extensive class of ideas and associations. It is then not to be wondered at that this state of social isolation should occasionally give rise to moroseness and despondency, and that external objects should inspire little sense of surprise or admiration. They are simply objects recognized by their form, colour, and texture, and the emotions they raise are different both in character and in intensity from those experienced by hear- ing children. This physical defect has not, however, any necessary connection with the presence or

absence of intel- lectual capacity, or with the active principles of our nature. There is only the want of one of the natural and most im- portant avenues to intellectual development, with its primary consequence of dumbness, and its secondary one of social isolation. Still, the denial of all such knowledge as can be derived through the medium of the ear is somewhat atoned for by the quickened influence of other senses, especially that of sight. Thus the visible marks of

attention the deaf and dumb receive from others,—their caresses, frowns, and smiles,—all make a corresponding impression on their tender minds, and as they grow older they watch the looks and gestures of those near them with a keenness unknown to other children, so that the slightest change of expression does not escape their observation. Their affections are stimulated and their passions excited much in the same way as in other children.

The proportion of children born deaf was formerly sup- posed to be much smaller than it really is. Cases have come to be known in largely increased numbers since institutions for the deaf and dumb have been estab- lished, and such statistical tables as are given in this article suggest the incorrectness of the popular supposition. The institutions which have been founded on their behalf have not only diffused correct information concerning their number, but by the gratifying success of the educational methods adopted have greatly contributed to dissipate pre- judicial notions concerning their capacity to receive instruc- tion, and to direct public sympathy towards the claims of this class. The latter office it is still needful that they fulfil, for prejudices yet exist against deaf mutes,—one of these being the general supposition that they are very vicious and hot-tempered. It may be admitted that some of them are so; and it may even be granted that the pro- portion of mutes with such dispositions is as high as in any other class of afflicted persons, for in the case of the deaf and dumb there are undoubtedly special circumstances of early life which tend in no small degree to such a result. The total inability of parents to deal with their abnormal peculiarities must be included among the causes which pre- judicially affect their dispositions, and overshadow attractive features of their character; and the kindly-intended in- terference of neighbours with the parental management often proves morally injurious to them, Their discernment of right and wrong is equal to that of other children ; and

hence, when neighbours unwisely seek to screen them from merited punishment, a spirit of insubordination is excited, and sullenness or passionateness is induced. It should therefore be the parents' utmost endeavour, when punish- ment is to be administered, to treat these children im- partially. It is most desirable also that external circum- stances should be as favourable to them as possible, and

everything calculated to pollute their uncultivated minds kept from their acute powers of observation.

Causes.—The causes assigned for congenital deafness are consanguineous marriages, hereditary transmission, weak coustitutions of parents, scrofula, climate, and the ill-health of the mother at a certain period of life. There is necessarily difficulty in ascertaining the real cause of deaf- ness. That difficulty has its ground in the unwillingness of parents to admit that their children were born deaf. Their deafness is often attributed to some infantile disease, though the defect is congenital. On the other hand, when they have lost the sense of hearing at an early age, they may be included among the congenitally deaf. But all institutions for the deaf and dumb contain instances which illustrate scientific investigations, and establish the position that such causes as those now alluded to tend to induce and perpetuate the disease of deafness. In all cases of congenital deafness it will be found that there exists some disorganization of the organ of hearing itself, some obstruc- tion in the internal ear or compression of the auditory nerve, whereby the vibrations of the ear are prevented from pro- ducing the required effect upon the internal parts of the ear, or from being communicated to the brain.

After-birth or acquired deafness occurs at all ages, and has its origin in such diseases as small-pox, measles, typhus, convulsions, paralysis, hydrocephalus, and other affections of the brain, and " scarlatina, which more frequently than any other disease leaves the patient deaf, in consequence of the inflammatory state of the throat extending to the internal ear, causing suppuration and destruction of the delicate apparatus on which hearing depends; such being the case, especial attention should be directed during the course of. the disease to the state of the throat, so as to prevent if possible the inflammation extending." Vaccina- tion has been the

means of greatly decreasing the cases of deafness; and doubtless, as sanitary laws become more general, the introduction of perfect sewerage, pure water, and good ventilaticn, will all tend to lessen the liability to those zymotic diseases upon which deafness supervenes.’ Amongst other causes of deafness are cold, and severe blows or falls upon the head. It has been ascertained that the proportion is about 60 per cent. congenitally deaf to 40 per cent. accidentally so ; and the census returns for 1871 show that of the 1054 inmates of 12 institutions of England and Wales 63 per cent. were congenitally deaf. Consanguineous marriages are perhaps the most fertile source of deafness, which fact is established by the numerous cases of deaf children who are the offspring of first cousins, It is not only so in England, but in other countries of Europe and in America. Dr Buxton says, ‘‘ In an inquiry which I made some time ago, I found that about every tenth case of deafness resulted from the marriage of cousins.” The Irish Commissioners’ Report for 1871 says, “ Too%close consanguinity in the intermarriage of relatives, and also hereditary predisposition, have Jong been supposed to be causes of congenital] deaf-muteism.” The results obtained by the census of 1871 tend to establish these suppositions.

The following table from census returns for Ireland exhibits the amount of deaf-muteism where consanguinity of parents existed :—

Congenital Deaf Cases,

Acquired Deaf Cases. |

Mingt COUSMIS..:2…0.2-.:.: 80

5

Second cousins…..... 60 8 63 ‘Mhind COUSINS 2. ..0…4.5502 31 1 32 Fourth cousins…..... f 0 7 Fifth and sixth cousins… 14 0 14

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DEAF AND DUMB

Thus we find that, in 201 instances of relationship be- tween the parents of mutes, 85 were in the degree of first cousins, 63 in that of second, 32 in that of third, 7 in that

of fourth, and in 14 they were more remotely related.

Dr Bondin, at a meeting of the Academy of Sciences, Paris,

noticed the following striking result of such unions :—

‘‘Two brothers in perfect health, and well constituted imen, had married two sisters, their cousins-german.

infant) are deaf and dumb.”

The report of Dr S. M. Bemiss of Louisville, Kentucky, to the Ametican Medical Association on the subject of the influence of marriages of consanguinity on offspring and re- cords the following results of 833 such marriages :—

Of the 3942 children of those marriages 1134 were defective in one way or another, viz.,—deaf and dumb, 145; blind, 85; idiotic, 308; insane, 38; epileptic, 60; scrofulous, 300; and deformed, 98; 883 died young ; and the writer concludes by remarking, “‘I feel satisfied, however, that my research gave me authority to assume that over 10 per cent. of the deaf and dumb, and over 5 per cent. of the blind, and nearly 15 per cent. of the idiotic, in our State institutions for subjects of those defects, and throughout the country at large, are

the offspring of kindred parents, or of parents themselves the descendants of blood intermarriages.’

Another great cause of deafness is hereditary transmis- sion. “It has clearly been ascertained,” says Dr Harvey (On the Ear), “that the most common cause is a strumous and delicate habit Of body, generally hereditary.”

The subjoined table from the census returns for Treland in 1871 proves that deaf-muteism is often transmitted by hereditary taint or family peculiarity.

The table is divided into two sections,—the first showing where the disease is transmitted by the father, the second by the mother.

Mute relations on Father’s side.

No. of Deaf Mutes in each family.

Great- Grandfather.

Great- Grandmother. Grandfather. Grandmother. Granduncle. Grandaunt, Father.

Aunt. Total.

5 ON a)

me bo 6

5 4 1

: bo co

Mute relations on Mother’s side.

Sis |e No.of Deaf | 3 | § | § Mutesin each} 3 | § , § |Mother.| Uncle. Cousin.| Total. family 8 g g , S15 15 One…» 2 |e | 2 Two. =e fe MDTCR. 6 55504

sea

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The Commissioners’ Report is as follows :—

- Although it has been shown that muteism is transmitted by hereditary taint, yet it very seldom descends directly from the parent to the offspring, which is manifest from the following results of the inquiry made respecting the marriage state of the congenitally

deaf. After a minute investigation of this subject, we find 115 instances, 77 males and 38 females, of the marriages of congenital deaf mutes where either one or both parties were affected. In 81 instances we ascertained that only one of the parties was congenitally deaf, and that 264 children, none of whom were deaf and dumb, resulted from 67 such marriages; in the remaining 14 instances

The elder brother has had several children, one of whom is deaf and dumb. The other brother has had six children, the first, third, and fifth of whom can hear, while the second, fourth, and probably the sixth (an

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there was no issue. We find four instances of the marriage of a congenital deaf mute with an acquired deaf mute, from three of whieh 7 children resulted, one of whom was deaf and dumb. There were 13 instances of the intermarriage of persons both of whom were deaf and dumb, and from 12 of these marriages 44 children resulted, of whom only one was deaf and dumb, and another was deaf only. The grand-parents of the former on the mother's side, and a grand-uncle of the father's, were also deaf anddumb. Of 315 children resulting from 87 of the afore-mentioned marriages, only two were deaf ahd dumb, and one deaf only. In a case of the intermarriage of congenital deaf mutes, although the husband's parents were second cousins and the wife's also related, and her sister deaf and dumb, yet none of the 8 children resulting from the marriage were in any way afflicted.'

The Principal of the New York Institution says, " We can show that it is much the most common for the children of deaf and dumb parents to possess the faculties of which their parents are deprived ; still, although the offspring may not be defective, they may likely inherit that peculiar taint of constitution by which the disease will be transmitted to future generations, which is so often the case."

Mr Turner, in a paper on Hereditary Deafness, gives the

following table :—

em oe No. of || sal “mii Families ear | Hearing.| One hearing and one 30 15 congenitally deaf…... One incidentally and one

3 56 6

congenitally deaf …... Both congenitally deaf…..) 24 17

From this it appears that in 86 families with one parent a congenital deaf mute there were 218 children, of whom 21 were deaf and dumb, or about one-tenth of the whole. In the 24 families with both parents congenital deaf mutes there were 57 children, of whom 17 were deaf and dumb, or about one-third of the whole. ‘The proportion of deaf- mute children of parents both congenitally deaf is thus more than three times greater than of parents only one of whom is congenitally deaf.

The subjoined table shows the proportion of the families, constituted as above, who had deaf-mute children in them :—

Parents. Families. | Families.

1 | One hearing and one 30 One or more deaf congenitally deaf … \ and dumb in 5

2 | One incidentally and 56 4 one congenitally deaf 2 x

3 Both congenitally deaf.. 24 5 – 5)

The proportion of families having one congenitally deaf parent, with at least one deaf-mute child, is about one-tenth of the whole, while the proportion of the families having both parents congenitally deaf with a deaf-mute child or children is more than one-third of the whole. The above tables show the amount of deafness transmitted by the marriage of one congenitally deaf with one hearing person. The cases of deafness resulting therefrom are only one- tenth of the whole, whereas those from the intermarriage of deaf mutes are about one third. Similar results could be obtained from reports of many of the institutions, but from what has already been stated on this cause of deafness, it appears that, while there is sufficient reason to justify the prohibition of the intermarriage of deaf mutes, the excep- ~~tional cases of~~

~~deaf mute offspring as the result of unions of deaf mutes with hearing persons would not justify inter~~ ference in such marriages.

History of Instruction.—In early times, it was an opinion maintained, even by philosophers, that the education of the deaf and dumb was not possible. It was then believed that language could only be acquired through the medium of the ear. The couplet of Lucretius is well known—

‘¢To instruct the deaf no art could ever reach, No care improve them, and no wisdom teach.”

Parents, influenced by this belief, allowed their children to grow up without culture. They were abandoned to them- selves, and exiled from the community of rational beings. To such a culpable extent was this prejudice carried, that it has been the practice in some countries to destroy children who remained at three years of age incapable of either hearing or speaking, and by the code of Justinian deaf mutes are declared to be incapable of civil acts. In France, the very birth of such children was accounted a sort of disgrace to the family from which they sprang, and the duties of humanity were deemed to extend no further in their behalf than to the maintenance of their animal existence, while they were carefully secluded from the eyes of the world either within the walls of the cloister or in some hidden asylum in the country. Abandoned thus early to their fate, and regarded as little better than idiots, it is not surprising that their future behaviour should have been such as might seem to justify the erroneous views which had prompted this un- generous treatment. The progress in the art of instructing the deaf and dumb was in consequence greatly retarded ; attempts to instruct them were scarcely known, and no school was established till the middle of the 18th cen- tury. In the 4th century, St Augustine, influenced by the dictum of Aristotle, expresses his unfavourable opinion respecting their ability to obtain any religious knowledge, remarking, ‘‘that deafness. from birth makes faith impos- sible, since he who is born deaf can neither hear the word nor learn to read it.” But in this enlightened age it has been fully proved that the neglect and forgetfulness to which these outcasts were formerly consigned were founded on very mistaken notions of their mental capacities.

The first instance of a deaf mute being instructed is mentioned by Bede in 685. No other case is met with till some centuries afterwards. Rodolphus Agricola, of Heidelberg, who was born in 1442, and died in 1485, makes mention in his De Inventione Dialectica, of an educated deaf mute ; but this instance, and probably others, were discredited on the ground of their impossibility. Jerome Cardan, a native of Pavia, born in 1501, took a more philosophical view of the subject, and says, “ Writ- ing is associated with speech, and speech with thought, but written characters and ideas may be connected without the intervention of sounds ;” from which he further argues that “the instruction of the deaf is difficult, but it is possible.” It was no doubt this enlightened view that gave to the education of the deaf and dumb its first and greatest impulse. A Spanish Benedictine monk of the convent of Sahagun in Spain, named Pedro de Ponce, who was born in Valladolid in 1520 and died in 1584, is the first person who is recorded to have instructed the deaf and dumb and taught them to speak. He was fifty-six years old when Jerome Cardan died, and he had no doubt, from his association with Cardan, imbibed his principles. He has, however, left no work upon the subject, though it is probable that the substance of his method is contained in a book of Bonet, secretary to the constable of Castile, printed at Madrid in 1620 under the title of Reduccion de las letras y artes para ensehar & hablar & los mudos. In the time of Bonet the teaching of the deaf and dumb was becoming more general and was entered upon by several persons, both m Italy and in England. Dr John Pee aan English physician, and Dr Wallis, professor of inathematics in the university of Oxford, were both engaged in the work in England about the same time, though it is not accurately known to whom the honour of being its prime mover is due. The former published a treatise on the education of the deaf and dumb in 1648, several

years before Dr Wallis’s valuable and able work had appeared. In the year 1669, some years after Dr Wallis’s writings and practice of instructing the deaf and dumb had been known, Dr W. Holder, rector of Bletchington, published a work entitled lements of Speech, with an Appendix concerning Persons Deaf and Dumb, in 1670 George Sibscote issued a Z’vreatise concerning those who are Born Deaf and Dumb, and in the year 1680 George Dalgarno, a native of Aberdeen, published an able and philosophical work, under the title of Ddascalocophus, or the Deaf and

Dumb Man's Tutor, which was reprinted some years ago by the Maitland Club. This last-named work is considered by Professor Porter as "one of the most remarkable and important productious in the whole history of the art." To an early work of his, entitled Ars Signorum, both Bishop Wilkins and Dr Wallis were indebted, but they nevcr mention his name. This un- generous silence unfavourably contrasts with Leibnitz's frequent commendation of tlle work. Above all others, John Conrad Amman, a Swiss physician living at Amster- dam, distinguished himself by his ingenious and successful method of teaching the deaf and dumb to speak. He reduced the work to a fixed art or method, which he pubiished in his Surdus Loquens, 1692, whereof an English translation was afterwards published by Daniel Foot.

In France the work of teaching the deaf and dumb was late in receiving the attention it deserved, in consequence of the still prevalent doubt as to its practicability, although many instances of success in other countries were generally known. It was not till about the middle of the 17th century that the subject was taken up with any interest. Vanin, a Father of the Christian Doctrine, made some attempts to alleviate the condition of the deaf and dumb, but his work was cut short by death. After him came Ernaud, Rodriguez Pereira, the Abbé Deschamps, and the Abbé de I'Epée. In Silesia, at the beginning of the 18th century, W. Kerger established his method on the principles of John C. Amman; and in 1718 George Raphel, a German, and contemporary with Kerger, published the system he had carried out in the education of three deaf mutes in his own family. All this interesting work had been accomplished before any public school for the deaf and dumb had been established ; and it was not till 1760 that Abbé de l'Epée started the first school in Paris. About the same time Thomas Braidwood opened a school in Edinburgh; and in 1778 Heinicke in Germany founded another at Leipsic under the patronage of the Govern- ment, where he pursued the system of articulation and lip reading which forms the basis of instruction in the German schools of the present day. Thomas Braidwood made himself famous by his remarkable success. He was visited by Dr Johnson when on his tour to the Hebrides, who expressed himself highly gratified with the success in what he considered a great philosophical curiosity. In 1783 Braidwood left Edinburgh and opened a school at Hackney, near London, where he continued his arduous duties till 1806, when he died. Two of his sons became instructors of the deaf and

dumb. A school was opened in Edinburgh by one of them in 1810, and the other started aschool at Birmingham in 1825.. In the year 1792 the first public school in Great Britain for the gra- tuitous education of the deaf and dumb was opened in Bermondsey, London, of which Dr Watson, the nephew of Thomas Braidwood, was for thirty-seven years the head instructor. Since the above date (1792) schools have been established in many of the principal towns of Europe and America.

Methods of Instruction. —All the institutions and schools for the education of the deaf and dumb employ one or other

of the two following methods—(1) that in which the sign language and manual alphabet form the basis of instruction, with articulation and lip reading to a greater or less extent, but, as a rule, only for the semi-mute, semi-deaf, and those of the congenitally deaf of good capacities, and who show an aptitude for it; and (2) that in which articulation and lip reading form the basis of instruction, and the sign language and the manual alphabet are used more or less as a means to thc end. The former is the more general, and is carried out in all the schools of the United Kingdom (although in the London Asylum articulation and lip reading are profes- sedly and systematically taught to every pupil), in America, aud in some of the Continental schools. The latter is the one chiefly employed in the German and Austrian schools, and is followed in one or two private schools in London. The signs in use in all schools are of two kinds—-the natural, and the conventional or arbitrary. The former are those with which all deaf mutes are familiar before coming to school, and which they use in ordinary intercourse with their friends. The latter are chosen and systematized by the teachers of the several schools, and, in combination with the natural signs, are employed to convey ideas of a complex nature. Every action, the visible part of which can be imitated by gesture, admits easily of being so expressed, as the action of eating by lifting the hand to the mouth followed by the motion of the jaws, and of sleeping by closing the eyes and reclining the head ; the expression of different passions, of approbation or disapprobation, of sur- prize, curiosity, &c., may all be signified very intelligibly by modifications of the countenance. “ It is in this simple

manner," observes Dr Watson, "that two or more deaf persons are enabled to hold instant converse with each other though brought together from the most distant parts." Thus far these signs may be termed natural, but the naturally deaf do not stop with this language of pantomime. When they are fortunate enough to meet with attentive companions, especially where two or more dcaf persons happen to be brought up together, it is astonishing what approaches they will make towards the construction of an artificial language. By an arbitrary sign fixed by common consent, or accidentally hit upon, they will designate a person, place, or thing, and this sign is ever after used by them as a proper name. It is impossible to give a verbal description of those "signs, because they are as various as the fancies and circumstances of their inventors. Yct being grafted on the parent stock of natural and universal signs, they may in some measure be regarded as different dialects of the same language. But since it would be impossible by means of natural signs alone to convey to the minds of the deaf and dumb ideas of a complex nature, recourse must be had to that system of signs known as conventional or arbitrary: These signs have been extended and systematized on natural and philo- sophical principles by the several teachers of the deaf and dumb, and they differ in degree in all schools. It would be impracticable to maintain the same system of signs throughout, even should such be desirable, but it is of the utmost importance that those in use in each school should be so cultivated as to prevent any confusion of ideas by the improper use of them. It is by their aid chiefly that all instruction is carried on, and, as used by missionaries for the deaf and dumb, they are remarkably serviceable, there being always to be found, in an assembly of deaf mutes, many whose minds cannot be reached by any other means. Attempts are often made in the institutions for the deaf and dumb to dispense with signs, and to use the manual alphabet alone after the fpupils have acquired a certain proficiency in language. Although this would prove of immense educational advantage, attachment to the natural language of signs is so strong that it has always

been found as impracticable to make the change as to substitute articulation and lip reading. Signs to the educated deaf and dumb should be as crutches to the halt—to be used only when occasion requires,—otherwise their constant use will tend to enfceble rather than strengthen the intellect. In the sixth report of the American Asylum at Hartford, Connecticut, the

following is given as an answer of a deaf mute to the question, “Which do you consider preferable—the language of speech or of signs ?”—

“I consider to prefer the language of signs best of it, because the language of signs is capable of to give me elucidation and under- standing well. I am fond of talking with the deaf and dumb quickly, without having the troubles of the voice: therefore the language of signs is more still and calm than the language of speech, which is full of falsehood and trouble.”

The Abbé de l’Epée, to whom teachers of mutes are greatly indebted for the methodical and ingenious system of signs, altogether mistook their function as a means of educating the deaf and dumb and in consequence his method failed entirely. He gave to each word its peculiar and appropriate gesture in the natural order of the language; and by the intervention of these gestures he succeeded in enabling his pupils to transcribe whole pages of the niost abstract disquisitions. The substance and diction of these, how- ever, were not theirs but his own, and, of course, the gestures, which they had mechanically associated with certain charaeters, conveyed to them uo notion of the real signification of those characters. Notwithstanding the radical and glaring defects of De l’Epée’s method, which could have had no utility to those who followed it, the ostentatious display he made (which was of a nature particularly calculated to impose upon superficial observers) excited the astonishment-and applause of a host of specta- tors; and, being seconded by the impulse of his religious zeal and beneficent character, it soon raised him to a high degree of reputation. His fame spread all over Europe, and his lectures and exhibitions attracted everywhere crowds of enthusiastic admirers. Some, however, saw through the delusion. At a public exhibition of the pupils of the Abbé Storck, who were taught according to this method at Vienna, Nicolai, an Academician of Berlin, pro- posed to the Abbé to require one of his pupils to describe in writing the action he was about to perform. ‘The chal- lenge being accepted, the Academician struck his breast with his hand, upon which the deaf and dumb boy wrote the words, “hand, breast.” Nicolai withdrew satisfied with this proof of total failure. It was evident that, notwithstanding their apparent knowledge and their quick- ness in writing down any question together with its answer, both had been equally dictated by their master, in the same language of gesture, but without any corre- sponding ideas or the excrtion

of any intellectual faculty, except that of memory. They were utterly incapable of composing a single sentence of their own accord;, and: it was found, accordingly, that their spontaneous answers to questions were limited to the monosyllables yes and no, of which it is even doubtful whether they fully understood the meaning. The proper method by which the pupils' knowledge of the construction of language can be tested is by dictating the lesson in the sigu language in the manner in which deaf mutes themselves use it, without any regard to logical or grammatical distinctions. Most pupils after a few months' instruction will be able to write down a very fair piece of composition if dictated by the method as employed by the Abbés de l'Epée and Storck, but without understanding its meaning. The following instance will at once explain the way in which the sign language is employed by the teachers, and used amongst the deaf and dumb themselves :-—

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Let it be supposed that a girl had been seen by a deaf mute child to drop a cup of milk which she was carrying home. He would relate the incident in the following order of sign words. Saw-I- girl-walk-cup-milk-carry-home-drop. This mode of dictating is the only sure road to the acquisition of language by those who have nothing but the natural language of gesture and feature to assist them.

The value of the language of signs is well expressed by the principal of the Ohio Institution for the Deaf and Dumb, who says :—

'The use of good scaffolding must attend the erection of every building. As seaffolding in architecture so is the sign language in deaf mute education, and only tyros in arehitecture or education would dispense with either. The riper the experience the deeper the convietion comes of the necessity and usefulness of the sign language, and in its use we find the corner stone of all deaf mute institutions. The cultivation of it and its effeetive usc is the only peculiar, although not the chief qualifieation of the teacher. He will teach written language by the sign, laying aside the latter as soon as the ready use of the former has been secured. It is not necessary to descant upon the

beauty, the grace, or the power of the sign language. ‘he mute ‘has no other, and the teacher must use and improve it as best he may.”

The first lesson in which the pupils are instructed on their entrance into school is the mode of visible communi- cation known as the finger or manual alphabet. There are two kinds of this,—the doubled-handed alphabet, where the letters are expressed by the dispositions of the fingers of both hands, and the single-handed, in which the letters | are formed with the fingers of one hand. It is supposed that the former was derived from a finger-alphabet which appeared ina work by Dalgarno; and the latter is said to have been invented in Spain, and appears to have been published in a work by Bonet to which the Abbé de ’:pée was much indebted.

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The Double-handed Alphabet, as in use in most of the schools for the deaf and dumb in England.

Talking with the fingers is an art easily acquired and retained, or recovered if lost, and it furnishes a ready sub- stitute for pen or pencil; but it must not be forgotten by those familiar with it that the extent to which the deaf mute will be able to understand any commuication will depend entirely upon the state of his education, or upon his knowledge of language. The deaf and dumb when

, except to those who are accustomed to its tones.

DEAF AND DUMB

properly instructed converse with the utmost rapidity by this method ;

habit enables them to follow with the eye

The Single-handed Alphabet, as used in the American and Conti- nental schools, and also in one or two English schools. motions which to others would be too rapid for observation. They readily catch at the meaning of a word or question

before it is half spelt.

Articulation.—Another very important branch of the education of the deaf and dumb is that system by which deaf mutes are taught to speak and to understand the speech of others by merely watching the motion of the vocal organs. This method is by no means novel, as it has long been practised in some of the schools in England, and the earliest attempts to teach the deaf and dumb to speak appear to have been as successful as those in modern times. We learn from the Venerable Bede's Lcclesiastical History (quoted by the Abbé Carton in his Annual of the Deaf and Dumb and Blind) that a deaf man was taught to pronounce words and sentences by John, bishop of Hagulstadt (Hexham), in the year 685; and from that time we meet with only isolated cases, till the latter part of the 18th century, when Samuel Heinicke established a schcol where this system formed the basis of instruction,

It would at first sight appear scarcely credible that a person, without the guidance of the sense of hearing, would be able, merely by watching the position and actions of the organs of the voice, to utter articulate sounds, with any tolerable perfection. Experience, however, has shown that this accomplishment, though laborious and tedious of acquisition, is not attended with extreme difficulty. Great patience, perseverance, and kindness are qualifications necessary on the part of the teacher to ensure success in ordinary cases, and the degree of success will greatly depend upou the number of children among whom the teacher has to divide his attention. A wide difference must ever be perceptible between the speech of the deaf and those who hear. This artificial speech is laborious and constrained. It frequently conveys the idea of pain as well as effort, and as it cannct be regulated by the ear of the speaker, it is often too ioud, and generally monotonous, harsh, and dis- cordant. It is often from this cause scarcely inteltigible

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system of articulation and lip reading prevails in the Ger- man and other Continental schools, where this art has been cultivated with greater success

than in England, which must be attributed to the adaptability of the German language to this peculiar mode of acquiring speech; the decision of this question, as far as it concerns any particular individual, must, however, depend in a great measure on peculiar circumstances, such as condition in life and future destination, &c. Children congenitally deaf, of good capacity, with a well-toned voice, can make surpriz- ing progress in the hands of private tutors ; but the limited success which has attended this method of instruction with numbers has not induced teachers to introduce it generally into large institutions, but rather to restrict it to special cases. Most of the German teachers consider that arti- culation is necessary for the acquisition of thought, and can be successfully taught to the majority of the deaf and dumb ; but most teachers of experience in England hold quite the opposite opinion, and teach it only to the semi- mute and semi-deaf. This subject continues to be much disputed, and the question, whether or not it should form a part of the course of the education of the deaf and dumb, and, if so, to what extent, is still keenly dis- cussed. The American institutions have sent over to Europe from time to time some of their most distinguished ilistructors to investigate the methods carried on in the English and Continental schools. They made most minute examinations of the different systems, and were somewhat disappointed to find that the German system so-called did not possess such advantages over theirs, or the French system, as they had been led to expect. Mr Gallaudet, in his report to the board of directors of the Columba Insti- tution for the Deaf and Dumb, says :—‘“‘ Nothing in my foreign investigations has led me to question the character of the foundation on which the system of instruction pur- sued in our American institutions is based. It is plainly evident, from what is seen in the articulating schools of Europe and from the candid opinions of the best instruc- tors, that oral language cannot, in the fullest sense of the term, be mastered by a majority of deaf mutes.” The fol- Jowing is the opinion of the Rev. George Day :— “Asa regular part of a system of public instruction, its introduc- tion into our institutions, I am persuaded, would be a serious misfortune.” Mr Hawkins (for many years a teacher in the London school), who may be said, in this connection, to represent the consensus of English authori- ties, says :—Scarcely more than one in thirty attains anything approaching success.”

The experience of Dr Watson, for many years principal of the London Asylum, is decidedly in favour of its utility. In support of his: opinion he states the following argu- ment, which must doubtless be allowed to have some weight :—

‘‘‘The more numerous are the means of observation, the more per- fect will be the recollection, or, in other terms, the more frequent the recurrence of words and their corresponding ideas to the mind. Thus, persons who can hear, speak, read, and write retain a discourse much better, and have far greater facility in expressing themselves, than persons who possess only two of these faculties, that is, illiterate persons, who can hear and speak, but who cannot read or write. Now, as deaf and dumb persons educated without articulation can only have two of the means, viz., the third and the fourth, that is, the impressions made upon the eye by characters and the action of the hand in writing, can it be questioned that we render them an essential service by adding the actions of the organs of speech, a very powerful auxiliary, since by it words become, as it were, a part of ourselves, and more immediately affect us? In learning the pronunciation of letters, a very important operation is going on in the mind of a deaf person, namely, the association and understanding of the figures of written or printed character with certain movements or actions of the organs of speech. The very habit of regarding the onc as the representative of the other

paves the way for considering combinations of those actions or characters, as the sign of things or idcas—that is, significant

words, written or articulate. We who hear consider words chicfly as sound; the deaf who have learned to speak consider them rather as actions proceeding from themselvés. And this gives language to them a sort of tangible property, which is of vast importance both as respects its retention in the memory, and one of its most important uses, the excitation of ‘ideas in their own minds. On this account the time, the labour, and attention, necessary to articulate speech by those who are dumb through want of hearing, would be well bestowed, even if their speech were not intelligible to others.”

In America oral teaching is now receiving much atten- tion. It has been introduced into several of the existing institutions, and two or three schools

have been established in which the German system is exclusively carried out, and in order to facilitate the acquisition of articulate speech, the ingenious method called ‘‘ Visible Speech,” invented by Mr Melville Bell, has been introduced.! In England, also, there are several ardent advocates of the oral system.

Time of School Attendance.—After the foregoing sketch and criticism of the different methods which have been adopted for the education of the deaf and dumb, it is natural to inquire what general end in their education is proposed by teachers, and what principal aims in conformity with that end should be regarded. Obviously the funda- mental object should be to qualify the pupils to hold ready communication with persons who, having the faculties of hearing and speech, employ the current language of the country for the purposes of mutual intercourse. They must above all things be taught the use of ordinary language, both as an instrument for expressing their own thoughts and for understanding those of others. This qualification, it is evident, is absolutely necessary to their becoming members of that community from which by nature they would have been excluded, and to which it is our chief aim to restore them.? Teachers are not agreed as to the age at which the deaf and dumb should com- mence their education with the greatest benefit, nor yet as to the term required for school attendance. It is the opinion of some that infant schools for the deaf and dumb would prove of immense advantage in compen- sating for the extra length of time requisite to acquire any- thing like a perfect knowledge of the English language, but others are strongly opposed to these for social, physical, and intellectual reasons,—socially, as it tends to alienate the children from their parents ; physically, as being naturally of delicate constitutions they require the years of childhood to be invigorated, and so to be fitted to undergo the strain of a regular and systematic course of instruction ; and intellectually, as it has been found by experience that children of an early age have not that power of compre- hension or memory to enable them to advance with satis- faction. Doubtless, they would benefit somewhat by coming to a school for the deaf and dumb for a short time daily ; but asthe deaf-mute population isso scattered, very few would be able to avail themselves of such a privilege. The only available remedy would be their attendance at ordinary schools for a stated time daily, where they would be disciplined and taught—the girls to sew, knit, and write, and the boys to write and draw.

By this suggestion it is not meant to affirm the possibility of educating deaf routes along with hearing children. The plan has been tried but has not been successful. The constant observation of the deaf mutes of the superiority of others over them tends to dishearten and depress them, and as they are at

1 Mr Bell has also invented an instrument called a Phonautograph, which he says has been found useful for educational purposes, as was demonstrated by a young deaf and dumb pupil from the Boston insti- tution.

2 “ Most institutions experience some difficulty in securing and then retaining able and efficient teachers, as the sphere of labour in the protes- sion is so circumscribed and the salaries offered are far from being an equivalent remuneration for the sacrifice of brighter prospects and the depressing influence of the work.”

all times too apt to be discouraged by the consciousness of their own defect, it should be the teacher’s duty cheerfully to stimulate and encourage them to advancement.}

An infant school was formed in connection with the Manchester Institution for the deaf and dumb some years ago, but from the report for 1876 it appears that there were only two children under the age of seven, out of a total of 149 pupils, in the two departments. Most of the institu- tions admit children from seven to nine years of age, and it isethe opinion of teachers of experience that at that age it is most suitable to commence instruction. Still, before they are eligible for an institution of the deaf and dumb, much may and ought to be done by the parents for their improvement.

The first and primary aim of the teacher is to get at the minds of the pupils, and for this end it is of immense advantage that they should be brought up together, so that they may acquire and maintain the language of signs. The acquisition enables them to convey to one another much and varied information, which proves of great service in the lands of the teacher in the class-room; and further, through this intercommunion the influence of

example operates with due force in stimulating them to intellectual exertions.

The length of time required at school for the education of the deaf and dumb must be determined by the capacities of the pupils, and perhaps even more by their position in life. Of course, they require a much longer time than hearing children to compensate for their deprivation. Still those who have to begin to earn their daily bread by the labour of their hands at about the age of fourteen (if of good capacity) leave the school with a store of varied and useful knowledge. They are able to understand directions given to them, to hold intercourse with others, to express their opinions on ordinary affairs—in short, they are raised from a wretched and forlorn condition to that of intelligent and moral beings, and as such their future progress will be proportional to their own diligence, and will be impeded by no obstacles except those which their own exertions are now competent to remove.

Occupations.—-Most of the deaf and dumb soon after leaving school are put to some trade, They will be found to be engaged in all kinds of employment except those to which hearing and speech are indispensable. The depriva- tion of hearing is no barrier to learning most trades, and the deaf and dumb acquire them with the same facility and show the same expertness as others. As a rule, they are very steady, and apply themselves with assiduity to their work; for while the attention of those who can hear is eften distracted in the workshop, they steadily keep to their task, as they well know that talking implies for them cessation from labour. There is at times a little difficulty to get employers for them, as they require more attention to be initiated into their trades.

The following extract trom an interesting work on the deaf and dumb by the Rev. T. Smith enumerates many of the trades in which they are engaged :—

‘* Deaf and dumb soldiers and policemen are not existent ; there is however a rifle volunteer, whose father being an old soldier drilled him well so that he is now able to join in general practice.

Amongst the males, besides various labouring employments, the trades of shoemaking’and tailoring predominate, but beyond these

1 In one sehool only, namely, Donaldson's Hospital in Edinburgh, are the deaf and dumb brought up together with hearing children, but even there it has never been thought practicable to instruet them in the same classroom. The benefit derived by the deaf and dumb from such a system is very slight in an educational point of view, but socially it is of great advantage, as it draws them out of that isolation to which they are naturally so prone, and fits them to hold free and ready intercourse with strangers in after life ; and besides, the associa- tion largely tends to spread the mode of deaf-mute eommunication throughout the country, as tke hearing ckildren learn to communi- cate freely with them. '

there is a diversity of occupation. We have bakers, blacksmiths, bookbinders, brassworkers, bricklayers, brickmakers, brusli- makers, cabinetmakers, carpenters, carvers on wood and stone, eigar-makers, compositors, coopers, cork-cutters, cutlers, en- gravers on wood and metals, French polishers, gardeners, gilders, glass writers and stainers, harness makers, saddlers, hatters, japanners, jewellers, law writers, optical and philosophical instrument makers, pattern designers, print and map colourers, printers both lithographie and letterpress, turners, typefounders, wateh-dial painters, wire drawers, &e. We also find artists—litho- graphic, photographic, heraldie—and some in the highest branches both in oil and water colours ; also a sculptor of great ability who produced a beautiful composition in competition for the Wellington memorial prize, who also once stood second for a gold medal, and who has most satisfactorily executed statuettes of Wellington, Peel, Raglan, Havelock, &c.* There are, besides, two heraldie painters, who have studios of their own, and are amongst the best of their art in London, with others who are rising in great proficiency. Two of the artists in oil, although but young and at present students, have executed pictures which have been accepted by the British Insti- tution, the Suffolk Academy, and in one instance by the Royal Academy. In more intelleetual occupations we find several gentle- men in the civil service, respecting one of whom, who has gained a superior position in his office, it has been remarked to us by some whose duties bring them into contact with him, 'that notwith- standing his affliction they can do business better with him than any other clerk in the establishment.'

There is a young gentleman making himself noted as an entomologist ; some are teachers of the deaf and dumb, oeeasionally even principals of institutions ; and the highest instance we know of is a barrister, not a pleader of course, but who is eminent as a conveyancer. In the employment of females there is not so much variety ; some are engaged in domestie work, others are artificial florists, bookfolders and sewers, brush- drawers, cigar makers, corset makers, dress, and mantle makers, fringe and tassel makers, laundresses, muslin workers, milliners, sewing machinists, straw bonnet makers, tailoresses, &e. We also know one who is a compositor, another a lady's maid, and a third who is employed in a telegraph office."

From this it will be seen that to the educated deaf mute nearly all trades are open, and the reports from their masters to the several institutions are generally most favourable. —

The census returns for 1871 give the following table of occupations of deaf and dumb in England and Wales and Scotland :—

Classes. meee Scotland.

PUP TONCSSLOMAisceacechssanacerscsceccorssesss 120 POW OINGS i Cterentarecavesscacescrcscesessnssses 376 | lemme ell paceascadccondececcnocedasecooe 118 ~ Agricultural……...0..0:.sccsssccsscescoese 728 POISTONSUMIAL srecerecsecccesescassncccecesensiss 2995 . Indefinite and non-productive…... 7181

SiG evencace

Institutions.—Most of the institutions for the deaf and dumb in England have originated in the benevolent in- terest of a few individuals of the localities in which they are established. They are supported by public an- nual subscriptions, donations, legacies, and fees of pupils for board and education. The principals are held re- sponsible for the educational department and for internal management, while the affairs of the institutions are directed by committees selected from the subscribers, Trades are taught to the boys in some of the schools, while all the pupils have to do some industrial work, and the girls are taught household work, sewing, and

knitting. The children are admitted either gratuitously or by payment of fees, varying in amount in the several institutions, some of which grant apprentice fees and otherwise assist the children on leaving school.

The London Asylum was the first public school in England for the gratuitous education of the indigent deaf and dumb. It was projected by the Rev. J. Townsend and Rev. H. Mason, rector of Bermondsey, London. On the 14th November 1792 the school was opened with four pupils

Among those who passed the recent Cambridge Local Examinations with honours in classies and mathematics was a deaf-mute lad under 16 years of age, named Farrar.

with Dr Watson as principal. Its existenee becoming more generally known, the number of candidates for admission increased so greatly beyond the means of accommodation that a larger and more commodious building was found to be absolutely necessary. An appeal for funds to erect such a building was made and liberally responded to, and an eligible plot of ground was taken in the Old Kent Road, London ; and on the 11th of July 1807 the late duke of Gloucester laid the foundation stone of the new building. Since its foundation 4094 children have been admitted. In 1862 a branch was started at Margate, and after twelve years' experience the committee of management were influenced to erect a permanent building for the accommodation of 150 children. It was formally opened by the Prince of Wales on the 19th of July 1876, with Mr R. Elliott as head master. The asylum, with the branch at Margate, is supported by voluntary contributions, legacies, donations, and dividends from stock. The average income is about £12,000 a year. There are at present 317 pupils in attendance, who come from all parts of the kingdom. The ages of admission are 84 to 114, and the children are elected by votes of the subscribers ; and, with a view to assist that class of the deaf and dumb whose friends are able to pay for their board, the committee receive children upon the payment of £25 per annum. Those children whose parents or guardians are unable to put them to some useful trade on leaving school are apprenticed by the charity. Since 1811 the number of children apprenticed has been 1515, and the total amount of premium £14,632, 16s.

Various institutions for similar objects have been formed on the Continent. The asylum for the deaf and dumb at Paris, which was formerly under the management of the Abbé Sicard, has for its object not only to enable the pupils to communicate their ideas and to form the under- standing, but also to qualify them to earn their subsistence. On quitting the asylum they are all capable of following a trade or profession. Their apprenticeship begins on their first entering the institution, and is terminated when their education is finished.

Institutions, formed more or less upon the model of that at Paris, have been established in Portugal, Spain, Italy, Switzerland, Baden, Wiirtemberg, Bavaria, Austria, Saxony, Hesse-Cassel, Nassau, Hanover, Brunswick, the Free Towns of Germany, Relgium, Holland, Denmark, Sweden, Russia, Poland, the United States of America, Canada, Mexico, and Bengal, to say nothing of those in Great Britain and France. The American annals of 1873 give us 35 Ameri- can institutions for the education of the deaf and dumb, containing a total of 4253 pupils—namely, 2393 males and 1860 females, 378 of whom are semi-mutes. The latter number includes all the deaf who have acquired language through the ear. In Canada there are 4 institutions with 292 pupils, of whom 220 are males and 72 females. Out of this number 17 are semi-mutes. The first institution for the education of deaf mutes in America was opened on the 15th April 1817. The circumstances which led to its establishment are as follows :—

A deaf-mute little girl in the family of Dr Cogswell, an eminent physician in Hartford city, attracting some atteution, it was soon afterwards found that there were other deaf mutes in the country. It was decided to send some one abroad to acquire the art of educating them ; and to establish a school for this purpose funds were raised, and the Rev. F. H. Gallaudet, D.D., was selected for this work. He left the United States, May 15, 1816, to execute this mission intrusted to him. The Institution was incorporated by

the Connecticut Legislature in May 1816, under the name of the Connecticut Asylum for the Education of the Deaf and Dumb.

Mr Gallaudet returned to America in August 22 of the same year, accompanied by Mr L. Clerc, a deaf-mute pupil of the Abbé Sicard. They

immediately commenced collecting funds to start the school. The enterprize excited general interest, and individuals and churches

contributed liberally. The sum of $12,000 was raised in the course of a few months, $5600 having been obtained in Massachusetts, above $2000 of which was collected in the city of Boston. After this school had been founded, the need of other schools was at once felt ; and the New York Institution was opencd in 1818, that in Pennsylvania in 1822, the one in Kentucky in 1823, Ohio school in 1829 ; and others followed till the number reached to 35, the last of which, a day school, was opencd at Cleveland, Ohio, in 1871.

In America, and in almost every country in Europe except Great Britain and Ireland, the state successfully undertakes the instruction of the deaf anddumb. All the institutions are munificently supported by large annual appropriations from the local legislatures, the state regarding it as a primary duty that the deaf and dumb, the blind, &c., shall not be excluded from those educational privileges accorded to every member of the community.

In a spirit of enlightened liberality, highly creditable to the United States, the Government of that country adopts the deaf and dumb as “ wards of the commonwealth,” and in the most generous manner acquits itself of its obligation towards them. The following facts have been taken from the official reports of some American institutions :—

The number of pupils in the Indiana Institution in the year 1870

was 186 ; for these the State had granted a sum of 50,000 dollars, which is equal to £10,400, or £56 per annum for each pupil A still further sum of 42,500 dollars, or nearly £9,000 sterling, was given for the erection of some additional buildings which the requirements of the Institution demanded. _ Every other State in the Union provides for its deaf-mute ward with similar gene- rosity. It is to be hoped that the day is not far distant when the deaf and dumb in Great Britain and Ireland may be congratulated on the inauguration by the legislature of a humane and beneficent policy on their behalf.

In many of the large towns where institutions are established, associations in aid of the deaf and dumb are springing up and carrying on most important and valuable work. ‘Their first business is to seek out neglected children and to get them placed in some special school. Situations are procured for those on leaving school whose parents are unable to do anything for them, and the education com- menced at the institutions is carried on by means of lectures ; and as little benefit is to be got by attending the ordi- nary church services, meetings are held on Sundays, when suitable religious exercises are performed, portions of Serip- ture explained, and an address given by spelling with the assistance of such signs as may be found necessary. The missionaries connected with these associations call upon them at their homes, in this way making themsclves familiar with their condition; the sick are visited and receive consolation ; and the distressed, infirm, and aged are assisted. These associations, while rendering assistance to the deserving, endeavour to make them help themselves, and help only at the point where otherwise they would be lost ; and it has been made a rule that when one loses his place through any fault of his own, he cannot claim the assistance of the association to find another for him. There seem to be few societies which have a greater claim on public sympathy; and that it deserves recognition is testified by the great good it is doing to this neglected and isolated class of persons, many of whom would otherwise have pro- bably acquired habits of idleness and intemperance.

In the English census returns for 1871 we find that only 529 deaf mutes, out of a total of 11,518, of whom 51 were imbeciles and 26 blind as well as deaf and dumib, were inmates of workhouses in England and Wales. ‘That small proportion affords evidence of the fact that by means of education the deaf and dumb may be transferred from the dependent and burdensome class into the self-supporting class of the community.

STATISTICS.

By the census of 1871, in Great Britain there are returned as

deaf and dumb 19,2386. ; Table I. shows the number of deaf and dumb persons in the

United Kingdom in 1871, with the proportion which they bear to the whole population.

Number of Total Poa . Deaf and itt (0) ae Dumb. Population. Population.

Me eee England and Wales …..-+.s0+ 11,518 22,712,266 1 in 1972 Se AGS oo scyuskosee 2,087 3,360,018 1 in 1610 Lreland….cscccsscsccscccssesceeccees 5,554 5,402,759 al in 975 Islands of the British Seas… 17 144,638 1 in 1879

Beas Scare 19,236 31,619,681 1 in 1644

The above, compared with the returns of the census of 1861, with an increase of population of 24 millions during that decennial period, will show an absolute decrease of 1075 deaf mutes, viz., 718 persons in England and Wales, 248 in Scotland, 99 in Ireland, and 10 in the islands of the British seas.

Number of Total

Proportion Deaf and Population. t

Census, 1861.

0

Population.

lin 1640 lin 1311 lin 1026 lin 1649

lin 1432

20,066,224 3,062,294 5,798,967

143,447

29,070,932

These figures afford an indication that causes are at work which are diminishing the extent of deaf-muteism in the country; such as direct sanitary improvements, general attention to the laws of health, and more skilful treatment of the diseases which result in deafness. Of the 11,518 deaf mutes in England and Wales in 1871 (including those described as dumb) 6262 are males and 5256 are females. In Scotland, out of the 2087 deaf mutes, 1133 are males and 954 females, of whom 1016 were ascer- tained to have been so from birth, while 1071 became so in after life from various causes. ‘The number of deaf and dumb persons in Treland is 5554, viz., in Leinster, 1818; Munster, 1590; Connaught, 882; and Ulster, 1764.

The instances of persons in the melancholy condition of being deaf and dumb and blind are more numerous than might be supposed; for the congenitally deaf are in a measure pre- disposed to the organic defect which results in blindness. No less than 111 persons were returned as deaf and dumb and blind ; of these 20 were in special asylums and 26 in workhouses. In 1861 only 80 persons were described as blind and deaf and dumb.

As dumbness can only co-exist with deafness from birth or from early life, the number of deaf and dumb, unlike that of the blind, does not increase with age, but is highest immediately after the age when the epidemic discases of children have been passed through.

Table II. shows concisely the locality, the date of establishment, and approximately the number of pupils in each of the institutions in Great Britain and Ireland.

: Date of No. of Locality. establishment.| Pupils.

ee BODO CCCEE LER Oc OCP CPECPERCE 1792 MAT @ALCNPIUANCH) (sc sccsccccssercesssescn ence 1862

ULMUNGTIG Verdeaneceteres:ctncacsasseanstsasasesss eAo SER ATNE TAT e ce con seis snanesecesetasassoncns 1812 WESIDCHONEGT: sce earecencscceecsceessssccssecac 1823

1825 1827 1829 1838 1840 1841 1542 1847 1862 1870

SCOTLAND. BAIDU Wah os eeecccce ects szsese sacsucceetece 1810 en Donaldson’s llosp oe 1850 GTM SOW, .3:0cccce neeeteee nee teres ae 1819 AWIOLEGE Ns ss. ssscccesceeen eee ce 1819 ADU GEresntecceacsertersrceeeteee eee 1846 IRELAND.

Dublin, Claremont…..... 1816 » Roman Catholic 1846 BG) GASHMicseesess

Table III. shows the number of deaf and dumb with their rela- tive proportion to the entire population in the different countries.

Date of Number of Enumera- Deaf and tion. Dumb.

Proportion

Countries. Population. | to population.

EUROPE. England and Wales.. 1871 11,518 22,712,266

1871 . 3,360,018

1871 d 5,402,759

1871 ; 41,058,196

1853 F 35,783,170

1835 3,885,507

183) d 2,500,000

185: 1,225,807 1835 1,065,825 1840 3,054,726 1834 8,675,327

1 in 1972 1 in 1610 lin 975 1 in 1677 1 in 1212 1 in 2226 lin 2000 1 in 1942 lin 977 lin 1528 lin 769

AMERICA. United States 1870 Nova Scotia 1871 New Brunswick 1871 City of Halifax…..... 1871 Prince Edward Isle.. 1861 Newfoundland 1861

1 in 2388 lin 879 lin 983 1 in 1095

80,857 1 in 1189 122,638 1 in 1022

38,558,000 8

DEAFNESS. See Ean. =

DEAK, Franz (1803-1876), an Hungarian statesman, was born on October 17, 1803, at Kehida, in the comitat of Szalad. He sprang from an old noble family, of which he was the last descendant. Having studied law at the academy of Raab, he practised as an advocate in Szalad, and soon became a prominent figure at the meetings of the comitat. He represented Szalad in the Diet which met at Presburg in 1832 and lasted till 1836. By his earnestness and practical sagacity he made so deep an im- pression that he was in a short time recognized as leader of the opposition. The object of his policy was, on the one hand, to resist the encroachinents of the central Government at Vienna on the rights of his country, and, on the other, to remove abuses which then made Hungary one of the most backward nations in Europe. He again sat for Szalad in the Diet of 1839-40, and by skilful management effected a tem- porary reconciliation between the Imperial Government and the Reform party, of which he was the head. He gave deep offence, however, by the vigour with which he denounced the exemption of Hungarian nobles from taxation, as well as other injurious survivals of the Middle Ages ; and when elected in 1843 he received such definite instructions from the constituency to vote in a reactionary sense that he declined to accept his seat. At a second election the Liberals exerted themselves so energetically that he was again appointed ; but, on the ground that violence had been used in connection with his candidature, he once more refused to enter the Diet. For some years he lived as a private citizen ; but he was everywhere regarded as the most influential Hungarian politician, and his party took no important step without consulting him. A project for a penal code which he drew up about this time was admitted in Germany, France, and England to be one of the most enlightened ever conceived. The excitement of 1843 caused the first symptoms of the disease

of the heart of which he ultimately died ; and during the rest of his life he always suffered more or less from ill health. On this account he could not enter the Diet of 1847; but next year, when revolutionary forces threatened to break up the empire, he was persuaded to take a seat vacated for him by one of the members for Szalad.

The emperor, alarmed by the dangers which surrounded him on every side, conceded in a number of measures, afterwards known as “ the laws of 1848,” every important demand Deak had ever made. The first independent Hungarian Cabinet, with Count Batthyanyi as president, was formed, and the ministry of justice was intrusted to Deak. In this office, during the few months he held it, he worked indefatigably ; and hé intended completely to reorganize legal administration. His plans, however, were

disturbed by the agitation of which Kossuth was the centre, and which aimed at changes of a more extreme character than heapproved. He desired to maintain the relations of Austria and Hungary, and exercised his whole influence in favour of a good understanding between the two countries. Events decided against him, for Kossutl rose to power and began the war in the course of which the Hapsburg dynasty was formally deposed. Dedk resigned his portfolio, and appeared in connection with the subsequent struggle only as one of the deputation which, on the approach of the Austrian army to Buda-Pesth, went to negotiate with Prince Windischgratz. When the war was over, Dedk was offered the post of Judex Curie; but he insisted that the laws of 1848 were still in force, and would have nothing to do with any system of government in which they were ignored. On the other hand, he discountenanced violent proposals, urging that the legal rights of the land could be secured only by legal means

Hungary suffered deeply from the reaction which followed the revolutionary period, and it was clear that she only awaited a favourable opportunity to throw off the imperial yoke. The disasters sustained by Austria in the Italian war of 1859 suggested to the emperor the necessity of a change of policy ; and the result was that in 1861 the Diet again met. This time Dedk appeared as member for Pesth, which henceforth returned him at every election till his death. The Moderate party rallied round him, and after

much discussion the address to the emperor drawn up by him was adopted. In this the Diet took its stand on the laws of 1848, and demanded the appointment of a Hungarian ministry ; but at Vienna they were not prepared to give way so far. The imperial rescript was very hostile in tone, and the Diet was speedily dissolved. In 1865 fresh negotiations were begun, and they were powerfully promoted by a series of letters in the Pests Vaplé, sctting forth Deak's ideas as to the proper bases of reconciliation. Towards the end of 1865 the Diet was opened by the emperor in person. About six months afterwards it was hastily closed because of the approaching war between Austria and Prussia ; but it reassembled on November 19, 1866, when Austria had been utterly defeated and seemed on the brink of ruin. The Radical party wished to take advantage of the general confusion by exacting terms to which the Austrian Government would uever before have consented; but De&k maintained his former position, desiring no more than that the system which he considered the only legal one should been forced. His influence over the Diet and the nation prevailed ; and he had the satis- faction of seeing Count Andrassy appointed president of an Hungarian cabinet and the emperor and empress crowned as king and queen of Hungary. The establishment of the dual system, which enabled the Austro-Hungarian monarchy to enter upon a new career after terrible humiliations and losses, was due to the efforts of De&k more than to any other cause, and the fact was gratefully acknowledged both by the mass of his countrymen and by the emperor.

For some years the Dedk party continued the most powerful in the Diet ; but the state of his health rendered it impossible for him to do much more than deliver an occasional speech on subjects of unusual interest. His last speech, in the summer of 1873, was on the relations of church and state ; and he proclaimed himself in favour of the American system—'"a free church in a free state." Before his death his party lost its hold over the nation ; and in 1875 Tisza, a man of more advanced opinions, was called to the head of the Government. Deak died on January 29, 1876, at Buda-Pesth, after a long and painful illness. His death was regarded as a national calamity, and he was buried at the cost of the state amid mani- festations of universal grief.

Hungary has produced no other statesman of equal distinction. He approached closely to the type which is supposed to be peculiarly English, holding fast vital principles, but always ready to accede to a compromise on matters of secondary moment. Intensely opposed to revolution, he was absolutcly fearless when sure that he was standing on lawful ground, and pursued the political ideal he had formed with a persistence which has been rarely equalled. In youth his style as an orator was passionate and florid ; but he ultimately became calm and deliberate, carrying conviction by command of facts, logical arrangement of ideas, and lucid statement. At all periods of his career he conveyed the impression of absolute sincerity and devotion to high and unselfish aims. He was of a genial disposition, remarkably fond of children, and with a gift of ready humour which made him as great a favourite in society as in parliament. (J. SI.)

DEAL, 2 municipal and parliamentary borough and market town of England, in the county of Kent, eight miles N.N.E. of Dover and five miles by rail 8.S.E. of Sandwich. It consists of three divisions :—Lower Deal, which is the most important, on the coast ; Middle Deal ; and, about a mile inland, Upper Deal. Though largely frequented as a sea-bathing place, the town derives its im- portance mainly from its vicinity to the Downs, a fine anchorage about eight miles long and six miles wide between the shore and the Goodwin Sands, in which large fleets of wind-bound vessels may lie in safety. The trade consequently consists largely in the supply of provisions and naval stores ; though boat-building and a few other indus- tries are carried on. The Deal pilots, limited by statute to the number of 56, are famous for their skill and daring. Among the public buildings in the town the most remark- able are St Leonard’s Church in Upper Deal, which dates from the Norman period ; the Baptist chapel in Lower Deal, founded by Captain Taverner, governor of Deal Castle, in 1663; the Deal and Walmer Institute, established in 1864 ; the military and naval hospital; and the barracks, which date from 1795. The site of the old navy yard is now occupied by villas; and the esplanade has been improved by the construction of a promenade pier. At the.south end of the town is Deal Castle, erected by Henry VIII. ; and about a mile to the east is Sandoun Castle, which owes its origin to the same monarch, and is of interest as the prison in which Colonel Hutchinson died in 1664. Walmer Castle, the official residence of the warden of the Cinque- Ports, is about a mile to the

south. It has become inti- mately associated with the memory of the duke of Welling- ton, who died within its walls in 1852. Deal was possibly the site of a Roman station, but it has not received any definite identification. In the 13th century it was regarded as a subordinate member of the Cinque-Port guild ; but even as late as the time of Henry VIII. it was still but a small village. Perkin Warbeck landed at this point in 1495. The castle was vainly besieged by the royalists in 1648 ; and in 1652 the Downs were the scene of Blake's victory over Van Tromp. Mrs Elizabeth Carter was @ native of Deal. The population of the borough, which unites with Sandwich and Walmer in sending one member to Parlia- ment, was, in 1871, 8009. The area is 1124 acres.

DEAN, Latin decanus, is derived from the Greek 8éka, ten ; and whether the term was first used among the secular clergy to signify the priest who had a charge of inspection and superintendence over ten parishes, or among the regular clergy to signify the monk who in a monastery had author- ity over ten other monks, appears doubtful. ‘‘ Decurius" may be found in early writers used to signify the same thing as " decanus," which shows that the word and the idea signified by it were originally borrowed from the old Roman military system.

The earliest mention which occurs of an " archipresbyter" seems to be in the 4th epistle of St Jerome to Rusticus, in which he says that a cathedral church should possess one bishop, one archipresbyter, and one archdeacon. Liberatus also (Breviar. c. xiv.) speaks of the office of archipresbyter in a manner which, as Bingham says, enables one to understand what the nature of his duties and position was. And he thinks that those are right who hold that the archipresbyters were the same as the deans of our cathedral churches. Stillingfleet (Zrenic. part ii. c. 7) says of the archipresbyters that "‘the memory of them is preserved still in cathedral churches, in the chapters there, where the dean was nothing else but the archipresbyter ; and both dean and prebendaries were to be assistant to the bishop in the regulating the church affairs belonging to the city, while the churches were contained therein." Bingham, however, following Liberatus, describes the office of the archipresbyter to have been next to that of the bishop, the head

of the presbyteral college, and the functions to have consisted in administering all matters pertaining to the church in the absence of the bishop. But this does not describe accurately the office of dean in an English cathedral church. The dean is indeed second to the bishop in rank and dignity, and he is the head of the presbyteral college or chapter; but his functions in no wise consist in administering any affairs in the absence of the bishop. There may be some matters connected with the ordering of the internal arrangements of our cathedral churches, respecting which it may be considered a doubtful point whether the authority of the bishop or that of the dean is supreme. But the consideration of any such question leads at once to the due theoretical distinction between the two. With regard to matters spiritual, properly and strictly so called, the bishop is supreme in the cathedral as far as—and no farther than—he is supreme in his diocese generally. With regard to matters material and temporal, as concerning the fabric of the cathedral, the arrangement and conduct of the services, and the management of the property of the chapter, &c., the dean (not excluding the due authority of the other members of the chapter, but speaking with reference to the bishop) is supreme. And the cases in which a doubt might arise on the point are those in which the material arrangements of the fabric or of the services may be thought to involve doctrinal con- siderations.

The Roman Catholic writers on the subject say that there are two sorts of deaus in the church—the deans of cathedral churches, and the rural deans—as has continued to be the case in the English Church. And the probability would seem to be that the former were the successors and representatives of the monastic decurions, the latter of the inspectors of “ten” parishes in the primitive secular church. It is thought by some that the rural dean is the lineal successor of the chorepiscopus, who in the early church was the assistant of the bishop, discharging most, if not all, episcopal functions in the rural districts of the diocese. But upon the whole the probability is otherwise. Beveridge, Cave, Bingham, and Basnage all hold that the chorepiscopt were true bishops, though Romanist theologians for the most part have maintained that they were simple priests. But if the chorepiscopus has any representative in the church of the present day, it seems more likely that the archdeacon is such rather than the dean.

The ordinary use of the term dean, as regards secular bodies of persons, would lead to the belief that the oldest member of a chapter had, as a matter of right, or at least of usage, become the dean thereof, But Bingham (lib. ii. ch. 18) very conclusively shows that such was at no time the case; as is also further indicated by the maxim to the effect that the dean must be selected from the body of the

chapter—‘ Unus de gremio tantum potest eligi et promovert ad decanatus dignitatem.” The duties of the dean in a Roman Catholic cathedral are to preside over the chapter, to declare the decisions to which the chapter may have in its debates arrived by plurality of voices, to exercise inspection over the choir, over the conduct of the capitular body, and over the discipline and regulations of the church ; and to celebrate divine service on occasion of the greater festivals of the church in the absence, or inability, of the bishop. With the exception of the last clause the same statement may be made as to the duties and functious of the deans of our cathedral churches.

Deans had also a place in the judicial system of the Lombard kings in the 8th, 9th, and 10th centuries. But the office indicated by that term, so used, seems to have been a very subordinate one ; and the name was in all probability adopted with immediate reference to the etymological meaning of the word,—a person having authority over ten (in this case apparently) families. Muratori, in his /talzan Antiquities, speaks of the resemblance between the saltarw or sylvani and the decant, and shows that the former had authority in the rural districts, and the latter in towns, or at least in places where the population was sufficiently close for them to have authority over ten families. Never- theless, a document cited by Muratori from the archives of the canons of Modena, and dated in the year 813, recites the names of several “deaneries” (decania), and thus shows that the authority of the dean extended over a certain circumscription of territory.

In the case of the “dean of the sacred college,” the connection between the application of the term and the etymology of it is not so evident as in the foregoing instances of its use ; nor is it by any mcans clear how and when the idea of seniority was first attached to the word. This office is held by the oldest cardinal— 2.¢., he who has been longest in the enjoyment of the purple, not he who is oldest in years—who is usually, but not necessarily or

always, the bishop of Ostia and Velletri. Perhaps the use of the word “dean,” as signify- ing simply the eldest member of any corporation or body of men, may have been first adopted from its applica- tion to that high dignitary. The dean of the sacred college is in the ecclesiastical hierarchy second to the Pope alone. His privileges and special functions are very many ; a compendious account of the principal of them may be found in the work of Moroni, vol. xix. p. 168.

There are four sorts of deans of whom the law of England takes notice. 1. The dean and chapter are a council suberdinate to the bishop, assistant to him in matters spiritual relating to religion, and in matters temporal relat- ing to the temporalities of the bishopric. The dean and chapter are a corporation, and the dean himself is a cor- poration sole. Deansare said to be either of the old or of the new foundation—the latter being those created and regulated after the dissolution of the monasteries by Henry VIII The deans of the old foundation before 3 and 4 Vict. c. 113 were clected by the chapter on the king’s congé @élire ; and the deans of the new foundation (and, since the Act, of the old foundation also) are appointed by the king’s letters patent. It was at one time held that a lay- man might be dean ; but by 13 and 14 Charles IT. c. 4, priest’s orders are a necessary qualification. Deaneries are sinecures in the old sense, z.¢., they are without cure of souls. The chapter formerly consisted of canons and pre- bendaries, the dean being the head and an integral part of the corporation. By 3 and 4 Vict. c. 113, it is enacted that “ all the members of the chapter except the dean, in every collegiate and cathedral church in England, and in the cathedral churches of St David and Llandaff, shall be styled canons.” By the same Act the dean is required to

be in residence eight months, and the canons three months, in every year. The bishop is visitor of the dean and chapter. 2. The dean of peculiars ‘‘ hath no chapter, yet is presentative, and hath cure of souls; he hath a peculiar, and is not subject to the visitation of the bishop.” 3. The third dean “hath no cure of souls, but hath a court and a peculiar, in which he holdeth plea and jurisdiction of all such ecclesiastical matters as come within his peculiar. Such is the Dean of the Arches, who is the judge of the court of

the arches, the chief court and consistory of the archbishop of Canterbury, so called of Bow Church, where this court was ever wont to be held.” The parish of Bow and twelve others are within the peculiar jurisdiction of the archbishop in spiritual causes, and exempted out of the bishop of London’s jurisdiction. 4. Rural deans are clergymen whose duty is described as being ‘ to execute the bishop’s processes and to inspect the lives and manners of the clergy and people within their jurisdiction” (see Phillimore’s Heclestastical Law).

In the colleges of the English universities one of the fel- lows usually holds the office of “dean,” and is specially charged with the discipline, as distinguished from the teaching functions of the tutors.

DEBENTURE, a deed by which certain property is charged with the repayment of money lent at a fixed inte- rest. It is commonly adopted by companies of a public nature as a means of raising money for carrying on their undertakings. The creation of debenture stock in such com- panies is regulated in England by the Companies Clauses Act, 1868, part iii, which makes debenture stock a prior charge on the undertaking, and gives the interest thereon priority of payment over all dividends or interest on any shares or stock of the company, whether ordinary or preference or guaranteed. Payment of arrears may be enforced by appointment of a receiver, or (in Scotland) of a judicial factor.

DEBRECZYN, or Desrerzn, a royal free city of Hungary, the chief town of the comitat of Bihar, and one of the largest in the kingdom, is situated in the midst of a slightly elevated sandy plain 114 miles east of Pestn, with which it is connected by rail. It is a meanly-built, straggling town, with irregular suburbs stretching out into the plain; its wide roadways are only paved with wood down the centre and along the sides; its houses are with few exceptions only one story high, and the courtyards or gardens with which they are usually furnished give the whole place the appearance of an overgrown village, in spite of the number of its public buildings. The most prominent of these is the principal Protestant church, which ranks as the largest in the country, but has no great architectural pretensions. In its immediate neighbourhood is the Protestant Collegium, a large and flourishing institu- tion founded in 1792, and possessed of an extensive

library. The town-house, the Franciscan church, the Piarist monastery and college, and the theatre are worthy of mention ; there are also hospitals, two gymnasiums, and an agricultural academy. The industries of the town are pretty various, but none of them are of importance enough to give it the character of a manufacturing centre. Its tobacco-pipes, of the genuine national style, its sausages, and its soap are widely known ; and the first of the three are imported to England and France. Flour and beet-root sugar are also manufactured. Every three months the neighbouring plain is covered with the booths and bustle of a great fair; but since the opening of the railway there is hardly so extensive a concourse as before. Between 300 and 400 square miles of territory belong to the municipality, which derives a large annual revenue from the woods, pas- tures, &c. The inhabitants are, with very few exceptions, of Magyar origin and Calvinistic creed, and are in bad

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repute for their alleged selfishness and inhospitality. The town is of considerable antiquity, but owes its develop- ment to the refugees who flocked from the villages plundered by the Turks in the 15th century. In 1552 it adopted the Protestant faith, and it had to suffer in consequence, especially when it was captured in 1686 by the imperial forces. In 1693 it was made a royal free city. In 1848-9 it formed a refuge for the National Government and Legislature when Buda-Pesth fell into the hands of the Austrians; and it was in the great Calvinist church that Kossuth read the proclamation that declared the house of Hapsburg to have forfeited the crown of Stephen. On the 3d of July the town was captured by the Russians. Population in 1869, 46,111.

DEBT is a sum certain due by one person to another. It may be created by contract, by statute, or by judgment. By the Judicature Act, 1873, any absolute assignment of any debt or other legal chose in action, of which express notice in writing shall have been given to the debtor, trustee, or other person from whom the assignor would have been entitled to receive or claim such debt, shall be effectual in law. If the debtor receives notice that such assignment is disputed by the assignor, or any one claiming under liim, he may call upon the parties to interplead con- cerning the same, or he may

pay the money into court in conformity with the Acts for the Relief of Trustees. Order xlv. of the Rules of Court under the same Act contains the provisions under which the debts due to a person against whom a judgment has passed for the payment of money may be attached by the judgment creditor. See BANKRUPTCY.

DECALOGUE (in patristic Greek, 1 Sexdédoyos, se., BiBdos or vopobeoia) is another name for the ten com- mandments, in Hebrew the ten words(Deut. iv. 13,x. 4; Exod. xxxiv. 28), written on the two tables of stone, the so- called tables of the revelation (KE. V., tables of testimony—Ex. xxxiv. 29, comp. ch. xxv. 21), or tables of the covenant (Deut. ix. 9). In Deuteronomy the inscription on these tables, which is briefly called the covenant (iv. 13), is expressly identified with the words spoken by Jehovah out of the midst of the fire at Mount Sinai in the ears cf the whole people on the "day of the assembly," and rehearsed in ch, v. 6-21. In the narrative of Exodus the relation of the "ten words" of ch. xxxiv. to the words spoken from Sinai, ch, xx. 2-17, is not so clearly indicated—a circumstance which has given rise to speculations as to the possible existence of a second decalogue. Before entering on this question, however, we must examine the decalogue as usually understood and embodied in the parallel passages in Exod. xx. and Deut. v.

1. The variations in the parallel teats, so far as they are important for the criticism of the decalogue, are mainly two. (a) The reason assigned for the institution of the Sabbath in Exodus is drawn from the creation,'and agrees with Gen. ii. 3. In Deuteronomy the command is based on the duty of humanity to servants and the memory of Egyptian bondage. (5) In the tenth commandment, as given in Exodus, "house" means house and household, including all the particulars which are enumerated in ver. 17. In Deuteronomy, "Thou shalt not covet thy neighi- bour's wife" comes first, and "house " following in associa- tion with field is to be taken in the literal restricted sense.

2. The construction of the Hebrew text of the second commandment is disputed, but the most natural sense seems to be, "Thou shalt not make unto thee a graven image ; [and] to no visible shape in heaven, &c., shalt thou

bow down, &c.” The third commandment might be better rendered, “Thou shalt not utter the name of the Lord thy God vainly.”

3. Divisions of the Decalogue.—The division current in

Ingland and Scotland, and generally amoug the Reformed (Calvinistic) churches and in the Greek Church, is known as the Philonic division (Philo de Decalogo, § 12). It is sometimes called by the name of Origen, who adopts 1t mm his Homilies on Exodus, On this scheme the. preface, Exod. xx. 2, has been usually taken as part of the first commandment. The Church of Rome and the Lutherans adopt the Augustinian division (Aug., Quest. super Exod., lxxi.), combining into one the first and second commandments of Philo, and splitting his teuth commandment into two. To gain a clear distinction between the ninth and tenth commandments on this scheme it has usually been felt to be necessary to follow the Deuteronomic text, and make the ninth commandment, Thou shalt not covet they neighbour’s wife. As scarcely any scholar will now claim priority for the text of Deuteronomy, this division may be viewed as exploded. But there is a third scheme (the Talmudic) still current among the Jews, and not unknown to early Christian writers, which is still a rival of the Philonic view. The preface, Exod. xx. 2, is taken as the first word, aud the second embraces verses 3-6. Among recent Christian writers who have adopted this view are Knobel (in his Com. on Haxodus) and Kuenen (Godsdienst van Israél, i. 278 f.). The decision between Philo and the Talmud must turn on two questions. Can we take the preface as a scparate word? And can we regard the pro- hibition of polytheism and the prohibition of idolatry as one commandment? Now, though the Hebrew certainly speaks of ten “words,” not of ten “ precepts,” it is most unlikely that the first word can be different in character from those that follow. But the statement “Iam the Lord thy God,” is either no precept at all, or only enjoins by implication what is expressly commanded in the words “Thou shalt have no other gods before me.” Thus to take the preface as a distinct word is not reasonable unless there are cogent grounds for uniting the commandments against polytheism and idolatry. But that is far from being the case. The first precept of the Philonic scheme enjoins monolatry, the second expresses God’s spiritual

and transcendental nature. Accordingly Kuenen does not deny that the prohibition of images contains an element additional to the precept of monolatry, but, following De Goeje, regards the words from “thou shalt not make unto thyself” down to “ the waters under the earth ” as a later insertion in the original decalogue. Unless this can be made out—of which below —the Philonic scheme is clearly best, and as such it is now accepted by most scholars.

How were the ten words disposed on the two tables? The natural arrangement (which is assumed by Philo and Josephus) would be five and five. And this, as Philo recognized, is a division appropriate to the sense of the precepts; for antiquity did not look on piety towards parents as a mere precept of probity, part of one’s duty towards one’s neighbour. The authority of parents and rulers is viewed in the Old Testament as a delegated divine authority, and the violation of it is akin to blasphemy (comp. Ex. xxi. 17, Lev. xx. 9, with Lev. xxiv. 15, 16, and note the formula of treason, 1 Kings xxi. 13).

We have thus five precepts of piety on the first table, and five of probity on the second, an arrangement which is accepted by the best recent writers. But the current view of the Western Church since Augustine has been that the precept to honour parents heads the second table. The only argument of weight in favour of this view is that it makes the amount of writing on the two tables less

1 So, for example, Augustine, J. c. Th :

5 » &¢ Lhomas, Summa (Prima Secunde. qu. ¢. art. 4), and recently Sonntag and Kurtz. nea anit is the idea of Lutheran writers (Gerhard, Loc. xiii. § 46) that the ninth com- mandment forbids concupiscentia actualis, the tenth conc. originalis.

the first was written on both sides (Ex. xxxii. 15). But we shall presently see that there may be another way out of this difficulty.

4. Critical questions—That the decalogue not only con- tains Mosaic ideas, but is as old as Moses in its form as a system of “ ten words,” is admitted by critics of almost every school.? But it is much disputed what the original

compass of the decalogue was. Did the whole text of Exod. xx. 2-17 stand on the tables of stone? The answer to this question must start from the reason annexed to the fourth commandment, which is different in Deuteronomy. But the express words “and he added no more,” in Deut. v. 22, show that there is no conscious omission by the Deuteronomic speaker of part of the original decaloguc, which cannot therefore have included the reason annexed in Exodus. On the other hand the reason annexed in Deuteronomy is rather a parenetic addition than an original element dropped in Exodus. Thus the original fourth commandment was simply “Remember the Sabbath day to keep it holy.”® When this is granted it must appear not improbable that the elucidations of other commandments may not have stood on the tables. Thus in the second commandment, “ Thou shalt not bow down to any visible form,” &c., is a sort of explanatory addition to the precept “Thou shalt not make unto thee a graven image.” And so the promise attached to the fifth commandment was probably not on the tables, and the tenth commandment may have simply been, “Thou shalt not covet thy neighbour’s house,” which includes all that is expressed in the following clauses. Such a view gets over the difficulty arising from the unequal length of the two halves of the decalogue. The elucidations (unless in the case of the fourth command- ment) may very well be as old as Moses (comp. Ewald, Geschichte, ii. 229). It is quite another question whether there is any idea in the decalogue which cannot be as old as Moses. It is urged by many critics that Moses cannot have prohibited the worship of Jehovah by images ; for the subsequent history shows us a descendant of Moses as priest in the idolatrous sanctuary of Dan. There were tera- phim in David’s house, and the worship of Jehovah under the image of a calf was the state religion of the kingdom of Ephraim. It is argued from these facts that image worship went on unchallenged, and that this would not have been possible had Moses forbidden it. This argument does not appear to have all the force that Kuenen and others attach to it, for it must be remembered how large a section of Christendom, in times much more advanced than those of the Old Testament, has accepted the decalogue and yet has worshipped images. And on the other side we have the much more cogent arguments that the number of ten words, which no one doubts to be primitive, cannot be naturally made out if the law against images is dropped, and that the existence of this law is necessary to explain the fact that the unquestionably Mosaic sanctuary of the ark, which is just the

sanctuary of the revelation of the ten words, embodies the principle of the worship of Jehovah without images in a distinct and practical form. It may be added that the prohibition of images of hewn stone, which is the primitive sense of the word “ graven-image,” can hardly be less ancient than the conception that the stones of an altar were defiled by the touch of the chisel (Exod. xx. 24). And this is a conception which cannot be viewed as a later refinement on Mosaic ideas.

5. The Decalogue of Exodus xaxiv.—In the book of Exodus the words written on the tables of stone are no- where expressly identified with the ten commandments of

2 Exceptions to this consensus are Vatke (Biblische Theologie, p. 202) and Noldeke (Untersuchungen, p. 51).

3 It is generally assumed that the addition in Exodus is from the hand that wrote Gen i.-ii. 4. =>

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chap. xx. In xxv. 16, xxxi. 18, xxxii, 15, we simply read of “the revelation ” inscribed on the tables, and it seems to be assumed that the contents of this revelation must be already known to the reader. The expression “ten words” first occurs in xxxiv. 28, in a passage which relates the restoration of the tables after they had been broken. But these “ten words ” are called “ the words of the covenant,” and so can hardly be different from the words mentioned in the preceding verse as those in accord- ance wherewith the covenant was made with Israel. And again, the words of verse 27 are necessarily the command- ments which immediately precede in verses 12-26. Accord- ingly many recent critics, following Hitzig,” who seems to have formed his view without reference to a previous suggestion of Goethe’s, have sought to show that Exod. xxxiv. 12-26 contains just ten precepts forming a second decalogue. In point of detail it is disputed whether the narrator of Exod. xxxiv. regards this decalogue as precisely identical with that which stood on the first tables (which seems to follow from xxxiv. 1) or as a modification of the original words (so Ewald). It does not seem possible to deny the connection of verses 27, 28 with one another and with the previous context as the text now stands. Hengs- tenberg

(Beitriige, ii. 387 #.) and Bertheau (Sieben Gruppen Mosaischer Gesetze, p. 97) seek to distinguish the words of verse 28, as written by God himself, from those which, in verse 27, Moses is commanded to write. But no such dis- tinction lies in the text, and it is not probable that the narrator felt any contradiction between God's promise to write the words in verse 1 and the use of human instrumen- tality as implied in verse 28. On the other hand, the hypothesis of a second decalogue has serious if not insuper- able difficulties. The number of ten precepts in Exod. xxxiv. is by no means clearly made out, and the individual precepts are variously assigned by different critics; while the most recent supporter of the theory admits tliat the original number of ten is now concealed by additions.? his supposed decalogue contains uo precepts of social morality, but forms a sort of unsystematic abstract of the oldest laws about points of religious observance. If such w system of precepts was ever viewed as tlie basis of the covenant with Israel, it must belong to a far earlier stage of religious development than that of Exod. xx. This is recognized by Wellhausen, who says that our decalogue stands to that of Exod. xxxiv. as Amos stood to his con- temporarics, whose whole religion lay in the observance of sacred feasts. But the idea that the ethical teaching of the prophets had no basis in the original document of the Mosaic covenant is so revolutionary that few will venture to accept " Goethe's decalogue" with such inferences. The difficulty is presumably due to the interweaving of several distinct narratives, which perplexes the sequence of many parts of Exodus. It is more probable that xxxiv. 10-27— a summary of the religious precepts of the Mosaic conve- nant—originally stood in a different connection than that there ever were two opinions as to what stood on the tables.

6. The Decalogue in Christian Theology.—Following the New Testament, in which the " commandments " summed up in the law of love are identified with the pre- cepts of the decalogue (Mark x. 19; Rom. mi Us of. Mark xii. 28 f.), the ancient church emphasized the permanent obligation of the ten commandments as a sum- mary of xatwral in contradistinction to ceremonial precepts, though the observance of the Sabbath was to be taken in a spiritual sense (Augustine, De Spiritu et Litera, X1v. ; Jerome, De Celebratione Pasche). The medieval theo- logians followed in the same line, recognizing all the pre-

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1 Ostern und Pfingsten im zweiten Dekalog, Heidelberg, 1838. 2 Wellhansen in Jahrod. f. D. Theol., 1876, p. 554.

cepts of the decalogue as moral precepts de lege nature, though the law of the Sabbath is not of the law of nature, in so far as it prescribes a determinate day of rest (Thomas, Summa, I™* II, qu. c. art. 3; Duns, Super Sententias, lib. iii. dist. 37). The most important medieval exposition of the decalogue is that of Nicolaus de Lyra ; and the 15th century, in which the decalogue acquired special importance in the confessional, was prolific in treatises on the subject (Antoninus of Florence, Gerson, &c.).

Important theological controversies on the decalogue begin with the Reformation. The question between the Lutheran (Augustinian) and Reformed (Philonic) division of the ten commandments was mixed up with controversy as to the legitimacy of sacred images not designed to be worshipped. ‘The Reformed theologians took the stricter view. The identity of the decalogue with the eternal law of nature was maintained in both churches, but it was an open question whether the decalogue, as such (that is, as a law given by Moses to the Israclites), is of perpetual obligation. The Socinians, on the other hand, regarded the decalogue as abrogated by the more perfect law of Christ ; and this view, especially in the shape that the decalogue is acivil and not amoral law (J.D. Michaelis), was the current one in the period of rationalism in last century. The distinction of a permanent and a transitory element in the law of the Sabbath is found, not only in Luther and Melanchthon, but in Calvin and other theologians of the Reformed church. The main controversy which arose on the basis of this distinction was whether the prescription of one day in seven is of permanent obligation. It was admitted that such obligation must be not natural but positive ; but it was argued by the stricter Calvinistic divines that the proportion of one in seven is agreeable to nature, based on the order of creation in six days, and in no way specially connected with anything Jewish. Hence it was regarded as a wniversal positive law of God. But those who maintained the opposite view were not ex- cluded from the number of the orthodox. The ldxer con- ception found a place in the Cocceian school.

Literature.—Geffeken, Ueber die verschiedenen Eintheilungen des Dekalog's wnd den Einflussderselben auf den Cultus; Ewald's History of Israel, vol. ii.; Schultz's and especially Oehler's Old Testament Theology ; Oehler's article " Dekalog" in Herzog's Eneyelopidie ; commentaries on Exodus, especially that of Knobel in German, and. in English of Kalisch ; Kuenen's Godsdienst van Isracl, Hfdst. v. Kurtz, Gesehiehte des Alten Bundes, Bd. ii. ; other literature cited by Oehler and by Koehler, Biblisehe Gesehiehte, i. 287. For guidance in the theological controversies about the Decalogue the student may consult Walch and Baumgarten. (W. R. 8.)

DECAMPS, ALEXANDRE GaBriEL (1803-1860), one of the foremost painters of the modern French school, was born in Paris on the 3d March 1803. He received his artistic training from Abel de Pujol, but set himself free at an early period of his career from academic trammels. He asserted his originality in his choice of subjects as well as in his style of treatment. In his youth he travelled in the East, aud reproduced Oriental life and scenery with a bold fidelity to nature that made his works the puzzle of conventional critics. His powers, however, soon came to be recognized, and he was ranked along with Delacroix aud Vernet as one of the leaders of the Frenchschool. At the Paris Exhibition of 1855 he received the grand or council medal. Most of his life was passed in the neigh- bourhood of Paris. He was passionately fond of animals, especially dogs, and indulged in all kinds of field sports. He died on the 22d August 1860 in consequence of being thrown from a Vicious horse while hunting at Fontainebleau. The style of Decamps was characteristically and intensely French. It was marked by vivid dramatic conception, by a manipulation bold and rapid, sometimes even to rough- ness, and especially by original and startling use of

decided contrasts of colour and of light and shade. His subjects embraced an unusually wide range. He availed himself of his travels in the East in dealing with scenes from scripture history, which he was probably the first of European painters to represent with their true and natural local background. Of this class were his Joseph sold by his Brethren, Moses

taken from the Nile, and his scenes from the life of Samson, nine vigorous sketches in charcoal and white. Perhaps the most impressive of his historical pictures is his Defeat of the Cimbri, representing with wonderful skill the conflict between a horde of barbarians and a disciplined army. Decamps produced a number of genre pictures, chiefly of scenes from French and Algerine domestic life, the most marked feature of which is humour. he same characteristic attaches to most of his numerous animal paintings. He painted dogs, horses, &c., with great fidelity and sympathy; but his favourite subject was monkeys, which he depicted in various studies and sketches with a grotesque humour that could scarcely be surpassed. Probably the best known of all his works is The Monkey Connoisseurs, a clever satire of the jury of the French Academy of Painting, which had rejected several of his earlier works on account of their divergence from any known standard. The pictures and sketches of Decamps were first made familiar to the English public through the lithographs of Eugéne la Roux. See Moreau's Decamps son uvre (Paris, 1869).

DE CANDOLLE, Aveustin Pyramus (1778-1841), a celebrated botanist, was born at Geneva, February 4, 1778. He was descended from one of the most ancient families of Provence, and his ancestors had been expatriated for their religion in the middle of the 16th century. His father was famous printer, and syndic of the university and republic. Though a weakly boy he showed great aptitude for study, and distinguished himself at school by his rapid attain- ments in classical and general literature, and specially by a faculty for writing elegant verse, which led Florian to antici- pate that he might become famous as a poet. He showed remarkable powers of memory, which proved of the greatest service to him in the science to which he ultimately devoted himself. His interest in plants was first roused while he was residing with his mother at a remote country village during the siege of Geneva in 1792. He began his scientific studies at the college of Geneva, by attending the courses of Saussure and Vaucher, the latter of whom first inspired him with the determination to make botanical science the chief pursuit of his life. In 1796 he removed to Paris, where he resided with Dolomieu, attended various courses of lectures on natural science, and gained the friendship of Jussieu and Desfontaines. His first productions, Historia Plantarum Succulentarum (4 vols., 1799) and Astragalogia (1802), introduced him to the notice of Cuvier (whose chair in the Collége de

France he supplied in 1802), Humboldt, Biot, and Lamarck, who afterwards confided to him the publication of the third edition of the Mlore Francaise (1803-15). The introduction to this work contained the first exposition of his principle of classification according to the natural as opposed to the Linnean or artificial method. Having been elected (1804) doctor of medicine by the inedical faculty of Paris, he wrote, as an inaugural work, the Mssat sur les propriétés médicinales des plantes com- parées avec leurs formes extérieures et leur classification naturelle, and soon after, in 1806, his Synopsis plantarum in flora Gallica descriptarum. At the desire of the French Government he spent the summers of the following six years in making a botanical and agricultural survey of the whole kingdom, the results of which he published in 1813. In 1807 he was appointed professor of botany in the medical faculty of the university of Montpellier, and in

botany of the faculty of sciences in the same university, He was an admirable lecturer, and the gardens under his charge were much improved during his occupancy of the chair. From Montpellier he removed to Geneva in 1816, having been invited by the now independent republic to fill the newly created chair of natural history. The rest of his life was spent in an attempt to elaborate and complete his “natural” system of botanical classification. The results of his labours in this department are to be found in his Regni vegetabilis systema naturale, of which two volumes only were completed (1821) when he found that it would be impossible for him to execute the whole work on so extensive a scale. He accordingly commenced in 1824 a less extensive work in the same direction—his Prodromus systematis regni vegetabilis,—but even of this he was able to finish only seven volumes, or two-thirds of the whole. It was carried on after his death by his son Alphonse, who in 1834 had succeeded him in his professor- ship. He had been for several years in delicate health when he died on the 9th September 1841 at Turin, whither he had gone to attend a scientific reunion. De Candolle received diplomas or the honour of membership from most of the learned societies of Europe, and was a very frequent contributor to their Transactions. Louis Philippe decorated him with the cross of the Legion of Honour. He was highly esteemed in his native city, where he was for a long period rector of the academy and a

member of the legislature. For an estimate of his place as a botanist see BoTANy, vol, iv. p. 80. :

See Flourens's Hloge de Candolle (1842), and Ne la Rive's Candolle, sa Vie et ses Travawse (1851).

DECAPOLIS, a district of Palestine, or perhaps rather a confederation of districts, situated, with the exception of a small portion, on the eastern side of the Upper Jordan and the Sea of 'liberias. Its boundaries are not accurately known, and probably were never precisely defined. It evidently takes its name from the fact that it included ten cities (Séca wdAcs), but the ancient geographers do not agree as to which these ten cities were. This difference of statement may be explained by the supposition that, like the Cinque Ports of England, Decapolis preserved its original designation after new members were received into the confederation, and perhaps some of the old members had lost their connection. Pliny recognizes the uncertainty, but gives the following list :—Damascus, Philadelphia, Raphana, Scythopolis (on the west side of the Jordan), Gadara, Hippo, Dion, Pella, Galasa (Gerasa), and Canatha. Damascus is the only one that retains its importance ; Scythopolis, or Beth-Shean, which seems to have been anciently the uext in size, is represented by the village of Beisan ; and Gerasa, Canatha or Kenath, and Pella are of interest only for their ruins. Decapolis was placed by the Romans under the jurisdiction of the Syrian governor, and seems to have enjoyed special privileges. Regarding the rise and decay of the confederation we have no precise information, but it was at the height of its prosperity in the time of Christ.

DECATUR, a flourishing city of the United States, capital of Macon county, Illinois, situated in the midst of a rich agricultural district to the right of the Sangamon river, at a railway junction about 38 miles east of Spring- field. It is well built, and has 15 churches and 24 public schools ; but none of its edifices are individually remarkable. Among its industrial establishments is a large rolling mill. Population in 1870, 7161.

DECCAN (Daxsutn, the Country of the South), in India, includes, according to Hindu geographers, the whole of the territories situated to the south of the Nerbudda. In its more modern acceptation, however,

1810 he was transferred to the newly founded chair of | it is sometimes understvod as comprising only the

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country lying between that river and the Krishna, the latter having for a long period formed the southern boundary of the Mahometan empire of Delhi. Assign- ing it the more extended of these limits, it compre- hends the whole of the Indian peninsula, and in this view the mountainous system, consisting of the Eastern and Western Ghats, constitutes the most striking feature of the Deccan. These two mountain ranges unite at their northern extremities with the Vindhya chain of mountains, and thus is formed a vast triangle supporting at a consider- able elevation the expanse of table-land which stretches from Cape Comorin to the valley of the Nerbudda. The surface. of this table-land slopes from west to east as indicated by the direction of the drainage of the country,— the great rivers the Cauvery, Godavery, Krishna, and Pennaur, though deriving their sources from the base of the Western Ghats, all finding their way into the Bay of Bengal through fissures in the Eastern Ghats.

In early times this country embraced that possessed by the five Hindu princes of Telingana, Maharashta, the Tamul country, Orissa, and Carnata or Bijayanagar. It was first invaded by the Mahometans in 1294, who stormed Deogiri, the capital of Maharashta, and abandoned the city to pillage. In the year 1325 the Mahometans made further progress in its conquest ; and having extirpated the Hindu dynasties, they annexed the provinces as far south as the Krishna to the empire of Delhi. The imperial sway was, however, of brief duration. Telingana and Carnata speedily reverted to their former masters ; and this defection on the part of the Hindu states was followed by a general revolt, resulting in the establishment in 1347 of the independent Mahometan dynasty of Bahmani, and the consequent with- drawal of the power of Delhi from the territory south of the Nerbudda. In the struggles which ensued, the Hindu kingdom of Telingana fell to the Mussulmans, who at a later period formed a league against the remaining Hindu prince, and at the battle of Talikota in 1565 destroyed the monarchy of Bijayanagar or Carnata. On the dissolution of the Bahmani empire, its dominions were distributed into the five Mahometan states of Golconda,

Bijapur, Ahmed- nagar, Beder, and Berar. Of these the larger succeeded in subverting those of less importance ; and in 1630, during the reign of Shah Jahan of Delhi, the greater proportion of the Deccan had been absorbed by the kingdoms of Golconda, Ahmednagar, and Bijapur. During the reign of Aurungzebe (in the latter half of the 17th century) all those states were reduced, and the Deccan was again annexed to the empire of Delhi. Inthe subsequent reigns, when the great empire of Aurungzebe fell into decay, the Nizam threw off his alliegiance and fixed his court at Hyderabad. At the same time the Mahrattas, emerging from obscurity, established a powerful monarchy, which was usurped by the Peshwa. The remainder of the imperial possessions in the peninsula were held by chieftains acknowledging the supremacy of one or other of these two potentates. In the sequel, Mysore became the prize of the Mahometan usurper Hyder Ali. During the contests for power which ensued about the middle of the last century between the native chiefs, the French and the English took opposite sides. After a brief course of triumph, the interests of France declined, and a new empire in India was established by the British. Mysore formed one of their earliest conquests in the Deccan. Tanjore and the Carnatic were shortly after annexed to their dominions. In 1818 the forfeited possessions of the Peshwa added to their extent ; and these acquisitions, with others which have more recently fallen to the paramount power by cession, conquest, or failure of heirs, form a continuous territory stretching from the Nerbudda to Cape Comorin. Its length is upwards of 1000 miles, and its

extreme breadth exceeds 800. This vast tract comprehends the chief provinces now distributed between the presidencies of Madras and Bombay, together with the native states of Hyderabad and Mysore, and those of Koldpur, Sawant- wari, Travancore, Cochin, and the petty possessions of France and Portugal.

DECEMBER, the last month of the year. In the Roman calendar, traditionally ascribed to Romulus, the year was divided into ten months, the last of which was called December, or the tenth month, and this name, though etymologically incorrect, was retained for the last or twelfth month of the year as now divided. In the Romulian calendar December had thirty

days; Numa reduced the number to twenty-nine; Julius Cassar added two days to this, giving the month its present length. The Saturnalia occurred in December, which is therefore styled “ acceptus geniis” by Ovid (Masti, iii. 58) ; and this also explains the phrase of Horace “ libertate Decembri utere” (Sat. ii. 7). Martial applies to the month the epithet canus (hoary), and Ovid styles it geledus (frosty) and ° fumosus (smoky). The Saxons called it winter-monat, or winter month, and heligh-monat, or holy month, from the – fact that Christmas fell within it. The 22d December is the date of the winter solstice, when the sun reaches the tropic of Capricorn.

DECEMVIRI (ie. the ten men), ten magistrates of absolute authority among the Romans. Their appointment, according to Roman tradition, was due to plebeian dissatis- faction with the capricious administration of justice by the patricians, who had no written law to dircct them. On the representation to the senate of the popular griev- ances by the tribunes, commissioners were sent to Greece to collect the laws of Solon and of the other celebrated legislators of Greece. On the return of these commissioners it was agreed, after much discussion, that ten new magis- trates, called decemviri, should be elected from the senate to draw up a body of laws. Their election involved the abdication of all other magistrates; they were invested with supreme power, and presided over the city with regal authority. They were, each in turn, clothed with the badges of the consulship, and the one so dis- tinguished had the power of assembling the senate and confirming its decrees. The first decemvirs were chosen in the year 302 a.v.c. (451 3.0.) They arranged the laws by which their government was to be regulated in ten divisions, submitted them to the senate and comitia for their approbation, and, after the code was recognized as constitutional, administered it with so much moderation and efficiency that the continuance of the decemviral office for another year was unanimously voted. The second body of decemvirs included one member of the first—Appius Claudius—and, according to Niebuhr, five plebeians. The new magistrates added to the laws which had already been enacted, and thus completed the celebrated Jeges duodecim tabularum, on which all Roman law, in future ages, was founded. ‘Their administration, however, was as unpopular as that of their predecessors had been the reverse ; and, by its partiality and injustice, which reached a climax in the flagitious pursuit of Virginia by Appius Claudius, it so roused the popular fury that the abolition

of the office was effected. But, as Sir G. Cornewall Lewis has shown in his work on the Credibility of Early Roman History, it is difficult to write with scientific accuracy about this episode in Roman history. There were other magistrates in Rome, called decemvirs, in regard to whose appointment and jurisdiction information is scanty. Scholars differ concerning the date of their institution, and the special functions of their office. There is evidence, however, that such a court existed during the empire ; but it is uncertain whether the jurisdiction of the later coincided

with that of the carlier magistrates bearing the same name, and connected by some scholars, not only with the republic, but with the kings. There were also the Decemvre Sacrorum, who were custodians of the Sibylline books. Their number, which originally consisted of two, and after- wards of ten, at last reached fifteen. It devolved on these functionaries not only to guard the Sibylline books, and to consult them on all emergencies of state, but also to take a prominent part in the celebration of the games of Apollo. DECIMAL COINAGE, It has often been proposed to substitute for our quarto-duodecimo-vicesimal system of reckoning money one entirely decimal, and therefore in harmony with the system, employed in all civilized coun- tries, of reckoning numbers both integral and fractional. In

the case of numbers, there is no difficulty in regard to the

standard by which to reckon ; it is unity, and all integral numbers are either so many units, tens of units, hundreds of units, &c., or combinations of these, and all fractional numbers either so many tenths of a unit, hundredths of a unit, &c., or combinations of these. In the case of money, however, the selection of the standard of value, or the unit by which to reckon, coustitutes the main, if not the sole, theoretical difficulty to be overcome, previous to the intro- duction of a decimal coinage. Practical difficulties would arise from the unwillingness of people to make the changes in thinking and speaking that would be necessitated by new coins, or the altered values of old ones.

Of all the schemes proposed in England, that which advocates the retention of the sovereign, or pound sterling, as the unit of value seems to have met

with most favour. According to this scheme, the pound would be divided into 10 florins, the florin into 10 cents, and the cent into 10 mils. The name florin, as well as the coin, is in use already ; the names cent and mil would mark the relation of the corres- ponding coins to the pound. The cent, being the ;ioth part of the pound, would represent 22d., or nearly 23d. ; the mil, being the zggoth part, would be worth a little less than a farthing, which is the },th. The coins which it would be found necessary to issue would probably be—in copper, the mil=,%d., the 2-mil piece=+2d., rather less than a halfpenny, and the 5-mil piece=14d., rather less than a penny farthing ; in silver, the cent = 22d., the 2-cent piece = 4d., the 5-cent piece, or shilling, and the 10-cent piece, or florin; in gold, the half-sovereign, and the sovereign. In addition to the preceding, perhaps a double florin = 4s., in silver, and a crown=5s,, in gold, might be found convenient.

The chief disadvantage of this system is that it would abolish the copper farthing, halfpenny, and penny, and the silver coins representing 3d., 4d., 6d. Since 6d,=25 mils is the lowest number of pence which could be paid exactly in mils, inconvenience would thus be caused to the poorer classes, whose unit of value may be said to be the penny ; and difficulties would also arise in cases where fixed imposts of a penny and a halfpenny are levied, such as penny and halfpenny tolls, postages, &c. |

A second scheme advocates the adoption of the farthing as the unit of value, and its coins of account would be the farthing, the cent or doit=10 farthings, the florin=10 cents or doits, the pound =10 florins. The coins required for circulation would probably be—in copper, the farthing, the halfpenny, the penny ; in silver, the cent or doit = 21d. the 2-cent piece or groat=5d., the shilling=124d., and the florin = 25d. ; in gold, the half-sovereign = 10s, 5d., and the sovereign = 20s. 10d. Here also a silver double florin = 4s, 2d., and a gold crown = 5s. 24d., might be found con- venient.

The chief disadvantages of this system would be the abolition of the present pound sterling, the unit of value in national finance, in banks, insurance and al] great com-

mercial offices, and the trouble that would thereby be, caused in comparing values expressed in the old coinage with those of the new. Among its advantages may be reckoned the fact that, during the transition to the new state of things, the old coins would still be serviceable, for any sum of money expressed in the new coinage could be paid by meaus of them. The alterations on small imposts, requisite under the first scheme, would here be unnecessary ; and inconvenience would be saved to those classes of the population who receive weekly wages, which are generally fixed at so many pence per hour. The reduction of sums expressed in the old coinage to their equivalents in the new would, however, be slightly more difficult than under the first system.

A third scheme proposes as the unit the half-sovereign, a coin almost as familiar as the sovereign, with the view of having only three instead of four coins of account. The half-sovereign would be divided into 10 shillings as at present, and the shilling into 10 pence, each of which would therefore be equivalent to 14d., or 20 per cent. more than the present penny. As a penny is of more value than the metal of which it is made, the present copper coinage could be made to serve under the new system. This scheme, from its alteration of the value of the penny, is open to most of the objections that can be brought against the first; and, in comparing accounts expressed in the old and the new coinages, it would necessitate—a very slight inconvenience certainly—multiplication or division by 2.

A fourth scheme proposes that the penny be made the unit of value, and that all accounts should be kept in tenpences and pence, All the present coins, though only one of them would be a coin of account, could still remain in circulation ; and only two new coins would be required, the tenpence and its half, fivepence.

It has also been proposed that there should be only two coins of account, the higher equivalent to 100 of the lower, such as florins and cents, the cent in this scheme being the mil of the first. Centesimal coinage similar to this exists in several foreign countries, &c.; but it is probable that, should a change be made, the practice of other nations will be imitated only where it is found to conduce to national convenience.

The preceding are the most important of the schemes that have been suggested to replace the present system, and the adoption of the first of them has been recommended by a committee of the House of Commons. But since 1855 public opinion on the question does not appear to have advanced much. ‘The arguments for and against a change are numerous, and to detail them would be to fill a moderate volume. The principal reason for making the change is that calculation would be enormously simplified, for reduction from one denomination of money into another could always be performed at sight; and the compound rules, as far as money is concerned, would be virtually abolished. The greatest objections to the change, apart from the difficulty of getting people to make it, which is doubtless much exaggerated, are that a decimal system docs not admit to a sufficient extent of binary subdivision, and that it does not admit of ternary subdivision at all. The third part, for instance, of a pound, of a florin, of a cent, being 3334, 334, 34 mils respectively, could not be exactly paid in decimal currency, while there is no difficulty in paying the third part of a pound, or of a shilling by our present coinage. Again, the 4, 4, 4 of the pound, the 3, 4 of the florin, and the 4 of the cent are the only binary subdivisions possible with the decimal coins of account ; the 3, 2, 4 ve sz vz of the pound, and the 4, 4,4 of the shilling are possible at present. Notwithstanding these drawbacks, the advantages of a decimal system seem con-

siderably to preponderate, and the introduction of it to be inerely a question of time. The coinage of the United States, which was made decimal in 1786, consists of the eagle=10 dollars, the dollar =10 dimes, the dime=10 cents, but of these de- nominations dollars and cents are the only ones commonly used. In France, shortly after the great Revolution, a decimal system not only of money, but also of weights and measures, was introduced. The standard of value is the franc = 100 centimes; but though the only coins are francs, centimes, and multiples of these, the word sou, a term belonging to the superseded coinage, is often used to denote the 20th part of the franc, or 5 centimes. The Belgian and the Swiss inonetary systems were assimilated to that of France in 1833 and 1851; and in 1865 France, Italy, Belgium, and Switzerland, became parties to a treaty for the

maintenance of a common system. Germany, within the last few years, has effected a reform of her currency, the mark, which corresponds closely to our shilling, being = 10 groschen=100 pfennige. A decimal coinage exists also in Russia, where the ruble = 100 kopecks ; in Holland, where the guilder=10 dubbeltjes=100 cents; and in Portugal, where the milrei = 1000 reis. See Observations on the Hxpedieney and Practicability of Simplifying and Improving the Measures, Weights, and Money, ke., by General Sir Charles Pasley, 8vo, 1834; the Report of the Select

Committee on a Decimal System of Coinage, August 1853 ; and the publications of the ‘“‘ Decimal Association.” (J. S. M.)

DECIUS MUS. See Mus.

DECLARATION in an action at law was the first step in pleading—the formal statement of the matter in respect of which the defendant sued. It was divided into counts, in each of which a specific cause of action was alleged, but the language used was cautious and general, and the same matter might be the subject of several counts. By the simpler form of pleading established by the Judicature Act, 1873, the declaration is replaced by a statement of claim setting forth the simple facts on which the plaintiff replies.

Statutory declaration.—By 5 and 6 Will. IV. « 62 (which was an Act to make provisions for the abolition of unnecessary oaths, and to repeal a previous Act of the saine session on the same subject) various cases are specified in which a declaration shall be substituted for an affidavit on oath. There is a general clause empowering any justice of the peace, notary public, or other officer now by law authorized to administer an oath, to take and receive the declaration of any person voluntarily making the same before him in the form in the schedule to the Act annexed and if any declaration so made shall be false or untrue in any material particular, the person wilfully making such false declaration shall be deemed guilty of a misdemeanour.

DECLARATION OF PARIS, a diplomatic instrument or protocol signed by the representatives of all the powers present at the Congress of Paris in 1856, and subsequently accepted as a binding engagement’ of public law by

all the other powers (except the United States of America, Spain, and Mexico), for the purpose of settling and defining certain rules of maritime law, in time of war, on points of great moment to belligerent and neutral states—points, it must be added, upon which the ancient law of nations had gradually undergone some change, and on which great differences of opinion and practice prevailed. The four propositions agreed to by the plenipotentiaries were embodied in the following terms :—

1. Privateering is and remains abolished.

2. The neutral flag covers enemy's goods, with the exception of contraband of war.

3. Neutral goods, with the exception of contraband of war, are not liable to capture under an enemy's flag.

4, Blockades, in order to be binding, must be effective, —that is to say, maintained by a force sufficient readily to prevent access to the coast of the enemy.

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By most of the modern writers on international law these principles are regarded as a distinct gain to the cause of civilization, international justice, commerce, and peace. But a feeble and ineffectual attempt has been made to repudiate these new rules of maritime law, though they received the tacit assent of Parliament, and have been acted upon by all nations in the six wars which have occurred since 1856, including the American civil war, although the United States had not concurred in the Declaration. The American Government withheld its assent, not because it objected to these principles, but because it held that they did not go far enough, and that they ought to be extended to secure frum capture all private property at sea. It is argued by the opponents of the Declaration that the British envoy at Paris exceeded his powers; that the form of the instrument itself is declaratory, but not binding either as a contract or a legis- lative act ; that it is not competent to a congress to change the rights of belligerents founded on ancient law and usage ; and that Great Britain committed a fatal error in

renouncing the right to seize enemy’s goods in neutral ships and to equip privateers,

To these arguments it is said in reply that the British envoy at Paris had full powers to pledge the faith of the Crown, with the concurrence of the Cabinet, and that if Parliament disapproved his conduct, it ought to have been pressed to a division at the time, and not when Great Britain has enjoyed the benefit of the Declaration, as a neutral, for twenty years. It isa part of the prerogative of the Crown to fix our international relations, and to determine the conditions of maritime warfare. The most fitting and binding expression of international law (which cannot assume the form of positive law by sovereign enact- ment) is to be found in instruments recording in solemn form the consent of all civilized nations, On the ground of expediency, it is contended by the supporters of the Declaration of Paris, that Great Britain is, of all countries in the world, that which has most to gain by it, because she is not only the greatest naval power, but the power which has the largest number of merchant vessels and the largest amount of property afloat on the seas, and liable to attack.

The primary advantage of the Declaration no doubt accrues to neutrals, as it secures to them a larger carrying trade in time of war, and exempts them from the seizure of enemy’s goods in neutral ships. Hence, if a belligerent were now to violate the rules of the Declaration, he would have to encounter the opposition of allieutral states, and would speedily find them arrayed on the side of the enemy. But in the event of war, Great Britain is the state most exposed, by reason of the magnitude of her maritime trade, to the depredations of hostile cruisers; the injury done is to be measured by the amount of the shipping and property exposed to it; anda single cruiser of a small state may cause enormous losses to the commerce of a great power, as was seen in the American civil war. Since the establish- ment of a general system of railroads, the greater part of the trade of all the states of continental Europe can be carried on by land, either by direct communication or through neutral ports. The power of a naval state to inflict serious injury on an enemy by the interruption of her trade is therefore by the nature of things greatly diminished, and the same remark applies to commercial blockades. To England all foreign commodities must be brought by sea, and England is more dependent than any other country

on foreign trade for the raw material of her manufactures, and even for the food of her inhabi- tants. It is therefore the paramount interest of England to keep open all the channels of trade, as much as possible, both in peace and war; and injuries done to the trade of an enemy are often equally prejudicial to the state which

yh), inflicts them. ‘These are some of the leading arguments which have been advanced in defence of the Declaration

of Paris, and which no doubt actuated the authors of it.

A full account of the controversy will be found in the third volume of Sir Robert Phillimore’s Commentaries on International Law, where the learned author supports and advocates the old traditions of the Court of Admiralty, and also in Hall’s Rights and Dutics of Neutrals (1874). The principles on which the Declara- tion of Paris is based are explained and defended in an article in the Edinburgh Review, No. 296. (H. R.)

DECLARATOR, in Scotch law, is a form of action by which some right of property, or of servitude, or of status, or some inferior right or interest, is sought to be judicially declared (see Bell’s Dictionary and Digest of the Law of Scotland.)

DECREE, DECREET, the judgment of a court of justice, and, in English law, more particularly the judg- ment of a court of equity. A decree nisi is the conditional order for a dissolution of marriage made by the court for divorce and matrimonial causes, which will be made absolute after six months, in the absence of sufficient cause shown to the contrary.

DECRETALS, in canon law, are the answers sent by the Pope to applications made to him as head of the church, chiefly by bishops, but also by synods, and even private individuals, for guidance in cases involving points of doc- trine or discipline. In the early days of the church these replies came to be circulated throughout the various dioceses, and furnished precedents to be observed in analogous circumstances. From the 4th century onwards they formed the most prolific source of canon law. Decre- tals (decreta constituta decretalia, epistole decretales, or shortly decretalia, or decretales) ought, properly speaking, to be distinguished, on the one hand

from constitutions (constitutiones pontifictee), or general laws enacted by the Pope sua sponte without reference to any particular case, and on the other hand from rescripts (rescripta), which apply only to special circumstances or individuals, and constitute no general precedent. But this nomenclature is not strictly obscrved.

For futher information see art. CANnon Law, in which will also be found an account of the Pseudo-Isidorian or False Decretals,

DECURIO, an officer in the Roman cavalry, com- manding a decuria, which was a body consisting of ten men. There were certain provincial magistrates called decurzones municipales, who had the same position and powers in free and corporate towns as the senate had in Rome. As the name implies, théy consisted at first of ten, but in later times the number was often as many as a hundred ; their duty was to watch over the interests of their fellow-citizens, and to increase the revenues of the commonwealth, Their court was called curta decurionum, and minor senatus ; and their decrees, called decreta decurionwm, were marked with D.D. at the top. They generally styled themselves clvitatum patres curiales, and honoratt municipiorum sena- cores. ‘They were elected with the same ceremonies as the Roman senators, and they required to be at least twenty- five years of age, and to be possessed of a certain fixed income, The election took place on the kalends of March.

DEE, Joun (1527-1608), a mathematician and astrolo- ger, was born in July 1527, in London, where his father was a wealthy vintner. In 1542 he was sent to St John’s College, Cambridge. After five years’ close application to mathematical studies, particularly astronomy, he went to Holland, in order to visit several eminent Continental mathematicians. Having remained abroad nearly a year, he returned to Cambridge, and was elected a fellow of Trinity College, then first erected by King Henry VIII. In 1548 he took the degree of master of arts; but in the same year he found it necessary to leave England on account of the suspicions entertained of his being a conjuror,

which were first excited by a piece of machinery, in the Trene of Aristophanes, he exhibited to the university, re- presenting the scarabeeus flying up to Jupiter, with a man aud a basket of victuals on its back. On leaving England he went first to the university of Louvain, where he resided about two years, and then to the college of Rheims, where he read lectures on Euclid's Hlements with great applause. On his return to England in 1551 King Edward assigned him a pension of 100 crowns, which he afterwards exchanged for the rectory of Upton-upon-Severn. Soon after the accession of Mary, he was accused of using en- chantments against the queen's life; but after a tedious confinement, he obtained his liberty in 1555, by an order of council.

When Elizabeth ascended the throne, Dee was asked by Lord Dudley to name a propitious day for the coronation. On this occasion he was introduced to the queen, who took lessons in the mystical interpretation of his writings, and made him great promises, which, however, were never ful- filled. In 1564 he again visited the Continent, in order to present a book which he had dedicated to the Emperor Maximilian. He returned to England in the same year ; but in 1571 we find him in Lorraine, whither two physicians were sent by the queen.to his relief in a dangerous illness. Having once more returned to his native country, he settled at Mortlake, in Surrey, where he continued his studies with unremitting ardour, and made a collection of curious books and manuscripts, and a variety of instruments, most of which were destroyed by the mob during his absence, on account of his supposed familiarity with the devil. In 1578 Dee was sent abroad to consult with German physicians and astrologers in regard to the illness of the queen. On his return to England, he was employed in investigating the title of the Crown to the countries recently discovered by British subjects, and in furnishing geographical descriptions. 'Two large rolls containing the desired information, which he presented to the queen, are still preserved in the Cottonian Library. A learned treatise on the reformation of the calendar, written by him about the same time, is still preserved in the Ashmolean Library at Oxford.

From this period the philosophical researches of Dee were concerned entirely with the pseudo-science of necromancy. In 1581 he became acquainted with Edward Kelly, an apothecary who professed to have

discovered the philosopher's stone, and by whose assistance he performed various incantations, and maintained a frequent imaginary intercourse with spirits. Shortly after, Kelly and Dee were introduced to a Polish nobleman, Albert Laski, palatine of Siradia (Sieradz), devoted to the same pursuits, who persuaded the two friends to accompany him to his native country. They embarked for Holland in September 1583, and arrived at Laski's place of residence in February following. They lived for some years in Poland and Bohemia in alternate wealth and poverty, according to the credulity or scepticism of those before whom they exhibited. They professed to raise spirits by incantation. Kelly dictated their utterances to Dee, who wrote them down and interpreted them.

Dee, having at length quarrelled with his companion, quitted Bohemia and returned to England, where he was made chancellor of St Paul's Cathedral in 1594, and warden of Manchester College in 1595, He afterwards returned to his house at Mortlake, where he died in 1608, at thé age of eighty-one.

His principal works are—Propedewmata Aphoristica, Lond. 1558; Monas Hieroglyphica, Antwerp, 1564; Epistola ad Fredericum Commandinum, Pesaro, 1570 ; Preface Mathematical to the English Euclid, 1570 ; Divers Annotations and Inventions added after the

tenth book of Linglish Euclid, 1570; Epistola prefixa Epheme- ridibus Joannis Feldi, a 1557; Parallaticee Commentationis Pramces-

que Nucleus quidam, London, 1573. The catalogue of his printed aud published works is to be found in his Compendious Rehearsal, as well as in his Jetter to Archbishop Whitgift, to which the reader is referred. A manuscript of Dee's, relating what passed for many years between him and some spirits, was edited by Meric Cas- aubon and published in 1659. The Private Diary of Dr John Dee, and the Catalogue of his Library of Manuscripts, edited by J. O. Halliwell, was published by the Camden Society in 1842.

DEED is a contract in writing, sealed and delivered by the party bound to the party benefited, Contracts or obligations under seal are called in English

law specialties, and down to a recent date they took precedence in payment over simple contracts, whether written or not. Writing, sealing, and delivery are all essential to a deed. The signature of the party charged is not material, and the deed is not void for want of a date. Delivery, it is held, may be complete without the actual handing over of the deed ; it is sufficient if the act of sealing were accompanied by words or acts signifying that the deed was intended to be presently binding; and delivery to a third person for the use of the party benefited will be sufficient. On the other hand, the deed may be handed over to a third person as an escrow (écrit), in which case it will not take effect as a deed until certain conditions are performed. Such con- ditional delivery may be inferred from the circumstances attending the transaction, although the couditions be not expressed in words. A deed indented, or indenture (so called because written in counterparts on the same sheet of parchment, separated by cutting a wavy line between them), is between two or more parties who contract mutually. The actual indentation is not now necessary to an indenture.

DEER (Cervide), a family of Ruminant Artiodactyle Mammals, distinguished by the possession of deciduous branching horns or antlers, and by the presence of spots on the young. The antlers are borne by the frontal bone, and generally begin to appear towards the end of spring. At that season there isa marked determination of blood to the lead, the vessels surrounding the frontal eminences become temporarily enlarged, and the budding horn grows with inarvellous rapidity, the antlers of a full-grown stag being produced in ten weeks. At first the horns are soft, vascular, and higlily sensitive, and are covered with a delicate hairy integument known as the “ velvet,” amply provided with blood-vessels. On attaining their full growth the ‘ burr,” consisting of a ring of usseous tubercles ut the base of the horn, is formed, and this by pressing upon, gradually cuts off the blood-vessels which supply nutriment to the antlers. The velvety covering then begins to shrivel and to peel off, its disappearance being hastened by the deer rubbing its antlers against trees and rocks ; while the grooves, which are seen to furrow the now exposed surface, mark the place of the former blood-vessels. With the single exception of the reindeer, antlers are confined to tle male sex, and are fully developed at the com- mencement of the rutting season, when they are brought into use as offensive weapons in the sanguinary fights between the males for possession of the females. When

the season of love is over they are shed, reappearing, how- ever, in the following spring, and continuing to grow larger and heavier until the deer attains its full growth. Whether the deer inhabiting the warmer regions of the earth shed their antlers every year has been a matter of considerable dispute, but in a recent work (Lighlands of Central India) Forsyth states that he has convinced himself, from repeated observations, that in Indian deer this operation does not take place annually. In castrated animals the antlers either cease to appear or are mercly rudimentary, while any influence whatever which disturbs

the general .

system seems detrimental to their growth, as was observed in a case quoted by Darwin, where the antlers of a Wapiti deer, formed during a voyage from America, were singularly stunted, although the same individual afterwards, when living under normal condi- tions, produced perfect horns. Spots are common to the young of so many species of deer that their presence may fairly be regarded as a family character. ‘These spots persist through life in such forms as the Axis, or Spotted Deer (Axis maculata), but in the majority of species they altogether disappear in the adult form. Darwin considers that in all such cases the old have had their colour changed in the course of time, while the young have remained but little altered, and this he holds has been effected “ through the principle of inheritance at corre- sponding ages.” The lachrymal sinus, or “ tearpit,” is present in most species of decr. ‘his cousists of a cavity beneath each eye, capable of being opened at pleasure, in which a waxy substance of a disagreeable odour is secreted, the purpose of which is not yet clearly-ascertained. ‘ The big round tears” which the contemplative Jacques watched, as they *“ Coursed one another down his innocent nose In piteous chase,”

is Shakespeare’s interpretation of the appearance presented by the motion of the glistening edges of the tearpits in the stag. The deer family comprises 8 genera and 52 specics, distributed over all the great regions of the earth except the Ethiopian, and living under the most diverse climatic conditions. Their total absence from Africa south of the Sahara may be due, as A. R. Wallace (Geographical Distri- bution of Animals) contends, to the presence

in the past, as now, of a great belt of dry and desert country effectually preventing the immigration from Europe into Africa of such a forest-frequenting group as the deer, while favour- ing the introduction of antelopes, which attain their greatest development in that region, They are also absent from Australia, although present in the Austro-Malayau region. The following are some of the more remarkable species.

The Red Deer or Stag (Cervus elaphus), the largest of the British deer, is a native of the temperatd regions of Europe and Northern Asia, inhabiting dense forests, or fre- quenting moors and barren hill-sides as in Scotland. In England, where in feudal times it was protected by forest laws, which set greater value on the life of a stag than on that of a man, it was formerly abundant in all the royal forests. It is now almost extinct in that country, as well as in Ireland, in the wild state. In Scotlaud considerable herds are still to be found in the Highlands, and in several of the Western Isles, although, owing probably to the diminished extent of their feeding grounds, to the breeding in and in which takes place, and to the anxiety of deer- stalkers to secure the finest heads, the species is believed to be degenerating. ‘The finest specimens in this country are found in the deer forests of Sutherlandshire, but these are inferior in size to thosc still obtained in the east of Europe. The antlers of the Stag are rounded, and bear three “ tines,” or branches, and a crown cousisting of three or more points. The points increase in nuinber with the age of the creature, and when 12 are present it is known in Scot- land asa “‘royal stag.” This number, however, is sometimes exceeded, as in the case of a pair of antlers, weighing 74 ib, from a stag killed in Transylvania, which had 45 points. The antlers during the second year consist of a simple un- branched stem, to which a tine or branch is added in each suc- ceeding year, until the normal developnient is attained, after which their growth is somewhat irregular. The Red Deer is gregarious, the females and calves herding together apart from the males except at the rutting season, which begins about tle end of September end lasts for three weeks, Dur-

ing this time the males go in search of the females, and are exceedingly fierce and dangerous. The period of gestation extends a few days beyond eight months, and the hind usually produces a single calf. The stag 18 remarkably shy and wary, and its sense of smell is exceedingly acute. In former times it was hunted with horse, hound, and horn, and such is still the practice in Devonshire and in Ireland, but in Scotland the old method has been superseded by “ stalking.” A full grown stag stands about 4 feet high at the shoulders; its fur in summer is of a reddish-brown colour with a yellowish-white patch on the buttocks, in winter the fur is much thicker and of a grayish brown.

The Wapiti Deer (Cervus canadensis) may be regarded as the representative of the stagin North America. It stands, however, a foot higher, and bears correspondingly heavier antlers. It occurs chiefly in Canada, where it fecds on grass and the young shoots of the willow and poplar. It has gained the reputation of being the most stupid of the cervine family, but this may have partly arisen from the peculiar noise it ,makes, corresponding to the “ belling ” of the stag, but in its case resembling very much the braying ofanass. Its flesh is coarse, and is held in little estimation by the Indians, owing to the excessive hardness of the fat. It thrives well in Britain, and would probably have been introduced had its venison been better.

The Fallow Deer (Dama vulgaris), a species semi- domesticated in Britain, where it forms a principal ornament in parks, still occurs wild in Western Asia, North Africa, and Sardinia, and in prehistoric times appears to lave abounded throughout Northern and Central Europe. It stands 3 feet high at the shoulders, and its antlers, which are cylindrical at the base, become palmated towards the extremity, the palmation showing itself in the third year, and the antlers reaching their full growth in the sixth. The fur is of a yellowish-brown cclour (whence the name “ fallow”), marked with white spots; there is, how- ever, a uniformly brown variety found in Britain, and said to have been brought by James J. from Norway on account of its hardiness, ‘The two varieties are said by Darwin to have been long kept together in the Forest of Dean, but have never been known to mingle. The bucks and does live apart except during the pairing season, and the doe produces one or two, and sometimes three fawns at a birth. They are exceedingly fond of music, and a herd of twenty bucks were, it is said,

brought from Yorkshire to Hampton Court, led by music from a bagpipeand violin. They feed on herbage, and are particularly fond of horse chestnuts, which the males endeavour to procure by striking at the branches with their antlers.

The Roe Deer (Capreolus capra) is the smallest of the British Cervide, a full-grown buck standing not more than 26 inches high at the shoulders. The antlers are short, upright, and deeply furrowed, and differ from those of the preceding species in the absence of a basal “tine.” The horns, in this, as well as in the other members of the deer family, are largely employed in the manufacture of handles for cutlery, and the parings from these were formerly used in the preparation of ammonia, hence the name hartshorn still applied to that substance. The Roe Deer inhabits southern and temperate Europe as far east as Syria, where it frequents woods, preferring such as have a large growth of underwood, and are in the neighbourhood of cultivated ground. This it visits in the evening in search of food ; and where roes are numerous, the damage done to growing crops is considerable. In going to and from their feeding grounds they invariably follow the same track, and the sportsman takes advantage of this habit to waylay them. In hunting the roe the woods are driven by beaters, and they are shot down, as they speed along the accustomed paths, by the ambushed hunter. The species

was until recently supposed to be monogamous, pairing in December, and the period of gestation only extending over five months. This supposition arose from the fact that the fostus in the doe was never found till January, and that then it was but slightly developed, although the sexes were known to seek the society of each other in July and August. From the investigations of Professor Bischoff of Giessen it appears that the true rutting season of the Roe Deer is in July and August; but that the ovum lies dormant until December, when it begins to develop in the normal way; the period of gestation is thus extended to nearly nine months. It was formerly abundant in all the wooded parts of Great Britain, but was gradually driven out, until in Pennant’s time it did not occur south of. Perthshire. Since then the increase of plantations has-led to its partial restoration in thesouth of

Scotland and north — of England. It takes readily to the water, and has been known to swim across lochs more than half a mile in breadth.

The Elk or Moose Deer (Alces malchis) is the largest of living Cervide, its shoulders being higher than those of the horse. Its head measures 2 feet in length, and its antlers, which are broadly palmated, often weigh from 50 to 60 ib; the neck is consequently short and stout. It is covered with a thick coarse fur of a brownish colour, longest on the neck and throat. Its legs are long, and it is thus unable to feed close to the ground—for which reason it browses on the tops of low plants, the leaves of trees, and the tender shoots of the willow and birch. Its antlers attain their full length by the fifth year, but in after years they increase in breadth and in the number of brauches, until fourteen of these are produced. Although spending a large part of their lives in forests they do not appear to suffer much in- convenience from the great expanse of their antlers. In making their way among trees, the horns are carried horizontelly to prevent entanglement with the branches, and so skilful is the elk that “ he will not break or touch a dead twig when walking quietly.” His usual pace, according to Lloyd (Field Sports), isa shambling trot ; but when frightencd he goes at a tremendous gallop. The elk is a shy and timorous creature, flecing at the sight of man This timidity, however, forsakes the male at the rutting season, and he will then attack whatever animal comes in his way. The antlers and hoofs are his principal weapons, and with a single blow from the latter he has been known to kill a wolf. In North Amcrica the moose is tormented in the hot season by mosquitoes, and it is when rendered furious by the attacks of those insects that it can be most readily approached. The female seldom gives birth to more than two fawns, and with these she retires into the deepest recesses of the forest, the young remaining with her till their third year. The elk ranges over the whole of Northern Europe and Asia, as far south as East Prussia, the Caucasus, and North China, and over North America from the New England States westward to British Columbia. It was formerly common in the forests of Germany and France, and is still found in some parts of Sweden and Norway, where it is strictly protected. The elk, according to Lloyd, is easily domesticated, and was at one time employed in Sweden in drawing sledges. During winter it is frequently seen alone, but in summer and autumn it may be met with in small herds. In summer also it frequents morasses and low grounds, and takes readily to the water; in winter it retires to the shelter of

the forests, where alone it can find suitable sustenance. Its flesh is considered excellent, and its tongue and nose are regarded as delicacies.

The Reindeer (Tarandus rangifer), the only domesticated species of deer, has a range somewhat similar to the elk, extending over the entire boreal region of both hemispheres, from Greenland and Spitzbergen in the north to New

Brunswick in the south. There are several well-marked varieties differing greatly in size, and in the form of the antlers—the largest forms occurring furthest north ; while by many writers the American reindeer, which has never been domesticated, is regarded as a distinct species. The antlers, which are long and branching, and considerably palmated, are present in both sexes, although in the female they are more slender and less branched than in the males. In the latter they appear at a much earlier age than in any other species of deer, and Darwin conjectures that in this circumstance a key to their exceptional appearance in the female may be found, The reindeer has long been domesticated in Scandinavia, and is of indispensable import- ance to the Lapland race, to whom it serves at once as a substitute for the horse, cow, sheep, and goat. As a beast of burden it is capable of drawing a weight of 300 ib, while its fleetness and endurance are still more remarkable. Harnessed to a sledge it will travel without difficulty 100 miles a day over the frozen snow, its broad and deeply cleft hoofs being admirably adapted for travelling over such a surface. During summer the Lapland reindeer feeds chiefly on the young shoots of the willow and birch ; and as at this season migration to the coast seems necessary to the well-being of the species, the Laplander, with his family and herds, sojourns for several months in the neighbourhood of the sea. In winter its food consists chiefly of the reindeer moss and other lichens, which it makes use of its hoofs in seeking for beneath thesnow. The wild reindeer grows to a much greater size than the tame breed, but in Northern Europe the former are being gradually reduced through the natives entrapping and domesticating them. The tame breed found in Northern Asia is much larger than the Lapland form, and is there used to ride on. There are two distinct varieties of the American reindeer—the Barren Ground Caribou, and the Woodland

Caribou. The former, which is the larger and more widely distributed of the two, frequents in summer the shores of the Arctic Sea, retiring to the woods in autumn to feed on the tree and other lichens. The latter occupies a very limited tract of woodland country, and, unlike the Barren Ground form, migrates southward in spring. ‘The American rein- deers travel in great herds, and being both unsuspicious and curious they fall ready victims to the bow aud arrow or the cunning snare of the Indian, to whom their carcases form the chief source of food, clothing, tents, and tools. Remains of the reindeer are found in caves and other Post- Pliocene deposits as far south as the south of France, this boreal species having been enabled to spread over Southern Europe, owing to the access of cold during the glacial period. It appears to have continued to exist in Scotland down even to the 12th century.

The Muntjac (Cervulus vaginalis) has its two pronged horns placed on permanent bony pedestals 3 inches in length, and the male is further furnished with long canines in the upper jaw. It is a native of Java, where it may occasionally be seen in the inclosures of Europeans, but, according to Dr Horsfield, it is impatient of confinement, and not fit for the same degree of domestication as the stag. Its flesh forms excellent venison. ‘There are four species of muntjacs inhabiting the forest districts from India to China, and southward to Java and the Philippine Islands.

The Musk Deer (Moschus moschiferus) differs from the true deer in the absence of horns, and in the presence of the musk-bag, and is now usually regarded as tlie type of a distinct family—Moschide. The young, however, are spotted as in the Cerwde, and it is doubtful whether the differences already mentioned are sufficient to warrant its separation from the other deer. Canine teeth are present in the upper and lower jaws of both sexes, those in tlic

upper jaw of the male being longest. It is a native of the highlands of Central Asia from the Himalayas to Peking, being found at an elevation of 8000 feet, and in its habit resembling such mountain species as the chamois. It is exceedingly shy and difficult of approach, and is hunted solely for its musk—an unctuous brown secretion, posses- sing a most penetrating and enduring odour, extremely disagreeable when present in large quantities,

but forming a pleasant perfume when used sparingly. The substance is contained in a bag, almost the size of a hen’s egg, situated on the abdomen, and secreted in greatest quantity during the rutting season. The hunters cut off the bag, and close the opening, and after drying, it is ready for sale.

Fossil Deer.—Remains of many extinct species of deer belonging to existing genera have been found in Post- Pliocene and other recent deposits; while the remains of extinct genera occur in both hemispheres, but do not extend further back than the Upper Miocene. The deer family, so far as yet discovered, is thus of comparatively recent origin, and is probably, as Mr Wallace suggests, an Old World group, which during the Miocene period passed to North America and subsequently to the southerir continent. The best preserved species of fossil deer is the gigantic Irish Elk (Cervus megaceros). It is not a true elk, but is intermediate between the fallow deer and reindeer, and is found in great abundance and perfection in the lake deposits of Ireland. It occurs also in the Isle of Man, in Scotland, and in some of the English caverns, The antlers of a specimen of this species in Dublin weigh about 80 ib, and their span is twice that of the living elk. It appears to have been contemporaneous with the extinct mammoth. and rhinoceros, but it is still doubtful whether it co-existed with man. In Kent’s Hole, near Torquay, the base of au antler, partly gnawed, was found ; and this, according to Owen, probably belonged to the most gigantic of our English cervine aninials. (@. cI.)

DEFAMATION, saying or writing something of another, calculated to injure his reputation or expose him to public hatred, contempt, and ridicule. See Lipset and SLANDER.

DEFENDER OF THE FAITH (Fidei Defensor), a peculiar title belonging to the sovereign of England, in the same way that Clatholicus belongs to the king of Spain, and Christianissimus to the king of France. Although certain charters have been appealed to in proof of an earlier use of the title, it appears to have been first conferred by Leo. X. on Henry VIII. in 1521 for writing against Luther, It was afterwards confirmed by Clement VII. When Henry suppressed the religious houses at the time of the Reformation, the Pope not only deprived him of this desig- nation, but also deposed him; in the thirty-fifth year of his reign, however, the title of “ Defender of the Faith

” was confirmed by Parliament, and has continued to be used by all his successors on the English throne.

DEFFAND, Maria pe Vicuy-CuamMronD, MARQquISE pu (1697-1780), a celebrated leader in the fashionable literary society of Paris during the greater part of the 18th century, was born in Burgundy of a noble family in 1697. Educated at a convent in Paris, she there displayed, along with great intelligence, the sceptical and cynical turn of mind which so well suited the part she was afterwards to fill in the philosophical circles of Paris. Her parents, alarmed at the freedom of her views, arranged that Massillon should visit and reason with her, but this seems to have had little effect. They married her at twenty-one years of age to the Marquis du Deffand without consulting her inclination. The union proved an unhappy one, and resulted in a speedy separation, Madame du Deffand, young and beautiful, did not, according to the common belief, succeed in keeping herself uncontaminated by the abounding vice of the age, and it is said that she was for

a time the mistiess of the regent. Ske was afterwards reconciled to her husband, but it proved impossible for them to live together, and a second and final separation took place. Without heart and without enthusiasm, Madame du Deffand was incapable of any strong attach- ment, but her intelligence, her cynicism, and her esprit made her the centre of attraction to a circle which included nearly all the famous philosophers and literary men in Paris, besides not a few distinguished visitors from abroad. In 1752 she became blind, and soon afterwards she took up her abode in apartments in the convent of St Joseph in the Rue St Dominique, which had a separate entrance from the street. This became the frequent resort of such men ag Choiseul, Bouflers, Montesquieu, Voltaire, D’Alembert, David Hume, and Horace Walpole. In 1764 the society was split into two parties by the defection of her companion Mademoiselle de L’Espinasse, who took with her D’Alembert and several others. Madame du Deffand had most affinity

of nature with Horace Walpole, who paid several visits to Paris expressly for the purpose of enjoying her society, and who maintained a close and most interesting correspondence with her for fifteen years. She died on the 24th September 1780. Of her innumerable witty sayings probably tbe best, and certainly the best known, is her remark on the Cardinal de Polignac's account of St Denis's miraculous walk of two miles with his head in his hands,—" I] n'y a que le premier pas qui cofite."

The correspondence of Madame du Deffand with D'Alembert, Henault, Montesquieu, and others was published at Paris in 1809. Her letters to Horace Walpole, edited, with a biographical sketch, by Miss Berry, were published at London from the originals in Strawberry Hill in 1810.

DEFOE, Dantet (1661-1731), was born in London in the year 1661, in the parish of St Giles, Cripplegate. Neither the exact date nor place of his birth is known, nor is his baptism recorded, probably because he was of a non-conformist family. Hardly anything is known of his ancestors ; his grandfather, Daniel Foe, is said to have been a squire or wealthy yeoman at Elton, in Huntingdonshire (not Northamptonshire, as more generally stated), and to have kept a pack of hounds; but the authority for the former statement seems to be mainly traditional, and for the latter we have merely an anecdote in one of Defoe's newspaper articles, which is at least as likely to have been fiction as fact. Attempts have been made, but merely fancifully, to trace the name to Vaux, Fawkes, cr even Devereux. As to the variation Defoe or Foe it is to be noticed that its owner signed either indifferently till a late period of his life, and that his initials where they occur are sometimes D. F. and sometimes D. D. F. Mr Lee's con- jecture, that the later form originated in his being called Mr D. Foe to distinguish him from his father, seems not unlikely, It may be added that three autograph letters of his are extant, all addressed in 1705 to the same person, and signed respectively D. Foe, de Foe, and Daniel Defoe.

James Foe, the father of the author of Robinson Crusoe, was a butcher and a citizen of London. Of his mother nothing isknown. Daniel was chiefly educated at a famous dissenting academy, Mr Morton's of Stoke Newington, where many of the celebrated nonconformists of the time were brought up. Itis noteworthy that one of his schooi- fellows suggested the

unusual name of Crusoe. In after life Defoe frequently asserted the sufficiency of his educa- tion and the excellence of the methods observed by his teacher. Judging from his writings his stock of general information must have been far larger than that of most regularly educated men of his day ; but it is probable that his attainments were in uo particular line very exquisite or profound, With. very few exceptions all the known events of Defoe's life are connected with authorship. In the older catalogues of his works two pamphlets, Speculum

Crapegounorum (a satire on the clergy) and A Treatise against the Turks, are attributed to him before the accession of James II., but there seems to be no publication of his which is certainly genuine before The Character of Dr Annesley, the family minister, published in 1697. He had, however, before this (if we may trust tradition) played an active part in public affairs. He had taken up arms in Monmouth's expedition, and is supposed to have owed his lucky escape from the clutches of the king's troops and tlie law, into which not a few of his school-fellows fell, to the fact of his being a Londoner, and therefore a stranger in the west country. On January 26, 1688, he was admitted a liveryman of the city of London, having claimed his freedom by birth. Since his western escapade he had 'aken to the business of wholesale hosiery. At the entry of William and Mary into London he is said to have served as a volunteer trooper " gallantly mounted and richly accoutred." In these days he lived at Tooting, and was in- strumental in forming a dissenting congregation at that place. His business operations at this period appear to have been extensive and various. He would seem both now and later to have beena sort of commission merchant, especially in Spanish and Portuguese goods, and at some time or other he visited Spain on business. Later we hear him spoken of as "a civet-cat merchant," but as he can hardly have kept a menagerie of these animals it is odd that no one has supposed that the civet-cat was the sign of luis place of business (it was a very usual one) rather than the staple of his trade. In 1692 his mercantile operations came to a disastrous close, and he failed for £17,000. By his own account the disaster would seem to have arisen from relying too much on credit. His misfortunes made him write both feelingly and forcibly on the bankruptcy laws; and although his creditors accepted a composi- tion, he afterwards

honourably paid them in full, a fact attested by independent and not very friendly witnesses. Subsequently, he undertook first the secretaryship and then the managership and chief ownership of some tile- works at Tilbury, but here also he was unfortunate, and his imprisonment (of which more hereafter) in 1703 brought the works to a stand-still, and thereby lost him £3000. From this time forward we hear of no settled business in which he engaged, He evidently, however, continued to undertake commissions, and made his political visits to Scotland an occasion for opening connections of this kind with that country. In the last thirty years of his life business played but a subordinate part, though he seems to have derived more profit from it than from his earlicr ventures. It was probably at the time of his troubles in 1692 that he had occasion to visit Bristol, where—according to a local tradition—he lay perdu for fear of bailiffs all the week, but emerged in gorgeous raiment on Sunday, whence he was known by the nickname of "the Sunday gentle- man."

It was not as a business man that Defoe was to make Beginnl his mark, though his business experiences coloured to some of poll

extent the literary productions to which he owes his fame. The course of his life was determined about the middle of the reign of William IIT. by his introduction (we know not how) to William himself and to other influential persons. He frequently boasts of his personal intimacy with the " glorious and immortal" king (epithets, by the way, to the invention of which he has considerable claim), and in 1695 he was appointed accountant to the commissioners of the glass duty, which office he held for four years. During this time he produced (January 1698) his Hssay on Projects, one of the first and not the least noteworthy of his works, This essay contains suggestions on banks, road-management, friendly and insurance societies of various kinds, idiot asylums, bankruptcy, academies (in the French sense),

military colleges, high schools for women, &c. It displays Defoe's lively and lucid style in full vigour, and abounds with ingenious thoughts and apt illustrations, though it illustrates also the unsystematic character of his mind. In the same year Defoe wrote the first of a long series of pamphlets on the then burning question of occasional conformity. In this, for the first

time, he showed the unlucky independence which, in so many other instances, united all parties against him. On the one hand he pointed out to the dissenters the scandalous inconsistency of their playing fast and loose with sacred things, and on the other he denounced the impropriety of requiring tests at all. In direct support of the Government he published, towards the close of the reign, a Defence of Standing Armies, against Trenchard, and a set of pamphlets on the Partition Treaty Thus in political matters he had the same fate as in ecclesiastical ; for the Whigs were no more prepared than the Tories to support William through thick and thin. He also dealt with the questions of stock-jobbing and of electioneering corruption. But his most remarkable publication at this time—the publication, indeed, as the author of which he became famous—was The T'rue-Born Englishman, a satire in rough but extremely vigorous verse on the national objection to William as a foreigner, and on the claim of purity of blood for a nation which Defoe chooses to represent as crossed and dashed with all the strains and races in Europe. He also took a prominent part in the proceedings which followed the famons Keutish petition, and was the author, and some say the presenter, of the equally famous Legion Memorial, which asserted in the strongest terms the supremacy of the electors over the elected, and of which even an irate House of Commons did not dare to take any great notice. The theory of the in- defeasible supremacy of the freeholders of England, whose delegates merely (according to this theory) the Commons were, was one of Defoe's favourite political tenets, and he returned to it ina most powerfully written tract entitled The Original Power of the Collective Body of the People of England examined and asserted. At the same time he was occupied in a controversy on the conformity question with the well-known John How (usually spelt Howe at present), and wrote several minor political tracts.

The death of William was a great misfortune to Defve, and he soon felt the power of his adversaries. After publishing Zhe Mock Mourners, intended to satirize and rebuke the outbreak of Jacobite joy at the king's death, he turned his attention once more to ecclesiastical subjects, and, in an evil hour for himself, wrote the famous Shortest Way with the Dissenters, The traditional criticism of this remarkable pamphlet isa most curious example of the way in which thoroughly inappropriate descriptions of books pass from mouth to mouth. Every commentator (with the single exception of Mr Chadwick) has dilated upon its " exquisite irony." Now, the fact of the matter is, that in The Shortest Way there is no irony at all, and, as Defoe's adversaries acutely remarked, irony would never have been pleaded had not the author got into trouble, when of course it suited him faire jléche de tout bois, The pamphlet is simply an exposition in the plainest and most forcible terms of the extreme "high-flying" position, and every line of it might have been endorsed, and was endorsed, by consistent high-churchmen. The author's object clearly was by this naked presentation to awaken the dissenters to a sense of their danger, and to startle moderate churchmen by showing them to what end their favourite doctrines necessarily led. For neither of these purposes was irony necessary, and irony, we repeat, there is none, If any lingering doubt from the consensus of authority on the other side remain, let the student read Zhe Shortest Way and then turn to Swift's Afodest Proposal or

his Reasons against Abolishing the Church of England. He will soon see the difference. Ironical or not, however, it was unlikely that the high-churchmen and their leader Nottingham (the Don Dismal of Swift) would let such a performance pass unnoticed. The author was svon discovered ; and, as he absconded, an advertisement was issued offering a reward for his apprehension, and giving us the only personal description we possess of him, as "a middle-sized spare man about forty years old, of a brown complexion and dark brown-coloured hair, but wears a wig ; a hooked nose, a sharp chin, grey eyes, and a large mole near his mouth." In this conjuncture Defoe had really no friends, for the dissenters were as much alarmed at lis book as the high-flyers were irritated. He surrendcred, and his

defence appears to have been injudiciously con- ducted; at any rate he was fined 200 marks, and condemned to be pilloried three times, to be imprisoned indefinitely, and to find sureties for his good behaviour during seven years. His sojourn in the pillory, however, wa3 rather a triumph than a punishment, for the populace took his side ; and his Hymn to the Pillory, which he soon after published, is one of the best of his poetical works. Unluckily for him his condemnation had the indirect effect of destroying his busi- ness. He remained in prison until August 1704, and then owed his release to the intercession of Harley, who repre- sented his case tu the queen, and obtained for him not only liberty but pecuniary relief and employment, which, of oue kind or another, lasted until the termination of Anne's reign. Defoe was uniformly grateful to the minister, and his language respecting him is in curious variance with that geuerally used. 'Ihere can be little doubt that, independ- ently of gratitude, Harley's moderation in a time of the extremest party-insanity was no little recommendation to Defoe. During his imprisonment the latter was by no means idle. A spurious edition of his works having been issued, he himself produced a collection of twenty-two treatises, to which some time afterwards he added a second group of eighteen more. He also wrote in prison many short pamphlets, chiefly controversial, published a curious work on the famous storm of November 26, 1703, and started perhaps the most remarkable of all his projects, The Leview. This was a paper which was issued during the greater part of its life three times a week. It was entirely written by Defoe, and extends to eight complete volumes and some few score numbers of a second issue. He did not confine himself to news, but threw his writing into the form of something very like finished essays on questions of policy, trade, and domestic concerns ; while he also introduced a so-called "Scandal Club," in which minor questions of manners and morals were treated ina way which undoubt- edly suggested the Zadlers and Spectators which followed. It is probable that if the five points of bulk, rapidity of production, variety of matter, originality of design, and excellence of style are taken together, hardly any author can show a work of equal magnitude. It is unlucky that only one complete copy of the work is known to exist, and that is in a private library. After his release he went to Bury St Edmunds for change of air, though he did not in- terrupt either his /eview or his occasional pamphlets. One of these, Giving Alms no Charity, and Employing the Poor a Grievance to the Nation, is for

the time an extraordinarily far-sighted performance. It denounces on the one hand indiscriminate alms-giving, and on the other the folly of national work-shops, the institution of which on a parochial system had been proposed by Sir Humphrey Mackworth.

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In 1705 appeared The Consolidator, or Memotrs of Govern-

Sundry Transactions from the World in the Moon, a political satire which is supposed to have given some hints for Gulliver ; and at the end of the year Defoe performed a secret mission (the first of several of the kind) for Harley.

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Novels.

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While on one of these in the west of England he was molested, though with no serious result, by the zealous country justices. In 1705 also appeared the famous Mrs Veal. As is well known, this admirable fiction is said to have been composed for a bookseller, to help off an unsaleable translation of Drelincourt on Death, Mr Lee, however, has thrown some doubts on this story. Defoe’s next considerable work was Jure Divino, a poetical argument in some 10,000 terribly bad verses ; and soon afterwards (1706) he began to be largely employed in promoting the union with Scotland. Not only did he write pamphlets as usual on the project, and vigorously recommend it in The Review, but in October 1706 he was sent on a political mission to Scotland by Godolphin, to whom Harley had recommended him. He resided in Edinburgh for nearly sixteen months, and luis services to the Government were rewarded by a regular salary. He seems to have devoted himself to commercial and literary as well as to political matters, and prepared at this time his elaborate //istory of the Union, which appeared in 1709. In this latter year occurred the famous Sacheverel sermon, and Defoe wrote several tracts on the occasion. In 1710 Harley returned to power, and Defoe was placed in a somewhat awkward position. To Harley himself he was bound

by gratitude and by a substantial agreement in principle, but with the rest of the Tory ministry he had no sympathy. He seems, in fact, to have agreed with the foreign policy of the Tories and with the home policy of the Whigs, and naturally incurred the reproach of time-serving aud the hearty abuse of both parties. At the end of 1710 he again visited Scotland. In the negotiations concerning the Peace of Utrecht, Defoe strongly supported the ministerial side, to the intense wrath of the Whigs, and this wrath was displayed in an attempted prosecution against some pamphlets of his on the all-important question of the succession, but the influence of Harley saved him, He continued, how- ever, to take the side of the dissenters in the questions affecting religious liberty, which played such a prominent part towards the close of Anne's reign. He naturally shared Harley's downfall ; and, though the loss of his salary might seem a poor reward for his constant support of the ITanoverian claim, it was little more than his ambiguous, not to say trimming, position must have led him to expect. He was violently attacked on all sides, and at last published in 1715 an apologia entitled An Appeal to Honour and Justice, in which he defends his political conduct, and which furnishes us with the main authority for the details of his life. With this publication his political work was formerly supposed to lave ended ; but in 1864 six letters were discovered in the Record Office from Defoe to a Government official, Mr Delafaye, which established the fact that in 1718 at least Defoe was doing not only political work, but political work of a somewhat equivocal kind— that he was, in fact, sub-editing the Jacobite Mist's Journal, under a secret agreement with the Government that he should tone down the sentiments and omit objectionable items. He seems to have performed the same not very honourable office in the case of two other journals— Dormer's Setter and the Mercurius Politicus ; and, if we may trust Mr Lee, he wrote in these and other papers till nearly the end of his life.

However this may be, the interest of Defoe's life from this time forward is very far from political, He was now # man of fifty-five years of age ; he had, up to this period, written nothing but what may be called occasional litera- ture, and, except the History of the Union and Jure Divino, nothing of any great length. In 1715 appeared the first volume of The Family Instructor, which was subsequently continued, and which was very popular during the last century. Three years afterwards came forth the first

published on the 25th of April 1719.

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The first edition of this was It ran through four editions in as many months, and then in August appeared the second part ‘Twelve months afterwards the third part, or Serious Leflections, appeared. This last part is now hardly ever reprinted. Its connection, indeed, with the two former is little more than nominal, Crusoe being simply made the mouth-piece of Defve’s sentiments on various points of morals and religion. Meanwhile the first two parts were reprinted as a fewilleton in Heathcote’s In- telligencer, perhaps the earliest instance of the appearance of such a work in such a form. Crusoe was immediately popular, and various wild stories were set afloat of its having been written by Lord Oxford in the Tower, and of its being simply a piratical utilization of Alexander Selkirk’s papers. It is sufficient to say that all such stories are not: only intrinsically of the wildest improbability, but also possess not a tittle of evidence in their favour. A curious idea, recently revived by the late Mr H. Kingsley, is that the adventures of Robinson are allegorical and relate to Defoe’s own life. This idea was certainly entertained to some extent at the time, and derives some colour of justifi- cation from words of Defoe’s, but there seems to be no serious foundation for it. The book was almost immediately imitated ; of such imitations Philip Quarll is the only one now known even by name. Contemporaneonsly with the later parts of Crusoe appeared The Dumb Philosopher, or Dickory Cronke. It is a short and rather dull book, of something the same typeas the Serious Reflections. .

In 1720cameforth The Life and Adventures of Mr Duncan Campbell. This, unlike the two former, was not entirely a work of imagination, inasmuch as its hero, the fortune-teller, was a real person. There are amusing passages in the story, but it is too desultory to rank with Defoe’s best. In the same prolific year appeared two wholly or partially fictitious histories, each of which might have made a repu- tation for any man. ‘The first was the famous Dfemoirs of a Cavalier, which, as has been often repeated, Lord Chatham believed to be true history, and which Mr Lee believes to be the embodiment at least of authentic private memoirs. It is more probable, however, that Defoe, with his extensive acquaintance with recent English

history, and his astonishing power of working up details, was fully equal to the task of its unassisted composition. As a model of luistorical work of a certain kind it is hardly surpassable, and many separate passages—accounts of battles and skir- mishes—have never been equalled except by Mr Carlyle. Captain Singleton, the last work of the year, has been un- justly depreciated by most of the commentators. The record of the journey across Africa, with its surprising anticipations of recent discoveries (anticipations which were commented on by Dr Birdwood in a paper read before the Bombay Branch of the Royal Asiatic Society in 1863, and which are probably due to Defoe's intercourse with Portugal) yields in interest to no work of thé kind known to us; and the semi-piratical Quaker who accompanies Singleton in his buccaneering expeditions is a character thoroughly deserving of life. It may be mentioned that there is also a Quaker who plays a very creditable part in Roxana, and that Defoe seems to have been well affected to the Friends. In estimating this wonderful productiveness on the part of a man sixty years old, it should be remembered that it was a habit of Defoe's to keep his works in manuscript some- times for long periods.

In 1721 nothing of importance was produced, but in the next twelvemonth three capital works appeared. These were The Fortunes and Mésfortunes of Moll Flanders, The Journal of the Plague Year, and The History of Colonel Jack, Moll Flanders (as a whole) may be placed next to Robinson Crusoe in order of merit, or bracketted for

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that position with the somewhat similar Roxana. Both are triumphs of novel-writing. Both have subjects of a rather more than questionable character, but both display the remarkable art with which Defoe handles such subjects. It is not true, as is sometimes said, that the difference of the two is the difference between gross and polished vice. The real difference is much more one of morals than of manners. Moll is by no means of the lowest class. Notwithstanding the greater degradation into which she falls, and her originally dependent position, she has been well educated, and has consorted with persons of gentle birth. She displays throughout much

greater real refinement of feeling than the more high-flying Roxana, and is at any rate flesh and blood, if the flesh be somewhat frail and the blood somewhat hot. Neither of the two heroines has any but the rudiments of a moral sense ; but Roxana, both in her original transgression and in her sub- sequent conduct, is actuated merely by avarice and selfish- ness—vices which are peculiarly offensive in connection with her other failing, and which make her thoroughly repulsive. The art of both stories is great, and as regards the episode in Roxana of the daughter Susannah is con- summate; but the transitions of the later plot are less natural than those in Moll Flanders. It is only fair to notice that while the latter, according to Defoe's more usual practice, is allowed to repent and cnd happily, Roxana is brought to complete misery; Defoe's morality, therefore, required more repulsiveness in one case than in the other. Zhe Journal of the Plague Year, more usually called, from the title of the second edition, A Hvstory of the Plague, has perhaps lacked less of its due meed of admiration than any of its author's minor works. Here also the accuracy and apparent veracity of the details is so great that many persons have taken it for an authentic record, while others have contended for the existence of such a record as its basis. But it appears that here too the genius of Mrs Veal's creator must, in the absence of all evi- dence to the contrary, be allowed sufficient for the task. The History of Colonel Jack is an unequal book. There is hardly iu Lobenson Crusoe a scene equal, and there is con- sequently not in English literature a scene superior, to that praised by Lamb, and extracted in Knight's Half Hours with the Best Authors,—the scene where the youthful pick- pocket first exercises his trade, and then for a time loses his ill-gotten (though for his part he knows not the meaning of the word ill-gotten) gains. But great part of the book, and especially the latter portion, is dull; and in fact it may be generally remarked of Defoe that the conclusions of his tales are not equal to the beginning, perhaps from the restless indefatigability with which he undertook one work almost before finishing another. Rowana, or the Fortunate Mistress, already commented on, appeared in 1724; and in the same year came forth the first volume of A Zour through the whole Island of Great Britain, which was completed in the two following years. Much of the in- formation in this was derived from personal experience, for Defoe claims to have made many more tours and visits about England than those of which we have record; but the major part must necessarily have been dexterous cumpila- tion. In 1725 appeared A

New Voyage round the World, apparently entirely due to the author's own fertile imagina- tion and extensive reading. It is full of his peculiar verisimilitude, and has all the interest of Anson's or Dampier's voyages, together with a charm of style superior even to that of the latter, and far beyond anything which the sot-disant chaplain of the " Centurion" could attain to. The journey by land across South America is of especial interest, and forms an admirable pendant to the African travels in Szngleton. In the same year Defoe wrote a curious little pamphlet entitled Hveryhody's Business ts

Nobody's Business, or Private Abuses Public Grievances, eremplified in the Pride, Insolence, and Exorlitant Wages of our Women-Servants, Footmen, &c. This subject was a very favourite one with Defoe, and in the pamphlet he showed the immaturity of his political views by advocat- ing legislative interference in these matters. Like all his work of this sort, however, it is extremely amusing reading. Towards the end of this same year Zhe Complete English Tradesman, which may be supposed to sum up the ex- perience of his business life, appeared, and its second volume followed two years afterwards, This book has been variously judged. Itis generally and traditionally praised, but those who have read it will be more disposed to agree with Charles Lamb, who considers it "' of a vile and debas- ing tendency," and thinks it 'almost impossible to suppose the author in earnest." It is certainly clear to those who know it what our foreign critics mean by the reproach of " shop-keeping ;" and the intolerable meanness advocated for the sake of the paltriest gains, the entire ignoring of any pursuit in life except money-getting, and the repre- setation of the whole duty of man as consisting first in the attainment of a competent fortune, and next, when that for- tune has been attained, in spending not more than half of it, are certainly repulsive enough. But there are no reasons for thinking the performance ironical or insincere, and it cannot be doubted that Defoe would have been honestly unable even to understand Lamb's indignation. In 1706 came forth The Political History of the Devil. This is a curious book, partly explanatory of Defoe's ideas on mo- rality, and partly belonging to a series of demonological works which he wrote, and of which the chief others are A System of Magic, and An Essay on the History of Apparitions.

In all these works his treatment is on the whole rational and sensible ; but in Ze History of the Devil he is somewhat hampered by an insufficiently worked-out theory as to the nature and personal existence of his hero, and the manner in which he handles the subject is an odd aud not altogether satisfactory mixture of irony and earnest- ness. ‘There are many very amusing things in the book, but to speak of its “extraordinary brilliancy and wit” (as Mr H. Kingsley has done) is certainly inappropriate. The works which have just been mentioned, together with A Plan of English Commerce, containing very enlightened views on export trade, appeared in 1727-8. During the whole of the years from 1715 to 1728 Defoe had issued pamphlets and minor works far too numerous to mention. The only one of them perhaps which requires special notice is Leligious Courtship (1722), a curious series of dialogues displaying Defoe’s unaffected religiosity, and at the same time the rather meddling intrusiveness with which he applied his re- ligious notious. This latter point was more flagrantly illustrated in one of his latest works, Zhe Tveatise con- cerning the Use and Abuse of the Marriage Bed (1727). This, which was originally issued with a much more offen sive name, has been called “ an excellent book with an improper title.” It might more properly be called an ill- judged work, with a title which gives fair warning of its contents. Zhe Memoirs of Captain Carleton (1728) have been long attributed to Defoe. There is, however, a well-known anecdote of Johnson which makes this extremely unlikely ; it is now known that an actual officer of the name did exist and serve ; and the internal evidence is, we think, strongly against Defoe’s authorship. These Aemoirs have been also attributed to Swift, with greater probability as far as style is concerned. Zhe Life of Mother Ross, re- printed in Bohn’s edition of Defoe, has no claim whatever to be considered his,

There is little to be said of Defoe’s private life during this period. He must in some way or other have obtained aconsiderableincome. In 1724 lhe had built himself a large

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house at Stoke Newington (only pulled down about ten | years ago), which had stables and grounds of considerable size, From the negotiations for the marriage of his daughter Sophia it appears that he had landed property in imore than oue place, and he had obtained on lease in 1722 a cousiderable estate from the corporation of Colchester. It was formerly thought that he soon got rid of this lease, but from documents in Mr Lee's possession it seems that he only effected a mortgage upon it (afterwards paid off), and that it wassettled on his unmarried daughter at his death. Other property was similariy allotted to his widow aud remaining children, though some difficulty seems to have arisen from the misconduct of his son, to whom, for some purpose, the property was assigned during his father's life- time, and who refused to pay what was due. There is a good deal of mystery about the end of Defoe's life ;_it used to be said thathe died insolvent, and thathe had been in jail shortly before his death. Asa matter of fact, after great suffcring from gout and stone, he died of a lethargy in Ropemaker's Alley, Moorfields, on Monday the 6th of April 1731, and was buried in the well-known ground of Bunhill Fields. He left no will, all his property having beeu previously assigned, and letters of administration were taken out by a creditor. How his affairs fell into this condition, why he did not die in his own house, aud why in the previous summer he had been in hiding, as we know he was from a letter still extant, are points appareutly not to be cleared up.

Defoe was twice married, aud his second wife Susannah outlived him a few months. He had seven children, one of whom, Martha, died in 1707---the others survived hin. The eldest, Daniel, emigrated to Carolina. The sccond, Bernard or Benjamin Norton, has, like his father, a scandalous niche in the Dunciad. Three of the daughters, Maria, Henrietta, and Sophia, marricd well—the husband of the last-named being a Mr Henry Baker, of some repute in natural science. In April 1877 public attention was called to the existence, in some distress, of threc maiden ladies, directly descended from Defoe, and bearing his name ; and a crown pension of £75 a year was

bestowed on each of them. There are several portraits of Defoe, the principal one being engraved by Vandergucht.

We have said that in his life-tiine Defoe, as not belonging to either of the great parties at a time of the bitterest party strife, was subjected to obloquy on both sides. The great Whig writers leave him unnoticed. Swift and Gay speek slightingly of him,—the former, it is true, at a time when he was only known as a party pamphleteer. Pope, with less excuse, put him in the Dunciad towards the end of his life, but he confessed to Spence in private that Defoe had written many things and none bad. Ata later period he was unjustly described as “a scurrilous party writer,” which he certainly was not; but, on the other hand, Johnsou spoke of his writing “so variously and so well,” and put Robinson Crusoe among the only three books that readers wish longer. From Scott downwards the tendency to judge literary work on its own merits has to a great extent restored Defoe to his proper place, or, to speak more correctly, has set him there for the first time. Lord Macaulay’s description of toxana, Moll Flanders, and Colonel Jack as “ utterly nauseous and wretched” must be set aside as a freak of criticism.

The grounds upon which the last-mentioned writer bases his depreciation of others of Defoe’s minor works are curious. ‘“ He had undoubtedly a knack of making fiction look like truth, but is such a knack much to be desired ? Is it not of the samc sort as the knack of a painter who takes in the birds with his fruit? And De Quiucey regards the literary skill of writcrs of this class as comparatively inferior because of the close resemblance of their writings

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nothing is really a greater triumph of art than this

j similarity, aud Macaulay has certainly made a mistake in

confounding the requirements of painting and of writing. Scott justly observed that Defoe’s style “is the last which should be attempted by a writer of inferior genius; for though it be possible to disguise niediocrity by fiue writing, it appears in all its naked inanity when it assumes the garb of simplicity.” The methods by which Defoe attains his result are not difficult to disengage. They are the preseut- ment of all his ideas and scenes in the

plainest and most direct language, the frequent employment of colloquial forms of speech, the constant insertion of little material details and illustrations, ofteu of a more or less digressive form, and, in his historico-fictitious works, as well as in his novels, the most rigid attention to vivacity and consistency of character. Plot he disregards, and he is fond of throw- ing his dialogues into regular dramatic form, with bye-play prescribed and stage directions interspersed.

The character of Defoe, both mental and moral, is very clearly indicated in his works. He, the satirist of the true- born Englishman, was himself a model, with some notable variatious and improvements, of the Englishman of his period. He sawa great many things, and what he did see he saw clearly. But there were also a great many things which he did not see, and there was often no logical con- ucction whatever between his vision and his blindness.

| The most curious example of this inconsistency, or rather

of this indifference to general principle, occurs in his Lssay on Projects. He there speaks very briefly and slightingly of life-insurance, probably because it was then regarded as impious by religionists of his complexion. But on either side of this refusal are to be found elaborate projects of friendly societies and widows' funds, which practically cover, in a clumsy and roundabout manner, the whole ground of life-insurance. In morals it is evident that he was, accord- ing to his lights, a strictly honest and honourable man. But sentiment of any high-flying description (to usc the cant word of his time) was quite incomprehensible to him, or rather never presented itself as a thing to be compre- hended. He tells us with honest and simple pride that when his patron Harley fell out, and Godolphin came in, he for three years held no communication with the former, and seems quite incapable of comprehending the delicacy which would have obliged him to follow Harley's fallen fortunes. His very anomalous position in regard to Mist is also indicative of a rather blunt moral perception. One of the most affecting things in his novels is the heroic con- stancy and fidelity of the maid Amy to her exemplary mistress Roxana. But Amy, scarcely by her own fault, is drawn into certain breaches of certain definite moral laws which Defoe did understand, and she is therefore con- demned, with hardly

a word of pity, to a miserable end. Nothing heroic or romantic was within Defoe's view; he could not understand passionate love, ideal loyalty, sesthctic adniiration, or anything of the kind; and it is probable that many of the little sordid touches which delight us by their apparent satire were, as designed, not satire at all, but merely a faithful representation of the feelings and ideas of the classes of which he himself was a unit. We have noticed Charles Lamb's difficulty as to The Complete Tradesman, and we think that the explanation we have

to the current speech and manner of their day. But! preferred will extend to a great deal more of his work,

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Biogra- phies.

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Some peculiarities of that work follow as a natural corollary His political and economical pamphlets are almost unmatched as clear presentations of For driving the nail home no one but Swift excels him, and Swift perhaps only in Zhe There is often a great deal to be said against the view presented in those pamphlets, but Defoe He was perfectly fair but perfectly one-sided, being generally happily ignorant of everything

from those considerations. the views of their writer. Drapier's Letters. sees nothing of it.

which told against his own view.

The same characteristics are curiously illustrated in his

moral works. its downright positive character.

The morality of these is almost amusing in With all the Puritan

eagerness to push a clear, uncompromising, Scripture-based

distinction of right and wrong into the affairs of every-day life, he has a thoroughly English horror of casuistry, and

his clumsy canons consequently make wild work with the

infinite intricacies of human nature. We have noticed, in

remarking on Zhe Use and Abuse, the worst instance of

this blundering morality. Another, though very different instance, is his amusingly feminine indignation at the in- creased wages and emibellished dress of servants. He is, in fact, an incarnate instance of the tendency, which has so often been remarked by other nations in the English, to drag in moral distinctions at every turn, and to confound everything which is novel to the experience, unpleasant to

the taste, and incomprehensible to the understanding, under the general epithets of wrong, wicked, and shocking. His

works of this class therefore are now the least valuable, thongh not the least curious, of his books. His periodical publications necessarily fall to some extent under the two foregoing heads, and only deserve separate notice because of the novelty and importance of their conception. His poetry, as poetry, is altogether beneath criticism. It is sometimes vigorous, but its vigour is merely that of prose. Of his novels we have already spoken in detail, excepting, as universally known, Robinson Crusoe.

The earliest regular life and estimate of Defoe is that of Dr Towers in the Biographia Britannica. Chalmers's Life, however (1786), added very considerable information. In 1838 Mr Walter Wilson wrote the book which is the standard on the subject. It is eoloured by political prejudice ; it does not display any critical

ower of a high order ; and it is in many parts rather a history of

ngland with some relation to Defoe than a life of the latter ; but it is a model of painstaking care, and by its abundant citations from works both of Defoe and of others, which are practically inaccessible to the general reader, is

invaluable. In 1859 appeared a life of Defoe by Mr William Chadwick, an extraordinary rhap- sody in a style which is half Cobbett and half Carlyle, but amusing, and by no means devoid of acuteness. In 1864 the diseovery of the six letters stirred up Mr William Lee to a new investigation, and the results of this were published (London, 1869) in three large volumes. The first of these (well illustrated) contains a new life and particulars of the author's discoveries. The second and third contain fugitive writings assigned by Mr Lee to Defoe for the first time. For most of these, however, we have no authority but Mr Lee's own impressions of style, &c.; and con- sequently, though qualified judges will in most cases agree that Defoe may have written them, it cannot positively be stated that he did. Mr Lee is equally ehary of his reasons for attributing and denying many larger works to his author. His work, though full of research and in many ways useful in correcting and enlarg- ing previous accounts of Defoe, has therefore to be used with some caution. Besides these publications devoted exelusively to Defoe, there are others of the essay kind which may be consulted respecting him. Such articles have been written by Scott, Hazlitt, Forster, a writer in The Retrospective Review, Mr Leslie Stephen, and others. No criticisms can, however, compare with three short ieces by Charles Lamb, two of which were written for Wilson's isi. and the third for The Reflector.

It has been a frequent and well-grounded complaint that no complete edition of Defoe's works has ever been published. There is, as may be gathered from what has already been said, considerable uncertainty about many of them; and even if all eontested works be excluded, the number is still enormous. Besides the list in Bohn's Zowndes, which is somewhat of an omnium gatherum, three lists drawn with more or less

eare have been compiled in the last half century. Wilson's con- tains 210 distinct works, three or four only of which are marked as doubtful; Hazlitt's enumerates 183 ''genuine" and 52 ''at- tributed" pieces, with notes on most of them; Mr Lee's extends to 254, of which 64 claim to be uew additions. Of these large numbers many are in the original editions, extremely scarce, if not unique. Only one perfect copy of the Review is known to exist, and this, as well as the partially printed but never published Complete

Gentleman, isin the hands of Mr James Crossley of Manchester, whose Defoe collection is nearest to completeness. Of reprints only one has ever aspired to be exhaustive. This was edited for the ‘‘Pulteney Library” by Hazlitt in 1840-43. It contains a good and full life mainly derived from Wilson, the whole of the novels (including the Serious Reflections now hardly ever published with Robinson Crusoe), Jure Divino, The Use and Abuse of Marriage, and many of the more important tracts and smaller works. The introductions are not written on a very uniform prineiple, but it is otherwise an excellent edition, and had it been continued (it stopped abruptly after the third volume had been completed and a few parts of a fourth issued) would have been satisfactory enough. It is still far the best, but is unfortunately scaree and expensive. There is also aun edition, often called Scott’s, but really edited by Sir G. C. Lewis, in twenty volumes (London, 1841). This contains the Complete Tradesman, Religious Courtship, The Consolidator, and other works not comprised in Hazlitt’s, but is correspondingly deficient. It also is somewhat expensive in a complete state, and the editions chosen for reprinting are not always the best. Scott had previously in 1809 edited for Ballantyne some of the novels, in 12 vols. Bohn’s libraries contain an edition which through want of support was stopped at the seventh volume. It ineludes the novels (except the third part of Robinson Crusoe), The History of the Devil, The Storm, and a few political pamphlets, also the undoubtedly spurious Mother Ross. In 1870 Mr Nimmo of Edin- burgh published in one volume an admirable selection from Defoe. 1t eontains Chalmers’s Life, annotated and completed from Wilson and Lee, Robinson Crusoe, pts. i. and ii., Colonel Jacek, The Cavalier, Duncan Campbell, The Plague, Everybody’s Business, Mrs Veal, The Shortest Way with Dissenters, Giving Alms no Charity, The True-born Englishman, Hymn to the Pillory, and very copious extracts from The Complete English Tradesman. Had the space oceupied by Robinson Crusoe, which in one form or another every one possesses, been devoted to a further selection from the minor works, this book would have gone far to supply a very fair idea of Defoe to all but professed students of literature. If we turn to separate works, the bibliography of Defoe is practically confined (except as far as original editions are concerned) to Robinson Crusoe. Mrs Veal has been to some extent popularized by the work which it helped to sell; Religious Courtship and The Family Instruetor had a vogue among the middle class until well into this century, and The History of the Union was

republished in 1786. But the reprints and editions of Crusoe have been innumerable ; it has been often translated ; and the eulogy pronounced on it by Rousseau gave it special currency in Franee, where imitations (or rather adap- tations) have also been common. (G. SA.)

DE GERANDO, Marte Josrrn (1772-1842), one of the most distinguished ethical and metaphysical philo- sophers of France, was born at Lyons, February 29, Lire: When that city was besieged in 1793 by the armies of the republic, the young De Gérando took up arms in defence of his native place, was made prisoner, and with difficulty escaped with hislife. He first took refuge in Switzerland, whence he afterwards fled to Naples. In 1796, after an exile of three years, the establishment of the Directory allowed him to return to France. Finding himself, at the age of twenty-five, without a profession, he resolved to embrace the career of arms, and enlisted as a private in a cavalry regiment. About this time the Institute had pro- posed as a subject for an essay this question,—“ What is the influence of symbols on the faculty of thought?” De Gérando gained the prize, and heard of his success after the battle of Zurich, in which he had distinguished himself. This literary triumph was the first step in his upward career. In 1799 he was attached to the ministry of tbe interior by Lucien Bonaparte ; in 1804 he became general secretary under Champagny; in 1805 he accompanied Napoleon into Italy ; in 1808 he was nominated master of requests ; in 1811 he received the title of councillor of state ; and in the following year he was appointed governor of Catalonia. On the overthrow of the empire, De Gérando

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was allowed to retain this office; but having been sent during the hundred days into the department of the Moselle to organize tne defence of that district, he was punished at the second Restoration by a few months of neglect. He was soon after, however, readmitted into the council of state, where he distinguished himself by the prudence and conciliatory tendency of his views. In 1819 he opened at the law-school of Paris a class of public and administrative law, which in 1822 was suppressed by Government, but was re-opened six years later under the Martignac ministry. In 1837 the Government acknowledged the long and important services which De

Gérando had rendered to his country by raising him to the peerage. He died in Paris, November 9, 1842, at the age of seventy.

De Gérando's works are very numerous. That by which he is best known now, and which constitutes his chief title to posthumous fame, is his Histovre Comparée des Systemes de Philosophie rélutivement aux principes des Connaissances Humaines, of which the first edition appeared at Paris in 1804, in 3 vols. 8vo. The germ of this work had already appeared in the author's Jémoire de la Génération des Connaissances Humaines, crowned by the Academy of Berlin, and published at Berlin in 1802. In this work De Gérando, after a rapid review of ancient and modern speculations on the origin of our ideas, singles out the theory of primary ideas, which he endeavours to combat under ail its forms. The latter half of the work, devoted to the analysis of the intellectual faculties, is intended to show how all human knowledge is the result of experience ; and reflection is assumed as the source of onr ideas of substance, of unity, and of identity.

De Gérando's great work is divided into two parts, the first of which is purely historical, and devoted to an ex- position of various philosophical systems ; in the second, which comprises fourteen chapters of the entire work, the distinctive characters and value of these systems are com- pared and discussed. Great fault has been found with this plan, and justly, as it is impossible to separate advantageously the history and critical examination of any doctrine in the arbitrary manner which De Gérando has chosen for himself. Despite this disadvantage, however, the work has great merits. It brought back the minds of men to a due veneration for the great names in _philo- sophical science,—a point which had been utterly neglected by Condillac and his school. In correctness of detail and comprehensiveness of view it was greatly superior to every work of the same kind that had hitherto appeared in France. During the Empire and the first years of the Restoration, De Gérando found time, despite his political avocations, to recast the first edition of his Histoire Comparée, of which a second edition appeared at Paris in 1823, in 4 vols. 8vo. The plan and method of this edition are the same as in the first ; but it is enriched with so many additions that it may pass for an entirely new work. The last chapter of the part | published during the author's lifetime ends with the revival | of letters and the philosophy of the 15th century. The second part, carrying the work

down to the close of the | 18th century, was published posthumously by his son in | fonr vols. (Paris, 1847). Twenty-three chapters of this | had been left complete by the author in manuscript ; |

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the remaining three were supplied from other sources, chiefly printed but unpublished memoirs.

The next valuable work of De Gérando was his essay Du. perfectionnement moral et ’éducation de sot-méme, crowned by the French Academy in 1825. The fundamental idea | of this work is that human life is in reality only a great education, of which perfection is the aim.

Besides the works already mentioned, De Gérando left many j others, of which we may indicate the following :—Considérations sur diverses méthodes d’observation des peuples swuvages, 8vo, Paris, 1801 ;

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Eloge de Dumarsais,—diseours quia remporté le prix proposé par la seconde elasse de IU Institut National, 8vo, Paris, 1805; Le Visiteur du pauvre, 8vo, Paris, 1820 ; Institutes du Droit Adminisiratif, 4 vols. 8vo, Paris, 1830 ; Cours normal des institutewrs primatres ow Directions rélatives a Pédueation physique, morale, et intelleetuelle dans les écoles primaires, 8vo, Paris, 1832; De Pédueation des Sourds-Muets, 2 vols. Paris, 18382 ; De la Bienfaisance publique, 4 vols. Svo, 1838. A detailed analysis of the Histoire Comparée des Systimes will be found in the Fragments Philosophiques of M. Cousin.

DEGGENDORF, or DEckEnporr, the chief town of a district in Lower Bavaria, about 25 miles north-west of Passau, on the left bank of the Danube, which is there crossed by two iron bridges. It is situated at the lower end of the beautiful valley of the Perlbach, with the mountains of the Bavarian Forest rising behind; and in itself it is a well-built and attractive town. Besides the administrative offices it possesses an old council-house

dating from 1566, a hospital, a lunatic asylum, an orphanage, a poor-house, and a large parish church rebuilt in 1756; but of greater interest than any of these is the Church of the Sacred Tomb, which for centuries attracted thousands of pilgrims to its Porta Ocli, Gnadenpforte, or Gate of Mercy, opened annually on St Michael's Eve, near the end of September, and closed again on the 4th of October. In 1837, on the celebration of the 500th anniversary of this solemnity, the number of pilgrims was reckoned at nearly 100,000. Such importance as the town possesses is now rather commercial than religious,—it being the main depdt for the timber-trade of the Bavarian Forest, a station for the Danube steamboat company, and the seat of several mills, breweries, potteries, and other industrial establishments. On the bank of the Danube, outside the town, are the remains of the castle of Findelstein ; and on the Geiersberg, in the immediate vicinity, stands the old pilgrimage-church of J/aree Dolores, About six miles to the north is the village of Metten, with the Benedictine monastery founded by Charlemagne in 801, restored as an abbey in 1840 by Louis I. of Bavaria, and well-known for its educational institutions, The first men- tion of Deggendorf occurs in 868, and it appears as a town in 1212. Henry XIII. of the Landshut dynasty made it the seat of a custom-house; and in 1331 it became thie residence of Henry III. of Natternberg, so called from a castle in the neighbourhood. In 1337 there took place in the towna dreadful massacre of the Jews, who were accused of having thrown the sacred host of the Church of the Sacred Tomb into a well; and it is probably from about this date that the pilgrimage above mentioned came into vogne. The town was captured by the Swedish forces in 1633, and in the war of the Austrian succession it was more than once laid in ashes. Population in 1871, 5452.

See Griiber and Miiller, Der Bayerische Wald, Ratisbon, 1851 ;

Mittermitiller, Die heil. Hostien wnd die Juden in Deggendorf, Landshut, 1866 ; and Das Kloster Metten, Straubing, 1857.

DEHRA DUN, a district of British India in the Meernt (Mirat) division of the lieutenant-governorship of the North- Western Provinces, lies between 29° 57' and 30° 59' N. lat., and 77° 37' 15" and 78° 22' 45" E. long. It com- prises the valley (din) of Dehra, together with the hills division

(pargand) of Jaunsaér Bawar, which runs from §.E. to N.W. of it, on the north. The district is bounded on the N. by the native state of Tehri or Garhwal, on the E. by British Garhwal, on the S. by the Siwdlik hills, which separate it from Saharanpur district, and on the W. by the hill states of Sirmur, Jubol, and Tarénch. The valley (the Den) has an area of about 673 square miles, and forms a parallelogram 45 miles from N.W. to 8.E. and 15 miles broad. It is well wooded, undulating, and intersected by streams. On the N.E. the horizon is bounded by the Mussooree (Manstri) or lower range of the Himalayas, and on the §. by the Siwdlik hills. The Himalayas in the north

of the district attain a height of between 7000 and 8000 feet, one peak reaching an elevation of 8565 feet; the highest point of the Siwalik range is 3041 above sea-level. The principal passes through the Siwalik hills are the Timli pass, leading to the military station of Chakrata, and the Mohand pass lcading to the sanatoriums of Mussooree and Laudaur. The Ganges bounds the Dehra valley on the E.; the Jumna bounds it on the W. From a point about midway between the two rivers, and near the town of Dehra, runs a ridge which forms the water-shed of the valley. To the west of this ridge, the water collects to form the Asan, a tributary of the Jumna ; whilst to the east the Suswa receives the drainage and flows into the Ganges. To the east the valley is characterized by swamps and forests, but to the west the natural depressions freely carry off the surface drainage. Along the central ridge, the water- level lies at a great depth from the surface (228 feet), but it rises gradually as the country declines towards the great rivers. To meet the demand for water five canals have been constructed, and are fed by the hill streams. These canals have a total leugth of 67 miles, irrigate about 10,734 acres, and yield a net annual revenue of about £2300. Jaunsdr BAwar, north of the valley, comprises a triangular hilly tract, situated between the Tons and Jumna rivers near their point of confluence, and has an area of about 343 square miles. It is covered with forests of deodars, firs, cypresses, and oaks.

The agricultural products consist of rice, mandua (Hleusine corocana), oil seeds, millets, vegctables, and garden crops, such as potatoes, turmeric, red

pepper, &c. The method of cultivation in the valley does not differ from that alopted in the plains; but in Jaunsar, the khil or jum system of cultivation is largely practised. This consists in clearing and burning the undergrowth on the steep banks of ravines and hills, and in sprinkling the seed, chiefly millets, over the ashes. The process yields a good crop for about two years, when the site is abandoned. The principal industries are tea planting and cultivation, rhea cultivation, and recently silk cultivation. The area under tea in 1872 was 2024 acres, yielding an out-turn of 297,828 tb, valued at £17,486.

The total revenue derived from Dehra district (exclusive of forests) in 1872-73 amounted to £19,169. Since 1872 the Dehra valley has been subject to the ordinary laws of other settled districts ; but in the hilly division of Jaunsdr a less formal code is better suited to the people, and this tract is still “non-regulation.” The fiscal arrangements of Jaunsar are also peculiar. The tract is divided into khats, each presided over by asayana, orhead-man. The sayanas engage with the Government for the payment of the land revenue, and exercise police and civil jurisdiction in their respective khats ; whilst a committee of sayanas, subject to the control of the British Superintendent of Dehra Dun, de- cide graver disputes affecting one or more khats. Education is progressing rapidly in the Dehra valley. Schools have also been established in Jaunsdr. Mussooree has Protestant diocesan schools for European boys and girls ; and similar institutions are managed by Roman Catholic priests for members of that faith. It likewise forms the head-quarters of an active American mission. ‘There is little crime in the district, and in Jauns4r no regular police are found necessary.

The principal places in the district are Dehra, Mussooree, with the military sanatarium of Landaur, and the military station of Chakrata. Dehra town is the civil head-quarters of the district, and is constituted a municipality. Tt con- tained (1872) a total population of about 7000 souls, (5000 Hindus, and 2000 Mahometans). The municipal income is mainly derived from a house tax. Dehra is the head- quarters of the 2d Gurkha regiment, and of the Great

portion of Mussooree.

belong to the spurious hill clans bearing these names. Mahometan population consists principally of Pathans and Shaikhs.

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Trigonometrical Survey. ‘The hill station of Mussoorec is a favourite summer resort. Its population varies according to the season of the year. During the wipter months it is almost entirely deserted. lLandaur, the military depot for European convalescents, is really a Chakrata is a hill station for a British regiment of infantry.

The census of 1872 returned the population of the entire district at 116,953 souls, of whom 102,814 were Hindus, 12,427 Mussul-

mans, 1061 Europeans, 191 Eurasians, and 460 native Christians. The Brahmans numbered 10,279, Rajputs or military caste 33,125,

Baniydés or traders 2664. The Brahmans and Rajputs ae ihe

DEISM is the received name for a curreut of theological thought which, though not confined to one country, or to any well-defined period, had England for its principal source, and was most conspicuous in the last years of the 17th and the first half of the 18th century. The deists, differing widely in important matters of belief, were yet agreed in seeking above all to establish the certainty and sufficiency of natural religion in opposition to the positive religions, and in tacitly or expressly denying the unique significance of a supernatural revelation in the Old and New Testaments. They either ignored the Scriptures, endeavoured to prove them in the main but a helpful republication of the Hvangelium eternum, or directly impugned their divine character, their infallibility, and the validity of their evidences as a complete manifestation of the will of God. The term deism is not only used to signify the main body of the deists’ teaching, or the tendency they represent, but has of late especially come into use as a technical term for one specific metaphysical doctrine as to the relation of God to the universe, assumed to have been characteristic of the deists, and to have distinguished them from atheists, pantheists, and thcists,—the belief, namely, that the first cause of the universe is a personal God, but

is not only distinct from the world but apart from it and its concerns.

The words deism and deist were treated as novelties in

the polemical theology of the latter half of the 16th century in France, but were uscd substantially in the same sense as

they were a century later in England. By the majority of

those historically known as the English Deists, from Blount onwards, the name was owned and honoured. They were

also occasionally called rationalists. Free-thinker (in Ger- many, freidenker) was generallytaken to be synonymous with deist, though obviously capable of a wider signification, and

as coincident with esprit fort, and with libertin in the original and theological sense of the latter word. Naturalists

was a name frequently used of such as recognized 10 god

but nature, of so-called Spinozists, atheists ; but both in

England and Germany, in the 18th century, this word was more commonly and aptly in use for those who founded their religion on the lumen nature alone. The same men were not seldom assaulted under the name of theists ; the later distinction between theist and deist, which stamped the latter word as excluding the belief in providence or in the immanence of God, was apparently formulated in the end of the 18th century by those rationalists who were aggrieved at being identified with the naturalists.

The chief names amongst the deists are those of Lord Herbert (1581-1648), Blount (1654-1693), Tindal (1657- 1733) Woolston (1669-1733), Toland (1670-1722), Shaftesbury (1671-1713) Bolingbroke (1 678-1751), Collins (1676-1729), Morgan (+1743), and_ Chubb (1679-1746). Annet, who died in 1768, and Dodwell who made his contribution to the controversy in 1742, are of less importance. Of the ten first named, nine appear to have

been born within twenty-five years of one another ; and it is noteworthy that by far the greater part of the

literary activity of the deists, as well as of their voluminous opponents, falls within the same half century.

The impulses that promoted a vein of thought cognate to deism were active both before and since the time of its greatest notoriety. But there are many reasons to show why, in the 17th century, men should have set themselves with a new zeal, in politics, law, and theology, to follow the light of ature alone, and to cast aside, to the utmost of their ability, the fetters of tradition and prescriptive right, of positive codes, aud scholastic systems, and why in England especially there should, amongst numerous free-thinkers, have been not a few free writers. The significance of the Copernican system, as the total overthrow of the traditional conception of the universe, dawned on all educated men. In physics, Descartes had prepared the way for the final triumph of the mechanical explanation of the world in Newton's system. In England the new philosophy had broken with time- honoured beliefs more completely than it had done even in France ; Hobbes was more startling than Bacon. Locke's philosophy, as well as his theology, served as a school for the deists. Men had become weary of Protestant scholas- ticism ; religious wars had made peaceful thinkers seek to take the edge off dogmatical rancour ; and the multiplicity of religious sects provoked distrust of the common basis on which all founded. There was a school of distinctively latitudinarian thought in the Church of England ; others not unnaturally thought it better to extend the realm of the adiaphora beyond the sphere of Protestant ritual or the details of systematic divinity. Arminianism had revived the rational side of theological method. Semi-Arians and Unitarians, though sufficiently distinguished from the free-thinkers by reverence for the letter of Scripture, might be held to encourage departure from the ancient landmarks. The scholarly labours of Huet, Simon, Dupin, and Cleri- cus, of Lightfoot, Spencer, and Prideaux, of Mill and Fell, furnished new materials for controversy ; and the scope of Spinoza's Zractatus Theologico-Politicus had naturally been much more

fully apprehended than ever his Ethica could be. The success of the English revolution permitted men to turn from the active side of political and theological controversy to speculation and theory; and curiosity was more powerful than faith. Much new fermeut was working. ‘The toleration and the free press of England gave it scope. Deism was one of the results.

A great part of the deistical teaching was the same from first to last ; but though deism cannot be said to have any marked logical development, it went through a sufficiently observable chronological growth.

Long ere England was ripe to welcome deistic thought, Lord Herbert earned the name “ Father of Deism” by laying down the main line of that religious philosophy which in various forms continued ever after to be the backbone of deistic systems. He based his theology on a comprehensive, if insufficient, survey of the nature, founda- tion, limits, and tests of human knowledge. And amongst the divinely implanted, original, indefeasible notitee com- munes of the human mind, he found as foremost his five articles :—that there is one supreme God, that he is to be worshipped, that worship consists chiefly of virtue and piety, that we must repent of our sins and cease from them, and that there are rewards and punishments here and here- after. These truths, though often clouded, are found in all religions and at all times, and are the essentials of any religion—their universal prevalence being, along with their immediacy, an unmistakable mark of their verity. Thus Herbert sought to do for the religion of nature what his friend Grotius was doing for natural law,—making a new application of the standard of Vincentius, Quod semper quod ubique, quod ab onmibus. ,

Herbert had hardly criticised the Christian revelation

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either as a whole or in its details. Blount, a man of a very different spirit, did both, and in so doing may be regarded as having inaugurated the second main line of deistic procedure, that of historico-critical examination of the Old and New ‘Testaments. Blount adopted and expanded Hobbes’s arguments against the Mosaic authorship of the Pentateuch ; and, mainly in the words of Burnet’s Archeo- logia Philosophica, he asserts the total inconsistency of the Mosaic Hexaemeron with the Copernican theory of the

heavens, dwelling with emphasis on the impossibility of admitting the view developed in Genesis, that the earth is the most important part of the universe. He assumes that the narrative was meant ethically, not physically, in order to eliminate false and polytheistic notions ; and he draws attention to that double narrative in Genesis which was elsewhere to be so fruitfully handled. The examin- ation of the miracles of Apollonius of Tyana, professedly founded on papers of Lord Herbert's, is meant to suggest similar considerations with regard to the miracles of Christ. Naturalistic explanations of some of these are proposed, and a mythical theory is distinctly foreshadowed when Blount dwells on the inevitable tendency of men, especially long after the event, to discover miracles attendant on the birth and death of their heroes. Blount assaults the doctrine of a mediator as irreligious ; and much more pronouncedly than Herbert he dwells on the view, afterwards regarded as a special characteristic of all deists, that much or most error in religion has been invented or knowingly maintained by sagacious men for the easier main- tenance of good government, or in the interests of themselves and their class.) And when he heaps suspicion, not on Christian dogmas, but on beliefs of which the resemblance to Christian tenets is sufficiently patent, the real aim is so transparent that his method seems to partake rather of the nature of literary eccentricity than of polemical artifice ; yet by this disingenuous indirectness he gave his argu- ment that savour of duplicity which ever after clung to the popular conception of deism.

Shaftesbury, dealing with matters for the most part different from those usually handled by the deists, stands almost wholly out of their ranks. But he showed how loosely he held the views he did not go out of his way to attack, and made it plain how little weight the letter of Scripture had for himself ; and, writing with much greater power than any of the deists, he was held to have done more than any one of them to forward the cause for which they wrought. Founding ethics on the native and cultivable capacity in men to appreciate worth in men and actions, and associating the apprehension of morality with the appre- hension of beauty, he makes morality wholly independent of scriptural enactment,and still more, of theological forecast- ing of future bliss oragony. He yet insisted on religion as the crown of virtue; and, arguing that religion is insepar- able from a high and holy enthusiasm for the divine plan of the universe, he sought the

root of religion in feeling, not in accurate beliefs or meritorious good works. The theology of those was of little account with him, he said, who in a system of dry and barren notions “ pay handsome compliments to the Deity,” “remove providence,” “ explode devotion,” and leave but “ little of zeal, affection, or warmth in what they call rational religion.” In the protest against the scheme of “judging truth by counting noses,” Shaftesbury recognized the danger of the standard which seemed to satisfy many deists; and in almost every respect he has more in common with those who afterwards, in Germany, annihilated the pretensions of complacent rationalism than with the rationalists themselves.

Toland, writing at first professedly without hostility to any of the received elements of the Christian faith, insisted that Christianity was not mysterious, and that the value of

religion could not lie in any unintelligible element ; though we cannot know the real essence of God or of any of his creatures, yet our beliefs about God must be thoroughly consistent with reason. Afterwards, Toland discussed, with considerable real learning and much show of candour, the comparative evidence for the canonical and apocryphal Scrip- tures, and denianded a careful and complete historical exami- nation of the grounds on which our acceptance of the New Testament canon rests. He contributed little to the solution of the problem, but forced the investigation of the canon alike on theologians and the reading public. Again, he sketched a view of early church history, further worked out by Semler, and surprisingly like that which, as elaborated by the Tiibingen school, is still held with modifications by a large number of students of Christian antiquity. He tried to show, both from Scripture and extra-canonical literature, that the primitive church, so far from being an incorporate body of believers with the same creed and customs, really consisted of two schools, each possessing its “own gospel ” —a school of Ebionites or Judaizing Christians, and the niore liberal school of Paul. These parties, consciously but amicably differing in their whole relation to the Jewish law and the outside world, were subsequently forced into a non-natural uniformity. The

cogency of Toland’s argu- ments was weakened by his manifest love of paradox.

Collins, who had created much excitement by his Discourse of Free-thinking, insisting on the value and necessity of unprejudiced inquiry, published at a later stage of the deistic controversy the famous argument on the evidences of Christianity. Christianity is founded on Judaism; its main prop is the argument from the fulfil- ment of prophecy. Yet no interpretation or re-arrangement of the text of Old Testament prophecies will secure a fair and non-allegorical correspondence between these and their alleged fulfilment in the New Testament. The inference is not expressly drawn. Collins indicates the possible extent to which the Jews may have been indebted to Chaldeans and Egyptians for their theological views, especially as great part of the Old Testament would appear to have been re-modelled by Ezra; and, after dwelling on the points in which the prophecies attributed to Daniel differ from all other Old Testament predictions, he states the greater number of the arguments still used to show that the book of Daniel deals with events past and contemporaneous, and is from the pen of a writer of the Maccabean period.

Woolston, at first to all appearance working earnestly in behalf of an allegorical but believing interpretation of the New Testament miracles, ended by assaulting, with a yet unknown violence of speech, the absurdity of accepting them as actual historical events, and did his best to over- throw the credibility of Christ’s principal miracles. The bitterness of his outspoken invective against the clergy, against all priestcraft and priesthood, was a new feature in deistic literature, and injured the author more than it furthered his cause.

Tindal’s aim seems to have been a sober statement of the whole case in favour of natural religion, with copious but moderately worded criticism of such beliefs and usages in the Christian and other religions as he conceived to be either non-religious or directly immoral and unwhole- some. The work in which he endeavoured to prove that true Christianity is as old as the creation, and is really but the republication of the gospel of nature, soon gained the name of the “ Deist’s Bible.”

Morgan criticised with great freedom the moral character of the persons and events of Old Testament history, developing the theory of conscious ‘“ accommodation ” on the part of the leaders of the Jewish church. This accommodation of truth, by altering the form and substauce

of it to meet the views and secure the favour of ignorant }

oo and bigoted contemporaries, Morgan attributes also to the apostles and to Jesus. He likewise expands at great length a theory of the origin of the Catholic Church much like that sketched by Toland, but assumes that Paul and his party, latterly at least, were distinctly hostile to the Judaical party of their fellow-believers in Jesus as the Messias, while the college of the original twelve apostles and their adherents viewed Paul and his followers with suspicion and disfavour. Persecution from without Morgan regards as the influence which mainly forced the antagonistic parties into the one- ness of the catholic and orthodox church.

Annet made it his special work to invalidate belief in the resurrection of Christ, and to discredit the work of Paul.

Chubb, the least learnedly educated of the deists, did more than any of them, save Herbert, to round his system into a logical whole. From the New Testament be sought to show that the teaching of Christ substantially coincides with natural religion as he understood it. But his main contention is that Christianity is not a doctrine but a life, not the reception of a system of truths or facts, but a pious effort to live in accordance with God’s will here, in the hope of joining him hereafter. Chubb dwells with special emphasis on the fact that Christ preached the gospel to the poor, and argues, as Tindal had done, that the gospel must therefore be accessible to all men without any need for learned study of evidences for miracles, and intelligible to the meanest capacity.

Dodwell’s ingenious thesis, that Christianity is not founded on argument, was certainly not meant as an aid to faith; and, though its starting-point is different from all other deistical works, it may safely be reckoned amongst their number.

Though himself contemporary with the earlier deists, Bolingbroke's principal works were posthumously published after interest in the controversy had declined. His whole strain, in sharp contrast to that of most of his predecessors, is cynical and satirical, and suggests that most of the matters discussed were of small personal concern to himself. He gives fullest scope to the ungenerous view that a vast proportion of professedly revealed truth was ingeniously palmed off by the more cunning on the more ignorant for the convenience of keeping the latter under. But he writes with keenness and wit, and knows well how to use the materials already often taken advantage of by earlier deists.

In the substance of what they received as natural religion, the deists were for the most part agreed ; Herbert's articles continued to contain the fundamentals of their theology. Religion, though not identified with morality, had its most important outcome in a faithful following of the eterual laws of morality, regarded as the will of God. With the virtuous life was further to be conjoined a humble disposi- tion to adore the Creator, avoiding all factitious forms of worship as worse than useless. The small value attributed to all outward and special forms of service, and the want of any sympathetic craving for the communion of saints, saved the deists from attempting to found a free-thinking church, a creedless communion. They seem generally to have inclined to a quietistic accommodation to established forms of faith, till better times came. They steadfastly sought to eliminate the miraculous from theological belief, and to expel from the system of religious truth all debat- able, difficult, or mysterious articles. They aimed at a rational and intelligible faith, professedly in order to make religion, in all its width and depth, the heritage of every man. They regarded with as much suspicion the notion of a " peculiar people" of God, as of a unique revelation, and insisted on the salvability of the heathen. They rejected the doctrine of the Trinity, and protested against mediatorship, atonement, and the imputed righte- ousness of Christ, always laying more stress on the teach-

ing of Christ than on the teaching of the church about him; but they repeatedly laid claim to the name of Christians or of Christian deists,

Against superstition, fanaticism, and priestcraft they were incessantly lifting up their testimony. They all recognized the soul of man —not regarded as intellectual alone—as the ultimate court of appeal. But they varied much in their attitude towards the Bible. Some were content to argue their own ideas into Scripture, and those they disliked out of it; to one or two it seemed a satisfaction to discover diffi- culties in Scripture, to point to historical inaccuracies and moral defects. Probably Chubb's position on this head is most fairly characteristic of deism. He holds that the narrative, especially of the New Testament, is in the main accurate, but, as written after the events narrated, has left room for misunderstandings and mistakes. The apostles were good men, to whom, after Christ, we are most indebted ; but they were fairly entitled to their own private opinions, and naturally introduced these into their writings. The epistles, according to Chubb, contain errors of fact, false interpretations of the Old Testament, and sometimes disfigurement of religious truth. Fortunately, however, the points on which the private opinions of apos- tolic men might naturally differ most widely, such as the doctrine of the Logos, are matters which have nothing to do with the salvation of souls,

The general tendency of the deistical writings is sufficiently self-consistent to justify a common name. But it is vain to speak of deism as a compact system, or to regard it as the outcome of any one line of philosophical thought. Of matters generally regarded as pertaining to natural religion, that on which they were least agreed was the certainty, philosophical demonstrability, and moral significance of the immortality of the soul, so that the deists have sometimes been grouped into "mortal" and "immortal" deists. For some the belief in future rewards and punish- ments was an essential of religion; some seem to have questioned the doctrine as a whole; and, while others made it a basis of morality, Shaftesbury protested against the ordinary theological form of the belief as immoral. No two thinkers could well be more opposed than Shaftesbury and Hobbes ; yet sometimes ideas from both were combined by the same writer. Collins was a pronounced necessitarian; Morgan regarded the denial of free will as tantamount to atheism. And nothing can be more misleading than to assume that the belief in a Creator, existent wholly apart from the work of his hands, was characteristic of the deists as a body. In none of them is any theory on the subject specially prominent ; save in their denial of miracles,

of supernatural revelation, and a special redemptive interposition of God in history, they seem to have thought of providence much as the mass of their opponents did, Herbert starts his chief theological work with the design of vindicating God's providence. Shaftes- bury vigorously protests against the notion of a wholly transcendent God. Morgan more than once expresses a theory that would now be pronounced one of immanence, Toland, the inventor of the name of pantheism, was noto- riously, for a great part of his life, in some sort a pantheist. And while as thinkers they diverged in their opinions, so too the deists differed radically from one another in their character, in reverence for their subject, and in religious earnestness and moral worth.

_ The deists were not powerful writers ; none of them was distinguished by wide and accurate scholarship ; hardly any was either a deep or comprehensive thinker. But though they generally had the best scholarship of England against them, they were bold, acute, well-informed men; they appreciated more fully than their contemporaries not a few truths now all but universally accepted ; and they

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seemed therefore entitled to leave their mark on subsequent theological thought. Yet while the seed they sowed was taking deep root in France and in Germany, the English deists, the most notable men of their time, were soon for- gotten, or at least ceased to be a prominent factor in the intellectual life of the century. The controversies they had provoked collapsed rather than were finally settled ; and deism became a by-word even amongst those who were in no degree anxious to appear as champions of ortho- doxy.

The fault was not wholly in the subjectivism of the movement. But the subjectivism that founded its theology on the ‘‘ common sense ” of the individual was accompanied by a fatal pseudo-universalism which, cutting away all that was peculiar, individual, and most intense in all religions, left in any one of them but a lifeless form. A theology consisting of a few vague generalities was sufficient to sustain the piety of the best of the deists; but it had not the concreteness or intensity necessary to take a firm hold on those whom it emancipated from the old beliefs. The negative side of deism came

to the front, and, communicated with fatal facility, seems ultimately to have constituted the deism that was commonly professed at the clubs of the wits and the tea-tables of polite society. But the intenser religious life before which deism fell was also a revolt against the abstract and argumentative ortho- doxy of the time.

That the deists appreciated fully the scope of difficulties in Christian theology and the sacred books is not their most noteworthy feature; but that they made a stand, sometimes cautiously, often with outspoken fearlessness, against the presupposition that the Bible is the religion of Protestants. They themselves gave way to another presup- position equally fatal to true historical research, though in great measure common to them and their opponents, It was assumed by deists in debating against the orthodox, as it is now by orthodox Protestants in contending against the Romish Church, that the flood of error in the hostile camp was due to the benevolent cunning or deliberate self- seeking of unscrupulous men, held to by the ignorant with the obstinacy of prejudice.

Yet deism deserves to be remembered as a strenuous pro- test against bibliolatry in every degree and against all traditionalism in theology. It sought to look not a few facts full in the face, from a new point of view and with a thoroughly modern, though unhistorical spirit. It was nota religious movement; and though, as a defiance of the accepted theology, its character was mainly theological, the deistical crusade belongs, not to the history of the church, or of dogma, but to the history of general culture, It was an attitude of mind, not a body of doctrine ; its nearest parallel is probably to be found in the eclectic strivings of the Renaissance philosophy and the modernizing tendencies of cisalpine humanism. The controversy was assumed to be against prejudice, ignor- ance, obscurantism ; what monks were to Erasmus the clergy as such were to Woolston. Yet English deism was in many ways characteristically English. The deists were, as usually happens with the leaders of English thought, no class of professional men, but represented every rank in the community. They made thcir appeal in the mother tongue to all men who could read and think, and sought to reduce the controversy to its most direct practical issue, making it turn as much as possible on hard facts or the data of common sense. And, with but one or two exceptions, they avoided wildness in their language as much as in the

general scheme of theology they proposed. If at times they had recourse to ambiguity of speech and veiled polemic, this might be partly excused by the death of Aikinhead on the scaffold, and Woolston's imprisonment.

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French deism, the direct progeny of the English move- ment, was equally short-lived. Voltaire was to the end a deist of the school of Bolingbroke ; Rousseau could have claimed kindred with the nobler deists. Diderot was for a time heartily in sympathy with deistic thought ; and the Encyclopédie was in its earlier portion an organ of deism. But as Locke's philosophy became in France sensationalism, and as Locke's pregnant question, reiterated by Collins, how we know that the divine power might not confer thought on matter, led the way to dogmatic materialism, so deism soon gave way to forms of thought more directly and ex- tremely subversive of the traditional theology.

In Germany there was a native free-thinking theology nearly contemporary with that of England, whence it was greatly developed and supplemented. The compact rational philosophy of Wolff nourished a theological rationalism which in Reimarus was wholly undistinguishable from dog- matic deism ; while, in the case of the historico-critical school to which Semler belonged, the distinction is not always easily drawn—although these rationalists professedly recognized in Scripture a real divine revelation, mingled with local and temporary elements. It deserves to be noted here that the former, the theology of the Aufklarung, was, like that of the deists, destined to a shortlived notoriety ; whereas the solid, accurate, and scholarly researches of the rationalist critics of Germany, undertaken with no merely polemical spirit, not only form an epoch in the history of theology, but have taken a permanent place in the body of theological science. Ere rational- ismus vulgaris fell before the combined assault of Schleier- macher's subjective theology and the deeper historical in- sight of the Hegelians, it had found a refuge successively in the Kantian postulates of the practical reason, and in the vague but earnest faith-philosophy of Jacobi.

In England, though the deists were forgotten, their spirit was not wholly dead. For men like Hume and Gibbon the standpoint of deism was long left

behind; yet Gibbon's famous two chapters might well have been written by a deist. Even now, between scientific atheism and speculative agnosticism on the one hand and church orthodoxy on the other, many seem to cling to a theology nearly allied to deism. Rejecting miracles and denying the infallibility of Scripture, protesting against Calvinistic views of sovereign grace aud having no interest in evan- gelical Arminianism, the faith of such inquirers seems fairly to coincide with that of the deists. Wherever religious indifferentism is rife, the less generous forms of deism are still alive. And even some cultured theologians, the his- torical representatives of latitudinarianism, seem to accept the great body of what was contended for by the deists, though they have a fuller appreciation of the power of spiritual truth, and a truer insight into the ways of God with man in the history of the world.

The deists displayed a singular incapacity to understand the true conditions of history; yet amongst them there were some who pointed the way to the truer, more gener- ous interpretation of the past. When Shaftesbury wrote that "religion is still a discipline, and progress of the soul towards perfection," he gave birth to the same thought that was afterwards hailed in Lessing's Lrzvehung des Menschen- geschlechtes as the dawn of a fuller and a purer light on the history of religion and on the development of the spiritual life of mankind.

See Leland's View of the Principal Deistical Writers, 2 vols. 1754; Lechler's Geschichte des Englischen Deismus, 1841; Rev. John Hunt, Religious Thought in England, 8 vols. 1870-72 ; Leslie Stephen, History of English Thought in the 18th Century, 2 vols. 1876. (DEP:)

DEJANIRA, the wife of Hercules. See HERCULES.

DEKKER, Jeremias DE (1610-1666), a Dutch poet, was born at Dort in 1610. He received his entire

education from his father, a native of Antwerp, who, having embraced the reformed religion, had been compelled to take refuge in Holland. Entering his father's business at au early age, he found leisure to cultivate his taste

for literature and especially for poetry, and to acquire without assistance a competent knowledge of English, French, Latin, and Italian. His first poem was a paraphrase of the Lamentations of Jeremiah (Klaagliedern van Jeremias), which was followed by translations and imitations of Horace, Juvenal, and other Latin poets. The most important of his original poems were a collection of epigrams (Puntdichten) and a satire in praise of avarice (Lof der Geldzucht). The latter is his best known work, Written in a vein of light and yet effective irony, it is usually ranked by critics along with Erasmus's Prazse of Folly. Dekker died at Amsterdam in November 1666. A complete collection of his poems, edited by Brouerius van Nideck, was published at Amsterdam in 1726 under the title Exercises Pottiques (2 vols. 4to). Selections from his poems are included in Siegenbeck's Proeven van nederduitsche Dichtkunde (1823), and from his epigrams in Geijsbeek's Zpigrammatische Anthologie, 1827.

DEKKER, Tuomas, dramatist. It is impossible to make out, from the scanty records of Dekker's personal life, what manner of man he was. His name occurs fre- quently in Henslowe's Diary during the last year of the 16th century ; he is mentioned there as receiving loans and payments for writing plays in conjunction with Ben Jouson, Chettle, Haughton, and Day, and he would appear to have been then in the most active employment.as a playwright. 'he titles of the plays on which he was engaged from April 1599 to March 1599-1600 are Troilus and Cressida, Orestes Fures, Agamemnon, The Stepmother's Tragedy, Bear a Brain, Pagge of Plymouth, Robert the Second, Patient Grissel, The Shoemaker's Holiday, Truth's Supplication to Candlelight, The Spanish Moor's Tragedy, The Seven Wise Masters. At that date it is evident that Dekker's services were in great request for the stage. He is first mentioned in the Diary two years before, as having sold a book ; the payments in 1599 are generally made in advance, "'in earnest" of work to be done. In the case of three of the above plays, Orestes Fures, Truth's Supplica- tion, and the Shoemaker's Holiday, Dekker is paid as the sole author. Only the Shoemaker's Holiday has been preserved; it was published in 1600. It would be unsafe to argue from the classical subjects of some of these plays that Dekker was then a young man from the university, who had come up like so many others to make a living by writing forthe stage. Classical knowledge was then in the air; playwrights in want of a subject were content with translations, if they did

not know the originals, However educated, Dekker was then a young man just out of his teens, if he spoke with any accuracy when he said that he was threescore in 1637; and it was not in scholarly themes that he was destined to find his true vein. The call for the publication of the Shoemaker's Holiday, which deals with the life of the city, showed him where his strength lay. To give a geueral idea of the substance of Dekker's plays, there is no better way than to call him the Dickens of the Elizabethan period. The two men were as unlike as possible in their habits of work, Dekker having apparently all the thriftlessness and impecunious shameless- ness of Micawber himself, Dekker's Bohemianism appears in the slightness and hurry of his work, a strong contrast to the thoroughness and rich completeness of every labour to which Dickens applied himself; perhaps also in the exquisite freshness and sweetness of his songs, and the natural charm of stray touches of expression and description in his plays. But he was like Dickens in the bent of his genius towards the representation of the life around him in

London, as well as in the humorous kindliness of his way of looking at that life, his vein of sentiment, and his eye for odd characters. There is a passage in Ben Jonson's caricature of Dekker under the name of "Crispinus,"—an allusion to his Shoemaker's Holiday,—from which it would appear that Dekker prided himself on his powers of observation. 'The less is included in the greater; the random pickings of Dekker, hopping here and there in search of a subject, give less complete results than the more systematic labours of Dickens. Dekker's Simon Eyre, the good-hearted, mad shoemaker, and his Orlando Frisco- baldo, are touched with a kindly humour in which Dickens would have delighted ; his Infelices, Fiamettas, Tormiellas, even his Bellafronta, have a certain likeness in type to the heroines of Dickens; and his roaring blades and their gulls are prototypes of Sir Mulberry Hawk and Lord Frederick Verisopht. Only there is this great difference in the spirit of the two writers, that Dekker wrote without the smallest apparent wish to reform the life that he saw, desiring only to exhibit it; and that on the whole, apart from his dramatist's necessity of finding interesting matter, he cast his eye about rather with a liking for the discovery of good under unpromising appearances than with any

determination to detect and expose vice. The observation must also be made that Dekker's personages have much more individual character, more of that mixture of good and evil which we find in real human beings. Hack-writer though Dekker was, and writing often under sore pressure, there is no dramatist whose personages have more of the breath of life in them; drawing with easy, unconstrained hand, he was a master of those touches by which an imaginary figure is brought home to us as a creature with human interests. A very large part of the motive power in his plays consists in the temporary yielding to an evil passion. The kindly philosophy that the best of natures may be fora time perverted by passionate desires is the chief animating principle of his comedy. He delights in showing women listening to temptation, and apparently yielding, but still rétaining sufficient control over them- selves to be capable of drawing back when on the verge of the precipice. The wives of the citizens were his heroines, pursued by the unlawful addresses of the gay young courtiers ; and on the whole Dekker, from inclination apparently as well as policy, though himself, if Ben Jonson's satire had any point, a bit of a dandy in his youth, took the part of morality aud the city, and either struck the rakes with reniorse or made the objects of their machinations clever enough to outwit them. From Dekker's plays we get a very lively impression of all that was picturesque and theatrically interesting in the city life of the time, the interiors of the shops and the houses, the tastes of the citizens and their wives, the tavern and tobacco-shop manners of the youthful aristocracy and their satellites. The social student cannot afford to overlook Dekker ; there is no other dramatist of that age from whom we can get such a vivid picture of contemporary manners in Tondon. He drew direct from life; in so far as he idealized, he did so not in obedience to scholarly precepts or dogmatic theories, but in the immediate interests of good-natured farce and tender-hearted sentiment.

In all the serious parts of Dekker's plays there is a

charming delicacy of touch, and his smallest scraps of song are bewitching ; but his plays, as plays, owe much more to the interest of the characters and the incidents than to any excellence of construction. We see what use could be made of his materials by a stronger intellect in Westward Ho! which he wrote in conjunction with John Webster. The play, somehow, though the

parts are more firmly knit together, and it has more unity of purpose, is not so in- teresting as Dekker's unaided work. Middleton formed a

more successful combination with Dekker than Webster ; the Honest Whore, or the Converted Courtesan, is generally regarded as the best that bears Dekker's naine, and in it he bad the assistance of Middleton, although the assistance was so immaterial as not to be worth acknowledging in the title-page. Still that Middleton, a man of little genius but of much practical talent and robust humour, was serviceable to Dekker in determining the form of the play may well be believed. The two wrote another play in concert, the Roaring Girl, for which Middleton probably contributed a good deal of the matter, as wellasa more symmetrical form than Dekker seems to have been capable of devising. In the Witch of Ldmonton, except in a few scenes, it is difficult to trace the hand of Dekker with any certainty ; his collaborateurs were John Ford and William Rowley ; to Ford probably belongs the intense brooding and murderous wrath of the old hag, which are too direct and hard in their energy for Dekker, while Rowley may be supposed to be responsible for the delineation of country life.

When Langbaine wrote his Account of the English Dramatic Poets in 1691, he spoke of Dekker as being "more famous for the contention he had with Ben Jonson for the bays, tlian for any great reputation he had gained by his own writings." This is an opinion that could not be professed now, when Dekker's work is read. In the conten- tion with Ben Jonson, one of the most celebrated quarrels of authors, the origin of which is matter of dispute, Dekker seems to have had very much the best of it. We can imagine that Jonson's attack was stinging at the time, because it seems to be full of sarcastic personalitics, but it is dull enough now when nobody knows what Dekker was like, nor what was the character of his mother. There is nothing in the Poetaster that has any point as applied to Dekker's powers as a dramatist, while on the contrary the Untrussing of the Humorous Poet is full of pungent ridicule of Jonson's style, and of retorts and insults conceived in the happiest spirit of good-natured mockery. Dekker has been accused of poverty of invention in adopting the characters of the Poetaster, but it is of

the very pith of the jest that Dekker should have set on Jonson's own foul-mouthed Captain Tucca to abuse Horace himself.

Dekker's plays were published in the following order:—TZhe Shoemaker's Holiday, 1600; The Pleasant Comedy of old Fortunatus, 1600 ; Satiromastrix, 1602 ; Patient Grissel (in conjunction with Chettle and Haughton) 1603 ; The Honest Whore (Part i.) 1604 ; The Whore of Babylon, 1607; Westward Ho! Northward Ho? and Sir Thomas Wyatt (in conjunction with Webster), 1607 ; The Roaring Girl (in conjunction with Middleton), 1611; If it be not good, the Devil is in it, 1612; TheVirgin Martyr (in conjune- tion with Massinger), 1622; Match Me in London, 1631; The Wouder of a Kingdom, 1636 ; The Sun's Darling (not published till 1656); and The Witeh of Edmonton (written in conjunc- tion with Rowley and Ford), 1658. An edition of the collected dramatic works of Dekker is published by John Pearson. Some of his prose tracts, of which he wrote many, are reprinted by the Shakespeare Society, notably The Seven Deadly Sins of London and The Gull's Hornbook. (W. M.)

DE LA BECHE, Henry Tuomas (1796-1855), one of the band of enthusiastic workers by whom the science of geology was developed so rapidly in England during the early part of this century, was born in the year1796. His father, an officer in the army, possessed landed property in Jamaica, but died while his son was still young. The boy accordingly spent his youth with his mother among the in- teresting and picturesque coast cliffs of the south-west of England, where probably he early imbibed that love for geological pursuits, and cultivated that marked artistic faculty, to which in large measure be owed the high position he ultimately reached. When fourteen years of age, being destined, like his friend Murchison, for the military pro- fession, he entered the college at Great Marlowe, where he specially distinguished himself by the rapidity and skill with which he executed sketches showing the salient

features ofa district. But this aptitude, which would have been of great service in a soldier's life, was not called forth for warlike purposes. The peace of 1815 changed the career of many young aspirants for military distinction, and among them De la Beche. Instead of pursuing the calling he

had chosen, he began to devote hiniself with ever- increasing assiduity to the pursuit of geology. When only twenty-one years of age he joined the Geological Society of London, continuing throughout life to be one of its most active, useful, and honoured members. Possessing a for- tune sufficient for the gratification of his tastes, he visited many localities of geological interest in Britain, and spent some time on the Continent studying features in the geology and physical geography of France and Switzerland. His journeys seldom failed to bear fruit in suggestive notes, papers, or sketches. arly attachment to the south-west of England led him back to that region, where, with augmented power from enlarged experience and reflection, he began the detailed investigation of the rocks of Cornwall and Devon, Thrown much into contact with the mining community of that part of the country, he conceived the idea that the nation ought to compile a geological map of the United Kingdom, and collect and preserve specimens to illustrate, and perhaps even to aid in further developing, its mineral industries. He showed his skilful management of affairs by inducing the Government of the day to recognize his work and give him an appointment in connection with the Ordnance Survey. This formed the starting-point of the present Geological Survey of Great Britain and Ireland. Year by year increasing stores of valuable specimens were transmitted to London ; for De la Beche enlisted the sym- pathy and co-operation of the mining authorities of Corn- wall and Devon. At last the building where the young Museum of Economic Geology was placed became too sinall. But De la Beche, having seen how fruitful his first idea had become, determined to use all his persuasion to prevail on the authorities not merely to provide a large structure, but to widen the whole scope of the scientific establishment of which he was the head, so as to impart to it the character of a great educational institution where practical as well as theoretical instruction should be given in every branch of science necessary for the conduct of mining work. In this endeavour he was again successful. Parliament sanctioned the erection of a museum in Jermyn Street, London, and the organization of a staff of professors with laboratories and other appliances. The establishment was opened in 1851. The Geological Survey also, which had grown up under his care, no longer under the Ordnance Department, received a new organization and an increase to its staff. To De la Beche belongs the high praise of having entirely originated and developed this important branch of the public service. Many foreign countries have since

formed geological surveys avowedly based upon the organization and experience of that of the United Kingdom. The British colonies, also, have in many instances established similar surveys for the development of their mineral resources, and have had recourse to the parent survey for advice and for officers to conduct the operations.

De la Beche was an able mineralogist as well as an admirable field-geologist. He published numerous memoirs on English geology in the Z'ransactions of the Geological Society of London, as well as in the Memoirs of the Geological Survey of the United Kingdom. He likewise wrote a valuable text-book of geology, and a work of singular breadth and clearness—Lesearches in Theoretical Geology—in which he enunciated a philosophical treatment of geological questions much in advance of his time. An early volume, JZow to Observe in Geology, was rewritten and enlarged by him late in life, and published under the title of The Geological Observer. It was marked by wide

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practical experience, multifarious knowledge, philosophical insight, and a geuius for artistic delineation of geological phenomena. He received from many foreign societies recognition of his services to science, and at the close of his life was awarded the Wollaston medal—the highest honour in the gift of the Geological Society of London. After a life of constant activity he began to suffer from partial paralysis, but, though becoming gradually worse, continued able to transact his official business until a few days before his death, which took place on 13th April 1855.

DELACROIX, Ferprnanp Vicror Evekzne, (1798- 1863), a French painter of history, was born at Charenton- St-Maurice, near Paris, 26th April 1798. His father was a partisan of the most violent faction during the time of the Revolution. The family affairs seem to have been conducted in the wildest manner, and the accidents that befell the child, well authenticated as they are said to be, make it almost a miracle that he survived. He was first nearly burned to death in the cradle by a nurse falling asleep over a novel, and the candle dropping on the coverlet; this left permanent marks on his arms and face. He was next dropped into the sea by another bonne, who was climbing up a ship's side to see her lover. He was nearly poisoned, and nearly

choked, and, to crown all, he tried to hang him- self, without any thought of suicide, in imitation of a print exhibiting a man in that position of final ignominy. The prediction of a charlatan founded on his horoscope has been preserved :—“ Cet enfant deviendra un homme célébre, mais sa vie sera des plus laborieuses, des plus tourmentées, et toujours livrée & la contradiction.”

Delacroix the elder died at Bordeaux when Eugene was seven years of age, and his mother returned to Paris and placed him in the Lycée Napoléon. Afterwards, on his determining to be a painter, he entered the atélier of Baron – Guérin, who affected to treat him as an amateur. His fellow-pupil was Scheffer, who was alike by temperament and antecedents the opposite of the bizarre Delacroix, and the two remained antagonistic to the end of life. Dela- croix’s acknowledged power and yet want of success with artists and critics—Thiers being his only advocate—perhaps mainly resulted from his bravura and rude dash in the use of the brush, at a time when smooth roundness of surface was general. His first important picture, Dante and Virgil, was painted in his own studio ; and when Guérin went to see it he flew into a passion, and told him his picture was absurd, detestable, exaggerated. ‘‘ Why ask me to come and see this? you knew what I must say.” Yet his work was received at the Salon, and produced an enthusiasm of debate (1822). Some said Géricault had worked on it, but all treated it with respect. Still in private his position, even after the larger tragic picture, the Massacre of Scipio, had been deposited in the Luxembourg by the Government, became that of an Ishmaelite The war for the freedom of Greece then going on moved him deeply, and his next two pictures—Marino Faliero Decapitated on the Giant’s Stair- case of the Ducal Palace (which has always remained a European success), and Greece Lamenting on the Ruins of Missolonghi—with many smaller works, were exhibited for the benefit of the patriots in 1826. This exhibition was much visited by the public, and next year he produced another of his important works, Sardanapalus, from Byron’s drama. After this, he says, “ I became the abomination of painting, I was refused water and salt,”—but, he adds with singularly happy naiveté, “J’étais enchanté de moi- méme!” The patrimony he inherited, or, perhaps it should be said, what remained of.jt, was 10,000 livres de rente, and with economy he lived on this, and continued the expensive process of painting large historical pictures. In 1831 he

reappeared in the Salon with six works, and immediately after left for Morocco, where

he found much congenial matter. Delacroix never went to Italy; he refused to go on principle, lest the old inasters, either in spirit or manner, should impair his originality and self-dependence. His greatest admiration in literature was the poetry of Byron; Shakespeare also attracted him for tragic inspirations ; and of course classic subjects had their turn on his easel. ;

He continued his work indefatigably, having his pictures very seldom favourably received at the Salon. These were sometimes very large, full of incidents, with many figures. Drawing of Lots in the Boat at Sea, from

syron’s Don Juan, and the Taking of Constantinople by

the Christians, were of that character, and the first- named was one of his noblest creations. In 1845 he was employed to decorate the library of the Luxcm- bourg, that of the Chamber of Deputies in 1847, the ceiling of the Gallery of Apollo in the Louvre in 1849, and that of the Salon de la Paix in the Hotel de Ville in 1853. He died on the 13th August 1863 ; and in August 1864 an exposition of his works was opened on the Boule- vard des Italiens. It contained 174 pictures, many of them of large dimensions, and 303 drawings, showing immense perseverance as well as energy and versatility.

DELAGOA BAY (ie, in Portuguese, the Bay of the Swampy Land), an inlet on the east coast of South Africa, between 25° 40’ and 26° 20’ §. lat., with a length from north to south of about 60 miles, and a Lreadth of about 20. It is protected by a series of islands stretching north from the mainland ; and in spite of a bar at the entrance, and a number of shallows within, it forms a valuable harbour, accessible to large vesscls at all seasons of the year. The surrounding country is low and very unhealthy, but the island of Inyak has a height of 240 feet, and is used by the nativesas a kind of sanatorium. A river 12 or 18 feet deep, variously known as the Manhissa, the Unkomogazi, or King George’s River, enters at the north ; several smaller streams, the Matolla, the Dundas, and the Tembi, from the Lobombo Mountains, meet towards the middle in the estuary called the English River ; and, of greatest

import- ance of all, the Umzati, which has its head-waters in the Draken Berg of the Transvaal scttlement, disembogues in the south. The bay was discovered by the Portuguese navigator Vasco da Gama in 1498 ; and the Portuguese post of Lorenzo Marques was established not long after to the north of the English River. A Dutch settlement was founded in 1720 ; but in 1730 it was abandoned. In 1822 Captain Owen, finding that the Portuguese seemed to exercise no jurisdiction to the south of Lorenzo Marques, hoisted the English flag and appropriated the country from the Dundas or English River southwards; but, when he visited the bay again in the following year, he found the Portuguese governor, Lupe de Cardenas, in posses- sion, and expelled him. Between the English and Portuguese Governments the question of possession was left undecided till the claims of the republic of Transvaal brought the subject forward. In 1835 the discontented boers, under Orich, had attempted to form a settlement on the bay; aud in 1868 the Transvaalian president, Martin Wessel Petronius, incorporated the country on each side of the Umzati down to the sea. The whole matter in dispute between the three powers was submitted to the arbitration of M. Thiers, the French president; and on April 19, 1875, his suecessor Marshal Macmahon declared in favour of the Portuguese. In December 1876 the Lisbon Government sent out an expedition of artizans and military workmen to Lorenzo Marques, with a battery of six guns for the defenée of the settlement.

See Owen's ‘‘ Narrative of Voyages,’ i Geogr. Soc. 1833; Botelkc, ie. oe circ an ona Bee guezes na Africa Oriental, 135 ; Report of the Min. of Marine and

the Colonies of Portugal, 1863-64 ; ‘‘ Baie de Delagoa,” in Bulletin de la Société de Géogr. 1873.

DELAMBRE, Jean Baptiste Josera (1749-1822), an eminent mathematician and astronomer, was born at Amiens, September 19, 1749. He commenced his studies in the gymnasium of that town under the celebrated poet Delille, with whom he maintained an intimate friendship till his death. Having obtained an exhibition founded by one of his ancestors for the benefit of the town of Amiens, he was enabled to prosecute his studies for a time at the

Collége du Plessis in Paris. The expiry of this privilege, however, left him to struggle with great privations. During the interval in which he was awaiting permanent employment he devoted himself to historical and literary studies. He undertook extensive translations from Latin, Greek, Italian, and English, and at the same time entered on the study of the mathematical scicnces. For about a year he supported himself by teaching at Compitgne. On his return to Paris in 1771 he obtained the situation of tutor in the family of D'Assy, the receiver-general of finance. By this time he had resolved to give himself speciaily to the study of physics and astronomy.

At the College of France he attended the lectures of Lalande, on whose works he had even at that time made a complete commentary. This was first remarked when, in the course of instruction, an occasion presented itself of citing from memory a passage of Aratus. Lalande immediately intrusted to him the most complicated astronomical calculations, and prevailed on JD 'Assy to establish an observatory at his house, where Delambre applied himself to astronomical observations. In 1781 the discovery of the planet Uranus by Herschel led the Academy of Sciences to propose the determination of its orbit as the subject of one of its annual prizes. Delambre undertook the formation of tables of its motion, and the prize was awarded to him. His next effort was the con- struction of solar tables, and tables of the motions of Jupiter and Saturn. He took part in the sitting of the Academy of Sciences when Laplace communicated his important discoveries on the inequalities of Jupiter and Saturn; and he formed the design of applying the result of that profound analysis to the completion of tables of the two planets. Delambre turned his attention more especially to the satellites of Jupiter—an undertaking of great difficulty and extent. He had been engaged for several years in the composition of his ecliptical tables, when the Academy of Sciences offered a prize for the subject, which was awarded to him. In the same year (1792) he was elected a member of the Academy.

Immediately afterwards he was appointed, along with Méchain, by the French section of the joint English and French commission to measure an arc from Dunkirk to Barcelona as a basis for the metric system. This under- taking, in itself laborious, was rendered highly dangerous to the personal safcty of those engaged in it by the events of the Revolution. Méchain died

whilst the work was proceeding ; and its successful termination in 1799 was due to the ability and the prudence of Delambre. A full and interesting account of the work was published in his Base du Systeme Métrique Décimal (3 vols. 1806-10), for which

‘he obtained, by a unanimous vote, the prize awarded by

the National Institute of France to the most important work in physical science of the preceding ten years. Delambre, who had been chosen as an associate of almost every scientific body in Europe, was appointed in 1795 a member of the French Board of Longitude, and in 1803 perpetual sccretary for the mathematical sciences in the Institute. In 1807 he succeeded Lalande in the chair of astrononiy of the College of France, and he was appointed one of the principal directors (étulatres) of the university.

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For twenty years he performed faithfully and impartially the duties of his oftice in one of the classes of the Institute. His annual reports, his historical éloges, which have been published, and his exposition of the progress of science are eminently distinguished by profound erudition, literary skill, and, above all, by generous appreciation of the works of others. His literary and scientific labours were very numerous, and, in respect of excellence, of the highest order. His History of Astronomy, published at intervals, and forming when complete six quarto volumes, is a work of prodigious research. It puts the modern astronomer in possession of all that had been done, and of the methods employed by those who lived before him.

His Méthodes Analytiques pour la Détermination @un Arc du Méridien, his numerous memoirs in the additions to the Connaissances des Temps, and his Astronomie Théorique et Pratique exhibit the finest applications of modern analysis to astronomy and geography.

Tt is a remarkable fact that Delambre did not apply him- sclf to astronomical observations until he had reached the comparatively late age of thirty-five. He was appointed a member of the Royal Council of Public Instruction in 1814; but he lost the place in 1815. He was in Paris when it was taken by the allied armies; and, in a letter written at that time to a friend

and pupil, he says that on the day of the siege, in the hearing of the cannon-ade, he laboured with tranquillity in his study from eight in the morning till midnight. He had a happier fate than Archimedes in a like position, for he was not molested by the victors, and no one was billeted on him, probably from respect to his high reputation. At the creation of the Legion of Honour in 1802 Delambre was made a member of that order. He was appointed chevalier of St Michael in 1817, an officer in the Legion of Honour in 1821 ; but a long time before, he had been created an hereditary chevalier, with an endowment, which was decreed as a national reward.

The life of continued and hard study which Delambre led at last affected his health. The disease by which he was cut off became apparent in the month of July 1822. His total loss of strength, with frequent and long continued fuinting-fits, gave warniug of a fatal result, which occurred on the 19th August 1822.

The following is a list of his works which appeared separately :— Tables de Jupiter et de Saturn (1789); Tables du Soleil, de Jupiter, de Saturn, d' Uranus, et des Satellites de Jupiter, pour servir & la 8me édition TP Astronomie de Lalande (1792) ; Méthodes Analytiques pour la Détcrmination d'un Arc du Méridien (1799) ; Tables Trigonométriques Décimales, par Borda, revues, augmentecs, et publiées par M. Delambre, (1801) ; Tables du Soleil, publiées par le Bureau des Longitudcs (1806); Base du Systeme Meétrique Dé- cimal, &c. (8 vols. in 4to, 1806-1810) ; Rapport Historique sur les Progres des Sciences Mathématiques deputs 1789, &c. (1810); Abrégé @' Astronomie, ou Lecons Elémentaires d'Astronomie Théorique et Pratique, in 8vo; Astronomie Théorique et Pratique (3 vols. in 4to, 1814); Yables Eeliptiques des Satellites de Jupiter (1817) ; Histoire de VT Astronomie Aneienne (2 vols. in 4to, 1817); Histoire de U Astronomie du Moyen Age (1819, 1 vol. in 4to); His- toire de VAstronomie Moderne (1821, 2 vols. in 4to) ; Histoire de l' Astronomte au Dixhuitieme Siecle (1 vol. 4to, 1827). In addition to these, he furnished a very considerable number of memoirs (about 28) on various points of astronomy to the Connaissances de Temps, beginning with the ycar 1788. He also contributed to the Memoirs of the Academies of Stockholm, St Petersburg, Berlin, and Turin, and to those of the first class of the French Institute ;

and he composed éloges on many of his contcmporaries at their death.

DE LA RIVE, Avauste (1801-1873), a Swiss physicist, distinguished chiefly for his researches on the subject of electricity, was born at Geneva on the 9th October 1801. He belonged to a good family closely connected with that of the Count Cavour, and he inherited his taste for natural science from his father, an eminent physician and chemist. After an unusually brilliant career as a student, he was ap-

-Bellangé, Eugéne Lami, and others.

pointed at the early age of twenty-two to the chair of natural philosophy in the Academy of Geneva. For some years after his appointment he devoted himself specially to the investigation of the specific heat of gases, and to obser- vations for determining the temperature of the earth's crust. In the latter inquiry he availed himself of an artesian well that had been bored to a depth of 700 feet, and his obser- vations were adopted by Poisson as the basis of his calcula- tions. The comparatively new subject of electricity, how- ever, received much of his attention from the first, and it gradually became the chief object of his scientific work. His name is associated with original discoveries in connec- tion with magnetism, electro-dynamics, the connection of magnetism with electricity, the properties of the voltaic are, and the passage of electricity through extremely rarefied media. His researches on the last-mentioned subject ied him to form a new theory of the aurora borealis, which, though not free from ditticulties, is on the whole the most probable explanation of a very obscure phenomenon. The most valuable practical result of his scientific discoveries was the process of electro-gilding carried out by Messrs Elkington & Ruolz from a memoir which he communicated to the Académie des Sciences. By making it known in this way he voluntarily renounced all the profits of his discovery. Between 1853 and 1858 De la Rive published a complete treatise on electricity in three octavo volumes, which was regarded as a work of high authority, and was at once translated into English, German, and Italian. Its author's scientific reputation received the usual recognition in his election to the membership of most of the learned societies of Europe. In 1842 he received the grand prize of 3000 francs from the Académie des Sciences for his dis- covery of the electro-gilding process; and in 1864 he received the

highest honour open to the scientific men of Europe in hisnominationas one of the eight foreign associates of the Academy. De la Rive's birth and fortune gave him considerable social and political influence. He was distinguished for his hospitality to literary and scientific men, and for his interest in the welfare and independence of his native country. In 1860, when the annexation of Savoy and Nice had led the Genevese to fear French aggression, De la Rive was sent by his fellow-citizens on a special embassy to England, and succeeded in securing a declaration from the English Government, which was communicated privately to that of France, that any attack upon Geneva would be regarded as a casus belle. On the occasion of this visit the university of Oxford conferred upon De la Rive the honorary degree of D.C.L. When on his way to pass the winter at Cannes he died suddenly at Marseilles, on the 28th November 1873.

DELAROCHE, Hirrotyts, commonly known as PavL (1797-1856), one of the most accomplished painters of the eclectic modern school, was born in Paris, 17th July 1797. Heis always spoken of as one of the most fortunate and successful of men, as well as one of the ablest, since he never appeared to encounter any obstacles or to feel any difficulties.

The father of Delaroche was an expert who had made a fortune, to some extent, by negotiating and cataloguing, buying and selling. He was proud of his son's talent, aud able to forward his artistic education. The master selected was Gros, then painting life-size histories, and surrounded by many pupils. In this atélier Delaroche met Bonington (an English youth of whose work we see little, but who has had a very considerable influence in France), Roqueplan, In no haste to make an appearance in the Salon, his first exhibited picture was a large one, Josabeth saving Joas, 1822. This picture led to his acquaintance with Géricault and Delacroix, with whom he remained on the most friendly terms, the three

forming the central group of a numerous body of historical painters, such as perhaps never before lived in one locality and at one time.

From 1822 the record of his life is to be found in the successive works comiug from his hand. He visited Italy in 1838 and 1843, when his father-in-law, Horace Vernet, was director of the French Academy. His studio in Paris was in the Rue Mazarine, where he never spent a day without some good result, his hand being sure and his knowledge great. His subjects, definitely expressed and popular in their manner of treatment, illustrating certain views of history dear to partisans, yet romantic in their general interest, were painted with a firm, solid, smooth surface, which gave an appearance of the highest finish. This solidity, found also on the canvas of Vernet, Scheffer, Leopold Robert, and Ingres, was the manner of the day. It repudiates the technical charm of texture and variety of handling which the English school inherits as a tradition from the time of Reynolds ; but it is more easily understood by the world at large, sincc a picture so exe- cuted depends for its interest rather on the history, scene iu nature, or object depicted, than on the executive skill, which may or may not be critically appreciated. We miy add, that his point of view of the historical characters which he treated is not always just, whatever self-command we may give him credit for. Cromwell lifting the Coffin- lid and looking at the Body of Charles is an incident only to be excused by an improbable tradition; but the King in the Guard-Room, with villainous round-head soldiers blowing tobacco smoke in his patient face, is a libel on the Puritans ; and Queen Elizabeth dying on the Ground, like a she-dragon no one dares to touch, is sensational ; while the Execution of Lady Jane Grey is represented as taking place in a dungeon. Nothing can be more incorrect than this last as a reading of English history, yet we forget the inaccuracy in admiration of the trevtment which repre- sents Lady Jane, with bandaged sight, feeling for the block, her maids covering their faces, and none with their eyes visible among the many figures. On the other hand, Strafford led to Execution, when Laud stretches his lawn- covered arms out of the small high window of his cell to give him a blessing as he passes along the corridor, is perfect ; and the splendid scene of Richelieu in his gorgeous barge, preceding the boat containing Cing-Mars and De Thou carried to execution by their guards, is perhaps the most dramatic semi-historical work ever done. The Princes in the Tower must also be mentioned as a very complete creation ; and the young female Martyr floating dead on the Tiber is so pathetic that criticism feels hard-hearted and ashamed before it. Asa realization of a page of authentic history, again, no picture can surpass the Assassination of the

Duc de Guise at Blois. The expression of the murdered man stretched out by the side of the bed, the conspirators all massed together towards the door and far from the body, show exact study as well as insight into human nature. This work was exhibited in his meridian time, 1835; and in the same year he exhibited the Head of an Angel, a study from Horace Vernet's young daughter Louise, the love of whom was the absorbing passion of his life, and from the shock of whose death, in 1845, it is said he never quite recovered, By far the finest productions of his peucil after her death are of the most serious character, a sequence of small elaborate pictures of incidents in the Passion. Two of these, the Virgin and the other Maries, with the apostles Peter and John, within a nearly dark apartment, hearing the crowd as it passes haling Christ to Calvary, and St John conducting the Virgin home again after all is over, are beyond all praise as exhibiting the divine story from a simply human point of view. They are pure and elevated, and also dramatic and painful. Delaroche was not

troubled by ideals, and had no affectation of them. His sound but hard execution allowed no mystery to intervene between him and his motif, which was always intelligible to the million, so that he escaped all the waste of energy that painters who try to be poets on canvas suffer. Thus it is that essentially the same treatment was applied by him | to the characters of distant historical times, the founders

of the Christian religion, and the real people of his own day, such as Napoleon at Fontainebleau, or at St Helena, or Maria Antoinette leaving the Convention after her

sentence. In 1837 Delaroche received the commission for the great

picture, 27 metres long, in the hemicycle of the lecture theatre of the Ecole des Beaux Arts. Thisrepresentsthe great artists of the modern ages asscmbled in groups on either hand of a central elevation of white marble steps, on the topmost of which are three thrones filled by the architects and sculptors of the Parthenon. To supply the female elenient in this vast

composition he introduced the genii or muses, who symbolize or reign over the arts, leaning against the balustrade of the steps, beautiful and queenly figures with a certain antique perfection of form, but not informed by any wonderful or profound expression. The portrait figures are nearly all unexceptionable and admirable. This grcat and successful work is on the wall itself, an inner wall however, and is executed in oil. It was finished in 1841, and considerably injured by a fire which occurred in 1855, which injury he immediately set himself to remedy ; but he died before he had well begun, on the 4th November 1856. Robert Fleury finished the repairs, and the picture as yet shows no sign of decay.

Personally Delaroche exercised even a greater influence than by his works. Though short and not powerfully made, he impressed every one as rather tall than otherwise ; his physiognomy was accentuated and firm, and his fine fore- head gave him the air of a minister of state. (Ww. B. SC.)

DELARUE, Gervais (1751-1835), a French historical investigator, and one of the chief authorities on Norman and Anglo-Norman literature. He was a native of Caen, received his education at the university of that town, and was ultimately raised to the rank of professor. His first historical enterprize was interrupted by the French Revolu- tion, which forced him to take refuge in England; but the interruption was the less to be regretted as he found the fullest encouragement from his northern compeers, and had the opportunity of examining a vast mass of original documents in the Tower and elsewhere, which proved of the utmost assistance to his investigations, In the preface to the second volume of his greatest work—the ssais historiques —he speaks feelingly of the kindness he had experienced, and mentions his supreme gratification at receiving the approval of Sir Walter Scott. From England he passed over to Holland, still in prosecution of his favourite task ; and there he remained till 1798, when the way was open for his return to France. The rest of his life was spent in his native town, where he was chosen principal of his university. While in England he had been elected a member of the Royal Society of Antiquaries ; and in his own country he was made a corresponding member of the Institute, and was enrolled in the Legion of Honour.

Besides numerous articles in the Memoirs of the Royal Society of London, the Mémoires de U Institut, the Mémotres de la Société d Agri- culture de Caen, and in other periodical collections, he published separately Hssais historiques sur les Bardes, les Jongleurs, et les Trouvéres normands et anglo-normands, 3 vols. 1834, and Recherches historiques sur la Prairie de Caen, 1837, and since his death have appeared Mémoires historiques sur le palinod de Cuen, 1841; Reeherches sur la tapisserie de Bayeux, 1841; and Nouveaux Essais historiques sur la ville de Caen, 1842. In all his writings he displays a strong partiality for everything Norman, and ratcs the Norman influence on French and English literature as of the very highest moment.

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DELAVIGNE, Jean Frangois Casimir (1793-1843), French poet and dramatist, was born April 4, 1793, at Havre, whence his father sent him at an early age to Paris, there to be educated at the Lycée Napoléon. During the first years of his attendance at this school he was little else than a dullard, but on reaching the age of fourteen he seems to have undergone a complete change—sluggishness gave place to unusual facility in the acquisition of knowledge ; a decided taste for literary studies, especially poetry, was evinced; and he quickly became a distinguished student. He read with avidity all the poets, great and small, to whose works access was obtainable, and was known to spend many an hour snatched from school duties in the elaboration of his own juvenile pieces. Constitutionally of an ardent and sympathetic temperament, with a mind the natural intelligence of which was quickened by extensive miscellaneous reading, and by contact with a world then in a state of revolutionary ferment, it will. be seen that Delavigne had much in his favour when he first sought popular applause. An opportunity for display soon pre- sented itself. On the 20th of Merch 1811 the Empress Marie Louise gave birth to a son, christened in his very cradle king of Rome. This long-desired event was hailed with the utmost satisfaction; congratulations reached Napoleon from every quarter of Europe, and fifty millions of human beings did homage to their future sovereign. But the poets were dumb. Our young aspirant to fame, there- fore, seeing the field unoccupied, composed a festal hymn. It was completely successful ; even the critics were pleased. On being shown the verses, Andrieux, albeit a man little disposed to flatter, exclaimed, “ Bring him to me! He shall make nothing but verses, and these, I hope, good ones.” Encouragement such as this augured well for the future ; but Delavigne’s purse was scantily furnished, and his friends were poor and unable to render any assistance. At this point he was fortunate in securing as a patron Count Frangais of Nantes, who attached him to the revenue office, but with the single proviso, that he should not trouble himself to appear at his post oftener than once a month.

About this time he competed twice for an academy prize, but without success. A victory, however, was at hand. Amid the throes in which society laboured at the period of Napoleon’s downfall, Delavigne, catching inspiration from the mingled hopes and fears which agitated his fellow-

countrymen, burst upon the world with two impassioned poems, the first entitled Waterloo, the second, Dévastation du Musée, both written in the heat of patriotic enthusiasm, and teeming with popular political allusions. A third, but of inferior merit, Sur le besoin de s'unir apres le départ des étrangers, was afterwards added. 'These stirring pieces, termed by him Afesséniennes, sounded a key-note which found an echo in the hearts of all. Twenty-five thousand copies were sold; Delavigne was famous. Nor was his reputation made solely with the populace ; his verses were the subject of much discussion in court circles ; and in spite of their political tone it was thought necessary to bestow upon him some mark of attention. He was therefore appointed to an honorary librarianship, with no duties to discharge. Thus was he fortunately rendered independent by the offer of one sinecure just as he was deprived of another, for his intercourse with Francais had now ceased.

Having achieved so signal a triumph in one department of literature, Delavigne was desirous of attaining distinc- tion in another, and accordingly brought out upon the stage a play well-known under the title of Les Vépres Sicilvennes. The manuscript having been refused at the Théatre- Frangais, the critic of which, a supercilious poetaster, told him that "some day he might write comedy very fairly," the mortified author, like Voltaire on a similar occasion,

cast the sheets into the flames, from which they were rescued by his brother Germain. A better fate than burn- ing awaited the piece, and in 1819 it was performed at the Odéon, then just rebuilt. On the night of the first representation, which was warmly received, Picard, the manager, threw himself into the arms of his elated friend, exclaiming, 'You have saved us! You are the founder of the second French Theatre." This was followed up by the production of the Comédiens (1820), a poor play, with little plot, and the Paria (1821), with still less, but con- taining some well-written choruses. The latter piece obtained a longer lease of life than its intrinsic literary merits warranted, on account of the popularity of the political opinions freely expressed in it—so freely ex- pressed, indeed, that the displeasure of the king was incurred, and Delavigne lost his post. But the duke of Orleans, willing to gain the people's good wishes by com- plimenting their favourite, wrote to him as follows,— ''The thunder bas

descended on your house ; I cffer you an apartment in mine.” Accordingly he became librarian at the Palais-Royal, a position retained curing the remain- der of his life. It was here that he wrote the Ecole des Vieillards, which gained his election to the Academy in 1825. To-this period also belong La Princess Aurélie (1828), and Marino Faliero (1829), a drama in the romantic style.

For his success as a writer Delavigne was in no small measure indebted to the stirring nature of the times in which he lived. The Dfesséniennes, which first introduced him to universal notice, had their origin in the excitement consequent on the occupation of France by the allies in 1815. Another crisis in his life and in the history of his country, the revolution of 1830, stimulated him to the production of a second masterpiece, La Parisienne. This song, set to music by Auber, was on the lips of every Frenchman, and rivalled in popularity the celebrated Marseillaise. A companion piece, La Varsovienne, was written for the Poles, by whom it was sung on the march to battle.

Other works of Delavigne followed each other in rapid succession ;—Don Juan d’Autriche (1835), Une Famille au temps du Luther (1836), La Popularité (1838), Le Fille du Cid (1839), Le Conseiller rapporteur (1841), and Charles VJ. (1848), an opera partly written by his brother.

But the poet had reached the acme of his reputation, an was now on the decline. In 1848 he quitted Paris to seek in Italy the health his labours had cost him. At Lyons his strength altogether gave way, and on the 11th of December, while listening to his wife, who read aloud one ot Scott’s novels, he gently expired, murmuring some Verses.

By many of bis own time Delavigne was looked upon as unsurpassed and unsurpassable. Every one bought his works; nay more, every one read them. If a new play of his was announced at the theatre, it was the affair of a month to secure a seat. alma and Mademoiselle Mars felt honoured in receiving from him a part; theatrical managers lay in wait for the fruits of his pen. But the applause of the moment was gained at the sacrifice of last- ing fame. Delavigne wrote but for the hour ; he was too little the retired, contemplative poet, and too much the busy man of the world. In the region

of politics alone does he shine ; when he quits thissphere it is to descend to the level of utter common-place.

But as a writer Delavigne had many excellencies. He is never at a loss for language, yet expresses himself in a terse and vigorous style. ‘The poet of reason rather than of imagination, he recognizes his own province, and is rarely tempted to flights of fancy beyond his powers. He wrote always as he would have spoken, from sincere convic-

tion. In private life he was in every way estimable,— upright, amiable, devoid of all jealousy, and generous to a fault. The best edition of his works is that of Furne, in 8 volumes. (E. 8. B.)

DELAWARE, one of the States of the American Union (next to Rhode Island, the smallest in extent), is situated on the Atlantic seaboard, forming part of the peninsula between the Chesapeake and Delaware Bays. It covers an area of 2120 square miles, The population in 1840, and at the end of every ten years down to 1870. has been as follows :—

White. Free coloured. Slaves. Total

1840 58,561 16,919 2605 78,085 1850 71,169 18,073 2290 91,532 1860 90,589 19,829 1798 112,216 1870 102,221 22,794 125,015

It is bounded on the N. by Pennsylvania, on the W. and S. by Maryland, and on the E. by the Atlantic Ocean and the Delaware Bay and River. Its rivers are small and unimportant, and most of them flow into the Delaware Bay or River. The Delaware and Chesapeake Canal connects the two great bays, and makes an easy water transit for produce between Philadelphia and Baltimore. Delaware is an agricultural State; a part of it is in a high state of cultivation, Besides wheat, maize, and other grain, peaches are grown in immense quantities, and sent over the country. Small fruits are also raised for transportation. In the northern parts of the State are numerous manufactories. Wilmington has large machine- shops, and cotton, paper, morocco, and carriage factories; and iron-ship building is largely carried on there. New Castle, also, has rolling-mills, and cotton and woollen factories.

The flour-mills of Delaware are famous, and the Dupont Gunpowder Works, six miles from Wilmington, are the largest and oldest in the country. The Philadelphia, Wilmington, and Baltimore Railroad runs through the northern part of the State, and the Delaware Railroad goes through the whole length of the peninsula. The Wilmington and Reading Railroad makes a connection with the Pennsylvania coal region. There are five judges in the State, viz.,a chancellor, who is also president of the Orphans' Court (the associate judge residing in the county serving with him in the county where the court is held), a chief justice, and an associate judge from every one of the three counties. There is a State school fund, which is further increased by the proceeds of the marriage and liquor licences. Every hundred which, by either taxation or subscription, supports a free school is entitled to its share of the fund. The debt of the State is $1,224,000, and as the cost of the government is moderate, the taxes are small.

On the 28th of August 1609 Henry Hudson sailed into the Delaware Bay; but, finding the water shallow and difficult to navigate, he made no exploration, leaving that honour to the Dutch navigators,—Hendrickson in 1616, and in 1623 Mey, whose name is borne by the eastern cape of the bay. There is a tradition that Lord De la Warr, when on his way to Virginia in 1610, anchored in the bay, but it is not authentic. It was in 1626 that Gustavus Adolphus, king of Sweden, by the advice of a Hollander, William Uesselinx, issued letters- patent for a settlement on the west shore of the Delaware River—called by the Indians Poutaxat, and by the Dutch South River—for a trading-post. The queen dowager, the royal council, the nobility, the bishops and clergy, as well as large numbers of the people, contributed money for the colony ; but the long war with Germany, and the death of the king, caused the scheme to fail. In 1639 Queen Christina sent out a colony under the charge of a Dutchman Peter Menewe, who first landed at the mouth of the

Delaware, near the present town of Lewes, which they: named Paradise Point. Here they made a purchase from the Indians of all the land on the west side of the river, from Cape Henlopen, at the mouth of the bay, to

Trenton Falls ; and as none of the Swedes understood the Indian language, the deeds were written in Dutch, and sent to Sweden for preservation. The first settlement the Swedes made in their newly acquired country, which they called New Sweden, was near the Delaware River, where the Christine and Brandywine Creeks join, and where the city of Wilmington now stands. Here they built a fort, which they called Christiana. The Dutch had a few weak settlements on the Jersey shore, but they also claimed the west bank of the river, and wrote a remonstrance to Menewe, though they did not, perhaps could not, interfere with the colony, which Minnewitz governed for three years, appointing at his death a successor. The Dutch proved troublesome neighbours, and as a retaliation for the build- ing of Fort Christiana, they built Fort Casimir, six miles below the Swedish settlement. Still Governor Stuyvesant and the Swedish governor, Printz, were on amicable terms; and when the former visited his new fort on the west side of the Delaware, the two promised to be neighbourly and friendly, and to act as allies if needful. But in 1654, Governor Rising was sent from Sweden with a large number of colonists ; and his first act was to take “Fort Casimir, which he did without bloodshed, renaming it the Fort of the Holy Trinity, in honour of Trinity Sunday, when he captured it. This brought Governor Stuyvesant from New York, with six or seven vessels, and as many hundred men, who not only retook Fort Casimir, but marched to Fort Christiana and captured it also. Stuyvesant compelled the Swedes to swear allegiance to the Dutch Government, aud those who refused the oath were forced to leave the country. Thus the colony of New Sweden was obliterated, and the Dutch became owners of the west shore of the Delaware River, having at Fort Casimir, which they called New Amstel, a governor of their own, though under the jurisdiction of the governor of Manhattan (New York). In 1664 Sir Robert Carr, after capturing Manhattan, sailed up South River, and took New Amstel, changing the name of the river to Delaware, and New Amstel to New Castle on Delaware; though the Swedish chronicler affirms—“ there has never been a castle in it.” For nine years was the colony held by the English, Carr being governor under Governor Lovelace of New York. Lord Baltimore had claimed, during the Dutch administration, all the lower part of the territory, within two miles of New Amstel, and whilst Governor Lovelace was in office he still urged his claim. In 1673 the Dutch admiral Eversten stormed New York, took it without capitulation, and again there was a Dutch governor on the Delaware. This

rule was short, for in the very next year all the English colonies were ceded back to England by the Peace of Westminster. Yet the settlement on the Delaware seemed doomed to change its owners; for, becoming the property of the duke of York by a special grant, there was a governor sent to New Castle in the name of the duke, who himself never visited his possessions in America. In 1682 the duke gave, or nominally sold, “the three lower counties ” to William Penn, so that they became a part of Pennsylvania. At first an effort was made that the “three lower counties ” should send their delegates to the Pennsylvania assembly, which should legislate for the whole; but as the interests of the two sections of the province were different, the “ three lower counties ” insisted upon a separate assembly held at New Castle. After Penn’s death, in 1718, there was a lawsuit between his heirs and those of Lord Baltimore, as to the boundary line between their possessions. The suit was carried into the

Court of Chancery in England, and pending the trial the “three lower counties” were not sure to whom they belonged, and so paid no land rents. In 1768 the suit was decided, and commissioners appointed, who defined the boundary line of Maryland as it now stands. It was in the year 1776 that the first constitution of the State of Delaware was framed, whereby “the three lower counties on the Delaware” lost their awkward name, and again had a new form of government. In the same year Delaware, as one of the thirteen colonies, signed the Declaration of Independence ; and in 1787 the State, in convention, adopted the constitution of the United States. In 1792 a new State constitution was enacted, and again in 1831, which is now in force. Under it, the governor is elected for four years, and the legislature meets biennially at Dover, the State capital. Delaware was one of the original thirteen States, and, though slave-holding, remained loyal to the Union at the secession of the Southern States in 1861.

DELAWARE, a city of the United States, capital of a county of the samme name in Ohio, is situated on the west bank of the Olentangy, nearly in the centre of the State, 24 miles north of Columbus. Its principal public institutions are the Ohio Wesleyan university and a female college belonging to the same body. The manufactures consist of oil, cordage,

hempen cloth, and iron work. A medicinal spring in the neighbourhood is resorted to for the benefit of its waters. Population (1870), 5641.

DEL CREDERE AGENT is one who, selling goods for his principal on credit, undertakes for an additional com- mission to guarantee the solvency of the purchaser.

DELFICO, Metcuiorre (1744-1835), an eminent Italian writer on political economy, was born at Teramo in the Abruzzi on the lst August 1744, and was educated at Naples. He devoted himself specially to the study of jurisprudence and political economy, and thus qualified himself for the valuable service he was to render tq his native country by his writings on legal and economic subjects. His first publication, Saggio jfilosofico nel matrimonio (1774), was an eloquent vindication of marriage against the loose views that were prevalent. To his Memorie sul Tribunale della Grascia e sulle Legge Economiche nelle Provincie confinante del Regno, addressed to the king, the- Neapolitans owed the abolition of the most vexatious and absurd restrictions on the sale and exporta- tion of agricultural produce. Other Memorze on kindred subjects followed, and did much to promote reform in the direction of free trade. Equally beneficial was the adop- tion of the principles developed in his Riflessiont sulla Vendita det Feudi Devoluti, in 1790, and his Lettera al Duca di Cantalupo st i Feudi Devoluti, in 1795, which were so powerfully reasoned that a law was promulgated for the sale of all feudalities reverting to the crown as free estates. During the short reign of Joseph Bonaparte at Naples, Delfico was made a councillor of state, and employed in the formation of the new judicial organization of Naples. He was employed in a similar manner under Murat; and, when Ferdinand was restored in 1815, Delfico was made president of the commission of the archives, an office which he filled until 1823, when he tendered his resignation on account of his advanced age. His sovereign acknowledged his eminently patriotic services by the grant of a large pension for life. Soon after, he retired to his native town, where he died on the 21st June 1835, at the advanced age of ninety-one. Besides the works we have noticed, on which his Neapolitan fame may be said chiefly to rest, we owe to him several general works of no mean reputation, especially Ricerche sul vero Carattere della Giurisprudenza Romana, e di sue Cultore, 1790, and Pensiert sulla Storia, esull’ Incertetza ed Inutilita

della Medesima, 1806, which have both been several times reprinted. In the latter he has anticipated the scepticism of Niebuhr on the early history of Rome, which he treats as fabulous ; and he denies to the Romans before the second Punic war all arts but that of agriculture, and of making war on their neighbours.

See Gregoire de Filippis Delfico's Della Vita e delle Opere di Melchiorre Deljico (Teramo, 1836), and Tipaldo's Biografia degli Italiani illustri (vol. ii.)

DELFT, a town of Holland, in the province of South Holland, on the Schie, nearly ten miles from Rotterdam, and in the line of the canal between that city and the Hague. It is well and regularly built in the form of a square, but has a rather gloomy appearance from its streets being traversed by narrow stagnant canals. The public buildings comprise the Prinsenhof, or palace, where William of Orange was assassinated in 1584; the town-house, erected in 1618, with antiquarian and artistic collections ; the Old Church, dating from the 11th century, and con- taining monuments to Van Tromp and Piet Hein, and the tomb of Leeuwenhoek, the naturalist; the New Church, founded in 1381, and interesting both for its chime of 500 bells, and as the burial-place of the princes of the house of Orange from the days of the Liberator down to the present century ; the arsenal, originally erected as a warehouse for the East India Company ; and the polytechnic school, with the fine collection of mechanical models formerly preserved in the dockyard at Amsterdam. It is sufficient to mention the powder-magazine, the school of military engineering, the theatre, the municipal school for the education of civil service students for the colonies, the school of design, the lunatic asylum, and Madame Renswonde's orphanage. For a long time the name of Delft was associated, not only in Holland, but even abroad, with the manufacture of excellent earthenware; but this industry, as well as the beer-brewing which was of great importance last century, has become almost extinct. The present branches are carpet-weaving, cooperage, dyeing, and distilling. The town was founded about 1075 by Duke Geoffrey of Lorraine after his con- quest of Holland from Count Thierry. It was almost totally ravaged by fire in 1536 ; and in 1654 it lost about 1200 of its

population by the explosion of a powder- magazine. In 1797 the Christo Sacrum Society was founded by Onder van Vyngaard-Ceanzius, the burgomaster of the city, for the utopian purpose of uniting in one community all the various branches of the Christian church. Of the celebrities of the town the most famous is Grotius, whose tomb is shown in the New Church. Popula- tion in 1874, 23,900.

DELHI, a district of British India under the jurisdic- tion of the lieutenant-governor of the Punjab, situated between 28° 13’ and 29° 13’ N. lat. and 76° 53’ and 77° 34” E. long. It consists of a strip of territory on the right or west bank of the River Jumna, 75 miles in length, and varying from 15 to 23 miles in breadth, bounded on the N. by the district of Karnél, on the E. by the Jumna river separating it from Meerut (Mirat) and Bulandshahr dis- tricts, on the §. by Rohtak, and on the W. by Gurgaon. With the exception of a low-lying alluvial tract in the north, and a narrow fringe of fertile soil along the river bank to the south of Delhi city, the country consists of stony or hard sandy soil, where cultivation mainly depends upon artificial irrigation. This is supplied by the Western Jumna canal, which has a course of 51 miles in the district; by the Ali Murd4n canal, constructed by a celebrated Persian nobleman of that name; by the new Agra canal ;

1 The name is also applied to a Division or Commissionership, com- prising the districts of Delhi, Gurgdon, and Karnal, containing a total area of 5557 square miles, with a population of 1,920,912.

and by the Jumna river, and a few hill streams. An offshoot of the Mewat hills runs in a north-easterly direction nearly across the district. This offshoot forms a sterile, rocky table-land, from two to three miles in breadth, but nowhere exceeding 500 feet above the level of the sur- rounding country. ; ;

The district population, according to a census taken in 1868, numbered 608,850 souls, scattered over an area of 1227 square miles, showing a density per square mile of 496 persons. According to their religious beliefs the inhabi- tants are thus classified :—Hindus, 438,886, or 7 2°08 per cent.; Mahometans, 130,645, or 21°46 per cent.; Sikhs, 580, or ‘09 per cent.;

others, 38,739, or 6°36 per cent. Four towns contain a population exceeding 5000,—viz., Delhi city, population 154,417 ; Sonipat, 12,176 ; Faridd- bad, 7990; and Balabgarh, 6281.

The principal agricultural products of the district are wheat, barley, sugar-cane, and cotton. In the lands of the northern part, commanded by the irrigation canals, cotton and sugar-cane are the most lucrative staples of the autumn harvest, while jodr (great millet), bdjrd (spiked millet), and makdi (Indian corn) are grown for local consumption. The spring crops consist of the better kinds of grain, such as wheat and barley, and of gram and tobacco. In some irrigated villages a superior kind of rice is grown, but it nowhere forms a staple product. Cotton cultivation

is extending, and a ready market for the fibre exists in’

Delhi city. The total area of the district is returned at 814,672 acres, of which 525,255 are cultivated, viz., 206,853 irrigated and 318,402 unirrigated. A tract of 1147 acres, set apart by the native rulers as a hunting ground, is now inclosed by Government as a timber preserve ; and other plantations along the banks of the river have recently been formed and placed under the Forest Department. The hills produce good building stone, and a fair kind of marble of two colours, black and grey. A white clay, supposed to be kaolin, is found at Arangpur, Murddpur, and Kasmpur, and has been employed with succéss at the Government foundry at Rurki for making crucibles. At the first named village is a crystal mine, no longer worked. The East India Railway and the Punjab Railway run trains into Delhi from their junction at Ghaziabad, about twelve miles distant, while the Rdjputand State Railway traverses the district for about twelve miles in the direction of Gurgdon. The Government revenue of Delhi district in 1872-73 amounted to £383,082,—of which £89,036 was derived from the land, £264,909 from salt and custom duties, and £14,086 from stamps. The land settlement is not a permanent one, but for a term of years, For the education of the people Government in 1872-73 main- tained in whole or in part 72 schools, attended by 3645 pupils, at an outlay to the state of £7760. There were also 32 unaided indigenous schools, attended by 529 pupils in 1872-73. Three Government dispensaries gave gratui- tous relief to 18,303 patients, at a cost of £925, 8s. (1872-73). For administrative purposes, the

district is subdivided into three tahs#/s of Delhi, Larsauli, and Balab- garh. The staff consists of a deputy commissioner, with two assistants and two extra assistant commissioners, a judge of the small cause court, 3 tahsildérs and 3 naib or assistant tahsilddrs, a superintendent and an assistant superintendent of police, and a civil surgeon.

The early history of the district will be found noticed below. In the last century, the Delhi empire fell under the Marhatt4s, and the emperor Shah Alam be- came a pensioner of the MahdrAj& Sindhia. In 1803 Lord Lake broke the Marhatta power. The Mughul emperor was taken under the protection of the Company,

and a considerable tract of country, consisting of nearly all

the present districts of Delhi and Hissar, was assigned for

the maintenance of the royal family. This tract was placed under charge of a British officer as Resident, and the revenue was collected and justice admiuistered in the name of the emperor. The annual allowance to the royal family paid from this assigned territory was originally £100,000; it was afterwards increased to £120,000, and subsequently to £150,000, exclusive of certain crown Jauds which yielded about £15,000 a year. The emperor received the homage of royalty ; and throughout the assigned territory all judicial decrees were pronounced in his name, and sentences of death were referred to him for approval. ‘The fiscal arrangements were under the entire control of the resident. This continued till 1832, when the office of resident was abolished, the tract being annexed to the North-Western Provinces, and a British Commissioner appointed to administer it. On the outbreak of the sepoy mutiny in 1857, the whole of the district was for a time lost to British rule, and the southern part was not subdued until after the fall of Delhi city in September 1857. In 1858 Delhi district was separated from the North-Western Provinces, and annexed to the then newly constituted lieutenant-governorship of the Punjab.

Deut, the chief city of the district and division of the same name, and the capital of the Mughul empire, is situated in 28° 39’ 40” N. lat. and 77° 17′

45” E. long. It abuts on the right bank of the River Jumna, and is inclosed on three sides by a lofty wall of solid stone constructed by the Emperor Shah Jahan, and subsequently strengthened by the English at the beginning of the present century by a ditch and glacis. The eastern side, where the city extends to the river bank, has no wall; but the high bank is faced with masonry, and bears from the outside the appearance of one. The circuit of the wall is 54 miles. Tt has ten gates, of which the principal are the Kashmir and Mori gates on the north; the Cabul and Lahore gates on the west ; and the Ajmir and Delhi gates on the west. The imperial palace, now known as “the fort,” is situated in the east of the city, and abuts directly on the river. It is surrounded on three sides by an imposing wall of red granite, with small round towers, and a gateway on the west and south. Since the mutiny of 1857 a great portion of the palace has been demolished in order to make room for English barracks. The more beautiful buildings in the palace, viz, the entrance hall, the naubdét khénd or music hall, the diwdn-t-dm or hall of public audience, the diwén- t-khdés or hall of private audience, the rang mahal, and some pavilions, have been preserved intact. As Mr Fergusson well says, in his History of Architecture, however, these buildings “ without the courts and corridors connect- ing them lose all their meaning, and more than half their beauty.” South of the fort, in the Daridganj quarter of the city, is a cantonment for a regiment of native infantry, which, with one wing of a European regiment stationed within the fort, makes up the garrison usually stationed at Delhi. On the opposite side of the river is the fortress of Salimgarh, erected in the 16th century by Salim Shah, and now inruins. At this point the East India Railway enters the city by a magnificent bridge across the Jumna, passing over Salimghar, and through a corner of the fort, to the railway station within the city walls. Thence the line proceeds as the Rajputand State Railway, and, after traversing the city, emerges through the wall on the north- west. In the north-eastern corner of the city, within the walls, and close to the Kashmir gate, are situated the treasury and other public offices. Daridganj, the fort, the public offices, and the railway form an almost continuous line along the eastern and northern faces of the city,—the angle between them being devoted to public gardens, The area thus occupied amounts to nearly half of that of the entire city; it presents a comparatively open appear-

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ance, and forms a marked contrast to the south-west quarter of the town, which is densely occupied by the shops and dwellings of the native population.

The buildings in the native town are chiefly of brick, well-built and substantial. The smaller streets are narrow and tortuous, and in many cases end in culs de sac. On the other hand, no city in India has finer streets than the main thoroughfares of Delhi, ten in number, thoroughly drained, metalled, and lighted. The principal thorough- fare, the Chandni Chauk, or Street of Silver, leads east- wards from the fort to the Lahore gate, and is three- quarters of a mile long by 74 feet broad. Throughout the greater part of its length, a double row of nim and pipdl trees runs down its centre on both sides of a raised path, which has taken the place of the masonry aqueduct that in former days conducted water from the canal into the palace. A little to the south of the Chandni Chauk is the Jam4 Masjid, or great mosque, standing out boldly from a siall rocky rising ground. Begun by Shah Jahan in. the fourth year of his reign, and completed in the tenth, it still remains one of the finest buildings of its kind in India. Its front court-yard, 450 feet square, and sur- rounded by a cloister open on both sides, is paved with granite inlaid with marble, and commands a view of the whole city. The mosque itself, a splendid structure form-

ing an oblong 261 feet in length, is approached by a

magnificent flight of stone steps. ‘Three domes of white marble rise from its roof, with two tall and graceful minarets at the corners in front. The interior of the «mosque is paved throughout with white marble, and the walls and roof are lined with the same material. Two other mosques in Delhi deserve a passing notice,—the Kala Masjid, or black mosque, so called from the dark colour given to it by time, and supposed to have been built by one of the early Afghan sovereigns, and the mosque of Roshdn-ud-daul4. Among the more modern buildings of Delhi may be mentioned the Government College, founded in 1792, the Residency, and the Protestant church, built at a cost £10,000, by Colonel Skinner, an officer well- known in the history of the East India Company. About half-way down the Chaéndni Chauk is a high clock-tower, with the institute and museum opposite. Behind the Chandni Chauk, to the north, lie the Queen’s Gardens ;

beyond them the “city lines” stretch away as far as the well-known rocky ridge, about a mile outside the town. From the summit of this ridge the view of the station and city is very picturesque. ‘To the west and north-west, considerable suburbs cluster beyond the walls, containing the tombs of the imperial family. That of Humayun, the second of the Mughul dynasty, is a noble building of granite inlaid with marble. It lies about two miles from the city, amid a large garden of terraces and fountains, the whole surrounded by an embattled wall, with towers and four gateways. In the centre stands a platform about 20 feet high by 200 feet square, supported by cloisters, and ascended by four great flights of granite steps. Above, rises the Mausoleum, also a square, with a great dome of white marble inthe centre. About amile to the westward is another burying-ground, or collection of tombs and small mosques, some of them very beautiful. The most remark- able is perhaps the little chapel in honour of a celebrated Mussulman saint, Niz4m-ud-din, near whose shrine the inembers of the late imperial family, up to the time of the mutiny, lie buried, each in his own little inclosure, sur- rounded by very elegant lattice-work of white marble. The Kutab Minar, or Pillar, is situated about nine miles south of the city.

The palaces of the nobles, which formerly gave an air of grandeur to the city, have for the most part disappeared. Their sites are occupied by structures of less pretension, but

still of some elegance of architectural design. The city is now amply supplied with water; and much attention has of late been paid to its cleanliness and its sanitary condition generally. The principal local institution was, until 1877, the Delhi College, founded in 1792. It wasat first exclusively an Oriental school, supported by the voluntary contributions of Mahometan gentlemen, and managed by a committee of the subscribers. In 1829 an English department was added to it; and in 1855 the institution was placed under the control of the Educational Department. In the mutiny of 1857 the old college was plundered of a very valuable Oriental library, and’ the building completely destroyed. A new college was founded in 1858, and was affiliated to the university of Calcutta in 1864. The old college attained to great celebrity as an educational institution, and

produced many excellent scholars. Under orders of the Government of the Punjab (February 1877), the collegiate staff of teachers was to be withdrawn, in order to concentrate the grant available for higher-class education upon the central and more useful institution at Lahore, the present capital of the province.

The population of Delhi in 1858 was returned at 152, 424, viz., 76,390 Hindus and 76,034 Mahometans. In 1868, the census showed that since the Mutiny the Mahometan population had greatly diminished, while on the other hand the Hindus had considerably increased. In that year, the population was ascer- tained to be made up as follows :—Hindus, 85,087 (males 46,541 and females 38,546); Mahometans, 61,720 (males 32,361 and females 29,359); Sikhs, 357 ‘males 267 and females 90); other denominations, 7258 (males 4177 and females 3076): total of all religions, 154,417 (males 83,346 and females 71,071). The Delhi municipality, which also embraces the suburbs, contains a population of 184,840. The total income (mainly derived from octroi duties) in 1871-72 amounted to £25,610, or an average of 2s. 94d. per head.

History.—From the earliest period of Indian history, Delhi or its immediate neighbourhood has been the site of a capital city. Within the circuit of a very few miles from modern Delhi, city after city has risen upon the ruins of its predecessors, and the debris of ancient build- ings is now estimated to cover an area of 45 square miles. The first of these fallen capitals, Indraprastha, is supposed to date from the 15th century B.c., when the Aryan colonists of India were beginning to feel their way down the Jumna. The Sanskrit epic, the d/chdbhdrata, relates how the city was founded by Yudhisthira and his brothers, the five Pandavas. It lay upon the banks of the Jumna, near Humayun’s tomb, about two miles south of the modern city; and the Migambod g/dé, near the old Calcutta gate of Delhi, is believed to be its one surviving relic. A list of monarchs brings the history of Indraprastha down to the middle of the 1st century B.c., when the name of Dilli, or Delhi, is first met with. By this time the city had spread or been removed some miles to the south, as far as the site now occupied by the Kutab Mindr. Another blank of several centuries occurs until the 3d or 4th century A.D.. To this latter period belongs the carved iron pillar near Delhi, one of the most curious monuments in India. It consists of a solid shaft of

wrought iron, upwards of 16 inches in diameter, and more than 50 feet in length, of which 22 feet are above ground. The pillar bears a Sanskrit in- scription in six lines, recording the history of one R4jé Dhava, who " obtained by his own arm an undivided sovereignty on the earth for a long period." Delhi nextmakes itsappear- ance in history at the time of the foundation of the Tomara or Tudr dynasty by Anang Pal in 736 a.p. This ruler is said to have restored the city, and during his dynasty the capital alternated between Delhiand Kanauj. About 1151 A.D. the Tomara dynasty was overthrown by Visala Deva, the Chohan king of Ajmir, but a marriage of the daughter of the vanquished monarch to the son of the conqueror united the two families. Theson of this union, the famous

Prithivi Raja, was the last Hindu ruler of Delhi. In 1191 came the invasion of Muhammad of Ghor. Defeated on this occasion, Muhammad returned two years later, overthrew the Hindus, and captured and put to death Prithivi Raja. Delhi became henceforth the capital of the Mahometan Indian empire, Kutab-ud-din (the general and slave of Muhammad of Ghor) being left incommand. His dynasty is known as that of the slave kings, and it is to them that old Delhi owes its grandest remains, among them Kutab- ud-din's mosque and pillar, a few miles south of the modern city. The slave dynasty retained the throne till 1288, when it was subverted by Jaldl-ud-din Ghilz4i. The most remarkable monarch of this dynasty was Ala-ud-din, during whose reign Delhi was twice exposed to attack from invad- ing hordes of Mughuls. On the first occasion, Ala-ud-din defeated them under the walls of his capital ; on the second, after encamping for two months in the neighbourhood of the city, they retired without a battle. The house of Ghilz4i came to an end in 1321, and was followed by that of Taghlak. Hitherto the Pathdn kings had been content with the ancient Hindu capital, altered and adorned to suit their tastes. Butone of the first acts of the founder of the new dynasty, Ghids-ud-din Taghlak, was to erect a new capital about four miles further to the east, which he called TaghlakAbad. Theruins of his fort remain, and the eye can still trace the streets and lanes of the long deserted city. Ghids-ud-din was succeeded by his son Muhanimad Taghlak, who reigned from 1325 to 1351, and is described by Elphinstone as "one of the most accomplished princes and most furious

tyrants that ever adorned or disgraced human nature.” Under this monarch the Delhi of the Taghlak dynasty attained its utmost growth. His successor Firoz Shéh Taghlak trans- ferred the capital to a new town which he founded some miles off, on the north of the Kutab, and to which he gave his own name, Firozdbad. In 1398, during the reign of Mahmud Taghlak, occurred the ‘Tartar invasion of Timurlane. The king fled to Guzerat, lis army was defeated under the walls of Delhi, and the city surrendered. The town, notwithstanding a promise of protection, was plundered and burned ; the citizens were massacred. The invaders at last retired, leaving Delhi without a Govern- ment, and almost without inhabitants. At length Mahmud Taghlak regained a fragment of his former kingdom, but on his death in 1412 the family became extinct. He was succeeded by the Sayyid dynasty, which held Delhi and a a few miles of surrounding territory till 1444, when it gave way to the house of Lodi, during whose rule the capital was removed to Agra. In 1526 Baber, sixth in descent from Timurlane, invaded India, defeated and killed Ibrahim Lodi at the battle of Panipat, entered Delhi, was proclaimed emperor, and finally put an end to the Afghan empire. Baber’s capital was at Agra, but his son and successor, Humayun, removed it to Delhi. In 1540 Humayun was defeated and expelled by Sher Shah, who entirely rebuilt the city, inclosing and fortifying it with a new wall. In his time Delhi extended from where Humayun’s tomb now is to near the southern gate of the modern city. In 1555 Humayun, with the assistance of Persia, regained the throne; but he died within six months afterwards, and was succeeded by his son, the illustrious Akbar.

During Akbar’s reign and that of his son J ahdngir, the capital was either at Agra or at Lahore, and Delhi once more fell into decay. Between 1638 and 1658, however, Shah Jahan rebuilt it almost in its present form 5 and his city remains substantially the Delhi of the present time. The imperial palace, the Jamd Masjid or great mosque, and the restoration of what is now the western Jumna canal, are the work of Shah Jahan. The Mughul empire rapidly

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expanded during the reigns of Akbar and his successors down to Aurungzebe, when it attained its climax. After the death of the latter

monarch, in 1707, came the decline. Insurrections and civil wars on the part of the Hindu tri- butary chiefs, Sikhs and Marhattds, broke out. Aurungzebe’s successors became the helpless instruments of conflict- ing chiefs. His grandson, Jahandar Shah was, in 1713, deposed and strangled after a reign of one year; and Farrakhsiyyar, the next in succession, met with the same fate in 1719. He was succeeded by Muhammad Shah, in whose reign the Marhattd forces first made their ap- pearance before the gates of Delhi, in 1736. Three years later the Persian monarch, Nadir Shah, after defeating the Mughul army at Karnal, entered Delhi in triumph. While engaged in levying a heavy contribution, the Persian troops were attacked by the populace, and many of them were killed. Nadir Shah, after vainly attempting to stay the tumult, at last gave orders fora general massacre of the inhabitants. For fifty-eight days Nadir Shah remained in Delhi, and when he left he carried with him a treasure in money amounting, at the lowest computation, to eight or nine millions sterling, besides jewels of inestimable value, and other property to the amount of several millions more.

From this time (1740) the decline of the empire pro- ceeded unchecked and with increased rapidity. In 1771 Shah Alam, the son of Alamgir IL, was nominally raised to the throne by the Marhattas, the real sovereignty resting with the Marhatta chief, Sindhia. An attempt of the puppet emperor to shake himself clear of the Marhattds, in which he was defeated in 1788, led to a permanent Mar- hatt4 garrison being stationed at Delhi. From this date, the king remained a cipher in the hands of Sindhia, who treated him with studied neglect, until the 8th September 1803, when Lord Lake overthrew the Marhattds under the walls of Delhi, entered the city, and took the king under the protection of the British. Delhi, once more attacked by a Marhatté army under the Marhatt4 chief Holkar in 1804, was gallantly defended by Colonel Ochterlony, the British resident, who held out against overwhelming odds for eight days, until relieved by Lord Lake. From this date a new era in the history of Delhi began. A pension of £120,000 per annum was allowed to the king, with ex: clusive jurisdiction over the palace, and the titular sove- reignty as before; but the city, together with the Delhi territory, passed under British administration.

Fifty-three years of quiet prosperity for Delhi were brought to a close by the mutiny of 1857. Its capture by the mutineers, its siege, and its subsequent recapture by the British have been often told, and nothing beyond a short notice is called for here. The outbreak at Meerut occurred on the night of the 10th May 1857. Immediately after the mur- der of their officers, the rebel soldiery set out for Delhi about 35 miles distant, and on the following morning entered the city, where they were joined bythe city mob. Mr Fraser, the commissioner, Mr Hutchinson, the collector, Captain Douglas, the commandant of the palace guards, and the Rev. Mr Jennings, the residency chaplain, were at once murdered, as were also most of the civil and non-official residents whose houses were situated within the city walls, The British troops in cantonments consisted of three regi- ments of native infantry and a battery of artillery. These cast in their lot with the mutineers, and commenced by killing their officers. The Delhi magazine, then the largest in the north-west of India, was in the charge of Lieutenant Willoughby, with whom were two other officers and six non-commissioned officers. The magazine was attacked by the mutineers, but the little band defended to the last the enormous accumulation of munitions of war stored there, and, when further defence was hopeless, fired the magazine. Five of the nine were killed by the explosion, and

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Lieutenant Willoughby subsequently died of his injuries ; the remaining three succeeded in making their escape. The occupation of Delhi by the rebels was the signal for risings in almost every military station in North-Western India. The revolted soldiery with one accord thronged towards Delhi, and in a short time the city was garrisoned by a rebel army variously estimated at from 50,000 to 70,000 disciplined men. The pensioned king, Bahadur Shah, was proclaimed emperor ; his sons were appointed to various military commands. About fifty Europeans and Eurasians, nearly all females, who had been captured in trying to escape from the town on the day of the outbreak, were confined in a stifling chamber of the palace for fifteen days ; they were then brought out and massacred in the court-yard, .

The siege which followed forms one of the memorable incidents of the British history of India. On the 8th June, four weeks after the outbreak, Sir

H. Barnard, who had succeeded as commander-in-chief on the death of General Anson, routed the mutineers with a handful of Kuropeans and Sikhs, after a severe action at Badli-ka-Sarai, and encamped upon the ridge that overlooks the city. The force was too weak to capture the city, and he had no siege train or heavy guns. All that could be done was to hold the position till the arrival of reinforcements and of a siege train. During the next three months the little British force on the ridge were rather the besieged than the besiegers. Almost daily sallies, which often turned into pitched battles, were made by the rebels upon the over-worked handful of Europeans, Sikhs, and Gurkhas. A great struggle took place on the ceutenary of the battle of

Plassey, June 23, and another on the 25th August ; but on

both occasions the mutineers were repulsed with heavy loss. General Barnard died of cholera in July, and was succeeded by General Archdale Wilson. Meanwhile reinforcements and siege artillery gradually arrived, and early in Septem- ber it was resolved to make the assault. The first of the heavy batteries opened fire on the 8th September, aud on the 13tha practicable breach was reported. On the morn- ing of the 14th the assault was delivered, the points of attack being the Kashmir bastion, the water bastion, the Kashmir gate, and the Lahore gate. The assault was thoroughly successful, although the column which was to enter the city by the Lahore gate sustained a temporary check, The whole eastern part of the city was retaken, but ata loss of 66 officers and 1104 men killed or wounded, out or the total strength of 9866. Fighting continued more or less during the ‘next six days, and it was not till the 20th September that the entire city and palace were occupied, and the reconquest of Delhi was complete. Dur- ing the siege, the British force sustained a loss of 1012 officers and men killed, and 3837 wounded. Among the killed was General John Nicholson, the leader of one of the storming parties, who was shot through the body in the act of leading his men, in the first day’s fighting. He lived, however, to learn that tle whole city had been recap- tured, and. died on the 23d September. On the flight of the mutineers, the king and several members of the royal family took refuge at Humdayun’s tomb, On receiy- ing a promise that his life would be spared, the last of the house of Timur surrendered to Major Hodson; he was afterwards banished to Rangoon. Delhi, thus recon-

quered, remained for some months under military autho- rity. Owing to the murder of several European soldiers who strayed from the lines, the native population was expelled the city. Hindus were soon afterwards re-ad- mitted, but for some time Mahometans were rigorously excluded. Delhi was made over to the civil authorities in January 1858, but it was not till 1861 that the civil courts were regularly reopened. The shattered walls of

the Kashmir gateway, and the bastions of the northern face of the city, still bear the marks of the cannonade of September 1857. Since that date, Delhi has settled down into a prosperous commercial town, and a great railway centre. The lines which start from it to the north, south, east, and west bring into its bazaars the trade of many dis- tricts. But the romance of antiquity still lingers around it, and Delhi was selected for the scene of the Imperial Proclamation on the lst January 1877.

An excellent chapter on Delhi will be found in Mr Keene's Fall of the Moghul Empire. In preparing the above account, the materials have been chiefly drawn from the official Statistical

Account of Delhi District, togethcr with Sir J. W. Kaye's History of the Sepoy War. (W. W. H.)

DELIA, a festival of Apollo held in Delos. It included athletic and musical contests, for which the prize was a branch of the sacred palm. This festival was said to have been established by Theseus when returning from Crete. The Athenians took special interest in maintaining its splendour.

DELILLE, Jacquss (1738-1813), a French poet, was: born on the 22d of June 1738, at Aigues-Perse in Auvergne. He was an illegitimate child, and was connected by his mother with the family of the Chancellor de VH6pital. With very slender means of sepport he was educated at the college of Lisieux in Paris, and made such progress in his studies as augured well for his future dis- tinction. When his education was completed, he was forced to accept of a very humble situation as elementary teacher in the college of Beauvais; but this was soon exchanged fur the more honourable station of professor of humanity at Amiens. After

returning to Paris, where he obtained a professorship at the Collége de la Marche, he speedily acquired a considerable poetical fame, which was . greatly increased by the publication (1769) of his transla- tion of the Georgics of Virgil, which he had begun at Amiens. Voltaire was greatly struck with the enterprise and the success of Delille; and without any personal acquaintance with the poet he, of his own accord, recom- mended him and his work to the good graces of the Academy. He was at once elected a member, but was not admitted until 1774 owing to the opposition of Richelieu, who alleged that he was too yonng. He now aimed at a higher distinction than even a finished translation of the most finished poem in the world could confer upon him ; and in the Jardins, which he published in 1782, he made good his pretensions as an original poet. Before he had gone far in the composition of his next poem, which was not; indeed, published till after many of his other works, he made a journey to Constantinople in the train of the ambassador M. de Choiseul Gouffier. On his return to Paris he lectured, in his capacity of professor, on the Latin ‘poets, and was attended by a numerous audience, who were delighted, not only with his critical observations, but with his beautiful recitation. Delille continued to advance in fame and fortune, though without hazarding any more publications, till the period of the Revolution, when he was reduced to poverty, and sheltered himself in retreat from the disasters which surrounded him. He quitted Paris, and retired to St Dié, the native place of Madame Delille ; and here he completed, in deep solitude, his translation of the Aneid, which he had begun many years before. A residence in I’rance, however, soon becamie very undesir- able, and he emigrated first to Basle and then to Glairesse in Switzerland, a charming village on the Lake of Bienne, opposite Rousseaw’s island of St Pierre. Much delighted with this enchanting country, and with the reception which he met from its inhabitants, he occupied himself coustantly in the composition of poetry, and here finished his Homme des Champs, and his poem onthe Z’row Hégnes de la

Nature. His next place of refuge was in Germany, where he composed his La Pitié ; and finally, he passed two years in London, chiefly employed in translating Paradise Lost. In 1801, finding that he might return safely to Paris, he did so, carrying with him his immense Poetical Encyclopedia, He resumed his professorship and his chair at the Academy, but lived in retirement. His later poems were very numerous, but were not fitted to increase his reputation, which rests mainly on his translation of the Georgics and his Jardins. In his Jater years he became blind. He died on the Ist May 1813.

Delille left behind him little prose. His preface to the transla- tion of the Georgics is an able essay, and coutains many excellent hints on the art and difficulties of translation. He wrote the atticle ‘‘ La Bruyére” in the Biographie Universelle. The following is the list of his poetical works :—Les Géorgiques de Virgile, traduites en vers francais, Paris, 1769, 1782, 1785, 1809 ; Les Jardins, en quatre chants, 1780, new edition, London, 1800, Paris, 1802 ; LT’ Hommes des Champs, ou les Géorgiques Frangaises, 1800 ; Poésies Fugitines, 1802; Dithyrambe sur 1 Immortalité de 1 Ame, suivi du passage du Saint Gothard,—poéme traduit de l Anglais de Madame la Duchesse de Devonshire, 1802; La Pitié,—poéme, en quatre chants, London and Paris, 1803 ; Z’ Enéide de Virgile, traduite en vers francais, 1805; L’ Imagination, poéme en huit chants, 1806; Les Trois Réegnes de la Nature, 1809 ; La Conversation, 1812.

DELIRIUM, a temporary disorder of the mind gene- rally occurring in connection with some form of bodily disease. It may vary in intensity from slight and occasional wandering of the mind and incoherence of expression, to fixed delusions and violeut maniacal. excitement, and again it may be associated with more or less of coma or insensibility (see Menrat Disxases). Delirium is apt to occur in most diseases of an acute nature, such as fevers or inflammatory affections, in injuries affecting the brain, in blood diseases, in conditions of exhaustion, and as the result of the action of certain specific poisons, such as opium, Indian hemp, belladonna, chloroform, and alcohol. ‘The form of delirium which is due to the action of the last-named substance is one of great importance from its comparative frequency, and is well known by the name of Delirium Tremens.

Delirium Tremens is one of a train of symptoms of what is termed in medical nomenclature acute alcoholism, or recent excessive indulgence in alcohol. It must, however, be observed that this disorder, although arising in this manner, rarely coines on as the result of a single debauch in a person unaccustomed to the abuse of stimulants, but generally occurs in cases where the nervous system has been already subjected for a length of time to the poison- ous action of alcohol, so that the complaint might be more properly regarded as acute supervening on chronic alcohol- ism. It is equally to be borne in mind that many habitual drunkards never suffer from delirium tremens.

It was long supposed, and is indeed still believed by some, that delirium tremens only comes on when the supply of alcohol has been suddenly cut off; but this view is now generally rejected, and there is abundant evidence to show ‘that the attack comes on while the patient is still continu- ing to drink. Even in those cases where several days have elapsed between the cessation from drinking and the seizure, it will be found that in the interval the premonitory symptoms of delirium tremens have shown themselves, onv of which is aversion to drink as well as food—the attack being in most instances preceded by marked derangement of the digestive functions. Occasionally the attack is pre- cipitated in persons predisposed to it by the occurrence of some acute disease, such as pneumonia, by accidents, such as burns, also by severe mental strain, and by the depri- vation of food, even where the supply of alcohol is less than would have been likely to produce it otherwise. Where, on the other hand, the quantity of alcohol taken has been very large, the attack is sometimes usl.ered in

by fits of an epileptiform character. Males are much more frequently the subjects of delirium tremens than females.

One of the earliest indications of the approaching attack of delirium tremens is sleeplessness, any rest the patient may obtain being troubled by unpleasant or terrifying dreams. During the day there is observed a certain rest- lessness and irritability of manner, with trembling of the hands and a thick or tremulous articulation. The skin is perspiring, the countenance oppressed-looking and flushed, the pulse rapid and feeble, and there is

evidence of con- siderable bodily prostration, These symptoms increase each day and night for a few days, and then the character- istic delirium is superadded. The patient is in a state of mental confusion, talks incessantly and incoherently, has a distressed and agitated or perplexed appearance, and a vague notion that he is pursued by some one seeking to injure him. His delusions are usually of transient charac- ter, but he is constantly troubled with visual hallucinations

‘in the form of disagreeable animals or insects which he

imagines he sees all about him. He looks suspiciously around him, turns over his pillows, and ransacks his bed- clothes for some fancied object he supposes to be concealed there. There is constant restlessness, a commou form of delusion being that he is not in his own house, but imprisoned in some apartment from which he is anxious to escape to return home. In these circumstances he is ever wishing to get out of bed and out of doors, and, although in general he may be persuaded to return to bed, he is soon desiring to get up again. The trembling of the muscles from which the name of the disease is derived is a prominent but not invariable symptom. It is most marked in the muscles of the hands and arms and in the tongue. ‘The character of the delirium is seldom wild or noisy, but is much more commonly a combination of busy restlessness and indefinite fear. When spoken to the patient can answer correctly enough, but immediately thereafter relapses into his former condition of incoherence. Occasionally maniacal symp- toms develop themselves, the patient becoming dangerously violent, and the case thus assuming a much graver aspect than one of simple delirium tremens,

In most cases the symptoms undergo abatement in from three to six days, the cessation of the attack being marked by the occurrence of sound sleep, from which the patient awakes in his right mind, although in a state of great physical prostration, and in great ineasure if not entirely oblivious of his condition during his illness.

Although generally the termination of an attack of delirium tremens is in recovery, it occasionally proves fatal by the supervention of coma and convulsions, or acute mania, or by exhaustion, more especially when any acute bodily disease is associated with the attack. In certain instances

delirium tremens is but the beginning of serious and permanent impairment of intellect, as is not unfre- quently observed in confirmed drunkards who have suffered from frequent attacks of this diseasc.

The treatment of delirium tremens has given rise to much discussion among medical men, and the result has been that more rational views now prevail on the subject than formerly. ‘This change is doubtless in great measure to be ascribed to the clearer ideas respecting the real nature and true cause of the malady which extensive and accurate observation has afforded. The theory once so widely accepted, that delirium tremens was the result of the too sudden breaking off from indulgence in alcohol, led to its treatment by regular and often large doses of stimulants, a practice fraught with mischievous results, since however much the delirium appeared to be thus calmed for the time, the continuous supply of the poison which was the original source of the disease inflicted serious damage upon the

brain, and Jed in many instances to the subsequent development of insanity. The former system of prescribing large doses of opium, with the view of procuring sleep at all hazards, was no less pernicious ; and there is reason to fear that not a few cases of delirium tremens have ended in fatal coma from what was in reality opium poisoning. In addition to these methods of treatment, mechanical restraint of the patient was the common practice.

The views of the disease which now prevail, recognizing ! the delirium as the effect at once of the poisonous action of alcohol upon the brain and of the want of food, encourage reliance to be placed for its cure upon the entire withdrawal, in most instances, of stimulants, and the liberal administration of light nutriment, in addition to quietness and gentle but firm control, without mechanical restraint. In mild attacks this is frequently all that is required. In more severe cases, where there is great restlessness, sedatives have to be resorted to, and many substances have been recommended for the purpose. Opiates administered in small quantity, and preferably by hypodermic injection, are undoubtedly of value ; and chloral, either alone or in conjunction with bromide of potassium, often answers

even better. Such remedies, however, should be administered with great caution, and only under medical supervision.

Stimulants may be called for where the delirium assumes the low or adynamic form, and the patient tends to sink from exhaustion, or when the attack is complicated with some other disease. Such cases are, however, in the : highest degree exceptional, and do not affect the general principle of treatment already referred to, which inculcates the entire withdrawal of stimulants in the treatment of ordinary attacks of delirium tremens. (3, 0. 2.)

DELITZSCH, a town of Prussia, in the province of

much interest as the production of a foreigner, and as con- taining many acute observations on the causes of the excellence of the English constitution as compared with that of other countries. It is, however, wanting in breadth of view, being written before the period when constitutional questions were treated in a philosophical manner. Several editions were published after the author's death, the latest being in 1853 by MacGregor. Delolme also wrote A Parallel between the English Government and the former Government of Sweden (1772), A History of the Plagellants (1782), based upon a work of Boileau's, An Hssay on the Union of Scotland and England (1787), and one or two smaller works.

DELOS, now Mtkra Dili, or Little Delos, to distinguish it from Megali Dili, or Great Delos, an island in the Zigean, the smallest but most famous of the Cyclades, and, according to the ancient belief, the spot round which the group arranged itself in a nearly circular form. It is a rugged mass of granite, about 12 square miles in extent, in 37° 23' N. lat. and 25° 17' E. long., about half a mile to the east of Megali Dili, or Rheneia, and two miles to the west of Myconos. Towards the centre it rises to its great-

-est height of 350 feet in the steep and rocky peak of Mount

Cynthus, which, though overtopped by several eminences in the neighbouring isiands, is very conspicuous from the surrounding sea. It is now completely destitute of trees ; but it abounds with brushwood of lentisk

and cistus, and here and there affords a patch of corn-land to the occasional sower from Myccnos. Of the many traditions that were current among the ancient Greeks regarding the origin of Delos—or, as they sometimes named it, Asteria, Ortygia, Chlamydia, or Pyrpile—the most popular describes it as struck from the bed of the sea by a dint of Neptune's trident, and drifting devious through the Aigean till moored

Saxony, at the head of a district in the department of | by Jupiter as a refuge for his persecuted Latona. It was Merseburg, situated on the Lober, an affluent of the Mulds, | soon after flooded with the birth-radiance of Apollo and

12 miles north of Leipsic at a railway junction. Its public buildings comprise an old castle of the 14th century | now used as a female penitentiary, one Roman Catholic and three Protestant churches, a normal college (Schul- lehrerseminar) established in 1873, and several other educational institutions. Besides Kuhschwanz, a peculiar kind of beer, it manufactures tobacco, cigars, shoes, and hosiery ; and coal-mining is carried on in the neighbourhood. Originally a settlement of the Sorbian Wends, and in the | 12th century part of the possessions of the bishops of Merseburg, Delitzsch ultimately passed to the Sachsen- Merseburg family, and on their extinction in 1738 was incorporated with Electoral Saxony. Ehrenberg, the famous naturalist, was born in the town in 1795. Popula- | tion in 1875, 8235. | DELOLME, Jean Louis (1740-1806), jurist and con- stitutional writer, was born at Geneva in 1740. He studied for the bar, and had entered on the profession of an advocate in his native town when he was obliged to emigrate on account of the publication of a pamphlet entitled Hxamen de. trots parts de droit, which gave offence to the authorities of the town. He found an asylum in England, where he lived for several years on the meagre and precarious income derived from occasional contributions to various journals. He maintained an honourable in- dependence, however, until 1775, when he found himself | compelled to accept aid from a charitable society to enable him to return home. He died at Sewen, a village in the canton of Schwytz, on the 16th July 1806. During his exile Delolme made a careful study of the English con- | stitution, the results of which he published in his La Con- ; stitution de l Angleterre (Amsterdam, 1771), of

which an | enlarged and improved edition in English appeared in } 1772, and was several times reprinted. The work excited |

Diana, and became for ever sacred to these twin deities of light. The island first appears in history as an Ionian colony and the seat of a great Ionic festival to which the Athenians, among the rest, were accustomed annually to despatch a ewpis, or sacred ship, with a number of Deliasts, cwpoc, or sacred delegates. In the 6th century B.o. the influence of the Delian Apollo was at its height ; Polycrates of Samos dedicated the neighbouring island of Rheneia to his service, and Pisistratus of Athens caused all the area within sight of the temple to be cleared of the tombs by which its sanctity wasimpaired. About a hundred years afterwards, in the sixth year of the Peloponnesian war (426 B.c.), the Athenians instituted a more elaborate lustration, caused every tomb to be removed from the island, and established a law that ever after any one whose condition seemed to threaten its pollution by either birth or death should be at once conveyed from its shores. And even this was not accounted sufficient; for, in 422, they expelled all its secular inhabitants. After the overthrow' of Corinth, in 146 3.c., the commercial element which had in all pro- bability been present from the first in the religious gather- ings, came prominently forward, and Delos became the central mart of the Augean. In the Mithridatic war it was laid waste by Menophanes, the general of the Bithynian king ; and it never recovered its former prosperity, though it is said that, under the Roman empire, 10,000 slaves were sometimes put up for sale in a single day. Hadrian attempted to found a city which was to bear the proud name of New Athens; but, when visited by Pausanias towards the close of the same century, the whole island

-was almost depopulated. It is now absolutely without a

permanent inhabitant, though during the summer months a few shepherds cross over with their flocks from Myconos or Rheneia. As a religious centre it is replaced by Tenos,

and as a commercial centre by the flourishing port of Syra. | making a new era in the adjuncts of the stage. Garrick's:

Besides the site of the chief settlement or city, the follow- ing are the spots of antiquarian interest which can still be identified :—the temple of Apollo, a splendid building of the Doric order which, in the words of Mr Tozer, now forms "a confused heap of white marble fragments, columns, bases, and entablatures, lying indiscriminately together ;" the portico erected by Philip of Macedon ; the base (within the temple area) of the colossal statue dedi- cated to the Delian Apollo by the people of Naxos; a theatre of Parian marble on the slope of Mount Cynthus ; a temple to Isis, further up the hill, which probably explains the myth of the connection between the brook Inopus and the Nile ; the so-called " treasury " of Delos ; an Jonic temple on the summit ; and the circular tank or lake which supplied the water for the religious rites. The ordinary buildings on the island were constructed of native granite, but marble was imported for the nobler edifices, which were destined to serve as so many quarries to the medixval builders of Constantinople and Venice.

See Leake, Northern Greece; Sallier, " Histoire de l'Isle de Délos," in Mémotres del' Acad. des Inscrip. ; Schwenck, Deliacorum,

art i, 1825; Tozer, ''Delos and Rheneia,":- in Academy, 1875 ; sebegue, Recherches sur Délos, Paris, 1876.

DE LOUTHERBOURG, Pattie Jamus (1740-1812), an artist of remarkably versatile ability and interesting personality. He was born at Strasburg, 31st. October 1740, where his father, the representative of a noble Polish family, practised miniature painting in a semi-amateur manner ; but he spent the greater part of his life in Lon- don, where he was naturalized, and exerted a considerable influence on the scenery of the English stage, as well as on the artists of the following generation, Turner, Martin, &c.

Young De Loutherbourg was intended for the Lutheran ministry, and was educated at the university of Strasburg. As the calling, however, was foreign to his nature, he insisted on being a painter, and placed himself

under Vanloo in Paris. The result was the immediate and precocious de- velopment of extraordinary powers. Besides this triumph, and independently of it, he became a figure in the fashion- able society of that day, and the friend of such men as Diderot, who had just then mainly contributed to make Gesner celebrated. He was elected into the French Academy below the age required by the law of the institu- tion, and painted landscapes, sea-storms, battles, all of which had a celebrity above those of the specialists then working in Paris. By temperament whatever was extra- ordinary and sensational was attractive to him, and the bizarre appeared in allhe did. His début was made by the exhibition of twelve pictures, including Storm at Sunset, Night, Morning after Rain; and when he painted common things, as a group of asses, he gave the picture such a fantastic title as—Father and Mother, Jittle Fanfan, Aunt and Uncle & la Bretagne, Cousin Germain, and the Perruquier of all the Family. In the next stage of his life we find him travelling in Switzerland, Germany, and Italy, distinguishing himself as much by mechanic inventions as by painting. One of these, constructed at his native city, was the wonder of the day, showing quite new effects produced in a model theatre. The exhibition of lights behind canvas representing the moon and stars, the illusory appearance of running water produced by clear blue sheets of metal and gauze, with loose threads of silver, and so on, were his devices. Charles Blanc says one of these curious models, called “ Le Séraphin,” still existed in the Palais Royal at the date of publication of his work, Zcole Frangaise. Waving repaired to London, De Loutherbourg was employed by Garrick, who offered him £500 a year to apply his mechanisms to Drury Lane, and to superintend the scene-painting, which he did with complete success,

own piece, the Christmas Tale, and the pantomime, 1781-2, introduced the novelties to the public, and the delight not only of the masses, but of Reynolds and the artists, was unbounded. The green trees gradually became russet, the moon rose aud lit the edges of passing clouds, and all the world was captivated by effects we now take little notice of. A still greater triumph awaited him on his opening an entertainment he called the “‘ Hidophusicon,” which showed the rise, progress, and result of a storm at sea—that which destroyed the great Indiaman, the ‘‘ Halsewell,”—-and the Fallen Angels raising the Palace of Pandemonium. De Loutherbourg has been called the inventor of the pano- rama, but this honour does not belong

to him, although it ° first appeared about the same time as the eidophusicon. The first panorama was painted and exhibited by Barker the elder. /

All this mechanism did not in the least prevent De Loutherbourg from painting. Lord Howe's Victory off Ushant, 1792, and other large naval pictures, were commis- sioned for Greenwich Hospital Gallery, where they still remain. His grandest work, the Destruction of the Ar- mada, is oue of the finest sea-fights ever realized on canvas. He painted also the Great Fire of London, and several historical works, one of these being the Attack of the Combined Armies on Valenciennes, 1793. He was made R.A., in addition to other distinctions, in 1781, shortly after which date we find an entirely new mental impnlse taking possession of him. He joined Balsamo, Comte de Cagliostro, and travelled about with this extraordinary person,—happily leaving him, however, before the priests in Rome condemned him to death. We do not hear that

- Mesmer had attracted De Loutherbourg, or that the Revolu-

tion carried him away, nor do we find an exact record of his connection with Cagliostro; but there exists a pamphlet published in 1789, A List of a few Cures per- formed by Mr and Mrs De Loutherbourg without Medicine, which relates some very remarkable examples of such cures. Cagliostro had led him to seek the philosopher's stone, but his success was frustrated by a female relative breaking in on his nocturnal experiments and destroying the crucible at the very moment of projection. He died 11th March 1812. His publications are few,—some sets of etchings, and English Scenery, 1805. His colour is hot and brown, which has injured his fame as a painter.

DELPHI, AeAdoi, a town of ancient Greece in the territory of Phocis, famous as the seat of the most important temple and oracle of Apollo. _ It was situated about six miles inland from the shores of the Corinthian Gulf, in a rugged and romantic glen, closed on the N. by the steep wall-like under-cliffs of Mount Parnassus known as the Phzedriades, or Shining Rocks, on the E. and W. by two minor ridges or spurs, and on the §. by the irregular heights of Mount Cirphis. Between the two mountains the Pleistus flowed from east to west, and opposite the town received the brooklet of the Castalian fountain, which rose in a deep gorge in the centre of the Parnassian cliff. The site of the ancient town is now occupied by the village

of Castri, and the natural features of the scene have been somewhat altered by the earthquake of 1870; but the main points of interest can still be distinguished.

The principal building of Delphi was the temple of Apollo, which stood immediately under the shelter of the northern cliff. It appears to have been of the Doric order outside, and of the Ionic within. The front was built of Parian marble, and the sculptural decorations were extremely rich. One pediment was adorned with repre- sentations of Latona, Diana, Apollo, and the Setting Sun, and the other with Dionysus. and the Thyiades; the eastern architrave was hung with gilded shields presented

by the Athenians from the spoils of Marathon, and the western with sinilar trophies taken by the Adtolians from the Gauls; while among the subjects of the metopes are mentioned Hercules slaying the Lernean Hydra, Bellerophon and the Chimera, Zeus and Mimas, Pallas and Enceladus, and Dionysus and a Giant. In the pronaos were inscribed the maxims of the Seven Sages of Greece; in the cella was the sacred hearth with a perpetual fire and the éudadds, or navel-stone, which was supposed to mark the centre of the world ; and in the adytwm was the sacred tripod and the subterranean chamber from which the vapour of prophecy ascended. Of less important buildings may be mentioned the ZLesche, or public hall, the walls of which were adorned with the works of Polygnotus and other master-pieces of ancient art; the theatre, where the musical contests connected with the Pythian games were held; the Stadiwm, of which there are still considerable remains ; and, in the suburb of the same name, the Pylc«a, or assembly hall of the Amphictyonic Council. The town was centered from the east by a road from Beeotia known as the Schiste, or Cloven Way, and from the west by the great Crissean road, which was used by the pilgrims who came from the Corinthian Gulf, and by another which stretched north-west to Amphissa. These roads were regarded almost as the property of the temple, and shared in its sacredness ; and each Amphictyonic state was bound to keep them in repair within its own boundaries. About seven miles to the north of the town, on the side of Mount Parnassus, was the famous Corycian cave, a large grotto in the limestone rock, which afforded the

people of Delphi a refuge during the Persian invasion. It is now called in the district the Sarant' Aulai, or Forty Courts, and is said to be capable of holding 3000 people.

Of the origin of the Delphian oracle nothing is known. One legend told how the prophetic virtues of the site were discovered by a shepherd whose goats began to frisk about under the influence of the subterranean vapour; and another related how Apoilo, after he had slain the great serpent Pytho on the spot, boarded a Cretan ship in the neighbouring gulf, and consecrated the crew to his service. It seems almost certain that the place was the seat of a religious establishment previous to its connection with the worship of Apollo; but its whole historic importance—which can hardly be over-estimated—is entirely due to this connection. he first temple of stone was reputed to have been built by the semi-mythical personages Trophonius and Agamedes. It was burned bown in 548 B.c., but was soon after replaced by the building which has already been described. The con- tract for the work was taken by the Athenian family of the Alemzonids, who were at that time in exile from the tyranny of Hippias. They employed the architect Spintharus, and acquired great credit for the disinterested liberality with which they accomplished their task. The principal facts in the history of Delphi have already been narrated in the article AMPHICTYONY (vol. i. p. 772), where the reader will also find an account of the relation in which the temple stood to the states of Greece. It only remains to tell how the sanctuary and its treasures, which had been miraculously saved from the Persians and the Gauls, were put under contribution by Sulla for the payment of his soldiers ; how Nero removed no fewer than 500 brazen images from the sacred precincts ; and how Constantine the Great en-riched his new city by the sacred tripods, the statues of the Heliconian Muses, the Apollo, and the celebrated Pan dedicated by the Greek cities after the conclusion of the war with the Medes. Julian afterwards sent Oribasius to

restore the temple ; but the oracle responded to .the

emperor's enthusiasm with nothing but a wail over the glory that had departed.

See Pausanias for a detailed description of the town in the second century of the Christian era; the Zon of Euripides for many interesting descriptions ; and among modern works Wilster, De religione et oraculo Apollinis Delphici, Copenhagen, 1827 ; Hullmann, Wirdigung des Delphischen Orakels, 1837 ; Gotte, Das Delphische Orakel, 1839; Curtius,

DELPHINIA, a festival of Apollo held aunually on the 7th of tlhe mouth Munychion (April) at Athens, where he was styled Delphinios. All that is known of the ceremonies is that a number of girls proceeded to his temple carrying suppliants' branches and seeking ta propitiate Apollo, probably as a god having influence on the sea, It was at this time of year that navigation opened again after the storms of winter.

DELTA. See Puysican GEOGRAPHY.

DELUC, Jean Anprit (1727-1817), geologist and metc- orologist, born at Geneva, February 8, 1727, was descended from a family which had emigrated from Lucca and settled at Geneva in the 15th century. His father, Frangois Deluc, was the author of some publications in refuta- tion of Mandeville and other rationalistic writers, whicli are best known through Rousseau's humorous account of his ennui in reading them; and he gave his son an excellent education, chiefly in mathematics and natural science. On completing it he engaged in commerce, which principally occupied the first forty-six years of his life, without any other interruption than that which was occasioned by some journeys of business into the neigh- bouring countries, and a few scientific excursions among ' the Alps. During these, however, he collected by degrees, in conjunction with his brother Guillaume Antoine, a splendid museum of mineralogy and of natural history in general, which was afterwards increased by his nephew André Deluc. Heat the same time took a prominent part in politics. In 1768 he was sent to Paris on an embassy to the Duc de Choiseul, whose friendship he succeeded in gaining. In 1770 he was nominated one of the Council of Two Hundred. Three years later unexpected reverses in business made it advisable for him to quit his native town, which he only revisited once fora few days. The change was welcome in so far as it set him entirely free for scientific pursuits, and it was with little regret that he removed to England in 1773. He was made a fellow of the Royal Society in the same year, and

received the appointment of reader to Queen Charlotte, which he con. tinued to hold for forty-four years, and which afforded him both leisure and a competent income. In the latter part of his life he obtained leave to make several tours. in Switzerland, France, Holland, and Germany. In Germany he passed the six years from 1798 to 1804; and after his return he undertook a geological tour through England. When he was at Gottingen, in the beginning of his German tour, he received the compliment of being appointed honorary professor of geology in that university ; but he never entered upon the active duties of a professorship. He was also a correspondent of the Academy of Sciences at Paris, and a member of several other scientific associa- tions.

His favourite studies were geology and meteorology. The situation of his native country had naturally led him to contemplate the peculiarities of the earth's structure, and the properties of the atmosphere, as particularly dis- played in mountainous countries, and as subservient to tho measurement of heights. He inherited from his father « sincere veneration for the doctrines of Christianity, and a disposition to defend the Mosaic account of the creation against the criticism whose principal weapons were furnished by his favourite science. His royal patroness was most anxious to encourage and promote his labours in this field; and he was generally supposed to have had

great success in removing the objections which had been advanced by his antagonists against the comparatively recent formation of the present continents. According to Cuvier, he ranked among the first geologists of his age. His principal geological work, Lettres physiques et morales sur Uhistotre de la terre (6 vols. 8vo, The Hague, 1778), was dedicated to Queen Charlotte. It dealt with the appearance of mountains and the aatiquity of the human race, explained the six days of the Mosaic creation as so many epochs preceding the actual state of the globe, aud attributes the deluge to the filling up of cavities supposed to have becn left void in the interior of the earth. This attempt to reconcile religion and science, so often since repeated, was ingenious and for a time successful with most minds. The theory of the Mosaic days was maintained in one form or other by

several later geologists of high repute, though it is scarcely now thought worth discussion by any to whom that title can justly be applied.

Deluc’s original experiments relating to meteorology are more valuable to the natural philosopher than most of his geological work; and he discovered many facts of consider- able importance relating to heat and moisture. He noticed the disappearance of heat in the thawing of ice about the same time that Black founded on it his ingenious hypothesis of latent heat. He ascertained that water was more dense about 40° Fahr. than at the temperature of freezing, expanding equally on each side of the maximum ; aud he was the originator of the theory afterward re-advanced by Dalton, that the quantity of aqueous vapour contained in any space is independent of the presence or density of the air, or of any other elastic fluid; though it appears difficult to reconcile this opinion with some of the experi- nients of Deluc’s great rival, Saussure, a philosopher who, as he very candidly allows, made in many respects more rapid progress in hygrometry thau himself. Deluc’s comparative experiments on his own hygrometer and on Saussure’s show only that both are imperfect; but it may be inferred from them that a mean between the two would in general approach much nearer to the natural scale than either taken separately. It appears also probable that Saussure’s is rather less injured by time than Deluc’s, which has been found to indicate an increasiug amount of meal moisture every year. |

Deluc was a man of warm feelings, and of gentle and obliging manners, and his literary and scientific merits, as well as his unremitting attention to the service of the queen, insured her respect and kindness. He saw her daily for many years, and in his last illness, which was long and painful, she showed him repeated marks of benevolent regard. He died at Windsor on the 7th of November

1817.

A brief notice of his more important works, in addition to that mentioned above, will give a clear idea of the nature and range of his scientific activity. His Recherches sur les modifications de ? Atmosphere (2 vols. 4to, Geneva, 1772; 4 vols. 8vo,. Par. 1784), contains many accurate and ingenious experiments upon moisture, evaporation, and the indications of hygrometers and thermometers, applied to the barometer employed in determining

heights. In the Phil. Trans., 1773, appeared his account of a new hygrometer, which resembled a mercurial thermometer, with an ivory bulb, which expanded by moisture, and caused the mercury to descend. The first correct rales ever published for measuring heights by the barometer were those he gave in the Phil. Trans., 1771, p. 158. His Lettres sur 0 Histoire physique dela Terre (8vo, Par. 1798) were addressed to Professor Blumenbach. The substance had already appeared in the Journal de Physique, for 4790, 1791, and 1798. The volume contains an essay written for a prize at Haarlem in 1791, but without success, on the existence of a General Principle of Morality. It also gives an interesting account of some conversations of the author with Voltaire and Rousseau. Deluc was an ardent admirer of Bacon, on whose writings he published two works,—Bacon tel qwil est (8vo, Berlin,

1800), shewing the bad faith of the French translator, who had:

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omitted many passages favourable to revealed religion, and Précis de la Philosophie de Bacon (2 vols. 8vo, Paris, 1802), giving an in. teresting view of the progress of natural science. Lettres sur le Christianisme (Berlin and Hanover, 1801, 1803) was a contro- versial correspondence with Dr Teller of Berlin in regard to the Mosaic cosmogony. His Traité démentatre de Géologie (8vo, Paris, 1809, alsoin English, by Delafite, the same year), was principally intended as a refutation of the Vulcanian system of Hutton and Playfair, who deduced the changes of the earth’s structure from the operation of fire, and attributed a higher antiquity to the present state of the continents than is required in tlhe Neptunian system adopted by Deluc after Dolomieu. He sent to the Royal Society, in 1809, a long paper on separating the chemical from the elcc- trical cffect of the pile, with a description of the electric column and aerial electroscope, in which he advanced opinions so little in unison with the latest discoveries of the day, that the council deemed it inexpedient to admit them into the ransactions. He had, indeed, on other occasions shown somewhat too much

scepticism in the rejection of new facts; and he had never

been convinced even of Cavendish's all-important discovery of the composition of water. The paper was afterwards published in Nicholson's Journal (xxvi.), and the dry column described in it was constructed by various experimental philosophers. Many other of his papers on subjects kindred to those already men- tioned are to be found in the Transactions and in the Philo- sophical Magazine. See Philosophical Magazine, November

1817.

DELUGE, a submersion of the world, related by various nations as having taken place in a primitive age, and in which all, or nearly all, living beings are said to have perished. By this definition we exclude all partial floods, and also the theory which would account for deluge-stories as exaggerations of traditions of local inundations. Upona low level of culture, as Von Hahn has shown, the memory of the most striking events is hardly preserved even fora few generatious. It is best therefore to regard the story of the deluge as a subdivision of the primitive man's cosmogony. The problem with which he had to deal was a complicated one,—given the eternity of matter to account for the origin of the world. The best solution which pre- sented itself (and that only to the shrewder races) was to represent creation as having taken place repeatedly, and the world as having passed through a series of deimotitions ald reconstructions. (See Cosmocony). This explains the confusion between the creation and the deluge noticed by various travellers, ¢.g., among the Troquois and the Santals—a confusion, however, which is only apparent, for the deluge is, when thoroughly realized, practically a second creation. Thus Manui the hero of the Indian flood-story, was, by permission of Brahma, the creator of the present human race. Noah is called by Arabic writers " the second Adam," and Maui might with as good a right be called the Noah as the Adam of New Zealand. We, in the adult age of the world, have renounced those mythical forms of expression, but we still retain much of the feeling which prompted them. The wonder of creation is even to us constantly renewed in spring ; to primitive man it was renewed ina special sense in each of the great world-cyeles of mythology. We may lay it down, then, as a

canon at the outset, that the various deluge-stories must be viewed in combination, and explained on a common principle. At

| the same time we must be careful not to confound different

“ deposits ” of tradition, and must regard primarily the

earliest and most original forms of myths. As in the case of the cosmogonies, a few typical specimens will be all that can here be described.

I. Among the Semitic races the seniority belongs to the Babylonians. ‘Till lately, the only version of their story known to us was that of Berosus (Miiller, /ragmenta, il. 501), who relates that the god Kronos appeared to Xisuthrus, tenth king of Babylon [¢/. Noah, tenth patriarch] in a dream, and warned him of the coming deluge. The dctails remind us a good deal of the biblical narrative, ex- cept that Xisuthrus is also accompanied by a steersman and Even the thrice repeated letting-out

of the birds is mentioned. At last the ship (as it is called) grounded “on a certain mountain,” where Xisuthrus erected an altar and sacrificed; after which both he and his companions disappeared [¢f. the “ translation ” of Enoch]. The duration of the deluge is not stated, and its cause is left to be inferred from the special commendation of Xisuthrus for his piety. Berosus has evidently drawn from cuneiform sources, but those sources have not yet been discovered. Our most valuable authority for the Babylonian deluge-story is the portion of the 11th lay of the great mythological epic, discovered by Mr George Smith. It came from the library of King Assurbanipal, and dates from about 660 B.c., but the Accadian original from which it was translated may well (says the cautious Assyriologue, Dr Schrader) have been composed between 1000and 2000 8.c., while the myths themselves will of course be mucli older. ‘The hero of the deluge bears the name of Tam-zi (“the sun of life,” cf. Tammuz), for so, with Mr Sayce, the signs should most probably be read. He is called the son of Ubara-tutu, an Accadian name meaning ‘the splendour of sunset”

(Lenormant, Sayce). This version of the story differs in several respects from that of Berosus. The deity who warns Tamziis Hea (god of knowledge and of the waters), who orders him to build a ship, and to put into it his household and his wealth and the beasts of the field. All this is related by Tamzi to the (solar) hero " Izdubar." He tells how he coated the ship within and without with bitumen (cf Gen. vi. 14), how he intrusted all to a " seaman,' how Samas, the sun-god, and other gols (Hea is not now mentioned) sent rain, and how the ruin-flood " destroyed all life from the face of the earth." (Why the deluge was sent is a little uncertain, owing to the mutilated condition of the tablets.) On the 'seventh day there was a calm, and the ship stranded on the mountain Nizir. Another seven days, and Tamzi let out "a dove" (?), then a swallow, both of which returned, and a raven which did not return. Then he left the ship and made a libation; Mr Smith's "altar" is uncertain. Finally, Hea intercedes with Bel that there be no second deluge, after which "'Tamzi and his wife, and the people, were carried away to be like the gods." Such are the leading authentic features of the Babylonian narrative, or rather narratives, for its inconsistencies and repetitious are such as to force upon us the hypothesis that two documents originally existed, which have bean welded together by an editor.

II. The Jewish narrative, like the Babylonian, has been thought to consist of two documents, an Elohistic and a Yahvistic, which have been connected by an editor. They appear to differ in various details,—e.g., in the duration of the flood (the Elohist extends it to a whole solar year), and in the description of the introduction of the animals into the ark (the Elohist alludes to the legal distinction between clean and unclean). But they have certainly the same origin, for they entirely coincide in the main outlines (e. ¢., in ascribing the flood to the depravity of mankind, in the uode of Noah's rescue, and in the promise that the catastrophe should not recur), and even in not a few ex- pressions, among which are the names for the flood and the ark. They agree, further, in this important point, 'that some expressions point to a universal deluge, others to one which only affected a level inland region like that of Mesopotamia. We naturally ask, therefore, are the former involuntary exaggeratious? or '" survivals" of a primeval myth? Both views are held by respectable critics; but

the latter is more favoured by analogy and by the remark- |

able parallelism between both the biblical suairatives (especially the Yahvistic) and the Babylonian.

These two—the Babylonian and the Jewish——are the only fully developed deluge-stories told by any of the

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Semitic nations. In what relation, then, do they stand to each other? Was the Babylonian borrowed from the Jewish (or from some earlier form of the story, of which the Jewish is an abridgment), or vice versa? On the ono hand, the Babylonian story as a whole perhaps produces an impression of greater originality than the Jewish ; for (not to mention other points) in the former the order in which the birds are sent out is much more natural. On the other, the ‘‘ark,” or rather “chest,” of the Jewish narrative sounds more archaic than the “ship” of the Babylonian. The word for “deluge” in Genesis is also evidently archaic, as appears from the facts that it only occurs once again (Psalm xxix. 3), and that the editor in Genesis needed to explain it by the word “ water ” (Gen. vi. 17, “the flood, viz., water”). It is possible, therefore, to hold that the Jewish story is a distinct offshoot of a common Semitic tradition. Bolder critics will maintain that the account in Genesis must be taken in connection with the other narratives which can be explained by, and are therefore possibly dependent upon, parallel Babylonian narratives. (See BasyLonia and Cosmocony). They will urge that “chest” may have been substituted for “ship” to avoid an anachronism, mankind in Noah’s time not having perhaps reached the sea; and that the archaic word for “ deluge ” does not prove the antiquity of a developed deluge-story ; also that there are traces in Genesis (see iv. 17—24, vi. 1-3) of another and presumably native Hebrew view, according to which the moral degenera- tion of man was explained without adeluge. The question is a large one, but may perhaps be reduced to this—Can the Yahvistic narrative in Genesis be safely broken up into several? There is some evidence, both internal and (see the prophetic references to Genesis) external to show that it can, but it would be premature in this place to pro- nounce whether the evidence is sufficient. It will hardly be possible, however, to derive the Yahvistic flood-story from Babylonia, and not the Elohistic, as has been suggested ; for though the former is nearest to the

Babylonian story (é.g., it ascribes the flood entirely to a rain-storm, whereas the latter introduces also the waters below the firmament), the latter agrees with it in all essential points, and even in the minor point of the bitumen. Let it be remarked in pass- ing that, even if the material of the biblical narratives be taken from the Babylonian, the former have received a peculiar and original stamp, both by their monotheism and by the moral significance so emphatically given to the catas- trophe, just as by the addition of the lovely story of the rainbow the Elohist has produced a conclusion far superior, artistically. speaking, to that of his Babylonian prede- cessor.

III. Another of the great countries by which the Israelites might have been influenced was Egypt; but in this, even more than in a former, case a direct Egyptian influence is out of the question. The deluge- story was entirely unknown in the Nile-valley. It is commonly said, but erroneously, that this was owing to the absence of sudden catastrophes of the nature of an in- undation. But if the terrestrial deluge is really (see below) only a transformation of the celestial, there is no reason why the story should not have grown up in Egypt, if the imagination of its inhabitants had invited such a develop- ment ; for the germs of the deluge-story certainly existed in Egypt. The Book of the Dead constantly refers to the sun-god, Ra, as voyaging in a boat on the celestial ocean ; and a story in an inscription of the archaic period (Seti I.) embodies a conception altogether analogous to that of the narrative in Genesis. According to this myth—which is described by M. Naville—Ra, the creator, being disgusted with the insolence of mankind, resolves to externiinate them. The massacre causes human blood to flow to Heliopolis,

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upon which Ra repents, and swears with uplifted hand not to destroy mankind again. ; ;

IV. The deluge-story exists in several forms in Indian literature. It does not, however, appear to be a genuine Aryan myth, for there is no clear reference to it in the fry Veda. The ’Satapatha Brahmana, where it first occurs, was written (Weber) not long before the Christian era. Another version, in which the lacuuz of the earlier one are filled up, is given in the Mahdbhdrata, but

this poem, though it existed in part before the Christian era, did not assume its present form till long afterwards, A third version, still more decidedly Indian in character, is given in the Bhdgavata Purdna, but the earliest possible date of this work is the 12th century A.D., which deprives its account of the deluge of all claim to originality. It is worth noticing, however, that it agrees with the biblical narrative in two subordinate points —the introduction of animals into the ark or box, and the interval of seven days between the warning and its fulfilment. The principal feature of the oldest flood-story is the part assigned to the fish, which warns Manu of the deluge, and ultimately saves him by drawing his ship to a northern mountain. The selection of the fish (which is clearly divine) is so out of character with the most genuine portions of Aryan mythology that it proves the foreign origin of the Indian narrative, perhaps we may even say, the Semitic origin. Not that the fish-god is peculiar to the Semitic world, but that he is un-Indian, and can so easily have reached India from a Semitic source. If the Indians sent apes, sandal- wood, and purple (both names and things) to Assyria, why should not the flood-story have been sent in exchange with other products of Mesopotamia? ‘True, the fish does not appear in the present form of the Mesopotamian story, but it probably did appear in the original myth, for among the titles of the god who warned Tamzi (see above) are “fish of the abyss,” “beneficent, saviour fish.” We admit the strong local colouring of the Indian story, which deceived even Weber (but not Burnouf), but this is exactly paralleled by the Hottentot colouring (Bleek) of several South African stories of Christian origin. Whether the early Iranians had a flood-story is perhaps uncertain, since the Avesta gives but little information respecting mythology, and it has not come down to us complets, But none was known to the Persians about 1000 a.p. (al-Birunf).

V. In Greece there appear to have been several floating flood-stories, which in time became localized and attached to the names of herozs. They all represent the flood as destroying all but a few men, and even in their least original forms they still contain many peculiar features which can only have arisen from an independent exercise of the mythopceic faculty. The most famous of them is that of Deucalion, and of this the earliest and simplest form is in Pindar (Olymp. ix. 64), who identifies the mountain where Deucalion and Pyfrha landed, and where without marriage they “gat

themselves a race from stones” (not a late Greek etymological fancy, for it recurs ainong American tribes), with Mount Parnassus, Apollodorus (about 100 B.c.) has infused fresh life into this story, perhaps from a Semitic source ; he extends the range of the flood to “ most parts of Greece,” and states that Deucalion (like Noah and Xisuthras) offered sacrifice after the flood. Lucian (160 A.D.), laughing in his sleeve, gives a still more conspicuously

Semitic account (De dea Syria, c. 12, 13), in which we hear.

for the first time of a “ great box,” and of “children and wives,” “swine and horses, and the kinds of lions and serpents, &c., all by pairs,” as entering the ark. It was a confusion of this kind which led to the charge of Celsus, thit the authors of the books of Moses had ‘““put a new stamp on the story of Deucalion ;”—reason sufficient for

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confining ourselves as much as possible to primitive versions of mythic narratives,

VI. America, which abounds in cosmogonies, is naturally not deficient in deluge-stories. Mr Catlin says, that “amongst 120 different tribes that he has visited in North and South and Central America, not a tribe exists that has

not related to him distinct or vague traditions of such a

calamity, in which one, or three, or eight persons were saved above the waters on the top of a high mountain” (Okeepa, p. 2). It is extremely difficult to tell how far Christian influences may have determined the form of these stories. | When, for instance, we find such a peculiar point as the sending out of the birds to see whether the flood had abated, we are disinclined to build any argument on the circumstance. We do find, it is true, strange points of agreement between the Greek and the Polynesian myths, yet considering the vast extent of Christian missionary activity in America, we are bound to special caution.

In addition to this, the American deluge-stories convey an impression that they have lost much of their original accuracy. ‘The Polynesian myths, on the contrary, are still almost as transparent as ever. But we shall have occasion to speak of these presently:

Instead of proceeding further with a detailed examination of myths, let us briefly touch on three general questious arising out of the subject. (1.) Is the deluge-story found among all nations? The Egyptians and (probably) the Persians had none; and it is doubtful whether it exists in non-Mahometan Africa, Probably, too, large deductions

should be made from the myths of savage tribes, on the

ground of Christian influences, even when related by well- informed travellers. (2.) Was the deluge-story propagated from a single centre? An affirmative answer has often been returned, e.g., by Hugh Miller, Testimony of the Rocks, p. 282. It is impossible, however, to justify this from the

mere fact of the superficial resemblance of the different

narratives. These may be accounted for (ou the ordinary historical theory of the flood-story) from the similarity of the circumstances of partial floods everywhere ; or (if we regard it as based on a nature-myth) from the fact that, by a fundamental law of psychology, the universal wonders of mature everywhere receive (within certain limits) a similar mythic expression. Granting, therefore, in its fullest extent the non-originality of many deluge-stories, we main- tain that the evidence points on the whole to the existence

of several independent centres from which these stories —

were propagated. (3.) Restricting ourselves to the con sideration of the non-biblical forms of the narrative, we now inquire, what was their original significance? A provi- sional answer, it is true, has already been given, but one which does not account for the peculiar details of the most original deluge-stories. The only explanation of these which has yet been offered is derived from comparative mythology. Itis agreed by mythologists that the exclusive subjects of really primitive traditional stories are frequently recurring natural phenomena, Consequently the elemen- tary mythic

descriptions or pictures of these phenomena were the most available material when, at a later period of mental growth, the attempt was made to construct a rude cosmogonical theory. Those ‘ demolitions and reconstructions ” of the world of which we spoke at the outset could only be narrated on the basis of these earliest, simplest, most primitive myths. What then was the natural phenomenon which, in a mythic dress, formed the substratum of the deluge-stories ? Not merely an annually recurring river-flood, such as those of the Euphrates, for the phenomenal basis of myths must be something strikingly wonderful as well as frequently recurring. ‘This the inun- dations of a river are not, neither could they be regarded as calamities. But the phenomena of the sky and especially

of the sun are, to the primitive man, daily miracles. Hence the theory (Schirren and Gerland) that the deluge of the stories we are considering has been transferred from the sky to the earth, that it is in a word an ether-myth. This mode of explanation is not set aside by referring to quasi-historical details in the deluge-stories. For as soon as the mythic stage begins to be outgrown, rationalism appears. In this transitional period (commonly of long duration) the old nature-myths are modified. Some mythic elements remain, others are turned into prose. The attempt to explain the existence of the world on the basis of an ether-myth was an early symptom of the denaturaliza- tion of which we have spoken. At a still more advanced stage of the process, the flood often ceased to be universal, and was restricted to the home of those who related the story, or to the region from which they supposed themselves to have migrated. At last the shrewder intellects (e.g., among the Tahitians and some of the American Indians) even clutched at phenomena like those of fossil-shells found on hills to prove the literal truth of their deluge.

The most plausible arguments for the celestial deluge- theory are derived from the Polynesian mythology. In the flood-story of Raiatea, given by Ellis (Polynesian Researches, ii. 58-9), the fleod rose “as the sun approached the horizon ;” and the island where the fisherman found refuge is called Toa-marama, 7.e., moon-tree (tree reaching up into the moon), which reminds us of the Teutonic world- ash-tree, Yggdrasil, and the mythic mountain of the

Babylonians (see below) and other nations. At Hawaii the flood was eveu called ‘flood of the moon,” and at New Zealand “flood of day’s eye” (7.e., the sun). Schirren explains all these myths as pictures of sunset, just as he derives the cosmogonies from myths of sunrise. But most of them are more easily explained, with Gerland, as ether- myths. The sun and moon were imagined as_ peaks emerging out of a flood—sometimes as canoes, sometimes as a nian and his wife—the sole survivors (except perhaps the stars, their children) from the inundation. There was, however, no fixity of meaning. The stars were sometimes regarded as ships; but so too were the clouds, “ Tangaloa’s ships.” The Babylonian story, as represented in the 11th Izdubar lay, suggests a similar theory. The names of the hero and his father mean “the (morning) sun” and “the evening-glow.” The flood is a rain-flood, and the “father of the rain” (cf. Job xxxviii. 28) is the celestial ocean, which in the original myth must have been itself the deluge ; and the “ship” is like that in which the Egyptian sun-god voyages in the sea of ether. The mountain on which the survivors come to land was originally (as in Polynesia) the great mythic mountain (cf. the Accadian kharsak kurra, mountain of the east”), which joins the sky to the earth, and serves as an axis to the celestial vault. Traces of an ether-myth have also been discovered in the Indian deluge-story, as indeed is only natural if it be based on the Babylonian. In the Afahdbhdrata, the divine fish has a horn issuing from his head, which reminds us of other horned deities, whose solar origin is admitted, such as Baal and the Berosian Oannes. (See also Schirren, Wander- ungen der Neuseelander, p. 193, who is, however, too fanciful to be a safe guide).

Two points should be mentioned in conclusion. (1.) Though a moral significance is by no means always attributed to the deluge, it is more common than miglit have been expected. In the Jfahdbhédrata (line 12,774) it takes the form not of retribution but of purification, which agrees with Plato’s view (Zimaus, p, 22). We find it in America among the Quichés, but this may perhaps be a later addition, as is certainly the case in one of the forms of the Tahitian myth (Waitz, vi, 271). And (2.)

‘the deluge is not always the last of those periodical

destructions alluded to at the beginning of this article.

Authorities.—Babylonian story: Mr George Smith's papers in Transactions of Biblical Archeological Soc., ii. 213-34, iii. 580-96 ; Lenormant, Les premiéres civilisations, tom. ii. 3-146 ; Delitzsch, George Smith's Chald. Genesis, 318-21. Biblical narrative : Com- mentaries on Genesis, by Knobel and Dillmann, Delitzsch, Kalisch ; Ewald, Biblische Jahrbiicher, vii. 1-23. "ndian: Muir Sanskrit Texts, i. 196-201; Burnouf, Bhdgavata Purdna, ii. 191 ; Webcr, Indische Studien, i. 161-232 ; Turnour, Mahavanso, i. 131 (referring to a local flood in its present form). Greek: Preller, Aufsitze, 165-7. Vogul (Altaic): Hunfalvy, summarized by L. Adam, Revue de philologie,i. 9-14. Lap : Friis, Lappisk Mythologie, reviewed in Lit. Ocntralblatt, March 1, 1878. America : Bancroft, Native Raccs, &c., v. 12-16; Schoolcraft, Notes on the Iroquois, p. 858. Polynesia: Schirren, Wanderungen der Neuseeldnder (Riga, 1856) ; Gerland, Waitz's Anthropologie, vi. 296-73. General works: Pictet, Origines Indo-ewropécnnes, ii. 620, &c.; Liiken, Die Traditionen des Menschengeschlechts (Miinster, 1869). (T.K.C.)

DEMADES, an orator and demagogue who flourished in the 4th century B.c. He was originally of humble posi- tion, and was employed at one time as a common sailor, but he rose partly by his eloquence and partly by his unscrupulous character to a prominent position at Athens, He espoused the cause of Philip in the war against Olynthus, and was thus brought into bitter and life-long enmity with Demosthenes. Notwithstanding his sym- pathies he fought against the Macedonians in the battle of Cheeronea, after which he was instrumental in procuring a treaty of peace between Macedon and Athens through his influence with Philip. He continued to be a favourite of Alexander, and, pronipted by a bribe, saved Demosthenes and the other obnoxious Athenian orators from his ven- geance. His conduct in supporting the Macedonian cause, yet receiving any bribes that were offered by the opposite party, caused him to be heavily fined more than once ; and his flagrant disregard of law and honour ultimately led the citizens of Athens to pass upon him the sentence of atimia. This was recalled in 322 on the approach of Antipater, to whom the citizens sent Demades and Phocion as ambassa- dors. Before setting out he persuaded the citizens to pass sentence of death upon Demosthenes and his followers who had fled from Athens. Harpalus and Antipater both suc- ceeded in bribing him to their cause; but the latter, discovering while Demades was

with him on another embassy in 318 a correspondence which showed him to have been at the same time in communication with Perdiccas, put him to death along with his son Demeas. A fragment of a speech bearing his name is to be found in the Oratores Attici, but its genuineness is exceedingly doubtful.

DEMERARA, or Demerary, a river and county of British Guiana. See GuIANA.

DEMETER. See Crrzs, vol. v. p. 345.

DEMETRIA, a festival in honour of Demeter, held at seed-time, and lasting ten days. It appears to be the same as that generally called Zhesmophoria.

DEMETRIUS L., king of Macedonia, a son of Antigonus and Stratonice, surnamed Polvorcetes, or the Besieger. Both father and son play an important part in the vicissitudes of the Macedonian empire after the death of Alexander the Great. Demetrius grew up to be a beautiful young man, reared in the fulness of the new Macedonian life, devoted to Greek science, and inspired with an eager ambition to rival the ancient heroes of his race. He united with these lofty aims a love of Oriental magnificence which formed at once the chief splendour and the principal weak-

ness of his Macedonian prototype. At the age of twenty- two he wag sent by his father against Ptolemy, who had invaded Syria; he was totally defeated near Gaza, but soon repaired his loss by a victory which he obtained over Cilles, in the neighbourhood of Myus. After coll ducting an expedition against Babylon, and engaging in several campaigns against Ptolemy on the coasts of Cilicia and Cyprus, Demetrius sailed with a fleet of 250 ships to Athens, and restored the Athenians to liberty, by freeing them from the power of Cassander and Ptolemy, and expelling the garrison which had been stationed there under Demetrius Phalereus. After this successful expedition he besieged and took Munychia, and defeated Cassander, at Thermopylae. His reception at Athens, after these victories, was attended

with the greatest servility; and under the title of “The Preserver” the Athenians worshipped him as a tutelary deity. In the next campaign he defeated Menelaus by land, and completely destroyed the naval power of Ptolemy. After an interval spent at Cyprus, he endeavoured to punish the Rhodians for having deserted his cause; and his ingenuity in devising new instruments of siege, in his unsuccessful attempt to reduce the capital, gained him the appellation of Poliorcetes. He returned a second time to Greece as liberator. But traces of Oriental despotism showed themselves, and the licentiousness and extravagance of Demetrius made the Athenians regret the government of Cassander. He soon, however, roused the jealousy of the successors of Alexander; and Seleucus, Cassander, and Lysimachus united to destroy Antigonus and his son. The hostile armies met at Ipsus, 301 B.c. Antigonus was killed in the battle, and Demetrius, after sustaining a severe loss, retired to Ephesus. This reverse of fortune raised him many enemies ; and the Athenians, who had lately adored him as a god, refused even to admit him into their city. But he soon afterwards ravaged the territory of Lysimachus, and effected a reconciliation with Seleucus, to whom he gave his daughter Stratonice in marriage. Athens was at this time oppressed by the tyranny of Cassander; but Demetrius, after a protracted blockade, gained possession of the city, and pardoned the inhabitants their former misconduct. The loss of his possessions in Asia recalled him from Greece; and he established himself on the throne of Macedonia by the murder of Alexander, the son of Cassander, 294 3.c. But here he was continually threatened by Pyrrhus, who took advantage of his occasional absence to ravage the defence- less part of his kingdom; and at length the combined forces of Pyrrhus, Ptolemy, and Lysimachus, assisted by the disaffected among his own subjects, obliged him to leave Macedonia after he had sat on the throne for seven years. He passed into Asia, and attacked some of the provinces of Lysimachus with varying success; but famine and pestilence destroyed the greater part of his army, and he retired to the court of Seleucus to seek support and assistance. Here he met with a kind reception; but, nevertheless, hostilities soon broke out; and after he had gained some advantages over his son-in-law, Demetrius was totally forsaken by lis troops in the field of battle, and becaine an easy prey to the enemy. His son Antigonus offered Seleucus all his possessions, and even his person, in order to procure his father’s liberty ; but all proved unavailing, and Demetrius died in the fifty-fourth year of his age, after a

confinement of three years, 284 3.c. His remains were given to Antigonus, honoured with a splendid funeral at Corinth, and thence conveyed to Demetrias. His ag ee oe possession of the Macedonian thronc e time of Perseus, w

Romans. See Mexcmnoie: oe ee

DEMETRIUS IL, king of Macedonia, son of Antigonus Gonnatas, who was a son of Demetrius Poliorcetes, He

DEMETRIUS

occupied the throne for ten years, but little is known of him. His reign coincided with the period of the Achzan league, which was then strengthened by an alliance with the CEtolians. Only a fragment of Macedonian power remained in Greece ; a few towns in the Peloponnesus were held by Macedonian governors. Demetrius offered a slight opposition to the two patriotic leagues, and wrested Boeotia from the Gétolians. At his death in 232 B.c. Antigonus Doson undertook the government for his son Philip, who was under age.

DEMETRIUS L, named Soter, king of Syria, was sent to Rome as a hostage during the reign of Antiochus Epiphanes, He contrived, however, to escape from confinement, partly through the assistance of the historian Polybius, and established himself on the throne. He acquired his surname from the Babylonians on account of the expulsion of Heraclides from their capital, and is famous ig Jewish history for his contests with the Maccabees. Demetrius fell in battle against the usurper Balas, about 150 B.c.

DEMETRIUS II., surnamed Nicator, the son of the preceding, lived in exile during the usurpation of Balas. At the head of a body of Cretan mercenaries, and with the assistance of Ptolemy Phbilometer, whose daugliter he married, he regained the throne of Syria. His cruelties and vices, however, ultimately procured his expulsion from the kingdom; and Antiochus, the infant son of Balas, was proclaimed king in his stead. After ten years’ captivity in Parthia he succeeded in establishing himself once more upon the throne ; but his wife Cleopatra, indignant at his subsequent

marriage with a daughter of the Parthian king, procured his assassination (126 B.c.).

DEMETRIUS IIL, called Lucerus, also Euergetes and Philometor, king of Syria, was the fourth son of Antiochus Grypus. By the assistance of Ptolemy Lathyrus he re covered part of his Syrian dominions from Antiochus Eusebes, and held his court at Damascus. He assisted the Jews against Alexander Janneus. In attempting to dethrone his brother Philip he was defeated by the Arabs and Parthians and taken prisoner. He was kept in con- finement in Parthia by king Mithridates until his death.

DEMETRIUS, an orator and Peripatetic philosopher, surnamed Phalereus, from the Attic demos of Phalerus, where he was born. He was the son of a poor man named Phanostratus, and was a scholar of Theophrastus. He governed the city of Athens as representative of Cassander for ten years, and 360 statues were erected to his honour. On the restoration of the old democracy by Demetrius Poliorcetes, he was obliged to leave the city, and escaped into Egypt, where he was protected by Ptolemy Lagus. This king, it is said, having asked his advice concerning the succession of his children to the throne, was advised by Demetrius to leave his crown to the children of Eurydice, rather than to Philadelphus, the son of Berenice. This displeased Philadelphus so much, that when his father died he banished Demetrius; and the unfortunate exile put an end to his life by the poison of an asp (282 B.c.) Demetrius composed more works in prose and verse than any other Peripatetic of his time. His writings treated principally of poetry, history, politics, rhetoric, and accounts of embassies; but none are extant. The treatise sept épynvetas, which is often ascribed to him, is probably the work of a later Alexandrian of the same name.

DEMETRIUS, a Cynic philosopher, was a disciple of Apollonius of Tyana, to whom he afterwards proved an able antagonist. He spent the greater part of his life at Corinth, and first became famous during the reign of Caligula. The emperor, wishing to gain the philosopher to his interest, sent him a large present; but Demetrius refused it with indignation, and said, “If Caligula wishes to bribe me, let him send me his crown.” Vespasian was

displeased with his insolence, and banished him; but the Cynic derided the punishment, and bitterly inveighed against the emperor. He lived to an advanced age; and Seneca observes that nature had brought him forth to show mankind how an exalted genius may live uncorrupted by the vices of the world.

DEMETRIUS, or Dmrrrr. See Russta.

DEMIDOFF, a Russian family honourably distinguished in various ways in the history of their country.

I, Demivorr, NrxiTa, the founder of the family, originally a blacksmith serf, was born about 1665. His skill in the manufacture of arms won him notoriety and fortune; and an iron foundry which he established for the Government became another source of wealth to him. Peter the Great, with whom he was a favourite, ennobled him in 1720.

II. Demiporr, AKINFIJ, son of the former, greatly in- creased the wealth he had inherited by the discovery (along with his son) of gold, silver, and copper mines, which they worked with permission of the Government for their own profit. He died about 1740.

III. Demivorr, Paut GricorJevicH, nephew of the preceding (born in 1738, died in 1821), was a great traveller, and devoted himself to scientific studies, the prosecution of which among his countrymen he encouraged by the estab- lishment of professorships, lyceums, and museums. He founded the annual prize of 5000 roubles, adjudged by the Academy of Sciences to the author of the most valu- able contribution to Russian literature.

IV. Demiporr, Nixotay Nixitircu, nephew of the preceding, was born in 1774, and died at Florence in 1828. During the invasion of Napoleon he commanded a regiment equipped at his own expense. He also greatly increased his resources as a capitalist by successful mining operations, and like his uncle used his wealth to multiply facilities for the scientific culture of the inhabitants of Moscow. The erection of four bridges at St Petersburg was mainly due to his liberality. In 1830 a collection of his pam- phlets, Opuscules d’Hconomie Politique et Privée, was pub- lished at Paris.

V. Demiporr, ANnaTou, son of Paul, was born at Florence in 1812, and died at Paris in 1870. Educated in France, his life was chiefly spent in that country and in Italy. After his marriage with the daughter of Jerome Bonaparte, he lost for a time the favour of the Emperor Nicholas on account of provision having been made in the contract for the education of his children as Roman Catholics. During the Crimean war he was a member of the Russian diplomatic staff at Vienna. Like other mem- bers of his house,

he expended large sums to promote education and to ameliorate the physical condition of his fellows. His munificence as a patron of art gave him European celebrity. The superb work, Voyage dans la Russie méridionale et la Crimée, par la Hongrie, la Valachie, et la Moldavie, was conjointly written and illustrated by him and the French scholars and artists who accompanied him. It has been translated into several European languages; the English version was published in 1853,

DEMISE. See Lzase.

DEMMIN, a town of Prussia, at the head of a circle in the government of Stettin, is situated on the Peene, which in the immediate neighbourhood receives the Trebel and the Tollense, 72 miles W.N.W. of Stettin. It has manu- factures of woollen cloths, linens, hats, and hosiery, besides breweries, distilleries, and tanneries, and an active trade in corn and timber. Demmin is a town of Slavonian origin and of considerable antiquity, and was a place of importance in the time of Charlemagne. It was besieged by a German army in 1148, and captured by Henry the Lion in 1164. In the Thirty Years' War it was the object of frequent conflicts, and even after the Peace of Westphalia was taken

o9 and retaken in the contest between the electoral prince and the Swedes. It passed to Prussia in 1720, and its fortifications were destroyed in 1759. In 1807 several engagements took place in the vicinity between the French and Russians. Population in 1875, 9856, DEMOCRITUS, one of the founders of the Atomic philosophy, was born at Abdera, a Thracian colony, the inhabitants of which were notorious for their stupidity. Nearly all the information that we possess concerning his life consists of traditions of very doubtful authenticity. He was a contemporary of Socrates ; but the date of his birth has been fixed variously from 494 to 460 B.c. His father (who is called by no less than three names) was a man of such wealth as to be able to entertain Xerxes and his army on their return home after the battle of Salamis. On coming into his inheritance, Democritus, there is good reason to believe, devoted several years to travel. He visited the East, and is supposed with great probability to have spent a considerable time in Egypt. The intensity of his thinking was figured by the ancients in the story that he put out his eyes in order that he might not be diverted from his meditations.

But of the way in which he obtained the vast learning for which he was famed, and of his inter- course with other philosophers, even with Leucippus, we have no certain information. According to one very doubtful tradition, he was so honoured in his native city that, his patrimony being all spent, the incredible sum of 500 talents was voted him by his fellow-citizens, together with the honour of a public funeral ; but, according to another tradition, his countrymen regarded him as a lunatic and sent for Hippocrates to cure him. All are agreed that he lived to a great age; Diodorus Siculus

| states that he was ninety at his death, and others assert

that he was nearly twenty years older. He left, according to Diogenes Laertius, no less that 72 works, treating of almost every subject studied in his time, and written in Ionic Greek, in a style which for poetic beauty Cicero deemed worthy of comparison with that of Plato. But of

all these works nothing has come down to us beyond small tragiments.

he cosmical theory propounded by Democritus—which in part at least was adopted from the doctrines of Leucippus —is of all the materialistic explanations of the universe put forth by the Greeks the one which has held the most permanent place in philosophical thought. All that exists is vacuum andatoms. The atomsare the ultimate material of all things, including spirit. They are uncaused, and have existed from eternity. They are invisible, but extended, heavy, and impenetrable. They vary in shape ; though whether Democritus held that they vary also in density is debated. And, lastly, these atoms are in motion. This motion, like the atoms themselves, Democritus held to be eternal. According to some, he explained it as caused by the downward fall of the heavier atoms through the lighter, by which means a lateral whirling motion was pro- duced; but whether this explanation was given by Democritus is extremely doubtful. Another principle also is said by some to have been used by Democritus to explain the concurrence of the atoms in certain ways, viz., that there is an innate necessity by which similar atoms come together. However this may be, he did declare that by the motion of the atoms the world was produced with all that it contaivs.

Soul and fire are of one nature ; the atoms of which they consist are small, smooth, and round ; and it is by inhaling and exhaling such atoms that life is maintained. It follows that the soul perishes with, and in the same sense as, the body. There is, in fact, no distinction made be- tween the principle of life and the higher mental faculties.

The Atomic theory of perception was as follows. From

every object eiSwAa (or images) of the object are continually being given off in all directions ; these enter the organs of sense, and give rise to sensation. The rest of the theory remarkably anticipates certain famous modern theories of perception (1) by its reduction of all sensation, on the objective side, to touch, and (2) by the distinction which it involves between the qualities of extension and resistance, which are said to be the only qualities that really belong to objects of sense, and the other (or secondary) qualities, which are said to exist only through the action of the organs of sense modifying the etdwAa.

Sensation, Democritus appears to have taught, 1s our only source or faculty of knowledge ; indeed his first prin- ciples admit the existence of no mental faculty of a nature distinct from sensation. He was classed among the most extreme sceptics of antiquity, and tradition attributes to him such sayings as —“ There is nothing true, and if there is, we do not know it,” “We know nothing, not even if there is anything to know ” ;

The system of Democritus was altogether anti-theological. He denied that the creation of the world was in any way duetoreason. He also rejected all the popular mythology ; put, according to one account, he taught that, as men were produced by the motion of the atoms, so was produced a race of grander beings, of similar form, and, though longer- lived, still mortal, who influence human affairs, some benevolently, some malevolently, and who appear to men in dreams.

The moral system of Democritus is strikingly like the negative side of the system of Epicurus. The swmmum bonum is placed in an even tranquillity of mind. Fear, and too strong desire, and all that is likely to bring sorrow or

even care, are to be avoided, as, for example, notably mar- nage, to which Democritus cherished the strongest objec- tions. This habit of mind Democritus is said to have himself so well attained that the merry spirit with which he re- garded all that happened earned him the title of ‘the laughing philosopher.” Another version, however, asserts that he received the name on account of the scorn which he poured on human ignorance and weakness,

See Mullach, Democriti Abderite operum fragmenta, Berlin, 1843; Franck, ‘‘ Fragments qui subsistent de Démocrite,” in the Mémoires de la Société royale de Nancy, 1836 ; Ritter, Geschichte der Philosophie, vol. i.; Brandis, Rhein. Musewm, vol. iii., and Geschichte der Griech. und Rim Philosophie, vol. i.; H. Stephanus, Pocsis Philos. ; Burchardt, Commeniaria critica de Demoeriti de sensibus philosophia, 1839 ; and Fragmente der Moral des Democrit.

DEMOIVRE, Apranam (1667-1754), an eminent mathematician, was born at Vitry, in Champagne, May 26, 1667 He belonged to a French Protestant family, and was compelled to take refuge in England at the revocation of the Edict of Nantes,in 1685. Having laid the founda- tion of his mathematical studies in France, he prosecuted them further in London, where he read public lectures on natural philosophy for his support. The Principia Mathe- matica of Newton, which chance threw in his way, made him comprehend at once how little he had advanced in the science which he professed; but he pursued his studies with vigour, and soon became distinguished among first-rate mathematicians He was among the intimate personal friends of Newton, and his eminence and abilities secured his admission into the Royal Society of London, and after- wards into the Academies of Berlin and Paris. His merit 7 < well known and acknowledged by the Royal Society

b ey Judged him a fit person to decide the famous con- = phe aren ee Leibnitz. The life of Demoivre feticre oat tea = a ee ces i one all ual a : riends and associates having nearly

Pp away betore him. He died at London, Novem- ber 27, 1754, The Philosophical Transactions of London

contain several of his papers, all of them interesting.' He also published some excellent works, such as Jfiscellanea Analytica de Seriebus et Quadraturis, 1730, in 4to. This then contained some elegant and valuable improvements on then existing methods, which have themselves, however, long been superseded. But he has been more generally known by his Doctrine of Chances, or Method of Calculating the Probabilities of Events at Play. This work was first printed in 1618, in 4to, and dedicated to Sir Isaac Newton. It was reprinted in 1738, with great alterations and improvements ; and a third edition was afterwards published with additions. He also published a 7'7eatise on Annutires, 1724, in 8vo, dedicated to Lord Carpenter. DEMONOLOGY. 'The word demon (or demon) is the Greek Sai/uwv, the etymology of which is too doubtful to explain its original signification (see Pott, Ltym. Forsch., ii. 1, 947). Setting aside the use of the word in the general sense of deity (as in Iliad, i. 222), we find it employed in classic Greek literature with the more specific meaning under which it becomes an important term in the science of religion. Among the most instructive passages are those in which Hesiod tells how the men of the golden race became after death demons, guardians or watchers over mortals (Hesiod, Op. et Dies, 109, &c.; see Welcker, Griech. Gotterlehre, vol. i. p. 731), and where the doctrines of Empedocles, Plato, and other philosophers are set forth, showing how the demons came to be defined as good and evil beings intermediate between gods and men (Plutarch, De Defect. Orac., De Isid. et Osir., De Vitand. Air, Alien., &c. ; Plato, Symposion, 28 ; Diog. Laert., Vit. Pythag. ; see Grote, History of Greece, vol. i. chaps. 2,17). The religions of the world usually recognize an order of spiritual beings, below the rank of governing deities, and distinguished from nature-spirits such as elves and nymphs by being especially concerned with living men and their affairs ; these beings, very often themselves considered to be ghosts of dead men, are the demons. The earlier and wider notion of demons includes the whole class of such spirits, who may be friendly or hostile, good or evil, persecuting and tormenting man or acting as his protecting and informing patron-spirits ; while, when they are mediators or ministers of some higher deity, they will be, like the god himself, kindly or ill-disposed. A narrower definition was introduced in Christian theology, where the ideas of a good demon and guardian genius were merged in the general conception of good

“ angels,” while the term demon was appropriated to evil spirits, or “devils.” For scientific purposes, it is desirable to use the term in the wider sense. Demonology, the branch of the science of religion which relates to demons, is much obscured in the treatises of old writers by their taking the evidence too exclusively from among civilized nations, and neglecting what is to be learnt from barbarous tribes, whose ideas of demons, being nearer their primitive state, are comparatively clear and comprehensible. When savage notions of the nature and functions of these spirits are taken as the starting-point, the demon appears as only a more or less modified human soul—whether it is still actually considered to be a human ghost, or whether part of the human quality has fallen away, so that only traces are left to show that man’s soul furnished the original model. But when such early and natural animistic concep- tions were carried on into higher stages of culture, their original use as explaining natural phenomena was gradually superseded by the growth of knowledge, and they came to be maintained as broken-down and confused superstitions, only to be understood by comparison with their earlier forms. Such comparison, however, is facilitated by the primitive demon-ideas cropping up anew even in civilized life, as in the so-called “ spirit-manifestations ” of the present day. The following details will show the main

purposes which the doctrine of demons served in the philo- sophy of the primitive and savage world, as well as its large contribution to civilized superstition. The authorities, when not mentioned, will mostly be found referred to in Tylor, Primitive Culture, chaps. xiv. xv. Other cases are given in Spencer, Principles of Sociology, vol. i., and every reader may supplement them with similar instances from the works of travellers and missionaries. Prof. Adolf Bastian’s Der Mensch in der Geschichte and Beitrdge zur Verglewhenden Psychologie are of great value to students. Among races of low culture, the conception of a ghost- soul being made to account for the phenomena of life (see article ANIMIsM) readily leads to a correspond- ing theory of morbid states of body and mind. As the man’s proper soul causes the functions of normal life by its presence, while its more or less continued absence induces sleep, trance, and at last death, so the abnormal phenomena of disease have a_ sufficient explanation at hand

in the idea that some other soul or soul-like spirit is acting on or has entered into the patient. Among the cases which most strongly suggest this are—first, such derangements as hysteria, epilepsy, and madness, where the raving and convulsions seem to bystanders like the acts of some other being in possession of the patient's body, and even the patient is apt to think so when he " comes to himself," and, second, internal diseases where severe pain or wasting away may be ascribed to some unseen being wounding or gnawing within. The applicability of demoniacal possession as a theory to explain diseas2 in general is best proved by the fact that it is so oftea thus ap- plied by savage races. Especially, reasoning out the matter in similar ways, rude tribes in different countries have repeatedly arrived at the conclusion that diseases are caused by the surviving souls or ghosts of the dead, who appear to the living in dreams and visions, thus proving at once their existence after death, and their continued concern with mankind. This notion being once set on foot, it becomes easy to the savage mind to identify the particular spirit, as when the Tasmanian ascribes a gnawing disease to his having unwittingly pronounced the name of a dead man, who thus summoned has crept into his body, and is consuming his liver; or when the sick Zulu believes that some dead ancestor he sees in a dream has caused his ailment, wanting to be propitiated with the sacrifice of an ox; or when the Samoan persuades himself that the ancestral souls, who on occasion reveal themselves by talking through the voices of living members of the family, are the same beings who will take up their abode in the heads or stomachs of living men and cause their illness and death. Here, then, the demon appears in what seems its original character of a human ghost. We may notice in the last example the frequent case of the man's mind being so thoroughly under the belief in a spirit possessing him that he speaks in the person of that spirit, and gives its name ; the bearing of this on oracular possession will appear presently. In many, perhaps in most cases, however, the disease-demon is not specially described as a human ghost ; for instance, some Malay tribes in their simple theory of diseases are content to say that one kind of demon causes small-pox, another brings on swellings, and so on. The question is whether in such cases the human character has merely dropped away, and this seems likely from the very human fashion in which the demons are communicated with; they are talked to with entreaties or threats, enticed out with offerings of food, or driven away with noises and blows, just as though they were human souls accessible to the same

motives as when they were in the body. Thus the savage theory of demoniacal possession has for its natural result the practice of exorcism or banishment of the spirit as the reeular means of cure, as where, to select

these from hundreds of instances, the Antilles Indians in Columbus's time went through the pretence of pulling the disease off the patient and blowing it away, bidding it begone to the mountain or the sea; or where the Patagonians till lately, believing every sick person to be possessed by an evil demon, drove it away by beating at the bed's head a drum painted with figures of devils.

That such modern savage notions fairly represent thie doctrine of disease-possession in the ancient world is proved by the records of the earliest civilized nations. The very charms still exist by which the ancient Egyptians resisted the attacks of the wicked souls who, become demons, entered the bodies of men to torment them with diseases and drive them to furious madness. 'The doctrine of disease among the ancient Babylonians was that the swarming spirits of the air entered man's body, and it was the exorcist's duty to expel by incantations "the noxious neck-spirit," "the burning spirit of the entrails which devours the man," and to make the piercing pains in the head fly away "like grasshoppers" into the sky. (See Records of the Past, vols. 1., iii., &c. ; Birch's trans. of the Egyptian Book of the Dead, see below; Maspero, L/istowe Ancienne des Peuples de l'Orient, p. 41; Lenormant, La Magie chez les Chaldéens, &c.) The transition-stage of the ancient belief in the classical period of Greece and Rome is particularly interesting. The scientific doctrine of medicine was beginning to encroach upon it, but it was still current opinion that a fit was an attack by a demon (ériAnyus = "seizure," hence English epilepsy), that fury or madness was demoniacal possession (dapovaw=to be possessed by an evil spirit, hence English demoniac, &c.), that madmen were "larvati," 2.¢., inhabited by ghosts, &c. No record shows the ancient theory more clearly than the New Testament, from the explicit way in which the symptoms of the various affections are described, culminat- ing in the patient declaring the name of his possessing demon, and answering in his person when addressed. The sunilarity of the symptoms with those which in barbarous countries are still

accounted for in the ancient way may be seen from such statements as the following, by a well- known missionary (Rev. J. L. Wilson, Western Africa, p. 217) :—‘* Demoniacal possessions are common, and the feats performed by those who are supposed to be under such influence are certainly not unlike those described in the New Testament. Frantic gestures, convulsions, foam- ing at the mouth, feats of supernatural strength, furious ravings, bodily lacerations, gnashing of teeth, and other things of a similar character, may be witnessed in most of the cases.” Among the early Christians the demoniacs or energumens (évepyovjevor) formed a special class under the control of a clerical order of exorcists, and a mass of evidence drawn from such writers as Cyril, Tertullian, Chrysostom, and Minutius Felix, shows that the symp- toms of those possessed were such as modern physi- cians would class under hysteria, epilepsy, lunacy, &c. (See their works, and refs. in Bingham, Antiquities of the Christian Church ; Maury, La Magie et l Astrologie, part ii. ch. 2, &c.) Some theologians, while in deference to advanced medical knowledge they abandon the primitive theory of demons causing such diseases in our own time, place themselves in an embarrassing position by maintain- ing, on the supposed sanction of Scripture, that the same symptoms were really caused by demoniacal possession in the lstcentury. A full statement of the arguments on both sides of this once important controversy will be found in earlier editions of the Encyclopedia Britannica, but for our times it seems too like a discussion whether the earth was really flat in the ages when it was believed to be so, but became round since astronomers provided a different explanation of the same phenomena. It is more profitable

to notice how gradual the change of opinion has been from the doctrine of demon-possession to the scieutific theory of disease, and how largely the older view still survives in the world, Not only in savage districts, but in countries whose native civilization is below the Furopean level, such as India and China, the curious observer may still see the exorcist expel the malignant ghost or demon from the patient afflicted with fever, dizziness, frenzy, or any unaccountable ailment. (See Ward, [istory of the Hindoos, vol. i. p. 155, vol ii. p. 183 ; Roberts, Oriental Illustrations of the Scriptures, p. 529; Doolittle, Social Life of the Chinese.) The unbroken continuance of

the belief in medizeval Europe may be gathered from such works as the excellent treatise by Maury, La Magie et VAstrologie dans U'Antiquité et au Moyen Age, already referred to. Even in the 18th century was published with ecclesiastical approval a regular exorcist's manual, the Fustis et Flagellum Demonum, Auctore k.PL. Hieronimo Mengo (1727), which among its curious contents gives instructions how to get the better of those cunning demons who hide in the bodies of men and vex them with diseases, and which are apt when expelled to take refuge in the patient's hair. The gradual shifting of opinion is marked by the attempt to reconcile the older demonology with the newer medicine. This argument, which appears among tlie early Christian fathers, is worked out most elaborately in that curious museum of demonology, the Desquisitiones Magice of Martin Delrio, published as late as 1720. While inveighing against those physicians who maintain that all diseases have natnral causes, this learned Jesuit adniits that men may be dumb, epileptic, or lunatic without being obsessed; but what the demons do is that, finding the disposition of epileptics suitable, they insinuate themselves into them ; also they attack lunatics, especially at full moon, when their brains are full of humours, or they introduce diseases by stirring up the black bile, sending blacks into the brain and cells of the nerves, and setting obstructions in the ears and eyes to cause deafness and blindness. Looking at the date of this celebrated work, we cannot wonder that in benighted districts of Europe the old diabolical possession and its accompanying exorcism may still now and then be met with, as in 1861 at Morzine in Savoy.t (See A. Coustans, Zelation sur une Lipidémie d' Hystéro-Démonopathie, Paris, 1863.) One of the last notable cases of this kind in England was that of George Lukins of Yatton, a knavish epileptic out of whom seven devils were exorcised by seven clergymen, at the Temple Church at Bristol, on June 13, 1788. (See Lneyc. Brit. 3d to 6th editions, art. " Possession ").

The derivation of the ideas of demons from the phantoms seen in dreams has already been instanced where the apparition is that of a dead man, but there are pecu- liar kinds of demons which are to be considered specially from this point of view. In savage animism, as among the Australians, what we call a nightmare is of course recognized as a demon ; and though we have long learnt to interpret it subjectively as arising from some action of

the sleeper’s brain, it is interesting to remember that its name remains proof of the same idea among our ancestors (Anglo-

1 The Times, in November 1876, contains an account in the casting out of devils by a priest in the Church of the Holy Spirit in Bar- celona, during the preceding month. On one occasion the patient, a youug woman of seventeen or eighteen, lay on the floor before the altar, writhing in convulsions with distorted features and foaming at the mouth, while the priest carried on a dialogue with the devil, whom he addressed by the name of Rusbel, the fiend’s answers being of course spoken by the voice of the frantic girl herself. At last a number of demons were supposed to come out of the patient’s body, and such scenes were repeated for days in the presence of many spectators till a riot arose, and the civil authorities intervening put a stop to the whole affair.

DENMONOLOGY

Saxon mer =spirit, elf, &c., compare old German mar= elf, demon, nahtmar = nightmare,—see Grinm, Deutsche Mythologie, p. 433). The vampires, or drinkers (Old Russian upéir), well known in Slavonic regions, are a varicty of the nightmare, being witch-souls or ghosts who suck the blood of living victims, thus accounting for their becoming pale and bloodless, and falling into decline. (See Grohmann, Aberglauben aus Béhmen, p. 24; Ralston, Songs of the Russian People, p. 410.) From dreams are avowedly formed the notions of zncubz and succubi, those nocturnal demons who consort with women and men in their sleep. From the apparent distinctness of their evidence, these beings are of course well known in savage demonology, and in connection with them there already arises among uncultured races the idea that children may be engendered between spirits and human mothers. (See Martin, Mariner’s Tonga Islands, vol, i, p. Won For an ancient example of the general belief in this class of demons, no better could be chosen than that of the early Assyrians, whose name for a succubus, /ilit, evidently gave rise to the Rabbinical tale of Adam’s demon-wife Lilith. (See Lenormant, op. cit. p. 36.) The literature of medieval sorcery abounds in mentions of this belief, of which the absurd pseudo-philosophical side comes well into view in the chapter of Delrio (lib. ii, quest. 15), “ An sint unquam demones incubi et succube, et an ex tall congressu proles nasci queat?” But its

serious side is shown by the accusation of consorting with such demons being one of the main charges in the infamous bull of Innocent VIII., which brought judicial torture and death upon so many thousands of wrctched so-called witches. (Sce Roskoff, Geschichte des Teufels, vol. ii. p. 222.) It further throws light on demonology that the frightful spectres seen in such affections as delirium tremens have of course been interpreted as real demons. It is needless to give instances from among savage tribes, for the connection between such phantoms and the doctrine of demoniacal possession is shown in its most primitive state in modern Europe. In the Fustis Demonum, p. 42, it is mentioned that demons before entering human bodies are apt to appear in some terrible form or deformity, human or bestial, and while they seem to the patients suddenly to vanish, then they enter into their bodies. By this supposition the disappearance of the phantom aud the accompanying illness of the delirious patient are ingeniously accounted for at one stroke. ; Though the functions ascribed to demons in savage philosophy are especially connected with disease, they are by no means exclusively so, but the swarming host of spirits pervading the world is called on to account for anj events which seem to happen by some unseen but controlling influence. Some cause must lead the wild man to find game one day and come back empty another, to stumble and hurt himself in the dusk, to lose his way and become bewildered in the dark forest, where the cries of animals and other sounds seem to him spirit-voices misleading or mocking him. ‘For all such events requiring explanation savages find personal causes in intervening demons, who are sometimes ghosts, as when an American Indian falling into the fire will say that an angry ancestral spirit pushed him in; or they may be simply spirits of undefined origin,

like those whom the Australians regard as lurking every-

where, ready to do harm to the poor black-fellow. To compare this state of thought with that of the classic world, we have but to remember the remark of Hippo- crates about the superstitious who believed themselves infested day and night by malicious demons, or the Romans’ fear of those harmful ghost-demons the lemures, whom they got rid of by the quaint ceremonies of the annual Lemaralia. How permanent these demon-ideas

have been from the infancy of culture, may be well shown by the permanence of the practice of holding at intervals such special ceremonies to expel them. In Siam the people first hunt the demons out of the houses, and tlien drive them with cannon-shots through the streets till they get them outside the walls into the forest. In Old Calabar they put puppets along the streets leading to the sea, to entice the demons into, and then at dead of night a sudden rush is made by the negroes with whips and torches to drive the spirits down into the sea. Not only do other barbaric regions, such as the South Sea Islands and Peru, furnish similar examples of the expulsion of demons, but it may still be seen among European peasantry. In Sweden, Easter-tide is the season for a general purging of the land from the evil spirits and trolls of the old heathendom ; and in many parts of Germany unseen witches are to this day driven out on Walpurgis- night with crack of whip and blast of horn. (See a collection of cases in Bastian and Hartmann, Zeitschrift fiir Ethnologie, 1869, p. 189; also Hylten-Cavallius, Warend och Wirdarne, part i. p. 178). In these cases it is generally unfavourable influences which are considered as due to the demons. But favourable events are even by savages often recognized as due to the intervention of some kindly spirit, and especially to a guardian or patron demon, whose help accounts for what among ourselves is often not much more rationally considered to be “luck.” It is often a recognized ancestral soul which from natural affection undertakes this duty, as when a Tasmanian has been known to account for escape from danger by the idea that his father’s soul was still watching over him. But it need not be so; and among the American Indians or West Africans, where each man lives in constant imaginary intercourse with his patron-spirit, talking with it, making it offerings, and trusting to its guidance in difficulty and protection from danger, this spirit may be revealed in a dream or vision, and is often connected with some object known as a “miedicine” or “fetish,” but is seldom identified with any particular ghost. In Greek literature this idea is best exemplified by the lines of Menander on the good demon whom every man has from birth as his guide through the mysteries of life (ap. Clem. Alex., Stromat. v.) ; the most popularly known example is the so-called “‘ demon ” of Socrates, but he himself did not give such personal definiteness to the divine or demoniv influence (Sayudvtov) which warned him by what he described as a voice

or sign (see Zeller, Socrates, ch. 4). The primitive idea of the patron spirit is carried on in the Roman genius, whose name (even without the addition of " natalis ") indicates that it is born with the person whom it accompanies through life. Its place very closely corresponds to that occupied in modern folklore by the guardian angel. There are districts in France where a peasant meeting another, salutes not only the man, but his "companion," the guardian angel who is supposed to be invisibly at his side.

Among attendant and patron demons, as recognized in the general belief of mankind, a specially important class is formed by the familiar spirits who accompany sorcerers, giving them mysterious knowledge, uttering oracular responses through their voices, enabling them to perform wonderful feats, bringing them treasure or injuring their enemies, and doing other spiritual services for them. From the descriptions of sorcerers among the lower nations, it is at once evident that their supposed intercourse with demons is closely connected with the symptoms of disease- possession. Thus among the Zulus, "the disease which precedes the power to divine " is distinctly hysterical, the patient's morbid sensitiveness and intensely vivid imagination of sights and voices fitting well with his persuasion that he is under the control of some ancestral ghost. So

well is this connection recognized among races like the Patagonians and rude tribes of Siberia, that children with an hereditary tendency to epilepsy are brought up to the profession of magicians. Where the sorcerer has not naturally such symptoms of possession by a controlling demon, he is apt to bring them on by violent dancing and beating drums, or by drugs, or to simulate them by mere kuavery ; which latter is really the most convincing proof that the original notion of the demon of the magician did not arise from imposture, but from actual belief that the morbid excitement, hallucination, and raving consequent on mental disease were caused by spirits other than the man's own soul, in possession of his body. The primitive and savage theory of inspiration by another spirit getting inside the body is most materialistic, and cheating sorcerers accordingly use ventriloqguism of the original kind, which (as its name implies) is supposed to be caused by the voice of a demon inside the body of the speaker, who

really himself talks ‘ina feigned human voice, or in squeaking or whistling tones thought suitable to the thin-bodied spirit-visitor. The familiar spirit may be a human ghost or some other demon, and may either be supposed to enter the man’s body or only to come into his presence, which is somewhat the same difference as whether in disease the demon “ possesses ” or “‘ obsesses ” a patient, ¢.e., controls him from inside or outside. Thus the Greenland angekok, or sorcerer, is described as following his profession by the aid of a torngak, or familiar spirit (who may be an ancestral ghost), whom he summons by drumming, and with whom he is heard by the bystanders to carry on a conversation within the hut, obtaining information which enables him to advise as to the treatment of the sick, the prospect of good or bad weather, and the other topics of the business of a soothsayer. Passing over the intermediate space which divides the condition of savages from that of medizeval or modern Europeans, we shall find, so far as the doctrine of familiar demons has survived, that it has changed but little in principle. In the witch trials a favourite accusation was that of having a familiar demon. Sir Walter Scott’s Demonology and Witchcraft contains among others the case of Bessie Dunlop, whose familiar was the ghost of one Thome Reid, killed at the battle of Pinkie (1547), who enabled her to give answers to such as consulted her abont the ailments of human beings or cattle, or the recovery of things lost or stolen. This miserable woman, chiefly on her own confession, was as usual “ convict and burnt.” Here the imagined demon was a human soul ; but other spirits thus attended sorcerers and diviners, such as the spirit called Hudhart, who enabled a certain Highland woman to prophesy as to the conspiracy to murder James I. of Scotland. Dissertations on the art of raising demons for the sorcerers’ service, and even the actual charms and ceremonies to be used, form a large part of the precepts of magical books. (See Ennemoser, His- tory of Magic; Horst, Zauberbibliothek, and other works already cited.) Among the latest English books treating seriously of this “black art” is Sibly’s JUlustration of the Occult Sciences, of which a 10th edition, in 4to, bears date London, 1807. The statute of James I. of England enacts that all persons invoking any evil spirit, or consulting, covenanting with, entertaining, employing, feeding, or re- warding any evil spirit, should be guilty of felony, and suffer death. This was not repealed till the reign of George II. Educated public opinion has now risen above this level ; but popular credulity is still to be worked upon by much the same means as those employed by savage

sorcerers profess- ing intercourse with familiar spirits. At “ spiritualistic séances” the convulsive and hysterical symptoms (pre- tended or real) of the “medium” under the “ control ” of his “guiding spirit ” are much the same as those which

nly be scen among the Fijians or the hill-tribes of Burmah, | while the feigned voice, supposed to indicate that it is some Negro or Irish spirit speaking through the medium’s organs, is often a clumsier performance than that of the New Zealand sorceress, producing in thin squeaking tones the voice of a family ghost. Many of the special “ manifesta- tions,” such as thumping and drumming in the dark, are those usual in the performances of the Siberian shamans, who also, in common with the Greenland angekoks, impose on the bystanders by the miraculous performance of the “rope-trick ;” the “planchette-writing,” by the guiding hand of a familiar spirit, has long been done by an inferior class of magicians in China. The crowning incident in the English proceedings is the “ materialization” of the familiar spirit in a dimly-seen figure which, when a rush is made to seize it, proves to be a dull or the medium himself in drapery.

Returning to the geueral theory of demonology, two important principles have to be brought together under notice. As the religions of the world become more com- plexly organized, the various kinds of spirits divide into orders or ranks of a hierarchy ; while with the growth of dualism the class of demons further arrange themselves as it were in two opposite camps, under the presiding good and evil deities. The way in which such views may be developed is well seen in Bishop Callaway’s Leligeon of the Amazulu, amoug whom the ancestral ghosts (amatongo)

carry on after death their friendly or hostile character, so that in general the ghosts of a man’s own family or tribe are friendly demons helping him and fighting on his side, while the ghosts of enemies remain hostile denions. In the religion of Congo, according to Magyar (Reisen im Stid- Afrika, 1849-57), the highest deity, Suku-Vakange, takes little interest in mankind, and the real government of the world belongs to the good and bad kilulu,—spirits or demons. When a man dies, according to his circumstances in life he becomes a friend or enemy of the living, and thus passes among the good

or bad kilulu. But as there ar: iaore bad spirits who torment than good who favour, man's iisery would be unbearable did not Suku-Vakange from time to time, enraged at the wickedness of the evil spirits, terrify them with thunder and smite the more obstinate with his bolts; then he returns to rest and leaves the demons to rule again, In the religion of the ancient Egyptians the dualistic system is worked out in the antagonism between the gods of light and the evil powers under the serpent Apap, whose long undulating form may be seen in those portions of the pictorial ritual of the dead which are painted on the mummy-cases. (See LBirch's translation of the Book of the Dead, in vol. v. of Bunsen, Lgypt's Place in Universal Irstory.) In the ancient Rabylonian system the demons were classified in orders, and the miunteness with which their functions as personal causes of evil are assigned to them is well shown by the following passage from a cuneiform inscription :—" They assail country after country ; they make the slave set him- self up above his place ; they make the son of the house leave his father; they make the young bird fly out of its nest; they make the ox and the lamb run away—the evil demons who set snares" (Lenormant, p. 29.) In Brahmanism and Buddhism which sprang from it, as well «3 in the ancient Persian religion, the various orders of spirits who come under the general definition of demons have large place. The latter faith, as represented in the Zend-Avesta, worked out to its extreme development the doctrines of the good and evil deities, Ahuramazda and Anra-mainyu (Ormuzd and Ahriman), each with his innumerable armies of spirits or demons, those of light, purity, and goodness being met in endless contention by the legions of darkuess who seek to undo all good and

spread foulness and sin around them. This remarkable system exercised strong influence on religions of later civilization. The later Jewish or Talmudic ideas are strongly leavened by it, and to it is in great measure due the rise of the Manichzean doctrine. The demonology of these systems may best be studied as part of their general doctrine, while their relation to the angelology and demonology of Christianity belongs to Christian theology. Though in this short uotice only a few illustrative cases are given as to the belief in demons, the great mass of details of the kind in the various religions of the world will be found to conform with them both as to the

notion of demons being derived from the idea of the human soul, and as to their function in primitive philosophy being to serve as personal causes of events. The principles of demonology thus form an interesting branch of intellectual history. But beside this, its names and formulas transmitted as they have been by the blind reverence of generations of magicians, preserve for the historical student some curious relics of antiquity. As a pendant to the already-mentioned Talmudic Lzlith, the female nocturnal demon of ancient Assyria, may be noticed Asmodeus, famous in Le Sage's novel Le Diable Boiteux, who is not only to be found in the book of Tobit and the Talmudic legend of King Solomon (see Eisenmenger, Hntdecktes Judenthum), but may be traced back still farther to his real origin in Aeshma daeva, one of the evil demons of the ancient Persian religion. The conjurations and formulas for raising demons in the curious old book of magic which bears the name of Doctor Faustus (see reprint in Horst) are a wonderful medley of scraps from several religions, Their principal source, beside Christian invocations and fragments of ritual, is Hebrew, whether biblical or from the later Rabbinical books; Aziel, Faust's own familiar, chosen because he can do his errands swift as thought, is apparently the fallen angel Azael of the Talmud, to whom Solomon goes every day for wisdom; Michael, Raphael, Uriel, and Gabriel guard the four quarters of a mystic demon-circle ; while the names of Satan and Pluto, Ariel and Hesper, Petrus and Adonis, figure among incantations in dog-Latin and good high Dutch, and a mass of words reduced to gibberish beyond comprehension. The study of demono- logy also brings into view the tendency of hostile religions to degrade into evil demons the deities of a rival faith. The ancient schism between two branches of the Aryan race, which separated the Zarathustrian religion from the Vedic religion, now represented by Brahmanism, is nowhere better marked than in the fact that the devas, the briglit gods of the Hindoo, have become the devs or evil demons of the Persian. So the evil beings recognized in the folk-lore of Christendom are many of them the nature- spirits, lares, and other deities of the earlier heathendom, not discarded as imaginary, but lowered from their high estate and good repute to swell the crowd of hateful demons. (B.2B.-T,) DE MORGAN, Aveustus (1806-1871), one of the most eininent mathematicians and logicians of his time, was born June 1806, at Madura, in the Madras presidency. His father was Colonel John De Morgan, employed in the East India Company's service, and his grandfather and

great-grandfather had served under Warren Hastings. On the mother's side he was descended from James Dodson, F.R.S., author of the Antilogarithmic Canon and other mathematical works of merit, and a friend of Demoivre. Very shortly after the birth of Augustus, Colonel De Morgan brought his wife, daughter, and infant son to England, where he left them during a subsequent period of service in India, dying in 1816 on his way home. Augustus, then ten years of age, received his early educa- tion in several private schools, and before the age of four-

teen years had learned Latin, Greek, and some Hebrew, in addition to acquiring much general knowledge. At the age of sixteen years and a half he entered Trinity College, Cambridge, and studied mathematics, partly under the tuition of Airy, subsequently the astronomer royal. In 1825 he gained a Trinity scholarship. De Morgan's atten- tion was by no means confined to mathematics, and his love of wide reading somewhat interfered with his success in the mathematical tripos, in which he took the fourth place in 1827, before he had completed his twenty-first year. He was prevented from taking his M.A. degree, or from obtaining a fellowship, to which he would doubtless have been elected, by his conscientious objection to signing the theological tests theu required from masters of arts aud fellows at Cambridge. A strong repugnance to any -sectarian restraints upon the freedom of opinion was one of De Morgan's most marked characteristics throughout life.

A career in his own university being closed against him, he entered Lincoln's Inn ; but had hardly done so when the establishment, in 1828, of the university of London, in Gower Street, afterwards known as University College, gave him an opportunity of continuing his mathematical pursuits. At the early age of twenty-two years he gave hisfirst lecture as professor of mathematics in a college which he served with the utmost zeal and success for a third of acentury. His connection with the college, indeed, was interrupted in 1831, when a disagreement with the governing body caused De Morgan and some other profes- sors to resign their chairs simultaneously. When, in 1836, his successor Mr White was accidentally drowned, De Morgan was requested to resume the professorship. It may be

added that his choice of a literary aud scientific career was made against the advice of his relatives and friends, who, on his entering Lincoln’s Inn, confidently anticipated for him a distinguished and lucrative career at the bar.

In 1837 De Morgan married Sophia Elizabeth, daughter of William Frend, a Unitarian in faith, a matheniatician and actuary in occupation, a notice of whose life, written by his son-in-law, will be found in the Monthly Notices of the Royal Astronomical Society (vol. v). Henceforward De Morgan’s life is scarcely niore than a record of his constant labours, and his innumerable publications. As in the case of many scholars, the even tenor of his life was unbroken by remarkable incidents. Surrounded bya growing family, ultimately seven in number, he sought happiness in his home, in his library, and in the energetic and vigorous discharge of his college duties. He seldom travelled or enjoyed relaxation, and could with difficulty be induced to remain many days from home.

As a teacher of mathematics De Morgan was unrivalled. He gave instruction in the fourm of continuous lectures delivered extempore from brief notes. The most prolonged mathematical reasoning, and the most intricate formule, were given with almost infallible accuracy from the resources of his extraordinary memory. De Morgan’s writings, however excellent, give little idea of the perspicuity and elegance of his viva voce expositions, which never failed to fix the attention of all who were worthy of hearing him. Many of his pupils have distinguished themselves, and, through Mr Todhunter and Mr Routh, he has had an important influence on the modern Cambridge school. In addition to occasional extra courses, it was his habit to give two lectures on each of the six week days throughout the working session of thirty weeks or more. Each lecture was exactly one hour and a quarter in length, and at the close a number of questions and problems were always given, to which the pupils returned written answers. These were all corrected by the professor’s own band, and personal explanations given before or after the lecture.

Although the best hours of the day were thus given to arduous college work, his public labours in other directions were extensive. For thirty years

he took an active part in the business of the Royal Astronomical Society, editing its publications, supplying obituary notices of members, and for 18 years acting as one of the honorary secretaries. His work for this society alone, it is said, would have been occupation enough for an ordinary man. He was also frequently employed as consulting actuary, a business in which his mathematical powers, combined with sound judgment and business-like habits, fitted him to take the highest place.

De Morgan's mathematical writings contributed power- fully towards the progress of the science. His memoirs on the " Foundation of Algebra," in the 7th and 8th volumes of the Cambridge Philosophical Transactions, contain soine of the most important contributions which have been made to the philosophy of mathematical method; and Sir W. Rowan Hamilton, in the preface to his Lectures on Quaternions, refers more than once to those papers as having led and encouraged him in the working out of the new system of quaternions. The work on 7rigonometry and Double Algebra, published by De Morgan in 1849, contains in the latter part a most luminous and philo- sophical view of existing and possible systems of symbolic calculus. But De Morgan's influence on mathematical science in England can only be estimated by a review of his long series of publications, which commence, in 1828, with a translation of part of Bourdon's Llements of Algebra, prepared for his students. In 1830 appeared the first edition of his well-known Hlements of Arithmetic, which has been widely used in schools, and has done much to raise the character of elementary training. It is distinguished by a simple yet thoroughly philosophical treatment of the ideas of number and magnitude, as well as by the introduc- tion of new abbreviated processes of computation, to which De Morgan always attributed much practical importance. Second and third editions were called for in 1832 and 1835, and more than 20,000 copies have been sold ; the book is still in use, a sixth edition having been issued in

1876.

De Morgan's other principal mathematical works were The Elements of Algebra, 1835, a valuable but somewhat dry elementary treatise ; the Hssay on Probabilities, 1838, forming the 107th volume of Lardner's Cyclopedia, still much used, being probably the best simple introduction to the theory in

the English language; and 7he Elements of Trigonometry and Trigonometrical Analysis, preliminary to the Differential Calculus, 1837.

Several of his mathematical works were published by the Society for the Diffusion of Useful Knowledge, of which De Morgan was at one time an active member. Among these may be mentioned the great Treatise on the Differential and Integral Calculus, 1842, which still remains the most extensive and complete English treatise on the subject; the Hlementary JIIilustrations of the Differential and Integral Calculus, first published in 1832, but often bound up with the larger treatise; the valuable essay, On the Study and Difficulties of Mathe- matics, 1831; anda brief treatise on Spherical Trigono- metry, 1834. By some accident the work on probability in the same series, written by Lubbock and Drinkwater- Bethune was attributed to De Morgan, an error which seriously annoyed his nice sense of bibliographical accuracy. For fifteen years he did all in his power to correct the mistake, and finally wrote to the Zimes to disclaim the authorship. (See Monthly Notices of the Royal Astro- nomical Society, vol. xxvi. p. 118.)

Two of his most elaborate treatises are to be found in the Encyclopedia Metropolitana, namely the articles on the

Calculus of Functions, and the Theory of Probabilities. The former article contains a profound investigation into the principles of symbolic reasoning ; the latter is still the most complete mathematical treatise on the subject in the English language, giving as it does a resumé of Laplace’s Théorie Analytique des Probabilités. De Morgan’s minor inathematical writings are scattered over various perio- dicals; five papers will be found in the Cambridge Mathematical Journal, ten in the Cambridge and Dublin Mathematical Journal, several in the Philosophical Magazine, while others of more importance are printed in the Cambridge Philosophical Transactions. A list of these and other papers will be found in the Royal Society’s Catalogue, which contains 42 entries under the name of De Morgan.

Iu spite of the excellence and extent of his mathematical writings, it is probably as a logical reformer that De Morgan will be best known to future times. In this respect he stands alongside of his great contemporaries Hamilton and Boole, as one of several independent discover- ers of the all-important principle of the quantification of the predicate. Unlike most mathematicians, De Morgan always laid much stress upon the importance of logical training. In his admirable papers upon the modes of teaching arithmetic and geometry, originally published in the Quarterly Journal of Education (reprinted in The Schoolmaster, vol ii.), he remonstrated against the neglect of logical doctrine. In 1839 he produced a small work called First Notions of Logic, giving what he had found by experience to be much wanted by students commencing with Luclid.

In October 1846 he completed the first of his original investigations, in the form of a paper printed in the Zrans- actions of the Cambridge Philosophical Society (vol. viii. No. 29). In this paper the principle of the quantified predicate was referred to, and there immediately ensued a memorable controversy with Sir W. Hamilton regarding the independence of De Morgan's discovery, some communica- tions having passed between them in the autumn of 1846. The details of this dispute will be found by those inte- rested in the original pamphlets, in the Athenceum newspaper, or in the appendix to De Morgan's Formal Logic. Suftice it to say that the independence of De Morgan's discovery was subsequently recognized by Hamilton, and that those acquainted with De Morgan's character could never suppose that it was otherwise. Moreover, the eight forms of pro- position adopted by De Morgan as the basis of his system partially differ from those which Hamilton derived from the quantified predicates The general character of De Morgan's development of logical forms was wholly peculiar and original on his part.

Not a year passed before De Morgan, late in 1847, pub- lished his principal logical treatise, called Formal Logic, or the Calculus of Inference, Necessary and Probable. This contains a reprint of the /irst Notions, an elaborate develop- ment of his doctrine of the syllogism, and of the numeri- cally definite syllogism, together with chapters of great interest on probability, induction, old logical terms, and fallacies, The severity of the treatise is relieved by charac- teristic touches of humour, and by quaint

anecdotes and allusions furnished from his wide reading and perfect memory.

There followed at intervals, in the years 1850, 1858, 1860, and. 1863, a series of four elaborate memoirs on the < Syllogism," printed in volumes ix. and x. of the Cam- bridge Phalosophical Transactions. These papers taken together constitute a great treatise on logic, in which he substituted improved systems of notation, and developed a new logic of relations, and a new onymatic system of logical expression. Apart, however, from their principal purpose,

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these memoirs are replete with acute remarks, lappy illus- trations, and abundant proofs of De Morgan's varied learn- ing. Unfortunately these memoirs are accessible to few readers, otherwise they would form invaluable reading for the logical student. In 1860 De Morgan endeavoured to render their contents better known by publishing a Syllabus of a Proposed System of Logic, from which may be obtained a good idea of his symbolic system, but the more readable and interesting discussions contained in the memoirs are of necessity omitted. The article " Logic " in the Hnglish Cyclopedia (1860) completes the list of his logical publica- tions.

Throughout his logical writings De Morgan was led by the idea that the followers of the two great branches of ex- act science, logic and mathematics, had made blunders,—

the logicians in neglecting mathematics, and the mathe-—

maticians in neglecting logic. He endeavoured to reconcile them, and in the attempt showed how many errors an acute mathematician could detect in logical writings; and how large a field there was for discovery. But it may be doubted whether De Moryan's own system, " horrent with mysterious spicule," as Hamilton aptly described it, is fitted to exhibit the real analogy between quantitative and qualitative reasoning, which is rather to be sought in the logical works of Boole. (See Boots, vol. iv. p. 47.)

Perhaps the largest part, in volume, of De Morgan's writings remains still to be briefly mentioned ; it consists of detached articles contributed to various periodical or composite works. During the years 1833-43, he contributed very largely to the first edition of the Penny Cyclopedia, writing chiefly on mathematics, astronomy, physics, and biography. His articles of various length cannot be less in number than 850, as may be ascertained from a signed copy in the British Museum, and they have been estimated to constitute a sixth part of the whole Cyclopedia, of which they formed perhaps the most valuable portion. He also wrote biographies of Newton and Halley for Knight's British Worthies, various notices of scientific men for the Gallery of Portraits, and for the uncoinpleted Biographical Dictionary of the Useful Knowledge Society, and at least seven articles in Smith's Dictionary of Greek and Roman Biography.

Some of De Morgan's most interesting and useful minor writings are to be found in the Companions to the British Almanack, to which he contributed without fail one article each year from 1831 up to 1857 inclusive. In these carefully written papers he treats a great variety of topics relating to astronomy, chronology, decimal coinage, life-assurance, bibliography, and the history of science. Most of them are as valuable now as when written.

Among De Morgan's miscellaneous writings may be mentioned his Explanation of the Gnomonic Projection of the Sphere, 1836, including a description of the maps of the stars, published by the Useful Knowledge Society ; his Prcatise on the Globes, Celestial and Terrestrial, 1845; and his remarkable Book of Almanacks, (second edition 1871), which contains a series of 35 almanacks, so arranged with indices of reference, that the almanack for any year, whether in old style or new, from any epoch, ancient or modern, up to 2000 A.p., may be found without difficulty, means being added for verifying the almanack and also for discovering the days of new and full moon from 2000 B.c. up to 2000 a.p. De Morgan expressly draws attention to the fact that the plan of this book was that of Francceur and Ferguson, but the plan was developed by one who was an unrivalled master of all the intricacies of chronology. The two best tables of logarithms, the small five- figure tables of the Useful Knowledge Society (1839 and 1857), and Shrocn's Seven Figure-Table (5th ed. 1865), were printed under De Morgan's superintendence. Several works edited by him will be found

mentioned in the British Musewm Catalogue. numerous anonymous contributions through a long series of years to the Atheneum, and to Notes and Queries, and his occasional articles in the North British Review, Macmillan's Magazine, c., must be passed over with this bare mention.

Considerable labour was spent by De Morgan upon the subject of decimal money. He was a great advocate of the pound and mil scheme. His evidence on this subject was sought by the Royal Commission, and, besides constantly supporting the Decimal Association in periodical publications, he published several separate pamphlets on the subject.

One marked character of De Morgan was his intense and yet reasonable love of books. He was a true bibliophil, and loved to surround himself, as faras his means allowed, with curious and rare books. He revelled in all the mysteries of watermarks, title pages, colophons, catch-words, and the like ; yet he treated biblio-

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graphy as an important science. As he himself wrote, ‘‘ the most worthless book of a bygone day is a record worthy of preservation ; like a telescopic star, its obscurity may render it unavailable for most-purposes ; but it serves, in hands which know how to use it, to determine the places of more important bodics.” His evidence before the Royal Commission on the British Museum in 1850, (Questions 5704*-5815,* 6481-6513, and 8966-8967), should be studied by all who would comprehend the principles of bibliography or the art of constructing a catalogue, his views on the latter subject corresponding with those carried out by Panizzi in the Bretish Museum Catalogue. Asample of De Morgan's bibliographical learning is to be found in his account of Arithmetical Books, from the Invention of Printing (1847), and finally in his Budget of Paradoxes. This latter work consists of articles most of which were originally published in the Athenewm, describing the various attempts which have bcen made to invent a perpetual motion, to square the circle, or to trisect the angle ; but De Morgan took the opportunity to include many curious bits gathered from his extensive reading, so that the Budget as reprinted by his widow (1872),

with much additional matter prepared by himself, forms a remarkable collection of scientific ana. De Morgan's correspondence with contemporary scientific men was very extensive and full of interest. It remains unpublished, as does also a large mass of mathematical tracts which he prepared for the use of hig students, treating all parts of mathematical science, and embodying some of the matter of his lectures. De Morgan's library was purchased by Lord Over- Stone, and presented to the university of London.

From the above enumeration it will be apparent that the extent of De Morgan's literary and scientific labours was altogether extraordinary ; nor was quality sacrificed to quantity. On the contrary every publication was finished with extreme care and accuracy, and no writer can be more safely trusted in every thing which he wrote. It is possible that his continual efforts to attain completeness and absolute correctness injured his literary style, which is wanting in grace; but the estimation in which his books are held is shown by the fact that they are steadily rising in market price. Apart from his conspicuous position as a logical and mathematical discoverer, we may conclude that hardly any man of science in recent times has had a more extensive, though it may often be an unfelt influence, upon the progress of exact and sound knowledge.!

De Morgan has left no published indications of his opinions on religious questions, in regard to which he was extremely reticent. He seldom or never entered a place of worship, and declared that he could not listen toa sermon, a circumstance perhaps due to the extremely strict religiour discipline under which he was brought up. Nevertlieless there is reason to believe that he was of a deeply religious disposition. Like Faraday and Newton he enterteined a confident belief in Providence, founded not on any tenuous method of inference, but on personal feeling. His hope of a future life also was vivid to the last.

In the year 1866 a life as yet comparatively free from trouble became clouded by the circumstances which led him to abandon the institution so long the scene of his labours. The refusal of the council to accept the recommendation of the senate, that they should appoint an eminent Unitarian minister to the professorship of logic and mental philosophy,

unknown to him, dying on the 18th March 1871. Aun interesting and truthful sketch of his life will be found in the Monthly Notices of the Royal Astronomical Society, for the 9th February 1872, vol. xxii. p. 112, written by Mr Ranyard, who says, “ He was the kindliest, as well as the most learned of men—benignant to every one who approached him, never forgetting the claims which weak- ness has on strength.” (w. 8. J.)
DEMOSTHENES was born in 384 B.c. His father, who bore the same name, was an Athenian citizen belong- ing to the deme of Pania. His mother, Cleobule, was the daughter of Gylon, a citizen who had been active in procuring the protection of the kings of Bosporus for the Athenian colony of Nymphzon in the Crimea, and whose wife was a native of that region. On these grounds the adversaries of Demosthenes, in after-days, used absurdly to taunt him with a traitorous or barbarian ancestry. The boy had a bitter foretaste of life. He was seven years old when his father died, leaving property (in a manufactory of swords, and another of upholstery) worth about £3500, which, invested as it seems to have been (20 per cent. was not thought exorbitant), would have yielded rather more than £600 a year. £300 a year was a very comfortable income at Athens, and it was possible to live decently on a tenth of it. Nicias, a very rich man, had property equivalent, probably, to not more than £4000 a year. Demosthenes was born, then, to a handsome, though not a great fortune. But his guardians —two nephews of his father, Aphobus and Demophon, and one Therippides — abused their trust, and handed over to Demosthenes, when he came of age, rather less than one-seventh of his patrimony, perhaps between £50 and £60 a year. Demosthenes, after studying with Isazus—then the great master of forensic eloquence and of Attic law, especially in will cases 2—brought an action against Aphobus, and gained a verdict for abont £2400. But it does not appear that he got the money ; and, after some more fruitless proceedings against Onetor, the brother-in-law of Aphobus, the matter was dropped,—not, however, before his relatives had managed to throw a public burden (the equipment of a ship of war) on their late ward, whereby his resources were yet further straitened. He now became a professional writer of speeches or pleas for the law-courts, sometimes speaking himself. Biographers have delighted to relate how painfully Demosthenes made himself a tolerable speaker,—how, with pebbles in his mouth, he tried his

lungs against the waves, how he declaimed as he ran up hill, how he shut himself up in a cell, having first guarded himself against a longing for the haunts of men by shaving one side of his head, how he wrote out Thucydides eight times, how hs was derided by the Assembly and encouraged by ajudicious actor who met him moping about the Peirzeus. He certainly seems to have been the reverse of athletic (the stalwart A®schines upbraids him with never having

Early life.

Profes-

sional worl: for the law-

courts.

revived all De Morgan's sensitiveness on the subject of sectarian freedom ; and, though his feelings were doubtless excessive, there is no doubt that gloom was thrown over

been a sportsman), and he probably had some sort of defect This work, or impediment in his speech as a boy. Perhaps the most kept up in interesting fact about his work for the law-courts is that let years.

his life, intensified in 1867 by the loss of his son George Campbell De Morgan, a young man of the highest scientific promise, whose name, as De Morgan expressly wished, will long be connected with the London Mathematical Society, of which he was one of the founders. From this time De Morgan rapidly fell into ill-health, previously almost

1In a notice of De Morgan's character it is impossible to omit a reference to his witty sayings, some specimens of which are preserved in Dr Sadler's most interesting Diary of Henry Crabb Robinson (1869), whieh also contains a humorous account of H.C.R. by De Morgan. It may be added that De Morgan was a great reader and admirer

: Dickens; he was also fond of music, and a fair performer on the ute,

he seems to have continued it, in some measure, through the most exciting parts of his great political career. The speech for Phormio belongs to the same year as the plea for Megalopolis. The speech for Boeotus ‘ Concerning the Name” comes between the First Philippic and the First Olynthiac. The speech against Pantznetus comes between the speech “On the Peace” and the Second Philippic.

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2 In Jebb’s Attic Orators from Antiphon to Isaeos, vol. ii. p. 267 f., the traditions of the relation between Demosthenes and Iszeus are ex- amined in detail. It is there shown that the intercourse of the men can scarcely have been either intimate or prolonged, but that Demosthenes undoubtedly learned from Iseus the art of grappling with a forensic adversary in close and strenuous argument.

Political career— its unity.

The rela- tion of Athens to Greece.

Decay of public spirit.

The political career of Demosthenes, from his first direct contact with public affairs in 355 B.c. to his death in 322, has an essential unity. It is the assertion, in successive forms adapted to successive moments, of unchanging prin- ciples. Externally, it is divided into the chapter which precedes and the chapter which follows Cheeronea. But its inner meaning, the secret of its indomitable vigour, the law which harmonizes its apparent contrasts, cannot be understood unless it is regarded as a whole. Still less can it be appreciated in all its large wisdom and sustained self-mastery if it is viewed merely as a duel between the ablest champion and the craftiest enemy of Greek freedom. The time indeed came when Demosthenes and Philip stood face to face as representative antagonists in a mortal conflict. But, for Demosthenes, the special peril represented by Philip, the peril of subjugation to Macedon, was merely a disastrous accident. Philip happened to become the most prominent and most formidable type of a danger which

was already threatening Greece before his baleful star arose. As Demosthenes said to the Athenians, if the Macedonian had not existed, they would have made another Philip for themselves. Until Athens recovered something of its old spirit, there must ever be a great standing danger, not for Athens only, but for Greece,—the danger that sooner or later, in some shape, from some quarter—no man could foretell the hour, the manner, or the source—barbarian violence would break up the gracious and undefiled tradition of separate Hellenic life.

What is the true relation of Athens to Greece? The answer which he gave to this question is the key to the life of Demosthenes. Athens, so Demosthenes held, is the natural head of Greece. Not, however, as an empress holding subject or subordinate cities in a dependence more or less compulsory. Rather as that city which most nobly expresses the noblest attributes of Greek political existence, and which, by her pre-eminent gifts both of intellect and of moral insight, is primarily responsible,.everywhere and always, for the maintenance of those attributes in their integrity. Wherever the cry of the oppressed goes up from Greek against Greek, it is the voice of Athens which should first remind the oppressor that Hellene differs from barbarian in postponing the use of force to the persuasions of equal law. Wherever a barbarian hand offers wrong to any city of the Hellenic sisterhood, it is the arm of Athens which should first be stretched forth in the holy strength of Apollo the Averter. Wherever among her own children the ancient loyalty is yielding to love of pleasure or of base gain, there, above all, it is the duty of Athens to see that the central hearth of Hellas is kept pure. Athens must never again seek “empire” in the sense which became odious under the influence of Cleon and Hy perbolus,— when, to use the image of Aristophanes, the allies were as Babylonian slaves grinding in the Athenian mill, Athens must never permit, if she can help it, the re-establishment of such a domination as Sparta exercised in Greece from the battle of Aigospotami to the battle of Leuctra. Athens must aim at leading a free confederacy, of which the members shall be bound to her by their own truest interests. Athens must seek to deserve the confidence of all Greeks alike.

Such, in the belief of Demosthenes, was the part which oie must perform if Greece was to be safe. But

must be effected before Athens could be capable of

— a part. The evils to be cured were different phases of one malady. Athens had long been suffering from the profound decay of public spirit. It was of the essence of ete that the citizen, while perfectly free above ans ae 4 of they pod Me ae .. ce fae me s. If the state needs his service in ? ot hire an inferior substitute to do the work,

i ner!

If the state requires funds, he must not grudge the money which in quiet times might have been spent on the theatre or the banquet. He must ever remember that, in the phrase of Sophocles, the state is the ship that bears us safe. It does not profit the passenger that his cabin is comfortable if the ship is going down.

Since the early years of the Peloponnesian war, the separation of Athenian society from the state had been growing more and more marked. The old type of the eminent citizen, who was at once statesman and general, had become almost extinct. Politics were now managed by a small circle of politicians. Wars were conducted by pro- fessional soldiers whose troops were chiefly mercenaries, and who were nsually regarded by the politicians either as instruments or as enemies. The mass of the citizens took no active interest in public affairs. But, though indifferent to principles, they. had quickly sensitive partialities for men, and it was necessary to keep them in good humour.

bounty from the Treasury to the poorer citizens, for the” purpose of enabling them to attend the theatre at the great festivals,—in other words, for the purpose of bringing them under the concentrated influence of the best Attic culture. A provision eminently wise for the age of Pericles easily became a mischief when the once honourable name of “demagogue” began to mean a flatterer of the mob. Before the end of the Peloponnesian War the festival-money (“‘ theoricon ”) was abolished. A few years after the restora- tion of the democracy it was again introduced. But until 3548.c. it had never been more than a gratuity, of which the payment depended on the Treasury having a surplus. It had never been treated as an annual charge on the revenue, or guaranteed to the citizens as a dividend which they could .

claim by constitutional right. In 354 3.c. Eubulus became steward of the Treasury. He was an able man, with a special talent for finance, free from all taint of personal corruption, and sincerely solicitous for the honour of Athens, but enslaved to popularity, and without prin- ciples of policy. He sought to manage the citizens by humouring to the top of its bent their disinclination for — personal sacrifice, and their preference for public show to public strength. More than any other one man, Eubulus represents that new, easy-going, improvident Athens in which the vigilant civic spirit was dead. His first measure was to make the festival-money a permanent item — in the budget. Thenceforth this bounty was in reality — very much what Demades afterwards called it,—the — cement (xédAa) of the democracy.) Years before the danger from Macedon was urgent, Th” Demosthenes had begun the work of his life,—the effort to 9°” lift the spirit of Athens, to revive the old civic loyalty, to a q rouse the city into taking that place and performing that 4) part which her own welfare as well as the safety of Greece ti prescribed. His formally political speeches must never bei considered apart from his forensic speeches in public causes. The Athenian procedure against the proposer of an unconstitutional law—z.e., of a law incompatible with existing laws—had a direct tendency to make the law-court, in such cases, a political arena. The same tendeney was indirectly exerted by the tolerance of Athenian juries (in the absence of a presiding expert like a judge) for irrelevant matter, since it was usually easy for a speaker to make capital out of the adversary’s political antecedents. But the forensic speeches of Demosthenes for public causes are not only political in this general sense. They are documents, as indispensable as the Olynthiacs or Philippics, for his own political career. Only by taking them along with the formally political speeches, and regarding the whole as one unbroken series, can we see clearly the full scope of the task which he set before him, —a task in which his long

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DH MWOSTHEWNZES

resistance to Philip was only the most dramatic incident, and in which his real achievement is not to be measured by the event of Cheronea.

A forensic speech, composed for a.public cause, opens the political career of Demosthenes with a protest against a signal abuse. In 355 B.c., at the age of twenty-nine, he wrote the speech “ Against Androtion.” This combats on legal grounds a proposal that the tout-going Senate should receive the honour of a golden crown. In its larger aspect, it is a denunciation of the corrupt system which that Senate represented, and especially of the manner in which the Treasury had been administered by Aristophon. In 354 B.c. Demosthenes composed and spoke the oration ‘Against Leptines,” who had effected a slender saving for the state by the expedient of revoking those hereditary exemptions from taxation which had at various times been conferred in recognition of distinguished merit. The descendants of Harmodius and Aristogeiton alone had been excepted from the operation of the law. This was the first time that the voice of Demosthenes himself had been heard on the public concerns of Athens, and the utterance was a worthy prelude to the career of a statesman. He answers the advocates of the retrenchment by pointing out that the public interest will not ultimately be served by a wholesale violation of the public faith. In thesame year he delivered his first strictly political speech. The Athenians, irritated by the support which Artaxerxes had lately given to the revolt of their allies, and excited by rumours of his hostile preparations, were feverishly eager for a war with Persia. Demosthenes urges that such an enterprise would at

present be useless ; that it would fail to unite Greece; that the energies of the city should be reserved for a real emergency ; but that, before the city can successfully cope with any war, there must be a better organization of resources, and, first of all, a reform of the navy. The scheme of naval reform which he propounds has characteristic exactness of detail. We see how closely he has thought out the ques- tion. The same practical and luminous precision is a striking traitin every speech of Demosthenes which recommends a course of action.

Two years later he is found dealing with a more definite question of foreign policy. Sparta, favoured by the depression of Thebes in the Phocian war, was threatening Megalopolis. Both Sparta and Megalopolis sent embassies to Athens. Demosthenes supported Megalopolis. The ruin of Megalopolis would mean, he argued, the return of Spartan domination in the Peloponnesus. Athenians must uot favour the tyranny of any one city. They must respect the rights of all the cities, and thus promote unity based on mutual confidence. In the same year Demosthenes wrote the speech "' Against Timocrates," to be spoken by the same Diodorus who had before prosecuted Androtion, and who now combated an attempt to screen Androtion and others from the penalties of embezzlement. The speech "Against Aristocrates," also of 352 B.c., reproves that foreign policy of feeble make-shifts which was now popular at Athens. The Athenian tenure of the Thracian Chersonese partly depended for its security on the good-will of the Thracian prince Cersobleptes. Charidemus, a soldier of fortune who had already played Athens false, was now the brother-in-law and the favourite of Cerso- bleptes. Aristocrates proposed that the person of Charidemus should be invested with a special sanctity, by the enactment that whoever attempted his life should be an outlaw from all dominions of Athens. Demosthenes points out that such adulation is as futile as it is fulsome. Athens can secure the permanence of her foreign possessions only in one way—by being strong enough to hold them.

Thus, between 355 and 352, Demosthenes had laid down the main lines of his policy. Domestic administration

must be purified. Statesmen must be made to feel that they are responsible to the state. They must not be allowed to anticipate judgment on their deserts by voting each other golden crowns. They must not think to screen misappropriation of public money by getting partisans to pass new laws about state-debtors. Foreign policy must be guided by a larger and more provident conception of Athenian interests. When public excitement demands a foreign war, Athens must not rush into it without asking whether it is necessary, whether it will have Greek support, and whether she herself is ready for it. Whena strong Greek city threatens a weak one, and seeks to purchase Athenian connivance with the bribe of a border-town, Athens must remember that duty and prudence alike command her to respect the independence of all Greeks. When it is proposed, by way of insurance on Athenian possessions abroad, to flatter the favourite of a doubtful ally, Athens must remember that such devices will not avail a power which has no army except on paper, and no ships fit to leave their moorings.

But the time had gone by when Athenians could have tranquil leisure for domestic reform. A danger, calling for prompt action, had at last come very near. Jor six years Athens had been at war with Philip on account of his seizure of Amphipolis. Meanwhile he had destroyed Potideca and founded Philippi. On the Thracian coasts he had become master of Abdera and Maronea. On the Thessalian coast he had acquired Methone. In a second invasion of Thessaly, he had overthrown the Phocians under Onomarchus, and had advanced to Thermopyle, to find the gates of Greece closed against him by an Athenian force. He had then marched to Herzeon on the Propontis, and had dictated a peace to Cersobleptes. He had formed an alliance with Cardia, Perinthus, and Byzantium. Lastly, he had begun to show designs on the great Con- federacy of Olynthus, the more warlike Miletus of the North. The First Philippic of Demosthenes was spoken in 351 B.c. The Third Philippic—the latest of the extant political speeches—was spoken in 341 Bc. Between these he delivered eight political orations, of which seven are directly concerned with Philip. The whole series falls into two great divisions. The first division comprises those speeches which were spoken against Philip while he was still a foreign power threatening Greece from without. Such are the First Philippic and the three orations for Olynthus. The second division comprises the speeches spoken against Philip when, by admission to the Amphic- tyonic Council, he had now won

his way within the circle of the Greek states, and when the issue was no longer between Greece and Macedonia, but between the Greek and Macedonian parties in Greece. Such are the speech “On the Peace,” the speech ‘On the Embassy,” the speech “On the Chersonese,” the Second and Third Philippics.

The First Philippic, spoken early in 351 B.c., was no sudden note of alarm drawing attention to an unnoticed peril. On the contrary, the Assembly was weary of the subject. For six years the war with Philip had been a theme of barren talk. Demosthenes urges that it is time to do something, and to do it witha plan. Athens fighting Philip has fared, he says, like an amateur boxer opposed to a skilled pugilist. The helpless hands have only followed blows which a trained eye should have taught them to parry. An Athenian force must be stationed in the north, at Lemnos or Thasos. Of 2000 infantry and 200 cavalry at least one quarter must be Athenian citizens capable of directing the mercenaries,

Later in the same year Demosthenes did another service to the cause of national freedom. Rhodes, severed by its

own act from the Athenian Confederacy, had since 355

Athens and

Philip.

The Philippic speeches.

First group.

Second group.

351 B.C. First Philippic.

351 B.C. “For the Rhodians.’

850 B.c. Eubcean war.

349 B.C. ** Against Midias.”

349 B.C. First Olynthiac.

349 B.C. Second Olynthiac.

348 B.C. Third Olynthiac.

been virtually subject to Mausolus, prince (Svvdorys) of Caria, himself a tributary of Persia. Mausolus died in 351, and was succeeded by his widow Artemisia. The democratic party in Rhodes now appealed to Athens for help in throwing off the Carian yoke. Demosthenes sup- ported their application. No act of his life was a truer proof of statesmanship. He failed. But at least he had once more warned Athens that the cause of political freedom was everywhere her own, and that, wherever that cause was forsaken, there a new danger was created both for Athens and for Greece.

Next year an Athenian force under Phocion was sent to Eubcea, in support of Plutarchus, tyrant of Eretria, against the faction of Clitarchus. Demosthenes protested against spending strength, needed for greater objects, on the local quarrels of a despot. Phocion won a victory at Tamyne. But the “ inglorious and costly war” entailed an outlay of more than £12,000 on the ransom of captives alone, and ended in the total destruction of Athenian influence throughout Eubcea. That island was now left an open field for the intrigues of Philip. Worst of all, the party of Eubulus not only defeated a proposal, arising from this campaign, for applying the festival-money to the war-fund, but actually carried a law making it high treason to renew the proposal. The amusement of the citizens was thus officially declared to be more important than the protec. tion of their properties or lives, and the expression of a different opinion was henceforth to be a crime. The degree to which political enmity was exasperated by the Eubcean war may be judged from the incident of Midias, an adherent of Eubulus, and a type of that opulent rowdyism which shows how curiously loose the hold of the state had now become on men who were not restrained by regard for their purses or their characters. Demosthenes was choragus of his tribe, and was wearing the robe of that sacred office at the great festival in the theatre of Dionysus, when Midias struck him on the face. The affair was eventually compromised. The speech written by Demosthenes for the

trial was neither spoken nor com- pleted, and remains, as few will regret, a sketch.

It was now three years since, in 352, the Olynthians had sent an embassy to Athens, and had made peace with their only sure ally. In 350 a second Olynthian embassy had sought and obtained Athenian help, The hour of Olynthus had indeed come. In 349 Philip opened war against the Chalcidic towns of the Olynthian League. The First and Second Olynthiacs of Demosthenes were spoken in that year. “ Better now than later,” is the thought of the First Olynthiac. ‘The fight must come. Better that it should be fought in Macedonia than in Attica. Everything favours us now. Send one force to defend Olynthus, and another to attack Philip.” The Second Olynthiac argues that Philip’s strength is overrated. ‘ Heis weak in so far as he is selfish and unjust. He is strong only because he is energetic. Let us be energetic too, and our just cause will prevail.” The Third Olynthiac— spoken in 348— carries us into the midst of action. It deals with practical details. The festival-fund must be used for the war. The citizens must serve in person. A few months later, Olynthus and the thirty-two towns of the Confederacy were swept from the earth. Men could walk over their sites, Demosthenes said seven years afterwards, without knowing that such cities had existed. It was now certain that Philip could not be stopped outside of Greece. The question was, What point within Greece shall he be allowed to reach ¢

Eubulus and his party, with that versatility which is the privilege of political vagueness, now began to call for a con- gress of the allies to consider the common danger. They

jound a brilliant interpreter in Avschines, who, after having | of the charge and the complexity of the evidence are con- been a tragic actor and a clerk to the assembly, had entered | sidered, the acquittal of Auschines by a narrow majority

political life with the advantages of a splendid gift for a happy address, a ready wit, While his opponents had thus

Phil the peace was ratified. But here the Athenians made a teen

open. Philip was now at war with the people of Halus in Thessaly. Thebes had for ten years been at war with Phocis. Here were two distinct chances for Philip's armed intervention in Greece. But if the Haliaus and the Phocians were included in the peace, Philip could not bear arms against them without violating the peace. Accordingly Philip in- sisted that they should not be included. Demosthenes . insisted that they should be included. They were not included. 'The result followed speedily. The same envoys were sent a second time to Philip for the purpose of Endof | receiving his oaths in ratification of the peace. It was April | late in June before he returned from Thrace to Pella—thus =| gaining, under the terms, all the towns that he had taken ppijip meanwhile. He next took the envoys with him through Thessaly to Thermopyle. There—at the invitation of Thessalians and Thebans—he intervened in the Phocian war. Phalecussurrendered. Phocis was crushed. Philip July? took its place in the Amphictyonic Council, and was thus pom! established as a Greek power in the very centre, at the 7 i sacred hearth, of Greece. 'The right of precedence in con-

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sultation of the oracle (zpoyarvre/a) was transferred from Athens to Philip. While indignant Athenians were clamouring for the revocation of the peace, Demosthenes Sept.' upheld it. It ought never to have been made on such "Ont terms, he said. But, having been made, it had better be Pence. | kept. 'If we went to war now, where should we find : allies? And after losing Oropus, Amphipolis, Cardia, Chios, Cos, Rhodes, Byzantium, shall we fight about the shadow of Delphi?"

During the eight years between the peace of Philocrates and the battle of Cheeronea, the authority of Demosthenes steadily grew, until it became first predominant and then paramount. He had, indeed, a melancholy advantage. . Each year his argument was more and more cogently | enforced by the logic of facts. In 344 he visited the Peloponnesus for the purpose of counteracting Macedonian | intrigue. Mistrust, he told the Peloponnesian

cities, is the | safeguard of free communities against tyrants. Philip lodged a formal complaint at Athens. Here, as elsewhere, the future master of Greece reminds us of Napoleon on the eve of the First Empire. He has the same imperturbable and persuasive effrontery in protesting that he is doing one thing at the moment when his energies are concentrated on doing the opposite. Demosthenes replied in the Second 3441 | Philippic. “If,” he said, “Philip is the friend of Greece, Bat

: ; ili we are doing wrong. If heis the enemy of Greece, we are doing right. Which is he? I hold him to be our enemy, because everything that he has hitherto done has benefited =~ himself and hurt us.” The prosecution of Auschines for malversation on the embassy, which was brought to an 3431 issue in the following year, marks the moral strength of “0m. the position now held by Demosthenes. When the gravity nb

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DEMOSTHENES

must be deemed his condemnation. The speech “ On the ‘¢ Affairs of the Chersonese,” and the Third Philippic, were the crowning efforts of Demosthenes. Spoken in the same year, 341 B.c., and within a short space of each other, they niust be taken together. The speech “On the Affairs of the Chersonese” regards the situation chiefly from an Athenian point of view. ‘If the peace means,” argues Demosthenes, “that Philip can seize with impunity one Athenian possession after another, but that Athenians shall not on their peril touch aught that belongs to Philip, where is the line to be drawn? We shall go to war, I am told, when it is necessary. If the necessity has not come yet, when will it come?” The Third Philippic surveys a wider horizon. It ascends from the Athenian to the Hellenic view. Philip has annihilated Olynthus and the Chalcidic towns. Hehasruined Phocis. He has frightened Thebes. He has divided Thessaly. Eubcea and the Pelo- ponnesus

are his. His power stretches from the Adriatic to the Hellespont. Where shall be the end? Athens is the last hope of Greece. And, in this final crisis, Demosthenes was the embodied energy of Athens. It was Demosthenes who went to Byzantiuni, brought the estranged city back to the Athenian alliance, and snatched it from the hands of Philip. It was Demosthenes who, when Philip had already seized Elatea, hurried to Thebes, who by his passionate appeal gained one last chance, the only possible chance, for Greek freedom, who broke down the barrier of an inveterate jealousy, who brouglit Thebans to fight beside Athenians, and who thus won at the eleventh hour a victory for the spirit of loyal union which took away at least one bitterness from the unspeakable calamity of Cheronea.

But the work of Demosthenes was not closed by the ruin of his cause. During the last sixteen years of his life he rendered services to Athens not less important, and perhaps more difficult, than those which he had rendered before. He was now, as a matter of course, foremost in the public affairs of Athens. In January 337, at the annual winter Festival of the Dead in the Outer Cerameicus, he spoke the funeral oration over those who had fallen at Cheeronea. He was member of a commission for strengthening the fortifications of the city (rexyorous). He administered the festival-fund. During a dearth which visited Athens between 330 and 326 he was charged with the organization of public relief. In 324 he was chief (dpyeOéwpos) of the sacred embassy to Olympia. Already, in 336, Ctesiphon had proposed that Demosthenes should receive a golden crown from the state, and that his extraordinary merits shonld be proclaimed in the theatre at the Great Dionysia. The proposal was adopted by the Senate as a bill (rpoBovAcyna) ; but it must be passed by the Assembly before it could become an act (Yjdurpa). To prevent this, Auschines gave notice, in 336, that he intended to proceed against Ctesiphon for having proposed an uncon- stitutional measure. For six years Adschines avoided action on this notice. At last, in 330, the patriotic party felt strong enough to force him to an issue. schines spoke the speech “ Against Ctesiphon,” an attack on the whole public life of Demosthenes. Demosthenes gained an over- whelming victory for himself and for the honour of Athens in the most finished, the most splendid, and the most pathetic work of ancient eloquence—the immortal oration ‘On the Crown.” .

In the winter of 325-4 Harpalus, the receiver-general of Alexander in Asia, fled to Greece, taking with him 8000 mercenaries, and treasure equivalent to about a million and a quarter sterling. On the motion of Demosthenes he was warned from the harbours of Attica. Having left. his troops and part of his treasure at Teenarum, he again presented himself at the Peireus, and was now

admitted. He spoke fervently of the opportunity which offered itself to those who loved the freedom of Greece. All Asia would rise with Athens to throw off the hated yoke. Fiery patriots like Hyperides were in raptures. For zeal which could be bought Harpalus had other persuasions. But Demosthenes stood firm. War with Alexander would, he saw, be madness. It could have but one result,—some indefinitely worse doom for Athens. Antipater and Olympias presently demanded the surrender of Harpalus, Demosthenes opposed this. But he reconciled the dignity with the loyalty of Athens by carrying a decree that Harpalus should be arrested, and that his treasure should be deposited in the Parthenon, to be held in trust for Alexander. Harpalus escaped from prison. The amount of the treasure, which Harpalus had stated as 700 talents, proved to be no more than 350. Demosthenes proposed that the Areopagus should inquire what had become of the other 350. Six months, spent in party intrigues, passed before the Areopagus gave in their report (arégaois). The report inculpated nine persons. Demosthenes headed the list of the accused. Hyperides was among the ten public prosecutors. Demosthenes was condemned, fined fifty talents, and, in default of payment, imprisoned. After a few days he escaped from prison to Aigina, and thence to Troeezen. Two things in this obscure affair are beyond reasonable doubt. First, that Demosthenes was not bribed by Harpalus. The hatred of the Macedonian party towards Demosthenes, and the fury of those vehement patriots wlio cried out that he had betrayed their best opportunity, coni- bined to procure his condemnation, with the help, probably, of some appearances which were against him. Secondly, it can hardly be questioned that, by withstanding the hot- headed patriots at this juncture, Demosthenes did heroic service to Athens.

Next year Alexander died. Then the voice of Demo- Death of sthenes, calling Greece to arms, rang out like a trumpet, Alexander Early in August 322, the battle of Crannon decided the 323 B.c. Antipater demanded, as 399 po. the condition on which he would refrain from besieg- End of surrender of the leading patriots, Lamian Demades moved the decree of the Assembly by which ¥4- Demosthenes, Hyperides, and some others were condemned pemo.

Lamian war against Greece.

ing Athens, the

to death as traitors. On the 20th of Boedromion sthenes is (September 16) 322, a Macedonian garrison occupied condemned. Munychia. It was a day of solemn and happy memories,

a day devoted, in the celebration of the Great Mysteries, to sacred joy,—the day on which the glad procession of the Initiated returned from Eleusis to Athens. It happened, however, to have another association, more significant than any ironical contrast for the present purpose of Antipater. It was the day on which, thirteen years before, Alexander had punished the rebellion of Thebes with annihilation. The condemned men had fled to Aigina, from Hyperides.and the rest, Demosthenes went on to Calauria, a small island off the coast of Argolis. In Calauria there was an ancient temple of Poseidon, once a centre of Minyan and Ionian worship, and surrounded with a peculiar sanctity as having been, from time immemorial, an inviolable refuge for the pursued. Here Demosthenes sought asylum. Archias of Thurii, a man who, like Aischines, had begun life as a tragic actor, and who was now in the pay of Antipater, soon traced the fugitive, landed in Calauria, and appeared before the temple of Poseidon with a body of Thracian spearmen. Plutarch’s Picturesque narrative bears the marks of artistic elabora- tlon. Demosthenes had dreamed the night before that he

‘and Archias were competing for a prize as tragic actors ;

the house applauded Demosthenes ; but his chorus was shabbily equipped, and Archias gained the prize. Archias was not the man to stick at sacrilege, In fgina,

Parting there y;;, flight.

His death (Oct. 322 B.C.)

His political eharacter,

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Hyperides and the others had been taken from the shrine of /acus. But he hesitated to violate an asylum so peculiarly sacred as the Calaurian temple. Standing before its open door, with his Thracian soldiers around him, he endeavoured to prevail on Demosthenes to quit the holy precinct. Antipater would be certain to pardon him. Demosthenes sat silent, with his eyes fixed on the ground, At last, as the emissary persisted in bis bland persuasions, he looked up and said,—‘ Archias, you never moved me by your acting, and you will not move me now by your promises.” Archias lost his temper, and began to threaten. ‘‘Now,” rejoined Demosthenes, “ you speak like a real Macedonian oracle; before you were acting. Wait a moment, then, till I write to my friends.” With these words, Demosthenes withdrew into the inner part of the tenple,—still visible, however, from the entrance. He took out a roll of paper, as if he was going to write, put the pen to his mouth, and bit it, as was his habit in com- posing. ‘Then he threw his head back, and drew his cloak over it, The Thracian spearmen, who were watching him from the door, began to gibe at his cowardice. Archias went,in to him, encouraged him to rise, repeated his old arguments, talked to him of recouciliation with Antipater. By this time Demosthenes felt that the poison which he liad sucked from the pen was beginning to work. He drew the cloak from his face, and looked steadily at Archias. “‘“ Now you can play the part of Creon in the tragedy as soon as you like,” he said, “ and cast forth my body un- buried. But I, O gracious Poseidon, quit thy temple while I yet live ; Antipater and his Macedonians have done what they could to pollute it.” He moved towards the door, calling to them to support his tottering steps. He had just passed the altar of the god, when he fell, and with a groan gave up the ghost.

As a statesman, Demosthenes needs no epitaph but his own words in the speech “Ou the Crown.” J say that, of the event had been manifest to the whole world beforehand, not even then ought Athens to have forsaken this

course, if Athens had any regard for her glory, or for her past, or for the ages to come. ‘The Persian soldier in Herodotus, following Xerxes to foreseen ruin, confides to his fellow-guest at the banquet that the bitterest pain which man can know is zoAAd dpovéovra pndevds kparéew,— complete, but helpless, pre- science. In the grasp of a more inexorable necessity, the champion of Greek freedom was borne onward to a more treniendous catastrophe than that which strewed the waters of Salamis with Persian wrecks and the field of Platea with Persian dead; but to him, at least, it was given to proclaim aloud the clear and sure foreboding that filled his soul, to do all that true heart and free hand could do for his cause, and, though not to save, yet to encourage, to console, and to ennoble. As the inspiration of his life was larger.and higher than the mere courage of resistaice, so his merit must be regarded as standing alto- gether outside and above the struggle with Macedon. ‘The great purpose which he set before him was to revive the public spirit, to restore the political vigour, and to re-establish the Panhellenic influence of Athens,— never for her own advantage merely, but always in the interest of Greece. His glory is, that while he lived he helped Athens to live a higher life. Wherever the noblest expres- sions of her mind are honoured, wherever the large concep- tions of Pericles command the admiration of statesmen, wherever the architect and the sculptor love to dwell on the masterpieces of Ictinus and Phidias, wherever the spell of ideal beauty or of lofty contemplation is exercised by the creations of Sophocles or of Plato, there it will be remembered that the spirit which wrought in all these would have passed sooner from among men, if it had not been recalled from a trance, which others were content

to mistake for the last sleep, by the passiouate breath of Demosthenes.

The orator in whom artistic genius was united, more His other man, with moral enthusiasm orator

perfectly than in any and with intellectual grasp, has held in the modern world the same rank which was accorded to bim in the old ; but he cannot enjoy the same appreciation. Macaulay’s ridicule has rescued from oblivion the criticism which pronounced the eloquence of Chatham to be more ornate than that of Demosthenes, and less diffuse than that of Cicero. Did

the critic, asks Macaulay, ever hear any speaking that was less ornamented than that of Demosthenes, or more diffuse than tbat of Cicero? Yet the critic's remark was not so point- less as Macaulay thought it. Sincerity and intensity are, indeed, to the mudern reader, the most obvious characteris- tics of Demosthenes. His style is, on the whole, singularly free from what we are accustomed to regard as rhetorical embellishment. Where the modern orator would employ

a wealth of imagery, or elaborate a picture in exquisite

detail, Demosthenes is content with a phrase or a word. Burke uses, in reference to Hyder Ali, the same image which Demosthenes uses in reference to Philip. '" Com- pounding all the materials of fury, havoc, desolation, into one black cloud, he hung for a while ou the declivity of the mountains. Whilst the authors of all these evils were idly and stupidly gazing on this menacing meteor, which darkened all their horizon, it suddenly burst, and poured down the whole of its contents upon the plains of the Carnatic." Demosthenes forbears to amplify. 'The people gave their voice, and the danger which hung upon our borders went by like a cloud." To our modern feeling, the eloquence of Demosthenes exhibits everywhere @ general stamp of earnest and simple strength. But it is well to remember the charge made against the style of Demosthenes by a contemporary Greek orator, and the defence offered by the best Greek critic of oratory. Aischines reproached the diction of Demosthenes with excess of elaboration aud adornment (zreprepyia). Diouysius, in reply, admits that Demosthenes does at times depart from simplicity,—that his style is sometimes elaborately ornate and remote from the ordinary usage. But, he adds, Demosthenes adopts this manner where it is justified by the elevation of his theme. The remark may serve to remind us of our modern disadvantage for a full appreciation of Demosthenes. 'The old world felt, as we do, his moral and mental greatness, his fire, his self-devotion, his insight. But it felt also, as we can never feel, the versatile perfection of his skill. 'This it was that made Demosthenes unique to the ancients. The ardent patriot, the far-seeing states- man, were united in his person with the consummate and unapproachable artist. Dionysius devoted two special treatises to Demosthenes,—one on his language and style (Aexruxds T67r0s), the other on his treatment of subject-matter (xpayparids Té7os). The latter is lost. The

former is one of the best essays in literary criticism which antiquity has bequeathed to us. The idea which it works out is that De- mosthenes has perfected Greek prose by fusing in a glorious harmony theelements which had hitherto belonged to separate types. Theaustere dignity of Antiphon, the plain elegance of Lysias, the smooth and balanced finish of that middle or normal character which is represented by Isocrates, have come together in Demosthenes. Nor is this all. In each species he excels the specialists. He surpasses the school of Antiphou iu perspicuity, the school of Lysias in nerve, the school of Isocrates in variety, in felicity, in symmetry, in pathos, in power. Demosthenes has at command all the discursive brilliancy which fascinates a festal audience. He has-that power of concise and lucid narration, of terse reasoning, of persuasive appeal, which is required by the forensic speaker. His political eloquence can worthily

\ rks,

image the majestyof the state, and enforce weighty counsels with lofty and impassioned fervour. A true artist, he grudged uo labour which could make the least part of his work more perfect. Isocrates spent ten years on the Panegyricus. After Plato’s death, a manuscript was found among his papers with the first eight words of the Republic arranged in several different orders. What wonder, then, asks the Greek critic, if the diligence of Demosthenes was no less incessant and minute? “To me,” he says, “it seems far more uatural that a man engaged in composing political discourses, imperishable memorials of his power, should neglect not even the smallest details, than that the generation of painters and sculptors, who are darkly showing forth their manual tact and toil in a corruptible material, should exhaust the refinements of their art on the veins, on the feathers, on the down of the lip, and the like niceties.” It may be surmised that much of the admiration professed for Demosthenes in modern times has been ‘conventional. The clumsiest and coarsest forgeries which bear his name long received among general readers their share of the eulogy. A soundly critical study of his text is not yet sixty years old. To this day popular books occasionally show traces of the notion that everything which the manuscripts ascribe to him was written by him. But modern study has long

since learned to recognize the surest traits of his style ; not, indeed, with the exquisite percep- tion of his old Greek critics, yet sufficiently, as a rule, for the discrimination of genuine work from false, and on a firmer diplomatic basis. The modern world can never catch again the finer tones of that great music as they still echoed on the ear of Greece in her calm after-time— when all the winds were laid, And every height came out, and jutting peak

And valley, and the immeasurable heavens Brake open to their highest ;

but men can still hear the voice of a prophet whose resonant warnings rise above confused sounds of strife ; they can still feel the energy, the anguish, the indignation which vibrate through his accents; and they can acknow- ledge, with an admiratiov undiminished by the lapse of twenty centuries, the power of his words to quicken the sense of honour in craven hearts, to raise the votaries of selfish luxury to the loyalty of prolonged self-sacrifice, to nerve irresolute arms for an inevitable struggle, and, when all has been lost, to sustain the vanquished with the thought that, though a power above man has forbidden them to prevail, yet their suffering has saved' the lustre of a memory which they were bound to guard, and has left them pure before the gods.

More than half of the sixty-one speeches extant under the name of Demosthenes are certainly or probably spurious. Much difference of opinion still exists in particular cases, especially as regards two or three of the private speeches. The results to which the preponderance of opinion now leans are given in the following table. Those marked a were already rejected or doubted in antiquity ; those marked m, first in modern times :—

J. DELIBERATIVE SPEECHES.

GENUINE. Om. 14 On the Navy Boards ….....0..eeisece cae 354 B.C Or. 16. For the People of Megalopolis…..... . 352 "igs Gems fo enbrstr PDDID PEG 20s je seis op so vningrss ow assein ses SOL oy Pree Ron Ge WDOUIADE, «.,.0.05 sce scsictesenss dass one 851 "3 Ore st Hirst Oly thiae ioe o.de5 sos coecsecaaeee weaaes 349", Om 2. Sotomd: Oly nt hiaes vg .ctsnns.e-ienusieedaadaeee 349 sy Digs Lint UY TDI AC cas cecrinersinaiowasassicer sisens 348 – CORR: OM te REACE..ccges.:.cenencinessPHIL PMG .....0…..65 cos cetcae oneee 344 i

Or. 8. On the Affairs of the Chersoncse…..... 341 i RY Ox TWhhind Pipes. icici cecsiacadnadeneces B41. 5

73

SPURLOUS. (a) Or. 7. On Halonnesus (by Hegesippus).....+4 842 8.0. Rhetorical Forgeries. (a) Or. 17. On the Treaty with Alexander. (a) Or. 10. Fourth Philippic. (m) Or. 11. Answer to Philip’s Letter. (m) Or. 12. Philip’s Letter. (m) Or. 18. On the Assessment (cdvragis). II. FORENSIC SPEECHES. A. In Pusuic CAUsEs. GENUINE. Or. 2%. In (ard) Androtionem ….. .....ceeeeee eee 355 B.C Or. 20. Contra (xpds) Leptinem…....~~6~~-s0.e- 3645, Or: GA Vaal Vimo eratewtt tise nciteiescvaiend cana Se 352 5 OW, 23. Th APIShOCrAHEM 66, .csjescapamncnes oononasdane 352 ai OT, Qi oy TT PAB ARI 6 oo ocisten(0 sine ome soins aig elslairiem =igise 349 “ Or. 19. On the Himbassy…....0sscsscseeserene ees 343 Hs Or 1S! On tte Crowil jcc. .cceeccmececcaoe, aenednans 330 % SpuR10US. (a) Or. 58. In Theocrinem. .....00.0. ssecsseeee se eesens 339 = (a) Or. 25, 26. In Aristogitona I. and II. (Rhetorical forgeries). B. In Private CAUSES. GENUINE. Or. 27, 28. In Aphobum I. et IL. .....~~.cse eee 364 B.C. (m) Or. 80, 31. Contra Onetora I. et Il…....06 362 3 Or; 41, Contra Spudians 4.0… ..ccctecssannaneon towns 2 (m) Or. 55. Contra Calliclem …....~~...csscnseneeeererees g Ory been Fin Camome rn) 6 criieae ied cnish demesne citi ge-p se 356 B.C.t (ny SG. Prose HOYEAMIING erect nea. “ae sree. Sequin S52 = (m) Or. 89. Contra Beeotum de Nomiue….....4. 850 x. Or; 37. Contra PartemetGint ii05..05.0.05cascaueene ove 846—5 ,, (m) Or. 88. Contra Nausimachum et Diopithem….. t Spur10vs.

(The first eight of the following are given by Schéfer to A pollodorus.)

(m) Or. 52. Contra Callippum…....:4).scsceesceses 369-8 B.C. (a) Or, 58. Contra Nicostratum, ...<00.00 after 368 ‘ia (2) Op. 49. Contra Timotbeum .. 0.4.06 000 .anseyreseaasee 362 “ (my Om, BO; Condon Polyedetiy s+ -vsy-roenaesencsdeesses _ ee (a) Or. 47. In Evergum et Mnesibulum…..... 350i} (m) Or. 45, 46. In Stephanum I. et II…..... 851 16 fea Oe, GR! Site OMI. 5. 15… doicnnininivine diixama- estas a0 00 849i, (m) Or. 51. On the Trierarchic Crown (by Cephis-

oS seamed Sn ed, 360-359» (my Or. 43. Contra Macartatum. .....0c0scsecseens i (m) Ors 48. In Olymipiod Grunts… .cecsases nee after 848, (m) Or. 44, Contra Leocharem, ...cc..s0scessensgeces 2 (a), Ox. 35, Comiire LACriin. 5. oyaens savesiinnadnaicunins 841 43 (@) Om 22, Contra Phanip puis s., the cinco sto saioc 200 nei 2 (m) Or. 32. Contra Zenothemifi «.....0..0000.00 ? (2) Om. 84 Contra, Phormionent 1.0.6 wadeah sasiseilece ? (m) Or. 29. Contra Aphobum pro Phano. (a) Or. 40. Contra Beeotum de Dote…....cccceseee 34% (qn) Ox), 57> (Contra Buabnlidem… ..5.05269-qearecgeeceey 346-5 ,, (m) Or. 33. Contra Apataviumr ….....0bcceseees ene ? (a) Or. 56. In Dionysodorum …..... not before 322-1 ,,

Or. 60 (émirdgios) and Or. 61 (épwrinds) are works of rhe- toricians. the composer of the twelve epistles which bear the name of Aischines. The 56 zmpoofuia, exordia or sketches for political speeches, are by various hands and of various dates. They are valuable as being compiled from Demosthenes himself, or from other classical models.

The ancient fame of Demosthenes as an orator can be compared only with the fame of Homer as a poet. Cicero, with generous appreciation, recognizes Demosthenes as the standard of perfection. Dionysius, the closest and most penetrating of his ancient critics, exhausts the language of admiration in showing how Demosthenes united and elevated whatever had been best in earlier masters of the Greek idiom. Hermogenes, in his works on rhetoric, refers to Demosthenes, as 6 fyrwp, the orator. The writer of the treatise On Sublimity knows no heights loftier than those to which Demosthenes has risen.

who founded their theory of rhetoric in large part on his VII. — 10

The six epistles are also forgeries ; they were used by-

From his. own younger contemporaries, Aristotle and Theophrastus,

Literary history of emo-

sthenes,

Manu- scripts.

practice, down to the latest Byzantines, the consent of | tions.

theorists, orators, antiquarians, anthologists, lexicographers, offered the same unvarying homage to Demosthenes. His work busied commentators such as Xenon, Minucian, Basilicus, Ailius Theon, Zosimus of Gaza. ; Arguments to his speeches were drawn up by rhetoricians 80 distin- guished as Numenius and Libanius. Accomplished men of letters, such as Julius Vestinus and Aélins Dionysius, selected from his writings choice passages for declamation or perusal, of which fragments are incorporated in the mis- cellany of Photius and the lexicons of Harpocration, Pollux, and Suidas. It might have been anticipated that the purity of a text so widely read and so renowned would, from the earliest times, have been guarded with jealous care. The works of the three great dramatists had been thus protected, about 340 z.c., by a standard Attic recension. But no such good fortune befell the works of Demosthenes. Alexandrian criticism was chiefly occupied with poetry. The titular works of Demosthenes were, indeed, registered, with those of the other orators, in the catalogues (pyropuxot wivaxes) of Alexandria and Pergamus. But no thorough attempt was made to separate the authentic works from those spurious works which had even then become mingled with them. Philosophical schools which, like the Stoic, felt the ethical interest of Demosthenes, cared little for his language. ‘The rhetoricians who imitated or analyzed his style cared little for the criticism of his text. Their treat- ment of it had, indeed, a direct tendency to falsify it. It was customary to indicate by marks those passages which were especially useful for study or imitation. It then became a rhetorical exercise to recast, adapt, or interweave such passages. Sopater, the commentator on Hermogenes, wrote on peraBoral al perarrounoes Tv Anno bévous xupiuv, ‘adaptations or transcripts of passages in Demosthenes.” Such manipulation could not but lead to interpolations or confusions in the original text. Great, too, as was the attention bestowed on the thought, sentiment, and style of Demosthenes, comparatively little care was bestowed on his subject-matter. He was studied more on the moral and the formal side than on the real side. An incorrect sub- stitution of one name for another, a reading which gave

an impossible date, insertions of spurious laws or decrees, were points which few readers would stop to notice. Hence it resulted that, while Plato, Thucydides, and Demosthenes were the most universally popular of the classical prose- writers, the text of Demosthenes, the most widely used perhaps of all, was also the least pure. His more careful students at length made an effort to arrest the process of corruption. ditions of Demosthenes based on a critical recension, and called “Arrucavdé (dvt’ypada), came to be distinguished from the vulgates, or Syddeus exddcrets. Among the extantmanuscripts of Demosthenes—upwards of 170 in number—one is far superior, as a whole, to the rest. This is Parisinus % 2934, of the 10th century. A com- parison of this MS. with the extracts of Alius, Aristides, and Harpocration from the Third Philippic favours the view that it is derived from an ’Arrixcaydv, whereas the Sypdders &xdd- oes, used by Hermogenes and by the rhetoricians generally have been the chief sources of our other manuscripts. The collation of this manuscript by Immanuel Bekker first placed the textual criticism of Demosthenes on a sound footing. Not only is this manuscript nearly free from interpola- tions, but it is the sole voucher for many excellent readings. se be Rieu ee ee of the most important are— Ginn cu. an ; e . century, the basis of the last, and colainin a dliclat Ay sae 5 apa eee * ae 0 the speeches on the Crown t ‘ Y, by Ulpian, with some by a younger hi er, who was perhaps Moschopulus; Parisinus Y: ntverprensis OQ —the last two comparatively free from addi

The fullest authority on the MSS. is Th. Voemel,’ Notitta codicum Demosth., and Prolegomena Critica to his edition published at Halle (1856-7), pp. 175-178.

The extant scholia on Demosthenes are for the most Scholig

part poor. Their staple consists of Byzantine erudition ; and their value depends chiefly on what they have preserved oi older criticism. They are better than usual for the epi Srefdvov, Kara Tyoxparovs; best for the Hepi Ilapampeo- Betas. The Greek commentaries ascribed to Ulpian are especially defective on the historical side, and give little essential aid. Editions :-—Scholia et Ulpiani commentarw in Demosth., ed. C. Miiller, in

Oratt. Att., Par., 1846-7 ; Scholia Greca in Demosth. ex codd. aucta et emendata, Oxon, 1851.

Editions and Commentaries.—In the vast literature of De- mosthenes, only a few books can be named here as specially notable or useful for the English student. ditio princeps, Aldus, Venice, 1504; Aldina posterior (more correct), 1527; Jerome Wolf, Basel, 1549, chief ed., 1572; J. Taylor, Cambridge, 1748; J. Reiske (with notes of J. Wolf, J. Taylor, J. Markland, &c.), Leipsic, 1770-5 ; revised ed. of Reiske by G. H. Schiafer, Lond., 1823-6 ; I. Bekker, in Orat. Att. (the first edition which was based on Codex %, see above), Leipsic, 1823-1828 ; G. H. Dobson, in Oratores Attict, Lond. 1828; Baiter and Sauppe, in Oratt. Alttict, 1850 ; Dindorf (in Teubner), 1867 ; Whiston, with English notes, 1859-

1868.

Particular Speeches.—De Falsa Legatione, R. Shilleto (3d ed.), 1864; G. H. Heslop, 1872. De Corona, A. Holmes, 1871; G. A. and W. H. Simcox (with Aschines Jn Ctesiph.), 1878. In Midiam, A. Holmes (after Buttmann), 1868 ; Olynthiacs and Philippies, G. H. Heslop, 1868, Select Private Orations [Part I. Contra Phormi- onem, Lacritum, Pantenetum, Boeotum de Nomine, id. de Dote, Dionysodorum : as to the last two, see list of spceches above. Part Il. Pro Phormione, Contra Stephanum I. II., Nicostratum, Cononem, Calliclem], F. A. Paley and J. E. Sandys, Cambridge, ee —Indices to Demosthenes, Reiske, ed. Schafer, Lond.

18238.

Illustrative Literature.—Arnold Schafer, Demosthenes und seine Zeit, 3 vols. Leipsic, 1856-8, a masterly and exhaustive historical work; K G. Bohnecke, Demosthenes, Lykurgus, Hyperides, und thr Zeitalter, Bert. 1864: Bouillé, Histoire de Demosthéne, ed. Par. 1868; T. Forsyth, Hortensius, 1874; Brodribb, Demosthenes (in Classics for English Readers), 1877; Nicolai, Gricchische Litera- turgeschichte (esp. for bibliography of Demosthenes). C. R. Ken- nedy’s Z’ranslations (8 vols., Bohn) are models of scholarly finish, and the appendices on Attic law, &c., are of great value. Z’ransla- tions of the Speech on the Crown, by W. Brandt, (1870), and Sir R, Collier, (1876). (Gis (Gs do);

DEMOTICA, a town of European Turkey, in the province of Adrianople and sanjak of Gallipoli, situated 25 miles south of the provincial capital, at the foot of a conical hill which rises on the right bank of the Maritza near its junction with the Kizildeki. It is the seat of a Greek archbishop ; and, besides the ancient citadel and palace on the top of the hill, it possesses several Greek churches, a mosque, and public baths. Charles XII. of Sweden resided at Demotica for more than a year after the battle of Pultowa. The town was in great part burned down in

1845.

DEMPSTER, Tuomas (1579-1625), a Scottish scholar, was born at Cliftbog, Aberdeenshire, and was the twenty- fourth of twenty-nine children of the same mother. From his earliest years he gave promise of the learned attainments which gained him contemporary celebrity and posthumous fame. At a very early age, qualified by the tuition of Thomas Cargill, his classical master in Aberdeen—of whom he speaks in his Historia Ecclestastica as vir literatissimus— he entered Pembroke Hall, Cambridge. After having studied there for some time, he went to Paris, but did not continue his studies, on account of a contagious disease which closed the schools and prostrated himself. On his recovery he hastened to Louvain, where he was selected, along with other young Scotchmen, to go to Rome for the furtherance of his education. Through the kindness of Cardinal Cajetan, he became a student in the Roman semi- nary; but he had hardly begun the art of Latin versifica-

tion when serious illness required that he should leave Rome for change of climate. By way of Switzerland, he travelled to the Netherlands, and made a short stay at Tournay, to which he returned to teach humanity after a period of study at the university of Douai, where he distinguished himself in poetical and philosophical competitions, and took the degree of M.A. As his prospects in Tournay were discouraging, lie went back to Paris, graduated as doctor of canon law, and became a regent in the college of Navarre, while yet, as he himself states, in his seventeenth year. Destined to be a wanderer through life, he soon quitted Paris to settle in Toulouse, where his stay was shortened by certain influential individuals, whose resentment he

had excited by his advocacy of university rights. At Nimes, his next resting-place, he was, by twenty-three of the twenty-four judges, chosen to the professorship of eloquence in the Protestant nniversity or academy, which circumstance colours in some degree the conjecture of Bayle, that his zeal for the Romish faith had somewhat cooled. Having retained his chair for little more than the two years of litigation into which he liad been dragged by one of the unsuccessful candidates who had libellously assailed him, and against whom tlie Parliament of Toulouse decided, Dempster made a journey into Spain, whence, after a brief engagement as preceptor to a son of the famous Saint-Luc, he departed for his native land. As he did not experience a favourable recep- tion either from his relatives or from the clergy, he remained but a short time, and again betook himself to Paris. There lie spent seven years with advantage to his reputation and purse, as regent in different colleges. His connection with that of Beauvais, over which he presided for a time, was brought to a close by a high-handed procedure illustrative of his fierce courage, and suggestive of his fitness for other than literary contests. Iu the year 1615 he accepted the invitation of King James to come to London, and was hononred and rewarded by that sovereign. But dis- appointed of preferment, which clerical and episcopal pre- judices influenced the king to withhold, he again left England for Italy. On his arrival in Rome he was at first suspected of being a spy, but when his claims were ascertained, he was so fortunate as to receive letters of recommendation from the Pope and other influential personages to the duke of Tuscany, which issued in his appointment to the professorship of the Pandects in the university of Pisa. Writings of this date attest his com- petency for the chair. After his inaugural lecture his reputation and emoluments increased. In the following year, on a visit to England, his disputatious spirit brought lim into collision with an English ecclesiastic, whose representation of the quarrel led the grand duke to re- quire that Dempster should either apologize or leave the country. Rather than make the prescribed apology he quitted Florence with the intention of settling in Scotland ; but he was prevailed upon by Cardinal Capponi to stay at Lologna, and in a few days, by the influence of the cardinal, was appointed to the chair of humanity, which he filled with the utmost efficiency and increase of fame. Honours, civil and literary, were bestowed upon him, and it seemed as if his wanderings and reverses had together come to an end. But the crowning calamity of his life then befell him. His light-headed wife

(he married her in London in 1615), whose beauty had always been a snare to her, eloped with one of his students; and the mental distress aud bodily fatigue consequent on his pursuit of the fugitives, during the dog days, predisposed him to -fever, which attacked him and proved fatal. He died at Bologna in 1625, in his forty-sixth year. Morally his chief defect was the fierceness of his temperament, which involved him in many broils, and made his sword and pen alike formidable. His natural impetuosity, which so easily broke forth in ebul-

litions of violence, explains in large measure the looseness and recklessness of statement often found in his writings. His intellectual qualifications entitle him to be considered “one of the most learned men whom Scotland has pro- duced.” A vast memory, which was the réceptacle of many books ; an extraordinary familiarity with Greek and Latin, that enabled him to improvise verses in these tongues with the utmost rapidity ; and a versatility which made versification, philological discussions, classical criticism, juridical expositions, biographical narratives, and historical annals congenial to him,—these endowments give him a high place among the learned. The defects of his writings were mainly due to the passionateness which often clouded his judgment, to a patriotic vanity that led to -absurd exaggerations on Scotch subjects, and to the disturbing influence of a restless life. For list of his very numerous writings see Irving’s Lives of the Scottish Writers. DEMURRAGE, in the law of merchant shipping, is the sum payable by the freighter to the shipowner for detention of the vessel in port beyond the number of days allowed for the purpose of loading or unloading. The contract between the parties generally specifies the amount per day to be paid as demurrage, and the number of days for which the ship may be detained at that rate. If it should be

‘detained longer than the specified time of demurrage, the

freighter will be entitled to damages, the measure of which will (in general, but not necessarily) be the sum agreed upon between the parties for demurrage. If no time is specified for unloading a ship, the “‘ usual customary time ” will be implied. But when there is positive contract that the goods are to be taken out by a fixed day, any delay beyond that time, not

caused by the act of the shipowner himself, will make the freighter liable for demurrage, whether the delay is caused by him or not. So an agreement to load, not mentioning time, according to the customary manner, is an agreement to load within a reason- able time according to the usage of the port ; and any delay beyond that time, though caused by circumstances beyond the control of the freighters, will make them liable. In calculating the number of lay-days (i.e., the days allowed for loading, &c., and not chargeable with demurrage), Sundays will be taken into account, unless it is otherwise specified or there is a custom to the contrary. The con- tract to pay demurrage in a charter-party is between the freighters and the shipowner ; but if demurrage is mentioned in the bill of lading, the consignee will be held to take the goods under an implied obligation to pay the demurrage, and the master may sue for it in his own name. See CHARTER-PARTY.

DEMURRER, in English law, is an objection taken to the sufficiency, in point of law, of the pleading or written statenient of the otherside. In equity pleading a demurrer lay only against the bill, and not against the auswer ; at common law any part of the pleading could be demurred to. And now in all cases any party may demur to any pleading of the opposite party, or to any part of a pleading setting up a distinct cause of action, ground of defence, set

‘off, counter-claim, reply, or as the case may be, on the

ground that the facts alleged therein do not show any cause of action or ground of defence, &c. (Judicature Act, 1875— Rules of Court, Order 28).

DENAIN, a town of France, in the department of Nord, and arrondissement of Valenciennes, 14 miles to the east of Douai, on the Scheldt Canal and the railway between Anzin and Somain. A mere village in the beginning of the preseut century, it has rapidly increased since 1850, aud now, according to the census of 1872, possesses about 10,500 inhabitants, who are mainly engaged in coal mines, iron-smelting works, sngar factories, and distilleries. The village was the scene of the decisive victory gained, in

1712, by Marshal Villars over the allies commanded by Prince Eugene; and the buttle-field is marked by a mono- lithic monument inscribed with the verses of Voltaire—

Regardez dans Denain l'audacieux Villars Disputant le tonnerre 4 l'aigle des Cesars.

DENBIGH, a maritime county of North Wales, is about 40 miles in its extreme length from N.W to S.E., by 36 at its greatest and 8 at its least width, where it is divided into two unequal portions. It embraces a super- ficial area of 392,005 statute acres, or 6124 square miles. The population in 1871 amounted to 105,102 persons, 52,866 males and 52,236 females; in 1861] it numbered 100,778, and in 1851, 92,583. The county was formed 27 Heh. VIIL, out of the lordships of Denbigh, Ruthin, Rhos, and Rhyfoniog, corresponding roughly with the dis- trict called Perfeddwlad (or the midland between the Conway and the Clwyd), and the lordships of Bromfield, Yale, and Chirkland, which at an earlier period had been comprised in the possessions of Gruffydd ap Madoc, the lord of Dinas Bran. It is bounded on the W. in its northern division by the River Conway, from one of its ancient mouths in Llandrillo Bay to its source in the Migneint mountains, inthe southern by the Berwyn chain, and on its xtreme E. by the line of the Dee, the Ceiriog, and a portion of Offa's Dyke. The intervening surface is very irregular, and its physical character highly diversified. The N.W. portion is occupied by the bleak, bare table-land of the Hiraethog hills, which slope on the west to the valley of the Conway and on the east to the Vale of Clwyd, by which they are divided from the Clwydian range and the hills of Yale. On the N. it stretches along the bays of Colwyn and Abergele, and on the S. it is separated from Mcrionethshire by the Yspytty and Llangwm range. From this watershed flow tributaries of the Clwyd, the Conway, and the Dee—viz., the Elwy, the Aled. the Clywedog, the Merddwr, and the Alwen. The valleys along which some of these streams flow are, from their fertility and natural beauty, in striking contrast to their bleak surroundings. Among these may be specified the beautiful gorge of the Elwy and the broad fertile plain of the Vale of Clwyd. Of the other division, which extends from near Farndon Bridge in the N.E. to the Rhaiadr in Mochnant 8.W., that portion which lies between the Rhuabon hills and the Dee is extremely rich in minerals as well as in agricultural

“produce ; the other portion, from the Berwyn to Offa’s Dyke, is comparatively wild and barren, save the pretty “valley of the Tanat, the cup-like plain of Llansilin, and the lower reaches of the Ceiriog. One of the feeders of the ‘Tanat rolls down a waterfall named Pistyll Rhaidr, which is 240 feet high; and another rises in the little lake of “ Llyncaws,” which nestles beneath Moel Sych, 2716 feet, the highest point in the Berwyn range, and indeed inthe county. There are also a few lakes in the Hiraethog district, the largest of which—Aled and Alwen—give rise to rivers of the same names.

Soil and Agricultwre—On the uplands the soil is too cold and poor, and the seasons too uncongenial, to admit of good corn crops ; but a more profitable investment is made in the rearing of mountain ponies and of sheep and black cattle, which are sold in great numbers to be fattened in the Midland Counties of England, for the London market. Less than a third of the surface is under cultivation ; and the agricultural acreage was thus distributed in the years 1873 and 1876 :—

Corn Crops. Green Crops. Cree

ta eee 65,488 15,461 ar ae 1 ae 61,416 14,334 42, 337

_ Of the corn crops, oats occupy much the largest amount of acreage, and of green crops, turnips,

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The live stock of the county in the same years was distributed thus :—

Cattle. Sheep. Pigs. Horses. ISB reesoncd 58,122 273,721 24,240 11,395 17! Onnannee 56,975 258,464 24, 438 11,789

and indeed far up the sunny slopes of the hills, the latest improvements in agriculture may be observed, and the reaping hook and the flail are fast disappearing before the reaping and the thrashing machines. This progress has been largely due to several Farmers’ Clubs, such as the Denbighshire and Flintshire, the Vale of Conway, and the Cerrigydrudion. But the railways have done still more. The Vale of Llanrwst, the Vale of Clwyd, and

the Denbigh and Chester lines have linked their respective districts to the great trunk line of the London and North Western; whilst the Denbigh, Ruthin, and Corwen, the Corwen and Rliuabon, thie Wrexham and Connali's Quay, and yet again the Rhos- llanerchrugog and the Glyn Ceiriog tramways, have done the same for tlhe Great Western,—thus opening all the main arteries of the county alike to external and internal com- munication, and vastly developing its resources. Down the picturesque Vale of Llangollen also runs the great Holyhead Road—in its day the principal mcans of com- munication between Loudon and Ireland, and for engincering skill, excellency of workmanship, and beauty of scenery probably still unsurpassed in the United King- dom.

The geology of the county is full of interest, as it develops all the principal strata that intervene between the Lower Silurian and the Triassic series. In the Lower Silurian district, which extends from the southern boundary to the Ceiriog, the Llandeilo formation of the eastern slopes of the Berwyn and the Bala beds of shelly sandstone are traversed east and west by bands of intrusive felspathic porphyry and ashes; northwards from the Ceiriog to the limestone fringe at Llandrillo, the Wenlock shale of the Upper Silurian covers the entire mass of the Hiraethog and Clwydian hills, but verging on its western slopes into the Denbighshire grit, which may be traced southward in a continuous line from the mouth of the Conway as far a Llanddewi Ystrad Enni in Radnorshire. On its eastern slope a narrow broken band of the Old Red crops up along the Vale of Clwyd and in Eglwyseg. Resting upon this the Carboniferous Limestone extends from Llanymynach, its extreme southern point, to the Cyrnybrain fault, and there forks into two divisions that terminate respectively in the Great Orme's Head and in Talargoch, and are separated from each other by the denuded shales of the Moel Famma range. In the Vale of Clwyd the limestone underlies the New Red Sandstone, and in the eastern division it is itself overlaid by the millstone grit of Rhuabon and Minera, and by a long reach of the coal measures which near Wrexham are 4} miles in breadth. Eastward of these a broad strip of the Permian succeeds, and yet again between this and the Dee the ground is occupicd—as in the Vale of Clwyd —by the New Red.

The mineral resources of the county under these condi- tions are naturally considerable. Paving flags are raised at Nantglyn; slates and slabs for ornamental purposes, on a large scale, on Rhiwfelen, near Llangollen ; and slates at Glyn Ceiriog. The limestone is used largely, and exported extensively for building, fluxing, and agricultural purposes ; and at Brymbo there is a fine layer of China stone. The sandstones of Cefn Rhuabon are wrought into grindstones, and the grit is used for millstones. The coal measures at Chirk, Rhuabon, and Brymbo are very productive, the num- ber of collieries in 1875 being 61, and the quantity raised annually estimated at 1,379,560 tons. In close contiguity to the coal scams, ironstone is found ; and the six furnaces in

In the valleys,

blast at Rhuabon and at Brymbo (where John Wilkinson was the first to introduce the industry) produced (together with one in Flintshire) in the same year 55,099 tons of pig iron, valued at £232,000. Lead ore is another and still more important item ; the most productive mine has been the Great Minera, which yields profits of about £30,000 a year. The seven mines in the county produced, in 1875, 2600 tons of lead ore, 1954 tons of lead, and 10,873 ounces of silver. One of the latest industries in- troduced has been the manufacture of dynamite in the valley of the Ceiriog. At the village of Llansantffraid, and at Llangollen, there are woollen factories.

The principal towns are Wrexham (population 8576), the centre of the mining district, noted for its beautiful church tower, and recently selected as the military centre for North Wales; Denbigh, the nominal capital (4276), notable for its castle ruins and Howell’s female orphan school ; Ruthin (3298), where the assizes are held, famous for its grammar school and its fine castle lately rebuilt ; Llangollen, with its beautiful scenery ; Llanrwst, with its church mouuments and rood-loft, its bridge, and salmon fishing ; and Holt, with its ancient ruined castle.

As regards the ownership of the land, the county (in 1873) was divided among 5708 separate proprietors, whose total rental was estimated at £450,421. Of the owners 3436, or 60 per cent., held less than 1 acre, about

the same proportion as in the neighbouring county of Flint ; while the average of small proprietors in all England was 71 per cent. The average holding amounted to 61 acres, while that of all England was 34, and the average value per acre was £1, 6s. 3d., as against £3, Os. 2d. for all England.

The following proprietors held more than 5000 acres in the above year—viz, Sir Watkin W. Wynn, 33,998 acres; J. L. Wynne, Coed Céch, 10,197; Lord Bagot, Pool Park, 9385; H. R. Hughes, Kinmel, 8561; C. W. Finch, Pentrefoelas, 8025 ; B. W. Wynne, Garthewin, 6435 ; C. S. Mainwaring, Galltfaenan, 6428; R. M. Biddulph, Chirk Castle, 5513; W. C. West, Ruthin Castle, 5457 ; and Sir Hugh Williams, Bodelwyddan, 5360.

For civil purposes, the county is divided into 6 hundreds, 9 petty sessional divisions, 3 police districts, 5 highway districts, and 9 lieutenancy subdivisions ; and it forms a part of the North Wales circuit, with a winter assize. For parliamentary purposes the county is an un- divided constituency, returning two representatives to Parlia- iaent, while the contributory boroughs of Denbigh, Ruthin, Wrexham, and Holt return one member. Lcclesiastically the county lies entirely within the diocese of St Asaph ; the number of parishes and ecclesiastical districts is 61, comprised under 6 deaneries withiu the archdeaconry of St Asaph. In educational matters, the Latin or second-grade schools comprise the endowed grammar schools of Holt, founded in 1661; Denbigh, in 1726; Wrexham, in 1603 ; Rhuabou, by Vicar Robinson, in 1703; and Llanrwst, by Sir John Wynne of Gwydir, in 1610. The Greek, or highest grade, is supplied by that of Ruthin, founded in 1574 by Dr Gabriel Goodman, dean of Westminster, a native of the town and the refounder of its Christ’s Hospital. ‘This school has been the nursery of many eminent Welshmen.

Antiquities—Of prehistoric remains, the caves in the limestone escarpments of Cefn, that overhang the valley of the Elwy, yield a noteworthy supply. They contain remains of the hippopotamus, elephant, rlinoceros, lon, hyena, bear, reindeer, &c. The glutton was found in the neighbouring cave of Plas Heaton, felstone implements in the adjoining Bont Newydd cave, and a polished stone-axe in a similar one at Rbhosdigre,—all in the same range.

Near Cefn, too, was discovered in 1&6), on the opening of a carnedd in Tyddyn Bleiddya, a

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chambered tomb containing skeletons, which, on conipari- son with a similar type found at Perthi Chwareu, gave rise to the title of the “Platyecnemic Men of Denbigh- shire.”

A writer in the

Of the earliest castles the ruins of “ Dinas Bran” still crown the conical hill that overhangs Llangollen. Denbigh, which has been compared to Stirling for site and beauty—built in the time of Edward I. and destroyed in the civil wars—overlooks the Vale of Clwyd; Holt, ou the banks of the Dee, probably the Caerlegion of Beda, shared the same fate. Ruthin, overthrown at the same time, has been twice rebuilt within this century. Chirk alone has weathered the storms of time and war, and is still occupied as a family residence.

Among the early ecclesiastical buildings and remains we niay name the Cistercian abbey of Valle Crucis and the Carmelite chapel at Denbigh, both now in decay; the cloisters at Ruthin, and the old house of Brynyffynnon, sometimes called the nunnery at Wrexham ; the collegiate churches of Wrexham and Ruthin ; the beautiful rood-lofts and screens of Llanrwst, Gresford, and Derwen ; the por- trait brasses and monuments in the Gwydir Chapel, Llanrwst, and at Whitchurch, Denbigh; the churchyard cross at Derwen ; and the stained glass at Gresford and Llanrhaiadr in Dyffryn Clwyd.

The principal gentlemen’s seats of Tudor date comprise Gwydir (Lady Willoughby d’Eresby), Brynkinallt (Lord A. E. Hill-Trevor), Trefalyn (B. T. Boscawen Griffith), Llwyn Ynn (Colonel Heygarth), Cadwgan (in decay). Those of later erection include Llangedwyn and Wynnstay (Sir W. Williams Wynn, Bart.), Kinmel (H. R. Hughes), Pool Park (Lord Bagot), Havodunos (H. R. Sandbach), Voelas (Colonel Wynne Finch), Llanerch (Whitehall Dod), Gwrych Castle (R. B. Hesketh), Plas Power (T. Fitzhugh), Llandy- silio Hall (C. F. Beyer), Acton Park (Sir R. H. Cunliffe, Bart.), Galltfaenan

(T. Mainwaring), Eriviatt (J.J. Ffoulkes), Glanywern (P. S. Humberston), Gelligynan (J. Carstairs Jones).

Among the books bearing upon the history of the county are the following :—the Archeologia Cambrensis, or Journal of the Cambrian Archeological Association; Pennant's Tours in Wales ; Lewis, Topographical Dictionary ; Thomas, History of the Diocese of St Asaph ; Annals of Counties and County Families of Wales, by Dr. Nicholas ; Yorke's Royal Tribes of Wales; Memoirs of the Gwydir Family, by Sir John Wynne ; Memoirs of the Goodmans, by R. Newcome ; Accounts of Denbigh and of Ruthin, by the same ; Ancient and Modern Denbigh, by John Williams ; Records of the Lord- ship of Denbigh, by the same ; Handbook of the Valeof Clwyd, by Davies; Wrexham and its Neighbourhood, by Jones. The village churches of the county have been well illustrated by Lloyd Williams and Underwood, architects, of Denbigh. (D:R. .)

DENDERAH, an Arab village in Upper Egypt, about 28 miles north of Thebes, marking the site and preserving the name of the ancient city of Tentyra, which was the capital of the Tentyrite nome and the seat of a famous temple dedicated to Athor, the Egyptian Venus. The temple, which is remarkable as the first well-preserved and

unencuinbered building of the kind to be seen on a voyage up the Nile, lies about a mile and a half from the left bank of the river, within a square inclosure formed by four crude-brick walls, each 1000 feet in length, and entered by means of a stone-built gateway, adorned with sculptures representing Domitian and Trajan engaged in acts of worship. The portico of the temple is about 135 feet in width, and is architecturally one of the richest and most beautiful structures of its class. It is supported by 24 columns, four deep, nearly 50 feet in height, and having a diameter of more than 7 feet at the thickest part. The capitals have sculptured on each of their four sides a full face of Athor, crowned by a small shrine or temple. The sculptures, which are of less merit than the architec- ture, represent offerings made by some of the earlier Ceesars; and on the ceiling are various mystical subjects, probably of an astronomical import, and the famous quadrangular zodiac, which will be referred to again in the latter

part of this article. Passing through the back wall of the portico (which was at one time the front wall of the temple) the visitor enters a hall supported by three columns on each side, with cup-shaped capitals beneath those formed by the temple-crowned faces of Athor; and thence, pro- ceeding right onwards through two similar halls, he reaches the sanctuary, which is isolated by a passage running all round. On each side of the temple are many small apart- ments, and two entrance-ways from the exterior, as well as singular inclined passages in the walls, two of which are entered from the sides of the portico. All the chambers and passages, except the two last mentioned, are profusely covered with sculptures and inscriptions of a religious character, chiefly depicting and narrating the piety of the sovereigns by whom the temple was erected. The royal names have not always been filled in, but, where they have been sculptured, they are generally those of the last Cleopatra, and Cxsarion, her son by Julius Ceasar. A staircase on the left-hand side of the second chamber, behind the portico, conducts to the roof of the temple. Here are a sort of chapel and some small chambers, one of which is very interesting, because its sculptures relate to the story of Osiris. The exterior of the temple is as completely covered with sculptures as the interior. Among the figures represented there are those of Cleopatra and Cesarion ; but they cannot be supposed to bear any re- semblance, since they belong not alone to a conventional art, but almost to its lowest period. There are two smaller temples within the same inclosure as the ereat temple of Athor, one dedicated to Isis in the thirty-first year of Augustus, and the other usually known as the Typhonium, from the representations of Typhon on the capitals of its columns, but probably connected with the worship of Athor. ame pan 8 “ Coptic Tentore, and in Greek 4 entyris, used to be regarded as equivalent to Thy-n Athor, “the abode of Athor ;” but, according to an hypothesis started by Brugsch, and since proved by the investigations of Diimichen, it is now explained as “ the Land of the Hippopotamus” (Zan-ta-rer), in allusion to the use of this animal as a symbol of the goddess Isis, who is regularly identified with Athor in the Denderah inscrip- tions. The sacred name was An, and a list is still extant of 136 substitutes or epitheta ornantia, such as the house eee eal ae the house of gladness, the house of tet ping and laughing of the sun-god Ra, Though, as a A y indicated, the present temples of Denderah belong aad eo ig Lene art, the original occupation times. Accordin eat oe cies a one © iiiihen _ ; ane discovered

and published ee ; ee iree mouths in personal explora- iS, tation of the temple was effected

by Thothmes III. of the 18th dynasty, in keeping with an ancient plan belonging to the reign of Chufu, which had been found, in the time of Pheops, “in the interior of a wall of the Southern House.”

The people of Tentyra were remarkable for their hostility to the crocodile and its worshippers ; and in their attacks on the reptile they displayed so much audacity and skill that the Romans in the time of Strabo brought a number of them over to Italy as a new attraction for the amphi- theatre. In modern times the name of Denderah has become especially famous on account of the two desigus known respectively as the circular aud the quadrangular zodiac, which have been the subject of the most elaborate discussion among Egyptologists. The former was dis- covered by General Desaix about the end of last century, and at length in 1820 removed by M. Ielorrain to Paris, where it was purchased by the Government for 150,000 frances, and deposited in the Brbliothéque Impériale ; the latter, first observed by M. Dupuis, a member of the French commission, is still in its original position, as, instead of occupying a comparatively small and portable disk, it forms, as already indicated, the decoration of two ex- tremities of the temple portico, and thus consists of two corresponding halves. Copies of both the zodiacs have frequently been made, and are easily accessible in F. C. Lauth’s Les Zodiaques de Denderah, Munich, 1865, a memoir in which he maintains that both designs are com- memorative calendars of the Greco-Roman period.

See also Wilkinson’s Ancient Egyptians ; Letronne, Observations sur Vobjet des représentations zodiacales de l’antiquité, Paris, 1824 ; Halma, Examen et explications des Zodiaques Egypticnnes, 1822 ; Lepsius’s Zeitschrift fiir Atgyptische Sprache und Alterthumskunde, passim ; Chabas, Sur Vantiquité de Denderah; and especially Diimichen’s Neweste Mittheilungen aus Aegypten, and Bauwurkunde der Tempelanlagen von Denderah, 1864.

DENDERMONDE, in French Zermonde, a town ot Belgium, in the province of East Flanders, about 18 miles east of Ghent, so called from its

situation at the mouth of the Dender, a right-hand affluent of the Scheldt. It is the seat of a court of primary instance, has a hospital, a lunatic asylum, two orphanages, an academy of architecture and design, a public library, and a picture gallery, and carries on the manufacture of woollens, linens, ropes, paper, tobacco, and various other branches of industry. In the old church of Notre Dame, which was raised to collegiate rank in 1106, there are two paintings by Vandyck—a Crucifixion and an Adoration of the Shepherds. Till 1264, when it passed into the possession of Robert Bethune, count of Flanders, Dendermonde was governed in direct dependence on the empire. Its name frequently occurs in the history of the various wars in the Low Countries, the most memorable occasions being in 1667, when it defended itself against Louis XIV. by laying the neighbourhood under water ; in 1706, when it was besieged and captured by General Churchill ; and in 1745, when it was taken by the French. The fortifications were dismantled by Joseph II. in 1784; but they were restored in 1822. The bridge over the Scheldt dates from 1825. Population in 1866,

8300,

DENHAM, Sir Joun (1615-1668), a royalist poet, who has wona place among the foremost British authors more by a happy accident than by any decided genius, was the only son of Sir John Denham, lord chief baron of the Exchequer in Ireland, and was born in Dublin in 1615. In 1617 his father was promoted to the rank of baron of the Exchequer in England, and removed to London with his family. The future poet attended a grammar school in London, and in Michaelmas term 1631 was removed to Oxford, where he was entered a gentleman commoner of Trinity College. Having taken his degree of B.A., be began the study of the law at Lincoln’s Inn in 1634; but the character he had

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maintained at Oxford, of being ‘‘a slow, dreaming young man,” gave way to a scandalous reputation for gambling, by which he beggared himself and seriously embarrassed his father. We learn that, by way of penance, he wrote at this time an Hssay against Gaming, whether in prose or verse isnotrecorded. After his father’s death the habit became still more dominant, and he squandered a fortune. It was a surprise to every one, therefore, when

in 1642 he suddenly, as Waller said, “ broke out like the Irish rebellion, threescore thousand strong, when no one was aware, nor in the least expected it,” by publishing in that year two most successful volumes of verse. The first of these was The Sophy, a tragedy in five acts, a thin folio, the theme of which was a Turkish tale of blood and intrigue, drawn from Sir Thomas Herbert’s travels, This, Denham’s only dramatic performance, is tame aud correct, without passion, but free from the faults of some of the minor authors of the time. It was successful, but it enjoyed nothing of the unparalleled popularity of his simultaneous venture, the descriptive poem of Cooper’s Hill, the first edition of which in quarto was anonymous. In this famous piece no entirely new style was attempted, for Ben Jonson had led the way in theme and Cowley in manner ; but it had a smooth grace and a polished antithesis that were doubtful merits in poetry, but extremely dear to the rising generation. One quatrain, out of the three or four hundred lines of reflection and description, has been universally praised, and forms one of our most familiar quotations. Addressing the Thames, the poet says— “O could I flow like thee, and make thy stream

My great example, as it is my theme!

Though deep, yet clear; though gentle, yet not dull ;

Strong without rage, without o’erflowing full.” _ Jrought into royal notice by his poems, Denham was appointed high sheriff for Surrey and governor of Farn- ham Castle ; but he showed no military talent, and soon followed the king to Oxford. During the civil war he served the queen mother, and was intrusted with the letters in cipher that Cowley wrote to the king, which he managed to deliver into Charles’s hands. Being detected, however, he was obliged to escape into France. In April 1648 he is said to have conveyed the young duke of York from St James’s to Paris ; it is certain that, later in that year, he was sent in company with Lord Crofts, as ambas- sador to Poland, to obtain money for the king, and he suc- ceeded in bringing back £10,000. In 1652 he returned, a ruined man, to England, and resided as the guest of the earl of Pembroke at Wilton for a year. He now disappears until the Restoration. When Charles IT. returned, Denham was made surveyor-general and Knight of the Bath, and seems to have been well provided for ; but his subsequent life was far from happy, for his second

wife, a young woman of great beauty, was seduced by the duke of York, and became his mistress. This catastrophe, which is abundantly noticed in the current literature of that day, shattered the old poet's reason ; and he recovered from his insanity only to die, at his house near Whitehall, on the 10th of March 1668. He was buried in Westminster Abbey. In the same year, 1668, his works were collected in a single volume, entitled Poems and Translations. This included, besides Cooper's Hill and The Sophy, a fragment of an epic on the destruction of Troy, some beautiful lines on the death of Cowley, written a few months before his own decease, a didactic poem on the progress of learning, and some translations. Notwithstanding the fame of Cooper's Hul, which Pope imitated in his Windsor Forest, Denham's poems have not been edited in modern times. He was one of the very first to note the tendency towards rhetorical and gallicized forms in public taste, and to gratify the new fashion. But to speak of him, as

was once customary, as a great reformer of metre and fashioner of language, is to fail to realize the limitations of his talent.

DENINA, Carto Grovannt Maria (1731-1813), an Italian author, was born at Revello, Piedmont, in 1731, and was educated at Saluzzo and Turin. In 1753 he was appointed to the chair of humanity at Pignerol, but he was soon compelled by the influence of the Jesuits to retire from it. In 1756 he graduated as doctor in theology, and began authorship with a theological treatise. Promoted to the professorship of humanity and rhetoric in the college of Turin, he showed his literary activity in his great work On the Revolutions of Italy, and in other writings. Colle- giate honours accompanied the issue of its successive volumes, which, however, at the same time, multiplied his foes and stimulated their hatred. In 1782 he repaired to Berlin, where he remained for many years, in the course of which he published various works. In 1804 he went to Paris as the imperial librarian, to which office he had been appointed by Napoleon, who was attracted to him at Metz. He died there on 5th December 1813. Denina's reputation is mainly founded on his History of the Revolutions of Italy, in which he combines a philosophic spirit and the habit of accurate narration.

DENIS, or Dionysius, St, the patron saint of France, flourished in the middle of the 3d century. What is known of his life rests chiefly on the not altogether trustworthy authority of Gregory of Tours, according to which he was the leader of a band of seven missionaries who came from Rome to Gaul, and founded churches in seven cities. Denis settled in Paris, where he made many converts, and became the first Christian bishop. In 272, during the persecution of Valerian, he was beheaded along with some of his companions. Another account places the date of the martyrdom between 286 and 290. The well-known legend, according to which St Denis after his decapitation walked two miles with his head in his hands, probably originated in a mistaken interpretation of pictures intended to indicate the manner of his death. It was not unusual to represent a martyr by decapitation bearing his head in his hands as an offering, and there are effigies of St Denis with the mitred head in its natural position and the head in the hands as well. The bodies of the three martyrs were thrown into the River Seine, but were afterwards recovered and honourably buried by a Christian lady named Catalla, not far from the place where they suffered. Over the tomb a chapel was built, which in the 5th century was replaced by a church. The famous abbey of St Denis was founded on the same spot by Dagobert in the 7th century. A later legend of the French church, following the tradi- tion of the Greek Church, identified St Denis of Paris with Dionysius the Areopagite, who was converted by St Paul. One of the gravest charges brought against Abelard was the fact that he denied this identity on the authority of a passage in Bede. St Denis was gradually adopted as the patron saint of the French people, St Louis being the patron saint of the royal family. His festival is celebrated on the 9th October.

DENIZEN, an alien who obtains by letters patent (ew donatione regis) certain of the privileges of a British subject. He cannot be a member of the Privy Council or of Parliament, or hold any civil or military office of trust, or take a grant of land from the Crown. The Naturaliza- tion Act, 1870, provides that nothing therein contained shall affect the grant of any letters of denization by Her Majesty. See NATURALIZATION.

DENMAN, Tuomas, First Baron (1779-1854), one of the most distinguished of the chief-justices of England, was born at London, the son

of a well-known physician, 23d July 1779. He received the rudiments of his educa-

Plate 1.

tion at Palgrave School, near Diss, in Norfolk, at that time conducted by Mrs Barbauld. At ten years of age he was sent to Eton, and he afterwards was entered at St John's College, Cambridge, where he graduated in 1800. He took only an ordinary degree, having a positive distaste for mathematics. Soon after leaving Cambridge he married ; and in 1806 he was called to the bar at Lincoln's Inu, and at once entered upon practice. His success was rapid, and in a few years he attained a position at the bar second only to that of Brougham and Scarlett. He distinguished him- self by his eloquent defence of the Luddites; but his most brilliant appearance was as one of the counsel for Queen Caroline. His speech before the Lords was very powerful, and some competent judges even considered it not inferior to Brougham's. It contained one or two daring passages, which made the king his bitter enemy, and retarded his legal promotion, At the general election of 1818 he was returned M.P. for Wareham, and at once took his seat with the Whig opposition. In the following year he was returned for Nottingham, for which place he continued to sit till his elevation to the bench in 1832. His liberal principles had caused his exclusion from office till in 1822 he was appointed common serjeant by the corporation of London. In 1830 he was made attorney-general under Lord Grey's administration. Two years later he was made lord chief-justice of the King's Bench, and in 1834 he was raised to the peerage. As a judge he is most celebrated for his decision in the important privilege case of Stockdale v. Hansard ; but he was never ranked as a profound lawyer. In 1850 he resigned the chief-justiceship of the Queen's Bench and retired into private life. He died September

26, 1854.

See Memoir of Thomas, first Lord Denman, by Sir Joseph Arnould, 2 vols. 1873.

DENMARK. The kingdom of Denmark, once a con- siderable power in Europe, but now confined within very narrow limits, comprises the peninsula of Jutland on the European continent and a group of islands in the Baltic. It lies between 54° 34’ and 57° 44’ 52” N. lat, and between 8° 4’ and 12° 34’ E. long., with the exception of the Island of Bornholm, which lies between 14° 42’ and 15° 10’ E. long. It is bounded N. by the Skagerrack ; E. by the Cattegat, the Sound, and the Baltic; S. by the Baltic, the Little Belt, and the German duchy of Schleswig ; and W. by the North Sea. Its area amounts to 14,553 English square miles. With the exception of Bornholm, which is situated considerably to the east between Pomerania and Sweden, the islands all lie close to one another, and form a cluster that almost closes the entrance to the Baltic. The largest island, and the nearest to Sweden, is Zealand, or Sjeelland ; the next in size, Funen, or Fyen, is divided from Jutland by only a minute channel ; Lolland, Bornholm, Falster, Langeland, Méen, Sams6, Alré, Lasd, Taasinge, Anholt, are, in order of their importance, the other noticeable islands.

Coast and Surface.—The coasts of Denmark is gener- ally low and sandy; the whole western shore of Jutland is a succession of sand-ridges and shallow lagoons, very danger- ous to shipping. Skagen, or the Scaw, a long, low, sandy point, stretches far into the northern sea, dividing the Skagerrack from the Cattegat. On the eastern side the coast 18 not so inhospitable; on the contrary there are several excellent havens, especially on the islands. Nowhere, however, is the coast very high, except at one or two points in Jutland, and at the eastern extremity of Mee, whee Hinetoe cis exit “The ong ford, =a cia € proximity of the islands divides the coast, guishing feature. There is little variety in the surface of Denmark. It is uniformly | h highest point in the whole c ree Ae

ountry, Himmelbjerget in

Jutland, being only 550 feet above the sea. Denmark, liowever, is nowhere low in the sense in which Holland is; the country is pleasantly diversified, and rises a little at the coast even though it remains flat inland. The landscape of the islands and the south-eastern part of Jutland is rich in beech-woods, corn-fields, and meadows, and even the minute islets are

green and fertile. In the western and northern districts of Jutland this gives place to a wide expanse of moorland, covered with heather, and ending at the sea in low, whitish-grey cliffs. There is a melancholy charm even about these monotonous tracts, and it cannot be said that Denmark is wanting in natural beauty, though of a quiet order. It is obvious that in such a country there can exist no rivers. The Gudenaa, the longest of the Danish streams, is little more than abrook. Norare thereany large lakes. Pieces of water of considerable size, however, are numerous ; of these the largest are the Arresé and the Esromso in Zealand, and the chain of lakes of various names near Silkeborg in Jutland. Many of these meres, overhung with thick beech-woods, are extremely beautiful.

The climate presents no remarkable features. The country lies at the division between Eastern and Western Europe, and partakes of the characteristics of both. Its climate differs from that of Scotland (which is in the same latitude) less in the nature of the seasons than in the rapidity of their transitions. The following are the mean annual temperature (Fahr.) :—

Copenhagen. Frederikshayn. WATE eeeeakee TOR 32°9 82: BPTI Gs sco…
.0tadenea tae Se 43°7 43°02 SUMMITS os waxinconsteteae cess « 63°05
60°65 SAUIGUIMIRG: 255 coer cits. 5 estooures, 405d 48°65 Whole
year…..... 47°18 46°00

Snow falls on an average on thirty days in the year, and westerly winds are more prevalent than easterly in the ratio of 16 to 10. Storms of wind and rain are exceedingly frequent, particularly in July and August. In the district of Aalborg, in the north of Jutland, a cold and dry N.W. wind called skaz prevails in May and June, and is exceed- ingly destructive to vegetation ; while along the west coast of the peninsula similar effects are produced bya salt mist, which carries its influence from 15 to 30 miles inland.

The fawna of Denmark presents no peculiarity. The wild animals and birds are those of the rest of Central Europe. The larger quadrupeds are all extinct; even the red deer—which was formerly so abundant that in a single hunt in Jutland in August 1593 no less than 1600 head of deer were killed—is now only to be met with in preserves. In the kjdkken-méddings and elsewhere, however, are found vestiges which prove that the urochs, the wild boar, the beaver, the bear, and the wolf have all existed since the

arrival of man. The usual domestic animals are abundantly found in the Denmark of to-day, with the exception of the goat, which is very uncommon.

In her jlora, Denmark presents greater variety than would have been anticipated from so low and monotonous a country. ‘The ordinary forms of the north of Europe grow with great luxuriance in the mild air and protected soil of the islands and the eastern coast; while on the heaths and along the sandhills on the Atlantic side there flourish a great variety of unusual species.

The Danish forest is almost exclusively made up of beech, a tree which thrives better in Denmark than in any other country of Europe. The oak and ash are now rare, though in ancient times both took a prominent place in clothing the Danish islands. The almost universal predominance of the beech dates from about two centuries ago. In the reign of Christian IV. the oak was still the characteristic Danish tree. No conifer grows in Denmark, except under careful

cultivation. In Bornholm, it should be mentioned, the flora is more like that of Sweden ; not the beech, but the pine, birch, and ash are the most abundant trees.

Agriculture. —Denmark is pre-eminently a corn land, and the cereals grown are all the usual European varieties ; i1 the light and sandy soils buckwheat takes the place of rye, wheat, barley, and oats. The potato is largely cultivated, as well as pease, clover, vetches, and turnips. The usual Noith European fruit-trees and bushes produce good crops, and even peaches and apricots ripen well in – sheltered places. The nectarine, however, is not known as a hardy fruit. The produce of grass is not very large, the fertility of the ground tempting the farmers to use it all for grain. In relation to its size there is no country in Europe, except Belgium and England, that can compete with Denmark as a corn-producer. According to the official returns of 1871, there were in that year 11,367,310 acres under some sort of crop, fallow, or in grass, or about 65 per cent. of the total area of the country ; 5,894,495 acres Imore were in woods and forests. The

following table will show the distribution of the crops, in English statute acres :—-

Carrots, turnips,

BALLON E esis, vevevineses 689,734 cabbage, &e…... 12,753 WOES Hes eaves sence cee 840,485 | Rape and other oil 3,937 Ms conde wciieye sss 561,607 BE CUS. semtee ee naser 2

Beans and pease…... 80,366 | Flax and hemp…..... 17,686 Buckwheat…..... 45,180 | Bare fallow …..... 588,354 Mixed Corn …..... 123,606 | Grass under rotation. 307,460 POTATOES .cceccescees ons 97,317 | Permanent pasture…2,433,356

Of the actual production of the above crops no estimate has been furnished by the Statistical Bureau. The land in Denmark is minutely subdivided, owing partly to the state of the law, which interdicts the union of small farms, and encourages in various ways the parcelling out of landed property.

The large cstates of the nobles are generally in the hands of farmers; but the greater part of the land is possessed by the peasantry, who maintain an hereditary attachment to their ancestral farms. Below these are the small peasant estates (generally capable of supporting from 10 to 15 cows); there is also a class of cottar freeholders called junsters, with land sufficient to keep one or two cows. The most remarkable feature in the Danish husbandry is, that greater value is attached to the produce of the dairy than to that of the soil, and that much of the horse power is withdrawn from the fields and employed in the work of the dairy. Independently of the stock maintained in the large dairy farms, this branch of industry has given rise to a distinct class of men, hiring cows by the year. Notwith- standing the great extent of pasture, the country produces more grain than is required for its own consumption.

The mineral products of Denmark are too unimportant to require enumeration. It is one of the poorest countries of Europe in this particular. It is rich, however, in clays, while it should be stated that in the island of

Bornholm there are quarries of freestone and marble. There is but little coal yet discovered in the country.

Manufactures are not carried on to any great extent. The most notable Danish manufacture is the fabrica- tion of porcelain. The nucleus of this important industry was a factory started in 1772, by F. H. Miiller, for the making of china out of Bornholm clay. In 1779 it passed into the hands of the state, and has remained there ever since. Originally the Copenhagen potters imitated the Dresden china made at Meissen, but they are now famous for very graceful designs of their own invention, and their porcelain has a distinct character of its own. The inven- tions of Thorwaldsen have been very largely repeated and imitated in this charming ware. Besides the royal works,

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there arc private factories employing a large number of men. ‘Terra cotta and faience are also manufactured in Copenhagen. The iron-works of Denmark have made very considerable progress since the separation of Norway, and they are largely supplied with raw material imported from England. There are many iron foundries around Copeu- hagen, and in that city there are small manufactories of locomotives, and of machinery of virious kinds.

The woollen, linen, and cotton manufactures of Denmark are for the most part domestic, and carried on purely for local consumption. Linen is the principal article of domestic industry in Zealand. The woollen manufacture occupies about 2000 men. The sugar refineries, of which the largest are at Copenhagen, prepare most of the sugar required for domestic consumption. Cherry brandy is also prepared in that city, and largely exported. The making of paper and distillation are carried on at different parts of the country to some extent.

Commerce.—Formerly the commercial legislation of Denmark was to such a degree restrictive that imported manufactures had to be delivered to the customs, where they were sold by public auction, the proceeds of which the importer received from the custom-houses after a deduction was made for the duty. To this restriction, as regards foreign intercourse, was added a no

less injurious system of inland duties impeding the commerce of the different provinces with each other. The want of roads also, and many other disadvantages, tended to keep down the development of both commerce and industry. Within the present century, however, several commercial treaties were concluded betwecn Denmark and the other powers of Europe, which made the Danish tariff more regular and liberal.

Of no less importance were the regulations made from time to time concerning the Sound toll, a question which in the 17th century led to many hostilities between Denmark, Sweden, and Holland. Having formerly possessed both sides of the entrance to the Baltic, the Danish Crown looked upon the Sound as exclusively her own, refusing to admit any foreign vessels without pay- ment of a certain duty, and this right was never success- fully contested by the other powers. An exception, how- ever, was made in favour of Sweden, and of late the toll has been entirely abolished.

The principal ports of Denmark are Copenhagen, Helsingér, Korsér, Aarhuus, Aalborg, and Frederikshavn.

The total value of the goods imported into Denmark in 1874 was £12,859,000; and of the goods exported, £9,574,000.

The following tables show the quantities of the prin- cipal articles imported and exported in the same year. We give them in the original figures, premising that a ténde of corn equals 3°8 imperial bushels, a ténde of coal 4°6775 bushels, and a pund 1:102 bb avoirdupois.

Imports. CIN So. i RIN Ae Er eee 3,561,354 pund. (Cag o ccon gd eechR eins. ARSE nee ae eee eee 3,610,085 tonder. Eee tinge: tec syieacorlacnbidedures 23,668,775 pund. (CoP aE), Sea ee eer ate 32,274 tonder, ono TAPS cdcceeanernsnp nnn en can roene eee PAS BY, An np UACSTI Gqreceemaccecnonsoeetmadscecienae ern Zb) 1k.

4,605,533 pund.

5,837,858,

Cotton manufactures….....0.00- 11,468,192 Woollen Sayer tae ree 3,672,834 ,, Metals, iron wrought and unwrought…96,938,041

Wie GlG® cammeecocsoan masonoaccododsnssdenc 23,320,340 ,, Oi MoisallGknd areas eee TLS) U2, Gil Rice ere ietecnccns ccc ere ee UACSO7S7 5, Salts cine ie kee ee 7 40,877,099 ,, Sutarteee case cen een eee 54,353,700 _,, i Wes teaianene coo nook Gondor ecencetac cn en ane eemn 772,396 ,, MNODAGCOMyetEatt 7 one e 5,955,629 ,

vi —

EXPORTS.

Oxen and Cows …....—cecseccorsereneeseees 66,986 head. RTT oat BBpPR ORGS EEBERnEE. Dansibeueconcescdon: WSO! op Bones, whole or groand…....---seeeeee + 3,759,509 pund. ee oo, as corns 23,144,128 ,, Corn—barley …....cccceceeeeeenees er eteces 1,001,969 tonder

yy barley meal…..... 1. seeeseeseers . 6,308, 424 pund.

gp OAS Leese eeece eee co eecee tenet ceeces 575,408 tonder

go EWEd----zeconertensaer nro ne* “enters nae 390,065 ,,

5, rye meal oi eva ste ace eG eae o le pund.

By NLR poncene sonagocenqseacbyooroounceC 361,840 tonder.

5: giNPDORDOHOUT gears. ncoseorcsnnssnaeem xe 49,510,702 pund. Hides and skins, undressed….....— 4,568,111 _ ,, Wieat— hain ands bacom .c..cc:- ese dssmes- 12,087,109 ,,

an FODGUES, SAUSAGES. ..... 2.5 --- eee ee 2,338,814 ,, (ONIVEDICA pashene enpeodeneoudeeen actoudcdanouaer 7,258,413 ,, (ME, NOE a 3,546,365 4, AWHGGi sono cnenpnountesesioneasiseq noneedban tba nec SoM 5;

The decimal system of coinage is in use in Denmark, the unit being the dre, 74 of which are equivalent to an English penny; 100 Gre make 1 krone,

equal to about Is, 1}d. sterling,

Government.—In early times the government of Den- mark was far from despotic; the succession to the Crown was even elective until the revolution of 1660. It then became entirely without constitutional check upon the will of the king. This singular change is to be explained by supposing, on the part of the nation, not so much an indifference to free institutions as a resentment of the overbearing conduct of the nobility, and a consciousness of the perpetual uncertainties of an elective Government. The court found it thus a matter of little difficulty to unite the clergy and commons against the aristocracy ; and the power of the Crown has since continued without a parlia- ment or any constitutional check. But when Frederick VIL came to the throne he promised to resign the nearly absolute power which had hitherto been connected with the Crown. Accordingly a charter was drawn up by an assembly elected for that purpose in 1849, and signed by the king in 1850, which acknowledged the principle of limited monarchy, the king sharing his power with a diet of two houses, both of which are elective. The first, called Folksthing, has the privilege of discussing the budget and other public questions ; while the other is confined to the local affairs of the provinces. The liberty of religion and of the press, and the inviolability of person and property, were amply guaranteed by the new constitution. This great charter received a further revision on the 28th of July 1866, according to which the second chamber, called the Landsthing, consists of 66 members, 12 of whom are nominated for life by the king, and the others elected for 8 years—7 by the city of Copenhagen, 45 by the electoral districts of the towns and country, 1 by Bornholm, and 1 by the Faroe Islands. The Folksthing is composed of one representative for every 16,000 inhabitants, elected for three years. In 1875 it contained 102 members. The privy council consists of the king, the crown prince, and the ministers,

The financial state of the kingdom will best appear from the following net estimates contained in the budget for 1876-77, given in kroner (1s. 14d. sterling) :—

RECEIPTS.

Dorman Se, «ccs we een coatunncut ener oer 937,450 BOs OA oe 796,872 SUADCMUT PINS ie. 5 coe. recndeeasncsvactvantauand 4,934,494 Tech

QUI ec aveceivat-s ssc 8,385,050 Indirect duties… sss reese cee 29, 297,000 [ROStamrmemett tak \ta ro. ace ae “379,941 WMG TAN oo ccisssccchcccctsseeedicns ce lee 20, 980 MOREE eo sete yns st ea eres 850,000 receipts from the Faroes ……..... oe 39,518

2 from the West Indies…..... 25,000 Various Teceipts. ..... icsseice coses-.: 1,187,772 Drawback, &..0….0ccccccccee cee, 173817880

(£2,671,441) 48,085,952 kroner.

‘Danish dominions.

DENMARK

EXPENDITURE. ‘ Givilelist:.~~vs.. ces: cee eee 1,600,000 Royal apanage ….~~..:.ssccecrsnss eo ees eee OE Privy Couneil…….....+ + L valnlanfostac slanets 2 94,616 Figg ae’ .ccpesesrees..s./del> 932,693 Gita 6 Sauna banana oddibandoonseencoo css caann dor 2,260,414 Home departnienti.ccnsc..’: ee rmeenee secs 1,508, 226 Wait» Gary sen MMS ou avecee crea eeametiae nats 8,598, 247 MATING! pe y5 0 | Gueescgserasedensss seems 4,774,802 WITSHCRM a5 eects ceacaa ou eemeeeee 2,960,708 Administration of Iceland… .....s064 109,200 Extraordinary expelseS…….....-...++ .. 2,906,007 Publtcswouks ss -c-cssccagaen care eens cee 3,718,550 Sulbbyen tions Cisse. ca. aeenesctaneanae ss 780,726

(£2,594,170) 46,695,071 kroner.

The national debt amounted in 1875 to 100,805,939 kr. (£5,600,330). .

Army and Navy.—The army is regulated according to the principles fixed by the law of the 6th of July 1867. Conscription is practised. The service begins at the age of twenty-two years, and continues eight years for the line and the reserve (first grade) ; the second grade goes on to the age of thirty-eight years. The following table shows the condition of the Danish army according to the latest statistics :— –

sal

Army of Reserve

Regular Army

Officers. R aa Officers. a Be Tigetry.: <<... 73 26,750 287 12,127 Cavalty io. 5.5.00. 126 2,122 fe ae AATHGUMETYs6,- sree 139 6,523 37 2,391 inigimeensee..«.- 36 580 22

35,975

346

eee eee

The staff of the army was composed, at the same time, of 25 cominissioned and 37 non-commissioned officers. The navy of Denmark comprised, at the commencetnent of September 1875, 6 iron-clads, 12 unarmoured vessels, 7 gun-boats, and 5 paddle steamers,—the whole carrying a total of 286 guns. The navy is recruited by conscription from the coast population. It was manned in September 1875 by 911 men, and officered by 1 admiral, 15 commanders, and 81 captains and lieutenants. In March 1875 the mercantile fleet of Denmark comprised 2846 vessels, of an aggregate burden of 212,600 tons.

The fortifications of Copenhagen have within the last few years been entirely razed, but the city is still protected by some forts in the Sound. The castle of Kronborg, near Helsingér, interesting to Englishmen as the scene of Hamlet, is in good preservation, and well-manned. The port of Frederikshavn, in the extreme north of Jutland, is also strongly fortified.

Religion and Education.—The established religion of Denmark is the Lutheran, which was introduced as early as 1536, the church revenue being at that time seized and retained by the Crown. In no country of Europe was the Reformation introduced in a more bloodless and easy way than in Denmark. During the earliest Christian times the whole of Denmark was under the jurisdiction of the archbishop of Hamburg. King Erik Eiegod, after personal visit to the Pope, contrived to place his kingdom under a Scandinavian prelate and his own subject, the archbishop of Lund in

Skaania, which then belonged to the After the cession of Skaania to Sweden, Roeskilde became the metropolitan see. At present (1877) there are six bishops, besides the metropolitan, viz., the bishops of Funen, of Lolland and Falster, of Aarhuus, of

Aalborg, of Viborg, and of Ribe. They have no political function by reason of their office, although they may, and often do, take a prominent part in politics, Dissent is comparatively unknown, or at least it has not yet become a serious danger to the national church. The Mormon apostles for a considerable time made a special raid upon the Danish peasantry, but the emigration to Great Salt Lake City is now but small. Roman Catholics were until lately hardly existent in Scandinavia, where their presence was not tolerated. The following statistics will show the proportion of religious bodies at the ccusus of 1870 :—Lutherans, 1,770,000 ; Jews, 4300; Baptists, 3200; Mormons, 2200; Roman Catholics, 1800; Irving- ites, 350. Complete toleration is now enjoyed in Denmark.

The educational institutions of Denmark have reached a very high degree of perfection; indeed few countries, if any, can compete with Denmark in this respect. Most of the peculiar advantages in the Danish system seem to arise from this, that all schools, both grammar and other, have been put in a state of dependence on the university of Copen- liagen, and under its control, while the university itself is particularly well managed. All educational institutions of the country are now managed by a royal college, consist- ing of three or four assessors and a president, called the royal commission for the university and grammar schools. ‘Fhis commission has no superior but the king, and reports to him directly. It appoints all professors in the university of Copenhagen, all rectors, co-rectors, and other teachers of grammar schools, and also promotes these functionaries from lower to higher grades. Education is compulsory. Poor parents pay a nominal sum weekly for the education of thcir children at the Government schools, so that almost all the lower class can read and write. Confirmation is also conipulsory, and till that rite has been received, the youth of both sexes are in statu pupillari. Certificates of baptism, confirmation, and vaccination are indispensable before entering on service, apprenticeship, or matrimony.

Territorial divisions. —These consist of provinces, amts, and parishes. The provinces are seven, and correspond to the episcopal sees above mentioned. Of these provinces three are in the islands :—Zealand, which includes Bornholm and Moen; Lolland and Falster, comprising those two islands ; and Funen, which also includes Langeland, ré, and Taasinge. Four provinces are on the mainland :—Aarhuus, occupying the south-east of Jutland ; Aalborg, the north ; Viborg, the centre ; and Ribe, the south-west of the same. Each of these provinces is divided into sevcral amts, answering very much to the English hundreds.

The only large city in Denmark is Copenhagen in Zealand, which was estimated in February 1876 to have a, population of 199,000, and, with its suburbs, of 233,000. Thirteen other towns contain 5000 inhabitants and upwards—viz,, Odense (Funen), 17,000; Aarhuus (Jut- land), 15,000 ; Randers and Aalborg (Jutland), 12,000 each ; Horsens (Jutland), 11,000; Helsingér (Zealand), 9000 ; Fredericia (Jutland), 7000; Viborg (Jutland), Svendborg (Funen), and Veile (Jutland), 6000 each; Rénne (Bornholm), Slagelse (Zealand), Kolding (Jutland), and Roeskilde (Zealand), 5000 each.

Communication both by land and water is well pro- vided for in Denmark. Arailway from the Schleswig frontier proceeds to Fredericia, from whence one branch passes to the extreme north of Jutland, another crosses the ‘island of Funen from Middelfart to Nyborg. This is the direct route from Germany to Copenhagen. From Nyborg a packet crosses the Great Belt to Korsér, and thence another line runs through Zealand to Copenhigen. There is also a south Zealand line, from Roeskilde to Vordingborg, which is continued through the island of Falster, besides

a short line in Lolland. The only canal is the Thyborén, a short canal which connects the Liim Fjord (the arm of the sea which penetrates so far into the north of Jutland) with the German Ocean. This is a natural canal, formed after the Agger channel (a passage opened by the storm of the 3d of February 1825) had become choked with sand. The canal can only be used by vessels of very small burden.

Dependencies,—The colonial possessions of Denmark are the Faroe Islands, Iceland, Greenland, and the Danish West Indies. The Faroe Islands are an archipelago nearly midway between Shetland and Iceland. They are considered as an out-lying amt of the mother-country rather than as a colony. Seventeen of these islands are inhabited ; the largest is Strom6, on the eastern shore of which is built the capital Thorshavn, The islands arc governed by an amtmand.

Iceland is a large island at the north-western extremity of the map of Europe, just outside the Arctic Circle, Until lately it was considered as a colony of Denmark, aud was subject to a tyraunous exercise of the laws of the mother country on the part of small officials. At the visit of Christian IX., however, in 1874, it received a constitu- tion and an independent administration, which came into force in August of that year.

The possessions of Denmark in the West Indies consist

of three islands lying to the east of Porto Rico. Of these

St Croix is the largest, and St John the smallest, while the

chief town and the residence of the governor are on

St Thomas, A few years ago the last named island was offered to and very nearly purchased by the United States,

but the proceedings fell through.

The whole peninsula or continent of Greenland is

nominally in the possession of Denmark ; but in point of fact her dominion there is limited to a few scattered

trading stations along the western coast. It is divided into

two provinces, north and south. Of these, the former con-

tained, according to a census of 1874, 4095 native inhabi-

tants, and the other 5512. The whole European population

was only 236, the inhabitants of the entire colony thus

numbering 9843.

Population.—There was a census of Denmark taken in

1870, according to which the population of the mother

country was 1,784,741, of the Faroe Isles 9992, and of

the other dependencies 117,409. On the Ist of February

1876 the following official estimate was made :—

Area in English

Provinces.' – square miles. Population. Zealand and Moen…... 2793 682,400 SOrmbolimeatauner ses -asees 221 33,500 Lolland and Falster…. 640 93,100 Funen, Langeland, &c. 1302 248, 400 AECL sangeenense onto GSCI 845,500

—-— 14,553 1,902,900

Faroe Islands …... ..... 495 10,600 Nigelandlsenesntacae was esesec 30,000 71,300 (Cream anideare-eaenseescss 9,800

West INpI&Es.

MS UAOLOUX sea ncmwe ess cael xe 60 22,600 Stbhomase..,.....-+- 14 14,000 DSUQUOMM ier scaseteescceense 13 1,000 Total, 45,135 2,032, 200

Denmark proper has 130 inhabitants to the English square mile. The density of population is much greater on the islands than in Jutland, Zealand having nearly 250- inhabitants to the square mile. The increase in the population of the towns has of late years been very rapid, aud has much exceeded that of the country districts. Of the provincial towns, the most prosperous is

Aarhuus, which, from being comparatively insignificant, has become the most important place in Jutland. The only exception to this rapid increase is in the case of the towns on the new German frontier, especially Fredericia and Ribe.

[HISTORY,

Emigration, which at one time was carried on to a con- | is a treasure-house of truth and falsehood. According to

siderable extent, has in recent years greatly diminished. Of the 2088 persons who left Denmark in 1875, 1678 emigrated to the United States of America, 329 to Australia, 47 to Canada, and 34 to other parts of America, including the Salt Lake City. ;

The Danes are a yellow-haired and blue-eyed Teutonic race, of middling stature, and still bearing traces of their kinship with the Northern Scandinavian peoples. Their habits of life resemble those of the North Germans even more than those of their friendly neighbours the Swedes. ‘The independent tenure of the land by a vast number of small farmers, binder, who are their own masters, gives an air of carelessness, almost of truculence, to the well-to-do Danish peasant. He is thoroughly well satisfied with himself, takes an eager interest in current politics, and ig generally a fairly-educated man of extreme democratic prin- ciples. The gaiety of the Danes is surprising ; they have nothing of the stolidity of the Germans, or the severity of the Norwegians. The townspeople show a bias in favour of French habits and fashions. The separation from the duchies of Schleswig and Holstein, which were more than half German, bas’ intensified the national character ; and there is now no portion of the Danish dominions, except perhaps in the West Indian islands, where a Scandinavian language is not spoken.

History.—The original form of the word Denmark is Danmirk, the march or border of the Danir; but whence the name Danir, or Danes, proceeded is

undecided, and has given rise to endless antiquarian discussion. A traveller of the name of Pytheas, who lived more than three centuries before the Christian era, is the first to speak of a northern country, under the name of Thule, by which he is believed to have meant Jutland. At this time the inhabitants of Southern Scandinavia are supposed to have been Celts, and it was long after this that what Rask defined as the Sarmatic Invasion (the flooding of the north of Europe by emigrants from Asia) began to take place. These Goths, as they were called, came through Russia into Germany and Denmark, and passed on into Sweden across the Sound. It used to be supposed that they pushed before them the‘races of the Lapps and Finns, but the latest discoveries of archeology tend to prove that these latter came from Siberia over the north of the Gulf of Bothnia,and met the Goths a little outside the Arctic Circle. The gods anciently worshipped in Denmark were the Aisir, a family of heroic deities in which the characteristics of the leaders of the Sarmatic Invasion are probably enshrined. The language spoken by all the Northern Gotlis was originally, or very early, called the Dénsk tunga, or Danish tongue, which gave way in the 13th and 14th centuries, when the Danish supremacy was on the decline, to Vorrena Mdl, or Norse speech. From the earliest historical accounts we possess it appears that Jutland was divided among a great number of petty chieftains, often at war with one another. These smaa-kongar, or ‘little kings,” as they were called, were, however, to some degree banded together, and entirely distinct from the eastern Danes of the islands. These also were ruled by a variety of chiefs, but they all recognized the supremacy of the king of Lejre, a city in Zealand somewhere near the present town of Roeskilde. Western Denmark was kuown to the Northmen as Red Gotland, and consisted of all the main-land north of the Elbe, that is, Holstein, Schleswig, and a utland. Island Gotland consisted of the islands, and of the provinces of Skaania and Bleking, that is, all the south of Sweden. During the rule of the Valdemar kings, the oli chronicler, Saxo Grammaticus, recorded in Latin an immense number of mythical and semi-mythical stories concerning the old history of Denmark, and his chronicle

him, the country takes its name from a King Dan the Famous, who united the smaa-kongar under his sole rule, and he was succeeded by a King Frode, with whom a golden age set in. The question of supremacy among the Scandinavian peoples was settled in favour of Sweden at the battle of

Bravalla, which was fought, as is supposed, in the 8th century between Sigurd Ring, king of Sweden, aud Harald Hildetand, king of Denmark ; with this battle the purely mythic age closes. In 823 the gospel was first preached in Denmark by some Frankish monks sent by the emperor Louis le Debonaire. Little was done in the way of actual conversion, but the road was opened for future missionaries. The famous Ansgarius failed to impress the Danes, though he was consoled by his brilliant success among the Swedes, The Christians, however, began by degrees to be tolerated. The first king of all Denmark was Gorm the Old, who flourished between 860 and 936. He was the son of a king of Lejre, and by great administra- tive and strategical skill managed to absorb into his hereditary dominions not only all that is now included in Denmark, but Schleswig, Holstein, Skaania, and even some provinces in Norway. And besides gaining all this terri- tory, he also pushed his conquests for a while as far as Smolensk and Kieff in Russia, as Aix-la-Chapelle in Ger- many, and as Sens in France, after besieging Paris.

At the period in question, or rather somewhat later, namely, about the early part of the 10th century, com- mences the authentic history of the country. As early as the 8th century the Danes were remarkable for their well-planned predatory expeditions by sea, as was proved by their repeated invasions of England, their occasional descents on Scotland, and their conquest of Normandy. To cross a sea of three or four hundred miles in breadth was a bold undertaking for men unacquainted with the use of the compass ; but the number of islands in Denmark early accustomed the inhabitants to navigation, and gave them a practical dexterity in it.

The early establishment of the Danes in England, and the subsequent arrival of bodies of their countrymen, joined to the talents of two of their princes, Sweyn, or Svend, and Canute, enabled the latter to acquire the crown of England. Canute (or Knud) the Great completed the con- quest begun by his father, and became king of England as well as of Denmark in the year 1018 ; he resided generally in the former country, and left the crown to his sons Harald and Harthaknud. On the death of the latter, without male heirs, the Danish dynasty in England came to a close in 1042.

The feudal system was introduced in the 12th century, which, as well as the 13th, was marked in Denmark by contentions between the sovereign and the barons. Aoout the 13th century the population of the towns in Denmark, as in Germany, though still very small, became such as to entitle them to obtain from the Crown charters of incorpora- tion, and an exemption from the control of the barons, in whom was vested almost the whole property of the land. A regular constitution began now to be formed in Den- mark, and the towns sent deputies or representatives to the States, or Parliament, which, it was enacted, should meet once a year. It was also ordered that the laws should be uniform throughout the kingdom, and that no tax should be imposed without the authority of Parliament. It is unnecessary to recapitulate the successive sovereigns of Denmark in the Middle Ages, of whom few were of dis- tinguished ability. The names of most frequent occurrence among them in those early times were Knud, Valdemar, and Erik. Those of Christiern, or Christian, and Frederick were of later date. One of the most remarkable of the sovereigns in the Middle Ages was Valdemar II., who suc

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ceeded to the crown in 1202, and who was the most prosperous and afterwards the most unfortunate of Danish kings. He conquered Holstein and Pomerania, and in 1217 the emperor recognized his authority over a large part of the north of Germany,—all in fact north of the Elbe. Valdemar then pushed his forces into Norway and Sweden, but with less success ; but in 1219 he set out on a vast crusade against the Pagans in Esthonia, the whole of which he overran, forcibly converting the inhabitants. It was in this war that Denmark commenced to use the Daunebrog, or national standard, a white cross on a blood- red field. On his return, in the midst of his magni- ficeut success, a great calamity befell Valdemar; he was treacherously captured at Lyé in 1223 by the duke of Schwerin, and imprisoned for several years in a dungeon in Mecklenburg; but he finally escaped, and ruled until his death in 1241.

The chief mercantile intercourse of Denmark in those times was with Liibeck and the north-west of Germany. To the Baltic Liibeck was nearly what Venice was to the Mediterranean, the earliest commercial town of consequence. There was also some traffic from Denmark to the mouths of the Vistula,—the name of Dantzic, or Dansvik (Danish town or port), indicating that a Danish colony, aware of the advantages of the situation, had established itself there.

During the same period (the 14th century), the associa- tion of the Hanse Towns had acquired considerable strength, and asserted strenuously the freedom of commerce in the north of Europe. Denmark, commanding the entrance into the Baltic, was the power most interested in laying merchant vessels under a toll or regular contribution; and the result was repeated contentions, followed at times by open war, between the Danish Government and this powerful confederacy.

The most important event, however, in the history of Denmark, or indeed of Scandinavia, in the Middle Ages, was the conjunct submission of Sweden, Denmark, and Norway to one sovereign, by the compact or union of Calmar, in the year 1397. Valdemar III., king of Denmark, having died in the year 1378, left two daughters, of whom the second, Margaret, was married to Hakon VI., king of Norway. On the demise of her husband the government of Norway remained in her hands; and after- wards, on the

death of .her son, who had been declared king of Denmark, the States, or Parliament, of that country fixed this princess on the throne, on her consenting to extend and secure their rights and privileges. The States of Norway followed their example ; so that Margaret, find- ing herself seated on the thrones of Denmark and Norway, directed her attention to that of Sweden, the succession to which would have fallen to her husband Hakon had he survived. The Swedes were divided into two parties—that of Margaret, and that of a duke of Mecklenburg. An appeal to arms took place, and the result was favourable to the cause of the queen, her competitor being defeated and made prisoner. In 1397 the States of the three kingdoms were convoked at Calmar, a town situated in the south of Sweden. There they concurred in passing the Act known as the Union of Calmar, by which the three kingdoms were henceforth to be under one sovereign, who should, however, be bound to govern each according to its respective laws and customs. To guard against their separation, it was enacted that, if a sovereign should leave several sons, one of them only should be the ruler of the three kingdoms, and in the event of the reigning king or queen dying with- out children, the senators and parliamentary deputies of the three kingdoms should jointly proceed to the election of another joint sovereign.

Such were the precautions taken by Margaret, who has been called the Semiramis of the North, in order to banish

war and political dissensions from Scandinavia. For a time they were successful, and peace and concord were maintained during the lifetime of the queen and her two successors. But the union, as regarded the Swedes, was far from being cordial ; they submitted reluctantly to a foreign family, and considered themselves as obliged to act in subserviency to the political viewsof Denmark. At last the severity, or rather the cruelty, of one of the Danish kings, Christian II.,and the appearance of an able assertor of Swedish independence in Gustavus Vasa, led to an in- surrection, which, beginning in the northern province of Dalecarlia, extended throughout Sweden, and led to a definitive separation of the two crowns in the year 1523.

In 1490 the reigning king of Denmark made a com- mercial treaty with Henry VII. of England, by which the English engaged to pay the Sound dues on all vessels entering or returning from the Baltic ; and in return they were allowed to have mercantile consuls in the chief sea- ports of Denmark and Norway. By this time the extension of trade had given rise in Denmark, as in England, to a middle class, among whom the sovereign found in each country the means of balancing the political weight of the nobility ; hence a grant was made by the kings of Denmark of various privileges to traders, and of relief from a number of local imposts on the transit of merchandise.

The rude habits of the age were strongly marked by the difficulty which the Danish Government found in putting a stop to the practice of plundering merchantmen ship- wrecked on the coast. ‘The practice was to collect in the vicinity of a wreck such a number of the inhabitants as to prevent the master or mariners from opposing the seizure of the merchandise. Even bishops residing on the coast, though humane in their treatment of the crews, did not scruple to aid in taking forcible possession of the cargo ; and it is a remarkable fact, that a law passed by the king, about the year 1521, tor the prevention of these practices, was abrogated and publicly burned at the instance of the barons and clergy a few years after, when a new sovereign had succeeded to the crown.

The doctrines of the Reformation found their way into Denmark at an early date. Frederick I., who began to reign in 1525, and had formerly been duke of Holstein, in that year embraced the Protestant religion. The inhabi- tants of Denmark being divided between the Catholics and Protestants, Frederick began by an edict for tolerating both religions. An assembly of the States, or Parliament, next passed a solemn Act for the free preaching of the Protestant faith, and for allowing ecclesiastics of any class to marry and reside in any part of the kingdom. The consequence of this was a reduction of the number of the inmates of abbeys, monasteries, and convents, along with the general diffusion of the Lutheran faith throughout the kingdom. This rapid progress enabled the succeeding sovereign, Christian III, to act like Henry VIII. of England, by annexing the church-lands to the Crown, and strengthening the power of the sovereign at the expense of that of the clergy. ;

The great religious war which broke out in 1618 for the first time fixed the attention of Europe on Denmark. The victories of the imperial general Tilly, and of Maximilian of Bavaria, over the Protestants, appeared to make the Emperor Ferdinand, who was the head of the Catholic party, complete master of Germany, when Christian IV. of Denmark, encouraged by England and France, determined to take up the Protestant cause as a principal in the general contest. But being weakly supported by his allies, the Danish king, after one year's campaign, was obliged to flee before the victorious army of Wallenstein (1626), and to sue for peace, which was concluded at Liibeck in 1629. By the stipulations of "ais peace Denmark bound itself never

to interfere in the affairs of Germany, and was besides com- pelled to acknowledge Wallenstein as duke of Mecklenburg. his peace would have been still more humiliating for Denmark, if France, already influenced by the counsels of Richelieu, had not interposed its efforts on behalf of the vanquished. The emperor now thought of nothing less than the entire subjection of Germany to his will. A new adversary, however, arose in Gustavus Adolphus the king of Sweden. Thc short and glorious career of this king will be found described in its proper place. But this much must be here observed, that despite the fall of Adolphus in the battle of Liitzen in 1632, the power of Sweden was becoming continually more considerable, and cousequently an object of real envy to all its neighbours, but especially to Denmark. Thus it happened that besides the general religious war, repeated hostilities were being carried on between Sweden and Denmark separately.

The first contest lasted from 1637 to 1645, and the treaty concluded in the latter year proved rather a truce than a peace. The Danish Government formed an alliance with Holland, and aided that republic in its sanguinary contest in 1652 with England, then under the authority of Cromwell. The king of Sweden at that time was Charles Gustavus, a prince in the vigour of life, and actuated by all the ambition and enterprise of the house of Vasa. He had carried his military operations into Poland, which then, as at other times, seemed to invite the presence of foreigners by its internal

dissensions. But on learning the hostile disposition of the Danish Government, Charles withdrew his troops from Poland, entered Holstein, and overran the whole province. As soon as the winter had advanced, and it had become practicable to cross on the ice the arms of the sea separating the Danish islands from the mainland, the Swedish army traversed in that manner the Little Belt, took Odense, the capital of the island of Funen, and even invested Copenhagen. That capital was not without a military force, but its walls were weak, nor was it adequately supplied with provisions or military stores. On this occasion the Danes, with their king Frederick ILI. at their head, displayed great firmness, and resisted the efforts of the Swedes, until, under the media- tion of the English envoy at the court of Copenhagen, hostilities were suspended, and a treaty signed. This treaty, however, was only partly carried into execution. Dissatisfied at the delay which took place, Charles Gustavus made a second attempt on Copenhagen in the autumn of 1658; but he found it impracticable to prevent the introduction of supplies into the city by sea, as the Dutch now came to the assistance of their Danish allies, Still the Swedes persisted in the siege, and in the depth of winter (in February 1659) made an attempt to take Copenhagen by storm. The attacks were made on three points; each was headed by an able commander, but all were unsuccessful, and the siege was necessarily converted into a blockade. Soon afterwards the king of Sweden died, and the sangulnary contest was brought to a close by the treaty of Copenhagen in 1660, This peace ceded to the Swedish Crown Skaania, Aland, several places on the island of Riigen, and a free passage through the Sound.

In the following year, 1660, the vicissitudes of war were succeeded by a remarkable revolution in domestic politics. The reigning king of Denmark had gained great popularity, as well by his spirit and firmness in the field, as by resist- ing a claims made by the nobility to the disadvantage of

e other orders of the state. He was thus assured of the support of the middle classes in any attempt to reduce the power of the nobility. On the assembling of the States, or Parliament, the representatives of the different towns were found sufficiently strong, when united with the clere d streugthened by the aie

g ry power of the Crown, to outweigh the

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inftuence of the nobility, and the court determined to act with vigour in extending its prerogative. The political contest began about the crown lands, which had hitherto been let to nobles only, and at very low rents. It was proposed and carried in the Parliament, that men of any class or station might henceforth be candidates for them, and that they should be let to the highest bidder. The next proposition of the clergy and commons was, that the crown, hitherto in some degree elective, should be so no longer, but should devolve, as a matter of right, on the lawfnl heir, whether male or female. Henceforth, in Den- mark, whatever power could be shown to have belonged to any ruler in any country, was now forthwith to be under- stood as belonging to the king.

This remarkable change in the form of the government

is to be explained chiefly by the repugnance of the people of Denmark to the ascendency of the nobility. The French » _Revolution procecded from causes somewhat similar; but in

Denmark the control possessed by the privileged class was not tempered, as in France, by civilized and refined habits. The direct authority of the nobles was also greater, for they possessed the power of life and death over their vassals, Frederick lived ten years after this singular revolution,—a period which enabled him to consolidate it, and to reinstate in peace the trade and finances of his country.

His successor, led away by the ardour of youth, abandoned the pacific policy of his father, and ventured to make war against Sweden. He relied on the aid of the elector of Brandenburg, commonly called the Great Elector, the possession of so extensive a country as Prussia placing him quite at the head of the princes of the empire. Swedish Pomerania was chosen as the scene of operations, from being open to attack by the Prussians. The Swedes were overmatched in force, but being well commanded, they made a firm and spirited resistance. By sea the Danes had the advantage, having the aid of a Dutch squadron commanded by Van Tromp. ‘This enabled them

to convey an invading force to Skaania, or Scania, the southern and most fertile province of Sweden. Here the forces of-the Swedes were brought to bear against their opponents, with the advantage of vicinity to their supplies. The result was that the Danes were obliged to retreat from Skaania, and, after several alternations of success, peace was signed between the two kingdoms in 1679, the year after the treaty of Nimeguen had suspended the war in the central part of Europe. As usual, after much bloodshed and many vicissitudes of fortune, the

adverse states were placed by the treaty in nearly the same |

situation as at the commencement of the war; but hopes of peace for the future were justified by the marriage of the young king of Sweden, Charles XIJ., with a princess of Denmark.

These hopes were realized during twenty years; and peace continued until 1699, when, Charles XT. having died, the reigning king of Denmark, Frederick [V., was tempted by the youth of Charles XII. of Sweden to invade the dominions of his ally the duke of Holstein. Frederick was little aware of the spirit of his opponent, who became afterwards so well known in the wars of the north of Europe. Charles, determined to strike at once at his

enemy’s capital, lost no time in crossing the narrow sea

between Sweden and Denmark, and in investing the city of Copenhagen. The inhabitants in alarm appealed to the humanity of the young monarch; and the result was the speedy conclusion of peace, with the payment of a sum of money to the Swedes. Taught by this lesson, the Danish Government remained neutral in the following years, when the course of events led Charles and his army into Poland and Saxony, where for a time success attended his arms. After the defeat of Charles at the battle of

Pultowa, in the year 1709, and his subsequent flight into Turkey, the king of Denmark eagerly embraced the opportunity of renewing hostilities with Sweden, and invaded both Holstein in the south and the province of Skaania to the north. Skaania was badly provided with troops, but it had officers trained in one of the best military schools of the age, and a peasantry full of national antipathy to the Danes. The result was a spirited attack on the invading army, followed by its defeat and precipitate flight into Denmark. The war was then carried on with alternate success in different parts—in Pomerania, in Holstein, and in Norway; until at last the military career of Charles XII. came unexpectedly to a close in the end of 1718. Some time afterwards, negotiations were opened between Sweden and Denmark, under the mediation of England, and ended in 1720 in a definitive treaty of peace, concluded at Stockholm. It was then that Sweden lost all the advantages gained since the Peace of West- phalia, and that George I. of England, as elector of Hanover, Prussia, and Peter the Great shared with Denmark the spoil of Sweden. From that time no danger threatened Denmark from the side of its neighbour, though the cessation of the rivalry was more perceptible in the decline of Sweden than in the progress of Denmark.

The Danish Government had now ample experience of the sacrifices attendant on war, and of the expediency, to a state of such limited power, of avoiding political collisions. It consequently adopted a peace policy, to which it has almost ever since endeavoured to adhere.

It was towards the middle of the 18th century that the family of Bernstortf became known in the councils of Denmark,—the first minister of that name, a man of superior talent and information, having come forward at that time. By the prudence of the ministry, and the pacific disposition of the sovereign, Denmark was kept from taking part in the war begun in Germany in 1740, as well as in the more general contest begun in the same country in 1756.

Frederick V. of Deumark was twice married, and died in 1766, leaving a son by each wife. The crown devolved of course on the elder, his son by the first wife, who took the name of Christian VII. He was a weak prince, and listened too readily to the insinuations of his step-mother, whose secret wish was to secure the succession of the crown to her own son, and who did not

scruple, with that view, to sow discord between Christian and his young consort, a princess of England, the youngest daughter of George II. The circumstances were these. A German adventurer named Struensee had ingratiated himself into the favour of Frederick V., the late king, and had found means to be appointed his prime minister—a situation which he was ill qualified to fill. He continued to hold that office under Christian, and was introduced to the young queen as her husband's confidential minister. On this the queen dowager founded an intrigue, and succeeded in persuading the king that the queen, in coucert with Struensee and his friend Count Brandt, had formed a project to set him aside, and to get herself declared regent of the kingdom. By working on the fears of this weak prince, the queen dowager prevailed on him to authorize the arrest of the queen and the two ministers The latter were thrown into prison, and Struensee was accused of having abused his authority as minister, and of other criminal acts. As there was no proof of these acts, recourse was had to the barbarous alternative of torture, the dread of which led Struensee to declare, in the form of a confession, much to the injury of the young queen, which is now considered as unfounded. This, however, did not enable him to escape, for he and Count Brandt were both beheaded in April 1772 ; whilst the queen consort was, at the instance of the British

Government, allowed to retire and to pass the remainder of her short life at Zell, in Hanover, repeatedly but fruitlessly — demanding an open trial. This ill-fated princess died in her twenty-third year, without the satisfaction of knowing that the author of her misfortunes, the queen dowager, had lost her influence at the court of Denmark.

One of the principal political questions between Great Britain and Denmark occurred in 1780, during the war carried on by England against France, Spain, and the North American colonies. During that arduous contest, England, superior at sea, had no difficulty in obtaining, by her own merchantmen, a supply of hemp, cordage, and other naval stores from the

Baltic, whilst France and Spain trusted to receiving such supplies by neutral vessels. But the English Government denied the right of neutrals to carry warlike stores ; and the northern powers, headed by the ambitious Catherine of Russia, entered into a compact, called the Armed Neutrality, by which, without resorting to actual hostility, they sought to overawe England, and to continue the questionable traffic. Happily no bloodshed followed this diplomatic menace, and the question fell to the ground in 1782, on the negotiation for a general peace.

The king of Denmark, subject all along to imbecility, became after 1784 quite incapable of governing, His son, the crown prince, was therefore appointed regent, and soon passed several judicious enactments. The peasants living on the crown lands were gradually emancipated—an example followed by a number of the nobility on their respective estates. In the abolition of the African slave trade Denmark had the honour of taking the lead among the Governments of Europe. The crown prince, guided by the counsels of Count Bernstorff, son of the minister already mentioned, long remained neutral in the political convulsion engendered by the French Revolution. He continued to adhere steadfastly to this plan until in 1801 the emperor Paul of Russia having, as in the case of the Armed Neutrality, formed a compact of the northern powers hostile to England, a British fleet was sent into the Baltic under the orders of Sir Hyde Parker, with Lord Nelson as his second in command.

It was this fleet which taught the Danes that their capital was not impregnable, and that the long line of men-of-war moored in front of the harbour was an in- sufficient defence against such enterprising opponents. The attack took place on 2d of April 1801; and the resistance of the Danes was spirited, but fruitless. The loss of the English in killed and wounded exceeded 1000 men, but that of their opponents was much greater, and most of their shipping was destroyed. Happily little injury was done to the capital. A cessation of hostilities took place forthwith, and was followed by a treaty of peace. The death of Paul, which occurred soon afterwards, dissolved the compact between the northern courts.

But no treaty of peace could be regarded as permanent during the ascendency of Napoleon. After defeating first Austria and then Prussia, that

extraordinary man found means to obtain the confidence of the emperor Alexander of Russia, and in the autumn of 1807 threatened to make Denmark take part in the war against England. Although the Danish Government discovered no intention to violate its neutrality, the English ministers, eager to please the public by acting on a system of vigour, despatched to the Baltic both a fleet and an army, in order to compel the surrender of the Danish navy, upon condition of its being restored in the event of peace. To such a demand the crown prince gave an immediate negative, declaring that he was both able and willing to maintain his neutrality, and that his fleet could not be given up on any such con- dition. On this the English army landed near Copen- hagen, laid siege to that city, and soon obliged the Govern-

ment to purchase its safety by surrendering the whole of its naval force. , ie

This act, the most questionable in point of justice of any committed by the British Government during the war, can hardly be defended on the score of policy. The resentment felt on the occasion by the emperor of Russia was so great as to deprive England during four arduous years of the benefit of his alliance ; and the seizure of the Danish fleet so exasperated the crown prince and the nation at large, that they forthwith declared war against England, throw- ing themselves completely into the arms of France.

The hostilities between England and Denmark were carried on by sea, partly at the entrance of the Baltic, and partly on the coast of Norway. These consisted of a series of actions between single vessels or small detachments, In which the Danes fought always with spirit, aud net unfre- quently with success. In regard to trade, both nations suffered severely,—the British merchantmen in the Baltic being much annoyed by Danish cruisers, whilst the foreign trade of Denmark was in a manner suspended, through the naval superiority of England.

The situation of the two countries continued on the same footing during five years, when at last the overthrow of Bonaparte in Russia opened a hope of deliverance to those who were involuntarily his allies. The Danish Government would now gladly have made peace with England ; but the

latter, in order to secure the cordial co- operation of Russia and Sweden, had gone so far as to guarantee to these powers the cession of Norway on the part of Denmark. The Danes, ill prepared for so great a sacrifice, continued their connection with France during the eventful year 1813; but at the close of that campaign a superior force was directed by the allied sovereigns against Holstein, and the result was, first an armistice, and eventually a treaty of peace in January 1814. The terms of the peace were, that Denmark should cede Norway to Sweden, and that Sweden, in return, should give up Pomerania to Denmark. But Pomerania, being too distant to form a suitable appendage to the Danish territory, was exchanged for a sum of money and a small district in Lauenburg adjoining Holstein. On the part of England, the conquests made from Denmark in the East and West Indies were restured,—all, in short, that had been occupied by British troops, excepting Heligoland.

After the Congress of Vienna, by which the extent of the Danish monarchy was considerably reduced, the court of Copenhagen was from time to time disquieted by a spirit of discontent manifesting itself in the duchies, and especially in that of Holstein, the outbreak of which in 1848 threatened the monarchy with complete dissolation. A short recapitulation of the relation of the different parts of the kingdom to each other will furnish a key to the better comprehension of these internal troubles. When Christian I. of the house of Oldenburg ascended the tlirone of Den- mark in 1448, he was at the same time elected duke of Schleswig and Holstein, while his younger brother received Oldenburg and Delmenhorst. In 1544 the older branch was again divided into two lines, that of the royal house of Den- mark, and that of the dukes of Holstein-Gottorp. Several collateral branches arose afterwards, of which those that survived were—the Augustenburg and Gliicksburg branches belonging to the royal line, and the ducal Holstein-Gottorp branch, the head of which was Peter III. of Russia. In 1762 Peter threatened Denmark with a war, the avowed object of which was the recovery of Schleswig, which had been expressly guaranteed to the Danish Crown by England and France at the Peace of Stockholm (1720). His sudden dethronement, however, prevented him from putting this design into execution. The empress Catharine agreed to an accommodation, which was signed at Copenhagen in

1764, and subsequently confirmed by the emperor Paul, 1773, by which the ducal part of Schleswig was ceded tu the Crown of Denmark. The czar abandoned also his part of Holstein in exchange for Oldenburg and Delmonhorst, which he transferred to the younger branch of the Gottorp family. According to the scheme of Germanic organization adopted by the Congress of Vienna, the king of Denmark was declared member of the Germanic body on account of Holstein and Lauenburg, invested with three votes in the General Assembly, and had a place, the tenth in rank, in the ordinary diet.

After the restoration of peace in 1815, the states of the duchy of Holstein, never so cordially blended with Denmark as those of Schleswig, began to show their dis- content at the continued non-convocation of their own assemblies despite the assurances of Frederick VI. The preparation of anew constitution for the whole kingdom was the main pretext by which the court evaded the claims of the petitioners, who met, however, with no better success from the German diet, before which they brought their complaints in 1822. After the stirring year of 1830, the movement in the duchies, soon to degenerate into a mutual animosity between the Danish and German population, became more general. The scheme of the court to meet their demands by the establishment of separate deliberative assemblies for each of the provinces failed to satisfy the Holsteiners, who continually urged the revival of their long-neglected local laws and privileges. Nor were matters changed at the accession in 1838 of Christian VIII., a prince noted for his popular sympathies and liberal prin- ciples. The feeling of national animosity was greatly increased by the issue of certain orders for Schleswig, which tended to encourage the culture of the Danish language to the prejudice of the German. The elements of a revolution being thus in readiness waited only for some impulse to break forth into action. Christian died in the very begin- ning of 1848, before the outbreak of tie French revolution in February, and left his throne to his son Frederick VII., who had scarcely received the royal unction when half of his subjects rose in rebellion against him.

In March 1848 Prince Frederick of Augustenburg, having gained over the garrison of Rendsburg, put himself at the head of a provisional Government proclaimed at Kiel. A Danish army, marching into Schleswig, easily reduced the duchy as far as the banks of the Eider ; but, in the meantime, the new national assembly of Germany resolved upon the incorporation of Schleswig; and the king o' Prussia followed up their resolution by sending an army into the duchies under the command of General Wrangel. The Prussian general, after driving the Danes from Schles- wig, marched into Jutland; but on the 26th of August an armistice was signed at Malmoe, and an agreement come to by which the government of the duchies was intrusted to a commission of five members—two nominated by Prussia, two by Denmark, and the fifth by the common consent of the four, Denmark being also promised an indemnification for the requisitions made in Jutland. ©

After the expiry of the armistice, the war was renewed with the aid of Prussian troops and other troops of the confederacy (from March to July 1849), when Prussia signed a second armistice for six months. The duchies now continued to increase their own troops, being deter- mined to carry on the war at their own charge without the aid of Prussia, whose policy they stigmatized as inconsistent and treacherous. The chief command of the Schleswig- Holstein army was intrusted to General Willisen, a scienti- fic and able soldier ; but henceforth the Danes had little to fear, especially as the cry of German unity brought but an insignificant number of volunteers to the camp of the Holsteiners. The last victory of the Danes, under generals

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Krogh and Schlepegrell, was at the battle of Idsted (July 23). Near this small village, protected by lakes and bogs, Willisen lay encamped with his centre, his right wing at Wedelspung, extending along the Lake Langsé, his left spreading along the Arnholtz lake. The Danes, approach- ing on the high road from Flensburg to Schleswig, attacked the enemy on all sides ; and, after having been repeatedly repulsed, they succeeded in driving the Schileswig- Holsteiners from all their positions. The forces engaged on

each side were about 30,000 ; the number of killed and wounded on both sides was upwards of 7000.

After the victory of Idsted, the Danes could hardly ex- pect to nieet with any serious resistance, and tlic coufidence of the court of Copenhagen was further increased by tlie peace which was concluded with Prussia (July 1856), by which the latter abandoned the duchies to their own fate, and soon afterwards aided in their subjection. The sole question of importance which now awaited its solution was the order of succession, which the European powers thought to be of such importance as to delay its final settle- ment till 1852.

The extinction of the male line in King Frederick was an event foreseen by the king, the people, and the foreign powers. After protracted negotiations between the dif- ferent courts, the representatives of England, France, Austria, Russia, Prussia, and Sweden, a treaty relative to the succession was signed in Loudon, May 8, 1852. Accord- ing to this protocol, in case of default of male issue in the direct line of Frederick VII, the crown was to pass to Prince Christian of Gliicksburg, and his wife the Princess Louisa of Hesse, who, through her mother, Princess Charlotte of Denmark, was the niece of King Christian VIIL.

The treaty of London did not fulfil the expectations of the signitaries as to a settlement of the agitation in the duchies. The duke of Augustenburg had accepted the pardon held out to him on condition that his family resigned all claim to the sovereignty of the duchies, but he continued to stir up foreign nations about his rights, and when he died his son Frederick maintained the family pretensions. At last, in the autumn of 1863, Frederick VII. died very suddenly at the castle of Glicksburg, in Schleswig, the seat of his appointed successor, As soon asthe ministry in Copenhagen received news of his death, Prince Christian of Gliicksburg was proclaimed king as Christian IX., and the young duke of Augustenburg appeared in Schleswig, assuming the title of Frederick VIIL The claims of the pretender were supported by Prussia, Austria, and other German states, and before the year was out Generals Gablenz and Wrangel occupied the duchies in command of Austrian aud Prussian troops. The attitude of Germany was in the highest degree peremptory, and Denmark was called upon to give up Schleswig-

Holstein to sailitary occupation by Prussia and Austria until the claims of the duke of Augustenburg were settled. In its dilemma the Danish Government applied to England and to France, and receiving froin these powers what it rightly or wrongly considered as cnconragement, it declared war with Germany in the early part of 1864, The Danes sent their general, De Meza, with 40,000 men to defend the Dannewerk, the ancient line of defences stretching right across the peninsula from the North Sea to the Baltic. The movements of General De Meza were not, however, successful; the Dannewerk, popularly supposed to be impregnable, was first outflanked and then stormed, and the Danish army fell back on the heights of Dybbol, near Flensborg, which was strongly fortified, and took up a position bchind it, across the Little Belt, in the island of Alsen. This defeat caused almost a panic in the country, and, finding

that England and France had no intention of aiding them, the Danes felt the danger of annihilation close upon them. The courage of the little nation, however, was heroic, and they made a splendid stand against their countless opponents. General Gerlach was sent to replace the unlucky De Meza; the heights of Dybbol were harder to take than the Germans had supposed, but they fell at last, and with them the strong position of Sonderburg, in the island of Alsen. The Germans pushed northwards until they overran every part of the mainland, as far as the extreme north of Jutland. It seemed as though Denmark must cease to exist anong the nations of Europe; but the Danes at last gave way, and were content to accept the terms of tle Peace of Vienna, in October 1864, by which Christian IX. renounced all claira to Lauenburg, Holstein, and Schleswig, and agreed to have no voice in the final disposal of those provinces.

For the next two years Europe waited to see Prussia restore North Schleswig and Alsen, in which Danish is the popular language, and which Austria had demanded should be restored to Denmark in case the inhabitants should ex- press that as their wish by a plébiscite. When the war broke out between Austria and Prussia in 1866, and resulted in the humiliation of Austria, the cliances of re- storation passed away ; and the

duchies have remained an integral part of Prussia. Notwithstanding her dismember- ment, Denmark has prospered to an astonishing degree. and her material fortunes have been constantly in the ascendant. Her only trouble within the last decade has arisen from the dissensions in the two houses of assembly, and in the spread of dangerous communistic opinions.

The following is a list of the monarchs of Denmark since the unification of the kingdom under Gorm the Old, with the dates of their accession :-—

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Literature.

The present language of Denmark is derived directly from the same source as that of Sweden, and the parent of both is the old Scandinavian, or Icelandic. In Ice- land this original tongue, with some modifications, has re-mained in use, and until about 1100 it was the literary language of the whole of Scandinavia. The influence of Low German first, and High German afterwards, has had the effect of drawing modern Danish constantly further from this early type. The difference began to show itself in the 12th century. Task, and after him Petersen, have distin-

guished four periods in the development of the language. The first, which has been called Oldest Danish, dating from about 1100 and 1250, shows a slightly changed character, mainly depending on the system of inflections. Tn the second period, that of Old Danish, bringing us down to 1400, the change of the system of vowels begins to be settled, and masculine and feminine are mingled in a common gender. An indefinite article has been formed, and in the conjugation of the verb a great simplicity sets in. In the third period, 1400-1530, the influence of German upon the language is supreme, and culminates in the Reformation. The fourth period, from 1530 to about 1680, completes the work of development, and leaves the language as we at present find it.

It was not till the fourth of these periods set in that literature began to be generally practised in the vernacular in Denmark. Thc oldest laws which arestill preserved are written in Danish of the second period.

judged historically or poetically. We know nothing of the.

authors of these poems, which treat of the heroic adventures of the great warriors and lovely ladies of the chivalric age in strains of artless but often

exquisite beauty. The language in which we receive these ballads, however, is as late as the 16th or even the 17th century, but it is believed that they have become gradually modernized in the course of oral tradition. The first attempt to collect the ballads was made in 1591 by A. G. Vedel, who published 100 of them. Peder Syv printed 100 more in 1695. In 1812-14 an elaborate collection in five volumes appeared, edited by Abrahamson, Nyerup, and Rahbek. Finally, Svend Grundtvig has lately been at work on an exhaustive edition, of which six thick volumes have appeared.

In 1490, the first printing press was set up at Copen- hagen, by Gottfried of Ghemen, who had brought it from Westphalia ; and five years later the first Danish book was printed, This was the famous Liimkrénike, a history of Denmark in rhymed Danish verse, attributed to Niels, a monk of the monastery of Sord. It extends to the death of Christian I., in 1481, which may be supposed to be approximately the date of the poem. In 1479 the university of Copenhagen had been founded. In 1506 the same Gottfried of Ghemen published a famous collection of proverbs, attributed to Peder Lolle. Mikkel, priest of St Alban's Church in Odense, wrote three sacred poems, Zhe Rose-Garland of Maiden Mary, The Creation, and Human Life, which came out together in 1514, shortly before his death. These few productions appeared along with innumerable works in Latin, and dimly heralded a Danish literature. It was the Reformation that first awoke the living spirit in the popular tongue. Christian Pedersen (1480-1554) was the first man of letters produced in Denmark. He edited and published, at Paris in 1514, the Latin text of the old chronicler, Saxo Grammaticus ; he worked up in their present form the beautiful half-mythical stories of Karl Magnus and JTolger Danske (Ogier the Dane). He further translated the Psalms of David and the New Testament, printed in 1529, and finally—in coii- junction with Bishop Peder Paladius—the Bible, which appeared in 1550, Hans Tausen, the bishop of Ribe (1494-1561), continued Pedersen's work, but with far less talent. But Vecdel (1542-161 6), whose edition of the

Kjcempeviser we have already considered, gave an immense stimulus to the progress of literature. excellent translation of Saxo Grammaticus in 1575, The frst edition of a Danish Reinecke Fuchs appeared in 1555, and the first

authorized Psalter in 1559. founded the practice of history by his Chronicle of the Kingdom of Denmark, printed in 10 vols. between 1595 and 1604. Hieronymus Rauch, who died in 1607, wrote

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some biblical tragedies, and is the first original Danish dramatist. Peder Claussen (1545-1623), a Norwegian by birth and education, wrote a Description of Norway, as well as an admirable translation of Snorre Sturlesen's Heimskringla, published ten years after Claussen's death. The father of Danish poetry, Anders Arrebo (1587-1637), was bishop of Trondhjem, but was deprived of his see for immorality, He was a poet of considerable genius, which is most brilliantly shown in J/exaemeron, a poem on the creation, in six books, which did not appear till 1641. He was followed by Anders Bording (1619-1677), a cheerful occasional versifier, and by Toger Reenberg (1656-1742), a poet of somewhat higher gifts, who lived on into a later age. Among prose writers should be mentioned Peder Syv (1631-1702) ; Bishop Erik Pontop- pidan (1616-1678), whose Grammatica Danica, published in 1668, is the first systematic analysis of the language; and Brigitta Thott, a lady who translated Seneca and Epictetus,

In two spiritual poets the advancement of the literature of Denmark took a further step. Thomas Kingo (1634- 1703) was the first who wrote Danish with perfect ease and grace. He was Scotch by descent, and retained the vital energy of his ancestors as a_ birthright. His Wenter Psalter, 1689, and the so-called Kingo's Psalter, 1699, con- tained brilliant examples of lyrical writing, and an employ- ment of language at once original and national. Kingo had a charming fancy, a clear sense of form, and great rapidity and variety of utterance. Some of his very best hymns are in the little volume he published in 1681, and hence the old period of semi-articulate Danish may be said to close with this eventful decade, which also witnessed the birth of Holberg. The other great hymn-writer was Hans Adol Brorson (1694-1764), who published in 1740 a great psalm-book at the king's command, in which

he added his own to the best of Kingo's. Both these men held high posts in the church, one being bishop of Funen and the other of Ribe; but Brorson was much inferior to Kingo in genius. With those names the introductory period of Danish literature ends. The language was now formed, and was being employed for almost all the uses of science and philosophy.

Holberg.—Ludvig Holberg was born at Bergen, in Norway, in 1684. He commenced his literary carecr in 1711 by writing A History of the World, which attracted notice from its style, rather than its matter, and gained hin a professorial chair at the university of Copenhagen. In 1719 he published his inimitable serio-comic epic of Peder Paars, under the pseudonym of Hans Mikkelsen. In 1721 the first Danish play-house was opened in Copen-hagen, and in four years Holberg wrote for it his first 20 comedies. He may be said to have founded the Danish literature; and his various works have still the same freshness and vital attraction that they had a century and a half ago. As anhistorian his style was terse and brilliant, his spirit philosophical, and his data singularly accurate. He united two unusual gifts, being at the same time the most cultured man of his day, and also in the highest degree a practical person, who clearly perccived what would most rapidly educate and interest the uncultivated. In his 33 dramas, sparkling comedies in prose, more Or less in imitation of Moliére, he has left his most important

positive legacy to literature. Nor in auy series of comedies in existence is decency so rarcly sacrificed to a desire for popularity or a false sense of wit.

Holberg founded no school of immediate imitators, but his stimulating influence was rapid and general. After the great conflagration, the university of Copenhagen was reopened in 1742, and under the auspices of the historian Gram, who founded the Society of Sciences, it recommended an "active intcllectual life. In 1744 Langebek founded the Society for the Improvement of the Danish Language, which opened the field of philology. In jurisprudence Andreas Héier represented the new impulse, and in zoology Erik Pontoppidan, the younger. This last name represents a life-long activity in many branches of literature. From Holberg's college of Soré, two learned professors, Sneedorff and Kraft, disseminated the seeds

of a wider culture. All these men were aided by the generous and enlightened patronage of Frederick V. A little later on, the German poet Klopstock settled in Copenhagen, bringing with him the prestige of his great reputation, and he had a strong influence in Germanizing Denmark. He founded, however, the Society for the Fine Arts, and had it richly endowed. The first prize offered was won by C. B. Tullin (1728-1765) for his beautiful poem of Afay-day. Tullin, a Norwegian by birth, represents the first accession of a study of external nature in Danish poetry ; he was an ardent disciple of the English poet Thomson. Ambrosius Stub (1707-1758) was a lyrist of great sweetness, born before his due time, whose poems, not published till 1782, belong to a later age than their author.

The Lyrical Revival.—Between 1742 and 1749, that is to say, at the very climax of the personal activity of Holberg, eight poets were born, who were destined to eutich the language with its first group of lyrical blossoms. Of these the two eldest, Wessel and Ewald, were men of extraordinary genius, and destined to fascinate the attention of posterity, not only by the brilliance of their productions, but by the suffering and brevity of their lives. Joannes Ewald (1743-1781) was not only the greatest Danish lyrist of the 18th century, but he had few rivals in the whole of Europe. As a dramatist, pure and simple, his bird-like instinct of song carried him too often into a sphere too exalted for the stage; but he has written nothing that is not stamped with the exquisite quality of distinction, In The Fishers, which contains the Danish national song, Kong Kristian stod, the lyrical element is most full and charming; in Jtolf Krage, and Balder’s Death, Ewald was the first to foresee the revival of a taste for Scandinavian history and mythology ; The Brutal Clappers, a polemical drama, shows that he also possessed a keen sense of humour. Wessel (1742-1785) excited even greater hopes in his contemporaries, but left less that is immortal behind him. After the death of Holberg, the affec- tation of Gallicism had reappeared in Denmark; and the tragedies of Voltaire, with their stilted rhctoric, were the most popular dramas of the day. Nordahl Brun (1745- 1816), a young writer who did better things later on, gave the finishing touch to the exotic absurdity by bringing out a wretched piece called Zarina, which was hailed by the press as the first original Danish tragedy, although Ewald’s exquisite Rolf Krage, which truly merited that title, had appeared two years before. Wessel, who up to that time had only been known as the president of a club of wits,

immediately wrote Love without Stockings, in which a plot of the most abject triviality is worked out in strict accord- ance with therules of French tragedy, and in most pompous and pathetic Alexandrincs. The effect of this piece was magical; the Royal Theatre ejected its cuckoo-brood of French plays, and even the Italian opcra. It was uow essential that every performance should be national, and in

the Danish language. ‘To supply the place of the opera, native musicians, and especially Hartmann, set the dramas of Ewald and others, and thus the Danish school of music originated. Of the other poets of the revival the most 1m- portant were born in Norway. Nordahl Brun, Claus Frimann (1746-1829), Claus Fasting (1746-1791), C. H. Pram (1756-1821), and Edvard Storm (1749-1794) were associates and mainly fellow-students at Copenhagen, where they introduced a style peculiar to themselves, and distinct from that of the truc Danes. Their lyrics celebratcd the mountains and rivers of the magnificent country they had left ; and, while introducing images and scenery unfamiliar to the inhabitants of the monotonous Denmark, they enriched the language with uew words and phrases. This group of writers are now claimed by the Norwegians as the founders of a Norwegian literature ; but their true place is certainly among the Danes, to whom they primarily appealed. They added nothing to the development of the drama, except in the person of N. K. Bredal (1733-1 778), who became director of the Royal Danish Theatre, and the writer of some mediocre plays.

To the same period belong a few prose writers of eminence. Werner Abrahamson (1744-1812) was the first cesthetic critic Denmark produced. Johan Clemens Tode (1736-1806) was eminent in many branches of science, but especially as a medical writer. Ove Malling (1748-1829) was an untiring collector of historical data, which he annotated in a lively style. Two historians of more

‘definite claim on our attention are Peter Frederik Suhm

(1728-98) and Ove Guldberg (1731-1808). In theology Bastholm (1740-1819) and Balle (1744-1816) demand a reference. But the only really great prose-writer of the period was the Norwegian Niels Treschow (1751-1833), whose philosophical works are composed in an admirably lucid style, and arc distinguished for their depth and originality.

The poetical revival sunk in the next generation to a more mechanical level. ‘The number of writers of some talent was very great, but genius was wanting. Two in- timate friends, Rein (1760-1821) and Zetlitz (1761-1821), attempted, with indifferent success, to continue the tradi- tion of the Norwegian group. Thomas Thaarup (1749- 1821) wasa fluent and eloquent writer of occasional poems. The early death of Ole Samsie (1759-1796) prevented the development of a dramatic talent that gave rare promise. But while poetry languished, prose, for the first time, began to flourish in Denmark. Knud Lyne Rahbek (1760-1830) was a pleasing novelist, a dramatist of some merit, a pathetic elegist, and a witty song-writer ; he was also aman full of the literary instinct, and through a long life he never ceased to busy himself with editing the works of the older poets, and spreading among the people a knowledge of Danish literature. Peter Andreas Heiberg (1758-1841) is best known as the husband and the father of two of the greatest Danish writers, but he was himself a political and esthetic critic of note. He was exiled from Denmark in company with Malte Conrad Brun (1775-1826), who settled in Paris, and attained a world-wide reputation as a geographer. ©. CO. Olufsen (1764-1827) was a writer on geography, zoology, and political economy. Rasmus Nyrup (1759-1829) expended an immense energy in the compilation of admirable works on the history of language and literature. From 1778 to his death he exercised a great power in the statistical and critical departments of letters. The best historian of this period, however, was Engelstoft (1774-1850), and the most brilliant theologian Bishop Mynster (1775-1854). In the annals of modern science Hans Christian Oersted (1777-1851) is a name uni versally honoured. He explained his inventions and described his discoveries in language so lucid and so char-

acteristic that he claims an honoured place in the literature of the country of whose culture, in other branches, he is one of the most distinguished ornaments. ;

We pause on the threshold of the romantic movement to record the name of a man of great genius, whose work was entirely independent of the influences around him. Jens Baggesen (1764-1826) is the greatest comic poet that Denmark has produced, As a dramatist he failed ; as a philosophic and critical writer he has not retained the attention lie once commanded ; but as a satirist and witty lyrist he has no rival among the Daues. In his hands the difficulties of the language disappear; he performs with the utmost case extraordinary towrs de force of style. His astonishing talents were wasted on trifling themes and in a fruitless resistance to the modern spirit in literature.

Romanticism.—With the beginning of the 19th century the new light in philosophy and poetry, which radiated from Germany through all parts of Europe, found its way lnto Denmark also. In scarcely any country was the result so rapid or so brilliant. There arose in Denmark a school of poets who created for themselves a reputation in all parts of Europe, and would have done honour to any nation or any age. The splendid cultivation of metrical art threw other branches into the shade; and the epoch of which we are about to speak is eminent above all for mastery over verse. The swallow who heralded the summer was a German by birth, Adolph Schack-Staffeldt (1769-1826), who came over to Copenhagen from Pomerania, and prepared the way for the new movement. Since Ewald no one had written Danish lyrical verse so exquisitely as Schack-Staffeldt, and the depth and scientific precision of his thought won him a title which he has preserved, of being the first philosophic poet of Denmark. The writings of this man are the deepest and most serious which Den- mark has produced, and at his best he yields to no one in choice and skilful use of expression. This sweet song of Schack-Steffeldt’s, however, was early silenced by the louder choir that one by one broke into music around him. It was Adam Gottlob Oehlenschliger (1779-1850), the greatest poet of Denmark, who was to bring about the new romantic movement. Oehlenschliger had already written a great many verses in the old semi-didactic, semi-rhetorical style, when in 1802 he happened to meet the young Nor- wegian Henrik Steffens

(1773-1845), who had just returned from a scientific tour in Germany, full of the doctrines of Schelling. Under the immediate direction of Steffens, Ochlenschlager commenced an entirely new poetic style, and destroyed all his earlier verses. A new epoch in the language began, and the rapidity and matchless facility of the new poetry was the wonder of Steffens himself. The old Scandinavian mythology lived in the hands of Oehlenschliger exactly as the classical Greek religion was born again in Keats, After twelve years of ceaseless labour, and the creation of a whole library of great works, the vigour of Ochlenschlager somewhat suddenly waned, and he lived for nearly forty years longer, completely superseded by younger men, and producing few and mainly inferior works. Since and except Holberg no author has possessed so great an influence on Danish letters as Oehilenschliger. He arouscd in his people the slumbering sense of their Scandinavian nationality.

_ The retirement of Ochlenschlager comparatively early in life, left the way open for the development of his younger contemporaries, among whom several had genius little inferior to his own. Stcen Steensen Blicher (1782 1848) was a J utlander, and preserved all through life the characteristics of his sterile and somtre fatherland. After a struggling youth of great poverty, he at length, in 1814, published a volume of lyrical poems; and in 1817 he attracted considerable attention by his descriptive pocm of

The Tour in Jutland. His real genius, however, did not lie in the direction of verse; and his first signal success was with a volume of stories in 1824, which were rapidly followed by others for the next twelve years. Blicher is a stern realist, in many points akin to Crabbe, and takes a singular position among the romantic idealists of the period, being like them, however, in the love of precise and choice language, and hatred of the mere com-monplaces of imaginative writing.

Nikolai Frederik Severin Grundtvig (1783-1872), like Oehlenschliger, Jearned the principles of the German romanticism from the lips of Steffens. He adopted the idea of introducing the Old Scandinavian element into art,

and even into life, still more earnestly than the older poet. There was scarcely any branch of letters in which Grundtvig did not distinguish himself; he was cqually influential as 2 politician, a theologian, a poet, and a social economist.

Bernhard Severin Ingemann (1789-1862) was a man in every way unlike the last-mentioned poet. A mild, idyllic mind, delicately appreciative of the gentler manifestations of nature, and shrinking from violent expression of any sort, distinguished the amiable Ingemann. His greatest contributions to Danish literature are the historical romances which he published in middle life, strongly under the influence of the novels of Sir Walter Scott. Several of these, particularly Valdemar Seier and Prince Otto of Denmark, have enjoyed and still enjoy a boundless popularity. He is remarkable as the first importer into Scandinavia of the historical novel, since very generally cultivated.

Johannes Carsten Hauch (1790-1872) first distinguished himself as a disciple of Oehlenschlaiger, and fought under him in the strife against the old school and Baggesen. But the master misunderstood the disciple; and thie harsh repulse of Oehlenschliger silenced Hauch for many years. He possessed, however, a strong and fluent genius, which eventually made itself heard in a multitude of volumes, poems, dramas, and novels, All that Hauch wrote is marked by great qualities, and by distinction ; he had a native bias towards the mystical, which, however, he learned to keep in abeyance.

Johan Ludvig Heiberg (1791-1860) as a critic ruled the world of Danish taste for many years, and his lyrical and dramatic works were signally successful. He had the genius of good taste, and his witty and delicate pro-ductions stand almost unique in the literaturo of his country.

The mother of J. L. Heiberg, the Countess Gyllembourg (1773-1856), was the greatest authoress which Den- mark has possessed. She wrote a large number of anonymous novels, which began to appear in 1828 in her son’s journal, The Flying Post, Her knowledge of life, her sparkling wit, and her almost faultless style, make these short stories, the authorship of which remained unknown until her death, master-pieces of their kind.

Indvig Adolf Bédtcher (1793-1874) wrote only one single volume of lyrical poems, which he gradually enlarged in succeeding editions. He was a consummate artist in verse, and his impressions are given with the most delicate exactitude of phrase, and in a very fine strain of imagination. Most of his poems deal with Italian life, which he learned to know thoroughly during a long residence in Rome. He was the secretary of Thorwaldsen for a considerable time.

Christian Winther (1796-1876) made the island of Zealand his loving study, and that province of Denmark belongs to him no less thoroughly than the Cumberland lakes belong to Wordsworth. Between the latter poet and Winther there was much resemblance, He was, without compeer, the greatest pastoral lyrist of Denmark, Tis ex-

quisite strains, in which pure imagination is blended with most accurate and realistic descriptions of scenery and rural life, have an extraordinary charm not easily described,

The youngest of the great poets born during the last twenty years of the 18th century was Henrik Hertz (1798-1870). He was the most tropical and splendid lyrist of the period, a sort of troubadour, with little of the Scandinavian element in his writing. It is true that in some of his dramas, particularly in Svend Dyring's House, 1837, the themc and plot were taken from Danish history, but the spirit of his poems was distinctly southern. As a satirist and comic poct he followed Baggesen, and in all branches of the poetic art stood a little aside out of the main current of romanticism. In his best pieces, at the same time, he is the most modern and most cosmopolitan of the Danish writers of his time.

It is noticeable that all the great poets of the romantic period lived to an advanced age. Of the ten writers last considered, five died at an age of more than cighty, and the briefest life lasted to the confines of seventy years. This prolonged literary activity—for some of them, like Grundtvig, were busy to the last—hada slightly damping in- fluence on thcir younger contemporaries, and since their day fewer great names have arisen. Four poets of the next generation, however, deserve most honourable mention.

Hans Christian Andersen (1805-1875), the greatest of modern fabulists, was born in very humble circumstances at Odeusein Funen. His life was a struggle for existence, in the course of which he suddenly found himself famous. He attempted lyrical and dramatic poctry, novels, and travels, beforc he discovered the true kent of his genius. In all these branches of literature he escaped failure, but without attaining brillant success. In 1835 there appeared the first collection of his Parry Tales, and won him a world-wide reputation. Almost every year from this time forward until near his death he published about Christmas time one or two of these unique stories, so deh- cate in their humour and pathos, and so masterly in their simplicity. He also wrote, later in life, some excellent novels, The Zwo Baronesses, Only a Player, and others ; his carly story of Zhe Improvisatore, 1835, has also consider- able charm. Andersen was an incessant wanderer over Europe, and the impressions of his travels form a series of interesting, if egotistical, memoirs.

Carl Christian Bagger (1807-1846) published volumes in 1834 and 1836 which gave promise of a great future,—-a promise broken by Jris early death. Frederik Paludan- Miller (1809-1876) survived much longer, and slowly developed a magnificent poetical career. He is one of the greatest names of Danish literature. His mythological dramas, his great satiric epos of Adam Lomo (1841-48), his comedies, his lyrics, and above all his noble philosophic tragedy of Kalanus, prove the immense breadth of his com- pass, and the inexhaustible riches of his imagination.

The pocts completcly rnled the literature of Denmark dur- ing this period. ‘There were, however, some emincnt men in other departments of letters, and especially in philology. Rasmus Christian Rask (1787-1832) was one of the most original and gifted linguists of his age. His grammars of Old Frisian, Icelandic, and Anglo-Saxon were unapproached in his own time, and are still admirable. Niels Matthias Petersen (1791-1862), a disciple of Rask, was the author of an admirable J/istory of Denmark in the Heathen Antiquity, and the translator of many of the Sagas. Christian Mol- bech (1783-1859) was a laborious lexicographer, author of the first good Danish dictionary, published in 1833. In Joachim Frederik Schouw (1789-1852), Denmark produced a very eminent botanist, author of an exhaustive

Geography of Plants. In later ycars he threw himself with zeal into politics. His botanical researches were carried on by

Frederik Liebmann (1813-1856). The most famous zoo- logist contemporary with these men was Salomon Dreier

(1813-1842.)

The romanticists found their philosopher in a most remarkable man, Séren Aaby Kierkegaard (1813-1855), one of the most subtle thinkers of Scandinavia, and the author of some brilliant philosophical and polemical works. A learned philosophical writer, not to be compared, how- ever, for genius or originality to Kierkegaard, was Frederik Christian Sibbern (1785-1875).

Of novelists who were not also pocts, only one was great enough to demand noticc,—Andreas Nikolai de Saint- Aubain (1798-1865), who, under the pseudonym of Carl Bernhard, wrote a series of charming romances. We close our brief skctch of the romantic period with the mention of two dramatists, Peter Than Foersom (1777-1817), who produced an excellent translation of Shakespeare, 1807— 1816, aud Thomas Overskou (1798-1873), author of a long scries of successful comedies.

Latest Period.—Three living writcrs connect the age of romanticism with the literature of to-day. Parnto Carl Ploug (born 1813) is a vigorous politician and poet, violently Pan-Scandinavian, and editor of the newspaper Fedrelandet, Meyer Aron Goldschmidt (born 1818) thie life-long opponent of Ploug in politics and journalism, is the author of some novels written in the purest Danish, and with great vivacity and art. Jens Christian Hostrup (born 1818) is by far the best of the younger dramatists, having prodnced between 1843 and 1855 4 series of exquisite comedics, unrivalled in delicacy and wit.

Hans Vilhelm Kaalund (born 1818) is a lyrist of much sweetness and force. He has lately published a good tragedy, Pulvia. Erik Boégh (born 1822) is the author of inimitable songs, vaudevilles, and jeux d'esprit. Christian Richardt (born 1831) is the man of most decided genius among the younger poets. His four volumes of lyrical poems include some exquisite and many admirable pieces. Holgar Drachmann (born 1847) is a young poet, novelist, and painter of amazing fecundity, and great, though still uncertain, promise.

The greatest living Danish zoologist is Johannes Japetus Smith Steenstrup (born 1813). Jens Jakob Armussen Worsaae (born 1821) is an eminent antiquarian. Johan Nikolai Madvig (born 1804) is celebrated as a philologist, and particularly as one of the most eminent of modcrn Latinists. A young disciple of Madvig, Vilhelm Thomsen, has distinguished himself by his researches into the Sclavonic languages. Rasmus Niclsen (born 1809) and Hans Bréchner (born 1820) arc the two most eminent philosophers who have proceeded from the school of Kierke- gaard. In «esthetic criticism no recent writer has ap- proached—in knowledge, catholicity, and eloguence—Georg Brandes (born 1842), who stands alone among the writers of his country as an advocate for the most liberal culture and the most advanced speculation.

Fine Arts.—Within the present century the fine arts have been successfully cultivated in Denmark. Jn painting there has been displayed of late years an increascd power aud varicty. The father of Dauish painting, Nikolaj Abildgaard (1744-1809), was a man of great but rhetorical talent, taught in the French school of his day. Jens Juel (1745-1802), a portrait-painter of the same age, is a great favourite among the Danes. It was, however, Kckersberg (1783-1853) who gave the first real stimulus to the art of the nation. He was the pupil, first of Abild- gaard, afterwards of David in Paris. In a distant and imperfect way he may be said to hold a position analogous to that of Turnerin England. The infinence of this genius has not been entirely beneficial, and while the Danish painters reproduce what they see around them with photos

graphie precision, they are singularly cold in colour and void of imagination. Marstrand (1810-1875) was by far the most richly-gifted of the

pupils of Eckersberg ; his best works are full of brilliant qualities, and would command admiration in any country. Sonne (born 1801) has made himself a name by painting a series of large canvases representing the victories of the Danish people in 1848, and their misfortunes in 1864. He has tenderness and a skill in composition that make up for the absence of greater gifts. Vermehren (born 1823) has shown an eminent talent in depicting the Danes in their country-life, at serious or mournful occasions; he carries stiffness and reserve to their greatest excess, Exner (born 1825) is far more genial and charming, a genre-painter of a high order, full of delicate fancy, and rejoicing in sunlight, humour, and soft gay colours. He has produced a large number of studies of the fast-disappearing habitsand dresses peculiar to the peasants. Dalsgaard (born 1824) has followed the practice of Marstrand with originality and success. Skov- gaard was the most eminent Danish landscape painter. Among the more recent artists the most powerful is Carl Bloch, who has produced some very brilliant work.

In sculpture the single name of Berthel Thorwaldsen (1770-1844) has raised Denmark to a great pre-eminence. As the opponent of the smooth and effeminate style of Canova, Thorwaldsen inaugurated a true revival of the masculine spirit of the ancients. He had an extraordinary fecundity, and conceived designs with such rapidity that he almost abandoned the use of the chisel in his later ycars. All the works he was able to leave he bequeathed to the Danish state. The Thorwaldsen Museum, in which these works were placed, is one of the greatest attractions of the capital, and is truly a national monument. ‘Two disciples of Thorwaldsen’s continued his tradition with ability, and one with a spark of his great genius. The few works completed during the short life of Bissen prove that he possessed very considerable force and imagination. Jerichas had a milder and more common-place talent.

In architecture the Danes have little to boast of. The most picturesque buildings in Copenhagen belong to the style of Christian IV., a sort of Tudor. One of the most important, the palace of Rosenborg, was actually designed by Inigo Jones. A few cathcdral churehes, as those of Ribe and Viborg, deserve attention. The country towns are poorly and monotonously built.

The Danes have a great delight in music. Their first great composer was Christoph Weyse (1774-1842), who represented in music the romanticism of Oehlenschlager in poetry and Steffens in philosophy. The comic operas of Weyse are especially admired. Frederick Kuhlau (1786— 1832) was a talented and a hated rival of Weyse, who put to charming music a great many of Ochlenschlager's lyrical dramas. The two most eminent living Danish composers are Hartmann (born 1805), who is allied to the latest German school, and whom Wagner has warmly commended, and Gade (born 1817), the pupil and friend of Mendelssohn, whose concerted pieces are admired and performed in all parts of Europe. Heise is the best Danish song-writer, a most imaginative and delicate musician.

No good work exists on Danish literature. See, however, Nyrup, Den danske Digtckunsts Historie, 1800-1808, and

On the fine arts the following works may be consulted :— Sam- mendrag af statistiske Oplysninger angaaende Kongeriget Danmark, Copenhagen, 1876 ; Trap (J. P.), Statéstisk-topographisk Beskrivelse af Kongeriget Danmark, 4 vols., Copenhagen, 1857-63; Julius Lange, Nutids-Kunst, Copenhagen, 1873; Carl Thrane, " Danske Komponisten, Copenhagen, 1875 ; E. C. Otté, Scandinavian History London, 1874; N. M. Petersen, Danmarks Histoire 1 Hedenold 3 yols., Copenhagen, 1854-55, (EW. G.)

DEN—DEWN

DENNIS, Joun (1657-1733), a critic and poet of some celebrity iu his own day, was the son of a saddler in London, where he was born in the year 1657. He received the first branches of cducation at Harrow and at Caius College, Cambridge, from which after four years' residence he removed to Trinity Hall. In 1683 he graduated M.A. When he quitted the university he made the tour of Europe, in the course of which he acquired a strong pre-judice against foreign manners and customs, and became confirmed, as was natural in one born and brought up a Whig, in his dislike of foreign Governments. On his return to England he became acquainted with Dryden, Wycherly, Congreve, and Southerne, whose conversation, inspiring him with a passion for poetry, and a contempt for every attainment that had not in it something of the belles lettres, diverted him from entering any profession. He lived for a time ona small fortune he had inherited from an

uncle, but this was soon squandered. Through the patronage of the duke of Marlborough, to whom he had recommended himself by his zeal for the Protestant succession, he obtained a place in the customs worth £120 per annum. After some years, however, his extravagance reduced him to the necessity of disposing of it; but, in selling it, he reserved to himself an annuity for a term of years. Out- living this term, he was in the closing years of his life reduced to extreme necessity.

Dennis was the author of several small poems of little merit, and one or two plays which possess none, though one at least of the latter was received with considerable favour at the time of its production, on account of its hitting the strongest popular prejudice then existing. His tragedy of Love Asserted, produced at Lincoln's Inn Fields theatre in 1704, was fiercely anti-French, and as such met with warm syrapathy and approval. Dennis conceived the insane idea that by writing it he had roused the implacable resentment of the French Government, and amusing stories are told of the precautions he thought it necessary to take in consequence. He is said to have visited the duke of Marlborough, previous to the negotia- tions for the peace of Utrecht, and asked him to secure the insertion of a special clause in the treaty protecting his person from vengeance. On another occasion the appear- ance of au approaching vessel is said to have causcd him to flee to London from a friend's house on the coast of Sussex. His tragedy of Appius and Virginia, produced at Drury Lane in 1709, was unsuccessful. It is memor- able only on account of a peculiar kind of thunder used in the performance, which was both novel and effective. A few nights after the failure of his play Dennis, sitting in the pit, heard the thunder introduced into the tragedy of Macbeth, whereupon he rose and cried to the audience, "They won't act my tragedy, but they steal my thunder."

But for his inordinate vanity, and an infirmity of tempe1 that fell little short of insanity, Dennis might have made some mark in literature as a critic. His reviews of Pope's Essay on Man and Addison's Cato showed considerable discernment and not a little wit; but they were disfigured by bitter personal feeling. As his attacks were almost always on persons of abilities greatly supcrior to his own, like Addison, Steele, and Pope, their replies usually turned opinion strongly against him, irritating his testy temper, and

rendering him a perpetual torment to himself. Pope pilloriedhim in the Dunciad, and in the following epigram—

Should Dennis publish you had stabb'd your brother, Lampoon'd your monareh, or debauch'd your mother,— Say, what revenge on, Dennis can be had?

Too dull for laughter, for reply too mad ;

On one so poor you cannot take the law ;

On one so old your sword you scorn to draw.

Uncag'd then let the harmless monster rage,

Secure in dulness, madness, want, and age.

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At length, after a long life of vicissitudes, he was com- pelled to receive obligations from those whom he had been continually reviling. In the very close of his days a play was acted for his benefit at the little theatre in the Haymarket, through the united interests of Thomson, Mallct, and Pope. It is much to the credit of Pope especially that, notwithstanding the gross manner in which Dennis had calumniated him on many occasions, he took part in the arrangements, and even wrote an occasional prologue to the play, which was spoken by Cibber. Not long after this Dennis died, on the 6th of January 1734. DENON, Dominique Vivant, Baron DE (1747-1825), artist and archologist, was born at Chalon-sur-Saéne on the 4th January 1747. His parents sent him to Paris to study law, but he showed from the first a decided preference for art and polite literature, and he soon gave up his pro- fessional studies. In his twenty-third year he produced a comedy, Le bon pére, which obtained a succés destime, its author having already made himself a favourite in society by his agreeable manners and exceptional conversational powers. He brought himself under the notice of Louis XV. with such address as to establish at once his position in court favour. The king intrusted him with the collec- tion and arrangement of a cabinet of medals and antique gems for Madame de Pompadour, and subsequently

appointed him attaché to the French embassy at St Petersburg. On the accession of Louis XVI. Denon was transferred to Sweden; but he returned, after a brief interval, to Paris with the ambassador M. de Vergenues, who had been appointed foreign minister. In 1775 Denon was sent on a special mission to Switzerland, and availed himself of the opportunity to visit Voltaire at Ferncy. He took a portrait of the philosopher, which was engraved and published on his return to Paris. His next diplomatic appointment was to Naples, where he spent seven years, first as secretary to the embassy and afterwards as chargé Vafaires. He devoted this period to a careful study of the monuments of ancient: art, collecting many specimens and making drawings of others. He also perfected himself in etching and mezzotinto engraving. The death of his patron, M. de Vergennes, in 1787, led to his recall, and the rest of his life was given mainly to artistic pursuits. On his return to Paris he was admitted a member of the Academy of Painting. After a brief interval he returned to Italy, and resided for some years chiefly at Venice. He also visited Florence and Bologna, and afterwards went to Switzerland. While there he heard that his property had been confiscated, and his name placed on the list of the proscribed, and with characteristic courage he resolved at once to return to Paris. His situation was critical, but ..v found support and protection in the friendship of the painter David, who obtained for him a commission to furnish designs for republican costumes. This he did to the satisfaction of the Revolutionists, and his name was removed from the list of emigrants. When the terrors of the Revolution were over, Denon was one of the numerous band of eminent men who found a congenial resort in the house of Madame de Beauharnais. Here he formed the acquaintance of Bonaparte, to whose fortunes he attached himself with the happy instinct of one who was always quick to discern the coming power. On the special invitation of the general he joined the expedition to Egypt, and thus found the opportunity of gathering the materials for his most important literary and artistic work. He accompanied General Desaix to Upper Egypt, and made numerous sketches of the monuments of ancient art, some- times under the very fire of the enemy. The results were published in his Voyage dans la basse et la haute Egypte (2 vols. fol., with 141 plates, Paris, 1802), a work which crowned his reputution both as an archeologist and as an

artist. In 1804 he was appointed by Napoleon to the important office of director-general of museums, which he filled greatly to the benefit of art and artists until the restoration in 1815, when he had to retire. He was a devoted friend of Napoleon, whom he accompanied in his expeditions to Austria, Spain, and Poland, taking sketches with his wonted fearlessness on the various battle-fields, and guiding the conqueror in his choice of spoils of art from the various cities that were pillaged. After his retirement he occupied himself with the preparation of a profusely illustrated history of ancient and modern art, in which he had the co-operation of several skilful engravers. He died at Paris on the 27th April 1825, leaving the work unfinished. It was published posthumously, with an ex- planatory text by Amaury Duval under the title J/onuments des Arts du dessin chez les peuples tant anciens que modernes, recuetllis par Vivant Denon (4 vols. fol. Paris, 1829). DENTISTRY. The province of dentistry embraces the art of treating diseases and lesions of teeth, and supplying artificial substitutes in the place of these organs when lost. Disease of the teeth is not always a mere local affection, but may, and very generally does, arise from constitutional causes. With cases of the latter description the dentist, unless qualified as a surgeon or physician, is not in a posi- tion to deal, except in so far as to repair or ameliorate the local affections produced. The morbid conditions of the system leading in some way to disorders of the dental tissues are, various and dissimilar in their nature; and the exact connection between such morbid conditions and their effects upon the teeth is not well understood. In this way the diagnosis, the treatment, and the removal of the cause might be considered more properly the duty of the general practitioner than of the speeialist. Up to a very recent date this has becn more particularly the case, dentists until lately having in the greatcr number of instances becn educated with a view to proficiency in the mechanical rather than the surgical department of their profession ; while what surgical knowledge they, in a few cases, did acquire was confined to certain facts connected exclusively with the organs upon which they were expected to operate. From the Lancet for 3d June 1876 it appears that not much more than fifty of all the numerous body of so- called surgeon-dentists of the United Kingdom then pos- sessed in reality any medical or surgical diploma at all.”

1 Jndeed it is comparatively of late years that dentistry has occupied anything like a properly recognized position among the different departments of minor surgery ; for long it was practised to a large extent as a superadded means of livelihood by persons engaged in some other pursuit, and without any professional education whatever. The blacksmith, barber, watchmaker, and others of the same class were the dentists of every village and country town; while even in some of our larger cities dentists of the kind were till lately to be found practising under the very shadow of universities and medical schools. The explanation of this seems to have been that mere tvoth- drawing constituted the surgical dentistry of these days ; and as the operation is one demanding muscular strength and manual dexterity more than anatomical knowledge or surgical skill, and was performed as successfully in many cases by the irregular as by the regular practitioners, it had not many attractions for medical men. It was accordingly consigned to the uneducated and the charlatan, who did not fail with proverbial unscrupulousness to parade their specialty as sufficient to confer a surgical status on those performing it, and entitle them to the designation of surgeon dentist,—a designation which has ever since been applied without discrimination or distinction to qualified or unqualified practitioners in this particular branch. In 1840 or 1841 this state of matters seems to have attracted the atten- tion of the profession, since, after much consideration, some anxiety was manifested by its more respectable members to be recognized in the new Medical Act of 1843, then being introduced by Sir James Grahan. Both then and later, however, the fully qualified medical men objected to the fractionally qualified being made to appear as on an equal footing with themselves. The profession may at this time be said to have divided itself into three sections—Ist, those who desired to see all dentists fully qualified surgeons ; 2d, those who wished them to have only a certain amount of surgical knowledgs,

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A special examination in dentistry now exists in connec- tion with the Royal College of Surgeons of England for students training in that profession, a certain amount of in- formation being required in various branches of medicine and surgery. Acurriculum of studyin these departments has been arranged ; and candidates who can produce

certificates of attendance on itare admitted for examination, and, if found fit, receive a certificate entitling them to practise as dentists.

In America this special system has for long been adopted and carried to a much greater extent. Colleges of dentistry are established in many of the leading cities therc, each with what they designate a faculty of professors in the various departments of the art. In the Dental Cosmos, vol. xvii. No. 11, an American periodical, advertisements appear of seven different dental colleges, with seventy- eight professors, demonstrators, &c. The professorships in these institutions comprehend those of mechanical dentistry, operative dentistry, dental physiology, dental pathology, dental therapeutics, mechanical dentistry and metallurgy, institutes of dentistry, &c. In each a diploma in dentistry —“doctor of dental surgery,” or of “ dental medicine,” as the case may be—is conferred, the general fec for which seems to be $30, on the candidates having fulfilled the curriculum and passed the examination,

In the medical schools and examining boards in Scotland all this is different. No special or partial diploma is there given by the Itoyal College of Surgeons or other licensing body, while diseases of the tceth and adjacent structures are understood to be made subjccts of lecture and examina- tion in the same manner as other regional or special diseases occurring in the practice of medicine or surgery ; and great as the improvements certainly are which such arrangements as those of England and America are ou the old system, still it is to be hoped, and it is likely, that ere long practitioners devoting themselves to dental surgery will—like oculists, or aurists, or obstetricians, or othcr physicians or surgeons restricting themselves to or selecting one branch of practice in preference to another— be at the same time fully qualified medical men.

Number of Teeth.1—The complement of teeth in the adult human subject amounts to 32—16 in the upper, and 16 in the lower jaw. These are divided into what are termed in- cisors, canines, bicuspids or small grinders, and molars or the large grinding teeth. The order in which these different forms of teeth are placed in each jaw is the following :— there are four incisors in front; immediately behind these on each side is placed the canine or eye tooth; next come tlle bicuspids, two on each side; and behind these again

are placed ou each side the three molar teeth, the last of which is sometimes termed the wisdom tooth, from its gene- rally appearing so latc as from cightcen to twenty-five.

Tn the infant or milk teeth, or, as they are more pro-

and in this way to be subordinate to fully qualified practitioners ; and vd, those who advocated dentists being altogether dissociated from surgeons, and having a college and a diploma of their own. The old tendency, however, of desiring to appear a kind of surgeons here again s-emed to predominate, as the idea of the dental college and diploma was abandoned for the prospect of being attached in some way or other to the Royal College of Surgeons of Inngland. The difficulties then presented, however, were not few, and many of them are found still to exist. A full medical or surgical education was always deemed desirable by those best able to judge of it, but the obstacle had been the mechanical acquirements which dentistry required and which wonld have to be added to a surgeon's qualifica- tions, an arrangement entailing a very protracted period of education. The scheme of partial surgical instruction, again, did not give the title to registration as qualified practitioners and both schemes were held to entail considerable hardships on provincial candidates, owing to the prescribed classes and constituted examining boned being exclusively confined to London. All these representations were, liowever, set aside and in 1858 the dental certificate of the College of Surgeons of England noticed above was established piel

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perly denominated, the temporary teeth, the number and class of these organs is different. Here only 20 members of the series exist, and are divided into four incisors, two canines, and four molar teeth, similarly placed—ten in each jaw. The four temporary molar teeth represent or rather precede the four bicuspid teeth of the adult set, while the six molars above

and below of the adult are not: repre- sented in the temporary set at all. In other words, the true permanent molar teeth have no predecessors,

Dentition.—The temporary set appear, or are cut, as follows. The two lower central incisors appear between the sixth and eighth months of infant life—these are generally succeeded in a few weeks by those of the upper jaw ; the two lateral incisors of the upper jaw next appear about the eighth or ninth month, and those of the lower jaw quickly follow; the anterior molars of the lower jaw are cut about the twelfth, fourteenth, or sixteenth mouth, and those of the upper jaw immediately after ; the canines appear about the seventeenth or eighteenth month, generally those in the upper jaw first; and before the age of two and a half years tlie second milk molars have usually com- menced to appear, thus completing the temporary set of teeth at the age of about three years.

The temporary sct of teeth begin to be shed between the sixth and eighth years of life. Previous to this, however, the first permanent molars are cut, gencrally about the age of seven. These are followed by the central and then by the lateral incisors. Next come the anterior bicuspids about nine years old; the posterior about’tcn or eleven ; the canines about twelve ; the second molars at thirteen ; and the last molars, or wisdom teeth, from the eighteenth to the twenty-fifth years of life. Deviations from the order and time of appearance of both sets occur, but the above may be regarded as the gencral rule in the evolution of the termporary and permanent teeth of the human subject.

Structure and Form of Teeth.—The structure of both sets may be saidto be the same. The body of each tooth is composed of a dense bony substance termcd dentine. This is invested on the crown by a cap of still more dense material termed enamel ; while the root, or fang, is coated externally by a layer of a softer substance, closely resemb- ling ordinary bone, and termed cement. In the centre of each fang, and extending into the body of the tooth, is a hollow canal termed the pulp cavity, for the passage of vessels and nerves.

In form the incisors of both jaws are single-fanged, as arc also the canines. The bicuspids of the lower jaw arc also single-fanged, while those of the upper jaw are occa- sionally double-fanged, or have a single fang bifid at its

extremity. The lower molars, both temporary and _per- manent, possess two fangs, one beltind the other. These two fangs are widcly separated in the temporary molars ; while, on the other land, in the postcrior molars of the permanent sct they are not uncommonly united into one. The upper molars of both sets possess three fangs—two external or cheek fangs placed one behind the other, and a third situated on that side of the tooth next the palate.

No such spaces exist between any of the teeth in the dental arch of man as occur in the lower animals. In this way, where the jaw is small, or where unusually rapid or simultaneous appearance of the members of the second, or persistence of those of the first set occurs, irregularity of the teeth results. This is sometimes increased by the evolution of supernumerary tecth, these being generally out of the line of the others; and occasionally matters are rendered worse by the natural tceth being themselves of unusually large size. Cases also occur in which the number of the teeth is defective, and some rare instances have been recorded where these organs never appeared at all.

The remedy in cases of dental irregularity is to remove

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by extraction such teeth as are in the way, and by mechanical contrivances, known as regulating plates, to apply pressure in such a manner as will move the misplaced tooth or teeth into their normal position, and retain them there for sometime afterwards. Such plates are constructed on the same principles, and of the same materials, as the bases of artificial sets, which will come to be treated of afterwards. It not unfrequently happens that nature, if left to herself, effects a wonderful improvement in cases of dental irregularity. This is frequently observable where it is the upper canines which are misplaced. These teeth when appearing, as they often do, outside and much above the necks of the adjoining teeth, occupy a long time in descending, and in certain cases the anterior portion of the maxillary arch seems to enlarge sufficiently to afford space for their almost perfect arrangement during this period. The same thing occurs, but to a Jess marked extent, in the case of other teeth; in general, however, nature requires to be

assisted by art in some way, as has been above indi- cated, where the irregularity exists to any great amount.

Diseases of Teeth.—The teeth being living organisms are, like other structures in the animal body, subject to disease. Some of the diseases bear a close resemblance to mere chemical decomposition, such as occurs in dead or inorganic matter, and at a certain stage of some dental affections a pro- cess of the kind does no doubt occur ; but this isso mixed up with, and accompanied and preceded by vital action, that to consider it as a mere chemical or physical lesion would be pathologically incorrect. Various arguments have been advanced by its advocates in support of the chemical theory of deutal caries; but however ingenious or specious these at first sight appear, they fail to explain many phenomena in the origin, the period of occurrence, and the stages and progress of this disease, unless the vital element in its nature be also taken into account.

Dental caries, or decay of the teeth, may briefly be described as consisting in a previous imperfect development, or in the access of some morbid action interfering with the nutrition or vitality of their tissues, thus rendering them liable to any destructive agencies to which they may be subjected, by which they become disorganized, disintegrated, and broken down, leaving the sensitive pulp exposed, whereby acute pain is occasioned, especially when the destruction of the protective tooth substance has been rapid. Sometimes the process of decay is insidious and unobserved. Its advent is then supposed to have been sudden, and its progress more speedy than has really been the case. This, however, in many instances arises from the condition of matters being overlooked until the enamel, which resists destruction longest, being undermined and falling in, reveals for the first time the cavity existing un- derneath. Pain, probably also for the first time, is then experienced from exposure and irritation of the dentinal pulp, and toothache, as it is termed, is produced.

Necrosis, or death of a whole tooth, is another lesion to which these organs are liable. This may result from either acute or chronic inflammation in the tissues connecting them with the jaw, or from a blow, or from any other cause leading to their vascular supply being cut off. The necrosis may involve the whole tooth, or it may be partial —as, for example, where it is

limited to one fang of a multiple fanged tooth. In these cases there may be no breaking down of texture, but the tooth becoines discoloured, loosened, extruded, and at last detached from its socket, from which after a time, and generally after considerable uneasiness, it drops out.

Exostosis, or a morbidly increased growth of certain parts of a tooth, being in almost every instance confined to the cement substance described as covering the fang or Toot, 1s an affection somewhat obscure in its outward

symptoms. It is generally a consequence of previous disease of the tooth, leading to chronic inflammation of the textures covering the fang and lining the socket (or alveolus) in which it is implanted. This leads to a deposi- tion of new material in the cement till that substance appears in nodular masses attached to or surrounding the apex uf each fang, and sometimes uniting several of such fangs into one. The presence of this additional and in- creasing bulk of hard tissue within the inclosing socket produces pain of a severe and somewhat anomalous charac- ter by pressure on the adjacent nerves, which is often mis- taken for neuralgia or tic of a less unaccountable origin. It further acts within the unyielding bony socket referred to asa means of rendering removal of the tooth much more difficult, owing to the bulbous extremity of the enlarged fang acting like a rivet in its fixation. Generally, however, the teeth in which exostosis occurs have been too long the subjects of irritation and decay not to be suspected when obscure pain of a less localized nature exists in their vicinity; and not unfrequently there is found round the necks of teeth or stumps so affected a red and tumified con- dition of the gum, sufficiently indicative of the state of matters below to warrant their extraction.

Alveolar abscess, or gum boil, as it is popularly denomin- ated, is a localized inflammation going on to suppuration, and generally confined to the tissues surrounding the apex of a tooth fang. The pain usually commences with a feel- ing of tenderness and enlargement or lengthening of the whole tooth. The gum becomes swollen and tender over the whole depth of the root, generally to a greater extent on the outer side of the jaw. The face also becomes swollen, and the glands in the neighbourhood of the jaw feel enlarged and tender. The pain is not commonly con- tinuous, but

rather remitting in its character, sometimes ceasing altogether—only, however, to be followed by an in- creased attack, while its repeated exacerbations night and day lead in many cases to very considerable constitutional disturbance. After a time the purulent matter secreted makes its way to the surface, sometimes finding an escape alongside of or through the pulp cavity of the fang, and very frequently, as the name given to the disease indicates, by pointing and discharging itself through the gum.

Occasionally, instead of pointing on the surface of the gum, the matter takes a more indirect course and points on the surface of the cheek, bursting and leaving an open sore there which seldom closes until the tooth or stump has been extracted. At an early stage of this disease fomenta- tions and other modes of relieving inflammatory action do good, but evacuating the matter by means of incisions or extraction of the offending tooth are the only reliable remedies at a later period.

Teething.—What is termed dentition, although in its widest sense properly including the development of the teeth within, as well as their subsequent appearance through, the superimposed tissues, is generally restricted in its application to the latter division of this process, more especially as it occurs in connection with the temporary or milk set, during the period of early infancy. The genesis, increment, and evolution of these organs involve so much of what is purely physiological, and would entail the discussion of so many points of a histological nature, that only the latter stages of evolution or cutting of the teeth can be referred to here. Regarding this occurrence, the most vague and contradictory opinions have been enter- tained. Erroneous notions of its nature, and of the exact manner in which to account for many of its phenomena, have been and still are promulgated. A number of morbid affections incident during infancy are set down as clearly attributable to the tooth’s penetration of its inclosing tissues, and considered by many authorities as of every day

occurrence ; while the views advanced with reference to the pathology and treatment of such cases, suppositional or otherwise, are equally various aud

conflicting. The pro- bable solution of the difficulty seems to be that, while evil consequences may in certain instances be traceable to dentition, the frequency and importance of such cases is very much exaggerated.

Extraction.—This constitutes the most important opera- tion of a surgical nature falling under the care of the dentist, and is chiefly called for where the condition of the tooth, from disease or injury, precludes the possibility of saving it by stopping or other means. The operation is also frequently resorted to where the teeth are too crowded in the jaw, or where they are irremediably misplaced, or where super- numerary members of the series exist and occasion incon- venience. In order to extract any tooth successfully, there is demanded a knowledge of what its configuration normally ought to be, and of the proper instrument to use ; and, along with these, the condition to which decay or other disease may have reduced the tooth must be kept in mind while proceeding with the operation.

Inu seizing a tooth in order to its extraction the part upon which the hold is taken should be sufficiently sound and strong to withstand the force necessary for dislodging the fangs; and to obtain such a hold it is necessary to thrust the grasp of the instrument as far as possible beyond the spot affected by decay. It should then be detached from the walls of its socket in that direction where least resistance is likely to be met. This must be judged of according to circumstances, but in general is indicated by an acquaintance with the anatomy of the structures concerned, After being thus loosened it has merely to be lifted from the jaw to complete the operation. Sometimes a tooth is so firmly secured in the jaw that its own tissue will give way before it will separate from the alveolar cavity in which it is fixed. This is particularly the case in friable teeth; and frequently even in the strongest teeth the root or fangs may be malformed or bent, or secured in such a manner as renders their extrac- tion extremely difficult or altogether impossible by any ordinary means.

The instruments employed in extraction may be divided into those which grasp the tooth between their blades and literally extract or draw it out, such as forceps, and those which apply the dislodging force by acting as a lever in the manner of a crow bar, such instruments being termed elevators. The key, an instrument of great power, but now very properly almost disused,

partakes in a measure of the properties of both these instruments, but that in a very imperfect and disadvantageous manner. In some rare cases, however, it may be found of much service when used with circumspection. It is impossible here to enter into detail regarding the different forms of forceps, elevators, and other instruments required in dental surgery ; but one great principle may be laid down with respect to all of them, which applies especially to forceps, and that is that their form should be as simple as possible consistently with fitting and grasping securely the particular tooth they are intended to remove, and with conveniently reaching that part of the mouth in which it is situated.

Regulation of Teeth.—Iu the extraction of teeth for the purpose of affording space in cases of dental irregularity from overcrowding, it often becomes necessary to remove a healthy organ, and before doing so among the permauent teeth certain questions present themselves for consideration. Unless there be a fair probability of such a step being suc cessful it endangers the loss of two teeth should the originally misplaced sne be so objectionable and so unyield- 1ug to treatment as to require this. In the temporary set the principal disadvantage connected with the removal of

any of their number is when to make room for one per- manent tooth two or more temporary ones would require extraction,—as of course space is thus provided at the expense of the second permanent tooth, for which one of the two temporary ones was keeping a place. In this set, however, the objection to removal of any of its series is greatly obviated by the fact that, while the teeth are very soon to be lost at all events, the jaw is increasing in size and progressively affording more and niore room itself for the incoming second set. Along with extraction, in the great majority of instances pressure requires to be applied to the misplaced teeth in order to effect their regulation. This has generally to be continuously kept up for a con- siderable period, and in many cases requires to be main- tained after the teeth have been restored to their natural position in order to keep them there until they seem settled in the new locality. Various forms of what are called regulating plates are used for the purpose of applying pres- sure in this manner, and may be said generally to consist of a framework fitted and

fixed to the adjoining teeth something in the same manner as an artificial set, and cal- culated to afford a fixed point or fulerum from which to act on the tooth to be moved.

In disease of the dental tissues it is not always necessary to remove the affected organ ; such an extreme measure as this is only called for when other remedial means have failed, or appear hopeless. The chief of all dental diseases demanding the dentist's care is, as has been already stated, that known as caries, or decay. It is this affection directly or indirectly that leads to by far the larger number of ex- tractions performed ; but it by no means follows that extraction is the only remedy at our command. Many teeth are extracted which might be saved, and the principal method by which this can be effected is by what is termed stopping, or plugging, or filling the teeth.

Stopping.—The operation of stopping adecayed tooth con- sists in cleaning out the carious cavity and removing all the softened or disintegrated tissue, and shaping and trim- ming it so as to reduce it to a form fit for receiving and retaining the material with which it is to be filled up. Along with these proceedings it in general becomes necessary to diminish the sensitive condition in which the interior surface of the prepared cavity is left, to remove or destroy any of the vascular and highly nervous pulp which may be protruding into it, and to subdue any inflammation and arrest any discharge which may have been going on in the fang. Various applications and other remedial measures are resorted to for these purposes, the most common being the applying for a time some of the more convenient escharotics on a plug inserted into and left within the cleaned-out cavity till this end is achieved. When thus prepared, the cavity is ready to be filled with whatever substance has been selected to replace the lost tissue, and as nearly as possible to restore the contour of the tooth. The substances employed as permanent stop- pings are generally metallic. Gold in the form of foil, or in that condition known as sponge gold, tin in the form of foil, and amalgams, composed of various metals either ina simple or compound condition combined with mercury, are the principal materials in use as stoppings. The oxychlorides, from their being capable of insertion in a plastic state, and quickly acquiring a density and hardness approaching that of tooth bone, are also favourites with many as serviceable fillings ; and

various preparations of gutta-percha, gum resins, sulphur, and other matters have long been known as valuable, though not very durable, when employed in certain cases.

Dexterity in the insertion of a gold or other foil filling is a matter which can be acquired by experience alone. The general principles are that, the cavity being prepared and

shaped as already described, the gold plug should be secured and consolidated piece by piece, until there is built up a mass filling every part of the vacant space with a uniform consistency of metal which, when finished, ought to present the feeling of being as hard as a piece of solid gold.

” ‘The other fillings are more easily dealt with. The same careful preparatory steps are requisite in all fillings, but the insertion of the plug inamalgam and other stoppings being performed while the material is in a plastic condition, the process is rendered much more simple. The cavity should be completely filled, but uot over-filled, and the amalgams ought to be used with as little mercury as is at all possible. A number of instruments are necessary for effecting all these various manipulations, but to describe them here would be as unintelligible as it appears unnecessary. Excavators, enamel cutters, burr head drills, points, pluggers, burnishers, &c., are only some of those required ; while their modes of use are either by the hand or by mechanical-apparatus, such as what are termed burring- engines, &c. Stopping may be regarded as one of the most valuable operatious in modern dentistry ; and although it is no guarantee that the tooth stopped is ever after safe from the renewed attack of caries any more than its unstopped neighbours are from its original attack, yet it is surprising how few well-filled teeth are lost by caries recommencing in the stopped cavity.

Besides those already mentioned, the teeth and jaws are subject to a number of disorders aud lesions which it would be out of place here todo more than enumerate. Fracture and dislocation of the teeth, ulceration and absorption of the gum, uecrosis and exfoliation of the jaw, alteration in the secretions of the mouth, the deposit of tartar or salivary calculus on the teeth or in the

salivary ducts, the effect of various medicines and poisonous agents on the teeth, jaws, and mouth generally,—these and the like matters are all of much interest, and more or less connected with dentistry proper. But for information in regard to them the reader must be referred to the various excellent publications treat- ing of them, which have appeared in considerable numbers since dental surgery has occupied more notice and taken a place as one of the recognized specialities of medicine.

Mechanical dentistry, properly so called, consists in the construction of artificial substitutes to supply the place of lost teeth. Stopping and such like operations might also be classed with mechanical dentistry as contrasted with purely surgical treatment ; as yet, however, these matters are not quite decided; and the day when the dental surgeon and the mechanical dentist—like the ophthalmic surgeon and the optician—should each occupy a separate sphere has not arrived. All that can here be given is a mere outline of the principles involved in mechanical dentistry. The subject is one comprehending a knowledge of many depart- ments of mechanical ssience ; and to do more than indicate the nature of the various modes of construction, and the processes carried on in the manufacture of artificial teeth, would be useless-and inexpedient.

The removal of roots and stumps as a preparatory step in the fitting of artificial teeth isa matter to be decided by the circumstances of the case. The length of time which can be afforded for cicatrization and absorption of the alveolar walls and gum ; the presence of adjoining teeth to be left standing, especially front teeth; the fitness of the patient for the operation of extraction,—these and other circumstances niust determine what amount of surgical preparation is to precede the supplying of false teeth. As a general rule, the clearer the gums are of stumps and decayed teeth the better ; but at the same time certain ad- vantages, transitory as they may be, are in some instances to be derived froni their retention.

The jaw, gum, and teeth being then considered as in a suitable condition, the first step in the process is to obtain a plaster cast of the parts,—“ the model,” as it is termed. This is done by pressing softened beeswax or some similarly plastic composition against them until they are imbedded and leave an impression in it, giving an exact mould of the gumis, remaining teeth, and all other parts on its removal. Plaster of Paris is now run into the mould so obtained, and when this is set and hardened a perfect facsimile of the structures to be fitted is the result.

Any further proceedings now depend upon the mode and material in which the future artificial set is to be cou- structed. Every set of artificial teeth consists of represcn- tatives of the lost organs, modelled in a species of porcelain, and mounted upon a base adjusted to the gum and remain- ing natural teeth. This base is manufactured in a variety of materials, the principal of which are—(1) metal plate, of gold, platinum, silver, or different alloys; (2) vulcanized caoutchouc, or vulcanite, as it is called; and (3) celluloid base, a composition of collodion and camphor, which has not been long enough tested as yet to rank with the other substances; while (4) the teeth may be mounted merely with as much extraneous material as will support a pin or pivot by which they may be attached as new crowns to a root in which such pivot is firmly inserted. When it is intended that the base shall be of gold or other plate, a metal die and counter have to be made from the plaster model, between which dies the plate is embossed, and the requisite form obtained. The die and counter die are generally made the one in zinc or gun metal, the other in lead or tin; and—unlike the dies from which jewellery patterns, &c., are embossed, and which may serve for thousands of times—the dental dies, having served to emboss the plate for one patient, are of no further use for any other case. The plate being thus far advanced next requires to be adjusted to the mode in which the patient closes the opposing jaw or teeth against it in shutting the mouth~-in other words, the “‘bite” has to be taken, and the artificial teeth, which are to be mounted on the plate, arranged accordingly. Any fastenings supporting or steady- ing the set have also to be adjusted; and after this, if every- thing

has gone well, the false set should be ready for placing in its destined locality and for use by the wearer.

Should it be proposed to make the base of vulcanite, celluloid base, or a similar material, a different mode of procedure must be adopted. These materials necessitate a greater bulk of substance occupying the mouth than is the case where metal plate is employed. This, however, is in some cases an advantage—since, for instance, where the gum has been greatly diminished in size through absorption, it requires some bulk of material to restore the parts to their normal size, and to give the former natural expression to the features. In preparing a vulcanite base no metal die is necessary. The base is built up in wax directly on the plaster model, and the porcelain teeth adjusted in their places, the bite and attachments being carefully attended to, as described in speaking of plate cases. The set thus made np, and presenting the exact counterpart of what the finished work is intended to be, is now, after testing it and finding it correct and perfect in the mouth, imbedded in Paris plaster as follows. A small box, or “ flask,” as it is denominated, of iron or other metal, like one saucer inverted on the top of another, is opened and the model with the wax-built set on it is placed in the lower saucer, which is then filled up with plaster to the level of the wax set. This being allowed to harden is soaped or oiled all over its surface, and the lid of the flask, or what corres- ponds to the upper saucer, is now placed upon the under portion of the flask. An opening in this covering portion enables plaster to be next poured into it till the inclosed

wax-mounted set is shut up like a fossil in the heart of its stony covering. On the two halves of the flask being separated, the set of course remains firmly secured in the lower portion. Boiling water is now poured over it, and the wax thus melted out, leaving the porcelain teeth undis- turbed and in situ. A cavity is thus left when the two sides of the flask are again closed, representing exactly the form of the wax removed. Raw vulcanite, or whatever other material of the kind is to be used, is now introduced with care into the space thus left by the removal of the wax. The two sides of the flask are next brought together and maintained there by the pressure of a clamp and screw. ‘The whole is then placed in a vessel termed a vulcanizer,

where it is subjected, for the space of from an hour and a quarter to two hours or more, to tlie action of steain at a temperature ranging up to 320° Fahr., at the end of which time the piece will be found hard and ready for finishing and polishing as may be desirable. In firing and manipulating the celluloid base some modification of this process is required, but as yet the substance is com- paratively little used, and would scarcely justify further remark in this place.

What is termed a pivot tooth, again, is an artificial tooth having a metal or sometimes a wooden pin firmly attached to it; and this being inserted into the opened pulp cavity of a healthy fang, the artificial forms a secure aud very perfect substitute for the original crown when destroyed by caries, broken off, or otherwise lost.

The use of artificial teeth, especially by those previously unaccustomed to them, requires considerable practice and no small amount of perseverance. The larger the artificial set,—that is, the greater the number of teeth replaced,— the greater the difficulties and the more the discomfort ex perienced. Time, however, works wonders here as in many other instances. It is not an uncommon thing to find a set which never has fitted well, or one which owing to many years of use does not fit well, being felt so com- fortable, through mere habit of wearing it, that on a new and perfectly fitting set being made, the old one, with all its faults, is preferred to the other. A few days' wear, however, of the new one generally brings all the short- comings of the old glaringly out on its being again attempted to be worn. And in the same manner, a week or two's perseverance generally enables any ordinary set to be worn and used with comfort and facility even by patients who are for the first time under the dentist's care. Various modes of fixation are adopted for the retaining of artificial teeth in their proper situation. Atmospheric pressure, or "suction," as it is termed, is the simplest of all, being merely the hold established between the palate and the set in the same way as occurs between a wet leather "sucker " and the stone it lifts. Another method is by what are termed "spiral springs," a mcde only applicable, however, where both an upper and lower set are worn at the same time. Anda third style of fixation is where the set is supported upon certain natural teeth among those remaining in the patient's jaw. Each mode has its own advantages, and sometimes one or other method is the only one

at all possible to be adopted. This, however, is seldom a difficult matter to decide by any one who has had much on of either the operating room or the dental work- shop.

The art of dentistry is difficult to acquire, and com- prehends in itself processes appertaining to several separate branches of manufacture. It is, however, an art which 1s an extremely useful one, and has done valuable service, since it is not too much to say that in all probability many lives have been saved and a still greater number

prolonged through the instrumentality of the aid afforded by the use of artificial teeth.

Literature of the subject and authorities on Dental Surgery.— Goodsir, Edinburgh Medical Journal, 1838; Heath, On Discases of the Jaws, 1868; Owen, On the Skeleton and Tceth, 1855; Tome's Dental Surgery, 1873; Taft's Operatwe Dentistry, 1877; Salter's Dental Pathology, 1874; Smith's Dental Anatomy and Surgery, 1864, and various papers in Edinburgh Medieal Journal, Proceedings of Royal Society of Edinburgh, &c., from 1852; Cole's Dental Mechanies, 1876 ; Waldeyer, in Stricker''s Handbuch, 1870 ; Turner's Human Anatomy, 1877 ; Richardson's Mechanical Den- tistry, 1860; Wedl's Pathology of the Teeth, 1860; various papers, by Kolliker, Arnold, Boll, Robin and Magitot, Huxley, &c., in British and Continental journals. (J. S.*)

DEODAND (Deo dandum), in English law, was a personal chattel (any animal or thing) which, on account of its having caused the death of a human being, was forfeited to the king for pious uses (omnia, quee movent ad mortem, sunt Deodanda,—Bracton). 'It seems to have been originally designed," says Blackstone, "in the blind days of Popery, as an expiation for the souls of such as were snatched away by sudden death, and for that purpose ought properly to have been given to holy church—in the same mauner as the apparel of a stranger who was found dead was applied to purchase masses for the good of his soul." The parallel usages mentioned by Blackstone himself would seem, however, to point to much more primitive ideas. He quotes the rule of the Mosaic Jaw " that, if an ox gore aman that he die, the ox shall be stoned and his flesh shall not be eaten ;" and the Athenian law that "' whatever was the cause of a man's death by

falling upon him was exterminated, or cast out of the dominions of the republic.” 1 In these and similar usages the notion of the punishment of an animal or thing, or of its being morally affected in some way by the fact of its having caused the death of a man, seems to be implied. The forfeiture of the offending instrument in no way depends on the guilt of the owner. If another kills aman with my sword, the sword is forfeit. If a man’s death is caused by pure accident, the thing or animal which is the immediate occasion of it is forfeit. The imputation of guilt to inanimate objects or to the lower unimals, repugnant as it is to our habits of thought, is not inconsistent with what we know of the ideas of uncivilized races. In English law, deodands came to be regarded as mere forfeitures to the king, and the rules on which they depended were not easily explained by any key in the possession of the old commentators. The law distinguished, for instance, between a thing in motion and a thing stand- ing still. If a horse or other animal in motion killed a person, whether infant or adult, or if a cart run over him, it was forfeited as a deodand. On the other hand, if death were caused by falling from a cart or a horse at rest, the law made the chattel a deodand if the person killed were an adult, but not if he were a person below the years of discretion. Blackstone accounts for the greater severity against things in motion by saying that in such cases the owner is more usually at fault, an explanation which is doubtful in point of fact, and would certainly not account for other instances of the same tendency. Thus, where a man’s death is caused by a thing not in motion, that part only which is the immediate cause is forfeited, as “if a man be climbing up the wheel of a cart, and is killed by falling from it, the wheel alone is a deodand ;” whereas, if the cart were in motion, not only the wheel but all that moves along with it (as the cart and the loading) are forfeited. A similar distinction is to be found in Britton. Where a man is killed by a vessel at rest the cargo is not deodand ; where the vessel is under sail, hull and cargo are both deodand. For the distinction between the death of a child and the death of an adult Blackstone accounts by suggesting that the child “was presumed incapable of

1 Compare also the rule of the Twelve Tables, by which an animal which had inflicted mischief might be surrendered in lieu of com- pensation.

actual sin, and therefore needed no deodand to purchase propitiatory masses ; but every adult who died in actual sin stood in need of such atonement, according to the humane superstition of the founders of the English law." Sir Matthew Hale's explanation was that the child could not take care of himself, whereon Blackstone asks why the owner should save his forfeiture on account of the imbecility of the child, which ouglit to have been an additional reason for caution. The finding of a jury was necessary to constitute a deodand, and the investigation of the value of the instrument by which death was caused occupies an important place among the provisions of our early criminal law. It became a necessary part of an indictment to state the nature and value of the weapon employed—as, that the stroke was given by a certain penknife, of the value of sixpence—so that the king might have his deodand. Accidents on the high seas did not cause forfeiture, being beyond the domain of the common law ; but it would appear that in the case of ships in fresh water, the law as quoted above from Britton held good. The king might grant his right to deodands to another.

In later times these forfeitures, so unintelligible in their purpose, so capricious and unjust in operation, became extremely unpopular; and juries, with the connivance of judges, found deodands of trifling value, so as to defeat the inequitable claim. But deodands were not abolished till the 9 and 10 Vict. c. 62 was passed, whereby it is enacted that " there shall be no forfeiture of any chattel for or in respect of the same having caused the death of a man ; and no coroner's jury sworn to inquire, upon the sight of any dead body, how the deceased came by his death, shall find any forfeiture of any chattel which may have moved to or caused the death of the deceased, or any deodand whatsoever ; and it shall not be necessary in any indictment or inquisition for homicide to allege the value of the instrument which caused the death of the deceased, or to allege that the same was of uo value." The date of this Act (1846) may suggest the great inconvenience which the law, if it had remained in operation, would have caused to railway and other enterprise in which loss of life is a frequent occurrence.

DEPRES, Josquin (1440-1521), also called Desprez, and, by a Latinized form of his name, Jodocus Pratensis or a Prato, a celebrated musical composer, was born about 1440 at Vermand, near St Quentin, in French

Flanders. He was a pupil of Ockenheim, the great contrapuntist, and himself one of the most learned musicians of his time. In spite of his great fame, the accounts of his life are vague and scanty, and even the place of his birth has only lately been established beyond dispute—Belgians, Germans, Italians, and Frenchmen claiming him as their countryman. M. Fétis, the well-known historian of music, has contributed greatly towards elucidating the doubtful points, and to that author's Biographie Universelle the reader is referred for more detailed information. In his early youth Josquin seems to have been a member of the choir of the collegiate church at St Quentin; when his voice changed he went (about 1455) to Ockenheim to take lessons in counterpoint ; afterwards he again lived at his birth-place for some years, till Pope Sixtus IV. invited him to Rome to teach his art to the musicians of Italy, where musical knowledge at that time was at a lowebb. In Rome Deprés lived till the death of his protector (1484), and it was there that many of his works were written. His reputation grew rapidly, and he was considered by his contemporarics to be the greatest master of his age. Luther, himself an excellent musical amateur, is credited with the saying that '"' other musicians do with notes what they can, Josquin what he likes." -The composer's journey to Rome is in itself a most important event in the history of musical progress ; for it marks in a

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manner the transference of the art from its Gallo-Belgian birth-place to Italy, which for the next two centuries remained the centre of the musical world. To the school of the Netherlands, of which Deprés and his pupils Arcadelt, Mouton, and others are the chief repre- sentatives, modern music owes its rise. But far more important than this school itself was its outgrowth and successor, the so-called Roman school, immortalized by the name of Palestrina. After leaving Rome Deprés went for a time to Ferrara, where the art-loving duke Hercules I. offered him a home ; but before long he accepted an invitation of King Louis XII. of France to become the chief singer of the royal chapel. According to another account, he was for a time at least in the service of the emperor Maximilian I. The date of his death has by some writers been placed as early as 1501. But this is sufti- ciently

disproved by the fact of one of his finest com- positions, A Dirge (Déploration) for Five Voices, being written to commemorate the death of his master Ocken- heim, which took place after 1512. The real date of Josquin's decease has since been settled as the 27th August 1521. He was at that time a canon of the cathedral of Condé. The most complete list of Deprés's compositions—consisting of masses, motets, psalms, and other pieces of sacred music—will be found in Feétis. The largest collection of his MS. works, containing no less than 20 masses, is in the possession of the Papal chapel in Rome. 'The well-known works by Drs Burney and Hawkins give specimens of his music.

DEPTFORD, a town of England situated at the junction of the Ravensbourne with the Thames, 34 miles east of London Bridge. It forms the western portion of the par- liamentary borough of Greenwich, occupying an area of about 1650 acres, situated mostly in the county of Kent, and partly in Surrey. It comprises two parishes—that of St Nicholas, including Lower Deptford on the Thames, and St Paul's, or the landward part of the town, which extends into Surrey and includes Hatcham Manor. Lower Deptford consists of irregular narrow streets, and the houses are mostly of a mean description. It contains the site of the old dockyard, and the royal victualling yard is also situated there. The former was discontinued as a dockyard in 1869; it was filled up and converted into a foreign cattle market by the corporation of London, but this was given up in 1873, The victualling yard immedi- ately to the west of it is the most important establish- ment of its kind in the kingdom, supplying the navy with provisions, medicines, furniture, &c., which are manufac- tured or stored in the large warehouses that constitute the establishment. As many as 500 hands are employed in the warehouses and at the lading wharf. The only other industrial employment of importance in the place is to be found in the engineering works, which are carried on near . the river. Of public buildings the most noteworthy are St Nicholas Church, with a square embattled tower, built on the site of an older structure at the beginning of the last. century, and St Paul's, of classic design, erected in 1730. There is also the hospital for master mariners, maintained by the corporation of the Trinity House, which was origin- ated here. Of the mansion known as Sayes Court, with which Deptford is historically identified, nothing now re- mains but the garden. The house—taken down in 1729— was the residence of the

duke of Sussex in Queen Eliza- beth’s time; it was occupied in the following century by John Evelyn, the author of Sylva, and by Peter the Great during his residence in England in 1698. The popula- tion of Deptford in 1871 amounted to 60,188 persons, seven-eighths living in the landward parish of St Paul’s.

DE QUINCEY, Tuomas (1785-1859), an eminent English author, was born at Greenhay, near Manchester, QNOCA Tp.

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on the 15th of August 1785. He was the fifth child in a family of eight (four sons and four daughters), of whom three died young. His father, descended from a Nor- man family, was an opulent merchant, who lived much abroad, partly to look after his foreign engagements, but mainly from considerations of health; he died of pul: monary consumption in the thirty-ninth year of his age, leaving his wife and six children a clear income of £1600 a year. The widow, a woman of exceptional talent, secured to her family the enjoyment of those social and educa- tional advantages which their position and means afforded. Thomas was from infancy a shy, sensitive child, with a constitutional tendency to dreaming by night and by day ; and, under the influence of an elder brother, a lad “‘ whose genius for mischief amounted to inspiration,” who died in his sixteenth year, he spent much of his boyhood in imaginary worlds of their own creating. The amusements and occupations of the whole family, indeed, seem to have been mainly intellectual; and in De Quincey’s case, emphatically, “‘ the child was father to the man.” “ My life has been,” he affirms in the Confessions, “on the whole the life of a philosopher; from my birth I was made an intellectual creature, and intellectual in the highest sense my pursuits and pleasures have been.” From boyhood he was more or less in contact with a polished circle; his education, easy to one of such native aptitude, was sedu- lously attended to. When he was in his twelfth year the family removed to Bath, where he was sent to the grammar school, at which he remained for about two years ; and for a year more he attended another public school at

Winkfield, Wiltshire. At both his proficiency was the marvel of his masters. At thirteen he wrote Greek with ease ; at fifteen he not only composed Greek verses in lyric measures, but could converse in Greek fluently and without embarrass- ment ; one of his masters said of him, “ that boy could harangue an Athenian mob better than you or I could address an English one.” Towards the close of his fifteenth year he visited Ireland, with a companion of his own age, Lord Westport, the son of Lord Altamont, an Irish peer, and spent there in residence and travel some months of the summer and autumn of the year 1800,—being a spectator at Dublin of “the final ratification of the bill which united Ireland to Great Britain.” On his return to England, his mother having now settled at St John’s Priory, a residence near Chester, De Quincey was sent to the Manchester grammar school, mainly that it might be easier for him to get thence to Oxford through his obtaining one of the school exhibitions.

Discontented with the mode in which his guardians con- ducted his education, and with some view apparently of forcing them to send him earlier to college, he left this school after less than a year’s residence—ran away, in short, to his mother’s house. There one of his guardians made an arrangement for him to have a weekly allowance, on which he might reside at some country place in Wales, and pursue his studies, presumably till he could go to college. From Wales, however, after brief trial, “suffer- ing grievously from want of books,” he went off as he had done from school, and hid himself from guardians and friends in the world of London. And now, as he says, commenced “ that episode, or impassioned parenthesis of my life, which is comprehended in Zhe Confessions of an English Opium Eater.” This London episode extended over a year or more; at the end of it the lad was recon- ciled to his guardians, and in 1803 went to Oxford, being by this time about nineteen. It was in the course of his second year at Oxford that he first tasted opium,—ha ving taken it to allay neuralgic pains, ;

After finishing his career of five years at college in 1808, he ultimately settled in 1812 to the life of a student on

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the borders of Grasmere, drawn thither partly by neigh- bourhood to Wordsworth, whom he early appreciated,— having been, he says, the only man in all Europe who quoted Wordsworth so early as 1802. Here also he enjoyed the society and friendship of Coleridge, Wilson, and Southey, as in London he had of Charles Lamb and his select circle. Here he continued his classical and other studies, especially exploring the at that time almost unknown region of German literature, and indicating its riches to English readers. Here also, in 1816, he married the "‘ dear M »" of whom a charming glimpse is ac- corded to the reader of the Confessions ; his family came to be five sons and three daughters. For a year he edited, at Kendal, the Westmoreland Gazette. He resided till the end of 1820 at Grasmere, afterwards in London, and latterly at Lasswade near Edinburgh, or in Edinburgh. He died in that city December 8, 1859, aged seventy-four, and is buried in the West Churchyard.

During nearly fifty years De Quincey lived mainly by his pen. His patrimony seems never to have been en- tirely exhausted, and his habits and tastes were simple and inexpensive ; but he was careless to recklessness in the use of money, and debts and pecuniary difficulties of all sorts hung about him through the greater part of his life. There was, indeed, his associates affirm, an element of romance even in his impecuniosity, as there was in every- thing about him ; and the diplomatic and other devices by which he contrived to keep clear of clamant creditors, while scrupulously fulfilling many obligations, often dis- armed animosity, and converted annoyance into amuse- ment. The famous Confessions of an English Opium Kater, having first appeared in The London Magazine, were pub- lished in a small volume in 1820, and attracted a very remarkable degree of attention, not simply from their dis- closures as to his excessive use of the drug, and its effects, but also by the marvellous beauty of the style of the work, its romantic episodes, and extraordinary power of dream- painting. All De Quincey’s other writings appeared in periodicals ~ Blackwood’s Magazine, Tait’s Magazine, Hogg’s Instructor, &c. No other literary man of his time, it has been remarked, achieved so high and universal a re- putation from such merely fugitive efforts. Since his works were brought together, that reputation has been not merely maintained, but extended. The American edition of twelve volumes was reprinted in this country in 1853, under the author’s own supervision, and expanded to fourteen volumes; upon his

death two more volumes were made up of previously uncollected material. For range of thought and topic, within the limits of pure literature, no like amount of material of such equality of merit has pro- ceeded from any eminent writer of our day. However profuse and discursive, De Quincey is always polished, and generally exact—a scholar, a wit, a man of the world, and a philosopber, as well as a genius. He looked upon letters as a noble and responsible calling; in his essay on Oliver Goldsmith he claims for literature the rank not only of a fine art, but of the highest and most potent of fine arts; and as such he himself regarded and practised it. He drew a broad distinction between " the literature of knowledge and the literature of power," asserting that the function of the first is to teach, the function of the second to move,—maintaining that the meanest of authors who moves has pre-eminence over all who merely teach, that the literature of knowledge must perish by supersession, while the literature of power is "triumphant for ever a8 long as the language exists in which it speaks." It is to this class of motive literature that De Quincey's own works essentially belong ; it is by virtue of that vital element of power that they have emerged from the rapid oblivion of periodicalism, and live in the minds of a second generation

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of readers and admirers, as they are safe to do in those of a third and fourth, The risk of their not reaching on through succeeding time arises from their diffuseness—their power is weakened by their volume.

De Quincey has fully defined his own position and claim to distinction in the preface to his collected works. These he divides into three classes :—" first, that class which proposes primarily to amuse the reader," such as the Narratives, Autobiographic Sketches, &c.; " second, papers which address themselves purely to the under- standing as an insulated faculty, or do so primarily," such as the essays on Essenism, the Czesars, Cicero, &c. ; and finally, as a third class, "and, in virtue of their aim, as a far higher class of compositions," he ranks those "modes of impassioned prose ranging under no prece- dents that I am aware of in any literature," such as the Confessions and Suspiria de Profundis, The high claim here asserted has been so far questioned ; and short and iso- lated examples of eloquent apostrophe, and highly-wrought linaginative description, have been cited

from Rousseau and other masters of style; but De Quincey's power of sustaining a fascinating and elevated strain of "impassioned prose" is allowed to be entirely his own. In this his genius niost emphatically asserts itself; if it be not admitted that in that dread circle none durst walk but he, it will be withont hesitation conceded that there he moves supreme. Nor, in regard to his writings as a whole, will a minor general claim which he makes be disallowed, namely, that he "does not write without a thoughtful consideration of his subject," and also with novelty and freshness of view. " Generally," he says, "I claim (not arrogantly, but with firmness) the merit of rectification applied to absolute errors, or to injurious limitations of the truth." Another obvious quality of all his genius is its overflowing fulness of allusion and illustration, recalling his own description of a great philosopher or scholar—' Not one who depends simply on an infinite memory, but also on an infinite and electrical power of combination, bringing together from the four winds, like the angel of the resurrection, what else were dust from dead men's bones into the unity of breathing life." It is useless to complain of his having lavished and diffused his talents and acquirements over so vast a variety of often comparatively trivial and passing topics, in- stead of concentrating them on one or two great subjects. The world must accept gifts from men of genius as they offer them ; circumstance and the hour often rule their form. Those influences, no less than the idiosyncrasy of the man, determined De Quincey to the illumination of such matter for speculation as seemed to lie before hin ; he was not careful to search out recondite or occult thenies, thongh these he did not neglect,—a student, a scholar, and a recluse, he was yet at the same time a man of the world, keenly interested in the movements of men andin the page of history that unrolled itself before him day by day. To the discussion of things new, as readily as of things old, aided by a capacious, retentive, and ready memory, which dispensed with reference to printed pages, he brought also the exquisite keenness and subtlety of his highly analytic and imaginative intellect, the illustrative stores of his vast and varied erudition, and that large infusion of common sense which preserved him from becoming at any time a mere doctrinatre, or visionary. If he did not throw himself into any of the great popular controversies or agitations of the day, it was not from any want of sympathy with the struggles of humanity or the progress of the race, but rather because his vocation was to apply to such incidents of his own time, as to like incidents of all history,

great philosophical principles and tests of truth and power. In politics, in the party sense of that term, he would probably have been classed as a Liberal Conservative

or Conservative Liberal—at one period of his life perhaps the former, and at a later the latter. Originally, as we have seen, his surroundings were somewhat aristocratic, in his middle life his associates, notably Wordsworth, Southey, and Wilson, were all Tories; but he seems never to have held the extreme and narrow views of that circle. Though a flavour of high breeding runs through his writings, he has no vulgar sneers at the vulgar. As he advanced in years his views became more and more decidedly liberal, but he was always as far removed froin Radicalism as from Toryism, and may be described as a philosophical politician, capable of classification under no definite party name or colour. Of political economy he had been an early and earnest student, and projected, if he did not so far proceed with, an elaborate and systematic treatise on the science, of which all that appears, however, are his fragmentary Dealogues on the system of Ricardo, which John Ramsay M'Culloch pronounces " unequalled for brevity, pungency, and force." But political and eco- nomic problems largely exercised his thoughts, and his historical sketches show that he is constantly alive to their interpenetrating influence. The same may be said of his biographies, notably of his remarkable sketch of Dr Parr. Neither politics nor economics, however, exer- cised au absorbing influence on his mind,—they were simply provinces in the vast domain of universal specula- tion through which he ranged " with unconfined wings." How wide and varied was the region he traversed a glance at the titles of the papers which make up his collected—or more properly selected—works (for there was much matter of evanescent interest not reprinted) sufficiently shows. He was equally at home in all provinces, though never exerting his great powers so as to make himself paramount in any. Surprising as his literary achievements are, his capabilities were still greater ; and the general survey leaves the impression of regret that, doing so much so well, he did not do more, or did not less better. Some things in his own line he has done perfectly ; he has written many pages of magnificently mixed argument, irony, humour, and elo- quence, which, for sustained brilliancy, richness, subtle force, and purity of style and effect have simply no parallels; and he is without peer the prince of dreamers. The use of opium no doubt

stimulated this remarkable faculty of reproducing in skilfully selected phrase the grotesque and shifting forms of that “cloudland, gorgeous land,” which opens to the sleep-closed eye ; but the faculty itself was a speciality of his constitution, coloured by the quality of his genius, and enriched by the acquisitions of his intellect.

To the appreciation of De Quincey the reader must bring an imaginative faculty somewhat akin to his own—a cer- tain general culture, and large knowledge of books, and men, and things. Otherwise much of that slight and delicate allusion that gives point and colour and charm to his writings will be missed; and on this account the full enjoyment and comprehension of De Quincey must always remain a luxury of the literary and intellectual. But his skill in narration, his rare pathos, his wide sympathies, the pomp of his dream-descriptions, the exquisite playfulness of his lighter dissertations, and his abounding though deli- cate and subtle humour, commend him to a larger class, Though far from being a professed humourist—a character he would have shrunk from—there is no more expert worker in a sort of half-veiled and elaborate humour and irony than De Quincey; but he employs those resources for the most part secondarily. Only in one instance has he given himself up to them unreservedly and of set pur- pose, namely, in the famous Essay on Murder considered as one of the Fine Arts,—an effort which, adinired and admirable though it be, is also, it must be allowed, some- what strained, He was a born critic and dreamer, a

logician by instinct and culture, a student by choice, a scholar by right of conquest of the stores of many minds, a writer of English of the first quality by dint of native command of language and life-long study and practice. His style, full and flexible, pure and polished, is peculiarly his own ; yet it is not the style of a mannerist,—its charm is, so to speak, latent ; the form never obtrudes ; the secret is only discoverable by analysis and study. It consists simply in the reader’s assurance of the writer’s com- plete mastery over all the infinite applicability and re- sources of the English language. Hence involutions and parentheses, “cycle on epicyle,” evolve themselves into a stately clearness and harmony; and sentences and _ paragraplis, loaded with suggestion, roll on smoothly and musically, without either fatiguing or

cloying—rather, indeed, to the surprise as well as delight of the reader ; -for De Quincey is always ready to indulge in feats of style, witching the world with that sort of noble horsemanship which is as graceful as it is daring.

It has been complained that, in spite of the apparently full confidences of the Confessions and Autobiographic Sketches, readers are left in comparative ignorance, bio- graphically speaking, of the man De Quincey. Two pas- sages in his Confessions afford sufficient clues to this mystery. In oue he describes himself “as framed for love and all gentle affections,” and in another confesses to the “besetting infirmity” of being “too much of an eude- monist.” “T hanker,” he says, ‘‘too much after a state of happiness, both for myself and others; I cannot face misery, whether my own or not, with an eye of suflicient firmness, and am little capable of surmounting present pain for the sake of any recessionary benefit.” His sensi- tive disposition dictated the ignoring in his writings of traits merely personal to himself, as well as his ever- recurrent resort to opium as a doorway of escape from present ill; and prompted those habits of seclusion, and that apparently capricious abstraction of himself from the society not only of his friends, but of his own family, in which he from time to time persisted. He confessed to occasional accesses of an almost irresistible impulse to flee to the labyrinthine shelter of some great city like London or Paris,—there to dwell solitary amid a multitude, buried by day in the cloister-like recesses of mighty libraries, and stealing away by night to some obscure lodging. Long indulgence in seclusion, and in habits of study the most lawless possible in respect of regular hours or any con- siderations of health or comfort,—the habit of working as pleased himself without regard to the divisions of night or day, of times of sleeping or waking, even of the slow procession of the seasons, had latterly so disinclined him to the restraints, however slight, of ordinary social inter- course, that he very seldom submitted to them. On such rare occasions, however, as he did appear, per- haps at some simple meal with a favoured friend, or in later years in his own small but refined domestic circle, he was the most charming of guests, hosts, or companions. A short and fragile, but well-proportioned frame , a shapely aud compact head ; a face beaming with intellectual light, with rare,almost feminine beauty of feature and complexion; a fascinating courtesy of manner ; and a fulness, swiftness, and elegance of silvery speech,—such was the irresistible “mortal mixture of earth’s mould” that

men named De Quincey. He possessed in a high degree what the American poet Lowell calls “the grace of perfect breeding, everywhere persuasive, and nowhere emphatic ;” and his whole aspect and manner exercised an undefinable attraction over every one, gentle or simple, who came within its in- fluence; for shy as he was, he was never rudely shy, making good his boast that he had always made it his “ pride to con- verse familiarly more socratico with all human beings—man,

woman, and child ”—looking on himself as a catholic creature standing in an equal relation to high and low, to educated and uneducated. He would converse with a peasant lad or a servant girl in phrase as choice, and sentences as sweetly turned, as if his interlocutor were his equal both in position and intelligence; yet with- out a suspicion of pedantry, and with such complete adaptation of style and topic that his talk charmed the humblest as it did the highest that listened to it. His conversation was not a monologue ; if he had the larger share, it was simply because his hearers were only too glad that it should be so; he wonld listen with something like deference to very ordinary talk, as if the mere fact of the speaker being one of the same company entitled him to all consideration and respect. The natural bent of his mind and disposition, and his life-long devotion to letters, to say nothing of his opium eating, rendered him, it must be allowed, regardless of ordinary obligations in life—domestic and pecuniary—to a degree that would have been not only culpable, but very highly so, in any less singularly con- stituted mind. It was impossible to deal with or judge De Quincey by ordinary standards—not even his publishers did so. Much no doubt was forgiven him, but all that needed forgiveness—and, after all, his sins were rather of omission than commission, trivial rather than heinous, trying rather than deadly—will soon be covered by the kindly oblivious veil of lapsing time, while his merits asa master in English literature will remain to be gratefully acknowledged.

A collection of De Quincey’s works was published by James Hogg and Sons, Edinburgh, in 14 volumes, 1856-1860 ; and the same edition was republished by A. & C. Black, Edinburgh, with altera- tions and additions, in 16 volumes, 1862-1871. An American edition, issued by Ticknor &

Fields, Boston, 1859-1868, extends to 20 disconnected volumes. A biography in two volumes, by

H. A. Page, Thomas De Quincey, his Life and Writings, has been published by John Hogg and Co., London, 1877. (J. R. F.)

DERA GHAZI KHAN, a district of British India, in the Derajit division of the lieutenant-governorship of the Punjab, is situated between 28° 27’ 0” and 31° 1’ 0” N. lat. and 69° 36’ 30” and 70° 58’ 20’ E, long, It is bounded on the N. by Der& Ismail Khan, on the E. by the Indus, on the 8. by Jacobaébad in Sind, and on the W. by the Sulaiman range of hills. The district is a long narrow strip of country, 198 miles in length,! sloping gradually from the hills which form its western boundary to the River Indus on the east. Below the hills the country is high and arid, generally level, but sometimes rolling in sandy undulations, and much intersected by hill torrents, 201 in number. With the exception of two, these streams dry up after the rains, and their influence is only felt for a few miles below the hills. The eastern portion of the district is at a level sufficiently low to benefit by the floods of the Indus. A barren tract intervenes between these zones, and is beyond the reach of the hill streams on the one hand and of the Indus on the other. Although liable to great extremes of temperature, and to a very scanty rainfall, the district is not unhealthy. The rainfall in 1872-73 was 7°7 inches; the mean temperature 79° Fahr. The maximum temperature (112°) occurred in June, the minimum (40°) in December. The principal agricultural products are wheat, great millet, jodr, cotton, rice, and indigo. The poppy plant is also rather extensively culti- vated in the south of the district. The less important food grains are barley, spiked millet (bard), and pulses. Oil seeds and tobacco are also grown to a small extent.

1 The area of the district is returned at 4950 square miles, oF 3,168,000 acres, of which 2,412,749 acres were under assessment in 1872-73. The cultivated area amounts to 1662 square miles, or 1,068,680 acres, or 33°57 per cent of the total area. Of the cultivated area 427,599 acres, or 40°24 per cent., are irrigated. The first regular land settlement of the districtwas concluded in 1872,

ultivation mainly depends upon artificial irrigation, effected principally by canals leading from the Indus. In 1872-73 there were 15 main canals, drawing their supply direct from the Indus, of which 2 were the property of private in- viduals, and 13 were under the management of Government. Alum, earth salt, and raggi (an impure carbonate of soda) are manufactured in some quantities. The exports are indigo, opium, salt, dates, wheat, cotton, barley, millet, ghz, and hides. The imports are sugar, fruits from Cabul, gram, woollen goods, English piece goods and broad cloth, metals, salt, and spices. The total revenue of the district in 1872-73, exclusive of local funds and canal collections, amounted to £45,161, of which £35,588, or 79 per cent., was derived from the land. The administrative staff of the district consists of a deputy commissioner, with two assistants and one extra assistant, fonr tahsilddrs, each with a deputy or assistant, a district superintendent of police, aud two civil surgeons. ‘The police force numbered 733 men. There are 35 schools, maintained or assisted by the state, and 132 indigenous village schools—total 167, at- tended in 1872-73 by 2907 pupils. Three charitable dis- pensaries afford gratuitous medical relief. The principal town of the district, and chief seat of commerce, is Derd Ghazi Khan, situated on the west bank of the Indus, 30° 4’ lat., 70° 51’ long. Population in 1868 :—Mahometans, 10,699; Hindus, 8850; Sikhs, 328; Christians, 52; “others,” 194—total, 20,123. The other towns contain- ing a population exceeding 5000 souls are Jampur, popu- lation 7796 ; Choti, population 7300 ; Dagil, population 5693 ; and Rajhan, population 5656. Rajanpur, although not containing 5000 inhabitants, is important as a canton- ment, a regiment of cavalry and two companies of infantry being stationed there. The foregoing towns are all muni- cipalities.

The census of 1868 returned thc population as follows :— Mahometans, 264,527; Hindus, 38,467; Sikhs, 1124; ‘“others,”’ 4722 ; total 308,840. The Beluehis, who are Mahometans, form by far the most important section of the population, and number 82,590. The Jats, who are also Mahometans, are the most numer- ous, numbering 162,519. Among the Hindu population, the Aroras form the most important caste, 33,024 in number, prineipally

traders. Of the total population, 164,729, or 58 per cent., are returned as agrieulturists.

DERA ISMAIL KHAN, a district of British India in the Derdjat division of the lieutenant-governorship of the Punjab, is situated between 30° 35’ 30” and 32° 33’0” N. lat.,and 70° 15’ 0” and 72° 3’ 20” E. long. It is bounded on the N. by the district of Bannu, on the E. by Shahpur and Jhang, on the S. by Muzaffargarh and Derd Ghazi Khan, and on the W. by the Sul4iman hills, which mark the frontier. The district is divided into two almost equal portions by the Indus, which intersects it from north to south, and is the only river of any importance. To the west of the Indus, the characteristics of the country resemble those of Dera Gh4zi Khan. To the east of the present bed of the river there is a wide tract known as the Kachi, exposed to river action. Beyond this, the country rises abruptly, and a barren, almost desert plain stretches eastwards, sparsely cultivated, and inhabited only by nomadic tribes of herdsmen. The area of the district is 709656 square miles, or 4,541,800 acres; the cultivated arca amounts to 541,912 acres, of which 428,604 acres are under irrigation, and 113,309 unirrigated. The unculti- vated area, which is returned at 3,999,887 acres, is sub- divided as follows : —grazing lands, 364,864 acres 5 culti- vable, but not actually under cultivation, 1,329,796 acres ; uncultivable, 3,999,887 acres. The district has recently been granted a regular land settlement for the first time. The period of the latest summary settlement expired in 1868 in part of the district, and in 1871 in the remainder, The principal agricultural products are wheat, barley, grain,

6134 ; total 394,864.

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pease, tobacco,and oil-seeds for the spring or abi harvest; and rice, millets, and cotton for the autumn or kharif crop. There are no manufactures of importance. The principal municipalities and trading towns, with their populations (1863), are as follows:—Dera Ismail Khan, the civil station and chief town, population 24,906; Leid, 17,033 ; Kolachi, 9921; Takhward, 6800; Karor, 5720; Bhakkar, 5554; Panmala, 5502. Other minor towns, which are also municipalities, are Kot Sultan, Mankherd, and Tank. The income of the district in 1872-73 (exclusive of municipal taxation) amounted to £50,918, of which £39,784 was derived from the land. The police force consisted of 617 men. ‘There were 18 Government or aided

and 87 indi- genous village schools in 1872-73, attended by 2190 pupils. The eensus of 1868 returned the population as follows :— Mahometans, 338,387; Hindus, 48,756; Sikhs, 1587; others Of the Mahometan population, the prinei- pal elasses are the Beluchis, 34,703 in number ; Pathans, 51,828 ; and Sayyids, 8669. The Hindus consist almost entirely of Aroras, 42,087, principally traders and money lenders. Of the total popu- lation, 187,096, or 48 per cent., are returned as agriculturists. DERAJAT, a division or commissionership of British India, under the jurisdiction of the lieutenant-governor of the Punjab, comprising the frontier districts of DerA Ghazi Khan, Dera Ismail Khan, and Bannu, situated between 28° 27’ 0″ and 33° 15’ 30” N lat. and 70° 15” 0” and 72° 3° 20” E. long. The division is bounded on the N. by the district of Kohat, on the E. by the districts of Rawal Pindi, Shahpur, and Jhang, and by the River Indus, on the 8. by the district of Jacobébad in Sind, and on the W. by the Waziri and Sulaiman hills, beyond British territory. The two northern districts of the division, Bannu and Dera Ismail Khan, are intersected by the Indus. The Bannu valley is drained by the Kuram and Gambila rivers. It is shut in on the N. and §. by hills, and is traversed from N. to 8. by a continuation of the great Punjab salt range. According to the census of 1868, the Derajat division com- prises an area of 14,432 square miles, with a population of 991,251 souls, inhabiting 1695 villages, classified as fol- lows :—Mahometans, 863,464, or 87-1 per cent.; Hindus, 113,445, or 11°5 per cent.; Christians, 341; Sikhs, 3204, or ‘3 per cent.; and “ others,” 10,797, or 1-1 per cent. DERBEND, or DERBENT, a town of Russia, in the government of Daghestan, on the western shore of the Caspian, about 170 miles E.N.E. of Tiflis, in 42° 4’ N. lat. and 47° 53’ EK. long, It occupies a narrow strip of land lying between the sea and a mountain ridge of moderate elevation, which is crowned by the citadel, or Narin Kalé : and on all sides except towards the east, where it projects into the water, it is surrounded by strong walls built of porous limestone. Its gencral aspect is decidedly Oriental, owing to the flat roofs of its two-storied houses, Besides the governor’s residence, which stands in the neighbour- hood of the citadel, the town possesses a fine Russian church, 3 Jewish synagogues, 17 mosques (including one belonging to the Sunna sect), 3 bazaars, and a number of caravanserais. The upper part of the town is supplied with water from a reservoir in the citadel, fed by a fountain in the mountain behind ; but the Dubar, or lower town along the shore, communicates by an aqueduct with

the Rubas-Chai, a small river to the south. ‘The environs are occupied by vineyards, gardens, and orchards, in which madder, saffron, and tobacco, as well as figs, peaches, pears, and other fruits are cultivated. The madder is a valu- able export, and the saffron is in high repute. Earthen- ware, weapons, and silk and cotton fabrics, are the principal products of the manufacturing industry. To the north of the town is the monument of the Kirk Lar, or Forty Heroes of Daghestan, whose valour is commemorated in Arabic in- scriptions ; and to the south lies the seaward extremity of the great Derbend or Caucasian wall, otherwise known as VIL, — 14

Plate II.

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Sedd-Eskender, or Alexander’s wall, which, while still | very diversified. The southern part presents little that is entire, had a height of 29 feet and a thickness of about 10, | picturesque, or in any way striking, being for the most

and with its iron gates and numerous watcli-towers formed a valuable defence of the Persian frontier. Derbend is a place of great antiquity, and is usually identified with Albana, the capital of the ancient Albania. The modern name, which is the Persian word for a gateway, probably came into use about the eud of the 5th or the beginning of the 6th century, when the city was re-founded by Kobod of the Sassanid dynasty. The walls and the citadel are believed to belong to the time of Kobod’s son, Nushirvan Chosroes. In 728 the Arabs entered into possession, and established a khanate in the city, which they called either Bab-el-abwab, “the principal gate,” Bab-el-Khadid, “the iron gate,” or Seril-el-Dagab, “the golden throne.” The celebrated caliph, Haroun-al-Rashid, lived in Derbend at different times, and brought it into great repute as a scat of arts and commerce. In 1220 it was captured by the Mongolians, and in the course of

the succeeding centuries it frequently changed masters. In the reign of Heodor Ivanovitch, the Persian Government promised to make it over to Russia in reward for assistance against the Turks, but the surrender was never completed. In 1722 Peter the Great took advantage of the disturbances in Persia, seized the town, established a garrison, and intrusted the govern- ment to Imam Kuli-Beg; but in 1733 the supremacy of the Persian Nadir Shah was again recognized. Captured in 1760 by Fut Ali Khan, and governed after his death by his brother Sheikh Ali, the town was in 1796 besieged by the Russians both by land and sea, and in 1813 formally incorporated by the treaty of Gulistan with the Russian empire. In 1831 it was vainly attacked by Kazi-mull. Population in 1873, 15,739.

DERBY, County of, lies as nearly as possible in the centro of England, being about equally distant from the eastern and western seas. In the time of the Britons it was part of the district which constituted the kingdom of the Coritani. While under the Roman sway it formed a part of Britannia Prima; and under the Heptarchy it belonged to the kingdom of Mercia. E. by Nottinghamshire and a part of Leicestershire, on the W. by Staffordshire and Cheshire (from which it is separ- ated by the rivers Trent, Dove, Etherow, and Goyt), on the N. by Yorkshire and a part of Cheshire, and on the 8. by Leicestershire. Its greatest length from 8.E. to N.W. is 56 miles, its greatest width from N.E. toS.W. is 33 miles. It contains an area of 656,243 statute acres, equal to about 10252 square miles. Its population in 1851 amounted to 296,084 persons, in 1861 to 339,327, and in 1871 to 379,394, of whom 190,657 were males, and 188,737 females. From the beginning of the century down to 1871, 13 per cent. was the mean rate of increase in each intermediate period of ten years; while from 1861 to 1871 the total increase was 40,067, or at the rate of nearly 12 per cent. For practical purposes the population may be taken at 400,000, giving an average of 0°60 persons per acre, or 1°64 acres per person. The rental of the county, as given in the Owners of Land Return, 1873, was £1,658,995.

Derbyshire is divided into the hundreds of High Peak, Scarsdale, Appletree, Repton and Gresley, Morleston and Litchurch, and the wapentake of Wirksworth. It consists of 331 parishes, townships, and parts of parishes. Tt has a court of quarter sessions, and is included as an archdeaconry in the diocese of Lichfield, For electoral purposes the county has been formed into

the 3 divisions of east, north, and south, each returning 2 members to eee ue thus, with the 2 members from the

gh o erby, is represented by a total of 8 members,

The geographical or physical aspect of Derbyshire is

Tt is bounded on the’

part a level surface, with occasional slight undulations, In its northern portions, however, particularly in the bold and mountainous regions of the High Peak, there are im. posing combinations of those features which go to consti- tute impressive and romantic scenery. In the more hilly districts, some of the valleys and dales are very beautiful, notably the valleys of Castleton and Glossop, Dovedale, Millersdale, and the dale of Matlock. . Derbyshire is on the whole a well-wooded county, and in the spacious parks surrounding the numerous mansions of noblemen and others which it contains, may be seen many fine oaks of noble appearance, those at Kedleston, the seat of Lord Scars- dale, three miles from Derby, being considered among the largest and oldest in the kingdom.

The climate, as might be expected from the diversified configuration of the land, varies very considerably in different parts. Fyrom the elevation which it attains in its northern division the county is colder and is more frequently visited with rain than other midland counties. In summer cold and thick fogs are often seen hanging over the rivers, and clinging to the lower parts of the hills, and hoar-frosts are by no means unknown even in June

and July. Owing to the great elevation some kinds of

grain will not grow at all in many of the northern parts, while that which is sown in the more sheltered spots is exceptionally Jate in coming to maturity. The winters there are generally severe, and the rainfall heavy. At Belper, in 1876, there were 36°01 inches of rain during the year, while the average for the five years was 32°09 inches per annum.

The elevation of the land proceeds gradually from south to north, the greatest altitudes being attained in the north division of the county, which is

of a distinctly mountainoms character. The mountains (or the plateau) of North Derbyshire may be said to form the central watershed of England, containing the source of many large rivers—as the Don, the Trent, andthe Mersey. The highest altitudes are Kinder Scout (1981 fect), the Peak (1880), and, on the borders of Cheshire and Staffordshire, Axe Edge (1751).

From Axe Edge the streams of the county radiate. Those of the north-west belong to the Mersey, and those of the north-east to the Don, but all the others to the Trent, which, like the Don, falls into the Humber. The principal river is the Trent, which, rising in the Staffordshire moor- lands, does not intersect this county, but forms its south- west boundary for some distance, separating Derbyshire from Staffordshire on the south. After the Trent the most important river is the Derwent, one of its tributaries, which, taking its rise in the lofty ridges of High Peak, flows southward through a succession of striking and beautiful scenery, receiving a number of minor streams in its course. The other principal rivers are the following. . The Dane rises at the junction of the three counties, Yorkshire, Cheshire, and Derbyshire. The Goyt has its source 4 very little further north, at the base of the same hill, and, taking a N.N.E. direction, divides Derbyshire and Cheshire, and falls into the Mersey. The Dove rises on the southern slope, and flows on as the boundary stream between Derbyshire and Staffordshire for about 45 miles. It receives several feeders, and falls into the Trent at Repton. The Erewash is the boundary between Notts and Derbyshire. The Rother rises about Baslow, and flows north-east into Yorkshire. A little more to the west are the Sheaf, Wallin, Poulter, and Ryton, which flow into the Don at Sheffield. é

Canals.—There are numerous canals intersecting this county in various directions, The Trent and Mersey oF Grand Trunk canal, communicating between Liverpool and

London, and also with Bristol and Hull, was begun in 1776 by the celebrated Brindley, a native of the county, and completed under Smeaton and Rennie. It passes through Derbyshire from Burton, following the course of the Trent ‘The Chesterficld canal was begun in 1771 by Brindley, and completed by his brother-in-law, Mr Henshall, in 1776. It enters the county

at Killamarsh, and terminates at Chesterfield. There are also the Langley Bridge or Erewash canal, the Peak Forcst canal, the Ashton-under-line, the Cromford, the Ashby-de-la- Zouch, the Derby, and the Nutbrook canals.

Nowhere have railways received a more complete develop- ment than in this county, and nowhere are their beneficial effects more apparent. For this the system of the Midland Company must claim the chief credit. The roads in Derbyshire are numerous, and generally in good condition. The great road from London to Manchester crosses the Trent near Shardlow, and passes through Derby and Ashbourne into Staffordshire.

Geology, Minerals, &c.—With the exception of drift gravel, and some alluvial deposits, the rocks of this county belong to the Paleozoic and Mesozoic periods. The mountain limestone underlies all the other rocks, and in the Peak district rises to a great clevation, It is in this formation that the well-known caves of Derbyshire occur. he calcareous rocks are confined to the western side of the county,—Tissington being the southern, Castleton the northern, Axe Edge the western, and Matlock the eastern extremities. There is also an outcrop at Crich. The intrusive beds of toadstone (some of which attain a thickness of 200 feet) and voleanic mud mark great submarine eruptions when this ancient lava was spread over the sea-bottom. It is estimated that upwards of half a million tons are worked yearly. The marbles are numerous and valuable for ornamental purposes. Derby- shire also contains several metallic ores—viz. galena, barytes, zinc, calamine, fluor spar, and elaterite. Galena (sulphide of lead) is obtained rather extensively, some mines near Castleton having been worked by the Romans. In 1874 the quantity raised was 4301 tons, from which were extracted 800 ounces of silver. In connection with galena zinc is found, of which 4050 tons were raised in 1876; of calamine (carbonate of zinc) 30 tons. SBarytes is used as an inferior white paint, and also for ornamental purposes. The total output for 1876 was 2700 tons. Blue john is a somewhat rare fluor spar, impregnated with oxide of man- ganese, It is one of the most ornamental minerals of the county, and is much used in the manufacture of tazzas, brooches, &c. In one or two places a thin seam of coal is found in the mountain limestone. Copper was once worked in this formation at Eoton, on the border of the county, but it has never bcen abundant. ‘Traces of gold have also been found in toadstone Chert is got near Bakewell, and is

used for the manufacture of porcelain. The most remarkable and rare mineral is elaterite, or elastic bitumen, found at Windy Knoll, near Castleton. It is found only at two other places—at Montrelaix in France, and in Con- necticut, United States. The fauna of this formation may be briefly tabulated as follows, from Ethercdge's list— Coelenterata, 54 specics ; Echinodermata, 27 ; Crustacea, 15 ; Brachiopoda, 96; Lamellibranchiata~-Monomyriata, 29; Gasteropoda, 55; Cephalopida, 31; Pisces, 12. The surface soils of the mountain limestone are very unproduc- tive, and, as a rule, ean only be used for grazing. The Yoredale rocks make a narrow margin round the above formation, forming also the range of hills between Hope and Edale valleys, and extends to the north of the Peak, attaining a thickness of 500 feet. As is usual with this rock, frequent landslips take place, notably at Alport Tower,

latter having earried with it part of the oid Roman eamp, &c. The Millstone Grit is part of a large formation stretch- ing into adjacent counties. It is a long, narrow outerop, running from north to south on the whole western side of the Coal Measures from Stanedge Pole to Little Eaton. There is also an outerop, 200 feet thick, south of the Trent. The high table-land of the Peak is of this formation. It is a valuable building-stone, and as such it is extensively used, as well as for millstones, from which it derives its name. The Coal Measures are the southern continuation of the great Yorkshire coal-field. They occupy the larger portion of the eastern side of the county from a few miles sonth of Sheffield to near Balborough Hall, where they dis- appear under the Permian. The coal-field (which extends into Notts) covers an area of about 700 square miles, 230 of which are in this county. At Shireoaks the top hard coal is worked, at a depth of 510 yards, the overlying Permian rock being only 200 feet thick. The principal coals worked are the deep soft and deep hard, both import- ant. Still more so is the clod, or black shale; but the best of all is the Kilbourne, near Belper, which is eqnal to the best Newcastle. Upwards of 10,000 people are employed. in the Derbyshire coal-fields, which produce annually more than 7,000,000 tons. The ironstones associated with this coalfield are very

valuable, yielding upwards of 130,000 tons annually. The Permian is represented in the north- east by a narrow strip of Magnesian Limestone, which is said to be one of the best building stones in the kingdom. The surface soils of this formation are probably the most fertile in the county, its barley or malt having become famous. A narrow strip of the Bunter stretches just ou the edge of the Yoredale, from Ashbourne to Quarndon, and patches occur to the north of Breadsal, at Sandiacre, and in the neighbourhood of Repton. The Keuper Red Marl and Sandstone occupy the larger part of South Derby- shire, the most northerly point being near Ashbourne. The sandstones are extensively used for building purposes. An important bed of gypsum is worked at Chellaston, which is burnt and pulverized for making plaster of Paris,— the white variety being made into chimney ornaments, statuettes, &c. The Drift Gravel is confined almost to the south and east of the county. Near Derby it is very abundant. Much light has been thrown upon the fauna of the Pleistocene period by the researches of Mr Pennington at Castleton, and Messrs Mills and Heath at Cresswell. The more rare and important " finds" are the matamoth, woolly rhinoceros, Irish elk, reindeer, cave bear, wolf, British lion, hyzena, glutton, Arctic fox, maehairo- dus (1), &¢., and a large collcetion of paleeolithic imple- ments, Peat bogs are spread over all the moorland districts

of the Yoredale and Millstone Grit.

Agriculture.—In the valley of the Trent a large surfaee is laid down in permanent grass, being devoted to cattle- feeding and dairy purposes, while heavy crops of wheat, turnips, é&e., are grown in other parts of the district. Dairy farms are numerous; and Derbyshire cheese, which holds a high reputation, is annually sent to the metropolis, or to the seaports for exportation. Cheese fairs or markets are held in various parts of the county, as at Derby, Burton-on-Trent, Ashbourne, Uttoxeter, and Loughborough. Barley is much cultivated, especially about Repton anc. Gresley, and also in the east of the county, the indueement being great from the proximity of Burton, the great seat of the brewing industry. In the upland districts, where the soil is poor and the climate harsh and unfriendly, agricultural industry is much less important and profitable. It is chiefly devoted to the feeding of sheep. The following figures, taken from the Agricultural Returns for 1873 and 1876, shows the distribution of the agricultural acreage of

Dove Holes, and at the southern flank of Mam-Ter, the | the county, and the numbers of live stoek, in those years ;— –

bas — ” Gorn Crops. Green Crops. agg NOUOn coos 498,674 74,940 20,896 85,967 ie 502,791 68,938 21,837 36,259 *

In 1876 wheat and oats constituted each one-third of the corn crops, and barley a fourth; turnips formed one-half of the green crops.

Horses. Cattle. Sheep. Pigs. LB Oyaeste: 18,004 186,939 263,429 40,078 S7 6.20, 20,618 134,891 242,732 38,361

A marked feature of the upland districts is the total absence of hedges, and the substitution of limestone walls, put together without any mortar or cement. The county possesses a flourishing agricultural society, which holds a show of cattle and other live stock annually. :

In respect of the ownership of the land, Derbyshire in 1873 was divided among 19,866 separate proprietors, whose gross estimated rental amounted to £1,764,689. The average size of each holding in that year was 31 acres, while that of all Eugland was 34 acres; and the average value per acre was £2, 16s. 10d., that of all England being £3, 0s, 2d. There were 12,874 owners holding less than one acre of land, cqual to 65 per cent. of the total number of proprietors, or about 6 per cent. fewer than the average of small owners in all England. Eight proprietors held more than 6000 acres each, viz.—duke of Devonshire (Chatsworth), 83,829 acres; duke of Rutland (Haddon Hall), 26,973; Sir J. H. Crewe, Bart. (Calke Abbey), 12,923; Lord Scarsdale (Kedleston), 9166; Lord Howard (Glossop Hall), 9108; duke of Portland, 7740 a an Evans (Allestree), 6799; Lord Vernon (Sudbury Hall) 6154,

Manufactures.—These are both numerous and important, embracing silks, cotton hosiery, iron, woollen manufacures, lace, elastic web, and brewing, for which see Burton, For. many of these this county has long been famous, especially silk, which is carried on to a large extent in Derby, as well as in Belper and Duffield, where the first silk mill in England was set up by a

mechanic, John Lombe, who introduced it from Italy. “Cotton was also at one time an important industry, but has in great measure passed into the county of Lancashire. It was introduced here by the celebrated Sir Richard Arkwright in 1771. Hosiery

also was much in vogue, and obtained great celebrity from

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the invention of Mr Strutt, by which “ribbed” stockings could be made—the Derby “rib” having been long the familiar designation of the article produced by Strutt’s in- veution. There are numerous iron foundries, machine and iron-bridge works, &c, in Derbyshire, those in the county town alone employing a great many hands. Silk-throwing is a principal industry of Derby, which in ordinary times gives employment to 3000 or 4000 persons, chiefly females. Elastic web weaving by power looms is carried on to a great extent, and the manufacture of lace and net curtains, gimp trimmings, braids, and cords. In the county town and neighbourhood are several important chemical and colour-works; and in various parts of the county, as at Belper, Cromford, Matlock, Tutbury, &c., are extensive cotton-spinning mills, as well as hosiery and tape manufactories.

eclestastical Buildings.—Derbyshire is distinguished for numerous old and interesting churches. The prevailing style of the churches is the N orman, and next to that the Early English, the style which immediately succeeded it. Steetly Chapelry, near Whitwell, on the east side of the county, is Norman ; and of this church Mr C. Cox, in his work on Derbyshire churches, says that it is “the most complete and beautiful specimen of Norman work, on a smal] scale, that can be met with anywhere in this country

or in Normandy.” It was probably:built during the rei of Stephen, 1135-54, “J g ign

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[county.,

The antiquities of Derbyshire are of considerable interest, One of the more noteworthy is a causeway, or Roman paved road, called Bathgate, running seven miles from Buxton to a small village called Brough, which road from its name seems to indicate that the Buxton waters were known to the ancients. Rocking-stones exist near Rowter and at other places ; Druidical remains, in the form of a Druidical temple, on Stanton moor, with a large number of associated objects which scem to justify the assumption that it has been inhabited by Druids, On Hartle moor, at Arbelow, is another Druidical temple, with its barrows and tumuli; there are others on the moor near Hiyam, and near Edale. Barrows are found at Arbelow, Brassington, on the moor near Eyam, and at Tissington, At Taddington is one of the most perfect examples now existing. Roman stations are to be found near Buxton, at Little Chester (which is the old Roman town Derventio), and at Mam-Tor, near Castleton, where there is also an encamp- ment. At Repton, in 660, “there was a noble monas- tery of religious, of both sexes, under an abbess, after the old Saxon fashion, wherein several of the royal line were buried.” This was afterwards destroyed by the Danes, when Maud, widow of Ranulph, second earl of Chester, built a priory for Black Canons in 1172. Here the Mercian kings who resided at Tamworth were buried. At Melbourne is a castle which was a royal demesne at the Conquest, and where John, duke of Bourbon, taken at the battle of Agincourt, was kept nine years in the custody of Nicholas Montgomery the younger.

Dery, the county town of Derbyshire, is a corporate and borough town, sending two representatives to Parlia- ment, and consisting of five parishes. It is situat-d chiefly on the western bank of the river Derwent, upon ground of varying heights, and is surrounded with gentle eminences, from which flow the Markeaton and other brooks. 1t occupies a position almost in the centre of England, 127 miles N.W. of London. Derby possesses several large public buildings, including the town hall, a spacious range of buildings recently erected for the postal and telegraph departments and the inland revenue offices, the county gaol, a new ma- sonic hall, All Saints Church, the tower of which (174 feet high) is considered one of the finest in themidland counties, and a Roman Catholic church of Pugin). tion which residence of the Strutt family), has lately had class-rooms added to it, erected by public subscription as a memorial of the visit of the Prince and Princess of Wales. There are flourishing schools of art and Science, a large

aud commodious infirmary for town and county, an arboretum of 17 acres, given to the town in 1840 by the late Joseph Strutt, Esq., a market Square, a market hall, and water-works erected at a cost of £40,000, and since greatly extended. A recreation ground, free public swimming baths, a free library, and museum buildings have all been presented to the town by Mr M.‘T. Bass. Since about 1850 Derby has been greatly improved and extended, owing chiefly to the impulse given by the establishment of the head offices and principal workshops of the Midland Railway Company, and will be still further improved by the construction now in process of a branch of the Great Northern Railway, which passes through the town over a long series of arches,

Seal and Arms of Derby.

(cne of the best examples The Derby grammar school, an ancient founda-
occupies St Helen’s House (once the town

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Derby has been long celebrated for its porcelain, which rivalled that of Saxony and France. This manufacture was introduced in the year 1750, and although for a time partially abandoned, it has been so far revived, and is still continued, There are also spar works where the fluor spar, or blue john, is wrought into a variety of useful and ornamental articles. The manufacture of silk, hosiery, lace, and cotton formerly employed a large portion of the population, and there are still numerous silk mills and elastic web works, &c. The iron manufacture is also of great importance ; among the larger establishments may be mentioned the Britannia Works, which furnished the roof of the great Agricultural Hall, London.

The sanitary condition of the town is much improved since the formation of a local board, and the rate of mor tality is low. Among benevolent institutions may be mentioned a ragged school, and a nurses’ “home.” The population of the municipal borough, which occupies an area of 1796 acres, numbered 40,609 persons in 1851, 43,091 in 1861, and 49,810 in 1871, ‘The parliamentary borough, which in 1867 was extended so as to include the townships of Litchurch and Little Chester, and covers an area of 2999

acres, had a population in 1871 of 61 381— 29,882 males and 31,499 feiales.

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Plan of Derby.

Derby is a town of great antiquity, but its origin js un- known. During the Heptarchy it was called Northworthig, and its present name Derby, or Deoraby, is due to the Danes. Constituted in the ninth century the chief town of Sy county by King Scgurd, Derby was incorporated by

enry I. 1680, and a new one was granted in 1683, by which the government of the borough was vested in a mayor, 9 alder- men, 14 brethren, and 14 capital burgesses. In 1835 the town council was re-organized under the Municipal Corpora- tions Act, and now consists of a mayor, 12 aldermen, and 36 councillors, Derby was the furthest place reached by

Its charter was surrendered to Charles II. in.

the Pretender in his march towards London in 1745 ; he lodged in Exeter House, Full Street, and held there a council of war, which resulted in the abandonment of his project.

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DERBY, Epwarp-Grorrrey Smita STANLEY, FOUR- TEENTH EARL OF, Baron Stanley of Bickerstaffe, and a baronet (1799-1869), born at Knowsley in Lancashire, on the 29th March 1799, was the eldest son of Lord Stanley, who afterwards (1834) became the thirtcenth earl of Derby. The title in the dircct line of succession to which he was thus born ranks second in precedency among the earldoms in the pecrage of England. He was educated at Eton and at Christ Church, Oxford, where he distinguished himself as a classical scholar, though he took only an ordi- nary degree on quitting the university. In 1819 he ob- tained the Chancellor’s prize for Latin verse, the subject being “Syracuse.” He gave early promise of his future eminence as an orator, and it is said that in his youth he used to practise elocution under the instruction of Lady Derby, his grandfather’s second wife, who as Miss Eliza Farren had been a celebrated actress. With such an in- clination and aptitude for public speaking, the heir to an ancient title was only fulfilling his natural destiny in secking a seat in the House of Commons, and of course he had no difficulty in finding one. In 1820, soon after he had attained his majority, he was returned for Stockbridge in Hampshire, one of the*fomination boroughs whose electoral rights were swept away by the Reform Bill of 1832, Stanley, like several others who entered parliament by means of them, being a warm advocate of their destruc- tion. It may appear somewhat strange that he should have remained for four years, so far as is known, a silent member ; but the representative of a pockct borough had no constituency to consider, and there was not in those days the incentive to frequent speaking that is now fur- nished by full daily reports of the debates circulating through the entire country, His maiden speech was de- livered early inthe session of 1824 in the debate on

a private bill for lighting Manchester with gas. Although the sub- ject can scarcely have given scope for any high flight of oratory, the speaker was warmly complimented by Sir James Mackintosh, one of the first authorities in the House, who welcomed him as an accession to the Liberal ranks, and Hansard reports the speech as characterized by “ much clearness and ability.” His second appearance was made in connection with a subjcct—irrepressible as it proved, though he always did his utmost to repress it—-which was afterwards to determine more than one important turning point in his political career, and to call forth his last utter- ance in parliament. It is noteworthy also as an early exhibition of the Conservative instinct whose growing strength led gradually to an entire change of his political position, On the 6th May 1824, he delivered what seems to have been a vehement and eloquent speech against Joseph Hume’s motion for a reduction of the Irish Church establishment, maintaining in its most conservative form the doctrine that church property is as sacred as private property. From this time his appearances became frequent ; and he soon asserted his place as one of the most powerful

speakers in the House. Specially noticeable almost from the first was the skill he displayed im reply. Macaulay, in an essay published in 1834, remarked that he seemed to pos- sess intuitively the faculty which in most men 1s developed only by long and laborious practice. ‘Indeed, with the exception of Mr Stanley, whose knowledge of the science of parliamentary defence resembles an instinct, it would be difficult to name any eminent debater who has not made himself a master of his art at the expense of his audience.”

In the autumn of 1824 Stanley went on an extended tour through Canada and the United States in company with Mr Labouchere, afterwards Lord Taunton, and Mr Evelyn Denison, afterwards Lord Ossington. In May of the following year he married the second daughter of Edward Bootle-Wilbraham, created Baron Skelmersdale in 1828, by whom he had a family of two sons and one daughter who survived, besides three children who died in infancy.

At the general. election of 1826 Stanley renounced his connection with Stockbridge, and became the repre- sentative of the borough of Preston, where the Derby in- fluence has usually, though not invariably, been paramount. The change of seats had this advantage, that it left him free to speak against the system of rotten boroughs, which he did with great force during the Reform Bill debates, without laying himself open to the charge of personal inconsistency as the representative of a place where, according to Gay, cobblers used to “feast three years upon one vote.” In 1827 he and several other distin- guished Whigs made a coalition with Canning on the de- fection of the more unyielding Tories, and he commenced his official life as under-secretary for the colonies, Whether the coalition arrangement would have proved stable had its distinguished leader survived is more than questionable, but it was entirely broken up by his death in August of the same year. Lord Goderich, who had been Stanley’s chicf at the Colonial Office, succeeded to the premiership, but le never was really in power, and he resigned his place after the lapse of a few months without venturing to meet parliament. During the succeeding administration of the duke of Wellington (1828-30), Stanley and those with whom he acted were in opposition, His robust and assertive Liberalism about this period sounds some- what curiously to a younger generation who knew him only as the very embodiment of Conservatism. They can

find little of the earl of Derby except his characteristic |

force of expression in the conviction uttered by Stanley, “that the old and stubborn spirit of Toryism is at last yield- ing to the liberality of the age—that the Tories of the old school, the sticklers for inveterate abuses under the name of the wisdom of our ancestors, the laudatores temporis acti are giving way on all sides.” Even the most retrograde political party, however, makes distinct progress almost in spite of itself as the years pass on, and Lord Derby might very well have main- tained that the Toryism he represented in his ma- turity was not the Toryism he had denounced in his yonth.

By the adveut of Lord Grey to power in November 1830, Stauley obtained his first opportunity of showing his capacity for a responsible office. He

was appointed to the chief secretaryship of Ireland, a position in which, as it turned out, he found ample scope for both administrative and debating skill. On accepting office he had, according to the usual practice, to vacate his seat for Preston and seek re-election ; and it must have been peculiarly mortify- ing to one of his liigh spirit that, in spite of his family in- fluence and growing reputation, he alone of all the members of the new ministry in the Lower House failed to secure his

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return. He was defeated, and the defeat was doubtless rendered more bitter by the fact that his opponent was the Radical “orator” Hunt. The contest was a peculiarly keen one, and turned upon the question of the ballot, which Stanley refused to support. He re-entered the house as one of the members for Windsor, Sir Hussey Vivian having resigned in his favour. In 1832 he again changed his seat, being returned for North Lancashire, which he continued to represent until his elevation to the House of Lords.

Mr Stanley was one of the most ardent supporters of the great measure which has made Lord Grey’s administra- tion the most memorable of the present century. Of this no other proof is needed than his frequent parlia- mentary utterances, which were fully in sympathy with the popular cry “The bill, the whole bill, and nothing but the bill.” Reference may be wade especially to the speech he delivered on the 4th March 1831 on the adjourned debate on the second reading of the bill, which was marked by all the higher qualities of his oratory. More than thirty years later, when he was premier, he was again called upon to deal with the question, and he had states- manship enough to settle it on a permanent basis; but the incertitude with which he then took what he himself in a well remembered phrase called “a leap in the dark” was in curious contrast to the clear conviction with which he advocated the earlier measure.

Apart from his connection with the general policy of the Government, Stanley had more than enough to have employed all his energies in the

management of his own department. The secretary of Ireland has seldom an easy task; Stanley found it one of peculiar difficulty. The country was in a very unsettled state. The just concession that had been somewhat tardily yielded a short time before in Catholic emancipation had excited the people to make all sorts of demands, reasonable and unreasonable. As one result of that concession these demands were now permitted to be urged on the floor of the House by the most eloqnent and the most widely popular representative Ireland has ever possessed,—one, too, whose hatred of the "base, bloody, and brutal Whigs" seems to have totally unfitted him for judging Whig measures fairly. Problems of great practical difficulty in connection with the land and the church pressed for solution ; and the alarming increase of agrarian outrages demanded even more urgently the instant applica- tion of vigorous measures of repression. Mr Stanley's con- duct in these trying circumstances showed that he liad the spirit that rises with difficulties. Undaunted by the fierce denunciations of O'Connell, who styled him Scorpion Stanley, he discharged with determination the ungrateful task of carrying a Coercion Bill throngh the House. Parlia- ment has probably seldom witnessed warmer or more pel sonal encounters than those which took place about this time between the Liberator and the Irish Secretary, and seldom has an official position been more gallantly defended. It was generally felt that O'Connell, powerful though ue was, had fairly met his match in Stanley, who, with invec- tive scarcely inferior to his own, evaded no challenge, ignored no argument, and left no tannt unanswered. The title " Rupert of Debate " is peculiarly applicable to him in connection with the fearless if also often reckless method of attack he showed in his parliamentary war with O'Connell. It was first applied to him, however, thirteen years later by Sir Edward Bulwer Lytton in the following passage of Zhe New Timon ;—

'¢ One after one the lords of time advance ; Here Stanley meets—here Stanley scorns the glance! The brilliant chief, irregularly great, Frank, haughty, rash,—the Rupert of debate."

The best answer, however, which he made to the attacks

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of the great agitator was not the retorts of debate, effective though these were, but the beneficial legislation he was instrumental in passing. Two of his measures deserve special mention. He introduced and carried the first national education act for Ireland, one result of which was the remarkable and to niany almost incredible phenomenon of a board composed' of Catholics, Episcopalians, and Presbyterians, harmoniously administering an_ efficient education scheme. He was also chiefly responsible for the Trish Church Temporalities Act, though the bill was not introduced into parliament until after he had quitted the Trish secretaryship for another office. By this measure two archbishoprics and eight bishoprics were abolished, and a remedy was provided for various abuses connected with the revenues of the church. As originally introduced, the bill contained a clause authorizing the appropriation of surplus revenues to non-ecclesiastical purposes. This had, however, been strongly opposed from the first by Stauley, and several other members of the cabinet, and it was withdrawn by the Government before the measure reached the Lords. 'There was therefore no ground for the charge of inconsistency brought against Stanley, when a year later he scceded from the cabinet on the proposal beiug renewed.

In 1833, just before the introduetion of the Irish Church Temporalitics Bill, Stanley had been promoted to be secretary for the colonies with a seat in the cabinet. Jn this position it fell to his lot to carry through parliament a measure which is one of the abiding glories of English legislation. The agitation for the emancipation of the slaves had been mainly the work of others whose names have become historical in connection with it; but to Stanley belonged the honour and privilege of bringing it to a successful practical issue in the pages of the statute book. The speech which he delivered on introducing the bill for the emancipation of the slaves in the West Indies, on the.14th May 1835, was one of the finest specimens of his eloquence. It showed a philanthropic spirit and a love of freedom which proved him to be a not unworthy associate of Clarkson, Wilberforce, and Buxton, and it was admirable for the clear statement of the somewhat coinplicated arrangement by whieh the all but unanimous wish of the nation was to be carried out. 'The latter quality was still more conspicuous in committee, through which Stanley carried the measnre with the firmness and tact of true statesmanship.

Tt has already been said that the Irish Church question determined more than one turning-point in Mr Stanley's political career. The most important occasion on which it did so was in 1834, when the proposal of the Government to appropriate the surplus revenues of the church to educational purposes led to his secession from the cabinet, and, as it proved, his complete and final separation from the Whig party. In the former of these steps he had as his companions Sir James Graham, the earl of Ripon, and the duke of Richmond. Soon after it occurred, O'Connell, ainid the laughter of the House, described the secession in a couplet from Canning's Loves of the Triangles :—

- Still down thy steep, romantic Ashbourne, glides The Derby dilly carrying six insides."

Stanley was by no means content with marking his disapproval of the conduct of the Government of which he had been a member by the simple act of withdrawing from it. He spoke against the bill to which he objected with a vehemence that showed the strength of hi feeling in the matter, and against its authors with a bitterness that he himself is understood to have afterwards admitted to have been unseemly towards those who had so recently been his colleagues. 'The language of one speech deserves to be quoted as a good specimen of what he could do in the way

of invective when he chose. " Plunder," a term very familiar in more recent debates on the same long-vexed question, was perhaps the mildest word he used. The course followed by the Government was " marked with all that timidity, that want of dexterity, which led to the fail- ure of the unpractised shoplifter." Huis late colleagues were compared to " thimble-riggers at a country fair," and their plan was "petty larecny, for it had not the redeeming qualities of bold aud open robbery."

In the end of 1834, Lord Stanley, as he was now styled by courtesy, his father having succceded to the earldom in October, was invited by Sir Robert Peel to join the short-lived Conservative ministry which he formed

after the resignation of Lord Melbourne. Though he declined the offer for reasons stated in a letter published in the Peel memoirs, he acted from that date with the Conservative party, and on its next accession to power, in 1841, he accepted the office of colonial secretary, which he had held under Lord Grey. His position and his temperament alike, however, made hima thoroughly inde- pendent supporter of any party to which he attached him-self. When, therefore, the injury to health arising from the late hours in the Commons led him in 1844 to seek elevation to the Upper House in the right of his father's barony, Sir Robert Peel, in acceding to his request, had the satisfaction of at once freeing hiniself from the possible effects of his 'candid friendship" in the House, and at the same time greatly strengthening the debating power on the Conservative side in the other. If the premier in taking this step had any presentiment of an approaching difference on a vital question, it was not long in being realized. When Sir Robert Peel accepted the policy of free trade in 1846, the breach between him and Lord Stanley was, as might have been anti- cipated from the antecedents of the latter, instant and irreparable. Lord Stanley at once asserted himself as the uncompromising opponent of that policy, and he became, as his position warranted, the recognized leader of the Protectionist party, having Lord George Bentinck and Mr Disraeli for his lieutenants in the Commons. They did all that could be done in a case in which the logic of events was against them, but their watch- word of Protection was never to become more tlhian a watchword. It is one of the peculiarities of English politics, however, that a party may come into power because it is the only available one at the time, though it may have no chance of carrying the very principle to which it owes its organized existence. Such was the case when Lord Derby, who had succeeded to the earldom on the death of his father in June 1851, was called upon to form his first administration in February 1852. He was in a minority, but the circumstances were such that no other than a minority Government was possible, and he resolved to take the only available means of strengthening his position by dissolving parliament and appealing to the country at the earliest opportunity. The appeal was made in autumn, but its result did not materially alter the position of parties. Parliament met in November, and by the middle of the following month, the ministry had resigned in consequence of their defeat on the clever but financially unsound kudget proposed by Mr Disraeli. For the six following years, during Lord Aberdeen's " ministry of all the talents " and Lord

Palmerston’s premiership, Lord Derby remained at the head of the opposition, whose policy gradually became more generally Conservative and less distinctively Protectionist as the hopelessness of revers- ing the measures adopted in 1846 made itself apparent to all but the most reactionary. In 1855, he was asked to form an administration after the resignation of Lord Aberdeen, but failing to obtain sufficient support, he

declined the task. It was in somewhat more hopeful cir- cumstances that, after the defeat of Lord Palmerston on the Conspiracy Bill in February 1858, he assumed for the second time the reins of government. Though he still could not count upon a working majority, there was a possibility of carrying on affairs without sustaining defeat, whick was realized for a full session, owing chiefly to the dexterous management of Mr Disraeli in the Commons. The one rock ahead was the question of Reform, on wkich the wishes of the country were being emphatically ex- pressed, but it was not so pressing as to require to be immediately dealt with. During the session of 1858 the Government contrived to pass two measures of very considerable importance, one a bill to remove Jewish disabilities, and the other a. bill to transfer the government of India fiom the East India Company to the Crown. Next year the question of parliamentary reform had to be faced, and, recognizing the necessity, the Government intro- duced a bill at the opening of the session, which, in spite of, or rather in consequence of, its ‘‘ fancy franchises,” was rejected by the House, and, on a dissolution, rejected also ky the country. A vote of no confidence having been passed in the new parliament on the 10th June, Lord Derby at once resigned.

After resuming the leadership of the Opposition Lord Derby devoted much of the leisure the position afforded him to the classical studies that had always been con- genial to him. Jt was his reputation for scholarship as well as his social pusition that had led in 1852 to his appointment to the chancellorship of the university of Oxford, in succession to the duke of Wellington; and perhaps a desire to justify the possession of the honour on the former ground had something to do with his essays in the field of authorship. These were made at first with a diffidence that contrasted strongly with his boldness in politics. His first venture was a poetical

version of the 9th ode of the 3rd book of Horace, which appeared in Lord Ravensworth's collection of translations of the Odes. In 1862 he printed and circulated in influential quarters a volume entitled Zranslations of Poems Ancient and Modern, with a very modest dedicatory letter to Lord Stanhope, and the words "Not published" on the title-page. It contained, besides versions of Latin, Italian, French, and German poems, a translation of the first book of the Zizad. The reception of this volume was such as to encourage him to proceed with the task he had chosen as his magnum opus, the translation of the whole of the //iad, which accordingly appeared in 1864. The fact that it speedily passed through six editions is, of course, not so unequivocal a proof of its literary merit as would have been the case had the work proceeded from an author of less social distinction, but it has considerable significance. 'Tried on its merits, the most severe critic could not pronounce the work a failure. That it was not a complete success was due principally to the facts that the author had not caught the difficult secret of the management of the metre he chose—blank verse,— and that he was unable to divest himself of the diffuseness and of the modern cast of thought and style of expression natural to the parliamentary orator,

During the seven years thit elapsed between Lord Derby's second and third administrations an industrial crisis occurred in his native county, which brought out very conspicuously his public spirit and his philanthropy. The destitution in Lancashire, caused by the stoppage of the cotton-supply in consequence of the American civil war, was so great as to threaten to overtax the benevolence of the country. That it did not do so was probably due to Lord Derby more than to any other single man. From the first he was the very life and soul of the movement for relief. His personal subscription, munificent though

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it was, represented the least part of his service. His nokle speech at the meeting in Manchester in December 1872, where the movement was initiated, and his advice at the subsequent meetings of the committee, which

he attended very regularly, were of the very highest value in stimulating and directing public sympathy. His relations with Lancashire had always been of the most cordial description, notwithstanding his early rejection by Preston; but it is not surprising that after the cotton famine period the cordiality passed into a warmer and deeper feeling, and that the name of Lord Derby js still cherished in most grateful remembrance by thousands of the factory opera- tives.

On the rejection of Earl Russcll's Reform Bill in 1866, Lord Derby was for the third time intrusted with the formation of a cabinet. Like those he had previously formed it was destined to be short-lived, but it lived long enough to scttle on a permanent basis the question that had proved fatal to its predecessor. The " education" of the party that had so long opposed all reform to the point of granting household suffrage was the work of another; but it is understood that Lord Derby fully concurred in, if he was not the first to suggest, the statesmanlike policy by which the question was disposed of in such a way as to take it once for all out of the region of controversy and agitation. 'The passing of the Reform Bill was the main business of the session 1867. The chief debates were, of course, in the Commons, and Lord Derby's failing powers prevented him from taking any large share in those which took place in the Lords. Tis description of the measure as a "leap in the dark," was eagerly caught up, because it exactly represented the common opinion at the time,—the most experienced statesmen, while they admitted the granting of household suffrage to be a political necessity, being utterly unable to forcsee what its cffect might be on the constitution and government of the country.

Finding himself unable, from declining health, to en- counter the fatigues of another session, Lord Derby resigned office early in 1868. 'The step he had taken was announced in both houses on the evening of the 25th February, and warm tributes of admiration and esteem were paid by the leaders of the two great parties. He was succeeded by Mr Disraeli, to whom he yielded the entire lcadership of the party as well as the premiership. His subsequent appearances in public were few and unimportant. It was noted as a consistent close to his political life that his last spcech in the House of Lords should have been a denunciation of Mr Gladstone's Irish Church Bill

marked by much of his early fire and vehemence. A few months later, on the 23rd October 1869, he died at Knowsley.

Lord Derby was one of the last and most brilliant repre- sentatives of a class whicli seems to have become cxtinet, for the time at least, if the sharp differentiation of human pursuits that has now established itself has not rendered it impossible that it should ever again exist. Politics 18 now a distinct and exclusive profession ; the number of those to whom, like Lord Derby, it is the main without being the all-absorbing interest of life seems to become fewer ycar by year. There still remain one or two noted statesmen who are also noted authors, but of the life of many interests embracing public affairs, scholarship, litera- ture, society, sportsmanship, and estate management, Lord Derby was almost the last specimen. Of another class, which will have ceased to exist when one or two more have passed away, he was also among the last and best; he was a master of the all but lost art of parliamentary oratory. On this point it is enough to quote the testimony of two most competent witnesses. Sir Archibald Alison, writing of him when he was in the zenith of his powers, styles him “by the admission of all parties the most pct

fect orator of his day.” Even higher was the opinion of Lord Aberdeen, who is reported by the 7’imes to have said that no one of the giants he had listened to in his youth, Pitt, Fox, Burke, or Sheridan, ‘“‘as a speaker, is to be compared with our own Lord Derby, when Lord Derby is at his best.” (W. B.S.)

DEREYEH, or Deraya, a town of Arabia, in the Nejd, on the caravan-route from the Red Sea to the Persian Gulf, about 15 miles west of Riad. It was formerly the capital of the Wahabees, and had a population of about 30,000 inhabitants; but it has never recovered from the ruin inflicted on it by the army of [brahim Pasha in 1818.

DERHAM, Witr1am (1657-1735), an eminent English divine and natural philosopher, was born at Stoughton, near Worcester, in 1657. He received his early educa- tion at Blockley, in his native county, and in 1679 graduated with much distinction at Trinity College, Oxford. Three years

later he became vicar of Wargrave, in Berkshire; and in 1689 he was preferred to the living of Upminster, in Essex. In 1696 he published his Artificial Clockmaker, which went through several editions. The best known of his subsequent works are Physico-Theology, published in 1713; Astro-Theology, 1714 ; and Christo-Theology, 1730. In consideration of these contributions to science and theology he was, in 1716, made a canon of Windsor ; and in 1730 he received the degree of D.D. from Oxford. His last work, entitled A Defence of the Church's Right in Leasehold Estutes, appeared four years previous to his death, which happened in 1735. Besides the works published in his own name, Derham contributed a variety of papers to the Philosophical Transactions, revised the Miscellanea Curtosa, edited the correspondence of John Ray, and Albin's Vatural History, and published some of the MSS. of Hooke, the natural philosopher.

DERVISH is a Persian word meaning "the sill of the door," or those who beg from door to door. The Arabic equivalent is fakir, or fuqueer. The dervishes of the Turkish empire may be said to constitute the regular religious orders, and are distinguished from the ulemas, or secular clergy. In Turkey, Egypt, Persia, Hindustan, and Central Asia, however, dervishes, or fakirs, are to be found in great number who belong to no society, but are simply mendicants or single devotees, many of whom subsist by professional jugglery. Especially is this true of the Byragis, the Dundis, the Bhikshooks, the Wanuprusts, the Sunyasis, the Aghorpunts, the Gosiens, the Jogis, the Oodassis, the Jutis, and the Lingaet Jungums of northern Hindustan, and still more emphatically of the Bonzes, or Buddhist monks. But in the more favourable sense.of the word, the dervishes represent Sofism, or the spiritual and mystic side of Islam. Long before the time of Mahomet, Arabic thought was divided, as if by Greek and Indian influences, into the schools of the Meschaiouns (the walkers) and the Ischrachaiouns (the contemplators). When the Koran appeared, these became the Mutekelim (meta- physicians), and the Sofis (mystics). The latter put an esoteric interpretation on both the Koran and the Hadisat, or collected sayings of the Prophet; they dispense with the jemaat and other formalities of the mosque; they in many cases recognize the fact of spiritual religion outside Islam; and in general they observe the rules of poverty, abstinence from wine, and celibacy. The name fakir, indeed, comes from the saying of the Prophet, " El fakr fakhri," poverty is my pride. The six Erkian,

or pillars of the Tesavvuf, or spiritual life, are (1) the existence of God, (2) His unity, (3) the angels, (4) the prophets, (5) the day of resurrection, and (6) good and evil through God's predestination. But it is only the Tarikats, or orders (lit. paths), among the more orthodox or Sunnite Mahometans who attach much importance to positive dogma. The

Shiite party, especially the Persian dervishes, who trace their descent through various sheikhs and peers from Ali, the fourth caliph, believe that "the paths leading to God are as many as the breaths of his creatures." These form the great majority of the orders ; for it is stated in a work called the Sisdeh ul Evlia Ullah (Genealogy of the Saints of God), last edited in 1783, that, out of 36 well- defined orders, 12 of which were in existence before the beginning of the Ottoman empire, only 3, viz, the Bestamis, the Nakshibendis, and the Bektashis, are descended from the congregation of Abu Bekr, the second caliph, and that all the others are descended from the caliph Ali. As the dervishes do not recognize the legal exposition which the ordinary tribunals give of the letter of the Koran, and acknowledge no authority but that of their spiritual guide, or of Allah himself speaking directly to their souls, the Ottoman sultans have always regarded them with jealousy; and in 1826 Mahmond entirely suppressed the order of the Bektashis, which had for centuries been closely connected with the Janissaries, or Hoo Keshans (him scatterers), and which is said to have formed part of a Fermasou (freemasonry) extending through Palestine, Syria, and Turkey.! The other orders, however, or most of them, have survived to the present day, and are generally popular,—one of them, the Mevlevis, being joined by persons from the highest and wealthiest ranks. But membership, when it does not proceed beyond the first stage of Shi'at or Sher'iat, z.¢, legal religion under the supervision of a murshid,? may be satisfied by the repeti- tion of a few prayers at home and the wearing of the sacred cap for a few minutes each day.

The regular dervishes live in tekkiehs, khanakahs, or con- vents, which are endowed with lands or wakf, just as the Muths of Hindustan are endowed with enam lands, incapable of mortgage or alienation. Thus, in 1634, the sultan Amurath IV. gave to the Bektashis of Konieh the whole tribute paid

by that city. Over each convent presides a sheikh, or murshid, who represents the pir, or original founder of the order. This corresponds to the mohunt, malik, or guru of Hindustan. Among the Persian Nosairis (who consider Mahomet an impostor, and perform no ablutions), the succession of sheikhs is hereditary—else- where by seniority or election, confirmed by the Sheikh ul Islam. In Hindustan the selection takes place in a dusname, or council of mohunts, called among the Sikhs a muta. The murid, or disciple, has to undergo a long initiation (called in Turkey Zkrar, in Egypt Akd) before he obtains the taybend, or woollen belt, with its palenk or cabalistic "stone of contentment ;" the mengusay, or ear- rings shaped like the horse shoe of Ali; the khirka, or mantle ; the tesbeeh, or rosary, containing the ismi jelal, or the 99 beautiful names of God; and finally the taj, or white cap, with the proper number of terks, or sections, belonging to the order. Similar distinctions are preserved in Hindustan by the barbarous method of marking on the forehead the sandal-wood stripes of Siva, or the white and red trident of Vishnu. In the Mevlevi order the murid goes through 1001 days of menial labour, and is during that time called the karra kolak, or jackal. It is not necessary, however, to give up one's private property ; and many dervishes are permitted to remain in trade on the

? This jealousy was not without foundation. The great political factions which disturbed Constantinople, the Reds, the Whites, the Masked, the Intimates, the Interpreters, the Hashashins (from Hashish, whence assassins), were to some extent connected with the dervish orders. The Kalenderis, founded by an Andalusian dervish who was expelled from the Bektashis, furnished several pretenders to the title of Mehdee, the 12th imam, whose second coming is looked for by all the mystics.

- The subsequent stages are Tarikat, mystical rites, Mearifat, know- ledge, and Hakikat, truth.

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principle stated by the Prophet, that " the seeker of gain is the friend of God." Some also are permitted to marry, just as among the Sikh fakirs of Nanuk those named Bashara (with the law), or Salik (travellers), are

allowed to marry and to move about ; those named Beshara (without the law), or Majzub (the abstracted), are condemned to celibacy and seclusion. But their lives are mainly directed to the production in themselves of the ecstatic state in which the soul enters the Alem-i-misal, or world of dreams, and becomes one with God. This part of Sofism strongly resembles Vedantism. Kaif, or quiescence, is often caused by the use of hashish (the Arabic khoshkhosh, sold at Constantinople in pastilles called esrar), or by khalwet, retirement, and the erba'cin, or fast for 40 days. Then they indulge in excessive and rapid repetitions of particular phrases, as the Esami Tlahi, or seven attributes of God, viz.—La ilaha il? Allah (no God but Allah), Ya Allah (O God), Ya Hoo (O Him), Ya Hakk (O just God), Ya Hay (O living God), Ya Kayyoum (O living God), Ya Kabhar (O revenging God). The Zikr consists mainly in a chant, always becoming louder and more violent, of the first attribute ; thus—

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This leads to the Devr, or rotation, in which the Rufai, or Howling Dervishes, stand in a circle, shoulder to shoulder, each on his right foot, and swaying the body and the left leg backwards and forwards or from side to side ; the Sem'a of the Mevlevis, or Spinning Dervishes, in which a pirouette is performed all round the khaneh on the left heel, the eyes being closed, the arms outstretched ; and other more violent dances, accompanied by the music of the nay, or flute, and tambourine, and by the cries of the dancers. In the Halet, or final ecstasy, the dervishes take hold of red-hot implements, place glowing charcoal in the mouth, and exhibit prodigies of muscular strength, which are in some cases the genuine and interesting effects of excitement, in others mere calculated imposture. At last the Jezbed, or attraction of God, begins to operate. Besides daily readings from the Koran, an infinity of small figurative prayers, or terjumans, is repeated. These are connected with the khirka, the palenk, the postaki, or seat, the seggadeh, or carpet, and with almost every act and motion of the dervish within the monastery. A rabouta, or silent prayer, is also practised. In return for these mystical rites the dervish obtains spiritual powers, of which the most remarkable is that called fascination, kuvveh iradat, the power of the will, which depends on certain physical conditions, and seems to include prophecy and the phenomena of mesmerism. By vifk, or the science of

numbers, a charm, composed of the names of the matloob, or patient, and the arif, or knowing person (each letter of the alphabet has a numerical value), is placed on the knee of the latter, and by diligent blowing and mental con- centration he is able to summon before him the spirit of the matloob. Some dervishes cure diseases, sell talis- mans, called tilsims and nushkas, charm snakes, and some are musicians and dancers. It is in Egypt and Hindustan that the extreme degrees of squalor, of imposture, and also of self-mortification are found. Some spend their lives in absolute nakedness, their bodies smeared with wood ash, their unkempt hair twisted into a turban; some roll head over heels for hundreds of miles ; some contemplate the tip of the nose from 84 different postures ; some live by the fraudulent sale of drugs or by feats of legerdemain. All Mahometan dervishes hold a powerful belief in the per- petual agency of the evlia, or saints, and the departed salihin (pure ones), the “unseen men or masters of destiny,” who are sent forth from the kutb, or centre of the roof of the

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Kaaba, to control the spiritual affairs of the world. This ig closely connected with the doctrine of tenassuh, or metem- psychosis, which, however, is held chiefly in a spiritual sense. The Bektashis believe that every one has a mesal, or equal (doppel-ginger ?), who watches over him from the unseen region.

For an account of dervishes in Persia, where mysticism has been refined by the poetry of Jelaleddin, Saadi, and Hafiz, and

where the seven original orders of Hulullieh, Ittihadieh, Vusoolieh, Ashkieh, Telkinieh, Zurikieh, Wahdettich, are still preserved, see

Malcolm’s History of Persia, and De Gobineau’s Three Years in Asia, 1859 ; for Central Asia, the works of Vambéry and other travellers ; for Hindustan, The Peoples of India, by Kaye and Watson, 1868- 72, and Steel’s Hindu Castes. For Egypt, where four orders are presided over by the Sheikh el Bekri, and where the ceremony of the Doseh, or the mounted sheikh riding over the bodies of the dervishes, is still practised, see Laue’s

Modern Egyptians ; and for the general subject, The Dervishes, or Oriental Spiritualism, by J. P. Brown, Constantinople, 1868, which contains a number of valu- able translations of Dervish MSS. (w.C. 8.)

DESAIX DE VOYGOUX, Louis CuarLes ANTOINE (1768-1800), one of the most eminent generals of the French republic, was born at the Chateau d'Ayat, near Riom, in Auvergne, on the 17th August 1768. He studied at the military school founded by the Marshal d'Effiat, and distinguished himself by his eagerness in acquiring a know- ledge of his chosen profession. After joining the army he spent some time in garrison at Briangon and Huningue. He was favourable to the Revolution, but was an object of suspicion to the Convention, on account of his aristocratic birth and his popularity with his men. He was twice sus- pended, andon the earlieroccasion he was imprisoned for two months by order of Carnot. The first engagement in which he took part was the battle of Lauterburg, in which he was wounded; and when Moreau executed his masterly retreat through the Black Forest, Desaix contributed not a little to the success of that memorable exploit. After some gallant achievements, such as the repulse of the Archduke Charles at Rastadt, and the defence of the bridge of Kehl, he accompanied Bonaparte (1798-9) to Egypt, where he dispersed the Arabs, and for his various services was made commander of Upper Egypt. The campaign of eight months in which he completed the conquest of Upper Egypt was the great achievement of his military career. During his occupation he conducted himself in such a way as to win from the inhabitants the title of the Just Sultan, and to be compared by his soldiers to Bayard. On his return to Europe he found Napoleon marching to the con- quest of Italy. With a small squadron he hastened to join the first consul, whom he overtook at Marengo at the very moment when the Austrians had deemed themselves secure of the victory. His timely arrival changed the fortune of the day ; but in the moment of victory he was shot through the heart aud immediately expired, 14th June 1800. His body was embalmed at Milan, aud finally deposited in the convent of Mount St Bernard, where a handsome monument is erected to his memory.

DESAUGIERS, Marc Antone Mapeteins (17 72- 1827), a French dramatist and song-writer, son of Mare Antoine Desaugiers, a musical composer, was born at Fréjus on the 17th November 1772. Being intended for the church,

he studied at the Mazarin College in Paris, where he had for one of his teachers the celebrated critic Geoffroy. He did not continue his studies long, howevel having shown signs of a decided dramatic talent, which his father thought it well to encourage. Ere he completed his twenticth year he had written a comedy in verse 18 one act, which was well received when produced on the stage in 1792. In the following year he wrote some verses which appeared in the Almanach des Muses, Dut ing the stormy period of the Revolution he emigrated to St Domingo with a sister who was about to marry @ creole

planter. He found that he had only escaped one danger for another equally great. During the negro revolt he was made prisoner, and barely escaped with his life. He took refuge in the United States, where he supported himself by teaching the piano. In 1797 he returned to his native country, and at once commenced to write for the stage. He was successful from the first, and in a very few years he became famous as a writer of comedies, operas, and vaudevilles, which were produced in rapid succession at the Thédtre des Variétés and the Vaudeville. During the same period he acquired a reputation of a still higher kind as a writer of convivial aud satirical songs, which, though different in character, cau only worthily be compared with those of Béranger. His singing of his own songs made his society eagerly sought for in many of the salons of Paris. In 1815 Desaugiers succeeded Barré as manager of the Vaudeville, and he was prosperous for some years, though not in all respects well-fitted for the position. In 1820, however, the opposition of the Gymnase proved too strong for him, and he resigned. Five years later he allowed himself to be persuaded to resume the position, but he had scarcely done so when he fell into bad health. He died in Paris of the result of an operation for stone on the 9th August 1827.

An edition of Desaugier’s Chansons et podsies diverses appeared in three volumes in 1827. It contains a notice of his life by Brazier. See also Saint Beuve’s Portraits Contemporains.

DESAULT, Pierre JoszrH (1744-95), a distinguished French anatomist and surgeon, was born at Magny-Vernais, a village of Franche-Compté, in 1744. He was descended of humble parents, and received the early part of his

education in a school of the Jesuits, being destined for the church. His own inclination, however, tended to the study of medicine ; and, after learning something from the barber-surgeon of his native village, he was at length settled as an apprentice in the military hospital of Belfort. Here he acquired some knowledge of anatomy aud military surgery ; and, having previously made considerable progress in mathematical studies, he applied this knowledge, after the example of Borelli and others, to the investigation of physiological subjects. He early translated Borelli's De Motu Animalium, and added notes and illustrations, which, although founded on wrong principles, gave undeniable proofs of zeal and industry.

He went to Paris when about twenty years of age, and opened a school of anatomy in the winter of 1766, which was soon attended by about 300 pupils, a great proportion of whom were older than himself. His success excited the jealousy of the established teachers and professors, who, although he was patronized and protected by some surgeons of great eminence, would have obliged him to renounce public teaching, had he not resorted to the expedient of adopting the name of another as a sanction to his proceed- ings. In 1776 he was admitted a member of the corpora- tion of surgeons; and so limited were his finances at this time, that he was allowed to pay his fees at his own con- venience. He successively held the positions of honour in the corporation and academy of surgery; and in 1782 he was appointed surgeon-major to the hospital Dela Charité,

Desault was now regarded as one of the first surgeons of Paris. He succeeded to the next vacancy at the Hotel Dieu ; and, after the death of Moreau, almost the whole surgical department of that hospital was intrusted to him. He instituted a clinical school of surgery there on a liberal and extensive plan, which attracted a great concourse of students, not only from every part of France, but also from other countries. He frequently had an audience of about 600; and most of the surgeons of the French army derived their knowledge from his lectures. He introduced many improvements into the practice of

surgery, us well as in the construction of various surgical instruments.

In 1791 he published a work entitled Journal de Chirurgerie, edited by his pupils, which was a record of the most interesting cases that had occurred in his clinical school, with the remarks which he had made upon them in the course of his lectures. But in the midst of his valuable labours he became obuoxious to some of the Revolutionists, and he was, on some frivolous charge, denounced to the popular sections. After being twice examined, he was seized on the 28th May 1793, while delivering a lecture, carried away from his theatre, and committed to the prison of the Luxembourg. In three days, however, he was liberated, and permitted to resume his functions. When the school of health was established, he was appointed clinical professor for external maladies ; and it was throug). his means that the Evéché was converted into an hospital for surgical operations. He died on the lst June 1795 of an ataxic fever, which he had caught two days previously while attending the dauphin in the Temple. An opinion was prevalent among the populace that he was poisoned because he had refused to do anything against the dauphin's life. The autopsy which was held went to dis- prove the story, but it shows the opinion the public enter- tained of Desault's integrity. A pension was settled on his widow by the republic. The only work of which he is the sole author is entitled Traité des Maladies Chirurgicales, et des Opérations qui leur conviennent, in 2 vols. 8vo.

See Petit's Eloge de Desault (Lyons, 1795).

DESCARTES, Ren#, was born at La Haye, in Touraine, on the 3lst of March 1596, and died at Stockholm on the 11th of February 1650. The small town of La Haye lies on the right bank of the Creuse, about midway between Tours and Poitiers. The house is still shown where he was born, and a métairie about three miles off still retains the name of Les Cartes. His family on both sides was of Poitevin descent, and had its head-quarters in the neigh- bouring town of Chatellerault, where his grandfather had been a physician. Joachim Descartes, his father, having purchased a commission as counsellor in the Parlement of Rennes, introduced the family into that demi-noblesse of the robe, which, in stately isolation between the bourgeoisie and the high nobility, maintained a lofty rank in the hierarchy of France. For the one half of each year required for residence the elder Descartes removed with his wife, Jeanne Brochard, to Rennes. Three children, all of whom first saw the light at La Haye, sprung from the union—a son who afterwards

succeeded to his father in the Parlement, a daughter who married a M. du Crevis, and a second son René. His mother, who had been ailing beforehand, never recovered from her third confinement ; and the motherless infant was entrusted to a nurse, whose care Descartes in after years remembered by a small pension.

Descartes, who in the family circle was known as Du Perron, from a small estate destined for his inheritance, soon showed, say the chroniclers, an inquisitive mind, which made his father style him his philosopher. He was sent off at the age of eight to the school of La Fléche, which Henry IV. had lately founded and endowed for the Jesuits; and there he continued from 1604 to 1612. Of the educa- tion there given, of the equality maintained among the pupils, and of their free intercourse, Descartes at a later period spoke in terms of high praise.!_ He himself enjoyed exceptional privileges ; his feeble health excused him from the morning duties, and thus early he acquired the habit of matutinal] reflection in bed, which clung to him through-

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} Giuvres (ed. Cousin), viii. 546.

out life. ven then he had begun to distrust the authority of tradition and his teachers.

Two years before he left school he was selected as one of the twenty-four gentlemen who went forth to receive the heart of the murdered king as it was borne to its resting- place at La Fléche. At the age of sixteen he went home to his father, who was now settled at Rennes, and had taken a second wife from Brittany. During the winter of 1612 he completed his preparations for the world by lessons in horsemanship and fencing ; and then in the spring of 1613, he started as his own master to taste the pleasures of Parisian life. Fortunately the spirit of dissipation does not seem to have carried him any perilous lengths ; the worst we hear of is a passion for gaming. Here, too, he made the acquaintance of Claude Mydorge, one of the foremost mathematicians of France, and renewed an early intimacy with

Marin Mersenne, an old fellow-student, senior by some years, at La Fléche, and now become Father Mersenne, of the order of Minim Friars. The withdrawal of the latter in 1614 toa post in the provinces was the signal for Descartes to abandon social life and shut him- self up for nearly two years in a secluded house of the Faubourg St Germain. Accident, however, betrayed the secret of his retirement ; he was compelled to leave his mathematical investigations, and to take part in en- tertainments, where the only thing that chimed in with his theorizing reveries was the music. The scenes of horror and intrigue which marked the struggle for supremacy between the various leaders who aimed at guid- ing the politics of France made Paris no fit place for a student, and held out little honourable prospect for a soldier. Accordingly, in May 1617, Descartes, now twenty-one years of age, set out for the Netherlands and took service in the army of Prince Maurice of Orange, one of the greatest generals of the age, who had been engaged for some time in a war with the Spanish forces in Belgium. At Breda he enlisted as a volunteer, and the first and only pay which he accepted he kept as a curiosity through life. There was alullin the war ; and the Nether- lands were distracted by the quarrels of Gomarists and Arminians. During the leisure thus arising, Descartes one day, as he roved through Breda, had his attention drawn to a placard in the Dutch tongue; and as the language, of which he never became perfectly master, was then strange to him, he asked a bystander to interpret it into either French or Latin, The stranger, who happened to be Isaac Beeckman, principal of the college of Dort, offered with some surprise to do so into Latin, if the inquirer would bring him a solution of the problem,—for the advertisement was one of those challenges which the mathematicians of the age, in the spirit of the tournaments of chivalry, were accustomed to throw down to all comers, daring them to discover a geometrical mystery known as they fancied to themselves alone. Descartes promised and fulfilled; and a friendship grew up between him and Beeckman—broken only by the literary dishonesty of the latter, who in later years took credit for the novelty contained in a small essay on music (Compendium Music) which Descartes wrote at this period and intrusted to Beeckman.!

After thus spending two years in Holland asa soldier in a period of peace, Descartes, in July 1619, attracted by the news of the i dit :

‘ impending struggle between the house of Austria and the Protestant princes, consequent upon the election of the palatine of the Rhine to the kingdom of eae = oe for Upper Germany, and volunteered

arlan service. The winter of 1619, spent

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1 It was only published after the author’s death ; and of it, besides

the French versi : : : a ay there exists an English translation ‘*by a Person

in quarters at Neuburg on the Danube, was the critical

period in his life. Here, in his warm room (dans un poéle), he indulged those meditations which afterwards led to the Discourse of Method. It was here that, on the eve of St Martin's day, he "was filled with enthusiasm, and discovered the foundations of a mar- vellous science." He retired to rest with anxious thoughts of his future career, which haunted him through the night in three dreams, that left a deep impression on his mind. "Next day," he continues,? "I began to understand the first principles of my marvellous discovery." The date of his philosophical conversion is thus fixed toa day. Butthe light was as yet dim ; he had only glimpses of a method which should invigorate the syllogism by the co-operation of ancient geometry and modern algebra. For during the year that elapsed before he left Swabia (and whilst he sojourned at Neuburg and Ulm), and amidst his geometrical studies, he would fain have gathered some knowledge of the mystical wisdom attributed to the Rosicrucians; but the Invisibles, as they called them- selves, kept their secret, and he found them not. His restlessness of spirit is well shown by a vow (which he himself records with the date of September 23, 1620), to make a pilgrimage to Loretto—" if possible, on foot from Venice; if not,in the most devout manner he could."? Soon after the Bavarian troops were ordered into active service. He was present at the battle of Prague, where the hopes of the elector palatine were blasted (9th November 1620), passed the winter with the army in Southern Bohemia, and next year served under Count Boucquoi in Hungary. On the death of this general Descartes quitted the imperial service, and in July 1621 began a peaceful tour through Moravia, the borders of Poland, Pomerania, Brandenburg, Holstein, and Friesland, from which he re-appeared in February 1622 in Belgium, and betook himself directly to his father's home in Brittany. The sole incident recorded of this excursion is his danger, when crossing in a small boat to Dutch Friesland, from the cupidity of the crew, who had taken him for a rich merchant, but at once abandoned their murderous designs when they saw him rise with drawn sword, in all the dignity of a French

-gentleman.

At Rennes, where the young family of his stepmother was growing up, Descartes probably found little to interest him; and, after he had visited the maternal estate which his father now put him in possession of, he took the opportunity of running up to Paris, where he found the Rosicrucians the topic of the hour, and heard himself credited with partnership in their:secrets. A shout visit to Brittany enabled him, with his father's consent, to arrange for the sale of his property in Poitou, The proceeds were invested in such a way at Paris as to bring him in a yearly income of between 6000 and 7000 frances, a sum probably equal to more than £500 at the present day. Towards the end of the year Descartes was on his way to Italy. The natural phenomena of Switzerland, and the political complications in the Valtellina, where the Catholic inhabitants had thrown off the yoke of the Grisons and called in the Papal and Spanish troops to their assist- ance, delayed him some time ; but he reached Venice in time to see the ceremony of the doge's wedlock with the Adriatic. After paying his vows at Loretto, he came to Rome, which was then on the eve of a year of jubilee—an occasion which Descartes seized to observe the variety of men and manners which the city then embraced within its walls. In the spring of 1625 he returned home by Mount Cenis, observing the avalanches, instead of, as his relatives hoped, securing a post in the French army in Piedmont.

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2 (Euvres Inedits, i. 8. 3 CEuvres Inedits, i. 12. * Guvres, v. 255.

For an instant Descartes seems to have concurred in the plan of purchasing a post at Chatellerault, but easily gave up the idea, and settled in Paris (June 1625), in the quarter where he had sought seclusion before. By this time he had ceased to devote himself to pure mathematics, and in company with his friends Mersenne and Mydorge was deeply interested in the theory of the refraction of light, and in the practical work of grinding glasses of the best shape suitable for optical instruments. But all the while his aim was fixed on something beyond either mathematics or physics; he was engaged with reflections on the nature of man, of the soul, and of God; and it need cause no surprise that Descartes fora while remained invisible even to his most familiar friends. But their importunity made a hermitage in Paris impossible

; aud a graceless friend surprised the philosopher in bed at 11 o’clock in the morning meditating on some problem, and occasionally taking notes. In disgust at the apparent hopelessness of the position for a student, Descartes started for the west to take part in the siege of La Rochelle, and entered the famine-stricken city with the victorious troops on the 30th October 1628. A meeting at which he was present after his return to Paris decided his vocation. He had expressed an opinion that the true art of memory was not to be gained by technical devices, but by a philo- sophical apprehension of things; and the Cardinal de Berulle, the founder of the Congregation of the Oratory, was so struck by the tone of the remarks as to impress upon the speaker the duty of spending his life in the examination of truth. Descartes accepted the philosophic mission. In the end of 1628 he left Paris, and in the spring of 1629 he settled in Holland. His financial affairs he had intrusted to the care of the Abbé Picot, and as his literary and scientific representative he adopted Pére Mersenne.

Between the ages of thirty-three and _ fifty-three (1629-1649) Descartes lived almost entirely in Holland. Thrice only did he revisit France during that period—in 1644, 1647, and 1648, The first of these occasions was in order to settle family affairs after the death of his father in 1640, The eldest brother seems to have been disposed to take all he could, and to have expected the philosopher to be yielding in money matters. So little notice did the family think it necessary to take of a brother who had sunk to the level of literature, that a letter of René to his father, affectionatcly excusing his long absence, reached Rennes only after that father was lying in the tomb. The second brief visit, in 1647, partly on literary, partly on family business, was signalized by the award of a pension of 3000 francs, obtained from the royal bounty by Cardinal Mazarin in consideration of the advantages which Descartes’s investigations conferred upon mankind, and to aid him in continuing his experiments. The pension was punctually paid. The last visit in 1648 was less fortunate. A royal ordcr summoned him to France for new honours— an additional pension and a permanent post—for his fame had by this time gone abroad, and it was the age when princes sought to attract genius and learning to their courts. But when Descartes arrived, he found Paris rent asunder by the civil war of the Fronde. He paid the costs of his royal parchment, and left for his Dutch home without a word of reproach, The only other occasions on which he was out of the

Netherlands were in 1630, when he made a flying visit to England to observe for himself some alleged magnetic phenomena, and in 1634, when he took an excursion to Denmark.

_During his residence in Holland he lived at thirteen different places, and changed his abode twenty-four times. In the choice of these spots two motives seem to have in- fluenced him—the neighbourhood of a university or college,

and the amenities of the situation. Franeker, one of the neatest towns in Friesland, was the seat of a university founded in 1585; Harderwyk contained a venerable gymna- sium, of some note in the physical sciences and theology ; Deventer possessed a seminary still well endowed, but less famous than it had been in the days of Erasmus ;! Utrecht acquired a university so late as 1634; and Leyden had a notable one founded in 1575. Amersfoort, where he also lived, seems to be connected with a love affair, —the only one in his life ; at least it was there that his daughter Francine died in 1640, at the age of five. Amsterdam, where he often lodged, Leeuwarden in Friesland, and Dort were also residences. He once settled near Utrecht, as well as in the town; but the three spots which seem to have been most attractive were— Endegeest, a country house morethan a mile north-west of Leyden, of which Sorbiére has given a pleasing description in one of his letters, and the two villages of Egmond op den Hoef and Egmond the Abbey, situated between Zaandam and the ocean, in one of the prettiest localities of North Holland.

The time thus spent seems to have been on the whole happy, even allowing for some warm discussions with the mathematicians and metaphysicians of France, and for some harassing controversies in the Netherlands. Friendly agents—chiefly Catholic priests—were the intermediaries who forwarded from Dort, Haarlem, Amsterdam, and Leyden his correspondence to his proper address, which he wished kept completely secret ; and Father Mersenne was only too willing to send him loads of objections and questions. During the first twenty years of his life his health had been weak? and his complexion pale. After that time the disease in his frame seems to have worked itself off, not without some effervescence. This is the

period of his camp life (due, as he himself says, to “ heat in the liver ”),? of his wanderings, enthusiasm, dreams, and vows. With his thirtieth year this struggle seems at an end; his health seems established ; and the washed-out vermilion of his prime gives place to a dark olive complexion in his riper manhood. It is touch- ing to hear his delight in the freedom from intruders. “T sleep here ten hours every night,” he writes from Amsterdam, “and no care ever shortens my slumber.” “IT take my walk every day through the confusion of a great multitude with as much freedom and quiet as you could find in your rural avenues.”* At his first coming to Franeker he arranged to get a cook acquainted with French cookery ; but, to prevent misunderstanding, it may be added that his diet was mainly vegetarian, and that he rarely drank wine. New friends gathered round him who took a keen interest in his researches. Once only do we find him taking an interest in the affairs of his neigh- bours,—to ask pardon from the Government for a homicide.® He continued the profession of his religion. Sometimes from curiosity he went to the ministrations of anabaptists,® to hear the ranting of peasants and artisans. He carried few books to Holland with him, but a Bikle and the Summa of Thomas Aquinas were amongst them.” One of the recom- mendations of Egmond the Abbey was the free exercise there allowed to the Catholic religion, At Franeker his house was a small chateau, “separated by a moat from the rest of the town, where the mass could be said in safety,’”’® And one motive in favour of accepting an invitation to England lay in the alleged leanings of Charles I. to the older church,

The best account of Descartes’s mental history during his life in Holland is contained in his letters, which extend

1 CQuvr. vi. 214, 2 Guvr. ix. 208. 3 Cluvr. viii. 70.

4 Quvr. vi. 199. 5 (Ruvr. viii. 59. § Quvr. viii. 173.

7 Quvr. viii. 181. 8 (uvr. vi. 123.

over the whole period, and are particularly frequent in the latter half. The majority of them are addressed to Mersenne, and deal with problems of physics and musical theory (in which he took a special interest).

Mathematical subjects area common topic. Several letters between 1643 and 1649 are addressed to the Princess Elizabeth, the eldest daughter of the ejected elector palatine, who lived at the Hague, where her mother maintained the semblance of a royal court. The princess was obliged to quit Holland, but kept up a philosophical correspondence with Descartes. It is to her that the Principles of Philosophy were dedi- cated; and in her alone, according to Descartes, were united those generally separated talents for metaphysics and for mathematics which are so characteristically co-operative in the Cartesian system. Two Dutch friends, Zuylichem, the father of the more celebrated Huyghens, and Hoogheland, figure amongst the correspondents, not to mention various savants, professors, and churchmen (particularly Jesuits).

His residence in the Netherlands fell on the most pros- perous and brilliant days of the Dutch state, under the stadtholdership of Frederick Henry (1625-1647). Abroad its navigators monopolized the commerce of the world, and explored unknown seas; at home the Dutch school of painting reached its acme in Rembrandt (1607-1669) ; and the philological reputation of the country was sustained by Grotius, Vossius, and the elder Heinsius. And yet, though Rembrandt's Nightwatch is dated the very year after the publication of the Jeditations, not a word in Descartes breathes of any work of art or historical learning. The contempt of esthetics and erudition is characteristic of the most typical members of the Cartesian school, especially Malebranche. Though Descartes probably read more than some of his admirers supposed he was not in any strict sense a reader. His wisdom grew mainly out of his own reflections and experiments, calmly yct ceaselessly pursucd. Of mere learning and scholarship he had no esteem. The story of his disgust, when be found that Queen Christina devoted some time every day to the study of Greek under the tuition of Vossius, is at least true in substance! It gives no evidence of science, he remarks, to possess a tolerable knowledge of the Roman tongue, such as once was possessed by the populace of Rome.? In all his travels, and in the different places at which he settled, his interest seems untouched either by art or history ; he looks only to the phenomena of nature und the actual aspects of human life. He was a spectator rather than an actor on the stage of the world. If he entered the army, it was merely because the position gave a vantage-grouud from which to make his obser- vations. In the political interests which these

contests involved he took no part; his favourite disciple, the Princess Elizabeth, was the daughter of the banished king, against whom he had served in Bohemia; and Queen Christina, his second royal follower, was the daughter of Gustavus Adolphus.

In many ways Descartes is a type of that self-reliant, harsh, and abstract spirit of science to which erudition and all the heritage of the past seem but elegant and un- worthy trifling. The science of Descartes was physics in all its branches, but especially as applied to physiology. Science, he says, may be compared to a tree; metaphysics is the root, physics is the trunk, and the three chief branches are mechanics, medicine, and morals,—the three applications of our knowledge to the outward world, to the human body, and to the conduct of life.3

Such then was the work, and such the ends, that

Descartes had in view in Holland. His residence was generally divided into two parts—one his workshop for

1 Quvr. x. 375. 2 Guvr. ix. 6. 3 Cuvr. iii. 24,

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science, the othcr his reception-room for society. ‘“ Here are my books,” he is reported to have told a visitor, as he pointed to the animals he had dissected. “ I am now,” he writes in 16380, “studying chemistry and anatomy together ; and every day I learn something which I could not find in books.”* He is working hard at his book on refraction, and at the same time is busy dis- secting the heads of different animals in order to explain imagination and memory, which he considers physical pro- cesses.©> It need not from this be supposed that Descartes was alaboriousstudent. “Ican say with truth,” he writes to the Princess Elizabeth,® ‘“ that the principle which I have always observed in my studies, and which I believe has helped me most to gain what knowledge I have, has been never to spend beyond a very few hours daily in thoughts which occupy the imagination, and a very few hours yearly in those which occupy the understanding, and to give all the rest of my time to the relaxation of the senses and the repose of the mind.” But his expectations from the study of ana- tomy and physiology

weptalong way. “ The conservation of health,” he writes in 1646, “ has always been the principle end of my studies.”? In 1629 he asks Mersenne to take care of himself “ till I find out if there is any means of getting a medical theory based on infallible demonstrations, which is what I am now inquiring.”® And to Zuylichen he writes in 1638,—® “I have never taken so much care of myself as at present; and whereas I used to think that death could take from me only thirty or forty years at most, it could not overtake me now without depriving me of the hope of more than a century.” And similar views seem to have been expressed by him to Sir Kenelm Digby, who visited him in Holland. Astronomical inquiries ia connection with optics, meteorological phenomena, and, in a word, the whole field of natural laws, excited his desire to explain them. His own observation, and the reports of Mersenne, furnished his data. Of Bacon’s demand for observation and collection of facts he is an imitator ; and he wishes (in a letter of 1632) that ‘* some one would undertake to give a history of celestial phenomena after the method of Bacon, and describe the sky exactly as it appears at present, without introducing a single hypothesis,’”!°

He had several writings in hand during the early years of his residence in Holland, but the main work of this period was a physical doctrine of the universe which he termed 7’he World. Shortly after his arrival he writes to Mersenne that it will probably be finished in 1633, but meanwhile asks him not to disclose the secret to his Parisian friends. Already anxieties appear as to the theological verdict upon two of his fundamental views— the infinitude of the universe, and the earth’s rotation round the sun.! But towards the end of year 1633 we find him writing as follows:12 “TI had intended sending you my World asa New Year’s gift, and a fortnight ago I was still minded to send you a fragment of thc work, if the whole of it could not be transcribed in time. But I have just been at Leyden and Amsterdam to ask after Galileo’s cosmical system, as I imagined I had heard of its being printed last year in Italy. I was told that it had been printed, but that every copy had been at the same time burnt at Rome, and that Galileo had been himself con- demned to some penalty.” He has also seen a copy of Galileo’s condemnation at Liége (20th September 1633), with the words—‘ Although he professes that the (Coper- nican) theory was only adopted by him as a hypothesis.” His friend Beeckman lent him a copy of Galileo’s work,

4uvr, vi. 101. 5 (uvr. vi. 234, 6 Quvr. ix. 131.

10 Qtuvr. vi. 210. N Quvr. vi. 73. 12 Giuvr. vi. 239.

’ Quvr. ix. 341. 8 CHuvr. vi. 89. 9 uvr. vii. 412.

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which he glanced throagh in his usual manner with other men’s books ; he found it good, and “ failing more in the points where it follows received opinions than where it diverges from them.”! The consequence of these reports of the hostility of the church to the doctrine on which his theory reposed led him to abandon all thoughts of publish- ing. The World was consigned to his desk ; and although doctrines in all essential respects the same constitute the physical portion of his Principia, it was not till after the death of Descartes that fragments of the work, including

Le Monde, or a treatise on light, and the physiological |

tracts L’‘Homme and La Formation du Fatus, were given to the world by Clerselier, in 1664. Descartes was not dis- posed to be a martyr; he had a sincere respect for the church and for authority, and had no wish to shock pre- judices, or to begin an open conflict with established doctrines.

In 1636 Descartes had resolved to publish some speci- mens of the fruits of his method, and some general observa- tions on its nature which, under an appearance of simplicity, might sow the good seed of more adequate ideas on the world and man. “I should be glad,” he says, when talking of a publisher,? “ if the whole book were printed in good type, on good paper, and T should like to have at least 200 copies for distribution. ‘The book will contain four essays, all in French, with the general title of ‘ Project of a Uni- versal science, capable of raising our nature to its highest perfection; also Dioptrics, Meteors, and Geometry, wherein the most curious matters which the author could select as a proof of the universal science which he

pro- poses are explained in such a way that even the unlearned may understand them.'" The work appeared anonymously at Leyden (published by Jean Maire) in 1637, under the 1nodest title of Lssais Philosophiques , and the project of a universal science becomes the Discours de la méthode pour bien conduire sa raison et chercher la verité dans les sciences. In 1644 it appeared in a Latin version, revised by Descartes, as Specimina Philosophica. A work so widely circulated by the author naturally attracted atten- tion, but in France it was principally the matlematicians who took it up, and their criticisms were more pungent than complimentary. Fermat, Roberval, and Desargues took exception in their various ways to the methods employed in the geometry, and to the demonstrations of the laws of refraction given inthe Dioptrics andthe Meteors. The dispute on the latter point between Fermat and Descartes was continued, even after the philosopher's death, as late as 1662. In the virgin soil of the youthful Dutch universities the effect of the Cartesian essays was greater.

The first public teacher of Cartesian views was Henri Renery, a Belgian, who at Deventer and afterwards at Utrecht had introduced the new philosophy which he had learned from personal intercourse with Descartes. Renery only survived five years at Utrecht; and it was reserved for Regius (Henri De Roy),—who in 1638 had been ap- pointed to the new chair of botany and theoretical medicine at Utrecht, and who visited Descartes at Egmond in order more thoroughly to learn his views,—to throw down the gauntlet to the adherents of the old methods. With more eloquence and vigour than judgment or prudence, he pro- pounded and defended theses bringing into prominent relief the points in which the new doctrines clashed with the old The attack was opened by Gisbert Voét, foremost among the theological professors and clergy of Utrecht, a preacher of note and a stronghold of orthodoxy. In 1639 he published a series of arguments against atheism, in which the Cartesian views were not obscurely indicated as perilous for the faith, though no name was mentioned. Next year he

1 Giuvr vi. 248 2 (Huvr. vi. 276.

persuaded the magistracy to issue an order forbidding Regius to travel beyond the received doctrine ; for Regius, contrary to the advice of

Descartes, had formulated his view of Cartesianism in the phrase that man was a unity merely by accident, and meddled in his lectures with topics not usually associated with a chair of medicine. The magisterial views seem to have prevailed in the pro- fessoriate, which formally in March 1642 expressed its disapprobation of the new and pretended philosophy as well asof its expositors. As yet Descartes was not directly attacked. Voét now issued, through the medium and under the name of Martin Schoock, one of his pupils, a pamphlet with the title of Jfethodus nove philosophie Renati Descartes, in which atheism and infidelity were openly declared to be the effect of the new teaching. Descartes replied to Voét directly in a long and vigorous letter, published at Amster- dam in 1643. Yet notwithstanding, he was summoned before the magistrates of Utrecht to defend himself against charges of irreligion and slander. What might have happened we cannot tell; but Descartes threw himself on the protection of the French ambassador and the prince of Orange, and the city magistrates, from whom he vainly demanded satisfaction in a dignified letter, were snubbed by their superiors. About the same time (April 1645) Schoock was summoned before the university of Groningen, of which he was a member, and forthwith disavowed the more abusive passages in his book. So did the effects of the odiwm theologicum, for the meanwhile at least, die away.

In the Discourse of Method Descartes had sketched the main points in his new views, with a mental autobio- graphy which might explain their origin, and with some suggestions as to their applications. His second great work, Meditations on the First Philosophy, which had been begun soon after his settlement in the Netherlands, expounded in more detail the foundations of his system, laying especial emphasis on the priority of mind to body, and on the absolute and ultimate dependence of mind as well as body on the existence of God. In 1640 a copy of the work in manuscript was despatched to Paris, and Mersenne was requested to lay it before as many thinkers and scholars as he deemed desirable, with a view to getting their views upon its argument and doctrine. Mersenne was not slack in submitting the work to criticism, and Descartes soon had a formidable list of objections to reply to. Accordingly, when the work was published at Paris in August 1641, under the title of Meditationes de prima philosophia ubi de Dev existentia et Anime immortalitate (though it was in fact not the tmmortality, but the ummateriality of the mind, or, as the second edition described it, aneme

humane a corpore distinctto, which was maintained), the title went on to describe the larger part of the book as containing various objections of learned men, with the replies of the author. These objections in the first edition are arranged under six heads :—the first came from Caterus, a theologian of Louvain; the second and sixth are anonymous criticisms from various hands ; whilst the third, fourth, and fifth belong respectively to Hobbes, Arnauld, and Gassendi. In the second edition appeared the seventh —objections from Pere Bourdin, a Jesuit teacher of mathematics in Paris ; and subsequently another set of objections known as those of /yperaspistes, was included in the collection of Descartes's letters. The anonymous objections are very much the statement of common sense against philosophy ; those of Caterus criticise the Cartesian argument from the traditional theology of the church; those of Arnauld are an appreciative inquiry into the bearings and consequences of the meditations for religion

3 Gluvr ix. 250

and morality ; while those of Hubbes and Gassendi—both somewhat senior to Descartes and with a dogmatic system of their own already formed—are a keen assault upon the Spiritualism of the Cartesian position from a generally 'sensational " stand-point. The criticisms of the last two are the criticisms of a hostile school of thought ; those of Arnauld are the difficulties of a possible disciple.

In 1644 the third great work of Descartes, the Principia Philosophie, appeared at Amsterdam. Passing briefly over the conclusions arrived at in the Meditations, it deals in its second, third, and fourth parts with the general principles of physical science, especially the laws of motion, with the theory of vortices, and with the phenomena of heat, light, gravity, magnetism, electricity, &c., upon the earth. This work exhibits some curious marks of caution. Un- doubtedly, says Descartes, the world was in the begin- ning created in all its perfection. " But yet as it is best, if we wish to understand the nature of plants or of men, to consider how they may by degrees proceed from seeds, rather than how they were created by God in the beginning of the world, so, if we can excogitate some extremely simple and comprehensible principles, out of which, as if they were seeds, we can

prove that stars, and earth, and all this visible scene could have originated, although we know full well that they never did originate in such a way, we shall in that way expound their nature far better than if we merely described them as they exist at present.”4 The Copernican theory is rejected in name, but retained in substance. The earth, or other planet, does not actually move round the sun; yet it is carried round the sun in the subtle matter of the great vortex, where it lies in equilibrium,-—carried like the passenger in a boat, who may cross the se: and yet not rise from his berth.

In 1647 the difficulties that had arisen at Utrecht were repeated on a smaller scale at Leyden. Theres the Cartesian innovations had found a patron in Adrian Heerebord, and were openly discussed in theses and lectures. The theological professors took the alarm at passages in the Meditations ; an attempt to prove the existence of God savoured, as they thought, of atheism and heresy. When Descartes complained to the authorities of this unfair treatment,” the only reply was an order by which all mention of the name of Cartesianism, whether favourable or adverse, was forbidden in the university. This was scarcely what Descartes wanted, and again he had to apply to the prince of Orange, whereupon the theologians were asked to behave with civility, and the name of Descartes was no longer proscribed. But other annoyances were not wanting from unfaithful disciples and unsympathetic critics. The Jnstantie of Gassendi appeared at Amsterdam in 1644 as a reply to the reply which Descartes had published of his previous objections; and the publication by Regius of his work on Physical Philosophy gave the world to understand that he had ceased to be a thorough adherent of the philosophy which he had so enthusiastically adopted.

Tt was about 1648 that Descartes lost his friends Mersenne and Mydorge by death. The place of Mersenne as his Parisiau representative was in the main taken by Claude Clerselier (the French translator of the Objections and Responses), whom he had become acquainted with in Paris. Through Clerselier he came to know Pierre Chanut, who in 1645 was sent as French ambassador to the court of Sweden. Queen Christina, the daughter of the great Gustavus, was not yet twenty, and took a lively, if a somewhat whimsical interest in literary and philosophical culture. Through Chanut, with whom she was on terms

- Erncip. L: iii, S. 4. 2 Ciuvr. x. 26,

of familiarity, she came to hear of Descartes, and a corre spondence which the latter nominally carried on with the ambassador was in reality intended for the eyes of the queen. The correspondence took an ethical tone. It began with a Jong letter on Love in all its aspects (February 1647),3a topic suggested by Chanut, who had been discus- sing it with the queen ; and this was soon followed by another to Christina herself on the Chief Good., An essay on the Passions of the Mind (Passions de lV Ame), which had been written originally for the Princess Elizabeth, in development of some ethical views suggested by the De Vita Beata of Seneca, was inclosed at the same time for Chanut. It was a draft of the work published in 1650 under the same title. Philosophy, particularly that of Descartes, was becoming a fashionable divertissement for the queen and her courtiers, and it was felt that the presence of the sage himself was necessary to complete the good work of education. An invitation to the Swedish court was urged upon Descartes, and after much hesitation accepted ; a vessel of the royal navy was ordered to wait upon him, and in September 1649 he left Egmond for the north.

The position on which he entered at Stockholm was cer- tainly no sinecure, and utterly unsuited for a man who had always tried to be his own master. The young queen, full of plans and energy, wanted Descartes to draw up a code for a proposed academy of the sciences, and to give her an hour of philosophic instruction every morning at five. And in order to tie him down to the country she had already determined to create him a noble, and begun to look out an estate in the lately annexed possessions of Sweden on the Pomeranian coast. But these things were not to be. His friend Chanut fell dangerously ill; and Descartes, who de- voted himself to attend in the sick-room, was obliged to issue from it every morning in the chill northern air of January, and spend an hour in the palace library. The ambassador recovered, but Descartes fell a victim to the same disease—an inflammation of the lungs. The last time he saw the queen was on the lst of February 1650, when he handed to her the statutes he had drawn up for the proposed academy. Ten days after he wasdead. The queen, in her first grief and

enthusiasm, would have liked to bury him grandly at the feet of the Swedish kings, and to raise a costly mausoleum in his honour; but these plans

_were overruled, and a plain monument in the Catholic

cemetery was all that marked the place of his rest. Sixteen years after his death the French treasurer D'Alibert made arrangements for the conveyance of the ashes to his native land; and in 1667 they were interred in the church of Ste Genevieve du Mont, the modern Pantheon. In 1819, after being temporarily deposited in a stone sarcophagus in the court of the Louvre during the Revolutionary epoch, they were transferred to St Germain-des-Prés, where they now repose between Montfaucon and Mabillon. A monument was raised to his memory at Stockholm by Gustavus IIL, and some years ago a statue was erected to him at Tours, with the inscription Je pense, donc je suis on the pedestal. Descartes was never married, and probably had little of the amorous in his temperament. He has alluded to a childish fancy for a young girl with a slight obliquity of vision ; but he only mentions it & propos of the consequent weakness which led him to associate such a defect with beauty.* Mythical rumours represent him as telling a belle that he found no beauty comparable to the beauty of truth. In person he was a little man, with large head, projecting brow, prominent nose, and eyes wide apart, with black hair coming down almost to his eyebrows. His voice was feeble. He usually dressed in black, with unobtrusive propriety.

3 Giuvr. x. 3. 4 Guvr. x. 53.

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The end of all study, says Descartes in one of his earliest writings, ought to be to guide the mind to form true and sound judgments on every thing that may be presented to it! The sciences in their totality are but the intelligence of man ; and all the details of knowledge have no value save as they strengthen the understanding. The mind is not for the sake of knowledge, but knowledge for the sake of the mind. This is the re-assertion of a principle which the Middle Ages had lost sight of—that knowledge, if it is to have any value, must be intelligence, and not erudition.

But how is intelligence, as opposed to erudition, possible? The answer to that question is the method of Descartes. That idea of a method grew up with his study of geometry and arithmetic,—the only branches of know- ledge which he would allow to be “ made sciences,” those which the Jesuits best taught, and which he himself cultivated most zealously in early life. But they did not satisfy his demand for intelligence. “I found in them,” he says, “ different propositions on numbers of which, after a calculation, I perceived the truth; as for the figures, I had, so to speak, many truths put before my eyes, and many others concluded from them by analogy ; but it did not seem to me tliat they told my mind with sufficient clearness why the things were as I was shown, and by what means their discovery was attained.” The mathematics of which he thus speaks included the geometry of the ancients; as it had been handed down to the modern world, and arithmetic with the developments it had received in the direction of algebra. The ancient geometry, as we know it, is @ wonderful monument of ingenuity—a series of towrs de force, in which each problem to all appearance stands alone, and, if solved, is solved by methods and principles peculiar to itself. Here and there particular curves, for example, had been obliged to yield the secret of their tangent; but the ancient geometers apparently had lo consciousness of the general bearings of the methods which they so successfully applied. Each problem was something unique ; the elements of transition from one to another were wanting ; and the next step which mathe- matics had to make was to find some method of reducing, for instance, all curves to a common notation. When that was found, the solution of one problem would immediately entail the solution of all others which belonged to the same series as itself.

The arithmetical half of mathematics, which had been gradually growing into algebra, and had decidedly established itself as such in the Logisteca Speciosa of Vieta (1540-1603), supplied to some extent the means of generalizing geometry. And the algebraists or arithmeti- cians of the 16th century, such as Lucas de Borgo, Cardan, and Tartaglia, had used geometrical constructions to throw light on the solution of particular equations. But progress was made difficult, in consequence of the clumsy and irregu- lar nomenclature employed. With Descartes the use of exponents as now employed for denoting the powers of a quantity becomes systematic; and without some such step by which the homogeneity of

successive powers is at once recognized, the binomial theorem could scarcely have been detected. The restriction of the early letters of the alphabet to known, and of the late letters to unknown quantities 1s also his work. In this and other details he crowns and completes, in a form henceforth to be dominant for the Innguage of algebra, the work of numerous obscure pre- decessors, such as Etienne de la Roche, Stiefel, and others.

Having thus perfected the instrument, his next step was to apply it in such a way as to bring uniformity of method into the isolated and independent operations of geometry.

1 Regula, Gluvr. xi. 202. * Giuvr, xi. 219.

“TI had no intention,” he says in the Method,” of attempt- ing to master all the particular sciences commonly called mathematics ; but as I observed that, with all differences in their objects, they agreed in considering merely the various relations or proportions subsisting among these objects, I thought it best for my purpose to consider these relations in the most general form possible, without refer- ring them to any objects in particular except such as would most facilitate the knowledge of them. Perceiving further, that in order to understand these relations I should some- times have to consider them one by one, and sometimes only to bear them in mind or embrace them in the aggregate, I thought that, in order the better to consider them individually, I should view them as subsisting between straight lines, than which I could find no objects more simple, or capable of being more distinctly represented to my imagination and senses ; and on the other hand that, in order to retain them in the memory or embrace an aggregate of many, I should express them by certain characters, the briefest possible.” Such is the basis of the algebraical or modern analytical geometry. The problem of the curves is sulved by their reduction to a problem of straight lines ; and the locus of any point is determined by its distance from two given straight lines—the axes of co- ordinates. Thus Descartes gave to modern geometry that abstract and general character in which consists its superi- ority to the geometry of theancients. In another question connected with this, the problem of drawing tangents to any curve, Descartes was

drawn intoa controversy with Fermat (1590-1663), Roberval (1602-1673), and Desargues (1593-1662). Fermat and Descartes agreed in regarding the tangent to a curve asa secant of that curve with the two points of intersection coinciding, while Roberval regarded it as the direction of the composite movement by which the curve can be described. Both these methods, differing from that now employed, are interesting as preliminary steps towards the method of fluxions and the differential calculus, In pure algebra Descartes expounded and illustrated the genera] methods of solving equations up to those of the fourth degree (and believed that his method could go beyond), stated the law which connects the positive and negative roots of an equation with the changes of sign in the consecutive terms, and introduced the method of indeterminate coefficients for the solution of equations.4 Attempts have been recklessly made to claim some of these innovations for the English algebraists Oughtred and Harriot, and others for the mathematicians of the Continent ; but such assertions are based upon no proof, and, if true, would only illustrate the genius of the man who could pick out from other works all that was productive, and state it with a lucidity which makes it look his own discovery.

The Geometry of Descartes, unlike the other parts of his essays, is not easy reading. It dashes at once into the middle of the subject with the examination of a problem which had baffled the ancients, and seems as if it were tossed at the heads of the French geometers as a challenge. An edition of it appeared subsequently, with notes by his friend De Beaune, calculated to smooth the difficulties of the work. All along mathematics was regarded by Descartes rather as the envelope than the foundation of his method ; and the ‘ yniversal mathematical science” which he sought after was only the prelude of a universal science of all-embracing character.5 iv”

The method of Descartes rests upon the proposition that all the objects of our knowledge fall into series, of which the members are more or less known by means of one ee ee

3 Disc. de Méthode, part ii. 4 Geométrie, book iii,

5 Ciuvres, xi. 224 :

another. In every such series or group there is a dominant element, simple and irresoluble, the standard on which the rest of the series depends, and hence, so far as that group or series is concerned, absolute. The other members of the group are relative and dependent, and only to be understood as in various degrees subordinate to the primt- tive conception. The characteristic by which we recognize the fundamental element in a series is its intuitive or self-evident character; it is given by "'the evident con- ception of a healthy and attentive mind so clear and distinct that no doubt is left." Having discovered this prime or absolute member of the group, we pro- ceed to consider the degrees in which the other members enter into relation with it. Here deduction comes into play to show the dependence of one term upon the others; and, in the case of a long chain of intervening links, the problem for intelligence is so to enunciate every clement, and so to repeat the connection that we may finally grasp all the links of the chain in one. In this way we, as it were, bring the causal or primal term and its remotest dependent immediately together, and raise a derivative knowledge into one which is primary and intuitive. Such are the four points of Cartesian method :—(1) Truth requires a clear and distinct conception of its object, excluding all doubt; (2) the objects of knowledge naturally fall into series or groups ; (3) in these groups investigation must begin with a simple and indecomposable element, and pass from it to the nore complex and relative elements; (4) an exhaustive and immediate grasp of the relations and interconnection of these elements is necessary for knowledge in the fullest sense of that word.?

"There is no question," he says in anticipation of Locke and Kant, "more important to solve than that of knowing what human knowledge is and how far it extends." " This is a question which ought to be asked at least once in their lives by all who seriously wish to gain wisdom. The inguirer will find that the first thing to know is intellect, because on it depends the knowledge of all other things. Examining next what immediately follows the knowledge of pure intellect, he will pass in review all the other means of knowledge, and will find that they are two (or three), the imagination and the senses (and the memory). He will therefore devote all his care to examine and distinguish these three means of knowledge ; and seeing that

truth and error can, properly speaking, be only in the intellect, and that the two other modes of knowledge are only occasions, he will carefully avoid whatever can lead him astray.” ? This separation of intellect from sense, imagination, and meniory is the cardinal precept of the Cartesian logic; it inarks off clear and distinct (2.e., adequate and vivid) from obscure, fragmentary, and incoherent conceptions.

The Dvscourse of Method and the Meditations apply what the Rules for the Direction of the Mind had regarded in particular instances to our conceptions of the world as a whole. ‘They propose, that is, to find a simple and inde- composable point, or absolute element, which gives to the world and thought their order and systematization. The grandeur of this attempt is perhaps unequalled in the annals of philosophy. The three main steps in the argument are the veracity of our thought when that thought 1s true to itself, the inevitable uprising of thought from its fragmentary aspects in our habitual consciousness to the infinite and perfect existence which God is, and the “oe reduction of the material universe to extension and ae — etl are the central dogmas of logic, iets ser fee hen from which start the subsequent

, Leibnitz, and Newton. They are also ee 1 Guvres, xi, 212. 2 Disc, de Méthode, part ii. 3 Cuvres, xi. 243,

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the direct antitheses to the scepticism of Montaigne and Pascal, to the materialism of Gassendi and Hobbes, and to the superstitious anthropomorphism which defaced the re- awakening sciences of nature. Descartes laid down the lines on which modern philosophy and science were to build. But himself no trained metaphysician, and un- susceptible to the lessons of history, he gives but fragments of a system which are held together, not by their intrinsic consistency, but by the vigour of his personal conviction transcending the weaknesses and collisions of his several arguments. ‘ All my opinions,” he says, “‘ are so conjoined, and depend so closely upon one another, that it would be impossible to appropriate one without knowing them all.”4 Yet every disciple of Cartesianism seems to disprove the dictum by his example.

The very moment when we begin to think, says Descartes, when we cease to be merely receptive, when we draw back and fix our attention on any point whatever of our belief, —that moment doubt begins. If we even stop for an instant to ask ourselves how a word ought to be spelled, the deeper we ponder that one word by itself the more hopeless grows the hesitation, The doubts thus awakened must not be stifled, but pressed systematically on to the point, if such a point there be, where doubt con- futes itself. The doubt as to the details is natural; it is no less natural to have recourse to authority to silence the doubt. The remedy proposed by Descartes is (while not neglecting our duties to others, ourselves, and God) to let doubt range unchecked through the whole fabric of our customary convictions. One by one they refuse to render any reasonable account of themselves ; each seems a mere chance, and the whole tends to elude us like a mirage which some malignant power creates for our illusion, Attacked in detail, they vanish one after another into as many teasing spectra of uncertainty. We are seeking from them what they cannot give. But when we have done our worst in unsettling them, we come to an ultimate point in the fact that it is we who are doubting, we who are thinking. We may doubt that we have hands or feet, that we sleep or wake, and that there is a world of material things around us ; but we cannot doubt that we are doubting. We are certain that we are think ing, and in so far as we are thinking we are. Je pense, done je suis, Of this we cannot doubt, and therefore this is true. In other words, the criterion of truth is a clear and distinct conception, excluding all possibility of doubt.

The fundamental point thus established is the veracity of consciousness when it does not go beyond itself, or does not postulate something which is external to itself, We are thinking ; we are minds; and from the mere primary intuition, which results when we analyze our doubts, we cannot tell that we are more. At this point Gassendi arrested Descartes and addressed his objections to him as pure intelligence,—O mens/ Buteven this mens, or mind, is but a point—we have found no guarantee as yet for its continuous existence. The analysis must be carried deeper if we are to gain any further conclusions.

Amongst the ideas or elements of our thought there are some which we can make and unmake at our pleasure; there are others which come and go

without our wish ; there is also a third class which is of the very essence of our thinking, and which dominates our conceptions, We find that all our ideas of limits, sorrows, and weaknesses pre- suppose an infinite, perfect, and ever-blessed something beyond them and including them,—that all our ideas, in all their series, converge to one central idea, in which they find their explanation. The formal fact of thinking is what constitutes our being; but this thought of which we

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4 CHuvres, vii. 381.

are certain leads us back, when we consider its concrete contents, to the necessary pre-supposition on which our ideas depend, the ultimate totality in which they are all reconciled, the permanent cause on which they and we as conscious beings depend. We have therefore, says Descartes, the idea of an infinite, perfect, and all powerful being which cannot be the creation of ourselves, and must be given by some being who really possesses all that we in idea attribute to him. Such a being he identifies with God. But the ordinary idea of God can scarcely be identified with such aconception. “The majority of men,” he says himself, “do not think of God as an infinite and inconi- prehensible being, and as the sole author from whom all things depend ; they go no further than the letters of his name.” “The vulgar almost imagine him as a finite thing.” The God of Descartes is not merely the creator of the material universe ; he is also the father of all truth in the intellectual world. ‘The metaphysical truths,” he gays, “styled eternal have been established by God, and, like the rest of his creatures, depend entirely upon him. To say that these truths are independent of him is to speak of God as a Jupiter or a Saturn,—to subject him to Styx and the Fates.”2 The laws of thought, the truths of number, are the decrees of God. The expression is anthropomorphic, no less than the dogma of material creation; but it isan attempt to affirm the unity of the intellectual and the material world. Descartes establishes a philosophic monotheism,—by which the medizeval poly- theism of substantial forms, essences, and eternal truths fades away before God, who is the ruler of the intellectual world no less than of the kingdom of nature and of grace.

To attach a clear and definite meaning to the Cartesian doctrine of God, to show how much of it comes from the Christian theology and how much from the logic of idealism, how far the conception of a personal being as creator and preserver mingles with the pantheistic conception of an infinite and perfect something which is all in all, would be to go beyond Descartes and to ask for a solution of difficulties of which he was scarcely aware. It seems impossible to deny that the tendency of his principles and his arguments is mainly in the line of a metaphysical absolute, as the necessary completion and foundation of all being and knowledge. Through the truthfulness of that God as the author of all truth he derives a guarantee for our perceptions in so far as these are clear and distinct. And it is in guaranteeing the veracity of our clear and distinct conceptions that the value of his deduction of God seems in his own estimate to rest. All conceptions which do not possess these two attributes—of being vivid in themselves and discriminated from all others—cannot be true. But the larger part of our conceptions are in such a predicament, We think of things not in the abstract elements of the things themselves, but in connection with, and in language which presupposes, other things. Our idea of body, ¢.g., involves colour and weight, and yet when we try to think carefully, and without assuming anything, we find that we cannot attach any distinct idea to these terms when applied to body. In truth therefore these attributes do not belong to body at all ; and if we go on in the same way testing the received qualities of matter, we shall find that in the last resort we understand nothing by it but extension, with the secondary and derivative characters of divisibility and mobility.

But it would again be useless to ask how extension as the characteristic attribute of matter is related to mind which thinks, and how God is to be regarded in reference to extension. he force of the universe is swept up and gathered in God, who communicates motion to the parts of

1 Cuvres, vi. 132. 2 Quvres, vi. 109.

secondary laws regarding impact.

extension, and sustains that motion from moment to monient ; and in the same way the force of mind has really been concentrated in God, Every moment one expects to find Descartes saying with Hobbes that man's thought has created God, or with Spinoza and Malebranche that it is God who really thinks in the apparent thought of man. After all, the metaphysical theology of Descartes, however essential in his own eyes, serves chiefly as the ground for constructing his theory of man and of the universe. His fundamental hypothesis relegates to God all forces in their ultimate origin. Hence the world is left open for the free play of mechanics and geometry. The disturbing conditions of will, life, and organic forces are eliminated from the problem ; he starts with the clear and distinct idea of extension, figured and moved, and thence by mathematical laws he gives a hypothetical explanation of all things. Such explanation of physical phenomena is the main problem of Descartes, and it goes on encroaching upon territories once supposed proper to the mind. Descartes began with the certainty that we are thinking beings ; that region remains untouched ; but up to its very borders the mechanical explanation of nature reigns unchecked.

The physical theory, in its earlier form in the World, and in its later in the Principles of Philosophy (which the present account follows), rests upon the metaphysical conclusions of the Meditations. It proposes to set forth the genesis of the existing universe from principles which can be plainly understood, and according to the acknow- ledged laws of the transmission of movement. The idea of force is one of those obscure conceptions which originate in an obscure region, in the sense of muscular power. The true physical conception is motion, the ultimate ground of which is to be sought in God's infinite power. Accordingly the quantity of movement in the universe, like its mover, can neither increase nor diminish. The only circumstance which pliysics has to consider is the transference of move ment from one particle to another, and the change of its direction. Man himself cannot increase the sum of motion ; he can only alter its direction. The whole couception of

force may disappear froma theory of the universe ; and we can adopt a geometrical definition of motion as the shifting of one body from the neighbourhood of those bodies which immediately touch it, and which are

assumed to be at rest, to the neighbourhood of other bodies. is strictly locomotion, and nothing else.

Motion, in short,

Descartes has laid down three laws of nature, and seven The latter are to a large

extent incorrect. The first law affirms that every body, so

far as it is altogether unaffected by extraneous causes,

always perseveres in the same state of motion or of rest ; and the second law that simple or elementary motion is always in astraight line? These doctrines of inertia, and of the composite character of curvilinear motiou, were scarcely apprehended even by Kepler or Galileo ; but they follow naturally from the geometrical analysis of Descartes.

Extended body has no limits to its extent, though the power of God has divided it in lines discriminating its parts in endless ways. The infinite universe is infinitely full of matter. Empty space, as distinguished from material extension, is a fictitious abstraction. There is no such thing really as a vacuum, any more than there are atoms or ultimate indivisible particles. In both these doctrines of a priori science Descartes has not been subverted, but, if anything, corroborated by the results of experimental physics ; for the so-called atoms of chemical theory already presuppose, from the Cartesian point of view, certain aggregations of the primitive particles of matter. Descartes regards matter as uniform in character

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8 Princip., pt. ii. 37.

throughout the universe; he anticipates, as it were, from his own transcendental ground, the revelations of spectrum analysis as applied to the sun and stars. We have then to think of a full universe of matter (and matter

= extension) divided and figured with endless variety, and set (and kept) in motion by God; and any sort of division, figure, and motion will serve the purposes of our supposition as well as another. “‘Scarcely any supposition,” + he says, in ominous language, “can be made from which the same result, though possibly with greater difficulty, might not be deduced by the same laws of nature; for since, in virtue of these laws, matter successively assumes all the forms of which it is capable, if we consider these forms in order, we shall at one point or other reach the existing form of the world, so that no error need here be feared from a false supposition.” As the movement of one particle in a closely-packed universe is only possible if ail other parts move simultaneously, so that the last in the series steps into the place of the first ; and as the figure and division of the particles varies in each point in the universe, there will inevitably at the same instant result throughout the universe an innumer- able host of more or less circular movements, and of vortices or whirlpools of material particles, varying in size and velocity. ‘Taking for convenience a limited portion of the universe, we observe that in consequence of the circular movement the particles of matter have their corners pared off by rubbing against each other; and two species of matter thus arise,—one consisting of small globules which continue their circular motion with a (centrifugal) tendency to fly off from the centre as they swing round the axis of rotation, while the other, consisting of the fine dust—the filings and parings of the original particles —gradually becoming finer and finer, and losing its velocity, tends (centripetally) to accumulate in the centre of the vortex, which has been gradually left free by the receding particles of globular matter. This finer matter which collects in the centre of each vortex is the first matter of Descartes—it constitutes the sun or star. The spherical particles are the second matter of Descartes, and their tendency to propel one another from the centre in straight lines towards the circumference of each vortex is what gives rise to the phenomenon of light radiating from the central star. This second matter is atmosphere or firmament, which envelops and revolves around the central accumulation of first matter.

A third form of matter is produced from the original particles. As the small filings produced by friction seek to pass through the interstices between the rapidly revolving spherical particles in the vortex, they are detained and become twisted and channelled in their passage, and when they reach the

edge of the inner ocean of solar dust they settle upon it as the froth and foam produced by the agita- tion of water gathers upon its surface. These form what we term spots in the sun. In some cases they come and go, or dissolve into an ether round the sun ; but in other cases they gradually increase until they form a dense crust round the central nucleus. In course of time the Star, with its expansive force diminished, suffers encroach- ments from the neighbouring vortices, and at length they catch it up. If the velocity of the decaying star be greater than that of any part of the vortex which has swept it up, It will ere long pass out of the range of that vortex, and continue its movement from one to another. Such a star = Benet. os in other cases the encrusted star settles in eo . a i ‘aoe revolving vortex which has a velocity ae own, and so continues to revolve in the

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, 1 Princip., pt. iii, 47,

impoverished star is a planet; and tlie several planets of our solar system are the several vortices which from time to time have been swept up by the central sun-vortex, The same considerations serve to explain the moon and other satellites. They, too, were once vortices, swallowed up by some other, which at a later day fell a victim to the sweep of our sun.

Such in mere outline is the celebrated theory of vortices, which for about 20 years after its promulgation reigned supreme in science, and for much longer time opposed a tenacious resistance to rival doctrines. It is one of the grandest hypotheses which ever have been formed to account by mechanical processes for the movements of the universe. While chemistry rests in the acceptance of ultimate heterogeneous elements, the vortex-theory assumed uniform matter through the universe, and reduced cosmical physics to the same principles as regulate terrestrial phenomena. It ended the old Aristotelian distinction between the sphere beneath the moon and the starry spaces beyond. It banished the spirits and genii, to which even Kepler had assigned the guardianship of the planetary movements ; and, if it supposes the globular particles of the envelope to be the active force in carrying the earth round the sun, we may remember that Newton himself

assumed an ether for somewhat similar purposes. The great argument on which the Cartesians founded their opposition to the Newtonian doctrines was that attraction was an occult quality, not wholly intelligible by the aid of mere mechanics. The Newtonian theory is an analysis of the elementary movements which in their combination de- termine the planetary orbits, and gives the formula of the proportions according to which they act. But the Cartesian theory, like the later speculations of Kant and Laplace, proposes to give a hypothetical explanation of the circum- stances and motions which in the normal course of things led to the state of things required by the law of attraction. In the judgment of D'Alembert the Cartesian theory was the best that the observations of the age admitted; and "its explanation of gravity was one of the most ingenious hypotheses which philosophy ever imagined." That the explanation fails in detail is undoubted: it does not account for the ellipticity of the planets; it would place the sun, not in one focus, but in the centre of the ellipse ; and it would make gravity directed towards the centre only under the equator. But these defects need not blind us to the fact that this hypothesis made the mathematical progress of Hooke, Borelli, and Newton much more easy and certain. Descartes professedly assumed a simplicity in the phenomena which they did not present. But such a hypothetical simplicity is the necessary step for solving the more complex problems of nature. The danger lies not in forming such hypotheses, but in regarding them as final, or as more than an attempt to throw light upon our observation of the phenomena. In doing what he did, Descartes actually exemplified that reduction of the processes of nature to mere transposition of the particles of matter, which in different ways was a leading idea in the minds of Bacon, Hobbes, and Gassendi, The defects of Descartes lie rather in his apparently imperfect apprehension of the principle of movements uniformly accelerated which his contemporary Galileo had illustrated and insisted upon, and in the indistinctness which attaches to his views of the transmission of motion in cases of impact. In modern times, it may be added, a theory of vortex-atoms has been suggested to explain the constitution of matter. But except in name it has but slight analogy with Cartesian doctrine, and finds a parallel, if anywhere, in a modification of that doctrine by Malebranche.

Besides the last two parts of the Principles of Philosophy, the physical writings of Descartes include the Dioptrics

and Meteors, as well as passages in the letters. His optical investigations are perhaps the subject in which he most contributed to the progress of science ; and the lucidity of exposition which marks his Deoptrics stands conspicuous even amid the generally luminous style of his works. Its object is a practical one, to determine by scientific considera- tions the shape of lens best adapted to improve the capa- bilities of the telescope, which had been invented not long before. The conclusions at which he arrives have not been so useful as he imagined, in consequence of the mechanical difficulties. But the investigation by which he reaches them has the merit of first prominently publishing and establishing the law of the refraction of light. Attempts have been made, principally founded on some jealous remarks of Huyghens, to show that Descartes had learned the principles of refraction from the manuscript of a treatise by Willebrord Snell, but facts do not bear out the charge; and, so far as Descartes founds his optics on any one, it is on the researches of Kepler. In any case the glory of the discovery is to a large extent his own, for his proof of the law is founded upon the theory that light is the tendency or inclination of the subtle particles of ethereal matter to propagate their movement in straight lines from the sun or luminous body tothe eye. And thus he approxi- mates to the wave theory of light, though he supposed, like his contemporaries, that the transmission of light was instantaneous. The chief of his other contributions to optics was the explanation of the rainbow—an explanation far from complete, since the unequal refrangibility of the rays of light was yet undiscovered—but a decided advance upon his predecessors, notably on the De rads visus et lwets (1611) of Marc-Antonio de Dominis, archbishop of Spalato, from whom careless critics have assumed that he derived his ideas.

If Descartes had contented himself with thus explaining the phenomena of gravity, heat, magnetism, light, and similar forces by means of the molecular movements of his vortices, even such a theory would have excited admiration by its daring grandeur. But Descartes did not stop short in the region of what is usually termed physics. Chemis- try and biology are alike swallowed up in the one science of physics, and reduced to a problem of mechanism. This theory, he believed, would afford an explanation of every phenomenon whatever, and in nearly every department of knowledge

he has given specimens of its power. But the most remarkable and daring application of the theory was to account for the phenomena of organic life, especially in animals and man. “If we possessed a thorough know- ledge,” he says,! “of all the parts of the seed of any species of animal (¢.g., man), we could from that alone, by reasons entirely mathematical and certain, deduce the whole figure and conformation of each of its members, and, con- versely, if we knew several peculiarities of this conforma- tion, we could from these deduce the nature of its seed.” The organism in this way is regarded as a machine, con- structed from the particles of the seed, which in virtue of the laws of motion have arranged themselves (always under the governing power of God) in the particular animal shape in which we see them. The doctrine of the circulation of the blood, which Descartes adopted from Harvey, supplied additional arguments in favour of his mechanical theory, and he probably did much to popularize the discovery. A fire without light, compared to the heat which gathers in a haystack when the hay has been stored before it was properly dry—heat, in short, as an agitation of the particles—is the motive cause of the contraction and dilatations of the heart. Those finer particles of the blood which become extremely rarefied during this process

1 Ciuvres, iv. 494.

pass off in two directions—one portion, and the least important in the theory, to the organs of generation, the other portion to the cavities of the brain. There not merely do they serve to nourish the organ, they also give rise to a fine ethereal flame or wind through the action of the brain upon them, and thus form the so-called ‘animal ” spirits. From the brain these spirits are conveyed through the body by means of the nerves, regarded by Descartes as tubular vessels, resembling the pipes conveying the water of a spring to act upon the mechanical appliances in an artificial fountain. The nerves conduct the animal spirits to act upon the muscles, and in their turn convey the im- pressions of the organs to the brain.

Man and the animals as thus described are compared to automata, and termed machines. The vegetative and sensitive souls which the Aristotelians had introduced to break the leap between inanimate matter and man are

ruthlessly swept away ; only one soul, the rational, remains, and that is restricted to man. One hypothesis supplants the various principles of life ; the rule of absolute mechanism is as complete in the animal as in the cosmos. Reason and thought, the essential quality of the soul, do not belong to the brutes ; there is an impassable gulf fixed between man and the lower animals. ‘The only sure sign of reason is the power of language—.e., of giving expression to general ideas; and language in that sense is not found save in man. The cries of animals are but the working of the curiously-contrived machine, in which, when one portion is touched in a certain way, the wheels and springs concealed in the interior perform their work, and, it may be, a note supposed to express joy or pain is evolved ; but there is no consciousness or feeling. “ The animals act naturally and hy springs, like a watch.”2 “The greatest of all the prejudices we have retained from our infancy is that of believing that the beasts think.” If the beasts can properly be said to see at all, “‘they see as we do when our mind is distracted and keenly applied elsewhere; the images of outward objects paint themselves on the retina, and possibly even the impressions made in the optic nerves determine our limbs to different movements, but we feel nothing of it all, and move as if we were automata.”4 I will not believe, said the Cartesian Chanet, that a beast thinks until the beast tells me so itself. The sentience of the animal to the lash of his tyrant is not other than the sensitivity of the plant to the influences of light and heat. It is not much comfort to learn further from Descartes that “he denies life to no animal, but makes it consist in the mere heat of the heart. Nor does he deny them feel- ing in so far as it depends on the bodily organs.”°

Descartes, with an unusual fondness for the letter of Scrip- ture, quotes oftener than once in support of this monstrous doctrine the dictum that “The blood is the life;” and he remarks, with some sarcasm possibly, that it is a comfort- able theory for the eaters of animal flesh. And the doctrine found acceptance among some whom it enabled to get rid of the difficulties raised by Montaigne and those who allowed more difference between animal and animal than between the higher animals and man. It also encouraged vivisection—a practice common with Descartes himself.¢ The recluses of Port Royal seized it eagerly, discussed automatism, dissected living animals in order to show to a morbid curiosity the circulation of the blood, were careless of the cries of tortured dogs, and finally embalmed the doctrine in a

syllogism of their logic,—No matter thinks : every soul of beast is matter: therefore no soul of beast thinks.

But whilst all the organic processes in man go on

2 Giuvres, ix. 426.

4 GHuvres, vi. 839. 3 CHuvres, x. 204.

6 Giuvres, iv. 452 and 454. > Giuvres, x. 208.

mechanically, and though by reflex action he may repel attack unconsciously, still the first affirmation of the system was that man was essentially a thinking being ; and, while we retain this original dictum, it must not be supposed that the mind is a mere spectator, or like the boatman in the boat. Of course a unity of nature is impossible between mind and body so described. And yet there is a unity of composition, a unity so close that the compound is “ really one and in a sense indivisible.” You cannot in the actual man cut soul and body asunder; they interpenetrate in every member, But there is one point in the human frame—a point midway in the brain, single and free, which may in a special sense be called the seat of the mind. This is the so-called conarion, or pineal gland, where in a minimized point the mind on one hand and the vital spirits on the other meet and communicate. In that gland the mystery of creation is concentrated ; thought meets exten- sion and directs it; extension moves towards thought and is perceived. Two clear and distinct ideas, it seems, pro- duce an absolute mystery. Mind, driven from the field of extension, erects its last fortress in the pineal gland. In such a state of despair and destitution there is no hope for spiritualism, save in God; and Clauberg, Geulinex, and Malebranche all take refuge under the shadow of His wings to escape the tyranny of extended matter.

In the psychology of Descartes there are two fundamental modes of thought,—perception and volition. ‘ It seems to me,” he says, “that in receiving such and such an idea the mind is passive, and that it is active only in volition ; that its ideas are put in it partly by the objects which touch

the senses, partly by the impressions in the brain, and partly also by the dispositions which have preceded in the mind itself and by the movements of its will.”! The will, therefore, as being more originative, has more to do with true or false judgments than the understanding. Unfortu- nately, Descartes is too lordly a philosopher to explain distinctly what either understanding or will may mean. But we gather that in two directions our reason is bound up with bodily conditions, which make or mar it, according as the will, or central energy of thought, is true to itself or not. In the range of perception, intellect is subjected to the material conditions of sense, memory, and imagination ; and in infancy, when the will has allowed itself to assent pre- cipitately to the conjunctions presented to it by these material processes, thought has become filled with obscure ideas. In the moral sphere the passions or emotions (which Descartes reduces to the six primitive forms of admiration, love, hatred, desire, joy, and sadness) are the perceptions or sentiments of the mind, caused and maintained by some movement of the vital spirits, but specially referring to the mind only. The presentation of some object of dread, for example, to the eye has or may have a double effect. On one hand the animal spirits “reflected”? from the image formed on the pineal gland proceed through the nervous tubes to make the muscles turn the back and lift the feet, so as to escape the cause of the terror. Such is the reflex and mechanical movement independent of the mind. But, on the other hand, the vital spirits cause a movement in the gland by which the mind perceives the affection of the organs, learns that something is to be loved or hated, admired or shunned. Such perceptions dispose the mind to pursue what nature dictates as useful. But, the estimate of goods and evils which they give is indistinct and unsatis- factory. The office of reason is to give a true and distinct appreciation of the values of goods and evils ; or firm and determinate judgments touching the knowledge of good and evil _are our proper arms against the influence of the passions.* We are free, therefore, through knowledge : ex 2 Aa 1 Giuvres, ix. 166. ? Passions de Ame, 36. 3 Passions de 1 Ame, 48.

magna luce in tntellectu sequitur magna propensio in vovun- tate, and omnis peccans est ignorans. “ If we clearly see that what we are doing is wrong, it would be impossible for us to sin, so long as we saw it in that

light.”* Thus the highest liberty, as distinguished from mere indifference, proceeds from clear and distinct knowledge, and such knowledge can only be attained by firmness and resolution, t.e., by the continued exercise of the will. ‘Thus in the perfection of man, as in the nature of God, will and intellect must be united. For thought, will is as necessary as understanding. And innate ideas therefore are mere capacities or tendencies,—possibilities which apart from the will to think may be regarded as nothing at all.

The philosophy of Descartes fought its first battles and gained its first triumphs in the country of his adoption. In his lifetime his views had been taught in Utrecht and Leyden. In the universities of the Netherlands and of Lower Germany, as yet free from the conservatism of the old-established seats of learning, the new system gained an easy victory over Aristotelianism, and, as it was adapted for lectures and examinations, soon became almost as scholastic as the doctrines it had supplanted. At Leyden, taught by De Raey, Heerebord, Heidan, and Volder; at Utrecht, by De Bruyn and P. Burmann, and Lambert Welthuysen (the last a private student); at Groningen, by Maresius, Gousset, and Tobias André; at Franeker, by Ruardus Andala; at Breda, Nimeguen, Harderwyk, Duisburg, and Herborn, and at the Catholic university of Louvain, Cartesianism was warmly expounded and defended in seats of learning, of which many are now left desolate, and by adherents whose lucubrations have for the most part long lost interest for any but the antiquary.

The Cartesianism of Holland was a child of the uni- versities, and. its literature is mainly composed of com- mentaries upon the original texts, of theses discussed in the schools, and of systematic expositions of Cartesian philosophy for the benefit of the student. Three names stand out in this Cartesian professoriate,— Wittich, Clauberg, and Geulinex. Wittich (1625-1688), professor at Duisburg and Leyden, is a representative of the moderate followers, who professed to reconcile the doctrines of their school with the faith of Christendom, and to refute the theology of Spinoza. Clauberg (like Wittich, a German), professor of philosophy at Herborn and Duisburg, died while still young in 1665. Like a schoolman on Aristotle, he has, clause by clause, commented upon the Meditations of Descartes ; but he specially claims notice for his work De corporis et anime in homine conjunctio, where he main- tains that the bodily movements are merely

procatarctic causes (7.¢., antecedents, but not strictly causes) of the mental action, and sacrifices the independence of man to the omnipotence of God. The same tendency to absorb all particular causes and movements in God is still more pronounced in Geulinex (1625-1669), who for the last six years of his life taught privately at Leyden. With Geulincx the reciprocal action of mind and body is altogether denied ; they resemble two clocks, so made by the artificer as to strike the same hour together. The mind can only act upon itself; beyond that limit, the power of God must intervene to make any seeming interaction possible between body and soul. Such are the half-hearted attempts at consistency in Cartesian thought, which eventually culminate in the pantheism of Spinoza.

Descartes occasionally had not scrupled to interpret the Scriptures according to his own tenets, while still main- taining, when their letter contradicted kim, that the Bible was not meant to teach the sciences. Similar tendencies are found amongst his followers. Whilst Protestant

4 Ciuvres, ix. 170.

opponents put him in the list of atheists like Vanini, and the Catholics held him as dangerous as Luther or Calvin, there were zealous adherents who ventured to prove the theory of vortices in harmony with the book of Genesis. It was this rationalistic treatment of the sacred writings which helped to confound the Cartesians with the allegorical school of John Cocceius, as their liberal doctrines in theology justified the vulgar identification of them with the heresies of Socinian and Arminian. The chief names in this advanced theology connected with Cartesian doctrines are Meyer, the friend and editor of Spinoza, author of a work termed Philosophia Scripture Interpres (1666) ; Balthasar Bekker, whose World Bewitched helped to discredit the superstitious fancies about the devil ; and Spinoza, whose Tractatus Theologico-Politicus is in some respects the classical type of rational criticism up to the present day. Against this work and the Ethics of Spinoza the orthodox Cartesians (who were in the majority), no less than scepti- cal hangers-on like Bayle, raised an all but universal howl of reprobation, scarcely broken for about a century.

In France Cartesianism won society and literature before it penetrated into the universities. Clerselier (the friend of Descartes and his literary executor), his son-in-law Rohault (who achieved that relationship through his Cartesianism), and others, opened their houses for readings to which the intellectual world of Paris—its learned profes- sors not more than the courtiers and the fair sex,— flocked to hear the new doctrines explained, and possibly discuss their value. Grand seigneurs, like the prince of Condé, the Duc de Nevers, and the Marquis de Vardes, were glad to vary the monotony of their feudal castles by listening to the eloquent rehearsals of Malebranche or Regis. And the salons of Madame de Sevigné, of her daughter Mme. de Grignan, and of the Duchesse de Maine for a while gave the questions of philosophy a place among the topics of polite society, and furnished to Moliére the occa- sion of his Femmes Savantes. The chateau of the Duc de Luynes, the translator of the Meditations, was the home of a Cartesian club, that discussed the questions of automatism and of the composition of the sun from filings and parings, and rivalled Port Royal in its vivisections. The Cardinal de Retz in his leisurely age at Commercy found amuseinent in presiding at disputations setween the more moderate Cartesians and Don Robert Desgabets, who interpreted Descartes in an original way of his own. Though rejected by the Jesuits, who found peripatetic formule a faithful weapon against the enemies of the church, Cartesianism was warmly adopted by the Oratory, which saw in Descar- tes something of St Augustine, by Port Royal, which discovered a connection between the new system and Jansenism, and by some amongst the Benedictines and the order of Ste Geneviéve.

The popularity which Cartesianism thus gained in the social and literary circles of the capital was largely increased by the labours of Pierre-Sylvain Regis (1632-1707). On his visit to Toulouse in 1665, with a mission from the Cartesian chiefs, his. lectures excited boundless interest ; ladies threw themselves with zeal and ability into the study of philosophy; and Regis himself, like a public benefactor in some old Greek town, was made the guest of the civic corporation. In 1671 scarcely less enthusiasm was aroused in Montpellier ; and in 1680 he opened a course of lectures at Paris, with such acceptance that intending hearers had to secure their seats some time before the lecture began.

Regis, by removing the paradoxes and adjusting the meta-.

physics to the popular powers of apprehension, made Car- tesianism popular, and reduced it to a regular system.

But a check was at hand. Descartes, in his correspond- ence with the Jesuits, had shown an almost cringing eagerness to have their powerful organization on his side.

Especially he had written to Pere Mesland, one of the order, to show how the Catholic doctrine of the eucharist might be made compatible with his theories of matter. But his undue haste to arrange matters with the church only served to compromise him more deeply. Unwise admirers and malicious opponents exaggerated the theologi- cal bearings of his system in this detail; and the efforts of the Jesuits succeeded in getting the works of Descartes, in November 1663, placed upon the Index of prohibited 20oks, —donec corrigantur. Thereupon the power of church and state enforced by positive enactments the passive resistance of old institutions to the novel theories. In 1667, the oration at the interment was forbidden by royal order. In 1669, when the chair of philosophy at the Collége Royal fell vacant, one of the four selected candidates had to sustain a thesis against ‘“ the pretended new philo- sophy of Descartes.” In 1671 the archbishop of Paris, by the king’s order, summoned the heads of the university to his presence, and enjoined them to take stricter measures against philosophical novelties dangerous to the faith. In 1673 a decree of the Parliament against Cartesian and other unlicensed theories was on the point of being issued, and was only checked in time by the appearance of a burlesque mandamus against the intruder Reason, com- posed by Boileau and some of his brother-poets. Yet in 1675 the university of Angers was empowered to repress all Cartesian teaching within its domain, and actually appointed a commission charged to look for such heresies in the theses and the students’ note-books of the college of Anjou belonging to the Oratory. In 1677 the university of Caen adopted not less stringent measures against Cartesianism. And so great was the influence of the Jesuits, that the congregation of St Maur, the canons of Ste Geneviéve, and the Oratory laid their official ban on the obnoxious doctrines. From the real or fancied rapproche- ments between

Cartesianism and Jansenism, it became for a while impolitic, if not dangerous, to avow too loudly a preference for Cartesian theories. Regis was constrained to hold back for ten years his System of Philosophy ; and when it did appear, in 1690, the name of Descartes was absent from the title-page. There were other obstacles besides the mild persecutions of the church. Pascal and other members of Port Royal openly expressed their doubts about the place allowed to God in the system; the adherents of Gassendi met it by resuscitating atoms; and the Aristotelians maintained their substantial forms as of old ; the Jesuits argued against the arguments for the being of God, and against the theory of innate ideas ; whilst Huet, bishop of Avranches, once a Cartesian himself, made a vigorous onslaught on the contempt in which his former comrades held literature and history, and enlarged on the vanity of all human aspirations after rational truth.

The greatest and most original of the French Cartesians was Malebranche. His Recherche de la Verité, in 1674, was the baptism of the system into a theistic religion which borrowed its imagery from Augustine; it brought into prominence the metaphysical base which De la Forge, Rohault, and Regis had neither cared for nor understood. But this doctrine was a criticism and a divergence, no less than a consequence, from the principles in Descartes ; and it brought upon Malebranche the opposition, not merely of the Cartesian physicists, but also of Arnauld, Fénelon, and Bossuet, who found, or hoped to find, in the Meditations, as properly understood, an ally for theology. Popular enthusiasm, however, was with MalJebranche, as twenty years before it had been with Descartes ; he was tne fashion of the day; and his disciples rapidly increased both in France and abroad.

In 1705 Cartesianism was still subject to prohibitions from the authorities; but in a project of new statutes,

drawn up for the faculty of arts at Paris in 1720, the Method and Meditations of Descartes were placed beside the Organon and the Metaphysics of Aristotle as text-books for philosophical study. And before 1725, readings, both public and private, were given from Cartesian texts in some of the Parisian colleges. But when this happened, Cartesianism was no longer either interesting or dangerous ; its theories, taught as ascertained

and verified truths, were as worthless as the systematic verbiage which preceded them. Already antiquated, it could not resist the wit and raillery with which Voltaire, in his Lettres sur les Anglais (1728), brought against it the principles and results of Locke and Newton. The old Cartesians, Mairan and especially Fontenelle, with his Zhéorie des Tourbillons (1752), struggled in vain to refute Newton by styling attraction an occult quality. Fortunately, the Cartesian method had already done its service, even where the theories were rejected. The Port Royalists, Nicole and Arnauld, had applied it to grammar and logic ; Domat and Daguesseau to jurisprudence; Fontenelle, Perrault, and Terrasson to literary criticism, and a worthier estimate of modern literature. Though it never ceased to influence individual thinkers, it had handed on to Condillac its popu- larity with the masses. A Latin abridgment of philosophy, dated 1784, tells us that the innate ideas of Descartes are founded on no arguments, and are now universally aban- doned, The ghost of innate ideas seems to be all that it had left.

In Germany a few Cartesian lecturers left their names at Leipsic and Halle, but the system took no root, any more than in Switzerland, where it had a brief reign at Geneva after 1669. In Italy the effects were more permanent, What is termed the iatro-mechanical school of medicine, with Borelli (1608-1679) as its most notable name, entered in a way on the mechanical study of anatomy suggested by Descartes, but was probably much more dependent upon the positive researches of Galileo. At N aples there grew up a Cartesian school, of which the best known mem- bers are Michel Angelo Fardella (1650-1708) and Cardinal Gerdil (1718-1802), both of whom, however, attached themselves to the characteristic views of Malebranche.

In England Cartesianism took but slight hold. Henry More, who had given it a modified Sympathy in the life. time of the author, became its opponent in later years ; and Cudworth differed from it in most essential points. Antony Legrand, from Douay, attempted to introduce it into Oxford, but failed. He is the author of several works, amongst others a system of Cartesian philosophy, where a chapter on “ Angels ” revives the methods of the schoolmen. His chief opponent was Samuel Parker, bishop of Oxford, who, in his attack on the irreligious novelties of the Cartesian treats Descartes (such is the irony of history) as a fellow criminal in infideli ty

with Hobbes and Gassendi. Rohault's version of the Cartesian physics was translated into English ; and Malebranche found an ardent follower in John Norris (1667-1711). Of Cartesianism towards the close of the 17th century the only remnants were an over- grown theory of vortices, which received its death-blow from Newton, and a dubious phraseology anent innate ideas which found a witty executioner in Locke.

For an account of the metaphysical doctrines of Des- cartes, in their connections with Malebranche and Spinoza, see the article CarTEsranisM, ;

The chief editions of the collected works of Descartes are the two

Latin texts in 9 vols. 4to by Elzevir 1713, and in7 vols, 4to, Frankfort,

1697, and the French edition by Cousin in 11 vols. 8vo, Paris, 1824—

papers. An edition of the philosophical works in 4 vols, 8yo, edited by Garnier, appeared at Paris, 1835. There is a good English translation of the Method, Meditations, and a small part of the Principles, first published at Edinburgh, 1853.

For the life of Descartes the chief authority is Baillet, Vie de Descartes, in 2 vols. 4to, 1691; of which a small abridgment, after- wards translated into English, appeared in 1692. Therc is a sum- mary of it in Garnier's edition, and in Kuno Fischer's Geschichte der Neuern Philosophie, Band i. Th. 1, 8vo, Mannheim, 1865. See the Hloge of Thomas in Cousin's edition.

For the philosophy of Descartes, see besides the works referred to under CARTESIANISM, Bordas-Demoulin, Le Owrtesianisme, 2d ed. Par. 1874; Damiron, Histoire dc la Philosophie du XVII. Sitele ; Renouvier, Manuel de Philosophie Moderne, Paris, 1842 ; Cousin, Fragments Philosophiques, vol. ii., Paris, 1838, Fragments de Philosophie Cartesienne, Paris, 1845, and in the Journal des Savants, 1860-61. A good estimate of the physical and mathematical labours is given in Ersch and Gruber's Encyclopddie ; and Professor Huxley has lately, in the Fortnightly Revicw, vol. xvi., called

atten- tion to automatism. There are also several German works treating of his theology and metaphysics. (W. W.)

DESCHAMPS, Evstacuz, called Moret, a distin- guished medizval poet of France, was born at Vertus, in Champagne, early in the 14th century. The date of his birth has been approximately given as 1328, 1340, and 1345, according to the interpretation put upon certain vague state- ments of lis own. It is certain that he lived under four kings—Philip VI., John, Charles V., and Charles VI. He studied the seven liberal arts at the university of Orleans, Karly in life he proceeded to the court of France, and, after first entering the service of a prelate whose name he has not recorded, for more than thirty years took an active and prominent part in the joyous society of the day. Charged with a succession of honourable offices, he served nearly all the princes his contemporaries. His life was a long and romantic series of tournaments, feasts, and battles, and he was one of the most popular persons of his time. But before settling down to this life, he had a stormy youth of vicissitude. He was an eye-witness of the English invasion in 1358; he was in the siege of Rheims, and witnessed the march on Chartres; he was present also at the signing of the treaty at Bretigny. In 1360, as Chatelain of Vertus, he became the vassal of the young princess Isabella, to whom he paid great poetic homage. But he was then already a travelled man; he had visited Italy, Germany, and Hungary. Later on he took a part in the Flemish wars, and it was on this occasion that, about 1385, he received the surname, or nickname, of Morel, which he sometimes himself adopted in later life. He is believed, but not on very strong evidence, to have travelled in Syria and Egypt, and to have been captured and imprisoned by the Saracens. In France he lived the true life of a trowvére, wandering from castle to castle with his poems. He had a violent hatred for the English nation, fostered no doubt by the experiences of his youth; and this he has expressed very abundantly in his writings, particularly in the famous prophecy that England would be destroyed so thoroughly that no one should be able to point to her ruins. He was huissier d’armes to King Charles V., and by him appointed bailli of Senlis and governor of Fismes. It was with great reluctance that, when he felt himself growing old, he retired from public life and went into a modest seclusion, where he occupied himself in the composition of a splenetic satire against women, entitled Le Miroir de Mariage; though 12,500 lines of this exist, he left it unfinished at his death,

which took place about 1420. Eustache Deschamps was an accomplished courtier, but he was extremely ugly; he disarms criticism by calling himself “Le Roi de Laidure.” His poems remained unprinted until our day, the great fount of them being a manuscript in the Royal Library at Paris, containing 1175 ballads, 171 rondeaux, 80 virelays, 14 lays, 28 farces, and various epistles and satires. This bulk of MSS. was edited and published in 4to by M. G. A.

Crapelet in 1832, preceded by a literary and historical monograph. ‘The value of his writings being recognized, another and more critical edition was brought out, in 1849, by M. Prosper Tarbé. The same editor published Le Miroir de Mariage in 1865, and a long poem entitled Le Lay des douze Hstats du Monde, in 1870. Deschamps excelled in the use of the ballad and chanson royal. In each of these forms of verse he was the greatest master of his time. One of his ballads is addressed to the English poet “ Geoffroy Chaucier,” to whom he says—

Tu es d’amours mondains dieux en Albie

Kt de la Rose en la terre Angélique.

In Eustache Deschamps the modern language of France first found a pure lyrical expression ; his long life seems to connect the literature of Theobald LV. with that of Charles of Orleans.

DESERT. See PaystcaL Grocraruy.

DESFONTAINES, Ren& Lovicne(1751—-1833), French botanist, was a native of Brittany, born at Tremblay, in the department of Ile-et-Vilaine, in 1751 or 1752, He was sent to the town school, but made slow progress in learning, and was at length dismissed by the schoolmaster as adullard and a robber of apple orchards. This treat- ment left a life-long painful impression on his mind. At the college of Rennes, to which he was next sent, he applied himself heartily to study, and rejoiced in a success which falsified the judgment of his old master. From Rennes he passed to Paris, to study medicine; but this soon became a secondary pursuit, his chief attention

being drawn to the study of plants. At Paris he acquired the friendship of Lemonnier, physician to the king, and of Jussieu. At the age of thirty he took his degree of M.D., and in 1783 he was elected member of the Academy of Sciences. In the same year he set out for North Africa, and spent two years in a scientific exploration of Barbary. In 1785 he returned to Paris, bringing with him a large collection of plants, animals, and other objects illustra- tive of natural history. The collection, it is stated, comprised 1600 species of plants, of which about 300 were described for the first time. His successful labours were rewarded, and a new congenial field of work was opened to him, by his nomination by Buffon to the post of pro- fessor at the Jardin des Plantes, vacated in his favour by his friend Lemonnier. The garden, says one of his biographers, now became his world. His life was thence- forth marked by few incidents. He devoted himself to his pupils, to his plants, and to the preparation of various botanical works. He purposed to publish a narrative of his African explorations, but the manuscript journal being lent to Lemonnier, and by him to the king, Louis XVL, was lost, and only a few fragments of the narrative appeared. His great work is entitled Flora Atlantica sive historia plantarum quae in Atlante, agro Tunetano et Algeriensi erescunt. It was published in 2 vols. 4to in 1798, and is esteemed for the singular clearness and precision of its descriptions and its nomenclature. Desfontaines, as a recluse student, escaped the ‘perils of the Reign of Terror. On two occasions he courageously quitted his retirement to rescue the naturalists Ramond and Lheritier from prison and from death. He was admitted to the Legion of Honour at the time of its establishment. At the age of sixty-three he married a young wife, but the prospect of happiness thus opened was soon closed by her death. In 1831 he became blind, and was reduced to the recognition of his favourite plants by touch alone. Desfontaines was author of many valuable memoirs on vegetable anatomy and physiology, descriptions of new genera and species, &e., contributed to learned societies and scientific journals. One of the most important was the “Memoir on the Organization of the Monocotyledons,” which gave him a

high place among discoverers. He published in 1804 a Tableau de Vécole botanique du muséum d’histowre naturelle de Paris, of which a third edition

appeared in 1831, under the new title Catalogus Plantarum Horti Regu Parisiensis. His modesty, simplicity of life, and good humour endeared him to his friends and to his pupils. He died at Paris on the 16th November 1833, a daughter surviving him. His Barbary collection was bequeathed to the museum, and his general collection passed into the handsof the botanist Webb.

DESHOULIERES, Antornerte pu Ligier DE LA GarveE (1634-1694), a French poetess, born at Paris, was the daughter of the Chevalier de la Garde, maitre d'hétel to the queens Mary de' Medici and Anne of Austria, She received a careful and very complete education, acquiring while still young a knowledge of Latin, Spanish, and Italian, and studying prosody under the direction of the poet Hesnaut. At the age of eighteen she married the Seigneur Deshouli¢res, who had soon afterwards to go abroad along with the prince of Condé on account of his complicity in the Fronde. Madame Deshouliéres returned for a time to the house of her parents, where she gave: herself to writing poetry and studying the philosophy of Gassendi. She rejoined her husband at Rocroi, near. Brussels, where, being distinguished for her personal, beauty, she became the object of embarrassing attentions on the part of the prince of Condé, against which, how- ever, she knew how to protect herself. Having made herself obnoxious to the Government by her urgent demand for the arrears of her husband's pay, she was imprisoned in the chateau of Wilworden, the hardships being increased by the refusal of all books except the Bible and some volumes of the fathers, After a few months she was freed by her husband, who attacked the chateau at the head of a small band of soldiers. An amnesty having been proclaimed, they returned to France, where Madame Deshoulitres soon became a conspicuous personage at the court of Louis XIV. and in literary society. She won the. friendship and admiration of the most eminent literary men of the age—some of her more zealous flatterers even going so far as to style her the tenth muse, and the French Calliope. Her poems were very numerous, and included specimens of nearly all the minor forms, odes, eclogues, idylls, elegies, chansons, ballads, madrigals, &c. Of these the idylls alone, and only some of them, have stood the test of time, the others being entirely forgotten. She wrote several dramatic works, the best of which do not rise to mediocrity, and the worst of which are worthy of the taste that could prefer the Phédre of Pradon to that of Racine. Voltaire

pronounced her, nevertheless, the most successful of the female poets of France ; and her reputation with her contemporaries is indicated by her election as a member of the Academy of the Ricovrati of Padua, and of the Academy of Arles. In 1688 a pension of 2000 livres was bestowed upon her by the king, and she was thus raised from the poverty in which she had long lived. She died at Paris on the 17th February 1694, Complete editions of her works were published at Paris in 1797 and 1799. ‘These include a few poems by her daughter Antoinette Thérése Deshoulitres (1662-1718), who in- herited her talent.

DESIDERIO DA SETTIGNANO, sculptor, was born nearly at the beginning of the 15th century, and died in all probability in 1485. Vasari’s statement, that he died at the age of twenty-eight, is altogether a mistake. Settignano is a village on the southern slope of the hill of Fiesole, still surrounded by the quarries of sandstone of which the hill is formed, and still inhabited, as it was 400 years ago, by a race of “ stone-cutters,” several of whom, though not disdaining the title of “lapicida,” earned for themselves honoured places in the roll of Florentine

sculptors, Desiderio was for a short time a pupil of Donatello, and he seems to have worked also with Mino da Fiesole, with the delicate and refined style of whose works those of Desiderio seem to have a closer affinity than with the perhaps more masculine tone of Donatello. Vasari especially praises the works of Desiderio for their grace and simplicity which, as the critic remarks, are a gift of nature, and can be acquired by no study. He particularly extols the sculptor’s treatment of the figures of women and children, and the eulogy applies equally to the genius and manner of Mino da Fiesole. It does not appear that Desiderio ever worked elsewhere than at Florence; and it is there that those who are interested in the Italian sculpture of the Renaissance must seek the few but remarkable works of his chisel, which have survived the changes and chances of four centuries.

DES MOINES, formerly Fort Des Motnks, a city of the United States, capital of Iowa, at the confluence of the Raccoon with the Des Mvines

River, which is one of the right hand tributaries of the Mississippi, and is navig- able thus far for steamboats. Its public buildings include the old capitol, erected in 1856, the new capitol, founded in 1870, the post-office, with a number of other United States offices under the same roof, the Baptist college, 15 churches, and 5 high schools; and among its industrial establishments are a paper-mill, a woollen factory, an oil-mill, besides foundries, machine-shops, flour-mills, and plough-factories. There are two public libraries in the town, one of which is maintained by the State, and numbers 15,000 volumes ; and, besides several dailyand weekly news-papers, no fewer than six monthly periodicals are published. Forty acres of ground have been appropriated for a public park; and another area of 100 acres belongs to a park- company. Coal, lime, and clay are abundant in the neighbourhood, and the town is supplied with water from the Raccoon. Des Moines, which dates from 1846, received incorporation in 1851, and was raised to the rank of a city and the capital of the State in 1857. Population in 1860, 3965; in 1873, 15,601.

DESMOULINS, Luci Smwprick Camititn BEnoist (1760-1794), was born at Guise, in Picardy, on the 2d of March 1760. His father was lientenant-general of the bailiwick of Guise, and was desirous that Camille his eldest sou, who from his earliest years gave signs of unusual intelligence, should obtain as complete an education as France could then bestow. His wishes were seconded by a friend obtaining a “bourse” for the young Desmoulins, who at the age of fourteen left home for Paris, and entered the college of Louis le Grand. In this school, in which Robespierre was also a bursar and a distinguished student, Camille laid the solid foundation of his learning, and made an acquaintance with the literature and history of the classical nations so deep and extensive that it furnished him throughout the whole of his short and chequered life with illustrations which he applied with brilliancy and effect to the social manners and political events of his time.

Desmoulins having been destined by his father for the law, and having completed his legal studies, was admitted an advocate of the Parliament of Paris in 1785. His pro- fessional success was not great; his manner was violent, his appearance far from attractive, and his speech was impaired by the natural defect of a painful stammer. He indulged and fostered, however, his love for literature, he was closely observant of the course of public

affairs, and he was thus gradually being prepared for the main duties of his life—those of a political lettérateur,

In March 1789 Desmoulins began his political career. Having been nominated deputy from the bailiwick of Guise, he appeared at Laon as one of the comniissioners for the election of deputies to the States General summoned by

royal edict of 24th January. Camille heralded its meeting by his Ode to the States General. It is, moreover, highly probable that he was the author of a radical pamphlet entitled La Philosophie au peuple Frangais, His hopes of professional success were now scattered, and he was living in Paris in extreme.poverty and almost in squalor. He, however, shared to the full the excitement which attended the meeting of the States General. As appears from his letters to his father, he watched with exultation the procession of deputies at Versailles, and with violent indignation the events of the latter part of June which followed the closing of the Salle des Menus to the deputies who had named themselves the National Assembly. It is further evident that Desmoulius was already sympathizing, not only with the enthusiasm, but also with the fury and cruelty, of the Parisian crowds.

The sudden dismissal of Necker by Louis was the event which brought Desmoulins to fame. On the 12th of July 1789 Camille, leaping upon a table in one of the cafés of the Palais Royal, startled a numerous crowd of listeuers by the announeement of the dismissal of their favourite, Losing in his violent excitement the stammer which impeded his ordinary speech, he inflamed the passions of the mob by his burning words and his call “To arms !” “This dismissal,” he said, “is the tocsin of the St Bartholomew of the patriots.’ Drawing, at last, two pistols from under his coat, he declared that he would not fall alive into the hands of the police who were watching his movements. He descended amid the embraces of the crowd, and his cry “ To arms !” resounded on all sides. This scene was the beginning of the actual events of the Revolution, Following Desmoulins the crowd surged through Paris, procuring arms by force; and on the 13th it was partly organized as the Parisian militia which was afterwards to be the National Guard. On the 14th the Bastille was taken.

Desmoulins may be said to have begun on the following day that public literary career which lasted till his death. In May and June 1789 he had written La France libre, which, to his chagrin, his publisher refused to print. The taking of the Bastille, however, and the events by which it was preceded, were a sign that the times had changed ; and on the 15th of July Desmoulins's work was issued. It attracted immediate attention. By its erudite, brilliant, and courageous examination of the rights of king, of nobles, of clergy, aud of people, it attained a wide and sudden popularity ; it secured for the author the friendship and protection of Mirabeau, and the studied abuse of numerous royalist pamphleteers. Shortly afterwards, with his vanity and love of popularity inflamed, he pandered to the passions of the lower orders by the pnblication of his Discowrs de la lanterne aux Parisiens, which with an almost fiendish reference to the excesses of the mob he headed by a quota- tion from St John, Que male agit odit lucem. Camille was dubbed " Procureur-général de la lanterne."

In November 1789 Desmoulins began his career a8 & journalist by the issue of the first number of a weekly publication—Hévolutions de France et de Brabant. He con- ducted this alone till July 1790, and thereafter with the assistance of Stanislas Fréron till July 1792, when the publication ceased. Success attended the Révolutions from its first to its last number, Camille was everywhere famous, and his poverty was relieved. These numbers are valuable as an exhibition not so much of events as of the feelings of the Parisian people during the most stormy period of their history ; they are adorned, moreover, by the erudi- tion, the wit, and the genius of the author, but they are disfigured, not only by the most biting personalities and the defence and even advocacy of the excesses of the mob, but by the entire absence of the forgiveness and

pity for which the writer was afterwards so eloquently to d.

Ea aeioulins had now become an acknowledged leader of public opinion. Its sudden changes suited his fickle temperament, and form the only excuse for the glaring inconsistencies which disfigure his published writings. Mirabeau, for instance, whose genius and hospitality he had frequently and openly lauded, he afterwards thought fit to denounce as the " god of orators,

liars, and thieves.” He was powerfully swayed by the influence of more vigorous minds ; and for some time before the death of Mirabeau, in April 1791, he had begun to be led by Danton, with whom he remained associated during the rest of his life. In July 1791 Camille appeared before the municipality of Paris as head of a deputation of petitioners for the deposition of the king. In that month, however, such a request was dangerous ; there was excitement in the city over the presentation of the petition, and the private attacks to which Desmoulins had often been subject were now followed by a warrant for the arrest of himself and Danton. Danton left Paris for a little ; Desmoulins, however, remained there, appearing occasionally at the Jacobins club. He resigned his functions as a journalist, and the issue of his Révoluteons ceased.

Three months afterwards, however, he again appeared in public, having been appointed secretary to the Society of the Friends of the Constitution. His second attempt at journalism was made in April and May 1792, in the issue of several numbers of the 7’ribune des Patriotes, but success did not attend the effort, and it was in his pamphlet Jean Pierre Brissot démasqué, which abounded in the most violent personalities, that Desmoulins again secured the eager attention of the public. This pamphlet, which had its origin in a petty squabble, was followed in 1793 by a Fragment de Vhistotre secréte de la Révolution, in which the party of the Gironde, and specially Brissot, were most mercilessly attacked.

On the nomination of Danton, after the excesses of the 10th of August 1792, to the post of minister of justice, Desmoulins was appointed his secretary general. On September the 8th he was elected one of the deputies for Paris to the lately created National Convention. He was not successful as an orator. He was of the party of “ the Mountain,” and voted for the abolition of royalty and the death of the king. With Robespierre he was now more than ever associated, and the Histoire des Brissotins, the fragment above alluded to, was inspired by the arch- revolutionist. The success of the brochure, so terrible as to send the leaders of the Gironde to the guillotine, alarmed Danton and the author. Not so with Robespierre ; and the split was formed which was to end in the ruin of the Dantonists.

In December 1793 was issued the first number of the Vieux Cordelier, by which Danton's idea of a committee of clemency was formulated and upheld. From the first Robespierre, although revising the sheets, disapproved of it, and at the fifth number the actual rupture became visible, _ Robespierre took advantage of the popular indignation roused against the Hébertists to send them to death, but the time had come when Saint Just and he were to turn their attention not only to les enragés, but to les mdulgents —the powerful faction of the Dantonists. On the 7th of January 1794 Robespierre, who on a former Occasion had defended Camille when in danger at the hands of the National Assembly, in addressing the Jacobins club counselled not the expulsion of Desmoulins, but the burning of certain numbers of the Viewx Cordelier. Camille sharply replied that he would answer with Rousseau,—* burning is not answering," and a bitter quarrel therenpon ensued. By the end of March not only

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were Hébert and the leaders of the extreme party guillotined, but their opponents, Danton, Desmoulins, and the best of the moderates were arrested. On the 31st the warrant of arrest was signed aud executed, and on the 3d, 4th, and 5th of April the trial took place before the Revolutionary Tribunal. It was ascene of terror not only to the accused but to judges and to jury. The retorts of the prisoners were notable. Camille on being asked his age, replied, '"T am thirty-three, the age of the sans-culotte Jesus, a critical age for every patriot." This was false; he was thirty-four. Tinville, alarmed at the eloquence of Danton, procured from the Committee of Public Safety a decree which closed the mouths of the accused. Armed with this and the false report of a spy who charged the wife of Desmoulins with conspiring for the escape of her husband and the ruin of the republic, Tinville by threats and beseechings at last obtained from the jury a sentence of death. It was passed in absence of the accused, and their execution was appointed for the same day.

Since his arrest the courage of Camille had miserably failed. He had exhibited in the numbers of the Vreux Cordelier almost a disregard of the death which he must have known hovered over him. He had with consummate ability exposed the terrors of the Revolution, and had. adorned

his pages with illustrations from Tacitus, the force of which the commonest reader could feel. In his last number, the seventh, which his publisher refused to print, he had dared to attack even Robespierre, but at his trial it was found that he was devoid of physical courage. He had to be torn from his seat ere he was removed to prison, and as he sat next to Danton in the tumbrel which conveyed them to the guillotine, the calmness of the great leader failed to impress him. In his violence, bound as he was, he tore his clothes into shreds, and his bare shoulders and breast were exposed to the gaze of the surging crowd. Of the fifteen guillotined together, including among them Hérault de Séchelles, Westermann, and Philippeaux, Desmoulins died third; Danton, the greatest, died last. With them also died the hope of the Revolution. But a few months were to pass ere it was to be solemnly decreed that they had “ deserved well of humanity.”

On the 29th of December 1790, Camille had married Lucile Duplessis, and among the witnesses of the ceremony are observed the names of Brissot, Pétion, and Robespierre. The only child of the marriage, Horace-Camille, was born onthe 6th of July 1792. Two days afterwards Desmoulins brought it into notice by appearing with it before the municipality of Paris to demand “ the formal statement of the civil estate of his son.” The boy was afterwards pensioned by the French Government. . Lucile, Des- maulins’s accomplished and affectionate wife was, a few days after her husband, and on a false charge, coudemned to the guillotine. She astonished all onlookers by the calmness with which she braved death.

See the biographies of Desmoulins by Edward Fleury and Jules Claretie. The latter, entitled Camille Desmoulins and his Wife, has been translated into English (London, 1876). The work of Roch Mercandier, Histoire des hommes de proie, is not trustworthy. See also the literature of the Revolution, and especially of the Dantonists. The standard edition of Desmoulins’s works is that of Matton. (T. 8.)

DE SOTO, Ferpinanpo (1496 ?-1542), a Spanish captain and explorer, who is frequently accredited with the honour of being the discoverer of the Mississippi, and is certainly one of the most remarkable of the Eldorado adventurers of the 16th century. He was korn at Xeres de Caballeros, in Estremadura, of an impoverished family

1 This is borne out by the register of his birth and baptism, and by words in his last letter to his wife,—‘‘I die at thirty-four.’ The dates (1762-94) given in nearly every biography of Desmoulins are certainly inaccurate,

of good position, and was indebted to the favour of Pedrarias Davila for the means of pursuing his studies at the university. He commenced active life in 1519 by joining his patron in his second expedition to Darien, where he distinguished himself by his ability and the inde- pendence of his demeanour. In 1528 we find him exploring the coast of Guatemala and Yucatan, and in 1532 he led a reinforcement of 300 volunteers to the assistance of Pizarro in Peru. pass through the mountains to Cuzco; and in the capture of that city and in other important engagements he bore a brilliant part. After the completion of the conquest De Soto, who had landed in America with “ nothing else of his own save his sword and target,” returned to Spain with a fortune of “an hundred and fourscore thousand duckets,” which enabled him to marry the daughter of his old patron ‘Davila, and to maintain “all the state that the house of a nobleman requireth.” The Emperor Charles V., to whom he had lent a portion of his wealth, appointed him governor of the Island of Cuba, and adelantado or president of Florida, which was then the object of great interest, as possibly another Peru. In 1538 he set sail with an enthusiastic and richly furnished company of about 600 men, of whom several had sold all that they possessed to furnish their equipment. Landing in May 1539 at Espiritu Santo Bay, on the west coast of the present State of Florida, the explorers continued for nearly four years to wander from one point to another, ever deceived in their expectations, and ever allured by the report of the wealth that lay beyond. The exact line of their route is in many places difficult to identify, but it seems to have passed N. through Florida and Georgia as far as 35° N. lat., then S. to the neighbourhood of Mobile, and finally N.W. towards the Mississippi. This river was reached early in 1541, and the following winter was spent on the Washita. As they were returning in 1542 along the Mississippi, De Soto died (either in May or June), and his body was sunk in its waters. On the failure of an attempt which they made to push eastwards again, his men, under the leadership of Moscoso, were compelled in 1543 to trust themselves to the stream, A voyage of nineteen

days brought them to the sea, and they then held along the coast to Panuco, in Mexico.

_ Of this unfortunate expedition three narratives are extant, of seemingly independent origin, and certainly of very different charaeter. The first was published in 1557 at Evora, and_pro- fesses to be the work of a Portuguese gentleman of Elvas, who had aceompanied the expedition :—Relacam verdadeira dos Tra- balhos ¢ ho Gowernador dé Fernddo d'Souto & certos Fidalgos Portu- gueses passarom no d'scobriméto da Provincia da Frolida. Agora nouamete feita per hi Fidalgo Deluas. An English translation was published by Hakluyt in 1609, and another by an anonymous translator in 1686, the latter being based on a Freneh version whieh had appeared at Paris in 1685 from the pen of Citri de la Guette. The second narrative is the famous history of Florida by the Inea, Gareilasso de la Vega, who obtained his information from a Spanish cavalier engaged in the enterprise ; it was eom- pleted in 1591, first appeared at Lisbon in 1605 under the title of La Florida del Ynea, and has since passed through many editions in various languages. The third is a report presented to Charles V. of Spain in his Council of the Indies in 1544, by 'Luis Hernandez de Biedma, who had aceompanied De Soto as His Majesty's faetor. It is to be found in Ternaux-Compans's Recuetl de Pieces sur la Floride in the Historical Collections of Louisiana, Philadelphia, 1850, and in W. B. Rye's reprint for

the Hakluyt Soeiety of Hakluyt's translation of the Portuguese narrative.

See Bancroft's History of the United States, vol. 1.3 M 'Culloch, Researches Concerning the Aboriginal History of A imerica ; Monette, History of the Discovery and Settlement of the Valley of the Mississippi.

DESSAIX, Joszpy Martz, Count (1764-1834), French general, was born at Thonon, in Savoy, September 24, 1764. He studied medicine, took his degree of doctor at Turin, and then went to Paris. When the Revolution

To him was due the discovery of the |

broke out he served in the National Guard. Sympathizing with the extreme party, he attempted in 1791 to establish its principles in his native land ; but, being prosecuted by order of the king, he escaped to France. He had organized the so-called Legion of the Allobroges, and as its captain took part in the great conflict of August 10, 1792. In the following years he served at the siege of Toulon, in the army of the eastern Pyrenees, and in the army of Italy. He was captured at ‘the battle of Rivoli, but was soon exchanged. In the spring of 1798 Dessaix was elected member of the Council of Five Hundred. In consequence of his opposition to the revolution of 18 Brumaire (Sth November 1799), by which Napoleon became supreme, he was excluded from the council, retaining, however, his military command. He was appointed successively com- mander of Frankfort and of Breda, and in September 1803 was promoted general of brigade, and soon after commander of the Legion of Honour. He distinguished himself at the capture of Ulm, at the passage of the Tagliamento, and at the battle of Wagram. His brilliant courage at this battle procured him from the emperor the surname of “the Intrepid,” and the dignity of count of the empire. He was also promoted general of division, and named grand officer of the Legion of Honour. He took part in the expedition to Russia, and was twice wounded. For several months lic was commander of Berlin, and afterwards delivered the department of Mont Blanc fram the Austrians. His just conduct on this occasion earned him the title of the Bayard of Savoy. After the first restoration, Dessaix was created chevalier of St Louis. He nevertheless joined Napoleon in the campaign of the Hundred Days, and in 1816 was imprisoned for five months. The rest of his life was spent in retirement. He died October 26, 1834.

DESSAU, the chief town of the duchy of Anhalt, in North Germany, is situated in 51° 51’ 6” N. lat. and 12° 18’ E. long., on the left bank of the Mulde, nearly two miles from its confluence with the Elbe, and 67 miles south-west of Berlin, with which it is connected by railway. The town has three suburbs. Of its gates the Zerbster Thor, with the statues of Otto the Rich and Albert the Bear, alone remains. The ducal palace, which stands in fine pleasure-grounds, contains a collection of historical curiosities, and a gallery of pictures, including works by Cimabue, Lippi, Rubens, Titian, and Vandyck, Among the other buildings are the palace of the hereditary prince, the theatre and concert room, the administrative offices, bank, gymnasium,

musical academy, Amelia and Wilhelmine Institutes, two hospitals, and the Schlosskirche, adorned with paintings by Lucas Cranach, in the most interesting of which (the Last Supper) are portraits of several Reformers. The manufactures of Dessau are woollen, linen, and cotton goods, hats, leather, tobacco, and organs and other musical instruments ; and there is a considerable trade in corn. In the environs are the ducal villas of Georgium and Luisium, the gardens of which, as well as those of the neighbouring town of Worlitz, are much admired. Dessau was probably founded by Albert the Bear ; it was already a town in 1213. It first began to grow into importance at the close of the 17th century, in consequence of the religious emancipation of the Jews in 1686, and of the Lutheransin 1697. Moses Mendelssohn, the philosopher, was born at Dessau in 1729. The population in 1875 was 19,621.

DESTERRO, Nossa Senora po Desrerro, or SANTA CaTHARINA, a city of Brazil, the chief town of the province of Santa Catharina, on the west coast of the island from which the province derives its name, in 27° 30’ S. lat. and 48° 30’ W long. It is a small but strongly fortified place, with an excellent harbour, some foreign commerce,

| and regular intercourse with Rio de Janeiro, from which it

ig distant about 460 miles. Its public buildings include a

overnor’s palace, an arsenal, a court-house, and a hospital ; but none of them have any architectural interest. In 1838 great damage was done to the town by a waterspout. Population from 7000 to 8000.

DETMOLD, the chief town of the principality of Lippe, in North Germany, is situated on the Werre, at the foot of the Teutoburger-W ald, in 51° 56’ N. lat. and 8° 50’ E. long. The foundations of the older portiow of the town were laid in 1300, and those of the newer in 1709. Among the chief buildings and institutions are the new palace, in the Renaissance style, erected about 1550, the town-house, house of correction, penitentiary, military hospital, gymnasium,

the industrial, commercial, and free schools, the theatre, ,

museum of natural science, and public library. The lead- ing industries are linen-weaving, tanning, brewing, horse- dealing, and the quarrying of marble and gypsum. About three miles to the south-west of the town is the Grotenburg, with Bandel’s colossal statue of Hermann or Arminius, the leader of the Cherusci. Detmold (Thiatmelli) was in 783 the scene of a conflict between the Saxons and the troops of Charlemagne. The population in 1875 was 6982. DETROIT, the most important city of Michigan, in the United States of America, capital of Wayne county, situated on the west bank of the Detroit River (from the French for a strait), opposite the Canadian town of Windsor.

Scale of Miles

° 0 20 30

LaPeer = Flint, eaaeeneenm= —— Gapac oO

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ENVIRONS OF DETROIT /2 3

It is about 7 miles S.W. of Take St Clair, 55 miles from Lake Huron, and 18 miles N. of Lake Erie, in 42° 20’ N. lat. and 83° 3’ W. long. The river,

which there separates the United States from Canada, is about half a mile to three quarters of a mile wide, and 54 fathoms deep, and flows with a pretty swift current. The population of Detroit has increased from 21,019 in 1850 to 45,619 in 1860, and 79,577 in 1870, Of this last number 35,381 were of foreign birth, including 12,647 Germans. According to the State census of 1874, the population of the city was 101,255 ; while in the neighbouring towns are not fewer than 15,000 persons whose business interests are in the aty. Detroit with its suburbs stretches about five miles along the river, and the central part extends for about two miles back from the shore. The strects generally cross each other at right angles, and are from 50 to 100 feet Wide, They are for the most part ornamented with rows @ trees. A number of avenues, from 100 to 200 feet Wide, diverge from the Grand Circus, a spacious park, semi- circular in form, which is divided into two quadrants by Woodward Avenue, Connected with the Grand Circus is

the Campus Martius, a public “ place ” about 600 feet long and 250 feet wide. The chief public building is the city hall, which faces the Campus Martius with fronts on four streets, and is one of the finest structures of the kind in the West. Built of sandstone, and designed after the Italian style of architecture, it measuree 200 feet long, and 90 feet wide, and is surmounted by a tower 180 feet high. The cost of the building amounted to $600,000 (£120,000). Other noteworthy structures are the opera house, the office of the Board of Trade, the Roman Catholic cathedral, which is the most imposing of the many churches in the city, the custom house, containing also the post-office, and the Michigan Central Railroad freight depot, which is 1250 feet long by 102 feet wide. On the Campus Martius stands the Michigan Soldiers’ and Sailors’ Monu- ment. It is of bronze and granite, 55 feet high and about 20 feet in diameter at the base. It is surmounted by a colossal bronze statue of an Indian girl representing Michigan in defence of the Union. The design comprises numerous other bronze figures, all of which were cast in Munich.

The commercial facilities of Detroit are very extensive. The Detroit River is a connecting link in the great chain of lake navigation, and affords the best harbour on the lakes. The city is the centre of an extensive railroad system,

which presents important channels of transportation in almost every direction. Not fewer than five trunk lines diverge to the eastern seaboard. More than 350 vessels are owned here, and from ten to thirteen daily lines of steamers run to various points on the lakes. There is a considerable foreign commerce with Canada, the imports in 1875 amounting to $1,680,922, and the exports to $2,340,015 ; 4426. vessels entered and 4355 cleared in the foreign trade; 3968 entered and 3000 cleared in the coastwise trade. The large quantities of produce, chiefly from Michigan, passing eastward through the city by rail and water, give to Detroit an extensive domestic commerce. The manufacturing industries of the city are extensive and important. The working of iron is carried on in numerous blast furnaces, foundries, and other establishments. In 1875, 9 mills manufactured 238,200 barrels of flour; 8 factories produced more than 4,000,000 tb of chewing and smoking tobacco; and 171 establishments made about 30,000,000 cigars. Twelve saw-mills annually cut from 45,000,000 to 50,000,000 feet of lumber; and 26 brick- yards make from 55,000,000 to 60,000,000 bricks a year. The extensive Pullman car works, with a capital of about $12,000,000, are situated here; also one of the seven pin factories in the United States. The city glass works produce about $200,000 worth of glass a year; and the copper smelting works more than $2,000,000 worth of ingot copper from Lake Superior ore. There are four ship-yards and three large dry docks.

Detroit has 10 lines of street railway, with more than 45 miles of track intersecting the city in every direction. It is divided into 11 wards, each returning 2 aldermen to the city council, and has a metropolitan police of 100 members; 7 steam fire-engines, the stations of which are connected by telegraphic alarm apparatus with all parts of the city; and ample supplies of water from the river. There are 64 churches, 14 asylums and hospitals, 18 public schools, 4 public libraries, the largest containing about 25,000 volumes ; 2 medical colleges, and 3 medical societies; 8 daily newspapers, and 30 weekly and mouthly papers and periodicals; several public parks ; 10 banks, with an aggregate capital of $3,210,000; and 62 incorporated companies, representing capital stock to the amount of $22,445,000. The net city debt proper, January 1, 1875, amounted to $990,340, or about $9°78 per head of the population.

Detroit was settled by the French early in the 18th century, and passed into the hands of the English in 1763, It was then besieged for eleven months by the Indian chief, Pontiac. Ceded to the Americans in 1783, it was not occupied by them till 1796. It was incorporated as a city in 1824, and was the capital of Michigan from 1837 to 1847, when that honour was transferred to Lansing.

DEUCALION, in Greek legend, corresponds to the Biblical Noah. A great flood had destroyed the whole race of men except Deucalion and his wife Pyrrha, who saved themselves in a boat or ark, from which they landed on Mount Othrys, or, as it was afterwards said, on Mount Parnassus. They were then commanded by Zeus to cast behind them the bones of their mother, z.¢., the stones of the hill side, and from the stones thrown by Deucalion sprang men, from those thrown by Pyrrha, women. Hence mei were called Aaof, ‘stone race.” Deucalion’s son Hellen was the founder of the race of Hellenes. ‘The chief locality of this legend was Thessaly ; it existed also at Dodona, where Deucalion was thought to have introduced the worship of Zeus.

DEUTERONOMY. See Pentatevcn.

DEUTSCH, Emanvet Oscar Menanem (1829-1873), an eminent Oriental scholar, was born on the 28th of October 1829, at Neisse, a town in Prussian Silesia. He was of Jewish extraction; and the family had been settled in his native place for several generations. When six years old, Emanuel began to attend the gymnasium of Neisse, and continued a pupil for two years ; after which, in compliance with the earnest wish of his uncle, David Deutsch of Mislowitz, the charge of the boy’s education was transferred to him. Rabbi Deutsch was a first-rate scholar, deeply learned in the Talmud, with stern ideas of duty, as we may infer from the fact that he made his nephew rise the whole year round at 5 o’clock, study for the first two hours, and then spend an hour in prayer, before allowing him to taste food or light a fire. The rest of the day, with the exception of half an hour for exercise and recreation, was devoted to hard study. This dull routine, which proved at once the foundation of his accurate scholarship and of his ill-health, continued till Emanuel was thirteen years old, when he returned

to Neisse, to solemnize his religious majority (Bar-mitzva). He proceeded once more to the gymnasium, where he enrolled in the highest class, On reaching his sixteenth year he began his studies in Berlin University, paying special attention to theology and the Talmud, Indeed the Talmud was seldom absent from his thoughts; and, after his death, a great accumulation of papers was found, con-

taining parts of it, copied or translated, beginning in a

child's hand-writing, and reaching down to a comparatively late period, Deutsch supported himself by teaching, and, about two years after going to Berlin, wrote some stories and poems on Jewish subjects for magazines. He also mastered the English language and studied English literature. In 1855 Deutsch was offered an appointment as assistant in the library of the British Museum, which he gladly accepted. " For nigh twenty years," he says, "it was my privilege to dwell in the very midst of that pantheon called the British Museum, the treasures whereof, be they Egyptian, Home- ric, palimpsest, or Babylonian cuneiforms, the mutilated glories of the Parthenon, or the Etruscan mysterious grotesqueness, were all at my beck and call, all days, all hours." He worked intensely, always aiming at a book on the Talmud as his master-piece, and contributed no less than 190 papers to Chambers's Encyclopedia, in addition to essays in Kitto's and Smith's Biblical Dictionaries, and articles in periodicals. In October 1867 his article on "The Talmud," published in the Quarterly Review, at once

made him famous. It was translated, within twelve months, into French, German, Russian, Swedish, Dutch, and Danish. He was passionately desirous of travelling in the East ; and, having obtained leave of absence for ten weeks, he left England on the 7th of March 1869. The rapidity and fatigue of the journey permanently injured his health ; but he thoroughly enjoyed his visit to Palestine, where his intense patriotism and finely-strung poetical nature found much food for reflection. Never, to the end of his life, did he nientioii his visit to the Wailing Place of the Jews in Jerusalem without profound emotion. He reached England on the 10th of May, submitted a valuable report of his travels to the trustees of the British Museum, and delivered a number of lectures, chiefly on Phoenicia, His

article on “ Islam” appeared in the Quarterly Review for October 1869; and, at the same time, overwork, the con- sciousness of approaching. ill-health, and the death of attached friends brought on terrible depression. Broken health continued to drag him down ; and, in the autumn of 1872, his old longing for the East returned so powerfully upon him that, after obtaining six months leave, he left for Italy and Egypt, There a cold moist winter told severely on his health. On the 30th of March 1873, he reached Cairo, and was ultimately removed to Alexandria, where, becoming rapidly worse, he died on the 12th of May. He was buried next day in the Jewish cemetery in Alexandria, where a granite stone marks his resting- place. Deutsch was one of the hardest workers of the century, and added to his own special studies of Sanskrit, Chaldaic, Aramaic, and Phoenician, a remarkable acquaint- ance with English literature. His Literary Remams, edited by Lady Strangford, were published in 1874, consisting of nineteen papers on such subjects as “ The Talmud,” “Islam,” “Semitic Culture,” “Egypt, Ancient and Modern,” ‘ Semitic Languages,” ‘The Targums,” “ The Samaritan Pentateuch,” and “ Arabic Poetry.”

DEUTSCHKRONE, AreEnskrone, or Watcz, a town of Prussia, at the head of a district in the government of Marienwerder, situated between the two lakes of Areus and Radau, about 15 miles north-west of Schneidemiihl, a railway junction 60 miles north of Posen. Besides being the seat of the public offices for the district, it possesses a Jewish synagogue, and a progymnasium established in the old Jesuit College ; and it manufactures woollens, tiles, brandy, and beer. Population in 1871, 6146.

DEUTZ (Latin, Z’uitiwm), an old town of Rhenish Prussia, on the right bank of the Rhine, opposite to Cologne, with which it is connected by two bridges. It contains the church of St Heribert, built in the 17th century, a Protestant church, cavalry barracks, artillery magazines, and gas, porcelain, machine, and carriage factories. The fortifications of the town form part of the defences of Cologne. The population in 1875 was 14,513. To the cast of Deutz is the manufacturing suburb of Kalk, with about 8,500 inhabitants. The old castle in Deutz was in 1002 made a Benedictine monastery by Heribert, archbishop of Cologne. Permission to fortify the town was in 1239 granted to the citizens by the archbishop of Cologne, between whom and the counts of Berg it was in 1240 divided. It was burnt in 1376, 1445, and

1583; and in 1678, after the peace of Nimeguen, the fortifications were demolished. They were rebuilt in 1816. See CoLoGNE.

DEUX PONTS, in German Zweibriicken, and in Latin Bipontium, a town of Bavaria, in the Palatinate, 50 miles west of Spires, on the Erbach, which ultimately finds its way tothe Moselle. Besides a court of appeal for the Palatinate, a penitentiary, and various administrative offices, it possesses a public library, a gymnasium, and a synagogue, Its most important buildings are the old ducal palace, greatly damaged by the French in the 18th century,

and in 1868 transformed into a caurt-louse, Alexander's Church, with the ducal -urial-place, and the church which was built by Charles XI. of Sweden. The industry of the inhabitants is mainly devoted to the manufacture of cotton, silk-plush, tobacco, and oil. Population in 1875, 9349. Deux Ponts, which derives its name from the two bridges over the Erbach, was before 1394 the seat of an imperial countship. On the partition of the Palatinate, with which it had been incorporated, it became in 1410 an independent duchy, which in 1654 furnished a king to Sweden in the person of Charles Gustavus. The death of Charles XII. in 1718 broke its connection with the Swedish crown ; and the extinction of the Klenburg line, to which it was next transmitted, passed it on to the present ruling family of Bavaria. In literary history it is interesting as the place where the Bipontine editions of the Greck, Latin, and French classics were published by a Jearned society in the latter part of the 18th century. See J. C. Crollins, Origines Bipontinee, 1761-1769 ; Lehmann, Voli- stiindige Geschichte des Herzogthums Zwetbriicken, Munich, 1867. DEVAPRAYAGA, a town of British India, in the pre- sidency of Bengal and province of Gurhwal, in 30° 9' N. lat, and 78° 39' E. long. Itis one of the five sacred towns of the Hindus,—a pre-eminence which it owes to its position at the confluence of the Alakananda and the Bhagirathi, whose united waters constitute the Ganges proper. It stands at an elevation of 2266 feet above the sea. DEVELOPMENT. See Empryotocy and Evo.urion. DEVENTER, or, by corruption, DEMTER, a town of Holland, in the province of Overyssel, about 25 miles north of Arnheim, ou the right bank of the Yssel, which there receives the waters of the Schipbeek, and is crossed by a bridge of

boats. It is a clean, prosperous place, and at the same time preserves a large number of ancient buildings as well as its fortifications. Of special interest are the Protestant church of St Leivin, which dates from 1334, occupies the site of an older structure of the 11th century, and possesses some fine stained glass ; the Roman Catholic Broerekerk, with three ancient gospels ; 9 4 g Pp 3 the Berghkerk, which belonged to the Premonstratensians ; the town-hall, built in 1693, containing a remarkable painting by Terburg, who was for some time burgomaster of the town ; and the weigh-house, which dates from 1528. There are also cavalry-barracks, an arsenal, a court-house, a hospital, and a lunatic asylum; while among the scientific and educational institutions, an observatory, a gymnasium, and a high school may be mentioned. The last, known as the “ Athenzeum ” down to 1864, dates from 1830, and has a library of 6000 volumes, inclusive of a number of Oriental MSS., several incunabula, and a 13th century copy of Reynard the Fox. The archives of the town are of cousiderable value from the fact that it was the chief town of a province. Besides a good agricultural trade, the inhabitants carry on the weaving of carpets, Woollens, and silks, cotton-printing, and iron-founding ; and their honey-cakes are exported in large quantities to all parts of the Netherlands. Population in 1869, 17,983. _ Deventer is mentioned in 778 in connection with a Saxon ne but its importance only dates from the 11th century. :n 1123 it was relieved by the emperor Henry V. from an cent by the duke of Saxony and the bishop of Munster. ” Queen Eleanor of England it was indebted for the monastery 0 i Reécollets, and in 1356 she breathed her last within its wa . During the War of Independence it was treacherously sur- Tendered to the Spaniards by Edward Stanley, an Englishman, ut was recaptured in 1591 by Prince Maurice of Orange. Its bishopric, which had been established only in 1559, was th bolished – dj nN €s ADL1S €a only 1n 9 Ss en pee 1; and in the following year it was found necessary to y its wooden bridge over the Yssel. In 1813 it was in-

vested by the Allies ; and in 1814 the French withdrew in terms of the Peace,

DEVEREUX, See Essex, EARLS oF. ie VIGNY, Aurrep Vicror, Count (1797-1863), a le ee French poet and novelist, was born at fath *s, m Touraine, March 27, 1797 (or 1799). His ather, a man of noble descent, was a cavalry officer, who

had served with distinction in the Seven Years' War. His mother was the daughter of an admiral. Tales of military achievements and traditions of the ancien régime were familiar to him in his childhood, and furnished the most powerful influences towards the formation of his character and the direction of his early ambition. He received his education at Paris, at the school of M. Hix; but, his royalist sympathies being threatened by the prevailing admiration for the empire, he was removed and placed under a private tutor. After the first restoration of the Bourbons he was admitted, at the age of sixteen, into the musqueteers of the royal household, and in this capacity he accompanied the royal family to Ghent in 1815. In the following year, on the suppression of the musqueteers, he passed into the royal guard. He remained in the army about thirteen years, and attained the rank of captain, but without seeing active service ; and, wearied with the dulness of the life which he had desired, resigned his com- mission in 1827. He had not long before married a rich English lady. The leisure of his soldier-life had not been wasted. Not only was he gaining knowledge by observa- tion of men and experience of life, but he meditated much, and, as he says, had all his works in his head,—" ils marchaient avec moi… et quand on m/arrétait, j'écrivais." His first publication was a volume of poems, which appeared in 1822. Some of these had already been published in periodicals ; and he was therefore starting on his poetical career about the same time that Victor Hugo was writing his earliest Odes and Lamartine his earliest Jféditations, Two years later (1824) he published the poem of Hloa, a graceful embodiment of a delicate fancy. It is the story of a bright creature, " sister of the angels," born of a tear of the Saviour, and whose tender pity for the evil spirit becomes the occasion of her own fall. This was followed by several other poems, Le Déluge, Moise, Dolorida, &c. In these later pieces De Vigny shows himself to have been under the powerful influence of Victor Hugo. Hitherto, however, notwithstanding the evident tokens of his genuine inspiration as a poet, he had not attained general recogni- tion. This he first secured, won it even by storm, by the publication, in 1826, of his historical romance, Cing-Mars, the story of a conspiracy under Louis XIII. This work appeared one year before Manzoni's famous novel, J Promesst Spost; and both works were among the most noteworthy productions of the school of Walter Scott, whose Continental reputation was then at its height.

The book had an immense run, and passed through many edi- tions. In its pages the author shows himself qualified to present in a masterly and truthful way the character of an age, to draw vigorous portraits of great historical figures, and to depict feeling with delicacy and simplicity. It was about this time that De Vigny's friendship with Lamartine began. He was now one of the recognized chiefs of the new school, the Romantic, and one of the editors of the Afuse francaise. In 1829 he produced a translation of Othello, which was acted at the Thédtre Frangais, but was not very warmly received. His next dramatic attempt was La Maréchale d'Ancre, performed at the Odéon in 1831. It is characterized as a learned study of the period, wanting the breath of life and the fire of poetic passion. These qualities were present in superabundance in his next and last dramatic work, Chatterton, produced in 1835, Although faulty in construction, and better fitted for the closet than for the stage, this powerful play has kept its place in the theatrical repertory. De Vigny's remarkable prose work, entitled Stedlo, ow les Diables bleus, appeared in 1832, It consists of three biographical studies, the subjects of which are three unfortunate poets, Gilbert, Chatterton, and André Chénier, whose fate is narrated to Stello, an invalid poet, by a philosophical physician, /e

docteur noir. True in spirit while inaccurate in detail, these stories, exquisitely told, are intended to teach poets the lesson of self-renunication. Stello was followed, in 1835, by another prose work of equal, perhaps superior, literary merit, entitled Servitude et grandeur militaire. This too, like Sted/o, is composed of three stories ; and in these is depicted the soldier's life, his sufferings, his duty, and his true reward. "The poem of human life," says J. 8. Mill, in his review of De Vigny's works (Dissertations, vol. i.), "is opened before us, and M. de Vigny does but chant from it, in a voice of subdued sadness, a few strains telling of obscure wisdom and unrewarded virtue, —of those antique characters which, without self-glorification or hope of being appreciated, carry out, as he expresses it, ' the sentiment of duty to its extremest consequences.'" De Vigny's latest gift to the world was his Poémes philo- sophaques, or Les Destinées, part of which appeared in his life-time in the Revue des Deux Mondes ; the rest, with these, were published after his death by his literary

executor. These poems are mainly utterances of unbelief and despondency, intermixed with exhortations to a stoical resignation and self-reliance. De Vigny was received at the French Academy in January 1846; kut, in consequence of the coldness of the reception and the offensive speech of M. Molé on the occasion, he refused to be presented to the king. He died at Paris, after severe and prolonged sufferings bravely borne, September 17, 1863. (W.L. B.C.)

DEVIL is the name which has been given in the New . Testament and in Christian theology to a supreme evil personality supposed to rule over a kingdom of evil spirits, of whom he is the chief, and to be the restless and unfail- ing adversary of God and man. The Hebrew term denot- ing “adversary,” or Satan, is also applied to this supreme evil spirit, or prince of the kingdom of evil. There can be no question that such an evil spirit is frequently spoken of in the New Testament. He is designated by various names in addition to these mentioned, such as “ the Tempter,” “ Beelzebub,” “the Prince of Devils,” “ the Strong One,” “ the Wicked One,” “the Enemy,” or “ the Hostile One.” Throughout the Gospels these terms are used interchangeably, and in all cases seem to denote the same active power or personality of evil outside man and exercising influence over him, It may be a question how far Jesus Christ himself acknowledges the existence of such an evil power, but there can be no question that such a being was recognized in the current belief of the Jews in His time.

But it is also certain that this belief amongst the Jews was one of gradual growth, and is not to be traced in the Old Testament in any such definite form as we meet with it in the New. The expression “ Satan,” is indeed found in the Old Testament, but only five times, if so frequently, as a proper name,—thrice in the book of Job (i. 6, 12; ii, 1), once in the opening of the 21st chap. of 1 Chronicles (although here the allusion to a distinct personality may be held doubtful), and in Zechariah (iii, 1). In all other places where the word occurs, “Satan” is used in its common. sense of “ adversary,” a sense in which it also occurs in the Gospels, in the well-known passage (Matt. xvi, 23) where our Lord addresses St Peter, “Get thee behind me, Satan,” or “adversary.” The books of Chronicles and Zechariah are indisputably amongst the latest writings of the Old Testament; and, although the date of Job is uusettled, it may also be presumed to belong to a

late period in the history of revelation. In the earlier prophetic literature of the Hebrews there is no recognition of any spirit of evil at war with Jehovah. All power and dominion are, on the contrary, clearly ascribed to Jehovah himself, who is supreme in heaven, on earth, and under

the earth. The connection of Satan with the serpent in the garden of Eden in Genesis (iii. 1-7) is an inference of later dogmatic opinion, arising probably out of the use of the expression ‘‘ Old Serpent” applied to Satan in Rey, (xx. 2), but receives no countenance from the scriptural narrative itself, which speaks of the serpent purely as an animal, and pronounces a curse against him with reference to his animal nature solely. The idea of a distinet personality of evil, therefore, is not to be found in the earlier Hebrew Scriptures, and is, in fact, inconsistent with the cardinal principle of the older Hebrew theology that Jehovah was the sole source of all power, the author both of good and evil, who hardened Pharaoh’s heart (Exod. x, 27), and sent alying spirit among the prophets of Ahab (1 Kings xxii. 20-3). Even in the later Scriptures in which “Satan ” is spoken of as a distinct person, there is little or no analogy betwixt what is said of such a person in these Scriptures and what is said of him in the New Testament, The ‘‘Satan” of the book of Job is described as coming among the “sons of God” to present himself before the Lord. Heis the image of malice, restlessness, and envy— the willing messenger of evil to Job; but he is not repre sented as the impersonation of evil, or as a spiritual assail- ant of the patriarch. He is really a delegated agent in the hands of Jehovah to execute His will, and the evils with which he assails Job are outward evils. The picture is quite different from that of the “ Archangel ruined,” or the devil, or Satan, of later theology.

The question then arises as to the special source of the conception of the devil as a fallen and evil spirit. The explanation commonly given of this conception by our modern critical schools is that it sprang out of the inter- course of the Jews with the Persians during their period of exile. In the Persian, or Iranian, mythology it is well known that a personal power of evil was conspicuously re- cognized. The Iranian religion divided the world betwixt two opposing self-existent deities, the one good and the other evil,

but both alike having a share in creation and in man. Ormuzd, or Ahuramazda, was holy and true, and to be honoured and worshipped. But Ahriman, or Anra- mainyu, the evil-minded, the spirit of darkness, was no less powerful, and claimed an equal share of man's homage. These were the good and the evil in thought, word, and deed. Man has to choose betwixt the two. He cannot serve both. With this dualistic system the Jews came in contact during their captivity at Babylon, and are supposed to have retained permanent traces of it in their subsequent theology. The conception of the devil, and of a lower kingdom of demons, or devils, is the evident illustration of this. The case is put in this way by a Christian writer of moderation and knowledge :—'" That the Hebrew prophets had reiterated their belief in one God with the most pro found conviction is not to be questioned ; but as little can it be doubted that, as a people, the Jews had exhibited little-impulse towards monotheism, and that from this time (the period of their captivity) we discern a readiness to adopt the Zoroastrian demonology " (Cox's Aryan Mytho- logy, 1, 356). The conception of Satan in the later canonical books of Chronicles and Zechariah is even attributed to this source. 'Thus far Satan had appeared, as in the book of Job, among the ministers of God ; but in later books we have a closer approximation to the Tramian creed, In Zechariah and the first book of Chronicles, Satan assumes the character of Ahriman, and appears a8 the author of evil. Still later he becomes the prince of devils, the source of wicked thoughts, the eneniy of the Word and Son of God" (Ibid., p. 351). }

The process by which the Jewish mind worked out this conception and the whole scheme of demonology found im the New Testament was of course gradual. The Book of

DEVIL

Wisdom, a product of Alexandrian-Jewish thought in the 2d century before Christ, which speaks of the devil having " through envy introduced evil into the world" (ii. 24), is supposed to represent a stage in this development ; and the apocryphal books of Enoch and Esdras (IV.), the

former of which is pre-Christian, indicate further stages, "

Another stage is supposed to be marked by the recognition of a “devil,” or evil spirit, under the name of Asmodeus, in the book of Tobit (150 pc.) There is certainly a remarkable analegy betwixt parts of the eschatological teaching of the book of Enoch and other apocryphal books and that of the gospels. But the development of Jewish theology as a whole, in the ages immediately antecedent to Christianity, is still involved in considerable obscurity ; and it is difficult to say how much of the eschatology and demonology of the New Testament is to be regarded as original, and how much as derived or inherited from prior modes of thought.

It must also be conceded that, even should we accept the modern critical theory of the rise of the New Testament conception of the devil and of demons, there is much in it that must be pronounced very different from the Zoroastrian or Iranian conception. The devil of the gospels is in some respects very unlike the Ahriman of Zoroastrianism. He is in no sense a twin-creator of man. He has no original share in him, and no right to his homage. In the Persian system the warfare of good or evilis a warfare of balanced forces. But the evil personality of the New Testament, powerful as he is, and always the enemy of the divine, is yet a subordinated and inferior being. He is the tempter of the Son of God and the enemy of man. He has power on earth, and even a certain power over the Son of man ; and yet the Son can restrain and bid him get behind Him. The subordinated forces of evil—the demons—are all subject to Christ. They hear His word and obey it. In short, the devil of the New Testa- ment is, in comparison with the source of evil recognized by Zoroastrianism, a limited power. He is a subordinate although insurrectionary spirit, working by spiritual means upon the heart of man, and in no sense a native power having an original or creative hold of him. This sets the evangelical conception on a higher level than the Persian, and proves that the Jewish mind, supposing that it did borrow certain impulses from the Iranian dualism with which it came in contact in the period of exile, yet wrought out the conception in the depth of its own religious and moral consciousness within the sphere of revealed truth which was its great educational medium.

The idea of an evil personality was therefore so far a native growth of the Jewish mind, working upon hints contained, although not developed, in the earlier Hebrew Scriptures. It is evident from various passages, both of the

Pentateuch (Lev. xvii. 17 ; Deut. xxxii. 17) and of the prophetic Scriptures and the Psalms (Isa. xiii. 21, xxxiv. ess Jer. xv. 36; Ps. evi. 37), that the Hebrews were cognizant of evil beings supposed to dwell in darkness and waste places. The names applied to those beings in the passages referred to are various, sometimes seirim—lit. goats (Lev. xvii. 7 ; Isa, xiii, 21), and sometimes shedim (Deut. Xxxi 17), probably a name for demigods, both phrases being translated “ devils ” in our authorized version of the

entateuch. This translation suggests later associations ; but such xpressions plainly denote a belief in evil beings, the survival, probably, in the Hebrew consciousness of fragments of an older native faith which deified the powers of evilas well as of good. Some have traced a similar

Survival in the name Azazel, translated in our version |

Stape-goat (Levit. xvi. 8, 10, 26), and which has been wie to represent an evil.being haunting the desert, 0 which was devoted the goat sent away on the great day of

atonement. This opinion is disputed by others on grounds both philological and theological. But it may be almost certainly assumed that, with all the jealous monotheism of the Jews, there was an undergrowth of darker conceptions, pointing to evil existences opposed to the divine, and that to some extent the later idea of the devil sprang out of this natural growth in the Hebrew mind of an evil side to nature and tolife. This process of growth may have been greatly aided by contact with the Persian dualism, and especially the idea of a kingdom and hierarchy of evil powers seems to have been indebted to this source. But it was also largely original, and at the end, as at the beginning, the Jewish and Christian conceptions of the devil and his angels were very distinct from those of the Persian faith, They belong to a higher level of thought, and are the product of a more advanced stage of moral and spiritual feeling. .

The idea of the devil so clearly expressed in the New Testament passed ag a dominant factor into the early Christian theology, acquiring for many centuries an always deeper hold on the popular religious imagination. In the

writings of the fathers of the 2d and 3d centuries the devil plays an important part. The whole of the Roman imperial system, and all that opposed the progress of the gospel, was identified with his kingdom. Satan was the ‘ prince of this world,” he was the rival and caricature of the diviue. “ Satan,” said Tertullian, “ is God’s ape ;’ and the saying passed intoa proverb. He fell by pride and arrogance and envy of the divine creation (Iren., Adv. Her., iv. 40). He was, according to Cyprian (De Unitate Eccl.), the author of all heresies and delusions ; he held man by reason of his sin in rightful possession, and man could only be rescued from his power by the ransom of Christ’s blood. This ex- traordinary idea of a payment or satisfaction to the devil being made by Christ as the price of man’s salvation is found both in Irenzeus (Adv. Her., v. 1. 1.) and in Origen, and may be said to have held its sway in the church for nearly a thousand years. And yet Origen is credited with the opinion that, bad as the devil was, he was not altogether beyond hope of pardon. In this as in other respects the early Alexandrian school showed a milder and broader type of thought than the prevailing theology of the church. Occasionally in later times the milder opinion was expressed, as by Gregory of Nyssa in the 4th century ; but gradually it vanished, and the devil was drawn by the theological pencil in darker and more terrible colours. Augustine greatly helped to strengthen and confirm the darker view, and to give in this as in other things a gloomier tinge to religious thought. During the Middle Ages the belief in the devil was absorbing—saints conceived themselves and others to be in constant conflict with him. It is hardly possible for us now, as M. Reville says in his short treatise on the subject, “to imagine to what a degree this belief controlled men’s whole lives. It was the one fixed idea with every one, particularly from the 13th to the 15th century—the period at which we may consider this superstition to have reached its climax.” The superstition showed certainly but slight signs of yielding in the 15th, or even in the 16th or 17th centuries. Luther lived ina constant consciousness of contact and opposition with the evil one. At his study, in bed, or in his cell, the devil was incessantly interfering with his work or rest. As he was going to begin his studies he heard a noise which he immediately interpreted as proceeding from his enemy. “As I found he was about to begin again, I gathered together my books and got into bed. Another time in the night I heard him above my cell walking in the cloister ; but as I knew it was the devil I paid

no attention to him and went tosleep.” Again he says: ‘ Early this morning, when I awoke, the fiend came and began disputing with

me. ‘Thouart a great sinner,’ said he. I replied, ‘ Canst thou not tell me something new, Satan?’ ”

This realism of belief in an evil power near to man, and constantly assailing him, continued more or less all through the 17th century, and was especially strong, as Mr Buckle has shown in his well-known volumes, in Scotland. He has somewhat overcharged his picture; but he presents at the same time indisputable facts which leave no doubt that the clergy and people alike imagined that ‘the devil was always and literally at hand—that he was haunting them, speaking to them, and tempting them. Go where they would he was there.” With the rise of a rationalistic temper throughout Europe, in the 18th century, this belief in the pervading influence of diabolic agency began to disappear. ‘The sense of the supernatural decayed in all directions, and especially the old belief in the arbitrary control exercised by an evil power over human destiny. And while the religious impulse has gained greatly since then, and shown renewed vigour both in an evangelical and catholic direction, it cannot be said that the earlier faith in the operations of a personal devil has acquired reascendency. It may be still the prevailing opinion of Christendom that there is an evil power working in the world opposed to the divine ; but whether this power is personal, or how far it touches the human will, or again, whether there is a subterranean kingdom of demons with a prince of demons or devil at their head, and how far such a kingdom has any relation to human destiny, are all qnestions that must be held to be very unsettled, or maintained with very doubtful confidence in any section of the Christian church. It is our business simply to note such a change in the attitude of Christian belief, and not to express any opinion as to its advantage or otherwise. It is too much to speak with M. Reville of Satan as a “fallen majesty ;’ but the idea of the devil certainly no longer bulks in Christian thought as it once did, nor is his reign the recognized influence that it once was over human life and experience. Gat)

DEVIL FISH, or Sea Devin (Lophius piscatorius), an Acanthopterygian fish belonging to the family Pediculati, so named from its hideous aspect, produced mainly by the enormous size of its head in proportion to the rest of its body. The latter tapers off rapidly towards the tail, and gives the creature the appearance of a gigantic tadpole—a resemblance to which it owes the name of frog-fish, applied to it from the earliest times. The cleft of the mouth is also exceedingly wide, measuring 14 inches in a specimen 44 feet-long; and when the mouth is open the lower jaw protrudes beyond the upper, while both jaws are armed with several rows of formidable teeth. The pectoral fins are broad, and are rendered conspicuous by the prolongation of the carpal bones to which they are attached ; the ventral fins are palmate, and are placed far forward on the body. The sea devil is a sluggish fish, and, being at the same time exceedingly voracious, is said to have recourse to stratagem in order to satisfy its inordinate appetite. Three anterior dorsal spines, isolated from the others, and attached to the head in front of the eyes, are so modified as to form long filiform appendages, two of these being articulated to the skull by means of a bony ring, and thus capable of being moved in all directions by appropriate muscles, while the end of the front tentacle is broad and flattened, and of a shining, silvery aspect. Concealing itself in the mud of the sea-bottom, it waves these tentacles aloft, and the silvery extremity of the front filament acts as a bait in tempting the smaller fishes to approach near enough to be seized by the capacious jaws beneath. On this account the creature has received the name of angler, or fishing-frog. The lobes, which form a fringe around the anterior part of the body, probably perform, although in a Ininor degree, the same function as the angling apparatus

on the head. Although its prey is usually taken at the bottom, it has been known to ascend and float upon the surface of the water in search of food, and thus sometimes to capture sea fowl. Not unfrequently, also, it lays hold on cod or other fish as these are being drawn up hooked to the fisherman’s line, and when caught with other fishes jn the net it busies itself in devouring as many as possible of its fellow-prisoners. As a food fish the sea devil is value- less, but as the process of its digestion proceeds but slowly, the fishermen often capture it for the fish contained in its stomach. Couch

tells of one which, when opened, contained nearly three-fourths of a hundred of herrings, all of them fit for the market. It attains a length of 5 feet, ordinary specimens measuring about 34 feet. It is an inhabitant of the seas of the temperate regions of Europe, North America, Asia, and Africa.

DEVISE. See W111.

DEVIZES, a municipal and parliamentary borough and market town of England, in North Wilts, situated on the Kennet and Avon canal, 86 miles west of London by rail, It stands on a plateau in the centre of the county, near the northern limit of Salisbury Plain. The town, which is of considerable antiquity, consists of a market-place with streets diverging therefrom. Some of the houses retain their antique timber construction. In the middle of the market-place there stands a large cross erected by Lord Sidmouth in 1815. The principal public buildings are the town hall, the corn exchange (a spacious and handsome building), the county jail, the Bear Club charity school, and the churches. St John's Church dates from the reign of Henry I., but has received numerous additions and repairs, and was restored in 1863; it belongs to the Norman Perpendicular style of architecture. The building is com- plete, with nave, transept, chancel, and chantry chapels. St Mary's is also of ancient origin, but was mostly rebuilt in the 15th century. Besides these there are chapels be- longing to the various nonconformist bodies. Devizes at one time was famous for its woollen manufactures, but these have long been discontinued, and the only articles now mant- factured are silk and snuff. Ale is also brewed. Thereis, however, a large trade in grain carried on; and the Devizes corn-market is one of the most important in the west of England. The town is said to have taken its rise after the erection of the formidable castle which once stood there,

but has now entirely disappeared. This fortress was built

about the year 1132 by Bishop Roger of Salisbury, in the reign of Henry I. In 1138 it was seized by Stephen in his campaign against the bishops, and three years thereafter was taken and held by Robert Fitz Herbert on behalf of Queen Maud. He did not, however, retain possession of it for any length of time. It was eventually dismantled in 1376. During the wars of the common- wealth Devizes was unsuccessfully besieged by Waller m 1643,

but was taken by Fairfax and Cromwell two years later. It received its borough charter from Maud under the name of De Vies; and it is governed by a mayor, 6 aldermen, and 18 councillors. From the time of Edward ITI. it was represented in Parliament by two members, but the Reform Act of 1868 reduced its representation to one member, The borough, which has an area of 907 acres, is divided into two wards—north and south. Population in 1851, 6554 ; and in 1871, 6839.

DEVONPORT, a municipal and parliamentary borough of England, in the county of Devon, contiguous to the towns of East Stonehouse and Plymouth, the seat of one of the royal dockyards, and an important naval an nlilitary station, It is situated immediately above Ply- mouth Sound, occupying a triangular peninsula formed by Stonehouse Pool on the east and the Hamoaze on the west. The town proper is inclosed by a line of ramparts 12 feet

high, protected by a ditch of about 15 feet in depth, excavated out of the solid limestone. Three gates—the Stonehouse gate, the Stoke barrier, and the North barrier— afford communication respectively with East Stonehouse, Stoke, and Morice Town, the last two being suburbs of Devonport. ‘The streets are laid out with regularity, and are paved with a peculiarly white limestone that gives an air of great cleanliness to the town. A copious supply of water is provided by means of a conduit from Dartmoor. The public buildings are both handsome andnumerous. The town hall, erected in 1821-22 partly after the design of the Parthenon, is distinguished by an elegant Doric portico ; while near it are the public library, in the Egyptian style of architecture, and a conspicuous colunin or Doric pillar built of Devonshire granite. This monument, which is 100 feet high, was raised in commemoration of the naming of the town in 1824. ‘There are numerous churches belonging to the different religious denominations. Besides the parish church, which is small, several chapels of ease have within the present century been erected in various parts of the town. One of them, a handsome edifice built in 1814-15 at a cost of £24,000, is situated in the dockyards, and was erected for the special use of those employed there. Of the Government buildings the principal are a

spacious hospital outside the barriers, the Raglan barracks, and the residences of the military and naval chief officers. On Mount Wise, which is defended by a battery, stands the military residence, or Government house, which is occupied by the commander of the western district; and near at hand is the other residence, the port admiral's house. Mount Wise itself and the parade form interesting features of the place, and tend greatly to the amenity of the town— the prospect from the former being one of the finest in the south of England. The most noteworthy object, however, in connection with Devonport is the royal dockyard, which extends along the shore of the Hamoaze from Mutton Cove to Keyham Lake, a distance of about 1 miles. The naval dockyard, which formed the nucleus of the town, is situated within the ramparts, and covers an area of 75 acres, with a wharfage of 1160 yards ; while beyond the ramparts, and higher up the Hamoaze, is the more recently constructed Keyham steam yard, connected with the former by means of a tunnel 900 yards long. Keyham Steam yard occupies an area of 100 acres; and its docks are built of granite. In connection with the dockyards are the gun wharf, and extensive store-houses and factories. The number of hands employed in the works is very large, varying from 3000 to 4000, according to circumstances ; and it may be said that, with the exception of a brewery in the suburb of Morice Town, the only manufactory of the place is that belonging to the Government. The history of Devonport is of comparatively recent date. After the outbreak of war with France in 1689 William III. established an arsenal there in connection with the neigh- bouring naval station of Plymouth, and it received the name of Plymouth Dock. Its proportions were, however, somewhat limited until in 1761 and in 1771 extensive additions were made, and since then it has steadily in- creased tn importance. In 1824 it received its present distinctive name, and by the Reform Act of 1832 it was erected into an independent borough returning 2 menibers to Parliament. The municipal borough, which is co-exten- Sive with the parish of Stoke-Damerel, is subdivided into 6 wards, and covers an area of 1760 acres; while the area of the parliamentary borough, which includes East Stone-house, extends to 1950 acres. The town is governed by a mayor, 12 aldermen, and 35 councillors, and has a separ- ate commission of the peace. The ground on which Devon- Port stands is for the most part the property of the St Aubyn family, whose steward holds a court leet and a court

baron annually. The population of the municipal borough was, in 1851, 38,180; in 1861, 50,440; and in 1871, 49,449—the males being slightly more numerous than the females. The population of the parliamentary borough in 1871 was 64,034. See PLymMoutH and Dockyarps,.

DEVONSHIRE, one of the south-western counties of Plate II. England, the third in extent in the country, being exceeded only by York and Lincoln. According to the latest survey, it contains 1,594,852 acres—equal to about 2492 square miles. On the N. and N.W. the county is bounded by the Bristol Channel, on the 8. by the English Channel; on the W. it adjoins Cornwall, on the E. Dorset and Somer- set. In form, Devonshire is very irregular ; but it sends out one long promontory towards the S., and on the N. the coast line trends sharply southward near Ilfracombe, and is broken into the deep hollow of Bideford Bay.

General aspect.—Nearly the whole area of Devonshire is uneven and hilly. It contains the highest land in England, south of the Yorkshire Ingleborough ; and the scenery, much varied, is in most parts of the county very striking and pictur- esque. The great feature of Devonshire is the granitic district of Dartmoor, so named from the principal river which rises onit, the Dart, and occupying an area of about 130,000acres. This great plateau, the mean height of which is about 1500 feet, rises in the southern division of the county, and is more or less conspicuous from all the lower tracts. It is the highest and easternmost in a broken chain of granite elevations, which extends to the Scilly Islands. Steep heights, crested with masses of broken granite, locally named tors, break up from the main table land in all directions, and are often singularly fantastic in outline. The highest of these is Yestor, 2050 feet, in the northern quarter ; whilst one of the most conspicuous is Heytor, 1501 feet, in the south. Dartmoor is a region of heather, and the central portion has been a royal forest from a period before the Conquest. Its grand wastes contrast finely with the wild but wooded region which imme- diately surrounds the granite (and along which occurs the most picturesque scenery in Devonshire), and with the rich cultivated country lying beyond. It is this rich country which has given Devonshire the name of the Garden of England. The most noticeable districts are the so-called Vale of Exeter, covering an area of about 200 square miles, and including the meadows which surround Crediton, the richest in €he county;

and the South Hams, the extent of which is not very clearly defined, but which covers the deep projection between the mouths of the Dart and the Erme. Another very picturesque division extends eastward of Exeter as far as the Dorsetshire border. The north and south coasts of the county differ much in cha- racter and climate, the north being by far the more bracing. Both have grand cliff and rock scenery, not exceeded by any in England or Wales; and, as a rule, the country immediately inland is of great beauty. The general verdure of Devonshire, and its broken hilly character, are the features which everywhere most strongly assert them- selves. The least picturesque part of the country is that toward the centre, which is occupied by some portions of the Carboniferous formation.

The principal rivers rise on Dartmoor, and are—the Teign, the Dart, the Plym, and the Tavy, falling into the English Channel, and the Taw and the Torridge, flowing north to- wards Bideford bay. The lesser Dartmoor streams are the Avon, the Erme, and the Yealm, all running south. The Exe rises on Exmoor in Somersetshire; but the main part of its course is through Devonshire (where it gives name to Exeter), and it is joined on its way to the English channel by the lesser streams of the Culm, the Creedy, and the Clyst. The Otter, rising on the Blackdown hills, also runs §., and the Axe, for part of its course, divides the

counties of Devon and Dorset. These eastern streams are comparatively slow and still-flowing. The Dartmoor rivers, rapid, dashing, and rocky, are famous trout streams. None have courses of any great length. —

The geological formations of Devonshire are of course the main cause of the general appearance of the county. Dartmoor, as has been said, is a granite region, By far the greater part of central Devon is occupied by Carboni- ferous rocks, consisting chiefly of sandstones, often siliceous, and of slates. All this formation has been subjected to great: disturbances, and the strata (as may be seen on every part of the coast between Boscastle and the mouth of the Taw), are twisted in a manner which defies description, the result being some very extraordinary and picturesque cliff scenery. True coal does not exist, but anthracite occurs near Bideford. These rocks are also associated with trappean and other ashes, which bear a striking analogy

to those of existing volcanoes. Underlying the carbonaceous deposits are the grauwacke or Devonian rocks, forming the extreme north of the county, and great part of the South Hams, They extend west of Plymouth, and cover the greater part of Cornwall. These rocks are generally held to be the equivalents of the “Old Red” system, although the characteristic Old Red rocks, so largely developed in Scotland, Herefordshire, and elsewhere, are not found at all in Devonshire. The Devonian rocks consist of clay- slates, grey limestones, brown sandstones, and flags, The fossils of the two series also differ; but although these Devonians offer many complexities, this and other difter- ences seem capable of explanation. The third great formation of Devonshire is the New Red, which occupies much of the eastern portion of the county, extends along the coast from Sidmouth to Torbay, and sends out a long spur westward into the Carboniferous district. The upper beds of the series consist principally of marls, the middle of sandstones, and the lower of breccias or coarse conglo- merates, coloured red by peroxide of iron. The formation is characterized by a scarcity of organic remains, and by the extreme fertility of some of its soils.

At or near the junction of the Carboniferous and New Red formations, from Washfield, near Tiverton, on the N, to Haldon on the §., occur numerous masses of igneous rock, feldspathic traps. These traps are for the most part excellent building stones, and many of the quarries have been worked for ages. Greenstones and elvans are also associated with the Devonian series. Greensand strata cap the Blackdown hills, and the heights near Axminster, Seaton, and Sidmouth, and with beds of chalk, occupy a depression in the coast at Beer (near the eastern border of Devonshire), coming down to the level of the sea at Beer Head. A very interesting and remarkable Tertiary deposit, belonging to the Lower Miocene period, occurs at Bovey Tracy, below the eastern escarpment of Dartmoor. It consists of beds of lignite, clay, and sand, with an aggregate thickness of more than 100 feet. In the lignites at least 50 species of plants have been found, all indicating a sub-tropical climate ; but the greater part of the lignite beds is formed by fragments of an enormous coniferous tree, belonging to the genus Sequoza, the only living species of which are to be found in California. Great lumps of inspissated resin occur occasionally. ‘The clay which over- lies the lignites is of much more modern date, and contains leaves of the dwarf birch, now an arctic plant, and of 3 species of willow, which all ketoken a

much colder climate than that of Devonshire at present. Fine potters' clay occurs above this "head" of coarse clay and sand, and has been turned to account. The lignite called " Bovey ao " burns with a disagreeable smell, and is not much used.

The ossiferous caverns of Devonshire are famous in

geological history. The most important is Kent's Hole, near Torquay, which has been carefully explored, and appears to have been frequented by bears, hyznas, and, af last, by primitive man. 'There are others at Brixham, at Chudleigh, and at Oreston near Plymouth.! Minerals.—The minerals of most account are tin and copper. Iron occurs, but to no great extent. The stlyep- lead mines at Combe Martin on the N. coast, and at Beer Alston, on the Devonshire side of the Tamar, were for. merly worked to advantage ; but the former have long been abandoned, and the latter, since 1860, have keen swamped by water from the river, under the bed of which the principal mine extended. Zin has been found on Dart moor (in stream works) from an unknown period. Copper was not much worked before the end of the last century, Tin occurs in the granite of Dartmoor, and along its borders, but rather where the Devonian than where the Carboni- ferous rocks border the granite. It is found most plenti- fully in the district which surrounds Tavistock, which, for tin and other ores, is in effect the great mining district of the county. Here, about 4 miles from Tavistock, are. the Devon Great Consols mines, which from 1843 to 1871 were among the richest copper mines in the world, and by far the largest and most profitable in the kingdom. The divided profits during this period amounted to £1,192,960. But the mining interests of Devonshire are affected by the same causes, and in the same way, as those of Cornwall. The quantity of ore has greatly diminished, and the cost of raising it from the deep mines prevents competition with foreign markets. In many mines tin underlies the general depth of the copper, and is worked when the latter has been exhausted. The metalliferous character of the Tavistock district is indeed very mixed, and besides tin and copper, ores of zinc and dron are largely distributed, but these have as yet received no great attention. At the Devon Great Consols more than 2000 tons of refined arsenic are annually produced by

elimination from the iron pyrites contained in the various lodes. This amount is calculated to be aoout one-third of the arsenic produced throughout Europe. Manganese occurs in the neighbour- hood of Exeter, in the valley of the Teign, and in N. Devon ; but the most profitable mines, which are shallow, are, like those of tin and copper, in the Tavistock district. The other mineral productions of the county consist of marbles, building-stones, slates, and potters' clay. Marbles occur in the Carboniferous series at Chudleigh and else where, but of very inferior character and beauty to those among the Devonian rocks, at Ipplepen, Babbacombe near Torquay, and Plymouth. These are largely worked, and are used extensively in the decoration of churches and other buildings, Among building stones, the granite of Dartmoor holds the foremost place. It is much quarried near Peince Town, near Moreton Hampstead on the N. of Dartmoor, and elsewhere. The annual export is consider able. There are very large and ancient quarries of @ chalky greensand at Beer, near the eastern border of the county. This is an excellent building-stone, nearly white, and composed of carbonate of lime, mixed with argillaceous and siliceous matter, and with particles of green silicate of iron. Hard traps, which occur in many places, are also much used, as are the limestones of Buckfastleigh and of Plymouth. The Roborough stone, used from an early period in Devonshire churches, is found near Tavistock, and is a hard, porphyritic elvan, taking a fine polish. Ex- cellent roofing slates occur in the Devonian series round the S. part of Dartmoor. The chief quarries are near Ashbur-

? For a full account of the literature connected with the caverns, and of the discoveries made in them, see Transactions of the Devon- shire Association, and the annual reports, by Mr W. Pengelly, © the committee appointed by the British Association in 1864.

ton and Plymouth (Cann quarry), but none of them are so extensive or important as those at Delabole in Cornwall. Potters' clay is worked at King's Teignton, whence it is largely exported, at Bovey Tracy, and at Watcombe near Torquay. The Watcombe clay is of the finest quality, and is capable of retaining the most delicate form. China clay or kaolin, is found on the S. side of Dartmoor, at Lee Moor, and near Trowlesworthy. There is

a very large deposit of wmber, as yet little known, close to Ashburton. Climate.—The climate varies greatly in different parts of the county but everywhere it is more humid than that of the eastern or south-eastern parts of England. Both Devon and Cornwall have a mean annual temperature about 1°°5 above that of the midland counties ; but in the summer they are cooler than the whole range of country from the south coast tv the 53° of lat. The air of the Dart- moor highlands is sharp and bracing. Mists are frequent, and snow often lies long. On the south coast frost is little known, and many half hardy plants, such as hydrangeas, myrtles, geraniums, and heliotropes, live through the winter without protection. The climate of Sidmouth, Teignmouth, Torquay, and other watering places on this coast, is very equable, and the mean temperature of the winter months is about 47°. The N. coast, exposed to the storms and swell of the Atlantic, is far more bracing ; although there also, in the more sheltered nooks (as at Combe Martin), myrtles of great size and age flower freely, and produce their annual crop of berries. Agricultwre—While the eastern division of England, ranging from Yorkshire to Hampshire and Sussex, is essentially a corn-growing country, the south-western is as specially the grazing or pasture-land division. The total amount of land in Devonshire under corn crops in 1876 was 283,332 acres, of which 112,652 were under wheat, 152,370 under green crops, 189,761 under clover, sanfoin, and grasses under rotation; and the permanent unbroken pasture (exclusive of the moors) extended to 442,406 acres. Of horses used solely for agricultural purposes, the number returned in 1876 was 51,753 ; of cattle, 217,111; of sheep, 943,542, of pigs, 90,773. These numbers, as compared with those of former years, show a steady progress, and an annual increase in the extent of permanent pasture. In the small farms on Dart- moor and along its borders grain crops are very uncertain, and on Dartmoor itself even oats do not ripen in unfavour- able seasons. The root and other crops obtained on the land attached to the convict prison are due to the amount of manual labour expended on them, which in ordinary cases would be altogether without profit. Devonshire is one of the cider-producing counties of England, soil and climate being favourable to the growth and bearing of the apple. The acreage of Devonshire orchards in 1876 was 24,097, The two other principal cider counties had tespectively—Hereford, 24,616 acres planted with fruit trees (apples and pears), and Somerset, 21,029. Z = Tespects the ownership of the land, according to 3 whers of Land Return for 1873, the

county was lvided among 31,809 proprietors, whose aggregate esti- sae rental amounted to £2,881,665. Of that number] 047 or 68 per cent. owned less than 1 acre—the pro- Portion of small proprietors in all England being 71 per cent.; and the rental per acre averaged £1, 18s. Od, as cy Os. 2d. in all England. Nearly one fifth of an. ee owned by 15 proprietors :—To the Duchy of a – elonged 48,457 acres ; Hon. Mark Rolle, Steven- a i ae 45,088 ; Duke of Bedford, 22,607 ; Earl Gee ah nia Castle, 20,558 ; Earl Fortescue, PW. kei us aie Lord Poltimore, Court Hall, 17,047 ; ford i gut, Exmoor, 16,903 ; Earl of Portsmouth, Egges- ouse, 16,414 ; Sir George Stucley, Bart., Hartland

Abbey, 15,144 ; Sir T. D. Acland, Bart., Killerton, 15,018. Lord Clinton,- Heanton Satchville, 14,431; Sir Massey Lopes, Bart., Maristow, 11,977 ; M. Preston, Chulmleigh, 11,280; Sir W. P. Carew, Bart., Newton Abbot, 10,889 ; and Sir Lawrence Palk, Bart., Haldon House, 10,109.

Industries.—Devonshire has few manufactures, and no very important industrial works. There is a considerable pottery at Bovey Tracy, manufacturing white, printed, and painted ware; and another at Watcombe, where the pro- ductions are finer and more artistic. Blankets and serges are made at Buckfastleigh and at Ashburton, and the factories employ many hands. At Tiverton there is an extensive lace-making factory. The manufacture of Honiton lace, made by hand on the pillow, is now confined to Beer and some other villages on the 8.E. coast. Shoes and boots, chiefly for export, are made at Crediton. The greatest industrial works in the county however, are the vast Government establishments at Plymouth and Devonport—the victualling yard, and the dockyard. The convict prisons in Dartmoor may also be regarded as an industrial establishment. They were built for French prisoners in 1809, and in 1850 were adapted for receiv- ing convicts. Since that year more than 100 acres round the prisons have been brought into cultivation under convict labour; and 1000 acres more were added to the prison lands in 1871. In addition to the old buildings, a large prison, arranged on the latest principles, was erected in 1872.

The fisheries of Devonshire are in no way so important as those of Cornwall. Avout 200 trawlers belong to the port of Brixham, the head

quarters of the fisheries of Tor Bay. Herrings and mackerel visit the coasts in their seasons, but not in the vast shoals known farther west. It may be said that trawling is the main feature of the Devonshire fishery whilst seining and driving characterize that of Cornwall.

fistory,—The British tribes inhabiting this western portion of the island are called Dumnoniw by Ptolemy ; and Dumnonia, or Dammonia, the Latinized name of a kingdom which long remained independent after the arrival and early conquests of the West Saxons, seems to be identical with the Cymric Dyfnaint, which survives in the present Devon. The Saxon settlers, as they advanced into the country, called themselves Defenas, z.¢., men of Devon or Dyfnaint, thus adopting the British name, and indicating the broad difference between their settle- ments in such a district as Devon, where British influence so long survived, and where they came as Christians, and those in southern or eastern England, where the Britons were either expelled or exterminated. In Devonshire the Christian Britons became subjects of the Christian Saxons. "' The Celtic element can be traced from the Somersetshire Axe, the last heathen frontier, to the extremities of Corn-wall, of course increasing in amount as we reach the lands which were more recently conquered, and therefore less perfectly Teutonized. Devonshire is less Celtic than Corn- wall, and Somersetshire is less Celtic than Devonshire ; but not one of the three counties can be called a pure Teutonic land, like Kent or Norfolk" (E. A. Freeman). Celtic names are accordingly found in various parts of Devonshire, and especially on Dartmoor, side by side with those which are truly Saxon.

For some time after the landing of William I. and the battle of Hastings, the western counties remained undis- turbed, In the spring of 1068 Exeter was besieged and taken by the Conqueror, who built a castle there, which was besieged in 1137 by Stephen for three months. In 1469 Exeter, which was Lancastrian, was besieged for twelve days by the Yorkists, but held out successfully; and in 1497

the city was again besieged by Perkin Warbeck. A more

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important siege occurred in 1549, when, the western counties rose in defence of what was called the “ old religion.” This lasted for 35 days. Both Exeter and Plymouth were besieged for many months during the civil war of the Commonwealth. This wasa period of consider- able disturbance in the west. The golden aye of Devon- shire is, however, that of Elizabeth. Drake, Hawkins, Raleigh, and the Gilberts, besides a host of others, were all of Devonshire ; and the history of the county at that time is bound up with the story of its harbours and seaside towns, and is in close connection with the general history of England. It was from Plymouth that the English ships sailed for the attack and dispersion of the Armada, the near approach of which was there first made certain. The landing of William of Orange at Brixham, November 5, 1688, is perhaps the event most fraught with important results which has taken place in the western counties. Antiquitres. —In primeval antiquities Devonshire is not so rich as Cornwall; but Dartmoor abounds in remains of the highest interest, the most peculiar of which are the long parallel alignments of upright stones, which, on a small scale, resemble those of Carnac in Brittany. On Dartmoor the lines are invariably straight, and are found in direct connection with cairns, and with circles which are probably sepulchral. These stone avenues are very numerous. Of the so-called sacred circles the best examples are the ‘ Lougstones” ou Scorhill down, and the “Grey Wethers” under Sittaford tor. By far the finest cromlech is the “Spinster’s Rock ” at Drewsteignton, a three-pillared cromlech which may well be compared with those of Cornwall. There are numerous maenhirs or single upright stones ; a large dolmen or holed stone lies in the bed of the Teign, near the Scorhill circle ; and rock basins occur on the summit of nearly every tor on Dartmoor (the largest are on Kestor, and on Heltor, above the Teign). It is, however, tolerably evident that these have been produced by the gradual disintegration of the granite, and that the dolmen in the Teign is due to the action of the river. Clusters of hut foundations, circular, and formed of rude granite blocks, are frequent ; the best example of such a primitive village is at Batworthy, near Chagford; the type resembles that of East Cornwall, Walled inclosures, or pounds, occur in many places ; Grimspound is the most remarkable. ‘Trackways, or boundary lines, run across Dartmoor in many directions; and the rude bridges, formed of great slabs of granite, deserve notice. All these remains are on Dartmoor. Scattered over the county are numerous large hill castles and camps,—all earthworks, and all

apparently of the British period. Roman relics have been found from time to time at Exeter (sca Damnoni- orum), the only large Roman station in the county. Buildings.—The churches are for the most part of the Perpendicular period, dating from the middle of the 14th to the end of the 15th century. Exeter Cathedral is of course an exception, the whole (except the Norman towers) being very beautiful Decorated work. The special features of Devonshire churches, however, are the richly carved pulpits and chancel screens of wood, in which this county exceeded every other in England, with the exception of Norfolk and Suffolk. The designs are rich and varied, and the skill displayed often very great. Granite crosses are frequent, the finest and earliest being that of Coplestone, near Crediton. Monastic remains are scanty ; the principal fragments are those at Tor, Buckfast, Tavistock, and Buckland Abbeys. Among domestic buildings the houses of Wear Gifford (15th century), Bradley (15th century), Dartington (15th), Bradfield (Elizabethan), and Holcombe Rogus (Elizabethan) deserve notice. The ruined castles of Okehampton (Edward I.), Exeter (with vast British earth- works), Berry Pomeroy (Henry ILL, and with ruins of a

large Tudor mansion), Totnes (Henry III.), and Compton (early 15th century), are all interesting and picturesque,

The dialect of Devonshire belongs, of course, to the West Saxon division ; but the mixture of races here was, as has been said, considerable ; and in the language as well as in the folk-lore of the people Celtic words and ideas are found closely united with those of Teutonic origin.

The episcopal see for Devonshire was at first established at Crediton, in 909. The ancient Cornish see, which had existed during the British independence of Cornwall, was afterwards united to that of Crediton; and in 1050 the place of the united sees was removed by the Confessor from Crediton to Exeter. There was no further change until 1876, when the Cornish see was again separated from that of Devonshire, and the place of it fixed at Truro. The diocese of Exeter is now therefore confined to Devonshire,

Devonshire is in the western circuit, and .the assizes are held at Exeter. It has one court of quarter sessions and 22 petty sessional divisions. The city of Exeter, a county of itself, and the boroughs of Barnstaple, Bideford, Dart- mouth, Devonport, Plymouth, South Molton, Tiverton, and Totnes have commissions of the peace, and, with the exception of Totnes, separate courts of quarter sessions, The jurisdiction of the court of the vice-warden of the stannaries extends over the county of Devon as well as that of Cornwall. There are 23 lieutenancy subdivisions, For the purposes of parliamentary election, Devonshire is divided into east, north, and south—each of which divisions returns 2 county members. The city of Exeter, in Hast Devon, returns 2; Barnstaple and Tiverton, in North Devon, 2 each; Devonport and Plymouth, in South Devon, 2 each; and Tavistock, also in South Devon, returns 1 member. There are thus altogether 17 members returned for Devonshire.

One of the earliest railways in England was that from Plymouth to the prisons at Prince Town on Dartmoor, opened in 1825, It was, and is, used only by horse cars. The county is now well intersected by railways. Of canals, the most important (and, except “ Morton’s Leam,” running from near Peterborough to the sea, the most ancient in England) is the Exeter Ship canal, cut in the reign of Henry VITI., and extended in 1826. It is about six miles in length, and connects the city of Exeter with the mouth of the River Exe. Tiverton is connected with Taunton by the Grand Western canal, 23 miles long; and a canal coni- pleted in 1817 connects Tavistock with the Tamar.

The principal gentlemen’s seats in Devonshire are Saltram (earl of Morley), Maristow (Sir Massey Lopes, Bart.), Kitley (Baldwin Bastard, Esq.), Stover (duke of Somerset), Ugbrooke (Lord Clifford), Haldon (Sir Lawrence Palk, Bart.), Mamhead (Sir Lidstone Newman, Bart.), Powderham Castle (earl of Devon), Killerton (Sir Thomas Acland, Bart.), Bicton (Lady Rolle), Castle Hill (Earl Fortescue), Tawstock (Sir Bourchier Wrey, Bart.), and Eggesford (earl of Portsmouth), There are many lesser houses noticeable for beauty of situation or for the ornamental grounds i which they stand. Of these by far the most remarkable are Endsleigh (duke of Bedford), near Tavistock, command- ing some of the finest scenery in the upper valley of the Tamar, and Buckland Court, on the Dart (Baldwin Bastard Esq.). .

The principal towns in the county are those already mentioned as returning members to Parliament, or as possessing courts of quarter sessions. Besides these are the watering-places of Teignmouth, Torquay, and Ilfracombe, and the smaller towns of Crediton, Honiton, Axminster, Ashburton, and Newton Abbot.

Population.—The total population of Devonshire in 1851 amounted to 567,098 persons ; in 1861 to 584,373 ; and in

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1871 to 601,374, of whom 285,248 were males, and 316,126 females. ‘There were, at the last census, on an average 0-36 persons toan acre, or 2°75 acres to each person. ‘The number of inhabited houses was 105,200, There were 480 parishes and 33 hundreds. ‘The population of the county in 1801 was 340,308 persons; so that the increase since that time has been at the rate of 77 for every hundred. Of the 52 counties in England and Wales, Devonshire is now the ninth in point of population. The comparative density of the population is considerably below the average. In England generally there are 389 persons to every square mile ; in Devonshire the number is not more than 232. Bibliogvaphy.—The best general history of the county is still that which forms part of Lysons’s Magna Britannia (1822). Polwhele’s Hist. of Devon (1793-98) was never completed, and is inaccurate. Westcote’s Survey of Devon, written about 1630, and first printed in 1845, is curious and important. Prince’s Worthies of Devon, a very valuable book, was first published in 1701, and was reprinted in 1810. Oliver’s Monasticon Diacesis Exoniensis (1845) is valuable for the history of the monastic foundations in both Devon and Cornwall. There are very good histories of Plymouth (1871) and of Devonport (1872) by R. N. Worth. Mrs Bray’s Borders of the Tamar and Tavy, 3 vols., 1836, is full and interesting, and contains much information relat- ing to Dartmoor. Rowe’s Perambulation of the Forest of Dartmoor (1848, and later editions) is still the most coniplete book on that district; but a great amount of important matter relating to Dart- moor and to the county in general will be found in the annual volumes of the Transactions of the Devonshire Association for the Promo- tion of Literature, Science, and Art, beginning in 1862. The notes to Carrington’s poem of Dartmoor should also be mentioned. For the

geology of the county reference should be made to the very valuable papers of Mr Pengelly in the Transactions of the Devonshire Association, and in the Journal of the Geological Society. The papers of Mr Ormerod and of Mr Vicary in the same Journals arealso of great importance. The fullest general notice is, however, to be found in the Report on the Geology of Cornwall, Devon, and West Somerset, by Sir H. J. De la Beche, 1839. Murray's Handbook for Travellers in Devon and Cornwall (8th ed., 1872) must also be mentioned as full of useful information. (R. J. K.) DEVONSHIRE, Writ1am Cavenpisu, Fourta Earn and First Duke or (1640-1707), distinguished as a statesman and patriot, born in 1640, was the eldest son of the third earl. After completing his education he made the tour of Europe according to the custom of young men of his rank, being accompanied on his travels by Dr Killigrew. On his return he obtained, in 1661, a seat in Parliament for the county of Derby, and soon became con- Spicuous as one of the most determined and daring opponents of the general policy of the court. In 1678 he was one of the committee appointed to draw up articles of impeachment against the lord-treasurer Danby. In 1679 he was re-elected for Derby, and made a privy councillor by Charles II. ; but he soon withdrew from the board with his friend Lord Russell, when he found that the Romish interest uniformly prevailed. He carried up to the House of Lords the articles of impeachment against Lord Chief. Justice Scroggs, for his arbitrary and illegal proceedings in the Court of King's Bench; and when the king declared his resolution not to sign the bill for excluding the duke of York, afterwards James IIi., he moved in the House of ommons that a bill might be brought in for the association of all his majesty's Protestant subjects. He also openly denounced the king's counsellors, and voted for an address to remove them. He appeared in defence of Lord Russell at his trial, at a time when it was scarcely more criminal to be an accomplice than a witness. After the condemna- tion he gave the utmost possible proof of his attachment by offering to exchange clothes with Lord Russell in the prison, remain in his place, and so allow him to effect his escape. In November 1684 he succeeded to the earldom on the death of his father, He opposed arbitrary govern- ment under James II. with the same consistency and high spirit as during the previous reign. He was withdrawn from public life for a time, however, in cansequence of a

hasty and imprudent act of which his enemies knew how to avail themselves. Fancying that he had received an insulting look in the presence chamber from Colonel Colepepper, a swaggerer whose attendance at court the king encouraged, he immediately avenged the affront by challenging the colonel, and, on the challenge being refused, striking him with his cane. This offence was punished by a fine of £30,000, which was an enormous sum even to one of the earl's princely fortune. Not being able to pay he was imprisoned in the King's Bench, from which he was released only on signing a bond for the whole amount. This was afterwards cancelled by King William. After his discharge the earl went for a time to Chatsworth, where he occupied himself with architectural improvements on his mansion. The Revolution again brought him into pro- minence. He was one of the seven who signed the original paper inviting the Prince of Orange from Holland, and was the first nobleman who appeared in arms to receive him at his landing, He received the Order of the Garter on the occasion of the coronation, and was made lord high steward of the new court. In 1791 he accompanied King William on his visit to Holland. He was created marquis of Hartington and duke of Devonshire in 1694 by William and Mary, on the same day on which the head of the house of Russell was created duke of Bedford. Thus, to quote Macaulay, " the two great houses of Russell and Cavendish, which had long been closely connected by friendship and by marriuge, by common opinions, common sufferings, and common triumphs, received on the same day the highest honour which it is in the power of the Crown to confer." His last public service was assisting to conclude the union with Scotland, for negotiating which he and his son, the marquis of Hartington, had been appointed among the commissioners by Queen Anne. He died on the 18th August 1707, and ordered the following inscription to be put on his monument :— Willielmus Dux Devon, Bonorum Principum Fidelis Subditus, Inimicus et Invisus Tyrannis.

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DEWBERRY, Rubus cesius, a deciduous trailing plant, allied to the bramble, of the natural order Rosacee. It is common in woods, hedges, and the borders of fields in England and other countries of Europe. The leaves are trifoliate, hairy beneath, and of a dusky green; the flowers, which appear in June and July, are white, or pale rose-coloured. The fruit is large, and

closely embraced by the calyx, and consists of few grains, which are black, with a glaucous bloom; it has an agreeable acid taste, and is used for making a kind of wine.

D'EWES, Sir Srimonps (1602-1650), antiquarian, chronicler, and collector of historical records, was born at Coxden, in the parish of Chardstock, in Dorsetshire, on the 18th December 1602, His father, one of the six clerks of Chancery, possessed a large official income, and gave him a liberal education at the grammar-school of Bury St Edmunds, and at St John's College, Cambridge. ~~Called to the bar in 1623, he did not enter upon practice, being possessed of independent means, and having already resolved to devote himself to historical research. His in~~ tention seems to have been to compile a history of Britain from original documents, and in endeavouring to carry it out he spent much of his time in examining historical records, which he describes as " the most ravishing and satisfying part of human knowledge," in the Tower of London and elsewhere. The chief results of this labour were his valuable collection of records—originals and tran- scripts—which now form part of the Harleian collection in the British Museum, and his Journals of all the Parliaments inthe reign of Queen Klizabeth, which, though completed in

1629, was first published by his nephew, Paul Bowes, in 1682. His means had been considerably increased by his marriage with an heiress in 1626, soon after which hé pro- cured the honour of knighthood. One of his many foibles was a desire to establish for himself an aristocratic lineage, and his efforts to do this, in spite of the fact he is forced toadmit, that he does not know who his great-grandfather was, are very amusing. In 1639 he became high sheriff of Suffolk, and in 1641 he was madea baronet. In the inter- vening year he entered the Long Parliament as member for Sudbury, Here he obtained a peculiar place for him- self by his whimsicality, and his parade of his knowledge of records, which he quoted at first in nearly every debate, sometimes relevantly, but oftener not. He was treated for a time with a sort of amused tolerance, but ultimately his innumerable interferences with the conduct of business had to be checked. He was not a very warm adherent of the cause of the Parliament against the king.

Belonging to the Presbyterian section of the Puritan party, he was excluded from the House of Commons by “ Pride’s Purge ” in 1648. He died on the 18th April 1650. The Awtodio- graphy and Correspondence of Sir Simonds D’ Ewes, edited by J. O. Halliwell, was published in 1845, and possesses considerable historical value. Much more important, how- ever, are his manuscript notes of the Long Parliament, describing its sittings between 1640 and 1645 with great graphic power and minuteness of detail. They form five volumes of the Harleian manuscripts in the British Museum, and have been largely drawn upon by John Forster and other writers on the period of the Long Parliament.

DE WETTE, Witaerm Martin Lepersecat (1780- 1849), a distinguished German theologian, was born on the 12th January 1780, at Ulla, near Weimar, where his father was clergyman. After receiving his preliminary education at a local school he was sent to the gymnasium at Weimar, a town which was then at the height of its literary glory. Here, as he himself testified in glowing terms many years later, he was much influenced by intercourse with Herder, who as “ephorus” frequently visited the gymnasium and examined the pupils. In 1799 he entered on _ his theological studies at the university of Jena, his principal teachers being Griesbach and Paulus, from the latter of whom more than any other he derived the tendency to free critical inquiry which characterized him as an expositor. Herder and Paulus were thus in some sense his spiritual fathers, but the relationship was entirely one of spirit and aim; in method and results he occupied an independent and almost solitary position among German theologians, Having taken his doctor’s degree, De Wette at once com- menced, according to German custom, the career of a “ privat-docent ” at Jena, which, however, he was not permitted to continue long. In 1807 he became professor of theology at Heidelberg, and in 1810 he was transferred to a similar chair in the newly-founded university of Berlin, from which he was dismissed in 1819 on account of his having written a letter of consolation to the mother of Sand, the murderer of Kotzebue. The letter was defensible, though it drew a distinction between the morality of the deed and of the doer which many were not prepared to admit, and a petition in its author’s favour was presented by the senate of the university. The king, how- ever, proved inexorable, and a decree was issued not only depriving De Wette of the chair, but banishing him from the Prussian kingdom. He

retired for a time to Weimar, where he occupied his enforced leisure in the preparation of his edition of Luther, and in writing the romance Lheodor oder die Weihe des Zweiflers (Berlin, 1822),in which he describes the education of an evangelical pastor. Dur- ing this period he made his first essay in preaching, and proved himself to be possessed of very popular gifts, An

invitation to a pastoral charge in Brunswick was under hig consideration, when the offer in 1822 of the chair of theology in the university of Basel, which had been re organized four years before, opened up to him a still more congenial sphere. Though his appointment had been strongly opposed by the orthodox party, De Wette soon won for himself a position of great influence both in the university and in the community of Basel. He was early admitted a citizen, and received many proofs of the esteem of his fellow-townsmen ; and the university owed much of its recovered strength, particularly in the theological faculty, to his individual efforts. He died on the 16th June 1849, being rector of the university at the time.

De Wette's chief work as a theologian was in the department of biblical criticism and exegesis, though he made valuable contributions to other branches of theology, In fact his range was unusually extensive, and he did much by precept as well as by example to widen the limits of theological culture. He had considerable poetic faculty, and wrote a drama in three acts, entitled Die Entsagung (Berlin, 1823). He had an intelligent interest in art, and devoted much attention to ecclesiastical music and architecture. Asa biblical critic he is sometimes classed with the destructive school, but his position was unique, and cannot be accurately defined by merely refernng him to a leader ora school. In the work of interpretation he strove to keep himself entirely free from dogmatic prepossessions, and he was fearless in recognizing and grappling with difficulties; but he was prevented by his deeper spirituality from identifying himself with the hard and uncompromising rationalism of Paulus, and on the other hand his unfettered critical method separated him distinctly from the supernaturalist or strictly orthodox school of interpreters. Thus it has happened that each school has classed him with the followers of the other, as he himself predicted would

be the case in the preface to his Christliche Stttenlehre. His works are generally admitted to be marked by great exegetical skill, unusual power of condensation, and uniform fairness. Accordingly they possess an element of permanent value which is little affected by the progress of criticism. The following isa list of the most important of them :—

Beitrige zur Einleitung in das Alte Testament (2 vols. 1806-7); Commentar tiber die Psalmen (1811), which has passed through several editions, and is still regarded as of high authority ; Lehrbuch der Hebrdisch-jidischen Archeologie (1814); Ueber Religion und Theologie (1815), a work of great importance as showing its authors general theological position ; Lehrbuch der Christlichen Dogmatik (1818-16) ; Christliche Sittenlehre (1819-21) ; Einleitung in das Neue Testament (1836); Religion, thr Wesen, ihre Erscheinungs- form, und ihre Einfluss auf das Leben (1827); Das Wesen des Christlichen Glaubens (1846); and Kurzgefasstes exegetisches Hand- oe zum Neuen Testament (1848). De Wette also edited Luther's works.

See Hagenhach in Herzog's Real-Encyclopedic, Liicke's W. i. L. De Weite, zur freundschaftlicher Erinnerung (1850), and Schen- kel's W. M. L. De Wette und die Bedeutung seiner Theologie fiir unsere Zeit (1849).

DE WINTER, Jan Witiem (1750-1812), Dutch admiral, was born at the Texel in 1750. He entered the navy at the age of twelve, but after twenty-five years of honourable service he had attained no higher rank than that of lieutenant. In 1787 he took part with the Revolu- tionists, and on the failure of their efforts fled to France. He then entered the French army, and served under Dumouriez and Pichegru in the campaigns of 1792 and 1793. In 1795 he returned to Holland and was appointed rear-admiral, In the following year he attained the rank of vice-admiral, and was named commander of the fleet at the Texel. The most memorable event in his career was the battle of the Texel, fought on the 11th of October 1797, which after a gallant struggle the Dutch fleet was defeated

and the admiral taken prisoner by the English under Admiral Duncan. De Winter was in a few months liberated by exchange ; and his conduct in the battle was declared by a council of investigation to have nobly main- tained

the honour of the Dutch flag. He held the post of minister-plenipotentiary to the French republic from 1798 to 1802, when he reassumed the command of the Dutch fleet, He was employed in suppressing the piracies of the Tripolitans, and negotiated a treaty of peace with the Government. He enjoyed the confidence of Louis Bonaparte, king of Holland, and afterwards of the emperor Napoleon I. By the former he was created count of Huessen and made commander-in-chief of his armies by sea and land; and by the latter he was named grand officer of the Legion of Honour, inspector-general of the coasts of the North Sea, and in 1811 commander of the Texel fleet. De Winter died at Paris, June 2, 1812, and his remains were buried in the Pantheon at the public expense.

DE WITT, Cornetius (1623-1672), brother of the more celebrated John De Witt, was born at Dort in 1623. Te 1650 he became burgomaster of his uative town, and member of the states of Holland and West Friesland. He was throughout life closely associated with his brother, whose opinions he shared, and whom he supported with great ability and vigour. Of the eight deputies appointed in 1672 to accompany the naval and military commanders, he was the one selected to go with De Ruyter, and in action he displayed remarkable courage, as he had done under similar circumstances in 1667. Compelled by sick- ness to leave the fleet, he found on his return to Dort that the revocation of the Perpetual Edict had been signed by his fellow magistrates. He was forced in his sick-room to follow their example, but added after his name the initials V.C. (vi coactus). See next article.

DE WITT, Joun (1625-1672), an illustrious Dutch statesman, was born at Dort in 1625. He was carefully educated, and early displayed remarkable talents. A work entitled Elementa Linearum Curvarum, published in 1650, is attributed to him. His father was a member of the States General of Holland and West Friesland, and well known as a bitter opponent of the house of Orange, which had gradually acquired almost regal functions, William II., ptince of Orange, died in 1650; and as his son, afterwards William III. of England, was an infant, the Republican party easily won predominance. De Witt was made pensionary of Dort, and in that position so distinguished himself by his eloquence, firmness, and sagacity, that in 1652, although only twenty-seven years of age, he became grand pensionary of Holland. He held this position for about twenty years, during

which he controlled the policy of the United Provinces. He inherited his father's intense jealousy of the Orange family, and steadily laboured to prevent it from ever again rising to power. When he became grand pensionary the United Provinces were at war with England. He had always disapproved of this conflict, and in 1654 succeeded in bringing about peace, conceding to Cromwell his demands with respect to the honours due to the English flag. The treaty included a secret article providing that no member of the house of Orange should in future be elected stadtholder or grand admiral, De Witt was afterwards accused of having suggested this condition to Cromwell; but the latter was also opposed to the claims of a family which was nearly allied to the Stuarts.

After the restoration of Charles IJ., who had been exposed to many affronts during his residence in Holland, De Witt cultivated the friendship of France ; and in 1661 a treaty was concluded by which that country and the United Provinces granted to each other freedom of commerce in their respective ports,—the Dutch guarantee-

ing to the French the possession of Dunkirk, and the French guaranteeing to the Dutch the right of fishing off the coasts of Great Britain and Ireland, The latter provi- sion caused much irritation in England; and it was increased by the incessant quarrels of English and Dutch merchants on the Guinea Coast, each desiring to have a monopoly in the trade of slaves and gold dust. War was declared in 1665 ; and in a battle off Lowestoft the Dutch fleet was defeated, the remnant taking shelter in the Texel. Antwerp was the only port at which it could be refitted, and the most experienced pilots decided that it was impossible the vessels could be removed thither. De Witt himself, however, with splendid courage, undertook the task, and not only accomplished it, but in a very short time had the fleet once more ready for action. After two more battles, in which the Dutch well sustained their fame for skill and bravery, De Witt entered upon negotiations which resulted in the Peace of Breda in 1667.

Meanwhile, by dint of severe labour, he introduced order into the financial system of the country ; and in 1667 the chief object of his life seemed to be attained, for owing to his efforts a Perpetual Edict was passed proclaiming

the office of stadtholder for ever abolished. At this time, however, a great danger threatened the Republic. In 1667 Louis XIV. invaded the Spanish Netherlands ; and it was clear that if the war ended in the annexation of that country to France it would be difficult to maintain the independence of the United Provinces. De Witt made secret but rapid preparations for resistance, and appealed to England to support Holland in curbing French ambition. Notwithstanding the prejudices of Charles IT., Sir William Temple was sent to propose an alliance between England, Holland, and Sweden. De Witt entered so heartily into this scheme that in the spring of 1668 the Triple Alliance was concluded. Louis XIV. saw that for the time his plans were foiled, and with as good a grace as possible signed the Peace of Aix-la-Chapelle. At heart, however, he bitterly resented the course which the States General, guided by De Witt, had taken, and slowly prepared for revenge. By artful diplomacy England and Sweden were detached from the alliance, and several German princes were persuaded to promise that they would join France in an attack on Holland in order to restore certain towns which, it was pretended, properly belonged to the empire.

While Louis was maturing his plans the power of De Witt was being steadily undermined. The Calvinist clergy, who had always been his enemies, excited their congrega- tions against him and bis party ; and, as the Prince of Orauge approached manhood, the people recalled the obliga- tions of the country to his ancestors, and freely expressed doubts whether his rule would not be preferable to that of nobles and wealthy burgesses. The state of public feeling rendered it impossible for De Witt to make ready for the approaching peril. Wheu, therefore, France, England, and the German allies of France proclaimed war against the United Provinces in 1672, and it was found that no effectual resistance could be offered to their attack, popular indignation turned against the grand pensionary. The Prince of Orange was appointed captain and admiral general ; and De Witt could only secure that a council of eight deputies of the States General should be associated with the military and naval commanders, one to go with De Ruyter, the other seven with Prince William. This plan added to the confusion, and in a few months after the declaration of war a large part of the country was overrun, and the French were within five leagues of Amsterdam. To save themselves the humiliation of surrender, the towns of Holland and Brabant broke the dykes and laid the sur- rounding land under water.

The Orange party so profited by these disasters that the Perpetual Edict was revoked, and Prince William assumed the office of stadtholder. De Witt's policy was thus finally defeated, and he himself became an object of general and intense hatred. All sorts of monstrous charges were brought against him, and belicved; and his brother Cornelius was falsely accused of conspiring against the life of the stadtholder. Brought to the Hague, Cornelius was there, on July 24, 1672, tortured and condemned to per- petual banishment. In the same town De Witt was assaulted by a band of assassins, who left him lying on the ground under the impression that he was dead. Sum- moned by a pretended message from Cornelius, De Witt went to visit him in prison, when a mob assembled and

murdered the brothers amid circumstances of revolting |

cruelty.

De Witt is one of the greatest figures of Dutch history. His action in connection with the Triple Ailiance proves that he thoroughly understood the central tendencies of European politics ; and, whether he is to be praised or blamed for his life-long opposition to the house of Orange, there can be no doubt as to the greatness and purity of his motives. As an administrator he displayed extraordinary energy and resource ; and personally he was a man of steady, upright character, loyal and fearless. His Memoirs were published at the Hague in 1667; and in 1725, at Amsterdam, appeared Lettres et Négociations entre Jean De Witt et les Plenipotentiaires des Provinces Unies aux Cours de France, &c., depuis Van 1652 jusqwa 1669."

DEWSBURY, a market-town in the West Riding of Yorkshire, situated at the foot of a hill, on the left bank of the Calder, eight miles 8. by W. of Leeds, on the Manchester and Leeds railway. The chief industries are the making of blankets, carpets, druggets, and worsted yam.

DEXTRIN, or British gum, C,H,)0,, is a substance produced from starch by the action of dilute acids, alkalies, and diastase or malt extract, and by

roasting it at a temperature between 140° and 160° C. (284°-320° Fahr.) till it is of a light brown colour, and smells like over-baked bread. Its name has reference to its powerful dextro-rotatory action on polarized light. The purest dextrin is prepared by boiling 25 parts ef sulphuric acid with 125 of water, and adding by degrees a mixture of 100 parts of starch and 125 of cold water. The liquid is then lowered in

temperature to 60° or 70° CO. (140°-158° Fahr.), at which |

it is kept for some time; it is next neutralized with chalk, filtered, and evaporated. Dextrin is an uncrystallizable, insipid, odourless, yellowish-white, translucent substance, brittle and friable when thoroughly dried. It dissolves in water and dilute alcohol; by strong alcohol it is pre- cipitated from its solutions as the hydrated conipound,

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C,H,,0;.H,O. Unlike starch it is not coloured blue by iodine. Diastase converts it eventually into maltose, Ci,H,.0,, ; and by boiling with dilute acids and alkalies it is transformed into dextrose, or ordinary glucose, C,H,,0,. It does not ferment in contact with yeast, and in the pure state has probably no reducing action on ap alkaline copper solution. If heated with strong nitric acid it gives oxalic, and not mucic acid. Limpricht has shown that dextrin is present in the flesh-juice of the horse, Dextrin much resembles guin arabic, instead of which it is generally substituted fora great variety of purposes, Tt is employed for sizing paper, for stiffening cotton goods, and for thickening colours in calico printing, also in the making of lozenges, adhesive stamps and labels, and surgical bandages. In most technical operations the crude solution only is used.

DHAR, a small native state of Malwé, in Central India, under the political superintendence of the British Govern- ment. Area, 2500 square miles; population, 150,000 souls. The state contains much fertile ground, the prin- cipal agricultural products being wheat, opium, gram, sugar- cane, Indian corn, and cotton. The Raja is a Puar or Pramar Rajput, who claims descent from the famous King Vikramaditya ; but the family only received

possession of Dhar in 1749, by gift from the Marhatté Peshwa, Baji Rao. Towards the close of the last, and in the early part of the present century, the state was subject to a series of spoliations by Sindhia and Holkar, and was only preserved from destruction by the talents and courage of the adoptive mother of the fifth Raja. By a treaty in 1819, Dhar passed under British protection, and bound itself to act in subordinate co-operation. The state was confiscated for rebellion in 1857, but subsequently restored to Raj Anand Réo Puar, then a minor, with the exception of the detached district of Bairusia, which was granted to the Begam of Bhopal. The revenue of the state is estimated at £80,000 per annum, inclusive of jagirs. The military force consists of 276 cavalry, with 800 infantry (including police), 2 guns, and 21 artillery. Road-making is being pushed on. Fifteen schools were attended in 1874 by 550 scholars. Two charitable dispensaries afford gratuitous medical relief. The town of Dhar, situated on the road from Mau (Mhow) to Baroda, extends 34 miles in length by half a mile in breadth, and is surrounded by a mud wall. The fort, built of red stone, forms a conspicuous object outside the city, and contains the Raja's palace.

DHARWAR, a district of British India in the presidency of Bombay, situated between 14° 6' and 15° 53' N. lat, and 74° 50' and 75° 58' E. long. It contains a total area of 4536 square miles, and a population of 988,037 inhabi- tants. The district is about 116 miles long, with an average width of 77 miles. It is bounded on the N. by the Belgaum and Kalddgi districts, on the E. by the Nizim's territory and Bellari district, on the S. by Mysore, and on the W. by Belgaum and North Kanara districts. The western portions of the district, in the neighbourhood of the Sabyddri range, are rugged and hilly ; but towards the east, the land falls away into plains of black soil in many parts very fertile and well suited to the growth of cotton, with occasionally a detached peak or group of hills The chief rivers are the Malprabha on the north and the Tungbhadra on the south. The hills are principally coml- posed of hornblende and chloritic schists, gneiss, and mica slate, large interstratified beds of silicious and ferruginous schists (as at and near Dharwar) oftcn forming their ridges. Seams and beds of a crystalline white marble occur, which, near their junction with the hornblende slate, are often coloured green. Gold is found sparingly in the Dumba hills, and chick mulgund, and also iron pyrites. Iron ore is worked toa small extent at Tegur, where there was once

a considerable trade in native iron. The most influential classes of the community are Brahmans and Lingayats. The LingAyats number 380,919, or 44 per cent. of the Hindu population; they worship the symbol of Siva, and males and females both carry this emblem about their person in a silver case. The manufactures of the district are not numerous; they cousist of cotton and silk cloth, glass bracelets, and articles of ironware. In four towus of the district cotton and mixed silk and cotton fabrics, for male and female attire, are delicately and tastefully woven, Agriculture is the chief industry of the district, the princi- pal products being cotton, exotic and native jawadrt, raolasses, and oil of various kinds. Of a total of 1,662,040 acres of Government arable and assessed land, 1,530,235 acres were in 1874 under cultivation as follows :—Rice, 90,896 acres ; cotton, 283,810 ; jawdri, 497,312; bdjre, 6126; wheat, 112,169; sugar-cane, 2909 ; tobacco, 790; til seed, 29,647 ; linseed, 7966; gram, 23,411; miscella- neous products, 294,491 ; fallow land, 182,869 acres. The cotton trade of Dharwar has great commercial import- ance. The land revenue realized in 1875 amounted to £196,064. The district contains six municipalities.

The territory comprised within the district appears at the earliest recorded period to have formed part of the Prahmanical realm of Vijayanagar. On the overthrow of its king at Talikot in 1565, the lands of Dharwar became part of the Mussulman kingdom of Bijapur. In 1675 the district seems to have been overrun and partially conquered by Sivdji, becoming thereby subject to the king of Satara, and subsequently to the Pcshw4. In 1776 the province was overrun by Hyder Ali, the usurping sultan of Mysore. In 1778 Dharwar was taken from the Marhattas by Hyder Ali, and in 1791 retaken by a British force. On the final overthrow of the Peshw4 in 1818, Dharwér was incorporated with the territory of the East India Company.

DHOLPUR, a native state of Rajputand, in Upper India, under the political superintendence of the British Government, is situated between 26° 30’ and 26° 57’ N. lat, and 77° 32’ and 78° 20’ E. long. The state is bounded on the N. and N.E. by the British district of Agra, on the E, and S. by the Gwalior state, from which it is separated by the Chambal river, and on the W. by the state of Karauli. It contains an area of about 1600 square miles, and an

estimated population of upwards of 500,000 souls. It is acrop-producing country, without any special manufactures, All along the bank of the Chambal the country is deeply intersected by ravines ; low ranges of hills in the western portion of the state supply inexhaust- ible quarries of fine-grained and easily-worked red sand- stone. The chief, who has the title of Rana, belongs, like most of his subjects, to the tribe of Deswali Jats, who are believed to have formed a portion of the Indo-Scythian wave of invasion which swept over Northern India about 100 ap. The earliest recorded ancestor of the family 1s one Jeyt Sinh, who in 1068 held certain territories south of Alwar. His descendant in 1505, Singan Deo, having distinguished himself in an expedition againsi the freebooters of the Deccan, was rewarded by the sovereignty of the small territory of Gohad, with the title of Rand. The family gradually extended their possessions until they included 56 estates, yielding an annual revenue said to amount to 66 lakhs of rupees (£660,000). Upon the defeat of the Marhattas at Panipat in 1761, Rand Bhim Sinh, the tenth in descent from Rana Singan Deo, seized upon the fortress of Gwalior. Political relations between the Rand and the East India Company commenced in 1779 during the Marhatté war, when an offensive and defensive alliance was entered into, The Rand joined the British forces against Sindhia, on receiving a promise tht, at the

conclusion of peace between the English and the Marhattas, all the territories then in his possession should be guaranteed to him, and protected from invasion by Sindlia. This protection was subsequently withdrawn, the Rand having been guilty of treachery. In 1783, Madhoji Sindli succeeded in recapturing the fortress of Gwalior, and crushed his Jat opponent by seizing the whole of Gohad. In 1803, however, the family were restored to their ancestral possessions of Gohad by the British Government ; but, owing to the opposition of Sindhia, the Rana agreed to relinquish possession of Gohad, in exchange for his present territory of Dholpur. By the treaty of 1804, the state was taken under the protection of the British Government,—the chief becoming bound to act in subordi- uate co-operation with the paramount power, and to refer all disputes with neighbouring princes to the British Govern- ment. The annual revenue of Dholpur, including jagirs,

amounts to about £110,000. The military force consists of 2000 men. The town of Dholpur is situated on the Agra and Gwalior road.

DIABETES (from &d, through, and Baivw, to pass), a disease characterized by a habitually excessive discharge of urine. Two forms of this complaint are described, viz.— Diabetes Mellitus, or Glycosuria, where the urine is not only increased in quantity, but also coutains a greater or less amount of sugar, and Diabetes Insipidus, or Polyuria, where the uriue is simply increased in quantity, and con- tains no abnormal ingredient. The former of these is the disease to which the term diabetes is most commonly applied, and is by far the more serious and important ailment. ‘

Although sometimes classed by medical writers among diseases of the kidneys, diabetes mellitus is rather to be regarded as a constitutional disorder. Its cause is still a matter of uncertainty, but there is sufficient evidence to connect it with a defect in the process of the assimilation of food, more especially that stage in which the function of the liveris concerned. The important researches of Claude Bernard, and subsequently those of Schiff, Harley, Pavy, M‘Donell, and others, have shown that this organ, besides the secretion of bile, has the additional function of forming in large quantity a substance to which the names of glycogen, dextrin, or amyloid substance have been giveil. This matter is capable of being converted by the action of ferments into glucose, or grape sugar, and such a change is supposed by some to take place normally in the blood where the sugar thus formed is consumed by oxidation in the course of the circulation, while by other authorities it is held that the glycogen is not directly converted into sugar, but is transformed into other compounds.

The theories of diabetes founded on these views ascribe its production either to an excessive formation of glycogen or to some defect in its transformation, the result being that grape sugar passes out of the body by the kidneys. It has long been known, both by experiment and by observa- tion in disease, that injuries to certain parts of the nervous system, particularly the floor of the fourth veutricle in the brain, and that portion of the sympathetic nerve which sends branches to the liver and regulates its blood supply, are followed by the appearance of sugar in the urine. Hence certain pathologists seek an explanation for the disease in a morbid state of

the parts of the nervous system whereby these particular nerves are either irritated or paralyzed and the flow of blood through the liver tem- porarily or permanently increased. It must, however, be remarked that, although in some instances the portions of the nervous system above mentioned are found after death to be involved in disease, this is by no means constant, and that in many cases of diabetes the post mortem appearances are entirely negative. While, therefore, considerable light

has by modern research been thrown upon this disease, its pathology cannot be regarded as yet settled. 7

It ought to be mentioned that small quantities of sugar are.frequently found in the urine in many diseases, and even in health after articles of food rich in sugar or starch have been eaten, as also in some forms of poisoning.

Little is known regarding the exciting causes of diabetes. Exposure to wet and cold, privation, depressing mental emotions, or mental overwork, the abuse of alcohol and of saccharine and starchy substances, have all been assigned as causes. It appears to be in some instances hereditary. It is most common among adults, and occurs much more fre- quently in males than in females. ;

The symptoms of diabetes are usually gradual in their onset, and the patient may suffer for a length of time before he thinks it necessary to apply for medical aid. The first symptoms which attract attention are failure of strength, and emaciation, along with great thirst and an increased amouut and frequent passage of urine. From the normal quantity of from two to three pints in the twenty-four hours it may be increased to 10, 20, or 30 pints, or even more. It is usually of pale colour, and of thicker consistence than normal urine, possesses a decidedly sweet taste, and is of high specific gravity (1°03 to 1:05). It fre- quently gives rise to considerable irritation of the urinary passages.

By simple evaporation crystals of sugar may be obtained

from diabetic urine, which also yields the characteristic chemical tests of sugar, while the amount of this substance can be accurately estimated by certain analytical processes. The quantity of sugar passed may vary from a few ounces to two or more pounds per diem, and it is found to be markedly increased after saccharine or starchy food has been taken. Sugar may also be found in the blood, saliva, tears, and in almost all the excretions of persons suffering from this disease. One of the most distressing symptoms is intense thirst, which the patient is constantly seeking to allay, the quantity of liquid consumed being in general enormous, and there is usually, but not invariably, a vora- cious appetite. The mouth is always parched, and a faint, sweetish odour may be evolved from the breath. The effect of the disease upon the general health is very marked, and the patient becomes more and more emaciated. He suffers from increasing muscular weakness, the temperature of his body is lowered, the skin is dry and harsh, the teeth are loosened or decay, while dyspeptic symptoms, constipation, and loss of sexual power are common accompaniments. There is in general great mental depression or irritability. _ Diabetes as a rule advances comparatively slowly except in the case of young persons, in whom its progress is apt to be rapid. Various complications arise in the course of the disease, among which may be mentioned cataract, various cutaneous eruptions, kidney diseases, inflammatory chest affections, and especially pulmonary consumption, which is one of the most frequeut modes of fatal termination in diabetes. Occasionally death occurs suddenly from exhaustion.

Diabetes is a very fatal form of disease, recovery being exceedingly rare. Nevertheless much may be done by appropriate treatment to mitigate the severity of the symptoms and to prolong life.

Cases may thus continue for years without material change to the worse, and in some rare instances it would Naret i ee The unfavourable cases

j g Im young persons, also where gece chest or other complications arise, and especially : “ne i pane itself is of severe character, the quantity

: passed being persistently large, and the patient losing flesh and strength rapidly.

With respect to the treatment of diabetes, the regula-

tion of the dict has by all authorities been regardeq as a matter of the first importance, inasmuch as it hag been proved beyond question that certain kinds of food have a powerful influence in aggravating the disease, more particularly those consisting largely of saccharine and starchy matter ; and it may be stated generally that the various methods of treatment proposed aim at the elimina. tion as far as possible of these constituents from the diet, Hence it is recommended that such articles ag bread, potatoes, and all farinaceous foods, turnips, carrots, parsnips, and most fruits should be avoided ; while animal food and soups, green vegetables, milk, cream, cheese, eggs, butter, aud tea aud coffee without sugar, may be taken with advantage As a substitute for ordinary bread, which most persons find it difficult to do without for any length of time, bran bread, gluten bread, almond biscuits, and even well-browned toast or rusks are recommended, Alcoholic stimulants are of little or no use, but if prescribed should be in those forms containing the least saccharine matter, such as claret, Burgundy, brandy, or bitter ale.

Thirst may be mitigated by iced water, or water slightly acidulated with phosphoric acid. The employment of a diet consisting entirely of skimmed milk has been recom- mended by Dr Donkin of London, who has obtained good results from this method of treatment. The milk is administered in quantities of from 8 to 12 pints in the twenty-four hours, all other articles of diet being excluded,

The plan of treatment once proposed, of administering sugar in large quantity in diabetes, proved to be highly injurious, and is now abandoned.

Numerous medicinal substances have been employed in diabetes, but few of them are worthy of mention as possessed of any efficacy. Opium is often found of great service, its administration being followed with marked amelioration in all the symptoms, and, according to some high authorities, with cure of the disease. It is borne in diabetes in larger doses than usual, and from 5 to 12 grains or more may be taken in the twenty-four hours. 1n like manner codeia (one of the constituents of opium), in doses of half a grain increased to two or three grains three times a day, has been used with good effect.

In most cases, however, it is the dieting of the patient to which the physician has to look in dealing successfully with this formidable disease ; and sufferers ought always to be impressed with the necessity of strictly abstaining from those articles of food which by general consent are allowed to exercise a hurtful influence in aggravating the symptoms.

In diabetes insipidus, there is constant thirst and an excessive flow of urine, which, however, is uot found to contain any abnormal constituent. Its effects upon the system are often similar to those of diabetes mellitus, except that they are much less marked, the disease being in general very slow in its progress. In some cases the health appears to suffer very slightly. 1t is rarely a direct cause of death, but from its debilitating effects may predis- pose to serious and fatal complications. Little is known as to its pathology, but it is generally supposed to own @ similar origin to diabetes mellitus. It is best treated by tonics and generous diet. Opium and valerian have beew found beneficial. (5. 0. A.)

DIAGORAS, born at Melos, was a writer of dith yrambic poetry. Religious in his youth, he became an atheist because a great wrong done upon hii (the details of which are unknown) was left unpunished by the gods. In conse quence of his blasphemous speeches, and especially from his publication of the Mysteries, he was condemned to death at Athens, and a price set upon his head, During his flight he perished by shipwreck. Aristophanes alludes to his atheism in the Clouds, 830 sqg., and to his condem- nation in the Birds, 1073. His date is not exactly known.

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He could not have been, as is usually stated, a pupil of Democritus, as he was older than this philosopher, or cer- tainly not younger. The circumstances of his death may have been confused with those of Protagoras. The writing in which he disclosed the Mysteries bore the name ¢pvyior Aéyou, OF dromupyilovres. ‘These are all the facts which are known of him, and none of his actual opinions are pre- served. See Zeller, Geschichte der Griechischen Philosophie.

DIAGRAMS. A diagram is a figure drawn in such a manner that the geometrical relations between the parts of the figure help us to understand

relations between other objects. A few have been selected for description in this article on account of their greater geometrical significance.

Diagrams may be classed according to the manner in which they are intended to be used, and also according to the kind of analogy which we recognize between the diagram and the thing represented.

Diagrams of Illustration,

The diagrams in mathematical treatises are intended to help the reader to follow the mathematical reasoning. The construction of the figure is defined in words so that even if no figure were drawn the reader could draw one for himself. The diagram is a good one if those features which form the subject of the proposition are clearly represented. The accuracy of the drawing is therefore of smaller import- ance than its distinctness.

Metrical Diagrams.

Diagrams are also employed in an entirely different way —namely, for purposes of measurement. The plans and designs drawn by architects and engineers are used to determine the value of certain real magnitudes by measur- ing certain distances on the diagram. For such purposes lt Is essential that the drawing be as accurate as possible.

We therefore class diagrams as diagrams of illustration, which merely suggest certain relations to the mind of the Spectator, and diagrams drawn to scale, from which measure- ments are intended to be made.

Methods in which diagrams are used for purposes of measurement are called Graphical methods.

Diagrams of illustration, if sufficiently accurate, may be used for purposes of measurement; and diagrams for measurement, if sufficiently clear, may be used for purposes of demonstration.

There are some diagrams or schemes, however, in which the form of the parts is of no importance, provided their connections are properly shown. Of this kind are the diagrams of electrical connections, and those belonging

to that department of geometry which treats of the degrees of cyclosis, periphraxy, linkedness, and knottedness,

Diagrams purely Graphic and mixed Symbolic and Graphie.

r Diagrams may also be classed either as purely graphical lagrams, in which no symbols are employed except letters or other marks to distinguish particular points of the diagrams, and mixed diagrams, in which certain magnitudes fc represented, not by the magnitudes of parts of the lagram, but by symbols, such as numbers written on the lagram. j ag : map the height of places above the level of ab 18 often indicated by marking the number of feet hg the sea at the corresponding places on the map. es oe another method in which a line called a contour hej ht rawn through all the places in the map whose ight above the sea isa certain number of feet, and the

— of feet is written at some point or points of this ine. By

the use of a series of contour lines, the height of a

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great number of places can be indicated on a map by means of a small number of written symbols, Still this method is not a purely graphical method, but a partly symbolical method of expressing the third dimension of objects on a diagram in two dimensions.

Diagrams in Pairs.

In order to express completely by a purely graphical method the relations of magnitudes involving more than two variables, we niust use more than one diagram. Thus in the arts of construction we use plans and elevations and sections through different planes, to specify the form of objects having three dimensions.

In such systems of diagrams we have to indicate that a point in one diagram corresponds to a point in another diagram. This is generally done by marking the corre- sponding points in the different diagrams with the same

letter. If the diagrams are drawn on the same piece of paper we may indicate corresponding points by drawing

sa line from one to the other, taking care that this line of

correspondence is so drawn that it cannot be mistaken for a real line in either diagram.

In the stereoscope the two diagrams, by the combined use of which the form of bodies in three dimensions is recognized, are projections of the bodies taken from two points so near each other that, by viewing the two diagrams simultaneously, one with each eye, we identify the corre-sponding points intuitively.

The method in which we simultaneously contemplate two figures, and recognize a correspondence between certain points in the one figure and certain points in the other, is one of the most powerful and fertile methods hitherto known in science. Thus in pure geometry the theories of similar, reciprocal, and inverse figures have led to many extensions of the science. It is sometimes spoken of as the method or principle of Duality.

DraGRAMS IN KINEMATICS.

The study of the motion of a material system is much assisted by the use of a series of diagrams representing the configuration, displacement, and acceleration of the parts of the system.

Diagram of Configuration.

In considering a material system it is often convenient to suppose that we have a record of its position at any given instant in the form of a diagram of configuration.

The position of any particle of the system is defined by drawing a straight line or vector from the origin, or point of reference, to the given particle. The position of the particle with respect to the origin is determined by the magnitude aud direction of this vector.

Tf in the diagram we draw from the origin (which need not be the same point of space as the origin for the material system) a vector equal and parallel to the vector which de- termines the position of the particle, the end of this vector will indicate the position of the particle in the diagram of configuration.

If this is done for all the particles, we shall have a system of points in the diagram of configuration, each of which corresponds to a particle of the material system, and the relative positions of any pair of these points will be the same as the relative positions of the material particles which correspond to them.

We have hitherto spoken of two origins or points from which the vectors are supposed to be drawn—one for the material system, the other for the diagram. These points, however, and the vectors drawn from them, may now be omitted, so that we have on the one hand the material

system and on the othcr a set of points, each point corre-

sponding to a particle of the system, and the whole repre-

senting the configuration of the system at a given instant. This is called a diagram of configuration.

Diagram of Displacement.

Let us next considcr two diagrams of configuration of the same system, corresponding to two different instants.

We call the first the initial configuration and the second the tinal configuration, and the passage from the one con- figuration to the other we call the displacement of the system. We do not at present consider the length of time during which the displacement was effected, nor the inter- mediate stages through which it passed, but only the 4inal result—a change of configuration. To study this change we construct a diagram of displacement.

Let A, B, C be the points in the initial diagram of con- figuration, and A‘, B’, C’ be the corresponding points in the final diagram of configuration.

From 0, the origin of the diagram of displacement, drawz

a vector oa equal and parallel to AA’, ob equal and parallel to BB’, oc to CC’, and so on.

‘The points, a, 4, c, &c., will be such that the vector al indicates the displacement of 6 relative to a, and so on. The diagram containing the points a, 6, c, &c., is therefore called the diagram of displacement.

In constructing the diagram of displacement we have hitherto assumed that we know the absolute displacements of the points of the systam. For we are required to draw a line equal and parallel to A,A,, which we cannot do unless we know the absolute final position of A, with respect to its initial position. In this diagram of displace- ment there is therefore, besides the points a, 0, c, &c., an crigin, 0, which represents a point absolutely fixed in space. This is necessary because the two configurations do not exist at the

samie time; and therefore to express their relative position we require to know a point which remains the same at the beginning and end of the time.

But we may construct the diagram in another way which does not assume a knowledge of absolute displacement or of a point fixed in space.

Assuming any point and calling it a, draw ak parallel and equal to B, A, in the initial configuration, and from & draw kb parallel and equal to A,B, in the final configura- tion. It is easy to see that the position of the point 0d relative to a will be the same by this construction as by the former construction, only we must observe that in this second construction we use only vectors such as A,B,, A,B,, which represent the relative position of points both of which exist simultaneously, instead of vectors such as A,A,, B,B,, which express the position of a point at one instant relative to its position at a former instant, and which therefore cannot be determined by observation, because the two ends of the vector do not exist simul- taneously

It app-ars therefore that the diagram of displacements, when drawn by the first construction includes an origin o, which indicates that we have assumed a knowledge of absolute displacements. But no such point occurs in the second construction, because we use such vectors only as we can actually observe. Hence the diagram of displace- nicnts wethout an origin represents neither more nor less then all we can ever know about the displacement of the material system.

Diagram of Velocity.

Tf the relative velocities of the points of the system are constant, then the diagram of displacement corresponding to an interval of a unit of time between the initial and the final configuration is called a diagram of relative velocity.

If the relative velocities are not constant, we suppose

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another system in which the velocities are equal to the velocities of the given system at the given instant and con. tinue constant fora unit of time. The diagram of dis. placements for this imaginary system is the required diagram of relative velocities of the actual system at the given instant.

It is easy to see that the diagram gives the velocity of any one point relative to any other, but cannot give the absolute velocity of any of them.

Diagram of Acceleration.

By the same process by which we formed the diagram of displacements from the two diagrams of initial and final configuration, we may form a diagram of changes of rela- tive velocity from the two diagrams of initial and final velocities. This diagram may be called that of total accelerations in a finite interval of time.

By the same process by which we deduced the diagram of velocities from that of displacements we may deduce the – diagram of rates of acceleration from that of tvtal accelera- tion.

We have mentioned this system of diagrams in clementary kinematics because they are found to be of use cspecially when we have to deal with material systems containing a great number of parts, as in the kinetic theory of gases, The diagram of configuration then appears as a region of space swarming with points representing molecules, and the only way in which we can investigate it is by consider- ing the number of such points in unit of volume in different parts of that region, and calling this the density of the gas.

In like manner the diagram of velocities appears as a region containing points equal in number but distributed in a different manner, and the number of points in any given portion of the region expresses the number of molecules whose velocities lie within given limits. We inay speak of this as the velocity-density.

Path and Hodograph.

When the number of bodies in the system is not so great, we may construct diagrams each of which represents some property of the whole course of the motion.

Thus if we are considering the motion of one particle relative to another, the point on the diagram of configura- tion which corresponds to the moving particle will trace out a continuous line called the path of the particle.

On the diagram of velocity the point corresponding to the moving particle will trace another coutinuous line called the hodograph of the particle.

The hodograph was invented and used with great success by Sir W. Rt. Hamilton as a method of studying the motions of bodies.

DIAGRAMS OF STRESS.

Graphical methods are peculiarly applicable to statical questions, because the state of the system is constant, s0 that we do not need to construct a series’ of diagrams corresponding to the successive states of the system.

The most useful of these applications relates to the equilibrium of plane framed structures. Two diagrams are used, one called the diagram of the frame and the other called the diagram of stress.

The structure itself consists of a number’cf separable pieces or links jointed together at their extremities. In practice these joints have friction, or may be made put- posely stiff, so that the force acting at the extremity of a piece may not pass exactly through the axis of the joint; but as it is unsafe to make the stability of the structure depend in any degree upon the stiffness of joints, we assume in our calcutations that all the joints are perfectly smooth, and therefore that the force acting on the end of any link passes through the axis of the joint.

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The axes of the joints of the structure are represented by points in the diagram of the frame.

The link which connects two joints in the actual struc- ture may be of any shape, but ix the diagram of the frame it is represented by a straight line joining the points repre- senting the two joints.

If no force acts on the link except the two forces acting through the centres of the joints, these two forces must be equal and opposite, aud their direction must coincide with the straight line joining the centres of the joints.

If the force acting on either extremity of the link is directed towards the other extremity, the stress on the link is called pressure and the link is called a strut. If it is directed away from the other extremity, the stress on the link is called tension and the link is called a tie.

In this case, therefore, the only stress acting in a link is a pressure ora tension in the direction of the straight line which represents it in the diagram of the frame, and all that we have to do is to find the magnitude of this stress.

In the actual structure, gravity acts on every part of the link, but in the diagram we substitute for the actual weight of the different parts of the link, two weights which have the same resultant acting at the extremities of the link.

We may now treat the diagram of the frame as composed of links without weight, but loaded at each joint with a weight made up of portions of the weights of all the links which meet in that joint.

If any link has more than two joints we may substitute for it in the diagram an imaginary stiff frame, consisting of links, each of which has only two joints.

The diagram of the frame is now reduced to a system of points, certain pairs of which are joined by straight lines, and each point is in general acted on by a weight or other force acting between it and some point external to the system.

To complete the diagram we may represent these external forces as links, that is to say, straight lines joining the points of the frame to points external to the frame. Thus each weight may he represented by a link joining the point of application of the weight with the centre of the earth.

_ But we can always construct an imaginary frame having its joints in the lines of action of these external forces, and this frame, together with the real frame and the links Tepresenting external forces, which join points in the one frame to points in the other frame, make up together a complete self-strained system in equilibrium, consisting of pomts connected by links acting hy pressure or tension. We may in this way reduce any real structure to the case of a system of points with attractive or repulsive forces acting between certain pairs of these points, and keeping them in equilibrium.

_ Tbe direction of each of these forces is sufficiently Indicated by that of the line joining the points, so that we have only to determine its magnitude.

We might do this by calculation, and then write down on each link the pressure or the tension which acts in it. We should in this way obtain a mixed diagram in which the stresses are represented graphically as regards direction aud position, but symbolically as regards magnitude.

ut we know that a force may be represented in a purely graphical manner by a straight line in the direction of the foree containing as many units of length as there are units ot force in the force. The end of this line is marked with an arrow head to show in which direction the force acts.

According to this method each force is drawn in its Proper position in the diagram of configuration of the frame, Such a diagram might be useful as a record of the result of calculation of the magnitude of the forces, but it

wvuld be of no use in enabling us to test the correctness of the calculation.

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But we have a graphical method of testing the equilibrium of any set of forces acting at a point. We draw in series a set of lines parallel and proportional to these forces. If these lines form a closed polygon the forces

are in equilibrium. We might in this way form a series of polygons of forces, one for each joint of the frame. But in so doing we give up the principle of draw- ing the line representing a force from the point of applica- tion of the force, for all the sides of the polygon cannot pass through the same point, as the forces do.

We also represent every stress twice over, for it appears as a side of both the polygons corresponding to the two joints between which it acts.

But if we can arrange the polygons in such a way that the sides of any two polygons which represent the same stress coincide with each other, we may form a diagram in which everystress is represented indirection and magnitude, though not in position, by a single line which is the com- mon boundary of the two polygons which represent the joints at the extremities of the corresponding piece of the frame.

We have thus obtained a pure diagram of stress in which no attempt is made to represent the configuration of the material system, and in which every force is not only represented in direction and magnitude by a straight line, but the equilibrium of the forces at any joint is manifest by inspection, for we have only to examine whether the corresponding polygon is closed or not. :

The relations between the diagram of the frame and the diagram of stress are as follows :—

To every link in the frame corresponds a straight line in the diagram of stress which represents in magnitude and direction the stress acting in that link.

To every joint of the frame corresponds a closed polygon in the diagram, and the forces acting at that joint are represented by the sides of the polygon taken in a certain cyclical order. The cyclical order of the sides of the two adjacent polygons is such that their common side is traced in opposite directions in going round the two polygons.

The direction in which any side of a polygon is traced is the direction of the force acting on that joint of the frame which corresponds to the polygon,

and due to that link of the frame which corresponds to the side.

This determines whether the stress of the link is a pressure or a tension.

If we know whether the stress of any one link is a pressure or a tension, this determines the cyclical order of the sides of the two polygons corresponding to the ends of the links, and therefure the cyclical order of all the poly- gons, and the nature of the stress in every link of the frame.

Definition of Reciprocal Diagrams.

When to every point of concourse of the lines in the dia- gram of stress corresponds a closed polygon in the skeleton of the frame, the two diagrams are said to be reciprocal.

The first extensions of the method of diagrams of forces to other cases than that of the funicular polygon were given by Rankine in his Applied Mechanics (1857). The method was independently applied to a large number of cases by Mr W. P. Taylor, a practical draughtsman in the office of the well-known contractor Mr J. B. Cochrane, and by Professor Clerk Maxwell in his lectures in King's College, London. In the Phil. Mag. for 1864 the latter pointed out the reciprocal properties of the two diagrams, and in a paper on " Reciprocal Figures, Frames, and Diagrams of Forces," Trans. R. S. Edinburgh, vol. xxvi. (1870), he showed the relation of the method to Airy's function of stress and to other mathematical methods.

Professor Fleeming Jenkin has given a number of appli- = of the method to practice (Trans. 22. S. Edin., vol. XXV.

Cremona (Ze figure reciproche nella statica grafica, Milan, 1872) has deduced the construction of reciprocal figures from the theory of the two components of a wrench as developed by Mobius.

Culmann, in his Graphische Statik, makes great use of diagrams of forces, some of which, however, are not reciprocal.

M. Maurice Levy in his Stateque Graphique (Paris, 1874) has treated the whole subject in an elementary but copious manner.

Mr R. H. Bow, C.E., F.R.S.E., in his work on Zhe Economics of Construction in relation to Framed Structures, 1873, has materially simplified the process of drawing a diagram of stress reciprocal to a given frame acted on by a system of equilibrating external forces.

Instead of lettering the joints of the frame, as is usually done, or the links of the frame, as was the writer's custom, he places a letter in each of the polygonal areas inclosed by the links of the frame, and also in each of the divisions of surrounding space as separated by the lines of action of the external forces.

When one link of the frame crosses another, the point of apparent intersection of the links is treated as if it were a real joint, and the'stresses of each of the intersccting links are represented twice in the diagram of stress, as the opposite sides of the parallelogram which corresponds to the point of intersection.

Fig. 2.—Diagram of Stress.

This method is followed in the lettering of the diagram of configuration (fig. 1), and the diagram of stress (fig. 2) of the linkwork which Professor Sylvester has called a quadruplane.

In fig. 1 the real joints are distinguished from the places where one link appears to cross another by the little circles O, P, Q, R, 8, T, V.

The four links RSTV form a "contraparallelogram " in which RS =TV and RV=ST.

The triangles ROS, RPV, TQS are similar to each other. A fourth triangle (TNV), not drawn in the figure, would complete the quadruplane. The four points O, P, N, Q form a parallelogram whose angle POQ is constant and equal to a-SOR. The product of the distances OP and OQ is coustant.

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DIAGRAMS

The linkwork may be fixedat O. If any figure is traced by P, Q will tracé the inverse figure, but turned round 0 through the constant angle POQ.

In the diagram forces Pp, Qq are balanced by the force Oo at the fixed point. The forces Pp and Qq are necessarily inversely as OP and OQ, and make equal angles with those lines.

Every closed area formed by the links or the external forces in the diagram of configuration is marked by a letter which corresponds to a point of concourse of lines in the diagram of stress.

The stress in the link which is the common boundary of two areas is represented in the diagram of stress by the line joining the points corresponding to those areas.

When a link is divided into two or more parts by lines crossing it, the stress in .each part is represented by a different line for each part, but as the stress is the same throughout the link these lines are all equal and parallel Thus in the figure the stress in RV is represented by the four equal and parallel lines HI, FG, DE, and AB.

If two areas have no part of their boundary in common the letters corresponding to them in the diagram of stress are not joined by a straight line. If, however, a straight line were drawn between them, it would represent in direc- tion and magnitude the resultant of all the stresses in the links which are cut by any line, straight or curved, joining the two areas.

For instance the areas F and C in fig. 1 have no common boundary, and the points F and C in fig. 2 are not joined by a straight line. But every path from the area F to the area C in fig. 1 passes through a series of other areas, and each passage from one area into a contiguous area cor- responds to a line drawn in the diagram of stress. Hence the whole path from F to C in fig. 1 corresponds to a path formed of lines in fig. 2 amd extending from F to C, and the resultant of all the stresses in the links cut by the path is represented by FC in fig. 2.

Automatic Description of Diagrams.

There are many other kinds of diagrams in which the two co-ordinates of a point in a plane are employed to indicate the simultaneous values of two related quantities.

If a sheet of paper is made to move, say horizontally, with a constant known velocity, while a tracing point is made to move in a vertical straight line, the height varying as the value of any given physical quantity, the point will fiftce out a curve on the paper from which the value of that quantity at any given time may be determined.

This principle is applied to the automatic registration of phenomena of all kinds, from those of meteorology and terrestrial magnetism to the velocity of cannon-shot, the vibrations of sounding bodies, the motions of animals, voluntary and involuntary, and the currents in electric telegraphs.

Indicator Diagram. ©

In Watt's indicator for steam engines the paper does not move with a constant velocity, but its displacement is proportional to that of the piston of the engine, while that of the tracing point is proportional to the pressure of the steam. Hence the co-ordinates of a point of the curve traced on the diagram represent the volume and the pressure of the steam in the cylinder. The indicator- diagram not only supplies a record of the pressure of the steam at each stage of the stroke of the engine, but indl- cates the work done by the steam in each stroke by the area inclosed by the curve traced on the diagram.

The indicator-diagram was invented by James Watt as @ inethod of estimating the work done by an engine. It was afterwards used by Clapeyron to illustrate the theory of

heat, and this use of it was greatly developed by Rankine in his work on the steam engine.

The use of diagrams in thermodynamics has been very completely illustrated by Prof. J. Willard Gibbs (Connec-

tieut Acad. Scz., vol. iii.), but though his methods throw much light on the general theory of diagrams as a method of study, they belong rather to thermodynamics than to the present subject. (5..¢. M.)

BLAL LING

DIALLING, sometimes called gnomonics, is a branch of applied mathematics which treats of the construction of sun-dials, that is, of those instruments, either fixed or portable, which determine the divisions of the day by the motion of the shadow of some object on which the sun's rays fall.

It must have been one of the earliest applications of a knowledge of the apparent motion of the sun ; though for a long time men would probably be satisficd with the division into morning and afternoon as marked by sun-rise, sun-set, and the greatest elevation.

History.—The earliest mention of a sun-dial is found in Isaiah xxxvili. 8: " Behold, I will bring again the shadow of the degrees which is gone down in the sun-dial of Ahaz ten degrees backward." The date of this would be about 700 years before the Christian era, but we know nothing of the character or construction of the instrument.

The earliest of all sun-dials of which we have any certain knowledge was the hemicycle, or hemisphere, of the Chal- dean astronomer Berosus, who probably lived about 340 B.c. It consisted of a hollow hemisphere placed with its rim perfectly horizontal, and having a bead, or globule, fixed in any way at the centre. So long as the sun remained above the horizon the shadow of the bead would fall on the inside of the hemisphere, and the path of the shadow during the day would be approximately a circular are. This arc, divided into twelve equal parts, deter- mined twelve equal intervals of time for that day. Now, supposing this were done at the time of the solstices and equinoxes, and on as many intermediate days as might be considered sufficient, and then curve lines drawn through the corresponding points of division of the different arcs, the shadow of the bead falling on one of these

curve lines would mark a division of time for that day, and thus we should have a sun-dial which would divide each period of daylight into twelve equal parts.

_ These equal parts were called temporary hours; and, since the duration of daylight varies from day to day, the temporary hours of one day would differ from those of another ; but this inequality would probably be disregarded at that time, and especially in countries where the variation between the longest summer day and the shortest winter day is much less than in our climates.

The dial of Berosus remained in use for centuries. The Arabians, as appears from the work of Albategnius, still followed the same construction about the year 900 a.p. Four of these dials have in modern times been found in Italy, One, discovered at Tivoli in 1746, is supposed to have belonged to Cicero, who, in one' of his letters, says that he had sent a dial of this kind to his villa near Tusculum. The second and third were found in 1751— one at Castel-Nuovo, and the other at Rignano; and a fourth was found in 1762 at Pompeii. G. H. Martini, the author of a dissertation in German on the dials of the ancients, says that this dial was made for the latitude of Memphis ; it may therefore be the work of Egyptians, per- haps constructed in the school of Alexandria.

It is curious that no sun-dial has been found among the antiquities of Egypt, and their sculptures give no indication of any having existed. It has, however, been supposed that the numerous obelisks found everywhere were erected in honour of the sun and employed as gnomons.

Herodotus has recorded that the Greeks derived from ' the Babylonians the use of the gnomon, but the great pro- gress made by the Greeks in geometry enabled them in later times to construct dials of great complexity, some of which remain to us, aud are proofs, not only of extensive knowledge, but also of great ingenuity.

Ptolemy's Syntaaxis treats of the construction of dials by means of his analemma, an instrument which solved a variety of astronomical problems. The constructions given by him were sufficient for regular dials, that is, horizontal dials, or vertical dials facing east, west, north, or south, and these

are the only ones he treats of. It is certain, however, that the ancients were able to construct declining dials, as is shown by that most interesting monument of ancient gnomonics—the Tower of the Winds—which is still in existence at Athens, This is a regular octagon, on the faces of which the eight principal winds are represented, and over them eight different dials—four facing the cardinal points and the other four facing the intermediate directions. The date of the dials is long subsequent to that of the tower ; for Vitruvius, who describes the tower in the sixth chapter of his first book, says nothing about the dials, and as he has described all the dials known in his time, we must believe that the dials of the tower did not then exist. The tower and its dials are described by Stuart in his Antiquities of Athens. The hoursare still the temporary hours, or, as the Greeks called them, jectemoria.

As already stated, the learning and ingenuity of the Greeks enabled them to construct dails of various forms— among others, dials of suspension intended for travellers ; but these are only spoken of and not explained; they may have been like our ring-dials.

The Romans were neither geometers nor astronomers, and the science of gnomonics did not flourish among them. The first sun-dial erected at Rome was in the year 290 B.c., and this Papirius Cursor had taken from the Samnites. A dial which Valerius Mcssala had brought from Catania, the latitude of which is five degrees less than that of Rome, was placed in the forum in the year 261 B.c. The first dial actually constructed at Rome was in the year 164 B.c., by order of Q. Marcius Philippus, but, as no other Roman has written on gnomonics, this was perhaps the work of a foreign artist. If, too, we remember that the dial found at Pompeii was made for the latitude of Mem- phis, and consequently less adapted to its position than that of Catania to Rome, we may infer that mathematical knowledge was not cultivated in Italy.

The Arabians were much more successful.. They attached great importance to gnomonics, the principles of which they had learned from the Greeks, but they greatly simplified and diversified the Greek constructions. One of their writers, Abul-Hassan, who lived about the beginning of the 13th century, taught them how to trace dials on cylindrical, conical, and other surfaces.

He even intro- duced equal or equinoctial hours, but the idea was not sup- ported, and the temporary hours alone continued in use.

Where or when the great and important step already conceived by Abul-Hassan, and perhaps by others, of reckoning by equal hours was generally adopted cannot now be determined. The history of gnomonics from the 13th to the beginning of the /6th century is almost a blank, and during that time the change took place. We

ean see, however, that the change would necessarily follow the introduction of clocks and other mechanical methods of measuring time ; for, however imperfect these were, the hours they marked would be of the same length in summer and in winter, and the discrepancy between these equal hours and the temporary hours of the sun-dial would soon be too important to be overlooked. Now, we know that a balance clock was put up in the palace of Charles V. of France about the year 1370, and we may reasonably sup- pose that the new sun-dials came into general use during the 14th and 15th centuries.

Among the earliest of the modern writers on gnomonics must be named Sebastian Munster, a cordelier who pub- lished his Horologiographia at Basel in 1531. He gives a number of correct rules, but without demonstrations. Among his inventions was a moon-dial,! but this does not admit of much accuracy.

During the 17th century dialling was discussed at great xength by all writers on astronomy. Clavius devotes a quarto volume of 800 pages entirely to the subject. This was published in 1612, avd may be considered to contain all that was known at that time.

In the 18th century clocks and watches began to supersede sun-dials, and these have gradually fallen into disuse except as an additional ornament to a garden, or in remote country districts where the old dial on the church tower still serves as an occasional check on the modern clock by its side. The art

of constructing dials may now be looked upon as little more than a mathematical recrea- tion,

General Principles—The diurnal and the annual motions of the earth are the elementary astronomical facts on which dialling is founded. That the earth turns upon its axis uniformly from west to east in 24 hours, and that it is carried round the sun in one year at a nearly uniform rate, is, we know, the correct way of expressing these facts. But the effect will be precisely the same, and it will suit our purpose better, and make onr explanations easier, if we adopt the ideas of the ancients, of which our senses furnish apparent confirmation, and assume the earth to be fixed. Then, the sun and stars revolve round the earth's axis uniformly from east to west once a day,—the sun lagging a little behind the stars, making its day some 4 minutes longer, so that at the end of the year it finds itself again in the same place, having made a complete revolution of tbe heavens relatively to the stars from west to east.

The fixed axis about which all these bodies revolve daily is a line through the earth's centre; but the radius of the earth is so small, compared with the enormous distance of the sun, that, if we draw a parallel axis through any point of the earth's surface, we may safely look on that as being the axis of the celestial motions. The error in the case of the sun would not, at its maximum, that is, at 6 A.M. and 6 P.M., exceed half a second of time, and at noon would vanish,

An axis so drawn is in the plane of the meridian, and points, as we know, to the pole,—its elevation being equal to the latitude of the place.

The diurnal motion of the stars is strictly uniform, and so would that of the sun be if the daily retardation of about 4 minutes, spoken of above, were always the same. But this is constantly altering, so that the time, as measured by the sun's motion, and also consequently as measured by a sun-dial, does not move on at a strictly uniform pace. This irregularity, which is slight, would be of little con- Sequence in the ordinary affairs of life, but clocks and

1 Tn one of the Courts of Queen's College, Cambridge, there is an elaborate sun-dial dating from the end of the 17th or beginning of the 18th century,

and around it a series of numbers which make it avail- able as a moon-dial when the moon’s age is known.

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watches being mechanical measures of time could not, except by extreme complication, be made to follow this irregularity, even if desirable, which is not the case,

The clock is constructed to mark uniforni time in gych wise that the length of the clock day shall be the average of all the solar days in the year. Four times a year the clock and the sun-dial agree exactly ; but the sun-dial, now going a little slower, now a little faster, will be some. times behind, sometimes before the clock—-the greatest accumulated difference being about 16 minutes for a few days in November, but on the average much less. The four days on which the two agree are April 15, June 15, September 1, and December 24.

Clock-time is called mean time, that marked by the sun- dial is called apparent time, and the difference between them is the equatzon of time. It is given in most calendars and almanacs, frequently under the heading “ clock slow,” ‘clock fast.” When the time by the sun-dial is known, the equation of time will at once enable us to obtain the corresponding clock time, or vice versa.

Atmospheric refraction introduces another error, by altering the apparent position of the sun ; but the effect is too small to need consideration in the construction of an instrument which, with the best workmanship, does not after all admit of very great accuracy.

The general principles of dialling will now be readily understood. The problem before us is the following :— A rod, or style, as itis called, being firmly fixed in a direction parallel to the earth’s axis, we have to find how and where points or lines of reference must be traced on some fixed surface behind the style, so that when the shadow of the style falls on a certain one of these lines we may know that at that moment it is solar noon,—that is,

that the plane through the style and through the sun then coincides with the meridian ; again, that when the shadow reaches the next line of reference, it is 1 o’clock by solar time, or, which comes to the same thing, that the above plane through the style and through the sun has just turned through the twenty-fourth part of a complete revolution ; and so on for the subsequent lours,—the hours before noon being indi- cated in a similar manner. The style and the surface on which these lines are traced together constitute the dial.

The position of an intended sun-dial having been selected —-whether on church tower, south front of farm-stead, or garden wall—the surface must be prepared, if necessary, to receive the hour-lines.

The chief, and in fact the only practical difficulty will be the accurate fixing of the style, for on its accuracy the value of the instrument depends.

It must be in the meridian plane, and must make am angle with the horizon equal to the latitude of the place. The latter condition will offer no difficulty, but the exact determination of the meridian plane which passes through the point where the style is fixed to the surface is not $0 simple. We shall, further on, show how this may be done; and, in the meantime, we shall assume that we have found the true position, and have firmly fixed the style to the dial and secured it there by cross wires, or by other means The style itself will be usually a strong metal wire whose thickness may vary with circumstances; and when We speak of the shadow cast by the style it must always be understood that the middle line of the thin band of shade is meant,

The point where the style mects the dial is called the centre of the dial. It is the centre from which all the hour-lines radiate.

The position of the xi o’clock line is the most important to determine accurately, since all the others are usually made to depend on this one, We cannot trace it correctly

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on the dial until the style has been itself accurately fixed in itg proper place, as will be explained hereafter. When that is done the x11 o’clock line will be found by the inter- section of the dial surface with the vertical plane which contains the style ; and the most simple way of drawing it on the dial will be by suspending a plummet from some

oint of the style whence it may hang freely, and waiting until the shadows of both style and plumb line coincide on the dial. ‘his single shadow will be the x11 o’clock line.

In one class of dials, namely, all the vertical ones, the xm o’clock line is simply the vertical line from the centre ; it can, therefore, at once be traced on the dial face. by using a fine plumb line.

The xit o’clock line being traced, the easiest and most accurate method of tracing the other hour lines would: at the present day when good watches are common, be by marking where the shadow of the style falls when 1, 2, 3, &e., hours have elapsed since noon, and the next morning by the same means the forenoon hour lines could be traced ; and in the same manner the hours might be subdivided into halves and quarters, or even into minutes.

But formerly, when watches were not, the tracing of the 1, U, 1, &c. o’clock lines was done by calculating the angle which each of these lines would make with the xm o’clock line. Now, except in the simple cases of a horizontal dial or of a vertical dial facing a cardinal point, this would require long and intricate calculations, or elabor- ate geonietrical constructions, implying considerable mathe- matical knowledge, but also introducing increased chances of error. ‘The chief source of error would lie in the uncer- tainty of the data; for the position of the dial-plane would have to be found before the calculations began,— that is, it would be necessary to know exactly by how many degrees it declined from the south towards the east or west, and by how many degrees it inclined from the vertical. The ancients, with the means at their disposal, could obtain these results only very roughly.

: Dials received different names according to their posi-

ion ;—

Horizontal dials, when traced on a horizontal plane ;

_ Vertical dials, when on a vertical plane facing one of the cardinal points ;

Vertical declining dials, on a vertical plane not facing a cardinal point ;

Inclining dials, when traced on planes neithei vertical nor horizontal (these were further distinguished as reclin- ing when leaning backwards from an observer, proclining when leaning forwards) ;

_ Lquinoctial dials, when the plane is ut right angles to the earth’s axis, &c. dc. :

_We shall limit ourselves to an investigation of the simplest and most usual of these cases, referring the reader, for further details, to the later works given at the end of this article.

Dial Construction.—A. very correct view of the problem of dial construction may be obtained as follows :-—

Conceive a transparent cylinder (fig. 1) having an axis AB

arallel to the axis of the earth. On the surface of the cylinder et equidistant generating lines be traced 15° apart, one of

them x1I…x1 being in the meridian plane through AB, and the others I…1, T1…01, &e., following in the order of the sun’s motion. °

Then the shadow of the line AB will obviously fall on the line XII...XII at apparent noon, on the line I…1 at one hour after noon, On Ij…11 at two hours after noon, and so on. If now the cylinder th cut by any plane MN representing the plane on which the dial is to be traced, the shadow of AB will be intercepted by this plane, and fall on the lines Axrr, At, AI, &c.

€ construction of the dial consists in determining the angles

made by Ar, Ait, &c. with Axi; the line Axi itself, being in the.vertical plane through AB, may be supposed known.

_ For the purposes of actual calculation, perhaps a trans-

parent sphere will, with advantage, replace the cylander, and we shall here apply it to calculate the angles made by the hour line with the xir o’clock line in the two cases of a horizontal dial and of a vertical south dial.

Horizontal Dial.—Let PEp (fig. 2), the axis of the supposed transparent sphere, be directed towards the north and south poles of the heavens. Draw the two great circles, HMA, QMa,

—— SS ae SS —- aes

_—

SP

\ \,

SS

Se 7] > \4 >,

the former horizontal, the other perpendicular to the axis Pp, and therefore coinciding with the plane of the equator. Let EZ be vertical, then the circle QZP will be the meridian, and by its intersection A with the horizontal will determine the XII o’clock line EA. Next divide the equatorial circle QMa into 24 equal parts ab, be, cd, &c. .. . of 15° each, beginning from the meridian Pa, and through the various points of division and the poles draw the great circles Php, Pep, &c. . . – These will exactly correspond to the equidistant generating lines on the cylinder in the previous construction, and the shadow of the style will fall on these circles after successive intervals of 1, 2, 8, &c. hours from noon. If they meet the horizontal in the points B, C, D, &e., then EB, EC, ED, &. . . . will be the 1, I, Il, &e., hour lines required ; and the problem of the horizontal dial consists in calculating the angles which these lines make with the x11 o’clock line EA, whose position is known. The spherical triangles PAB, PAG, &c., enable us to do

this readily. They are all right-angled at A, the side PA is the latitude of the place, and the angles APB, APO, &c., are respectively 15°, 30°, &., then

tan. AB=tan. 15° sin. latitude, ~ tan. AC=tan. 30° sin. latitude, &e.., eC,

: i a These determine the: sides AB, AC, &c. that is, the angles AEB, AEC, &c., required.

For examples, let us find the angles made by the 1 o’clock line at the following places—Madras, London, Edinburgh, and Hammer- fest (Norway).

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Madras (18° 4’ N. lat.) London (51° 30’ N, lat.) Log. tan. 15°..... 9°42805 | Log. tan. 15°..... 9°42805 Log. Bim. 13° 4 5. .cie. 9°35427 ! Log. sin. ol” SOs 9°89854

Log. tan. 3° 28’..... 8°78232 | Log. tan. 11° 51’.....9°32159 Edinburgh (55° 57’ N. lat.) Hammerfest (73° 40’ N. lat.) Huo. tans WS nce > 9°42805 | Log. tan. 15°..... 9°42805 Log. sin. 55° 57’.....9°91832 | Log. sin. 78° 40’.....9°98211

Log. tan. 12° 81’.....9°84687 | Log. tan. 14°.25’.....9°41016

Thus the 1 o’clock hour line EB must make an angle ona Madras dial of only 3° 28’ with the meridian EA, 11° 51’ on a London dial, 12° 81’ at Edinburgh, and 14° 25’at Hammerfest. In the same way may be found the angles made by the other hour lines.

The calculations of these angles must extend throughout one quadrant from noon to vio’clock, but need not be carried further, because all the other hour-lines can at once be deduced from these. —In the first place the dial is symmetrically divided by the meridian, and therefore two times equidistant from noon will have their hour lines equidistant from the meridian ; thus the x1 o’clock line and the 1 o’clock line must make the same angles with it, the x1 o’clock the came as the 11 o’clock, and so on. And uext, the 24 great circles, which were drawn to determine these lines, are in reality only 12;

for clearly the great circle which gives I o’clock after midnight, and that which gives 1 o’clock after noon, arc one and the same, and so also for the other hours. Therefore the hour lines between vi in the evening and v1 the next morning are the prolongations of the remaining twelve.

Let us now remove the imaginary sphere with all its circles, and retain only the style EP and the plane HMA with the lines traced on it, and we shall have the horizontal dial.

On the longest day in London the sun rises a little after 4 o’clock, and sets a little before 8 o’clock ; there is there- fore no necessity for extending a London dial beyond those hours. At Edinburgh the limits will be a little longer, while at Hammerfest, which is within the Arctic circle, the whole circuit will be required.

Instead of a wire style it is often more convenient to us a metal plate from one quarter to half an inch in thickness. This plate, which is sometimes in the form of a right-angled triangle, must have an acute angle equal to the latitude of the place, and, when properly fixed in a vertical position on the dial, its two faces must coincide with the meridian plane, and the sloping edges formed by the thickness of the plate must point to the pole and form two parallel styles. Since there are two styles, there must be two dials, or rather two half dials, because a little consideration will show that, owing to the thickness of the plate, these styles will only one at a time cast a shadow. Thus the eastern edge will give the shadow for all hours before 6 o’clock in the morning. [rom 6 o’clock until noon the western edge will be used. At noon, it will change again to the eastern edge until 6 o’clock in the evening, and finally the western edge for the remaining hours of daylight.

The centres of the two dials will be at the points where the styles meet the dial face; but, in drawing the hour- lines, we must be careful to draw only those lines for which the corresponding style is able to givea shadow as explained above. The dial will thus have the appear- ance of a single dial plate, and there will be no confusion (see : fig. 3). ¢ _ The line of demarcation between the shadow and the light will be better defined than when’ a wire style is used ; but the indications by this double dial will always be one minute too fast in the morning and one minute too slow in the afternoon. This is owing to the magnitude of the

sup, whose angular breadth is half a degree. The well. defined shadows are given, not by the centre of the sun,ag we should require them, but by the forward limb in the morning and by the backward one in the afternoon; and the sun takes just about a minute to advance through a space equal to its half-breadth.

Dials of this description are frequently met with in the country. Placed on an ornamental pedestal some 4 feet high, they form a pleasing and useful addition to a lawn or to a garden terrace. The dial plate is of metal as well as the vertical piece upon it, and they may ke purchased ready for placing on the pedestal,—the dial with all the hour-lines traced on it, and the style-plate firmly fastened in its proper position, if not even cast in the same piece with the dial-plate.

When placing it on the pedestal care must be taken that the dial be perfectly horizontal and accurately oriented, The levelling will be done with a spirit-level, and the orien- tation will be best effected either in the forenoon or in the afternoon, by turning the dial-plate till the time given by the shadow (making the one minute ccrrection mentioned above) agrees with a good watch whose error on solar time is known. It is, however, important to bear in mind that a dial, so built up beforehand, will have the angle at the base equal to the latitude of some selected place, such as London, and the hour-lines will be drawn in directions calculated for the same latitude. Such a dial can therefore not be used near Edinburgh or Glasgow, although it would, without appreciable error, be adapted to any place whose latitude did not differ more than 20 or 30 miles from that of London, and it would be safe to employ it in Essex, Kent, or Wiltshire.

Ifa series of such dials were constructed, differing by 30 miles in latitude, then an intending purchaser could select one adapted to a place whose latitude was within 15 miles of his own, and the error of time would never exceed a small fraction of a minute. The following table will enable us to check the accuracy of the hour-lines and of the angle of the style—all angles on the dial being readily measured with an ordinary protractor. It extends from 50° lat. to 594° lat., and therefore includes the whole of Great Britain and Ireland :—

Lat, | Xi AM. | X.AM. | IX. A.M, /VJIL A.M.| VIL AM. : IPM. | I. P.M. | IL P.M./ IV. P.M. | V. P.M. 50° 0’) 11° 36’) 28° 51’| 87° 27’| 58° 0’| 70° 43’

ocoooooocoocoooooocooocoscococoocooS

Vertical South Dial.—Let us take again our imaginary trans parent sphere QZPA (fig. 4), whose axis PEp is parallel to the earth’s axis. Let Z be the zenith, and consequently, the great circle QZP the meridian. Through E, the centre of the sphere, draw a vertical plane facing south. This will cut the sphere 1 the great circle ZMA which, being vertical, will pass ‘ae the zenith, and, facing south, will be at right angles to the meridian. Let QMa be the equatorial circle, obtained by drawing a plane through E at right angles to the axis PEp. The lower portion Ep of the axis will be the style, the vertical line EA im

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the meridian plane will be the x11 o’clock line, and the hori- zontal line EM! will-be the vi o’clock line. Now, as in the pre- vious problem, divide the equatorial circle into 24 equal arcs of 15° each, beginning at @, viz., ab, bc, &c.,—cach quadrant aM, MQ, &c., containing six,—then through each point of division

and through the axis Pp draw a plane cutting the sphere in 24 equidistant great circles. As the sun revolves round the axis the shadow of the axis will successively fall on these circles at intervals of onc hour, and if these circles cross the vertical circle ZMA in the points A, B, C, &c., the shadow of the lower portion Ep of the axis will fall on the lines EA, EB, EC, &c., which will therefore be the required hour lines on the vertical dial, Ep being the style.

There is no necessity for going beyond the vi o’clock hour-line on each side of noon ; for, in the winter months the sun sets earlier than 6 o’clock, and in the summer months it passes behind the plane of the dial before that time, and is no longer available.

It remains to show how the angles AEB, AEC, &c., may be calculated.

The spherical triangles pAB, pAC, &c., will give us a simple tule, These triangles are all right-angled at A, the side pA, equal to ZP, is the co-latitude of the place, that is, the differ- ence between the latitude and 90°; and the successive angles ApB, ApC, &e. are 15°, 30°, &e., respectively. Then tan. AB=tan. 15° sin. co-latitude ; or more simply, tan. AB=tan. 15° cos. latitude, tan. AC=tan. 30° cos. latitude, &c., &c. and the ares AB, AC so found are the measure of the angles AEB, C, &e., required. We shall, as examples, calculate the 1 o'clock hour angle AEB

pa ii of the four places we had already taken in the horizontal

Log. tan. 14° 38'.....9°41666

Edinburgh (55° 57' N. Jat.) Log. tan. 15°.....9°42805 Log. cos, 55° 57'..... 9°74812

Log. tan..8° 32',..... 9°17617

London (51° 30' N, lat.) Lops tatl, Ws. ..s6<- 9°42805 Log. cos. 51° 30'..... 9°79415

Log. tan. 9° 28'.....9°22220

Hammerfest (73° 40' N, lat.) Lopes tamer sit. cs sc 9-42805 Log. cos. 73° 40'..... 9°44905

Log. tau, 4 19'..... 8°87710 |

In this case the angles diminish as the latitudes increase, the opposite result to that of the horizontal dial.

Inelining, Leclining, &c., Dials.—We shall not enter into the calculation of these cases. Our imaginary sphere being, as before supposed, constructed with its centre at the centre of the dial, and all the hour-circles traced upon it, the intersection of these hour-circles with the plane of the ee OUE-Circies: WIth the plane or the

: EM is obviously horizontal, since M is the intersection of two OzP, circles ZM, QM, each at right angles to the vertical plane

dial will determine the hour-lines just as in the previous cases ; but the triangles will no longer be right-angled, and the simplicity of the calculation will be lost, the chances of error being greatly increased by the difficulty of drawing the dial-plane in its true position on the sphere, since that true position will have to be found from obser- vations which can be only roughly performed.

In all these cases, and in cases where the dial surface is not a plane, and the hour-lines, consequently, are not straight lines, the only safe practical way is to mark rapidly on the dial a few points (one is sufficient when the dial face is plane) of the shadow at the moment when a good watch shows that the hour has arrived, and afterwards connect these points with the centre by a confinuous line. Of course the style must have been accurately fixed in its true position before we begin.

Equatorial Dial.—The name equatorial dial is given to one whose plane is at riglit angles to the style, and therefore parallel to the equator. Itis the simplest of all dials. A circle (fig. 5) divided into 24 equal arcs is placed at right angles to the style, and hour divisions are marked upon it. Then if care be taken that the style point accurately to the pole, and that the noon division coincide with the meridian plane, the shadow of the style will fall on the other divisions, each at its proper time. The divisions must be Fig. 5. marked on both sides of the dial, because the sun will shine on opposite sides in the summer and in the winter months, changing at each equinox.

To jind the Meridian Plane.—We have, so far, assumed the meridian plane to be accurately known ; we shall pro- ceed to describe some of the methods by which it may be found.

The mariner’s compass may be employed as a first rough approximation. It is well known that the needle of the compass, when free to move horizontally, oscillates upon its pivot and settles in a direction termed the magnetic meridian. This does not coincide with the true north and south line, but the difference between them is generally known with tolerable accuracy, and is called the variation of the compass. ‘The variation differs widely at different parts of the surface of the earth, being now about 20° W.

in London, 7° W. in New York, and 17° E. in San Francisco. Nor is the variation at any place stationary, though the change is slow. We said that now the variation in London is about 20° W. ; in 1837 it was about 24° W. ; and there is evena small daily oscillation which takes place about the mean position, but too small to need notice here.

With all these elements of uncertainty, it is obvious that the compass can only give a rough approximation to the position of the meridian, but it will serve to fix the style so that only a small further alteration will be necessary when a more perfect determination has been made.

A very simple practical method is the following :-—

Place a table (fig. 6), or other plane surface, in such a position that it may receive the sun’s rays both in the morning and in the afternoon. Then carefully level the surface by means of a spirit-level. This must be done very accurately, and the table in that position made perfectly secure, so that there be no danger of its shifting during the day.

Next, suspend a plummet SH from a point S, which must be rigidly fixed. The extremity H, where the plum- met just meets the surface, should be somewhere near the

middle of one end of the table. With H for centre, describe any number of concentric arcs of circles, AB, CD, EF, &e.

Fig. 6.

A bead P, kept in its place by friction, is threaded on the plummet line at some convenient height above H.

Every thing being thus prepared, let us follow the shadow of the bead P as it moves along the surface of the table during the day. It will be found to describe a curve ACE... . FDB, approaching the point H as the sun advances towards noon, and receding from it afterwards. (The curve-is aconic section —an hyperbola in these regions.) At the moment when it crosses the arc

AB, mark the point A; AP is then the direction of the sun, and, as AH is horizontal, the angle PAH is the altitude of the sun. In the afternoon mark the point B where it crosses the same arc; then the angle PBH is the altitude. But the right- angled triangles PHA, PHB are obvivusly equal; and the sun has therefore the same altitudes at those two instants, the one before, the other after noon. It follows that, ¢f the sun has not changed its declination during the interval, the two positions will be symmetrically placed one on each side of the meridian. Therefore, drawing the chord AB, and bisecting it in M, HM will be the meridian line.

Each of the other concentric arcs, CD, EF, &c., will furnish its meridian line. Of course these should all coincide, but if not, the mean of the positions thus found must be taken,

The proviso mentioned above, that the sun has not changed its declination, is scarcely ever realized ; but the change is slight, and may be neglected, except per- haps about the time of the equinoxes, at the end of March and at the end of September. Throughout the remainder of the year the change of declination is so slow that we may safely neglect it. The most favourable times are at the end of June and at the end of December, when the-sun’s declination is almost stationary. If the line HM be produced both ways to the edges of the table, then the two points on the ground vertically below those on the edges may be found by a plummet, and, if permanent marks be made there, the meridian plane, which is the vertical plane passing through these two points, will have its position perfectly secured.

Lo place the Style of a Dial in its True Position.— Before giving any other method of finding the meridian plane, we shall complete the construction of the dial, by showing how the style may now be accurately placed in its true position. The angle which the style makes with a hanging plumb-line, being the co-latitude of the place, is known, and the north and south direction is also roughly given by the mariner’s compass. The style may therefore

be already adjusted approximately—correctly, indeed, as to its inclination—but probably requiring a little horizontal motion east or west. Suspend a fine plumb-line from some point of the style, then the style will be properly

adjusted if, at the very instant of noon, its shadow falls exactly on the plumb-line,—or, whicli is the same thing, if both shadows coincide on the dial.

This instant of noon will be given very simply by the meridian plane, whose position we have secured by the two permanent marks on the ground. Stretch acord from the one mark to the other. This will not generally be horizontal, but the cord will be wholly in the meridian plane, and that is the only necessary condition. Next, suspend a plummet over the mark which is nearer to the sun, and, when the shadow of the plumb-line falls on the stretched cord, it is noon. A signal from the observer there to the observer at the dial enables the latter to adjust the style as directed above.

Other Methods of finding the Meridian Plane.—We have dwelt at some length on these practical operations because they are simple and tolerably accurate, aud bevause they want neither watch, nor sextant, nor telescope—nothing more, in fact, than the careful observation of shadow lines.

The polar star may also be employed for finding the meridian plane without other apparatus than plumb-lines, This star is now only about 1° 21’ from the pole ; if there- fore a plumb-line be suspended at a few feet from the observer, and if he shift his position till the star is exactly hidden by the line, then the plane through his eye and the plumb-line will never be far from the meridian plane. Twice in the course of the 24 hours the planes would be strictly coincident. This would be when the star crosses the meridian above the pole, and again when it crosses ib below. If we wished to employ the method of determin- ing the meridian, the times of the stars crossing would have to be calculated from the data in the Nautical Almanac, and a watch would be necessary to know when the instant arrived. The watch need not, however, be very accurate, because the motion of the star is so slow that an error of ten minutes in the time would not give an error of one- eighth of a degree in the azimuth.

The following accidental circumstance enables us to dis- pense with both calculation and watch. The right ascen- sion of the star 7 Urse Majoris, that star in the tail of the Great Bear which is farthest from the “ pointers,” happens to differ by a little more than 12 hours from the right ascension of the polar star. The great circle which joins the two stars passes therefore

close to the pole. When the polar star, at a distance of about 14° from the pole, is crossing the meridian above the pole, the star » Urse Majoris, whose polar distance ig about 40°, has not yet reached the meridian below the pole.

When y Urse Majoris reaches the meridian, which will be within half an hour later, the polar star will have left the meridian ; but its slow motion will have carried it only a very little distance away. Now at some instant between these two times—much nearer the latter than the former— the great circle joming the two stars will be exactly vertical ; and at this instant, which the observer determines by seeing that the plumb-line hides the two stars simultaneously, neither of the stars is strictly in the meridian ; but the deviation from it is so small that it may be neglected, and the plane through the eye and the plumb-line taken for meridian plane.

In all these cases it will be convenient, instead of fixing the plane by means of the eye and one fixed plummet, to have a second plummet at a short distance in front of the eye ; this second plummet, being suspended so as to allow of lateral shifting, must be moved so as always to be

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between the eye and the fixed plummet. The meridian plane will be secured by placing two permanent marks on the ground, one under each plummet.

This method, by means of the two stars, is only available for the upper transit of Polaris ; for, at the lower transit, the other star y Urse Majoris would pass close to or beyond the zenith, and the observation could not be made. Also the stars will not be visible when the upper transit takes place in the day-time, so that one-half of the year is lost to this method.

Neither could it be employed in lower latitudes than 40° N., for there the star would be below the horizon at its lower transit ;—-we may even say not lower than 45° N., for the star must be at least 5° above the horizon before it becomes distinctly visible.

There are other pairs of stars which could be similarly employed, but none so convenient as these two, on account of Polaris with its very slow motion

being one of the pair.

To place the Style i tts True Position without previous determination of the Meridian Plane.—The various methods given above for finding the meridian plane have for ultimate object the determination of the plane, not on its own account, but as an element for fixing the instant of noon, whereby the style may be properly placed.

We shall dispense, therefore, with all this preliminary work if we determine uoon by astronomical observation. For this we shall want a good watch, or pocket chronometer, and a4 sextant or other instrument for taking altitudes. The local time at any moment may be determined in a variety of ways by observation of the celestial bodies. The simplest and most practically useful methods will be found described and investigated in any good educational work on astronomy.

For our present purpose a single altitude of the sun taken in the forenoon will be most suitable. At some time in the morning, when the sun is high enough to be free from the mists and uncertain refractions of the horizon—but to insure accuracy, while the rate of increase of the altitude is still tolerably rapid, and, therefore, not later than 10 o'clock—take an altitude of the sun, an assistant, at the same moment, marking the time shown by the watch, The altitude so observed being properly corrected for refraction, parallax, é&c., will, together with the latitude of the place, and the sun's declination, taken from the Mautical Almanac, enable us to calculate the ume. This will be the solar or apparent time, that is, the very time we require ; and we must carefully abstain from applying the equation of time. Comparing the time so found with the time shown by the watch, we see at once by how much the watch is fast or slow of solar time 3; we know, therefore, exactly what time the watch must mark when solar noon arrives, and waiting for that instant we can fix the style in its proper position as explained before. _ We can dispense with the sextant and with all calculation and observation if, by means of the pocket chronometer, We bring the time from some observatory where the work is done ; and, allowing for the change of longitude, and also for the equation of time, if the time we have brought is clock time, we shall have the exact instant of solar noon as in the previous case.

In remote country districts a dial will always be of use to check and even to correct the village clock ; and the description and directions here given will, we think, enable any genious artisan to construct one.

, In former times the fancy of dialists seems to have run tot in devising elaborate surfaces on which the dial was to be traced. Sometimes the shadow was received on a cone, sometimes on a cylinder, or on a sphere, or on a combination of these. A universal dial was constructed of a figure in the shape of a cross; another universal dial

showed the hours by a globe and by several gnomons. These universal dials required adjusting before use, and for this a mariner's compass and a spirit-level were necessary. But it would be tedious and useless to enumerate the various forms designed, and, as a rule, the more complex the less accurate.

Another class of useless dials consisted of those with variable centres. 'They were drawn on fixed horizontal planes, and each day the style had to be shifted to a new position. Instead of hour-/ines they had hour-points ; and the style, instead of being parallel to the axis of the earth; might make any chosen angle with the horizon. There was no practical advantage in their use, but rather the reverse ; and they can only be considered as furnishing material for new mathematical problems.

Portable Dials.—The dials so far described have been fixed dials, for even the fanciful ones to which reference was just now made were to be fixed before using. There were, however, other dials, made generally of a small size, so as to be carried in the pocket ; and these, so long as the sun shone, roughly answered the purpose of a watch.

The description of the portable dial has generally been mixed up with that of the fixed dial, as if it had been merely a special case, and the same priuciple had been the basis of both; whereas there are essential points of difference between them, besides those which are at once apparent.

In the fixed dial the result depends on the uniform angular motion of the sun round the fixed style; and a small error in the assumed position of the

sun, whether due to the imperfection of the instrument, or to some small neglected correction, has only a trifling effect on the time. This is owing to the angular displacement of the sun being so rapid—a quarter of a degree every minute—that for thie ordinary affairs of life greater accuracy is not required, as a displacement of a quarter of a degree, or at any rate of one degree, can be readily seen by nearly every person. But with a portable dial this is no longer the case. The uniform angular motion is not now available, because we have no determined fixed plane to which we may refer it. In the new position, to which the observer has gone, the zenith is the only point of the heavens he can at once practically find ; and the basis forthe determination of the time is the constantly but very irregularly varying zenith distance of the sun.

At sea the observation of the altitude of a celestial body is the only method available for finding local time ; but the perfection which has been attained in the construction of the sextant (chiefly by the introduction of telescopes) enables the sailor to reckon on an accuracy of seconds instead of minutes. Certain precautions have, however, to be taken. ‘The observations must not be made within a couple of hours of noon, on account of the slow rate of change at that time, nor too near the horizon, on account of the uncertain refractions there ; and the same restrictions must be observed in using a portable dial. ;

To compare roughly the value (as to accuracy) of the fixed and the portable dials, let us take a mean position in Great Britain, say 54° lat., and a mean declination when the sun is in the equator. It will rise at 6 o’clock, and at noon have an altitude of 36°,—that is, the portable dial will indicate an average change of one-tenth of a degree in each minute, or two and half times slower than the fixed dial. The vertical motion of the sun increases, however, nearer the horizon, but even there it will be only one-eighth of a degree each minute, or half the rate of the fixed dial, which goes on at nearly the same speed throughout the day.

Portable dials are also much more restricted in the range of latitude for which they are available, and they should

not be used more than 4 or 5 miles north or south of the place for which they were constructed.

We shall briefly describe two portable dials which were in actual use.

Dial on a Cylinder.—A hollow cylinder of metal (fig. 7), 4 or 5 inches high, and about an inch in diameter, has a lid which admits of toler- ably easy rotation, A hole in the lid receives the style, shaped some- what like a bayonet ; and the straight part of the style, which, on account of the two bends, is lower than the lid, projects hori- zontally out from the cylinder to a distance of 1 or 14 inches, When not in use the style would be taken out and placed inside the cylinder.

A horizontal circle is traced on the cylin- der opposite the pro- jecting style, and this circle is divided into. 36 approximately equi- : distant intervals.! These intervals represent spaces of time, and to each division is assigned a date, so that each month has three dates marked as follows :—January 10, 20, 31; February 10, 20,28; March 10, 20, 31; April 10, 20, 30, and so on,—always the 10th, the 20th, and the last day of each month.

Through each point of division a vertical line parallel to the axis of the cylinder is drawn from top to bottom. Now it will be readily understood that if, upon one of these days, the lid be turned so as to bring the style exactly opposite the date, and if the dial be then placed on a horizontal table so as to receive sun-light, and turned round bodily until the shadow of tlie style falls exactly on the vertical line below it, the shadow will terminate at some definite point of this line, the position of which point will depend on the length of the style—that is, the distance of its end from the surface of the cylinder—and on the altitude of the sun at that instant. Suppose that the observations are continued all day, the cylinder being very gradually turned so that the style may always face the sun, and suppose that marks are made on the vertical line to show the extremity of the shadow at each exact hour from

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Fig 7.

sunrise to sunset—these times being taken from a good !

fixed sun dial,—then it is obvious that the next year, on the same date, the sun’s declination being about the same, and the observer in about the same latitude, the marks made the previous year will serve to tell the time all that day. } What we have said above was merely to make the principle of the instrument clear, for it is evident that this mode of marking, which would require a whole year’s sunshine and hourly observation, cannot be the method employed.

The positions of the marks are, in fact, obtained by calculation. Corresponding to a given date, the declination

4 Strict equality is not necessary, as the observations made are on the vertical line through each division-point, without reference to the others. It is not even requisite that the divisions should go completely and exactly round the cylinder, although they were always so drawn,

and both these con‘litions were insisted upon in the directions for the construction,

of the sun is taken from the almanac, and this, together with the latitude of the place and the length of the style, will constitute the necessary data for computing the length of the shadow, that is, the distance of the mark below the style for each successive hour.

We have assumed above that the declination of the sun is the same at the same date in different years. This is not quite correct, but, if the dates be

taken for the second year after leap year, the results will be sufficiently approxi- mate. The actual calculations will offer no difficulty.

When all the hour marks have been placed opposite to their respective dates, then a continuous curve, joining the corresponding hour-points, will serve to find the time for a day intermediate to those set down, the lid being turned till the style occupy a proper position between the two divisions. The horizontality of the surface on which the instrument rests is a very necessary condition, especially in summer, when, the shadow of the style being long, the extreme end will shift rapidly for a small deviation from the vertical, and render the reading uncertain. The dial can also be used by holding it up by a small ring in the top of the lid, and prcbably the verticality is better ensured in that way.

Portable Dial on a Card.—This neat and very ingenious dial is attributed by Ozanam to a Jesuit Father, De Saint Rigaud, and probably dates from the early part of the 17th century. Ozanam says that it was sometimes called the capuchin, from some fancied resemblance to a cowl thrown back.

Construction.—Draw a straight line ACB parallel ta the top of the card (fig. 8) and another DCE at right angles to it ; with C as

lak. 517°

Fig. 8.

centre, and any convenienttadius CA, describe the semi-circle AEB below the horizontal. Divide the whole are AEB into 12 equal parts at the points 7, s, ¢, &c., and through these points draw perpendl culars to the diameter ACB, these lines will be the hour lines, V2. the line through 7 will be the x1 ..1 line; the line through s the X…11 line, and so on; the hour line of noon will be the point

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itself ; by subdivision of the small arcs Ar, rs, st, &., we may draw the hour lines corresponding to halves and quarters, but this only where it can be done without confusion. ;

Draw ASD making with AC an angle equal to the latitude of the place, and let it meet EC in D, through which point draw FDG at right angles to AD. ; ; ;

With centre A, and any convenient radius AS, describe an are of circle RST, and graduate this arc by marking degree divisions on it, extending from 0° at S to 234° on each side at RandT. Next determine the points on the straight line FDG where radii drawn from A to the degree divisions on the are would cross it, and care- fully mark these crossings.

The divisions of RST are to correspond to the sun's declination, south declinations on RS and north declinations on ST. In the other hemisphere of the earth this wonld be reversed ; the north declinations would be on the upper half.

Now, taking a second year after leap year (because the declina- tions of that year are about the mean of each set of four years), find the days of the month when the sun has these different declina- tions, and place these dates, orso many of them as can be shown without confusion, opposite the corresponding marks on FDG. Draw the swn-line at the top of the card parallel to the line ACB ; and, near the extremity, to the right, draw any sniall figure intended to form, as it were, adoor of which 6 shall be the hinge. Care must be taken that this hinge is exactly at right angles to the sun-line. Make a fine open slit ¢ d right through the card and extending from the hinge to a short distance on the door,—the centre line of this slit coinciding accurately with the swn-line. Now, cut the door completely through the card ; except, of course, along the hinge, which, when the card is thick, should be partly cut through at the back, to facilitate the opening. Cut the card right through along the line IDG, and pass a thread carrying a little sos pam W and avery small bead P; the bead having sufficient

iction with the thread to retain any position when acted on only by its own weight, but sliding easily along the thread when moved by the hand. At the back of the card the thread terminates in a knet to hinder it from being drawn through ; or better, because giving more friction and a better hold, it passes through the centre of a smail dise of card—a fraction of an inch in diameter—and, by a knot, is made fast at the back of the disc.

To complete the construction,—with the centres F and G, and radii FA and GA, draw the two ares AY and AZ which will limit the hour lines; for in an observation the bead will always be found between them. The forenoon and afternoon hours may then be marked as indicated in the figure. The dial does not of itself dis- criminate between forenoon and afternoon ; but extraneous circum- stances, as, for instance, whether the sunis rising or falling, will settle

. that point, except when close to noon, where it will always be uncertain,

To rectify the dial (using the oid expression, which means to pre-

pare the dial for an observation),—open the ‘small door, by turning it about its hinge, till it stands well out in front. Next, set the thread in the line FG opposite the day of the month, and stretching — the point A, slide the bead P along til! it exactly coine:de with A. _ To find the hour of the day,—hold the dial in a vertical position in such a way that its plane may pass through the sun. The verti- cality is ensured by seeing that the bead rests against the card without pressing. Now gradually tilt the dial (without ltcring its vertieal plane), until the central line of sunshine, passing through the open slit of the door, just falls along the sun-line. The re line against which the bead P then rests indicates the ime,

The sun-line drawn above has always, so sar as we know, been used as a shadow-line. The upper edge of the rectangular door was the prolongation of the line, and, the door being opened, the dial was gradually tilted until the shadow cast by the upper edge exactly coincided with it. But this shadow tilts the card one- quarter of a degree more than the sun-line, because it is given by that portion of the sun which just appears above the edge, that is, by the upper limb of the sun, which is one-quarter of a degree higher than the centre. Now, even at some distance from noon, the sun will sometimes take a considerable time to rise one-quarter of a degree, and by so much time will the indication of the dial be 10 error. :

The central line of light which comes through the open slit will be free from this error, because it is given by light from the centre of the sun.

The card-dial deserves to be looked upon as something more than a meré toy. Its ingenuity and scientifie accuracy give it an educa- tional value which is not to be measured by the roughness of the results obtained, and the following demonstration of its correct- pa ~ if is hoped, usefully close what we have to say on this

ject.

Demonstration. —Let H (fig. 9) be the point of suspension of the Plummet at the time of observation, so that the angle DAH is the horth dectination of the sun, —P, the bead, resting against the hour-

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line VX. Join CX, then the angle ACX is the hour angle from noon given by the bead, and we have to prove tnat this honr-angle is tlie correct one corresponding to a north latioude DAC, a north declination AH and an altitude equal to the angle which the

Fig. 9.

sun-line, or its parallel AC, makes with the horizontal. PHQ will be eqtal to the altitude, if HQ be drawn parallel to DC, for the pair of lines HQ,HP will be respectively at right angles to the sun-line and the horizontal.

Draw PQ and HM parallel to AC, and let them meet DCE in M

The angle

and N respectively. Let HP and its equal HA be represented bya. Then the follow- ing values will be rdadily deduced from the figure :— AD = a cos. decl., DH =a sin. decl., PQ =a sin. alt. CX = AC = AD cos. lat. = cos. deci. cos. lat. PN = CV=CX cos. ACX =a cos. deel. cos. lat. cos. ACX, NQ =MH=DHsin.MDH =a sin. deci. sin. lat. (".' the angle MDH = DAC = latitude). And, since PQ=NQ+PN, we have, by simple substitution, a sin. alt. =a sin. deci. sin. lat. +a

cos. dee?. cos. lat. cos ACX or, dividing by throughout. sin. alt. =stn. decl. sin. lat. +cos. decl. cos. lat.cos. ACK... (At which equation determines the hour angle ACX shewn by the bead. To determine the hour-angle of the sun at the same moment, let

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ae

~ Fig. 10.

fig. 10 1epresent the celestial sphere, HR the horizon, P the pole, and Z the zenith, and § the sun,) VII, — 21

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he spherical triangle PZS, we have aaa Ba ae PS ot ZP+sin. PS sin. ZP cos. ZPS but ZS=zenith distance = 90° — altitude ZP=90°-PR = 90° — latitude | PS=polar distance =90° — declination. refore, by substitution an alt. ec. decl. sin. lat. +cos. deci. cos. lat. cos. ZPS. . . (B) and ZPS is the hour-angle of the sun.

A comparison of ge formule (A) and (B) shows that the hour-angle given by the bead will be the same as that given by the sun, and proves the theoretical accuracy of the ecard-dial. Just at sun-rise or at sun-set, the amount of refraction slightly exeeeds half a degree. If, then, a little cross m (see fig. 8) be made just below the sun-line, at a distance from it which would subtend half a degree at c, the time of sunset would be found eorrected for refrac- tion, if the central line of light were made to fall on cm.

The following list includes the principal writers on dialling whose works have come down to us, and to these we must refer for descriptions of the various constructions,

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DIAMANTE. The Italian fresco painter, commonly known as Fra Diamante, was born at Prato about 1400. He was a Carmelite friar, a member of the Florentine com- munity of that order, and was the friend and assistant of the more celebrated Filippo Lippi. The Carmelite convent of Prato which he adorned with many works in fresco has been suppressed, and the buildings have been altered toa degree involving the destruction of the paintings. He was the principal assistant of Fra Filippo in the grand frescoes which may still be seen at the east end of the cathedral of Prato. Inthe midst of the work he was recalled to Florence by his conventual superior, and a minute of proceedings of the commune of Prato is still extant, in which it is deter- mined to petition the metropolitan of Florence to obtain his return to Prato,—a proof that his share in the work was so important that his recall involved the suspension of it. Subsequently he assisted Fra Filippo in the execu- tion of the frescoes still to be seen in the cathedral of Spoleto, which Fra Diamante completed in 1470 after his master's death in 1469. Fra Filippo Jeft a son ten years old to the care of Diamante, who, having received 200 ducats from the commune of Spoleto, as the balance due for the work done in the cathedral, retuned with the child to Florence, and, as Vasari says, bought land for himself with the money, giving but a small portion to the child. The accusation of wrong-doing, however, would depend upon the share of the work executed by Fra Diamante, and the terms of his agreement with Fra Filippo. Fra Dia- mante must have been nearly seventy when he completed the frescoes at Spoleto, but the exact year of his deatlris not known.

See Relazione delle Pitture di Fra Filippo nel coro di Prato, by a "ee Baldanzi, Prato ; also the last edition of Vasari, Florence,

DIAMANTINA, formerly Tejuco, a town of Brazil, in the province of Minas-Geraes, is situated at an altitude of 5700 feet above sea-level, in a valley watered by affluents of the Jequitinhonha. Its streets are broad, and the houses are mostly of wood. The public structures include several churches, a theatre, barracks, three hospitals, and a school. The surrounding district is sterile, but is rich in minerals. The discovery of diamonds there was made in 1729. . Population about 7000, or, with that of the neighbouring

villages, 15,000. See Brazix, vol. iv. p. 224.

DIAMANTINO, a town of Brazil, in the province of Matto-Grosso, is situated close to the Diamantino river, ‘a ty a from its junction with the Paraguay, at ee 3 a cee of country, in 14° 24’ 33” S. lat. oe ’. long. The neighbourhood, which is

ile, yields diamonds and gold. Population about

some simple and direct, others fanciful aud intricate, which have been at different times employed :—

Ptolemy, Analemma, restored by Cominandine ; Vitruvius, Architecture ; Sebastian Munster, Horologiographia; Orontins Fineus, De Horologtts Solaribus; Mutio Oddi da Urbino, Horologi Solari; Dryander, De Lorologiorwm Compositione ; Conrad Gesner, Pandectee ; Andrew Schoner, Gnomonice ; F. Commandine, Horolo. giorum Descriptio ; Joan. Bapt. Benedictus, De Gnomonum Usu, Georgius Schomberg, Haxegesis Fundamentorum Gnomonicorum ; | Joan. Solomon de Caus, Horologes Solaires ; Joan. Bapt. Trolta, Praxis Horologiorum ; Desargues, Maniére Universclle pour poser U’Essiew, &e. ; Ath. Kireher, Ars magna Lucis et Umbra ; Hallum, Explicatio Horologit in Horto Regio Londini ; Joan. Mark, Practa. tus Horologiorum ; Clavius, Gnomonices de Horologitis.

Also among more modern writers, Deschales, Ozanam, Schottus, Wolfius, Picard, Lahire, Walper ; in German, Paterson, Michael, Miiller ; and among English writers, Foster, Wells, Collins, Lead- better, Jones, Leybourn, Emerson, and Ferguson. See also Meikle’s article in former editions of the present work. (HL. G.)

DIAMOND. This gem, the most highly valued and Hx», brilliant of precious stones, is also reniarkable for its | history and its peculiar physical and chemical properties, © Though uot always accurately distinguished from other — similar stones, it seems to have attracted notice ata very early period, especially in India, the chief source of supply — in ancient times. The old Jewish doctors regarded the — jahalom, the third in the second row

of stones in the — breast-plate of the high priest (Exod. xxxix. 11), as the diamond, and it is thus translated in the English and other versions. But as each stone bore the name of one of the | tribes, and there is no reason to believe that any method of polishing such hard stones, still less of engraving letters on them, was then known, the identification cannot be accurate. Among the Greeks it is first meutioned about three centuries B.c. under the name of adamas (éddpas),

“ the unsubduable,” referring to its hardness and power of resisting fire. The same name was previously given to metal highly valued from its extreme hardness for armour and weapons, and the twofold use of the term continued . long both in Greek and Latin. The name of the gem in our own and most modern languages is derived from this old naine, occurring in the form diamas in Albertus Magnus and other authors of the 13th century. Curiously enongh, — the French aimant, applied to the magnet, comes from the same term in its other signification of an ore or metal.

The fullest account of the adamas as a stone is found 0 Pliny, who says it exceeds in value all human things, and its nse was confined to kings, and to few even of them. He mentions six varieties, the most remarkable being the Indian and Arabian, of such unspeakable hardness that when struck with a hammer even the iron and anvil were torn asunder—“ ita respuentes ictum, ut ferrum utrinque dissultet, incudesque etiam ipsi dissiliant.” Tt also resisted the fire, and could only be subdued and broken down when dipped in fresh warm goat’s blood. Similar fables eon- tinued to prevail during the Middle Ages, and even yet have hardly vanished from popular belief. As an ornamental stone it was highly esteemed during the early times of the Roman empire, as some scandalous stories recorded by Juvenal testify, though only stones with naturally polished faces could be used. This fact is proved not only by the © words of Seneca—“ nee secari adamas aut cdi vel deter! potest””—and others, but from specimens of diamonds set 0 gold, with no artificial polishing, which have come down both from classic times and from the Middle Ages. This unworkable character long greatly limited both its use and its value ; and the more highly coloured rubies, and evel emeralds and sapphires, were often preferred to it. Tt was only after Ludwig van Berquen (or Berghem, as he is often named) in 1476 discovered the mode of cutting and polish-

re

ing it, that the diamond slowly regained the first place among gems. Even in the 16th century (1550), Benvenuto Cellini (Frattato dell' orificerto, cap. i.) assigns it only the third rank in value, estimating a perfect ruby of one carat weight as worth 800 scudi d'oro (each equal to about 4s.), a similar emerald at 400, an equal diamond at 100, and a sapphire at 10 scudi, In the same century the use of the diamond for cutting glass and engraving gems seems also to have become known.

The diamond always occurs in crystals of the tesseral or cubical system. Its most frequent forms are the octahedron, or double four-sided pyramid (fig. 1), the

®(hombie dodecahedron with twelve faces (fig. 2), and others with twenty-fonr (fig. 3), and forty-eight faces.

Fie, 1.—The Octahedron. Fic. 2.—Rhombic Dodecahedron.

expansion by heat is very small, the volume from the freezing to the boiling point of water only rising from 16 to 100000354. By friction it becomes positive electric. The so-called compact diamond or carbonado of the stone polishers, found as round grains or masses of one or two pounds weight in the washings near Bahia, of a brownish black colour and sp. g. =3:012 to 3-416, is porous diamond mixed with a small amount of other matter.

The optical properties of the diamond are also very remarkable. The purest stones, or those of the first watcr are highly. transparent and colourless. But more generally it is less transparent, and shows various tints, specially white, grey, or brown; more rarely blue, red, yellow, green; and very seldom black. Such stones, when the colours are pure, are often highly valued. It is also distinguished by its brilliant adamantine lustre. Newton, two centurics ago, remarked its high refractive power, and from this conjectured that it was.a substance of a peculiar nature. The index of refraction is 2°4135 for

the red rays, 2°4195 for the yellow, and 2°4278 for the green, This high refractive power, and the strong reflection at both surfaces, render it seldom completely transparent, but give it the high lustre for which it is valued as au ornament. They also produce the numerous internal reflections seen in the interior of cut stones, all the rays of light falling on the posterior surfaces at angles above 25° being totally reflected. Like all crystals of the same system it posscsses only simple refraction, but – Dr (Sir David) Brewster found that many showed traces of double refraction by their action on polarized light. This he ascribed to a peculiar tension produced in the interior of the stone during its formation, and a somewhat similar explanation is still adopted.

Optical properties.

Ina history of gems published early in the 17th century, Chemical Boetius de Boot conjectured that the diamond was an in- character flammable body. Robert Boyle, who iu 1664 described its and com

Vid. 3.—Triakisoctahedron, Fig. 4, —Hexakisoctahedron.

(fig. 4). The first form is most common in stones from India, the second in those from Brazil. Cubes also occur, but are rare, whilst the icositetrahedron has not been observed. Hitherto the diamond has been described as liemihedric, but Sadebeck from his own aud G. Rose's researches shows it to be holohedric (in the Berlin Monatsherichte, Oct. 1876). The faces are often curved, respec striated, or marked by stair-like inequalities, hiding = trueform. Many of the crystals also are round almost like spheres (fig. 5), or the smaller ones ' € grains of sand. This docs not arise, AILS lowever, from attrition during transport A by water, but is the original shape of the y stones, Macles, or twin-crystals, specially 7 of 'wo octahedrons, are common, and the a Striee due to this structure appear even : on the polished facets, The diamond has Fg: 5. i one cleavage parallel to the faces of the octahcdron, pe cm wget § both in this and other directions. Con- brittle oO $3 old and still common opinion, it is rather h ae = 'n casily injured by a slight blow or fall. Its pape a 0 in the mineralogical scale—far surpasses that "a known stones, and was used even by the pete nag ; discriminate it from other gems. In specific ete es 2 (or 3-515 to 3°525), it is considerably higher maple a, but nearly the same as the topaz, which its Yo pf aetalen for

it. According to Fizeau, it has – - est density at — 42°-3 C., and below this begins to pand, a property seen in very few other solid bodies, Its

property of shining in the dark, or phosphorescing after being exposed to the light of the sun, a few years later observed that a part of it was dissipated in acrid vapours when subjected to a high temperature. This combustibility of the diamond was confirmed in 1694 and 1695 by experiments with a powerful burning glass or lens made in the presence of Cosmo IIL, grand duke of Tuscany, by the Florentine Academicians. The experiment of the com- bustibility of the diamond when freely exposed in a strong heat has been often repeated, and its true character was proved by Lavoisier, who determined that the product was carbonic acid gas, Sir George Mackenzie converted iron into steel by powdered diamonds; whilst Mr Smithson Tennant showed that the carbonic acid produced corresponded to the oxygen consumed. No doubt, therefore, now remains that the diamond is only pure carbon in the crystallized condition, and like it insoluble in acids.

position.

In regard to the action of heat on the diamond, various Action of experiments have been made Before the blowpipe it is heat.

infusible, and closely packe”. in powdered charcoal it can resist a very high temperature. But when oxygen is present it burns slowly at a temperature usually given at about that of melting silver. Gustaf Rose lately found that when air is excluded diamonds exposed to a tempera- ture at which pig-iron melts, or to the strongest heat pro- duced in the porcelain kiln, undergo no change ; but at a

higher temperature, like that at which bar-iron melts, they |

begin, whilst retaining their form, to be converted into graphite. Hefurther observed that when diamonds and graphite were exposed together in the same mufile, foliated graphbite’was far more difficult to burn than the diamond, but compact graphite was consumed more readily. In the current of air the diamond gradually became smaller and smaller, but retaining its brilliancy till it finally vanished.

Where found.

The faces also during burning became marked with peculiar triangular hollows, with their sides parallel to the edges of the octahedron. Seen in a strong light they appear as faces of an icositetrahedron, whilst other regular triangular impressions on the faces of natural crystals of diamond are produced by faces of the dodecahedron. (Rose, “ Ueber das Verhalten des Diamants,” &c., in Berlin Monatsberichte, June 1872).

India is the oldest, and was long the most celebrated, or rather the only, source of diamonds. ‘They have been obtained from a wide district on the eastern side of the Deccan, extending from the Pennar river in 14° N. lat. to near the Sone, in Bundelkund, in 25° N. lat. In the south the chief mines were at Cuddapah, Karnul, and Ellore, near the Kishna, in Madras presidency. In this district some of the largest Indian diamonds were obtained, Golconda, however, not being a mine, but a fortress where the diamonds were collected. There were other mines near Nagpore, and east at Sambhalpur, on the Mahanuddy, and north at Panna, in Bundelkund. At all of these the diamond was sought chiefly in recent deposits, beds of sand and clay, or in some places a ferruginous sandstone or conglomerate, but probably none of them the original matrix. Heyne states that the diamond has hitherto been found only in alluvial soil, or in the most recent rocks ; and that the stones are not scattered through the whole of these beds, but confined to one rather harder than the rest. The upper stratum, of 18 inches, consists of sand, gravel, and loam ; next there is a deposit of stiff black clay or mud, about 4 feet thick ; and next the diamond bed, which is distinguished by a mixture of large rounded stones. It is from 2 to 24 feet thick, closely cemented together with clay. Sometimes this stratum is covered with caleareoustufa. Here shallow pits are excavated, of a few feet in diameter, in such spots as the practice of the workman may induce him to select; he sinks to a depth of a few feet, and searches the bed which he considers most promising for his purposes ; and if he meets with little encouragement, he shifts his situation and proceeds elsewhere. Thus a great deal of the country may be turned to waste and neglected. The working was chiefly in the hands of certain tribes or castes, but was conducted on no

regular plan, and afforded a very miserable livelihood. There has been little change since, and though mines still exist at Panna, Karnul, and a few other places, but com- paratively few diamonds are found, and probably scarcely pay the expense of collecting them. Diamonds have also been long collected in Borneo, at Pontiana, near the south- east extremity of the island. They occur in a red clay along with gold and platina, and the rajah of Mattan is said to possess one weighing 367 carats, of the purest water, but uncut.

During the end of last and the beginning of the present century the supply of diamonds chiefly came from Brazil. They were first recognized in 1727 in the province of Minas Geraes, where they had been long used by the negroes as counters in playing cards. ‘The principal mines are still in that province near Diamantina (formerly Tejuco), and near Diamantino in Matto Grosso. Mines have also been recently worked in the province of Bahia. Other localities are enumerated in the article Braztr. The diamonds are chiefly obtained from the Cascalho, a loose, gravelly deposit mixed with red clay, and containing large lumps of quartz and grains of gold. This rock is probably derived from the itacolumite, a quartzose variety of mica slate, or metamorphosed sandstone, on which it often rests, and in which diamonds are also said to occur. When first brought to Europe the Brazil diamonds were regarded as inferior to those from India, but without reason. Though the mines are strictly watched

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as Crown property, the produce is not well ascertained, Martius estimated that in the forty-six years from 1779 to 1818 diamonds weighing about 3,000,000 carats, and worth £7,000,000, were exported. Mr Mawe stated the produce at 25,000 to 30,000 carats annually of rough diamonds, equal to 8000 or 9000 carats when reduced to brilliants, After his time it seems to have greatly decreased, the whole value from 1861 to 1867 being given at about £1,900,000; and the discovery of the Cape diamonds has further reduced the amount. The stones are mostly small, averaging little more than one carat, and very rarely exceeding twenty carats.

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The largest diamond —

from Brazil was long an uncut octahedron of 120 carats, —

but in 1854 a fine stone of 2544 carats was sent to London, It was an irregular dodecahedron, but of brilliant lustre and with no flaws. Since cut it weighs about 124 carats, and is known as the “Star of the South.”

Diamonds occur in other parts of America, having been found in the Sierra Madre, south-west of Acapulco in Mexico; anda few also in Georgia and North Carolina. They have also been obtained in California, but all small (under 2 carats); and in the district of Arizona, where one is mentioned of 3 carats.

In 1829 diamonds were discovered on the European side of the Ural mountains in the gold washings near the iron mines of Bissersk. Engelhardt conjectured that they were derived from a dolomite rock, but others state that it is mica slate like that of Brazil. Only about seventy were

found in the first twenty years, and all of them small, the :

largest weighing under 8 carats. The only other European locality is at Dlaschkowitz, in Bohemia, where a single diamond was found in the sand containing pyropes,—the

one said by Murray to have been picked up in a brook in |

Ireland being very doubtful.

Not more important are those from Australia, where |

they were found as early as 1852, and again in 1859, on the Macquarie river. In 1869 they were discovered in the Mudgee, near one of the tributaries of the Macquarie, by gold-diggers, and worked for a time pretty extensively, They lie there in old river drift covered by basalt said to be of Pliocencage. They occur in a similar position in the Bingera diamond field. In both places they are sparingly distributed and small, the largest mentioned being under 6 carats.

Far more important are the diamond fields of South Africa. In 1867 a Dutch farmer obtained from a boer 4 bright stone which his children were using as a plaything. This stone was sent to the Cape, where its true nature as diamond was recognized, and subsequently forwarded to the Paris exhibition and sold for £500. This valuable dis- covery soon led to further researches, and diamonds were cbtained from various places near the Orange and Vaal rivers in Griqua Land West. They were first collected by wash-

ing recent alluvial or supposed lacustrine deposits, apparently |

the detritus of rocks in the vicinity, that are spread over —

the lower river valleys, but are now rather sought for in “pans,” or “ pipes,” of a circular form running down into

the inferior strata, or shale, and filled with a peculiar igneous .

rock, named diabase, or gabbro, often much changed near the surface. Throughout this rock, which has beet penetrated to a depth of from 100 to 200 fect, diamonds are disseminated weighing from over 150 carats down to the 100th of a carat, or less. Many are entire, well-formed crystals, but a large proportion are broken and isolated fragments. Hence it has been inferred that the rock i which they now occur is not the matrix or mother rock 1 which they were originally formed, but that the “ pipes

are rather channels by which volcanic matter has made 1s way to the surface, bringing the diamonds along with 1 from some inferior deposit. However this may be,

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DIAMOND

diamond-digging has become a regular branch of industry toa large population; and it is probable, though no very accurate estimate can be formed, that nearly fifteen million pounds sterling worth of diamonds have been obtained from this district since their discovery. The largest diamond

from the Cape we have scen mentioned is the Stewart, of 2883 carats, found on the Vaal river in 1872. It was an irregular octahedron of the purest water, and 1} inch in diameter, and is of a light yellow since cut.

There has been much speculation regarding the mode of origin of these gems, but hitherto leading to no certain result. Newton conjectured that the diamond was “ an unctuous substance coagulated;” Jameson thouglit it might be a secretion from some ancient tree, tike amber ; and Brewster also traced it toa vegetable source, Lavoisier, Guyton-Morveau, and others observed black specks when diamonds were burned, which were considered as uncrys- tallized carbon. Petzhold, in 1842, also supported this view, affirming that he had found vegetable cells in the ashes of diamonds. Goeppert,in his Haarlem Prize Essay, in 1863, supported the same view, both from supposed plant tissues and from other inclosures in diamonds, but admitted that the evidence was not free from doubts. Liebig and others have explained its origin by a slow pro- cess of decomposition in a fluid rich in carbon and hydro- gen. On the other hand, the occurrence of the diamond in the itacolumite or mica slate, and more recently in or near igneous rocks, as at the Cape, has tended to favour the view that it owes its origin to heat or metamorphic action, as is the case with graphite. But this, as graphite also shows, does not preclude the idea that originally it may have been, like amber, some peculiar vegetable product, subsequently altered and crystallized. It may here also be mentioned that all attempts to produce diamonds artificially have hitherto failed.

Diamonds are chiefly used and valued as ornamental stones, and for this purpose they are cut in various forms according to the original shape of the crystals. It is probable that the Indians knew some metliod of doing this at an early period, and it is said there were diamond- polishers in N uremberg even in 1373. Berghem of Bruges has the credit of having first used, in 1456, their own powder for this purpose. He found that by rubbing two diamonds on each other their surfaces were polished and facets formed, and acting on this hint, he employed diamond powder anda polishing wheel. His countrymen continued to follow out the art with great success, but some two centuries ago the English cutters were the more celebrated. The trade then reverted to Holland, but is again returning to Britain, where many of the finest stones are cut. The method has undergone little change, and is still

chiefly effected by the hand, partly by rubbing one stone on another, partly by a wheel and diamond powder. Where there are flaws or large pieces of value to be removed, they are occasionally cut by iron wires armed with the powder, or split by a blow of a hammer and chisel in the direction of the natural cleavage. The latter is, however, a danger- ous Process, as the diamond is very brittle, and many valu- able gems have been thus destroyed. When reduced to a proper form, the facets are polished on a lapidary's wheel. The process demands not only great skill but much time and labour. The period required to reduce a stone of 24 Mp 30 carats to a regular form extended formerly to at east seven or eight months of constant work, and in the case of the Pitt diamond two years were needed ; but the pre 18 now greatly shortened by the use of machinery a by steam. Jewellers have long cut diamonds n three forms—the brilliant, the rose, and tables.

The brilliant is most esteemed, as giving highest effect |

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to the lustre, and implying less reduction of the stone. It is, as it were, a modification of the primary octahedron, | the most comnion form of crystal, and is shown in its first form in figs. 6 and 7, and with the full number

Fig. 7. Fig. 9. Fras. 6-9.—Showing cutting of brilliants.

of facets in figs. 8 and 9. Figs. 4 and 6 show the upper surfaces, with the ¢able, or principal face, in the middle, surrounded by the bez/, or upper faces, lying between its edge and the girdle, or common base of the two pyramids. The lower facet corresponding to the table is named the collet, and the whole portion below the girdle the collet side. The portion removed to form the table (generally .$ ths) and the collet (5th) is shown in fig. 10 Brilliants are usually i. paeh 8 ue

set open, both the upper or table side and the lower collet-side being exposed. The rose cut (upper view, fig. 11; lateral view, fig. 12) is given to stones which have too little depth to be cut as brilliants; it has the whole upper curved surface covered ae i ae with equilateral tri- Fig. 10.

angles. The ¢able diamond, figs. 13 and 14, the least beautiful, is adopted for broad stones of trifling depth,

Fires, 11 and 12.—Rose cut. showing a series of four-sided facets above and below the girdle. Recently brilliants are cut in the star form

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‘Fics. 18 and 14.—Table diamond.

(taille & étoile), with the table above only one-fourth the diameter, and thus with less loss of weight. There

Value.

Remarkable

dianionds.

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are also “mixed” or less regular forms used to suit the shape of the stone; and even splinters of diamond of suv carat are facetted. In all the forms the girdle ought to be perfectly smooth, as a rough edge often appears through some of the facets as a flaw, and injures the brilliancy of the stone.

The value of diamonds is determined chiefly by their size, purity, colour, freedom from flaws or stains, and the skill with which they are manufactured. Their weight is reckoned by the carat, of four diamond grains, originally an Indian weight. In England the carat is estimated as =3‘174 grains troy; but it varies in different places, being, according to Schrauf, in Amsterdam = 205-70 milli- grammes, in Florence =197°20, in London = 205-409, in Madras = 207°353, in Paris=205°50, and in Vienna= 206°13. The usual rule is that the value of the stone increases with the square of the weight in carats, and assuming £8 or £10 as the value of a cut

brilliant of first quality in water and shape, weighing 1 carat, a similar stone of 2 carats would be worth four (2 × 2) times £8 or £10, ze. £32 to £40; one of 3 carats nine (3 × 3) times, or £72 to £90 ; and so in proportion. Fine brilliauts, however, of the sizes most in demand sell much higher, or from £12 to £20 or more the first carat ; whilst roses and tables are of considerably smaller value, and rough or uncut diamonds, generally sold in lots, fetch only about £2 or even less, tle value being further diminished in all cases where the stones are “ off colour,” that is milky or tinted, or imperfect in other respects. Still more important is the state of supply and demand, especially for the largest and most valuable stones, for which there are often very few purchasers, and their price is thus lower than the rule would imply. ven political events affect the price by bringing many into tle market, as at the time of the first French Revolution. In 1873 Cape diamonds were stated to be worth—yellows under 5 carats, 40s. to 50s. ; above that weight, £3 to £4 per carat; pure white stoncs under 5 carats, £3 to £4; and above 5 carats, £4 to £7, or more according to form or lnstre. Fig. 15 shows the size of

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200 Carats.

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Fic. 15.—Relative sizes and weights of diamonds.

set stones round the girdle, the line indicating their depth, and the numerals the number of carats they may be expected to weigh. :

Some diamonds are remarkable for their size or history. The largest undoubted diamond is the Orloff in the sceptre of the emperor of Russia, weighing 194? carats, and cut in the rose form, with a flat face below, resembling the half of a pigeon’s egg. According to one story, it formed the eye of an Indian ido, and was stolen by a French deserter ; another is that it belonged to Nadir Shah of Persia, and on his murder came into the hands of an Armenian merchant, who brought it to Amsterdam. In 1772 it was

sold to Count Orloff for the Empress Catherine for 450,006 | third fragment.

pilver roubles (£90,000), with

DIAMOND

and a title of Russian nobility. Second to it is the Regent or Pitt diamond (fig. 16), bought by Mr Pitt, the governor of Madras, in 1702, for about 7

£20,000. He brought it to ae” Tae df London, had it cut as a bril- # liant at, it is said, a cost of £3000, and sold itin 1717 to the regent duke of Orleans, * for Louis XV., for 24 million : francs, or £130,000; but itis & estimated to be worth fully ° twice that sum, At the time of the first French Revolution

it was sent to Berlin, but re- appeared in the hilt of the sword of state worn by Napoleon

I, It is considered as the finest and most perfect brilliant

in Europe. It weighs 136? carats, but originally weighed 410 carats, and the fragments split or sawn from it when cut were valued at some thousand pounds. The third in weight is the Florentine, or Grand Duke, as it is named (fig. 17), It is of a fine yellow colour, oblong, and eut in rose. It is said to have been lost by Charles the Bold at the battle of Granson, and fonnd by a Swiss soldier, who sold it for a few pence as a piece of rock crystal. It afterwards belonged \ to the grand duke of Tuscany, from whom it passed to the emperor of Austria. Its weight is usually given at 1394 carats, but Sehrauf finds its exact weight 5 —— 133°16 Vienna carats, and its Fs. 1) — an specific gravity at 19° C, 3°5213. The Koh-i-noor (fig. 18), the largest belonging to the British Crown, has also a singular history, corresponding to that of the country of its origin. The Indian legend tells that it was found in one of the Golconda mines near the Kishna river, and worn 5000 years ago by Karna, one of the heroes cele- brated in the Mahabharata. It passed through many hands to Baber, the founder of the Mogul dynasty, in 1526, and was shown by his suecessor in 1665 to Tavernier, the French tra veller. He describes it then as of the shape of a half egg, and weighing 280 carats, having been thus reduced by an unskilled stone-cutter from 7938 carats, which it once weighed. In 1739 it passed to Nadir Shah, the Persian invader of India, who gave it the name of Koh-i-noor, or Mountain of Light, and from his successors in 1813 to Runjeet Sing, the ruler of Lahore. In 1849,

on the annexation of the Punjab to British India, the Koh-i-noor was also surrendered and presented to the Queen in June 1850. It was exhibited in the Great Exhibition of 185], and then weighed 186,}, carats, but has since been recut, with doubtful advantage, in the rose form, and is noW 106,14, carats. Its lower side is flat, and undoubtedly, cor- responds to a cleavage plane. Hence it has been con- jectured that it and the Russian Orloff diamond are portions of the original stone belonging to the Great Mogul, whilst a stone of 132 carats, obtained by Abbas Mirza at the storming of Coocha, in Khorassan, in 1832, may be This portion was long used by a peasant

Fia. 16.—Pitt diamond.

Fre, 18.—Koh-i-noor.

an annuity of 4000 roubles ! as a flint for striking fire. The three united would have

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nearly the form and size given by Tavernier, and the Koh—noor would then surpass all known diamonds in its magnitude as in its eventful history. ;,

It is not necessary to notice in detail other diamonds of smaller size, as the Sancy, of 534 carats, once the property of Charles the Bold, like the Austrian, and afterwards of Lonis XIV. of France, but sold in 1830 for £20,000 to the emperor of Russia, In the Russian treasury are also the Shah of 86 carats, and the Polar Star of 40. Other noted ones are the Nassac of 892 carats (now recut, and 783), the Piggot of 824, and the Pasha of Egypt of 40 carats, which cost £28,000. Some are valued for other properties, as the Hope diamond, of a rare colour, a fine blue, and high brilliancy, estimated at £25,000,{though! only weighing 444 carats. Red diamonds seem very rare, but there is a brilliant of 10 carats among the crown jewels of Russia, which cost £15,000, and in Dresden some very fine yellow stones, the largest of 294 carats.

Perhaps even more important is the use of the diamond for cutting glass, for polishing gems and other hard bodies, and recently by engineers for boring machines used in form- ing tunnels and artesian wells. The glaziers' diamond is about the size of a pin's head, and is set;in copper or brass. The curvature of the fracture faces gives a sharp edge that cuts and not scratches merely. Hach costs about 12s. to 18s,, and, as it will weigh only about j1,th carat, the price is higher than that used as gems. For polishing purposes the so-called "bort," ze. stones so imperfect in form and quality as to be useless for ornament, are broken down and crushed into diamond powder. The carbonado from Bahia is also employed both for polishing and for boring

machines. In the latter the stones are fixed in a ring of steel, made to revolve with great rapidity, and kept cool by a current of water, which also removes the detritus. In

consequence its price has risen lately from about 1s. to 18s. or 20s. a carat.

The literature of the diamond is very extensive, and seattered through many works. Its history in ancient times is given by Pinder, De Adamante, Berlin, 1829; its general character in treatises on mineralogy and on precions stones —of the latter those by Jeffries, London, 1757 ; Mawe, ib. 1831; Emanuel, ib. 1865; and Streeter, ib, 1877; with the Hdelsteinkunde of Kluge, Leipsie, 1860, and of Schrauf, Vienna, 1869, may be mentioned. More special are Murray, Memoir on the Diamond, London, 1831; Petzholdt, Beitriige tur Natur d. Diamanten, Dresden, 1842; Goeppert, Ueber Binschlisse in D., Haarlem, 1864; and many papers in the Journals and transactions of scientific societies. or its mode of oceurrenee may be eonsulted :—in India, Heyne's Tracts, London, i Ritter's Hrdkunde, Asien, vol. iv.; and many papers by ney Adam, Franklin, Blandford, and others ; in Brazil, Mawe's cae London, 1812; Nsehwege, Claussen, Spix and Martius, ual ner, Tschudi, &e.; for the Ural, Rose's deise, vol.. i, but Tae a seneral information; for Australia, Liversidge, in cme . – Society; for the Cape, many papers in the Jowrnals of oe Bw and the Society of Arts, and in the Geological Sten pee by R. Jones, Tennant, Dunn, Maskelyne, Flight, and

Vv; and by Cohen in Leonhard and Geinctz' s Jahrbuch. (J, NI.)

DIANA, who w. Greek Artemis by Independent deity hame, which ig th tally the moon and water, as wel and the special f and war,

as at a later period reverenced as the the side of Apollo, was originally an of Italy, as, indeed, is shown by the e feminine form of Janus. She is essen- goddess, and presidcs over wood, plain,] as over the changes of human character, unctions – the female sex, also over chase : lana was worshipped ky the Sabines, but more ane ¥ the Aaqui, Hernici, and Latins, whose united ot, a the wooded hills of Algidus beyond ae ee had also a sanctuary in Anagnia, tlic Tics a Hernici, and another in Corne, near ce ka ut more celebrated than all these was the Nas ae uate of Diana of Aricia, on the

Lake of is i ch gave the name of ‘Nemorensis to Diana. me Was Worshipped side by side with a male deity

Virbius. After the destruction of Alba Longa this grove was for a long time the united sanctuary of the neighbour- ing Latin and Rutulian cities, until at last it was extin- guished beneath the supremacy of Rome. The festival of the goddess was on the ides of August, the full moon of the hot season. She was worshipped with torches, her aid was sought by women seeking a happy deliverance in childbirth, and many votive offerings have rewarded modern excava- tions on the site. Another celcbrated sanctuary of Diana was that on the slopes of Mount Tifata, near Capua, where she was worshipped under the name of Tifatina. This sanctuary was specially favoured by Sulla and at a later period by Vespasian, There were several ancient groves and sanctuarics of Diaua in Rome, one in the Vicus Patricius between the Viminal and Esquiline, into which no man was admitted, another at the highest point of the Vicus Cyprius, another on the Ceeliolus. But the most celebrated of all was the temple on the Aventine. This was originally a sanctuary of the Latin League, which accounts for the hill not being included in the original circuit of Rome, and for its being the rcfuge of the plebeians in political disturbances. The statue of the goddess was of the Ephesian type, the day of dedication was the ides of August, and the temple was especially fre- quented by slaves and their wives. Runaway slaves throughout Italy had a special dependence upon Diana. Sucli are the chief characteristics of the Roman Diana ; but as early as 400 3B.c. she began to be identified with the Greek Artemis, of which an account has alrcady been given (see Artemis). For fuller information see Preller, Léimische Mythologre.

DIANO, or Treeiano, a town of Italy in the province of Principato Citeriore, 45 miles south-east of Salerno, on an isolated eminence, above the upper part of the valley of the Negro, or Tanager, to whicli it gives the name of Val di Diano. It represents tle ancient Tegiannm, a municipal town of Lucania, of which the ruins can still be traced at the foot of the hill; and it possesses a castle, several churches of some interest, and three conventual buildings. In 1497 it was strong enough to resist, under Antonio

Sanseverino of Salerno, the siege undertaken by Frederick of Aragon. Population in 1871, 6224.

DIAPHORETICS (from duadopéw, to carry through), such remedies as promote perspiration. In health there 1s constantly taking place an exhalation of watery vapour from the skin, by which not only are many of the effete products of nutrition eliminated, but the body is kept cool. Under exertion or in a heated atmosphere this natural function of the skin is increased, sweating more or less profuse follows, and, evaporation going on rapidly over the whole surface, little or no rise in the temperature of the body takes place. In many forms of disease, such as fevers and inflammatory affections, the action of the skin is arrested, and the surface of the body feels harsh and dry, while the temperature is greatly elevated. The occurrence of perspiration not un- frequently marks acrisis in such diseases, and is in general regarded as a favourable event. In some chronic diseases, such as diabetes and some cases of Bright's disease, the absence of perspiration is a marked feature; while, on the other liand, in many wasting diseases, such as phthisis, the action of the skin is increased, and copious exhausting sweating occurs. Many means can be used to induce per- spiration, among the best known being baths, either in the form of hot vapour or hot watcr baths, or in that part of the process of the Turkish bath which consists in exposing the body to a dry and"hot atmosphere. Such measures, particularly if followed by the drinking of hot liquids and the wrapping of the body in warm clothing, seldom fail to excite copious perspiration. Numerous medicinal sub- stances have a similar effect, although the modus operandi

appears to differ in the case of several of them. Thus antimony and ipecacuan appear to produce their,diaphoretic action by their nauseating and depressing or relaxing effects ; while others seem to act as direct stimulants to the function of the sudoriparous glands of the skin, such as the well-known diaphoretics—Mindererus spirit (acetate of ammonia), guaiacum, nitrous ether, and the recently intro- duced drug, jaborandi. Opium acts powerfully as a diaphoretic, especially when in combination with ipecacuan, as in Dover's powder, or with antimony ; and alcohsi has similar

properties. Diaphoretics are of great service in many diseases. When employed at the commencement of a catarrh or common cold they frequently check it, and thus prevent the evils which are so apt to follow this affec- tion. In acute dropsy due to kidney disease, such as that which sometimes results from scarlet fever, the hot air or hot water bath is a valuable remedy, and even in dropsical accumulations of long standing, when diaphoresis can be induced, marked improvement in the symptoms generally follows. In certain circumstances, however, diaphoretics, particularly in the form of baths, may be unsafe, especially where there is any affection of the heart or lungs attended with embarrassed respiration ; and in general in diseases where diaphoretics seem to be indicated, the physician is required to take into account the patient's whole condition in his selection of any one remedy for this purpose. DIARBEKIR (or Kara Amid, the Black Amid), a city of Asiatic Turkey, the administrative centre of the pashalic of the same name, is situated 2050 feet above the level of the sea, on a mags of basaltic rock which rises abruptly to a height of 100 feet from the western bank of the Tigris, about 100 miles north-east of Aleppo, in 37° 55' 30' N. lat. and 39° 53' 39" BE. long. It is about three miles in circumference, has a nearly circular form, and is encom- passed by ancient and dilapidated walls of a very remark- able character. They are built of basalt, have in most places a thickness of 14 feet, vary in height from 30 to 40 or 50 feet, and are strengthened by upwards of 70 towers, some square and some round, which communicate with each other by two passages formed in the heart of tlie masonry. There are four gates, which are closed at night: —the Dagh Kapi, or Mountain gate, on the N.; the Rum Kapi, or Anatolian gate, on the W.; the Mardin gate on the 8.; and on the E. the Kydprii gate, which takes its name from the stone bridge that spans the Tigris. Both the gates and the walls bear numerous ornamental designs and inscriptions in Arabic and Cufic characters relating to their erection or restoration. The citadel, or Jéch Kaleh, which stands in the north-east corner between the Dagh Kapi and the Kydprii Kapi, commands the town; and a fine view of the valley of the Tigris is obtained from one of its towers, supposed to be the belfry of an ancient Christian church. Within the enceinte is the official residence of the pasha, but he has another mansion at some distance from the town in the vicinity of the military barracks. The interior of the town contrasts unfavourably with the massive and spacious character of its defences; it has only one street about 20 feet in breadth, the

rest being mere lanes from 4 to 5 feet across The houses are built of basalt in the lower stories and of dark-coloured brick above ; and this, combined with the flat terraces of the roofs, gives a same- ness and gloominess of aspect. The public buildings com- prise upwards of 50 mosques large and small, 9 Christian churches, a Jewish synagogue, upwards of 20 baths, about 15 khans or caravanserais, and a good military hospital; but only a few are worthy of individual notice, though some of the minarets are richly sculptured, and several of the mosques preserve interesting traces of ancient work. The Ulu-jami, or Great Mosque, which was formerly a Christian church, and perhaps originally the ancient

palace of Tigranes, has an outer wall with two fagades, each formed by a row of Corinthian columns surmounted by an equal number of a Byzantine type; the interior is divided into three portions, appropriated to as many Mahometan sects. The Hassan Pasha Klan, in the im- mediate vicinity of the mosque, is a fine building con- structed of layers of white and black stone; but it is exceeded in size by the Ali Pasha Khan, which indeed is the largest in Asiatic Turkey. The town is supplied with water both by springs within the walls and by an aqueduct fed by a fountain at Ali-punar about two miles to thé west ; but in the heats of summer, which are sometimes exceedingly severe, these supplies become greatly exhausted and the water impure. In the last century Diarbekir was one of the largest and most flourishing cities of Asia; and as a commercial centre it still ranks second to Mosul, inthe upper region of the Tigris and Euphrates. The principal trade routes are by Argana and Kharput to Samsun, by Sort, Bitlis, and Van, to Tabriz, by Mardin to Mosul, by Urfa and Aintab to Aleppo, and by means of kalleks, or inflated skins, down the river to Mosul and Baghdad. The bazaars are not much behind those of Baghdad, and display a rich variety of both Asiatic and European wares. Owing partly to the introduction of the latter, the manufacturing industry of the town has greatly decreased, and most of the 1600 cotton looms of which it could boast in 1816 have disappeared. Red and yellow morocco of the greatest repute throughout Asiatic Turkey is still produced, as well as copper vessels, pipe- heads, and goldsmith-work. The population, which was reckoned at 400,000 in 1750, was in the latter part of the century greatly reduced by war, and famine, and

pestilence. In 1837 it was estimated by Southgate at from 13,000 to 14,000 souls ; in 1856 it was found to be 27,480; and in 1873 it was stated by Cernik at 40,000, and by another authority at 60,000. The principal nationalities in the polyglot community are the Kurds and Armenians, but there are also numerous Turkomans, Turks, and exiled Bulgarians. The Mahometans and Christians are now pretty equally balanced in numbers. Besides representatives of the Armenian, Syrian, and Greek churches, there are Roman Catholics enough to support a church and convent, and @ mission is maintained by American Protestants.

Diarbekir is the city which, under the name of Antida, became a Roman colony in 230 a.p. and received a Christian bishop in 825. Fortified by Constantius JI. it was before long captured by Sapor the Persian king, after a siege of which a detailed account from his personal experience is given by Ammianus Marcellinus ; and in the later wars between the Persians and the Romans it more than once changed hands. On its capture by the former in 502, it is said that 80,000 of its inhabitants perished. After having been from about the 11th century in the possession, by no means uninterrupted, of several Turkoman dynasties, it was finally captured by Selim, the first Sultan of the Osmanli Turks, in the year 1515, and since that date it has remained under the Ottoman rule.

See Sandreczy, Retse nach Mosul und durch Kurdistan nach Urumia, 1857; R. J. Garden's " Description of Diarbekir," in Journal of Roy. Geogr. Soc., 1867 ; and Cernik, Technische Studien Hape dition durch die Gebdiete des Euphrat und Tigris, 1875.

DIARRHGEA (from é:é, through, féw, to flow), looseness of the bowels. The causes of this complaint are vely numerous. As a primary affection it has been treated of under Cuoxera (qg. v.) It is frequently a symptom of complication of other diseases, such as consumption OF typhoid fever, and as such it will be mentioned im describing the various ailments in which it occurs.

DIAS, Anronro Gongatves (1823-1864), a Brazilian poet and historian, was born at the little town of Caxias, in Maranhio, with the charms of which he has made his readers familiar. From the university of Coimbra, 1 Portugal, he returned to his native country well-equippé with legal lore, and obtained

an official appointment at Maranhao; but the literary tendency which was strong

DIA—

within him led him to try his fortune as an author at Rio de Janeiro, Here he wrote for the newspaper press, ventured to appear as a dramatist, and at last in 1846 established his reputation by a volume of poems—Primieros Cantos —-which appealed to the national feelings of his Prrazilian readers, were remarkable for their autobiographic impress, and by their beauty of expression and rhythm placed their author at the head of the lyric poets of his country. In 1848 he followed up his success by Secundos Cantos e sex Tilhas de # et Antdo, in which, as the title indicates, he puts a number of the pieces in the mouth of a simple old Dominican friar; and in the following year, in fulfilment of the duties of his new post as professor of Brazilian history in the imperial college of Pedro IL., he published an edition of Berredo, and added a sketch of the migrations of the Indian tribes. A third volume of poems, which appeared with the title of Ultemos Cantos in 1850, was practically the poet's farewell to Rio de Janeiro and the service of the muse, for he spent the next eight years engaged under Government patronage in obtaining a personal acquaintance with the scientific institutions of Europe, was appointed on his return to Brazil a member of an expedition for the exploration of the province of Ceara, was forced in 1862 by the state of his health to try the effects of another visit to Europe, and died in September 1864 on board the vessel that was bearing him once again to his native shores. While in Germany he published at Leipsic a complete collection of his lyrical poems, which has since gone through several editions; the four first cantos of an epic poem called Os Tymbiros (1857) ; and a Duccionarw da lingua Tupy (1858). To the publications of the Rio de Janeiro Geographical and Historical Institute he contributed a number of papers, among which the one on Braal and Oceania has received special notice. A complete edition of the works of Dias has made its appear- ance at Rio de Janeiro. See Francisco Sutero in the Rwistan Maranhense, and Wolf, Brésil Littéraire.

DIAS, BarToLomMso, a Portuguese navigator, the dis- coverer of the Cape of Good Hope, flourished towards the close of the 15th century, the date of

his birth being unknown, He seems to have interested himself at an early period in geographical research, and to have been intimate with Martin Behem. In August 1486 he was appointed by King John II. to the command of a small expedition Intended to carry on the work of exploration on the coast of Africa, After touching at various points on the western — – the continent, and taking possession of them for

18 royal master, he and doubled the Cape without being aware of it. He touched land at the mouth of the Great Fish River. He now found that he had rounded the continent, and in his Teturn voyage he sighted the promontory to which he gave the name Cabo Tormentoso, or Cabo de todos los tormientos (Cape of all the Storms), This was afterwards changed by the king for the happier title it still bears. Dias arrived in Lisbon in December 1487. He afterwards commanded a ship in the first expedition of Vasco da Gama, who sent him back to Portugal after they had reached the Cape Verd Islands. He held a similar position in the expedi- hon under Cabral which discovered Brazil. On the return a Sey thn commanded foundered in a storm on

ay ;

DIATOMACEA, For the knowledge we possess of these beautiful organisms, so minute as to be undiscernible

Y our unaided vision, we are indebted to the assistance of ~ © inleroscope. It was not till towards the close of the ‘st century that the first known forms of this group were discovered by O. F. Miiller. And so slow was the progress ot discovery in this field of scientific research that in the Course of half a century, when Agardh published his

sailed onward into the unknown sea |

Systema Algarum in 1824, only 49 species included under 8 genera had been described. Since that time, however, the microscope has been greatly improved ; and eminent naturalists in all parts of the civilized world have been induced to engage in the study of these forms. The result is that the

number of known genera and species has been greatly increased ; the species found in Great Britain and Ireland may be estimated at little less than 1000; and Rabenhorst, in the index to his Flora Huropea, enumerates about 4000 forms which have been discovered throughout the continent of Europe. At a time when little was understood of the structure of these organisms they were: generally known among botanists by the appellation of Bacillariacese ; but almost all recent authors are agreed in adopting the later and more appropriate designation of Diatomacez,

Various opinions have been entertained as to the position to be assigned to these forms. The earlier observers referred them to the vegetable kingdom. Subsequent authors, including Ehrenberg, regarded them as animals ; but in consequence of their analogy to other organisms acknowledged to be vegetable, as regards their general structure, and more especially their modes of reproduction, they are now almost universally included in the vegetable kingdom, and classified with the Monocellular Alga.

The Diatomaceze exhibit great variety in form. While some species are circular, as Coscinodiscus perforatus (fig. 1), others are of an oval outline, as Surdrella ovalis (fig. 2).

Fria. 1.—Coscinodiscus Fic. 2.—Surirella perforatus. x 400. ovalis. x 400.

Some are linear, as Synedra radians (fig. 3) ; others more

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Fic. 3.—Synedra radians.

or less crescentic, as Hpithemia hyndmanit (fig.

x 400. again, are cuneate, as Podosphenia lyngbywi (fig. 5); some

Fie. 4.—-Epithemia hyndmanii.

few have a sigmoid outline, as Pleurosigma 7 balticun (fig. 6); but the prevailing forms are |}! | naviculoid, as Navicula cuspidata (fig. 7). } They vary greatly also in their modes of

growth,—some being free, others attached to foreign bodies by gelatinous stipes, the stipes being in some species very short, while in others they are of considerable length. In some genera the forms are simple, while in others the frustules are connected together in ribbon-like filaments, or form, as in other cases. zig-zag chains. naked, while in many others they are inclosed in a more or less definite gelatinous investment, or frond,

Fie. 5.— » Podosphenia In some genera the frustules are lyngbyii.

x 400.

as this covering is usually designated. The conditions necessary to their growth are moisture and light. Wherever these circumstances coexist, diatomaceous forms will almost

invariably be found. They occur mixed with other organisms on the surface of moist rocks; in streamlets and

x 200.

Fig. 6.—Pleurosigma balticun.

pools, they form a brownish stratum on the surface of the mud, or cover the stems and leaves of water plants or floating twigs with a furry investment. Marine forms are usually attached to various sea-weeds, and many are found

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Fig. 7.—Navicula cuspidata. x 400.

in the stomachs of molluscs, holothurians, ascidians, and other denizens of the ocean. The fresh-water forms are specifically distinct from those incidental to salt or brackish water,—fresh-water species, however, are sometimes carried some distance into the sea by the force of the current, and in tidal rivers marine forms are carried up by the force of the tide. Some notion may be formed of the extreme iinuteness of these forms from the fact that one the length of which is ,%%pths of an inch may be considered as beyond the medium size. Some few, indeed, are much larger, but by far the greater proportion are of very much smaller dimensions.

Structure. —These minute vegetables are distinguished from kindred forms by the fact of having their soft vegeta- tive part covered by a siliceous case. This covering of silex consists of two similar valves nearly parallel to each other, each valve being furnished with a rim projecting froin it at aright angle. One of these valves with its rim is slightly smaller than the other, the smaller fitting into the larger pretty much as a pill box fits into its cover. This peculiarity of structure affords ample scope for the growth of the cell-contents usually known asthe endochrome. As the endochrome increases in volume the siliceous valves are pushed out, and their corresponding siliceous rims become broader.

As regards the vegetative contents of this cell, in so brief a description the following parts only need to be referred to. There is first what Pfitzer, a distinguished German writer on this subject, designates the plasm-sac, consisting of a fine colourless plasm forming a closed sac of the same shape as that of the cell. The refractive power of this plasm differing but slightly from that of water, the presence of this structure is not always obvious ; but on the application of hydrochloric acid its outline may be discerned as it slowly separates from the cell wall,—at first preserv- ing the shape of the cell, but ultimately contracting into a smal] round mass. Within the plasm-

sac is the structure which the writer just named designates the endochrome-plates. They consist of a thick substance, and are of the same colour throughout, varying from bright yellow to a dark yellowish brown. The number and position of the endochrome plates vary in the different genera —some having two, others only one. Within the folds of these plates is sometimes noticeable a collection of plasm which Ehrenberg describes as resembling the embryo in an egg, and which Pfitzer calls the middle plasm-mass, Within this plasm-mass oil globules and vacuoles are diffused, and in the centre of it a small vesicle may often be observed.

Motion.—One of the first phenomena which comes under

the notice of the observer is the extraordinary power of motion with which the frustules are endowed. Some species move slowly backwards and forwards in pretty much the same line, but in the case of Bacillaria paradoxa the motion is very rapid, the frustules darting through the water in a zig-zag course. To account for this motion various theories have been suggested, none of which appear to be altogether satisfactory. So while the extraordinary motion of the Diatomacez excites admiration, it must be acknowledged that the mechanical agency which produces the motion remains unexplained.

Classification.—In this group, as well as in almost all others, various systems of classification have from time to time been adopted ; but that which seems to commend itself most strongly, as well by reason of its simplicity as its facility of application, is the system which has been matured by Heiberg, the distinguished Danish writer on the subject, and which he has founded on the symmetrical or unsymmetrical form of the frustule in its several aspects. A diatomaceous frustule may be regarded on what is called the front view, in which the connecting rim or loop is seen, or on the side view, by which the valve is presented to the eye of the observer. If the outline be symmetrical both on the transverse and longitudinal axis, in both these aspects the frustule is said to be symmetrical ; but if the outline be different on one side from that of the other, or if perfect symmetry does not exist as respects the longitudinal or transverse axis, the frustule is said

to be unsymmetrical on the aspect or axis in which want of symmetry is found to exist.

Keproduction.—In the Diatomacese, as well as in the Desmidiez, the ordinary mode of increase is by self-division of the cell (see Ata, vol. i, p. 508). The cell-contents within the inclosure of the siliceous case separate into two distinct masses. As these two masses of endochrome become more and more developed, the valves of the mother cell are pushed more and more widely apart. A new siliceous valve is secreted by each of the two masses on the side opposite to the original valve. When this process has been completed the hoop of the mother frustule gives way, and two distinct frustules are formed, the siliceous valves in each of these new frustules being one of the valves of the mother cell, and a newly formed valve similar and more or less parallel to it.

During the life of the plant this process of self-division is continued with au almost incredible rapidity. On this subject the observation of the late Professor Smith is worthy of special notice :—‘I have been unable to ascertain the time occupied in a single act of self-division, but sup- posing it to be completed in twenty-four hours we should have, as the progeny a of single frustule, the amazing number of 1,000,000,000 in a single month, a circumstance which will in some degree explain the sudden, or at least rapid, appearance of these organisms in localities where they were a short time previously either unrecognized oF sparingly diffused ” (British Diatomacee, vol. i. p. 25).

Some authors of reputation have been under the impres- sion that the Diatomacez, like other kindred forms, are sometimes reproduced by zoospores, and some few facts from time to time have been recorded by various observers which seem to bear out this view of the case. But in this group, as well as in the Desmidiew already referred to, there obtains another mode of reproduction which is gene rally known as conjugation. It would be unnecessary here to describe in detail the various observed modes of this process, Suffice it to say that usually two parent frustules unite, invest themselves in a gelatinous sac in which their cell contents are discharged and formed into two bodies terraed sporangia, which soon are

developed into two frustules in all respects resembling the parents but usually

double their size. In some phases of this process the gela- tinous sac bears a considerable resemblance to that lowest form of animal life known by the name of Amceba, so much so that an inexperienced observer might suppose that the object before him was an Ameeba gorged with diatomaceous frustules. ;

Mode of Preparation.—The Diatomacese are usually gathered in small bottles, and special care should be taken to collect them as free as possible from extraneous matter. Asmall portion having been examined under the microscope, should the gathering be thought worthy of preservation, some of the material is boiled in acid for the purpose of cleaning it. The acids usually employed are hydrochloric, nitric, or sulphuric, according as circumstances require. When the operator considers that by this process all foreign matter has been eliminated, the residuum is put into a pre- cipitating jar of a conical shape, broader at the bottom than at the top, and covered to the brim with filtered or distilled water. When the diatoms have settled in the bottom of the jar, the supernatant fluid is carefully removed by a syringe or some similar instrument, so that the sediment be not disturbed. The jar is again filled with water, and the process repeated till the acid has been completely removed. It is desirable afterwards to boil the sediraent for a short time with supercarbonate of soda, the alkali being removed inthe same manner as the acid. A small portion may then be placed with a pipette upon a slip of glass, and, when the moisture has been thoroughly evaporated, the film that temains should be covered with dilute Canada balsam, and, a thin glass cover having been gently laid over the balsam, the preparation should be laid aside for a short time to harden, and then is ready for observation.

General Remarks.—Like all other organisms, the Diatomacez doubtless have a definite function assigned to them in the grand system of creation, but a special interest attaches tothem. Allusion has been made to the fact that the soft cell of these organisms is encased in a siliceous epiderm, When the plant has fulfilled its natural course the siliceous covering sinks to the bottom of the water in which it had lived, and there forms part of the

sediment. When in the process of ages, as it has often happened, the accumulated sediment has been hardened into solid rock, the siliceous exuvize of the diatoms remain unaltered, and, if the rock be disintegrated by natural or artificial means, may be removed from what has been called “ their stony shroud,” and subjected to examination under the microscope. The forms found may from their character help in some degree to illustrate the conditions under which the stratum of rock had been originally deposited.

Vast deposits of Diatomaceze have been discovered in Varlous parts of the world,—some the deposit of fresh, others of salt water. Of these deposits the most remark- able for extent, as well as for the number and beauty of the Species contained in it, is that of Richmond, in Virginia, one of the United States of America. It is said to extend for many miles, and to be in some places at last 40 feet deep. The material has long been used as a polishing powder, and recently has been largely employed in the manufacture of the powerful explosive agent known as

ynamite. It is a remarkable fact that existing species of |

Diatomacer have been traced so far down as the lower strata of the Tertiary formation ; and, though the genera- hons of a diatom in the space of a few months far exceed Mm number the generation of man during the period usually assigned to the existence of the race, the fossil genera and species are in all respects to the most minute details identical with the numerous living representatives of their class. 5 E. 0’M.) DIAZ DE LA PENA, Narcrsse Virerie (1809-1876), a French artist, distinguished chiefly as a landscape painter,

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was born at Bordeaux in August 1809. His first works were exhibited at the Salon in 1831, and attracted little notice, being poor in colour, the quality for which he after- wards became conspicuous. The same criticism applies to the pictures he exhibited annually until 1840, when his style underwent a decided change. His Nymphes de Calypso (1840), Le Réve (1841), Vue de Bas-Bréau, L’Orieutale, Le Maléfice, and Les Bohémiens se rendant & une Féte (1844), showed in an increasing degree the rich- ness of colour and the

mastery of the more subtle effects of light and shade which ultimately obtained for Diaz a place in the first rank of landscape painters. His powers were seen at their best in his Baigneuse and L'Amour désarmé (1851), and in the pictures he sent to the Paris Exhibition of 1855, Les Présents d'Amour, La Rivale, La Fin d'un Beau Jour, Nymphe Endormie, Les Derniéres Larmies, &c. As the titles of several of these works indicate, Diaz endeavoured to add to the interest of his landscapes by introducing into them the personages of the classical mythology. Late in his career he devoted himself to genre subjects with but indifferent success. Diaz received a medal of the third class in 1844, of the second class in 1846, and of the first class in 1848 ; and in 1851 he was made a chevalier of the Legion of Honour. He died in November 1876. ©

DIBDIN, Cuartus (1745-1814), a well-known writer of songs and musical composer, was born at Southampton on the 15th March 1745, and was the youngest of a family of eighteen. His parents designing him for the church, he was sent to Winchester; but his love of music early diverted his thoughts from the clerical profession. After receiving some instruction from Kent, the organist of Winchester Cathedral, he went to London at the age of fifteen. In the following year his first work, an operetta entitled Zhe Shepherd's Artifice, with words and music by himself, was produced at Covent Garden Theatre. This proved successful, and was followed by other works, his reputation being firmly established by the music to the play of The Padlock, which was produced at Drury Lane under Garrick's management in 1768, the composer himself taking the part of Mungo. He continued for some years to be connected with Drury Lane, both as composer and as actor, and produced during this period two of his best known works, Zhe Waterman (1774) and The Quaker (1775). A quarrel with Garrick led to the termination of his engagement, and in 1782 he became joint manager of the Royal Circus, afterwards known as the Surrey Theatre. In three years he lost this position owing to a quarrel with his partner. In 1788 he sailed for the East Indies on the invitation of a sailor brother (the "Tom Bowling" of his famous song); but, the vessel having put in to Torbay in stress of weather, he changed his mind and returned to London. A series of mono-dramatic entertain- ments which he gave at his theatre, Sans Souct, in Leicester Square, brought his songs, music, and recitations more prominently into notice, and permanently established his

fame as a lyric poet. It was at these entertainments that he first introduced many of those sea songs which so powerfully influenced the national spirit. The words breathed the simple loyalty and dauntless courage that are the cardinal virtues of the British sailor, and the music was appropriate and naturally melodious. Their effect in stimulating and ennobling the spirit of the navy during the war with Irance was so marked as to call for special acknowledgment. On retiring from public life, in 1805, Dibdin was rewarded by Government with a pension of £200 a year, of which he was only for a time deprived under the administration of Lord Grenville. Dibdin died of paralysis in 1814. Besides his Musical Tour through Lingland (1788), his Professional Life, an autobiogaphy

published in 1803, a ZHustory of the Stage (1795), and several smaller works, he wrote upwards of 1400 songs and about 30 dramatic pieces. He also wrote one or two novels which are now forgotten. An edition of his songs by G. Hogarth (1843) contains a memoir of his life. The edition prepared by his son Thomas is referred to below _

DIBDIN, Tuomas (1771-1841), English dramatist and song writer, was one of the sons of the subject of last notice, and was born on the 21st of March 1771. He was apprenticed to a London upholsterer, but after four years' service he broke his engagement and joined a company of country players. From 1789 to 1795 he performed in every department of the drama, composing during the same period more than 1000 songs, and making his first attempt as a dramatic writer. He returned to London in 1795, having married two years before ; and in the winter of 1798-1799 his Jew and the Doctor was pro- duced at Covent Garden. From this time he contributed a very large number of comedies, operas, farces, &c., to the public entertainment. Some of these brought immense popularity to the writer and immense profits to the theatres. It is stated that the pantomime of Mother Goose produced more than £20,000 at Covent Garden Theatre, and the High-metiled Racer £18,000 at Astley's. Not- withstanding this run of popularity, and the author's con- nection with theatrical notabilities, his last years were passed in comparative indigence. In 1827 he published two volumes of Reminiscences ; and at the time of his death he was preparing

an edition of his father's sea songs, for which a small snm was allowed him weekly by the lords of the Admiralty. He died in London, September 16,

1841.

DIBDIN, Rev. Tuomas Froenaut (1776-1847), an enthusiastic bibliographer, born at Calcutta in 1776, was the son of Thomas Dibdin, the sailor brother of Charles Dibdin, whom tlie latter has immortalized in his song "Poor Tom Bowling." His father and mother both died on the voyage home to England in 1780, and he was brought up by a maternal uncle. He was educated at St John's College, Oxford, but left the university without taking his degree. Intended for the bar, he was entered at Lincoln's Inn, and studied for a time in the chambers of Basil Montague. After an unsuccessful attempt to obtain practice as a provincial counsel at Worcester, he resolved to abandon law for the church, and he was ordained a clergyman at the close of 1804. His ecclesiastical prefer- nent was slow. For a number of years he had to content himself with the appointinent of preacher at various chapels in the West End of London, and it was not until 1823 that he received the living of Exning in Sussex. Soon afterwards he was appointed by Lord Liverpool to the rectory of St Mary's, Bryanstone Square, which he held until his death on the 18th November 1847. The first of the numerous bibliographical works on which Dibdin's fame entirely rests was his Introduction to the Knowledge of the Rare and Valuable Editions of the Latin and Greek Classics (1803), which, though superficial, incomplete, and untrustworthy in many of its details, supplied a blank in English literature. A fourth and greatly enlarged edition appeared in 1827. The first edition rendered a valuable service to its author in bringing him under the notice of Earl Spencer, to whom he owed not only his first living but much important aid in his bibliographical pursuits. The rich library at Althorp was thrown open to him; he spent much of his time in it, and in 1814 published his Bibliotheca Spenceriana, giving an account of the many rare works it contained. As the library was not open to the general public, the information given in the Bibliotheca was found very useful, but the work was marred by the maccuracy In matters of detail which more or less

characterized all its author’s productions. This fault was naturally least obtrusive in a series of playful, discursive works in the form of dialogues on his favourite subject, in which great exactness was not necessary. The first of these, Bibliomania (1809), was republished with large additions in 1811, and was very popular, passing through numerous editions. To the same class belonged the Bibliographical Decameron, a larger work, which appeaied in 1817, and has a higher value than its predecessor, though it did not attain the same circulation. In 1810 he commenced the publication of a new and much extended edition of Ames’s Typographical Antiquities. The first volume was so great a success that Dibdin realized £600 by it. This, however, was not maintained, and the fourth volume, which did not appear until 1819, fell almost still. born from the press. The work was scarcely half-finished when its publication was thus checked. The chief cause of its failure was that Dibdin had not critical sagacity enough to make a thorough change in the arrangement his predecessor had followed, and to enable him to distinguish what was valuable from what was worthless in the vast stores of information he had himself collected. In 1818 Dibdin was commissioned by his patron, Earl Spencer, to purchase books for him on the Continent, and he afterwards published an account of his journey in his Bebleographical, Antiquarian, and Picturesque Tour in France and Germany (3 vols. 1821), which was got up in a most sumptuous style, the engravings alone, it is,said, costing £5000. In 1824 he published an ambitious venture in his Labrary Companion, or the Young Man’s Guide and Old Man’s Comfort in the Choice of a Library, which was intended to point ont the best works in all departments of literature. His culture was not broad enough to render him competent for the task, and the Library Companion, being severely criticized in the Quarterly and Westminster Reviews, seriously injured his reputation. He had been for some time involved in pecuniary difficulties, from which he tried to free himself with only partial success by extending the range of his literary activity. He wrote for periodicals, published many of his sermons, and for some years gave himself chiefly to religious literature. He returned to bibliography in his Bibliophobia, or Remarks on the Present Depression in the State of Literature and the Book Trade (1831), and the same subject furnishes the main interest of his Reminiscences of a Literary Life (1836), and his Bibhographical, Antiquarian, and Picturesque Tour in the Northern * Counties of England and Scotland (1838). Didbin was the originator and vice-president,

Lord Spencer being the president, of the Roxburghe Club, founded in 1812, —the first of the numerous book clubs which have done such service to literature in the present century. DICH ARCHUS, a celebrated Peripatetic philosopher, historian, and geographer, was a native of Messana, in Sicily. He was the contemporary of Theophrastus and Aristotle, and flourished towards the close of the 4th century B.c. The exact dates of his birth and death are unknown ; the time of the latter event is approximately fixed by good authorities as the year 285 3.c. Nothing 8 known with certainty concerning the life of Dicaarchus except that he was a disciple of Aristotle and a friend of Theophrastus, to whom he dedicated the majority of his works. Of his writings, which comprised treatises oD 4 great variety of subjects, none have descended to our day. Nothing but their titles anda few fragments survive. ‘The most important of them was his Life in Greece, in which the moral, political, and social condition of the people was very fully discussed. Among the philosophical works of Diczarchus may be mentioned the Lesbiaci, in three books, in which the author endeavours to prove that the soul 1s mortal. This work is written in the form of a dialogue,

and derived its name from the fact that the scene of the dialogue was laid at Lesbos. To it the author afterwards appended a supplement, likewise in three books, which he called Corinthiacc. The only complete edition of the frag- ments of Diczearchus is that published at Darmstadt in 1841 by Max Fuhr. An excellent dissertation on them will be found in Osann, Beitrdge zur Giriech. und Rom. Literatur.

DICK, THomas (1775-1857), a popular writer on astronomy and other scientific subjects, was born in 1775. He was educated for the ministry in connection with the Secession (now United Presbyterian) Church of Scotland, and was ordained at Stirling in 1803. About two years afterwards his connection with the church was severed, and he became a teacher, first at Methven, a village in Perthshire, and afterwards at Perth. In 1824 he published in two volumes the Christian Philosopher, a work whose “aim was,” in his own words, “to illustrate the harmony which subsists between the system of nature and the system of revelation, and to show that the manifestations of God in the material universe ought to be blended with our

view of the facts and doctrines recorded in the volume of inspira- tion.” The success of this work enabled him to resign his labours as teacher, and in 1827 he removed to Broughty Ferry, a suburb of Dundee, where he devoted his whole time to literary and scientific pursuits. Besides the Christian Philosopher, he is author of the Philosophy of a

Future State (1828), the Improvement of Society by the

Diffusion of Knowledge (1833), Celestial Scenery (1837), The Sidereal Heavens (1840), and several smaller treatises. These works were all intended to supplement and extend the aims of the Christian Philosopher, and may be regarded as endeavours by means of scientific discoveries to illustrate particular aspects of religious truth, aud to suggest solutions of difficult religious problems. ‘They are written in a popular and fascinating style, and manifest great aptitude for simplifying scientific subjects, and rendering them in- teresting to non-scientific readers. Some years before his death, which took place 27th July 1857, a pension was conferred on him by Government.

DICKENS, Cuartes (1812-1870), the great English uovelist, was what would generally be described as a self- educated man, and yet, if by a mai’s education we under- stand preparation for the work he has to do in life, he was mdebted to circumstances for an education on which it Would have been difficult to improve. His father was a clerk in the Navy Pay Office, stationed at Portsmouth when Charles was born, but soon afterwards at Chatham, and soon after that in London,—a conscientious man, industrious and punctual in his occupation, but too easy tempered and unpractical to expend his income so as to keep pace with the wants of a rapidly increasing family. The boy’s mother seems to have been a person of more *nergy, as well as of. considerable accomplishments ; she taught him the rudiments of Latin, and tried to establish a boarding school in Gower Street. ‘The one parent was the original of Micawber, the other the original of Mrs A ae With all their united efforts they could not ee out of distress ; the boarding school scheme came too ate; and when Dickens was nine years old the family = living in abject poverty in Bayham Street, Camden i then one of the poorest London suburbs, and their

ifficulties were increasing upon them. Charles was sent – to earn six shillings a week in a blacking warehouse, oa blue covers on pots of paste-blacking. For two years € child led a very hard, uncared-for life at this uncon- — work. He bitterly felt that it was uncongenial, for _ Bes a very Precocious boy, had read many books, and ormed an arbition to be “a learned and distinguished man.” It must have been very galling to him, with his

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prematurely developed sensibilities and aspirations, to be thrown among such companions as Bob Fagin and Poll Green. And perhaps he was right in afterlife to wonder at the thoughtlessness of his parents in subjecting him to such a humiliation. His sufferings were so acute, and made such an impression on him, that years afterwards he could not think of them without crying ; and there were certain quarters of the town through which he used to pass to his daily work, and where he used to loiter with less than enough to eat, that he habitually shunned for their painful memories. “It is wonderful to me,” he wrote when in the height of his fame, ‘ how I could have been so easily cast away at such anage. It is wonderful to me that, even after my descent into the poor little drudge I had been since we came to London, no one had compassion enough on me—a child of singular abilities, quick, eager, delicate, and soon hurt, bodily or mentally—to suggest that some- thing might have been spared, as certainly it might have been, to place me at any common school. Our friends, I take it, were tired out. No one made any sign. My father and mother were quite satisfied. They could hardly have been more so if I had been twenty years of age, dis-tinguished at a grammar school, and going to Cambridge.”

And indeed, if his parents could have foreseen the future, they would have had cause to be much more satisfied. For when the fragile little boy was sent into his cousin’s blacking warehouse, he entered a better school, as it happened, than his father could have chosen for kim. It was an infinitely more painful school than Harrow or Eton, but for one whose destined work was to describe the poorer houses and streets of London, and the many varieties of life, odd and sad, laughter-moving and pitiful, that swarmed in them, it was a more instructive school, it was the true road to knowledge.

The chances were that a delicate boy like him succumbed to his wretchedness, and that a clever boy like him became a rogue and vagabond ; but he survived these dangers and became a great novelist. Instead of sinkivg into the depths of the thronging atoms, he rose above them, or kept apart from them, observed

‘them, and became their describer.

It is impossible to say how this watchful habit began, and when it connected itself with his love of literary dis- tinction. We have Dickens’s own testimony that he was a singularly observant child, and that at a very early period he had an ambition to become “a learned and distingnished man,” but it would be going too far to suppose that from his childhood he held himself apart and kept a keen eye on the doings of others with a view to making capital out of his observations. At first in all likelihood the distinction which he coveted was a kind of distinction that seemed to him possible only through the mediuin of grammar-schools and universities, ‘To the last no doubt he regretted this want of academical study, and believed that it had placed him at a disadvantage, Still accident is so very much better a schoolmaster than design, that from the first it gave him also the literary training needful to make hin a painter of manners. His father, the navy pay clerk, had a small collection of books, with which the “very small and not over-particularly taken care of boy ” had made himself familiar while he was living at Chatham, before his experi- ences in Camden Town and the blacking warehouse. A¥fiong these books were Roderick Random, Peregrine Pickle, Humphrey Clinker, Tom Jones, the Vicar of Wake- field, Don Quixote, Gul Llas, Robinson Crusoe, the Arabian Nights, Mrs Inchbald’s Yarces, and the Tales of the Geni. This literature did not glide over the boy’s mind like water over marble ; it found congenial soil, and fell into it as seed. He lived the life of his favourite characters. “I have been Tom Jones,” he says, putting his own case into the mouth of David Copperfield “(a child’s Tom Jones, a

harmless creature), for a week together. I have sustained my own idea of Roderick Random for a month at a stretch, I verily believe. J had a greedy relish for a few volumes

of voyages and travels—I forget what now—that were on

these shelves; and for days and days I can remember to have gone about my region of our house, armed with the centre-piece out of an old set of boot-trees, the perfect realization of Captain Somebody of the Royal British navy, in danger of being beset by savages, and resolved to sell his life at a great price.” And then follows something still more suggestive, as showing his tendency to connect these ideal creations with the world of sense around him. “ Every barn in the neighbourhood, every stone in the church, and every foot of the churchyard had some association of its own in my mind, connected with these books, and stood for some locality made famous in them. I have seen Tom Pipef go climbing up the church steeple ; I have watched ’ Strap, with the knapsack on his back, stopping to rest him- self upon the wicket gate ; and I know that Commodore Trunnion held that club with Mr Pickle in the parlour of our little village alehouse.” Even thus early, too, he tried to imitate what he read, wrote a tragedy founded on oue of the Tales of the Genti, and acquired great fame in his own circle as a teller of stories.

A boy with this preliminary training was excellently prepared for a course of strange and painful experiences. The bitter contrast between the ideal world in which he had lived, and the miserable poverty in which he spent the first three years of his life in London, making himself use- ful at home, running errands, carrying things to the pawn- brokers, visiting his father in the Marshalsea, into which the poor man and lus family soon drifted, tying up pots of blacking at the warehouse, prowling about cook-shops, a-la-mode beef-shops, and coffee-shops, a shabbily clad and insufficiently fed little boy, seeking to invest his livelihood of ashilling a day to the best advantage, helped to fix these experiences and the many odd scenes and characters with which they brought him in contact more indelibly on his memory. According to his own account, intensely as he felt the misery and shame of this kind of life, he was not without a perception of its humorous side. He used to say that, incredible as it might appear, he looked upon things then very much as he did afterwards. He even began to make attempts to sketch what he saw. Colman’s Broad Grins was lent him by some kind people—-another wise provision on the part of the great schoolmaster Accident ; and with this before him as a stimulus, he actually

sketched the barber who came to shave his bachelor uncle, the old charwoman who helped his mother, and laid the founda- tion of subsequent sketches,—Mrs Pipchin, the little Marchioness, Bob Sawyer's lodgings, and many other char- acters and scenes to which we have not the same direct traces. He was pursuing his education, in fact, as thoroughly as if he had been a pupil in a painter's studio. He was serving his apprenticeship. He could not have been better employed if he had been the holder of an endowment for research.

Dickens himself by no means looked upon it in that light. It was with difficulty, twenty-five years afterwards, that he could bring himself to speak of this period of his life. In his eyes it was a miserable servitude, from which he was happily relieved by a quarrel between his fathtr and one of the partners in the warehouse wher he was rather more than twelve years old, and sent to a school in Mornington Place, where he consorted with more respect- able boys, and had some chance of book learning. If his father's fortunes had been equal to it, he might now have passed through a regular course of grammar-school and university training, and thereby perhaps been in- capacitated for the work to which he was called. But

fortunately he was soon again thrown chiefly on his own resources. At the age of fifteen he was engaged as an office-boy by an attorney in Gray's Inn at a salary of 135, 6d., and afterwards 15s. a week. Here again he had a good field for observation, and did not fail to use it, for his employer afterwards recognized in Pickwick and Nickleby several incidents that took place in his office, and professed also to identify some of the characters. With Mr Black- more he remained for eighteen months. During that time his father became a newspaper parliamentary reporter, and the office-boy, who had lost none of his thirst for distine- tion, and spent all his spare time reading hard in the British Museum, resolved to qualify himself for a similar occupation. He mastered the difficulties of short-hand, and in November 1828 obtained employment as a reporter in Doctors' Commons. He spent two years reporting law cases, practising in Doctors' Commons and the other law courts. It would be difficult to conceive a more perfect way of completing the education of the future novelist, giving him an

insight into the strange by-paths of that higher stratum of society of which he had before had little experience. At the age of nineteen he entered the parlia- mentary gallery to enlarge his knowledge still further. He was a reporter of political speeches in and out of Parlia- ment for five years from 1831 to 1836, First he reported for the 7rue Sun, then for the Mirror of Parliament, finally for the Morning Chronicle. In his excursions into the country, and back with his " copy," he saw the last of the old coaching days and of the old inns that were a part of them; but it will be long, as Mr Forster remarks, "before the readers of his living page see the last of the life of either."

His first published piece of original writing appeared in the Old Monthly Magazine for January 1834. The title was " A Dinner at Poplar" ("Mr Minns "), one of the pieces afterwards published as Sketches by Boz, the nom de plume which he adopted from the nickname of one of his brothers. He wrote nine of these sketches for the Monthly Magazine, and then he was engaged to write some for an evening offshoot to the Morning Chronicle. The first series of Sketches by Boz was collected and published in two volumes in the February of 1836, with illustrations by George Cruickshank. 'The first edition was exhausted in a few months ; a second was called for in August. The Sketches had at once attracted attention. No wonder, for in them we find already in full swing the unflagging delight in pursuing the humorous side of a character, and the inex- haustible fertility in inventing ludicrous incidents, which had only to be displayed on a large scale to place him at once on a pinnacle of fame. There are many of them, such as the Parish, the Boarding House, Mr Minns and his Cousin, and the misplaced attachment of Mr John Dounce, which show Dickens's humour at its very richest. He had formed, too, by this time his characteristic likes and dislikes, and plays them off upon his butts and favourites with the utmost frankness, The delight in homely socit- bility and cheerfulness, in the innocent efforts of simple people to make merry, the kindly satire of their little vanl- ties aud ambitions, the hearty ridicule of dry fogies who shut themselves up in selfish cares and reserves, and of sour mischief-makers who take pleasure in conspiring against the enjoyment of their neighbours, —these tenden- cies, which remained with Dickens to the last, are strongly marked in the Sketches, though lighter-hearted in their expression than in his later works. The mark and indis- pensable condition of all great work is

there, that which Mr Carlyle calls veracity—the description of what the writer has himself seen, heard, and felt, the fearless utterance of his own sentiments in his own way.

The first number of Zhe Posthumous Papers of the

DICKENS

Pickwick Club was issued in April 1836. The story of its origin was first authentically told in the preface to the edi- tion of 1847. Some ofthe details were afterwards slightly modified. The first thought of the work did not originate with Dickens, although the whole character of it was deter- mined by him. Tke publishers, Messrs Chapman & Hall, and Mr Seymour the artist, had agrced to issue a monthly serial to be illustrated by Mr Seymour, and they went to Dickens, whose Sketches had attracted their attention, to propose that he should write the letterpress of this “ monthly something.” Their idea was that the author should describe the adventures of a ‘‘ Nimrod Club,” the members of which should go out shooting, fishing, and so forth, and getting themselves into difficulties through their want of dexterity. Dickens undertook the monthly some- thing, but obtained the required diverting incidents by a different machinery, namely, the Pickwick Club. The first four numbers went off slowly; the demand first became “brisk” after the fifth number, in which Sam Weller made his appearance. But by the discerning few the value of the work was recognized ; and one of them, Mr Bentley the publisher, only a few weeks before fame came to the author with its capricious and overwhelming suddenness, engaged him to undertake the editing of a monthly magazine to be started the following January, and to write a serial story fordt, and further made an agreement with him for the writing of two other tales at a specified early date. Of the vexation arising out of this agreement, when the huge suc- cess of the Pickwick Papers showed its terms to be inade- quate, and Dickens was disposed to resent it as a selling of himself into slavery, and of the manner in which the bargain was re-adjusted, an account is given by Mr Forster from the author’s point of view. Nine monthly numbers of the Pickwick Papers were published in 1836; eleven more in 1837; by November of the latter year the sale had reached 40,000 copies, Pickwick had become a popular hero aud godfather to imnumerable articles of merchandise, and

Sam Weller’s sayings were catchwords in the street and the household wherever the English language was spoken. In the first excitement of success, the young author’s appetite for work was unbounded. In 1837 he wrote his monthly instalments of the Pickwick Papers and Oliver Twist side by side, not even by a week in advance of the printer with either. They kept him fully occupied, and held in abeyance for that year a taste which from his youth to the end of his career was strong in him, and had no inconsiderable influence upon his style as a painter of manners. In his childhood at Chatham he got his first experience of fame as the author of a tragedy; at the school in Mornington Place he and his companions mounted Small theatres and acted small plays ; when in the attorney’s Office in Lincoln’s Inn Fields he frequented minor theatres, the nature of which he has caricatured in the Sketches, and not unfrequently engaged in parts; one of his first published sketches, “ Mrs Joseph Porter Over the Way,” is a descrip- tion of private theatricals in a stage-struck family. In 1836, before his serial engagements miultiplied, he wrote a farce called the Strange Gentleman, and a short comedy with songs called the Village Coquettes. It is strange that with this passion for the stage, which he always retained, he should not have written more plays. He probably felt that in this kind of composition he had but the use of his left hand, and did not care to risk his reputation where he had no field for those powers of description and narrative over which he had proved his mastery. But though he did not Write plays, and finally sought no outlet for his theatrical longings except in amateur acting and in reading from his own novels, the habit of realizing incidents as they would appear on the stage is unmistakably apparent in his work. He constantly seems to be working up scenes to the pitch

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of stage effect, elaborating the actions of his characters as if he were inventing “business” for a player, suggesting, in fact, an exuberance of business far beyond the capabilities of any human performer.

We doubt whether the fact that Dickens did not write plays is explained by saying that his genius was descriptive and narrative, but not dramatic. There is plenty of the raw material of dramatic action in his dialogues. He probably could have written a good acting play if he had tried. His

characters are essentially theatrical, though their story is told according to the laws of the novel, and not according to the laws of the drama. The explanation of his not having tried to write plays we take to be simply that be discovered full employment for his powers in another direction before he had applied himself to the art of constructing plays. Dickens was eminently a practical man, and, when publishers were fighting for his novels, he directed his whole energy to meeting the demand without secking to experiment on other modes of composition. As some compensation to Mr Bentley for releasing him from the strict terms of the agreement we have mentioned, he edited a life of Grimaldi, which was published in 1838 ; but after that he put his whole strength into the art of writing sketches and serial tales. As soon as Pickwick was off his hands, and before Oliver 7'wist was yet completed, he made an agreement with Chapman & Hall " to write a new work, the title whereof should be determined by him, of a similar character and of the same extent as the Posthumous Papers of the Pickwick Club ;" and between April 1838 and October 1839 he produced the Life and Adventures of Nicholas Nickleby.

Before the end of the seria] publication of Nickleby, he had conceived a new project, partly with a view to relief from the strain of writing a continuous story in instalments with the printer at his heels, and partly with a view to getting more profit for himself out of his labours. This was a weekly publication, to be edited by himself, and to contain sketches, essays, tales, adventures, and letters from imaginary correspondents. He was to receive a certain sum every week for what was written, and was besides to share half the profits with the publishers. When the scheme was agreed to by the publishers, he proceeded to release him- self from other engagements by resigning the editorship of Bentley's Miscellany, and getting clear of his obligation to write Barnaby Rudge for Mr Bentley in consideration of his buying the copyright and stock of Olwer Twist for £2250, He thus started clear with Master Humphrey's Clock, the title upon which he fixed for his new publication. The first number of Master Humphrey was issued on April 4, 1840. The sale of the first number was 70,000 copies, but the orders fell off when it was found that there was to be no continuous story. A story in weekly instalments it was thereupon necessary for him to write. A tale which he had begun in his magazine, and put into the mouth of Old Humphrey, was seen to be capable of expansion, and he expanded it into the

Old Curiosity Shop, finding him- self thus driven to his old employment of keeping ahead of the printers with a serial story, the only difference being that the instalments were weekly, and that he had the stimulus of larger profits from his success.

It is necessary in any account of Dickens, if we care to understand his method as a novelist, to give prominence to the conditions under which he worked. All that has been said about the want of plot in his novels finds its true ex- planation in those conditions. We need not search for deeper causes. His stories being published in instalments, it was indispensable to success that each separate part should have an independent interest ; and as each instal- ment was published before the next was written, it was necessary tliat he should have a piot leaving him with the

utmost possible freedom of action. Of course, when we say that this explains his method, we do not mean that it accounts for his success; we do not mean to detract from the marvellous genius that enabled him to write with success under such conditions. We are only concerned to show how the kind of plot that he adopted, and the numerous branches, offshoots, and meanderings which he permitted himself were imposed upon him by circumstances of publication and composition,—were, in fact, necessary to success under those circumstances. A great deal too much has been made of the want of plot in Dickens's novels, as if it were a weakness, as if he had been incapable of con- structing a plot,—the truth being that his method was deliberately adopted as that best suited to the position in which he found himself. It is evident that he was very much exercised over this question of plot, as indeed he was on all points touching his art. The Pickwick Papers may be put on one side in studying his method ; he tumbled as it were into writing them ; "no ingenuity of plot," as he himself explained, "was attempted ;" they were simply "'designed for the introduction of diverting characters and incidents." In his subsequent novels, if the Pickwick Papers can be called a novel, he could lay his plans before- hand, and consider how far it was possible to reconcile the introduction of interesting characters and incidents with greater regularity of structure, and he never seems to have solved the problem to his own

satisfaction. In Olwer Twist he adopted the method of Defoe, and wrote what may be called a biographical novel, the hero of which is involved in a series of complications, arising one after another without being foreseen and calculated for from the beginning, In this way he avoided committing himself too far in advance to engagements which might afterwards prove embarrassing ; the toils are laid for Oliver and cleared away more than once in the course of the story. In Wicholas Nickleby he reserved sinular freedom of action by making Ralph conspire to ruin his brother's children withont committing himself at the outset to any particular scheme as the villain's one resource; he thus also makes provision for a series of plots, one after another, and secures a certain unity for the whole by making them all proceed from one malevolent agency, whose motive was formed before the story began. In WNicholas Nickleby, however, he departs from certain restraints under which he had laid lumself in the construction of Oliver Twist ; he asserts greater freedom from the bit and bridle of plot in his introduction of diverting incidents which have no proper connection with the main story. Miss La Creevy and the Kenwigses are brought in on the slightest of pretexts, slighter even than that which serves for the introduction of the Mantalinis and the Crummles family. But no one can quarrel with a breadth of canvas which the author is able to fill with such figures; the critic can only say that he would have made a mistake if he had limited himself from the scope thereby given for his powers. As in Vickleby the moving principle of the story is the malevolent humour of Ralph, so in the Old Curiosity Shop the moving principle is the malevolent humour of Daniel Quilp. It is characteristic of Dickens that the uncalculating impulses should have so much influence in the direction of his stories. Fagin has some amount of selfish object in his designs against Oliver Twist; but Ralph and Quilp have nothing to gain by their conspiracies except the gratification of pure malice. The counter-agencies to these simple incarnations of the devil are equally disinterested. Oliver's good angel Nancy, Kate Nickleby's Newman N oggs, Little Nell's Kit, and Kit's Dick Swiveller are swayed by impulses of pure generosity. Observe, too, the analogous positions of Mr Brownlow the protector of Oliver, the Cheeryble brothers the protectors of Nicholas, and Mr Garland the

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protector of Kit. It isa game between the elementary passions, in which the good triumphs.

Master Humphrey's Clock was allowed to run. out in November 1841, with the conclusion of the tale of Barnaby Rudge, which followed the Old Curiosity Shop. The con- struction of Barnaby Rudge is less simple than that of any of its predecessors ; Dickens here attempted a more closely knit form of plot. There are no incidental diversions jn this novel, all the characters have some finger in the main story, and every scene tends towards the development of some relation which afterwards has a potent influence on the course of the main events. It is true the Lord George Gordon riots fill so much space as to eclipse for a time the private interests of the novel; but the lives of all the personages whose fortunes we are following are interwoven with the public history with the most elaborate care and consummate skill, and when our fears for the commonwealth in the general storm are allayed, the keenest interest is left for the fates of the individuals that have been involved in the commotion.

Barnaby Rudge cost the author much labour, and after finishing it, and with it Master Humphrey's Clock, he felt the need of some change of strain. He had begun to chafe under the weekly form of publication, and fret as to what he might have done with Barnaby if he could only have produced it in monthly instalments. This determined him tomake an agreement with his publishers for the issue of his next story in the old monthly form. When he pro- jected the Clock, one of his schemes was that he should visit Ireland or America, and write from there a series of descriptive papers for it. The Clock was discontinued, but the desire to seek fresh fields remained. He accordingly set out for America in January 1842, returning in June, after a reception which might well have turned his head, to write the American Notes. He had been run after and stared at by crowds, and cheered with greater enthusiasm than if he had been a crowned potentate ; and the people of the United States complained that in these JVotes, as well as in his fierce endeavours to enlighten them on the subject of copyright, he had made but a poor return for their welcome. He was superfluously aggressive, there Is no doubt; but they freely forgave him when he returned some years afterwards.

From whatever cause, the sale of the first number of Martin Chuzalewit (January 1843), in which he returned to the broad and free method of Nickleby, only seeking a new motive for his plot in the design of a severe but bene- volent old uncle for his nephew's reformation, and the schemes of a pious hypocrite, fell considerably below what he had been led to expect by the sale of his former month- lies. Only 20,000 were sold; his publishers, with whom he had made a very advantageous bargain, irritated him by grumbling ; and though the novel obtained still higher praise than any of its predecessors, he was disappointed and discontented, and began to revolve other plans for making a living by his pen. He conceived the idea of writing 4 Christmas tale, the Christmas Carol ; but he made much less profit by the enterprise than he made by similar tales afterwards, when he charged less for them and appealed to a wider audience. Although he sacrificed nothing of his individuality in the substance of the tale, and it was no failure in point of reputation, the pecuniary side of the work was for the moment uppermost in his mind, for, large as his income had been, he had exceeded it, and the most popular author of his time was suffering horrors, as he himself said, of ' intolerable anxiety and disappointment." This disappointment determined him to live abroad fora time, partly to reduce his expenses, and partly to store his mind with fresh material. He settled at Genoa, and there finished Chuzzlewit, and wrote the Chimes, his Christmas

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tale for 1844, making a brief visit to ngland to read it to a party of friends and arrange for its publication. He visited the principal towns of Italy in the first months of 1845, returning to England by way of Switzerland in June. His first work on returning to London was to project a new weekly, to be called the Cricket, " price three half- pence, if possible—partly original, partly select, notices of books, notices of theatres, notices of all good things, notices of all bad ones ; carol philosophy, cheerful views, sharp anatomization of humbug, jolly good temper, papers always in season, pat to the time of year; and a vein of glowing, hearty, generous, mirthful, beaining reference in everything to home and friends." 'The scheme for the time fell through. About the same time he "opened communica- tions with a leading member of the Government to ascer- tain what chances there might be for his appointment, upon due qualification, to the paid magistracy of

London ; but the reply did not give him encouragement to entertain the notion farther." Soon after he was asked to undertake the editorship of a new daily paper, the Daily News, and consented. But a fortnight's experience (from January 21 to February 9, 1846) satisfied him that he was out of his element. He then resolved to go abroad again, and write another novel in shilling monthly numbers. 'The fruit of this resolution was Dombey and Son, the first number of which was issued in October 1846, and the last in April 1848. On resigning the editorship of the Daily News, he did not wholly part connection with it; he continued in it from January to March 1846 a series of descriptive letters, which he afterwards published under the title of Pictures from Italy. The sale of Dombey, which reached 52,000, reassured him in the pursuit of his special calling. He followed it up in 1849 and 1850 with David Copperfield. There is not much room for variety of incident in the life of a novelist securely established in popular favour, work- ing hard, and happy in the exercise of his art. When we have mentioned that Bleak House appeared in monthly numbers, from March 1852 to September 1853, Little Dorrit from December 1855 to June 1857, Our Mutual Frvend from May 1864 to November 1865, we have given the chief incidents in the later half of the literary life of Dickens. He was much too restless a man, however, to settle down into a steady routine of work. He was not content to appear before the public only in monthly num- bers. He stuck steadily enough to work in which he had proved his mastery, but yet he had always a craving for new experiences, and was always planning new enterprises. While David Copperfield was still upon his hands he returned to his old notion of a weekly periodical. At first he thought of calling it The Shadow, making it contain, as lt Were, the observations of "a kind of semi-omniscient, omnipresent, intangible creature," "which should go into any place, by sunlight, moonlight, starlight, firelight, candlelight, and be in all houses, and all nooks and corners, and be supposed to be cognizant of everything, and go everywhere, without the least difficulty ; which might be in the theatre, the palace, the House of Commons, the prisons, the unions, the churches, on the railroad, on the sea, abroad, and at home." But on consideration he abandoned this idea, and chose the title Household Words. The first nuniber appeared in March 30, 1850. In House- hold Words, besides contributing short stories to the annual Christmas number, Dickens wrote Hard Times between April] and August 12, 1854. In 1859, in consequence of a quarrel between the editor and the publishers,

Household Words was discontinued, and Ali the Year Round, Practically the same periodical under a new title, took its Place, In All the Year Round, besides Christmas con- tributions, Dickens wrote 4 ale of J'wo Cities between April 30 and November 26, 1859; the Uncommercral

Traveller, between January 28 and October 13, 1860 ; and Great Expectations between December 1, 1860, and August 3, 186i. It is often made a question whether there was any falling off of power in the later works of Dickens. Dand Copperfield would generally be named as the novel in which his power was at its zenith. The question is not one that can be answered by an unqualified yes or no, There is certainly no falling off in descriptive power. The idiom of his dialogue is finer; the wit is perhaps keener and more swift. His characters are more sharply defined ; the force with which they are drawn is more delicate. In no point of the novelist's art, whether in the general con- struction or in the execution of details, is there any sign of failing power; on the contrary the power seems to have become firmer and more sure from practice. Does the fault then lie with the reader? Is it that we have grown tired of his manner? 'This is probably part of the reason, but yet it is not to be denied that we miss something in the later works. We laugh less over the pages. There are longer "intervallums" of seriousness. Humorous characters are still there in abundance ; Joe Gargery, Old Boffin, Silas Wegg, Rumty Wilfer, Septimus Crisparkle, Durdles, Mr Sapsea, are as irresistible as any of their pre- decessors. But on the whole there is less exuberance of animal spirits, The fun is not so unflagging. It is even less hearty, for there is mixed with our laughter something of contempt or pity for the object of it. Not that it is all laughter and undesigning diversion in any of the earlier works. Dickens belonged to a serious and moralizing generation ; he came in with the Reforin Bill, and partook largely of the moral spirit of its framers. Even in the joyous Pickwick Papers there is a serious blow at prison abuses, Oliver Twist is almost as didactic as one of Harriet Martineaw's tales. Before writing Nicholas Nickleby he weut down to Yorkshire like a Government commissioner to inquire into the abuses of the Yorkshire schools, Through all the fresh and boisterous fun of his earlier works, there was an almost declared doctrine that it is our duty to laugh, a sort of protest in favour of laughter, and a

denunciation of the dismal as a crime. The same genial doctrine runs also through his later works, but it is urged with a trace of bitterness, and with a greater sensitiveness to the evil principles that opposeit. Dickens was not written out, but he was growing old, and the animal spirits which fed the flame of his marvellous humour began to show symptoms of exhaustion, The quality of his humour was unimpaired, but the quantity had suffered diminution.

Dickens established his first weekly periodical from a desire to draw closer the relations between himself and his readers. He drew those relations still closer in 1858, by beginning a series of public readings of his own works. He had long hungered for this way of giving body and substance to his feeling of success. He had always been eager for the immediate and palpable triumphs of the stage. The idea of taking a hall or theatre and reading-from his own books was first mentioned by him in 1844, after he had read the Chimes to a small company in Mr Forster's rooms, and he often returned to it, but was obliged to hold it'in abeyance for fourteen years, his friends urging that it would be beneath his dignity. In 1858 his resolution was taken in spite of all discouragements, partly, he said, to escape from uneasiness at home, though it may well be believed that his own temper—restless, irritable, and exacting in the midst of his work—was largely to blame for the discomfort from which he suffered. He gave four series of readings, in 1858-59, 1861-63, 1866-67, and 1868-70, appearing in nearly every town of any size in the United Kingdom ; and in 1867-68 renewing in this way his acquaintance with the Americans. 'The success of VIL — 23

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these readings was enormous from every point of view. Mr Forster mentions that he remitted from America £10,000 odd as the result of 34 readings.

That Dickens should so long have abstained from appearing as a public reader of his own works, and stand- ing face to face with his audience to enjoy the delight of their effect, notwithstanding his strong desire to do so, is a significant fact. It gives a sort of measure of two things,—the force of his craving for sympathy and applause, and the extent of his patience under

conventional preju- dices. It was from deference to these prejudices that he abstained ; and it required an almost fierce effort on his

. ° : : ce Pd (T3 part to dismiss those prejudices as “ humbug,” and “ the proprieties of old women.” His attitude towards society, in the narrow sense of the word, was always peculiar. To understand it, we must bear in mind the circumstances of his youth. He seems never to have quite lost a lurking fear that those circumstances exposed him to contempt. He was much too proud and great-hearted a man to give in to such a fear; but it clung to him, and was always demanding a certain struggle to keep it down. Slight as the struggle was, the traces of it are perceptible in his work. We have an evidence of it in the common saying that he never succeeded in painting ‘a gentleman.” That is not to be got over by calling for a definition of the word ; it is a popular expression of a fact, the fact that nearly all the personages in his novels occupying a position in life to which that word would have been applied in his own time are painted in unfavourable colours. Perhaps the course of his stories did not call upon him to paint more favour- able specimens of that class ; still the fact remains that in Dickens’s attitude towards society there was something of the defensive, even of the aggressive. He faced towards society with a certain air of defiance, with the conscious- ness of a vast popular multitude behind him, to which he could appeal if they refused him what was hisdue. He never claimed more thar. his due, and it was never refused to him. It is perhaps for this reason that the traces of his spirit of revolt against society are so slight as to be more matter of inference than of observation. It is more correct to say that he never tried to paint “a gentleman,” than that he did not succeed. The question can hardly be raised without giving it undue importance, an importance which Dickens himself would have been the first to make light of; for, though he had his full share of the little vanities inseparable from humanity, he was a great man in temper as ‘well as in genius, and littlenesses were of the accidents and not of the essence of his nature.

Dickens’s want of perfect sympathy with the cultured society of his time incapacitated him for that kind of novel which answers to comedy in dramatic composition, although it left him free for work of a greater and more enduring kind. What may be called the comedy novel, the novel of Thackeray in Dickens’s generation, is much less sure of enduring fame,

because the sentiments on which it rests, being the product of a particular knot of circumstances, are more fugitive, and pass sooner into the province of the historian. The novels of Dickens will live longer because they take hold of the permanent and universal sentiments of the race,—sentiments which pervade all classes, and which uo culture can ever eradicate. His fun may be too boisterous for the refined tastes of his own time, or, for the matter of that, of posterity ; his pathos may appear maudlin; but they carried everything before them when they first burst upon our literature, because, however much exaggerated, they were exaggerations of what our race feels in its inner heart ; and unless culture in the future works a miracle, and carries its changes beneath the surface, we may be certain that Dickens will keep his hold.

If Dickens had been asked why his novels were likely to

live, he would probably have answered that it was because he put more work into them than any of his contemporaries, He was fond of insisting that genius meant attention. The definition may be accepted with a qualification. No man can become a genius by resolving to attend; but if he attends very much in some one direction by natural impulse, then he may be said to have a genius, whatever may be his field of work. No genius is of much avail for great literary productions without attention. Dickens could never have gathered together his amazing variety of characters and abundance of incidents without attention. M. Taine, in his criticism of Dickens, dwells much upon the boundless wealth of his imagination ; Dickens himself would have expressed the same fact by speaking of the persistence and closeness of his attention, It comes to the same thing in the end, whichever way we express it; but there is no doubt that Dickens’s own expression is more descriptive of his actual method of work. M. Taine rather gives us the notion that Dickens sat down and trusted to the inexhaust- ible fertility of his imagination ; whereas, ready and active as his imagination ever was, he accumulated materials for it with the industry of a pre-Raphaelite painter. The charm, the inimitable secret, lay, of course, in the trans- muting process through which dry facts passed in his imagination ; but he laboured earnestly, exercised the most painstaking attention, not

merely in bringing his faets together, but in setting them, with all their superadded value, for his special purposes. Dickens would have been a humorist though he had never written a line; he could never have helped attending to the humorous side of whatever met his eye; but without the attention on which he prided himself as the secret of his power, he could never have established himself securely as one of the greatest humorists in literature.

Our Mutual Friend was published in 1864 and 1869. After an interval of five years, during which he contributed to three Christmas numbers of All the Year Round, and wrote A Holiday Romance and George Silverman's Eupla- nation for an American publisher, the first number of The Mystery of Edwin Drood was issued in April 1870. He did not live to complete the novel. For some years severe pains in the left hand and foot had given warning that he was overtaxing his system, but the warning was not fully understood till too late. He was suddenly over- come by a stupor, caused by effusion on the brain, on the evening of the 8th of June, and ceased to breathe on the following day. In his will he had desired that he should be buried in "an inexpensive, unostentatious, and strictly private manner, without any public announcement of the time or place of his burial." These conditions. were observed ; but his executors did not consider them inconsistent with his receiving the honour of interment in Westminster Abbey, where he was buried on tle 14th of June 1870.

His death took place at Gadshill Place, a house near the main road between Rochester and Gravesend, which he had bought in 1856, and which had been his home since 1859. Here he worked, and walked, and saw his friends, and was loved and almost worshipped by his poorer neighbours for miles around. His previous residences m London had been Furnival's Inn, where fame found him a young Man writing sketches for the Chronicle ; 48 Doughty Street, after his marriage and first flood of success ; Devon- shire Terrace, from 1839 to 1851; Tavistock House, from 1851 to 1859. These residences were varied by his numerous excursions to provincial towns, to the Continent, to America. But "perhaps there was never a man who changed places so much and habits so little. He was always methodical and regular, and passed his life from day to day, divided for the most part between working

and walking, the same wherever he was.” It is a notable feature in his regularity that it was never a complacent routine; it was persisted in in spite of restless longings which he never conquered to the last.

The authorized life’ of Dickens is that by John Forster, 3 vols. 8yo, 1871-2-4. Thére are two books on his public readings— Charles Dickens as a Reader, by Mr CO. Kent, and Pen Photographs of his Readings in America, by Miss Kate Field. Mr G. A. Sala has pub- Hished a valuable essay on his ‘‘Genius and Charaeter.” (W. M.)

DICOTYLEDONS. See Borany, vol. iv. p. 92, &e., and VEGETABLE KINGDOM.

DICTATOR, the highest extraordinary magistrate of the ancient Roman republic. The original name of this office was magister populi, by which appellation he was called in the sacred books down to the latest times of the commonwealth.

When the republican form of government was established

at Rome, and the supreme executive vested in the two consuls, emergencies sometimes occurred in which it seemed that the safety of the state might advantageously be in- trusted for the time to some one man, whose past life had gained for him the esteem and respect of the whole body of the citizens. The idea of this office was borrowed by the Romans from the constitution of some of the Latin towns which they had subdued. It lay with the senate to decide when the services of a dictator were necessary. The power of nominating a man to the office was by that body made over to one of the consuls. It is not exactly deter- mined to which of these officers the nomination of a dictator properly appertained. * The insignia of the dictator’s office were—first, thie lictors, twenty-four in number, who bore the fasces and secures; second, the curule chair; and third, the toga pretexta.

The first dictator was appointed at Rome 501, B.c. nine years after the expulsion of the Tarquins. Who the first dictator was is differently stated by different historians, but it is most probable that it was T. Lartius.

Dictators were generally appoiuted to conduct a foreign war, but it often happened that in matters of less impor- tance they were appointed with nominal authority. The dictator was generally selected in the absence of the consuls to perform some small ceremonies, which in strict propriety could only be gone through by one of the consuls. Thus he was sometimes chosen to hold the comitia, to appoint

holidays, to aflix the clavus annalis in the temple of Jupiter, and to preside at trials. As soon as the dictator was appointed, he was required to select a master of the horse (magister equitum), whose term of office was the sarae as his own. ;

The power of the dictator was absolute ; and so long as he remained in office no appeal was open against his man- dates to any other authority in the state. He was nearly altogether independent of the senate. He could inflict much severer punishments than the consuls without being liable, as these officers were, to have his sentence reversed by the assembly of the people. His power was as irrespon- sible as it was absolute. In token of the absolute power of the dictators over the lives of their fellow-citizens, their lictors bore the axe in the midst of the fasces, even in their walks through the city—a mark of distinction which the consuls had formerly enjoyed, but which had been abo- lished in their case by the Valerian law.

Though the power of the dictator was thus great, it was nevertheless limited by certain indirect restrictions. The most important of these was, that he had no control what- ever over the public money, and had to content himself with such sums as were allowed him by the senate. He was not allowed to leave Italy ; and could not appear on horseback in the city without the express permission of the people. The surest safeguard, however, against any treacherous designs on the part of the dictator was the shortness of the period during which he remained in office. This was never permitted to exceed six months.

When a dictator was appointed, all the ordinary magis- trates ceased to be directly responsible to the governing authorities of the state, and took their orders directly from him. The only magistrates exempt from this necessity

were the tribunes of the commons. ‘The inferior officers, however, did not, as has been supposed, retire from office altogether. They merely obeyed the dictator so long as he continued in power, and on his resignation entered once more upon the untrammelled exercise of their authority.

It remains to be added that dictators were only appointed at Rome so long as Italy remained unsubdued. The last dictator appointed at Rome held office in 202 B.c. ; from that time the constitutional dictatorship disappears from Roman history.

See Mommsen’s Rémische Staatsrecht, ii. 1.

DICTIONARY

LTHOUGH dictionaries are so numerous, so well known, and so much used, they vary so greatly in

the nature and treatment of their subjects that any defini- tion must be very much modified in order to include some works so entitled and usually so called. In its proper and most usual meaning, a dictionary is a book containing 4 collection of the words of a language, dialect, or subject, arranged alphabetically or in some other definite order, and with explanations in the same or some other language. What is essential is, that the words given should be all or Most of those belonging to the subject of the dictionary, or at least be very many in number, and that they should be arranged in ‘definite order, and accompanied with Interpretations. Many other characters may rightly and advantageously belong to a dictionary, but these are the essentials. When the words are few in number, being only a small part of those belonging to the subject, or when they are given without explanation, or some only are explained, or the explanations are partial, the work is called a vocabulary, An alphabetical arrangement of the Words of some book or author with references to the

places where they occur is called an index. When under each word the phrases containing it are added to the references, the work is called a concordance. Sometimes, however, these names are given to true dictionaries ; thus the great Italian dictionary of the Academy of La Crusca, in six volumes folio, is called Vocabolario, and Ernesti’s dictionary to

Cicero is called Zndew. When the words are arranged according to a definite system of classification under heads and subdivisions, according to their nature or their meaning, the book is usually called a classed voca- bulary ; but when sufficient explanations are given, it is often accepted as a dictionary, like the Onomasticon of Julius Pollux, or the native dictionaries of Sanskrit, Manchu, and many other languages. Dictionaries were originally books of reference explaining the words of a language or of some part of it. As the names of things, as well as those of persons and places, are words, and often require explanation even more than other classes of words, they were necessarily included in dictionaries, and often to a very great extent. In time, books were devoted to them alone, and were limited to special

subjects, and these have so multiplied, that dictionaries | Crusea from the great Italian dictionary, and Calepino

of things now rival in number and variety those of words or of languages, while they often far surpass them in bulk. There are dictionaries of biography and history, real and fictitious, general and special, relating to men of all countries, characters, and professions; diction- aries of bibliography, relating to all books, or to those of some particular kind or country; dictionaries of geo- graphy, of the whole world, of particular countries, or of small districts, of towns and of villages, of castles, monasteries, and other buildings. There are dictionaries of philosophy; of mathematics; of natural history, zoology, botany ; of birds, trees, plants, and flowers ; of chemistry, geology, and mineralogy; of architecture, painting, and music; of medicine, surgery, anatomy, pathology, and physiology; of diplomacy ; of law, canon, civil, statutory, and criminal; of political and social sciences; of agri- culture, rural economy, and gardening; of commerce, navigation, horsemanship, and the military art; of mechanics, machines, and the manual arts. There are dictionaries of antiquities, of chronology, of dates, of genealogy, of heraldry, of diplomatics, of abbreviations, of useful receipts, of monograms, of adulterations, and of very many other subjects. And lastly, there are diction- aries of the arts and

sciences, and their comprehensive oflspring, encyclopedias, which include in themselves every branch of knowledge. The tendency of dictionaries of Janguage is to increase the vocabulary, to multiply articles ; the tendencies of dictionaries of things, and especially of encyclopedias, is to diminish the number of articles, fusing subjects together as far as possible, and to develop the explanation, making it longer and more copious and cir- cumstantial. This does away with the necessity of turning to many articles scattered through all parts of the work for a complete view of a subject. On the other hand, as requiring an index, it is less convenient for frequent reference on minor points.

Dictionarium is a word of low or modern Latinity ; 1 dictio, from which it was formed, was used in medieval Latin to mean a word. Lexicon is a corresponding word of Greek origin, meaning a book of or for words—a dic- tionary. A glossary is properly a collection of unusual or foreign words requiring explanation. It is the name frequently given to English dictionaries of dialects, which the Germans usually call idioticon, and the Italians vocabolario. Worterbuch, a book of words, was first used among the Germans according to Grimm, by Kramer (1719), imitated from the Dutch woordenboek. From the Germans the Swedes and Danes adopted ordbok, ordbog. The Icelandic ordabdék, like the German, contains the genitive plural. The Slavonic nations use slovar, slovnik, and the Southern Slavs ryetshnik, from slovo, ryetsh, a word, formed, like dictionary and lexicon, with- out composition. Many other names have been given to dictionaries, as thesaurus, Sprachschatz, cornucopia, gazo- phylacium, comprehensorium, catholicon, to indicate their completeness ; manipulus predicantium, promptorium puerorum, liber memorialis, hortus vocabulorum, ionia (a violet bed), alveary (a beehive), kamoos (the sea), haft kulzum (the seven seas), tsze tien (a standard of character), onomasticon, nomenclator, bibliotheca, eluci- dario, Mundart, Sammlung, clavis, scala, pharetra,? La ne Sa see _1 Joannes de Garlandia, who probably was born about 1275, and died soon after 1250, gives the following explanation in his Diction- arius, which is a classe vocabulary :— * Dictionarius dicitnr libellus iste a dictionibus magis necessariis, quas tenetur quilibet scolaris, non tantum in scrinio de lignis facto, sed in cordis armariolo firmitur retinere.” This has been supposed to be the first use of the word.

as An excellent dictionary of quotations, perhaps the first of the kind; a large folio volume printed in Strasburg about 1475, is

(in Spanish and Italian) from the Latin dictionary of Calepinus.

A dictionary of language should contain all the words which may be reasonably looked for in it, so arranged as to be readily and surely found, and so explained as to make their meaning, and if possible their use, clear to those who have a competent knowledge of the language or languages in which the explanations are given. Some dictionaries may suppose a very considerable degree of knowledge in those who use them, but though one could not be written which would make every word clear to a young child, they should in general be as easy and simple as possible. A full and complete dictionary of a great literary language can be compiled only by great labour, patience, knowledge, and skill, employed for imany years in collecting, correcting, adjusting, and completing the labours of many previous generations of workers, Sucha dictionary should include all the words of the language, As a great library cannot select books and publications, but must collect and preserve all without regard to their apparent value or worthlessness, for it is impossible to foretell what may be valued in future times, or what may be required by its readers for completing their researches, so a complete and standard dictionary should make no choice. Words obsolete and newly coined, barbarous, vulgar, and affected, temporary, provincial, and local, belonging to peculiar classes, professions, pursuits, and trades, should all find their place,—the only question being as to the evidence for their existence,—not indeed, all received with equal honour and regard, but with their characteristics and defects duly noted and pointed out. A complete dictionary should be the complete record and picture, or, as Arclibishop Trench says, the inventory of language. It must contain all words ever in any way belonging to it, in writing or in speech, or it will not bea complete record, and will not satisfy those who consult it. Lexicographers have too often tried to exercise a choice, and not content with being recorders, have made them- selves judges of words, and refiners and improvers of language, and have attempted not only to reform the language, but to check it in that growth and development which is inherent in all living tongues, and to make their dictionaries standards and rules of language, rather than inventories and

records. Unfortunately, this error is echoed by popular opinion; and a standard dictionary 1s too often supposed to be an arbitrator of words, rather than a standard of excellence among dictionaries, ‘The intention of the author should ke, as Bescherelle says, not to reform the language, but to present it with all its caprices, anomalies, irregularities, beauties, defects, — in a word, as the nation has made it. The precise value or worthlessness of a word can ouly be marked when it is admitted. If not found in the dictionary, it may be supposed to have been unknown to the author, as there is nothing to show that it has been condemned and rejected. The French Academy at first rejected all technical terms, but was compelled by popular clamour and the success of Furetiére’s dictionary, in which very many were given, to admit them in increasing numbers in its sccond and all subsequent editions. It is the more necessary that they should not be excluded, as the meanings are difficult to learn, and are most often looked for; and a dictionary intended for general use, should, as Dr Johnson says, include the words belonging to every profession. Oksolete words are admitted by Johnson, Littré, and other first- rate lexicographers, only when they have remained in use

entitled ‘‘ Pharetra anctoritates et dicta doctorum, philosophorum, et poetarnm continens.”’

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after a certain period. Richardson gives only those useful for ctymology, which is Littré’s rule for patois. Grimm admits all words at any time belonging to High German or its dialects. The great German dictionaries generally admit dialects, and in this respect are more complete than the French and English. The Chinese give in their standard dictionaries every character known to exist, though many are erroncous, corrupt, vulgar, or local, or are merely itaprovements proposed by some eminent person. Of the ancient characters, sometimes the pro- nunciation, and occasionally the meaning, are unknown, while both one and the other are in some cases completely lost. Jolinson omits all words relating to proper names, but they, as well as proper names, often as really belong to a langnage as any other words. The Philological Society propose that their new dictionary of English, begun in 1856, shall contain “every word occurring in the literature

of the language," and "admit as authorities all English books," unwisely excepting "such as are devoted to purely scientific subjects, as treatises on electricity, mathe- matics," &c., beginning " with that definite appearance of an English type of language distinct from the preceding semi-Saxon," about the year 1250. Their vocabulary of words beginning with the letter B, printed in 1863, con- tains 17,729. The practice of universal admission of words is becoming more generally adopted in standard dictionaries of all languages.

Words can be most surely and quickly found when arranged alphabetically in a single series. Other arrange- ments, though sometimes more useful, are not so geuerally convenient. When it is thought desirable to separate any class of words, they should still be also inserted in their proper places in the general alphabet. In a large dic- tionary a small separate additional alphabet is almost lost, aud is usually overlooked by searchers. According to Grimm, the alphabetical arrangement not only facilitates reference, but makes the author's work quicker and surer ; "for he who would insert rich contributions must have the places for them before his eyes, and not have to search about undecidedly to find whether the word is already there or not." The order of the alphabet should be that commonly uscd in the language. Any other makes re- ference more slow and uncertain. Grimm says that the order of the Sanskrit alphabet, adopted by Diefenbach and others, brings confusion rather than light to European languages, The etymological arrangement under roots has been generally condemned by experience. It places all words of the same origin together, so that they can be at once seen, which is often very useful and important, and is a great help in learning a language, as it assists the memory. Buta word not belonging to the small number of roots cannot be found unless its root is known; other- wise 1t must be looked for in the index, or if there is none, sought for by guess-work in many places. And as ety- mologies will vary according to fancy or knowledge, no word, as Grimm says, will be sure of its place, and no arrangement is more destructive of the object and use of a dictionary, All its advantages may be secured by giving under each root a list of derivatives. Another system, more rarely adopted, though perhaps more useful, is that of arranging all words under their leading ideas, so that all those relating to a subject are seen together, and the Proper word to express an idea may be found almost as easily as the idea expressed by a word may

be found in an ordinary dictionary. It is, in fact, a classed vocabulary of all the words of the language, with the sections arranged alphabetically, and resembles in its purpose the classified Index of a bibliographical dictionary, while it is quite as useful and necessary. Boissiére has chosen about 2000

Common words, under each of which he gives all the ; they may merely give the sense.

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French words evidently attached to it by community of ideas, or by relations of habitual usc, cause, means, etfect, or any analogy whatever. This part, he says, shows how to call things by their right names, and, as he remarks, great care is taken to teach children grammar, but none to teach them words. In the upper part of each page he gives all the words in alphabetical order, with a reference to the group in which each will befound. Roget, in his Thesaurus, gives under each head (1000 in number) not only tlic words belonging to the idea, but their opposites, and adds at the end of the book an index of all the words. This system, on account of its very great use and value, might well be made a subsidiary part of a standard dictionary, the groups being placed in the general alphabet, and a reference to each group being added to each word. The arrangement by terminations is of use grammatically and stenogra- phically, aud for making out words of which the beginning is illegible or wanting. A dictionary of rhymes is similar, but not exactly the same, and is of little use except for making verses, and, when the rhymes are perfect, for showing the pronunciation. In the Semitic languages words are commonly placed under their roots, and in MS. lexicons the roots are often arranged alphabetically, accord- ing to the last radical. When Lane was making his great Arabic lexicon, he generally had before him eight or ten native lexicons, containing three different arrangements of roots. In Chinese dictiouarics the characters are usually arranged under the 214 radicals, which now scrve as an alphabet. In former times the number varied, and was much greater. The characters under each radical are further subdivided according to the number of strokes used in making each character, in addition to its radical, or the abbreviation of its radical which each character contains. But no arrangement is attempted of the charac- ters having the same number of strokes. Other systems are

sometimes used, arranged by toncs and endings, and by the characters (about 1040) called phonetics.

In the separate articles of a dictionary the arrangement must vary very much with the language, as well as with the word itself. When necessary, the orthography, pro- nunciation, and grammatical inflexions of the word shonld be given, and any variations of these at different times and places carefully pointed out, as well as the character of the word, such as obsolete, provincial, &c.; and forms be- ginning with a different spelling should be placed in separate articles, with references to the main article. The etymology should be given, referring derivatives to their respective roots; and under each root giving, if not the derivation as far back as it can be traced, at least what Littré calls the secondary etymology—that is, deriving it from a word not belonging to the Janguage, as when a French word is traced to a Latin or German word with- out proceeding farther; and cognate words should gene- rally be enumerated, often with their principal meanings. This gives a primary meaning, but care must be taken that the derivation is a real one, not a mére fancy or guess. The times when the word was introduced or became obsolete should be noted, and the mean- ing it bore at first, as well as those which prevailed at various periods. The meanings may be arranged in a series, not merely as they may be imagined to have been logically developed from each other, but as their connec- tion may be traced, and can be shown to have existed in actual use; and where this connection cannot be traced, the defect should be pointed out. Sometimes, too, the meanings are, as Johnson says, collateral. In some kinds of dictionaries the explanations may be merely sufficient to identify the word, as in Bilderdijk's Voordenboek voor de Nederduitsche Spelling, or, as in most small dictionaries, They may also be full

and complete explanations of all the meanings, and again, as is necessary in a complete dictionary, may include usage. The explanations of the meanings should be precise and not vague, real definitions and not a mere reference of one word to another of the same meaning, as when the French Academy explains fier by hautain, altier, and hautain by fier, orgueileux. Bunt when one language is explained by another, nothing conveys the

meaning so well as a perfectly equivalent word. The interpretation of a language by itself is, as Dr Johnson says, very difficult, for there is no other word to express the idea, and simple ideas cannot be described. Therefore, in Grimm's dictionary Latin and other languages are used when necessary. Synonyms and homonyms should be given, as well as words of opposite meaning, and their similarities and differences explained. Remarks should be made on difficulties, faults to be avoided, peculiar constructions, figurative, idiomatic, and proverbial expressions, and the origin of these given when possible. All this should be done in the fewest and plainest words. Eloquence is out of place in a dictionary; but the author must not fear fulness when it is necessary, and must not allow brevity to make him obscure. A com- plete dictionary of a copious language must necessarily be a very large book, but much space may be saved by the use of well-selected terms and abbreviations, and by typo- graphical arrangements.

Examples form a very important part of a dictionary, but one which is generally omitted, often neglected, and seldom so carefully attended to as it deserves. When no quotations are given, the whole language depends on the authority of the author of the dictionary. The French Academy have always claimed the right of making their own examples. Voltaire says they seem to have made a law not to quote, but, he adds, a dictionary without quotations is a skeleton. Examples may be arranged either under the meanings they illustrate, which is the usual and most useful plan, or, in languages possessing an extensive literature of long duration, chrono- logically in one scries, as the Philological Society formerly proposed. Littré has adopted a medium, and gives examples from authors of the 17th, 18th, and 19th centuries under the meanings to which they belong, and those from previous authors in a chronological series. Each quotation should give a complete sense, and not be a mere fragment of a sentence. It should, if possible, be instructive and interesting in itself, but should not on this account be made too long, Those containing etymologies, definitions, or explanations of a word, as well as those in which it is joined to words of the same or opposite meaning, and those which mark its intro- duction or disnse, and those in which it is used as a foreign word uot yet naturalized, should be especially sought for. Hach should have as exact a reference as pos- sible, The common practice of giving only the author's name makes it sometimes impossible to verify a quotation without searching through his

entire works, which may fill many volumes. In the case of some rare words, when the quotation would add nothing to the information other- wise given, the mere reference may suffice. The value of a dictionary and the richness of its vocabulary depend very much on the carefulness and extent of the search for examples, which can only be complete when it has ex- tended to the whole literature of the language. If con- cordances and full indexes were more universal, the search for examples would be much facilitated. The foundation of the Philological Society's intended dictionary was to have been the reading of all English books not purely scientific for examples by volunteers. In October 1864, 1149 had been read, and 360 were in hand.

Though complete dictionaries of a la nguage are very few,

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and none as yet exists in English, large dictionaries are many. The teudency of great dictionaries is to unite in themselves all the peculiar features of special dictionaries, A large dictionary is most useful when a word is to be thoroughly studied, or when there is difficulty in making out the meaning of a word or phrase. Special diction- aries are more useful for special purposes ; for instanee, synonyms are best studied in a dictionary of synonyms, And small dictionaries are more convenient for frequent use as in translating from an unfamiliar language, for words may be found more quickly, and they present the words and their meanings in a concentrated and compact form, instead of being scattered over a large space, and separated by other matter. Dictionaries of several languages, called polyglots, are of different kinds. Some are polyglot in the vocabulary, but not in the explanation, like Johngon's dictionary of Persian and Arabic explained in English; some in the interpretation, but not in the vocabulary or explanation, like Calepint Octoglotton, a Latin dictionary of Latin, with the meanings in seven languages. Many great dictionaries are now polyglot in this sense. Some are polyglot in the vocabulary and interpretation, but are explained in one language, like Jal's Glossaire Nautique, a glossary of sea terms in many langnages, giving the equi- valents of each word in the other languages, but the ex- planation in French. Pauthier's Annamese Dictionary is polyglot in a peculiar way. It gives the Chinese charac- ters with their pronunciation in Chinese and Annamese, Special dictionaries are various, and many kinds

will be found in the following list. There are dictionaries of etymology, foreign words, dialects, secret languages, slang, neology, barbarous words, faults of expression, choice words, prosody, pronunciation, spelling, orators, poets, law, music, proper names, particular authors, nouns, verbs, participles, particles, double forms, difficulties, and many others. Fick's dictionary (Géttingen, 1868, 8vo ; 1874-76, 8vo, 4 vols.) is a remarkable attempt to ascertain the common language of the Indo-European nations before each of their great separations. In the second edition of his Ltymologische Forschungen (Lemgo and Detmoldt, 1859-73, 8vo, 7217 pages) Pott gives a comparative lexicon of Indo-European roots, 2226 in number, occupy- ing 5140 pages.

Comparatively few languages possess dictionaries, and they are few in number compared to other books, probably much under 2 per cent.; and 5000, not counting different editions, might be considered a very large collection. More than half belong to European languages, of which five surpass the rest in the number and variety of their dictionaries, namely, Greek, Latin, French, English, and German. In Asia, those excelling in this respect are Hebrew, Arabic, Persian, Sanskrit, Hindustani, Malay, Chinese, and Japanese ; in Africa, Egyptian, Ethiopic, and Kaffre; in America, Otomi, Aztec, Guarani, Tupi, and Quichna.

The following list of dictionaries is arranged geographi- cally by families of languages, or by regions. In each group the order, when not alphabetical, is usually from north to south, cxtinct languages generally coming first, and dialects being placed under their language. Diction- aries forming parts of other works, such as travels, histories, transactions, periodicals, reading-books, &c., are generally excluded. When a selection has to be made, the earliest, largest, latest, and best dictionaries are preferred. This system seemed on the whole best calculated to keep together dictionaries naturally associated. The languages to be considered are too many for an alphabetical arrange ment, which ignores all relations both natural and ge0- graphical, and too few to require a strict classification by affinities, by which the European languages, which for many reasons should be kept together, would be dispersed.

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Under eithcr system, Arabic, Persian, and Turkish, whose dictionaries are so closely counected, would be widely separated. A wholly geographical arrangement would be ‘neonvenicnt, especially in Europe. Any system, however, which attempts to arrange in a consecutive series the great network of languages by which the whole world is enclosed, must be open to some objections; and the arrangement adopted in this list has produced some anomalies and dispersions which might cause inconveni- cnce if not pointed out. The old Italic languages are placed under Latin, all dialects of France under French (but Provengal as a distinct language), and Wallachian among Romanic languages. Low German and its dialects are not separated from High German, Basque is placed after Celtic; Albanian, Gipsy, and Turkish at the end of Europe, the last being thus separated from its dialects and congeners iu Northern and Central Asia, among which are placed the Kazan dialect of Tartar, Samoyed, and Ostiak. Accadian is placed after Assyrian among the Semitic languages, and Maltese as a dialect of Arabic ; while the Ethiopic is among African languages, as it seemed undesirable to separate it from the other Abys- sinian languages, or these from their neighbours to the north and south. Circassian and Ossetic are joined to the first group of Aryan languages lying to the north-west of Persia, and containing Armenian, Georgian, and Kurd. The following is the order of the groups, some of the more important languages, that is, of those best provided with dictionaries, standing alone :—

Evrore: Greek, Latin, French, Romance, Scandinavian, Teutonic (including English and German), Celtic, Lithu- anic, Slavonic, Ugrian, Turkish.

Asta: Semitic, Armenian, Persian, Sanskrit, Indian, Indo-Chinese, Indian Archipelago, Philippines, Chinese, Japanese, Northern and Central Asia.

Arrica: Egypt and Abyssinia, Eastern Africa, Southern, Western, Central, Berber.

Australia and Polynesia. |

America: North, Central (with Mexico), South.

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Greek.—Athenxus quotes 35 writers of works, known or sup- posed to be dictionaries, for, as they are all lost, it is often difficult to decide on their nature. Of these, Anticlides, who lived aftcr the reien of Alexander the Great, wrote ’Efmynriueds, which seems to have been a sort of dictionary, perhaps explaining the words and phrases oceurring in ancient stories. Zenodotus, the first super- intendent of the great library of Alexandria, who lived in the reigns of Ptolemy I. and Ptolemy II., wrote TA@ooa:, and also Aetets €Ovixat, a dictionary of barbarous or foreign phrases. Aristo- phanes of Byzantium, son of Apelles the painter, who lived in the reigns of Ptolemy IJ. and Ptolemy III., and had the supreme man- agement of the Alexandrian library, wrote a number of works, as Articat Meters, Aaxovixad TA@ooa, which, from the titles, should be dictionaries, but a fragment of his Adte:s, printed by Boissonade, in his edition of Herodian (London, 1869, 8vo, pp. 181-9), is not alphabetical. Artemidorus, a pupil of Aristophanes, wrote a dic- tlonary of technical terms used in cookery. Nicander Colophonius, hereditary priest of Apollo Clarius, born at Claros, near Colophon, Mm Tonia, probably in reputation for 50 years, from 181 to 135, ho TAdcou in at least three books, Parthenius, u pupil of the ae grammarian Dionysius (who lived in the Ist century Bs > hrist), wrote on choice words used by historians. Didymus,

: ri Xa@Anevrepos, who, according to Atheneus, wrote 3500 books, (of ’ pe ing to Seneca, 4000, wrote lexicons of the tragic poets a hich book 28 is quoted), of the comie pocts, of ambiguous we = of corrupt expressions. Glossaries of Attic words were b ae y Crates, Philemon, Philetas, and Theodorus ; of Cretan, i ee or Hermonax; of Phrygian, by Neoptolemus; of rie ee by Moschus ; of Italian, by Diodorus of Tarsus ; of % or ords, by Silenus ; of synonyms, by Simaristus , of cookery, en ; and of drinking vessels, by Apollodorus of Cyrene. allows to Suidas, the most ancient Greek lexicographer was ao the sophist, son of Archibius. According to the common pee ved im the time of Augustus at Alexandria. He com- 4 lexicon of words used by Homer, Aéters ‘Ounpixal, a very

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valuable and useful work, though much interpolated, cdited by Villoison, from an MS. of the 10th century, Paris, 1773, 4to, 2 vols.; and by Tollius, Leyden, 1788, 8vo; ed. Bekker, Berlin, 1833, 8vo. Erotian or Herodian, physician to Nero, wrote a lexicon on Hippocrates, arranged in alphabetical order, probably by some copyist, whom Klein calls ‘homo sciolus.” It was first published in Greek in H. Stephani Dictionariwm Medicum, Paris, 1564, 8vo; ed. Klein, Lipsie, 1865, 8vo, with additional fragments. Timens the sophist, who, according tc Ruhnken, lived in the 3d century, wrote a very short lexicon to Plato, which, though much interpolated, is of great value, 1st ed. Ruhnken, Leyden, 1754; ed. locupletior, Lugd. Bat. 1789, 8vo. Alius Maris, called the Atticist, lived about A.D. 190, and wrote an Attic and Greck lexicon, 1st ed. Hudson, Oxf, 1712, 8vo. Julins Pollux (LovAsos MoAvSevuns) of Naucratis, in Egypt, died, aged 58, in the reign of Commodus (180-192), who made him professor of rhetoric at Athens. He wrote, besides other lost works, an Onomasticon iu ten books, being a classed vocabulary, intended to supply all the words required by cach subject with the usage of the best anthors. It is of the greatest value for the knowledge both of language and antiquities. First printed by Aldus, Venice, 1500, fol.; often afterwards ; ed. Lederlinus and Hemsterhuis, Amst. 1706, fol. 2 vols.; ed. Dindorf, Leip. 1824, 8vo, 5 vols. Harpceration of Alcxandria, who lived in the 4th century, wrote a lexicon on the ten Attic orators, first printed by Aldus, Ven. 1503, fol.; ed. Dindorf, Oxford, 1853, 8vo, 2 vols. from 14 MSS. Orion, a grammarian of Thebes, in Egypt, who lived between 390 and 460, wrote an ctymological dictionary, printed by Sturz, Leipzig, 1820, 4to. Helladins, a pricst of Jupiter at Alexandria, when the heathen temples there were destroyed by Theophilus in 389 or 391 cscaped to Constantinople, where he was living in 408. He wrote an alphabetical lexicon, now lost, chiefly of prose, called by Photius the largest (roavorixérarov) which he knew. Ammonius, professor of grammar at Alexandria, and priest of the Egyptian ape, fled to Constantinople with Helladius, and wrote a dictionary of words similar in sound but different in meaning, which has been often printed in Greek texicons, as Aldus, 1497, Stephanus, and separately by Valckenaer, Lugd. Bat. 1739, 4to, 2 vols., and by others. Zenodotus wrote on the cries of animals, printed in Valekenaer’s Anumonius; with this may be com- pared the work of Vineentio Caralucci, Lexicon vocum que a vrutis animalibus cmittwntur, Perusia, 1779, 12mo. Hesychius of Alex- andria, probably a heathen, who lived before 389, wrote

a lexicon, important for the knowledge of the language and literature, con- taining many dialectie and local expressions and quotations from other authors, Ist ed. Aldus, Ven. 1514, fol.; the best is Alberti and Ruhnken, Lugd. Bat. 1746-66, fol. 2 vols.; collated with the MS. in St Mark's Library, Venice, the only MS., existing, by Niels Iversen Schow, Leipzig, 1792, 8vo; ed. Schmidt, Jena, 1867, 8vo. The foundation of this lexicon is supposed to have been that of Pamphilus, an Alexandrian grammarian, quoted by Atheneus, which, according to Snidas, was in 95 books from Eto; Ato A had been compiled by Zopirion. Photius, consecrated patriarch of Constantinople, 25th Dec. 857, living in 886, left a lexicon, partly extant, and printed with Zouaras, Lips. 1808, 4to, 3 vols., being vol. iii.; ed. Naber, Leidse, 1864-5, 8vo, 2 vols. The miost cele- brated of the Greek glossaries is that of Suidas, of whom nothing is known. He probably lived in the 10th century. His lexicon is an alphabetical dictionary of words, including thc names of. per- sons and places,—a compilation of extracts from Greek writers, grammarians, scholiasts, and lexicographers, very carelessly and unequally cxeeutcd. It was first printed by Demetrius Chalcon- dylas, Milan, 1499, fol.; the best edition, Bernhardy, Haile, 1853, 4to, 2 vols. Joln Zonaras, a celebrated Byzantine historian and theologian, who lived in the 12th century, compiled a lexicon, first printed by Tittmann, Lips. 1808, 4to, 2 vols. An anonymous Greek glossary, cntitled'Erupoaoyimdy né-ya, Etymologicum magnum, has been frequently printed. The first edition is by Musurns, Venitia, 1499, fol.; the best by Gaisford, Oxonii, 1848, fol. It contains many grammatical remarks by famous authorities, many passages of authors, and mythological and historical notices. The MSS. vary so much that they look like the works of different authors. Kudocia Augusta of Makrembolis, wife of the emperors Constantine XI. and Romanus IV. (1059 to 1071), compiled a dictionary of history and mythology, called *Iwvid (bed of. violcts), first printed by D'Ausse de Villoison, Anecdota Graca, Venetiis, 1781, 4to, vol. 1. pp. 1-442. It was supposed to have been of much value before it was published. Thomas, Magister Officiorum under Andronicus Paleologus, afterward called as a monk Theodulus, wrote' Exdoyal évoudrwr ArriKay, printed by Calliergus, Rome, 1817, 8vo. Papias, Vocabulariwm, Mediolani, 1476, fol.: Craston, an Italian Carmelite monk of Piacenza, compiled a Greek and Latin lexicon, edited by Bonus Accursius, printed at Milan, 1478, fol.; Aldus, Venetiis, 1497, fol.: Guarino born about 1450 at Favora, near Camarino, who called himself both

Phavorinus and Camers, published his Zesawrus in 1504. These three lexicons were frequently reprinted. Estienne, Thesaurus, Geneve, 1572, fol. 4 vols; ed. Valpy, Lond. 1816-26, 8 vols. fol.; Paris, 1831-65,

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2d ed. ib. 1861-62, 8vo, 2 vols; 3d ed. 2b. 1869-70, 8v0, transl. by Donkin, 1864, 8vo. ine French.—Ranconct, Thresor, cd. Nicot, Paris 1606, fol. i.

Srey lon ARE

1618, 4to: Richelet, Genbve, 1680, fol. 2 vols.; ed. Gattel, Paris, f vo, 2 vols.

TF iench Academy, after five years' consideration, began their dictionary, 7th February 1639, by examining the letter A, which took them nine months to go through. The word Académie was for some time omitted by oversight. They decided, 8th March 1638, not to cite authorities, and they have since always claimed the right of making their own examples. Ollivier justifies them by saying that for eighty years all the best writers belonged to their body, and they could not be expected to cite each other. Their design was to raise the language to its last perfection, and to open a road to reach the highest eloquence. Antoine Furetiére, oneof their members, compiled a dictionary which he says cost him forty years' labour for ten hours a day, and the manuscript filled fifteen chests. He gave words of all kinds, especially technical, nai : oe ane pee o- ee. eee specimen ae a lished his Essaz, 'Paris, , 4to; Amst. , 12mo. e Aca- demy charged him with using the materials they had prepared for their dictionary, and expelled him, 22d January 1685, for plagiarism. He died 14th May 1688, in the midst of the consequent controversy and law suit. His complete work was published, with a preface by Bayle, La Haye and Rottcrdam, 1690, fol. 3 vols.; again cdited by Basnage de Beauval, 1701; La Haye, 1707, fol. 4 vols. From the edition of 1701 the so-called very popular Dictionnaire de Trevouzx, Trevoux, 1704, fol. 2 vols., was made by the Jesuits, who excluded everything that seemed to favour the Calvinism of Basnage. The ast of its many editions is Paris, 1771, fol. 8 vols. The Academy's dictionary was first printed Paris, 1694, fol. 2 vols. They began the revision in 1700; second edition 1718, fol. 2 vols.; 3d, 1740, fol. 2 vols.; 6th, 1885, 2 vols. 4to, reprinted 1855; Supplément, by F. Raymond, 1836, 4to; Complément, 1842, 4to, reprinted 1856; Dictionnaire Historique, Paris, 1858-65, 4to, 2 parts (A to Actu), 795 pages, published by the Institut: Docliez, Paris, 1859, 4to: Bescherelle, 2b. 1844, 4to, 2 vols.; 5th ed. Paris, 1857, 4to, 2 vols.; 1865: Landais, Paris, 1835; 12th ed. 7b. 1854, 4to, 2 vols.: Littré, Paris,

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which he worked sixteen to eighteen hours a day): Otho, Frankf. a. M. 1702, 4to (the same languages with Rabbinical).

Hebrew.—MSS. David ben Abraham, of Fas, wrote, in Arabie, a large Hebrew dictionary, the MS. of which, a quarto of 318 leaves on cotton paper, was found about 1830 by A. Firko- witz, of Eupatoria, in the cellar cf a Karaite synagogue in Jeru- salem. The age of this work cannot be ascertained. About 1050, Ali ben Suleiman wrote a dictionary in Arabic, on the plan of that of David ben Abraham. The MS. of 429 leaves belongs to Firko- witz, aja ben Sherira, the famous teacher of the Academy of Pumbeditha, wrote a Hebrew dictionary in Arabic, called £2 Chavi (The Gathering), arranged alphabetically in the order of the last radical letter. “This dictionary is lost, as well as that of the Span- 1ard Isaac ben Saul, of Lucena. Jona ibn Ganach, of Cordova, born about 985, wrote a Hebrew dictionary in Arabic called Kitéd el Azul (Book of Roots), This, as well as a Hebrew translation by Samuel ibn Tabén, is extant in MS., and was used by Gesenius in his Thesaurus. Rabbi David ben J oseph Kimehi died Soon after 1232. His lexicon of roots, called ow, was printed at Naples 1490, fol. ; Constantinople, 1513, fol., Naples, 1491, 8vo ; Venice, 1552 ; Berolini, 1838, 4to. Zishbi (The Tishbite), by Elijah ben Asher, the Levite, so called because it contained 712 Le Was printed at Isny 1541, 8vo and 4to, and often afterwards. Conk. —-Munster, Basile, 1523, 8vo; 5 editions to 1564: Zamora, ie ae 1526, fol.: Pellicanus, Argentorati, 1540, fol.: Reuchlin,

asil. 1556, fol. : Avenarius, Witteberge, 1568, fol.; auctns, 1589: oe Lugd. Bat, 1575, fol.; 1577; Geneve, 1614: Buxtorf, rep 1607, 8vo; 1615; and many other editions: Frey (Lat.-Fng.), i ed. London, 1815, 8vo: Gesenius, Thesaurus, Leips. 1829-58, va 3 vols. ENGLIsH.—Bale, London, 1767, 4to: Parkhurst, 7b. 2, 4to: Lee, ib, 1840, 8vo: Gesenius, translated by Robinson, E 1844, 8vo; by Tregelles, 2b. 1846, 4to: Fuerst, 4th ed. transl.

y Davidson, ib: 1866, 8vo; 1871, 8vo, 1547 pages. FRENcH.—

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1811, 8vo: Fontanella, Venezia, 1824, 8vo. Durcu.—Waterman, Rotterdam, 1859, &c., 8vo. Hun- GARIAN.—Khrentheil (Pentateuch), Pest, 1868, 8vo. RomaAIc.— Loundes, Melité, 1845, 8vo, 987 pages.

Rabbinical and Chaldee.—Nathan ben Jehiel of Rome wrote in the beginning of the 12th century a Talmudie dictionary, Aruch, printed 1480 (?), s.l., fol.; Pesaro,{1517, fol.; Venice, 1531 ; and often: Isaiah ben Loeb, Berlin, wrote a supplement to Aruch, vol. i., Bresslau, 1830, 8vo; vol. it. (2 tom), Wien, 1859, 8vo: Munster, Basil, 1527, 4to ; 1530, fol.: Elijah ben Asher, the Levite, transl. by Fagius, lsnw, 1541, fol.; Venet. 1560: David ben lsaac de Pomis, Zamach David, Venet. 1587, fol.: Buxtorf, Basilex, 1639, fol.; ed. Fischer, Leips. 1866-75, 4to: Otho, Geneva, 1675, 8vo; Altona, 1757, 8vo: Zanolini, Patavii, 1747, 8vo: Hormheim, Halle, 1807, 8vo: Landau, Prag, 1819-24, 8vo, 5 vols.: Dessauer, Erlangen, 1838, 8vo: Nork (i.e, Korn), Grimma, 1842, 4to: Schouhak, Warschau, 1858, 8vo, 2 vols) Tarcums.—Levy, Leip- zig, 1866-68, 4to, 2 vols.; 1875: Id. (ng.), London, 1869, 8vo, 2 vols. TautmMup.~~—Lowy (in Heb.), Wien, 1863, 8vo: Levy, Leip~~ zig, 1876, &c., 4to. Prayer-Boox.—Hecht, Kreuznach, 1860, 8vo: Nathan, Berlin, 1854, 12mo. Syvnonyms.—Pantavitius, Lodevee, 1640, fol. Foreign Worps.—Rabeini, Lemberg, 1857, 8vo, &e. JEWisH-GERMAN.—Callenberg, Halle, 1736, 8vo: Voll- beding, Hamburg, 1808, 8vo: Stern, Miinehen, 1833, 8vo, 2 vols.: Theile, Berlin, 1842-43, 8vo, 2 vols: Avé-Lallemant, Das Deutsche Gaunerthum, Leipzie, 1858, 8vo, 4 vols; vol. iv. pp. 321-512.

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Samaritan. —Criuesius, Altdorphi, 1613, 4to: Morini, Parisiis, 1657, 12mo: Hilligerus, Witteberge, 1679, 4to: Cellarius, Cize, 1682, 4to; Frankof. 1705: Uhlemann, Leipsie, 1837, 8vo: Nicholls, London, 1859, 8vo.

Assyrian.—Norris, London, 1868, 8vo, 3vols. Proper NamMEs, —Menant, Paris, 1861, 8vo.

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Syriac.—Joshua ben Ali, a physician, who lived about 885, made a Syro-Arabic lexicon, of which there is an MS. in the Vatican. Hoffmann printed

this lexicon from Alif to Mim, from a Gotha MS., Kiel, 1874, 4to. Joshua bar Bahlul, living 963, wrote another, great part of which Castelli put into his lexicon. His MS. is now at Cam- bridge, and, with those at Florence and Oxford, was used by Bern- stein. Elias bar Shinaya, born 975, metropolitan of Nisibis, 1009, wrote a Syriac and Arabic lexicon, entitled Aiidéb dt Tarjuman ji Taalem Loghat es Sdridn (Book called the Interpreter for teaching the Language of the Syrians), of which there is a MS. in the British Museum. It was translated into Latin by Thomas & Novaria, a Minorite friar, edited by Germanus, and published at Rome by Obicinus, 1636, 8vo. It is a classified voeabulary, divided in 30 chapters, each containing several sections. Crinesius, Witteberge, 1612, 4to . Buxtorf, Basilez, 1622, 4to: Ferrarius, Rome, 1622, 4to: Trost, Cothenis Anhaltor. 1648, 4to : Gutbir, Hamburgi, 1667, 8vo: Schaaf, Lugd. Bat. 1708, 4to: Zanolini, Patavii, 1742, 4to. Castellus, ed. Michelis, Gottingen, 1788, 4to, 2 vols.: Bernstein, Berlin, 1857, &e. fol.: Smith (Robt. Paine), Dean of Canterbury, Oxonli, 1868, &c. fol.; fasc. 1-3 contain 538 pages: Zingerle, Rome, 1873, 8vo, 148 pages.

Arabic.—The native lexicons are very many, voluminous, and copious, In the preface to his great Arabic-English lexicon, Lane describes 33, the most remarkable of which are—the yn, so called from the letter which begins its alphabet, commonly aseribed to El Khaleel, (who died before a.H. 175 [A.p. 791], aged 74: the Sihah of El Jowharee (died 398 [1003]): the Mohkkam of Ibn Seedah the Andalusian, who was blind, and died A.H. 458 [a.p. 1066], aged about 60: the Asas of Ez Zamakhsharee (born 467 {1075}, died 588 [1144]), ‘‘a most excellent repertory of choice words aud phrases”: the Lisén el ’Arab of Ibu Mukarram (born 630 [1232], died 711 [1311]); Lane’s copy is in 28 vols. 4to: the Kamoos (The Sea) of El Feroozabdédee (born 729 [1328], died 816 [1413]): the Zaj el Aroos, by Murtada Ez Zebadee (born A.D. 1732, died 1791)—the copy made for Lane is in 24 vols. thick 4to. The Sihah was printed Hardervici Getorum, 1774, 4to; Bulak, 1865, fol. 2 vols.: Kamoos, Calcutta, 1817, fol. 2 vols.; Bombay, 1855, fol. 920 pages: Strr el Lagal, by Farish esh Shidiac, Tunis, fol. 609 pages: Muheet al Muheet, by Beitrus Al Bustanee, Beyrout, 1867-70, 2 vols. 4to, 2358 pages (abridged as Katr Al Muheet, ib, 1867-69, 2 vols. 8vo, 2352 pages), is excellent for spoken Arabic. Prerstan.—The Soorah, by Jumal, Calcutta, 1812-15, 2 vols. 4to: Samachsharti Lexicon, ed. Wetzstein, Leipz. 1845, 4to; 1850: Muntakhal al Loghat, Calcutta, 1808 ;

7b. 1836 ; Lucknow, 1845 ; Bombay, 1862, 8vo, 2 vols.: Muntaha ? Arabi, 4 vols. fol. 1840: Shams al Loghat, Bombay, 1860, fol. 2 vols. 509 pages. TURKISH. — Achtert Kabir, Constantinople, 1827, fol.: Hl Kamoos, ib. 1816, fol. 3 vols.; translated by Agan Effendi, Boulac, 1835, fol. 3 vols.: El Sihah, translated by Al Vani, Constantinople, 1728, fol. 2 vols.; 1755-56 ; Scutari, 1802, fol. 2 vols. Latin.—Raphelengius,

Leiden, 1613, fol.: Giggeius, Mediolani, 1632, fol. 4 vols.: Golius, Lugd. Bat. 1658, fol. (the best except Lane's): Jahn, Vindobone, 1802, 8vo: Freytag, Halle, 1830-88, 4 vols. 4to; abridged, 7b. 1837, 4to. Eno isu. — Catafago (Arab.-Eng. and Eng.-Arab.), London, 1858, 8vo, 2 vols.; 2d ed. 1873, 8vo: Lane, London, 1863-74, fol. book i. parts i.~~v. 2218 pages. The Arabic title is Medd el Kamoos, meaning either The Flow of the Sea, or The Extension of the Kamoos. It was undertaken in 1842, at the sug~~ gestion aud at the cost of the late duke of Northumberland, then Lord Prudhoe, by Mr Lane, who returned to Egypt for the purpose, and lived in Cairo for seven years to study, and obtain copies of, the great MS. lexicons in the libraries of the mosques, few of which had ever been seen by a European, and which were so quickly dis- appearing through decay, carelessness, and theft, that the means of composing such a work would not long have existed. His work is divided into two books, the first, to be completed in 8 parts, con- taining words and meanings eommonly known to learned Arabs; the second, those that are of rare oceurrence, aud not commonly known. It does not contain proper names or modern words. The publication, interrupted by his death, will be carried on by his nephew, Mr Stanley Lane Poole. The preface to Part vi., now in the press, will state fully how far Mr Lane had advanced in this work, and what materials he has left for coutinuing it. Dr Badger is pre- paring an English-Arabic dictionary of at least 1000 pages 4to, which will be very useful when finished. Newman (modern), tb, 1872, 8vo, 2 vols. 856 p2ges. FrENcH.—Ruphy (Fr.-Ar.), Paris, 1802, 4to: Bochtor (do.), Paris, 1828, 4to, 2 vols.; 2d ed. tb. 1850: Roland de Bussy (Algiers, Fr.-Ar.) Alger, 1835, 16mo: Id., 1836, 8vo; 1839: Berggren (Fr.~~vulg. Ar., Syria and Egypt), Upsala, 1844, 4to: Farhat (Germanos), revu par Rochaid ed Dahdah, Mar~~ seille, 1849, 4to: Biberstein Kasimirski, Paris, 1846, 8vo, 2 vols.; 1853-56 , 1860, 2 vols. 3032 pages:

Marcel (vulgar dialects of Africa), Paris, 18380; 1835, 8vo; 1837; enlarged, 1869, 8vo: Paulmier (Algeria), 2d ed. Paris, 1860, 8vo, 931 pages ; 1872: Bernard (Egypt), Lyon, 1864, 18mo: Cuche, Beyrouth, 1862, 8vo; 1867: Nar Bey (A. Calfa), 2d ed. Paris, 1872, 12mo, 1042 pages: Cherbonneau (written language), Paris, 1876, 2 vols. 8vo: Id. (Fr.~~Ar.), Paris, 1872, 8vo: Beausier (Algiers, Tunis, legal, epis~~ tolary), Alger, 1871, 4to, 764 pages; 1873. GERMAN. —Sey- farth (Algeria), Grimma, 1849, 160: Wolff (Mod. Ar.), Leipzig, 1867, 8vo: Walirmund (do.), Giessen, 1870-75, 8vo, 4 vols. ITALIAN.—Germano, Roma, 1636, 8vo; (Ar. Lat. It.), Rome, 1639, fol.: Dizionario, Boulak, 1824, 4to: Schiaparclli, Firenze, 1871, 4to, 641 pages. SpanisH.—Alcala, Grenada, 1505, 4to: Catiies, Madrid, 1787, fol. 3 vols. Suri Tecunicat TeRMs,—Abd Errahin, ed. Sprenger, Calcutta, 1845, 8vo. TEcHNICAL TERMS OF THE MussuLMan Screncrs.—Abd al Hagg and Gholam Kadir, Calcutta, 1853-62, 4to, 1593 pages. MerpicaL TrermMs.—Pharaon and Ber- therand, Paris, 1860, 12mo. MaTERIA Mepica.—Muhammed Abd Allah Shirazi, Ulfaz Udwiyeh, translated by Gladwin (Eng. Pers. Hindi), Calcutta, 1798, 4to, 1441 ‘words. : Noms pes VireMENTs. —Dozy, Amst. 1845, 8vo. WOrRTER IN ENTGEGENGESETZTEN BepreuTuncEN.—Redslob, Gottingen, 1873, 8vo. Koran.—Willmet (also in Haririum et vitam Timuri), Lugd. Bat. 1784, 4to; Amst. 1790: Fluegel, Concordantia, Leips. 1842, 4to: Penrice, Dictionary and Glossary, London, 1873, 4to. Ex Tasrisi’s Locic.—Mir Abufeth (French), Boulac, 1842, 8vo. MALTESE.—Vassali, Rome, 1796, 4to: Falzon (Malt. Ital. Eng.), Malta, s.a. 8vo: Vella, Livorno, 1848, 8vo.

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1859, fol., the Vyupatti or Muhavyupatti from the Tanguwir, vol. 123 of the Sutra. Larin.—Paulinus a Saneto Bartholomeo, Amarasinha, sectio i. de ccelo, Rome, 1798, 4to: Bopp, ENGLISH. — Amarakosha, transl. by Colebrooke, Serampore, 1808, 4to; 1845, 8vo: Rousseau, London, 1812, 4to: Wilson, Calcutta, 1819, 4to; 2d ed. 1832 : ed. Goldstiicker, Berlin, 1862, &c., folio, to be in 20 parts: Yates, Calcutta, 1846, 4to: Benfey, London, 1865, 8vo: Ram Jasen, Benares, 1871, 8vo, 713 pages: Williams, Oxford, 1872, 4to. ENGLIsH-Sanskrir.—Williams, London, 1851, 4to. FRENCH.— Amarakosha, transl. by Loiseleur Deslongchamps, Paris, 1839-45, 8vo, 2 vols. 796 pages: Burnouf and Leupol, Nancy, 1863-64, 8vo. GERMAN.—Bohtlingk and Roth, St Petersburg, 1853, &c., 4to, 7 vols. to 1875. ITALIAN.—Gubernatis, Torino, 1856, &., 8vo, un- finished, 2 parts. Russtan.—Kossovich, St Petersburg, 1859, 8vo. Roots.—Wilkins, London, 1815, 4to: Rosen, Berolini, 1827, 8vo: Westergaard, Bonne, 1840-41, 8vo: Vishnu Parasurama Sastri Pandita (Sans. and Marathi), Bombay, 1865, 8vo: Taranatha Tar: kavachaspati, Dhatupadarsa, Calcutta, 1869, 8vo: Leupol, Paris, 1870, 8vo. SynonyMs.—TECHNICAL TERMS OF THE NYAYA PuiLosopuy.—Nydyakosa, by Bhimacharya Jhalakikar (Sanskrit), Bombay, 1875, 8vo, 183 pages. Ric VEDA.—Grassmann, Leipzig, 1873-75, 8vo.

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Cambridge, U.S. 1829, 8vo. Onondaga: Shea (French-Onon.), from an MS. of 17th eent.), London, 1860, 4to, 109 pages. Daeota: Riggs, New York, 1851, 4to, 424 pages: Williamson (Eng. Dac.), Santos Ageucy, Nebraska, 12mo, 139 pages. Jfohawk : Bruyas, New York, 1863, 8vo, Hidatsa(Minnetarces, Gros Ventres of the Missourt) : Matthews, ib. 1874, 8vo. Choctaw: Byington, 7b. 1852, 16mo. Clallam and Lummi: Gibbs, 7b. 1863, 8vo. Yakuma : Pandosy, translated by Gibbs and Shea, 7b. 1862, 8vo. Chinook: Gibbs, New York, 1863, 4to. Chinook Jargon, the trade language of Oregon: Id., ib. 1863, 8vo. T'atche or Telamé;: Sitjar, 1b. 1861, 8vo. AMutins: Arroyo de la Cuesta, London, 1862, 4to.

Mexico and Central America. — Tepehuan; Rinaldini, Mexico, 1748, 4to. Cora: Ortega, Mexico, 1732, 4to. Zarahu- mara: Steffel, Brinn, 1791, 8vo. Otomi: Carochi, Mexico, 1645, 4to: Neve y Molina, 7d. 1767, 8vo: Yepes, 7b. 1826, 4to: Picco- lomini, 'Roma, 1841, 8vo. Afexiean or Aztec : Molina, Mexico, 1555, 4to; 1571, fol. 2 vols.: Arenas, 7b. 1583; 1611, 8vo; 1683;

DICTYS CRETENSIS, one of the early historians from whom the later Roman grammarians imagined that Homer derived materials for the Jad and Odyssey. According to an introduction prefixed by an unknown writer to the Latin translation entitled Dictys Cretensis de Bello Trojano, the author followed Idomeneus, king of Crete, in the Trojan war ; and the MS. of his work, written in Pheenician char- acters, was found in his tomb at Gnossus at the time of the occurrence of an earthquake in the thirteenth year of Nero's reign, aud translated into Greek by order of that prince. A Latin version of the first five books has alone come down to us; but this is generally regarded as aforgery. There is little doubt, however, that there was a Greek original which was probably composed about the time of Ners, The main interest of the work consists in the fact that, along with that of Dares (q.v.), it was the source from which the Homeric legends were introduced into the romantic literature of the Middle Ages. he editio princeps dates as far back as 1470. The work is now usually printed along with that of Dares. The best edi- tions are those of Perizonius aud Dederich (Bonn, 1837).

DIDEROT, Dents (1713-1784), one of the most active and original of the famous group of men of letters in France in the middle of the 18th century. He was born at Langres in 1713; he was educated by the Jesuits, like most of those who afterwards became the bitterest enemies of Catholicism ; and, when his education was at an end, he vexed his brave and worthy father's heart by turning away from respectable callings, like law or medicine, and throw- ing himself into the vagabond life of a bookseller's hack in Paris. An imprudent marriage (1743) did not better his position. His wife was a devout Catholic, but her piety did not restrain a narrow and fretful temper, and Diderot's domestic life was irregular and unhappy. He sought con- Solation for chagrins at home in attachments abroad, first with a Madame Puisieux, a fifth-rate female scribbler, and then with Mdlle. Voland, to whom he was constant for the Test of her life. His letters to her are among the most graphic of all the pictures that we have of the daily life of the philosophic circle in Paris. An interesting contrast may be made between the Bohemianism of the famous literary set who supped at the Turk's Head with the Tory Johnson and the Conservative Burke for their oracles, and the Bohemianism of the set who about the same time dined once a week at the Baron D'Holbach's, to listen to the

Mexiean, Tontonacan, and Huastecan ; Olmos, Mexico, 1555-60, 4to, 2 vols. Huastecan: Tapia Zenteno, ib. 1767, 4to, 128 pages. Opata or Tequima: Lombardo, 7b. 1702, 4to. Tarasea ; Gilberti, 7b. 1559, 4to: Lagunas, 7, 1574, 8vo. Afixtecan: Alvarado, Megico, 15938, 4to. Zapoteca: Cordova, 7b. 1578, 4to. Maya: Beltran de Santa Rosa Maria, 7b. 1746, 4to; Merida de Yucatan, 1859, 4to, 250 pages: Brasseur de Bourbourg, Paris, 1874, 8vo, 745 pages. Quiché: Id. (also Cakchiquel and Trutuhil dialects), 7b. 1862, Svo. South America.—Chibeha: Uricoechea, Paris, 1871, 8vo. Chayma: Taustc, Madrid, 1680, 4to: Yanguas, Burgos, 1683, 4to. Carib: Raymond, Auxerre, 1665-66, 8vo. Galibi: D.[e] L.[a] S.[auvage], Paris, 1763, 8vo. Z'upi: Costa Rubim, Rio de Janeiro, 1853, 8vo: Silva Guimaries, Bahia, 1854, 8vo: Diaz, Lipsia, 1858, 16mo. Guarani: Ruiz de Montoyo, Madrid, 1639, 4to; 1640; 1722, 4to; ed. Platzmann, Leipzig, 1876, etc., 8vo, to be in 4 vols. 1850 pages. Jfoxa: Marban, Lima, 1701, 8vo. Zule : Machoni de Corderia, Madrid, 1732,12mo0. Quichua: Santo Thomas,

Ciudad de los Reyes, 1586, 8vo: Torres Rubio, Sevilla, 1608, 8vo; Lima, 1609, 8vo; ed. Figueredo, Lima, 1754, 8vo: Holguin, Ciudad de los Reyes, 1608, 8vo: Tschudi, Wien, 1858, 8vo, 2 vols.: Mark- ham, London, 1864, 8vo: Lopez, Les Races Aryennes de Perou, Paris, 1871, 8vo, comparative vocabulary, pp. 345-421. Aymara: Bertonio, Chicuyto, 1612, 4to, 2 vols. Chileno: Valdivia (also Allentiac and Milcocayac), Lima, 1607, 8vo: .Febres, 7b. 1765, 12mo; ed. Hernandez y Caluza, Santiago, 1846, 8vo, 2 vols. Tsonecan (Patagonian): Schinid, Bristol, 1860, 12mo. (P. A. L.)

wild sallies and the inspiring declamations of Diderot. For Diderot was not a great writer; he stands out as a fertile, suggestive, and daring thinker, and a prodigious and most eloquent talker.

Diderot's earliest writings were of as little importance as Goldsmith's Lnquiry into the State of Polite Learning or Burke's Abridgement of English History. He earned 100 crowns by translating Stanyan's L/istory of Greece ; with two colleagues he produced a translatioi: of James's Dictionary of Medicine ; and about the same date (1745) he published a free rendering of Shaftesbury's Zngutry Concerning Virtue and Merit, with some original notes of his own. With strange and characteristic versatility, he turned from ethical specu- lation to the composition of a volume of stories, which are gross without liveliness, and impure without wit. In later years he repented of this shameless work, just as Bovcaccio is said in the day of his gray hairs to have thought of the sprightliness of the Decameron with strong remorse. From tales Diderot went back to the more congenial region of philosophy. Between the morning of Good Friday and the evening of Easter Monday he wrote the Philosophic Thoughts (1746), and he presently added to this a short complementary essay On the Sufficiency of Natural Religion. The gist of these performances is to press the ordinary rationalistic objections to a supernatural revelation ; but though Diderot did not at this time pass out into the wilderness beyond natural religion, yet there are signs that he accepted that less as a positive doctrine, resting on grounds of its own, than asa convenient point of attack against Christianity. In 1747 he wrote the Sceptic's Walk, a rather poor allegory—pointing first to the extravagances of Catholicism ; second, to the vanity of the pleasures of that world which is the rival of the church ; and third, to the desperate

and unfathomable uncertainty of the philosophy which professes to be so high above both church and world.

Diderot's next piece was what first introduced him to the world as an original thinker, his famous Letter on the Blind (1749). The immediate object of this short but pithy writing was to show the dependence of men's ideas on their five senses. It considers the case of the intellect deprived of the aid of one of the senses; and in a second piece, published afterwards, Diderot considered the case of a similar deprivation in the deaf and dumb. The Letter on Deaf-Mutes, however, is substantially a digressive examination of some points in esthetics. The philoso-

phic significance of the two essays is in the advance they make towards the principle of Relativity. But what interested the militant philosophers of that day was an episodic application of the principle of relativity to the master-conception of God. What makes the Letter on the Blind interesting at the present moment is its presentation, in a distinct though undigested form, of the modern theory of variability, and of survival by superior adaptation. It is worth noticing, too, as an illustration of the comprehen- sive freedom with which Diderot felt his way round any subject that he approached, that in this theoretic essay he suggests the possibility of teaching the blind to read through the sense of touch. If the Letter on the Blind introduced Diderot into the worshipful company of the philosophers, it also introduced him to the penalties of philosophy. His speculation was too hardy for the authorities, and he was thrown into the prison of Vincennes. Here he remained for three months ; then he was released, to enter upon the gigantic undertaking of his life.

A certain bookseller had applied to him with a project for the translation into French of Ephraim Chambers's Cyclopedia. Diderot accepted the proposal, but in his busy and pregnant intelligence the scheme became trans- formed. Instead of a mere reproduction of Chambers, he persuaded the bookseller to enter upon a new work, which should collect under one roof all the active writers, all the new ideas, all the new knowledge, that

were then moving the cultivated class to its depths, but still were comparatively ineffectual by reason of their dispersion. His enthusiasm infected the publishers; they collected a sufficient capital for a vaster enterprise than they had at first planned; D'Alembert was persuaded to become Diderot's colleague ; the requisite permission was procured from the Government ; in 1750 an elaborate prospectus announced the project to a delighted public ; and in 1751 the first volume was given to the world. The last of the letterpress was issued in 1765, but it was 1772 before the subscribers received the final volumes of the plates. These twenty years were to Diderot years not merely of incessant drudgery, but of harassing persecution, of sufferings from the cabals of enemies, and of injuryfrom the desertion of friends. The ecclesiastical party detested the Zncyclopedia, in which they saw a rising stronghold for their philosophic enemies. By 1757 they could endure the sight no longer. The sub- scribers had grown from 2000 to 4000, and this was a right measure of the growth of the work in popular influence and power. 'To any one who turus over the pages of these redoubtable volumes now, it seems surprising that their doctrines should have stirred such portentous alarm. There is no atheism, no overt attack on any of the cardinal mysteries of the faith, no direct denunciation even of the notorious abuses of the church. Yet we feel that the atmosphere of the book may well have been displeasing to authorities who had not yet learnt to encounter the modern spirit on equal terms. The Encyclopedia takes for granted the justice of religious tolerance and speculative freedom. It asserts in distinct tones the democratic doctrine that it is the common people in a nation whose lot ought to be the main concern of the nation's government. From beginning to end it is one unbroken process of exaltation of scientific knowledge on the one hand, and pacific industry on the other. All these things were odious to the old governing classes of France; theirspirit was absolutist, ecclesiastical, and military. Perhaps the most alarming thought of all was the current belief that the Encyclopedia was the work of an organized band of conspirators against society, and that a pestilent doctrine was now made truly formidable by the confedera- tion of its preachers into an epen league. When the seventh volume appeared, it contained an article on

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“ Geneva,” written by D’Alembert. The writer contrived a panegyric on the pastors of Geneva, of which every word was a stinging reproach to the abbés and prelates of Versailles. At the same moment Helvétius’s book, LI’ Esprit, appeared, and gave a still more profound, and, let us add, a more reasonable shock to the ecclesiastical party, Authority could brook no more, and in 1759 the

_ Encyclopedia was formally suppressed.

The decree, however, did not arrest the continuance of the work. The connivance of the authorities at the breach of their own official orders was common in those times of distracted government. The work went on, but with itg difficulties increased by the necessity of being clandestine, And a worse thing than troublesome interference by the police now befell Diderot. D’Alembert, wearied of shifts and indignities, withdrew from the enterprise. Other powerful colleagues, Turgot among them, declined to contribute further to a book which had acquired an evil fame. Diderot was left to bring the task to an end as he best could. For seven years he laboured like a slave at the oar, He wrote several hundred articles, some of them very slight, but many of them most laborious, comprehensive, and ample. He wore out his eyesight in correcting proofs, and he wearied his soul in bringing the manuscript of less com- petent contributors into decent shape. He spent his days in the workshops, mastering the processes of manufactures, and his nights in reproducing on paper what he had learnt during the day. And he was incessantly harassed all the time by alarms of a descent from the police. At the last moment, when his immense work was just drawing to an end, he encountered one last and crowning mortification : he discovered that the bookseller, fearing the displeasure of the Government, had struck out from the proof sheets, after they had left Diderot’s hands, all passages that he chose to think too hardy. The monument to which Diderot had given the labour of twenty long and oppressive years was irreparably mutilated and defaced. It is calculated that the average annual salary received by Diderot for his share in the Encyclopedia was about £120 sterling. “ And then to think,” said Voltaire, “ that an army contractor makes £800 in a day!”

Although the Hncyclopedia was Diderot's monumental work, he is the author of a shower of dispersed pieces that sowed nearly every field of intellectual interest with new and fruitful ideas. We find no masterpiece, but only thoughts for masterpieces ; no creation, but a criticism with the quality to inspire and direct creation. He wrote plays —le Fils Naturel and le Pere de Famille—and they are very insipid performances in the sentimental vein. But he accompanied them by essays on dramatic poetry, including especially the Paradoxe sur le Comédien, in which he announced the principles of a new drama,—the serious, domestic, bourgeois drama of real life, in opposition to the stilted conventions of the classic French stage. It was Diderot's lessons and example that gave a decisive bias to the dramatic taste of Lessing, whose plays, aud his Hamburgische Dramaturgie (1768), mark so important an epoch in the history of the modern theatre. In the pictorial art, Diderot's criticisms are no less rich, fertile, and wide in their ideas. His article on "Beauty" in the Encyclopedia shows that he had mastered and passed beyond the metaphysical theories on the subject, and the Essay on Painting was justly described by Goethe, whs thought it worth translating, as "a magnificent work, which speaks even more helpfully to the poet than to the painter, though to the painter too it is as a blazing torch. Diderot's most intimate friend was Grimm, one of the conspicuous figures of the philosophic body. Grimm wrote news-letters to various high personages in Germany, reporting what was going on in the world of art and

literature in Paris, then without a rival as the capital of the intellectual activity of Europe. Diderot helped his friend at one time and another between 1759 and 1779, by writing for him an account of the annual exhibitions of paintings. These Salons are among the most readable of all pieces of art criticism. They have a freshness, a reality, a life, which took their readers into a different world from the dry and conceited pedantries of the ordinary virtuoso. As has been said by Ste-Beuve, they initiated the French into a new sentiment, and introduced people to the mystery and purport of colour byideas. " Before Diderot," Madame Necker said, "I had never seen anything in pictures except dull and lifeless colours gab was his imagi- nation that gave them relief and life, and it is almost a new sense for which I am indebted to his genius."

Greuze was Diderot’s favourite among contemporary artists, and it is easy to see why. Greuze’s most character- istic pictures were the rendering in colour of the same senti- ment of domestic virtue and the pathos of common life, which Diderot attempted with inferior success to represent upon the stage. For Diderot was above all things interested in the life of men,—not the abstract life of the race, but the incidents of individual character, the fortunes of a particu- lar family, the relations of real and concrete motives in this or that special case. He delighted with the enthusiasm of a born casuist in curious puzzles of right and wrong, and in devising a conflict between the generalities of ethics and the conditions of an ingeniously contrived practical dilemma. Mostly his interest expressed itself in didactic and sympa- thetic form ; in two, however, of the most remarkable of all his pieces, it is not sympathetic but ironical. Jacques le Fatalaste (written in 1773, but not published until 1796) is iN Manner an imitation of Tristram Shandy and The Sentimental Journey. Few modern readers will find in it any true diversion. In spite of some excellent criticisms dispersed here and there, and in spite of one or two stories that are not without a certain effective realism, it must as a whole be pronounced savourless, forced, and as leaving un- mnoved those springs of laughter and of tears which are the common fountain of humour. Jtameau’s Nephew is a far superior performance. If there were any inevitable compul- sion to name a masterpiece for Diderot, one must select this singular “ farce-tragedy.” Its intention has been matter of dispute ; whether it was designed to be merely a satire on contemporary manners, or a reduction of the theory of self-interest to an absurdity, or the application of an ironi- eal clencher to the ethics of ordinary convention, or a mere setting for a discussion about music, or a vigorous dramatic sketch of a parasite and a human original. There is no dispute as to its curious literary flavour, its mixcd qualities of pungency, bitterness, pity, and, in places, unflinching shamelessness, Goethe’s translation (1805) was the first mtroduction of Rameau’s Nephew to the European public. After executing it, he gave back the original French manu- script™to Schiller, from whom he had it. No authentic French copy of it appeared until the writer had been nearly forty years in his grave (1823).

It would take several pages of this encyclopzdia merely to contain the list of Diderot’s miscellaneous pieces, from an infinitely graceful trifle like the

Regrets on My Old Dressing Gown upto D'Alembert's Dream, where he plunges into the depths of the controversy as to the ultimate con- stitution of matter and the meaning of life. It isa mistake to Set down Diderot for a coherent and systematic matenialist. We ought to look upon him "as a philosopher n whom all the contradictions of the time struggle with one another " (Rosenkranz), That is to say, he is critical and not dogmatic. There is no unity in Diderot, as there Was in Voltaire or in Rousseau. Just as in cases of conduct

® loves to make new ethical assumptions and argue them

out as a professional sophist might have done, so in the speculative problems as to the organization of matter, the origin of life, the compatibility between physiological machinery and free will, he takes a certain stand-point, and follows it out more or less digressively to its consequences. He seizes an hypothesis and works it to its end, and this made him the inspirer in others of materialist doctrines which they held more definitely than he did. Just as Diderot could not attain to the concentration, the positive- ness, the finality of aim needed for a master-piece of literature, so he could not attain to those qualities in the way of dogma and system. Yet he drew at last to the conclusions of materialism, and contributed many of its most declamatory pages to the Systéme de la Nature of his friend D'Holbach,—the very Bible of atheism, as some one styled it. All that he saw, if we reduce his opinions to formulas, was motion in space : "attraction and repulsion, the only truth." If matter produces life by spontaneous generation, and if man has no alternative but to obey the compulsion of nature, what remains for God to do

In proportion as these conclusions deepened in him, the more did Diderot turn for the hope of the race to virtue ; in other words, to such a regulation of conduct and motive as shall make us tender, pitiful, simple, contented. Hence his one great literary passion, his enthusiasm for Richardson, our English novelist. Hence, also, his deepening aversion for the political system of France, which made the realiza- tion of a natural and contented domestic life so hard. Diderot had almost as much to say against society as even Rousseau himself. The difference between them was that Rousseau was a fervent theist. The atheism of the Holbachians, as he called Diderot's group, was intolerable to him; and this feeling, aided by certain private perversities of humour, led to a breach of what had once been an intimate friendship between Rousseau and Diderot (1757). Diderot was still alive when the Confessions appeared, and he was so exasperated by Rousseau's stories about Grimm, then and always Diderot's intimate, that in 1782 he transformed a life of Seneca, that he had written four years earlier, into an Lssay on the Reigns of Claudius and Nero, which ig much less an account of Seneca than a vindication of Diderot and Grimm, and is one of the most rambling and inept productions in literature. As for the merits of the old quarrel between Rousseau and Diderot, we may agree with the latter, that too many seusible people would be in the wrong if Jean Jacques was in the right.

Varied and incessant as was Diderot's mental activity, it was not of a kind to bring him riches. He secured none of the posts that were occasionally given to needy men of letters ; he could not even obtain that bare official recognition of merit which was implied by being chosen a member of the Academy. The time came for him to provide a dower for his daughter, and he saw no other alternative than to sell his library. When the empress Catherine of Tussia heard of his straits, she commissioned an agent in Paris to buy the library at a price equal to about £1000 of our money, and then she handsomely requested the philosopher to retain the books in Paris until she required them, and to constitute himself her librarian, with a yearly salary. In 1773 Diderot started on an expedition to thank his imperial benefactress in person, and he passed some months at St Petersburg. The empress received him cordially. The strange pair passed their afternoons in disputes on a thousand points of high philosophy, and they debated with a

vivacity and freedom not usual in courts. “ Ht, done,” said Catherine one day, when Diderot hinted that he argued with her at a disadvantage, “ds there any difference among men?” Diderot returned home in 1774. Ten years remained to him, and he spent them in the in- dustrious acquisition of new knowledge, in the composition

of a host of fragmentary pieces, some of them mentioned above, and in luminons declamations with his friends. All accounts agree that Diderot was seen at his best in con- versation. ‘‘ He who only knows Diderot in his writings,” says Marmontel, ‘‘does not know him at all. When he grew animated in talk, and allowed his thoughts to flow in all their abundance, then he became truly ravishing. In his writings he had not the art of ensemble; the first operation which orders and places everything was too slow and too painful tohim.” Diderot himself was conscious of the want of literary merit in his pieces. In truth he set no high value on what he had done. It is doubtful whether he was ever alive to the waste that circumstance and temperament together made of an intelligence from which, if it had been free to work systematically, the world of thought had so much to hope. He was one of those simple, disinterested, and intellectually sterling workers to whom their own personality is a3 nothing in presence of the vast subjects that engage the thoughts of their lives. He wrote what he found to write, and Icft the piece, as Carlyle has said, ‘on the waste of accident, with an ostrich-like indifference.” When he heard one day that a collected edition of his works was in the press at Amsterdam, he greeted the news with “ peals of laughter,” so well did he know, the haste and the little hced with which those works had been dashed off.

Diderot died in the month of July 1784, six years after Voltaire and Rousseau, one year after his old colleague D’Alembert, and five years before D’Holbach, his host and intimate for a lifetime. Notwithstanding Diderot’s peals of laughter at the thought, there is now just completed—nearly a hundred years since his death——an elaborate and exhaustive collection of his writings in twenty stout volumes, edited by MM. Assézat and Tourneux. (J. mo.)

DIDO, or Etisa, the reputed founder of Carthage, was the daughter ,of Mutgo, Belus, or Agenor, king of Tyre. She may have been an historical character, but the stories told of her by Justin and Virgil differ essentially. She was worshipped at Carthage, and as a deity may be iden- tified with Juno Celestis, the Roman form of the Pheenician Astarte.

. DIDOT, the name of a family of learned French printers and publishers.

Frangors Dipor (1689-1757), founder of the family, was «born at Paris. He began business as a bookseller and printer in 1718, and among his undertakings was a collection of the travels of his friend the Abbé Prévost, in 20 volumes (1747). It was remarkable for its typographical perfection, and was adorned with many engravings and maps.

Francois Amproise Dipot (1730-1804), son of Frangois, made important improvements in type-founding, and was the first to attempt printing on vellum paper. Among the works which he published was the famous collection of French classics prepared by order of Louis XVI. for the education of the Dauphin, and the folio edition of L'Art dle verifier les dates.

Pierre Frangors Divot (1732-1795), brother of the

preceding, devoted much attention to the art 02f type- founding and to paper-making. Among the works which issued from his press was an edition in folio of the Zmitatio Christi (1788). _ Henri Divor (1765-1852), son of Pierre Francois, 1s celebrated for his " microscopic" editions of various standard works, for which he engraved the type when nearly seventy years of age. He was also the engraver of the assignats issued by the Constituent and Legislative assemblies and the Convention, i

Divot Saint-LitcEr, second son of Picrre Francois, was

the inventor of the paper-making i i ; – machine known in England as the Didot machine, .

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Pierre Drpor (1760-1853), eldest son of Francois Ambroise, is celebrated as the publisher of the beautiful “‘ Louvre ” editions of Virgil, Horace, and Racine. The Racine, in 3 volumes folio, was pronounced in:1801 to be ‘‘the most perfect typographical production of all ages.” ‘

Firmin Dipor (1764-1836), second son of Francois Ambroise, sustained the reputation of the family both as printer and type-founder. He invented or revived the process of stereotyping, coined its name, and first made use of the process in his edition of Callet’s Zables of Logarithms (1795), in which he secured an accuracy till then unattain- able, He published stereotyped editions of French, English, and Italian classics at a very low price. He was the author of two tragedies—La JPeine de Portugal and La Mort @Annibal; and he wrote metrical translations from Virgil, Tyrtzus, and Theocritus.

AMBROISE Firmin Dipor (1790-1876), was the eldest son of the preceding. After receiving a classical education, he spent three years in Greece and in the East; and on tle retirement of his father in 1827 he undertook, in con- junction with his brother Hyacinthe, the direction of the publishing business. Their greatest undertaking was a new edition of the Thesaurus Greece Lingue of Henry Stephens, under the editorial care of the brothers Dindorf aud M. Hase (9 vols. 1855-59). Among the nnmerous important works published by the brothers, the 200 volumes forming the Bibliotheque des auteurs grecs, Biblis- théque latine, and Bibliothégue francaise deserve special mention. Ambroise Firmin Didot was the first to propose (1823) a subscription in favour of the Greeks, then in insurrection against Turkish tyranny. Besides a trans lation of Thucydides (1833), he wrote the artieles “ Estienne” in the Nouvelle Biographie Générale, and “ Typographie” in the Hnxcy. Mod., as well as Observa- tions sur Vorthographie francaise (1867), &c. In 1875 he published a very learned and elaborate monograph on Aldus Manutius. His collection of MSS., the richest in France, was said to be worth, at the time of his death, not less than 2,000,000 frances.

DIDRON, ApotrHe Napotton (1806-1867), French archeologist, was born at Hautvillers, in the department of Marne, March 13, 1806. At first a studeut of law, he began in 1830, by the advice of Victor Hugo, to apply

himself to the study of the Christian archzxology of the Middle Ages. After visiting and examining the principal churches, first of Normandy, then of Central and Southern France, he was on his return appointed by M. Guizot secretary to the Historical Committee of Arts and Monu- ments (1835); and in the following years he delivered several courses of lectures on Christian iconography at the Bibliothéque Royale. In 1839 le visited Greece for the purpose of examining tlie art of the Eastern Church, both in its buildings and its manuscripts. In 1844 he originated the Annales Archéologiques, a periodical devoted to his favourite subject, which he edited until hisdcath. In 1845 he established at Paris a special archeological library, and at the same time a manufactory of painted glass, In the same year he was admitted to the Legion of Honour. His most important work is the Jconographie Chrétienné, of which, however, the first portion only, [Histoire de Duew (1843), was published. It was translated into English by E. J. Millington. Among his other works may be men- tioned the Afanuel @Iconographie Chrétienne grecque & latine (1845), the Iconographie des chapiteaux du palars ducal de Venise (1857), and the Afanwel des objets de bronze et dorfévrerie (1859). He died November 13, 1867.

DIDYMUS of Alexandria, an ecclesiastical writer born in 309 or 314. Although he became blind at the age of fonr, before he had learned to read, he succeeded in mastering the whole circle of the scienccs then known ; and on entet-

ing the service of the church he was placed at the head of the Alexandrian theological school. He died in 394 or 399. Most of his theological works are lost. We possess, however, a Latin translation by Jerome, who was one of his pupils, of his Treatise on the Holy Ghost (Liber de Spiritu Sancto), and a similar translation by Epiphanius of his Brief Comments on the Canonical Epistles (Breves Enarrationes in Epistolas Canonicas). A Treatise against the Manicheans (Liber adversus Alanicheos) is extant in the original Greek, and was first published at Bologna in

1769.

DIE (Dea Vocontiorwm), the capital of an arrondissement in the department of Dréme, in France, is situated on the right bank of the Dréme, at the foot of Mont Glandaz, in a wide and fertile plain. The manufactures are woollen cloth, paper, leather, and silk ; there is some trade in mules, cattle, and wool; and the neighbourhood produces excellent fruit, and the white wine ealled “ Clairette de Die.” The town was formerly the seat of a bishop, and, previous to the revocation of the Edict of Nantcs in 1685, of a Calvinistic university. The most intercsting structures of Die are the old cathedral, with granite eolumns from an ancient temple of Cybele, and a porch of the 11th century ; the episcopal palace, the walls, flanked by towers, and the ruins of a castle—all of considerable age; the triumphal arch on the road towards Gap, known as the Porte St Marcel, portions of an aqueduct, and other Roman remains. In the vicinity are several mineral springs. The population in 1872 was 3876.

DIE SINKING. The preparation of dies for stamping coins and medals is a work requiring eonsiderable skill and care, The steel selected should be of moderately fine grain and uniform texture, and, when polished, should show no spots or patches under a magnifying glass. Two short lengths having been cut from bars of this, and forged into rough dies, are next made as soft as possible by careful annealing,—being put in an iron pot of animal charcoal, heated to a ehcrry red, and allowed to cool gradually. After being faced up flatly and smoothly in a lathe, they pass into the hands of the engraver, who traces upon them their appropriate images, obverse and reverse, and works these out, with steel tools, in intaglio. (The inscription is generally stamped with punches and hammer.) The new matreces, or maternal dies, when, after repeated impressions on clay, &e., and alteration, they are found correct, are ready for hardening—a process simple enough as regards plain steel, but here very critical, seeing that a delicate engraving has to be kept intact. Each matrix is first protected with a mask, composed of fixed oil thickened with animal chareoal, or of lampblack and linseed oil. They are then placed face downwards in a crucible, and burned in animal charcoal. After being heated to a cherry red, they are taken out with a pair of tongs, plunged in a large body of water, moved about rapidly till all noise ceases, and Icft in the water till quite cool. If the matrix Pipes or sings, there is probably a crack in it. The hardened die is next polished and tempered,—the former by holding it against a running iron disc coated with flour-

emery and oil; the latter by putting it in water, which is gradually raised to the boiling point, then allowing it to cool slowly, or by placing it on a heated bar of iron till it acquires a rich straw colour. ‘To increase its strength an The ting may be shrunk upon it like 2 mechanical jacket. : e ra treated as here described, might now be used PP tiply coins or medals, but it is preferred to use it for With ts punches, or steel impressions in relief. 5 this view a steel block is procured, softened by

nnealing, and turned in the lathe, being made flat at the ee and obtusely eonieal at the top. The block is put n the bed of a die-stamping press, and the matrix brought

down on it with force by means of the central screw, Thus a copy is produced in relief on the conical surface. Further strokcs may be required to perfect it, and the punch is therefore first re-annealed (its surface having been hardened by compression), then replaced in the press ; the matrix, detached from the serew, is fitted on to it, and pressed in contact by the descent of a bloek of steel attached to the screw. Thus, after repeated blows and frequent annealing, thc impression is completed, and after being retouched by the engraver is hardened and tempered like the matrix. The matrix is now laid aside, and the punch used to produce any number of steel dies by an opera- tion substantially similar to that by which the puneh itself was obtained, These arc, of course, fac-sumiles of the matrix, and when completed are used for purposes of coinage. Besides coining and medalling, dies are required for a variety of purposes, such as the manufacture of buttons, steel seals, serews, and ornamental articles of metal, calieo printing, &c.

DIEBITSCH-SABALKANSKT, [ans Karu FRrepRIcH Anton (1785-1831), Count von Diebitseh and Narden, Russian field-marskal, was born in Silesia, May 13, 1785. He entered the Prnssian army at the age of twelve; but four years later, by the desire of his father, a Prussian officer who had passed into the service of Russia, he also did the same. He served in the campaign of 1805, and was wounded at Austerlitz, fought at Eylau and Friedland, and after Friedland was promoted captain. During the next five years of peace he devoted himself to the study of military science, engaging

onee more in active service in the eampaign of 1812. He distinguished himself by the recapture of Polozk; and by his defence of an important post he saved Wittgenstein's corps in retreat. He was now raised to the rank of major-general. In conjunction with General Yorek he took possession of Berlin. After the battle of Liitzen he was sent into Silesia and took part in negotiating the secret treaty of Reichenbach. Having dis- tinguished himself at the battles of Dresden and Leipsic, he was promoted lieutenant-general. In 1814 Diebitsch strongly urged the march of the allies on Paris ; and after their entry the emperor Alexander conferred on him the order of St Alexander Newski. In 1815 he married, attended the Congress of Vienna, and was afterwards made adjutant-general to the emperor. As chief of the imperial staff he accompanied tle emperor to Taganrog, and was present at his death. He obtained the confidence of the emperor Nicholas, and was createcd baron and afterwards count. Inthe Turkish war of 1828-1829 Diebitsch had the ehief command; he took Varna, crossed the Balkan, and eoncluded peace at Adrianople. His passage of the Balkan is commemorated by his surname Sabalkanski ; it procured him the rank of field-marshal, On the outbreak of the insurrection in Poland, in 1830, he was appointed to the chief command. His good genius, however, now failed him. After the battle of Ostrolenka he transferred his head-quarters to Kleckzewo, near Pultusk, where he died of cholera, June 10, 1831.

DIEPENBECK, Apranam van (1599-1675), was born at Herzogenbusch, and studicd painting at Antwerp, where he beeame one of Rubens's " hundred pupils." Rubens complains in his letters that, being overwhelmed with applications for apprentices' indentures, he refused to aecept as disciples even the children of some of his best friends. Diepenbeck was oue of those who was fortunate enough to obtain admission to Rubens's workshop. But he was not one of the cleverest of Rubens's followers, and he suc- eeeded, at the best, in imitating the style and aping the peculiarities of his master. We see this in his earliest pictures—a portrait dated 1629 in the Munich Pinakothek, and a Distribution of Alms of the same period in the same

collection. Yet even at this time there were moments when Diepenbeck probably fancied that he might take another path. A solitary copperplate executed with his

own hand in 1630 represents a peasant sitting under a |

tree holding the bridle of an ass, and this is a minnte and finished specimen of the engraver's art which shows that the master might at one time have hoped to rival the animal draughtsmen who flourished in the schools of Holland. However, large commissions now poured in upon him ; he was asked for altar-pieces, subject-pieces, and pagan allegories. He was tempted to try the profession of a glass-painter, and at last he gave up every other occupation for the lucrative business of a draughtsman and designer for engravings. Most of Diepenbeck's important can- vases are in Continental galleries. The best are the Marriage of St Cathcrine at Berlin, and Mary with Angels Wailing over the Dead Body of Christ in the Belve- dere at Vienna, the first a very fair specimen of the artist's skill, the second a picture of more energy and feeling than might be expected from one who knew more of the outer form than of the spirit of Rubens. Then we have a fine Entombment at Brunswick, and St Francis Adoring the Sacrament at the museum of Brussels, Clelia and her Nymphs Flying from the Presence and Pursuit of Porsenna in two examples at Berlin and Paris, and N eptune and Amphitrite at Dresden. In all these compositions the drawing and execution are after the fashion of Rubens, though inferior to Rubens in harmony of tone and force of contrasted hght and shade. Occasionally a tendency may be observed to imitate the style of Vandyck, for whom, in respect of pictures, Diepenbeck in his lifetime was fre- quently taken. But Diepenbeck spent much less of his leisure on canvases than on glass-painting. Though he failed to master the secrets of gorgeous tinting, which were lost, apparently for ever in the 16th ccntury, he was constantly employed during the best years of his life in that branch of his profession. In 1635 he finished forty scenes from the life of St Francis of Paula in the church of the Minimes at Antwerp. In 1644 he received payment for four windows in St J acques of Antwerp, two of which are still preserved, and represent the Virgins to whom Christ appears after the Resurrection. The windows ascribed to him at St Gudule of Brussels are now proved to have been executed from the cartoons of Theodore van Thulden. On the occasion

of his matricula- tion at Antwerp in 1638-9, Diepenbeck was registered in the guild of St Luke as a glass-painter. He resigned his membership in the Artist Club of the Violette in 1542, apparently because he felt hurt by a valuation then made of drawings furnished for copper-plates to the engraver Pieter de Jode. The earliest record of his residence at Antwerp is that of his election to the brotherhood (Soda- litét) “of the Bachelors” in 1634. It is probable that before this time he had visited Rome and London, as noted in the work of Houbraken. In 1636 he was made a burgess of Antwerp. He married twice, in 1637 and 1652. Hisdeath took place in December 167 5, and his funcral was celebrated at St Jacques of Antwerp on the 31st day of that month.

Consult, besides earlier authorities, the Antwerp Liggeren,

DIEPPE, a seaport town of France, at the head of an arrondissement in the department of Seine-Inférieure, 38 miles north of Rouen and 125 north-west of Paris by rail, in 49° 55° 35” N, lat. and 1° 5’ 9″ E long. Jt lies at the mouth of the River Arques, in a hollow of the coast,—the main part of the town being on the west side of the river, and thé suburb of Pollet on the east. Tis principal street stretches for about a mile along the shore, and terminates in the west at the foot of the chalk cliff, which is surmounted “by a castle of the 15th century, now employed as barracks,

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‘The whole town has a modern aspect ; its streets are Wide and regular, and its houses mostly built of brick, The principal building is the church of St J acques, which wags

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“Plan of

Dieppe.} 1. Chureh of Pollet. 6. Theatre. 2. Bourse. 7. Church of St Remi. 3. Statue of Duquesne. 8. Bazaar.

4. Church of St Jacques, 9. Protestant Church.

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. Hotel de Ville. founded in the 13th century, but consists in good measure of considerably later workmanship, and has in some portions been restored in the present century; the main entrance (of the 14th century) and the Ango chapel are worthy of special remark. It is sufficient to mention the church of St Remi (1522-1640), the town-house, the hospital, the theatre, and the communal college which preserves some fragments of Ango’s mansion. As the chief town of an arrondissement, and an important seaport, Dieppe is the seat of a large number of public offices. Its harbour, which has been greatly improved during the present century, is pro- tected by two piers, admits vesscls of 500 tons burden, and has a large floating dock. There is regular steamboat com- munication with England, the passage to Newhaven being accomplished in about six hours. The general trade of the town, both export and import, is extensive ; and it carries on ship-building, rope-spinning, cooperage, watchmaking, and a remarkable manufacture of articles in ivory and bone, which dates from the 15th century. The tobacco factories alone employ upwards of 1000 work people. Oysters in large numbers are fattened in the retenwe des chasses’; and the fishermen of Pollet are among the main providers of the Parisian markets. Ever since the time of the duchess of Rerry (whose favourite residence, the matson Quenouille, is still pointed out) the town has been a fashionable watering-place; and in 1857 a large bathing establishment was crected after the model of the Crystal Palace. The so-called Jardin Anglais, the Cours Bourbon, and the clif’s are the principal promenades ; and the castle of Arques, the Manoir d’Ango, the abbey of St Victor, and the ancient camp, locally known as la cité des Limes, are the most interesting objects of interest in the neighbourhood. Population 12 1851, 16,216 ; and in 1872, 19,757.

It may be safely asserted, on the authority of its name, that Dieppe owed its origin to a band of Norman adventurers, who found its ‘‘ diep” or inlet suitable for their ships. Its first castle was probably built in 1188 by Henry II. of England, and it was eounted a place of some importanee when Philip Augustus attacked it in 1195. By Riehard I. of England it was bestowed, in 1197, on the arehbishop of Rouen in return for certain territory in the neighbourhood of the episeopal eity. In 1339 it was plundered by the English, but it soon reeovered from the blow, and in spite 0 the opposition of the Lords of Hantot, managed to surround itself with fortifieations. Its commercial aetivity was already great, and it is believed its seamen visited the coast of Guinea in 1339, an founded there a Petit Dieppe in 1365. A siege undertaken 10 1442 by Talbot in person was raised by the Dauphin, afterwards Louis XJ., and the day of the deliveranee continued for centuries to be celebrated by a great procession and miraele plays. In the beginning of the 16th century we find Parmentier, a native of the

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eels to Brazil and eon F ae ree ae, | ri able to bloekade the Portuguese flee

ean tis inhabitants in great numbers Gibasel the Reformed religion ; and they were arnong the first to aeknowledge Henry 1V., who fought one of his great battles at the neighbouring village of Arques. Few of the cities of France suffered more from the revocation of the Ediet of Nantes in 1685 ; and this blow was followed in 1694 bya terrible bombardment on the part of the Enelish and Duteh. The town was rebuilt after the peaee of Ryswick, put the deerease of its population and the deterioration of its port prevented the restoration of its eommereial prosperity. Within the present century, however, especially since eommuniea- tion by rail was effected with Paris, it has made rapid advances. During the Franeo-German war the town was oeeupied by the Germans from Deeember 1870 till July 1871.

See Pierre Pillon, Recueil général des édits, dc., donnez en faveur des habitants de Dieppe, Dieppe, 1700; Vitet, Histoire de Dieppe, 1844 ; Cochet, Les églises de Varrondissement de Dieppe, 1846-1850, and Galerie Dieppoise, 1862 ; Jules Hardy, Les Dieppois en Guinée en 1364, 1864;

Asseline, Les Antiquites et Chroniques de la ville de Dieppe, a 17th eentury aceount, whieh comes down only to 1694, and was first published in 1874 by Hardy, Guerillon, and Sauvage.

DIES, CuristopH ALBERT (1755-1822), was born at Hanover, and learned the rudiments of art in his native place. For one year he studied in the academy of Diisseldorf, and then he started at the age of twenty with thirty ducats in his pocket for Rome. There he established his domicile, and lived a frugal life till 1796. Copying pictures, chiefly by Salvator Rosa, for a livelihood, his taste led him to draw and paint from nature in Tivoli, Albano, and other picturesque places in the vicinity of Rome. Naples, the birthplace of his favourite master, he visited more than once for the same reasons. In this way he became a bold executant in water colours and in oil, though he failed to acquire any originality of his own. Lord Bristol, who encouraged him as a copyist, predicted that he would be a second Salvator Rosa. But Dies was not of the wood which makes original artists. Besides other disqualifications, he had necessities which forced him to give up the great career of an independent painter. David, then composing his Horatii at Rome, wished to take him to Paris. But Dies had reasous for not accepting the offer. He was courting a young Roman whom he subsequently married. Mcanwhile he had made the acquaintance of Volpato, for whom he executed numerous drawings, and this no doubt suggested the plan, which he afterwards carried out, of publishing, in partner- ship with Méchan, Reinhardt, and Frauenholz, the series of plates known as the Collection de vues pittoresques de P'Italie, published in 72 sheets at Nuremberg in 1799, With so many irons in the fire Dies naturally lost the power of concentration. Other causes combined to affect his talent. In 1787 he swallowed by mistake three- quarters of an ounce of sugar of lead. His recovery from this poison was slow and incomplete. His return to Germany was hastened by it. He had hoped that the air of his native country would improve his health, He settled at Vienna, and lived there in the old way on the produce of his brush as a landscape painter, and on that of his pencil or graver as a draughtsman and etcher. But instead of getting better as he had hoped, his condition became worse, and he even lost the use of one of his hands. Tn this condition he turned from painting to music, and spent his leisure hours in the pleasures of authorship. He did not long survive, dying at Vienna in 1822, after long years of chronic suffering. From two pictures

now in the Belvedere gallery, and from numerous engraved drawings from the neighbourhood of Tivoli, we gather that Dies was never destined to rise above a respectable mediocrity. He followed Salvator Rosa's example in imitating the manner of Claude Lorraine. But Salvator adapted the style of Claude, whilst Dies did no more than copy it.

DIEST, a town and fortress of Belgium, in the province of Brabant, and the arrondissement of Léwen, is situated

town, taking ves

on the Demer, 28 miles E. by N. of Brussels. The manu- factured are hats, leather, stockings, beer, and spirits. It was taken from the French by Marlborough in 1705, and recaptured the same year. 'The fortifications, which replace the old ramparts and walls, were commenced in se and finishedin 1853. The population in 1866 was (O61, –

DIET (German, Jeeichstag). The origin of the German Diet is to be sought in the national assembly, which was a common institution of the Teutonic race. From the earliest recorded times we find all leading questions first discussed by the chiefs and then referred to the assembly of the clan or tribe, in which every freeman had a voice.

The earliest Diets of the German or Holy Roman Empire were assemblies in which the monarch deliberated with his subjects on the common interests of the empire. Originally all members were bound by their feudal tenure to be present, and if absent they not only forfeited their vote but were liable to fine. 'hus the Diet was a feudal, not a representative, Parliament. As by degrees the feuda- tories of the emperor turned into independent sovereigns, the Diet became nothing more than a congress of princes. 'The emperor, instead of presiding in person, was represented by a delegate called principal commissarius, and the princes sent envoys, the right of suffrage being no longer personal, but attached to certain territories or districts.

At first the emperor was, in theory at least, elected by universal suffrage ; a candidate was chosen by the chief men, and their nominee approved by the

people. Thus we read that at the election of Conrad II. 50,000, and at that of Lothaire II. 60,000 persons were present. In time this custom of nominating the emperor grew into an established right, which, under the name of preetaxation, was arrogated by the chief princes of the empire. Thus the chief func- tion of the Diet, the choice of an emperor, became the prerogative of a few of its most powerful members, who claimed the right not only of election but of deposition. Thus in 1298 Adolphus of Nassau was deposed, and Albert of Austria chosen in his stead. The right of the electors and the forms and rules of election were defined and settled by the famous instrument of Charles IV. known as thie Golden Bull, 1356.

The Diet consisted of three bodies, who met and voted in separate colleges, —(1) the electoral college, (2) the princes of the empire spiritual and temporal, (3) the free imperial cities.

1. In a law of Otho IV. (1208), we find the right of electing an emperor vested in the electoral college of seven. These consisted of three spiritual princes—the archbishops of Mentz, Treves, and Cologne,—and four secular electors —the duke of Saxony, the count palatine of the Rhine, the king of Bohemia, and the margrave of Brandenburg. The former sat as recognized heads of the German church. The latter would naturally have been the dukes of Saxony, Franconia, Swabia, and Bavaria; but when Bavaria was united with the county palatine its right was transferred to Bohemia; that of Swabia was, on the accession of Frederick (who by his election was incapacitated from voting), dele- gated to Brandenburg, and by it retained; and probably that of Franconia was for similar reason forfeited (see Dunham, Germanic Empire, i. 216).

2. The princes of the empire had in all other respects, save that of electing an emperor, the same rights as the dukes or electors. They consisted of the archbishop of Salzburg, 20 bishops, 4 abbots, and 2 prebendarics, and of 44 temporal princes, though this number was after- wards largely augmented. Of these several, such as the archduke of Austria, and the dukes of Brunswick and Burgundy, were in rank and power more than equals of the electors,

3. The free imperial cities formed a college divided into two benches,—the Swabian, with 37 cities, and the Rhenish, with 14. They first appear at the Diet under Henry VIL, but their position was not recognized till the peace of Westphalia. The power exercised by this muni- cipal constituent of the Diet was small and strictly limited. Only what had been agreed upon by the electors and princes could be submitted to the college of cities for their sanction. The lower nobility, the knights of the empire, and the commons were unrepresented.

Each college voted separately ; when the three colleges agreed, the decree or recess of the Diet, as it was called, was subniitted to the emperor for his ratification ; but the emperor had no power to modify it, and no resolution which affected the general interests of the empire could be passed without the approbation of the Diet.

Besides extraordinary meetings, the Diet was regularly convened twice a year. At the spring session the general business of the empire was discussed, laws were passed, alliances concluded, rebels proscribed, and grants of fiefs confirmed. The autumn session was occupied with finance and attended only by dukes, counts, and officers of administration. From 1663 the Diet met at Regensburg.

From the end of the Thirty Years' War the power of the Diet steadily declined. The Peace of Westphalia, while confirming the rights of the Diet as against the emperor, at the same time, by recognizing the territorial independence of the German princes, so limited the province of the federative assembly that, to quote the words of Frederick the Great, the Diet became " a mere shadow, a congress of publicists more busied with forms than things, like dogs who bay the moon."

The most important Dicts were the following :—

1106. Maintz. Henry IV. deposed on motion of his son.

1142. Frankfort. Conrad surrendered Saxony to Henry the Lion.

1356. Nuremberg. The Golden Bull.

1486. Worms. Private defianee forbidden, and Imperial Chamber established.

Worms. Ediet against Luther.

Spires. Choiee of religion allowed to the several states.

Spires. Ediet of Worms re-enacted.

Augsburg. The confession of Augsburg presented.

Regensburg. Napoleon’s envoy announces ‘the dissolution of the empire. Franeis II. resigns imperial erown.

1848, Frankfort. First Diet of Germanie confederation.

DIETETICS. The application of science to the regula- tion of the continuous demands of the body for nutriment aims mainly at three objects —Hecalth, Pleasure, and Economy. They are rarely inconsistent with one another, but yet require scparate consideration, as under varying circumstances each may claim the most prominent place in our thoughts.

Influence of Diet upon Health.

The influence of diet upon the health of a man begins at the earliest stage of his life, and indecd is then greater than at any other period. It is varied by the several phases of internal growth and of external relations, and in old age is still important in prolonging existence, and rendering it agreeable and useful.

Diet in Infaney.—No food has as yet been found so suitable for the young of all animals as their mother’s milk, And this has not been from want of seeking. Dr Brouzet (Sur ?Education médicinale des Linfants, 1, p. 165) has such a bad opinion of human mothers, that he expresses a wish for the state to interfere and prevent them from suckling their children, lest they should coi- municate immorality and discase! A still more determined pessinust was the famous chemist Van Helmont, who thought life had been reduced to

its present shortness by our inborn propensities, and proposed to substitute bread boiled in beer and honey for milk, which latter he calls

1521. 1526. 1529. 1530. 1806.

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“brute’s food.” Baron Liebig has followed the lead witha “Food for infants,” in the prescription for which half ounces and quarter grains figure freely, and which has to be prepared on a slow fire, and after a few minutes boiled well. And after all not nearly such a close imitation of human milk is made as by the addition to fresh cow’s milk of half its bulk of soft water, in each pint of which has been mixed a heaped up teaspoonful of powdered “sugar of milk” and a pinch of phosphate of lime. Indeed, in default of these cheap chemicals, the milk and water alone, when fresh and pure, are safer than an artificial compound which requires cooking. And experience shows that the best mode of administering food to the young is also that which is most widely adopted throughout warm-blooded nature, namely, in a fresh, tepid, liquid state, frequently, and in small quantities at a time.

Empirical observation is fully supported in these deduc- tions by physiological and chemical science. Milk con- tains of —

WrateDiis2/.5 (kcaciosaunee ehaecnlageges eae ledeee ere enee 88 per cent, Oleaginous matter (cream or butter).....000.4 3 ae Nitrogenous matter (eheese and albumen)..... 4 ,,

Hydroearbon (sugar) Saline matter (phosphate of lime, chloride of SOCIUMMS PINON, MOVES) wc anes cueee es saskicecesteeeeee 4

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These are at once the constituents and the proportions of the constituents of food suited to a weakly rapidly- growing animal, The large quantity of water makes it pass easily through the soft absorbent walls of the digestive canal, and the complcte suspension in an alkaline fluid of the finely divided

fat and nitrogenous matter introduce more of them than could be effected were they in a solid form. The fat is the germ of new cellular growth, and the nitrogenous matter is by the new cells formed into flesh, which is doubling its bulk monthly. The phosphate of linie is required for the hardening bones, the chloride of sodium and the iron for the daily increasing amount of blood in circulation, Milk may be said to be still alive as it leaves the breast fresh and warm, and quickly becomes living blood in the infant's veins. A very slight chemical change is requisite. Its frequent administration 1s demanded by the rapid absorption, and the absence of regular meals prevents the overloading of the delicate young stomach with more than it can hold at once, .

The wholesomest nutriment for the first six months 1s milk alone. A vigorous baby can indeed bear with im- punity much rough usage, and often appears none the worse for a certain quantity of farinaceous food; but the majority do not get habituated to it, without an exhibi- tion of dislike which indicates rebellion of the bowels.

To give judicious diet its fair chance the frame must be well protected from the cold ; and just in proportion as the normal temperature of the body is maintained so does growth prosper, as is satisfactorily proved by experiments on the young of the lower animals

It is only when the teeth are on their way to the front, as shown by dribbling, that the parotid glands secrete an active saliva capable of digesting bread stuffs. Till then anything but milk must be given tentatively, and consider in the light of a means of education for its future mode 0 nutrition. Among the varieties of such means, the most generally applicable are broth and beef tea, at first pure, and then thickened with tapioca and arrowroot. Chicken soup, made with a little cream and sugar, serves asa cn Baked flour, biscuit powder, tops and bottoms, should al have their turn; change is necessary in the imp dietary which art supplies, and for change the stomac should be prepared by habit. ae

The consequences of premature weaning are insidious. The external aspect of the child is that of health, its muscles

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are strong, but the bones do not harden in proportion, and if it tries to walk its limbs give way, and it is said to be suffering from rachitis or ‘‘ rickets.”

These consequences follow in other animals as surely as in the human race; and in them it was possible to make the experiment crucial. A gentleman namcd Guérin set himself to find if he could produce rickets at will. He took a number of puppies in equally good condition, and having let them suckle for a time, he suddenly weaned half of them and fed them on raw meat, a fare which at first thought wouldseemthe mostsuitable for carnivorous animals. Nevertheless, after a short time, those which continued to take the mother’s milk had grown strong and _ hearty, whilst those which had been treated with a more substantial dietary pined, and frequently threw up their victuals, then their limbs bent, and at the end of about four months they showed all the symptoms of confirmed rickets. From these experiments we must conclude that the rachitis depended mainly on the derangements of nutrition brought on by improper diet. A diet which is taken at a wrong season may fairly be called improper. For carnivora, it is flesh before the age of suckling has passed ; for herbivora (and an experiment bearing on the point has been made on pigs), it is vegetable feeding begun when they ought to be at the teat.

The time for weaning should be fixed partly by the child’s age, partly by the growth of the teeth. The troubles to which children are subject at this crisis are usually gastric, such as are induced by summer weather ; therefore at that season the weaning should be postponed, whereas in Winter it should be hurried forward. The first group of teeth nine times out of ten consists of the lower central front teeth, which may appear any time during the sixth and seventh month, The mother may then begin to diminish the number of suckling times; and by a month she can have reduced them to twice a day, so as to be ready when the second group makes its way through the upper front gums to cut off the supply altogether. The third group, the lateral incisors and first grinders, usually after the first anniversary of birth give notice that solid food can be chewed. But it is prudent to let dairy milk form a con- siderable portion of the fare till the eye teeth are cut, which seldom happens till the eightecnth or twentieth month. At this period children are liable to diarrhea, convulsions, irritation of the brain, rashes, and febrile catarrhs. In such cases it is often advisable to resume a complete milk diet,

and sometimes a child’s life has been saved by its reapplication to the breast. These means are most feasible when the patient is accustomed to milk ; indeed, if not, the latter expedient is hardly possible.

Diet in Childhood and Youth—At this stage of life the diet, must obviously be the best, which is a transition from that of infancy to that of adult age. Growth 18 not completed, but yet entire surrender of every consideration to the claim of growth is not possible, nor Indeed desirable. Moreover that abundance of adipose tissue, or reserve new growth, which a bab y can bear, is an impediment to the due education of the muscles of the boy or girl. The supply of nutriment needs not to be so con- tinuous as before, but at the same time should be more frequent than for the adult. Up to at least fourteen or fifteen years of age the rule should be four meals a day, varied indeed, but nearly equal in nutritive power and in quantity, that is to say, all moderate, all sufficient. The maturity the body then reaches involves a hardening and enlargement of the bones and cartilages, and a Strengthening of the digestive organs, which in healthy young persons enables us to dispense with some of the _ (i es

i Trousseau, Clinique Médicale, vol. iii. p. 484, 3d edit.

watchful care bestowed upon their diet. Three full meals a day are generally sufficient, and the requirements of mental training may be allowed to a certain extent to modify the attention to nutrition which has hitherto been paramount. But it must not be forgotten that the changes in figure and in internal organs are not completed till several years have passed, and that they involve increased growth and demand full supplies. As less bulky food is used, care should be taken that itis sufficiently nutritious, and habits should be acquired which conduce to making the most of it for the maintenance of strength.

The nutritiousness of food depends on digestibility and concentration. Food is digestible when it yields readily its constituents to the fluids destined for their reduction to absorbable chyme. It is more or less concentrated, accord- ing as a given weight contains more or less matter capable of;supporting

life. The degree in which they possess these qualifications united constitutes the absolute nutritive value of alimentary matters,

The degree of cohesion in the viands influences digesti- bility. Tough articles incapable of being completely grouud up by the teeth, remain unused, while fluids and semifluids lead the van of digestibles. The tissues of young vegetables and young animals are for this reason more digestible than old specimens. It is desirable also that the post mortem rigidity, which lasts several days in most instances, should have merged into softness before the meat is cooked, or should have been anticipated by cooking before the flesh is cold. In warm climates and excep- tionally warm weather the latter course is the preferable. The dietician, especially when the fceding of the young is in question, will prefer those methods of culinary prepara- tion which most break up the natural cohesion of the viands. And it may be noticed that the force of cohesion acts in all directions, and that it is no advantage for an article to be late- rally friable if it remains stringy in a longitudinal direction.

Fat interposcd between the component parts of food diminishes its digestibility. It is the interstitial fat between the fasciculi of muscular fibre in beef which renders it to young persons and to dyspeptics less digestible – than mutton.

A temperature above that of the body retards digestion. Meat, which is digested by the gastric juice in the stomach, has time to cool before it gets there ; but farinaceous food, which depends for its conversion into chyme on the salivary glands, suffers a serious loss if by reason of being too hot it cannot avail itself of the saliva supplied by the mouth. It should also be borne in mind that a temperature much above that of the body cracks the enamel of the teeth.

Excessive concentration impairs digestibility. The prin- cipal medium by which nutriment is carried through the absorbent membrane of the digestive canal is water. There is no doubt it passes more rapidly by endosmosis than anything else. The removal, then, of water is an injury to viands, and drying, salting, over-frying, over-roasting, and even over-boiling renders them less soluble in the digestive juices, and so less nutritious. A familiar illustration of this may be taken from eggs. Let an egg be lightly boiled,

poached in water, custarded, or raw, and the stomach even of an invalid can bear it ; but let it be baked in a pudding which requires a hot oven, or boiled hard, or otherwise submitted to a high temperature for a prolonged period, and it becomes a tasteless, leathery substance, which can be of no more use in the stomach than so much skin or hair. It is obvious then that it is mainly in a commercial point of view that articles of diet can be called nutritious in proportion to their concentration. About this there can be lo question; milk adulterated from the pump is worth so much less than pure milk, and a pound of beef steak sustains a man longer than a pint of veal broth.

! The attainment of nutritiousness by concentration is of considerable importance to travellers and in military medicine. There are not a few strategists who attribute the success of the Germans in the war of 1870 to the easily carried and easily prepared food supplied to them by the sausage-makers of Berlin. Concentration of viands carried to excess, so as to be likely to affect the health, is usually made manifest by a diminution in the secretion of urine and itscondensed condition; while, on the other hand, if dilution is needlessly great, the action of the kidneys is excessive. Now the urine of young persons is naturally of lower specific gravity, that is more aqueous, than that of adults. If it is found to equal in density the excretion of full growth, or if it is observed to be voided but rarely, the meals should be made more bulky, or better still, more frequent, so as not to overload the stomach.

An over-concentrated diet often induces costiveness. This should be counteracted by green vegetables and other dilute appetizing dishes, and never by purgative drugs. The habit of taking a considerable quantity and variety of fresh green vegetables has the further advan- tage of preventing that tendency to minor develop- ments of scurvy which is not uncommonly found in youths nourished mainly on animal food. A _ softness or friability of the gums is one of the first signs of this. If the mouth bleeds after the application of a tooth brush, the use of fresh vegetables at every meal should be enforced,

The young are peculiarly liable to be affected by poisons conveyed in fluids. Their sensitive frames absorb quickly, and quickly turn to evil account such substances, even when diluted to an extent which makes them harmless to adults. The water therefore with which families, and still more with which schools are supplied, should be carefully subjected to analysis. Wherever a trace of lead is found, means should be adopted to remove the source of it; and organic products should have their origin clearly accounted for, and all possibility of sewage contamination excluded. These precautions are essential, in spite of the grown-up portion of the household having habitually used the water without injury,

Fresh milk has Jong had a bad popular reputation as occasionally conveying fever, and in some parts of Ireland the peasantry can hardly ever be got to take it “ raw.” This is quite irrespective of the state of the cattle which furnish it; no cases of discase thus communicated have ever been traced home to sick cows. It is pro- bably always due either to adulteration with dirty water, or to the vessels being washed in that dangerous nicdium, or to their being exposed to air loaded with clements of contagion.

Up to the period of full development the daily use of wine should be allowed only during illness and the express attendance of a medical adviser. Its habitual consuniption by healthy children hastens forward the crisis of puberty, checks growth, and habituates them to the artificial sensa- tion induced by alcohol.

Diet for Bodily Labour.—It seems certain that the old theory of Liebig, which attributed the whole of thie force exhibited in muscular movements to the oxidation of muscular tissue, is untenable. There is not enough of the material oxidized, that is to say, destroyed and carried away as urea and other nitrogenous excretions, to generate so much force, as measured by the method of Joule. On the other hand, Traube goes too far when he would make out that in the performance of muscular work the metamorphosis of the organized constituents of contractile tissue is not involved, and that non-nitrogenous substances alone are consumed. The prolonged feats of walking performed by the pedestrian Weston in 1876 vastly

increased the amounts excreted of those elements of the urine which are derived from the oxidation of musele and nerve! The urea formed by the destructive assimilation of contractile fibre, and the phosphates whose main source is nervous tissue, were each nearly doubled during and shortly after the extraordinary strain upon those parts of the body. As might be expected, the machinery wears away quicker when it is harder worked, and requires to be repaired immediately by an enhanced quantity of new material, or it will be worn beyond the power of repair. The daily supply, therefore, of digestible nitrogenous food, meat par excellence, must be increased whenever the muscular exercise is increased. In making the recent extension of railways in Sicily, the progress was retarded by the slack work done by the Sicilian navvies compared with that got through by the English gangs. The former took scarcely any meat, preferring to save the wages expended by their comrades in that way. The idea occurred to the contractor of paying the men partly in money and partly in meat; and the result was a marked increase in the amount. of work executed, which was brought nearly up to the Britishaverage. A mixed diet, ‘with an increase in the proportionate quantity of meat when extra corporeal exertion is required, is the wholesomest, as well as the most economical, for all sorts of manual labourers.

It is absolutely essential that the fleshly machinery for doing work should be continuously replaced by flesh food, as it becomes worn out. Nitrogenous aliment after a few chemical changes replaces the lost muscle which has passed away in the excretions; just as the engineer makes ore into steel and renews the corroded boiler plate or thinned piston. Now, as the renewal of the plate or piston is a “ stimulus” to the augmented performances of the engine, so meat is a “stimulus” to augmented muscular action. Taken ma digestible form during exertion, it allows the exertion to be continued longer, with greater ease and less consequent exhaustion. According to the testimony of soldiers experimentally put through forced marches of twenty miles a day, with loads of half a hundredweight each, “meat- extract” bears away the palm from the other reputed stimulants commonly compared with it (viz.,rum and coffee). “It does not put a spirit into you’ for a few miles only, but has a lasting effect; if I were ordered for contimt- ons marching, and had my choice, I wonld certainly take the meat

extract,” said an unprejudiced sergeant to Dr Parkes, who was the conductor of the experiments alluded to.? ,

When the continuous repair of the muscular machinery is fully secured, the production of heat and force is most readily provided for by vegetable aliment, by reason of the large proportion of carbon which it contains, In assign- ing their physiological functions to the several sorts of food, nearly all the business of begetting active force should ap- parently be ascribed to the solid hydrocarbons, starch and fat, by their conversion into carbonic acid. It is not necessary to be acquainted with every step of the process, which in the body we confessedly are not, to appreciate the argument. It is clearly important that these elements of diet should be furnished in sufficient quantity and im 4 digestible form. In additions to diet made in consequence of additional bodily work not only should the stimulus of animal food be attended to, but the bulk of starch and fat in the rations should be augmented even in larger ee ee a ee

1 See Dr Pavy on Weston’s walk, in Lancet of Dec. 28, 1876. The urea excreted when walking bore to that excreted during rest the rela- tion of 17 to 10, phosphoric acid 19 to 10, lime 15 to 10, &c.

2 On the Issue of a Spirit Ration during the Ashantee Campug” of

1874, by E. A, Parkes, M.D., Professor of Military Hygiene in the Army Medical School. London, 1875. a |

proportion, for these aliments are the most direct con- tributors of force.?

“Training” for athletic sports is based on the principles above enunciated. The usual time allotted to it igs six weeks, and the objects to be attained in this period may be described as—

~ (1.) The removal of superfluous fat and water ; (2.) The inerease of contractile power in the muscles ;

(3.) Increased endurance ; tt ‘ Wind,” that is to say, a power of breathing and circulating

the blood steadily iu spite of exertion.

The first is aimed at by considerably adding to the daily amount of nitrogenous and by diminishing farinaceous and liquid food, and providing that it should be so consumed as to be fully digested. ‘The second and third are secured by gradually increasing the demands made upon the muscles, till they have learnt to exert at will all the powers of which they are capable, and for as long a period as the natural structure of the individual frame permits. ‘ Wind” is improved by choosing as part of the training an exercise, such ag running, which can be sustained only when the respiratory and circulating organs do their duty fairly.

As an example, the Oxford system of training for the summer boat-races may be cited. It may be considered a typical regimen for fully developing a young man’s corporeal powers to fulfil the demands of an extraordinary exertion, a standard which may be modified according to the circumstances for which the training is required, It is as follows :—

A Day’s Training?

Rise about 7 A.M. TENOROISE .....00008 A short walk or run. Of tea,

Meat, beef or mutton

Not compulsory.

As little as possible.

Underdone.

Crust only recom- mended,

Breakfast at 8.30 Bread or dry toast…

lixercise in forenoon} None. ; Meat, much the same * i as for breakfast. Crust only recom- mended.

Not always adhered to.

Dinner at 2 p.m.

\

if Exercise ……., | f

Supper at 8.30 or

)

Vegetables, none

Beer, one pint

About 5 o’clock start for the river, and row twice over the course, the speed increasing with the strength of the erew. —

Meat, cold.

Bread, and perhaps a little jelly or water- eresses.

Beer, one pint.

Bed about 10.

1 This is well illustratrated by a remarkable feat performed on the Great Western Railway in the summer of 1872. It was neces- sary to shift the rails from the broad to the narrow gauge on upwards of 500 miles of permanent way within a fortnight. The task was enormous, for the Great Western is one of the few English lines whose rails are held down by bolts screwed into nuts. All these had to be unscrewed and replaced after removing the heavy rail two feet. About 3000 men were employed, working double time, some- times from 4 in the morning till 9 at night; and, without one being sick or drunk, they accomplished the work in the prescribed time. The scheme for generating muscular power was this. The men were hutted along the line, so as not to waste their strength by coming and going, and they brought with them bacon, bread, cheese, cocoa, &c., to provide their usual

meals at usual times. But they had no beer, nor aleohol in any form. A pound and a half of oatmeal and half a pound ofsugar was allowed extra to each man daily, and for every gang of 21 a cook was provided. ‘The first thing done in the morning was to breakfast ; and then the cook and his caldron started along the line till water was found convenient ; a fireplace of stones was built, and the pot boiled. Oatmeal was then sprinkled into it with sugar,

The Cambridge system differs very slightly, and in neither is any exaggerated severity of discipline enforced, while some latitude is permitted to peculiarities and a wish for variety, and plenty of time is left for business and social intercourse. Other plans are objectionable, from involving, without any corresponding advantage, a complete departure from the usual habits of the educated classes. For instance, according to Clasper, dinner is to be at noon, with only a light tea afterwards, and no supper. Then a country walk of four or five miles is to be taken before breakfast, and two hours row afterwards, and another hard row between dinner and tea.3 “Stonehenge,” again, requires the time between breakfast and dinner to be spent. entirely on billiards, skittles, quoits, rowing, and running, in spite of another hour’s row being prescribed at 6 P.M. He also requires the aspirant for athletic honours to sleep between 10 and 11 hours. Only professionals will carry out such rules, and even they do not either benefit their health or lengthen their lives by the sacrifice. For it is notorious that “over-training” leads to a condition of system in which the sufferers describe themselves as “fallen to pieces.” The most peculiar symptom is a sudden loss of voluntary power after exertion. It is sometimes called “ fainting,” but there is no loss of sense, and it is quickly relieved by liquid food. It is to the pathologist a timely warning of that consequence of overstrained muscle which constitutes paralysis scriptorum, turner’s palsy, and blacksmith’s palsy, and which results in fatty degencration of the red muscular fibre. To get and to keep its health a muscle needs a constant alternation of active contraction and rest, and an enforced protraction of either one or the other leads to the loss of vital properties. The limbs of an Indian fakir, voluntarily held in a strained posture, or those of a bed-ridden invalid, are equally apt to become useless. Overtrained persons are also liable to a languor and apparent

weakness, which is found on examination to depend on an excessive secretion of urea by the kidneys.

Such are not the results, however, of the training adopted at the universities, by which it would appear that the con- stitution is strengthened, the intellect sharpened, and life lengthened. Dr John Morgan (University Oars, 1873), has collected statistics of the subsequent health of those who have rowed in the university races since 1829, and he finds that, whereas at twenty years of age, according to Farr's life tables, average expectation of survival is forty years, for these oarmen it.is forty-two years. Moreover, in the cases of death, inquiry into its causes exhibits evidence of good constitutions rather than the contrary, the causes consisting largely of fevers and accidents, to which the vigorous and active are more exposed than the sick, And eee a EEE eee and thoroughly well boiled till thin gruel was made. As soon as the " shout for drink" was heard, buckets were filled and carried round with small pannikins to convey the liquid to the panting mouths. The men liked it exceedingly, and learned by experience the impor- tance of having it well cooked. m

The incident may remind the reader of classical mediciné of Hippo- crates, who considers the culinary preparation of oatmeal ptisan su im- portant that in a short treatise On the Treatment of Acute Disease he devotes to it the only cookery recipe he has inserted in his works. He describes how it is to be boiled till it can swell no longer (so that it may swell no more in the stomach), how it is to be settled and strained (through a coarse cullender). He prescribes it indeed for sick people but he would have been the first to agree with our advanced physiologists in the opinion; that overstrained muscular effort produces the same effects as continued fever (és muperoy xablorarat paxpdrepov), its chief dangers lying in rise of tempera- ture and arrested cutaneous action, and that its true antagonist is nutriment capable of rapid absorption, dissolved in that most essential nutriment, water.

2See Maclaren's Training in Theory and Practice, appendix to edition 1866.

3 Rowing Almanac, 1863.

4 Article " Boat-Racing," in British Rural Sports, 1861. |

it is not at the expense of the mind that the body is culti- vated, for this roll of athletes is adorned with the names of bishops, poets, queen's counsel, &e,

Training greatly increases the vital capacity of the chest, so that much more air can be blown in and out of the lungs, and with greater force, than previously. And this vital capacity endures longer,than the other improvements. It is evidence of the permanent elasticity of the pul- monary tissue, and an efficient protection against asthma, emphysema, and other degenerations of the organ of breathing.

Indigestion, sleeplessness, nervous indecision, palpitation of heart, and irregularity of bowels disappear under train- ing; but if they exist, the regimen should be entered upon with more than usual caution.

An important modification of training is that which contemplates the reduction of CorPULENCE (g. v.), which has increased to the extent; of interfering with comfort and preventing 'active exercise. If an exhausting amount of muscular effort is enforced, the digestion of meat is interfered with, while at the same time there still goes on the absorption of such fat as is unavoidably present in the victuals, so that the muscles and nerves lose strength, while the adipose tissue grows. Besides this, if by violent means the weight is worked down, then, to kcep it down, those violent means must be persisted in ; and if they be ncglected for more interesting occupations, the burden rapidly increases to a greater degree than ever. Many uncomfortably obese persons are very active in mind and body, and could not add to their muscular exercise without risk of harm.

Regimen, then, is more essentially important to them than to other trainers, and they will probably be more induced to attend to it if they understand the principles on which it is based. This is simply to exclude from the bill of fare all those articles which contain fat or which by the chemical actions of the digestive viscera may be con- verted into fat.

For the reduction of corpulence the following rules may be observed for a three weeks' course :—

Rise at 7, rub the body well with horse-hair gloves, have a cold bath, and take a short turn in the open air. Breakfast (alone) at 8 or 8.30, on the lean of beef or mutton (cutting off the fat and skin), dry toast, biseuit or oat cake, a tumbler of claret and water, or tea without milk or sugar, or made in the Russian way with a slice of lemon. Lunch at one on bread or biscuit, Dutch cheese, salad, water-cresses, or roasted ‘apples, hung becf or anchovies, or red- herring, or olives, and similar relishes. After eating, drink claret and water, or unsweetened lemonade, or plain water, in moderation. Dine at any convenient hour. Avoid soup, fish, or pastry, but eat plain meat of any sort except pork, rejecting the fat and skin. Spinach, haricots, or any other green vegetable may be taken, but no potatoes, made dishes, or sweets. A jelly, or a lemon- water-ice, or a roast apple, must suffice in their place. Take claret and water at dinner, and one glass of sherry or Madeira afterwards.

Between meals, as a rule, exercise must always be taken to the extent of inducing perspiration. Running, when practicable, is the best form in which to take it.

Seven or eight pounds is as much as it is prudent to lose during the three weeks. If this loss is arrived at sooner, or indeed later, the severe parts of the treatment may be gradually omitted, but it is strongly recommended to modify the general habits in aceordance with the principle of taking as small a quantity as possible of fat and sugar, or of substances which form fat and sugar, and sustaining the respiratory function. By this means the weight may be gradually reduced for a few months with safety.

Small quantities of dilute aleoholic liquids taken with meals slightly increase the activity of the renewal of the nitrogenous tissues, mainly muscle ; that is to say, there is a more rapid reconstruction of those parts, as is shown by the augmented formation of urea and the sharpened appetite. Life is fuller and more complete, old flesh is removed | and food appropriated as new ficsh somewhat more quickly, than when no alcohol is ingested. There appears to be a temporary rise in the digestive powers of the stomach, which is probably the initiative act. The

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nerve functions are blunted, and a lessened excretion of phosphorus exhibits a temporary check in the wear and renewal of the nerve tissue. The “ vital capacity ” of the lungs, as indicated by the spirometer, is reduced, showing a diminished oxidation of the blood.

The effect on a healthy man of taking with a meal such a quantity of fermented liquor as puts him at ease with lumself and the world around, without untoward exhilara- tion, is to arrest the wear of the nervous system, especially that part employed in emotion and sensation. Just as often, then, as the zest for food is raised to its normal standard by a little wine or beer with a meal, the moderate consumer is as much really better as he feels the better for it. Where the food is as keenly enjoycd without it, the consumption of a stimulant is useless. But alcohol is not a source of force, and its direct action is an arrest of vitality.

Diet for Mental Work.—An expression of Biichner’s— “No thinking without phosphorus ”1—has gained an un- happy notoriety. Strictly speaking, it is a groundless assumption, for we cannot say that intellectual being may not exist joined to any form of matter, or quite independent of matter. We certainly do not know enough of the sub- ject to lay down such a negative statement. And if it be held to mean that the amount of phosphorus passing through the body bears a proportion to the intensity of thought, it is simply a mis-statement. A captive lion, tiger, leopard, or hare assimilates and parts with a greater amount of phosphorus than a hard-thinking man; while a beaver, noted for its powers of contrivance, excretes s0 little phosphorus that chemical analysis cannot find it in the exercta. All that the physiologist is justified in assert- ing is that for the mind to energize in a living body that body must be kept living up to a certain standard, and that for the continuous renewal of life a supply of phosphatic salts is required. The same may be said with equal justice of water, fat, nitrogen, chloride of sodium, oxygen, &c. The phosphates are wanted indeed, but wanted by pinches, whereas water is required by pailfuls. A few days without water, or a few minutes without oxygen, will ter- minate the train of consciousness. The practical points taught us by physiology are that for the integrity of thought integrity of the nervous tissuc is requisite, and for the integrity of the nervous tissne a due quantity of such food as contains digestible phosphatic salts.

The most perfect regimen for the healthy exercise of thought is such as would be advised for a growing boy, viz., frequent small supplies of easily soluble mixed food, so as to furnish the greatest quantity of nutriment without overloading the stomach, or running the risk of generating morbid half-assimilated products. For it is essential to the intellectual direction of the nervous system that it should not be oppressed by physical impediments. The presence in the stomach or blood of imperfectly assimilated nutriment impedes its functions in close proportion to their amount, so that not only the constituents, but tle mode of administering food, must come into the caleulation. “¢ Repletus venter non studet libenter” is an old proverb, the application of which saves many a brain and many 2 stomach from being worked against the grain. Rest from brain-work for twenty minutes before meals, entire abstinence from it during meals, and rest again till the weight has passed from the stomach, are essential to the reconcilement of psychical exertion with bodily health.

The physiology of the action of alcohol has a vety important bearing on the physical management of the mental functions. Alcohol has the power of curbing; arresting, and suspending all the manifestations of the i a ee ts

1 Ohne Phosphor kein Gedenke. raft wnd Stoff, sect. 122.

nervous system, so that we fcel its inflnence on our thoughts sooner than on any other part of the system. Sometimes it brings them more completely under our command, controls and steadies them; more often it con- fuses or disconnects them, and then breaks off our power over them altogether. When a man has tired himself by intellectual exertion, a modcrate quantity of alcoholic stimulant taken with food acts as an anesthetic, stays the wear of the system wluch is going on, and allows the nerve force to be turned to the due digestion of the meal. But it must be followed by rest from toil, and is in essence a part of the same treatment which includes rest—it is an artificial rest. To continue to labour and at the same time to take an anwsthctic is a physiological inconsistency. The drug merely blunts the useful feeling of weariness, and prevents it from acting as a warning. There is no habit more fatal to a literary man than that of taking stimulants

between meals; the vital powers go on wearing out more and more without their cry for help being perceived, and in the end break down irrevocably.

As to quantity, the appetite for solid food is the safest guide. If a better dinner or supper is eaten when it is accompanied by a certain amount of fermented liquor, that is the amount most suitable; if a worse, then an exccss is committed, however little be taken.

The aim of the diet should be (to quote the words of John Milton) “to preserve the body’s health and hardness, to render lightsomc, clear, and not lumpish obedience to the mind, to the cause of religion and our country’s liberty, when it shall require from hearts in sound bodies to stand and cover their stations.”

It is especially when the mind of genius is over- shadowed by the dark clouds of threatened insanity, of hypochondriasis, or of hysteria, that a rational mode of life preserves it. Nothing but daily exercise, temperate meals, and a punctnal observance of regular hours of rest and study could have kept burning the flickering reason in poor Cowper.

As regards the proper quantity of alcohol that may be used the two following questions naturally occur—How is a man to know when he has had enough? and what are the signs of too much 2? The ancients used to wear dark red or purple engraved gems, which they considered preser- vatives against excess, and called them épebvoro/, “sober-stones,” “ amethysts.” The name is now limited to the violet rock crystal, but in early times it was applied to several other stones, cut in intaglio, and worn on the fingers at festive gatherings. So long as the wearer could de- cipher the minute works of art they bore, he had not reached excess, A more delicate test still is the appreciation of temperature by the skin; if a draught does not chill, if a hot room fails to produce the usual discomfort, the wisc man knows he has exceeded and must stop at ouce. In short, the safest rule is that when there is a consciousness of any psychical effect at all beyond that of satisfaction at the relief of bodily weariness—such a satisfaction as is felt on taking a good meal by a vigorous person—then the limits of moderation have been attained. On ordinary occasions of daily life, and “for the stomach’s sake, ” no more should be taken. ach fresh drop is a step down- wards to the evil results of alcohol. But to the practiser of daily temperance,

festive occasions are safe and may be beneficial. A man may from time to time keep up without harm the above mentioned scnse of satisfaction by good and digestible wine in good company without fear of setting drunk or failure of health, if he makes it a law be himself to stop as soon as he experiences any hurry of ideas or indistinctness of the senses.

Diet of Mothers.—During pregnancy as much care should be taken not to get too fat as is taken by an athlete

training for a race. The rules for modified training explained above will afford hints on the subject, but it is not desirable to carry the process so far.

There is a temptation at this time to increase the usual allowance of stimulant; alcohol is taken between meals to overcome the nausea and depression incident to the state of body. Aud by this mistaken expedient the nausea gradu- ally becomes dyspeptic vomiting. On leaving it off the sickness ceases. A mother should also remember that nearly all the aleohol she consumes mixes with her blood, which now is one with the blood of the foetus.

During lactation the most suitable drink for a mother is cow’s milk, fresh and unskimmed. If it turns sour on the stomach, lime-water mixed with it not only corrects the acescence, but also supplies a valnable aid to the growing bones of the infant, In her solid dietary also milk may be fairly taken as the type of a due admixture of alimentary principles, because it is not individual growth, or the prodnetion of muscular force, but the secretion of milk, that is the object of the selection of diet.

Supposing the full diet to consist of three pounds of solid food, that will require six pints extra of uncombined aqueous fluid to make it as fluid as milk; and, to combine the nitrogenous and carbonaceous constituents in due pro- portion, the three pounds of solid food should consist of

144 oz. 13 oz.

20 02.

At first, from the exhaustion consequent on childbed, from tle want of exercise and of fresh air, the appetite turns against meat. Let then milk, especially boiled milk with arrowroot or the like, chicken broth, or egg custards, fill up the deficiency.

Any increase in the habitual allowance of alcohol is as unfitting to this period of life as during pregnancy.

Diet of Old Age.—It is a remark extant from the rough times when famine was more frequent than now, that the older a human being is the better deficiency of food is borne. Old men suffer least from abstinence,! aud benefit therefore most from temperance iu eating. Everybody who has passed the age of fifty, or thereabouts, with a fairly unimpaired constitution, will act wisely in diminishing his daily quantity of solid food. There is less demand for the materials of growth, and consequently animal food should bear a smaller proportion than heretofore to vegetable, and it is mainly in that ingredient of the diet that reduc- tion should be effected. Neglect of this rule in declining years is often punished by gout, a disease attributable to excess of nitrogenous aliment, and for this reason common in elderly men. :

In the autunin of life the advantages de:ived from fermented liquor are more advantageous, aud the injuries it can inflict less injurious to the body than in youth. The effect of alcohol is to check the activity of destructive assimilation, to arrest that rapid flux of the substance of the frame which in healthy youth can hardly be excessive, but which in old age exhausts the vital force. Loss of appetite is a frequent anda serious symptom in old age. It usually arises from deficient formation of gastric juice, which, in common with other secretions, diminishes with years. It is best treated physiologically rather than by drngs.

Diet in Sickness.—In all that has gone before health has been presupposed. ‘The modifications necessitated by sickness are of three kinds:—first the avoidance of such articles of consumption as would inercase the disease undcr the special circumstances, although ordi- narily wholesome ; second, the maintenance of the functions

of meat.

of fat, butter, and sugar.

of farinaceous food and vegetables. of salt, lime, &c.

1 Hippocrates, Aphorism xiii.

or parts of the frame which remain normal ; third, the administration, for a special curative purpose, of peculiar food which would not be recommended for general use.

In all fevers, which are classed together as being apparently due to a poison multiplying itself in the blood, the art of diet consists in giving an almost continuous supply of liquid nutriment, holding very soluble aliments in a dilute form. There is nothing so digestible as water, and we take advantage of this high digestibility to get whatever it can dissolve digested along with it. For the first three or even four days patients previously strong should have only farinaceous food, well boiled and cooled to the temperature of the body. Evidence has been already quoted of the power which oatmeal gruel possesses of sus- taining force under the trying circumstances of excessive toil. Now, fever closely resembles muscular effort in its arrest of the digestive functions, at the samc moment that it makes an urgent demand for nutriment. With ultra- Egyptian rigour, while straw is withheld, “the tale of the bricks is doubled,” and we know by the quantity of urea and phosphates in the urine, and by the feecal excretion, that the muscles and nerves of the bed-ridden sufferer are melting away as fast as if he were scaling the Alps with nothing to eat. It is quite reasonable to transfer the experiences derived from health to sickness, and to feel satisfied that we are not wasting precious opportunities when we are giving fever patients such a time-honoured diet as oatmeal gruel, care being taken that itis thoroughly well boiled. After three days the tissues are beginning to suffer, and it is advisable to add chicken broth, meat jelly, and strong soup. Let that be supplied which the emaciation shows to be passing away—unitrogenous tissue.

The administration of alcohol is to be regulated partly by the temperature and partly by the condition of the nervous system. Usually if the heat of the blood (as taken at the axilla) is above 103°, and always if it is above 105°, there is a necessity for it. Again, if there is great prostra- tion of strength, or tremor of the hands, or quivering in the voice and respiration, if thercis low muttering delirium wheu the patient is left quiet, it is required.

Green-sickness, or anemia, is characterized by the rapid disappearance of the red particles which float in the blood. To what a strange extent this goes may be seen by looking at the insides of the lips, which naturally hold such a quantity of the fluid as to be quite scarlet, but which now are pale like those of a corpse. It is calculated that the loss of material in marked cases of green-sickness may amount to three pounds of this important constituent of the blood! Yet it is capable of complete renewal by diet. If by dint of remedies, notably iron, the appetite can be so regulated as to enjoy meat in excess of the inimiediate wants of the body, that meat is converted into hzematine, and the healthy hue returns to the cheeks as quickly as it left. Wine is useful at meals on account of the stimulus it gives to the appetite ; it is injurious between meals by spoiling it.

Acute rheumatism and acute gout are best treated on an opposite principle. A nutrient nitrogenous diet, which the patient assimilates only too readily, retards recovery, and will even bring on a relapse during convalescence. If meat in any form, solid or liquid, be eaten, it seems to turn into acid, which is already in excess in the blood. The power of fully converting it into living flesh is wanting, and until this power is regained a semi-conversion into an organic acid takes place. The redder and more muscular the meat is, the more it disagrees.

_ Chronic gout is indubitably due to good cheer indulged in, either by the sufferer or his ancestors. When a man

1 Chambers’s Lectures, chiefly Clinical. Lect. li,

for the repair of his tissues, the following results may be expected, with variations dependent upon his original con- stitution. If the digestive

solvents are weak and scanty, the excess passes through the canal in an undigested state, and is partially decomposed there. Thereon ensue all gorts of abdominal derangements, which, however, have the advantage of getting rid of the offending matters. If, on the other hand, the stomach secretes vigorously on being | stimulated, then indeed the excess is digested and absorbed, and is subject to the future changes consequent on assimilation. An active out-of-door life neutralizes this in some measure by augmenting oxidation; much of the albumen goes to form glycogen, and acts as a fuel for the maintenance of muscular force. ‘The balance is wasted in an unexplained way, and does not necessarily injure a hardy frame. The violent muscular exertion and high training needful for oxidation being inconsistent with the habits of intellectual society, a man in the prime of life who puts too much meat into a good stumach habitually retains in his blood an excess of uric acid, into which the nitrogenous waste converts itself. Uric acid in the blood has been distinctly traced as the essence of gout, Perhaps this imaginary first offender develops the full con- sequences ; and that is the best thing that can happen, inducing greater carefulness in future.

These views can suggest but one line of preventive treatment. The children of gouty families should be brought up to a life of strict abstemiousness and muscular activity. From the earliest years vegetables and ‘“ meagre” soups should form a considerable portion of their dietary.

Gouty adults require meat but once in twenty-four hours. The bill of fare should be varied from day to day, but as simple as possible at each meal. Rich sauces are to be eschewed, and a lemon, an infusion of herbs and pepper, bread-sauce, or a purée ‘of vegetables, adopted in their place. Sugar at the end of meals generates an excess of organic acid, and is to be avoided; if cheese is eaten it should be new, and is best toasted and creamed.

Dilute alkaline waters containing soda, such as Apollinaris or the weaker Vichy, are a rational drink during meals; but it is probably best to keep to pure water. Those who live idle lives require no alcohol; and it should not be an habitual accompaniment to meals.

Red gravel is evidence of a constitution so closely allied to gout, that nothing need be said further about its appropriate regimen.

In Bright’s disease of the kidneys, in contracted liver, and jn short in all degenerative lesions, alcohol has a baneful influence. Its action upon the tissues is directly the same as theirs. Moreover, if we agree with its latest expositor, Dr Sibson, that Bright’s disease is closely ass0- ciated with increased arterial tension, alcohol (whose effect is also to increase tension) must be peculiarly poisonous.”

For the cure of these diseases, independent of the nutri tion of the rest of the body, a milk diet has been proposed, and it seems to offer a fair prospect, if the patients cau be persuaded to persist in it. How safcly a milk diet may be adopted in middle life is shown by the example of Dr Cheyne, a Bath physician of the last century, who at about fifty-five restricted himself entirely to milk and biscuits, and yet was able to fulfil the duties of his laborious pre- fession. He took at first of the former six pints, of the latter twelve ounces; but he shortly diminished the quantity to half, and after sixtcen years’ experience found it fully sufficient, and indeed capable of further reduction quantity.®

Weak and slow digestion is a condition which enforces 4”

2 Sibson’s Harveian Lectures, British Med. Jour., Feb. 10, 1877. 3 The Natural Method of Curing Diseases of the Body, &¢, by Geo. Cheyne, M.D, 1742.

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especial care for meat and drink. The cause of the im- perfection lies in a deficiency in the supply of nerve power to the stomach, so that it both secretes its solvent fluid and also rotates its contents too slowly ; and the more it is loaded the slower it goes. Of the medicinal means of curing such a state this is not the place to speak ; but none of them will avail without the aid of a rational dietary. Time must be given to the oppressed organ wherein to empty itself of every complete meal, and such a period of rest given as will allow of the recovery of force ; or if the meals are frequent they must be very sparing. ‘The observations of Busch (Virchow’s Archiv. xiv.) show that a period of five hours clapses in the healthy subject before a fully filled stomach can empty itself, and in the dyspeptic the process is still longer. Whenever, therefore, the organ is loaded as healthy people rightly load it, a

man should allow at least seven or eight hours to elapse before sitting down to another meal. And he must never eat till the need for food is announced by appetite. Perhaps a more generally applicable and easier obeyed law is not to make full meals at all, but to stop short at the feeling of repletion, and, when that has gone off, again to take in the supply allowed by circumstances. ‘Three mode- rate meals are usually sufficient to keep up the strength.

Meat should be once cooked. Mutton, feathered fowl,

venison, lamb, and beef arc digestible in the order they here are placed in. ‘The more difficult dishes should have the longest time allowed to them. Of the farinaceous articles of diet, bread and biscuits are the most easily penetrated by the gastric juiccs, and all their prepara- tions are safe. The best bread is the “ acrated,” which is frec from decomposing yeast. Macaroni is good if soaked till quite macerated. Pastry is difficult of solution. Vegetables are very necessary; cauliflowers, Jerusalem artichokes, beetroot, French beans, soft peas, stewed celery, turnip-tops, spinach, are the most readily disposed of. _ When the usual mixture of meat and vegetables is found to induce flatulence, it is a good expedicnt to eat vegetables only at one meal and meat and bread only at another. The principle on which this plan is based is that starchy food is dissolved mainly by the alkaline saliva, whereas meat is dissolved by the acid gastric juice. In a vigorous person both these are copious enough to render immatcrial their mutual neutralization, but when thcy are scanty, their separate employment is a physiological economy.

Consumption is a disease whose treatment is almost wholly dietetic. The children of a mother whose pedigree exhibits proof of a consumptive tendency may with propriety be put to a healthy wet nurse immediately on birth, and, on being weancd, be fed from a Channel Island cow. The milk should be boiled and then cooled down to tepidity. A small tca-spoonful of “ saccharated solution cf lime ” may be advantageously added to each quart of railk when the coming teeth require the elements of their ae to be added to the dict. The rules already given ss ? healthy management of the young sliould be adhered 4 Ms unusual strictness, and any departure from them

snould be made only to provide for some peculiar necessity of the case according to medical advice.

Tn cases of consumption it is difficult to say that drugs are useless, but certainly those that come nearest to aliments have most evidence in their favour, such as iron, hares oil, and the phosphates of lime. Their effect on ut peal must be sedulously watched, and the end must pi © sacrificed to the means ; that is to say, if they spoil oe.” they must be left off. The reason for a oil is to afford an easily assimilated basis of ae ed organic growth, to take the place of the abnormal “ndency to form tubercular matter. If anytiting pre-

vents its easy assimilation it is obviously useless, The use of climate in the treatment of phthisis may be tested by its dietetic action; if it improves the appetite, it is doing good; if it injures the appetite, it is doing harm.

In chronic jaundice the function of the liver is best restored by the free use of green vegetables at all meals.

Diabetes, when it has once assumed a chronic form, is never really cured, but life may be much prolonged by the employment of a diet from which sugar and starch arc excluded as far as practicable, and the patient nourished on animal food. The best fare for diabetic patients is that given by Professor Bonchardat in his work Du Diabete sucrée, Paris, 1852.

In functional nervous diseases, such as hysteria and hypochondriasis, the appetite, muscular elasticity, and inental powers will often be observed to be deficient in the early part of the day, and to recover their tone in the evening. At this latter time, therefore, it is advisable to make the principal meal.

Scurvy is a notable example of a disease of which, more than any other, the prevention depends on the adoption of a suitable diet. Its symptoms so far resemble those of general starvation that from the earliest time of its appearance in history it has been suspected that it is due to a dietary defective in some necessary ingredient ; and practical observation soou

showed that this was fresh vegetables. It was found on every long voyage that the crew suffered from scurvy in proportion to the length of time they were restricted to dry food, and that they recovered rapidly as soon as they got access to a supply of succulent plants. This requisite for health is obviously the most difficult of all things to procure aboard ship, and efforts were made to find a substitute capable of marine transport. From the time of Hawkins! (1593) downwards the opinion has been expressed by all tle most intelligent travellers that a substitute is to be found in the juice of fruits of the orange tribes, such as oranges, lemons, &c. But inits natural state this is expensive and troublesome to carry, so that skippers and owncrs for a couple of centuries found it expedient to be sceptical. The pictures of scurvy as it appeared during the 18th century are horrible in the extreme. But the statute of 1795, passed through the exertions of Captain Cook and Sir Gilbert Blane, has enforced the carrying of lime-juice. This invaluable preventive has shown its influence all the more decidedly by the disease still appearing occasionally under strong promoting circumstances, and to a certain extent in spite of the antidote ; but it is so modified as to be usnally more of the nature of a warning or demonstration than of a serious invasion. Some indeed have questioned and even denied altogether the blessings derived from the enforced use of lime-juicc. But they make a very scanty show when weighed with those whom they undertake to oppose ; and it is superfluous here to entcr into the arguments and results of observation constituting the ponderous Report of the Committee appointed by the Lords Commissioners of the Admiralty to Enquire into the Causes of the Outbreak of Scurvy in the recent Arctic Hapedition, dc. and presented to both Houses of Parliament, May 7th 1877," which seems to settle for ever the preventive powers against scurvy of the use of lime-juice.

The committee alluded to was appointed in consequence of one of those exceptional outbreaks of scurvy indneed by exceptional circumstances. The ships sent on the explor- ing expedition of 1875 were amply provided with lime-juice, and with printed expositions of its value, During the voyage out and in the long inaction of the winter the men's health was so well preserved by general attention to

1 Sir Rd. Hawkins's Voyage, edited by Uakluyt Society, p, fn

hygiene that no cases of even mild scurvy.were deteeted ; the pallor and languor and depression of spirits of some among the sailors were attributed to the want of sunlight for 142 days, and it was expected that a few days sledge travelling in the open air would reinvigorate them. There was plenty of lime-juice aboard ; but it seems that it is not the custom to add to the weight of provisions, which Polar sledging parties have to propel, by ineluding the preserva- tive amongst them. Sir George Nares, the commander of the expcdition, cites the names of 10 admirals, 10 doctors, aud 15 captains who have conducted Jand explorations in this fashion without it; and they returned unscathed to any serious extent. But on this recent oecasion the crews seem to have becn peculiarly predisposed to illnesses of scorbutic nature by the more than ordinary searcity of fresh meat in their dietary, arising out of the deficiency of game in the extremely high latitude where they wintered. With few exceptions the whole of the crews of the “ Alert ” and the ‘ Diseovery ” were employed in sledging, and the cousequenee was, that of the 122 oftieers and men, 59 were more or less incapacitated by seurvy, and 4 died.

The real reason for not carrying lime-juice in such expeditions is its cumbersomeness. Including bottles, though in truth they are not wanted ina hard frost, it may be said that lib a week for each man would have to be added to the baggage,1—a serious item, no doubt, And with a view of remedying the inconvenience, mcdieal men have long sought to diseover to what constituent of the complicated mixture afforded by nature it is that it owes its efficacy. Ina contribution to the Afedico-Chirurgical Review for 1848, Dr Parkes examined exhaustively the evi- dence concerning the various deficiencies in ship food as compared with fresh food which might be filled up by one or other of the components of lime-juice ; and by exclusion he is led to the conclusion that the cause of scurvy is to be found in deficiency of salts whose aeids form carbonates in the system, viz., citric, tartaric, acetic, lactic, and malic acids.

Though not so good as when in their natural form, because less digestible and pleasant, yet a supply of citrates, tartrates, lactates, and malates of potash might be packed in small bulk, and, under circumstances where

weight is of importanee, might take the plaee of lime-juice. Or bolo-lozenges might be made of lime-juice freed from its aqueous portion and preserved with sugar. Three or four of these a day might be easily swallowed without stepping work.

Before leaving the subject of maritime scurvy, it may be suggested how useful it would be if those who sail in desolate regions were to carry seeds of antiscorbutie vege- tables, which, strewn broadcast in uninhabited places, would form a flora capable of saving the lives of many a wreeked or weather-bound crew.

Scurvy, as landsmen see it in time of peace, amounts to little more than anemia with a softening and blecding condition of the gums, But it indieates the use of exactly the same preventives and remedies as the more severe complaint.

Starvation is a disease which it isa platitude to say may be prevented by diet ; nevertheless there are connected with it a few peculiarities of scientific and practical interest which may not be unworthy of notice, “ Inedia,” as it is called in the nomenclature of diseases by the London College of Physicians, is of two kinds, arising from want of food and from want of water.

Whien entirely deprived of nutriment the human body is capable of supporting life under ordinary cireumstanees for little more than a week. Tn the spring of 1869 this was

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_In merchant ships lime-juice is used during Polar service in a ration of an ounce daily. See “Report” above cited. But the opinions of the officers examined seems to agree that the quantity is not sufficient, and advise half as much again or more,

Dl Tea A cs

tried on the person of a “ fasting girl” in South Wales, The parents made a show of their child, decking her ont like a bride on a bed, and asserting that

she had eaten no food for two years. Some reckless enthusiasts for truth set four trustworthy hospital nurses to watch her ; the Celtic obstinacy of the parents was roused, and in defence of their imposture they allowed death to take place in eight days. Their trial and conviction for manslaughter may be found in the daily periodicals of the date ;- but, strange to say, the experimental physiologists and nurses escaped scot- free. ‘There is no doubt that in this instance the unnatural quietude, the grave-like silence, and the dim religious light in whieh the victim was kept contributed to defer death,

One thing which remarkably prolongs life is a supply of water. Dogs furnished with as much as they wished to drink were found by M. Chossat (Sur ’Jnanition, Paris, 1843) to live three times as long as those who were deprived of solids and liquids at the same time. ven wetting the skin with sca-water has been found useful by shipwrecked sailors, Four men and a boy of fourteen who got shut in the Tynewydd mine near Porth, in South Wales, in the winter of 1876-7 for ten days without food, were not only alive when released, but several of them were able to walk, and all subsequently recovered. The thorough saturation of the narrow space with aqueous vapour, and the presence of drain water in the cutting, were probably their chief preservatives,—assisted by the high even temperature always found in the deeper headings of coal mines, and by the enormous compression of the confined air. ‘Tis doubtless prevented evaporation, and retarded vital processes dependent upon oxidation. The accumula- tion of carbonic acid in the breathed air would also have a similar arrestive power over destruetive assimilation. These prisoners do not seem to have felt any of the severer pangs of hunger, for they were not tempted to eat their eandles. With the instinctive feeling that darkness adds a horror to death, they preferred to use them for light.

It is a paradoxical fact, that the supply of the stomach even from the substance of the starving individual’s body should tend to prolong life. In April 1874, a case was recorded of exposure in an open boat for 32 days of three men and two boys, with only ten days provisions, exclusive of old boots and jelly-fish. They had a fight in their delirium, and one was severely wounded. As the blood gushed out he lapped it up; and instead of suffering the fatal weakness which might have been expected from the hemorrhage, he seems to have done well. Experiments have been performed

by a French physiologist, M. Anselmier (Archives Gén. de Alédecine, 1860, vol. i. p. 169), with the object of trying to preserve the lives of dogs by what he calls “ artificial autophagy.” He fed them on the blood taken from their own veins daily, depriving them of all other food, and he found that the fatal cooling incident to starvation was thus postponed, and existenee prolonged. Life lasted till the emaciation had proceeded to six-tenths of the animal’s weight, as in Chossat’s experiments, extend- ing to the fourteenth day, instead of ending on the tenth day, as was the case with other dogs which were not bled.

These instanees of the application of the art of dietetics to the treatment of disease are sufficient to show the principles which should be kept in sight, The pathology of the ailment should be considered first, then its bearmg upon the digestive organs, and lastly the bearing of the digestive organs upon it.

And before quitting the subject of lalth as affected by diet, the common-sense hint may be given to those who are in good sanitary condition, that they cannot do bettet than let well alone. The most trustworthy security for future health is present health, and there is some risk 0 overthrowing nature’s work by overcaring.

Pawel i Tics

Pleasure as an object of Dietetics.

The social importance of gratifying the palate has certainly never been denied in practice by any of the human race. Feasting has been adopted from the earliest times as the most natural expression of joy, and the readiest means of creating joy. If ascetics have seemed to put the pleasure away from them, they have done so in the hope of purchasing by their sacrifice something greater and nobler, and have thus tacitly conceded, if not exaggerated, its real value. Experience shows that its indulgence, unregulated by the natural laws which govern our progress in civilization, leads to unutterable degradation and meanness, brutalizes the mind, and deadens its per- ception of the repulsiveness of vice and crime. But that is no cause why this powerful motive power, governed by right reason, should not be made subservient to the highest purposes.

The times of meals must be regulated with a regard to the disposal of the remainder of the day, whether that depends on choice or on necessity. Violent exertion of either mind or body retards digestion ; and therefore, when this is practised, food is not called for so soon as on a day of rest. The heaviest meal should be postponed till the day's work is done; it is then that social home joys give the requisite repose to the body and mind. Light eaters may dine as late as they please, but those of larger appetite should lengthen the interval between their repast and bed-time. After the night's sleep and the long fast which has emptied the digestive canal of its nutritive contents, a breakfast should be taken before any of the real business of life be begun. It is no proof of health or vigour to forego it without inconvenience ; but it is proof of health and vigour to be able to lay in then a solid foundation for the day's labour. Not less than four and not more than six hours should elapse before the store is again replenished. A light farinaceous lunch with vegetables and fruit may be made most appetizing, and is followed by a cheerful afternoon, whereas a ponderous meat and wine meal entails heaviness of spirit,

Diet in relation to Economy.

Due Proportion of Animal and Vegetable Food.—It has been taken for granted thus far, that the mixed fare, which has met the approval of so many generations of men, is that which is most in accordance with reason. But there are physiologists who argue that our teeth resemble those of the vegetable-feeding apes more than those of any other class of animal, and that therefore our most appropriate food must be of the fruits of the earth! And if we were devoid of the intelligence which enables us to fit food for digestion by cookery, it is probable no diet would suit us better. But our reason must not be left out of account, and it is Surely quite as natural for a man to cook and eat every thing that contains in a convenient form starch, fat, albumen, fibre, and phosphorus, as it is for a monkey to eat nuts or an ox grass. 'he human race is naturally Onnivorous,

Moreover, man is able not only to develop his highest faculties and perform all his duties on any form of digestible aliment, but he is able also very much to diminish the Tequisite quantities by a due admixture. The diet which supplies the demand most accurately will be the Most economical in

the highest sense. And that this diet 1S a mixed one can be shown by the following method of calculation. We can measure by experiment the ultimate elements of all that is thrown off from the body as the result of vital decomposition, the ashes, the smoke, and the

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: Milne-Edwards, Cours de Physiologie, vol. vi. p. 198.

gases whicli the fire of life produces; and tlius we can lay down a rule for the minimum quantity of those elements which the daily food must contain to keep up the standard weight. If the diet be such as to make it necessary to eat too much of onc element in order to secure a ‘sufficient amount of another, there is a waste, and) the digestive viscera are burdened with a useless load. But there is no single article procurable for the food of the adult population which presents the exact proportion of elements required by an adult, and therefore no single article alone can sup- ply human wants without waste.

As an example, apply this reckoning to the elements carbon and nitrogen, which constitute the main bulk of the solids in our food and in our bodies. Suppose a gang of 100 healthy prisoners to excrete, in the shape of breathed air and evacuations, 714 tb of carbon and 4} ib of nitrogen (which is pretty nearly the actual amount of those elements in the dried solids of the secreta, as estimated by current physiological works). Both nitrogen and carbon to that extent must of course be supplied in the food. Now, if you fed them on bread only, there would be wanted daily at least 380 Ib of it to sustain them alive long, for it takes that weight to yicld the 44 tb of nitrogen daily excreted ; while, in the 380 ib of bread there are 1284 1b of carbon, which is 57 Ib above the needful quantity of that substance.2

If, on the other hand, the bread were replaced by” a purely animal diet, there would have to be found 354 tb of lean meat in order to give the 714 Ib of carbon ; and thus there would be wasted 105 ib of nitrogen contained in the meat, over and above the 44 ib really required to prevent emaciation.®

In the first case each nan would be eating about 4 tb of bread, in the second 34 Ib of meat per diem. If he ate less, he would lose his strength. The first would carry about with hima quantity of starch, and the last quantity of albuminous matter not wanted for nutrition, and would burden the system with an useless mass very liable to decompose and become noxious.

When work is undertaken, much more is actually wanted. According to Mr Vizetelly, the labourer in a Spanish vine- yard consumes daily between 8 and 9 tb of vegetable food, consisting of bread, onion-porridge, and grapes. ¢ And when animal food alone is taken, as in the case of the Esquimaux, 20 ib of it a day is the usual allowance.

Now, if a mixed dietary be adopted for the gang of 100 prisoners before mentioned, 200 ib of farinaceous food, with 56 Ib of animal muscle, would fulfil the requirements of the case ; 2 tb of bread and a little more than 4 ib of meat a head would be enough, under ordinary circumstances, for each man's daily food.

200 Ibs. of bread contains…..... 60 of carbon, 2 of nitrogen. 60 lbs. of meat (including 124 Ibs. of fut on it), contains 12 3 2} % | 72 4}

halance of Food and Work.—The most important modifi- cation to be made in the above estimate arises from the differences of work demanded. Men may exist in inaction on a scale of food-supply which is followed by death from starvation when they are put to hard labour. It is of im- portance, therefore, to have some measure of the effects of physical exertion. And here mechanical science has con-

2 Dr Letheby's analysis gives 8°1 per cent. of nitrogenous matter to bread (Lectures on Food, p. 6). Of this }th is nitrogen, Boussingault's analysis of gluten giving 14°60 per cent. (Annales de Chim. et Phys., Ixiij, 229). M. Payen makes the proportion of nitrogen to carbon in bread as 1 to 30.

- The proportion of nitrogen to carbon in albumen is as 1 to 34 (15°5 to 68°5 by Mulder's analysis, quoted in Lehmann, Phys, Chemie, i, 343). In red meat there is 74 per cent. of water (ditto iii, 96).

4 facts about Sherry, chap. i. 1876; and Sir John Ross's Second Voyage for tie Liscovery of the North-West Passage, p. 413.

tributed to physiology a precision rarely attainable in our dealings with social economy. Mr Joule of Manchester analyzed, about thirty years ago, the relation which the _ heat, used as a source of power in machinery, bore to the force of motion thus made active. He showed that raising the temperature of 1 tb of water 1° Fahr. was equivalent to raising 772 ib to the height of . conversely, that the fall of 772 tb might be so applied as to heat 1 Ib of water 1° Fahr. Thus, the mechanical work represented in lifting 772 Ib 1 foot, or 1 tb 772 feet, forms the " dynamic equivalent," the measure of the possible strength of 1° of temperature as marked by the thermometer in 1 tb of water. Physiologists seized eagerly on the opportunity which Joule's demonstration seemed to afford them of cstimating in actual numerals the relation of living bodies to the work they have to do. So much earth raised on an embankment represents so much heat developed in the machinery, be it living or dead. The fully digested food, converted through several stages into gaseous, liquid, and solid excretory matters, produces by its chemical changes a definite amount of heat, of which a definite amount escapes and a definite amount is employed in working the involuntary machinery of the body, and the rest is available for conversion at will into voluntary muscular actions.

It may be reckoncd that the daily expenditure of force in working the machinery of the body—in raising the diaphragm about 15 times and contracting the heart about 60 times a minute, in continuously rolling the wave of the intestinal canal, and in various other involuntary move- ments, without anything to be fairly called work,—it may be reckoned that the expenditure of force in doing this is equal to that which would raise a man of 10 stone 10,000 feet.

There are several reasons for believing that in assigning their physiological functions to the several sorts of food, nearly all the business of begetting force should be ascribed to the solid hydrocarbons, starch and oil, by their

conver- sion into carbonic acid and water, just as there are good grounds for thinking that it is the conversion of the solid hydrocarbon of coal into the same substances which drives a locomotive. To the nitrogenous aliments scems allotted primarily the task of continuously replacing the wear and tear of the nitrogenous tissues, while any excess of them assists the starch and oil in keeping up the animal heat.

One of the most cogent of the reasons for this view is that the chief nitrogenous excretion, the urea, is not in- ercased in amount in proportion to the work done, as shown by the experiments of Messrs Fink and Wiscelenus ; whereas the excretion of carbonic acid in a decided manner follows the amount of muscular exertion. Now, it is very clear that if the supply of power to do work depended on the decomposition and renewal of the muscles by flesh food, the

urea must be exactly proportioned to the exertion, which is.

not the case.

To give an example of the mode of working out a problem by this theory. Professor Frankland, in a series of ‘experiments made in 1866 at the Royal Institution, and published in the London Philosophical Magazine, vol. xxxii. p. 182, ascertains with the “ calorimeter ” (which reckons the amount of heat evolved as a thermometer does its degree) the quantity of energy or force evolved under the form of heat during the oxidation of a given weight of alimentary substance, It has been explained that heat and mechani- cal work, being convertible into one another, bear a constant proportion to one another; so that a definite pro- duction of so much heat invariably represents the poten- tiality of so much motion, used or wasted according to circumstances. From the reading of the calorimeter there- fore may be calculated how many cxtra pounds ought to

1 foot; and

DIEHEWVETICS

be raised a foot high by a man who has eaten an extra pound of the food in question; how many steps a foot high he ought to raise a weight of ten stone

(say himself) before he has worked out the value of his victuals, Pro. fessor Frankland has thus estimated the comparative value of foods as bases of muscular exertion, and he has made out a table of the weight and cost of various articles that would require to be consumed daily to enable a man to support life, the equivalent of which has been already reckoned as the muscular force in action which would raise a man of 10 stone 10,000 feet.

Weight in pounds required,

Name of Food. Price per Lb, | Cost.

5s. s a Cheshire cheese……..... 1°156 OF ile 0 Te SGHAOCS Mrenset sere. faces 5°068 al 0 5t PSPs itecleaeieiccnesuaemnae nee 7°815 0 14 0 12 OFT a ere 1'281 0 22 0 34 ie 1°311 0 298 0 = [Pieeiiaveyal | camer oaneonnacgee Oy Se 0 4 Groumdlimices.. cen «.-- 0 4 0 ASTOWMOOL. Jccccccc.ecsscae! i 0 i a readies... cans ee 0 0 3 Age anual Cetera cccemounveus 1 0 3 64 ean Vials: accastemes «sone: 1 4 3h Lean ham (boiled)..... 1 6 4 6 Mtckenell. .. asc... oe 0 8 a Gil WMI. 00. .ieeeeeone. 1 ae 9 W hide Of 26g sou, .vcssees 0 6 4 4} Hard-boiled ege..... 0 63 1 2 J STHDSIEISS: i eae aa aneeenesoo: 16 0 22 «0% EVIGANE FR. sare ees cece 0 2 1 Waits Bisrcesairs...cceee. 0 14 1 & alae «ss: anes “uae Oo 1 Of Cocoa-nibs ……. j 1 6 1 i UDG CIN., omc eee ee i 6 1 03 | Bete) ec ee ae 0 10 0 5s Cod-liver oil……..... 3 6 1 114 DOD Bay ose. s.ssvenes D © 0 a Commercial grape sugar Db ee 0 5% Bass’s pale ale (bottled)} 9 bottles. 0 10 7 Guinness’s stout……..... 62 bottles. 0 10 5 74

After the supply of sufficient albuminoid matters in the food to provide for the necessary renewal of the tissues, the best materials for the production of internal and external work are non-nitrogenous matters, such as oil, fat, sugar, starch, gum, &c. When the work is increased, not so much extra meat as vegctable food, or its dietetic equivalent, fat, is demanded,

In comparing the cost of a daily sufficiency of the various foods to produce the required force, we must not forget the inconveniences which many of them entail. These incon- veniences must be added to the cost. For example, suppose a man to have been living upon potatoes only, just supporting life with 5 Ib a day, and then to get work which enabled him and required him

to take a double supply of non-nitrogenous food, he would act unwisely if he were to swallow it in the form of 12 ib of cabbage. He would be knocked up by the shear labour of carrying 12 Ib extra in a vessel so ill-adapted to sustain heavy loads as the stomach. A similar objection would lie against milk, or veal, or apples, however cheap accident might make them; and a more serious objection still would hold against nine bottles of ale, or seven of stout. On the other hand, the over-concentration of cheese, beef dripping, and lump sugar, makes them nauseous when in large quantity or monotonously persisted in, though when introduced as a variety they are appetizing and digestible. There 1s n0 saving in using that against which the stomach is seb, of which the absorbents refuse to assimilate.

Reverting to the illustration of the gang of a hundre} prisoners, and supposing it were requisite to put them on hard labour equivalent to half "Frankland's unit" of 10

stone raised 10,000 feet —such, for instance, as carrying up ladders, altogether 1} mile high, three tons of stone daily— calculation would show that to add this amount of labour to the outgoings caused by the functioning of physiological life, would mere Et Pod Ba eae – of at least 117 of bread, or o of bread wit 44 Tb of lean meat and 63 Ib of potatocs. The slightest imperfection or indigestion of any of this would cause a loss of bodily weight, and cases of illness would be culpably frequent. Were a draught of milk, or a cup of cocoa and sugar, or some oatmeal porridge and treacle, or even a little dripping or butter or bacon given, the danger wenld probably be averted.

The most conspicuous fault in the dietary of the working classes is want of variety. Many of the articles which combine ample nutritiousness with small cost are habitually neglected, because when used exclusively cl are disagree- able and unwholesome. From never being eaten they become absolutely unknown. 'There are many sorts of cheap beans, vetches, and pease, unheard of except at gentlemen's tables, of which a complete meal may be made, or which may support the dish of meat ; while beet-root, cresses, kail, carrots, and other plants easily grown are left unused.

Quantity of Food required.—The caiculations of Dr Playfair “on the food of man in relation to his useful work!” enable us by another route to arrive at an estimate of what amount of solid victuals is required by an adult living by bodily labour to preserve his health under various circumstances. ‘The circumstances which chiefly affect the question can be classified thus :—(1) bare existence ; (2) moderate exercise ; (3) active work; and (4) hard work.

1. The first is calculated from the mean of sundry prison dietaries, of the convalescents’ diet at hospitals, that of London needlewomen, and of that supplied during the Lancashire cotton-famine, as reported by Mr Simon. The result is that, in a condition of low health, without activity, 24 ounces of nitrogenous food, 1 ounce of fat, 12 ounces of starch, and } of an ounce of mineral matters a day are necessary. ‘The amount cf carbon in this is equal to 7-44 ounces. In other words, a man’s life will be shortened or burdened by disease in the future, or he will die of gradual starvation, unless his provision for a week is equivalent to 3 ib of meat with 1 ib of fat on it, or with the same quantity of butter or lard, two quartern loaves of bread, and about an ounce of salt and other condiments. Tf he cannot get meat, he must supply its place with at least two extra quartern loaves, or about a stone and a half of potatoes, or between 5 and 6 ib of oatmeal,—unless he 1s, Indeed, so fortunate as to be able to get skim milk, of which 5 pints a week will replace the meat.

A person reduced to bare existence diet can undertake no habitual toil, mental or bodily, under the penalty of breaking down.

“Bare existence” diet is that which requires to be estimated for administration to certain classes of the community who have a claim on their fellow-countrymen that their lives and health shall be preserved in statu quo, but nothing further. Such are prisoners, paupers, or the members of a temporarily famine-stricken community.

It would be obviously unjust to apply the same scale of quantity and quality to all persons under varying circuni- stances of constitution and outward surroundings ; and to attempt to feed in the same way all these people for short or long periods, idle or employed, with light work or hard Work, in hot or in cold weather, excited by hope or depressed by failure, involves an

error of either excess or defect, or both at once. The dictaries recommended by

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— Lecture delivered at the Royal Institution, London, April 28, 1865.

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the Home Office for prisoners very properly take all these circumstances into consideration. They allot ‘bare existence” diet only to those sentenced for short terms without labour. And they recognize the fact that a man’s health is not injured (perhaps sometimes it is improved) by a few days of such abstinence as would in the Jong run be deleterious to him. Under a sentence of seven days a prisoner gets daily 1 lb of bread, and a quart of gruel con- taining 4 oz. of oatmeal. For more than seven and under twenty-one days lie has anextra $16 of bread. Yor longer terms it is advised to add potatoes and meat.

The nutritive value of the first named diet is thus calcu- lated by Dr Pavy (Treatise on Food, p. 415) :—

IME OG@eHOUS IMAGLED cre covae, nmacearecennc. <1 1°800 oz

(ee i Senne -480 ,,

ROMO MME ROOS ccs ceteccane ceansecdnevans sue cabiens nT a2 §, of the second—

WUGELOSCMOUS THATIOL. .0…51sccnecee van caeswevecesl 2°448 oz.

TERME Soon at ben CaO Meee eRe aie Bece eR pecacqcmnercr nadcec 608 ,,

(Charellno) nny cbiaaies), aeenver scopeerencnd bev bacaspsconnen: 14°792 ,,

In the convict establishments prisoners are all under long sentence, and are classified for dietetic purposes according to their occupation.

The sparest of all is called “‘ punishment diet,” and is administered for offences against the internal discipline of the prison, Itis equivalent to corporeal chastisement, being designed to make the stomach a source of direct pain. It is limited to a period of three days, and fully answers its proposed end as a deterrent by causing the solar plexus to experience the greatest amount of distress it is capable of ; for after the expiration of that period sensation becomes blunted. It consists of 1 ib of bread and as much water as the prisoner chooses to drink. This last-named concession is not an unimportant one; for it has been already remarked that a supply of fluid enables starvation, and by implication abstinence, to be longer borne. At the same time it probably postpones the anesthesia, and therefore makes the intended suffering more real. ‘“ Punishment dict” contains, in Dr Pavy’s estimate,—

Nitrogenous MAtter…...c.csccsecseeseoeeeneees 1.296 oz

(Cau S10) OFC TRIKE oo Aor nononanosne snononaononne coHtaeoDG Salody

TEE Loe ch OSUe CRUDE] Seacanbeecuos cane adrearosdeeigntsn 0°256 ,,

LOOT), T0091 (OTP onneedan soo sacasEsonngoonaden sonkce 0°368 ,, af

Total of dry solids 10°080 ,,

This is about half of what an average man requires to sustain himself without work, and under its discipline he would probably lose 3 or 4 ounces of his weight daily till his bodily substance was reduced by six-tenths, at which period, according to Chossat’s experiments, he would die.

‘Penal diet” is that which is apportioned for more pro- tracted punishment. It may be continued for three months. Tt consists of 20 oz. of bread, 8 oz. of oatmeal, 20 oz. of milk, and 16 oz. of potatoes daily. Its chemical constituents are as follows :— ;

WNitrogenous matter. .....sceseceeceeeeeeeee ees 3°784 oz
Carbohydrates. .....s:ssseceersecneee creeeeenenaes 19°864 ,, Tf’nffsobe oc on Soo onc dbonongndonnuosrenasaranopaccgoneCncc ILO Juthnermall aenjcerR-gyngnpseencssnoddee Somuseceeccoon: OO».

Total of dry solids 26°200 ,,

Upon this diet a fair amount of work may be done. The combustion of the carbohydrates evolves sufficient force to raise a ton 4193 feet; and thus the effete muscular sub- stance may be worn off by destructive assimilation, making place for new muscle derived from the nitrogenous matter of which a bare sufficiency, but yet probably a sufficiency, issupplied. A man of strong constitution is usually found at the end of it to be in good health and of normal weight ;

yet he has never probably experienced the content which arises from a Juxus-consumption of food. It is intended to deny him the normal pleasure of the accumulation of reserve-force in the gastricregion. This pleasurable sensa- tion under ordinary circumstances much promotes diges- tion, so that the whole of the ingesta are made the best use of; and therefore in “penal diet,” as above quoted, it has been found expedient to introduce the slight excess to be noticed above what is needful to accomplish the required work in ‘ foot-tons” (see before). The penalty of the regimen involves a certain degree of waste.

A close imitation of “penal diet” is that which the duty of a responsible Government demands should be served out during a temporary famine, that is, one calculated not to lastabove three months. Itis more economical to intro- duce the elements of variety in the diet than to be too monotonous,—that is, to save in the daily issue and to be occasionally liberal, to feast frofn time to time as a break in the regular fast. The expense of the excess is more than replaced by the diminished habitual ration, and that powerful preservative of life, anticipation of pleasure, is brought into play. A reduction of the allowance below what experience has indicated as “bare existence diet,” made during the famine in Madras in the beginning of 1877, was attended with disastrous results.

By dint of mixing and varying his diet and making it consist of very nutritious articles, such as bread, meat, yolk of eggs, and soup, Signor Cornaro (see CornaRo) succeeded in reducing the quantity he daily consumed to as little as 12 oz. (Venetian). But then he made the solids go much further by taking 14 oz. of good wine. And the proba- bility is that this gentlemen had a peculiar constitution, for, in spite of his many readers, he has had no imitators of the experiment on their own persons.

2. The appropriate food of the second class may be fairly represented by the dietaries of European soldiers in time of peace. The English soldier on home service, according to Dr Parkes, receives from Government 5} ib of meat and 7 Ib of bread weekly, and buys additional bread, vegetables, milk, and groceries out of his pay. Such a diet is sufficient for anybody under ordinary circumstances of regular light occupation; but should extra demands be made upon mind or body, weight is lost, and if the demands continue to be made the health will suffer. Mr F. Buckland, surgeon in the Guards, remarks (Soc. of Arts Journal, 1863, quoted by Dr Playfair) that though the sergeants in the Guards fatten upon their rations, the quantity is not enough for recruits during their drill.

The Prussian soldier during peace gets weekly from his canteen 11 ib 1 oz. of rye bread, and not quite 24 tb of meat. This is obviously insufficient, but under the con- scription system it is reckoned that’ he will be able to make up the deficiency out of his own private means, or obtain charitable contributions from his friends. Dr Hildesheim (Die Normal-Ditit, Berlin, 1856, p. 60) states that asthenic diseases are very common in the army, which leads to the inference that the chance assistance on which the authori- ties lean is not trustworthy. As the legal ration in these two services does not profess to be a man’s full food, it is needless to analyze it. In the French infantry of the line each man during peace gets weekly 15 tb of bread, 353, bb of meat, 24 ib of haricot beans or other vegetables, with salt and pepper, and 13 oz. of brandy. This seems to be enough to support a man under light employment. Its analysis gives—

LS OMe 179°83 oz Paros nos matter (or albuminates)..... 30°17 ,, a dof SU DON DuGooH at HAG EBOUDS gnboooHAnbennconseHanaace 9°29 , Carbohydrates (or Stare). 7.00 126°84 Total of dry solids 166°30 r

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An Austrian under the same circumstances receives 13-9]h of bread, 4 tb of flour, and 3°3 ib of meat. The alimentary contents are—

A NGUIG) Conte Reps eeO 0 DuaEncS. .copER ia. ce ooLoncc 129°50 oz INH OPEROTWVOUNE) TART UNE Rhee cp pastnanonoae ban soodco foes 27°40 ,, Tiley ioe conenceenee Pe eno co cee inccend sabe ond ioc Some CAVVONVOMRUCS 40 <..1navasesennceavamas eens a0 eee Bs).

Total of dry solids 155-08 ,, The Russian conscript is allowed weekly!—

IBINCKMDYCACM ss nccdacccacssesreansnecs MAU

DY GOI ieand 5 de uae Rane ome arte ibere 7b.

Kawass (beer) .....ceeceeee ee 77 quarts. NOUTMOADWACE cscs aeentuasacseesene 244 gills, =1224 oz, BOM OV ovscra come sates siew vs ceeectioe soe eae 244 gills, = 122% oz. SAILS) ccmtecnn tenata Season acreearabad 104 oz. NouseeradiGliy.. vecewricccsvesscese ste 28 grains.

tei eerste. wes ccacawcesc eee 28 grains.

ASS A nah Gros et ncr nee cat Ucmmooor coe 4 gills, = 264 oz,

The “ moderate exercise” of brain and muscle combined in the above classes is fairly represented in the convict scale by “light labour” (such as oakum-picking), and by “industrial employment ” (such as tailoring, cobbling, Roman mosaic and mat making, basket weaving, &c). The dietary for prisoners thus engaged is nearly identieal, except that the artisans using their brains are supplied with about an ounce extra daily.

The “industrial employment diet” for a week is thus analyzed by Dr Pavy : —

Nitro- | 1 Weekly Allowanee, enous |, Cato Mineral] water- y Loris hydrates. ee 0z. oz. Oz. 02. (COCOA een ene: 3°500) 0°560] 1°540 3°500 Oatmeal 0. cscs. 14000) 1:764) 8:932 11°900 GUD eee 28°000) 1:°148; 1:°456 3°920 Molasses ……. 7000)... 5°390 5°390 Sule ae ee ee 3°500| ...

ah 3°500 BUTE Viea. ca cn sem cee 1°000) 0°063] 0°743 0-850 IBUGAOE sc srasueses ve 148°000} 11:988} 75°480 93 240 (CURSES 0 (een Been en, A-O00) AGs40l 4. 2°528 JNO? Siecon nonobese 8625] 0°931) 6°081 7331 Meat (cooked, without bone or 16°000; 4°416 7360 a . | ins (made in- ; ‘ to SOUP ..... 8000; 1°688 ee 4°080 ISUELocone siete smn oene n-500)) 5. an 1274 @arnotseennnass eee 1:000; 0:013} 0°145 0170 ONGMSi vss cccesene. 3°000} 0°036} 0:216 0:270 JUUIAOTSS ocaonenopsses 1:000; 0°612) 0:°072 0°090 JEOUBNEOSSe paenoones .| 96°000) 2°016) 21:120 24-000 Total water-free matter…j 25°975) 121°175) 10°937| 11°316] 169°403

This is probably a fair model for the most economical dietary on which an artisan or labourer on light work can thrive. It may be observed that the principle of variety is very conspicuous, and in private life it is possible to in- troduce still more variety by cookery (see Cookery.) In the English and Prussian armies the introduction of variety is left to be attained by forcing the soldier to purchase some portion of his food out of his own pocket; in the French scale it is managed by issuing spices and various vegetables, and trusting to the innate genius of the Gaulish warrior for cooking. The issue of an occasional glass of brandy on holidays makes an agreeable change and benefits digestion ; but if wine could be obtained it would be better, and not extravagant. The Austrian bill of fare is sadly monotonous. The Russian ration may be noticed as particularly liberal of accessory and antiscorbutic food, from which civil as well ag military dieticians might take an useful hint.

1 Report of Sanitary Commission, 1858, p. 425, quoted by Dr Parkes,

PeELYTe Tics

Vinegar aud other vegetable acids are too much neglected by our handicraftsmen and soldiers. The Carthaginians are stated by Aristotle to have used vinegar asa substitute for wine during their campaigns ; and the recipes given by Cato for flavouring vinegar with fruits show that it was in use among the labouring population in Italy.

3. “ Active” labourers are those who get through such an amount of work daily, exclusive of Sundays, as may be represented by a walk of 20 miles. In

this class are soldiers during a campaign, letter carriers, and engineers employed on field work or as artisans. ‘These habitually consume on the average about a fifth more nitrogenous food and twice at much fat as the last class, while the quantity of vegetable hydrocarbons is not augmented, exeept in the Royal Engineers.

The “hard labour diet” of convict prisons fairly represents what the authorities consider the minimum. It is the same as that already described as “industrial employment diet,” with the following additions :—barley, 1 oz,; bread, 20 oz.; shins for soup, 8 oz.; carrots, 1 0z.; onions, 4 oz. ; turuips, 1 oz. It contains, however, 14 oz. less milk, and | oz. less ‘ meat.”

The nutritive value of the additions may be seen by Dr Pavy’s alimentary analysis, which is as follows :—-

Total water-free matter.

Nitro- | genous matter.

Mineral matter,

Weekly Additions. ie aata.

0°743

0°063

Total watcr-free matter,

Total water-free matter 0-850 | 0:728 | 0°700

The same-food is given summer and winter, though the demaud must be greater to provide for the extra quantity of heat required to be produced in eold weather. But then the amount of work is diminished at the latter season by 1% hours, which is equivalent to an augmentation of the diet. The additions are more judicious than those made by the elasses above mentioned who partly furnish their own food; for bread and vegetables constitute a large portion of the conviet ration, and the extra quantity of

soup replaces the lost milk, without risk of the waste in cooking conimon when the uneducated deal with solid meat.

4.“Hard work” is that got through by English navvies, hard-worked weavers, and blacksmiths, &e, which 18 more earnest and intense than the enforced “hard labour” of the convict. It is difficult to obtain aceurate information, but it would appear from Dr Playfair’s esti- mates that the eustomary addition to the diet is entirely In hitrogenous constituents. The higher their wages the nhlore meat the men eat.

The negleet of vegetables by the last two classes is in a physiological point of view imprudent, and possibly may be & contributing eause of an inordinate thirst for alcohol Which impoverishes and degrades many among them. To satisfy their instinctive eraving for a hydrocarbon, they take one convenient indeed in some respects, but of

which any excess is unwholesome. The diseovery already mentioned of the production of foree from the assimilation of starch leads to a knowledge, opposed to old pre- judices but supported by experience, that the raising of the energies to their full height of usefulness may be effected by vegetable food quite as well as by the more stimulating and more expensive animal nutriment, or by the more rapidly absorbed alcohol.

With regard to the tables quoted above in which ultimate analyses are used as data for dietetic rules, it must be noticed that their authors deprecate arguments being founded on any but the very broadest characters of the articles analyzed. Specimens, even when of the highest quality, differ strangely from one another. Season, soil, nodes of culture, the variations of species, and many other little known influences come into play and prevent our taking the market names of eatables as representatives of a definite chemical constitution. And it may be added that ample seope should be allowed for the peeuliarities of the individual and. of his life-history. In the applieation of general rules some one must be trusted to relax or strain them when circumstances require, or failures of a fatal character may occasionally result, and more often a galling perversion of justice.

Estimates for the thrifty management of food-supply have usually reference to the feeding of others rather than to the ealculation of a mau's own dietary. Enough has been said on that point under the head of the influence of diet upon health, aud if a person really wants to bring down the expense of feeding himself to the lowest point, he can readily rate himself under one of the classes enumerated above, and act aceordingly. It may, however, be doubted whether it is wise to reduce the diet to the minimum whieh the work requires. The eertain evils of an accidental deficieney or of a miscalculation are so serious that the danger outweighs the possible ineonvenience of a slight excess. It were an unthrifty thrift indeed which imperilled vigour of mind and body to effect a pecuniary saving ; for there is no investment so remunerative as high health. A man need not consider that he is wasteful when he spends money upon making his bill of fare palatable and provocative of indulgence to the extent of moderate superfluity. Pleasure and prudence here walk hand in hand, (T. K. CH.)

DIETRICH, Curistian WitnEetm Ernst (1712-1774), was born at Weimar, where he was brouglit up early to the profession of art by his father Johann George, then painter of miniagures to the eourt of the grand duke. Being sent to Dresden to perfect himself under the eare of Alexander Thiele, he had the good fortune to finish in two hours, at the age of eighteen, a picture which attracted the attention of the king of Saxony. Augustus IT. was so pleased with Dietrich's readiness of hand that he gave him means to study abroad, and visit in succession the chief cities of Italy and the Netherlands. There he learnt to copy and to imitate masters of the previous century with a versatility truly surprising. Winckelmann, to whom he had been re-eommended, did not hesitate to call him the Raphael of landscape. Yet in this branch of his practice he merely imitated Salvator Rosa, Roos, and Everdingen. He was more successful in aping the style of Rembrandt, aid numerous examples of this habit may be found in the galleries of St Petersburg, Vienna, and Dresden. At Dresden, indeed, there are pictures aeknowledged to be his, bearing the fictitious dates of 1636 and 1638, and the name of Rembrandt. Among Dietrich's eleverest repro- ductions we may aeeount that of Ostade's manner in the Itinerant Singers at the National Gallery. His skill in catehing the eharacter of the later masters of Holland is shown in candle-light scenes, sueh as the Squirrel and the

Peep-Show at St Petersburg, where we are easily reminded of Godfried Schalecken. Dietrich tried cvery branch of art except portraits, painting Italian and Dutch views alternately with Scripture scenes and still life. In 1741 he was appointed court painter to August ITT. at Dresden, with an annual salary of 400 thalers (£60), conditional on the pro- duction of four cabinet pictures a year. This condition, no doubt, accounts for the presence of 52 of the master's panels and canvases in one of the rooms at the Dresden museum. These pieces enable the spectator, if careless of more serious occupation, to study the numerous varietics of a changing style. It is needless, perhaps, to add that Dietrich, though popular and probably the busiest artist of his time, never produeed anything of his own; and his imitations are necessarily inferior to the originals which he affected to copy. His best work is certainly that which he gave to engravings A copious eollection of these at the British Museum, produced on the general lines of earlier men, such as Ostade and Rembrandt, reveal both spirit and skill. Dietrich, after hig return from the Peninsula, generally signed himself " Dietericij," and with this signature most of his extant pictures are inscribed. His death took plaee at Dresdeu, after he had successively filled the important appointments of director of the school of painting at the Meissen poreelain faetory and professor of the Dresden academy of arts

DIEZ, Friepricn Curistian (1794-1876), the founder of Romance philology, was born at Giessen, in Hegse- Darmstadt, March 15, 1794, and died at Bonn, May 29, 1876. He was educated first at the gymnasium and then at the university of his native town. There he studied classics under Welcker, who had just returned trom a two years' residence in Italy to fill the chair of archeology and Greek literature It was Welcker who kindled in him a love of Italian poetry, and thus gave the first bent to his genius. In 1813 he joined the Hesse corps as a voluntcer and served in the French campaign. Next year he returned to his books, and this short taste of military service was the only break in a long and uneventful life of literary labours. By his parents' desire he applied himself for a short time to law, but a visit to Goethe in 1818 gave a new direction to his studies, and determined his future career. Goethe had been reading Raynouard's Selections from the Ltomance Poets, and advised the young scholar to explore the rich mine of Provengal

literature which the French savant had opened up. This advice was eagerly followed, and hence- forth Diez devoted himself to Romanee literature. After supporting himself for some years by private teaching, he removed in 1822 to Bonn, where he held the position of privat-docent, which is the lowest grade of the German professoriate. In 1823 he published his first work, dn Introduction to Romance Poetry; in the following year appeared The Poetry of the Troubadours, and in 1829 The Inves and Works of the Troubadours. In 1830 he was called to the ehair of modern literature. The rest of his life was mainly oceupied with the composition of the two great works on whieh his fame rests, the Grammar of the Romance Languages, 1836-1844, and the Lexicon of the Ltomance Languages—TItalian, Spanish, and French, 1853.

In these two works Diez has done for the Romance group of languages what Jacob Grimm has for the Teutonie family. In both eases much remains to be accomplished, many words and forms are not yet accounted for, some errors have already been pointed out, but all future philologists must build on the foundations which these two men have laid. <«“ Nothing,” says Max Miiller, “ can be a better preparation for the study of the comparative grammar of the ancient Aryan language than a careful perusal of the

comparative grammar of the six Romance languages by Professor Diez,”

Dikh—

Dt af

In order to appreciate the importanee of Diez’s work jt is necessary to take a rapid glance at the history of philology in France. The earliest philologists, such as Perion and Henri Estienne, sought to discover the origin of French in Greck and even in Hebrew. For more than a century Ménage’s Ltymological Dictionary held the field without a rival. Considering the time at which it wag written (1650), it was a meritorious work, but philology was then in the empirical stage, and many of Ménage’s derivations (such as that of “rat” from the Latin “mus,” or of “harieot” from ‘faba”) have since become by-words among philologists. A great advance was made by Raynouard, who by his critical editions of the works of the Troubadours, published in the first years of the present century, laid the foundations on

which Diez afterwards built. The differenee between Diez's method and that of his predeeessors is well stated by him in the preface to his dictionary. In sum it is the difference between seience and guess-work. The seientifie method is to follow implicitly the discovered principles and rules of phonology, and not to swerve a foot's breadth from them unless plain, actual exceptions shall justify it; to follow the genius of the language, and by eross-questioning to elicit its secrets ; to guage each letter and estimate the value which attaches to it in each position; and lastly to possess the trne philosophic spirit which is prepared to welcome any new faet, though it may modify or upset the most cherished theory.

Such is the historical metliod which Diez pursues in lus grammar and dictionary. To colleet and arrange facts 1s, as he tells us, the sole secret of his suecess, and he adds in other words the famous apophthegm of Newton, " hypo- theses non fingo."

The introduction to the grammar consists of two parts: —the first discusses the Latin, Greek, and Teutonic clements eommon to the Romance languages; the second treats of the six dialects separately, their origin, and the elements peculiar to each. The grammar itself is divided into four books, on phonology, on flexion, on the formation of words by composition and derivation, and on syntax.

His dictionary is divided into two parts. The first contains words common to two at least of the three principal groups of Romance,—-Italian, Spanish and Portu- guese, and Provengal and French. The Italian, as nearest the original, is placed at the head of each article. The second part treats of words peculiar to one group. 'There is no separate glossary of Wallachian.

Of the introduction to the grammar there is an excellent transla- tion into French by Gaston Paris, a pupil of Diez, and an English translation by C.B. Cayler. The dictionary has been published in a remodelled form for English readers by T. OC. Donkin. A second

edition, enlarged and corrected, appeared in 1861, and a third edition was begun in 1869.

DIFFERENTIAL CALCULUS. See InrinrrEsimAL CALCULUS.

DIFFUSION. Some liquids, such as mercury and water, when placed in contact with each other do not mx at all, but the surface of separation remains distinct, and eX- hibits the phenomena described under CarrtLARy ACTION. Other pairs of liquids, such as chloroform and watet, mix, but only in certain proportions. The chloroform takes up a little water, and the water a little chloroform; but the two mixed liquids will not mix with each other, but remain in contact separated by a surface showmg capillary phenomena. The two liquids are then in a state of equilibrium with each other. The conditions of the equilibrium of heterogeneous substances have been invest gated by Professor J. Willard Gibbs in a series of papel published in the Transactions of the Connecticut Academy of Arts and Sciences, vol. iii. part i. p. 108. Other pairs of liquids, and all gases, mix in all proportions,

Pirivu si om

When two fluids are capable of being mixed, they cannot remain in equilibrium with each other; if they are placed in contact with each other the process of mixture begins of itself, and goes on till the state of equilibrium is attained, which, in the case of fluids which mix im all proportions, is a state of uniform mixture.

This process of mixture is called diffusion, It may be easily observed by taking a glass jar half full of water and pouring a strong solution of a coloured salt, such as sulphate of copper, through a long-stemmed funnel, so as to occupy the lower part of the jar. If the jar is not disturbed we may trace the process of diffusion for weeks, months, or years, by the gradual rise of the colour into the upper part of the jar, and the weakening of the colour iu the lower part.

This, however, is not a method capable of giving accurate measurements of the composition of the liquid at different depths in the vessel. Jor more exact deter- minations we may draw off a portion from a given stratunt of the mixed liquid, and determine its composition either by chemical methods or by its specific gravity, or any other property from which its composition may be deduced.

But as the act of removing a portion of the fluid inter- feres with the process of diffusion, it is desirable to be able to ascertain the composition of any stratum of the mixture without removing it from the vessel. Tor this purpose Sir W. Thomson places in the jar a number of glass beads of different densities, which indicate the densities of the strata in which they are observed to float. The principal objection to this method is, that if the liquids contain air or any other gas, bubbles are apt to form on the glass beads, so as to make them float in a stratum of less density than that marked on them.

M. Voit has observed the diffusion of cane sugar in water by passing a ray of plane-polarized light horizontally through the vessel, and determining the angle through which the plane of polarization is turned by the solution of sugar. This method is of course applicable only to those substances which cause rotation of the plane of polarized light.

Another method is to place the diffusing liquids in a hollow glass prism, with its refracting edge vertical, and to determine the deviation of a ray of light passing through the prism at different depths. The ray is bent downwards on account of the variable density of the nuxture, as well as towards the thicker part of the prism ; but by making it pass as near the edge of the prism as pos- stble, the vertical component of the refraction may be made very small; and by placing the prism within a vessel of water having parallel sides of glass, we can get rid of the constant part of the deviation, and are able to use a prism of large angle, so as to increase the part due to the diffus- Ing substance. At the same time we can more easily control and register the temperature.

The laws of diffusion were first investigated by Graliam. The diffusion of gases has recently been observed with steat accuracy by Loschmidt, and that of liquids by Fick and by Voit.

Difusion as a molecular motron—If we observe the Process of diffusion with our most powerful microscopes, – eet follow the motion of any individual portions of ee _We cannot point out one place in which the fluid ae ascending, and another in which the upper

uid is descending. There are no currents visible to us, and the motion of the matcrial substances goes on as inperceptibly as the conduction of heat or of electricity. ee, ee motion which constitutes diffusion must be al ite ed from those motions of fluids which we can x Y means of floating motes. It may be described as ction of the fluids, not in mass, but by molecules,

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When we reason upon the hypothesis that a fluid is a continuous homogeneous substance, it is comparatively easy to define its density and velocity ; but when we adinit that it may consist of molecules of different kinds, we must revise our definitions, We therefore define these quantities by considering that part of the medium which at a given instant is within a certain small region sur- rounding a given point. This region must be so small that the properties of the medium as a whole are sensibly the same throughout the region, and yet it must be so large as to include a Jarge number of molecules. We then define the density of the medium at the given point as the mass of the medium within this region divided by its volume, and the velocity of the medium as the momentum of this poftion of the medium divided by its mass.

If we consider the motion of the medium relative to an imaginary surface supposed to exist within the region occupied by the medium, and if we define the flow of the medium through the surface as the mass of the medium which in unit of time passes through unit of area of the surface, then it follows from the above definitions that the velocity of the medium resolved in the direction of the normal to the surfacc is equal to the flow divided by the density. If we suppose the surface itself to move witli the same velocity as the fluid, and in the same direction, there will be no flow through it.

Having thus defined the density, velocity, and flow of the medium as a whole, or, as it is sometimes expressed, “‘in mass,” we May now considcr one of the fluids which constitute the medium, and define its density, velocity, and flow in the same way. The velocity of this fluid may be different from that of the medium in mass, and its velocity relative to that of the medium is the velocity of diffusion which we have to study.

Diffusion of Gases according to the Kinetic Theory.

So many of the phenomena of gases are found to be explained in a consistent manner by the kinetic theory of gases, that we may describe witli: considerable probability of correctness the kind of motion wliuch constitutes dif- fusion in gases. We shall therefore consider gaseous diffusion in the light of the kinetic theory before we con- sider diffusion in liquids.

A gas, according to the kinetic theory, is a collection of particles or molecules which are in rapid motion, and which, when they encounter each other, behave pretty much as elastic bodies, such as billiard balls, would do if no energy were lost in their collisions. Hach molecule travels but a very small distance between one encounter and an- other, so that it is every now and then altering its velocity both in direction and magnitude, and that in an exceedingly irregular manner.

The result is that the velocity of any molecule may be considered as compounded of two velocities, one of which, called the velocity of the medium, is the same for all the molecules, while the other, called the velocity of agi- tation, is irregular both in magnitude and in dircction, though the average magnitude of the velocity may be calculated, and any one direction is just as likely as any other.

The result of this motion is, that if in any part of the medium the molecules are more numerous than in a neighbouring region, more molecules will pass from the first region to the second than in the reverse direction, and for this reason the density of the gas will tend to become equal in all parts of the vessel containing it, except in so far as the molecules may be crowded towards one direction by the action of an external force such as gravity. Since the motion of the molecules is very swift, the process of equalization of density in a gas is a very

rapid one, its velocity of propagation through the gas being that of sound. .

Let us now consider two gases in the same vessel, the proportion of the gases being different in different parts of the vessel, but the pressure being everywhere the same. The agitation of the molcules will still cause more mole- cules of the first gas to pass from places where that gas is dense to places where it is rare than in the opposite direction, but since the second gas is dense where the first one is rare, its molecules will be for the most part travelling in the opposite direction. Hence the moleculcs of the two gases will encounter each other, and every encounter will act as a check to the process of equalization of the density of each gas throughout the mixture.

The interdiffusion of two gases in a vessel is there- fore a much slower process than that by which the density of a single gas becomes equalized, though it appears from the theory that the final result is the same, and that each gas is distributed through the vessel in pre- cisely thc same way as if no other gas had been present, and this even when we take into account the effect of gravity.

If we apply the ordinary language about fluids to a single gas of the mixture, we may distinguish the forees which act on an element of volume as follows :—

lst. Any external foree, such as gravity or eleetricity.

2d. The difference of the pressure of the particular gas on oppo- site sides of the element of volume. [The pressure due to other gases is to be considered of no account].

3d. The resistance arising from the percolation of the gas through the other gases which are moving with different velocity.

The resistance due to encounters with the molecules of any other gas is proportional to the velocity of the first gas relative to the seeond, to the product of their densities, and to a coefficient which depends on the nature of the gases and on the temperature.

The equations of motion of one gas of a mixture are therefore of the form

5, u

ad a Pisa a — X py + Cyop;po(% — %2) + Cyypyps(ey — tg) + &e.=0,

where the symbol of operation a} prefixed to any quantity denotes

the time-variation of that qnantity at a point which moves along with that medium which is distinguished by the suffix (,), or more explicitly d d d tee ay ee 6 In the state of ultimate equilibrium 2#,=2, = &c.=0, and the equation is redueed to

dp = 1 Xp,=0,

which is the ordinary form of the equations of equilibrium of a single fluid. Hence, when the process of diffusion is complete, the density of each gas at any point of the vessel is the same as if no other gas were present.

If V, is the potential of the foree which acts on the gas, and if in the equation p, =/yp,, &, is constant, as it is when the temperature is uniform, then the equation of equilibrinm becomes

lags ——‘p, =0,

4 dx

the solution of which is Preah

Hence if, as in the ease of gravity, V is the same for all gases, but kis different for different gases, the composition of tle mixture will be different in different parts of the vessel, the proportion of the heavier gases, for which & is smaller, being greater at the bottom of the vessel than at the top. It would be difficult, how- ever, to obtain experimental evidence of this differenee of coin- position except in a vessel more than 100 metres high, and it would be necessary to keep the vessel free from inequalities of tem- perature for more than a year, in order to allow the process of diffusion to advance to a state even half-way towards that of ultimate equilibrium. The experiment might, however, be made in a few nunutes by placing a tube, say 10 centimetres long, on a whirling apparatus, so that one end shall be close to the axis, while the other 1s moving at the rate, say, of 50 metres per second. Thus if equal volumes of hydrogen and carbonic acid were used, the proportion

DIF RrUe1eN

of hydrogen to earbonic acid would be about 437 greater at the end of the tube nearest the axis. The experimental verification of the result is important, as it establishes a method of effecting the partial separation of gases without the selective action of chemical agents.

“Let us next consider the ease of diffusion in a vertical cylinder, Let m, be the mass of the first gas in a column of unit area extend- ing from the bottom of the vessel to the height x, and let v, be the volume which this mass would occupy at unit pressure, then /

UD Oe d m a=so 2 See 4 ’ d dv Ae s a = a ; and the equation of motion becomes Wo 6 e% dv,|“_ dv, dv,)? 2 _ X dey, ky as 2) dx® dt dt? dx de is dz Cy, (dv, dv, dv, de, 1 + &e.=0. okey dt de di des

If we add the corresponding equations together for all the gases, we find that the terms in Cj, destroy each other, and that if the medium is not affected with sensible currents the first term of each equation may be neglected. In ordinary experiments we may also neglect the effeet of gravity, so that we get

ip

— I. =0

oe Ge V2) ? or Vi +Me=pL, where p is the uniform pressure of the mixed medium. Hence

and

an equation, the form of which is identical with the well-known equation for the conduction of heat. We may write it

D is called the coefficient of diffusion.

kyk,

Chop It therefore varies inversely as the total pressure of the medium, and if the coefficient of resistance, C,,, is independent of the tem- perature, it varies directly as the product Ah, 7.¢., as the square of the absolute temperature. It is probable, however, that the effect of temperature is not so great as this would make it.

In liquids D probably depends on the proportion of the ingredients of the mixed medium as well as ou the temperature. The dimen- sions of D are L? T-1, where L is the unit of length and T the unit of time.

The values of the coefficients of diffusion of several pairs of gases have been determined by Losehmidt.!_ They are referred in the following table to the centimetre and the second as units, for the temperature 0°C aud the pressure of 76 centimetres of mereury.

It is equal to

D Carbonic aeid and air, F 01428 Carbonie acid and hydrogen, – : . 0°5558 Oxygen and hydrogen, . c : , On72ae Carbonic aeid and oxygen, ‘ . – 01409 Carbonic acid and earbonie oxides, – - 071406 Carbonie acid and marsh gas, ee 0°1586 Carbonie acid and nitrous oxide, 00983 Sulphurous acid and hydrogen, : 0°4800 Oxygen and carbonic oxide, : 0°1802 Carbonic oxide and hydrogen, : 06422

Diffusion in Lnquids.

The nature of the motion of the molecules in liquids is less understood than in gases, but it is easy to see that if there is any irregular displacement among the molecules 1n @ mixed liquid, it must, on the whole, tend to cause each com- ponent to pass from places where it forms a large proportion of the mixture to places where it is less abundant. It is also manifest that any relative motion of two constituents of the mixture will be opposed by a resistance arising frou

1 Imperial Academy of Vienna, 10th March 1870.

ra

Piierus von

the encounters between the molecules of these componeuits. The value of this resistance, however, depends, in liquids, on more complicated conditions than in gases, and for the present we must regard it as a function of all the physical properties of the mixture at the given place, that is to say, its temperature and pressure, and the proportions of the different components of the mixture.

The coefficient of interdiffusion cf two liquids must therefore be considered as depending on all the physical properties of the mixture according to laws which can be ascertained only by experiment.

Thus Fick has determined the coefficient of diffusion for common salt in water to be 0:00000116, and Voit has found that of cane-sugar to be 0:00000365.

It appears from these numbers that in a vessel of the game size the process of diffusion of liquids requires a greater number of days to reach a given stage than the process of diffusion of gases in the same vessel requires seconds.

When we wish to mix two liquids, it is not sufficient to place them in the same vessel, for if the vessel is, say, a metre in depth, the lighter liquid will

lie above the denser, and it will be many years before the mixture becomes even sensibly uniform. We therefore stir the two liquids to- gether, that is to say, we move a solid body through the yessel, first one way, then another, so as to make the liquid contents eddy about in as complicated a manner as possible. The effect of this is that the two liquids, which originally formed two thick horizontal layers, one above the other, are now disposed in thin and excessively convoluted strata, which, if they could be spread out, would cover an im- mense area. ‘The effect of the stirring is thus to increase the area over which the process of diffusion can go on, and to diminish the distance between the diffusing liquids; and since the time required for diffusion varies as the square of the thickness of the layers, it is evident that by a moderate amount of stirring the process of mixture which would otherwise require years may be completed in a few seconds, That the process is not instantaneous is easily ascertained by observing that for some time after the stir- ring the mixture appears full of streaks, which cause it to lose its transparency. This arises from the different indices of refraction of different portions of the mixture which have been brought near each other by stirring. The surfaces of separation are so drawn out and convoluted, that the whole mass has a woolly appearance, for no ray of light can pass ee it without being turned many times out of its path.

Graham observed that the diffusion both of liquids and gases takes place through porous solid bodies, such as plugs of plaster of Paris or plates of pressed plumbago, at a rate hot very much less than when no such body is interposed, and this even when the solid partition is amply sufficient to check all ordinary currents, and even to sustain a con- siderable difference of pressure on its opposite sides.

But there is another class of cases in which a liquid or a gas can pass through a diaphragm, which is not, in the or- dinary sense, porous. For instance, when carbonic acid gas is confined ina soap bubble it rapidly escapes. The gas is absorbed at the inner surface of the bubble, and forms @ solution of carbonic acid in water. This solution diffuses from the inner surface of the bubble, where it is strongest, to the outer surface, where it is in contact with ait, and the carbonic acid evaporates and diffuses out into the atmosphere, It is also found that hydrogen and other gases can pass through a layer of caoutchoue. Graham showed that it is not through pores,

in the ordinary sense, that the motion takes place, for the ratios are determined by the chemical relations between the gases and the caout- choue, or the liquid film,

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According to Graham's theory, the caoutchouc is a colloid substance,—that is, one which is capable of combining, in a temporary and very loose manner, with indeterminate proportions of certain other substances, just as glue will form a jelly with various proportions of water. Another class of substances, which Graham called crystalloid, are distinguished from these by being always of definite com- position, and not admitting of these temporary associations. When a colloid body has in different parts of its mass different proportions of water, alcohol, or solutions of crys- talloid bodies, diffusion takes place through the colloid body, though no part of it can be shown to be in the liquid state.

On the other hand, a solution of a colloid substance is almost incapable of diffusion through a porous solid, or another colloid body. Thus, if a solution of gum and salt in water is placed in contact with a solid jelly of gelatine and alcohol, alcohol will be diffused into the gum, and salt and water will be diffused into the gelatine, but the gum and the gelatine will not diffuse into each other.

There are certain metals whose relations to certain gases Graham explained by this theory. For instance, hydrogen can be made to pass through iron and palladium at a high temperature, and carbonic oxide can be made to pass through iron. The gases form colloidal unions with the metals, and are diffused through them as water is diffused through a jelly. Root has lately found that hydrogen can pass through platinum, even at ordinary temperatures.

By taking advantage of the different velocities with which different liquids and gases pass through parchment- paper and other solid bodies, Graham was enabled to effect many remarkable analyses. He called this method the method of Dialysis.

Diffusion and Evaporation, Condensation, Solution, and , Absorption.

The rate of evaporation of liquids is determined prin- cipally by the rate of diffusion of the vapour through the air or other gas which lies above the liquid. Indeed, the coefficient of diffusion of the vapour of a liquid through air can be determined in a rough but easy manner by placing a little of the liquid in a test tube, and observing the rate at which its weight diminishes by evaporation day by day. For at the surface of the liquid the density of the vapour is that corresponding to the temperature, whereas at the mouth of the test tube the air is nearly pure. Hence, if p be the pressure of the vapour corresponding to the tem- perature, and p=fp, and if m be the mass evaporated in time ¢, and diffused into the air through a distance i then

This method is not, of course, applicable to vapours which are rarer than the superincumbent gas.

The solution of a salt in a liquid goes on in the same way, and so does the absorption of a gas by a liquid.

These processes are all accelerated by currents, for the reason already explained.

The processes of evaporation and condensation go on much more rapidly when no air or other non-condensible gas is present. Hence the importance of the air-pump in the steam engine.

Relation between Diffusion of Matter and Diffusion of LTeat.

The same motion of agitation of the molecules of gases which causes two gases to diffuse through each other also ST

1 % should be taken equal to the height of the tube above the surface

of the liquid, together with about 2 of the diameter of the tube.—See Clerk Maxwell’s Electricity, Art, 309. VII, — 28

causes two portions of the same gas to diffuse through each other, although we cannot observe this kind of diffusion, because we cannot distinguish the

molecules of one portion from those of the other when they are once mixed. If, however, the molecules of one portion have any property whereby they can be distinguished from those of the other, then that property will be communicated from one part of the medium to an adjoining part, and that either by con- vection—that is by the molecules themselves passing out of one part into the other, carrying the property with them— or by transmission—that is by the property being com- municated from one molecule to another during their en- counters. The chemical properties by which different substances are recognized are inseparable from their mole- cules, so that the diffusion of such properties can take place only by the transference of the molecules themselves, but the momentum of a molecule in any given direction and its energy are also properties which may be different in different molecules, but which may be communicated from one molecule to another. Hence the diffusion of momentum and that of energy through the medium can take place in two different ways, whereas the diffusion of matter can take place only in one of these ways.

In gases the great majority of the particles, at any in- stant, are describing free paths, and it is therefore possible to show that there is a simple numerical relation between the coefficients of the three kinds of diffusion, —_the diffusion of matter, the lateral diffusion of velocity (which is the phenomenon known as the internal friction or viscosity of fluids), and the diffusion of energy (which is called the conduction of heat). But in liquids the majority of the molecules are engaged at close quarters with one or more cther molecules, so that the transmission of momentum and of energy takes place in a far greater degree by com- munication from one molecule to another, than by con- vection by the molecules themselves. Hence the ratios of the coefficient of diffusion to those of viscosity and thermal conductivity are much smaller in liquids than in gases,

Theory of the Wet Bulb Thermometer.

The temperature indieated by the wet bulb thermometer is deter- mined in great part by the relation between the coefficients of diffusion and thermal eonduetivity. As the water evaporates from the wet bulb heat must be supplied to it by convection, conduetion, or radiation. This supply of heat will not be sufficient to maintain the temperature constant till the

temperature of the wet bulb has sunk so far below that of the surrounding air and other bodies that the flow of heat due to the difference of temperature is equal to the latent heat of the vapour which leaves the bulb.

The use of the wet bulb thermometer as a means of estimating the humidity of the atmosphere was employed by Hutton! and Leslie,? but the formula by which the dew-point is eommonty deduced from the readings of the wet and dry thermometers was first given by Dr Apjohn.?

Dr Apjohn assumes that, when the temperature of the wet bulb is stationary, the heat required to eonvert the water into vapour is given out by portions of the surrounding air in eooling from the temperature of the atmosphere to that of the wet bulb, and that the air thus eooled becomes saturated with the vapour whieh it receives from the bulb.

Let m be the mass of a portion of air at a distanee from the wet

bulb, @ its temperature, y, the pressure due to the aqueous vapour in it, and P the whole pressure.

If o is the specifie gravity of aqueous vapour (referred to air), then the mass of water in this portion of air is 5 om.

Let this portion of air communieate with the wet bulb till its temperature sinks to 6, that of the wet bulb, and the pressure of the aqueous vapour in it rises to ~,, that eorresponding to the tem- perature @,.

= The quantity of vapour which has been communicated to the air

Jeet J . 1 Playfair's " Life of Hutton," Hdinburgh Transactions, vol. v. p. 67, note.

2 Encyc. Brit., 8th ed. vol. i. Dissertation Fifth," p. 764 > Trans, Royal Irish Academy, 1834, A

DIFFUSION

m (21 -Po) and if L is the latent heat of vapour at the temperature 6,, the quantity of heat required to produce this vapour is

(P1—Po) > L.

Aceording to Apjohn’s theory, this heat is supplied by the mixed air and vapour in eooling from to ,.

If S is the specifie heat of the air (which will not be sensibly dif. ferent from that of dry air), this quantity of heat is

(8) — 0,) mS. Equating the two values we obtain

PS PoFPi – Lo (°° ~ 6).

Here po is the pressure of the vapour in the atmosphere. The temperature—for which this is the maximum pressure—is the dew- point, and , is the maximum pressure eorresponding to the tempera. ture 6, of the wet bulb. Henee this formula, eombined with tables of the pressure of aqueous vapour, enables us to find the dew-point from observations of the wet and dry bulb thermometers.

We may eall this the eonveetion theory of the wet bulb, because we consider the temperature and humidity of a portion of air brought from a distanee to be atfeeted directly by the wet bulb without communication either of heat or of vapour with other por- tions of air.

Dr Everett has pointed out as a defeet in this theory, that it does not explain how the air ean either sink in temperature or increase in humidity unless it eomes into absolute eontaet with the wet bulb. Let us, therefore, consider what we may eall the eonduttion and diffusion theory in ealm air, taking into aecount the effects of radiation.

The steady eonduetion of heat is determined by the eonditions—

6=6, at a great distanee from the bulb, = 6, at the surface of the bulb, v’@=0 at any point of the medium.

The steady diffusion of vapour is determined by the eonditions—

P=Py at a great distanee from the bulb, p=p, at the surfaee of the bulb, v’p=0 at any point of the medium.

Now, if the bulb had been an eleetrified eonduetor, the conditions with respect to the potential would have been

V=0 ata great distanee, V=V, at the surface, v?V=0 at any point outside the bulb.

Henee the solution of the electrical problem leads to that of the other two. For if V is the potential at any point,

Vv Vv O= 6) + (0, — 0) — P=Po t+ (M.P) = — 0 1 Vy, ot (A Po)

If E is the eleetrie eharge of the eonduetor,

d= – ff 2 as,

where the double integral is extended over the surface of the bub, and dy is an element of a normal to the surfaee. If H is the flow of heat in unit of time from the bulb,

= ado H=-K ff Zs and if Q is the flow of aqueous vapour from the bulb,

Q—7 ff 2a,

where & is the ratio of the pressure of aqueous vapour to its density. If C is the electrical capacity of the bulb, E=CYV,, H=45CK(—6,), Q—4×02 (p,-p)).

The heat which leaves the bulb by radiation to external objects

_at temperature @) may be written ‘

h=AR(6,~ 0),

where A is the surface of the bulb and R the coefficient of radiation of unit of surfaee. When the temperature becomes eonstant

LQ+H+A=0, PS{K AR oer ile D * Gecpsp § o~%). This formula gives the result of the theory ofrdiffasion, condae

prrPrPUsRIOCS

tisp, and radiation in a still atmosphere. It differs from the formula of the convection theory only by the factor in the last

term. K The first part of this factor D is certainly less than unity, and

probably about 77.

If the bulb is spherical and of radius r, A=4ar? and C=r, so

that the second part is a ;

Hence, the larger fhe wet bulb, the greater will be the ratio ot the effect of radiation to that of conduction. If, on the other hand, the air is in motion, this will increase both conduction and diffu- gion, so as to increase the ratio of the first part to the second. By comparing actual observations of the dew-point with Apjohn's formula, it has been found that the factor should be somewhat

greater than unity. r j greater if the bulb is larger, and smaller if there is much wind.

Relation between Diffusion and Electrolytic Conduction.

Electrolysis (see separate article) is a molecular movement of the constituents of a componnd liquid in which, under the action of electromotive force, one of the components travels in the positive and the other in the negative direc- tion, the flow of each component, when reckoned in electro- chemical equivalents, being in all cases numerically equal to the flow of electricity.

Electrolysis resembles diffusion in being a molecular movement of two currents in opposite directions through the same liquid; but since the liquid is of the same compo- sition throughout, we cannot ascribe the currents to the molecular agitation of a medium whose composition varies from one part to another as in ordinary diffusion, but we must ascribe it to the action of the electromotive force on particles having definite charges of electricity.

The force, therefore, urging an electro-chemical eqitiva- lent of either component, or zon, as it is called, in a given direction is numerically equal to the electromotive force at a given point of the electrolyte, and is therefore comparable with any ordinary force. The resistance which prevents the current from rising above a certain value is that arising from the encounters of the molecules of the ion with other molecules as they struggle forward through the liquid, and this depends on their relative velocity, and also on the nature of the ion, and of the liquid through which it has to flow.

_The average velocity of the ions will therefore increase, till the resistance they meet with is equal to the force which urges them forward, and they will thus acquire a definite velocity proportional to the electric force at the point, but depending also on the nature of the liquid.

_ If the resistance of the liquid to the passage of the ion is the same for different strengths of solution, the velocity

of the ion will be the same for different strengths, but the |

quantity of it, and therefore the quantity of electricity which passes in a given time, will be proportional to the strength of the solution.

Now, Kohlrausch has determined the conductivity of

the solutions of many electrolytes in water, and he finds that for very weak solutions the conductivity is propor- tional to the strength. When the solution is strong the liquid through which the ions struggle can no longer be considered sensibly the same as pure water, and conse- quently this proportionality does not hold good for strong solutions. _Kohlrausch has determined the actual velocity in cen- timetres per second of various ions in weak solutions under an electro-motive force of unit value. From these Velocities he has calculated the conductivities of weak solutions of electrolytes different from those of which he made use in calculating the velocity of the ions, and he finds the results consistent with direct experiments on those electrolytes,

It is manifest that we have here important informa-

According to our theory it ought to be.

tion as to the resistance which the ion meets with in travelling through the liquid. It is not easy, however, to make a numerical comparison between this resistance and any results of ordinary diffusion, for, in the first place, we cannot make experiments on the diffusion of ions. Many electrolytes, indeed, are decomposed by the current into components, one or both of which are cap- able of diffusion, but these components, when once separated out of the electrolyte, are no longer ions—they are no longer acted on by electric force, or charged with definite quantities of electricity. Some of them, as the metals, are insoluble, and therefore incapable of diffusion ; others, like the gases, though soluble in the liquid electro- lyte, are not, when in solution, acted on by the current. Besides this, if we accept the theory of electrolysis pro- posed by Clausius, the molecules acted on by the electro- motive force are not the whole of the molecules which form the constituents of the electrolyte, but only those which at a given instant are in astate of dissociation from niolecules of the other kind, being forced away from them tempo- rarily by the violence of the molecular agitation. If these dissociated molecules forma small proportion of the whole, the velocity of their passage through the medium must be

much greater than the mean velocity of the whole, which is

the quantity calculated by Kohlrausch.

On Processes by which the Mixture and Separation of Fluids can be effected in a Reversible Manner.

A physical process is said to be reversible when the

material system can be made to return from the final state to the original state under conditions which at every stage of the reverse process differ only infinitesimally from the conditions at the corresponding stage of the direct process.

All other processes are called irreversible. Thus the passage of heat from one body to another is a

reversible process if the temperature of the first body exceeds that of the second only by an infinitesimal quan- tity, because by changing the temperature of either of the the bodies be made to flow back again from the second body to first.

by an infinitesimal quantity, the heat may

But if the temperature of the first body is higher than

that of the second by a finite quantity, the passage of heat from the first body to the second is not a reversible process, for the temperature of one or both of the bodies must be altered by a finite quantity before the heat can be made to flow back again.

In like manner the interdiffusion of two gases is in

general an irreversible process, for in order to separate the two gases the conditions must be very considerably changed. For instance, if carbonic acid is one of the gases, we can separate it from the other by means of quicklime ; but the absorption of carbonic acid by quicklime at

ordinary temperatures and pressures is an irreversible pro- cess, for in order to separate the carbonic acid from the

lime it must be raised to a high temperature.

In all reversible processes the substances which are in contact must be in complete equilibrium throughout the process ; and Professor Gibbs has shown the condition of equilibrium to be that not only the temperature and the pressure of the two substances must be the same, but also that the potential of each of the component substances must be the same in both compounds, and that there is an additional condition which we need not here specify.

Now, we may obtain complete equilibrium between quicklime and the mixture containing carbonic acid if we raise the whole to a temperature at which the pressure of dissociation of the carbonic acid in carbonate of lime is equal to the pressure of the carbonic acid in the mixed gases, By altering the temperature or the pressure very slowly we may cause carbonic acid to pass from the mix-

ture to the lime, or from the lime to the mixture, in such a manuer that the conditions of the system differ only by infinitesimal quantities at the corresponding stages of the direct and the inverse processes. The same thing may be done at lower temperatures by means of potash or soda.

If one of the gases can be condensed into a liquid, and if during the condensation the pressure is increased or the temperature diminished so slowly that the liquid and the mixed gases are always very nearly in equilibrium, the separation’ alld mixture of the gases can be effected in a reversible manner.

The same thing can be done by means of a liquid which absorbs the gases in different proportions, provided that we can maintain such conditions as to temperature and pressure as shall keep the system in equilibrium during the whole process.

If the densities of the two gases are different, we can effect their partial separation by a reversible process which does not involve any of the actions commonly called chemical. We place the mixed gases in a very long horizontal tube, and we raise one end of the tube till the tube is vertical. If this is done so slowly that at every stage of the process the distribution of the two gases 1s sensibly the same as it would be at the same stage of the reverse process, the process will be reversible, and if the tube is long enough the separation of the gases may be carried to any extent.

In the Philosophical Magazine for 1876, Lord Rayleigh has in- vestigated the thermodynamics of diffusion, and has shown that if two portions of different gases are given at the same pressure and temperature, it is possible, by mixing them by a reversible process to obtain a certain quantity

of work. At the end of the process the two gases are uniformly mixed, and occupy a volume equal to the sum of the volumes they occupied when separate, but the temperature and pressure of the mixture is lower than before.

The work which can be gained during the mixture is equal to that which would be gained by allowing first one gas and then. the other to expand from its original volume to the sum of the volumes ; and the fall of temperature and pressure is equal to that which would he produced in the mixture by taking away a quantity of heat equivalent to this work.

If the diffusion takes place by an irreversible process, such ag goes on when the gases are placed together in a vessel, no external work is done, aud there is no fall of temperature or of pressure during the process.

We may arrive at this tesult by a method which, if not so instructive as that of Lord Rayleigh, is more general, by the use of the physical quantity called by Clausius the Entropy of the system.

The, entropy of a body in equilibrium is a quantity such that it remains constant if no heat enters or leaves the body, and such that in general the quantity of hext which enters the body is

Sods , where ¢ is the entropy, and 6 the absolute temperature. _ The entropy of a material system is the sum of the entropy of its parts.

In reversible processes the entropy of the system remains un- changed, but in all irreversible processes the entropy of the system increases.

The increase of entropy involves a diminution of the available energy of the system, that is to say, the total quantity of work which can be obtained from the system. This is expressed by Sir W. Thomson by saying that a certain amount of energy is disstpated.

The quantity of energy which is dissipated in a given process is

equal to 9o($2-$1)-;

where 9, is the entropy at the beginning, and , that at the end of the process, and 6, is the temperature of the system in its ultimate state, when no more work can be got out of it.

When we can determine the ultimate temperature we can calculate the amount of energy dissipated by any process ; but it is sometimes difficult to do this, whereas the increase of entropy is determined by the known states of the system at the beginning and end of the process.

The entropy of a volume v, of a gas at pressure p, and temperature 6, exceeds its entropy where its volume is v, and its temperature 6) by the quantity

Py ‘| _1 6, ty-]

6, V, log A. + log me

D1? Us TOW

Hence if volumes v, and v, of two gases at the same temperature and pressure are mixed so as to occupy a volume v, +, at the same temperature and pressure, the entropy of the system increases during the process by the quantity

V+ %,

Uy

V+,

+ v, log :

2

z v, log Since in this case the temperature does not change during the pro- cess, we may calculate the quantity of cnergy dissipated by multi- plying the gain of entropy by the temperature, and we thus find for the dissipation

pr, log “1 * “8 + py, log A> ,

V2 or the sum of the work which would be done by the two portions of gas if each expanded under constant temperature to the yolume V+, . It is greatest when the two volumes arc equal, in which case it is 1°386 pv, where p is the pressure and v the volume of one of the portions.

Let us now suppose that we have in a vessel two separate portions of gas of equal volume, and at the same pressure and temperature, with a iovable partition between them. If we remove the partition the agitation of the molecules will carry them from one side of the partition to the other in an irregular manner, till ulti- mately the two portions of gas will be thoroughly and uniformly mixed together. This motion of the molecules will take place whether the two gases are the same or different, that is to say, whether we can distinguish between the properties of the two gases or not.

If the two gases are such that we can separate them by a reversible process, then, as we have just shown, we might gain a definite amount of work by allowing them to mix under certain conditions; and if we allow them to mix by ordinary diffusion, this amount of work is no longer available, but is dissipated for ever. If, on the other hand, the two portions of gas are the same, then no work can be gained by mixing them, and no work is dissipated by allowing them to diffuse into each other.

It appears, therefore, that the process of diffusion does not involve dissipation of euergy if the two gases are the same, but that it does if they can be separated from each other by a reversible process.

Now, when we say that two gases are the same, we mean that we cannot distinguish the one from the other by any known reaction. It is not probable, but it is pos- sible, that two gases derived from different sources, but hitherto supposed to be the same, may hereafter be found to be different, and that a method may be discovered of separating them by a reversible process. If this should happen, the process of interdiffusion which we had formerly supposed not to be au instance of dissipation of energy would now be recognized as such au instance.

It follows from this that the idea of dissipation of energy depends on the extent of our knowledge. Avail- able energy is energy which we can direct into any desired channel. Dissipated energy is energy which we cannot lay

hold of and direct at pleasure, such as the energy of the confused agitation of molecules which we call heat. Now, confusion, like the correlative term order, is not a property of material things in themselves, but only in relation to the mind which perceives them. A memorandum-book does not, provided it is neatly written, appear confused to an illiterate person, or to the owner who understands it thoroughly, but to any other person able to read it appears to be inextricably confused. Similarly the notion of dis- sipated energy could not occur to a being who could not turn any of the energies of nature to his own account, or to one who could trace the motion of every molecule and seize it at the right moment. It is only to a being in the i intermediate stage, who can lay hold of some forms of

energy while others elude his grasp, that energy appears to be passing inevitably from the available to the dissipated state. G. Cc. M.)

DIGBY, Sm Keyetm (1603-1665), an eminent English physical philosopher, born at Gothurst, Bucking- hamshire, on the 11th July 1603, was descended from an ancient and illustrious family. His great-grandfather had distinguished himself at Bosworth on the side of Henry VII.; and his father, Sir Everard Digby, was one of the leading Roman Catholic gentry at the time of the Gun- powder Plot. Having msen in arms on that occasion, Sir Everard was executed at London, January 27,1606. The young philosopher was educated by his gnardians in the Protestant faith. Having finished his education at Oxford, he went abroad in 1621, and travelled in France, Spain, and Italy. On his return he was knighted, and received from Charles J. the appointments of gentle- man of the bed-chamber, commissioner of the navy, and governor of Trinity House. At the head of a smali syuadron, which he equipped at his own expense, he sailed in 1628 against the Algerines, and afterwards defeated the Venetians near the port of Scanderoon. During a brief stay in Paris he joined the Church of Rome. Having returned to. England in 1638, he espoused the cause of the king, and was imprisoned in Winchester House, by order of the Parliament. He was, however, liberated at the request of the French queen- dowager in 1643, and retired to France, where he was taken into the confidence of the court, and enjoyed the friendship of Descartes and other learned men. Here he wrote

his Treatise on the Nature of Bodies, his Treatise on the Soul, Peripatetick Institutions, and other works, He visited England, after the defeat of the Royalist party, but the Parliament refused to allow him to remain. Banished from England upon pain of death if he returned, he resumed his residence in France, where he was treated with the highest respect, and was intrusted with an embassy to several of the courts of Italy. He returned again to his native country during the Protectorate of Cromwell, and seemed to be more zealous for the advance- ment of the interests of the Commonwealth than befitted a staunch royalist. He used his influence to reconcile the Catholics to the Protectorate on condition of their being secured the free exercise of their religion. With Crom- well he was on terms of intimate friendship, the bond of sympathy being probably not so much politics as a common interest in the new-born science of physics. At the Restoration he returned finally to London, where he died in 1665. He married Venetia Anastasia, the daughter of Sir Edward Stanley of Shropshire, “a lady of an extraordinary beauty and of as extraordinary a fame.” His whimsical experiments to preserve her beauty by the in- vention of new cosmetics procured him as much notoriety as his sympathetic powder for the cure of wounds at a stance. He was appointed one of the council of the Royal Society at the time of its first establishment, and he took a very active part in its management. Besides the works already mentioned, Digby wrote A Conference about a Choice of Religion, Paris, 1638 ; Letterson the same sub- Ject, Lond. 1651; Observations on Religio Medici, Lond. 1643; 4 Treatise of Adhering to God, Lond. 1654; On the Cure of Wounds by the Powder of Sympathy, Lond. 1658 ; and a Discourse on Vegetation.

DIGESTIVE ORGANS. The organs of digestion, or slimentary apparatus, are for the purpose of receiving the ood or aliment ; of converting that portion of the food which is digestible into chyle, so that it may be absorbed and applied to the nourishment of the body; and of trans- mitting that which is indigestible onwards to be excreted.

Tn the Protozoa there is no special digestive apparatus,

but the particles of food are introduced into the general substance of the body, where they undergo digestion and assimilation, But in animals

generally there is a definite digestive cavity or stomach, which communicates with the surface by a distinct opening or mouth, through which the food is introduced into the stomach. Asa rule a second opening, or anus, is also in communication with the stomach, at which the indigestible parts of the food are excreted, As animals increase in structural complexity the digestive apparatus has additional parts superadded to it. In man and all the more highly organized animals it con- sists of an elongated tube, the Alimentary Canal, divided into various compartments, into which numerous Glands pour their secretions to be used in the digestive process. In most vertebrates, the great class of birds being excepted, the compartment of the canal called the mouth, or oral cavity, contains a hard masticatory apparatus, the Teeth, which play an important part in breaking down the food.

As the digestive organs in the Auman body are so con- structed as to illustrate one of the most perfect forms of an alimentary apparatus, they will form the special subject of description in this article.

relation to the ventral surface of the bodies of the vertebree. It commences on the face at the orifice of the mouth, and

terminates on the surface of the lower part of the trunk at the orifice of the anus. It is divided into a series of segments, or compartments, which communicate with eacli other, from above downwards, in the longitudinal axis of the canal, These compartments are named mouth, pharynx, cesophagus, stomach, small intestine (subdivided into duodenum, jejunum, and ileum), and large intestine (sub- divided into cecum, colon, and rectum). The canal is lined by a mucous membrane, called the alimentary mucous membrane, which is continuous with the nasal mucous membrane, with the respiratory mucous membrane, and at the anal and oral orifices with the integument. Outside this mucous membrane is the submucous coat, and external to it is the muscular wall of the canal. By the contraction of the muscular wall the food is propelled along the canal from above downwards. Opening on the surface of the mucous membrane are tlie orifices of the ducts of numerons glands, the secretions of which, mingling with the food, act chemically on it, so as to render it soluble and capable of being absorbed.

The Afouth, Oral Cavity, or Buccal Cavity, is the dilated Mouth.

commencement of the alimentary canal, in which the food is masticated and mingled with the secretion of the salivary and mucous glands. It is situated in the face, and extends from the lips in front to the pharynx behind. It is bounded above by the hard and soft palate, with the uvula; below by the lower jaw, the mucous membrane of the floor of the mouth, and the tongue; on each side by the cheek ; and in front by the lips, between which is the aperture of communication with the surface of the face. Behind it freely communicates with the pharynx through the isthmus faucium. The muscles situated in the lips, cheeks, floor of the mouth, tongue, and soft palate enter into the formation of the walls of the mouth.

The mouth is lined by a red-coloured mucous membrane, which becomes continuous posteriorly with that of the pharynx, and at the margins of the lips with the skin of the face. The mucous membrane covering the alveolar portions of the jaws, and surrounding the necks of the teeth, is called the gum. From the outer surface of each jaw it is reflected tothe inner surface of the cheeks and lips. From

| the inner surface of the lower jaw the mucous membrane is reflected to the floar of the mouth, and a broad band,

The ALIMENTARY Canal is a tube about 28 feet long, Auruext which traverses almost the entire length of the axial part A8Y of the body. In manandall other vertebrates, it lies in “4*4™

Tonsils.

Glands of the mouth.

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called frenum lingue, is prolonged to the middle line of the under surface of the tongue.

In its structure the mucous lining of the mouth consists of a stratified pavement epithelium, and a sub-epithelial fibro-vascular corium, possessing

numerous vascular papilla. The mucous membrane of the gum is characterized by its density and toughness, due to the numerous strongly developed bundles of connective tissue in the corium, many of which are continued into the fibrons tissue of the periosteum, which covers the alveolar surface of the jaw. The free surface of the corium of the gum possesses numer- ous broad papille, and is covered by a stratified pavement epithelium similar to that in the lips and cheeks. The mucous membrane of the hard palate is also tense and tough, though not so much so as the gum; and the fibrous fasciculi of its corium blend with the connective tissue of the subjacent periosteum. The mucous lining of the mouth is a sensitive membrane, and receives its nervous supply from the fifth cranial nerve.

The mucous membrane of the mouth is specially modified on the dorsum of the tongue, in the interval between the circumvallate papilla and the epiglottis, and in the sub- stance of the tonsils, by the development of collections of lymphoid tissue in the sub-epithelial connective tissue.

The Z'onsils are two almond-shaped bodies, situated, one on each side of the posterior orifice of the mouth, in the fossa between the anterior and posterior pillars of the soft palate. Their normal size is not bigger than a hazel nut, but they are very apt to enlarge, grow inwards across the posterior aperture of the mouth, and diminish the size of that opening. The free surface is marked by several rounded holes, leading into , shallow pits or crypts, which may be either simple or branched, in the substance of the tonsil. The pits are lined by the epithelial cover- ing of the mucous: mem- : brane, into which minute : papille project. Inthesub- : epithelial connective tissue ~ of the walls of the crypts numerous follicles of lym- phoid tissue are situated, and lymph cells are infiltrated in great numbers in the con- nective tissue between the follicles. Interspersed amidst the crypts are small racemose mucous glands. The tonsils are very vascular, and capillary blood- vessels are distributed in connection with the papille, the lymphoid tissue, and the racemose glands, The tonsillar veins form a plexus in relation to the attached surface of the tonsil.

Mucous and Salivary Glands of the Mouth.—The ducts of numerous glands, engaged in secreting mucus and saliva, open on the free surface of the mucous membrane of the mouth, Their secretion not only keeps the

mouth moist, and aids therefore in articulation, but by mingling with the food assists in mastication, deglutition, and the digestive process. ach gland is characterized by being divided into small lobules, and by possessing a duct or ducts, which branch off in an arborescent manner in the substance of the gland, and finally end in the minute lobules. They all belong to the compound racemose group of glands.

The mucous glands of the mouth are situated beneath its mucous lining in the following localities :—(a) labial glands, in the upper and lower lips, but absent at the angles of the mouth ; (6) buccal glands, scattered on the inner surface of the cheek from the lips to the opening of the parotid duct ; (c) palatine glands, on the oral surface of the hard palate, in the uyula, on both surfaces of the soft palate, and in the

Fig. 1.—Vertical section through one of the tonsils, to show a pit vertically divided. e, its epithelial lining; /,/, lymph follicles; 7, /, 7, lymph cells diffused in the connective tissue; a, small artery ending in capillary blood-vessels. Slightly magnified.

tonsils ; (¢) molar glands, close t» the last lower molar tooth on each side ; (e) lingual glands, extending backwards from the tip of the tongue along its margin, and also on its dorsum between the circumvallate papille and epiglottis, The ducts of these mucous glands consist of a delicate membrane lined by a single layer of columnar epithelial cells. The terminal branches of the ducts which enter

_the lobules end in a series of saccular dilatations, the

acint, alveoli, or gland-vesicles, which contain rounded or polygonal secreting cells. A collection of such vesicles forms a lobule. ‘The lobules are bound together by inter. mediate connective tissue, in which the blood-vessels divide into a capillary network, that ramifies on the outer surface of the delicate membrane forming the wall of the gland- vesicles.

The salivary glands of the mouth are the parotid, sub- maxillary, and sublingual glands. The parotid gland is the largest salivary gland, and

occupies the parotid hollow between the lower jaw and the external ear. Its anterior border overlaps the masseter muscle, and the excretory duet emerges out of this border. A prolongation of gland sub- stance, the socca parotidis, frequently accompanies the duct for a short distance. The excretory duct of the gland, called Stenson's duct, passes forwards superficial to the masseter muscle, then pierces the cheek, and opens on its inner surface opposite the second upper molar tooth. The duct is between 2 and 3 inches long, and about the thick- ness of a crow-quill, The submaxillary gland is situated immediately below the lower jaw. The excretory duet of the gland, called Wharton's duct, runs forwards and opens on the floor of the mouth by the side of the frenum linguz. The sublingual is the smallest of the salivary glauds, and lies under the mucous membrane of the floor of the mouth, close to the frenum lingua. It possesses from ten to twenty small excretory ducts, the ducts of Rivinus, some of which join Wharton's duct, though the greater number open directly on the floor of the mouth near the frenum lingue.

Structure.—The ducts of the salivary glands branch and terminate in the lobules,—each terminal duct ending ina series of saccular dilatations, the acini, alveoli, or gland- vesicles, the wall of which, formed apparently of a membrana propria, is continuous with the simple membranous wall of the terminal duct. The terminal ducts are lined by a layer of squamous epithelium, and the gland-vesicles contain the secreting cells,

The blood-vessels.are distributed in the interlobular con- nective tissue, and form a capillary network on the wall of the gland-ducts, and on the wall of the gland vesicles.

The Pharynx is an irregularly dilated canal, which forms Ph«™

a common passage, connecting the mouth with the cesopliagus, and the nose with the larynx, so as to be sub- servient to the processes both of deglutition and respiration. Its position and connections have been described under the heading ANATomyY.

The wall of the pharynx consists of three coats—an external muscular and an internal mucous coat, and an intermediate fibrous membrane, which blends with the sub- mucous coat. The muscular coat consists of three pairs

of circularly arranged muscles, the constrictors of the pharynx; and of two pairs of longitudinally-arranged muscles, the stylo-pharyngei and plato-pharyngei, with occasionally 4 third pair, the salpingo-pharyngei. The constrictor muscles extend from the lateral wall to the middle line of the posterior wall of the pharynx, and are named from below upwards the inferior, middle, and superior Col strictors ; they lie on three different planes, so that the inferior constrictor overlaps the middle, and the middle the superior. ;

The mucous coat of the pharynx lines the canal, and 1s

So! alate.

© thagus,

continuous through the several openings with the mucous membrane lining the Eustachian tubes, nose, mouth, larynx, and cesophagus.

The epithelium covering the mucous membrane of the nasal part of the pharynx is columnar aud ciliated over a considerable surface, put clsewhere the pharyngeal _epithe- lium is tesselated and stratified; and in the latter localities, vas- cular papillee project into the epithelial layers. Small race- 2 mose glands lie be- neath the mmucous \ membrane, which is pierced by theirducts to open on the sur- face (fig. 2); they = most numerous Fic, 2.— Vertieal seetion through the mneous mem- in the nasal part of

brane of the pharynx, to shew the raeemose the pharynx. Col-

glands. e, the epithelium; cf, subjacent eonncc- J tive tissue; g, raeemose gland; 4d, its duct;

lections of lymphoid

tissue are found in

a, artery ending in a capillary plexus on the gland vesicles. X 40

the sub-epithelial connective tissue, more especially in the

nasal part of the pharynx, where it forms a mass, extending

across the posterior and upper wall, between the openings

f the two Eustachian tubes, which Luschka has called the

pharyngeal tonsil. The arteries of the pharynx are derived from the external carotid or some of its branches. The motor, sensory, and sympathetic nerves unite to form the pharyngeal plexus situated behind the middie constrictor muscle, _ The Soft Palate forms an inclined plane, which pro- jects, downwards and backwards into the pharynx, from the posterior border of the hard palate. It is less dependent at the sides than in the mesial plane, where it forms an elongated body, the wvuda. Its anterior or oral surface is smooth, and gives origin on each side to a fold, which curves downwards to the side of the root of the tongue, to form the anterior pillars of the palate or fauces. Its posterior or pharyngeal surface, also smooth, gives origin on each side to a fold, which, springing from the base of the uvula, curves downwards and backwards to be lost in the side-walls of the pharynx; this pair of folds forms the posterior pillars of the palate or fauces. The soft palate is complex in structure, and consists of muscles, mucous membrane, glands, blood and lymph vessels, and nerves. The muscles of the soft palate are arranged in two groups, those which elevate and make it tense, and those which constrict the fauces.

The mucous membrane of the soft palate is continuous With that of the mouth and pharynx. The epithelium covering the anterior or oral surface is a stratified pavement epithelium, That on the posterior or pharyngeal surface %$ In infancy a laminated cylindrical and_ ciliated epithelium, With isolated areas of pavement epithelium, a. adults it is a laminated pavement epithelium. aon he racemose mucous glands lie beneath the mucous io sna but much more abundantly on the oral than on ee a aspect. Coliections of lymphoid tissue, The ta those found in the tonsils, are also met with. on —. are branches of the internal maxillary, facial, reel – ing pharyngeal. The veins of the soft palate i al ume a dilated character, and are continuous with be Pharyngeal veins. Lymphatics are also distributed

“om the mucous membrane.

Pw val ie bee or Gullet, is an almost cylindrical tube, or 10 inches long, which transmits the food from

the pharynx to the stomach. It commences in the neck opposite the body of the sixth cervical vertebra, where it is continuous with the pharynx. It passes down the lower part of the neck, traverses the cavity of the thorax, pierces the diaphragm at the cesophageal opening, enters the abdomen, and becomes continuous with the cardiac end of the stomach close to that opening.

Structure.—The wall of the cesophagus consists of three coats, named, from without inwards, muscular, submucous, and mucons coats.

The muscular or external coat is divided into two layers, an external and an internal. The external layer is com- posed of fibres arranged longitudinally in the wall. The enternal layer consists of fibres arranged in a series of rings around the tube, which lie sometimes horizontally, at others obliquely. The muscular coat in the upper fourth of the esophagus is red, and its fibres are transversely striped ; in the second fourth numerous non-striped fibres are mingled with the striped ; whilst in the lower half the coat consists exclusively of non-striped fibres. By the contraction of the fibres of the muscular coat the food is propelled down- wards into the stomach.

The submucous coat connects the muscular and mucous coats with each other. It consists of bundles of white fibrous tissue intermingled with elastic fibres, and the nerves and blood-vessels passing to the mucous coat ramify in it.

The mucous or cnternal coat lines the interior of the tube, and is continnous above with the mucous lining of the pharynx, and below with that of the stomach. When the wsophagus is empty it is thrown into longitudinal folds, Its free surface is covered by a thick layer of stratified squamous epithelium, which terminates abruptly at the car- diaz orifice of the stomach in anirregular line. Projecting into the epithelinm are multitudes of

minuteconical papille. Opening on the surface of the membrane are the ducts of numerous small racemose glands similar to those in the pharynx (fig. 2). Collections of lymphoid tissue, form- ing solitary follicles, are also found in the mucous membrane. The deep surface of the mucous membrane consists of a layer of non-striped muscular tissue, the bundles of which run longitudinally ; it forms the muscular layer of the mucous coat, or muscularis mucosce.

The cesophagus is supplied with blood by the inferior thyroid artery, the oesophageal branches of the thoracic aorta, and the ascending branch of the coronary artery of the stomach. The nerves are derived from the pneumo-gastrics, which form plexuses containing nerve-cells, not only in the muscular coat, but in the muscularis mucose. A network of lymphatic vessels also occurs in both the mucous and submucous coats.

ABpoMmINAL CAVITY AND PerrronrumM.—As the remaining por- tions of the alimentary canal are situated in the abdominal cavity, it will be advisable, before describing their anatomy, to give an ac- count of the form and boundaries of that cavity, of its division into regions, aad of the general arrangement of the peritoneum, which constitutes its lining membrane.

The Abdominal Cavity, Abdomen, or Belly, is the largest of the Abdownen,

three great cavities of the body. It oecupies about the lower two- thirds of the trunk, and extends from the diaphragm above to the pelvic floor below. As its walls, execpt in the pelvic region, are chiefly formed of muscles and of fibrous membrane, they are much more distensible than those of the thorax, and permit considerable modifications to occur in the size of the viscera contained within the cavity. The abdomen is elongated in form; its vertical diameter is greater than either the transverse or the antero-posterior diameter. The superior boundary is formed by the concave vault of the diaphragm, aud by the seven lower pairs of ribs and costal cartilages; in this boundary occur the opening through which the cesophagus passes into the abdomen, and also the apertures for the transmission of the great blood-vessels, the nerves, and the thoracic duct. The inferior boundary is formed by the levatores ani and coecygei muscles, and the pelvic fascia; in relation to this boundary are the termination of the rectum and anal orifice, the termination

of the urethra, and in the female that of the vagina also. The anterior boundary is formed above by the muscles of the anterior abdominal wall and the fascia transversalis ; the linea alba oceupies its middle line, and about the middle of the linca alba is the umbilicus or navel; the anterior wall below is formed by the two pubic bones with the symphysis. The lateral walls, or flanks, are formed above by the flat muscles of the abdominal wall and the fascia transversalis, and below on cach side by the ilium and ischium with the muscles attaehed to them. The posterior wall is formed by the lumbar spine, sacrum, and coecyx, and by the muscles attached to these bones with their accompanying fascie. The abdomen is primarily divided into the pelvis and abdomen proper. The pelvis is subdivided into the false pelvis, or the part above the pelvic brim, and true pelvis, or part below the pelvic brim.

The Peritonewm is the largest and most complicated serous mem- brane in the body. Like the other serous membranes, it not only lines the walls of the eavity in which itis situated, but gives a more or less complete investinent to the contained viscera. It is arranged, therefore, so as to form a parietal and a viseeral part, which are continuous with each other in the various regions where the part lining the wall is reflected as a covering upon the viscera. A space or cavity, ealled the peritoneal eavity, is inclosed between the parietal and visceral layers. This cavity, as in other serous mem- Pane. isa closed or shut sac, without any communication externally, except in the female, where the two Fallopian tubcs open into it.

Through these openings the mucous membrane lining the tubes becomes continuous with the serous membrane, and a communication is established between the lumen of each tube and the peritoneal cavity. That surface of both the parietal and visceral portion of the peritoneum which lies next the cavity is free, smooth, covered by an endothelium, and Iubrieated by a little serous fluid, which uuder some pathological conditions may be greatly increased in quantity, soas to eauseahdominal dropsy. The moistening of the

two free surfaces by the scrum permits them to glide smoothly on each other, during the movements of the viscera, and the changes which take place in their size and position. The opposite surface of the peritoneum is attached—that of the parietal part to the fascie situated internal to the abdominal muscles, that of the visceral part to the subjacent coat of the several organs.

Special names arc applied to the folds or duplicatures of the peri- toneum, whieh pass from the wall of the abdomen to the viscera. In the case of the liver, spleen, bladder, and uterus, these folds are named ligaments, whilst the corresponding folds whieh pass to the intestine have received the name of mesenteries, Folds of peri- toneum also pass between ccrtain of the viscera themselves, and these are called omenta.

The Stomach is the bag-like dilatation of the alimentary canal, connecting the cesophagus with the duodenum, in which the food is mingled with the gastric juice, and con- verted into a pulpy substance—the chyme. The stomach is situated in the costal zone of the abdominal cavity ; three-fourths of its volume being contained in the left hypochondrium, whilst the remaining fourth extends into the epigastrium. About five-sixtls of the organ lies to the left of the mesial plane, and one-sixth to the right. The stomach varies in size, shape, and somewhat in position, according as itis empty or full of food. When moderately full it is about 1 foot in length, whilst its greatest transverse diameter is 4 to 5 inches. Its general shape is pytiform, and it may be described as possessing two extremities, two surfaces, and two borders. The larger extremity, called the fundus, cardiac extremity, or great cul-de-sac, 1s directed upwards so as to be in contact with the under surface of the diaphragm, whilst tle smaller end, the pyloric or duodenal extremity, is directed downwards, curves to the right, and becomes continuous with the duodenum. The surfaces form the anterior and posterior walls of the stomach. When the organ is empty, the walls are flattened, and in apposition with cach other by their inner surfaces ; but when it is distended they are convex. The borders of the stomach are curved and unequal in size ; one is convex, about three times as long as the other, and is named the greater curvature ; the other is concave, and forms the lesser curvature. The curvatures are so arranged that the greater has its

convexity directed downwards and to the left, wherc it lies in relation to the transverse colon and the splenic flexure of the colon. The lesser curvature

has its concavity directed upwards-and to the right, and |

the cesophagus opens into the stomach at the upper end of the lesser curvature. Above this orifice the stomach expands into the fundus, which is situated in the highest part of thie left hypochondrium, and occupies therefore the summit of the vault of the left half of the diaphragm. At the lower and right end the two curvatures lie almost horizontally in the epigastrium and terminate at the pylorus, where the stomach becomes continuous with the duodenum. The pylorus, or gate of the stomach, is situated in the epigastrium about tliree fingers' breadth below the ensiform cartilage, and immediately to the right of the mesial plane. The junction of the stomach with the duodenum is marked by a circular constriction externally, called the pyloric constriction, and by a valve internally, the pyloric valve. At its pyloric end the stomach presents a small bulging, the lesser cul-de-sac, or antrum pylori,

The stomach is retained in position, partly by its con- nections with the cesophagus and duodenum, partly by the pressure of the surrounding abdominal walls and viscera, and partly by folds of peritoneum which pass from it to the adjacent structures. These folds are as follows :—-The gastro-phrenie ligament extends from the diaphragm to the stomach in the angle between the cesophagus and the cardiac extremity; the gastro-hepatic or small omentum passes from the lesser curvature of the stomach to the lips of the transverse fissure of the liver; the gastro-splenic omentum from the cardiac end of the stomach to the spleen ; the gastro-colic or great omentum descends from the greater curvature of the stomach in front of the coils of the small intestine, and then ascends to inclose the transverse colon.

Structure of the Stomach.—The wall of the stomach consists of four coats, named, from without inwards, serous, muscular, submucous, and mucous coats.

The eaternal or serous coat is that part of the peritoneal membrane which incloses the stomach,—one layer covering the anterior, the other the posterior surface. It leaves the stomach at the curvatures, where it forms the great and small omenta, and along these borders the two layers inclose between them the blood-vessels and nerves which supply the organ.

The muscular coat consists of non-striped fibres arranged in three layers from without inwards. The outer layer consists of longitudinal fasciculi, which are continuous with the external longitudinal layer of the cesophagus, They form scattered fasciculi extending longitudinally over the surface of the stomach from cardia to pylorus; but along the two curvatures, more especially the lesser, they are col- lected into stronger bundles, and at the pylorus they become continuous with the longitudinal fibres of the duodenum. The middle layer consists of circular fasciculi, which form a ring-like arrangement transversely to the long axis of the stomach, ‘These fasciculi are comparatively thin and scattered at the cardiac end, but as they approach the pylorus they become more closely aggregated, so as to form a thick layer, which at the pylorus extends into the pyloric valve, and forms the sphincter pylori muscle. The circular fibres of the stomach are in the same morphological plane as the circular fibres of the cesophagus and duodenum. The inner layer consists of oblique fasciculi, which are not found over the entire organ; the greater number sprig from the left side of the cardiac orifice, and radiate on the anterior and posterior surfaces towards the pylorus and greater curvature, These oblique fibres by their contraction approximate the cardia to the pylorus, the great curvature to the smaller, and the anterior to the posterior wall; they are thus the true grinding muscles of the stomach, and have been compared to the muscular gizzard of the bird, From the relation of the two groups of oblique fibres to the cardiac orifice they probably close that opening during gastric digestion, The longitudinal and circular fibres

oceasion @ longitudinal shortening and transverse constric- | states that in a fasting dog the glands are shrunken, and tion of the stomach. By the action of the muscular coat | the axial cells are transparent, whilst during digestion the the food is churned about in the stomach, so as to become | peptic

glands are swollen out and ; thoroughly intermingled with the gastric juice. ‘The con- | the cells are clouded and granular.

traction of the sphincter pylori closes the pyloric orifice, The gastric glands are separated \ E and prevents the passage of the food into the duodenum, | from each other by slender pro- P| A before it is converted into chyme. longations of the muscularis mu- ane

The submucous coat consists of the areolar variety of | cose, and by the vascular inter- connective tissue, and lies immediately subjacent to the | glandular connective tissue, which oblique layer of the muscular coat. is soft and delicate, and contains

The mucous or internal coat lines the cavity of the | a small proportion of lymphoid stomach, and is continuous with the mucous membrane of | corpuscles diffused init. In some the esophagus and duodenum. It is a soft, pulpy | localities the lymphoid tissue may membrane, of a pink colour, which becomes redder during | be collected into solitary follicles, digestion, owing to turgescence of the blood-vessels, At | forming the lenticular glands of the pyloric end it is often stained yellow or green with bile, | the stomach. Beneath the glands and in old people it has a brown colour, from formation of | is a well-defined muscularis mu- pigment. In the empty stomach it is thrown into folds or | cose, arranged in two layers, mn eee ruge, which have usually a longitudinal direction, but | which gives off bundles that pass smZes\ when distended the rugs are obliterated, and the surface | between the gastric glands. of the mucous membrane is smooth. This membrane is| ‘The gastric mucous membrane Ee eee eet on anne commonly said to be thicker at the pyloric end than in the | is highly vascular; small arteries of a cat, to show the tubular fundus ; but Brinton, who had opportunities of examining | enter it from the submucous PG Sa. ine aland the stomach of healthy young adults immediately after | coat, and terminate in a capil- mouth: p, peptic cells; m,

° é : 3 interglandular muscular band; death, found the cardiac mucous membrane to be more | lary plexus, situated in the inter- », vessels surrounding tubular than twice as thick as the pyloric. He ascribes the thinning | glandular connective tissue sur. 20205 /“iemncous coat of the cardiac mucous membrane to the effects of post- | rounding the gastric

glands; a mortem digestion, owing to the gravitation of the gastric | vascular capillary ring surrounds the orifice of each gland. juice, in the recumbent position of the dead body, into the The pyloric valve is the name given tv the circular fold, fundus of the stomach. situated at the junction of the stomach and duodenum,

If the free surface of the gastric mucous membrane be | which surrounds the pyloric orifice. This fold is covered examined with a pocket lens it will be seen to be pitted | on its free surface by mucous membrane, which incloses the with shallow depressions or alveoli, polygonal in form, and | submucous coat and the circular layer of the muscular coat, varying from ;{5th to zi,jth inch in diameter. In the | but not the longitudinal layer, or the serous coat. That sides and bottom of each of these pits numerous rounded | portion of the mucous membrane which covers the gastric orifices may be seen, which are the mouths of the gastric | surface of the valve possesses the structure of the mucous secreting glands. If vertical sections be now made through | membrane of the stomach; whilst that which covers the the mucous membrane, these glands will be seen to be | duodenal surface is studded with villi, and possesses the tubular in form. structure of the intestinal mucous membrane.

In the human stomach the tubular glands are, for the The arteries of the stomach form arches along the greater most part, simple, almost straight cylinders, and possess an | and lesser curvatures, and anastomose in the anterior and average length of .1,th inch, and a breadth of about s15th | posterior walls of the stomach, The veins of the stomach inch. They are somewhat dilated at their orifices, and at | are rootlets of the portal vein. The lymphatics are numer-

» their closed ends give rise to ccecal pouches. For about | ous, and form a superficial and a deep set. The nerves of the upper fourth or fifth of their length the tubes are lined | the stomach are derived from the epigastric plexus of the by a single layer of columnar epithelium, continuous with | sympathetic and from the pneumogastric nerves. the columnar epithelium covering the free surface of the The Intestinal Canal, Intestine, Gut, or Bowel, is situated Intestinal gastric mucous membrane. In the rest of the gland-tube | in the abdominal cavity, and extends from the pyloric canal.

Brinton found two kinds of cells. The one, the so-called | opening, or gate, of the stomach to the orifice of the anus. peptte cells, about >,4,5th inch in diameter, and of an ovoid | In it the chyme becomes mingled with the bile, the pan- or somewhat. polygonal form, lay next to the wall of the | creatic fluid, and the secretions of the intestinal glands, gland. The other kind, somewhat cubical in form, lined the | and is converted into chyle. In it also the absorption of very narrow central canal of the gland, and formed an | the chyle takes place, and the insoluble part of the food is axial layer, which was continuous above with the columnar | passed onwards to be excreted in the form of feces. The epithelium lining the upper end of the tube. intestine is the longest division of the alimentary canal, and

It is in the dog and cat, however, that the structure of | measures on an average about 25 feet. It is primarily the gastric mucous membrane has especially been studied, | divided into two parts, called small intestine and large

and two kinds of glands have been described. ‘The one, | intestine ; the length of the small is about 20 feet, that of tuated especially in the region of the pylorus, consists for | the large about 5 feet.

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the most part of simple tubes, which may, however, branch The Small Intestine is the upper of the two divisions of Small

at their deeper end; they have been called the mucus | the canal, and consists of a convoluted, almost cylindrical intestine.

glands, They are lined by a columnar epithelium, the cells | tube, which reaches from the pylorus to the caecum, or

of which at the deeper end of the gland are more cubical in | commencement of the large intestine. It is subdivided into

form, and have a clouded granular appearance. ‘The other | three portions, named duodenum, jejunum, and ileum.

kind of gland is situated in the remaining part of the The Duodenum is the commencement of the small

gastric Mucous membrane, and consists of tubes which | intestine, and has received its name from its length being

divide usually into four branches ; they have been named | regarded as about equal to the breadth of twelve fingers.

the peptic glands. The cellular lining of these peptic | It forms the shortest and widest of the three sub-divisions

glands closely corresponds with the dimorphous arrangement | of the small bowel; it curves, in the form of a horse-shoe,

i the human stomach already referred to. Heidenhain | from the pylorus to opposite the left side of the body of VIL — 29

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the second lumbar vertebra, where it becomes continuous with tbe jejunum. The duodenum is distinguished from the rest of the small intestine by having the ducts of the liver and paucreas opening into its canal, by containing in its wall a collection of compound racemose glands, named the glands of Brunner, and by being developed from the primitive fore-gut, and not, like the jejunum and ileum, from the primitive middle gut. Like the stumach, it should be regarded as a distinct segment of the alimentary canal.

The Jejunum and Ilewm form by far the longest part of the small intestine, and are not separated from each other by any sharp line of demarcation — ~~the upper two~~ fifths being called jejunum, on account of its being usually empty after death, the lower three-fifths being termed ileum, from its

convoluted arrangement. They occupy the umbilical, hypogastric, right and left iliac regions of the abdomen, in which they are arranged in a series of coils or eonvolutions ; one or two coils of the ileum sometimes lie in the cavity of the pelvis, between the bladder and rectum. The coils are attached to the posterior wall of the abdomen, along a line from the body of the first lumbar vertebra to the right sacro-iliac joint, by the fold of peritoneum called the mesentery. Owing to the extent of the mesentery, the coils of the jejunum and ileum can be freely moved about in the abdominal cavity, so that they are apt to be dis- placed from their natural position, and, when a rupture occurs, to become the most usual contents of the hernial sac. The lower end of the ileum passes into the right iliac fossa, where it becomes continuous with the large intestine, at the junction of the ccecum and ascending colon. Though the line of demarcation between jejunum and ileum is an arbitrary one, yet the upper end of the jejunum may be distinguished from the lower end of the ileum by being wider, and having a thicker mucous membrane, in which the folds called valvule conniventes are larger and more numerous,

Structure of the Small Intestine-——The wall of the small intestine consists in the greater part of its extent of four coats, named, from without inwards, serous, muscular, submucous, and mucous coats.

The serous or external coat, derived from the peritoneum, forms a complete investment for the jejunum and ileum, and is continuous with the mesentery along a line of attachment, named the mesenteric border of the intestine ; but the serous covering of the duodenum is incomplete.

The muscular coat consists of non-striped fibres arranged in two layers from without inwards. The outer layer consists of longitudinal fasciculi, which form a thin layer parallel to the long axis of the intestine. The inner layer consists of cirewlar fasciculi arranged around the gut transverse to its long axis; this layer is thicker, stronger, und more highly coloured than the longitudinal layer. By the contraction of the muscular coat, the peristaltic or vermicular movement is produced, which propels the ingested materials along the intestine.

The submucous coat lies immediately subjacent to the circular layer of the muscular coat, and consists of areolar connective tissue; in it the blood-

vessels ramify before they pass into the mucous membrane.

The mucous or internal coat is a soft, velvety-looking membrane, which lines the wall of the small intestine, and possesses a complex appearance and structure. The inner sutface is not smooth, but is thrown into strongly-marked, transverse folds, the valvule conniventes, which are not obliterated during distension of the gut. They are very numerous in the duodenum and jejunum, but then decrease in size and numbers, until at the lower end of the ileum they have disappeared. Each valvula consists of a fold of the mucous membrane with its submucous coat. Owing to

their presence, the extent of the mucous surface is much greater than if it were a plane-surfaced membrane.

In its more minute structure the mucous coat may be regarded as composed of numerous projecting bodies, a glandular layer, and a muscular layer.

The projecting bodies are the intestinal Vili, which jut out into the lumen of the intestine from the free surface of the mucous membrane, not only of the valvulz, but. of the intermediate surface. They are delicate, minute processes, varying in length from a fourth to half a line, and in number aniount to several millions.

They are best examined when the mucous surface js placed in water or spirit, when they may be seen with the naked eye, or, still better, with a pocket lens ; when the chyle-vessels or blood-vessels are injected, they become erected, and staud out more prominently from the surface, They vary in form, being filiform, or cylindrical, or conical, or club-shaped, or Jeaf-shaped. They are more numerous in the duodenum and jejunum than in the ileum, and to their presence is due the velvety appearance of the mucous surface. They are not found elsewhere than in the small intestine.

As they are the parts of the mucous membrane directly concerned in the absorption of the chyle, their structure is interesting and important. Each villus is invested bya cap of epithelium continuous with the general epithelial covering of the mucous membrane. The epithelium con- sists of a

single layer of colwmnar cells, compactly arranged side by side. Scattered amidst the columnar cells are cells which possess the form of microscopic goblets, and are named goblet cells. The free end of each goblet cell appears to have an open mouth on the surface of the villus, through which a mucus-like substance exudes. Various opinions have been expressed as to the nature of these goblet cells. Some regard them as special struc- tures engaged either in the absorption of chyle, or the secretion of mucus; others look upon them as merely modifications of the columnar epithelium ; whilst others again consider them to be post-mortem productions, due t0 the swelling out of the columnar epithelium by the imbibition of fluid. There can be no doubt, however, that they are not specially concerned in the absorption of chyle, as cells of the same character are found in the respiratory mucous membrane, and on other surfaces, where the absorption of chyle does not take place.

The sub-epithelial tissue of a villus forms its matrix or basis substance, and consists of the sub-epithelial counec- tive tissue of the mucous membrane. When thin sections through a villus are examined, the matrix is seen to be

Fic, 4.—A, transverse seetion through an intestinal villus, showing ee thelial investment and the matrix of lymphoid tissue; ¢, columnar at re g, goblet-shaped cell; 7, lacteal; r, r, lymphoid.retiform tissue; % with versely divided blood-vessels. B, free ends of columnar epithelium, mouths of four goblet-shaped cells. X 300.

composed of a delicate retiform tissue, which forms a net work, in the meshes of which numbers of colourless lymphoid corpuscles are imbedded. These cells were described and figured by Goodsir, as the absorbing cells or vesicles of the villus. In the axis of the villus one, or perhaps two, minute lacteals or chyle vessels are situate 2 which serve as rootlets of origin of the lacteal- avi the lymph vascular system. The lacteal is a capillary tu>®

which ends near the apex of the villus, as a dilated

microscopic cul-de-sac. By becomes continuous with a submucous coat.

its opposite extremity it plexus of lacteals in the

In the matrix substance, around the

lacteal vessel of the villus, is a layer of non-striped muscular fibre-cells, which is continuous with the general muscular layer of the mucous coat, and extends as far as the apex of

the villus.

By the contraction of this layer the chyle

during absorption is propelled along the lacteal vessel. The villus also contains blood-vessels ; a small artery enters at its attached base, and terminates in a capillary plexus, situated in the peripheral part of the matrix, close to the

cap of epithelium ; from the leaves the villus at its base, submucous coat.

plexus a vein arises, which and joins the veins in the

Various theories have becn put forward to account for the mode of passage of the chyle, during digestion, from the lumen of the intestine into the lacteal vessels of the villi; but the question cannot even yet be regarded as definitely settled. The appearance of a network of minute tubules within the matrix, extending from the epithelial investment to the lacteal, which Letzerich supposed to be the channels along which the chyle flowed, is doubtless produced by the arrangement of the strands of the retiforn

tissue.

There seems little doubt that both the cells of the

epithelial investment and those of the retiform tissue of

the matrix become distended

previous to its passage into the lacteal.

with the particles of chyle The view advanced

by Schafer, that the corpuscles in the meshes of the retiform tissue may serve as carriers of the fatty particles of the ehyle into the lacteals, is but another mode of expressing the function of these cells advocated thirty years ago by

Goodsir,

The mucous membrane of the small

abundantly provided with secreting glands, named the glands of Brunner and of Lieberkiihn.

Brunner’s glands are con-

fined to the duodenum ; they ,

belong to the compound race- mose group of glands, and resemble generally in struc- ture the mucous and salivary glands. The minute lobules of these glands lie in the submucous coat, and the excre- tory duct pierces the mucous Membrane to open on the sur- face. The wall of the duct is formed of connective tissue lined by columnar epithelium. The finest branches of the duct are continuous with the acim or gland-vesicles, and the gland-vesicles contain the secreting cells, which are col- umnar in form. A plexus of capillary blood-vessels is dis- tributed outside the membrana propria of the gland-vesicles, and lymphatic vessels lie around the lobules,

intestine is

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Fig. 5.—Vertical section through the wall of the duodenum, showing the glands of Brunner. V, intestinal villi; L, layer of glands of Lieb: r- kiihn; m m, muscularis mueose; B, a Brunner’s gland, d, its excre- tory duct; SM, submucous coat; M, muscular coat; v, a small artery. x 40.

Into the duodenum, about the junction

of its descending and horizontal portions, the duct of the pancreas, and the bile duct from the liver, open by a

common orifice, as accessory

These glands may be regarded, therefore, glands to this portion of the small intestine.

The glands of Lneberkiihn are distributed throughout the

whol ¥

h € length of the mucous coat of the small intestine. °y are simple tubular glands, in shape like test tubes,

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which lie vertically in the mucous membrane, and form its proper glandular layer (figs. 5 and 6). The tubes are microscopic in size, vary in length from th to ith of a line, and are sometimes closely set together, but in the localities where the solitary and Peyer's glands occur they are more widely separated. The glands open on the surface of the mucous membrane between the villi ; and the opposite end of the tubes is closed and rounded, and reaches close to the muscular layer of the mu- cous coat. They are lined by a layer of columnar epithe- lium cells, continuous with the versely-divided blood-vessels. x 300. epithelial investment of the villi. The glands are separated from each other by retiform connective tissue, in the meshes of which colourless lymphoid corpuscles exist in consider- able numbers ; the plexus of capillary blood-vessels, which is distributed outside the membrana propria of the gland tube, lies in this connective tissue.

The connective tissue of the mucous coat is characterized generally by its retiform character, and by the diffusion of colourless lymphoid corpuscles in the meshwork. But in some parts of the mucosa these corpuscles, with their supporting framework of retiform tissue, are collected into distinct masses or follicles, visible to the naked eye, and known as the solitary and Peyer's glands or follicles.

The solitary glands are scattered throughout the whole length of the intestinal mucous membrane. They are about the size of millet seeds, and vary in number and distinct- ness in different individuals. ‘They are globular or ovoid in form, and occasion a slight elevation of the mucous membrane. One pole of the gland lies next the free sur- face of the mucous membrane, and is in relation to the columnar epithelium covering the mucosa, whilst the opposite pole rests on the submucous coat.

Peyer’s glands, or the agminated glands, consist of an aggregation of solitary glands or follicles, which are crowded together, so as to form distinct elongated patches, which may vary in length from }inch to 3 or 4 inches. The long axis of each patch corresponds to the long axis of the intestine, and the patches are placed opposite to the mesenteric attachment of the bowel. Villi either may

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Fia. 6.— Horizontal section througk the mucosa of the small intestine, to show the glands of Licberkithn L, and the interglandular retiform lymphoid tissue r, r. v, v, trans-

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Fia. 7.—Vertical section through a Peyer’s patch in the wall of the small in- testine. V, the intestinal villi; L, the layer of Lieberkiihn’’s glands; mm, the muscularis mucos; sm, the connective tissue of the submucous coat; P, the follicles of a Peyer’s patch (the two to the right are completely divided from the cupola to the base; the two to the left are cut through to one side of the apex); aa, small artcries in the submucous coat, which enter the follicles of Peyer, and form ¢, a capillary network; M, muscular coat. Slightly magnified.

or may not be situated on the surface of the patch, in the intervals between the individual follicles, but Lieberkiihnian glands are always found opening on the surface, and fre- quently forming a ring of orifices around each follicle. Peyer's patches are most abundant in the lower end of the

ileum, but diminish in size and numbers in its upper end and in the jejunum, and are absent in the duodenum.

These follicles are lymphoid organs, and are composed of lymphoid or adenoid tissue. The solitary and Peyer's glands, as is the case gencrally with the lymphoid organs, are more distinct and perfect in structure in infancy and childhood, than in adults or in advanced age.

The muscular layer of the mucous membrane lies next to the submucous coat, and consists of non-striped fibres which lie parallel to the surface of the membrane. It passes into the substance of the villi, and lies around the closed end of the glands of Lieberkiihn.

Of the blood-vessels of the small intestine, the arteries enter the wall of the jejunum and ileum at its attached or mesenteric border, and are branches from the arcades of the superior mesenteric artery. They run in the sub-serous tissue around the wall of the intestine; then pierce the muscular coat and supply it; they then enter the submucous coat, and a form a nétwork from which branches pass into the mucous coat. The veins accompany the arteries, and form rootlets of the superior mesenteric vein.

The lymph-vessels, or lacteals, may be traced into the wall of the intestine at the mesenteric border ; they form a net- work in the muscular coat, and then enter the submucous coat, where they are very abundant ; from this submucous layer offshoots pass through the retiform tissue, which lies between the Lieberkiihnian glands, into the villi. Where the solitary and Peyer's glands are situated, the lacteals, as Frey has pointed out, form a system of anastomosing vessels around the base and mesial part of each follicle.

The merves are derived from the plexuses of the sympathetic, which accompany the branches of the superior mesenteric artery. They form between the two layers of the muscular coat an important plexus, named, after its dis- coverer, Auerbach's plexus, in which large stellate nerve- cells are intermingled with nerve-fibres, and a similar nervous plexus is found in the muscular coat of the other divisions of the alimentary canal. It supplies and regulates the movements of the muscular coat.

The Large Intestine, though not nearly so long as the small intestine, is of much greater diameter. It reaches from the end of the ileum to the orifice of the anus, and is divided into the ccecum with the appendix vermiformis, the colon, and the rectum ; whilst the colon is subdivided into the ascending colon, the hepatic flexure, the transverse colon, the splenic flexure, the descending colon, and the sigmoid flexure.

The Caecum, the dilated commencement of the large intestine, lies below the ileum, and occupies the right iliac fossa. It forms a large cul-de-sac, closed in below, but communicating freely above with the ascending colon. Opening on the inner and posterior wall of the cecum is the appendix vermiformis, which is a slender hollow pro- longation of the bowel, varying in length from 3 to 6 inches. It has the calibre of the stem of acommon tobacco pipe, and ends in a free closed extremity, so that, like the cacum, it is a cul-de-sac. It is not generally found in mammals, but is present in man, the orang, certain lemurs, and the marsupial wombat.

The Colon extends from the cecum to the rectum, and forms the longest part of the large intestine. The trans- verse part of the colon lies immediately below the great curvature of the stomach, but owing to the length of the transverse meso-colon, which forms its peritoneal attach- ment, 1t not unfrequently undergoes sume change in its position, and may hang downwards towards the pelvis, or be elevated in front of the stomach, or thrown to the right or left side.

__ The sigmoid flexure of the colon is situated in the left iliac fossa, but as the sigmoid meso-colon, which forms its

peritoneal attachment, is of some length, it is freely movable, and not unfrequently hangs into the pelvis, or even extends across into the right iliac fossa.

The Rectum is the terminal segment of the large intestine, and extends from the sigmoid flexure to the orifice of the anus. It lies in the cavity of the pelvis. It commences opposite the left sacro-iliac joint, and passes at first obliquely downwards and to the right until it reaches the middle line of the sacrum ; secondly, it closely follows the curvature of the sacrum and coccyx, lying in relation to their anterior surface; thirdly, when it reaches the tip of the coccyx its terminal or third part inclines downwards and backwards for about 14 inch to the anal orifice. The anus opens on the surface of the middle line of the perineum, midway between the two ischial tuberosities, and the skin surrounding the orifice is thin, and wrinkled when the opening is closed. Immediately beneath the skin is the sphincter ant externus muscle, which forms a thin layer of fasciculi, arranged in a series of ellipses around the orifice. The sphincter in its normal condition of contraction simply closes the opening, but, under the influence of the will, a more powerful contraction can be induced, so as to resist the entrance of foreign bodies into the rectum.

The large intestine is arranged in the abdominal cavity in the form of an arch, the summit of which is the transverse colon, whilst the cacum and rectum are the right and left piers. Within the concavity of this arch the coils of the jejunum and ileum are situated. The large intestine is not, except in the rectum, a cylindriform tube, but is dilated into three parallel and longitudinal rows of sacculi, which rows are divided from each other by longitudinal muscular bands, whilst the sacculi in each row are separated externally by intermediate constrictions, In the rectum the sacculi have disappeared, and the intestine assumes a cylindrical form, but at its lower end it dilates into a reservoir, in which the faeces accumulate prior to being excreted.

At the junction of the large with the small intestine a valvular arrangement, termed the leo-ceecal or tleo-colic valve, is found. This valve is due to the peculiar manner in which the ileum opens into the large intestine.

The opening is bounded by two semi-lunar folds, which project into the large bowel. These folds are the two seg- ments of the valve ; one situated above the opening is the ileo-colie segment, the other, below the opening, the

Structure of the Large Intestine.-—The wall of the large intestine consists in the greater part of its extent of four coats, named, from without inwards, serous, muscular, sub mucous, and mucous coats.

The serous or external coat, derived from the peritoneum, forms a complete investment for the flexures of the colon, the transverse colon, and the first part of the rectum, but not for the czecum, or the ascending and descending colon. The second part of the rectum has only a partial serous investment, and the third part has no serous coat. Nume- rous pedunculated processes invested by the serous membrane, and containing lobules of fat, named appendices epuploicce, are attached to the large intestine.

The muscular coat consists of non-striped fibres arranged

L in,

in two layers from witnout inwards. The outer layer con- sists of longitudinal fascicull, which are not as a rule dis- tributed uniformly in the wall, but in the cecum and colon are collected into three longitudinal bands, which start from the caecum, where it is joined by the appendix vermiformis, and extend along the colon tothe rectum. As these bands are not so long as the colon itself, they oecasion the puckerings which separate the sacculi, so that when the bands are cut through the saceuli disappear. The colon then becomes more elongated and cylindriform.

In the appendix vermiformis the longitudinal layer is not collected into bands, but arranged uniformly along the wall. In the rectum, also, the longitudinal layer is spread uniformly along the wall, and forms a_ well-defined red-coloured layer.

The inner layer of the muscular coat consists of erreular fasciculi distributed around the wall of the large intestine. In the rectum this layer increases in thickness, and in proximity to the anus forms a circular muscle, the sphincter ant internus, which is a strong band, about half an inch broad, around the lower end of the rectum. In the large, as in the small intestine, the muscular coat occasions the peristaltic movements, and its increased thickness in the rectum is for the purpose of expelling the feces.

The submucous coat has similar relations and structure to the corresponding coat in the small intestine.

The mucous or internal coat is not thrown into valvule conniventes, but presents a series of well-marked permanent ridges, lying transversely or somewhat obliquely to the long axis of the gut, and corresponding internally to the constric- tions, which, on the outer surface of the colon, separate the sacculi from each other. The mucous membrane of the large intestine is covered by a layer of columnar epithelium. It is devoid of villi, and consists of a glandular and a muscular layer. The secreting glands of the glandular layer have the form and structure of the Lieberktihnian glands of the small intestine (fig. 7); they open on the free surface of the mucous coat, and, owing to the absence of villi, their mouths are more closely set together than is the case with the corresponding glands in the small intestine ; the tubular glands are separated by a retiform tissue with lymphoid corpuscles. Solitary glands, similar to those in the small intestine, are also present, but no Peyer’s patches, The muscularis mucose resembles generally that of the small intestine.

Of the blood-vessels of the large intestine, the arteries are principally derived from branches of the superior and inferior mesenteric arteries, but the lower end of the rectum receives the hemorrhoidal branches of the internal iliac and the pudic. The veins which correspond to these arteries for the most part join the superior and inferior mesenteric veins, and are consequently rootlets of the portal. But the veins which belong to the middle and Inferior hemorrhoidal arteries form a plexus about the anal orifice, which partly joins the superior hemorrhoidal vein, and through it the portal vein, and is partly connected through the middle and inferior hemorrhoidal veins with the internal iliac vein, and through it with the

inferior vena cava, The veins about the anus are very apt to become Varicose, and to form the excrescences termed hemorrhoids or piles. The lymph vessels are arranged as in the small intestine, except that they are not prolonged into villi, Nervous plexuses with ganglion cells are found in both the muscular and.submucous coats. They proceed from the superior and inferior mesenteric plexuses, but the rectum receives branches from the hypogastric plexus, and from the third and fourth sacral spinal nerves.

The Liver is the biggest of the abdominal viscera, and the largest, gland in the body. It is the organ in which the secretion of bile takes place, and is the chief seat in the

body of the formation of glycogen, a substance like dextrin, which readily undergoes conversion into sugar. It lies in the costal zone of the abdomen, fills up the greater part of the right hypochondrium, and extends, through the epigastrium, into the left hypochondrium. In its long or transverse diameter it averages about 12 inches, in its antero-posterior diameter about 6 inches, in the vertical diameter of its thickest part about 3 inches. Relatively to the size of the body the liver is bigger and heavier in the foetus than in the adult; soon after birt the relative weight declines, and that of the left lobe diminishes much more rapidly than the right lobe. Frerichs states that the relative weight of the healthy liver fluctuates in adults between ; th and j>th of that of the body, and the absolute weight varies from 1°8 to 4°6 pounds avoird. During the digestion of the food the liver increases both in size and weight, partly from the greater quantity of blood flowing through it, and partly from the new material in the secreting cells ; whilst after a long fast it becomes smaller and lighter.

For descriptive purposes the liver may be regarded as having two surfaces, two borders, and two extremities.

The superior or diaphragmatic surface is smooth and convex, and attached to the diaphragm by the falciform ligament.

The posterior or vertebral border is comparatively thick, and attached by the coronary ligament to the diaphragm. The anterior border of the liver is unattached, thin, and attenuated, and is marked by a deep notch, opposite

the anterior edge of the falciform ligament, which lodges the round ligament of the liver.

Of the two extremities of the liver the right is thick and massive, and lies deep in the right hypochondrium, in con- tact with the diaphragm; the /eft is thin and attenuated, and overlaps the cesophageal opening and fundus of the stomach.

The inferior or visceral surface of the liver is much more complex in form than the upper. The longitudinal or umbilical fissure, continuous with the notch in the anterior border of the liver, and much nearer to the left than the right extremity of the gland, divides it into a large right

Fie. 8.—Under surface of the liver. R, right lobe; L, left lobe; Q, lobus quad- ratus; §, lobus Spigelli; C, lobus caudatus; p, pons hepatis; //, longitudinal fissure; ¢, transverse fissure; ¢/, caudate fissure; of, fossa for vena cava; kf fossa for right kidney; G, gall bladder in its fossa; w, obliterated umbilical yein; v, obliterated ductus venosus; IV, inferior vena cava; h, h, hepatic veins; P, portal vein; A, hepatic artery; D, bile duct; c, coronary ligament; liand 77, left and right lateral ligaments; s, suspensory ligament; r, round ligament.

and a small left lobe. In the anterior part of.the fissure the round ligament, formed by the obliteration of the umbilical vein of the foetus, is lodged ; whilst the posterior part contains a slender fibrous cord formed by the oblitera- tion of a vein of the foetus, named ductus venosus. The longitudinal fissure is often bridged across by a band of

liver substance called pons hepatis. The under surface of the left lobe is smooth, and overlaps the anterior surface of the stomach. The under surface of the right lobe is divided into smaller lobes by fissures and fosse. Starting from about the middle of the longitudinal fissure is the portal or transverse fissure, which extends for from 3 to 4 inches across the under surface of the right lobe. It is the gate (porta) of the liver, the hzlus or fissure of entrance into the organ of the portal vein, hepatic artery, hepatic duct, and hepatic nerves and lymphatics. A short distance to the right of that part of the

longitudinal fissure in which the round ligament lies, is the fossa for the gall bladder, which is a depression on the under surface of the right lobe extending from the anterior border to the transverse fissure : in it the gall bladder lies. Extending somewhat obliquely from the posterior border of the liver, towards the transverse fissure, is a deep fossa for the inferior vena cava. Opening into the vena cava as it lies in this fossa are the trunks of the large hepatic veins from the substance of the liver. A portion of liver substance, which is bounded by the gall bladder, the longitudinal fissure, the transverse fissure, and the anterior border, forms a four-sided lobe called lobus guadratus. Another portion, bounded by the transverse fissure, the posterior border, the vena cava, and the longitudinal fissure, is the lobus Spigeliit, A thin pro- longation of liver substance continuous with the lobus Spigelii, and running obliquely between the fossa for the inferior cava and the transverse fissure, is the lobus caudatus.

Structure of the Liver.—The liver is a solid organ, of a brownish-red colour. It is composed of the ramifications of the portal vein, of the portal capillaries, the hepatic vein, the hepatic artery, the hepatic duct, of secreting cells, nerves, and lymphatics. These several structures are bound together by connective tissue, and the organ is invested by the peritoneum. The liver possesses two coats, a serous and a fibrous.

The serous or external coat is a part of the peritoneal membrane, and forms an almost complete investment for the liver. It is reflected from the transverse fissure as the gastro-hepatic omentum, and from the upper surface and the posterior border as the falciform, coronary, and right and left lateral ligaments of the liver.

The fibrous coat, or tunica propria, is immediately sub- jacent to the serous coat. When carefully raised from the liver delicate processes of areolar tissue may be seen to pass from its deep surface into the substance of the organ, At the transverse fissure it is prolonged into the liver as a very distinct sheath, enveloping the portal vein, hepatic artery, hepatic duct, nerves, and lymphatics. This sheath is named the capsule of Glisson, and is prolonged through- out the substance of the organ, along the ramifications of the portal vein and the structures that accompany it.

Lobules of the Liver.—To the naked eye the substance of the liver does not present a homogeneous aspect, but is mottled, and mapped out into multitudes of small areas or lobules,—the hepatic lobules or leaflets. The lobules of the liver are irregular polygons, and vary in size from jth to goths of an inch. In manand the mammalia generally the lobules are imperfectly separated from each other by the interlobular vessels and duct, and a scarcely appreciable quantity of areolar connective tissue. In the pig, camel, and polar bear, each lobule is circumscribed by a definite capsule of connective tissue.

As a lobule of the liver is a liver in miniature, and as the structure of the entire liver is the sum of the structure of its lobules, it will be necessary to examine with care the constituent parts of a lobule, and the arrangement of the vessels, duct, and nerves which pass to and from it. An hepatic lobule is composed of blood-vessels, secreting cells,

and bile-ducts, with perhaps nerves and lymphatics, ‘The blood-vessels will first be considered.

The portal vein conveys to the liver the venous blood from the stomach, spleen, pancreas, gall bladder, and small and large intestine. It ascends to the transverse fissure, and before it enters the liver divides into two branches, one for the right and one for the left lobe. In its course within the liver, the portal vein divides and subdivides after the manner of an artery. It is closely accompanied by the hepatic artery and duct, and, along with them, is invested by the fibrous sheath, called Glisson’s capsule. The terminal branches of the portal vein run between the lobules, and are named, from their position, the

SSS lobule to some extent iN NEF; S communicate with i) » Gs those of adjacent \ 4 lobules. JZ The hepatic artery * closely accompanies the portal vein, and Fie. 9.—Transverse section through the hepatic

ae ¢ lobules. 7, ¢, 4, interlobular veins ending in the divides into =two__ intralobular capillaries ; c, c, central veins be by the intralobular capillaries, At a, @ the

branches, for the capillaries of one lobule communicate with

right and left lobes. It is the nutrient artery of the liver, and gives off three series of branches :—(a) vaginal branches, which are dis- tributed to the walls of the portal vein, the hepatic duct, and to Glisson's capsule, probably also to the wall of the hepatic vein; they end ina capillary network in these structures, from which vaginal veins arise that terminate in the portal vein; (b) capsular branches, which are dis- tributed to the fibrous coat of the liver, and end in a capillary network, from which arise capsular veins that join the portal vein; (c) interlubular branches of the hepatic artery lie along with the interlobular branclies of the portal vein, and end in the capillary network within the lobules.

The hepatic vein arises within the substance of the liver from the intralobu- lar capillaries. In the centre of each lobule is the intra- lobular or central ven, It traverses the axis of the lobule, and leaves it to join a small vein running immediately under the bases of adjacent lobules, which, from its position, is named the sublobular vein. Fre. 10,—Vertical section through two hepatic

Q Jobules of a pig. c, c, central veins receiving Adj acent sublobular the intralobular capillaries ; s, sublobular vein; veins then join to-

cet, interlobular connective tissue forming the ether and form '

capsules of the lobules; 4, 7, interlubular veins. larger vessels, which are the trunks of the hepatic vei, oF

those adjacent to it,

' the hepatic venous canals. These trunks run towards the posterior border of the liver, and open into the inferior vena cava.

From this description of the vascular arrangements within the liver, it will be seen that the intralobular capillaries are continuous with three vascular trunks,—two which carry blood to them, the portal vein and the hepatic artery, and one which conveys the blood away from them, the hepatic vein.

‘The communication in each case is so free that the capillaries can be artificially injected from any one of these vessels.

The secreting cells of the liver, hepatic cells, form the proper parenchyma of the organ. They are situated within the lobules, and occupy the spaces of the capillary network. The cells vary in diameter from },th to >o/s9th inch; they have the form of irregular polyhedrons, with from four to seven sides, and with the angles sometimes sharp, at other times rounded. They do not appear to possess definite walls, but have a distinct nucleus. The cell protoplasm is granular, and usually contains fat drops, and yellow particles, apparently bile pigment. The general arrangement of. the calls is in rows or columns, and when sections are made through a lobule, transverse to the long axis of the central vein, the columns of cells are seen to converge from the periphery te the centre of the lobule, and to form a net- work,

By many observers the cells are regarded as in contact with

Fie. 11.—Transverse section through lobules of human liver to show the columns of secreting ceils. c,c,

6 3 3 central veins; ¢, interlobular vein the intralobular capillaries, with a fine sheath of connective without the intervention of sue * 10. au intermediate membrane. By others, and more

especially by Lionel Beale, the secreting cells are regarded as inclosed in a tubular network, the wall of which is formed by a basement membrane. Beale states that the diameter of the network is usually about roooth of an inch in most mammals. According to this view, the cells are not in direct contact with the capillary blood-vessels, but separated fron them by the basement membrane. In some parts of the lobule Beale has been able to demonstrate the basement membrane as distinct from the wall of the capillaries, but usually they are incorporated together. At the periphery of the lobule the membrane becomes continuous with the wali of the interlobular duct.

The hepatic or bile duct is the tube that conveys the bile out of the liver. It lewes the transverse fissure as two branches, one from the right, another from the left lobe, which almost immediately unite at an acute angle. It closely accompanies within the liver the ramifications of tne portal vein and hepatic artery, and its terminal branches yee between the lobules to form the interlobular branches a the duct. If the hepatic duct be injected, not only does the Injection fill the interlobular ducts, but it flows into a o of excessively minute passages within the lobules them-

se These passages are arranged so as to form a fe age network, which may appropriately be called the ra. obular biliary network. This network has a most in-

imate relation to the polyhedral hepatic calls, for the ae lie between the flattened sides of adjacent cells, so on each cell is inclosed in a mesh of the network. The

“ian observers, who first directed attention to these ina named them bile-capillaries, but it is probable

at they are merely intercellular passages bounded by the Protoplasm of the hepatic cells. yal. intralobular biliary network differs from the intra-

ar blood capillary network, not only in the character

of the fluid conveyed, but in other important particulars, The bile passages have a tranverse diameter of about 544th of that of the blood capillaries; the passages are in relation to the sides of the cells, the blood capillaries to their angles, so that the two systems of networks are not in contact with each other, but are separated by intervening hepatic cell sub- stance ; the passages have not, in all probability, an inde- pendent wall, such as is possessed by the blood capillaries. As these passages can be injected from the hepatic duct, and as they convey bile from the interior of the lobule into the duct, it is obvious that they must be continuous with the lumen of the interlobular branches of the duct, at the periphery of the lobules.

The wall of the larger bile ducts is formed of a fibro- elastic tissue, with a proportion of non-striped muscular fibre ; it is lined by a columnar epithelium. Opening into the larger ducts are numerous orifices, which communicate with branched cecal tubes and follicles, situated within and clustered around the walls of the larger ducts, often in con- siderable numbers. Some of these appendages to the duct doubtless serve as glands for the secretion of mucus, but others are probably, as Beale supposed, mere diverticula cf the duct, in which the bile may be temporarily retained, as in the gall bladder.

The lymphatics of the liver form a superficial and a deep set. The superficial set ramifies beneath the serous coat, where they form a network. The deep lymphatics accompany the portal vein and hepatic artery as far as the intervals between the lobules, where they form znterlobular lymphatics,

which, like the corresponding branches of the portal vein, run around the lobule.

The nerves of the liver arise from the cceliac plexus of the sympathetic and from the left pneumogastric. They accompany the portal vessels in their distribution, and supply the muscular coats of the vessels.

The Gall Bladder is a reservoir for the bile, situated Gall in a fossa on the under surface of the right lobe of the ladder.

liver, and in a notch in its anterior border (fig. 8). It is pyriform in shape; its larger end, or fundus, projects beyond the anterior border; its opposite end, or neck, gives origin to the cystee duct, which is directed towards the transverse fissure ; after a course of 14 inch it joins the hepatic duct, and forms the common bile duct, ductus communis choledochus. At its neck, the gall bladder bends on itself in a sigmoid curve. The gall bladder is 3 or 4 inches long, and can hold from one to two ounces of bile. It is attached to the liver partly by areolar tissue, and partly by the peritoneum, which is reflected over its free surface.

Structure——In addition to its partial serows coat, the gall bladder has a fibrous and mucous coat. The jibrous coat consists of interlacing bands of connective tissue, with which non-striped muscular fibres are sparingly inter- mingled. The mucous membrane lining the gall bladder is deeply bile-stained, and presents on its free surface an alveolar appearance, due to the presence of multitudes of minute folds, which form a reticulum with intermediate depressions. The surface is covered by columnar epithe- lium. The mucous lining of both the neck of the gall- bladder and cystic duct is thrown into folds, which in the duct have an oblique direction, and form the spiral valve, Racemose glands, for the secretion of mucus, occur in the wall of the gall bladder, cystic duct, and common bile duct. The gall bladder is supplied with blood by the cystic branch of the hepaticartery. It receives lymphatics and nerves continuous with those which belong to the liver.

The common bile duct, formed by the junction of the cystic and hepatic ducts, is about 3 inches long, and con- veys the bile into the duodenum. It lies in the gastro-

hepatic omentum between its two layers, having the hepatic artery to its left, and the portal vein behind it. It then inclines behind the duodenum to the inner side of its descending part, where it comes into relation with the pancreatic duct. The two ducts then run together in an oblique direction throvgh the wall of the duodenum, and open on the summit of a papilla, by a common orifice, about the junction of the descending and transverse portions of the duodenum. :

The PANoREAS is an elongated gland which lies in relation to the posterior wall of the abdomen, in front of the first lumbar vertebra, and extends obliquely from the right lumbar region through the epigastrium into the left hypochondriac region. It is from 6 to 8 inches long, and whilst its dilated right extremity, or head, occupies the liorse-shoo curve of the duodenum, and is attached by areolar tissue to the descending and transverse portions, its attenuated left extremity, or ¢ail, is in relation to the spleen. A prolongation of the gland, named the accessory or lesser pancreas, usually surrounds the superior mesenteric artery at its origin,

Structure.—The pancreas is one of the compound

ricemose glands, and resembles generally in structure the uiucous and. salivary glands of the mouth and the glands of Brunner (fig. 5). It is sometimes called the ab- dominal salivary gland, and its secretion flows into the duodenum, and assists in the process of chylification, It has a yellowish creamy colour, and is divided into distant lobules by septa of connective tissue. The excretory duct, or duct of Wirsung, is completely surrounded by the lobules, and extends from the tail to the head of the gland, receiving in its passage the numerous secondary ducts, and increasing gradually in size. It leaves the head of the gland, comes into relation with the common bile duct, and with it pierces obliquely the posterior wall of the descend- ing part of the duodenum, to open by a common orifice about the junction of the descending and transverse

portions. Sometimes the duct froin the accessory part of the pancreas opens independently into the duodenum, a little above the common hepatico-pancreatic orifice. The finest ducts within the gland terminate in the acini, or gland-vesicles, of the lobules. These acini contain the secreting cells, which have a somewhat cubical form. The ducts are lined by a columnar epithelium, and mucous glands are situated in the mucous membrane lining the duct of Wirsung. The pancreas receives its supply of blood from the splenic, superior mesenteric, and hepatic arteries. Its veins join the splenic and superior mesenteric veins, and through them contribute to the formation of the portal vein. Its blood capillaries are abundantly distri- buted on the walls of the gland vesicles. Lymph vessels are found in the connective tissue between the lobules, The nerves are derived from the solar plexus, and accom- pany the arteries. _ Tue Treru.—tThe teeth are calcified organs developed in connection with the mucous membrane of the mouth. Their primary use is that of biting and grinding the food ; but in man they serve as aids to speech, and in many animals act as instruments of offence and defence.

Arrangement and Form of the Teeth.—Teeth are present in the greater number of the Mammalia, in which class they are implanted in sockets in the alveolar arches of the bones of the upper and lower jaws, and form only a single row in each arch, In a few mammals, as the toothed whales and the sloths, only one generation of teeth is produced, aud when these drop out they are not replaced by Successors ; these animals are called Monophyodont. In the majority of the Mammalia, however, there are two generations of teeth,—a temporary or milk set, which are deciduous, and are replaced by a permanent or adult set ;

these a1.imals are called Diphyodont. But in speaking of two generations of teeth it is not to be supposed that all the teeth in the adult jaw have had temporary predecessors, for the molar or back teeth have only a single generation, A few mammals, as the toothed whales, have the teeth uniform in size, shape, and structure, and are named Homodont ; but, in the majority of the Mammalia, the teeth in the same jaw vary in size, form, and structure, and they are therefore called Heterodont. In every Heterodont

mammal, possessing a complete dentition, four groups of teeth are found, which are named incisor, canine, premolar, and molar teeth. Each of these teeth possesses a crown, which projects into the cavity of the mouth, and a fang lodged in the socket in the jaw ; at the junction of the crown and fang there is usually a coustriction named the neck of the tooth,

In man the dentition is / Diphyodont and Heterodont. Vidi the cows; 5 a The single row of teeth in each {hua tooth? 2, cay of ene 4 alveolar arch of the human cement; d, dentine; p, pulp cavity, jaw is characterized by the crowns of the teeth being of almost equal length, and by the absence of any great interspace, or diastema, between the different teeth, or of irregularities in the size of the interspaces, so that the teeth form an unbroken series in each jaw. The span of the upper dental arch is slightly bigger than that of the lower, so that the lower incisors fit within the upper, and the lower molars, being inclined obliquely upwards and inwards, are somewhat overlapped by the upper molars. The upper and lower dental arches terminate behind in line with each other, and the teeth are equal in number in the two jaws.

Man possesses 32 teeth in his permanent dentition, arranged in four groups, viz.—8 incisors, 4 canines, 8 pre- molars or bicuspids, and 12 molars, The number and arrangement of the permanent teeth in the two jaws is expressed in the following formula :—

™. pm. c in. in. om pm. m.

3 2 1 2 2 1 2 3

38 2 i 2 2 1 2 3

Man possesses only 20 teeth in his milk or temporary

dentition, and their arrangement is expressed in the follow- ing formula :—

=32.

m. c. in. in. c. m. g 1 2 g 1 2 ; T 3 : ——

If the temporary and permanent formule be compared with each other, it will be seen that, while the incisors and canine teeth correspond in numbers in both dentitions, 1 the temporary dentition there is an absence of premolars, and the molar teeth are only eight, instead of twelve, m number. The characters of the permanent teeth will now be considered.

The incisor teeth, eight in number, are lodged in the front of the jaws, two on each side of the mesial plane. ‘The upper incisors project downwards and forwards, the lower are directed almost vertically upwards. The oblique direction of the upper incisors in the Negroes, Kaffres, and Australians adds to the prognathic form of the face possessed by these races. The central pair of uppet incisors are larger than the lateral; whilst the lateral pair of lower incisors are larger than the ceutral pair, which are the smallest incisor teeth. The crowns of the incisor teeth are chisel-shaped, and adapted for biting and cutting the food. When the crown is first erupted the cutting edge minutely serrated, but the serrations soon wear down by use. The fangs are long and simple,—being in the upp

incisors round and fusiform, in the lower laterally com- pressed, and sometimes marked by a longitudinal groove. Although the human incisors are, as the name implies, cutting, chisel-shaped teeth, in many mammals the incisors are greatly modified in form, as for example in the tusks of the elephant. The determination of the incisor teeth does not depend, therefore, on their form, but on their position in thejaws. The name incisor is given to all the teeth situated in the pre-maxillary portion of the upper jaw, and in the anterior end of the lower jaw, whatever their shape may be.

The canine or wnicuspid teeth, four in number, one on each side of the mesial plane of each jaw, are placed next the lateral incisors. and the upper canines, which are sometimes called the eye- teeth, are larger than the lower; the fangs of the upper canines are lodged in deep sockets in the superior maxilla, which extend towards the floor of each orbit. The crowns of these teeth are thick and conical; the fangs are long, single, conical, compressed on the sides where they are marked by a shallow groove. In many mammals these teeth are developed into large projecting tusks.

The premolar or bicuspid teeth, eight in number, two on each side of the mesial plane of each jaw, lie imme- diately behind the canines, and the upper bicuspids are somewhat larger than the lower. The crown is quadri- lateral in form, and convex both on the inner and outer surfaces. It possesses two cusps, of which the outer or labial is larger and more projecting than the inneg palatal, or lingual cusp. The fangs of the upper bicuspids are single and laterally compressed, often bifid at the point into an outer and inner segment ; in the lower bicuspids the fangs are rounded, and taper to a single point.

The molar or multicuspid teeth, twelve in number, are placed three on each side of the mesial plane of each jaw. They are the most posterior teeth, are the largest of the series, and as a rule decrease in size from the first to the last; the crowns of the lower molars are somewhat bigger than those of the upper molars. The last molar tooth does not erupt until the end of puberty, and is called dens sapientio, or wisdom tooth. The crowns are broad, quadrilateral, and convex both on the inner and outer sur- faces. The first and second upper molars have four cusps projecting from the angles of the grinding or masticating surface, and an oblique ridge often connects the large anterior internal cusp with the posterior external cusp; in the upper wisdom teeth, the two inner or palatal cusps are frequently conjoined. The first lower molar has five cusps, the fifth being interposed between the two posterior cusps ; in the second lower molar the fifth cusp is usually absent, or only rudimentary in size, but in the lower wisdom tooth it 18 often present. The fangs of the first and second upper molars are three in number, and divergent; two on the outer or buccal side, one on the inner or palatal side ; In the upper wisdom the fangs are frequently partially Conjomed, though trifid at the point. The fangs of the first and second lower molars are two in number, an anterior and a posterior, of which the anterior is the larger ; they usually curve backwards in the jaw ; in the lower Yn the fangs are usually conjoined, but bifid at the

int.

The crowns of all the teeth become more or less flattened Y use, so that the incisors lose their sharp cutting edge, and the cusps of the premolars and molars are worn away,

The temporary or milk teeth are smaller than the per- manent teeth. ‘They are more constricted at the neck, where the crown joins the fang, especially in the milk molars, the fangs of which also diverge more widely than in the permanent set. The second temporary molar is bigger than the first. The crown of the first upper molar

as three cusps, two buccal, one palatal ; that of the second

They are bigger than the incisor teeth, j

- The animal matter is resolved

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four cusps. The crown of the first lower molar has four cusps ; that of the second five, three of which are buccal, two lingual. The temporary teeth lie more vertically in the jaws than the permanent.

The alveolus, or socket for the lodgment of the single fanged teeth, is a single socket ; in the multi-fanged teeth, the socket is divided into two or three compartments, according to the number of the fangs. The socket is lined by the alveolo-dental periosteum, which is continuous at the mouth of the socket with the periosteal covering of the jaw, and with the deeper fibrous tissue of the gun, where it embraces the neck of the tooth. The alveolo-dental periosteum is formed of retiform connective tissue, on the one hand connected with the surface of the cement, on the other with the more fibrous periosteum lining the bony wall of the socket (fig. 15), It is vascular, its vessels being continuous with those of the gum, the pulp-vessels, and the bone. It receives nerves from those going to the pulp. The fang fits accurately in the socket, and through a hole at the tip of the fang the blood-vessels and nerves of the tooth pass into the pulp-cavity of the tooth.

Structure of the Teeth.—Kach tooth is composed of the following hard structures—dentine, enamel, and cement or crusta petrosa ; occasionally other substances, named osteo- dentine or vasodentine, are present. In a tooth which has been macerated, an empty space exists in its interior, called the pulp-cavity, which opens externally through the hole at the tip of the

fang; but in a living tooth this cavity contains a soft, sensitive substance named the pulp.

The Dentine, or Ivory, makes up the greater part of each Dentine,

tooth ; it is situated both in the crown, where it is covered by the enamel, and in the fang, where it is invested by the crusta petrosa ; whilst the pulp cavity in the centre of the tooth is a cavity in the dentine. The dentine is composed of an intimate admixture of earthy and animal matter in the proportion of 28 of the animal to 72 of the earthy.

on boiling into gelatine ; the Ms oe

earthy matter consists mostly UU we 7. of salts of lime. OU TIT Se

If thin slices through the Fie. 13.—Transversc section throu, h the dentine of a macerated tooth crown of a tooth. p, pulp cavity; a,

5 7 S dentine; e, enamel.

be examined microscopically,

it will be seen to consist of a hard, dense, yellowish- white, translucent matrix, penetrated by minute canals, called dentine tubes. The dantine tubes commence at the pulp cavity, on the wall of which they open with distinct orifices. They radiate in a sinuous manuer from the pulp cavity through the thickness of the dentine, and terminate by dividing into several minute branches ; this division takes place in the crown of the tooth immediately under the enamel, and in the fang of the tooth immediately under the crusta petrosa. In their course the dentine tubes branch more than once in a dichotomous inanner, and give off numbers of extremely minute collateral branches, The transverse diameter of the dentine tubes near the pulp cavity is zs49th inch, but that of their terminal branches is much more minute.

If the dentine be examined in a fresh tooth, the tubes will be seen to be occupied by soft, delicate, thread-like prolongations of the pulp. The passage of processes of the pulp into the dentine tubes was first seen by Owen in the examination of the tusk of an elephant; but the soft con- tents

of the dentine tubes have been made the subject of special investigation by J. Tomes in the human and other mammalian teeth, and have been named the dentinal fibrils.

Ia sections through the dentine of dried teeth, it is not uncommon to find, near its periphery, irregular, black

VIT. — 30

Enamel.

Cement.

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spaces containing air. ‘These spaces freely communicate with each other. As the dentine which forms their boundary has not unfrequently the appearance of globular contours, they were named by Czermak the interglobular spaces. In a fresh tooth they are not empty, but are occupied by a soft part of the matrix, which is traversed in the usual manner by the dentine tubes. This matrix is apparently imperfectly calcified dentine, which shrinks up in a dried tooth, and occasions an air-containing space. A layer of small irregular spaces situated in the peripheral part of the dentine in the fang, immediately under the crusta petrosa, and sometimes named the granular layer, is apparently of the same nature as the interglobular spaces.

The “name is the brilliant white layer which forms a cap on the surface of the crown

of a tooth. It is thickest grinding surface of the crown, and thins away it disappears. It is not only the hardest part of tissue in the body, and consists of 96°5 per cent. cent. of animal matter. The earthy matter consists lime. The great. hardness of the enamel admirably e < enamel and immediately subjacent the cutting edge, or grind- dentine; e, enamel rods; d, branched Ing surfaces, of the crowns verse section through the enamel rods. 8, trausverse section through dentine The enamel is composed of microscopic rods,—the enamel fibres, or enamel prisms. each other ; one end of each rod rests on the surface of the dentine, the other reaches the free surface of

other, for whilst some are straight, others are sinuous, and the latter seem to decussate with each other. The solid structures in the fully formed enamel. When cut across transversely, they are seen to be hexagonal or The free surface of the enamel of an unworn tooth is covered by a thin membrane, named the cuticle of the demonstrated by digesting an unworn tooth in a dilute mineral acid, when it separates as a thin flake from the resists the action of acids. Its deep surface is pitted for the ends of the enamel rods, As the crown of the tooth enamel itself by prolonged use is thinned and worn down. In persons who live on hard food, that requires much of the crowns of the molar teeth worn down quite flat, and the dentine exposed. covering for the surface of the fang of a tooth, and extends upwards to the neck. It is ef a yellowish colour, aud is . . ° 5 as ° multifanged teeth it sometimes forms a thickish mass at structure of bone, and consists of a lamellated matrix with perforating fibres, lacunz, and canaliculi. The lacunz are

on the cutting edge or towards the neck, where a tooth, but the hardest of earthy and of 3°5 per almost entirely of salts of adapts it as a covering for F:6. 14-1, Vertical section through th termination of dentine tubes, 2, trans-ab ia Seek tubes and matrix, x 300. These rods are set side by side in close contact with the crown. The rods do not all lie parallel to each rods are marked by faint transverse lines, and are pentagonal, and about <>),5th inch in diameter. enamel, or Nasmyth’s membrane. This membrane can be free surface of the crown. It is a horny membrane, which comes into use, Nasmyth’s membrane is worn off, and the mastication, it is not uncommon to find the grinding surface The Cement, Crusta Petrosa, or Tooth Bone, forms a thin usually thickest at the point of the fang ; though in the the point of convergence of the fangs. It possesses the irregular in size and mode of arrangement, and vary also in

the number of the canaliculi proceeding from them. Some times the canaliculi anastomose with the branched terminations of the dentine tubes. In the thin cement situated near the neck of the tooth the lacunz are usually absent. If the jaw with its contained teeth be softened in acid, and sections be made so as to show the teeth in situ, there is no difficulty in recognizing

the cellular masses of nucleated protoplasm within the lacune, which resemble in

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Fic. 15.—Scction through the socket and fang of a tooth. 6, the bony wall ofa socket, its lacune containing the bone corpuscles; J, the fibrous, and”, the reti- culated portion of the alyeolo-dental periosteum, in which transversely divided vessels, v, v, may be scen; c, the cement, the lacunz of which contain the bone corpuscles; d, the dentine. X 450.

appearance the corresponding structures in the adjacent bone. Haversian canals are only found in the cement when it acquires unusual thickness. In old teeth the cemeutathickens at the tip of the fang, and often closes up the orifice into the pulp cavity ; the passage of the nerves and vessels into the pulp is thus cut off, and the nutrition of the tooth being at an end, it loosens in its socket and drops out.

Osteo-dentine and Vaso-dentine do not exist as normal structures in human teeth, though they occur in various animals. They may appear, however, as abnormalities in the human teeth, and are found on the inner wall of the pulp cavity. Osteo-dentine consists of dentine structure, intermingled with lacunz and canaliculi. If vascular canals, like the Haversian canals of bone, are formed in it, then the name vaso-dentine is applied.

The Pulp of the tooth is one of its most important con- stituents. It is a soft substance occupying the cavity in the dentine, or the pulp cavity, and is destroyed in 4 macerated and dried tooth. It consists of a very delicate gelatinous connective tissue, in which numerous cells are imbedded. Those which lie at the periphery of the pulp are in contact with the dentine wall, and form a layer, named by Kdlliker the membrana eboris. As the cells of this layer play a part in the formation of the dentine similar to that performed by the osteoblast cells in the formation of bone, Waldeyer has named them odontoblasts. The odontoblasts are elongated in form, and their protoplasm gives off several slender processes; some enter dentine tubes to form the soft dentinal fibres already described ; one passes towards the centre of the pulp, to become con- nected with more deeply-placed pulp cells ; whilst others are given off laterally to join contiguous cells of the odontoblast layer. The pulp contains the nerves and blood-vessels of the tooth, which pass into the pulp, through the foramen at the point of the fang. The vessels form @ beautiful plexus of capillaries. The nerves are sensory branches of the fifth cranial nerve. They enter the pulp as medullated fibres, which divide into very fine non- medullated fibres, that form a network in the peripheral portions of the pulp. The pulp of the tooth is the remains of the formative papilla, out of which the dentine or 1vory has been produced. In adult teeth changes that lead to the production of osteo-dentine and vaso-dentine may take place in it. Through the dentinal fibres an organic con nection is preserved between the dentine and the pulp, and

the sensitiveness exaioited by the dentine in some states of a tooth is not necessarily due to the passage of nerves into it, but to its connection with the sensitive dentine pulp.

Development of the Teeth.—In studying the development of the teeth, not only has the mode of formation of the individual teeth to be examined, but the order of succession of the different tecth both in the temporary and permanent series.

The teeth are developed in the mucous membrane or gum, which covers the edges of the jaws of the young embryo, and their formation is due to a special differentiation in the arrangement and structuro of portions of the epithelial and sub-epithelial tissues of that membrane. ‘The enamel is produced from the epithelium, and the dentine, pulp, and cement from the sub-cpithelial connective tissue.

The development of the temporary teeth will first be consideied. Ifa vertical section be made through the mouth of a young human

Fic. 16.—Verticel transverse section through the mouth of a yowig human em- bryo. 2p, naso-palatine region; ¢, tongue; m, mouth; 7, 4, 1, J, lips; d@, d, primitive dental grooves with epithelial contents in upper gum; @’, d’, sinilar structures in lower jaws; ¢, e, cuticular epiblast; 4,/, hair follicles; e, epiblast prolonged into the mouth. .

embryo about the sixth or scventh week, its cavity may be seen to be lined by a stratified epithelium, continuous with the layer of stratified epiblast forming the cuticle of the face. Along the edge of the gum, corresponding in position to that of the future jaws, the epithelium is of some thickness, and an involution of the epithclium into the subjacent connec- tive tissue has taken place. Owing to this involution a narrow furrow or groove in the connective tissue is produced, which consti- tutes the primitive dental groove of Goodsir. This groove is not, however, an empty furrow, but is occu- pied by the involuted ecpi- thelium. Thesub-epithclial connective tissue is softand gelatinous, and abounds in corpuscles, which are espe- cially abundant in the connective tissue at the bottom of the groove, where the dental popille are pro- duced, These papille are formed, at the bottom of the

groove, by an increased development and growth of the corpuscles of the subjacent connective tissue. ‘The base of each papilla is con- tinuous with the-subjacent connective tissue, and the apex projects into the deeper: parts of the involuted epithelium. As a papilla increases in breadth and | length the groove widens and deepens, and the in- Voluted epithelium, in- creasing in quantity, ex- pands over the apex and sides of the papilla, so as to form a hood-like cover- Ing or cap for it. The cap of epithelium consti- tutes the enamel organ, : Whilst the papilla is the Formative pulp for the den. ‘“** “a

tine and permanent pulp. Fic. 18.—Vertical scction through the gum to Whilst these changes are show the formation of the dental papilla. taking Seca” in cae pi e’, the epithelium covering the gum; 2, the thelin Pl- neck of en, the enamel organ; p, the dental : m and the connective papilla; cf, sub-cpithelial connective tissue. taaiie at the bottom of Magnified. bs * pers, Oo commensurate widening occurs at its upper part, 1c) Yemains for a time relatively narrow, but retains within

Fig. 17.—A more highly magnified view of a section through the same jaw as fig. 16; cf, sub-epithclial connective tissue of the gum; d, primitive dental groove; e”, its epithelium; é,epithelium lining m, the cavity of the mouth; J, 2, lips; e, the epiblast cuticle. The deepest layer of the epithelium consists of columnar cells.

ThE SA SEEN 2 RRL See ve

it a narrow string of epithelial cells, continuous on the one hand with the epithelial lining of the mouth, and on the other with the enamel organ. This epithelial string forms the neck of the enamel organ. After a time, however, the growth of the connective tissne forming the lips of the primitive groove canses the neck of the enamel organ to atrophy, so that all communication between the enamel organ and the superficial epithelium is cut off; and the embryo tooth, being now conipletely inclosed in a cavity or sac, formed by the gelatinous connccctive tissuc of the gum, has entered on what Goodsir termed its saccular stage of development.

When inclosed in its sac the embryo tooth, though perfectly soft, acquires a shape which enables one to recognize to what group of teeth it belongs. After a time it begins to harden and to exhibit the characteristic tooth structure.

‘he dental papilla is nore vascular than the surrounding connce- tive tissuc, from the blood-vesscls of which its vessels are derived. The papilla abounds in cells, which are, in the first instance, rounded and ovoid in_ shape. Changes then take place in the cells situated at its periphery, which become elongated and branched, and form layers of cells (odonto- blasts).

Calcification of the protoplasm of these odontoblasts then oe curs, and the peripheral layer of the dentine is : produced. In contact pg 19 —sacculated stage of development of two with the inner surface molar tecth in the cat. cf, cf, connective tissue

of the thin film of den- forming the sacs for the _: p, p, dental G papille ; the opaque bands, a, d, mark the com- tine, a second layer of mencement of calcification' of the dentine; e, e, odontoblast cells is then internal enamel epithelium; the outer enamel arranged, which in their epithelium was not recognizable; 6, b, the bony turn calcify and asthe Walls of the alveoli are beginning to form > process goes on in suc-

Magnified. cessive layers of odontoblasts, the entire thickness of the matrix of the dentine and the dentinal sheaths are produced. But the pro- cess of calcification does not apparently take place throughout the whole thickness of the protoplasm of the odontoblasts, for, as Waldeyer _—_— pointed out, the axial part of

the cells remains undifferentiated as the soft dentinal

fibrils of the dentine tubes, As these changes are going on in the peripheral layers of the odonto- blasts, the central part of the dental papilla increases in quantity, apparently Fig. 20.—Section through the dentine and pulp cavity

: ° of a young tooth. p, the pulp, with v, one of its ad a a gage of vessels, and 0, layers of odontoblast cells giving off 1ts cells ; nerve

processes into d, the dentine. x 450. fibres are developed

in'it, and it persists as the soft pulp of the tooth. The papilla of the tooth has essentially, therefore, the same relation to the formation of dentine that the cellulo-vascular contents of the medullary spaces, in intra-cartilaginous ossification, have to the formation of bone. In both instances the hard matrix is due to a special differ- entiation of the protoplasm of the formative cells ; the dentinal fibrils are the equivalent structures to the soft contents of the lacune and canaliculi, and the persistent pulp is equivalent to the cellulo-vascular contents of the Haversian canals. :

Prior to the embryo tooth becoming sacculated, changes had taken place in the enamel organ. Those cells of the enamel organ which lie next the dental papilla are continuous, through the neck of te enamel organ, with the deepest layer of cells of the oral epithelium, which cells are clongated columns set perpendicularly to the surface on which they rest. Similarly the cells of the deepest layer of the enamel organ are columns set perpendicularly to the surface of the dental papilla. They undergo a greater elongation, and form six-sided prismatic cells, which K6lliker bas named the internal or enamel epithelium. The cells of the most superficial layer of the enamel organ lie in contact with the vas- cular connective tissue which encloses the embryo tooth. They form the external epitheliwm of the enamel organ, and slender papillary prolongations of the connective tissue frequently project into this epithelial layer. The cells of the enamel organ, situated between its external and its internal epithelium, become stellate, and form with each other an anastomosing network of cells like those sometimes seen in the gelatinous connective tissue,

After the tooth has become sacculated, and coincident with the transformation of the odontoblast cells of the dental papilla into dentine, calcification begins in the clongated prismatic cells of the internal or enamel epithelium ; their protoplasm becomes calcified,

Fie. 21.—Vertical section through the gum in the region of the molar teeth. ‘p, the papilla of a milk molar; 1, the inner, 2, the middle, and 3, the outer layers of the enamel organ; n, the neck of the enamel organ; e’, the superficial epithelium; ct, ct, ct, the sub-epithelial connective tissue which subsequently forms the sac of the tooth; 1, the cavity of reserve occupied by epithelium, in connection with which the permanent successional tooth is formed. X 300.

and they become the rods or prisms of the euamel. As the hardening takes place from the periphery to the centre of each cell, the axial portion may, as Tomes pointed out, remain soft for some time in the axis of the enamel rod. With the increase in length, and with the calcification of the cells of the enamel epithelium, the stellate gelatinous cells disappear, and the outer ends of the enamel rods come in contact with the cells of the external enamel

epithelium. By some observers the external epithelium is sup- posed to disappear without undergoing any special diiferentiation, but by others it is believed to undergo conversion into Nasmyth's membrane.

In this manner the crown of a tooth is formed, and it is lodged in a membranous sac formed hy the differentiation into a fibro- vascular membrane of the surrounding connective tissue. Whilst within its sac, the crown of the tooth possesses the characteristic form of the group of teeth to which it belongs. After the calcifica- tion of the enamel rods is completed, it can undergo no further change either in shape or in increase of size.

Whilst the crown of the tooth is being formed, ossification of the jaws has been going on, and the tooth, with its membranous sac, has become lodged in an alveolus or socket in the jaw, which alveolus is closed in by the gum.

In order that the crown of the tooth may come into use as a masticatory organ, it has to be elevated to the level of the gum, which is absorbed by the pressure, and the crown then erupts into the cavity of the mouth. The process of eruption is due to the

j{ development of the fang, which, as it grows in length, elevates +. the crown of the tooth and forces it outward. The dentine of the

fang is developed from the odontoblast cells of the pulp in a manner similar to that already described for the development of the dentine of the crown. The cement or crusta petrosa is developed from the connective tissue lining the alveolus, which forms the alveolo-dental periosteum. It is therefore an ossifica- tion in membrane,

As the temporary or milk teeth precede the permanent teeth, their papille are naturally the first to form. The series of milk- papille are not, however, simultaneously produced. From the observations of Goodsir, it has been shown that the milk-papilla of the anterior molar in the upper jaw appears about the seventh week ; then the canine papilla, the two incisor papille, and the posterior molar papilla are sucessively formed, the last making its appear- ance about the end of the tenth week. The dental papille in the upper Jaw immediately precede the papille of the corresponding teeth in the lower jaw.

The eruption of the milk teeth into the mouth does not begin to take place until the latter half of the first year of extra-uterine life, and is not completed until betweeen the second and third year. Though variations occur in the date of eruption of each tooth in different children, it may be stated that the incisors usually appear from the seventh to the ninth month, the anterior molars from the twelth to the sixteenth month, the canines during the seven- teenth or eighteenth month, the posterior milk molars from two to two and a half years. The milk teeth begin to be shed about the

sixth year by the dropping out of the incisors. The last to be shed are the canines, which do not fall out till the tenth or cleventh year. The shedding of the milk teeth is preceded hy the absorption of the fangs. This is cffected, as was satisfactorily shown by J,

a 4

Fie, 22.—One-half the lower jaw of afcetus about the Ith or 12th weck, showing the dental papille in the order of their appearance. 1, the first milk molar; 2 the canine; 3 and 4, the two incisors; 5, the second milk molar.—From Goodsir.

Fig. 23.—Posterior part of the lower jaw of a child at birth. 5, the crown and sac of the posterior milk molar; 6, the crown and sac of the first permanent molar; 6, the cavity in connection with which the papilla of the second per- manent molar uitimately forms. y, shows a temporary and permanent incisor from the same fetus.—From Goodsir.

2

Tomes, by the agency of a group of cells situated at the bottom of the sockets. As these cells occasion absorption of the tooth tissue, similar to that oceurring in the bone tissue from the action of the large multi-nucleated osteo-klast cells, they may appropriately be called odonto-klasts.

The development of the permanent teeth will now be considered.: In the description of the arrangement of the teeth it has been pointed out that the number of teeth in the permanent set exceeds that of the temporary set. The permanent incisors and canines come into the place of the temporary incisors and canines, and the permanent bicuspids succeed the temporary molars, but the permanent. molars have no milk predecessors, and are superadded at the back of the dental series.

The development of the successional permanent teeth, which are the ten anterior teeth in each jaw, will first be examined.. Prior to the period when the lips of the primitive dental groove: meet, to produce the saccular stage of dentition of the several temporary teeth, an indentation, or furrow, takes place in the connec- tive tissue adjoining the string of epithclialcells which form the neck of the enamel organ. This furrow constitutes what Goodsir termed the eavity of reserve, and itis filled up by epithelial cells continuous with the epithelium of the neck of the enamel organ. As @ cavity of reserve is formed immediately behind (7.e., on the lingual side of) each milk tooth, they are ten in number in each jaw, and, except that for the anterior molar, are formed successively from before backwards.

The cavities of reserve are concerned in the production of the per- manent successional teeth, and each temporary tooth is replaced by the permanent tooth formed in connection with the cavity of re- serve situated immediately behind it (fig 21). The cavities of re- serve become elongated, and widened, and pass above the tem- porary teeth in the upper jaw, and below those in the lower jaw. At the bottom of each a dental papilla forms, the apex of which indentates and becomes covered by the epithelium contained in the cavity, which formsa cap for the papilla, and constitutes the enamel organforthe permanent tooth. Thecavity becomescompletely closed by the growth of the surrounding connective tissue, and the embryo permauent tooth becomes sacculated. The process of caleification then goes on, in both the enamel organ and dental papilla, in a man- ner similar to that already described in the temporary teeth. The permanent teeth then become lodged in sockets in the jaw distinct from, those of the temporary teeth. The sac of each permanent tooth re-. mains connected with the fibrous tissue of the gum by a slender fibrous band, or gubernaeulum, which passes through a hole in the jaw immediately behind the corresponding milk tooth. Before

the successional permanent tooth erupts, not only should the temporary tooth be shed, but the bony partition between their respective sockets must be absorbed. : ;

The superadded permanent teeth, or permanent molars, three m number on each side, lie behind the successional teeth. Their mode of origin is similar to that of the temporary teeth. The primitive groove, oceupied by an involution of the epithelial cover- ing of the gum, is prolonged backwards. Three dental papille successively appear at the bottom of this groove, and the epithelium covering each papilla forms itsenamel organ. Legros and Magitot, however, state that the second permanent molar arises in connection with a diverticulum (cavity of reserve) proceeding from the epithelial string of the enamel organ of the first permanent molar, and that the wisdom tooth is formed in connection wjth a similar diverticulum from the second permanent molar. The embryo tooth becomes sacculated, and goes through the process of calcification similar to what has been described in the other teeth

The germ of the first permanent molar appears about the sixteenth week of embryo life; that of the seeond permanent molar not until about the seventh month after birth; whilst that of the wisdom tooth is not formed until about the sixth year The erown of the

Trg, 31.—A, the lower jaw of a child between four and five years old. 5, the last mik molar, with the successional bicuspid tooth in the cavity of reserve imme- diately below it; 6 and 7, the first and second pe manent molars in their sacs; b, the cavity in connection with which the wisdom tooth is formed. B, the lower jaw of a child about six years old; 6 and 7, the first and second per- manent molars; 8, the papilla of the wisdom tooth devcloped in connection with its cavity b.—From Goodsir

first molar is the first of the permanent teeth to erupt into the mouth, whieh it usually does in the sixth year. The incisors appear when the child is seven or eight ; the bicuspids when it is nine or ten ; the canines about twelve; the second molars about thirteen ; and the wisdom teeth from seventeen to twenty five.

In his dentition man is diphyodont as regards his incisor, canine, and premolar teeth, but monophyodont in the molar series.

From the description of the developmeut of the teeth, it will have been seen that a tooth is made up of three hard tissues—enamel, dentine, and eement —and of the soft vaseular and nervous pulp. These tissues are not developed from one layer only of the blasto- derm. The enamel is of epiblast origin, whilst the dentine, cement, and pulp are derived from the mesoblast. A tooth in its funda- mental development, as was long ago pointed out by Goodsir, must be referred to the same class of organs as the hairs and feathers. The enamel of the tooth, like the hair, is produced by a differentia- tion of the involuted epithelium of the epiblast, whilst the dentine and pulp resemble the papilla of the hair, in procecding from the mesoblast. The tooth-sae, like the hair-folliele, is also of meso- blast origin. Whether the cement, as Robin and Magitot have de- seribed, be developed by means of a special cement organ, in the in- terior of the tooth-sac, or be formed, as has been stated in this de- scription, by the alveolo-dental periosteum, it is on either view de- rived from the mesoblast. As to the origin of Nasmyth's membrane, there is a difference of opinion ; some regard it as a special eornifica- tion of the external cells of the enamel organ, in which case it would be from the epiblast ; whilst others consider it to be continuous with though strueturally different from, the cement— homologous, there- fore, with the layer of cement, which in the horse, ruminants, and some other mammals covers the surface of the crowns of the teeth.

The tissues of a tooth have not all the same importance in the strueture of a tooth. The dentine is apparently always present, but the enamel, or the enamel and cement, may be absent in the teeth of some animals. For example, the tusks of the elephant and narwhal, and the teeth of the Edentata, are without enamel, and in the Rodentia enamel is present on only the anterior sur- fave of the incisors. But though the enamel is not developed, or forms only an imperfect covering for the crowns of these teeth yet an enamel organ is formed in the embryo jaws. In 1872 W. Turner deseribed a structure homologous with the enamel organ in relation with each of the dental papille in the lower jaw of a foetal narwhal ; but this organ did not exhibit a differentiation into th three epithelial layers, such as

occurs in those teeth in which enamel lg developed. Sinee then C. S. Tomes has seen an enamel ia in the embryo armadillo, and has also pointed out that, in eeth generally, enamel organs exist, quite irrespective of whether enamel subsequently does or does not form. io ane, the involution of the oral epithelium, and the coin- ee of a primitive groove, take eg not only where Hea teen oo eget arise, but along the whole curvature of the Py a. ae sag st the production of dental papille is restricted fata pots where the teeth are formed. Henee it would seem i ; € infleetion of the oral epithelium is not so essential to the opith oo of 2 tooth as the formation of a papilla. The inflected

: Geter. only a preliminary stage, and it may or may not tek Biecad into tooth structure. But that which is essential Pe inh 1on of a tooth is the production of the papilla which

at the bottom of the primitive groove. (W. T.)

pee TALIS, or FoxcLove, a genus of biennial and ; ah plants of the natural order Scrophulariaceee. ray he or purple*foxglove, D. purpurea, is common i ™Y pastures and rocky places and by road sides in mS parts of Europe; it ranges in Great Britain from

; Cornwall and Kent to Orkney, but it does not occur in

Shetland or in some of the eastern counties of England. It flourishes best in siliceous soils, and is not found in the Jura and Swiss Alps. The characters of the plant are as follows :—stem erect, roundish, downy, leafy below, and from 18 inches to 6 feet or more in height; leaves alternate, creuate, rugose, ovate or elliptic-oblong, and of a dull green, with the under surface downy and paler than the upper; radical leaves together with their petioles often 4 foot in length ; root of numerous, sleuder, whitish fibres ; flowers 12-24 inches long, pendulous, on one side of the stem, purplish crimson, and hairy and marked with eye-like spots within ; segments of calyx ovate, acute, cleft to the base ; corolla obtuse, with the upper lobe entire or obscurely divided ; stamens four and didynamous (see vol. iv. p. 138, fig. 226); anthers yellow and bilobed; capsule bivalved, ovate, and pointed ; and seeds

numerous, small, oblong, pitted, and of a pale brown. As Parkinson remarks of the plant, “It flowreth seldome before July, and the seed is ripe in August ;” but it may occasionally be found in blossom as late as September. In one variety, common in gardens, the flowers are white; in another their purple is of a coppery or metallic hue; and not unfrequently in cultivated plants several of the uppermost blossoms may be united together so as to form a cup-shaped compound flower, through the centre of which the upper part of the stem passes. A figure of D. purpurea will be found in vol. iv. plate xi. Many species of foxglove with variously- coloured flowers have been introduced into Britain from the Continent. The plants may be propagated by off-sets from the roots, but are best raised from seed,

The foxglove (Ang.-Sax., fowes-clife, foxes-glofa) is known by a great variety of popular names in Britain. In the south of Scotland it is called bloody fingers; further north, dead-men’s-bells ; and on the eastern borders, ladies’ thimbles, wild mercury, and Scotch mercury. Among its Welsh synonyms are menyg-ellyllon (elves’ gloves), menyg y llwynog (fox’s gloves), bysedd cochion (red fingers), and bysedd y cwn (dog’s fingers). In France its designations are gants de notre dame, and doigts de la Vierge. The German name fingerhut (thimble) suggested to Fuchs, in 1542, the employment of the Latin adjective digitalis as a designation for the plant.

The leaves, gathered from wild plants when about two- thirds of their flowers are expanded, deprived usually of the petiole and the thicker part of the midrib, and dried, constitute the drug digitalis or digitalis folia of the pharmacopeeia. The prepared leaves have a faint odour and bitter taste ; to preserve their properties they must be kept excluded from light in stoppered bottles. They are occasionally adulterated with the leaves of Znula Conyza, Ploughman’s Spikenard, which may be distinguished by their greater roughness, their less divided margins, and their odour when rubbed; also with the leaves of Symphytum officinale, Comfrey, and of Verbacewm Thapsus, Great Mullein, which unlike those of the foxglove have woolly upper and under surfaces. The powder, infusion, and tinc- ture of digitalis are employed both externally and inter- nally ; and its active principle, digitalin, may further be used for subcutaneous injection. Digitalin, according to Nativelle, is a crystallizable, neutral, inodorous, bitter substance, of the formula C,,H,.0,;, insoluble in water and ether, but soluble

in alcohol and chloroform. The earliest known descriptions of the foxglove are those given by Fuchs and Tragus about the middle of the 16th century, but its virtues were doubtless known to herbalists at a much remoter period. Gerarde, in his Herbal (1597), advocates the use of foxglove for a variety of complaints ; and John Parkinson, in the Zheatrum Botanicum, or Theater of Plants (1640), tells us that

‘The Italians have an usuall proverbe with them concerning this | ditions of the circulation it acts diuretically by increasing arterial

herb, called by them Aralda, which is Aralda tutte piaghe sulda: Aralda salveth all sores… .. It hath been found by late ex- perience to beavaileable forthe King’s Evill. . . . also to be effectuall against the Falling Sicknesse, that divers have been cured thereby.”

Later, Salmon, in Zhe New London Dispensatory, praises the remedy foxglove in no measured terms.

Digitalis was first brought prominently under the notice of the medical profession by Dr W. Withering, who, in his Account of the Foxglove (1785), gave details of upwards of 200 cases, chiefly dropsical, in wliich it was used. Having become acquainted with the drug in 1775 as an ingredient ina Shropshire family receipt for the cure of dropsy, he began to administer it asa diuretic, but at first in doses too large ; for, ‘‘ misled by reasoning from the effect of the squills, which generally acts best upon the kidneys when it excites nausea,” he sought to produce the same effect by foxglove. Further experience, however, convinced him “that its diuretic effects do not at all depend upon its exciting nausea or vomiting ;” and that often the urinary discharge may be checked when the dose is imprudently urged so as to occasion sickness. He moreover observed that in cases where the drug produced purging it was inefficacious unless combined with small doses of opium, so as to restrain its actioa on the bowels, Withering seldom found it to succeed in men of great natural strength, tense fibre, warm skin, and florid complexion, or in those with a tight and cordy pulse. He

recommended digitalis ‘fin every species of dropsy, except the encysted;” and he was of opinion that it might be made subservient to the cure of diseases unconnected with dropsy, and that its power over the motion of the heart, to a degree unobserved by him in any other medicine, might be turned to good account by the physician.

The experiments of Mareet and Brunton show that the infusion of digitalis has a poisonous effeet on various plants, and, even in very small quantity, kills fishes, —their aurieles after death being found distended, their ventricles strongly contracted. On birds the effect of the infusion is to cause firm eontraction of the left ventricle, and eonsequent excessive congestion of the lungs. A large turkey, according to M. Salerne (Hist. de ? Académie, 1748, p. 120, 12mo, and p. 84, 4to ed.), walked as if intoxicated, in consequenee of partaking oncc of foxglove leaves. Another turkey, weighing 7 tb, ate during 4 days about half a handful of the leaves, after which it refused nourishment, and in a couple of weeks died, its weight being reduced to 3 Ib. Uandfield Jones and Fuller have proved that the infusion produces upon the hearts of frogs and mammals effects similar to those observed in birds. The usual results of small and repeated doses of digitalis are contraction of the capillaries, and augmented arterial blood-pressure, with slower and more powerful cardiac systole, and an inerease in the urinary seeretions ; large or long-continued doses, besides causing nausea or vomiting, often accompanied by purging, occasion a slow or irregular pulse, dilatation of the eapillaries, decrease in the rate of respiration, cold sweats, disordered vision, chilliness of the extremities, giddi- ness, and great weakness, followed by convulsions and insensibility. Syncope is apt to occur on sudden changes of posture by patients fully under the influence of the drug. Its cumulative action, or unexpected production of alarmingly acute symptoms, may arise cither from an increase in the dose, the elimination of the drug being constant, or from a check in the elimination, the dose remaining unaltered, hence the caution with whieh digitalis should be administered in cases where the renal functions are disturbed. The experiments of various physiologists have shown that digitalis, by stimulating the sympathetic ganglia of the heart, ,causcs the contraction of .its musculo-motor fibres, this effect being at first masked by a similar action on the pneumogastric nerves. By effecting more complete emptying of the ventricles in cases of cardiac disturbance, digitalis

improves the circulation, bringing about in the lings a more thorough oxidation of the blood. ‘The consequent increased nutrition of the heart is promotive of hyper- trophy in that organ; small doses of digitalis are therefore an assistanee in hypertrophy following upon cardiac injury. Tn cases of dilatation of the heart, on the other hand, large doses are required. The eontinued use of the drug when the heart has become sufficiently hypertrophied may render ventricular action excessive. Digitalis ealms exeitement of the heart not by act- ig a8 @ narcotic or sedative but by stimulating its nerves, and enabling it to contract without laboured effort.

In feeble con- H

tension, but its influence as a diuretic is not constant. Its efficacy in epilepsy appears to be limited by its action on the circulae tion. In enteric fever, erysipelas, and acute rheumatism, it hag been employed to reduee temperature. Its use as a sedative in pneumonia, delirium tremens, and some other diseases has been objected to on the ground that it cuts off the irritating blood supply only by an extreme degree of ventricular contraction. 1p araehnitis in children, in inflammation tending towards serous effusion, in dropsy, hemorrhage, cerebral anemia, and occasionally in angina pectoris and nervous palpitation, it is a valuable remedy, Upon the uterus digitalis acts by stimulating the ganglia in which its motor power resides (W. Howship Diekenson, in Med. Chir, Trans. vol. xxxix. Lond. 1856). In poisoning by digitalis, aconite and probably also Calabar bean may be resorted to.

A. L. J. Bayle, Bibliotheque de Therapeutique, tom. iii. pp. 1-372; Chyistison, A Treatise on Poisons, p. 886, 4th ed. 1855; Sir H. Holland, Medica Notes ang Reflections, chap. xxix. 3d ed., 1855; Trousseau et Pidowx, Traité de Therg- peutique, vol. li. p. 754, 1862; T. L. Brunton, On Digitalis, 1868; J. Milner Fothergill, Digitalis, tts Mode of Action, and tis Use, 1871; Pereira, Materia Medica, 1874; Garrod, Materia Medica, 1814; G. W. Balfour, Clinical Lectures on the Diseases of the Heart and Aorta, pp. 97 and 304, 1876. (F. H.B)

DIGNE, the chief town of the department of Basses. Alpes, in France, about 70 miles north-east of Marseilles, in 44° 5’ 32” N. lat. and 6°14’ 6” E. long. It is built on a spur of the mountains jutting out into a gorge traversed by the

Bléonne, which in winter is a formidable torrent, but in summer is almost dry ; and the neighbourhood is rich in orchards, which have long made the town famous in France for its preserved fruits and confections, The streets are narrow and tortuous, with the exception of the Boulevard Gassendi, at the upper end of which is a public garden, with a statue of the philosopher, who was bom in the neighbouring village of Chantercier. The cathedral within the town is a buildingof very hybrid architecture, and is of less importance than the cathedral of Notre Dame, in the vicinity, which dates from the 12th century, and is numbered among the historic monuments of France, The thermal springs are not in much repute, and the bathing establishment is in a state of decay. Digne is identified with Dinia, the capital of the Avanticiand Bodiontici. It early became an ecclesiastical see, and its bishops acquired the secular rank of barons of Lauziéres. In the 16th century it suffered on four separate occasions from the Huguenot soldiery ; and in modern history it is known as the place from which Napoleon issued his proclamation of March 1815. Population in 1872, 5300 in the town and 6877 in the commune. ;

DIJON (Divio, Dibio, or Divionense Castrum), the ehiet town of the department of Cédte-d'Or in France; and formerly capital of the province of Burgundy, is situated at the foot of Mount Affrique, in a fertile plain, on the Burgundy canal, and at the confluence of the Ouche and Suzon, in 47°19' 19" N. lat., and 5° 2' 5" E. long, The strects are broad and well built of freestone, and there are fifteen squares ; an abundant supply of water is obtained from the vale of Suzon by means of a subterranean aque duct nearly eight miles in length. Among the more note worthy of the public edifices are the cathedral of St Bénigne, in the Gothic style of the 13th century, with a spire erected in 1742; the church of Notre Dame built in 1331-1445, containing a group in stone, the Assumption of the Virgin, by Dubois, and a statue of the Black Virgin, celebrated in the Middle Ages; the church of St Michel, of the 16th century ; the general hospital, founded by Otho III. in 1206; the castle, com- rmenced in 1478 by Louis XL, and finished in 1512 by Louis XII, once a state prison, in which the duchess of Maine, Mirabeau, the Chevalier d'Eon, and Toussaint Louverture were confined, and since then a_ barrack for gendarmes ; and the old palace of the dukes of Burgundy, or hétel de ville, rebuilt between the end of the 17th and the end of the 18th century, in which are an art collection, the archives,

a museum of natural history, a school of arts, and the salle des gardes, containing the

- tombs of Philippe le Hardi and Jean sans Peur. Important structures also are the lunatic asylum, the ancient court- house, the theatre, and the hospice Saint-Anne, aud numer- ous other educational establishments. Dijon possesses a library of 70,000 volumes and 900 manuscripts, a picture gallery, @ collection of coins and of 40,000 engrav-

| ings, @ jardin des plantes and herbarium, and a fine park, commenced in 1670, after the designs of Le Notre, by the Great Condé, and finished by his sou. It is the

seat of a bishop, and of tribunals of primary instance and

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Plan of Dijon. 6. St Michel.

f 1 Statue of St Bernard.

2, Prefecture. 7. Theatre. 3. Notre Dame. 8. Cathedral of St Bénigne, 4, Post Office. 9. Palace of Justice.

§. Hotel de Ville.

commerce, and has faculties of law, science, and literature. The ramparts that formerly surrounded the town have been replaced by broad avenues. The principal industries are the manufacture of hosiery, woollen and cotton cloth Paris lace, leather, candles, earthenware, mustard, confec- lions, vinegar, and chemicals; iron and type-founding, Printing and binding, brewing, saltpetre-refining, and hursery-gardening. Dijon does an important trade in cereals, and is the chief emporium for Burgundy wines. The population of the commune in 1872 was 42.573: that of the town, 40,116. ,

Dijon was a fortified eamp of the Romans, and j ‘ about 274 was aie by Aurelian. In 731 it was taken and burnt by the eee Councils were held there in 1077, 1116, and 1199 or dete el in the 12th century the town was almost entirely he : ved by fire, but it was soon rebuilt. Til! 1107 it was held Bold . Sine of Dijon, and. from 1179 to the death of Charles the a ca 77 it was the residence of the dukes of Burgundy ; it then th. 4 the possession of Louis XJ., who established there the ma oe Parlement.’ _ In 1513 Dijon was besieged by 20,000 31 “ae whom a humiliating treaty was concluded. On October rae : e town capitulated to General Werder ; it was evaeuated 17 degen on the 27th of December, and early in January Boudbad a e head-quarters of the French eastern army under agelated. b n the Ist of the following February it was re- acgnes C Eh Germans. Dijon is the birthplace of Bossuct, viens — te, tne elder Crébillon, Daubenton, Jouffroy, Long- ey rnard de la Monnoie, Guyton de Morvean, Piron, Rameau,

aumaisa, D EAPIDATIONS, in English law, is the name given saa _ committed by the incumbent of an ecclesi- a’ ‘ving. By the general law a tenant for life has no

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power to cut down timber, destroy buildings, &c. (voluntary waste), or to let buildings fall into disrepair (permissive waste). In theeye of the law an incumbent is a tenant for life of his benefice, and any waste, voluntary or perniissive, on his part must be made good by his administrators to his successor in office. The principles on which such dilapida- tions are to be ascertained, and the application of the money payable in respect thereof,

depend partly on old ecclesiasti- cal law and partly on recent Acts of Parliament. Questions as to dilapidations usually arise in respect of the residence bouse and other buildings belonging to the living. Inclosures, hedges, ditches, and the like are included in things “of which the beneficed person hath the burden and charge of reparation.” In a leading case (Ross v. Adcock, 37 Law Journal, C.P. 290) it was said that the court was acquainted with no precedent or decision extend- ing the liability of the executors of a deceased incumbent to any species of waste beyond dilapidation of the house, chancel, or other buildings or fences of the benefice. And it has been held that the mere mismanagement or misculti- vation of the ecclesiastical lands will not give rise to an action for dilapidations. To place the law relating to dilapidations on a more satisfactory footing, the Act 34 and 35 Vict. c. 43 was passed. The buildings to which the Act applies are defined to be such houses of residence, chancels, walls, fences, and other buildings and things as the incumbent of the benefice is by law and custom bound to maintain in repair. In each diocese a surveyor is to be appointed by the archdeacons and rural deans subject to the approval of the bishop ; and such surveyor shall by the direction of the bishop examine the buildings on the follow- ing occasions—-viz., 1, when the benefice is sequestrated ; 2, when it is vacant ; 3, at the request of the incumbent or on complaint by. the arghdeacon, rural dean, or patron. The surveyor is to specify the works required, and to give an estimate of their probable cost. In the case of a vacant benefice, the new incumbent and the old incumbent or his representatives may lodge objections to the surveyor’s report on any grounds of fact or law, and the bishop, after consideration, may make an order for the repairs and their cost, for which the late incumbent or his representatives are liable. The sum so stated shall be a debt due from the late incumbent or his representatives to the new incumbent, who shall pay over the money when recovered to the governors of Queen Anne’s Bounty. The governors pay for the works on execution on receipt of a certificate from the surveyor ; and the surveyor, when the works have been completed to his satisfaction, shall give a certificate to that effect, the effect of which, so far as regards the incumbent, will be to protect him from liability for dilapi- dations for the next five years. Unnecessary buildings belonging to a residence house may, by the authority of the bishop and with the consent of the patron, be removed. An amending statute (35 and 36 Vict. c. 96) relates

chiefly to advances by the governors of Queen Anne's Bounty for the purposes of the Act.

DILIGENCE, in law, is the care which a person is bound to exercise in his relations with others. The possible degrees of diligence are of course numerous, and the same degree is not required in all cases. 'Thus a mere depositary would not be held bound to the same degree of diligeuce as a person borrowing an article for his own use and benefit. Jurists, following the divisions of the civil law, have concurred in fixing three approximate standards of diligence—viz., ordinary, less than ordinary, and more than ordinary. Ordinary or common diligence is defined by Story (On Batlments) as " that degree of diligence which men in general exert in respect of their own concerns." So Sir William Jones :—" This care, which every person of common prudence and capable of governing a family takes of

his own concerns, is a proper measure of that which would uniformly be required in performing every contract, if there were not strong reasons for exacting in some of them a greater and permitting in others a less degree of attention " (Essay on Bailments). The highest degree of diligence would be that which only very prudent persons bestow on their own concerns ; the lowest, that which even careless persons bestow on their own concerns. 'The want of these various degrees of diligence is negligence in corresponding degrees. These approximations indicate roughly the greater or less severity with which the law will judge the performance of different classes ofi contracts; but English judges have been inclined to repudiate the distinction as a useless refinement of the jurists. Thus Baron Rolfe could see no difference between negligence and gross negligence ; it was the same thing with the addition of a vituperative epithet. See NEGLIGENCE.

Diligence, in Scots law, is a general term for the process by which persons, lands, or effects are attached on execu: tion, or in security for debt.

DILKE, Sm Cwartes Wentworth (1810-1869), Baronet, born in London, February 18, 1810, was the only son of Charles Wentworth Dilke, proprietor and editor of the Atheneum, and was educated at Westminster schoo] and Trinity Hall, Cambridge. He studied law, and in 1834 took his

degree of LL.B.; but he did not enter upon the practice of his profession. He assisted his father in his literary work, and afterwards gave up much of his time to several of the learned societies. He was for some years chairman of the council of the Society of Arts, and took a prominent part in the affairs of the Royal Horticultural Society. He was one of the most zealous promoters of the Great Exhibition (1851), and a member of the executive committee, At the close of the exhibition he was honoured by foreign sovereigns, and the Queen offered him knighthood, which, however, he did not accept ; he also declined a large remuneration offered by the royal commission, In 1853 Dilke was one of the English com- mi3sioners at the New York Industrial Exhibition, aud prepared a report on it. He again declined to receive any money reward for his services. He was appointed one of the five royal commissioners for the Great Exhibition of 1862; and soon after the death of the Prince Consort he was created baronet by the Queen. In 1865 he entered parliament as member for Wallingford. In 1869 he was sent to Russia as representative of England at the Horticultural Exhibition held at St Petersburg, His health, however, had been for some time failing, and he died suddenly in that city, May 10, 1869. He wasa fellow of the Society of Antiquaries, aud a member of other learned bodies.

DILL (Anethum), a genus of umbelliferous plants having decompound leaves ; umbels without involucre ; yellow flowers, with calices incomplete above; and lenticular fruit, compressed from back to front, flattened at the margin, and presenting on each side three ridges. The common species, A. graveolens, is indigenous to the south of Kurope, Egypt, and the Cape of Good Hope. It resembles fennel in appearance. Its root is long and fusiform; the stem is round, jointed, and about a yard high ; the leaves have fragrant folioles ; and the fruits are brown, oval, and concavo-convex. The plant flowers from June till August in England. The seeds are sown, preferably as soon as ripe, either broadcast or in drills between 6 and 12 inchesasunder. The young plants should be thinned when three or four weeks old, so as to be at distances of abont 10 inches. A sheltered spot and dry soil are needed for the production of the seed in the climate of England. The leaves of the dill are used in soups and sauces, and, as well as the umbels, for flavouring pickles.

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The seeds are employed for the preparation of dill-water and oil of dill (valued for their carminative properties), are largely consumed in the manufacture of gin, and, when ground, are eaten asa condiment in the East. See Borany vol, iv. p. 123.

DILLEN [Dittentvs], Jouann Jaxos (1687-1747), a distinguished botanist, Was born at Darmstadt. He was educated at the university of Giessen, where he received his doctor's diploma, but he early turned his attention from medicine to the study of plants. Whilst at Giessen he wrote several botanical papers for the Lphemerides Nature Curtosorum, and in 1719 he printed there his Catalogus Plantarum sponte circa Gissam nascentium, a little octavo volume illustrated with figures drawn and engraved by his own hand, and containing descriptions of many new genera, In the preface he discusses the classifications of Rivinus, Tournefort, Knaut, and Ray, the last of which was that adopted by him. In 1718 Dillen became acquainted in Germany with the botanist William Sherard, who invited him to come to England. Soon after his arrival there, in 1721, he took up his abode at Oxford, where Sherard resided. In 1724 he published an enlarged edition of Ray's Synopsis Stirpium Britannicarum. In accordance with the will of Sherard, who died in 1728, Dillen was appointed professor of botany at Oxford. He published in 1732, in two volumes folio, with 324 plates executed by himself, the Hortus ilthamensis, of which Linneus wrote—* Est opus botanicum quo absolutius mundus non vidit." That naturalist spent a month with Dillen at Oxford in 1736, and afterwards dedicated to him his Critica Botanica. In 1741 appeared the Historia Mus- corum of Dillen, to whom and his contemporary Micheli (1679-1731) cryptogamic botany owes its origin. He died April 2, 1747, in his sixtieth year. A print from his picture at Oxford is to be seen in Sim and K6nig's Annals of Botany, vol. ii. His books and collection of mosses, with many drawings, were bought by his successor at Oxford, Dr Humphrey Sibthorp, and added to the Sher- ardian Museum,

DILLINGEN, a town of Bavaria, in the circle of Schwaben-Neuburg, on the left bank of the Danube, 24 miles north-west of Augsburg. Its principal structures are the royal palace, formerly the residence of the bishops of

Augsburg, the royal gymnasium and Latin school, with a library of 75,000 volumes, five churches, two episcopal seminaries, a Capuchin monastery, a Franciscan nunnery, and a deaf and dumb asylum. The university, founded in 1549, was abolished in 1804, being converted into a lyceum. The inhabitants, who in 1875 numbered 5029, are engaged in cattle-rearing, the cultivation of corn, hops, and fruit, ship-building and the shipping trade, and the manufac- ture of cloth, paper, and cutlery. Dillingen was taken by the Swedes in 1632 and 1648, by the Austrians in 1702, and on the 18th July 1800 by the French.

DIMENSIONS, In geometry a line is said to be of one dimension, a surface of two, and a solid of three dimensions, The use of the word is extended to algebraical terms, which are said to be of m dimensions with respect to any quantity when that quantity enters t the nth power.

If the term contains several variables, x, y, 2 &0., and if the sum of the indices of these variables is 2, the term is said to be of m dimensions with respect to the system of variables x, ¥, 2. : +l

Tf all the terms of an eqnation are of m dimensions with respect to the system of variables 2, y, 2, the equation 18 said to be homogeneous of » dimensions with respect 1 that system of variables. ; t

Theequation mayor may not be homogeneous with respec to another system af variables which occur in it, a8 P) %”

DIM—DIN

Tf all the variables of a system with respect to which the equation is homogencous are increased in the same ratio, the equation will still be true. —

The general equations occurring in the application of mathematics to natural phenomena are equally true what- ever units we employ for the measurement of the different quantities which erter into them, provided we employ the same units throughout the equation. Hence such equations must be homogeneous with respect to any system of vari- ables which is referred to the same unit, and all quantities essentially numerical, such as exponents

and cxponentials, logarithms, angles, and circular and elliptic functions, must be of zero dimensions.

There are two methods of interpreting the equations relating to geometry and other conerete sciences.

We may regard the symbols which occur in the equation as of themselves denoting lines, masses, times, &c. ; or we may consider each symbol as denoting only the numerical value of the corresponding quantity, the concrete unit to which it is referred being taeitly understood.

If we adopt the first method we shall often have difficulty in interpreting terms which make thcir appear- ance during the calculations. We shall therefore consider all the written symbols as mere numerical quantities, and therefore subject to all the operations of arithmetic during the proeess of calculation. But in the original equations and the final equations, in which every term has to be interpreted in a physical sense, we must convert every numerical expression into a concrete quantity by multiply- ing it by the unit of that kind of quantity.

Thus if we write [L] for the unit of length, that is to say, the actual conerete centimetre or foot, and if # denotes the numerical value of a certain line, then the complete expression for the line is x [Ii]; and if y, 2, &c., are the numerical values of other lines, then the complete exprcs- sion for the quantity whose numerical value is x%y27 is

may ust h ty], and this quantity is said to be of a+ 6+ dimensions with respect to [L], the unit of length.

There must be as many diffcrent units as thcre are different kinds of quantities to be measured, but in all dynamical sciences it is possible to define these units in terms of the three fundamental units of length, timc, and mass. We therefore suppose thesc three fundamental units to be given, and deduce all the others from these by the aintplest attainable definitions.

The equations at which we arrive must be such thet a person of any nation, by substituting for the different symbols the numerical values of the quantities as measured by his own national units, would obtain a true result.

This can only be the case if the equation is homogeneous with respeet to each of the fundamental units. ‘To ascertain if it is so we must count the dimensions of every term, and for this purpose we must know the dimensions of any derived units which enter into the equation. The theory of the dimensions of physical quantities were first stated by Fourier, Uhéorie de Chaleur, sec. 160.

By knowing the dimensions of any quantity we are able at once to deduce its numerical value as expressed 1 terms of one system of units from its numerical value as given in terms of another system.

Thus, magnetic measurements have bean made according to the British system, in which the foot, the grain, and the seeond of mean time are the fundamental units. Other Magnetic measurements have been made according to systems derived from the French metric system, using the metre, centimetre, or millimetre as unit of length, the kilogramme, gramme, or milligramme as unit of mass, and the second as unit of time, In recent times an effort has

becn made to proeurc the adoption for all scientific measurements of a system in which the centimetre, gramme, and second are the units. ‘This is sometimes referred to as the C. G. S. system, and a copious list of examples of the measurement of physical quantities on this system, of its comparison with other systems, and of the dimensions of quantities occurring in all branches of physics, has been prepared by Dr Everett, and published by the Physical Society of London and by Taylor and Francis, under the title Zidustrations of the C. G. S. System of Units,

The three fundamental units may be selected each independently of the others, in an entirely arbitrary mazner. It is possible, however, by taking advantage of the permanence of the properties of natural substances, so to define the units that one or more of them may be re- produced withont reference to any material standard at present existing.

Thus, if the density of a standard substance in a standard state, such as water when at its maximum density under the pressure of its own vapour, is

defined as the unit of density, then the unit of mass may be derived from the unit of length, or wice versa. In this system, tlierefore, the dimensions of mass in terms of

length are L’, or of length in terms of mass, M-?

We may define the three fundamental units without reference to any actual body, but by means of a natural substance such as water. For if the solid, liquid, and gaseous states of pure water are in equilibrium in a vessel containing no other fluid, the pressure and temperature of the system are determinatc. We may therefore define the unit of density in terms of the density of the liquid water under these conditions, and the unit of pressure in terms of the pressure in the vessel. We may deducc the third unit from the law of gravitation, and define the unit of time in terms of the time of revolution of a satellite about a sphere having the unit density at a distance equal to the radius. This time must be calculated from the results of experiments on attraction. Having thus obtained a density, a pressure, and a time, the magnitudes of which arc the same under all circumstances, we can derive from them standards of length and mass. For the dimensions

of the unit of density [D] are [Mu], and those of the unit of pressure [F] are [ML T’], so that the dimensions of [L] are [P?D™? mu and those of [M] are

[Pep tT],

This method of defining the three fundamental units is suggested, not as being at all comparable in point of accuracy with the usual methods, but as being an example of a method independent of the preservation of any material standards, whether artificial, as those kept by Government, or natural, as the earth, and its time of revolution. (s. C. M.)

DINAJPUR, a district of British India, within the Rajshéh{ Kuch-Bekar division or commissionership, under the lieutenant-governor of Bengal, is situated between 24° 43’ 40” and 26° 22’ 50” N. lat., and between 88° 4’ 0” and 89° 21’ 5” E. long. The district, which occupies an area of 4126 square miles, is a triangular tract of country with the acute angle towards the north, lying between the dis- tricts of Jalpdiguriand Rangpur on the E., ana Purniah on the W.; on the S. it is bounded by the districts of Bogrda,

Rajshahi, and Maldah. The country is generally flat, but towards the south becomes undulating, some of the eleva- tions being about 100 fect in height. The district is traversed in every direction by a network of channels and water courses. Along the banks of the Kulik river, the undulating ridges and long lines of mango-trees give the landseape an aspect cf beauty which is nut found elsewhere.

Dinajpur forms part of the rich arable tract lying between | is preserved by the name of the Place Duguesclin, which

the Ganges and the southern slopes of the Himéalayas. Although essentially a fluvial district, it does not possess any river navigable throughout the year by boats of 4 tons burden. Rice forms the staple agricultural product. It consists of three species, the dman or winter rice (the great harvest: of the year), the dus or autumn rice, and the doro or spring rice. The déman and dus rice are each subdivided into several varieties. The other crops are oats, barley, millet, maize, oilseeds, pulses, jute, sugar-cane, betel leaf, tobacco, and vegetables. The imperial road from Barhampur to Darjiling runs through the district for a distance of about 130 miles, and the new Northern Bengal State Railway intersects the district for about 30 miles. The climate of the district, although cooler than that of Calcutta, is very unhealthy, and the people have a sickly appearance. The worst part of the year is at the close of the rains in September and October, during which months few of the natives escape fever. The average maximum temperature is 92°3°, and the minimum 74°8°. The average rainfall is 85-54 inches. The population in 1872 amounted to 1,501,924 souls, equal to 364 persons per square mile,—the Hindus forming 46-8 per cent., and the Mahometans 52°8 per cent.

DinAspur, the principal town and administrative head- quarters of the above district, is situated on the east bank of the Purnabhabé river, in 25° 38’ 0” N. Jat. and 88° 40’ 46” KE. long. The town seems to have declined in import- ance of late years. In 1808 it was estimated to contain 5000 houses ;

the census of 1872 returned only 3631. Population in 1872 :—Hindus, 5847 ; Mahometans, 7016 ; Christians, 995; others, 80 :—total (7700 males and 5342 females), 13,042. The disparity in the propor- tion of the sexes arises from the fact that many of the shopkeepers and traders have houses in the country where they leave their wives and children.

DINAN, a town of France, in the department of Cétes du Nord, about fifteen miles inland, on the left bank of the Rance. The river is navigable for vessels of 150 tons up to the foot of the great granite viaduct which was com- pleted in 1852 across the ravine between the town and the suburb of Lanvallay. The town has a highly picturesque appearance, not only from the position which it occupies on the rocky heights above theriver, but also from the numerous remains which it still preserves of the architecture of earlicr days. ‘There are considerable portions of the ancient ram- parts and towers ; the castle of the 14th century still looks down from its height ; and many of the houses in the Rue de Jarzuel and the Rue de la Larderie can boast of almost equal antiquity. Of the public buildings may be mentioned the church of St Sauveur, dating from’ the 12th to the 16th century ; the church of St Malo ; the town- house, which was formerly a hospital; and the monastery of the Capuchins, now used as a benevolent institution, Besides a good general trade, the inhabitants carry on the manufacture of linen, sailcloth, cotton, thread, beetroot- sugar, and salt. About half a mile from the town are the ruins of the castle and the Benedictine abbey at Lehon, of which the latter is called in the country the Chapelle des Beaumanoirs ; near the neighbouring village of St Esprit stands the large Junatic asylum of Les Bas Foins, founded in 1836; and at no great distance is the now dismantled chateau of La Garaye, which was rendered so famous in the 18th century by the philanthropic devotion of the count and countess whioge story is told in Mrs Norton’s well- known Lady of La Garaye. The principal event in the history of Dinan is the siege by the English under the duke of Lancaster in 1359, during which Duguesclin and an English knight called Thomas of Canterbury engaged In single combat. The memory of the Breton hero’s victory

marks the site of the lists. Population in 1872, 7469,

DINANT, a town of Belgium, at the head of an arrondissement in the province of Namur, about twelve miles south of Namur, on the railway between that city and Givet. It occupies a narrow site between the River Meuse and a rocky limestone hill which is crowned by a castle ; its streets are consequently short and crowded, and a considerable number of its houses are built on terraces cut out on the declivity. A cathedral of the 13th century, richly decorated in the interior, two hospitals, and a Latin school are its principal buildings ; and among its industrial establishments are paper-mills, glass-factories, salt-refineries, oil-mills, flour-mills, and works for the cutting and polish- ing of the black marble which is quarried in the neighbour. hood. Population in 1866, 6428.

Dinant is a place of great antiquity. A church was consecrated there in 558, and a second in 604. It did not, however, rise to any importance till the 11th century. In the 12th century it was reckoned a place of great strength, and had attained considerable wealth by means of its industry, especially in the manufacture of copper wares, which were familiarly known as Dinanderic, In 1466 Philip the Good, duke of Burgundy, took and destroyed the town and its fortifications; but, thrce years later, his successor, Charles, allowed it to be rebuilt. It was taken and pillaged by the French in 1554, and again in 1675. By the treaty of Ryswick in 1697 it was restored to the Bishop of Liége, but it was again taken by the French in 1794, and became the capital of an arrondissement in the department of Sambrc-et-Meuse.

DINAPUR, a town and military station of British India, is situated on the right or south bank of the Ganges, and on the East Indian Railway, in the district of Patna, province of Behar, about ten miles west of Patna, The town, which stretches along the river bank for about a mile, consists mostly of thatched cottages, one story high, and is not laid out with regard to order or symmetry. Several handsome villas, however, surround the place—the residences of the European officers and the richer natives. Barracks sufficiently large to accommodate 1200 men are situated in Dinapur. In 1857 the sepoy garrison of the place took part in the mutiny of that year, but after a con- flict with the European troops were forced to retire from the town. Population about 18,000.

DINARCHUS (Acivapxos), the orator, son of Sostratus, was born at Corinth about 361 x.c. (Ol. 104, 4). Thus, like at least one greater member of the decade, Lysias, this last of the ten Attic orators was not an Athenian citizen. But his career at Athens, as a resident alien, was at least commenced early in life. When not more than twenty-five, he was already active as a writer of speeches for the law courts. He had been the pupil both of Theophrastus and of Demetrius Phalereus, and had early gained a certain fluent force, and a versatile command of style, which gave him some oratorical repute. His first important coxtact with public life was in 3243.0. The Areopagus, after inquiry, reported that nine men had taken bribes frum Harpalus, the fugitive treasurer of Alexander. ‘Ten public prosecutors were appointed. Dinarchus wrote, for one or mere of these prosecutors, the three speeches which are still extant—one “ Against Demosthenes,” one “ Against Aristo: giton,” one “ Against Philocles.” The authenticity of the speech against Demosthenes was indeed denied by Demetrius of Magnesia, chiefly on the ground that it is largely composed of matter taken from Aischines. Wester- mann went further, and doubted the genuineness of all three speeches. But Schiifer—who justly remarks that the absence of originality and of character is itself charac of Dinarchus—is probably right in accepting the genera opinion that they are authentic. .

It must always be borne in mind that Dinarchus was Corinthian, a mere resident alien at Athens, whose sympathies were in favour of an Athenian oligarchy undet

Macedonian control. Little as the man’s life, so far as we know of it, engages our respect or esteem, his position must at least be broadly distinguished from that of such a man as Aischines, an Athenian citizen who, while his city could still be saved, abetted its enemies—or from that of such a hireling as Demades. In the Harpalus affair, Demosthenes was, beyond all reasonable doubt, innocent, and so, pro- bably, were others of the accused. Yet Hyperides, the most fiery of the patriots, was on the same side as Dinarchus. Under the regency—for such it really was—of his old master, Demetrius Phalereus, Dinarchus had much political influence. The years 317-306 B.c. were the most prosper- ous of his life. On the fall of

Demetrius Phalercus, Dinarchus withdrew into exile at Chalcis in Eubcea. About 292 2.c. he ventured to return to Attica, and took up his abode with a former associate, Proxenus, in the country, against whom he afterwards brought an action, on the ground that Proxenus had robbed him of some money and plate which he had brought with him. He died at Athens, at the age of about seveuty, z.e., about 291 z.c. Dionysius held that, out of 85 extant speeches bearing the name of Dinarchus, 58 were genuine,—28 in public causes, 30 in private causes, In addition to the three speeches above mentioned, we have scanty fragments of 88 more which passed, with at least some authors, under his name. The number need not surprise us, when we remember that Suidas speaks of 160 speeches of Dinarchus, and (following Czecilius probably) allows 60 as genuine. No orator of the Attic decade had so little of an individual style, and to no other, consequently, was alien work so largely ascribed by the Alexandrian critics. Dinarchus imitated by turns the style of. Lysias, of Hyperides, of Demosthenes. As Dionysius says of him, oddév otre xowvdv ovr idiov éoyev, he had no general stamp of his own, no distinctive trait. He was neither an inventor, like Lysias, Isocrates, and Iseeus, nor a perfecter like Adschines, Hyperides, and Demosthenes. He is called by Hermogenes 0 Kpifivos Anpoobévys,—a metaphor taken either from barley compared with wheat, or, better perhaps, from beer compared with wine,—-a Demosthenes whose strength is rougher, and who has neither the flavour nor the sparkle. Our best MSS. are the Codex Crippsianus and the Codex Oxoniensis (containing also Antiphon, Andocides, Iseus, Lycurgus.) The three extant orations, with the fragment ascribed to Demades, ed.

¥. Blass, Lips. 1871. The fragments in Baiter and Sauppe’s Oratores Attict, vol. ii.

DINGWALL, a royal burgh of Scotland, the county town of Ross-shire, 15 miles north-west of Inveruess, at the Junction of the Sutherland and Dingwall and Skye railways. It occupies a low situation at the upper end of Cromarty Firth, where the valley of Strathpeffer unites with the alluvial lands at the mouth of the Conan. Though a neatly built and thriving place, it has nothing special to show except the curious old towu-house, a few remains of the ancient mansion-house of the powerful family of Ross, and an obelisk 57 feet in height, erected to the memory of George, first earl of

Cromarty. Dingwall, like so many towns on the same coast, is of Norse origin, and its name in Scandinavian significs the Court Hill. In Gaelic it is known as Inbhir-pheoran, or the mouth of the Peffer. Its charter, granted by Alexander II., was renewed by James

It unites with Tain, Dornoch, Wick, Kirkwall, and Cromarty in returning one member to Parliament. Popula- tion in 1871, 2195.

DINKELSBUHL, a town of Bavaria, in the depart- Ment of Mittelfranken, or Middle Franconia, on the Wornitz, about 40 miles by rail from Donauwérth, where the river joins the Danube. It is an important centre both of civil and ecclesiastical administration, and has a Roman catholic and a Protestant church, a Latin and

industrial school, and several benevolent institutions. The inhabitants carry on the manufacture of gloves, stockings, and other articles, and deal largely in cattle. Fortified by Henry I., Dinkelsbiihl received in 1305 the same municipal rights as Ulm, and obtained in 1351 the position of a free imperial city, which it retained till 1803. Its municipal code, the Dinkelsbiihler Recht, printed in 1536, and re- published in a revised form in 1738, contained a very extensive collection of laws on matters both of public and private interest. Population in 1875, 5238.

DINOCRATES (called by Pliny Dinochares), a Greek architect, who lived in the reign of Alexander the Great. He applied to that king’s courtiers for an introduction to the Macedonian king, but was put off from time to time with vain promises. Impatient at the delay, he is said to have laid aside his usual dress, besmeared his body with oil in the manner of an athlete, thrown a lion’s skin over his shoulders, and, with his head adorned with a wreath of palm branches, and a club in his hand, made his way through a dense crowd which surrounded the royal tribunal to the place where the king was dispensing justice. Amazed at the strange sight, Alexander asked him who he was. He replied that he had come into the royal presence to make known a scheme which would be worthy of the consideration of the greatest monarch in the world. Out of Mount Athos, a mountain rising like a pyramid toa height of 6780 feet topped with a cone of white limestone, he

proposed to construct the gigantic figure of a man, holding a large city in his right hand, while in his left he held a gigantic tank large enough to contain all the water from the brooks in the peninsula. The story goes that the king was not displeased with the idea, but, as he thought it chimerical, it came to nothing. Alexander, however, was so delighted with the man, and with his bold and daring conceptions, that he carried Dinocrates with him when he went on his campaigns against Darius. He was employed by the king to design and lay out the city of Alexandria. This city was founded in 332 3.c., but the untimely death of Dinocrates prevented it from assuming the propor- tions intended by its designer. The Ephesians, whose temple of Diana had just been burnt down, employed him in its reconstruction, But perhaps the most original of all his conceptions was his design for a temple to Arsinoé, wife of Ptolemy II., king of Egypt. The roof of the building was to have been composed of a mass of loadstones, strong enough to hold floating in the air, and suspended within it, an iron statue of the queen.

DINORNIS (Sewés, terrible, and épvis, bird), a genus of gigantic Struthious birds, believed to be extinct, which in post-Pliocene times must have formed a principal feature in the fauna of New Zealand. Their remains are found in greatest abundance in the provinces of Otago and Canter- bury, often strewn in great profusion over the surface of the ground, but more usually met with buried in alluvial deposits, and in swamps ; and they indicate that many of the species attained a huge sizc—thus the tibia of Dinornis giganteus measures about a yard in length, and the bird itself must have stood 10 or I1 feet high. Another species, Dinornis elephantopus, although less in height, possessed, according to Professor Owen, the most massive skeleton in the entire order of birds, its toe bones almost rivalling those of the elephant. Wing bones are believed to have been entirely wanting in those species which now constitute the genus Dinornis, as also the fourth toe, which is present along with rudimentary wing bones in the species which have been placed in the new genus Palapteryx. Among living birds Dinornis agrees most closely with the Apteryx, the diminutive living representative in New Zealand of this gigantic race of bipeds, while somewhat resembling the emeu and cassowary in the formation of

the feathers. Judging from their general structure, and from the habits of their nearest living allies, these great wingless birds may be supposed to have inhabited the plains and hillsides rather than the forests of New Zealand, and to have been omnivorous, feeding indiscriminately on seeds and roots, lizards and insects. Crop-stoncs are often found in little heaps beside their skelctons, and as these are generally such stones as occur in the neighbourhood, it has been inferred that the Dinornis was comparatively stationary in its habits. New Zealand has been so thoroughly explored in recent years as to render it highly improbable that the moa, as the Dinornis is called by the Maoris, will yet be found alive, but there seems sufficient reason for believing that its final extinction may have taken place since the arrival of the Maori race in New Zealand. The Maoris have only been settled there for about five centuries, yet they have traditions regarding moa hunting, its bones are found in ancient cooking ovens, and many specimens have been obtained in which portions of the skin with feathers attached are still preserved. An egg has also been recently found containing the bones of the chick, and another measuring 10 inches long and 7 inches broad was taken from a grave, where it rested in the hands of a human skeleton. There is evidence of the coexistence in New Zealand of about 20 species of moas during post-Pliocene times, and this, as A. R. Wallace remarks, points to the conclusion that New Zealand was at one time a much more extensive land than it now is ; while the fact, that recently remains of the Dinornis have been found in a post- Pliocene deposit in Qucensland strengthens the supposition that when the moa flourished Australia and New Zealand formed portions of one continent,

DINOTHERIUM, an extinct mammal, fossil remains of which occur in the Miocene beds of France, Germany, Greece, and Northern India. These until lately con- sisted exclusively of teeth and the bones of the head. An entire skull, obtained from the [Epplesheim beds of Hesse Darmstadt in 1836, measured 4} fect in length and 3 feet in breadth, and thus indicated an animal exceeding the elephant in size. Its upper jaw was destitute of incisor and canine teeth, but possessed 5 molars on each side, with & corresponding number in the jaw bencath. Its most remarkable feature, however, consisted in tlic front part of the lower jaw being bent downwards and bearing two tusk- like incisors also directed downwards and backwards. Judging from these remains Professor Owen placed the Dinotherium among

the proboscidean mammals; De Blainville, on the other hand, regarded it as an aquatic animal, destitute of legs, and somewhat resembling the manatee, —its reversed tusks having probably been uscd to moor the creature to the bank of the streams it frequented, or to assist it in leaving the water. The recent discovery, however, of limb bones, decidedly proboscidean in type, , and supposed to belong to the Dinotherium, supports the view that these creatures were more akin to the elephant and mastodon than to the manatee.

DIOCESE, from the Greek dcoceno1s—primarily mean- ing administration, then the territorial circumscription in which administration was exercised—was first used to denote the Greek provinces of the Roman empire, or more properly the portion of a province ruled by a propretor. hus Cicero had, besides Cilicia, three “ dioceses ? in Asia. Bingham (lib. ix. c. 1) says that the division of the empire into clerical dioceses was in the time of Constantine, whereas the division into provinces was much anterior. He goes on to show that the primitive church followed exactly the example of the empire in her territorial arrange- ments. As in every metropolis of each province there was a magistrate with authority over the inagistrates of each city, so in every metropolis there was a bishop, whose

authority extended over tlie entire province, who was thence called “ metropolitan,” or “ primate,” as being the first or principal bishop of the province. And everywhere the episcopal sees were under the authority of the bishop of the civil metropolis, except in Africa, where the primate was usually the senior bishop of the province. The term ‘ diocese,” however, was sometimes used in the more com- prehensive, and the term province in the less comprehen- sive sense, as appears from the Notitia dignitatum Imperii, drawn up, as it would seem, in the time of the emperors Arcadius and Honorius (sec Bingham, loc. cit.) The territorial division, however, as given in the Wotitia, was purely civil. But Bingham tells us that, though we have no equally ancient account of the ecclesiastical division of the empire, yet if we compare the fragmentary bits of in- formation which may be picked out of the acts of and subscriptions to the earlier councils with later notices, it will be seen that the ecclesiastical very exactly followed the civil distribution.

Tt may be mentioned that, before the 4th century, the term “ parish”—rapocxta—was often used indiscriminately with the word ‘ diocese,” a circumstance which las caused ecclesiastical antiquarians to expend much erudition in showing that, despite the confusion of terms, the thing intended corresponded to our idea of a diocese, and not to our idea of a parish.

The uncertainty with regard to the number and circum- scription of the English ecclesiastical diocescs under the Romans is great, and the information attainable fragmen- tary. At the council of Arles, held in the year 314, the bishop of York, the bishop of London, and the bishop “de colonia Lindi,” probably Lincoln, are recorded to have becn present. But the changes in the number and terri- torial circumscription followiug the Saxon invasion—and not yet finally completed—were so great that volumes of minute antiquarian investigation would be needed to trace —in so far as it may be still possible to trace—the progress of nomenclature and delimitation of the various dioceses of Britain from the first establishment of them to the present day.

The division of dioceses found to be too large to be con- veniently administered by one bishop was practised from very early times, as may be seen by the decrees of a council held in Portugal about the middle of the Gth century. Another reason for dividing a diocesc, and establishing a new see, has been recognized by the church as duly exist- ing “if the sovereign should think fit to endow some principal village or town with the rank and privileges of a city” (Bingham, lib. xvii. c. 5). But there are canons for the punishment of such as might induce the sovereign so to erect any town into a city, solcly with tle view of becoming bishop thereof. Nor could any diocese be divided without the consent of the primate.

In the countries more immediately subjected to the Roman pontiff the multiplication of dioceses has been excessive, the number of them in the apostolic dominions being no less than 68, while the Roman Church reckons 1n the whole of Europe (exclusive of the English, but inclusive of the Irish sees) 578 sees.

DIOCLETIAN, Vaterius DiocLerianus (245-313), Roman emperor, was born of obscure parents near Salona, in Dalmatia, and reigned from 284 to 305 a.p. He entered the army and served with high distinction, held

important commands under the emperors Probus and Aurelian, and accompanied Carus to the Persian war. After the death of Numerianus he was chosen emperor by the troops at Chalcedon, and slew with his own hands Arrius Aper, the prefect of the pretorians. His advent to the throne marks the commencement of the era of Diocletian, August 29, 284. Having been installed at

DIO—

Nicomedia, he received general acknowledgment after the murder of Carinns. He appointed Maximian Augustus in 986, and Constantius Chlorus and Galerius, Czesars in 292. Fach of the four rules was placed at a separate capital— ‘Treves, Sirmium, Milan, Nicomedia. This amounted to an entirely new organization of the empire, on a plan com- mensurate with the work of government which it now had to effect. At the age of fifty-nine, exhausted with labour, he abdicated his sovereignty on May 1, 305, and retired to Salona, the place of his birth, where le died eight years afterwards. His reign was memorable for the persecution of the Christians.

DIODATI, Giovanni (1576-1649), a Swiss theologian of the Reformed Church, was born at Geneva on the 6th June 1576 of anoble family originally belonging to Lucca, which had been expatriated for the profession of Protestantism. In his youth he distinguished himself as a biblical scholar, and at the age of twenty-one he was nominated Professor of Hebrew at Geneva on the recom- mendation of Beza. In 1608 he became a pastor, or parish minister, at Geneva, and in the following year he succeeded Beza as professor of theology. As a preacher he was eloquent, bold, and fearless, with his full share of thie intolerance that prevailed among his party at Geneva. He held a high place among the reformers of Geneva, by whom he was sent on a mission to France in 1614. He had previously visited Italy, and made the acquaintance of Sarpi and Fulgenzio, whom he endeavoured unsuccessfully to engage in a reformation movement. In 1618-19 he attended the Synod of Dort, and took a prominent part in its deliberations, being one of the six divines appointed to draw up the account of its proceedings. He was a thorough Calvinist, and entirely sympathized with the con- demnation of the Arminians. In 1645 he resigned his professorship, and he died at Geneva on the 3d October 1649, Diodati is

chiefly celebrated as the author of the translation of the Bible into Italian which appeared in 1603. Another edition with notes was issued in 1607. Asa translator he possessed the primary qualification of a competent knowledge of the original, but his work was rather a paraphrase than a translation, and his notes were those of a theologian rather than of a critic. He also un- dertook a translation of the Bible into French, which appeared with notes in 1644. Among his other works were his Annotationes in Biblia (1607), of which an English translation was published in London in 1648, and various polemical treatises, such as De fictitio Pontificiorum Purgatorio, 1619; De justa Secessione Reformatorum ab Heclesia Romana, 1628; De Antichristo, &e. He also published French translations of Sarpi's ZHistory of the Council of Trent, and of Edwin Sandys's Account of the State of Religion in the West.

DIODORUS, named SicuLus, a Greek historian, born at Agyrium in Sicily. Of his life we know nothing except what he himself has narrated, that, in prosecution of his historical researches, he undertook frequent and dangerous Journeys, and studied Latin at Rome. His history occupied thirty years in writing, and was at last completed in forty books, From internal evidence it is certain that it was wnitten after the death of Julius Cesar; but the passages Which show him to have survived the alteration of the calendar by Augustus are generally regarded as spurious. His history, to which, from its comprehensive plan, he has given the title of Bibliotheca, is divided into three parts. The first treats of the mythic history of the non-Hellenic, and afterwards of the Hellenic tribes ; the second section ends with Alexander's death ; and the third continues the history as far as the beginning of Czsar's Gallic war. Of this extensive work there are still extant only the first five books, treating of the mythic history of the Egyptians,

Assyrians, Aithiopians, and Greeks ; and also from the 11th to the 20th book inclusive, beginning with the second Persian war, and ending with the history of the successors of Alexander, previously to the partition of the Macedonian empire. The rest exists only in fragments which have been collected by Photius. The faults of Diodorus arise principally from the gigantic nature of the undertaking, the cumnbrous nature of the materials,

and the awkward form of annals into which he has thrown his narrative. He has been at little pains to sift his materials, and hence frequent repetitions and contradictions may be found in the body of the work. As a ctitic, he seems to have been altogether ignorant of the ethical advantages of history, and shrinks from administering praise or blame to the persons whose history he writes. In the chronology of the strictly historical period he is occasionally inaccurate ; and the poetical myths which take the place of the early history are related with all the gravity of historical detail. His narrative is without colouring, and monotonous ; and his simple aud clear diction, which stands intermediate between pure Attic aud the colloquial Greek of lis time, enables us to detect in the narrative the nndigested frag- ments of the materials which he employed. The parti- culars, however, which he has handed down are valuable, as enabling us in several points to rectify the errors of Livy.

The best editions of Diodorus are Wesseling's, 2 vols., Amstel. 1745 ; that printed at Deux-Ponts, 11 vols., 1795-1801; EFichstadt's (to book xiv.) 2 vols., Halle, 1802-4 ; and Dindorf's, 5 vols., Leips. 1828-31.

DIOGENES, of Apollonia in Crete, a celebrated natural philosopher who flourished at Athens about 460 B.c. He was a pupil of Anaximenes and a contemporary of Anaxagoras. The fragments of his writings have been collected together by Panzerbieter. He believed air to be the source of all being, and all other substances to be derived from it by condensation and rarefaction. His chief advance upon the doctrines of his master is that he asserted air, the primal force, to be intelligence— the air which stirred within him not only prompted but instructed. The air as the origin of all things is necessarily an eternal, imperishable sub- stance, but as soul it is also necessarily endowed with consciousness." Mr Lewes and Mr Grote assign to him a higher place in the evolution of philosophy than either Hegel or Schwegler.

DIOGENES (about 412-223 3.c.), the famous Cynic philosopher, was the son of Icesias, a money-changer of Sinope in Pontus. Having been detected in adulterating coin, his father and he were compelled to leave their native city. According to another account, however, Icesias died in prison, and Diogenes fled to Athens with a single attendant. On his arrival in that city

he dismissed his attendant with the piquant question, ‘“‘ 1f Manes could live without Diogenes, why not Diogenes without him?” and on the same principle he denuded himself of all superfluous dress, furniture, and even ideas. A wooden bowl, which, with his cloak and wallet, formed his only movables, is said to have been immediately discarded when he saw a boy drinking water from the hollow of his hand. The fame of Antisthenes soon attracted him to Cynosarges, and the pertinacity with which, for the sake of wisdom, he not only endured the scoffs but volunteered to submit to the blows of the great teacher, soon procured him a favourable reception from the whole Cynical school. The favourite pupil, however, soon outstripped his master in the ex- travagancies of his life, and the pungent keenness of his sarcasms. That he took up his abode in a cask belonging to the temple of Cybele is a circumstance liable to suspicion, from being more frequently alluded to by the satirists than by the biographers of Diogenes, That he

used to inure himsclf to the vicissitudes of the weather by rolling himself in hot sand in summer, and in winter by embracing statues covered with snow, are facts resting on the authority of all the ancient historians. His numerous witty apophthegms are preserved by Diogenes Laertius. After his voyage to Augina, during which he fell into the hands of pirates, who sold him as a slave in Crete, the conduct of Diogenes appears in a much less ridiculous light. With characteristic boldness he proclaimed to his captors that he knew no trade except “to govern men,” and wished to be sold “toa man that wanted a master.” Such a purchaser he seems to have found in Xeniades, who took him to Corinth to superintend the education of his children, There he spent the rest of his life; and he is said to have reached an extreme old age. There at the Isthmian games he taught tle assembled concourse in the Kraneion ; and thither he attracted a crowd of disciples when Antisthenes had ceased to tickle their ears in Cynosarges. There, too, in all probability, his famous interview with Alexander took place, in which the only favour he had to beg of the prince was that he would not stand between him and the sun,—when Alexander is said to have exclaimed, “Tf I were not Alexander, I would be Diogenes.” To Athens Diogenes seems never to have returned, Of his death, which is said to have taken place on the same day with that of Alexander the Great, there are various con- flicting accounts.

That he perished by the bite of a dog, or from the immoderate use of raw flesh, or by his own hand, is now generally disbelieved. It is more probable that his death was calm and peaceful; and in spite of his desire to be thrown to the beasts of the field, he received from Xeniades an honourable interment. In the days of Pausanias the Corinthians pointed with pride to his grave; and on the isthmus there was a pillar erected to his memory, on which, as the self-chosen symbol of his life, there rested a dog of Pariau marble. His alleged con- nection with Lais, and the open indecencies of which he is said to have been guilty, have thrown a shade upon his character. The former is, however, it must be confessed, exccedingly improbable ; and the latter charge was undoubt- edly exaggerated, if it was not originated by the shameless excesses of the later Cynics. The Cynics answered argu- ments by facts. When some one was arguing in support of Zeno of Elea's notion respecting the impossibility of movement, Diogenes rose and walked. – Definitions might prove that there was no motion, but definitions were only verbal, and could be answered by facts. This appeal to common sense, the argumentum ad bacillum, was of more value and importance in ethical than in speculative philosophy.

DIOGENES LAERTIUS, the biographer of the Greek philosophers, is supposed by some to have received his surname from the town of Laerte in Cilicia, and by others from the Roman family of the Laertii. Of the circum- stances of his life we know nothing. The date at which he wrote—probably the reign of Septimius Severus (193-211)—is known only from conjecture. His own opinions are equally uncertain. By some he was regarded as a Christian ; but it seems more probable that he was an Kpicurean. The work by which he is known professes to give an account of the lives and sayings of the Greek philosophers. Although it is at best an uncritical and unphilosophical compilation, its value, as giving us an insight into the private life of the Greek sages, justly led Montaigne to exclaim that he wished that instead of one Laertius there had been a dozen. In the commencement of the work lie divides philosophers into the Ionic and Italic schools. The biographies of the former begin with Anaximander, and end with Clitomachus, Theophrastus, and Chrysippus; the latter' begins with Pythagoras, and

ends with Epicurus. The Socratic school, with its various branches, is classed with the Ionic; while the Eleaties and sceptics are treated under the Italic. The whole of the last book is devoted to Epicurus. From the statements of Burlus, the text of Laertius seems to have been much fuller than that which we now possess; and hopes haye been entertained of obtaining a more complete copy.

The best modern edition is that of Hiibner, Leipsic, 2 vols, 8yo,

1828-31.

DIOMEDES, son of the impetuous Tydeus, is a hero of the Attolian and Argo -Theban legends. He is in the Jad the leader of the tribes which belong to the government of the Amythonide. A favourite of Athene, from whom he received the gift of immortality, he does not spare even gods if she is standing by his side. He carried off the Trojan Palladium and brought it to Argos, where it was preserved by his descendants. He was known in many other places as a devotee of Athene and a supporter of her worship, In Argos his shield was carried through the town as a relic on the festival of Athene. A temple of Athene Ancmotis (the storm ruler) was said to have been founded by him. He was worshipped in several parts of Italy, and in Salamis in Cyprus. Indeed he may be said generally to belong to the worship of Athene in so far as she is the goddess of storm and war.

DION, of Syracuse (408-353 3.c.), was the son of Hipparinus, and brother-in-law of Dionysius the Elder, In his youth he was an ardent admirer and diligent pupil of Plato, whom Dionysius had invited to Syracuse ; and he used every effort to promote the carrying out of his master’s maxims in the administration of the kingdom. His nea relationship to the despot gave him great influence at court, and also enabled him to amass considerable wealth, Accordingly, on the accession of the younger Dionysius, the stern morality of the philosopher stood in marked con- trast to the dissolute character of the prince. An antagonism thus silently sprung up between the two; and the proposal of Dion to invite Plato again to Syracuse was made the occasion of an open rupture. To counteract the influence of that distinguished philosopher, the enemies of Dion obtained the recall of the historian Philistus, who had already signalized himself as a faithful supporter of despotic power. ‘This artful courtier quickly regained his ascendency over

the mind of Dionysius, and was at length successful in procuring the banishment of Dion. The exiled philosopher retired to Athens, where he was at first permitted to enjoy his revenues in peace ; but the interces- sions of Plato served to exasperate the tyrant, and at length provoked him to confiscate the property of Dion, and give his wife to another. This last outrage roused Dion to seek the liberation of his country by force ofarms, Assembling a small force at Zacynthus, he sailed to Sicily, and, in the absence of Dionysius, was received with demonstrations of joy. He succeeded in defeating the forces of the tyrant, but was himself soon after supplanted by the intrigues of Heraclides. Again he was banished; but the incompetency of the new leader soon led to his recall. He had, however, scarcely made himself master of Sicily when the people began to express their discontent with his tyrannical con duct, and he was assassinated by Caliphus, an Atheniat who had accompanied him in his expedition. ;

DION CASSIUS COCCEIANUS, the celebrated his torian of Rome, was born at Nicsea in Bithynia, 155 A.D. His father's name was Cassius Apronianus, and by bis mother's side he was the grandson of Dion Chrysostom, who also obtained the surname of Cocceianus, When 2 young man he accompanied his father to Cilicia, of which he had the administration; and on his father's death he went to Rome, where in the last year of the reign 0 Marcus Aurelius, or immediately after the death of that

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emperor, le was received into the senate. During the reign of Commodus, Dion continued to practise as an advocate at the Roman bar, and held the offices of eedile and questor. He was raised to the preetorship by Pertinax, but did not assume office till the reign of Septimius Severus, with whom he was for a long time on the most intimate footing. By Macrinus he was intrusted with the administration of Pergamus and Smyrna; and on his return to Rome he was raised to the consulship about 220, After this he obtained the proconsulship of Africa, and again on his return was sent as legate successively to Dalmatia and Pannonia. He was raised a second time to the consulship by Alexander Severus, in 229; but under precext of suffering from a diseased foot, he soon after retired to Niceea, where he

died. The date of his death is unknown. Previous to writing his history Dion Cassius had inscribed to the Emperor Severus an account of various dreams and prodigies which had presaged his elevation to the throne, and had also written a biography of the Emperor Commodus, which was afterwards incorporated into his larger work. he history of Rome, which consisted of 80 books,—and, after the example of Livy, was divided into decades,—began with the landing of A‘neas in Italy, and was continued as far as the opening of the reign of Alexander Severus. The first 24 books exist only in fragments ; from the 36th to the 54th, the work is extant complete ; from the 55th to the 60th, it is probably an abridgment, and besides these, parts of the 71st and 75th books have ialso beenrecovered. ‘The diligence of Dion as an historian is undoubted, and the various important offices which he held under the emperors gave him valuable opportunities for historical investigation. Although more philosophical than the corapilations of the mere annalist, his work is not remarkable for vigour of judgment or critical acumen. His style is far clearer than that of Thucydides, whom he took as his model ; but his diction is full of Latinisms.

His history was first published in a Latin translation by N. Leonicenus, Venice, 1526. The best modern edition is that of Sturz, Leipsic, 1824-48, which contains the Excerpta Vaticana. Various other writings, such as a History of Persia, Enodia or Itiner- ares, a Life of Arrian, Getica, and a work on the Emperor Trajan, are attributed to Dion Cassius, but in all probability without founda- tion. The substance of his history is reproduccd in the annals of Zonaras.

DION CHRYSOSTOM (i.¢., golden mouthed), (c. 50- 117), was born at Prusa, in Bithynia, about the middle of the Ist century. He visited Egypt with his father at an early period of his life, and went to Rome during the reign of Domitian. Being implicated ina plot against the tyrant, Dion fled from the capital, and wandered about in Thrace, Mysia, Scythia, and the other countries of the Gets, with only Plato’s Phado and Demosthenes On the Embassy in his possession, till the accession of Nerva, when he was allowed to return. With Nerva and Trajan he continued on the most friendly footing. Tle retired to Prusa for a short time; but having been accused of peculation and treason, he returned to Rome, where he re- maimed till his

death. ighty orations of his are extant entire, and there are fragments of about fifteen others.

ey are written in a lucid and elegant style, and treat mostly of political, ethical, and mythological subjects.

DIONYSIA, or Baconanatza, were festivals in honour of Dronysus (q.0.) generally, but in patticular the term refers to the festivals celebrated in Attica and by the branches of the Attic-Ionic race in the islands and in Asia Minor. y Attica there were two festivals annually. (1) The lesser

Onysla, Or 74, kar’ d-ypous, were held in the country places Where the vine was grown in the month of December.

his was a vintage festival, and was accompanied by songs, dance, phallus processions, and the impromptu performances of Itinerant players, who with others from the city throngei

to take part in the excitement of the rustic sports. (2) The greater Dionysia, or ré& év doret, were held in the city of Athens in the month of March. This was a festival of joy at the departure of winter and the promise of summer, Dionysus being regarded as having delivered the people from the wants and troubles of winter. The religious act of the festival was the conveying of the ancient image of the god, which had been brought from Eleuthers to Athens, from the ancient sanctuary of the Lenzon to another sanctuary, with a chorus of boys and a procession carrying masks and singing the dithyrambus. The cul- mination of the festival was in the production of tragedies, comedies, and satiric dramas in the great theatre of Dionysns. Besides the Divnysia strictly so called, there were also the Lencwa and Anthesteria, both held in honour of this god, the former in January and the latter in February.

DIONYSIUS, the Elder (c. 430-367 B.c.), tyrant of Syracuse, was born abont 430 n.c. He began life as a clerk in a public office, and first took part in political affairs during the dissensions that followed the destruction of the Athenian expedition. He was wounded in the attempt of Hermocrates to

seize upon Syracuse; and, during the disasters inflicted by the Carthaginians who had invaded the island, he succeeded, along with Philistns and Hipparinus, in procuring the deposition of the Sicilian generals, and was himself included in the number appointed in their stead. By intriguing with the inhabitants of Gela, which he had been sent to relieve, and spreading insinua- tions of treachery in regard to his colleagues, he was ultimately invested with the supreme command; and by the help of a large body-guard he soon made himself independent of the popular opinion. Pestilence having thinned the Carthaginian army, Dionysius, in spite of his ill success, found no difficulty in procuring peace (405 B.c.). In the stronghold of Ortygia he defied the machinations of his enemies, until, partly from defeats and partly from dissensions, the opposition died away. After a success- ful expedition against Naxos, Catana, and Leontini, his efforts were directed against Carthage. (See CARTHAGE). He also carried an expedition against Rhegium and its allied cities in Magna Grecia. In one campaign, in which he was joined by the Lucanians, he devastated the territories of Thurii, Croton, and Locri. After a protracted siege he took Rhegium, 387 B.c., and sold the inhabitants as slaves. He joined the Ilyrians m an unsuccessful attempt to plunder the temple of Delphi, and also pillaged the temple of Cere on the Etruscan coast. In the Peloponnesian war he espoused the side of the Spartans. Not content with his military renown, Dionysius aspired also to poetical glory. His poems were hissed at the Olympic games; but having gaineda prize for tragic poetry at Athens, he was so elated that he engaged ina debauch which proved fatal (367 B.c.) His life was written by Philistus, but the work has unfortunately perished.

DIONYSIUS, the Yonnger, ascended the throne of Syra- cuse at his father’s death, in 367 B.c. He was driven from the kinglom by Dion, and fled to Locri ; but during the commotions which followed the assassination of that leader, he managed to make himself master of Syracuse. On the arrival of Timoleon he was compelled to surrender and retire to Corinth (343 B.c.), where he spent the rest of his days in poverty.

DIONYSIUS, of Halicarnassus, was born about the middle of the first century B.c. His father’s name was Alexander. From the introduction to his great work we learn that he went to Italy after the termination of the civil wars, and spent twenty-two years in preparing materials for his history,

which is entitled Archwologia, and embraced the history of Rome from the mythical period

to the beginning of the frst Punic war. Ib was divided into twenty books,—of which the first nine remain entire, the tenth and eleventl are nearly complete, and the remaining books only exist infragments. In the first three books of Appian, and in the Camillus of Plutarch, much of Dionysius has undoubtedly been embodied. Asan historian he is minute and painstaking; but his atteinpts to Grecianize the early history of Rome, that the Greeks might in some measure be reeoneiled to a foreign yoke, render his aceuracy more than suspicious. Dionysius was also the author of a treatise on rhetoric, which, with his criticisms on 'Thucydides, Lysias, Isocrates, Iszeus, Dinarchus, Plato, and Demosthenes, have been preserved. The best editions of his works are those of Hudson and Reiske. The rlictorical works have been edited separately, by Gros and by Westermann.

DIONYSIUS, the Areopagite, according to Snidas, was an Athenian by birth, and eminent for his literary attainments. He studied first at Athens, and afterwards at Heliopolisin Egypt, While in the latter city, he beheld that remarkable eclipse of the sun, as he terms it, which took plaee at the death of Christ, and exclaimed to his friend Apollophanes, 7 76 Oeiov mécyxe, 4 TO TacxovTL ouvpracye, " Hither the Divinity suffers, or sympathizes with some sufferer." He further details that, after Dionysius returned to Athens, he was admitted into the Areopagus, and, having embraced Christianity about 50 A.D., was constituted bishop of Athens by the apostle Paul (Acts xvii. 34). Aristides, an Athenian philosopher, asserts that he suffered martyrdom—a fact generally admitted by historians; but the precise period of his death, whether under Domitian, Trajan, or Adrian, is not certain. A writer in later times attempted to personate the Areopagite, and contrived to pass his productions on the Christian world as of the apostolic age, thereby greatly influencing the spirit of both the Eastern and Western Churches. These writings consist of a book called Zhe Celestial Hierarchy ; another Of the Lcclesiastical Iier- archy ; A Treatise on the Divine Names ; another Of Mystical Divinity ; and Ten Epistles. Different opinions have been held as to the real author of these productions. They were ascribed, at an early

period, to Apollinaris, bishop of Laodicea, in the 4th century. The resemblance between the Areopagitica aud the writings of Proclus and Plotinus is so great that it is probable the Pseudo- Dionysius did not write much earlier than the 5th century. The first uncontroverted oceasion on which these supposi- titious writings are referred to, is in the conference between the Severians (a sect of Eutychians) and the Catholics, held in the emperor Justinian's palace, 532 a.p., in which they are quoted by the heretical party.

DIONYSIUS, surnamed Periegetes, from his being the author of a repujynows ris yis, containing a descrip- tion of the whole earth in hexameter verse, and written iu a terse and elegant style. This work enjoyed a high degree of popularity in aneient times, and two transla- tious or paraphirases of it were made by the Romans, one by Rufus Festus Avienus, and the other by the grammarian Priscian. The best edition of the original is that by Bern- hardy (Leipsic, 1828). Great differenees of opinion have been entertained as to the age and eountry of this Dionysius. All, however, are agreed in plaeing him in the time of the Roman emperors, and it seems highly probable that he flourished in the latter part of the 3d or the beginning of the 4th century. Kustathius says that he was by descent a Libyan.

DIONYSIUS EXIGUUS, one of the most learned men of the 6th century, and especially distinguished as a chronologist, was, according to the statement of his friend Cassiodorus, a Scythian by birth, " Scytha natione." This

may mean only that he was a native of the region border. ing on the Black Sea, and does not necessarily imply that he was not of Greek origin. Such origin is indicated by his name and by his thorough familiarity with the Greck language. His surname " Exiguus" is usually translated "the Little," and is suppos2d to refer to his stature ; but it appears to be at least as probable that his known humility led him to assume the designation. He was living at Rome in the first half of the 6th century, and is usually spoken of as abbot of a Roman monastery, Cassiodorus, however, calls him simply " monk," whiie Bede calls him "abbot." But as it was not unusual to apply

the latter term to distinguished monks who were not heads of their houses, it is uncertain whether Dionysius was abbot in fact or only by courtesy. He was in high repute asa learned theologian, was profoundly versed in the Holy Scriptures and in canon law, and was also an accomplished mathematician and astronomer. We owe to him a collection of eeclesiastical canons, comprising the a:ostolical eanons and the decrees of the couneils of Nicma, Constantinople, Chalcedon, and Sardis, and also a collection of the decretals of the Roman pontiffs from Siricius to Anastasius II. These collections were published by Justel in 1628. Dionysius did good serviee to his con- temporarics by Lis translations of many Greek works into Latin ; and by these translations some works, the originals of which have perished, have been handed down to us. THis name, however, is now perhaps chiefly remembered for his chronological labours, It was Dionysius who intro- duced the method of reckoning the Christian era which we now use. (See CuHronotocy.) His friend Cassiodorus depicts in glowing terms the character of Diomysius asa saintly ascetic, and praises his wisdom and simplicity, his accomplishments and his lowly-mindedness, his power of eloquent speech and his capacity of silence. He died at Rome, probably about the year 545.

DIONYSUS, in Greek Mythology, is principally the god of the vine; and in the myths concerning him it is clear that the effects of wine and the spread of vine growing have both been kept in view. No sooner had the god grown up than he started on distant expeditions to teach men to cultivate the vine, and on these occasions his followers were known for their ecstatic ceremonies. It would scem also as if the story of his birth was onlya mythical representation of the growth and ripening of the grape. Thebes in Beeotia was originally the local centre of his worship in Greece ; and he was a son of Semele, a daughter of Cadmus, the king of Thebes, his father being Zeus, who among other divine functions exercised also that of god of the fertilizing spring showers. Before the child was mature, Zeus appeared to Semele at her request in his majesty as ged of lightning, by which she was killed, but the infant was saved from the same fate by cool ivy which grew up suddenly around him. Zeus took him up, inclosed him within his own thigh till he came to maturity, and then brouglit lim to the light, of that he was twice born ; and it was to celebrate this double birth that the dithyrambus was sung. He was now con veyed by Hermes to be brought up

by the nymphs of Nysa, from which pleee it is probable his name Dio-nysts, or “ god of Nysa,” is derived ; but among the many places of this name claiming to have been the true oue tt 18 impossible to decide. In his journeys to teach the cultiva- tion of the vine he met with opposition in some cases, 5. in that of Lycurgus, a Thracian king, from whose attac Dionysus saved himself by leaping into the sea, where he was kindly received by Thetis. Lyeurgus was blinded by Zeus and soon died, or, according to another story, became frantic and hewed down his own son, mistaking him for & vine; while ina third story Ambrosia, who was change

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into a vine, clung so closely round him that, failing to escape, he died. A similar incident is that of Pentheus, ling of Thebes, who opposed the orgiastic ceremonies introduced by Dionysus among the women of Thebes, and, having been present watching one of these ceremonies, was mistaken for some animal of the chase, pursued, and slain by his own mother. At Orchomenus, the three daughters of Minyas refused to join the other women in their nocturnal orgies, and for this were transformed into birds. It was in accordance with this tradition that in after times, at the festival of the Agrionza, the priests of Dionysus pursued the women of the race of Minyas with drawn swords, and if they captured them, killed them, which incident, it will be seen, also justifies the title of dpnorys applied to Dionysus. On the other hand, when the god was received hospitably he repaid the kindness by the gift of the vine, and of this the chief instance is that of Icarius of Attica, who lived in the time of King Pandion. But Icarius, instead of keeping secret the use of the vine, spread it among the herdsman and labourers, who, becoming intoxicated with the wine, slew him and threw him into a well or buried him under a tree, where his daughter Frigone found his grave, and in her-despair hanged herself on the tree. In recollection of this it was the custom to hang small figures and masks on trees at the ceremony in her honour. The district of Icaria, though in Attica, was on the borders of Boeotia, which latter was the earliest and chief seat of the worship of Dionysus in Greece, with its famous festival on Mount Cithzron. Festivals of the same ecstatic kind spread to Attica, to Mount Parnassus, and north to Thrace. But in Boeotia Dionysus was personally associated with so many festivals and incidents that he has more the appearance of a hero or

demigod than of a god, and it may have been from a sense of this that Herodotus (ii. 52) calls him the most recent of the gods. In Homer also he has a secondary character. To what extent the idea of his functions may have been derived from the Vedic god Soma cannot be determined, but the similarity between the two deities becomes the more striking when we remember how actively the worship of Dionysus was con- ducted in Asia Minor, particularly in Phrygia and Lydia, where he was styled Sabazius, with the epithet also of Bayatos, from which it is supposed his Greek name of Bacchos was derived. As Sabazius he was associated with the Phrygian goddess Cybele, and was followed in his expeditions by a ¢hiasos of Centaurs, Pan, Satyrs, and Silenus. In Lydia his triumphant return from India was celebrated by an annual festival on Mount Tmolus, and it was in Lydia that he assumed the long beard and long robe which were afterwards given him in his character as the “Indian Bacchus.” The other incidents in which he appears ina purely triumphal character are his transforming the Tyrrhene pirates who attacked him into dolphins, as told in the Homeric hymn to Dionysus, and as represented on the monument of Lysicrates at Athens, and his part in the war of the gods against the giants. The adventure with the pirates occurred on his voyage to Naxos, where he found Ariadne when she had been abandoned by Theseus. At Naxos Ariadne was associated with Dionysus as his wife, and their marriage was annually celebrated by a festival. (See ArtapNg.) Another phase in the myth of Dionysos originated in observing the decay of vegetation Mm winter, to suit which he was supposed to be slain and to jo the deities of the lower world, in which connection he figured in the mysteries of Eleusis. This phase of his character wag developed by the Orphic poets, he having here the name of Zagreus, and being no longer the Theban god, but a son of Zeus and Persephone. The child was brought up secretly, watched over by Kuretes; but the jealous Hera discovered where he was, and sent Titans to

the spot, who, finding him at play, tore him to pieces, and cooked and ate his limbs, while Hera gave his heart to Zeus. To connect this with the myth of the Theban birth of Dionysus, it is said that Zeus gave the child’s heart to Semele, or himself swallowed it and gave birth to the Theban god. Altogether there were, it was said, five different gods “ Dionysus,” each

having different parentage. The conception of Zagreus, or the winter Dionysus, appears to have originated in Crete, but it was accepted also in Delphi, where his grave was shown, at which sacrifice was secretly offered annually on the shortest day. This feature of going away in the winter and returning at spring, which was common to Dionysus and Apollo, would commend the former god to the priests of Apollo at Delphi. Dionysus had further, in common with Apollo, the prophetic gift. Like Hermes, he was a god of the productiveness of nature, and hence Priapus was one of his regular com- panions, while not only in the mysteries but in the rural festivals his symbol, the phallus, was carried about ostentatiously. His symbols from the animal kingdom were the bull, panther, ass, and goat. His personal attributes are an ivy wreath, the thyrsus (a staff with pine cone at the end), a drinking cup (cantharus), and sometimes the horn of a bull on his forehead. Artistically he was repre- sented mostly either asa youth of soft nearly feminine form, or as a bearded and draped man, but frequently also as an infant, with reference to his birth or to his bringing up in Nysa, The earliest images were of wood with the branches still attached in parts, whence he was called Dionysus Dendrites. He was figured also, like Hermes, in the form of a pillar or term surmounted by his head.

The Greek colonists of Southern Italy (Magna Grecia) had taken with them the worship of Dionysus, and so successfully had it spread there that Sophocles (Antig. 1106) speaks of him as the god who rules in Italy. From Campania the joint worship of Dionysus (Liber), Demeter (Ceres), and Kore (Libera) was introduced into Rome, and a temple was erected to them 495 3.c., in obedience to the Sibylline books, But the mysteries which were held in con- nection with this worship were suppressed by the senate, 186 s.c. In Campania Dionysus was styled Hebon, and conceived in the form of a bul] with a human head. Libera, usually identified with Kore, corresponds rather to the goddess Hebe as worshipped at Phlius. (a. 8. M.)

DIOPHANTUS. See Ancesra, vol. i. p. 511.

DIPHTHERIA (from &Oépa, a skin or membrane), the term applied to an acute infectious disease, which is accompanied by a membranous exudation on a mucous surface, generally on the tonsils and back of the throat or pharynx. Although popularly believed to be a newly dis- covered disease,

there is distinct evidence that diphtheria was known to the ancient physicians as a malady of great virulence. Under the name of the Malum Lgyptiacum, Areteeus in the 2d century gives a minute description of a disease which in all its essential characteristics corresponds to diphtheria, In the 16th, 17th, and 18th .centuries epidemics of diphtheria appear to have frequently prevailed in many parts of Europe, particularly in Holland, Spain, Italy, France, as well as in England, and were described by physicians belonging to those countries under various titles; but it is probable that other diseases of a similar nature were included in their descriptions, and no accurate account of this affection had been published till M. Breton- neau of Tours in 1821 laid his celebrated treatise on the subject before the French Academy of Medicine. By him the term Le Diphthérite was first given to the disease. The subject has since been largely investigated both in Britain and on the Continent, where epidemics more or less extensive have been of common occurrence in recent times ; but while many important facts have been made out

regarding the pathology of diphtheria, the real nature of the malady still appears to be undetermined. By some it it is regarded as primarily a blood poison, the local mani- festations being secondary and not essential, while others hold, and this is the view now largely maintained by Con- tinental authorities, that diphtheria is at first a local disease, the constitution becoming secondarily affected or poisoned from the local affection. This latter view receives support both from experiments on inoculation of the disease in animals, and from the discovery in the diphtheritic mem- branes and surrounding tissues, as well as in the blood and other fluids of persons suffering from diphtheria, of the lower forms of vegetable organism (bacteria, micrococci, &c.), which are supposed to be the infecting agents both in the local affection and in its general constitutional effects. Whether this be the correct explanation of the disease, or whether, as is held by many, these organisms are to be looked upon merely as accompaniments or complications of the affection, not present in all cases, the following facts appear to be made out respecting diphtheria :—

1. That it is a disease communicable both by infection and by contagion.

2. That grave constitutional disturbance is a constant and prominent symptom of diphtheria.

3. That certain important consequences or, as they are

termed, sequel are apt to follow diphtheria, particularly some forms of paralysis.

These points, moreover, serve to distinguish this disease from croup, which, although in some cases presenting cer-

tain features of resemblance to diphtheria, differs from it in being a merely local inflammatory affection. See Croup.

As already observed, diphtheria has frequently appeared as an epidemic. It is probably more common in a sporadic form (single cases). It is sometimes endemic in certain localities where the hygienic conditions.are bad ; and there is ample evidence to show that air or water contaminated with decomposing animal matter may readily cause an out- break of diphtheria. The influence of climate, weather, and condition of soil appear to be inappreciable. When the disease has broken out in a dwelling it is apt to spread not merely by direct contagion, but apparently also through the air of apartments, this being notably the case in over- crowded habitations. The contagiousness of diphtheria is very marked, and has unhappily been often exemplified in the case of physicians, who have fallen victims to the disease from inoculation with its morbid products when cauterizing the throats or perfurming tracheotomy in those suffering from it. Children appear to be on the whole rather more liable to diphtheria than adults ; and although the most robust people may be attacked, those whose health is weakened by any cause are specially predisposed, One attack of diphtheria appears to afford no immunity from others.

It must be observed, however, that the mere existence uf a sore throat accompanied with some amount of membran- ous exudation does not constitute diphtheria, as is often erroneously supposed by non-medical persons, who are apt tu fancy they have had diphtheria several times from

having suffered from what is a comparatively simple complaint. The diagnosis can only be reliably made by a medical man.

Cases of diphtheria differ as to their intensity from the mildest forms, which resemble an ordinary catarrhal sore throat, to those of the most severe character (such as the gangrenous form), where the disease is hopelessly intract able from the first,

In general the symptoms at the commencement of an attack of diphtheria are comparatively slight, being those commonly accompanying a cold, viz., chilliness and depres- sion. Sometimes more severe phenomena usher in the attack, such as vomiting and diarrhwwa. A slight feeling of

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uneasiness in the throat is experienced along with some stiffmess of the back of the neck. When looked at the throat appears reddened and somewhat swollen, particularly in the neighbourhood of the tonsils, the soft palate, and upper part of pharynx, while along with this there is tenderness and swelling of tle glands at the angles of the jaws. The affection of the throat spreads rapidly, and soon the characteristic exudation appears on the inflamed surface in the form of greyish-white specks or patches, in- creasing in extent and thickness until a yellowish-looking false membrane is formed. This deposit is firmly adherent to the mucous membrane beneath or incorporated with it, and if removed leaves a raw, bleeding, ulccrated surface, upon which it is reproduced ina short period. The appear. ance of the exudation has been compared to wet parchment or washed leather, and it is more or less dense in texture. It may cover the whole of the back of the throat, the cavity of the mouth, and the posterior nares, and spread downwards into the air passages on the one hand and into the alimen- tary canal on the other, while any wound on the surface of the body is liable to become covered with it. This mem- brane is apt to be detached spontaneously, and as it loosens it becomes decomposed, giving a most offensive and charac. teristic odour to the breath. There is pain and difficnlty in swallowing, but unless the disease has affected the larynx no affection of the breathing. The voice acquires a snufiling character. Wheu the disease invades the posterior nares an acrid, fetid discharge, and sometimes also copious bleeding, takes place from the nostrils. Along with

these local phenomena there is evidence of constitutional disturbance of the most severe character. ‘There may be no great amount of fever, but there is marked depression and loss of strength. The pulse becomes small and frequent, the countenance pale, the swelling of the glands of the neck increases, which, along with the presence of albumen in the urine, testifies to a condition of blood poisoning. Unless favourable symptoms emerge death takes place within three or four days or sooner, either from the rapid extension of the false membrane into the air passage, giving rise to asphyxia, or from a condition of general collapse, which is sometimes remarkably sudden. In cases of recovery the change for the better is marked by an arrest in the extension of the false mem- brane, the detachment and expectoration of that already formed, and the healing of the ulcerated mucous mem- brane beneath. Along with this there is a general im- provement in tle symptoms, the power of swallowing returns, and the strength gradually increases, while the glandular enlargement of the neck diminishes, and the albumen disappears from the urine. Recovery, however, . is generally slow, and it is many weeks before full con valescence is established. Even, however, where diphtheria ends thus favourably, the peculiar sequelz already mentioned are apt to follow, generally within a period of two or three weeks after all the local evidence of the disease has disappeared. These secondary affections may occur after mild as well as after severe attacks, and they are principally in the form of paralysis affecting the soft palate and pharynx, causing difficulty in swallowing with regurgitation of food through the nose, and giving @ peculiar nasal character to the voice. There are, however, other fornis of paralysis occurring after diphtheria, especl- ally that effecting the muscles of the eye, which produces a loss of the powei of accommodation and consequent impairment of vision. There may be, besides, paralysis of both legs, and occasionally also of one side of the body (hemiplegia). These symptoms, however, after continuing for a variable length of time, alinost always ultimately disappear.

In the treatment of diphtheria regard must be had both

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to the local and general nature of the disease. Difference of opinion exists among physicians as to the utility of topical applications in the form of caustics applied to the affected parts, some attaching great importance to their use as tending to arrest the progress of the disease, while others hold that the irritation so produced favours the spread of the false membranes. Probably at the outset, when the local manifestations are but slight, the use of such a caustic as nitrate of silver, either in the solid form or instroug solution, may be of service; but after any con- siderable surface has been invaded by the false membrane little good, it is to be feared, can be done in this way. The forcible removal of the false membrane is generally con- demned, as by this means a raw bleeding surface is left, upon which the deposit is reproduced with great rapidity. The exudation, however, tends to be cast off spontaneously by a process of suppuration, and, as favouring this, and at the same time acting as a soothing remedy, the inhalation of steam is recommended. The employment, in the form of spray or of washes or gargles, of solutions of carbolic acid, Condy's fluid, perchloride of iron, chlorine water, or chlorate of potash, is valuable in the way of disinfecting the parts, and subduing the fetid exhalations which are always present, When the disease has spread into the larynx and the breathing is embarrassed, an emetic may be of use in aiding the expulsion of the false membrane. It is, however, in great measure to the constitutional treat- ment that the plysician's attention must be directed in diphtheria. The effect of the disease upon the patient's strength is so marked that from the very beginning there is an urgent demand for strong nourishment, which should be freely administered in the form of milk, soup, &c., as long as there exists the power of swallowing, and when this fails nutrient enemata should be resorted to. Large doses of quinine and of the tincture of the perchloride of iron are recommended, and stimulants will in almost all cases be called for from an early period. The question of tracheo- tomy has to be considered when the false membrane has spread into the air passages and threatens death by asphyxia; and although the operation in such circum- stances affords but a feeble chance of success, the cases of recovery by this means have been sufficiently numerous to Justify its employment as a last resort. The paralysis which follows diphtheria usually yields in the course of time to tonics and good nourishment.

It should be mentioned that in all cases of diphtheria Means should be taken by isolation of the patient and the use of disinfectants to prevent as far 4s possible the spread of the disease in a household ; while the attendants ought to be scrupulously careful to avoid inoculation with the products of the disease, and should frequently use gargles of some of those substances above mentioned. G O:mm)

DIPLOMACY is the art of conducting the intercourse of nations with each other. The word obviously owes its Origin to the source subsequently explained in the article Dirromarics, It is singular that a term of so much Practical importance in politics and history should be so recent in its adoption that it is not to be found in Johnson's dictionary. There has, indeed, ever been a reluctance in the English nature to acknowledge the art of transacting international business as a pursuit worthy of a British statesman, or as one entitling its adepts to honourable fame. It is popularly looked on as the art of carrying into the business of nations a morality condemned in the intercourse of men with each other, and as a mears of employing suktlety where force is insufficient to accomplish some statesman's object. Hence the term has been colloquially used to express a modified degree of running ; and conduct which is wily and subtle, without being directly false or fraudulent, is styled " diplomatic."

The subject has been usually treated under the head of the Law of Nations, or, as it is now more properly termed, international law. But a little examination will show that diplomacy, though closely assvciated with international law, is a separate sphere of intellectual exertion. The diplomatist undoubtedly requires to be acquainted with international Jaw, and to observe its general injunctions. He often finds it necessary to appeal to the rules, or supposed rules, of that code ; but it would be a confusion of terms to count him an officer engaged in the execution of international law, He has to accomplish objects which are not achievable through any law real or fictitious, but are achieved solely through the art of diplomacy. Questions in whieh private rights and obligations are con- cerned are a perpetual source of diplomatic exertion. In England, and to some extent in the other states called the great powers, the administration of justice is pursued on

rules so absolute that there is no chance of their being relinquished to favour a friendly or to injure a hostile nation. Further, diplomacy, besides the larger operations connected with great treaties or alliances, keeps a vigilant eye on the ordinary details of international law, for the purpose of seeing that it is equitably administered. In this sense the diplomatist is like a law-agent, whose duty it is to see that his client receives justice at the hands of other nations under this code.

Diplomacy, as a science, has arisen out of the develop- ment of the European powers, and their rise on the ruins of the Roman empire. As a uniform system, following principles nearly as well established as those of many codes of law, it exists solely among the European powers, partly embracing those nations, such as Turkey and Persia, which have been brought into close association with them. The difficulty, however, of getting those Eastern states to understand and obey the laws of diplomacy, and submit to its restraints, has ever been an object of anxious comment to Wickefort and the other systematic writers on diplomacy. To submit to be bound in the moment of power by a theoretical system not enforced by the strong hand of any judge, spiritual or temporal, is not consistent with the Oriental mind ; and the great civilized powers, in dealing with the Eastern states, as in their intercourse with barbarous tribes, have relied on their own strength, exercised with cruelty or with mildness as the case might be. Alliances and leagues, declarations of war and treaties of peace, have takeu place, it is true, among those states, but it would be an historical absurdity to suppose diplomatic relations counecting together China, Burmah, and Japan, as they connect the great European powers.

Iu the same manner the ancient world had its treaties and leagues, but no systematic diploniatic relations. The pretensions of Rome during the empire, indeed, superseded every kind of international engagement, since she would permit of no relation between the empire and any other state, save that of predominance on her part and subjection on the other, Yet it is evidently from this system of centralization that the diplomatic relations of the Euro- pean states arose. Freed from the temporal jurisdiction of the empire, and no longer mere dependencies, the European states were still subject in a modified shape to an influence radiating from the old centre of imperial authority. The bishop of Rome, in claiming a spiritual authority at

least co-extensive with the geographical area of the temporal authority of the departed emperors of Rome, created a sanction, though an imperfect one, for the execution of justice among nations, and acted in some measure as a cou- trolling influence over their diplomatic operations. A memorable instance of the influence of the Pope is found in the relations between John of England and Philip of Trance. The semi-judicial authority of the court of

Rome was cited in support of the English conquest of Ireland, and was appealed to by both parties in the Scottish War of Independence. Little as the Papal authority was respected by even the most Catholic monarchs when they were at the head of large and well-found armies, yet in matters of dubious equilibrium the authority of the Pope had some weight ; and as his was a power not limited to any particular state or cluster of states, but ever prescnt throughout all the transactions of Christian realms with each other, it had, beyond doubt, an influence gradual and continuous in giving modern diplomacy the amount of specific character which it had obtained at the period of the Reformation. Under the head BALANCE or Power, the evils arising from the absence of a supreme power to judge between states, ag the courts of law decide questions between individual citizens, will be found discussed. It suffices here to say, that much of the deficiency is filled up by the fortunate train of events which have created, throughout the civilized world, a traditional system of diplomatic practice.

The representatives of great nations, following up the traditions of the science of diplomacy, have often sought by similar acts to do what they considered their duty to their country by taking advantage of every opportunity of aggrandizing it. But modern political philosophy and morality teach us that this is not the mauner in which great nations are to be supported or aggrandized, and: that for their diplomatic servants there is spread out a far nobler field of exertion. It is founded on the consciousness that the real power of states must come from within—from the sound condition of the people, physically, industrially, and morally—from well-poised political institutions and good government. If these are absent no diplomatic skill can make up for them ; if they be present it cannot enhance the real power of the state which possesses them. But to the diplomatic

representatives of states both powerful and honest a function of a higher character still than mere national aggrandizement belongs, in the capacity, by able, temperate, and honourable negotiation, to keep feeble states from being crushed by their potent neighbours, to preserve peace in the world so long as it can honourably be preserved, and to see generally that international justice is observed among mankind. The true functions of the great powers are in some measure embodied in the well-known lines of Virgil :

‘*Tu regere imperio populos, Romane, memento ;

He tibi erunt artes; pacisque imponere morem, Parcere subjectis, et debellare superbos.”’

The historical events, and the industrial and commercial progress which have during the past hundred years so aggrandized the power of Britain among European nations, have, in this view of the uses of our diplomacy, become a great boon to the smaller states, and even to the citizens of the greater. The parliamentary responsibility, and the perpetual public scrutiny and discussion to which the acts of our statesmen are subjected, are not only checks on our own diplomatic acts, but on those of every other civilized state. It was a boast attributed to one of the great ‘fabricators of British diplomacy, the elder Pitt, that not a gun should be fired throughout the world without Britain knowing why. If Britain could make good this boast, it would extend in some measure to mankind at large the blessings enjoyed at home from living under a responsible government. As it is even at present, the continuous liability of having whatever he does called before Parliament and the public, must be an ever present and influencing motive with every British diplomatist. Hence he not only dare not countenance any act of national rapacity, tyranny, or fraud, but he is, as the representative of a nation which

has great power and no secrets, a check upon the diplomatic honesty of all the world,

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In contrast to the old opinions which attributed the power and prosperity of nations to diplomatic ability, overlooking the substantial sources of material progress, a political sect has appeared in recent times who denounce the diplomatic system as foolish or wicked, and proclaim the doctrine of non-intervention in the affairs of other nations,

t is practically clear, however, that whatever degree of

perfection the world may; reach in time, the first great power which avows this opinion will become the immediate victim of its rivals; and thus, should Britain withdraw herself from the diplomacy of Europe, the despotic states would soon become strong enough to shut up the commerce of the world, and cast the world two centuries back in civilization.

It is perhaps scarcely necessary to mention that the source of the diplomatic organization in any nation is its supreme power; but it js useful to keep in view that, for the rapid movements of this department of politics, nations the most jealous of their constitutional rights have been obliged to place at least provisional power in the hands of individual rulers. Thus in Britain the sovereign, indepen- dently of Parliament, has technically the power to make treaties and to declare peace and-war; and an authority not much less extensive is committed to the president of the United States. The guidance of a great state's relations with foreign countries is generally committed to one depart- ment of the Government—with us it is the function of the foreign secretary. How far he is bound to consult his colleagues in his intercourse with foreign states has some- times been matter of acrimonions discussion. The repre- sentatives of the Government at foreign courts, though the dignified character of their missions sometimes gives them a rank much higher than that of their instructor, must obey the directions of the foreign minister. In the negotiation of treaties there is an old-standing dispute among publicists, how far nations can be bound if their ambassadors exceed the instructions given to them, which are generally kept secret. When, therefore, an important international act, such as a treaty, is undertaken, there are many sanctions and ceremonials to be accomplished before it is held to be completed. While matters are in a vague condition, many briefly expressed fundamental suggestions will lave passed among the negotiators in the form of notes. When the matter becomes more ripe for

adjustment, it assumes the shape of a protocol, or draft of the conditions. The ambassadors, when all is adjusted, sign the articles of the treaty ; but still it is generally deemed essential that the several Governments should ratify it, or, admitting that their representatives have not exceeded their instructions, engage to fulfil the bargain they have made, In tus country, whenever treaties affect the private rights of the citizen, they must be ratified by Act of Parliament. In addition to notes and substantive treaties, the most important documents in diplomacy may be considered the manifestoes, in which, paying homage to public opinion and the established rules of diplomacy, Governments profess to justify their conduct. When any vile act of oppression or injustice is perpetrated, it is generally followed by an able manifesto, and the ingenuity of the accomplished diplomatist is taxed to make the deed appear just, rational, and necessary.

The nature and functions of the large body of officers who chiefly conduct the diplomacy of the world having been described under the heading Ampassapor, it only remains to notice the incidental circumstance that custom has for some time established the French language as the language of diplomacy. In the 16th and during a great part of the 17th century, Latin was employed. — In Ludlow's memoirs there is, under the year 1656, a curious notice to the effect that the Swedish ambassador "com-

plained of the delays in his business, and that, when he desired to have the articles of this treaty put into Latin accord- ing to the custom of treaties, it was fourteen days they made him stay for that translation, and sent it to one Mr Milton, a blind man, to put them into Latin, who, he said must use an amanuensis to read it to him, and that amanuensis might publish the matter of the articles as he pleased, and that it seemed strange to him there should be none but a blind man capable of putting a few articles into Latin." In turning over the pages of the great collection of treaties by Dumont and Rousset, one may observe how gradually, during the ascendency of Richelieu, and the sub- sequent reign of Louis XIV., the use of the French language radiates from the immediate diplomatic transac- tions of France over tliose of Europe at large. Probably its propagation was originally connected with the visions of that universal French empire to which Louis

XIV. seemed to be marching before he encountered the combina- tions of William of Orange. At the present day it can only be pronounced a fortunate thing that diplomatists have agreed to use one language, and that the best adapted for their peculiar functions.

DIPLOMATICS, the science derived from the study of ancient diplomas, so called from being written on two leaves, or on double tablets. The Romans used the term more specially for the letters of licence to use the public conveyances provided at the different stations, and gene- rally for public grants. Snbsequently it attained a more extended signification, and in more modern times has been used as a general term for ancient imperial and ecclesiastical acts and grants, public treaties, deeds of conveyance, letters, wills, and similar instruments, drawn up in forms and marked with peculiarities varying with their dates and countries. With the revival of literature, the importance of such documents in verifying facts and establishing public and private rights led to their being brought together from the historical works and the monastic registers in which they had been copied, or, in rarer instances, from public aud ecclesiastical archives where the originals were still preserved. Then arose questions of authenticity, and doubts of the so-called originals; disputants defended or condemned them ; and, in order to establish principles for distinguishing the genuine from the forged, treatises were written on the whole subject of these diplomas. With a view to establish the credit of those preserved in the original, the Benedictine, Dom Mabillon, in the year 1681 produced his masterly work De re diplomatica,—Papebroch, the Jesuit, having already, in the year 1675, written his Pp ropileum antiquarium circa veri ac falsi discrimen in vetustis membranis in the Acta Sanctorum, April, vol. ii. Tn the following century appeared the Vouveau Traité de Diplomatique, by Dom Toustain (who, however, died before the completion of the work) and Dom Tassin, Benedictines of the congregation of St Maur, 6 vols. 4to, 1750~1765, treating of the whole subject of diplomas, and accordingly entering at length into a minute investigation of the peculiarities and characteristics of writing proper to different ages and countries. Thus treatises on the subject of diplomas gave the name of diplomatics to the study of ancient writing, now more properly termed PALZOGRAPHY, under which it will be separately treated.

Imperial decrees and privileges, public acts and treaties, and, no doubt, contracts between private persons, were in remote times inscribed on marble and stone, on wood and

on metal. _The wonderfully preserved monuments of a Nineveh show the prevalent use of sun-burnt rick,

: Iu Egypt papyrus was used from the remotest tunes. The Greeks and Romans recorded public docu- ments on wooden tablets, on stone, bronze, lead, and tvory, as well as on papyrus, parchment, and other sub-

stances, Tablets of wax served for letters and writings of various kinds, but must lave been unsuitable for public acts. Pliny speaks of the use of rolls of lead and of linen. There are many Greek documents preserved in the British Museum, the Bibliothéque Nationale of Paris, and elsewhere, such as royal letters, petitions, contracts, and wills, of the time of the Ptolemies, written on papyrus. See Wotices et Hatraits des Manuscrits, tome xvili., with plates. The Byzantine emperors often used golden and coloured inks from the 8th to the 12th century.

We know that archives were provided by the Romans for the preservation of their public acts; but fire and war have been the great destroyers of these documents so precious to the historian. Suetonius relates that Vespasian under- took to restore from copies 3000 brazen tablets, containing most ancient records, dating almost from the beginning of the republic, which had been consumed when the Capitol was burnt. Original documents of the nature of diplomas, written in Latin, are now not forthcom- ing of an earlier period than the 5th century. The acts emanating from royal authority anterior to the 13th century are almost exclusively derived from ecclesiastical archives, and consist of foundations of monasteries, and grants of property, privileges, and immunities. In England, from the 13th century they are systematically registered in the royal chancery ; the series of rolls in which they are written, under different classes, is very complete from the reign of King John. History is greatly indebted to the care with which religious houses registered their title deeds, From an early time it was their practise to copy them into volumes, arranging them generally under

the name of the property. Chartularies of this character of the 10th century are still extant, The chartulary of Winchester Abbey, compiled early in the 12th century, and containing numerous documents of the time before the Conquest, is in the British Museum.

Imperial acts affecting the state at large were proclaimed through the governors of provinces; as in later times, in England royal writs and ordinances were addressed to the sheriffs of the several counties. In England, it would seem, when the object was to appeal to the people, the document was publicly exhibited. When Edward III. landed, as Prince of Wales, on the Yorkshire coast, with the design of overthrowing his father's government, he drew up a manifesto of his purposes, addressed to the citizens of London, who exhibited it on the cross in the Cheap, placing copies in their windows (Chron. Monasterti de Melsa.)

At all times diplomas have been drawn very much in set forms. The Romans employed official clerks, (scribe), assigning them to the different magistrates. Under the empire they are called tabelliones, and act as public notaries. After the breaking up of the Roman empire, there was a period when thechanceries of the new states were imperfectly served, The notarial science was partially lost, and, in the general neglect of learning, the composing a public act or private document was a task of difficulty. In the 7th century the monk Marculfus composed a formulary for guidance in drawing up documents of various kinds. It was first published by Bignonin 1613. In Migne's edition, Patrologie Cursus, vol. xxxvii., it is accompanied with several anonymous compilations of the same character. In the 12th and 13th centuries we meet with works of the same kind under the title of de arte dictaminum. A very interesting collection of precedents of royal warrants, state letters, papal bulls, and other documents, arranged under many heads of subjects, was compiled by the English poet Occleve, while he was a clerk in the council office at the beginning of the 15th century, and is now in the British Museum, We are best able to understand the nature of

early diplomas by examining the originals, still extant, ol papyrus or parchment, which go back in date to the 5thcentury. The oldest come chiefly from Ravenna. They have been commented on by Maffei in his

Jstorta diplomatica, 1727, and printed in full with facsimiles in the Papirt diplomatict of the Abbate Marino-Marini, 1805. A considerable number of the original diplomas of the Merovingian and succeeding sovereigns of France have also been preserved, aud have been published in facsimile (Letronne, Diplomata et Chart), and in letterpress. England also can boast of a series of very beautifully written royal charters from the 7th century. The larger number of them are in the British Museum, and are in course of publication in facsimile (Facsimiles of Ancient Charters, parts i. ii. ili.), Many original papal bulls, too, of an early date, are still extant, in different repositories.

There is a general uniformity in the diplomas of the earlier times. Taking the French series as examples, we find a regularity of formulas in the following order :—

1. An invocation, as In nomine domini Det Salvatoris nostri Jesu Christt.

2. The name and style of tle sovereign, and the name and title of the person addressed. In the 6th, 7th, and 8th centuries, the style of the French kings was in general NV. Francorwm rea, vir inluster ; Pepin added Det Gratia. From the time of Louis le Débonnaire the form was Divina ordinante (or propitiante, annu- ente, or favente) providentia (elementia, or misericordia). Popes called themselves simply bishop until the end of the 11th century, when, or only rarely before, they used the title Paya. Gregory the Great (590-604) introduced the form servus servorum Dei. They placed their name before or after that of the person addressed indifferently, before the 10th century ,when the custom prevailed to give it precedence.

3. A preamble, cousisting of a moral or religious reflexion, or a recital of the motives to the grant. Iu the earlier times the moral sentiment is expressed briefly, as Memor finis met, or Poenas inferni eupiens egfugere ; but later on it is often of great length and in inflated language, with admixture of barbarized Greek words.

4, The substance of the act or donation.

5. A protecting clause, in the nature of an imprecation on such as should infringe the privilege granted, or thwart the object of the act. It is first met

with in papal bulls of the 6th century, and appears in an exaggerated form in a later time, the bitterest curses being heaped on the hypothetical offender without mcasure. The papal type is closely followed in French and English diplomas. In the 12th centnry it took a milder form, as in papal bulls, Nulli ergo hominum liceat, &e. In the 10th and 1ith centurics the commin- atory clause was often placed after the date, having sometimes been previously introduced into the text,

6. The Merovingian sovereigns authenticated their diplomas by the addition of their signature. Those who were unable to write signed with their monogram. The Carlovingians signed with a monogram, and the same form prevailed from the 9th century in Germany and Italy. It ceased to be used in France in the 14th cen- tury. Theclergy adopted the use of the monogram in the 11th and 12th centuries. It is not found in the charters of English sovereigns. In the earlier times the monogram was formed of letters of tall cur- sive character ; capitals and uncials were afterwards more commonly uscd. Sometimes the word rew was added. It is possible that the monogram was in some instances entered by the hand of the sove- reign, for so much is indicated by the words in which it is introduced, but it was usually added by the chancellor or scribe. It was not used for some kinds of documents, as judgments, decrees, and mandates. In acts of the later Roman emperors, the form of sub- scription is simply the word Zegi, with a cross prefixed, as ina diploma of Valentinian, printed by Marini, p, 94. The name of the refendary or chancellor, with the expression optulit, was in France, in the earliest time, inserted before, subsequently after, the subscription of the monarch. A paraph of the word subseripst, and often tironian notes, accompanied the subscriptions. Some- times in royal diplomas, and commonly in private charters, the names of several witnesses were subscribed, each preceded by the word signum, with a cross, or followed by sudseripst. The popes, in their bulls, originally used the form of Bene valete, or Deus te tmeolumem servet, in place of subscription of their name, which they applied only to synodal and other public acts. At the beginning of the 9th century they used their monogram. In the 14th century they signed with theirown hand. In the 9th century also began the practice of adding the subscriptions of cardinals, but it was not commonly followed until the middle of the 12th century. Sentences from the Scriptures were used by popes fora

signature, instead of their names, in consistorial bulls in the 11th century. English kings, before the Conquest, neither signed their name hor used a monogram. They affixed the sign of the cross— the scribe adding Signwm manus N. regis, or variations of the form.

7. Dating clause. In France, this followed the subscription and attestation. ‘The manner of dating varied at different times, and in different countries. In diplomas of the emperors, the year is not expressed. For example, an act of Valentinian of about 480 .p, has simply the words, Dat. sexto idus Januarti, Ravenne. + Legi. The Merovingian kings and their successors dated by their regnal years, adding the day of the month, the place, and generally the word felietter. Some dated from epochs in their reign, as Louisle

Débonnaire from Easter 781, the day of his coronation at Rome;

from, September 813, when he was associated in the imperial power; and from the 28th of January 814, the day of his accession after the death of Charlemagne.

The year of the incarnation was seldom used by the French kings before the end of the 9th century. In England it was generally added to royal charters in the times preceding the Conquest, but, subsequently to the death of William the Conqueror, was very rarely used in public or private deeds until the 13th century. The English charters of the early period often added also the regnal year and papal indiction. In papal bulls the date was given by the names of consuls from 3885 to 546; by years of the Greek emperors from 550 to 772; by years of emperors of the west from 802 to 1047, and in 1111; and by years of the pontificate as early as the year 781, but often still by the year of the emperor, or by both together, eventually by the year of the pontificate alone. The year of the incarnation is found in bulls as early as the 7th century, and came into ordinary use in 968. Up to 1088, in the papal dominions, the year was calculated from the 25th of December ; subsequently the Florentine and Pisan years were used, the former beginning three months after the nativity, the other nine months before it. The indiction was also added :—from 584 to 1087, that of Constantinople,

beginning on the 1st of September; afterwards the Constantinian, or Czosarean, beginning on the 25th of September, and the Papal, beginning on the lst of January. These dates were accumulated principally in the bulls; in the briefs the year is rarely designated from 1086 to 1124, and is always wanting from 1124 to 1187. (See Jaffé, Regesta Pontificum Romanorum.)

An additional security was given to diplomas by the seal, —the antiquity (going back to remotest ages), the form, colour, substance, and use of which are treated of at great length in works on diplomatics (see Sears). It was im use by the popes from the earliest time, and under the Merovingian kings and their successors; but by the great feudatories only from the 10th century. In England tt is not found during the Saxon period, saving in a few Im- stances in the reign of Edward the Confessor. The use of it came in with the Conquest and became general. The popes' seals were of lead, or in rare instances of gold, and suspended to the document, The precious material was introduced by Charlemagne, and was freely employed by the emperors of Constantinople, who with their pnt: cipal officers used metal seals, In France, under the Merovingians, and elsewhere at the same period, the seal was of white wax, fixed "en placard," or to the surface of the document, From the 10th century, it was suspended, first by a parchment label, afterwards by cords of silk or other substances. The colour of the cords by which papal budlwe. were attached varies under different pontiffs. bse wax, but of various qualities, was in use to the La century, in which and subsequently it was coloured chiely yellow, red, or green. The quality of the wax, the shape, the legend or inscription, the character of the charge ot device—which was sometimes the impression of an antique gem—all these change with the progress of time an become evidence of age.

DPTP—DIP

English charters of the Saxon period have forms in many respects different from those of foreign diplomas. Variations have been already noticed, as, that the king signed neither with his name nor with his monogram, but only with a cross, and that they were dated from the in- carnation. It would appear, indeed, that the charters were not drawn up by an officer of the chancery, as in France, but were composed and written by ecclesiastics, whose services were employed for the occasion. In the grant of the

monastery of Reculver to Christ Church, Canterbury, by King Eadred, in the year 949, to which Dunstan, then abbot of Glastonbury, and one of the king's principal ministers is a witness, he states that he both drew up the form and wrote the document with his own land. Tt is on this account that we find in English charters before the Conquest a variety of styles of writing, even in those of the same date ; whereas on the Continent the writing is uniform in the several states. In the absence of a

strictly official character, the grant was attested by nume-'

rous witnesses, varying from four or five, the more ordinary number in the earlier times, to from 30 to 100 subse- quently. For it was always an object with the religious houses in whose favour a grant was made to fortify its authority and secure its recognition by impressive solemni- ties. They made the benefaction a religious act by inviting the grantor to offer the charter to God on the altar of their church ; and they obtained the approval and attes- tations of the members of the court, or of the council over which the king might be at the time presiding. The names which are subscribed to the English charters add greatly to their historical value. A difference in another respect from the foreion typeis attended with advantage to the study of both the language and manners of the time. he pro- perty conveyed was defined by a minute description of its boundaries, written in English ; and, as the documents are dated and can generally be referred to special localities, dialectic differences and the formation of names, with other incidental lights on subjects of antiquity, are preserved, Tn English charters of as early a date as the 9th century, and from that time onwards, is sometimes found, at the top or the bottom, the upper or lower half of an inscription. It is often the word chirographum, but some- times other words, or merely letters. It was used when it was an object that two parties to a contract should each have a copy of the deed, which accordingly was written in duplicate on one skin ; the inscription was written in large letters between the copies, and the skin was then divided. The line of division was at a later period generally in- dented, and the document was called an indenture. The custom was not introduced into France until the middle of the 11th century, he practise of forging and falsifying diplomas, ecclesiastical constitutions, and documents of all kinds is traced back to very early times. The laws of the Visigoths of the 7th century enact severe punishments on offenders of tus class, as do the

Capitularia of Charlemagne. The English chronicler Hoveden, under the year 1196, gives an account of wholesale forgeries of papal bulls and briefs Y a agent of the archbishop of York. IIT. (1195-1216) gives rules for detect- Ing fabricated bulls (Epist. i. 201, ed. Baluz.). It was SO easy to impose upon the ignorance of people, and the temptations to falsify were so great, that we cannot Oubt it was done extensively. The science of diplomatics Professes to give the power to detect these forgeries.

le two concluding books of the Nouveau Traité de

Diplomatique treat of the subject at great length, but the

Tules given for distinguishing the true from the false docu- ment can only be applied by one who is practically versed

in thestudy. ” Tn passing judgment on a professed original,

grata e Diplomatica, 8v0., 1870.

not only the foimulas, historical facts, and date have to be tested, but the external features have to be regarded—the material, the ink, the forms of abbreviation and character of writing, and the seal ; and the properties and character- istics of these cannot well be learnt from written instruc- tion. They are treated of in works on the general subject of palzeography.

In testing the authenticity of diplomas, assistance will be found, in addition to authors already quoted, in the following works :—Germon (Barthélemi), De veteribus regum Francorum diplomatibus, Paris 1703-1707, 3 vols. 12mo ; Muratori, De diplo- matis et chartis antiquis; Antiquit. Ital. medti evi, tom. iii; Raguet, Hist. des contestations sur la diplomatique, 12mo, 1708, and 8vo, 1767; Hickes, De antique litterature septentrionalis utilitate dissertatio cpistolaris, fol. Oxon. 1703 ; Marino- Marini, Diplomatica pontificia, 4to, 1841 ; Kemble, Codex Diplomaticus evi Anglosaxonici, 6 vols. 8vo, 1839-1848 ; Quantin, Dictionnaire raisonné de Diplomatique Chrétienne, in Migne’s Encyclopédie Théologique, 1846 ; Archives de CEmpire, Monuments Historiques, Cartons des Rois, ed. J. Tardif, Paris,

4to 1866 ; Bibliotheque del Ecole des Chartes, 1839-1875 3 Gloria, Compendio di Paleo- (E. A. B.)

DIPPEL, Jowann Conrap (1673-1 734), a German theologian and alchemist, who assumed as an author the name “ Christianus Democritus,” was born at the castle of Frankenstein, near Darmstadt, his father being a Lutheran clergyman. He studied at Giessen, where he took the degree of master in philosophy in 1693. After a short visit to Wittenberg he went to Strasburg, where he delivered lectures on astrology and chiromancy, and occasionally preached. He gained considerable popularity, but was obliged after a time to quit the city, owing to his irregular manner of living, and the suspicion attaching to him of having been concerned in a murder. He had up to this tine espoused the cause of the orthodox as against the pietists, and had justified his gay and worldly habits on the ground that he intended to make a practical protest against pietism; but in his two first published works, Orthodoxia Orthodoxorum (1697) and Papismus vapulans Protestantium (1698), he assailed vehemently the funda- mental positions of the Lutheran theology, denying the inspiration of Scripture, the efficacy of the sacraments, and the doctrine of justification by faith, He held that religion consisted not in dogma but exclusively in love and self- sacrifice. T’o avoid persecution he was compelled to wander from place to place, and he resided successively in various towns of Germany, Holland, Denmark, and Sweden. He took the degree of doctor of medicine at Leyden in 1711. From 1698 he devoted himself to experiments in alchemy, which wasted a considerable fortune, and he was frequently imprisoned for debt. He made several valuable discoveries in chemistry, one being Prussian blue, and another an oil, still known as Dippel’s animal oil, which he offered as a panacea, and which has useful medicinal properties of a more limited kind. Provoked by false reports of his death, he published in 1733 an intimation that he would live until 1808. In spite of this, however, he died at Berleburg on the 25th April 1734.

An enlarged edition of Dippel’s collected works was published at Berleburg in 1748. See a somewhat too eulogistic biography by Ackermann (Leipsic, 1781), and a memoir by Buchner in the Historisches Taschenbuch for 1858.

DIPSOMANIA. See Mzntat Disraszs,

DIPTERA (Aristotle, from 8, double, and mrepa, wings), an Order of the Znsecta, containing the “flies,” properly so called, with which, also, in spite of not possessing its chief characteristic, the sub-order Aphaniptera (fleas), a part of the obsolete Aptera, is now incorporated. The Diptera proper (with the exception of the apterous Nycteribiide, and a few aberrant species of other families, to which the majority of the characters given will not strictly apply, but which cannot, from their general structure, meta-

mortphoses, habits, or evident natural affinities, be separated from the Orde: under consideration) have the following characters :—wings two, mesothoracic, membranous, mostly horizontal and transparent, not capable of being folded, with nervures generally few and longitudinally disposed, and having a pair of alulets at the base; metathoracic wings replaced by a pair of halteres or balancers; mouth antliate (whence the Fabrician name Antliata for the Order), with a proboscis formed of the labium, inclosing modifications of other usual parts of the mouth, except of the labial palpi, which are wanting; tarsi 5-jointed; prothorax reduced to a very small collar. They are divided into two sections—the ORTHORHAPHA, in which the pupa is incomplete (the details of the future perfect insect being visible), and the CycLoRHAPHA, in which the pupa is coarctate (of a hard, uniform surface, cylindrical, rounded at the extremities). The ORTHORHAPHA are again divided into two sub-sections—the NVematocera (antenne composed of more than 6 joints, palpi 4-or 5-jointed), and the Brachycera (antenne short, with apparently only three distinct joints, palpi 1l- or 2-jointed). Of these, the Nematocera comprise three tribes, viz. :—-1, the Oligoneura, in which the wings have very few nerves (fam. Cecidomyiide); 2, the Hucephala, in which the larva has a distinct head (fams. Mycetophilide, Bibionide, Rhyphide, Stmuliide, Chironomde, Culicide, and Psychodide) ; and 3, the Polyneura, in which the wings have many veins (fam. Zipulide). The Brachycera also comprise three tribes, viz. :—1, the Cyclocera, in which the third joint of the antenne is annulated (divided into two groups—a, Notacantha, = fams. Stratiomyiide, Xylophagide, and Acanthomeride ; and 6, Tanystoma,= fams. Tabanide and Leptide); 2, the Orthocera, in which the antenne are normal (divided into two groups—c, Polytoma, =fams. Therevide and Scenopinide ; and d, Procephala, =fams. Acroceride,

Bombyliide, Nemestrinide, Mydaside, Asilide, Empide, and Dolichopodidew); and 3, the Acroptera, in which the wings are pointed (fam. Lonchopteride). The CycLorHapHa in like manner are divided into two sub-sections—the Proboscidea, possessing a proboscis, and the larve having an cesophageal frame; and the proboscidea (also variously termed Coriacea or Pupipara), in which the proboscis is wanting, the body leathery, and the larve have no cesophageal frame. Of these, the Probosecdea comprise three tribes, viz. :—1, the HZypocera, in which the antenne are inserted quite close to the mouth (fam. Phoridew); 2, the Pseudoneura, in which the wings have a false longitudinal veinlet (fam. Syrphide); and 3, the Lumyiide, or type flies (fams. Pipunculide, Platypezide, Conopide, Muscidae, aud stride). The Eproboscidea comprise three families, all parasitic.—the Hippoboscide, Nucteribiide, and Streblide, the latter a very limited and aberrant group stated to be oviparous, and having the wings distinct and well veined, unlike the Vycteribiide.

The sub-order Aphaniptera consists of two families only, the Pulicide and Platypsyllide (the latter so peculiar in structure as to have been claimed for the Coleoptera). Its members are parasitic, entirely coriaceous, much compressed or flattened, and destitute of wings or balancers, these organs being represented by more or less obsolete leathery plates ; they have 3- or 4-jointed antenne, 4-jointed maxillary and 3-jointed labial palpi, and 5-jointed tarsi. The larve of such of them as are known are vermiform, and the pup inactive, incomplete. If not considered as a sub-order, these two families would apparently have to be placed at the head of the Eucephalous Nematocera,—in that tare of course, deranging the characters given for that ‘ribe.

Other families of the Diptera have been proposed, but

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need not be here noticed, being as yet scarcely established, or merely entitled tothe rank of sub-families (the Muscide especially comprising many of the latter).

The Diptera, in number of species and individuals (very many having swarming propensities), have been considered to be the order of animated beings most diffused over the globe ; and the extremes of heat and cold seem alike indifferent to them. They have long been known to abound in very high latitudes; and, among the insects brought back by Captain Feilden, the naturalist attached to Sir George Nares's Arctie expedition, were Dipterous species of apparently the most feeble organism, The Rey, A. E. Eaton, attached as naturalist to the late " Transit of Venus " expedition, discovered also, on the desolate shores of Kerguelen's Island, Diptera of a degraded type suitable to the climatic peculiarities of the locality. Tropical countries naturally furnish the most developed and in some cases extraordinary forms,—the genera Pangonia, Khopalomera, Achias, Diopsis, and Elaphomyia, and various Acroceride (even in temperate regions) abounding in instances of exaggerated and apparently unnatural struc- ture. To a geographical distribution of the widest extent, the flies add a range of habits of the most diversified nature; they are both animal and vegetable feeders, an enormous number of their species acting as scavengers in cousuming putrescent or decomposing matter of both kinds. The phytophagous species are attached to various parts of the plant, dead or alive ; and the carniverous in like manner feed on dead or living flesh, many being parasitic on living animals of various classes (even Reptilia, as a fly is parasitic upon frogs in Australia), and more especially upon other insects, including Hymenoptera, of which they frequently simulate the external facies. No reasonable approximation can be made to the number of existing species, as the Diptera are not collected or examined with the same assiduity as the more attractive orders. Schiner, however, in 1868, stated the number then recorded to be no less than 20,800, to which a considerable annual increase is being made (e.g., 550 species in 1869, and 230 in 1875); and more than 4090 different genera have been found necessary for their reception. These must be nevertheless taken as vastly below the mark of existent species. No catalogue of the British species has recently been made; Westwood, in 1840, enumerated about 2350,

Considered in relation to man, there would seem to be sufficient reason for placing this apparently feeble order at the head of our insect enemies. Allowing for the good effected by the clearing away of animal and vegetable impurities by many species, and for the indirect advantage caused

by the known instances of a few others assisting 1 the fecundation of plants, there remains a long list of direct injuries effected by Diptera. Without laying undue stress upon the formation of galls and other vegetable deteriorations caused by many species, there can be ne doubt that the destruction of grass-lands by the larva of the crane-fly, or “Daddy Long-Legs” (Zipula oleracea), of olive-crops by Dacus, of oranges by Ceratitis, of various culinary plants by Psila, Tephritis, Anthomyia, Phytomy, Drosophila, &c., and of wheat and other crops by the “Hessian fly,” Oscinis, and Chlorops, are of very serious consequence. Our domestic animals, moreover, suffer front the bot-flies (Wstrus, Gasterophilus, and Cephenemyia), the tick (Melophagus), gad-flies (Tabanus, Hematopold, Chrysops, and Stomoxys, many of which attack man, bim- self), and last, and most dreaded, the African “ Zimb, or “Tsetse,” Glossina morsitans, which is of sufficient power to close the exploration of a region in which it occurs. Nor is man himself spared; the petty meor veniences of wasted food, broken rest, and slight personal

pain or irritation experienced in temperate regions from fly-larve, gnats, midges, &c., and the parasitic species, are aggravated in both warmer and more boreal countries to a dangerous extent, and have even been found prejudicial to life. ‘There are many recorded instances of the larva of Diptera feeding upon the human intestinal canal, and of species (dubiously referred to @strus) attacking man ; as also of loathsome cases of individuals being eaten alive by the larvze of flies, developed in food secreted about the persous of beggars. Various cases have, moreover, recently been noted of the diffusion of the germs of disease by flies ; and instances of death from transference of putrid animal matter in New Caledonia have also been recorded. One of the Muscide, Lucila hominivorax, is known to have caused considerable destruction to human life among French convicts in Cayenne, laying its eggs in the mouth or nostrils during sleep; anda very precise account of much disease and death in man and domestic animals at Mohilew, by a similar action of another of the same family, Sarcophila wohklfarti, has recently been given by Portchinsky, a Russian naturalist. It is perhaps super- fluous to speak of mosquitoes, too well known since the Biblical “ plague of flies ;” but it may be observed that the corresponding

plague of sand-flies, Szmulium, so well known to affect the eyes of sufferers from ophthalmia in Egypt, has made its appearance in the deserts of West Australia, where the last exploring expedition of Mr Ernest Giles suffered severely from it.

The antiquity of the fly is scarcely more than historical. Very few fossil species are known (5 only being recorded from the Solenhofen lithographic Oolite); but the more recent “flies in amber” are so constantly found that the expression has become a common proverb. (H.C. RB.)

DIPTYCH, a double tablet made with a hinge to open and shut. Diptychs were used in the time of the Roman empire for sending letters—‘ mainly love letters,” says Facciolati, quoting tle scholiast to Juvenal ix. 36, whose note does not, however, seem to imply as much. The consuls and questors used, on assuming office, to send diptychs containing their names and portraits to their friends. The exterior of the leaves was often ornamented with other paintings. The tablets were made, the more ordinary kind of boxwood or maple, the richer sort of cedar, of ivory, of silver, and sometimes even of gold. They were very frequently sent by friends to each other as presents at the beginning of a new year. The early Christians used tablets thus made in the celebration of divine worship. And Cardinal Noris (Dissertat. de Hist. Synod.) expends much learning in showing, what is very evident, that the Christians adopted the use of them from that of the con- sular diptychs. They were placed on the “ambones,’—the pulpits, or reading desks, which may still be seen in ancient basilicas at the west end of the choir or presbytery ; and from them were read to the congregation of the faithful the names of the celebrating priests, of those who occupied the superior positions in the Christian hierarchy, of the saints, martyrs, and confessors, and, in Process of time, also of thuse who had died in the faith. It is the diptychs that are referred to by the early Christian Writers under the names of “ mystic tablets,” “ anniversary books,” “ matriculation registers” of the church, and some- times “books of the living,” or “books of life.” The Word is also occasionally found used in other senses, e.g. for the priest’s vestment, which was usually folded in two (see ~ deange, ad voc.) When it became customary to write in the diptychs names so numerous as those of the different Classes of persons above mentioned, it will be easily under- stood that it became impossible to inscribe them on two tablets of

convenient size. Hence the diptychs became triptychs, ¢.¢., consisting of three such conjoined tablets.

But, though triptychs are often spoker of in the art- language of a later time, these were by the early church writers still called diptychs ; and continued to be socalled, even when many leaves, probably of parchment in some cases, though more frequently of wood, were introduced between the two original folds of the diptych, thus forming a veritable book. The inscription on the diptychs of deaths and baptisms, naturally led to the insertion of dates, and the diptychs seem thus to have grown into calendars, and to have been the germ from which necrologies, lists of saints, and almanacs have been developed. Much doubt exists as to the time when the use of diptychs to read from died out in the church. The best opinion seems to be that their use lasted to about the end of the 8th century. The outsides of the diptych folds being often very richly ornamented, their preservation was carefully attended to, and even those which were ornamented with profane paintings or carvings were often to be found in use in the primitive churches. This ornamentation caused the diptychs to be exhibited to the congregation, and used as adornments for the altar. And in this position, by a natural process of development, the ornamentation became the main end and object of the thing itself. The best painters of the time employed their talents in painting them—generally in the form of triptychs, and on both sides of the folding doors, so that the triptych when closed showed two subjects, often the portraits of the donor and his wife, and when open three paintings ;—hence the very large number of diptychs and triptychs which are found in our museums and galleries.

See Bingham, Orig. Zccles., lib. xv. ch. 13, sec. 18, and Moroni, Erudizione Storica-Ecclesiastica.

DIRCE, in Greek legend, tlie personification of a fountain (and stream) at Thebes, from the water of which Hercules derived part of his strength, and which was usually identified with the fountain of Ares in the legend of Cadmus. Besides, the fountain was the grave of Dirce, at which sacrifices for the dead and other rites were per- formed. According to the legend, Dirce, the wife of Lycus, king of Thebes, had sorely persecuted Antiope,

who at last escaped to Mount Cithzron, where her twin sons Amphion and Zethus were being brought up by a herdsman unconscious of their parentage. Mother and sons met, but had not recognized each other, till Dirce, who had come to the hill for a Dionysiac ceremony, proposed that Amphion and Zethus should tie Antiope to the horns of a wild bull to be dragged to death. They were about to do this when the herdsman announced their relationship, and they then tied Dirce to the bull instead. She was dragged by it over the hill to the fountain into which she was trans- formed.

DIRSCHAU, in Polish Szczewo, a town of Prussia, in the government of Dantzic and district of Stargard, on the left bank of the Vistula, at a railway junction about twenty miles §.S.E. of Dantzic. Besides dealing in wood and cattle, it displays considerable industrial activity in the manufacture of agricultural implements, iron and tin wares, and cement; but its principal claim to attention is the lattice-work iron bridge, thrown across the river in 1850- 1857, which, with its total length of 2726 feet and its six spans of 410 feet each, is a noble testimony to the engineering skill of Lentze and Schinz, and affords a passage for the railway between Konigsberg and Berlin, for two ordinary carriage roads, and two sideways for foot passen- gers. Unfortunately, as it lies only about 12 feet above- the highest level attained by the river, and there is no opening for the passage of ships, it is necessary in passing under it to remove or drop the masts, J. Forster, the traveller, was born at Dirschau in 1729. Population in 1875, 9727, .

DISCUS, a quoit, or circular plate of stone or metal, 10 or 12 inches in diameter, which was used by the ancient Greeks and Romans for throwing to a distance as a gymnastic exercise. Sometimes a kind of quoit of a spherical form was used for the same purpose ; and through a hole in its centre a thong was passed, to assist the player in throwing it. Statius, in 7heb,, vi. 646-721, fully explains the manner in which the discus was uscd. In the British Museum there is a copy of a famous statue by Myron of a discobolus in the act of throwing the discus,

DISINFECTANTS are agents or substances employed to prevent the spread of contagious or infectious disease. Recent investigations all tend to demonstrate that the efficiency of any disinfectant is due to its power of destroy- ing, or of rendering inert, specific poisons or disease germs which possess in themselves an independent existence ; and which, when introduced into the animal system, under favourable conditions, increase and multiply, thus pro- ducing the phenomena of special diseases. Therefore, antiseptic substances generally, which check or stop putrefactive decay in organic compounds, by preventing the growth of those minute organisms which produce putrefaction, are, on that account, disinfectants. So also the deodorizers, which act by oxidizing or otherwise changing the chemical constitution of volatile substances disseminated in the air, or which prevent noxious exhala- tions from organic substances, are in virtue of these properties effective disinfectants in certain diseases. A knowledge of the value of disinfectants, and the use of some of the most valuable agents, can be traced to very remote times ; and much of the Levitical law of cleansing, as well as the origin of numerous hcathen ceremonial practices, are clearly based on a perception of the value of disinfection. The means of disinfection, and the substances employed, are very numerous, as are the classes and condi- tions of disease and contagion they are designed to meet. Nature, in the oxidizing influence of freely circulating atmospheric air, in the purifying effect of watcr, and in the powerful deodorizing properties of common earth, has pro- vided the most potent ever-present and acting disinfecting media. Of the artificial disinfectants employed or available three classes may be recognized :—Ist, volatile or vaporizable substances, which attack impurities in the air; 2d, chemi- cal agents for acting on the diseased body or on the infec- tious discharges therefrom ; and 3d, the physical agencies of heat and cold. In some of these cases the destruction of the contagium is effected by the formation of new chemical compounds by oxidation, deoxidation, or other reaction, and in others the conditions favourable to life are removed or life is destroyed by high temperature. Of the first class—aerial disinfectants—those most employed are the gaseous sulphurous anhydride, the fumes of nitrous acid and other acid substances, including vaporized carbolic acid, with chlorine gas and the vapours of bromine and iodine, The use of sulpburous anhydride, obtained by burning sul- phur, is of great antiquity, and it still is unequalled as a disinfectant of air on account both of its convenience and general

efficaey. Camphor and some volatile oils have also been employed as air disinfectants, but their virtues lie chiefly in masking, not destroying, noxious effluvia. In the 2d class—non-gaseous disinfecting compounds—all the luumerous antiseptic substances may be reckoned ; but the substances principally employed in practice are oxidizing agents, as potassic manganates and permanganates (Condy's fluid), and solutions of the so-called chlorides of lime, soda, and potash, with the chlorides of aluminium and zine, soluble sulphates and sulphites, solutions of sulphurous acid, and the tar products—carbolie, cresylic, and salicylic acids. DrJ. Dougall of Glasgow found the following sub- stances the most powerful in destroying minute forms of

life :—sulphate of copper, chloride of aluminium, chromic acid and bichromate of potassium, bichloride of mercury, benzoic acid, bromal hydrate, chloral hydrate, hydrocyanic acid, alum, hydrochlorate of strychnia, ferrous sulphate, arsenious acid, and picric acid. Of the physical agents heat and cold, the latter, though a powerful natural digin. fectant, is not practically available by artificial means; heat is a power chiefly relied on for purifying and disinfect. ing clothes, bedding, and textile substances generally, Different degrees of temperature are required for the destruction of the virus of various diseases; but as clothing, é&e., can be exposed to a heat of abont 250° Fahr. without injury, provision is made for submitting articles to nearly that temperature. For the thorough disinfection of a sick-room the employment of all threo classes of disinfectants, for purifying the air, for destroying the virus at its point of origin, and for cleansing clothing, &c., may be required, DISLOCATION. 'his term is applied in surgery to the displacement from each other of the cartilaginous or articular surfaces of the bones entering into the formation of a joint. In a normal joint these surfaces are in contact and held together by ligaments and muscles ; in a dislocated joint they are separated more or less completely—in the great majority of cases by external violence; in some instances, however, by powerful muscular exertion. The ease with which a joint is dislocated varies with the form and structure of the joint and with the position in which the joint is when the force is applied. The relative frequency of fracture and dislocation depends on the strength of the bones above and below the joint

relatively to the strength of the joint. These points may be illustrated by cxamples from the joints of the arm and leg, because, with perhaps the exception of the joint between the lower jaw and the skull, it is in these situations that dislocation is most fre- quently observed. ‘The strength of the different joints in the body is dependent on either ligament, muscle, or the shape of the bones. In the hip, for instance, all three sources of strength arc present ; therefore, considering the great leverage of the long thigh bone, the hip is rarely dislocated. The shoulder, in order to allow of extensive movement, has no osseous or ligamentous strength; its strength is muscular, therefore it is frequently dislocated, because the muscular strength varies in power, the muscles may be relaxed, the person is unprepared, and dislocation occurs; if, on the other hand, the muscles are tense, and the patient is prepared for the strain, then the result will be either a sprain of the joint ora fracture of one of the adjoining bones. The wrist and ankle are rarely dislocated ; in the wrist the radius gives way, in the ankle the fibula, these bones being relatively weakcr than the respective joints. The wrist owes its strength to ligament, the ankle to the shape of the bones. The elbow is osseously strong, but this strength necessarily varies with the position of the arm. ‘The symptoms of a dislocation are distortion and limited movement, with absence of the grating sensation felt in fracture when the extremities of a broken bone are rubbed together. The treatment consists in reducing the dislocation. The sooner this is done the better —the longer the delay the more difficult it becomes to remedy tlie displacement. Aftcr a variable period, depending on the nature of the joint and the age of the person, it may be impossible to replace thc bones. The result will be a more or less useless joint. The administra tion of chloroform, by relaxing the muscles, greatly assists the operation of reduction. The length of time that @ joint has to be kept quict after it has been restored to its normal shape depends on its form ; if osseously strong, then early movement is allowable, as in the elbow joint; if osseously weak, then early movement is unjustifiable. More especially is this the case when, associated with osseous

weakness, the strength of the joint is ligamentous, as in the sterno-clavicular and superior radio-ulnar articulations. In such joints the boues must be kept in accurate position and at rest for a lengthened period; if movement is allowed soon after the accident the bone will again slip out of its place.

DISMAL SWAMP, the name given to two extensive stretches of morass on the western seaboard of North America. ‘he larger of the two, distinguished as the Great Dismal, lies in the peninsula between the James Liver on the north and Albemarle Sound on the south, and thus belongs partly to Virginia and partly to North Carolina. Its length from north to south is about 40 wiles and its breadth about 25. ‘The greater part of the area is covered with a thick stratum of spongy vegetable soil, without any mixture of earthy particles, which at once supports and is augmented by a luxuriant growth of aquatic plants, brushwood, and timber. The prevailing trees are cypress, juniper, aud white cedar, and on the higher ridges oak and beech. By a curious arrangement, minutely described by Sir Charles Lyell in his Travels in

. North America, the surface of the swamp is actually higher,

in some parts by as much as 12 feet, than that of the surrounding couutry ; so that, except on the western side, where it receives a few small streams, the waters flow outwards. The centre is occupied by Drummond’s Lake, an oval basin about 6 miles long and 3 wide, with perpendicular banks and an extreme depth of 15 feet; the water is clear and abounds with fish. The swamp has long furnished large supplies of timber, much of which has been obtained by excavation from the peaty soil in which it was preserved. The transit is facilitated by means of canals, of which the two most important are the Dismal Swamp Canal, uniting the western branch of Elizabeth river with the Pasquotank, and the Chesapeake and Albemarle Canal, connecting the eastern branch of Elizabeth river with Currituck Sound. The former is flanked by a stage road, which terminates inthe south at Elizabeth City, and in the north at Norfolk. Two lines of railway pass through the outskirts of the Virginian portion of the swamp.

The Little Dismal is of much less importance. It lies in North Carolina, in the peninsula between Albemarle Sound and Pamlico Sound; and in the days when slavery was still legal, it was a noted harbour of runaway negroes. _DISPENSATION is a term used by the canonists tu signify an act of jurisdiction by which the rigour of the general law is relaxed in a particular case. Regarded from this point of view a dispensation is considered by the canonists not to be an exception to, but a complement of, the law, and it is granted with discretion in cases where the law would otherwise work injustice. ‘‘ Fuit dispensatio Inventa, ut esset pars distributive justitie:.” The exercise of this jurisdiction in the earlier days of the Christian church was vested in respect of minor matters in the bishops, and in more important matters in the provincial councils ; but by degrees this latter jurisdiction came to be exercised by the patriarchs exclusively, and ultimately, in the case of the Western Church, by the Pope alone, who, at the time of the Reformation of the Auglican Church, had acquired for the Holy See supreme authority In all the more important matters of dispensation. It was one object of the Parliament of England, by the statute Concerning Peter Pence and Dispensations ” (25 Henry Will, c 21), to divest the Pope of the exercise of ally powers of dispensation within the realm of England, by forbidding the king and his subjects to sue to the Pope or to the Holy See for any dispensation. The Parliament further vested the power of granting dispensations, such as had been hitherto obtained from the see of Rome, in the archiepiscopal see of Canterbury—subject, however, to the

limitation that they should be only granted for such causes as were not contrary or repugnant to Holy Scripture or to the laws of the realm, and for this purpose the archbishop of Canterbury was empowered to constitute a sufficient commissary, and a clerk who should write and register all such dispensations. The representative of the clerk so appointed by the archbishop is the registrar of the office of faculties, over which the master of the faculties presides, as the archbishop’s commissary. The matters for which dispensations were accustomed to be granted from the office of faculties, in the reign of Henry VIII., have almost all become obsolete, or have been withdrawn from the cognizance of the master of the faculties;

and the special authority of his court in the present day consists in the grant of special licences for marriages, which are valid in both the provinces of Canterbury and of York, and the right of granting which has been preserved to the archbishop of Canterbury in all subsequent marriage Acts. These special licences are simply dispensations for the solemnization of marriage at other times and in other places than those to which marriage is restricted by the Anglican canons or by the statute law of the realm. ,

DISRAELI, Isaac (1766-1848), was born at Enfield in May 1766. He belouged to a Jewish family which, having been driven by the Inquisition from Spain, towards the end of the 15th century, settled as merchants at Venice, and assumed the name which has become famous. In 1748 his father, then only about eighteen years of age, removed to England, where, before passing the prime of life, he amassed a competent fortune, and retired from business. Both he and his wife gradually dropped con- nection with their co-religionists, with whom their son never appears to have associated himself.

The strongly marked characteristics which determined D'Israeli's career were displayed to a singular degree even in his boyhood. He spent his time over books, and in long day-dreams, and evinced the strongest distaste for business and all the more bustling pursuits of life. These idiosyn- cracies met with no sympathy from either of his parents, whose ambitious plans for his future career they threatened to disappoint. At length, when he was about fourteen, in the hope of changing the bent of his mind, his father sent him to school at Amsterdam, where he remained four or five years. Here in the principal's library, and under-the principal's influence, he studicd Bayle and Voltaire, and became an ardent disciple of Rousseau. Here also he wrote a long poem against commerce, which he produced as an exposition of his opinions when, on his return to England, his father divulged his intention of placing him in a com- mercial house at Bordeaux. Against such a destiny his mind strongly revolted; and, in this extremity, it was natural that he should eagerly seek the sympathy and counsel of a literary friend. He carried his poem, with a letter earnestly appealing for advice and assistance, to Samuel Johnson; but when, full of eager hope, he called again a week after to receive an answer, the packet was returned unopened—the grand old censor was on his death- bed. He also addressed a letter to Dr

Vicesimus Knox, in a tone of the loftiest sentiment, displaying all his literary aspirations, his earnestness and simplicity of heart, and his utter lack of all the qualities of ‘ that despicable thing” (as he called him) “a mere man of the world,” and begging to be received into the scholar’s family, that he might enjoy the benefit of his learning and ex- perience. How this application was answered we do not know. ‘The evident firmness of his resolve, however, was not without effect. His parents gave up their purpose for atime. He was sent to travel in France, and allowed to occupy himself as he wished ; and he had the happiness of spending some months in Paris, in the society of literary

men, and devoted to the literary pursuits in which he delighted. :

In the beginning of 1788 he returned home, being then a few months past his majority, to lay the first stone of his literary fame by an attack on Peter Pindar, under the form of a poem in the manner of Pope On the Abuse of Satire. Published, as it was, at a most appropriate moment, it at once attained popularity. Its authorship became the great subject of debate in literary circles, and it was attributed by some to Hayley, upon whom it was actually revenged, with characteristic savageness, by its victim. It is greatly to Wolcott’s credit that, sensitive though he was to attacks upon himself, he at once, on learning his mistake, sought the acquaintance of his young opponent, towards whom he seems to have borne no malice, and whose friend he remained to the end of his life. But of all the fortunate issues of this success not the least fortunate was that it brought D’Israeli what he had so long earnestly desired-— the friendship of a refined man of letters, Through it he made the acquaintance of Henry James Pye, who helped

to persuade his father that it would be a mistake to force him into a business career, and who introduced him into literary circles. Henceforth his life was passed in the way

he best liked-—in quiet and almost uninterrupted study. His health was for the most part sufficiently robust,

though he was for some years the victim of a nervous depression aud weakness, which came upon him when he was about twenty-eight years of age, and which doubtless was chiefly caused by his sedentary habits. He was able to maintain his strenuous and extraordinary age of still in the enjoyment of

devotion to study till he reached the advanced seventy-two, when, though unimpaired health, and in the very midst of what would have been his greatest undertaking, paralysis of the optic nerve, to give up work almost entirely. He lived ten years longer, and his death, which took place at his seat at Bradenham House on the 19th January 1848, was due not to old age but to an epidemic which carried him off after a few hours' illness.

Isaac D'Israeli is most celebrated as the author of the

Curiosities of Literature, by far the best and most popular

of all the many works of the kind which have appeared in England. It is a miscellany of literary and historical anecdotes, of original critical remarks, and of interesting and curious information of all kinds, animated by genuine literary feeling, taste, and enthusiasm. The first volume was published anonymously in 1791 ; and it immediately attained the popularity it deserved. Two years later it was followed by a second volume ; it was not, however, till the lapse of twenty-four years that the third made its appearance. Three other volumes were subsequently added, and in the later editions the first two volumes were rauch improved. With the Curiosities of Literature may be appropriately classed D'Israeli's M; escellanies, or Literary Recreations (1796), the Calamities of Authors (1812), and the Quarrels of Authors (1814). Towards the close of his life D'israeli formed the project of embodying his wide knowledge of English literature in a continuous history ; loss of sight, however, prevented him from publishing more than three volumes, which appeared in 1841 under the title of the Amenities of Interature. But of all his literary works the most interesting and delightful is his Zssay on the Literary Character (1795), which, like most of his writings, abounds in illustrative ancedotes. His contribu- tion to the famous Pope controversy "—in which Bowles and Hazlitt so vigorously attacked, and Byron and Campbell 80 vigorously asserted, the poetical merit and personal worth of the great poet of the 18th century,—a defence

of Pope contained in a criticism of Spence's Anecdotes contributed to the Quarterly Review (July 1820)—is of interest,

he was forced, by

both as indicating the nature of his critica] views, and as founded upon elaborate study of the life and era of the poet. He also published a slight sketch of Jewish history, and especially of the growth of the Talmud, entitled the Genius of Judaism, as well as a few poems in imitation of Pope, and several novels.

He was, besides, the author of two historical works—a brief defence of the literary merit and personal and political character of James IL. (1816), and a work. of considerable research and magnitude entitled a Commentary on the Life and Reign of King Charles I, (1828-31). The latter work was recognized by the University of Oxford, which con. ferred upon the author the honorary degree of D.C,\L. Ag an historian D'Israeli is distinguished by two characteris. tics. In the first place, he had small interest in politics, and no sympathy with the passionate fervour, or adequate appreciation of the importance, of political struggles. And, secondly, with a laborious zeal then less common than now among historians, he sought to bring to light fresh historical material by patient search for letters, diaries, and other manuscripts of value which had escaped the notice of previous students. Indeed, the honour has been claimed for him of being one of the founders of the modern school of historical research, whose patient labours have thrown so much light upon important events and characters.

Of the amiable personal character and the placid life of Isaac D'Israeli a charming picture is to be found in the brief memoir prefixed to the Curiosities of Literature, by his son the earl of Beaconsfield, from which the following may be quoted :—Isaac D'Israeli " was a complete literary a man who really passed his life in his He disliked business, and he never required relaxation ; he was absorbed in his pursuits, In London his only amusement was to ramble among book- sellers ; if he entered a club, it was only to go into the- library. In the country he scarcely ever left his room but to saunter in abstraction upon a terrace, muse over a chapter, or coin a

sentence. .. . , He had by nature a singular volatility which never deserted him. His feelings, though always amiable, were not painfully deep, and amid

Joy or sorrow, the philosophic vein was ever evident. He’

more resembled Goldsmith than any man I can compare him to; in his conversation, his apparent confusion of ideas ending with some felicitous phrase of genius, his naiveté, his simplicity not untouched with a dash of sarcasm affecting innocence—one waa often reminded of the gifted and interesting friend of Burke and Johnson, ‘There was, however, one trait in which my father did not resemble Goldsmith ; he had no vanity. Indeed one of his few infirmities was rather a deficiency in self-esteem.”
DISTILLATION, a generic term for a class of chemical operations which all agree in this, that the substance operated upon is heated in a close vessel (“ retort,” “ still”) and thereby wholly or partially converted into vapour, which vapour is then condensed, by the application of cold, in another apparatus (the “condenser ”) connected with the vessel, and allowed to collect in a third portion of the apparatus, called a “receiver.” In most cases the substance is a liquid, or assumes the liquid form previous to emitting vapours, and the product obtained (the “ distillate ”) is also in greater proportion liquid. The comparatively few and special cases of distillation, wherein solids are converted into vapours which condense directly from the gaseous into the solid form, are designated “ sublimations.” Thus we speak of the “distilmtion” of water or of spirits, while we speak of the “sublimation ” of sal-ammoniac. _Distillations may be divided into two classes—viz., 1st, those which are not, and 2d, those which are, accompanied by chemical changes. The word ‘ distillation,” in a narrower sense, is generally understood to apply to the first class only. The

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second might be called “ destructive distillations,” if it were not customary to reserve this term for the particular case in which the substance operated on consists of vegetable or animal matter which is being decomposed by the application of heat alone, z.¢., without the aid of reagents. , . ee

The general object of simple distillation is the separation of substances of different degrees of volatility. The apparatus used varies very much according to the nature of the substance operated on and of the product extracted, and according to the scale on which the operation is carried out. Of the various contrivances used in chemical laboratories, the simplest is a glass retort, the descending neck of which is inserted into, and goes to near the bottom of, a slanting globular flask. The retort serves for the reception of the substance to be distilled, and is heated by means of char- coal or gas fire ; the vapours pass into the flask, which is kept cool by a continuous current of cold water running over it, or, in the case of more volatile substances, by being immersed in iceor some freezing mixture. This somewhat primitive arrangement works satisfactorily only when the vapours are easily condensible, and when the product is meant to be collected as a whole. In the majority of cases, however, the distillate has to be " fractionated," ze., collected in a number of separate, consecutive portions ; and itis then desirable that the apparatus should be so constructed as to enable one at any moment to examine the distillate as it is coming over. For this purpose it is necessary to condense the vapours on their way to, and not within, the receiver, so that the latter can, at any time, be removed and replaced by another. The condenser most generally used in chemical laboratories is that known as Lnebig's condenser. It consists of a straight glass or metal tube, 1 to 3 feet long and } to 1 inch wide, fitted co-axially, by means of corks or india-rubber tubes, into a wider tube (made of glass or iron) which communicates at the lower end with a water tap, and at the upper with a sink, so that a stream of cold water can be made to run against the current of the vapour. The condenser tube is fixed in a slanting position, and the vapours made to enter at the upper end. The dimensions of the condenser and rate of water-flow depend on the speed at which the vapour is driven over, and on the temperature of that vaponr, and, last not least, on the latent heat of the vapour and. specific heat of the distillate. To show the importance of the last- named point, let us compare the quantities of heat to be withdrawn from 1 Ib of steam and 1 tb of bromine vapour respectively, to reduce them to liquids at 0°C. We have in the case of water and bromine—

Water Bromine. For the temperature of the vapour…... 100° 63° Boe eratent heat…....00….. .....60… 536° 45°°6 For the specific heat of the liquids…...

slag 0°-106 For the total heats of the vapours……. 636° 52°°3

The withdrawal of 52°3 units of heat from 1b of bromine vapour reduces it to liquid bromine at 0° C. By the with-

100

drawal of (S x 52°3 =) 83 units from the steam, as

an easy calculation shows, only 0°16 ib of liquid water, of even 100°, could be produced—hence more than 0°84 ib of steam Yemains uncondensed (at a temperature of about 96°

~~, suming the steam to remain saturated, and to have the temperature of the condensed water). But obviously a condenser under all circumstances is the more efficacious the greater its surface and the thinner its body. It is also — ceteris paribus, that the most suitable material Or a condenser tube is that which conducts heat best. ae & metal tube will generally condense more rapidly an one of glass, and for metal tubes copper is better than tin, and silver better than either. In chemical laboratories glass is the only material which is quite generally appli~~

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cable. In chemical works, on the other hand, glass, on account of its fragility, is rarely used; condensers there, wherever possible, are made of metal, usually fashioned into spirals (‘ worms ”) and set in tub-shaped refrigerators. Where acids have to be condensed, stoneware worms are generally employed. In the distillation of acetic acid pla- tinum worms, notwithstanding their high price, have been found to work best, and in the long run to be cheapest. The theory and successful execution of the process

assume their greatest simplicity when the substances to be

separated differ so greatly in their volatility that, without appreciable error, one can be assumed to be non-volatile at the boiling point of the other. A good illustration of this special case is afforded by the customary process used for the purification of water. A natural sweet water may in general be

assumed to consist of three parts—I1st, water proper, which always forms something like 98 per cent. or more of the whole; 2d, non-volatile salts ; 3d, gases. To obtain pure water from such material, we need only boil it in a distillation apparatus, so as to raise from it dry steam, which steam when condensed yields water con- taminated only with the gases. To expel these all thiat is necessary is to again boil it for a short time; the gases go off with the first portions of steam, so that the residue, when allowed to cool in absence of air, constitutes pure water. To pass to a less simple case, let us assume that the substance to be distilled is a solution of ether in water, and the object is the separation of these two bodies. Ether boils at 35° C., water at 100° C. The elastic force of saturated steam at 35° is 42 mm., = zy = ygth of an atmosphere. Assuming now the mixture to be distilled from a flask, what will goon? Neglecting for the sake of simplicity the small tension of the steam at 35°, we should expect that at first the ether would simply boil away, so to speak, from a bath of warm water at 35° C.; that the vapour would be pure ether, and maintain that composition until all the ether had boiled off ; then there would be a break—the tempera- ture of the liquid would gradually rise to 100°, and tlie water then distil over in its turn. And so it is approxi- mately, but not exactly. Our theory obviously neglects some important points. Water at 35° has a tension of jsth atmosphere, ether of one atmosphere ; hence the two saturated vapours together should press with a force of 1,4,th atmosphere—in other words, the mixture should com- mence to boil at less than 35°. This, however (as in the majority of analogous cases), is not confirmed by experi- ment. The mixture commences to boil at a little above 35°, and the boiling point rises steadily as the proportion of ether in the liquid decreases. Now, a priori, we should presume that at every given moment the volumes of ether and water in the vapour should be, approximately at least, proportional to the respective vapour tensions at the temperature at which the mixture happens to boil. Thus, for instance, assuming at the first that the liquid boils at 40° C., when the two tensions are equal to 910 and 55 mm. respectively, the vapour will contain sien = 094 of its volume of ether vapour, and 0:06 of its volume of steam, supposing both substances to have the same chances of forming saturated vapour, which, of course, holds only so long as they both are present in appreciable quantities. We easily see that, as the distillation progresses, the ether vapour must get more and more largely charged with vapour of water, until at last what goes off is steam, con- taminated with less and less -of

ether vapour. A thermometer placed near the entrance end of the condenser will, of course, record lower than one plunged into the boiling liquid, because the vapour in rising undergoes partial condensation, and the thermometer being bedewed with the condensed vapour will approximately indicate the

boiling point of that dew, ¢.¢., of that which is just going over. ‘The composition of the vapour as above given must not be confounded with the composition by weeght of the distillate. To obtain the latter we must multiply each of the two volumes by the density of the respective vapour, or, what comes to the same thing, by its molecular weiglit as expressed by the chemical formula. In our case tlie vapour volume ratio

corresponds to the weight ratio

55xH,O 55×18 1 ‘ 901 x O,H,,0 910 × 747 68 NPY:

This consideration strips of its apparently anomalous character what we observe when vegetable substances con- taining essential oils are distilled with water, when we find that these oils, although boiling far above 160° C., go over with the first fractions of the water. Take the case of lemon oil, which boils at about 174° C. ‘The molecular weight of the oil is 136=C,)H,,; its vapour tension at 100° is 70mm. Hence what goes over at first when lemon peel is distilled with water should contain oil and water in the proportion—

Oil of Lemons. Water. ~_— cea Mol. Vap. Mol, Vap. wt., tension. wt. tension. 136 × 70 Ig & 60> 12 17 (nearly).

The oil, although the less volatile substance of the two, being present in small quantity, but finely diffused, is soon completely driven over. No doubt the latent heats of vaporization of the two constituents have somie- thing to do with the composition of the vapour formed, as the chance of every particle of the mixture to be vaporized is obviously the greater the less its latent heat of vaporization.

After what has been said it will be clear that in the dis- tillation of a mixture of two substances of approximately equal molecular weiglit and latent heats of vaporization, supposing neither to predominate overwhelmingly over the other, the one with the lower boiling point will predominate in the early, and the other will gradually accumulate in the later, fractions of the distillate. And similarly with mixtures of three or more bodies. The further the respec- tive boiling points are removed from one another the more complete a separation can be effected ; but in no case is the separation perfect. It is, however, easily seen that the analytic effect of a distillation can be increased by causing the vapour, before it reaches the condenser, to undergo partial condensation, when naturally the less volatile parts chiefly will run back. This artifice is largely employed by chemists, technical as well as scientific. The simplest mode is to let the vapour ascend through a long, vertical tube before it reaches the condenser, and to distil so slowly that a sufficiently large fraction of the vapour originally formed fails to survive the ascent through the cooling influence of the atmosphere. A more effective method is to let the condensed vapour accumulate in a series of small receptacles inserted between flask and condenser, constructed so that the vapour cannot pass through the receptacles without bubbling through their liquid contents, and so that the liquid in the receptacles cannot rise above a certain level, the excess flowing back into the next lower receptacle or into the still. But the most effective method is to let the vapour ascend through a slanting condenser kept by means of a bath at a certain temperature, which is controlled so that while the liquid in the flask boils rapidly, the dis- tillation only just progresses and no more.

_The general principles thus stated regarding fractional distillation are liable to not a few exceptions, of which the

following may be cited as examples.

Dry (DESTRUCTIVE) DuistILLation.—Of the great nuntber of chemical operations falling under this head, we can notice only those which are carried out industrially for the manufacture of useful products. Of such the most important are those in which wood, coal, shale, and bones form the materials operated upon. But as these processes form so many important

industries, which have all special articles devoted to them, we must confine ourselves here to summing up shortly the features common to all.

In all cases the “retorts” consist of iron or fire-cay semi-cylinders placed horizontally in a furnace and ¢on- nected by iron pipes with refrigerators, and through these with gas-holders, Within these retorts the materials are brought up, more or less gradually, to a red heat, which 1s maintained until the formation of vapours practically ceases. Each of the materials named is a complex mixture of different chemical species. Wood consists mainly of cellulose and other carbo-hydrates, ¢.¢., bodies composed of carbon and the elements of water; in coal and shale the combustible part consists of compounds of carbon and hydrogen, or carbon, hydrogen, and oxygen, richer carbon than the components of wood; bones consist of about half of incombustible and infusible phosphate of hime (bone earth) and half of organic matter, of which the ereater part is gelatine (compounds of carbon, mitroge?, hydrogen, and oxygen), and the lesser is fat (compounds o carbon, hydrogen, and oxygen). The chemical eon, tion in each case is highly complex. An infinite variety 0! products is invariably formed, which, however, always readily divide into three :—Ist, a non-volatile residue, aa sisting of mineral matter and elementary carbon (“W00 charcoal,” “coke,” &c.) which, in the case of animé matter, contains chemically combined nitrogen; 2d) ® part condensible at ordinary temperatures which ng readily separates into two distinct layers, VIZ. :—(4) ‘4. aqueous portion (“ tar-water ”) and (6) a semifluid, viscle,

oily, or resinous portion (“tar”); and 3d, a gaseous por- nthe ‘“‘tar-water” is the one, of all the four products, of which the qualitative composition most directly depends on the nature of the material distilled. In the case of wood it has an acid reaction, from the presence in it of acetic acid, which is associated (amongst many other things) with acetone and methyl alcohol. In the case of eoal it is alkaline, from ammonia, present as carbonate, sulphide, sulphocyanide, and in other forms. Alcohols and oxygenated acids are absent.

The “tar” is a complex mixture of carbon com- pounds, all combustible, but, although all directly derived from a vapour, not by any means all of

them volatile. (Regarding the components, see Tar.) The quantity and quality of the tar naturally depend on the kind of material used, but perhaps yet more on the mode in which the dis- tillation is conducted. Thus, for instance, a coal tar pro- duced at low temperature contains a considerable per- centage of paraffins. If, on the other hand, the dis- tillation is conducted ata high temperature, the paraffins are almost absent, while the proportion of benzols con- siderably increases. A similar remark applies to the gaseous portion, as will readily be understood when we say that al/ volatile tar constituents, when passed through red hot tubes, are decomposed with formation of hydrogen and gaseous hydrocarbons, which latter again, when submitted to the same operation, are all liable to undergo dissociation into simpler compounds and associa- tion into more complex.

Distmiation or Watrer.—The continual interchange and circulation cf water, between oceans and other great reservoirs of water on the one hand and dry land on the other, may be regarded as a process of distillation. Rain is thus a form of distilled water; and when it falls through a pure atmosphere it is found to possess the softness and freedom from dissolved salts characteristic of water artificially distilled. Rain water, however, absorbs a considerable proportion of air and some carbonic acid from the air, and also frequently contains ammonia, salts, and free acids.

_ Water of that purity which can be secured only by dis- tillation is of indispensable value in many operations both of seientific and industrial chemistry. The apparatus and process for distilling ordinary water are very simple. The body of the still is made of copper, with a head and worm, or condensing apparatus, either of copper or tin. The first portion of the distillate brings over the gases dissolved in the water, ammonia, and other volatile impurities, and is consequently rejected, and scarcely two-fifths of the entire = of water can be with safety used as pure distilled Water.

Among the innumerable schemes which have been pro- posed for the production of a potable fresh water from the salt water of the ocean, two or three dependent on simul- taneous distillation and aeration have been found, in pieetice, to produce most satisfactory results. Of course the simple distillation of sea water, and the production thereby of a certain proportion of chemically fresh water, is ‘very simple problem; but it is found that water

which 18 merely evaporated and recondensed has a very disagree- able empyreumatic odour, and a most repulsive flat taste, and it is only after long exposure to pure atmospheric air, With continued agitation, or repeated pouring from one vessel to another, that it becomes sufficiently aerated to se ts unpleasant taste and smell and become drinkable. The water, moreover, till it is saturated with gases, readily in noxious vapours to which it may be exposed. For 0 Successful preparation of potable water from sea water,

erefore, the following conditions are essential :—Ist,

aeration of the distilled product so that it may be immedi- ately available for drinking purposes ; 2d, economy of coal to obtain the maximum of water with the minimum expenditure of fuel ; and 3d, simplicity of working parts, to secure the apparatus from breaking down, and enable unskilled attendants to work it with safety. Among the forms of apparatus which have most fully satisfied these conditions are the inventions of Dr Normandy and of. Chaplin of Glasgow. While these have met with most acceptance in the United Kingdom, the apparatus of Rocher of Nantes, and that patented by Gallé and Mazeline of Havre, have been highly appreciated by French maritime authorities,

Normandy’s apparatus, while leaving nothing to be desired in point of economy of fuel and quality of water produced, is very complex in its structure, consisting of very numer- ous working parts, with elaborate arrangements of pipes, cocks, and other fittings. It is consequently expensive, and requires for its working the careful attention of an ex- perienced workman, It consists of three essential parts, in addition to any convenient form of boiler from which steam under a certain amount of pressure may be obtained. These parts are called respectively the evaporator, the con- denser, and the refrigerator. Thesc are all closed cylindrical vessels, permeated internally with sheaves of pipes, through which pipes the steam generated percolates, condenses, and is aerated as explained below. The refrigerator is a horizontal vessel above which the condenser and the evaporator are placed in a vertical position. When the apparatus is in operation the refrigerator and condenser are filled with sea water, and a constant cnrrent is main- tained which enters by the

refrigerator, passes upwards through the condenser, and is discharged by an overtlow pipe at a level a little above the top of the condenser. The evaporator is filled only to about two-thirds of its height with water from the condenser, and the admission and regulation of its contents are governed by a stop-cock on the pipe communicating between the two vessels. The vessels being so prepared, superheated steam is admitted by a pipe leading from the boiler into the top of the evaporator, and, passing through the sheaf of pipes immersed in water, is there condensed. The condensed water passes direct from the evaporator into the pipes of the refrigerator, in which it is cooled to the temperature of the surrounding sea water. Here then is produced pure distilled but non-aerated water; and the means by which it is aerated and rendered fit for immediate use may be now traced. The superheated steam in permeating the pipes in the evaporator heats and vaporizes a portion of the water around them. The steam so generated passes into the sheaf of pipes in the condenser, in which, as already explained, a current of water is constantly rising and pass- ing away by the overflow pipe. The condensation of the steam within the pipes, again, communicates a high temperature to the upper stratum of water in the condenser. As water at a temperature of 54°°5 C. parts with its dis- solved air and carbonic acid gas, a stream of water is con- tinually rising to the upper part of the condenser at a temperature more than sufficient to liberate these gases, and by means of a pipe these pass over into the npper part of the evaporator, and there mingle with and supersaturate the steam generated in that vessel. Instead, therefore, of it being simply steam which passes from the evaporator to the tubes of the condenser, it is a mixture of steam aud gases, the latter being in sufficient quantity not only to supersaturate the steam with which they are mixed, but also fully to aerate the condensed steam which passed direct from the evaporator into the refrigerator. The super-aerated condensed steam passes from the pipes in the condenser into those in the refrigerator, where it meets the

non-aerated water from the evaporator pipes, the course of which has already been traced. Here the two products mingle, cool down to the temperature of the sea, and passing outwards through a filter, may be drawn off as pure aerated water of excellent quality. In Dr Normandy’s apparatus

the combustion of 1 tb of coal yields from 14 to 20 Ib of potable water. The apparatus is extensively adopted in the British navy, the Cunard line, and many other important emigrant and mercantile lines.

Chaplin's apparatus, which was invented and patented later, has also, since 1865, been sanctioned for use on emi- grant, troop, and passenger vessels. The apparatus possesses the great merit of simplicity and compactness, in con- sequence of which it is comparatively cheap and not liable to derangement. In addition to a boiler for generating steam from sea water the apparatus consists of an aerator, a con- denser, and a filter. The condenser is a cylinder, usually of cast iron with an internal worm pipe of copper, which is found to be the only really suitable metal for this use, The steam to be condensed is admitted to this worm or coil through the aerator. This part of the apparatus—the aerator—is really the essential feature in the invention, and consists simply of a series of holes perforated around the steam inlet pipe at the point where it enters the con- denser. The steam passing down in a powerful jet draws with it through these holes a proportion of atmospheric air sufficient to properly aerate the water for drinking purposes. The steam and air thoroughly commingled are together condensed as they pass through the coils of the worm,—cold sea water passing in to the condenser at its lowest end, and rising upwards and flowing away at the top. After passing through the filter placed directly under the condenser, the aerated water is delivered or stored ready for use, clear, bright, colourless, palatable, and devoid of odour, at a temperature of about 15° C. The cold sea water for condensing may be forced into tlie condenser by a special steam pump attached to the apparatus—a plan usually followed on sailing vessels—or any other convenient pumping arrangeinent may be resorted to. The steam for condensation is, in steamers, frequently supplied from the engine boilers; but generally it is preferable to employ a special small upright boiler, or to use the boilers attached to steam winches. Chaplin's apparatus has been adopted by many important British and Continental shipping com- panies, among others by the Peninsular and Oriental, the Inman, the North German Lloyd, and the Hamburg American Companies.

DisTILUATION oF Spirits.—Notwithstanding the enormous scale on which this industry is now prosecuted, it is only in modern and comparatively recent times that it has attained to the important position

which it now occupies. The art of separating alcoholic spirit from fermented liquors appears, however, to have been known in the far East from the most remote antiquity. It is supposed to have been first known to, and practised by, the Chinese, whence a knowledge of the art gradually travelled westward. A rude kind of still, which is yet employed, has been used for obtaining ardent spirits in Ceylon from tine immemorial. The name alcohol indicates that a knowledge of the method of preparing that substance probably came to Western Europe, like much more chemical knowledge, through the Arabs. Albucasis, who lived in the 12th century, is spoken of as the first Western philo- sopher who taught the art of distillation as applied to the preparation of spirits ; and in the 13th century Raymond Lully was not only well acquainted with the process, but also knew the method of concentrating it into what he denominated agua ardens by means of potassic carbonate. At the time when Henry IL—in the 12th century-— invaded and conauered Ireland, the inhabitants were in the

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habit of making and using an alcoholic liquor—usquebagh (wisge-bédtha, water of life), a term since abbreviated into whisky, which consequently is synonymous with the classical agua vite. It is further a noticeable fact that Captain Cook found, among the inhabitants of the Pacific Islands discovered by him, a knowledge of the art of distilling spirit from alcoholic infusions.

The preparation of ardent spirit involves two separate series of operations: —1st, the making of an alcoholic solution by means of vinous fermentation ; and 2d, the concentration of the alcoholic solution so obtained by the process of dis- tillation and rectification.

All substances in nature which contain sugar in any of its forms are susceptible of undergoing vinous fermentation, and may therefore be used as sources of alcohol. Further, all starchy substances and ligneous tissue, seeing that by various chemical processes starch and cellulose may be converted into grape sugar, may also be used for the pre- paration of alcohol. It is thus obvious that the variety of organic substances, especially of the vegetable kingdom, from which alcohcl may be elaborated is almost endless; and in practice it is found that the sources employed are very

numerous. Commercially, distilled alcoholic liquors are manufactured of varying strength, or proportion of alcohol to water, according as the spirit is intended to be used for drinking purposes or for employment in the arts. The standard by which excise duty on alcoholic liquor is charged in Great Britain is proof spirit, in which the alcohol and water are in almost equal proportions by weight, there being in 100 parts 49-24 of absolute alcohol, and 50°76 of water. Distilled spirits are said to be “over proof” when the proportion of alcohol is greater, and ‘“‘under proof” when there is more water present than is indicated by “ proof.” Thus a spirit 11 over proof (o.p.) is a compound which requires the addition of 11 volumes of water to every hundred to reduce it to proof strength; and similarly 10 under proof (u.p.) indicates a liquor from every 100 gallons of which 10 gallons of water must be withdrawn to bring it to proof strength. Spirit for drink- ing is seldom sold at more than 11 over proof, from which it varies downward to 25 and more under proof. Rum, however, is manufactured and imported as highly concen- trated as from 10 to 43 over proof. Spirit of wine as used in the arts must be at least 43 over proof, and generally it is sold at from 54 to 64 over proof.

The alcoholic liquors enumerated below are those most commonly distilled for drinking or medicinal purposes. Brandy, when genuine, is a spirit chiefly distilled in France from wine. Rum is made from molasses or treacle, and 18 distilled in the West Indies, and generally in all countries where the sugar cane is cultivated. From fermented infusions of grain, malted and unmalted, and chiefly from barley, whisky is distilled, and that spirit when “silent or flavourless is the basis of flavoured spirits, such a8 gi! and factitious or British brandy. Arrack is an Oriental spirit distilled from ‘ toddy,” or the fermented juice of certain palm trees, and also from rice, which grain 18 the source of saké, the national spirit of the Japanese. Potato brandy is very extensively prepared from the fecula of potatoes in Germany and Russia, and is a spirit much use for fortifying wines, and for making factitious wine, a8 well as in the arts. Beet root, carrots, Jerusalem artichokes, am several other saccharine roots are also used for the distille- tion of spirit on a commercial scale. The only example % a spirit drawn from animal sources is the koumiss © the Tartars, which is distilled from the fermented of mares. d

The modifications of stills or of distilling apparatus a in the preparation of alcoholic liquor are exceeding’y numerous. and many of the Jater inventions are of mos

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complicated structure. ‘The simple and primitive varieties of apparatus yield only a comparatively weak spirit on the first distillation, whilc the effect of the complex appliances now generally used is to produce, in one opcration, a highly concentrated spirit, and that with a great saving of fuel, time, and labour. Jl varieties of distillatory apparatus resolve themselves under these heads :—Ist, stills heated and worked by the direct application of the heat of a fire ; 2d, stills worked by the action of steam blown dircct into the alcoholic solution from a steam boiler ; and 3d, stills heated by steam passing in coiled pipes through the alcoholic solutions to be acted upon.

To the first of these classes—stills heated by direct fire— belong the earliest and simplest forms of distillatory apparatus ; and for producing particular classes of alcoholic liquor, stills very simple in their construction are yet employed. The common still is a flat-bottomed, close vessel of copper, with a high head to prevent the fluid within boiling over. Tothe top of this head a tube is connected, which is carried in a spiral form round the inside of a tub or barrel (the condenser or refrigerator), filled with cold water, and from its twisted form this tube receives the name of the “worm.” The tube terminates at the bottom of the barrel, passing through it to the outside, and is con- ducted into the vessel termed the receiver, a stopcock, or more commonlya vessel termed a ‘‘safe,” being usually placed on the tube where it leaves the refrigerator. In distilling with an apparatus of this simple construction, it is obvious that at the beginning of the operation, when the wash or liquid to be distilled is rich in alcohol, and its boiling point consequently low, the distillate will pass over at a low temperature and contain a high percentage of alcohol. But as the operation progresses, the boiling point of the mixture in the still rises, the heat has therefore to be forced, and the quantity of watery vapour which passes over with the alcohol is proportionately increased. As the wash or liquid in the still continually weakens, a point is arrived ab when the value of the weak

distillate produced will not balance the expenditure on fuel for maintaining the heat of distillation.

One of the earliest devices for economizing the heat of distillation consisted in interposing between the still and the refrigerator a wash warmer, or vessel charged with liquid ready for distillation. Through this vessel the pipe conveying the hot vapours to the refrigerator coil passed, and the vapours, partly condensing there, heated up the wash, which was thus prepared to pass into the still at an elevated temperature. The “ pot” stills, in which the markedly flavoured Irish whisky is made, are of this con- struction. In the great establishment of the Banagher Distillery Company, King’s co., Ireland, simple stills of a capacity of 20,000 gallons are erected having a rousing apparatus within them to keep the wash in agitation so as to prevent solid particles from settling on the bottom and buraing, Beyond a wash warmer, or intermediate charger interposed between the still and the condenser, there is no other appliance attached to the apparatus, The first dis- tillatefrom the still is termed “low wines,” and passes into “a “low wines receiver,” whence it passes into No. 1

ow wine still” to undergo a second distillation. The product of the second distillation, under the name of

faints or feints,” is caught in the “faints receiver,” from Which it passes to No. 2 low wines still, and from this it 1s discharged as [rish whisky.

The introduction of another principle into distillatory apparatus is illustrated by Dorn’s stili, which was intro- duced into Germany in the early part of the century, and s yet much used in smaller establishments in that country. Tn that apparatus the vessel, of copper, interposed between the still and the condenser is divided horizontally into two

unequal compartments by a diaphragm of copper. The upper and larger portion acts as a wash warmer (German, Vorwarmer), and through it the pipe from the still body coils, opening into the lower division. For a time the whole distillate condenses in this division, but as the temperature of the wash in the upper division rises, and the heat of the more watery distillate

from the still also increases, the condensed liquor in the lower division in its turn begins to boil, and undergoes a second distillation or rectification, the vapours from it passing onwards to be con- densed in the ordinary refrigerator. In many forms of distillatory apparatus two or more such rectifiers are placed between the primary still and the final condenser. The principle of the rectifier is easily understood, Supposing the operation of distilling to commence, the vapours which condense in rectifier No. 1 are much richer in alcohol than the liquid remaining in the still. The boiling point of the condensed liquid is consequently proportionately lower, and the vapour from the still passing into it gradually raises it to the boiling point, so that in its turn rectifier No. 1 distills into rectifier No 2 a liquid of still higher alcoholic richness. The relation of No. 2 to No. 1 is the same as that of No. 1 to the still body, and thus the concentration and redis- tillation might be carried on to any practicable or desired extent.

Another principle brought into play in complex stills for the separation of stronger from weaker alcoholic solutions consists of dephlegmation, or the submitting of the vapour to a temperature so regulated that a portion of it, and that of course the most watery, is condensed and separated, running back into the still or into a special vessel, whilst the richly alcoholic vapour passes on to the rectifier or con- denser, In Dorn’s still the wide and lofty head attached acts as a dephlegmator, watery vapours condensing on it, and thence falling back into the body; but in the more recent forms of apparatus —such as those of Pistorins and Siemens—special dephlegmators of an elaborate nature are introduced,

Of the second class of stills—those in which the opera- tion is conducted by the heat of steam generated in a boiler, and forced into the apparatus—the Coffey still may be taken as an example. It is the form most frequently adopted in Great Britain for the manufacture of “silent ” spirit, and it is generally recognized as the best and most ecouomical device for preparing a highly concentrated spirit in a single operation. The Coffey still may further be regarded as a type of continuous distilling apparatus, as in it the necéssity for withdrawing exhausted solutions and recharging the still with fresh wash is avoided. Beginning, as the Coffey still docs, with the steam of pure water, the principle of rectification formerly alluded to is here carried out from the first step. The watery vapour becomes more and more highly

charged with alcoholic fumes, till in the end the strongest spirit falls, condensed, into the receiver. In Coffey's apparatus the wash is exposed in a series of shallow chambers, placed one over the other, to the vapour of steam, which rises through the perforated bottoms of each chamber, and carries off the alcoholic vapours into the condenser. 'This condenser also consists of a scries of chambers separated from each other by per- forated plates, and is so contrived that the cold wash passing in pipes through these chambers, in its way to feed the other scries of chambers, acts as tlhe condenser to the vapour of the alcohol, the wash being gradually heated thereby, as it passes through the successive chambers. The still, therefore, consists essentially of three separate but connected parts. The firstis a large square receiver at the base, which receives the spent wash after it has been deprived of its alcohol by passing through the series of evaporating chambers; the second, a large, square, upright

box, termed an "analyzer," contains the series of evaporat- ing chambers, each communicating with the one below by means of a valved tube, which allows fluid to escape from the upper to the lower chamber only, and having the dividing partition of each chamber perforated with fine apertures, to allow the steam which is admitted from below to pass from chamber to chamber through the shallow layer of wash of each. A safety or escape valve is also fitted to each chamber. The already heated wash enters the upper- most of these chambers in a continuous regulated stream, is gradually deprived of its alcohol by the steam as it passes from chamber to chamber, and at last escapes into the lower large receiver, from which it flows off after attaining a certain depth. The third part of the apparatus also consists of a square upright box, termed a "' condenser," divided into compartments by means of finely perforated plates, and in each chamber is a link of the tube which carries the cold wash onwards to supply the evaporating chambers just described. The alcoholic vapours escaping from the upper- most of the evaporating chambers are carried by pipes to the lowermost of these chambers, and are partly condensed by each successive chamber being colder than the one below it, in consequence of the wash

entering the pipes from above, and only getting gradually heated by contact with the alcoholic vapour as it advances from chamber to chamber. As in the lowest of these chambers the heat is greatest, the alcoholic vapour or the condensed spirit con- tains a large amount of water ; but as the chambers are successively cooler, the alcoholic vapour and condensed spirit at last arrive at a temperature only sufficient to con- vert spirit of the strength wished into vapour, and by an adaptation of valves, the substitution of an impervious parti- tion for the perforated plate, and the admission of the alcoholic vapour into the chambers cooled by the passage of the cold wash in its contained pipes, that spirituous vapour is condensed, and the spirit is drawn off at one operation, of the very strength which it ought to have, and of the utmost purity.

Flat-bottomed and fire-heated stills are considered the best for the distillation of malt spirit, as by them the flavour is preserved. Coffey's still, on the other hand, is the best for the distillation of grain spirit, as by it a spirit is obtained almost entirely destitute of flavour, and of a strength varying from 55 to 70 over proof, Spirit produced of this high strength evaporates at such a low temperature that scarcely any of the volatile oils on which the peculiar flavour of spirits depends are evaporated with it, hence the reason why it is not adapted for the dis- tillation of malt whisky, which requires a certain amount of these oils to give it its requisite flavour. The spirit produced by Coffey's still is, therefore, chiefly used for laaking gin and factitious brandy by the rectifiers, or for being mixed with malt whiskies by the wholesale dealers,

As the preparation of alcoholic spirit is the most import- ant industry in which the operation of distillation occupies a prominent place, the establishments in which the manu- facture is conducted are known as distilleries. But there are many other important industries in which distillation is an essential feature, being in them employed either for the separation, purification, or concentration of various products. A large proportion of the essential oils are, for example, obtained by the distillation of the substances containing them from water or a mixture of salt and water. The treatment of other bodies in which distil- lation plays a part will be found under their respective headings. (w. D.—s. PA.)

DISTRESS is one of the few cases in which the law still permits an injured person to take his remedy into his own hands, Other instances mentioned in the text-books are self-defence in the case of a personal assault, the

reseizure of property wrongfully taken away, the abatement of nuisances, &c. Distress differs from these as being a remedy for what is really a breach of contract, and it jg the only case of the kind in which such a remedy is given, It is the right which the landlord has of seizing the personal chattels of his tenant for non-payment of rent, Cattle damage feasant (doing damage or trespassing upon a neighbour's land) may also be distrained, i.e., may be detained until satisfaction be rendered for the injury they have done. The cattle or other animals thus distrained are a mere pledge in the hands of the injured person, who has only power to retain them until the owner appear to make satisfaction for the mischief they have done. Distress for rent was also at one time regarded as a mere pledge or security ; but the remedy, having been found to be speedy and efficacious, was rendered more perfect by enactments allowing the thing taken to be sold. Blackstone notes that the law of distresses in this respect "has been greatly altered within a few years last past." The legislature, in fact, converted an ancient right of personal redress into a powerful remedy for tlie exclusive benefit of a single class of creditors, viz, landlords. Now that the relation of landlord and tenant in England has come to be regarded as purely a matter of contract, the language of the law- books seems to be singularly inappropriate. The defaulting tenant is a "wrong-doer," the landlord is the " injured party ;" any attempt to defeat the landlord's remedy by carrying off distrainable goods is denonnced as " fraudulent and knavish." The operation of the law has, as we shall point out, been mitigated in one important respect bya recent Act, but it still remains an almost unique specimen of one-sided legislation.

At common law distress was said to be incident to rent service, and by particular reservation to rent charges; but by 4 Geo. II. c. 28 it was extended to rent seck, rents of assize, and chief rents (see Rent.) It is therefore a general remedy for rent certain in arrear, All personal chattels are distrainable with the following exceptions :—l, things in which there can be

no property, as animals fere nature ; 2, things in actual use; 3, things delivered toa person following a public trade, as a horse sent to be shoed, &c.; 4, things already in the custody of the law; 5, money, unless placed in a sealed bag; 6, things which cannot be restored in as good a plight as when distrained ; 7, fixtures; 8, beasts of the plough and instruments of husbandry; 9, instruments of a man's trade or profession. These excep tions, it will be seen, imply that the thing distrained is to be held as a pledge merely—not to be sold. They also imply that in general any chattels found on the land in question are to be available for the benefit of the landlord, whether they belong to the tenant or not. This principle worked with peculiar harshness in the case of lodgers, whose goods might be seized and sold for the payment of the rent due by their landlord to his superior landlord. Now, however, by the Lodgers' Goods Protection Act (34 and 35 Vict. c. 79), where a lodger's goods have been seized by the superior landlord the lodger may serve him with a notice stating that the intermediate landlord has no interest in the property seized, but that it is the property or in the lawful possession of the lodger, and setting forth the amount of the rent due by the lodger to his immediate landlord. On payment or tender of such rent the landlora cannot proceed with the distress against the goods in ques tion. And originally the landlord could only seize things actually on the premises, so that the remedy might be defeated by the things being taken away. But by 9 Anne c. 14, and 11 Geo. Il. c 19, he may follow things fraudu- lently or clandestinely removed off the premises within thirty days after their removal, unless they have been 12 the meantime dona fide sold for a valuable consideration.

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The sixth exception mentioned above was held to extend to sheaves of corn; but by 2 Will. and Mary c. 5, corn, when reaped, as well as hay, was made subject to distress.

Excessive or disproportionate distress exposes the distrainer to an action, and any irregularity formerly made the proceedings void ab inztio, so that the remedy was attended with considerable risk. The statute 11 Geo. IL. c. 19, before alluded to, in the interests of landlords, protected distresses for

rent from the consequences of irregularity. In all cases of distress for rent, if the owner do not within

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HE subject specially discussed under this heading is T the Distribution of Life, Animal and Vegetable, in Space and Time.

So long as each species of organism was supposed to have had an independent origin, the place it occupied on the earth's surface or the epoch where it first appeared had little significance. It was, indeed, perceived that the organization and constitution of each animal or plant must be adapted to the physical conditions in which it was placed; but this consideration only accovnted for a few of the broader features of distribution, while the great body of the facts, their countless anomalies and curious details, remained wholly inexplicable. But the theory of evolution and gradual development of organic forms by descent and variation (some form of which is now universally accepted by men of science) completely changes the aspect of the question and invests the facts of distribu- tion with special importance. The t?me when a group or a species first appeared, the place of its origin, and the area it now occupies upon the earth, become essential portions of the history of the universe. The course of study initiated and so largely developed by Mr Darwin has now shown us the marvellous interdependence of every part of nature. Not only is each organism necessarily related to and affected by all things, living and dead, that surround it, but every detail of form and_ structure, of colour, food, and habits, must—it is now held—have been developed in harmony with, and to a great extent as a result of, the organic and inorganic environments. Dis- tribution becomes, therefore, as essential a part of the science of life as anatomy or physiology. It shows us, as it were, the form and structure of the life of the world considered as one vast organism, and it enables us to comprehend, however imperfectly, the processes of development and variation during past ages which have resulted in the actual state of things. It thus affords one of the best tests of the truth of our theories of development; because, the count- less facts presented by the distribution of living things in present and past time inust be explicable in accordance with any true theory, or at least must never directly contradict it.

From these indications of the scope and bearing of the subject, it will be seen that its full and adequate treatment would require volumes, and would necessarily involve an amount of details only suited to specialists in the various branches of natural history. All that can be attempted here is to give such a general sketch of the whole sub- Ject as to place the reader in possession of the main re- sults arrived at, and enable him to comprehend the bear- ing of the more detailed information he may meet with elsewhere.

Arrangement of the Subject.—The three great heads under which the various matters connected with distribution may be classed are—Ist, the geographical distribution of living organisms ; 2d, the geographical distribution of extinct organisms ; and 3d, the geological succession of the chief

Animals may be roughly divided into two great series, |

five days replevy the same with sufficient security, the thing distrained may be sold towards satisfaction of the rent and charges, and the surplus, if any, must be returned to the owner. To “replevy” is when the person distrained upon applies to the proper authority (the registrar of the county court) to have the thing returned to his own possession, o1 giving security to try the right of taking it in an action of replevin.

Duties and penalties imposed by Act of Parliament are sometimes enforced by distress.

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of animals and of plants form very distinct sciences, and that there are special peculiarities in the phenomena pre- sented by each which require to be carefully discriminated, it is found to be necessary to make a primary division of the subject into the distribution of animals and of plants respectively.

DISTRIBUTION OF ANIMALS.

The distribution of living animals in space naturally forms the first division of our subject, both because the phenomena are simpler and better known, and because it puts before us the main problems and difficulties to the solution of which the other divisions furnish the key.

broadly distinguished as regards their mode of life—the terrestrial and the aquatic ; and for the purpose of our present study these divisions are of primary importance, because that element which limits the range of the one class offers a free passage to the migrations of the other, and vice versa, The first series is by far the most important. It is the best known, and includes almost all the higher animals ; while the variety and interest of the various land divisions of the globe are far greater than in the case of that portion of its surface covered by water. We shall therefore consider first, and with a greater amuunt of detail, the distribution of land animals, including among them the fresh-water forms whose range is limited by the same general conditions.

Ture GEOGRAPHICAL DISTRIBUTION oF LAND ANIMALS.

As soon as we begin to examine into the distribu tion of animals over the land surface of the globe, we meet with two very distinct and sometimes con- flicting classes of facts, which may be conveniently grouped as climatal and geographical distribution. The first is the most obvious, and was long considered to be the most essential, since we find that not only many species, as the polar bear and musk sheep, are strictly limited to cold countries, and others, as the tapir, to warm, but that entire groups, as the sheep on the one hand and the trogons on the other, seem almost equally dependent on temperature. But when we come to compare the produc- tions of the several continents, we find a set of differences in which climate appears to play no part. Thus, almost the whole of the warblers (Sylviide) of Europe and North Asia are absent in similar climates in North America, their place being taken by a totally distinct family, the wood- warblers /Mniotiltide) ; the ant-eaters, sloths, and tapirs of tropical America are replaced in tropical Africa by aard- varks (Orycteropus), lemurs, and hippopotami; while islands like Borneo and New Guinea, situated in the same ocean not very far apart, and whose climates and physical conditions

are, as nearly as possible, identical, are yet as radically different in their chief forms of animal life as are

forms of life. Owing, however, to the fact that the study | remote countries situated respectively in the cold and tropi-

cal zones. It is evident then, that althongh climate has a certain amount of influence on the distribution of animal forms, yet geographical conditions are far more important. There is reason to believe that the direct action of climate on animal life is far less effective than its indirect action through the limitation of the variety and quantity of vege- table and insect food; whereas geographical isolation has led to diversity of type by its influence on development during successive ages, as pointed out by Mr Darwin (Origin of Species, 6th ed. p. 81, 83.) It follows that zoological regious, or those primary divisions of the earth characterized by distinct assemblages of animals, will, for the most part, coincide with natural geographical divisions. They do not, however, conform to the actual divisions of our geographies, because these are often political or ethno- graphical, rather than physical—as in the separation of Europe from Asia. In another case, the coincidence of a mountain chain (the Himalayas) and the plateau of Thibet, with the demarcation of the tropical and temperate zones, forms a zoological division across a continent almost as complete as would be effected by a considerable extent of ocean,

Vertical Distribution of Animals.—Besides the horizontal distribution dependent on the various causes just indicated, the range of animals is more or less determined by the altitude of the land surface above, or its depth below the sea-level, As we ascend lofty mountains, the forms of life change in a manner somewhat analogous to the changes observed in passing from a warm toa cold country. This change is, however, far less observable in animals than in plants ; and it is so unequal in its action, and can so fre- queutly be traced to mere change of climate aud deficiency of food, that it must rank as a phenomenon of secondary importance. Vertical distribution among animals will be found in most cases to affect species rather than generic or family groups, and to involve in each case a mass of local details which can hardly be introduced in a general sketch of the whole subject of

distribution. The same remarks apply to the bathymetrical zones of marine life. Many groups are confined to tidal, or shallow, or deeper waters ; but these differences of habit are hardly “ geographical,” but involve details, suited rather to the special study of individual groups than to such a general outline of the dis- tribution of the animal kingdom as we are here attempting to lay betore our readers.

Powers of Dispersal of Animals.—Animals differ greatly in their pewers of dispersal or migration ; and this is an important element in determining the causes of their actual distribution. Mammaliaas a class are more limited in this respect than birds; because the former have no means of passing over seas and oceans, or, with few exceptions, over lofty mountains or arid deserts, all of which wheu

of moderate width can be easily traversed by many birds, °

Reptiles in their adult state are almost as restricted in their powers of dispersal as mammals, but most of them being

oviparous, their eggs may be floated on drift wood over seas and straits, or even, in rare cases, be carried by birds 7

whereas the young of mammalia are for soine time wholly dependent on their parents. Amphibia and fresh-water fishes have yet another advantage, that many of them can endure great cold, and their ova may sometimes be frozen without injury. Thus floating ice becomes an important agent in their dispersal, and enables us to account for the curious fact that their distribution often differs in a remark- able manner from that of the three higher classes of verte- brates. When we come to insects, we find the power of dispersal (as regards land animals) at a maximum ; for not only can they travel by almost every mode available to other groups, but their small size, low specific gravity, and (in many cases) great tenacity of life, give them altogether

exceptional advantages in this respect. They are easily carried for great distances through the air by gales and storms ; and there is evidence to

show that many remote islands have been thus stocked, and that many wide-spread groups owe their extensive range to this cause. Others can float uninjured for many days at sea; while their eggs or larve, inclosed in crevices of tree-trunks or concealed under bark, may be carried for hundreds or even thousands of miles by surface currents across extensive seas (Wallace, Geographical Distribution of Animals, vol. i. pp. 82, 209-214). The fact, then, that these small creatures have often a more extensive range, and present greater anomalies in their distribution, than larger animals, is only what we might expect; and if we keep their unusual powers of dispersal ever present to our minds, we shall be able to account for most of the anomalies they present, and thus bring them under the same general classification of the phenomena of distribution which is most serviceable in studying the history of the higher animals.

But the actual power of dispersal is by no means the only factor in determining the distribution of a species or a group. It is no use to bring a creature to a new country if it cannot live and maintain itself there. Whether it can do so depends upon many causes. It must be able to adapt itself to a different climate, and generally to different physical conditions ; it must be able to live upon whatever food it may find in its new abode; and, most important of all, it must be able to defend itself against new kinds of enemies and to live in successful com: petition with allied organisms which are already in possession of the soil.

Wide-spread and Local Groups.—There ig much reason to believe that the last-mentioned condition is the most difficult for an intruder to fulfil, and that a large propor- tion of the immigrants which from any cause arrive in a new country, are unable to maintain themselves in it, not because the couutry itself is not well adapted to their wants, but solely because it is already occupied by other creatures somewhat better adapted to all the surrounding conditions. Hence arise the phenomena of wide-spread or dominant species, and others which are exceedingly local and often rare, that is, consisting of but a small group of individuals, The former are best adapted to the entire environment, and are generally increasing their numbers and area of distribution; the latter are less perfectly adapted, and probably diminishing in numbers and on the road to final extinction. The power of adaptation seems, generally speaking, to be in an inverse ratio to

the power of dispersal. The larger mammalia and many birds are capable of enduring a great variety of climates, and even of maintaining themselves in many new countrics in competi- tion with the native inhabitants. Thus horses and cattle from the Old World have run wild and greatly multiplied in both North and South America, and are probably capable of existing in any country where there is a sufficiency of open uncultivated land. Insects, on the other hand, are often dependent on some one kind of vegetable food, are especially liable to injuries by climate, and unless very numerous would be liable to be at once exterminated by their various enemies.

Barriers which Limit the Distribution of Animals.—These are of many kinds, and affect the several groups in unequal degrees. The nature of the vegetation alone determines the range of a number of animals. Deserts, marshes, open plains, and especially forests, have each their peculiar inhabitants which can hardly stray far beyond their limits. This is particularly the case with the tropical forests, whose perennial foliage and almost perennial succession of flowers and fruits supply the wants of an immense number of peculiar forms of life. These forests are, in fact, the home

of all that is most characteristic of the tropics, and their limits form the dividing lines between very distinct faunas. Rivers, when very large, also determine the range of many species, but this is probably because their valleys have been once arms of the sea separating districts with some- what different faunas. Mountains, when rising to a great height in unbroken ranges, form an impassable barrier to many groups; but their geological age is also an important factor, and they are seldom so ancient and so continuous as to form absolute barriers. Climate, whetler determined by latitude or by elevation above the sea, is also a very effective barrier, though probably its action is indirect, and is determined by its influence on vegetation, and by bring- ing diverse groups into competition. The limits of the tropical and temperate zones, generally marked out by more or less extensive deserts, form the boundary between regions or sub-regions all round the globe. Oceans are, however, by far the most important barriers ; and this is due not only to their great extent and general impassability to

land animals, but also to their enormous antiquity, so that for countless ages they have separated the faunas of remote continents from each other.

In accordance with these principles, it is found, that continents separated by the widest and deepest oceans differ most radically in the entire series of their animals ; while those which are less completely separated, or which are only divided by climatal differences or by mountain ranges, are less unlike iu their chief forms of life. Thus are con- stituted zoological regions, which represent the most | permanent geographical features of the globe, and afford us | an indication of that permanence in the isolation and pecu- | liarity of their animal inhabitants.

Zoological Regions.—Although there is some difference | of opinion as to the number and limits of the primary divisions of the earth termed regions, the following are now generally admitted to be the most satisfactory. They are nearly identical with those first proposed by Mr P. L. Sclater in 1857.

I, The Palearctic Region, which includes all Europe to the Azores and Iceland, all temperate Asia from the high Himalayas and west of the Indus, with Japan, and China from Ningpo and to the north of the watershed of the Yang-tse-kiang; also North Africa and Arabia, to about the line of the tropic of Cancer. This may be popularly called the European region, Kwrope being the richest and most varied portion of it and containing representatives of all the more Important types ; but it must not be forgotten that the region includes a much larger area in Asia, and that there are many peculiar North Asiatic animals. .

2. The Ethiopian Region, which includes all Africa south of the tropic of Cancer, as well as the southern part of Arabia, with | Madagascar and the adjacent islands. It may be popularly termed the African region. . : 3. The Oriental region, which is comparatively small, including

ndia and Ceylon, the Indo-Chinese countries and southern China, be the Malay Archipelago as far as the Philippines, Borneo, and ae It may be popularly called the South Asiatic or Indian

F ae Australian Region, which is composed of the remainder

a he Malay Archipelago, Australia, New Zealand, and all the opical islands of the Pacific, as far east as the Marquesas and the

Low Archipelago.

F 5. The N eotropical Region, which comprises the whole of South merica and the adjacent islands, the West Indies or Autilles, and ¢ tropical parts of Central America and Mexico. It may be well

called the South American region.

Nae e Nearetic region, which consists of all temperate and arctic

‘ America, with Greenland, and is thus well described as the

orth American region,

These Six regions, although all of primary importance from their extent, and well marked by their total assemblage i animal forms, vary greatly in their zoological richness,

er degree of isolation, and their relationship to each other. The Australian region is the most peculiar and the most isolated, but it is comparatively small, and poor in the

igher animals, The Neotropical region comes next in

| well-marked features of the region.

| divers.

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peculiarity and isolation, but it is extensive and excessively rich in all forms of life. The Ethiopian and Oriental regions are also very rich, but they have much in common. The Palearctic and Nearctic regions, being wholly temperate, are less rich, and they too have many resem- blances to each other ; but while the Nearctic region has many groups in common with the Neotropical, the Palearctic is closely counected with the Oriental and

Ethiopian regions. The cause of these various resem- blances and differences depends on the past history of the earth, aud will be better understood when we have sketched the zoological features of each region and the changes they have undergone in the latest geological periods.

I. The Palearctic Region.—This extensive region, though varied in physical aspect, and often covered with luxuriant vegetation, is poor in animal life when compared with the great tropical regions of the Old and New Worlds. This is no doubt due mainly to climate, but also in part to so much of its surface being densely populated and highly cul- tivated. It contains, however, a number of characteristic and nota few altogether peculiar animal forms. Beginning with the Mammalia, we have first the sheep and goats with such allied forms as the chamois and saiga-antelope, which are especially characteristic ; deer are abundant and varied ; the smaller cats, the wolves, the foxes, and the bears abound, with a variety of smaller groups, as weasels, badgers, and some otters. Seals are plentiful on the northern coast, and even in the Black and Caspian Seas; wild horses and asses abound in Asia, as they once did in Europe; there are many peculiar forms of mice, voles, and hamsters ; while dormice, squirrels, marmots, hares, and pikas are The insectivorous family of the moles is almost peculiar, as are the curious mole-rats (Spalax). The genera which are peculiar to the Palearctic region belong to the following families :—to the moles (Talpide) 7 genera; to thedogs (Canide) 1 genus; to the weasels (Mustelidw) 3 genera; to the pandas (diluride) 1 genus; to the seals (Phocide) 1 genus; to the camels (Camelide) 1 genus; to the deer (Cervide) 6 genera; to the hollow-horned ruminants (Bovidw) 7 genera ; to the rats (Jfuride) 6 genera ; to the mole-rats (Spalacide) 2 genera; to the Octodontidw, a peculiar group of rat-like animals only found in South America, Abyssinia, and North Africa, 1 genus.

In birds, the Paleearctic region is pre-eminently rich in thrushes, warblers, titmice, jays and magpies, sparrows, and buntings. It also abounds in grouse, and in its eastern half in magnificent pheasants. Water-birds are plentiful, and its northern districts produce many fine ducks and The following enunieration of the families of which the Palzarctic region possesses peculiar genera will help to give an idea of the characteristic features of its ornithology :—Of the warblers (Sylvizde) 15 genera, many of

whicli, however, migrate into tropical Africa and India in winter; of babblers (Zimaliide) 1 genus; of reedlings (Panuride) 4 genera; of creepers (Certhiide) 1 genus ; of tits (Paride) 1 genus; of the crow family (Corwde) 4 genera; of finches and buntings (fringilidew) 12 genera; of starlings (Sturnidw) 1 genus; of larks (Alaudidw) 2 genera; of sand-grouse (Pteroclide) 1 genus; of grouse (Zetraonide) 4 genera; of pheasants (Phasianide) 5 genera; of vultures (Vulturide) 1 genus ; of rails (Halide) 1 genus; of snipes (Scolopacide) 4 genera; of coursers (Glareolide) 1 genus; of bustards (Otididee) 1 genus.

Of the remaining groups less accurate information is obtainable, and their distribution is less generally interest- ing. Reptiles, being heat-loving animals, are comparatively scarce, yet in the desert regions they are more plentiful and furnish a considerable number of peculiar types, there

being two genera of snakes and four of lizards not found in any other region. All reptiles diminish rapidly as we go north, and cease before we reach the Arctic circle. The common viper reaches 67° N. lat. in Scandinavia, the northern limit of reptiles in the region. Amphibia are much more patient of cold, the common frog ranging to the extreme north of Europe. There are no less than 16 peculiar genera of Amphibia, 8 of the tailed and 8 of the tailless group, the most remarkable being the Proteus, found only in subterranean lakes in Carniola and Carinthia.

Of fresh-water fishes about 20 genera are wholly confined to the region, of which the perches (Percide) have 3 genera; the salmons and trout (Salmonide) 3 genera; the carp (Cyprinide) 13 genera; with a peculiar genus and family (Comephorus) found in Lake Baikal, and another (Tellia) belonging to the Cyprinodontide, in the Atlas Mountains.

Insects are so extensive a class that the barest enumera- tion of their most remarkable forms would be out of place in such a sketch as this. We can only mention that, although butterflies are not very numerous, yet no less than 15 genera are peculiar to the region. Beetles, how- ever, abound, and the most characteristic Palearctic group is undoubtedly the Carabide, or predaceous ground-beetles, which are more predominant here than in any

other region, and are also of larger average size—a inost unusual cir- cumstance in the insects of a temperate as compared with those of tropical regions.

Land shells are tolerably numerous both in species and in- dividuals, but are of small size and little beauty as com- pared with those of warmer countries. Very few of the genera are peculiar.

The total number of the generic forms of Vertebrata peculiar to the Palearctic region is, as nearly as can be estimated, 138,—a very large number when we consider the general severity of the winter, and the circumstance that along its whole southern margin this region is bounded by tropical lands with no absolute barrier against intermi- gration. The amount of peculiarity may be even better estimated by the fact that, out of a total of 274 genera of Mammalia and birds inhabiting the region, 87, or somewhat less than one-third, are confined to it. This mode of esti- mating the zoological character of a region by genera, gives a far truer idea than any enumeration of peculiar species, because the former imply more radical and important differences than the latter.

Subdivisions of the Palwarctic Region.—The general zoological characters here given apply with considerable uniformity to the whole of the Palearctic region, the similarities being of course greater where climate and physical conditions generally correspond. Thus, even between such remote islands as Great Britain and Yesso (North Japan) there is a wonderful similarity in the general forms of life, many of our most familiar birds and insects reappearing at the other extremity of the region under identieal or but slightly modified forms. Owing perhaps to the great climatal changes the north temperate zone has undergone in recent geologieal times, and the vast amount of migration thereby produced, as well as to the absence of any continuous barriers, it is very difficult to mark out with aceuracy the zoological subdivisions of this region. Certain broad divisions, depending partly on climate, partly on physical features, and partly on geographical proximity to other regions, may, however, be indicated.

Europe, north of the Pyrenees, Alps, Balkans, and Caucasus, may perhaps be considered as the most typieal portion of the Palearctic region, possessing most of its characteristic features in their full de- velopnient. 1t

may be termed the European sub-region. South of this comes the Mediterranean sub-region, including South Europe and North Afriea, which wonderfully resemble each other in all their chief forms of animal life, although some few purely African speeies are found south of the Mediterranean. This sub-region in- cludes also Asia Minor and Persia, with Syria and Northern arabia. It is chiefly characterized by a number of desert forms, such as gazelles, civets, jerboas, quails, desert-larks, and numerous lizards ; and by a number of species which cannot endure the colder climate of the north, as porcupines, monkeys, ichneumons,

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and a host of peculiar groups of insects. To this region belong the Atlantic islands from the Azores to the Canaries, the animal pro- ductions of all of them being closely related to those of South Europe or North Afriea. It is a curious faet that the remotest of these islands, the Azores, offer less peculiarity in their birds and insects than Madeira and the Canaries, which are so mueh nearer the continent ; but this is sufficiently explained by the greater pre- valence of storms and gales in the more northern latitude of the Azores, and helps to prove that aerial currents are the ehief means by which these two classes of animals are dispersed. For a discus. sion of this interesting subject and its bearing ou the theories of distribution and development, see Wallace, Gcographical Distriby. tion of Animals, vol. i. p. 206.

The northern part of Asia differs very little in the main features of its zoology from the corresponding parts of Europe, but as we ap- proach the northern slopes of the great plateau of Central Asia many peculiar forms occur, as wild horse, pikas (Lagomys), starlings of the genus Podoces, and many others. The great desert plateaus of Thibet and Mongolia form another subdivision, with many peculiar forms. Here are found the yak, some peculiar antelopes, with wild sheep and goats, and several peculiar rodents ; and among birds many peculiar forms of grouse, partridges, and pheasants,

Another well-marked division is formed by the temperate portien of Eastern Asia, comprising Japan, Manchuria, Northern and Cen- tral China, with parts of Hast Thibet and the higher portions cf the Himalayas as far west as

Nepaul. This is a fertile and luxuri- ant district which receives several tropical forms of life from the adjoining Oriental region. It is rich in Insectivora and in deer, the deer-like musk being eonfined to it; it has a peculiar form of wild-dog (Nyctereutes), and even several peculiar species of the monkey tribe. It is also pre-eminently the home of the pheasant tribe, such magnificent birds as the golden, silver, and Keeve's

heasants being peculiar to it. It has also a number of showy jays, finches, tits, and warblers ; and its insects present a number of fine tropical-looking species. The Manchurian sub-region has thus a very beautiful and varied fauna, but the intermingling of Oriental types, and the uncertainty of its southern boundary, render it less characteristically Palearctic than the European sub-regions.

Il. The Ethiopian Region.—This region is much less extensive than the last, but being almost wholly tropical it presents a richer and more varied assemblage of animals. Its southern extremity, although really extra-tropical, ts yet so warm and so little subject to extremes of temperature that the growth of vegetation and the corresponding develop- ment of animal life are scarcely diminished, and the same may be said of the elevated interior of the continent. As Madagascar is quite isolated and its productions very pect liar, it will be best first to sketch the main features of African zoology, which are tolerably well marked and homogeneous.

The African continent is pre-eminently the country of large Mammalia. It possesses an abundance of elephants, rhinoceroses of several species, giraffes (now peculiar to it), gorillas and baboons—the largest of the ape tribe, a host of large and remarkable antelopes, the huge hippopotamus, several species of zebras, wild buffaloes, several remarkable forms of swine, and an abundance of lions, leopards, and hyzenas,—forming together an assemblage of large and highly organized animals such as occur nowhere else upon the globe. There are also many smaller, but very remark-able forms. There are 7 peculiar genera of apes, of lemurs, 5 of Insectivora, 12 of Viverride, the remarkable Proteles forming a distinct family allied to hyenas an weasels, 2 of Canide, 2 of Mustelide, 2 of Sude, 1 of Tragulide, 12 of Bovide (antelopes), 18 of various families of Rodents, and the curious aardvark (Orycteropus), form- ing a distinct family of Hdentata,

In birds Africa is not so peculiar, yet it has many remarkable groups. Such are the plantain-eaters (Muso- phagide), the colies (Coliide), the secretary-birds (Ser- pentarvide), the ground horn-bills, and the guinea-fowl,— all of which are peculiar. It abounds also in peculiar fly- catchers, shrikes, sun-birds, weaver-birds, starlings, pag barbets, grouse, and hawks,—more than half the genera 0 land-birds being peculiar, and, if we include those 0 Madagascar, nearly two-thirds, #

Reptiles abound, there being three peculiar families 4 snakes and one of lizards; and there is one peculiar famuy

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of toads. There are also three peculiar families of fresh-

water fishes. _ It is impossible to give any idea of the special features

presented by the insects and land-shells without going into details which would be out of place in such a sketch as we are here giving. In both these groups Africa is fully as rich as the other tropical regions, and exhibits perhaps more peculiar features than among the higher

animals. ; We must, however, just mention the remarkable absence

from the Ethiopian region of certain groups of Mammalia which abound in the countries to the north and east of it, as this phenomenon has an important bearing on the probable origin of the fauna. ‘The most striking of these deficiencies are the two families of the deer and the bears, which abound over: the whole northern hemisphere, in tropical Asia and the Malay islands, and even in North Africa, but are both entirely unknown over the whole Ethiopian region, as are, among smaller groups, the gvats and sheep, the true oxen, and the mole family. Among birds such wide-spread groups as the wrens (7’roglodytide), dippers (Cizclide), and the true pheasants are also entirely wanting.

The exceeding speciality of the forms of life which are still found in the Ethiopian region is well shown by the fact that there are about 24 family groups of vertebrate animals which are entirely confined to it, while two-

thirds of its genera of Mammalia, and three-fifths of the genera of birds, are also peculiar.

Subdivisions of the Ethiopian Region.—The most remarkable of those is undoubtedly that comprising Madagascar and the Mas- ca ene islands, a district which contains so many singular forms o° life that it has been proposed by some naturalists to make it one oc the primary zoological regions. The peculiarity of these islands is twofold, consisting as much in the absence of a great number of the most characteristic African forms as in the possession of others entirely peculiar. The apes and monkeys, the large Carnivora, the zebras, giraffes, antelopes, elephants, and rhinoceroses, and even such smaller forms as the porcupines and squirrels, are entirely wanting. Yet Madagascar possesses a host of remarkable Zemur- tle, consisting of 7 genera and 35 species, all of which are peculiar; a peculiar family of Jsectivora, comprising 5 genera and 10 species; a) peeuliar family and 5 peculiar genera of small Curnivora ; and 3 peculiar genera of Muride. Even among birds, so much better able to traverse a narrow sea, there are some curious deficiencies, the families of woodpeckers (Picide), honey-guides (Indicatoride), barbets (Megalemide), plantain – eaters (Musophagide), colies (Colitde), hornbills (Bucerotide), and mockers (rrisoride)—all abundant on the opposite coast of Africa—being. entirely wanting. Yet birds are sufficiently abundant, nearly 120 species of true land- birds being known, while there are no less than 33 genera which are altogether confined to Madagascar and the Mascarene islands. If we consider the species, the peculiarity is even more remarkable, there being more than a hundred which are peculiar to about a dozen which are found elsewhere. These numbers, however, by no means fairly represent the special character of the Mascarene bird- fauna, which consists in the anomalous character of many of the genera, so that it is to this day a matter of dispute among ornitho- logists in what families a considerable number of them should be classed, Among these anomalous genera are Mesites, Tylas, Ar- tamia, Calicalicus, Euryceros, Philepitia, Leptosomus, Atelornis, and several others. Taking all these facts into consideration, we oe at the conclusion that the fauna of Madagascar is more pecu-

tar than that of any other single island on the globe.

The reptiles of Madagascar are less known, but they exhibit some Temarkable peculiarities. Many African groups are wanting, others ure tepresented by peculiar genera, while a considerable number of groups have their nearest allies, not in Africa, but in tropical Asia pe in South America. Among insects the butterflies are allied to

Pare of Africa; but the beetles, like the reptiles, show many cases a alfinity with the Malay islands and South Amcrica, though the Majority are perhaps related to true Ethiopian forms. The continental part of the Ethiopian region appears to have no subdivisions clearly marked out by natural barriers, yet it may be ivided into three tolerably well-defined sub-regions in accordance a differences of climate and vegctation. These may be termed € sub-region of open plains, the forest sub-region, and the south temperate sub-region. The first comprises the greater part of Central and East Africa,

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and a northern belt from Senegambia through Lake Chad to Abys- sinia, while it extends to the Atlantic coast trom Angola to Damara Land. This extensive district may doubtless be further sub- divided, but it exhibits throughout the main features of Central African zoology as distinct from that of West and South Africa. Its zoological charactcrs are negative rather than positive, as it has very few peculiar groups; but all the great African Mammalia abound, and a greater variety of antelopes are found here than in the other sub-regions.

The West African or forest sub-region extends from the Gambia to the Congo, and inland to the sources of the Nile and the western watershed of the great lakes. It is characterized gencrally by a luxuriant forest-vegetation, and it possesscs many peculiar animal forms. Here we find the gorilla and chimpanzee, a great variety of monkeys, and two peculiar genera of Jemurs, as well as some re- markable genera of Liscctivora, Viverride, and Tragulide. It is the hone of the gray parrots (Psittacus), the typical plaintain-eaters (Musophaga), one of the Eastern group of ground thrushes (Pitta), and many peculiar genera of passerine birds. Reptiles are very abundant, no less than 13 genera of snakes and 3 of lizards being peculiar to this sub-

region. As is always the case in tropical forest-districts, insects are especially numerous, of large size and brilliant colours.

The South African or extra-tropical sub-region, though quite open to the ccntral districts and to a large cxtent overrun with the same fauna, yet presents so many peculiarities as to indicate, pro- bably, a former southward extension of the contincnt. We find here 3 peculiar genera of Viverride, the remarkable Proteles, pecu- liar Canide and AMustelide, many peculiar rodents, including Bathyerges (one of the mole-rats), Petronvys (one of the spiny-rats), and Pedetes (the Cape-hare). There are also some peculiar genera of birds, among which are a sun-bird, 2 weaver-birds, 3 larks, and a curious woodpecker (Geocolaptes). Reptiles are still more pecu- liar, 4 genera of snakes and 10 of lizards being almost or quite restricted to this limited district. Insccts, too, are very remark- able, there being 7 peculiar genera of butterflies, and a host of beetles which are either quite peculiar or have their nearest allies in Madagascar, in India, or America. This remarkable and isolated fauna must be considered, in connection with the wonderful Cape flora—so much richer and more isolated than that of any other part of Africa—as indicating important changes in the past history of this part of the globe.

III. The Oriental Region. —The Oriental region is wholly tropical, but is of smaller extent than the Ethiopian. It is very largely covered with forest-vegetation, and is much broken up into islands and promontories, conditions so favourable to animal life as fully to compensate’ for its smaller area.

In the larger Mammalia there are many resemblances between the Oriental and Ethiopian regions. Both have anthropoid apes, elephants, rhinoceroses, large felines, buffaloes, and an abundance of civets. But the Oriental regiou abounds in deer and bears, it has many remarkable Insectivora, the Malay tapir, and many wild cattle. It has also a great number of characteristic forms of life. It has 6 peculiar genera of apes, and 3 of lemurs; 5 of Insectivora, among which are two peculiar families, Galeopithecide and Tuparvide ; 12 of Viverride; 1 one of Cande, 5 of Mustelide ; 2 of Urside ; 1 of Tragulide ; 1 of Cervide ; 4 of Bovide ; and 5 of Rodents.

The birds of this region are exceedingly abundant, varied, and remarkable. Among them are 3 peculiar families of passerine birds—the hill-tits (Liotrichide), the green bulbuls (Phyllornithide), and the gapers (Hurylemide) ; while the babblers (Zimaliide), the fruit-thrushes (Pycnonotide), and the king-crows (Dicruride) are far more abundant than in the adjacent regions. Tits, flycatchers, crows, sun-birds, starlings, kingfishers, pigeons, and pheasants are also very abundant, and are represented by many remarkable forms. More than 340 genera of land-birds inhabit the region, of which number 165 are peculiar to it. Reptiles are very abundant. Three small families of snakes are peculiar, and there are a large number of peculiar genera both of snakes and lizards.

Insects are exceedingly varied and beautiful, especially in the Himalayas and in the Malay islands, Among butterflies the Danacde are very abundant, while the true Papilios are perhaps finer than in any other part of the

world. Among beetles the Lucanide, Cetoniide, and Bu- prestide are especially remarkable, while the elegant Longi- corns have their full quota of curious and beautiful forms.

Subdivisions of the Oriental Region.—These are tolerably well marked, though very unequal in extent and productiveness. The Himalayan slopes with all the Indo-Chinese countries form the chief and most typical part of the region. Here are the greatest variety of Mammalia and birds, and almost all the more important groups are represented. Three genera of Mammalia and 44 of birds are peculiar to this sub-region.

The Malay Peninsula, with the larger Malay islands, as far as Java, Borneo, and the Philippines, form a sub-region which has much in common with the last, aud is almost equally rich, and in some groups even richer and more peculiar. Thus it has no less than 14 genera of Mammalia and more than 40 genera of birds which are wholly peculiar to it, among which are such intcresting forms as the orang-utans (Simi), the spectre-lemur (Zarsius), the flying- lemur (Galeopithecus), the feather-tailed tupaia (Ptilocerus), the sun-bear (Zelarctos), and the magnificent argus-pheasants (Argusianus). About an equal number of genera are common to the Malayan and the Indo-

Chinesc sub-regions, but are not found elsewhere; so that the two have much in common, and together comprise nearly all that is most remarkable and beautiful of the Oriental fauna.

The other two sub-regions consist of the peninsula of India aud Ceylon, whose chief feature is their comparative zoological poverty. Taking first what may be termed the Indian sub-region, extending from the foot of the Himalayas to the Carnatic, we find that this extensive and fertile region, though abounding in life of every kind, yet possesses no peculiar genus of either Mammalia or birds; while, favoured by the open and arid plains of which much of the surface consists, some African types are more abundant than in other parts of the region, though these are numerically unimportant.

Ceylon and Southern India are somewhat more interesting, as they possess some peculiar forms, and others in common with the Malay islands. Among the former is Loris, a peculiar lemur; and there is a peculiar genus of Mwride, as well as one or two peculiar genera of birds. There are also several peculiar species of monkeys, and the Malayan genus Zupaia; while among birds we find Malayan forms of cuckoos and Timaliide.. The reptiles, however, best characterize this sub-region, as it possesses an entirely peculiar family of snakes (Uropeltid), consisting of 5 genera and 18 species, as well as 4 other peculiar genera of snakes. ‘T’here are also many peculiar genera of lizards belonging to the Agamide and Acontiade, and 3 peculiar genera of tailless Batrachia. The insects also offer some remarkable cases of Malayan affinity, the genus Hestia (or spectre-butterflies) being found in Ceylon only beyond the Malay islands; while 6 genera of Malayan Longicorns and the wingless Tricondyla belonging to the Cicindelida, are in the same category. The combination of so many peculiaritics justifies the separation of Ceylon and a portion of Southern India as a distinct Oriental sub-region.

IV. The Australian Region.—On entering this region we meet with such a radical change in all the higher forms of life, that the zoologist seems to have got into a new world. Even the Austro-Malay islands, though differing in no way in climate or luxuriance of vegetation from the Indo-Malay islands to the west of them, exhibit this change in an almost equally marked

degree. With the exception of Celebes, which is a debatable land hardly belonging to either region, the other islands only posssess a few deer and pigs to represent the host of varied Mammalia—from the elephant and tapir to the squirrel and monkey—which characterize every part of the Oriental region to its extreme south-eastern limits in Java and Borneo. In place of these we have Marsupials only, in great variety in the extensive country of Australia and less abundantly in the islands; and besides these, only those flying mammals—the bats, which can traverse the ocean, and the smallest forms of rodents, the mice—which may be occasionally carried by floating trees or other accidental means across narrow arms of the sea. There are 5 distinct families and 33 genera of Australian Marsupials, as well as 2 families and genera of the still more lowly-organized Monotremata which comprise the anomalous Ornithorhynchus and Echidna,

Birds, as might be expected, are not so excessively peculiar, a large number of almost cosmopolitan families extending into Australia ; yet there are no less than 16 families altogether characteristic of the region, among which

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are such remarkable forms as the Paradise-birds (Paradi- seid), the honey-suckers (Meliphagide), the lyre-birds (Menuridee),the cockatoos (Cacatuide),the lories (Trichoglos- side), the mound-builders (Megapodiide), and the casgo- waries (Casuaride). Among the important groups which are entirely wanting in Australia are the barbets (Megalemide : the woodpeckers (Picide, otherwise cosmopolitan), the trogons (7’rogonide), aud the pheasants (Phasianide). The reptiles, as in most other cases, offer less marked peculiari- ties than the birds ; but a large proportion of the genera are peculiar, and there are even 3 peculiar families of lizards, as well as the singular Hatteria of New Zealand, which constitutes not only a separate family but a new order of reptiles. The Amphibia and fresh-water fishes present a corresponding amount of peculiarity ; and the recent discovery of the genus Ceratodus (the mud-fish) is very interesting, since its nearest allies appear to have lived early in the Secondary period, while other members of the same group are found isolated in the rivers of tropical Africa and America.

Insects are very abundant in Australia and the Austro- Malay islands ; but owing to the various means by which these small creatures are conveyed across the seas, and the identity of physical conditions in the Oriental and Australian portions of the archipelago, the true Australian fauna is chiefly developed in Australia itself, where there are a considerable number of peculiar genera in all orders of insects,

Subdivisions of the Australian Region.—Besides the Australian continent, which is by far the richest and most important part of the region, there are three groups of islands which have each some distinctive peculiaritics. These are the Austro-Malay islands, comprising New Guinea, the Moluccas, and the Timor group; the Pacific islands; and the New Zealand group. The first is very rich, especially in birds and insects, while the other two are exceed- ingly poor.

The Austro-Malayan sub-region, of which New Guinea is the central mass, is comparatively poor in Mammalia, only 9 genera of marsupials being yct known, 6 of them being peculiar, with pigs, a few mice, and some deer (perhaps introduced) in the Moluccas Birds are far more numerous, the Paradise birds and the true crimson lories being peculiar to the sub-region, while more than 40 genera of land-birds are confined to it. It is exceptionally rich in peculiar forms of flycatchers, honey-suckers, kingfishers, cockatoos, and pigeons; and its birds are ‘generally characterized by a bril- liancy of plumage far exceeding that which prevails in the sur rounding regions. The insects exhibit a similar brilliaucy, some of the finest butterflies and beetles in the world belonging to this sub-region.

Directly we pass east of the Solomon Islands we enter upon one of the poorest zoological regions in the world in proportion to 31s extent and luxuriant vegetation, the only exception to this poverty being in the land-shells, which are very largely developed and very peculiar. Indigenous Mammalia are wholly wanting. Birds are very scaree, no more than about 150 species being known from the numerous islands scattered over 5000 miles of the Pacific, while there are only about a dozen peculiar genera. Reptiles are more numerous than might be expected, considering the wide extent of ocean separating many of the islands. There are 14 genera of lizards, of which 6 are peculiar, but few extend eastward of theSamoa

Islands, Snakes are much less abundant, and none are found east of the Fiji Islands. Insects are exceedingly scarce, and of little interest.

The New Zealand group, though situated beyond the tropics and very remote from other lands, yet possesses a more ample and more intcresting fauna. If we except two bats, mammals are wanting; but birds are tolerably abundant, and are very peculiar and in- teresting. There are 34 genera of land-birds, of which 16 ar peculiar. Twelve of these are passerine birds, chiefly Meliphagide and Sturnide, with Nestor and Stringops, peculiar genera of parrots, and the extraordinary wingless Apterya. Reptiles are few. There are afew lizards, with one peculiar genus, but no snakes. The anomalous Hatteria has been already mentioned. There is also one frog belonging to a peculiar genus. There are some interesting fresh-water fishes, one genus belonging to the Salmonide, a family not occurring elsewhere in the southern hemisphere; and there are several species allied to South American fishes. ; i

Insects are very few, and generally of small size and inconspl- cuous colours. Many of them are peculiar, but they have mostl, uy affinities with Australian groups, or with those from the Orienta region.

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V. The Neotropical Region.—This is in some respects the richest zoological region on the globe, yet it has certain resemblances to the Australian region, which is the poorest, and which it follows in natural order. This is owing to both being inhabited mainly by low types of Mammalia and birds, some of which have been preserved from early geological times, the Marsupials being a good example. But there has also been some intermigration between south temperate America and Australia, by means of intermediate islands and floating ice, and this has led to a community of forms in a few groups to which suck a mode of trans- mission was possible.

The Mammalia are as abundant and varied as in any other countries except Africa and tropical Asia; but the region is characterized by poverty in the more highly organized forms, with a corresponding abundance of lower

types. Monkeys are abundant, but all belong to two peculiar families—Celide@ and Hapalide—different in struc- ture and of a somewhat lower organization than those of the Old World. About half of them have powerfully prehensile tails, a character unknown among the monkeys of the eastern hemisphere. Bats are very numerous, and one extensive family—the Phyllostomide, or vampyre- bats—is peculiar. Insectivora are unknown in South America, but one peculiar genus occurs in the larger Antilles, and a few shrews in Central America. The Carnivora are but moderately numerous, the Civet family being entirely wanting, as are the bears, with the exception of a solitary species in Chili. There is, however, one peculiar family—the Procyontde—which extends over North America as well. A marked feature is the excessive scarcity of the great family of the Ungulata, or hoofed animals. There are no wild cattle, sheep, goats, antelopes, horses, or rhinoceroses ; and only a very few species of tapirs, peccaries, llamas, and deer in their place. Coming to the small and feeble Rodents, however, we find a great abundance and variety of forms, including the largest on the globe. Five families are peculiar or nearly so,— the chinchillas and the cavies being the most important, while all the genera, except Sciwrus and Lepus, are peculiar to the American continent. We now come to the Kdentata, the most imperfectly organized and the most characteristic of the Neotropical mammals. ‘There are twelve genera belonging to the three families of the sloths (Bradypodide), the armadillos (Dasypodidce), and the ant- eaters (Myrmecophagide). Lastly, we have the Marsupial opossums, which range far over temperate North America, but are most abundant in the tropical regions of South America.

Tn birds the Neotropical region is wonderfully rich. It possesses far more distinct genera and species than any other region, and it has 24 entire families peculiar to it, while the region which comes next in speciality and isola- tion as regards this order—the Australian—has only 16. Most of these peculiar families are, however, of a somewhat low grade of organization, and it is these which abound Most in genera and species and give a special feature to the ornithology of the country. These peculiarly American families (for some of them range into North America) are the tyrant fly-catchers (Tyrannide), the manakins (P ipride), the chatterers (Cotingide), the plant-cutters (P. hytotomidee), the tree-creepers (Dendrocolaptide), the ant-thrushes (Pormicarude), and the wren-thrushes

(Pteroptochide), All these have a deficiency in the sing- ing-muscles of the throat, and they comprise more than “00 genera. Then, among the Picarie, which are a low though wide-spread order, we have the toucans (Khamphastide), the puff-birds (Bucconide), the jacamars (Galbulide), the motmots (Momotidw), and the humming- birds (Lrochilide), comprising 140 genera. The only

peculiar families of high organization are the sugar-birds (Ceerebide), the greenlets (Vireonide), the hang-nests (Icteridee), and the tanagers (Tanagride), comprising in all 82 genera. The most highly organized groups of birds, and those which are most abundant in the eastern hemisphere, such as crows, starlings, thrushes, warblers, and flycathers, are either scarce or entirely wanting. Finches are numerous, as are parrots. Among game-birds the higher types, as the grouse (Z’etraonida), are scarce ; while the more lowly-organized curassows (Cracide) and tinamous (Z%namide) are much more abundant and more widely distributed over the whole region. Among the wading groups (Gralle), which are decidedly of low organization, there are 6 peculiar and very isolated families, the most remarkable being the Cartamide, the Psophiide (trumpeters), the Zurypygide (sun-bitterns), and the Palamedeide (horned-screamers). ‘The very low struthious type is represented by the American ostriches (hea).

Reptiles are also very abundant in the Neotropical region, and there are many peculiar groups. Snakes are represented by peculiar genera only, the families being almost always widely and often universally distributed in warm regions ; lizards are more restricted in their range, and no less than 5 families are peculiar to the region, while 9 are found only in the American continent. All are of very small extent except two, the Veide and Iguanide, which are very numerous, and comprise the most characteristic American lizards. There are also 4 peculiar families of tailless Batrachians, the most popularly known being the Piped, which contains the remarkable Surinam toad.

Fresh-water fishes are probably more abundant and varied than in any other region. ‘Three entire families and several sub-family groups are peculiar, and the enormous forest-bordered rivers and extensive tracts of annually

flooded woodland have Jed to the development of special groups of fruit-eating fishes, which, as articles of food, are not only unsurpassed but altogether unequalled in any other part of the globe. Fresh-water rays (Trygonide) and electric eels (Gymnotide) are also peculiar to Neotropical rivers, and there are an immense variety of Suluride, Characimde, and Cyprinodontide. It is reported that Professor Agassiz obtained more than a thousand species of fishes in the Amazon alone; but, although this may be exaggeration, there is no doubt that a still greater number exists in that wonderful river and its tributaries.

The insects of tropical America are so inexhaustible in their variety, and so wonderful in their beauty, that it is hopeless to attempt to give an adequate idea of them. The butterflies are far more abundant and more gorgeous than in any other region, and their variety may be imagined from the fact that the peculiar genera are nearly equal in number to those of the rest of the world. The beetles, though very abundant, are not so clearly preponderant over those of all other regions. The stag-beetles (Lucanide) and rose-chafers (Cetoniide) are somewhat poorly de- veloped ; but all the other large families are very abundant, and comprise many forms of extreme beauty and interest. Such are-the genera Agra among Carabide, Pyrodes among Longicorns, and Hxtimus among Curculionide. Land-shells equally surpass those of all other regions, but this is owing to the exceptional richness of the West Indian islands, the continent of America being by no means extraordinarily rich in this class of animals.

Subdivisions of the Neotropical Region. —The manner in which this region may be most naturally and conveniently divided for zoological purposes is doubtful. Almost the whole of tropical South America (excluding only the higher Andes south of Chim- borazo and the dry plain to the west) forms a compact area in

which all the more characteristic Neotropical animal groups are developed in their highest luxuriance. This, however, falls natu-

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rally into three subdivisions, which may be generally indicated as Guiana, Brazil, and the Eastern Andes, each of which is character- ized by a great number of peculiar generic types. These three areas are considered by Professor Newton (in his article Brrps in this work) to be sub-regions, each equivalent to the whole of south temperate America, and to the tropical part of North America, which may be termed the Mexican sub-region. But each of these latter may be also divided. South temperate America consists of a western and an eastern division, each with many distinct groups, while the southern parts of Central America differ greatly from the northern ; and all these subdivisions may be considered as provinces of their respective sub-regious. It seems better, therefore, for the purposes of such a general sketch as the present, to consider the tropical parts of South America, as above limited, to be one great sub-region, characterized by possessing a large proportion of the animal ene of the whole region. It will therefore only be neces- sary to indicate in what way the other sub-regions differ from this.

The Chilian sub-region, or temperate South America as above defined, is well characterized by its exclusive possession of the family of the Chinchillide (comprising three genera) and the genus Auchenia (the llamas and alpacas), the only representatives of the Camelide in the New World. It also has a peculiar form of bear, several peculiar genera of rodents, and two peculiar forms of arma- dillos. Among birds it has the curious plant-cutters (Phytotomide), a peculiar family of waders (Thinocoride), about 26 peculiar genera of passerine birds—1 of parrots, 2 of pigeons, and 2 of tinamous. It also possesses the American ostriches (Rhea), and 3 peculiar genera of plovers. The reptiles are usually of tropical genera, but a few are peculiar. Many of the fresh-water fishes are of peculiar genera, but there are some Australian forms, and even oné species (Galaxias attenuatus) is common to New Zealand, Tasmania, and Patagonia.

Among insects alone we meet with indications of a decided affinity for forms of the north temperate zone. There are several butterflies allied to Hrebia, an Arctic genus, and others belonging to the northern genera Hipparchia, Argynnis, and Colias. The mass of the butterflies, however, are purely Neotropical. Of the beetles some are Australian, but the majority are allied to Neo- tropical forms ; yet among the Carabide, or carnivorous ground- beetles, there are many truly northern genera, such as Carabus,

Anchomenus, Trechus, &e., whose presence supports the theory of a migration along the Andes from the northern hemisphere. (See lie Geographical Distribution of Animals, vol. ii. pp. 44-

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In tropical North America, or the Mexican sub-region, we find far less peculiarity. The southern portion from Panama to Nica- ragua can hardly be separated zoologically from the adjacent parts of South America, while further north the chief difference consists in the absence of many typical Neotropical groups, and the appear- auce of a few which more especially characterize the Nearctic region. A peculiar form of tapir (Elasmognathus) inhabits Central Ainerica, with one or two peculiar genera of rodents; while such northern forms as Sorex, Vulpes, Lepus, and Pteromys range as far south as Guatemala. Birds are more especially characteristic, since the sub-region possesses no less than 37 peculiar genera of land birds ; but many Neotropical groups are absent. ‘The most im- portant of these deficiencies are the Pteroptochide, and the sub- families Furnartine, Conophagine, and Rupicoline, as well as most of the peculiar groups of waders. In place of these are found tits (Paride), creepers (Certhiide), waxwings (Ampelide), and turkeys (Phasianidw) from the north. The fresh-water fishes as well as the insects are almost wholly Neotropical in character, but exhibit a considerable amount of speciality.

There remains the West Indian Islands or the Antillean sub- region, which in the amount of isolation and speciality it exhibits is better marked than any other part of the region. The Mam- malia are few but very interesting, as is usually the case in islands separated from continents by very deep sea. There are no monkeys, Carnivora, Ungulates, or KEdentata, the only orders represented being the Insectivora and the Rodentia. The former, which is unknown in South America, is here represented by a peculiar genus, Solenodon, belonging to a family, Centetide, only fonnd elsewhere in Madagascar. The Rodents consist of two very peculiar genera— Capromys and Plagiodontia belonging to a family which is espe- cially South American, with a peculiai mouse, and an agouti (Dasy- procta) in the lesser Antilles. The birds are far more abundant, about 200 resident species being known, besides a large number of inigrants from the United States. These

belong to 95 genera, of which about one-third are peculiar, The only entirely peculiar family group is that of the todies (Todide), small and elegant birds whose nearest allies are the South American motmots and jacamars.

The reptiles are not very well known, but they seem tolerably numerous, and mostly allied to South American groups; and the same remark applies to the fresh-water fishes. Insects are not very abundant, and beetles scem especially scarce considering the luxu- rlant vegetation of most of the islands. In land-shells, however, the very reverse is the casc, the Antilles being more productive than

any other part of the world. The number of species of West Indian land-shells is equal to that of the entire continent of America, while the number of genera is greater. No less than 11 of the genera are peculiar, a very unusual degree of Speciality con. sidering the extensive range of most of the genera of land-mollusca,

VI. The Nearctic Region.—This comprises all temperate North America ; and its peculiar fauna is best represented in the United States, and especially in that portion extend. ing from the Mississippi valley to the Atlantic. It is allied both to the Neotropical and the Palearctic regions, but it also possesses a considerable number of peculiar or charac- teristic forms. Among Mammalia it possesses 3 peculiar genera of moles, 2 of weasels, 2 of hollow-horned ruminants —Antilocapra (the prong-buck) and Aplocerus (the moun- tain goat or antelope)—and a number of Rodents, among which the most peculiar are the Saccomyide or pouched rats. Ofthose groups which are more peculiarly Neotropi- cal it has skunks (AMephitis), racoons (Procyon), and opossums (Didelphys). The number of Palearctic groups is greater, the more important being lynxes, wolves, martens, bears, elks, bisons, sheep, flying-squirrels, and marmots.

Of birds there are between forty and fifty genera which are peculiar or highly characteristic. Most of them belong to the passerine families, the wood-warblers (JMniotiltide) and the finches (Fringillide) being especially rich in peculiar groups; and there are also a few among the thrushes, wrens,

crows, haug-nests, woodpeckers, grouse, and some other families. Among the larger birds the turkeys (Meleagris), the ruffed grouse (Cupidona, &c), and the crested partridges (Oreortyx, &c.) are the most remarkable.

Reptiles seem to be more numerous than in the Palearctic region. About a dozen genera of snakes are peculiar or characteristic, the most remarkable being the well-known rattlesnakes (Crotalus). Among lizards the so-called " glass-snake " (Ophisaurus) is a peculiar form analogous to our slow-worm ; while the horned-lizards (Phrynosoma) and many other genera of Iguanide are peculiar. Fresh-water fishes are exceedingly numerous and highly peculiar, there being no less than five (or, according to recent authors, eight) peculiar families, and a large number of peculiar genera. The perches and their allies (Percide, Ichthelide, Labracide, aud Etheostomide), the carps (Cyprinidae), the suckers (Catostomide), and the catfish (Siluridc) are the most abundant groups. ;

In insects the Nearctic region is not remarkably rich or very peculiar. Its butterflies, though tolerably abundant, belong for the most part to well-known European groups with a smal] infusion of Neotropical forms in the Southern States. The same may be said of its Coleoptera. Land- shells are tolerably plentiful but not strikingly peculiar ; the Alleghany district being the most productive, and possessing a large number of peculiar species. In fresh- water shells North America surpasses every other part of the globe, considerably over a thousand species, most of them Unionide or fresh-water mussels, having been described.

Subdivisions of the Nearctic Region.—Owing to the rresearehes of American zoologists these have been ascertained with da accuracy, and may be termed respectively the Californian, Rocky Mountain, the Alleghany, and the Canadian sub-regions. :

The western or Californian sub-region comprises the nalrow ood between the Sierra Nevada and the Pacific, not including 4 California, but extending northward into British Columbia toa i 53°.N. lat. It is characterized by a few very peculiar forms, ie 4 a greater infusion of South American types than are foun 4 similar latitndes on the east coast. Among Mammals hak genus of vampyre bats; among birds a cuckoo of the ao ith), coccyx, and 2 genera of humming-birds (Sedasphorus and a, and among reptiles Lichanotus, a

snake allied to the boas, are aeer tropical forms. California has also five or six peculiar gene adtip mammalia,—Urotrichus, one of the moles, and Haploodon, forit ‘le a distinct family of Rodents, being the most remarkable;

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Chamen, forming a ed family allied to the wrens, is the most i ing and peculiar. bird.

ae eel : Rocky Mountain sub-region extends | eastward from the Sierra Nevada across the Rocky Mountains to a line a little eastward of the 100th meridian, where a marked change in the cli- mate, vegetation, and animal life is found to occur. ‘T’o the north it is bounded by the great Canadian forest-zone on the upper Sas- katchewan, while southwards it extends into Texas and Lower California and along the line of highlands to beyond the city of Mexico. This sub-region is characterized by many peculiar animals, some of which are closely allied to Palearctic types—as the so-called buffalo (Bison americanus), the big-horned sheep (Ovis montana), the glutton (Gulo arcticus), and the pika (Lagomys princeps) ; while others are altogether distinct forms, as the prong-horn (Antilo- capra) and the antelope or mountain goat (Aplocerus). Of Pale- arctic forms of birds it has two peculiar genera of grouse (Centro- cereus and Pediocetes), and the Arctic wood-pecker and ptarmigan. More especially Nearctic are a genus of wrens (Salpinctes) and some peculiar genera of finches and crows. The Nearctic pouched- rats (Saccomyide) are abundant. :

The eastern or Alleghany sub-region coniprises the country to the east of the last, and as far north as Wisconsin and the scuthern parts of Canada, It contains examples of al] that is most charac- teristic in Nearctic zoology, and has besides a few peculiar groups. Of these the most noteworthy is the star-nosed mole (Condylura), and among birds the passenger-pigeon (ctopistes) and a few groups of wood-warblers and finches, The reptiles are more peculiar, as there are scveral genera of snakes, including two of Homalopside and two of rattle-snakes, which hardly extend beyond it. Among lizards the glass-snake (Ophisawrus) is peculiar, and no less than four genera of tortoises are almost or quite confined to the sub- region. Here, too, are found the peculiar Amphibia for which North America is so

remarkable, such as the two genera of the Sirenide (Siren and Pseudobranchus), Menobranchus allied to the Proteus of Europe, Amphiuma, an eel-like creature with four rudimentary feet constituting a distinct family, and three peculiar genera of salamanders (Salamandride). Fishes, too, are very abundant, and several of the peculiar North American forms are confined to this sub-region; such are the pirate-perch (Aphredo- derus), the cave-fishes (Amblyopside), the trout-perches (Per- copside), several genera of sun-fishes (Zchthelide), and many others.

The sub-Arctic or Canadian sub-region has very few distinctive features, but it serves at once to connect and separate the other three regions which almost merge into it. The musk-sheep (Ovibos) is almost the only form peculiar to it, though this is more pro- perly Arctic. Many of the most characteristic Nearctic animals, such as Condylwra and Mephitis, only just enter its southern bor- ders, while most of the Arctic forms are more abundant here than further south. Great numbers of birds migrate here in summer from the Southern States and Mexico; while a few especially Palzarctic groups (as Budytes, Phylloscopus, and Pyrrhula), which do not occur elsewhere in North America, have been found in Alaska. The scanty fauna of Greenland shows that it forms a part of this sub-region.

DIsTRIBvTION oF THE HigHER ANIMALS DURING THE TERTIARY PERIOD.

_ Before we proceed to other divisions of our sub- Ject, we shall find it useful to consider briefly the geo- graphical relations of the Tertiary and post-Tertiary faunas to that which now exists, as we shall thereby arrive at a better comprehension of the true nature of zoological regions, and the meaning of the diverse and complex rela- tions that exist between them.

Post-Tertiary Faunas,—Researches in alluvial clays and gravels, cave-earths, and other superficial deposits have made known to us very completely the character of the fauna which immediately preceded that now existing, and which lived at the close of the glacial period and in the era of prehistoric man. We find, as might be expected, that a considerable number of the Mammalia were identical with living species, but along with these we almost always find a number of extinct forms, some closely related to living Species in the same district, while others seem to Indicate migration and a

change of climate, by their resemblance to species which now only live further north or south. More extraordinary is the fact, that many of these recently extinct forms were of huge size as compared to any now living, often reminding us of the bulkiest in- habitants of the tropics or of those huge animals which we

associate with an earlier condition of the earth's surface. Thus, in Europe during the post-Tertiary period, the reindeer, the glutton, and the Tartarian antclope inhabited France, along with powerful felines allied to the existing lion. At the same time elephants and rhinoceroses of several species roamed all over Europe ; and at one period hippopotami ranged as far north as the Thames, while the European beaver was replaced by a much larger species, In North America about the same time we find extinct lions, horses, tapirs, and camels, with bisons and musk- sheep, as well as elephants and mastodons ; and along with these, three genera of gigantic sloths as large as rhinoceroses and elephants,—forming an assemblage of large Mammalia wonderfully different from that which now exists in the same country. In South America we find that there were larger monkeys than any row living, together with lions, bears, horses, tapirs, and antelopes, as well as mastodons, and a tree-porcupine as large as a peccary. Here also were armadillos as large as a rhinoceros, and huge sloths as in North Ainerica but of more varied kinds. Even in Australia very similar phenomena occur. Extinct wombats as large as tapirs, kangaroos the size of elephants, and a phalanger nearly as large as a lion have been found in cave-deposits, along with a number of other forms more nearly like those now living. But in this case all are Marsupials or Monotremes, and there is no sign of any migration from other lands, which indeed, owing to the insular nature of the country, we could hardly expect. Again, in New Zealand and Madagascar we have a similar phenomenon presented to us by the great extinct terrestrial birds—the ‘‘ moas,” the ‘‘ dodos,” and the Zpyornis, which, from the conditions under which their remains are found, have evidently not long ceased to exist.

It appears then that in all parts of the world where we have been able to obtain the requisite information, the period which immediately preceded

that in which we live was characterized by great movements or migrations of the higher animals where that was possible ; and everywhere, by the extinction of a variety of huge animals belonging to almost every order of Mammalia and to several orders of birds, many of which are now totally unrepresented on the globe.

Tertiary Faunas, and their Geographical Relations with those of the si Zoological Regions—When we go back to the late and middle Tertiary deposits, we find a series of remains of the higher animals which exhibit vet more remarkable changes of distribution. Various parts of cen- tral and southern Europe, for example, were then inhabited by animals which now form the most characteristic features of Ethiopian and Oriental zoology—such as apes and monkeys, lions and hyzenas, horses, tapirs, elephants, rhinoceroses, giraffes, and various antelopes ; and along with these a number of extinct ancestral forms of many of the same groups. Among birds, too, we find the eastern jungle-fowl, the edible-nest swift, and the trogon, along with African parrots and plantain-eaters. In the Miocene beds of Northern India are found such typical African groups as the hippopotamus and giraffe.

Now geology teaches us, that in the Eocene, or earliest portion of the Tertiary epoch, a continuous arm of the sea extended from the Bay of Bengal to the Atlantic Occan, cutting off the peninsula of India and Central Africa from the Palzearctic region ;! and it is therefore highly probable that, when this sea-bed became dry land, the various large Mammalia now so characteristic of Africa entered it for the

1 See Mr Searles V. Wood, jun., ‘‘On the Form and Distribution of the Land Tracts during the Secondary and Tertiary Periods re- spectively, and on the effect upon Animal Life which great changes in

Geographical Configuration have probably produced ” (Philosophical Magazine, 1862).

first time from the north. This will explain many of the peculiarities of the Palearctic, Oriental, and Ethiopian regions, and of their several sub-regions,

and especially the persistence of low types in those districts which were wholly or partially protected from the competition of more highly organized animals.

The Tertiary fauna of North America compared with that of Europe exhibits proofs of a former communication between the two northern continents both in the North Atlantic and North Pacific, but always, probably, in rather high latitudes. This is indicated both by the groups which appear to have originated in one continent and then to have passed across to the other, and also by the entire absence from America of many important groups which abounded in Europe (and vice versa), indicating that the communication between the two hemispheres was always imperfect and of limited duration.

The past zoological history of North and South America exhibits a somewhat analogous series of phenomena. Their productions were generally very dissimilar. North America, in closer connection with the great northern continent, made an almost eyual advance in the development of the more highly-organized animals ; while South America, for the most part isolated and thus prevented from receiving a constant supply of immigrants from the larger land-areas, developed a series of lowly-organized creatures, the smaller forms of which still constitute its chief zoological feature.

The knowledge we possess of Tertiary and post-Tertiary Mammalia thus gives us an important clue to the successive migrations of the various groups of animals from one region to another, and to the geographical changes which rendered such migrations possible. The general result arrived at is, that the great northern continents represent the original seat of mammalian life, and the region of its highest development ; while the southern continents—Australia, South America, and Africa—have been isolated for varying periods, and, after receiving an immigration of lowly forms, have developed and preserved tliese to a greater or less ex- tent, according as they were more or less completely pro- tected from the irruption and competition of higher types. Australia, during the Secondary period, received from the northern continent a stock of Marsupials and perhaps some still lower forms, and, having been since completely isolated, has developed these groups alone into its existing fauna. South America, at

a somewhat Jater period, obtained the ancestors of its Edentata and Rodents; and though at various times some higher forms entered it from the north, these never seem to have been sufficiently numerous to overcome its indigenous fauna. In Africa the case was different. For a long time its Mammalia were probably analogous to those of South America; but when the great irruption of higher animals took place in the latter part of the Tertiary period, most of these were destroyed, and a few only remain—such as the Orycteropus, the Lemurs, and the peculiar Rodents—as indications of the character of the primeval fauna. In the peninsula of India a very similar course of events occurred, and the fauna of both these countries now consists mainly of comparatively recent immigrants. (For a fuller discussion of this subject see Wallace's Geographical Distribution of Animals, chapters v1. to xv.)

"Lhe Birth-place and Migrations of some Mammalian Families and Genera. —From the knowledge we now possess of the extinct fauna of most of the great continents, it 18 possible to determine approximately the original birth- place of some now widely distributed groups. The true bears, for example, date back in Europe to the older Pliocene, while in North America they occur only in post- Pliocene deposits. We may conclude, therefore, that they originated in the Old World and are comparatively recent

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immigrants in America. 'True horses of the genus Houus are also of older Pliocene date in Europe and of the post. Pliocene, or perhaps newer Pliocene, in America, and are therefore also recent immigrants into the latter country, But it is a curious fact that the most perfect series of ancestral forms of horses occur in the Miocene and Eocene deposits of North America ; whence it would seem probable that the earlier stages of the development of this wonder- fully specialized animal were effected in America, whence they passed to the eastern hemisphere, and there attained to the full development of the equine type, again, perhaps, to be transferred to America,—to be largely developed there (for remains of eight or ten distinct species have been discovered), and finally to become wholly extinct, while continuing to exist in the Old World, whence the most perfect form has been again introduced, and seems quite capable of maintaining

itself in a wild state. Tapirs, though now more abundant in America than in Asia, are an Old World group, going back to the Lower Miocene in Europe, but only appearing in America in the post-Pliocene epoch. The peccaries (Dicotyles), now almost wholly Neotropical, are really a North American group, and probably only entered South America in Jater Pliocene times. Camels, though now confined to Asia and South America, are really a North American form, having been largely developed during the Miocene period, whence the true camels appear to have passed into Asia and the llamas into South America. True deer are European from Miocene times, but only appear in America in the later Pliocene and post-Pliocene epochs. Elephants are an Old World type, abounding from the Miocene period in Europe and Asia, but only appearing in America in the later Pliocene and post-Pliocene times. It is possible, however, that the Eocene Dinocerata of North America may be ancestral forms of Proboscidea, and that, as in the case of the horses, the development of elephants may have begun in America to be subsequently perfected in the larger area of the eastern hemisphere. As a last and curious example

‘we may refer to the marsupial opossums, now exclusively

American, but which are certainly recent immigrants from Europe or Asia. No trace of them occurs in American deposits before the post-Pliocene period, while they existed in Europe both in Eocene and Miocene times.

The cases now adduced are sufficient to show how much interest attaches to the distribution of the ancestral forms of our existing animals ; but we wait for fuller knowledge of the Tertiary deposits of Asia, Africa, and South America in order to complete the history of these migra- tions, and to gain some knowledge as to many other groups Whose origin is now involved in obscurity (Geog. Dist. of Animals, vol. i. p. 153.)

DISTRIBUTION OF MARINE ANIMALS.

The zoological regions which serve to represent the main facts of the distribution of land animals are evi- dently inapplicable to those inhabiting the ocean, except in a few cases where the group is confined to shallow waters or to estuaries, It is true that, as the great continents are separated by the oceans, so the oceans are to some extent separated by the continents, but

owing to the superior area of water the separation is far less complete and effective. In the southern hemisphere the Pacific, Atlantic, and Indian oceans freely communicate, and for truly oceanic animals there would seem to be hardly any obstacle against universal distribution. Yet even m this case physical conditions, especially depth and tempera- ture, are found to be effective barriers. The fact that the deep waters even of the tropical seas are cold, renders it indeed possible for some temperate or Arctic forms to cross the equator if they can travel at great depths ; but for sur-

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face-dwellers the broad expanse of warm water between the tropics, with its hosts of specially adapted organisms, forms anabsolute barrier. In like manner the inhabitants of the tropical shallow waters are limited, and it is only by tem- porary subsidences of land or elevations of the sea-bottom to near the surface, allowing of a passage east or west, that they can migrate into remote areas. We have good reason to believe, however, that subsidences have often occurred between North and South America, allowing of a free inter- change of aquatic animals between the Atlantic and Pacific oceans; while in Kocene times a strait is supposed to have connected the Atlantic and Indian oceans, and more recently the Red Sea and Mediterranean have almost cer- tainly been united, ‘We cannot, therefore, expect to find any such strongly-marked zoological regions among aquatic as among terrestrial animals, and the facts at our command entirely confirm this view. For many groups the warm and the cold, or the northern, tropical, and southern seas, are the only well-marked divisions ; while for others the North Atlantic, the North Pacific, and the Indian Ocean form additional regions of a more or less defined character. For special studies of the more highly-organized marine groups—as the Mollusca or Crustacea—a host of provinces and sub-provinces have been formed, each important sea or coast presenting some peculiar features ; but as these divi- sions mostly depend on specific rather than generic distri- bution, they need hardly be noticed here.

Owing to the absence of any well-marked regions, and the general imperfection of our knowledge of the distribu- tion of marine animals, we must follow a different plan in our sketch of this subject from that adopted

for the terrestrial fauna. We propose, then, to notice successively the more important classes of marine animals, and to state briefly what general facts are established as to their distri- bution,

Poraminifera.—These exceedingly low organisms are im- portant, because their shells or tests are found extensively in various geological formations, and often form a considerable part of the constituents of rocks. They are found in all seas, and the species have often an enormous range. The surface swimmers are almost universally distributed, while the bottom-livers—as the writer is informed by Mr H. B. Brady—appear to be distributed according to depth and latitude rather than to follow any circumscribed areas. This gentleman is now engaged in working out the "Challenger " collections, and already sees reason to think that there may be found some differences between Atlantic and Pacific, and also between North Atlantic and South Atlantic forms. These organisms have been found living In the surface waters and down to a depth of 2000 fathoms, but only their dead remains are brought up from the floor of the deep ocean,

Spongida.—Sponges form another extensive group, often preserved as fossils, of which our knowledge of the Tecent forms is rapidly increasing. There seems, however, to be little geographical limitation of groups. The fresh- water Spongillide are found in all regions. The horny and calcareous Sponges are widely distributed, but are much more abundant in warm and tropical seas, The beautiful siliceous sponges—of which the glass-rope (Hyalonema) and Venus's flower-basket (Huplectella) are Conspicuous examples—are found scattered throughout all warm seas, and have recently been found in abundance in many of the great ocean depths,—in the Atlantic at 2650 fathoms, and in the Pacific at 3000 fathoms,—so that they Probably exist wherever the nature of the bottom is favourable, (Sir Wyville Thomson, Depths of the Sea;

Reports from the Challenger," Proc. Roy. Soe., vol. xxv. ; Bowerbank's Papers on Sponges" in Proceedings of Zoological Society, 1869-1874.)

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Actinozoa.—The coral-bearing groups of these animals are the more important, because of the abundance of fossil forms of every geological age. By far the greater number of these are found exclusively in tropical seas. Many of the Alcyonaria are temperate and even Arctic, while among the Zoantharia the Caryophyllide alone are well repre- sented beyond the tropics. The distribution of corals is in great part determined by the physical conditions of the sea- An influx of fresh water or of mud brought down by rivers is fatal to them, and voleanic deposits seem to be almost equally prejudicial. A high temperature is also necessary for most of the groups. Coral reefs are therefore restricted to certain seas and coasts within or near the tropics. They abound in and near the West Indies, on the east coast of Africa, in the Indian Ocean, in the Malay and Pacific archipelagoes, and on the coast of Australia ; while they are absent from the whole of the west coasts of South America and of Africa, from the Indian peninsula, and from much of the east coast of South America. The coral-reefs of the Berinudas, in 33° N. lat., are the farthest from the equator; in the Red Sea they reach 30° N., in the Pacific 27° N., while they nowhere extend to more than 29° 8. of the equator. Besides the corals actually forming the reefs, the same localities abound in what are termed deep-sea corals, and thus the general distribution of the group is determined by similar conditions. The coral regions are therefore somewhat peculiar, and differ con- siderably from those which best exhibit the distribution of other marine animals. The regions adopted by Mr Dana are three,—the first comprising the Red Sea and Indian Ocean ; the second, the whole of the Pacific islands and the adjacent coasts of Australia; and the third the West Indies. This last region is the most isolated in position, and it is not surprising that it should contain the largest proportion of peculiar forms. ‘The corals of the Central Pacific are also very peculiar, as are those of the Red and Indian seas. Considering the great similarity of the molluscan fauna of the Pacific and Indian oceans, it is remarkable that the corals should be so different as Mr Dana’s tables show them to be. Although some corals exist at great depths in the ocean, they diminish rapidly when we pass the moderate depth of 200 fathoms. The ‘‘ Challenger” expedition obtained 27 genera at a greater depth than 250 fathoms, but only 3 of these extended below 1500 fathoms. Count Pourtales on the American coast found them at 400 fathoms; the “ Porcupine ” expedition first found them at a greater depth than 1000 fathoms in the North Atlantic; while in the Pacific a single species has been

found at the enormous depth of 2900 fathoms. The following genera were obtained by the “Challenger” dredgings at a greater depth than 1000 fathoms :—Caryophyllia, Deltocyathus, Ceratotrochus, Flabellum, Amphehelia, Cryptohelia, and Fungia. Some of these were of brilliant colours—pink, madder-red, white, and emerald green. A large proportion of fossil genera of corals survive in the deep seas, no less than seven genera, before only known in the fossil state, having been added by the explorations of the “Challenger ;” seven of these are found at or below 1000 fathoms. It is curious, how- ever, that the deepest by far of all corals, Fungia, is not known to be fossil, nor is any member of the family Stylasteride, six genera of which are deep-sea corals ; so that too much importauce must not be attached to the fact of genera hitherto only known as fossils having been found living at great depths in the ocean, (Dana’s “ Zoophytes ” in U.S. Exploring Kxpedition, vol. vii.; “Report on Corals Dredged by the ‘ Challenger,’” by H. N. Moseley, Proc. Roy. Soc., vol. xxiv. p. 544.)

Polyzoa.—The coral-like Molluscoida forming the exten- sive group of marine polyzoa, have been carefully studied,

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but they are so widely distributed as to offer few special features of distribution. One or two families—as the Selenariade—are almost exclusively tropical ; others—as the Catenicellide and Vinculariade—are confined to the southern hemisphere. The Diastoporide are mostly northern, while the Celleporide@ are found in both north and south temperate seas. But the great mass of the families are either universally distributed or widely scattered over the globe. They range to high northern latitudes, having been found abundantly by the Swedish expedition on the shores of Nova Zembla in 70° N. lat. They inhabit the profound depths of the ocean, having been dredged from near 2000 fathoms in the North Atlantic, 2500 fathoms in the Pacific, and 2650 fathoms in the Southern Ocean during the voyage of the “ Challenger.” (Busk’s Brit. Mus. Catalogue of Marine Polyzoa; “* Challenger’ Reports,” Proc. Roy. Society, vol. xxiv. pp. 466, 468, 572,

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Thee rmata.—The best-known groups—the starfishes and sea-urchins—occur abundantly as fossils, but their ex- isting distribution does not offer many features of special interest. The Asteroidea, or star-fishes, are most abundant in the Indian and Pacific oceans, while the Ophiuroidea (brittle stars) are better represented in the European and African seas. A few genera are exclusively American, but on the whole star-fishes are far less abundant in the western than in the eastern hemisphere. Although most abundant in shallow seas, they also inhabit the floors of the deepest oceans, some having been obtained by the “Challenger ” expedition from a depth of 2700 fathoms in the Pacific. They abound even in the Arctic seas, “ hundreds of seastars”” having been obtained by a single haul of the swab at 76° N, lat. in Novaya Zembla by the Swedish ex- ploring ship “ Proven” in 1875. The Zechinoidea (sea- urchins) are also very abundant in Eastern seas, while they are comparatively scarce in America, Although much larger and more varied in the tropics, they are tolerably abundant in temperate and cold seas ; and they probably reach the greatest, depths in the ocean, since some have been obtained by the “ Challenger ” from a depth of nearly 3000 fathoms in the North Pacific. (Nature, vol. xii. p, 556; Van der Hoeven, Handbook of Zoology.)

Crustacea.—The distribution of the higher Crustacea has been discussed in detail by Mr James Dana in the Zoology of the United States Exploring Expedition ; and, considering that most of the species are shore-dwellers, the facts are very interesting and often quite unexpected. We will, therefore, give an abstract of the conclusions of this writer,

The marine regions which best represent the distribution of these animals are three in number, termed by Mr Dana the Occidental, the Africo-European, and the Oriental, The first comprises both coasts of the American continent ; the second, the eastern shores of the Atlantic both African and European; and the third comprehends the vast area from the east coast of Africa to the Central Pacific. Each of these is of course subdivided into climatal and local provinces, but the primary divisions alone are those which we have now to consider. The facts adduced in support of this scheme of distribution are very interesting. No less than 47 genera are exclusively American, and 15 are common to both the east and west coasts ; but as 26 genera are said to be confined to the west coast, and 6 to the east,

it will be seen that these two proviuces are really very dis- tinct, even if they do not form primary regions. The Africo-European region has 19 peculiar genera, and only 8 in common with the American region; so that the eastern and western shores of the Atlantic are decidedly more dis- tinct than the eastern and western coasts of America. The extensive Oriental region is by far the richest, containing

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no less than 115 peculiar genera, and ouly 19 in common with the Africo-European region. About 40 genera are said to be found in all three regions,

The distribution of Crustacea in relation to temperature also presents some peculiar features. The Species are almost equally divided between the tropical and the extra. tropical regions. The highest form of Crustacea—the Brachyura—are most abundant in the tropics, while the less developed Amphipoda and Isopoda are more numer- ous in temperate and frigid zones, This may, however, in part depend on these groups having been less assiduously collected in the tropics. More interesting, and less open to doubt, is the fact that among the four chief types of Crustacea—Brachyura, Macroura, Isopoda, and Amphipoda

.—the most highly developed species are extra-tropical,

The largest species of the Macroura are found in temperate seas, and though the largest Brachyura are tropical, yet the Maioids—the highest group of Brachyura and of all Crustaceans—reach their largest dimensionsin the temperate zone. Mr Spence Bate adduces the curious fact that in the cosmopolite sub-family Lysianassina, the largest species aie found in Arctic and Antarctic latitudes, while a species from the Straits of Magellan so closely resembles one from Spitzbergen that they may even be identical; and in the family Capreliide the same species often occurs in both the northern and southern hemispheres. Mr Dana lays great stress on similar cases of wide and discontinuous distribu- tion, which (he considers) necessitate the adoption of the theory of special creations. Thus, two species (Kraussia rugulosa and Galene natalensis) are found at the Hawaian islands aud Natal, but in no intermediate localities, Other identical species occur in the Japan seas and Natal. The same species (Plagusia tomentosa) occurs in

South Africa, New Zealand, and Valparaiso; and another (Cancer Hdwardsti) at New Zealand and Valparaiso. The same species and several identical genera (Latreillia, Ephyra, Sicyonia) are found in the Mediterranean Sea and J apan, but in no intermediate districts, Closely allied species (of the genera Amphiroidea and Ozius) are found in Australia and Chili ; but perhaps the most singular fact is the occur- rence of closely allied or perhaps identical species of Paloeemon in New Zealand and the British Seas, and also of certain British or American genera (as Portunus and Cancer) in New Zealand. Many of these cases, and more especially the last, undoubtedly offer great difficulties on the theory of transmission and specific modification. ‘There are, however, some considerations which afford hints for a possible solution of the difficulty. We now know many cases in which the distribution of an animal or a group of animals has been rendered discontinuous by its recent ex- tinction in intermediate localities. The tapirs, for example, exist only in tropical America and the Malay islands, and 1t might well be argued that no passage from one of these localities to the other is conceivable for such an animal. But we now know that the South American tapir lived in North America down to post-Pliocene times, that in Europe there were tapirs in the later Pliocene period, while in the Pliocene or Miocene periods allied species inhabited North India and some parts of China, The present remotely isolated forms are therefore seen to be the remnants of @ genus which once ranged over almost the whole northern hemisphere. Perhaps more to the point is the case of the genus Panopea, adduced by Mr Woodward in his Manual of the Mollusca, There are only 11 living species, which occur widely scattered in the northern seas, the Cape of Good Hope, Australia, New Zealand, and Patagonia. But of this same genus nearly 150 fossil species are known, dis- tributed over many intermediate localities, so that the existing species are seen to be but relics of an ancient form of life lingering at various points on the outskirts of the,

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yast area it once occupied. Such cases as these occur in all classes of animals where our knowledge of the extinct fauna is sufficiently extensive, and we are therefore justified in believing that a large proportion of the existing instances of anomalous and discontinuous distribution are to be

explained in a similar way. In the case of the Crustacea we must also take into account our comparative ignorance of many parts of the globe, and especially our ignorance of the powers of dispersal of the ova, and of the young animals during their earlier larval condition. This dis- persal may systematically occur to a far greater extent than we are yet aware of ; though only in rare and exceptional instances May a species succeed in maintaining itself beyond the normal limits of itsrace. The certainty we are now acquiring of the long duration and wide-spread influence of the glacial period must also materially affect sich questions as these ; for although the equatorial low- lands may never have suffered from its influence, it is highly probable that during the period of greatest cold the temperature of the entire ocean may liave been lowered, while in certain directions cold currents may have affurded a passage for temperate forms of marine animals from the northern to the southern hemisphere. While admitting, therefore, that the distribution of Crustacea presents to us some problems of extreme difficulty, we must deny that they are such as to justify us in resorting toa solution such as “special creation,” which is negatived by the evidence afforded by almost every other class of animals. The reports of the “Challenger” expedition already published afford valuable information on the distribution of Crustacea in the oceanic depths. The higher forms (Decapoda) have been found living at a depth of 1875 fathoms in the North Pacific, 2600 fathoms under the equator, and 2385 fathoms in the South Pacific. In the North Atlantic, at a depth of 1900 fathoms, was found a cray-fish allied to the Astacide, but deprived of even the rudiments of eyes, while others equally blind (from both the Atlantic and Pacific) are believed to have their nearest allies among the extinct Hryonide of the Jurassic period. The higher Crustacea, which are most abundant at great depths, and which have afforded the greatest variety of new and interesting forms, belong to the Schizopoda. They have been found at depths of more than 2000 fathoms in the Pacific, and down to 2550 fathoms in the Atlantic Ocean. Some of them are blind, but a more remarkable fact is, that many of them are brightly coloured, though living in absolute and perpetual darkness. Among the Edriopthalmata (sessile-eyed Crustacea) examples of the remarkable blind family Afunopsidw have been found at a depth of 2175 fathoms in the Atlantic, and at nearly 2000 fathoms in the Southern Ocean. Other forms usually found in shallow water (Serolis) also occurred at great depths—more than 2000 fathoms in the Pacific ; and one of these, obtained near the

southern ice-barrier at a depth of over 1900 fathoms, was of “a fine blue colour with a rad spot over the middle of the body.” Entomostraca also ovcur at great depths, the most remarkable being a figantic Ostracod found at 1600 fathoms in the Southern Ocean, At 1375 fathoms, near the Crozets, a Pycnogonoid (sea-spider) was obtained, measuring 2 feet across the legs. But besides these bottom-dwellers, the trawl nets at d. ferent depths showed that the ocean is inhabited by peculiar tribes of free-swimmers—principally Copepoda, Amphipoda, and Cypridinas, often of a bright orange colour, These occurred in all parts of the Pacific to a depth of 2000 fathoms, but they were never found in the surface nets. (United States Exploring Expedition, vols xiii. and Xiv.; Spence Bate on “Geographical Distribution,” in Spence Bate and Westwood’s British Sesstle-Eyed Crustacea ; Dr Radelf von Willemées-Sulim’s “Report on the

Crustacea of the ‘Challenger,’” Proc. of the Royal Society, vol. xxiv. p. 585.)

Cirrhipedia.—The barnacles are a tolerably extensive group of anomalous Crustacea, whose distribution differs somewhat from that of the more typical portion of the class, The genera are almost all widely or universally distributed, from 74° 18’ N. lat. to Cape Horn, and some of the species have an equally wide range. No genus having more than a single species is confined to the torrid zones, and only two genera are limited to the southern hemisphere. Although the temperate zones have a smaller area than the torrid, they possess rather more species of Cirrhipeds, which Mr Darwin imputes to the fact of these zones being éwo, while the torrid is but one. As in some groups of the higher Crustacea, large species are most abundant in the temperate zones. Owing to the wide range of the genera the Cirrhipedal regions can only be determined by the distribution of species. These, according to Mr Darwin, are as follows:—1l. The North Atlantic, comprising North America and Europe down to N, lat 30°; 2, The West American, from Behring Straits to Tierra- del-Fuego; 3. The Malayan, from India to New Guinea ; 4, The Australian, comprising Australia and New Zealand. The Malayan and Australian regions are the richest in Cirrhipeds. During the voyage of the ‘‘ Challenger” these animals were found to inhabit

the deep seas, the most remarkable being a gigantic Scalpellum from a depth of 2850 fathoms in the North Atlantic, while other forms occurred at almost the same depth in the Pacific. (Darwin's " Monograph of Cirrhipedia," Ray Society,

1854.

ae marine Mollusca, from their great abund- ance in all seas, the ardour with which they have been collected and studied, and the frequency of their occurrence as fossils, offer an extensive field for the study of distribu- tion. But many causes have combined to render the results yet arrived at unsatisfactory. Their classification has been for some time undergoing a progressive change, owing to the greater attention paid to the organization and development of the animals, but there is still much uncer- tainty as to the limits of genera and sub-genera. Owing to their being in many cases articles of commerce, either on account of their uses or their beauty, the place where they were originally obtained lias often been confused with the place from which they were exported. Their numters, too, have so rapidly increased that few persons have been found to devote themselves to the great labour of geographical tabulation. And, lastly, the genera are so often of great extent and world-wide distribution that the range of species alone has generally been attended to.

The late Dr Woodward established a series of eighteen marine provinces, founded professedly on the fact of one- half of the species being peculiar. The distribution of the genera is only casually mentioned, and it is almost certain that a large number of these provinces have no claim to rank as primary regions as regards the distribution of the Molluscan fauna. Mr Woodward himself states that his Arctic province is comparatively small and exceptional, while the three southern faunas of America, Africa, and Australia differextremely. Allthe warmer provinces may, he says, be naturally grouped into three great divisions— the Atlantic, the Indo-Pacific, and the West American ; and these are perhaps the only true Molluscan regions, The Indo-Pacific extends from the Red Sea and east coast of Africa to the easternmost Pacific islands, and exactly corresponds to Mr Dana's Oriental region for Crustacea. About 100 species are said to range over nearly the whole of this vast area, The Atlantic region unites the fauna of

the east coast of America with that of West Africa and South Kurope, but it also has considerable affinity for that

of West America, since about 60 genera are common to both. Several important genera appear to be restricted to the north temperate zone, which should perhaps form a distinct region, About 30 important genera are confined to the Indo-Pacific region; and nearly 20 are peculiarly tropical. The Atlantic coasts have few peculiar genera of importance, and the west coast of America hardly any, its difference from the Atlantic fauna on the one side and the Pacific on the other being chiefly specific. There is said to be not a single species common to he east and west coasts of tropical South America ; while the corresponding coasts of North America have more than 50 species in common, and many others so closely representative as to be almost equivalent to identicai species.

The shells of the Mediterranean were once supposed to be very peculiar, but recent dredgings have proved that most of them exist also in the Atlantic, and it is now doubted if any are really confined to that sea. A small number (about 70 or 80 species) are identical with Red Sea shells. The marine-shells of Australia and New Zealand are exceedingly unlike those of Britain,—exactly the reverse of what obtains among the Crustacea.

The influence of temperature on the distribution of Mollusca is very marked, the warmer regions presenting a greater variety of forms, with a greater proportion of large and finely-coloured species. Yet in some cases the largest species are extra-tropical, a striking example being found among the volutes, which abound in tropical seas, yet attain their largest size in New Zealand, In temperate and even in Arctic seas Mollusca are perhaps as abundant individually as in the tropics, but the number of species and genera is far less, and they are generally dwarfed in size, and of obscure colours.

Till a comparatively recent period very few shells had been obtained at a greater depth than 200 fathoms. These were mostly of small size and obscure colours, belonging to groups of wide range and great geological antiquity. Dentalium, Cryptodon, Leda, and Arca were the most important,

and it was generally believed that the zero of Molluscan, if not of all but the very lowest forms of life, would be found at a depth of 300 or 400 fathoms. The recent development of deep-sea dredging has, however, completely changed our ideas on this subject, and the Mollusca as well as most other groups of Invertebrata are found to be capable of existing in the profoundest depths of the ocean. Off the coast of Norway Professor Sars has obtained Mollusca from a depth of 450 fathoms ; and near Florida, Agassiz found them at 500 fathoms. During the cruise of the “Porcupine” Professor Wyville Thomson obtained species of Plewrotoma and Dentalium from the enormous depth of 2500 fathoms in the Bay of Biscay. During the recent voyage of the “ Challenger ” many other groups have been discovered in the deepest seas, In the North Atlantic, 500 miles west of Teneriffe, three small living Mollusca belonging to the genera Arca, Limopsis, and Leda were dredged from a depth of 2740 fathoms ; while in the Central Pacific, from a depth of 2425 fathoms, species of Arca, Newra, Pleuronectia, Trochus, Fusus, Dentalium, and some others have been obtained, All are small obscurely-coloured forms, resembling Arctic rather than tropical shells, due no doubt to the fact that in these profound depths thy water is permanently at a temperature very little differing from that of melting ice. Equally lateresting is the fact ascertained by the naturalists of the “Challenger,” that the waters of the ocean down to the enormous depth of 1500 fathoms abound with true pelagic Mollusca belonging to the orders Pteropoda, Heteropoda, aud Gasteropoda, while below this limit they appear to

be absent (Woodward’s Manual of the Mollusca ; © Challenger’

pp. 536, 578; Letters of Sir Wyville Thomson, in Nature, vols. 7-10.)

fishes.—The distribution of marine fishes appears to agree generally with that of the Mollusca and Crustacea, their greater powers of locomotion, leading to a wider dis. persal, being to some extent compensated by the more recent origin of most of the species, genera, and families, There are about 80 families of marine fishes, and no less than 50 of these are almost universally distributed, Several other families range over all tropical seas. About dD families are found only in the Arctic and temperate seas of both

hemispheres, while two (Déscoboli and Accipenseride) are found in the north temperate seas only. The best marked region is undoubtedly (as in the Mollusca and Crustacea) that which extends from the Red Sea and east coast of Africa to the Sandwich Islands and Australia, About ten families are confined to this region (which may be termed the Oriental or Indo-Pacific marine region); many genera of other families equally characterize it, while there are even a number of species which range over the greater part of its vast area. On the other hand, no family of importance seems to be confined to the Atlantic, or to the coasts of Eastern or Western America, the differ. ences of these provinces, as of the European and American shores of the Atlantic, being confined to generic and still more largely to specific forms. Many species of fish have enormous ranges, extending from the North Atlantic to Australia, from the Red Sea to the Sandwich Islands, and from New Zealand toSouth America. Some species range over almost the whole Atlantic Ocean, and a considerable proportion of those inhabiting the Atlantic and Paeife coasts of Central America have been found by Dr Giinther to be identical.

It has long been known that a considerable number of fishes inhabit very deep water, never coming to the surface when alive ; but the researches of the “Challenger” expe- dition have added greatly to our knowledge of these curious forms. A large number of genera and species, many of them new, and belonging to ten distinct families, have been obtained in the nets and trawls from a depth of 200 to 2400 fathoms in all the great oceans. These often come up greatly inflated by the expansion of the internal gases; some were transparent, several were blind, and some had curious phosphorescent organs on the head. These deep- sea forms generally have a wide range. The greater num- ber of the new and remarkable forms obtained during the voyage of the “Challenger” belong to the Scopelide, a family known to inhabit the deep waters of all the warmer seas. The size attained by marine fishes appears to have no relation to latitude or temperature. (Giinther’s British Museum Catalogue of Fishes ; Mr J. Murray’s “ Preliminary Report on Vertebrates collected by the ‘ Challenger,’ ” Pro. Roy. Soc., vol. xxiv. p. 537.)

Marine Turtles.—These reptiles, forming the family Cheloniide, are too few in number and too widely distri buted to afford any indications as to oceanic

regions.

Cetacea.—The whales and dolphins form the only group ot truly oceanic Mammalia. They are very widely distr: buted, but their classification is too unsettled, and their history too imperfectly known, to throw much light on the general question of oceanic distribution. Two of the families—Balenide and Balcenopterida—seem to be con- fined to the cold and temperate seas of both hemispheres. The Catodontide (comprising the sperm whales), on the other hand, are more especially tropical and sub-tropical. The Hyperoodontide, or beaked-whales, are widely distrl- buted in northern, southern, and tropical seas ; while the largest family—the Delphinida—are universally dis tributed.

| The largest whales inhabit the cold northern and southern Reports," Proc. Royal Society, vol. xxiv. | seas. (Dr J. E. Gray's British Museum Catalogue of

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Whales and Seals ; Mr Andrew Murray's Geographical Dis- tribution of the Mammalia.)

General Relations of Marine with Terrestrial Zoological Regions—The general facts of distribution of marine animals now adduced accord very well with what we know of those terrestrial changes which have led to the actual distribution of land animals. The great Indo-Pacific region —so well marked in every important group of marine animals—probably owes its individuality to the fact that Australia bas been isolated during the whole of the Tertiary, and probably during much of the Mesozoic epoch, while numerous islands in the Indian and Pacific oceans have always afforded an extensive shore-line favourable to the development of aquatic forms of life. The Atlantic has probably been for long periods even more inclosed than it is now, owing to the greater southward extension of South Africa and South America; while the profound depths of its central channel have served as a barrier between the inhabitants of the shallow waters of its eastern and western shores. In like manner the great trough of deep water which separates the most eastern groups of the Pacific islands from the west coast of America has necessarily led to the establishment of distinct oceanic

faunas in these regions ; while this very fact—the remarkable distinctness of the Pacific and West American faunas—tells us plainly that this barrier of deep ocean is one of the ancient features of the earth's surface.

We shall find, too, that many of the details, and not a few of the anomalies, of the distribution of marine animals become intelligible from our knowledge of past geographical changes. The considerable affinity between the Crustacea, Mollusca, and fishes of the eastern and western coasts of America exactly corresponds to the fact, clearly established by a consideration of the distribution of living and extinct land animals, that these oceans have been united, at several distinct periods, by two or more channels over what is now Central America, the final union of the two continents being comparatively recent. The fact that the uniting channels were always situated within the same limited area sufliciently explains the considerable amount of generic and specific difference of two faunas ranging over coast-lines running north and south for many thousand miles on the Opposite sides of great continents. The curious fact (only recently established) that so deep and extensive an inland sea as the Mediterranean contains but few peculiar marine animals, becomes quite intelligible when we consider that till middle or late Tertiary times it consisted of two inland Seas or lakes, Such inland seas are always very poor in animal life; and it is therefore not surprising that the Mediterranean should now contain hardly any forms but such as it has received from the Atlantic, or from the Red Sea during a submergence of the Isthmus of Suez. The humerous allied or even identical forms in the northern and southern oceans, which are not found in the interven- Ing Warm regions, are more difficult to explain, Mr Darwin believes that such facts are due to the action of the glacial period, which at its height may have cooled certain tracts of the tropical ocean sufficiently to allow temperate forms to cross from the northern to the southern hemi-sphere or the reverse. Perhaps, however, the agency of leebergs may have been sufficient without any permanent cooling of the equatorial ocean; for even now these huge floating glaciers often reach to 40° N. lat. and 35° 8., and, Captain Maury assures us, sometimes even reach the tropics. We may therefore well suppose that during the height of the glacial period icebergs would not only tegularly reach the tropics, but, carried on by currents in definite lines, might often pass across the equatorial zone, "Tying with them

a girdle of cold water in which many Inhabitants of the Arctic or Antarctic seas might safely

make the passage to another hemisphere. The fact that many forms of plants peculiar to cold or temperate regions are found scattered on isolated mountain summits in the tropics is, as Mr Darwin has shown, to be explained only by the influence of an extreme glacial period, and this must have produced analogous effects on the inhabitants of the ocean, (Origin of Species, 6th ed. p. 330.)

DISTRIBUTION OF ANIMALS IN TIME.

This subject will necessarily be treated in some detail under the articles GroLocy and Patzonrotoey. Here we shall only sketch its outlines and general principles.

The past history of living things as revealed by geology is an ever-changing panorama, At each successive stage some forms disappear, while new ones take their place. The farther we go back the more unlike is the general assemblage of animals and plants to that which now exists. If we confine our attention to any one class or order of animals, we find that it makes its first appearance at some definite epoch, and, under successively changing forms, either continues till the present time, or reaches a maximum, diminishes, and finally disappears. Thus some groups are altogether modern, others extremely ancient; some have run through all their phases in a comparatively short period, others have lived from the earliest epochs of the earth’s history of which we lave any record and still survive. If we could be sure that the numerous fossils yet discovered gave us anything like an adequate idea of all the varied forms of life that had ever lived upon the globe, and the order in which they had appeared, we should be in a position to decide as to the truth and value of the development hypothesis. But the more we examine the question, the more certain it becomes that the “ geological record,” as it is termed, is extremely imperfect, and that the whole of the extinct animals which we have discovered do not form any fair representation of the entire series that have lived upon the earth. This isthe case even with the more recent deposits and, those which are richest in

animal remains; but as we go back into the past the record becomes more and more imperfect, till in the Secondary, and still more in the Paleozoic formations, we only have preserved to us a few scattered fragments, equivalent perhaps to a few pages with here and there a short chapter taken at random out of a voluminous history. The causes of this necessarily imperfect record of the past have been fully discussed by Sir Charles Lyell and Mr Darwin; we need only refer here to two general causes of such imperfection, The first is, that every aqueous deposit is formed by the wearing down of previous deposts, so that the records of one age are, to a large extent, necessarily destroyed to provide the records of the next, which in its turn is destroyed in a succeeding age. The other cause of imperfection is, that extensive areas are always sinking (to allow new deposits to be formed over them), and are being subjected to subterranean heat to such an extent as to change their texture and obliterate their fossils, when they become crystalline or metamorphic rocks. The more recent deposits so acted on will rarely have had time to have become raised above the sea-level, and subsequently exposed by denudation; yet certain Eocene strata in the Alps are stated by Sir C. Lyell to be truly metamorphic (Students' Elements of Geology, p. 600). The older a formation is, therefore, the more frequently will it have been exposed in one area or another to this metamorphic action ; and it follows that, going back- ward in time, we shall at last come to a period, all the formations antecedent to which will have become metamor- phosed, and their fossils, if any, obliterated. We appear to have almost reached such a state of things at the base of the Paleeozoic rocks ; and there is good reason to believe

that an extensive series of fossiliferous deposits may have once existed, whose record of the earlier stages of the history of life upon the earth has been either destroyed by denudation or obliterated by internal heat. This being the case, we must carefully distinguish between positive and negative evidence ; and we may also fairly apply such principles as can be established by means of the fuller record afforded by the Tertiary deposits, to interpret the more scanty and fragmentary record with which we have to

deal in the older rocks. We will now proceed to sketch very briefly the successive stages of the development of animal life as indicated by the materials at our command.

The lowest and most ancient of all the stratified rocks is the Laurentian, consisting of crystalline beds of gneiss, mica-schist, quartzite, and limestone, reaching in Canada the aggregate thickness of 30,000 feet. The whole mass was long thought to be destitute of organic remains, till in one of the beds of limestone in the lower part of the series a curious structure was discovered, which is held by Dr Carpenter and Professor Rupert Jones, who have made a special study of the Foraminifera, to be the fossilized remains of one of that group of the Protozoa. It has been named Lozoon canadense, and if really organic (which is denied by some naturalists of eminence) is by far the oldest trace of animal life. The Upper Laurentian deposits, 10,000 feet thick, lie unconformably on the lower, and seem to be entirely destitute of fossils.

The next formation is the Cambrian, largely developed in Wales, Scandinavia, Bohemia, and North America, and consisting of a variety of distinct deposits. But in the very lowest of these (the Longmynd group) abundant organic remains have recently been found, comprising perfectly developed brachiopodous and_pteropodous Mollusca, entomostracous Crustacea, and Trilobites. In the overlying beds of the same formation similar forms abound, and are accompanied by sponges, annelids, graptolites (which are supposed to be peculiar extinct Hydrozoa), starfishes, and encrinites. Here also first appear lamellibranchiate Mollusca, belonging to the families Arcadw, Nuculide, and Atlantidw, and there are even soine Orthoceratide, belonging to the highest order of molluscs—Cephalopoda. The Trilobites are already wonderfully varied, the smallest and largest kinds” being found here (one 2 feet long), species with the least and with the greatest number of rings, blind Trilobites, and others with the most largely developed eyes. (Lyell’s Students’ Elements of Geology, pp. 483, 485, 634.)

We next come to the Silurian formation, in which we first meet with corals, of the three great divisions Rugosa, Tabulata, and Perforata,—ostracode Crustaceans, Trilobites in enormous variety, Merostomata—extinct

Crustaceans of gigantic size, Echinoidea (Palwchinus), and true gastero-podous Mollusca. And lastly, in the Upper Silurian deposits, we find vertebrates, whose first representatives are several genera of fishes belonging to the Ganoid and Plagiostomous groups.

In the succeeding Devonian formation we find an abundance of new families of fishes, a fresh-water mussel of the living genus Anodon, and no less than six forms of winged insects. These have been found in the Devonian rocks of New Brunswick, and are considered by Mr Scudder to be ancient forms of Neuroptera.

The Carboniferous formation is very rich in animal as well as vegetable remains; and, along with most of the animals already met with, we find several higher types of great interest. The higher macrurous Crustacea (Anthra- palemon) are here first met with, as are true air-breathing molluscs, numerous specimens of the living genera, Pupa and Zonites, having been found in the coal-fields of Nova Scotia. Along with these are insects of various orders—

Myriapoda, scorpions, spiders, Orthoptera, Neuroptera, Coleoptera, and even Lepidoptera. Here, too, we meet with air-breathing vertebrates—the Labyrinthodonts, ancient forms of Amphibia which occur in considerable abundance and variety. (Lyell’s Students’ Elements, p. 408 ; Annales de la Société Hntomologique de Belgique, 1875, tom xviii, where a wing from the coal-measures, closely resembling those of moths belonging to the family Saturnide, is photographed.)

In the Permian formation, which closes the series of Paleozoic rocks, we have the important addition of true Lacertian reptiles (Protorosaurus), which, according to Professor Huxley, differ wonderfully little from some living groups, What are supposed to be Chelonian footprints have been discovered in the Permian sandstones of Dumfriesshire. (Huxley’s American Addresses, p. 41.)

Entering the Secondary period with the Triassic forma- tion, we at once meet with higher forms of life. Among Crustacea we first find traces of the

brachyurous division of Decapods (Etheridge, in Lyell's Students' Elements, p, 632) and many new forms of Mollusca. Among reptiles the Dinosauria, Dicynodontia, Plesiosauria, and Crocodilia appear; what seem to be undoubted footprints of birds have been found in the New Red Sandstone of Connecticut (see figures in Lyell's Students' Hlements, p. 371, and Nicholson's Paleontology, p. 389) ; and all improbability of this early appearance of birds is removed by the fact that a little higher in the same formation remains of a true Mammalian have been undoubtedly discovered. This is the Microlestes, founded on well-preserved teeth from a bone bed in the Upper Trias of Wiirtemberg, and since found also in the Rhetic beds of Somersetshire; while in rocks supposed to be of the same age in North Carolina the lower jaw of an allied form (Dromatheriwm) has been obtained. Both are believed to be Marsupials, and most nearly allied to the Afyrmecobius of Australia.

In the Jurassic or Oolitic period, the main forms of life which have already appeared are further developed. In- sects of all orders are found, and they can mostly be classed in existing families and even genera, as—Locusta, Nepa, Sphinx, Termes, Ephemera, Agrion, Aishna, Agrion, Prionus, Libellula, (Rev. P. B. Brodie, in Proc. Warwiek- shire Nat. Hist. Soc., 1873.) Among reptiles, Cheloma and Jchthyosauria are added. Of birds we have the long- tailed and feathered Archwopteryx ; while no less than eight genera of small Mammalia have been discovered, most of them Marsupials, though some may have been ancestral forms of Insectivora. Many living genera of shells, both inarine and fresh-water, first appear ; and among fishes, true sharks of the existing family Notidanide.

In the Cretaceous period, we make a still further approach to living forms. The highest Crustacea (Bra- chyura) are tolerably abundant, and the living genus Caneer appears. Mollusca (Lamellibranchiata and Gasteropoda) are represented by a number of living genera, Malacop- terous fishes now appear. Reptiles are still mostly of extinct types — Pterosauria, Ichthyosauria, Dinosauna, &e.; but among birds we find some allied to existing waders, as well as the curious extinct group of Odon- tornithes, or toothed birds. (Marsh, in American Jour. of Science und Arts, vol. x. 1875.) ;

When we pass over the great chasm of time which separates the Mesozoic from the Cainozoic or Tertiary period, we at once come upon a host of new forms closely resembling those which now live upon the earth. The majority of living genera of Mollusca now appear, with a gradually increasing proportion of living species, as we pass from the Eocene to Miocene and Pliocene times; the highest forms of Crustacea are plentiful; Insecta of all orders, and almost all of living genera, abound ; fishes of

living genera gradually appear, and true snakes (Ophidia) are first met with. Among birds, all the existing orders, many families, and some living genera appear in the Miocene period. Mammalia, however, exhibit the most surprising advance. Ancestral forms of all the existing orders are found in the Eocene formation ; in the Miocene, most living families are well developed; while in the Pliocene and post-Pliocene deposits we find the genera and species for the most part closely resembling those that still

inhabit the earth. The following diagrammatic table will enable the reader better to comprehend the main facts which we have here endeavoured to set forth. It comprises only the larger or more important groups of animals, an¢é of each of these the known range in time is indicated by a thick line. It has not been attempted to show the breaks which occur in our knowledge ofthe range of a group, since no one now doubts that where any type appearsin two remote periods it must have been in existence during the whole

TABLE SHOWING THE RANGE IN TIME OF THE MORE IMPORTANT Groups oF ANIMALS.

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ANIMAL GROUPS.

| Laurentian. Cambrian.

Lower Silurian.

Mesozoic. CarInozorc,

Upper Silurian. Devonian. Carboniferous. Permian. Oolite. Purbeck. Wealden. Cretaceous. Miocene. Pliocene. Post-Pliocene.

PROTOZOA,....+++++

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Macroura

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ARACHNIDA

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INSECTA

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Brachiopoda

Lamellibranchiata….....000000

Gasteropoda Branchifera ….....

Gasteropoda Pulmonifera

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Reptilia

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intervening period, although we may have no record of it. Neither has it been attempted to indicate the abundance or Scarcity of the group in each

period, this being a detail suited only toa special treatment of science of paleontology. Tt must also be remembered that it is often impossible for us to determine whether the increased prevalence of fossil remains of a particular group is due to a really greater development of the animals, or only to more favourable con- ditions for their preservation and discovery.

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On considering the successive phases of animal life pre- sented to us by the fossil remains preserved in the rocks, we cannot help perceiving that there has been on the whole a steady advance in organization and an increase in variety and complexity, from the earliest geological periods to the present day. Thus the oldest known fossil belongs to the lowest type of animal life —the Protozoa, Then we have the lower forms of Mollusca,—Brachiopoda and Pteropoda—followed by the Cephe*vpoda and Gasteropoda,

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The Entomostraca, Trilobites, and Phyllopods, come before the higher Decapod Crustacea, and of these the highest form—the Brachyura— appears much the latest. Again, all the aquatic classes of invertebrates appear in abundance before the earliest of the aquatic vertebrates—fishes— make their appearance. ‘These are followed by Amphibia, and later still by true reptiles. The more highly organized birds and mammals appear later, and almost simultane- ously.

There are, it is true, many anomalies, the higher and more complex organisms in some of the minor groups appearing before the lower ; but these cases generally occur in the oldest (Palzeozoic) formations, where, on the principles already laid down, the record must be necessarily more imperfect. In the Mesozoic and Tertiary formations the succession is more regular, and accords better with the grade of organization of the several groups, and the best examples of this are to be found among the Mammalia of the Tertiary period, the series of which is, in some groups, tolerably

complete. Thus, among the Ungulata we find in the Eocene deposits the remains of a number of generalized types, such as the Palcotherium, allied to the horse, tapir, and rhinoceros ; Lophiodon, an ancestral form of tapir ; Anoplotherium, intermediate between pigs and ruminants ; Pliolophus, allied to the tapir and horse; and the North American Orohippus, a remote ancestor of the horse. This last-named animal, Professor Marsh tells us, had four toes in front and three behind, and was no larger than a fox ; yet an almost perfect series can be traced, in succeeding deposits, of animals with smaller and smaller lateral tues, the size and speed increasing, the head and neck becoming longer, the canine teeth decreasing in size, the bones of the fore-arm consolidating, and other modifications successively taking place till we come, by almost imperceptible grada- tions, to an animal so completely unlike the one we started from as our existing horse. In like manner we have the extinct families of the

Having now laid before our readers a sketch of the more important facts of the distribution of animals in time, we will conclude this branch of our subject with a brief discussion of its bearing on the theory of evolution, and on the imperfection of the geological record. The abrupt- ness with which animal remains in considerable variety first appear in very ancient deposits is undoubtedly a most remarkable phenomenon. With the exception of the still somewhat doubtful Lozoon, the vast series of Laurentian rocks have produced no fossils. But the moment we enter

2 A still more remote ancestral form Hohippus has since been

discovered in the lowest Eocene deposits of West America. See Huxley’s American Addresses, p. 90.

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the Cambrian formation we at once meet with a somewhat extensive series of complex and varied organisms, Besides the Brachiopoda we have Pteropoda, a by no means low form of Mollusca; while the Trilobites and Phyllopods exhibit a considerable amount of specialization. Almost as early, we have sponges, annelids, star-fishes, encrinites, lamellibranchiates, and Orthoceratidze,—a variety of divergent and complex types, which, on any theory of development, indicates a very long successsion of ancestral

forms. But we must also bear in mind that the few fossiliferous deposits of this early age cannot possibly haye made us acquainted with more than a minute fraction of the organisms which then existed on the whole earth, We are therefore compelled to believe that the absence of al] remains of more ancient forms of life in the pre-Cambrian rocks is fallacious, and due solely to no record of them having been preserved, or, if preserved, to their not having been discovered by us. This conclusion is supported by analogous facts which occur and recur in every succeeding formation. The highly specialized corals and fishes of the Silurian rocks must have had ancestors in Cambrian times of which we kuow nothing ; and the sudden appearance of perfectly developed winged insects in the Devonian forma- tion, plainly tells us that during countless unrecorded ages various lower forms of terrestrial Annulosa must have been gradually developing into these marvellously specialized types,—yet these lower forms (Myriapods, &c.) only appear as fossils in the succeeding Carboniferous formation. Such highly organized insects also imply the existence of vegetation, and, by analogy, of other terrestrial animals of an equally high grade of development. Hence the dis- covery of these winged insects (which can, with great pro- bability, be classed in one of our existing orders—the Neuroptera) opens up to the imagination of the evolutionist a wonderful picture, far removed from the dreary waste of waters which was once thought to characterize the epoch of the early Palsozoic formations. Geologists, indeed, have long taught us that the vast piles of sedimentary rocks of the Silurian, Cambrian, and even the Laurentian period necessarily implied the co-existence of extensive continents or islands whose denudation could alone produce them; and now the theory of evolution enables us to clothe these ancient lands with vegetation and people them with animal life, since it is only thus that we can find space and time suflicient for the development of the wonderful insects, the land shells, the Amphibia, and the reptiles,— all of which appear suddenly, in perfect and completely organized forms, in some parts of the Paleozoic series. When we consider that we have indications of the existence during the Carboniferous age of such diversified and highly specialized types of Annulosa as myriapods, spiders, cock- roaches, locusts, dragon-flies, ephemeras, lamellicorn-beetles, and bombyciform moths,—so that it is highly probable that no fresh ordinal type of insects has originated during all succeeding ages, and when we further consider that all these are

specialized modifications of simple Annulosa, we shall be forced to conclude that, whatever time may have elapsed from that epoch to the present day, a far longer time is required, antecedent to the Carboniferous period, to allow of the development of such varied terrestrial forms of life.

As bearing upon this question it is important to consider how scattered and fragmentary are the few indications of mamnialian life older than those of the Tertiary period. Sir Charles Lyell tells us, that up to the beginning of the present century it was a generally received dogma m geology that the Mammalia had not been created before the Tertiary period; and the first discovery of the jaw-bone of a small Marsupial in the lower Oolite caused as muc sensation as would now be excited by our finding &

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Secondary monkey, or (we may add) a Silurian bird or mammal, The following table is abbreviated from that in the Students' Elements (p. 315), as it is well calculated to show how scanty and accidental is our knowledge, and how necessarily imperfect must be the geological record in still earlier periods.

Number and Distribution of Fossil Mammalia from Strata older than the Tertiary.

First Discovery.

Number of species.

SECONDARY STRATA. Locality.

Maestricht chalk…..... White chalk…..,.. Chalk marl .. .

Neocomian (Lower Greensand)..... \W quill oaeene eRe eee Upper Purbeck Oolite….. Middle Purbeck Oolite … Lower Purbeck Oolite…. Portland Oolite…..... Kimmeridge clay…. ..... Clouzil 722 2 Qeeee eee ORMOKONCIAY....:c000…00-5 WeAtMOOMICE…....0 0000-00. irenvor Oolite,..... PRM fos oc ccsnsicseeee see

Upper Trias (Somersct, iNerCaroling)..... Middle Trias…. ..... a 1 a

Swanage…....

1X2) Oop fF COFRCCCOCOMNOCSO oc ocoooo

Stonesficld Bier 1818

Wiirtem berg. 1847

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For an account of the characteristics of these small animals, and for some details of their history, we refer the reader to Sir Charles Lyell's work ; it is here only necessary to state the circumstances under which these re- mais have been preserved and discovered. Fossil remains of land animals are, of course, rarely found except in lacustrine or estuarine deposits; and these are often en- tirely wanting throughout extensive geological formations. But even where such fossiliferous beds occur, the condi- tions favourable to the preservation of small Mammalia are exceedingly rare,—the entire series of fresh-water Wealden beds having yielded no trace of them, although Wwe are quite certain that they were then both varied and abundant. Even more remarkable is the fact that the whole 25 species of Purbeck mammals, belonging to 10 genera, were obtained from a single stratum only a few inches thick, and from an area of less than 500 square yards, Yet these small animals must have abounded at this period ; and it is impossible to believe that anything but a Most imperfect and fractional representation of the mam- malian fauna of the country could have been gathered into this narrow graveyard. But this thin stratum occurs amid a mass of fresh-water deposits 160 feet thick, the whole of Which have been thoroughly and systematically examined by the officers of the Geological Survey of Great Britain ; and though many of the layers contain remains of land organisms —plants, insects, and land-shells—no other part of the whole series has yielded a single fragment of Mammalian remains ! Having this striking example of the Worthlessness of negative evidence, it behoves us to be cautious of rejecting any legitimate conclusions from the facts M1 our possession, on account of the absence of the direct evidence of fossil remains. The varied and bighly-

developed Mammalia of the Eocene period really necessitate (to the evolutionist) the long-continued previous existence of this class of animals; and the discovery of isolated species in the Oolite and Trias would (had it been delayed to our time) have been but a confirmation of theoretical deductions.

In his anniversary address to the Geological Society in 1870, Professor Huxley adduces a number of special cases showing that, on the theory of development, almost all the higher forms of life must have existed during the Paleozoic period. Thus, from the fact that almost the whole of the Tertiary period has been required to convert the ancestral Orohippus into the existing horse, he believes that, in order to have time for the much greater change of the ancestral Ungulata into the two great divisions of Perissodactyles and Artiodactyles (vf which change there is no trace even among the earliest Eocene Mammals), we should require a large portion, if not the whole, of the Mesozoic period. Another case is furnished by the bats and Cetacea, which occur fully developed in the Eocene formation ; and these would have required still more time for their modification out of ancestral Insectivora and Carnivora. The Marsupials of the Trias, again, were already differentiated into herbivorous and carnivorous forms ; so that on the lowest estimate we must place the common ancestor of the Mammalia very far back in Paleozoic times. Reptiles furnish evidence of the same character. Professor Huxley says, ‘If the very small differences which are observable between the Crocodilia of the older Mesozoic formations and those of the present day furnish any sort of approxima- tion towards an estimate of the average rate of change among the Sauropsida, it is almost appalling to reflect how far back in Paleeozoic times we must go before we can hope to arrive at that common stock from which the Crocodilia, Lacertilia, Ornithoscelida, and Plesiosauria, which had attained so great a development in the Triassic epocli, must have been derived.” And if to these indications we add the appearance of two orders of fishes-—Elasmobranchs and Ganoids—in the Silurian period, we shall be compelled to place the origin of the whole vertebrate stock at an epoch far beyond that of the lowest fossiliferous rocks of the Cambrian series.

If, then, we bear in mind the very early appearance of so many highly complex organisms, representing all the great types of animal life—almost all the great invertebrate groups in the Cambrian and Lower Silurian, with many Vertebrata and almost all forms of Insecta in the Devonian and Carboniferous periods,—-while a large number of these have hardly increased in complexity of organization down to our times, we shall be prepared to admit the extreme probability of Mr Darwin's view, that "before tle lowest Cambrian stra- tum was deposited, long periods elapsed, as long as, or probably far longer, than the whole interval from the Cambrian age to the present day ; and that during these vast periods the world swarmed with living creatures" (Origin of Species, 6th ed. p. 286.)

Professor Ramsay has recently expressed analogous views, founded on an extensive survey of the whole series of geological formations. In a paper "On the com- parative value of certain Geological Ages (or Groups of Formations) considered as items of Geological Time" (Proceedings of the Royal Society, 1874, p. 334), he says—speaking of the abundant and well-developed fauna of the Cambrian period, a sketch of which we have given at p. 282 :—'"In this earliest known varied life we find no evidence of its having lived near the beginning of the zoological series. In a broad sense, compared with what must have gone before both biologically and physically, all the phenomena connected with this old pericd seem, to my mind, to be of quite a recent description; and the climates of seas and lands were of the very same kind as those the world enjoys at the present day,"

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It thus appears that the general geological principle with which we started, of the more complete destruction by denudation and metamorphism of the earlier as compared with the later records of life upon the earth, receives ample support in the apparently sudden appearance of whole groups of complex and specialized forms in some of the earliest rocks; while the general imperfection of the geo- logical record is made manifest by such facts as the very few and isolated remains of Mammalia in the Mesozoic rocks, although we know they must have existed in abun- dance throughout

the whole Secondary and much of the Paleozoic periods. The great lesson we have to learn from the facts of paleontology is, that its negative evidence is at the best of but little value ; but when this negative evidence is opposed to general principles established upon a wide basis of physical and biological research, it becomes absolutely worthless. Just in proportion as the serics of fossiliferous deposits is more complete, and the fossil remains more abundant and varied, does the evidence for evolution and progressive development become more powerful. The difficulties are almost wholly dependent on incomplete knowledge, and on the assumption (which we have endeavoured to show is entirely unfounded) that the earliest traces of the fossil remains of any animal type which have been discovered can give, even approximately, the period of its first appearance upon the earth.

We find, then, that just as a study of the distribution of animals in space enables us to learn much of the immedi- ately preceding condition of the earth's surface, and especially of the recent changes of land and water,—so a study of the distribution of animals in time, when aided by the modern theory of evolution, gives us some knowledge of the physical condition and life of the earth in times beyond the reach even of geological history. (4. RB. w.)

DISTRIBUTION OF VEGETABLE LIFE.

The literature in which the immense multitude of dis- tinct kinds of plants which are dispersed over the earth's surface and form its vegetation has so far been described has necessarily becn adapted to the divisions of political geography. The causes which have brought about the formation of such divisions have rarely, however, had any- thing in common with those which have determined the characteristic features, whether superficial or profound, of the floras of different countries. The great mass of catalogues and descriptive enumerations of the plants cf such countries, the boundaries of which are for the most part quite artificial, are therefore ill adapted for bringing out any general conclusions as to the mode in which plants are distributed. It is only by making some kind of analysis of the often heterogeneous contents of such catalogues, and piecing together the results obtained from different sources, that any clue can be obtained to the approximate lines of demarcation of floras which are really naturally

limited and characterized. The process is, however, enormously laborious, and, even apart from that, must for a long time to come be exceedingly imperfect in its application, owing to the immense tracts of land—and those with the most varied and copious vegetation—of the natural products of which our knowledge is still most defective.

Numerous attempts have, however, been made, notwith- standing the difficulty of the task, to map out the earth's surface into "regions of vegetation." The real significance of these regions will, of course, entirely depend upon the principles which have been relied upon in forming them. And in this respect the progress of geographical botany has been exactly similar to that of classification. |The characteristic distinctions which were first seized upon in

either case proved on closer scrutiny to be superficial, and to bring about imerely artificial and arbitrary assemblages, The doctrine of evolution has in fact effected the same revolution in both; it has shown in the one that community of descent is the real meaning of a natural classification, it has shown in the other that community of origin is the real key to geographical distribution.

Most of the writers on geographical botany have been content to set aside all considerations of origin and history in attempting to define the limits of botanical regions. They have not attempted to see in the peculiar features which such regions may possess anything more than adaptations to physical conditions working on plants created in great measure where they are found. Although, therefore, the literature of geographical botany has been useful! in enabling the reader to realize the local features—the colouring, if one may so express it—of particular countries, the facts have hitherto been presented in a form void of any true significance. And these remarks apply to the system of Schouw (1833), which has been much employed, partially to that of De Candolle, and conspicuously to that more recently published by Grisebach. It is to the writings of Darwin, Hooker, Asa Gray, and Bentham that we must look for a real insight into the origin and dispersion of floras, and for the real causes of the existing distribution of plant life.

The first attempt to review the whole subject of plant- distribution from the modern point of view afforded by evolution is due to Bentham, who made it the sub- ject of a presidential address delivered to the Linnean Society in 1869. Bentham's conclusions are based upon the experience of a long life devoted to systematic botany, and will probably always hold a fundamental position in the study of the subject ; at any rate for some time to come, until the distribution of a large number of sub- ordinate groups has been carefully worked out, the main points established by him are not likely to be materially modified.

The general facies of vegetation is obviously largely affected by purely physical causes. In the polar regions, arboreal and even shrubby plants become incapable of existence, and only small perennials which are safely covered up by snow during the long winter are able im the brief summer to expand their flowers and ripen their seeds. Putting aside for the moment the severances effected by large bodies of watcr and mountain chains, it 1s easy to see that the vegetation of the earth must have always been separable into three great latitudinal zones, two belonging to the north and south hemispheres respec tively, and one dividing them lying between the tropics. The constitutents of the vegetation of these zones must always have had a certain homogeneity ; very considerable divergences, however, have grown up within the zones themselves, owing to circumstances of geographical isolation. Even without these, distance alone, independently of isola- tion, would in time be sufficient to effect it. It is also obvious that the precise northern and southern limitations of such hypothetical zones must have varied with secular changes in the earth's climate, and when these changes have taken place over a broken configuration of land an sea, the intermixture of diverse floras must necessarily have become very complicated.

Underlying, however, the tangled fabric of the earths existing floral covering, we may agree with Bentham ™ recognizing the existence of three tolerably ancient floras— the Northern, the Tropical, and the Southern.

I. The Northern is characterized by its needle-leaved Coniferee, its catkin-bearing Amentacee and other forest ee ee eet

1 Presidental address to Linnean Society, 1869, p. 18.

trees deciduous in winter, and its vast assemblage of her- baceous types, Ranunculacee, Crucifere, &e. These spread over Europe, northern and central Asia, and great part of North America.

IL. The Southern is broken up into numerous divergent floras. Their original connection is now traceable only in the common possession by two or more of them of large characteristic groups, such as Kestiacee, Proteacew, Dios- mee, &e., the subordinate divisions of which have been locally specialized. To this belong the floras of extra- tropical South America, South Africa, and Australia with New Zealand, to which must probably be added an area borrowed from the northern hemisphere in Mexico and California.

III. The Tropical is characterized by the predominance of mostly evergreen arborescent Polypetale (Anonacece, Meliacew, Leguminose, &e.), and gigantic Monocotyledons, of which Palms, Scitaminece, and Bambusee amongst grasses are especially striking.

J. Tue NortHern Frora.—This has been long divided into that of Old and New World by the severance of North America from Northern Asia, and by the barrier to an interchange of vegetation in the upheaval of the Rocky Mountain range. Nevertheless its marked con- tinuity (with only a gradual east and west change in the arctic regions, but an increased divergency southwards) requires it to be treated as a whole. The Old and New World divisions of this flora, which, no doubt, began to diverge fromthe mere influence of distance, have now had that divergence immensely increased by isolation. According to Lesquereux,! the essential types of the present arborescent flora of North America are indicated in the Cretaceous rocks of that country, and become more distinct and numerous in the Tertiary; and he believes that the origin of the existing American flora is American. The analogy between the Miocene flora of Central Europe and the present North American flora is unquestioned, and is greater than between the same fossil flora and that now existing in Europe. Lesquereux’s conclusion is that the American element in the vegetation of Miocene Europe was derivative, and this 1s one of many illustrations of the curious observation of Asa Gray that plants have in general a greater tendency to migrate from east to west than

from west to east. This Miocene flora was, however, gradually driven back again, and it is only as we travel from Europe to the East that We gradually find its traces getting stronger and stronger. Thus, as Oliver? has pointed out, in passing from the Mediterranean to the Levant, the Caucasus, and Persia, we meet with living representatives of the Miocene genera Chanwerops, Platanus, Liquidambar, Pterocarya, Juglans, &e. Along the Himalayas and through China we trace other Miocene genera, Japan forming part of the same botanical region as Eastern Asia. Among the remarkable existing North American types which may be mentioned as reappearing in the Himalayas and Japan are Aralia quinquefolia, Phryma leptostachya, and Trillium erectum. One of the most interesting additional facts which has recently come to light is the occurrence of @ species of tulip tree (Liriodendron) in Central China, which genus, though a member of the European Miocene flora, has in recent times been regarded exclusively characteristic of America? With respect to other

Merican genera which are not necessarily part of the Miocene flora, the same general principle holds good.

entham remarks, that while some, like Astragalus, have multiplied largely in both continents, “other genera, like Hupatorium, Aster, Phlox, Solanum, &c., very nume-

1 Geological Survey of Montana, 1871, p. 314. 2 Nat. Hist. Rev. 1862. § Moore, Journ. of Bot. 1875, p. 225.

rously represented in America, have transmitted or produced a smaller number in Eastern Asia, gradually diminishing westward till they disappear altogether or attain Western Europe in single species but little altered from American ones.” * The Europeo-Asiatic genera, on the other hand, such as Cruceferee, Umbelliferce, &c., which are so dominant a feature in the existing Old World Northern flora, appear ‘to have left but few representatives in America, and those much more modified than the American races left in Asia.”

Besides the internal migrations of the various constitu- ents of the great Northern flora, its boundaries have been changed longitudinally under the

influence of secular varia- tions of climate alluded to above. The nature of these cannot be better summed up than in the words of Bentham :-—®

‘* Where the chief portion of this great northern flora originated, and whether it may be best termed Seandinavian, or North Asiatie, or Caueasian, is a question for the determining of which we have little or no data; but, as observed by Hooker, it is probably one of the most aneient and widest spread, having at different: epochs travelled over a great part of the globe. Shown by the researehes of Lesquereux, as well as by the reeent ones of Heer and others, to have extended far north during the warmer preglacial times, it must have been slowly driven southwards as the glaeial epoeh eame on, and either then, or at some one or more other periods, have been for a time econtinucus, in two lines at least, into the southern hemi- sphere ; for it has left traees still diseernible, especially in its herbaeeous and mountain forms, in the mountains of tropieal Asia, down at least to the Indian peninsula, and westward to the Abys- sinian and Cameroons mountains of Afriea, and, again, down the Andes to the extreme south of Ameriea, where it is still luxuriant, and in a less degree in New Zealand, Tasmania, and Vietoria. In all these migrations, whilst retaining a general identity, the flora must have undergone eontinual changes, losing speeies or other raees of limited areas and propagation as their habitations beeame unfit for them, and gradually forming new ones when favoured by long-continued isolation or other requisite conditions.”

The Northern flora has further undergone a specialization into three secondary floras, due to the combined influence of physical and genetic causes.

1. The Arctic-alpine flora (“ consisting chiefly of plants of small stature, slow growth, and limited means of dis- persion, compensated by long lives and great powers of endurance”) is perhaps the most interesting of the three subdivisions, both because in its arctic aspect it reduces the divergence of the Old and New World divisions of tho Northern flora to a minimum, and more especially on account of the great interest which attaches to the problem of its scattered alpine outliers. With regard to the first point, Hooker found that estimating the whole Arctic flora at 762 species, Arctic East America possessed 379, of which 269 were common to Scandinavia.

Of the whole flora 616 species are found in Arctic Europe, and of these 586 are Scandinavian, and this leads Hooker to the striking observation that “the Scandinavian flora is present in every latitude of the globe, and is the only onc that is so.”6 Christ objects to Heoker’s giving the title of Scandinavian to the Arctic flora, but we must agree with Bentham’ that Scandi- navia “ would, according to older rules, have been regarded as the centre of creation for the arctic lands, and may now be termed the chief centre of preservation within the arctic circle, owing perhaps partly to its more broken conforma- tion, aud partly to that warmer climate which, while it now admits species which Christ objects to being included in the Arctic flora, was during the glacial period a meaus of preservation of some colder species which were everywhere else expelled or destroyed.”

Just as at present the Arctic is more homogeneous than

4 Presidential address, 1869, p. 18; see also Bentham in Journ. Tinn. Soc. Bot., xiii. p. 500.

5 Presidential address, 1869, p. 19.

6 Hooker, on the ‘‘ Distribution of Aretic Plants,” Trans. Linn. Soc., vol. xxiii. p. 253.

7 Presidential address, 1869, p. 21,

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the more southern divisions of the Northern flora, so we may infer that towards the close of the Tertiary epoch the continuous circumpolar land was covered with a vegetation also largely composed of identical plants but adapted to a warmer climate. As the climate became less warm there would commence a migration southwards, which would result in the modified descendants of these plants being now blended with the vegetation of Central Europe and the United States. As the glacial period gradually advanced, ‘‘ the tropical plants and animals will have retreated from both sides towards the equator, followed in the rear by the temperate

productions, and these by the arctic.”1 Wheu the climate of the earth again ameliorated, the migration took place in the reverse direction, and in this way mountain ranges became the havens of refuge of fragments of the original arctic floras which were exter- minated on the lowlands. Even the equatorial region ceased to be a barrier during the glacial period, and to migration at that time must be attributed the survival of arctic forms in the south temperate zone. ‘The southern migration of the Arctic flora does not appcar to have taken place in one continuous wave. Thus, as Bentham points out,” “many facts showed separatc communications between the north aud each of the three chains of the Pyrences, the Alps, and the Himalayas, whilst these three gave little evidence of any lateral communication of their respective alpine vegetations.”

The fact that the migration southwards and remigration northwards of the Arctic flora took place along parallels of longitude, accounts for somc of its existing peculiarities. Hooker explains in this way the comparative poverty of the Greenland flora.?

*‘Tf it be granted that the polar area was once occupied by the Scandinavian flora, and that the cold of the glacial epoch did drive this vegetation southwards, it is evident that the Greenland indi- viduals, from being confined toa peninsula, would be exposed to very different conditions to those of the great continents. In Green- land many species would, as it were, be driven into the sca, that is exterminated ; and the survivors would be confined to the southern portion of the peninsula, and not there being brought into compcti- tion with other types, there could be no struggle for life amongst their progeny, and consequently no selection of better adapted varieties. On the return of heat, these survivors would simply travel northwards unaccompanied by the plants of any other country.

**In Arctic America and Asia, on the other hand, where there was a free southern extension and dilatation of land for the same Scandinavian plants to occupy, these would multiply enormously in individuals, branching off into varieties and sub-species, and occupy a larger area the further south they were driven; and none need be altogether lost in the southern migration over plains, though many would in the strnggle that ensued when they reached the mountains of those continents and were brought into competi-

tion with the alpine plants, which the same cold had caused to descend to the plains. Hence, on the return of warmth, many more Scandinavian species would return to Arctic America and Asia than survived in Greenland ; some would be changed in form, because only the favoured varieties could have survived the struggle ; some of the alpine Siberian and Rocky Mountain species would accom- pany them to the arctic zone ; while many arctic species would ascend those mountains, accompanying the alpine species in their reascent.”

The Arctic-alpine flora is obviously In its present condi- tion a composite one. Portions of the Northern flora, probably originally very distinctly characterized, became adapted to the peculiar physical conditions of high moun- tain ranges and of the extreme north. The gradual deterioration of the climate brought the alpine flora, to the lowlands and the arctic flora southwards till they intermingled. When they again returned to their original territories they were so far changed that each gave

the other some new members, while both had experienced many losses. + Darwin, Origin of Species, 4th ed. p. 447,

? Presidential address, 1869, p. 21.

3 Hooker, 7. c. p, 254.

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A. de Candolle has very ingeniously applied the general principles laid down above to the detailed explanation of the distribution of the flora of the Alps themselves, The following is a brief summary of his conclusions :—4

The valleys and groups of mountains which have at present a maximum of rare species and the most varied flora belong to districts on which the glaciers disappeared earliest. On the other hand, where the duration of snows and glaciers has been most pro- longed, the existing flora is poor. From a variety of causes which A. de Candolle enumerates, it seems probable that the southern and eastern glaciers of the Alps were of smaller extent than the northern, and would consequently be the soonest to retreat. We have consequently the curious fact that some of the most ancient

fragments of the alpine flora are now only to be found on the southern slopes of the Alps. This is the case with species of Primula, Pedieularis, and Oxytropis, which exist neither in the interior of Switzerland, nor in the north of Europe. But it is easy to see that, like the other members of this flora, they were driven sonth during the glacial period, returning as the mountains reappeared from underneath their snowy covering, while on the northern side they were in great measure exterminated. A. de Candolle points out as a fact in further confirmation that the Alpine species of Campanula, peculiar to Mont Cenis and the Simplon and . neighbouring valleys, are not related to the Arctic species, but find their nearest allies in Greece, Asia Minor, and the Himalaya.

A further indication of the great antiquity of the Arctic- alpine ‘flora is afforded by the fact of its absence in the comparatively modern volcanic mountains of Franee. “The Monts d’Or and Cantal, at an elevation of 6000 feet, offer scarcely any of those alpine and sub-alpine plants which abound at the same or lower elevations in the Pyrenees on the one side, and in the Alps on the other, as well as in the British and Scandinavian mountains to the north.”® Hooker, however, points out that the absence of the alpine-arctic flora in Auvergne may be duc to severe glaciation rather than to its absence (see Vature, Nov. ll,

1875, pp. 31, 32).

2. The Intermediate or Temperate flora is best described in the words of Bentham as

‘*A mongrel vegetation of mixed origin, including a large pro- portion of species of the most extended geographical range, witha very few local ones, and those chiefly in the extreme west. The majority, whether trees, shrubs, or herbs, are plants of compara tively rapid growth, very prolific, endowed with great facilities for dispersion, aud constitutions capable of adapting themselves toa great varicty of physical and climatological conditions. They are great travellers, aud soon take possession of any district left denuded by the abandonment of cultivation. To the great majority of them no primeval antiquity can be ascribed in Central or Westem Europe ;® they appear to have come from the east, a considerable number perhaps from Western Asia, where their types appear to be more varied, but many also must have

made half the tour of the globe. Large American genera have sent out offsets into Haste Asia, which gradually diminishing in number of species, and some times slightly modifying their character, have spread over the whole of Asia, and invaded almost every part of Europe. These plants are, moreover, generally continuous, that is, interrupted only by intervals which under present condition they have means of cross: ing ; and they are abundant in individuals, ascending in latitude and elevation, or descending to the south, until checked in their career by competing species, better enabled to endure the increas- ing rigour or the searching drought of the respective climates. Many of them will even assume slight modifications suited to their exceptional circumstances, and it is then as difficult to separate them from the genuine northern or southern floras as ne cases to give plausible grounds for establishing the precise origin © individual species."

The peat deposits of Denmark tell an unmistakable tale of the gradual advance of successive waves of vegetation from

the south-east. The Scotch fir was once abundant within eS Se

4 These are givenin greater fulness in Nature, April 27, 1876, p. 516.

5 Bentham, Nat. Hist. Rev., 1864, p. 870. th

6 Martins, however, considers that many of the plants of 1 existing south of Europe flora are of great antiquity in their prese2 situations ; thus the Oleander (Nerium Oleander) has been found : deposits from the Eocene upwards (Mém. de 0 Acad. d. Se. de Mon pellier, ix. p. 95).

7 Nat. Hist. Rev., 1864, pp. 370, 371.

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the Roman period in the Danish islands, but is now extinct ; it was succeeded by the sessile-fruited oak, to be in turn supplanted by the pedunculated form of the same tree, associated with the alder, birch, and hazel. The oak is now almost supplanted by the beech! According to Areschoug, the original post-glacial flora of Scandinavia has retreated to the

north, and is probably still retreating, whilc the flora of central and south Scandinavia consists of “an eastern and north-eastern vegetation, which spread into Europe after the glacial period and before the beech tree had invaded Sweden, with the admixture of more southern species, which, with the beech, have since penetrated into Sweden through Denmark.”? The beech and the chestnut occur in Japin, and, as far as Europe is concerned, there is good reason to regard their origin as Kastern.

As already pointed out, the American element in the European flora suffered sevcrely during the glacial period, and has never since recovered itself. Japan, however, appeared to have been a great centre of preservation, and hence thc numerous points of contact which its flora presents with that of the North American continent. In the New World itself, the continuity of the pre-glacial and post-glacial temperate floras has been better preserved. The following passage from an address of Asa Gray’s may be quoted as giving its history in a concise form :—

He “‘considered that the present vegetation or its proximate ancestry must have occupied the arctic and sub-arctic regions in Pliocene times, and that it had been gradually pushed southward as the temperature lowered and the glaciation advanced, even be- yond its present habitation ; that plants of the same stock and kindred probably ranging round the arctic zone as the present arctic species do, made their forced migration southwards upon widely different longitudes, and receded more or less as the climate grew warmer; that the general difference of climate which marks the eastern and western sides of the continents,—the one extreme, the other mean,—was doubtless even then established, so that the same species and the same sorts of species would be likely to secure and retain foothold in the similar climates of Japan and the Atlantic United States, but not in intermediate regions of different distribu- tion of heat and moisture; so that different species of the same genus, asin Torreya, or different genera of the same group as red- wood, Taxodium and Glyptostrobus, or different associations of forest-

trees, might establish themselves each in the region best suited to

i: particular requirements, while they would fail to do so in any other.

The west of Europe possesses the remains of a local and probably more ancient flora of very great interest, characterized by Gorse, and allied shrubby Leguminose, fTeaths, Lobelias, Sibthorpias, &c. These are closely checked in any tendency towards eastern dispersion by the severity of the winter climate away from the ameliorating Influence of the sea. The probability of a southern extra- tropical connection of this peculiar element in the Nor- thern flora will be adverted to hereafter. guhe flora of the British Isles is in many respects interesting ; it is in its main features an extcnsion of the Germanic area of the temperate flora with the presence of the western element above alluded to distinctly marked on the south-western coasts, Zriocaulon septangulare is an anomalous constituent, being limited to Ireland and a few Islets on the western side of North Britain, and being otherwise an American and not a European species.* Its presence can hardly be explained except by the agency of migratory birds.

3. The Mediterraneo-Caucasian flora, like the Arctic- alpine, contrasts in the most marked way with the temperate,

_ By far the richest and most diversified in specics [it comprises ‘i-sevenths of the European flora], it is also remarkable for the

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Lyell, Antiquity of Man, p. 9. 2 Bentham, J. ¢. p. 22.

3 Darwiniana, pp. 224, 225.

1. Watson, Compendium, p. 31,

great variations centering round individual types, as well as for the very restrieted areas occupicd by a number of the most marked species ; the limits are not to be accounted for by any physical peculiarities we arc acquainted with, uor perhaps to be otherwise explained than by a supposition of very great antiquity.”

Eastward of the Caucasus this remarkable flora dies away, reaching its castern limit in Scinde, and the tem- perate flora of Asia is only separated from the tropical by the Himalayas. Southwards its progress is arrested by the arid zone formed by the African and Arabian deserts.® As in the case of the Arctic flora, traces still exist of its former southern extension under the influence of a colder terrestrial climate. Adenocarpus, a characteristic Mediter- ranean genus, is represented by an identical species on Kilima Njaro, near the equator, and on the Cameroons mountains, 2000 miles distant on the opposite and westeru side of the African continent.®

II, Tue SoutHEeRN FLora.—The Southern flora exhibits relations much more complex than those presented by the Northern. Instead of extending over large con- tinental areas it is now dismembered into isolated groups scattered over the southern hemisphere, and in both the New and Old World sending northern extensions across the equator.

Five types may be briefly described, the definition of all but the first being taken from Bentham :—’

1. The Antarctec-alpine flora is the complement of the Arctic-alpine. It consists mainly of some widely distri- buted northern genera such as Carex, Poa, Ranunculus, &c., with alpine types of strictly south temperate gcnera char- acteristic of the respective localities. Hooker describes it as possessing ‘“‘decided Australian representatives in Cen- trolepidece and Stylidiew, commencing in Fucgia, the Falk- lands, and Lord Auckland’s and Campbell’s groups, re- appearing in the Alps of New Zealand, Tasmania, and Australia, and disappearing under the equator, on the Alps of Borneo.”

2. The Australian flora is “almost endemic, showing some slight connection with the New Zealand, and a few remains of former ramifications northward to some parts of the Indian Archipelago, a very few species, perhaps of modern introduction, extending to China and Japan.” Bentham ® conclusively dismisses Unger’s theory of the former extension of the Australian flora into Europe in Eocene times.

3. The Andine flora, characterized by a large number of distinct genera, Muchsia, Caultheria, Calceolarva, ranges more or less along the whole chain, “penetrating far northwards in Western America, throwing off a few

branches into Eastern Asia, and at its southern extremity crossing over to New Zealand, and in smaller numbers to Tasmania, and the mountains of Victoria.” 1°

4, The Mexico-Californian flora is “ represented at great distances by closely allied species of small distinct gencra —in Mexico and California, in the Argentine states, and in S. Africa er Australia.”!!

5. The S. African flora is “ perhaps the richest known in proportion to its extent, and remarkably varied within its narrow limits.” Its connection with other floras is very slight. That with Australia, alluded to at the commencc-ment, does not extend beyond groups of the highest order (in the Proteacee not merely the species but the genera

5 Bentham, Nat. Hist. Rev., 1864, p. 373.

6 Hooker in Journ. Linn. Soc. Bot., xiv. p. 144.

? Presidential address, 1869, pp. 24, 25.

8 Introductory Essay to the Flora of Tasmania, p. 104.

9 Presidential address, 1870, pp. 12-67.

10 On the extra-tropical southern connection between Anierica and the Old World as illustrated by the Composite, see Bentham in Jour Linn. Soc., xiii. p. 561.

11 See also Asa Gray, Darwiniana, pp. 218, 219.

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have become geographical); and, as mentioned above, there are a few scattered species, representing the South African flora, in extra-tropical South America. There are, however, two offshoots in a northern direction. The remarkable West European flora, already referred to, pos- sesses species of Hrica, shrubby Leguminose, Lobelia, Gla- diolus, &c., ‘more

nearly added to corresponding Cape species than they are to each other." The other extension is to Eastern Africa, The sub-alpine vegetation of Kilima Njaro is distinctly South African, and Hooker suggests "the probability of the South African flora being repre- sented all along the highlands of Eastern Africa, from Natal to Abyssinia ; and further, seeing that most of the South African plants found in the Cameroons are also natives of Abyssinia, it would appear probable that the niigration of these to the Cameroons was by and through Abyssinia." 1 The further suggestion that this may have been the path travelled by the West European extension of the South African flora is sufficiently obvious.

The amount of agreement amongst these scattered frag- ments of a great flora points necessarily to a state of things when the lands they now occupy were at one time or other in more or less of intimate connection. The amount of differentiation between the floras, and the fact that agree- ment has to be sought in groups of high rather than of small rank, points equally to the fact that such connections must have been far from recent.2 The detailed study of separate groups leads by another path to the same result, and, as a good instance of the new phase into which taxo- nomic botany is entering in the light of the study of geographical distribution, reference may be particularly made to Bentham's important investigation into the past history and migrations of the Campanulacee.®

III. Toe Tropica Frora.—tThis is still perhaps too imperfectly known to admit of any very plausible general- ization. It obviously presents three great subdivisions.

1. The Indo-Malayan extends from the Himalayas to north-east Australia and Japan. In the latter country it meets the northern temperate flora, from which in India it is sharply divided by the Himalayas.

2, The American is still a perfect mine of unexplored botanical wealth. Bentham remarks—" No general com- parison of Asiatic and American tropical vegetation can therefore be made without immense labour of detail, As far as we know, however, the resemblance between them is only in some of the races of a higher grade, natural orders and comprehensive genera; the smaller genera and species, and many even of the higher ones, are totally different ; or if a few species are identical, they are genc- rally, if woody or

arborescent such as Hntada, Gyrocarpus, &e., wholly or partially maritime, and may have traversed the ocean during its present configuration, or if herba- ceous widely, spread weeds still more likely to be spread all round the tropics under existing conditions.”4 There are, however, some extraordinary points of connection between the tropical floras of the Old and New Worlds, to which there is at present scarcely any clue. Thus Lernstremia emarginata, endemic to Ceylon, so closely resembles the Brazilian Ternstremia cunetfolia as ta be barely distinguishable.

3. The African tropical flora is probably the most

1 Cf. also Darwin, Origin of Species, 4th ed. p. 474. 2 Journ. Linn. Soc. Bot., xiv. p. 145.

3 Journ. Linn. Soc. Bot., xv. p. 11.

- Presidential address, 1869, p. 24.

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imperfectly known of any. Bentham considers it as of great antiquity, and as having preserved large numbers of persisténtt types from which races “have widely diverged in Asia or America, or in both.” He further remarks that “as our knowledge of the vegetation of tropical Africa has increased, we have discovered a greater number of Asiatic types; but still there are, even in the interior, a certain number of American ones, offering a problem the solution of which has scarcely been attempted.” 5

In Composite American genera are represented in cast tropical Africa, and Bentham is led on various grounds to regard this as the principal area of preservation of the most ancient tropical flora of the Old World.6 A well-marked eastern element in the African tropical flora is generally accepted. Madagascar, whose flora bears the marks of long isolation, contains Malayan and even Australian types; and it is a problem worth future inquiry whether the connection between the floras of tropical America and Africa may not have taken place south of the tropics, and by similar (though more northern) paths to those which once united the scattered members of the great Southern flora,

As might have been expected, during the Tertiary period the tropical flora extended much beyond its present limits, De Saporta, who has studied with great caution the fossil flora of the gypseous beds (Eocene) of Aix in Provence, arrives at the following conclusions :'—The principal families were such as characterize tropical vegetation, especially Indian—Hbenacee, Anacardiacece, Sapindacece, Sterculiacee, Legu- minose. 'The affinities of the ancient vegetation of Aix in respect of generic types, general facies, and composition with that of India and the Indian archipelago, China, the

.Philippines, and Japan at the present day, are in perfect accordance with the theory that these regions formed the shores of our ancient nummulitic sea, extending from Morocco to Japan, and entirely comprised in the tropical zone of the Eocene world, which extended to the 55th parallel, Besides its relation to South-Eastern Asia, the Aix flora exhibits, according to De Saporta, a strong affinity with that of Africa, lying between Abyssinia and the Cape, of which, however, it must be confessed, but little is as yet known.

Here this outline of the present state of a most impor- tant and rapidly developing branch of biological science must be concluded. The writer has availed himself very freely of the kind permission of Mr Bentham—perhaps the greatest living master of the subject—to make use of his scattered but invaluable papers, not scrupling to borrow from them all that seemed most important and sugges- tive, but has generally thought it fairer both to the subject and to Mr Bentham to do so in his own words. For two heads of the subject it must suffice merely to give refer ences. On the remarkable phenomena of insular floras, the reader should consult Sir Joseph Hooker's well-known lecture delivered before the British Association in 1866, and printed in the Gardener's Chronicle for January 1867, or, in default of this, the summary given in Lyell's Prin ciples of Geology, 10th ed., vol. ii. pp. 417-421. On the means of dispersion of plants, reference may also be made to Lyell's work already quoted, vol. ii. pp. 386-400 ; Dar- win's Origin of Species, 4th ed., pp. 425-442 ; Bentham, Presidential Address, 1869, pp. 7, 8. (w. TF. D.)

5 Journ. Linn. Soc. Bot., xiii. 545,

§ Bentham, J. c. p. 24. 7 Annales des Sciences Naturelles, Sept. 1, 1872.

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DITHMARSCHEN, or Dirmanrsu, in the oldest form of the name Zhiatmaresgaho, Dietmar's Gau, a territory between the Eider and the Elbe, forming the western part of the old duchy of Holstein, and now included in the Prussian province of Schleswig-Holstein. It was originally colonized mainly from Friesland and Saxony,—the Frisian kindred of the Vogdemans settling on the coast and giving rise to the two marks of Norderstrand and Siiderstrand, and the Saxon kindred of the Woldersmen settling inland and forming the two marks of Norderhamme and Siiderhamme. The district was subjugated and Christian- ized by Charlemagne in 804, and ranked as a separate Gau, included perhaps in the countship of Strade, or Comztatus atriusque ripe. From the same century, according to one opinion, or from the year 1180, when the countship was incorporated with their see, according to another, the arch- bishops of Bremen claimed supremacy over the land ; but the inhabitants, who had developed and consolidated a systematic organism for self-government, made obstinate resistance, and rather attached themselves to the bishop of Schleswig. The Danish king Bjérn Svendsén succeeded in defeating them ; and Ditmarsken, to use the Scandinavian form of the name, continued part of the Danish dominions till the disastrous battle of Bornhéved in 1227, when its former independence wasregained. The claims of the arch- bishop of Bremen were now so far recognized that he exer- cised the royal rights of LZeerbann and Blutbann,) enjoyed the consequent emoluments, and was represented first by a single advocatus, or vogt, and afterwards by one for each of the five Doffts, or marks, into which the land was divided after the establishment of Meldorp. The community was governed by a landrath of forty-eight elective consuls, or twelve from each of the four marks ; and even in the 14th century the power of the episcopal vogts was so slight that a chronicler of that date, quoted by Maurer, says, De Ditmarschen leven sunder Heren und Hovedt unde dohn wadt se willen, "the Ditmarschen live without lord and head, and do what they will." In 1319 and in 1404 they suc- ceeded in defeating the invasions of the Holstein nobles ; and though in 1474 the land was

nominally incorporated with the duchy by the emperor Frederick IIL., the attempt of the Danish king Hans and the duke of Gottorp to enforce the decree in 1500 resulted only in their complete rout in the marshes of the Dussend-Diiwels-Warf. During the early part of the century which began with such prestige for Ditmarsh, it was the scene of violent internal conflict in regard to the religious questions of the time ; and, thus weakened, it was obliged in 1559 to submit to partition among its three conquerors—King Frederick II. of Denmark and Dukes John and Adolphus. A new division took place on Duke John's death in 1581, by which Frederick obtained South Ditmarsh, with its chief town of Meldorp, and Adolphus obtaincd North Ditmarsh, with its chief town of Heide; and this arrangement continued till 1773, when all the Gottorp possessions were Mcorporated with the Danish crown.

_ See Dahlmann's edition of Neocorus, Chronik von Dithmarscn, Kiel, 1827, and Geschichte Dénemarks, 1840-44; Michelsen, Urkund- enbuch eur Geschichte des Landes Dithmarschen, 1834, Sammlung altdithmarscher Rechtsquetlen, 1842, and Dithmarschen im Verhalt- ness xum Bremischen Hrzstift; G. L. von Maurer, Hinleitung zur Geschichte der Mark-, Hof-, Dorf-, und Stadt-Verfassung, 1854 ; Nitzsch, Das alte Dithmarschen, 1862; Kolster, Geschichte Dith- marschens, nach F. R. Dahlmanns Voriesungen, 1873.

DITTON, Humpury (1675-1715), an eminent mathe- matician, was born at Salisbury, May 29, 1675. In com- plianee with the wishes of his father rather than by his oWn inclination he entered on the study of theology, and Was for some years a dissenting minister at Tunbridge, Shall bala Samara ai i tn ig

That is, the right of claiming military service, and the right of

bringing capital offenders to justice.

where he married. On the death of his father, however, he was induced to relinquish the clerical profession; and at the persuasion of Whiston and Dr Harris he devoted himself to the more congenial study of mathematics.

Through the influence of Sir Isaac Newton, he was elected mathematical master in Christ's Hospital, where he con- tinued till his death in 1715,

Ditton was the author of the following treatises :—Of the Tan- gents of Curves, &e., Phil. Trans. vol. xxiii. ; A Treatise on Spherical Catoptrics, published in the Phil. Trans. for 1705, from which it was copied and reprinted in the Acta Fruditorum, 1707, and also in the Memoirs of the Academy of Sciences at Paris ; Gencral Laws of Nature and Motion, 8vo, 1705, a work which is commended by Wolfius as illustrating and rendering easy the writings of Galileo and Huygliens, and the Principia of Newton; An Institution of Fluxions, containing the First Principles, Operations, and Applications of that admirable method, as invented by Sir Isaac Newton, 8vo, 1706. In 1709 he published the Synopsis Algebraica of John Alexander, with many additions and corrections. In his Treatise on Perspective, published in 1712, he explained the mathe- matical principles of that art ; and anticipated the method after- wards elaborated by Dr Brook Taylor. In 1714 Ditton published his Discourse on the Resurrection of Jesus Christ ; and The New Law of Fluids, or a Discourse concerning the Ascent of Liquids in exact Geometrical Figures, betwecn two nearly contiguous Surfaces. To this was annexed a tract to demonstrate the impossibility of thinking or perception being the result of any combination of the parts of matter and motion,—a subject much agitated about that time. There was also added an advertisement from him and Whiston concerning a method for discovering the longitude, which it seems they had published about half a year before. Although the method had been approved by Sir Isaac Newton before being presented to the Board of Longitude, and successfully practised in finding the longitude between Paris and Vienna, the board deter- mined against it. This disappointment, aggravated as it was by certain unquotable lines written by Dean Swift, affeeted Ditton's health to such a degree that he died in the followirg ycar.

DIU, an island and small seaport on the south coast of the Kathiawdr peninsula, in the province of Guzerat, in India. The Portuguese obtained possession of the island in 1515, and have held itever since. Diu town is situated at the eastern extremity of the island, in 20° 42' N. lat and 71° 0'E. long. The anchorage is fairly protected from the sea, but the depth of water is only 3 to 4 fathoms, and is said to be decreasing. The channel between

the island of Diu and the mainland is navigable only by fishing boats and small craft. The town is well fortified on the old system, being surrounded by a wall with towers at regular intervais,

DIURETICS (from dé, through, and ovpéw, to pass urine) are remedies which, under certain conditions, produce an increascd flow of urine. Their mode of action is various. Some, as turpentine and cantharides, are absorbed into the blood, are carried to the secretory organs (the kidneys), and stimulate them directly, causing an increased flow of blood to them ; others act as stimulants through the nervous system. A second class act in congested conditions of the kidneys by diminishing the congestion; this is supposcd to be onc of the modes of action of digitalis. Another class, such as the saline diuretics, are effectual by virtue of their osmotic action. A fourth class are diuretic by increasing the blood pressure within the vessels in general, and the Malpighian tufts in particular,—some, as digitalis, by incrcasing the strength of the heart's contrac- tions, and others, as water, by increasing the amount of fluid circulating in the vessels. Some remedies, as mercury, although not diuretic themselves, when prescribed along with those which have this action, increase their effect. The same remedy may act in more than one way, eg., alcohol, besides stimulating the secretory organs directly, is a stimulant to the circulation, and thus increases the pressure within the vessels. It is stated above that remedies have a diuretic action under " certain conditions." These relate to—Ist, the state of the kidneys themselves ; 2d, the condition of other organs ; 3d, the surroundings of

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the patient ; 4th, the dosc and mode of administration of the remedy. In illustration of each of these—Ist, a dose of cantharidcs, which in a patient with the kidncys healthy would be diuretic, would in one with the kidneys acutely congested have the reverse effect ; 2d, if there were much irritation of the gastro-intestinal tract, acid tartrate of potash, instead of producing diuresis, would probably cause diarrhoea, squills would induce vomiting, digitalis either diarrhoea or vomiting ; 3d, Mindererus spirit, if taken by one exposed to an elevatcd temperature, would probably produce sweating, but if the temperature were low and the puticnt cool its action would be

diuretic; 4th, many salines which in small doses are diuretic in larger doses are laxa- tive ; digitalis if too long continued diminishes the flow of urine, irritant diuretics in too large doses diminish or alto- gether arrest it. Diuretics are indicated, when the quantity of urine is mach diminished, or wheu, although the quantity may be normal, it is wished to relicve some other organ or set of organs of part of their ordinary work, or to aid in carrying off some morbid product circulating in the blood, or to hasten the removal of inflammatory serous exudations, or of dropsical collections of fluid.

DIVAN, Tue, or privy council of the Sublime Porte, is presided over by the sadri-azam, grand vizier (porter), or minister of the interior, who communicates its deliberations to the sultan. It also contains the mufti, shcikh-ul-islam, chief of the ulema, also called principal of the court of cassation, and minister of justice and ecclesiastical affairs, whose fefva is nominally required for the firmans of the Government. Among other members we may mention the seraskier, or war-minister; the capudan pasha, or minister of marine ; the foreign minister (called, until the reforms of Mahmoud, reis effendi); the grand terftardar, or finance minister ; the mustechar, or assistant vizier, who comes in place of the ancient kiaya bey, abolished by Mahmoud ; the tchiaous bashi, or intendant general of police; and the intendant of vakufs, or church-lands. The divan mcets twice a week ; on emergencies an Ajaik Divani, including the provincial pashas, the beys, aijams, and chief military officers, is summoned. On its advice in cases of popular tumult the sultan used to show himself at a window and promise reforms. But the word divan was applied by Turks, Persians, and Arabs to many kinds of assembly. Thus the Abbaside caliphs had a “ Divan of Oppression, ” which inquired into charges of tyranny against officers of state. A woman is said to have been president of this divan in the reign of Moctader, at the beginning of the 10th century. The Diwan-i-humayun was the imperial court of Persia ; while in modern Turkey diwan-khanc is any large room or hall in which people meet. Hence the word has been applied to the vizicr, or head of the assembly; to the bags in which the judicial records of the kazi were kept ; and to the court-hand in which the firmans were written. (See Freytag’s Lexicon Arabico-Latinum, ii. p. 37; De Sacy Gramm., 1. p. 76.) It was also the name given by the East Indian Company in Bengal to the principal native officers under them. ‘The origin of the

word is not clear. One form of it, said to be connected with the adverb p= = below or inferior, has the meanings of the desert, tlic upper end of a chamber, anything on which one leans, a sofa formed in masonry, a pillow, a frame. Another form has the meanings of a list, a register of the several classes of officers and servants regulating the amount of royal gifts and salaries, in particular a muster-roll or military pay-book, an album or ledger, an almanack. (Lane's Arabic Dictionary, ed. 1874, i. pp. 878-9.) Ithas been suggested by Fakhreddin Razi that the first of these meanings was really derived from the second ; that in the reign of caliph Omar, a Persian marzban, or satrap, introduced a military pay-book, the Persian name of which (diwan) was trans-

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ferred to a financial board, and subsequently to othe) boards and to the places where they mct. One interestine application of the second meaning is to the selection of several poems by one author in the alphabetical order of the rhyming syllables ; for instance, rhymes of the first

class ending in $ (Alif=A);of the second, in ~~ (Ba=B); of the third, in Wt, (Ta=T), and so on. The most

important diwans are those of Ghassani, Sa'uti, and Zamrani among the Arabs ; and of Hafiz, Saadi, and Jann among the Persians. The plan has been imitated by Goethe in his West-dstlicher Divan (see the notes appended to vol. ii, of the Stuttgart ed. of 1828), and Goethe was imitated by Rickert. A few meanings of the word divan remain which it is hard to reconcile, Cue a game or dance of the magians, which consisted in turning round in a circle so as to imitate the motions of the heavenly bodies; the expression " by your leave," used in entering a Turkish house where there may be unveiled women; a copper cooking pot wide at the bottom and contracted at the mouth. " Diwan durnak" is the Turkish army phrase for "order arms." In modern Europe divan often means a café,

DIVER (Colymbide), a family of natatorial birds closely allied to the grcbes, but differing from them in haying the front toes entirely webbed, and in their mach greater sizc. Their legs are placed at the further extremity of the body, and both wings and tail are short. This family contains only

four species, three of which are common to the northern regions of both hemispheres, while the fourth is exclusively North American. The largest species is the Great Northern Diver (Colymbus glacialis), It measures about 30 inches in length; and in its full adult plumage, the male especially is an exceedingly hand- some bird. The greater part of its upper surface is blaek, beautifully marked with numerous rows of white spots; the head and throat are also black, the latter relieved by two collars of white, spotted with black, while the greater part of the under surface is white. The Great Northern Diver lives chiefly on the ocean, feeding on the smaller fish, as herrings and sprats, in pursuit of which it dives beneath the surface with a facility to which it owes its common name. It can remain a long time under water, and by means of its fect and wings makes extraordinary progress beneath the surface, and while thus submerged it is sometimes taken with a baited hook, and has often been caught in herring and salmon nets. It has great difficulty in rising on the wing, but once aloft its flight is both vigorous and swift ; when in danger, however, it always resorts to diving in preference to flying, and from ils exceeding watchfulness, and the great distance it can swim bencath the surface of the water, specimens of the Great Northern Diver are difficult to obtain. During the breed- ing season it retires to inland lakes, where it builds its nest within a few feet of the water’s edge, and lays two, some- times three eggs, of an olive brown colour, sparingly spotted with a darker brown. The young do not attam their perfect plumage till the end of the third year. It remains in Britain during the greater part of the year, but there is no sufficiently satisfactory evidence of its ever breeding in this country ; from the shortness of its absence, however, its breeding ground is probably not further off than Iceland and Greenland, The Black-throated Diver (Colymbus areticus), 2 remarkably handsome species, and the Red-necked Diver (Colymbus septentrionalis) also occur in Britain, where, unlike the former species, they remain to breed.

DIVIDIVI, the commercial name for the astringent pods of Cesalpinia coriaria, a leguminous shrub of the sub-order Cesalpiniew, which grows in low marshy tracts

in the West Indies and the north of South America. The plant is between 20 and 30 feet in height, and bears white flowers. ‘The pods arc flattened, and curl up in drying ; they are about ? inch broad, from 2 to 3 inches long, and of a rich brown colour. JDividivi was first brought to Europe from Caracas in 1768. Its value in the manufac- ture of leather is duc to the large amount of tannin contained in the yellow resinous matter exterior to the seed lusks. It may be employed in dyeing as a substitute for galls or sumach. Maracaibo, Rio Hacha, and Sabanilla are the ports from which it is principally shipped.

DIVINATION. ‘This tcrm is uscd to mean the obtain- ing knowledge of secret or future things by revelation from oracles or omens. ‘The derivation of the word points to divine influence communicated through the soothsayer, much as the equivalent Greck term mantike refers to the utterances of the spiritually inspired or possessed seer, mantis. Itis well seen from Cicero’s treatise De Divina- tione that in classic times theology not only included in its system all revelation by oracles, which clearly belongs to it, but also claimed possession of a variety of diviner’s arts, such as augury and astrology, on tlie ground that their signs were sent by the gods. On thie side of the Stoics, it is there argued that if divination is a real art, then there must be gods whio gave it to mankind, which proposition is met by the counter-suggestions that signs of future events may be given by nature without any god, or that there may be gods and yct they not have bestowed on man any such art as divination. ‘The real point of the relation of divination to religion is touched in the division of it into two kinds, —airyicial divination, by haruspication, prodigies, light- hing, augury, astrology, and lots, as contrasted with natural dwination, by dreams and prophetic oracles. On a general survey of such arts among mankind, it appcars that oracles, &c., being taken as revelations made directly by spiritual beings, fall to be considered under headings treating of religion (sce, ¢.7., DEMoNOLOGY); but divining by such signs as the flight of birds or the falling of lots does not necessarily depend on the notion of intervening demons or dcities. One part of its position is well stated in the argument by which Cicero makes his Stoic defend it :—If frogs by croak- ing, and oxen by snuffing the air, can give us signs to fore- tell the weather, why should there not be omens in the fibres of a victim’s entrails, or in thunderstorms? But the religious view which regards omens as divine signs

seems to have been from very early ages blended with the naturalistic view, so that in a great part of the cases it is impossible to disentangle them, or even to say which is the original one, This will appcar in the following brief sum- mary of the principal methceds of divination. Now that the diviner's art has all but perished, we moderns are able to look back upon its history, to see how its futile proceed- gS Were suggested by mistaken analogy, and how the ex- perience of ages, which ratifies true inferences and destroys fancies, is now reducing them to curious antiquarian relics,

The various " artificial" modes of divination for the most part rest evidently on the association of ideas in analogy and symbolism (see evidence in Tylor, Harly Hist. of Mankind, p. 132; Primitive Culture, vol. i. p Uli, &c., 78.) A tree planted at a child's birth, or any other plant mentally associated with a person, gives a sign by its flourish- ing or withering as to that person's health or death (Ploss, Das Kind, vol. i. p. 71.) So with the sticks set up by Polynesians to see if the warriors they stand for will fall in battle, or with the cocoa-nut that is spun like a teetotum to point outa thief (Polack, Vew Zealanders, vol. i. p. 270; Mariner's Zonga Islands, ch. xx.) This kind of fanciful association appears in sortilege, or casting of lots, a proceed- ing remarkable not only for its antiquity but for the fre-

quency with which religions have adopted it as a means of obtaining divine guidance, from the ages when classic poets sang of Homeric heroes praying to the gods when they cast lots in Agamemnon's leather cap, or of Mopsus the sooth- sayer divining with sacred lots when the Argonauts embarked on their voyage (Homer, JU., vii. 175; Pindar, Pyth., iv. 338), and on until modern times, when tho Moravians still resorted to solemn religions lots to determine difficult questions, such as the choice of wives. Dice or astragali (hucklebones) have been used for the pur poses of sortilege (see Suetonius, 7tberius) ; and cartomancy, or fortune-telling by means of playing-cards, is still com- mon. In ancient times omens were drawn from poets' verses, fixed on by chance, a practice well known as Sortes Virgiliane, from Virgil being often so consulted (sec Smith's Dic. Gri and Rom. Antiy., art. "Sortes"); and the Bible came to be afterwards so used for drawing texts, or "pricking for texts ;" this practice is still very usual in Germany (see

Wuttke, Deutsche Volksaberglaube, 2 ed., p. 227.) The haruspication, or examination of entrails, by which Roman statesmen were (or pretended to be) guided in public affairs (sec Cicero, De Div., ii, 12; Plin. J. X., xi. 73); and scapulimancy, or the Tatar mode of divining by the cracks and lines in a shoulder blade (Lubbock, Origin of Civilization, p. 230), formerly known in England as ‘reading the speal-bone ” (Brand, Popular Antiquities, vol. lil, p. 339), depended on imaginary symbolic associations, such as that cracks in opposite directions meant good and ill fortune, that the course of particular lines indicated tlie course of the consultcr’s life, &c. This sort of false analogy may be well understood by any one who will have the similar art of palmistry, or divining by the lines of the land, applied to his own future by a fortunc-teller at a fair. Omens obtained by augury, or divining by the sight and cries of animals, especially birds (as the name indicates), are as familiar among uncivilized races as they were in ancient Ronie ; their symbolism is apparent in sucli rules as that a hawk means victory, an owl’s hoot is unlucky, and that a beast or bird on the right hand portends good, but ons theslett amd evil (iylom P. C., velk ie gy 11:0). Another class of arts depend on the unconscious or half- conscious action of some person, often the diviner himself. Among these is the use of the well-known divining-rod, which when lield in the hands, dips to indicate a hidden spring of water, a vein of ore, or a buried treasure (Brand, vol. in. p. 332; sce Chevreul, De la Baguette Divinatoire, &c.) The use of this instrument remains in some districts of England ; it is locally known as “ dows- ing,” whence no doubt the name of Dousterswivel in The Antiquary. Similar in principle is the ancient coscinomancy, or divining by a sieve held suspended, and giving its indications by turning. In later times this gave placc to the ordeal by the Bible and key, where the book is suspended by a key ticd in with its wards between the leaves and the key supported on two persons’ forefingers, and the whole turns round to prove guilty some servant maid accused of theft (Brand, vol. iii. p. 351). In such cases, where the eulprits’ fears are apt to betray them, the process of divination really serves as a practical test. Dreams are not only eonsidered visits from ghosts, but often also as supernatural signs to be interpreted symbolically, as when a Kamtschatkan dreaming of dogs or lice would take it as foretelling a visit from Russians (Steller, Kamtschatka, p. 279). Of such interpretations the ancient art of onevromancy consists, as may be seen in such rules as that if a woman dreams of kindling a fire, she will bear a male child’; if one dreams of white

clouds it means joy, but if black clouds: trouble (Brand, vol. lil, p. 132; Tylor, 2c.) It remains to mention in few words astrology, the branch of divination whose importance

Karly Diving.

Diving bell,

in the world has exceeded that of all the rest together. Researches into the ancient writings of Chaldaea have now shown how fully historians were justified in treating that country as the principal among the sources whence the star- gazers received their precepts (see Sayce, “ Astronomy aud Astrology of the Babylonians,” in Z’rans. Soc. Bibl. Arch., vol. ili; Maury, La dlagie et l Astrologie.) The rules in such coniparatively modern works as Sibly’s Occult Sciences and Lilly’s Astrology fairly enough represent the ancient traditions, and show their still intelligible symmbolism,—how the stars rising at a child’s birth are nade in the horoscope to typify its destiny, and the planets and signs of the zodiac exercise “ influences ” often plainly drawn from their natures or names. Thus Mars has to do with soldiers, Venus with lovers, and Mercury with prattlers ; the solar man is grand and generous, the lunar man unsteadfast and inclined to change his dwelling, the sign Leo presides over places where wiid beasts abound, but Aries over pastures. At the courts of Asiatic rulers, the state astrologer still nominally holds a position like that of his predecessor in the ancient empires of the world, but it is evident that the last twenty years have shaken, even in the barbaric Hast, the power of the occult sciences over the human mind. (m BoD.

DIVING. The art of diving to considerable depths under water to bring up pearls, corals, and sponges has been practised in the Indian seas from very early times, and if we may believe the accounts that have come down to us, the feats of early divers are truly remarkable—some of them, it is said, having been able to prolong their sub- marine descents for periods varying from two to three minutes. It is obvious, however, that not having the aid of any artificial appliances for supplying air, the powers of these bold

adventurers, both as regards the depth to which they could descend and the length of time they could remain submerged, were comparatively limited.

At an early period, therefore, the attention of philo- sophers and mechanics was turned to the discovery of a contrivance for aiding the diver in prosecuting his daring but useful calling, which was rendered all the more important from its being no longer confined to the acquisi- tion of Eastern luxuries, but to the raising of treasure from sunken vessels. It is not considered expedient to occupy space by further reference to the feats of the early divers, put rather to pass at once to the history and construction of the diving apparatus of modern times, as illustrated by the Diving Bell and the Diving Dress at present in use. And here it may be stated that in addition to the sponge aud coral trade of foreign lands, which has been greatly advanced by the use of modern appliances, there are the works of the naval engineer, and more particularly of the civil engineer, in which diving apparatus is so extensively employed and so essentially necessary as to place the art of diving on a wider basis, and to give it an importance only fully developed within the present century.

Diving Bell.—The most useful of ancient contrivances is the diving bell, which, introduced at an early period and gradually improved, is now the well-known apparatus used by engineers in the present day ; and it may be interesting to trace the successive improvements that have brought it to its present state of perfection and usefulness in con- ducting submarine works, Pci oe of the diving bell is very simple. The oer. bis ioe he jar sunk in a vessel of water malo OEE en ai e interior, and if the vessel be ie irik fils out a, ase contain persons within it, it may Stier i er being wetted, and they may continue erged so long as the air within the bell continues pure enough to support animation. Such were the “ diving- chests” of the first makers, which, thouch ¢h i 4 p ch, g ey differed in

form and details, were constructed on the same principle as the modern bell, and were generally formed of wood, girded with iron hoops, like a barrel.

It will be obvious that if such a vessel were submerged in shallow water, having a depth of say one foot of water, a large supply of air would be

inclosed in the bell, and the bottom on which it rested would, from the smalli depth of water upon it, be easily reached for any operation to be performed on it. But if we conceive the same bell to be lowered further below the surface, the air being compres- sible will be reduced in volume, and the water will rise ip the bell to fill its place. The result would be that at the depth of about 33 feet the air would be compressed into about one-half its original bulk, and the bell itself would be half filled with water ; and the bottom of the sea on which it rested would no longer be so conveniently reached as when the water was only a few inches above the lips of the bell. Moreover, the air by repeated inspiration becomes unfit to support life, and the ancient bells had to be raised to the surface at very short intervals of time that fresh air might be supplied to the men employed. Although, therefore, the original diving bell was a step towards the perfect appliances afterwards introduced, it will readily be seen that its use in diving operations was very limited indeed,

Dr Halley, the secretary of the Royal Society, who seems Halley

to have taken an interest in diving and divers, and com- “ins |

passionated their want uf fresh air, communicated a paper to the Royal Society in which, to use his own words, he proposes a plan “for carrying the pabulum vite down to the divers, who must without being supplied therewith return very soon to the surface or perish.” The following is the description of his arrangements for this purpose. After describing the bell itself, which was of wood of the form of a truncated cone, with a capacity of 60 cubic feet, and was suspended by a sprit from the mast of a ship, he says—

‘*To supply air to this bell when under water, I caused a couple of barrels, of about 36 gallons each, to be cased with lead, so as to sink empty, each of them having a bung-hole in its lowest parts to let in the water, as the air in them condensed on their descent, and to let it out again when they were drawn up full from below. And to a hole in the uppermost part of these barrels I fixed a leathern hose, long enough to fall below the bung-hole, being kept down hy a weight appended, so that the air in the upper part of the barrels could not escape, unless the lower ends of these hose were first lifted up.

“The air-barrels being thus prepared, I fitted them with tackle proper to make them rise and fall alternately, after the manner of two buckets in a well ; and in their descent they were directed by lincs fastened to the under edge of the bell, which passed through rings on both sides of the leathern hose in each barrel, so that, sliding down by these lines, they came readily to the hand of a man, who stood on purpose to receive them, and to take up the ends of the hose into the bell. Through these hose, as soon as their ends came above the surface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell, whilst the water entered at the bung-holes below and filled them, and as soon as the air of one barrel had been thus reccived, upon a signal given that was drawn up, and at the same time the other descended, and, by an alternate succession, furnished air so quick, and in so great plenty, that I myself have been one of five who have been together at the bottom, in ninc to ten fathoms water, for above an hour and a half at a time, without any sort of ill consequence, and I might have continued there so long a8 pleased, for anything that appeared to the contrary. _I only observed that it was necessary to be let down gradually at first, at about 12 feet at a time ; and then to stop and drive out the air that entered, by receiving 3 or 4 barrels of fresh air before I descended i But being arrived at the depth designed, I then let out as much 0 the hot air that had been breathed as each barrel would replenish with cool, by means of the cock at the top of the bell, through whose aperture, though very small, the air would rush withso much violence as to make the surface of the sea boil, and to cover it with a white foam, notwithstanding the weight of the water over us.

‘Thus I found that I could do anything that required to be ein just under us, and that I could, for a space as wide as the circuit 0 the bell, lay the bottom of the sca so far dry, as not to be over

Sm on’s div -bell.

Mo n div bell,

shoes thereon. And, by the glass window, so much light was transmitted, that when the sea was clear, and especially when the gun shone, | could see

perfectly well to write or read, much more to fasten or lay hold on anything under us that was to be taken up ; and, by the return of the air barrels, I often sent up orders, written. with an iron pen on small plates of lead, directing how to move up from place to place as occasion required. At other times when the air was troubled and thick, it would be as dark as night below ; but in such cases I have been able to keep a candle burning in the bell as long as I pleased, notwithstanding the great expense of air necessary to maintain flame. This I take to be an invention appli- cable to various uses, such as fishing for pearls, diving for coral or sponges and the like, in far greater depths than has hitherto been thought possible ; also for the fitting and placing of the found- ations of moles, bridges, &c., inrocky bottoms, and for cleaning and scrubbing of ships' bottoms when foul, in calm weather at sea. I shall only intimate that, by an additional contrivance, I have found it not impracticable for a diver to go out of an engine, to a good distance from it, the air being conveyed to him with a continued stream by small flexible pipes ; which pipes may serve as a clue to direct him back again when he would return to the bell."

Such is an account of Dr Halley's apparatus, which un- doubtedly effected an important improvement; but it involved the sending down of constant relays of air vessels, and the great loss of time and interruption which attended such a means of supply. It remained for Smeaton to overcome these objections. In repairing the shoeing of the foundations of Hexham Bridge, in 1778, there being but a small depth of water, to work in, he contrived a bell to the top of which he attached a force pump in lieu of Dr Halley's air-barrels, and as the bell, in consequence of the small depth of water, did not require to be wholly sub- merged, the supply of air for the divers was forced directly into the bell, being the first application of the force pump for that purpose! Subsequently to this, in 1748, having occasion to remove stones in clearing the foundations for a pier at Ramsgate, he applied an air-pump placed in a ship or barge, and pumped air into the bell at any depth under water by means of a hose screwed into an air-hole in the top of the bell. The following is Smeaton's description of his last improvement :—

'Instead of the usual form of a bell, or of a conical tub of wood sunk by weights (externally applied), this for convenience was a square chest of cast

iron, which being 50 cwts. was heavy enough to sink itself, and being 44 feet in height, 44 feet in length, and 8 feet wide, afforded room sufficient for two men ata time to work under it. But it was peeuliar to this machine that the men there- M were supplied with a constant influx of fresh air without any

attention of theirs, that necessary article being amply supplied by

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a forcing atr-pump in a boat wpon the water's surface."

Tt will thus be seen that Smeaton's Ramsgate bell con- tained all the elements of the present appliances, which, as improved in details, and constructed by Messrs Rennie, has been so extensively employed in harbour works.

The bell as now used is shown in plan and section in figs, 1 and 2. It is a cast-iron chest weighing about 5 tons, and is suspended = by block and tackle, On the top of the bell there are 8 apertures _ a, fitted with very "| thick glass for admit- ting light ; and in the

centre is the passage 8, eee SS i : nto which the hose is Fra, 1.—Plan of Diving Bell.

Screwed for admitting

theairsupply. The interior is fitted with two seats e, which can be removed to make room when the men are at work ; and in the centre is a lifting chain ¢, to which stones are attached to facilitate their being lifted and properly adjusted to the beds on which they are to be laid. The bell is used acccording to two different systems, depending on the ee RyStems; Sep Oe

: Smeaton's Reports, vot. iii. p. 279. Historical Report on Ramsgate Harbour, by John Smeaton, London 1791, p. 70. el

nature of the work to be performed. In building masonry under water itis suspended from a staging of timber, but in excavativg rock or removing

boulders, scattered over

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s 6 7 Fee

wi a i] 2 3 4 OT ee ee ae ae eee a Fic. 2.—Section of Diving Bell,

a considerable area, where a staging would be inapplicable, it is suspended from a barge or lighter.

Fig. 3 shows the arrangement as employed in laying Pell- stones or blocks of concrete. It represents a cross section staging. of the staging, bell framing, and bell carriage, in which a

Fid. 3.—Block-laying by Diving Bell.

is the staging, 6 longitudinal beams on which the bell- framing cc traverses on the wheels and toothed racks d. The diving bell e is suspended from the bell carriage /, which traverses on the bell framing by the wheels and toothed rack g across the whole breadth of the pier. The stones 2 are brought along the surface of the finished part of the pier, and lowered down by the travelling crab-wincl 1, The force-pumps by which the bell is supplied with air are shown at m, and the air-hose at». It will be understood from this description that the bell framing c, moves freely along the staging, while the bell carriage has a

Bell- lighter

motion at right angles across the work, so that the position of the bell can be altered with the greatest ease so as to bring it over any spot within the area of the staging.

In proceeding to work, the men take their seats in the bell from a boat, and the bell is then lowered to the required depth. If the work be that of building a wall a stone 18 lowered at the same time. The changes in the position of the bell are all made according to signs given by the divers by strokes of a

hammer on the bell, which experience has shown can be heard at any depth at which the diving bell has been employed. The signals are—one stroke, more air ; two, hold on ; three, raise ; four, lower ; five, north ; ee, south ; seven, east; eight, west. These signals are narrowly observed by a watchman stationed in a boat, and reported to the men working the bell carriage. The rule for the supply of air both to the bell and diving dress is to give it so freely that there shall be a constant eseape of air rising to the surface in air-bubbles all the time the men are under water. After being lowered, the bell is first raoved over the stone to be laid; the divers then unhook the lowering chain from the lewis in the stone, and at the same time make fast the stone to the tackle within the bell, which is at once signalled to be raised, and carries the

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stone with it. The bell is then moved over the site on which it is to be placed; it is then lowered until it has nearly reached its bed, on which it is finally deposited, The lewis is then removed and the bell raised for another stone; aud with trained workmen it is surprising how expeditiously the bell is moved from place to place, and stone after stone is built in the walls. The staff of men required to work the bell is two divers, one watchman, four men working the air-pump, and four working the bell varriage, besides the men required to bring forward and send down the stones. The men engaged generally work in shifts of from 3 to 6 hours according to the depth, and the diving work may be continued as long as in ordinary day-work, as in elear water the light is good to the greatest depth at which the bell is used in harbour building.

When engaged in blasting, the bore is made in the ordinary way, and eharged with a shot inclosed in a water-tight eanvas ease, to which is attached a length of 6 or-8 feet of patent fuse. The bell is then moved from above the bore, and the fuse ignited, and when the shot is

{fired the smoke rises to the surface clear of the bell. When employed for removing rock or boulder stones—for

Fis, 4.—Longitudinal Section of Diving Bell Lighter (56 feet long and 24 feet beam).

example, in a river navigation,—it is of advantage that the bell be capable of being easily transported, and in that ease it 1s swung from a barge or lighter, which contains the machinery for working the bell and air-pumps, and a erane

for raising the boulders as the divers sling them, It is of course attended with greater trouble and risk to the divers to work the bell from a lighter than from a stage; but, on the other land, the convenience in being enabled to trans

Fic. 5.—Plan of Bell Lighter (

port it from place to

place, in a river navigation, ig 9 great advantage, ee Sr,

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6 feet long and 24 feet beam).

Figs. 4 and 5 show the disposition of the various appliances in the most recent bell-lighter built by Messrs

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DIVING

late Sir Charles Pasley, which will be found fully described in the Minutes of Proceedings of the Institution of Civil Engineers.3 The long continued experience gained in diving while these operations were in progress suggested improvements aud alterations which had a great effect in bringing the diving dresss to its present perfection as how manufactured by Siebe, Heinke, Barnett, and other

Simons of Renfrew for the River Clyde, which was com- municated by Mr Deas, the engineer, to the Clyde Trustees, Fig. 4 is a longitudinal section, and fig. 5 a plan in which ais the bell, 6 the bell crab, c the air-pumps, and d the crane for lifting stones, &c., slung by the divers.

The large cost of a diving bell limits its use to works of magnitude, especially as many submarine works can be done better by the diving dress, which is much less expensive; but there are certain operations, such as the clearing and levelling of foundations, for which the bell is peculiarly well adapted, that still enable it to take its place as one of the most useful appli- ances of the marine engineer. Mr B. B. Stoney has, in an interesting paper in the MLinutes of Proceedings of the Institution of Cuil Engineers,' described a diving bell, or chamber, 20 feet square, with which he success- fully built the foundation of the quays of Dublin, Mr Stoney's apparatus does not come under the article diving, but belongs more properly to the subject of the compressed air cylinders used in bridge building, which are described under the article BRipGs.

Diwing Dress.—The diving dress is peculiarly well fitted for such works as the repair or overhaul of rollers and sluices of lock-gates, cleaning or repairing ships' bottoms, descend- ing into the hatches of wrecks to recover property, and, in short, everything that cannot be done from the interior of a bell. The inexpensiveness also of the diving dress, dispensing with all costly staging, and its ease of transport and appliance, are much in favour of its use. It is, indeed, so convenient in the repair of propellers, examining ships' bottoms, recovering anchors, &c., that all ships in,..Her Majesty's navy of sufficient size to be commanded by captains are now supplied with a diving dress or apparatus, and bear a certain number of divers in their complements ; and all sea-going flagships and iron-clads on foreign stations carry two sets of diving apparatus, and are allowed a suitable number of trained divers,

The invention of the diving dress, like that of most use- ful appliances, was gradual, and the work of many minds. Some early proposals, such. as that already referred to in the quotation from Dr Halley's paper in 1721, and others of more modern date, were made for providing the diver with a dress to enable him with safety to carry on his work, for an account of which the

reader is referred to a paper by Mr J. W. Heinke in the Minutes of Proceedings of the Institution of Civil Engineers.2 But to Mr A. Siebe 18 due the credit of being the first to introduce a dress which was supplied with a constant stream of fresh air, and may be said to have been the precursor of the dress now muse. We allude to what was called the “open dress” invented in 1829, which consisted of a helmet and water- proof jacket, under which, and fitting more closely to the body, were worn trousers reaching to the arm-pits, and between the jacket and trousers the air pumped in at the helmet was allowed to force its way and escape to the surface as in the diving bell, and hence it was called “open.” Although some divers of the old school are said still to give a preference to the open dress, its danger became manifest; for if a diver stumbled and fell on his face or side, the water entered his dress, and unless quickly brought to the surface he was in danger of being drowned ~® necessary requirement of the open dress being that he should remain in an upright or gently stooping posi- tion. To meet this defect, Mr Siebe, in 1837, introduced the “close” dress, which is now almost universally used.

arlous minor improvements were introduced between 1839 and 1843 connected with the removal of the wreck of the « Royal George” ship of war, conducted by the

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? Vol. xxxvii. p, 339. 2 Vol. xv. p. 309,

makers,

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The diving dress, as will be understoood from fig. 6,

envelops the whole body of the diver, the upper por- tion a being the “ helmet,” the intermediate portion the “‘ breast-plate,” and tbe lower portion ¢ the ‘‘dress.” The hose by which the air is supplied is shown at d, and ¢ is the “life” or “ sig- nal” line, which is attached to the diver’s waist, and by which he makes signals and is hauled to the surface. The water-proof

material of which the dress is made is very generally sheet india- rubber covered on both sides with tanned twill to protect the india-rubber

from injury. The cuffs fit

tightly round the wrists, leaving the hands free, and india-rubber bands slipped over then render the joint water-tight. The breast- plate 6 is made of tinned copper with an outer edge of brass, which has screws

Fie. 6.—Diving Dress.

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fitted to it projecting upwards and passing through cor-

responding holes in the collar of the dress.

On the top

of this, and with holes in it corresponding to the screws, four pieces of a metal band are firmly screwed down by wing nuts, nipping the soft material of the collar between the metal of the breast-plate and band, aud thus

ensuring a water-tight joint.

On the front of the breast-

plate two studs are fastened for securing the back and front weights g. Some makers put a valve h on the front of the breast-plate, by means of which the diver can regulate the pressure inside his dress at will, and in this way has the power, by simply inflating his dress more or less, of making himself of any specific gravity, so as to float at any desired depth or rise to the surface without the assistance of the

attendant.

diver is undoubtedly a great convenience.

This arrangement in the hands of a skilled

But it is still a

matter of difference of opinion whether it is not safer to trust to being hauled up by the watchman on the surface, whose duty it is to hold the dife or signal line in one hand, and the air hose in the other, while the diver is at work, and to attend to whatever signal he may give by pulling

the life line.

The inconvenience of the air bubbling up in

front of the bulls' eyes, and the danger of inexperienced divers becoming giddy and turning the valve the wrong way, have induced some makers to do away with this use- ful valve, and to substitute at the back of the helmet a valve which the diver can regulate by the pressure of his hand, but which rights itself the moment his hand is removed, The neck of the breast-plate is fitted with a "'segniental screw bayonet joint" (introduced by Messrs Siebe), and to this the helmet, the neck of which is fitted ne a ree 3 Vol. xv. p. 328,

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Depth at which diving can be prose- cuted.

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with a corresponding screw, can be attached or removed by one eighth of a turn. The helmet, a side view of which is given in fig. 7, is made of tinned copper, and fitted in front with three strong plate-glass — win- dows, or bulls' eyes, in brass frames protected with guards, Messrs Heinke introduced _ slid- ing covers todraw over these win- dows in case of their getting bro- ken, 'The front eye piece is made so that it can be unscrewed, and in this way the diver on ascend- ing can rest lim- self for a short time or give orders without removing the rest of his dress. Messrs Barnett have introduced instead of this a hinged glazed frame, which 'its tightly into a conical vulcanized india-rubber seat like the ordinary port hole of a ship, so

that it can be opened by the diver himself the moment his head is above water, and being attached to the helmet it cannot be dropped acciden- tally into the sea or otherwise mislaid. An outlet valve a is fixed at the back of the helmet, which, opening outwards, permits the escape of the foul air but prevents the entrance of water. The inlet valve 6 to which the hose is attached is also fixed at the back of the helmet, and is so constructed as freely to admit the air from the force pump ; but should anything occur to the hose or pumps the valve at once shuts, inclosing a sufficient supply of air in the dress to support the diver till he can be hauled to the surface. The air after entering by the inlet valve is conducted in tubes c to the front of the helmet, so that the diver has the advantage of inhaling fresh air, and the front glasses are kept free from the condensation of his breath which would otherwise take place. On each side of the helmet is a hook over which the cords pass which carry the front and back weights, and a brass stud to one of which the life line, and to the other the air tube, are attached ; dd is the Joint by which the helmet is screwed upon the breast-plate. The back and front weights weigh about 40 Ib each, and are held close to the diver's body by means of a lashing passing under his arm-pits, The boots are made of stout leather, with leaden soles, secured by two buckles and straps, each boot weighing about 20 b. hep tp te a diving dress, with all its appliances, is The sponge, pearl, and coral fisheries, originally carried on only by naked divers, as already noticed, are now con- ducted to a great extent by the help of artificial aids; and, according to Mr Siebe, upwards of 300 sets of diving dresses are employed in the Mediterranean sponge fisheries alone, and they are being introduced in the Bahamas, Rermudas, Ceylon, the West Indian Islands, and on the coast of Australia. ; As already stated, at moderate depths not exceeding 0 to 40 feet, and with clear water, sufficient light is tted to enable the diver to perform any ordinary

Fic. 7.—Divers Helmet.

transmi

ran and in working in turbid water with the diving bell ~ es are employed. Mr Siebe has also constructed an : is lamp and an oil lamp which can be employed where ight requires to be used by divers at great depths.

Captain Eads! states that at the Mississippi bridge candles . were at first employed, which, under a pressure of 100 feet, were found to be burnt down in about three-fifths of the time required in the open air; under a pressure of 80 feet it was found that a candle if blown out by the breath would immediately reignite ; and at the depth of 1084 feet a . candle was blown out thirteen consecutive times in the) course of half a minute, and each time excepting the last was reignited. The depth at which diving can be safely conducted isa question of importance. The ordinary depth at which the . diving bell has been employed in harbour works is from 3) to 35 feet, and it has been used in 60 fcet at Dover. With the diving dress-much greater depths have been attained. Mr Siebe relates that in removing the cargo of the ship “Cape Horn,” wrecked off the coast of South America, a diver named Hooper made 7 descents to a depth of 201 feet, and at one time remained 42 minutes, sup- posed to be the greatest diving feat ever achieved. M. Frendenberg states that in the repair of a pump in the Scharley zinc mines in Silesia two divers went down the pump well to a depth of 85 feet, remaining from periods varying from 15 minutes to two hours.? Jn the knowledge of the author the greatest depth at which tlie diving dress was used in the open sea was in the Firth of Forth. A Royal Commission “on the Operation of the Acts relating to the Trawling for Herring on the Coast of Scotland ” resolved to obtain the herring spawn from various portions of the ’ exposed parts of the firth, and this duty was successfully accomplished in depths of from 14 to 16 fathoms, from the deck of the ‘‘ Princess Royal ” cutter, under the command r of Mr Macdonald. | The writer is indebted to Mr P. J. Messent, the engineer Diving of the Tyne piers, for the following notes of his experience work : . at that work, “On the Tyne Pier works helmet and bell” divers are employed simultancously—the former for excavat- . ing for and fixing the feet of the piles of which the staging is formed, the bell divers for levelling the foundations and fixing the blocks of which the pier is composed. The helmet diver has greatest power in lifting. He can exert but a few pounds of force in pulling downwards (unless ho can fasten himself down) on account of his buoyancy, and for the same reason he cannot pull or push horizontally with much force unless he has a fulcrum or stop for his feet or body. Thus, in boring an augur hole in a pile he | would have to lash himself to it, unless there was a pro-) jecting rock or stone that he could get his foot against. / In the use of a hammer and other tools for striking he 1s restricted by the water,” but Mr Messent has known

good i men do fair work with a hammer and chisel. It is j difficult for them to walk against even a moderate tide, and | men who by accident get on the (lee) tide side of their work, generally have to be hauled up to their boat and lowered down again in order to get on the (windward)* | tideward side of it ; again experience enables many of these difficulties to be met or modified, but it is advantageous to bear them in mind in arranging work for divers, Most of the divers at the Tyne have been made or instructed on the works, and of the men who have tried helmet diving not more than one out of three or four succced or become divers, the failure being sometimes from physical causes, but more often from want of head. There is less difficulty in making bell-divers, probably on account of their work- ing in company, there being always two men in a bell, and the same amount of self-reliance is not needed. —

1 Reports by Captain James B, Eads to the President and Directors | of the Illinois and St Louis Bridge Company.

2 Minutes of Proceedings of Inst. of Civil Engineers, vol. xlv. Pp.

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LY INGE

The practice of diving obliges the diver to conduct his work under a pressure greater than that of the atmosphere at the surface of the earth. All diving work is done under an abnormal atmospheric pressure, which increases with the depth at which the diver is submerged in water. This pressure, when he is submerged to the depth of 33 feet, is twice that of the normal superficial atmospheric pressure. At greater depths the pressure is proportionatcly increased, and ultimately becomes so great that life could not be maintained. To descend even to the moderate depth of 30 or 40 feet, which is about the maximum required for ordinary engineering sea works, demands some practice and nerve on the part of the diver, bus when greater depths have to be explored, in raising sunk vessels, for example, the energy and power of endurance of the diver are much more severely taxed, and it seems not uninterest- ing, before concluding this article, to refer to the

effect which the work has on the health of the diver, as well as on some physiological facts of interest in general science.

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Eustachian tube is a long and narrow passage; at its com- mencement in the ear it has a bony structure, but towards its termination in the pharynx behind the nostrils, it becomes soft, so that its walls can be forced together. It admits an easy passage from the ear to the pharynx ; but when any pressure arises in the opposite direc- tion, it acts in some degree like a valve, shutting the passage, until the increasing pressure again forces it open. Some time then elapses before all this can be accomplished ; and during this time the external air, pressing with full force on the tympanic membrane, produces the pain which is felt. When the Eustachian tube opens, it is generally all of a sudden, aud with a slight explosion or pop, which is followed by instant relief from the pain. This relief may often be produced by filling the mouth, or gulping the air and passing it into the tube.

That the above is what really takes place may be shown experimentally by shutting the mouth and nostrils, and exhausting the air from them by the action of the lungs

8 ations ‘The sensations experienced in a diving bell are common, | The air in the tympanic cavity immediately rushing through ett jt i8 believed, to all divers. According to the writer’s ex- | the Eustachian tube into the mouth, the external air acts ell by perience, very soon after the lips of the bell have touched | on the tympanic membrane and produces a slight sensation

dors.

the surface of the water pain is felt in the ears and above the eyes, which continues with greater or less intensity according to the rate of descent until the bell has attained the bottom. Soloug as the bell continues there no pain is felt, the only feeling being that of depression duc to the depth to which the diver is submerged. As soon as the upward movement commences the pain in the ears and above the eyes returns, and continues till the surface is reached. The motion of the bell is very gradual, sometimes not exceeding 3

feet per minute, but even at that slow rate the head does not accommodate itself to the increase of pressure so as to avoid inconvenience, Aeronauts do not suffer to the same extent in their ascents in bailoons, because the alteration of pressure is much more gradual in passing through the atmosphere than through a medium having the density of water.

Several suggestions have been offered as accounting for the sensations which are experienced in diving, and the following explanation, which the author has submitted to Professor Turner of Edinburgh, is believed to afford the true solution.

Under the ordinary atmospheric conditions, the air presses not only on the surface of the body, but into every cavity within the body which communicates with the sur- face, so that the pressure, both externally and internally, is exactly balanced, In passing into a denser atmosphere the increased pressure operates externally more rapidly

of deafness, such as is felt in the bell. But if, instead of exhausting the air, we attempt to compress it, and force it through the tube into the tympanic cavity, at first no effect is produced; but after exerting a considerable pressure a slight pop is felt, and a little pain in the ear, which is just the sudden opening of the tube.

The pain above the eyes is doubtless due to the inequality between the pressure of the air on the surface of the fore- head and that of the air in the frontal sinuses, or air spaces in the frontal and other bones which form the boundaries of the orbits, The return of the disagreeable sensations during the upward ascent of the bell is due to the pressure on the outer surface of the tympanic membrane and of the forehead being diminished, before the air within the tympanic cavity and the air spaces in the bones of the orbits has accommodated itself to the diminished external pressure.

It may further be interesting to notice that any upward motion is accompanicd bya thick mist within the bell, which disappears whien it is stationary or moving down- wards. The explanation is that the air inside the bell, when it is ascending, being relieved of pressnre, expands, and its temperature is lowered ; and as the air inside is about the point of saturation, the fall of temperature pro- duces condensation, which becomes

visible in the form of vapour or mist. An analogous phenomenon takes place in commencing to exhaust the receiver of an air-pump.

The question of the effect produced on the health of the Effect of men employed in diving is of interest and importance. pas or So far as the author’s experience goes, he is not aware that the healt

: : ; 5 of the divers suffer from prosecuting their submarine work under givers,

than it does internally, more especially if the communica: tion of the internal cavitics with the surface is by tortuous passages ; and so long as this inequality in the pressure exists the disagreeable sensations in the ears and above the

eyes will continue. ‘he pain in the ears arises from the effect of the condensed air acting externally on the tympanic membrane of the ear, before the air within the tympanic cavity has acquired the same density to counter- balance it. The tympanic membrane stretches across the bottom of the passage or meatus, which leads from the outer ear into the side of the head (see Anatomy, fig. 80.) This passage is in direct communication with the atmo- sphere, the pressure of which, therefore, acts instantaneously On the tympanic membrane. But on its inside the tympanic membrane bounds the tympanic cavity, which has no communcation with the external air, excepting by the Eustachian tube, which leads from the cavity into the pharynx immediately behind the nose. Through this tube, therefore, the condensed air must pass from the pharynx to supply what is necessary within the cavity for restoring he same equilibrium within and without. But the

the pressure of one or two atmospheres to which they are subjected in ordinary harbour works, the men selected for such duty being generally healthy young men of athletic make. Indeed, it is well known that to some constitutions, and in some forms of disease, subjection to moderate increase of atmospheric pressure proves beneficial. But when greater depths and high pressures have to be sustained the case may be very different.

Mr Siebe, who states the greatest depth to which a diver has descended to be 201 feet, with a pressure of 87 Ib on the square inch (but who states 150 feet as the limit for safe work), has given various directions, the result of his experience, as to the selection of men for deep diving, and advises that men should not be employed who are of full habit of body, who suffer from headache or deafness, who have at any time had spitting of blood or palpitation of the heart, who are pale and whose circulation is languid,

or who are of intemperate habits. He also says that the rate of descent end ascent must depend very much on the constitution and experience of the diver, about 2 feet a second for a strong man for depths not exceeding 80 feet, and for descending to greater depths additional care must be used. The greatest pressures to which men are subjected in engineering works are experienced in the compressed air cylinders used in bridge building (see article Brrver). At Saltash bridge it was found that the men could not work long shifts at the depth of 86 feet without serious inconvenience—some of them, after working seven hours, being slightly paralyzed, but in two or three days they quite recovered. With three hours' shifts the men could work for several months consecutively.

At Londonderry bridge, where the men wrought under a pressure of 75 feet, or about two atmospheres, Sir John Hawkshaw found that there was considerable difference in the relative ability of men to stand the pressure. He had found Irishmen less able to stand the work than Envlish- men, one of the effects being that the joints began to swell. [n other cases no evil resulted.

Captain Eads, the engineer of the St Louis bridge, built across the Mississippi in 1870, gives some interesting in- 1ormation, in his reports to the directors of the Illinois and St Louis Bridge Company, on the effect of working under high pressure on the men. The maximum depth to which the cylinders had to be sunk was 1104 feet below summer water level, and the greatest pressure under which the men worked was 50 or 51 ib on the square inch. When the depth of 60 feet had been reached some of the men were affected by paralysis of the lower limbs, which usually passed off in a day or two. At greater depths the symptoms were more severe. The duration

of working in the air chamber was gradually shortened from four hours to one hour. The total number of men employed in working under pressure was 352, of whom 30 were seriously affected and 12 cases proved fatal. (D. s.)

DIVISION. See Loaic.

DIVORCE is the dissolution of the relationship of marriage. Few social questions are surrounded with greater difficulty than this. For what causes divorce should be granted, and whether complete divorce should be granted at all in the sense of authorizing the spouses to contract new marriages, are points on which civilized socicties have arrived at very different conclusions. Modern practice and opinion are to be traced mainly to two sources of principle, viz., Roman law and the Christian religion. The effect of the spread of Christianity was to reinvest marriage with the religious character from which in the later law of Rome it had completely escaped ; and the history of divorce in modern times has been the gradual decay of the restrictions which were thought appropriate to the religious character of the institution of marriage. At the same time these restrictions have nowhere disappeared, The opinion of society visibly fluctuates between the belief that marriage is a civil contract only and the belief that it is @ contract of a peculiarly sacred character, the dissolution of which must not be lightly, if at all, permitted by human legislation. Again, divorce appears to be regarded some times as a penalty against the offending spouse, sometimes as a right to which the innocent spouse is entitled. It will be granted only if a matrimonial offence is proved to have been committed, but it will not be granted if such an offence hasbeen committed on bothsides. Hence a certain amount of inconsistency in legislation about divorce, which 18 111 nO system more remarkable than in our own, founded as 1t is on the doctrines of the canon law, modified by the opinions of secular judges, and altered by Acts of Parliament,

In Roman law marriage was regarded as a voluntary union which might be terminated at any time by the

consent of the partics. No legal process was required, although the abuse of the power of divorce was sometimes punished. her husband, her father might withdraw her from the union against tle wishes of both parties. Antoninus Pius limited this power. Justinian divorce by consent of both parties does not appear to have been subject to any restriction. however, allowed it only in three specified cases, viz., for im- potency, or when either party desired to enter on a monastic life or was for a long time in captivity.

If a wife had not passed under the manus of

A constitution of Until the time of

Justinian, “Ata later period

Justinian enacted that persons dissolving a marriage by mutual consent should forfeit all their property and be con-

fined for life to a monastery, which was to receive a third

of the forfeited property, the remaining two-thirds going to the children of the marriage. This severity, so much at variance with the Roman spirit, indicates the growing power of the clergy (ut non Dei judicium contemnatur).” (Hunter’s Roman Law, p. 500.) These prohibitions were repealed in the next reign. Divorce by the husband against the wish of his wife was a power much more likely to be abused than that of dissolving marriage by mutual consent. Although the legal right was recognized, it is said not to have been acted on for a period of 500 years, and Spurius Carvilius is said to have been the first who put away his wife for barrenness. Harshness in the exercise of the power was condemued by public opinion, and sometimes punished by the authority of censors. L. Antonius, a senator, was expelled from the senate for a harsh divorce of a young wife. The wife who had not come under the manus of the husband had the same power of repudiating the marriage at will. Later legislation curbed this excessive licence. By the lex Julia et Papia Poppzea, a husband divorcing a wife for adultery might re- tain one-sixth of her dowry ; for any smaller offence, only one-eighth. When a husband was guilty of adultery he had to repay the dowry at once; if the fault were less serious, in six months. Constantine allowed the wife to divorce the husband in the following cases

:— 1, for murder; 2, for being a preparer of poison; 3, for violating tombs. Just causes for repudiation by the husband were—l, adultery ; 2, preparing poisons; 3, being a procuress. A wife divorcing her husband for other than the specified grounds forfeited the dowry, and might be punished by deportation. Similarly a husband lost his interest in the dowry of his wife by an injurious divorce. Similar pro- visions are to be found in the legislation of Honorius and Theodorus (421 «.p.), of Theodosius and Valentinian (449 A.D.) Justinian settled the grounds of divorce as follows: —The wife could divorce her husband—l, for conspiracy against the empire; 2, attempting her life ; 3, attempting to induce her to commit adultery ; 4, wrongfully accusing her of adultery ; 5, taking a paramour to his house or fre- quenting any other house in the same town with a paramour. Ona divorce for these reasons a wife recovered her dowry, and obtained the husband's portion as well. If she divorced for other reasons she forfeited her dowry, and could not marry for five years, as in the legislation of Theodosius and Valentinian. So a husband might justly divorce his wife for—], concealment of plots against the empire ; 2, adultery ; 3, attempting her husband's life, or concealing plots against him ; 4, going to baths or banquets with other men; 5, remaining from home against her husband's wish ; 6, going to circus, theatre, or amphitheatre against his wish. In such cases the husband retains the dowry for life, or if he has no children absolutely. In other cases penalties as fixed by previous legislation of Theodosius and Valentinian apply. The grounds for divorce specified in these various enactments are an inte- resting commentary on contemporary manners,

These experiments in divorce legislation display anxiety to regulate the relationship of marriage as a purely civil institution, with a view mainly to public decorum and the comfort of individuals. When marriage had manifestly failed it was no longer worth preserving, and it had failed when either of the parties showed a desire to withdraw from the alliance. At the same time an innocent party must be protected against the caprices of an unjust spouse, and such protection was sought by the device just described. It is a remarkable illustration of the Roman view of marriage that, in view of what must have been the great social evil of capricious divorce, the right of either party to dissolve the marriage was never successfully questioned.

From the pure Roman to the canon law the change is great indeed. Theceremony becomes sacred, the tie indissoluble. Those whom God hath joined let not man put asunder, was the first text of the new law of marriage, and against such a prohibition social convenience and experience pleaded in vain. While marriage once created became indissoluble, the impediments to marriage also multiplicd. The canon law annulled a marriage ab initio for causes which we should now consider wholly inadequate. The tie of consanguinity was extended to the eighth generation ; and affinity, it was held, might be established by adulterous intercourse with- out marriage. The power of dispensing with canonical disabilities, and the power of annulling marriage on the ground of such disabilities, belonged to the church, and were important aids to its influence in society. In countrics which have embraced the doctrines of the Reformation, a relaxation of the law of divorce has generally followed the changes of religion—whether immediately, as in Scotland, or indirectly, as in England. In Roman Catholic countries the theory of the canon law still rules.

The history of divorce in English law is particularly in- teresting. Down to the passing of the Divorce Act of 1858, the theory of the law of England was the same as the theory of the Roman Church, There were attempts during the period of the Reformation to introduce a greater licence of divorce, and in the Ieformatio Legum Ecclesiasts- carum (a code of ecclesiastical law projected by a royal commission, but never enacted) the leaders of the Reformation sanctioned principles which would even now be considered liberal. Divorce was to be granted for adultery, and the innocent spouse was to be permitted to Marry again. Other grounds for divorce were specified, such as desertion and continued absence, and savageness of temper, Separation a mensa et toro was to be superseded by this more complete remedy. And the more advanced Reformers advocated even greater liberty of divorce. The nature of their proposals, and the arguments by which they reconciled them with the language of Scripture, may be Studied in Milton’s tractate on the Doctrine and Discipline of Divorce, addressed to the Parliament of England. But the jaw remained unchanged. The constitution of marriages belonged to the jurisdiction of the ecclesiastical courts, The tie was indissoluble. The marriage, indeed, might be declared null and void in certain cases, €.9., where the parties were within the prohibited degrees of consanguinity or affinity. This proceeding

was not a dis- Solution of marriage so much as a declaration that no real marriage had taken place between the parties. Divorce a mensa et thoro was granted for adultery and cruelty. Here the marriage, being originally good, was not dissolved, but a separation was ordered either for a limited or an indefinite time. The spouses were not permitted to marry again. But while the law remained unchanged, the practice of granting complete divorces by private Acts of Parliament had come into existence. The legislature did in particular tases that which it refused to do by a general law. Two conditions were in general necessary to satisfy Parliament.

Ist, A divorce a mensa et thoro had to be obtained from the ecclesiastical court. 2d, An action for damages had to be brought against the adulterer in the civil court for criminal conversation. The latter was not absolutely necessary, and appears to have been regarded as a safeguard against divorce being granted to persons who had connived at the acts of adultery, or had themselves been guilty of miscon- duct in the marriage state. The passing of these Acts through Parliament became a matter of as much formality as a proceeding in an ordinary law court. The two Houses passed standing orders on the subject, under which bills on divorce were argued before the law lords by professional advocates, and generally neither the House of Commons nor the lay lords interfered. By this characteristic evasion, the law of England completely changed its practice while still maintaining its ancicnt theory of divorce. Probably the anomalous character of the remedy might not have brought about a change but for the great practical evil of the expense attending the proceedings. Three suits— ecclesiastical, civil, and parliamentary—were necessary. Divoree became a remedy for the rich. The poor were driven to bigamy.! Yet it was not until 1857—and not then without determined resistance—that this disgraceful state of things was changed. A commission appointed in 1850 recommended the establishment of a regular court for divorce, and that divorce should be granted for the wifc’s adultery but not for the husband’s unless aggra- vated by other offences. Bills constructed on these prin- ciples were introduced into Parliament, and successively abandoned or lost, until in 1857 the ministry of the day by great exertions carried the bill which is now the Act of 20 and 21 Vict. c. 85. Notwithstanding the hostility it excited, the bill proposed

little more than a consolidation of jurisdictions ; and proceedings in the Divorce Court have now, with few exceptions, the same object and result as the former proceedings in Parliament and in the civil and ecclesiastical courts. The action for damages for crim, con. is represented by the adultcrer being made a party to the husband's suit. Full divorce is granted on the principles usually recognized by the House of Lords ; and the other remedies are such as might formerly have been granted by the ecclesiastical court.

The following statement embraces the most important provisions of the Act :—

All jurisdiction in matters matrimonial (.¢., in respect of divorces amensa et thoro, suits of nullity of marriage, of jactitation of marriage, for restitution of conjugal rights, &c.), shall cease to he so exercisable, and shall in future be exercised by a new court, to be called the "Court for Divorce and Matrimonial Causes," The Lord Chancellor and other judges are named as members of this court, along with the judge of the new constituted Court of Probate, who is to be the judge ordinary of the new court. Divorce a mensa et thoro is under that name abolished, but a new remedy called judicial separation is introduced, whieh shall have the same effect, and such other legal effect as in the Act mentioned. This remedy may be obtained by either husband or wife, on the ground of adultery or cruelty, or desertion without cause for two years and upwards. At the same time it is provided that a wife descrted by her husbarid

may apply to a police magistrate or justice of the peace for a pro- teetion order, by which her earnings and property acquired since the

1 The satirical address of Mr Justice Maule to a poor man convieted of bigamy, in 1845, put the absurdities of the existing law in a way not likely to be forgotten. The prisoner's wife had robbed him and run away with another man. ‘‘ You should have brought an action," he told him, ‘‘and obtained damages, which the other side would probably not have been able to pay, and you would haye had to pay your own eosts, perhaps a hundred or a hundred and fifty pounds. You should then have gone to the ecclesiastical courts, and obtained a divorce a mensa et thoro, and then to the House of Lords, where, having proved that these preliminaries had been

complied with, you would have been enabled to marry again. The expense might amount to five or six hundred or perhaps a thousand pounds. You say you are a poor man. But I must tell you that there is not one law for the rich and another for the poor,”

commencement of the descrtion may be protected from her husband and his creditors, and belong to herself as if she were an unmarried woman. In all cases except dissolution of marriage, the divorce court shall act on ‘‘ principles and rules which in the opinion of the gaid court shall be as nearly as may be conformable to the principles and rules on which the ecclesiastical courts have heretofore acted,” subject of course to the rules and orders under the Act. Where a decree of separation has been obtained, in the absence of the husband or wife, as the case may be, it may be reversed on proper cause shown. In the case of judicial separation, the wife shall be treated in respect of any property she may acquire as if she were an unmarricd woman ; on her death it will descend as it would have done if her husband were dead; and should she again cohabit with her husband, any property she may be entitled to shall be held to her separate use, subject to any agreement she may have made with her husband when separated. So also a judicially separated wife should be treated as an unmarried woman for pur- poses of contract and in civil proceedings generally. The most important section of the Act is that under which a marriage may be dissolved. ‘‘It shall bo lawful for any husband to present a petition to the said court praying that his marriage may be dis- solved on the ground that his wife has since the celcbration thereof been guilty of adultery ; and it shall be lawful for any wife to pre- sent a petition to the said court, praying that her marriage may be dissolved, on the ground that since the celebration thereof her husband has been guilty of incestuous adultery, or of bigamy with adultery, or of rape, or of sodomy, or bestiality, or of adultery coupled with such cruelty as, without adultery, have entitled her toa divorce a mensa et thoro, or of adultery coupled with desertion without reasonable excuse for two years and up- wards.” Incestuous adultery includes adultery committed with a woman within the prohibited degrees of consanguinity and aflinity. Ona husband’s petition for divorce the alleged adulterer must be made a co-respondent, unless the court permits otherwise, and one of the

parties may insist on trial byjury. And thecourtistotake special care to satisfy itself, not only as to the fact alleged, but as to the existence of anything like connivance or condonation on the part of the petitioner ; and it shall inquire at the same time into any counter charge made against the petitioner. When the court is not satisfied as to the facts, or finds connivance or eondonation or collusion, the petition must be dismissed. If the court is satisfied on these points, a decree dissolving the marriage may be pronounced; but the court shall not be bound to produce such decree, if it finds that the petitioner has been guilty of adultery, or unreasonable delay in prosecuting the suit, or of cruelty, or desertion, or such neglect and misconduct as has conduced to the adultery. The court may decree the payment of alimony by the husband to the wife. The husband may in his petition clain: damages against the co-respondent, and such claim shall be tried aceording to the same or like rules and regulations as actions for criminal conversation at common law, and the damages shall in all cases be ascertained by a jury ; but the court has power to direct the application of the damages, in whiole or part, to the benefit of the children of the marriage, or the maintenance of the wife. And the co-respondent, if the case is established against him, may be ordered to pay the whole or any part of the costs. In proceedings for judicial separa- tion, or nullity or dissolution of marriage, the court may make interim or final orders as to the custody and maintenance of the children. Questions of fact may be tried before the court itself or a jury, or issues of fact may be directed by the common law court. Every petitioner in a case of judicial separation, nullity, dissolution, or jactitation of marriage, must file an affidavit verifying his petition, and stating that there has been no eollusion. In any case of divorce or judicial separation for wife’s adultery, the court may order the settlement of any property to which the wife may be entitled, for the benefit of the innocent party or the children of the marriage. Appeals may be made from the. judge ordinary, within three months, to the full court, and from that court to the House of Lords. By the 57th section, after a dissolution of marriage, “it shall be lawful for the respective parties thereto to marry again, as if the prior marriage had been dissolved by death.” Here follows a singular compromisc, marking the conflict of opinions through which the Act had to pass. No clergyman of the United Church of England and Ircland shall be compelled to solemnize the marriage of any person whiose former marriage has been dissolved on the ground of his or her adultcry, or shal] be liable to

any penalty for refusing todo so. Butany niinister of a church or chapel so refus- ing to solemnize the marriage of persons who would otherwise have been entitled to have the service performed in such church or chapel shall permit any other clergyman of the same diocese to Pee sucli marriage in such church or chapel. The common aw aetion for criminal conversation is abolished.

Acts amending the Divorce Act were passed in 1858, 1859, 1860, 1864, 1866, 1868, and 1873. The Amendment Act of 1859, by a most unhappily worded section, gives power to the court, after a decree of nullity or dissolution, to revise the marriage settlements, and apply the property to the bencfit of the ‘‘children of the marriage or

their respective parents.” It has been held that the court has no power to alter settlements unless there are children of the inalriage alive at the date of the order. ‘his Act also makes husband and wife competent and compellable to give evidence touching cruelty or desertion in a wife’s petition for dissolution of marriage.

The Act of 1860 contains the following important clause (§ 7). ‘* Every decree for a divorce shall in the first instance be a decree, nist, not to be made absolute till after the expiration of such time, not less than three months from the pronouncing thereof, as the court shall by general and special order from time to time direct, aud during that period any person shall be at liberty to show cause why the said decree should not be made absolute, by reason of the same having been obtained by collusion, or by reason of material facts not having been brought before the court ; and on cause being so shown, the court shall deal with the case by making the deeree absolute, or by revising the decree nisi, or by requiring further inquiry or otherwise as justice may require ; and at any time during the progress of the cause, or before the decree is made absolute, any person may give information to her Majesty’s proctor of any matter material to the due decision of the ease, who may thereupon take such steps as the attorney-general may deem necessary or expedient ; and if from any such

information or otherwise the said proctor shall suspect that any parties to the suit are, or have been, acting in collusion for the purpose of obtaining a divorce contrary to the justice of the case, he may, under the direction of the attorney general, and by leave of the court, intervene in the suit, alleging such case of collusion, and retain counsel and subpcena witnesses to prove it." This clause isa most important addition to tlie securities against collusive suits provided by the earlier Acts. The period of three months has been extended to six by the Act of 1866. These sections have been extended by the Act of 1873 to cases of nullity of marriage. The other provisions of the various amending Acts do not call for notice here.

One or two points in the above summary may be further explained. The greater favour shown to husbands' petitions for divorce than to wives' follows with tolerable closeness the principles on which the House of Lords acted in passing private bills. The reason why the adultery of the husband is considered a less serious offence than the adultery of the wife will be obvious to every one. Asa matter of fact, wives' bills for divorce before Parliament were comparatively few, and some circumstance of aggravation was required. The first divorce granted to a wife by Parliament was in Addison's case in 1801, and the decision was mainly brought about by the masterly speech of Lord Thurlow. It may be added that Parlia- mentary bills for divorce were not common until the 18th century. After the accession of the house of Hanover they became frequent.

The right to a divorce or separation on any of the grounds mentioned may be avoided by conduct on the part of the petitioner amounting to what is called condonation, or forgiveness, e.g., if after the offence complained of the parties resume cohabitation. But the offence condoned may be revived, that is, the original right to sue thereon may be restored by a repetition of the offence. Thus a new act of adultery will revive a condoned adultery. So with an act of cruelty. It was also held in the ecclesiasti- cal courts, and appears to be the law, that cruelty would revive adultery, and vice versa. The question then arose whether an act of cruelty could revive an old condoned act of adultery, or vice versa, so that the two might be pleaded together by the wifc in support of her petition for dissolu- tion of marriage. The remedy may also be barred by the connivance of the petitioner, ¢.e, his consent, express or implied, to the adultery of the spouse ; and also by

collusion, t.€., 2 conspiracy between the parties, or between one. of them and a third party, to obtain a sentence of divorce or separation. The mere fact that both parties desire the same end is not of itself collusion. But where they combine to bring about the offence, or to produce evidence from which the offence may be inferred, or to deceive the court by the suppression of material facts or otherwise, they are guilty of collusion. Recrimination under the old ecclesiastical law is where the respondent retorts by imputing to the petitioner conduct similar to

that complained of. He must come into court with clean hands ; and if he has himself been guilty of adultery he cannot obtain a sentence against his wife for adultery. Recrimination ought strictly to be of an offence of the saine nature as the one complained of ; the petitioner is said to have compensatio im eodem delicto. But under the 3lst section of the new Act above referred to, adultery, cruelty, unreasonable delay, desertion, and misconduct conducing to adultery are made discretionary bars to divorce,—that is, if they are proved, the court is not bound to proaounce the sentence of dissolution which would otherwise follow on proof of the respondent's adultery. In arecent case, where the respondent had previously obtained a decree of judicial separation on the ground of desertion, the husband's petition for dissolution of marriage on the ground of the wife's adultery was rejected by the court.

The matrimonial suits inherited by the Divorce Court from the old ecclesiastical courts are those for nullity of marriage, for restitution of conjugal rights, and for jactita- tion of marriage. These suits must be decided according to the principles of the canon law as administered in the English ecclesiastical courts. A marriage will be declared null ad citio when the requisites of a legal marriagé have not been complied with. The alleged defect must have existed at the tinie of the celebration of the marriage. The formal requisites are (L) that the marriage should be celebrated in pursuance of a special licence, ordinary licence, publication vf banns, superintendent-registrar's licence or certificate, in the presence of a person in holy orders, or a registrar; and (2) in a parish church or public chapel, or superintendent- registrar's office, or in some building registered for the

solemnization of marriages, except when solemnized by special licence (see MarriaGe.) These rules only apply to marriages in England, and a marriage is void only when the requisites are deficient, and known to both parties to be deficient, at the time of the ceremony. The two other requisites apply to all marriages, and if they are wanting the marriage is absolutely void :—(1), The marriage must be between single persons, not being within the prohibited degrees of consauguinity and affinity, and who are (2) con-seuting and of a sound mind, and able to perform the duties of matrimony, The " prohibited degrees " are those set forth in the common prayer book, and extend to illegitimate as well as legitimate relations. The ecclesiastical courts hat been in the habit of annulling such niarriages previous to the 5 and 6 Will. IV. c. 54, and until so annulled, in the lifetime of the parties, they were regarded as voidable only, and not void. That enactment, however, while ordering that marriages already celebrated " between persons within the prohibited degrees of affinity" shall not be annulled for that cause only by the ecclesiastical courts, goes on to declare that all marriages which shall thereafter "be celebrated between persons within the prohibited degrees of consanguinity and affinity shall be absolutely null and void to all intents and purposes whatever." As to the second requisite, fraud, force, or duress, showing the absence of consent, will make void the marriage. Insanity at the time of the marriage has the same effect. A marriage may also be annulled for bodily incapacity existing at the time of the marriage, and proved to be incurable.

In a petition for restitution of conjugal rights, the marriage must be proved, and it must be shown that the respondent has withdrawn without reasonable cause from cohabitation with the other spouse. The court can ouly order husband and wife to live under the same roof. The petitioner will be refused a decree for restitution if he has himself committed any matrimonial offence which would be a ground for judicial separation.

Jactitation of marriage is when "one party boasts or gives out that he is married to the other, whereby a common

reputation of their marriage may ensue." Suits for jactita- tion are not now common. 'The only remedy of the court is to decree perpetual silence

against the jactitator.

Scotch Law.—Divorce for adultery has been recognized in Scot- land since the Reformation. It appears not to have becn intreduced by any statute, but to have been assumed by the post-Reformation judges as the common law. In another point the law of Scotland is in advance of the law of England. Divorce for adultery is com- petent to either spouse. Malicious descrtion is also a ground for divorce. This was enacted by a statute of 1578, c. 55. A previous action of adherence was formerly necessary, but is now abolished by the Conjugal Rights Act 1861 infra. Recrimination is no bar to an action for divorce in Scotland, but any ground which would satisfy a decree of judicial scparation would have been a defence to the old action for adhcrence. Judicial separation is granted for cruelty and adultery; the party injured by the adultery of the other spouse may choose either judicial separation or divorce. The cruelty required to justify judicial separation must, asin England, be of a somewhat aggravated character. Divorce in Scotland had the effect of remitting the parties to the status of unmarried persons. The law, however, made oneexception. A divorced person was not allowed to marry the paramour, at all events if the paramour was named in the decree, and for this reason the name of the paramour is some- times omitted, so that the parties may be allowed to marry if they wish.

By the Conjugal Rights (Scotland) Amendment Act 1861, pro- visions similar to those of the Knglish Divorce Acts were established. A deserted wife may apply to the Court of Scssion for an order to protect any property which she has or may acquire by her own industry, or may succeed to ; and such order of protection, when made and intimated, shall have the effect of a decree of separation a mensa et thoro in regard to the property rights and obligations of the husband and of the wife, and in regard to the wife’s capacity to sue and be sued. When a wife obtains a decrce of scparation a mensa et thoro, all property she may acquire shall be considered as property belonging to her, in reference to which the husband’s jus maritté aud right of administration are excluded; she may dispose of itin all respects as if she were unmarried, and if she dies intestate it will pass to her heirs and representatives, as if her husband had been dead. A wife so separated shall be capable of entering into obligations, and of suing and being sued, as if she were not married, and the husband shall not be liable for her

obligations, &c., except when separation aliment has been ordered to be paid to the wife, and remains unpaid, in which case he shall be liable for her neces- saries. In a husband's action for adultery, the alleged adulterer may be cited as co-defender, and the expenses of process taxed as between agent and client may be charged upon him if the adultery is proved. The co-defender may be examined as a witness, and he may be dismissed from the cause, if the court is satisfied that such a course is conducive to the justice of the case. The Lord Advocate may enter appearance in any action of nullity of marriage or divorce. In any consistorial action, the summons shall be served personally on the defender when he is not resident in Scotland, but if the court is satisfied that he cannot be found, edictal citation will be sufficient, provided that the pursuer shall also serve the summons on the children and the next of kin of the defender other than the children, when they are known and resident within the United Kingdom, and they, whether they are cited or so resident or not, may appear and state defences tothe action. By sect. xi. it shall not be necessary prior to any action of divorce to institute against the defender any action of adherence, nor to charge the defender to adhere to the pursuer, nor to denounce the defender, nor to apply to the presbytery of the bounds or any other judicature to admonish the defender to adhere. Proofs in consistorial actions are in future to be taken before the Lord Ordinary. Consistorial actions are defined in the Act as including actions of declaration of marriage, of nullity of marriage, and of legitimacy and bastardy, actions of separation a mensa et thoro, of divorce, and of adherence and of putting to silence, and actions of aliment between husband and wife instituted in the court of session.

United States.—The matrimonial law of England, as at the time of the declaration of independence, forms part of the common law of the United States. But as no ecclesiastical courts have ever existed there, the law must be considered to have been inoperative. There is no national jurisdiction in divorce, and though it is competent to Congress to authorize divorces in the Territories, still it appears that this subject like others is usually left to the territorial legislature. In the different States, as in England, divorces were at first granted by the legislatures, whether directly or by granting special authority to the tribunals to deal with particular cases. his practice has, it appears, fallen into general disrepute, and by the constitution of some States legislative divorces are expressly prohibited. Apart from such express

prohibitions, it has heen contended that legislative divorces are debarred by general clauses in the constitution of the United States, or in the constitution of particular States. Thus the con-

stitution of the United States says that no State shall pass a law impairing the obligation of contracts, and it has been argued that this clause prohibits legislative divorces. Bishop states that it ‘‘is settled law that legislative divorces are not invalid as impairing the obligation of contracts.’ Again, some States forbid their legislatures to pass any retrospective laws ; and legislative divorce, it has been said, is of the nature of a retrospective statute, and authority on that point seems to be divided. Again, in some States it is contended that a legislative divorce is an infringement of the judicial power, and therefore unconstitutional. The judicial practice throughout the States is to confer jurisdiction in divorce on the courts of equity, to be administered in gencral accordance with the ordinary rules of equity practice. Each State of course determines for itself the causcs for which divorce may be granted, and no general statement of the law can be made. In most States it appears to be allowed, not only for adultery, but for cruelty, wilful desertion, and habitual drunkenness. In New York divorce is allowed only for adultery ; in South Carolina not for any cause ; in some other States for causes to be determined by the court in the exercise of its discretion. South Carolina, says Bishop (Marriage and Divorce, 1873), is the only State in which no divorce, legislative or judicial, has ever for any cause been granted; and he quotes judicial testimony to show that the effect of this state of things is to bring about a partial recognition of concubinage. The proportion of his goods which a married man tay leave to his concubine has in fact been fixed by statute. Among the less usual grounds for divorce which lave been recognized in particular States, habitual drunkenness has been mentioned above, which has been defined to be a fixed habit of drinking to excess, to such a degree as to disqualify a person from attending to his business during the principal portion of the time usually devoted to business. In Kentucky the offence must be accompanied with a wasting of his estate, and without any suitable provision for the wife and children. Gross neglect of duty, and more at neglect or refusal to maintain his wife on the part of a husband having ability to do so, are in some States grounds of

divorce. In New Hampshire, if either spouse joins a socicty believing the relation of husband and wife to be unlawful, and accordingly refuses cohabitation for three years, that is a sufficient ground of divorce, and ‘‘the Shakers” have been held to be such a society. In the same State ‘‘to be absent and not heard of” for three years is ground for divorce. Conviction for crime is a tolerably commonground. ‘Gross misbehaviourand wickedness,” and “‘offer- ing indignities to the wife so as to render her condition intolerable and her life burdensome,” are also specified causes of divorce in some States. In Missouri and North Carolina it has been held under such a clause that a false accusation of adultery brought by the husband against the wife was a valid ground for divorce ; and in Missouri, where the court subsequently held that the statute con- templated indignities to the person only, and not to the mind (as in the case of a false charge), the State legislature amended the statute by specifying as a cause for divorce ‘the offering such indignities to the other as to make his or her condition intolerable.” The effect of this diversity of jurisdictions in producing a conflict of laws is noted below.

France.—Freedom of divorce was one of the short-lived results of the French Revolution. The code civil (1803) allowed divorce and judicial separation, although then the advocates of free divorce appear to have desired the exclusion of the latter remedy. The husband might demand divorcee for adultery ; the wife for adultery when the husband has kept his paramour in the conjugal residence. Hither party might demand divorce for outrage, cruelty, or grave injuries (caces, sévices, ow injures graves), or on account of condem- nation to an infamous punishment. Divorce by mutual consent was also allowed, but under close restrictions as to the age of the parties, the duration of the marriage, the consent of relations, the protection of the children, &. No new marriage could be made by either party within three years of this divorce. Separation was also allowed as an alternative remedy, but not by consent. When sentence of separation has been pronounced against the wife for adultery, she shall be condemned, on the requisition of a public officer, to confinement in a house of correction for a period of not less than three months, and not more than two years, In 1816 the divorce clauses of the code civil were abolished, but judicial separation was retained. Subsequent attempts to restore freedom of divorce have been unsuccessful.

The law of divorce being thus different in different countries, while people are constantly moving from one country to another, there arises the juridical difficulty of the conflict of laws. A man born in one country, married in a second, and domiciled in a third, may there sue for a divorce on account of a matrimonial offence committed in a fourth. How is sucha case to be decided, and what will be the effect of the decision in other countries than that in which it was pronounced? It is in the jurisprudence of

England and Scotland, as Story points out, that such questions have been most satisfactorily discussed. On the Continent the prevalence of the canon law, and the in- difference of domestic tribunals to the opinion of foreign countries, have made these questions of less importance than they have been ‘with us. England and Scotland stand to each other legally in the relation of foreign countries, while socially and politically they are one country. On the fundamental question whether marriage can be dissolved or not they took, until the passing of the English Divorce Act, different sides. When an English marriage was brought before the Scotch courts on a matrimonial complaint, they dissolved the marriage, while the English courts after such a dissolution held that the marriage still subsisted in full force and effect. The House of Lords, which was at once the highest court of appeal in Scotch and in English law, may almost be said to have decided the same question in two different ways,—holding that by the Scotch law the dissolution was good for Scotland, and not denying that by the English law it was bad for England. The two cases on which this opposition of views was most distinctly brought out were Lolley’s case (1 Russell and Ryan) and Warrender v. Warrender (2 Clark and Finnelly). Inthe formercase a man was convicted for bigamy for marrying again after having had his English marriage dissolved by the Scotch courts for his wife’s adultery. The latter was an appeal to the House of Lords from the Court of Session asserting jurisdiction to decree divorce from an English marriage, and in the result it was held that the House of Lords in a Scotch case was bound to administer the law of Scotland, and that by the law of Scotland the jurisdiction was well founded. But the judgment in Lolley’s case was not overruled; and although English marriages are no longer indissoluble, it may be presumed that the principle of that case would be applied when an

English marriage had been dissolved in a foreign country for an offence not recognized as a valid ground of divorce in England. The following more recent cases may be noted as illustrating the attitude of English law towards foreign divorcees. When the marriage took place in England, but the parties never lived together, and the husband committed adultery, and afterwards by arrange- ment went to Scotland for the purpose of founding a juris- diction against himself, and the Scotch court pronounced a decree of divorce,—it was held that a Scotch marriage duly celebrated between the divorced wife and an Englishman did not give to the children of the marriage the character of lawfully begotten so as to enable them to succeed to property in England, So when A, an Englishwoman, married Bin Scotland, and was again married to him in Belgium, and afterwards a Belgian court pronounced a decree of divorce by mutual consent, it was held that A's subsequent marriage to C in England was null and void, and that the Scotch marriage was still valid and subsisting, Again, a petitioner whose original domicile was English, and who married in England, resided two years and a half in one of the United States, and then obtained a divorce from a competent court there for grounds recognized in England, but without personal notice to the husband, who had never been within the State, and whose domicile con- tinued to be English ; it was held that her re-marriage in America during the lifetime of her husband was invalid in England. Had the petitioner been legally domiciled in the State which granted the divorce it appears that the English courts could have recognized the decree. In this class of questions may be placed those which have arisen as to the jurisdiction of the court. Here four points are mentioned in the English text-books as material, viz., allegiance, the place of marriage, the place of domicile, and the place of the delictum (sce Domicizz.) The court

has asserted its jurisdiction in the following cascs :—when the allegiance and the place of marriage were English, the locus delicti and domicile foreign ; when the allegiance and domicile were English, and the locus conétractus et delicti foreign. It has been held that the court can inquire into the validity of a marriage in England between foreigners domiciled abroad at the time of the marriage. And when the marriage had been solemnized betwecn forcigners in a foreign country, and the wifc committed adultery

abroad, the court held itself entitled to dissolve the marriage on the petition of the husband then domiciled in England. And in an Irish case it was held that the domicile of the husband will sustain the jurisdiction of the court over the wife though marricd abroad, always after marriage resident abroad, and accused of adultery committed abroad. Questions of this sort have frequently ariscn in American jurisprudence. The different States are to each other in the matter of divorce as foreign countries. The learned writer to whom we have alrcady referred (Bishop, Marriage and Divorce) formulates the following propositions :—1. The tribunals of a country lave no jurisdiction in divorce, wherever the offence may have occurred, if neither of the parties has an actual bona fide domicile within its territory; 2. It is sufficient for one of the parties to be domiciled in the country; both need not be, ncithcr need the citation where the domiciled party is plaintiff be served personally on the defendant, if such personal serviec cannot be madc; 3. The place wherc the offence was committed is immatcrial; 4, The domicile of the partics at the time of the offence is immaterial ; 5. It is immaterial under what system of divorce Jaws the marriage was celebrated. The author holds that the foregoing doctrines are not in conflict with the United States constitution, but that they are made binding by that constitution on the tribunals of all the States. It has been pointed out, however, that the fourth proposition has been denicd by the courts of Pennsylvania and New Hampshire, which hold that only the courts of that country where the parties were domiciled when the offence was committed have jurisdiction to dissolve marriage for such offence. Bishop finally holds that “if a court has jurisdiction in a divorce cause, valid according to the law of the State in which it is taken, and not obnoxious to principles of inter-State comity, and it pronounces a divorce, it is binding on all the other States of the Union. If there was the domicile necessary to give the jurisdiction, and the defendant appeared to the suit, then the judgment would be everywhere in our country of absolute forec, both as to the status of marriage and as to alimony and other like property rights. If the plaintiff only had a domicile, and there was no notice to the defendant within the juris- diction, then the decrce could affect only the plaintiff’s status of inarriage.” (E. RB.) DIXMERIK, Nicotas DE LA. See La DIXMERIE. DIXON, GrorcE (1755-18001), an English navigator, born in 1755. He served under Captain Cook in his third expedition, during which he had an opportunity of learning the commercial capabilities of the north-west coast

of America, and was thus prompted to the expedition in con- nection with which his own name is celebrated. After his return from Cook's expedition he became a captain in the royal navy. In 1785 he offcred his services to the King George's Sound Company of London in making a minute exploration of the north-west coast of America. His offer having been accepted, he set sail in the autumn of that year in command of the " Queen Charlotte,"—a companion ship, the "King George," being under the command of Captain Portlock. The voyage resulted in the discovery of numerous small islands, ports, and bays, of which Queen Charlotte's Island, Port Mulgrave, Norfolk Bay, and Dixon's Archipclago may be named as the most important.

From North Anicrica he sailed to China, where he disposed of his cargo. He returned to England in 1788. In the following ycar he published an account of his voyage, entitled A Voyage round the World, but more particularly to the North-West Coast of America, the bulk of which con- sists of descriptive letters by William Beresford, his super- cargo. His own contribution to the work included valuable charts and appendices. In 1791 he published The Navigator's Assistant. He died about 1800.

DIZFUL, or Desrut, formerly known as Anda-el-Misk, a town of Persia, in the province of Khuzistan, 36 miles north-west of Shuster, on the right bank of the Shat-el-Diz, or Abzal, a tributary of the Karun, and there crossed by a fine bridge of twenty arches, the lower part of which is of ancient workmanship. It is the principal market of the province, and lics in a fertile district, productive of oranges, lemons, and indigo. 'The whole vicinity is full of the remains of ancient canals and buildings, which afford con- clusive proof of former importance; and Mr Layard identified the spot with the castle of Lethe, or Oblivion, in which Shapur imprisoned the Armenian monarch Arsaces I]. The popular identification of the ruins to the east with Jundi Shapur he regarded asa mistake. Popula- tion about 15,000.

DMITRIEFTF, Ivan Ivanovitrcu (1760-1837), a Russian statesman and poct, was born at his father's estate in the government of Simbirsk. In consequence of the revolt of Pugacheff, the family had to flee to St Petersburg, and there Ivan was entered at the school of the Semenoff Guards, and afterwards obtained a post in the military service. On the

accession of Paul to the imperial throne he quitted the army with the title of colonel; and his appointment as procurator for the scnate was soon after renounced for the position of privy councillor. During the four years from 1810 to 1814 he served as minister of justice under the cmperor Alexander ; but at the close of this period he retired into private lifc, and though he lived more than twenty ycars, he never again took office, but occupied himself with his literary labours and the collection of books and works of art. In the matter of language he sided with Karamsin, and did good service by his own pen against the Old Slavonic party. His poems include songs, odes, satires, tales, epistles, &c., as well as the fables—partly original and partly translated from Fontaine, Florian, and Arnault — on which his fame chiefly rests. Several of his lyrics have become thoroughly popular from the readiness with which they can be sung ; and a short dramatico-epic poem on Ycrmak, the Cossack conqueror of Siberia, is well known. His writings occupy three volumes in the first five editions; in the 6th (St Petersburg, 1823) there are only two. His memoirs, to which he devoted the last years of his life, were published at Moscow in 1866.

DMITROFF, a town of Russia, in the government of Moscow, 45 miles due north of the city of that name, in 56° 21’ N. lat. and 37° 31’ E. long., near the river Yakhroma, a sub-tributary of the Volga. Besides the Cathedral of the Assumption and Paraskene, an ancicnt building originally erected as a nunnery, it possesses seven churches, a monastery, a hospital, an almshouse, and factories for the manufacture of silk, wool, and cotton. The inhabitants also cultivate market-gardens for Moscow, and carry on a moderate trade in grain. The existence of Dmitroff is duc to the grand-duke George Vladimirovitch, who happening, during his exile from Kieff, to receive on the spot thc news of the birth of his son Demetrius, cclebrated the event by founding the city and assigning it as an apanage for his child. Demetrius continued in possession till he was himself called to the grand-ducal dignity in 1177. In 1304 the town was the seat of a

ducal diet ; in 1656 it was visited by a terrible pestilence ; and in the Polisl-Lithuanian invasion it witnessed the defeat of Sapieha by Prince Ivan

Karukin. Population in 1873, 8042.

DMITROVSK, a town of European Russia, in the government of Orel, near the Nerusa, a sub-tributary of the Dnieper, about 57 miles sonth-west of the town of Orel, in 52° 30’N. lat. and 35° 4’ 9” E, long. It consists of about 700 wooden houses, has four churches and a hospital, manufactures soap, and deals in grain, hemp, linseed oil, and tallow. Dmitrovsk was founded by Demetrius Cantemir, the hospodar of Moldavia, who in 1711 received from Peter I. the district in which it stands in compensation for the loss he had sustained in Moldavia ; and its first inhabitants cousisted of Malo Russian and Wallachian immigrants. Population, 7600.

DNIEPER, the Borysthenes of the Greeks, Danapris of the Romans, Uzi of the Turks, Eksi of the Tatars, Elice of Visconti’s map (1881), Lerene of Contarini (1437), and Luosen of Baptista of Genoa (1514), is one of the most important rivers of Europe, ranking after the Volga and the Danube. It belongs to Russia, and takes its rise in the government of Smolensk, in a swampy district at the foot of the Valdai Hills, not far from the sources of the Volga and the Dwina, in 55° 52’ N. lat. and 38° 41’ E. long. Its length is about 11,000 miles, and it drains an area of 242,000 square miles, which supports a population of upwards of twelve million inhabitants. In the first part of its course, which may be said to end at Dorogobush, it flows through an undulating country of Carboniferous for- mation ; in the second it passes west to Orsha, south through the great fertile plain of Kisheneff and Chernigoff, and then south-east across the rocky steppe of the Ukraine to Ekaterinoslaff. About 45 miles south of this town it has to force its way across the same granitic offshoot of the Carpathian Mountains which interrupts the course.of the Dniester and the Bug, and for a distance of about 40 miles rapid succeeds rapid. The whole fall of the river in that space is 155 feet,—the greatest of the ten distinctly marked rapids, that at Nenasitetz, having an average of 3 inches in every 50 feet, and the smallest, or the Leshni Porog, about igths of an inch in the same distance. The river having got clear of the rocks continues south-west through tlle grassy plains of Kherson and Tauris, and enters the Black Sea by means of a considerable estuary in 46° 21’ N. lat. and 32° 20’ E. long. The navigation of the Dnieper extends as far up as Dorogobnsh, where the depth is about 12 feet, and rafts are floated down from the higher reaches. About the town of Smolensk the

breadth is 455 feet, at the confluence of the Pripet 1400, and in some parts of the Ekaterinoslaff district as much as 7000. In the course above the rapids the channel varies very greatly in nature and depth, and it is not unfrequently inter- rupted by shallows, no fewer than 55 being counted in the Kieff government alone. The rapids, or porogs, form a ‘serious obstacle to navigation ; it is only for a few weeks, when the river is in flood, that they are passable, and even then the ventnre is not without risk, and can only be un- dertaken with the assistance of the special pilots, who to the number of 2000 or 3000 have established themselves at Lotmanskaya-Kamenka and other places in the neighbour- hood. As early as 1732 an attempt was made to improve the channel, and extensive operations have since been carried on from time to time. A canal, which ultimately proved too small for use, was constructed at Nenasitetz in me at private expense ; blastings were employed in 1798 4 mee at various parts by Generals Besh and Devolan ‘ in S05 2 canal was formed at Kaindatzki, and the channel rectified at Sursk ; by 1807 a new canal was completed at

Nenasitetz ; in 1833 9 passage was cleared through the

or Yampol Rapids.

DMI—DNI

Starokaindatzki Porog ; and in the period from 1843 to 1855 a whole series of ameliorations were effected. The result has been not only greatly to diminish the dangers of the natural channel, but also to furnish a series of artifi- cial canals by which vessels can make their way when the water is too low in the river. Between 1852 and 1857, 277 vessels and 674 rafts passed the rapids annually ; and only 4 of these vessels came to grief. Within recent years the water in the river has been unusnally low, but it is expected that the draining of the Pinsk marshes may remedy the evil. Of the tributaries of the Dnieper tlle following are navigable,—the ~~Berezina and the Pripet from the right, and the Merea and Sozh and the Borona and Desna from the left. Inthe upper parts of the river the fisheries are not of sufficient importance to consti~~ tute a separate occupation ; but in the estuary they attract a large concourse of people from the neighbouring govern- rents, and form almost the sole means of subsistence for the Swedish

colonists. At Kieff the river is free from ice on an average 267 days in the year, at Ekaterinoslaff 274, and at Kherson from 280 to 285.

DNIESTER, the Tyras of the classical authors, and the Turla of the Turks, a river of south-eastern Europe belong- ing to the basin of the Black Sea. It takes its rise on the northern slope of the Carpathian Mountains in the Sambor circle of Galicia, and belongs for the first 330 miles of its course to Austrian, for the remaining 600 to Russian terri- tory. In its excessive meandering it frequently almost returns to the same spot ; for example, while the actual distance from Turunchuk to Mayakoff is about 33 miles, the development of the river would require about 133. At the same time, as the average fall is from 25 to 26 inches in the mile, the current in most parts even during low water is pretty rapid, the mean rate per hour being calculated at 8638 feet. The average width of the channel is from 560 to 700 feet, but in some places it attains as much as 1400 feet ; the depth is various and changeable. The banks are usually about 3500 feet apart, but in certain reaches approach each other so as to leave room for nothing but the actual bed ; their average height above the water in the Bessarabian portion is 350 feet. ‘The principal interruption in the navigable portion of the river, besides the somewhat exten- sive shallows, is occasioned by a granitic spur from the Carpathians, and bears the name of the Yampolskie Porogi, For ordinary river-craft the passage of these rapids is rendered possible, but not free from danger, by a natural channel on the left side, and a larger and deeper artificial channel on the right; for steam-boats they form an insuperable barrier. The river falls into the sea by several shallow arms, of which the most important has a depth of only 24 feet near its mouth; but the Turunchuk, an independent stream, disemboguing in the neighbourhood, las a depth of 7 cr 8 feet, and is connected with the main channel of the Dniester by the Surovtzoff canal, so named after the merchant at whose expense it was constructed. There are two periodical floods in the river,—the first and greatest caused by the breaking up of the ice, and occurring in the latter part of February or in March; and the second, due to the melting of the snows of the Carpathians, and consequently taking place about June. The spring flood raises the level of the water 20 feet, and pours along so violent a curreut that large blocks of stone are drifted from their position ; towards the mouth of the river gardens and vineyards are submerged, and the surface of the stream measures from four to six miles across. In some

years the general state of the water is so low that navigation is pos- sible only for threeor four weeks, while in other years it is so high that navigation continues without interruption. Steam- boat traffic was introduced in the lower reaches in 1 840, when

the government vessel “ Prince Vorontzoff” began to make regular trips between Ovidiopol and Akerman ; and since that date it has acquired very considerable dimensions. The fisheries of the estuary are of some importance ; and the lakes which are formed by the inundations of the valley furnish a valuable addition to the diet of the people in the shape of carp, pike, and tench. The principal towns on the river are Sambor, Khotin, Mobhileff, Dubossari, Grigoriopol, Bender, Tiraspol, and Akerman ; its tributaries are numerous, but not of individual importance.

DOAB, or Dvas, or Dooas, a name, like the Greek Mesopotamia, applicable, according to its derivation (do, two, and ab, river), to the stretch of country lying between any two rivers, as the Baree Doab between the Sutlej and the Ravee, or the Reechna Doab between the Ravee and the Chenab, but frequently employed, without any distinctive adjunct, as the proper name for the region between the Ganges and its great tributary the Jumna. In like manner the designation of Doab Canal is given to the artificial channel which breaks off from the Jumna near Fyzabad, and flows almost parallel with the river till it reunites with it at Delhi.

DOBELL, Sypnzy (1824-1874), a distinguished English poet, born on the 5th of April 1824 at Cranbrook, Kent, was sprung from an old Sussex family, noted for its staunch loyalty in the struggle between the Cavaliers and Round- heads. His father, John Dobell, who wrote a pamphlet on Government, was a wine merchant at Cheltenham ; his mother was a daughter of Samuel Thompson, a famous political reformer. When Dobell was twelve years old, the family went to Gloucestershire ; and the poet, ever after, with occasional breaks, kept up his connection with the district. He was educated privately, and never attended either school or university. He refers to this in some precocious lines, in imitation of Chaucer, dating from his eighteenth year. In 1844 he married Emily Fordham, a lady of an old county family in Cambridgeshire. Chelten- ham was, for the most part,

his home in those early years, as his father's business had to be carried on; but the summer was often spent in the country. During this period his poetic vein flowed freely. He wrote a number of minor poems instinct with a passionate desire for political reform. Zhe Roman was also in progress, and was written mainly among the Cotswolds. It appeared in 1850, under the nom de plume of Sydney Yendys. Next year he travelled through Switzerland with his wife ; and, after his return, he formed friendships with Robert Browning, Philip Bailey, George Macdonald, Emanuel Deutsch, Lord Houghton, Ruskin, Holman Hunt, Mazzini, Tennyson, and Carlyle, and conducted an interesting correspondence with Charlotte Bronte. His second large poem, Balder, written partly at Coxhorne, partly among the Alps, and finished at Amberley Hall, appeared in 1854. The three following years were spent in Scotland—the winters in Edinburgh, the summers in the Highlands. Here he endeared himself to an entirely new circle, including Dr John Brown, Dr Hanna, Hugh Miller, Sir Noel Paton, Sir James Y, Simpson, and Professor and Mrs Blackie. Perhaps his dearest friend at this time was Alexander Smith, in company with whom he published, in 1855, a number of sonnets on the Crimean War, which were followed by a volume on England in Time of War. The delivery of an elaborate lecture on the " Nature of Poetry" to the Edinburgh Philosophical Institution, in April 1897, seriously injured Dobell's chest. Accordingly he spent the winters of the four following years in the Isle of Wight ; aud, after 1862, the winter generally found him on the Continent, the summer in Gloucestershire. On one occa- sion, while near Naples, he fell through a thin crust of earth into some underground works, to a depth of about

12 feet. This accident proved injurious to his health ; and, in 1869, a mare, which he was trying to break, fell and rolled over with him. After this he was, more or less, an invalid, and lived in Gloucestershire, preserving his admi- ration for natural beauty, his keen interest in public affairs, his sunny sweetness of temper, and deep religious feeling, till his death in 1874.

As a poet Dobell belongs to the " spasmodic school," as it was happily named by Professor Aytoun, who parodied its style in Firmilian. The epithet, however, was first applied by Carlyle to Byron. 'The school

includes the Rev. George Gilfillan, Philip James Bailey, Stanyan Bigg, Dobell, Alexander Smith, and, according to some critics, Gerald Massey. It is characterized by an under-current of discontent with the mystery of existence, by vain effort, unrewarded struggle, sceptical unrest, and an uneasy strain- ing after some incomprehensible end. It thus faithfully reflects a prevalent phase of 19th century thought, and con- sequently is a perfectly legitimate exercise of the muse. Poetry of this kind is marked by an excess of metaphor, which darkens rather than illustrates, and a general extra- vagance of language. On the other hand, it manifests a freshness and originality, and a rich natural beauty, not often found in more conventional writings. In this school Dobell shares with Bailey the foremost place; and his genius received early recognition from the Rev. George Gilfillan. He is possessed by his ideal of what a poet ought to be. An intensely earnest spirit pervades all his works ; and, like Milton and Wordsworth, he has no humour. We sometimes meet, in his writings, conceits and obscurities which remind us of Cowley and Donne ; and still oftener his intellectual subtlety, gorgeous imagery, and exquisite lyrics recall Shelley. The Homan, a poem dedicated to the interests of political liberty in Italy, is marked by pathos, energy, and passionate love of freedom ; and its clear vivid style enchains the reader throughout. His treatment of the Colosseum has been compared, not unfavourably, with Byron's. 'The faults of the work arise almost entirely from the author's embarrassment in dealing with his own riches. The drama, too, is overlaid with monologue, which is carried to such a dreary excess in Balder—a poem so intensely subjective as to fail utterly in human interest. The gloomy egotism of the moody hero wearies most readers, but is relieved, from time to time, by some of the finest descriptions of nature in English poetry, by Amy's exquisitely touching sougs, and by grander passages than any to be found in Zhe Roman. There is a distinct falling off, however, in purity of style. The purpose of Balder has been strangely misunderstood by many critics ; and some have actually identified the hero with the author. The object of the book is to show the evil moral effects of egotism and a lust for power ona man of genius. 'The pas- sage on Chamouni is unsurpassed even by Coleridge. Balder, still more than his other poems, manifests Dobell's wealth of thought, as well as the prodigal richness of his imagery.

England in Time of War is the most pleasing of Dobell's works, and allows his lyrical impulse full scope. The book is steeped in passion, and gives faithful and poetical, because thoroughly simple, expression to the feelings of many English hearts at the time. 'In all Dobell's poems a great fondness for alliteration is observable.

His chief prose writings have been collected and edited with an introductory note by Professor Nichol (Zhoughts on Art, Philosophy, and Religion. 'London: Smith, Elder, and Co., 1876.) The lecture on the " Nature of Poetry " is an elaborate disquisition, in which a perfect poem is defined as "the perfect expression of a perfect human mind." In his pamphlet on Reform, he maintains " that a just national representation is such as represents the nation at its efficient durable best." In his memoranda for

a projected play, the character of the cardinal is finely con- ceived. He is to have "no element not common to all men and no element as common to all men,—a life such as every man might lead but no man does lead,—in which the things done are not those which men do rarely, but the common acts of men done in a rare spirit." Dobell's prose writings are studded with such suggestive sentences as we have quoted. 'The singular truth of his observations of nature is well seen in his description of the "Symptoms ot the Dissolution of Night" (Zhoughts, p. 83.) "His prose style lacks simplicity, both in the individual words used and in the structure of the sentences. The classical element is much too prominent in his vocabulary In his religious views, Dobell was a Christian of the Broad Church type. Socially he was one of the most amiable and true-hearted of men. He will long be remembered as an admirable song-writer, a suggestive and original thinker, and an ardent lover of political liberty. The standard edition of his poems is edited by Professor Nichol of Glasgow University, who has prefixed to the work a beautifully written life. (tT. GI.)

DOBELN, a town of Saxony, in the circle of Leipsic, and 35 miles to the south-east of that town, standing partly on an island formed by the Mulde. It is the centre of a considerable corn trade. The. manufactures are cloth, cordwain and other leather, shoes, hats, belts lacquered tin ware, agricultural and weighing machines, and cigars, Population, 10,969 in 1875,

DOBERAN, or DozssEran, a market town of Northern Germany, in the grand duchy of Mecklenburg-Schwerin, about two miles from the shores of ‘the Baltic, and seven west of Rostock. Besides the ruins of a Cistercian abbey founded by Pribislav II. in 1173, and secularized in 1552, it possesses a church of the 14th century, which ranks as one of the finest in Northern Germany, a grand-ducal palace, a theatre, an exchange, and a concert-room. In 1793 Duke Frederick Francis caused the first seaside watering-place in Germany to be established on the neigh- bouring coast, at the spot where the Heiliger Damm, a great bank of rocks about 1000 feet broad and 15 feet high, stretches out into the sea and forms an excellent bathing ground. Though no longer so popular as in the early part of the century, it is still frequented. In the immediate neighbourhood of the town three mineral springs were discovered in 1829—one sulphurous, a second saline, and the third chalybeate. Population in 1875, 3866.

DOBRENTET, Gazor (i.c., Gaprrer) (1786-1851), an Hungarian philologist and antiquary, was born at Nagyszéllos in 1786. Je completed his studies at the universities of Wittenberg and Leipsic, and was afterwards engaged as a tutor in Transylvania. At this period lhe originated and edited the Hrdelyi Muzéum, which, not- withstanding its important influence on the development of the Magyar language and literature, soon failed for want of support. In 1820 Dobrentei settled at Pesth, and there he spent the rest of his life. He held various official posts, but. continued zealously to pursue the studies for which he had early shown a strong preference His great work is the Anctent Monuments of the Magyar Language (Régi Magyar Nyelvemlékek), the editing of which was intrusted to him by the Hungarian Academy. The first volume was published in 1838 and the fifth was in course of preparation at the time of his death. Débrentei was one of the twenty-two scholars appointed in 1825 to plan and organize, under the presidency of Count Teleki, the Hungarian Academy. In addition to his great work he wrote many valuable papers on historical and philological subjects, and many biographical notices of eminent Hungarians. These appeared in the Hungarian translation of Brockhaus’s Conversations-Lexikon, We translated into

Hungarian Afacbeth and other plays of Shakespeare, several of Schiller's tragedies, and Molitre's Avare, and wrote several original poems. His article on " Magyar Litera- ture" in the Conversations-Lextkon was translated into English. Débrentei does not appear to have taken any part in the revolutionary movement of 1848. He died at his country house, near Pesth, March 28, 1851.

DOBRIZHOFFER, Martin (1717-1791), a Roman Catholic missionary, whose fame is preserved by the historical interest and the literary character of his narrative, Born at Gratz, in Styria, he joined the Society of Jesus in 1736, and in 1749 proceeded to Paraguay, where for eighteen years, firs; among the Guaranis, and latterly among the Abipones, he continued with steadfast devotion and easy cheerfulness to discharge the difficult and hazardous duties of his profession. Returning to Europe on the expulsion of the Jesuits from South America, he settled at Vienna, obtained the patronage, or rather the friendship, of Maria 'Theresa, survived the extinction of his order, com- posed the history of his mission, and died on July 17, 1791. His history appeared at Vienna in 1784, in the author's own Latin, and in a German translation by Professor Krai] of the university of Pesth. Of the contents of the work some idea may be obtained from its extended title :—Historia de Abiponibus, Lquestri Bellicosaque Paraquarie Natione, locupletata Copiosis Barbararum Gentium Urbium, Kluminum, Ferarum, Amphibiorum, Insectorum, Serpentium preecipuorum, Piscium, Avium, Arborum, Plantarum aliarumque ¢jusdem Provineice Pro- prietatum Observationibus. The "lively singularity " and garrulous quaintness of the style could only be dis- played by lengthened quotation. In 1822 there appeared in London an anonymous (not altogether complete) transla- tion, which has not unfrequently been ascribed to Southey, but was really the work of Sara Coleridge, who, while still in her teens, had undertaken the task to defray the collego expenses of one of her brothers. To the youthful translator a delicate compliment was paid by Southey in the third canto of his Z'ale of Paraguay, the story of which was derived from the pages of Dobrizhoffer's narrative :—

'* And if he could in Merlin's glass have seen By whom his tomes to speak our tongue were taught,

The old man would have felt as pleased, I ween, As when he won the ear of that great Empress Queen.”

DOBROWSKY, Josren (1753-1829), one of the earliest and greatest of Slavonic philologers, was born of Bohemian parentage at Gjermet, near Raab, in Hungary. He received his first education in the German school at Bischofteinitz, made his first acquaintance with Bohemian at the Deutschbrod gymnasium, studied for some time under the Jesuits at Klattau, and then proceeded to the university of Prague. In 1772 he was admitted among the Jesuits at Briinn ; but on the dissolution of the order in 1773 Le returned to Prague to study theology. After holding for some time the office of tutor in the family of Count Nostitz, he obtained an appointment first as vice- rector, and then as rector, in the general seminary at Hradisch ; but in 1790 he lost his post through the aboli- tion of the seminaries throughout Austria, and returned as a guest to the house of the count. In 1792 he was com- missioned by the Bohemian Academy of Sciences to visit Stockholm, Abo, Petersburg, and Moscow in search of the manuscripts which had been scattered by the Thirty Years’ War; and on his return he accompanied Count Nostitz to Switzerland and Italy. His reason began to give way in 1795, and in 1801 he had to be confined in a Iunatic asylum ; but by 1803 he had completely recovered. ‘The rest of his life was mainly spent either in Prague or at the country-seats of his friends Counts Nostitz and Czernin ; but his death took place at Briinn, whither he had gone in

1828 to make investigations in the library. While his fame rests chiefly on his philological labours, his botanical studies are not without valne in the history of the science. The following is a list of his more important works ; and it will be observed that, dealing, as they do, with Slavonic subjects, they are all composed in Latin or German :—

Fragmentum Pragense evangelit S. Marei, vulgo autographi, 1778 ; a periodical for Bohemian and Moravian Literature, 1780- 1787 ; Seriptores Rerum Bohemicarum, 2 vols. 1783 ; Gesehichte der bihm. Sprache und dltern Literatur, 1792; Die Bildsamkeit der slaw. Sprache, 1799; a Deutseh-bihm. IWéorterbuch compiled in collaboration with Leschka, Puchmayer,

and Hanka, 1802-1821 ; Entwurf eines Pflanzensystems nach Zahlen und Verhiiltnissen, 1802 ; Glagolitiea, 1807 ; Lehrgebdiude der bihm. Sprache, 1809; Institutiones linguee slaviece dialectt veteris, 1822; Entwurf zu einem allgemeiner Etymologikon der slaw. Sprachen, 1813; Slowanka zur Kenntniss der slav. Literatur, 1814; and a critical edition of Jordanis, De Rebus Getieis, for Pertz's Monwmenta Germanic historiea. See Palacky, J. Dobrowsky's Leben und gelehrtes Wirken, 1833.

DOBRUDJA, or DosrupscHa, in Bulgarian Dobritch, is the district lying between the Black Sea and the lower reaches of the Danube, by which it is separated from Roumania, The southern part of its area of 2900 square miles is occupied by an irregular steppe stretching north from the Balkan range ; while the northern belongs to the alluvial tract produced by the action of the river. he predominant element in its heterogeneous population, which is estimated at 160,000, consists of the Tatars, whose num- bers have been greatly augmented by immigration since 1859 ; but there are also Turks, Bulgarians, Roumanians, Greeks, Armenians, Germans, and Jews, and all the various nationalities remain strikingly distinct, and usually occnpy more or less exclusively their separate settlements. The principal places in the Dobrudja are Rassova, Hirsova, Matchin, Isakcha, and Tulcha on the Danube; Babadagh towards the north, which was formerly regarded as the chief town of the district; Kustendji, Mangalia, and Beltchik on the coast; Basardjik towards the south and some distance inland; and, finally, the new Tatar city of Medjidia, which has sprung up since 1860 on the railway between Tchernavoda and Kustendji. The strategical importance of the Dobrudja was recognized by the Romans, who in the reign of Trajan built a line of fortifica- tious from the river near Rassova to the coast near Kustendji ; and in modern times it has been more than ouce utilized, especially during the Russian invasions of 1828, 1854, and 1877. See Peters, Grundliuien zur Geo- graphie und Geologie der Dobrudscha, Vienna, 1867—1868.

DOBSCHALU, or Dossina, a town of Northern Hungary, in the comitat of Gémér, on the Dobsina. In the vicinity are mines of iron, copper, cobalt, and mercury. Population, 5505 in 1869.

DOBSON, Wirtram (1610-1646), an English portrait and historical painter, born at Londonin 1610. His father was master of the Alienation Office, but by his improvi- dence had fallen into reduced circumstances. The son was accordingly bound an apprentice to Peak, a stationer and picture dealer in Holborn Bridge; and while in his employment he began to copy the pictures of Titian and Vandyck, whose manner he ever after retained. He also took portraits from life under the advice and instruction of Francis Cleyn, a German artist of considerable repute. Vandyck, happening to pass a shop in Snow Hill where one of Dobson's pictures was exposed, sought out the artist, and presented him to Charles I., who. took Dobson under his protection, and not only sat to him several times for his own portrait, but caused the prince of Wales, Prince Rupert, and many others, to do the same. The king had a high opinion of his artistic ability, styled him the English Tintoret, and appointed him sergeant-painter on the death of Vandyck. After the fall of Charles, Dobson was reduced to great poverty, and fell into dissolute habits,

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He died at the early age of thirty-six. Excellent examples of Dobson's portraits are to be seen at Blenheim, Chats- worth, and several other country seats throughout England. The head in the Decollation of St John the Baptist at Wilton is said to be a portrait of Prince Rupert. DOCET (from ddxew, to appear), a name applied to those heretics in the early Christian church who held that Christ, during his life, had not a real or natural, but only an apparent or phantom body. Other explanations of the ddxyots, or appearance, have, however, been suggested, and in the absence of any statement by those who first used the word of the grounds on which they did so, it is impossible to determine between them with certainty. The name Docets is used by Clement of Alexandria as the designation of a distinct sect, of which he says that Julius Cassianus was the founder. Docetism, however, undoubtedly existed before the time of Cassianus. The origin of the heresy is to be sought in the Greek, Alexandrine, and Oriental philo- sophizing about the imperfection or rather the essential impurity of matter. Traces of a Jewish Docetism are to be found in Philo ; and in the Christian form it is generally supposed to be combated in the writings of John, and more formally in the epistles of Ignatius. It differed much in its complexion

according to the points of view adopted by the different authors. Among the Qnostics and Manichzeans it existed in its most developed type, and in a milder form it is to be found even in the writings of the orthodox teachers. The more thoroughgoing Docete assumed the position that Christ was born without any participation of matter ; and that all the acts and sufferings of his human life, including the crucifixion, were only apparent. They denied, accordingly, the resurrection and the ascent into heaven. To this class belonged Dositheus, Saturninus, Cerdo, Marcion, and their followers, the Ophites, Manichzeans, and others. The other, or milder school of Docetz, attributed to Christ an ethereal and heavenly instead of a truly human body. Amongst these were Valentinus, Bardesanes, Basilides Tatianus, and their followers. They varied considerably in their estimation of the share which this body had in the real actions and sufferings of Christ. Clement and Origen, at the head of the Alexandrian school, took a somewhat subtle view of the incarnation, and Docetism pervades their controversies with the Monophysites. Docetic tendencies have also been developed in later periods of the church's history, as for example by the Priscillianists and the Bogomiles, and also since the Reformation by Jacob Boehme, Menno Simonis, and a small fraction of the Anabaptists. Docetism springs from the same roots as Gnosticism, and the Gnostics generally held Docetic views. Accordingly, for a fuller account of the principles out of which Docetism arose, and of the various modifications it assumed, the reader is referred to the article Gnosticism. See also the articles on the leading Docetz mentioned above. = DOCK, the name applied to the plants constituting the section Lapathum of the genus J¢wmex, and natural order Polygonacee. The leaves of the docks are pinnate-veined, and are never sagittate or hastate ; the flowers, which are arranged in two to five rows, in alternate fascicles similar to whorls, are generally perfect, and have three free styles, multifid stigmas, six stamens, and the three inner perianth- segments or petals in some cases tubercled ; the fruit is an achene (see vol. iv. p. 150). In the Common or Broad- leaved Dock, Rumex obtusifolius, the flower-stem is erect, branching, and 18 inches to 3 feet high, with large radical leaves, heart-shaped at the base, and more or less blunt ; the other leaves are more poiuted, and have shorter stalks. The whorls are many-flowered, close to the stem, and mostly leafless. The root is many-headed, black externally, and yellow within, Tho flowers appoar from Juno to

August, In autumn the whole plant may become of a bright red colour. It is a troublesome weed, common by roadsides and in fields, pastures, and waste places through- out Europe. An infusion of its root has been used as a remedy for ichthyosis; in large quantities it acts as a purgative. The powdered root is sometimes employed as a dentifrice. The Great Water Dock, &. Hydrolapathum, believed to be the herba britannica of Pliny (Vat. Hist., xxv. 6), isa tall-growing species ; its root is used as an antiscor- butic. The root of the Curled Dock, #. crispus, affords an ointment and decoction reputed to be cures for scabies ; and the seeds of the same species have been found efficacious in dysentery. Other British species are the Sharp Dock, 2. conglomerata, the root of which has been employed in dyeing; the Bloody-veined Dock, or Bloodwort, JF. sanguineus ; the Yellow Marsh Dock, FR. palustris; the Fiddle Dock, 2. pulcher ; the Golden Dock, R, maritimus ; the Grainless Curled Dock, 2. domesticus (= aquaticus) ; atid the Meadow Dock, &. pratensis. The naturalized species, J. alpinus, or “ Monk’s Rhubarb,” was early cul- tivated in Great Britain, and was accounted an excellent remedy for ague.

DOCK, See Harzovrs.

DOCKYARDS. Previously to the reign of Henry VIIL, the kings of England had neither naval arsenals nor dockyards, nor any regular establishment of civil or naval officers to provide ships of war, or to man them; they had admirals, however, possessing a high jurisdiction and very great power (see the article ApmiraL). There are strong evidences of the existence of dockyards, or of something answering thereto, at very early dates, at Rye, Shoreham, and Winchelsea. In November 12438 the sheriff of Sussex was ordered to enlarge the house at Rye in which the king’s galleys were kept, so that it might contain seven galleys. In 1238 the keepers of some of the king’s galleys were directed to cause those vessels to be breamed, and a house to be built at Winchelsea for their safe custody. In 1254 the bailiffs of Winchelsea and Rye were ordered to repair the buildings in which the king’s galleys were kept at Rye. At Portsmouth and at Southampton there seem to have been at all times depéits both for ships and stores, though there was no regular dockyard at Portsmouth till the

reign of Henry VIII. It would appear, from a very curious poem in Hakluyt's Collection, called The Policte of Keeping the Sea, that Henry V. had ships, officers, and men exclusively appropriated to his service, and independently of those which the Cinque Ports were bound, and the other ports were occasionally called upon, to furnish on any emergency. By this poem it also appears that Little Hampton, unfit as it now is, was the port at which Henry built

his great Dromions Which passed other great shippes of the commons.

The "dromion," "dromon," or "dromedary," was a large war ship, the prototype of which was furnished by the Saracens. Roger de Hoveden, Richard of Devizes, and Peter de Longtoft celebrate the struggle which Richard I., in the "Trench the Mer," on his way to Palestine, had with a huge dromon,—"a marvellous ship! a ship than which, except Noah's ship, none greater was ever read of." This vessel had three masts, was very high out of the water, and is said to have had 1500 men on board. It required the united force of the king's galleys, and an obstinate fight, to capture the dromon.

The foundation of a regular navy, by the establishment of dockyards, and the formation of a board, consisting of certain commissioners for the management of its affairs, was first laid by Henry VIII.; and the first dockyard erected during his reign was that of Woolwich. Those of Portsmouth, Deptford, Chatham, and Sheerness followed

in succession. Plymouth was founded by William IIT. Pembroke was established in 1814, a small yard having previously existed at Milford.

From the first establishment of the dockyards to the present time, most of them have gradually been enlarged and improved by a succession of expedients and make- shifts, which answered the purposes of the moment; but the best of them have not possessed those conveniences and advantages which might be obtained from a dockyard systematically laid out on a uniform and consistent plan, with its wharfs, basins, docks, ships,

magazines, and work- shops arranged according to certain fixed principles, cal-_ culated to produce convenience, economy, and despatch. ;

Neither at the time when our dockyards were first estab- lished, nor at any subsequent periods of their enlargement, could it have been foreseen what incalculable advantages would one day be derived from the substitution of machinery for human labour; and without a reference to this vast im- provement in all mechanical operations, it could not be expected that any provision would be made for its future introduction ; on the contrary, the docks and slips, the workshops and storehouses, were successively built at random, and placed wherever a vacant space would most conveniently admit them, and in such a manneras in most cases to render the subsequent introduction of machinery and railways, and those various contrivances found in large private manufacturing establishments, quite impossible, even in the most commodious of Her Majesty's dockyards.

From a brief description of the royal dockyards as they now stand a general idea may be formed of their several capacities, advantages, and defects. Taking them in suc- cession, according to their vicinity to the capital, the first is

DerptrorD.—Deptford dockyard was first established about the year 1513, and continued to be a building yard, as well asa large depét for naval stores, until 1869, when it was closed as a building yard in pursuance of a recom- mendation of acommittee of the House of Commons, which reported in 1864. The increasing size of ships of war rendered the yard unsuitable for any but the smaller types of vessels, while the continuous deposits of river mud, not only along the frontage but also in the docks and basins, rendered it a costly and decreasingly valuable place of construction. It had an interesting history. Not only were some of the most celebrated ships of the navy built there, but during the Great Plague the office of the Admiralty was removed thither from Seething Lane. Peter the Great worked in the yard as a shipwright, dwelling the while at Sayes Court, the residence of Evelyn, the author of Sylvia and of the diary not less famous than Pepys's. Evelyn was the grantee of some of the ground on which the dockyard stood, for no other consideration than that there should always bea keel laid down in the yard. Queen Elizabeth's Admiralty officials were at one time resident

at Deptford ; and thither went the queen in 1580 to confer the honour of knighthood on Sir Francis Drake, and’to dine with him on board the ship in which he had circum- navigated the world,

Though closed as a building yard in 1869, in accordance with the recommendation of a committee of the House of Commons, part of the establishment, with suitable store- houses, was retained as a depét for naval stores, and as the

| one place from which shipments of stores to naval depdéts

abroad should be made. Of the residue, part was sold to Mr Evelyn, who made the purchased part into a recreation ground for the Deptford people, and gave it tothem. The rest was sold for a metropolitan meat market to the Corporation of London. When intact the front or wharf wall of this dockyard, facing the Thames, was about 1700 feet in length, and the mean breadth of the yard 650 feet ; the superficial content about 30 acres, It had three slips

DOCK Y ARDS

for ships of the line on the face next the river; and two for smaller vessels, which launched into a basin or wet dock, 260 by 220 feet. There were also three dry docks,— one of them a double dock, communicating with the Thames, and the other a smaller one, opening into the basin. The number of men employed in this yard, in time of war, was about 1500, of whom one-half were shipwrights and artificers, and the other half labourers. There were, besides, 18 or 20 teams of 4 horses each, to drag timber and heavy stores,

The proximity of Deptford yard to the capital is of great importance, in the convenicnce it affords for receiving from this great mart all the home manufactures and products which may be purchased for the use of the navy. It is the general magazine of stores and necessaries for the fleet, whence they are shipped off, as occasion requires, to the home yards, the outports, and the foreign stations, in store-ships, transports, coasting sloops, lighters, and launches, according to the distance they have to be sent.

The management of Deptford naval store yard is now merged in that of the victualling yard, a most complete establishment of its kind. Till 1869 this managenient comprised a naval captain superintendent, with a master in the navy as his assistant. Under them a storekecper, a store receiver, an accountant, an inspector of stores, and their respective staffs, conducted the administrative duties of the place. In 1869 the Board of Admiralty, in accordance with the recommendations of a departmental committee, abolished the offices of captain superintendent and master attendant, and placed the establishment under the civilian management of the storekeeper. The naval superiutendents were appointed for five years, and after that time were withdrawn to make way for others. The superintending storekceper is appointed as a permanent

‘officer, and under him experience is accumulated and applicd in all the manufactories and other business depart- ments of the yard. The manufactures conducted by and for the Government at Deptford comprise biscuit making on such a scale as to supply, with the yield of the victualling yardsat Gosport and Plymouth, biscuit enough for the whole navy, and also chocolate making, mustard making, flour grinding, and the operations of a large cooperage. Most of the salt beef required for the navy is salted and put up there. Deptford may be called the heart of the victualling service. From its stores are shipped the whole of the con- signments required for replenishment of depdts abroad, as well as the requirements of the other two victualling yards in England, except that at the last-named the supplies of biscuits and flour are provided on the spot. The number of men employed at Deptford necessarily varies. During war upwards of a thousand men are required. The space occupied by the victualling yard is about 19 acres. There is a river frontage of 1700 fcet, and a mean depth of 1000 feet.

In 1877 there are employed in the naval store and victualling yard at Deptford 258 men on tlic establishment, and 390 men on the hired list, at a cost of £25,847.

Wooiwicu Docxyarp,—This no longer exists as a naval station. Though retaining its name, it remains as a depdt in the hands of the War Department, for whose work its river frontage of 3680 feet, and its docks and basins, afford excellent accommodation. Woolwich was the first and

most ancient of all the dockyards, having been established in the reign of Henry VII. From it have been launched some of the finest and most celebrated ships of the English navy. In 1512 the “Harry Grace de Dieu” was built, and in 1552 was accidently burnt, there. In more modern times the “ Nelson” and the “‘ Ocean ” were from Woolwich, and those latest specimens of the now extinct class of fighting ship, the “Trafalgar,” ‘“ Agamemnon,” and “Royal Albert.” As an establishment for the building

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and repair of ships, especially steam ships, Woolwich was perhaps the completcst and best furnished of all the dockyards. Its power to make and repair engines and all iron work, whether of ship or fittings, was so extensive as to enable the Government, before the introduction of iron-clads, to be nearly independent of the private trade. With occupation for 1800 workmen, it was able to rely upon its own resources almost exclusively. Its proximity to London gave it other great advantages, including this, that the Admiralty were thereby enabled the more easily to supervise the constructive work for which its architects were responsible. But for the fatal operation of two causes, the increased and increasing depth of ships of war, and the continuous silting of the river into the docks and basins of the yard, Woolwich would probably have remained one of the chief dockyards. Both thcsc causes, however, operated. The depth of the ‘“ Nelson’s” hold had to be lessened in order to ensure her passing Erith ; and it was stated in the Highth Report of the Select Committee on Finance (1818) that “ the wharf wall at Woolwich, owing to the action of the tide on the foundation, is in a falling state, and in danger of being swept into the river, it being secured only ina temporary manner; and requires to be immediately rebuilt in a direction that will preserve it from similar injury hereafter, and prevent, in a great degrec, that accumulation of mud which has, in the course of the last ten years, occasioned an expense of upwards of £125,692, and would threaten in time to render the yard uscless.” Till 1869, however, notwithstanding the recom- mendations of a parliamentary committee, and the frequent urgings of members on both sides of the House of Commons, Woolwich yard was kept open. Then, in accordance with a policy long commended, it was closed, steps were taken to dispose of the

plant and material that remained, and the place itself was handed over, with its workshops and factories, to the War Department in 1872.

Woolwich Division of Royal Marines.—About the same time that the dockyard was broken up, the division of marines—no longer in coutact with ships and shipping— was abolished, and its strength was distributed between the divisions at Chatham and Plymouth. _

CHatHam Docxyarp.—This dockyard, founded by Qucen Elizabeth, though not on the present site, is situated on the right bank of the Medway, to which it presents a line of wharfage extending 10,000 fect, and of embankment 4500 feet more. The superficial contents may be estimated at about 500 acres. The old part of the yard has seven building-slips on the front, from which ships are launched into the river, all cqual to the building of ships of the line, and three others for frigates and smaller vessels. Inthe same front arc four dry docks communicat- ing with the Medway. At the southern extremity of the yard is the ropery, 1248 fect in length and 474 feet in width, in which are employed about 250 persons. It is equal to the manufacture of every description of cordage required for the naval service, including the largest size cable. The hemp houses, 306 fect long by 36 feet wide, are equal to the stowage of 1600 tons of hemp and 3000 hauls of yarn, Next to these are the slips and docks, with the working-sheds and artificers' shops close in the rear, an excellent smithery, timber-berths, seasoning sheds, deal and iron yard, &c,, and beyond these, on the eastern extremity of the yard, the officers' houses and gardens. The superintendent's house is situated nearly in the centre of the yard. The lower or north-eastern part of the old yard ig occupied by mast-ponds, mast-houses and slips, store-boat houses and slips, ballast wharf, timber-berths, and saw-pits.

Before the construetion of the extension works in 1867- 73, there was no wet dock or basin in Chatham-yard ; but tho

Medway, flowing along it in a fine sheet of water, in some degree answercd the purpose of one. Owing to the shallowness of the water and the crooked navigation from Chatham round Upnor Point, ships were obliged to take in

their water and ballast at one place, their stores and provisions at another, their guns, powder, and ammunition at a third; in consequence of which,a ship was usually longer in getting out to sea from Chatham than even from Deptford.

The necessity of improving the accommodation at Chatham forced itself upon the attention of those who were responsible for the navy many years before the opportunity came for effecting the improvements. Pepys records a visit to Chatham in July 1663, to inspect the site of a projected wet dock. It was estimated to cost £10,000, and Pepys remarked that “the place indeed is likely to be a very fit place when the king hath money to do it with.” In effect, however, it was not taken in hand by the king, who allowed the Dutch, instead of docks, to be found in the Medway. It was not till 1867 that ground was broken for the extension works at Chatham, though the plans had been prepared and certain preparations made many months before, under the supervision of Colonel Sir Andrew Clarke, C.B. The extension works may be thus described. Three basins give access from Gillingham Reach, which formerly con- nected the mainland with the salt marshes. These marshes were covered with water every spring tide. The Govern- ment bought 150 acres of tliem, and proceeded to re-make the ground which forms the site of the new dockyard workshops and factories. The three basins communicate with each other by caissons, so that ships of the largest class can pass from the bend of the Medway at Gillingham to that at Upnor. Upnor Reach entrance, opposite Upnor Castle, is 80 feet wide, the others are 84 feet. The first (Upnor) basin is the repairing basin, which has an area of 22 acres, and a depth, in common with the others, of 33 feet at spring, and 30 feet at neap tides, On the south side of this basin, and opening into it, are four graving docks, each capable of receiving the largest man of war. From this basin a passage about 175 feet long leads to the “factory” basin, which has an area of 20 acres. Con- tiguous to it are being erected the engine and boiler factories, and the principal workshops neccssary for iron war-ship building. Next to the “ factory” basin is the fitting-out basin, with an area of 28 acres. In this place ships are to receive their sea stores and be got ready for service. Here, too, they will be dismantled and paid cut of commission.

Very great engineering difficulties had to be contended against in prosecuting these works, owing chiefly to the soft mud and to the treacherous character of the ground on which foundations had to be laid. Convict labour was largely employed in the work of excavation, and in the manufacture of bricks, whereof 20,000,000 a year were turned out, at small cost, on the spot. The cost of these new works is reckoned at about £2,000,000,

A considerable piece of new ground (about 2000 feet in length by 200 in breadth) was added afew years ago to the upper part of the present Chatham dockyard, on which Mr Brunel erected one of the completest saw-mills in the United Kingdom. of fifty saw-pits and nearly one hundred sawyers, and is capable of supplying the dockyards of Chatham and Sheer- ness with all the straight-sawn timber that they can require. But the great advantage of the plan is in its application of the steam engine to the management and arrangement of timber, by which the labour and expense of a great number of horses are saved, and the obstruction and impediments to the general services of the yard avoided.

It is supposed to be equal to the power.

DOW Kh Teh wD s

Since the introduction of iron as the material for ships hulls, Chatham has taken a more prominent place amongst dockyards. Most of the iron ships built in the royal yards have been built at Chatham and Pembroke,—the capabi- lities being greater at Chatham, where the “ Achilles,” “ Monarch,” “ Glatton,” “ Rupert,” “Raleigh,” “ Bellero- phon,” “Sultan,” ‘“ Alexandra,” ‘“‘Temeraire,” and many also of the Musquito fleet of gunboats were built. At Chatham and Devonport the whole of the cordage required for the navy is manufactured ; and, since 1869, the whole business of remanufacturing copper and old iron for the navy has been concentrated at Chatham.

The first division of royal marines, consisting of twenty-eight companies, is stationed at Chatham, in ex- cellent barracks, situated near one of the extremities of the dockyard, and occupying nine acres of ground.

There was formerly a small victualling depot, situated partly in the parish of Chatham and partly in that of Rochester, from which the ships at Chatham and at Sheerness and the Nore received a supply of provisions and water. Ships now obtain their supplies from Deptford, except fresh meat and vegetables, which are obtained on local contracts on demand,

It may be found necessary to establish a fresh depdt for victualling stores at Chatham when the port becomes developed as a place for fitting out and repairing as well as for building. ‘This process of development is going on rapidly. In March 1873 the executive of the Sheerness steam reserve with their ship were removed to Chatham, and the steps necessary for transferring the principal powers and attributes of the exposed dockyard at Sheerness to the strongly defended port of Chatham will be quickly taken. The great difficulties of navigation in the Medway, combined with the successive forts and torpedo stations which stud the river, are calculated to make Chatham unassailable. As Hollingshed said of Lundy Island, there will be “no entrance but for friends.” When the Chatham works shall have been finished, the question will probably be revived whether Sheerness should not, as has been often recommended, be closed ; but the advantages of hav- ing even a small yard whither ships only slightly injured by sea or by the enemy can run for repair, without having to thread the reaches of the Medway up and down, are so great that it is unlikely the place will be abandoned.

In 1876 Chatham dockyard was raised to a rear- admiral’s command. The number of workmen employed at Chatham yard in 1877 is 1478 established and 2022 hired men, at an aggregate cost of £220,138.

SHEERNESS Dockyarp.—This dockyard is situated on a low point of land on the island uf Sheppey, of which the soil is composed of sand and mud brought from the sea on the one side, and down the Medway on the other, and has so much contracted the mouth of that river as completely to command the entrance of it. The situation, in a military point of view, is a most important oue, particularly from its vicinity to the North Sea and to the anchorage at the Nore; by which anchorage, and by the works of Sheerness, the mouths of the Thames and the Medway are completely defended.

As a situation for a dock, the objections to which it was liable are now ina great measure removed, On account of the low swampy ground on which it stood, fevers and agues were at one time so prevalent that shipwrights and other artificers were literally impressed and compelled to work at Sheerness. In process of time, however, a town sprung up close to the dockyard, and with it some little improvement by drainage, embankments, and other measures. Still it continued, for a considerable time, an unhealthy and disagreeable place. As a dockyard it was totally destitute of all convenience or arrangement; and

the whole premises, mixed among wharfs and buildings belonging to the Ordnance Department, did not cover more than 15 acres. The storehouses were dispersed in various parts of this space, and in so ruinous a state, that a ship hauled up in the mud was by far the best storehouse in the whole yard. There were two small inconvenient docks for frigates or smaller vessels. Jt was in fact a mere port of refitment, and might be considcred as an appendage to Chatham.

The very limited capacity of Sheerness, and other consi- derations, led to the origination of the project of a naval arsenal at Northflcet, which, from change of circumstances, and from the important improvements now carried out at Sheerness, is not likely ever again to be revived. ‘These improvements were of sufficient magnitude to rendcr any establishment at Northfleet wholly unnecessary, by making Shcerness a very complete dockyard. Previously to carrying into execution this important undertaking, a committee of engineers and others was appointed, whose plan was afterwards minutely examined, and with some slight improvements adopted. ‘The first stone was laid on the 19th August 1814, and the whole work was com- pleted at an expense not far short of one million sterling. The additions, together with some part of the premises held by the War Department, make the whole area of the dockyard of Sheerness amount to upwards of 50 acres. The wharf wall on the south side of tlie basin in front of the mast-houses is 100 fect, and that on the river front 60 feet in width, lined on both sides with as complete a specimen of good and beautiful masonry of granite as any in the kingdom.

Portsmouth Dockyard. — Portsmouth dockyard, founded by Henry VII., will always be considered as the grand naval arsenal of England, and the headquarters or general rendezvous of the British fleet. It appears at all timesto have been regardedas avery important naval station, not withstanding the rivalry of Southampton, which was the principal port in Plantaganet times. In 1225 an order was issued to the barons of the Cinque Ports to provide men for the king's galleys at Portsmouth. In 1226 the sum of £25, 14s. 4d. was paid to the masters and crews of the ‘“‘king's two great ships at Portsmouth.” In 1229, £40 was paid to the king's clerk for the repairs of the king's galleys and great ship at Portsmouth. King John on several occasions assembled his barons at Portsmouth for naval expeditions, He seems, moreover, to have aimed at increasing the accommodation there for ships. In May 1212 the sheriff of Southampton was commanded to cause the docks at FUrtsmouth to be inclosed with a strong wall, in the manner which the archdeacon of Taunton would point out, for the preservation of the king's ships and galleys. He was also to cause pent-houses to be erected for their stores and tackle. This was to be done immediately, lest the galleys or their stores should be in- jured in the coming winter.

In 1540, when the dockyard seems to have been regularly established, the area of the yard was comprised in 8 acres of ground, and abutted upon the harbour near what are now known as the King's Stairs. Cromwell added 2 acres in 1658; Charles II. added 8 in 1663, and 10 more in 1667. Between 1667 and 1710, 30 acres were reclaimed from harbour mud, or bought from the town, and various subsequent additions gave 90 acres as the area on which Portsmouth dockyard stood at the end of the last century. Early in Queen Victoria's reign the growth of the steam navy necessitated an enlargement of dock accommodation. In 1843 were ordered, and in 1848 were opened a fine steam basin holding 7 acres of water, and four new docks, the dockyard ground being extended to 115 acres in all, A few years more and the want of dock

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roonl was as great as ever. Huge iron-clads, of a draught and length greater than had yet been known, required new docks and basins of special

construction. The extension works at Chatham (see above) and Portsmouth were accordingly entered upon. At the present time (August 1877) great progress has been made with both sets of works, under the direction of Colonel Sir A. Clarke, C.B., R.1., and Colonel Pasley, R.E. When finished the Ports- mouth new works will comprise a tidal basin, three floating basins (upon one of which four docks will abut), a large deep dock, entered from the tidal basin, two floating basin entrance locks, which may also be used as deep docks, and greatly increased wharfage aud space for building store- houses and factories. The system of docks and basius will begin with the tidal basin, entered from the harbour by an opening 100 yards wide, and having a depth of 30 feet of water at low spring tides, The deep dock and the two locks at the head of this basin will carry 28 feet of water over the invert at low spring tides; the two latter will be the cntrances to the repairing, rigging, and fitting-out

-basins, which will lead froin each other in the order named.

These locks will in themselves be magnificent docks, able to receive the largest iron-clad at once from the tidal basin. They will lead to the repairing basin, a vast excavation, of a parallelogram shape, which will measure 22 acres, and carry at high spring tides 35 feet of water. This depth of water will be common to the three basins ; it may be made permanent by the closing of the lock gates, and one great use of the locks will be that vessels may be docked in them in any state of the tide without lowering the level of water in the inner basins, where the tide may be ponded at its highest level of 35 feet of water, if necessary. Having been raised to this level in the locks by ingress of water from the tidal basin, vessels will be able to pass inwards to the repairing and other basins without any lessening of the depth of water. ‘The four large docks of the repairing basin will have a depth of 30 feet of water on their sills, even when filled at high neap tides. Two of thei are entirely finished, and the excava- tion of the others is faradvanced. Opposite to these docks will be the entrance to the rigging basin, an excavation of 14 acres, in a trapezoid shape. ‘he third, or fitting-out basin, which will receive the ships when they have been repaired and rigged, will be a pentagon of 14 acres. On one side of this basin there will be a coal depét, so that vessels may leave the docks with their coals on board, ready for sea. In addition to these four basius and seven docks there is an entrance

between the tidal basin of the new works and the steam basin of 1848, which will connect the old and new portions of the dockyard ; and, as for wharfage, the harbour or north wall of the extension works will have 26 feet and the wall of the tidal basin 30 feet of water alongside it at low spring tides, making altogether three miles of wharfage accommo- dation in connection with the extension works, and that for ships of the largest class. The size of the whole dockyard will be more than doubled, for its present 115 acres will be increased by more than 177 acres of reclaimed mud land and fortifications glacis, making in allan exact measurement of 293 acres 2 roodsand 29 perches. These great works were estimated when designed in 1865 to cost £3,000,000, exclusive of convict labonr. They have given employment on the spot to upwards of 1600 free nen and about 800 convicts. The latter are employed in brick-making, and have made upwards of 100,000,000 bricks since the works were beguu.

A complete network of railway connects all parts of the yard with the docks and basins, and the whole with the neighbouring railroad to all parts of the kingdom, so that iron or coal can be put into waggons at Sheffield or Cardiff

and brought ina few hours, without change of medium, to the side of the ship which is to use the material.

This dockyard, accordingly, 1s by far the most capacious of all ; and the safe and extensive harbour, the noble anchorage at Spithead, the central situation with respect to the English Channel and the opposite coast of France, render Ports- mouth of the very first importance as a naval station; and in this view of it, every possible attention appears to have been paid to the extcnsion and improvement of its dockyard.

In the centre of the old wharf-wall, facing the harbour, is the entrance into the great basin, whose dimensions are 380 by 260 fect, and its area 24 acres. Into this basin open four excellent dry docks, and on each of its sides is a dry dock opening into the harbour; and all of these six docks are capable of receiving ships of the largest class, Besides these is a double dock for frigates, the stern dock communicating through a lock with the harbour, and the head dock with another basin about 250 feet square. There is also a camber, with a wharf-wall on cach side, 660 feet in length, and of sufficient width to admit of transports and merchant ships bringing stores to the dock-yard. In the same face of the yard are three building slips capable vf receiving the largest ships, and a small one for sloops, esides two building slips for frigates on the northern face of the yard, and a smaller slip for sloops. The range of storehouses on the north-east side, and the rigging-house and sail-loft on the south-west side of the camber are magnificent buildings, the former occupying nearly 600 feet in length, exclusive of the two intermediate spaces, and nearly 60 feet in width, and the two latter 400 feet. The sea-store houses occupy a line of building which, with the three narrow openings between them of 25 feet each, extend 800 feet. The rope-house, tarring-house, and other appen- dages of the ropery are on the same scale ; but since the sup- pression of the Portsmouth ropery (in 1869), and the con- centration of rope-making at Devonport and Chatham, these premises have been used as general storehouses. The two sets of quadrangular storehouses, and the two corresponding buildings, with the intervening timber-berths and saw-pits, at the head of the dry docks, issuing from the great basin, are all excellent, and conveniently placed. The smithery is on a large scale, and contiguous to it are the various factories for metal work used in the building and repair of iron ships. Formerly there was also a copper mill, capable of turning out 300,000 sheets a year, besides bolts, bars, and gudgeons for ships' use. But since 1869 the whole business of remaking old metal of whatever kind has been concentrated at Chatham. Most of these factories were constructed under the direction of General Bentham. At the head of the north dock are the wood mills, at which every article of turnery, rabetting, &c., is performed for the use of the navy, from boring the chamber of a pump to the turning of a button for a chest of drawers. But the principal part of these mills is the remarkable machinery for making blocks, contrived by Brunel (see Brock- MACHINERY).

The northern extremity of the dock-yard is chiefly occupied with seasoning-sheds, saw-pits, and timber-berths, the working boat-house, and boat store-house. On the eastern extremity are situated the houses and gardens of the superintendent and principal officers of the yard, the chapel, and the late royal naval college, oa

Portsmouth yard, in 1877, employs 4910 men, at a cost of £324,844,

WVaval College.—The establishment of a college at Ports- mouth for the education of young gentlemen for the navy was first formed in 1729 ‘under the title of the Naval Academy, It contained 40 scholars, the sons of the nobility and gentry. In 1806 it was reorganized under the name of the Royal Naval College, and the number of

scholars was raised from 40 to 70; of whom 40 were to consist of the sons of commissioned officers of the navy, and to receive their board, clothing, lodging, and education free of all expense; the remainder to consist of sons of noblemen, gentlemen, civil and military officers, on pay- ment of £72 a year. The age of admission was from twelve and a half to fourteen years. No student to remain at college longer than three years; at the end of which time, or sooner if he should nave completed the plan of education, he was to be discharged into one of Her Majesty’s ships, the college time being reckoned two years of the six required to be served to qualify for such a commission. In 1837 the Royal Naval College for the education of young gentlemen for the navy was abolished, and by an order in council of 1838 it was reopened as an establishment for tho scientific education of a certain number of officers and mates of the naval service, the latter to have passed both their cxaminations in seamanship and in navigation, and to remain one year in the college. A limited number of commissioned officers of any rank were also permitted to study at the college, but no expense was incurred on their account,

Naval Architectural School.—-The number of students formerly did not exceed 24. Candidates were admitted by examination at stated periods ; the age of entrance was from fifteen to seventeen, and the duration of apprentice- ship seven years. At the expiration of their apprentice- ship they

were eligible to all the situations in the ship- building department of her Majesty's dockyards, to be there cmployed as supernumeraries until regular vacancies might occur, This school, which was subsequently cm- bodied with South Kensington, is now incorporated with Greenwich College.

Victualling Yard.—Thcre were formerly two victualling establishments at this port,—the one in Portsmouth town, the other across the harbour, at a place called Weevil,— both of them inconveniently situated for supplying the ships with water and provisions, more especially such as had to take them on board at Spithead. 'The former con- sisted chiefly of provision-stores and magazines, with a tide- mill and a bakery ; at the latter there were a cooperage and a brewery. The victualling establishments are now con-solidated at Gosport, and the Royal Clarence Victualling

1 On Ist February 1873 Portsmouth College was superseded by the Royal Naval College at Greenwich. The means of education pro: vided at Portsmouth were at once too limited and not technical enough. The disused buildings of Greenwich hospital furnished the extra space required, and the new system of higher education of naval officers, which was pronounced by the select committee on that subject to be necessary, was considered and carried out by Mr Goschen, then first lord of the Admiralty. Rear-admiral Sir Cooper Key, K.C.B., was the first president of the college. The minute of the Board of Admiralty consequent upon the Order in Council of 16th J anuary 1873, whereby Greenwich College was founded, states that—'' My Lords intend that the Royal Naval College at Greenwich shall be so organized as to provide for the education of naval officers of all ranks above that of midshipman, in all branches of theoretical and scientific study bearing upon their profession ; but my Lords will continue the instruction given in the 'Excellent' gunnery ship as here- tofore, and arrangements for instruction in practical surveying will also be continued at Portsmouth. My Lords desire, by the establish- ment of the college, to give to the executive officers of the navy generally every possible advantage in respect of scientific education ; but no arrangements will be made at all préjudicing the all-im- portant practical training in the active duties of their profession." All matters relating to the particular classes of officers admitted to study, and the different subjects of study, are determined by such regulations as may from time to time be laid down by the Admiralty. Special pecuniary

concessions arc made fo officers on half-pay who may enter for study, and officers of the lower grades are put upon full pay, while in all cases there is a Government contribution in aid of the mess. Special professional inducements to study are offered, and everything is done to make the college answer thoroughly the purposes for which it was founded. Practical knowledge is taught on the Thames and its estuaries, as theory is taught in the college.

DOCKYARDS

Yard is a very fine establishment. At this victualling yard, as at Deptford and Plymouth, large quantities of biscuit and flour are manufactured. Casks and barricoes are also made; but with these exceptions there is no manufacture at Gosport. The depét is supplied with sea provisions and clothing from Deptford, and re-issues them to the fleet at Portsmouth. ‘There is an excellent slaughter yard in the place, where cattle delivered under contract are slain, and the meat issued to the fleet.

Haslar Hosjital.—This magnificent hospital for the reception of sick and wounded lies at the point seawards, on the Gosport side of the harbour. It is in charge of a resident medical inspector-general, who is assisted by a competent medical and clinical staff.

The second division of royal marincs, consisting of twenty-six companies, is stationed at Forton barracks, on the Gosport side. Sixteen companies of royal marine artillery have excellent quarters at Eastney, three miles from Portsmouth, opposite St Helen’s, and at Fort Cumber- land, a half mile from Eastney.

Prymoura Docxyarpv.—The naval station of Plymouth is hardly inferior to that of Portsmouth. It possesses one of the finest harbours in the world, capable of containing, in perfect security at their moorings, not less than a hundred sail of the line; and by means of the breakwater it may boast of an excellent road- stead for eighteen or twenty sail of the line. The old dockyard has only one basin, without gates, but the dimensions are 300 by 280 feet. The excellent harbour of Hamoaze, on the western bank of which the wharf- wall extends, almost compensates for the want of other basins,

especially as the depth of water allows the largest ships to range along the jetties, and receive their stores on board immediately from the wharf.

Plymouth dockyard proper extends in a circular sweep along the shores of Hamoaze 3500 feet, its width about the middle, where it is greatest, being 1600, and at each extremity 1000 feet, making its superficial contents about 96 acres. The land front is about 2850 feet. In the line facing the harbour are two dry docks for ships of the first rate, a double dock for seventy-four gun ships, com- municating with Hamoaze, and another dock for ships of the line, opening into the basin. There is, besides, a graving-dock without gates, and a canal or camber similar to that in Portsmouth yard, for the admission of vessels bringing stores into the yard, which, communicating with the boat-pond, cuts the dock-yard nearly into two parts. There are five jetties projecting from the entrances of the dry docks into Hamoaze, alongside of which ships are conveniently brought when undocked. All these are situated between the centre and the northern extremity of the harbour line. On the southern part are three building slips for the largest class of ships and two for smaller vessels, the outer mast-pond and mast-houses, timber- berths, saw-pits, and smithery. Higher up, on this end of the yard is an extensive mast-pond and mast-locks, with plauk-houses over them, and, above these, three hemp magazines, contiguous to which is the finest ropery in the kingdom, consisting of two ranges of buildings, one the laying-house, the other the spinning-house, each being 1200 fcet in length, and three stories in height. In the con- struction of the new rope-house no wood has been used excepting the shingles of the roof, to which the slates are fastened. All the rest is of iron. The ribs and girders of the floors are of cast iron, covered over with Yorkshire paving stone, and the doors, window frames, and staircases are all of cast iron, so that the whole building may be considered as proof against fire.

The northern half of the yard, besides the docks and basin, with all the appropriate working sheds and artificers'

shops, contains a cluster of very elegant stone buildings, ranged round a quadrangle, the longest sides being about 450 feet, and the shortest 300 fcet. Within the quadrangle are also two new ranges of buildings, in which iron

has been used in the placc of wood. These buildings consist of magazines for different kinds of stores, rigging-houses, and sail-lofts. The northern and upper part of the yard is occupied by a range of handsome houses, with good gardens behind them, for the admiral-superintendent and the principal officers of the yard, the chapel, the guard-house, and pay-office, stables for the officers and the teams, and a fine reservoir of fresh water for the supply of the yard.

Plymouth is not only a good building and repairing yard, on account of its excclllent docks and slips, and the great length of line along the Hamoaze, but also a good refitting yard.

A large addition has been made to Plymouth yard by the finc establishment of Keyham steam factory which. adjoins it, with a water frontage of about 1300 feet, with two steam basins——one 630 feet by 560 feet, and another 700 feet by 400 feet. There are also excellent graving docks leading into these basins, around which are coal sheds, storehouses, boat berths, engineers' shops, boiler factories, and all the necessary appliances of mast shears, cranes, and. capstans worked by hydraulic or steam machinery. There is no railway within the yard connecting it with the general system of railroad, though means are being taken to secure a junction with the narrow gauge line through Okehampton. Traction engines, called ' camels," at present discharge most of the work of a railway.

The number of men borne in Plymouth yard in 1877 is 4336, costing £292,563.

Plymouth Victualling Establishment.—The Royal William Victualling Yard stands on the eastern entrance to Hamoaze, on about 11 acres of ground,—adjoining 4 acres on its south side, on which stand two small forts, and a reservoir containing about 8000 tons of water, which sup- plies the fleet-—the water being brought from Dartmoor.

Plymouth Iospital is a handsome building. of stone, or rather a series of separate buildings, regularly arranged, in which respect, as admitting a freer circulation of air, it is perhaps superior to that of Haslar.

The third division of royal marines, consisting of thirty companies, is stationed at Plymouth. The barracks, situated at Stonehouse, are very airy and spacious.

Premproxe Dooxyarp.—This dockyard was established in 1814, and is now used merely as a building-yard. Tt is situated on the southern shore of Milford Haven, not two milcs from the town of Pembroke. It in- cludes an area of about 60 acres, its surface descending in a gradual slope to the water's edge, along the shore of which there is a frontage of about 2350 feet. It has a dock, and 14 building slips, 6 of which are for first- rates. The largest wooden ship of the royal navy, the " Duke of Wellington," 131 guns, was launched from this yard. Here, too, were built the '' Thunderer " and the " Fury," the huge mastless iron-clads, intended with the " Devastation " and the ' Staunches " to form the sea police of the coasts.

Orner Yarps.—In addition to the foregoing, there are several small naval yards—at Haulbowline in the Cove of Cork, at Gibraltar, Malta, Antigua, Halifax, Bermuda, Kingston (Jamaica), Cape of Good Hope, Trincomalee, and Hong Kong.

Docxyarp OrFicers.—The management of the dock- yards is intrusted to a superintendent, either a rear- adwiral or captain; a master attendaut and his assistant ; a chief constructor and assistant; a store-keeper; an accountant, who is also store-receiver; and a director of police.

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Reserves in Docxyarps.—At cach of the ports where there is a dockyard, Pembroke excepted, a certain number of ships when put out of commission, or new ships not commissioned, are laid up in reserve, being classed in one of the four classes, according to the state in which they are when paid off, or the state of forwardness for further service to which they may be ordered by the Admiralty. The reserves used to be comprehended in what was called " the ordinary." But since twenty years the reserve ships have been placed under a captain of the navy, the flag captain of the dockyard admiral. 'The captain of the reserve is responsible for the care of ship and engines, and also for the due preservation and readiness for immediate service of all the ship's stores and equipment. The latter, excepting very heavy gear, which is

kept on board, are kept in special storchouses at the dockyard, where all the items of the ship's " establishment," from cordage to hammocks and lanterns, are kept ready for immediate shipment. 'These arrangements apply to the ships in the first division of the rescrvc. Competent technical officers, all the ship's artificers in port not other- wise employed, and a large body of seamen are under the orders of the captain of the reserve.

History or Manacument or Dockyarps.—When Henry VIII. first established a regular king's dockyard at Woolwich, he appointed a board, consisting of certain commissioners for the management of all naval matters ; and it is curious enough (see the Pepysian Collection of Manuscripts in the university of Cambridge), that the regulations which he made for the civil government of the navy, and which were in the reign of Edward VI. revised, arranged, and turned into ordinances, form the broad basis of all the subsequent instructions given to the several officers to whom the management of the civil affairs of the navy has been committed. The commissioners of the navy then consisted of the vice-admiral of England, the mastcr of the ordnance, the surveyor of the marine causes, the treasurer, comptroller, general surveyor of the victualling, clerk of the ships, and clerk of the stores. They had each their particular duties ; and once a week they were ordered to meet at their office on Towcr Hill, and once a mouth report their proccedings to the lord high admiral.

In 1609 the principal officers for conducting the civil affairs of the navy were suspended, in consequence of many abuses being complained of ; and other commissioners werc appointed, with powers to manage, settle, and put tlic affairs of the navy into a proper train, and to prevent, by such measures as might appear to be necessary, the con- tinuance of the many great frauds and abuses which had prevailed, A similar commission was rencwed in 1618, which in a full and minute report detailed and explained those frauds and abuses. That commission, which ended on the death of James I., was renewed by his successor, and remained in force till 1628, when it was dissolved, and the management of the navy was restored to the board of officers established by Edward VI.

In the disturbed reign of Charles I. the navy was suffered to go to decay; but by the extraordinary exertions of Cromwell it was raised toa height which it

had never before reached; it again declincd, however, under the administration ef hisson. At the Restoration, the duke of York, of whom Macaulay wrote that he was the only honest man in his dockyards, was appointed lord high admiral; and by his advice a committce was appointed to consider a plan he had drawn out for the future regula- tion of the affairs of the navy, at which he himself presided. “Tn all naval affairs,” say the commissioners of revision, “he appears to have acted with the advice and assistance of Mr Samuel Pepys, who first held the

otfice of clerk of the acts, and was afterwards secretary of the Admiralty,—a man of extraordinary knowledge in alt that related to the business of that department, of great talents, and the most indefatigable industry.”

The entire management of the navy was now in the hands of the duke, as lord high admiral, by whom three new commissioncrs were appointed to act with the treasurer of the navy, the comptroller, the surveyor, and clerk of the acts, as principal officcrs and commissioners of the navy. A book of instructions, drawn out by Pepys, was sent to the navy board for its guidance. A rapid progress was made in the repair and augmentation of the fleet ; but the duke being called away, in consequence of the Dutch war in 1664, the example of zeal and industry set by Pepys was not sufficicnt, in the duke’s absence, to prevent neglect and mismanagement in every department, except his own.

From 1673 to 1679, the office of lord high admiral was put in commission with Prince Rupert at the head of it. The king, through Pepys, arranged all naval affairs ; but in the latter year, when the duke was sent abroad, and Pepys to the Tower, a new set of men were made commissioners of the navy, who, without ex- pericnee, ability, or industry, suffered the navy to go to decay. ‘All the wise regulations,” say the commissioners of revision, “ formed during the administration of the duke of York, were neglected ; and such supineness and waste appear to have prevailed as, at the end of not more than five years, when he was recalled to the office of lord high admiral, only twenty-two ships, uone larger than a fourth- rate, with two fireships, were at sea; those in the harbour were quite unfit for service ; even the thirty new ships which he had left building had been suffered to

fall into a state of great decay, and hardly any stores were found to remain in the dock-yards.” Pepys was re-appointed secretary of the Admiralty ; the king instituted an inquiry into the characters and abilities of the first ship-builders in England, and by the advice of Pepys added Sir Anthony Dean, eminent in that profession, with thrce others, to the former principal officers. The old commissioners were directed entircly to confine their attention to the business of a committee of accounts. To each of thic new commissioners was intrusted a distinct branch of the proposed reform ; and it appears that, highly to their credit, ‘‘ they performed what they had undertaken in less time than was allowed for it, and at less expense,” having completed their businciss to the general satisfaction of the public two months before the Revolution. Thc business aes the navy, thus methodized and settled, remained undisturbed by that event.

It will readily be seen that the vast increase of our naval force since that time has necessarily required many addi- tional orders and regulations, some of which, from circum- stances, were not compatible with each other; some were given to one dockyard and not to another; others in‘one yard became obsolete, while they continued to be acted upon in another ; so that there was no longer that uniformity in the management which it is desirable —indeed, essen- tially necessary—to preserve. From the year 1764 to 1804, when the king appointed a commission “ for revis- ing and digesting the civil affairs of his navy,” the attention of the lords of the admiralty and the navy board had frequently been directed to this important subject ; but nothing was done to forward so desirable an arrangement, except that Sir Charles Middleton (afterwards Lord Barham), when comptroller of the navy, classed and digested under distinct heads all orders and regulations prior to the year 1786. The commissioners of naval inquiry, appointed in 1803, state the necessity of revising the instructions, and digesting the immense mass of orders

isaucd to the dockyard officers, and regret that a work of such utility should not have been completed. The com- nission consisted of Admiral Lord Barham, Jolin Fordyce, Esq., Admiral Sir Roger Curtis, Bart., Vice-Admiral Domett, and Ambrose Serle, Esq. They made fifteen dis- tinct reports, the

date of the first being 13th June 1805, of the last the 6th March 1808. All these except two were printed by order of the House of Commons, and were mostly carried into effect by Orders in Council. One of the two not printed is an inquiry into the state of the navy at different periods, and of naval timber; the other relates to the formation of a new dock-yard at Northfleet.

These reports led to the establishment, for the first time, in all dockyards, of one uniform system of management, by which it was hoped incalculable advantages would have been secured, in the preventing of frauds, in the saving of labour and materials, and consequently time and expense, and in securing better workmanship in the construction of ships ; but the system was cumbrous and expensive, and has given way to other more judicious management.

The management of the dockyards, and of all the civil affairs of the navy, was formerly intrusted to certain com- missioners, of whom the comptroller of the navy, three surveyors, and seven other commissioners formed a board at Somerset House, for the general direction and superin- tendence of the civil concerns of the navy, subject to the control of the Admiralty. At most of the yards, both home and foreign, was a commissioner of the navy, who was nearly always a naval officer of the rank of captain. The foreign yards over which a commissioner presided were Bermuda, Cape of Good Hope, Gibraltar, Halifax, Jamaica, Malta, Quebec, Kingston (Canada), and Trincomalee. These, with the five belonging to the home yards, Woolwich (including Deptford), Chatham, Sheerness, Portsmouth, and Plymouth, made the whole number of commissioners of the navy amount to twenty-four.

In 1832 Sir James Graham, then first lord of the Admiralty, substituted for these commissioners five depart- mental officers, who were called “ principal” officers of the navy. These were the surveyor of the navy, the accountant – general, the storekeeper- general, the comp- troller of victualling and transports, the director general of the medical department (see ApMiraLty). To these were subsequently added a director of works and a director of transports. In 1869 this arrangement was modified. The post of storekeeper-general was abolished, and the duties discharged by him were incorporated with the department of the comptroller of the navy, who lad a

few years before superseded the more limited surveyor of the navy; the office of comptroller of victual- ling was also modified, and the work of his department was incorporated with that of the Admiralty generally, under the control of the sea lord. The business of purchase and sale for each of the five departments was at the same time concentrated in one purchase department under a director of navy contracts.

Victualling establishments.—At each of the dockyards at Deptford, Portsmouth, and Plymouth are victualling establishments for supplying the fleet with provisions and water ; and also at Cork, Cape of Good Hope, Gibraltar, Malta, Jamaica, Halifax, Trincomalee, Rio de Janciro, Barbados, Sierra Leone, Hong Kong, Valparaiso, and Bermuda. The victualling board at Somerset House con- sisted formerly of a chairman and deputy cliairman, aud five other commissioners, two secretaries, a registrar of securities, and 136 clerks.

The transport board having been dissolved at the end of thegreat French war, its twofold duties were divided between the navy and victualling boards ; those which concerned the hiring of transports devolved on the commissioners of the

ait navy, and those which related to the sick and hurt depart- ment, on the commissioners of the victualling board, on whom also devolved the direction and superintendence of all the naval hospitals at home and abroad. These have also merged in the Admiralty, where there is a transport depart- ment under the supervision of a director of transports,— a naval officer, first appointed after the Crimean war.

Officers of the dockyard.—The principal officers of an established dockyard, prior to 1833, were—l, the com- missioner ; 2, the master attendant; 3, the master ship- wright; 4, the clerk of the clieck; 5, the storekeeper ; 6, the clerk of the survey ; to which were added the subor- dinate officers of timber-master, and the master measurer. By the regulations in 1833, the commissioner was superseded by a superintendent, the offices of clerk of the check, clerk of the survey, and master measurer were abolished, and a store-receiver was substituted for the timber-master. Many subordinate offices were abolished, and the whole system of working the men and keeping the accounts was simplified and amended. Some idea

may be formed of the diminution of the expense by the simple fact that, while in the ordinary estimate of the navy for 1817 the establish- ment of officers in Portsmouth yard was £50,065, in 1833 it was only £19,803, and in 1853, £20,121. ‘To this last, however, must be added the salaries of officers employed in the steam factory, which amounted to £2555, The principal officers in the factory are—l, the chief engineer and inspector of machinery; 2, his assistant; 3, assistant inspector of machinery; 4, foreman of the factory; 5, foreman of boilermakers; 6, pay-clerk and book-keeper.

At one time the men in the dockyards were employed almost wholly on job and task-work. Between 1850 and the present time they have been almost wholly on a day pay smaller than that given in the general trade, but having a title to a pension, contingently upon good service and good behaviour, attached to it. In 1869 Mr Childers cut down to a considerable extent the “establishment” system of dockyardmen, replaced the vacancies with hired men on higher pay, but without a title to pension, and with the usual liability to discharge at a week’s notice when work is slack. ‘The salary system, with its concomi- tant vested interests, was not found to be productive of quick and therefore of economical work. Mr Childers’s alteration improved matters not a little, but job and task- work, besides being more in accordance with the usages of the day, is far more likely to interest and stimulate the men. One great advantage, however, of the salary system is the discouragement it gives to strikes. The conditions under which alone pensions are earned act as deterrents.

In ordinary years the number of workmen of all kinds required for the service of the dockyards is, in round numbers, 16,000.

Defence of the yards.—In the year 1847 the workmen of the several dockyards were enrolled into a corps for the defence of the yards; and certain numbers were trained to the use of the great gun exercise, so that each of the dock- yard battalions had some artillery attached to them. In 1854 the corps fell into desuetude, and was. finally swallowed up in the volunteer movement.

Forrign Dockyarps.— The dockyards of the principal foreign states at the present time (1877) are as follows :—

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Denmark…..... Copenhagen.

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Germany…..... Kiel, Dantzie, Wilhelmshafen.

Mitel aemsmistes ens cee Spezzia, Naples, Castellamare.

HRUSBI eos cenceacer Cronstadt, St Petersburg, Sevastopol, Nieholaieff.

RPA vcowetwnnainos Cartagena, Cadiz.

United States…Portsmouth, Charlestown, Brooklyn, Philadelphia, Washington, Norfolk, Pensacola, Mare Island (Pacitie).

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DOCKWYVYARODS

Numbers and Dimensions of Docks, Locks, and Basin Entrances in H.M. Dockyards, February 1876.

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(F. W. k.)

DOC—DOD

DOCTOR, denoting etymologically a teacher, is the title conferred by the highest university degree. Originally there were only two steps in graduation, those of bachelor and master, and the title doctor was given to certain masters as an alternative or as a merely honorary appella- tion. It ia in this sense that the word is to be understood in the phrase Doctor Angelicus applied to Aquinas, and in many other familiar instances of a similar kind. The process by which the doctorate became established as a third degree, distinct from and superior to that of master, cannot be very clearly traced. At Bologna it seems to have been conferred in the faculty of law as early as the 12th century, but there is no sufficient authority for the statement commonly nade that the celebrated Irnerius drew up the formulary for the ceremonial, and that Bulgarus was the first who took the degree. Paris, the other great university of the Middle Ages, conferred the degree in the faculty of divinity, according to Antony Wood, some time after 1150, the earliest recipients being Peter Lombard and Gilbert de la Portree. In England the degree was intro- duced in the reign of John or of Henry III. Both in England and on the Continent it was confined for a con- siderable period to the faculties of law and divinity; it was not until the 14th century that it began to be conferred in medicine, and in England it is still unknown in the faculty of arts. In Germany, however, there is a degree of doctor of philosophy. The doctorate of music was first conferred at Oxford

and Cambridge ; its use in Germany is comparatively recent. See UNIVERSITIES.

DOCTORS' COMMONS was a society of ecclesiastical lawyers in London, forming a distinct profession for the practice of the civil and canon laws. Some members of the profession purchased in 1567 a site near St Paul's, on which at their own expense they erected houses for the residence of the judges and advocates, and proper buildings for holding the ecclesiastical and admiralty courts, 'In the year 1768 a royal charter was obtained by virtue of which the then members of the society and thcir successors were incorporated under the name and title of 'The College of Doctors of Law exercent in the Ecclesiastical and Admiralty Courts.' The college consists of a president (the dean of Arches for the time being) and of those doctors of law who, having regularly taken that degree in either of the universities of Oxford or Cambridge, and having been adinitted advocates in pursuance of the rescript of the archbishop of Canterbury, shall have been elected fellows in the manner prescribed by the charter." The judges of the archiepiscopal courts were always selected from this college. By 20 and 21 Vict. c. 77 (the Act to amend the law relating to Probate and Letters of Administration) § 116 and 117, the college is empowered to sell its real and personal estate and to surrender its charter to Her Majesty, and it is enacted that on such surrender the college shall be dissolved and the property thereof shall belong to the then existing members as tenants in common for their own use and benefit. In pursuance of this enactment the college has been dissolved and the ecclesiastical courts are now open to the whole bar.

DOCTRINAIRES, the name applied by its opponents to a small but very influeutial political party in France which made itself prominent after the restoration of the Bourbons in 1815, The doctrine or fundamental principle on which its action was based was that the sole justification of any form of government was the manner in which it exercised its power. Rejecting the claim of divine right, whether urged for monarchy or for republicanism, the doctrinaires were opposed alike to the ultra-royalists and to the revolutionists. In the chamber they occupied the left centre, and thus marked themselves out from the centre or ministerialist and the left or opposition party.

While maintaining the re-established dynasty their efforts were mainly directed towards moulding the constitution into a shape resembling as nearly as possible that of England. The leaders of the doctrinaires were Royer- Collard, the Duc de Broglie, and Guizot. After the re- volution of 1830 several of them came into power and proved strong supporters of constitutional monarchy on the model that has existed in England since the reign of William. The name doctrinaires fell entirely out of use after 1848, but the principles of the party have been faith- fully represented since that date by the Orleanists. See FRANCE,

DODD, Dr Wirtiam (1729-1777), an unfortunate English divine, eldest son of the Rev. William Dodd, many years vicar of Bourne, in Lincolnshire was born there in May 1729. He was sent, at the age of sixteen, to tlic university of Cambridge, where he was admitted a sizar of | Clare Hall in 1745. He took the degree of B.A. in 1750, being in the list of wranglers. On leaving the university, he married a young woman of the name of Perkins, the daughter of a verger. She had a more than questionable reputation, and her extravagant habits contributed in no small degrce to her husband's dis- grace and ruin. In 1751 he was ordained deacon, and in 1753 priest, and he soon became a popular and celebrated preacher. His first preferment was the lecture- ship of West-Ham and Bow. In 1754 he was also chosen lecturer of St Olave's, Hart Street; and in 1757 he took the degree of M.A. at Cambridge. He was a strenuous supporter of the Magdalen Hospital, which was founded in 1758, and soon afterwards became preacher at the chapel of that charity. In 1763 he obtained a prebend at Brecon, and in the same year he was appointcd oue of the king's chaplains,—soon after which the education of Philip Stan- hope, afterwards earl of Chesterfield, was committed to his care. In 1766 he went to Cambridge, and took the degree of LL.D. At this period he was held in high estimation ; but eager for further advancement, he un- happily entered on courses which in the end proved the occasion of hisrnin. On the living of St George's, Hanover Square, becoming vacant, he wrote an anonymous letter to the wife of the lord chancellor offering three thousand guineas if, by her assistance, he was promoted to the benefice. 'This letter having been traced to him, a com- plaint was immediately made to the king, and he was dismissed with

disgrace from his office of chaplain. After residing for some time at Geneva and Paris, he returned to England in 1776. He still continued to exercise his clerical functions, but his extravagant mode of life soon involved him in difficulties. To meet the demands of his creditors he forged a bond on his former pupil Lord Chesterfield for £4200, and actually received the money. But le was detected, committed to prison, tried at the Old Bailey, found guilty, and sentenced to death; and, in spite of numerous applications for mercy, he was executed at Tyburn on the 27th June 1777, Dr Samuel Johnson was very zealous in pleading for a pardon, and a petition from the city of London received 23,000 signatures. Dr Dodd was a voluminous writer, and possessed considerable abilities, with but little judgment and much vanity. His Beautres of Shakespeare, published before he entered the church, was long a well-known work ; aud his Thoughts in Prison, a poem in blank verse, written in the interval between his conviction and his execution, naturally attracted much attention. He published a large number of sermons and other theological works, An accurate list of his various writings is prefixed to his Thoughts in Prison.

DODDER (Frisian dodd, a bunch ; Dutch dot, ravelled thread), the popular name of the annual, leafless, twining,

epiphytic plants forming the genus Cuscuta and natural order Cuscutacew or, according to some botanists, the tribe Cuscutece of the Convolvulacee. All the species are natives of temperate regions, and all have strong acrid properties. The flowers, which grow in clusters, have a quinque-partite, coloured calyx ; scales alternating with the corolline lobes ; carpels forming a syncarpous ovary; the albumen of theseeds fleshy ; and the embryo spiral, filiform, and acotyledonous. On coming in contact with the living stem of some other plant the seedling dodder throws out a sucker, by which it attaches itself and commences to absorb the sap of its foster-parent; it then soon ceascs to have any connection with the ground. As it grows, it throws out fresh suckers, establishing itself firmly on its victim. After making a few turns round one stem the dodder finds its way to another, and thus it continues twining and branching till it resembles “finc, closely-tangled, wet catgut.” The injury done to flax, clover, hop, and bean crops by specics of

dodder is often very great. C. cwropwa, the Greater Dodder, is found parasitic on nettles, thistles, vetches, and the hop; C. Epilinum, on flax; C. Hpithymum, on furze, ling, and thyme. C. Z'rifolii, the Clover Dodder, is perhaps a sub-species of the last-mentioned. For a figure of C. verricosa, the Warty Dodder, see vol. iv. pl. x. DODDRIDGE, Puise (1702-1751), a celebrated nonconformist divinc, was born in 1702. His father, Daniel Doddridge, was a London merchant, and his mother the orphan daughter of the Rev. John Bauman, a Bohemian clergyman who had fled to England to escape religious persecution, and had held for some time the mastership of the grammar school at Kingston-upon-Thames, He was the youngest of a family of twenty, of whom there was at his birth only one other child, a daugliter, surviving. It is also remarkable that he himself at his birth was put aside as actually dead, and was only preserved alive owing to the accidental glance of one of the attendants, who fancied she perceived a feeble heaving of the infant's chest, and was successful in rekindling the almost extinguished vital spark. Before he could read, his mother taught him the history of the Old and New Testament by the assistance of some blue Dutch tiles; and these stories, he says, were the means of enforcing such good impressions on his heart as never afterwards wore out. When sufficiently old to leave the paternal roof he was placed under the tuition of the Rev. Mr Scott, who taught a private school in London, and on attaining his tenth year he was sent to the grammar school at Kingston-upon-Thames. About 1715 he was removed to a private school at St Albans, where he began to kecp an exact account of his time in order the better to improve himself by private meditation and study, and was in the habit during his walks of entering the neighbouring cottages to read to the inmates a few pages from the Bible or from some religious book. Through the interest of friends a proposal was made to him, in 1719, which would have enabled him to enter the English bar; but receiving at the same timc an invitation to study for the ministry, he preferred the latter, and shortly thereafter removed to the academy for dissenters at Kibworth in Leicestershire, taught at that time by the Rev. John Jennings, Mr Jennings having in 1722 received an invitation to Hinckley, the academy was removed thither ; and in 1723 Doddridge, having finished lis studies, accepted an invitation to succeed him in the ministry at Kibworth. He had also been mentioned by Jennings, who died in 1723, as the person most fitted to extend his plans and views as an instructor of candidates for the ministry, but it was not till 1729 that, at a

general meeting of nonconformist ministers, he was chosen to conduct the academy established in that year at Harborough. In the same year he received an invitation from the congregation

at Northampton, which he accepted. Here he continued his ministrations till 1751, when the rapid progress of con- sumptive disease caused him to seck the advantages of a milder climate. Accordingly he sailed for Lisbon on the 30th September of that year; but the change was unavailing, and he died there on 26th October.

His popularity as a preacher is said to have been chietly due to his ‘ high susceptibility, joined with physical advantages and perfect sincerity.” His sermons were mostly practical in character, and his great aim was to cul- tivate in his hearers a spiritual and devotional frame of mind. ‘“ He endeavoured,” he says, ‘to write on the com- mon general principles of Christianity, and not in the narrow spirit of any particular party.” ‘“ There is,” says his biographer, ‘‘a remarkable delicacy and caution evinced in the works of Dr Doddridge whenever the subject approaches the disputed points of theology. The genuine expressions of the sacred writers are then employed, and the reader is allowed to draw his own conclusions, unbiassed by the prejudices of human authorities,” Those portions of his theological lectures which treat on the matter alluded to, substantiate this statement. His principal works are The Rise and Progress of Religion in the Sow, The Family Expositor, Life of Colonel Gardiner, and a Course of Meta- physical, Ethical, and Theological Lectures. He also pub- lished several courses of sermons on particular topics, and is the author of many well-known hymns.

See Memoirs, by Rev. Job Orton, 1766 ; Letters to and from Dr Doddridge, by Rev. Thomas Stedman, 1790 ; and Correspondence cn Den in 5 vols. by his grandson, John Doddridge Humphreys,

DODERLEIN, Jouann CuristorpH WitHELM Lupwia (1791-1863), a distinguished German philologist, was boru at Jena on the 19th December 1791. His father, Johann Christoph Déderlein, professor of theology at Jena, was celebrated for his varied learning, for his eloquence as a preacher, and

for the important influence he exerted in guiding the transition movement from strict orthodoxy to a freer theology. Ludwig Déderlein, after receiving his preliminary education at Windsheim and Schulpforta, studied at Munich, Heidelberg, Erlangen, and Berlin. He devoted his chief attention to philology under the instruc- tion of such men as Thiersch, Creuzer, Voss, Wolf, Boeckh, and Buttmann. In 1815, soon after completing his studics at Berlin, he accepted the appointment of ordinary professor of philology in the academy of Bern. In 1819 he was transferred to Erlangen, where he became sccond professor of philology in the university and rector of the gymnasiuni. In 1827 he became first professor of philology and rhetoric and director of the philological seminary, He continued to discharge the duties of both these offices until within a short period of his death, which occurred on the 9th November 1863, Déderlein's most valuable work as a philologist was rendered in the department of etymology and lexicography. He is best known by his Lateinische Synony- men und Htymologien (6 vols., Leipsic, 1826-38), and his Homerische Glossarium (3 vols., Erlangen, 1850-58). To the same class belong his Lateinische Wortbildung (Leipsic, 1838), Handbuch der Lateinischen Synonymik (Leipsic, 1839), and the Handbuch der Lateinischen Hiymologic (Leipsic, 1841), besides various works of a more elementary kind intended for the use of schools and gymnasia. Most of the works named have been translated into English. To critical philology Déderlein contributed valuable editions of Tacitus (Opera, 1847 ; Germania, with a German transla- tion) and Horace (Zpistole, with a German translation, 1856-8 ; Sater@w, 1860). His Reden und Aufsdtzen (Erlangen, 1843-7) and Oeffentliche Reden (1860) consist chiefly of academic addresses dealing with various subjects in pedagogy and philology.

DIO De

DODO, from the Portuguese Déudo (a simpleton!), a large bird formerly inhabiting the island of Mauritius, but now extinct—the Didus ineptus of Linnzeus.

Brief mention of this remarkable creature has already been made (see Brrps, vol. ili. p. 732), but some further particulars may be welcome. The precise year in which the Portuguese discovered: the island we now know as Mauritius is undetermined; various dates from 1502 to 1545 having been

assigned. Mascaregnas, their leader, seems to have called it Cerne, from a notion that it must be the island of that name mentioned by Pliny ; but most authors have insisted that it was known to the seamen of that nation as J/ha do Cisne—perhaps but a corruption of Cerne, and brought about by their finding it stocked with large fowls, which, though not aquatic, they likened to Swans, the most familiar to them of bulky birds. How- ever, the experience of the Portuguese is unfortunately lost to us, and nothing positive can be asserted of the island or its inhabitants (none of whom, it should be observed, were human) until 1598, when the Dutch, under Van Neck, arrived there and renamed it Mauritius. A narrative of this voyage was published in 1601, if not earlier, and has been often reprinted. Here we have birds spoken of as big as Swans or bigger, with large heads, no wings, and a tail consisting of a few curly feathers. The Dutch called them Walghvégels (the word is ‘variously spelled), z.e., uiauseous birds, because, as is said, no cooking made them palatable ; but another and perhaps better reason, for it was admitted that their breast was tender, is also assigned, namely, that this island-paradise afforded an abundance of superior fare. De Bry gives two admirably quaint prints of the doings of the Hollanders, and in one of them the Walchvigel appears, being the earliest published representation of its unwieldy form, with a footnote stating that the voyagers brought an example alive to Holland. Among the company there was a draughtsman, and from a sketch of his Clusius, a few years after, gave a figure of the bird, which he vaguely called “ G’allinaceus Gallus pere- grinus,” but described rather fully. Meanwhile two other Dutch fleets had visited Mauritius. One of them had rather an accomplished artist on board, and his drawings fortunately still exist.2 Of the other a journal kept by one of the skippers was subsequently published. This in the main corroborates what has been before said of the birds, but adds the curious fact that they were now called by some Dodaarsen and by others Dronten.®

Henceforth Dutch narrators, though several times mentioning the bird, fail to supply any important fact in its history. Their navigators, however, were not idle, and found work for their naturalists and painters. Clusius says that in 1605 he saw at Pauw’s House in Leyden a Dodo’s foot,t which he minutely describes. Of late years a copy of Clusius’s work has been discovered in the high a ee ee set.

1Alewyn and Collé, in their Woordenschat der twee Taalen Portugeesch en Nederduitsch (Amsterdam : 1714, p. 362), render it ‘* Hen sot, dwaas, dol, of, uitzinnig mensch.”

2 Tt is from one of these that the figures of the large extinct Parrot

(Lophopsittacus mauritianus), before given (Brrps, vol. iii. p. 732), were taken. Prof. Schlegel has announced his intention of imme- diately publishing these sketches in JSac-simile. ‘

3’The etymology of these names has been much discussed. ‘That of the latter, which has generally been adopted by German and French aithorities, seems to defy investigation, but the former has been shown by Prof. Schlegel (Versl. en Mededcel. K. Akad. Wetensch. ii. pp. 255 et seqg.) to be the homely name of the Dabchick or Little Grebe (Podiceps minor), of which the Dutchmen were reminded by the round stern and tail diminished to a tuft that characterized the Dodo. The same learned authority suggests that Dodo is a corruption of Dodaars, but, as will presently be seen, we herein think him mistaken.

4 What has become of the specimen (which may have been a relic of the bird brought home by Van N eck’s squadron) is not known. Broderip and the late Dr Gray have suggested its identity with that now in the British Museum, but on what grounds is not apparent.

school of Utrecht, in which is pasted an original drawing by Van de Venne superscribed “ Vera effigies huius avis Walghvogel (que & a nautis Dodaers propter foedam posterioris partis crassitiem mnuncupatur), qualis viua Amsterodamum perlata est ex insula Mauritii Anno M.DC.XXVI.” Now a good many paintings of the Dodo by a celebrated artist named Roelandt Savery, wlio was born at Courtray in 1576 and died in 1639, have long been known, and it has always been understood that these were drawn from the life. Proof, however, of the limning of a living Dodo in Holland at that period had hitherto been wanting. There can now be no longer any doubt of the fact; and the paintings by this artist of the Dodo at Berlin and Vienna—dated respectively 1626 and 1628—as well as the picture by Goiemare,

belonging to the Duke of Northumberland, at Sion House, dated 1627, may be with greater plausibility than ever considered portraits of a captive bird. It is even probable that this was not the first example which had sat to a painter in Europe. In the private library of the late Emperor Francis of Austria is a series of pictures of various animals, supposed to be by the Dutch artist Hoefnagel, who was born about 1545. One of these represents a Dodo, and, if there be no mistake in Von Frauenfeld's ascription, it must almost certainly have been painted before 1626, while there is reason to think that the original may have been kept in the wivariwm of the then Emperor Rudolf IT., and that the portion of a Dodo's head, which was found in the Museum at Prague about 1850, belonged to this example. The other pictures by Roelandt Savery, of which may be mentioned that at the Hague, that in the possession of the Zoological Society of London (formerly Broderip's), that in the Schénborn collection at Pommersfelden near Bamberg, and that belonging to Dr Seyffery at Stuttgart are undated, but were probably all painted about the same time (viz. 1626 to 1628). The large picture in the British Museum, once belonging to Sir Hans Sloane, by an unknown artist, bunt supposed to be by Roelandt Savery, is also undated ; while the still larger one at Oxford (considered to be by the younger Savery) bears a much later date, 1651, Undated also is a picture said to be by Pieter Holsteyn, and in the possession of Dr A. van der Willige at Haarlem in Holland.

In 1628 we have the evidence of the first English observer of the bird—one Emanuel Altham, who mentions it in two letters written on the same day from Mauritius to his brother at home. These have only of late, through the intervention of Dr Wilmot, been brought to liglt.® In one he says: "You shall receue. .. . .astrange fowle: which I had at the Iland Mauritius called by ye portingalls a Do Do: which for the rareness thereof I hope wilbe welcome to you." The passage in the other letter is to the same effect, with the addition of the words "'if it liue." Nothing more is known of this valuable consignment. In the same fleet with Altham sailed Herbert, whose Z'ravels ran through several editions and have been long quoted. It is plain that he could not have reached Mauritius till 1629, though 1627 has been usually assigned as the date of his visit. The fullest account he gives of the bird is in his edition of 1638, and in the curiously affected style of many writers of the period. It will be enough to quote the beginning: '" The Dodo

comes first to a description : here, and in Dygarrois® (and no where else, that ever I could see or heare of) is generated the Dodo (a Portuguize name it is, and has reference to her simpleness,) a Bird which for shape and rareness might be call'd a Phoenix (wer't in Arabia :) "—+the rest of the passage is entertaining, but the whole has been often reprinted. Herbert, it may be remarked, when he could see a possible Cymric similarity,

5 Proc. Zool. Soc. 1874, pp. 447-449. 6 T.e., Rodriguez; an error, as we shall see.

was weak as an ctymologist, but lis positive statement, corroborated as it is by Altham, cannot be set aside, and hence we do not hesitate to assign a Portuguese derivation for the word.! Herbert also gave a figure of the bird.

Proceeding chronologically we next come upon a curious pit of evidence. This is contained in a MS. diary kept between 1626 and 1640 by Thomas Crossfield of Queen's College, Oxford, where, under the year 1634, mention is casually made of one Mr Gosling " who bestowed the Dodar (a blacke Indian bird) vpon ye Anatomy school." Nothing inore is known of it. About 1638, Sir Hamon Lestrange tells us, as he walked London streets he saw the picture of a strange fowl hung out on a cloth canvas, and going in to see it found a great bird kept in a chamber " somewhat bigger than the largest Turky cock, and so legged and footed, but shorter and thicker." The keeper called it a Dodo and shewed the visitors how his captive would swallow "large peble stones….. as bigge as nutmegs."

In 1651 Morisot published an account of a voyage made by Frangois Cauche, who professed to have passed fifteen days in Mauritius, or " l'isle de Saincte Apollonie," as le called it, in 1638. According to De Flacourt the narrative is not very trustworthy, and indecd certain statements are obviously inaccurate. Cauche says he saw there birds bigger than Swans, which he describes so as to leave no doubt of his meaning Dodos ; but perhaps the most import- ant facts (if they be facts) that he relates are that they had a cry like a Gosling ("il a un cry comme !'oison"), and that they

laid a single white egg, “ gros comme un pain dun sol,” on a inass of grass in the forests. He calls them “oiseaux de Nazaret,” perhaps, as a marginal note infornis us, from an island of that name which was then supposed to he more to the northward, but is now known to have no existence.

In the catalogue of Tradescant’s Collection of Rarities, preserved at South Lambeth, published in 1656, we have entered among the “ Whole Birds” a “ Dodar from the island Mauritius ; it is not able to flie being so big.” This specimen may well have been the skin of the bird seen by Lestrange some eighteen years before, but anyhow we are able to trace the specimen through Willughby, Lhwyd, and Hyde, till it passed in or before 1684 to the Ashmolean collection at Oxford. In 1755 it was ordered to be destroyed, but, in accordance with the original orders of Ashmole, its head and right foot were preserved, and still vrnament the Museum of that University. In the second edition of a Catalogue of many Natural Rarities, &c., to be seen ‘at tlie place formerly called the Music House, near the West End of St Paul’s Church, collected by one Hubert alzus Forbes, and published in 1665, mention is made of a “legge of a Dodo, a great heavy bird that cannot fly ; it is a Bird of the Mauricius Island.” have subsequently passed into the possession of the Royal Society. At all events such a specimen is included in Grew’s list of their treasures which was published in 1681. This was afterwards transferred to the British Museum, where it still reposes. As may be seen it is a left foot, without the integuments, but it differs sufficiently in size from the Oxford specimen to forbid its having been part of the same individual. In 1666 Olearius brought out the Gottor fisches Kunst Kammer, wherein he describes the head of a Walghvogel, which some sixty years later was removed to the Museum at Copenhagen, and is now preserved there, ee re agg Oe

P u Hence we venture to dispute Prof. Schlegel’s supposed origin of ; Dodo. The Portuguese must have been the prior nomenclators, and ite, as is most likely, some of their nation, or men acquainted with their language, were employed to pilot the Hollanders, we see at once how the first Dutch name W alghvogel would give way. The mean- ing of Doudo not being plain to the Dutch, they would, as is the habit

of sailors, convert it into something they did understand. Then Doduers would easily suggest itself,

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having been the means of first leading zoologists, under the guidance-of Prof. Reinhardt, to recognize the true affinities of the bird.

Little more remains to be told. For brevity's sake we have passed over all but the principal narratives of voyagers or other notices of the bird. A compendious bibliography, up to the year 1848, will be found in Strickland's classical work,? and the list was continued by Von Frauenfeld? for twenty years later. The last evidence we have of the Dodo's existence is furnished by a journal kept by Benj. Harry, and now in the British Museum (J/SS, Addit. 3668. 11. D). This shows its survival till 1681, but the writer's sole remark upon it is that its " files: is very hard." 'The successive occupation of the island by different masters seems to have destroyed every tradition relating to the bird, and doubts began to arise whether such a creature had ever existed. Duncan, in 1828, shewed how ill-founded these doubts were, and some ten years later Broderip with much diligence collected all the available evi- dence into an admirable essay, which in its turn was suc- ceeded by Strickland's monograph just mentioned. But in the meanwhile little was done towards obtaining any material advance in our knowledge, Prof. Reinhardt's determination of its affinity to the Pigeons (Columba) excepted ; and it was hardly until Clark's discovery in 1865 (Eirps, vol. iii. p. 732) of a large number of Dodos' remains, that zoologists generally were prepared to accept that affinity without question. The examination of bone after bone by Prof. Owen and others confirmed the judgment of the Danish naturalist, and there is now no possibility of any different view being successfully maintained.

The causes which led to the extirpation of this ponder- ous Pigeon have been discussed in a former article, and nothing new can be added on that branch of the subject ; but it will be remembered that the Dodo does not

stand alone in its fate, and that two more or less nearly allied birds inhabiting the sister islands of Rénnion and Rodriguez have in like manner disappeared from the face of the earth. (A. N.)

DODONA, in Epirus, was the seat of the most ancient and venerable of all Hellenic sanctuaries. In the plain of the Dodonza, and on the banks of the neighbouring Acheloiis, there dwelt in times long anterior to history the race of Helli or Hellenes, who thence spread into Thessaly and Greece. In after times the Grecks of the south looked on the inhabitants of Epirus as barbarians ; nevertheless for Dodona they always preserved a certain reverence, and the temple there was the object of frequent missions from them. This temple was dedicated to the Pelasgic Zeus, the wielder of the thunderbolt in the storms so frequent in Epirus. Connected with the temple was an oracle which enjoyed more reputation in Greece than any other save that at Delphi, and which would seem to date from more early times than the worship of Zeus; for the normal method of gathering the responses of the oracle was by listening to the rustling of an old oak tree, which was supposed to be the seat of the deity, and by taking thence an augury of the future. Weseem here to have a remnant of the very ancient and widely diffused tree-worship. Sometimes, however, anguries were taken in other manners, being drawn from the moaning of doves in the branclhies, the murmur of a fountain which rose close by, or the resounding of the wind in the brazen tripods which formed a circle all round the temple. The oracle was thins, compared with the articulate responses of Delphi, dumb, but none the less constantly consulted. Croesus proposed

2 The Dodo and its Kindred, &c. Melville. London: 1848. 4to. 3 Neu aufgefundene Abbildung des Dronte, u. 8. W. ; Georg Ritter von Frauenfeld. Wien’ 1868. fol.

By H. E. Strickland and A. G.

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to it his well-known question ; Lysander sought to obtain from it a sanction for his ambitious views; the Athenians frequently appealed to its authority

during the Peloponne- sian war. But the most frequent votaries were the neigh- bouring tribes of the Acarnanians and Aitolians, together with the Boeotians, who claimed a special connection with the district.

Dodona is not unfrequently mentioned by ancient writers. Homer speaks of it twice, once calling it the stormy abode of Selli who sleep on the ground and wash not their feet, and on the second occasion describing a visit of Odysseus to the oracle. Hesiod has left us a com- plete description of the Dodonza or Hellopia, which he calls a district full of corn-fields, of herds and flocks and of shepherds, where is built on an extremity (ém écyaruy) Dodona, where Zeus dwells in the stem of an oak (diyds). Herodotus tells a story which he learned at Egyptian Thebes, that the oracle of Dodona was founded by an Egyptian priestess who was carried away by the Pheenicians, but says that the local legend substitutes for this priestess a black dove, a substitution in which he tries to find a rational meaning. From later writers we learn that in historical times there was worshipped, together with Zeus, an Asiatic goddess under the ‘name Dione, and thencefor- ward the responses were given by the priestesses of the latter, who were called doves, and not by the Selli.

As to the site of Dodona there has been a good deal of discussion. We know from the authorities that the town was situated in a fertile vale at the foot of the mountain Tomarus, whence issued a multitude of springs, and that it was on the eastern boundary of Epirus, and on the confines of Thesprotia and Molossis. We are further told that Dodvna was a two days’ journey from Ambracia, and a journey of four days from Buthrotum. It would also appear certain that it was in a region of frequent thunder- storms. In accordance with these indications, Colonel Leake fixed on Castritza near Janina in Epirus, at the foot of the mountain Mitzikéli, as the site of Dodona. But his reasons are not conclusive. Quite recently excavations have been undertaken at a spot in the valley of Dramisius, a few leagues south of Castritza, at the foot of Mount Olytzika, where Leake found the remains of a theatre and of two temples. This has usually been supposed to be the site of Passaron, the ancient capital of the Molossian kings. But these excavations have brought to light not only many autiquities, but tablets ex voto bearing dedicatory inscrip- tions to Zeus Naios and Dione, and many fragments of tripods, whence it would seem highly probable that the

opinion of Leake must be given up, and the new site definitely fixed upon as that of Dodona. (See Leake, Northern Greece, vols. i. iv.; Revue Archéologique for 1877, pp. 329, 397.)

The temple of Dodona was destroyed by the /Mtolians in 219 B.c., but the oracle survived to the times of Pausanias and even of the emperor Julian.

DODSLEY, Rozert (1703-1764), an eminent book- seller' and versatile writer, born in 1703 at Mansfield, Nottinghamshire, where his father is said to have been a schoolmaster. In his youth he was apprenticed to a stocking-weaver, from whom he ran away, taking service asa footman. His first poetical attempts seem to have been made when he was a servant in the family of the Hon. Mrs Lowther, and were published by subscription under the title of The Musein Livery, or the Footman's Miscellany (1732). This was followed by an elegant little satirical farce called Zhe Toyshop, the hint of which is said to have been taken from Randolph's Jfuse's Looking-glass, and which, having obtained the approbation of Pope, was acted at Covent Garden with great success. The profits accruing

from the sale of these two publications enabled him to | and fellow.

establish himself as bookseller in Pall Mall; and his merit and enterprising spirit soon made him one of the foremost publishers of the day. One of the first copyrights he published was that of Johnson's London, for which he gave ten guineas in 1738, and he was afterwards the leader of the association of booksellers that furnished Johnson with funds for the preparation of his Hnglish Dictionary. In 1737 a new piece of his own, entitled Zhe King and the Miller of Mansfield, was received with undiminished applause. His immediately subsequent farces, however, were not so popular. In 1738 he published a collection of his dramatic works in one volume 8vo, under the modest title of Zzzfles, which was followed by the Triumph of Peace, a masque, occasioned by the treaty of Aix-la-Chapelle, anda fragment on Public Virtue. Dodsley was also the author of the Economy of IZuman Life, a work which acquired considerable celebrity ; but for this it is supposed he was not a little indebted to the mistaken opinion which long prevailed that it was the production of Lord

Chesterfield. The name of Dodsley is from this period associated with much of the literature of his time. Among other things he projected V'he Annual Register, com- menced in 1758, The Museum, The World, and The Preceptor. To these various works Horace Walpole, Akenside, Soame Jenyns, Lord Lyttelton, Lord Chesterfield, Edmund Burke, and others were contributors. His owu latest production was a tragedy entitled Cleone, which was received with even greater enthusiasm than his earlier works. It had a long run at Covent Garden; two thousand copies of it were sold on the day of publication, and it passed through four editions within the year. It has long, however, ceased to be read, and apart from his fame as a publisher Dodsley is now chiefly remembered on account of his Select Collections of Old Plays (12 vols. 12mo, London, 1744 ; 2d edition, 12 vols. 8vo, 1780), He died at Durham while on a visit to a friend, 25th September 1764.

DODWELL, Epwarp (1767-1832), an English anti- quarian writer and draughtsman of considerable note in the department of classical investigation. He belonged to the same family as Henry Dodwell the theologian, and received his education at Cambridge. Being under no necessity to adopt a profession as a means of livelihood, he devoted himself entirely to his favourite pursuits, travelled for several years—from 1801 to 1806—in Greece, and spent the rest of his life for the most part in Italy, either at Naples or at Rome. An illness contracted in 1830 during a visit of exploration to the Sabine Mountains, undermined his constitution and ultimately resulted in his death, which took place at Rome in May 1832. His widow, a daughter of Count Giraud, was thirty years his junior, and after his death became famous as the " beautiful" countess of Spaur, and played a considerable réle in the political life of the Papal city.

His works are—A Classical and Topographical Tour through Greece, 2 vols., London, 1819, of which a German translation by Sickler was publighed at Meiningen in 1821 ; Views in Greece, con- sisting of thirty toloured plates, London, 1821 ; and Views and Descriptions of Cyclopian and Pelasgic Remains in Italy and Greece, London 1834. The last work, which contains 130 plates, was brought out simultaneously at Paris with a French text.

DODWELL, Henry (1641-1711), a learned controver- sial writer, was born at Dublin in October 1641. His father had once been possessed of considerable property in Connaught, but having lost it at the rebellion settled at York in 1648. Here Henry received his preliminary edu- cation at the free school. By the death of his parents he was reduced in early life to the greatest poverty. In 1654 he was sent by his uncle to Trinity College, Dublin, of which he was soon afterwards cliosen scholar Having conscientious objections to take

o2t orders he relinquished his fellowship in 1666, and resiced for some time at Oxford, Dublin, and London successively. In 1688 he was elected Camden professor of history at Oxford; but in 1691 he was deprived of his professorship for refusing to take the oaths of allegiance to William and Mary. Retiring to Shottesbrooke in Berkshire, and living on the produce of a small estate in Ireland, which he had at first generously relinquished in favour of a near relation, he devoted himself to those literary labours in chronology and ecclesiastical polity on which his fame now rests. In the former department he published—Dvscourse on the Phenician History of Sanchoniathon (1681) i Annales Thucydidet et Xenophonter (1696) ; Chronologia Graco- Romana pro Hypothesibus Dion. Halicarnasset (1692) ; Annales Velleiani, Quintiliani, Statiant (1698); and a larger treatise entitled De Veteribus Grecorum Romanor- umque Cyclis, obiterque de Cyclo Judeorum ac Aitate Christi, Dissertationes (1701). All these obtained con- siderable reputation, and were frequently reprinted. Gib- bon speaks of his learning as “immense,” and says that his “ skill in employing facts is equal to his learning.” In the department of ecclesiastical polity his works are more numerous and of much less value, his judgment being far inferior to his power of research. In his earlier writings he was regarded as one of the greatest champions of the non-jurors ; but the absurd doctrine which he afterwards promulgated, that immortality could be enjoyed only by those who had received baptism from the hands of one set of regularly ordained clergy, and was therefore a privilege from which dissenters were hopelessly excluded, justly de- prived him of the confidence even of his friends. It is in- teresting, however, in view of the recent revival of the same doctrine, to know that he published in 1706 a treatise pro- fessing to prove from Scripture and the first fathers that the soul is naturally mortal. Dodwell died at Shottes- brooke, 7th June 1711. His eldest son Henry is known as the

author of a pamphlet entitled Christianity not founded on Argument, to which a reply was published by his brother William, who was besides engaged in a contro- versy with Dr Conyers Middleton on the subject of miracles,

DOG, a name common to several species of Cantde—a family of Carnivorous Mammals widely distributed over nearly every part of the globe. Many of the species belonging to this family, as the wolf and the jackal, are social animals, hunting in packs, and are readily tamed ; while in confinement they show little or no repugance to breeding. Ina group thus eminently capable of domestica- tion, it is not surprising that in the earliest times one or more species should have been brought under the dominion of man, or that under human care the domestic dog should have become, as Baron Cuvier calls it, “the completest, the most singular, and the most useful conquest ever made by man.” There is sufficient evidence to show that the dog existed in the domesticated state during prehistoric times ; consequently neither history nor tradition is avail- able to solve the question of its origin. That must be decided, if at all, by the naturalist, and the variety of opinion existing on this point at the present time renders it exceedingly improbable that the parentage of the dog will ever be ascertained with certainty. Some suppose that all our breeds have sprung from a single wild source, others that they are the product of the blending of several distinct species. Of the former, the majority regard the wolf as the parent form, others favour the claims of the Jackal, while a few regard them as the descendants of an extinct species, and point to the fossil remains of a large dog, found in the later Tertiary deposits, as the probable wild stock. The prevalent belief at the present day is probably that which regards the domestic dog as the pro-

duct of the crossing of several species, living and extinct. This opinion is founded on such considerations as the presence in the earliest historic times of many breeds (totally distinct from each other, and nearly resembling existing forms), the existence of wild species of dogs in all quarters of the globe, the fondness of savage man for taming wild animals, and the extreme improbability that among so many presumably equally tameable canine

species only one should have been chosen for domestication. Nor is it to be forgotten, as Darwin has well shown, that fear of man in most wild animals is a gradually acquired instinct, and that before its acquirement a wild species would have been much more readily tamed than after. Thus the wild dog of the Falkland Islands (Canis antarcticus), when these were first visited by man, approached him without sign either of fear or of aversion. The weightiest reason for this opinion, however, lies in the fact that many of the breeds of domestic dogs, found in different countries, bear a more or less striking resemblance to the wild species still existing in those countries. The Esquimaux dogs of North America so closely resemble the wolf of the same regions, both in appearance and in voice, that Sir J. Richardson on one occasion mistook a pack of those wild animals for a troop of Indian dogs; and the Indians are said to take the young of wolves in order to improve their canine breed, which would seem to prove that the dog and wolf are sufficiently fertile znter se. The Hare Indian or Mackenzie River Dog, although somewhat smaller in size than the prairie wolf (Canis latrans) occur- ring in the same regions, so resembles the latter that Richardson could detect no decided difference in form. It seems, in fact, to bear the same relation to the prairie wolf that the Esquimaux dog does to the great grey wolf already mentioned. The wolf certainly exhibits few peculiarly dog-like qualities, being both ferocious aud cowardly, and showing no attachment to man; but instances, neverthe- less, are on record of tamed wolves which in their gentle- ness, in love for their masters, and in intelligence, showed true dog-like capacity. The Esquimaux dogs are likewise decidedly wolfish in disposition, showing little or no attachment to their owners, and sometimes, it is said, even attacking them when pressed by hunger. Distinct varieties of the wolf occur in Europe and in India, and such European breeds as the shepherd dog of Hungary so closely resemble the wolf that an Hungarian has been known to mistake that animal for one of his own dogs; while certain of the Hindu pariah dogs are said by Blyth to resemble the Indian variety of wolf. The large semi-domesticated dogs of the northern parts of both hemispheres may thus be regarded as principally derived from the various species and varieties of wolves still existing there. The period of gestation in the wolf and dog is the same, being 63 days in both. In the tropical regions of the Old World the wolf disappears, and with it the prevalence of wolf-like dogs, their places being taken by smaller breeds, such as certain of the pariah dogs of India and of Egypt, between

which and the jackals abounding in those countries no structural difference can, according to Geoffroy Saint-Hilaire, be pointed out. Their period of gestation agrees with that of the dog and wolf, and like dogs, tamed jackals when caressed “ will,” says Darwin, “jump about for joy, wag their tails, lower their ears, lick their master’s hands, couch down and even throw themselves on the ground belly upwards ;” when frightened, also, they carry their tails between their legs. Jackals associate readily with dogs, and their hybrid offspring are not sterile; there is also an instance on record of one of these which barked like an ordinary dog. The habit of barking, so characteristic of dogs, is not, however, universal among them, the domestic dogs of Guinea and certain Mexicau breeds being described

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asdumb. This faculty appears to be readily lost and to be capable of reacquirement. ‘he domestic dogs which ran wild on the island of Juan Fernandez are said to have lost the power of barking in 33 years, and to have gradually reacquired it on removal from the island. The Hare Indian Dog makes an attempt at barking, which usually ends in a howl, but the young of this breed born in the Zoological Gardens seem to possess this faculty to the full extent. In tropical America, where jackals are unknown, there are several wild species of dogs to which the domestic breeds of those regions bear a considerable resemblance, and at the present day the Arawak Indians cross their dogs with an aboriginal wild species for the purpose of improving the breed. In Australia the Dingo, regarded by many as constituting a distinct species indigenous to that country, its remains having been found in caves associated with those of other extinct mammals, occurs both in the wild state and domesticated at the present day. Darwin, after reviewing this question, cuncludes that “ it is highly probable that the domestic dogs of the world have descended from two good species of wolves (Canis lupus and C. latrans), and from two or three other doubtful species of wolves, namely, the European, Indian, and North African forms, from at least one or two South American canine species, from several races or species of the jackal, and perhaps from one or more extinct species.”

Remains of the dog, of Neolithic age, ocenr in the kitchen- middens of Denmark, and in similar deposits in Switzer- land. In Denmark the earliest

known dog is followed, in the Bronze period, by a larger breed, and that by a still larger form in the succeeding or Iron period; while a somewhat similar succession occurs in Switzerland. These successive changes, however, may merely indicate the appearance in those countries of new races of prehistoric man, who brought with thei their own dogs, In historic times the earliest records of the dog are to be found in the figures of these animals on Egyptian monuments from tliree to five thousand years old; and these show that thus early, such varieties as the hound, greyhound, watch-dog, and turnspit were cultivated on the banks of the Nile. By the ancient Egyptians the dog was worshipped under the title Anubis, as the genius of the River Nile,—the appearance of Sirius, the dog star, corresponding with tlle time of the annual rise of that river. The city of Cynopolis was built in its honour, and there its worship was carried on with great pomp. Certain kinds of dogs were regularly sacrificed to Anubis, their bodies being afterwards embalmed ; and occasionally the mummies of these are still found. The earliest record of the dog in sacred history is in connection with the sojourn of the Israelites in Egypt; and the religious homage paid to it by their oppressors may probably explain why the Jews were taught to regard itas unclean. Under Moslem law, which in many matters was founded upon Jewish practices, the dog occupies an equally degraded position ; and through- out Mahometan countries at the present day, their generally wretched condition bears ample testimony to the neglect and ill-treatment to which for centuries they have been subjected. The pariah dogs of Eastern cities know no master; they prowl about the streets in troops, eating whatever garbage may come in their way, thus serving the useful purpose of scavangers, and occasionally receiving a meal from the more humane of the inhabitants. On no account, however, must even the garments of an orthodox Mahometan be defiled by their touch, and such is the intelligence and sagacity of these ownerless curs that, having become aware by painful experience of this religious prejudice, they seem to take the greatest care to avoid giving such offence. The value set upon the dog by the Egyptiins seems to have been shared in by the ancient

Greeks and Romans, who possessed many breeds closely allied to still existing forms. Those early breeds, however, are remarkable for the entire

absence of pendulous ears, which do not make their appearance till near the decline of the Roman empire. By both Greeks and Romans they were employed in the chase, and in war, and for the latter purpose they were armed with spiked collars, and some- times even with a coat of mail. Corinth was said to have been saved by 59 war dogs, which attacked the enemy that had landed while the garrison slept, and which fought with unbounded courage till all were killed except one, which succeeded in ronsing the garrison. Shakespeare thus put no figure of speech in the mouth of Antony when he exclaims— **Cry havoe, and let slip the dogs of war."

Dogs are naturally carnivorous, preferring flesh that is slightly putrid ; but they can also live on vegetable food, and in countries where the dog itself is eaten, it is generally thus fed. In drinking it laps with its tongue, and it never perspires, although when heated its tongue hangs from its mouth, anda fluid runs from it. When about to go to sleep, no matter where, it turus round and round, and scratches the ground with its forepaws as if to form a hollow couch; and in this seemingly senseless action it is no doubt continuing a habit once found useful to its wild progenitors. Its sense of smells and hearing are exceed- ingly acute, aud many suppose that the remarkable power possessed by the dog, in common with the cat, of finding its way for great distances along unknown roads may be due to the exercise of the former sense. The differences that obtain between the various breeds of dogs are very great, the skulls, according to Cuvier, differing more from each other than they do in the different species of a natural genus. The molar teeth, which normally consist of 6 pairs above and 7 below, sometimes number 7 pairs above and below, while in the hairless dog of Egypt the teeth are sometimes reduced to a single molar on each side, incisors and canines being entirely awanting. Some varieties are six times as Jong as others, excluding the tail, and the number of vertebree in the latter organ is also exceedingly various ; nor is the number of mamme always uniform, there being 5 on each side in some, and 4 in others, while occasionally the number on the two sides is unequal.

While man has thus bestowed great attention on the physical development of the dog, and availing himself of natural variations has, by careful selection aud intercross- ing, moulded the dog into an almost infinite variety of forms, he has also, by education, developed its moral and

intellectual capabilities, so that the dog may, in this respect, be said to have, within its own limits, kept pace with its master’s advancement; and it is undoubtedly owing toa certain community of feeling existing between dog and man that this domestic animal has, since the earliest times, been regarded as the companion as well as the humble servant of mankind. There are few human passions not shared in by the dog. It is, like him, subject to anger, jealousy, envy, love, hatred, and grief; it shows gratitude, pride, generosity, and fear. It sympathizes with man in his troubles, and there are numerous instances on record of its showing sympathy for the distressed of its own kind, It remembers, and is evidently assisted thereto, as man is, by the association of ideas; that it is not devoid of imagina- tion may be assumed from the fact that it dreams, pursuing in its sleep imaginary game. Its judgment is often singularly correct ; while it may almost be said to have a religion, in which man is its god, and his will its rule of conduct, disobedience to which produces an evident feeling of shame and a quiet submission to punishment. It shares with man in awe of the unknown, and the most

courageous dog will often tremble at the sudden rustle of without assistance. The shcep-dog of Europe is generally

a leaf. him fit above all other animals for the companionship of man, the physieal and intellectual qualities characteristic of the various breeds have been seized upon and de- veloped to their utmost by man, so as to enable him to use the dog for a great variety of purposes; what these are will appear in the following necessarily brief aceount of the more important breeds of dogs.

According to Professor Fitzinger, there are at least 189 distinet varieties of the domestie dog, and when it is eon- sidered that the origin of many if not most of these is un- certain, it is not surprising that considerable difference of opinion should exist as to the most natural mode of group- ing them together. Their arrangement into the following six raees, founded to a certain extent on the form and de- velopment of the ears, probably affords

an approximation to a natural classification, viz., WoLF-Doas, GREYHOUNDS, SpANIELS, Hounps, Mastirrs, and TERRIERS.

I, Woxr-pocs.—Throughout the northern regions of _ both hemispheres there are several breeds of semi-domesti- eated wolf-like dogs having nearly ereet ears, and long woolly hair; these include among others the dogs of the Esquimaux and the Kamtchadales. The Esquimaux Dog is usually of a black and white colonr, nearly as large as a mastiff, with a fine bushy tail, and sharp pointed muzzle. It is of the greatest value to the inhabitants of the boreal regions of America in hunting the seal, bear, and reindeer ; while it is equally useful as a beast of burden, carrying loads on its baek—a kind of work for which dogs are by uo means well suited—and drawing s!edges over the snow. On a good road half a dozen of these dogs will draw, it is said, from 8 to 10 ewts., at the rate of 7 miles an hour; and Kane, the Arctic traveller, tells how that number of

dogs, well worn by previous travel, carried him with a fully –

burdened sledge, between seven and eight hundred miles during the first fortnight after leaving lis ship—a mean rate of 57 miles a day. According to the same authority, the training of these dogs is of the most ungracious sort. “T never heard,” he says, “a kind aecent from the Fsquimaux to his dog. The driver’s whip of walrus hide, some 20 feet long, a stone or a lump of ice skilfully directed, an imprecation loud and sharp, made emphatie by the fist or foot, and a grudged ration of seal’s meat, make up the winter’s entertainment of an Esquimaux team.” Owing to the ill-treatment to whieh they are thus habitually subjected, they are highly irritable and difficult to manage, and in sleighing it is necessary to have a well-trained dog as leader, to whom the driver speaks, and by whom the other dogs in the team are guided. They readily relapse into the wild state, and have been known thus ta hunt the reindeer in packs like wolves. These dogs have borne a prominent part in Aretie exploration, and mueh of the difficult work done in this field would have been well-nigh impossible without them, The Kamtchatka dogs are also used for sledging, and are famed for their swiftness and endurance. During summer they run at large and cater for themselves, returning in winter to their masters, who feed them prineipally with the heads of dried fish.

The Sheep-dog.—In Eastern eountries where the sheep follow the shepherd, the duties that fall upon the dog are simpler, and require less intelligence, than those performed by the European breeds. Their task is chiefly to defend the flocks and herds from wild beasts and robbers, and for this purpose the wolf-like Turkoman Wateh-dog and the Sheep-dog of Natolia are, by their great strength and courage, eminently fitted. The former is described by Sir J. M‘Neill as a shaggy animal, nearly as large as the New-foundland dog, and very fieree and powerful, the dam of the specimen he deseribes having killed a full-grown wolf

While the possession of such faculties has rendered };

classed among the wolf-like dogs, owing to the ereet or seini-erect character of its ears, its pointed nose, and shaggy covering ; and Buffon, for such reasons, regarded it as nearest to the primitive type of the domestie dog. It is more reasonable to suppose with Martin (History of the Dog) that those points “only indicate purity of breed unalloyed by admixture with other varieties.” The faet that its life is spent almost entirely out of doors, and that it has little or no opportunity of mixing with dogs other than of its own kind, would tend to preserve uniformity in external appearanee ; while its high eerebral development and intelligenee prove beyond a doubt that the breed of sheep-dogs is one of the most highly improved, and in this respeet remotest from the primitive type. Its whole intelleet is devoted to the one duty of tending its master’s flocks, and in the performanee of this it is equally sagacious, vigilant, and patient. Ata word, or even a look, from its master, it will gather the sheep, seattered for miles around, to one place. During and after the snowstorms to whieh highland distriets are so frequently exposed, the sheep-dog is invaluable in saving its master’s property from almost total destruction, Without it the Highlands of Scot-land would be almost useless for sheep-farming purposes. “Tt would require,” says the Ettriek Shepherd, “ more hands to manage a stoek of sheep, gather them from the hills, force them into houses and folds, and drive them to inarkets, than the profits of the whole stoek would be capable of maintaining.” The sheep-dog stands about

Fig. 1.—Sheep Dog.

15 inches high, is covered with long shaggy hair of a black colour varied with dark grey or fulvous brown, and its tatl is of moderate length, slightly reeurved and bushy. In dis- position it is quiet; and although not quarrelsome, it shows great courage in defending itscharge. It will not wantonly attack a stranger, but evidently regards him with suspicion, and rejeets all friendly advances. There are three varieties of the sheep-dog found in Great Britain, viz.—the Seottish Collie, standing only from 12 to14 inches high, and regarded as the purest and most intelligent; the Southern Sheep-dog, of larger size, but with shorter fur, and having the tail often very short—a peculiarity which, aceording to Bell, “ appears to be perpetuated from parents whose tails have been cut ;” and the Drover’s Dog or Cur, generally black and white in colour, and taller in its limbs than the others. It is employed in driving sheep and eattle to the eity markets, and in the diseharge of this duty shows intelligenee quite equal to that of the other vareties ; although in the treat- ment of the herds under its charge, it often displays a more savage disposition. The sheep-dogs of South Ameriea are so trained as to unite in themselves the duties of dog and shepherd. ‘ When riding,” says Darwin, ‘it isa eommon thing to meet a large flock of sheep, guarded by one or two

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dogs, at the distance of some miles from any house or man.” And on inquiry he found out the method by which this friendship between dog and sheep had been established. ‘The dog when a puppy is removed from its mother, and is no longer allowed to associate with other dogs, or even with the children of the family. It is kept in the sheep pen, and suckled by a ewe. Generally also it is castrated and thus has little or no community of feeling with its kind. Brought up among the sheep it shows no desire to leave the flock, but assumes the position of leader. “ It is amusing,” says the above writer, “ to observe, when approaching a flock, how the dog immedi- ately advances barking, and the sheep all close in his rear as if round the oldest ram.” It comes home daily for food, on receipt of which it immediately returns to the flock ; and this it is often taught to bring home in the evening.

The Newfoundland and Great St Bernard or Alpine Dogs occupy an uncertain position, forming, according to some authors, a group by themselves, and being classed by others among the wolf-like dogs, although in their large and pendulous ears they differ widely from the typical forms already noticed.

The Newfoundland Dog is believed to have been brought to England from the island to which it owes its name, but probably owing to partial crossing, it differs somewhat from the original American breed, the latter being smaller in size, with the muzzle less blunted, and almost totally black in colour. In Newfoundland and Labrador these dogs are used as beasts of burden, drawing considerable loads of wood and provisions on sledges. The feet are pittially webbed, and consequently they are unrivalled as watcr-dogs, and although their weakness of scent and com-

‘pirative slowness of foot renders them useless to the hunter,

yet in a country of fens and morasses, the sportsman finds them of the greatest service in rescuing birds that have fallen into the water; nor do they hesitate in their eager- ness for retrieving to make their way through the roughest cover. The English variety of Newfoundland Dog is a noble creature, standing 30 inches high at the shoulders,

Fra. 2.—Newfoundland Dog.

its hair waved or curly and of a black and white colour in nearly equal proportions, its tail massive and bushy and curled upwards at the extremity. Equally noble in dis- position, it does not allow the annoyance of smaller dogs to disturb its serenity, while its patience with children is not readily exhausted. In defence of its master’s property it will fly with bull-dog ferocity at any intruder, while it will battle with the waters to save him from drowning. Its services in the saving of life are well known. When kept in confinement its temper is more variable, and in a fit of irritation these dogs have been known to attack those for whom they have previously shown tlie greatest regard; but

even in confinement such cases are altogether exceptional. This breed is supposed by some not to be indigenous to North America, but to have been introduced either on the first discovery of Newfoundland by the Norwegians about the year 1000, or on its re-discovery by Cabot in 1497. The Norwegians, according to Martin, have dogs closely resembling the Newfoundland breed, which are used in hunting bears and wolves, and which are armed with spiked coilars in order to protect them from the wolves which seek to seize them by the throat. The Great St Bernard Dog of the present day is a powerful animal, as large as a mastiff, with close short hair and pendulous ears, and varying in colour, in one case being described as “ sandy red or tawny ” with black muzzle, in another as “ more or less marked with grey, liver colour, and black clouds.” Previous to 1820 there existed another breed of these dogs, closely allied in form and size to the Newfoundland, but in that year the greater portion of them died of au epidemic, which necessitated the introduction of the present variety. Thesc dogs are kept by the monks of the Hospice of St Bernard, in their convent, situated on one of the most dangerous passes between Switzerland and Italy, near the top of the Great St Bernard, where they are trained to the work of rescuing travellers who, overtaken by the snow- storm, may have lost their way, or sunk benumbed by thie cold. On such occasions these sagacious and powerful dogs set out from the convent in pairs, one bearing a flask of spirits attached to his neck, the other with a cloak, Should they come upon the bafiled yet struggling traveller, they conduct him to the convent; but should he have succumbed and be covered by the suow, their keen scent detects his presence although buried several feet beneath the surface. By loud barking—and a young dog of this breed kept many years ago in the suburbs of Edinburgh was able to make itself heard a mile away —they apprise the monks of the need of succour, while with their feet they attempt to clear away the snow from the body. In this way these dogs are instrumental in saving many lives every year, although often at the sacrifice of their own ; one dog which thus met its death bore a medal stating that it had been the means of saving twenty-two lives.

Il. GreyHounps.—Representations on Egyptian monu- ments prove the existence of the greyhound race of dogs at least 3000 years ago, and the silky-haired breeds exist- ing in Egypt, Arabia, and Persia at the present day are probably the slightly modified descendants of those ancient forms. ‘The

numerous varieties of this race may be con- veniently grouped into the wire-haired and smootli-haired breeds,—of the first of which the Irish Greyhound or Wolf- dogis an example. In former times this magnificent breed was employed in Ireland in hunting the wolf and the stag, but the extirpation of these beasts of chase led to the neglect and consequent degeneracy of the breed, and it has now become extinct in that country. It was probably in- troduced from the sister isle into Scotland, where its modified descendant, the Scottish Deerhound, in hunting the stag still bears testimony to the great strength and agility of its progenitor. The Old English Greyhound was only allowed to be kept by the nobles and princes, and tlie killing of it was, under the old game laws, a felony punish- able by death. It was employed in coursing the red deer aud fallow deer, and Queen Elizabeth is said to have witnessed, on one occasion, the pulling down of 16 bucks by greyhounds. These must have been much more power- ful animals than the modern English breed, which, how- ever, is regarded as the finest of the smooth-haired grey- hounds. In speed and wind it is unrivalled, all other points having been sacrificed to these by breeders. It has thus almost lost the power of scent, and is the only dog that hunts by sight alone, hence probably the name gaze-

hound formerly applied to it. According to Daniel, its speed on flat ground is little inferior to that of a racehorse,

Fic. 3.——Greyhound.

while on hilly ground it is probably superior to it. Every pirt of its body is suggestive of activity and speed—the long and pointed muzzle, the narrow head, thin neck, chest deep and flanks contracted, long slender legs, and the tail narrow and curved upwards. It is exceedingly docile, good-tempered, and affectionate. The colour varies in different breeds, and even in individuals of the same breed. Bell suggests that the greyhound may owe its name to the prevailing colour of the original stock ; while others, with more probability, derive it from the ancient British grech or greg, a dog. The Italian greyhound is a small but exceedingly elegant and delicate breed, relegated in this country to the parlour as a ladies’ pet. The Lurcher is supposed to be the result of a cross between the rough greyhound and the

sheep-dog, having the sharp, pointed muzzle of the former, and owing its diminished height but greater stoutness to the latter. It resembles the sheep-dog still more in its great intelligence, and in devotion to its master. That master is usually the poacher, and in his illegal pursuit of game, the keeness of scent, the cunning, and the absolute silence of this dog render it the most suitable of all for such nocturnal work. It waylays the rabbit returning to its burrow, its cunning circumvents the hare where its speed would not avail, and it has strength sufficient to pull down the fallow deer. According to Colonel Smith these dogs sometimes run wild when their owners are captured and imprisoned, and when thus cater- ing for themselves they have been regularly hunted with hounds.

III. SpanieLs.—The spaniels are characterized by large pendulous ears, long silky hair often curled and shaggy, and acute scent. In cerebral development, and, con- sequently in intelligence, they are probably superior to all other dogs, while they are unrivalled in docility and in devotion to man's service. They include the Common Spaniel, the Water Dog, and the Setter, besides numerous fancy varieties, as King Charles's Spaniel, the Blenheim Spaniel, and the Maltese Dog. The Spaniel is the favourite of the sportsman, entering more than any other dog into his master's feelings, and seeming to enjoy the sport for its own sake. It is elegant in form, with remarkably long ears, and beautifully waved hair, usually of a red and white colour. It takes readily to the water, and has been known to exhibit a remarkable propensity, as well as great dexterity, in fish-catching. The Water Dog is larger than the spaniel, and is covered with abundant curly hair. Its colour is generally a mixture of black and white. From its aquatic habits it is of great service to the water-fowl sportsman as a retriever. It is readily taught to fetch and

carry, and the sagacity which it shows in finding any article

it has once seen, but which has afterwards been lost or

purposely eoncealed, is truly remarkable. The Setter is also a favourite with sportsmen, its habit of crouching when

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gee Fic. 4.—Setter.

it has scented game rendering it specially serviceable, This habit, like that of pointing, is probably, as Darwin suggests, “merely the exaggerated pause of an animal about to spring on its prey.” It is generally white in colour, with large liver-coloured spots.

IV. Hounps.—Hounds are those dogs with long pendulous ears, close hair, and long deep muzzle which hunt by scent. They include the Bloodhound, Staghound, Foxhound, Harrier or Beagle, and Pointer.

The Bloodhound, regarded by many as the original stock from which all the other varieties of British hounds have been derived, is now rarely to be met with in entire purity. Its distinguishing features are long, smooth, and pendulous ears, from 8 to 9 inches in length, full muzzle, broad breast, muscular limbs, and a deep sonorous voice. ‘The prevailing colour is a reddish tan, darkening towards the upper part, and often varied with large black spots. It stands about 28 inches high. The bloodhound is remark- able for the acuteness of its scent, its discrimination in keeping to the particular scent on which it is first laid, and the intelligence and pertinacity with which it pursues its object to a successful issue. These qualities have been taken advantage of not only in the chase, but also in pursuit of felons and fugitives of every kind. According to Strabo, these dogs were used in an attack upon the Gauls. In the clan feuds of the Scottish Highlands, and in the frequent wars between England and Scotland, they were regularly employed in tracking fugitive warriors, aud were thus employed, according to early chroniclers, in pursuit of Wallace and Bruce. The former is said to have put the Sleuth-hound, as it was called, off the scent by killing a suspected follower, on whose corpse the hound stood,

- Nor farther moved fra’ time she found the blood.” For a similar purpose captives were often killed. Bruce is said to have baffled his dogged pursuer as effectually, though less cruelly, by wading some distance down a stream, aud then ascending a tree by a branch which overhung the water, and thus breaking the scent. In the histories of border feuds these dogs constantly appear as employed in the pursuit

of enemies, and the renown of the warrior was great who, ‘* By wily turns and desperate bounds, Had baffled Percy’s best bloodhounds.”

In suppressing the Irish rebellion in the time of Queen Elizabeth, the earl of Essex had, it is said, 800 of these animals accompanying the army, while in later times they

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became the terror of deer-stealers, and for this purpose were kept by the earls of Buccleuch so late as the 18th century, and even at the present time their remarkable power of scent is occasionally employed with success in the detection of murder. The Cuban Bloodhound is of Spanish descent, and differs considerably in form from the English variety, having small, though pendulous ears, with the nose more pointed, and with a more ferocious appearance. Its employment in the capture of runaway slaves, and in the cruelties connected with the suppression of negro insurrec- tions, has brought the animal into the evil repute which more properly belongs to the inhuman masters, who thus prostituted the courage, sagacity, and pertinacity of this noble dog to such revolting purposes.

The Staghound has been generally regarded as the result of a cross between the slow-paced old southern hound

Fia. 5.—Staghound.

and the fleeter foxhound; but it has been objected that the breed was known in England long before the foxhound was made use of, and indeed before there was an animal at all resembling the one which is now known by that term, and those who maintain this view regard the staghound as a bloodhound crossed with some lighter dog, as a grey- hound or a lurcher. However produced, it is a majestic

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Fia. 6.—Foxhound.

dog, of great strength and considerable swiftness, besides possessing in common with the bloodhound, and with it alone, the property of unerringly tracing the scent it is first laid upon among a hundred others. In the reign of George

III., who was himself ardently attached to the sport of stag-hunting, packs of these dogs were maintained in several parts of the country, but since the death of that monarch this form of hunting has declined, and the total extinction of these dogs at no distant date seems probable. The Foxhound is the hunting-dog upon which the breeder has bestowed the greatest pains, and, according to Bell (British Quadrupeds), his efforts have been rewarded " by the attainment of the highest possible degree of excellence in the union of fine scent, fleetness, strength, perseverance, and temper." It stands usually from 20 to 22 inches high at the shoulders, and is of a white colour, marked with large clouds of black and tan. Its speed is such that a fox-hound has been known to get over 4 miles in 7 minutes, while its endurance has been shown in such cases as the 10 hours' continuous run performed by the duke of Richmond's hounds in 1738 before killing the fox, durivg which many of the sportsmen tired three horses, and several of the latter died during the chase. The Harrier is smaller

Fic. 7.—Harrier.

than the foxhound, not exceeding 18 inches in height at the shoulders, and is exclusively used, as the name shows, in hunting the hare. Of late years it has been greatly im- proved, so as to be almost literally a foxhound in minia-

Fic. 8.—Beagle.

ture. According to Beckford, to whom much of the improvement in the breed is owing, " harriers, to be good, like all other hounds, must be kept to their own game. If

you run fox with them you spoil them; hounds cannot be : VII .— 42

perfect unless used to one scent and one style of hunting.” A still smaller hound is the Beagle, from 12 to 14 inches high, the most diminutive of the hunting dogs. It was formerly a great favourite, being used in hunting the hare, but in this it has been almost wholly superseded by the ‘harrier. It is much slower than the foxhound or harrier, but in spite of this its exquisite scent and its perseverance seldom fail to secure for it the object of its chase, although it may be after a leisurely hunt of 3 or 4 hours. The voice of the beagle is highly musical, and on this account a certain number of them were formerly added to each pack of hounds as a band now is to a regiment of soldiers. Diminutive packs, from 9 to 10 inches high, have been kept, and O’Connell used to beguile his winter leisure with a dozen of these tiny favourites. The Pointer is related to the hounds, and is supposed to be derived from an old Spanish breed. It is a beautiful, smooth-haired dog, coloured somewhat like a foxhound, active in its move- ment, and patient of fatigue. It owes its name to its habit of standing fixed at the scent of game, and this, like the crouching of the setter, whether due to long-continued training alone, or to the modification and exaggeration by man of the instinctive start of surprise common to all dogs, when first aware of their prey, is now inherited, the puppy pointing before his training has begun, The strength of this pointing propensity was never more signally shown than in the case, told by Daniel, of two pointers which stood immovable as statues during the hour and a quarter occupied in sketching them, The Dalmatian Dog is a remarkably handsome breed, apparently intermediate between houndand pointer Itis of a white colour, thickly

Fic. 9.—Dalmatian Dog.

marked with rounded black spots, but it is not sufficiently keen scented or sagacious to be of use in hunting. It has accordingly been relegated to the stables, where it receives the training necessary to a coach-dog. It is known in France as the Brague de Bengale, and is supposed to be an Indian variety.

V. Mastirrs.—The Mastiff race of dogs is characterized by extreme shortness and breadth of muzzle, enormous strength of jaws, and general

robustness of form. It in- cludes the Mastiff, the Bull-dog, and the Pug,

The Mastiff equals in courage, while in strength, in- telligence, and mildness of disposition it excels, its near ally the bull-dog. It is commonly supposed to have beer the breed of large dogs abundant in Britain during Roman times, which were exported in large numbers to Rome for the purpose of fighting in the Amphitheatre, although Colonel Smith believes that these early British dogs were only bull-dogs of a larger size than the present breed, and that the mastiff was introduced into Britain from the cold regions of Central Asia, It isa large dog, standing 30

inches high at the shoulders, with thick muzzle, pendulous lips, and heavy expression, its ears small and droopiag, and the tail well developed. It is usually of a buff colour, with ears and muzzle darker. Although fierce in combat,

Fia. 10.—Mastiff.

it does not attack without considerable provocation, and it bears the teasings of children with the greatest good nature. When in former times it entered into combat with wild animals, it has been known to engage a bear, a leopard, and a lion, and pull each of them down in succes- sion. At the present time the breed .is rarely met with pure, and is chiefly useful as a watch-dog, its sagacity and fidelity in this capacity being well known. While he shows great attachment to man when made his companion, the temper of the mastiff becomes soured by confinement, and he is then dangerous to strangers. The Thibet Mastiff is larger than the English breed, and its countenance is still heavier. It is the watch-dog of the tribes inhabiting Thibet and tle Central Asian table-land, to whom it is strongly attached, although exceedingly savage towards strangers. There is a huge mastiff figured on an Assyrian sculpture, 640 Bc., and Sir H. Rawlinson states that similar dogs are still imported into that country. The Bull-dog is the least sagacious, as well as the most ferocious and obstinate, of the dog tribe. It is smaller than the mastiff, but is strongly built. Its broad, thick head, the projection of the lower jaw beyond the upper disclosing the incisor teeth, the sudden rise of the head from the face, and the scowling

expression of the eyes, combine to make the countenance of the bull-dog terrible. Bell points out, in his History of British Qua drupeds, the resemblance in the deep chest, the narrow loins, muscular limbs, and stiff tapering tail of the bull-dog to the elegant form of the greyhound. The chief difference appears in the muzzle, a variation which may have suddenly arisen in a single individual, and been perpetuated in its progeny. ‘The ears of the bull-dog are short and semi-erect, and the nostrils distended ; the colour varies, being brindled in some, and black and white in others. It is essentially a fighting-dog, and was formerly bred for the brutal sport of bull-baiting, in which its terrible obstinacy usually gained for it the victory. It differs from other dogs in giving no warning of its attack by preliminary barking, and when once it has fixed its teeth into the object of attack, no amount of torture will cause it to relax its hold. Colonel Smith states that he has seen one “ pinning down an American bison and holding his nose down till the animal gradually brought forward its hind feet, and, crushing the dog to death, tore his muzzle out of the fangs, most dreadfully mangled ;” and there is an instance on record of its returning to the attack on a bull,

after each of its feet had been cut off in succession. The intelligence of this breed has been but slightly developed, and it exhibits little of that attachment to man which characterizes other dogs, although it may be said to show a sullen sort of fondness for its master. The Spanish Bull- dog is larger and more powerful than the English breed. The Pug-dog, which in form might be described as a minia- ture bull-dog, is probably a monstrous variety, rather than a degenerate form, of the bull-dog It is, however, wholly unlike the latter i: disposition, being timid and good tempered, and is kept only as a pet, for which its dulness of intellect scarcely fits it.

_ VI. Terriers —These include the numerous varieties of Terrier dog, and the Turnspit The Terrier is a small but very distinct breed and is probably one of the aldest dogs

Fia 11.—Terrier

found in Great Britain Three distinct varieties exist in this country, viz., the English Terrier, smooth and graceful in form, with sharp muzzle and erect

ears, compact body, strong though slender limbs, and tail carried aloft and some- what curved—the colour being black, with the belly and extremities usually tan, but sometimes white; the Scotch Terrier, differing from the former in the shortness of the muzzle and limbs, and in the rough wiry character of the hair, which is usually of a dirty white colour ; and the Skye Terrier, distinguished by the length and coarseness of its hair, the extreme shortness of its limbs, and the great length of its body. It is of a light brown colour, The Terrier in allits varieties is an exceedingly bold, active, and intelligent dog. It was formerly a regular accompaniment to every pack of hounds, for the purpose of unearthing the fox, and to its eagerness in taking the earth it owes itsname, Terriers are now chiefly employed in the destruc- tion of otters, badgers, weasels, and rats, a form of sport into which they enter with the greatest ardour, and in which they show the most remarkable dexterity, a cele- brated Terrier having been known to kill 100 rats, collected in one room, in 7 minutes. The Bull-terrier is a cross between this breed and the bull-dog, and is one of the most savage and obstinate of its kind. It was the breed chiefly used 1n the brutal sports of badger-baiting and dog-fighting, now almost unknown in England. The Turnspit, a monstrous form of dog, is not confined to any single breed. It is figured on the ancient monuments of Egypt, and occurs among the pariah dogs of India and of Paraguay. In Britain, where they seem to be derived from hounds or terriers, there are smooth and rough turnspits, 2 name which they owe to their having been formerly employed in turning kitchen spits by working inside a wheel, which

30 L when once set in motion forced the dog to continue running At Caerleon in Monmouthshire, a few years ago, a dog of this kind might have been seen thus employed in the inn kitchen. ‘The turnspit is characterized by great length of body and extreme shortness of limb, the latter being generally crooked. (J. GI.)

DOGE, a modified form of the ordinary Italian ‘duce, from the Latin dux, a leader or duke, employed to designate the chief magistrate in the republics of Genoa and Venice. In both cities the office underwent from time to time a variety of trausformations, for details on which the larger histories of the republics must be consulted,

In Venice the doge was originally chosen by universal suffrage, held office for life, and was regarded as the civil, military, and ecclesiastical chief. His duties and preroga- tives were not defined with much precision, and the limits of his ability and ambition were practically the limits of his power, In 755 his independence was diminished by the appointment of two assistants or duwumvirs ; but this institution was again allowed to fall into the background, and the doge acquired more and more of irresponsible authority, while at the same time the office was usually committed to a member of one or other of the more power- fulfamilies. This tendency towards a hereditary despotism was checked in 1033 by Flabenigo's law, which reinstituted the duumvirate, and declared distinctly that no doge had the right of associating any member of his family with himself in the government, or of transmitting his office on his decease. In 1172 a still more important change was introduced ; not only was the duumvirate replaced by a body of six councillors, but universal suffrage was abolished, and the election of the doge intrusted to a committee of twelve persons, elaborately selected from the members of the great council, On the death of Ziani IT. in 1229, two commissions were appointed, which obtained a permanent place in the constitution, and gave emphatic testimony to the fact that the doge was merely the highest servant of the community ; the first consisted of five Correttori della promisione ducale, whose duty was to consider if any change ought to be made in the oath of investiture administered to the doge; the second was a board of three inquisitori sul doge, intrusted with the curious task of examining and passing judgment on the acts of the deceased magistrate, whose estates might be mulcted in accordance with their decision. To minimize as far as possible the influence of individual families, the election of the doge was in 1268 effected by a curiously complex machinery, which remained, with some modifications, till the close of the republic ; thirty members of the great council, elected by ballot, selected nine members, who in their turn chose forty ; of these forty twelve taken by lot chose twenty-five; the twenty-five were next reduced to nine; the nine elected forty-five ; the forty-five were reduced to eleven ; and the eleven chose the final forty-one in whose hands lay the actual election of the doge. In proportion to the development attained by the oligarchical element in the constitution, the more important functions of the office were assigned to other officials or to administrative boards, and he who had once been really the pilot of the ship became little more than an animated figure-

head, properly draped and garnished. On state occasions he was still attended by all the

ceremonial observances of former times: his robe was still

purple, the horns of his beretta were still exalted, the sword, the tapers, and the trumpets were borne before him, his leaden seal was affixed to public documents, and the ring was still dropped yearly from his hand in symbolic espousal of Venice and the sea. But he was under the strictest surveillance, had to wait for the presence of other officials in order to open the despatches from foreign powers, was forbidden to leave the city, could not legally

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be possessed of property in a foreign land, or contract a foreign alliance for any of his children, and was moreover liable to the infliction of a fine for any trespass he might commit. ‘The office was maintained, however, till the last days of the republic, and from time to time was held by men who knew how to make it something more than such an empty simulacrum. (See Cecchetti, J Doge di Venezia,

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“ _— the institution of the doge dates from 1339, and at first he was elected without any restriction by popular suffrage, and held office for life; but after the reform effected by Andrea Doria in 1528, the term was reduced to two years, plebeians were declared ineligible, and the appointment was intrusted to the members of the great and the little councils, who were bound, however, to employ, in proof of impartiality, nearly as complex a machinery as that of the later Venetians.

DOG-FISH, a name applied to several species of the smaller sharks, and given in common with such names as hound and beagle, owing to the habit these fishes have of pursuing or hunting their prey in packs. — The Small-spotted Dog-fish or Rough Hound (Seylliwm canicula) and the Large-spotted or Nurse Hound (Scydliwm catulus) are also known as ground-sharks. They keep near the sea bottom, feeding chiefly or. the smaller fishes

and Crustacea, and causing great annoyance to the fishermen by the readiness with which they take bait. They differ from the majority of sharks, and resemble the rays in being ovoviviparous. Their young are brought forth inclosed in semi-transparent horny cases, known on the British coasts as mermaids' purses, and these have tendril-like prolongations from each of the four corners, by means of which they are moored to sea-weed or some other fixed object near the shore, until the young dog-fish is ready to make its exit. The larger of these species attains a length of 4 to 5 feet, the smaller rarely more than 30 inches. The Picked Dog fish (Acanthias vulgaris) is pre-eminently the dog-fish. It is the smallest and most abundant of the British sharks, and occurs in the temperate seas of both northern and southern hemispheres. It rarely attains a length of two feet, the female, as in most sharks, being larger than the male. The body is round and tapering, the snout projects, and the mouth is placed far under. There are two dorsal fins, each of which is armed on its anterior edge with a sharp and slightly curved spine, hence its name "picked." In order to strike with these spines the fish first bends itself into a bow, and by a quick motion causes them to spring asunder in opposite directions, seldom failing thus to strike the object aimed at. The dog-fish is exceedingly prolific, the female, according to Couch, producing young almost daily for 9 or 10 months in the year. These are not contained in egg-cases, as in the ground-sharks, but are producedalive. It is gregarious, and is abundant at all seasons everywhere on the British coasts. In 1858 an enormous scull of dog-fish, many square miles in extent, appeared in the north of Scotland, when, says Couch, "they were to be found floating in myriads on the surface of every harbour." They are the special enemies of the fisherman, injuring his nets, removing the hooks from his lines, and spoiling his fish for the market by biting pieces out of them as they hang on his lines. Still greater injury is caused to the fisheries in the wholesale destruction of small fishes by this predacious species. They are, however, eaten, both fresh and salted, by fishermen, especially on the west coast of England.

DOGMATIC (Ger. Dogmatik) is the name usually given by modern writers, especially on the Continent, to that branch of theological study which treats of the doctrines of Christianity. As there are considerable varieties in the conception and treatment of dogmatic by different

theologians, churches, and schools, it will be best to give an historical account of the origin and usage of the term.

The Greek word ééypza, from which it is derived, has two Origin and meanings, one of which is found in the LXX. and New use of the

Testament, while the other is given to it by some of the ancient philosophical writers. According to the former sense, it denotes a decree or ordinance, 7.¢., a precept as to conduct or observance, proceeding from human or divine authority (Luke ii, 1, Acts xvi. 4, Eph. ii. 15). This is the only meaning in which the word is used in Scripture ; but by Plato, Cicero, Seneca, and others it is employed to denote the doctrines of the philosophers, 7.¢., principles or theories formulated or accepted in the different schools. In this latter sense the word was used by the early Christian writers, as describing indifferently heathen, Christian, or heretical doctrines, as the case might be; although some- times, when the word was applied to the Christian verities, it may have acquired, from the other use of it, a certain tinge of the idea of authority belonging to the doctrines of the faith. As early as Cyril of Jerusalem (Catech. iv. 2) the distinction was made between the doctrinal and the moral elements of Christianity ; and the term déypza was appropriated to the former, the latter being called 7@cKdv fhepos.

But it was not till long afterwards that the adjective, “dogmatic,” was used to distinguish a particular branch of theological study ; for in early times the need of subdivision in the scientific study of Christian truth was not felt, and the name theology was sufficient to describe all works deal- ing with that subject in any way. The progress of thought and inquiry in the history of the Church has, however, made it possible and necessary to treat the truths of Christianity in various different ways, from distinct points of view; and hence different kinds and departments of theology have come to be distinguished. In the 17th cen- tury the divines who wrote systems of theology gave different titles to their works, indicating the special manner of their treatment ; ¢.g., Mastricht, Z’heologia T’heoretico- Practica; F. Turretin, Theol. Elenctica ; Marckius, Com- pendium Theol. Didactico-Elencticum ; Quenstedt, Theol. Didactico-Polemica ; Baier, Theol. Positiva.

The title Zheologia Dogmatica was first adopted by John Francis Buddeus, a Lutheran divine, in 1724. This ter- minology was followed by J. H. Michaelis, Seiler, and others, and from it the word Dogmatik as a substantive came into common use in Germany. In England and America, in so far as any specific designation of the general term theology or divinity has been thought necessary, the title “systematic” has been until recently more current than “dogmatic.” As, however, the division and mutual rela- tions of the various theological studies have been very thoroughly discussed in recent times, especially by German theologians, and as the name “ dogmatic” has been used by them to denote one principal department of these, there is good reason for its adoption by English writers. Some prefer the form “dogmatics,” after the analogy of “‘mathematics,” “ physics,” &c.; but this seems awkward and needless.

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But there is among the best authorities on the subject Nature and

a considerable difference as to the proper nature and place in the theological sciences of dogmatic. There are two dis- tinct conceptions of its nature, each supported by emi- nent names, according to one of which it is an historical, and according to the other a philosophical study. The difference may be said to turn on what substantive is to be understood along with the adjective dogmatica. If, accord- ing to what was undoubtedly the older usage, we supply theologia, then the name “‘ dogmatic theology ” would denote the study of God and divine things in a doctrinal manner, or so as to exhibit its results in a series of doctrines, The epithet dogmatic would indicate, not the subject of the

place of dogmatic.

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study, but the manner of it; and thus it would fall under the general head of philosophical or systematic theology. This was the older view, and is held in modern times by Julius Miiller 1 and Hagenbach.? If, however, it be held, as is held by many moderns, that scientia is the substantive understood with dogmatica, then the term means the science of doctrines, and has for its

object not the Christian realities themselves, but the doctrines that have been formed about them ; and as such it must be an histori- cal science. This is the view adopted by Schleiermacher,? Rothe,* Martensen, Oosterzee, and others; though the particular form and development of the general idea differs according to the different views of these writers as to the nature and formation of doctrines. There can be no doubt that an historical and critical study of the doctrines that have been held in the Christian Church or its several branches is a legitimate, and in its own place, not unim- portant pursuit, and whether such study should be called dogmatic is a mere question of nomenclature and usage. But it can be as little doubted that this study does not occupy that central place in the theological sciences that has usually been assigned to dogmatic, and is not fitted to supersede that direct study of Christian truth that has long borne the name of theology by way of eminence. Hence some of those who make dogmatic a merely historical science hold that there is required besides that a science of speculative theology, dealing directly in a philosophical way with the objects of Christian faith ; while Al. Schweizer thinks that dogmatic, as a science of dogmas, should be discarded as essentially un-Protestant, and that in its stead should be placed what he calls Glaubenslehre It is clear that we must have some nanie to express the former con- ception of dogmatic, and there is no other name so con- venient or so generally used as this. On the other hand, all are not agreed on the necessity and importance of a separate science of dogmatic in the historical conception of it; and it is not easy to draw a line of distinction between it and symbolical theology, or the study of the creeds and confessions of the different churches. It seems therefore convenient to regard dogmatic as a branch, not of histo- rical, but of systematic or philosophical theology. In this view it is the study which endeavours to under- stand the facts and truths of Christianity in their true nature, causes, and mutual relations, This study presup- poses the reality of Christianity, as the divinely-revealed and perfect religion, and on that basis proceeds to in- vestigate what is contained in it with a view to its scientific comprehension. It is thus distinct from, and posterior in the order of nature to, apologetic, which is another branch of philosophical theology, and has for its function the scientific exhibition of the grounds of religion in general and of Christianity in particular. Apologetic has accomplished its task, when it has established and vindicated against attacks that Christianity is truly divine, and the final

form of revealed religion. Dogmatic accepts this conclusion as its starting-point, and proceeds to inquire what are the facts that constitute Christianity, how they are to be accounted for, and what is their mutual relation. In this process it must needs generalize and determine the conceptions suggested by the facts by means of definitions, and combine these in the form of definite propositions, which are what are called doctrines, and which are again arranged and framed into a system of doctrine. Doctrines, as usually understood, have reference simply to truths to be believed ; and they correspond to the

1 Art.“ Dogmatik” in Herzog’s Real Encyclopadie fiir Protestanti sche Theologie u. Kirche.

2 Encyclopidie u. Methodologie der Theologischen Wissenschaften.

3 Kurze Darstellung des theologischen Studiwms.

- Zur Dogmatik.

laws of nature discovered and formulated by science. The leading theological doctrines are thus attempts to ea- plain in a scientific way certain religious phenomena that belong to Christianity. In dealing simply with facts as distinct from laws, with what is as distinct from what ought to be, dogmatic is distinguished from ethic or moral theology, which is another branch of the same general division of theological studies. For Christianity is more than a revelation of truths; it is also a body of practical precepts; and the meaning, principles, and application of these afford a wide and important field of inquiry. There have indeed been some weighty and earnest protests raised against the separation of ethic from dog- matic ;° and there is a certain advantage in the two subjects being treated together, as they usually were by the older theologians, under the heads of fides and observantia, or the like. Christian doctrine and Christian duty can never be separated in reality without the loss of the life of both, and this should be kept in mind in their discussion. But each of these subjects has grown to such an extent that convenience almost necessitates the plan that has become usual in academic teaching and books, of giving them a separate

treatment, and restricting the province of dogmatic to the truths of Christianity that are objects of belief, as distinct from its precepts as matters of duty. Polemic and irenic are branches of theology that have also a very close connection with dogmatic,—the former having for its object tle exclusion from the system of Christian doctrine of ideas and opinions that are essentially alien to its principles, and the latter the harmenizing or bringing into a relation of mutual toleration views of doctrine which differ in some particulars, and yet are neither of them essentially un-Christian or anti-Christian. These may be regarded as appendices to dogmatic, being the application of its principles to the varieties of belief that exist among Christians.

There are two other studies, of recent origin, whose rela- tion to dogmatic should be defined, as they have sometimes been thought capable of superseding it-—biblical theology and the science of religion. The former of these is a development of Scripture exegesis, and seeks, in dealing with the sacred writings, not merely to understand their direct meaning, but to enter into the conceptions of their several writers on the whole subject of religious truth,—to find out from their writings the theology of Paul, or Peter, or John, just as the historian of doctrine endeavours to ex- hibit the theology of Athanasius, Augustine, or Luther. Then, taking a wider view, it groups all the inspired writers of a period together, and seeks to present the theology of the New Testament, or of the Old, just as one may do with the Nicene or the Reformation theology. This is a most in- teresting and useful study, and much valuable work has been done by it ; but it is clearly an historical study, and as such belongs to a different department from dogmatic, if that is placed in philosophical theology. It furnishes important materials for dogmatic, and gives us the power of using Scripture in a more historical way than would be possible without it; but as it cannot be assumed that any one inspired man, or any one age of the history of revela- tion, saw the entire system of divine truth as it is in itself, even the most perfect results of biblical theology will only be materials for dogmatic, not dogmatic itself.

The science of religion, again, investigates the various forms of religion among mankind, and by the comparative study of these seeks to discover their origin and mutual re- lations. It is probably too soon yet to judge what

the results of this young and promising study may be, but they should certainly not be despised by the Christian theologian. They may have an important bearing on apologetic, and

5 By Schleiermacher, Nitzsch, and Beck. onl

through that may possibly affect the form, and even in some points the substance, of dogmatic But the science of religion is itself entirely distinct from dogmatic ; for it takes as its subject all religious beliefs, and treats them simply as psychological phenomena, without considering, in the first instance, whether any, or which of them, have objective reality, whereas dogmatic is a science of faith, and proceeds upon the assumption of the truth of Christianity and the Christian view of the universe.

The possibility and the need of such a science as dogmatic rest upon the specific nature of Christianity as the perfect form of a divinely given religion. Religion in general is a relation between man and God, and it may be either natural or supernatural, In the former case, it is the rela- tion of man to the divine Being as manifested in the world, and as long as men have no other knowledge of God than this, their religion is apt to degenerate into unworthy ideas and practices; and thus natural religion, in the present state of mankind, tends to become false religion, as is seen in the various forms of heathenism. But the funda- mental assumption of Christianity is, that God has, in addition to the manifestation of Himself that nature affords, also come forth in history by a divine work, lead- ing men from the errors of false religion to the true know- ledge and pure service of Himself. This work of grace has always dealt with men in a way suitable to their nature as intelligent beings, and hence has included a discovery of truth that they could not have found out for themselves, which is the idea of revelation. But while supernatural religion must include revelation as an essential part of it, this is not the whole, nar even the most vital and im- portant element in it. The divine religion is essentially the establishment of aright relation between man and God, a fellowship between earth and heaven ; and it only includes the communication of new truths, because that fellowship must be

an intelligent one, brought about in an intelligent way. ‘Tis work las also been a gradnal one, and has had its several successive stages. Scripture represents the call of Abraham, the exodus of Israel from Egypt and covenant of Sinai, the establishment of the kingship and temple worship in Israel, and the messages of the prophets, as so many stages in the history and progress of religion ; and the coming of Christ and the foundation of the Christian church is the final stage of its development. Now, like all the earlier stages, Christianity, while it implies the com- munication of new truth, is essentially a fact or work of history—the establishment of the perfect fellowship of man with God, which is that mediated by Jesus Christ, and the reconciliation effected by His death. It is this conception of Christianity that makes possible a scientific exhibition of it in the form of a system of doctrines as distinct from the simple interpretation of its records. If, according to a notion that early entered and long pervaded the church, Christianity is merely a new law, a revelation of hitherto unknown truths to be believed, precepts to be obeyed, and promises to be hoped for, then the theologian has nothing to do but to expound the revelation, ascertain- ing the meaning of its several statements, and classifying them according to their subjects or character. Any attempt to gain a scientific knowledge of the realities with which these statements have to do must proceed on general philosophical principles, and not on a specifically Christian foundation. Now this conception of Christianity was the prevailing one up to the time of the Reformation ; and consequently the pre-Reformation theology, and much of later theology too, consists either of the mere exposition of certain dicta of authority, biblical or ecclesiastical, or of purely logical ratiocination, applying to these the principles of the philosophy current at the time. Only when the Reformers brought out the principle that Christianity is not

a new law, but a work of God’s grace, reconciling men ta himself in Christ, and that as such it must come before theology, was the construction of a system of Christian doctrine on right principles possible. On the basis of the direct experience of reconciliation to God throngh Jesus Christ, it is possible to raise and investigate the question— What is the nature, the cause, the various parts and rela- tions, of this great work, this new relation

into which I as a believer am brought to God? Now this is just the question that dogmatic seeks to answer; for it is, as before said, a scientific treatment of Christianity as the perfect form of supernatural religion. On this view the existence of dogmatic is not due to a primary, but to a secondary necessity of Christian life. The primary neces- sity for the Christian is a fellowship with God, includ- ing a sense of His favour, of His guidance in practi- cal life, and protection against all hostile influence. To this religious fellowship it is not necessary that a com- plete system of divine truth be known or believed ; according to the Pauline and Protestant doctrine of salva- tion by grace through faith, it is secured at once by the direct exercise of trust in Christ; and there must be this before there can be any right understanding of the truths contained and implied in Christianity. But there isa secondary need and impulse that forms a motive to dogmatic,—the desire of knowing as much as possible of the way in which we have been brought into that relation to God which is designated a state of grace or salva- tion. Christ and His apostles fully recognize the importance of knowledge, understanding, wisdom ; while they teach that the only true knowledge of divine things must be preceded by direct experience of them, through faith in Christ. They speak wisdom among them that are perfect, though it isa heavenly wisdom, that needs spiritual enlightenment to know; and they exhort their converts to strive to be perfect or mature Christians, not children but men in understanding,—to add to their faith knowledge, and to growin it. Itis this craving for under- standing of their new relation to God, which forms, though not the first, yet an important secondary necessity of healthy religious life, that affords the motive for the con- struction of theology in general, and of dogmatic in particular. Some amount of such knowledge seems to be indispensable to qualify one for teaching others; and so, if the church or Christian community is to exercise the function of teaching, there must be, beyond the faith that is the primary and essential quality of true Christians, the higher stage of Christian progress that is attained by those who add to their faith knowledge, Theology is thus not essential to the bare existence of the church ; yet it is the natural and necessary form and means of her development in one department of her functions, the intellectual ; just as in the department of practical morality a system of ecclesiastical discipline is an indispensable development, and in that of social devotion, ordinances of worship. Every living and thriving branch of the church of Christ must, in proportion to its health and vigour,

cultivate scientific theology, as well as earnest conscientious dis- cipline and warm spiritual devotion,

This motive prompts equally to all the branches of theological study—exegetical, historical, practical, as well as systematic or philosophical ; but that which is designated dogmatic, as falling under the last head, may well be esteemed the highest of them all, and that which is most to be desired, if only it can be attained. As, however, some have doubted whether such a science is possible, we must not take this for granted, but indicate the grounds on which we believe it is. Now, if a scientific knowledge of any subject is impossible, this must be either because we do not possess materials enough to give us a thorough

Its sources,

Nature.

Revelation in Christ.

DOGMATIC

knowledge of it, or becatise we have no means of reducing these materials to their true and natural order. If there are sufficient materials of knowledge about Christianity, and a method by which these may be reduced to a system, tie conditions of a scientific dogmatic may be said to exist.

The sources of dogmatic have been variously enume- rated by different branches of the church and schools of thought, and the determination of the genuine ones in- volves the most important issues as to the whole charac- ter of the system. We may begin with the lowest and most universally accepted, and then proceed to those in regard to which there is more difference of opinion, and which determine the peculiarities of the dogmatic of different sects or churches. First, then, we may place the testimony of nature to God, which is admitted by nearly all theists to be real and valuable, so far as it goes, and which is clearly recognized in Scripture.) The Socinians in the 16th and 17th centuries denied the possibility of any knowledge of God without revelation; but this position, which was zealously controverted by the orthodox, has been given up by those who are

the nearest modern representa- tives of the Socinians, and may be said to be held now only by those who would deny all knowledge of God what- ever. This natural knowledge of God has sometimes been separated from properly Christian dogmatic, and relegated for separate treatment under the title of natural theology ; but since most of the truths reached by it are also expressly taught in Scripture, it seems impossible to exclude from their consideration in the Christian system the prior light that nature throws on them. Hence the most orthodox divines admit that reason has as one of its functions in theology that of establishing or confirming some of its doc- trines, which are therefore distinguished by many, especially of the Lutherans, as articuli miati, being supported by reason and revelation together, from the articulé purt, which are known by revelation alone. This source of theological knowledge includes the manifestatious of the being and character of God, and the nature and destiny of man in the phenomena of the external world, and also in the intellect, conscience, and religious affections of man. The import- ance of it arises from the fact that this natural knowledge of God alone connects the doctrines of revelation with the actual realities of consciousness and experience, and gives to the whole of theology a basis in ascertainable and verifiable fact. Unless we know, on grounds as legitimate as those of any secular science, that God is, and that He is true and good, we cannot rationally receive any revelation from Him, and our whole dogmatic would be a mere castle in the air.

But most Christians, while recognizing the reality and importance of the manifestation of God in nature, consider that this alone is inadequate, in the present condition of mankind, to bring us into that relation to Him which is the true and perfect religion ; and all but those who deny the supernatura] entirely believe that God has made a special revelation of luimselfin Christ. The person of Jesus of Nazareth is for all such the centre of God’s saving dis- covery of himself and of His will to sinners of mankind ; in His life and death we have an image of the character of God, and in His teaching, statements of religious truth that are of primary authority. On this account it may be truly said that the person and teaching of Christ is the fountain- head of revealed theology.2 It would be quite possible to maintain that this is the only source of theological know- ledge beyond the teaching of nature; but nearly all who entertain such views of Christ also believe that we have in the writings of His disciples an authoritative record of

1 Ps, xix. 1-6 ; Rom. i, 19-21; Acts xiv. 15-17, xvii, 24-29.

® Oosterzee, Christian Dogmatics, sec. viii.

His words and deeds, and a divinely-taugnt explanation of their meaning. Hence the Scriptures, at least of the New Testament, are recognized as themselves a direct source of dogmatic material. Some have limited this recognition of an inspired book to the New Testament, as Schleiermacher ; but this position virtually rests on the idea that Christ himself is really the only supernatural source of religious truth, and that the New Testament Scriptures are not a real communication from God, but only an authentic human record of the revelation He has made of Himself in Christ. When the notion of a truly divine and authoritative Scrip- ture is really admitted, it is impossible, in view of the use made of the Old Testament in the New, to deny the authority of these earlier Scriptures. The coming of Christ was not a sudden isolated appearance, unprepared for and alone, like a lightning-flash in a dark night; it was rather like the rising of the sun after along and gradually lighten- ing twilight. The way was prepared for Him by a series of historical revelations recorded in the sacred books of the Jewish peuple, which have from the days of the apostles onwards been regarded as divine by the Christian church. It is this continuous line of revelation, from the beginning onwards, that gives Christianity its universality in point of time, as the perfect form of the true religion that has always in some shape or other existed in the world. On this view, the Scriptures of the Old and New Testaments, as testifying of Christ, are the more immediate source of

dogmatic materials ; and this is the fundamental Protestant

position.

The Church of Rome goes further, and maintains, not only that the Divine Spirit has inspired the writers of Scripture to convey to us an authoritative record of God’s revelation in Christ, but also that the Spirit so dwells in the church as to enable her to develop that revelation, supplementing it by tradition, authenticating it by her authority, and interpreting it by decision on controverted points. Hence, for the Romanist, tradition, decrees of

councils and of popes, opinions of fathers and doctors of the church, are equally with Scripture authoritative sources of doctrine. In this, however, Protestants hold that they err as much in the way of excess, as Rationalists, who deny the authority of the Bible, err in the way of defect. Those Protestants, however, who have taken the most profound and spiritual view of the subject, have been ready to allow that there is provision made in Christianity for what Romanists seek to attain by the authority of the church. They admit that something more is needed than unaided human reason for the right interpretation and application of the word of God ; but they find this, not in an infallible

church, but in the work of the Divine Spirit, enlightening Work of the mind of believers in and with the word (testemonium the Spirit.

Spiritus Sanctr). The recognition of this, which was very fully and strongly made by the Reformers, not only gives to Protestant theology a firmer position as against the claims of Rome than it can have without it, but also enables us to give their due place to the elements of truth, exaggerated and distorted, in the Romish doctrines of the authority of the church, fathers, and councils. If we have the witness of the Spirit, giving us an assurance of the truth and insight into the meaning of Scripture, we must admit that our fellow Christians have the same guidance also, and that believers have had it in all ages. Hence we may reason- ably allow great weight to the opinions of men whio have given evidence of being guided by the Spirit, and more especially to those doctrines that have been received as scriptural by the great body of the spiritually enlight- ened in different ages. Thus the teaching of fathers and theologians, and the consent of the Christian church, are important helps and guides to the Protestant theologian ; only he does not, like the Roman Catholic, attach absolute

Christian conscious- ness.

Method of doginatic

authority to any of them ; aud he esteems them, not simply because of their antiquity or their official position, but in proportion to the evidence they

have given of being really guided by the Divine Spirit, who is the Spirit of holiness, love, peace, and godliness.

This inward spiritual enlightenment of the believer corresponds very nearly to what has been called Christian consciousness, to which a prominent place has been assigned among the sources of theology by many modern divines. The currency of the phrase is due mainly to Schleiermacher ; and the form of it procceds from his fundamental principle, that religion consists properly in feeling, by which we have an immediate consciousness of the divine—a ‘ God-con- sciousness.” Whatever justification this view may have had, as a needed protest against the previously dominant intellectual view, that made religion virtually an affair of the understanding only, it is now generally admitted that Schleiermacher went to an extreme on the other side, and that no complete account of religion can be given that does not include the exercise of thought and will, as well as of feeling. In so far, therefore, as the phrase Christian con- sciousness represents in its form tue one-sided conception of Schleiermacher, it is insufficient ; and that which really corresponds to it is the Christian life, with its full com- plement of beliefs, emotions, and volitions. This, being the work of the Divine Spirit in the soul, may and must be recognized, on the principles already indicated, as the expression of the witness of the Spirit, by which the authority and meaning of the revelation in Scripture are established. In this sense, therefore, Christian conscious- ness, or the knowledge that a Christian has of his own religious experience aud of what is implied in it, is a legitimate means of obtaining doctrinal conclusions, But if the authority of Scripture is to be recognized as the objective and normative representation of what true Christianity is, Christian consciousness can ouly be a mediate and subordinate source of theology, a channel rather than the fountain-head.!_ By giving it this position we are also saved from the one-sided subjectivity and variable individualism that must result from its being made a primary and independent source of knowledge. The history of the church, especially as it presents to us the expression of Christian faith and devotion in different ages and countries, gives us an insight into the religious life of the church as a whole, and so exhibits the Christian con- sciousness on a large scale as it were; but if we do not believe in an absolutely infallible guidance of the church, we cannot regard this either as

a primary or authoritative source of doctrine, but must always test it by the standard presented in Scripture.

From these various sources, (1) God's manifestation of himself in nature, (2) His revelation in Jesus Christ authori- tatively recorded in Scripture, and (3) His enlightenment of the believing soul by the Spirit in Christian life, when used, as they should be, in combination and in their proper order and subordination, we have a large supply of materials for the construction of a dogmatic system.

What then is the method to be followed in order to educe general principles and laws of mutual relation from the mass of facts and truths thus presented to us bearing upon God's character and dealings with men? This is the next question that arises in regard to dogmatic theology. Now, plainly, if this study is to have a scicntific character at all, it must be pursued in the same methods that are proper in other sciences of a similar kind. Theology, no doubt, differs in some important respects from all other sciences ; but the difference lies in its matter rather than

; 1 This view of the nature and function of Christian consciousness is that taken by Martensen, Dogm., sec. 29; J.T. Beck, Hinleitung in das System der Christlichen Lehre; Oosterzee, Dogm., sect. 10,

in the form of its elaboration. Its materials are not merely the phenomena of nature, but the great redemptive and saving works of God made known by revelation. In this respect it differs from all mercly natural sciences. But if it is to have any analogy to them at all, it must apply to these facts of revelation the same processes by which the facts of nature are made to yield natural sciences. Now, there are just two essentially distinct methods by which general laws and principles can be ascertained,—the analytic or inductive, and the synthetic or deductive. Neither of these, indeed, can be absolutely separated from the other. Induction in physical science, for example, calls in the aid of deduction, when hypotheses are formed to explain certain phenomena ; aud then it is tested by tracing them down- wards to what would be their results whether they arc true or not: and, on the other hand, geometric demonstration sceks the aid of analysis as a guide

to the solution of its problems. And not only in subordinate points, but as wholes, the two methods supplement each other. There can be no concrete science that does not begin with induc- tion; and there is no complete science unless it ends in deduction. All knowledge of facts must be a postertort, aud from these we ascend to general principles and laws; but the aim of all such procedure must be to reach such a com- plete and satisfactory explanation of all the phenomena, that the process might be reversed and the facts deduced from the most general principles. It is only in a few sciences, ¢.g., mechanics, that such a degree of perfection has been attained as to enable them to enter ou the deduc- tive process. Now it is a question debated by some of the ablest divines, whether theology can adopt this method. It is not denied by any that the inductive method, or that of empirical reflection, as it is called in Germany, is com- petent; but some maintain that, while this is so, that of speculation is also legitimate and possible, and that it must be followed, if we are to have a theology in the highest and most proper sense of the term. Those who take this posi- tion are for the most part of the Hegelian school; and we have a favourable specimen of the way in which it may be maintained in a truly believing spirit in Rothe.2 But the considerations adduced by Julius Miiller? against the pussi- bility of such a method, if we are to avoid a pantheistic view of the universe, seem conclusive. The real and thorough-going recognition of personality and free will, both in God and man, makes it impossible to arrive at the phenomena of Christianity by any process of @ priort demonstration ; and more particularly, neither the fact of sin on the one haud, as the act of the free will of man, nor of grace on the other, as the work of God’s free will, can be exhibited in their essential character in such a method. No science that has to do with the events of a real history in which rational and moral agents are recog- nized as acting with true liberty can be constructed by a priori deduction of logical consequences from abstract necessary first principles. The dogmatic theologian there- fore, who maintains the freedom alike of the human and of the divine will, is shut up to the a posteriori method of induction. Even though the existence and attributes of God could be satisfactorily demonstrated by reasoning from necessary truths and laws of thought, as Anselm, Descartes, Clarke, and others thought possible, yet when we come to inquire what God has done, and on what principles He acts, we must, if the world’s history is not a mere nature- process, learn from experience and testimony the facts, and ascend

inductively from them to the principles or laws that direct them. The inductive method, therefore, is the one proper for Protestant evangelical dogmatic. This is recog- nized by writers so different in many respects as Dr

2 Theologische Ethik, sec. 2. 3 Die Christliche Lehre von der Siinde,—Hinleitung,

Coaumers,) Julius Miiller,? Hodge ;? and it has been prac- tically followed by most evangelical divines. They have indeed sometimes disguised the real nature of their method by the arrangement of topics adopted, for the almost uni- versal practice has been to begin the systematic exhibition of Christian doctrine with the loftiest and most recondite part of the subject, which would come first in a really de- ductive treatment, and to descend from them to those that are more immediately verified by experience. This has tended to produce the impression that these systems are properly chains of logical demonstration, especially as doc- trines once held to be established are often appealed to as forming part of the proof of other doctrines. In many cases, however, this appearance is deceptive ; and the system, though wearing a deductive garb, is not really of that nature. Each of the doctrines is established on its own proper basis of Scripture testimony and Christian ex- perience ; and the order of progress, from above downward, does not show the order in which the doctrines have been ascertained, either by the church in general or by the individual theologian, but only the order in which it is thought best that they should be exhibited and taught.

Besides these two distinct methods, the speculative or de- ductive, and the empiricor inductive, a third is recommended by Beck, and approved also by Oosterzee, called by the former the real-genetic. This proceeds on the assumption that the object of theological knowledge is faith, z.e., accord- ing to Beck’s use of the term, spiritual life in the soul appre- hending as its object God in Christ. This faith or spiritual life has, he points out, a principle of development and growth ; and theology grows by following the growth of faith in the soul. But the life of faith in us is not perfect ; it is liable to hindrances and abnormal development ; hence this by itself is not a safe guide for theology. There is, how- ever, a perfect archetype (Urbild) of

the true and normal de- velopment of faith in the soul, and that is to be found in revelation. The revelation of which we find the record in Scripture has the same course of development as the sub- jective life of faith is the soul ; and the growth of revelation is the perfect pattern of what the growth of faith within us should be. In order, therefore, to be a representation of the faith or spiritual life of the Christian in its ideal con- dition, theology has to follow the development of revelation as presented to us in Scripture, and must first go back to its primary source, and trace from thence its growth and development. Hence the designation of the true dogmatic method as real-genetic, Now whether or not the results of theological inquiry will come out in this parti- cular form depends on the truth or falsehood of a number of positions, and these can only be established by the examination of facts and evidence bearing on the case. This method, therefore, does not in principle differ from the inductive or empiric one; it is only a special form which that method will assume, if the views of Beck as to the relation of revelation to the life of faith in the soul are true and borne out by evidence. It does not, therefore, seem proper to regard this as a distinct kind of method, and we may legitimately claim those who follow it as dis- ciples in general of the inductive school.

On the whole, there appears no reason why the principles of inductive philosophy, which have been so fruitful in their application to the sciences of external nature, should not be applied to materials, bearing on the relation of man aud the world to their Author, that are furnished by the phenomena of nature, the dictates of conscience, the facts of revelation, and the experience of the Christian life. Surely, too, : nor an impossible one. Those who have objected niost

1 Institutes of Theology, bk. iti. ch. 10. 2 Ubi supra. 3 Syst, Theol., Introd. ch. i.

the endeavour to do this is neither a hopeless ;

strongly to the application of logic to theology, such as Isaac Taylort and Bishop Hampden,® will be found at bottom to object chiefly to the use of a merely verbal and deductive system of logic, and not to that inductive

method which is the mighty instrument of the progress of niodern science. But it must be admitted that the processes of theologians have too often been, and too often still are, of that merely formal and logical kind that cannot really increase our store of knowledge. If dogmatic is to hold its ground as a true science at all, it must frankly and consistently adopt the inductive method; and it must take as the objects of its analysis, classification, and induction, not merely the statements of Scripture, but the religious realities which those statements, as well as our own experience, make known to us.

Further, if a scientific character is to be vindicated for dogmatic, it must also accept the position of a variable and progressive study. This does not imply that nothing is certain within its domain, or that there must be a constant flux and reflux of opinions about its contents. It is as much characteristic of science that it has certain well- established principles and results, which are not to be overthrown by any future inquiries, as that it is constantly advancing to further acquirements and discoveries. Those who claim an absolutely fixed and unprogressive character for theology, though they may seem todo honour to its divine authority, really degrade it from the rank of a science; and if they retain any reverence for it at all, can only do so on the principles and in the spirit of Roman Catholicism. Thus Macaulay's brilliant statements to that effect,® which are sometimes quoted by those who defend an immobile orthodox theology, imply as their basis either a contemptuous dismissal of theology altogether as a tissue of uncertainties, or a lurking belief that the one unchang- ing system is to be found in the faith of the Church of Rome. What has tended, and still tends very powerfully, to obscure the idea of progress in dogmatic theology is the want of a clear apprehension of the distinction between religion and theology, and the notion that the Bible is directly a revelation of theological dogmas, which need only to be correctly interpreted and arranged in logical order. If this were so, then we should be able at once to construct a complete system of theology, by simply applying the laws of grammar and logic to Scripture ; and this could be done as correctly and well in the 2d century as in the 16th or 19th. There would be no room, or the very narrowest conceivable, for progress, In that case, then, if it were found that students dealing thus with Scripture came to widely different conclusions as to the system of doctrine to be drawn from it, we should be obliged to

conclude that the revelation was not complete or unambiguous, and therefore that it must either be supplemented and checked by a living authority in the church to determine its truc meaning, or that no certain knowledge in regard to doctrine can be attained. ‘The former is the Roman Catholic, the latter the sceptical or anti-dogmatic alternative ; but both alike proceed from the same premises, and indicate the impossibility of carrying them out without either giving up the practicahility of dogmatic, or seeking it in an infallible church.

But this difficulty disappears when the Bible is regarded as a revelation, not solely or directly of doctrine, but of religion. On this view, it is the inspired record of the great historical events by means of which the religious fellowship of man with God has been established, and gradually elevated to its perfect form in Christianity, and ain a

4 Logic in Theology.

5 ‘Scholastic Philosophy in Relation to Christian Theology,” Bamp- ton Lectures for 1882.

6 Essay on Ranke’s History of the Popes. : Vil — 43

Progressive nature ef dogmatic.

of the inward experience of that fellowship in a new life | or an abnormal development of spiritual life, but it is not

produced by a moral and spiritual renovation of the soul of man. Doctrines, or general principles bearing on the relation of God to man, are indeed contained in the Bible, but only as they are involved in the great realities that the Bible makes known to us. The Bible is to the theologian what the telescope is to the astronomer, or thie microscope to the physiologist. Many of the laws of these sciences could not have been known without the help of these instrnments,—not because the telescope discovers to us laws of

astronomy, or the microscope enables us to see the principles of physiology, but because they bring within our ken the phenomena from which tliese laws and principles may be ascertained. So the Bible does not directly reveal dogmatic pvinciples; but its function is to reveal to us that great work of renovation by God in Christ, from which the principles of Christian dogmatic are to be derived. On this view, while the Christian religion is ever one and the same, unalterable in all ages, Christian theology, or the scientific knowledge of that religion, is constantly progressive. All its truths are indeed contained implicitly in the Bible; but they have to be drawn from it, not by a mere process of interpreting and systematizing the words of Scripture, but by apprehending and experiencing the realities made known to us by the words, and so coming to understand what they are and in what relations they stand one to another. It is in this way that all the great doctrines in theology have been established,—not merely by the application of grammar and logic to the text of Scripture, but by the apprehension and experience of the renovating change, and the comparison and understanding of its different parts. So, for example, the doctrine of the Logos was formulated by men like Justin Martyr, who, after vainly searching for truth in all the schools of philosophy, found that there is in Christianity, when sincerely received, a light that dispels the darkness and doubt of the mind. So Augustine learned the doctrines of original sin and divine grace, by finding in his own experience the power of inward corruption on the one hand, and the deliverance wrought by the gospel on the other. So Luther discovered the truth of justification by faith, through learning by sore and bitter conflicts how impos- sible it was to find peace of conscicnce, as long as he trusted to any works of his own, and how fully he obtained it by faith in Christ. In this way the system of dogmatic has been built up, one doctrine after another being added, as it was discovered and verified by the experience of the church. None of these developments was any addition to the Christianity of true disciples of the Lord ; that remains substantially the same in all ages, and contains implicitly all true doctrines of religion, But all Christians are not conscious of what is involved in their religion and experi- ence, and some are very imperfectly aware of it. The men who have made their mark in theology have been those who have been led by circumstances, and enabled by their intellectual powers, to discern elements in Christian life not previously seen ; and the kody of the church, coming after them, have verified and accepted the results of their experi- ence, In

this way dogmatic theology hitherto has been progressive, and no man or church has a right to say that the goal has been reached beyond which no further progress is possible.

There is one condition always to be borne in mind, with Which alone such progress is sound and genuine. It is that what is added to the system of doctrine be really an expression of the Christianity which is revealed in Scrip- ture. Anything that is not such may be a fancy of men, i a ee

1 Cf. Candlish's Cunningham Lectures, Lect. vi. Note A; Rainy's

ti ail Lectures, 'On the delivery and development of doctrine," ect. ¥.

really a discovery of Christian truth. There have been opinions held and widely prevalent that are of this charac- ter, and it is part of the work of the theologian to detect and remove what is false as well as to build up what is true. There have been false developments of doctrine; there have been exaggerations and maladjustments of important truths. It is not probable that any minute and elaborate system cousists of pure and absolute truths unmixed with any error. The work of progress in theo- logy, therefore, must sometimes consist of undoing what has been laboriously built up in past ages. But if any true progress is possible now, it is not to be expected that all the old beliefs will have to be swept away, and an entirely new system put in their place. For if nothing had been ascertained in the course of the ages during which so many great minds have been directed to the study of theology, there would seem to be little hope of anything certain being discovered now. 'Those who think theology to be a progressive science can most consistently hold that some progress has been made already, and some conclusions have been reached that are not to be overturned by any new inquiries, They do not look for an entire reversal of old beliefs, anda new theory of the universe and its relation to God to be put in their place; they expect that what has been most generally agreed upon in former ages will be maintained and confirmed, and that any new truth that may be brought to light will fit in to the old foundations ; though in some cases former modes of statement may have to be reconsidered and adjusted to larger and deeper views, and exaggerated or one-sided doctrines may have to be given up or modified. There are some doctrines in every system that are merely sectarian, adopted by one particular branch of the church, but not

recognized by others as cor- rect expressions of Christian faith and life, eg., the Anglican dogma of baptismal regeneration, or the Lutheran tenet of the communication of attributes in the person of Christ, or the supralapsarian and _ sublapsarian theories of Calvinists ; in regard to such points there is no just ground of confidence of their permanence; they are like plausible but unproved hypotheses in science. But there are many leading doctrines which, ever since they have been distinctly formulated, have been accepted by the great mass of Christians in all branches of the church; these may be said to be established results of theological investigation, which no further progress of the science is likely to overthrow.

The progressive character of dogmatic, and the manner History of of its progress in the past, may be seen from a brief sketch dogmatic.

of its history from the end of the apostolic age to the present day. The apostolic writings themselves do not properly fall within the range of such a history; for they are not of the nature of human science but of divine revela- tion. No doubt several of them present to us conceptions and trains of thought that are very analogous to the systems of later times, and have sometimes been employed as the basis of dogmatic systems. But the inspired writers do not stand in the same line as the thinkers who come after them ; their aim in writing was not the scientific one of investigating the principles of Christianity in their mutual relations, but the more primary religious one of presenting Christianity itself to the world. This they have been enabled to do, by the working of the Spirit in them, with a power and fulness and insight that throw much light on the scientific study of Christian doctrine ; but their writings are not doctrinal systems, and do not come into the line of the rise and progress of the human science of dogmatic. Its history begins with the attempts of men to comprehend the revelation of Christianity, and presupposes that revelation complete, though not completely

Apologetic period.

Polemic period.

DOGMATIC

understood, as its starting point. From that point onward it may be regarded as passing through six pretty well defined periods or stages.

L. The first may be called the apologetic age, extending from the apostolic time to the death of Origen (254 s.D.), in whom it may be said to have culminated. During this period the intellect of the church was gradually awakening and coming into activity ; but it was only by degrees, and in the course of several generations, that its efforts led to any properly doctrinal results. The very earliest Christian literature is simply practical and hortatory, chiefly in the form of epistles (Apostolic Fathers). From the middle of the 2d century, however, the need was felt of defending the church's faith against argumentative attacks, whether popular, literary, or philosophic. Hence the chief mental power of the Christian cominunity was turned in the direc- tion of "apologies," by which these attacks were repelled, and attention was directed mainly to the evidences of the truth and divinity of Christianity. This, however, in- directly led to the articulate statement of some of the most essential doctrines of Christianity, and to the beginnings of a dogmatic system. The great apologetic question was generally and rightly couceived in the form of a search for some true and reliable teaching about God and divine things; and the Johannine idea of Christ as the light of the world, the Logos or Word of God, naturally occurred to the apologists as that which most exactly met the want. Thus the doctrine of the Logos, in some at least of its aspects, was brought out, 'Then in the conflicts with Gnosticism, which may be said to ke as really apologetic as those with Judaism and heathenism, certain aspects of Christianity were very distinctly brought into conscious- ness, such as the creation of all things by God, the reality of the human nature, death, and resurrection of Christ, the universality of the gospel, and the responsibility of man. The apostolic creed probably shows us how the original baptismal formula became the basis of more definite articles of faith, shaped in the light of the apologetic necessities of the age. But while there was thus an inevitable tendency towards dogmatic development and definition, there was not for long any direct interest in doctrine as such, still less in the ordering of doctrines into a system. Origen was the first in whom this impulse was

strong and active, and his work De Principiis (Tlepi'Apxav) |

may be said to be the earliest attempt in the field of dog- matic.

Il. The second great period in the history of dogmatic, extending from Origen (who died 254) to John of Damascus (who died 754), is distinguished from the first by its being occupied mainly with controversies within the church, and thus may be called the polemic age. As the gospel spread more and more throughout the world, and gained the victory over paganism in the minds and hearts of the most enlightened of the day, the defence of Christianity against external assaults gradually ceased to be the one all-engrossing duty of the church's theologians ; and at the same time heresies so thoroughly and manifestly antichristian as those of the Gnostics ceased to have any prevalence among Christians, and other divergent views, of a less openly hostile nature, began to appear. As the doc- trine of the logos had been one of the first that the church was led to think out in the apologetic period, it not unnaturally became the point at which varying conceptions first came into conflict. On this, as on many other sub- jects, the Christian redemption is so full and many-sided that it is no wonder that its entire contents could not be grasped at once and by all minds, or that some were led to accept some aspects of it more readily than others, and to give these an exaggerated predominance. Hence the progress of Christian thought to the right understanding of

divine truth has been through a series of controversies and oscillations from one extreme to another. This process may be said to have begun about the middle of the 3d century, from which time to the end of the 7th there stretches a continuous series of controversies on questions relating to God and the Trinity, the incarnation and person of Christ, original sin, and regenerating grace. In the course of these, successive forms of opinion on these sub- jects were discussed, condemned, and stamped as heresies— the Sabellian, Arian, Apollinarian, Macedonian, Nestorian, Pelagian, Monophysite, Semi-pelagian, Monothelite doc- trines. In sharp contrast with these opposing heresies, and sometimes in a narrow strait between them, the doctrine of the church was defined niore and more precisely. As authoritative expressions of this doctrine we have the first six cecumenical councils, with the provincial ones in the West that condemned Pelagianism

and Semi-pelagianism, and the creed of Nicwa (325) as enlarged and altered at Constantinople (381), with the decisions of Chalcedon (451) against Monophysitism, Orange and Valentia (529) against Semi-pelagianism, and Constantinople (1st Trullan, 680) against Monotheletism.,

This long series of keen and varied controversies on the loftiest doctrines represents a vast amount of intellectual activity in the field of dogmatic, and some of the greatest names in the church's history belong to this period. Athanasius, Basil, the two Gregories, the two Cyrils, and Chrysostom in the East, and Ambrose, Augustine, and Hilary in the West, are but a few of the more vutstanding and best known of the church's teachers during these controversies. On the whole it may be said that they have done their work satisfactorily and well, in establishing the true Christian view on the special doctrines they had to discuss ; and the decisions of the church on these points have been very generally accepted in after times. The Reformers adopted either tacitly or expressly the whole body of them as in accordance with Scripture ; and even in the immense upturning of opinions on all theological doctrines that has been going on in modern times, the faith of Niceea has been maintained by the majority of theolo- gians. Even the more detailed creed of Chalcedon is questioned by comparatively few, though the still more minute discussions and definitious after that have ceased to command the respect and interest of the modern church. But while the theologians of this polemic period were thus successful in establishing and defining some of the more important doctrines of Christianity, and by so doing contributed very valuable materials for dogmatic, they did little or nothing towards the construction of the system as an organic unity. Very few of their works even attempt such a task. The Catecheses of Cyril of Jerusalem contain an exposition of the various articles of the creed, and so may be said to exhibit a body of divinity such as was then generally held; but they do so not in a scientifically theological manner, but rather in that of simple popular teaching. Augustine's Enchiridion, de Fide, Spe, et Caritate, is a more properly theological attempt to lay the basis of a connected and organic system ; but 1t is very brief and summary, and holds a very subordinate position among the writings of that great father in comparison with his argumentative and controversial treatises on the parti- cular doctrines that he did so much to elucidate and defend. Perhaps a more real evidence of a sense of the organic connection of all the doctrines of

Christianity is to be found in the recognition of the atlinity between the apparently unconnected heresies of Nestorianism and Pelagianism, which were both alike condemned by the council of Ephesus in 431.

The results of the polemic discussions of nearly five centuries were gathered by John of Damascus into a. serics

of dogmatic propositions in his work axpisis éxdoots TS épO08dfov wicrews, which remained for the astern Church the chief authority in theology for a thousand years after. There has becn, however, no living ouward movement in the comprehension of Christian doctrine in the Greek Church ; and if on this account that great section of Christendom has escaped the rigid formulating of the many corruptions in doctrine, government, and life that took place in the Western, Church, it has been at the expense of resting in a system of merc dead orthodoxy that could neither hinder nor heal practical corruption. In the West, however, there was a powerful intellectual life, even in what are generally called the Dark Ages; and that being directed towards the doctrines of the church gave a con- tinual progress and a new epoch to theology, though in a peculiar and not the most hcalthy form.

III. The third period in the history of dogmatic, extend- ing from the 8th century to the beginning of the 16th, may be called in general, from its most remarkable development, the scholastic age; though scholasticism, strictly so called, is usually reckoned to extend only from the 11th century to the middle of the 15th. But the times before and after these narrower limits were characterized, only in less degree, by the same general tendency of thought. The doctrines of the church were established as of indisputable authority, and had begun to be collected in the form of books of sentences (Sententearum Lnbri) from the fathers, by Isidore of Seville, and others; and by means of such compilatory labours the learning and theology of former ages were preserved through the devastating flood of the barbarian immigrations. Any fresh theological discussions in this age were few and unimportant, tending for the most part in the direction of sacerdotalism, as

in the formation of the dogma of transub- stantiation. But by and by a mighty intellectual force took hold of the whole collected dogmatic matcrial, and reared out of it the great scholastic systems, which have been compared to the grand Gothic cathedrals that were the work of the same ages. The character of these systems of dogmatic may be understood by bearing in mind the two leading principles of the scholastic thinking. One was the acceptance as of absolute authority of whatever had been decided in Scripture or by the church; and the other was the application of the notions and syllogisms of formal logic to these doctrines, for the purpose of demonstrating their truth to the understanding! With such principles, it was natural that the systems constructed should be lacking in unity and a real grasp of the essence of Christianity. They attempted, indeed, the harmonizing of philosophy and theology, of reason and faith, but they could only do so in a mechanical way, and by a kind of compromise. On the one hand, reason was entirely sub- jected to faith in the acceptance of all the doctrines of the church as so many decisions or sentences that were not to be criticised or called in question. This made it impossible to grapple with the fundamental and general principles underlying the particular opinions that were received as authoritative ; and it was only in regard to their details and application that free inquiry was allowed. Hence in the scholastic works we find a series of doctrines or ques- tions on different subjects following one after another, but not connected in any natural way as parts of one organic whole. On the other hand, however, reason was allowed such full scope in deducing consequences from the established doctrines, and that by purely formal processes, that a rationalistic character was imparted to a large extent to the whole body of the scholastic theology. At the same

7 See Hampden’s Bampton Lectures, p. 46, 847; Schwegler’s History of Philosopiy, sect. Xxil.; Baur, Versthnungslehre, p. 147, foll.; Hagen- bach, Dogmengeschichte, sect. 149,

time, as reason was excluded from the great questions of principle, by the absolute authority accorded to the church’s decisions, it could only find scope in questions of detail, and the more intellectual vigour was applied to theology the more minute, subtle, and unprofitable did its results become.

The scholastic age produced no system of Christian doctrine tliat has, as a whole, retained any value in after ages; though in it some doctrines were more dis- tinctly articulated than before,—particularly that of the atonement, by Anselm; and the keen and subtle analysis to which all doctrines and conceptions were subjected has produced many distinctions that have been found useful in later times as conducing to clearness of thought.

The decline and fall of scholasticism was due to the gradually awakening consciousness of the unsounduess of the principles on which it rested. ‘The nominalistic con- troversy shook men’s faith in the absolute identity of thought and being, reason and authority; and _ the identification of theology and philosophy came to an end. The latter refused to be any longer the mere handmaid of the church; and from the assertion of its freedom the history of modern philosophy dates. This was necessarily a fatal blow to the scholastic theology ; and at the same time the great religious movement of thc Reformation made a reconstruction of the system of church doctrine necessary.

IV. The age of the Reformation, occupying the greater Reforma- part of the 16th century, may be said to form by itself a tion period

fourth period in the history of dogmatic, for it was animated by a spirit that distinguishes it both from the preceding and from the following time. The Reformation was a movement too full of spiritual life and activity in many directions to be adequately described by any single phrase ; but for the present purpose it may comprehen- sively cnough be said to be the reassertion of the principle of the direct and personal relation of the believer to God. This involved the sweeping away of all ccclesiastical autho- rity and mediation, and the assertion of the sole authority of God’s word and of justification by faith, which have been called the formal and material principles of Protestantism, This also necessarily brought with it a new conception of theology. Christianity was no longer a new law, and saving faith was no longer the intellectual assent to certain doc- trines ; Christianity was a new life, offered in the gospel and received by the soul’s trust (jiduwcia) in Christ. Hence, when the Reformers came, as some of the greatest of them did, to give a systematic statement of Christian doctrine,

they not only rejected those tenets which had been held in the medizval church on no higher authority than that of tradition and ecclesiastical decisions, but they also found that they could cxhibit a much more organic unity in the body of Christian doctrine, because they regarded it not as a necessary meaus or step towards spiritual life, but as the outcome and systematic presentation of that life whicli is obtained and preserved directly by faith in Christ. The great theological works of the Reformation age were not for the most part written purely in the intercst of scieucc or system, but for more practical purposes, for the defence of the new doctrines against attacks made upon them, or for the guidance of ministers in the practical teaching of the people. But it is nevertheless true that in these ways were produced works which had more of the symmctry and unity of a complete system than any that had previously appeared. This can only be accounted for by assuming that the Reformers had laid hold of the right principle of theology, and that the new life of the Reformation had carried them above and beyond the mistaken view of Christianity that had long hindered a right construction of dogmatic. The Zoct Communes Theologict of Melanch-

| then (Ist ed. 1521, final form 1550), and the Tnstitutio

Confes- sional period.

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Religionis Christiane: of Calvin (Ist ed. 1535, final form 1559), are the two chief systematic works of this period, and have formed the starting-points of the Lutheran and Reformed dogmatic respectively. The system expounded in them is suminarily set forth in the several Protestant Con- fessiovs of this era, aud various special doctrines were elaborated and defended by other leaders of the Reforma- tion. The Reformers accepted the doctrinal statcinents of the ancient creeds and of the first four general councils as scriptural and truc ; they also adopted with great earnest- uess the Augustinian doctrines of grace, while they added to them the principle with which Luther’s name is insepar- ably associated of justification by faith, and that of the supreme authority of the Bible as the rule of faich and life,— both of these being in their view witnessed and guaranteed by the testimony of the Holy Spirit. Maintaining these principles, they rejected the authority of the ehurch, the ululiplication and magical efficacy of the

sacraments, the merit of good works, monastic vows, penance, purgatory, and other corruptions of the Middle Ages. In their hands, theology lost the merely cbjective character that it had borns in patristic and medizval times, and was brought into closer eonncction with religious and Christian life, by the recognition and cultivation of its subjective side. The vital matter with them was, not to have right opinions about the Trinity and the hypostatic union, but to be sure of the true way of salvation by Christ. Their writings are pervaded by a warmth of spiritual life, as well as by a freshness of theological thought, that mark them as the genaine products of a creative age in the history of Christian dectrine. The Reformation age may be said to have closed with the final fixing of the Protestant doctrines in the generally-aceepted symbolical books, which took place for the Lutheran church in the adoption of the Lormula Con- cordie in 1580, aud for the Reformed churches in the decisions of the Synod of Dort in 1618-19. Even earlier, however, a declension may be observed from the lofty and free spirit of the first Reformers ; and a somewhat different character began to mark the theology of both the branches of the Protestant church.

V. A fifth period in the history of dogmatic, which may be called the confessional one, extends from the beginning of the 17th till near the end of the 18th century. During this time the doctrinal systems, of which the foundations had been laid by Melanchthon and Calvin, were elaborated and carried into details with great learning and acuteness ; the various doctrines were most carefully and precisely defined, distinguished, and defended. The 17th century was an age of theological controversy. The Roman Catholic Church had recovered from the shock of the Reformation, and by the aid of the Jesuits aud the power- ful reaction inaugurated by them, had regained strength uot only materially but intellectually. Controversialists like Bellarmine, Petavius, and Bossuet taxed the learning and ingenuity of Protestantism to meet them. There were also many less uecessary and profitable controversies among Pro- testants themselves; and almost cvery theologian was led to devote his energy to the attack of what he held to be error, and the maintenanee of true doctrine. Much valuable argument was brouglit into use in the course of these discussions, and the system of dogmatic was 1ore fully worked out than it had been before. The great dog- matie works of the 17th century, sueh as those of John Gerhard, Calovius, Quenstedt, and Baier in the Lutheran church, and of Francis Turretin,

Mastricht, and De Moor among the Reformed, are more minute, precise, and full in their exhibition of the doctrines of the faith than the writings of the Reformers, and they contain a great deal of vigorous and profound thought. Never probably have the

doctrines which they haudle been so ably and thoroughly |

discussed. They were, however, treated somewhat in the scholastie method that had prevailed before the Reforma- tion. The theologians of the 17th century did indeed clearly perceive and firmly maintain the principle of the sole authority of Scripture, which was one of those involved in the revolt against the authority of the church and hierarchy of Rome. Hence, in point of matter, their systems are vastly superior to those of the schoolmen, freer from traditional and sacerdotal dogmas, and far more in harmony with apostolic teaching. “But they failed to apprehend a deeper principle that was implicitly contained in the Reformation movement, viz., that Christian doctrine, instead of preceding Christian life as a necessary means to it, must come after its actual experience. Sound doctrine was regarded as the preliminary condition of spiritual life ; and as it had thus to be established apart from the living experience of Christianity in the soul, it must rest on purely external authority. This was found in au extreme and one-sided view of the inspiration of Scripture, as cqui- valent to verbal or litcral dictation, and in an uncritical and indiscriminate use of proof texts from all portions of Scripture, without due regard to their historical connection and scope. These became to many of the divines of that age very much what the sentences of the fathers and councils had been to the schoolmen ; and an undue weiglit was sometimes allowed even to the avowedly human forms in which Protestant doctrine had been expressed. An ex- cessive subtlety and minuteness of definition were also often adopted ; and when these were made matters of faith in different parts of the church, numerous schisms and separations took place. The rigid exclusiveness of the Lutheran divines on the basis of the Formula Concordia, the intolerant zeal of the Anglicans for cpiseopacy and ceremonies, the extreme doctrinal minuteness of the Formula Consensus Ielvetici of 1675, and the narrowness of some of the English Puritans and Scottish Presbyterians are instanees of this tendency;

and the disastrous effects of many of these are well known. The issue of this form of theology was very similar to that of the scholastic system. It was gradually undermined by the spirit of rationalism calling in question the validity of its minute definitions. This tendency had been active from the time of the Reformation in various forms; and though for long it was controverted and excluded from the Protestant Churches, in the course of the 18th century it brought about a general disintegration of their dugmaties. It was found that there was not sufficient cvidenee to main- tain the too minutely articulated systems in the face of a more critical study of the Bible ; and the orthodoxy that had rested on an insecure foundation was for a time almost entirely overthrown. In nearly all the churches there came, in various forms, an age of indifference and even unbelief in the old doctrines of the gospel ; and this was generally accompanied with a declension in spiritual life. It was in Germany that the sceptical movement took the most pro- nouueed form; and there, accordingly, the break with the theology of the 17th century has been most complete. In this country the triumph of rationalism has never been so absolute, and the transition to a new era in the history of theology has not been so marked.

VI. But a new period has undoubtedly come, since the Modern A reaction has set in period.

beginning of the present century. against the rationalism that overthrew the older dogmatics In some eases, indeed, this has taken the form of a simple reassertion and re-establishment of the old systems of doc- trine, as in the school of Hengstenberg, Havernick, Philippi, and others, who maintain the Lutheran orthodoxy in all its rigidity, and in many British and American divines, who reproduce the Calvinistic system in its precise 17th century form. But by many the need is felt of more thoroughly

carrying out the prineiples of the Reformation than was i

done in the succeeding age, so as to place the dogmatic system ona surer basis. Schleiermacher exercised great influence on theological thought ; and though he did not succeed in emancipating himself from the pantheistic prin- ciples of his philosophy, his mode of conceiving Christianity and its

relation to theology has been fruitful of good results. By a large number of divines it has been felt to be unsatis- factory to base, as was practically done formerly, the whole system of theology on the one doctrine of the inspiration of Scripture ; and a broader foundation, as well as a more living conception, has been sought for it, by recognizing as its subject-matter, not merely the sayings of Scripture, but that living Christianity which it is the direct object of the Bible to produce and reveal. This is really a taking up and carrying out more fully of the principles of the Mefor- mation; and it is in this line that dogmatic seems to be cultivated with most prospect of success and stability. There is in the present day much confusion in this as in many other departments of theology, and systems of the most diverse contents and on the most diverse principles arc produced in abundance ; but the line in which such men as Nitzsch, Martensen, Julius Miiller, Ebrard, Oosterzec, Ritschl, and others have been labouring is that which at once maintains the substance of what has been gained in former ages, and is free to welcome modifications and developments on sound and firmly based principles.

Litcrature.—The literature ‘of dogmatic is exceedingly rich and varied, and only the more important and influential works can be mentioned here. Before the Reformation, however, though there are many treatises of primary importanee on particular doctrines, and though the more comprehensive works have an historical value, yet there is no eomplete system construeted on sound principles, so as to be of muchdireetuse. Calvin’s Jnstitutio Religionis Christiane isthe first great work, embracing the whole subject, that is still of direct and primary importance. It is distinguished by a depth of insight into the principles of Christian doctrine, a comprehensive grasp and elear arrangement of their details, a reverence and sobriety in the interpretation and application of Scripture, and a spirit of Christian earnestness and piety that have never been surpassed. Of the later dogmatic systems in the Reformed Church, some are brief eonipends, among which the Theologice Medulla of William Ames, the English puritan, is specially distinguished for precision of thought and power of construction ; others are much larger, and greatly exceed in the length and minuteness of their discussions the work of Calvin. Among them Francis Turretin’s Jnstitutio Theologice Elencticce (1679) is remarkable for the logical power with which he maintains the strict Calvinistie doctrine on all

the points controverted in his day. Peter Van Mastricht's 7'hcoretico-Practica Theologia (1682-7), is a favourable specimen of the Dutch theology of the time—laborious, aceurate, and at the same time pro- found and spiritual. Of the federal school, as it is called, which exercised great influence on the popular theology of this country, Hermann Witsius's Qiconomia Federum isa very able and suggestive produetion, The Arminian system is well represented by the 7hco- logia Christiana of Philip Limborch (1686), a work written in a elear, biblieal, and econeiliatory style.

The Lutheran dogmatie works are even more colossal and volum- inous than the Reformed ; the greatest of them, John Gerhard's Loct Theologict (1609-22), shows a spirit of piety, as well as great learning, exaetness of thought, and logical skill. He ocenpies a middle position between the more rigidly orthodox such as Hiitter and Calovius, and the so-called syncretism of Calixtus. Of the same general character are the Institutioncs Theologice Doginaticce of John Francis Buddeus (1724). A very fair idea of the contents of the Lutheran dogmatie works may be obtained from Schnrid's (of Erlangen) conipendions Dogmatik der evangelisch-Luthcrischen Kirche (1853), which consists mainly of quotations from the old divines on the different doctrines of the system, and from Luthardt's Compendium der Dogmatik, In this country no important syste- matic treatise on dogmatic as a whole appeared till the publication of Dr George Hill's Lectures in Divinity in 1821, a work distin- guished by lucid arrangement of topics, and clear and eautious state- nent of doetrines and exposition of their evidence, though lacking somewhat in spiritual warmth. Dr Chalmers's Jnstitutes of Theology (1849) have this last quality in a very high degree, and follow a method that brings dogmatic into eloser connection with Christian experienee than had been usual; but the system is very imperfectly filled up, and is marked more by brilliant' and suggestive thoughts amply illustrated, than by thorough and minute investigation.

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The modern era of dogmatic may be said to have been opened by Schleiermacher's Christliche Glaube (1821), a work of great genius, learning, and power, which did good service in putting an end to the

previously prevalent rationalism, though in some essential respects ofa doubtful and defective character. Nearly all who have worked at dogmatic sinee have been stimulated and influenced more or less by Sehleiermacher ; but those who have received most from him have in general left beliind the pantheistie and emotional elements of his system, and approached nearer to the old faith of the ehureh. Among other works on dogmatie may be mentioned Nitzseh's System der Christlichen Lehre, containing in short compass much clear, profound, and enlightening thought, and Martensen's Christian Dogmatics, with his {comprehensive, philosophic, and suggestive views. One part of Schleiermacher's system which is given up by these and most modern theologians—his determinism—has been rigorously earried out by Alexander Schweizer in Ziirich (Glaubens- ichre der Reformirten Kirche) and Seholten in Leyden (Dogmaticcs Christiane Initia ; De Leer der Hervormde Kerk). Against the former Kprard has made a vehement and keen protest in his Christliche Dogmatik ; while the latter has, since publishing these works, given up belief in supernaturalism entirely. Oosterzee's Christian Dogmatics is a very useful and judicious exhibition of a moderate Calvinistic system.

Of the theologians who endeavour to reproduce more exactly the old Lutheran orthodoxy, the ehief are Philippi, whose Kirchliche Glaubenslehre is very strictly confessional, and Kahnis, who in his Lutherisehe Dogmatik displays a more liberal and eritical spirit.

In a similar way, Dr Charles Hodge of Princeton has restated the Caivinistie system of the 17th century in his Systematic Theology, which shows a wonderful acquaintance with the multifarious modern literature of the subject, great logical power, and an adherence to the old doctrines that is not in the least shaken by all the diverg- ing views and arguments with which he is so famillar.

¥or fuller aceounts of the literature and history of dogmatie, reference may be made to Hagenbach's Lncyclopdidie wu. Methodologie der theologischen Wissen- schaften, to the same author's Dogmengeschichte, and to Dorner's Geschichte der Protestantischen Theoiogte. (J. S.C.)

DOGWOOD (according to Prior, Ang. Sax. dole, a brooch-pin), the name applied to plants of the genus Cornus, of the natural order Cornacew or cornely. The common dogwood, prick-wood, skewer-wood, or so-called dogberry, C'. sanguinea, is a shrub reaching a height of 8 or 9 feet, common in hedges, thickets, and plantations in Great Britain. Its branches are dark-red ; the leaves egg- shaped, pointed, about 2 inches long by 14 broad, and turning red in autumn; and the flowers dull white, in terminal cymes. The fruits are of a black purple, arc bitter, and one-seeded, and contain a _consi- derable percentage of oil, which in some places is employed for lamps, and in the manufacture of soap. The wood is white and very hard, and like that of other species of the genus is used for making ladder- spokes, wheel-work, skewers, forks, and other implements, and gunpowder charcoal. The red berries of the dwarf species, C'. swecica, of the Scotch Highlands are eaten, and are reputed to be tonic in properties. C. mascula, the Cornelian Cherry, a native of Europe and Northern Asia, bears a pulpy and edible fruit, which when unripe contains much tannin. It is the Akenia of the Greeks, and the Kizziljiek of the Turks; by the latter the wood is employed for giving a red dye. The bark of the handsome Flowering Dogwood, C. florida, and of other American species, is valued as a stomachic and febrifuge, and is administered as a substitute for Peruvian bark. The

Jamaica Dogwood, the root-bark of which is poisonous, is the species Piscidia Hrythrina, of the natural order Leguminose.

DOL, a town of France, in the department of Tlle-et- Vilaine, about 15 miles by rail from St Malo, on an eminence in the midst of a marshy plain, protected from the inroads of the sea by a dyke of the 12th century, which extends for a distance of 22 miles. A quiet, sombre, avricultural little place, with nothing more remarkable in its modern life than the corn-market which is held in the old Carmelite church of Notre-Dame-sous-Dol, it preserves, in the remains of its ramparts and its ditch, the memory of the time when it was one of the most important fortresses

on the frontier between Brittany and Normandy. The streets are still rendered picturesque by the dark liouses of the 14th and 15th centuries, which form deep arcades by the projection of their upper stories ; and, high above all, in spite of its five hundred years, rises the grey granite of the cathedral, which formerly ranked as the metropolitan church of all Brittany, and still keeps fresh the name of that old Bishop St Samson, who, having fled, as the legend tells, from the Saxon invaders of England, sclected this spot as the site of his monastery, To the architect it is interesting for the English character of its design, and to the antiquarian for its stained glass windows of the 13th ecntury, its tombs, and its carvings. The town was twice besieged by William the Conqueror, had thrice to defend itself during the wars of the League, and in 1793 witnessed the defeat of the republican forces by the Vendeans who had taken refuge within its walls. About a mile and a half from the town is the pierre du champ dolant, a menhir about 30 feet above the ground; not far off stands the great granite rock of Mont Dol, about 200 feet in height, and surmounted by the chapel of Notre Dame de |’Espé- rance ; and about 10 miles to the south is the castle of Com- bourg where Chateaubriand spent his early days. Popula- tion in 1875, 3358.

DOLABELLA, Pustius Cornetius, a Roman general notorious for his profligacy, was born about 70 B.c. His vicious character made itself apparent even in his early years. Before he attained his majority he is said to have been more than once guilty of capital crimes, from the punishment of which he was only delivered through the advocacy of Cicero. In the year 50

he forced his wife Fabia to leave him, and married Tullia, the daughter of Cicero, who strongly opposed the union. Dolabella's motive in establishing this connection was to prevent Cicero from giving evidence in favour of Appius Claudius, whom he had accused of having violated the sovereign rights of the people. In the following year, his numerous creditors having become clamorous, he was forced to quit Rome, and betook himself to the camp of Cesar, to the great regret of his father-in-law. During Czsar's absence in Spain, Dolabella commanded the fleet in the Adriatic, but he did not gain any distinction. He took part in the battle of Pharsalus (48), after which he returned to Rome, in the expectation, delusive as it proved, that Cesar would give him a substantial reward for his services, and so enable him to pay his debts. To gain immunity from the urgent demands of his creditors, he procured his election to the tribuneship, which he had no sooncr done than he iutro- duced a bill (rogatio) proposing that all debts should be cancelled. This was strongly resisted by his colleagues, and two parties were formed, between whom more than one bloody encounter took place in the streets of the city, On Caesar's return from Alexandria he saw the expediency of removing Dolabella from Rome, and accordingly took him as one of his generals in the expedition to Africa and Spain, Dolabella was ambitious of the consulship, and obtained a promise of it from Cesar for the year 44. The latter, however, influenced partly by the strong opposition of Antony, assumed the office himself, and deferred the fulfilment of his promise to Dolabella until he should sect out on his expedition against the Parthians. The assassina- tion of Cesar occurring before this arrangement could be carried out, Dolabella at once scized the insignia of the consulship, and, by making friends with Brutus and the other assassins, was confirmed in the office he had usurped. To ingratiate himself still further with the republican party, he caused an altar erected in honour of Cxsar to be thrown down, and many of those who had sought to offer sacrifices

on it to be crucified or thrown from the Tarpeian rock. |

He did not hesitate at once to change sides, however, when

Antony made it his interest to do so by offering him the command of the expedition against the Parthians and the province of Syria. An unduly protracted and circuitous march was signalized by rapacious extortion, which became still more rapacious when at length Dolabella reached Syria. His crowning iniquity was the murder of Trebonius at Smyrna, which, according to Cicero's account, was preceded by two day's torture for the purpose of discover- ing the locality and amount of the treasure contained in the town. On hearing of this gross abuse of power, the senate outlawed Dolabella, and declared him a public enemy. Cassius was appointed to supersede him, proceeded to Asia Minor, and had taken Laodicea, when Dolabella in despair oe himself to be killed by one of his own soldiers, 3 B.C.

DOLCE, Lupovico, or Luter (1508-1568 or 1569), one of the most laborious and multifarious writers of Italy in the 16th century, was a native of Venice, and belonged to a family of honourable tradition but decadent fortune. He received a good education, and early undertook the task of maintaining himself by his pen. His life, even more destitute of outward events than such a life usually is, may be briefly summed up in one word—he wrote. Translations from Greek and Latin, epics, satires, histories, plays, and treatises on language and art followed each other in rapid succession, till the whole nnmber amounted to upwards of 70 works. In his own day his industry was rewarded by no small amount of fame; but he is now mainly memorable as the author of Marianna, a tragedy from the life of Herod, which was recast in French by Tristan and by Voltaire, and still keeps a place on the stage. Four licentious comedies, Jd Ragazzo (1541), Il Capitano (1545), Il Marito (1560), Il Rugiano (1560), and seven of Seneca's tragedies complete the list of his dramatic efforts. In one epic—to translate the title-page—' he has marvellously re- duccd into oftava vima and united into one narrative the stories of the Iliad and the Aineid ;" in another he devotes 39 cantos to a certain Primaleone, son of Palmerius ; in a third he celebrates the first exploits of Count Orlando ; and in a fourth he sings of the Paladin Sacripante. A life of the emperor Charles V. and a similar account of Ferdinand L., published respectively in 1560 and 1566, are his chief his- torical productions ; and among his minor treatises it 1s enough to mention the Osservazioni sulla lingua vol- gare, 1550; the Dialogo della

pittura, 1557 ; and the Dia- logo nel quale si ragiona del modo di acerescar la memoria,

1552.

- Tiraboschi, Storia, &c., vii.; Klein, Geschiehte des Dramas, VOl. V.

DOLCT, Canto, or Carino (1616-1686), a painter of considerable celebrity, was born at Florence in May 1616. He was the grandson of a painter on the mother's side, and became a disciple of Jacopo Vignali ; and when only eleven years of age he attempted a whole figure of St John, and a head of the infant Christ, which received extraordinary approbation. He afterwards painted a portrait of his mother, and displayed a new and delicate style which brought him into notice, and procured him extensive employ- ment at Florence (from which city he hardly ever moved) and in other parts of Italy. Dolci used his pencil chiefly in sacred subjects, and bestowed much labour on his pictures. In his manner of working he was remarkably slow. It is said that his brain was affected by seeing Luca Giordano, in 1682, despatch more business in four or five hours than he could have executed in as many months, and that he hence fell into a state of lrypochondria, which compelled him to relinquish his art, and soon brought him to the grave. His works are not very aumerous. He generally painted in a small size, although there are a few pictures by him as large as life. Ho died at Florence in January

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1686, leaving a daughter (Agnese), who arrived at some degree of excclllence in copying the works of her father.

Carlo Dolci holds somewhat the same rank in the Florentine that Sassoferrato does in the Roman school. Without the possession of much genius, invention, or eleva- tion of type, both these artists produced highly wrought pictures, extremely attractive to some tastes. The works of Dolci are casily distinguishable by the delicacy of the composition, and by an agreeable tint of colour, improved by judicious management of the chiaroscuro, which gives liis figures a striking relicf; he affected the use of ultra- marine, mucl loaded in tint. 'His pencil," says Pilkington, "was

tender, his touch inexpressibly neat, and his colouring transparent; though he has often been censured for the excessive labour bestowed on his pictures, and also for giving his carnations more of the appearance nf ivory than the look of flesh.” All his best productions are of a devout descriptiou ; they frequently represent the patient suffering of Christ or the sorrows of the Mater Dolorosa. Dolci was, in fact, from early youth, exccedingly pious; it is said that during passion week every year he painted a half-figure of the Saviour. His sacred heads are marked with pathetic or at least strongly sentimental emotion. There is a want of character in his pictures, but the general tone accords with the idca of the passion por- trayed. Among the best works of this master are the St Sebastian ; the Four Evangelists, at Florence ; Christ Breaking the Bread, in the marquis of Exeter’s collection at Burleigh ; the St Cecilia in Dresden ; an Adoration of the Magi; and in especial St Andrew praying before his crucifixion, in the Pitti Gallery, his most important com- position, painted in 1646; also sevcral smaller pictures, which are highly valucd, and occupy honourable places in the richest galleries.

DOLE, a town of France, at the head of an arrondisse- ment in the department of Jura, 28 miles N. of Lons-le- Saulnier, occupying the declivity of a hill on the right bank of the Doubs, which is there accompanied by the canal between the Rhone and the Rhine. It is the seat of a tri- bunal of primary instance, and has a Jesuit college, an agri- cultural society, a school of design, a theatre, a museum, and a public library of upwards of 40,000 volumes. The principal public buildings are the court- house, originally a Franciscan monastery dating from 1572; the church of Notre Dame, a Gothic structure of the 16th century ; the Hétel-Dieu, the prison, the tarracks, two hospitals, and the ancient tower of Vergy. Among the manufactures of the town are straw hats, hosiery, chemicals, leather, and agri- cultural implements ; and it carries on a good trade in agri- cultural produce, wood, iron,and marble. Déle is believed to have been a station on the Roman road from Lyous to the Rhine, and it still preserves what seem to be remains of an aqueduct, a bridge, and a theatre, of Roman construc- tion From 1423 to 1481 it was the seat of a university ; but there can have been but little study in the year 1479 when the town was taken by Louis XI., and so completely sacked that only Jean Vurry’s house, as it is still called, and other two buildings werc left standing. It subsequently came into the hands

of the Spaniards, and in 1530 was fortified by Charles V. In 1636 it was able to hold out against the prince of Condé; bnt in 1668 and 1674 it was captured by the French, and on the latter occasion was deprived of its defences. Till Besancon was incorporated with the province, Déle ranked as the capital of Franclie Comté, and was the seat of a parlement,

DOLET, Evrenne (1509-1546), a French scholar and painter, whose fame is duc as well to the painful romance of his life as to the high importance of his labours. A tradition, of what authority it is hard to say, makes him the illegitimate son of Francis I. « and it is evident that he

was at least connected with some family of rank and wealth. From Orleans, where he was born, he was taken to Paris about 1521; and after enjoying there the instruc- tion of Nicolas Bérauld, tlic teacher of Coligni, he procecded in 1526 to Padua, The death of his friend and master, Simon de Villanova, led him, in 1529, to accept the post of secretary to Jean de Langcac, French ambassador to the republic of Venice; but he managed, in spite of his new occupation, to attend the lectures of the Venetian scholar Battista Egnazio, and to write Latin love poems to some Venetian Elena, who died, however, before he left the city. Returning to France in 1530 he proceeded to Toulouse for the study of law; but there he soon became involved in the violent disputes then raging between the different “ nations ” of the university, roused the anger of the public authorities by his keen condemnation of some of their measures, was thrown into prison, ran the risk of being assassinated, and was finally banished by a decree of the parlement. In 1535 he entered the lists against Erasmus in the famous Ciceronian controversy, by publishing, through Sebastian Gryphe at Lyons, a Dialogus de Imitatione Ciceroniana ; and the following year saw the appearance of his two folio volumes Commentariorum Linguce Latine. In 1537 he obtained from Francis I. a privilege to print during ten years any works in Latin, Greck, Italian, or French which were the product of his own pen or had received his super- vision ; aud accordingly, on his relcase from an imprison- ment occasioned by his justifiable homicide of a painter Campanini, he commenced at Lyons his typographical and editorial labours.

That he was not altogether unaware of the dangers to which he was exposed from the bigotry and fierce-heartedness of the times is shown not only by the tone of his mottoes—Préserve moi, Seigneur, des calomnies des hommes, and Durior est spectatce virtutis quam incognite conditio—but also by the fact that he endeavoured first of all to conciliate the theological wolves by publishing a Cato christianus, or Christian moralist, in which he made pro- fession of his crecd. The catholicity of his literary appreciation, in spite of his ultra-Ciceronianism, was soon displayed by the variety of the works which proceeded from his press—ancicnt and modern, sacred and secular, from the New Testament in Latin to Rabelais in French. But long before the term of his privilege expired his labours were interrupted by the machinations of his enemies, who neither shrank from bringing against him what was then the most terrible of all accusations, nor relented in their pursuit till their purpose was completely realized. From a_ first imprisonment of fifteen months their victim was released by the advocacy of Picrre Duchatel, bishop of Tulle; and from a second he escaped by his own ingenuity; but, venturing back from Piedmont, whither he had fied in ordcr that he might print at Lyons the letters by which he appealed for justice to the king of France, the queen of Navarre, and the parlement of Paris, he was again arrested, hurried up to the capital, branded as a relapsed atheist by the theological faculty of the Sorbonne, and on the 3d of August 1546 put to the torture, strangled, and burned in the Place Maubert. On his way thither he is said to have composed the punning pentameter—Won dolet ipsa Dolet, sed pia turba dolet. As if in prophetic mockery of their own proceedings, the doctors of the Sorbonne based their decision on the three words Ztven du tout or “ Nothing at all,” inserted by Dolet in a passage of the Axiochus of Plato, which even without them denied, if not so empliati- cally, the immortality of the soul; and this they did in spite of the fact that according to their own showing, his works must have been full of most damnable hercsies, and had already in 1543 furnished excellent fuel to the hangman’s fire. Whether Dolet is to be classed with the j representatives of Protestantism or with the advocates of

anti-Cliristian rationalism has been frequently disputed ; by the principal Protestants of his own time he was not re- cognized, and by Calvin he is

formally condemned, along with Agrippa and his master Villanova, as having nttered execrable blasphemies against the Son of God ; but, to judge by the religious character of a large number of tlhe books which he translated or published, such a condemna- tion is altogether misplaced. His repeated advocacy of the reading of the Scriptures in the vulgar tongue ts especially noticeable.

To the works already mentioned the following must be added :— A volume published by Simon Finet, without the author's know- ledge, containing Orationes duce in Toloswit, epistolarum libri duo, carminum libri duo, and epistolarwm améleorum liber, 1533 ; De ve navalt liber, 1587; Genethliaewm Claudii Doleti, 1539 (a collection of Latin poems on the birth of his son, translated into French as L' Avant-Naissance de Claude Dolet, 1539) ; La maniére de bien traduire Pune langue en wne autre, and De la ponetuation francaise, 1541; Le Manwel du Chevalier Chrétien and Le vrat moyen de se bien confesser, both translated from Krasmus's Latin, 1542; Bref Discours dela Republique francaise, 1544 ; Second Enfer, 1544, a poe giving an account of his escape from prison, which was reprinted in 1836 by 'I'echener. See Née de la Kochelle, Vie d' Estienne Dolet, Paris, 1799; Joseph Boulmier, '' Estienne Dolet," in the Revue de Paris, 1855, and a separate work, Hstienne Dodlet, sa vie, &e., Paris, 1857; A. F. Didot, Lssat sur la Typographie. The proeés or trial of Dolet was published in 1836, by A. H. Taillandier from the registers of the parlement of Paris.

DOLGELLY,amarketand assize town of Merionethshire, North Wales, situated at the junction of the Aran with the Wnion, aud at the northern base of Cader Idris, 19 miles §.W. of Bala and 9 miles E. of Barmouth, with both of which it is connected by railway. 'he town consists of a series of small squares and narrow streets, the houses being built of stone. It contains a market hall, assize hall, county gaol, and parish church. An old building, described as the Parliament House, is said to have been the place in which Owen Glendower assembled his parliament in 1404. Dolgelly, which is the principal town of Merionethshire, forms a local board district, There is an inconsiderable manufacture of coarse flannels and tweeds carried on by the inhabitauts. Population in 1871, 2357.

DOLLOND, Joxun (1706-1761), the celebrated optician, was the son of a French refugee, a silk-weaver at Spital- fields, where he was born, June 10, 1706. He was early trained to his father's occupation, but made leisure for the acquisition of a knowledge of mathematics, physics, Greck, Latiu, the elements of anatomy, and other subjects. In 1752 he abandoned silk-weaving in order to join his son Peier, who had entered upon business as an optical instru- ment-maker in Vine Court, and before long he became uni- versally celebrated as an optician. His last and most im- portant contribution to the Philosophical Transactions, for which he, in 1758, received the Copley medal of the Royal Society, gave a description of the various experiments, begun early in 1757, on the combined effect of water and prisms and lenses of glass, by which he was led to the dis- covery of a means of constructing achromatic lenses, Sir Isaac Newton had stated in his Optics " that all refracting substances diverged the prismatic colours ina constant pro- portion to their mean refraction," and consequently " that refraction could not be produced without colour," for which reason " no improvement could be expected in the refract- ing telescope." Dollond, however, found that as flint glass causes a greater dispersion in proportion to its refractive power than crown glass, achromatic magnified images could be obtained by using a combination of a doubly concave lens of the former substance with a doubly convex lens of the latter. As the two glasses to be combined were the segments of spheres of considerable curvature, the aberra- tions from their surfaces were very great, but by varying the surfaces he was enabled to make the aberrations equal, s0 that, as the refractions of the two glasses were contrary,

they corrected each other. In 1761 Dollond was appointed optician to the king, and became a fellow of the Royal Society. On September 30th of that year, whilst reading a work by Clairaut on the theory of the moon, he had an attack of apoplexy, of which he died in a few hours.

Dollond's published papers are '' A letter to Mr James Short, F.R.S., concerning an Improvement of Reflecting Telescopes ;" a second letter to Mr Short ''Concerning a Mistake in M. Euler's Theorem for Correcting the Aberration in the Object-Glasses of Refracting Telescopes ;" and ''.A

Description of a Contrivance for measuring Small Angles ”—Phil. Traus. 1768, pp. 108, 287, 178; ‘An Explanation of an Instrument for measuring Small Angles,” thid. 1754, p. 551; and ‘‘An Account of some Experiments concerning the different Refrangibility of Light,” ¢bid., 1758, p. 733.—See Kelly, Life of John Dollond, 3d ed. 1808.

DOLOMIEU, Diopat-Guy-Si1nvain-TANCREDE GRATET pE (1750-1801), a celebrated geologist and mineralogist, was bornat Dolomieu, near Tour-du-Pin, in the department of Istre in France, June 24, 1750. He was admitted in his infancy a member of the Order of Malta. When in his 19th year he quarrelled with a knight of the galley on which he was serving, and in the duel that ensued killed him. In consonance with the statutes of his order, Dolomieu was condemned to death !for his crime, but in consideration of his youth the grand master granted him a pardon, which, at the instance of Cardinal Torrigiani, was confirmed by Pope Clement XIIT., aud after nine months’ imprisonment he was set at liberty. Throughout that period he had solaced himself with the study of the physi- cal sciences, and during his subsequent residence at Metz he continued to devote himself to them. In 1775 he pub- lished his Recherches sur la pesanteur des corps a différentes distances du centre de la terre, and two Italian translations of mineralogical treatises by Cronstedt and Bergmann. These works gained for him the honour of election as a corresponding member of the Academy of Sciences at Paris. ‘To obtain leisure to follow his favourite pursuits Dolomieu now threw up the commission which, since the age of fifteen, he had held in the carabineers, and in 1777 he accompanied the bailli De Rohan to Portugal. In the following year he visited Spain, and in 1780 and 1781 Sicily and the adjacent islands. ‘lwo months of the year 1782 were spent in examining the geological structure of the Pyrenees, and in 1783 the earthquake of Calabria induced him to go to Italy. The scientific results of these excursions are given in his Voyage auw tles de Lipari ; Mémoire sur le tremblement de terre de la Calabre ; Mémoire sur les tles Ponces, et catalogue raisonné des products de ?Htna, and other works. In 1789 and 1790 he busied himself with an examination of the Alps, his observations on which form the subject of numerous memoirs published in the Journal de Physique. The mineral dolomite, which was named after him, was first described by Dolomieu in 1791. He returned to France in that year, bringing with him rich collections of minerals. On September 14, 1792, the Duc de

la Rochefoucault, with whom he had been for twenty years on terms of the closest intimacy, was assassinated at Forges, and Dolomieu retired with the widow and daughter of the duke to their estate of Roche Guyon, where he wrote several important scientific papers. The events of the 9th Thermidor (July 27, 1794) having restored the country to some tranquillity, Dolomieu recom- menced his geological tours, and visited various parts of France with which he had been previously unacquainted. He was in 1796 appointed engineer and professor at the school of mines, and was chosen a member of the Institute at the time of its formation. At the end of 1797 he joined the scientific staff which in 1798 accompanied Bonaparte's expedition to Egypt. He had proceeded up the Nile as far as Cairo when ill health made his return to Europe necessary, and on March 7, 17¥7, he set sail from

Alexandria. His ship proving unseaworthy put into Taranto, and as Naples was then at war with France, all the French passengers were made prisoners. On May 22, they were carried by ship to Messina, whence, with the exception of Dolomieu, they embarked for the coast of France. Dolomieu had been an object of the hatred of the Neapolitan court since 1783, when he revealed to the grand master of his order its designs against Malta, and the calumnies of his enemies on that island served now as a pretext for his detention. He was confined in a pestilential dungcon, where, clothed in rags, and having nothing but a little straw for a bed, he languished during 21 months. To the eomplaint that if unsupplied with some neeessary he should die, his jailer replied, " What does it matter to me if you do? I have to give account to the king of nothing but your bones." Dolomieu, however, did not abandon himself to despair. Deprived of writing materials, he made a piece of wood his pen, and with the smoke of his lamp for ink he wrote upon the margins of a Bible, the only book he still possessed, his Z'raité de philosophie minéra- logiqgue and Mémoire sur Vespéce minérale. Friends entreated, but in vain, for his liberty; it was with difficulty that they sueceeded in furnishing him with a little assistance, and it was only by virtue of a speeial clause in the treaty between France and Naples that, on March 15,1801, he was released. On his arrival in France he

commenced the duties of the chair of mineralogy at the museum of natural history, to which, after the death of Daubenton, he had been elected in January 1799. His course of lectures concluded, he revisited Switzerland. Returning thence he reached the residence of his brother- in-law at Chateau-Neuf, in the department of Sadne-et- Loire, where he was seized with a fever, to which in a few days he suecumbed, November 25, 1801. Dolomieu's geological theories are remarkable for originality and boldness of conception. The materials constituting the primordial globe he held to have arranged themselves according to their specifie gravities, so as to have constituted a fluid eentral sphere, a solid erust external to this, next a stratum of water, and lastly the atmosphere. Where water penetrated through the crust, solidification took plaee in the underlying fluid mass, which enlarging in consequence produced rifts in the superincumbent rocks. Water rushing down through the rifts beeame decomposed, and the resulting efferveseence occasioned submarine volcanoes. The crust of the earth he believed to be continually in- creasing in thiekness, owing to the deposition of aqucous rocks, and‘ to the gradual solidifieation of the ‘molten in- terior, so that the voleanic eruptions and other geological phenomena of former must have been of far greater mag- nitude and frequeney than those of recent times.

Lacépéde, ‘ Hloge historique de Dolomieu," in Mémoires de la classe des sciences de 1 Institut,1806 ; Thomson, in Annals of Philo- sophy, vol. xii., p. 161, 1808.

DOLPHIN (Delphinus delphis), the common name of a species of whale belonging to the family Delphinide. It usually measures from 6 to 8 feet in length, and is thickest near the centre, where the dorsal fin rises to a height of 9 or 10 inches, and whence the body tapers towards both extremities. The forehead descends abruptly to the base of the slightly flattened beak, which is about 6 inches long, and is separated from the forehead by a transverse depres- sion. The mouth is armed with sharp, slightly eurved teeth, of uniform size, varying in number from 40 to 50 ou each side of either jaw, and those above locking exactly with the teeth below. The aperture of the ear in dolphins 1s exceedingly minute; the eyes are of moderate size and the blow-hole is crescent-shaped. The colour of the upper surface is black,

becoming lighter on the flanks, and per- fectly white on the parts beneath. Like many other

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‘cetaceans, the dolphin is gregarious, and large herds are often seen following ships in full sail, and disporting them- selves on the surface of the water as if delighted at the near proximity of man. In such exercises they exhibit the most remarkable agility, individuals having been known to leap to such a height out of the water as to fall upon the deck. Their aquatic gambols and apparent relish for human society have attracted the attention of mariners in all ages, and have probably given rise to the many fabulous stories told of dolphins by ancient historians. Their

_appearanee at sea was formerly regarded as a good omen

by sailors, for although it presaged a tempest, yet by thus giving warning of its approach, it enabled them, in those days when the mariner’s compass was unknown, and navigators had consequently to keep within sight of the coast, to stecr for a place of safety. The dolphin is excecdingly voracious, feeding on fish, euttlefishes, and crustaceans. On the south coast of England it is said to live chiefly on pilchard and mackerel, and when in pursuit of these it is often taken in the fishermen’s nets. The female brings forth a single young one, which she nurses with the greatest care. Her milk is both abundant and rich, and during the operation of suckling the mother floats in a slightly sidelong position, so as to allow of the neeessary respiration in herself and her young. The dolphin was formerly supposed to be a fish, and as such was allowed to be eaten by Roman Catholies on those occasions when the use of flesh was prohibited, and it seems to have been esteemed as a great delicaey by the French. It is said to show great fondness for music, and aecording to the aneient fable, Arion was said to have escaped on the back of a dolphin which he had first charmed by his music. It is an inhabitant of the temperate regions of the North Atlantie and the Mediterranean Sea, and has been observed as far north as the coast of Greenland. It is much more common in English than in Scottish waters. Among the seafaring population of Britain the name “dolphin” is most

usually given to the beautifully coloured fish Coryphcena hippuris—the dorado of the Portuguese, and it is to the latter the poct is alluding when he speaks of “ the dying dolphin’s changing hues ”—while the true dolphin is usually spoken of as the “bottlenose” or “ bottlehead.” This species oecurs as a fossil in the sandy downs of the French eoast.

DOMAT, or Davmat, Jean (1625-1696), a eclebrated French juriseonsult, born at Clermont in Auvergne, on the 30th November 1625. He was closely in sympathy with the Port-Royalists, was intimate with Pascal, and at the death of that celebrated philosopher was intrusted with his private papers. He is principally known from his elaborate legal digest, in four volumes 4to, under the title of Lois Crviles dans leur Ordre Naturel Suivies du Droit Publique (1689),—an undertaking for which Lonis XIV. settled on him a pension of two thousand livres. This is one of the most important works on the science of law that France has produeed. Domat endeavours to found all law upon ethical or religious prineiples, his motto being L’homme est fait par Drew et pour Dieu. An English translation of the Lois Civiles by Strahan, was published in 1722, and passed through several editions. Besides the Lots Civiles, Domat made in Latin a selection of the most common laws in the colleetions of Justinian. This work, however, did not appear until after his death, when it was published separately (Paris, 1700, Amsterdam, 1703) under the title of Legum Delectus, and was subsequently appended to the Lois Civiles. It was translated into English by Strahan. Domat died at Paris on the 14th Mareh 1696.

See in the Journal des Savants for 1843 several papers on Domat by Victor Cousin, giving much information not otherwise acces- sible.

DOM—DOM DOMBROWSKI, Jan Heyrvx (1755-1818), Polish |

general, was born at Pierszowice in the palatinate of Cracow, Angust 29,1755. He was of noble family, and his father was an officer in the Saxon army. Brought up in Saxony, he entered and for some years served in the army; but when, in 1791, the Polish Diet recalled all Poles serving abroad, he returned to his native land. Placed then under the orders of Poniatowski, he took part in the campaign of 1792 against the Russians. In 1794 he distinguished himself in command of the right wing under Kosciusko assisted in the defence of Warsaw, and reunited the scattered Polish forces

after its fall. He was compelled, however, to capitulate and to surrender himself prisoner of war at Radoszyce, November 18. Suwaroff offered him a post in the Russian army, but this he declined, and for two years he lived in retirement. In 1796 the rank of lieutenant-general in the Prussian army was offered to him by the king; but this he likewise declined. He then went to Paris. The formation of a Polish legion was at this time in contemplation by the French authorities ; and in January 1797 Dombrowski was formally authorized by the Government of the Cisalpinc Republic to onganize it. This task he executed at Milan. In command of his legion he played an important part in the war in Italy, entered Rome in May 1798, and distinguished himself greatly at the battle of Trebbia (June 19, 1799). On this occasion he narrowly escaped death, being struck by a ball the force of which was broken by a volume of Schiller which he carried with him. He next served under Saint- Cyr and Masséna; but being severely wounded he was for some time incapacitated for action. After Marengo he was intrusted by Napoleon with the organization of two new Polish legions; and at the head of the new levies he captured, in January 1801, the fortified post of Casa Bianca, near Peschiera. After the peace of Amiens he passed, as general of division, into the service of the Italian republic, Summoned by Napoleon after the battle of Jena to promote a rising in Poland, he returned there, took command of the Polish army, and distinguished himself at the siege of Dantzic (1807). He fought and was wounded at Friedland, and took an active part against the Austrians in the campaign of 1809. In the Russian campaign of 1812 he commanded a division of the great French army, and was wounded at the passage of the Beresina. He fonght under Gencral Marmont at the battle of Leipsic (1813), and in the following year returned to Poland. He was onc of the generals entrusted by the emperor Alexander with the reorganization of the Polish army, and was named in 1815 general of cavalry and senator palatine of the new kingdom of Poland, He retired, however, in the following year to his estates in Posen, and employed himself in preparing for publication his History of the Polish Legions im Italy, which was published some years after his death. General Dombrowski died at his seat of Wina-Gora in Posen, in June or July 1818.

DOME is usually understood to mean a roof which is round or polygonal horizontally, and of which any vertical section is either a round or a pointed arch. ‘There happen to be none of elliptical or any other section than thiese.

But some, especially in the East, have what is called an ogival outline, convex below and concave towards the top, aud these are generally called cupolas, though there is no real distinction. Most of the great European domes have au opening or eye at the top, on which stands a lan tern, except in the Pantheon at Rome, where the eye is open. Until modern times all the domes worth notice were of masonry, 7.¢., stone, brick, tiles, or pots, which last were used for lightness. Probably the first large wooden dome was St Paul's, of which the colstraction is peculiar, the inner dome visible in the church being

of brick only 18 inches thick, except near the bottom where it grows out of a conc of the same thickness going up outside it and carrying the stone lantern, which looks right down into tlie church through an eye in the internal dome. Outside the cone is built a wooden dome covered with lead. The domes of St Peter's at Rome and Florence Cathedral are of two stone shells near together, and connected by some vertical ribs, and also carrying lanterns. But Wren's construction is infinitely stronger, since a cone sufficiently tied at the bottom cannot give way until it is ab- solutely crushed, while the bursting pressure of a weight on the top of a dome increases the bursting force enormously. St Peter's dome is cracked in several places, and held to- gether by bands, and it is covered with lead, and therefore looks no better than St Paul's, and indeed on the whole not near so well, for varions reasons which may be secn in archi- tectural books; and the lantern is smaller in proportion. The only full mathematical investigation of the theory of domes with practical results, that we know of, is in a paper by Sir Edmund Beckett (then Mr Denison) in the Memozrs of the Royal Institute of British Architects of February 1871, and two shorter ones by Mr E. W. Tarn, architect, in the Civil Lngineer's Journal of March 1868, which sub- stantially agree, so far as they deal with the same points. The investigation is long and complicated, and can only be done approximately, because the introduction of the thick- ness deranges all the ordinary trigonometrical relations, and so we only give the principal results of those calcu- lations. Some more of them are given in Sir E. Beckett's Book on Building. It is easy to prove by strict mathe- matics that the upper 52° (nearly) of a hemispherical dome would be absolutely stable, or have no

tendency to fall in or burst ont, without any sensible thickness, if only tied strongly enough round the base, where the tension would be ‘3 of the weight of the complete hemisphere, disregard- ing the bonding effect of mortar and friction. The weight of a thin hemispherical shell is the same as that of a cylin- der of the same height and thickness standing on the same base, and is twice that of the area which the dome covers, of the same thickness, provided that bears only a small pro- portion to the diameter. The weight of any zone of the dome is proportional to its height. A hemisphere of ordi- nary stone 100 feet wide at mid-thickness and 1 foot thick weighs about 1000 tons. It is also demonstrable that a dome spreading at the bottom a little more than a hemi- sphere, so as not to start vertically, and rather flattened at the top, would stand without any sensible thickness; and so wonld sundry other curves, and especially an inverted catenary, which will stand even as an independent arch without thickness, for a dome is far more stable than an arch or a barrel vault of the same thickness.

The essential difference between them is that the mathe- matical element of a dome is not an arch of any unt- form breadth, but one whose breadth, and therefore weight, decreases npwards to nothing, being in fact a dune enclosed between two meridians very close together. And it was shown in the R.I.B.A. paper, and also by models exhibited, that a dome is stable with a thickness of only ‘023 of its diameter, while an independent round arch or a barrel vault requires three times as much thickness, or ‘072 of its diameter. Therefore a barrel vault 100 feet wide must be 7 feet thick to be stable, while a dome of that diameter need only be 27 inches ; besides which, the strength of the dome can be increased to almost any extent by building in iron bands in the lower courses, while a barrel vault cannot be so helped. Bands would be of no use whatever in a dome above 52° from the top, as the pressure above that point is entirely inward, assnming it to be tied there, and from thence it gradually increases towards the bottom, where the tension is ‘215 of the weight of the

hemisphere. It may scem paradoxical that it should be less there than at 52°; but the explanation is that the tension bears a higher proportion to the weight in a thin dome than a thick one, and it was an infinitely thin one

which had the tension of °3 of its weight at 52°; and sucha dome cannot be carried lower without bands. Inw dome of the required thickness ties would have very little to do above 68°.

As the tension at the bottom is rather more than a fifth of the weight, a dome of proper thickness would be stable standing on a conical drwm, with a slope inwards of about 1 to 5, or 12°, of which the tangent is -215, if the drum itself has foundations which cannot spread. The thickness requisite, and also the tension at the bottom, may evidently be greatly diminished by gradually tapering the dome upwards. If itis half as thick at the top as at the bottom, with the thickness increasing downwards as the heiglit, it need only weigh 5% of the lightest uniform dome of the same size, and only need be 20 inches thick at the bottom for 100 feet diameter.

Pointed domes are also much stronger than hemispheres, having lost the flat top which has the greatest bursting pressure. A dome generated by the revolution of an equilateral arch, or one of 60°, requires a thickness only = ‘0137 diameter, or 164 inches for 100 feet; and one of 70° requires 20 inches. The tension at the bottom of a 60° dome is only “15 of its weight, which weight, how- ever, is 1°372 of a hemisphere on the same base, their heights being as 1:73 to 1.

For the same reason pointed domes are fittest for carry- ing a lantern, but they are not much benefited by tapering, having already lost the most oppressive part. The Florence dome, across the flat sides of the polygon, is about 70° of the circle of its curvature. It is shown in the R.1.B.A. paper that both iu hemispherical and pointed domes the weight of the lantern they will carry varies practically as the cube of the thickness. Moreover a lauterned domme requires tieing much higher up than a plain one. In short, the cone is the only proper way of carrying a stone lantern. The cone at St Paul’s has a great chain round the base, which is probably superfluous, as the drnm below it seems thick enough to contain the requisite slope, and visibly leans in- wards besides.

Ribs inside a dome weaken more than strengthen it, as some persons imagine, uuless they are themselves deep enough to be stable as independent arches, or unless they decrease in width and weight upwards like a lune, as those in the Pantheon do, which also is so cnormonsly thick

at the haunches that it has superabundant stability. Some of the Indian domes are thick enough for arches, and they have neither eyes nor lanterns. considered as composed of a small number of widish lunes, and only differ from round ones in being rather weaker for any given thickness and size.

Domes require no wooden centring to build them on as arches do, until you get near the top, ze, so long as each stone laid on the ring of stones below it will not slide inwards, And if they are notched to prevent sliding the whole dome may be built without centring. The dome of Mousta in Malta was so built in this century by a common mason, who must, however, have been a man of genius. There would be no difficulty in building a dome of almost any size of bricks or stones, with the help of hoop iron in all the lower courses up to about 22° from the bottom, and then less up to 52°, and higher if it has to carry a lantern, There is no masonry dome in the world wider than 142 feet. But there have been several larger iron ones, which are an easy piece of engineering, inasmuch as iron has enormous tensile strength, while stone has very little, and mortar practically none; and all the calculations

Polygonal domes may be

above mentioned assume the domes to be composed of nar- row lunes having no lateral bond or tie; but on the other hand all the stones are assumed to go nmght through the thickness and not to be liable to crush at the edges. Building the lowest courses with horizontal beds, which some architects suggested, was shown to be exactly the opposite of what is mathematically required, as there would be nothing to prevent their sliding over cach other, where- as the essence of dome-construction is that the lower courses should confine the upper. It is not lowever prac- tically expedient to make the beds lean inwards so much as to involve acute angles of the stones, as such angles in stone will bear very little pressure. Drick domes over wells or tanks, which should always be round for strength, are usually built on mere mounds of carth for centring, and they are always of flat section, or only about the upper half of a hemisphere, and are consequently stable with very little thickness, as the earth round them forms a strong abutment.

The following inside diameters of the largest domes in the world are given in Sir E. Beckett’s Book on Building :—

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DOMENICHINO, or Domeyico, Zamprerr (1581- 1641), the celebrated painter, born at Bologna on 21st October 1581, was the son of ashoemaker. The diminutive form of Christian name by which he is known indicates his short stature. He was placed, when young, under the tuition of Denis Calvart; but having been treated with great severity by that master, he left him, and became a pupil in the academy of the Caracci, under Agostino. To-wards the beginning of the 17th century he went to Rome, at the invitation of his fellow-pupil and intimate Albano, and proseeuted his studies under Annibale Caracci. ‘The faculty of Domenichino was slow in its development. He was at first timid and distrustful of his powers; while his studious, unready, and reserved manners were misunder- stood by his companions for dulness, and he obtained the nickname of “the Ox” (Bue). But Annibale Caracci, who observed his faculties with more attention, predicted, that the apparent slowness of Domenichino’s genius would in time produce what would be an honour to the art of painting. When his early productions had brought him into notice, he stndied with extreme application, and made such advance as to raise his works into a comparison with those of tlhe most admired masters of the time. From his acting as a continual censor of his own works, he became distinguished araongst his fellow-pupils as an accurate and expressive designer; his colours were the truest to nature ; Mengs, indeed, found nothing to desire in his works,

except a somewhat larger proportion of elegance. That he might devote his whole powers to the art, Domenichino shunned all society ; or, if he occasionally sought it in the public theatres and walks, it was in order better to observe the play of the passions in the features of the people—those of joy, anger, grief, terror, and every affection of the mind—and to commit them vividly to his tablets; thus, says Dellori, it was that he succeeded in delineating the soul, in colouring life, and calling forth heartfelt emotions, at which all his works aim. In personal character he is credited with temperance and modesty; but, besides his want of sociability, he became somewhat suspicious, and jealous of his master,

In Rome, Domenichino obtained employment from Cardinals Borghese, Farnese, and Aldobrandi, for all of

whom he. painted works in fresco, The distinguished reputation which he had acquired excited the envy of some of his contemporaries. Lanfranco in particular, one of his most inveterate enemies, asserted that his celebrated Com- munion of St Jerome (painted for the church of La Carita towards 1614, for a pittance of about ten guineas, now in the Vatican Gallery, and ordinarily, but most irrationally, spoken of as the second or third best oil picture in the world) was an imitation from Agostino Caracci; and he procured an engraving of this master's picture of the same subject (now in the Gallery of Bologna), copies of which were circulated for the purpose of showing up Domenichino as a plagiarist. There is in truth a very considerable resemblance between the two compositions. Tlie pictures which Zampieri painted immediately afterwards, represent- ing subjects from the life of St Cecilia, only increased the alarm of his competitors, and redoubled their injustice and malignity. Disgusted with these cabals, he left Rome for Bologna, where he remained until he was recalled by Pope Gregory XV., who appointed him principal painter and architect to the pontifical palace. In this architectural post he seems to have done little or nothing, although he was not inexpert in the art. He designed in great part the Villa di Belvedere at Frascati, and the wholc of the Villa Ludovisi, and some other edifices. From 1630 onwards Domenichino was engaged in Naples, chicfly on a series of frescoes (never wholly completed) of the life

of St Januarius in the Cappella del Tesoro, He settled in that city with his family, and opened a school. There the persecution against him became far more shameful than in any previous instance. The notorious so-called “Cabal of Naples ”— the painters Corenzio, Ribera, and Caracciolo,— leagued together as they were to exclude all alien competition, plagued and decried the Bolognese artist in all possible ways; for instance, on returning in the morning to his fresco-work, he would find not unfrequently that some one had rubbed out the performance of the previous day. Perpetual worry is believed to have brought the life of Domenichino to a close; contemporary suspicion did not scruple to speak broadly of poison, but this has remained unconfirmed. He died in Naples, after two days’ illness, on 15th April 1641. Domenichino, in correctness of design, expression of the passions, and simplicity and variety in the airs of his heads, has been considered little inferior to Raphael; but in fact there is the greatest gulf fixed between the two. Critics of the last century adulated the Bolognese beyond all reason or toleration; he is now regarded as commonplace in mind and invention, lacking any innate ideality, though undoubtedly a forcible, resolute, and learned executant. “We must,” says Lanzi, “despair to find paintings ex- hibiting richer or more varied draperies, details of costume ore beautifully adapted, or more majestic mantles. The fizures are finely disposed both in place and action, con- duciug to the general effect ; whilst a light pervades the whole which seems to rejoice the spirit, growing brighter and brighter in the aspect of the best countenances, whence they first attract the eyc and heart of the beholder. The persons delineated could not tell their tale to the ear more plainly than they speak it to the eye. The Scourging of St Andrew, which he executed in competition with Guido at Rome [a fresco in the ehurch of San Gregorio], is a powerful illustration of this truthful expression. Of the two works of these masters, Annibale Caracci preferred that of Domenichino. It is said that in painting one of

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natural, it appeared to him that the artist, like the orator should feel within himself all that he is representing tc others.” Domenichino is estcemed the

most distinguished disciple of the Caracci, or second only to Guido. Algarotti preferred him to the greatest masters ; and Nicolo Poussir considered the painter of thc Communion of St Jerome to be the first after Raphael. His pictures of Adam and Eve, and the Martyrdom of St Agnes, in the Gallery of Bologna, are amongst his leading works, Others of superior interest are his first known picture, a fresco of the Death of Adonis, in the Loggia of the Giardino Farnese, Rome; the Martyrdom of St Sebastian, in Santa Maria degli Angeli ; the Four Evangelists, in Sant' Andrea della Valle ; Diana aud her Nymphs, in the Borghese Gallery ; and thic Assumption of the Virgin, in Santa Maria di Trastevere, His portraits are also highly reputed. It is admitted that in his compositions he often borrowed figures and arrange- ments from previous painters. Domenichino was potent in fresco. He excelled also in landscape painting. In that style (in which he was one of the earliest practitioners) the natural elegance of his scenery, his trees, his well- broken grounds, the character and expression of his figures, gaincd him as much public admiration as any of his other performances. (W. M. RB.) DOMESDAY BOOK, or simply Domrspay, is, in its commonest use, the name applied to the Liber de Win- tonia, or Exchequer Domesday, a very ancient record containing a survey of all the lands of England, made in the time of William the Conqueror. It consists of two volumes-—a greater and a less, 'The first is a large folio, written on 382 double pages of vellum, in a small but plain character, each page having a double column. Some of the capital letters and principal passages are touched with red ink, and some have strokes of red ink run across them, as if scratched out. 'This volume contains the description of the following countics :—Kent, Sussex, Surrey, South- ampton, Berks, Wilts, Dorset, Somerset, Devon, Cornwall, Middlesex, Hereford, Bucks, Oxford, Gloucester, Worcester, Hereford, Cambridge, Huntingdon, Bedford, Northampton, Leicester, Warwick, Stafford, Salop, Cheshire, Derby, Notts, York, and Lincoln, together with the anomalous districts of Rutland and the land "inter Ripan et Mer- sham." The second volume isin quarto, written upon 450 double pages of velluin, but in a single column, and ina large but very fair character. It contains the counties of Essex, Norfolk, and Suffolk. This second volume, together with the Exon Domesday, which contains the fuller reports of the western counties, Wiltshire, Dorset, Somerset, Devon- shire, and Cornwall, and the Jnquisitio Lhensis, which relates to the lands of the abbey of Ely, secms to be the original record of the survey itself, which

appears in the first volume of the Exchequer Domesday in an abridged form. “In both volumes of the Exchequer Domesday,” writes Mr Freeman ia his History of the Norman Conquest, “cach shire is commonly headed with a list of the chief landowners in it. ‘The king comes first, then the great ecclesiastical, and then the great temporal proprietors, followed in many cases by the smaller pro- prietors lumped in classes * servientcs regis,’ ‘taim regis, ‘eleemosynarii regis,’ and the like, the list being num bered, and forming an index to the survey itself, whick follows. Lastly, in several shires come the ‘Clamores, the records of lands which were said to be held unjustly and to which other meu laid claim.” Then follows the survey itself, The lands of the king or other landowner

the executioners the artist actually wrought himself into a | are arranged under the hundreds in which they were

passion, using threatening words and actions, Annibale Caracci, surprising hin at that moment, embraced him, exclaiming with joy, ‘To-day, my dear Domenichino, thou art teaching me.’ So novel, and at the same time so

and that | placed, and the necessary particulars of which the survey

was to be a record are put down under each manor or other holding. The northern shires are not described in the survey. Nor-

thumberland, Cumberland, Westmoreland, and Durham are conspicuous by their absence. Lancashire does not appear under its proper name; but Furness and the northern part of the county, as well as the south of Westmoreland, with a part of Cumberland, are included within the West Riding of Yorkshire. That part of Lancashire which lies between the rivers Ribble and Mersey is subjoined to Cheshire ; and part of Rutland is described in the counties of Northampton and Lincoln. ‘The reasons which led to the omission of, these northern counties from Domesday are not difficult to be understood. Durham and Northumberland had been laid waste by the merciless hand of conquest. The devastations of the Conqueror himself in the winter of 1069-1070, the various inroads of Malcolm, and the venge- ance taken by Odo after the murder of Bishop Walcher in 1080,

must have left very little in those districts worth the surveying. Lancashire did not then exist as a separate county. Cumberland and Westmoreland had no being as English shires,—their southern portions then formed part of Yorkshire, and they are surveyed in Domesday as such ; whilst their northern portions did not become part of the kingdom of England till the reign of William Rufns, hav- ing been held by the Scottish kings as a fief ever since the grant by Edmund the Magnificent, on the final overthrow of the old kingdom of Strathclyde. The notion that the northern portions of Cumberland and Westmoreland were conquered in 1072 by William I. is derived from a careless blander in the work of Matthew of Westminster, who has confounded William Rufus with his father.

The cxact time of the commencement of this survey is variously stated. The Red Book of the Exchequer has been quoted as fixing the date at 1080 ; whereas the Red Book merely states that the survey was undertaken at a time subsequent to the total reduction of the island to the authority of the Conqueror. From the memorandum of the completion of the survey at the end of the second volume, it is evident, however, that Domesday was finished in 1086. Matthew Paris, Robert of Gloucester, the Annals of Waverley, and the Chronicle of Bermondsey give 1083 as the date of the record ; Henry of Huntingdon places it in 1084; the Saxon Chronicle in 1085 ; Simcon of Durham, Florence of Worcester, Roger Hoveden, and Hemingford in 1086; whilst the Ypodigma Neustriw and Diceto state 1087 as the year.

The reason given for taking this survey, as assigned by several ancient records and historians, was that every man should be satisfied with his own right, and not usurp with impunity what belonged to another. But besides this, it is stated by others that all those who possessed landed estates now became vassals to the king, and paid him so much money by way of fee or homage, in proportion to the lands they held. According to the false Ingulphus, the sur- vey was made in imitation of the policy of Alfred, who, at the time he divided the kingdom into counties, hundreds, and tithings, had an inquisition taken and digested into a register, which was called, from the place in which it was deposited, the Roll of Winchester. But the compilation of such a survey in the time of Alfred may be more than doubted ; for, with the exception of the statement of Ingulphus, no

chronicler alludes to the existence of this register, noris any mention of it to be found in the records of the time or in those of a subsequent period. Had it been extant in the century immediately preceding the N orman Conquest, it would have prevented the necessity of giving those minute descriptions of land so common among the later of the Saxon charters. Again, the separation of counties is known to have been a division long anterior to the time of Alfred. The confusion in all pro- bability has arisen from a similarity in the title of the two works. The survey of the Conqueror was called Domesday

DOMESDAY BOOK

Book ; the register of Alfred had the name of Dome-boc; but the Dome-boc, instead of being a territorial analysis as is Domesday Book, was in reality the code of Saxon laws.

For the execution of the survey recorded in Domesday Book, certain commissioners, called the king's justiciaries, were sent into every county and shire, and juries summoned in each hundred, out of all orders of freemen, from barons down to the lowest farmers. These commissioners were to be informed by the inhabitants, upon oath, of the name of each manor and that of its owner, also by whom it was held in the time of Edward the Confessor ; the number of hides ; the quantity of wood, of pasture, and of meadow land ; how many ploughs were in the demesne, and how many in the tenanted part of it ; how many mills and how many fish-ponds or fisheries belonged to it; the value of the whole in the time of King Edward, as well as when granted by King William, and at the time of this survey ; and also whether it was capable of improvement or of being advanced in value. 'They were likewise directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or slaves, and also the number and kinds of their cattle and live stock. These inquisitions, being first methodized in the county, were afterwards sent up to the king's Exchequer. So minute was the survey, that the writer of the contemporary portion of the Saxon Chronicle records—" So very narrowly he caused it to be traced out that there was not a single hide or yardland, not an ox, cow, or hog that was not set down."

By the completion of this survey the king acquired an exact knowledge of the possessions of the Crown. It afforded him the names of the land-holders; it furnished him with the means of ascertaining the military strength of the country ; and it pointed out the possibility of in- creasing the revenue in some cases and of lessening the demaud of the tax-collectors in others. It was, moreover, a register of appeal for tlose whose titles to their property might be disputed.

So accurate has Domesday Book been considered that its — authority was never permitted to be called in question ; and when it has been necessary to distinguish whetlier lands were held in ancient demesne or in any other manner, recourse was always had to Domesday, and to it only, in order to determine the doubt. From this definitive authority, from which, as from the sentence pronounced at Domesday, or the Day of Judgment, there could be no appeal, the name of the book is said to have been derived. Stowe indeed assigns another reason for this appellation, namely, that Domesday Book is a corruption of “ domus Det book,” a title given it because heretofore it was deposited in the king’s treasury in a part of the church of Westminster or Winchester called domus Dez; the name, however, is plainly English. From the great care formerly taken to preserve this survey, we may learn the estimation in which it was held. In the Dialogus de Scaccario it is said, Leber dle (meaning Domesday) sigillt regis comes est mdividuus in thesauro. It was formerly kept at Westminster with the king’s seal by the side of the Tally Court in the Exchequer, under three locks and keys, in the charge of the auditor, the chamberlains, and deputy-chamberlains of the Exchequer, till in 1696 it was deposited among other valuable records in the chapter- house. It is now carefully preserved beneath a strong class case in the Public Record Office, and can be consulted without payment of any fee.

Various local Domesdays exist, as those of York, Norwich, Ipswich, Chester, and Evesham. The most notable among them is the Domesday of St Paul’s, made in 1181 by the Dean, Ralph de Diceto, and edited by Archdeacon Hale.

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In 1783 Domesday Book was published in two volumes, and in 1816 a volume of indices was printed by the Record Commission, to which a very

valuable “ general introduc- tion was prefixed.” During the latter year another volume appeared containing the Exon Domesday, and the Inquisitio Eliensis, already noticed ; the Winton Domesday, com- prising lands in Winchester between 1107 and 1128 ; and the Boldon Book, or Survey of the Palatinate of Durham in 1183. Within the last few years the whole of Domesday has been issued in parts, each part comprising a county, and printed by the process of photozincography, under the scholarly superintendence of Mr W. B. Sanders, one of the assistant keepers of the Public Records.

See Sir H. Ellis’s Zntroduetion and Indexes to Domesday, vol. i. and ii. ; Domesday Look, illustrated by Kelham ; Deseriptive Cata- logue of Maruseripts relative to the early History of Great Britain,

vol. ii.; History of the Norman Conquest, by 4.A. Freeman, vol. v.; Our Publie Records, hy A. C, Ewald. (A. C. E.)

DOMICILE, in law, may be defined generally as the place of a man’s permanent abode; but a precise definition of the word is a matter of acknowledged difficulty. Its use in jurisprudence is to fix the legal rights of a person in certain cases where it is felt that the application of the law of the country to which he owes allegiance on the one hand, or of the country in which for the moment he happeus to be, would be attended with inconvenience. Thus an English citizen who, for purposes of business, health, &c., has for many years permanently resided in France, has, let us suppose, died during a casual visit to Denmark. The question would arise under which of the three systems of law—English, French, or German—the validity of his will, the succession to his estate, &c., would be detcrmined. Or, again, a French subject habitually resident in England, but not naturalized, might sue for a dissolution of his marriage in the matrimonial courts of this country, and it would be generally admitted that our courts in such a case were entitled to exercise jurisdiction, and that their decision ought to be received as determining the status of the persons concerned, just as fully as if they had been natural- born subjects of the Crown. In such cases there is a general agreement that a man’s legal character, so to speak, should be determined by his domicile, rathcr than by his political

nationality or his residence for the time being. We shall notice briefly the conditions of residence under which domicile may generally be established.

The Roman jurists defined domicile to be the place “ubi quis larem rerumque ac fortunarum summam constituit : unde rursus non sit discessurus si nihil avocet: unde cum profectus est, peregrinari videtur ; quo si rediit peregrinari jam destitit.” The general result of the definitions to be found in writers on the civil law is to make that place the domicile which may be described as the head-quarters of the person concerned, or, as it is expressed in tle Code Civile, “le lieu ou il a son principal établissement.” But here characteristic difficulties embarrassed the civil lawyers, A man’s habits of life might point equally to two places as his head-quarters. It might be impossible to say which of them was the principal seat of his business. Which of the two in such a case is the legal domicile. Or can the same person at the same time have two domiciles? The two essential things are residence and the intention of remain- ing. Story’s definition is, “That place is properly the domicile of a person in which his habitation is fixed without any present intention of removing therefrom.” Change of residence not intended to be permanent would not create a new domicile. Cases will readily suggest themselves in which the question of intention may be surrounded with difficulties.

The following summary follows the general rules laid down by Story for determining the domicile of a person

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(Conflict of Laws, sec. 46). The child takes the domicile of the father, except in the case of an illegitimate child, which takes the domicile of the mother. Minors follow the changes of the father’s domicile ; and a married woman follows the domicile of herhusband. The place of residence is prima facie the domicile; and when a person removes to another place with the intention of making it hispermanent residence, that place becomes his domicile. “When a person has removed to another place with the intention of remain- ing there for an indefinite time, that is his domicile, though he may have a gencral intention of returning at some future time. In general the domicile of a married man is the place where his family permanently resides, even though he habitually transacts his business elsewhere. When a

married man has two places of residence, that will be his domicile ‘“ which he himself selects or describes or deems to be his home, or which appears to be the centre of his affairs, or where he votes or exercises the rights and duties of a citizen.” An unmarried man’s domicile is where ke transacts his business or exercises municipal dutics or privileges, Compulsory detention will not create a domicile. A domicile once established remains until a new one has been acquired ;! but ambassadors resident in a foreign country retain their domicile of nationality.

To these general rules may be added some of thie prin- ciples laid down in recent cases by the English courts. The distinction between the question of domicile and that of naturalization or allegiance is clearly pointed out in Haldane v, Eckford (Law Jeports, 8 Equity, 631) where it is said that to cffcct a change of domicile it is not necessary that a man should do all in his power to divest himself of his original nationality (exuere patriam), it being sufficient that there should be a change of residence of a permanent character voluntarily assumed. And in Udny v, Udny (Law Reports, 1 House of Lords, Scotch Appeals) Lord Westbury said: ‘“ To suppose that for a change of domicile there must be a change of natural allegiance is to confound the political and civil status, to destroy thie distinction between patria and domicilium.” So the lord chancellor: ‘‘ A man may change his domicile as often as he pleases, but not his allegiance.” In the British cmpire, composed as it is of communities having each its own system of law, there may be numberless domiciles under one allegiance, In the first of the cases above mentioned the question was as to the domicile of a testator, whose domicile of origin was Scotch, who was a servant of the East India Company for thirty-three ycars, and who on leaving India went to Jersey, where he lived continuously for twenty-five years till his death, The Scotch domicile reverted on his leaving India, but was held to have been lost by the residence in Jersey, where a new domicile was acquired. This is a fair sample of the cases which frequently arise in British courts on the question of domicile. In the second of the cases mentioned above it was held to be “a settled principle that no man shall be without a domicile, and to secure this end the law attributes to every individual as soon as he is born the domicile of his father, if the child be legitimatc, and the domicile of his mother, if the child be illegitimate. This is called the domicile of origin, and is involuntary. It is the creation of the law, not of the party. It may be

extinguished by act of law, as for example by sentence of death or exile for life, which destroys the status civilis of the criminal ; but it cannot be destroyed by the will and act of the party. Domicile of

1Some Roman jurists, however, maintained that a man might be without any domicile at all, as for example when he has definitely abandoned his old domicile, and is travelling in search of a new abode, Itis said that whon a domicile different from that of birth has been acquired and is abandoned, the domicile of birth reverts the moment the other is given up. ‘‘ The native domicile easily reverts.”

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choice is the creation of the party. When a domicile of choice is acquired, the domicile of origin is in abeyance, but is not absolutely extinguished or obliterated. When a domicile of choice is abandoned, the domicile of origin revives, a special intention to revert to it not being necessary. A natural-born Englishman may domicile himself in Holland, but if he breaks up his establishment there and quits Holland, declaring that he will never return, it is absurd to suppose that his Dutch domicile clings to him until he has set up his tabernacle elsewhere.”—Per Lord Westbury. These extracts, it will beseen, state even more strongly than the corresponding rule adopted by Story tlic position that the original domicile differs from an acquired domicile, in being suspended rather than destroyed by the acquisition of a new domicile. Onc of the law lords in Udny v. Uduy even finds fault with Story’s nse of the phrase “to reacquire a native domicile.” The native domicile is not reacquircd bnt restored tpso facto by the abandonment of the acquired domicile.

The intention necessary to effect a change of domicile may be illustrated by the following cases. In the case of Douglas v. Douglas (12 Equity, 617), R ——, son of a domiciled Scotchman, entered the Home Office, London, in 1792, re- mained till 1802, thereafter having married an English lady, lived in England in hired houses, and finally settled in Scot- land and died there. It was held that he had not lost his domicile of origin. The testator inthe case, the son of R- , was born in London in 1803 during a visit of his parents to London, lived from the age of thirteen witli his parents in Scotland, paying occasional visits to England till his mother’s death in

1857, after which he let lis family estate in Scotland, and lived chiefly in England in hired houses. It was held that his domicile was Scotch. The intention required to create a new domicile is au intention to settle in a new country as a permanent home, and this is sufficient without any intention to change civil status. In another case (Brunel v. Brunel, 12 Hgwity, 298), where a French subject had established limself in business in England, and resided there continuously for thirty years, making only occasional visits to France, but had refused to take out Ictters of naturalization on the ground that he might return to France, and would not give up his status as a French citizen, it was held, notwithstanding, that he had lost his domicile of origin, and had acquired an English domicile.

The effect of domicile on the rights and duties of parties is even inore difficult to statc. Continental jurists draw a distinction between. personal and real laws,—the former being supposed to fix the legal character of the person and accompany him wherever he may be, tle latter dealing with things ouly. In matters covered by the former, there- fore, the domicile prevails ; while things are governed by the law of the placc in which they are. If the distinction were maintainable it would still be of little use in fixing the extent of the operations of the law of domicile, because onc large class of real laws, that dealing with movables, is universally admitted to be governcd by domicile; while a large but undefined class of personal laws would certainly not be acted ou by forcign states, eg., where the law of domicile fixes with incapacity persons professing a religion contrary to that established by the state. There is no uniformity of practice or opinion on this point in modern jurisprudence. Story considers the following to be the best established principles in England and America on the point of personal capacity or status :-—

1, The capacity, state, and eondition of persons aecording to the law of their domicile, will ‘generally be regarded as to acts done, rights acquired, and contracts made in the place of thcir domicile touching property situate thercin. If valid or invalid there, they will be valid or invalid everywhere. 2. As to acts done, &e., in other countries touehing the property therein, the law of sueh

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countries, as to capacity, &e., and not the law of domicile, will generally prevail. Thus ‘‘in questions of minority or majority, com- petency to marry, incapacities incident to coverture, guardianship, emancipation, and other personal qualities and disabilitics,” the lca loci contractus aut actus, and not the dcx domictlit ought to prevail, e.g., if a person over 21 but under 25 years of age has his domicile ina country which fixes majority at 25, he may make generally a valid eontract, even of marriage, in a country which fixes majority at 21. 8. Personal disqualifications not arising from the law of nature, especially such as are penal, as disqualifications for heresy, popish recusancy, &c., are not enforced in any other eountry. The refusal of non-slaveholding States to recognise the status of slavery is an example.! 4. Questions of legitimacy are generally to be decided by the law of the place where the marriage was cclebrated. When issue born before marriage may by thc law of the eountry of their birth be legitimated by the subsequent marriage of the parents, such legitimacy would be recognized in other countrics. (But sec BASTARD and MARRIAGE).

The operation of the law of domicile is most free from doubt in questions touching personal or movable property. Real property is governed by the lex locz,; but personal property has in law no locality. On this point English law is now substantially in harmony with Continental jurisprudence. The principle that personal property is subject to the law of the owner’s domicile is fully recognized in the distribution of the estate of a person deceased, whether with or without a will. The capacity of a person to make a will, the validity of the will, and its effect, are to be dctcrmined by the law of his actual domicile in the case of movable property. In the case of real property, on the other hand, these questions must be decided by the law of the country in which it is situated. It was donbted by Story whether a will valid according to testator’s domicile at the time of its execution would be affected by a sub- sequent change of domicile. A recent case (Lynch v. Government of Paraguay) decided that personal property in England is governed by the law of testator’s domicile at the time of his death. In this case the testator, a domiciled Paraguayan, died leaving personal property in England ; and between his death and the application for probate a decree of the Government of Paraguay declared that all the property of the deceased, wherever situated, was the property of the state of Paraguay. The court, neverthcless, held that the property in England must be governed by the law

of Paraguay as at the time of the death (2 Probate and Matrimonial Cases, 268). So in cases of intestate succes- sion, the law of the actual domicile of the intestate at the time of his death governs his personal property everywhere. The persons entitled, the proportions in which they are to take, &c., must be scttled by the law of the domicile, how- ever different that may be from the law of the country in which the goods are.

The following statutes relating to the effeet of domieile ou wills were passed in 1861 :—

24 and 25 Vict. e. 114. Wills made out of the United Kingdom by British subjects (whatever may be the domicile of such person at the time of inaking the same or at tlic time of dcath) shall, as regards personal estate be hcld to be well executed, if the samc be made according to (1), the forms required by the law of the place where the same were made, or (2), the place where such pcrson was domiciled when the same were made, or (8), by the laws in force in that part of her Majesty's dominion where he had his domicilcof origin. Willsmade byany British subject (whatevermay be his domicile) shall, as regards personal estate, be well executed if they are according to the forms then required in that part of the United Kingdom in which they are made, No will or other testa- mentary disposition shall be held to be revoked or become valid, nor shall the construction thereof be altered by reason of any subsequent ehange of domicile.

24 and 25 Vict. c. 121 recites that by the operation of the law of domicile the expeetation and belief of British subjects dying abroad with regard to the distribution of their property are often defeated, andenaets that when a convention has been made between

1 When the foreign lsw which would otherwise operate as lex domicilti is repugnant to the moral principles of the country in which it is sought to be enforced, the lea domicilit would not be allowed to prevail.

Her Majesty and any foreign country, it may be declared and shall be enacted that no British subject dying in such country shall be deemed to have acquired a domicile therein, unless he has been resident in such

country for one year previous to death, and has made a declaration in writing of his intention to become domiciled; and British subjects so dying without having so resided and made snel deelaration shall be deemed for all purposes of testate or intestate succession as to movables to retain the domicile he possessed at the time of going to reside in such foreign country. Similar exemptions are conferred on the subjects of the foreign state dying in Great Britain or Ireland. But the Act does not apply to foreigners who have obtained letters of naturalization in any part of Her Majesty's dominions. CO

DOMINIC, St, founder of the Dominican ordcr of monks, was born at Calahorra, a village of Old Castile, in 1170. His family name is said to have been Guzman, an illustrious name connected with many of the most honour- able families in Spain. Little is known of his father and mother, but in the mcdizval legends his birth is surrounded with portents indicative of his future greatness. His mother dreamed she gave birth to a boy with a torch in his mouth, which set the world on fire. At his baptism a new sign was given. A starry radianee eneircled tlie baptismal font. His followers delighted to recognize a similar radiance in his countenance, which drew all hearts tohim. Hischildhood gave evidence of his future devotion and self-denial. He used to creep from his bed and prostrate himself on the hard boards. At seven years of age he quitted the paternal home for the house of his uncle, who was a churchman, and gave him his first lessons in divine things. At fifteen he went to the university of Palencia, afterwards translated to Salamanea, where it attained reputation as the most famous university in Spain. He applied himself to letters and philosophy, but above all to theology,—opening his mind, according to one of his biographers, to the true knowledge, and his ears to the doctrines, of Holy Scripture. Two stories are told of him at this time, showing the intensity of his character, and indicating the future zealot in behalf of religion and the church, He sold his clothes to feed the poor in a time of famine, and, to a woman who complained that her brother had been made a slave by the Moors, he offered himself to be given in exehange. His career as a student is obscure. He appears to have remained at the university for about ten years, and it is only in 1195, when he was twenty-five years of age, that he begins to emerge into notice. He is then one of the eanous of Osma, under the guidance of a new and zealous bishop, whose lieart was full of extending the power of the

church and reforming its abuses. He gradually became known by his fervour as a preacher and the severity of lis austerities, although it was still nearly ten years later before the opportunity came for him to show his true eharaeter and abilities. In 1203 the bishop of Osma was delegated to negotiate the marriage of Alphonso VIII. of Castile with a Danish princess, and for this he undertook a journey to Denmark with Dominic as hiscompanion. Accustomed to the obedienee and reverence everywhere paid to the clergy in Spain, a very different speetacle presented itself to them as soon as they crossed the Pyrenees, and found themselves in the plains and cities of Languedoc. ‘There a new spirit—-half poetical and half spiritual—had sprung up in opposition to the chureh. The Provencal poets found much of their inspiration in a prevailing excitement at the worldly vices and corruptions of the elergy, as well as in the chivalric loves and gaieties of their time. And in addition to the poets there had arisen in this interesting and beautiful country multitudes of preachers of a new, more simple, and more liberal faith. Peter de Brueys and Henry the Deacon became the organs of popular indignation against the superstitious observances which the priests everywhere encouraged,—the worship of the cross, transubstantiation, prayers, alms, and oblations

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to the dead, and even infant baptism,—for, as in all sueh cases of popular movement, the church was attacked not merely in its abuses but in its essential rites and its very existeuce. The “Poor Men of Lyons” rejected the whole church system, and permitted women to offieiate at the altars. The “ Paulicians,” a sect of Manicheans surviving from the 5th century, had spread from the East through tlle Greek provinces of Sicily and Italy, and settled amongst the other elements of disturbance in the south of France. ‘It was discovered,” as Gibbon says (c. 54), “that many thousand Catholics of every rank and of either sex had embraced the Manicheean heresy ;” and the flames consumed twelve canons of Orleans supposed to be tainted with the heresy. ‘The same vicissitudes of martyrdom and revenge as had been displayed in the East were repeated in the 13th century on the banks of the Rhone.” The result of all was a state of leretieal insurrection and confusion sufficiently startling to men like St Dominic or even St Bernard, who has left us a description of what he himself observed—‘“ Churches without

people, the people without priests, priests without respect, Christians without Christ, holy places denied to be holy, the saeraments no longer sacred, and holy days without their solemnities." (Quoted by Milman, Z/tst. of Latin Christianity, iv. 178.)

In such a country, and in such a state of things, St Dominic found his mission as a champion of the chureh and a preacher of Catholie truth. Painfully impressed by what he saw on his journey to Denmark, he was so aroused by the spectacle of abounding heresy ou his return that he resolved to devote himself to the conversion of the inhabitants, and the revival of the church in a land whieh appeared to him so giveu over to evil. The Pope had sent legatcs thither for the correction and repression of the heretics, but after a year's labours they had met with no success, and were on their way back to report the failure of their mission at Rome. Dominic met with them on his journey, and, struck at once by their splendid retinue and their failure, he exclaimed,—'" How can you expect suecess with all this secular pomp? These men eannot be touched by words without corresponding deeds. The heretics deceive them by their simplicity. You must throw aside all your splendour, and go forth, as the disciples of old, barefoot, without purse or scrip, to proclaim the truth." He acted without delay on his own principle, and betook himself to the profession of a mendicant preacher. Even the legates were shamed for a time to follow in the wake of the enthusiastic Spaniard. But their enthusiasm did not last long, and Dominie was left alone in his self-deny- ing labours.

It is diffieult to describe with any fidelity the character of St Dominic's career, which his mediseval biographers have enveloped in a haze of miraculous exaggeration. Apparently at first he confined himself in the main to moral and intellectual influences, preaching against the heretical errors, and inviting the heretics to eonfercnces and reasonings. His modern biographer, Lacordaire, has even ventured to compare this early phase of his work with St Paul's conferences with the Jews, and St Augustine's ex-postulations with the Donatists and Manichzeans. His arguments were of course powerfully enforced by miraculous tokens when otherwise likely to fail of their purpose. Wherever he moved the glory of the supernatural moved with him. Signs and portents, most of them too trivial and absurd for mention, gave emphasis to his preaching and triumph to his mission. But

withal the suecess that awaited him as a preacher was disappointing; and the flames of war, kindled by the growing antagonism of the sects and the church, and fomented by the rival ambitions which are always at hand to make use of the fury of religious passion, soon swept over the country, and hid from

view the figure of the missionary and the preacher. It was, as Milman says, a stubborn generation, which, besides preaching, argument, and miracles, needed the sword of Simon de Montfort to cure it of its heresies. The atrocious crusade known as the Albigensian war, the violent incident and picturesque display of character on both sides, the plea- sant, vacillating, and humiliated Count Raymond, the intre- pid and bloodthirsty Montfort,—all belong to history rather than to the life of Dominic. What part he really played in the war evades clear historical judgment. Did he share in its atrocities, as religious zealots in similar cases have often done, or did he mourn the interruption of his peace- ful labours of conversion, and preach moderation to the conquerors, as well as penitence to the heretics? Facts fail us in the matter. All that is known is that he remained through all the friend of De Montfort, and obeyed the call to bless the marriage of his sons and the baptism of his daughter. This implies that the darker features of the crusade, and the conduct of its leader, awakened no such horror in him as they ought to have done; and when to this is added the glory (!) claimed for him of instituting the Holy Inquisition, the light which is thus thrown upon his character is far from pleasing. It is in no spirit of apostolic milduess, certainly, that he at last left the country in 1217, after the death of De Montfort. “For many years,” he says, “I have spoken to you with tenderness, with prayers, and tears, but, according to the proverb of my conntry, where the benediction has no effect the rod may have much. Behold now we rouse up against you princes and prelates, nations and kingdoms, and many shall preach by the sword.” This was a poor gospel for a people already decimated by the armies of the church, and the preacher of it was certainly no apostle of peace. Full of enthusiasm, of eloquence, of dogmatic zeal, with a genius for combina- tion and the great power of

inspiring devotion in his followers, Dominic fails in the higher virtues of patience, magnanimity, reasonableness, and moderation. He is a prince of the church, but not a saint save in its official calendar,

On leaving Languedoc Dominic repaired to Rome, and spent the remainder of his life in the organization of his order, which received the papal sanction in 1216, and which, under his generalship, had extended in the course of five years throughout most of the countries of Europe, He died at Bologna in 1221, in the fifty-first year of his age. See DomINIcans. (a,

DOMINICA, in French Domrniquz, British West India island, the largest in the Leeward group of the Lesser Antilles, lying between the French islands of Martinique and Guadaloupe, 24 miles north of the former and about the same distance south of the latter, at the intersection of 15° 30′ N. lat. by 61° 30’ W. long. It has a length of 29 miles with a maximum breadth of 16, and its area isestimated at 291 square miles. The longer axis is formed by a chain of mountains, which attains in some parts a height of up- wards of 5000 feet, and gives the whole island a strongly marked profile and great irregularity of surface. The results and symptoms of volcanic activity are abundant, in the shape of solfataras, emissions of subterranean vapours, and hot springs; and in the southern part of the island there exists a boiling lake of unascertained depth, in which the water is frequently projected 3 feet or more above the surface by the force of the ebullition. Besides a large number of minor rivulets, upwards of thirty streams of considerable size might be mentioned, and this abundance of natural irrigation develops great fertility in the rich voleanic soil. The hills are in many parts covered with valuable timber trees of the kinds commonly found in the West Indies; and the sugar-cane, coffee, cocoa, cotton, indigo, oranges, plantains, and arrow-root are grown in the

lowlands. The island is botanically remarkable for the great number of peculiar species which it possesses in com- parison with the poverty in this respect of Guadaloupe, Martiniqne, Montserrat, and Antigua: as many as 24 are mentioned by Grisebach. Game is abundant ; the fisheries on the coast are productive; and large quantities of honey and wax are furnished by the wild bees, which were originally introduced from Europe. The coasts of the

island are not much indented, and the only anchorages of importance are Prince Rupert's Bay and Roseau, both on the west side. The total tonnage of the ships that annually enter and clear amounts to 18,018 tons, according to the average of the fifteen years from 1860 to 1874 inclusive ; and of this total only 3742 tons belong to foreign vessels, The imports in 1874 were valued at £56,714, and the exports of the same year at £67,720,—being a decrease since 1860 of £11,087 and £12,738 respectively. Since 1872 Dominica has formed part of the colony of the Leeward Islands, and sends its representatives to the general legisla- tive council; but at the same time it retains its lieutenant- governor or president, a separate treasury, and its local legislature, consisting of seven elective members and seven nominees of the crown. In 1874 its public revenue amounted to £15,022, its expenditure to £17,456, and its debt to £4813. In common with the Virgin Islands it has attained complete religious equality by the abolition of the salaries paid from the public funds to the clergymen of the Church of England, who had a much smaller portion of the population under their jurisdiction than the Roman Catholic priests. Of the Carib aborigines there are no representatives; and the present inhabitants, numbering, according to the census of 1871, 27,178, consist mainly of descendants of the former negro slaves, with a certain number of Spanish and English families. The capital is Roseau, or Charlotteville, a fortified port near tho southern end of the island, with about 5000 inhabitants. Dominica «was so named on its discovery by Columbus in 1493, in commemoration of the date, which happened to be Sunday (Dies Dominica) the 8d of November. it was ceded to England by France at the Peace of Paris in 1763, was captured by the French in 1778, regained by the English in 1783, again seized by the French in 1802, and finally surrendered to Britain in 1814, It was in the neighbouring sea that Rodney obtained his victory over Count de Grasse in 1782.

DOMINICANS, the name by which the disciples of St Dominic became known. The Dominican order was founded, as stated in the article on the founder, in 1216 by a bull of Honorius IIL It conformed to the general rule of the Augustinians, but further embraced a rule of absolute poverty or mendicancy, in addition to the usual vows of chastity and obedience. Its members were supposed to be exclusively devoted to preaching and public instruction, and were described as mendicant or preaching friars. The order

held its first chapter in the year 1220 at Bologna, under the presidency of its founder. It adopted as its insignia within the cloister a white robe and white hood, to which it added outside a black cloak, hence the popular name of black friars by which the Dominicans became known in England, The novitiate was for a year, and candidates were mainly recruited from the schools founded by the order, which became the nurseries of great preachers and great theologians, The order speedily extended itself through the whole Christian world, and popes, cardinals, and learned doctors sprang from it in numbers, Its preachers and teachers addressed all classes, invaded "the high places of the human intellect," and were soon found, as Milman says, "disputing in the universities of Italy and Germany, in Cologne, Rome, and Oxford. Before long they were to claim two of the

greatest luminaries of the prevalent philosophy, Albert the Great and Thomas Aquinas."

DOMINIS, Marc Anronto px (1566-1624), celebrated as a theologian and natural philosopher, was born in the island of Arbe, in 1566. He was educated in the order of the Jesuits at their college at Loretto, and afterwards studied at the university of Padua. He was employed for some time by the Jesuits as a teacher of rhetoric and mathematics, but he did not join the order. In 1596 he was appointed to the bishopric of Segni, and in 1602 he was raised to the archbishopric of Spalatro. His endeavours to reform the church soon after made him obnoxious to the papal authorities, and he was compelled to leave his native country. Having become acquainted with Bishop Bedell, whilst the latter was chaplain to Sir Henry Wotton, ambassador from James I. at Venice, he communicated to that prelate his treatise De Republica Ecclesiastica, which was afterwards (1617, 1620) published at London, with Bedell's corrections, 'The main argument of the work was directed against the superiority of the bishop of Rome to other bishops. He came to England with Bedell, where he was received with great respect, and preached and wrote against the Roman Catholic religion. In 1619 he published at London Father Paul's History of the Council of T'rent, with a dedication to King James. He was favourably received by the king, who bestowed on him the deanery of Windsor and other ecclesiastical

preferments. But on the promotion of Pope Gregory XIV., who had been his school- fellow and old acquaintance, he was deluded by Gondomar, the Spanish ambassador, into the hopes of procuring a cardinal's hat, and thus of proving an instrument of great reformation within the church, Accordingly he returned to Rome in 1622, recanted his errors, and was at first well received; but he afterwards wrote letters to England recanting his recantation, and, these being intercepted, he was imprisoned by Pope Urban VIII., and died in 1624. There were suspicions that be had been poisoned. Being convicted of heresy after his death, his body was exhumed and burned, and the ashes were thrown into the Tiber. He is believed to have been the first to promulgate a true theory of the rainbow in a tract De radiis visus et lucts in vitris perspectivis et ride (Venice, 1611).

DOMITIAN (52-96). Titus Flavius Domitianus, the second son of Titus Flavius Vespasianus and Flavia Domi- tilla, twelfth of the Czsars, and third of the Flavian dynasty, was born at Rome, 24th October 52 a.p, He enjoys an evil prominence as the only tyrant among the succession of good and just princes from Vespasian down to Commodus. According to Suetonius, he was brought up in squalor and ignorance, and led a degraded and miserable youth ; but it is hardly credible that so good a prince and so indulgent a father in all his other acts should thus have neglected his gon's education, and the story of his scandalous youth was more probably invented to suit his after life. When Vespasian was proclaimed emperor, Domitian escaped with difficulty from the burning temple of the Capitol, and lay in hiding from the Vitellians till his father's party proved victorious. After the fall of Vitellius he was saluted as Cxesar, or prince imperial, by the troops, obtained the city pretorship, and was intrusted with the administra- tion of Italy till his father's return from the ast. Intoxicated by this sudden rise from obscurity, he grossly abused the power committed to him, and conducted himself more like a Turkish pasha than the son of a sturdy Sabine soldier. Such were the airs of authority he assumed that Vespasian, as the story goes, wrote in irony to thank him for not having dismissed his own father. Certain it 1s that though in his father's lifetime he several times filled the office of consul, and after his death was nominally the partner in the empire with his brother, yet he never took

any part in public business, but lived in great retirement, devoting himself to a life of pleasure and of literary pursuits till he succeeded to the purple. The death of Titus, if not hastened by foul means, was at least eagerly welcomed by his brother. His succession (13th Sept. 81) was unquestioned, and it would seem as if, when his ambition was sated, and before his fears were aroused, he intended, as far as his weak volitions and mean abilities would allow, to govern well, Like Augustus, he attempted a reforma- tion of morals and religion. As chief pontiff he inquired into the character of the vestal virgins, three of whom were fonnd guilty, while in the case of one the awful penalty of a living entombment was revived. le enforced the laws against adultery, mutilation, and the grosser forms of immorality. He forbade the public acting of mimes. He erected many temples and public buildings and restored the temple of the Capitol, on the gilding of which, if Plutarch is to be believed, he expended 12,000 talents, or nearly two and a half millions of our money. He passed. many sumptuary laws, one of which is noticeable as showing the increasing dearth of corn, which was now grown mainly by the wasteful and inefficient process of slave labour, An edict was issued forbidding the withdrawal of arable land from the plough, and reducing existing vineyards by ono half. ‘Finally, he took a personal share in the administra- tion of justice at Rome, and exercised a jealous supervision over the governors of provinces.

Such public virtues counterbalanced in the eyes of the people all his private vices, gross and glaring as they were from the first. Former emperors had been deified after their death, but Domitian was the first to arrogate divine honours in his lifetime, and cause himself in public docu- ments to be styled Our Lord and God. Doubtless in the poets (such as Martial, who calls the emperor’s minion the Ganymede of our second Jove) this deification was nothing but fulsome flattery, but in the case of the provincials it was a sincere tribute to the impersonation of the Roman Empire, as the administrator of good government, and the peacemaker of the world. Even when Rome and Italy felt his heavy hand, and smarted beneath his proscriptions and extortions, the provinces were undisturbed. Though he took the title of imperator more than twenty times, and enjoyed at least one triumph, his achievements as a general were insignificant. His campaign in 83 against the Chatti was “a mere summer promenade;” in Dacia (87) he received a severe check, and the peace concluded with this nation in 90 was

due to the victories of his lieutenant Julianus. Juvenal hints that the flaxen-haired Germans who figured in his triumph were purchased slaves. His jealousy was provoked by the successes of Agricola in Britain, and the conqueror of Galgacus and the hero of the battle of the Grampians was recalled to Rome (84) in the midst of his conquests, condemned to retirement, and, as Tacitus is inclined to believe, removed by poison.

The revolt of Antonius Saturninus, the commander of the Roman forces in Upper Germany (93), marks the turning point in his reign. By a fortunate rising of the Rhine, which prevented his barbarian allics from coming to hisassistance, and by the vigour of Norbanus, it was speedily crushed; but the fears of the emperor once aroused seem never again to have slept. A proscription as bloody as that of Sulla followed, and nv man of eminence conld feel his life safe. Before this he had sought out victims to gratify his cupidity and replenish his exhausted treasury. Now he struck at all that was conspicuous for talent or virtue, glutted himself with the blood of the Lamiz, and sentenced to death his own cousin and nephew by marriage, Flavius Clemens. A conspiracy among his own freedmen— set on foot, it is said, by his wife, who knew her own life to be tlreatened—cut short his career of tyranny and

bloodshed. He was stabbed in his bedroom by a freedman of Clemens named Stephanus, 18th Sept. 96. Had Domitian died after as short a reign as his brother he might have left bchind him as fair a name, and the interesting problem for the historian is to connect the two portions of his reign, and account for the double part he played. Like Hamlet he was born toa position which he felt himself unequal to fill. So long as the popularity which he inherited from his brother lasted, and he felt himself secure on his throne, he earried ou the traditions of his father’s government, denounced delators, and administered even justice. Afterhis unsuccessful campaign and theconspiracy of his general, he was seized with the eommou disease cf absolute monarchs, the fear of assassination and distrust of all around him. ‘The last three years of his rcign witnessed the awful spceetacle of the acts of a madman endowed with unlimited power.

DON, anciently Tanats, a river of European Russia, which ranks immediately after the Volga and the Dnieper. It rises in the Ivan lake, a small basin in the government of Tula, which also sends a portion of its waters to the Volga by means of the Shat, a tributary of the Upa; its course has a general southern direction through the governments of Riasan, Tamboff, Orloff, Voronesh, and the Country of the Don Cossacks ; its total length, inclusive of its various windings, is 1325 miles ; and its drainage area is ealculated at 170,000 square miles, The Ivan lake lying 586 feet akove the level of the sea, the average fall in the river is about 54 inches to the mile. In the upper division of its eourse, which may be regarded as extending to the eon- fluence of the Voronesh, the Don flows for the most part through a low-lying and fertile country, though in the government of Itiasan its banks are rocky and steep, and in some places become even precipitous. The strata which it traverses belongs to the Devonian formation. In the middle division, or from the mouth of the Voronesh to the point when it makes its nearest approach to the Volga, it cuts its way to the S.E., for the most part through Creta- ecous rocks, which in many places rise on either side in steep and elevated banks, and at intervals encroach on the ehannel, After passing Kachalinskaya it turns to the S.W., and maintains this direction till it falls into the Sea of Azoff, the first part of this division being still in the Cretaceous formation, but the latter part lying in an Upper Tertiary district. A short distance below the town of Rostoff it breaks up into several channels, of which the largest and most southern retains the name of the river, while the others are known respectively as the Mertvi Donetz, the Mokraya Koloncha, and the Staraya Kuterma. Before it receives the Voroncsh, the Don has attained a breadth of from 500 to 700, or even in a few places 1000 feet, while its depth varies from 4 to 20 feet; by the time it has reached its most eastern point, the depth has increased to from 7 to 50 feet, and the ordinary breadth to from 700 to 1000 feet, with an occasional maximum of 14,000 feet; in the lowest division the depth is frequently 70 feet, and the breadth in many places 1800 feet. Shallow reaches are not uncommon, and there are at least seven considerable shoals in the south-western part of the course. The river can be used for rafts as far up as the confluence of the Sosna; it becomes navigable after the addition of thc Voronesh, and has four regular stations for traffic at Vilkoff, Pavloff, Masloff, and Mamon, in the middle part of its ccurse ; but partly owing to obstructions of the channel, and partly to the scarcity of ship-timber in the

Voronesh government, it does not attain any great importance as a means of communication till it reaches Kachalinskaya. From that point, or rather from Kalatch where the railway from the Volga has its western terminus, the traffic is very extensive, and is carried cn, not only by a variety of small

river craft, but also by a regular system of steamboats, Of the tributarics of the river, which are between 30 and 40 in number, the Voronesh, the Khoper, the Medvieditza, and the Donetz are navigable,—the Donctz having a course of 678 miles, and affording during high water a passage to the government of Kharkoff. The lower section of the Donis subject to two annual floods, of which the first, known as the cold water, is caused by the melting of the snow in the country of the Don Cossacks, aud the second, or the warm water, is duc to the same process taking place in the region drained by the upper parts of the river. About the middle of June (0.s.) the subsidence sets in with great rapidity ; in August it is very low water, and navigation almost ceases ; but occasionally after the September rains the traffie with small craft is again practicable. During the last hundred years there have been five floods of extraordinary magni- tude,—namely, in 1748, 1786, 1805, 1820, and 1848, The river is usually elosed by ice from November or December to March or April, and at rare intervals the freezing takes place in October. At Aksai it remains open on the average 250 days in the year, at the mouth of the Mcdvieditza for 239, and at Novo-Cherkassk for 246.

DON COSSACK COUNTRY (in Russian, Donskago Voiska Zemlya, the Land of the Don Army), the south-west portion of European Russia, situated in the basin of the Don, and bounded in part by the Sea of Azoff. Its area, according to the military survey, is 59,650 square miles, or 135,761 square versts, but according to Schweizer 62,574 square miles, or 142,401 square versts. The most of the surface consists of an irregular steppe broken in some places by undulating elevations or conical hills, and traversed by the channels and ravines of the numerous tributaries and sub-tributaries of the principal river. The district to the north is especially flat, forming in fact, as is shown by the characteristics of its flora, a part of the great Aralo-Caspian depression. Cretaceous formations appear through- out the whole “

country," Tertiary and Carboniferous forma- tions especially to the south of the Donetz. Coal and anthracite are found in considerable abundance in several places, and iron ore occurs near the Miuss, the Donetz, and the Khoper. Limestone, chalk, and slate are common; and salt is obtained from various lakes. The upper soil is in general black earth, the subsoil usually clay. Agricul- ture is still in a backward state owing to the military pre-jndices of the Cossacks; but the virgin fertility of the ground, and the proximity of such seaports as Taganrog and Rostoff conduce greatly to its development. Wheat is the most generally cultivated cereal, but rye is pretty largely grown in the northern and millet in the southern districts. Flax and hemp have been introduced, and maize is sown in the gardens. Stock-rearing is extensively prosecuted : in 1860 there were about 373,000 horses, 991,000 cattle, and 2,242,000 sheep. The horses show a mixture of various Asiatic strains, those of the southern districts "being the best. The cattle are usually of Calmuck or Tatar race, but sometimes of Hungarian or Dutch; and the sheep are, with slight exception, Russian, Calmuck, or Wallachian. The land of the Don Cossacks was divided in 1802 into the following seven districts—Cherkassk, First Don, Second Don, Ust-Medvieditzki or Mouth of the Medvicditza, Khoper, Donetz, and Miuss ; and in 1806 a new district, or okrug, was formed of the nomadizing Calmucks. The six first-mentioned are divided into stanitzas, to each of which belongs a definite territory ; the Miuss district is occupied by regular landholders; and the Calmucks are arranged according to hundreds, or sofnias. The population in 1858 of the whole Zemlya was 896,870, and in 1867, 1,010,135. Novo-Cherkassk is the seat of government and the residence of the directing ataman of the Don army. In ancient times the Greeks had a colony at Tanais on the Sea of Azoff, and

various factories on the Don; and the Scythians and Sarmatians nomadized throughout the district. Afterwards came the Alans, the Huns, the Ugrians, the Bulgarians,

the Avars, and the Khazars, the lust even building the |

small town of Sarkel; then followed the Pechenegs, the Polovians, and finally the Tatars, whose power was gradually diminished during the 16th

and 17th centuries by the encroachments of the Russian Cossacks.

DON JUAN, a legendary personags whose story, originating in Spain, has found currency in various poetic and dramatic forms throughout most of the countries of Europe. The character has a certain historic basis in so far as it is localized at Seville in the time of Peter the Cruel, or, according to another version, of Charles V. Don Juan, who belonged to the illustrious Tenorio family, lived a life of unbridled licentiousness. In an attempt to abduct Giralda, daughter of the governor of Seville, he was encountered by her father, whom he subsequently killed in a duel. In mocking defiance of the spirit world, in whose existence his sensuality had destroyed all faith, he visited the tomb of the murdered man in the vault of San Francesco and challenged luis statue to follow him to supper. The invitation was accepted ; the animated statue appcared at table among the guests, and carried the blaspheming sceptic to hell. Ina few later dramatic versions of the story some features are introduced belonging to another personage of the same name, Don Juan of Marana, who, having sold himself to the devil, passed the greater part of his life in debauchery and crime. His mother, however, had provided that masses should be said for his salvation, and, being converted through the influence of these, he ended his days in a monastery, where he subjected himself to the severest penance.

As a dramatic type Don’ Juan is essentially the impersonation of the scepticism that results from sensuality, and is thus the eomplement of Faust, whose scepticism is the result of speculation. In its literary treatment it bas received various degrees of intensity. In the hands of the earlier Spanish dramatists it becomes, without their in- tending it, a solemn and impressive moral beacon, while Byron’s Don Juan is a gay adventurer, with nothing in eommon with the legendary personage except his name and his libertinism. The first introduction of the story into dramatic literature seems to have been in Lope de Vega’s Money makes the Man, where the incident of a walking statue occurs; but the earliest occasion on which the story was dramatized as a whole was in the Burlador de Sevilla (The Deceiver of Seville) of Gabriel Tellez, who published his secular works under the name Tirso de Molina. The Don Juan of this play is almost heroic in his fearlessness, indulging his cold grim humour without restraint even in the realized presence of the supernatural; but his unrelieved depravity revolts

the moral sense. From Spain the drama was soon after 1620 transferred to Italy, where a translation of it was produced at Naples. A few years later it was transferred to Paris, where it was frequently acted, some- times in the form of a translation of the work of Tellez, and sometimes in more or less free imitations, of which several were produced. A new aspect was given to the character in Moliére's Don Juan, ow le Festin de Pierre (1665), where the hero, though as heartlessly depraved as in the Spanish original, loses some of the sterner elements both of his wickedness and of his humour, and becomes more seductive and more amusing. Into English literature the story was first introduced by Shadwell's Lzbertine (1676), a grossly indecent and, from a literary point of view, worthless play. 'The eontinued popularity of the legend in the eountry of its birth is attested by the fact that it has furnished the groundwork for a play—Don Juan Qenorio (1844),—and two poems—£l Desajfio del Diablo

DoF and Un Z'estigo di Bronce (1845),—by the celebrated poet Zorrilla, During the present century it has also been a favourite subject with French writers of the romantic school, having been dealt with by Dumas the elder, Musset, Levasseur, Mallefille, and others. Its eapacity for musical treatment has been tested by two composers of the first rank. Gluck made Don Juan the hero of a ballet, and Mozart's opera, Don Giovanni, the libretto of which was furnished by Da Ponte, has probably done more to popularize the story in the Moliére as distinct from the severer carly Spanish form than any other setting, literary or musical, it has ever received.

DONAGHADEE, a market town of Ireland, in county Down, situated near the mouth of Belfast Lough on the Irish channel, is the nearest port in Ireland to Great Britain, being 214 miles 8.W. of Port Patrick in Wigtown-shire. It consists of two principal streets, and possesses a harbour which admits vessels of 16 feet in draught. On the north-east side of the town there is a rath 70 feet high, in which a powder magazine has been bnilt. The town is frequented for sea-bathing in the summer months. Popula- tion (1871), 2226.

DONALDSON, Joun Wittiam, a philologist and biblical critic, born 1812, died February 10, 1861. He was educated at the London university and at Trinity College, Cambridge, of which college he was afterwards elected a

fellow. He graduated in the year 1834, being placed in the second class of the mathematical tripos, and second in the elassical tripos, when G. J. Kennedy was senior, and W. Forsyth, the author of Jfortenstus, third classic. After his degree he devoted himself with uure- mitting energy to classical philology, and the New Cratylus, which appeared five years later, is not only a work of wonderful erudition for so young a man, but forms a landmark in the history of philology in England. In 1841 he was elected to the head-mastership of King Edward's school at Bury St Edmunds, a position which he held for over ten years. On resigning this post he returned to Cambridge, where his time was divided between literary work and private tuition, At the time of his death, which was accelerated by over-study, he was engaged in the pre- paration of a Greek lexicon.

The New Cratylus, the work on which Dr Donaldson's fame inainly rests, is an attempt to apply the general principles of eomparative philology to the Greek language. The book eonsists of two parts—a general introduction, in which the philosophy of language and the ethnographical affinities of the ancient Greeks are discussed, and a treatise on the grammatical structure and etymology of Greek. It is mainly founded on the eomparative grammar of Bopp, but a large part of it is original, and it is but just to the English philologist to observe that the great German's grammar was not completed till ten years after the first edition of the Cratylus. In the Varronianus, which followed in 1844, the same method is applied to the classi- fication and analysis of Latin and the other Italian dialects. It includes a critical commentary on the remains of old Latin, Umbrian, and Oscan. If we consider the recent birth and rapid strides of philology it is not wonderful that these early essays should have been superseded by the riper labours of such men as Curtius, Schleicher, and Momsen. Distinguished as Donaldson's works are by wide and varied learning, much ingenuity, and independence of thought, they are deficient in soberness of judgment, and, most of all, in the ability to distinguish between certain infereuce and uncertain eonjecture. More especially are tliese defects ap- parent in the ethnographical theories of the Varronianus. To take a single instance, the origin and affinities of the Etruscan language, problems which have yet to be solved, are stated no less confidently than those of modern French,

Before discussing his other works it is necessary to mention an unfortunate controversy which this book provoked, A eharge of plagiarism was brought against the author by the late Professor Key, and a war of pamphlets followed as violent as those which were common in the days of Bentley and Porson, Without attempting to decide on the merits of this dispute, it is enough to state that though the obligations of Donaldson to Key ought in the first instance to have been more explicitly acknowledged, yet the strictures of the latter were needlessly sweeping and aggressive,

We pass on to Donaldsons work as a biblieal critic. In 1854 he published his Jashar, or Fragments of original ITebrew songs inserted in the Masoretic text of the Old Testament, The book was written in Latin, as an appeal ad clerum, to the learned world in general, and especially to German theologians. It is an attempt to reconstitute the lost book of Jashar from the remains of old songs and historical records, which, according to the author, are incor- porated in the existing text of the Old Testament. Here, too, we notice the same merits and defects as in the Cratylus, the same ingenuity and Jearning, the same rash and over- coufident speculation, The bold views of the author on the nature of inspiration, and the free handling of the sacred text, provoked a storin of theological odium, but the only one of his numerous assailants who deserves meution is Dr Perowne. A full analysis of the book will be found in Smith's Biblical Dictionary, s. v. ' Jashar."

Ofhis numerous other works the most important are The Theatre of the Greeks, The History of the Literature of Ancient Greece (a completion of K. O. Miiller's work), an edition of Pindar, and a Hebrew, a Greek, and a Latin Grammar. Among his oceasional writings the article "Philology" in the 8th edition of this Zneyclopedia is the most important, Though much of what he wrote has already become obsolete, Donaldson will long be re- membered as one of the pioneers of philology in Eng- land,

DONATELLO (1386-1466), the diminutive of Donato, was the son of Niccolo Bardi, and was born in Florence in 1386. In the struggle between the rival parties of the Albizzi and the Medici, the father took part with the former, and was involved in their ruin. He must have been a man of considerable property, judging from the decree by which his houses are confiscated. His son Donatello found protection and shelter and the means

of early training from the Martelli family, and to this connection must be ascribed Donatello's introduction to the great Cosmo de' Medici, pater patric, who during the life-long relation between himself and the artist, did everything to efface, by kindness towards the son, the recollection of the sufferings which the house of Medici had inflicted on the father. He learned the goldsmith's trade under the father of the

renowned Lorenzo Ghiberti, and the goldsmith's trade then –

included all kinds of bronze ereations. At the age of seventeen he set out for Rome with his friend Brunellesco, At Rome the two young men maintained themselves by working as goldsmiths during the first half of the week, devoting the second half to the study-of the ancient monuments, and to making excavations in search of lost works of art, The Romans, we are told, believed them to be treasure-seekers. The Romans of Donatello's time still reflected the feelings with which their forefathers, nearly three centuries before, had wondered when the agents of Henry of Blois, bishop of Winchester, dug up and earried away from their city similar artistic treasures. On their return to Florenee, rich in artistic knowledge and treasures, the careers commenced in which Brunellesco was destined to hang above the Florence cathedral the dome of the Pantheon, and Donatello to impart to the multitudinous

creations of his chisel the truthfulness and grace and power for which he was so largely indebted to his ancient models, There exist 40 works of Donatello of unqucstioned authen- ticity, and 31 respecting which controversies have arisen ; and 25, recorded by his contemporaries but no longer found, must be added to the number. When it is borne in mind that many of these works are life-size or colossal statues, or large bas-reliefs crowded with figures, an idea may be formed of the extent of his labours, prosecuted untiringly during a life which extended to eighty years. He was fortunate in the precise period of his labours. During the whole of the previous century Florentine art lad concen- trated its efforts on the creation of its grand architectural monuments, In the second half of the 15th century seulpture was cultivated, but chiefly to adorn the palaces and gratify the vanity of the rich. Donatello, placed between the two periods, could devote

his genius to the execution of the great plastic works required for the completion and adornment of the public buildings of the state. Hence the statues of the church of St Michele, those on Giotto's belfry, the pulpit of St Lorenzo, those in the baptistry, as well as all the other works which still remain exactly where first placed—unhappily no longer the ease with the St George—possess an exceptional beauty ; for no sculptor ever studied more carefully than Donatello the exact relation of a work to its local destination. The varied and characteristie elements of Donatello's art, what he borrowed from the antique, what peculiar tricks of drapery he took from his immediate predecessors, how, frorr his first habit of painting luis figures he passed into a phase of purely sculptured effects, how he was influenced by his friend Brunelleseo in his .treatment of proportion and perspective, how he imparted a more pictorial character by the greater flatness of the figures to his bas-reliefs, all this forms oue of the most interesting chapters in the history of Renaissance sculpture. Besidés Florence he worked also at Rome, Padua, Venice, Siena, Modena, Mantua, and Ferrara ; and he visited Rome a second time, In Padua he produced, in 1432, the equestrian statue of Gattainelata with some minor works, and as almost his latest work we may consider the statue of St Louis of France, executed for St Croce. 'To English students of art it may be satisfactory to learn that, in the opinion of Semper, the South Kensington museum possesses seven undoubted specimens of Donatello, besides one, the Magdalen seated on clouds, probably by a scholar, and a virgin and child of doubtful origin. Donatello, though best known as a sculptor, was likewise a painter,— at least was admitted as such into the academy of St Lueca in 1412, We find him paid for architectural drawings and opinions respecting the dome of the Florence cathedral in 1420, and he was sent as military engineer to the siege of Lucea in 1430. His first trade of goldsmith was never abandoned, 'Thus varied and versatile, we cannot but form the highest opinion of one respecting whom Vasari has said that he threw the same love of art into every work great or small, and that he always did more than he promised. His life-long attachment to his patron Cosmo was only equalled by his lavish kindness to his friends; for we read that the large sums received by him were kept in an open box in his workshop, and that his friends when wanting money were invited and expected to help themselves, no questions being asked or receipts given. In his last years he was provided for by Piero, the son of Cosmo. He died at Florence in 1466. Donatello's greatest works, his

Baptist, David, Judith, St George, and Mark, are declared by some recent critics not to rise into the highest sphere of true Christian art. The sculptor, we are told, wanted the deep faith of Michelangelo. Perhaps the best corrective of this criticism is the language of Micliel- angelo himself, who, when gazing with gencrous admiration

on the St Mark, exclaimed, ‘So noble a figure could indeed write a gospel.”

DONATI, Grovaynt Battista, professor of astronomy at the Royal Institution of Florence, was born at Pisa, December 16, 1826, and died at Florence, September 20, 1873. In (852 he became an assistant at the Florentine observatory, of which in 1864 he was appointed director. On June 2, 1858, he discovered the comet which bears his name (see vol. ii. p. 815). Other comets were discovered by him on June 3, 1855, November 10, 1857, and July 238 and September 9, 1864. He made numerous spectroscopic observations of comets and the solar disc, and in 1862 published diagrams of three or four lines in the spectra of fifteen stars, The new observatory on the hill of Arcetni, near Ilorence, was crected under his superintendence, and was directed by him. At the time of his death Donati had just returned from Vicnna, where he was the representative of Italy in the international meteorological congress,

DONATISTS, a powerful sect which formed itself in the Christian church of northern Africa in the beginning of the 4th century. In its doctrine if sprang from the sanie roots, aud in its history it had in many things thie same character, as the earlier Novatians. The predisposing causes of the Donatist schism were the belief, early intro- duced into the African church, that the validity of all sacerdotal acts depended upon the personal character of the agent, and the question, arising out of that belief, as to the eligibility for sacerdotal office of the ¢raditores, or those who had delivered up their copies of the Scriptures under the compulsion of the Diocletian persecution; the exciting cause was the election of a successor to Mensurius, bishop of Carthage, who died in 311. Mensurius had held moderate views as to the questio vewata of the treatment of the traditores, and accordingly a strong fanatical party had formed itself in Carthage in opposition to him, headed by a wealthy and therefore influential widow named Lucilla, and

countenanced by Secundus of Tigisis, primate of Numidia. There were thus two parties each anxious to securc the succession to the vacaut see. The friends of the late bishop fixed their choice on Cecilian, the arch- deacon, and secured his clection and his consecration by Felix, the bishop of Aptungis, before the other party were ready for action. It had been customary, though probably it was not essential, that the Numidian bishops should be present at the election and consecration of the bishop of Carthage ; Cecilian's party had not waited for them, knowing them to be in sympathy with their opponents. Soon after Cecilian's consecration, however, Secundus and seventy of the Numidian bishops arrived at Carthage, and steps were at once taken to displace the new bishop. A synod was formed before which Cecilian was summoned ; lis consecration was declared invalid, on the ground that Felix had been a traditor ; and finally, having refused to obey the summons to appcar, he was excommunicated, and Majorinns, a dependent of Lucilla's, consecrated in his stead. Thus the schism became overt, and in a very short time there were rival bishops and rival churches in most of the cities of North Africa, as well as in Carthage.

The inevitable appeal to the civil power to scttle the dispute was first made by the Donatists, who were incited to do so by recciving proof, in their exclusion from certain privileges conferred on the African cliurch, that the sympathies of Constantine were with the other party.

peer eee

1 There were two Donatuses eonnected with the Donatist sect, Donatus of Case Nigre, and Donatus surnamed Magnus, who sueeeeded Majorinus as the Donatist bishop of Carthage. The name of the seet was probably derived from the latter, who was the more influential of the two. Itis to be observed that the Donatists themselves repudiated that designation, which was applied to them by their opponents as a reproach. 'They called themselves So Pars Majorini" or " Pars Donati."

They accordingly petitioned the emperor to appoint a com- mission to try the case, indicating a preference for Callic bishops, among whom there were no traditors, the Diocletian persecution not having extended to Gaul,

The result was that a commission was issued to five Gallic bishops, under the presidency of Miltiades, bishop of Rome. The number of referees was afterwards increased to twenty, and the case was tried at Rome in 313. ‘Ten bishops appeared on cach side, the leading representative of the Donatists being Donatus of Casz Nigra. The decision was entirely in favour of Cacilian, and Donatus was found guilty of various ecclesiastical offences. An appeal was taken and allowed ; but the decision of the synod of Arles (314) not only confirmed the position of Ceecilian, but greatly strengthened it by passing a canon that ordination was not invalid because performed by a traditor, if otherwise regular. Jfelix had previously been declared innocent after an examination of records and witnesses at Carthage.

The attempt to destroy by force a fanatical sect had its usual result in only intensifying its fanaticism and con- solidating its sectarianism. Majorinus, the Donatist bishop of Carthage, dying in 315, was succeeded by Donatus, sur- named Magnus, a man of great force of character, under whose influence the schism gained fresh strength from the opposition it encountered. Force was met with force ; the Circumeclliones, bands of fugitive slaves and vagrant (circum cellas) peasants, were enlisted as the champions of Donatism, and their violence reached such a height as to threaten civil war. In 321 Constantine, secing probably that he had been wrong in abandoning his usual policy of toleration in this case, sought to retrace his steps by grant- ing the Donatists liberty to act according to their con- sciences, and declaring that the points in dispute between them and the orthodox should be left to the judgment of God. This wise policy, to which he consistently adhered to the close of his reign, was not followed by his son and successor in the Western Empire, Constans, who, after repeated attempts to win over the sect by bribes, resorted to persecution. The renewed excesses of the Circum- celliones, among whom were ranged fugitive slaves, debtors, and political malcontents of all kinds, had given to the Donatist schism a socialist aspect; and its forcible sup- pression may thercfore have seemed to Constans even more necessary for the preservation of the empire than for tho vindication of orthodoxy. The power which they had been the first to invoke having thus declared so emphatically and persistently against them, the Donatists were led to adopt the theory known in more recent times as that of spiritual independence, which Donatus Magnus formulated in the question, ‘What has the emperor

to do with the church?" (Quid est imperatori cum ecclesia?) Such a theory naturally aggravated the lawlessness of the Circum- cellion adherents of the sect, aud tlicir outrages were in turn made the justification for the most rigorous measures against the whole Donatist party indiscriminately. Many of their bishops fell victims to the persecution, and Donatus and several others were banished from their sees,

With the accession of Julian (361) an entire change took place in the treatment of the Donatists. Their churches were restored and their bishops reinstated, with the natural result of greatly increasing both the numbers and the fanaticisin of the sect. A return to the earlier

; policy of repression was made under Valentinian I. and

Gratian, by whom the Donatist churclies were again closed, and all assemblies of adherents of the sect forbidden. It was not, however, until the commencement of the 5th century that the sect began to decline, owing partly to the occurrence of a division within it, but still more to the arguments used against it by the greatest theologian of the carly church, The division arose out of a quarrel between Maximian, a deacon in Carthage, and Primian, the successor of VParmenian in the (Donatist) bishopric. Maximian, being excommunicated, formed a party which, as Neander puts it, "stood in precisely the same relation to the body of the Donatists as the Donatists themselves did to the Catholic church." The dispute was a source of weakness in itself, and still more by the unanswerable arguments it furnished to the Cutholic party, who during the reign of the emperor Honorius made repeated and determined efforts to secure the extinction of the schism. In 405 an imperial edict was issued commanding the Donatists, under the severest penalties, to return to the Catholic church. Meanwhile the more appropriate weapon of argument was being effectively wielded by the Catholic party, under the leadership of one of the ablest controver- sialists the Christian church has ever known, Augustine, bishop of Hippo, after several years' negotiation, found it possible to arrange a great conference between the Donatists and the orthodox, which took place under the orders of the emperor at Carthage in 411. There were present two hundred and eighty-six Catholic and two hundred and seventy-nine Donatist bishops.

Before entering on the proceedings the Catholics pledged themselves, if defeated, to give up their sees, while in the other event they promised to recognize the Donatists as bishops on their simply declaring their adherence to the Catholic church. The latter proposal, though it was received with scorn at the time, had perhaps ultimately as much influence as the resistless logic of Augustine in breaking the strength of the schism. The discussion, which lasted for three days, Augustine and Aurelius being the chief speakers on the one side, and Primian and [etilian on the other, turned exclusively upon the two questions that had given rise to the schism,—first, the question of fact, whether Felix had been a traditor, and secondly, the question of doctrine, whether a church by tolerance of unworthy members within its pale lost the essential attributes of purity and catholicity. On the second point, to which alone abiding interest attaches itself, the Catholic view was stated and defeuded by Augustine with a force of argument, an aptness of quotation from Scripture (often, however, founded on mis-interpretation), and a beauty of language that all but compel assent. Nowhere else in polemical theology are there to be found more valuable statements as to the con- nection between the divine and the human elements in the communication of grace, and as to the relative importance of the two attributes of catholicity and purity respectively as tests of the true church. It is to be observed, however, that on the side of Augustine as well as on that of his opponents there is the inevitable confusion of thought that arises from failure to apprehend the distinction between the visible and the invisible church.

The decision of Marcellinus, the imperial commissioner, was in favour of the Catholic party on both questions, and it was at once confirmed on an appeal to the emperor. As in the case of the similar decision almost exactly a century earlier, there followed the severest penal measures against the schismatics, the clergy being banished and the laity subjected to heavy fines. The extinction of the schism, which all the arguments of Augustine had failed to effect, was still less to be bronght about by persecution. The Donatists continued to maintain an independent existence until the 7th century, when they disappear from history,

along with the whole Christian church of North Africa, before the invading Saracens.

Sources.—1. Contemporary.---Optatus Milevitanus De Schismate Donatistarum Lib. VII., (Dupuis's ed., Paris, 1700), and several of the works of Augustine. 2. Modern.—Walsh's Lntwurf einer vollstindigen Ilistorie der Ketzereien, Neander's Kirehengeschichte, Hagenbach's Kirehengesehiehte, Herzog's Eneyelopddic, art. '* Don- atisten," Robertson's History of the Christian Chureh.

DONATUS, é11us, a grammarian and rhetorician, who taught at Rome in the middle of the 4th century a.p., had the honour of numbering St Jerome among his pupils, and was the author of a number of professional works. We still possess his Ars grammatica, consisting of three parts, De literis, syllabis, pedibus et tonis, De octo partibus orationts, and De barbarismo, solecismo, schematibus, et tropis; the larger portion of his commentary on Terence, in a greatly interpolated condition ; and a few fragments of his notes on Virgil preserved and severely criticised by Servius. The first of these works, and especially the section De octo partibus, though possessing little claim to originality, and in fact evidently based on the same authorities which were used by Charisius and Diomedes, attained such popularity as a school-book that in the Middle Ages the writer's name became a common netonymy for a rudimentary treatise of any sort, and bade fair to furnish as permanent an addition to the English vocabulary as has been obtained in French from the name of Calepinus.

Sec Teuffel, History of Roman Literature, vol. ii., and the writers there referred to.

DONAUWORTH, «a town of Bavaria, in the circle of Swabia-Neuburg, 25 miles N. of Augsburg, on the left bank of the Danube, at the confluence of the Wornitz. It is of some importance as a river port, and the centre of a considerable agricultural trade; but its main interest is historical. Having grown up in the course of the 11th and 12th centuries under the protection of the castle of Mangoldstein, it became in the 13th the seat of the duke of Upper Bavaria, who, however, soon withdrew to Munich to escape if possible from the manes of his wife Maria of Brabant, whom he had there belieaded on an unfounded suspicion of infidelity. 'The town received the

freedom of the empire in 1308, and maintained its position in spite of the encroachments of Bavaria till 1607, when the inter- ference of the Protestant inhabitants with the abbot of the Holy Cross called forth an imperial law authorizing the duke of Bavaria to inflict chastisement for the offence. In the Thirty Years' War which soon after broke out, it was stormed by Gustavus Adolphus in 1632, and captured by King Ferdinand in 1634. In the vicinity the Bavarians and French were defeated by Marlborough and [Prince

Louis of Baden in 1704. The imperial freedom restored to the town by Joseph I. in 1705 was again lost by re- incorporation with Bavaria in 1714. The abbey of the Holy Cross is still standing, and the neighbouring chapel still preserves the sarcophagus of the unfortunate duchess Maria.

DONCASTER, the Danum of Antoninus and Dona Ceaster of the Saxons, a muni- cipal borough and market-town of England, in the west rid- ing of Yorkshire, 32 miles 8. of York and 156 miles N.) of London by railway, in the S24 line of the ancient Roman road of Ermine street or, as \ some write, Watling street, is situated on the right bank of the Don, over which and an arm of it called the Cheswold it has two bridges. The parish church of St George, occu- pying the site of an older structure of tle same name destroyed by fire in 1858, was finished in 1858 at a cost of £43,128 ; its tower is 172 feet high. Among the other pablic buildings are Christ Church aud St James's, the mansionhouse, market-hall, guildhall, theatre, grammar-school, infirmary, and jail. The commerce of Doncaster is mainly agricultural, aud tle corn market is of consider- rable importance. The manufactures are iron and brass ware, sacking and linen, spun flax, ropes, and agricultural machines. About a mile to the south-east of the town is the race course, which is nearly circular, and las a circum- ference of 1 mile 7 furlongs and 70 yards; the principal races eld annually commence on the Tuesday after the 10th of September. The grand stand, erected in 1777, has been frequently altered and improved, but has lost much of its importance by the erection of minor stands, Races have long been held at Doncaster, and there was a stand on the course before the year 1615. The St Leger race takes its name from Lieut.~~Gen. St Leger, who originated it in 1776; but it~~

~~was not so named till 1778. Don~~ caster received its first charter from Richard I. In 1399, after landing at Ravenspur, Bolingbroke, subse- quently Henry IV., lodged for a time in the town. In 1871 the population of the municipal borough was 18,768, The area is 1691 acres.

DONEGAL, a maritime county in the extreme north- west of Ireland, in the province of Ulster, bonnded on the N. and W. by the Atlantic Ocean, on the E. by Lough Foyle, and the counties of Londonderry and Tyrone, and on the 8. by Donegal Bay and the counties of Fermanagh and Leitrim, It covers an area of 18704 square miles, or 1,197,154 acres, of which 22,880 are under water.

Coast.—The county possesses a large extent of sea-coast indented by numerous inlets. Ballyshannon harbour, the most southern of tliem, is small, and has a bar at its mouth, ashave Donegal and Inver harbours farther west. Killibegs harbour is well sheltered, and capable of receiving large vessels. On tiie western coast are Bruckles or M‘Swiney’s Bay, and Teelin harbour, suitable for small vessels; and on the north is Sheephaven, within which is Dunfanaghy Bay, where the largest ships may lie in safety, as they may also in Mulroy Bay and Lough Swilly farther east. Lough Foyle, which divides Donegal from Londonderry, isa noble sheet of water, but is shallow and dry at ebb tide, contracted at its entrance, and encumbered with shoals. A few miles from Malin Head, the most northerly portion of the main- land of Ireland, the varied and extensive Lough Swilly runs far into the interior. From these two loughs much land has been reclaimed, Numerous islands and rocks

re

Arms of Doncaster.

stud the coast. The largest island is North Aran, about fiftecn miles in circumference, with a lofty hill in its centre, and a gradual declivity down te the sea, On the northern coast are Tory Island, on which is one of those singular round towers marking the holy places of ancient times, and, further east, Innistrahul the wltema Thule of Ireland. The inhabitants of the islands

obtain a precarious livelihood by fishing, kelp-burning, and rude hnsbandry, but are often reduced to extreme destitution.

Mountains.—Mountains and irregular groups of high- lands occupy the whole interior of the county, and a con- siderable portion is bog and moor land. Arrigal mountain attains an elevation of 2462 feet above the level of the sea, and commands from its summit a fine view over a consider- able portion of the country. Bluestack (2213 fect), Muckish mountain (2190 feet) in Kilmacrenan barony, and Slieve Snaght (2019) in Innishowen are, next to Arrigal, the highest mountains, The eastern and southern portions of the county are comparatively level, and contain the most fertile land. Occasionally the scenery attains a character of savage and romantic grandeur in the highland districts aud on the sea-coast, and of much beauty in the eastern part of the county; but a considerable portion of the surface is occupied by bogs, and entirely destitute of timber.

Geology. —The main body of the county rests upou mica slate, which forms the eastern districts and most of the barony of Bannagh. From Sheephaven to Lochrusmore and the north-western coast, granite forms the surface rock, and quartz is very abundant, often forming mountains of considerable elevation. Carboniferous or mountain lime- stone occurs round Donegal Bay. The geological aspect of the county affords many indications of ternal wealth, but very few attempts have been made to ascertain the mineral resources of the district. The minerals hitherto dis- covered are lead and iron. Steatiteis worked to some extent at Gartan. Manganese, copper pyrites, and clay for potteries and brick-making are also found. Siliceous sand, raised in Muckish Mountain, was formerly conveyed in large quantities to Belfast and Scotland for the manufacture of glass Indications of coal have been observed near Lough Swilly, and at Inver on the southern coast ; and marble of fine quality exists in many places, Among the mountain streams the pearl-mussel (Unio margaritifera) is sometimes found. There are several mineral springs, the chief of which is the sulphureo-chalybeate water at Killymard near the town of Donegal.

Rivers.—With the exception of the tidal river Foyle, which forms the boundary between this county and Tyrone and Londonderry, the rivers, though numerous, are of inferior size. The branches of the Foyle which rise

in Donegal are the Derg, issuing from Lough Derg, and the Finn, rising in the beautiful little lake of the same name in the highlands, and passing through some of the best cultivated land in the county. The Foyle, augmented by their contributions, and by those of several other branches from Tyrone and Londonderry, proceeds northwards, discharging its waters into the southern extremity of Lough Foyle, at the city of Londonderry. It is navigable for vessels of large burden to this place, and thence by lighters of fifty tons as far as Lifford. Boats of fourteen tons can procced up the Finn river as far as Castlefinn. ‘The fine river Erue flows from Lough Erne through the southern extremity of the county into the southern extremity of Donegal Bay. Its navigation is prevented by a fall of 12 feet, generally called the Salmon Leap, in the neighbourhood of Ballyshannon, and by rapids between Ballyshannon and Belleek, on the confines of Fermanagh. The Guibarra, the Awen Ea, and the Eask are the only other streams of any note.

Lakes, or rather tarns, are very numerous in Donegal,

The most remarkable, and also the largest, is Lough Derg, comprising within its waters several small’islets, on one of which, Station Island, is the cave named Saint Patrick’s Purgatory, a celebrated place of resort for pilgrims and devotees, The circumference of the lake is about nine miles, and the extent of the island to which the pilgrims are ferried over is less than one acre. The landscape around Lough Derg is desolate and sombre in the extreme, barren moors aud heathy hills surrounding it on all sides.

Agriculture.—The modes of agriculture present little that is peculiar to the county, and the spade still supplies the place of the plough where the rocky nature of the surface prevents the application of the latter implement. The soil of the greater portion of the county, we, the granite, quartz, and mica slate districts, is thin and cold, while that on the Carboniferous limestone is warm and friable. Owing to the boggy nature of the soil, agriculture has not made much progress, although in certain districts (Gweedore, for instance) much land has been brought under cultiva- tion, through the enterprise of

the proprietors. In 1871 about 434 per cent. of the land was returned as bog and waste, about 35 per cent. under pasture, and 21 per cent. under tillage. As an indication of the stationary condition of the husbandry of Donegal, it may be stated that the number of acres returned as under crops in 1853 was 236,097, while in 1876 it was 236,015.

The following statistics will show the details of the agricultural acreage and the numbers of live stock in recent

years :— Meadow Total

Oats. and elover. under crops.

Flax. Potatoes. Turnips.

12\//Baonae 96,347 14,496 48,804 17,141 47,917 232,794

1876…..,95,422 15,887 47,164 17,695 51,647 236,015

Cattle. Sheep. eee, Pigs. Poultry. S78 Beeson 184,233 182,608 23,759 20,960 408,766 ASO cies 187,547 171,304 23,148 35,628 637,441

Wheat and barley are quite an inconsiderable crop, and in this as well as in other respects Donegal is much behind the rest of Ulster in the extent of its crops. It bears, how- ever, a more favourable comparison as regards its live stock, possessing, as it does, the largest number of cattle and sheep of any county in the province, and after Cavan the largest number of poultry.

As regards the division of the land, according to the Return of 1876, the county was held in 1874 by 2174 sepa- rate owners, whose holdings amounted in the aggregate to 1,172,526 acres, valued at £340,632. There were 1171 pro- prietors of less than 1 acre of ground, forming a proportion of 54 per cent. of the total proprietors,—that of all Ulster being 48 per cent. The average size of the holdings was 539 acres, and the value per acre, 5s. 9d., while the averages for Ulster were respectively 2394 acres and 15s. 84d. Sixteen proprietors owned more than 15,000 acres each, and _to- gether an aggregate equal to about 45 per cent. of the whole land. They were the following :—Marquis of Conyngham, 122,300 acres ; Earl of Leitrim, 54,352; H. G. Murray Stewart, 50,818 ; W. H. M. Style (Glenmore), 39,564; A. J. R. Stewart (Castlemore), 39,306; John Leslie, 28,827’; George Harvey, 25,593 ; Lord G. A. Hill, 24,189; Messrs Musgrave, 23,673 ; Sir Samuel H. Hayes, Bart., 22,825 ; Thomas Connolly, 22,736 ; Church Tempo- ralities Commission, 21,489; Wybrants Olphert (Bally- connel), 18.133 ; J. G. Adair (Glenveagh), 16,308 ; Duke of Abercorn, 15,942 ; T, Y. Brooke (Lough Esk), 15,134.

Manufactures.—In Donegal, as in other counties of Ulster, the linen manufacture affords employment to a number of the inhabitants, especially at Raphoe, while the manufacture of woollen stockings and worked muslin is carried on pretty extensively. The trade in these manufac- tures and in the domestic produce of the county finds its

principal outlets through the port of Derry and the inland town of Strabane, county Tyrone.

Fisheries.—The deep sea fisherics are important. They comprise the three districts of Killybegs, Dunfanaghy, and Carndonagh—the last-named including a small part of the Derry coast—and extend to 395 miles of maritime boundary. In 1875 there were 777 boats registered in the fisheries, manned by 3053 men and boys. The salmon fishery is also prosecuted to a considerable extent, the principal seats of the trade being at Ballyshannon and Letterkenny.

Administration, §c.—The county is divided into the six baronies of Innishowen, Kilmacrenan, Boylagh, Raphoe, Bannagh, and Tyrhugh, and into 51 parishes. It contains seven poor law unions, and ecclesiastically it belongs for the most part to the diocese of Raphoe. It is included in the military district of Belfast, and the assizes are held at Lifford on the borders of Tyrone. The population has decreased within the last 20 ycars at a greater ratio than the rest of Ulster, and emigration has drawn off a greater proportion of the people than in other parts of the province. For the 24 years ending in 1875 the rate of emigration has averaged 2908 perannum. By the census of 1851 Donegal contained 255,158 persons, in 1861, 237,390, and in 1871, 218,334, of whom 106,080 were males and112,254 females— thus showing a decrease within these 20 years of 144 per cent. In 1875 the population was estimated at 208,607.

After Cavan, Donegal is the most Catholic county in Ulster. In 1871, 75 per cent. of the inhabitants belonged to that persuasion, while 124 per cent. were Episcopalians and 103 per cent. Presbyterians, Education in the same year was conducted in 7 superior and 407 primary schools. There were, however, 93,285 persons above five years of age who were returned as illiterate, and 18,629 who could speak Erse only. The Donegal dialect is said to be the purest of the Irish language,

This county returned no fewer than twelve members to the Irish parliament, —two for the county at large, and two for each of the insignificant boroughs of Ballyshannon, Donegal, Killybegs, Lifford, and Johnstown. Since the

union with Great Britain, it has been represented in the imperial parliament by two county members only,

Towns.—The towns are small in extent and importance. Lifford, the county town (population 660), and formerly a parliamentary Lorough, is practically a suburb of Strabane, in the neighbouring county of Tyrone. Ballyshannon (population 2958) is the most populous and important town in the county. It stands on both sides of the river Erne, but does not derive much advantage from its favour- able situation in consequence of the fall of the river, usually called the Salmon Leap, above the town, and the bar at the mouth of the harbour. Letterkenny at the head of Lough Swilly, with 2116 inhabitants, is, next to Bally- shannon, the largest town in the county. Donegal (population 1422), is situated at the foot of a range of hills in the inidst of scencry of great natural beauty, with a mineral spa in the neighbourhood, and sea-hathing close to the town.

History.—The greater part of Donegal was ancicntly called Tir- conaill, or the country of Conall; and it was sometimes called O'Donnell's country, after the head chieftains of the district. The other chieftains of note were the O'Doghertys, MacSweeneys, O'Boyles, O'Gallaghers, O'Gormleys, O'Breslins, &e. Tyreonnell is conneeted with some of the earliest events recorded in Irish history or tradition. The chief eastle of the O'Donnells, who be- came prinees of Tyreonnell in the 12th century, was at Donegal, and the place of their inauguration the rock of Doune in Kilma- crenan. The celebrated Red Hugh O'Donnell, one of the most distinguished chieftains of the race, in conjunction with the Earl of Tyrone, became a formidable opponent to the Government of Queen Elizabeth ; but being ultimately defeated, he sailed to Spain to solicit fresh suecours, was there seized with fever, and died at

Valladolid. Rory O'Donnell, who was promoted to the chieftainship by the English Government, and ereated Earl of Tyrconnel, a title

now extinct, became afterwards disaffected to the Government and fled to Rome, where he died in exile, his estates having been pre- viously confiscated by James J. Iu 1608, Sir Cahir O'Dogherty, lord of Inuishowen,

deceived by hopes of aid from Spain, raised an jusurrection against the English Government in Ulster. He burnt Londonderry and maintained his ground for a short period; but the Lord-Deputy Chichester having offered a reward for his head, he retired to the wilds of Kilmacrenan, and was shot by a Scotch settler in his encampment on the rock of Doune. His extensive estates were confiscated and transferred to Chichester, the ancestor of the earls and marquises of Donegall. Shortly afterwards, the eolonization of Ulstcr with English and Scotch undertakers and settlers, in pursuance of the scheme of James I., was partially carried out, and the baronies of Boylagh and Bannagh were allotted to'John Murray; Sir James Cunningham, Sir John Stewart, and others, reeeived the district of Portlough ; the London Grocers' Company obtained Muff in Innishowen ; Sir Roger Bingley, Sir John Kingsmill, and other English settlers the district round Lifford; Sir William Stewart, Sir John Kingsmill, Sir George Macburie, Captain Hart, Sir M. M'Swine, Turlogh Roe O'Boyle, MacSwine Bannagh, MacSwine Fannet, and other servitors and natives the district of Kilmaerenan. Since the period of the settle- meut of Ulster, no forfeitures have taken place in this county. The landholders remained loyal in the rebellion of 1641, aud also during the war of the Revolution.

This district was formed into the county of Donegal in the reign of Queen Elizabeth, in 1585, by the Lord-Deputy Sir John Perrott.

Antiquities. —The most noteworthy are iteetural remains of autiquity in the county are to be found at the head of Lough Swilly, where, situated on the summit of a hill 802 feet high, some remark- able remaius exist of a fortress or palace of the Northern Irish kings. These arc known as the Grianan of Aileach, and evidently date from a period prior to the 12th eentury. On Tory island there is one of the best specimens of a round tower and some other interest- ing remains.

Numerous ruins of ancient castles along the coast prove that much attention was formerly paid to the defence of the country from invasion. 'The principal are—Kilbarron Castle, an ancient stronghold of the O'Clerys, near Ballyshannon ; Donegal Castle, built by the O'Donnells, ancicntly their chief residence, aud now a fine ruin standing close to the water's edge ; Burt Castle, built in the reign of Henry VIII. on the shores of Lough Swilly

by Sir Cahir O’Dogherty, to whom is also attributed the crection of Green Castle, one of the strongholds of the clan on Lough Foyle.

Near the Castle of Doe, or M‘Swiney’s Castle, at Horn Head, is a

natural perforation in the roof of a eave, called M‘Swiney’s Gun, formed by the workings of the ocean into the overhanging cliff. When the wind blows due north, and the tide is at half flood, the guu is scen to spout up jets of water to a height of 100 feet, attended with explosions heard oecasionally in favourable weather at an immense distance. Gulmore Fort, on the coast of Lough Swilly, supposed to have been erected by the O’Doghertys, having come into the possession of the crown, was granted in 1609 to the corporation of London. It was aftcrwards enlarged or rebuilt, and acted a pro- minent part in the celebrated siege of Derry. _.‘Traces of religious houses, some existing only in traditionary or doeumental records, are also numerous. Ashroe Abbey, on a small stream near Ballyshaunon, was of great extent. The ruins of that of Donegal, founded in 1474, also afford proofs of its ancient grandenr. It was there that the celebrated eollection of ancient Trish annals were written, known by the name of the Annals of the Four Masters, and sometimes called the Annals of Donegal, eom- piled in the year 1632, by Michael O’Clery and his eoadjutors.

DONGOLA, or Donxoxa, a town of Egypt, in the district of the same name in the province of Nubia, situated on the left bank of the Nile, about 45 miles above the Third Cataract. It is frequently styled Dongola Makarah, or New Dongola, to distinguish it from Dongola Agusa, or Old Dongola, a now decadent village 75 miles further up the river, which was formerly a flourishing fortified town, but fell into ruins after the devastation of the Mamelukes. Kasr Dongola, or Castle Dongola, and El Ordeh, or The Barracks, are also names in use. ‘The town grew up round the military and administrative buildings established about 1820 by the Egyptian Government; and it is now a thriving commercial centre, with well-furnished bazaars, an indigo factory, and public baths. The barracks were built after a plan by the celebrated German naturalist Ehrenberg. Population about 6000. ;

DONIZETTI, Gazrano (1798-1 848). There is a strange

parallelism observable in the lives of the three most cele-

brated Italian composers of the present century. Rossini,

he showed at an early age a strong taste for art. strangely enough, he mistook architecture for his vocation, and only after an unsuccessful trial in that direction did he discover his real talent. his native city, where he studied under Simon Mayr, the fertile operatic composer. the headmaster of the celebrated music school of Bologna, where Donizetti resided for three years. to Bergamo the young composer determined to devote him- self to dramatic music, but his father insisted upon his giving lessons with a view to immediate gain. The disputes arising from this cause ultimately led to Donizetti's

year, established Donizetti' reputation.

rate of three or four a year.

Bellini, and Donizetti had no sooner established their reputations on the Italian stage than they left their own country for Paris, at that time the centre of the musical world. All three settled in France, and all three were anxious to adapt the style of their music to the taste and artistic traditions of their adopted country. The difference which exists between Rossini's Zell and his Semiramide may, although in a less striking degree,

be noticed between Donizetti's Fille du Régiment and one

of his earlier Italian operas. But here the parallel ends,

As regards artistic genius Donizetti can by no means be

compared with his illustrious countrymen. He has little

of Bellini's melancholy sweetness, less of Rossini's sparkle, and is all but devoid of spontaneous dramatic impulse. For these shortcomings he atones by a considerable though by no means extraordinary store of fluent melody, and by his rare skill in writing for the voice. last act of the Favorita and the celebrated ensemble in

The duet in the

Lucia following upon the signing of the contract, are

masterpieces of concerted music in the Italian style. These advantages, together with considerable power of humorous

delineation, as evinced in Don Pasquale and LD' Elisw @ Amore, must account for the unimpaired vitality of many of his works on the stage.

The life of Donizetti may be told in few words. He

was born at Bergamo in 1798, the son of a Government

official of limited means. Originally destined for the bar,

At first, He entered the conservatoire of His second master was Mattei,

After his return

eulisting in the army. But this desperate step proved.

beneficial against all expectation. The regiment was quartered at Venice, and here the young composer's first dramatic attempt, an opera called Lnrico Comte di Borgogna, saw the light in 1818.

The success of this work, and of a second opera brought out in the following He obtained his discharge from the army, and henceforth his operas followed each other in rapid and uninterrupted succession at the Although he had to contend successively with two such dangerous rivals as Rossini and Bellini, he succeeded in taking firm hold of the public, and the brilliant reception accorded to his Anna Bolena at Milan carried his name beyond the limits of his own country. In 1835 Donizetti went for the first time to Paris, where, however, his M arino Faliero failed to hold its own against Bellini's Puritani, then recently produced at the ThéAtre Italien. The disappointed composer went to Naples, where the enormous success of his Lucia di Lammermoor consoled him for his failure in Paris. For Naples he wrote a number of works, none of which is worth notice. In 1840 the censorship refused to pass his Poliuto, an Italian version of Corneille's

Polyeucte, in consequence of which the disgusted composer once more left his country for Paris. Here he produced at the Opéra Comique his most popular opera, La Fille du Régiment, but again with little success, It was not till after the work had made tho round of the theatres of Germany and Italy that the Parisians reconsidered their unfavourable verdict. A serious opera, Les Martyrs, produced about the same time with the Daughter of the Regiment, was equally unsuccess-

ful, and it was reserve to Za Savorita, generally | England, he secured the patronage of Sir Thomas Fgerton, ?

considered us Donizetti's masterpiece, to break the evil spell. His next important work, Linda di Chamountx, was written for Vienna, where it was received most favourably in 1842, and the same success accompanied the production of Don Pasquale after Donizetti's return to Paris in 1843. Soon after this event the first signs of a fatal diseas:, caused to a great extent by overwork, began to show them- selves, The utter failure of Don Sebastian, a large opera produced soon after Don Pasquale, is said to have hastened the catastrophe. A paralytic stroke in 1844 deprived Donizetti of his reason; for four years he lingered on in a state of mental and physical prostration. A visit to his country was proposed as a last resource, but he reached his native place only to die there on April Ist, 1848. The sum total of his operas amounts to 64, the more important of which have been mentioned in the course of this

notice, The large number of Donizetti's works at the same time accounts for many of their chief defects. His rapidity of working made all revision impossible. It is

said that he once wrote the instrumentation of a whiole opera within thirty hours, a time hardly sufficient, one would think, to put the notes on paper. And yet it may be doubted whether more elaboration would have essentially improved his work; for the last act of the /avorita, infinitely superior to the preceding ones, is also said to have been the produet of a single night.

DONNE, Joun (1573-1631), poet and divine of the reign of James I., was born in London in 1573 of Catholic parents. His father was a wealthy and influential merchant, a Welshman by descent ; his mother claimed relationship with Sir Thomas More and Heywood the epigrammatist. Brought up under a tutor at home until his tenth year, he proceeded to Oxford, and was entered at Hart Hall about 1583. At the university his learning was extraordinary, and he was compared, for juvenile erudition, with Pico della Mirandola. In 1587 he was removed to Trinity College, Cambridge, but he took no degree there or at Oxford, his seruples asa Catholic standing in the way. In 1590 he went up to London and was admitted into Lincoln's Iun. His father presently died, and left his son £3000. Until le came of age, he was under his mother's care, and it is supposed that this was the period to which he refers in Psewdo-Martyr, in which an increasing convic- tion of the truth of Protestantism streggled with the old faith and the familiar surroundings, Walton has given an interesting account of Donne's change of faith, which probably took place about 1592. Before this he must have been writing, for many of the Divine Poems, and of these not the worst, are obviously written by a sincere Catholic. The rebound from Catholic asceticism was a severe trial to an ardent nature ; it seems that he plunged into various excesses, and that his father's legacy was rapidly squandered. In 1593, however, he had already laid the foundation of his poetic reputation. The first three of his famous Satires exist ina MS. dated 1593, and the rest appear to have been composed at various times before 1601. In 1594 he commenced his travels, wandering over Europe, and accompanying the earl of Essex at the taking

of Cadiz in 1596, and again in the expedition of 1597. It

has been thought that he was engaged in military service in Holland in 1596, He did not return to England until he had seen Italy, and was planning an excursion into Palestine, when the difficulty of travelling in the East diverted his thoughts to Spain. In both Italy and Spain he took considerable pains to master the language and existing literature of each country, as the notes to his works testify. It is possible that the fantastic Spanish school of conceits, which takes its name from Gongora, may have affeeted the stylo of Donne. Returning to

afterwards Lord Chancellor Ellesmere, who appointed him his chief private secretary, and took so much delight in his company and conversation that he made him lodge under his roof. The young poet was five years in Egerton's house, with every prospect of a successful career. He had the misfortune, however, to fall in love with the daughter of Sir George More of Loxly, lord lieutenant of the Tower, who was visiting in the house. Donne's love was returned, but her father violently objeeted. Recalling her to Loxly, he was enraged to find that the young couple had already been privately married. In his anger, Sir George More not only persuaded Lord Ellesmere to dismiss his secretary, but threw Donne, with his friend Christopher Brooke, the poet, who had given the bride away, into prison. They were soon released, but the father was inexorable, and the young couple would have suffered from penury if it had not been for the generosity of Sir Francis Wooley, who invited them to reside at his house. During these later years Donne had written much in prose and verse. He had completed his Satz7es, and in 1601 he had written his extra- ordinary poem of Zhe Progress of the Soul, which De Quineey has so warmly praised. In 1602 ten sonnets, addressed to Philomel, were printed in Davison's Poetical Ithapsody. It is probable that many of his miscellaneous elegies and lyrics date from the same period of early man- hood. Among his early works, too, we know was the singular treatise called BuaOdvaros, in praise of suicide, of which he was afterwards ashamed, and which was not printed until long after his death, in 1648. The early follies of his career were now, however, played out, and his temperament was become so grave and earnest that it attracted the attention of Morton, afterwards bishop of Durham, who was staying in the house of Sir Francis Wooley in 1607, and who offered the poet certain preferment in the church, if he would only consent to take holy orders. Donne, however, had conscientious seruples against taking such a step. His generous patron soon after died, and the Donnes took a house at Mitcham, where they resided for. two years. It was here that in 1610 he published his prose work against the Catholics, Pseudo-Martyr, and in 1611 a still more bitter polemical treatise, Zynatius his Conclave. In 1611, moreover, appeared Donne's first poetical work, Zhe Anatomy of the World, of which revised and enlarged editions appeared in 1612, 1621, and 1625. This was but a pamphlet, how- ever. He was urged by Sir Robert Drury to come with his wife and their eleven children to reside in his mansion in Drury Lane ; after some demur this offer was accepted, but when, almost immediately after

their arrival, Sir Robert desired Donne to travel on the Continent with him, Mrs Donne, who was in feeble health, strongly objected. It seems almost certain that this objection caused him to com- pose one of his loveliest poems— Sweetest Love, I do not go For weariness of thee.

He permitted himself to be persuaded, however, and aceompanied his patron to Paris, where he is said to have had a vision of his wife, with lier hair over her shoulders, bearing a dead child in her arms, on the very night that Mrs Donne, in London, was delivered of a still-born infant. This was in 1612. In 1613 he published An Hlegy on the Death of Prince Henry. Efforts were made to gain him preferment at court, but James I., who had conceived a high opinion of Donne's theological gifts, refused to give him a single post out of the church. The poet's scruples were at last removed, and in 1614 he preached in orders before the king at Whitehall. Within asingle year fourteen good livings were offered to him ; but he refused them all, simply aecepting the post of lecturer at Lincoln's Inn. In 1617 the death of his wife was a blow under which hig health

so far suffered that he was persuaded by his friends to go abroad, and to spend more than a yearin Germany. In 1619 he returned, with the expectation of the deanery of Can- terbury. This he did not gain, but in 1620 he was appointed dean of St Paul's. To the kindness of the earl of Dorset he owed the vicarage of St Dunstan inthe West. In 1624 he was elected prolocutor to Convocation, and the same year was attacked by an illness that threatened to prove immediately fatal, but from which he rallied. He continued in feeble health for some years, and preached for the last time before Lent 1630, an oration which the king called "the Dean's own funeral sermon," and which was printed, under the title of Death's Duel, in 1632. On the 31st of March 1631, he died, having previously wrapped himself in his winding sheet to have his portrait taken, He was buried in St Paul's cathedral. Very few of Dr Donne's writings were published during his life- time. It is sup- posed that an edition of the Satires may have been printed before the close of the 16th century, but if so, it has entirely disappeared. His poems were first collected in 1633, and afterwards in 1635, 1639, 1649, 1650, 1654, and 1669, of which editions the second and last appear to be

tolerably trustworthy. Of his prose works the Juvenilia appeared in 1633; the LXXX. Sermons, with an admir- able life of the author by Izaak Walton, in 1640; the Essays in Divinity in 1650; and the Letters to Several Persons of Honour in 1651. No very excellent modern biography of the poet or edition of his works has been issued. Dr A.B. Grosart's privately printed edition of the poetical works is very complete.

It is singularly difficult to pronounce a judicious opinion on the writings of Donne. They were excessively admired by his own and the next generation, praised by Dryden, paraphrased by Pope, and then entirely neglected for a whole century. The first impression of an unbiassed reader who dips into the poems of Donne is unfavourable. He is repulsed by the intolerably harsh and crabbed versification, by the recondite choice of theme and expression, and by the oddity of the thought. In time, however, he perceives that behind the fantastic garb of language there is an earnest and vigorous mind, an imagination that harbours fire within its cloudy folds, and an insight into the mysteries of spiritual life which is often startling. Donne excels in brief flashes of wit and beauty, and in sudden daring phrases that have the full perfume of poetry in them. Some of his lyrics and one or two of his elegies excepted, the Satires are hig most important contribution to literature. Thicy are probably the first poems of their kind in the language, and they are full of force and picturesqueness. Their obscure and knotty language only serves to give peculiar brilliancy to the not uncommmon passages of noble perspi- cacity. To the odd terminology of Donne's poetic philo- sophy Dryden gave the name of metaphysics, and Johnson, borrowing the suggestion, invented tlie title of the meta- physical school to describe, not Donne only, but all the amorous and philosophical poets who succeeded him, and who employed a similarly fantastic language, and whio affected odd figurative inversions. (E, W. G.)

DONOVAN, EpwarbD, naturalist, was author of many popular works on natural listory and botany. In 1792 appeared the first voluine of his Vatwral History of British Insects, which extended to sixteen volumes, and was com- pleted in 1816. Although now superseded, this compila- tion did good service in its time. During the same period Donovan published Watural Histories of British Burds,

in 10 vols. 8vo. (1799-1819), of British Fishes, in 5 vols. |

(1802-1808), of British Shells, in 5 vols. (1800-1804), a series of illustrated works on The Insects of India, China, New Holland, &c., in 3 vols. 4to (1798-1805), and Excursions in South Wales and Monmouthshire (1805).

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To these works must be added his periodical entitled The Naturalists Repository, a monthly publication, of which three volumes were completed (1823-1825), and an Essay on the Minute Parts of Plants in general. Donovan was author of the articles on natural history in Rees's Cyclopedia. Inhis old age this hard-working student and writer published a Memorial respecting my Publications in Natural History, in which he complains of the small profits accruing to him from the sale of his books. We have searched in vain for any biographical particulars of Donovan,—the only facts apparently recorded being that he was a fellow of the Linnean Society, and that he died in London, February 1, 1837.

DORAT, JEAN. See Daurat.

DORCHESTER (the Durnovaria of the Romans), a parliamentary and municipal borough and market town of England, capital of the county of Dorset, situated on an eminence on the right bank of the Frome, 8 miles N. of Weymouth, and 120 miles from London by the old coach road, but some 20 miles farther by = railway. It stands within a wide open tract of land, containing 3400 acres, held under the duchy of Corn- wall, called Fordington Field. It is Ria governed by a mayor, four aldermen, WG and twelve councillors, and returns one member to parliament. The el; rag population of the borough in 1871 en was 6915; the area 635 "acres, The Seas 08 DEE town, consisting chiefly of tliree spacious streets, is neat and pleasantly situated, and is nearly surrounded by fine avenues. St Peter's church is an ancient edifice in the Perpendicular style, containing some curious monu- ments. The grammar school has two exhibitions to St John's College, Cambridge, and one to each university. Of the other public buildings the principal are—the town-hall, with market-house, shire-hall, county prison, and county hospital; there is also a small county museum, containing many local objects of mucli interest. The cavalry barracks in the

vicinity may also be noticed. There are also several almshouses and other charities, and a savings-bank. Market-days, Wednesday and Saturday. The woollen manufacture of Dorchester was once consider- able, and it was noted also for its ale, of which there are still some popular breweries. It is a place of considerable trade, and large sheep and lamb fairs are held there annu- ally. The borough includes four parishes—All Saints, St Peter's, Holy Trinity, and Fordington. In the vicinity there are some interesting Roman remains, including an amphitheatre, the most perfect of its kind in England. The seats for the spectators are formed of masses of chalk, rising 30 feet above the arena. This amphitheatre when perfect is supposed to have been capable of accommodating 13,000 spectators. The camp called Poundbury, to the N.W. of the town, is probably Roman, and well worthy of examination. Durnovaria was one of the principal stations in England of the Romans, by whom it was surrounded with a wall and fosse, part of the former being still stand- ing. Here Judge Jeftreys's " bloody assize" was held in Sep- tember 1685, when 292 prisoners were sentenced to death,

DORDOGNE, an inland department in the S.E. of France, taking its name from the river which traverses its centre from east to west, and formed from nearly the whole of Périgord, a part of Agénais, and small portions of Limousin and of Angoumvis. It is bounded on the N. by Haute Vienne, W. by Charente and Charente Inférieure, S.W. by Gironde, S. by Lot-et-Garonne, and E. by Lot and Corréze, and lies between 44° 45' and 45° 42' N. lat., and from 0° 1' 51" to 1° 26' 49" W. long. Its surface is beautifully variegated, comprising small mountains, -—some

of which are covcred with vines and crowned with. wood, and others rocky and barren, —large plateaus, and a few pleasant valleys. In the north it is wild and sterile, and in the west is covered with forests of pine, but the splendid valley watered by the Dordogne is rich in vines, fruit trees, and cereals. The climate is generally agreeable and healthy, but rather humid, especially in the south. Dordogne is watered by 11 rivers and more than 600 streams, all tribu- taries of the Dordogne except the Bandiat and the Dropt. The Dordogne itself is formed by the union of two moun- tain streams, the Dor and the Dogne, which rise in Mont d'Or, Puy-de-Déme, and unite after

a short course. Sufficient corn is grown in the department for home consumption. The cultivation of the vine occupies about a tenth of its surface, and its red and white wines are in high repute. Its truffles are considered the best in France. In the forests the prevailing trees are the oak and chestnut. The fruit of -the latter is much used both as food by the people and for fattening hogs. The walnut is extensively cultivated for making oil. Dordogne is rich in various kinds of minerals; iron is very abundant, and there are found also copper, lead, manganese, coal, marble, alabaster, lithographic stones, lime of gypsum, &c. The chief branches of industry are the working in metals, particularly iron and steel, the manufacture of paper, and boat-building ; but there are also produced coarse woollens, serges, leather, earthenware, hosiery, vinegar, brandy, and liqueurs. Dordogne is divided into the arrondissments Périgueux, Bergerac, Nontron, Riberac, and Sarlat, with 47 cantons and 582 communes. The chief town is Périgueux. The total area is 8545 square miles, and the population in 1872 numbered 480,142.

DORIA, Anprea (1466-1560), the famous Genoese admiral, was born at Oneglia in 1466. He belonged to a noble family, several of whose members, both before and after his time, distinguished themselves in the history of Genoa. Having lost both his parents in his youth, he embraced the military profession, and served in the papal guards and under various princes of Italy. It was not until le was fifty years of age that he entered into the service of Francis I. of France, who gave him the command of his fleet in the Mediterranean. In this position he preserved that spirit of independence which is so natural to a sailor and arepublican. When the French attempted to render Savona, long the object of jealousy to Genoa, its rival in trade, Doria remonstrated strongly against the measure ; this irritated Francis to such a degree that early in 1528 he ordered his admiral Barbesieux to sail for Genoa, then in the hands of the French troops, to arrest Doria, and to seize his galleys. Doria, however, retired with all his galleys toa place of safety, and closing with the offers of the emperor Charles V., returned his commission to Francis, and hoisted the imperial colours. To deliver his country, now weary alike of the French and the imperial yoke, from the dominion of foreigners, was Doria’s highest ambition ; and the favourable moment had presented itself. Genoa was afflicted with the pestilence, the French garrison was il paid and greatly reduced, and the inhabitants were

sufficiently disposed to second his views. Before the close of the same year (1528) he sailed to the harbour with thirteen galleys, landed five hundred men, and made him- self master of the gates and the palace with very little resistance. The French governor with his feeble garrison retired to the citadel, but was soon forced to capitulate ; upon which the people speedily levelled the citadel with the ground. Itwas now in Doria's power to have declared himself _the sovereign of his country; but, with a magnanimity of which there are few examples, he assembled the people in the court before the palace, disclaimed all pre-eminence, and recommended to them to settle what form

of government they chose to establish, The people, animated by his spirit, forgot their factions, and fixed, with his approval, that republican form of government which, with little variation, subsisted until 1815 His dis- interested patriotism won for him the appointment of censor for life and the title " Father and Liberator of his Country." Doria afterwards cngaged in an expedition against the Turks, from whom he took Coron and Patras, He also co-operated with Charles V. in the reduction of Tunis and Goulette. In 1547 two successive attempts were made against his life by Fieschi and a Genoese emigrant of the name of Giulio Cibo. He resigned his command in 1556, and died at Genoa in November 1560, being then ninety-four years of age.

DORIANS, the name by which one of the two foremost races of the Hellenic or Greek people was commonly known, the other being the Ionic. These two races, if the term may here be rightly used, stand out in marked con- trast, as exhibiting different types of character, which have their issue in different modes of thought and forms of government. But when from a consideration of their political and intellectual development we endeavour to work our way backward to the origin and early history of these races, we find ourselves confronted by traditions which show little consistency, or which even exclude cach other. The writer who speaks with the greatest confidence on this subject is the perfectly truthful man who well earned his title to be known as the father of history ; but Herodotus, although thoroughly to be trusted as to all that he relates from his own experience,

could not rise much above the standard of his age in dealing with alleged matters of fact, nor could he see that the eking out of theory by conjecture is an illegitimate process Herodotus then, in speaking of the Athenians and Spartans as standing at the head severally of the Dorian and Ionian races, states positively that the Ionian was a Pelasgic, the Dorian a Hellenic people ; that the former had always been stationary, while the latter had many times changed its abnde. In the time of Deucalion, he asserts, the Dorians, or rather the tribe or tribes which were afterwards to be called Dorians, inhabited Phthiotis, by which he probably understands the southern portion of the great Thessalian plain. After- wards, under their eponymus Dorus, they occupied Histizotis, which he describes as the region under Ossa and Olympus. They had thus migrated from the most southerly to the most northerly parts of the great plain which is drained by the Peneius. The next migration was to the highlands of Pindus, the chain which runs down at right angles from the Cambunian range, or the westward extension of Olympus. Here, he says, they were known not as Dorians, but as Macedonians. A later southward migration brought them into Dryopis, whence they made their way into the Peloponnesus, and it would seem were then only first known as Dorians (Herod. i. 56).

If we examine the statement thus boldly advanced, we shall find at each step that the ground becomes more uncertain. We may indeed, in order to explain it, assume that the Pelasgic race was closely akin to the Greek, and that their language stood midway between the Hellenic and the Latin; but if we do so we are reasoning strictly from the point of view of modern philology, and really abandoning that of Herodotus, who says that, if he may judge from the Pelasgian populations which he found at Placia, Scylace, and Creston, the Pelasgians generally must have spoken a barbarous dialect, 7.¢., a dialect unintclligible toa Greek. He is thus driven to assuine, first, that the Attic tribes had”been Pelasgic before they became Hellenic, and that the change was accompanied by a change of language (Herod. i, 57). isewhere (ii. 51) he speaks of the Athenians as being already Greek cr Hellenic before

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the Pelasgians became their neighbours, and adds that the latter came in time to be reckoned Hellenic also. We thus see, without going further, how vague and misty were the notions of {Herodotus; but we have to note further that the account here given of the Dorians and Ionians is said t» apply to the time of Croesus, and thus, down to his age, the Ionians had been stationary in their original abodes, these abodes in his day being assuredly not in the Peloponnesus. Yet he can assert elsewhere that the Peloponnese had been their original home, and that they lad been expelled from it by the Achaians (i. 145), But, apart from the fact that the poets of the Ziad and the Odyssey know nothing of any cxpulsion of Ionians from Peloponnesns, the difficulties are increased if we betake ourselves to the tribal genealogies which the Greeks regarded as undoubtcdly historical documents. We have then, on the one side, the assertion that the Ionians were originally non-Hellenie and Pelasgian ; on the other, the Iapetid gencalogy speaks of Dorians, Achaians, Jonians, and Aolians, as being all sprung from Hellen,—Xouthus, theson of Hellen, being the father of Jon and Achaius. If, therefore, we were to argue from these data, we should have to conclude that, as the tribes just mentioncd were all Hellenic, and as the Tonians were Pelasgians, some Pelasgians at least were Hellenes. But the whole process would be deceptive, for as Ion and Achaius are here the sons of Xouthus, the Ionians would be expelled from the Peloponnesus by their nearcst brethren. It is, however, more important to note that the opinion of Herodotus respecting the Pelasgi was distinetly contradicted by another, which had the countenance of Strabo, Plutarch, and other writers. Strabo speaks of them as virtually nomadic tribes ; and the story even went that theyreecived their namc, Pelasgi=Pelargoi, or Storks, from their wandering habits. It is difficult to resist the inference of Sir G. Cornewall Lewis that this radical ineonsisteney in the views respecting the Pclasgians is a proof that they rest on no historical basis (Credibility of Harly Roman History, i. 282). Further, there is the extreme unlikeli- hood that the tribes afterwards known as Dorians should for a certain period have been ealled Macedonians, or rather, as Herodotus implies, that they should more than once change their name. The assertion that they were called Macedonians involves a fresh contradiction, for else- where Herodotus asserts that the Macedonians were not Hellcnic at all, although they were governed by chiefs of genuine Greek descent, Nor is our position improved if we choose to prefer the statements of the genealogies in preference to those of

Herodotus or other historians, on the ground that the national tradition by which these genealogies were handed down must be trustworthy, for the descent in one genealogy is often directly contradicted by that of another, and not unfrequently, and indeed even gencrally, the genealogy betrays the nature of the materials from which it has been made up. ‘Thus, for instance, Dorus, the eponymus of the Dorians, has as his sister Protogencia (the Early Dawn), who, being wedded to Zeus, the god of the gleaming heaven, becomes the mother of Aéthlius, the toiling sun, who is the father of Endymion, that is, of the sun-god who sinks to sleep in Latmus, the land. of forgetfulness. Finally, we have to note the fact that, in the Hellenic world as elsewhere, tribes bearing the same name were found separated by great distances ; and in such cases traditions always sprang up, not merely asserting their connection, but accounting for it. Thus they found Achaians in Thessaly and Achaians in the Peloponnese ; and it was said, not merely that the former passed south- wards across the isthmus of Corinth, but that they were led by the barbarian Pelops from Phrygia. The same process connected the Peloponnesiav Dorians with the

Dorian clans who dwelt between Cita and Parnassus, and spoke of the latter as the stock from which the Spartans sprang, to the great benefit of the insignificant elans, who thus acquired a foremost rank in the Hellenic world.

AN that we can do, then, is to bring together the genealogies which refer in any way to Dorus and his supposed descendants the Dorians, and then gather from historians aud geographers the various regions in whieh Dorians were found during ages which may reasonably be regarded as historical, The result of the former process will scarcely appear satisfactory. We have noticed one genealogy which represents Dorus as the son of Hellen ; but in the Etolian genealogy he is the son of Apollo and Phthia, and is slain by Aitolus in the land which from him was called Etolia (Grote, Hist. Gr., i. 140). The great tradition which connects the Dorians of the Peloponnesus with their more noteworthy namesakes is the legend which relates the return of the Heraclids, or descendants of Hercules, who, after the death of that hero, had been compelled to take refuge in Athens. Hyllus,

in his exile, is adopted by the Dorian king Agimius, the father of Pamphylus and Dymas, who with Hyllus become the eponymi or name-givers of the three tribes found in Dorian communities generally, and known as Hylleans, Pamphylians, and Dymanes, Hyllus being more particularly illustrious as the forefather of Eurysthenes and Proeles, the progenitors of the two houses from which the Spartan kings were always elected. But this legend, like the rest, was variously related, and, aceording to the version of Plato, the return of thé Heraclids would be rather a return of the Achaians to the Peloponnesus.

We cannot, however, question the fact that the Dorian race was widely extended, that it was found, like the Ionians, in various portions of the Hellenic world, separated by considerable distances of land or sea, and that the people who bore this name were singularly active in the work of colonization. They are found not only in all parts of the Peloponnese but in the islands of the Agean, and on the coasts of Asia Minor ; and from the foremost Dorian cities went forth, it is said, the colonists who were to carry the Hellenic name and Hellenic culture far to the east and the west. Thus Corinth became the mother eity of Corcyra and Syracuse, and from these sprang Epidamnus, Camarina, Ambracia, Potidzea. The Dorians of Crete and Rhodes sent forth the settlers of the Sicilian Gela, and Gela in turn be-eame the parent of the mighticr Acragas, or Agrigentum, while to Megara is assigned the origin of Byzantium, the future home of Roman Caesars and of Ottoraan Sultans. These several communities exhibit a general likeness in their dialect, their art, and their polity. Their civilization assumed a magnificent phase in the splendour of Corinth and the great Dorian cities of Italy aud Sicily. Their powers of resistance were attested by the success with which their colonies were planted in regions occupied by powerful and hostile tribes, who failed to overthrow them simply because they lacked the Dorian power of cohesion. Yet vith the Dorians this power was subjected to strictly defined bounds of action. All Dorian cities might feel a pride in belonging to the great Dorian stock, and the parent city might claim certain prerogatives in its colonies ; but each city was for them nevertheless an absolute unit, with whose independence no other city had any right to interfere, even though this interference might have for its object the establishment of a pan-Hellenic union, Any movements in this direction were sure to rouse the keenest and most persistent opposition of the Dorian

Greeks ; and thus we can understand the natnre of the quarrel which was fought out between Sparta and Athens, aud which ended in the ruin of the great Ionian city, whose imperial rule must otherwise have checked, and may perhaps have rooted out,

this fatal instinct of isolation. Th Spartans, who stood at the head of the Dorian portion of the Greek world, are recarded by K. O. Miiller, in his History of the Dorians, as exhibiting in their institutions and government the true type of the race, This theory is strenuously combated by Grote, History of Greece, pt. ii, ch. 6; and at the least it must be said that if they displayed the true Dorian type, that type must have been completely lost among all the other Dorian tribes, The Spartans occupied Laconia strictly as an army of occupation, and carrying out inflex- ibly their rigid system, they opposed an uncompromising resistance, not only to luxury, but generally to art, refine- ment, and speculation (Cox, Mistory of Greece, i. 72). No such condition of things is found even in Crete, from which Sparta was supposed to have derived her special institutions. Not only is their reputation as models of Dorism altogether undeserved, but it probably would have been exceedingly distasteful to the countrymen of Leonidas, Archidamus, and Agesilaus. (a. w. ©.)

DORIS, the name which, in the time of Herodotus and later writers, designated the little territory which lay to the south-west of the Malian Gulf, and between the rauges of (ta and Parnassus, bounded by the lands of the Phocians ou the east, of the Etoliaus on the west, of the Malians and Epicnemidian Locrians on the north, and of the Ozolian Locrians on the south, the whole being barely thirty miles in length by ten at its greatest width. The inhabitants were divided into the four townships of Boion, Cytinion, Erineus, and Pindus. Of their history down to the time of the invasion of Xerxes we know nothing, and probably they had none; nor is there more to be said than that they then consulted their interests by submitting to the Persian king. This confederacy of four little townships was honoured by the Spartans as their metropolis, or the home from which the Dorians had come who achieved the con- quest of the Peloponncsus—a tradition which has been noticed in the article Dor1ans, The political

insignificance of Doris is to be ascribed to the fact that it had no sea- board. The only other Greek communities in like plight were those of Arcadia or the Peloponnesian highlands, and both Doris and Arcadia remained far in the rear of Hellenic development generally.

DORKING, a market town of West Surrey, England, situated on a small brook, a tributary of the Mole, 29 miles S. of London by rail. The town is well built and clean, and occupies a picturesque position in a sheltered vale near the base of Box Hill. The parish church of St Martin's is a handsome edifice rebuilt in 1873; and St Paul's district church, erected in 1857, is a building of some pretension. Lime of exceptionally good quality is burnt to a large extent in the neighbourhood, and forms an important article of trade; it is derived from the Lower Chalk formation, Dorking has long been famous for a fincly-flavoured breed of fowl, distinguished by their having five claws. Several elegant mansions are in the vicinity of the town, notably that of Deepdene, containing a gallery of sculpture collected here by the late Thomas Hope, the author of Azastastus. The Noman road which crossed from the Sussex coast to the Thames, passed close to Dorking. The population of town is about 4800; that of parish in 1871 was 8567.

DORLEANS, Louis, (1542-1629), a minor French poet and political pamphleteer, and a prominent partisan of the Catholic League, was born in 1542, probably at Paris, though one of his biographers states that Orleans was his birthplace. He studied under Jean Daurat, and after taking his degree in law began to practise at the bar with but slight success. He added little to his reputation by writ- ing indifferent verses, and it was not until the League had taken the daring step of arresting the royalist members of parliament, that he was brought into prominence by being

appointed its advocate-general. He maintained the position and claims of the League in language that was always strong and often insolent, going so far as to express regret that the king of Navarre und the prince of Condé had not been assassinated. He was, however, courageous enough to intercede with the duke of Mayenne for the inhabitants of Paris, but without effect. After this failure he con- tinued the publication of violently-worded pamphlets in- tended to render the accession of Henry impossible. One of these, Le Banquet et Aprés-dinée du Conte d' Arete, in which he accused

Henry of insincerity in his return to the Roman Catholic faith, was so scurrilous as to be dis- approved of by many members of the League, Whien Henry at length entered Paris, Dorléans was among the number of the proscribed. He took refuge in Antwerp, where he remained for nine years, At the expiration of that period he received a pardon, and returned to Paris, where he had uot been long before he was imprisoned for sedition. The king, however, ordered him to be set free after he had been three months in the Conciergerie, and this generous conduct had the effect of attaching him ever afterwards to the cause of Henry. His last years were passed in obscurity, and he died in 1629 at the age of eighty- seven. Dorléans's political pamplilets are now exceed- ingly scarce. His chief poem, Jenaud (Paris, 1572), is a poor imitation or translation of part of the Orlando Furioso.

DORMOUSE, the common name of a family of small rodents (Myoxidw), generally regarded as intermediate be- tween mice and squirrels. It contains 12 species, distributed over the temperate parts of the great Palearctic region from Britain to Japan, and throughout the greater portion of Africa. The Common Dormouse (M/yoxus avellanarius) occurs in most parts of Europe, and is the only species found in Britain, It is an active little creature, measuring about three inches long, with a thick bushy tail of nearly similar length, Its posterior legs are slightly longer than those in front, and both fore and hind feet form pre- hensile organs, whereby the dormouse climbs along the twigs of the low bushes among which it lives, and in which it builds a neat round nest formed of leaves, It is a shy and timid animal, choosing the recesses of woods for its habitation, and seldom showing itself by day; in confine- ment, however, it is readily tamed and becomes very familiar. It feeds, as its specific name implies, on hazels, and is also partial to berries, haws, and grain, These it eats, either sitting on its haunches or suspended by its hind feet, and holding them between its forepaws like a squirrel. In autumn it grows very fat, and lays up a store of food for winter use,—retiring at the commencement of the cold season to its nest, and curling itself up into a ball, when it becoracs dormant. A warmer day than usual restores it to temporary activity, and then it supplies itself with food from its autumn hoard, again becoming torpid till the advent of spring finally rouses it. Owing to this hybernat- ing habit it is known as the Sleeper, while tlie name dormouse has reference to the same peculiarity.

The young of the dormouse are generally four in number, and these, according to Bell, are produced twice a year. They are born blind, but in a marvellously short period are able to cater for themselves, and their hibernation begins later in the season than with the adult form. The fur of the dormouse is of a tawny colour above, and paler beneath, with a white patch on the throat. The Fat Dormouse (Myoxus glis) is larger than the British species, and is the one most commonly found in Southern Europe.

DORNBIRN, or Dornsifuren, a straggling but well- built township of Austria, in Tyrol, about six miles §, of Bregenz, situated on the right bank of a stream known as the Dornbirn Ach, which flows into the Lake of Con-

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stance. It has upwards of 8000 inhabitants, ranks as the principal market-place in the Vorarlberg, and carries on iron and copper smelting and the manufacture of cotton cloth and worked muslin.

DOROGOBUSH, a town of Russia in Europe, in the government of Smolensk, about 55 miles E. of the city of that name, on the banks of the Dnieper, in 54° 55’ N. lat. and 33° 17’ E. long. It has twelve churches, and still preserves its ancient earthen fortress, with its ramparts and ditch, within the precincts of which are situated the cathedral, the courthouse, and two victualling stores. Its manufactures are of no importance, but it maintains an extensive trade with various parts of Russia, and even with foreign countries, in tallow, leather,and hemp. First mentioned in 1300 as the object of a contest between Alexander of Smoijensk and Andrew of Viasma, Dorogobush continued through the 13th century to share in the vicissitudes of the neighbouring principalities, passed in the 15th successively into the power of the Lithuanians and the Poles, and was finally united with Russia in 1667. It was partially burned by the French on their retreat from Moscow. Popnlation in 1873, 7905, of whom only a very few are Catholics and Jews.

DOROGOI, or Doronor, a town of Roumania, in the northern part of Moldavia, about 80 miles north-west of Jassy, on the Shiska, a tributary of the Pruth. It has ubout 10,000 inhabitants, a large transit trade with the

products of Northern Europe, and several important annual fairs; but its buildings are of a poor description.

DOROTHEUS, a professor of jurisprudence in the law school of Berytus in Syria, and one of the three commis- sioners appointed by the emperor Justinian to draw up a book of Institutes, after the model of the Institutes of Gaius, which should serve as an introduction to tle Digest already completed. THis colleagues were Tribonian and Theophilus, and their work was accomplished in 533. Dorotheus was subsequently the author of a commentary on the Digest, which is called the Zindex, and was publishied by him in 542, Fragraents of this commentary, which was-in the Greek language, have been preserved in the Scholia appended to the body of law compiled by order of the emperor Basilius the Macedonian and his son Leo the Wise, in the 9th century, known as the Dasilica, from which it seems probable that the commentary of Dorotheus contained the substance of a course of lectures on the Digest delivered by him in the law school of Berytus, although it is not cast in a form so precisely didactic as the Jadex of Theophilus.

DORP, a town of Prussia, in the government of Diisseldorf, 17 miles north-east of Cologne, which, like Barmen and many other towns in the valley of the Wupper, has since 1849 rapidly grown into importance as a centre of manufacturing industry. Tobacco, paper, steel, and iron wares are the principal objects of its activity. In 1872 the population amounted to 10,689.

DORPAT, in German frequently Dorpt, in Russian Derpt or Yurieff, in Esthonian Tartoma, a city of Russia in Europe, in the government of Livonia, situated on both banks of the Embach, 157 miles north-east of Riga, in 58° 23’ N. lat. and 26° 23’ E.long. ‘The principal part of the town lies to the south of the river, and the more important buildings are clustered round the two eminences known as the Domberg and the Schlossberg, which, in the Middle Ages, were occupied by the citadel, the cathedral, the episcopal palace, the monastery, and the houses of the wealthier inhabitants. Owing to the great conflagration of 1777, the actual town is almost entirely of modern erection ; and its fortifications have been transformed into pro-menades. Besides one Roman Catholic, three Lutheran, and two Russian churches, a hospital, and an orphanage,

veterinary institute founded in 1846, the economical society of Livonia, an Esthonian learned society, and a medico- physical society, it possesses a famous university, with an observatory, an anatomical theatre, a botanical garden, and a library of about 250,000 volumes, which are housed in a restored portion of the cathedral, burned down in 1596,

This university, which renders the town the great intel- lectual centre of Livonia, preserves the Teutonic tradi- tions of its earlier days, and is much more German than Russian in its culture. It was founded by Gustavus Adolphus in 1632; but in; 1699 teachers and students removed to Pernau on the advance of the Russians, and on the occupation of the country by Peter the Great again took flight to Sweden. In spite of the stipulation of the treaty of 1710 and the efforts of the Livonian nobles, it was not till 1802 that its restoration was effected under tlle patronage of Alexander I.; but since that date its history has been one of considerable prosperity. It possesses 42 ordinary professors, a total teaching staff of 73 members, and upwards of 800 students. The astronomical department is especially famous, owing partly to the labours of Otto Struve, and partly to its possession of Frauenhofer's great refracting telescope, pre- sented by the emperor Alexander]. The manufacturing industry of the town is very slight, but it carries on a good trade, and has six great markets in the year. Population in 1873, 20,780.

The foundation of Dorpat is ascribed to the grand duke Yaroslaff I., and is dated 1030. In 1228 the{town was seized by the Teutonic Knights, and in the following year Bishop Hermann erected a eathedral on the Domberg. From that date till about 1559, the greatest prosperity was achieved under the patronage of the inde- pendent episcopal see, and the population reached as high as 50,000. In 1559, the town was eaptured by the Russians under Peter Ivan Shiuski, but in 1582 it was yielded by treaty to Stephen Bathori of Poland. In 1600, it fell into the hands of the Swedes, in 1603 reverted to the Poles, and in 1625 was 'seized by Gustavus Adolphus. The Russians again obtained possession in 1666, but once more yielded before the Swedes, and did not effeet a permanent oeeupation till 1708. In 1708 the bulk of the population was removed to the interior of Russia ; but before

long the town began to receive better treatment from the victors, and when in 1777 it suffered so severely trom the eonflagration already mentioned, it obtained valuable assistance in the work of restoration from Catherine II.

D’ORSAY, ALFRED GUILLAUME GABRIEL, COUNT (1798-1852), a celebrated leader of society in Paris and London, who added to the attractions of dandyism those of high intellectual and artistic gifts, was born at Paris in 1798. He was the son of General D’Orsay, from whom he inherited the exceptionally handsome person which contributed so much to his social success. Through his mother he was grandson by a morganatic marriage of the king of Wtirtem- berg. In his youth he entered the French army, and served as a garde du corps of Louis XVIII. In 1822, while stationed at Valence on the Rhone, he formed that acquaintance with the earl of Blessington and his family which affected the whole course of his future life. The acquaintance quickly ripened into intimacy, and at the invitation of the earl he accompanied the party on their tour through Italy. In the spring of 1823 he met Lord Byrou at Genoa, and the published correspondence of the poet at this period contains numerous references to the count’s gifts and accomplishments, and to his peculiar relationship to the Blessington family. A diary which D’Orsay had kept during a visit to London in 1821-2 was submitted to Byron’s inspection, and was much praised by him for the knowledge of men and manners and the keen faculty of observation it displayed. On the 4th December 1827, Count D’Orsay married Lady Harriet Gardiner, a girl of fifteen, the daughter of Lord Blessington by his first wife. The union, if it rendered his connection with the Blessington family less ostensibly equivocal than before,

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was in other respects an unhappy one, aud a separation took place soon after the death of Lord Blessington, which occurred in 1829. When the widowed countess returned to England she was accompanied by Count D’Orsay, and the two lived under the same roof, first at Seamore Place and then at Kensington Gore. Their house soon became a resort of the

fashionable literary and artistic society of London, which found an equal attraction in host and in hostess. The count's charming manner, brilliant wit, and artistic faculty were accompanied by benevolent moral qualities, which endeared him to all his associates. His skill as a painter and sculptor was shown in numerous por- traits and statuettes representing his friends, which were marked by great vigour and truthfulness, if wanting the finish that can only be reached by persistent discipline. Count D'Orsay had been from his youth a zealous Bonapartist, and one of the most frequent guests at Gore House was Prince Louis Napoleon. It was to Paris, there- fore, that he naturally resorted in 1849, after the breaking up of the establishment at Gore House in consequence of his bankruptcy. The countess of Blessington, who had accompanied him, died a few weeks after their arrival, and he endeavoured to provide support for himself by adopting the profession of a portrait painter. He was deep in the counsels of the prince president, but the relation between them was less cordial after the coup d'état, of which the count had by anticipation expressed his strong disapproval. His appointment to the post of director of fine arts was announced only a few days before his death, which occurred on the 4th August 1852.

Much information as to the life and character of Count D'Orsay is to be found in Madden's Literary Life and Correspondence of the Countess of Blessington (1855).

DORSET, an English county, situated on the south- western coast. In British times, previous to the land- ing of Cesar, it was inhabited by a tribe which Ptolemy calls the Durotriges, and which, upon no good authority, but not without probability, has been identified with the Morini, the occupants of a part of the opposite coast (extremi hominum Morini, din. viii. 727), the two appellations being apparently of similar import, and refer- ring to their location on the sea-shore. Under the Romans this county constituted a portion of Britannia Prima ; and the Saxons called it Dornszeta, or Dorseeta (a word in- volving the same root, Dwr, water), and included it in the kingdom of Wessex.

On the north Dorsetshire is bounded by Somersetshire and Wiltshire, on the east by Hampshire, on the west by Devonshire and a part of Somersetshire, whilst the British Channel washes the whole of its southern coast. Its form

is very irregular ; the northern boundary has a considerable angular projection in the middle ; its southern coast runs out into various points and headlands; and the western inclines towards Devonshire with an uneven line. Its greatest breadth from north to south is about 35 miles, and its length from east to west 55. Its circumference, including 627,265 acres, is nearly 160 miles. In 1871 the population was found to be 195,537,—having in- creased from 114,452 in 1801 and 175,054 in 1841. 111,731 acres were under corn-crops, and 60,633 under green-crops. ‘The males numbered 95,616, the females

99,921

Dorset is divided into 35 hundreds, containing more than 300 parishes, 8 boroughs, 22 liberties, and 12 market towns, the principal of which are Dorchester, Bridport, Sherborne, Lyme-Regis, Shaftesbury, Weymouth and Melcombe-Regis, Poole, and Blandford. Only 10 members are returned to parliament, instead of 20 as before the first Reform Act. The county itself sends three ; Dorchester, Bridport, Poole, Shaftesbury, and Wareham one each, and

Melcombe-Regis and Weymouth two between them, Dorsetshire forms a part of the see of Salisbury. It originally fell under the wide jurisdiction of the ancient sees of Dorchester in Oxfordshire and of Winchester, till the foundation of the bishopric of Sherborne, 705 a.p., and when that see was transferred to Salisbury it still remained a part-of it, tillin 31st Henry VIII. it was annexed to the newly-erected bishopric of Bristol, and so continued till 1836, when its ancient connection with Salisbury was revived, and still continues.

Branches of the London and South-Western Railway, or in connection with it, enter the county from Southampton, Salisbury, and Bath, meet near Wimborne, and continue to Poole, Wareham, Dorchester, and Weymouth, which last two places are also reached by a branch of the Great- Western from Yeovil, with a drop-line to Bridport at Maiden-Newton. The main line of the London and South- Western likewise touches the north of the county near Shaftesbury, Gillingham, and Sherborne.

The surface of Dorsetshire is hilly and uneven. Throw- ing out for the present the consideration of the coast-line in Purbeck, Portland, and to the westward, and proceeding in the direction of from 8.E., to N.W., we find a descending series of formations, commencing from the Tertiaries, which occupy an almost equilateral triangle, and include the towns of Wareham, Poole, Wimborne, and Cranborne ; passing through a band of Chalk some ten or twelve miles in breadth, in which the chief town Dorchester and Blandford are situated, and which is fringed by a thin belt of Greensand ; and thence to the Oolitic beds in the north-east, and the Lias at Bridport and the south-west. The three systems thus roughly indicated have been popularly divided into the Sands, the Chalks, and the Clays. It is, of course, the last which has won for this county the somewhat exaggerated, and not uncontested, designation of “the garden of England ;” though the rich wide vale of Blackmore, ard the luxuriant pastures and orchards of the extreme wert may fairly support the claim. The Downs of the Chalk district, formerly so celebrated as sheep-walks, have been rapidly disappearing of late years under the influence of a more scientific system of agriculture, though still the stock of sheep pastured in the county amounts to between 500,000 and 600,000. Even in the sandy region, cultiva- tion is advancing, aud detached portions are improved, though there is still much waste land, dreary and barren, hardly supporting, even in the summer mouths, a few sheep and cattle, and supplying the scattered cottars with heath and turf for fuel. :

Dorsetshire is not generally speaking a _ well-wooded county, though much fine timber may be seen, not only in the richer and deeper soils, but likewise in the sheltered valleys of the Chalk district, and more especially upon the Greensand. The views from some of the higher hills, which constitute, as it were, the back-bone of the county, are often vastly extensive, ranging on many points from the Needles to the very utmost limit of the Mendip and Quantock Hills, where they sink into the Bristol Channel.

The Dorsetshire air is remarkably mild and salubrious, and in some suunier spots of the coast, such as Abbotsbury, even tropical plants are found to flourish, Weymouth has long been celebrated as a watering-place, and owing to the general calmness of the sea there, its pleasant situation, and

commodiousness for bathing, it still maintains con- siderable consequence. ‘The sea-side villages of Swanage, Lulworth, and Charmouth also, though more difficult of access, and affording less accommodation for visitors, abound with many quiet and enjoyable charms.

The chief port of the county is Poole, situated on an estuary formed by the mouth of the Frome. Its entrance is defended by Brownsea Castle,—not, however, a military

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fortress, but simply a castellated mansion,—and it is very secure in all winds. It was formerly the chief place for equipping ships for the Newfoundland fishery ; and a brisk trade was carried on from it with Spain, Portugal, and the Mediterranean; but it is now chiefly occupied with a coasting trade, and the export of potters’ clay. Swanage, Weymouth, Bridport, and Lyme have harbours capable of admitting small vessels only. The magnificent breakwater at Portland, of which the first stone was laid by Prince Albert in 1849, provides a harbour of refuge which is nearly land-locked, and a secure anchorage of almost unlimited extent, and of easy access to the largest class of vessels.

The principal rivers of Dorsetshire are the Frome, the Stour, the Piddle, and the Ivel. The Frome rises in the north-western part of the county, near Evershot, and passing by Dorchester, reaches Poole, and falls into its bay. The Stour enters this county from Wiltshire, near Gillingham, and, pursuing a southern and south-eastern direction, enters Hampshire. The Piddle rises in the north, and, flowing to the south-east, falls into Poole Bay. The Ivel, anciently the Yeo, has its origin from several springs near Horethorn, in a hill north-east from Sherborne, from which town it flows into Somersetshire, and falls into the Parret, near Yeovil.

Although neither coal nor any metallic ores have ever been found in Dorsetshire, the stone quarries of Purbeck and Portland have long been celebrated. Purbeck, though called an island, is more properly a peninsula, of an irregular oval form, about twelve miles in length and seven in breadth.

It consists, according to Mantell, of Cretaceous, Wealden, and Oolitic strata in their regular order of succes- sion, and highly inclined in their section towards Swanage Bay, where they are easily detected. At Handfast Point the chalk is discovered, its lower division dipping at a con- siderable angle ; then comes a layer of firestone, next gault, and then greensand—all inclined ; then, at Swanage Bay, a thick wealden bed; to the south of which are the Purbeck Hills, with their peculiar strata, and, a little further on, the Portland Oolite. The soil is-altogether calcareous, and for the most part a continuous mass of either white ora brownish limestone, the latter having a mixture of sea- shells. The quarries on the south side of the isle afford an inexhaustible fund of natural curiosities. The best quarries are at Kingston, Worth, Langton, and Swanage. The Swanage stone is white, full of shells, takes a polish, and looks like alabaster. All over the heaths, both here and on the mainland, blocks of indurated Tertiary grit, commonly called firestone, are found, and have been occasionally employed in the building of some of the neighbouring churches ; and at Downshay and Quar, in the parish of Worth, and elsewhere, the beautiful Purbeck marble, so conspicuous in the monuments and shafts of many of our cathedrals and finest churches of the 13th century, and now often sought for their restoration, has been exteusively quarried. One of the most valuable pro- ducts of Purbeck is a white clay used for making pipes, and very largely applied to the manufacture of china. Large quantities of it are dug, and many vessels loaded with it for Staffordshire in the port of Poole.

The Isle of Portland, as it is called, is also a peninsula, rising at its highest point, the Verne, to nearly 500 feet above the sea-level, and sloping gradually to near the water’s edge at its extreme southerly point, the Bill. Its famous quarries, about 100 in number, are scattered in all directions under heaps of rubble and unsaleable stone. They are Crown-property, and, except where the stone 1s taken for Governnient purposes, are leased to various firms, who pay a royalty of so much per ton. Some 50,000 tons are annually raised and exported. The stratum of stone

sk T ov that is worked for sale lies nearly parallel with the upper surface of the island, and without much earth or rubbish on it. The Portland stone (or freestone as it is sometimes called) is well known for its almost white colour, and as composing the materials of the most splendid erections in

London, as well as in other parts of the British empire. The connection of Portland with the mainland occurs at some 10 or 11 miles' distance, at Abbotsbury, where a most remarkable beach cf raised shingle, called the Chesil (Anglo-Saxon Ceosol) or Pebble Beach, touches the shore, being thus far separated from it by a narrow estuary, famous for its swannery, called the Fleet.

The entire length of the beach is from 16 to 18 miles, with an average height of about 40 feet, and a breadth of some 180 or 190 yards, the pebbles constantly decreasing in size from 1 to 3 inches in diameter at Portland, to the size of peas at its termination.

Agriculture throughout the county has made very important advances within the. last few years,—steam- cultivation and improved implements having been largely introduced, and the growth of root-crops abundantly stimulated by the use of artificial manures. The precarious crops of flax and hemp for the supply of the rope and twine works of Bridport are less cultivated than formerly. On the larger farms in the Chalk district a peculiar custom prevails of under-letting the dairies at so much per cow, the farmer finding the stock and the food, and the dairyman disposing of the produce. The horned sheep of Dorsetshire, long celebrated, have now become established as a useful and lucrative breed. Professor Bell, in his History of British Quadrupeds, gives a figure of this, as the typical English sheep, of " a handsome, though somewhat old- fashioned breed, principally esteemed for its producing lambs earlier perhaps than any other in this country." "To the eye of him who seeks for beauty in harmony and propro- tion (he adds) this sheep is one of the handsomest in any part of England. The strong well-formed body and limbs, the clear white fleece, the finely-curved horns, and other points will to him constitute a more pleasing combination of character than is to be found in those breeds which have become more changed from the old stock by repeated trans- mission of peculiarities, which, however advantageous to the breeder, whether for the sake of the fleece or the flesh, cannot be considered as adding to the abstract beauty of the animal." 'There are still many fine flocks of this characteristic breed existing in the county, though many farmers prefer the Southdowns or Hampshires, as better adapted to their particular holdings. There is a small breed in Portland,

which fattens too highly upon richer pastures, but the mutton of which is an especial dainty, weighing only about 8 ib a quarter.

The old hardy race of long-horned cattle, formerly common in the hilly districts, are fast disappearing, and Devons, short-horns, and Herefords are almost exclusively now bred. Great quantities of butter are sent to the London market. The skimmed-milk cheese is often much esteemed, though little of it is exported from the county.

Vast numbers of mackerel are taken near Abbotsbury, and along the shore from Portland to Bridport. The season for taking them is from the middle of March till'midsummer, in nets or seines.

The manufactures of Dorsetshire are not extensive. The principal are those of flax and hemp in the neighbourhood of Bridport and Beaminster, and of pottery and tiles in the district near Poole. Net-making, or braiding as it is called, and also gloving, are carried on in some of the villages ; but the manufactures of lace, and of thread- buttons, formerly flourishing at Blandford and elsewhere, may be said to be now entirely obsolete. At Sherborne these industries have been succeeded by extensive silk-mills.

Few, if any, parts of England possess a more abundant treasure of prehistoric remains, than are to be found throughout this county, though the march of agricultural progress inevitably tends to their obliteration. Vestiges of peaceful British occupation may constantly be traced on those portions of the Downs which are still uninclosed, whilst a series of magnificent hill-forts crown all the most prominent heights, and probably served as camps of refuge for the harassed tribes and their cattle in times of war and invasion. 'The grandest of these, called Maidun Castle, is supposed to be the Dunium of Ptolemy, the stronghold or Acropolis of the Durotriges, whose gigantic ramparts may be seen outlined against the sky between the Weymouth and Bridport roads, about two miles south from Dorchester. Its inner area covers about 44 acres, its outer area about 116, the difference being absorbed in its stupendous double, and sometimes triplc, entrenchments, some 60 feet high, and extraordinarily steep. Other grand examples of these hill- fortresses may be seen at Eggardun and Pilsdun to

the westward, at Chalbury and Flowers-barrow to the eastward, aud at Rawlsbury, or Bulbarrow, Hod (inclosing an equilateral Roman camp), and Hameldun, overlooking the valley of the Stour, and at Badbury, Woodbury, d&c., in the more central parts of the county. It has been conjectured with great probability that some of these last were among the oppida subdued in the expedition of Vespasian ; and it is not unlikely that in that remarkable chain of twmulz, or barrows, which are visible along the crest of the Ridgeway, now tunnelled for the lines of railroad which connect Weymouth and Dorchester, may have been deposited the ashes of certain nameless heroes who fought the battles either of invasion or resistance. Such barrows are widely distributed elsewhere through the county, and when opened have usually been found to contain little more than burnt bones, corroded metal, and rude cinerary urns, with occasional marks of subsequent Roman interments. A few monoliths, cromlechs, and stone circles have also been recorded.

Of the period of Roman occupation many relics exist. The Vea Iceniana, or Icknield Street, with various vicinal off-shoots, passes through the centre of the county, and connects its chief town Dorchester, or Durnovaria, with Old Sarum and Exeter. An indisputable though scanty fragment of the Roman wall of Dorchester still exists ; and the avenues, called the walks, which surround the town appear to follow its ancient course, the trees being planted sometimes on the agger and sometimes in the vallum. A tesselated pavement, some 20 feet square, was exhumed in 1858 in the grounds of the county prison, and is preserved in its chapel; and various fragments of a similar charac- ter, as well as many coins of the later emperors, and other metallic and fictile antiquities, have been and still are not unfrequently brought to light, wherever the ground is dis- turbed. oman pavements have been found elsewhere,— one at Rampisham in 1799, one at Frampton of unusual size and beauty in 1794, and others at Weymouth, Sherborne, Dewlisn, &c. The amphitheatre, near the Dorchester railway station, has been generally attributed to the time of Agricola, and constructed very probably for the amusement of the Roman soldiers by the enforced labour of their captives. Jt is more perfect than any other remaining in this country, and has been calculated to suffice for nearly 13,000 spectators. The Roman stations in Dorsetshire which antiquarians pretty nearly agree in identifying are Landinis or Londinis, Lyme Regis ; Canca- Arixa, Charmouth ;

Durnovaria, Dorchester; Clavinio, Weymouth, or a place in the immediate neighbourhood ; Morinio, Wareham, or Hamworthy ; Bolvelaunio, Poole ; Bindogladia, Wimborne, or (Sir R. C. Hoare) Gussage Cow- down ; Ibernio, Bere, Of medieval castles no consider-

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able remains exist, except at Corfe and Sherborne, both of them brought to ruin in the great Civil War, but both retaining picturesque and highly interesting traces of their former magnificence.

The three principal churches of the county are the abbey- church of Sherborne, a ricli specimen of Third Pointed archi- tecture, restored in recent years at immense cost, and with admirable taste ; Wimborne Minstcr, with its two stately towers of different periods and its massive Norman nave; and the noble but unfinished abbey-church of Milton, now also carefully restored, and presenting some rich examples of the Decorated period. Besides these, there are notice- able churches at Bere-Regis, Dorchester (St Peter’s), and Fordington, Maiden-Newton, Piddletrenthide, Cerne, Bea- minster, Powerstock, d&c.; but, generally speaking, the ecclesiastical buildings of the county, though not uninte- resting, caunot boast of special grandeur or beauty.

At Milton abbey, originally founded by King Athelstan, and also at Forde-Abbey, handsome portions of the monastic buildings are incorporated in the modern mansions; and there are monastic remains of varying in- terest at Cerne, Abbotsbury, Bindon, and elsewhere. At Sherborne some of the conventual buildings are to be traced within the precincts of the flourishing grammar school.

The dialect of the county, perfectly distinguishable from those of Wiltshire and Somersetshire, yet bearing many common marks of its Saxon origin, has been admirably illustrated, both philologically and poetically, by a living author, the Rev. Wm. Barnes, whose poems in the vernacu- lar have won the eulogium of several eminent critics, whilst their Doric simplicity and tenderness and truth is heartily appreciated by high and low in the county.

This county has afforded titles to various noble families, besides the dukes and earls of Dorset, duke of Portland to that of Bentinck, earl of Dorchester to that of Damer, Shaftesbury to that of Ashley-Cooper, Viscount Brid- port to tliat of Hood, Baron Melcombe to Bubb- Dodington; whilst Blandford, Weymouth, Woodsford, Encombe, &c., are swallowed in the higher titles of their noble possessors.

Amongst its more eminent natives may be reckoned Cardinal Morton, Archbishops Stafford and Wake, Bishops Sprat and Stillingfleet, Matthew Prior, Sir George Summers, Sir James Thornhill, &c.

The county rates have been recently assessed on an annual income of £1,095,736.

A curious ancient Survey of the county was written by a Rev. Mr Coker, about the middle of the 17th century, and published from his MS. in 1732. (In 1774 a very valuable County History appeared, by the' Rev. John Hutchins, in 2 vols. folio ; a second edition in 4 vols. folio, in 1803 ; and a third, greatly improved, and brought down to the present date, also in 4 vols. folio, in 1874. No other county in England, perhaps, possesses so full and accurate a topographical and genealogical survey as this. The antiquities of the county have likewise been satisfactorily elucidated in various publications by Mr Sydenham, Mr C. Warne, F.S.A., Dr Wake Smart, and others. (C. W. B.)

DORSET, THomas SAckvitue, Lorp BuckKHURST, FIRST EARL or (1536-1608), was born in at Buckhurst in the parish of Withyham in Sussex. His father, Sir Richard Sackville, the friend of Roger Ascham, was connected with the Boleynfamily, and thus distantly with Queen Elizabeth ; his mother was Winifrede, daughter of Sir John Bruges or Bridges, of London. Jn his fifteenth or sixteenth year he was entered at Hart Hall, Oxford ; but it was at Cambridge that he completed his studies and took the degree vt master of arts. On leaving the university, where he had already obtained the reputation of a poet, he proceeded to the Inner Temple, and though the statement made by some authori- ties that he became a barrister is not supported by the registers, his connection with the society was not without result, He had already at the age of nineteen married

Cicely, daughter of Sir John Baker of Sissinghurst in Kent, and in 1557 he entered public life as member of parliament for Westmoreland. In the following year he sat for Kast Grinstead in Sussex, and the record of his activity is still to be found iu the Journals of the House of Commons. Queen Elizabeth, who had just come to the throne, was attracted by the handsome person, high culture, and evident ability of her young poet-kinsman, who was accordingly, to quote his own words, ‘ selected to a continual private attendance upon her own person,” which did not, however, prevent him from appearing again in the Parliament of 1563 as member for Aylesbury in Buckinghamshire. A visit to the Continent in 1565 was interrupted by an unexplained imprisonment at Rome, and terminated by the news of his father’s death, which took place on 21st April 1566. On his return he was knighted in the queen’s presence, and obtained the title of Lord Buckhurst, by which he continued to be known through the most of his life. Apartments were provided for him inthe queen’s palace at Shene, where his mother was in charge ; but the simplicity of his mode of life isshown by the fact that, when in 1568 he had to entertain Odet de Coligni, Cardinal de Chatillon, at the queen’s commaud, he failed to satisfy the luxurious desires of his guest, and thus fell under her majesty’s dis- pleasure. In 1571 he was sent to France to congratulate Charles IX. on his marriage with Elizabeth of Austria ; in 1572 he was one of the peers who tried Thomas Howard, earl of Norfolk ; and in 1586 he was employed to convey to Queen Mary of Scotland the sentence of death. A more difficult task was found for him in 1587; as ambassador to the Hague he was expected “ to expostulate in favour of peace with a people who knew that their existence depended on war, to reconcile those to delay who felt that delay was death, and to heal animosities between men who were enemies from their cradles to their graves.” With what fearlessness, fidelity, and sagacity he discharged his duty, has been told in detail by the historian of Z’he United Netherlands, who asserts that there i3 not a single line in all the ambassador’s correspondence which does not reflect honour onhis name. But his expostulations with the queen on her parsimonious policy, and his independent conduct towards the royal favourite Leicester, procured him, on his return to England, instead of approbation and reward for his services, an order confining him to his house for nine or ten months in token of her

majesty’s displeasure. On the death of the earl, however, he was again received into favour; in 1588 he was presented with the Order of the Garter ; in 1591 he was elected chancellor of the university of Oxford, his claims having been supported by a royal letter ; and, in 1599, on the death of Lord Burghley, lie succeeded to the office of Lord High Treasurer of England. In the following year he had to pronounce sentence as High Steward on the earl of Essex, who had been his rival for the chancellorship and his opponent in politics. The change of the dynasty which took place in 1603 left his position unimpaired ; his office of Lord Treasurer was confirmed to him by King James, and on 13th of March 1604, he was created earl of Dorset. He died suddenly on April 19th 1608, while sitting at the council table in Whitehall, and left his earldom to his son Robert Sackville.

In the history of English literature Thomas Sackville occupies an honourable position. We no longer possess any of the “ sonnets finely sauced ” for which, in his student days, he was praised by Jasper Heywood, but we may still read the Ferrex and Porrex by which he takes rank as the first writer of genuine English tragedy, the Znduction to the Mirror of Magistrates, and the Complaint of Henry Duke of Buckingham. The first was written with the assistance of Thomas Norton, during Sackville’s connection with the Inner Temple, was acted before Queen Elizabeth in 1561,

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appeared without the author’s permission in 1565, and again in authorized editions in 1570-1 and 1590. The second is a stately allegorical poem of the kind so much in vogue in the reign of Elizabeth, with elaborate per-souifications of sorrow, death, old age, &c., intended to stand as preface to a series of poems descriptive of the tragic fates of famous men; and the Complaint was to form the first of the series. They all display a lively fancy, and no small command of pure and sonorous English, but hardly awaken any regret that the author soon laid aside the poet’s for the diplomatist’s pen.

See Sackville’s Works, edited by Reginald W. Sackville-West, 1859 ; and Arber’s Reprint of the Jnduction.

DORSET, Caarces SACKVILLE, SixTH Earn or (1637- 1706), eldest son of Richard Sackville, the fifth earl, and Frances Cranfield, eldest daughter of Lionel, earl of Middle-

‘gex, was born January 24, 1637, and succeeded his father

in 1677. His youth, spent partly in London and partly in Italy, was filled with all the madcap and libertine excesses of the period ; but, owing doubtless to the nobler qualities which he none the less displayed, the graceful scapegrace found more favour with the public than the rest of the dissolute crew. He was high-spirited, generous, and humane ; as years passed on his character ripened and refined, and he who had been the worthy rival of Charles II. lived to be laughed at by Etherege for fidelity to his wife. Though present as a volunteer under the duke of York during the Dutch war in 1665, and afterwards sent on more than one mission to the court of France, he took comparatively an unimportant part in politics until the commencement of the troubles which ended in the Revolu- tion of 1688. Deprived in 1667 of his office as lord-lieu- tenant of Sussex, for his refusal to comply with James IT.’s arbitrary demands, he soon after became one of the active members of the opposition, and in 1688 assisted the flight of the Princess Anne. After James had left the country, Dorset wasa member of the council for the preservation of the public peace ; and on William’s accession he was appointed lord chamberlain. Jn 1691 he accompanied the new king to Holland ; and, though he was afterwards involved in the accusations of infidelity brought forward by Preston, he retained and deserved the royal favour to the last. He died at Bath in January 1705-6, and was succeeded in the earldom by Lionel Cranfield Sackville, his only son by his second wife, Mary, daughter of James Compton, earl of Essex. Dorset keeps his place in the list of English poets in virtue of a few lyrical and satirical pieces, which, though extravagantly praised by his contemporaries, and, even according to Macaulay, displaying the easy vigour of Suck- ling and wit as splendid as that of Butler, are after all of no great moment in themselves, and only suggestive of what in happier circumstances the writer might have done. The best known is a pleasant careless song—7o all you Ladves now at Land—written at sea shortly before the engagement with the Dutch, in which Admiral Opdam’s ship was blowu up. As a patron of literature, however, Dorset stands unrivalled,—

judicious, impartial, and munificent. To him Prior was indebted for his education, Montague for promo- tion, and Wycherly for support against the disfavour of the public. Though compelled aslord chamberlain to deprive Dryden of his official laurel, he took care to make good from his private purse the pecuniary loss involved inthe dismissal.

See Prior's dedication of his poems to the duke of Dorset; J ohn- son's Lives of the Poets; Walpole's Royal and Noble Authors ; Macaulay's History of England, vol. iti. chap. viii.

DORT, or DorDRECHT, an important commercial city of Holland, at the head of a district in the province of South Holland, 10 miles S.E. of Rotterdam, on the' railway, between that city and Breda. 'The island of the Meuse or. Merwe on which it stands is said to have beeu separated,

ot4 from the mainland in 1421, by an inundation which swept away 72 villages, and about 100,000 inhabitants. Con- cerning its origin there is no authentic information, but it is certainly one of the oldest cities of Holland, and pro- bably dates from the 10th century. It was surrounded by walls in 1231 by Florent IV., count of Holland, who made it his residence, and granted it many important privileges. In 1457, almost the entire town, including the church of Notre Dame, founded in 1366, and other public buildings, was destroyed by fire. One of the first towns in the Netherlands to embrace the Reformed religion, and to throw off the yoke of the Spanish king, it was chosen in 1572 as the meeting-place of the deputies by whom the independ- ence of the United Provinces was first asserted; and in 1618 and 1619 it became intimately associated with the theological history of Europe, as the seat of the great synod which declared against the Arminian party. Among its celebrities are the De Witts and Ary Scheffer the artist. The town-hall is a handsome building, and the principal church is an old Gothic structure 300 feet long by 125 wide, with a heavy square tower, and numerous monumental stones, some of great antiquity. The hall in which the synod was held is now demolished. The houses are generally of an antique fashion, with the gables turned outwards, and many of them date from the period of the Spanish occupation. Dort possesses a good harbour, from which two canals lead to the centre of the town. It carries on an extensive trade in corn, flax, salt fish, train oil, and the timber which is

brought down the Rhine ; and it has shipbuilding docks, saw-mills, sugar-refineries, tobacco- factories, linen-bleacheries, salt-works, and white-lead works. Population in 1850, 20,878, and in 1874,

25,577.

DORT, Sywnop or, an assembly of the Reformed Dutch Church, with deputies from France, Switzerland, the Pala- tinate, Scotland, and England, called to decide the theolo- gical differences existing between the Arminians (or Re- monstrants) and the Calvinists (or Counter Remonstrants), was held at Dort or Dordrecht in the years 1618 and 1619. During the life of Arminius a bitter controversy had sprung up between his followers and the strict Calvinists, led by Francis Gomar, his professorial colleague at Leyden ; and, in order to decide their disputes, a synodical conference was proposed, but Arminius died before it could be held. At the conference held at the Hague in 1610, the Arminians addressed a remonstrance to the States-general in the form of five articles, which henceforth came to be known as the five points of Arminianism. This conference had no influence in reconciling the opposing parties, and another, held at Delft in the year 1613, was equally un- successful. In 1614, at the instance of the Arminian party, an edict was passed by the States-general, in which toleration of the opinions of both parties was declared, and further controversy forbidden ; but this act only served, by rousing the jealousy of the Calvinists, to fan the contro- versial flame into greater fury. Gradually the dispute pervaded all classes of society, and in nearly all the towns both parties began to hold large meetings, and to indulge in threatening words and gestures, until finally, in Nov. 1617, Prince Maurice of Orange, in order finally to decide the controversy, called a synod which met at Dort in Nov. 1618 This synod was strictly national—called by the national authority to decide a national dispute, and not intended to have more than a uational influence. The foreign deputies were invited to attend, only to assist by their advice in the settlement of a controversy which con-cerned the Netherland church alone, and which the Netherland church alone could decide. At the fourth sitting it.was decided to cite Simon Episcopius and twelve other Remonstrants to appear within 14 days before the synod,

to state and justify their doctrines. It was also agreed to allow the Arminian deputies to take part in the delibera tions, only on condition that they forbore to consult with, or in any way assist, their cited brethren, but this they refused. During the interval between the citation and the appearance of the accused, the professorial members of the synod were instructed to prepare themselves to be able to coufute the Arminian errors, and the synod occupied itself with deliberations as to a new translation of the Bible, for which a commission was named, made arrangements regarding the teaching of catechisms, and granted permis- sion to the missionaries of the East Indies to baptize such children of heathen parents as were admitted into their fami- lies. At the 25th sitting Episcopius and the others cited ap- peared, when Episcopius surprised the deputies bya bold and outspoken defence of his views, and even went so far as to say that the synod, by excluding the Arminian deputies, could now only be regarded as a schismatic assembly. The Remonstrants were asked to file copious explanations of the five points in dispute, but objecting to the mauner in which they were catechized, they were, at the 57th sitting, dis- missed from the synod as convicted “ liars and deceivers.” The synod then proceeded in their absence to judge them from their published writings, and came to the conclusion that as ecclesiastical rebels and trespassers they should be deprived of all their offices. The synodical decision in regard to the five points, and the sentence against the Remonstrants was, at the 144th sitting, read in Latin before a large audience in the great church. The Remonstrants were required to subscribe the condemnation, and many of

‘them refusing were banished. The synod was concluded

on 29th April 1619, by a magnificent banquet given by the chief magistrate of Dort.

DORTMUND, a town of Germany, capital of a circle of the same name, in the district of Arnsberg, and Prussian province of Westphalia, is situated on the Emscher, in 51° 31’ 25” N. lat. and 7° 27’ 9” E. long. Among the chief structures may be mentioned the large railway station, the workshop and factories of which give employment to upwards of 1000 hands, the Reinoldikirche, with a choir built in 1421-1450, the old Marienkirche, and the Gothic Dominican church. To the W. of the station is one of the ancient

linden trees of the Konigshof, where the meetings of the supreme court of the formidable Vehmgericht, or secret tribunal of the Middle Ages, were held. In the vicinity of Dortmund are collieries, in the working of which several thousands of persons are engaged. Since the dis- covery of iron-ore in the coal district, in 1850, many forges and blast-furnaces have been erected. The manufactures include tobacco, iron and steel, machinery, porcelain, earthenware, oil and flour, and woollen, linen, and cotton fabrics. In 1875 the town had 47 breweries, which fur- nished more than 64 millions of gallons of beer. The population in 1875 was 57,742.

Dortmund, the Throtmanni, Trutmanna, Trutmonia, Tremonia, and Trotmunde of early history, was already a town of some im- portance in the year 800. In 1005 it was the scene of an ecclesi- astical council, and in 1016 and 1180 of imperial diets. The town was walled in the 12th century, and in 1887-88 successfully with- stood the troops of the archbishop of Cologne, who besieged it for 21 months. About the middle of the 13th century it joined the Han- seatic League. At the close of the Thirty Years' War the population had become reduced to 3000. In 1808 Dortmund lost its rights as a free town, and was annexed to Nassau. 'he French occupied it in 1806, and in 1808 it was made over by Napoleon to the grand duke of Berg, and became the chief town of the department of Ruhr. Through the cession of Westphalia by the king of the Netherlands, May 31, 1815, it became a Prussian town.

DORY or Jonw Dory (Zeus faber) an Acanthopterygian fish belonging to the family Scombride, held in such esteem by the ancient Greeks that they called it Zeus after their principal divinity. Its English name 1s probably a corrup.

tion of the French jaune dorée, and has reference to the prevailing golden-yellow colour of the living fish, The body in the dory is much compressed, and is nearly oval in form, while the mouth is large and capable of extensive protru- sion. It possesses two dorsal fins, of which the anterior is armed with long slender spines, and the connecting mem- brane is produced into long tendril-like filaments; while a row of short spines extends along the belly and the roots of the anal and dorsal fins. The colour of the upper

surface is olive brown; the sides are yellowish, and are marked with a prominent dark spot, on account of which the dory divides with the haddock the reputation of being the fish from which Peter took the tribute money. It is an inhabitant of the Atlantic coasts of Europe, the Mediter- ranean, and the Australian seas. It is occasionally abun- dant on the coasts of Devon and Cornwall, and is also found, though more sparingly, throughout the British seas, It is exceedingly voracious, feeding on mollusks, shrimps, and the young of other fish; and Couch states that from the * stomach of a single dory he has taken 25 flounders, some 24 inches long, 3 fatherlashers half grown, and 5 stones from the beach, one an inch anda half inlength. They are often taken in the fishermen's nets off the Cornwall and Devon coast, having entered these in pursuit of pilchards. They are seldom found in deep water, preferring sandy bays, among the weeds growing on the bottom of which they lie in wait for their prey, and in securing this they are greatly assisted by their great width of gape, by their power of protruding the mouth, and by the slender filaments of the first dorsal fins, which float like worms in the water, while the greater part of the body is buried in the sand, and thus they entice the smaller fishes to come within easy reach of the capacious jaws. The dory often attains a weight of 12 ib, although those usually brought into the market do not average more than 6 or 7 tb, It is highly valued as an article of food.

DOTIS. See Torts.

DOUAT, or Dovay, an ancient and once strongly-fortified town of France, at the head of an arrondissement, in the department of Nord, situated on the Scarpe, at a railway junction 18 miles 8. of Lille. Its triple line of fortifica- tions, partly the work of Vauban and partly of more modern structure, includes a considerably larger space than is requisite for the area of its buildings; the streets are consequently spacious, and the number and size of the gardens unusually large. Besides a variety of administra- tive offices, the town possesses a court of appeal, which holds its sessions in the palace of the ancient parlement of Flandres; it contains also one of the principal cannon foundries of the kingdom, an arsenal, and large artillery establishments, and is further remarkable for the number of its literary and scientific institutions, among which may be mentioned the academy, with its faculties of letters and law, representing the university established in

1562, the college, founded by cardinal Allen, for the education of English Roman Catholic priests, the Government school of artillery, 2 school of drawing and music, a museum of natural history and antiquities, enriched with sculptured

stones and inscriptions from Bevai, a botanical garden, a.

collection of paintings, and a public library of upwards of 40,000 volumes, and among the rest about 300 incunabula. The church of Notre Dame dates from the 12th and 14th centuries, and preserves a remarkable painting, containing 254 figures, which formerly belonged to the abbey of Anchin, and was apparently the work of Jean Bellegambe ; the aucient Carthusian convent is still extant as an artillery magazine ; and the town-house ranks as one of the historical monuments of France, and is architecturally interesting for its ogival windows and its belfry and spire. Railways and canals oven up to Douai an extensive trade in corn,

wine, brandy, cattle, wool, flax, and other agricultural pro- ducts; and it manufactures lace, gauze, cottons, linens, thread, earthenware, soap, salt, and beer. The origin of the town is a matter of dispute ; but it rose into importance in the Middle Ages under the Counts of Flanders, passed afterwards into the possession of the dukes of Burgundy, and thus became subject to the Spanish crown. In 1667 it was captured by the French under Louis XIV. ; and though the allies under Marlborough and Eugene obtained possession in 1710, it was retaken by the French in 1711, and finally incorporated with France in 1714. Population in 1872, 21,703.

DOUARNENEZ, a town and watering-place of France, in the department of Finistére, to the 8. of a bay of the same name. Its sardine fishery, which is carried on from the end of June to the beginning of December, gives occu- pation to about 800 boats, and between 3000 and 4000 men; the average nuniber of sardines caught each year is 360,000,000, worth 9,000,000 francs. Population, 7180 in 1872.

DOUBLEDAY, Txomas, an English author in political and general literature. He early adopted the views of his friend William Cobbett, and

was active in promoting the agitation which resulted in the passing of the Reform Act of 1832. As secretary of the Northern Political Union of Whigs and Radicals, he took a prominent part in forwarding the interests of Lord Grey and the reforming party. In 1858-59 he was a member of the council of the Northern Reform Union; and to the last he was a keen observer of political events. He succeeded his father as partner in an eminent firm of soap manufacturers at Newcastle, but devoted his attention rather to literature than to mer- cantile affairs. On the failure of the firm he obtained the registrarship of St Andrew's parish, Newcastle, a post which he held until appointed secretary to the coal trade, He died at Burham, near Newcastle, December 18,

1870.

Besides poems, dramas, numerous pamphlets, contributions to Blackwood's Magazine, the Eclectic Review, and other periodicals, and leading articles in the Manchester Guardian and the Newcastle Chroniele, Doubleday wrote A Financial, Monetary, and Statistical History of England, 1847 ; A Treatise on Mundane Moral Govern- ment, 1852; The True Law of Population, 1853 ; a romance, The Eve of St Mark, 1857 ; The Political Life of Sir Robert Peel, 1859 ; and Matter for Materialists, 1870.

DOUBS, an eastern frontier department of France, so named from its chief river, is formed of the ancient German principality of Montbéliard (Momipelgard), and of part of the province of Franche-Comté. It is bounded E.8.1. by Switzerland, N. by the territory of Belfort and by Haute- Saéne, and N.W. and 8.W. by Haute-Saéne and Jura ; and lies between 46° 33' 10" and 47° 33' 45" N, lat., and 5°42' and 7° K. long. The surface is chiefly mountainous, four parallel chains of the Jura crossing it from 8.W. to N.E. In the loftiest and most easterly chain the principal summit, Mont d'Or, has an altitude of 4800 feet ; in the most westerly the highest points do not exceed 1000 feet. The river Doubs rises at the foot of the Noir Mont, in the arrondissement of Pontarlier, and, after twice traversing the department, passes through Jura, enters Sadéne-et-Loir, and joins the Sadne at Verdun, after a course of 267 miles. It is navigable from Voujaucourt, near Montbéliard, to its mouth. Near Morteau it forms a cataract 88 feet in height. From Voujaucourt to Déle it constitutes a part of the navigable canal

between the Rhone and Rhine. Doubs is well watered by smaller rivers andrivulets, The climate, owing to the differences of elevation, is variable; but it is generally cold aud rainy, and the winters are severe. The soil is stony and loamy, and at the higher levels there are numerous peat-bogs. The department may be divided into three regions, The highest, on which the snow usually lies

from six to eight months in the year, is in part barren, but on its less exposed slopes is occupied by forests of fir trees, and affords good pasturage for cattle. In the second or lower region the oak, beech, walnut, and sycamore flourish ; and the valleys are susceptible of cultivation. The region of the plains is the most fertile, and produces wheat, rye, maize, hemp, pulse, and grapes and other fruits. Agriculture is ina backward state, but cattle-rearing and dairy-farming receive much attention. Gruyére cheese to the value of seven millions of francs is produced yearly. The most important manufactures are watches, of which about 300,000 are annually made, cotton and woollen cloths, hardware, cutlery, paper, glass, and leather. ‘There are several iron foundries, and distilleries for brandy and absinthe ; and the trade in cattle, hides, and timber is con- siderable, Among the mineral products are iron, coal, lignite, marble, building stone, gypsum, glass-sand, and grindstoncs. Doubs is divided into the arrondissements of 3esangon, Pontarlier, Baume-les-Dames, and Montbéliard, comprising 27 cantons and 639 communes. The capital is Besancon. Of the total area of 522,755 hectares (1,291,200 acres), about 462,353 acres are arable, 299,329 under wood, 19,848 vineyard, 215,684 meadows, and 225,294 heath. The population in 1872 was 291,251.

DOUCE, Francis (1762-1834), an English antiquarian, born in 1762, was the son of one of the six clerks of Chancery, After completing his education he entered his father’s office, but quitted it after a short time, and devoted himself to the collection and study of antiquities. He became a prominent member of the Society of Antiquaries, and maintained an active correspondence with most of the leading antiquaries of hisday. Jor a time he held the post of keeper of manuscripts in the British Museum, but he was compelled to resign it owing to a quarrel with one of the trustees. In 1807

he published his Illustrations of Shakespeare and Ancient Manners (2 vols. Svo), which contained some curious information, along with a great deal of trifling criticism and mistaken interpretation. An unfavourable notice of the work in the Hdinburgh Review greatly irritated the author, and made him unwilling to venture any further publications, He contributed, how- ever, a considerable number of papers to the Archaologia and the Glentlemen's Magazine. In 1833 he published a Dissertation on the various Designs of the Dance of Death, the substance of which had appcared forty years before, He died on the 30th March 1834. By his will he left his printed books, illuminated manuscripts, coins, &c., to the Bodleian Library ; his own manuscript works to the British Museum, with dircctions that they should not be opened until 1900; and his paintings, carvings, and miscellaneous antiquities to Sir Samuel Meyrick, who published an account of them, entitled Zhe Doucean Museum,

DOUGLAS, the commercial capital of the Isle of Man, and a favourite watering-place, stands on a fine semicircular bay on the east coast of the island, at the junction of the Dhoo and Glass, in 54° 10' N. lat. and 4° 26' W. long. The older streets, as is usual with seaport towns, are ir- regular and narrow, but the modern ones, on terraces rising beyond the old town, are handsome and spacious, Among the public buildings may be noticed Castle Mona (now converted into a hotel), the "tower of refuge," on a dangcr- ous rock in the bay, the court-house, the house of industry, the public hospital, and the theatre, which has accommo- dation for 1000 persons. 'The ancient parish church of Braddan, partially rebuilt in 1773, has been replaced by a more modern building. 'here are four chapels and dis- trict churches—St Matthew's, St George's, St Barnabas's, and St Thomas's ; and the Roman Catholics, Wesleyan and Primitive Methodists, Congregationalists, and Scotch Pres- byterjans have also placcs of worship. The salubrity of

the climate, the peculiar characteristics of the surrounding scenery, and the cheapness of living render Douglas a favourite resort. There is communication daily in summer with Liverpool, Fleetwood, and Barrow, twice or thrice weekly with Ireland, and occasionally with Glasgow. 'The harbour is dry at low water ; but vessels drawing not more than 10 feet may

enter during neap tides, and those draw- ing not more than 14 feet during spring tides. A splendid new pier, at which passengers can land and embark at all heights of tide, was erected in 1872, and a spacious pro- menade, inclosing the greater part of the shore, in 1876. The principal industries are the coasting trade and fisheries. Population in 1871, 18,846.

DOUGLAS, Gawain or Gavin (c. 1474-1513), bishop of Dunkeld, and the ancient classical poet of Scotland, was the third son of Archibald, earl of Angus, known in Scottish history as " Bell-the-Cat." His mother was Elizabeth, daughter of Robert Lord Boyd, high chamberlain of Scot- land. The year when he was born has not been recorded, but it is almost certain that it was 1474, or the beginning of 1475 ; and of bis father's scats the one most likely to have been his birthplace was Douglas Castle, Lanarkshire. Being intended for the church, Douglas studied at the university of St Andrews, where his name appears in the lists of alumni between 1489 and 1494. Having entered into holy orders, he was shortly afterwards appointed rector of Hauch, or Prestonkirk, and parson of Linton in East Lothian.2 In 1501 he was elected dean or provost of the collegiate church of St Giles's, Edinburgh, an office of dignity and emolument.

In the battle of Flodden (1513), when James IV. and many of the Scottish nobility and ecclesiastics were killed, the earl of Angus lost his two eldest sons, which so affected him that he retired to St Mains, a religious house in Galloway, where he soon after died. He was succeeded by his grandson, Archibald, a handsome young nobleman, who attracted the attention of the widowed Quecn Margaret, sister of Henry VIIL. of England, and they were married within eleven montlis after the death of the king. While this precipitate connection incensed the nobility and caused much jealousy of the Douglas family, it seemed to open up a way for the preferment of Gavin Douglas. By the influence of the queen, Douglas was " postulated" by the Pope to the abbacy of Aberbrothock, or Arbroath. He met with such opposition, however, from a rival claimant, that his appointment was never completed, and he was unable to obtain his abbacy. Douglas was next recom- mended by the queen to the Pope for the archbishopric of St Andrews, then vacant; and, relying upon the validity of this appointment, he attempted by force to obtain possession of the castle of St Andrews. He was, however, unsuccessful, and ultimately was passed over in favour of

Andrew Forman. At length, by the united influence of the quecn and the Pope, he was nominated for the bishopric of Dunkeld, which shortly afterwards became vacant. The people were so indignant at the marriage of the queen with Angus that the Parliament deprived her of the regency of the kingdom and the charge of the young King James V., and appointed the duke of Albany to be regent in her room. Ouc of the first acts of the duke, who came from France to assuine the reins of government, was to bring Douglas to trial for intriguing for ecclesiastical benefices with the queen and the pope without the sanc-

1 Brechin has been stated as the birth-place of Douglas by Mr D. Black in his history of that town (2d ed. p. 287), but no authority for this is quoted.

2The authority for the former designation is Myln's MS. Vite Episcop. Dunkeld., by misreading which Douglas is by Bishop Sage called rector of Herriot, and by Dr Irving and others, rector of Hawick. His latter designation is found in the MS. of his Translation of Virgil preserved in Trinity College, Cambridge.— IV orks, i. p. 173.

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tion of Parliament. He was found guilty, and put in prison in what he calls the " wyndy and richt vnplesant castell and royk of Edinburgh," where he continued for about a year. This harsh step of the duke of Albany seems to have brought about a feeling of sympathy for Douglas. He was at length set at liberty, and, to make some amends, the duke permitted him to be consecrated bishop of Dunkeld.

The marriage of the queen with the earl of Angus proved an unliappy one; and, in consequence of his ill- treatment of her, the qucen separated from her husband and joined with the regent against the Douglases. Angus fled to the borders for a time; and in 1521 his uncle Gavin was deprived of his bishopric. The bishop then took shelter at the court of Henry VIII., but in 1522 he died of the plague at London, in the forty-eighth year of his age. His remains were interred in the Hospital Church of the Savoy.

The works of Bishop Douglas, though not numerous, are important. They consist of—(1) Zhe Palice of Honour, a poem written in 1501,—an

allegorical description of many gorgeous cavalcades of famous persons trooping to a magni- ficent palace somewhat like Chaucer’s Temple of Fame, in the execution of which Douglas has displayed much originality of. treatment; (2) Another allegorical poem called King Hart, or the heart of man, descriptive of the progress of life from youth to age ; (3) A short poem called Conscience; and (4) A Zranslation of the dneid of Virgil, with the supplemental book of Mapheus Vegius. To each book a short prologue is prefixed, of which the one before the 12th,

‘‘ Where splendid Douglas paints the blooming May,”

is perhaps the finest effort of his muse. This Translation of Virgil, by which Douglas is best known, is a work of which Scotland will always be proud, as it was the first metrical translation of a classical author made in Britain, and the precursor of many others, Although it is very diffuse, from the difficulty its author had in adapting the Doric language of his country to the purposes of translation, by the same reason it is a work of considerable philological value in tracing the history of the literary language of Scotland. Although Douglas was the first native writer who applied the name “ Scottis ” to the language he employed, he has Scotticized many Latin words, and imported many expressions from the French ; while his admiration of Chaucer has induced him to avail himself of some of the grammatical forms used by that poet. Still, his translation, written in the broad and widely spread dialect common at an early period to the north of England and Scotland, will always form one of the most important landmarks in Scottish philology. In concluding it Douglas unfortunately took farewell of poetical composition, and entered the arena of political strife, as the following extract shows :— ‘¢Thus vp my pen and instrumentis full yore

On Virgillis post I fix for evirmore.

Neuir from thens syk matteris to diseryue,

My muse sall now be clene contemplatiue

And solitar as doith the byrd in cage.

Sen fer byworn is all my chyldis age,

And of my dayis nere passit the half date

That nature suld me grantyn, wele I watc;

Thus, sen I feill doun sweyand the ballance,

Here I resigne vp younkeris obseruanice,

And wyil direk my labouris euermoir ’ Vnto the commoun welth and Goddis gloir.”?

Several early MSS. of Douglas’s Translation of Virgil exist. One is preserved in the library of Trinity College, Cambridge, copied by his amanuensis, Matthew Geddes, from the bishop’s own papers. Two are in the library of the university of Edinburgh, and one in that of the marquis of Bath at Longleat. Of the

ee ee ee ee 1 Works, vol. iv. p. 283, The last two lines occur in the Bl. L.

ed. of 1553.

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printed editions one was issued by William Copland at London in 1553, one was printed by Ruddiman at Edinburgh in 1711, and one was presented to the members of the Bannatyne Club in 1839. The Palice of Honour was first printed at London by William Copland, without date, but probably in 1553; and an edition, printed by ‘‘Johne Ros for Henrie Charteris,” appeared at Edin- burgh in 1579, of which only two copies are known to exist. This rare edition was reprinted for the Bannatyne Club. The poems called King Hart and Conscience exist in the Maitland MS. in the Pepysian Library, Cambridge. The works of the bishop were first collected and published at Edinburgh in 1874, under the editorship of Mr John Small, with a life prefixed, and a glossary appended. (J. SM.)

DOUGLAS, SrrepHen Aprnotp (1813-1861), an American statesman, was born at Brandon, in the State of Vermont, on the.23d April 1813. His father, a physician, dicd when he was still an infant, and in his youth he had to struggle with poverty. He was apprenticed to a cabinet- maker, but his health failed, and he quitted the employment after a year anda half. He next studicd for three years at the academy of Canandaigua, giving special

attention in the latter part of his course to law. In 1833 he went west to seek his fortune, and settled in Jacksonsville, Illinois. Here he supported himself for a few months by acting as an auctioneer's clerk and keeping a school. Called to the bar in March 1834, he quickly obtained a large and lucrative practice, and so early as the following year was elected attorney-general of the State. In December 1835 he was elected a member of the legislature, in 1837 he was appointed registrar of the land office at Springfield, and in December 1840 he became secretary of state of Illinois. He was a judge of the supreme court of Illinois from 1841 till November 1843, when he resigned the office in order to stand a candidate for Congress in the Democratic interest. Ta 1837 he had failed to secure his return by a minority of 5 in a total vote of 36,000; on this occasion he was successful, being elected by a majority of 400. He took an active share in the Oregon controversy, asserting his unalterable determination not to "yield up one inch" of the Territory to Great Britain, and advocating its occupa- tion by a military force. He was also a leading promoter of the measures which resulted in the annexation of Texas and in the Mcxican war. Being chairman of the Territorial committee at first in Congress and then in the Senate, to which he was elected in March 1847, it fell to him to in- troduce the bills for admitting Iowa, Wisconsin, Minnesota, California, and Oregon into the Union, and for organizing the Territories of Minncsota, Oregon, New Mexico, Utah, Washington, Kansas, and Nebraska. On the keenly dis- puted question of the permission of slavery in the Territories, Douglas advocated, if he was not the first to promulgate, what came to be known as the " popular sovereignty doctrine," by which each territory was to be left to decide the matter for itself in the same manner asa State. The bill for organizing the Territories of Kansas and Nebraska, which Douglas reported in January 1854, caused great popular excitement, as it repealed the Missouri compromise, and deciared the people of "any State or Territory " "free to form and regulate their domestic institutions in_their own way, subject only to the constitution of the United States." There was great indignation throughout the free states; and Douglas, as the chief promoter of the measure, was hanged or burned in effigy in many places, In 1852, and again in 1856, he was a candidate for the presidency in the National Democratic Convention, and though on both occasions he was unsniccessful, he reccived strong support. In 1857 he distinguished himself by his vigorous opposition to the admission of Kansas into the Union under

the Lecompton constitution, which he maintained to be fraudulent. In the following year he was engaged in a close and very exciting contest for the senatorship with Abraham Lincoln, who was the Republican candidate. The

popular vote was against him, but in the legislature vote he secured his return by 54 to 46.- Douglas paid great attention to the local affairs of Illinois, and he was the chief promoter of the Illinois Central Railroad. In 1860 he was again one of the Democratic candidates for the presidency, and received a large popular vote, but he was very feebly supported in the electoral college. On the outbreak of the civil war he denounced secession as criminal, and was one of the strongest advocates of main- taining the integrity of the Union at all hazards. He delivered frequent addresses in this sense after the adjourn- ment of Congress, and during his last illness he dictated a letter for publication urging all patriotic men to sustain the Union and the constitution, He died at Chicago on the 3d June 1861.

DOUR, a town of Belgium, in the province of Hainault, nine miles south-west of Mons, to the right of the rail- way from that city to Valenciennes. It owes its whole importance to its manufacturing industry, which includes iron-smelting, weaving, bleaching, and tanning, and is fostered by the existence in the vicinity of coal and iron mines. Population in 1866, 8501.

DOUSA, Janus [Jan van DER Dous] (1545-1604), a distinguished Dutch statesman, historian, poet, and philologist, the heroic defender of Leyden, was born at Noordwyck, in the province of Holland, December 6, 1545, Left an orphan at the age of five, he was brought up by his grandfather, after whose death an uncle took charge of him. He began his studies at Lier in Brabant, became a pupil of Henry Junius at Delft in 1560, and thence passed successively to Louvain, Douai, and Paris. Here he studied Greek under Petcr Dorat, professor at the Collége Royal, and became acquainted with the Chancellor ‘L’Hopital, Turnebus, Ronsard, and other eminent men. On his return to Holland in 1565 he married. His name stands in the list of nobles who in that year formed a league against Philip II.; but he does not appear to have taken any active part in public affairs till 1572, when he was

sent as head of an embassy to England. Two years later he was intrusted with the government and defence of Leyden, then besieged by the Spaniards; and in this arduous post he displayed rare intelligence, fortitude, and practical wisdom. On the foundation of the university of Leyden by William I. of Orange, Dousa was appointed first curator, and this office he held for nearly thirty years. Through his friendships with foreign scholars he drew to Leyden many illustrious teachers and professors. After the assassination of William I. in 1584, Dousa came privately to England to seek the aid of Queen Elizabeth, and in the following year he was sent formally for the same purpose. About the same time he was appointed keeper of the Dutch archives, and the opportunities thus afforded him of literary and historical research he turned to good account. In 1591, being named a member of the States-General, he removed to the Hague. Heavy blows fell upon him in the deaths of his eldest son in 1597 and of his second son three years later. A bitterer trial still was the misconduct of another son. Dousa was author of several volumes of Latin verse and of philological notes on Horace, Catullus, Tibullus, Petronius Arbiter, and Plautus. But his principal work is the Annals of Holland, which first appeared in a metrical form in 1599, and was pub- lished in prose, under the title of Batavie Hollandiaque Annales, in 1601. This work had been begun by his eldest son. Dousa also took part, as editor or contributor, in various other publications. He died at Noordwyck, October 8, 1604, and was interred at the Hague ; but no monument was erected to his memory until 1792, when

one of his descendants placed a tomb in hi if church of Noordwyck. EF omb in his honour in the

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DOUVILLE, Jean Baptiste (1794-c. 1837), a French traveller born at Hambye, in the department of Manche, whose asserted discoveries in Africa have in large measure been relegated to the region of romance. At an early period his imagination seems to have been fired by narratives of travel and adventure ; and accordingly, when he fell heir to a wealthy relation, he at once proceeded to gratify his desire for personal acquaintance with foreign lands. He certainly wandered far and wide ; and, according to his

own profession, he visited India, Kashmir, Khorassan, Persia, Asia Minor, and many parts of Europe. After spending some time in Paris, and being admitted a member of the Société de Géographie, he proceeded in 1826 to Brazil, with the intention apparently of carrying on scientific explorations : from this purpose, however, he was diverted by the political circumstances of the country; and to replenish his funds he started business at Montevideo in partnership with a M. Laboissiére. Towards the close of the following year, probably in October, after a short residence at Rio Janeiro, he left Brazil for the Portuguese possessions on the west coast of Africa, where his presence in March 1828 is proved by the mention made of him in certain letters of Castillo Branco, the governor-general of Loandau, In May 1831 he reappeared in France, claiming to have pushed his explorations into the very heart of Africa, as far as the 27th degree of longitude E. of Greenwich, or, in other words, into what is now known as the great equatorial lake region. His story was readily accepted by the Société de Géographie at Paris, which hastened to recognize his services by assigning him the great gold medal, and appointing him their secrctary for the year 1832. On the publication of his narrative —Voyage au Congo et dans Vintérieur de Afrique équi- noxiale—which occupied four large volumes, and was accompanied by an elaborate atlas, the public enthusiasm might well run high. In company with his wife (a sister of his old Montevidean partner), and attended by about 400 native porters, the happy traveller had advanced from kingdom to kingdom rather like a monarch making a progress through his tributary states, distributing largesses and receiving homage, than like a humble adventurer defraying his expenses from his private purse. Everything went smooth for a time; the interior of Africa was de- scribed in text books and depicted in maps according to the discoveries of Douville; but in the August number of the Foreign Quarterly Review for 1832 the most sweeping charges of ignorance and fraud were launched against the author, and this attack was followed up in the Levue des Deux Mondes for November, by Thomas Lacordaire, who asserted that, during part of the time which he claimed to have spent in Africa, Douville had been a familiar object in the streets of Rio Janeiro. The tide of popular favour turned ; and, in spite of the explanations furnished by Douville in da defence, 1832, and Z’rente mois de ma vie, ou guinze mois avant et quinze mois aprés mon voyage au Congo, 1833, the general decision was openly against him. Mlle. Audrun, a lady to whom he was about to be marricd, committed suicide

from grief at the disgrace; and, after vainly attempting to obtain satisfaction from Lacordaire by duel, the poor adventurer himself withdrew in 1833 to Brazil, and proceeded to make explorations in the valley of the Amazon. According to Dr Gardner, in his 7’ravels in the Interior of Brazil, he was murdered in 1837 on the banks of the Sao Francisco for charging too high for his medical assistance. His Brazilian manuscripts fell into the hands of M. S. Rang, by whom they were transmitted to M. Ferdinand Denis. While modern exploration has done nothing to support the wider pretensions of Douville, no less an authority than Captain Burton asserts that his descriptions of the country of the Congo are life-like and

picturesque; that his observations on the anthropology, ceremonies, customs, and maladies of the people are remarkably accurate; and that even the native words inserted into the text of his narrative “ are for the most part given with unusual correctness.”

DOUW, or Dow, Geruarp (1613-1680), a celebrated Flemish painter, was born at Leyden on the 7th April 1613. His first instructor in drawing and design was Bartholomew Dolendo, an engraver; and he afterwards learned the art of glass-painting under Peter Kouwhoorn. At theage of fifteen he became a pupil of Rembrandt, with whom he continued for three years. From the great master of the Flemish school he acquired his skill in colouring, and in the more subtle effects of chiaroscuro ; and the style of Rembrandt is reflected in several of his earlier pictures, notably in a portrait of himself at the age of twenty-two, in the Bridgewater Gallery, and in the Blind Tobit going to meet his Son, at Wardour Castle. At a comparatively early point in his career, however, he had formed a manner of his own distinct from, and indeed in some respects antagonistic to, that of hismaster. Gifted with unusual clearness of vision and precision of manipula- tion, he cultivated a minute and elaborate style of treatment ; and probably few painters ever spent more time and pains on all the details of their pictures down to the most trivial. He is said to have spent five days in painting a hand ; and his work was so fine that he found it necessary to manufacture his own brushes. Notwithstanding the minuteness of his touch, however, the general effect was harmonious and free from stiffness, and his colour was

always admirably fresh and transparent. He was fond of representing subjects. in lantern or candle light, the effects of which he reproduced with a fidelity and skill which no other master has equalled. He frequently painted by the aid of a concave mirror, and to obtain exactness looked at his subject through a frame crossed with squares of silk thread. His practice as a portrait painter, which was at first considerable, gradually declined, sitters being unwilling to give him the time that he deemed necessary. His pictures were always small in size, and represented chiefly subjects in still life. Upwards of two hundred are attri- buted to him, and specimens are to be found in most of the great public collections of Europe. His chef deuwvre is generally considered to be the Woman sick of the Dropsy, in the Louvre. The Evening School, in the Amsterdam Gallery, is the best example of the candle-light scenes in which he excelled. In the National Gallery favourable specimens are to be seen in the Poulterer's Shop and a portrait of himself. Douw's pictures brought high prices, and it is said that President Van Spiring of the Hague paid him 1000 florins a year simply for the right of pre- emption. Douw died in 1680. His most celebrated pupil was Francis Mieris.

DOVE (Dutch, Duyve ; Danish, Due; Icelandic, Dufa ; German, Z'aube), a name which seems to be most commonly applied to the smaller members of the group of birds by ornithologists usually called Pigeons (Columba) ; but no sharp distinction can be drawn between Pigeons and Doves, and in general literature the two words are used almost indifferently, while no one species can be pointed out to which the word Dove, taken alone, seems to be absolutely proper. The largest of the group to which the name is applicable is perhaps the Ring-Dove, or Wood-Pigeon, also called in many parts of Britain Cushat and Queest (Colwmba palumbus, Linn.), a very common bird throughout these islands and most parts of Europe. It associates in winter in large flocks, the numbers of which (owing partly to the destruction of predacious animals, but still more to the modern system of agriculture, and the growth of plantations in many districts that were before treeless) have of late

years increased enormously, so that their depredations are very serious. In former days, when the breadth of land in Britain under green crops was comparatively small, these birds found little food in the dead season, and this scarcity was a natural check on their superabundance. But since the extended cultivation of turnips and plants of similar use the case is altered, and perhaps at no time of the year has provender become more plentiful than in winter. The Ring-Dove may be easily distinguished from other Evropean species by its larger size, and especially by the white spot on either side of its neck, forming a nearly continuous “ring,” whence the bird takes its name, and the large white patches in its wings, which are very conspicuous in flight. It breeds several times in the year, making for its nest a slight platform of sticks on the horizontal bough of a tree, and Jaying therein two eggs—which, as in all the Columbe, are white.

The Stock-Dove (C. wxas of most authors) is a smaller species, with many of the habits of the former, but breed- ing by preference in the stocks of hollow trees or in rabbit- holes. It is darker in colour than the Ring-Dove, without any white on its neck or wings, and is much less common and more locally distributed.

The Rock-Dove (C. livia, Temm.) much resembles the Stock-Dove, but is of a lighter colour, with two black bars on its wings, and a white rump. In its wild state it haunts most of the rocky parts of the coast of Europe, from the Feeroes to the Cyclades, and, seldom going inland, is comparatively rare. Yet, as it is without contradiction the parent-stem of all our doinestic Pigeons, its numbers must far exceed those of both the former put together. In Egypt and various parts of Asia it is represented by what Mr Darwin has called “ Wild Races,” which are commonly accounted good “species” (C. schimperi, C. affiinis, C. intermedia, C. lewconota, and so forth), though they differ from one another far less than do nearly all the domestic forms, of which more than 150 kinds that “ breed true,” and have been separately named, are known to exist. Very many of these, if found wild, would have unquestionably been ranked by the best ornithologists. as distinct “species,” and several of them would as undoubtedly have been placed in different genera. These various breeds are classified by Mr Darwin! in four groups as follows :—

Grovr I. composed of a single Race, that of the ‘* Pouters,” hav- ing the gullet of grcat size, barely separated from the crop, and often inflated, the body and legs elongated, and a moderate Dill. The most strongly marked subrace, the Improved English Pouter, is considered to be the most distinct of all domesticated pigeons.

Group II. includes three Races :—(1.) ‘‘ Carriers,” with a long

pointed bill, the eyes surrounded by much bare skin, and the neck and body much elongated ; (2.) ‘* Runts,” with a long, massive bill,

-and the body of great size ; and (3.) ‘‘ Barbs,” with a short, broad

bill, much bare skin round the eyes, and the skin over the nostrils swollen. Of the first four and of the second five subraces are distinguished.

Group III. is confessedly artificial, and to it are assigned jive Races :—(1.) ‘‘ Fan-tails,” remarkable for the extraordinary develop- ment of their tails, which may consist of as many as forty-two rectrices in place of the ordinary twelve ; (2.) ‘‘Turbits” and “ Owls,” with the feathers of the throat diverging, and a short thick bill ; (3.) ‘* Tumblers,” possessing the marvellous habit of tumbling backwards during flight or, in some breeds, even on the ground, and having a short, conical bill; (4.) ‘‘ Frill-backs,” in which the feathers are reversed ; and (5.) ‘‘ Jacobins,” with the feathers of the neck forming a hood, and the wings and tail long.

Group IV. greatly resembles the normal form, and comprises two Races :—(1.) Trumpeters,” with a tuft of feathers at the base of the neck curling forward, the face much feathered, and a very peculiar voice, and (2.) Pigeons scarcely differing in structure from the wild stock.

Besides these some three or four other little-known breeds exist, and the whole number of breeds and sub-breeds

1 The Variation of Animals and Plants undex Domestication. London: 1868. Vol. i. pp. 131-224,

fies computation. ein i cases far from being superficial, for Mr Darwin has shown that there is scarcely any part of the skeleton which is constant, and the modifications that have been effected in the proportions of the head and sternal appa- ratus are very remarkable. Yet the proof that all these different birds have descended from one common stock is nearly certain. Here there is no need to point out its bearing upon the “ Theory of Natural Selection ” which that eminent naturalist and Mr Wallace have rendered so well known. The antiquity of some of these breeds is not the least interesting part of the subject, nor is the use to which one at least of them has long been applied. The Dove from tlie earliest period in history has been associated with the idea of a messenger (Genesis villi. 8-12), and its employment in that capacity, developed successively by Greeks, Romans, Mussulmans, and Christians, has never been more fully made available than in our own day, as witness the “ Pigeon-post ” established during the recent siege of Paris.

Leaving, then, this interesting subject, space does not permit our here dwelling on various foreign species, which, if not truly belonging to the genus Columba, are barely separable therefrom. Of these examples may be found in the Indian, Ethiopian, and Neotropical Regions. Still less can we here enter upon the innumerable other forms, though they may be entitled to the name of “ Dove,” which are to be found in almost every part of the world, and nowhere more abundantly than in the Australian Region. Mr Wal- lace (bis, 1865, pp. 365-400) considers that they attain their maximum development in the Papuan Subregion, where, though the land-area is less than one-sixth that of Europe, more than a quarter of all the species (some 300 in number) known to exist are found—owing, he suggests, to the absence of forest-haunting and fruit-eating Mam- mals.

It would, however, be impossible to conclude this article without noticing a small group of birds to which in some minds the name Dove will seem especially applicable. This is the group containing the Turtle-Doves——the time- honoured emblem of tenderness and conjugal love. The common Turtle-Dove of Europe (Zurtur auritus) is one of those species which is gradually extending its area. In England, not much more than a century ago, it seems to have been chiefly, if not solely, known in the southern and western counties, Though in the character of a straggler only, it now reaches the extreme north of Scotland, and is perhaps nowhere more abundant than

in many of the mid- land and eastern counties of England. On the continent the same thing has been observed, though indeed not so definitely ; and this species has within the last twenty years or so appeared as a casual visitor within the Arctic Circle. The probable causes of its extension cannot here be discussed ; and there is no need to dwell upon its graceful form and the delicate harmony of its modest colouring, for they are proverbial. The species is migratory, reaching Europe late in April and retiring in September. Another species, and one perhaps better known from being commonly kept in confinement, is that called by many the Collared or Barbary Dove (Z'. risorius)—the second English name probably indicating that it was by way of that country that it was brought to us, for itis not an African bird. This is distinguished by its cream-coloured plumage and black necklace. Some uncertainty seems to exist about its original home, but it is found from Constantinople to India, and is abundant in the Holy Land, though there a third species (7. senegalensis) also occurs, which Canon Tristram thinks is the Turtle-Dove of Scripture. (A. N.)

DOVER (the ancient Dubris), principal cinque port of England, is situated close to the South Foreland, 72 miles

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The difference between them.

from London, in a main valley of the chalk hills correspond- ing with the opposite cliffs between Calais and Boulogne, Its dominant object is the castle, on the east heights. Within its walls stands the Roman pharos; the Romano-British fortress church, remaining not only 2m situ, but (excepting roof) integrally on statu quo, forming a primitive Christian relic, unique in Christendom; some remains of the Saxon fort; and the massive keep and subsidiary defences of Norman building. These ancient works provide for a garrison of 758; but they are now covered by the superior site of Fort Burgoyne, a position of great strength for 221 men. The western heights, where is still the foundation of a consort Roman pharos, form a circuit of elaborate fortifications, with provision for 3010 troops. Between these, and stretching inland, lies the town, of which the following are the principal features. 1. The harbour, once at the eastern, is now at the western

extremity,—its three considerable basins being fit for mail steamers and ordinary trading vessels. 2. The admiralty picr is a massive struc-

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ture of solid concrete and masonry extending about one- third of a mile into the sea, affording lee and landing accommodation for vessels of almost any burthen, made for ultimate connection by break-water with a horn east of the castle, so inclosing the bay as a vast harbour, 3. The visitors’ quarter consists of ranges of good houses along the length of the seaboard and elsewhere, notably a fine elevation newly built on a western spur of the Castle Hill. 4. Of old Dover, within its walls and gates, but little remains, except a remnant of the Saxon collegiate church of the canons of St Martin, and the parish church of St Mary the Virgin—rebuilt and enlarged in 1843-44, but preserving the three bays of the Anglo-Saxon church, with its western narthex, on which had been superimposed the Norman tower, still presenting its rich front to the street. 5. A later Norman church stands under the Castle Hill, which has been partially restored, but its parochial status trans-

feired to the new parish church of St James. There are two other modern churches—Holy Trinity and Christ- church, and, fnrther np the valley, the parish chnrch of Charlton (originally Norman)and Buckland (Early English), which, including the Castle Church, completes tlie former number of seven for the town, There are also 13 chapels of nonconformist worship,

representing most denomina- tions, and placed in various parts of the borough. 6, The remains of the once (12th century) splendid foundation of St Martin's priory include the great gatc, the house refectory with campanile, and the spacious strangers' refectory, lately converted into the college school-room. 7. Just across the High Street stand the tower and truncated fabric of the noble hall of the hospital Maison Dicu, founded (13th century) for the reception of pilgrims of all nations, long used as a Crown victualling office, but latterly purchased by the corporation and adapted for a

Corporation Seal.

town hall, with prison cells as basements, and other prison buildings annexed, the former chapel of the society serving now as acourt of sessions. 8. The ground work of around (Holy Sepulchre) church of the Templars is on the opposite heights, approaching the citadel. 9. Among the centres of educational work are a proprietary college, occupying the site and remaining buildings of St Martin's Priory, for a cheap but sound education of town boys, and for boarders in the masters' houses, and also a strong array of national schools, worked up toa high mark, according to H. M. Inspectors' reports, and providing means for a good practical education of about 3400 children. In physical conditions the place is exceptionally healthy, the registrar- general's returns showing them in some years to be little below those of the Malvern Hills. The steep shore and open downs make it agreeable for bathing and summer resort; and it has constant sea-going interest from the Con- tinental mail service, and the course of vessels up and down channel lying within two miles of the shore. Objects of intercst within easy reach are—the 8. Foreland electric light-houses ; the (florid Norman) church of St Margaret's; the Templars' Manor, Ewell; St Radigund's

Abbey ; the Preceptory of Knights of St John, Swingfield ;

rich Norman votive chapel, Barfreystone. There are two lines of railway to London—one traversing the Weald of Kent, the other following the old Roman road, w/a Canter- bury and Rochester. Dover returns 2 members to Parlia- ment, and is governed by a mayor, 6 aldermen, and 18 councillors. The arza of the borough is 1262 acres. Population (1871), 28,590.

DOVER, a city of the United States, capital of Strafford county, New Hampshire, situated on the Coeheco, a tributary of the Piscataqua, at a railway junction twelve miles north-west of Portsmouth. It has eight churches, a high school, a city hall, and a public library ; and the water-power furnished by the falls of the Cocheco encourages its industrial activity, the principal results of which are prints and other cotton goods to the valne of upwards of £200,000 annually, woollens, leather, boots and shoes, hats, oil-cloth, sand-paper, iron and brass wares,

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The town was founded in 1623, and Population in 1870,

and carriages. received its city charter in 18955.

9294,

DOVER, a town of the United States, the capital of Delaware, on St Jones river, 9 miles inland from Delaware Bay, and 48 miles south of Wilmington. It is a regular brick-built place, with broad, well-shaded strects, has a State honse, a court-housc, six churches, an academy, and several other public buildings, and carries on a brisk trade in preserved fruits. Population in 1870, 1906, of whom 301 were people of colour,

DOVER, Grorce James Wetpore Acar Etuis, Baron (1797-1833), born on the 14th January 1797, was the eldest son of the second Viscount Clifden. He was educated at Christ Church College, Oxford, and in 1818 he entered Parliament as member for Heytesbury. He afterwards represented Seaford (1820), Ludgershall (1826), and Oakhampton (1830). In party politics he took little interest ; but he was a zealous and enlightened advocate in Parliament and elsewhere of state encouragement being given to the cause of literature and the fine arts. In 1824 he was the leading promoter of the grant of £57,000 for the purchase of Mr Angerstcin’s collection of pictures, which formed the foundation of the National Gallery. On the formation of Lord Grey’s administration, in November 1830, he was appointed chicf commissioner of woods and forests. The post was one for which his tastes

well fitted him, but he was compelled by delicate health to resign it after two months' occupancy. In June 1831, during the lifetime of his father, he was raised to the House of Lords under the title of Baron Dover. His services to the cause of learning and the fine arts, as well as his own distinction as an author, led in 1832 to his election to the presideney of the Royal Society of Literature. He died on the 10th July 1833. Lord Dover's literary works were chiefly his- torical, and included The True History of the Iron Mask, extracted from Documents in the French Archives (1826), Historical Inquiries respecting the Character of Clarendon 1827), and a Life of Frederick the Great (1831). He also edited the £llis Correspondence and Walpole's Letters to Sir Horace Mann. He left in manuscript a volume written for the instruction of his son, which was published posthumously under the title Lives of the Most Eminent Sovereigns of Modern Europe,

DOW, Lorenzo (1777-1834), an American preacher, noted for his eccentricities of dress and manner, was born at Coventry, Connecticut, U.S., October 16, 1777. He received but a limited education, and was much troubled in his youth by religious perplexities; but he ultimately joined the Methodists, and was appointed a preacher (1799). The same year, however, his official connection with that body ceased, and he came over to preach to the Catholics of Ireland. He attracted great crowds to hear and sec him, and was often persecuted as well as admired. He also visited England, introduced the system of camp mect- ings, and thus led the way to the formation of the Primitive Methodist Socicty. These visits were repeated in 1805, Dow's enthusiasm sustained him through the incessant labours of more than thirty years, during which he preached in almost all parts of the United States. His later efforts were chiefly directed against the Jesuits. His Polemical Works were published in 1814. Among his other writings are The Stranger in Charleston, or the Trial and Confession of Lorenzo Dow (1822), A Short Account of a Long Travel (1823), and the Jlistory of a Cosmopolite. He died February 2, 1834.

DOWLETABAD, a city and fortress of India, in the north-western corner of tle Nizam's Dominions, near one of the right-hand tributaries of the Godavery. Thongh

still the centre of an administrative district, the city has sunk into comparative insignificance since the rise of Aurungabad, about ten miles to the east ; but the fortress remains, from its natural position, one of the most remark- able in the country. It occupies the conical top of a great granite rock, which rises abruptly from the plain to a height of at least 300 feet, and is encompassed at the foot by a ditch upwards of 30 feet wide. The only means of access to the summit is afforded by a narrow bridge, with passage for not more than two men abreast, and a long gallery, excavated in the rock, which has for the most part a very gradual npward slope, but about midway is intercepted by a steep stair, the top of which is covered by a grating destined in time of war to form the hearth of a huge fire kept burning by the garrison above. In spite, however, of its natural strength and its various artificial defences, the fortress has frequently been taken. When about the year 1203 the Mahometans invaded this part of the Deccan, Deogurh, as the city was then called, was the wealthy residence of a powerful rajah. In 1306 it was occupied by Mallek Naib, the emperor of Delhi's general ; and in the early part of the same century Mahomet IIL., in his anxiety to make it the capital of his kingdom and worthy of its new name of Dowletabad, or Abode of Prosperity, endeavoured, but in vain, to cause a wholesale transmigra- tion of the inhabitants of Delhi About the year 1595 it surrendered to Ahmed Nizam, shah of Ahmadnagar ; and on the fall of his dynasty it was taken possession of by Mallek Amber, an Abyssinian slave. Hig successors reigned till 1634, when it was taken by the Moguls, who transferred the seat of government to Aurungabad. In the 18th century it passed into the possession of Nizam el Mulk.

DOWN, a maritime county of Ireland, in the province of Ulster, occupying the most easterly part of the island, is bounded N. by the county Antrim and Belfast Lough, Ki. and 8. by the Irish Sea, and W. by the county Armagh, Its area, including Ballymacarret, a suburb of Belfast (1670 acres), covers 967 square miles, or 612,409 acres. The coast-line is very irregular, and is indented by several loughs and bays. The largest of these is Strangford Lough, a fine sheet of water studded with 260 islets, 54 of which have names, and all of which are finely wooded or rich in pasturage. The lough runs for ten miles north- wards, and the ancient castles and ruined abbeys on the islets render the scene one of singular interest and beauty. Further

south Dundrum Bay forms a wider expanse of water. In the south-west Carlingford Lough separates the

county from Louth. On its north-east: shore lies the village.

of Rosstrevor, now the resort of invalids from all parts of the United Kingdom.

Mountains. —Between Strangford and Carlingford loughs the county is occupied by a range of hills known in its south-western portion as the Mourne Mountains, which give rise to the four principal rivers—the Bann, the Lagan, the Annacloy, and the Newry. The highest peak in the Mourne range is named Slieve Donard. It is 2796 feet above the level of the sea, and is exceeded only by one peak, Lugduff, in the Wicklow range, and the higher reeks in Killarney.

Springs.—Down is celebrated for its holy wells and mineral springs. The chalybeate are more numerous than the sulphurous, but both abound. ‘ There are springs at Ardmillan, Granshaw, Dundonnell, Magheralin, Dromore, Newry, Banbridge, and Tierkelly. The Struel springs, a mile south-east of the town of Downpatrick, are celebrated for their healing properties. Fifty years ago they were regarded as possessing not only chemical wealth in rare abundance, but miraculous powers; and the decline of public credulity in the latter was coincident with the failure

of the former. To this day, however, the wells, which are four in number, are visited, and certain religious observances maintained, sometimes for a week. Circuits on the knees are made round the wells; and amongst the ignorant the reputation of the sacred waters remains unimpaired.

The scenery of the county is pleasantly diversified, the people are intelligent and comparatively well educated, the landed proprietors are resident, and there is a thriving in- dependence which may be looked for in vain ontside the province of Ulster.

Minerals.—There are several quarries of fine sandstone. The best is that on Scrabb Hill, near Newtownards, where a very close-grained, clear-coloured, and hard and durable stone is raised. Limestone is not very general. Near Comber, on the shores of Strangford Lough, is a very had and sparkling kind of reddish granular limestone. But the greatest magazine of this rock is in the vicinity of Moira, where the stone lies very near the surface. Granite occurs in many places in detached masses, but the great body of it is confined to the southern and western regions, chiefly in the Mourne Mountains. Crystals of topaz and beryl are found in the granite of Slieve Donard. Indica- tions of lead have been discovered near Castlewellan, Killough, Newtownards, and Warrenpoint ; and traces of copper in the Mourne Mountains near Rosstrevor.

Soil.—The predominating soil is a loam of little depth, in most places intermixed with considerable quantities of stones of various sizes, but differing materially in character according to the nature of the subsoil. Clay is mostly confined to the eastern coast, and to the northern parts of Castlereagh. Of sandy soil the quantity is small ; it occurs chiefly near Dundrum. Moor grounds are mostly confined to the skirts of the mountains. Bogs, though frequent, are scarcely sufficient to furnish a supply of fuel to the population.

According to Owners of Land Retum (1876), there were, in 1875, 3605 separate proprietors, holding a total area of 608,214 acres, valued at £776,518. The number of owners of less than 1 acre numbered 1460, or 40} per cent., that of all Ulster being 48 per cent. The average size of the holdings was 1684 acres, and the average value per acre was £1, ds. 6jd., as against 239} acres and 15s, 84d. respectively for Ulster. As in the neighbouring counties of Antrim and Armagh, the valuc of the land in Down is considerably higher than that of the rest of the province. Eighteen proprietors held upwards of 6000 acres each, and among them an aggregate extent equal to 484 per cent. of the total area,—the prin- ciple holders being :—Marquis of Downshire (Hillsborough), 64,356 acres; the Kilmerley Trustees, 37,454 ; Earl of Annesley (Castlewellan), 23,567 ; Marquis of Londonderry (Newtownards), 23,554; Colonel W. B. Forde (Seaforde), 19,882; Earl Dufferin (Clandeboy), 18,238; Hon. R. Meade’s trustces

(Dromore), 13,492 ; R. N. Batt (Belfast), 12,010 ; and Lord A. E, Hill-Trevor, 10,940.

Agriculture.—Of the total area of the connty, which is 610,740 acres (exclusive of Ballymacarret), there are 339,541 acres under tillage, 187,604 in pasture, and 12,027 under wood. Although comparisons as to yields of crops between different periods is now fallacious, inasmuch as the increased and increasing importation of wheat into Ireland has altered the system of agriculture, it may be mentioned that, while in five years the cultivation of wheat has fallen from 244,451 acres to 119,597 in Ireland, during the same period in Down the decrease was from 32,734 acres to 21,272. There are many landed proprietors who hold large tracts in their own hands. The great bulk of the labouring pepulation is orderly and industrious. Their dwellings are better constructed and furnished than those for a similar class in other parts of Ireland. The pro-

cesses of agriculture, owing in a great degree to the ex- ample set by the resident gentry, are skilfully carried on, The land is well cultivated. The farms are in some dis- tricts small, but the effect of emigration has been to con- solidate the holdings.

The breed of horses is an object of much attention, and some of the best racers in Ireland have been bred in this county. The native breed of sheep, a small hardy race, is confined to the mountains. The various other kinds of sheep have been much improved by judicious crosses from the best breeds. Hogs are reared in great numbers, chiefly for the Belfast market, where the large exportation occa- sions a constant demand for them, hams of very superior quality being prepared in that town.

The following figures give the acreage of the principal crops and the numbers of live stock raised in the years 1873 and 1876 respectively :—

Wheat. Oats. Potatoes. Turnips, Flax.

1878 24,788 118,342 53,266 21,117 27,098

sve, Bike72 119,857 52,273 20,978 238,612 BE ee: Cattle. Sheep. Pigs. Goats,

1873 32,188 146,971 75,406 32,827 11,4384

1876 381,875 143,832 68,968 pibo2ie eLZery,

Along with Tyrone, the county grows the largest extent of flax in Ireland, and the largest extent of the other cereals of any county in Ulster. In live stock Down possesses a

. greater number of horses than any other Irish county with

the exception of Cork.

Fisheries. —These are not developed as they might be. The Kilkeel herring fishery realized £4203 in 1871, £6200 in 1872, £13,349 in 1873, £6000 in 1874, and £1360 in 1875. There are fishing stations at Donaghadee, Strang-ford, Newcastle, and Carlingford ; the total number of vessels in 1875 was 678, and of men and boys 2537. In 1850 there were 1468 vessels and 4640 hands. ©

Administration.—The county is divided into 14 baronies, 70 parishes, and 1258 town-lands. It forms part of the united dioceses of Down, Connor, and Dromore; and it belongs to the military district of Belfast. The assizes are held at Downpatrick ; quarter sessions at Banbridge, Downpatrick, Hillsborough, Newry, and Newtownards ; and there are 26 petty sessions districts. The poor-law unions of Downpatrick, Kilkeel, and Newtownards are wholly within the county, and those of Banbridge and Newry partly in Down and partly in Armagh. The total sum expended in poor-law administration in 1875 was £21,076, and the average daily number of paupers 1280. The county prison and infirmary are in Downpatrick, but the county lunatic asylum is in Belfast. Down returns 4 members to Parliament —2 for the county at large, 1 for Downpatrick, and 1 for Newry. Portions of the boroughs of Belfast and Lisburn are in Down county, but they are regarded more properly as parts of Antrim and Armagh respectively. Previons to the Act of Union Down returned 14 members to the Irish

Parliament—2 for the county at large, and 2 each for the boroughs of Bangor, Downpatrick, Hillsborough, Newry, Newtownards, and Killyleagh.

Population.—The general decrease of population in the province of Ulster between the census of 1851 and that of 1871 indicates a percentage of 8%, while that of this county amounts to 134. This decrease may be ascribed in some part to the migration of the people to Belfast and the neighbouring manufacturing towns, as well as to the emigration to foreign countries. In 1851, the inhabitants of Down (exclusive of the part of Belfast) numbered 320,817; in 1861, 299,302; and in 1871, 277,294, of whom 130,457 were males and 146,837 females,

At the last census it appeared that 312 per cent. belonged to the Roman Catholic persuasion, the numbers

being—Catholics, 88,003 ; Episcopalians, 60,868 ; Presby- terians, 116,017 ; and others, 12,406. There were at the same time 140,886 persons of five years and upwards who could read and write, 57,140 who could read but could not write, and 45,792 who were illiterate. There were 20 superior schools in the county, and 527 primary schools.

The following are the principal towns :—Newtownards, population 9562; Banbridge, 5600; Downpatrick, 4155 ; Holywood, 3573 ; Gilford, 2720; Bangor, 2560 ; Dromore, 2408 ; Donaghadee, 2226 ; Comber, 2006 ; Portaferry, 1938 ; Rathfriland, 1827 ; Warrenpoint, 1806; Killy- leagh, 1772 ; Kilkeel, 1338 ; and Ballynahinch, 1225. Newry, partly in Down and partly in Armagh county, has a population of 14,218. .

History and Antiquities. —From the period of the English settlement to the Irish revolt in 1333, Down formed two counties, Newtownards in the north and Down in the south. The English settlers at that time were driven into the maritime baronies of Ards, Lecale, and Mourne, of which they in part retained possession. The remainder of the district fell into the hands of Irish families, the O’Neals of Clandeboy, the MacArtans, MacRorys, and MacGinnises, whose possessions, however, reverted to the crown on the attainder of Shane O’Neal, in the latter half of the 16th century ; but having afterwards submitted to the Govern- ment, they received back their former estates. In 1602 the O’Neal estates were again forfeited, and granted to Sir

Hugh Montgomery and Mr Hamilton, who planted Scottish colonies on the land, The estates of the remaining old Irish and Anglo-Norman families were mostly forfeited in the rebellion of 1641, or subsequently at the Revolution.

The county is not wanting in interesting remains. At Slidderyford, near Dundrum, there is a group of ten or twelve pillar stones in a circle, about 10 ten feet in height. A very curious cairn on the summit of Slieve Croob is 80 yards in circumference at the base and 50 at the top, where is a platform on which cairns of various heights are found standing. The village of Anadorn is famed for a cairn covering a cave which contains ashes and human bones. Cromlechs, or altars, are numerous, the most remarkable being the Giant's Ring, which stands on the summit of a hill near the borders of Antrim. 'This altar is formed of an unwrought stone 7 feet long by 64 broad, resting in an inclined position on rude pillars about 3 feet high. This solitary landmark is in the centre of an inclosure about a third of a mile in circumference, formed of a rampart about 20 feet high, and broad enough atop to permit two persons to ride abreast. Near Downpatrick is a rath, or mound of earth, three-quarters of a mile in circumference, its exterior consisting of three artificial ramparts, the largest of which is 30 fcet broad. In its vicinity are the ruins of Saul Abbey, said to have been founded by St Patrick, and Inch Abbey, founded by Sir John de Courcy in 1180. The number of monastic ruins is also considerable. The most ancicnt and celebrated is the abbey or cathcdral of Down- patrick, supposed to have been founded by St Patrick soon after his arrival here in 432, and said to contain luis remains, together with those of St Columba and St Bridget. Tt was restored in 1790, when the adjoining round tower was taken down. (Gs. at, ze)

DOWNPATRICK, a municipal and parliamentary borough and market-town of Ireland, capital of the county of Down, 18 miles §.E. of Belfast, and 74 N.N.E. of Dublin. Downpatrick lies in a valley formed by hills of some elevation, near the south-west extremity of Strangford Lough, and is divided into the English, Irish, and Scotch quarters. [It consists of four main streets meeting near the centre, the principal of which are the Irish and English streets. In the former all business is carried on; the latter is well built, and contains neat private residences,

The principal buildings are the cathedral church of the diocese, the parish church, Roman Catholic chapel, two Presbyterian and two Methodist ineeting-houses, diocesan school, county court-house, prison, alms-houses, two branch banks, barracks, infirmary, and fever hospital. A small trade is carried on at Strangford Lough by means of vessels of 100 tons, which discharge at Qnoil quay, about a mile from the town; but vessels of larger tonnage can discharge at a steamboat quay built lower down the Quoil, The imports are principally iron, coal, salt, and timber; the exports—barley, oats, cattle, pigs, and potatoes. The Jinen manufacture is also carried on. The County Down Railway connects the town with the other trading centres, and a line specially constructed in 1862 connects it with the port of Donaghadee. Brewing, tanning, and soap-making give considerable employment. The Down corporation races are very popular, and are regarded as a meeting for the province. The parliamentary borough, which returns one member to Parliament, had in 1871 a population of 4155, with an arca of 1486 acres; the area of this town is 278 acres, population 3621.

DOXOLOGY, a hymn in praise of the Almighty. The name is often applied to the Trisagion, or ‘ Holy, Holy, Holy,” the scriptural basis of which is found in Isaiah vi. 3; to the Hallelujah of several of the Psalms and of Rev. xix.; and to the last clause of the Lord’s Prayer according to Saint Matthew, which critics are generally agreed in regarding as an interpolation. It is used, however, more definitely as the designation of two hymns distinguished by liturgical writers as the Greater and Lesser Doxologies. The origin and history of these it is impossible to trace fully. The germ of both is to be found in the Gospels ; the first words of the Greater Doxology, or Gloria in Kacelsis, being taken from Luke ii. 14, and the form of the Lesser Doxology, or Gloria Patri, having been in all pro- bability first suggested by Matt. xxviii. 19. The Greater Doxology, in a form approximating to that of the English prayer-book, is given in the Apostolical Constitutions (vii. 47), This is the earliest record of it, unless, indeed, the A postolical Constitutions be taken to be of a later date than the Alexandrine Codex, where the hymn also occurs. Alcuin attributes the authorship of the Latin form—the Gloria in Hxcelsis—to St Hilary of Poitiers (died 368), but this is at best only a plausible conjecture. The

quotations from the hymn in the De Virginitate of Athanasius, and in Chrysostom (Hom. 69 tn Matth.), include only the opening words (those from St Luke's gospel), though the passage in Athanasius shows by an et cetera that only the commencement of the hymn is given. These references indicate that the hymn was used in private devotions; as it does not appear in any of the earliest liturgies, whether Eastern or Western, its introduc- tion into the public services of the church was probably of a later date than has often been supposed. Its first intro- duction into the Roman liturgy is due to Pope Symmachus (498-514), who ordered it to be sung on Sundays and festival days. The Mozarabic liturgy provides for its eucharistic use on Sundays and festivals. In these and other early liturgies the Greater Doxology occurs imme- diately after the commencement of the service; in the English prayer-book it is introduced at the close of the communion office, but it does not occur in either the morning or evening service. The Lesser Doxology, or Gloria Patri, combines the character of a creed with that of a hymn. In its earliest form it ran simply— Glory be to the Father, and to the Son, and to the Holy Ghost, world without end, Amen," or " Glory be to the Father, in or by the Son, and by the Holy Ghost." Until the rise of the Arian heresy these forms were probably regarded as indifferent, both being equally capable of an orthodox

i? © & a) hook

interpretation, When the Arians, however, finding the second form more consistent with their views, adopted it persistently and exclusively, its use was naturally discoun- tenanced by the Catholics, and the other form became the symbol of orthodoxy. To the influence of the Arian heresy is also obviously due the addition of the clause" as it was in the beginning, is now, and ever shall be," the use of which was, according to some authorities, expressly enjoined by the Council of Niczea. There is no sufficient evidence of this, but there exists a decrce of the second Council of Vaison (529), asserting its use as already estab- lished in the East propter hereticorum astutiam, and order- ing its adoption throughout the churches of the West. In the Western Church the Gloria Patri is repeated at the close of every psalm, in the Eastern church at the close of the last psalm,

DOYEN, Gasrizt Francois (1726-1806), an eminent French painter, was born at Paris in 1726, His passion for art prevailed over his father's wish, and he became in his twelfth year a pupil of Vanloo. Making rapid progress, he obtained at twenty the grand prize, and in"1748 set out for Rome. He studied the works of Annibale Caracci, Cortona, Giulio Romano, and Michelangelo, then visited Naples, Venice, Bologna, and other Italian cities, and in 1755 returned to Paris. At first unappreciated and disparaged, he resolved by one grand effort to conquer a reputation, and in 1758 he exhibited his Death of Virginia. It was completely successful, and procured him admission to the Academy. Among his greatest works are reckoned, — the Miracle des Ardents, painted for the church of St Genevieve at St Roch (1773) ; the Triumph of Thetis, for the chapel of the Invalides ; and the Death of St Louis, for the chapel of the Military School. In 1776 he was appointed professor at the Academy of Painting. Soon after the beginning of the Revolution he accepted the invitation of Catherine II. and settled at St Petersburg, where he was loaded with honours and rewards, He died there June 5, 1806.

DRACO, a celebrated Athenian legislator who flourished in the 7th century B.c. By a strange irony of fate his name has passed into a proverb for an inexorable lawgiver, whose laws were written with blood and not with ink. Modern Greek historians, such as Thirlwall, Grote, and Curtius, have clearly shown that such a character is an utter perversion of fact. Of Draco's famous code not a single line remains, and all we know of it is derived from a few scattered notices occurring mostly in late Greek authors. Of these the most important is a passage in Plutarch's life of Solon. After stating that Solon abolished the whole of Draco's legislation, except in cases of murder, on account of its harshness and severity, Plutarch adds by way of commentary—" Forfor nearly all crimes there was the same penalty of death. The man who was convicted of idle- ness, or who stole a cabbage or an apple, was liable to death no less than the robber of temples or the murderer." To the same effect is a traditional saying of Draco by which he justified the rigour of his laws. The least offence, he said, seemed to him deserving of death, and he could devise no greater for the worst crime. It is obvious that the statement of Plutarch is not meant to be accepted as a literal statement of fact, and it is probable that to the most bloodthirsty of Draco's laws parallels:might be quoted from English statutes against

vagrancy and theft. All that Draco did was to put in writing the customary laws of his time and nation. It was natural that these laws, the growth of a rude and primitive age, should strike writers of the Augustan age as indiscriminative and inhuman. That he made no change in the constitution of Athens we have the express testimony of Aristotle. The judicial changes which he effected, so far from aggravating, all

tended to mitigate the severity of eany Athenian law. Before his time all cases of homicide were tried by the Areopagus, and we are justified in inferring that death was the universal penalty. To Draco is generally attributed the establishment of the éfera:, a body of fifty-one elders, who sat in four different courts,—one for cases of accidental homicide, a second for justifiable homicide, a third for cases where another homicide had been committed abroad by a prisoner who had been banished by one of the above-named courts, and a fourth for cases of deodand. Such an insti- tution is of itself enough to explode the traditional concep- tion of Draco, and we may now proceed to discuss the true character of his legislation. At Athens, as at Rome, the kings were the depositaries and administrators of law. With the extinction of the regal power this prerogative passed into the hands of the aristocracy as represented by the archons. It was in the nature of things that such a monopoly should be abused. The remedy for this abuse which the commons sought was a published code of laws. It was attained at Rome by the law of the Twelve Tables, and at Athens by the code of Draco, 621 B.c. In both cases the promulgated law was merely an enunciation of existing customs, Such was the work of Draco. Of his life we know absolutely nothing with the exception of a most improbable story related by Snidas, In Suidas's

Lexicon, under the word " Draco," we are told that he |

composed his code in his old age, and was smothered to death in the theatre at Aigina with the caps, chitons, and cloaks which were thrown at him by aun enthusiastic audience. The only value of the story is that it may show the feelings with which he was regarded by the commons of his own day.

DRAGON (épéxwr, sharp-sighted), the name given by the ancients to a fabulous monster represented by them as a huge winged lizard or serpent. They regarded it as the enemy of mankind, and its overthrow is made to figure among the greatest exploits of the gods and heroes of heathen mythology. A dragon watched the garden of the Hesperides, and its destruction formed one of the seven labours of Hercules. Its existence does not seem to have been called in question by the older naturalists, figures of the dragon appearing in the works of Gesner and Aldrovandi, and even specimens of the monster—evidently formed artificially of portions of various animals—having been ex- hibited. The only creatures ever known to have existed, at all comparable to this imaginary monster, are the Ptero-dactyls, remains of which are found in the Liassic and Oolitic formations. ‘These were huge reptiles, provided with true wings somewhat resembling those of bats. The name “dragon ” is now applied to a highly interesting, bunt very harmless, group of small flying lizards forming the genus Draco, belonging to the Agamide, a family of Saurian Reptiles. They inhabit India and the islands of the Malay Archipelago, and 18 specics of then are known. ‘They are small creatures, measuring about 10 inches long, including the tail, which in some cases is more than half of the entire length. The head is small, and the throat is provided with three pouches which are spread out when they lie on the trunks of trees. They are, however, chiefly remarkable for the wing-like cutaneous processes with which their sides are provided, and which arc extended and supported by greatly elongated ribs. These form a sort of parachute by which the animals are enabled to glide from branch to branch of the trees on which they reside, but, being altogether independent of the fore limbs, they cannot be regarded as true wings, nor do they enable the lizard to fly, but merely to make extensive leaps. When notin use they are folded by the side after the manner of a fan, and the dragon can then walk or run with considerable agility. They also use their wing-like expausions in clasping the branches

of trees, where they are fond of lying basking in the sun, and feeding on whatever insect may come in their way. When threatened with danger they are said to feign death.

DRAGON-FLY (German, Wasserjungfer ; Swedish, Trolislinda ; Danish, Guldsmed ; Dutch, Scherpstekende- vlieg,; French, Demoiselle), the

popular English name applied to the members of a remarkable group of insects which formed the genus Lzbellula of Linnezeus and the ancient authors. In some parts of the United States they appear to be known as “ Devil’s Darning Needles,” and in many parts of England are termed ‘ Horse-stingers,” It is almost needless to say that (excepting to other insects upon which they prey) they are perfectly inno- cuous, though some of the larger species can inflict a momentarily painful bite with their powerful jaws. Their systematic position is at present contested and somewhat uncertain. By most of the older systematists they were placed as forming part of the heterogeneous order Neuroptera. Fabricius, however, elevated them to the rank of a distinct order, which he termed Odonata ; and what- ever may be the difference of opinion amongst authors at the present day, that term is almost universally employed for the group. Erichson transferred all the groups of so- called Neuroptera with incomplete metamorphoses, hence including the dragon-flies, as a division of Orthoptera, which he termed Pseudo-Neuroptera. Gerstacker more recently also retains them in the Orthoptera, terming those groups in which the earlier states are sub- aquatic Orthoptera amphibiotica, Itis not necessary to enter into an examina- tion here of the merits or demerits of those various systems, and it will suffice to say that all are agreed in maintaining the insects as forming a group marked by characters at once extraordinary and isolated in their nature.

The group Odonata (using the term as a matter of con- venience) is divided into three families, and each of these again into two sub-families. The families are the Agiv- onide, Aischnide, and Libellulide,—the first including the sub-families Calopterygina and Agrionina, the second Gomphina and A’schnina, and the third Cordulina and Lnbellutina.

The structure of a dragon-fly being so very remark- able, it is necessary to enter somewhat extensively into details. The head is comparatively small, and excavated posteriorly, connected very slightly with the prothorax, on which it turns almost as ona pivot. The eyes are, as a rule, enormous, often contiguous, and occupying nearly the whole of the upper surface of the head, but some- times (Agrionide and Gomphina) widely distant; occu- pied by innumerable facets, which are often larger on the upper portion. In front of them is a portion termed the vertex, which sometimes (Zibcllulidw)

forms a swollen vesicle, before which are placed the three very small ocelli, and on either side of which are inserted the antenne, which are smaller in proportion than in almost any other insects, consisting only of two short swollen basal joints and a 5 or 6-jointed bristle-like thread. The front of the head is vertical, and consists of a large, often dilated upper portion, which is commonly termed the nasus, followed by a tranverse portion termed the rhinarium, and this again by the large labrum, which conceals the jaws and inner mouth parts. The lower lip, or labium, is attached to a very small chin piece (or mentum), and is gencrally very large, often (Agrivonide) divided almost to its base into two portions, or more frequently entire or nearly so; on each side of it are two usually enormous hyper- trophied pieces, which form the “ palpi,’ and which are often furnished at the tips with an articulated spine (or terminal joint), the whole structure scrving to retain the prey. Considerable diversity of opinion exists

with respect to the composition of the mouth parts, and by some authors the “ palpi” have been termed the side pieces of the lower lip. In a dead dragon-fly the parts are closed on each other, and, for a just appreciation of their structure and power, it is necessary to take a living example in the fingers by the thorax, slight lateral pressmre on which causes the insect to display the formidable arrangement. The prothorax is extremely small, consisting of only a narrow ring, the upper portion of which is often elevated. into lobes. ‘The rest of the thorax is very large, and con-

solidated into a single piece, with oblique sutures on the _

sides beneath the wings; the portion in front of the wings is extremely robust, and offers a median carina or suture above, and a broad transverse sinus posteriorly. ‘The inter- alar portion is somewhat excavated, and on cach side of it above are nodosities forming the attachments of the power-ful muscles that work the wings; on each side is a large and distinct spiracle. The abdomen varies excessively in form, the two extremes being the filiform séructure observ- able in most Agrionide, and the very broad and depressed formation seen in our familiar Libellula depressa. It con-

sists of ten distinct segments, whereof the basal two and those at the apex are short, the others clongate, the first being excessively short. In a slit on the under side of the second in the male, accompanied by external protuberances, are concealed the genital organs: on the under side of the eighth in the female is a scalc-like formation, indicating the entrance to the oviduct. The tenth is always provided in both sexes with prominent appendages, differing greatly in form, avd often furnishing the best specific (and even generic) characters ; by some authors these appendages are considcred as representing a modified eleventh segment. The basal segments often have additional transverse sutures, and in the common triquetrous abdomen there is a fine longitudinal dorsal carina, and prominent lateral angles; invariably the ventral surface has a longitudinal membranous space counecting the here divided chitinous portion of the external skeleton.

slender, and in a measure that appears disproportionate to

the necessities of the insect; for a dragon-fly can scarcely | be said to walk after the short promenade it takes on

emerging from its puparium. ‘The anterior pair probably assist in capturing and holding its insect prey, but the greatest service all the legs render is possibly in enabling the creature to rest lightly, so that it cau quit a position of repose in chase of passing prey in the quickest possible mauner, in which the majority of the species are aided also by the horizontally extended wings. The coxa is short and stout, followed by a still shorter trochanter ; the femora and tibize long and slender, almost invariably furnished on their under surface with two serics of strong spines, as also

invariably) with a small tooth internally below the tips ; the palms are absent or nearly so, and naturally are not necessary in a non-ambulatory insect. The wings are always elongate, and furnished with strong longitudinal neuration and dense transverse nervules strengthening the already strong (although typically transparent) membrane. In the Agriontde both pairs are nearly equal, and are carried vertically and longitudinally in repose, and the neuration and membrane are less strong ; heuce the species of this family are not so powerful on the wing as are those of the other groups in which the wings are horizontally extended in a position ready for

instant service. The neuration is peculiar, and in many respects without precise analogy infother groups of insects, but it is not necessary here to euter into more than some special points. On the costal margin (excepting in some Calopterygina) there is a

The legs vary in length | and stoutness, but may, as a rulc, be termed long and |

small dark space limited by nervules,termed the pterostigma; and between this and the base of the wing is a point termed the “nodus,” at which the sub-costal nervure is suddenly arrested. The arrangement of the nervures at the base of the wing is very singular, and slight differences in it form useful aids to classification. In the Mschnide and Libellulide this arrangement results in the formation of a triangular space (known as the “ triangle ”), which is either open or traversed by nervules; but in many Agrionide this space, instead of being triangular, is oblong or elongately quadrate, or with its upper edge partly straight and partly oblique. This fixitude of type in neuration is not one of the lcast important of the many peculiarities exhibited in these insects.

The internal structure is comparatively simple. The salivary glands appear to be absent, and the whole digestive apparatus consists of an elongate canal extending from mouth to anus, comprising the cesophagus, stomach, and intestine, with ccrtain dilatations and constrictions ; the characteristic Malpighian vessels are stated to number about forty, placed round the posterior extremity of the stomach. Dragon-flies eat their prey completely, and do not content themsclves by merely sucking its juices; the harder portions are rejected as elongate, nearly dry, pellcts of excrement.

But the most extraordinary feature in the economy, —one which has attracted the attention of naturalists from remote times,—is the position of the genital organs, and the corresponding anomalous manuer in which the pairing of the sexes and impregnation is effected. In the male the intromittent organ is (as stated above) situated in a slit on the under surface of the sccond abdominal segment ; it is usually very crooked or sinuous in form, and is accompanied by sheaths, and by external hooks or secondary

appendages, and also by scminal vessels. But the ducts of the vessels connected with the testes unite and open on the under surface of the ninth segment ; hence, before copulation can take place, it is necessary that the vessels in the second segment be charged from this opening, and in the majority of cases this is done by the male previously to seeking the female. In the latter sex the entrance to the oviduct and genital organs is on the under surface of the eighth abdominal segment. The act of pair- ing may be briefly stated as follows. The male, when flying, seizes the prothorax of the female with the strong appendages at the extremity of the abdomen, and the abdomen of this latter sex is then curved upward so as to bring the under side of the eighth segment into contact with the organs of the second segment of the male. This act mnst have becn observed by all, though but few non-

| entomologists are acquainted with the reasons for this most | extraordinary position. are the tarsi, which consist of threc slender joints, the last having two long and slender claws, usually (but not |

In the more powerful Libellulide, &e., the act is of short duration, and it is probable that polygamy and polyandry exist, for it possibly requires more than one almost momentary act to fertilize all the eggs in the ovaries of a female. But in many Agrionda, and in some others, the male keeps his hold of the prothorax of the female for a lengthened period, retain- ing himself in flight in an almost perpendicular manner, and it may be that the deposition of eggs and pairing goes on alternately. There is, however, much yet to be learned on these points. The gravid female usually lays her eggs in masses (but perhaps sometimes singly), and the operation may be witnessed by any one in localities frequented by these insects. She hovers for a considerable time over nearly the same spot, rapidly dipping the apex of her abdomen into the water, or at any rate touching it, and often in placcs where there are no water-weeds, so that in all probability the eggs fall at once to the bottom. But in some of the Agrionide the female has been often noticed

by trustworthy observers to creep down the stems of aquatic plants several inches below the surface, emerging after the act of oviposition has been effected ; and in the case of Lestes sponsa, Von Siebold saw the male

descend with the female. The same exact observer noticed also in this species that the female makes slight incisions in the stems or leaves of water plants with the double serrated apparatus (vulva) forming a prolongation of the ninth seg- ment beneath, depositing an egg in each excision. He has

seen two pairs thus occupied beneath the surface on one and the same stem.

Fia. 1.—The anterior portion of the body of M@schna cyanea freed from the puparium.

Fic. 2,—The tail being extricated.

The duration of the sub-aquatic life of a dragon-fly is no doubt variable, according to the species. In the smaller forms it is probably less than a year, but precise evidence is wanting as to the occurrence of two broods in one year. On the other hand, it is certain that often a longer period

Fria. 3.—The whole body extricated.

is requisite to enable the creature to attain its full growth, and three years have been stated to be necessary for this in the large and powerful Anax formosus. Like all insects with incomplete metamorphoses, there is no quiescent pupal condition, no sharp line of demarcation between the larval and so-called “nymph” or penultimate stage. The creature goes on eating and increasing in size from the moment

O87 it emerges from the egg to the time when it leaves the water to be transformed into the aerial perfect insect. The number of moults is uncertain, but they are without doubt numerovs, At probably about the antepenul- timate of these operations, the rudimentary wings begin to appear as thoracic buddings, aud in the full-grown nymph these wings overlap about one-half of the dorsal surface of the abdomen. In structure there is a certain aniount of resemblance to the perfect insect, but the body is always much stouter and shorter, in some cases most dis- proportionately so, and the eyes are always separated ; even in those genera (e.g., @schna) in which the eyes of the imago are absolutely contiguous, the most that can be seen in the larva is a prolongation towards each other, and there are no

ocelli. ‘The Jegs are shorter and more fitted for crawling about water plants and on the bottom. In the mouth parts the mandibles and maxillz are similar in form to those of the adult, but there is an extraordinary and unique modification of the lower lip. This is attached to an elongate and slender mentum articulated to the

Pra. 4.—The perfect insect (the wings having acquired their full dimen- sions) resting to dry itself, preparatory to the wings being horizon: tally extended. 2

posterior portion of the lower surface of the head, slightly

widened at its extremity, to which is again articulated the

labium proper, which is very large, flattened, and gradually dilated to its extremity ; but its form differs according to group as in the perfect insect. Thus in the Agrionide it is deeply cleft, and with comparatively slender side- pieces (or palpi), and strongly developed articulated spines; in the dschnide it is at the most notched, with narrow side-pieces and very strong spines ; in the Libel- lulide it is entire, often triangular at its apex, and with enormously developed palpi without spines, but having the opposing inner edges furnished with interlocking serra- tions, The whole of this apparatus is commonly termed the mask. In a state of repose it is applied closely against the face, the elongated mentum directed backward and lying between the anterior pair of legs; but when an approaching victim is secn the whole apparatus is suddenly projected, and the prey caught by the raptorial palpi; in some large species it is capable of being projected fully half an inch in front of the head. The prey, once caught and held by this apparatus, is devoured in the usual manner.

There are two pairs of thoracic spiracles, but respiration is

mostly affected by a peculiar apparatus at the tail end, and

there are two different methods. In the Agrionide there are three elongate flattened plates, or false gills, full of tracheal ramifications, which extract

the air from the water, and convey it to the internal trachez (in Calopteryx these plates are excessively long, nearly equalling the abdomen), the plates also serving as means of locomotion, But in the other groups these external false gills are absent, and in their place are five valves, which by their sudden opening aud closing force in the water to the rectum, the walls of which are furnished with branchial lamelle. The alternate opening and closing of these valves enables the creature to make quick jerks or rushes (incorrectly termed "'leaps"') through the water,! and, in conjunction with its mouth parts, to make sudden attacks upon prey from a considerable distance. The lateral angles of the terminal abdominal scgments are sometimes produced into long curved spines. In colour these larve are generally muddy, and they frequently have a coating of muddy particles, and hence are less likely to be observed by their victims. If among insects the perfect dragon-fly may be termed the tyrant of the air, so may its larva be styled that of the water. Aquatic insects and larve form the principal food, but there can be no doubt that worms, the fry of fish, and even younger larve of their own species, form part of the bill of fare. Tbe "nymph " when arrived at its full growth sallies forth froin the water, and often crawls a considerable distance (frequently many feet up the trunks of trees) before it fixes itself for the final change, which is effected by the thorax splitting longitudinally down the back, through which fissure the perfect insect gradually drags itself. The figures on last page indicate this process as observed in Aischna cyanea.

For a considerable time after its emergence a dragon-fly is without any of its characteristic colours, and is flaccid and weak, the wings (even in those groups in which they are afterwards horizontally extended) being held vertically in a line with the abdomen. By degrces the parts harden, and the insect essays its first flight, but even then the wings have little power and are semi-opaquc in appearance, as if dipped in mucilage. In most specics of Calopterygina, and in some others, the prevailing colour of the body is a brilliant bronzy green, blue, or black, but the colours in the other groups vary much, and often differ in the sexes. Thus in Lzbellula depressa the abdomen of the fully adult male is covered with a bluish bloom, whereas that of the female is yellow; but several days clapse before this pulverulent appearance is attained, and a comparatively young male is yellow like the female. The wings are typically hyaline and colourless, but in many species

(especially Calopterygina and Libellulina) they may be wholly or in part opaque and often black, due apparently to gradual oxydization of a pigment between the two membranes of wluch the wings are composcd ; the brilliant iridescence, or metallic lustre, so frequently found is no doubt due to interference—the effect of minute irregularities of the surface—and not produced by a pigment. A beauti- ful little genus (Chalcopteryx) of Calopterygina from the Amazon is a gem in the world of insects, the posterior wings being of the most brilliant fiery metallic colour, whereas the anterior remain hyaline.

These insects are pre-eminently lovers of the hottest :

sunshine (a few are somewhat crepuscular), and the most powerful and daring on the wing in fine weather become inert and comparatively lifeless when at rest in dull weather, allowing themselves to be captured by the fingers without making any effort to escape. Many of the larger species (Aschna, &c.) have a habit of affecting a particular

1A similar contrivance was suggested and (if the writer mistakes not) actually tried as a means of propelling steam-ships.

twig or other resting place like a fly-catcher among birds, darting off after prey and making long excursions, but returning to the chosen spot. Mr Wallace, in his Malay Archipelago, states that the inhabitants of Lombock use the large spccics for food, and catch them by means of limed twigs.

They are distributed over the whole world excepting the polar regions, but are especially insects of the tropics. At the present day about 1700 species are known, dispersed unequally among thc several sub-families as follows: Agrionina, 490 specics ; Calopterygina, 170; Gomphina, 210; Mschnina, 150; Corduliina, 100 ; Lrbellulina, 580. In Europe proper only 100 species have been observed, and about 46 of these occur in the British islands, New Zealand is excessively poor, and can only number 8 species, whereas they arc very numerous in Australia. Some species are often seen at sea, far from land, in calm weather, in troops which are no doubt migratory ; our common Labellula quadrimaculata, which inhabits the cold and tempcrate

regions of the northern hemisphere, has been frequently seen in immense migratory swarms. One species (Pantala jlavescens) has about the widest range of any insect, occurring in the Old World from Kamtchatka to Australia, and in the New from tlie Southcrn States to Chili, also all over Africa and the Pacific islands, but is not found in Europe. The largest species occur in the Aischnina and Agrionina ; a member of the former sub-family from Borneo expands to nearly 64 inches, and with a moderately strong body and powerful form ; in the latter the Central American and Brazilian Afegaloprepus ceerulatus and species of JAZecistogaster are very large, the former expanding to nearly 7 inches, and the latter to nearly as much, but the abdomen is not thicker than an ordinary grass-stem and of extreme length (fully 5 inches in Mecrstogaster). Among living entomologists the dragon- flies have received, and are receiving, great attention, especially from the Baron de Selys-Longchamps of Jiége, and from Dr H. A. Hagen, formerly of Konigsberg, now of Cambridge, Massachusetts.

It is impossible to prepare dragon-flies for the cabinet so as to retain all the brilliant colours the bodies have in life. They are excessively brittle when dry, and in the smaller species it is advisable to run a bristle into the under side of the thorax, pushing it down till it reach the extremity of the abdomen, when the other end can be cut off close to thethorax. But tlie larger species should be disembowelled through: a slit along tle under surface of the abdomen, and then filled (but not too tightly) with clean white cotton wool. The colours stand a much better chance of not greatly altering if the insects be not killed until some hours after they are captured, so as to allow the contents of the intestinal canal to be naturally passed away, for it is the decomposition of the food that assists materially to alter or obliterate the colour and markings.

Among fossil insects dragon-flies hold a conspicuous position. Not only do they belong to what appears to have been a very ancient type, but in addition, the large wings and strong dense reticulation are extremely favourable for preservation in a fossil condition, and in many cases all the intricate details can be as readily followed as in a recent example. In this country they have been found more especially in the Purbeck beds of Swanage, and the vales of Wardour and Aylesbury, in the Stonesfield Slate

series, and in the Liasand Rhetic series of the west of Engkand. But the richest strata appear to be those of the Upper Miocene at, iningen, in the Rhine valley; the Middle Miocene at Radaboj, in Croatia ; the Eocene of Aix, in Provenge ; and more especially the celebrated Secondary rocks furnishing the lithographic stone of Solenhofen, in Bavaria, This latter deposit would appear to have been of marine origin,

and it is significant that, although the remains of gigantic dragon-flies discovered in it are very numerous and perfeet, no traces of their sub-aquatie conditions have been found, although these asa rule are numerous in most of the other strata, hence the insects may be regarded as having been drowned in the sea and washed on shore. Many of these Solenhofen speeies differ considerably in form from those now existing, so that Dr Hagen, whi has especially studied them, says that for nearly all it is necessary to make new genera. A notiee of fossil forms should not be eoneluded without the remark that indieations of at least two speeies have been found in amber, a number disproportionately small if eom- pared with other insects entombed therein ; but it must be remembered that a dragon-fly is, as a rule, an insect of great power, and in all probability those then existing were able to extricate themselves if accidentally entangled in the resin. See De Selys-Longchamps, Monographie des Libellulidées d’Europe, Brussels, 1840; Synopses des Agrionines, Caloptlérygines, Gomphines, et Cordulines, with Supplements, Brussels, from 1853 to 1877; De Selys-Longchamps and Hagen, Revue des Odonates d’Europe, Brussels, 1850 ; Afonographie des Caloptérygines et des Gomphines, Brussels, 1854 and 1858; Charpentier, Libellulinew ewropece, Leipsic, 1840. (R. M‘T,.) DRAGON’S BLOOD, a name applied to the resins obtained from several species of plants. Calamus Draco (Willd.), one of the Rotang or Rattan Palms, which pro- duees much of the dragon’s blood of commeree, is a native of Further India and the Eastern Archipelago. When young it grows ereet, but with age it beeomes elimb- ing. The leaves are pointed, about a foot long, of a finger’s breadth, and, like the stems, armed with spines. The flower has a three-cleft eorolla, and the ovary is egg- shaped. The fruit is round, pointed, sealy, and the size of a large elierry, and when ripe is eoated with the resinous exudation known as dragon’s blood. The finest dragon’s blood, ealled jernang or

djernang in the Hast Indies, is obtained by beating or shaking the gathered fruits, sifting out impurities, and melting by exposure to the heat of the sun or by placing in boiling water; the resin thus purified is then usually moulded into stieks or quills (the sangais draconis in baculis of pharmaey), and wrapped in reeds or palm-leaves, and is then ready for market. An impurer aud inferior kind, sold in lumps of eonsiderable size (sanguis draconis in massis), is extraeted from the fruits by boiling. Dragon's blood is dark red-brown, nearly opaque, and brittle, eontains small shell-like flakes, and gives when ground a fine red powder ; it is soluble in aleohol, ether, and fixed and volatile oils, and in the pure condition has, aeeording to F. W. Johnston (Phil. Trans., 1839, p. 134), the composition C,,H,,O, If heated it gives off fumes of benzoie acid. In Europe it was once valued as a medicine on aeeount of its astringent properties, and is now used for eolouring plasters, dentrifiee, and varnishes; in China, where it is mostly eonsumed, it is employed to give a red facing to writing paper. The drop dragon's blood of eom- meree, called cinnabar by Pliny (WV. Jf. xxxiii. 39),and sangre de dragon by Barbosa, was formerly and is still one of the products of Socotra, the Dioscoridis insula of ancient seographers ; it was known to the Arabs by the term Adtir, from which the name of the island may have been derived (see A. Sprengel, Alte Geographie Arabiens, 1875). It is the spontaneous exudation of a leguminous tree, Pterocarpus Draco, which grows at elevations between 800 and 2000 feet above sea-level (see Wellsted, Journ. fh. Geog. Soc., 1835, p. 198). Jacquin states (Select. Stirpium Amer. Hist., p. 283, 1763) that the tree grows in the woods of Tierra Bomba, off Cartagena, in Colombia, and that dragon's blood, obtained from it by ineision, was at one time imported into Spain for medicinal purposes. The dragon's blood of the Canary Islands 1s a tonie and astringent resin vroeured from the surface of the leaves

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and from eraeks in the trunk of Draceena Draco, a tree of the natural order Liliacee. The hardened juiee of a euphorbiaceous tree, Croton Draco, a resin resembling kino, is the sangre del drago or dragon's blood of the Mexicans, nsed by them asa vulnerary and astringent.

Rumphius, Herbariwm Amboinense, p. v. 114-119, tab. lviii., 1747 ; Fliickiger and Hanbury, Pharmacographia, 1874.

DRAGUIGNAN, the chief town of the department of Var, in Franee, and of an arrondissement of the same name, on the River Pis, a branch of the Nartuby, lies at the foot of the wooded height of Malmont, in 43° 32’ 18” N. lat. and 6° 27’ 56” KE. long. The préfeeture, palace of justiee, theatre, hospital, and prison are the most important publie buildings. The town possesses a communal college, a training sehool for teachers, a botanical garden, a fine promenade, a library of about 18,000 volumes, eolleetions of eoins, pictures, and natural history objeets, and an archeologieal soeiety. The inhabitants, who in 1872 numbered 8177, are engaged in agriculture and the manu- faeture of wine, eoarse eloth, earthenware, silk, soap, eandles, oil, brandy, eopper wares, and leather.

DRAINAGE. See AcRicuLTURE, ARCHITECTURE, BuiLvine, and SEWAGE.

DRAKE, Sir Francts (c. 1545-1595), a eelebrated English admiral, was born near Tavistoek, Devonshire, about 1545 aceording to most authorities, but Barrow, in his life, says the date may have been as early as 1539. His father, a yeoman and a zealous Protestant, was obliged to take refuge in Kent during the persecutions in the reign of Queen Mary. He obtained a naval ehaplainey from Queen Elizabeth, and is said to have been afterwards vicar of Upnor Chureh, on the Medway. This, however, must ke a mistake, as there is no evidenee of any chureh ever hav- ing existed at Upnor. Young Drake was edueated at the expense and under the eare of Sir John Hawkins, who was his kinsman; and, after passing an apprenticeship on a eoasting vessel, at the age of eighteen he had risen to be purser of a ship trading to Biseay. At twenty he made a voyage to Guinea; and at twenty-two he was made captain of the “Judith.” In that eapaeity he was in the harbour of San Juan de Ulloa, in the Gulf of Mexieo, where he behaved most gallantly in the actions under Sir John Hawkins, and returned with him to England, having aequired great reputation, though with the loss of all the money which he had embarked in the expedition. In 1570 he obtained a regular privateering commission from Queen Elizabeth, the powers of which he immediately exereised in a cruise in the Spanish Main. Having next

projected an attack against the Spaniards in the West Indies to indemnify himself for his former losses, hie set sail in 1572, with two small ships named the “ Pasha” and the “Swan.” He was afterwards joined by another vessel ; aud with this small squadron he took and plundered the Spanish town of Nombre de Dios. With his men he pene- trated across the isthmus of Panama, and eommitted great havoe among the Spanish shipping. From the top of a tree which he elimbed while on the isthmus he obtained his first view of the Pacific, and resolved “ to sail an English ship in these seas.” In these expeditions he was much assisted by a tribe of Indiaus, who were then engaged in a desultory warfare with the Spaniards. Having embarked his men and filled his ships with plunder, he bore away for England, and arrived at Plymouth on the 9th August 1573.

His suceess and honourable demeanour in this expedition gained him high reputation; and the use whieh he made of his riehes served to raise him still higher in popular esteen. Having fitted out three frigates at his own expense, he sailed with them to Ireland, and rendered effective service as a volunteer, under Walter earl of Essex, the father of the famous but unfortunate ear! After the death of his

patron he returned to England, where Sir Christopher Hatton introduced him to Queen Elizabeth, and procured him a favourable reception at court. In this way he acquired the means of undertaking that grand expedition which has immortalized his name. ‘The first proposal he made was to undertake a voyage into the South Scas through the Straits of Magellan, which no Englishman had hitherto ever attempted. This project having been well reccived at court, the queen furnished him with means ; and his own fame quickly drew together a sufficient force. The fleet with which he sailed on this enterprise consisted of only five small vessels, and their united crews mustered only 166 men. Having sailed on the 13th December 1577, he on the 25th made the coast of Barbary, and on the 29th Cape Verd. He reached the coast of Brazil on the 5th of April, and entered the Rio de la Plata, where lre parted company with two of his ships; but having met them again, and taken out their provisions, he turned them adrift. Onthe 29th May he entcred the port of St Julian’s, where he continued two months for the

sake of laying in a stock of provisions, On the 20th August he entered the Straits of Magellan, and on the 25th September passed them, having then only his own ship. On the 25th Nov- ember he arrived at Macao, which he had appointed as tlie place of rendezvous in the event of his ships being separ- ated ; but Captain Winter, his vice-admiral, had repassed the straits and returned to England. He thence continued his. voyage along the coast of Chili and Peru, taking all opportunities of seizing Spanish ships, and attacking them on shore, till his men were satiated with plunder ; and tlien coasted along the shores of America, as far as 48° N. lat., in an unsuccessful endeavour to discover a passage into the Atlantic. Having landed, however, he named the country New Albion, and took possession of it in the name of Queen Elizabeth. Having careened his ship, he sailed thence on the 29th September 1579 for the Moluccas. On the 4th November he got sight of those islands, and, arriving at Ternate, was extremely well received by the king. On the 10th December he made the Celebes, where his ship unfortunately struck upon a rock, but was taken off without much damage. On the 16th March he arrived at Java, whence he intended to have directed his course to Malacca; but he fonnd himself obliged to alter his purpose, and to think of returning home. On the 25th March 1580 he again sct sail ; and on the 15th June he doubled the Cape of Good Hope, having then on board only fifty-seven men and three casks of water. He passed tlie line on the 12th July, and on the 16th reached thie coast of Guinea, where he watered. On the 11th September he made the Island of Terceira, and on tlic 3d November he entered the harbour of Plymouth. This voyage round the world, the first accomplished by an Englisliman, was thus performed in two years and about ten months. The queen hesitated for some time whether to recognize his achievements or not, on the ground that such recognition might lead to complica- tions with Spain, bunt she finally decided in his favour. Accordingly, soon after his arrival she paid a visit to Dept- ford, went on board his ship, and there, after partaking of a banquet, conferred upon him the honour of knighthood, at the same time deciaring her entire approbation of all that he had done. She likewise gave directions for the preservation of his ship, the “ Golden Hind,” that it might remain a monument of his own and his country’s glory. After the lapse of a century it decayed and had to be broken up. Of the sound timber a chair was made, which was presented by Charles II. to the university of Oxford. In 1585, open hostilities having commenced with Spain, Drake sailed with a fleet to

the West Indies, and took the cities of St Jago, St Domingo, Cartagena, and St Augustine. In 1587 he went to Lisbon with a fleet of thirty sail ; and

having received intelligence of a great fleet being assembled in the bay of Cadiz, and destined to form part of the Armada, he with great courage centered the port on the 19th April, and there burnt upwards of 10,000 tons of shipping, — a feat which he afterwards jocoscly called “ singcing the king of Spain’s beard.” In 1588, when the Spanish Armada was approaching England, Sir Francis Drake was appointed vicc-admiral under Lord Howard, and made prize of a very large galleon, commanded by Don Pedro de Valdez, who was reputed the projector of the invasion, and who struck at once on learning his adversary’s name.

It deserves to be noticed that Drake’s name is mentioned in the singular diplomatic communication from the king of Spain which preceded the Armada :—

Te veto ne pergas bello defendere Belgas ; Que Dracus eripuit nunc restituantur oportet ;

Quas pater evertit jubeo te condere cellas : Religio Pape fac restituatur ad unguem.

To these lines the queen made this extempore response :— Ad Grecas, bone rex, fiant mandata kalendas.

In 1589 Drake commanded the fleet sent to restore Dom Antonio, king of Portugal, the land forces being under the orders of Sir John Norris ; but they had hardly put to sea when the commanders differed, and thus thie attempt proved abortive. But as the war with Spain continued, a more formidable expedition was fitted out, under Sir John’ Hawkins and Sir Francis Drake, against their settlements in the West Indies, than had hitherto becn undertaken during the whole course of it. Here, however, the commanders again disagreed about the plan; and the result in like manner disappointed public expecta- tion. These disasters were keenly felt by Drake, and were

| the principal cause of his death, which took place on board

his own slip, near the town of Nombre de Dios, in the West Indies, January 28, 1595.

Sce Lives of Drake by Samuel Clarke (1671) and John Barrow, junr. (1848).

DRAKENBORCH, Arnozp (1684-1748), a cclebrated scholar and editor, was born at Utrecht on the lst January 1684, Having studied belles-lettres under Greevius and Burmann, and law under Cornelius Van Eck, he succeeded Professor Burmann in 1716, and continued to hold his professorship till his death in 1748, in the sixty-fourth year of his age. His earliest work was a dissertation entitled Disputatio philologico-historico de Prafectis urbis, in 4to (1704), and its merit caused it to be reprinted at Frankfort, in 1752, by Professor Uhl, accompanied with a life of its learned author. His next work, entitled Désputatio de officio preefectorum preetorio, was published in 1707; and ten years afterwards he issucd his edition of Silius Italicns (1717), undertaken at the suggestion of Burmann. In order to render this edition as perfect as possible, nothing was omitted ; and many historical subjects were engraved for the purpose of elucidating the text, to which his own copious and learned annotations greatly contributed. But his splendid edition of Livy (Lugd. Batav. 1738 and 1746, 7 vols.), with a life of that historian, is that on which his fame as a scholar cluefly rests. The preface to this work is replete with crudition, and gives a particular account of all the literary men who have at different periods com- mented on the works of Livy. His edition is based on that of Gronovius; but hc made many important altera- tions on the authority of manuscripts which it is probable Gronovius either had never seen, or had not taken the pains to consult. The cdition is pecuharly rich in various readings, but the text is, of course, inferior to that which has been furnished by the skill of later editors. Upon the whole, this edition of Livy was, at the time of its publi- cation, one of the most elaborate, interesting, and instruc- tive that had ever been given to the world.

Drama defined.

Origin of tne drama,

and of dramatic literature,

Relations betweenthe lramatic and the histrionie arts,

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DRAMA

RAMA (from dpaw) signifies action. The term is applied to compositions which imitate action by re- presenting the personages introduced in them as real and as employed in the action itself. The varieties of the drama differ more or less widely, both as to the objects imitated and as to the means used in the imitation. But they all agree as to the method or manner which is essential to the draniatic art, viz., dmitation in the way of action.

Tho desire to give expression to feelings and couceptions is inseparable from human nature. Man expresses his thoughts and emotions by gesture and by speech, or by a combination of both ; and these expressions he soon learus in the society of other men—and more especially on joyous or solemn occasions—to vary or regulate in dance and song. Another way of expression, often combined with the other, is imitation. To imitate, says Aristotle, is instinctive in man from his infancy; and from imitation all men naturally receive pleasure. Gesture and voice are means of imitation common to all human beings; and the aid of some sort of dress and decoration is generally within the reach of children, and of the childhood of nations. The assumption of character, whether real or fictitious, is there- fore the earliest step towards the drama. But it is only a preliminary step ; nor is the drama itself reached till the imitation extends to action.

Action, which man is not wont to attribute (except figuratively) to any but members of his own species and to the superior Being or beings in whose existence and power he believes, implies an operation of the will and an execu- tion of its resolution, whether or not amounting to a fulfil- ment of its purpose. It implies a procedure from cause to result. Action must therefore present itself to the human mind as having its source in a human or superhuman will. Every imitation of action by action is in germ a drama. But to this point not all nations have advanced.

After this step has been taken, it only remains for the drama to assume a form regulated by literature, of which art it thus becomes a branch. We may then speak of a dramatic literature; but this only a limited number of nations has come to possess. A nation may, however, have a drama without a dramatic literature ; it may even continue in possession of the former after having ceased to cultivate the latter. On the other hand, both before and after the drama of a nation has assumed a literary form, it may allow one or more of its adventitious elements—music, dancing, decoration—predominantly to assert themselves, and thus eventually to bring about the formation of new, or the revival of disused, dramatic species. But as a branch of literature the drama necessarily includes speech among its means of imitation; and its beginnings as such are accordingly, in the history of all literatures known to us, preceded by the beginnings at least of other forms of poetic composition, the lyric and the epic, or by those of one of these forms at all events. It is in the combination of both that the drama in its literary form takes its origin in the case of all national civilizations in which it has found a place and with which we are more than superficially acquainted.

The art of acting is the indispensable adjunct of the dramatic art, while the aid of all other arts is merely an accident. But though really inseparable from one another, the courses of the dramatic and the histrionic arts do not at all times run parallel. The actor is only the temporary interpreter of the dramatist, though he may occasionally be left to supply some of the proper functions of his text- giver. On his side, the dramatist may in practice, though

he cannot in theory, dispense with the actor’s interpreta- tion; but though the term literary drama is sometimes used of works kept apart from the stage, it is in truth a misnomer, since, properly speaking, no drama is such till it is acted.

The whole body of the laws and rules of the drama, could it be written down with completeness, would indicate, together with the ends proper to the art, the means by which it is able to accomplish them. But neither the great authorities of dramatic theory—an Aristotle or a Lessing—nor the resolute apologists of more or less transitory fashions—a Corneille or a

Dryden—have ex- hausted the exposition of the means which the drama has proved or may prove capabie of employing. The multitude of technical terms and formule which lias gathered round the practice of the art has at no time seriously interfered with the operation of creative power, whose inventive activity the existence of; accepted systems has frequently—in the Greek drama, for instance, and in the Spanish-—served to stimulate. On the other hand, it is self-evident that no dramaturgic theory has ever given rise to a single dramatic work of enduring value, unless the creative force was there to animate the form.

The task of this creative force begins with the beginnings of the dramatist's labours.

Laws and rules of the

drama.

Subject,

For it is in the dramatic zdea idea, and

that the germ of the action of a play lies—not in the ®t.

subject, which is merely its dead material. The story of the Scottish thane as it stood written in the chronicle, is the subject, not the action, of Macbeth. To convert a subject—whatever its kind or source—into the action or fable of a play is the primary task, which in its progressive development becomes the entire task, of the dramatist ; and though the conception may expand or modify itself with the execution, yet upon the former the latter depends. The range of subjects open to a dramatist may be wide as the world itself, or it may be limited by usage, by imperious fashion, by the tastes and tendencies of a nation or an age, by the author's own range of sympathies, by a thousand restrictions of an historical, moral, or esthetical origin ; it may be virtually confined (as with the earlier Greek tragedians) to a body of legend, or (as with the English comedians of the Restoration) to the social experiences of a particular epoch. But in all cases the transformation of the subject into the action is equally indispensable ; and an imperfect transformation is (as in the old Chronicle Histories) the work of a rude, or

(as in ninety- nine out of a hundred modern plays “founded upon fact ”) that of a careless method of dramatic production.

What, then, are the laws which determine the nature of all actions properly such, however they may vary either in subjects or in form? In the first place, a dramatic action must possess waity—and this requirement at once distin- guishes it from the subject which has suggested its idea. The events of real life, the facts of history, the incidents of narrative fiction, are like the waves of a ceaseless flood ; that which binds a group or body of them into a single action is the bond of the dramatic idea, and this it is which the dramatist has to supply. Within the limits of a dramatic action all its parts claim to be connected together as contributions to a single stream ; and upon the degree in which they are true to this purpose their primary dramatic significance depends. The unity of action which a drama should possess, therefore, means that everything in it should form a link in a single chain of cause and effect. This law is incumbent upon every kind of drama —alike upon the tragedy which solves the problems of a life,

Unity of action.

hop

and upon the farce which sums up the follies of an after- noon.

Such is not, however, the case with certain rules which have at different times been set up for this or that kind of drama, but which have no absolute validity for any kind. The supposed necessity that an action should consist of one event ig an erroneons interpretation of the law that it should be, as an action, one. For an event is but an element in an action, though it may be an element of decisive momeut. The assassination of Cresar is not the action of a Cesar- tragedy ; the loss of his treasure is not the action of Zhe Miser. Again, unity of action does not exclude the intro- duction of one or even more subsidiary actions as contri- buting to the progress of the main action. The sole indispensable law is that these should always be treated as what they are—subsidiary only; and herein lies the difficulty, which Shakespeare so successfully overcame, of solving a combination of subjects into the idca of a single action; herein also lies the danger in the use of that favourite device of the modern drama—bye- or wnder-plots. On the other hand, a

really double or multiple action, logically carried out as such, is inconecivable in a single drama, though there is many a play which is palpatly only two plays knotted into one. Every one is familiar with the dramatist who towards the drop of the curtain seems to be counting on his fingers whom he has killed or what couples he has to marry. ‘Thirdly, unity of action need not imply unity of hero—for hero (or heroine) is merely a term signifying the principal personage of the action. And inasmuch as an action may consist in the joint contention of more than one will against the same obstacle—as in the instance of Zhe Seven against Thebes, or Romeo and Juliet—it is only when the change in the degree of interest excited by different characters in a play results from a change in the conception of the action itself, that the consequent duality (or multiplicity) of heroes recalls a faulty uncertainty in the conception of the action they carry on. Such is the objection applying to the crucial case of Schiller’s Don Carlos. Lastly, the entirely arbitrary exactions of unity of time and of place are not, like that of unity of action, absolute dramatic laws. Their object is by representing an action as visibly continuous to render its unity more distinctly or easily perceptible; but the effect of their observance cannot be to render it more really one. Thus they may in one sense be regarded as devices to avoid the difficulty experienced by the human mind in regarding an action as one when the eye beholds its different parts occurring in what are supposed to be different places, or when the process of its advance from cause to effect extends over what is supposed to be a con- siderable period of time. But the imagination is capable of constructing for itself the bridges necessary to preserve to an action, conceived of as such, its character of con- tinuousness. In another sense these rules were convenient usages conducing toa concise and clear treatment as actions of subjects in themselves of a limited nature; for they were a Greek invention, and the repeated resort to the same group of myths made it expedient fora Greek poet to seek the subject of a single tragedy in a part only of one of the myths open to him. The observance of unity of place, moreover, was suggested to the Greeks by certain outward conditions of their stage-—as assuredly as it was adopted by the French in accordance with the construction and usages of theirs, and as the neglect of it by the Elizabethans was in their case encouraged by the established form of the English scene. The palpable artificiality of these laws needs no demonstration, so long as the true meaning of the term action

be kept in view. Of the action of Othello part takes place at Venice aud part at Cyprus, and yet the whole is one in itself ; while the limits of time

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over which an action extends cannot be restricted by a revolution of the earth round the sun, or of the moon round the earth.

In a drama which presents its action as one, this action Compl. te- must be complete in itself. This law, like the first, distin- ness of guishes the dramatic action from its subject. The former action may be said to havea real artistic, while the latter has only an imaginary real, completeness. The historian, for instance, aims indced at a complete exposition of a body of events and transactions, and nay even design to show their working to a definite end; but he is aware that this aim can never be more than partially accomplished, since he may present only what he knows, and all human know- ledge is partial. But art is limited by no such uncertainty.

The dramatist in treating an action as one, comprehends

the whole of it in the form of his work, since to him whio

has conceived it all its parts, from cause to effect, are equally

clear, Accordingly, every drama should represent in \ organic sequence the several stages of which a complete action consists, and which are essential to it. This law of completeness therefore lies at the foundation of all systems { of dramatic construction.

Every action, if conceived of as complete, has its causes, Systems of growth, height, consequences, and close. There is no construe: binding law to prescribe the relative length at which these tion

: 3 é on this law | several stages in the action should be treated in a drama, o¢ oom. or to enforce a more or less exact correspondence between pleteness, the successive presentment of each, and technical divisions, such as acts or scenes, which dramatic practice may find it convenient to adopt. Neither is there any law to assert any obligatory regulation of the treatment

of such subsidiary ; actions as may be introduced in aid of the main plot, or of such more or less directly connected episodes which may at the same time advance and relieve its progress. But ex- perience, as the parent of usage, has uecessarily from time to time established certain rules of practice, from which the dramatist, working under customary forms, will find it neither easy, nor in most cases advantageous, to swerve too widely ; and from the adoption of particular systems of division for particular species of the drama—such as that into five acts for a regular tragedy or comedy, which Roman example has caused to be so largely followed—has naturally resulted a certain uniformity of relation between the conduct of an action and the outward sections of a play. Essentially, however, there is no difference between the laws regulating the construction of a Sophoclean or Shakespearcan tragedy, a comedy of Molicre or Congreve, and a well-built modern farce. And this, because all exhibit an action complete in itself.

The introduction or exposition forms an integral part of Prologues | the action, and is therefore to be distinguished from the pro- and epi; | logue in the more ordinary sense of the term, which, like the ae | epilogue (or the Greek parabasis), stands outside the action, act | and is a mere address to the public from author or actor ; occasioned by the play. Prologue and epilogue, greatly as they may have at times contributed to the success of a drama, are mere external adjuncts, and have as little to do with the construction of a play as the bill which announces it, or the musical prelude which disposes the mind for its reception. The introduction or exposition belongs to the Parts of action itself; it is, as the Hindu critics called it, the seed the action. | or circumstance from which the business arises. Clearness hie being its primary requisite, many expedients have been at os osition. various times adopted to secure this feature. Thus, the Euripidean prologue, though spoken by one of the charac- ters of the play, takes a narrative form, aud places itself half without, half within the action of which it properly is part. The same purpose is served by the separate induc- tions in many of our old English plays, and the preludes or prologues, or by whatever name they may call

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Opening of

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themselves, in numbcrless modern dramas of all kinds— from Faust down to the favourites of the Ambigu and the Adelphi, Another such expedient is that of the inductive dumb-shows, which sought to secure rapidity together with impressiveness of exposition by the process of pantomimic summary. Such, again, are the opening scenes in French tragedy between hero and confidant, and those in French comedy and its derivatives between observant valet and knowing lady's-maid. But it is clear how all such expedicnts may be rendered unnecessary by the art of the dramatist, who is able outwardly also to present the intro- duction of his action as what it is— an organic part of that action itself; who seems to take the spectators in medias res while he is really building the foundations of his plot ; who can dramatically account for an Iliad of wocs without going back to Leda's egg ; who touches in the opening of his action the chord which is to vibrate throughout its course—" Down with the Capulets! down with the Montagues !"—" With the Moor, sayest thou ?"

The introduction ends with the opening of the movement

movement. of the action, a passage which it may prove highly effective

Growth.

J – Height or | climax.

to mark with the utmost distinctness (as in Hamlet, where it is clearly to be sought in the actual meeting between the

hero and the ghost), but which in other instances is advan-

tageously marked by the insertion of subsidiary action or episode (as in King Lear, where the opening of the move- ment of tlie main action would follow too sharply upon its exposition, were not the beginning of the subsidiary action of Gloster and luis sons opportuncly introduced between them). From this point the second stage of the action—its growth—

progresses to that third stage which is called its height or climax, All that has preceded the reaching of this constitutes that half of the drama—usually its much larger half—which Aristotle terms the déoxs, or tying of the knot. The varieties in the treatment of the growth or second stage of tle action are infinite, and it is here that the masters of the tragic and the comic drama—notably those uncqualled weavers of intrigues, the Spaniards—are able most fully to exercise their cnventive faculties. If the growth is too rapid, the climax will fail of its effect—and it is, therefore, at this stage that subsidiary actions and episodes are most largely used ; if it is too slow, the interest will be exhausted before the greatest demand upon it has been made—a fault to which comedy is specially liable ; if it is involved or inverted, a vague unccrtainty will take the place of an eager or agreeable suspense, the action will seem to halt, ora fall will begin prematurely. In the contrivance of the climax itself lies one of the chief tests of the dramatist's art; for while in the transactions of real life their climax is often only a matter of assumption, in the action of a drama its climax should present itself as self-evident. In the middle of everything, says the Greek poet, lies the strength ; and this strongest or highest point it is the task of the dramatist to make manifest. Much here depends upon the niccties of constructive instinct ; much (as in all parts of the action) upon a thorough dramatic transformation of the subject. The historical drama here presents peculiar difficulties, and perhaps the example of /Zenry VIIJ., as compared with Shakespeare's other historicul plays, may be held to furnish an instructive example of defective (because hasty) workmanskip.

From the climax, or height, the action proceeds through its fall to its close, which in a drama with an unhappy ending we still call its catastrophe, while to terminations in general we apply the term dénouement. This latter name would, however, more properly be used in the sense in which Aristotle employs its Greek equivalent Avows—the untying of the knot—of the whole of the second part of the action, from the climax downwards. If, in the manage- ment of the climax, everything depended upon making the

effect, in the fall everything depends upon not marring it. This may be ensured by a rapid progress to the close; but neither does every action admit

of such treatment, nor is it in accordance with the character of those actions which are of a complicated kind. is often a return—z.c., in Aristotle's phrase, a change into the reverse of what is expected from the circumstances of the action (zepirérea),—as in Coriolanus, where the Roman story lends itself so admirably to dramatic demands. In any case the art of the dramatist is in this part of his work called upon for the surest exercise of its tact and skill. The effect of the climax has becn to concentrate the interest; the fall must therefore, above all, avoid dissipating it. The use of episodes is not even now excluded ; but they must be of a more directly significant kind than is necessary in the earlier stages of the drama ; even where serving the purpose of relief they must help to keep alive the interest previously raised to its highest pitch, This may be effected by a return or revolution ; or again, by the raising of obstacles between the height of the action and its expected consequences, by the suggestion in tragedy of a seemingly possible recovery or escape from them (as in the wonderfully powerful construc- tion of the latter part of Macbeth), by the gradual removal in comedy, or wherever the interest of the action is less intense, of such difficulties as the growth and climax have occasioned. In all kinds of the drama discovery will remain, as it was in the judgment of Aristotle, a most effective expedient; but it should be a discovery which has been foreshadowed by that method of treatment which in its consummate master, Sophocles, has been termed his trony.

Nowhere should the close or catastrophe be other than a Close or Sudden rcvulsions from catastrophe.

consequence of the action itself. the conditions of the action—such as the deus ex machina, or the revising officer of the emperor of China, or the nabob returned from India bring about—condemn them- sclves as unsatisfactory makeshifts. However sudden, and even, in manner of accomplishment, surprising, may be the catastrophe, it should not be unprepared, but like every other part of the action should preserve its organic connec- tion with the whole. The sudden suicides which terminate so many tragedies, and the paternal blessings which close an equal number of comedies, should be something more than a signal for the fall of the curtain.

The action of a drama, besides being one and complete Probability The probability of action.

in itself, ought likewise to be probable. required of a drama is not that of actual or historical experience—it is a conditional probability, or in other words the consistency of the course of the action with the conditions under which, and with the characters by which, the dramatist las chosen to carry it on. As to the former, he is fettered by no restrictions save those which he imposcs upon himself, whether or not in deference to the usages of certain accepted specics of dramatic composition. Ghosts appear neither in real life nor in dramas of real life; but the introduction of supernatural agency is neither enjoined nor prohibited by any general dramatic law. The use of such expedients is as open to the dramatic as to any other poct; the judiciousness of his use of them depends upon the effect which, consistently with the general conduct of luis action, they will exercise upon the spectator, whom other circumstances may or may not predispose to their accept- ance. The ghost in Hamlet belongs to the action of the play' the ghost in the Perse is not intrinsically less pro- bable, but the apparition scems to spring, so to speak, less naturally out of the atmosphere around it. Dramatic probability lias, however, a far deeper meaning than this. The Lumenides is probable with all its primitive mysterious- ness, and Jfacbeth with all its barbarous witchcraft, The proceedings of the feathered builders of Cloudcuckootown | VIL. — 50

With the latter, therefore, the fal Return.

Character- ization.

Advance of produces.

the drama in this respect.

Requisites of cha- racter,

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are as true to dramatic probability as are the pranks of Oberon's fairies. In other words, it is in the consistency of the action with the characters, and of

the characters with themselves, that this dramatic probability lies. The dramatist has to represent characters affected by the pro- gress of an action in a particular way, and contributing to it in a particular way, because, if consistent with themselves, they must be so affected, and must so act.

Upon the invention and conduct of his characters the dramatist must therefore expend a great proportion of his labour. His treatment of them will, in at least as high a degree as his choice of subject, conception of action, and method of construction, determine the effect which his work And while there are aspects of the dramatic art under which its earlier history already exhibits an un- surpassed degree of perfection, there is none under which its advance is more perceptible than this. Many causes have contributed to this result ; the chief is to be sought in the multiplication of the opportunities for mankind's study of man. The thcories of the Indian critics on the sub- ject of dramatic character are a scaffolding more elaborate than the edifice it surrounds. Aristotle's remarks on the subject are scanty; and it may be unhesitatingly asserted that the strength of the dramatic literature from whose examples he abstracted his maxims is not to be sought in the fulness or variety of its characterization. This relative deficiency the outward conditions of the Greek theatre—the remoteness of actor from spectator, and the consequent necessity for the use of masks, and for the raising and therefore conventionalizing of the tones of the voice—-undoubtedly helped to occasion, Later Greek and Roman comedy, with a persistency furnishing a remarkable illus- tration of the force of habit, limited their range of charac- tcrs to an accepted gallery of types. Nor is it easy to ignore the fact that these examples, and the influence of national tendencies of mind and temperament, have inclined the dramatists of the Romance nations to attach less import- ance to characterization of a closer and more varied kind than to interest of action and effectiveness of construction. The Italian and the Spanish drama more especially, and the French during a great part of its history, have in general shown a disposition to present their characters, as it were, ready made—whether in the case of tragic heroes and heroines, or in that of comic types, often moulded accord- ing to a long-lived system of local or national selection. It is in the Germanic drama, and in its master Shakespeare above ali, that the individualization of characters has becn carried to its furthest point, and that

their significance has been allowed to work itself out in closest connection with the progress of the dramatic action to which they belong.

But, however the method and scope of characterization may vary under the influence of different historical epochs and different tendencies or tastes of races or nations, the laws of this branch of the dramatic art are everywhere based on the same essential requirements. What interests us in @ man or woman in real life, or in the impressions we forin of historical personages, is that which seeins to us to individualize them. A dramatic character must therefore, whatever its part in the action, be sufficiently marked in its distinctive features to interest the imagination ; with these its subsequent conduct must be consistent, and to these its participation in the action must correspond. In order that such should be the result, the dramatist must first have distinctly conceived the character, whatever nay have suggested it tohim. If, for instance, he has taken 1t, as the phrase is, from history or from contemporary life, – transform it, just as he must transform the subject

the action into the action itself. His task is not to paint a copy of any particular man, but to conceive a kind of man—of which a particular individual may have occurred

characterization.

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to him as a suggestive illustration—under the operation of particular circumstances. His conception, growing and modifying itself with the progress of that of the action, will determine the totality of the character he creates. The likeness which the result bears to an actual or histori- cal personage muy very probably, from secondary points of view, concern the success of his creation ; upon its dramatic effect this likeness can have no influence whatever. Ina different sense from that in which Shakespeare used the words, it should be possible to say of every dramatic char- acter which it is sought to identify with an actual personage, “ This is not the man.” The mirror of the drama is not a photographic apparatus.

Distinctiveness, as the primary requisite in dramatic Distinctive characterization, is to be demanded in the case of all per- ness.

sonages introduced into a dramatic action, but not in all cases in an equal degree. Schiller, in adding to the dramatis persone of his /%esco superscriptions of their chief characteristics, labels Sacco as ‘‘an ordinary person,” and this suffices for Sacco. Between Bassanio’s two unsuccess- ful rivals in the trial of the caskets there is difference enough for the dramatic purpose of their existence. But with the great masters of characterization a few touches, of which the true actor’s art knows how to avail itself, distinguish even their lesser characters from one another ; and every man is in bis humour down to the third citizen. Elaboration is necessarily reserved for characters who arc the more important contributors to the action, and the fulness of elaboration for its herocs. Many expedients may lend their aid to the higher degrees of distinctiveness. In characters designed to influence the whole of the action it must be marked early, in others in due relation to their con- tribution towards the course of the plot. Much is gained by a significant introduction of hero or heroine,—so Antigone is dragged in by the watchman, Gloucester entcrs alone upon the scene, Volpone is discovered in adoration of his golden saint. Nothing marks character more clearly than the use of contrast—as of Othello with Iago, of Octavio with Max Piccolomini, of Joseph with Charles Surface. Nor is direct antithesis the only effective kind of contrast ; Cassius is a foil to Brutus, and Leonora to her namesake the Princess.

a consistency between its conduct in the action and the features it has established as its own. ‘This consistency does not imply uniformity ; for, as Aristotle observes, there are characters which, to be represented with uniformity, must be presented as uniformly un-uniform. Of such consistently complex characters the great critic cites no instances, nor indeed are they of frequent occurrence in Greek tragedy; in the modern drama Hamlet is their unrivalled exemplar; and Weislingen in Goethe’s Gotz, and Alceste in the Misanthrope, may be mentioned as other illustrations in dramas widely different from one another. It should be added that those dramatic lite- ratures which freely admit of a mixture of the serious with the comic element thereby enormously increase the opportunities of varied characterization. The difficulty of the task at the same time enhances the effect resulting from its satisfactory solution ; and if the conception of a character is found to bear a variety of tests resembling that which experience shows life to have at hand for every man, its

naturalness, as we term it, becomes more obvious to the imagination. Naturalness is only another word for what Aristotle terms propriety ; the artificial rules by which usage has at times sought to define particular species of cha- racter arc in their origin only a convenieuce of the theatre, though they have largely helped to conventionalize dramatic

But besides impressing the imagination as Self-con- a conception distinct in itself, each character must maintain sistency.

Lastly, a character should be directly Effective- effective with regard to the dramatic action in which it ness.

Manners.

Their rela- tive signifi- cance,

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takes part,—that is to say, the influence it exerts upon the progress of the action should correspond to its distinctive features, tlle conduct of the play should scem to spring from the nature of its characters. Hence even the minor characters should not idly intervene, and, before they intervene significantly, we should be prepared by some previous notion of them. The chief characters, on the other hand, should predominate over or determine the course of the action ; its entire conception should harmonize with their distinctive features; it is only a Prometheus whom the gods bind fast to a rock, only a Juliet who will venture into a living death for her Romeo. Thus in 4 sense chance is excluded from dramatic action, or rather, like every other clement in it, bends to the dramatic idea. And in view of this predominance of character over action, we may appropriately use such expressions as a tragedy of love or jealousy or ambition, or a comedy of character—by which is merely meant one whose preponderating interest lies in the effectiveness with which its conduct impresses upon the mind the conception of its chicf character or characters.

The term manners (as employed in a narrower sense than the Aristotelian) applies to that which colours both action and characters, but does not determine the essence of cithcr. As exhibiting human agents under certain

conditions of time and place, and of the various relations of community existing or conceivable among men, the action of a drama, together with the char- acters engaged in it and the incidents and circumstances belonging to it, must be more or less suited to the external conditions assumed. From the assumption of some such conditions not even those dramatic species which indulge in the most sovereign licence, such as Old Attic comedy or burlesque in general, can wholly emancipate themselves ; and even supernatural characters and actions must adapt themselves to some antecedents. But it depends altogether on the measure in which the nature of an action and the develdpment of its characters are affected by considerations of time and place, or of temporary social systems and the transitory distinctions they produce, whether the imitation of a particular kind of manners becomes a significant ele- ment in a particular play. What is of vanishing import- ance in one may be an adjunct of inestimable value in another. The Hindu caste-system is an antecedent of every Hindu drama, and the peculiar organization of Chinese society of nearly every Chinese with which we are acquainted. Greek tragedy itself, though treating subjects derived from no historic age, had established a standard of manners from which in its decline it did not depart with impunity. The imitation of manners of a particular age or country may or may not be of moment ina play. The conjuncture of the Crusades is merely a felicitous choice for the time of action of Nathan the Wise ; but the dramatic conflict of Afinna von Barnhelm derives half its life from the background of the Seven Years' War. In some dramas, and in some species of drama, time and place are so purely imaginary and so much a matter of indifference that the adop- tion of a purely conventional standard of manners, or at least the exclusion of any definitely fixed one, is here desir- able. 'The ducal reign of Theseus at Athens (when ascer- tained) does not date A Midsummer Night's Dream ; nor do the coasts of Bohemia localize the manners of the customers of Autolycus. Where, on the other hand, as more especially in the historic drama, or in that kind of comedy which directs its shafts against the ridiculous vices of a particular age or country, the likeness of the manners represented to what is more or less known possesses significance, there the dramatist will use care in his colour- ing. How admirably is the French court specialized in Henry V., how completely are we transplanted among the

burghers of Brussels in the opening scenes of Lymont / What a picture of a clique we have in the Précveuses ridicules of Moliére ; what a reproduction of a class in tise pot-house politicians of Holberg! Yet even in such instances the dramatist will only use what suits his dramatic purpose; he will select, not transfer in mass, his- toric features, and discriminate in his use of modern instances. The details of historic fidelity, and the lesser shades distinguishing the varieties of social usage, he will introduce at his choice, or leave to be supplied by the actor. Where the reproduction of manners becomes the primary purpose of a play, ‘ts effect can only be of an inferior kind ; and a drama purely of manners is a contra- diction in terms.

No complete system of dramatic species can be abstracted Species ot They are often the the drama,

from any one dramatic literature. result of particular antecedents, and their growth is often affected by peculiar conditions. Different nations or ages use the same name, and may preserve some of the same rules, for species which in other respects their usage may have materi- ally modified from that of their neighbours or predeccssors. Who would undertake to define, except in their successive applications, such terms as tragi-comedy or melodrama? Yet this docs not imply that all is confusion in the terminology as to the species of the drama. In so far as they are distin- guishable according to the effects which their actions, or those which the preponderating parts of their actions, produce, they may primarily be ranged in accordance with the broad difference established by Aristotle between tragedy and

comedy. Tragic and comic effects differ in regard to the Tragic and emotions of the mind which they excite ; and a drama is comic.

tragic or comic according as such cffects are produced by it. The strong or serious cmotions are alone capable of exercising upon us that influence which, employing a bold but marvellously happy figure, Aristotle termed purification, and which a Greek comedian, after a more matter-of-fact fashion, thus expressed :

‘¢ For whensoe’er a man observes his fellow Bear wrongs more grievous than himself has known, More easily he bears his own misfortunes ;”

i.e. the petty troubles of self which disturb without elevating the mind are driven out by the sympathetic participation in greater griefs, which raiscs while it excites the mind employed upon contemplating them. It is to these emotions—which are and can be no others than pity and terror—that actions and characters which we call tragic appeal. Those which we term comic address themselves to the sense of the ridiculous, and their ubjects are those vices and moral infirmities, the repre- sentation of which is capable of touching the springs of laughter. Where, accordingly, a drama excludes all effects except those of the former class, it may be called a pure tragedy ; when all except those of the latter, a pure comedy. In those dramas where the effects are mixed, it is the nature of the main action and of the main characters (as determined by their distinctive features) which alone enables us to classify such plays as serious or humorous dramas—or as tragic or comic, if we choose to preserve the terms. But the classification admits of a variety of transi- tions, from pure tragedy to mixed, from mixed tragedy to mixed comedy, and thence to pure comedy and her slighter sister farce. This method of distinction has no concern with the mere question of the termination of a play, according to which Philostratus and other authorities have sought to distinguish between tragic and comic dramas. The serious drama which ends happily (the German Schauspiel) is not a species co-ordinate with tragedy and comedy, but only one subordinate to the former, if, indeed, it be necessary to distinguish it as a species at all, Other

The art of acting.

Its means,

Gesture.

Speech,

Costume,

distinctions may be almost infinitely varied according to the point of view adopted for the classification. _

The historical sketch of the drama attempted in the following pages will best serve to indicate the successive growth of national dramatic species, many of which by asserting their influence in other countrics and ages than those which gave birth to them, have acquired a more than national significance,

The art of acting, whosc history forms an organic though a distinct part of that of the drama, necessarily possesses a theory and a technical system of its own. But into these it is impossible here to enter. One claim, however, should be vindicated for the art of acting, viz., that though it is a dependent art, and most signally so in its highest forms, yet its true exercise implies a creative proccss. The conception of a character is determined by antecedents not of the actor's own making ; and the term originality can be applied to it only in a relative sense. Study and reflection enable him, with the aid of expericnce and of the intuition which genius bestows, but which experience may in a high degree supply, to interpret, to combine, and to sup- plement given materials. But in the transformation of the conception into the represented character the actor's func- tions are really creative; for here he becomes the character by means which belong to his art alone. The distinctive- ness he gives to the character by making the principal features recognized by him in it its groundwork ;—the consistency which he maintains in it between groundwork and details ;—the appropriateness which he preserves in it to the course of the action and the part borne in it by the charactcr :—all these are produced by himself, though suggested by the conception he has derived from his materials. As to the means at his disposal, they are essentially of two kinds only ; but not all forms of the drama have admitted of the use of both, or of both in the same completeness. All acting includes the use of gesture, or, as it has been more comprehensively termed, of bodily eloquence. From various points of view its laws regulate the actor's bearing, walk, and movements of face and limbs. They teach what is esthetically permitted and what is eesthetically pleasing. They deduce from observation what is appropriate to the expression of particular affections of the mind and of their combinations, of emotions and passions, of physical and mental conditions—joy and grief,

health and sickness, waking, sleeping, and dreaming, mad- ness, collapse, and death—of particular ages of life aud temperaments, as well as of the distinctive characteristics of race, nationality, or class. While under certain conditions —as in the masked drama—-the use of bodily movement as one of the means of expression has at times been partially restricted, there have been, or are, forms of the drama which have altogether excluded the use of speech (such as pantomime), or have restricted the manner of its employ- ment (such as opera). In the spoken drama the laws of rhetoric regulate the actor's use of speech, but under con- ditions of a special nature. Like the orator, he has to follow the laws of pronunciation, modulation, accent, and rhythm (the last in certain kinds of prose as well as in such forms of verse as he may be called upon to reproduce). But he has also to give his attention to the special laws of dramatic delivery, which vary in soliloquy and dialogue, and in such narrative or lyrical passages as may occur in his part.

The totality of the effect produced by the actor will in some degree depend upon other aids, among which those of a purely external kind will not be lost sight of. But the significance of costume in the actor, like that of decoration and scenery in an action, is a wholly relative one, and is to a large measure determined by the claims which custom enables the theatre to make, or forbids its making, upon

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the imagination of the spectators. The actor's real achievement lies in the transformation which the artist himself effects ; nor is there any art miore sovereign in the use it can make of its means, or so happy in the directness of the results it can accomplish by them.

Ry

The origin of the InpIANn drama may unhesitatingly be Inpray

described as purely native. overran India brouglit no drama with them; the Persians, the Arabs, and the Egyptians were withont a national theatre. It would be absurd to suppose the Indian drama to have owed anything to the

Chinese or its offshoots. On the other hand, there is no real evidence for assuming any influence of Greek examples upon the Indian drama at any stage of its progress. Finally, it had passed into its decline before the dramatic literature of modern Europe had sprung into being.

The Hindu writers ascribe the invention of dramatic enter- tainments to an inspired sage Bharata, or to the communi- cations made to him by the god Brahma himself concerning an art gathered from the Vedas. As the word Bharata signifies an actor, we have clearly here a mere personifica- tion of the invention of the drama. Three kinds of cntertainments, of which the nédtya (defined as a dance combined with gesticulation and speech) comes nearest to the drama, were said to have been exhibited before the gods by the spirits and nymphs of Indra's heaven, and to these the god Siva added two new styles of dancing.

The origin of the Indian drama was thus doubtless religious ; it sprang from the union of song and dance in the festivals of the gods, to which were afterwards added narrative recitation, and first sung, then spoken, dialogue. Such scenes and stories from the mythology of Vishiu are still occasionally enacted by pantomime or spoken dialogue in India (jdtras of the Bengalis; rdsas of the Western Provinces) ; and the most ancient Indian play was said to have treated an episode from the history of that deity,—the choice of him as a consort by Laxmi,—a favourite kind of subject in the Indian drama. The tradition connecting its carliest themes with the native mythology of Vishtiu agrees with that ascribing the origin of a particular kind of dramatic performance—the sangita—-to Krishvia and the shepherdesses. The author's later poem, the Gitagovinda, has been conjectured to be suggestive of the earliest species of Hindn dramas. But while the epic poetry of the Hindus gradually approached the dramatic in the way of dialogue, their drama developed itself independently out of the union of the lyric and the epic forms. Their dramatic poetry arose later than their epos, whose great works, the Mahabharata and the Rémdyana, had again been long pre- ceded by the hymnody of the Vedus—just as the Greek drama followed upon the Homeric poems, and these had been preceded by the early hymns. The beginuings of the Indian drama may accordingly belong to the 3d century B.c., or to a rather earlier date. But by the time it produced the first specimens with which we are acquainted, it had already reached its zenith ;

and it was therefore looked upon as having sprung into being as a perfect art. We know it only in its glory, in its decline, and in its decay,

The history of Indian dramatic literature may be roughly : ie)

divided into the following periods :—

I. From the 1st century B.c. to the 10th century A.D.— Firstperiod

The Mahometans when they DRawa,

Origin,

hrono- sy.

This period belongs to the pre-Mahometan age of Indian (classical).

history, but to that second division of it in which Buddhism had already become a powerful factor in the social, ag well as in the moral and intellectual, life of the land. It is the classical period of the Hindu drama, and includes the works of its two indisputably greatest masters. Of these Kélidésa was by far the earlier, who lived at. the

Second period (decline).

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court cf King Vikramaditya of Avanti (dicd 56 B.c.), being accounted the brightest of its “nine gems” of genius. He is the author of Sékuntald,—the work Sir William Jones’s translation of which first revealed to the Western world of letters the existence of an Indian drama. It is a dramatic love-idyll of surpassing beauty, and, in the opinion of the highest authorities, one of the master-pieccs of the poetic literature of the world. Kalidasa’s other drama, Vikrama aid Urvasi (The Hero and the Nymph), though unequal as’a whole to Sdkuntald, contains one ‘act of incomparable loveliness; and its enduring effect upon Indian dramatic literature is shown by the imitations of it in later plays. To Kélidd4sa has likewise been attributed a third play—the Mdélavikdguimitra ; but it is doubtful whether this comedy, though held

to be of ancient date, was not composed by a different poet of the same name.

Another work of high merit, the pathetic Mrichchhakati (The Toy-Cart), a domestic drama with a public underplot, may possibiy belong to the close of the 2d century A.D., and seems certainly of an earlier date than the 10th. It is attributed (as is not uncommon with Indian plays) to a royal author named Sudraka.

The palm of pre-eminence is disputed with Kalidisa by the great dramatic poet Babhavuti (called Qrikatitha, or he in whose throat is fortune), who flourished in the earlier part of the 8th century. While he is considered more artificial in language than his rival, and in general more bound by rules, he can hardly be deemed his inferior in dramatic genius. Of his three extant plays, Mahdvdra- Charitra and Uttara-Réma-Charitra are heroic dramas concerned with the adventures of Rama (the seventh incarnation of Vishiin); the third, the powerful J/dlaté and Médhava, has love for its theme, and has been called (with more aptitude than such comparisons usually possess) the Romeo and Juliet of the Hindus. It is considered by their critical authorities tle best example of the prakarazia, or drama of domestic life.

Among the remaining chief works of Indian draimatic literature, the Verii-Samhara is thought probably to date from about the 8th or 9th century. Its author's name seems doubtful; the play is described as one in which both pathos and horror are exaggerated, and which in the violence of its action recalls the manner of Shakespeare's predecessors. The next series of plays forms.a transition between the first period of Indian dramatic literature and

II. The period of decline, which may be reckoned from about the 11th to about the 14th century of our era, and of which the beginning roughly coincides with tha' of a con- tinuous scries of Mahometan invasions of India. J/andman- Nataka, or "'the great Nataka" (for this play, the work of several hands, surpasses all other Indian dramas in length, extending over not less than fourteen acts), dates from the 10th or 11th century. Its story is taken from the Réma- cycle, and prominent character in it is the mythical monkey-chief Hantunat, to whom, indeed, tradition ascribed the original authorship of the play. Krtishriamicra's

_“theosophic mystery,” as it has been called, of Prabodha-

Chandrodaya (The Rise of the Moon of Insight, 1.e., the victory of true doctrine over error), is ascribed by one authority to the middle of the 11th century, by another to about the end of the 12th. The dates of the famous Ratnavali (The Necklace), a court-comedy of love and intrigue, with a half-Terentian plot, and of the interesting Buddhist drama Vdgdnanda, which begins as an erotic play but passes into a most impressive exemplification of the supreme virtue of self-sacrifice, depend on the disputed question of their respective authorship. One of them belongs to the first quarter of the 12th century, the other to an earlier time. Finally, Viskhadatta’s interesting drama of political intrigue, Mudrd-Rakshasa (The Signet of

the Minister), in which prince Chandragupta, presumably identifiable with Sandrocottus, makes his appearance, was probably composed later than the end of the 12th century. This is the only Indian play known to us with an essentially historical fable—a noteworthy circumstance, if (as is most likely) it was produced at a time when the Mahometan invasions had already begun.

The remaining plays of which it has been possible to conjecture the dates range in the time of their composition from the end of the 11th to the 14th century, and belong to the period of decline. Of this period, as compared with the first, the gencral characteristics seem to be an undue preponderance of narrative and description, and an affected and over-elaborated style. Asa striking instance of this class is mentioned a play on the adventures of Rama, the Anargha-Rdghava, which in spite, or by reason, of the commonplace character of its sentiments, the extravagance of its diction, and the obscurity of its mythology, is stated to enjoy a higher reputation with the pandits of the prescnt age than the master-pieces of Kalidésa and Babhavuti. To the close of this period, the 14th century, has likewise (but without any pretension to certainty) been ascribed the only Tamil drama of which we possess an English version. Arichandra (The Martyr of Truth) exemplifies—with a strange likeness in the contrivance of

its plot to the Book of Job and Faust—in the trials of a heroically enduring king the maxim “ Better die than lie.”

ILI. Isolated plays remain from centuries later than the Third

14th ; but these, which chiefly turn on the legends of Kfishtia (the last incarnation of Vishriu), may be regarded as a mere aftergrowth, and exhibit the Indian drama in its decay. Indeed, the latest of them, Chitra-Yajua, which was composed about the beginning of the present century, and still serves as a model for Bengali dramatic per- formances, is imperfect in its dialogue, which (after the fashion of Italian improvised comedy) it is left to the actors to supplement. Besides these there are farces or farcical entertainments, more or less indelicate, of uncertain dates.

The number of the plays which have descended to us Number of from so vast an expanse of time is both relatively and Plays.

absolutely small, Wilson doubts whether all the plays to be found, and those mentioned by Hindu writers on the drama, amount to many more than 60; and it has been seen that not more than three are ascribed to either of the two great masters. To these should be, however, added the plays in Tamil, stated to be about 100 in number, and to have been composed by poets who enjoyed the patronage of the Pandian kings of Madura. On the other hand, thcre

is among the Hindus no dearth of dramatic theory. The Critical sage Bharata, the reputed inventor of dramatic entertain- literature.

ments, was likewise revered as the father of dramatic criticism—a combination of functions to which the latter days of the English theatre might perhaps furnish an occasional parallel. The commentators (possibly under the influence of inspiration rather than as a strict matter of memory) constantly cite his setras, or aphorisms. (From sitra, thread, was named the sdétra-dhéra, thread-holder, carpenter, a term applied to the architect and general manager of sacrificial solemnities, then to the director of theatrical performances). By the 11th century, when the drama was already approaching its decline, dramatic criticism had reached an advanced point; and the Dasa- Rupaka (of which the text belongs to that age) distinctly

defines the ten several kinds of dramatic composition. Other critical works followed at later dates, exhibiting a rage for subdivision unsurpassed by the efforts of Western theorists, ancient or modern ; the misfortune is that there should not be examples remaining (if they ever existed) to illustrate all the branches of so elaborate a dramatic system.

Exclusive- ness of the Indian drama.

Species of dramas.

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“ What,” inquires the manager of an actor in the induc- tion to one of the most famous of Indian plays, “are those qualities which the virtuous, the wise, the venerable, the learned, and the Brahmans require ina drama?” “ Pro- found exposition of the various passions,” is the reply, “pleasing interchange of mutual affection, loftiness of character, delicate expression of desire, a surprising story, and elegant language.” “Then,” says the manager (for the Indian dramatists, though not, like Ben Jonson, wont to “rail” the publie “into approbation,” are unaffected by manvaise honte) “TI recollect one.” And he proceeds to state that “ Babhaviiti has given us a drama composed by him, replete with all qualities, to which indéed this sentence is applicable: ‘How little do they know who speak of us with censure! This entertainment is not for them. Possibly some one exists, or will exist, of similar tastes with myself; for time is boundless, and the world is wide.’” This self-possessed disregard of popularity, springing from an imperturbable consciousness of lofty aims, accounts for much that is characteristic of the higher class of Indian plays. It explains both their paucity and their length, renders intelligible the chief peculiarity in their diction, and furnishes the key to their most striking ethical as well as literary qualities. Connected in their origin with religious worship, they were only performed on solemn occasions, chiefly of a public nature, and more especially at seasons sacred to some divinity. Thus, though they might in some instances be reproduced, they were always written witha view to one particular solemn representation. Again, the greater part of every one of the plays of Northern India is written in Sanskrit, which ceased to be a popular language by 300 3.c., but continued the classical, and at the same time the sacred, form of speech of the Brahmans. Sanskrit is spoken by the

heroes and principal personages of the plays, while the female and infcrior char- acters us varieties, more or less refined, of the Prakrit languages (as a rule not more than three, that which is employed in the songs of the women being the poetic dialect of the most common Prakrit language, the Cauraseni). Hence, part at least of each play cannot have been under- stood by the large majority of the audience, except in so faras their general acquaintance with the legends or stories treated enabled them to follow the course of the action. Every audience thus contained an inner audience, which could alone feel the full effect of the drama. It is, then, easy to see why the Hindu critics should make demands upon the art, into which only highly-trained and refined intellects were capable of entering, or called upon to enter. The general public could not be expected to appreciate the sentiments expressed in a drama, and thus (according to the process prescribed by Hindu theory) to receive instruc- tion by means ofamusement. These sentiments are termed rasas (tastes or flavours), and said to spring from the bhdvas (conditions of mind and body). A variety of subdivisions is added ; but the sata rasa is logically enough excluded from dramatic composition, inasmuch as it implies absolute quiescence.

The Hindu critics know of no distinction directly corre- sponding to that between tragedy and comedy, still less of any determined by the nature of the close of a play. For, in accordance with the child-like element of their character, the Hindus dislike an unhappy ending to any story, and a positive rule accordingly prohibits a fatal conclusion in their dramas. The general term for all dramatic composi- tions is réipaka (from répa, form), those of an inferior class being distinguished as wpartipakas. Of the various sub- divisions of the rv%ipaka, in a more limited sense, the nafaka, or play proper, represents the most perfect kind. Its sub- Ject should always be celebrated and important—it Is virtually either heroism or love. and most frequently the

latter—and the hero should be a demigod or divinity (such as Rdma in Babhaviti’s heroic plays) or a king (such as the hero of Sékuntald), But although the earlier drama- tists took their plots from the sacred writings or

Puranas, they held themselves at liberty to vary the incidents,—a licence from which the later poets abstained. Thus, in accordance, perhaps, with the respective developments in the religious life of the two peoples, the Hindu drama in this respect reversed the progressive practice of the Greek. The prakaranas agree in all essentials with the natakas except that they are less elevated ; their stories are mere fictions, taken from actual life in a respectable class of society.! Among the species of the wpardipaka may be mentioned the ¢rofaka, in which the personages are partly human, partly divine, and of which a famous example remains.? Of the Ukana, a monologne in one act, one literary example is extant—a curious picture of manners in which the speaker describes the different persons he meets at a spring festival in the streets of Kolahalapur.? The satire of the farcical prahasanas is usually directed against the hypocrisy of ascetics and Brahmans, and the sensuality of the wealthy and powerful. These trifles represent the lower extreme of the dramatic scale, to which, of course, the principles that follow only partially apply.

Unity of action is strictly enjoined by Hindu theory, though not invariably observed in practice. Episodical or prolix interruptions are forbidden ; but, in order to facilitate the connection, the story of the play is sometimes carried on by narratives spoken by actors or “ interpreters,” some- thing after the fashion of the Chorus in Henry V., or of Gower in Pericles. ‘“ Unity of time” is liberally, if rather arbitrarily, understood by the later critical authorities as limiting the duration of the action of a single year ; but even this is exceeded in more than one classical play.* The single acts are to confine the events occurring in them to “one course of the sun,” and usually do so. “ Unity of place ” is unknown to the Hindu drama, by reason of the absence of scenery ; for the plays were performed in the open courts of palaces, perhaps at times in large halls set apart for public entertainments, or in the open air. Hence change of scene is usually indicated in the texts ; and we find ® the characters making long journeys on the stage, under the eyes of spectators not trained to demand “ real” mileage.

With the solemn character of the higher kind of

The “ unities,”

Pro-

dramatic performances accord the rules and prohibitions prieties.

defining what may be called the proprieties cf the Indian drama. Not only should death never be inflicted coram populo, but the various operations of biting, scratching, kissing, eating, sleeping, the bath, and the marriage ceremony should never take place on the stage. Yet such rules are made to be occasionally broken. It is true that the mild humour of the widdéshaka is restricted to lis “oesticulating eating” instead of perpetrating thie cbnoxious act. he charming love-scenc in the Sékuntald (at least in the earlier recension of the play) breaks off just as the hero is about to act the part of the bee to the honey of the heroine’s lips.” But later writers are less squeamish, or less refined. In two dramas® the heroine is dragged on the stage by her braid of hair; and this outrage, a worse one than that imputed to Dunstan, is in both instances the motive of the action. Ina third,® sleeping and the marriage ceremony occur in the course of the representation.

The dramatic construction of the Indian plays presents Constiuc-

no very striking peculiarities.

leg., Mrichchhakiti; Mdlati and Madhava.

2 Vikrama and Urvasi. 3 Safada-Tilaka.

4 Sdkuntalé; Uttara-Rdma-Charitra. 5 Arichandra, act iv.

6 Nagdnanda, acti. 7 Act iii.; of. Nagdnanda, act iii,

8 Vehi-Samhdra; Prachatda-Paiddva. 9 Viddha-Salabhanjila.

They open with a benedic- tion.

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Scenes and situations.

Characters.

INDIAN. |

tion (xdndi), followed by “some account” of the author, and by an introductory scene between the manager and one of the actors, which is more or less skilfully connected with the opening of the play itself, This is divided into acts (ankas) and scenes ; of the former a naéaka should have not fewer than 5, or more than 10; 7 appears a common number; ‘the great nafaka” reaches 14. Thus the length of the higher class of Indian plays is considerable—about that of an Aischylean trilogy; but not more thana single play was ever performed on the same occasion. Coinic plays are restricted to two acts (here ealled sandhis). In theory the scheme of an Indian drama eorresponds very closely to the general outline of dramatic construction given above ; it is a characteristic merit that the business is rarely eon- cluded before the last act. The piece closes, as it began, with a benediction or prayer. Within this framework room is found for situations as ingeniously devised and highly wrought as those in any modern Western play. What could be more pitiful than the scene in Sdékuntald, where the true wife appears before her husband, whose remembrance of her is fatally overclouded by a charm ; what more terrific than that in Afdlaté and Médhava, where the lover rescues lus beloved from the horrors of the eharnel-field? Re- cognition—especially between parents and ehildren—fre- quently gives rise to scenes of a pathos which Euripides has not surpassed.) The ingenious device of a “ play Within the play” (so familiar to the English drama) is employed with the utmost success by Babhavuti.? On the other hand, miraculous metamorphosis? and, in a later play,* vulgar magic lend their aid to the progress of the action. With scenes of strong effectiveness contrast others of the most delicate poetic grace—such as the indescribably lovely little episode of the two damsels of the god of love helping one another to pluck the red and green bud from the mango tree; or of gentle domestic pathos—such as that of the courtesan listening to the prattle of her lover’s child, one of the prettiest scenes of a kind rarely kept free from affectation in the modern drama. For the dénowement in the narrower sense of the term the Indian dramatists largely resort to the expedient of the dews ex machina, often in a sufficiently literal sense.®

Every species of drama having its appropriate kind of hero or heroine, theory here again amuses itself with an infinitude of subdivisions, Among the heroines are to be noticed the courtesans, whose social position to some extent resembles that of the Gresk hetcerw, and association with whom does

not seem in practice, however it may be in theory, to be regarded as a disgrace even to Brahmans.° In general, the Indian drama indicates relations between the sexes subject to peculiar restraints of usage, but freer than those which Mahometan example seems to have introduced into higher Indian society. The male characters are frequently drawn with skill, and some- times with genuine force. Prince Samsthanaka' is a type of selfishness born in the purple worthy to rank beside figures of the modern drama, of which this has at times naturally been a favourite class of character; elsewhere ® the intrigues of ministers are not more fully exposed than their characters and principles of action are judiciously dis- criminated. Among the lesser personages common in the Indian drama, two are worth noticing, as corresponding though by no means precisely to familiar types of other dramatic literatures. These are the witd, the accomplished but dependent companion (both of men and women), and the viddishaka, the humble associate (not servant) of the

1 Sdkuntald; Uttara-Réma-Charitra. 2 7b., act vii. 3 Vikrama and Urvdsi, act iv. 4 Ratndvali. 5 Vikrama and Urvdsi: Arichandra,; Ndgdnanda.

6 Mfrichchhakatt. 7 Ib,

8 Mudra-Rakshasa.

prince, and the buffoon of the action.® Strangely enough, he is always a Brahman, or the pupil of a Brahman. His humour is to be ever intent on the pleasures of a quiet life, and on that of eating in particular; his jokes are always devoid of both harm and point.

Thus, clothing itself in a diction always ornate and Diction.

tropical, in which (as Riickert has happily expressed it) the prose is the warp and the verse the weft; in which (as Goethe says) words become allusions, allusions similes, and similes metaphors, the Indian drama

essentially depended upon its literary qualities, and upon the familiar sanctity of its favourite themes, for such effect as it was able to produce.

Of scenic apparatus it knew but little ; the simple devices Scenery

by which exits and entrances were facilitated it is unneces- 2nd cos- tume.

sary to describe, and on the contrivances it resorted to for such ‘ properties” as were required (above all, the cars of the gods and of their emissaries)!° it is useless to speculate. Propriety of costume, on the other hand, seems always to have been observed, agreeably both to the peculiarities of – the Indian drama and to the habits of the Indian people.

The ministers of an art practised under such conditions Actors.

could not but be regarded with respect, and spared the eon- tempt or worse, which, except among one other great eivilized people, the Greeks, has everywhere at one time or another been the actor’s lot. Companies of actors secm to have been common in India at an early date, and the inductions show the players to have been regarded as respectable members of society. In later if not in earlier times individual actors enjoyed a widespread reputation,—“ all the world” is acquainted with the talents of Kalaha-Kandala. The directors, as already stated, were usually Brahmans. Female parts were in general, though not invariably, represented by females. One would like to know whether such was the ease in a piece where—after the fashion of more than one Western play—a crafty minister passes off his daughter as a boy, on which assumption she is all but married to a person of her own Sex.

The Indian drama would, if only for purposes of com- Summary.

parison, be invaluable to the student of this branch of literature. But from the point of view of purely literary excellence it holds its own against all except the very fore- wnost dramas of the world. It is, indeed, a mere phrase to call KAliddsa the Indian Shakespeare—a title which, more- over, if intended as anything more than a synonym for poetic pre-eminence, might fairly be disputed in favour of Babhavuti; while it would be absolutely misleading to place a dramatic literature, which, like the Indian, is the mere

quintessence of the culture of a caste, by the side of one which represents the fullest development of the artistic consciousness of a people such as the Hellenes. The Indian drama cannot be described as national in the broadest and highest sense of the word ; it is, in short, the drama of a literary class, though as such it exhibits many of the noblest and most refined, as well as of the most characteristic, features of Hindu religion and civilization. The ethics of the Indian drama are of a lofty character, but they are those of a scholastic system of religious philosophy, self-conscious of its completeness. To the power of Fate is occasionally ascribed a supremacy, to which gods as well as mortals must bow ;!8 but if man's present life is merely a phase in the eycle of his destinies, the highest of moral efforts at the same time points to the summit of possibilities, and self-sacrifice is the supreme condition both of individual perfection and of the progress of the world. Such eonceptions as these seem at once to

9 Sdkuntald; Ndgdnanda. 10 Sdkuntald, acts vi. and vii.; Aldlati and Madhava, act v. 11 Tnduction to Anargha-Rdghava.

2 Viddha-Salabhanjika. 13 Vikrama and Urvast.

Poetry of the Indian drama,

CHINES! DRAMA,

Chirono- logy.

enfold and to overshadow the moral life of the Indian drama. The affections and passions forming part of self it delineates with a fidelity to nature which no art can neglect ; but the freedom of the picture is restricted by conditions which to us are unfamiliar and at times seein intolerable, but which it was impossible for the Indian poet's imagination to neglect. The sheer self-absorp- tion of ambition or love appears inconceivable by the minds of any of these poets; and their social philosophy is always based on the system of caste. On the other hand, they are masters of many of the truest forms of pathos, above all of that which blends with resignation. In humour of a delicate kind they, are by no means deficient ; to its lower forms they are

generally strangers, even in productions of a professedly comic intention. Of wit, Indian dramatic literature—though a play on words is as the breath of its nostrils—furnishes hardly any examples intelligible to Western notions.

The distinctive excellence of the Indian drama is to be sought in the poetic robe which envelops it as flowers overspread the bosom of the earth in the season of spring. Jn its nobler productions, at least, it is never untrue to its half religious, half rural origin; it weaves the wreaths of idyllic fancies in an unbroken chain, adding to its favourite and familiar blossoms ever fresli beauties from an inexhaust- ible garden. Nor is it unequal to depicting the grander aspects of nature in her mighty forests and on the shores of the ocean.

Like the Indian drama, the CuinesE arose from thie union of the arts of dance and song. To the ballets and pantomimes out cf which it developed itself, and which have continued to flourish by the sido of its more advanced forms, tho Chinese ascribe a primitive antiquity of origin ; many of them originally had a symbolical refereuce to such subjects as the harvest, and war and peace.

Though some traditions declare the emperor Wan-Te (fl. about 580 a.p.) to have invented the drama, this honour is more usually yiven to the emperor Heun-Tsung (720 a.D.), who is likewise remembered as a radical musical reformer. Pantomimes henceforth fell into disrepute ; and the history of the Chinese drama from this date is divided, with an accuracy we cannot profess to control, into four distinct periods, of each of which the plays composed in it are stated to bear the manifest impress, ‘Tliese are

I. That of the dramas composed under the Tang dynasty, from 720 to 907 a.pv. These pieces, called Z’chhouen-Kha, were limited to the representation of extraordinary events, and were therefore, in design at least, a species of heroic drama. The ensuing times of civil war interrupted the

‘pleasures of peace and prosperity ” (a Chinese phrase for (P dramatic performances)—which, however, revived

II. Under the Sung Dynasty, from 960 to 1119.— The plays of this period aie called Z/i-Khio, and presented what became a standing peculiarity of the Chinese drama, viz., that in them figures a principal personage who sings.

Ill. The best known age of the Chinese drama was

DRAMA

under the Kin and Yuen dynasties, from 1125 to 13867, Classical The plays of this period are called Yuen-Pen and T'sa-K7 ,; 48°

[CHINESE.

the latter seem to have resembled the //i-Khio, and to have treated very various subjects. The Ywen-Pen are the plays from which our literary knowledge of the Chinese drama is mainly derived ; the short pieces called Yen-Kia were in the same style, but briefer. The list of dramatic authors under the Yuen dynasty is tolerubly extensive, comprisiug 85, among whom four are designated as courtesans; the number of plays composed by these and by anonymous authors is reckoned at not less than 564. In 1735 the Jesuit missionary Prémare first revealed to Europe the existence of the tragedy Z'chao-Chi-Cu-Hul (Lhe Litile Orphan of the Louse of Ychao), which was founded upon an earlier piece treating of the fortunes of an heir to the imperial throne, wlio was preserved in a mysterious box like another Cypsclus or Moses. Voltaire seized the theme of the earlier play for a rhetorical tragedy, in which he coolly professes it was his intention "to paint the manners of the Chinese and the Tartars." The later play, which is something less elevated in the rank of its characters, and very decidedly less refined in treatment, was afterwards re- translated by Stanislas Julien; and to the labours of this scholar, of Sir J. F. Davis, and of Bazin the elder, we owe a series of translated Chinese dramas, among which there can be no hesitation whatever in designating the master-piece.

The justly famous Pi-Pu-Ai (The Story of the Lute) belongs Pi-Pa-Ki,

to a period rather later than that of tle Yuen plays, having been composed towards the close of the 14th century by Kao-Tong-Kia, and reproduced in 1404, under the Ming dynasty, with the alterations of Mao-Tseu, a

commentator of learning and taste. Pi-Pa-Ki, which as a domestic drama of sentiment possesses very high merit, long enjoyed a quite exceptional popularity in China; it was repeatedly republished with laudatory prefaces, and so late as the 18th century was regarded asa monument of morality, and as the mastcr-piece of tle Chinese theatre. It would seem to have remained without any wortliy competitors, for although it had been originally designed to produce a reaction against the immorality of the drama then in fashion, especially of Wang-Chi-Fou's celebrated Si-Stang- Ki (The Story of the Western Pavilion), yet

IV. The period of the Chinese drama wader the Jfing Declineand | dynasty, from 1368 to 1644, exhibited no improvement decay.

"What " (says the preface to the 1704 edition of P:~~Pa~~ ki) "do you find there? Farcical dialogue, a mass of scenes in which one fancies one hears the hubbub of the streets or the ignoble language of the highways, the ex-travagances of demcns and spirits, in addition to love- intrigues repugnant to delicacy of manners." Nor would it appear that the Chinese theatre las ever recovered from its decay.

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In theory, no drama could be more consistently elevated Theoretical:

in purpose and in tune than the Chinese. learn, should have both a moral anda meaning. A virtuous aim is imposed upon Chinese dramatists by an article of the penal code of the empire ; and those who write immoral plays are to expect after death a purgatory which will last so long as these plays continue to be performed. In practice, however, the Chinese drama falls far short of its ideal ; indeed, according to the native critic already cited, among teu thousand playwrights not one is to be found intent upon perfecting the education of mankind by means of precepts and examples.

The Chinese are, like the Hindus, unacquainted with the Religious | distinction between tragedy and comedy; they classify drama.

their plays according to subjects in twelve categories. It may be doubted whether what seems the highest of these is actually such; for the religious element in the Chinese drama is often sheer buffoonery. Moreover, Chinese

Every play, we aims.

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listorical.

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Range of sharacters.

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CHINESE. |

religious life as reflected in the drama seems one in which ereed elbows creed, and superstitions are welcome whatever their origin. Of all religious traditions and doctrines, however, those of Buddhism (which had reached China long before the kuown beginnings of its drama) arc the most perceptible ; thus, the theme of absolute self-sacrifice is treated in one play,! that of entire absorption in the religious life in another.? The historical drama is not un- known to the Chinese; and although a law prohibits the bringing on the stage of “ emperors, empresses, and the famous princes, ministers, and generals of former ages,” no such restriction is observed in practice. In Lan-Kong-T’seu (The Sorrows of Han), for instance, which treats a national historic legend strangely recalling in parts the story of Esther and the myth of the daughter of Erechtheus, the Emperor Yuen-Ti (the representative, to be sure, of a fallen dynasty) plays a part, and a sufficiently sorry one. By far the greater number, however, of the Chinese plays accessible in translations belong to the domestic species, and to that sub-species which may be called the criminal drama. Their favourite virtue is piety, of a formal ? or a practical* kind, to parents or parents-in-law ; their favourite interest lies in the discovery of long-hidden guilt,and inthe

vindication of persecuted innocence. In the choice and elaboration of such subjects they leave little to be desired by the most ardent devotees of the literature of agony. Besides this description of plays, we have at least one love-comedy pure and simple—a piece of a nature not "'tolerably mild," but ineffably harmless.®

Free in its choice of themes, the Chinese drama is like- wise remarkably unrestricted in its range of characters. Chinese society, it is well known, is not based, like Indian, upon the principle of caste; rank is in China determined by office, and this again depends on the results of examination. These familiar facts are constantly brought home to the reader of Chinese plays. The Z'chcang-Yuen, or senior classman on the list of licentiates, is the flower of Chinese society, and the hero of many a drama ;" and it is a proud boast that for years " one's ancestors have held high posts, which they owed to their literary successes." ® On the other hand, a person who has failed in his military examination, becomes, as if by a natural transition, a man- eating monster.® But of mere class the Chinese drama is no respecter, painting with noteworthy freedom the virtues and the vices of nearly every phase of society. The same liberty is taken with regard to the female sex; it is clear that in earlicr times there were few vexatious restrictions in Chinese life upon the social intercourse between men and women. The variety of female characters in the Chinese drama is great, ranging from the heroine who sacrifices herself for the sake of an empire?° to the well brought-up young lady who avers that "' woman came into the world to be obedient, to unravel skeins of silk, and to work with her needle" }\—from the chambermaid who con- trives the most gently sentimental of rendezvous," to the reckless courtesan who, like another Millwood, upbraids the partner of her guilt on his sueing for mercy, and bids him die with her in hopes of a re-union after death.' In marriage the first or legitimate wife is distinguished from the second, who is at times a ci-devant courtesan, and

1 The Self-Sacrifice of Tchao-In. 2 Lai-Seng-Tchat (The Debt to be Paid in the Next World). ! 8 Lao-Seng-Hul. 4 Pi-Pa-Bi. 5 The Circle of Chalk (Hoei-Lan-Ki); The Tunic Matched; The Revenge of Teou-Ngo. _ © Tehao-Mei-Hiang (The Intrigues of @ ? Ibid.; Ho-Han-Chan,; Pi-Pa-Ki. » 8 Tchao-Li. | 3) Pi-Pa-Ki, se. 2. 1S T1o-Lang-Tan, act iv ;

Chambermaid).

8 Hoei-Lan-Ki, Prol. sc. i. 10 Sorrows of Han.

12 Tchao-Met-Hiang.

of. Hoei-Lan-Ki, act iv.

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towards whom the feclings of the former vary between bitter jealousy! and sisterly kindness.

The conduct of the plays exhibits much ingenuity, and Construe-

an aversion from restrictions of time and place ; the nature of the plot constantly covers a long series of years, and spans wide intervals of local distance. The plays are divided into acts and scenes—the former being usually four in number, at times with an induction or narrative prologue spoken by some of the characters (Stve-7'sen). Favourite plays were, however, allowed to extend to great length ; the P-Pa-A7v is divided into 24 sections, and in another recension apparently comprised 42. 'I do not wish," says the manager in the prologue, ' that this per- formauce should last'too long; finish it to-day, but cut out nothing,"—whence it appears that the performance of some plays occupied more thana singleday. The rule was always observed that a separate act should be given up to the dénowement ; while, according to a theory of which it is not always easy to trace the operation, the perfection of construction was sought in the dualism or contrast of scene and scene, just as the perfection of diction was placed in the parallelism or antithesis of phrase and phrase. Being subject to no restrictions as to what might, or might not, be represented on the stage, the conduct of the plots allowed of the introduction of almost every variety of incidents. Death takes place, in sight of the audience, by starvation,'¢ by drowning,!" by poison,!§ by execution ; flogging and torture are inflicted on the stage ;?° wonders are wrought ;?! and magic is brought into play ;?? the ghost of an innocently- executed daughter calls upon her father to

revenge her foul murder, and assists in person at the subsequent judicial enquiry.22 Certain peculiarities in the conduct of the busi- ness are due to the usages of society rather than to dramaturgic laws. Marriages are generally managed—at least in the higher spheres of society—by ladies profession- ally employed as matrimonial agents.24 The happy resolu- tion of the nodus of the action is usually brought about by the direct interposition of superior official authority *—a tribute to the paternal system of government, which is the characteristic Chinese variety of the deus ex machina. This naturally tends to the favourite close of a glorification of the emperor,”° resembling that of Louis XIV. at the end of Tartuffe, or in spirit, at all events, those of the Virgin Queen in more than one Elizabethan play. It should be added that the characters save the necessity for a bill of the play by persistently*announcing and re-announcing their names and genealogies, and the necessity for a book by frequently recapitulating the previous course of the plot.

One peculiarity of the Chinese drama remains to be noticed. The chief character of a play represents. the author as well as the personage; he or she is hero or heroine and chorus in one. This is brought about by the hero’s (or heroine’s) singing the poetical passages, or those containing maximsof wisdom and morality, or reminiscences and examples drawn from legend or history. Arising out of the dialogue, these passages at the same time diversify it, and give to it such elevation and brilliancy asit can boast. The singing character must be the principal personage in the action, but may be taken from any class of society. If this personage dies in the course of the play, another sings in his place. From the mention of this distinctive feature of the Chinese drama it will be obvious how unfair it would be to judge of any of its productions without a due appre- eel ee Hoei-Lan-Kt. 15 Pi-Pa-Ki. Pi-Pa-Ki, se. 15. Ho-Han-Chan, act ii. Hoei-Lan-Ki, act i. Teou-Ngo-Yuen, act iii, ! Hoei-Lan-Kt, act ii. Teou-Ngo-Yuen, act iii. Pi-Pa-Ki, sc. 18. Teou-Ngo-Yuen, act iv. Tchauo-Mei-Hang; Pi-Pa-Ki. 5 Hoet-Lan-Kt. i “3 [Jo-Han-Chan.

V5

in fact, tion and conduct of

plots.

The princi- pal person-

age who sings.

Poetic diction.

Merits of

ciation of the lyric passages, whieh do not appear to be altogether restricted to the singing of the principal personage, for other characters frequently “ recite verses. In these lyrical or didactic passages are to be sought those flowers of diction which, as Julien has shown, eonsist partly in the use of a metaphorical phraseology of infinite nicety in its variations—such as a long series of phrases eom- pounded with the word signifying je¢ and expressing severally the ideas of rarity, distinetion, beauty, &c., or as others derived from the names of eolours, birds, beasts, precious metals, elements, constellations, &e., or alluding to favourite legends or anecdotes. These features constitute the literary element par svcellence of Chinese dramatic composition. At the saine time, though it is impossible for the uutrained reader to be alive to the charms of so unfamiliar a phraseology, it may be questioned whether even in its diction the Chinese drama can claim to be regarded as really poetic. It may abound in poetic ornament ; it is not, like the Indian, bathed in poetry. On the other hand, the merits of this dramatic hterature

the Chinese are by uo means restricted to ingenuity of constrection

drama.

Scenery and

costume.

Actors,

JAPANESE DRAMA,

and variety of eharacter—merits, in themselves important, which no candid eriticism will deny to it. Its master-piece is not only truly pathetic in the conception and the main situations of its action, but includes scenes of singular grace and delieacy of treatment—such as that where the re-married husband of the deserted heroine in vain essays in the presence of his second wife to sing to his new lute, now that he has east aside the old! In the last act of a tragedy appealing at once to patriotism and to pity, there is true imaginative power in the picture of the emperor, when aware of the departure but not of the death of his beloved, sitting in solitude broken only by the ominous shriek of the wild fowl? Nor is the Chinese drama devoid of humour. ‘The lively abigail who has to persuade her mistress into confessing herself in love by arguing (almost like Beatrice) that “lumanity bids us love men ;”8 the corrupt judge (a standing type of the Chinese plays) who falls on his knees before the prosecuting parties to a suit as before “the father and mother who give him sustenance,” may serve as examples; and in Pi-Pa-Ki there is a scene of admirable burlesque on the still more eharaeteristie theme of the humours of a eompetitive examination.> If such illustrations could not casily be multiplied, they are at least worth citing in order to deprecate a perfunctory criticism on the qualities of a dramatic literature as to which our materials for judgment are still scanty.

While in the north of China houses are temporarily set apart for dramatic performances, in the south these are usually eonfincd to theatres erected in the streets (7i-That). Thus scenic decorations of any importance must always have been out of question in the Chinese theatre. The eostumes, on the other hand, are described as magnificent ; they are traditionally those worn before the 17th eentury, in accordance with the historical colouring of most of the plays. The actor’s profession is not a respectable one in China, the managers being in the habit of buying children of slaves and bringing them up as slaves of their own. Woinen may not appear on the stage, since the emperor Khien-Long admitted an actress among his concubines ; female parts are therefore played by lads, oecasionally by eunuchs,

The JAPANESE drama, as all evidence seems to agree in showing, still remains what in substance it has always — eee eee

1 Pi-Pa-Ki, sc. 14,

3 Tchao-Met-Kiang, act ii, 4 Teou-Ngo- Yuen, act ii.; of. Woet-Lan-Ki, 5 Li-Pu-Ki, se. 6,

2 Sorrows of Han.

been—an amusement passionately loved by the lower orders, but dignified by no literature deserving the name. Apart from its native elements of music, dance, and song, and legendary or historical narrative and pantomime, it is clearly to be regarded as a Chinese importation ; nor has it injits more advanced forms apparently even attempted to emancipate itself from the reproduction of the conven- tional Chinese types. As early as the close of the 6th century Hada Kawatsu, a man of Chinese extraction, but born in Japan, is said to have been ordered to arrange entertainments for the benefit of the country, and to have written as many as thirty-three plays. The Japanese, however, aseribe the origin of their drama to the introduc- tion of the dance called Sambdso as a charm against a volcanic depression of the earth which occurred in 805; and this dance appears still to be uscd as a prelude to theatrical exhibitions. In 1108 lived a woman called Iso no Zenji, who is looked upon as “the mother of the Japanese drama.” But her performances seem to have been confined to dancing or posturing in male attire (otoko- mat) ; and the introduction of the drama proper is univer- sally attributed to Saruwaka Kanzabur6, who in 1624 opened the first theatre (stbaia) at Yeddo. Not long after- wards (1651) the play-houses were removed to their prescnt site in the capital; and both here and in the pro- vincial towns, especially of the north, the drama has since continued to flourish. Persons of rank are never seen at these theatres ; but actors are occasionally engaged to play in private at the houses of the nobles, who appear for- merly themselves to have taken part in performances of a species of opera affected by them, always treating patriotic legends and called 2d. ‘The Mikado only has a court theatre.

The subjects of the popular plays are to a large extent Cryin pin. historical, though the uantes of the characters are changed. guru,

An example is to be found in the jdturt, or musical romance, in which the universally popular tale of Chiushingura (The Loyal League) has been amplified and adapted for theatrical representation. This famous narra- tive of the feudal fidelity of the forty-seven rowins, who about the year 1699 revenged their chief's judicial suicide upon the arrogant official to whom it was due, is stirring rather than touching in its incidents, and contains much bioodshed, together with a tea-house scene which suffices as a specimen of the Japanese comedy of manners. One of the books of this dramatic romance consists of a metrical description, mainly in dialogue, of a journey which (after the fashion of Indian plays) has to be performed on the stage. Other popular plays are mentioned dealing with similar themes, besides which there are domestie dramas of a very realistic kind, and often highly improper, though all intrigues against married women are excluded. Fairy—and demon—operas and ballets, and farces and tntermezzos form an easy transition to the interludes of tumblers and jugglers. As a specimen of nearly every elass is required to make up a Japanese theatrical entertainment—which lasts from sunrise to sunset—and as the lower houses appropriate and mutilate the plays of the higher, it is clear that the eondition of the Japanese theatre cannot be regarded as promising. In respect, however, of its movable scenery and properties, it is stated to be in advance of its Chinese prototype. The performers are, exeept in the ballet, males only. Though the leading actors enjoy great popularity and very respectable salaries, the class is held

in eontempt, and the eompanies were formerly recruited

from the lowest sources. The disabilities under which they lay have, however, been removed ; nor is it impossible that the reign of progress in Japan may revolutionize an agency of civilization which it seems for the present to have regarded as beneath its notice.

[JAPANESE,

DRAMA

EGYPTIAN. | Absence of No traces of a drania exist in any of the other civilized jirama in peoples of Asia—for that in Siam may probably be regarded

A of ag a branch of the Indian. Among the Hebrews and other i a Semitic peoples, as well as in at least one originally Aryan

i people of Asia which has cultivated letters with assiduity

and suecess—the Persians—the dramatic art is either

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wanting, or only appears as an occasional and exotic growth. It is unnecessary to dwell on the dramatic element apparent in two of the books of the Hebrew Scripture—the Book of Ruth and the Book of Job. Of the dramatic clement in the religious rites of the Egyptians a word will be said immediately ; meanwhile it may be convenient at once to state that traces of dramatic entertainments have Isolate! been found in various parts of the New World, which it ‘traces of it cannot be part of the present sketch to pursue. Among in the these are the performances, accompanied by dancing and peoples of . ; : ae se ‘ine New intermixed with recitation and singing, of the South-Sea ‘World, Islanders, first described by Captain Cook, and lately re- introduced to the notice of students of comparative mythology by Mr W. Wyatt Gill. Of the so-called Inca drama of the Peruvians, the unique relic, Apu Ollantay, | said to have been written down in the Quichua tongue from native dictation by Spanish priests shortly after the conquest of Peru, has been partly translated by Mr Clements Markham, and recently twice rendered into German verse. It appears to bean historic play of the heroic type, combin- ing stirring incidents with a pathos finding expression in at least one lyric of some sweetness—the lament for the lost Collyar. With it may be contrasted the ferocious Aztek dramatic ballet, Rabinal-Achi (translated by the Abbé de Bourbourg), of which the text seems rather a succession of warlike harangues than an attempt at dramatic treat- ment of character. But these are mere isolated curiosities,

Dramatic The civilization and religious ideas of the EGyPpTIANS so elements in vitally influenced the people of whose drama we are about vious to speak that a reference to them cannot be altogether “and popu. Omitted, The influence of Egyptian upon Greek civiliza- “lariife, tivn has probably been over-estimated by Herodotus ; but while it will never be clearly known how much the Greeks owed to the Egyptians in divers

branches of knowledge, it is certain that the former coufessed themselves the scholars of Egypt in the cardinal doctrine of its natural theology. The doctrine of the immortality of the soul there found its most solemn expression in mysterious recitations connected with the rites of sepulture, and treating of the migration of the soul from its earthly to its eternal abode. These solemnities, whose transition into the Hellenic mysteries I has usually been attributed to the agency of the Thracian worship of Dionysus, undoubtedly contained a dramatic element, upon the extent of which it is, however, useless to speculate. The ideas to which they sought to give utterance centred in that of Osiris, the vivifying power or universal soul of nature, whom Herodotus simply identifies with the Dionysus of the Greeks. The same deity was likewise honoured by processions among the rural Egyptian population, which, according to the same authority, in nearly all respects except the absence of choruses resembled

the Greek phallic processions in honour of the wine-god. That the Egyptians looked upon music as an important science seems fully established ; it was diligently studied by their priests, though not, as among the Greeks, forming a part of general education, and in the sacred rites of their gods they as a rule permitted the use of flute and harp, as / well as of vocal music. Dancing was as an art contined to professional persons; but though the higher | orders abstained from its practice, the lower indulged in it on festive occasions, when a tendency to pantomime naturally asserted itself, and licence and wanton buffoonery prevailed, as in the carly rustic festivals of the Greek and Italian

peoples. Of a dance of armed men, on the other hand, there seems no satisfactory trace in the representations of the Egyptian monuments.

But whatever elements the Greek drama may, in the ae sources from which it sprang, have owed to Egyptian, or Tig religi- Phrygian, or other Asiatic influences, its development was ous origin. independent and self-sustained. Not only in its begin- nings, but so long as the stage existed in Greece, the drama was in intimate connection with the national religion. This is the most signal feature of its history, and one which cannot in the same degree and to the same extent be ascribed to the drama of any other people, ancient

or modern, Not only did both the great branches of the Greek drama alike originate in the usages of religious worship, but they never lost their formal union with it, though one of them (comedy) in its later growth abandoned all direct reference to its origin. Hellenic polytheism was at once so active and so fluid or flexible in its anthropo- morphic formations, that no other religious system has ever so victoriously assimilated to itself foreign elements, or so vivaciously and variously developed its own. Thus, the worship of Dionysus, introduced into Greece by the Phoenicians as that of the tanriform sun-god whom his worshippers adored with loud cries (whence Bacchus or Iacchus), and the god of generation (whence his phallic emblem) and production, was brought into connection with the Dorian religion of the sun-god Apollo, Apollo and his sister, again, corresponded to the Pelasgian and Achwen divinities of sun and moon, whom the Pheenician Dionysus and Demeter superseded, or with whose worsbip theirs was blended. Dionysus, whose rites were specifically conducted with reference to his attributes as the wine-god, was attended by deified representations of his original worshippers, who wore the skin of the goat sacrificed to him. These were the satyrs. Out of the connected worships of Dionysus, Bacchus, Apollo, and Demeter sprang the beginnings of the Greek drama. *%

“Both tragedy and comedy,” says Aristotle, “ originated in a rude and unpremeditated manner,—the first from the leaders of the dithyramb, and the second from those who led off the phallic songs.” This diversity of origin, and the distinction jealously maintained down to the latest times between the two branches of the dramatic art, even where they might seem to come into actual contact with one another, necessitate a separate statement as to the, origin and history of either.

The custom of offering thanks to the gods by hymns and Orisin of dances in the places of public resort was first practised by teagedy. the Greeks in the Dorian states, whose whole system of life was organized on a military basis. Hence the dances of the Dorians originally taught or imitated the movements of soldiers, and their hymns were warlike chants. Such. were the begivnings of the chorus, and of its songs (called peans, from an epithet of Apollo), accompanied first by the phorminx and then by the flute. A step in advance was taken when the poet with his trained singers and dancers,

like the Indian sdétra-dhdra, performed these religious functions as the representative of the population. From the Doric pan at a very early period several styles of choral dancing formed themselves, to which the three styles of dance in scenic productions—the tragic, the comic, and the satyric —are stated afterwards to have corresponded. But none of these could have led to a literary growth. This was due to the introduction among the Dorians of the dithyramb,—originally a song of revellers, probably led by. a flute-player and accompanied by the music of other Eastern instruments, in which it was customary in Crete to! celebrate the birth of Bacchus (the doubly-born) and possibly also his later adventures. The leader of the kaud

Lyrical tragedy.

Invention of the tragic drama,

404.

C us) may be supposed to have at times assumed the oe ‘ sie oe eka whose worshippers bore aloft the vine-clad thyrsus. The dithyramb was reduced to a definite form by the Lesbian Arion (fl. 610), who composed regular poems, turned the moving band of worshippers into a stand- ing or cyclic chorus, invented a style of music adapted to the character of the chorus— the tragic or goat style—and called these songs goat-songs, or tragedies. Arion thus became the inventor of lyrical tragedy—a transition stage between the dithyramb and the regular drama. His invention, or the chorus with which it dealt, was established according to fixed rules by his contemporary Stesichorus. About the same time that Arion introduced these improve- ments into the Dorian city of Corinth, the (likewise Dorian) Families at Sicyon honoured the hero-king Adrastus by tragic choruses. Hence the invention of tragedy was ascribed by the Sicyonians to their poet Epigenes ; but this step, significant for the future history of the Greek drama, of employing the Baccbic chorus for the celebration of other than Bacchic themes, was soon annulled by the tyrant Clisthenes.

The element which transformed lyrical tragedy into the tragic drama was added by the Ionians. The custom of the recitation of poetry by wandering minstrels called rhapsodes (from paBdos, staff, or from fdrrw, to piece together) first sprang up in the Ionia beyond the sea; to such minstrels was

due the spread of the Homeric poems and of subsequent epic cycles. These recitations, with or without musical accompauiment, soon included gnomic or didactic, as well as epic, verse ; if Homer was a rhapsode, so was the sententious or “moral” Hesiod. The popular effect of these recitations was enormously increased by the metrical innovations of Archilochus (from 708), who in- vented the trochee and the tambus, the latter the arrowy metre which is the native form of satirical invec- tive—the species of composition in which Archilochus excelled—though it was soon used for other purposes also. The recitation of these iambics may already have nearly approached to theatrical declamation. ‘The rhapsodes were welcome guests at popular festivals, where they exercised their art in mutual emulation, or ultimately recited parts, perhaps the whole, of longer poems, The recitation of a long epic may thus have resembled theatrical dialogue ; that of alternating iambic poems, the form being frequently an address in the second person, even more so. The rhapsode was in some sense an actor; and when these recitations reached Attica, they thus brought with them the germs of theatrical dialogue.

The rhapsodes were actually introduced into Attica at a very early period ; the J/iad, we know, was chanted at the Brauronia, a rural festival of Bacchus, whose worship had early entered Attica, and was cherished among its rustic population. Meanwhile the cyclic chorus of the Dorians had found its way into Attica and Athens, ever since the Athenians had recognized the authority of the great centre of the Apolline religion at Delphi. It therefore only remained for the rhapsodic and the cyclic—in other words, for the epicand the choral—elements to coalesce ; and this must have been brought about by a union of the two accompaniments of religious worship in the festive rites of Bacchus, and by the domestication of these rites in the ruling city. This occurred in the time of Pisistratus, perbaps after his restoration in 554. To Thespis (535), said to have been a contemporary of the tyrant and a native of a Diacrian deme (Icaria), the invention of tragedy is accordingly ascribed. Whether his name be that of an actual person or not, his claim to be regarded as the inventor of tragedy is founded on the statement that he Introduced an actor for the sake ef relieving the Dionysian chorus. This actor, the representative of the rhapsodes,

Dole nem A

[GREEK,

and doubtless, at first, generally the poet lumself, instead of merely alternating his recitations with the songs of the chorus, addressed his speech to its leader—the corypheus— with whom he thus carried on a species of dzalogue. The chorus stood round its leader upon the steps of the Bacchic altar (thymele), the actor was placed upon a table. This table is the predecessor of the stage, for the waggon of Thespis is a fiction, probably due to a confusion between his table and the waggon of Susarion. It is a significant minor invention ascribed to Thespis, that he disguised the actor's face first by means of a pigment, afterwards by a mask, In the dialogue was treated a myth relating to Bacchus or some other deity or hero. Whether or not Thespis actually wrote tragedies (and there seems no reason to doubt it), and although both the cyclic chorus and rhapsodic recitation continued in separate use, tragedy was now in existence. The essential additions afterwards made to its simple framework were remarkably few. A%schylus added a second actor, and by reducing thie functions of the chorus further established the dialogue as the principal part of the action, Sophocles added a third actor, by which change the preponderance of the dialogue was made complete.

If the origin of Greek comedy is simpler in its nature than that of Greek tragedy, the beginnings of its progress are involved in more obscurity. It is said to have been invented by Susarion, a native of Megaris, whose inhabitants were famed for their coarse humour, which they communicated to their colonies in Sicily. In this island, to this day the home of spontaneous mimicry, comedy was said to have arisen. In the rural Bacchic vintage-festivals bands of jolly companions (xpos, properly a revel con- tinued after supper) went about in carts or afoot, carrying the phallic emblem, and indulging in the ribald licence of wanton mirth. From the song sung in these processions or at the Bacchic feasts, which combined the praise of the god with gross personal ridicule, and was called comus in a secondary sense, the Bacchic reveller taking part in 1t was called a comus-singer or comedus. These phallic proces- sions, which were afterwards held at Athens as in all

Greek cities, imparted their character to Old Attic comedy, whose essence was personal vilification.

Thus independent of one another in their origin, Greek tragedy and comedy never actually coalesced. The satyr- drama, though in some sense it partook of the nature of both, was in its origin as in its history connected with tragedy alone. Pratinas of Phlius, a contemporary of AXschylus in his earlier days, is said to have restored the tragic chorus to the satyrs, ze, lie first produced dramas the same in form and theme as the tragedies, but in which the dances were different and cntirely carried on by satyrs. The tragic poets, while never writing comedies, henceforth also composed satyr-dramas ; but neither tragedies nor satyr- dramas were ever written by the comic poets, and it was in conjunction with tragedies only that the satyr-dramas were performed, The theory of the Platonic Socrates, that the samme man ought to be the best tragic and the best comic poet, was uever cxemplificd in practice. The so-called hilaro-tragedy or tragi-comedy of later writers, thought in some of its features to have been anticipated by Euripides,' in form nowise differed from tragedy ; it merely contained a comic element in its characters, and invariably had a happy ending. The serious and sentimental element in the comedy of Menander and his contemporaries did far more to destroy the essential difference between the two great branches of the Greek dramatic art.

The history of Greek-—which virtually always remained Attic—tragedy divides itself into three periods.

1 Alcestis; Orestes.

Origin of comedy,

The satyr drama,

Tragi- comedy.

Periods cf | Greek tra- gedy.

_ Period I. Lhe period before Aeschylus (535-499).—From this The incontestable pre-eminence of the three great tragic The great a we have but

a few names of authors and plays—those of | poets was acknowledged at Athens by the usage allowing ‘8! Afischy lus. ° ° . : . : : masters and the former being (besides Thespis) Cheerilus, Phrynichus, | no tragedies but theirs to be more than once performed, ineir con- and Pratinas, all of whom lived to contend with Aischylus | and by the law of Lycurgus (c. 330) which obliged the actors tempora- for the tragic prize. To each of them certain innovations | to use, in the case of works of the great masters, authentic ries. are ascribed—among the rest the introduction of female | copies preserved in the public archives. It is thus not ; characters to Phrynichus. impossible that the value of later Attic tragedy, of which b eeioal iI. The classical period of Attic tragedy—that of | the fertility continued considerable, has been under-rated. period. § Aischylus, Sophocles, and Euripides, and their con- | In all the names of 1400 tragedies and satyr-dramas are temporaries (499-405),—To this belong all the really im- | preserved ; and tragic poets are mentioned of whose plays | portant phases in the progress of Greek tragedy, which | no names are known. Among the more celebrated Attic severally connect themselves with the names of its three | tragedians contemporary with the great writers, Ion of great masters. ‘They may be regarded as the representa- | Chios (d. before 419) seems to have followed earlier tradi- tives of different generations of Attic history and life, | tions of style than Euripides ; Agathon, who survived the though of course in these, as in the progress of their art | latter, on the other hand, introduced certain innovations of Fschylus. itself, there is an unbroken continuity, Auschylus | a transnormal kind into the art of tragic composition, (525-456) had not only fought both at Marathon and at Tl. Of the third period of Greck tragedy the concluding Last Salamis against those Persians whose rout he celebrated | limit cannot be precisely fixed. Down to the days of Period. : with patriotic pride,! but he had becn traincd in the Alexander the Great, Athens remained the chief home of Eleusinian mysteries, and was a passionate upholder of the | tragedy. Though tragedies must have begun to be acted The succes institution most intimately associated with the primitive | at the Syracusan and Macedonian courts, since Aischylus, 8°78 of the political traditions of the past—the Areopagus.? He had | Euripides, and Agathon had sojourned there,—though the ae a se been born in the generation after Sulon, to whose maxims | practice of producing plays at the Dionysia before the allies athens. he fondly clung; he must have belonged to that anti- | of Athens must have led to their holding similar exhibi-

democratical party which favoured the Spartan alliance, | tious at home,— yet before the death of Alexander we meet and it was the Dorian development of Hellenic life and the _ with no instance of a tragic poet writing or a tragedy plulosophical system based upon it with which his religious , written outside Athens. An exception should indeed be and moral convictions were imbued. Thus even upon the made in favour of the tyrant Dionysius of Syracuse, who generation which succeeded him the chivalrous spirit and (like Critias in his earlier days at Athens) was “addicted diction of his poetry, and the unapproached sublimity of to” tragic composition. Not all the tragedians of this period, his dramatic imagination, fell, as it falls upon later posterity, | however, were Athenians born; though the names of Sophocles. like the note of a mightier age. Sophocles (495-405) was Euphorion, the son of schylus, Iophon, the son of the associute of Pericles, and an upholder of his authority | Sophocles, and Euripides and Sophocles, the nephew and | rather than a consisteut pupil of his political ideas ; but his | the grandson respectively of their great namesakes, illustrate | inanhiood and perhaps the maturity of his genius coincided | the descent of the tragic art as an hereditary family posses- | with the yreat days when he could stand, Jike his mighty | sion. Cleremon (fl. 380) already exhibits tragedy on the , friend and the community they both so gloriously repre-| road to certain decay, for we learn that his plays were i sented, on the sunny heights of achievement. Sereuely | written for reading, : pious, he yet treats the myths of the national religion in the Soon after the death of Alexander theatres are found 4 spirit of a conscious artist, coutrasting with lofty irony tle | spread over the whole Hellenic world of Europe and Asia— struggles of humanity with the irresistible march of its| a result to which the practice of the conqueror and his destinies. His art (which he described as having passed | father of celebrating their victories by scenic performances through three successive stages) may in its perfection be | had doubtless contributed. Alexandria having now The Alex- said to typify the watchful and creative calm of his city’s im- | become a literary centre with which even Athens was in 4rians. _ Euripides. perial epoch. Euripides (480-406), as is the fate of genius | some respects unable to compete, while the latter still

of a more complex kind, has beeu more variously and anti- thetically judged than either of his great fellow-tragedians. His art has been called thinner and tamer than tlieirs, his genius rhetorical rather than poetical, his morality

that of a sophistical wit. Ou the other hand, he has been recognized not only as the most tragic of the Attic tragedians and the most pathetic of ancient poets, but also as the most humane in his social philosophy and the most various in his psychological insight. At least though far removed from the uuiver age of the national life, he is, both in patriotic spirit and in his choice of themes, genuinely Attic; and if he was “haunted on the stage by the demon of Socrates,” he was, like Socrates himself, the representative of an age which was a seed-time as well as a season of decay. To

remained the home of comedy, the tragic poets flocked to the capital of the Ptolemies; and here, in the reign of Ptolemy Philadelphus (283-247) flourished the seven tragic poets famed as the ‘“Pleias,” who still wrotc in the style and followed the rules observed by the Attic masters. Tragedy and the dramatic art continued to be favoured by the later Ptolemies ; and about 100 3.c, we meet with the curious phenomenon of a Jewish poet, Ezechiel, composing Greck tragedies, of one of which (the Exodus from Egypt) frag- ments have come down to us. Tragedy, with the satyr- drama and comedy, survived in Alexandria beyond the days of Cicero and Varro, nor was their doom finally sealed till the Emperor Caracalla abolished theatrical performances in the Egyptian capital in 217 a.v.

During the whole of its productive age Greek tragedy The tra- seems to have adhered to the lines laid down by its great th of the Attic masters ; nor were these in most respects departed one

Euripides the general progress of dramatic literature owes more than to any other ancient poet. Tragedy followed in

his footsteps in Greece and at Rome; comedy owed him raastaty,

something in the style of the very Aristophanes who mocked him, and more in the sentiments of Menander ; and when the modern drama came to engraft the ancient

upon its own crude growth, his was directly or indirectly |

the most powerful influence in the establishment of a living connection between them.

1 Persea. 2 Kumenides.

from by the Roman imitators of these poets and of their successors,

Tragedy was defined by Plato as an imitation of the Subjects.

noblest life. Its proper themes—the deeds and sufferings of heroes—were familiar to audiences intimately acquainted with the mythology of the national religion. Tosuch themes Greek tragedy almost wholly confined itself ; and in later days there were numerous books which discussed these

Construc- tiou.

The Adschylean trilogy.

The tetra-

lugy.

myths of the tragedians. They only very exceptionally treated historic themes, though one great national calamity,} anda yet greater national victory,? and in later times a few other historical subjects, ® were brought upon the stage. Such veiled historical allusions as critical ingenuity has sought not only in passages but in the entire themes of other Attic tragedies * cannot, of course, even if accepted as such, stamp the plays in which they occur as historic dramas. No doubt Attic tragedy, though after a different and more decorous fashion, shared the tendency of her comic sister to introduce allusions to contemporary events and persons; and the indulgence of this tendency was facilitated by the revision (8:acxevy) to which the works of the great poets were subjected by them, or by those who produced their works after them.> So far as we know, the subjects of the tragedies before Aischylus were derived from the epos ; and it was a famous saying of this poet that his dramas were ‘ but dry scraps from the great banquets of Homer ”—an expression which may be understood as including the poems which belong to the so-called Homeric cycles. Sophocles, Euripides, and their successors likewise resorted to the Trojan, and also to the Heraclean

and the Thesean myths, and to Attic legend in general, as well as to Theban, to which already Aischylus had had recourse, and to the side or subsidiary myths connected with these several groups. These substantially remained to the last the themes of Greek tragedy, the Trojan myths always retaining so prominent a place that Lucian could jest on the universality of their dominion, Purely invented sub- jects were occasionally treated by the later tragedians; of this innovation Agathon was the originator.® .

Thespis is said to have introduced the use of a prologue and a rhesis (speech)—the former being probably the opening speech recited by this solitary actor, the latter the dialogue betwecn actor aud chorus. It was a natural result of the introduction of the second actor that a second rhesis should likewise be added ; and this tripartite division would be the earliest form of the trilogy,—three sections of the sume myth forming the beginning, middle, and end of a single drama, marked off from one another by the choral songs. From this Adschylus proceeded to the treatment of these several portions of a myth in three separate plays, connected together by their subject and by being performed in sequence on a Single occasion. This is the AMschylean trilogy, of which we have only one extant example, the Orestea,—as to which critics may differ whether Adschylus adhered in it to his principle that the strength should lie in the middle—in other words, that the interest should centre in the second play. In any case, the symmetry of the trilogy was destroyed by the practice of performing after it a satyr-drama, probably, asa rule, if not always, connected in subject with the trilogy, which thus became a tetralogy, though this term, unlike the other, seems to be a purely technical expression invented by the learned.’

1 Phrynichus, Capture of Miletus.

2 Id., Phoentsse; Aischylus, Perse (Persce-trilogy ?).

- Moschion, Themistocles ; Theodectes, Mausolus ; WLycophron, Marathonii ; Cassandret ; Socit ; Philiscus, Themistocies.

4 Aschylus, Septem v. Thebas; Prometheus Vinctus ; Danais- trilogy ; Sophocles, Antigone ; Gidipus Coloneus ; Euripides, Medea.

5 Quite distinct from this revision was the practice against which the law of Lycurgus was directed, of ‘‘cobbling and heeling” the dramas of the great masters by alterations of a kind familiar enough to the students of Shakespeare as improved by Colley Cibber. The later tragedians also appear to have occasionally transposed long speeches or episodes from one tragedy into another—a device largely followed by the Roman dramatists, and called contamination by Latin writers, 8 Anthos (The Flower).

One satyr-drama only is preserved to us, the Cyclops of Euripides,

a dramatic version of the Homeric tale of the visit of Odysseus to Polyphemus, _ Lycophron, one of the poets of the Pleias, by using the satyr-drama (in his Menedemus) as a vehicle of personal ridicule, applied it to a purpose like that of Old Attic comedy.

DEAR A

[GREEK

Sophocles, a more conscious and probably a more self- critical artist than Auschylus, may be assumed from the first to have elaborated his tragedies with greater care; and to this, as well as to his innovation of the third actor, which materially added to the fulness of the action, we may attribute his introduction of the custom of contending for the prize with single plays. It does not follow that he never produced connected trilogies, though we have no example of such by him or any later author ; on the other hand, there is no proof that either he or any of his succes- sors ever departed from the Alschylean rule of producing three tragedies, followed by a satyr-drama, on the same day. This remained the third and last stage in the history

of the construction of Attic tragedy. The tendency of its Complicat. action towards complication was a natural progress, and is ¢4 actions.

approved by Aristotle. This complication, in which Euripides excelled, led to his use of prologucs, in which one of the characters opens the play by an exposition of the circumstances under which its action begins. This practice, though ridiculed by Aristophanes, was too convenient not to be adopted by the successors of Euripides, and Menander transferred it to

comedy. As the dialogue increased in importance, so the dramatic significance of the chorus diminished. While in Alschylus it mostly, and in Sophocles occasionally, takes part in the action, its songs could not but more and more approach the character of lyrical cntermezzos ; and this they openly assumed when Agathon began the practice of inserting choral songs (embolima) which had nothing to do with the action of the play. In the general contrivauce of their actions it was only natural that, as compared with Auschylus, Sophocles and Euripides should exhibit an advance in both freedom and ingenuity ; but the palm due to a treatment at once piously adhering to the substance of the ancient legends and original in an effective dramatic treatment of them must be given to Sophocles. Euripides was, moreover, less skilful in untying complicated actions than in weaving them ; hence his frequent resort® to the expedient of the deus ex machina, which Sophocles employs only in his latest, lay.®

The other distinctions to be drawn between the dramatic qualities of the three great tragic masters must be mainly based upon a critical estimate of the individual genius of each. In the characters of their tragedies, Aischylus and Sophocles avoided those lapses of dignity with which from oue point of view Euripides has been charged by Aristophanes and other critics, but which from another connect themselves with his humanity. If his men and women are less heroic and statuesque, they are more like men and women. Aristotle objected to the later tragedians that, compared with the great masters, they were deficient in the drawing of character—by which he meaut the lofty drawing of lofty character. In diction, the transition is even more perceptible from the ‘‘ helmeted phrases” of Atschylus, who had Milton’s love of long words and sonorous proper names, to the play of Eurtpides’s “smooth aud, diligent tongue ;” but toa sustained style even he remained essentially true, and it was reserved for his successors to introduce into tragedy the “low speech ”—1.¢., the con-~ versational language—of comedy. Upon the whole, how- ever, the Euripidean diction secms to have remained the standard of later tragedy, the flowery style of speech introduced by Agathon finding no permanent favour.

Finally, Aischylus is said to have made certain reforms in tragic costume of which the object is self-evident,—to have improved the mask, and to have invented the

cothurnus or buskin, upon which the actor was raised to ~

8 Jon; Supplices; Iphigenia in Tauris; Electra; Helena; Hippolytus; Andromache. 9 Philoctetes.

Characters _

Diction.

Improve- | ments in costume &e. |

Perio 1s of Greek comedy.

Sicilian comedy,

Attic.

Old.

Aristopha-

nes,

loftier stature.

QEFEK |

Euripides was not afraid of rags and tatters ; but the sarcasms of Aristophanes on this head seem feeble to those who are aware that they would apply to King Lear as well as to Telephus.

The history of Greek comedy is likewise that of an essentially Attic growth, although Sicilian comedy was earlier in date than her Attic sister or descendant. The former is represented by Epicharmus (fl. 500), and by the names of one or two other poets. It probably had a chorus, and, dealing as it did in a mixture of philosophical discourse, antithetical rhetoric, and wild buffoonery, neces- sarily varied in style. Though in some respects it seems to have resembled the Middle rather than the Old Attic comedy, its subjects sometimes, like those of the latter, coincided with the myths of tragedy, of

which they were doubtless parodies. ‘The so-called mimes of Sophron (fl. 430) were dramatic scenes from Sicilian life, intended, not for the stage, but for recitation.

Attic comedy is usually divided into three periods or species, VizZ. :—

I. Old Comedy, which dates from the complete establish- ment of democracy by Pericles, though a comedy directed against Themistocles is mentioned. The Megarean farcical entertainments had long spread in the rural districts of Attica, and were now introduced into the city, where Cratinus and Crates (fl. 450) first moulded them into the forms of Attic art. The final victory of Pericles and the democratic party may be reckoned from the ostracism of Thucydides (444) ; and so eagerly was the season of freedom employed by the comic poets that already four years after- wards a law—which was, however, only a short time in foree—limited their licence. Cratinus,) an execedingly bold and broad satirist, apparently of conservative ten- dencics, was followed by Eupolis (446-after 415), every one of whose plays appears to have attacked some in- dividual,? by Phrynichus, and others ; but the representative vf old comedy in its fullest development is Aristophanes (c. 444-c. 380), a comic poet of unique and unsurpassed genius. Dignified by the acquisition of a chorus (though of a less costly kind than the tragic) of masked actors, and of scenery and machinery, and by a corresponding lite- rary elaboration and elegance of style, Old Attic comedy nevertheless remained true both to its origin and to the purposes of its introduction into the free imperial city. It borrowed much from tragedy, but it retained the phallic abandonment of the old rural festivals, the licence of word and gesture, and the audacious directness of personal invec- tive. These characteristics are not features peculiar to Aristophanes. He was twitted by some of the older comic poets with having degenerated from the full freedom of the art by a tendency to refinement, and he took credit to him- self for having superseded the time-honoured cancan and the stale practical joking of his predeccssors by a nobler kind of mirth. But in boldness, as he likewise boasted, he had no peer; and the shafts of his wit, though dipped in wine-lees and at times feathered from very obscene fowl, flew at high game.? Ife has been accused of secking to degrade what he ought to have recognized as good ;* and it has been shown with complete success that he is not to be taken as an impartial or accurate authority on

Athenian history. But partisan as he was, he was also a genuine patriot ; and his very political sympathies—which were conservative—were such as have often stimulated the most effective political satire, because they imply an antipathy to every species of excess. Of the conservative quality of reverence he was, however, altogether devoid; and his

1 Archilocht. ® Maricas (Hyperbolus); Bapte (Alcibiades); Lacones (Cimon), &c 3 Knights. 4 Clouds.

HRA WwW #

AST

love for Athens was that of the most free-spoken of sons, Flexible even in his religions notions, he was in this as in other respects ready to be educated by his times ; and, like a true comic poet, he could be witty at the expense even of his friends, and, it might almost be said, of himself. [n wealth of fancy,® and in beauty of lyric melody, he ranks high among the great pocts of all times.

The distinctive feature of Old, as compared with Middle Comedy, is the parabasis, the speech in which the chorus, moving towards and facing the audience, addressed it in the name of the poet, often abandoning all reference to the action of the play. ‘The loss of the parabasis was involve. in the loss of the chorus, of which comedy was deprived in consequence of the general reduction of expenditure upon the comic drama, culminating in the law of Cinesias (396).° But with the downfall of the independence of Athenian public life, the ground had been cut from under the feet of its most characteristic representative. ‘The catastrophe of the city (405) had been preceded by the temporary over- throw of the democracy (411), and was followed by the establishment of au oligarchical “ tyranny” under Spartan protection ; aud when liberty was restored (404), the citizens for a tine addressed themselves to their new life iu a soberer spirit and continued (or passed) the law prohibit- ing the introduction by name of any individual as one of the personages of a play. The change to which comedy had to accominodate itself was one which cannot be defined by precise dates, yet it was not the less inevitable in its progress and results. Comedy, in her struggle for existence, now chictly devoted herself to literary and social

themes— such as the criticism of tragic poets,’ and the literary craze of women’s rights’—and the transition to Middle Comedy accomplished itself. Of the later plays of Aristophanes, three? are without a paradasis, and in the last of those preserved to us}? the chorus is quite insignificant.

Il. Afididlle Comedy, whose period extends over thie remaining years of Athenian freedom, thus differed in sub- stance as well. as in form from its predecessor. It is re- presented by the names of thirty-seven writers (more than double the number of poets attributed to Old Comedy) among whom Eunbulus, Antiphanes, and Alexis are stated to have been pre-eminently fertile and successful. It wasa comedy of manners as well as character, although its ridicule of particular classes of men tended to tho creation of stand- ing types, such as parasites, courtesans, revellers, and—a favourite figure already drawn by Aristophanes!!—the self-conceited cook. In style it necessarily inclined to become more easy and conversational ; while in that branch which was devoted to the parodying of tragic myths, its purpose may have been to criticise, but its effect must have been to degrade. This species of the comic art had found favour at Athens already before the close of the great civil war; its inventor was the Thasian Hegemon, at whose Gigantomachia the Athenians were laughing on the day when the news arrived of the Sicilian disaster.

IIL. Mew Comedy, which is dated from the establishment of the Macedonian supremacy (338) is merely a further development of Altddle. If its favourite types were more numerous, including the captain (of mercenaries)—the original of a long line of comic favourites—the cunning slave, &c., they were probably also more conventional. New Comedy appears to have first constituted love intrigues the main subject of dramatic actions. The most famous of the 64 writers said to have belonged to this period of comedy were Philemon (fl. from 330), Menander (342-29),}

5 Birds. 8 Strattis, Choricida. 7 Aristophanes, L’rogs; Phrynichus, dfuse; Tragedi. 8 Aristophanes, Icclesiazuse.

® Lysistrata; Thesmophoriazuse; Plutus II.

1 Plutus. 1 _olosicon.

The end of Old Co-

medy.

Middle.

New.

Philemon

and

Menander.

Decay of comedy.

Results of religious origin of Attic drama.

and his contemporary Diphilus. Of these authors we know something from fragments, but more from their Latin adapters Plautus and Terence. As comedians of character, they were limited by a range of types which left little room for originality of treatment; in the construc- tion of their plots they were skilful rather than varied. In style, as well as to some extent in construction, Menander took Euripides as his model, infusing into his comedy an element of moral and sentimental reflection, which refined if it did not enliven it. Yet it may be doubted whether either a high moral or a high artistic purpose animated this school of writers, and whether Epicurus in Landor's dialogue does injustice to Menander in suspecting him of " enjoying the follies of men in our rotten state as flies enjoy fruit in its decay." Fate or chance were the directing powers of his dramatic actions.

New Comedy, and with it Greek comedy proper, is regarded as having come to an end with Posidippus (fl. c, 280). Other comic writers of a later date are, however, nientioned, among them Rhinthon of Tarentum (fi. c. 300), whose mixed compositions have been called by various names, among them by that of phlyacographies (from phlyax, useless chatter). But Greek comedy ceased to be productive after it had been transplanted from

Athens to Alexandria; and though even in its original form it long continued to be acted in imperial Rome, these are phases of its history which may here be passed by.

The religious origin of the Attic drama impresses itself npon all its most peculiar features. Theatrical per- formances were held at Athens only at fixed seasons in the early part of the year—at the Bacchic festivals of the country Dionysia (vintage), the Lenzea (wine-press), pro- bably at the Anthesteria, and above all, at the Great Dionysia, or the Dionysia par eacellence, at the end of March and beginning of April, when in her most glorious age Athens was crowded with visitors from the islands and cities of her federal empire. As a part of religious worship, the performances took place in a sacred locality— the Lenceum on the south-eastern declivity of the Acropolis, where the first wine-press (Jenos) was said to have been set up, and where now an altar of Bacchus (thymele) formed the centre of the theatre. For the same reason, the exhibitions claimed the attendance of the whole population, and room was therefore provided on a grand scale—according to the Platonic Socrates, for " more than 30,000" spectators. The performances lasted all day, or were at least, in accordance with their festive character, extended to as great a length as possible. To their religious origin is likewise to be attributed the fact that they were treated as a matter of state concern. The expenses of the chorus, which in theory represented the people at large, were defrayed on behalf of the state by the liturgies (public services) of wealthy citzens, chosen in turn by the tribes to be choragt (leaders, z.¢., providers of the chorus), the duty of training being, of course, deputed by them to profes- sional persons (chorodidascal). Publicly appointed and sworn judges decided between the merits of the dramas pro- duced in competition with one another ; the successful poet, performers, and choragus were crowned with ivy, and the last-named was allowed at his own expense to consecrate a tripod in memory of his victory in the ueighbourhood of the sacred Bacchic enclosure. Such a monument—one of the most graceful relics of ancient Athens—still stands in the place where it was erected, and recalls to posterity the victory of Lysicrates, achieved in the same year as that of Alexander on the Granicus. The dramatic exhibitions being a matter of religion and state, the entrance money, (theoricum) which had been introduced to prevent over- crowding, was

from the time of Pericles provided out of the public treasury. The whole vopulation had a right to its

DR AG A

[GREEN.

Bacchic holiday ; neither women, nor boys, nor slaves were excluded from theatrical spectacles at Athens.

The religious character of dramatic performances at Costume Athens, and the circumstances under which they accord- and ingly took place, likewise determined their externals of

costume and scenery. The actor’s dress was originally the festive Dionysian attire, of which it always retained the gay and variegated hues. The use of the mask was due to the actor’s appearing in the open air and ata dis- tance from most of the spectators ; its several species were elaborated with great care, and adapted to the different types of theatrical character. The cothwrnus, or thick-soled boot, which further raised the height of the tragic actor

(while the comedian wore a thin-soled boot), was likewise _

a relic of Bacchic costume. The scenery was, in the simplicity of its original conception, suited to open-air performances ; but in conrse of time the art of scene-paint- ing came to be highly cultivated, and movable scenes were contrived, together with machinery of the ambitious kind required by the Attic drama, whether for bringing gods down from heaven, or for raising mortals aloft.

On a stage and among surroundings thus conventional, it might seem as if little scope could have been left for the actor’s art. But though the demands made upon the Attic actor differed in kind even from those made upon his Roman successor, and still more from those which the histrionic art has to meet in modern times, they were not the less rigorous. Mask and buskin might increase his stature, and the former might at once lend the appropriate expression to his appearance and the necessary resonance to his voice. But

in declamation, dialogue, and lyric passage, in gesticulation and movement, he had to avoid the least violation of the general harmony of the performance. At the same time, the refinements of bye-play must, from the nature of the case, have been impossible on the Attic stage ; the gesticulation must have been broad and massive; the movement slow and the grouping hard in tragedy ; and the recitation must have surpassed in its weighty sameness that half-chant of which the echoes have never wholly died out from the stage. Not more than three actors, as has been seen, appeared in any Attic tragedy, The actors were provided by the poet ; perhaps the performer of the first parts (protagonist) was paid by the state. It was again a result of the religious origin of Attic dramatic performances, and of the public importance attached to them, that the actor's profession was held in high esteem. These artists were as a matter of course free Athenian citizens, often the dramatists them- selves, and at times were employed in other branches of the public sorvice. In later days, when tragedy had migrated to Alexandria, and when theatrical entertain- ments had spread over all the Hellenic world, the art of acting seems to have reached an unprecedented height, and to have taken an extraordinary hold of the public, mind. Synods or companies of Dionysian artists abounded, who were in possession of various privileges, and in one instance at least (at Pergamus) of rich endowments. The most important of these was the [onic company, estab- lished first in Teos, and afterwards in Lebedos, near Colophon, which is said to have lasted longer than many a famous state. We likewise hear of strolling companies performing in partibus. Thus it came to pass that the vitality of some of the master-pieces of the Greek drama is without a parallel in theatrical history; while Greek actors were undoubtedly among the principal and most effective agents of the spread of literary culture through a great part of the known world.

The theory and technical system of the drama exercised Writers on the critical powers both of dramatists, such as Sophocles, the theory If Plato of the

and of the greatest among Greek philosophers.

touched tlie subject incidentally, Aristotle has in his Poetics | very early period developed in lively intermixture the ele- Origin of (after 334) included an exposition of it, which, mutilated | ments of the dance, of jocular and abusive improvisations ‘ts native

ROMAN. |

forms.

as it is, has formed the basis of all later systematic enquiries. The specialities of Greek tragic dramaturgy refer above all to the chorus ; its general laws are those of tlie regular drama of all times. The theories of Aristotle and other earlier writers were elaborated by the Alexandrians, many of whom doubtless combined example with precept; they also devoted themselves to commentaries on the old masters, such as those in which Didymus (c. 30 3.c.) abundantly excelled, and collected a vast amount of learning on dramatic composition in general, which was doomed to perish, with so many other treasures, in the flames kindled by religious fanaticism. ,

“The history of the Greek stage,” says Sir Walter Scott, ‘ig that of the dramatic art in general ;” and herein no doubt lies the broad distinction to be drawn between tlie drama of the Greeks and the isolated growths previously treated in thissketch. Yet though such is the case,—though in the Roman drama the native elements sink into insigni- ficance when compared with those borrowed from the Greeks, and though the literary element in the modern drama of the West is directly or indirectly derived from the same source,—the Greek drama, both tragic and comic, had features of its own which it has been the principal aim of the foregoing brief account of it to mark. ‘Tragedy never lost the traces of its religious origin; and the festive purposes of comedy are most signally apparent in precisely that period of its productivity whose works are least con- genial to modern feeling and taste. But such is the wonderful power of the highest kind of art, that the tragedy of the three great masters, though its themes are so peculiar to itself that they have never been treated with the same effect by the numberless writers of other peoples who have essayed them, “‘ hath ever been held the gravest, moralest, and most profitable of all other poems ;” and such is the commanding claim of genius, that Aristophanes, who cultivated a species of

comedy of an altogether eccentric kind, occupies an eminence in his branch of the drama hardly more contestable than that of the great tragic triad in theirs. What is Hecuba to us that we should weep for her,—or Antigone that our sympathy should accompany her on her holy errand, forbidden by human laws, but en- joined upon her by the behest of Zeus and of Justice dwelling with the gods below,—or Agamenmon that we should thrill with horror when his cries announce the wreaking of his doom? Why can we laugh at the ribald repartees of hide-seller and sausage-seller, careless of the merits of the former of these advanced politicians, aud catch something of the dew of the rain-bringing maidens as it falls upon their beloved land, where the Bromian joy greets the advent of spring ? Because in all these instances, and in every other, the art of the Greek drama, while winged by the individual power of genius, is at the same time trne to its purposes as an art, and in harmony with Nature, who will not teach her laws or surrender her secrets of a sudden or to all.

In its most productive age, as well as in the times of its decline and decay, the Roman drama exhibits the continued coexistence of native forms by the side of those imported from Greece—either kind being uecessarily often subject to the influence of the other. Italy has ever been the native land of acti.g and of scenic representation ; and though Roman dramatic literature is in the main but a faint reflex of Greek examples, yet there is perhaps no branch of Roman literary art more congenial than this to the soil whence it sprang.

The beginnings of dramatic performances in Italy are to

be sought in the rural festivities which doubtless from a | simple ;

of song, speech, and dialogue, and of an assumption of character such as inay be witnessed in any ordinary conver- sation among southern Italians at the present day. The occasions of these festivities were religious celebrations, public or private—among the latter more especially wed- dings, which have in all ages been provocative of mirth ful demonstrations. The so-called Mescennine verses (from fascinum, or from Fescennium in southern Etruria), which were afterwards confined to weddings, and ultimately gave rise to an elaborate species of artistic poetry, never merged into actual dramatic performances. other hand—a name originally due to

the goatskins of the shepherds, but from primitive times connected with the fullness of both performers and performance—there seems from the first to have been a dramatic element ; they were probably comic songs or stories recited with gesticulation and flute accompaniment. Introduced into the city, these entertainments received a new impulse from the perfor- mances of the Etruscan players (/wdiones), who had been brought into Rome when scenic games (dudi scenici) were, in 364 B.c., for purposes of religious propitiation, first held there. had been their native name), who have had the honour of transmitting their appellation to the entire hestronce art and its professors, were at first only dancers and panto- mimists in a city where their specch was unintelligible. But their performances encouraged and developed those of other players and mountebanks, so that after the establish- ment of the regular drama at Rome on the Greek model, the saturew came to be performed as farcical after-pieces (exodia), until they gave way to other species. Of these

In the satu, on the Sature,

These zstriones, as they were called at Rome (¢st7? Istriones.

the mdm were at Rome probably coeval in their beginnings Mimi.

with the stage itself, where those who performed them’

were afterwards known under the same name, possibly in the place of an older appellation (planipedes, bare-footed). These loose farces, after being probably at first performed independently, were then played as after-pieces, till in the imperial period, when they reasserted their predominance, they were again produced by themselves. At the close o1 the republican period the mdmus had found its way into literature (through D. Laberius and others), and had been assimilated in both form and subjects to other varieties of the comic drama—preserving, however, as its distinctive feature, a preponderance of the mimic or gesticulatory ele- ment. Together with the pantomimus (v. imfra) the mimus continued to prevail in the days of the empire, having transferred its innate grossuess (for it was originally a representation of low life) to its treatment of mythologi- cal subjects, with which it dealt in accordance with the demands of a “lubrique and adulterate

age.” As a matte1 of course, the mimus freely borrowed from other species, among which, so far as they were of native Italian origin,

the Atellane fables (from Atella in Campania) call Atellane. Usually supposed to be of Oscan,

for special mention. birth, they originally consisted in delineatiors of the life of small towns, in which dramatic and other satire has never ceased to find a favourite butt. The principal personages in these living sketches gradually assumed a fixed and conventional character, which they retained even when, after the final overthrow of Campanian independence (210), the Azellance: had been transplanted to Rome. Here the heavy father or husband (pappus), the ass-eared glutton (maccus), the fuli-cheeked, voracious chatterbox (eco), and the wily sharper (dorsenus) became accepted comic types, and with others of a similar kind were handed down, to reappear in the modern Italian drama. In these characters lay the essence of the Atellane ; their plots were extremely the dialogue (perhaps ee with songs in

the Saturnian metre) it was left to the performers to improvise. In course of time these plays also assumed a literary form, being written out at length by their authors ; but under the cmpire they were gradually absorbed in the pantomimes.

The regular Roman drama, on the other hand, was of foreign (i.e., Greek) origin; and its early history, at all events, attaches itself to more or less fixed dates. It begins with the year 240 B.o., when at the ludi Loman, held with unusual splendour after the first Punic war, the victory was, according to Macedonian precedent, celebrated by the first production of a tragedy and a comedy on the Roman stage. Theauthor of both, who appeared in person as an actor, was Livius Andronicus (b. 278 or earlier), a native of the Greek city of Tarentum, where the Dionysiac festivals enjoyed high popularity. His models were in tragedy the later Greek tragedians and their revisions of the three great Attic masters, in comedy no doubt Menander and his school. These continued the examples of the regular Roman drama during the whole of its course, even when it resorted to native themes.

The nature of Roman tragedy admits of no doubt, although our conclusions respecting its earlier progress are ouly derived from analogy, from scattered notices especially of the titles of plays, and from such fragments—mostly very brief-—as have come down to us, Of the known titles of the tragedies of Livius Andronicus, six belong to the Trojan cycle, and this preference consistently maintained itself among the tragedians of the “Trojugene;” next in popularity seem to have been the myths of the house of Tantalus, of the Pelopidw, and of the Argonauts. The distinctions drawn by later Roman writers between the styles of the tragic poets of the republican period must in general be taken on trust. The Campanian Cn. Nevius (fl. from 236) wrote comedies as well as tragedies, so that the rigorous separation observed among the Greeks in the cultivation of the two dramatic species was at first neglected at Rome. His realistic tendency, displayed in that fond- ness for political allusions which brought upon him the vengeance of a noble family (the Metelli) incapable of understanding a joke of this description, might perhaps under more favourable circumstances have led him more fully to develop a new tragic species invented by him. But the fabula pretexta or protextata (from the purple-bordered robe worn by higher magistrates) was not destined to become the means of emancipating the Roman serious drama from the control of Greek examples. In design, it was national tragedy on historic subjects of patriotic interest—which the Greeks had only treated in isolated instances ; and one might at first sight marvel why, after Nevius and his successors had produced skilful examples of the species, it should have failed to overshadow and outlast in popularity a

tragedy telling the oft-told foreign tales of Thebes and Mycenz, or even the pseudo-ancestral story of Troy. But it should not be forgotten to how great an extent so-called early Roman history consisted of the tradi- tions of the gentes, and how little the party-life of later republican Rome lent itself to a dramatic treatment likely to be acceptable both to the nobility and to the multitude. As for the emperors, the last licence they would have per- mitted to the theatre was a free popular treatment of tlie national history; if Augustus prohibited the publication of a tragedy by his adoptive father on the subject of (dipus, it was improbable that he or his successors should have sanctioned the performance of plays dealing with the earthly fortunes of Divus Julius himself, or with the story of Marius, or that of the Gracchi, or any of the other tragic themes of later republican or imperial history. The historic drama at Rome thus had no opportunity for a vigorous life, even could tragedy have severed its main

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course from the Greek literature of which it has been well called a ‘free-hand copy.” The pretexte of which we know chiefly treat—possibly here and there helped to form!—legends of a hoary antiquity, or celebrate battles chronicled in family or public records ;? and in the end the species died a natural death.®

Q. Ennius (239-168), the favourite poet of the great Enzius and families, was qualified by his Tarentine education, which: his succes. taught the Oscan youth the Greek as well as the Latin

tongue (so that he boasted “three souls”), to become the literary exponent of the Hellenizing tendencies of his age of Roman society. Nearly half of the extant names of his tragedies belong to the Trojan cycle; and Euripides was clearly his favourite source and model, M. Pacuvius (b. c. 229), like Ennius subject from his youth up to the influences of Greek civilization, and the first Roman dramatist who devoted himself exclusively to the tragic drama, was the least fertile of the chief Roman tragedians, but was regarded by the ancients as indisputably superior to Ennius. He again was generally (though not uniformly) held to have been surpassed by L. Accius (b. 170), a learned

scholar and prolific dramatist, of whose plays 50 titles and a very large number of fragments have been pre- served. The plays of the three last-named poets maintained themselves on the stage till the close of the republic; and Accius was quoted by the emperor Tiberius. Of the other tragic writers of the republic several were diletéanti—such as the great orator and eminent politician C. Julius Strabo ; the cultivated officer Q. Tullius Cicero, who made an attempt, disapproved by his illustrious brother, to introduce the satyr-drama into the Roman theatre; L. Cornelius Balbus, a Czesarean partisan; and finally C. Julius Caesar himself. Tragedy continued to be cultivated under the earlier emperors ; and of one author, the famous and ill-

fated L, Annzus Seneca (4 B.c.—65 a.D.), a series of works Seneca.

has come down to us. In accordance with the cliaracter of their author's prose-work, they exhibit a strong predominance of the rhetorical element, and a pomposity of style far removed from that of the poets Sophocles and Euripides, from whom Seneca derived his themes. The metrification of his plays is very strict, and they were doubt- less intended for recitation, whether or not also designed for the stage. A few tragic poets are mentioned after Seneca, till about the reign of Domitian (81-96) the list comes to anend. The close of Roman tragic literature is obscurer than its beginning ; and, while there are traces of tragic performances at Rome as late as even the 6th century, we are ignorant how long the works of the old masters of Roman tragedy maintained themselves on the stage.

It would obviously be an error to draw from the plays of Character-

Seneca—unfortunately the only examples of Roman tragedy we possess—conclusions as to the method and style of the earlier writers. In general, however, no important changes seem to have occurred in the progress of Roman tragic com- position. The later Greek plays remained, so far as can be gathered, the models in treatment; and inasmuch as at Rome the single plays were performed by themselves, there was every inducement to make their action as full and compli- cated as possible. The dialogue-scenes (deverbia) appear to have been largely interspersed with musical passages (cantica) ; but the effect of the latter must have suffered from the barbarous custom of having the songs sung by

? Nevius, Lupus (The Wolf); Romulus; Ennius, Sabinw (The Sabine Women); Accius, Brutus.

? Nevius, Clastidiwm (Marcellus ?); Ennius, Ambracia; Pacuvius, Paulus ; Accius, Alneadee (Decius?.

3 Balbus’s Iter (The Mission), an isolated play on an episode of tho Pharsalian campaign, seems to have been composed for the mere p1i- vate delectation of its author and hero, Octavia, a late preeteatu ascribed to Seneca, was certainly not written by him.

- ◦ Oderint dum metuant” Atreus.

a ne

History of Roman comedy.

Palliata.

Plautus.

Terence,

ROMAN. |

PRAM G

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a boy placed in front of the flute-player (cantor), while the | than their originals. which they often altered. by the

actor accompanicd them with gesticulations. The chorus (unlike the Greek) stood on the stage itself and seems occasionally at least to have taken part in the action. But the whole of the musical element can hardly have attained to so full a development as among the Greeks. The divisions of the action appear at first to have been three; from the addition of prologue and epilogue may have arisen the invention (probably due in tragedy to Varro) of the fixed number of five acts. In style, such influence as the genius of

Roman literature could exercise must have been in the direction of the rhetorical and the pathetic; a sur- plus of energy on the one hand, and a defect of poetic rich- ness on the other, can hardly have failed to characterize these, as they did all the other productions of earlier Roman poetry.

In Roman comedy two different kinds—respectivcly called palliata and togata from the names of dress—were distinguished,—the former treating Greek subjects and imitating Greek originals, the latter professing a native character. The pallzata sought its originals especially in New Attic comedy; and its authors, as they advanced in refinement of style, became more and more dependent upon their models, and unwilling to gratify the coarser tastes of the public by local allusions or gross seasonings. But that kind of comedy which shrinks from the rude breath of popular applause usually has in the end to give way to less squeamish rivals ; and thus, after the species had been cultivated for about a century (c 250-150 B.c.), palliate ceased to be composed except for the amusement of small circles, though the works of the most successful authors, Plautus and Terence, kept the stage even after the estab- lishment of the empire. Among the earlicr writers of palliate were the tragic poets Andronicus, Nevius, and Ennius, but they were alike surpassed by T. Maccius Plautus (254-184), nearly all of whose comedies esteemed genuine by Varro—not less than 20 in number—have been preserved. He was exclusively a comic poet, and though he borrowed his plots from the Greeks—from Diphilus and Philemon apparently in preference to the more refined Menander—there was in him a genuinely national as well as a genuinely popular element. Of the extent of his originality it is impossible to judge ; probably it lies in his elaboration of character and the comic details of his dialogue rather thau in his plots. Modern comedy is indebted to him in all these points ; and in consequence of this fact, as well as of the attention his text has for linguistic reasons received from scholarship both ancient and modern, his merits have met with their full share of recognition, Statius Cecilius (an Insubrian brought to Rome as a captive c. 200) stands midway between Plautus and Terence, but no plays of his remain. P. Terentius Afer (c. 185-159) was, as his cognomen implies, a native of Carthage, of whose conqueror he enjoyed the patronage. His six extant comedies seem to be tolerably close render- ings of their Greek originals, nearly all of which were plays of Menander. It was the

good fortune of the works of Terence to be preserved in an exceptionally large number of MSS. in the monastic libraries of the Middle Ages, and thus (as will be seen) to become a main link betwcen the ancient and the Christian drama. As a dramatist he is distinguished by correctness of style rather than by variety in his plots or vivacity in his characters ; his chicf merit— and at the same time the quality which has rendered him so suitable for modern imitation—is to be sought in the polite ease of his dialogue. In general, the characteristics of the palléatw, which were divided into five acts, are those of the New Comedy of Athens, like which they had no chorus ; for purposes of explanation from author to audience the prologue sufficed ; the Roman versions were probably terser

process called contamination.

The togate, in the wider sense of the term, included all Togate.

Roman plays of native origin—amoug the rest the prectexte, in contradistinction to which and to the transient species of the trabeatce (from the dress of the knights) the comedies dealing with the life of the lower classes were afterwards called tabernarie (from taberna, a shop), 2 name suited by some of their extant titles,1 while others point to the treatment of provincial sccnes.2 The togata, which was necessarily more realistic than the padlzata, and doubt- less fresher as well as coarser in tone, flourished in Roman literature between 170 and 80 B.c. In this species Titinius, all whose plays bear Latin titles and were tabernarie, was succeeded by the more refined L. Afranius, who, though still choosing national subjects, seems to have treated them in the spirit of Menander. His plays continued to be per- formed under the empire, though with an admixture of elements derived from that lower species, the pantomime, to which they also were in the end to succumb. The Romans likewise adopted the burlesque kind of comedy called from its inventor Rhinthonica, and by other names (cf. ante).

The end of Roman dramatic literature was dilettantism and criticism ; the end of the Roman drama was spectacle and show, buffoonery and sensual allurement. It was for this that the theatre had passed through all its early troubles, when the political puritanism of the old school had upheld the martial games of the circus against the enervating influence of the stage. In those days the guardians of Roman virtue had sought to diminish the

attractions of the theatre by insisting upon its remaining as uncomfortable as possible; but as was usual at Rome, the privileges of the upper orders were at last extcnded to the population at large, though a separation of classes continued to be characteristic of a Roman audience. The first permanent theatre erected at Rome was that of Gn. Pompeius (55 B.c.), which contained nearly 18,000 seats ; but even of this the portion allotted to the performers (scena) was of wood; nor was it till the reign of Tiberius (22 a.p,) that, after being burnt down, the edifice was rebuilt in stone. See THEATRE,

Though a species of amateur literary censorship, intro- duced by Pompeius, beeame customary in the Augustan age, in general the drama's laws at Rome were given by the drama's patrons—in other words, the production of plays was a matter of private speculation. The exhibitions were contracted for with the officials charged with the superintendence of public amusements (cwratores ludorwm) ; the actors were slaves trained for the art, mostly natives of Southern Italy or Greece. Many of them rose to reputation and wealth, purchased their freedom, and themselves became directors of companies; but though Sulla might make a knight of Roscius, and Cesar and his friends defy ancient prejudice, the stigma of civil disability (infamza) continued to adhere to the profession. The actor's art was carried on at Rome under conditions differing in other respects from those of the Greek theatre. The Romans loved a full stage, and from the later period of the republic liked to see it crowded with supernuincraries. This accorded with their military instincts, and with the general grossness of their tastes, which led them in the theatre as well as in the circus to delight in spectacle and tumult, and to applaud Pompeius when he furnished forth the return of Agamemnon in the Clytemmnestra with a grand total of 600 heavily-laden mules. On the other hand, the actors were nearer to the spectators in the Roman theatre

1 Augur; Cinerarius (The Crimper); Fullonia (The Fuller's Trade); Libertus (The Freedman); Tibicina (The Flute-girl). 2 Brundisine; Ierentinatis; Setina.

The Roman theatre.

Actors.

Roscius and Alisopus.

End of the

Roman drama,

Pantomi-

mus,

Mimus,

Downfall of the drama.

than in the Greek, the stage (pulpitum) not being separated from the first rows of the audience by an orchestra occupied by the chorus ; and this led in earlier times to the absence of masks, variously-coloured wigs serving to distinguish the age of the characters. Roscius, however, is said (in con- sequence of an obliquity of vision disfiguring his counten- ance) to have introduced the use of masks; and the in- novation, though disapproved of, afterwards maintained itself. The tragic actors wore the crepida, corresponding to the cothurnus, and a heavy toga, which in the preetexta had the purple border giving its name to the species, The conventional costumes of the various kinds of comedy are likewise indicated by their names. The eomparative nearness of the actors to the spectators encouraged the growth of that close eriticism of acting for which Italy has always been famous, and which manifested itself in all the ways familiar to modern audiences. Where there is ‘criti- cism, devices are apt to spring up for anticipating or direct- ing it; and the evil institution of the claqgue is modelled on Roman precedent. In fine, though the art of acting at Rome must have originally formed itself on Greek example and precept, it was doubtless elaborated with a care un- known to the greatest Attic artists. Its most famous representatives were Gallus, ealled after his emancipation Q. Roscius Gallus (d. c. 62 B.c.), who, like the great “English Roscius,” excelled equally in tragedy and comedy, and his younger contemporary Clodius Aisopus, a Greek by birth, likewise eminent in both branches of his

art, though in tragedy more particularly. Both these great actors are said to have been constant hearers of the great orator Hortensius; and Roscius wrote a treatise on the relations between oratory and acting. In the influence of oratory upon the drama are perhaps to be sought the chief among the nobler features of Roman tragedy to which a native origin may be fairly ascribed.

The ignoble end of the Roman—and with it of the ancient classical—drama has been already foreshadowed. The elements of dance and song, never integrally united with the dialogue in Roman tragedy, were now altogether separated from it. While it became customary simply to recite tragedies to the small audiences who continued (or, as a matter of courtesy, affected) to appreciate them, the pantomimus commended itself to the heterogeneous multitudes of the Roman theatre by confining the performance of the actor to gesticulation and dancing, a ehorus singing the accompanying text. The species was developed with extraordinary success already under Augustus by Pylades and Bathyllus; and so popular were these entertainments, that even eminent posts, such as Lucan (d. 65 a.p.), wrote the librettos for them, of which the subjects were generally mythological, only now and then historical, and chiefly of an amorous kind. A single masked performer was able to enchant admiring erowds by the art of gesticulation and movement only. In what direction this art tended, when suiting itself to the demands of a recklessly sensual age, may be gathered from the remark of one of the last pagan historians of the empire, that the introduction of pantomimes was a sign of the general moral decay of the world which began with the beginning of the monarchy. Comedy more easily lost itself in the cognate form of the mdmus, which survived all other kinds of comic entertainments because of its more audacious immorality and open obscenity. Women took part in these performances, by means of which, as late as the 6th century, a mzma acquired a celebrity which ulti- mately raised her to the imperial throne. Meanwhile the regular drama had lingered on, enjoying in all its forms imperial patronage in the days of the literary revival under Hadrian (117-138); but the perennial taste for the Spectacles of the amphitheatre, which reached its climax in

the days of Constantine the Great (306-337), hastened the downfall of the dramatic art in general. It was not absolutely extinguished even by the

irruptions of the northern barbarians ; but a bitter adversary had by this time risen into power. The whole authority of the The drama Christian ehurch had, without usually caring to distin- and the guish between the nobler and the looser elements in the Christian drama, involved all its manifestations in a consistent eon- demnation ; and wheu the faith of that church was acknowledged as the religion of the Roman empire, the doom of the theatre was sealed. This doom was not undeserved ; for the remnants of the literary drama had loug been overshadowed by entertainments such as both earlier and later Roman emperors—Domitian and Trajan as well as Galerius and Constantine—had found themselves obliged to prolibit in the interests of publie morality and order, by the bloody spectacles of the amphitheatre, and by the maddening excitement of the circus ; the art of acting had become the pander of the lewd or frivolous itch of eye and ear ; and the theatre had contributed its utmost to the demoralization of a world. The attitude taken up by the Christian church towards the stage was in general as un- avoidable as its particular expressions were at times heated by fanaticism or distorted by ignorance. Had she not visited with her anathema a wilderness of decay, she could) not herself have become—what she little dreamt of | becoming—the nursing mother of the new birth of an art which seemed incapable of regeneration. | Though already in the 4th century actors and mounte- Survival of banks had been excluded from the benefit of Christian the mimes sacraments, and excommunication had been extended to those who visited theatres instead of churches on Sundays and holidays, and though similar enactments had followed at later dates, yet the entertainments of the eondemued profession had never been entirely suppressed, and had even occasionally received imperial patronage. Gradually, how- ever, the mimes and their fellows became a wandering fraternity, who doubtless appeared at festivals when they were wanted and vanished again into the deepest obscurity which has ever covered that mysterious existence —a stroller’s life. It was thus that these strange intermediaries of civilization carried down such traditions as survived of the acting drama of pagan antiquity into the succeeding ages,

While the scattered and persecuted strollers thus kept alive Ecclesias- something of the popularity, if not of the loftier traditions, tical and of their art, neither, on the other hand, was there an utter iterate absence of written compositions to bridge the gap between grama, ancient and modern

dramatic literature. In the midst of the condemnation with which the Christian churcli visited the stage, its professors, and votaries, we find individual ecclesiastics resorting in their writings to both the tragic and tle comic form of the ancient drama. These isolated productions, which include (in the latter part of the 4th century) the Passion of Christ, usually attributed to St Gregory Nazianzen, were doubtless mostly written for educational purpeses, whether Euripides and Lycophron, or Menander, Plautus, and Terence served as the outward niodels. The same was probably the design of the famous } “comedies” of MHrotsvitha, the Benedictine nun _ of Hrotsvitha Gandersheim, in Eastphalian Saxony, which associate them- selves in the history of Christian literature with the spiritual revival of the 10th century in the days of Otto the Great.

While avowedly imitated in form from the comedies of Ter- ence, these religious exercises derive their themes—martyr- | doms,! and miraculous or otherwise startling conversions *— :

1 Gallicanus, Part ii.; Sapientia. ; 2 Gallicanus, Part i; Callimachus; Abraham, Paphnutius,

a

The jocula- tores, jong- Jeurs, mins- | trels.

The liturgy the main

— source of the me-

— dizval religious drama.

The liturgical mystery.

MEDLEVAL. |

from the legends of Christian saints. Thus from perhaps the 9th to the 12th centuries Germany and France, and through the latter, by means of the Norman Conquest, England, became acquainted with what may be called the literary monastic drama. It was no doubt occasionally performed by the

children under the care of monks or nuns, or by the religious themselves ; an exhibition of the former kind was that of the Play of St Katharine, acted at Dunstable about the year 1110 in “copes” by the scholars of the Norman Geoffrey, afterwards abbot of St Albans. Nothing is known of it except the fact of its performance, which was certainly not regarded as a novelty.

These efforts of the cloister came in time to blend them- selves with more popular forms of the early Christian drama. ‘To what extent the mimes, or joculatores (as in the early Middle Ages they came to be more generally called), kept alive the usage of entertainments more essentially dramatic than the minor varieties of their per- formances, we cannot say ; but we know that in Northern France they at a very early date appropriated the begin- nings of the religious drama to secular uses. Doubtless in both Celtic and Teutonic populations there survived the remnauts of religious rites containing dramatic elements, and the heathen festivals, of Roman or other origin, com- municated something of their character to the Christian, at whith the joculatures were apt to appear. In different countries these entertainers suited themselves to different tastes, and with the rise of native literatures to different literary tendencies. The literature of the trowbadours of Provence, which communicated itself to Spain and Italy, came only into isolated contact} with the beginnings of the religious drama; in Northern France the jongleurs, as the joculatores were now called, were confounded with the trouveres, who sang the chansons de geste commemorative of deeds of war. As appointed servants of particular house-

holds they were here, and afterwards in England, called |

menestrels (from ministertales) and minstrels. Such a histrio or. mimus (as he is called) was Taillefer, who rode first into the fight at Hastings, singing his songs of Roland and Charlemagne, and tossing his sword in the air and catching it again. In England such accomplished minstrels easily outshone the less versatile gleemen of pre-Norman times ; while here as elsewhere the humbler members of the craft strolled from castle to convent, to village-green and city-street, exhibiting as jugglers their pantomimic and other tricks.

Both the literary and the professional clement had thus survived to become tributaries to the main stream of tle early Christian drama, which had its

source in the leturgy of the church itself. The service of the mass contains in itself dramatic elements, and combines with the reading out of portions of Scripture by the priest, its epical part, a lyrical one in the anthems and responses of the congrega- tion. At avery early period—certainly already in the 5th century—it was usual to increase the attractions of public worship on special occasions by living pictures illustrating the Gospel narrative and accompanied by songs ; and thus a certain amount of action gradually introduced itself into the service. When the epical part of the liturgy was con- nected with its spectacular and to some degree mimical adjuncts, the lyrical accompaniment being of course retained, the Liturgical mystery—the earliest form of the Christian drama—was in existence. This had certainly been accomplished as early as the 10th century, when on grcat ecclesiastical festivals it was customary for the priests to perform in the churches the offices (as they were called) of the Shepherds, the Innocents, the Holy Sepulchre, &ec.,

1 The Foolish Virgins (Provengal mystery cf the 12th or 11th cen- tury),

in connection with the gospel of the day. In France in the 12th, or perhaps already in the 11th century, short Latin texts were written for these liturgical mysteries; these in- cluded passages from the popular legend of St Nicholas as well as from scriptural story. In the same century the further step was taken of composing these texts in the vernacular—the earliest example being the mystery of the Resurrection. joined together ; then more elaborately pursued in France and elsewhere, and finally resulted in the collectwwe mystery—a mere scholars' term of course, but one to which the principal examples of the English mystery-drama correspond. The productions of the medieval religious drama usual teclinically to divide into three classes. mysteries proper dcal with scriptural events only, their pur-

pose being to set forth, with the aid of the prophetic or guished.

preparatory history of the Old Testament, and more especially of the fulfilling events of tlic New, the central mystery of the Redemption of the

world, as accomplished by the Nativity, the Passion, and the Resurrection. Put in fact these were not kept distinctly apart from the miracle-plays, or mtracles, which are strictly speaking con- cerned with the legends of the saints of the church; and in England the name mysteries was not in use. Of these specics the miracles must more espccially have been fed from the resources of the monastic literary drama. Thirdly, the moralities, or moral-plays, teach and illustrate the same truths; not, however, by direct representation of scriptural or legendary events and personages, but allegorically, their characters being personified virtues or qualities. Of the moralities the Norman érouwvéres had been the inventors ; and doubtless this innovation connects itself with the endeavour, which in France had almost proved victorious by the end of the 13th century, to emancipate dramatic per- formances from the control of the church.

The attitude of the clergy towards the dramatic The clergy performances which had ariscn out of the elaboration of the and the

services of the church, but which soon admitted elements from other sources, was not, and could not be, uniform. As the plays grew longer, their paraphernalia more exten- sive, and their spectators more numerous, they began to be represented outside as well as inside the churches, and the use of the vulgar tongue came to be gradually preferred. Miracles were less dependent on this connection with the church services than mysteries proper ; and lay associations, guilds, and schools in particular, soon began to act plays in honour of their patron saints in or near their own halls. Lastly, as scenes and characters of a more or Icss trivial description were admitted even into the plays acted or superintended by the clergy, as some of these characters came to be depended on by the audiences for conventional extravagance or fun, every new Herod seeking to out- Herod his predecessor, and the devils and their chief assert- ing themselves as indispensable favourites, the comic element in the religious drama increased; and that drama itself, even where it remained associatcd with the church, grew more and more profane. The endcavonr to sanctify the popular tastes to religious uses, which connects itself with the institution of the great festival of Corpus Christi (1264, confirmed 1311), when the symbol of the mystery of the Incarnation was borne in solemn procession, led to the closer union of the dramatic exhibitions (hence often called processus) with this

and other religions feasts ; but it neither limited their range, nor controlled their develop- ment.

At times favoured, at times denounced by the clergy, dramatic entertainments thus lustily flourished for a series of centuries, in some countries more, in others less, religious in their character, and variously reinforced by the efforts

In time a whole series of mysteries was The a process which was at first roughly and collective

it is Mysteries, The miracles,

Progress of the mediaeval drama in Europe;

of the craftsmen of the acting profession. In France, where they had always preserved a secular side, they soonest advanced into forms connecting themselves with later growths of the drama, At Paris the fraternity of the Bazoche (clerks of the Parliament and the Chatelet) in 1303 acquired the right of conducting the popular festivals ; but after the Confrérie de la Passion, who devoted themselves originally to the performance of passion-plays, had obtained a royal privilege for this purpose in 1402, the Bazoche gave itself up to the production of moralities. A third association, calling itself the Hnfans sans souci (the Devil- may-cares), having about the same time acquired the right of acting sottzes—short comic plays with allegorical figures— the other eompanies took a leaf out of their book, inter- wove their mysteries and moralities with comic scenes from

‘popular life, and gradually began to confine themselves to

secular themes. Thus the transition to the regular drama here easily prepared itself ; already in 1395 we find the brethren of the Passion performing a serious play on the story of Griseldis ; and among the abundant literature of sotties and farces (from Italian farsa, Latin farcita), which after mingling real types with allegorical personages had come to exclude the latter, the immortal MMarstre Pierre Patelin (acted in 1480 by

the Bazoche) is, however slight in plot, inallessentialsa comedy. No Italian mystery has been preserved from an earlier date than 1243, about which time associations were in this eountry also founded for the pro- duction of religious plays. These seem to have differed little from those of Northern Europe except by a less degree of coarseness in their comic characters. Plays on Old Testament subjects were called figure, on New vangeli ; in the 15th and 16th centuries they were elaborated and produced with great care, and bore various names, of which rappresentaziont was the most eommon.! The spectacular magnificence of theatrical displays accorded with that of the processions, both ecclesiastical and lay,—the trionfi as they were called in the days of Dante,—and the religious drama gradually acquired an academical character assimi- lating it to the classical attempts which gave rise to the regular Italian drama. ‘The poetry of the Troubadours, which had come from Provence into Italy, here frequently took 9, dramatic form, and perhaps suggested his early ex- periments in this to Petrarch, the father of the Italian Renaissance. After his death there are traces of similar literary efforts in the volgare Provenzale dialect. Meanwhile remnants of the ancient popular entertainments had survived in the improvised farees acted at the courts, in the churches (farsa spirituale), and among the people ; the Roman carnival had preserved its waggon-plays (cart) ; and numerous links remained to eonneet the popular modern comedy of the Italians with the Atellanes and mimes of their ancestors. In Spain, where all traces of the ancient Roman theatre (except its architectural remains) had dis- appeared after the Moorish cunquest, the extant remains of the religious drama date from a still later period than the Italian—the 13th or 14th century. Its beginnings presented themselves in an advaneed form, which aroused the opposition of the clergy, who sought to take the plays under their own control. In the secular literature of Spain nothing dramatic can be proved to have existed till the latter part of the 15th century. It had probably been customary from early times to insert in the mysteries so- called entremeses or interludes ; but it is not till 1472 that in the couplets of Mingo Revulgo (2.e., Domingo Vulgus, the common people), and about the same time, in another dialogue by the same author, we have attempts of a kind

1 Such a piece was the San Giovanni e San Paolo (1488), by Lorenzo the Magnificent, the prince who afterwards sought to reform the Italian gtage by paganizing it. : ——

resembling the Italian contrasti (v. infra). In Germany, on the other hand (the history of whose drama so widely differs from that of the Spanish), religious plays were performed probably as early as the 12th century at the Christmas and Easter festivals. Other festivals were afterwards celebrated in the same way, but up to thie Reformation Easter enjoyed the preference. About the 14th century miracle-plays began to be frequently per- formed; and as these often treated subjects of historical interest, local or other, the transition to the barren beginnings of the German historical drama was afterwards easy. Though these early German plays often have an element of the moralities, they were not as in France blended with the drolleries of the professional strollers (fahrende Leute), which, carried on chiefly in carnival time, gave rise to the Shrove-Tuesday plays (Fastnachtsspiele), scenes from common life largely interspersed with practical fun. To these last a more enduring literary form was first given in the 15th century by Hans Rosenpliit, called Schnepperer—or Hans Schnepperer, called Rosenbltit—the predecessor of Hans Sachs. By this time a connection was establishing itself in Germany between the dramatic amusements of the people and the literary labours of the master-singers ; but the religious drama proper survived in Catholic Germany far beyond the times of the Reformation, and was uot suppressed in Bavaria and Tyrol till the end of the 18th century.? |

Omitting any notice of traces remaining of the religious Religions drama in other European countries, we come to our own, dtama in from whose literature a fair idea may be derived of the sland general character of these mediaeval productions. The miracle-plays, miracles, or plays (these being the terms used in England) of which we hear in London in the 12th century, were probably written in Latin and acted by ecclesiastics ; but already in the following century mention is made—in the way of prohibition—of plays acted by professional players. (Isolated moralities of the 12th century are not to be regarded as popular productions.) Jn England as elsewhere, the clergy either sought to retain Comish their control over the religious plays, which continued to be ™izacle- occasionally acted in churches even after

the Reformation, P!¥ or else reprobated them with or without qualifications. In Cornwall miracles in the native Cymrie dialect were per- formed at an early date; but those which have been preserved are apparently eopies of English (with the occasional use of French) originals; they were repre- sented, unlike the English plays, in the open country, in extensive amphitheatres constructed for the purpose.

The flourishing period of English miracle-plays begins TheTowne: | with the practice of their performance by trading-companies re! , Ches:| ‘ ‘ ; 4 : er, and in the towns. Of this practice Chester is said to have set Qoventry the example (1268-1276); it was followed in the course plays. | of the 13th and 14th centuries by many other towns, in- cluding Wakefield, Coventry, York, Newcastle-on-Tyne, i Leeds, Lancaster, Preston, Kendal, Wymondham, Dublin, and London, in which last the performers were the parish clerks, Three collections, in addition to some single examples, of such plays have eome down to us—viz., the Towneley plays, which were probably acted at the fairs of Woodkirk, near Wakefield, and those bearing the names of Chester and of Coventry. Their dates, in the forms in which they have come down to us, are more or less uncer- tain , that of the Zowneley may be even earlier than the 14th century ; the Chester may be ascribed to the close of the 14th or the earlier part of the 15th ; the body of the Coventry probably belongs to the 15th or 16th. Many of

1 The passion-play of Oberammergau, familiar in its present artistic form to so many visitors, was instituted under special circumstances in the days of the ‘Uhirty Years’ War (1634). Various reasons account | for its having been allowed to survive.

the individual plays in these collections were doubtless founded on French originals ; others are taken direct from

in manner of representation differed in no essential point The Devil from the miracles, in a character borrowed from the latter, and the

Mystere du Vieil Testament. Iniquity, &c.), but his usual duty is to torment and teaze ; : a ee er , | the Devil his master for the edification and diversion of the Manner ‘“‘The manner of these plays,” we read in a description of those dj Tf deal Wiended will the d x of their at Chester, dating from the close of the 16th century, “‘ were :— audience, € was gradually blenaed with the domestic perfor- Every company had his pageant, which pageants Were a high scaffold fool, who survived i the regular drama. mance. With two rooms, a higher and a lower, upon four wheels. In the The earlier English moralities’—from the reign of Henry Groups of lower they apparelled themselves, and in the higher room they VI. to that of Henry VII. —usually allegorize the conflict English played, being all open at the top, that all beholders might hear and eles Teauidbavil ax lee caintl aed (inset ith. Moralities. see them. ‘The places where they played them was in every street. etween good aud evil in the mind and life of man, with They began first at the abbey gates, and when the first pageant was | out any side-intention of theological controversy ; such also played, it was wheeled to the high cross before the mayor, and so | is still essentially the purpose of thie niorality we possess by etn ad one Hane HI eit trad cureot hed a pageant playing before | Henry VIII’s poet, the witty Skelton,? and even of another, ime tlil a @ pageants a inte or the aa er ye ° . ied ; aa when one pagent was near iettled, word was Prowalt perhaps the most perfect example of its class, which in date from street to street, that so they might come in place thercof, cx- | 18 already later than the Reformation. Butif such theology ceedingly orderly, and all the strects have their pageants afore them | as Hvery-IMan teaches is the orthodox doctrine of Rome, all re” nh eee playing ae to a4 ie Te pak en its successor, R. Wever’s Lusty Juventus, breathes the spirit nee where they detained fo ay thes stants | of the dogmatic reformation of the reign of lidward VI Theological controversy largely occupies the moralities of Fach play, then, was performed by the representative of | the earlier part of Elizabeth’s reign, and connects itself a particular trade or company, after whom it was called the | with political feeling in a famous morality,? Sir David fishers’, glovers’, &e., pageant ; while a general prologue Lyndsay’s Satire of the Three Estaitis, written on the other was spoken by a herald. As a rule the movable stage | side of the border, where such efforts as the religious drama sufficed for the action,

though we find horsemen riding up proper had made had been extinguished by the Reforma- to the scaffold, and Herod instructed to “ rage in the | tion, Only a single English political morality proper pagond and in the strete also.” There is no probability | remains to us, which belongs to the beginning of the reign that the stage was, as in France, divided into three platforms | of Elizabeth.¢ Yet another series connects itself with the with a dark cavern at the side of the lowest, appropriated | ideas of the Renaissance rather than the Reformation, respectively to the Heavenly Father and His angels, to treating of intellectual progress rather than of moral con- saints and glorified men, to mere meu, and to souls in hell. | duct ° this extends from the reign of Henry VIII. to that But the last-named locality was frequently displayed in the | of his younger daughter. English miracles, with or without fire in its mouth. ‘The The transition from the morality to the regular drama in Transition costumes were in part conventional,—divine and saintly lingland was effected on the one hand by the intermixture ee personages being distinguished by gilt hair and beards, | of historical personages with abstractions—as in Bishop acl Herod being clad as a Saracen, the demons wearing hideous | Bale’s Kyng Johan (c. 1548)—which easily led over to the regular heads, the souls black aud white coats according to their | Chronicle Listory ; on the other by the introduction of drama. kind, and the angels gold skins and wings, types of real life by the side of abstract figures. This Character § Doubtless these performances abounded in what seem to | latter tendency, of which instances occur in earlier plays, ofthese us ludicrous features, and though their main purpose was | is observable in several of the 16th century moralities ;° but plays. serious, they were not in England at least intended to be | before most of these were written, a further step in advance devoid of fun. But many of these features are in trath | lad been taken by aman of genius, Jolin Heywood (d. only homely and naif, aud the simplicity of feeling they | 1565), whose ¢nterludes’ were short farces in the French Heywood’s exhibit is at times not without its pathos. The occasional manner, dealing entirely with real—very real—men and imterludes. excessive grossness is due to an absence of refinement of | women, Orthodox and conservative, he had at the same taste rather than to an obliquity of moral sentiment. In | time a keen eye for the vices as well as the folies of his age, this, as in other respects, the Coventry Plays, which were | and not the least for those of the clerical profession. Other possibly written by clerical hands, show an

advance upon | writers, such as T. Ingeland,® took the same direction ; and the others. Ju the same plays is already to be observed an | the allegory of abstractions was thus undermined on the) elernent of abstract figures, which connects them with a stage, very much as in didactic literature the ground had different species of the medieval drama. been cut from under its feet by the Ship of Mooles. Thus Morslities. The moralities corresponded to the love for moral allegory | the éxtertudes—a name which had been used for the which manifests itself in so many periods of our literature, | moralities themselves from an early date—facilitated the aud which, while dominating the whole field of medimval | advent of comedy, without having superseded the earlier

Scripture, from the apocryphal gospels, or from the legends of the saints. ‘Their characteristic feature is the combina- tion of a whole series of plays into one collective whole, ex- hibiting the entire course of Bible history from the creation to the day of judgment. [or this combination it is unnecessary to suppose that they were generally indebted to foreign examples, though there are several remarkable coincidences between the Chester plays and the French

literature, was nowhere more assiduously and effectively cultivated than in England. It is necessary to bear this in mind, in order to understand what to us seems £9 strange, the popularity of the moral-plays, which indeed never equalled that of the miracles, but sufficed to maintain the former species till it received a fresh impulse from the con- hection established between it and the “new learning,” together with the new political and religious ideas and questions, of the Reformation age. Moreover, a specially Popular element was supplied to these plays, which

and, in the moralities, usually provided with a companion whose task it was to lighten the weight of such abstractions as Sapience and Justice. These were the Devil and his attendant the Vice, of whom the latter seems to have beeu of native origin, and, as he was usually dressed in a fool’s habit, was probably suggested by the familiar custom of keeping an attendant fool at court or in great houses. The Vice had many aliases (Shift, Ambideater, Sin, Fraud,

form. Both moralitiesand miracle-plays survived into the Elizabethan age, after the regular drama had already begun its course.

1 The Castle of Perseverance; Medwall, Mature; The World and the Child; Hycke-Scorner, &e. 2 Magny fycence.

8 New Custome; N. Woodes, The Conflict of Conscience, &c.

4 Albyon Knight.

> Rastell, Nature of the Four Elements; Redford, Wit and Selence; The Marriage of Wit and Science.

8 Jack Juggler; Tom Tiler and his Wife, &e.

? The Four P’s, &e. 8 The Disubedient Child.

1¢ee.

Pageants.

The Re- naissance and the national drama.

The

modern Italian drama,

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Such, in barest outline, was the progress of dramatic entertainments in the principal countries of Europe, before the revival of classical studies brought about a return to the examples of the classical drama, or before this return had distinctly asserted itself. It must not, however, be for- gotten that from an early period in England as elsewhere had flourished a species of entertainments, not properly speaking dramatic, but largely contributing to form and foster a taste for dramatie spectacles. The pageants—as they were called in England—were the sueeessors of those ridings from whieh, when they gladdened ‘“ Chepe,” Chaucer’s idle apprentice would not keep away ; but they had advanced in splendour and ingenuity of device under the

influence of Flemish and other foreign examples. Cos- tumed figures represented before gaping eitizens the heroes of mythology and history, and the abstractions of moral, patriotic, or municipal allegory ; and the city of London clung with speeial fervour to these exhibitions, which the Elizabethan drama was neither able nor—as repre- sented by most of its poets who composed devices and short texts for these and similar shows—willing to oust from popular favour. Some of the greatest and some of the least of our dramatists were the ministers of pageantry ; and perhaps it would have been an advantage for the the future of the theatre, if the legitimate drama and the Triumphs of Old Drapery had been more jealously kept apart.

The literary influence which finally transformed the growths noticed above into tlie national dramas of the several eountries of Kurope, was in a word the influence of the Renaissance. Among the remains of classical antiquity whieh were studied, translated, aud imitated, those of the drama necessarily held a prominent place. Never altogether lost ‘sight of, they now became subjects of devoted research and models for careful copies, first in one of their own, then in modern, tongues; and these essen tially literary endeavours came into more or less direct contact with, aud acquired more or less control over, the already existing entertainments of the stage. Thus the stream of the modern drama, whose souree and con- tributories have been deseribed, was brought back into the ancient bed, from whieh its flow diverged into a number of national courses, unequal in impetus and strength, and varying in aecordance with the manifold conditions of their progress. Of these it remains to pursue the most produc- tive or important.

The priority in this as in most of the other aspects of the Renaissance belongs to Iraty. In ultimate achieve- ment, the Italian drama fell short of the fulness of the results obtained elsewhere—a surprising faet when it is considered, not only that the Italian language had the vantage-ground of closest relationship to the Latin, but tnat the genius of the Italian people has at all times inspired it with a predilection for the drama. The eause is doubtless to be sought in the absence from Italian national life during a long period, and more especially during that contemporary with the rise and earlier promise of Italian dramatie literature, of those loftiest aud most potent impulses of popular feeling to which a national drama owes so much

of its strength. This absence was due partly to the peculiarities of the Italian character, partly to the politieal and eeclesiastical experiences Italy was fated to undergo, The Italians were strangers to the enthusiasm of patriotism, which was as the breath in the nostrils of our Elizabethan age, as well as to the single- minded religiosity which identified Spain with the spirit of the Catholic Revival. The clear-sightedness of the Italians had something to do with this—for they were too intelligent to believe in their tyrants, and too free from

illusions to deliver up their minds to their priests. The chilling and enervating effects of a pressure of foreign domination, such as no Western people with a history and a civilization like those of Italy has ever experienced, did the rest, and for many generations rendered impotent the higher cfforts of the dramatie art. No basis was per- manently found for a really national tragedy; while literary comedy, after turning from the direct imitation of Latin models to a more popular form, lost itself in an abandoned immorality of tone and in reckless insolence of invective against particular classes of society. Though its productivity long continued, the poetic drama more and more concentrated its efforts upon subordinate or subsidiary species, artificial in origin and decorative in purpose, and surrendered its substanee to the overpowering aids of music, dancing, and spectacle. Only a single form of the Italian drama, the improvised comedy, remained truly national; and this was of its nature dissociated from higher literary effort. The revival of Italian tragedy in later times is due partly to the imitation of French models, partly to the endeavour of a brilliant genius to infuse into his art the historical and political spirit. Comedy likewise attained to new growtlis of considerable significance, when it was sought to accommodate its popular forms to the representation of real life in a wider range, and again to render it more poetical in accordance with the tendencies of modern romanticisra.

The regular Italian drama, in both its tragie and its eomic Latin

branehes, began with a reproduction, in the Latin language, of classieal models; but tragedy in its beginnings showed a tendeney which it was before long to treat themes of national historical interest. Two earliest tragedies of which we hear, written by the Paduan historian Mussato about 1390, were both copies of Seneea; but while the one (Achilleéis) treated a classical theme, the other dealt with the history of a famous tyrant of the author's native city (Eecerinis). In the next century events of recent or eontemporary history were similarly dealt with ;! but the majority of its Latin dramas were doubtless written to suit the tastes of the friends and patrons of the Italian Renaissance, who, like Lorenzo the Magnificent, wished to domesticate the heathen gods and goddesses on a stage hitherto occupied by the sacred figures of Christian belief. Such were the Latin imitations and translations of Greek and Latin tragedies and eomedies by Bishop Martirano, the friend of Lorenzo's son Pope Leo X., on the adventure of Danaé' and other subjects; the famous Progne of G. Corraro (d. 1464), the nephew of an earlier Pope ; and the efforts of Pomponius Leetus, who, with the aid of Cardinal Riaro, sought to revive the ancient theatre, especially that of Plautus and Terence, at Rome. Many Latin eomedies are mentioned from the 15th century, during which, as during its predeeessor, Latin eontinued the dominant language of the stage in Italy. Nor was the representation even of Greek plays altogether unknown; it was by her performanee of the Hlectra of Sophocles that Alexandra Scala caused Politian to envy Orestes.

plays of

the 14th and 15th centuries,

Early in the 16th century, tragedy began to be written Italian in the native tongue; but it retained from the first, and tragedy

never wholly lost, the impress of its origin. Whatever

in the 16th

the source of its subjects—whieh, though mostly of classieal century

origin, were occasionally derived from native romanee, or even due to invention—they were all treated with a pre- dilection for the horrible, inspired by the example of Seneca, though no doubt eneouraged by a perennial national taste. The chorus, stationary on the stage as in old Roman

1 Landivio, De Captivitate Ducis Jacobi (Jacopo Piccinino, d. 1464) Tragedia;Verardo, Ferdinandus (of Aragon) Servatus; Historia Betica (expulsion of the Moors from Granada). :

2 Imber Aureus,

Italian

/ tragedy in the 17th and 18th centuries.

“ITALIAN. |

tragedy, was not reduced to a merely occasional appearance between the acts till the beginning of the 17th century, or ousted altogether from the tragic drama till the earlier half of the 18th. Thus the changes undergone by Italian tragedy were for a long series of generations chiefly confined to the form of versification and the choice of themes ; nor was it, at all events till the last century of the course it has hitherto run, more than the after-growth of an after- growth. The honour of having been the earliest tragedy in Italian seems to belong to Galeotto’s Sofonisba (1502), a piece in 15 or 20 acts, regardless of unity of scenc. A. da Pistoia’s Pam/fila (1508) followed, of which the subject was taken from Boccaccio, though the names of the characters were Greek. The play usually associated with the beginning of Italian tragedy—that with which “ th’ Italian scene first learned to glow ”—was another Sofonisba, acted before Leo X. in 1515, and written in blank verse (verso sciolto) instead of the ottava and terza rima of the earlier trage-dians (retaining, however, the lyric measures of thie chorus), by Trissino, who was employed as nuncio by that Pope. Other tragedies of the former half of the 16th century were the Mosmunda of Rucellai, a nephew of Lorenzo the Magnificent (1516); Alamanni’s Antigone (1532); the Canace of Sperone Speroni, the envious Mopsus of Tasso, who, like Guarini, took Sperone’s elaborate style for his model; the Orazia, the earliest dramatic treatment of this famous subject, of the notorious Aretino (1549); and the

uine tragedies of G. Cinthio, among which L'Orbecche (1541) is accounted the best and the bloodiest. Cinthio, the author of those /ecatommitht to which Shakespeare was indebted for so many of his sub- jects, was (supposing him to have invented these) the first Italian who was the author of the fables of his own dramas ; he introduced some novelties into dramatic con- struction, separating the prologue and probably also the epilogue from the action, and has by some been regarded as the inventor of the pastoral drama. In the latter half of the 16th ceutury may be mentioned the Didone and the Marianna of L. Dolce, the translator of Seneca (1565); the Hadriana (acted before 1561 or 1586) of L. Groto, which treats the story of Romeo and Juliet; Tasso's Torrismondo (1587); the Z'ancredi of Asinari (1588); and the Merope of Torelli (1593), the last who employed the stationary cliorus (coro jisso) on the Italian stage. Leonico's Soldato (1550) is noticeable as supposed to have given rise to the tragedia cittadina, or domestic tragedy, of which there are few examples in the Italian drama, and De Velo's Z'amar (1586),as written in prose. Subjects of modern historical in- terest were in this period treated only in isolated instances.'

The tragedians of the 17th century coutinued to pursue the beaten track, at times in vain, seeking by the intro- duction of musical airs to compromise with the danger with which their art was threatened of being (in Voltaire's phrase) extinguished by the beautiful monster, the opera, now rapidly gaining ground in the country of its origin. (See Opera.) To Count P. Bonarelli (1589-1659), the author of Solimano, is on the other hand ascribed the first disuse of the chorus in Italian tragedy. The innovation of the use of rhyme attempted in the learned Pallavicino's Erminigildo (1655), and defended by him in a discourse prefixed to the play, was in Italy no more than in England able to achieve a permanent success; its chief repre- sentative was afterwards Martelli (d. 1727), whose rhymed Alexandrian verse (Martelliano), though on one occasion used in comedy by Goldoni, failed to commend itself to the popular taste. By the end of the 17th century Italian tragedy secmed destined to expire, and the great tragic actor Cotta had withdrawn in disgust at the apathy of the

1 Mondella, Zsifide (1582); Fuligni, Bragadino (1589).

public towards the higher forms of the drama. The 18th century was, however, to witness a change, the beginnings of which are attributed to the institution of the Academy of the Arcadians at Rome (1690). The principal efforts of the new school of writers and critics were directed to the abolition of the chorus, and to a general increase of freedom in treatment. with his Jferope (first printed 1713) achieved one of the most brilliant successes recorded in the history of dramatic literature. This play, which is devoid of any love-story, loug continued to be considered the master-piece of Italian tragedy ; Voltaire, who declared it ‘‘ worthy of the most glorious days of Athens,” adapted it for the French stage, and it inspired a celebrated production of the English drama.?_ It was followed by a tragedy full of horrors,? noticeable as having given rise to the first Italian dramatic parody ; and by the highly esteemed productions of Granelli (d. 1769) and his contemporary Bettinelli. The influence of Voltaire had now come to predominate over the Italian drama; and, in accordance with the spirit of the times, greater freedom prevailed in the choice of tragic themes. ‘Thus the greatest of Italian tragic poets,

Before long the Marquis 8. Maffei Maffei.

Count V. Alficri (1749-1803), found his path prepared Alfieri.

for him. Alfieri’s grand and impassioned treatment of his subjects caused his faultiness of form, which he never altogether overcame, to be forgotten. The spirit of a love of freedom which his creations breathe was the herald of the national ideas of the future. Spurning the usages of French tragedy, his plays, which abound in soliloquies, owe part of their effect to an impassioned foree of declamation, part to those “points” by which Italian acting seems pre-eminently capable of thrilling an audience. He has much —besides the sub- jects of two of his dramas>—in common with Schiller; but his amazon-muse (as Schlegel called her) was not schooled into serenity, like the muse of the German poet. Among his numerous plays (21), Aferope and Saul, and perhaps Mirra, are accounted his master-pieces.

The political colouring given by Alficri to Italian tragedy reappears in the plays of U. Foscolo (c. 1760-1827) and A. Manzoni (1784-1873), both of

whom are under the influ- ence of the romantic school of modern literature ; and to these names must be added those of S. Pellico (1789-1854) and G. B. Niccolini (1785-1861), whose most celebrated dramas® treat national themes familiar to all students of niodern history and literature. While Italian tragedy has upon the whole adhered to its love of strong situations and passionate declamation, its later growths have shown a capability of development precluding the supposition that its history is closed. The art of tragic acting at the pre- sent day probably stands higher in Italy than in any other European country ; if the tragic muse were to be depicted with the features of a living artist, it is those of Adelaide Ristori which she would assume.

In comedy, the efforts of the scholars of the Italian Renaissance for a time went side by side with the progress of the popular entertainments noticed above. While the

contrast of the close of the 15th and of the 16th century faa

were disputations between pairs of abstract or allegorical figures, in the frottola human types take the place of abstractions, and more than two characters appear. To the farsa (a name used of a wide variety of entertainments) a new literary as well as social significance was given by the Neapolitan court-poet Sannazaro (c. 1492) ; about the same time a “capitano valoroso,” Venturino of Pesara, first brought on the modern stage the capitano glorioso or spavente, the ns Ae MRE Se

2 Home, Douglas. 3 Lazzaroni, Ulisse il Giovane (1719).

4 Ig., BrutoT. and II. ° Filippo; Maria Stuarda.

8 Pellico, Francesca da Rimini; Niccolini, Giovanni da Procida; Beatrice Cenc,

Tragedians

since Alfieri.

Italian comedy. Its popular

Commedia dell’ arte.

Masked comedy.

Early Italian regular comedy.

Ariosto.

military braggart who owed his origin both to Plautus! and to the Spanish officers who abounded in the Italy of those days. ancient Atellanes, likewise took a new lease of life—and this in a double form. The improvised comedy (commedia a sogetto) was now as a rule performed by professional actors, members of a craft, and was thence called the commedia dell’arte, which is said to have been invented by Francesco (called Terenziano) Cherea, the favourite player of Leo X. Its scenes, still unwritten except in skeleton (scenario), were connected together by the ligatures or links (azzt) of the arlecchino, the descendant of the ancient Roman sannio (whence our zany). Harlequin’s summit of glory was pro- bably reached early in the 17th century, when he was ennobled in the person of Cecchino by the Emperor Matthias; of Cecchino’s successors Zaccagnino and Truffaldino, we read that ‘‘ they shut the door in Italy to good harlequins.” Distinct from this growth is that of the masked comedy, the action of which was chiefly carried on by certain typical figures in masks, speaking in local dialects,? but which was not improvised, and indeed from the nature of the case hardly could have been. Its inventor was A. Beolco of Padua, who called himself Ruzzante (joker), and who published six comedies in various dialects, including the Greek of the day (1530). This was the masked comedy to which the Italians so tenaciously cluug, and in which, as all their own and imitable by no other nation, they took so great a pride that even Goldoni was unable to overthrow it.

Meanwhile the Latin imitations of Roman, varied by occasional translations of Greek, comedies early led to the production of Italian translations, several of which were performed at Ferrara in the 15th century, and before

its close to the composition of what is regarded as the first original Italian comedy—in other words, as the first of the modern drama. But the ‘claim to this honour of Boiardo’s Timone (before 1494) is doubtful—not in time,? but be- cause this play is only in part origina], being founded upon, and in a great measure taken from, a dialogue of Lucian’s ; since moreover its personages are abstractions, it repre- sents at most the transition from the moralities. The “first Italian comedy in verse,” Ricchi’s J Tre Ttranni (before 1530), is likewise a morality, and Trissino’s comedy, which followed, a mere adaptation of the Menechmi of Plautus. About this time, however, the commedia erudita, or scholarly comedy, began to be cultivated by a succession of eminent writers, among whom the title of the father of modern comedy, if it belongs to any man, belongs to Ariosto (1474-1533). His comedies (though the first two were originally written in prose) are in blank verse, to which he gave a singular mobility by the dactylic ending of the line (sdrucciolo). Ariosto’s models were the master- pieces of the paliata, and his morals those of his age, which equalled those of the worst days of ancient Rome or

1 Pyrgopolinices in the Afiles Gloriosus.

- The masked characters, each of which spoke the dialect of the place he represented, were (according to Baretti) Pantalone, a Venetian merchant; Dottore, a Bolognese physician; Spaviento, a Neapolitan braggadocio; Pullicinella,a wag of Apulia; Giangurgulo and Coviello, clowns of Calabria; Gelfomino, a Roman beau; Brighella, a Ferrarese pimp; and Arlecchino, a blundering servant of Bergamo. Besides these and a few other such personages (of whom four at least appeared in each play), there were the Amorosos or Innamoratos, men or women (the latter not before 1560, up to which time actresses were unknown in Italy) with serious parts, and Smeraldina, Colombina, Spilletta, and other servettas or waiting-maids. All these spoke Tuscan or Roman, and wore no masks.

3 Boiardo died in 1494, in or after which year Nardi’s Amicizia was written ; while Dovizio’s (afterwards Cardinal of Bibbiena) disreputable but entertaining Calandra, a prose comedy, which protests that it is not taken

from Plautus, is thought to have been composed not long before its representation in 1508.

DRAMA

[ITALIAN,

Byzantium in looseness, and surpassed them in effrontery; He chose his subjects accordingly; but his dramatic

The popular character-comedy, a relic of the | genius displayed itself in the effective drawing of char-

acter,* and more especially in the skillful manage- ment of complicated intrigues.5 Such, with an additional brilliancy of wit and lasciviousness of tone, are likewise the characteristics of Machiavelli's (1469-1527) famous prose comedy, the Mandragola (The Magic Draught);6 and in their climacteric, of the plays of P. Aretino (1492-1557), especially the prose Marescalco, whose name, it has been said, ought to be written in asterisks. Other comedians of the 16th century were B, Accolti, whose Virginia (prob. before 1513) treats the story from Boccaccig which reappears in Adl's Well that Ends Well ; G. B. Araldo and J. Nardi, noteworthy as decent and moral in tone and tendency ; G. Cecchi, I. d'Ambra, A. F. Grazzini, N. Secco or Secchi, and L., Dolce—all writers of romantic cometly of intrigue in verse or prose.

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Other comediang of the 16th century,

During the same century the pastoral drama flourished The in Italy. The origin of this peculiar species—which was pastoral the bucolic idyll in a dramatic form, and which freely lent °"@™*

itself to the introduction of both mythological and allegorical elements—was purely literary, and arose directly out of the classical studies and tastes of the Renaissance. Its first example was the renowned scholar A. Poliziano's Orfeo (1472), which begins like an idyll 'and ends like a

tragedy. Intended to be performed with music—for the pastoral drama is the parent of the opera—this beautiful work tells its story simply. N. da Correggio's (1450-1508) Cefalo, or Aurora, and others followed, before in 1554 A. Beccari produced, as totally new of its kind, his Arcadian pastoral drama I? Sagrifizio, in which the comic element predominates. But an epoch in the history of the species is marked by the Aminta of Tasso (1573), in whose Arcadia is allegorically mirrored the Ferrara court. Adorned by choral lyrics of great beauty, it presents an allegorical treatment of a social and moral problem ; and since the con- ception of the characters, all of whom think and speak of nothing but love, is artificial, the charm of the poem lies not in the interest of its action, but in the passion and sweetness of its sentiment. This work wags the model of many others, and the pastoral drama reached its height of popularity in the famous Pastor Fido (written before 1590) of B. Guarini, which, while founded on a tragic love-story, introduces into its complicated plot a comic element, partly with a satirical intention. Thus, both in Itelian and in other literatures, the pastoral drama became a distinct species, characterized like the great body of modern pastoral poetry in general by a tendency either towards the artificial or towards the burlesque. Its artificiality affected the entire growth of Italian comedy, including the commedia dell'arte, and impressed itself in an intensi- fied form upon the opera. (See Opsra). The foremost Italian masters of the last-named species, go far as it can claim to be included in the poetic drama, were A. Zeno (1668-1750) and P. Metastasio (1698-1782),

The comic dramatists of the 17th century are grouped as followers of the classical and of the romantic school, G. B. Porta and G. A. Cicognini (whom Goldoni describes as full of whining pathos and common-place drollery, but as still possessing a great power to interest) being regarded as the leading representatives of the former. But neither of these largely intermixed groups of writers could, with all its fertility, prevail against the competition on the one hand of the musical drama, and on the other of the popular farcical entertainments and of those introduced in imita-

4 La Lena; Il Negromante. 5 La Oassaria; I Suppositi. § Of Machiavelli's other comedies one is in verse, the other two, free | adaptations from Plautus and Terence, are in prose.

Comedy in the 17th and 18th centuries.

xoldoni.

i

Gozzi.

Comedians after Gol- -doni.

ITALIAN. |

tion of Spanish examples. Italian comedy had fallen into decay, when its reform was undertaken by the wonderful theatrical genius of C. Goldoni (1707-1793). One of the most fertile and rapid of playwrights (of his 150 comedies 16 were written and acted in a single year), he at the same time pursued definite aims as a dramatist. Dis- gusted with the conventional buffoonery, and ashamed of the rampant immorality, of the Italian comic stage, he drew his characters from real life, whether of his native city (Venice)! or of society at large, and sought to enforce virtuous and pathetic sentiments without neglecting the essential objects of his art. Happy and various in his choice of themes, he produced, besides comedies of general human cbaracter,? plays on subjects drawn from literary biography? or from fiction. Goldoni, whose style was con- sidered defective by the purists whom Italy has at no time

_ lacked, met with a severe critic and a temporarily success-

ful rival in Count C. Gozzi (1722-1806), who sought to rescue the comic drama from its association with the real life of the middle classes, and to infuse a new spirit into the figures of the old masked comedy by the invention of a new species. His themes were taken from Neapolitan? and Oriental ° fairy tales, to which he accommodated some of the standing figures upon which Goldoni had made war. This attempt at mingling fancy and humour—occasionally of a directly satirical turn’—was in harmony with the tendencies of the modern romantic school, and Gozzi’s efforts, which though successful found hardly any imitators in Italy, have a family resemblance to those of Tieck. During the latter part of the 18th and the

early years of the present century comedy continued to follow the course marked out by its acknowledged master Goldoni, under the influence of the sentimental drama of France and other countries. Villi, Nelli, the Marquis Albergati Capacelli, Sografi, Federici, and Signorelli (the historian of the drama) are mentioned among the writers of this school ; to the present century belong Count Giraud, Marchisio (who took his subjects especially from commercial life), and Nota, a fertile writer, among whose plays are three treating the lives of poets. Of still more recent date are Bon and Brofferio. Though no recent Italian comedies have acquired so wide a celebrity as that which has been obtained by the successful productions of the recent French stage, there seems no reason to predict a barren future for Italian comedy any more than for Italian tragedy. Both the one and the other have survived periods of a seemingly hopeless decline; tragedy has been rescued from the pedantry of a timid classicism, and comedy from the conventionalism of its most popular but least progressive form ; and neither the opera nor the ballet has succeeded in ousting from the national stage the legitimate forms of the national drama,

To the above summary of the history of the modern Italian drama it would not have been inappropriate to append a brief account of that of the MODERN GREEK. The dramatic literature of the later Hellenes is a creation of the literary movement which preceded their glorious

1 Momolo Cortesan (Jerome the Accomplished Man); La Bottega del Caffé, &c.

2 La Vedova Scaltra (The Cunning Widow); La Putta Onorata (The Respectable Girl); La Buona Figtia; La B. Sposa; La B. Famigiia; La B. Madre (the last of which was unsuccessful ; ‘‘ good- ness,” says Goldoni, ‘‘ never displeases, but the public weary of every- thing’), &c.; and J2 Burbero Benefico called in its original French version Le Bourru Bienfaisant.

3 Moliére; Terenzio; Tasso.

4 Pamela; Pamela Maritata ; Il Filosofo Inglese (Afr Spectator).

5 TL’ Amore delle tre Melarance (The Three Lemons); Il Corvo.

6 Turandot; Zobeide.

7 TL’ Amore delle tre M. (against Goldoni); ZL’ Angellino Belverde (The Small Green Bird), (against Helvetius, Rousseau, ‘and Voltaire).

struggle for independence, or which may be said to form part of that struggle. After beginning with dramatic dia- logues of a patriotic tendency, it took a step in advance with the tragedies of J. R. Nerulos® (1778-1850), whose name belongs to the political as well asto the literary history of his country. His comedies—especially one directed against the excesses of journalism’—largely contributed to open a literary life for the modern Greek tongue. Among the earlier patriotic Greek dramatists of the present century are T. Alkeeos, J. Zampelios (whose tragic style was influenced by that of Alfieri),!° S. K. Karydis, and A, Valaoritis. A. Zoiros!! is noteworthy as having introduced the use of prose into Greek tragedy, while preserving to it that association with sentiments and aspirations which will probably long continue to pervade the chief productions of modern Greek literature. The love of the theatre is ineradicable from Attic as it is from Italian soil ; and the tendencies of the young dramatic literature of Hellas seem to justify the hope that a worthy future awaits it.

Italy produced many brilliant growths, from which the Spanisu dramatic literatures of other nations largely borrowed ; but DRaMa.

SPAIN is the only country of modern Europe which shares with England the honour of having achieved, at a relatively early date, the creation of a genuinely national form of the regular drama. So proper to Spain was the form of the drama which she produced and perfected, that to it the term romantic has been specifically applied, though so restricted a use of the epithet is clearly unjustifiable. The influences which from the Romance peoples—in whom Christian and Germanic elements mingled with the legacy of Roman law, learning,and culture—spread to the Germanic nations were represented with the most signal force and fulness in the institutions of chivalry,—to which, in the words of Scott, “it was peculiar to blend military

valour with the strongest passions which actuate the human mind, the feelings of devotion and those of love." These feelings, in their combined operation upon the national character, and in their reflection in the national literature, were not peculiar to Spain ; but nowhere did they so long or so late continue to animate the moral life of a nation. Outward causes contributed to this result. For centuries after the crusades had become a mere memory, Spain was a battle ground between the cross and the crescent. And it was precisely at the time when the Renaissance was establishing new starting-points for the literary progress of Europe, that Christian Spain rose to the height of Catholic as well as national self-consciousness by the expulsion of the Moors and the conquest of the New World. From their rulers or rivals of so many centuries the Spaniards had derived that rich glow of colour which became permanently distinctive of their national life, and more especially of its literary and artistic expressions ; they had also perhaps derived from the same source an equally characteristic refinement in their treatment of the passion of love. The ideas of Spanish chivalry—more especially religious devotion and a punctilious sense of personal honour—asserted themselves (according to a process often observable in the history of civilization) with peculiar distinctness in literature and art, after the great achievements to which they had contributed in other fields had already been wrought. The ripest glories of the Spanish drama belong to an age of national decay—mindful, it is true, of the ideas of a greater past. The chivalrous enthusiasm pervading so many of the master-pieces of its literature is indeed a characteristic of

8 Aspasia; Polyxena. 9 EHphemeridophobos.

10 Timoleon; Konstantinos Paleologos; Rhigas of Phere.»

ll 2he Three Hundred, or The Character of the Ancient Hellene (Leonidas); The Death of the Orator (Demosthenes); A Scion of Timoleon, &c.

Early efforts.

Gil Vicente and the Portuguese drama.

the Spanish nation in all, even in the least hopeful, periods of its later history ; and the religious ardour breathed by these works, though associating itself with what is called the Catholic Reaction, is in truth only a manifestation of the spirit which informed the noblest part of the Reformation movement itself. The Spanish drama neither sought nor could seek to emancipate itself from views and forms of religious life more than ever sacred to the Spanish people since the glorious days of Ferdinand and Isabella ; and it is not in the beginnings but in the great age of Spanish dramatic literature that there is often most difficulty in distinguishing between whatis to betermed a religious and what a secular play. After Spain had thus, the first after England among modern European countries, fully unfolded that incomparably richest expression of national life and sentiment in an artistic form—a truly national dramatic literature,—the terrible decay of her greatness and pros- perity gradually impaired the strength of a brilliant but, of its nature, dependent growth. In the absence of high original genius the Spanish dramatists began to turn to foreign models, though little supported in such attempts by popular sympathy ; and it is only in more recent times that the Spanish drama has sought to reproduce the ancient forms from whose master-pieces the nation had never become estranged, while accommodating them to tastes and tendencies shared by later Spanish literature with that of Europe at large.

The earlier dramatic efforts of Spanish literature may without inconvenience be briefly dismissed. The reputed author of the Couplets of Mingo Revulgo (R. Cota the elder) likewise composed the first act of a story of intrigue and character, purely dramatic but not intended for representation, This tragic comedy of Calisto and AMelrbea, which was completed (in 21 acts) by 1499, afterwards became famous under the name of Celestina ,; it was fre- quently imitated and translated, and was adapted for the Spanish stage by R. de Zepedain 1582. But the father of the Spanish drama was J. de la Enzina (b. c. 1468), whose representaciones under the name of “eclogues” were dramatic dialogues of a religious or pastoral character. His attempts were imitated more especially by Gil Vicente (fl. 1502-1536), a Portuguese who wrote both in Spanish and in his native tongue—the dramatic literature of which is stated to have produced nothing of equal merit afterwards. (The Portuguese literary drama is held to have begun with the prose comedies of Vicente’s contemporary, F. de Sa de

Miranda.) A further impulse came, as was natural, from Spaniards resident in Italy, and especially from B. de T. Naharro, who in 1517 published, as the chief among the “ firstlings of his genius ” (Propaladia), a scries of eight commedias—a terin generally applied in Spanish literature to any kind of drama. He claimed some knowledge of the theory of the ancient drama, divided his plays into ‘ornadas} (to correspond to acts), and opened them with an introyto (prologue). Very various in their subjects, and secasionally odd in form,? they were gross as well as audacious in tone, and were soon prohibited by the Inquisi- tion. The church remained unwilling to renounce her control over such dramatic exhibitions as she permitted, aud sought to suppress the few plays on not strictly religi- ous subjects which appeared in the early part of the reign of Charles I. The few translations published from the classical drama exercised no effect.

Thus the foundation of the Spanish national theatre was

reserved for a man of the people. Cervantes has vividly ——— ee ee ee ee
2 The term is the same as that used in the old French collective

mysteries (journées), In some of his plays (Comedia Serafina; C. Tinelaria) there is a

mixture of lancuages eveh stranger than the i i i aaa ee g ger than that of dialects in the Italian

sketched the humble resources which were at the command Lope de

of Lope de’ Rueda (fl. 1544-1567), a mechanic of Seville, Rueda and

who with his friend the bookseller Timoneda, and two ae ‘ ‘ . ers,

brother authors and actors in his strolling company, suc-

ceeded in bringing dramatic entertainments out of the

churches and palaces into the public places of the towns,

where they were produced on temporary scaffolds. The

manager carried about his properties in a corn sack ; and the “‘ comedies” were still only “ dialogues, and a specics of eclogues between two or three shepherds and a shepherdess,” enlivened at times by intermezzos of favourite comic fignres, such as the negress or the Biscayan, “ played with inconceivable talent and truthfulness by Lope.” One of his plays at least,? and one of ‘Timoneda’s,* seem to have been taken from an Italian source ; others mingled modern themes with classical apparitions ;> one of Timoneda’s was (perhaps again through the Italian) from Plautus.6 Others of a slighter description were called pasos,—a species after-wards termed entremeses and resembling the modern French proverbes. With these popular efforts of Lope de Rueda and his friends a considerable dramatic activity began in the years 1560-1590 in several Spanish cities, and before the close of this period permanent theatres began to be fitted up at Madrid. Yet Spanish dramatic hterature Classical might still have been led to follow Italian in turing 24mas. to an imitation of classical models. Two plays by G. Bermudez (1577), called by their learned author “ the

first Spanish tragedies," treating the national subject of

Inez de Castro, but divided into five acts, composed in

various metres, and introducing achorus ; a Dido (c. 1580)

by C. de Virues (who claimed to have first divided

dramas into three jornadas); and the tragedies of L…

de Argensola (acted 1585, and praised in Don Qucxote)

alike pointed in this direction. ;

Such were the alternatives which had opened for theCer ~ Spanish drama, when at last, about the same time as that of the English, its future was determined by writers of original genius. The first of these was the immortal Cervantes, who, however, failed to anticipate by his earlier plays (1584-1588) the great (though to him unpreductive) success of his famous romance. In his endeavour to give a poetic character to the drama he fell upon the expedient of introducing personifizd abstractions speaking a "divine " or elevated language—a device which was for a time favourably received. But these plays exhibit a neglect or ignorance of the laws of dramatic con- struction ; their action is episodical; and it is from the realism of these episodes (especially in the Numancia, which is crowded with both figures and incidents), and from the power and flow of the declamation, that their effect nust have been derived. When in his later years (1615) Cervantes returned to dramatic composition, the style and form of the national drama had been definitively settled by a large number of writers, the brilliant success of whose acknowledged chief may previously have diverted Cervantes from his labours for the theatre. His influence upon the general progress of dramatic literature is, however, to be sought, not only in his plays, but also in those novelas exemplares to which more than one drama is indebted for its plot, and for much of its dialogue to boot.

Lope de Vega (1562-1635), one of the most astonishing Lope de geniuses the world has known, permanently established Vega the national forms of the Spanish drama. Some of these were in their beginnings taken over by

him from ruder predecessors ; some were cultivated with equal or even superior success by subsequent authors; but in variety, as in fertility of dramatic production, he has no rivals. His

3 Los Engafios (Gli Ingannati). 4 Cornelia (Il Negromante). 5 Lope, Armelinu (Medea, and Neptune as deus ex machina —si modo machina adfuisset). , © Menennos.

and the national forms of the Spanish drama,

Comedies de capa y espada.

Herdicas.

SPANISH. |

fertility, which was such that he wrote about 1500 plays, besides 300 dramatic works classed as autos sacramentales and entremeses, and a vast serics of other literary composi- tions, has indisputably prejudiced his reputation with those to whom he is but a name and a number. Yet as a dramatist Lope more fully exemplifies the capabilities of the Spanish theatre than any of his successors, though as a poet Calderon may deserve the palm. Nor would it be possible to imagine a truer representative of the Spain of his age than a poct who, after suffering the hardships of poverty and exile, and the pangs of passion, sailed against the foes of the faith in the Invincible Armada, subse- quently became a member of the Holy Inquisition and of the Order of St Francis, and after having been decorated by the Pope with the cross of Malta and a theological doctorate, honoured by the nobility, and idolized by the nation, ended with the names of Jesus and Mary on his lips. From the plays of such a writer we may best learn the manners and the sentiments, the ideas of religion and honour, of the Spain of the Philippine age, the age when she was most prominent in the eyes of Europe and most glorious in her own. For, with all its inventiveness and vigour, the genius of Lope primarily set itself the task of pleasing his public,—the very spirit of whose inner as well as outer life is accordingly mirrored in his dramatic works. In them we have, in the words of Lope’s French translator Baret, “the movement, the clamour, the conflict of unforeseen intrigues suitable to unreflecting spectators; perpetual flattcries

addressed to an unextinguishable national pride ; the painting of passions dear to a people never tired of admiring itself ; the absolute sway of the point of honour ; .. Geification of revenge; the adoration of symbols ; buffoonery and burlesque, everywhere beloved of the multitude, but here never defiled by obscenities, for thus people has a sense of delicacy, and the foundation of its character is nobility; lastly, the flow of proverbs which at times escape from the gracioso" (the comic servant domesticated in the Spanish drama by Lope)—" the com- monplace literature of those who possess no other."

The plays of Lope, and those of the national Spanish drama in general, are divided into classes which it is naturally not always easy, and which there is no reason to suppose him always to have intended, to keep distinct from one another. After in his early youth composing eclogues, pastoral plays, and allegorical moralities in the old style, he began his theatrical activity at Madrid about 1590, and the plays which he thenceforth produced have been distributed under the following heads. The comedias, all of which are in verse, include (1) the so-called c. de capa y espada—not comedies proper, but dramas the prin- cipal personages in which are taken from the class of society which wears cloak and sword. Gallantry is their main theme, an interesting and complicated, but well-constructed and perspicuous intrigue their chief feature; and this is usnally accompanied by an underplot in which the graczoso plays his part. 'Their titles are frequently taken from the old proverbs or proverbial phrases of the people,! upon the theme suggested by which the plays often (as Mr Lewes admirably expresses it) constitute a kind of gloss (g/osa) in action. This is the favourite species of the national Spanish theatre; and to the plots of the plays belonging to it the drama of other nations owes a debt almost incalculable in extent. (2) The c. herdicas are distinguished by some of their personages being of royal or very high rank, and by their themes being often historical and largely? (though not

1 El Azero de Madrid (The Steel Water of Madrid); Dineros son Calidad (= The Dog in the Manger), &c.

2 La Estrella de Sevilla (The Star of Seville, t.e., Saucho the Brave) ; El Nuevo Mundo (Columbus), &c.

invariably?) taken from the national annals, or founded on contemporary or recent events.4 Hence they exhibit a greater gravity of tone; but in other respects there is no difference between them and the cloak and sword comedies with which they sbare che element of comic underplots. Occasionally Lope condescended in the opposite direction, to (3) plays of which the scene is laid in common life, but for which no spccial name appears to have existed.°

Meanwhile, both he and his successors were too devoted Religious.

sons of the church not to acknowledge in some sort her claim to influence the national drama. ‘This claim she had never relinquished, even when she could no longer retain an absolute control over the stage. For a time, indeed, she was able to reassert even this; for the exhibi- tion of all secular plays was in 1598 prohibited by the dying Philip IL, and remained so for two years ; and Lope with his usual facility proceeded to supply religious plays of various kinds. After a few dramas on scriptural subjects he turned to the legends of the saints ; and the comedias de

Comedias

santos, of which he wrote a great number, became an de santos.

accepted later Spanish variety of the miracle-play. ‘True, however, to the popular instincts of his genius, he threw himself with special zeal and success into the composition of another kind of religious plays—a development of the Corpus Christi pageants, in honour of which all the theatres had to close their doors for a month. These were the famous autos sacramentales (v.e., solemn “acts” or pro- ceedings in honour of the Sacrament), which were per- formed in the open air by actors who had filled the cars of the sacred procession. Of these Lope wrote about 400. These entertainments were arranged on a fixed scheine, comprising a prologue in dialogue between two or more actors in character (loa), a farce (entremes), and the auto proper, an allegorical scene of religious purport, as an example of which Ticknor cites the Bridge of the World,—in which the

Prince of Darkness in vain sceks to defend the bridge against the Knight of the Cross, who finally leads the Soul of Man in triumph across it. Not all the entremeses of Lope and others were, however, composed for insertion in these autos. This long-lived popular species, together with the old kind of dramatic dialogue called eclogues, completes the list of the varieties of his dramatic works.

Autos sacramen- tales.

Entre- meses.

The example of Lope was followed by a large number The school

of writers, and Spain thus rapidly became possessed of a dramatic literature almost unparalleled in quantity—for in fertility also Lope was but the first among many. Among the writers of Lope's schvol, his friend G. de Castro (1569-1631) must not be passed by, for his Cud® was the basis of Corneille's; nor J. P. de Montalvan (1612-1638), "the first-born of Lope's genius," the ex- travagance of whose imagination, like that of Lee, culminated in madness. Soon after him died (1639) Ruiz de Alarcon, in whose plays, as contrasted with those of Lope, has been recognized the distinctive element of a moral purpose. To G. Tellez, called Tirso de Molina (d. 1648), no similar praise seems due; but the frivolous gaiety of the inventor of the complete character of Don Juan was accompanied by ingenuity in the construction of his excellent? though at times " sensational" ® plots. F. de Roxas y Zorilla (b. 1607), who was largely plundered by the French dramatists of the latter half of the century, survived Molina for about a generation. In vain scholars

3 Roma Abrasada (R. in Ashes—Nero).

4 Arauco Domado (The Conquest of Arauco, 1560).

5 La Moxa de Cantaro (The Water-maid).

6 Las Mocedades (The Youthful Adventures) del Cid.

7 Don Gil de las Calzas Verdes (D. G. in the Green Breeches).

8 Fl Burlador de Sevilla y Convivad de Pierra (The Decewer of Seville, t.e., Don Juan, and the Stone Guest)...

of Lope.

Calderon.

Contem- poraries of Calderon.

Moreto and the comecta de figuron,

of strictly classical tastes protested in essays in prose and verse against the ascendency of the popular drama; the prohibition of Philip II. had been recalled two years after his death and was never renewed ; and the activity of the theatre spread through the towns and villages of the land, everywhere under the controlling influence of the school of writers who had established so complete a harmony between the drama and the tastes and tendencies of the people.

The glories of Spanish dramatic literature reached their height in P. Calderon de la Barca (1600-1681), though in the history of the Spanish theatre he holds only the second place. He elaborated some of the forms of the national drama, but brought about no changes of moment in any of them. Even the brilliancy of his style, glittering with a constant reproduction of the same family of tropes, and the variety of his melodious versification, are mere in- tensifications of the poetic qualities of Lope, while in their moral and religious sentiments, and their general views of history and society, there is no difference between tle two. Like Lope, Calderon was a soldier in his youth and an ecclesiastic in his later years ; like him he suited himself to the tastes of both court and people, and applied his genius with equal facility to the treatment of religious and of secular themes. In fertility he was inferior to Lope (for he wrote not many more than 100 plays) ; but he surpasses the elder poet in richness of style, and more especially in fire of imagination. In his awtos (of which he is said to have left not less than 73), Calderon probably attained to his most distinctive excellence; some of these appear to take a wide range of

allegorical invention,! while they uniformly possess great beauty of poetical detail. Other of his most famous or interesting pieces are comedias de santos.2 In his secular plays Calderon treats as wide a variety of subjects as Lope, but it is not a dissimilar variety ; nor would it be easy to decide whether a poet so uniformly admirable within his limits has achieved greater success im romantic historical tragedy,* in the comedy of amorous intrigue,‘ or in a dramatic work combining fancy and artificiality in such a degree that it has been diversely described as a romantic caprice and asa philosophical poem.® _ During the life of the second great master of the Spanish drama there was little apparent abatement in the productivity of its literature ; while the autos continued to flourish in Madrid and elsewhere, till in 1765 (shortly before the expulsion of the Jesuits from Spain) their public representation was prohibited by royal decree. In the world of fashion, the opera had reached Spain already during Calderon’s lifetime, together with other French influences, and the great dramatist had himself written one or two of his plays for performance with music. But the regular national drama continued to command popular favour ; and with A. Moreto (1618-1669) may be said to have even taken a fresh step. While he wrote in all the forms established by Lope and cultivated by Calderon, his manner seems most nearly to approach the master-picces of French and later English comedy of character ; he was the earliest writer of the comedias de figuron, in which the most prominent personage is (in Congreve’s phrase) “a character of affectation,” in other words, the Spanish fop of real life.© His master-piece, a favourite of many stages, is one of the most graceful and pleasing of modern comedies— simple but interesting in plot, and true to nature, with something like Shakespearean truth.? Other writers trod

1 El Divino Orfeo, &. === SOS

J Ll Magico Prodigiosi; El Purgatorio de San Patricio; La Devo- ‘ne, ee,

on i fe

Ta pit Ned pay £ (chy eg of Portugal).

“i Be es Suetto (Life is a Dream).

ra pine Don Diego (Pretty Don Diego.)

esden con el Desden (Disdain against Disdain).

DRAMA

[SPANISH.

more closely in the footsteps of the masters without effect- ing any noticeable changes in the form of the Spanish drama ; even the saynete (tit-bit), which owes its name to Benavente (fl. 1645), was only a kind of extremes. The Spanish drama in all its forms retained its command over the nation, because they were alike popular in origin and character ; nor is there any other example of so complete an adaptation of a national art to the national taste and sentiment in its ethics and esthetics, in the nature of the plots of the plays (whatever their origin), in the motives of their actions, in the conduct and tone and in the very costume of their characters,

National as it was, and because of this very quality, the Spanish drama was fated to share the lot of the people it so fully represented. At the eud of the 17th century, when the Spanish throne at last became the declared apple of discord among the Governments of Europe, the Spanish people lay, in the words of a historian of its later days, “like a corpse, incapable of feeling its own impotence.” That national art to which it had so faithfully clung had fallen into decline and decay with the spirit of Spain itself. By the time of the close of the great war, the theatre had sunk into a mere amusement of the populace, which during the greater part of the 18th century, while allowing the old masters the measure of favour which accords with traditional esteem, continued to uphold the representa- tives of the old drama in its degeneracy—authors on the level of their audiences. But the Spanish court was now French, and France in the drama, even more than in any other form of art, was the arbiter of taste in Europe. With the restoration of peace accordingly began isolated attempts to impose the Frengh canons of dramatic theory, and to follow the example of French dramatic practice; and in the middle of the century these endeavours assumed more definite form. Montiano’s bloodless tragedy of Virginia (1750), which was never acted, was accompanied by a dis- course endeavouring to reconcile the doctrines of the author with the practice of the old Spanish dramatists ; the play itself was in blank verse (a metre never used by Calderon, though occasionally by Lope), instead of the old national ballad-measures (the

romance-measure with assurance and the rhymed redondilla quatrain) preferred by the old masters among the variety of metres employed by them. ‘The earliest Spanish comedy in the French form (a translation only, though written in the national metre)® (1751), and the first original Spanish comedy on the same model, Moratin’s Petimetra (Petite-Mdattresse), printed in 1726 witli « critical dissertation, likewise remained unacted. In 1770, however, the same author’s Hormesinda, an historic drama on a national theme and in the national metre, but adhering to the French rules, appeared on the stage; and similar attempts followed in tragedy by the same writer and others (including Ayala, who ventured in 1775 to compete with Cervantes on the theme of Numantia), and in comedy by Yriarte and Jovellanos (afterwards minister under Godoy), who produced a sentimental comedy in Diderot’s manner.? But these endeavours failed to effect any change in the popular theatre, which was with more success raised from its deepest degradation by R. la Cruz (b. 1731), a fertile author of light pieces of genuine humour, especially saynetes, depicting the manners of the middle and lower classes. In literary circles La Huerta’s voluminous collection of the old plays (1785) gave anew impulse to dramatic productivity, and the conflict continued between representatives of the old school, such vas Comella (fl. 1780) and of the new, such as the younger Moratin (1760-1828), whose comedies—of which the last

8 Luzan, La Razon contra la Mode (Lachaussée, Le Préjugé a la Mode). 9 Il Delinguente Honrado (The Honoured Culprit),

Decay of e national Spanish drama,

The French school of the 18th century,

Other ater

dramatists. e.

FRENCH. |

and most successful! was in prose—raised him to the fore- most position among the dramatists of his age. In tragedy N. de Cienfuegos (d. 1809) likewise showed some originality. After, however, the troubles of the

French domination and the war had come to an end, the precepts and examples of the new school failed to reassert them- selves. The Spanish dramatists of the present century, after passing, as in the instances of I'. Martinez de la Rosa and Breton de los Horreros, from the system of French comedy to the manuer of the national drama, appear either to have stood under the influence of the French romantic school, or to have returned once more to tle old national models. Among the former class A. Gil y Zarate, among the latter J. Zorilla, are mentioned as specially prominent. Mean- while the old popular religious performances are not wholly extinct in Spain, and their relics may long continue to sur- vive there. Whatever may be the future history of one of the most remarkable of dramatic literatures, it may confidently be predicted that so long as Spain is Spain, her theatre will not be permanently denationalized, and that the revolutions it may be destined to undergo are unlikely to extinguish, in whatever degree they may repress, its conservative elements.

provided with a ghost and a chorus. Though mainly written in the five-foot Iambic couplet, it already contains passages in the Alexandrine metre, which soon afterwards La Péruse by his Médée (pr. 1556) established in French tragedy, and which Jodelle employed in his Dvdon. Numerous tragedies followed in the same style by various authors, among whom Bonnyn produced the first French regular tragedy on a subject neither Greek nor Roman,* and the brothers De la Taille,® and J. Grevin,® distinguished themselves by their style. Though in the reign of Charles IX. a vain attempt was made by Filleul to introduce the pastoral style of the Italians into French tragedy' (while the Brotherhood of the Passion was intermingling with pastoral plays its still continued reproductions of the old entertain- ments, and the religious drama making its expiring efforts), the classical school, in spite of all difficulties, prevailed. Monchrestien exhibited unusual vigour of rhetoric ;8 and in R. Garnier (1545-1601) French tragedy reached the greatest height in nobility and dignity of style, as well as in the exhibition of dramatic passion, to which it attained before

Corneille. In his tragedies? choruses are still inter- spersed among the long Alexandrine tirades of the dialogue.

During this period, comedy had likewise been influenced Comedy

by classical models; but the distance was less between the ie ahan

The The beginnings of the regular drama in France, which | national farces and Terence, than between the mysteries a ‘French here, without absolutely determining, potently swayed its | and moralities, and Seneca and the Greeks. L’Lugéne : Bed eutire course, sprang directly from the literary movement of | differs little in style from the more elaborate of the old ‘ the Renaissance. Dubellay sounded the note of attack which | farces ; and while it satirizes the foibles of the clergy converted that movement in France into an endeavour to | without any appreciable abatement of the old licence, its transform the national literature; and in Ronsard the | theme is the favourite burden of the French comic theatre classical school of poetry put forward its conquering hero | of all times—le cocwage. The examples, however, which aud sovereign lawgiver. Among the disciples who gathered | directly facilitated the productivity of the French comic round Ronsard, and with him formed the “ Pleiad ” of | dramatists of this period, among whom J. de la Taille was Jodelle. French literature, Stephen Jodelle (1532-1572), the | the first to attempt a regular comedy in prose,!° were those reformer of the French theatre, soon held a distinguished | of the Italian stage, which in 1576 established a permanent place. The stage of this period left ample room for the | colony in France, destined to survive there till the close of enterprise of this youthful writer. The popularity of the | the 17th century, by which time it had adopted the French old entertainments had reached its height when Louis XIL, | language, and was ready to coalesce with French actors, in his conflict with Pope Julius IT., had not scrupled to call | without, however, relinquishing all remembrance of its origin. in the aid of Pierre Grégoire (Gringore), and when the Mere | R. Belleau(1528-1577),a member of the “Pleiad,” produced Sorte had mockingly masqueraded in the petticoats of Holy | @ comedy in which the type (already approached by Jodelle) Church, Under Francis I. the Inquisition had to some | of the swaggering captain appears ;!! J. Grevin copied extent succeeded in repressing the audacity of the actors, | Italian intrigue, characters, and

manners ;!2 O, de Turnébe whose follies were at the same time an utter abomination | (d. 1581) borrowed the title of one Italian play!® and perhaps in the eyes of the Huguenots. For a time the very | parts of the plots of others; the Florentine F. d'Amboise mysteries had been prohibited. Meanwhile, isolated trans- | (d. 1558) produced versions of two Italian comedies ;14 lations of Italian? or classical' dramas had in literature | and the foremost French comic poet of the ceutury, P. de begun the movement which Jodelle now transferred to the | Larivey (1550-1612), likewise an Italian born (of the name Stage itself. His tragedy, Cléopatre Captive, was produced | of Pietro Giunto), openly professed to imitate the poets of his there on the same day as his comedy, J' Hugéne, in 155%, native country. His plays are more or less literal transla- his Didon se sacrifiant following in 1558. Thus at a time | tions of L. Dolce, Secchi,!® and other Italian dramatists ' When a national theatre was perhaps impossible in a | and this lively and witty author, to whom Moliére owes country distracted by civil and religious conflicts, whose | much, thus connects two of the most important and monarchy had not yet welded together a number of | successful growths of the modern comic drama. ; provinces attached each to its own traditions, and whose Before, however, either tragedy or comedy in France ane population, especially in the capital, was enervated by | entered into the period of their history when genius was to a y frivolity or enslaved by fanaticism, was born that long-lived | illuminate both with creations of undying merit, they had, comedy artificial growth, the so-called classical tragedy of France. | together with the general literature of the country, passed in the; For French comedy, though subjected to the same influences | through a new phase of the national life. The troubles 17th as tragedy, had a national basis upon which to proceed, and and terrors of the great civil and religious wars of the 16th eae its history is partly that of a modification of old popular | century had in certain spheres of society produced a reac- Conaciile: forms. tion towards culture and refinement ; and the seal had been French The history of French tragedy begins with the Cléopatre | set upon the results of the Renaissance by Malherbe, the tragedy in Captive, in the representation of which the author, together | 47, sowane(156l). 8 Daire(Darius). a with other members of the "'Pleiad," took part. It isa e, ae, ee eae

8 Les Lacénes; Marie Stuart or L' Ecossaise.

® La Juive, &e. 10 Les Corivauz (1578). 11 La Reconnue (Le Capitaine Rodomont). 1% Les Esbahis.

13 Les Contens (S. Parabosco, J Content).

M4 Les Néapolitaines; Les Désespérades de 0 Amour.

Les Laquais (Ragazzt). 16 Les Tromperies (Gu Inganni).

tragedy in the manner of Seneca, devoid of action and

1 Hl Si de las Niftias (The Young Maiden's Consent). 2 Trissino, Sofonisba. 3 Sophocles, Antigone; Flectra; Euripides, IZecuba ; Terence, Andria; Aristophanes, Plutus (by Ronsard, 1549).

Corneille.

His tragedies.

father of French style. The people continued to solace or distract its weariness and its sufferings with the help of the ministers of that half-cynical gaiety which has always lighted up the darkest hours of French popular life. In the troublous days preceding Richelieu's definitive accession to power (1624) the Zabarinades—a kind of street dialogue recalling the earliest days of the popular drama—had made the Pont-Neuf the favourite theatre of the Parisian populace. Meanwhile the influence of Spain, which Henry LY. had overcome in politics, had throughout his reign and afterwards been predominant in other spheres, and not the least in that of literature. The stelo culto, of which Gougora was the native Spanish, Marino the Italian, and Lyly the English repiesentative, asserted its dominion over the favourite authors of French society; the pastoral romance of Honoré d'Urfé—the text-book of pseudo-pastoral gallantry—was the parent of the romances of the Scudérys and De la Calprenede ; the Hotel de Rambouillet was in its glory ; the true (not the false) précieuses sat on the heights of intellectual society ; and Balzac (ridiculed in the earliest French dramatic parody)! and Voiture were the dictators of its literature. Much of

the French drama of this age is of the same kind as its romance-literature, like which it fell under the polite castigation of Boileau's satire. Heroic love (quite a technical passion), "fertile in tender senti- ments," seized hold of the theatre as well as of the romances; and Calprenéde (1610-1663), G. de Scudéry? (1601-1667) and his sister (1607-1701), and others were equally fashionable in both species. Meanwhile Spanish and Italian models continued to influence both branches of the drama. Everybody knew by heart Gongora's version of the story of "young Pyramus and his love Thisbe" as dramatized by Th. Viaud (1590-1626) ; and the sentiment of Tristan? (1601-1655) overpowered Herod on the stage, and drew tears from Cardinal Richelieu in the audience. Even Duryer's (1609-1659) style, otherwise superior to that of his contemporaries, is stated to have been Italian in its defects. A mixture of the forms of classical comedy with elements of Spanish and of the Italian pastoral was attempted with great temporary success by A. Hardi (1560-1631), a playwright who thanked Heaven that he knew the precepts of his art while preferring to follow the demands of his trade. The mixture of styles begun by him was carried on by Racan (1589-1670), Rotrou (1609-1650), and others; and among these comedies of intrigue in the Spanish manner the earliest efforts of Corneille himself' are to be classed. Rotrou's noteworthier productions? are later in date than the event which marks an epoch in the history ¢ a French drama, the appearance of Corneille's Cid

(1636).

P. Corneille (1606-1684) is justly revered as the first, and in some respects the unequalled, great master of

French tragedy, whatever may have been unsound in his

theories, or defective in his practice. 'The attempts of his predecessors had been without life, because they lacked really tragic characters and the play of really tragic passions; while their style had been either pedantically imitative ora medley of plagiarisms. He conquered tragedy at once for the national theatre and for the national litera- ture, and this not by a long tentative process of production, but by a few master-pieces,—for in lis many later tragedies he never again proved fully equal to himself, The French tragedy, of which the great age begins with the Cid, Hlorace, Cinna,

and Polyeucte, was not, whatever it professed to be, a copy of the classical tragedy of Greeks or Romans, or an Imitation of the Italian imitations of these ; hor, though in

oe a ay ; L. du Peschier" (de Barry), La Comédie des Coméd:cs.

LD' Amour Tyrannique. 3 Marianne. 4 Mélite; Chitandre, &c. 5 Le Véritable Satnt Gewais; Venceslas,

his later tragedies Corueille depended less and less upon characters, atid more and more, after the fashion of the Spaniards, upon situations, were the forms of the Spanish drama able to assert their dominion over the French tragic stage. The mould of French tragedy was cast by Corneille; but the creative power of his genius was unable to fill it with more than a few examples. His range of passions and characters was limited ; he preferred, he said, the reproach of having made his women too heroic to that of having made his men effeminate. His actions inclined too much to the exhibition of conflicts pulitical rather than broadly ethical in their significance. The defects of his style are of less moment ; but in this, as in other respects, he was, with all his strength and brilliancy, not one of those rarest of artists who are at once the example and the despair of their successors.

In comedy also Corneille begins the first great original epoch of French dramatic literature ; for it was to him that Moliére owed the inspiration of the tone and style which he made those of the higher forms of French comedy. But Le Menteur (the parent of a numerous dramatic progeny'®) was itself derived from a Spanish original,' which it did not (as was the case with the Cid) transform into something new. French tragi-comedy Corneille can hardly be said to have invented ; and of the mongrel growth of sentimental comedy, domestic drama or drame, he rather suggested than exemplified the conditions.

The tragic art of Racine (1639-1699) supplements rather than surpasses that of his older contemporary. His works reflect the serene and settled formality

of an age in which the sun of monarchy shone with an effulgence no clouds seemed capable of obscuring, and in which the life of a nation seemed reducible to the surroundings of a court. The tone of the poetic literature of such an age is not necessarily unreal, because the range of its ideas is limited, and because its forms seem to exist by an immutable authority. Madame de Sévigné said of Racine, whose plays so well suit themselves to the successive phases in the life of Louis XTV., that in his later years he loved God as he had formerly loved his mistresses ; and this sally at all events indicates the range of passions which inspired his tragic muse. His heroes are all of one type—that of a gracious gloriousness ; his heroines vary in their fortunes, but they are all the "trophies of love,"® with the exception of the scriptural figures, which stand apart from the rest.®

T. Corneille (1625-1709), Campistron, Duché, Lafosse, and Quinault (1637-1688) were mere followers of one or

both of the great. masters of tragedy, though the last-named neille and

achieved a reputation of his own in the bastard species of the opera. The form of French tragedy thus established, like everything else which formed part of the "age of Louis XIV.," proclaimed itself as the definitively settled model of its kind, and was accepted as such by a submis- sive world. Proud of its self-imposed fetters, French tragedy dictatorially denied the liberty of which it had deprived itself to the art of which it claimed to furnish the highest examples. Yet, though calling itself classical,

j it had not caught the essential spirit of the tragedy of the

Greeks. The elevation of tone which characterizes the serious drama of the age of Louis XIV. is a real eleva- tion, but its heights do not lose themselves in a sphere peopled by the myths of a national religion. Its per- sonages are conventional like its themes, but the conven- tion is with itself only; Orestes and Iphigenia have not brought witli them the cries of the stern goddesses and the flame on the altar of Artemis ; their passions like their

8 Steele, The Lying Lover; Foote, The Liar; Goldoni, IZ Bugiardo. " Ruiz de Alarcon, La Verdad Sospechosa.

8 Andromaque; Phédre; Bérénice, &e, 9 Ksther; Athalie

His comedies, | &e. |

Racine,

Followers | | of Cor-

Racine. j Character: istics of f French | classical |

tragedy. q

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Voltaire,

French classical tragedy in its decline,

FRENCH. |

speech are cadenced by a modern measure. In construc- tion, the simplicity and regularity of the ancient models are stereotyped into a rigid etiquette by the exigencies of the court-theatze, which is but an apartment of the palace. The unities of time and place, with the Greeks mere rules of convenience, French tragedy imposes upon itself as a permanent yoke. The Euripidean prologue is judiciously exchanged for the exposition of the first act, and the lyrical element essential to Greek tragedy is easily suppressed in its would-be copy; lyrical passages still occur in some of Corneille's early master-pieces,! but the chorus is con- sistently banished, to reappear only in Racine's latest works? as a scholastic experiment appropriate to a con-ventual atmosphere. Its uses for explanation and comment are served by the expedient, which in its turn becomes conventional, of the conversations with confidants and con- fidantes, which more than sufficiently supply the foil of general sentiments. The epical element is allowed full play in narrative passages, more especially in those which relate parts of the

catastrophe,? and, while preserving the stage intact from realisms, suit themselves to the generally rhetorical character of this species of the tragic drama. This character impresses itself more and more upon the tragic art of a rhetorical nation in an age when the loftiest themes are elsewhere (in the pulpit) receiving the most artistic oratorical treatment, and develops in the style of French tragedy the qualities which cause it to become something between prose and poetry—or to appear (in the phrase of a French critic) like prose in full dress. The force of this description is borne out by the fact that tlie distinction between the versification of French tragedy and that of French comedy is at times an imperceptible one.

The universal genius of Voltaire (1694-1778) found it necessary to shine in all branches of literature, and in tragedy to surpass predecessors whom his own authority declared to have surpassed the efforts of the Attic muse. He succeeded in impressing the world with the belief that his innovations had imparted a fresh vitality to French tragedy ; in truth, however, they represent no essential

‘advance in art, but rather augmented the rhetorical

tendency which paralyzes true dramatic Jife. Such life as his plays possess lies in their political and social senti- ments, their invective against tyranny,‘ and their exposure of fanaticism.> In other respects his versatility was barren of enduring results. He miglt take his themes from French history,® or from Chinese,’ or Egyptian,’ or Syrian, from the days of the Epigoni!® or from those of the Cru- sades;!1 he might appreciate Shakespeare, with a more or less partial comprehension of his strength, and con- descendingly borrow from and improve the barbarian.” But he added nothing to French tragedy where it was weakest—in character; and where it was strongest—in diction—he never equalled Corneille in fire or Racine in refinement. While the criticism to which French tragedy in this age at last began to be subjected has left unimpaired the real titles to immortality of its great masters, the French theatre itself has all but buried in respectful oblivion the dramatic works bearing the name of Voltaire—a name second to none in the history of modern progress and of modern civilization.

As it is of relatively little interest to note the ramifica- tions of an art in its decline, the contrasts need not be

pursued among the contemporaries of Voltaire, between his | y ; the Hcole des Marts (1661) to begin a long series of master-

+ Le Cid; Polyeucte. 2 Esther; Athalie.

8 Coreille, Rodogune; Racine, Phédre.

4 Brutus; La Mort de César; Sémiramis. : 5 Bdipe; Le Fanatisme (Mahomet). 6 Adélaide du Guesclin. 7 TL' Orphelin de la Chine. 8 Tunis et Zeiide. % Les Guebres. 19 Olimpie. © Tuncrede, ™ La Mort de César; Zaire Othello).

imitator Saurin (1706-1781), Saurin's royalist rival De Belloy (1727-1775), Racine's imitator Lagrange-Chancel (1676-1758), and Voltaire's own would-be rival, the " terrible" Crébillon the elder (1674-1762), who professed to vindicate to French tragedy, already mistress of the heavens through Corneille, and of the earth through Racine,' Pluto's supplementary realm, but who, though thus essaying to carry tragedy lower, failed to carry it further. In the latter part of the 18th century French classical tragedy as a literary growth was dying a slow death, however numerous might be the leaves which sprouted from the decaying tree. Its form had been permanently fixed; and even Shakespeare, as manipulated by Ducis (1733-1816)—an author whose tastes were better than his times—failed to bring abouta change. "It is a Moor, not a Frenchman, who has written this play," cried a spectator of Ducis's Othello (1791) ; but though Talma might astonish the theatre, Shakespeare's influence over the French drama was only gradually preparing itself, by means more especially of Letourneur's translation (1776- 1782), which attracted the sympathy of Diderot and tha execrations of the aged Voltaire. 'The command which classi- cal French tragedy continued to assert over the stage was due in part, no doubt, to the love of Roman drapery which in more than one sense characterized the Revolution, and which was by the Revolution handed down to the Empire.

It was likewise, and more signally, due to the great The tragic actors who freed the tragic stage from much of its artifici- 8*#8°

ality and animated it by their genius, No great artist has ever more generously estimated the labours of a predecessor than Talma (1763-1826) judged those of Le Kain (1728- 1778) ; ibut it was Talma himself whose genius was pre- eminently fitted to reproduce the great figures of antiquity in ° the mimic world, which, like the world outside, both required and possessed its Cesar. He, like Rachel (1821-1858) after him, reconciled French classical tragedy with nature; and it is upon the art of great original actors such as these that the theatrical future of this form of the drama in France depends. Mere whims of fashion—even when inspired by political feeling—will not ‘waft back to it a real popu larity ; nor will occasional literary aftergrowths, however meritorious, such as the effective Zucréce of F, Ponsard, and the attempts of even more recent writers, suffice to re-establish a Jiving union between it and the progress of the national literature.

The rival influences under which classical tragedy has Comedy.

become a thing of the past in French literature connect themselves with the history of French comedy, which under the co-operation of other influences produced a wide variety of growths, The germs of most of these—though not of all—are to be found in the works of the most versatile, and, in some respects, the most consummate comic

dramatist the world has known,—Molitre (1622-1693). Moliére.

What Moliére found in existence was a comedy of intrigue, derived from Spanish or Italian examples, and the elements. of a comedy of character, in French and more especially in Italian farce and ballet-pantomime. Corneille’s Aenteur had pointed the way to a fuller combination of character with intrigue, and in this direction Moliére’s genius exercised the height of its creative powers. After begin- ning with farces, he produced in the earliest of his plays (from 1652), of which more than fragments remain, comedies of intrigue which are at the same time marvel- lously lively pictures of manners, and then proceeded with

pieces of comedy of character. Yet even these, the chief of which are altogether unrivalled in dramatic literature, do not exhaust the variety of his productions. To define the

Se ee

38 Hamlet; Le Koi Léar, &e. Yao 54

Moliére’s contem- poraries and stuccessors.

range of his art is as difficult as to express in words, the essence of his genius. Jor though he has been copied ever since he wrote, neither his spirit nor his manner has descended in full to any of his copyists, whole schools of whom have missed elements of both. A Moliére can only be judged in his relations to the history of comedy at large. He was indeed che inheritor of many forms and styles— remaining a stranger to those of Old Attic comedy only, rooted as it was in the political life of a. free imperial city ; though even the rich extravagance of Aristophanes’s burlesque was not left wholly unreproduced by him. Moliére is both a satirist and a humourist ; he displays at times the sentiments of a loyal courtier, at others that gay spirit of opposition which is all but indispensable to a popular French wit. His comedies offer elaborate and subtle—even tender—pictures of human character in its eternal types, lively sketches of social follies and literary extravagances, and broad appeals to the ordinary sources of vulgar merriment. Light and perspicuous in construc-

tion, he is master of the delicate play of irony, the penetrat-_

ing force of wit, and the expansive gaiety of frolicsome fun, Faithful to the canons of artistic taste, and under the safe guidance of true natural humour, his style suits itself to every species attempted by him. His morality is the reverse of rigid, but its aberrations are not those of prurience, nor its laws those of pretence; and wholly free as he was from the didactic aim which is foreign to all true dramatic representation, the services he rendered to his art are not the less services rendered to society, concern- ing which the laughter of true comedy tells the truth. He raised the comedy of character out of the

lower sphere of caricature, and in his greatest creations subordinated to the highest ends of all dramatic composition the plots he so skilfully built, and the pictures of the manners he so faith- fully reproduced,

Even among the French comic dramatists of this age there must have been many who “were not aware” that Molidre was its greatest poet. For though he had made the true path luminous to them, their efforts were still often of a tentative kind, and one was reviving Patelin while another was translating the Andria, A more unique attempt was made in one of the very few really modern versions of an Aristophanic comedy, which deserves to be called an ori- ginal copy—Les Plaideurs of Racine. The tragic poets Quinault and Campistron likewise wrote comedies, one! or more of which furnished materials to contemporary English dramatists, as did one of the felicitous plays in which Boursault (1638-1701) introduced Mercury and Alsop into the theatrical salon.2 But if the mantle of Molidre can be said to have fallen upon any of his contemporaries or successors, this honour must be ascribed to J. F. Regnard (1655-1709), who imitated the great master in both themes aud characters,? while the skilfulness of his plots, and his gaiety of the treatment even of subjects tempting

into the by-path of sentimental comedy,‘ entitle him to be

regarded as a comic poet of original genius. In the next generation (that of Voltaire) this by-path threatened to become the chosen walk of comedy, though Gresset (1709- 1777) still attempted comedy of character,® and the witty Piron (1689-1778) produced something like a new type in the hero of his epigrammatic, but hardly dramatic, Métromanie. Marivaux (1688-1763), “the French

a a ee ae ener

1 Quinault, LZ’ Amour Indiscret (Newcastle and Dryden’s Sir Martin Maraii),

2 4

amy Mercure Galant; Esope @ la Ville; Esope a la Cour (Vanbrugh,

(Pier ie by . de Powrceaugnac); Geronte in Le Légataire Universel

des Femmes), lalade Imaginatre); La Critique du L. (La C. de ? Ecole

4 1 e a e e . ° Le Joueur; Le Légataire Universel, 5 Le Méchant.

Spectator," whose minute analysis of the tendcr passion 6 excited the scorn of Voltaire, forms the connecting link between comedy and the mixed species of the sentimental or " tearful" domestic drama, which still retained the name, but no longer pursued the ends, of the comic art. The Seni. most effective and professedly didactic dramatic moralists mental

of this school were Destouches 7 (1680-1754) and Nivelle comedy | de la Chaussce (1692-1754), in whose hands French io comedy became a champion of the sanctity of marriage® drama, | and reproduced the sentiments—in one instance® even the | characters—of Richardson.

Melpomene, humbly shod with the sock, and Thalia, dissolved in tears, had now entered into partnership. The species which varied as comédie larmoyante or as tragédie bourgeoise, and which ruled or was to rule supreme in so many dramatic literatures of Europe, more and more firmly established its hold on that of France. In the hands of Diderot (1713-1784) it sought to proclaim itself as an agent of social reform, and as an apostle of the gospel of philanthropy ; but the execution of these works fell short of their aims ;!° it was, in Mme. de Staél's words, " the affectation of nature," not nature itself which they ex- hibited. Their author announced them as examples of a : third dramatic form—the genre sériewx—which he declared to be the consummation of the dramatic art. Making war upon the frigid artificiality of classical tragedy, he banished verse from the new species. 'The effect of these plays was | intended to spring from their truth to nature —a truth such | as no spectator could mistake, and which should bring home | its moral teachings to the business as well as the bosoms of all. 'The theatre was to become a real and realistic school of the principles of society and of the conduct of life—it | was, in other words, to usurp functions with which it has | no concern, and to essay the reformation of mankind. The ' idea was neither new nor just, but its speciousness will | probably continue

to commend it to many benevolent minds, whensoever and in whatsoever shape it is revived.]

From this point the history of the French drama The becomes that of a conflict between an enfeebled artistic comedy o! } school and a tendency which is hardly to be dignified by i the name of a school at all. Beaumarchais (1732-1799), the First (who for his early sentimental plays, in which he imitated Empire, Diderot, invented the appellation drame—so convenient in its vagueness that it became the accepted name of the hybrid species to which they belonged—in two works of a very different kind, the famous Barbier de Séville and the still more famous Mariage de Figaro, boldly carried comedy back into its old Spanish atmosphere of intrigue; but while surpassing all his predecessors in the skill with which | he constructed his frivolous plots, he drew his characters with a lightness and sureness of touch peculiar to himself, animated his dialogue with an unparalleled brilliancy of wit, and seasoned action as well as dialogue with a political and social meaning, which caused his epigrams to become | proverbs, and which marks his /igaro as a herald of the Revolution. Such plays as these were ill suited to the rule of the despot whose vigilance could not overlook their signifiance. The comedy of the empire is, in the hands of Collin d'Harleville, Picard, A. Duval, Etienne, and others, mainly a harmless comedy of manners; nor was the attempted innovation of N. Lemercier (1771-1840)—who was fain to invent a new species, that of historical comedy— more than a flattering self-delusion, 'The theatre had its share in all the movements and changes which ensued in

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5 Le Jeu de VAmour et du Hasard; Le Legs; La Surprise de VAmour; Les Fausses Confidences; L' Epreuve.

" Le Dissipateur; Le Glorieux, &c.

8 La Fausse Antipathie; Le Préjugé dla Mode; AMéluside.

9 Paméla. é

1° Le Fils Naturel ou les Epreuves de la Vertu; Le Pére de Famille.

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The stage.

Transition to the romantic school,

The romantic school,

Recent Trench dramatists.

FRENCH. |

France ; but the impulse which gave rise to the revolu- tion the drama itself was to undergo was not one of native origin. Those branches of the drama which belong specifically to the history of the opera, or which associate themselves with it, are here passed by. (See Oprra). Among them was the vaudeville (from Val de Vire in Calvados), which began as an interspersion of pantomime with the airs of popular songs, and which, after the Italian masks had been removed from it, was cultivated by Ponsard (1690-1765) and Marmontel (1723-1799). The latter, as well as Rousseau,? likewise composed opérettes— a smaller kind of opera, at first of the pastoral sort; and these flexible species easily entered into combination. The melodrama proper, of which the invention is also attributed to Rousseau,' in its latter development became merely a drama accentuated by music, though usually in little need of any accentuation.

The chief home of the regular drama, however, demanded efforts of another kind. At the Thé&tre Frangais, or Coméddie Frangaise, whose history as that of a single company of actors begins in 1780, the party-strife of the times made itself audible ; and the most prominent tragic poet of the Revolution, M. J. de Chénier (1764-1811), a disciple of Voltaire in dramatic poetry as well as in political philosophy, wrote for the national stage the historical drama—with a political moral'—in which in the memorable year 1789 Talma achieved his first complete triumph. But the victorious Revolution proclaimed among other liberties that of the theatres in Paris, of which soon not less than 50 were open. In 1807 the empire restricted the number to 9, and reinstated the Thé4tre Frangais in sole possession (or nearly such) of the right of performing the classic drama. No writer of note was, however, tempted or inspired by the rewards and other encouragements offered by Napoleon to produce such a classic tragedy as the emperor wonld have willingly stamped out of the earth. The tragedies of C. Delavigne (1794-1844) represent the transition from the expiring efforts of the classical to the ambitious beginnings of the romantic school of the French drama, Of this it must suffice to say that it derives some of its characteristics from the general movement of romauticisin which in various ways and at various points of time traus- formed nearly every modern European literature, others from the rhetorical tendency which is a French national feature. Victor Hugo was its conquering founder; A. Dumas the elder (1803-1870) its middleman. The marvellous energy and poetic genius

of the former, always in extremes, was nowhere more signally so than in the drama; the latter was a Briareus, working with many hands besides his own. The name of A. de Vigny (1799-1863), “Georges Sand ” (1804-1876), A. de Musset (1810-1857), whose dramatic “ proverbes ” and other pieces of a similar kind have a delicate flavour all their own, and perhaps that of P. Mérimée (1803-1870), who invented not only Spanish dramas but a Spanish dramatist,> may be all with more or less precision classed in the romantic school, which in its turn has come to an end asa productive body of writers. It was not, however, the brief classical revival begun by F. Ponsard, and continued, in closer relation to modern ideas, both by him and by E, Augier, which overthrew the Romanticists. While the theatrical ability of E. Scribe (1791-1858) supplied a long series of productions attest- ing therapid advance of the playwright’s mastery over the secrets of his craft, and while the name of his competitors, with the aid of some of whom he held his own against the rest, is legion, the latest developments of the French drama

ee ee eee ee 1 Zémire et Azor; Jeannot et Jeannette. 2 Les Muses Galantes; Le Devin du Village. 3 Pygmalion. 4 Charles IX. ow Ecole des Rois. 5 Thédtre de Clara Gazul.

possess a social and often a moral interest of greater depth, while they are not inferior in technical skill to anything that has preceded them. After a fashion which would have startled even Diderot, the younger A. Dumas has under- taken to reform society by means of the stage; O. Feuillct and others have, with perhaps fewer prefaces, applied themselves to the solution of the same “ problems ;” and whatever style will best succeed with the public is the style of V. Sardou.

That the theatre will lose the hold it possesses over the intellectual and moral sympathies of nearly the whole

of the educated, and of a great part of the uneducated theatre and

population of France, seems hardly within the range of probability. But this is not tantamount to a prophecy that the creative activity of French dramatic literature is certain to endure. The art of acting is not depen- dent. upon a contemporary literary productivity ; Talma and Mdlle. Mars (1779-1847) flourished in one of the most barren ages of the French literary drama; the authors and actors of the sotties, like those of the Palazs Royal farces of our own day, could strike their roots in the lightest of soils. The constantly accumulating experience and the apparently inexhaustible fertility of the art of acting in France may ensure to it a future not less brilliant than its past ; and the judicious policy of not leaving the lead- ing theatres at the mercy of shifting fashion will at all events supply the possibility of maintaining a high histrionic standard. So long as the French nation continues to main- tain its ascendency over other nations in much that adorns and brightens social life, the predominant influence of the French theatre over the theatres of other nations is likewise assured, But in the end its own future must be ruled by that progress or decay of French dramatic literature. The history of that literature shows periods of marvellously rapid advance, of hardly less swift decline, and of frequent though fitful recovery. Its future may be equally varied ; but it will not be less dependent on the conditions which in every people, ancient or modern, are indispensable to national vigour and vitality. Should the calamity—for it would be nothing less—befall modern civilization of a hope- less degeneration of the French drama, the fault will lie in the severance of self-consciousness from self-control; and, under other circumstances, but with even deeper regret, the story of the Roman theatre of the later Empire may have to be told again.

Among the nations of Germanic descent, but one—our own—succeeded under the influence of the Renaissance movement in transforming the last growths of the medizval drama into the beginnings of a great and enduring national dramatic literature. This transformation connects itself with one of the greatcst epochs of the national history, or, more properly speaking, forms part of it; the Elizabethan drama and the Elizabethan age are, it is no exaggeration to assert, equally inconceivable the one without the other.

It has been seen how already in the reign of Edward VL, the breath of a new age with its “new learning ” had quickcned the relatively inanimate species of the morality into the first chronicle history (still intermingled with

remnants of the earlier species) ; and how at an even earlier datc John Heywood's interludes had bridged the distance separating from only partially relieved abstractions the con- crete directness of comedy proper. Soon afterwards, the study and imitation of the ancient classical drama were in- troduced into the English world of letters ; and under their influence tragedy and comedy, which might otherwise have from the first coalesced, were in their early growths in our literature kept asunder, though not absolutely so. Already, in Queen Mary's reign, translation was found the readiest form of expression offering itself to literary scholar-

The future

of the French

of the French drama,

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DRAMA.

Beginning

of the regular drama.

Earliest tragedies,

Chronicle histories:

Earliest comedies,

ship, and Italian examples helped to commend Seneca, the most modern of the ancient tragedians, as a favourite author for such exercises. With the year of Elizabeth's accession began a series of translations of his plays by Jasper Heywood (John Heywood's son) and others; and to the direct influence of one of Seneca's tragedies! is to be ascribed the composition of the first tragedy proper in the English tongue, the Gorboduc (after- wards renamed Werrex and Porrex) of T. Sackville, Lord Buckhurst, with whom T.

Norton was joint author (1562), Though, unlike Gorboduc, classical in theme, and in some respects approaching nearer to the true conception of tragedy in their treatment of dramatic passion, the nearly contemporary Apius and Virginia (c. 1563) and Preston's Cambises King of Percia, in the roughness of their form more closely resemble the old religious drama ; of other tragedies on classical subjects we have only the names, except in the instance of Gascoigne's Jocasta, a free version of the Pheenisse of Euripides (1566), and of R. Edwards's Damon and Pithias (printed 1571), which calls itself a comedy, and is in fact a mixture of both species. Simul- taneously with the influence, directly or indirectly exercised, of classical literature, that of Italian, both dramatic and narrative, asserted itself ; early works from this source were the first Romeo and Juliet (not preserved, but apparently anterior in date even to Gorboduc), Tanered and Gismunda (1563 1), and G. Whetstone's Promos and Cassandra (printed 1578), from which Shakespeare tock the story of Measure for Measure.

From the double danger which threatened our tragic drama in the days of its infancy—that it would congeal on the cold heights of classical themes, or dissolve its vigour in the glowing heat of a passion fiercer than that of the Italians (Inglese Italianato é un diavolo incarnato)—it was preserved, more than by any other cause, by its happy association with the traditions of the national history. The crude growth of the chronicle history proved strong enough to assert itself by the side of tragedy based on classical and Italian models ; and in a series of works of more or less uncertain dates, a vein was worked from which Shakespeare was to draw the richest ore. Among these rude compositions, which intermixed the blank verse introduced by Gorboduc with prose, and freely mingled comic with tragic elements—-works half-epic, half-dramatic, and popu- lar in form as they were national in theme,—are the Famous Victories of Henry V., acted before 1588, The Troublesome Raigne of King John (printed 1591), and the Prue Chronicle History of King Leir (acted 1593). A still further step in advance was taken in what really deserves the title of the Tragedy of Sir Thomas More (c. 1590), not so much on account of the relative nearness of the subject to the time of its treatment, as because of the tragic responsibility of character here already clearly worked out.

Such had been the beginnings of tragedy in England up to the time when the genius of dramatists worthy to be called the predecessors of Shakespeare, under the influence of a creative literary epoch, seized the form ready to their hands. The birth of comedy, at all times a process of less labour, had slightly preceded that of tragedy in the history of our drama. Isolated Latin comedies had been produced in the original or in English versions or reproductions as early as the reign of Henry VIII., and the morality and its descendant, the interlude, pointed the ‘way towards nationalizing and popularizing types equally fitted to divert Roman and Italian and Xinglish audiences. Thus the earliest extant English comedy, N. Udall’s Ralph Roister Doister, which cannot be dated later than 1551, may be

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described as a genuinely English adaptation of Plautus, while its successor, Gammer Gurton’s Needle, printed 1575, and probably written by (Bishop) Still, has an original, aud in consequence a slighter, though by no means unamusing, plot. In the main, however, our early English comedy, while occasionally introducing characters of genuinely native origin, and appealing to the traditional humours of Will Summer, the court-fool of Henry VIII.,2 or Grim, the collier of Croydon,? was content to borrow its themes from Italian or classical sources; Ariosto’s J Supposite found a translator in Gascoigne! (1566), and the Mencechmi of Plautus translators or imitators in writers of rather later dates.®> While on the one hand the mixture of tragic with comic motives was already leading in the direction of tragi-comedy, the precedent of the Italian pastoral drama encouraged the introduction of figures and i stories from classical mythology; and the rapid and { versatile influence of Italian comedy seemed likely to cou- tinue to control the progress of the lighter branch of the English drama. i Out of such promises as these the glories of our drama Conditions | were ripened by the warmth and light of the great of the Elizabethan age—of which the beginnings may fairly be a. reckoned from the third decennium of the reign to which it bethan | owes its name. The queen’s steady love of dramatic

drama, entertainments could not of itself have led, though it undoubtedly contributed, to such a result, Against the attacks which a nascent puritanism was already direct- |

| ing against the stage by the hands of Northbrooke, the

repentant playwright Gosson, Stubbes, and others, were to

be set not only the barren favour of royalty, and the more direct patronage of great nobles, but the fact that literary authorities were already weighing the endeavours of the | English drama in the balance of respectful criticism, and f that in the abstract at least the claims of both tragedy and

comedy were upheld by those who shrunk from the desipience of idle pastimes. As the popularity of the stage increased, the functions of playwright and actor, whether combined or not, began to hold out a reasonable promise

of personal gain. Nor, above all, was that higher impulse,

which leads men of talent and genius to attempt forms of

art in harmony with the tastes and tendencies of their | times, wanting to the group of writers who can be remem- bered by uo nobler name than that of Shakespeare's predecessors.

The lives of all of these are, of course, in part contem- The pre- porary with the life of Shakespeare himself; nor was there ee any substantial difference in the circumstances under which ie be: : most of them, and he, led their lives as dramatic authors, P°"" A distinction was manifestly kept up between poets and Play- playwrights. Of the contempt entertained for the actor's wrights profession some fell to the share of the dramatist; even and Lodge," says Dr Ingleby, "who had indeed never trod the 2 stage, but had written several plays, and had no reason to be ashamed of his antecedents, speaks of the vocation of the play-maker as sharing the odium attaching to the actor." Among the dramatists themselves good fellowship and literary partnership only at times asserted themselves as stronger than the tendency

to mutual jealousy and abuse ; of all chapters of dramatic history, the annals of the early Elizabethan stage perhaps least resemble those ; of Arcadia.

Moreover, the theatre had hardly found its strength History of as a powerful element in the national life, when it a | | was involved in a bitter controversy, with which it had ae | originally no connection, on behalf of an ally whose sympathy with it can only have been of a- very limited

2 Misogonus. 3 The History of the Collier. 4 The Supposes.

° A Historie of Error (2), 1577 3 The Menechmi taken out of Plautus (pr. 1595).

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kind. The Marprelate controversy in 1589 led to a stoppage of stage. plays which proved only temporary ; but the general result of the attempt to make the stage a vehicle of political abuse and invective was beyond a doubt to coarsen and degrade both plays and players. The true remedy was at last applied, when from about the year 1594 the chief London actors became divided into two great rival companies—the Lord Chamberlain's and the Lord Admiral's—which alone received licences. Instead of half-a-dozen or more conipanies whose jealousies com- municated themselves to the playwrights belonging to them, there were now, besides the Children of the Chapel, two established bodies of actors, directed by steady and, in the full sense of the word, respectable men. To the Lord Chamberlain's Company, which, after being settled at "the Theater," moved to the Globe on the Bankside in 1599, Shakespeare and Richard Burbadge, the greatest of the Elizabethan actors, belonged ; the Lord Admiral's was managed by Philip Henslowe, the author of the Deary, and Edward Alleyn, the founder of Dulwich College, and was ultimately, in 1600, settled at the Fortune. In these and other houses were performed the plays of our Elizabethan dramatists, with few adventitious aids, the performance being crowded into a brief afternoon, when it is obvious that only the idler sections of the population could attend. No woman might appear at a playhouse unless masked; on the stage, down to the Restoration, women's parts continued to be acted by boys.

~ It is futile to take no account of such outward circum- stauces as these and many which cannot here be noted in surveying the progress of the literature of the Elizabethan drama. No dramatic literature which has any claim to rank beside it—not that of Athens nor those of modern Italy and Spain, nor those of France and Germany in

their classic periods—had to contend against such odds;

a mighty inherent strength alone ensured to it the vitality which it so triumphantly asserted, and which

pression so luxuriant in his Doctor Jaustus and so surpass-

ingly violent in his Jew of Afalta. His master-piece, Edward II., is a tragedy of singular pathos and of a dramatic power unapproached by any of his contemporaries. George Peele (1552-1596-7) was a far more versatile writer even as a dramatist; but though his plays contain passages of exquisite beauty, not one of them is worthy to be ranked by the side of Marlowe's Edward JJ., compared with which, if indeed not absolutely, Peele's Chronicle of Hdward I. still stands on the level of the species to which its title and character alike assign it. His finest play is undoubtedly Dawd and Bethsabe, which resembles Edward J. in construction, but far surpasses it in beauty of language and versification, besides treating its subject with greatly superior dignity. If the difference between Peelo and Shakespeare is still in many respects besides that of srenius an immeasurable one, we seem to come into something like a Shakespearian atmosphere in more than one passage of the plays of the unfortunate Robert Greene (1561-1592), unfortunate perhaps in nothiug more enduringly than in his notorious enmity to Shakespeare himself. His genius, which shone most brightly in plays treating English life and scenes, was in the main free from the pedantry which occasionally besets the flight of Peele's and even of Marlowe's muse; and his most delightful work 5 at all events seems to breathe something of that indescribable freshness which we recognize, if not as a peculiarly Shakespearian characteristic, at least as one belonging to

none but a truly national art. Thomas Lodge (c. 1558-1625), Thomas Nash the redoubtable pamphleteer (c. 1565-c. 1602), Henry Chettle (1564~c. 1667), who worked the chords of both pity® and terror’ with equal vigour, and Anthony Munday (1553-1633), better remembered for his city pageants than for his plays, are among the other more generally known writers of the early Elizabethan draina, though not all of them can strictly speaking be called predecessors of Shakespeare.

Peele.

Greene.

enabled it to run so unequalled a course. The common characteristics of nearly all these dramatists Common

icsly. Among Shakespeare’s predecessors John Lyly (1554— | were in accordance with those of the great age to which character- 1660), whose plays were all written for the Children of the | they belonged. Stirring times called for stirring themes, ae] Chapel and the Children of St Paul’s, holds a position | such as those of ‘“ Mahomet, Scipio, and Tamerlane ;” and py. zl i apart in our dramatic literature. The euphuism, to | these again for a corresponding vigour of treatment. bethans.

which his famous romance gave its name, likewise distin- guishes his mythological, quasi-historical,? allegorical,? and satirical comedies. But his real service to the progress

of our drama is to be sought neither in his choice of

subjects nor in his imagery—though to his fondness for fairy- lore and for the whole phantasmagoria of legend, classical as well as romaniic, his contemporaries, and Shakespeare in particular, were indebted for a stimulative precedent. It lies in his adoption of Gascoigne’s innovation of writing plays in prose; and in his having, though under the fetters of an affected and vicious style, given the first example of brisk and vivacious dialogue—an example to which even such successors as Shakespeare and Jonson

Neatness and symmetry of construction were neglected for fulness and variety of matter. Novelty and grandeur of subject seemed well matched by a swelling amplitude aud often reckless extravagance of diction. Asif from an inner necessity, the balance of rhymed couplets gave way to the impetuous niarch of blank-verse; “strong lines” were as in- evitably called for as strong situations and strong characters. Distinct as the chief of these poets are from one another by the marks impressed upon both form and matter by individual genius, yet the stamp of the age is upon them all. Writing for the stage only, of which some of them possessed a personal experience, they acquired an instinctive insight into the laws of dramatic cause and effect, and in-

Kyd. were indebted. Thomas Kyd (d.c. 1594), the author of the | fused a warm vitality into the dramatic literature which they Spanish Tragedy, possesses some of the characteristics, | produced, so to speak, for immediate consumption. On but none of the genius, of the greatest tragic dramatist | the other hand, the same cause made rapidity of work- who preceded Shakespeare. No slighter tribute than this is | manship indispensable to a successful playwright. How a

Marlowe. assuredly the due of Christopher Marlowe (1564-1585), | play was produced, how many hands had been at work

whose violent end prematurely closed a poetic career of dazzling brilijaucy. His earliest play, Zamburlaine the Great, in which the use of blank verse was introduced upon the English public stage, while full of the “high astounding terms” of an extravagant and often bombastic diction, is already marked by the passion which was this

poet’s most characteristic feature, and which was to find ex-

1 The Woman in the Moone; Sapho and Phao. 2 Alexander, Campaspe, and Diogenes.

3 Endimion; Mydas. 4 Gallathea.

upon it, what loans and what spoliations had been made in the process, were considerations of less moment than the question whether it was produced,

and whether it succeeded. His harness—frequently double or triple—was inseparable from the lusty Pegasus of the early English drama, and its genius toiled, to borrow the phrase of the Attic comedian, “like an Arcadian mercenary.”

5 Friar Bacon and Friar Bungay. § Patient Grissil (with Dekker and Haughton) T Hoffman, or A Revenge for a Father.

Progress of

tragedy and comedy before Shake- speare,

Shake-

speare.

Shake- speare and the national historica] drama.

This period of our drama, though it is far from being one of crude effort, could not therefore yet be one of full con- summation. In tragedy the advance which had been made in the choice of great themes, in knitting closer the connec- tion between the theatre and the national history, in vindi- cating:to passion its right to adequate expression, was already enormous. In comedy the advance had been less decisive and less independent ; much had been gained in reaching greater freedom of form and something in enlarg- ing the range of subjects ; but artificiality had proved a snare in the one direction, while the licence of the comic stage, upheld by favourite “clowns,” such as Kemp or Tarleton, had not succumbed before more exacting demands. ‘The way of escaping the dilemma had, however, been already recognized to lie in the construction of suitable plots, for which a full storehouse was open in the popular traditions preserved in national ballads, and in the growing literature of translated foreign fiction, or of native imitations of it. Meanwhile, the aberration of the comic stage to political and religious controversy, which it could never hope to treat with real freedom in a country provided with a strong

monarchy and a dogmatic religion, seemed likely to extinguish the promise of the beginnings of English romantic comedy.

These were the circumstances under which the greatest of dramatists began to devote his genius to the theatre. Shakespeare's carecr as a writer of plays can have differed little in its beginnings from those of his contemporaries and rivals, Before or while he was proceeding from the re-touching and re-writing of the plays of others to original dramatic composition, the most gifted of thoge we have termed his predecessors had passed away. He had been decried as an actor before he was known as an author ; and after living through days of darkness for the theatre, if not for himself, attained, before the close of the century, to the beginnings of his prosperity and the beginnings of his fame. But if we call him fortunate, it is not because of such rewards as these. As a poct Shakespeare was no doubt happy in his times, which intensified the national character, expanded the national mind, and were able to add their stimulus even to such a creative power as his. He was happy in the antecedents of the form of literature which commended itself to his choice, and in the opportunities which it offered in so many directions for an advance to heights yet undiscovered and unknown. What he actually accomplished was due to his genius, whose achievements are immeasurable like itself. His influence upon the pro- gress of our national drama divides itself in very unequal proportions into a direct and an indirect one. To the former alone reference can here be made.

Already the first editors of Shakespeare's works in a collected form recognized so marked a distinction between his plays taken from English history and those treating other historical subjects (whether ancient or modern) that, while they included the latter among the tragedies at large, they grouped the former as histories by themselves. These histories are in their literary genesis a development of the chronicle histories of Shakespeare's predecessors and contem- poraries, the taste for which had greatly increased towards the beginning of his own career as a dramatist, under influences naturally connecting themselves with the general current of national life and sentiment in this epoch. Though it cannot be assumed that Shakespeare composed his several dramas from English history in the sequencc of the chronology of their themes, his genius gave tothe entire Series an inner harmony which has not unfiaturally inspired commentators

with the wish to prove it a symmetrically constructed whole. He thus brought this peculiarly national species to a perfection which made it difficult, if not impossible, for his later contemporaries and successors

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to add to it more than an occasional supplement. None of them was found able or ready to take up the thread where Shakespeare had left it, after perfunctorily attachin the present to the past by a work (probably not all his | own) which must be regarded as the end rather than the crown of the series of his Aistories.1 But to furnish such supplements accorded, little with the tastes and tendencies } of the later Elizabethans; and with the exception of an { isolated work,’ the national historical drama in Shakespeare | reached at once its perfection and its close. The ruder | form of the old chronicle history for a time survived the advance made upon it; but the efforts in this field of T. Heywood,’ 8. Rowley,? and others are, from a literary point | of view, anachronisms. | Of Shakespeare’s other plays the several groups exercised Shake. amore direct influence upon the general progress of our pa and dramatic literature. His Roman tragedies, though follow- P™8tsh ing their authorities with much the same fidelity as that of the English histories, even more effectively taught the great lesson of free dramatic treatment of historic themes, and thus pre-eminently became the perennial models of the modern historic drama. His tragedies on other themes, tragedy, which necessarily admitted of a more absolute freedom of treatment, established themselves as the examples for all time of the highest kind of tragedy. Where else is exhi- | bited with the same fulness the struggle between will and obstacle, character and circumstance? Where is mirrored ! with equal power and varicty the working of those passions [in the mastery of which over man lies his doom? Here, above all, Shakespeare as compared with his predecessors, as well as with his successors, “7s that nature which they paint and draw.” He threw open to modern tragedy a range of hitherto unknown breadth and depth and height, and emancipated the national drama in its noblest forms from limits to which it could never again restrict itself without a consciousness of having renounced its enfranchisement. Happily for the variety of his creative genius on the English stage, no divorce had

been pro- claimed between the serious and the comic, and no division of species had been cstablished such as he himself ridicules as pedantic when it professes to be exhaustive. The and 1 comedies of Shakespeare accordingly refuse to be tabulated comedy. 1 in deference to any method of classification deserving to be | called precise ; and several of them are comedies only accord- | ing to a purely technical use of the term. In those in which the comic interest asserts itself to the instinct of reader or | Spectator as supreme, it is still of its nature incidental to the progress of the action ; for it seems a just criticism (and one agreeing with what we can conclude as to Shake- speare's process of construction) that of all his comedies but one® is in both design and effect a comedy of character proper. Thus in this direction, while the unparalleled ¥ wealth of his invention renewed or created a whole gallery of types, he left much to be done by his successors ; while. the truest secrets of his comic art, which interweaves fancy with observation, draws wisdom from the lips of fools, and imbues with character what all other hands would have left shadowy, monstrous, or trivial, are among the things inimitable belonging to the individuality of his poetic genius. The influences of Shakespeare's diction and versification His style upon those of the English drama in general can hardly be and its over- rated, though it would be next to impossible to state uence | them definitely. In these points, Shakespeare's manner as a writer was progressive ; and this progress has been deemed sufficiently well traceable in his plays to be used as an aid in seeking to determine their chronological sequence. The

tragedy,

1 Henry Vill. 2 Ford, Perkin Warbeck. 3 Edward IV.; If You Know Not Me, &c. 4 Henry VIII. 5 The Merry Wives of Windsor.

field of the national drama, every form commending itself Forms of to the tastes and sympathies of the national genius was the later essayed. None were neglected except those from which — the spirit of English literature had been estranged by the drama,

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general laws of this progress accord with those of the natural advance of creative genius ; artificiality gives way to freedom, and freedom in its turn submits to a greater degree of regularity and care. In versification as in diction

the earliest and the latest period of Shakespeare’s dramatic writing are more easily recognizable than what lies between and may be called the normal period, the plays belonging to which in form most resemble one another, and are least affected by distinguishable peculiarities—such as the rhymes and intentionally euphuistic colouring of style which char- acterize the earliest, or the feminine endings of the lines and the more condensed manner of expression common to the latest plays. But such distinctions apart, there can be on doubt but that in verse and in prose alike, Shakespeare’s style, so far as it admitted of reproduction, is itself to be regarded as the norm of that of the Elizabethan drama, that in it the prose form of English comedy possesses its first accepted model, and that in it the chosen metre of the English versified drama established itself as irremovable unless at the risk of an unnatural experiment.

Reformation, and those which had from the first been artificial importations of the Renaissance. The mystery could not here, as in Spain, produce such an aftergrowth as the auto, and the confines of the religious drama were only now and then tentatively touched.! The direct imitations of the classical drama were few and feeble; Chapman, while affecting some of its usages, made no serious attempt to reproduce its essentials ; experiments like W. Alexander’s (afterwards Earl of Stirling) Monarchicke Tragedies? (1603- 1605) are the mere isolated efforts of a student, like Milton’s Samson Agonistes at a later date (1677). At the opposite end of the dramatic scale, the light gaiety of the Italian and French force could not establish itself on the English popular stage without more solid adjuncts; the English- man’s festive digestion is robust, and lie likes his amuse- ments substantial. however, mauy of our dramatists found special opportunities t

In the pastoral drama and the mask, The pas-

“Influence It may seem paradoxical to assert that it is by their con- oral _ of his struction that Shakespeare’s plays exerted the most palpable | for the exercise of their lyrical gifts and of their inventive “““* / method of

influence upon the English drama, as well as upon the | powers. The former could never become other than an construe modern drama of the Germanic nations in general, and upon | exotic, so long as it retained the artificial character of its

tion.

| | His charac- | ters.

such forms of the Romance drama as have been in more re- cent times based upon it. For it was not in construction that his greatest strength lay, or that the individuality of his genius could raise him above the conditions under which he worked incommon with his immediate predecessors and contemporaries. Yet the fact that he reconciled these con- ditions with creations of matchless strength and of un- equalled fidelity to the demands of nature and art, estab- lished them as the conditions of what a popular (and consequently often abused) term bas instinctively come to designate as the Shakespearian drama. The great and irresistible demand on the part of Shakespeare's public was for incident—a demand which of itself necessitated a method of construction different from that of the Greek drama, or of those modelled more or less closely upon it.

'To no other reason is to be ascribed the circumstance that Shakespeare so constantly combined two actions in the course of a single play, not merely supplementing the one

by means of the other as a bye or under-plot. In uo respect is the progress of his technical skill as a dramatist nore apparent,—an assertion which a comparison of plays clearly ascribable to successive periods of his life would satisfactorily establish.

Should it, however, be sought to express in one word the greatest debt of the drama to Shakespeare, this word must be the same as that which expresses his supreme gift as a dramatist. It is in characterization—in the drawing of characters ranging through almost every type of humanity which furnishes a fit subject for the tragic or the comic art —that he remains absolutely unapproached ; and it was in this direction that he pointed the way which the English drama could not henceforth desert without

becoming untrue to itself. It may have been a mere error of judgment which afterwards held him to have been surpassed by others in particular fields of characterization (which, for- sooth, regarded him as supremely excellent in male but not in female characters). But it was a sure sign of decay when our writers began to shrink from following him in the endeavour to make the drama a mirror of humanity, and when, in self-condemned arrogance, they thrust un- reality back upon a stage which he had animated with the warm breath of life, where Juliet had blossomed like a flower of spring, and where Othello's noble nature had suffered and sinned,

By the numerous body of poets who, contemporary with Shakespeare or in the next generation, cultivated the wide |

origin. Shakespeare had accordingly only blended elements derived from it into the action of his romantic comedies. In more or less isolated works Jonson, Fletcher, Daniel, Randolph, and others sought to rival Tasso and Guarini,— Jonson? coming nearest to nationalizing an essentially foreign growth by the fresh simplicity of his treatment, Fletcher* bearing away the palm for beauty of poetic execution. position, mixing in varying proportions its constituent elements of declamation and dialogue, music and dancing, decoration and scenery. In its least elaborate literary form—which, of course, externally was the most elaborate— it closely approached the pageant ; in other instances the distinctness of its characters or the fullness of the action introduced into its scheme, brought it nearer to the regular drama. A frequent ornament of Queen Elizabeth's pro- gresses, it was cultivated with increased assiduity in the reign of James I., and in that of his successor outshone, by the favour it enjoyed with court and nobility, the attractions of the regular drama itself. Most of the later Elizabethan dramatists contributed to this species, upon which Shake- speare only incidentally in the course of his dramas ex- pended the resources of his fancy; but by far the most successful writer of masks was Ben Jonson, of whose numerous compositions of this kind many hold a permanent place in our poetic literature, and "next" whom, in his own judgment, "only Fletcher and Chapman could write a mask." From a poetic point of view, however, they were at least rivalled by Dekker and Ford ; in productivity and favour T. Campion (d. 1623) seems for a time to have excelled. Inasmuch, however, as the history of the mask in England is to a great extent that of

“painting and carpentry ” and of Inigo Jones, it need not here be further pursued. The Aficrocosmus of T. Nabbes (print2d 1637), which is very like a morality, seems to have been the first mask brought upon the public stage. It was the perform- ance of a mask by Queen Henrietta Maria and her ladies at Whitehall which had some years previously (1632) been thought to have supplied to the invective of Mistrio Mastix against the stage the occasion for disloyal innuendo; and it was for the performance of a mask in a great nobleman’s castle that a very different Puritan had not long afterwards

1 Massinger, The Virgin Martyr; Shirley, St Patrick for Treland. 2 Dariusy Cresus; Julius Cesar; The Alexandrean Tragedy. 3 The Sad Shepherd. 4 The Faithful Shepherdess,

The mask was a more elastic kind of com- The mask.

The later Eliza- bethan drama,

Tragedy.

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(1634) composed one of the loftiest and loveliest of English poems, Comus has been judged and condemned as a drama,—unjustly, for the dramatic qualities of a mask are not essential to the species. Nor need its history in England have here been referred to, were it not so inseparably connected with that of the Elizabethan drama. In later times the mask merged into the opera, or continued a humble life of its own apart from contact with higher literary effort. It is strange that our later poets should have done so little to restore to its nobler uses, and to invest with a new significance, a form of so proved a flexibility as the poetic mask.

The annals of our drama proper in the period reaching from the closing years of Elizabeth to the outbreak of the great Revolution include, together with numerous names relatively insignificant, many illustrious in the history of our poetic literature. Among Shakespeare’s contemporaries and successors there is, however, but one who by the energy of his genius, not less than by the circumstances of his literary career, stands in a position of undisputed primacy among lis fellows. Ben Jonson (1573-1635), to whom

in his latter days a whole generation of younger writers did homage as to their veteran chief, was alone in full truth the founder of a school or family of dramatists. Yet his pre-eminence did not (whatever he or his followers may have thought) extend to both branches of the regular drama. In tragedy he fell short of the highest success ; the weight of his learning lay too heavily upon his efforts to draw from deeper sources than those which had sufficed for Shakespeare. Such as they are, his tragic works! stand almost, though not quite, alone in this period as examples of sustained effort in historic tragedy proper. G. Chapman (1557 or 1559-1634) treated stirring themes, more especially from modern French history,' always with vigour, and at times with genuine effectiveness; but though rich in beauties of detail, he failed in this branch of the drama to follow Shakespeare even at a distance in the supreme art of fully developing a character by means of the action. Mention has already been made of Ford's isolated effort in the direction of historic tragedy and of those excursions into the still popular domain of the chronicle history by T. Heywood, Dekker, and others, which are to be regarded as nothing more than retrogres- sions. With the great body of the English dramatists of this and of the next period, tragedy had passed into a phase where its interest depended mainly upon plot and incident. The romantic tragedies and tragi-comedies which fill our literature in this period constitute together a growth of at first sight astonishing exuberance, and in mere externals of theme—ranging from Byzantium to ancient Britain, and from the Caesars of ancient Rome to the tyrants of the Renaissance—of equally astonishing variety. The sources from which these subjects were derived had been constantly on the increase. Besides Italian, Spanish, and French fiction, original or translated, besides British legend in its Romance dress, and English fiction in its humbler or in its more ambitious and artificial forms, the contemporary foreign drama, especially the Spauish, offered opportunities for resort. To the English, as to the French and Italian drama, of both this and the following century, the prolific dramatists clustered round Lope de Vega and Calderon supplied a whole arsenal of plots, incidents, and situations—among others to Middleton, to Webster, and most sigually to Beaumont and Fletcher. And in addition to these materials, a new field of resources was at hand since our dramatists had begun to regard events and episodes of English domestic life as fit subjects for tragic treatment.

‘ Sejanus his Fall; Catiline his Conspiracy. p ee) d Ambois; The Revenge of B. d’A.; The Conspiracy of yron; The Tragedy of B.; Chabot, Admiral of France (with Shirley).

Domestic tragedy of this description was indeed no novelty on the English stage; Shakespeare himself may have touched, with his master-hand, more than one effort of this kind ;3 but T. Heywood (c. 1570-c. 1605) may be regarded as the first who achieved any work of considerable literary value of this class,* to which some of the plays of T. Dekker (c. 1570-c. 1640), T. Middleton, aud otliers like- wise more or less beloug. Yet in contrast to this wide variety of sources, and consequent apparent variety of themes, the number of motives employed—at least as a rule—in the tragic drama of this period was comparatively small and limited. Hence it is that, notwithstanding the diversity of subjects among the tragic dramas of such writers as Marston, Webster, Fletcher, Ford, and Shirley, an impression of sameness is left upon us by a connected perusal of these works. Politic ambition, conjugal jealousy, absolute female devotion, unbridled masculine passion, such are the motives which constantly recur in the Decameron of our later Elizabethan drama. And tliis impression is heightened by the want of moderation, by the excess of passion, which these dramatists so habitually exhibit in the treatment of their favourite themes, All the tragic

poets of this period are not equally amenable to this charge; in J. Webster? (d. c. 1650), master as he is of the j effects of the horrible, and in J. Ford® (1586-c. 1640), surpassingly seductive in his sweetness, the monotony of exaggerated passion is broken by those marvellously sud- | den and subtle touches through which their tragic genius | creates its most thrilling effects. Nor will the tendency to excess of passion which F. Beaumont (1586-1616) and J. Fletcher (1576-1625) undoubtedly exhibit be confounded with their distinctive power of sustaining tenderly pathetic characters and situations in a degree unequalled by any of their contemporaries—a power seconded by a beauty of diction and softness of versification which for a time raised them to the highest pinnacle of popularity, aud which entitles them in their conjunction, and Fletcher as an inde- pendent worker, to an enduring pre-eminence among their fellows. In their morals Beaumont and Fletcher are not above the level of their age. The manliness of sentiment which ennobles the rhetorical genius of P. Massinger (1584- 1640), and the gift of poetic

illustration which entitles J. Shirley (1595-1666) to be remembered as something besides the latest and the most fertile of this group of dramatists, have less direct bearing upon the general character of the tragic art of the period. The common features of the romantic tragedy of this age are sufficiently marked, but not capable of obscuring the distinctive features in its individual writers which it is the highest function of criticism to discover and establish.

In comedy, on tke other hand, the genius and the in- Comedy. sight of Jonson pointed the way to a steady and legitimate Ben advance. His theory of “humours” (which found the Js most palpable expression in two of his earliest plays’), if translated into the ordinary language of dramatic art, signifies the paramount importance in the comic drama of the creation of distinctive human types. In the actual | creation of these it was impossible that Jonson should | excel Shakespeare; but in the consciousness with which he | recognized and indicated the highest sphere of a comic | dramatist’s labours, he rendered to the drama a direct service which Shakespeare had left unperformed. By the rest of lris contemporaries and. his successors, some of whom (such as Brome) were content avowedly to follow in his footsteps,

Jonson was only occasionally rivalled in individual

3 Arden of Faversham; A Yorkshire Tragedy,

4 A Woman killed with Kindness.

5 Vittoria Coromboni; The Duchess of Malfi.

6 °Tis Pity She ’s a Whore; The Broken Hearc.

7 Every Man in his Humour; Every Man out of his Tumour

instances of comic creations; in the entirety of its achieve- ments his genius as a comic dramatist remained un- approached. he favourite types of Jonsonian comedy, to which Dekker, J. Marston (1575-1624), and Chapman

had, though to no large extent, added others of their own, were claborated with incessant zeal and remarkable effect by their contemporaries and successors. It was after a very different fashion from that in which the Roman comedians reiterated the ordinary types of the New Attic comedy, that the inexhaustible verve of T. Middleton (1574-1624), the buoyant productivity of Fletcher, the observant humour of N. Field (c. 1590-c. 1640), and the artistic versatility of Shirley—not to mention many later and lesser names— mirrored in innumerable pictures of contemporary life the undying follies and foibles of mankind. As comedians of manners more than one of these surpassed the old master, not indeed in distinctness and correctness,—the fruits of the most painstaking genius that ever fitted a learned sock to the living realities of life,—but in a lightness which did not impair their sureness of touch; while in the construction of plots the access of abundant new materials, and the greater elasticity in treatment which is the result of accumulated experience, enabled them to maintain a steady progress. Thus our comic dramatic literature from Jonson to Shirley is unsurpassed as a comedy of manners, while as a comedy of character it at least defies comparison with any other national literary growth preceding or contemporane- ous with it. Though the younger generation, of which W. Cartwright (1611 or 1615-1643) may be taken as an example, was unequal in originality or force to its prede- cessors, yet so little exhausted was the vitality of the species, that its traditions survived the enterregnum of the Revolution, and conuected themselves in some measure with later growths of English comedy.

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The later § The rivals against which in its closing period the old Eliza- English drama had to contend have been already noticed. — From the masks and triumphs at court and at the houses

of the nobility, with their Olympuses and Parnassuses built by Inigo Jones, and filled with goddesses and nymphs clad in the gorgeous costumes designed by his inventive hand, to the city pageants and shows by land and water,—from the tilts and tournaments at Whitehall to the more philoso- phical devices at the Inns of Court and the academical plays at the

universities,—down even to the brief but thrilling theatrical excitements of Bartholomew Fair and the _ Ninevitical motions ” of the puppets,—in all these ways the various sections of the theatrical public were tempted aside. Foreign performers—French and Spanish actors, and even French actresses —paid visits to London. But the national drama held its ground. The art of acting main- tained itself at least on the level to which it had been brought by Shakespeare’s associates and contemporaries, Burbadge and Heminge, Alleyn, Lewin, Taylor, and others “‘of the older sort.” The profession of actor came to be more generally than of old separated from that of playwright, though they were still (as in the case of Field) Occasionally combined. But this rather led to an increased appreciation of artistic merit in actors who valued the dignity of their own profession and whose co-operation the authors learnt to esteem as of independent significance. The stage was purged from tlie barbarism of the old school of clowns. Women’s parts were still acted by boys, many of whom attained to considerable celebrity; and a practice was thus continued which placed the English theatre at a considerable disadvantage as compared with the Spanish (where it never obtained), and which probably to some extent reacted upon the licence of expression assumed by our dramatists. The arrangement of the stage, which facilitated a rapid succession of scenes without any necessity for their being organically connected with one another, re-

mained essentially the same as in Shakespeare’s days, though the primitive expedients for indicating locality had begun to be occasionally exchanged for scenery more or less appropriate to the place of action. Costume was apparently cultivated with much greater care ; and there is no reasou to suppose that the English stage of this period had not gone as far as was expedient in a direction in which in feebler times so vast an amount of effort has come to be spent. The drama still depended in the main upon its literary essentials and upon the actor’s art ; but the system of prologues and epilogues, and of dedications to published plays, was more uniformly employed than it had been by Shakespeare as the conventional mcthod of

recommending authors and actors to the favour of individual patrons, and to that of their chief patron, the public.

Up to the outbreak of the Civil War the drama in all its The drama forms continued to enjoy the favour or good-will of the #04 Puri- court, although a close supervision was exercised over al] ™™- **attempts to make the stage the vehicle of political references or allusions. The regular official agent of this supervision was the Master of the Revels ; but under James I. a special ordinance, in harmony with the king's ideas concerning the dignity of the throne, was passed " against representing any modern Christian king in plays on the stage." The theatre could hardly expect to be allowed a liberty of speech in reference to matters of state denied to the public at large ; and occasional attempts to indulge in the freedom of criticism dear to the spirit of comedy met with more or less decisive repression and punishment.! But the sympathies of the dramatists were so entirely on the side of the court, that the real difficulties against which the theatre had to contend came from a directly opposite quarter. With the growth of Puritanism the feeling of hostility to the stage increased in a large part of the popu- lation, well represented by the civic authorities of the capital, This hostility found many ways of expressing itself. The attcmpts to suppress the Blackfriars theatre (1619, 1631, 1633) proved abortive; but the representation of stage plays continued to be prohibited on Sundays, and during the prevalence of the plague in London in 1637 was temporarily suspended altogether. The desire of the Puritans of the more pronounced type openly aimed at a permanent closing of the theatres. The war between them and the dramatists was accordingly of a life-and- death kind. On the one hand, the drama heaped its bitterest and often coarsest attacks upon whatever savoured of the Puritan spirit ; gibes, taunts, caricatures in ridicule and aspersion of Puritans and Puritanism make up a great part of the comic literature of the later Elizabethan drama and of its aftergrowth in the reigns of the first two Stuarts. This feeling of hostility, to which Shakespeare was no stranger,? though he cannot be connected with the authorship of one of its earliest and coarsest expressions,® rose into a spirit of open defiance in some of the master- pieces of Ben Jonson ;** and the comedies of his contempor- aries and successors® abound in caricatured reproductions of

the more common or more extravagant types of Puritan life. On the other hand, the moral defects, the looseness of tone, the mockery of ties sanctioned by law and conse- crated by religion, the tendency to treat middle-class life as the hunting-ground for the amusements of the upper classes, which degraded so much of the dramatic literature

1 Chapman, Marston (and Jonson), Hastward Hoe (1605); Mid- dleton, A Game at Chess (1624); Shirley and Chapman, The Bail (1632); Massinger (7), The Spanish Viceroy (1634).

2 Twelfth Night.

‘3 The Puritan, or The Widow of Watling Street, by ““W. 8S.” {Wentworth Smith ?)

4 The Alchemist; Bartholomew Fair.

5 Chapman, An Humorous Day’s Mirth; Courtesan; Middleton, The Family of Love.

Marston, The Dutch VIL. — 55

Closing of the theatres.

Revival of the drama.

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of the age, intensified the Puritan opposition to all and any stage plays. A patient endeavour to reform instead of suppressing the drama was not to be looked for from such adversaries, should they ever possess the _Ineans of carrying out their views; and so soon as Puritanism should victoriously assert itself in the state, the stage was doomed, Among the attacks directed agaiust it in its careless heyday of prosperity Prynne’s Histrio Mastox (1632), while it involved its author in shamefully cruel persecution, did not remain wholly without effect upon the tone of the dramatic literature of the subsequent period ; but the quarrel between Puritanism and the theatre was too old and too deep to end in any but one way, so soon as the latter was

deprived of its protectors. The Civil War begau in August 1642; and early in the following month was published the Ordinance of the Lords and Commons, which, after a brief and solemn preamble, commanded “that while these sad causes and set-times of humiliation do coutinue, public stage plays shall cease and be forborne.” Many actors and playwrights followed the fortunes of the royal cause in the field ; some may have gone into a more or less voluntary exile ; upon those who lingered on in the familiar haunts the hand of power lay heavy ; and though there seems reason to believe that dramatic entertainments of one kind or another continued to be occasionally presented, stringent ordinances gave summary powers to magistrates against any players found engaged in such proceedings (1647), aud bade them treat all stage-players as rogues, and pull down all stage galleries, seats, and boxes (1648),

A few dramatic works were published in this period ;

while at fairs about the country were acted farces called “drolls,” consisting of the most vulgar scenes to be found in popular plays. Thus, the life of the drama was not absolutely extinguished ; and its darkest day proved briefer than perhaps either its friends or its foes could have supposed.

Already “in Oliver’s time” private performances took place from time to time at noblemen’s houses and (though not undisturbed) in the old haunt of the drama, the Red Bull. In 1656 the ingenuity of Sir William Davenant (1606-1669), whose name, though not otherwise eminent in our dramatic literature, is memorable as connecting together two distinct periods in it, ventured ona bolder step in the production of a quasi-dramatic entertainment “of declamation and music ;” and in the following year he brought out with scenery and music a piece which was afterwards in an enlarged form acted and printed as the first part of his opera, Zhe Siege of Rhodes. This entertainment he afterwards removed from the private house were it had been produced to the Cockpit, where he soon ventured upon the performance of regular plays written by himself. Thus, under the cover of two sister arts, Whose aid was in the sequel to prove by no means altogether beneficial to its progress, the English drama had boldly anticipated the Restoration, and was no longer hid- ing its head when that much desired event was actually brought about, Soon after Charles IT.’s en try into

London, two theatrical companies are known to have been acting in the capital. For these companies patents were soon granted, under the names of “the Duke (of York)’s” and “the King’s Servants,” to Davenant and one of the brothers Killigrew respectively,—the former from 1662 acting at Lincoln’s Inn Fields, then at Dorset Garden in Salisbury Court, the latter from 1663 at the Theatre Royal near Drury Lane. These companies were united from 1682, a royal licence being granted in 1695 to a rival company which performed in Lincoln’s Inn Fields, and Which migrated to Covent Garden in 1733. Meanwhile Vanbrugh had in 1705 built the theatre in the Haymarket ; and a theatre in Goodman’s Fields—afterwards rendered

famous by the first appearance of Garrick—led a fitful existence from 1729 to 1733. The Act of 1737 deprived the Crown of the power of licensing any more theatres i so that the history of the English stage for a long period was confined to a limited area. The rule which prevailed after the Restoration, that neither of the rival companies should ever attempt a play produced by the other, operated beneficially both upon the activity of dramatic authorship and upon the progress of the art of acting, which was not exposed to the full effects of that deplorable spirit of personal rivalry which leads actors, in order to outshine their fellows, to attempt parts for which they often have no special qualification, There can be little doubt that the

! actor’s art has rarely flourished more in England than in

the days of T. Betterton (1635-1710) and his con- temporaries, among whose names those of Hart, Mohun, Kynaston, Nokes, Mrs Barry, Mrs Betterton, Mrs Bracegirdle, and Mrs Eleanor Gwynne have, together with many others, survived in various connections among the memories of the Restoration age. No higher praise has ever been given to an actor than that which Addison bestowed upon Betterton, in describing his performance of Othello as a proof that Shakespeare could not have written the tnost striking passages of the character other- wise than he has done.

It may here be noticed, that the fortunes of the Irish The trish theatre in general followed those of the English, of which stage

of course it was merely a branch. Of native dramatic compositions in earlier times not a trace remains in Ireland ; and the drama was introduced into that country as an English exotic—apparently already in the reign of Henry VIII., and more largely in that of Elizabeth. The first theatre in Dublin was built in 1635; but in 1641 it was closed, and even after the Restoration the Irish stage continued in a precarious condition till near the end of the century.

Already in te period preceding the outbreak of the The later civil war the English drama had perceptibly sunk from Stull the height to which it had been raised by the great ©”

Elizabethans, When it had once more recovered possession of that arena with which no living drama can dispense, it would have been futile to demand that the dramatists should return altogether into the ancient paths, unaffected by the influences, native or foreign, in operation around them. But there was no reason why the new drama should not, like the Elizabethan, be true in spirit to the higher purposes of the dramatic art, to the nobler tendencies of the national life, and to the eternal demands of moral law. Because the later Stuart drama was as a whole untrue to these, and, while following its own courses, never more than partially returned from the aberrations to which it con- demned itself, its history is that of a decay which the indisputable brilliancy, borrowed or original, of many of its productions is incapable of concealing.

Owing in part to the influence of the French theatre, which by this time had taken the place of the Spanish as the ruling drama of Europe, the separation between tragedy and comedy is clearly marked in our post-Restoration plays. Comic scenes are still occasionally introduced into tragedies by some of our dramatists who adhered more closely to the Elizabethan models (such as Otway and Crowne), but the practice fell into disuse ; while the endeavour to elevate comedy by pathetic scenes and motives is one of the char- acteristic marks of the beginning of another period in our dramatic literature. The successive phases through which English tragedy passed in the later Stuart times cannot be always kept distinct from one another ; and

the guidance offered by the theories put forth by some of the dramatists in support of their practice is often delusive. Following the example of Corneille, Dryden and his contemporaries

and successors were fond of proclaiming their adherence to this or that principle of dramatic construction or form, and of upholding, with much show of dialectical acumen, maxims derived by them from French or other sources, or elaborated with modifications and variations of their own, but usually amounting to little more than what Scott calls “ certain romantic whinisical imitations of the dramatic art.” The student of the drama will find much both to entertain and to instruct him in these prefaces, apologies, dialogues, and treatises ; he will acknowledge that Dryden’s incom- parable vigour does not desert him either in the exposing or in the upholding of fallacies; and that even Rymer,? usually regarded as having touched the nadir of dramatic criticism, is not wholly without grains of salt. But Restoration tragedy itself must not be studied by the light of Restoration criticism. So long as any dramatic power remained in our tragic poets—and it is absent from none of the chief among them from Dryden to Rowe—the struggle between fashion (disguised as theory) and instinct (tending in the direction of the Elizabethan traditions) could never wholly determine itself in favour of the former.

Lord Orrery (1621-1679), in deference, as he declares, to the expressed tastes of his sovereign King Charles II. himself, was the first to set up the standard of herotc plays. This new species of tragedy (for such it professed to be) commended itself by its novel choice of themes, to a large extent supplied by recent French romance—the romans de longue haleine of the Scudérys and their contemporaries— and by French plays treating similar themes. It likewise borrowed from France that garb of rhyme which the English drama had so long abandoned, and which now reappeared in the heroiccouplet. But the themes which to readers of novels might seem of their nature inexhaustible could not long suflice to satisfy the more capricious appetite of theatrical audiences ; and the form, in the ap- plication it was sought to enforce for it, was doomed to remain an exotic. Jn conjunction with his brother-in-law Sir R. Howard (1626-1698),? and

afterwards more con- fidently by himself,? Dryden (1631-1699) threw the incomparable vigour and brilliancy of his genius into the scale, which soon rose to the full height of fashionable popularity. At first he claimed for English tragedy the right to combine her native inheritance of freedom with these valuable foreign acquisitions. Nor was he dismayed by the ridicule which the celebrated burlesque (by the duke of Buckingham and others) of The Rehearsal (1671) cast upon heroic plays, without discriminating between them and such other materials for ridicule as the contem- porary drama supplied to its facetious authors, but returned to the defence of a species ° which he was himself in the end to abandon. ‘The desire for change proved stronger than the love of consistency—which in Dryden was never more than theoretical. After summoning tragedy to rival the freedom (without disdaining the machinery) of opera, he came to recognize in characterization the truest secret of the master-spirit of the Elizabethan drama,° and, after auda- ciously but not altogether unhappily essaying to rival Shakespeare on his own ground,’ produced under the influ- ence of the game views at least one work of striking merit.® But he was already growing weary of the stage itself as well as of the rhymed heroic drama; and though he put an end to the species to which he had given temporary vitality, he failed effectively to point the way to a more legitimate development of English tragedy. Among the) pe “ne

1 4 Short View of Tragedy (1693). 2 The Indian Queen.

3 The Indian Emperor; Tyrannic Love; The Conquest of Granada.

4 Essay of Dramatic Poesy.

5 Essay of Heroic Plays.

6 The Grounds of Criticism in Tragedy.

7? All for Love (Antony and Cleopatra). 8 Don Sebastian,

other tragic poets of this period, N. Lee (1650-1690), in the outward form of his dramas, accommodated his practice to that of Dryden, with whom he occasionally co-operated as a dramatist, and like whom he allowed political partisanship to intrude upon the stage. His rhetorical genius was not devoid of genuine energy, nor is he to be regarded as a mere imitator. T. Otway (1651-1695), the most gifted tragic poet of the younger generation contemporary with Dryden, inherited some- thing of the spirit of the Elizabethan drama; he possessed a real, gift of tragic pathos and of expressive tenderness; but his genius had an alloy of impurity, and though he was often happy in his novel choice of themes, his efforts were as incomplete as his end was pre- mature. T. Southerne (1660-1746) was likewise possessed of pathetic power ; but his success was primarily due to his skill in the choice of " sensational" plots ;° J. Crowne (d. c. 1703), Lord Lansdowne ("Granville the polite") (c. 1667-1735), Congreve, by virtue of a single long cele- brated but not really~remarkable tragedy,!° and N. Rowe (1673-1718) may be further singled out from the list of the tragic dramatists of this: period, many of whom were, like their comic contemporaries, mere translators or adapters from the French. The tragedies of Rowe, whose direct services to the study of Shakespeare are not to be forgotten, indicate with singular distinctness the transition from the fuller declamatory style of Dryden to the calmer and thinner manner of Addison. In tragedy (as to a more marked degree in comedy) the excesses (both of style and subject) of the past period of the English drama had pro- duced an inevitable reaction; decorum was asserting its claims on the stage asiin society ; and French tragedy had set the example of sacrificing what passion—and what vigour —it retained in favour of qualities more acceptable to the "reformed" court of Louis XIV. Addison (1672-1719), in allowing his Cato to take its chance upon the stage, when a moment of political excitement (April 1718) ensured it an extraordinary success, to which no feature in it corresponds, except an unusual number of lines predestined to become familiar quotations, sealed the doom of English national tragedy. The "first reasonable English tragedy," as Voltaire called it, had been produced, and the oscillations of the tragic drama of the Restoration were at an end.

English comedy in this period displayed no similar Comedy.

desire to cut itself off from the native soil, though it freely borrowed the materials for its plots and many of its figures from Spanish, and afterwards more generally from French, originals. The spirit of the old romantic comedy had long since fled; the graceful artificialities of the pastoral drama, even the light texture of the mask, ill suited the demands of an age which made no secret to itself of the grossness of its sensuality. With a few unimportant exceptions, such poetic elements as admitted. of being combined with the poetic drama were absorbed by the opera and the ballet. No new species of the comic drama formed itself, though towards the close of the period may be noticed the beginnings of modern English farce. Political and religious partisanship, generally in accordance with the dominant reaction against Puritanism, were allowed to find expression in the directest and coarsest forms upon the stage, and to hasten the necessity fur a more systematic control than even the times before the Revolution had found requisite. At the same time the unblushing inde- cency which the Restoration had spread through court and capital had established its dominion over the comic stage, corrupting the manners, and with them the morals, of its dramatists, and forbidding them, at the risk of seeming

9 Oroonoko ; The Fatal Marriage. 10 The Mourning Bride.

A36 dull, to be anything but improper. Much of this found its way even into the epilogues, which, together with the pro- logues, proved so important an adjunct of the Restoration drama. ‘These influences determine the general character of what is with a more than chronological meaning termed the comedy of the Restoration. In construction, the national love of fulness and solidity of dramatic treat- ment induced its authors to alter what they borrowed from forcign sources, adding to complicated Spanish plots characters of native English directness, and supplementing single French plots by the addition of others. At the same time the higher efforts of French comedy of character, as well as the refinement of expression in the list of their models, notably in Moliére, were alike seasoned to suit the coarser appetites and grosser palates of English patrons. The English comic writers often succceded in strengthening the borrowed texture of their plays, but they never added comic humour without at the same time adding coarseness of theirown. Such were the productions of Sir George Etherege (c. 1636~c. 1694), Sir Charles Sedley (c. 1639- ce. 1728), and the other “gentlemen

who wrote at ease ;” nor was there any signal difference between their productions and those of a playwright-actor, such as J. Lacy (d. 1681), and a professional dramatist of undoubted ability, such as J. Crowne. Such, though often displaying the bril- liancy of a genius which even where it sank could never wholly abandon its prerogative, were, it must be confessed, the comedies of Dryden himself. On the other hand, the lowest literary deeps of the Restoration drama were sounded by T. D’Urfey (1630-1723), while of its moral degradation the “divine Astrea,” the “unspeakable ” Mrs Aphra Behn (1642-1689) has an indefeasible title to be considered the most faithful representative. ‘‘T. Shadwell (1640-1692), fated like the tragic poet Elkanah Settle (1648-1724), to be chiefly remembered as a victim of Dryden’s satire, deserves more honourable mention. Like J. Wilson (d. 1690), whose plays seem to class him with the pre-Restoration dramatists, Shadwell had caught something not only of the art, but also of the spirit, of Ben Jonson; but in most of his works he was, like the rest of his earlier contemporaries, and like the brilliant group which succeeded them, content to take his moral tone from the reckless society for which, or in deference to the tastes of which, he wrote. The absence of a moral sense, which, together with a grossness of ex- pression often defying exaggeration, characterizes our comic dramatists from the days of Dryden to those of Con- greve, is the main cause of their failure to satisfy the demands which are legitimately to be made upon their art. They essayed to draw character as well as to paint manners, but they rarely proved equal tv the former and higher task ; and while choosing the means which most readily commended their plays to the favour of their immediate public, they achieved but little as interpreters of those essential distinctions which their art is capable of illustrating. Within these limits, though occasionally passing beyond them, and always with the same deference to the immoral tone which seemed to have become an indispensable adjunct of the comic style, even the greatest comic authors of this age moved. W. Wycherley (1640-17 15) was a comic dramatist of real power, who drew his characters with vigour and distinct- ness, and constructed his plots and chose his language with natural ease. He lacks gaiety of spirit, and his wit is of a cynicalturn, But while he ruthlessly uncloaks the vices of his age, his own moral tone is affected by their influence in as marked a degree as that of the most light-hearted of his contemporaries. The most brilliant of these was in- disputably WwW.

Congreve (1672-1728), who is not only one of the very wittiest of English writers, but equally excels

in the graceful ease of his dialogue, and draws his characters and constructs his plots with the same masterly skill. His chief fault as a dramatist is one of cxcess—the brilliancy of the dialogue, whoever be the speaker, overpowers the dis- tinction between the “humours” of his personages. Though he is less brutal in expression than “manly” Wycherley, and less coarse than the lively Sir J. Vanbrugh (c. 1666- 1726), licentiousness in him as in them corrupts the spirit of ‘his cornice art; but of his. best though not most successful play! it must be allowed that the issue of the main plot is on the side of virtue. G, Farquhar (1678- 1707), whose morality is on a par with that of the other members of this group, is inferior to them in brillianey; but as pictures of manners in a wider sphere of life than that which contemporary comedy usually chose to illustrate, two of his plays deserve to be noticed, in which we alrcady seem to be entering the atmosphere of the 18th century novel.?

The improvement which now begins to manifest itself in the moral tone and spirit of English comedy is partly due to the reaction against.the reaction of the Restoration, partly to the punishment which the excesses of the comic stage had brought upon it in the invective of Jeremy Collier? (1698), of all the assaults the theatre in England has had to undergo the best-founded, and that which pro- duced the most perceptible results, The comic poets, who had always becn more or less conscious of their sins, and had at all events not defended them by the ingenious sophistries which it has pleased later literary criticism to suggest on their behalf, now began with uneasy merriment to allude in their prologues to the reformation which had come over the spirit of the town. Writers like Mrs Centlivre (c. 1678-1722) became anxious to reclaim their offenders with muck emphasis in the fifth act; and Colley Cibber (1671-1757)—whose Apology for his Life furnishes a useful view of this and the subsequent period of the history of the stage, with which he was connected as author, manager, and actor (excelling in this capacity as representative of those fools with which he peopled the

comic stage*)—may be credited with the moral intention he claims to have kept in view throughout his career as a drama- tist. Sir R. Steele (1671-1729), in accordance with his general tendencies as a writer, pursued a still more definite moral purpose in his comedies; but his genius perhaps lacked the sustained vigour necessary for a dramatist, and his humour naturally sought the aid of pathos. Accord- ingly, taking a hint from Colley Cibber, who so well under- stood the public taste, Steele, passing from partial to more complete® experiment, became the founder of that sentimen- tal comedy which exercised so depressing an influence upon the progress of our drama. Thus the two writers whose associated efforts so largely contributed to open a new and productive vein in our literature, both signally helped to hasten the decline of its dramatic branch. With Cato English tragedy committed suicide, though its pale ghost survived; with Zhe Conscious Lovers English comedy sank into the tearful embrace of artificiality and weak- ness, from which it has never again altogether torn itself away. |

It seems superfluous within the limits of a summary like the present to attempt to classify with any degree of minuteness the remaining phenomena in the history of our dramatic literature. During the 18th century its produc- tions were still as a rule legitimately designed to meet the demands of the stage, from which its higher efforts after-

1 The Double Dealer.

- The Recruiting Officer; The Beaus’ Stratagem.

3A Short View of the Immorality and Profaneness of the English Stage. * Sir Novelty Fashion (Lord Foppington), &e.

° The Lying Lover; The Tender Husband. © The Conscious Lovers.

be |

Seuti- mental comedy,

The drama

and stage in the period before Garrick.

)

Garrick,

Decline of tragedy.

ENGLISH. |

wards to so large an extent became dissociated. But the demands of the stage and those of its patrons and of the public of the “Augustan” age, and of that which succeeded it, in general were fast bound by the trammels of a taste with which a revival of the poetic drama remained irreconcilable during a long period of our litcrature. There is every reason to conclude that the art of acting progressed in the same direction of artificiality, and stiffened into apparently immutable forms in such actors as Macklin and Quin. The genius of Garrick, whose theatrical career extended from 1741 to 1776, opened a new era in his art. His unparal- leled success was due in the first instance to his incompar- able natural gifts; but these were indisputably enhanced by a careful and continued. literary training, and ennobled by a purpose which prompted him to essay the noblest, as he was capable of performing the most various, range of English theatrical characters. By devoting himself as actor and manager with special zeal to the production of Shake- speare, Garrick permanently popularized on the national stage the greatest creations of our drama, and indirectly helped to seal the doom of the surviving tendency to main- tain in the most ambitious walks of our dramatic literature the nerveless traditions of the pscudo-classical school. A generation of celebrated actors and actresses, many of whom live for us in the drastic epigrams of Churcliill’s Rosciad (1761), were his helpmates or his rivals ; but their fame has paled, while his is destined to endure as that of one of the typical masters of his art.

The contrast between the tragedy of the 18th century and those plays of Shakespeare and one or two other Elizabethans which already before Garrick were known to the English stage, was indeed weakened by the mutilated form in which these generally, if not always, made thcir appearance there. Even so, however, there are perhaps few instances in

theatrical history in which so strange a competition was so long sustained. In tlic hands of the tragic poets of the age of Pope, as well as of that of Johnson, tragedy had hopelessly stiffened into the forms of its accepted French models. Direct reproductions of these continued, as in the case of Ambrose Philips's (c. 1671- 1749) and Charles Johnson's (1679-1748) translations from Racine, and Aaron Hill's (1685-1750), from Voltaire. Among other tragic dramatists of the earlier part of the century may be mentioned J. Hughes (1677-1720), who, after assisting Addison in his Cato, produced at least one praiseworthy tragedy of his own;! FE. Fenton (1683-1730), a joint translator of " Pope's Z/omer" and the author of onc extremely successful drama ;? and L. Theobald (d. 1744), the first hero of the Danctad, who, besides translations of Greek dramas, produccd a few morc or less original plays, one of which he was daring enough to father upon Shakespeare. A more distinguished name is that of J. Thomson (1700-1748), whose unlucky Sophonisba and subsequent tragedies are, however, barely remembered by the side of his poems. The literary genius of E. Young (1681-1765), on the other hand, possessed vigour and variety enough to distinguish his tragedies from the ordinary level of Augustan plays ; in one of them he seems to challenge comparison in the treat- ment of his theme with a very different rival * but by his main characteristics as a dramatist he belongs to the school of his contemporaries. 'The cndeavours of G. Lillo (1693- 1739) to bring the lessons of tragedy home to his fellow-citizens werc destined to excrcise a powerful influence upon the early progress of the German drama, and not to remain without significance for the history of our own ; but lis pedestrian muse failed in the end to satisfy higher artistic demands than those met in his most popular

2 Mariamne. 4 The Revenge (Othello).

1 The Siege of Damascus. 3 The Double Falsehood.

play,® aud broke down in the attempt to carry the terrors of Macbeth into the regions of domestic tragedy.® " Classical" tragedy in the generation of Johnson pursued the even tenor of its way, the dictator himself treading

with solemn footfall in the accustomed path', and Mason (1725-1797) making the futile attempt to produce a close imitation of Greek models. The best-remembered tragedy of the century, Home's Douglas (1757), was the production of an author whose famous kinsman, David Hume, had advised him 'to read Shakespeare, but to get Racine and Voltaire by heart." The indisputable merits of the play cannot blind us to the fact that Douglas is the child of Merope.

While thus no high creative talent arose to revive the English poetic genius of English tragedy, comedy, which had to pera.

contend against the same rivals, naturally met the demands of the conflict with greater buoyancy. The history of the most formidable of those rivals forms no part of this sketch (see OpErRA); but the points of contact between its progress and the history of our dramatic literature cannot be altogether Icft out cf sight. H. Purcell's (1658-1695) endeavours to unite English music to the words of English poets were now a thing of the past ; the isolated efforts of Addison® and others to recover the operatic stage for the native tongue had proved powerless. Italian texts, wich had first made their entrance piecemeal, in the end asserted themselves in their entircty ; and the German genius of Handel completed the triumphs of a form of art which no longer had any connection with the English drama, and which reached the height of its fashionable popularity about the time when Garrick began to adorn the national stage. In one form, however, the English opera was preserved as a pleasing species of the popular drama. The pastoral drama had (in 1725) produced an isolated aftergrowth in Allan Ramsay's Gentle Shepherd, which, with genuine freshness and humour, but withont a trace of burlesque, transferred to the scenery of the Pentland Hills the lovely tale of Florizel and Perdita. 'The dramatic form of this poem is only an accident, but it doubtless suggested an experiment of a different kind to the most playful of London wits. Gay's " Newgate Pastoral " of The Beggar's Opera (1728), in which the amusing text of a burlesque farce was interspersed with songs set to popular airs, caught the fancy of the town by this novel com- bination, and became the ancestor of a series of agreeable productions, none of which, however, have ever rivalled it in celebrity. Among these the pieces of J. Bickerstaff? (c. 1735-c. 1788) and of C. Dibdin!® (1745-1814) may be signalized. The opera in England as

elsewhere thus absorbed what vitality remained to the pastoral drama, while to the ballet and the pantomime (whose glories in England began at Covent Garden in 1733, and to whose popularity even Garrick was obliged to defer) was left (in the 18th century at all events) the inheritance of the external attractions of the mask and the pageant.

In the face of such various rivalries it is not strange that Comedy. comedy, instead of adhering to the narrow path which Buulescme

Steele and others had marked out for her, should have permitted herself some vagaries of her own. Gay's example pointed the way toa fatally facile form of the comic art ; and burlesque began to contribute its influence to the decline of comedy. In an age when party-government was severely straining the capabilities of its system, dramatic satire had not far to look for a source of effective season- ings. The audacity of H. Fielding (1707-1754), whose regular comedies (original or adapted) have secured no enduring remembrance, but whose love of parody was

6 The Fatal Curiosity (Act iii.). 8 Rosamunda. 10 The Waterman, &c,

5 George Barnwell. 7 Trene (1749). * ® Love in a Village, &e.

The Licens- ing Act.

Comedy in the latter half of the 18th century

afterwards to suggest to him the theme of the first of the novels which have made his name immortal, accordingly ventured in two extravaganzas! (so we should call them in these days) upon a larger admixture of political with litcrary and other satire. A third attempt? (which never reached the stage) furnished the offended minister, Sir Robert Walpole, with the desired occasion for placing a curb upon the licence of the theatre, such as had already been advocated by a representative of its old civic adversaries. The famous Act of 1737 asserted no new principle, but converted into legal power the customary authority hither exercised by the Lord Chamberlain (to whom it had deseended from the Master of the Revels). The regular

censorship which this Act established has not appreciably affected the literary progress of the English drama, and the objections which have been raised against it seem on candid consideration untenable. The liberty of the stage is a question differing in its conditions from that of the liberty of speech in general, or even from that of the liberty of the press ; and occasional lapses of official judgment weigh lightly in the balance against the obvious advantages of a system which in a free country needs only the vigilance of public opinion to prevent its abuse. The policy of the restraint which the Act of 1737 put upon the number of playhouses is a different, but has long become an obsoletc, question.

Brought back into its accustomed grooves, English comedy seemed inclined to leave to farce the domain of healthy ridicule, and to coalesce with domestic tragedy in the attempt to make the stage a vehicle of home-spun didactic morality. Farce had now become a genuine English species, and has as such retained its vitality through all the subsequent fortunes of the stage; it was actively cultivated by Garrick as both actor and author, but the very best farce of this age is ascribed to clerical authorship.? S. Foote (1720-1761), whose comedies‘ and farces are distinguished both by wit and by variety of char- acters (though it was an absurd misapplication of a great name to call him the English Aristophanes), introduced into comic acting the abuse of personal mimicry, for the exhibition of which he ingeniously invented a series of entertainments, the parents of a long progeny of imitations. Meanwhile the domestic drama of the sentimental kind had achieved its greatest success in Z’he Gamester of E. Moore (d. 1757) ; and sentimental comedy courted sympathetic applause in the works of A. Murphy (1727-1801), the single comedy of W. Whitehead® (1714-1785), and the earliest of H. Kelly® (1714-1785). It cannot be said that this species was extinguished, as it is sometimes assumed to have been, by O. Goldsmith (1728-1774); but his admirable character-comedy of The Good-Natured Man, and his delightfully brisk and fresh She Stoops to Conquer, after startling critical propriety from its self-conceit, taught comedy no longer to fear being true to herself. ‘The most successful efforts of the elder G. Colman (1733-1794)” had in them something of the spirit of genuine comedy, besides a finish which, however playwrights may shut their eyes to the fact, is one of the qualities which ensure a long life to a play. And in the masterpieces of R. B. Sheridan (c. 1752-1816) some of the happiest features

of the comedy of Congreve were revived, together with its too uniform brilliancy of dialogue, but without its indecency of tone. The varnish of the age is indeed upon the style, and the hollowness of its morality in much of the sentiment (even where that

1 Pasqwin; The Historical Register for 1736.

2 The Golden Rump.

3 Townley, High Life Below Stairs (1759).

4 The Minor; Taste; The Author, &c.

5 The School for Lovers. 6 False Delicacy. 7 The Jealous Wife; The Clandestine Marriage.

sentiment is meant for the audience) of Lhe Rivals and The School for Scandal ; but in tact of construction, in distinctness of characters, and in pungency of social satire, they are to be ranked among the glories of English comedy. Something in Sheridan's style, but quite without his brilliancy, is the most successful play ® of the unfor- tunatc General Burgoyne (d. 1792). R. Cumberland (1732-1811), who too consciously endeavoured to excel both in sentimental morality and in comic characterization, in which lic was devoid of depth, closes the list of authors of higher pretensions who wrote for the theatre. Like him, Mrs Cowley? ("Anna Matilda") (1743-1809), T. Holcroft 1° (1744-1809), and G. Colman the younger! (1762-1836), all writers of popular comedies, as well ag the prolific J. O'Keefe (1746-1833), who contributed to nearly every species of the comic drama, survived into our century. 'To an earlier date belong the favourite burlesques of O'Keefe's countryman K. O'Haral? (d. 1782), good examples of a species the further history of which may be left aside. In the hands of at least one living writer, J. R. Planché, it has proved capable of satisfying a more refined taste than his successors have habitually consulted.

The decline of dramatic composition of the higher class,

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perceptible in the history of the English theatre about the English beginning of the 19th century, is attributed by Scott to the ‘ama of

wearing out of the French model that had been so long wrought upon; while, as he points out, the new impulse which was sought in the dramatic literature of Germany was derived from some of its worst, instead of from its noblest, productions—from Kotzebue rather than from Lessing, Schiller, and Goethe. But the change which was coming over English literature was in truth of a wider and deeper nature than it was possible for even one of its chief representatives to perceive. As that literature freed itself from the fetters so long worn by it as indispensable ornaments, and threw aside the veil which had so long obscured both the full glory of its past and the lofty capabilities of its future, it could not resort except tenta- tively to a form which like the dramatic is bound by a hun- dred bonds to the life of the age itself. Soon, the poems with which Scott and Byron, and the unrivalled prose fictions with which Scott both satisfied and stimulated the imaginative demands of the public, diverted the attcntion of the culti- vated classes from dramatic literature, which was unable to escape, with the light foot of verse or prose fiction, into “the new, the romantic land.” New themes, new ideas, new forms occupied a new generation of writers and readers ; nor did the drama readily lend itself as a vessel into which to pour so many fermenting elements. In Byron (1788-1824) the impressions produced upon a mind not less open to impulses from without than sub- jective in its way of recasting them, called forth a series of dramatic attempts betraying a more or less wilful ignorance oi the demands of dramatic compositions; his beautiful Manfred, partly suggested by Goethe’s Faust, and his power- ful Cain, have but the form of plays; his tragedies on Italian historical subjects show some resemblance in their political rhetoric to the contemporary works of Alfieri; his Werner is a hastily-dramatized sensation novel. To Coleridge (1772-1834), who gave to English literature a fine though inaccurate translation of Schiller’s Wallenstein, the same poet’s Jobbers (to which Wordsworth’s only dramatic attempt, the orderers, is

likewise in- debted) had probably suggested the subject of his tragedy of Osorio, afterwards acted under the title of Remorse. Far

8 The Heiress.

9 The Belle’s Stratagem; A Bold Stroke for a Husband, &c.

10 The Road to Ruin, &c. John Bull; The Heir at Law, &c. 12 Midas; The Golden Pippin.

the 19th

century.

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superior to this is his later drama of Zapolya, a genuine homage to Shakespeare, ont of the themes of two of whose plays it is gracefully woven. Scott, who in his earlier days had translated Goethe’s Gétz von Berlich- ingen, gained no reputation by lis own dramatic compositions. W. 8. Landor (1775-1864), apart from those Imaginary Conversations upon which he best loved to expend powers of observation and character- ization such as have been given to few dramatists, cast in a formally dramatic mould studies of character of which the value is far from being confined to their wealth in beauties of detail. Of these the magnificent, but in con. struction wholly (1792-1822) undramatic, Count Julian is the most noteworthy. Shelley’s (1792-1822) The Cenci, on the other hand, is not only a poem of great beauty, but a drama of true power, abnormally revolting in its theme, but singularly pure and delicate in treatment. A humbler niche in

the temple of our dramatic literature belongs to some of the plays of C. R. Maturin! (1782-1824), Sir T. N. Talfourd? (1795-1854), and Dean Milman® (1791-1868). Divorced, except for moments, from the stage, English drainatic literature in its higher forms can in the present century no longer be regarded as a connected national growth, though it would be rash to deny that with the isolated efforts of individual poets future developments may connect themselves. Among living poets Sir H. Taylor has perhaps approached nearest to the objective spirit and the fullness of style of the Elizabethan drama ; R. H. Horne survives as a worthy representative of the modern Romantic school; Matthew Arnold has the dignity of form of his classic models, Longfellow the graceful facility of a mellow literary culture; while R. Browning's insight into the secrets of human character, and A. ©. Swinburne's gift of passionate poetic speech, are true dramatic qualities. By his Hannibal J. Nichol has likewise made a noteworthy contribution to the higher literature of our drama. The latest English dramatic poet is Tennyson, whose homage to the national form of the his- toric drama may be hopefully interpreted as a promise of the future possibly awaiting it. Far greater is the number of those English writers of the present century who, while seeking to preserve a connection between the demands of the stage and their dramatic productions, have addressed themselves to the theatrical rather than the literary public—since such a distinction must needs be drawn. The respect paid by her contemporaries to the modestly simple and judiciously concentrated efforts of Mrs Joanna Baillie (1762-1851) entitles her to remem- brance in the annals of literature as well as those of the stage ; but it would be going too far to make a similar ex- ception in favour of the plays of Sheridan Knowles (1784-1862) or of the late Lord Lytton (1806-1873). At the present day the theatre commands the services of many authors of talent, a few of whose most successful productions may peradventure be destined to survive the age which gave birth to them. But here, if anywhere, the task of selection must be left to time.

The history of the English stage in the present century has been one of gradual decline and decay, not (especially at the present day) without prospects of recovery, of which @ praiseworthy hopefulness is ever willing to make the most. At the beginning of the century the greatest tragic actress of the English theatre, Mrs Siddons, had passed her prime ; and before its

second decade had closed, not only she (1812), but her brother John Kemble (1817), the representative of a grand style of acting upon which the present generation would hardly dare to look, had with. drawn from the boards. Mrs Siddons was soon followed 2 Ton.

1 Bertram. 3 Fazio.

into retirement by her successor Miss O'Neill (1819) ; while Kemble's brilliant later rival, Edmund Kean, an actor the intuitions of whose genius seem to have supplied, so far as intuition ever can supply, the absence of a steady self-culture, remained on the stage till his death in 1833 Young, Macready, and others handed down some of the traditions of the older school of acting to the very few who remain to suggest its semblance to the living generation. But even these—among whom a tribute of gratitude is specially due to Helen Faucit and 8. Phelps—are now lost (or all but lost) as active members to the theatre, and they have left no school behind them. The comic stage has been fortunate in au ampler aftergrowth, from generation to generation, of the successors of the old actors who live for us in the reminiscences of Charles Lamb; nor are the links all snapped which bind the humours of the present to those of the past. It is least of all in any spirit of depreciation that the efforts of the actors of our day, in any branch of the art, should be discussed. ' But it is right to point out that these efforts are carried on under conditions of a partly novel character, to which the actors are forced to submit. No art stands in greater need of the help of training,—an advantage with which the modern English actor is virtually obliged to dispense. No art stands in greater need of the relief of change in the subjects of its exercise,—but the modern English actor is made to look forward, as to the height of success, to playing the same character for three hundred nights. No art stands in greater need of the guidance of criticism,—but the modern English actor is too often left to criticise himself. Finally, none stands in greater need of the protection of self-respect,—but there are few theatres in England which are not from time to time degraded in deference to tastes which in earlier days not Puritan censors only would have called by a simpler name.

The reaction against the theatre, which set in with the spread of the religious movement at the close of the last century, had the natural effect of lowering instead of raising its tone and manners, as well as those of the literature designed to supply its immediate demands. With tho growth of that enlightenment which is inseparable from tolerance, this reaction seems to be giving place to a counter-reaction ; while on the other hand, a larger section of the educated classes have begun to take an interest in the progress of the national drama, and the world of fashion is condescending to follow the impulse. Dramatic criticism, too—a branch of English literature to which from the days of Steele to those of Hazlitt so many writers of mark were ready to devote their efforts, but which had more recently often fallen into hands either unequal to the task or disdainful of it—seems hcre and there awakening to a sense of its higher dutics. But all this will not permanently recover the stage for its higher tasks, or reunite to it a living dramatic literature, unless an object of serious moment for the future of the nation is pursued in a serious spirit, and unless it is thought worth while to devise means suited to this end. In a word, so long as there is no national theatre which, removed above the conditions of a commercial speculation, can cultivate the art to which it is dedicated for the sake of that art itself, the future of the English drama will be at the mercy of the likings of London, and of the adoption of those likings by the London which is not London, and by the “ provinces,” as in theatrical matters they are only too appropriately called. The time may come when it will be recognized that the progress and culture of a people depend upon its diversions as well as upon its occupations ; and that the interests of a national art are not unworthy the solicitude of thoughtful statesmen.

GERMAN DRAMA,

Its beginnings.

Hans Sachs.

The English comedians.

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The history of the German drama differs widely from that of onr own, though a close contact is observable between them atan early point, and again at relatively recent points, in their annals. The dramatic literature of Germany, though in its beginnings intimately connected with the great national movement of the Reformation, soon devoted its efforts to a sterile imitation of foreign models ; while the popular stage, persistently suiting itself to a robust but gross taste, likewise largely due to the influence of foreign examples, seemed destined to a hope- less decay. ‘The literary and the acted drama were thus estranged from one another during a period of extraordinary length ; nor was it till the middle of the 18th century that, with the opening of a more hopeful era for the life and literature of the nation, the reunion of dramatic literature and the stage began to accomplish itself. Before the end of the same century the progress of the German drama in its turn began to influence that of other nations, and by the widely comprehensive character of its literature, as well as by the activity of its stage, to invite a steadily increasing interest.

Towards the close of the Middle Ages, as has been seen, dramatic performances had in Germany as in England largely fallen into the hands of the civic guilds, and the composition of plays was more especially cultivated by the master-singers of Nuremberg and other towns. Thus, while the scholars of the German Renaissance, who so largely became the agents of the Reformation, eagerly dramatized, both in the Latin and the native tongue, the narratives of the Bible, and sought to suit the scholastic drama to the

demands of the times (P. Rebhun,! a protegee of Luther, ‘standing foremost among those religious dramatists), it was

under the influence of the Reformation also, and of the impulse given by Luther and others to the use of High German as the popular literary tongue, that Hans Sachs, the immortal shoemaker of Nuremberg, seemed destined to become the father of the popular German drama. In his plays, “spiritual,” secular,” and Fastnachtsspiele alike, the interest indeed lies in the dialogue rather than in the action, nor do they display any attempt at development of character. Scripture, or from popular legend and fiction,” there is no novelty, and in their treatment no originality. But the healthy vigour and

fresh humour of this marvellously fertile author, and his innate sympathy with the views and sentiments of the burgher class to which he belonged, were elements of genuine promise—a promise which the event was signally to disappoint. Though the manner of Hans Sachs found a few followers, and is recognizable in the German popular drama even of the beginning of the 17th century, the literature of the Reformation, of which his works may claim to form part, was soon absorbed in labours of a very different kind. The stage, after admit- ting novelties introduced from Italy or (under Jesuit supervision) from Spain, was subjected to another and enduring influence. Among the foreign actors of various

nations who flitted through the innumerable courts of the

empire, or found a temporary home there, special pro- minence was acquired, towards the close of the 16th and in the early years of the 17th century, by the “ English comedians,” who appeared at Cassel, Wolfenbiittel, Berlin, Dresden, and elsewhere. Through these players a number of early English dramas found their way into Germany, where they were performed in more or Jess imperfect versions, and called forth imitations by native authors. Duke Henry Julius of Brunswick-Liineburg? (1564-1613)

1 Susanna (Geistliches Spiel) (1586), &c. ? Siegfried; Eulenspiegel, &c. * Susanna; Vincentius Ladislaus, &c.

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In their subjects, whether derived from

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and Jacob Ayrer (a citizen of Nuremberg, where he died, 1605) represent the endeavours of the early German drama to suit its still uncouth forms to themes suggested by English examples ; and in their works, and in those of con- temporary playwrights, reappears no small part of what we may conclude to have been the ‘“ English comedians’ ” répertoire.* (The converse influence of German themes brought home with them by the English actors, or set in motion by their strolling ubiquity, cannot have been

equal in extent, though Shakespeare himself may have derived the idea of one of his plots® from such a source.) But though welcome to both princes and people, the exer- tions of these foreign comedians, and of the native imitators who soon arose in the earliest professional companies of actors known in Germany, instead of bringing about a union between the stage and literature, led to a directly opposite result. The popularity of these strollers was owing partly to the (very real) blood and other horrors with which their performances were deluged, partly to the buffoonery with which they seasoned, and the various tricks and feats with which they diversified them. The representatives of the English clowns had learnt much on their way from their | brethren in the Netherlands, where in this period the art of grotcsque acting greatly flourished. Nor were the aids of other arts neglected,—to this day in Germany professors | of the “ equestrian drama” are known by the popular appellation of ‘‘ English riders.” From these true descend- ants of the mimes, then, the professional actors in Germany inherited a variety of tricks and traditions; and soon the favourite figures of the popular comic stage became conventional, and were stereotyped by the use of masks. Among these, an acknowledged supremacy | was acquired by the native Mans Wurst (Jack Pud- ding)—of whose name Luther disavowed the inven- tion, and who is known already to Hans Sachs—the privileged buffoon, and for a long series of generations | the real lord and master, of the German stage. If that Separation stage, with its grossness and ribaldry, seemed likely to a become permanently estranged from the tastes and.4 ° sympathies of the educated classes, the fault was by no jiterature. means eutirely its own and that of its patron the populace. The times were evil times for a national effort of any kind; and poetic literature was in all its branches passing into the hands of scholars who were often pedants, and whose language was a jargon of learned affectations. Thus things continued, till the awful visitation of the Thirty Years’ War cast a general blight upon the nation, and the tradi- tions of the popular theatre were left to the guardianship of the marionettes (Puppenspiele)! When, in the midst of that war, German poets once more The began to essay the dramatic form, the national drama was literary left outside their range of vision. M. Opitz (1597-1639), | who holds an honoured place in the history of the German century, language and literature, in this branch of his labours con- tented himself with translations of classical dramas and of Italian pastorals—among the latter one of Rinuccini’s , Daphne, with which the history of the

opera in Germany begins, A. Gryphius (1616-1664), though as a comic dramatist lacking neither vigour nor variety, and acquainted with Shakespearian® as well as Latin and Italian examples, chiefly devoted himself to the imitation of Latin, earlier French, and Dutch tragedy, the rhetorical dialogue of which he effectively reproduced in the Alexandrine metre, Neither the turgid dramas of D.C. von Lohen- stein (1665-1684), for whose Cleopatra the honour of having been the first German tragedy has been

4 Mahomet; Edward IIT.; Hamlet; Romeo and Juliet, &c.

- The Tempest (Ayrer, Comedia v. d. Schinen Sidea).

6 Herr Peter Squenz (Pyramus and Thisbe); Worribilicribrifaz (Pistol ?).

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the stage; efore its eform., ,

BC. Neuber, Gottsched, and the Leipsic school.

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recently claimed, nor even the healthier comedies of Chr. Weise (1642-1708) were brought upon the stage; while the religious plays of J. Klay (1616-1656) are mere recita- tions connected with the Italian growth of the oratorio. The frigid allegories commemorative of contemporary events, with which the learned from time to time supplied the theatre, and the pastoral dramas with which the idyllic poets of Nuremberg-—‘‘the shepherds of the Pegnitz”—after the close of the war gratified the peaceful longings of their fellow-citizens, were alike mere scholastic efforts, These indeed continued in the universities and gymnasia to keep alive the love of both dramatic composition and dramatic representation, and to encourage the theatrical taste which led so many students into the professional companies. But neither these dramatic exercises nor the ludi Cesarei in which the Jesuits at Vienna revived the pomp and pageantry, and the mixture of classical and Christian symbolism, of the Italian Renaissance, had any influence upon the progress of the popular drama.

The history of the German stage remains to about the second decennium of the 18th century one of the most melancholy, as it is in its way one of the most instructive, chapters of theatrical history. Ignored. by the world of letters, the actors in return deliberately sought to emancipate their art from all dependence upon literary inaterial, Improvisation reigned supreme, not only in farce, where Hans Wurst, with the aid of Italian examples, never ceased to charm his public, but in the serious drama likewise (in which, however, he also played his part) in those Haupt- und Staatsactionen (high-matter-of-state- dramas), the plots of which were taken from the old stores of the English comedians, from the religious drama and its sources, and from the profane history of alltimes. The hero of this period is “Magister” J. Velthen, who at the head of a company of players fora time entered the service of the Saxon court, and by producing comedies of Moliere and other writers sought to restrain the licence which he had himself carried beyond all earlier precedent, but who had to fall back into the old ways and the old life. His career exhibits the climax of the efforts of the art of acting to stand alone; after his death (c. 1693) chaos ensues. The strolling companies, which now included actresses, cou- tinued to foster the popular love of the stage, and even under its most degraded form to uphold its national character against the rivalry of the opera, and that of the Italian commedia dell’arte. From the latter was borrowed Harlequin, with whom /Zans Wurst was blended, and who became a standing figure in every kind of popular play. He established his rule more especially at Vienna, where from about 1712 the first permanent German theatre was maintained But for the actors in general there was little permanence, and amidst miseries of all sorts, and under the growing ban of clerical intolerance, the popular stage seemed destined to hopeless decay.

The first endeavours to reform what had thus apparently passed beyond all reach of recovery were neither wholly nor generally successful; but this does not diminish the honour due to two names which should never be mentioned without respect in connectiun with the history of the drama. Friderica Caroline Neuber's (1690-1760) bio- graphy is the story of a long-continued effort which, not- withstanding errors and weaknesses, and though, so far as her personal fortunes were concerned, it ended in failure, may almost be described as heroic. As directress of a company of actors which from 1727 had its headquarters at Leipsic (hence the new school of acting is called the Leipsic school), she resolved to put an end to the form-lessness of the existing stage, to separate tragedy and comedy, and to extinguish Harlequin. In this endeavour she was supported by the Leipsic professor J. Chr.

Gottsched (1672-1766), who induced her to establish French tragedy and comedy as the sole models of the regular drama. Literature and the stage thus for the first time joined hands, and no temporary mischance or personal misunderstanding can obscure the enduring significance of the union. Not only were the abuses of a century swept away from a representative theatre, but a large number of literary works, designed for the stage, were produced on it. It is true that they were but versions or imitations from the French (or in the case of Gottsched's Dying Cato from the French and English),! and that at the moment of the regeneration of the German drama new fetters were thus imposed upon it, and upon the art of acting at the same time. But the impulse had been given, and the beginning made. On the one hand men of letters began to subject their dramatic compositions to the test of performance ; the tragedies and comedies of J. E. Schlegel (1718-1749), the artificial and sentimental comedies of Clir. I. Gellert (1715-1769) and others, together with the vigorous popular comedies of the Danish dramatist Holberg, were brought into competition with translations from the French. On the other hand, the Leipsic school exercised a con- tinuous effect upon the progress of the art of acting, and

before long the Garrick of Germany, C. Eckhof (1720- Eckhof.

1778), began a career, outwardly far humbler than that of the great English actor, but which made his art a fit subject for the critical study of scholars, and his profession one for the equal esteem of honourable men.

Among the authors contributing to Mme. Neuber's Lessing.

Leipsic enterprise had been a young student destined to complete, after a very different fashion and with very different aims, the work which she and Gottsched had begun. The critical genius of G. E. Lessing (1729-1781) is peerless in its comprehensiveness, as in its keenness and. depth ; but if there was any branch of literature and art which by study and practice he made pre-eminently his own, it was that of the drama. As bearing upon the progress of the German theatre, his services to its literature, both critical and creative, can only be described as inestimable. The Hamburgische Dramaturgie, a series of criticisms of plays and (in its earlier numbers) of actors, was undertaken in furtherance of the attempt to establish at Hamburg the first national German theatre (1767-9). This alone would invest these papers with a high significance ; for though the theatrical enterprise proved abortive, yet it established the principle upon which the future of the theatre in all countries depends, that for the dramatic art the immediate theatrical public is no sufficient court of appeal. But the direct effect of the Dramaturgie was to complete the task Lessing had in previous writings begun, and to overthrow the dominion of the arbitrary French rules and the French models established by Gottsched. Lessing vindicated its real laws to the drama, made clear the difference between the Greeks and their would-be representatives, and established the claims of Shakespeare as the modern master of both tragedy and comedy. His own dramatic productivity was cautious, tentative, progressive. His first step was, by his Miss Sara Sampson (17 55), to oppose the realism of the English domestic drama to the artificiality of the accepted French models, in the forms of which Chr. F. Weisse (1726-1804) was seeking to treat the subjects of Shakespearian plays. Then, in his Minna von Barnhelm (1767) he essayed a national comedy drawn from real life, and appealing to patriotic sentiments as wellas to broad human sympathies, written in prose (like Miss Sara

Sampson), but in form holding a judicious mean between French and English examples.

The note sounded by the criticisms of Lessing met with a

2 Richard III.; Romeo and Juliet. Vil. — gal

1 Deschamps and Addison.

Efforts of ready response, and the productivity displayed by the nascent the theatre dramatic literature of Germany is astonishing both in the oi efforts inspired by his teachings and in those which con- ” tinued to controvert, or which aspired to transcend them. On the stage, Harlequin and his surroundings proved by no means easy to suppress, niore especially at Vienna, the chosen home of frivolous amusement ; but even here a reform was gradually effected, and, under the intelligent rule of the emperor Joseph I., a national stage grew into being. The mantle of Eckhof fell upon the shoulders of his eager younger rival, F. L. Schroder (1743-1816), who was the first to domesticate Shakespeare upon the German stage. In dramatic literature few of Lessing’s earlier contemporaries produced any works of permanent value, unless the religi- ous dramas of F, G. Klopstock (1724-1803)—a species in which he had been preceded by J. J. Bodmer (1698-1783) —and the patriotic Bardietten of the same author be excepted. §. Gessner (1730-1787), J. W. L. Gleim (1719— 1803), and G. K. Pfeffel (1736-1809) composed pastoral plays. But a far more potent stimulus prompted the efforts of the younger generation. The translation of Shakespeare, begun in 1762 by C. M. Wieland (1733-1813), whose own plays possess no special significance, and com- pleted in 1775 by Eschenburg, which furnished the text for many of Lessing’s criticisms, helps to mark an epoch in German literature. Under the influence of Shakespeare, or of their conceptions of his genius, arose a youthful group of writers who, while worshipping their idol as the repre- sentative of nature, displayed but slight anxiety to harmonize their imitations of him with the demands of art. The notorious Ugolino of H. W. von Gerstenberg (1737—1823) seemed a premonitory sign that the coming flood might make a circular motion back to the extravagances and horrors of the old popular stage ; and it was with a sense of this danger in prospect that Lessing in his’third import- ant drama, the prose tragedy Hmilia Galotti (1772), set the

example of a work of incomparable nicety in its adaptation of means to end. But successful as it proved, it could not stay the excesses of the Sturm wnd Drang period which now set in. Lessing's last drama, Nathan the Wise (1779), was not measured to the standard of the contemporary stage, but it was to exercise its influence in the progress of time,—not only through causing a reaction in tragedy from prose to blank verse (first essayed in Brawe's Brutus, 1770), but through ennobling and elevating by its moral and intellectual grandeur the branch of literature to Which in form it belongs. The ' Meanwhile the young geniuses of the Sturm und Drang Sturm had gone forth, as worshippers rather than followers of ind Drang. Shakespeare, to conquer new worlds. The name of this group of writers, more remarkable for their collective significance than for their individual achieve- ments, was derived from a drama by one of the most prolific of their number, M. F. von Klinger (1752- 1801); other members of the fraternity were J. A. Leisewitz! (1752-1806), M. R. Lenz? (1750-1792), and F. Miiller? the "painter" (1750-1825). The youthful genius of the greatest of German poets was itself under the influences of this period, when it produced the first of its master- pieces. But Goethe's Gétz von Berlichingen (1773), both by the choice and treatment of its national theme, and by the incomparable freshness and originality of its style, holds a position of its own in German dramatic literature. Though its defiant irregularity of form prevented its com- plete success upon the stage, yet its influence is far from being represented by the series of mostly feeble imitations to which it gave rise. The Ritterdramen (plays of chivalry) had their day like similar fashions in drama or romance ; ee 1 Julius von Tarent. * Die Soldaten, &c. 3 Genoveva, &c,

but the permanent effect of Gétz was to have crushed with an iron hand the last remnants of theatrical conventionality (those of costume and scencry included), and to have extin- guished with them the lingering respect for rules and tradi- tions of dramatic composition which even Lessing had treated with consideration. Its highest significance, how- ever, lies in its having been the first great dramatie work of a great national poet, and having definitively associated the national drama with the poetic glories of the national literature.

Thus in the classical period of that literature, of which Goethe,

Goethe and Schiller were the ruling stars, the drama had a full share of the loftiest of its achievements. Of these, the dramatic works of Goethe vary so widely in form and character, and connect themselves so intimately with the different phases of the development of his own self-deter- mined poetic genius, that it was impossible for any of them to become the starting-points of any general growths in the history of the German drama. His way of composition Was, moreover, so peculiar to himself—conception often preceding execution by many years, part being added to part under the influence of new sentiments and ideas and views of art, flexibly followed by changes of form—that the history of his dramas cannot be severed from his general poetic and personal biography. His Clavigo and Stella, which succeeded Gétz, are domestic dramas in prose ; but neither by these, nor by the series of charming pastorals and operas which he composed for the Weimar court, could any influence be exercised upon the progress of the national drania. In the first conception of his Faust, he had indeed sought the suggestion of his theme partly in popular legend, partly in a domestic motive familiar to the authors of the Sturm und Drang (the story of Gretchen) ; the later addi- tions to the frst Part, and the Second Part generally, are the results of metaphysical and critical studies and medita- tions belonging to wholly different spheres of thought and experience. ‘The dramatic unity of the whole is thus, at the most, external only ; and the standard of judgment to be applied to this wondrous poem is not one of dramatic criticism. Hgmont, originally designed as a companion to Gétz, was not completed till many years later ; there are few dramas more effective in parts, but the idea of a historic play is lost in the elaboration of the most graceful of love episodes. In Iphigenia and Tasso, Goethe exhibited the perfection of form of which his classical period had enabled him to acquire the mastery ; but the sphere of the action of the former (perfect though it is asa dramatic action), and the nature of that of the latter, are equally remote from the demands of the popular

stage. Schiller’s genius, unlike Goethe’s, was naturally gchiller.

and consistently suited to the claims of the theatre. His juvenile works, Zhe Robbers, Fiesco, Kabdale und Liebe (Intrigue and Love), vibrating under the influence of an age of social revolution, mingled in their prose form the truthful expression of passion with no small element of extravagance. But

with true insight into the demands of his art, and with unequalled single-mindedness and self- devotion to it, Schiller gradually emancipated himself from his earlier style; and with his earliest tragedy in verse, Don Carlos, the first period of his dramatic authorship ends, and the promise of the second announces itself. The works which belong to this—from the Wallenstein trilogy to 7'ell—-are the acknowledged master-pieces of the German poetic draima, treating historic themes reconstructed by conscious dramatic workmanship, and clothing their dia- logue in a noble vestment of rhetorical verse. In one of these, Zhe Bride of Messina, Schiller attempted a new use of the chorus of Greek tragedy ; but the endeavour was a splendid error, and destined to exercise no lasting effect.

Schiller's later dramas gradually conquered the stage,

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over which his juvenile works had trivmphantly passed, but on which his Don Carlos had met with a cold welcome. For a long time, however, its favourites were authors of a very different order, who suited themselves to the demands of a public little concerned with the literary progress of the drama. After popular tastes had oscillated between the imitators of Gétz and those of Hmilia Galotti, they entered into a more settled phase as the establishment of standing theatres at the courts and in the large towns increased the demand for good "acting" plays. Famous actors, such as Schréder and A. W. Iffland (1759-1814), sought by translations or compositions of their own to meet the popular likings, which largely took the direction of that irrepressible favourite of theatrical audiences, the sentimental domestic drama. But the most successful purveyor of such wares was an author who, though not himself an actor, understood the theatre with professional instinct,—-A. von Kotzebue (1761-1819). His productivity ranged from the domestic drama and comedy of all kinds to attempts to rival Schiller and Shakespeare in verse ; and though his popularity (which ultimately proved his doom) brought upon him the bitterest attacks of the Romantic school and other literary authorities, his self-conceit is not astonishing, and it seems time to say that there is some exaggeration in the contempt which has been lavished upon him by

posterity. Nor should it be forgotten that German literature had hitherto failed to furnish the comic stage with any successors to Minna von Barnhelm ; for Goethe's efforts to dramatize characteristic events or figures of the Revolutionary age! must be dismissed as failures, not from a theatrical point of view only. The joint efforts of Goethe and Schiller for the Weimar stage, important in many respects for the history of the German drama, at the same time reveal the want of a national dramatic literature sufficient to supply the needs of a theatre endeavouring to satisfy the demands of art.

Meanwhile the so-called Romantic school of German literature was likewise beginning to extend its labours to original dramatic composition. From the universality of sympathies proclaimed by this school, to whose leaders Germany owed its classical translation of Shakespeare, and an introduction to the dramatic literatures of so many ages and nations,' a variety of new dramatic impulses might be expected; while much might be hoped for the future of the national drama (especially in its mixed and comic species) from the alliance between poetry and real life which they preached, and which some of them sought personally to exemplify. But in practice universality pre- sented itself as peculiarity or even as eccentricity ; and in the end the divorce between poetry and real life was announced as authoritatively as their union had been. Outside this school, the youthful talent of Th. Korner (1791-1813), whose early promise as a dramatist* might perhaps have ripened into a fulness enabling him not unworthily to occupy the seat left vacant by his father's friend Schiller, was extinguished by a patriotic death. The efforts of M. von Collin (1776-1823) in the direction of the historical drama remained isolated attempts. But of the leaders of the Romantic school, A. W. (1767-1845)? and F. von Schlegel' (1772-1829), contented themselves with frigid classicalities; and L, Tieck (1772-1855), in the strange alembic of his Phantasus, melted legend and fairy- tale, novel and drama,' poetry and satire, into a compound, enjoyable indeed, but hardly so in its entirety, or in many of its parts, to any but the literary mind. TF', de la Motte- eee FS

1 Der Groosskophta (Cagliostro); Der Birgergeneral.

2 A, W. Schlegel and Tieck's (1797-1833).

3A. W.S., Lectures on Dramatic Art and Literature, &e.

4 Zriny, &c. 5 Jon. 8 Alarcos. ? Kaiser Octavianus; Der Gestiefelte Kater (Puss vn Boots), &c,

Fouqué (1777-1843) infused a spirit of poetry into thé chivalry drama. Clemens Brentano (1777-1842) was a fantastic dramatist unsuited to the stage. Here a feeble outgrowth of the romanticists, the “destiny dramatists ” Z. Werner® (1768-1823), A. Miillner® (1774-1829), and C. E. v. Houwald!” (1778-1845), achieved a temporary furore ; and it was with an attempt in the same direction! that the Austrian dramatist F. Grillparzer (1791-1871) began his long career. He is assuredly what he pronounced himself to be, the foremost of the later dramatic poets of Germany, unless that tribute be paid to the genius of H. von Kleist (1776-1811), who in his short life produced besides other works a romantic drama}? and arustic comedy! of genuine merit, and an historical tragedy of singular originality and power.!# Grillparzer’s long series of plays includes poetic dramas on classical themes! and historical subjects from Austrian history.16 The Romantic school, which through Tieck had satirized the drama of the bowrgeovsie and its offshoots, was in its turn satirized by A. Count von Platen- Hallermiinde’s (1796-1835) admirable imitations of Aristo- phanic comedy.!’ Among the objects of his banter were the popular play-wright E. Raupach,and K. Immermann (1796— 1840), a true poet, who is, however, less generally remem- bered as a dramatist. IF. Hebbel!® (1813-1863) is justly ranked high among the foremost later dramatic poets of his country, few of whom equal him in intensity, Other names of literary mark are those of Chr. D. Grabbe (1801-1836), J. Mosen (1803-1867), O. Ludwig (18138-1865), and “ F. Halm” (1806-1871), and, among living writers, K. Gutzkow, G. Freytag, and H. Laube. in one of their most noteworthy examples the long-continued and systematic efforts which have raised the modern German stage to the position at present occupied by it among the theatres of Europe. These efforts have not been confined to fostering the art of acting

in a succession of eminent re- presentatives, among whom the sons of L. Devrient in various ways acquired a reputation worthy of their name, and B. Dawison was accounted the equal of the most bril- liant of the brotherhood, or to maintaining as intimate a relation as possible between the stage and literature. Happily contrasting with other countries by the number and variety of its centres of intellectual life—rivals in artistic effort even where political or social rivalry is out of the question—Germany has not only cherished its own national drama, but with a catholicity of taste, aided by the powers of a language admirably adapted for trans- lation, has opened its theatre to the dramatic master- pieces of other nations also, and more especially of our own. The German theatre has its weak points, and has not maintained itself wholly free from vicious influences ; but upon the whole its efforts are on a level with the demands of the national culture, and in harmony with the breadth and variety of the national intelligence. No other stage furnishes the same opportunities for the study of dramatic literature.

With this summary of the history of the German drama it is necessary to close this survey. To be even nominally complete, it would have had to take into account the

fortunes of more than one other modern European drama. Dutch

Among these the Durcu isinteresting both in its beginnings, cece 8 Der 24 Februar. 9 Die Schuld (Guilt). 10 Das Bild (The Picture). ll Die Ahnfrau (The Ancestress). 12 Das Kithchen (Kate) von Heilbronn. 13 Der Zerbrochene Krug (The Broken Pitcher). 14 Pring Friedrich von Homburg. 15 Sappho, Medca, &c. 16 Konig Ottokar’s Glick und Ende (Fortune and Fall); Der Bru-

| derawist (Fraternal Feud) in Habsburg.

17 Dic Zerbrochene Gabel (The Broken Fork); Der Romantische Gdipus. j 18 Die Nibelungen; Judith, &c.

The last of these names recalls The

Scandi- navian

drama. .

Holberg.

44-4

which resemble those of the German—the influence of the so-called chambers of the rederykers (rhetoricians), from the early years of the 15th century onwards, resembling that of the master-singers of contemporary Germany. The earliest of their efforts, which so effectively tempered the despotism of both church and state, seem to have been of a dramatic kind ; and a manifold variety of allegories, moralities, and comic entertainments (esbatementen or comedies, Aluiten and factten or farces) enhanced the attractions of those popular pageants in which the Nether- lands surpassed all other countries of the North. The art of acting flourished in the Low Countries even during the troubles of the great revolt ; but the birth of the regular drama was delayed till the advent of quieter times. Dutch dramatic literature begins, under the influence of the classical studies cherished in the seats of learning founded before and after the close of the war, with the classical tragedies of S. Koster (c. 1585-c. 1650). The romantic dramas aud farces of Gerbrand Bredero and the tragedies of Hooft belong to the same period ; but its foremost dramatic poet was J. vau den Vondel (1587-1659), who from an imitation of classical models passed to more original forms of dramatic composition, including a patriotic play} and a dramatic treatment of part of what was to form the theme of Paradise Lost. But Vondel had no successor of equal mark. The older form of Dutch tragedy—in which the chorus still appeared—was, especially under the influence of the critic A. Pels, exchanged for a close imitation of the French models, Corneille and Racine ; nor was the attempt to create a national comedy successful. Thus no national Dutch drama was permanently called into life. Still more decidedly the dramatic literature of the SCANDINAVIAN peoples springs from foreign growths ; but Denmark, where the beginnings of the drama in the plays of the schoolmaster Chr. Hansen recall the mixture of rcligious and farcical elements in contemporary German efforts, at a later date produced a comic dramatist of thorough originality and of a wholly national cast. L. Holberg (1684-1754), one of the most noteworthy comic poets of modern literature, not only marks an epoch in the dramatic literature of his

native land, but he contributed to overthrow the trivialities of the German stage in its worst period, which he satirized with merciless humour,? and set an example, never surpassed, of a series of comedies? deriving their types from popular life and ridiculing with 1 Gysbrecht van Almstel. 2 Ulysses of Ithaca.

3 The Politician-Tinman; Jean de France or Hans Franzen; The Lying-In, &c.

DKA—

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healthy directness those vices and follics which are the proper.theme of the mest widely effective species of the comic drama. Among his followers P. A. Heiberg (1758— 1860) is specially noted. Under the influence of the Romantic school, whose influence has nowhere proved so long-lived as in the Scandinavian north, A. Oehlenschliger (1779-1850) began a new era of Danish literature. His productivity, which belongs partly to his native and partly to German literary history, turned from foreign‘ to native themes ; and other writers followed him in his endeavours to revive the figures of Northern heroic legend. The reaction recently observable in Danish literary criticism against the supremacy of the Romantic school may be expected to produce results in the draina, in the direction perhaps of those already attested by the success of two living Norwegian dramatists, H. Ibsen and Bjornsterne Bjérnson.

Lastly, the history of the Russtan drama, which in its Ruse earliest or. religious form is stated to have been introduced drama,

from Poland (early in the 12th century), is in its later forms an outgrowth of Western civilization. A species of popular puppet-show called vertep, which about the middle of the 17th century began to treat secular and popular themes, had helped to foster the dramatic taste of the people ; but the Russian regular drama characteristically enough had its origin in the cadet corps at St Petersburg, a pupil of which, A. Sumarokoff (1718-1777), is regarded as the founder of the modern Russian theatre. As a tragic poet he seems to have imitated Racine aud Voltaire, though treating themes from

the national history, among others the famous dramatic subject of the False Demetrius. He also translated Hamlet. As a comic dramatist he is stated to have been less popular than as a tragedian ; yet it is in comedy that he would seem to have had the most noteworthy successors. Among these it is impossible to pass by the empress Catharine IT. (1729-1796), whose comedies seem to have been satirical sketches of the follies and foibles of her subjects, and who in one comedy as well as in a tragedy had the courage to imitate Shake- speare. Comedy aiming at social satire has continued to flourish in Russia to the present day, and possesses (or recently possessed) a representative of mark in A. N, Ostrovsky of Moscow. The church is stringently pro- tected against the satire of the stage in the dominions of the Czar, but in all other directions except one considerable

DRAMBURG, a town of Prussia, at the head of a circle in the government of Kdslin, about fifty miles east of Stet- tin. It occupies both banks of the River Drage, a sub- tributary of the Oder, is inclosed by walls and defended by a fort, contains a hospital and various administrative offices, and carries on cotton and woollen weaving, tanning, brewing, and distilling. Population in 1875, 5625.

DRAMMEN, a town in the amt of Buskerud, in Norway, is situated at the northern end of the Drammen fiord, a western arm of Christiania fiord, at the mouth of the Dramselv. It consists of the three places Bragerniis or Braguiis, Stromsié, and the port Tangen, the first on the north, and the other two on the south side of the river. The greater part of the town has been rebuilt since the conflagrations of 1866 and 1870. The principal industrial establishments are oil, cotton, and tobacco factories, breweries, tanneries, sawmills, and iron foundries. An active trade in wood, pitch, and iron is carricd on. The population at the end of December 1875 was 18,838,

licence appears to be allowed to the drama. (a. W. W.) 4 Aladdin; Correggiv. DRAUGHTS, a game of unknown origin. Some con-

sider it to be a very old game, but Stratt (Sports and Pastimes) calls it a “modern invention.” It is not men- tioned in the older editions of the Académie des Jeux, uor in the Compleat Gamester, so, if an old game, it was not formerly an important one. As early as 1668 M. Mallet published a treatise on draughts, at .Paris, and the gamc was played in Europe at least a

century earlier. The Romans played a similar game called Jatrunculz, the men moving diagonally, capturiug by leaping over, and obtaiu- ing superior power when they arrived at the furthest row of squares. ‘The board, however, consisted of only sixteen squares. It is believed that reocot among the Grecks was a similar game with a central space “called the sacred barrier ;” and representations of a kind of draught game are frequently found on the monuments of the ancient Egyp- tians (Wilkinson). Draughts is played by two persons. A board (see | diagram) is required, and twenty-four men—twelve white

and twelve black—which at starting are disposed on the board as in the diagram. ither the white or black squares may be played on (the latter being now more

usual),

If the black squares are used the board must be

placed with a black square in the left hand corner; if the white squares are used, it is placed as in diagram.

The game is played by moving a man, one square at a time, along the diagonal to the right or left. Thus a man placed on square 18 in diagram can move to 15 or 14. Each player moves alternately, the first move being decided by lot.

As soon as a man is moved on the square adjacent to an opponent’s man, and there is an unoccupied square beyond, the unprotected man may be captured and removed from the board. Thus, if there is a white man on square 18, and a black man on square 14, square 9 being vacant, and white having to move,‘he jumps over 14 and remains on square 9, and the man on 14 is taken up.

If two or more men are so placed that one square inter- venes ketween each they may all be taken at one move. Thus if white having to move has a man on 29, and black men on 25, 18, and 10, the intermediate squares and

square 6 being vacant, white could move from 29 to 6, and take the men on 25, 18, and 10. In making such a move with a man, all the steps must be forward, that is, in the direction away from the player, just as in making simple moves and captures.

It is compulsory to take if able. Ifa player has a man en prise, and makes a move that does not capture, his adver- sary may allow the move to stand without penalty, or he may have the move retracted and compel the player to take, or he may allow the move to stand and remove the man that neglected to capture from the board (called huffing). “ Huff and move” go together, ze, the player who hufts then makes his move. The huff must be made before the move. If the adversary of the player who fails to capture allows the move to stand, without huffing, and the player who can capture moves again without taking, the adversary again has the options he had before. Ifa player can take one man in one place and more than one in another, he may take in which place he pleases, not being obliged to capture the larger number of men. But if he elects to take the larger number, he must take all of that lot that are en prise, or he may be huffed from where he stands when he has taken a portion of the men, or he may be compelled to take the remainder, or the incomplete move may be allowed to stand,

As soon aga man reaches one of the squares furthest from his side of the board, ¢e.g., when a white man (see diagram) reaches square 1, 2, 3, or 4, or a black man square 29, 30, 31, or 32, he is crowned by placing one of the captured men of his own colour on him, and becomes a king. A king has the additional power of moving and taking backwards, z.c., toward his own side of the table, as well as forwards. But on becoming a king the move ends, notwithstanding that there may be an ‘adverse man en prise. Thus if there are black men on squares 7 and 6, a

white one on 9, and squares 2 and 11 are unoccupied, white having to move takes the man on square 6 and becomes a king ; but he cannot take the man on square 7 at the same move. A king can be huffed for not taking, the sanie as a man, with the exception just pointed out.

The game proceeds until one of the players has all lis men and kings taken, or has all those left on the board blocked, so that he has no more left. If it should so happen that neither of the players has sufficient advantage in force or position to enable him to win, the game is drawn. The player having the stronger force may be required to win in forty moves(z.e., forty on eachside), computed from the move on which notice was given; if he fail, the game is drawn.

The game of draughts has been exhausted, z.¢., the reply to every possible move is known by all proficients, and as there is no advantage in moving first, every game ought to end inadraw. Under these circumstances rules for playing are of but little use; the only way to become a player is to study the analyses laid down in works ou the subject, and to know them by heart. For begiuners, however, it may be stated that men should as a rule be played to the middle of the board rather than to the sides, as in the middle the man attacks two squares, at the side only one. It is good play to push fora king early in the game. Also, as soon as a player has any advantage in force, he should exchange whenever he can. When the forces are equal the position of having the move should be striven for. To have the move means to occupy such a position as to be able to secure the last move. For example, place kings of opposite colours at 19 and 12. If the king at 12 is next to move, the king at 19 has the move and must win; but if the king at 19 is next to move, the other king has the move and the game must be drawn. Having the move does not always win. Thus at the ‘beginning of a game the second player has the move, but at this stage it is of no use to him. When a player is in a cramped position it is often disadvantageous to have the move.

In order to ascertain who has the move, divide the squares into two systems of four columns each, the columns of one system being those which commence with the num- bers 29, 30, 31, and 32 (see diagram), and end with the numbers 5, 6, 7, and 8, the remainder being the columns of the other system. Add together all the men and kings which stand in either system, and if their sum is odd the next player has the move, if even the last player has the move. For example, white has men or kings at squares 26 and 32, black at 28 and 19. There are three pieces on one system and one on the other, both odd. If white is the next player he has the move. An exchange

generally, but not always, changes the move; so, when about to exchange, the player should prefer an exchange that will keep the move, or, nct having it, an exchange that will gain it. To discover whether an exchange wil] chauge the move add together all the capturing pieces in both systems, and if they are odd and the captured pieces are also odd, the move is not changed by an exchange; the same rule applies if they are both even; but if one is even and the other odd, an exchange changes the move.

The laws of draughts used in match play are Anderson's, but so few matches at draughts are played that there is scarcely any demand for them, and they are out of print. Omitting those which relate only to match play, the follow- ing is an abridgment of Anderson's laws.

1. Ina series of games the players take the white and black men alternately. Black has the first move, whether the previous game was won or drawn. 2. A player whose turn it is to play touching aman must move it, except he gives notice of adjusting the man ; if it cannot be moved, he loses the game. 8. If a man is moved over an angle of the square on which it is stationed, the move must be eompleted in that direction. 4. The move is completed as soon as the hand is withdrawn from the man played to another square,

A4B DRA—DRA DRAWING. Although the verb to draw has various Derivation,

b. Ifa player who has the option of huffing touches the man he is Eiiitled to rea he must huff. 6. A false move loses the game. 7. If a player capture one of his own men by error, the adversary may have it replaced or not. 8. When more than one man can be taken at one niove, the player must not remove his hand from the capturing man until he has taken all he can ; if he does so the move is completed, and he is liable to be huffed. 9. When a player pushes a man to king, his adversary is bound to crown it. 10, Each player must move within a spccified time [the time is generally three, five, or six minutes by previous agreement, unless there is only one way of taking or one move on the board, when only two minutes areas arule allowed]. 11. The player having the stronger force may have notice given him to win in forty moves ; when two kings remain against one, in twenty moves. When the odds of the draw are given, and the situations may be rendered equal by

repeating the same manceuvres, the player giving the odds may be required to win in twenty moves.

Portsh DRAvGHTS was formerly played on a board of a hundred squares with forty men; but it is now more frequently played with an ordinary draught-board and men, the men being placed at starting as at draughts. The men move and take as at draughts, except that in capturing they move either forwards or backwards like a draught king. A man arriving at a crowning square becomes a queen, and has the move of a bishop at chess. In her capture she takes any unguarded man or queen in any diagonal she commands, leaping over the captured man or queen and remaining on any unoccupied square she chooses of the same diagonal, beyond the piece taken. But if there is another unguarded man she is bound to choose the diagonal on which it: can be taken, For example, place a

8 E> queen on square 29, and adverse men at squares 22, 16, 24, 14. The queen is bound to move from 29 to 11, 20, 27, and having made the captures to remain at 9 or 5, which- ever she prefers.

The capturing queen or man must take all the adverse pieces that are en prise, or that become so by the uncover- ing of any square from which a piece has been removed during the capture, eg., white queen at square 7, black at

g pture, ¢.9., q q ?

squares 10, 18, 19, 22, and 27, the queen captures at 10, ;

22, 27, and 19, and the piece at 22 being now removed,

she must go to 15, take the man at 18, and stay at 22, 25, –

or 29, In consequence of the intricacy of some of these moves, it is the rule to remove every captured piece as it is taken.

If a man arrives at a crowning square when taking, and he can still continue to take, he must do so, and not stay on the crowning square as at draughts.

Passing a crown- ing square in taking does not entitle him to be made a queen,

In capturing, the player must choose the direction by which he can take the greatest number of men or queens, or he may be huffed. Numerical power is the criterion, e.g., three men must be taken in preference to two queens. If the numbers are equal and one force comprises more queens than the other, the player may take whichever lot he chooses,

A single queen against three queens can draw. If one player has a queen and man, and the other three queens, the best play is to sacrifice the man, as the draw is more certain with the queen alone.

When two men of one colour are played on a diagonal with one vacant square between them (e.g., at squares 16 and 23), the position is called a lunette. If the adversary enters the dunette he must capture one of the pieces which compose it. Before entering a lunette it is advisable to calculate what the position will be after a capture, as the position is sometimes intentionally left as a trap.

William Payne, Introduction to the Game of Draughts, London, 1756 ; W. Painter, Companion to the Draught Player, 1767 ; Joshua Sturges, Guide to the Game of Draughts, London, 1800 (re-edited by Walker, 1835 ; reprinted with additions by Martin in Bohn’s Handbook of Games, 1850); Henry Spayth, The American Draught Player. (H. J.)

meanings, the substantive drawing is confined by usage to that of design, and is treated as if it were a synonym of design. The word comes from the Latin trahere, or from a kindred Gothic word, so that traction and drawing are nearly related, and preserve still the same meaning when applied to the work of animals or machines, as we say that a traction engine draws so many tons. Another form of the same word is dray, the strong low vehicle used by brewers and carriers. It may be worth while to inquire what is the connection between the idea of a dray horse and that of a drawing-master.

The primitive idea, which is the common origin of both The primi- senses of the word to draw, is that of moving something in tive idea,

one’s own direction. Thus, a horse draws a plough; but a carpenter does not draw his plane, he pushes it ; and we should say that a locomotive drew a train when the locomotive was in front, but not when it was behind. The same idea is preserved in the fine arts. We do not usually say, or think, that a sculptor is drawing when he is using his chisel, although he may be expressing or defining forms, nor that an engraver is drawing when he is pushing the burin with the palm of the hand, although the result may be the rendering of a design. But we do say that an artist is drawing when he uses the lead pencil, and here we have a motion bearing some resemblance to that of the horse or engine. ‘The fingers of the artist draw the pencil point along the paper. The analogy may be ciearly seen in certain circumstances. Whenthe North American Indians shift their camps they frequently tie a tent-pole on each side of the horse like a shaft, leaving the ends to drag along the ground, whilst their baggage is laid on cross pieces. Here we have a very close analogy with artistic drawing. The poles are drawn on the ground as a pencil is on paper, and they leave marks behind them corresponding to the lines of the pencil.

The same analogy may be observed between two of the The French senses in which the French verb tirer is frequently verb diver,

employed. This verb is not derived from trahere, but may be ultimately traced, like our own verb fo tear, to the Ionic defpw. It was formerly used by good writers in the two senses of our verb to draw. Thus Lafontaine says, “ Six forts chevaux tzrazent un coche ;’ and Cailliéres wrote, “ I] n’y a pas longtemps que je me suis fait ¢¢ver par Rigaud,” meaning that Rigaud had drawn or painted his portrait. At the present day the verb ¢iver has fallen into disuse amongst cultivated Frenchmen with regard to the drawing and painting, but it is still universally used for all kinds of design and even for photography by the common people. The cultivated use it still for printing, as for example “cette gravure sera tirce & cent exemplaires,” but here rather in the sense of pulling than of drawing,

7

A verb much more nearly related to the English verb fo The French

draw is traire, which has trait for its past participle. It verb éraire.

comes from ¢rahere, and is so little altered as to be scarcely even a corruption of the original Latin form. TZraire is now used exclusively for milking cows and other animals, and the analogy between this and artistic drawing is not obvious at first, nevertheless there is a certain analogy of motion, the hand passing down the teat draws the milk downwards. The word éva¢é is much more familiar in connection with art as “les traits du visage,” the natural markings of the face, and it is very often used in a figura- tive sense, as we say “traits of character.” It is quite familiar in portrait, derived from protrahere.

The ancient Romans used words which expressed more Delination.

clearly the conception that drawing was done in line (delineare) or in shade (adumbrare), though there are reasons for believing that the words were often indis- criminately applied. Although the modern Italians have

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‘The Greek

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ypapetue

Picture- writing.

DRAWING

both ¢raire and trarre, they use delineare still in the sense of artistic drawing, and also adombrare.

The Greek verb ypddev is familiar to the English reader in “ graphic ” and in many compounds, such as photo- graph, &e. It is worth observing that the Greeks seem to have considered drawing and writing as essentially the saine process, since they used the same word for both. This points to the early identity of the two arts when drawing was a kind of writing, and when such writing as men had learned to practise was essentially what we should call drawing, though of a rude and simple kind. ‘ The origin of the

hieroglyphics of Egypt," says Dr Wilson (Pre- Historic Man, chap. xviii.), "is clearly traceable to the simplest form of picture-writing, the literal figuring of the objects designed to be expressed. Through a natural series of progressive stages this infantile art developed itself into a phonetic alphabet, the arbitrary symbols of sounds of the human voice." Even in the present day picture writing is not unfrequently resorted to by travellers as a means of making themselves intelligible. There is also a kind of art which is writing in the modern sense and drawing at the same time, such as the work of the medizval illuminators in their manuscripts.

The mental processes by which man has gradnally become able to draw, in our niodern sense of the word, may be followed, like the development of a chicken in the egg, by examining specimens at various stages of formation.

these days in an archaic spirit, In some of the best. modern caricatures there are peculiarities which belong to early symbolic drawing, in which, as Dr Wilson says, ''the figures are for the most part grotesque and monstrous from the very necessity of giving predominance to the special feature in which the symbol is embodied."

The first idea of drawing is always delineation, the Delinea- marking out of the subject by lines, the notion of drawing #2.

without lines being of later development. In primitive work the outline is hard and firm, but interior markings are given also. When the outline was complete, the primitive artist would proceed at once in many cases to fill up the space inclosed by it with flat colour, but he did not understand light and shade and gradation, 'The historical development of drawing may always be seen in the practice of children whien left to draw for their amusement. They begin, as the human race began, with firm outlines, re- presenting men and animals, usually in profile. The next thing they do, if left to their own instincts, is to fill up the spaces so marked out with colours, the brightest they can get. This is genuine primitive art.

By referring to the earliest kind of drawing we perceive how drawing may exist without certain elements which in modern times are usually associated

with it. We generally conceive of drawing in close association with perspective, and at least with some degree of light and shade, but it may exist independently of both. This may perhaps help

us to a definition of drawing. Such a definition would Difficulties

Abstract His first efforts are remarkable for their highly abstract need to be exceedingly comprehensive, or else it would of 4 defini-

character of Character, because the undeveloped intellect has few and earliest art, .

tion.

_ Archaic forms of arawing,

simple ideas, and takes what it perceives in nature without being embarrassed by the rest. It seizes upon facts rather than appearances, and the primitive artist is satisfied when the fact has been clearly stated or conveyed by him, The study of appearances, and the effort to render them, come much later; and the complete knowledge of appearances is the sign of a very high state of civilization, implying most advanced artistic culture both in the artist and in the public to whom he addresses himself. The work of the primitive artist is an affirmation of the realities that he knew without mystery or confusion. In all early Egyptian work you sec at once what the artist intended to draw, whercas the finest modern drawing is often so mysterions as to be most obscure to those who have not made a special study of the fine arts. The primitive artist knew that his work was really that of a writer, and as the sign-painter of the present day takes care to make his letters plain in order that they may be read, so the early Egyptian draftsman had no thought of any more delicate truth of appearance that that which sufficed to let people clearly understand what his figures and symbols were intended for. There was no conception of what artists call “ effect,” which enters into the greater part of modern drawing, until a very much later period.

We may mention briefly two survivals of primitive art in our own day, which have for their purpose a high degree of legibility. These are coats-of-

arms and trade-marks, Heraldic drawing, when properly done, is executed on primitive principles, and is a survival of the earliest uses of graphic art, being really a kind of writing intended to be recognizable by the illiterate when they saw it on shield or banner. Modern trade-marks, of which the use has greatly extended of late years, are of the same class, and are often designed with a simplicity of intention like tkat of remote antiquity.

Archaic forms of drawing are thus not all extinct even in our own day, and certain arts are practised among us which compel the modern mind to recover by effort and study something of that simplicity and decision which were instinctive in earlier ages. Book-binding, illuminating, and designing for pottery are often rightly practised in

certainly exclude some of the many arts into which drawing more or less visibly enters. A modern critic would be very likely to say that a figure was deficient in drawing if it was deficient in perspective, and yet the two are easily separable, as for example in the work of the mechanical draftsman ; or drawing may be associated with a kind of perspective which is visually false, as isometric perspective. We might say that drawing was.the imitation of form, but a moment’s reflection would enable us to perceive that it may create forms without imitating, as it does in many fanciful conceptions of ornamental designers. It might be suggested that drawing was the representation ona flat surface of forms which are not flat, but the most variously curved surfaces, as in vases, are frequently drawn upon, and flat objects are sometimes represented on rounded surfaces. The Greeks were so logical in their use of ypédew for both drawing and writing that it is not possible to construct a definition comprehensive enough to include all the varieties of drawing without including writing also.

If we say that drawing is a motion which leaves significant Definition.

marks, we are as precise as the numerous varieties of the art will permit us to be.

The first step in the arts of design is a resolute and Conven- decided conventionalism. Drawing always begins with tionalism..

line, and there are no lines in nature. The natural world presents itself to the eye as an assemblage of variously- coloured patches or spaces, always full of gradation both in shade and colour, but in all this there is no such thing as a real line. Even the sea-horizon, which is commonly spoken of as a line, is not so in reality, it is only the end- ing of a coloured space. ‘I’he conventionalism of the line being once admitted, it may be considered as neither good nor bad in itself, but a simple necessity. Beyund this, however, in the use of the line when it has once been adopted, there may be artistic merit or demerit, . All primitive line-drawing gives a version of natural

-truth which is idealized in one way or the other, and it is

always conventional not only in the sense of using conven- tional means, but also in that of interpreting natural forms with conventional amplifications or omissions, The temper of a primitive civilization always led its artists to the

Chinese and Japanese design.

Egyptian

design.

Assyrian design,

expression of certain customary ways of seeing things which were transmitted traditionally by art, so that the artists in their turn became the means of imposing the authority of public sentiment upon their suceessors. The liberty of individual artists, even to draw what may seem such a simple thing as the outline of a human figure, is dependent upon the degree in which the civilization under which they live is or is not traditional.

To understand the effect of customary ways of seeing things on the use of pure line in drawing, the reader is recommended to study some specimens of early design as it was practised in China, in Japan, in Egypt, in Assyria, and in Greece. It is easy, in these days, to procure photo- graphic

reproductions of ancient design when the student does not live near a museum. He will perceive at once in the five countries four entirely different ways of seeing aud designing the curvature of lines, although the Chinese and Japanese ways are nearer to each other than they are to the Egyptian or the Greek ; whilst on the other hand, different as the two latter may be, they are nearer to each other than to the art of China or Japan.

A certain kind of curvature is dominant in Chinese art, along with the preference for certain easily recognizable forms. In Japanese drawings the curves are wilder, bolder, more unexpected, more audacious ; and when the Japanese designer chose to make use of angles he was, from the same tendency to vivacity and exaggeration, disposed to prefer acute angles. In both Chinese and Japanese work, when at its best, there is often the most exquisite beauty and delicacy of line, especially in the contours of female faces; and there is frequently a masterly power in the interpretation of natural truth, or certain portions of natural truth, by means of the utmost simplicity.

In ancient Egypt the line was quieter and less “ tormented ” than in China or Japan, the curvature more restrained, and the artistic expression generally rather that of calm dignity than of vigorous action. Egyptian art was kept within the strictest limits by tle most powerful con- ventionalisin that ever existed, but the student of drawing will find much in it that is well worth his attention. The Egyptian draftsmen attained to a most noble use of line, combining a serious and disciplined reserve with much delicacy of modulation, The true grandeur of Egyptian work has only been apprebended of late years, because it was formerly supposed that its conventionalism was due to simple ignorance of nature and want of skillin art. It is of various degrees of excellence, and there were inferior artists in the early Egyptian schools, as in others ; but we are often startled by magnificent power in conventionalizing natural material, and by a peculiar sense of beauty. There is in Egyptian design a singular combination of tranquil strength with refinement,

Assyrian design is very familiar to us through the aneient wall-sculptures, where the line i3 often rather engraved than carved, so that we can see quite plainly what were the qualities of drawing which the Assyrian artists

valued. They, too, conventionalized nature, but sought for those curves and aceents of line which express manly beauty rather than feminine. They drew, in their own way, admirably well, with great firmness and self-command, knowing always exaetly what equivalents or representatives to give for the lines and markings of nature, in accordanee with the spirit of their artistic system. Their art is mueh more strongly accentuated than the Egyptian, and we might even say that it is more picturesque while it is less tranquil. Assyrian design has more of the spirit of paint- ing in it than Egyptian, and less of the spirit of sculpture. The Assyrian line tends to the expression of energy

in action, the Egyptian to strength aud beauty in re- pose.

DRAWING

Notwithstauding the high degree of power and skill attained in linear design by nations which existed before

the artistic development of Greece, it must ever remain an Greece,

inexplicable marvel that the Greek designers should have attained, apparently without effort and simply by the gift of nature, to a degree of perfection in the use of line which had never been approached before and has never been equalled since. The manly beauty of an Assyrian king at a lion hunt, with his curly beard and his muscular legs, and his arm mighty to bend the bow, is grand indeed, but with a purely barbaric grandeur ; the half-feminine beauty: of an Egyptian deity lives chiefly in the serene face—the body is often frankly architeetural, and has always rather the qualities of a column than those of the living flesh. But in Greeee the curves of the line were for the first time made to express the fulness and grace of life, with an ideal perfection coming from the exquisite innate taste and refinement of the artists, and never to be found in any single model. How much knowledge and taste may be expressed by a simple line may be seen in any Greek vase of the best time, especially if there are both draped and naked figures, of both sexes, in the composition. ;

The leading principle of Greek design on vases was the Greek

expression of form by pure, firm, and accurate line. were distinguished by flat tints of red, black, and white,, but there was no shading to indicate modelling. When. local colour could be easily hinted at by markings of black thicker than a simple outline, it was frequently done, as it was continually in Japanese art, but care was taken that these broader black markings should never be important enough to alter the true character of the design, as essentially a work in simple line. Thus, a woman's hair might be drawn with broad touches to make us see that it was darker than her flesh, and the dark band round the edges of her dress would be given in pure black of its own width. Nor was this the only device by which a certain degree of local colour was suggested to the eye, though it was not really imitated. The red did for ordinary flesh colour, and white for flesh-colour intended to be of more than ordinary fairness. Great spaces of black were reserved for the background, by which a striking relicf was given to the figures, This is the regular principle of Greek vase decoration, though the artists did not strictly confine themselves to it, but would also work in simple black and white, as in the Portland vase, or introduce brighter colour sparingly, like the turquoise of the mantle of Thetis and in the wings of Eros in the vase of Camirus. This use of colour, however, did not in the least interfere with the unflinching system of Greek drawing, whieh was, in the strictest sense of the word, delineation. In this it differs

absolutely from many modern kinds of drawing which avoid This is

the line as much as the Greeks delighted in it. not intended as an expression either of praise or blame; it is simply a statement of fact. The truth is that Greek line-drawing is simply the most perfect condition of a very early form of art. It is the child's idea of drawing, carried out with the knowledge an taste of men who lived in the early youth of the human race and were not disturbed and distracted by the dis- coveries and experiments of modern Europeans. Amongst its other peculiarities may be mentioned its beautiful independence of anatomy. No anatomical markings are ever given simply as such, 'The figures are living men and women with their skins on, not écorchés in a dissecting room, There is less of the anatomical tendency in Greek' art than in Assyrian. When the Assyrian artist wishes to make you feel that a man's leg is very strong he maps out every musele and tendon as

far as his knowledge will allow, but the Greek contents himself with showing the vigour and ease of the strong man’s action, It is, however, in

delinetion.

Spaces drawing on vases.

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f Greek

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The mediseval artists began exactly like the Medieval Greeks by the natural primitive process of line and flat drawing.

the representation of the female form that the gracc of the Greek line-drawing is most conspicuous and most unprece- dented. There had been before some lithe feminine grace of motion even in Egyptian art, but it is stiffness and awkwardness themselves in comparison with the Greek.

The right progress of art-education in modern times could not be better assured than by following in the case of each individual student that course of development whick humanity itself has followed. True and careful lines, in combination with the colouring of spaces in a few flat tints, are the natural beginning. What a child does with infantile unsuccess for its amusement the beginner in serious art should be taught to do carefully and well for his instruction. The accurate use of line is the first thing to be

learned with the pencil point, and ths equal laying of a flat tint is the first thing to be learned with the brush. –

Even at so early a stage in art as the use of the simple line, we find ourselves face to face with one of the most remarkable peculiaritics of the fine as distinguished from the mechanical arts. It does not require much critical acumen to discover that accuracy is one thing ina line and beauty another. The student ought to work at first for accuracy, but from beautiful works of art which are not in themselves accurate copies of nature but copies idealized at least in some degree by the taste and feeling of the artist. All works of art that are worth studying are ideal in one way or another. We have spoken of the Greek line, which is one of the most highly idealized of all artistic expressions. The Greek artists when they outlined an object always greatly simplified the outline by omitting many minor accidents of angle and curvature which a modern picturesque artist would seek for because of their variety. But simplification does not explain all that the Greek mind did to alter nature indesign. Its sense of beauty and elegance was so exquisite that it continually amplificd what was incagre in the model, reduced what was superabundant, and corrected what was awkward. All this could be done,

. and was done, with the simple line alone without any help

from chiaroscuro, and it is one of the most remarkable proofs of the expressional power of tlie line that it even suggests modelling in the blank spaces which are inclosed by it.

Notwithstanding the excellence of Greek linear design it would be well that the student’s attention should not be confined to it too exclusively. For, in the first place, we may remember that the vase-paintings which remain to us were not executed by the most eminent painters living at that time, but were only done by clever workmen in the artistic spirit which the eminent painters had rendered prevalent and fashionable ; whereas in modern art we can study the ipsisseme linece of truly great men, both in their drawings and in many cases more accessibly still in their etchings. Again, the Greek designers had certain ex- cellencies, but not aJl excellencies, the remarkably harmonious character of their work being, in fact, quite as much due to its absolute neglect of certain qualities of line as to its possession of other

qualities, It is a narrow and limited kind of art, the singular perfection of it being due in great measure to that narrowness. Modern art, on the contrary, is infinitely vast aud varied, full of imper- fection, abounding in all conceivable kinds of error and failure, but also rich beyond all that a Greek could pos- sibly have imagined in knowledge and sentiment of many kinds,

The Greek spirit passed through its first decadence in Roman art, and was at last degraded past recognition at Byzantium, A new spirit of linear design arose in the northern countries during the Middle Ages, gradually forming what we call the Gothic schools of architecture and

ornament.

colouring of spaces, of which we have abundant examples in theirilluminated manuscripts, and examples less abundant in the mural paintings which remain to us. Students who intend to qualify themselves for decorative work, or for carving, will do well to give earnest attention to medieval designs of ornament which abound in the richest and most fanciful invention ; but students of the figure have little to learn from the Middle Ages, for in those centuries the figure was very imperfectly understood. Sometimes we meet with a startling exception, with some instance of individual observation which strikes us because it looks like science ; but the plain truth is that the medieval artists of all classes were as inferior to the Greek in the knowledge of the human frame as they were superior to them in the capacity for inventing new and fanciful schemes of decoration. If the student wishes to learn the figure he may therefore pass at once from the period of decline in Greek art to the Renaissance, without concerning himself about the more or less successful attempts of thie intervening ages, in which, indeed, may be found examples of quaintly rendered human character, but hardly any of well-studicd lruman form. The best way is to go from antiquity to Hans Holbein the younger at once. remarkable power and skill in the use of line, many of his best portraits being hardly anything more than a delicately true outline, with just enough shading to make us under- stand the modelling, but nothing of what is commonly understood by chiaroscuro, As Holbein was much more of a realist than the Greeks were, his lines have more variety of curvature than

theirs, and the forms inclosed by them are more individual. All that is best in the peculiar spirit of northern drawing at that time is to be found in Holbein's art, which is full of close observation, of calm sobriety, and unflinching truthfulness. In the south of Europe the Renaissance led to that artistic development of which the modern schools of figure design have inherited the ideas and principles. A certain period in the life of Raphael marks the transition from the old spirit to the new, and his great success in the application of the new principles led to their anthoritative establishment in the schools of Europe. same time more scientific and more ideal. studied anatomy more than it had ever kecn studied before, and they gave a degree of attention to the whole of the human body which a medieval draftsman would have con- centrated almost exclusively on the face. But they did not rest satisfied with copying the facts of nature and investigat- ing the laws of construction and of action,—they took that farther step which the Greeks had taken before them, and drew the figure not merely as it appeared to thew hodily eyes, but with that more perfect beauty which was suggested to the eye in the artist's mind. Raphael openly affirmed this principle by declaring that he drew men and women, not as they were, but as they ought to be, and the process of idealization may be actually seen in what he did by comparing his studies with his completed works.

We have hitherto spoken simply of the use of line, that being essentially drawing in the strict sense of delineation ; but when the European mind had reached the period of

the Renaissance a new study took its rise—chiaroscuro— Chiar-

which became so inextricably mingled with that of drawing that it is impossible to speak adequately of the one without giving some account of the othcr. The increased know- ledge of the muscular structure of the body led the artists to pay more attention to modelling than had ever been paid to it before, so that good modelling got to be considered an essential part of drawing. It may be necessary, for the uninstructed in artistic matters to explain in this place

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Michel- angelo.

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that modelling in design is the art of shading in such a manner as to give everything its due degree of projection or relief, and the practical difficulty of it lies in the necessity for making the degree of proj ection in any object or part of an object exactly what it ought to be relatively to other projecting masses or details in the same drawing. ‘The simple line-work of the early stages of art was therefore abandoned by the greatest artists of the Renaissance as a general means of study. Even when using the most rapid means of expression for themselves alone, they were accustomed to treat the outline with little respect, and always to indicate shading in some way, often by the very rudest means, as for example by a few hasty diagonal strokes of the pen. ‘Leonardo da Vinci retained to the last a good deal of that care about the outline which characterizes the earlier stage of art, but even in his case it was accom- panied by an equal degree of care in modelling. In the sketches and studies of Michelangelo the care and time given to the outline are always in exact proportion to the pains taken with the modelling, and this employment of the time at the artist’s disposal is a clear proof that heSconsidered modelling as much a part of drawing as the outline itself. When he had time to do the modelling thoroughly, as in. his finished studies, he made the outlines very carefully also, but when the time at his disposal was limited he did not economize it by making, as an earlier artist would probably have done, a careful outline without modelling,—he still gave both together, but in a rougher and readier way. ‘The student can

find no better examples of this treatment than any three sketches and studies of Michelangelo which may have cost him respectively five minutes, half an hour, and three or fours hours of labour. The work in each instance is economized, not by rejection of one portion of his art, but by summarizing the whole, more or less, with the strictest reference to the time at his disposal. The studies of Raphael are done on the same principle.

The spirit of the Renaissance was caught from the study of antiquity, but it gave more latitude to original genius by allowing a freer play to personal qualitiesin art. This led to bold exaggerations, which became a part of artistic expression, and were to it what emphasis is to the orator. Michelangelo himself set the example of this, and it may be observed that, whereas when the works of the ancients seem to lose their spirit on reduction to a smaller scale, and require to be accentuated by the copyist who reduces them, those of Michelangelo bear reduction easily by reason of their own strong accents and exaggerations. Leonardo da Vinci, being of a calmer temper, put little exaggeration into his finished works, which are distinguished by great suavity and sobriety of manner; but he gave it free play in his caricatures, which served as an outlet for the more violent side of his genius. ~

A kind of exaggeration almost universal during and since the Renaissance has been a more than natural mark- ing of the muscles, which is opposed to the spirit of the best Greek design, and was directly due to anatomical studies, especially to the habit of dissection. This has continued down to our own day in all the learned schools of Europe. For example, in the St Symphorien of Ingres the figures of the Roman lictors are drawn as if they were without skins, and every muscle is enormously ex- ageerated.,

A better result of the scientific spirit of the Renaissance was the degree of care and attention which artists began to pay to the measurement of the human body, so as to determine its true proportions. Albert Durer made and recorded very numerous and careful measurements both of man and the horse, declaring that “no one could be a good workman without measuring,” and that “it was the true

foundation of all painting.” Leonardo affirmed in words of equal plainness that “a young man ought to begin to learn perspective by measuring

everything.” This habit of measurement has been continued down to our own day by the more careful artists. Whenever an animal died in the Jardin des Plantes, at Paris, Barye the sculptor went at once to take all its measurements, and drew or modelled it besides ; but he measured animals all his life, notwith- standing his great skill in drawing by the eye.

It is necessary to say something in this place of the rise Purist ana of what we call picturesque drawing, which is now more pieturesgua: prevalent than any other throughout Europe. We all know “Wing. _ what we mean by the word “ picturesque” as applied to real objects ; for example, we all consider that a feudal castle or abbey, when it has become an ivied ruin, is a picturesque object, but that a Greek temple in perfect repair is not. Even amongst things in equally good repair the distinction is recognized, thus we say that the costume worn by Charles II. was more picturesque than that worn by William Pitt. We are less acccustomed to recognize the fact that almost any object may be drawn in a manner which is picturesque or not picturesque, according to the temper of the artist. The temper which produces pictur- esque work is tolerant, observant, and playful ; the temper which produces the other kind of work is always either . simple or severely disdainful,—simple in Greece and in the purists of the Middle Ages, disdainful in the great men of the Renaissance and in all their strongest successors. ‘The most perfect development of the picturesque spirit in drawing before our own century took place in Holland, the Dutch school working almost entirely in that spirit. The severe spirit has maintained itself chiefly as a sort of academic protest against the picturesque, which is never authoritatively taught in any academy of art. The academies direct students continually to Raphael, but never to Rembrandt. On the other hand, the kind of drawing usually taught to amateurs is picturesque, especially through the medium of water-colour. The strongest reaction against the picturesque has been that of | the French “néo-Grecs,” who in study went back to the pure Greek line and flat space, the most earnest of them declaring that nothing more was needed to the perfection’ of art. The most perfect and studied picturesque in modern drawing will be found in the works of etchers and fusinists (artists who draw in charcoal). The picturesque is always easily recognizable by its love of accident and variety of line and character, and by its strong effects of light and shade. When in excess it violently exaggerates these accidents, varieties, and effects.

The kind of drawing which is best for landscape differs Landscape. in some important respects from that which is best for the figure. To perceive the full truth of this, the reader has only to draw a landscape with the simplicity of the line in a Greek figure, when he will see that the more complicated character of landscape material requires a more varied interpretation. Good landscape draftsmen are seldom very accurate as to form, and it is not necessary that they should be ; but they are always careful to preserve truth of character, and have great difficulties of their own to contend against, which are generally much underestimated. The inaccuracy of landscape design comes from the necessity for composition. When the figure painter composes, he can move his models about, and place them in different attitudes, and draw them faithfully after all; but when a landscape painter does the same thing, by an effort of imagination, with his mountains, trees, or towers, he unavoidably violates topographic accuracy. The habit of inaccuracy soon forms itself, for this reason, in all landscape draftsmen who compose ; and all artists by profession are compelled to compose in order to make their works attractive in appear-

Courses of | study in drawing.

ance and saleable. Simple studies of landscape may, however, be made with perfect accuracy, and are so done occasionally for special purposes. The best examples of such accurate landscape design to which we are able to refer the reader are the engraved studies of Mr Ruskin. Fine examples of artistic landscape design, in which natural scenery is well interpreted but not literally copied, are infinitely more numerous. The Leber Veritutis of Claude, and the Liber Studiorum of Turner, abound in fine examples of composed landscape, and a great number of illustrated works have been published during the present century, in which the student may find endless instruction.

Landscape design is usually taught to amateurs by drawing masters, because it is thought to be easier than that of the figure; but the choice of landscape for elementary instruction is unfortunate, because a beginner requires simpler and more definite material than is to be found in landscape nature. It is wiser for all beginners in art to study for a long time the most

simple and. definite objects which can easily be entirely detached from other objects and thoroughly studied by themselves. This was the true early classic manner of drawing, and the student who follows it in the present day will always be rewarded by an earlier insight into the qualities of form than can be attained by any other method. The truth of this is more fully recognized wherever drawing is taught seriously ; but those who teach water-colour to amateurs too often encourage them ina confused way of looking at nature which, at the best, only results in a feeble imitation of fifth-rate water-colour landscapes, in which there is nothing worthy to be called drawing at all, nor any real rendering of form. It is of the utmost importance to amateurs that they should not misapply the little time which they can usually give to practical art, and yet they often do misapply it in many ways. A very common causc of loss of time, in their case, is false finish, aud Jabour thrown away by the employment of methods which take more time than other methods for an inferior result, as, for example, when painful pen hatching is employed for shading where the chalk and stump, or charcoal, or the brush, would give a shade of far better quality in a twentieth part of the time. All truly great artists, though prodigal of labour when their purposes required it, have economized it whenever the economy was not artistically an evil, and this is often best seen in their sketches, which give rapidity, not by hurrying the hand, but by using the most summary means of expression. his art of summary expression in drawing is of great use to figure-painters, but it is still more important in landscape, because the effects of nature pass so rapidly that they do not permit any slow method of interpretation. Many of the fine sketches by great men have been done, without hurry, in a few minutes. Tinted papers are often used to economize time, because they supply a middle tint on which lights can be noted in white, and darks in chalk, charcoal, or a wash of water-colour. Good examples of sketches and studies by the greatest artists are now quite easily accessible through the photographic processes, and by their help a student at a distance from the national collections may easily learn for himself how they used the pen by itself, or the pen for line with a wash for shadow, or the lead pencil point, or chalks (white and black) on grey paper, or sanguine, getting a shade more quickly by one method, a line more precisely by another. Original drawings by great masters may be seen in all the capitals of Europe, in the public collections. Of late years drawings by modern artists have attracted more of the public attention than they did

formerly, and “ black-and-white ” exhibitions have ! with been successfully established in London, Paris, and New| and is a very serious production in ottava rima. He after- York. xnrough the influence of the South Kensington wards enlarged and modified this poem, and republished it

Museum and its affiliated schools, of design the knowledge| in 1603 under the title of Zhe Barons’ Wars. In 1596,

of drawing is now becoming much more general in Great Britain than it has ever been before. ‘The preliminary difficulties of the art can scarcely be overcome without the assistance of a master, but in his absence the student may obtain useful help from books.

The student should thoroughly master and remember Burnet’s Lissay on the Education of the Eye, which is most concise, and con- tains nothing doubtful or disputable. Mr Harding’s works, and Mr Ruskin’s Elements of Drawing, are also useful books for amateurs, especially if taken together. There are also various little treatises on elementary technical practice, usually written by artists, and published by the colour-makers, from which good practical hints may be obtained as to the use of instruments and materials. It is not generally known in England that there is a magnificent national collection of drawings by the old masters in the British Muscum, to which access may easily be obtained on compli- ance with a simple formality. The student is earnestly recom- mended to avail himsclf of these treasures, which are generally strangely neglected. A handbook to the Department of Prints and Drawings, with an introduction and notices of the various schools (Italian, German, Dutch and Flemish, Spanish, French, and Eng- lish) has been lately compiled by Mr Fagan, of the Museum, and published by Messrs Bell & Sons. A selection of drawings by the Italian masters in the British Museum has been been lately pub- lished in autotype by Messrs Chatto & Windus, with notes by Mr Comyns Carr, which, it is to be hoped, will be followed by selec- tions from other schools. It is much to be regretted that some portion, at least, of these national treasures should not be made readily accessible to the general public by framing them and exhi- biting them under glass in a gallery, according to the plan adopted in the Louvre. Their very existence is not so much as suspected by the great majority even of cultivated Englishmen. (P. G. H.)

DRAYTON, Micnazn (1563-1631), English poet, was born at Hartshill, near Atherston, in Warwickshire, in 1563. Even in childhood it was his great ambition to execl in writing verses. At the age of ten he was sent as page into some great family, and a little later he is supposed to have studied for some time at Oxford. Sir Henry Goodere became his patron, and introduced him to the countess of Bedford, and for several years he was supported by Sir Walter Aston. How the early part of his life was spent, however, we possess no means of ascertaining. It has been surmised that he served in the army abroad, In 1590 he seems to have come up to London, and to have settled there. In 1591 he produced his first book, Zhe Harmony of the Church, a volume of spiritual poems, dedicated to Lady Devereux. The best piece in this is a version of the Song of Solomon, executed with considerable richness of expression, A singular and now incomprehen- sible fate befell the book ; with the exception of forty copies seized by the archbishop of Canterbury, the whole edition was destroyed by public order. It is probable that he had come up to town laden with poetic writings, for he pub- lished a vast amount within the next few years. In 1593 appeared Idea: The Shepherd's Garland, a collection of pastorals, in which he celebrated his own love-sorrows under the poetic name of Rowland. The circumstances of this passion appear more distinctly in the cycle of 64 sonnets, published in 1594, under the title of Jdea's Mirror, by which we learn that the lady lived by the river Anker, in Warwickshire. It appears that he failed to win his "Tdea," and lived and died a bachelor. The same year, 1594, saw the publication of Matilda, an epical poem in rhyme royal, the first of his studies from English history. Tt was about this time, too, that he brought out Endimaon and Phoebe, a volume which he never republished, but which contains some interesting autobiographical matter, and acknowledgments of literary help from Lodge, if not from Spenser and Daniel also. In his Fig for Momus, Lodge has reciprocated these friendly courtesies. In 1596 Drayton published his long and important poem of Mortimeriados, which deals with the Wars of the Roses,

also, appeared another historical poem, Lhe Legend of Robert, Duke of Normandy, and a similar piece on Piers Gaveston. In 1597 appeared England's Leroical Epistles, a series of historical studies, in imitation of

those of Ovid. These last poems, written in the heroic couplet, contain some of the finest passages in Drayton's writings. With the year 1597 the first half of the poet's literary life closes. He had become famous by this rapid production of volumes, and he rested on his oars, It would seem that he was much favoured at the court of Elizabeth, and he hoped that it would be the same with her successor,' But when, in 1603, he addressed a poem of compliment to James I. on his accession, it was ridiculed, and his services rudely rejected. His bitterncss of spirit found expression in a satire, Zhe Owl, which he printed in 1604, although he had no talent in this kind of composition. Not much more en- tertaining was his scriptural narrative of Moses im a Map of his Miracles, a sort of epic in heroics printed the same year. In 1605 Drayton reprinted his most important works, that is to say, his historical poems and the Jdea, in a single volume, which ran through eight editions during his lifetime. He also collected his smaller pieces, hitherto unedited, in a volume undated, but probably published in 1605, under the title ef Poems Lyric and Pastoral ; these consisted of odes, cclogues, and a fantastic satire, called The Manin the Moon. Some of the odes are extremely spirited, He then adopted the extraordinary resolution of celebrating all the points of topographical or antiquarian interest in the island of Great Britain, and on this laborious work he was engaged for many years. At last, in 1613, the first part of this vast work was published under the title of Poly- Olbion, eighteen books being produced, to which the learned Selden supplied notes. The success of this great york, which has since become so famous, was very small at first, and not until 1622 did Drayton succeed in finding a pub- lisher willing to undertake the risk of bringing out twelve more books in a sccond part. This completed the survey of England, and the poet, who had hoped to "crown Scot- land with flowers," and arrive at last at the Orcadcs, never crossed the Tweed. In 1627 he published another of his miscellaneous volumes, and this contains some of his most characteristic and exquisite writing. It consists of the following pieces :—Zhe Battle of Agincourt, an historical poem in ottava rima, and he Miseries of Queen Margaret, written in the same verse and manner; Nimphidia, the Court of Faery, a most jeyous and graceful little epic of fairyland ; The Quest of Cinthia and The Shepherd's Sirena, two lyrical pastorals ; and finally The Moon Calf, a sort of satire. Of these Mimphidia is perhaps the best thing Drayton ever wrote, except his famous ballad on the Battle of Agincourt ; it is quite unique of its kind, and full of rare

fantastic fancy. The last of Drayton’s voluminous publications was Zhe Muses’ Elizium in 1630. He died in London on the 23d of December 1631, was buried in Westminster Abbey, and had a monument placed over him by the countess of Dorset, with memorial lines attri- buted to Ben Jonson, Of the particulars of Drayton’s life we know almost nothing but what he himself tells us ; he en- joyed the friendship of some of the best men of the age. He corresponded familiarly with Drummond ; J onson, Browne, Wither, and others were among his friends. In one of his poems, an “elegy ” or epistle te. Mr Henry Reynolds, he has left some valuable criticisms on poets whom he had known. FY. was even engaged in the labour of the dramatists 3 at least he had a share, with Munday, Chettle, and Wilson, In writing Sir John Oldcastle, which was printed in 1600. That he was a restless and discontented, as well as a worthy man, may be gathered from his own admissions.

_ The works of Drayton are bulky, and, in spite of the high place that he holds in critical esteem, it cannot be

pretended that he is much read. For this his ponderous style ismuch to blame. The Poly-Olbion, the most famous but far from the most successful of his writings, is tedious and barren in the extreme. The metre in which it is com- posed, a couplet of Alexandrines, like the French classical measure, is wholly unsuited to our language, and becomes excessively wearisome to the reader, who forgets the learn- ing and ingenuity of the poet in labouring through the harsh and overgrown lincs. His historical poems, which he was constantly rewriting and improving, are much more interesting, and often rise to a true poetic eloquence. His pastorals are brilliant, but overladen with colour and sweet to insipidity. He is, with one or two magnificent exceptions, an indifferent sonneteer. The poet with whom it is most natural to compare him is Daniel; he is more rough and vigorous, more varied and more daring than the latter, but Daniel surpasses him in grace, delicacy, and judgment, In their elegies and epistles, however, the two writers frequently resemble each other. Drayton, however, approaches the very first poets of the Elizabethan era in his charming Mimphidia, a poem which inspired Herrick with his swect fairy fancies, and which stands alone of its kind in

our literature; while some of his odes and lyrics are inspired by noble feeling and high imagination.

In 1748 a folio edition of Drayton's complete works was published, under the editorial supervision of Oldys, and again in 1753 there appeared an issue in four volumes. But these were very 'unintelli- gently and inaccurately prepared. An attempt is now being made to edit Drayton in a more critical spirit. 'Three volumes of an edition (to be completed in six or eight volumes), collected by the Rev. R. Hooper, have already appeared, comprising the Poly-Olbion and the Harmony of the Church. (E. W. G.)

DREAM. Dreams are a variety of a large class of mental phenomena which may be roughly defined as states of mind which, though not.the result of the action of external objects, resume the form of objective perceptions. To this class belong the fleeting images which occasionally present themselves during waking hours, and especially before sleep, the "visions" which occur in certain exalted emotional conditions, as in religious cestasy, the hallucina- tions of the insane, the mental phenomena observable in certain artificially produced states (hypnotism), &c. These and other mental conditions rescmble one another in many important respects, to be spoken of by and by. At the same time they are roughly marked off by certain special circumstances, Thus, dreaming may be distinguished from the other species of the class as depending on the most complete withdrawal of the mind from the external world. All products of the imagination which take the aspect of objective perceptions must, it is clear, involve a partial aberration of the intellectual processes. Yet in all cascs except that of dreaming—including even somnambulism— the mind preserves certain limited relations to external objects. In dreams, on the contrary, the exclusion of the external world from consciousness is for the most part coniplete. Sleep has under normal circumstances the effect both of closing the avenues (sensory nerves) by which external impressions are conveyed to consciousness, and of cutting off from the mind that mechanism (the voluntary- motor nerves and muscles) through which it maintains and regulates its varying relations to the outer world. Dreaims cover a great variety of mental states, from fleeting momentary fancies to extended series of imaginations, Again, dreams have certain constant or approximately con- stant features, while in other respects they manifest wide diversity. Among

the most general characteristics is to be named the apparent objectivity of dream-experience. The presence of this objective element in dreams is clearly indi- cated in their familiar appellation “visions,” which also points to the well-recognized fact that a large part of our dream-imagination simulates the form of visual perception,

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The next general characteristic of dreams is that, though re- sembling waking experience in many respects, they seem never exactly to reproduce the order of this experience. Most of our dreams differ very widely from any events ever known to us in waking life, and even those which most closely resemble certain portions of this life introduce numerous changes in detail. These deviations involve one or two distinct elements. First ofall, there is a great confusion of the order in time, space, &c., which holds among real objects and events. Widely remote places and events are brought together, persons set in new relations to one another, and so on. Secondly, the objects aud scenes are apt to assume a greatly exaggerated intensity. They take a firmer hold of us, So to speak, than our waking experience. We may when awake think of dreams as unsubstantial and unreal, but to the dreamer at the moment his imagined surroundings are nore real, more impressive, than the actual ones which he perceives when awake. Dream-fancy exaggerates the various aspects of objects, makes what is large still larger, what is striking still more striking, what is beautiful still more beautiful, and so on.

Having touched on these approximately universal characteristics of dreams, we will now specify a few of the more variable features. Tor example, in a large number of our dreanis we appear to be passive spectators of events which we are incapable, or rather do not think, of control- ling in any way. In other dreams, again, we seem to be lively actors in the scene,—talking, moving, &c., as we are wont to do in waking life. In a class of dreams lying midway between these two extremes we appear to be impelled to act, to be struggling to seize some offered good or to avert some threatening evil, yet to be unable to execute our wishes. Once more, dreams differ very much as to their degree of reasonableness. It is certain that in niany cases the dreamer is easily imposed on, sees no con- tradictions, does not seek to

understand the events which unfold themselves before his fancy, and so on. In some instances, indeed, the mind of the dreamer loses even the sense of ideutity in objects, and metamorphizes persons in the most capricious manner ; and this confusion of identity may embrace the dreamer himself, so that he imagines himself to be somebody else, or projects a part of himself, so to speak, into another personality, which thus becomes an alter ego and an object for the contemplation of the remaining self. Yet though itis true that many, probably a large proportion, of our dreams, are thus unintelligible to waking thought, there is a number of well authenticated dreams in which persons have proved themselves to be possessed not only of their ordinary, but even of an extra- ordinary, power of reflection. We refer to the well-known stories of the intellectual achievements of Condillac, Con- dorcet, Coleridge, &c., when dreaming. Once more, great differences are observable in dreams with respect to the feelings excited by the visionary experiences. Sometimes the circumstances in which we find ourselves affect us much as in waking life;—danger terrifies us, beauty delights ns, and so on. At other times, however, we are not thus affected ; —-what would puzzle, confuse, or shock our minds in waking experience fails to do soin dream-life. Finally, tllere are certain exceptional features of dream-life, as a vague consciousness of dreaming, which assumes the form of a dream within a dream, and the repetition of the images of previous dreams with a recognition of the familiarity of the dream scenes. It need hardly be added that dreaming varies greatly, both in quantity and in quality, according to individual temperament, habits of thought, de.

Theories of Dreaming.—From the slight sketch of the character of the dreaming process just given, it might be conjectured that the human mind at all times would be profoundly impressed with the fact of dreaming, and seek

toyarrive at some explanation of what on the surface is un- doubtedly so mysterious and so wonderful a phenomenon. And as a matter of history we find that men have in all the known stages of their intellectual development endeavoured to account for the visions of the night. The various theories thus put forward fall into two main classes—the super- natural and the

natural. By the former we mean all ex- planations which assume the action of forces unknown to our waking experience ; by the latter those which make no such assumption, but-seek to interpret dream-phenomena as products of forces familiar to waking perception. The supernatural hypothesis, again, falls into two divisions, according as the dream is regarded as the immediate effect of some reality corresponding to the actual world of our waking experience, or as it is conceived as a mediate result depending on the volition and command of some absent being. We thus have three main methods of explaining dreams :—(a) The naive objective explanation; (6) the religious explanation ; (c) the scientific explanation.

(a) The Dream as Immediate Objective Experience.—Ac- cording to recent researches the savage mind regards dream- ing as no less real an objective experience than waking. The objects and scenes which flit before the dreaming fancy of the primitive man are real material existences, the sounds he seems to hear are real external sounds, the dream figures which stand before his imagination and converse with him are real persons. How then does he conceive the relation of this dream-world to the world of waking experience ? This question has lately been answered by Mr E. B. Tylor and Mr Herbert Spencer. The belief in the objective reality of dreams requires the savage to conceive a double nature both for objects (animate and inanimate) external to himself and for himself. The vision of dead ancestors, of material objects long since lost or destroyed, easily suggests the idea of a duplicate of the original person of thing, a second self or soul. On the other hand, when the savage dreams that he goes forth to accustomed scenes, to hunt, to fight, and so on, he accounts for the dream by the supposition that his own second self or soul leaves the body and passes forth to the particular locality. Thus the dream-life shapes itself to our primitive philosopher as an intercourse of souls or duplicate selves, co-ordinate with, and of equal reality with, the experience of waking life. It appears to follow from the unfamiliarity of dream scenes, personages, &c., that the region visited during sleep will be projected by the savage inind quite outside the world of waking observation. Mr Spencer connects with this fact the earliest theories of another world or a spiritual state. (For a fuller account of the part played by dreams in primitive ideas consult E. B. Tylor, Primitive Culture, vol. i. chap. xi. ; H. Spencer, Prznciples of Sociology, i. ch. x. et seq.) (6) The Dream asa Communication from a

Supernatural Beimg.—It is plain that even in the savage's conception of dreaming there is room for the thought of a divine announcement. When once the idea of superior beings, deities, demons, &c., is reached, it becomes natural to regard the visit of some departed soul as the despatch of a messenger to the dreamer. In this way the first mode of explanation passes insensibly into the second, In higher stages of religious thought the view of a dream as a divine revelation takes a less crude form. The immediate object present to the dreamer is no longer conceived as possessing the same degree of materiality. Something is still present, no doubt, and so the dream is in a sense objective ; but the reality is less like a tangible material object, and is trans- formed more or less completely into something unsubstantial, spiritual, and phantasmal. On the other hand, the dream is objective in the sense of being a message or revelation from some actual divine personage. The essence of the

dream, so to speak, lies in the fact that it conveys to the dreamer something which the divine personage wishes him to know, whether it be the will of this being in the shape of a command or a prohibition, or some fact as yet unknown (past or future), the knowledge of which will be of practical utility to the recipient. We may distinguish three stages in this conception of dreams :—(L) The deity sends a messenger or angel who is vaguely conceived as a spiritual being clothed in a thin material vestment ; (2) the divine communicator, dispensing with the medium of a material appearance, lets his message be heard by the dreamer as the utterance of an external voice; (3) he discloses his purpose by causing to pass before the soul a vision which is not distinctly conceived as objective, but rather as some- thing mysteriously imprinted on the mind,

The divine communication which thus makes use of the medium of a dream will, it is plain, vary eonsiderably in the degree of its intelligibility. Sometimes the meaning of the message is obvious and unmistakable. The actions to be performed and the facts to be known are revealed plainly and directly. This will be the case for the most part with the first and second forms of dream-communica- tion. At times, too, the divinely created vision may distinctly picture some coming event in the individual or national life.

On the other hand, the communication may be disguised and only partially divulged by symbol, in which case there arises the necessity of an art of inter- pretation. Thus at times the oral utterance may assume the form of a dim oracular declaration which ealls for care- ful attention and.a certain skill in the application of verbal figures. It is, however, in the last form of dream-revela- tion that we find the greatest demands made on the interpreter's art. It follows from what has been said respecting the novelty of dream-combinations that many of the visual images which make up so large a bulk of our dreams caunot easily be fitted to any actual order of events. Hence, if such dreams are to be interpreted as having a bearing on actual events, they must be regarded as figura- tive or symbolic. Accordingly we find that the symbolic function of dreams has been fully recognized in all the theories of dreaming now dealt with. It seems to have been assumed that the normal mode of divine communication to man during sleep was that of such a figurative dream. And agreeably with this supposition the task of deciphering dream-symbols gradually grew into a skilled art, which became the prerogative of a certain class of experts,—as prophets, divinators, or magicians.

A very brief historical review of this religious theory of dreams must here suffice. Among the Oriental peoples this view of dreams was the prevailing one. We find, however, great differences in the mode of interpretation adopted. Among the ancient Hebrews, for example, we find all the three forms of dream-communication mentioned above. As to interpretation there seem to have been no definite rules, and the procedure followed resolves itself into an attempt to discover the most natural or least forced application of the persons, objects, and relations of the dream to some existing persons, social circumstances, and events. This mode of interpretation clearly left wide scope for individual skill. In the Persian scheme of interpretation, on the other hand, so far as we ean judge of it from the eompilations of a later age, the art of dream-interpretation, oneirocritics, or oneiromancy, was defined and fixed in a number of rules. Thus in the work known under the name of the S7fat-i- Sirozah, minute and elaborate prescriptions are given for interpreting various classes of dreams according to the par- ticular day of the month on which they occur. A similar systcmatization of the rules of dream-interpretation is to be met with among the Arabs (see L'Onirocrite Mussulman, par Gabdorrhachaman, traduction de Pierre Vattier.) In

such cases, it is plain, the interpretation of dreams involved less of individual genius or inspiration, and became a more mechanical process, involving only careful knowledge of formule, and one which could be easily communicated, Such a state of things points to the transition of dream-lore from the stage of an esoteric mystery to that of a eom-municable scicnce. Among the Greeks and Romans the religious view of dreams is to be found in popular literature as well as in philosophic writings. In Homer, dreams are distinctly said to be sent by the gods and goddesses, as in the expression Oetos overpos, and it is implied that they may be intended to deceive the subject of them (eg., Agamemnon's dream, Jliad, book ii.). Similarly the dramatists frequently speak of foreknowledge divinely communicated by dreanis (e.g., Clytemneestra's prescience as to the fall of Troy in the Agamemnon of AXschylus is ascribed toa dream). The popular view was countenanced to a certain extent by philosophers. Thus Plato found room in his mystic scheme of knowledge for the idea of a divine manifestation to the soul in sleep. In the Zimaus (chaps. xlvi. and xlvii.) a prophetic character is distinctly assigned to the images of dreams. These divine inspira- tions (divinations) are not, however, given to the rational soul, but to the lower appetitive soul through the medium of the sensible images of rational truths which are reflected on the liver, an organ contiguous with the bodily seat of the appetitive soul, These prophetic visions are received only when the reasoning faculty is fettered by sleep or alienated by disease and enthusiasm, In this way the divine artificer has given to the inferior regions of the soul a certain substitute for rational knowledge. At the same time the interpretation of the visions requires intclligence, and hence the business of receiving them and of interpret- ing them does not properly belong to the same persons. Even Aristotle treats the supposition of divine revelation in dreams very considerately when he writes, in the treatise mept pavrikys THS ev Tots varvous, "that there is a divina- tion concerning some things in dreams is not incredible." The Stoics, again, to judge from Cicero's account of their views in his De Divinatione, reasoned a priori that the gods, if they love men and are omniscient as well as all- powerful, will certainly disclose their purposes to man in sleep. Chrysippus is, on the same authority, said to have written a volume on the interpretation of dreams as divine portents. Cicero's brother

Quintus, who here defends the orthodox theory of dreams, speaks of a skilled interpretation of dreams which is a true divination, even though, like all other arts in which men have to pro- ceed on conjecture and on artifieial rules, it is not infallible. The eurrent views of dreams of classic antiquity are supposed to be to some extent embodied in the “Oveipoxputixd of Daldianus Artemidorus of Ephesus (written about the year 170). Here the interpretation of dreams is reduced to a body of elaborate rules. To dream of a particular element, as fire, air, &c., of a particular plant, part of the body, and so on, always signifies the same kind of event for the same kind of person. It is the over-looking of the age, social eondition, é&c., of the dreamer which, in the view of Artemidorus, leads to the abuse of dream-inter- pretation. He attempts to draw a distinction between éveipos, a vision having a real bearing on events, and évimviov, a mere dream having no actual significance ; but this does not, according to Liddell and Scott, correspond with classical usage. The divine origin of dreams became a doctrine of the Christian ehurch. It appears in the writings of the fathers, being defended partly on biblical, partly on classic, authority. Synesius of Cyrene (born 375) has left a treatise on dreams (epi évvrviwv). He puts forward eertain psychological hypotheses drawn largely from Plato and Plotinus and ascribes to the imagination

(which is intermediate between the soul and the animal part} the power of accompanying the soul in its flights to the celestial regions, and so of sharing in the contemplation of divine truths. Synesius exalts the rank of dreaming among the arts of divination, setting it far above other modes of prophecy as being most simple and sure, open to all, unencumbered with expensive and laborious prepara- tions, and so on. He aflirms that he has repeatedly found dreams of service in arranging his ideas, and in improving his style of composition. Medizval and modern Christian theologians have continued to attribute dreams, or, more accurately, certain orders of dream, to the intermediate agency of the divine Being. The popular theory of dreams to be met with among the later European peoples bears the impress of that folklore which developed itself in the Middle Ages under influences partly Christian, partly pagan. Dreams were referred to a variety of supernatural agencies, including uot ouly God and the devil, but also

subordinate beings, as fairy, fiend (incubus), &c. Further, the art of interpreting dreams according to definite rules (oneiromancy) was developed to a very high point. (See Brand, Popular Antiquities, vol. iii. Dictionary of Dreams). In our own times certain restricted classes of dreams are customarily associated with the action of benevolent or malignant beings. On the other hand, people are now wont to interpret dreams as omens or signs without dis- tinetly attributing them to any supernatural agent. This view of dreams forms the transition-point between the religious and the scientific theories.

(c) The Dream as a Subjective Phenomenon Dependent on Natural Causes. —While the theory of the divine or super- natural origin of dreams has thus held its ground so long, there has been gradually growing up from an early period of human history a more scientific conception of the phenomenon as dependent on natural laws (of mind and body). Psychologists and physiologists alike have approached the subject from their respective points of view, and sought to explain the phenomena of dreaming as natural events. The first germs of a scientific theory of dreams are to be found in antiquity. Thus Democritus, from whom the Epicureans derived their theory, held that dreams are the product of the simulacra or phantasms of corporeal objects which are constantly floating in the atmosphere, and which attack the soul during repose. Again, Plato speaks in the Republic of dreaming as illustrating the dominant mental impulses and habits of the individual (unchecked appetite, and temperance with intellectual pursuits), and thus connects it with the normal waking operations of feeling and thought. Aristotle in his short treatise on dreams (zepi évurviwv) refers dreaming to the action of objects of outward sense which leave behind impressions on the soul and bodily frame. Dreaming is said to be the function of the sensitive part of the mind, but of this so far as phantastic ; and a dream is defined as “the phantasm arising from the motion of sensible per- ceptions when it presents itself to him who is asleep.” Aristotle further has some correct observations on the immediate bodily conditions of dreaming, and on the exaggeration of sensation in this condition of mind. Thus, he says, we fancy it thunders and lightens when a small sound is produced in our ears; we imagine that we are eating honey in consequence of a defluxion of the least quantity of phlegm. In the De Divinatione of Cicero we have almost an unique instance among classic writings of a

complete rejection of the doctrine of the supernatural origin of dreams, and of a full and consistent adoption of the natural method of explaining the phenomena. Cicero's position stands in marked contrast to that of partial sceptics, as, for example, Pliny, who seems content to exclude from the supernatural method of exvlanation certain

of the more obviously natural dreams, such as those occurring immediately after food and wine, or when one has just fallen asleep after waking (Wat. Hist.)

While philosophers were thus learning to regard dreams as natural processes, physicians, on the other side, had their attention called to dreaming in its relation to patho- logical bodily conditions. It seems probable, indeed, that men occupied in studying bodily diseases were among the first to suspect the true nature and origin of dreaming. Thus Hippocrates, while inclined to admit that some dreams may be divine, distinctly says that others arise from the action of the mind and the body. Hippocrates, too, appears to have been the first to supply a scientific basis for the premonitory character of certain kinds of dreams. There are dreams, he says, which announce beforehand the affections of the body. 'This idea has, as we shall see presently, been confirmed by modern pathological observa- tions. It is easy to understand that this prognostic side of dreams was in the early stages of knowledge greatly exaggerated. This appears to be true of the speculations of Galen, who held that to dream one's thigh was turned into stone signified the approaching loss of this member. This belief in the premonitory character of dreams was only one side of a general doctrine of dreams according to which they arise from bodily disturbances, and so may serve as symptoms which the physician has to include in the complete diagnosis of a disease. This idea, which is recognized by modern physiologists as true within certain limits, led in the first crude stages of scientific investigation to exaggerated and fanciful conclusions, Thus a new system of dream-interpretation came into vogue according to which to dream of a certain thing always means a dis- turbance in one particular organ. In the doctrines of Oriental physicians (the Hindus and Chinese) dreams are thus referred to pathological states of the five organs— heart,

lungs, kidneys, spleen, and liver. Thus to dream of war and fighting signifies a bad state of the lungs; of fire, smoke, d&c., a bad state of the heart, and so on.

Modern Theory of Dreams.—Under this head we shall give an account of the principal results of modern in- vestigations, psychological and physiological, on the nature and conditions of dreains. Respecting many points there is still considerable diversity of view. Certain questions of fact yet remain unanswered, the reason of this being the inaccessibility of dream-phenomena to accurate and adequate observation. Further, owing to the divided condition of psychological principles, the explanation of dreaming assumes very different forms with different writers. On the one hand there are those who conceive the mind as an independent spiritual substance, which employs the body as its instrument, but is not dependent on this. With these, dreams will naturally wear the aspect of products of some spiritual faculty or faculties which are not involved in the sleep of the body and the senses, At the other extreme are those who regard mental phenomena as an outcome of bodily changes, as a refined result of physical processes. By these, dreams will be regarded as given off, so to speak, by the various organs of the body during sleep. Midway between the spiritualist and materialist hypotheses is the scientific view in its narrower sense, namely, the doctrine that the mental and the bodily are perfectly dissimilar regions of phenomena, which are yet connected in such a way that bodily events appear as the conditions of mental events. In the follow- ing account of modern dream theory we shall confine our- selves for the most part to the last stand-point, though indicating here and there how the other theories of the relation of mind to body lead to divergent conclusions. –

On the very threshold of our inquiry we are met by a much disputed question—What is the relation of dreaming

to sleep? Is dreaming an indication of imperfect sleep which must cease as soon as the higher nervous centres reach a complete repose ? Is it, on the other hand, some- thing wholly spiritual and independent of sleep as a bodily condition? Here we have two different views arising from different

theories of the relation of mind and body. These distinct views of the subject have commonly appeared as answers to the question of fact—Are we when asleep always dreaming ? This question was first raised by philosophers in connection with certain conceptions of the soul and its activity. Descartes, who regarded thought as of the essence of personal existence, was naturally led to maintain that the mind is always thinking. “Iam,” he says, “I exist, that is certain; but for how long? as long as I think ; for perhaps even it might happen that if I ceased wholly to think I should cease at the same time wholly to exist” (Meditation ii.). Among the Cartesians tle proposi- tion, the mind is always thinking, became a leading tenet, Locke argues against this supposition. He contends that in sleep men do not always think, or they would be con- scious of it. If it is asserted that they dream but they forget it, he replies it is “‘hard to be conceived” that “the soul in a sleeping man should be this moment busy a-thinking, and the next moment in a waking man not remember nor be able to recollect one jot of all those thoughts.” To suppose that in sleep the soul thinks apart from the body involves the absurdity of a double mind, and is further contradicted by the irrationality of dreains (Essay, book ii. ch. i.). Locke was answered by Leibnitz in the Nouveaux Hssais, who upheld the Cartesian aftirma- tion, and maintained that during sleep the mind has always some “little perceptions ” or ‘‘ confused sentiments,” though, according to his doctrine of unconscious perceptions, these need not become objects of conscious attention. That we never sleep without dreaming is further maintained by Kant in his Anthropologie, by Jouffroy and others. In his Lectures on Metaphysics, Sir W. Hamilton argues fully for the same idea. He says that during sleep the mind “ is never either inactive or wholly unconscious.” He seeks to refute the argument of Locke, that we ought to remember our dreams, by calling attention to the fact that the somnambulist has no recollection of his dream, and that persons who betray in their expression and utterance the fact of dreaming retain no recollection of the state, He further holds that the continuity of dreaming is proved by the fact that whenever we are suddenly roused from sleep we find ourselves dreaming.

While metaphysicians have thus in the main affirmed the continuity of dreams, those who regard mental phenomena as invariably connected with bodily conditions have for the most part viewed dreaming as only an

occasional accom- paniment of sleep. By some, indeed, dreaming is viewed as confined to the transition state from sleeping to waking, though this view is now rejected by physiologists no less than by metaphysicians. It is true that the great rapidity of dream-thought has been proved, e.g., by the experience of Lord Holland, who fell asleep when listening to some- body reading, had a long dream, and yet awoke in time to hear the conclusion of the sentence of which he remembered the beginning. And this takes off from the value of Hamilton's argument that we always find ourselves dream- ing when wakened, for such dreaming may clearly be an incident of the transition state. Yet the other facts emphasized by Hamilton, as well as the results of Maury's experiments, to be spoken of presently, show that we may dream when soundly sleeping. On the other hand, we cannot, it is certain, directly prove that we are always dreaming during sleep. Many physiologists are disposed to regard dreaming as the accompaniment of some slight disturbance, whether arising from the lower organs or from

an undue excitability of the brain and its nervous connec- tions; and according to this view the continuity of dreaming would seem to be an improbable supposition, To the physiologist the idea of perfectly unconscious steep presents no difficulties. The results of experiment show him that the lower bodily (vegetative) functions are in- dependent of cerebral activity ; and the phenomena of swooning, the effects of anesthetics, &c., familiarize him with the temporary suspension of the conscious activity of the brain. Hence the view commonly adopted by physio- logists seems to be that dreaming is only an occasional incident of sleep. +See the article on "' Sleep and Dreams " by Dr Carpenter in Todd's Zncy. of Anat. and Physiol.) At the same time certain physiologists, as Sir H. Holland (Chapters on Ment. Physiol.) and Sir Benj. Brodie (Psycho- logical Inquiries), are disposed to think that dreaming is the rule and not the exception.

The question whether we are always dreaming during sleep leads up naturally to the inquiry into the causes or conditions of dreams. This question has been approached from different sides. On the one side, metaphysicians have sought to account for dreaming by some simple theory

of a suspension of certain niental faculties. On the other side, writers have tried to explain dreaming as a result of simple bodily operations. We will just glance at one or two of these simple hypotheses. A common view among meta- physicians is that the nature of dreaming is amply explained by the absence or suspension of the will. The importance of the cessation of the will's action has been emphasized by Dugald Stewart (Zlements of the Phil. of the Human Mind, vol. i. chap. v. sect. 5). Stewart does not mean that the will is wholly dormant in sleep, but that it loses its hold on the faculties. By this supposition he seeks to account not only for the incoherence but also for the apparent reality of dream-images. That the absence of the normal processes of volition, especially as involved in attention, con- stitutes one important factor in the explanation of dreaming seems to be admitted by all writers,—for example, Dr Darwin (Zoonomia), Sir Benj. Brodie, Dr Carpenter, and M. Alf. Maury (Le Somme! et les Réves). It is doubtful, however, whether this simple hypothesis explains all that Stewart refers to it. Maury objects to Stewart's theory that the will does not wholly lose its command of the bodily organs, d&c., in dreams.

While great stress has thus been laid by some writers on this negative condition, the suspension of will, others have sought to construct a simple theory of dreaming by supposing the unimpeded action of some special mental faculty. Thus Cudworth (Treatise concerning Eternal and Immutable Morality) reasons, from the orderly coherence of dream-imaginations and the novelty of their combinations, that this state of mind arises from the action of "the phantastical power of the soul," and not from '"'any fortuitons dancings of the spirits." A very curious theory of dreaming as dependiug on a particular circum- scribed faculty of the soul is to be found in Scherner's Das Leben des Traumes, Dreaming is a decentralization of the movement of life. In waking consciousness the central force, the ego spontaneity, is supreme,—in dreaming the activity of the ego becomes purely receptive. The central ego is now merely the point about which the peripheral life plays in perfect freedom. Thus the will (the spontaneous ego) is suspended, and thought loses its categories. On tle other hand, the imagination now freed from the ego reaches its perfect unrestrained function. And this fune- tion is seen in the symbolic representation both of the bodily parts and of the mental stimuli which influence consciousness in

sleep. A similar conception of the action of the creative fancy in dreaming is adopted by Dr Johannes Volkelt (Die Traum-phantasie.) ~—

In addition to these simple metaphysical and psycho- logical theories of dreaming, there are to be found no less simple physiological hypotheses. Among these we may take the opinion of Hobbes (Leviathan), that the imagina- tions of dreams all proceed from "'theagitation of the inward parts of a man's body," the disturbance of which paris, owing to their connections with the brain, serves to keep the latter in motion. Another simple physiological hypothesis for explaining dreams is offered by Schopenhauer. According to this writer, the exciting causes of dreams are impressions received from the internal regions of the organism through the sympathetic nervous system. These impressions are afterwards worked up by the mind into quasi-realities by means of its "forms" of space, time, &e.

This simple and "geometric" method of explaining dreams, though it may be valuable up to a certain point, must necessarily fail to account for all the phenomena con- cerned. As we have shown in our preliminary description of dreams, their contents vary within very wide limits, and cannot therefore all be referred to one or two simple principles whether mental faculties or bodily stimuli ; also, it is by no means safe to affirm of any mental function that it is universally absent in dreams, since the second mental processes, as Sir H. Holland and M. Maury point out, enter in very unequal degrees into different dreams.

A full and exhaustive theory of dreaming would seem to include several distinct lines of inquiry. Among these there are three which have already been well defined by recent writers on the subject. The first relates to the sources of dream-imaginations, or the stimulations which are the immediate causes of these. The second question has to do with the order or form of dream-combinations, and seeks to determine the conditions of the peculiar arrangements, simultaneous and successive, which are observable in dreams. 'The last problem is that of accounting for the objective reality and generally for the intensity and impressiveness of dream-fancies.

In briefly opening up each of these lines of inquiry we shall seek to keep in mind the variable as well as the con- stant features of dreaming; also we shall proceed, as far as possible, according to that double method of study, the psychological and the physiological (subjective and objective), which offers itself to those who accept the idea of a perfect parallelism between mental and bodily events.

(A) The Sources of Dream Materials.—The numerous images which make up the ever-renewed current of a dream appear sometimes to come from the internal depths of the mind itself. In other cases, as even the ancients recognized, they depend on a stimulation of the brain arising from vary- ing conditions of the bodily organs. According to the view that all mental events have their physical accompaniments, the first class of imaginations must also be referred to cer- tain conditions of the brain and nervous system. These various sources of dream-activity are roughly classified by Hartley in his Observations on Man. Dream-images, he tells us, are deducible from three causes :—(1) impressions and ideas lately received; (2) present state of the body (especially the stomach and the brain); (3) association. The large part played by bodily states in our dream-life is recognized not only by physiologists, as Maury, but also by those who ascribe dreams in part to occult spiritual faculties, as Scherner. By help of the results of recent researches we are able to improve a little on Hartley's classification. The exciting causes of dream-images fall into two main classes :—(J.) peripheral, and (LL.) central stimulations. The latter arise in the outlying parts of the nervous system, namely, the organs of sense, the muscular apparatus, the internal bodily organs, together with the external portions of the nerves connected with these.

Central stimulations are such as arise mainly, if not entirely, within the encephalic region. These again are either (a) direct, or (@) indirect. The first depend on the condition of the nerve-elements acted upon, and the unknown influences (possibly connected with the condition of the circulation) brought to bear on these at the moment. The indirect stimulations arise as a result of some preceding excitation in a connected region of the brain. The former underlie the apparently spontaneous imaginations of dream- ing, as well as those which are the echo of a recent

waking experience. ‘he latter are the physical counterpart of images or ideas called up by association with preceding images or thoughts.

(I.) Among peripheral stimulations are to be noticed (a) those which arise from the action of external objects on the organs of sensation. Recent researches show that these may play an important part in dreams. Dr Beattie speaks of a man who could be made to dream about a subject by whispering into his ear. Experiments were made by M. Giron de Buzareingues (Journal de Physiol. tom. viii.) as to the effects of external impressions on dreaming, Thus, by leaving his knee uncovered during sleep, he dreamt he was travelling in a diligence (where knees are apt to get cold). The most elaborate experiments bearing on this point have been carried on by Alf. Maury, with the help of an assist- ant. The latter produces some external stimulation while the experimenter sleeps; he is then wakened up so as to record the dream immediately resulting. By this means important results were reached. When, for example, his lips were tickled, he dreamt that he was subjected to horrible tortures, that pitch plaster was applied to his face and then torn off. Sensa- tions of hearing, smell, and taste were also followed by appropriate though greatly exaggerated images. Wundt (Physiologische Psychologie) thinks that cutaneous sensa- tions, arising from the varying pressure and temperature of the bodily surface, are frequent excitants of dream-images. (8) Along with such objective sensations must be reckoned subjective sensations which arise in the absence of external stimuli, and which have as their physical basis certain actions in the peripheral as well as the central regions of the nerves, Of such are the visual images (Schlummer- bilder) seen by J. Miiller, Goethe, Purkinje, and others, when the body is disposed to sleep. These are called the dream- chaos by Gruithuisen, since they are supposed to form the raw material of dreams. Maury gives a full account of these phenomena, which he terms “ hypnagogic hallucina- tions,” and which appear to include not only visual images but also subjective sensations of sound, touch, &c. He attaches great importance to the action of these subjective sensations in dreams. The predominance of visual imagery jn dreaming appears to be connected with the great activity of the organ of sight and its consequent excitability. It is to be added that one can only roughly distinguish these subjective sensations, which involve the peripheral regions of the nervous system, from images supposed to be con- fined to the central regions. (y)

The conditions of our muscles during sleep, which somehow convey impressions to the brain, affect consciousness, and so influ- ence dreaming. To this source we must refer the active phenomena of dreams, as running, flying, resisting, struggling, &c. It is probable, as Wundt remarks, that the movements of the body during sleep, as those of breathing and the extensions and contractions of the limbs, give rise to dream fancies, and painful conditions of the muscles due to an awkward position of the limbs may also serve to excite images. (6) Among the most frequent excitants of dreams are organic or systemic sensations con- nected with the varying states of the internal bodily organs, The prominence given to this source of dreaming

in ancient and modern systems of medicine has already been referred to. States of the stomach, lungs, heart, secretory organs, teeth and gums, &e., are, as we all know, powerful provocatives of dreams. Owing to the close con- nection of dreams with these organic conditions they may serve as important elements in the diagnosis of bodily disease. Thus M. Macario (Du Sommeil, des [eéves, et du Somnambulisme) recognizes among the morbid class of dreams those which are “ prodromic,” or premonitory (¢.9., a dream of sanguinary conflict before hemorrhage), as well as those which are symptomatic of existing bodily and mental disorders. va

(II.) We pass to internal or cerebral excitations. Under (a), the direct excitations, are to be included all dream ideas which do not arise from bodily stimuli, or through associa- tion with preceding feelings and ideas. It seems fairly certain that many of our dream-images are thus occasioned by a kind of “automatic excitation ” of the cerebral regions. The dreams which clearly arise from an after-effect in the brain of recent perceptions, especially those of the previous day, appear to illustrate this process. Also, many of the images which correspond to persons and scenes supposed to beslong since forgotten may be due to some such local automatic cerebral “ sub-excitation.” Maury distinctly recognizes this factor in dream-stimulation. It appears from experiences recorded by him that by means of these automatic central excitations images may sometimes be called up of

objects which have never been distinctly perceived, and which yet have left a trace of their action on the cerebral substance. (@) The indirect central stimulations include, no doubt, a large number of our dream-fancies. When once a starting-poiut is reached, whether through a peripheral or a central automatic (direct) excitation, the nervous connections which answer to mental associations provide a vast range of new cere- bration. It is to be added that the very same causes which excite particular cerebral regions,to automatic action must affect other and connected parts in a less degree, producing a powerful predisposition to activity. Hence it is to be supposed that links of association which are insufficient to restore an idea to consciousness in the wak- ing,state may suffice to do so in sleep.

(B) The Order of Dream-Combinations,—Dreams are \ commonly said to be incoherent, and this is no doubt fre- quently the case. On the other hand many dreams appear ‘ to simulate orderly arrangements of objects and successions of events. It must follow that on simple theory, such as that the mind has lost the forms of thought—as space, time, and causation (which, as we have seen, is contradicted by Schopenhauer)—will cover all the facts. The absence of volition and voluntary attention goes far to throw light on dream-combinations. In dreaming, as Maury observes, attention, instead of dominating the images which present themselves, is itself dominated by these. At the same time, as we shall see presently, the action of attention, though no longer controlled by the will and directed to some practical end, plays an important part in dream- construction. In order, if possible, to get at the laws of dream-structure, we may roughly divide dreams into two classes :—(a) the disconnected and incoherent, and (8) the coherent,

(a) The want of coherence in disorderly dreams appears to arise from the play of association acting on all the heterogeneous and disconnected elements supplied by peripheral and central (direct) stimulation at the time, there being no volitional control (dominating attention) to inter- fere with the process. Supposing that these two primary sources are continually sending forth new and disconnected Images to the dream-consciousness, and that owing to the extreme excitability of the brain during sleep numerous

paths of association open themselves up in connection ‘with every such image, we may see how it is that objects group themselves, and events succeed one another in such a chaotic manner. It is not correct to say that we here dispense with the “ forms ” of space and time ; objects are viewed in space, and events “ intuited ” in time, it is only that the particular positions of things in space and time are overlooked. On the other hand, it is true that there is in these loosely-threaded dreams, if not in all dreams, a suspension of the reasoning process by which objects are intuited in a causal relation. In these dreams, then, the mind is passive, and consciousness is made up of a flux of images and feelings which is not analyzed and rationalized as it is in the normal processes of waking perception.

(8) Let us now consider the more coherent class of dreams. These, as we have seen, have by some been accounted for as the products of some occult power of the soul, as the ‘‘ phantastical power ” of Cudworth and the symbolic plastic phantasy of Scherner. There is no doubt that in many of the more elaborate and pictorial of our dreams a result is reached very similar to the products of the waking imagination. Can this operation be analyzed into simple processes? First of all, the images, however disconnected their corresponding objects may be, group themselves in a certain arrangement. This process would be-described by psychologists of the Kantian school as the superposition on the dream-materials of certain mental forms. On the other hand, it may perhaps be explained as a result of association. When two orders of impression— for example, the sight of the human form and the sound of a human voice—have been habitually associated, there arises what may be called a general associative disposition to con- nect some variety of one order of impression with any par- ticular variety of the order which happens to present itself to the mind; and so, when dreaming, the mind is disposed to add to images of colour certain relations of space, posi- tion, magnitude, &c., to images of human beings some form of the appropriate human actions, relations, &c. By this means the intuitive clearness and completeness of our dream-imaginations may largely be accounted for. It is to-be added that these general associative tendencies do not determine what particular relations or actions are to be attributed to the images of sleep. These latter depend on the particular circumstances of the

moment, as, for example, the locality of the optic fibres involved, the varying excitability of the central regions, &c.

In thisfactor of our dream-constructions the mind seems to be wholly passive. We have now to turn to a second influence, which involves to some extent the active side of the mind, namely, the play of attention under the influence, not of the will, but of certain vague emotional impulses. The chief of these are the feeling for unity, and the instinct of emotional harmony. First of all, there seems to be a tendency in the more orderly dreams to bring new images into some intelligible connection or relation of unity with the pre-existing ones. This vague im- pulse, acting through the processes of expectation and attention, becomes selective, leading to a detention of those members of the ever-renewed flux of images which are fitted to enter into the dream-scene as con- sistent factors.. In certain cases, indeed, this process seems to rise to something like a conscious voluntary exertion. We occasionally remember that we strove in our dream to discover a consistency in the variegated and confused scene presented to consciousness. Secondly, the unity of dream-structure is largely determined by the need of emotional harmony. A large part, if not all, of our dream-fancies are attended with a feeling of pleasure or of pain. Now, when a certain state of emotion has been excited in the mind, there is a tendency to reject all ideas

which conflict with this feeling, and to accept any which harmonize with it. ‘The emotion controls the movements of anticipation and of intellectual attention, so that suitable ideas are at once recognized and detained. The unity of our most complex dreams appears to arise very largely from this source. In dreams described by Scherner, Volkelt, and Wundt the successions of imaginary events are clearly strung together by a thread of emotion, as joy, terror, and so on. ‘The commonest example of such a dominating emotional tone in dreaming occurs when there is a current of pleasurable or painful feeling contributed by the condition of some of the internal organs of the body. These bodily sensations become the basis of complex groups of images, each new scene being connected with some analogous shade of feeling, “bodily” or “mental.”

(C) The Objective Reality and Intensity of Dream- Imaginations.—These are explained by Hartley by two circumstances,—first, the absence of any other reality to oppose to the ideas which offer themselves ; and secondly, the greater vividness of the visible ideas which occur in dreams as measured by the corresponding waking ideas. This last fact may, he thinks, be partly accounted for by an increased heat of the brain. As already remarked, Dugald Stewart explains the reality of dreams through the suspension of the ordinary action of volition. In waking life, he says, we distinguish objective impressions from ideas by finding that the former are independent of volition, while the latter are dependent on the same. Hence, in dreaming, when the will no longer controls ideas, these are mistaken for realities. The chief influences here concerned appear to be included in Hartley's theory, though the cir- cumstances emphasized by Stewart may be a secondary element in the case. That the reality of dreami-images depends in large part on the absence of external impressions has been recognized by most recent writers. Among others M. Taine (De U Intelligence) dwells on the function of external sensation as a corrective to internal imaginations, keeping these below the illusory stage. External impres- sions are distinguished from ideas in the waking state, in part at least, by their greater intensity. When this relation is no longer recognized by reason either of the ideas acquiring preternatural vividness or of the sensations being withdrawn, illusion follows. Waking hallucinations depend on the first circumstance, dream-illusions on the second, perhaps also on the first as well. This leads us to the reflection that during sleep the ideas arising in consciousness undergo an increase of absolute as well as of relative vividness. That is to say, they are in themselves more intense states of consciousness than waking ideas. This seems to point, as Maury observes, to an increased ex- citability of the nervous substance in sleep. This same circumstance, too, helps to account for the preternatural impressiveness and the exaggeration which meet us in dream-life. Ifthe brain is during sleep peculiarly excitable it will follow that all sensational stimuli, external and internal alike, will produce an exaggerated result. Thus the intensity of sensations will be augmented, and their volume, and so the apparent magnitude of dream-images be increased, Again, if in dreaming the stream of fancies be a rapid one, if images simultaneously and successively crowd in on consciousness, we may understand how space and time may appear to swell to unusual proportions. Once more, the peculiar excitability of the

brain will mani- fest itself in an exaggeration of all feeling. Slight bodily discomforts, for example, will be transformed, as in Maury's experiments, into huge sufferings, and so locally circum- scribed bodily sensations of pleasure may expand into pre- ternatural forms of emotional delight.

We are now perhaps in a position to explain the symbolic function of dreams so much emphasized by

'regions of the brain.

Scherner. He considers that our dream-phantasy habitually represents the seat of bodily sensations under the symbol of a house and its parts, and the silent processes of thought as the audible conversation of living persons. The latter remark is probably correct, and its truth follows from a consideration of the close association between thought and audible speech, The former observation is surely an exaggerated statement, as has been shown by his friendly critic Volkelt. Yet though bodily sensations do not as a rule reveal themselves under the symbol of a building or mass of buildings, they undoubtedly do appear in conscious- ness disguised and transformed ; and the reasons of this are plain. Even in the waking condition we have but a vague consciousness of the seat of the bodily sensations, and in sleep this can hardly be present at all. In addition to this, the exaggerating influences just referred to must tend to disguise the real nature of bodily sensations, and sv to remove all consciousness of their locality. Hence bodily sensations do as a rule clothe themselves in a disguise appearing under the form of emotional experiences, And the particular pleasurable or painful images selected, which will vary, with the individual's emotional nature and experience, will be apt to recur as a " symbolic expression " of this variety of bodily feeling. It will follow, too, from the predominance of visual ideas in dreams, that these emotional faucies will commonly take the shape of alluring or alarming visual perceptions.

Dreaming is a subject of great interest by reason of its points of contact with other mental conditions. Thus the common suspension of many of the higher processes of emotion, thought, and volition suggests an analogy

between the dreaming state and the instinctive stage of mental growth as observable in children, primitive men, and the lower animals, This aspect of dreams has been treated by Maury.

Again, dreaming has many curious resemblances to the mental states of the insane. The differences which mark off dreaming from these states have already been given. The resemblances between them are no less important. In the illusory intensity of its internal images, in the rapidity ot its flux of ideas, and in the wildness and incoherence of its combinations, the dream stands very close to the whole class of hallucinations and illusions of waking life. In truth, a systematic psychological treatment of dreams must connect them with other forms of illusion, This is done, for example, by Wundt, who refers all these groups of phenomena to an increased excitability of the sensory Maury seems disposed to regard dreaming as the incipient stage of a pathological mental condition, of which somnambulism, insanity, &c., are more fully developed forms. Among other writers who have discussed dreams in relation to these other abnormal states of mind are Macario (op. cit.), Bierre de Boismont (Les Hallucinations), J Moreau (Du Haschisch et d Alvenation Mentale), also Sir H. Holland, and Dr Carpenter (Mental Physiology). *

A goodi deal of random and undigested information respecting dreams and dream-theories is to be found in Mr Frank Seafield's Literature and Curtosities of Dreams. A eurious account of the aneients' views of dreams is to be met with in a work entitled His- toire du Sonnambulism, par Austin Gauthier. For the best state- ment of the modern theory of dreams, the student is referred to the works of Maury, Wundt, Carpenter, and Volkelt, already named. Dreams have been roughly elassified according to the souree of their images and the relative activity of association and imagination in- volved, by Scherner, Volkelt, and others. The view of the pro- cesses involved in the imaginative construction of dreams here adopted has been more fully developed by the present writer in an artiele in the Cornhill Magazine of November 1876. (J. 5.)

DREDGE, Tur Naruratist's, an implement con- structed on the general plan of the common oyster-dredge, and used by naturalists for obtaining specimens of the

animals living ou the bottom of the sca at greater or less depths, for the purpose of determining their structure and zoological relations, and ascertaining their geographical dis- tribution. The instrument usually employed in this and other northern countries for dredging oystcrs and clams is a light frame of iron about 5 feet long by a foot or so in width, with a scraper like a narrow hoe on one side, and a suspending apparatus of thin iron bars which meet in an iron ring for the attachment of the dredge-rope on the other. From the frame is suspended a bag about 2 feet in depth of iron chain netting, or of wide-meshed hempen-cord netting, or of a mixture of both. Natu- ralist dredgers at first used the oyster dredge, but it is scarcely suitable for scicntific purposes. Having a scraper on one side only, it is liable in a current, in deep water, or in unskilled hands, to fall on its back and conse- quently to come up empty, the scraper not having come into play. Oyster dredgers arc not allowed to take oysters below a certain size, and the commercial dredge is so contrived as to allow all small bodies to fall through, and, as many of these are of the highest interest to the naturalist, his object is thus in a great measure defeated.

The remedy for these defects is to have a scraper on each side, with the arms attached in such a way that one or other of the scrapers must reach the ground in whatever position the dredge may fall; and to have the dredge-bag deeper in proportion to the size of the frame, and of a material which is only sufficiently open to allow the water to pass freely through, with the openings so distributed as to leave a part of the bag close enough to bring up the finest mud.

The late Dr Robert Ball of Dublin devised the modifica- tion which has since been used almost universally by naturalists in this country and abroad under the name of “ Ball’s Dredge ” \fig. I). The dredges on tnis pat- tern, used in Britain for ten years after their first introduction, about the year 1838, were usually small and rather heavy—not more than 12 to 15 inches in length, by 4 or 44 inches in width at the mouth. Two scrapers, the length of the dredge-frame, and 1} to 2 inches wide, were set at an angle of about 110° to the plane of the dredge’s mouth, so that when the dredge was gently hauled along }.\! it took hold of the ground and

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Latterly Ball’s dredges of con- tL ((hi siderably larger size have been used. us ny . Perhaps the most convenient form Se for dredging from a row hoat or Fia. 1.— a yawl is that represented in the ists’ Dredge. figure. The frame is 18 inches long, and its width is 5 inches, The scrapers are 3 inches wide, and these are so set that the distance across between their scraping edges is 74 inches, The ends of the frame connecting the scrapers are round bars of iron five-eighths of an inch in diameter, and from these bars two curved arms of round iron of the same thickness, dividing beneath into two branches, which are attached to the ends of ‘the cross-bars by eyes allowing the arms to fold down over the dredge-mouth, meet in two heavy eyes at a point 18 inches above the centre of the frame. The total weight of the dredge frame and arms is 2). Wscit ought to be of the best Lowmoor or Swedish wrought iron.

The thick inner edges of the Scrapers are perforated by round holes at distances of about an inch, and through

these stroug iron rings about an inch in diamecter are

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Ball’s Naturai-

passed, and two or three similar rings run on the short rods which form the ends of the dredge-frame. A light iron rod, bent to the form of the dredge opening, usually runs through these rings, and to this rod and to the rings the mouth of the dredge-bag is securely attached by stout cord or strong copper wire. The dredge-bag for a dredge of this size should be about 2 fect deep; and probably the most suitable material is hand-made netting of very strong twine, the meshes half an inch to the side, the inter-spaces contracting to a third of an inch across when the twine is thoroughly soaked. So open a network would let many of the smaller things through, and to avoid this, and at the same time to give free egress to the water, the bottom of the bag, to the height of about 6 inches, is lined with ‘‘bread-bag,” a light open kind of canvas. It may be said that in such a dredge many valuable small objects may be washed through the meshes of the upper part

of the dredge along with the mud and thus lost ; but, on the other hand, if the bag be very close it is apt to get filled up with mud at once, and to collect nothing more.

For work round the coasts of Europe, at depths attain- able from a row-boat or yawl, probably the best kind of line is bolt-rope of the best Russian hemp, not less than 1} inches in circumference, containing eighteen to twenty yarns in three strands. Each yarn should bear nearly a hundred weight, so that the breaking strain of such a rope ought to be about a ton, Of course it is never voluntarily exposed to such a strain, but in shallow water the dredge is often caught among rocks or coral, and the rope should be strong enough in such a case to bring up the boat, even if there were some little way on. It is always well, when dredging, to ascertain the approximate depth with the lead before casting the dredge; and the lead onght always to be accompanied by a registering thermometer, for the sub- sequent haul of the dredge will gain greatly in value as an observation in geographical distribution, if it be accompanied by an accurate note of the bottom-temperature. For depths under 100 fathoms the amount of rope paid out should be at least double the depth; under 30 fathoms, where one usually works more rapidly, it should be more nearly three times ; this gives a good deal of slack before the dredge if the boat be moving very slowly, and keeps the lip of the dredge well down. When there is anything of a current, from whatever cause, it is usually convenient to attach a weight, varying from 14 ib to half a hundred weight, to the rope 3 or 4 fathoms in front of the dredge. This prevents in some degree the lifting of the mouth of the dredge; if the weight be attached nearer the dredge it is apt to injure delicate objects passing in,

In dredging in sand or mud, the dredge-rope may simply be passed through the double eye formed by the ends of the two arms of the dredge-frame ; but in rocky or unknown ground it is better to fasten the rope to the eye of one of the arms only, and to tie the two eyes together with three or four turns of rope-yarn. This stop breaks much more readily than the dredge-rope, so that if the dredge get caught it is the first thing to give way under the strain, and in doing so it often alters the position of the dredge so as to allow of its extrication.

The dredge is slipped gently over the side, cither from the bow or from the stern—in a small boat more usually the latter—while there is a little way on, and the direction which the rope takes indicates roughly whether the dredge is going down properly. When it reaches the ground and begins to scrape, an experienced hand upon the rope can usually detect at once a tremor given to the dredge by the Scraper passing over the irregularities of the bottom. The due amount of rope is then paid out, and the rope hitched to a bench or rollock-pin. The boat should move very slowly, probably not faster than a mile an hour. In still

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water or with a very slight current the dredge of course anchors the boat, and oars or sails are necessary ; but if the boat be moving at all it is all that is required. It is perhaps most pleasant to dredge with a close-reefed sail before a light wind, with weights, against a very slight tide or current ; but these are conditions which cannot be com- manded. The dredge may remain down from a quarter of an hour to twenty minutes, by which time, if things go well, it ought to be fairly filled. In dredging from a small boat the simplest plan is for two or three men to haul in, hand over hand, and coil in the bottom of the boat. For a large yaul or yacht, and for depths over 50 fathoms, a winch is a great assistance. The rope takes a couple of turns round the winch, which is worked by two men, while a third hand takes it from the winch and coils it down.

The dredge comes up variously freighted according to the locality, and the next step is to examine its contents and to store the objects of search for future use. In a regularly organized dredging expedition a frame or platform is often erected with a ledge round it to receive the con- tents of the dredge, but it does well enough to capsize it on an old piece of tarpauling. There are two ways of emptying the dredge ; we may either turn it up and pour out its contents by the mouth, or we may have a con- trivance by which the bottom of the bag is made to unlace. The first plan is the simpler and the one more usually adopted ; the second has the advantage of letting the mass slide out more smoothly and easily, but the lacing intro- duces rather a damaging complication, as it is apt to loosen or give.way. Any objects visible on the

surface of the heap are now carefully removed, and placed for identification in jars or tubs of sea-water, of which there should be a number secured in some form of bottle basket, standing ready. The heap should not be much disturbed, for the delicate objects contained in it have already been unavoid- ably subjected to a good deal of rough usage, and the less friction among the stones the better.

Close to the place where the dredge is emptied there ought to be a tub about 2 feet in diameter and 20 inches

deep, provided with a set of

sieves so arranged that the lowest sieve fits freely within Y the bottom of the tub, and f

the three remaining sieves @ fit freely within one another. (fig. 2.) Each sieve has a pair of iron handles through which the hand can pass easily, and the handles of the largest sieve are made long, so that the whole nest can be lifted without stooping or putting the arms into the water. The upper smallest sieve is usually deeper than the others ; it is made of a strong open net of brass wire, the meshes half an inch to a side. The second sieve is finer, the meshes a quarter of an inch toa side; the third is finer still ; and the fourth is so close as only to allow the passage of mud or fine sand. The sieves are put into the tub, and the tub filled up to the middle cf the top sieve with sea- water. The top sieve is then filled with the contents of the dredge, and the set of sieves are ‘gently moved up and down by the handles of the bottom sieve in the water. It is of great importance not to give a rotatory motion to the sieves in this part of the process, for this is very ruinous to fragile organisms ; the sieves should be gently churned up and down, whether singly or together. The result is that the rougher stones and gravel and the larger organisms are washed and retained in the upper sieve; the fine mud or sand passes through the whole of the sieves and subsides to the bottom of the tub; while the three lower sieves contain, in graduated series, the objects of intermediate

Fie. 2.—Set of Sieves.

size. The sieves are examined carefully in succession, and the organisms which they contain are gently removed with a pair of brass or bone forceps into the jars of sea-water, where their movement and their natural colours may be observed, or placed at once in bottles of strong or weak spirit of wine or dried, according to the object for which they have been collected.

The scientific value of a dredging depends mainly upon two things,—the care with which the objects procured are preserved and labelled for future identification and reference, and the accuracy with which all the circumstances of the dredging~-the jpcsition, the depth, the nature of the ground, the date, the bottom-temperature, é&c. —are recorded. Every specimen, whether dry or in spirit, should be labelled at once with tne number under which this particular dredging is entered in the dredger's note-book.

Up to the middle of last century the little that was known of the inhabitants of the sea beyond low-water mark seems to have been gathered almost entirely from the objects found thrown on the beach after storms, and from chance captures on lead-lines, or by fishermen on their long lines, and in trawls and oysterand clam dredges. The naturalist's dredge does not appear to have been used for investigating systematically the fauna of the bottom of the sea until it was employed by Otho Frederick Miiller in the researches which afforded material for the publication, in 1779, of his admirable Descriptions and History of the rarer and less known Animals of Denmark and Norway. In the preface to the first volume Miiller gives a quaint description and figure of a dredge (fig. 3) not very unlike that used by Hall and Forbes, only the mouth of the dredge was square, a form which, unless used with great caution, gives fatal facilities for ‘‘ wash- ing out” in the process of hauling in.

At the Birmingham meeting of the British Association in 1839 an important committee was appointed “ for researches with the dredge with a view to the investigation of the marine zoology of Great Britain, the illustration of the geographical distribution of marine animals, and the more accurate determination of the fossils of the Fra. 8.—Otho Frede- Pliocene period.” Of this committee tick Miiller's Dredge Edward Forbes was the ruling spirit, (1770). and under the genial influence of his contagious enthusiasm great progress was made during the next decade in the knowledge of

the fauna of the British seas, and many wonderfully pleasant days were spent by the original committee and by many others who from year to year were “added to their number.” Every annual report of the British Association contains communications from the English, the Scottish, or the Irish branches of the committee ; and in 1850 Edward Forbes submitted its first general report on British marine zoology. This report, as might have been anticipated from the eminent qualifica- tions of the reporter, was of the highest value ; and, taken along with his remarkable memoirs previously published, “On the Distribution of the Mollusca and Radiata of Aigean Sea,” and “On the Zoological Relations of the existing Fauna and Flora of the British Isles,” may be said to mark an era in the progress of human thought.

The dredging operations of the British Association committee were carried on generally under the idea that at the 100-fathom line, by which amateur work in small boats was practically limited, the zero of animal life was approached—a notion which was destined to be gradually undermined, and finally overthrown. From time to time, however, there were not wanting men of great skill and ex-

perience to maintain, with Sir James Clark Ross, that ‘“¢ from however great a depth we may be enabled to bring up mud and stones of the bed of the ocean we shall find them teeming with animal life.” Samples of the sea-bottom, procured ~~with great difficulty and in small quantity from the first deep soundings in the Atlantic, chiefly by the use of Brooke’s sounding machine, an instru~~ ment which by a neat contrivance disengaged its weights when it reached the bottom, and thus allowed a tube, so arranged as to get filled with a sample of the bottom, to be recovered by the sounding line, were eagerly examined by miscroscopists ; and the singular fact was established that these samples consisted over a large part of the bed of the Atlantic of the entire or broken shells of certain Foraminifera. Dr Wallich, the naturalist to the “ Bull- dog ” sounding expedition under Sir Leopold M‘Clintock, reported that star-fishes, with their stomachs full of the deep-sea Foraminifera, had come up from a depth of 1200 fathoms on a sounding line; and doubts began to be enter- tained whether the bottom of the sea was

in truth a desert, or whether it might not present a new zoological region open to investigation and discovery, and peopled by a peculiar fauna suited to its special conditions.

In the year 1868, while the question was still undecided, two testing investigations were undertaken independently, In America Count L. F. Pourtales, one of the officers employed in the United States Coast Survey under Pro- fessor Pierce, commenced a series of deep dredgings across the Gulf Stream off the coast of Florida, which were con- tinued in the following year, and were productive of most valuable results; and in Great Britain the Admiralty, on the representation of the Royal Society, placed the "Lightning," a small gun vessel, at the disposal of a small committee to sound and dredge in the North Atlantic between Shetland and the Faroe Islands.

In the " Lightning," with the help of a " donkey- engine " for winding in, dredging was carried on with comparative ease at a depth of 600 fathoms, and at that depth animal life was found to be still abundant. The results of the " Lightning's " dredgings were regarded of so great importance to science that the Royal Society pressed upon the Admiralty the advantage of continuing the researches, and accordingly, during the years 1869 and 1870, the gun-boat " Porcupine" was put under the orders of a committee consisting of Dr Carpenter, F.R.S., Dr Gwyn Jeffreys, F.R.S., and Professor Wyville Thomson, ¥.R.S., one or other of whom superintended the scientific work of a series of dredging trips in the North Atlantic to the north and west of the British Isiands, which occupied two summers,

In the " Porcupine," in the summer of 1869, dredging was carried down successfully to a depth of 2435 fathoms, upwards of two miles and a half, in the Bay of Biscay, and the dredge brought up well-developed representatives of all the classes of marine invertebrates. During the cruises of the "Porcupine" the fauna of the deep water off the western coasts of Great Britain and of Spain and Portugal was tolerably well ascertained, and it was found to differ greatly from the fauna of shallow water in the same region, to possess very special characters, and to show a very marked relation to the faune of the earlier Tertiary and the later Cretaceous periods,

In the winter of 1872, asa sequel to the preliminary cruises of the “ Lightning” and “ Porcupine,” by far the most considerable expedition in which systematic dredging had ever been made a special object left Great Britain. H.M.S. “Challenger,” a corvette of 2306 tons, with auxiliary steam working to 1234 horse-power, was despatched to in-

vestigate the physical and biological conditions of the great ocean basins.

DREDGE

The “ Challenger ” was provided with a most complete and liberal organization for the purpose ; she had powerful deck engines for hauling in the dredge, workrooms, laboratories, and libraries for investigating the results on the spot, and a staff of competent naturalists to undertake such investigations and to superintend the packing and preservation of the specimens reserved for future study.

In these deep-sea dredgings it was frequently found that, while few objects of interest were brought up within the dredge, many echinoderms, corals, and sponges came to the surface sticking to the outside of the dredge, and even to the first few fathoms of the dredge-line. This suggested many expedients, and finally a long transverse iron bar was attached to the bottom of the dredge-bag, and large bunches of teazed-out hemp were fastened to the free ends of the bar (fig. 4). The ‘“‘hempen-tangles” are now regarded as an essential part of the dredge, nearly as important as the dredge- } bag, and often much more con- spicuous in its results. This addi- tion to Ball’s dredge is not, how- ever, generally available in dredg- ing from a boat or in shallow water; the tangles-are apt to catch on rocks or coral, and a turn of the drum of the donkey-engine is re- quired to free them.

Ball’s dredge was still employed, with some slight modifications, the result of further experience. Fig. 4 represents the form of dredge which was found most suit- able for great depths. The dredge- frame of hammered iron is 4 feet 6 inches long and 1 foot 3 inches broad ; the scrapers are 3 inches wide, and are connected at the ends by bars of 1} inches round iron. The arms are of inch round iron, and slightly curved ; they are bolted together to a stout iron bar which ends above in a swivel and ring. Two bars of square iron of some strength are attached by eyes to the round cross-bars at the ends of the

dredge-frame, and have the other ends lashed to the iron bar which bears the tangles. These rods keep the dredge-bag at its full length, and prevent it or the tangles from folding over the mouth of the dredge. The dredge-bag is 4 feet 6 inches in length ; the lower half is of twine netting so close as to retain everything except the finest mud, which indeed only partially washes through, and the upper half is of twine netting with the meshes an inch to the side. The bag is guarded by three loops of bolt-rope attached to the frame of the dredge, to the bottom of the bag, and finally to the tangle-bar. The canvas pads represented in the figure on the dredge-frame are only to protect the seizings of the loops. The dredge is suspended by an iron chain, which forms the first few fathoms of the dredge-line. The chain is not, however, directly fastened to the ring at the end of the arms, but is made fast to one of the end bars of the dredge-frame, and it is stopped to the ring by a single strand of bolt-rope. If the dredge get caught the stop carries away, the direction of the strain on the dredge is altered, and it probably relieves itself and comes up end upwards. In deep water a 28 Ib deep-sea lead is usually hung from the centre of the tangle-bar with four tangles on each side.

Dredging was carried on in the “ Challenger ” from the main yard-arm. A strong pendant was attached by a hook to the cap of the main-mast, and by a tackle to the yard- arm a. compound arrangement of 55 to 70 of Hodge’s patent accumulators was hung to the pendant, and beneath

h A tN WAR Nit Fia, 4.—Deep-sea Dredge, with Tangle-bar.

it a block through which the dredge-rope passed. The donkey-engines for hauling in the dredging and sounding gear were placed at the foot of the main-mast on the port side. They consisted of a pair of direct-acting, high-pressure, horizontal engines, in combination of 18 horse- power nominal. Instead of a connecting rod to each, a guide was fixed to the end of the piston-rod with a brass block working up and down the slot of the guide. The crank-axles ran through the centre of the blocks, and the movable block, obtaining a backward and forward motion from the piston-rod, acted on the crank as a connecting-rod would do. This style of engine is commonly used for pumping, the pump-rods being attached to the guide on

the opposite side from the piston-rod, At one end of the crank a small toothed wheel was attached, which drove one thrice the multiple on a horizontal shaft extending nearly across the deck, and about 3 feet 6 inches above it. At each end of this shaft a large and a small drum were fixed, the larger having three sheaves cast upon it of different sizes, the lesser being a common barrel only. To these drums the line was led, two or three turns being taken round the drum selected. In hauling in, the dredge-rope was taken to a gin-block secured to a spar on the forecastle, then aft to the drum of the donkey-engines on the port side, then to 2 leading-block on the port side of the quarter-deck, and across the deck toa leading-block on the starboard side corresponding in diameter with the drum used on the port side, and from this it was finally taken by the hands and coiled. ‘The strain is of course greatest at the yard-arm and the first leading-block, and by this arrangement it is gradually diminished as the line passes round the series of blocks and sheaves.

A change made latterly in the handling of the dredge had certain advantages. Instead of attaching the weights directly to the dredge-rope, and sending them down with the dredge, a “toggle,” a small spindle-shaped piece of hard wood, was attached transversely to the rope at the required distance, 200 to 300 fathoms in advance of the dredge. A “ messenger,” consisting of a figure of eight of rope, with two large thimbles in the loops, had one of the thimbles slipped over the chain before the dredge was hung, and the other thimble made fast to a lizard. When the dredge was well down and had taken its direction from the drift of the ship, the weights, usually six 28-Ib deep- sea leads in three canvas covers, were attached to the other thimble of the traveller, which was then cut adrift from the lizard and allowed to spin down the line until it was brought up by the toggle. By this plan the dredge took a some- what longer time to go down; but after it was adopted not a single case occurred of the fouling of the dredge in the dredge-rope, a misadventure which had occurred more than once before, and which was attributed to the weights getting ahead of the dredge in going down, and pulling it down upon them entangled in the double part of the line. The great risk in dredging in very deep water is that of the dredge running down nearly vertically and sinking at once into the soft mud, and remaining imbedded until hauling in commences. Duringthe earlier part of the voyage

of the “ Challenger” this accident seemed too often to-

defeat, at all events partially, the object of the operation ; and, after various suggestions for modifying the dredge, it was proposed to try some form of the trawl in order to insure, so far as possible, the capture of any of the larger marine animals which might be present, and thus to gain a better general idea of the nature of the fauna. A 15-feet beam-trawl was sent down off Cape St Vincent to a depth of 600 fathoms ; the experiment looked hazardous, but the trawl came up in due time all right, and contained, along with many of the larger Invertebrata, several fishes, The

trawl seemed to answer so well that it was tried again a little farther south in 1090 fathoms, and again it was per- fectly successful, and during the remainder of the voyage it was employed almost as frequently, and in nearly as deep water, as Ball’s dredge. The deepest successful haul of the trawl was in the Pacific in 3125 fathoms, and the deepest haul of Ball’s dredge was in the Atlantic at 3150 fathoms,

During the voyage of the “Challenger” a course of about 70,000 nautical miles was traversed in three years and a half, and 362 observing stations were established at intervals as nearly uniform as circumstances would permit ; and at the greater number of these dredging or some modifi- cation of the process was successfully performed—52 times at depths greater than 2000 fathoms, and thrice at deptlis beyond 3000 fathoms. So fully convinced were the “Challenger ” officers that they could dredge at any depths, that it was only want of time and daylight which pre- vented their doing so at their deepest sounding, 4575 fathoms. The Atlantic was crossed five times, and an erratic route through the Pacific gave a good idea of the condi- tions of the abysses of that ocean, while in the South Indian Ocean dredging and trawling were carried down close to the Antarctic ice-barrier.

The expedition was successful, and the results were of the most interesting nature. Animal life was found to exist at all depths, although probably in diminishing abundance as the depth becomes extreme ; and in all parts of the world at depths beyond 400 or 500 fathoms the fauna had much the same general character. The species usually differed in widely separated areas, but the great majority of forms, if not identical, were so nearly allied that they might be regarded as representative and genetically related,

Although all marine invertebrate classes were represented, echinoderms in their different orders, sponges, and Crustacea preponderated, while corals and Mollusca were comparatively scarce. In the first two groups named many forms occurred allied to families which had been pre- viously regarded as extinct or nearly so; thus among the echinoderins, stalked crinoids were by no meaus rare, and many species of regular Echinidea related to the Chalk genus Echinothuria, and many irregular species allied to Ananchytes and Dysaster occurred. The sponges were mainly represented by the LHewactinellidew, the beautiful order to which the glass-rope sponge of Japan and the marvellous ‘‘ Venus’s Flower Basket” of the Philippines belong, the order to which the Ventriculites of the Chalk must also be referred.

Dredging at these great depths is a difficult and critical operation, and, although by its means some idea of the nature and distribution of the abyssal fauna of the ocean has already been attained, it will be long before the blanks are filled up; for of the area of 140,000,000 square miles forming the “‘ abyssal province ” the actual amount hitherto traversed by the naturalist’s dredge may still be readily reckoned by the square yard. (C.“W. T.)

DREDGING. Dredging is the name given by engineers to the process of excavating materials under water, raising them to the surface, and depositing them in barges. It is a process which has been useful from very early times in works of marine and hydraulic engineering, and it has of late years, by improved appliances, been brought to high perfection.

Bag and Spoon Dredge.—The first employment of machinery to effect this object is, like the discovery of the canal lock, claimed alike for Holland and Italy, in both of which countries dredging is believed to have been practised before it was introduced into Britain. The Dutch at a very early period used what is termed the ‘bag and spoon” dredge for cleaning their canals, It was

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simply a ring of iron, about 2 feet in diameter, flattened and steeled for about one-third of its circumference, having a bag of strong leather attached to it by leathern thongs. The ring and bag were fixed to a pole, which, on being used, was lowered to the bottom from the side of a barge moored in the canal or river. A rope made fast to the iron ring was then wound up by a windlass placed at the other end of the barge, and the spoon was thus dragged along the bottom, and was guided in its progress by a man who held the pole. When the spoon reached the end of the barge where the windlass was placed, the winding was still continued, and the suspending rope being nearly per- pendicular, the bag was raised to the surface, bringing with it the stuff excavated while it was being drawn along the bottom. The windlass being still wrought, the whole was raised to the gunwale of the barge, and the bag, being emptied, was again hauled back to the opposite end of the barge, and lowered for another supply. This system is slow, and only adapted to a limited depth of water and a soft bottom. But it has been generally employed in canals, and is much used inthe Thames. The writer had occasion to use it at the Fossdyke Canal, in Lincolnshire, where 135,000 tons were raised in the manner described.

Dredging by Bucket between two Lighters.—Another plan, practised at an early period in rivers of considerable breadth, was to moor two large barges, one on each side ; between them was slung an iron dredging bucket, which was attached to both barges by chains wound round the barrels of a crab winch worked by six men in one barge, and round a simple windlass, worked by two men in the other. The bucket, being lowered at the side of the barge carrying the windlass, was drawn across the bottom of the river by the crab winch on the other barge; and, having been raised aud emptied, it was hauled across by the opposite windlass for a repetition of the process. This plan was in use in the Tay till 1833.

Steam Dredges.—In all large operations these and other primitive appliances have now, as is well known, been superseded by the steam dredge, which was first employed, it is believed, in deepening the Wear at Sunderland about the year 1796. The Sunderland machine was made for Mr Grimshaw by Boulton and Watt. Receiving improve- ments from Mr Hughes, Mr Rennie, Mr Jessop, and others, the steam dredge, as now generally constructed, is a most powerful machine in skilful hands,

excavating and raising materials from depths of 15 to upwards of 30 feet of water according to the size of the machinery, at a cost not very different from, and in some cases even less than, that at which the same work could be performed on dry land.

As to the kind of work that may be accomplished by dredging, it may be stated that almost all materials, ex- cepting solid rock or very large boulders, may now be dredged with ease. Loose gravel is probably the most favourable material to work in ; but a powerful dredge will readily break up and raise indurated beds of gravel, clay, and boulders, and even find its way through the surface of soft rock, though it will not penctrate very far into it. | In such cases it is usual to alternate on the bucket-frame a bucket for raising the stuff, with a rake or pronged instru- ment for disturbing the bottom. The writer in his own ex- perience has raised boulders weighing upwards of a ton with a powerful dredge of the ordinary construction, and removed disintegrated or rotten rock at least to a limited depth, and he believes that in many cases the surfaces of submerged rocks may, by means of such appliances, be to some extent broken up and removed, so as to obtain in certain situa- tions a considerable increase of depth, without recourse to cofferdams, which involve great expense,

The construction of large river steam dredges is now carried on by many engineering firms. The main feature

of the machineis the bucket-ladder, whichis lowered through an ark formed in the vessel till it reaches the bottom. Along this ladder a series of buckets traverse which cut into the bottom at the lower extremity of the ladder and return loaded with the excavated material, which is discharged at the top of the bucket-ladder into a lighter or barge prepared for its reception. The machines are sometimes made with single and sometimes with double ladders, sometimes dis- charging at the stern of the vessel and sometimes at both sides, but it is obviously impossible to give illustrative drawings of the different forms of dredgers in sufficient detail to be practically useful. It may be stated that a first-class dredging machine to work in 30 feet water, and discharge over either side, of 60 horse-power complete, costs at present prices about £16,000 to £18,000. The steam hoppers employed to receive

and remove the dredgings carry about 500 tons of excavations; they are 70 horse- power, and steam at about 9 miles per hour. The hopper barges are made with opening hinged bottoms, which can be opened when the place of deposit is reached, and the dredgings easily and quickly discharged. These steam barges cost about £8000. Large dredges, such as those constructed by Messrs Wingate of Glasgow for the Tyne and other places, will excavate at the rate of 460 tons per hour when working on favourable ground.

Hopper Dredge.—Some improvements that have been suggested on the dredging plant hitherto used deserve notice. Among these may be mentioned that of Messrs Simons & Company, Renfrew, who have patented and constructed what they have called a hopper-dredge, combining in itself the advantages of a dredge for raising the material and a screw hopper vessel for conveying it to the place of discharge, both which services are performed by the same engines and the same crew. Messrs Simons have constructed seven hopper dredges on this plan, varying from 200 to 1000 tons of “ bopper capacity.”

Silt Dredge.—Another of the recently suggested improve- ments is that by Mr ©. Randolph, who, in 1879, proposed that, instead of the ordinary dredging buckets, pipes should be lowered until they come into contact with the sand ormud atthe bottom. The tops of these pipes were to be in communication with powerful centrifugal pumps, so that the velocity of the in-flowing water through the pipes could be made so great as to carry with it a large percentage of the sand or mud from thé bottom; and when the solid matter, and the water in which it is suspended, were raised to the desired height, they would flow freely to any required place for deposit of the suspended material. It is not known that this plan has been carried into practical opera- tion.

Dredging at Amsterdum and Suez Canals.—Another arraugement is that of raising the material by buckets in the ordinary way, and thereafter receiving it in a vessel and floating it off by pipes to the place of deposit. This, of course, can only be done where the place of deposit is close to the spot whence the material is dredged. Two plans have been proposed for effecting this. One of these has been used in the Amsterdam Canal, where the stuff is dis- charged from the buckets into a vertical cylinder, and is there mingled

with water by a revolving Woodford-pump and sent off under pressure to the place of deposit ina semi-fluid state. At the Amsterdam Canal this was done by pipes made of timber, and hooped with iron like barrels. These wooden cylinders were made in lengths of about 15 feet, connected with leather joints, and floated on the surface of the water, conveying the stuff to the requisite distance, like the hose of a fire engine, under a head of pressure, it is believed, of 4 or 5 feet, and depositing it over the banks of the canal. A somewhat similar process was employed

on the Suez Canal,—not, however, by using pumps, but simply by running the stuff to the banks on steeply inclined shoots, which were supplied with water when the material raised did not contain sufficient water to cause it to run freely. It is obvious, however, that these arrangements can only be applied in situations where the material to be excavated is of a very soft nature, and where the place of deposit is close at hand. In keeping clear the Suez Canal such appliances may be very useful, as the soft deposit of the canal has only to be raised and projected over the banks on either side.

American Dredges.—Dredging in Canada and the United States is done by what are called Dipper and Clam-shell dredges, the bucket dredge being seldom used.

The dipper dredge consists of a barge, with a derrick- crane reaching over the stern, suspending a large wrought- iron bucket which brings up the dredged material. To the bucket is attached a pole 6 inches by 4 inches in cross section, by which means it is guided while being drawn along the bottom; it is then raised, and its bottom being made to drop open, the contents fall into the barge moored alongside of the dredge. The bottom of thie bucket is kept closed by a catch, which, by means of a rope, can be withdrawn at the propermoment. The clam- shell is a box made of two similar pieces of wrought iron hinged together at one end; by a simple arrangement of the gearing the clam, mouth open, drops down and sinks into the bottom, and the first effect of heaving up is to close it, thus imprisoning a quantity of material which is raised and deposited as in the case of the dipper. Both kinds of dredges are worked by a steam-engine, and rough as they appear to be, they are extensively employed in deepening and

widening river channels, making or deepening canals, and other such works.

This is not the place to discuss the merits of different apparatus, which perhaps can only be settled by the actual performance of different arrangements when fully tested by practice. Having thus briefly noticed them, a few practical observations on dredging, as more im- mediately applicable to British rivers, have still to be mentioned.

Longitudinal and Cross Dredging.—In river dredging two systems are pursued. One plan cousists in excavating a series of longitudinal furrows parallel to the axis of the stream, the other in dredging cross furrows from side to side of the river. It is found that inequalities are left between the longitudinal furrows when that system is practised, which do not occur, to the same extent, in side or cross dredg- ing; and the writer invariably finds cross dredging to leave the most uniform bottom. To explain the difference between the two systems of dredging it may be stated that in either case the dredge is moored from the head and stern by chains about 250 fathoms in length. These chains in improved dredges are wound round windlasses worked by the engine, so that the vessel can be moved ahead or astern by simply throwing them into or out of gear, In longitudinal dredging the vessel is worked forward by the head chain, while the buckets are at the same time per- forming the excavation, so that a longitudinal trench is made in the bottom of the river. When the dredge has proceeded a certain length, it is stopped and permitted to drop down and commence a new longitudinal furrow, parallel to the first one. In cross-dredging, on the other hand, the vessel is supplied with two additional moorings, one on each side; and these chains are, like the head and stern chains, wound round barrels wrought by the engine. In commencing to work by cross dredging we may suppose the vessel to be at one side of the channel to be excavated. The bucket frame is set in motion, but, instead of the dredge being drawn forward by the head chain, she is

aud, having reached the extent of her work in that direc- tion, she is then drawn a few feet forward by the head chain, and, the bucket frame being still in motion, the vessel is hauled across by the opposite chains to the side whence she started. By means of this trans- verse motion of the dredge a

series of cross furrows is made ; she takes out the whole excavation from side to side as she goes on, and leaves no protuberances such as are found to exist between the furrows of longitudinal dredging, even where it is executed with great care. The two systems will be best explained by reference to fig. 1, where A and B are the head and stern moorings, and C

drawn to the opposite side of the river by the side chain, and D the side moorings; the arc ef represents the course

Fia. 1.

of the vessel in cross dredging; while in longitudinal dredging, as already explained, she is drawn forward towards A, and again dropped down to conmmence a new longitudinal furrow.

Blasting combined with Dredging.—In some cases, how- ever, the bottom is found to be too hard to be dredged until it has been to some extent loosened and broken up. Thus at Newry, Mr Rennie, after blasting the bottom in a depth of from 6 to 8 feet at low water, removed the material by dredging at an expense of from 4s. to 5s. per cubic yard. The same process was adopted by Messrs

| Stevenson at the bar of the Erne at Ballyshannon, where, in a situation exposed to a heavy sea, large quantities of boulder stones were blasted, and afterwards raised by a dredger worked by hand at a cost of 10s. 6d per cubic yard,

? Sir William Cubitt also largely employed blasting in connection with dredging on the Severn, of which an instructive account is given in the Minutes of Proceedings of the Institution of Civil Engineers, from which the following particulars are taken :—

‘‘It appears that a succession of marl beds, varying from 100 yards to half a mile in length, were found in the channel of the Severn, which proved too hard for being dredged, the whole quantity that could be raised being only 50 or 60 tons per day, while the machinery of the dredgers employed was constantly giv- ing way. Attempts were first made to drive iron rods into the marl bed, and to break it up ; a second attempt was made to loosen it by

dragging across its surface an instrument like a strong plough. But these plans proving unsuccessful, it was determined to blast the whole surface to be operated on. The marl was very dense, its weight being 146 ib per cubic foot ;1 and it was determined to drill perpendicular bores, 6 feet apart, to the depth of 2 feet below the level of the bottom to be dredged out. The bores were made in the following manner, from floating rafts moored in the river. Pipes of ;3;th inch wrought iron, 34 inches diameter, were driven a few inches into the marl. Through these pipes holes were bored, first with a 14 inch jumper, and then with an auger. The holes were bored 2 feet below the proposed bottom of the dredging, as it was expected that each shot would dislocate or break in pieces a mass of marl of a conical form, of which the bore-hole would be the centre and its bottom the apex; so that the adjoining shots would leave between them a pyramidal piece of marl where the powder would have produced little or no effect. By carrying the shot holes lower than the intended dredging, the apex only of this pyramid was left to be removed ; and in practice this was found

1 Clay weighs about 109 Tb, and sandstone about 155 tb per cubic foot.

to form but a small impediment. Fig. 2 is a section of the bore-

holes, and fig. 8 a plan in which the inner dotted circles repre- ae the diameters of the broken spaces at the level of the bottom

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of dredging. The cartiidges were formed, in the ordinary way, with canvas, and fired with Bickford’s fuse. The weights of powder used for bore-holes of 4 feet, 4 feet 6 inches, and 5 feet were respectively 2 1b, 3 tb, and 4 tb. The effect of the shot was generally to lift the pipes—which were secured by ropes to the

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rafts—a few inches. Mr Edwards says that not one in a hundred shots missed fire, and these shots were generally saved by the fol- lowing singular expedient :—The pointed end of an iron bar, § inch diameter, was made red hot, and, being put quickly through the water, and driven through the tamping as rapidly as possible, was, in nine cases out of ten, sufticiently hot to ignite the gun- powder and fire the shot. The cost of each shot is calculated as follows :-—

Use Jef SWRDOTIAL.....z:cmseniiiahenlab anata £0 1 0 Pulls 0108 lien aoonaneaccshgecodeneske oe reld ned ‘es cor 0 38 3 Pitched bag for Charpe ..is.sivssesecias cate sce 0 0 8 3%) of powder et 54d. oo… .cccsenveoe aneasvase 0 1 44 15 ft. of patent fuse at % ofa penny ……. 0 0 9 Pitch, tallow, twine, coals, &c. ..... fn 0 0 44

Cost per shot…...£0 7 0

Each shot loosened and prepared for dredging about four cubic yards, so that the cust of blasting was 1s. 9d. per yard. The cost of dredging the material, after it had been thus prepared, was 2s. ne making the whole charge for removing the mar! 4s. per cubic yard.

One of the most recent successful combinations of blasting and dredging was that completed in 1875 by Mr John Fowler of Stockton at the river Tees, to whom the writer is indebted for the following particulars, The chief novelty was in the barge upon which the machinery was fixed. It was 58 feet by 28 feet by 4 feet, and had eight legs which were let down when the barge was in position. The legs were then fixed to the barge, so that on the tide falling it became a fixed platform from which the drilling was done. The holes were bored and charged, and when the tide rose the legs were heaved up and the barge removed, after which the shots were discharged. There were 24 boriug tubes on the barge, and that was the limit which

could at any time be done in one tide. The surface over which the blasting was done measured 500 yards in length by 200 yards in breadth, a small part of that surface being uncovered at low water. The depth obtained in mid- channel was 14 feet at low-water, the average depth of rock blasted being about 4 feet 6 inches. The holes, which were bored with the diamond drill, varied in depth from 7 to 9 feet, the distance between them being 10 feet. Dynamite in tin canisters fired by patent fuse was used as the ex- plosive, the charges being 2 tb and under. The rock is Oolite shale of variable hardness, and the average time occupied in drilling 5-feet holes was twelve minutes,

The dredger raised the blasted rock,—the cost for blast- ing, lifting, and discharging at sea being about 4s, per cubic yard, including interest on dredging and other plant employed. The dredger sometimes worked a face of blasted material of from 7 to 8 feet. The quantity blasted was 110,000 cubic yards, and the contract for blasting so as to be lifted by the dredger was 3s. 1d. per cubic yard.

Dredging in Exposed Situations.—In some cases dredg- ing has to be conducted in exposed situations such as the deepening of the “flats” at Londonderry and the bar at Carlingford. Messrs Stevenson found that dredging at the Foyle could not be conducted when the height of the waves exceeded 24 feet; and Mr Barton at Dundalk so far con- firms this, as he estimates a swell of 2 feet as the highest to work in.

Dredging on the River Clyde.—An important point con- nected with this subject is the cost at which dredging may be done when conducted on a large scale. This, of course, inust depend on the character of the stuff to be raised and other circumstances ; but the following information, kindly communicated by Mr James Deas, the engineer to the Trustees of the Clyde Navigation, cannot fail to be both interesting and useful.

Mr Deas says truly that the Clyde Trustees employ pro- bably the largest dredging fleet of any trust in the kingdom, in maintaining and still deepening and widening the river to meet the ever-increasing demands of the shipping trade.

In the year 1871, for example, 904,104 cubic yards, or about 1,130,000 tons, were dredged from the river, of which 689,560 cubic yards were carried to sea by steam hopper barges, and 214,544 cubic yards deposited on Jand by means of punts. Of this 904,104 cubic yards, 345,209 cubic yards were deposit from the higher reaches of the river and its tributaries, and from the city sewers, and 558,895 cubic yards new material. The total cost for dredging and depositing was £35,448, or about 9°41 pence per cubic yard.

Owing to the difference in power of the dredging machines employed, and the character of the material lifted, the cost of dredging varies much. In 1871 the most powerful machine, working 2420 hours, lifted 430,240 cubic yards of silt and sand at a cost of 2°60 pence per yard; and this was deposited in Loch Long, 27 miles from Glasgow, by steam hopper barges, at 5°46 pence per yard, On the other hand, another dredger, working 2605 hours, lifted only 26,720 cubic yards of hard gravel and boulder clay, at the cost of 20-8 pence per cubic yard, which was deposited on the alveus of the river at the cost of 17°46 pence per cubic yard; another, working 18313 hours, lifted 122,664 cubic yards of silt, sand, and sewage deposit, at the

cost of 5°67 pence per cubic yard, which was deposited on land at the cost of 16°40 pence per cubic yard; and another, working 2233 hours, lifted 65,160 cubic yards of till, gravel, and sand, at the cost of 5:89 pence per cubic yard, which was deposited on the alveus of the river at the cost of 9°83 pence per cubic yard.

The total quantity dredged from the river during the twenty-seven years prior to 1872 amounts to 13,617,000

cubic yards, or upwards of 17,000,000 tons. The dredg- ing plant of the Clyde Trust comprises— 6 steam dredges, 14 steam hopper barges, 1 steam-tug, 3 diving-bells, 270 punts, and numerous small boats.

The expenditure for wages of crews, coal, and stores amounted in the year 1871 to fully £14,000, and for repairs £10,775. The value of the dredging plant employed is about £140,000.

Mr Deas has also kindly furnished the following tables, from which the reader will see the gradual increase that has been made on the size of the dredging machines to meet the increased depth of water and growing necessity of increased accommodation for the larger class of vessels which now frequent the river :—

General Dimensions of Dredgcrs employcd on the Clyde in 1872.

Remarks,

Greatest depth can dredge in Single or double bucket ladder.

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Ft.

224! Double | Punt-loading Machine. Single | Do. Do. Double | Hopper Barge Do. Single | Punt Do.

Do, | Hopper Barge Do. Do, Do. Do.

The following are the details as regards the dredgers and barges employed on the Clyde:—

No. 8 Dredger. Length, 161 ft.

Breadth moulded, 29 ft.

Depth, 10 feet.

Engine, 75 horse power, Cylinder, 48 in. diameter. Stroke, 8 ft. One bucket ladder, 90 ft. 9 in. between centres.

Size of buckets, 8ft. 3in. x2 ft. 5in. x1 ft. 11 in.

When working in sand, can lift 190 cubic yards per hour. Greatest depth can dredge in, 28 fect.

Working draught, 6 to 7 feet.

Wages per day of 10 hours as under :—

NIARHOT reacane tc aaneeav cats CponEDenTas Ravanndentanesitins qoppgdedoorgobenscds 7s. Od. IMILGR: covucneesccccasurnussssasecter: coset tasieanciennieearersorerece CSEBOOOLY 3. (O9¢# UM CON eartessassascssussescessescsesvecescetesettessavcsccasastesenrtseve oF ES Fireman 3 8 Assistant do. and cook 3 4 Bow orabmMan .,....s0008 3 4 Stern crabman ……. 8 4 Deck hands (3), each. oe DSR SR OLLCDALivsersasecessscccnsntstsess Rueccee once WAGCHEHGN....coccsssssccccensvsccsanns ancievenerseeantathestarcaciecirerirt 38 «(0 Pegi de sine s asnaslesaudtstduesusaeucdtecetssbssescdecsecessssacavavssiveen 65 cwt. ALAN OWja0 cess nMOGOOOOCRAOGAnANNSS

(pOENOBORBOACHONaAGADAdEBAONdaadoooDADEEL 2 tb. COMINGIEAN I ecasvectecsarceccerecevecsacetseecesccestecsasssvicrscocsasveceseas 16 gills Waste. ....0. SponososuereoONDENACD HenogoobnconcHioncoboonacann qodbaacaonAnoaoD 14 Ib Steam Hopper Barge. Length, 145 ft. Breadth moulded, 25 ft. Depth, 11 ft. 9 in. Engines, 40 horse power, Draught light (average), 5 ft. 6 in. Draught loaded, 11 ft. Speed, 8 to 9 miles per hour. Capacity of hopper, 320 cubic yards, or say 400 tons. Average distance run, loaded, 20 miles. ‘Wages per day as under :— 1G)? pecanponopodenoecnendoooD .adocoDooSoonooognoxooigasciconosnoaoeoodNCeD 73, Od ML Oerarsarderss cuss: sscsectsessenessnsectecssevssccccuscticesscdsenssaerecese 4 JE INET thoagarancsnane pean cannes aaacco snp peannarniconncenccocradoddccnannaaca 5 10 IP AROMAAT a ctensenates seece recesses: cite terccueveeesescascasestarstorcets revs eo DECKS AN Ca) s CMC lieccareswaanateacsseracrectseasceccaenaeteasesaaaed on Coals per day of 10 hours .70 ewts Tallow i i 6 . 5 Tb. Jil * a) bs . Waste _ 5

Quantity and cost of dredging done by No. 8 Dredger during year ending 30th June 1871 :—

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\Wii@GSierserricenscitestsenssetasesesrcrrtenaeteenmscrcencrunrtsre teres £678 O 0 Coals…. coco CHL MSS StOUCSisecasrccscsssccrsccessccceseoncrccecetestteatencte mestesssceenan 1820 7 0 1 £1932) (5 a4 REPALTS Es scocsesncnecsscorsessreecectssertcnaeretect ett ttemmeettre ste 1669 6 Il

1293

Interest and depreciation—cost of dredger, £17,653, at TO) SOE. CE oadosneaeboocncdboeobcacobodenbodcaonaognonactacrina 1765 6 O

£4,666 18 3

Time worked during year, 24193 engine hours, Sand, silt, till, and gravel lifted, 480,240 cubic yards,

430,240 ; ;

24195 hours)? 80 cubic yards lifted per hour.

£4666, 18s. 3d. 430,240 cubic yards – °° pence cost per cubic yard lifted. _ Quantity and cost of conveying and discharging the total dredg- ings lifted by Nos. 6 and 8 Dredgers during the year ending 30th June 1871 :— Wages, Coals, and St0res..sssecscccsessssssssreceers £6,917 0 58

ERGDALUS ts scessccevensscasmimttecets tne cosccdscara steer 3,255 7 9 £10,172 8 2 Intcrest and depreciation—cost of 10 hopper barges, LDL) avin) OMMGIENCCHUeressastesacterssadvertnuesestrcsanetedcersnste 5,151 0 0 £15,323 8 2

£15,323, 8s. 2d, , * che ee Se =5‘46 pence cost per cubic yard. 673,240 cubic yards, 2 e 4 total dredgings conveyed.

Note.—Four hopper barges are required to keep one dredger in constant work.

Abstract of the Quantity and Cost per Cubic yard of Dredging and Depositing during the year ending 30th June 1871.

Pence per cubic yard.

eS lee : a = 2 3 m oh g ars ae a. | ae Ste | £5 wasls. = where | 23 /54| ¢/#S0| 228d /ees 83] ¢ ey dredged 3 ag] & | eSP) Pas Pasion! 2 3 k : mae) 8 Soa | apg os je te Ziel tS) = generally. © of§| &/SS89/egclsvaly – cs) 3 Bn/ S3/ESa>(ESa BES ES! S zm S 9| £|/8rte|/ sv Ara ss] s a i= 5 Fil jy te) HS & i=) Ne a Sand, silt, and |122,664) 66°96 5°67 2°88 10°00 1) 3°52;22°07 redger aes ane od ae a 65,160; 29°18 5°89; «+ 1:76 | 5:42 2 2°65 15:72 it ‘| vel, and san from Erskine Ferry, &c. a eae pee sity 243,000] 83:19, 5°36, 5°46) ... core || nore qh eS) Glasgow, &e. Ne Gees. ne oe and 26,720, 10°26

20°81} + 2°34 | 5°42 2 9°70 38:27 Y | clay from Er- skine Ferry, Elderslie, &c. No. 8 Sand, silt, till, 430,240 177°80, 2°60 Dredger| and gravel, from Glasgow and Bowling harbours, &c. average 10 Hopper 5°46 barges average Tug 2°83 steamcr

Nos. 1, 5, and 7 are punt-loading machines. Nos. 6 and 8 are hopper barge machines.

Reference is made to the following works :—Ency. of Civil Engin. ecring, by Edward Cressy, London, 1847 ; ‘“The Dredging Machine,’ Weale’s Quarterly Papers, i., London 1843; T’he Improvement of the Port of London, by R. Dodd, Engineer, 1798 ; “‘ Account of Blast- ing on the Severn,” by George Edwards, C.E., Minutes of Procccd- ings of the Institution of Civil Engineers, vol. iv. p. 361; ‘the River Clyde,” by James Deas, C.E., Minutes of Proceedings of the Institution of Ctvil Engineers, vol. xxxvi. p. 124; Principles and Practice of Canal and River Engineering, by David Stevenson, 2d ed., A. & C. Black, Edinb. 1872, p. 126. (D. 8.)

DRELINCOURT, Cuartes (1595-1669), an eminent minister of the French Calvinistic church, was born at Sedan on the 10th July 1595. He studied first at the university of his native town, and afterwards at Saumur under the celebrated Professor Mark Duncan. Jn June 1618 he undertook the charge of the French Protestant church at Langres, where his ministrations were highly appreciated. The church, however, failed to receive the necessary royal sanction, and early in 1620 Drelincourt

1 Contractor’s price for discharging at Blythswood Park, including slip docks, and waggoning a distance of about } mile.

2 Discharging by Trustees’ men on river banks near Erskine Ferry, by beaching punts and wheeling.

removed to Paris, where he was ordained minister of the church at Charenton. He was a popular and eloquent preacher, distinguished especially by his power of practically applying the words of Scripture. He was the author of a large number of works in devotional and polemical theology, several of which had great influence, and attained a very extensive circulation. His Catechism and his Consolations against the Kear of Death (Consolations contre les frayeurs de la mort) became well known in England by means of translations, which were very frequently reprinted. It has been said that Defoe wrote his fiction of Mrs Veal, who came from the other world to recommend the perusal of Drelincourt on death, for the express purpose of promoting the sale of an English translation of the work.

His con- troversial works were very numerous. Directed entirely against Roman Catholicism, they did much to strengthen and consolidate the Protestant partyin France. Drelincourt died on the 3d November 1669. In 1625 he had married the only daughter of a wealthy merchant, by whom he had a family of sixteen. Several of his sons were distinguished as theologians or physicians. The third, Charles, was professor of physic at the university of Leyden, and physician to the prince of Orange ; the sixth, Peter, was ordained a priest in the Church of England, and became dean of Armagh. ;

DRESDEN, the capital of the kingdom of Saxony, is situated in a beautiful and richly cultivated valley on both sides of the Elbe, at an altitude of 402 feet above the level

Plan of Dresden.

of the Baltic, 72 miles E.S.E. of Leipsic, and 116 miles S.E. of Berlin, in 51° 3’ N. lat. and 13° 44’ E. long. It is approached on almost every side through avenues of trees, and the distance is bounded by gentle eminences covered with plantations and vineyards, On the left bank of the Elbe are the Altstadt, with three suburbs, aud Friedrich- stadt (separated from the Altstadt by the Weisseritz, a small affluent of the Elbe) ; on the right the Neustadt and Antonstadt. Two fine brdges connect the Alstadt and Neustadt,—one of them, the old bridge, erected 1727-31, being 1420 feet long, and having 16 arches. The other, built 1846-52, unites the railways on the right and left

banks. The streets of the Altstadt are narrow and some: what gloomy ; those of the Neustadt wider and more regu: lar. In 1875 there were 196,378 inhabitants, of whom 138,306 were on the left bank, 58,072 on the right. The vast majority of the population belong to the Lutheran Church.

On account of its delightful situation, and the many objects of interest it contains, Dresden is often called “the German Florence,” a name first applied to it by Herder, The most imposing of the churches is the church of Our Lady, built 1726-45, with a cupola 311 feet high, The Roman Catholic

church, built 1737-56, contains a magnificent organ by Silbermann, a number of statues by Mattielli, and pictures by Raphael Mengs, Sylvestre, and other artists. The church of St Sophia, begun in the 14th century, completed in the 16th, and restored in 1864-69, the Cross Church, the Russian church, and the synagogue are also noteworthy buildings. The Royal Palace, rebuilt in 1534 by Duke George, surmounted by a tower 387 feet high, the highest in Dresden, is externally unattractive, but the interior is splendidly decorated. In the palace chapel are pictures by Rembrandt, Nicolas Poussin, Guido Reni, and Annibale Caracci. The Prince's Palace, built in 1715, has a fine chapel, in which are various works of Torelli; it has also a library of 20,000 volumes. The Zwinger, begun in 1711, and built in the Rococo style, forms an inclosure within which is a statue of King Frederick Augustus 1. It was intended to be the vestibule toa palace, but now contains a number of collections of great value. Until 1846 it was open at the north side; but this space has since been occupied by the Museum, a beautiful building in the Renaissance style, the exterior of which is adorned by statues of Michelangelo, Raphael, Giotto, Dante, Goethe, and other artists and poets, by Rietschel and Hiahnel. The Briihl Palace was built in 1737 by Count Briihl, the minister of Augustus II. Near it is the Briihl Terrace, approached by a grand flight of steps, on which are groups, by Schilling, representing Morning, Evening, Day, and Night. The terrace com- mands a charming view of the Elbe and the surrounding country, and is a favourite promenade. The Japanese Palace, in the Neustadt, built in 1715 as a summer residence for Augustus IL., receives its name from certain Oriental figures with which it is decorated ; it is also some- times called the Augusteum. Connected with it is a public garden, from which, as from the Briihl Terrace, fine views are obtained. Among the remaining buildings of note may be named the guard-house, the arsenal, and the court theatre, an edifice in the Renaissance style, built since 1871 to replace the theatre burnt in 1869. In the Neustadt there is an equestrian statue of Augustus the Strong, erected in 1737. The public monuments of Dresden also include the Maurice Monument, a relief dedicated by the elector Augustus to the memory of his brother ; a statue of Weber, the musical composer, by Rietschel ; statues of King Frederick Augustus II. and Theodor Korner, by Hahnel ; and the Rietschel monument, on the Briihl Terrace, by Schilling.

The chief pleasure-ground of Dresden is the Grosser Garten, in which there are a summer theatre, the Rietschel Museum, and a chateau containing the Museum of Antiquities. The latter is composed chiefly of objects removed from the churches in consequence of the Reforma- tion. Near the chateau is the zoological garden, formed in 1860, and excellently arranged. A little to the south of Dresden, on the left bank of the Elbe, is the village Racknitz, in which is Moreau's monument, erected on the spot where he was fatally wounded in 1813. The moun- tains of Saxon Switzerland are seen from this neighbour- hood. On the right bank, the slopes of which are covered

with villas, there are several popular places of public resort.

Dresden owes a large part of its fame to its extensive artistic, literary, and scientific collections. Of these the most valuable is its splendid picture gallery, founded by Augustus I. and increaséd by his successors at great cost. It is in the Museum, and contains about 2500 pictures, being especially rich in specimens of the Italian, Dutch, and Flemish schools. Among the Italian masters repre- sented are Raphael, Titian, Corr2ggio, Leonardo da Vinci, Paolo Veronese, Andrea del Sarto, Giulio Romano, Annibale Caracci, Guido Reni, and Carlo Dolci. Of the Flemish and Dutch schools there are paintings by Rubens, Vandyck, Rembrandt, and Ruysdael, Wouvermann, Dow, Teniers, Ostade, Potter, &c. The French school is represented, among others, by Poussin and Claude. 'The gem of the collection is Raphael's Madonna di San Sisto, for which a room is set apart. There is also a special room for the Madonna of the younger Holbein. Other paintings with which the name of the gallery is generally associated are Coreggio's La Notte and Mary Magdalene; Titian's Tribute Money and Venus; The Adoration and The Marriage in Cana, by Paolo Veronese; Andrea del Sarto's Abraham's Sacrifice ; Rembrandt's Portrait of Himself with his Wife sitting on his Knee; The Judgment of Paris and The Boar Hunt, by Rubens ; Vandyck's Charles I., his Queen, and their Children. In separate compartments there are a number of crayon portraits, most of them by Rosalba Carriera, and views of Dresden by Canaletto and other artists. Besides the picture gallery the Museum in- cludes a magnificent collection of engravings and drawings. There are upwards of 350,000 specimens,

arranged in twelve classes, so as to mark the great epochs in the history of art. A collection of casts, likewise in the Museum, is designed to display the progress of plastic art from the timeof the Egyp- tians and Assyrians to modern ages. This collection was begun by Raphael Mengs, who secured casts of the most valuable antiques in Italy, some of which no longer exist.

The Japanese Palace contains a public library of more than 300,000 volumes, with about 3000 MSS. and 20,000 maps. This library is especially rich in the ancient classics, and in works bearing on literary history and the history of Germany, Poland, and France. In the Japanese Palace there are also a valuable cabinet of coins and a collection of ancient works of art. A collection of porcelain, formerly in the Japanese Palace, but since 1876 in the ‘“ Museum Johanneum” (which once contained the picture gallery), is made up of specimens of Chinese, Japanese, East Indian, Sevres, and Meissen manufacture, carefully arranged in chronological order. There is in the same building an excellent’ Historical Museum, in which there are many inte- resting relics of past times, besides objects which cast light on the history of races and of manners. In the Green Vault of the Royal Palace, so called from the character of its original decorations, there is an unequalled collection of precious stones, pearls, and works of art in gold, silver, amber, and ivory. The objects, which are about 3000 in number, are arranged in eight rooms. They include the regalia of Augustus II. as king of Poland ; the electoral sword of Saxony; a group by Dinglinger, in gold and enamel, representing the court of the Grand Mogul Aurung- zebe, and consisting of 132 figures upon a plate of silver 4 feet 4 inches square ; the largest onyx known, 6% inches by 2} inches ; a pearl representing the dwarf of Charles II. of Spain ; and a green brilliant weighing 40 carats. Besides the Green Vault the Royal Palace has a gallery of arms, consisting of more than 2000 weapons of artistic or histori- cal value. In the Zwinger are the Zoological and Minera- logical Museums, and a collection of instruments used in mathematical and physical science.

The two chief art institutions in Dresden are the Royal Academy of Arts, founded in 1764, and the Royal Choir. The Art Union, founded in 1828, which has a permanent exhibition in the Briihl Terrace, is a private body; and there are a good many other private art societies more or less distinguished. Dresden is also the seat of a number of well-known scientific

associations. The educational in- stitutions of the town are both numerous and of a high order, including a technical college with a staff (in 1876) of 39 professors and teachers, three gymnasia, two real schools of the first class, and many schools of different ranks for popular education. The Catholics and Jews have schools of their own; and there are two seminaries for the education of teachers. Dresden has several important hospitals, asylums, and other charitable institutions.

Among the chief branches of industry are manufactures in gold and silver, turnery, straw plait, scientific and musical instruments, paper-hangings, artificial flowers, and painters' canvas. There are several large breweries ; a considerable corn trade is carried on ; and there is an ex- tensive traffic in books and objects of art. A number of steam-ship companies provide for the navigation of the Elbe.

Dresden, which is known to have existcd in 1206, is of Slavonic origin. It became the capital of Henry the Illustrious, margrave of Meissen, in 1270, but belonged for some time aftcr his death, first to Wenceslas of Bohemia, and next to the margrave of Bran- denburg. Early in the fourteenth century it was restored to the margrave of Meissen. On the division of the territory in 1485, it fell to the Albertine line, which has since held it. Having been burned almost to the ground in 1491, it was rebuilt ; and in the 16th century the fortifications were begun and gradually extended.

John George II., in the 17th century, formed the Grosser Garten, and otherwise greatly improved the town; but it was in the first

half of the 18th century, under Augustus I. and Augustus II., who

were kings of Poland as well as electors of Saxony, that Dresden assumed something like its present appearance. The Neustadt, which had been burned down in the 17th century, was founded anew by Augustus I.; he also founded Friedrichstadt. The town suffered severely during the Seven Years' War, being boinbarded in 1760. Some damage was also inflicted on it in 1813, when Napo- leon made it the centre of his operations ; one of the buttresses and two arches of the old bridge were then blown up. The dis- mantling of the fortifications had been. begun by the French in 1810, and was gradually completed after 1817, the space occupied by them being

appropriated to gardens and promenades. Many buildings were completed or founded by King Anton, from whom Antonstadt derives its name. Dresden again suffered severely during the revolution of 1849, but all traces of the disturbances which then took place were soon effaced. In 1866 it was occupied by the Prussians, who did not finally evacuate it until the spring of the following year. Since that time numerous improvements have been carried out, and between 1871 and 1875 the population in- creased at the rate of rather more than 11 per cent. (J. SL)

DREUX (Durocassis, Droce), a town of France in the department of Eure-et-Loir, on the Blaise, 21 miles north of Chartres. Noteworthy structures are the Gothic church of St Pierre ; the town-house, partly in the Gothic and partly in the Renaissance style, built in the 16th century ; and the remains of a castle of the 12th century, situated on the hill overlooking the town, within the inclosure of which is a chapel commenced in 1816 by the dowager duchess of Orleans, and completed and adorned at great cost by Louis Philippe. “Thé chief industries Of Dreux aré dyeing and silk- weaving, and the manufacture of jewellery, serges, hosiery, candles, hats, and leather. In 1872 the population of the commune was 7418, of the town 6666,

Dreux was governed by counts in the Middle Ages. In 1188 it was taken and burnt by the English ; and in 1562 Coligni and the prince of Condé were defeated in its vicinity by Montmorency. In 1593 Henry IV. captured the town after a fortnight’s siege. Dreux was occupied by the Germans on October 9th, 1870, was subse-

quently evacuated, and was again taken, on November 17th, by General Von Tresckow.

DREW, Samvet (1765-1833), theologian, was born in the parish of St Austell, in Cornwall, March 3,1765. His

father was a poor farm-labourer, and could not afford to send him to school long enough even to learn to read and write. At the age of seven he lost his mother, a woman of superior mind and religious character; and he was then sent to work with the tinners. At ten he was apprenticed to a shoemaker, and

at twenty he settled in the town of St Austell, first as manager for a shoemaker ; and about three years later he began business on his own account, He had already gained a reputation in his narrow circle as a keen debater and a jovial companion. He was first aroused to serious thought by the preaching of Adam Clarke ; and the impression thus produced was deepened by the death of his elder brother. He now joined the Methodists, was soon employed as a class leader and local preacher, and continued to preach till a few months before his death. His opportunities of gaining knowledge were very scanty, but he strenuously set himself to make the most of them. It is stated that an accidental introduction to Locke's great essay determined the ultimate direction of his studies. In 1798 the first part of Paine's Age of Reason was put into his hands; and in the following year he made his first appearance as an author by publishing his Remarks on that work. The book was favourably received, and was re- published in 1820. Drew had begun to meditate a greater attempt before he wrote his Remarks on Paine, and the fruits of his laborious investigation were given to the world in the Essay on the Immuteriality and Immortality of the Soul, in 1802. This work made him widely known, and for some time it held a high place in the judgment of the religious world as a powerful and conclusive argument on its subject. A fifth edition appeared in 1831. Drew con- tinued to work at his trade till 1805, when he entered into an engagement which enabled him to devote himself entirely to literature. In 1809 he published his Hssay on the Identity and General Resurrection of the Human Body, perhaps the most original of his works, which reached a second edition in 1822, In 1819 Drew removed to Liverpool, on being appointed editor of the Zmperial Magazine, then newly established, and in 1821 to London, the business being then transferred to the capital. Here he filled the post of editor till his death, and had also the supervision of all works issued from the Caxton press. He was an unsuccessful competitor for a prize offered in 1811 for an essay on the existence and attributes of God. The work which he then wrote, and which in his own judgment was his best, was published in 1820, under the title of An Attempt to demonstrate from Reason and Revelation the Necessary Existence, Essential Perfections, and Superintend- ing Providence of an Eternal Being, who is the Creator, the Supporter, and the Governor of all Things (2 vols. 8vo). This procured him the degree of M.A. from the university of Aberdeen, Among Drew's lesser writings are a Life of Dr Thomas Coke (1817), a History of Cornwall (1824), and a work

on the divinity of Christ (1813). He died at Helston, in Cornwall, March 29, 1833. A memoir of his life by his eldest son appeared in 1834.

DREYSE, Jowann NicHotas von (1787-1867), in- ventor of the needle-gun, was the son of a locksmith, and was born at Sdémmerda the 20th November 1787. He served his apprenticeship in the shop of his father, and from 1806 to 1809 followed his calling at Altenburg and Dresden. From 1809 to 1814 he was in Paris, where he succeeded in finding employment in the gun-factory of the Swiss officer Pauli, patronized by N: apoleon I. After- wards he returned to Sdmmerda, where, in partnership with Kronbiegel, he established a factory for the making of articles in jron by machine tools. In 1824 he patented @ new percussion action for the gun, and continued there-after to busy himself with experiments to improve in every way possible the process of shooting. In 1827 he invented

the needle-gun, but without the advantage of breech-load- ing; and in 1836, having been encouraged in his en- deavours by the Prussian Government, he invented his first complete needle-gun. A gunnery was opened by him in 1841, which ultimately supplied weapons for the troops of all the German states, and before his death employed about 1500; persons. In 1864 he and his family had the rank of nobility conferred on them. He died 9th December 1867.

DRIFFIELD (or Great Drirriezp, to distinguish it from the neighbouring hamlet of Little Driffield), a market- town of England, in the east riding of Yorkshire, 28 miles to the east of York, and 196 miles from London by road. The town—consisting of one principal street, from which some smaller ones diverge—is agreeably situated at the foot of the Wolds, and is connected with the port of Hull by a navigable canal. It stands in the centre of a fertile agricultural district. An important corn and cattle market is held in the town every Thursday, and there are four large stock-fairs annually at Little Driffield. Resides the parish church, a fine old edifice in differeut styles, the principal public buildings in Great Driffield are the places of worship for Independents, Methodists, and Baptists, the corn exchange, the dispensary, the mechanics’ institute, and the station of the Hulland Scarborough railway. Carpets, cotton, and chemical manure are

manufactured in the town; and in the neighbourhood are numerous flour-mills and mills for bone-crushing. Population in 1871, 8364.

DROGHEDA, a seaport, market-town, and municipal and parliamentary borough of Ireland, in the province of Leinster, about 4 miles from the mouth of the Boyne, and 314 miles north of Dublin by rail. Though situated on the borders of Louth and Meath, it belongs to neither, as the town and surrounding district constitute a county of a city, with an area of 9 square miles, or 5780 acres. It occupies both banks of the river ; but the northern division is the larger of the two, and has received greater attention in modern times, The ancient fortifications, still extant in the beginning of the century, have almost completely dis- appeared ; but of the four gateways, one named after St Lawrence remains comparatively perfect, and there are con- siderable ruins of another. Great improvements have been effected in the town since 1840, under the encouragement bestowed by Benjamin Whitworth, M.P., who built a town- hall at his own expense in 1865, and furnished half the funds necessary for the construction of the water-works which now supply 800,000 gals. daily. Among the public buildings are a inansion-house or mayoralty, with a suite of assembly rooms attached ; the " Tholsel," a square building with a cupola; a corn-market, the old linen-hall, an infirmary, a workhouse, and a prison ; five Protestant churches, five Roman Catholic chapels, three friaries, and four nunneries. St Peter's Chapel formerly served as the cathedral of the Roman Catholic archbishopric of Armagh ; and in the abbey of the Dominican nuns there is still preserved the head of Oliver Plunkett, the archbishop who was executed at Tyburn in 1681 on an unfounded charge of treason. There was at one time an archiepiscopal palace in the town, built by Arch- bishop Hampton about 1620 ; and the Dominicans, the Fran- ciscans, the Augustinians, the Carmelites, and the knights of St John had monastic establishments. Of the Dominican buildings there still exists the stately Magdalen tower; the Franciscan friary is a striking ruin ; and there are traces more or less distinct of the Augustinian priory, the priory of St Lawrence, and the hospital of St Mary. At the head of the educational institutions is a classical school endowed by Erasmus Smith ; and among the public charities are an almshouse for twenty-four aged widows, and a foundation providing houses and annuities for thirty-six clergymen's widows. 'There is also a blue-coat school, founded about

1727 for the education of freemen's sons. The present building was erected by T. P. Cairnes in 1870. The industrial establishments comprise a large cotton factory, erected by Mr Whitworth in 1864, four extensive saw- mills, three flax-mills, six flour-mills, eight tanneries, five salt-works, four soap works, two extensive breweries, two newspaper offices, chemical manure works, and a large engineering factory for the making of steam-engines, iron- bridges, ec. A brisk trade is carried on, especially with Liverpool (which is distant 133 miles due east), and with Glasgow. The harbour has been greatly improved by the commissioners, and vessels of 400 tons can discharge at the quays. In 1873, 707, with a burden of 115,673 tons, entered the port; and the harbour receipts in 1871 were £3627. The tide reaches 24 miles above the town to Oldbridge ; and barges of 50 tons burden can proceed 19 miles inland to Navan. 'The river is crossed by a bridge for ordinary traffic, and by a splendid railway viaduct. Assizes, quarter sessions, and petty sessions are held in the town; the parliamentary borough returns one member to Parliament; and the municipal borough is governed by a mayor, 6 aldermen, and 18 councillors. The population of the municipal borough (area, 454 acres) was 17,365 in 1831, 16,845 in 1851, 14,740 in 1861, and 13,510 in 1871. The whole population, with the éxception of about 1100, are Roman Catholics. The inhabitants of the parliamentary burgh, which has an area of 5785 acres, numbers 16,165.

In the earliest notices the town of Drogheda is called Inver-Colpa or the Port of Colpa; the present name signifies ''The Bridge over the Ford." In 1152 the place is mentioned as the seat of a synod convened by the papal legate, Cardinal Paparo; in 1224 it was chosen by Lucas de Netterville, archbishop of Armagh, for the foundation of a Dominican friary; and in 1228 the two divisions of the town received separate incorporation from Henry III. But there grew up a strong feeling of hostility between Drogheda versus Uriel, and Drogheda versus Midiam, in consequence of trading vessels landing their cargoes in the latter or southern town, to avoid the pontage duty levied in the former or northern town. At length, after much

blood had been shed in the dispute, Philip Bennett, a monk residing in the town, succeeded by his eloquence, on the festival of Corpus Christi, 1412, in persuading the authorities of the two corporations to send to Henry IV. for a new charter sanctioning their combination.

Drogheda has always been considered by the English a place of much importance. In the reign of Edward III. it was classed along with Dublin, Waterford, and Kilkenny, as one of the four staple towns of Ireland. Richard II. reccived in its Dominican monastery the submissions of O'Neal, O'Donnell, and other chieftains of Ulster and Leinster. The right of coining money was bestowed on the. town, and parliaments were several times held within its walls. In the reign of Edward IV. the mayor received a sword of state, and an annuity of £20, in recognition of the services rendered by the inhabitants at Malpus Bridge against O'Reilly ; the still greater honour of having a university with the same privileges as that of Oxford remained a mere paper distinction, owing to the poverty of the town and the unsettled state of the country ; and an attempt made by the corporation in modern times to resuscitate their rights proved unsuccessful. In 1495 Poyning's laws were enacted by a parliament held in the town. In the civil wars of 1641 the place was besieged by O'Neal and the Northern Irish forces ; but it was gallantly defended by Sir Henry Tichbourne, and after a long blockade was relieved by the Marquis of Ormond. The same nobleman relieved it a second time, when it was invested by the Parliamentary army undcr Colonel Jones, In 1649 it was eaptured by Cromwell, after a short thongh spirited defeuce ; and nearly every individual within its walls, without distinction of age or sex, was put to the sword. Thirty only escaped, who were afterwards transported as slaves to Barbados. In 1690 it was garrisoned by King James's army ; but after the decisive battle of the Boyne, —the site of which, about 24 miles to the west, is marked by an obelisk 150 high,—it surrendered to the conqueror without a struggle, in consequence of a threat that quarter would not be granted if the town werc taken by storm. Its subsequent history is purely of local interest.

DROHOBYCZ, a town of Austria, in the Galician circle of Sambor, on the Tysminika, a right-hand affluent of the Dniester, at the junction of a branch line from Boryslaff with the main Galician railway. It possesses a castle, a

beautiful Roman Catholic church, a synagogue, and a German high school ; and its inhabitants, who number up- wards of 12,000, deal in cattle, grain, earthenware, leather, and salt,—the last being obtained from the local brine-wells.

DROITWICH, a municipal and a parliamentary borough of England, in Worcestershire, on the Salwarpe, a left-hand tributary of the Severn, about seven miles by rail N.N.E. of Worcester. With the exception of its modern exten- sions, the town is built in a straggling and irregular fashion ; but it numbers among its public edifices a court- chamber and market-house, two churches—St Andrew's and St Peter's—several chapels, and a hospital established by Lord Keeper Coventry, the revenues of which maintain about forty men and women, and educate about 100 young persons of both sexes. The principal occupation is the manufacture of the salt obtained from the brine springs, or wyches, to which the town probably owes both its name and its origin; and the annual quantity obtained is about 116,000 tons. These springs were known to the Romans, who had a station on the spot, as was shown by the remains of a villa, with some interesting and valuable relics, dis- covered during the formation of the Oxford and Wolver- hampton railway. In Domesday-book mention is made of a tax levied on the salt, which must consequently have been manufactured in the 11th century. A charter was bestowed on Droitwich by King John. The population of the muni- cipal borough, with its area of 1849 acres, was 3504 in 1871; that of the parliamentary borough, with its area of 27,577 acres, was 9510.

DROME, a department in the south-east of France, formed of parts of Dauphiné and Provence, is bounded W. by the Rhone, which separates it from Ardéche, N. and N.E. by Istre, E. by Hautes-Alpes, S.E. by Basses-Alpes, and 8. by Vaucluse, and lies between 44° 8' and 45° 20' 25" N. lat. and 4° 41' and 5° 55' E. long. To the east it is covered by spurs of the maritime Alps, one of the largest of which forms part of its eastern boundary, and throws off ridges, mostly wooded, that run east and west with tolerable regularity. These ridges divide the department in its whole extent into three great valleys, having a general slupe west- wards to the Rhone, namely, that of the Istre in the north, that of the Dréme, which

occupies the central portion of the province, and that of the Aygues, in the south. The Rhone and Isére are both navigable. The former receives the whole of the drainage of the department. The soil consists of clays and argillaceous sand with rolled pebbles. Irrigation canals are numerous, and are skilfully managed. The climate, except in the valleys bordering the Rhone, is rather cold, but on the whole bracing and healthy. Snow is visible on the mountain-tops during the greater part of the year. The principal forest-trees are the pine, beech, and oak. In the valleys flourish the olive, chestnut, vine, almond, mulberry, nut, and other fruit trees, and wheat and madder are grown. Black truffles are abundant. Besides agriculture the principal industries are the rearing of silk- worms and sheep, and the manufacture of wines, the best of which are the red and white Ermitage, of woollen, cotton, and dyed linen goods, spun and woven silk, paper, oil, ropes, earthenware, and leather. The wool and wood trades are considerable. The mineral products include iron, copper, lead, lignite, marble, granite, black and red potter's clay, millstones, chalk, and cement-stone. Dréme is divided into the arrondissements of Valence, Die, Montélimart, and Nyons, comprising 29 cantons and 366 communes. The capital is Valence. Of the total area of 652,155 hectares (1,610,823 acres) about 514,227 acres are arable, 415,866 under wood, 329,961 heath, 58,430 vineyards, and 49,203 meadow. The population in 1872 was 320,417.

DROMEDARY. See Camet, vol. v. p. 737.

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DROPSY (contracted from the old word hydropisy, from the Greek tSpwy —vdwp, water, and dy, the appearance) signifies a collection of simple serous fluid in all or any of the cavities of the body, or in the meshes of its tissues. Dropsy of the subcutaneous connective tissue is termed cedema when it is localized and limited in extent; when more diffuse it is termed anasarca ; the tern edema is also applied to dropsies of some of the internal organs, notably to that of the lungs. Hydrocephalus signifies an accumulation of fluid within the ventricles of the brain or in the arachnoid cavity ; hydrothorax, a collection of fluid in one or both pleural cavities ; hydropericardium, in the pericardium ; ascites, in the peritoneum ; and,

when anasarca is conjoined with the accumulation of fluid in one or more of the serous cavities, the dropsy is said to be general.

Dropsy is essentially a symptom and not a specific disease, and ought not to be confounded with inflammatory exudations of a serous character. The transudation is a inere filtrate from the blood produced by increased intravascular pressure, of local or general origin, and occur- ring through the walls of the capillaries or smaller venules. Its specific gravity varies from 1-008 to 1-014; it is alkaline, occasionally neutral, very rarely feebly acid; it is not the liquor sanguinis, but merely water holding in solution a varying proportion of the constituents of the blood serum, chiefly the saline constituents, and of these notably the chloride of sodium, occasionally urea, sometimes cholestrine, always more or less albumen, and a proportionate amount of fibrogenous matter. It may be colourless, greenish or reddish from the presence of blood pigment, or yellowish from the presence of bile pigment; transparent, or opalescent, or milky from the presence of fatty matter derived from the chyle. The membrane from which the dropsical fluid escapes is healthy, or at least not inflamed, and only somewhat sodden by long contact with the fluid— the morbid condition on which the transudation depends lying elsewhere. The occurrence of dropsy is favoured by a watery condition of the blood due to imperfect nutrition, the pre-occurrence of acute disease, or the long continuance of exhausting discharges, as of albumen in Bright’s disease, &c. his watery condition of the blood not only pre- disposes to dropsy, but also lends active aid in producing it by enfeebling the heart and thus disturbing the relations of the intravascular pressure. The active agents in the production of dropsy are whatever increases the intravenous blood pressure locally or generally. Obstruction to the centripetal venous current by thrombosis of the veins, by the pressure of hyperplasic connective tissue, as in hepatic cirrhosis, by the pressure of tumours either pathological, as aneurisms, cancerous or tubercular masses, or physiological, as a gravid uterus or a mass of feces, or by the mere weight of the body in certain positions, as the sedentary, are efficient causes in the production of local dropsies. These are also more rarely brought about by thrombosis, or compression of the lymphatics, or of the thoracic duct, and this partly directly and partly indirectly by acting on the venous blood stream. The active agents in the production of general dropsy are diseases of the heart, the lungs, and the kidneys. The natural

tendency of all diseases of the heart is to transfer the blood pressure from the arteries to the veins, and, so soon as this has reached a sufficient degree, dropsy in the form of local edema commences to appear at whatever may be the most depending part of the body—the instep and ankle in the upright position, the lower part of the back or the lungs if the patient be in bed—and this tends gradually to increase till all the cavities of the body are invaded by the serous accumulation. The diseases of the lungs which produce dropsy are those which obstruct the passage of the blood through them, such as emphysema and bronchitis, and thus act precisely like

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disease of the heart in transferring the blood pressure from the arteries to the veins, inducing dropsy in exactly a similar manner. The discases of the kidney which give rise to dropsy are those in which there is more or less obstruction to the secretion of the watery and saline con- stituents of the urine, accompanied by a more or less free escape of albumen ; these are the acute congestive form of nephritis following scarlet fever, the inflammatory or intratubular form of chronic Bright's disease, and the final stage of amyloid degeneration. In the two former the dropsy is often very considerable, and in the absence of cardiac disease will be found to appear first about the loose cellular tissue surrounding the eyes, where the vessels, turgid with watery blood, have less efficient support. Dropsy, though often a terminal and always a serious symptom, is yet one which much can be done to ameliorate and in many cases to remove, and this is particularly the case in many local dropsies and in those of cardiac origin. Lung, kidney, and hepatic dropsies are less amenable to treatment ; yet one case of ascites is on record in which a perfect recovery took place after the woman had been tapped 133 times, and nearly 400 gallons of fluid removed. Diuretics and purgatives are the remedies chiefly employed ; but in certain cases diaphoretics and especially the use of a hot air bath are very effectual, and in a large number paracentesis or tappingiseither indispensable, or at allevents much expcdites the cure.

It may be well to mention that there are certain affcc- tions which may be termed spurious dropsies, such as ovarian dropsy, which is only a cystic

disease of the ovary ; hydrometria, dropsy of the uterus, due to inflammatory occlu- sion of the os uteri; hydronephrosis, dropsy of the kidney, due to obstruction of the ureter, and subscquent distention of these organs by serous accumulations; other hollow organs may also be similarly affected. (G. W. B.)

DROSTE-HULSHOFF, Annette EvizaBetH, BARONESS or (1798-1848), a German poetess, was born on the estate of Hiilshoff, near Munster, and belonged to the elder branch of the Catholic Westphalian family which about the same time had its reputation increased by the juridical labours of Clemens Augustus von Droste-Hiilshoff. She received an education of a more scientific character than usually fell at that time to the lot of her sex; and the delicate state of her health obliged her to lead a very quiet and secluded life, which in its turn fostered the natural sensibility of her tem- perament, and increased her devotion to literature and study. With the exception of a short time spent at Cologne and Bonn about 1825, she mainly resided at her mother's country seat of Rischhaus, near Munster ; but in 1841 she went to the castle of Eppishausen, in Thuringia, and in 1844 became a guest at the house of her brother-in-law Von Lassberg, on the borders of the Lake of Constance. She had just purchased an estate in that neighbourhood when she died in May 1848. Besidesa volume of Gedichte published during her lifetime (Stuttgart, 1844), we have also from her pen Das geistliche Jahr, nebst einem Anhang religidser Gedichte, Stuttgart, 1852; and Letzte Gaben, Hanover, 1860. The popularity of the first work is shown by a third edition in 1873. The characteristics of the author are great perfection of form, delicacy of feeling, and vivid realization of external nature. A number of her poems have been rendered into English by Medwin. See Schiicking, Annette von Droste- Hiilshof, Hin Lebensbild, 1871

DROUAIS, Jean Germain (1763-1788), a French historical painter, was born at Paris on the 25th November 1763. His father, Henri Drouais, and his grandfather, Hubert Drouais, were well-known portrait painters ; and it was from his father that he received his first artistic instruc- He was afterwards intrusted to the care of Brenet, an excellent teacher, though his own pictures did not take

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high rank. In 1780 David, who had just returned from Rome, opened a school of painting in Paris, and Drouais was one of his earliest and most promising pupils. He adopted the classical style of his master, and gave his whole time to study,—painting during the day, and spending a great part of every night indesigning. For weeks together it is said that he never left his studio. In 1783 he was admitted to compete for the great prize of painting offered by the Academy, the subject being the Widow of Nain. After inspecting the works of his fellow-competitors, how- ever, he lost hope and destroyed his own canvas, but was consoled by the assurance of his master David that had he not done so he would have won the prize. Next year he was triumphantly successful, the picture of the Woman of Canaan at the Feet of Christ, with which he gained the prize, being judged by competent critics to be worthy of comparison with the works of Poussin. He was carried shoulder high by his fellow-students through the streets to his mother's house, and a place was afterwards found for his picture in the Louvre. His success making him only the more eager to perfect himself in his art, he accompanied David to Rome, where he worked even more assiduously than in Paris. He was most strongly influenced by the remains of ancient art and by the works of Raphael. Goethe, who was at Rome at the time it was finished, has recorded the deep impression made by his picture of Marius at Minturno, which he characterizes as in some respects superior to the work of David, his master, The last picture which he completed was his Philoctetus on the Island of Lemnos. He died of fever on the 15th July 1788. A monument to his memory was erected by his fellow-students in the church of Santa Maria in the Via Lata.

DROUET, Juan Barriste (1763-1824), one of the Terrorists of the first French Revolution, chiefly noted for the part he played in the arrest of Louis XVI, at Varennes, was born at Sainte-Menchould in 1763. He served for seven years in the army, and afterwards assisted his father, who was post-master of his native town. 'The carriages conveying the royal family on their flight to the frontier stopped at his door on the evening of June 21, 1791; and the passengers, travelling under assumed names, were recog-

nized by Drouet, who iramediately took steps which led to their arrest and detection on reaching Varennes, For this service the Assembly awarded him 30,000 francs, but he appears to have declined the reward. In September 1792 he was elected deputy to the Convention, and took his place with the most violent party. He voted the death of the king without appeal, showed implacable hostility to the Girondins, and proposed the slaughter of all English residents in France. Sent as commissioner to the army of the north, he was captured at the siege of Maubeuge and imprisoned at Spielberg till the close of 1795. He then became a member of the Council of Five Hundred, and was named secretary, Drouet was implicated in the conspiracy of Babeuf, and was imprisoned ; but he made his escape into Switzerland, and thence to Teneriffe, There he took part in the successful resistance to the attempt of Nelson on the island, in 1797. The first empire found in him a docile sub-prefect of Sainte-Menehould. After the second Restoration he was compelled to quit France. Returning secretly he settled at Macon, under a false name and a guise of piety, and preserved his incognito till his death, which took place in that town April 11, 1824.

DROUET D'ERLON, Jean Baptiste (1765-1844), count, marshal of France, and governor of Algeria, was born at Rheims, July 29, 1765. He entered the army in 1782, was discharged after five years' service, re-entered it in 1792, and two years later became aide-de-camp to General Lefévre. He served at the sieges of Valenciennes, Quesnoy, and Condé, and under Hoche at the blockade of

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Ehrenbreitstein. As general of brigade (1799) he fought at Zurich, at the bridge of Schafthausen, and at the taking of Constance. In August 1800 he was promoted general of division. Hedistinguished himself at Ulm and Hohenlinden, and by a skilful manceuvre decided the victory of Jena (1806). Drouet took a brilliant part in the siege of Dant- zic, and signed the capitulation of the town; he fought at Mohrungen, and was severely wounded at Friedland (1807). After this battle he was made grand officer of the Legion of Honour, was created Count d'Erlon, and received a pension. He afterwards served with distinction in the Peninsular War, and defeated

General Hill at the Col de Maya. After the first Restoration he was named com- mander of the 16th military division. He presided at the council of war, at Lille, which acquitted General Excelmans ; but in March 1815 he was arrested on suspicion of treason, and suffered a short imprisonment. He was present,under Napoleon at Waterloo, and was severely reproached by the emperor for not bringing his division into action. After the second Restoration he quitted France, and {did not return till 1825. He was appointed governor of Algeria in 1834, was created marshal of France in 1843, and died at Paris January 25, 1844.

DROWNING is one of the various forms of death from suffocation, the asphyxiating agent being water; and, accordingly, all the appearances characteristic of death from asphyxia or apnoea are present,—varying in intensity accord- ing to the manner of the death, whether it has or has not been attended with violent struggling. In addition, owing to the medium in which the death occurs, certain other signs specially characteristic of drowning are never absent.

By older authors a peculiar form of death by drowning was described, in which the appearances of asphyxia were awanting, and also the special signs of this form of death. To this the name of syncopal asphyxia was given. Hence, in treating of drowning, descriptions of these two forms were given, and in the case of bodies recovered from the water death was said to have occurred either from asphyxia or from syncope, Now, undoubtedly it often happens when persons fall or are thrown into the water that, in con- sequence of fright or of the shock sustained by violent con- tact with the surface of the water, no effort is made to save themselves, and death rapidly ensues from syncope. In such cases none of the characteristic signs of drowning are found, and, so far as the examination of the body is con- cerned, it is impossible to decide upon the exact cause of death. It is quite within the bounds of possibility that in such cases death may have been effected by other means, and the body have been thrown into the water to conceal the true cause of death.

No such uncertainty, however, attends the investigation of a case of drowning by true asphyxia, as it was called. The drowned individual struggles to reach the surface of the water in his cfforts to respire; as he

does so he draws water into his windpipe which provokes cough. This expels the air from his lungs, and the water which threatened to suffocate him; and as he sinks, in his struggles he endeavours again to respire, but now draws water into his mouth which chokes him, and can only be got rid of by swallowing. Insensibility then comes on, and death rapidly but placidly ensues from a true asphyxia.

If the body be recovered—say within two hours—it is relaxed, and generally presents a pallid appearance. The face is slightly congested, the features placid and composed. The lips are livid, and the tongue is either protruded from the mouth, firmly grasped by the teeth, or it is applied so closely to the dental arch that the various teeth leave along its edge a distinct imprint. Here and there on the surface of the trunk may be observed patches of lividity which cannot be accounted for by the usual gravitation of blood

which takes place more or less in all forms of death. On the thighs the skin presents a roughened appearance, owing to the unusual development of the papille, and to this the name of cutis anserina, or goose-skin, has been applied. Among the external signs which we are passing in review the state of the hands and fingers merits special attention. In his dying agonies the drowned individual spasmodically clutches for help in all directions ; and, should it be a pond or a canal with built retaining walls into which he has fallen, his nails may be injured, sand or mud may be found beneath them, and, firmly grasped in the hand, may be vegetable structures from the sides or the bottom of the pond; or, on the other hand, his fingers may present traces of recent injury.

Internally, the usual signs of asphyxia or apnoea are well marked. ‘These are :—(1) A distended condition of the right cavities of the heart with dark fluid blood, while the left are well contracted, and are either empty or contain only a small quantity of dark-coloured blood. (2) The lungs are developed, and highly congested. On their tissue being incised, the cut surfaces on pressure give out dark-coloured blood and frothy mucus in large

quantity. (3) There is congestion of the mucous lining of the air passages; and

(4) dark colour and fluidity of the blood through the body. |

Among the signs specially characteristic of this form of asphyxia we have: —(1) An unusual quantity of water in the stomach (amounting to one or two pints), which can only be accounted for by water having been swallowed during the last agonies of death. In many cases this cannot be determined with any degree of certainty, the fluid found in the stomach presenting no characters by which it can be positively identified as having formed a portion of the water in which the drowning occurred. In other cases, the fluid by certain characters, as its taste, can be determined to be sea-water, or from its containing some foreign substances, such as aquatic plants or insects, &c., can be identified as the water of the pond or river in which deceased was found, (2) Water in small quantity has been detected in the air- passages. But this, as we shall show, is a sign of little im- portance, and evenin the most favourable circumstances one not easily observed. (3) A peculiar foamy froth presents itself in the throat and windpipe. The appearance of this froth is most striking. It is of a silvery whiteness, and when closely examined is seen to be composed of an infini- tude of minute bulle of air.

with any water that may have entered, is churned up along with the air which is pent up in the windpipe. Where death has been attended with violent struggling this froth is poured out in great quantity, and may occupy the mouth and nostrils. It is a sign of great importance, as showing that the person was alive while in the water. — It is, how- ever, apt to be confounded with a somewhat similar appearance in two other forms of death. When acute bronchitis proves fatal, the air-passages are filled with frothy mucus—which, however, differs in its external characters from the froth found in the drowned. It is not foamy, and the bulle of air are much larger. In addition the special signs of an acute disease of the bronchial tubes are present. In death occurring during a fit of epilepsy, frothy mucus is also often found in the windpipe, but in comparatively small quantity as compared with death by drowning, and the bulle are of larger size.

Of course when all the characteristic signs are present the evidence of drowning is so much the stronger; but it 18 quite possible, from the presence of a well-marked sign, to be certain as to the cause of death.

Its origin is easily explained. | In the struggle for breath, mucus is poured out along the | air passages in greatly increased quantity, and this, together

pain of the burning quickly awoke her.

In her desperation she rushed up the cabin stairs and threw herself into the water. In the morning her body was recovered consider- ably burned and covered with the charred dress. ‘The conduct of the parties in the barge at the time was open to suspicion, and it was of importance to determine whether the body had not been thrown into the water after death. All the signs of death by drowning were well marked. The stomach contained water in considerable quantity, and floating on the surface of this fluid were two charred frag- ments of the dress. These must have been swallowed. The burnt dress was very friable, and portions of it similar to those found floating in the stomach broke away on the slightest touch. The surface of the canal in the immediate neighbourhood of deceased must, during her dying agonies, have been covered with these fragments, and the water which she swallowed happened to contain two of these fragments. Their presence clearly indicated that deceased was alive after she had reached the water. Again, cases have come under our notice, and many such are on record, where in the hand of the deceased have been found firmly grasped a bunch of aquatic vegetable structures which were known to grow only at the bottom of the pond in which the body was found.

Experiments on dogs show that complete immersion pro- duces fatal asphyxia in four minutes, arid in man from oue to two minutes suffices to cause death. On the other hand, a certain amount of practice enables experienced swimmers to resist asphyxia ; and it is related that in 1872 the champion swimmer of England, of the name of Johnson, remained under water for three minutes and ten seconds. It is also known that recovery has followed after an immersion of twenty minutes. In such cases it is to be presumed that the immersion was not complete. As to the sensations of the

drowned, after the first struggle for breath, the brain becomes loaded with venous blood, and unconsciousness to external objects ensues. Captain Marryatt tells us that his sensations as he was drowning were rather pleasant than otherwise: “The first struggle for life once over, the water closing round me assumed the appearance of waving green fields, ... It is not a feeling of pain, but more like sink- ing down, overpowered by sleep, in the long soft grass of a cool meadow.” (Life, vol. i. p. 74.) Hence drowning is a favourite death with suicides, in whom—resolutely bent, as they generally are, on self-destruction—the preliminary struggle issoon over. The presence of marks of violence ig our only indication of homicide, and when these are absent the verdict of the medical jurist must be that the case is either one of suicide or of simple accident.

One circumstance, however, interferes with the recognition of the signs which we have passed in review, and that is the presenee of putrefaction or decay. In consequence of death having occurred in such a medium as water, and as from the sinking of the body it is not exposed to atmospheric air, putrefaction in the colder months of the year proceeds slowly ; but in summer, owing to the rapid development of gas in all the soft structures of the body, but especially in the intestines, the body quickly comes to the surface of the water, and decomposition proceeds with great rapidity. All the canals of the body are relaxed, and the pressure of gas is such as to force the froth from the air passages, the water from the stomach, and the blood from the heart. “‘ Almost never,” says Devergie, the great authority on the effects of putrefaction in the drowned, “can the signs of drowning during life be determined in summer, so quick is the gaseous putrefaction.” Hence, too great caution cannot be exercised by the medical jurist in giving a positive opinion in such cases.

It is remarkable that the progress of putrefaction in persons who have died by drowning should differ widely

from that of the same process in other forms of death. In ordinary cases, the first signs of putrefaction manifest themselves in the lower parts of the abdomen. The rest of the trunk is attacked, then the extremities, and lastly the face. In drowning, on the contrary, the first part of the body to show

evidence of decay is the face ; and in the course of a few hours, so rapid is the advance of the putre- factive process, that it becomes utterly impossible to recognize the features. Hence it is that it has been chiefly in cases of drowning that difficulties have arisen as to identification, in consequence of that part of the body by which persons are most readily recognized undergoing alteration so rapidly. Devergie, who, from his official con- nection with the Morgue at Paris, enjoyed unusual facilities for watching the various stages of putrefaction in the drowned, has carefully described them, and we now proceed to give a résumé of his observations. The 1st stage includes a green discoloration of the skin, first noticed on the face aud neck, which gradually extends over the body. The 2d is the evolution of gas, distending the abdomen, and causing those changes to which we have already adverted. The 3d is that of brown putrefaction, which affects all the parts of the body previously coloured green. The 4th is that of putrilage. The discoloured parts soften, liquefy, and dis- appear. Under such circumstances the body rapidly decays, and the bones fall asunder. On the other hand, in cool weather the process of liquefaction is arrested, and the soft parts become solidified, owing to their conversion into adipocire, a peculiar kind of animal soap. To this stage— the 5th—Devergie gives the name of saponification. The 6th stage is termed desiccation, or drying, from the con- tinued removal of the fluids from the body, which, thus hardened, is liable, from the action of the elements, to undergo corrosion ; and at the same time long immersion leads to the formation of various incrustations. Devergie treats of these two conditions under the heads of corrosion and incrustation. In the 9th and last stage we have the destruction of the soft parts generally. In the liquid decomposition the part of the body first attacked was the face, and the same order is observed in the later stages— the soft parts of the face, now hardened by their transfor- mation into adipocire, fall off, and leave nothing but a grinning skeleton of a face behind, the rest of the body being comparatively perfect. This peculiar progress of the process of decomposition in the drowned explains the cases reeorded of apparently decapitated heads, and of bodies consisting of headless trunks, having been found floating in the sea. These stages of the putrefactive process Devergie states do not follow any definite order or period of sequence, and each case demands careful investigation as to the con- dition of the body and the time of the year when the drowning occurred; but as the result of his experience he finds that the respective

seasons of summer and winter make at least a month's difference in the period at which the earlier changes occur.

As to the treatment of the drowned, a complete revolu- tion has in recent times taken place in its details. To induce a renewal of the respiration it was formerly recom- mended that air should be forcibly introduced into the lungs by means of a pair of tbellows, and, according to the older directions of the Humane Society, the body was "to be well shaken every ten minutes in order to render the process of animation more certain." These expedients proved singularly inefficacious except in cases where the other proposals of the society, such as rubbing and the application of warmth, would of themselves have procured recovery. In 1856 Dr Marshall Hall devised his ready method or postural treatment of the asphyxiated, and by dissections, and by actual results in cases of still birth and of drowning, proved that respiration could be imitated by

simply changing the position of the body. Since then Dr R. Silvester has suggested a still more simple plan of postural treatment which, along with that of Dr Marshall Hall, has been adopted by the Humane Society and also by the National Life Boat Institution, from whose published directions we give the modern treatment of the drowned by both methods, which is "in use in Her Majesty's Fleet, in the Coast-guard Service, and at all the stations of the British Army at home and abroad."

Directions For RESTORING THE APPARENTLY DROWNED.

I. Send immediately for medical assistance, blankets, and dry clothing, but proceed to treat the patient instantly on the spot, in the open air, with the face downward, whether on shore or afloat ; exposing the face, neck, and chest to the wind, except in severe weather, and removing all tight clothing from the neck and chest, especially the braces. The points to be aimed at are —first and immediately, the restoration of breathing ; and secondly, after breathing is restored, the promotion of warmth and circulation. The efforts to restore breathing must be commenced immediately and energetically, and persevered in for one or two hours, or until a medical man has pronounced that life is extinct. Efforts to pro- mote warmth and circulation, beyond removing the wet clothes and drying the skin, must not be made until the first appearance of natural breathing ; for if circulation of the blood be

induced before breathing has recommenced, the restoration to life will be endangered. 7

II.—To Restore BREAtHING.—To clear the throat.—Place the patient on the floor or ground with the face downwards, and one of the arms under the forehead, in which position all fluids will more readily escape by the mouth, and the tongue itself will fall forward, leaving the entrance into the windpipe free. Assist this operation by wiping and cleansing the mouth. If satisfactory breathing commences, use the treatment described below to pro- mote warmth. If there be only slight breathing—or no breathing — or if the breathing fail, then—

To exeite breathing—Turn the paticnt well and instantly on the side, supporting the head, and excite the nostrils witl snuff, harts-

horn, and smelling salts, or tickle the throat with a feather, &c. if they are at hand. Rub the chest and face warm, and dash cold water, or cold and hot water alternately, on them. If there be no success, lose not a moment, but instantly—

To imitate breathing—Replace the paticnt on the face, raising and supporting the chest well on a folded coat or other article of dress. Turn thebody very gently on the side and a little beyond, and then briskly on the face, back again, repeating these measures cautiously, efficiently, and perscveringly, about fifteen times in the minute, or once every four or five seconds, occasionally varying the

side. (By placing the patient on the chest, the weight of the body,

forces the air out ; when turned on the side, this pressure is removed,

and air enters the chest.) On cach occasion that the body is replaced on the face, make uniform but efficient pressure with brisk move- ment on the back between and below the shoulder-blades or bones on each side, removing the pressure immediately before turning the body on the side. During the whole of the operations let one person attend solely to the

movements of the head and of the arm placed under it. (The first measure increases the expiration—the second commences inspiration.) The result isrespiration or natural breathing, and, if not too late, life. ;

Whilst the above operations are being proceeded with, dry the lands and feet, and as soon as dry clothing or blankets ean be procured, strip the body, and cover or gradually reclothe it, but taking care not to interfere with the efforts to restore breathing.

III. Should these efforts not prove successful in the course of from two to five minutes, proceed to imitate breathing by Dr Silvester's method, as follows :—Place the patient on the back on a flat surface, inclined a little upwards from the feet ; raise and support the head and shoulders on a small firm cushion or folded article of dress placed under the shoulder-blades. Draw forward the patient's tongue, and keep it projecting beyond the lips ; an elastic band over the tongue aud under the chin will answer this purpose, or a piece of string or tape may be tied round them, or by raising the lower jaw, the teeth may be made to retain the tongue in that position. Remove all tight clothing from about the neck and chest, especially the braces.

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Fie. 4.—Expiration (Dr Silvester's method).

To imitate the movements of breathing—Standin head, grasp the arms just above the elbows, an gently and steadily upwards above the head, and keep them stretched

at the patient's draw the arms

upwards for two seconds. (By this means air is drawn into the lungs.) Then turn down the patient's arms, and press them gently and firmly for two seconds against the sides of the chest, (By this means air 1s pressed out of the lungs.) Repeat these measures alternately, deliberately, and perseveringly, about fifteen times in a minute, until a spontaneous effort to respire is perceived, imme- diately upon which cease to imitate the movements of breathing, and procced to induce circulation and warmth.

IV.—TreatMent arrer NaTurat BREATHING HAS BEEN RE- STORED. . Lo promote warmth and circulation—Commence rubbing the limbs upwards, with firm grasping pressure and energy, using handkerchiefs, flannels, &c. (By this measure the blood is propelled along the veins towards the heart.) The friction must be continued under the blankets or over the dr clothing. Promote the warmth of the body by the application of hot flannels, bottles, or bladders of hot water, heated bricks, &c., to the pit of the stomach, the arm- pits, between the thighs, and to the soles of the feet. If the patient has been carried to a house after respiration has been restored, be careful to let the air play freely about the room,

_On the restoration of life, a teaspoonful of warm water should be Siven ; and then, if the power of swallowing have returned, small quantities of wine, warm brandy-and-water, or coffee should be alministered. The patient should be kept in bed, and a disposition to sleep encouraged, :

«GENERAL OBsERvATions, —The above treatment should be per-

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severed in for some hours, as it isan erroncous opinion that persons are irrecoverable because life does not soon make its appearance, persons having been restored after persevering for many hours. The appearances which generally accompany death are the follow- ing :—breathing and the heart’s action cease entirely ; the eyelids are generally half closed, the pupils dilated; the tongue approaches to the under edges of the lips, and these, as well as the nostrils, are covered with a frothy mucus; coldness and pallor of surface Increase,

The following cautions should be attended to:—Prevent unneces- sary crowding of persons round the body, especially if in an apartment. Avoid rough usage, and do not allow the body to remain on the back unless the tongue is secured. Under no cireumstances hold the body up by the feet. On no account place the body in a warm bath unless under medical direction, and even then it should only be employed as a monientary excitant.

Dr Silvester’s method is more generally practised than that of Dr M. Hall,—its special advantages being that it com. mences by imitating inspiration,

and more completely distends the chest. But we are of opinion that the combina- tion of the two methods as recommended above should undoubtedly be practised in every case.

It has frequently been pointed out that in fatal cases of drowning the right auricle of the heart is very much dis- tended; and it has been plausibly urged by Professor Struthersof Aberdeen (Hdinburgh Medical Journal, 1857, p. 418) that the movements of respiration may be successfully imitated, and air may enter the lungs, and yet the patient may not recover in consequence of the stoppage of the action of the heart. He recommends that blood should be drawn from the external jugular vein, so as to relieve the engorged auricle, which, from its distension, is paralyzed. The abstraction of a small quantity of blood is all that is required to effect this—from half to one or two table-spoonfuls, Finally, as a last resource, galvanism must be had recourse to. Both this and the blood-letting must be practised by a qualified medical man ; but it is important to know that the methods of Dr Hall and Dr Silvester can easily be learned by any one, and that, if early and perseveringly applied, they are attended with a large measure of success. The treatment must be continued for at least eight hours, should there be an absence of extreme pallor, and while any heat of the body remains.

The question of the treatment of the drowned cannot be regarded as definitely settled, and the plans of Hall and Silvester have from time to time been subjected to criti- cism. Among the latest suggestions is that of Dr B. Howard of America, who, by means of what he terms hig “direct” method, which mainly consists in pressure of the chest from above (the patient being placed on his back), claims that air is more easily introduced into the lungs, and that the expansion and contraction of the chest are more perfectly attained (see Lancet, August 11, 1877). At the meeting of the British Medical Association at Man- chester 1877, Dr Howard practically demonstrated his plan on the living subject, and there can no doubt that involuntary respiration was readily produced. Further evidence, however, is necessary from actual cases of sus pended animation.

See the treatises on Medical Jurisprudence by Devergie, Orfila, Caspar, Taylor, Guy, and Woodman and Tidy; article “ Apnea,” by G. Harley, M.D.,

in vol. v. of Holmes's Surgery, 2d edition, pp. 889; and Report on Asphyxia by Committee of the Royal Medical

and Chirurgical Society of London, in vol. xlv. of Transactions, 1862. (H. D. L.)

DROZ, Frangois-Xavier Josery (1773-1850), a French writer on moral and political subjects, was born on October 31, 1773, in the city of Besancon, where his family had furnished men of considerable mark to the legal profession. His own legal studies led him to Paris in 1792; he arrived on the very day after the dethronement of the king, and was present during the massacres of September ; but on the declaration of war he jomed the volunteer batadllon of the Doubs, and for the next three years served in the army

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of the Rhine. Receiving his discharge on the score of ill health, he soon after obtained a much more congenial post in the newly-founded école centrale of his native city ; and in 1799 he made his first appearance as an author by an Lssat sur Vart oratovre, Paris, Fructidor, An VIL, in which he acknowledges his indebtedness more especially to Hugh Blair. This early reference to Scottish literature is interest- ing in connection with the peculiarly Scottish tone of mind which is observable in his writings, and has attracted the notice of Sainte-Beuve. Removing to Paris in 1803, he became intimate not only with the like-minded Ducis, but also with the sceptical Cabanis; and it was at the philosopher's advice that, in order to catch the public ear, he produced the romance of Lina, whicli Sainte-Beuve has characterized as a mingled echo of Florian and Werther.

Like several other literary men of the time, he obtained a.

post in the revenie office known as the Drozts réunies, then under the control of M. Francois of Nantes ; but from 1814 he devoted himself exclusively to literature and became a contributor to various journals. Already favourably known by his Hssar sur Part Wétre heureux, Paris, 1806, his Liloge de Montaigne, 1812, and his Essai sur le beau dans les arts, 1815, he not only gained the Monthyon prize in 1823 by his work De la

philosophie morale ou des différents systémes sur la science de la vie, but also in 1824 obtained admission to the Académie Frangaise. The main doctrine inculcated in this treatise is that society will never be in a proper state till men have been educated to think of their duties and not of their rights. It was followed in 1825 by Application dela morale & la philosophie et a la politique, and in 1829 by Leonomie politique, ow principes de la science des richesses, a methodical and clearly written treatise, which has had the honour of being edited by Michel Chevalier in 1854, His next and greatest work was a Histowe du réegne de Lows XVI. (3 vols. Paris, 1838-1642), the result of very careful and prolonged study, and marked by greater vigour of style and deeper powers of thought than he had previously displayed. As he advanced in life Droz had become more and more decidedly religious, and the last work of his prolific pen was Pensées du Christianisme, 1842. Few have left so blameless a reputa- tion : in the words of Sainte-Beuve, he was born and he remained all his life of the race of the good and the just.

See Guizot, Discowrs Académiques ; Montalembert, ‘‘ Discours de Reception,” in Mémoires de T’ Académie francaise; Sainte-Beuve, Causeries du lundi, t. iii.; Michel Chevalier, Notice prefixed to the Economie politique.

DRUIDISM, the name usually given to the religious system of the ancient Gauls and Britons, The word Druid, oue form or other of which is used in early Celtic records to designate a class of priests corresponding to the Magi or wise men of the ancient Persians, is of uncertain etymology. The derivation from the Greek dpis, an oak, though as old as the days of the elder Pliny, is probably fanciful.

We find in Cesar the first and at the same time the most circumstantial account of the Druids to be met with in the classical writers. In the digression on the manners and customs of Gaul and Germany which occupies a portion of the sixth book of his Gallic war, he tells us that all men of any rank and dignity in Gaul were included among either the Druids or the nobles. The former were the religious guides of the people as well as the chief expounders and guardians of the law. On those who refused to submit to their decisions they had the power of inflicting severe penalties,

of which excommunication from society was the most dreaded. As they were not a hereditary caste, and enjoyed exemption from service in the field as well as from payment of taxes, admission to the order was eagerly sought after by the youth of Gaul. The course of training to Which a novice had to submit was protracted, extending

sometimes over twenty years. All instruction was com- municated orally, but for certain purposes they had a writteu language in which they used the Greek characters. The president of the order, whose office was elective and who enjoyed the dignity for life, had supreme authority among them. They taught that the soul was immortal. Astrology, geography, physical science, and natural theology were their favourite studies. Britain was the head-quarters of Druidism, but once every year a general assembly of the order was held within the territories of the Carnutes in Gaul, probably in the neighbourhood of the modern Dreux. The Gauls in extreme cases offered human sacrifices, usually criminals. Their chief deity was identified by Cesar with the Mercury of the Romans. Writing a few years later, Cicero, in his treatise on divination, introduces his brother Quintus as remarking on the existence among the Gauls of augurs or soothsayers, known by the name of Druids. With one of these, Divitiacus, an Auduan, Quintus says he was well acquainted. Cicero's contemporary, Diodorus Siculus, informs us that there were among the ancient Gauls bards, certain: philosophers and theologians named Druids, and soothsayers. He also hints at some conneetion between their philosophy and that of Pythagoras. The geographers, Strabo and Pomponius Mela, add little to our knowledge of the Druids. Lucan, in his Pharsalia, men- tions, among the Gallic and other tribes that relapsed into their former ways upon Cesar's crossing the Rubicon, " the worshippers with bloody rites of Teutates, Hesus, and Taranis," and refers immediately afterwards to the bards and Druids. Something more noteworthy is told by the elder Pliny. According to him the Gallic Druids held the mistletoe in the highest veneration. Groves of oak were their chosen retreats. Whatever grew on that tree was thought to be a gift from heaven, more especially the mistletoe. When thus found the latter was cut with a golden knife by a priest clad in a white robe, two white bulls being sacrificed on the spot. The name given it by the Druids signified in

their language All-Heal; and its virtues were believed to be very great. Two other herbs, called selago and samolus, were likewise greatly valued by them for their medicinal efficacy. But the most remarkable of all the Druidical charms was the anguineum, or snake's egg. It was said to be produced from thie saliva and frothy sweat of a number of serpents writhing in an entangled mass, and to be tossed up into the air as soon as formed. The fortunate Druid who managed, as it fell, to catch it in his sagum, or cloak, rode off at full speed on a horse that had been in waiting for him, pursued by the serpents till they were stopped by the intervention of aruuning stream. A genuine specimen of this egg when thrown into the water would float against the current, even if encased in gold. Pliny declares that he had seen one. 'It is," he says, "about the size of a

' moderately large round apple, and has a cartilaginous

rind studded with cavities like those on the arms of a polypus." Tacitus, in describing the attack made on the island of Mona (Anglesea) by the Romans under Suetonius Paulinus, represents the legionaries as being awe-struck on landing by the appearance of a band of Druids who, with hands uplifted towards heaven, poured forth terrible impre- cations on the heads of the invaders. The courage of the Romans, however, soon overcame such fears ; the Britons were put to flight; and the grovesof Mona, the sceneof many a sacrifice and bloody rite, were cut down. The annalists Lampridius and Vopiscus, two of the Scriptores Ivstorie Auguste, introduce us, if the "Dryas" of these writers be connected, as is probable, with the " Druides " of Cesar and others, to a new branch of the order—Druidesses, who, however, are simply prophetic women. For example, Vopiseus tells us, on the authority of his grandfather, who

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had the story from the future emperor himself, that it had been foretold to Diocletian by one of these women that he would wear the purple after he had slain a wild boar. Many years afterwards, when Diocletian found himself, on the d-ath of Numerian, unexpectedly declared emperor by the troops, he at once cut down with his sword Arrius Aper, regarding whom dark suspicions were afloat, ex- claiming, " At length I have slain the fated wild boar," and thus fulfilled the prophecy delivered to him in Gaul by the

weird woman, Ausonius of Bordeaux, tutor of Gratian, son of the Emperor Valentinian, in his Professores, or notices of the professors of bis native city, apostrophizes the rhetorician Attius Patera as sprung from a race of Druids and from the priesthood of Balenus, and as deriving his name of Patera from being connected through the latter with the mysteries of Apollo. He also addresses another as keeper of the temple of Balenus, and as the offspring of the Druids. Lastly, Ammianus Marcellinus, after noticing the foundation of Marseilles by a colony of Phoczans, goes on to state that when the people in those parts had been gradually civilized, learned studies, which had been begun by the bards, the Euhages (probably a corruption of the Odvadres, t.¢., Vates, of Strabo), and the Druids, throve vigorously. Of these, he says the Druids were intellectually superior to the others, and were formed into unions in accordance with the precepts of Pythagoras.

The early Christian fathers seldom mention the Druids. Origen, Clement of Alexandria, and others speak of them as philosophers or priests among the Gauls, but in a manner that shows they knew almost nothing about them. In early Irish poems and tales, however, a class of persons called by this name is frequently referred to, who also appear as Magi in certain well-known lives of Irish saints written in Latin. These Irish Druids were a kind of sorcerers. They were said to be in league with the demons of paganism, and to be able by this agency to do good to their friends and mischief to their enemies. The followers of the first missionaries of Christianity in Ireland and Scotland seem to have thought it necessary, in order to prove the superiority of the new faith, to spread thie belief that its apostles also were gifted with supernatural powers, which they could use more especially for the purpose of counteracting the malice of these Druids. Thus Adamnan, in his life of Columba, represents that saint as miraculously baffling the machinations of Broichan, the Druid of the Pictish king Brude, when they met at the court of the latter near the mouth of the Ness.

To John Toland probably belongs the credit of being the first to plan, for he did little more, a connected history of the Druids, in which the scanty notices of ancient writers were to be expanded and largely supplemented by details drawn from other sources. This he did in three letters addressed to Viscount Molesworth, and first published from the author’s papers in 1726, some years after his death. A little later, Pelloutier, in his JZis- toire des

Celtes, carried out a portion of Toland's design by giving a lengthened account of the origin, position, and influence of Druidism among the early Celtic tribes. On the foundations thus laid others were not slow to build. It is from Cvsar and Pliny, of course, that the materials have been chiefly derived. But fragments of very doubtful value were eagerly appropriated from every quarter; and in this way an imposing structure was reared, the solidity of which till very recently few ever thought of doubting. If we may trust these writers, the ancient priesthood of Britain and Gaul, in pomp of ritual no less than in learning and influence, rivalled the hierarchies of later days. Clad in white and wearing ornaments of gold, they celebrated their mystic rites in the depths of the forest. The Hesus mentioned by Lucan was said, on the authority

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of a remark by Lactantius, to be their chief deity. But they had other gods, especially Apollo, whom they worshipped under the name of Belinus, supposed to be the Pheenician Baal. They believed in metempsychosis, or the doctrine of the transmigration of souls. That their philosophy was identical with that of Pythagoras was held as certain, though whether Pythagoras was the instructor of the Druids or the Druids of Pythagoras, or whether indeed both did not derive their tenets from a common source, were moot questions. Pythagoras's friend Abaris, the mysterious Hyperborean philosopher who rode on an arrow, the gift of Apollo, must have been a British Druid. Botany, astronomy, medicine, and letters were all subjects studied by the Druids; though, in spite of their boasted civilization, many of their rites were barbarous in the extreme. In mechanics they had attained to no mean skill, since the ponderous megalithic remains of Britain and France could have been set up only by them. Stone circles like Stennis and Callernish were ancient temples, once surrounding groves sacred to Druidism. According to Stukeley, Stonehenge was the cathedral of the arch-druid of all Britain, and Avebury with its avenues had been originally constructed in the form of a circle with a serpent attached to it,—the circle being regarded as the symbol of the Supreme Being, and the serpent of the divine Son. Dolmens or cromlechs were transformed into altars, and even the menhir or stone pillar, and the rocking-stone, were pressed into the service of the druidi- cal priesthood. In the neighbourhood of the circles, as

well as on the tops of mountains, may be seen cairns sur- mounted each by a flat stone, on which Druid fires were lighted. Over their countrymen the authority of the Druids was almost unbounded, continuing to assert itself long after the order had passed away. With Druidism every unexplained custom and almost every relic of Celtic antiquity were held to be connected, and the snperstitions that still linger in the ancient homes of the Celtic race were set down as derived from the same source. Its decadence is attributed by these writers to the hostility of the Romans, Ardent lovers of their country as well as of liberty, the Druids, it is asserted, were the uncompromising foes of Roman rule in the west. Hence sprang the orders issued for their suppression by Claudius, to which reference is' made both by Pliny and Suetonius. In the end, Rome proved too strong for Druidism, and the political power of its priesthood was soon broken, especially in Gaul and South Britain. Some, among whom Herbert is. prominent, maintain that, after the destruction of pagan Druidism as a system, the order was revived as a corrupt form of Christianity, in which the truths of the latter were largely mixed up with the rites of Mithras, the sun god of the Persians. This hypothesis, to which its supporters have given the name of neo-Druidism, has already been noticed in the article Cettic Lirerature (vol. v. p. 318).

These views were fora long time generally received in this country as wellas ou the Continent. In France, Druidism has proved an attractive subject to some writers of a high order of ability, who have discussed it, if not from a more critical, at least from a more philosophical, stand-point. Amédée Thierry, in his Zistotre des Gaulois, while adopt- ing in the main the opinions of Toland, Pelloutier, and their followers, finds in the accounts that have come down to us traces of two distinct systems of religion in ancient Gaul. One of these was a worship of natural phenomena and objects, akin to the polytheism of the Greeks; the other a kind of metaphysical pantheism, strikingly resembling the religions of some Eastern nations. The latter, accord- ing to him, was the foundation of Druidism, and had been brought into the country when the Cymric branch of the Gauls entered it under a leader named Hu, or Hesus,

dcified after his death. The more ancient inhabitants, also a Gallic race, were the polytheists, whose religious belief, however, the Cymri did not altogether destroy but rather amalgamated with their own. Thierry further thinks that Druidism was on the decline in Gaul before the days of Casar. After a time the Gallic nobles on the one hand, and the people on the other, became alike jealous of a priestly authority that controlled both and had suc- ceeded in greatly reducing their political influence. For a while the Druids retained their power as a religious and learned order, and preserved many of their privileges ; but even at the date of Ceesar's invasion these had so diminished that Britain, and not Gaul, was recognized as their chief seat. But the most distinguished among the expounders of Druidism is undoubtedly Jean Reynaud, one of the chiefs of a small school of thinkers whose metaphysical speculations have exercised in France a real, if an indirect and quiet, influence. Reynaud, who was of a mystical cast of mind, began in 1836, along with Pierre Leroux, the publication of L'Hncyclopédie Nouvelle, which, how- ever, was never finished. For this the former wrote the article "' Druidisme," which he afterwards enlarged and gave to the world separately under the title of L'Hsprit de la Gaule, dedicated to his friend, the historian Henri Martin. It is an elaborate and in some respects able essay. Rey- naud maintains that the ancient Druids were the first to teach clearly the doctrine of the soul's immortality, and that they had originally as high conceptions of the true nature of God as the Jews themselves. If they afterwards encouraged the worship of subordinate deities, it was for the purpose of reconciling to Druidism that class of uneducated minds for which the cultus of demi-gods and angels has more attraction than the worship of the Unseen One, Hesus, radically the same word as the Aioa of the Greeks, was the type of an absolute supreme Being whose symbol on earth was the oak, and was quite distinct from Hu, the leader of the Cymric Gauls. The mistletoe, when found growing on the latter, represented man, a creature entirely dependent on God for support, and yet with an individual existence of his own. Human sacrifices were a natural consequence of the idea, dominant now as in the days of the Druids, that the higher the victim tlhe more complete the atonement offered to the Deity for the sins of man. Druidism _ declined and at last disappeared, because, according to Reynaud, one element was wanting in its system both of morals and of religion, necessary to the true development of man and society—charity or love. The Druids aimed indeed at the improvement of

both, but failed to prescribe the true means of promoting it. Christianity supplied what was needed, and Druidism disappeared—not, however, till it had accomplished what was its special mission, the

preservation in Western Europe of the idea of the unity of |

God. How far all this is mere theory founded on in- sufficient data, or an attempt, more or less successful, to prove the existence among the Gallic tribes of certain ideas regarding the true nature of God and his relation to man, which afterwards degenerated into the grossest

superstition, it would be out of place to discuss here. |

Reynaud's views have been to a great extent accepted by Henri Martin, one of the foremost of French historical writers; and both countenance the neo-Druidical fancies of Davies and Herbert. In Germany the latest authority on Druidism seems to be Barth—Ueber die Druiden der Kelten, who follows closely the views long popular in this country. To judge from the article " Druiden " in the last edition (1875) of Meyer's Conversations-Lexihon, nothing fresher has yet found currency there. Titerature.—Toland's Specimen of the Critical Llistory of the

Celtic Religion and Learning, containing an accownt of the Druids, in A Collection of seweral pteces of Mr John Toland, now first

published from his original Manuscripts, 2 vols. 8vo, London, 1726 ; Pelloutier (Simon), Histoire des Celtes, 2 vols. 12mo, Paris, 1740-1750 ; nouvelle édition par M. de Chiniac, 2 vols. 4to, or 8 vols. 8vo, Paris, 1770-1771; Stukeley's Stonehenge, A Temple restored to the British Druids, fol. London, 1740; Stukeley's Abury, A Temple of the British Druids, fol. London, 17433 Frick (Johann Georg.), Commentatio de Druidis occidentalium populorum philosophis, new edition, 4to, Ulme, 1744; Borlase's Antiquities, Historical and Monwmental, of the County of Cornwall, second edition, fol. London, 1769; Davies (Edward), Ifythology and Rites of the British Druids, 8vo, London, 1809; Thierry's Histoire des Gaulois, Paris, 1828; Barth, Ueber die: Druiden der Kelten, Erlangen, 1828 ; Higgins's Celtic Drwids, London, 1829; (Herbert's) Essay on the Neo-Druidic Heresy in Britannia, pt. i. London, 1888; Dr J. H. Burton, in

Edinburgh Review, July 1863; Reynaud, L'Hsprit de la Gaule, Paris, 1866; Henri Martin, Histoire de France, vol. i., Paris (no date); Stuart's Sculptured Stones of Scotland, vol. ii, printed for the Spalding Club, 1867. (J. M'D.)

DRUM, a musical instrument of percussion, which is supposed to have been introduced into Europe from the East by the Moors or after the Crusades. In certain forms, however, it was known in Europe in classical times. The Greek and Roman tympanum seems from descriptions and pictorial representations to have included not only tambourines but kettledrums of a small size, or at least in- struments convex on one side like the kettledrum. The instrument designated in Scripture a timbre] (Heb. toph) was undoubtedly a kind of tambourine, such as might be conveniently played by females. In India and Egypt the use of drums in a considerable variety of forms may be traced back to the earliest historic times, The tam-tam or tom-tom of India, a cylindrical drum of some size beaten with the fingers, had its counterpart in Egypt at least as early as 1600 B.c. Among savage races, whose music has not risen above the primitive or percussive stage, the druin is naturally the chief, and in many cases the sole instrument employed. Three principal forms of drum are in general use in the modern orchestra,—the common or side drum, the base or Turkish drum, and the kettledrum, The first is composed of a cylinder of wood, or, more generally, of metal, covered at each end with vellum or parchment, the tension of which is regulated by strings. As its name in- dicates, it is worn at the side of the performer, who beats upon the upper end with two sticks. Its distinctive though not its exclusive use is to accompany the military fife band. The base drum is a larger instrument of the same kind, the cylinder being composed of oak. It is beaten at both ends with drum-sticks furnished with leather pads. It is an important constituent of a full military band, but it is also employed in the orchestra, especially by more recent composers. The kettledrum is the most important form of the instrument in orchestral as distinct from military music. Itis composed of a basin of brass or copper, almost hemispherical in shape, covered with vellum attached to an iron ring, and it is usually placed upon an iron tripod. By means of screws it is capable of being tuned within certain necessarily narrow limits. "Kettledrums are always used in pairs, one being tuned to the key-note and the other to the fourth below. The music is invariably written in the key of C; and the key in which it is to be played, if different, is indicated in words

at the beginning of the passage, The three forms of drum just described are essential in every complete orchestra. In addition other percussive instruments, such as the gong and the tam-tam, are sometimes introduced for the sake of particular effects.

DRUMMOND, Henry (1786-1860), an English banker, politician, and miscellaneous writer, remarkable for the versatility of his gifts and the eccentricity of his character, was born on the 5th December 1786. He was the eldest son of Henry Drummond, a prominent London banker, by a daughter of the first Lord Melville. He was educated at Harrow and at Christ Church, Oxford. His name is per-

manently connectcd with the university through the chair of political economy, which he founded in 1825, He entered Parliament in early life, and took an active interest from the first in nearly all departments of politics. Thoroughly independent and often eccentric in his views, he yet acted generally with the Conservative party. He was an effective speaker, clear and forcible, and on occa- sion caustic and severe. From 1847 until his' death on the 20th February 1860 he represented West Surrey. Drummond took a deep interest in religious subjects, and published numerous books and pamphlets on such questions as the interpretation of prophecy, the circulation of the Apo- crypha, the principles'of Christianity, &c., which attracted considerable attention. He was intimately associated with the origin and spread of the Catholic Apostolic or "Trvingite" Church. Stated meetings of those who sym- pathized with Irving were held for the study of prophecy, between 1826 and 1830 at his seat of Albury Park, in Surrey ; he contributed very liberally to the funds of the new church; and he became one of its leading office- bearers. The numerous works he wrote in defence of its distinctive doctrines and practice were generally clear and vigorous, if seldom convincing.

DRUMMOND, Tuomas (1797-1840), was born at Edin- burgh in October 1797, and was educated at the High School there. He was appointed to a cadetship at the Royal Military Academy, Woolwich, in February 1813 ;

and by Christmas of that year he had entered the Second Academy. He early distinguished himself by his aptitude for mathe- inatics, and an original demonstration in conic sections, discovered by him whilst still in the junior Academy, was published in Leybourn's Mathematical Repository. In 1815 he entered the Royal Engineers, In 1819, when meditat- ing the renunciation of military service for the bar, he made the acquaintance of Colonel Colby, from whom in the following year he received an appointment on the trigonometrical survey of Great Britain. During his winters in London he applied himself indefatigably to the higher branches of mathematics, and attended the chemical lectures of Brande and Faraday at the Royal Institution. The mention at one of these of the brilliant luminosity of lime when incandescent suggested to him the employment of that material instead of the Argand lamp for making surveying stations visible when far distant. Inthe autumn of 1824 he assisted Captain Colby in the selection of stations for the great triangulation, and the best situation asa base for the survey ordered to be made in Ireland, His limelight apparatus (the Drummond light) and heliostat, both completed in 1825, he first put to a practical test in 1826 at the stations of the Irish survey. In the next season he brought into use an improved form of his heliostat, in which the telescope was dispensed with. Through the recommendation of Mr Bellenden Ker, Drummond was in 1831 appointed by Lord Brougham to be-superintendent of the Boundary Commission. On the passing of the Reform Act he resumed his duties on the survey,—Wwhich, however, he soon finally quitted in order to become private secretary to Lord Althorp, the chancellor of the exchequer. In 1834, on the dissolution of the Government, he received a pension of £300 a year, which he drew until September 30, 1835. In July of that year he was made under-secretary of state for Ireland; and when, in 1836, the bill for municipal reform in that country was introduced into Parliament, he undertook the direction of the officers appointed to determine the boundaries of the boroughs. He was in October 1836 made head of the Irish Railway Commission, the report of which was completed in 1838. The health of Captain Drummond,—impaired originally by exposure during the Irish survey, and further injured by his unwearied exertions on the Boundary Com:

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mission—had, through his last labours in connection with. the railways of Ireland, received a strain from which it never recovered. His strength gradually gave way, and he died on the 15th April 1840.

See Captain Larcom in Papers on Subjects connected with the Duties of the Corps of Royal Engineers, vol. iv., 1840.

DRUMMOND, Witti4m (1585-1649), of Hawthorn- den, a Scottish poet of the Spenserian school, and descen- dant of an old family of noble blood, was born at Hawthorn- den, near Edinburgh, on the 13th December 1585. His father, John Drummond, was the first laird of Hawthorn- den; and his mother, Susannah Fowler, was well-con- nected, her brother William being private secretary to Queen Anne, and a man of literary tastes. Drummond received his early education at the Edinburgh High School, and graduated as M.A. of the recently founded (1582) metropolitan university in July 1605. The years 1607 and 1608 were spent at Bourges and Parig in the study of law; and, in 1609, Drummond was again in Scotland, where, by the death of his father in the following year, he became laird of Hawthornden at the early age of twenty- four. The list of books he read up to this time indicates a strong preference for the finer and more imaginative, as distinguished from the argumentative kinds of literature. Accordingly, on finding himself his own master, Drummond naturally abandoned law for the muses; “for,” says his biographer in 1711, “the delicacy of his wit always run on the pleasantness and usefulness of history, and on the fame and softness of poetry.” He was a good linguist, and read Latin, Greek, Italian, Spanish, French, and Hebrew, He had already written several poems, chiefly sonnets; and some early letters, which have been preserved, show a fine command of pure English, as well as Drummond’s critical sagacity in abandoning the Scottish dialect for the language raised to literary supremacy by the illustrious Elizabethans. Drummond’s first publication appeared in 16138, and was an elegy on the death of Henry, prince of Wales, called Teares on the Death of Meeliades, As might have been expected from Spenser’s influence, it is pastoral throughout. Milton, in his Lycidas, has at once imitated and surpassed this early poem of Drummond’s. In 1614 Drummond for the first time met Sir William Alexander, known later as earl of Stirling, the author of a ponderous poem on Doom’s-day. In the following year Drummond sustained a dreadful blow

in the death of Miss Cunningham of Barns, to whom he was engaged to be married. In 1616, the year of Shakespeare's death, appeared Poems: Amorous, Funerall, Divine, Pastorall : in Sonnets, Songs, Sextains, Madrigals, being substantially the story of his love and loss. Drummond's next poem is entitled Porth Feasting : A Panegyric to the King's Most Excellent Majesty, and celebrates James's visit to Scotland in 1617. In 1613 there was an interesting correspondence between Drummond and Drayton ; and, about the close of the same year, or about the beginning of 1619, Drummond was honoured with a visit of a fortnight or more from the great literary dictator of the time—Ben Jonson. Drummond, as tradition relates, sat awaiting Jonson's arrival under the shade of a fine sycamore, and exclaimed when Jonson came in sight, "Welcome, welcome, royal Ben!" Upon which the dramatist rejoined, "' Thank ye, thank ye, Hawthornden." The famous account of their conversations, long supposed to be lost, was discovered in the Advocate's Library, Edinburgh, by Mr David Laing, and, after being read to the Society of Scottish Antiquaries in 1832, appeared, ten years later, as a publication of the Shakespeare Socicty. . The conversations are full of interesting literary gossip, and embody Ben's opinion of himself and of his host, whom he frankly told that he '" was too good and simple, and that oft a man's modesty made a fool of his wit."

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The next few years in Drummond's life are comparatively uneventful, being marked only by correspondence with Sir William Alexander and Drayton. In 1623, the year of a great famine and consequent mortality in Scotland, appeared the poet's fourth publication, entitled Powers of Zion: By William Drummond of Hawthornedenne: to which is adjoyned his Cypresse Grove. From 1625 till 1630 Drummond was probably for the most part engaged in travelling on the Continent. In 1627, however, he seems to have been home for a short time, as, in that year, he appears in the entirely new character of the holder of a patent for the construction of military machines, entitled "Litera Magistri Guliclmi Drummond de Fabrica Machin- arum Militarium, Anno 1627." The same year, 1627, is the date of Drummond's munificent gift of about 500 volumes to the library of Edinburgh University. This collection, to which Drummond afterwards made addi- tions, is kept in a separate cabinet, and is particularly rich in the English poets. In 1630

Drummond again began to reside permanently at Hawthornden; and, in 1631, he received his last letter from Drayton, who died in London on the 23d of December. In 1632 Drum- mond married Elizabeth Logan, by whom he had five sons and four daughters. In 1683 Charles made his coronation-visit to Scotland ; and Drummond's pen was employed in writing congratulatory speeches and poetry. As Drummond naturally preferred Episcopacy to Presbytery, we are not surprised to learn that he approved of the main object Charles had in view in this visit, although his peace-loving nature was averse to the means employed in establishing Episcopacy. Drummond was a true Scottish gentleman in his pride of blood. Partly to please the earl of Perth, and partly to satisfy his own curiosity, the poet had studied the genealogy of the family very carefully, and had given due prominence to the fact that Annabella Drummond, daughter of Sir John Drummond of Stobhall, was the queen of Robert III. This investigation was the real secret of Drummond's interest in Scottish history ; and so we find that he now began his History of the Lives and Reigns of the Five Jameses, Kings of Scotland—a work which did not appear till 1655, and is remarkable only for its good literary style. His next work was called forth by the king's enforced submission to the opposition of his Scottish sub- jects. It is entitled Zrene: or a Remonstrance for Concord, Amity, and Love amongst His Majesty's Subjects, and embodies Drummond's political creed of submission to authority as the only logical refuge from democracy, which he hated. In 1639 Drummond had to sign the Covenant in self-protection, but was uneasy under the burden, as ex- isting squibs by him testify. Drummond's next work Sxiapaxta: or a Defence of a Petition tendered to the Lords of theCouncil of Scotland by certain Noblemenand Gentlemen, January, 1643, is a political pamphlet in support of those royalists in Scotland who wished to espouse the king's cause against the English Parliament. Its burden is a passionate invective on the intolerance of the then dominant Presbyterian clergy ; but Irene fails to do justice to the substantial work they had done. Drummond's subsequent works may be described briefly as royalist pamphlets, written with more or less caution, as the times required.

After being an invalid for several months, the poet died on the 4th December 1649, and was buried in the church- yard of Lasswade, a neighbouring village.

The only works of Drummond which call for special notice are the Cypresse Groveand the poems. The Cypresse Grove, one of the noblest prose poems in literature, exhibits great wealth of illustration, much fine thinking, and an extraordi- nary comniand of musical English. It isan essay on the folly of the fear of death, and shows how much the author was impressed with the comparative insignificance of this world.

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“This globe of the earth,” says he, “ which seemeth huge to us, in respect of the universe, and compared with that wide pavilion of heaven, is less than little, of no sensible quantity, and but as a point” (1711 edition, p. 123). Death, he argues, from many of its accidental associations, appears to be much more dreadful than it really is. Its universality, and a correct estimate of human life, ought to nerve us against the fear of death. Further, we should re- member that death is not annihilation, but the vestibule to immortality and a higher life. The essay, which is com- posed throughout in a strain of lofty idealism, is concluded in the form of a vision.

A noteworthy feature in Drummond’s poetry is that it manifests no characteristic Scottish element, but owes its birth and inspiration rather to the English and Italian masters. This was owing partly to his anti-Presbyterian bias and his long residence abroad ; but it was also natural, on other grounds, for a quiet, cultured, and meditative poet to imitate the Elizabethans and the great Italian writers. Drummond was essentially a follower of Spenser, delighting in the description of outer nature ; but, amid all his sensu- ousness, and even in those lines most conspicuously laden with lustrous beauty, there is a dash of melancholy thought- fulness—a tendency deepened by the death of his first love.

Drummond was so successful as a writer of sonnets that he was called “the Scottish Petrarch ;” and his sonnets are still ranked immediately after Shakespeare’s, Milton’s, and Wordsworth’s. Most of his poems are steeped in the pre- Copernican ideas of astronomy, and are marked by a sense of the smallness of the visible in comparison with the infinite lying beyond. This is one of Drummond’s favourite moods ; and he is constantly harping upon such phrases as “the All,” “this great All.” Even in such of his poems as may be called more distinctively Christian, this philoso- phic conception is

at work. Drummond's poems are distin- guished by pensive beauty, sweetness of versification, and richly worded descriptions, but lack vigour and originality. Altogether this poct is to be remembered as the best re- presentative of ‘‘ sweetness and light ” amid much that was dull and ephemeral in contemporary Scottish literature.

There are several editions of his works :—(1) Hall's edition of the prose works, published in 1655 ; (2) Phillips's (2 nephew of Milton) edition of the poems, which appeared in the same year ; (3) Bishop Sage's, published in 1711, the only complete edition of Drummond's writings ; (4) an edition of his poems by Lord Dundrennan and David Irving, issued in 1832; (5) Cunningham's edition of the poems of 1833; and (6) Turnbull's in 1857. The only collected edition of the prose writings was published in 1711. Drummond's life has been ably written by Professor Masson (1873). (T.GI.)

DRUNKENNESS may be either an act_or a habit, the latter consisting in frequent repetitions of the former. As an act it may be an accident, most usually arising from the incautious use of one or other of the commonly employed intoxicating agents ; as a habit it 1s one of the most degrad- ing forms of vice which can result from the enfeeblement of the moral principle by persistent self-indulgence.

Drunkenness is a mere complexity of symptoms which may arise from many different causes. To be drunk is simply to be apoplectic ; and the close resemblance between the pathological and the toxic phenomena has been the cause of many untoward accidents. Cold alone may pro- duce such peculiar effects that Captain Parry has said, in his Journal, “I cannot help thinking that many a man may have been punished for intoxication who was only suffering from the benumbing effects of frost ; for I have more than once seen our people in a state so exactly resembling that of the most stupid intoxication, that I should certainly have charged them with that offence had I not been quite sure that no possible means were afforded them on Melville Island to procure anything stronger than snow water. |

But, apart from the pathological causes of seeming drunkenness, this condition may be actually produced by a multitude of agents whose use is so wide-spread throughout the world as inevitably to lead to the belief that their moderate employment must subserve some important object in the economy of nature. Moreover, the physiological action of all these agents gradually shades into each other,

all producing or being capable of producing consecutive.

paralysis of the various parts of the nervous system, but only in doses of a certain amount,—a dose which varies with the agent, the race, and the individual. Even the cup so often said to “cheer, but not inebriate,” cannot be regarded as altogether free from the last-named effect. Tea-sots are well known to be affected with palpitation and irregularity of the heart, as well as with more or less sleep- lessness, mental irritability, and muscular tremors, which in some culminate in paralysis ; while positive intoxication has been known to be the result of the excessive use of strong tea (Third Annual Report of the Massachusetts Board of Health, p. 129). In short, from tea to haschisch we have, through hops, alcohol, tobacco, and opium, a sort of graduated scale of intoxicants, which stimulate in small doses and narcotize in larger,—the narcotic dose having no stimulating properties whatever, and only appearing to possess them from the fact that the agent can only be gradually taken up by the blood, and the system thus comes primarily under the influence of a stimulant dose. In certain circumstances and with certain agents—as in the production of chloroform narcosis—this precursory stage is capable of being much abbreviated, if not altogether annihilated ; while with other agents—as tea—the narcotic stage is by no means always or readily produced. It is well to remember, also, that there is not a shadow of proof that the moderate use of any one of these agents as a stimulant has any definite tendency to lead to its abuse ; it is otherwise with their employment as narcotics, which, once indulged in, is almost certain to lead to repetition, and to a more or less rapid process of degradation; but there are many exceptions to this latter statement. In regard to this matter it is interesting to know that opium, which, used in excess, 1s one of the most deleterious of these stimulants, is employed by 400,000,000, or nearly one-third of the whole human race, and that among these we have the Chinese, who almost to a man are opium smokers, and who nevertheless are well

known to be one of the most frugal and industrious of peoples, “powerful, muscular, and athletic, and the lower orders more intelligent, and far superior in mental acquirements, to those of corresponding rank in our own country.” It is also interesting to know that a late judge who lived to nearly ninety years fof age believed he had prolonged his life and added greatly to his comfort by the moderate use of ether, which he was led to employ because neither wine nor tobacco agreed with him; while the im- moderate use of the same agent has—particularly of late, and in the north of Ireland —given rise to a most delete- rious form of drunkenness. And, however degrading, demoralizing, and pauperizing the vice of drunkenness may be, it is important to remember in all our thoughts concern- ing it, that it is the outcome of a craving innate in human nature, whether civilized or savage, and that there has been no period in the world’s history, and no nation on its surface, in which one or other, and often several simultane- ously, of the many natural or artificial nervine stimulants have not been employed, and well it has been for those who have used them moderately. Two great influences have been regarded as of importance in regulating the prevalence of intemperance—temperature and race. Of these unques- tionably race is by far the most influential. Within the isothermal lines of 77° Fahr. north and south of the equatorial line of 82° 4’ Fahr, the mild native tribes seek

their happiness in a quiet introspective self-complacency termed keyf, induced by opium or haschisch. Between the isothermal lines of 77° Fahr. and 50° Fahr, north and south lie those regions where the grape-vine grows luxuriantly, and in these riotous intemperance, though still comparatively rare, is no longer regarded as the disgraceful social crime it is looked on in the tropics ; while beyond the isotherms of 50° Fahr. north and south the vine is no longer grown, and the stronger beers and distilled spirits become the wide-spread sources of a deeper intoxication, which too often terminates in crime, a result almost unknown in southern latitudes. How much of this is actually due to the more highly intoxicating qualities of the fluids imbibed, and how much to what Parry would rightly have termed the intoxicating quality of the climate, has never been fairly ascertained ; but this much is known, that in these northern climes what is merely a stimulant dose in moderate weather becomes stupefying under the influence of cold ;

—not because cold increases the intoxicating power of any liquor, but because the previous excitement of the cerebro-spinal system produces a condition of functional exhaustion which makes it more readily succumb to the benumbing influence of cold,—renders it, as we say, more liable to become morbidly congested by the reflex action of cold applied to the surface.

But of the two great influences which regulate the prevalence of intemperance, that of race far exceeds that of temperature. A glance at the map of the world, coupled with some knowledge of its history, teaches us that, whethcr in temperate, subtropical, or tropical regions, wherever the Teuton is, there drunkenness prevails ; and the wild orgies in which Tacitus tells us the Teuton of his day indulged in the cold climate of northern Europe are reproduced with wonderful circumstantiality irrespective of climatc or tem- perature. It may be, as a recent speaker has said, that “a national love for strong drink is a characteristic of the nobler and more energetic populations of the world ;” it may be, as he goes on to say, that it “accompanies public and;private enterprise, constancy of purpose, liberality of thought, and aptitude for war; it,” as he further adds, “exhibits itself prominently in strong and nervous constitu- tions, and assumes in very many instances the character of a curative of itself.” In other words, in certain constitutions the moderate use of stimulants excites to action rather than to a sensual keyf, and the pleasurable stimulus of action renders such individuals less likely to fall into degrading habits of excess.

The effects of intoxicants are variously modified by the temperament of the individual and the nature of the inebriant. When that is alcohol, its action on an average individual is first to fill him with a serene and perfect: self-complacency. His feelings and faculties are exalted into a state of great activity and buoyancy, so that his language becomes enthusiastic, and his conversation vivacious if not brilliant. The senses gradually become hazy, a soft hum- ming seems to fill the pauses of the conversation, and modify the tones of the speaker, a filmy haze obscures the vision, the head seems lighter than usual, the equilibrium unstable. By and by objects appear double, or flit con- fusedly before the eyes ; judgment is abolished, secretiveness annihilated, and the drunkard pours forth all that is within him with unrestrained communicativeness; he becomes boisterous, ridiculous,

and sinks at length into a mere animal, Every one around him, the very houses, trecs, even the earth itself, seem drunken and unstable, he alone sober, till at last the final stage is reached, and he falls on the ground insensible—dead drunk—a state from which, after profound slumber, he at last awakes feverish, exhausted, sick, and giddy, with ringing ears, a throbbing heart, and a violent headache,

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The poison primarily affects the cerebral lobes, and the other parts of cerebro-spinal system are consecutively involved, till in the state of dead-drunkenness the only parts not invaded by a benumbing paralysis are those automatic centres in the medulla oblongata, which regulate and main- tain the circulation and respiration. But even these centres are not unaffected; the paralysis of these as of the other sections of the ccrebro-spinal system varies in its incomplete- ness, and at times becomes complete, the coma of drunken- ness terminating in death. More usually the intoxicant 1s gradually eliminated, and the individual restored to conscionsness, a consciousness disturbed by the secondary results of the agent he has abused, and which vary with the nature of that agent. Whether, however, directly or indirectly, through the nervous system the stomach suffers in every case; thus nutrition is interfered with by the defective ingestion of food, as well as by the mal-assimilation of that which is ingested; and from this cause, as well as by the peculiar local action of the various poisons, we have the various organic degenerations induced which in most cases shorten the drunkard’s days.

The primary discomforts of an act of drunkenness are readily removed for the time by a repetition of the cause. Thus what has been an act may readily become a habit, all the more readily that each repetition more and more enfeebles both the will and the judgment, till they become utterly unfit to resist the temptation to indulgence supplied by the knowledge of the temporary relief to suffering which is sure to follow, and in spite of the consciousness that each repetition of the act only forges their chains more tightly. From this condition there is no hope of relief but in enforced abstinence ; any one in this condition must be regarded as temporarily insane, and ought to be placed in an inebriate asylum till he regain sufficient

self-control to enable him to overcome his love for drink. The desire for stimulants is one of the strongest instincts of human nature. It cannot be annihilated, but may be regulated by reason, conscience, education, or by law when it encroaches on the rights of others or is injurious to the individual him- self. By the Intoxicating Liquors Licensing Act of 1872 any one found drunk on a highway or public place or in a licensed house is liable to a fine of 10s., on a repetition of the offence within twelve months to one of 20s., and on a third offence within twelve months to one of 40s. 'To be drunk or riotous, or to be drunk while in charge of a horse, a carriage, or a gun is punishable with a fine of 20s, or im- prisonment for one month. And by the Police and Improve- ment Act of Scotland, 25 and 26 Vict. c 101, § 254, persons found drunk on the streets are subject to a fine of 40s, or 14 days' imprisonment, wherever that Act has been adopted. These Acts, properly enforced, ought to restrain the public exhibitions of drunkenness; while for thosc seasoned casks who ruin their own health and pauperize their families, without perhaps ever appearing in public offensively drunk, the only remedy which appears to promise hope of reform would seem to be the power of temporarily consigning them to an inebriate asylum. (a. w. B.)

DRUSES, a people of Syria remarkable for the pertinacity and success with which they have defended their independ- ence against the encroachments of Turkish supremacy, and for the profession of a form of religious belief, which, in the words of Dean Milman, is " one of the most extra- ordinary aberrations which ever extensively affected the mind of man." 'The greater body, whom for the sake of convenience we shall distinguish as the Western Druses, occupy the mountainous region of the Lebanon and Anti- Lebanon; but there are also extensive settlements in the Hauran or Auranitis; a considerable colony exists at Safed, in Palestine proper, to the north-west of the Sea of Tiberias; and it is believed that a number of

Crypto-Druses—Druses, however, by religion only, and not by race—still maintain themselves in the neighbourhood of Cairo. The Western Druses are found as far north as Beyrout, as far south as Sur or Tyre, and as far east as Damascus; in the north they are intermingled with Maronites, and in the

south with Greeks and Melchites. They form the exclusive population of about 120 towns and villages, and share with the Christians the occupation of nearly 230 more ; their total number, not reckoning women and children, has been calculated at from 60,000 to 65,000 men. ‘he chief town of the district which they occupy, though not their most populous settlement, is Deir-el-Kamar—the Convent of the Moon—situated about 15 miles south-east of Beyrout, in the district of Manaasif ; it was the seat of the powerful family of the Abu Nekads, and in its vicinity is the palace of Ebteddin, formerly occupied by the emir Beshir Shehaab. Ammatam and Bakhlin in the Lebanon, and Hasbeya and Rosheya in the Anti-Lebanon, rank as sacred cities, and serve as rallying-points in time of war.

The Eastern or Hauranitic Druses are less known, and preserve their ancient customs and characteristics perhaps more perfectly than their western brethren. The date at which they first settled in the district is not ascertained ; but for many generations the Hauran has been the chosen refuge of rebels and malcontents from the west, and has consequently increased its population at the expense of the Lebanon. ‘The same process of emigration is still going on; and the Turkish Government has to be careful not to press too heavily on the defaulting Druse of the west, lest it needlessly augment the power of the more independent community. The number in the Hauran was stated by Qyril Graham at 7000 men in 1857 ; at present it must be much nearer 10,000. The principal town is Kunawat, the residence of the most influential of the Ockals.

In many respects the Druses are a mysterious people, and, in spite of the great additions made to our knowledge in the present century, many important questions in regard to them still await solution, Of their origin and ethno- graphical affinity no absolutely certain information has been obtained. Though they speak Arabic with a correctness that would do credit to the people of Mecca, and their feudal aristocracy refer to their Arab descent with feelings of pride, it is pretty generally agreed that, whatever may be irue of certain families, the main body of the people does not belong to the Semitic family. Mr Cyril Graham regards them as of Indo-Teutonic race, and describes them as; fair-haired, of light complexion, strong and well-made, and often as tall as northern Europeans.” Their own tradition vaguely connects them with China, where they firmly believe that to this

day there exist numerous adherents of their creed, and whence they expect the ad- vent of their promised deliverer. The mere fact that they possess a knowledge of the Celestial Empire in such contrast to the geographical ignorance of the other Syrian races is in itself remarkable enough ; though it would be rash to assert that it is practically significant. According to an opinion mentioned by Sandys, and pretty often to be met with in the older accounts, they derive their name from a count of Dreux, and are mainly the descendants of a band of the crusaders who were left behind, and finally forgot their country and language and creed ; but this story is disproved by the fact that allusion is made to their existence at an earlier date by Benjamin of Tudela.

A more modern theory identifies them with one or other of the tribes introduced into Northern Syria by Esarhaddou in the 7th century B.c. If its generally but not univer- sally received derivation from Ismael Darazi be accepted, their present name, which is properly Durus, dates no further back than about the 11th century, and throws

no light on the question of affinity ; and just as little is to be learned from the various explanations current among themselves—those put in possession (of the faith), from the Arabic verb darisa ; those who read the book of Hamze, as if from darasa ; the clever ones, from Durs ; the shields, from Twrs, and so on. It is well known, however, that the district which they now occupy has over and again received extraneous additions to its population ; and, in the absence of more precise information, it seems at least certain that, whatever may have been the original nucleus of his race, the Druse of the present day carries in his veins the mingled blood of a various ancestry, in like manner as his religion combines the products of many different intellec- tual moments. ‘The presence of a Kurdish element is un- doubted, and its influence may probably be traced in the peculiar position granted to the women.?

The rise and progress of the religion which gives unity to the race can be stated with considerable pre- cision. As a system of thought it may be traced back in some of its leading principles to the Shiite sect of the Batenians, or Batiniya, whose main doctrine was that ‘every outer has its

inner, and every passage in the Koran an allegorical sense," and to the Karamatians, or Karamita, who pushed this method to its furthest limits ; as a creed it is somewhat more recent. In the year 386 AH. (1019 a.p.) Hakim Biamrillahi (7.¢, he who judges by the command of God), the sixth of the Fatimite caliphs, began to reign; and during the next twenty-five years he indulged in a tyranny at once so terrible and so fantastic that little doubt can be entertained of his insanity. As madmen sometimes do, he believed that he held direct intercourse with the deity, or even that he was an incarnation of the divine intelligence ; and in 407 a.u., or 1040 a.p., his claims were made known in the mosque at Cairo, and sup- ported by the testimony of Ismael Darazi. The people showed such bitter hostility to the new gospel that Darazi was compelled to seek safety in flight ; but even in absence he was faithful to his god, and succeeded in winning over the ignorant inhabitants of Lebanon. According to Druse authority this great conversion took place in the year 410 A.H. Meanwhile the endeavours of the caliph to get his divinity acknowledged by the people of Cairo continued. The advocacy of Hasan ben Haidara Fergani was without avail; but in 408 a.n, the new religion found a more successful apostle in the person of Hamze ben Ali ben Ahmed, a Persian mystic, feltmaker by trade, who became Hakim's vizier, gave form and substance to his creed, and by his ingenious adaptation of its various dogmas to the prejudices of existing sects finally enlisted an extensive body of adherents. In 411 the caliph was assassinated by con- trivance of his sister Sitt Almulk ; but it was given out by Hamze that he had only withdrawn for a season, and his followers were encouraged to look forward with confidence to his triumphant return. Darazi, who had acted inde- pendently in his apostolate, was branded by Hamze as a heretic, and thus, by a curious anomaly, he is actually held in detestation by the very sect which probably bears his name. The propagation of the faith, in accordance with Hamze's initiation, was undertaken by Ismael Ben Muham- med Zemimi, Muhammed ben Wahab, Abulkhair Selama ben Abdalwahab ben Samurri, and Moktana Bohaeddin, the last of whom was known by his writings from Con- stantinople to the borders of India. In two letters ad- dressed to the emperor Constantine VIII. and Michael the Paphlagonian he endeavours to prove that the Christian Messiah reappeared in the person of Hamze.

_ The full exposition of the Drusian creed thus brought

into existence, even in the somewhat imperfect state of

ee a ee 1 Cf. Lord Carnarvon’s suggestive account of the Yezidis.

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European knowledge in regard to many of its details, would require a volume of considerable size: the following is a summary of its main doctrines. The Muahhidin or Unitarians, as the Druses call themselves, believe that there is one and only one God, indefinable, incomprehensible, ineffable, passionless. He has made himself known to men by ten successive incarnations in the persons of Ali, Albar, Alya, Moill, Kaim, Moezz, Aziz, Abu Zechariah, Mansur, and Hakim. No further incarnation can take place: in Hakim a final appeal was made to mankind, and after the door of mercy had stood open to all for twenty-six years, it was finally and for ever closed. When the tribulation of the faithful has reached its height, Hakim will reappear to conquer the world and render his religion supreme. The first of the creatures of God is the Universal Intelligence, impersonated in Hamze at the time of the last incarnation ; he is the creator of all subordinate beings, and he alone has immediate communion with the Deity. Next in rank to him, and along with him supporting the throne of the Almighty, are four archangels, the Soul, the Word, the Right Wing, and the Left Wing, who were embodied re- spectively in Ismael Darazi, Mohammed ben Wahab, Selama ben Abdalwahal, and Bolaeddin; and beneath these again are spiritual agents of various ranks. The number of human beings adinits neither of increase nor of decrease, and a regular process of metempsychosis is main- tained. The souls of the virtuous pass after death into the bodies of Chinese Druses ; those of the wicked may be degraded to the level of camels or dogs. All previous re- ligions are mere types of the true, and their sacred books and observances are to be interpreted allegorically. As the admission of converts is, no longer permitted, the faithful are enjoined to keep their doctrines secret from the profane ; and in order that their allegiance may not bring them into danger, they are allowed to make outward profession of whatever religion is dominant around them. To this latter indulgence is to be attributed the apparent in- differentism with which they join the Mahometan in his prayers and ablutions, or sprinkle themselves with holy water in the

Maronite churches. Obedience is required to the seven great commandments of Hamze, the first and greatest of which enjoins truth in words (but only of Druse towards Druse) ; the second, watchfulness over the safety of the brethren; the third, absolute renunciation of every other religion; the fourth, complete separation from all who are in error ; the fifth, recognition of the unity of “Our Lord” in all ages; the sixth, complete resignation to his will; and the seventh, complete obedience to his orders. Prayer, however, is regarded as an impertinent in- terference with the Creator; while at the same time, instead of the fatalistic predestination of Mahometanism, the free- dom of the human will is distinctly maintained. Not only is the charge of secrecy rigidly obeyed in regard to the alien world, but full initiation into the deeper mysteries of the creedilis permitted only to a special class desig- nated Ockals or Akals—probably from the Arabie AM, intelligence—in contradistinction from whom all other members of the Druse community, whatever may be their position or attainments, are called Djahel or Ignorant. About 15 per cent. of the adult population belong to this order. Admission is granted to any Druse of either sex who expresses willingness to conform to the laws of the society, and during a year of probation gives sufficient proof of sincerity and stability of purpose. There appears to be no formal distinction of rank among the various members; and though the emir Beshir Shehaab used to appoint a sheik of the Ockals, the person thus distin- guished obtained no primacy over his fellows. Exceptional influence depends on exceptional sanctity or ability. Allare required to abstain from tobacco and wine ; the women are

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to wear neither gold nor silver, nor silk, nor brocade ; and although neither celibacy nor retirement from the affairs of the world is either imperative or customary, unusual respect is shown to those who voluntarily submit themselves to ascetic discipline. While the Ockals mingle frankly with the common people, and are remarkably free from what in Europe would be called clerical pretension, they are none the less careful to maintain their privileges. They are distinguished by the wearing of a white turban, emblematic of the purity of their life. Their food must be purchased with money lawfully acquired; and lest they should unwittingly partake of any that is ceremonially unclean, they require those djahels whose hospitality

they share to supply their wants from a store set apart for their exclusive use. The ideal Ockal is grave, calm, and dignified, with an infinite capacity of keeping a secret, and a devotion that knows no limits to the interests of his creed. On Thursday evening, the commencement of the weekly day of rest, the members of the order meet together in the various districts, probably for the reading of their sacred books and consulta- tion on matters of ecclesiastical or political importance. Their meeting-houses, holowés, halwes, or khalwas, are plain, unornamented edifices, usually built in secluded spots, and not unfrequently on isolated eminences. ‘All have property attached to them, the revenues of which are con- secrated to the relief of the poor and the demands of hospitality. In one at Necha, in the Shoof, a lamp is kept burning night and day.”!_ Even while the Ockals are assembled, strangers are readily enough admitted to the holowés ;; but as long as they are present the ordinary ceremonies are neglected, and the Koran takes the place of the Drusian scriptures. In has been frequently asserted that the image of a calf is kept in a niche, and traces of phallic and gynecocratic worship have been vaguely suspected ; but there is no authentic information in support of either statement. “The calf, if calf there be, is probably a symbol of the execrable heresy of Darazi, who is fre- quently styled the calf by his orthodox opponents. Ignor- ance is the mother of suspicion as well as of devotion ; and accordingly the Christian inhabitants of the Lebanon have long been persuaded that the Druses in their secret assemblies are guilty of the most nefarious practices. Of this allegation, so frequently repeated by European writers, there seems to be little evidence ; and it is certain that the sicred books of the religion inculcate what is on the whole a high-toned morality. Colonel Churchill, in his last volume, asserts that while the majority of the people follow the pure teaching of Bobaeddin, there still exists a party which indulges in the “dark and unscrupulous libertinism of Darazi.”

The Druses, like the Arabs, have a high reputation for hospitality, and they give special welcome to the English, whom they regard as their particular friends and allies. Whoever presents himself at their door in the quality of a suppliant or passenger is sure of being entertained with food and lodging in the most generous manner. Volney often saw the lowest peasants give their last morsel of bread to the hungry traveller; and their only answer to the accusation of imprudence was, “God is great and liberal, and all men are

brethren.” Beggary at the same time is altogether unknown among the common people, and the Ockals are not a mendicant order. It would be easy to illus- trate by many a striking incident the fidelity with which they keep inviolate the pledge tacitly given to the guest who has eaten of their bread and salt. Nor is their hospitality unassociated with other virtues. ‘There was nothing,” says Lord Carnarvon, “which surprised me more than the self-possession, the delicate appreciation of wishes and feel-

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1 Churchill, ii. p. 255.

ings, the social ease, and to a great extent the refinement which distinguished the conversation and manners of those amongst the Druse chiefs whom I then met, and on which no drawing-room of London or Paris could have conferred an additional polish ;” and a similar testimony is borne by Mr Chasseaud, who was brought up in the city of Beyrout, and had abundant opportunities of observation. There is a darker side, indeed, to the picture; though, after all, while his merits are in the main peculiarly his own, the Druse only gives additional intensity to the ruthlessness and revengefulness of so many 6f the Eastern nations. Polygamy is not permitted. Among the old feudal families intermarriage is often restricted to one or two houses ; and the daughter of a sheik will rather remain a virgin than bring disgrace on her blood by a mésalliance. The marriage of near relations is naturally the conse- quence ; but, whatever may have been formerly the case, it no longer appears to be the custom for brother and sister to wed. All prenuptial arrangements on the part of the woman are conducted by the father, who cannot act, how- ever, without lier consent. On the wedding daya number of Ockals and a few of the bridegroom’s relations go to the bride’s house; the marriage contract is drawn up and read ; and the bride, completely enveloped in a veil, is led off on horseback to her husband, accompanied by her friends, both male and female. As she approaches her future home, the bridegroom’s party sallies forth, and a mock contest, with blank cartridge, ensues. Ultimately the bride is successful; shouts of welcome follow her into the harem, where she is received and caressed by the women of her husband’s family. After a little

she is left alone; the bridegroom enters, lifts her veil, takes his first glance at his wife, replaces it, and withdraws. The revels continue for several days.? Divorce is freely allowed ; but when once obtained it cannot be cancelled, though either party is free to marry again. Births are rarely celebrated with any public or private jubilation. When a sheik dies, all the sheiks in the mountain are at once informed. Next day they assemble, and the dead body is borne forth in au open coffin to meet all those whom it is especially wished to honour. All day long the mourners walk up and down the

‘medan, or tilt-yard, in parties of fifty and sixty, singing or

reciting eulogy or dirge ; and every now and thena number rush into the “lichroom ” and kiss the dead man’s hands and face and beard. A little before sunset the burial takes place. The women watch afar off, while the men follow silently to the grave. A few passages from the Koran are read by the Ockals, and the ceremony is over. The family mausoleums are built without doorways, and the wall has to be broken down to admit each new tenant. Those who die in the odour of sanctity are buried in their own houses : the tomb is in the form of an altar, aud stands east and west, and the body is laid on its side with the face looking to the south.’

Education, according to Eastern ideas, receives consider- able attention among the Druses; and all their ladies, in contrast to the majority of their countrywomen, can both read and write. The defence and the diffusion of their religion were originally undertaken in great measure by means of little books or treatises ; and from an early period several of the wealthier sheiks have prided themselves on their collection of manuscripts. Fora people so small in number, their literature, though almost purely theological, is remarkably. extensive—a fact which may probably be ascribed to the influence of the Semitic element. In spite of the excessive care with which their manuscripts have been guarded (and they are enjoined if need be to kill any alien found in possession of their sacred books), a considerable

2 Churchill, ii, 292 ; Porter’s Giant Cities of Bashan, p. 296, 3 Urquhart, vol. il. p. 328,

number, undoubtedly genuine, have found their way to Europe.

Mysteries of the Unity, consisting of seventy treatises in four folio volumes, was found in the house of the chief Ockal at Bakhlin, and presented in 1700 to Louis XIV. by Nusralla Ibn Gilda, a Syrian doctor. Other manuscripts are to be found at Rome in the Vatican, at Oxford in the Bodleian, at Vienna, at Leyden, at Upsala, and at Munich ; and Dr Porter got possession of the seven standard works of Druse theology while at Damascus. The Munich collection was presented to the king of Bavaria by Clot- bey, the chief physician in the Egyptian army during its occupation of Syria; and for a number of the other manu- scripts we are indebted to the elder Niebuhr. A history of the Druse nationality by the emir Haider Shehaab is quoted by Urquhart.

From an early period, the internal organization of the Druses has been eonstrueted after a patriareho-feudal type, which, as usual, has placed a large amount of arbitrary power in the hands of the chiefs or sheiks, and given rise to an endless suceession of petty feuds and confederations between the various clans or families. Into the pieturesque confusion of the resulting history, complicated as it is by Turkish eneroachments and intrigue, it would be useless to enter ; and the euriosity of the reader may easily be gratified by turning to Colonel Churehill's interesting, if somewhat diffuse and desultory, volumes. The following, however, may be mentioned as among the most important of the elans, whieh at one period or other have aequired an influential position in the Lebanon :— ~~The Tnoohs or Tanuehs, now extinct, who had their seat at Abeigh or Obeah, in the Shahaar, a short distance to the S. of the Bahr Beyrout ; the Talhook family, originally the Beni Hazamm, one branch of whieh has its principal residence at Heittat, and the other at Allaye, about nine and ten imiles respectively S.E. of Beyrout ; the Abdelmeliks with their seat at Ebtater, about four miles E. of Heittat ; the Cadis of Bisoor, nearly two miles to §. of Heittat, an offshoot of the Tnoohs; the house of Raslan with its seat at Shwyfat, seven miles S. of Beyrout ; Aminadins, now settled at Abeigh, remarkable for their attention to religion ; the house of Jumblatt or Djembelat with its splendid mansion at Muc~~ tara on the eastern bank of the Nahr-el-Awleh, the Abu-Nekads, formerly the feudal lords of Deir-el-Kamar ; the louse of Abn- Harmoosh, the Amads, and the Kids,

The Druses first attained to pre-eminence in the Lebanon under the presidency of the Arab family of the Tnoohs, whieh had adopted the doctrines of Hamze. For a long time they continued to be tolerated as serviceable allies by the orthodox Mahometans, and the Tnoohs even obtained possession of Beyrout; but about 1300, after Malek Ashraf had expelled the Christians from Syria, he turned his attention to the Lebanon and ordered the Druses to ereet mosques throughout their territory. They refused, and prepared to defend themselves ; but their forees were defeated at Ain-Sofar, about halfway between Beyrout and the Bekaa. A long period of peace ensued, and while acknowledging the supremacy of the Sultan of Egypt, the Druses attained considerable importance. An impetus was given to their religion by the emir Jemaladin Said Ab- dallah Tnooh (d. 1480), whose shrine at Abeigh is still visited by pious pilgrims.

On the defeat of the Egyptian sultan by the Ottoman invader Selim I., in 1517, the Druses were obliged to submit to the new dynasty, which bestowed the chief power in the Lebanon on Faka- radin-Maan, a member of a Mohametan family originally known as the Beni-Rabua, who had immigrated from the Nahrain about 1145. The family of the Tnoohs which had already been destroyed by internal feuds, was thrown into the shade and never recovered its position. In the early part of the 17th eentury, the interest of European nations was excited in the fate of the emir Fakaradin Maan II., who on the failure of his plans sought refuge for a time with the grand duke of Tuseany and the king of Naples, but ultimately perished by the bow-string in the city of the sultans. His family died out in the beginning of the 18th century, and the position of Grand Emir was bestowed on a member of the house of Shehaab, originally a branch of the Beni Koreish of Mecea. In 1713 the emir Haider Shehaab, having routed the Turkish forces at Aindara with the assistanee of the sheiks of the Cadis, Abu- Nekads, Abl-el-Meliks, and Talhooks, iminediately afterwards divided the whole of the southern Lebanon into territorial dis- triets, and bestowed the administration on the chiefs to whom he had been principally indebted. Each macaatagee thus created had full power of taxation and punishment over the distriet en- trusted to him by his macaata or eontraet ; and the system thus instituted continued in foree till its abolition by Fuad Pasha in

1860. The events of the next hundred years—full as those years were of revolutions and counter-revolutions in which the Druses

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had ample share—-belong rather to the gencral history of the Lebanon than to the special history of the Druses. The latter part of the period is oecupied by the life of the emir Beshir Shehaab, undoubtedly one of the most remarkable men who ever fought and intrigued in Syria. In 1799, along with many of the Druses, he aeeepted the advances of Sir Sidney Smith, and swore perpetual hostility against the Freneh, who were, however, soon after driven back to Egypt without his assistanee; and in 1823 his co-operation, though only supported by the half-hearted acqui- escence of most of the sheiks, was of the greatest service to the eause of Ibrahim Pasha against the Turks. Not long after the restoration of the authority of the Porte, which in spite of their emir had been considerably furthered by the Druse sheiks, the peaceful relations whieh from time immemorial had existed between the Druses and the Maronites gradually gave place to the bitterest hostility. Under the patronage of the next emir, Beshir cl Kassim (himself a proselyte to their religion), and instigated by their patriarch and priest, the Maronites began to assert their independ- ence of the Druse sheiks under whose feudal authority they were placed. Civil war broke out in 1841, and raged for three years. In January 1842 the Turkish Government appointed Omar Pasha as administrator of the Druses and Maronites, with a council of four chiefs from each party ; but the pasha attempting to effect a disarming, was in November besieged in the eastle of Beit-ed-din by the Druses under Shibli-el-Arrian. At the instigation of the European powers le was recalled in December, and the Druses and Maronites were placed under separate kaimakams or governors. Disturbanees again broke out in 1845: the Maronites flew to arms, but with the assistance of the Turks their opponents earried the day.

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DRUSIUS, or Van ven Drirscun, Jonannes (1550- 1616), a learned Protestant divine, distinguished specially as an Orientalist and exegete, was born at Oudenarde, in Flanders, on the 28th June 1550, Being designed for the

church, he studied Greek and Latin at Ghent, and philosophy at Louvain; but his father having been out- lawed for his religion, and deprived of his estate, retired to England, where the son followed him in 1567. He found an admirable teacher of, Hebrew in Chevalier, the celebrated Orientalist, with whom he resided for some time at Cambridge. In 1572 he became professor of Oriental languages at Oxford. Upon the pacification of Ghent (1576) he returned with his father to their own country, and was appointed professor of Oriental languages at Leyden in the following year. In 1585 he removed to Friesland, and was admitted professor of Hebrew in the university of Franeker, an office which he discharged with great honour till his death,

which happened in February 1616. He acquired so extended a reputation as a professor that his class was frequented by students from all the Protestant countries of Europe. His works prove him to have been well skilled in Hebrew and in Jewish antiquities ; and in 1600 the States-general employed him, at a salary of 400 florins a year, to write notes on the most difficult passages in the Old Testament ; but, as he was frequently interrupted in prosecuting this undertaking, it was not published until after his death. As the friend of Arminius, he was charged by the orthodox and dominant party with unfairness in the execution of this task, and the last sixteen years of his life were, therefore, somewhat embittered by controversy. He carried on an extensive correspoudence with the learned in different countries ; for, beside letters in Hebrew, Greek, and other languages, there were found amongst his papers upwards of 2000 written in Latin. He had a son, John, who died in England at the age of twenty-one, and was accounted a prodigy of learning. He had mastered Hebrew at the age of nine, and Scaliger said that he was a better Hebrew scholar than his father. He wrote a large number of letters in Hebrew, besides notes on the Proverbs of Solomon and other works.

Paquot states the number of the printed works and treatises of the elder Drusius at forty-eight, and of the unprinted at upwards of twenty. Of the former more than two-thirds were inserted in the collection entitled Critici Sacri, sive Annotata doctissimorum Virorwm in Vetus et Novum Testamentum (Amsterdam, 1698, in 9 vols. folio, or London, 1660, in 10 vols. folio.) Amongst the works of Drusius not to be found in this collection may be mentioned—l. Alphabctum Hebraicum vetus, (1584, 4to) ; 2. Tabule in Gramma- ticam Chaldaicam ad usum Juventutis, (1602, 8vo); 3. An edition of Sulpicius Severus (Franeker, 1807, 12mo); 4. Opuscula que ad Grammaticam spectant omnia, (1609, 4to) ; 5. Lacrymee in obitum

J. Scaligcri, (1609, 4to); and6. Grammatica Lingue Sanctee nova (1612. 4to.)

DRUSUS, Marcus Livius, a patrician of the age of the Gracchi, and a colleague of Caius Gracchus in the tribune- ship, 122 B.c. He was a creature of the senatorial party, and was employed by them to outbid the measures of the popular tribune. Gracchus had proposed to found three

colonies outside Italy; Drusus provided twelve in Italy. Gracchus had proposed to distribute allotments to the poorer citizens subject to a state rent-charge ; Drusus pro- mised them free of all charge. Gracchus had proposed to give the Latins the citizenship; Drusus added immunity from corporal punishment, even in the field. The bait thus offered was swallowed ; the people forsook their champion, who fell an easy victim to the hired bravos of Opimius. Drusus was rewarded for his services by the consulship, which he held, 112 3.c. He received Macedonia for his province, where he distinguished himself in a campaign against the Scordisci, whom he drove across the Danube into Dacia, being the first Roman general who reached that river. It is probable that he isthe Drusus mentioned by Plu- tarch as having died in the year of his censorship, 109 B.c.

DRUSUS, Marcus Liviuvs, son of the preceding, and, like his father, during the first part of his career a thorough supporter of the optimatcs. From his earliest youth he

devoted himself to politics, was assiduous as a pleader in the law-courts, and lavished in gifts and shows the large fortune which he had inherited. By such popular acts he rose to be tribune of the people, 91 3.c. In the agitation which was then raging for the transfer of the judicial func- tions from the equites to the senate, he proposed as a com- promise a measure which restored to the senate their office of judges, while the numbers were doubled by the admission of 300 equites. But the senate was lukewarm, and the knights whose occupation was threatened offered the most violent opposition. In order, therefore, to catch the popular votes, he coupled with this measure others for the establish- ment of colonies in Italy and Sicily, and the distribution of corn at a reduced rate. By help of these riders the bill was carried, but not till its most factious opponent, the consul Philippus, had been arrested by Drusus and carried off to prison. ‘Tostrengthen his hands Drusus now sought a closer alliance with the Italians, promising them the long coveted boon of the Roman franchise. The senate, who had before suspected his aims, broke out into open opposi- tion. His laws were abrogated as informal, and each party armed its adherents for the civil struggle which was now inevitable. It was only prevented, or rather

postponed, by the assassination of Drusus. One evening as he was returning to his house he was struck by a dagger, and fell at the foot of his father's bust, exclaiming with his dying breath, 'When will the republic find again a citizen like me?" His character is hard to decipher, and is one of the moot problems of Roman history. To some he has appeared an unscrupulous adventurer, who deserted his own order to gratify his selfish ambition ; others have pronounced him the ablest and wisest of the Roman demagogues. That he was proud and ambitious there can be no question. When a questor in Asia he refuses to wear the robes of office, "ne quid ipso esset insignius." When summoned before the senate he bids them come to him—" they will find me in the Curia Hostilia"—and they came. No less certain is it that the reforms he advocated were, on the whole, salutary and needful. The corruption of the equites was flagrant ; the claims of the Italians to the franchise were just and pressing. Drusus was the Mirabeau of the social re- volution of Rome, and had his measures been carried Rome might have been spared the most terrible of her civil wars.

DRYADES, or HamapryapbEs, in Greek Mythology, were nymphs of trees and woods, each particular tree or wood being the habitation of its own special Dryad, just as each river was the abode of its own local god. From being so closely identified with trees, the Dryades came to be thought of as having been, like the trees, produced from the earth, as Hesiod says, Zheog., 129.

DRYANDER, Jonas (1748-1810), a Swedish naturalist of eminence, and a pupil of Linnzeus, was born in 1748. By his uncle, Dr Lars Montin, to whom his education was in- trusted, he was sent to the university of Gottenburg, whence he removed to Lund. After taking his degree there in 1776, he studied at Upsala, and then became for a time tutor to a young Swedish nobleman. He next visited England, and, on the death of his friend Dr Solander in 1782, he succeeded him as librarian to Sir Joseph Banks. He was librarian to the Royal Society and also to the Linnean Society. Of the latter, in 1788, he was one of the first founders, and, when it was incorporated by royal charter in 1802, he was chiefly concerned in the drawing up of its laws and regulations. He was vice-president of the society till the time of his death, which took place in October 1810.

Besides papers in the Transactions of the Linnean and other societies, Dryander published Disscrtatio gradualis Fungos Regno Vegetabilt vindicans, Lond. 1776, and Catalogus Bibliothece Historico-Naturalis Josephi Banks, Bart., Lond. 1796-1800, 5 vols. He also edited the first and part of the second edition of Aiton's Hortus Kewensis, and Roxburgh's Plants of the Coast of Coromandel.

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DRYDEN, Joun (1631-1700), the poet, born on the 9th of August 1631, at Aldwinkle, in Northamptonshire, was of Cumberland stock, though his family had been settled for three generations in Northamptonshire, had acquired estates and a baronetcy, and intermarried with landed familiesin that county. His great-grandfather, who first carried the name south, aud acquired by marriage the estate of Canons Ashby, is said to have known Erasmus, and to have been so proud of the great scholar's friendship that he gave the name of Erasmus to his eldest son. The name Erasmus was borne by the poet's father, the third son of Sir Erasmus Dryden. The leanings and connections of the family were Puritan and anti-monarchical. Sir Erasmus Dryden went to prison rather than pay loan money to Charles I.; the poet's uncle, Sir John Dryden, and his father Erasmus, served on Government commissions during the Commonwealth. His mother's family, the Pickerings, were still more prominent on the Puritan side. Sir Gilbert Pickering, his cousin, was chamberlain to the Protector, and was made a peer in 1658.

Dryden's education was such as became a scion of these respectable families of squires and rectors, among whom the chance contact with Erasmus had left a certain tradition of scholarship. His father, whose own fortune, added to his wife's, the daughter of the rector of Aldwinkle All Saints, was not large, and whose family, of whom the poet was the eldest, amounted to fourteen, procured him admission to Westminster School as a king's scholar, under the famous Dr Busby. Some elegiac verses which Dryden wrote there on the death of a young Lord Hastings, in 1649, had the distinction of being published in a volume called Lacryme Musarum, among other elegies by " divers persons of nobility and worth " in commemoration of the same event. He appeared soon after again in print,

among writers of commendatory verses to a friend of his, Jolin Hoddesdon, who published a little volume of religious poetry in 1650. Dryden's contribution is signed " John Dryden of Trinity C.," he having gone up from Westminster to Cambridge in May 1650. He was elected a scholar of Trinity on the Westminster foundation in October of the same year, and took his degree of B.A. in 1654, The only recorded incident of his college residence is some unex- plained act of contumacy to the vice-master, for which he was '" put out of commons " and " gated " for a fortnight. No inference can be built upon this as to Dryden's habits at the university. Contumacy to authorities was not a feature in his later life. His father died in 1654, leaving him master of two-thirds of a small estate near Blakesley, worth about £60 ayear. The next three years he is said to have spent at Cambridge. It was then probably that he laid the foundation of that habit of learned discussion of literary methods which is so remarkable a feature in the prefaces to his plays and poems. Not content with doing a thing, like writers who are suddenly placed under the necessity of writing, Dryden must always be arguing as to how it ought to be done, pushing on argumentative justifi- cation in advance of execution. Whether or not he spent the three years before 1657 at Cambridge, there can be little doubt, judging from internal evidence, that he spent them somewhere in study ; for his first considerable poem bears indisputable marks of scholarly habits, as well as of a command of verse that could not have been acquired without practice.

The middle of 1657 is given as the date of his leaving the university to take up his residence in London. In one of his many subsequent literary quarrels, it was said by Shadwell that he had been clerk to Sir Gilbert Pickering, his cousin, the favourite of Cromwell ; and nothing could be more likely than that he obtained some employment under his powerful cousin when he came to London. He first

emerged from obscurity with his Heroic Stanzas to the memory of the Protector, who died September 3, 1658. That these stanzas should have made him a name as a poet does not appear surprising when we compare them with Waller's verses on the same occasion. Dryden took some time to consider them, and it was impossible that they should not give an

impression of his intellectual strength, Donne was his model; it is obvious that both his ear and his imagination were saturated with Donne's elegiac strains when he wrote; yet when we look beneath the surface, we find unmistakable traces that the pupil was not without decided theories that ran counter to the practice of the master. It is plainly not by accident that each stanza con- tains one clear-cut brilliant point. The poem is an academic exercise, and it seems to be animated by an under- current of strong contumacious protest against the irregularities tolerated by the authorities. Dryden had studied the ancient classics for himself, and their method of uniformity and elaborate finish commended itself to his robust and orderly mind. In itself the poem is a magnifi- cent tribute to the memory of Cromwell. Now that the glittering style of the so-called 'metaphysical poets" has gone very far out of fashion, it requires an effort, a deliberate dismissal of prejudice, to enjoy such a poem. A poet writing now on such a man would present his grandeur in a much more direct and simple way. Yet judged in the spirit of its own style, Dryden's isa noble poem. The recognition of Cromwell's greatness is fulland ample. The thought in each stanza, the inclosing design of each of the parts of the edifice, is massive and imposing, although the massiveness is not presented in its naked simplicity, so as to hold the foremost place in the eye—the gaze being arrested by glittering accidents, so. that the essential grandeur of the mass is disguised and diminished. We are not invited to dwell upon the grand outline; we are not called upon to surrender ourselves to its simple impressive- ness; but it is there, although the author does not insist upon it, and rather deprecates it, waves it off, and challenges our admiration of some artificial centre of attraction. It is the ornamental centre upon which the art of the poet has laboured, not the effect of the massive whole ; still there is loftiness and nobility in the scope of the work, if our prejudices in favour of a less adorned workmanship permit us to feel it.

From a moral point of view, Dryden's next appearance as a poet is not creditable. To those who regard the poet ag a seer with a sacred mission, and refuse the name alto- gether to a literary manufacturer to order, it comes with a certain shock to find Dryden, the hereditary Puritan, the panegyrist of Cromwell, hailing the return of King Charles in Astrwa Redux, deploring his long absence, and proclaiming the despair with which he had seen "the retel thrive, the loyal crost." From a literary point of view also, Astrea

Medux is very inferior to the Herove Stanzas ; Dryden had need of Waller's clever excuse that it is easier to praise a bad man than a good, because the essence of poetry is fiction. And it was not merely in thus hastening to welcome the coming guest, and recant all praise of his rival, that Dryden showed a shamelessly accommodating spirit, and placed himself in such unpleasant contrast to the greater poet who was waiting his fate in all but friendless blindness. It might have been expected of one with his Puritan connections and scholarly training that, if he purposed making a living by the stage, which was restored with Charles, his literary as well as his moral conscience would have required him to make some effort to raise or at leastnot toloweritstone. But Dryden seems to have had no higher ambition than to make some money by his pen. He naturally first thought of tragedy, —his own genius, as he has informed us, inclining him rather to

that species ot composition ; and in the first year of the Restoration he wrote a tragedy on the fate of the duke of Guise. But some friends advised him that its construction was not suited to the requirements of the stage, so he put it aside, and used only one scene of the original play later on, when he again attempted the subject with a more practised hand. Having failed to write a suitable tragedy, he next turned his attention to comedy, although, as he admitted, he had little natural turn for it. He was very frank afterwards in explaining his reasons for writing comedy. 'I confess," he said, ina short essay in his own defence, printed before Zhe Indian Emperor, "my chief endeavours are to delight the age in which I live. If the humour of this be for low comedy, small accidents, and raillery, I will force my genius to obey it, though with more reputation I could write in verse. I know I am not so fitted by nature to write comedy ; I want that gaiety of humour which is required to it. My conversation is slow and dull; my humour saturnine and reserved; in short, I am none of those who endeavour to break jests in company or make repartees. So that those who decry my comedies do me no injury, except it be in point of profit ; reputation in them is the last thing to which I shall pretend." This, of course, was said by Dryden standing at bay ; there was some bravado, but also a great deal of frank truth in it. He was really as well as ostentatiously a play- wright; the age demanded comedies, and he endeavoured to supply the kind of comedy that the age

demanded. His first attempt was unsuccessful. Bustle, intrigue, and coarsely humorous dialogue seemed to him to be part of the popular demand; and, looking about for a plot, he found something to suit him ina Spanish source, and wrote The Wild Gallant. The play was acted in February 1663, by Killigrew's company in Vere Street. It was not a success, although the most farcical incident received a certain interest and probability from a story which was current at the time. That astudent, fresh from his library, trying to hit the taste of the groundlings with ribald farce, should make the ingredients too strong even for their palates, was but natural. Pepys showed good judgment in pronounc- ing the play "so poor a thing as ever I sawin my life." That such a play should be written by Dryden, and acted in by one of the daughters of Stephen Marshall, must have been a bitter thought for Puritanism at the time. Dryden never learned moderation in his humour; there is a student's clumsiness and extravagance in his indecency ; the plays of Etherege, a man of the world, have not the uncouth riotousness of Dryden's. Of this he seems to have been conscious, for when the play was revived, in 1667, he complained in the epilogue of the difficulty of comic wit, and admitted the right of a common audience to judge of the wit's success. Dryden, indeed, took a lesson from the failure of The Wild Gallant; his next comedy, The Rival Ladies, also founded on a Spanish plot, produced before the end of 1663, was correctly described by Pepys as "a very innocent and most pretty witty play," though there was much in it which the taste of our time would consider indelicate. But he never quite conquered his tendency to extravagance. The Wild Gallant was not the only victim. The Assignation, 07 Love in a Nunnery, produced in 1673, shared the same fate ; and even as late as 1680, when he had had twenty years' experience to guide him, Limberham, or the Kind Keeper, was prohibited,

after three representations, as being too indecent for the |

stage. Dislike to indecency we are apt to think a some- what ludicrous pretext to be made by Restoration play- goérs, and probably there was some other reason for the sacrifice of Limberham ; still there is a certain savageness in the spirit of Dryden's indecency which we do not find in his most licentious contemporaries. The undisciplined force

of the man carried him to an excess from which more dexterous writers held back.

After the production of The Rival Ladies in 1663, Dryden assisted Sir Robert Howard in the composition of a tragedy in heroic verse, Zhe Indian Queen, produced with great splendour in January 1664. It was probably through this collaboration that Dryden made the acquaintance of Lady Elizabeth Howard, Sir Robert's sister, whom he married on the lst of December 1663. Lady Elizabeth's reputation was somewhat compromised before this union, and, though she brought some small addition to the poet's income, she does not seem to have added to his happiness. The Indian Queen was a great success, one of the greatest since the reopening of the theatres. This was in all likeli- hood due much less to the heroic verse and the exclusion of. comic scenes from the tragedy than to the magnificent scenic accessories—the battles and sacrifices on the stage, the aerial demons singing in the air, and the god of dreams ascending through a trap. The novelty of these Indian spectacles, as well as of the Indian characters, with the splendid Queen Zempoalla, acted by Mrs Marshall in a real Indian dress of feathers presented to her by Mrs Aphra Behn, as the centre of the play, was the chief secret of the success of Zhe Indian Queen. These melodramatic pro- perties were so marked a novelty that they could not fail to draw the town. The heroic verse formed but a small ingredient in the play ; still, being also anovelty which had just been introduced by Davenant in The Svege of Rhodes, it interested the scholarly part of the audience, and so helped to consolidate the success of the stage carpenter. Dryden was tempted to return to tragedy: he followed up The Indian Queen with The Indian Emperor, which was acted in 1665, and also proved a success.

But Dryden was not content with writing tragedies in rhymed verse. Taking it up with enthusiasm as the only thing which the Elizabethan dramatists had left for their successors to excel in, he propounded the propriety of rhyme in serious plays as a thesis for discussion, and made it the prominent question of the day among men of letters. He took up the question immediately after the success of Z'he Indian Queen, in the preface to an edition of The Rival Ladies. In that first statement of his case, he considered the chief objection to the use of rhyme, and urged his chief argument in its favour. Rhyme was not natural, some people had said ; to which he answers

that it is as natural as blank verse, and that much of its unnaturalness is not the fault of the rhyme but of the writer, who has not sufficient command of language torhyme easily. In favour of rhyme he has to say that it at once stimulates the imagination, and prevents it from being too discursive in its flights. During the Great Plague, when the theatres were closed, and Dryden was living in the country at the house of his father-in-law, the earl of Berkshire, he occupied a considerable part of his time in thinking over the principles of dramatic composition, and threw his meditations and conclusions into the form of a dialogue, which he called an Essay of Dramatic Poetry, and published in 1668. One of the main topics of the essay was the admissibility of rhyme in serious plays, Dryden making Neander, the interlocutor who represents himself, repeat with fresh illustrations all that he had said in its favour. By this time, however, Sir R. Howard, his brother-in-law, whom he had joined in writing the rhymed Indian Queen, had changed his mind about the heroic couplet, and made some offensive comments on Dryden's essay in a hoity-toity preface to The Duke of Lerma. Dryden at once replied to his brother-in- law in a master-piece of sarcastic retort and vigorous reasoning, publishing his reply as a preface to Zhe Indian Emperor. Itis the ablest and most complete statement of his views about the employment of rhymed couplets in tragedy..

Before his return to town at the end of 1666, when the theatres were reopened, Dryden wrote a poem on the Dutch war and the Great Fire, entitled Annus Mirabilis. The poem is in quatrains, the metre of his Heroic Stanzas in praise of Cromwell, which Dryden chose, he tells us, ‘‘ because he had ever judged it more noble and of greater dignity both for the sound and number than any other verse in use amongst us.” The preface to the poem contains an interesting discussion of what he calls “ wit-writing,” intro- duced by the remark that ‘the composition ofall poems is or ought to be of wit.” His description of the Fire is a famous specimen of this wit-writing, much more careless and daring, and much more difficult to sympathize with, than the graver conceits in his panegyric of the Protector. In Annus Mirabilis the poet apostrophizes the newly founded Royal

Society, of which he had been elected a member in 1662, more probably through personal connection than on the ground of scientific attainments.

From the reopening of the theatres in 1666, till November 1681, the date of his Absalom and Achitophel, Dryden pro- duced nothing but plays. The stage was his chief source of income. Secret Love, or the Maiden Queen, a tragi- comedy, produced in March 1667, does not come up to our expectations as the first-fruit of the author's rest from com- position and prolonged study of dramatic art. The prologue claims that it is written with pains and thought, by the exactest rules, with strict observance of the unities, and 'a mingled chime of Jonson's humour and of Corneille's rhyme ;" but it owed its success chiefly to the charm of Nell Gwynne's acting in the part of Florimel. It is notice- able that only the more passionate parts of the dialogue are rhymed, Dryden's theory apparently being that rhyme is then demanded for the elevation of the style. His next play, Sir Martin Marall, an adaptation from Moliére's L' Etourdi, was produced at the Duke's Theatre, in the name of the duke of Newcastle. It was about this time that Dryden became a retained writer under contract for the King's Theatre, receiving from it £300 or £400 a year, till it was burnt down in 1672, and about £200 for six years more till the beginning of 167& If Sir Martin Marall was written but not produced before this contract was entered into, one can understand why it was announced as the duke of Newcastle's. His co-operation with Davenant in a new version of Shakespeare's Tempest —for his share in which Dryden can hardly be pardoned on the ground that the chief alterations were happy thoughts of Davenant's, seeing that he affirms he never worked at anything with more delight—must also be supposed to be anterior to the com- pletion of his contract with the Theatre Royal. The existence of the contract came to light from Dryden's non-fulfilment of its terms. He was engaged to write three plays a year, and he contributed only ten plays during the ten years of his engagement, finally exhausting the patience of his partners by joining in the composition of a play for the rival house. In adapting Z'Ztowrdi, Dryden did not catch Moliére's lightness of touch; his alterations go towards making the comedy into a farce. Perhaps all the more on this account Sir Martin Marall had a great run at the theatre in Lincoln's Inn Fields. As we have said, there is always a certain coarseness in Dryden's humour, apart from the coarseness of his age,—a certain forcible roughness of touch which belongs to the

character of the man. His An Evening's Love, or the Mock Astrologer, an adaptation from the younger Corneille, produced at the King's Theatre in 1668, seemed to Pepys very smutty, and nothing so good as The Maiden Queen or The Indian Emperor of Dryden's making." Evelyn thought it foolish and profane, and was grieved "to see how the stage was degenerated and polluted by the licentious times." Ladies & la Mode, another of Dryden's contract comedies, produced in 1668,

was "so mean a thing," Pepys says, that it was only oncé acted, and Dryden never published it. Of his other comedies, Marriage & la Mode (produced 1672), Love in a Nunnery (1672), Limberham, or the Kind Keeper, only the first was moderately successful. The failure was not due to want of ribaldry.

While Dryden met with such indifferent success in his willing efforts to supply the demand of the age for low comedy, he struck upon a really popular and profitable vein in heroic tragedy. Tyrannic Love, or the Royal Martyr, a Roman play, in which St Catherine is introduced, and with her some striking supernatural machinery, was produced in 1669, It is in rhymed couplets, but the author again did not trust solely for success to them ; for, besides the magic incantations, the singing angels, and the view of Paradise, he made Nell Gwynne, who had stabbed herself as Valeria, start to life again as she was being carried off the stage, and speak a riotously funny epilogue, in violent contrast to the serious character of the play. Almanzor and Almahide, or the Conquest of Granada, a tragedy in two parts, appeared in 1670. It seems to have given the crowning touch of provocation to the wits, who had never ceased to ridicule the popular taste for these extravagant heroic plays. Dryden almost invited burlesque in his epilogue to Zhe Conquest of Granada, in which he charged the comedy of the Elizabethan age with coarseness and mechanical humour, and its conceptions of love and honour with meanness, and claimed for his own time and his own plays an advance in these respects. Zhe Lehearsal, written by the duke of Buckingham, with the assistance, it was said, of Clifford, Sprat, and others, and produced in 1671, was a severe and just punishment for this boast. Dryden is here unmercifully ridiculed under the name of Bayes, he having obtained the laureateship from the king (with a pension of

£300 a year and a butt of canary wine) in 1670. It is said that The Rehearsal was begun in 1663 and ready for representation before the Plague. But this probably only means that Buckingham and his friends were so tickled with the absurdities of Davenant's operatic heroes in The Siege of Rhodes, and the extravagant heroics of The Indian Queen, that they resolved to burlesque them. Materials accumulated upon them as the fashion continued, and by the time Dryden had produced his 7yrannic Love, and his Conquest of Granada, he had so established himself as the chief offender as to naturally become the centre of the burlesque. It is commonly said that Dryden passed over the attack on himself without reply, either because he admitted its justice or because he feared to offend the king's favourite. But this is not strictly so; his reply is contained in the dedication and preface to his Conquest of Granada; and his prose defence of the epilogue was published in 1672, in which, so far from laughing with his censors, he addresses them from the eminence of success, saying that " with the common good fortune of prosperous gamesters he can be content to sit quietly." Heroic verse, he assures them, is so established that few tragedies are likely henceforward to be written in any other metre, and he retorts upon their exposure of improbabilities in his plays, by criticizing the ridiculous incoherent stories and mean writing of Shakespeare and Jonson. Dignified reasser- tion of his positions was Dryden's way of meeting the ridicule of The Rehearsal. In the course of a year or two, Zhe Conquest of Granada being attacked also by Settle, a rival playwright who had obtained considerable success, he had an opportunity of taking revenge in a style more suited to his sharp temper and power of severe writing.

BDryden's reply to The Rehearsal was lofty and firm. But though he put a bold face on a practice which it is but fair to suppose that he adopted only to supply a popular

demand, he did not write many more heroic plays in rhyme. Perhaps the ridicule of The Fehearsal had destroyed their popularity. His next tragedy, Amboyna, an exhibition of certain atrocities committed by the Dutch on English merchants in the East Indies, put on the stage to inflame the public mind in view of the Dutch war, was written, with the exception of a few

passages, in prose, and those passages in blank verse. An opera which he wrote in rhymed couplets, called The State of Innocence, or the Fall of Man, an attempt to turn part of Paradise Lost into thyme, as a proof of its superiority to blank verse, was prefaced by an apology for heroic poetry and poetic licence, and published in 1674, but it was never acted. The redeeming circumstance about the performance is the admiration professed by the adapter for his original, which he pronounces “ undoubtedly one of the greatest, most noble, and most sublime poems which either this age or nation has produced.” Dryden is said to have had the elder poet’s leave “to tag his verses.” Aurengzebe was Dryden’s last rhymed tragedy. In the prologue he confessed that he had grown weary of his long-loved mistress rhyme. But the stings of Zhe Rehearsal had stimulated him to do his utmost to justify his devotion to his mistress. He claims that Awrengzebe is “ the most correct ” of his plays, and it is certainly superior, both in versification and in moderation of language, to its predecessors. It was acted in 1675, and published in the following year.

If Dryden-had died in 1676, at the age of forty-five, he would have left a very inconsiderable name behind him. The fray between him and Settle might have been looked. upon as a passage at arms between equals. After the pro- duction of Aurengzebe he seems to have rested for an interval from writing, enabled to do so, probably, by an additional pension of £100 granted to him by the king. During this interval he would seem to have reconsidered the principles of dramatic composition, and to have made a par- ticular study of the works of Shakespeare. The fruits of this appeared in AU for Love, or the World Well Lost, a version of the story of Antony and Cleopatra, produced in 1678, which must be regarded as a new departure in his dramatic career, a very remarkable departure for a man ofjhis age, and a wonderful proof of undiminished openness and plasticity of mind. In his previous writings on dramatic theory, Dryden, while admiring the rhyme of the French dramatists as an advance in art, did not give the same praise to the regularity of their plots ; he was disposed to give the preference to the irregular structure of the Elizabethan dramatists, as being more favourable to variety both of action and of character. But now he abandoned rhyme, and, if we might judge from All for Love, and the precepts laid down inhis Grounds of Criticism in Tragedy, the chief point in which he aimed at excelling the Elizabethans was in giving greater unity to his plot. He upheld

still the superiority of Shakespeare to the French dramatists in the delineation of character, but he thought that the scope of the action might be restricted, and the parts bound more closely together with advantage. Adi for Love and Antony and Cleopatra are two excellent plays for the comparison of the two methods. Dryden gave all his strength to Ad for Love, writing the play for himself, as he said, and not for the public. Carrying out the idea expressed in the title, he represents the two lovers as being more entirely under the dominion of love than Shakespeare's Antony and Cleopatra. Shakespeare's Antony ismoved by other impulses than the passion for Cleopatra ; it is his master motive, but it has to maintain a struggle for supremacy; " Roman thoughts " strike in upon him even in the very height of the enjoyment of his mistress's love, he chafes under the yoke, and breaks away from her of his own impulse at the call of spontaneously reawakened ambition. Dryden's

Antony is so deeply sunk in love that no other impulse has power to stir him ; it takes much persuasion and skilful arti- fice to detach him from Cleopatra even in thought, and his soul returns to her violently before the rupture has been completed. On the other hand, Dryden's Cleopatra is so completely enslaved by love for Antony that she is incapable of using the calculated caprices and meretricious coquetries which Shakespeare's Cleopatra deliberately practises as the highest art of love, the surest way of maintaining her empire over her great captain's heart. It is with difficulty that Dryden's Cleopatra will agree, on the earnest solicitation of a wily counsellor, to feign a liking for Dolabella to excite Antony's jealousy, 4nd she cannot keep up the pretence through a few sentences. The characters of the two lovers are thus very much contracted, indeed almost overwhelmed, beneath the pressure of the one ruling motive. And as Dryden thus introduces a greater regularity of character into the drama, so he also very much contracts the action, in order to give probability to this temporary subjugation of individual character. The action of Dryden's play takes place wholly in Alexandria, within the compass of a few days; it does not, like Shakespeare's, extend over several years, and present incessant changes of scene. Dryden chooses, as it were, a fragment of an historical action, a single moment during which motives play within a narrow circle, the

culminating point in the relations between his two per- sonages. He devotes his whole play, also, to those relations ; only what bears upon them is admitted. In Shakespeare's play we get a certain historical perspective, in which the love of Antony and Cleopatra appears in its true proportions beneath the firmament that overhangs human affairs. In Dryden's play this love is our universe ; all the other con- cerns of the world retire into a shadowy, indistinct background. If we rise from a comparison of the plays with an impression that the Elizabethan drama is a higher type of drama, taking Dryden's own definition of the word as "a just and lively image of human nature," we rise also with an impression of Dryden's power such as we get from nothing else that he had written since his Heroic Stanzas, twenty years before.

It was twelve years before Dryden produced another tragedy worthy of the power shown in All for Love. Don Sebastian was acted and published in 1690. In the interval, to sum up briefly Dryden's work as a dramatist, he wrote Hdipus (1678) and The Duke of Guise (1683) in con- junction with Lee; Totus and Cressida, 1679; The Spanish Friar, 1681; Albion and Albanius, an opera, 1685; Amphitryon, 1690. In Troilus and Cressida he follows Shakespeare closely in the plot, but the dialogue is rewritten throughout, and not for the better. The versifi- cation and the language of the first and the third acts of Cidipus, which with the general plan of the play were Dryden's contribution to the joint work, bear marked evi- dence of his recent study of Shakespeare. The plot of Don Sebastian is more intricate than that of All for Love. It has also more of the characteristics of his heroic dramas ; the extravagance of sentiment and the suddenness of impulse remind us occasionally of The Indian Emperor ; but the characters are much more elaborately studied than in Dryden's earlier plays, and the verse is sinewy and power- ful. It would be difficult to say whether Don Sebastran or All for Love is his best play ; they share the palm between them. Dryden's subsequent plays are not remarkable. Their titles and dates are—King Arthur, an opera, 1691; Cleomenes, 1692; Love Triwmphant, 1694.

Soon after Dryden's abandonment of heroic couplets in tragedy, he found new and more congenial work for his favourite instrument in satire, As

usual the idea was not original to Dryden, though he struck in with his majestic step and energy divine, and immediately took the lead.

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His pioneer was Mulgrave's Essay on Satire, an attack on Rochester and the court, circulated in 1679. Dryden him- self was suspected of the authorship, and cudgelled by hired ruffians as the author ; but it isnot likely that he attacked the king on whom he was dependent for the greater part of his income. In the same year Oldham's satire on the Jesuits had immense popularity, chiefly owing to the excite- ment about the Popish plot. Dryden took the field as a satirist towards the close of 1681, on the side of the court, at the moment when Shaftesbury, baffled in his efforts to exclude the duke of York from the throne as a papist, and secure the succession of the duke of Monmouth, was wait- ing his trial for high treason. Absalom and

Dryden's next poem in heroic couplets was in a different strain, On the accession of James, in 1685, he became a Roman Catholic. There has been much discussion as to whether this conversion was or was not sincere, It can only be said that the coincidence between his change of faith and his change of patron was suspicious, and that Dryden's character for consistency is certainly not of a kind to quench Suspicion. The force of the coincidence cannot be removed by such pleas as that his wife had been a Roman Catholic

for several years, or that he was converted by his son, who'

was converted at Cambridge, even if there were any evidence for these statements, Scott defended Dryden's conversion, as Macaulay denounced it, from party motives; on any other grounds, it is not worth discussing. Nothing can be

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clearer than that Dryden all his life through regarded his literary powers as a means of subsistence, and had little scruple about accepting a brief on any side. Zhe Hind and Panther, published in 1687, is an ingenious argument for Roman Catholicism, put into the mouth of 'a milk-white hind, immortal and

unchanged.” There is considerable beauty in the picture of this tender creature, and its enemies in the forest are not spared. One can understand the admiration that the poem received when such allegories were in fashion. It was the chief cause of the veneration with which Dryden was regarded by Pope, who, himself educated in the Roman Catholic faith, was taken as a boy of twelve to see the veteran poet in his chair of honour and authority at Will’s coffee-house. It was also very open to ridicule, and was treated in this spirit by Prior and Montagu, the future earl of Halifax. Dryden’s other literary services to James were a savage reply to Stillingfleet—-who had attacked two papers published by the king immediately after hig accession, one said to have been written by his late brother in advocacy of the Church of Rome, the other by his late wife explaining the reasons for her conversion—and a translation of a life of Xavier in prose. He had writ- ten also a panegyric of Charles, and a eulogy of James under the title of Britannia Rediviva, which it is in- teresting to compare with his other productions of the same kind. | Dryden did not abjure his new faith on the Revolution, and so lost his office and pension as laureate and historio- grapher royal. For this act of constancy he deserves credit, if the new powers would have considered his services worth having after his frequent apostasies. His rival Shadwell reigned in his stead. Dryden was once more thrown mainly upon his pen for support. He turned again to the stage and wrote the plays which we have enumerated. A great feature in the last decade of his life was his translations from the classics. A volume of miscellanies published in 1685 had contained some translations from Virgil, Horace, Lucretius, and Theocritus. He now produced translations more deliberately as a saleable commodity. A volume of miscellanies, which appeared in 1693, contained translations from Homer and Ovid. In the same year he published a translation of the satires of Juvenal and Persius, written with the assistance of his two elder sons. Johnson passes on this work the just criticism that “ though, like all other productions of Dryden, it may have shining parts, it seems to have been written merely for wages, in an uniform mediocrity.” When Dryden took his farewell of the stage in 1694, he announced his intention of devoting himself to a translation of the whole of Virgil. On this he seems really to have laboured, and great expectations were formed of it. It was published in 1697, and proved a great success. To judge it by its fidelity as a reproduc- tion of the original would be to apply too high a standard, but it is an interesting rendering of Virgil into the style

of Dryden, and as a poem was read with delight in its own age. Soon after its publication, Dryden wrote one of his master-pieces, the second Ode on St Cecilia's day. His next work was to render some of Chaucer's and Boccaccio's tales and Ovid's metamorphoses into his own verse. These translations appeared a few months before his death, and are known by the title of Fables. Thus a large portion of the closing years of Dryden's life were spent in translating for bread. He had a windfall of 500 guineas from Lord Abingdon for a poem on the death of his wife in 1691, but generally he was in considerable pecuniary straits. He is supposed to have received occasional presents from rich and powerful friends, but he never received anything from the court, and he was too proud to make advances. Besides, his three sons held various posts in the service of the Pope at Rome, and he could

not well be on good terms with both courts. However, he was not molested in London by the Government, and in private he was treated with the respect due to his old age and his admitted position as the greatest of living English poets. His death took place on the Ist of May

700.

; Dryden's conversion to Catholicism had a great indirect influence on the preservation of his fame. It was this which gained him the discipleship and loving imitation of Pope. He thus became by accident, as it were, the literary father and chief model of the greatest poet of the next generation. If his fame had stood simply upon his merits as a poet, he would in all likelihood have been a much less imposing figure in literary history than he is now. The splendid force of his satire must always be admired, but there is surprisingly little of the vast mass of his writings that can be considered worthy of lasting remembrance. He showed little inventive genius. He was simply a masterly litéérateur of immense intellectual energy, whose one lucky hit was the first splendid application of heroic couplets to satire and religious, moral, and ,political argu- ment, Upon this lucky hit supervened another, the accidental discipleship of Pope. Dryden lent his gift of verse to the service of politics, and his fame profited by the connection. It would be unjust to say that his fame was due to this, but it was helped by this; apart

from the attachment of Pope, he owed ‘to party also something of the favour of Johnson and the personal championship and editorial zeal of Scott.

The standard edition of Dryden is Scott’s. There is an admir- able edition of his poetical works in the Globe series, by Mr W. D. Christie, enriched with an elaborately accurate memoir and pains-

taking notes. His two best plays, 4d/ for Love and Don Sebastian, have recently been republished by Mr. J. L. Seton. (W. M.)

DRY ROT, a disease in timber, apparently infectious, which occasions the destruction of its fibres, and reduces it eventually to a mass of dry dust. It is produced most readily in a warm, moist, stagnant atmosphere, while com- mon or wet rot is the result of the exposure of wood to re- peated changes of climatic conditions. In both diseases, however, a kind of spontaneous combustion or decomposition goes on in the wood ; water, carbonic acid gas, and probably carburetted hydrogen are evolved, and a pulverulent sub- stance, or humus, remains. Though the growth of fungi undoubtedly accelerates the progress of dry rot, it would seem that the true origin of the disease is the incipient decomposition of the sap in wood, and that by virtue of this decomposition the fungi obtain a nidus for their growth. The most formidable of the dry rot fungi is the species Merulius lacrymans, which is particularly destructive of coniferous wood ; other species are Polyporus hybridus, which thrives in oak-built ships, and P. destructor and Thelephora puteana, found in a variety of wooden struc- tures, The nature of ships’ cargoes has a considerable in- fluence on the duration of their timbers,—hemp, pepper, and cotton being highly favourable, and lime and coal un- favourable, to the development of dry rot. The commonest precaution against the occurrence of that disease is to deprive the wood of its moisture by exposure to the open air, or, in other words, to season it, Charring, steaming, boiling, and smoke-curing are other modes of desiccation which have been resorted to, At one time a Mr Lukin

attempted the rapid seasoning of logs of green oak at Wool-

wich dockyard by heating them in pulverized charcoal ; but

the process, though it lessened the weight and dimensions of He then’

the wood, started its fibres from one another. sought to replace the moisture of heated wood by the pro- ducts of the distillation of pitch-pine saw-dust ; before, however, the operation was judged to be complete, an ex- plosion took place, which proved fatal to eight workmen,

if cut at other seasons. which dissolves out or alters its putrescible constituents, has long been practised as a means of seasoning. The old

and wounded twelve; the experiment, therefore, was not

repeated. Davison and Symington’s patent process of arti- ficial drying, which has been found to yield good results,

consists in exposing the wood to a current of air moving at

the rate of about 48 miles an hour, and having’a tempera- ture of 110° to 112° Fahr.

The felling of trees when void of fresh sap, as a means

of obviating the rotting of timber, is a practice of very ancient origin. good timber, trees should be cut to the pith, so as to allow of the escape of their sap, which by dying in the wood would injure its quality ; also that felling should take place only from early autumn until the end of winter. posed superior quality of wood cut in winter, and the early practice in England of felling oak timber at that season, may be inferred from a’statute of James I, which enacted

Vitruvius directs (ii. cap. 9) that, to secure

The sup-

‘that no person or persons shall fell, or cause to be felled,

any oaken trees meet to be barked, when bark is worth 2s. a cart-load (timber for the needful building and reparation of houses, ships, or mills only excepted), but between the first day of April and last day of June, not even for the king's use, out of barking time, except for building or repairing his Majesty's houses or ships." mony before a committee of the House of Commons in March 1771, Mr Barnard of Deptford expressed it as his opinion that to secure durable timber for ship-building, trees should be barked in spring and not felled till the succeed- ing winter. limited the felling of timber from the lst October to the

In giving testi-

In France, so long ago as 1669, a royal decree

15th April ; and, in an order issued to the commissioners of forests, Napoleon I. directed that the felling of naval

timber should take place only from November 1 to March

15, and during the decrease of the moon, on account of the rapid decay of timber, through the fermentation of its sap, The burying of wood in water,

" Resistance " frigate, which went down in Malta harbour, remained under water for some months, and on being raised was found to be entirely freed from the dry rot fungus that had previously covered her ; similarly, in the ship ' Eden," the progress of rot was completely arrested by 18 months' submergence in Plymouth Sound, so that after remaining a year at home in excellent condition she was sent out to the East Indies. It was an ancient practice in England to place timber for thrashing-floors and oak planks for wain- scotting in running water to season them. Whale and other oils have been recommended for the preservation of wood ; and in 1737 a patent for the employment of hot oil was taken out by a Mr Emerson. Common salt, but for the attraction of its impurities for moisture, might be advantageously used ; indeed the Dutch ship-builders, hav- ing observed that the busses in which herrings were stowed away in pickle lasted longer than any other craft, adopted the practice of filling up with salt, not only the vacant spaces between the planks, but also holes bored for its reception in the large timbers.

Among the many processes for the prevention of dry and wet rot in wood by impregnating it with material capable of precipitating its coagulable constituents in a permanently insoluble and imputrescible form, the following may be enumerated :—Kyan's (1832), in which, according to Sir Humphry Davy's suggestion, a solution of corrosive sublimate is employed ; Sir W. Burnett's (1836), M. Breant's (1837), Margary's (1837), and Payne's (1841), which consist respectively in the use of zine chloride, copperas, copper sulphate, and copperas followed by sodium carbonate ; and Bethell's (1838), for the treatment of the wood with crude creasote or oil of tar. The application of solution of copper sulphate, containing about a quarter of a

pound of the salt to each gallon of water, according to Margary's patent, has been found very efficacious in the case of timber not liable to the solvent action of water ; but of all processes the most satisfactory is Bethell's. In this the wood is injected with heavy tar-oil in cylinders 6 feet in diameter and 20 to 50 feet in length, at a temperature of 120° Fahr., and under a pressure of 150 tb to the square inch, so that ordinary fir timber absorbs on the average 8 to 10 tb of the liquid per cubic foot. Timber thus prepared has been found not only durable, but also exempt from the attacks of insects and other pests.

J. Papworth, An Essay on the cause of the Dry Rot in Buildings, 1806 ; Bowden, A 7'reatise on the Dry Rot, 1815 ; Wade, A Treatise on the Dry Rot in Timber, 1815 ; Chapman, On the Prevention of Timber from Premature Decay, 1817; M'Williams, Hssay on the Origin and Operation of the Dry Rot, 1818 ; Burnell in Journal of the Society of Arts, June 1, 1860, vol. viii.

DU BARRY GOMARD DE VAUBERNIER, Martz JEANNE, Countess (1746-1793), mistress of Louis XV., was the daughter of Vaubernier, a clerk of the customs at Vaucouleurs, and was born there on the 19th August 1746. She received little or no education, and, coming to Paris while yet very young, she entered the house of a 'mar- chande de modes." She soon fell a victim to the tempta- tions which there beset her, and lived as a courtesan under the name of Mdlle. Lange. Her great and peculiar per- sonal charms

led Jean Count Du Barry to form the design of receiving her into his house, in order to make it more attractive to the dupes from whom by gambling he won money to furnish him with the means of dissipation, Her success surpassing his expectations, his hopes took a higher flight, and he presented her to Lebel, valet de chambre of Louis XV., with the intention that she should become the mistress of the king, In this she succeeded ; but as the favour shown by Louis to a courtesan roused murmurs in the court and remonstrances from his ministers and the members of the royal family, Louis, who was too infatuated to remove her, met their wishes half-way by securing for her a nominal husband. Count Jean Du Barry was married himself, but his brother William offered himself for the ceremony, and after its performance the Countess Du Barry was presented at court on the 22d April 1769. Her influ- ence over the monarch was absolute until his death, and courtiers and ministers were in favour or disgrace with him in exact accordance with her wishes. The Duc de Choiseul, who refused to acknowledge her, was disgraced in 1771; and the Duc d'Aiguillon, who had the reputation of being her lover, took his place, and in concert with her governed the monarch. The favour of Louis for the Countess Du Barry continued to estrange him from his children and from the most of the royal family, and this isolation induced him to build for her the magnificent mansion of Luciennes. At his death in 1774 an order of his successor banished her to I' Abbaye-du-Pont-aux-Dames, near Meaux, but the queen interceding for her, the king in the following year gave her permission to reside at Luciennes with a pension. Having gone to England in 1792 to endeavour to raise money on her jewels, she was on her return accused before the Revolutionary tribunal of having dissipated the treasures of the state, conspired against the republic, and worn, in London, "mourning for the tyrant." She was con- demned to death December 7, 1793, and beheaded the same evening.

DUBLIN, a maritime county of Ireland, situated in the province of Leinster, and containing the Irish metropolis, It is bounded on the N. by the county Meath, E. by the Irish Sea, 8. by Wicklow, and W. by Kildare and Meath. With the exception of Louth and Carlow, Dublin is the smallest county in Ireland. Its greatest length is 32 miles, its greatest breadth 18; and the area is 354 square miles, or 226,895 acres,

Geology.—The greater part of the county rests on the eastern extremity of the great bed of flotz limestone that extends over the middle of the island, widening as it spreads westward. It rises in its southern part into a range of mountains, which forms the verge of an elevated district, extending thence for more than thirty miles to the south through the county of Wicklow. Through this tract a large body of granite passes in a south-western direction, com- mencing at Blackrock and passing by Dundrum and Rath- farnham, and forming the loftiest summit in the county, bounded on its eastern and western sides by incumbent rocks of great variety of structure and relations ; micaceous schist exists at Killiney and Rathfarnham, and argillaceous schist, on both sides of the granite and quartz rock, in the eastern side alone, forming the promontory of Bray Head, and reappearing in the more northern part of the county, where it forms the picturesque peninsula of Howth, and rises to the height of 567 feet above the level of the sea. The country. near Bray presents, within a small space, an instructive series of rocks; and at Killiney schistose beds are to be seen, of considerable extent, reposing on granite. Near Booterstown, a mass of compact limestone is visible within a few fathoms of the granite. Calp, or “ black quarry stone,” a variety of limestone, is the prevailing rock in the immediate vicinity of Dublin, and is much used for building ; and the granite of Dalkey and the neighbour- hood is also much used for architectural purposes in the city and environs ; quantities of it are exported to Eng- land. Petrifactions abound in many parts of the limestone country. In. the peninsula of Howth gray ore of man- ganese, brown ironstone, and brown iron-ore occur in abun- dance.

Surface.—The northern portion of the county is flat, and the soil good, particularly on the borders of Meath; but on the southern side the land rises into elevations of consider- able height. The mountains are chiefly covered with heath, except where a subsidence in the ground affords a nucleus for the formation of bog, with which about 2000 acres are covered.{ | There are also a few small tracts of bog in the northern part of the county. The mountain district is well adapted for timber, to the growth of which some attention has lately been paid.

Coast.—The northern coast of the county from Bal- briggan to Howth has generally a sandy shore, and affords only the small harbours of Balbriggan and Skerries. In the promontory of Howth, the coast suddenly assumes a bolder aspect ; and between the town of Howth and the picturesque rocky islet of Ireland's Eye an artificial harbour has been constructed, at an expense of above one-third of a million sterling, which is useful only to vessels of small burthen, and those engaged in the fisheries. Soon after the harbour was finished it was discovered that a shifting sand- bank was likely to render the refuge quite useless; and the slow but certain filling upjof the harbour is made apparent at low tide. Kingstown harbour, on the south side of Dublin Bay, is by far the best in the county. It was commenced in 1816, and was not quite finished until 1859,—at a total expenditure of £825,000. A quay runs out into the harbour to a distance of 500 feet, at which vessels drawing 24 feet of water may unload at any state of the tide. The petty harbours of Bullock and Coolamore are on this coast, the former being quite dry save at high tide, and the mouth of the latter being much higher than the bed. Balbriggan is little better, and that at Skerries is hardly to be mentioned. Opposite Coolamore harbour lies Dalkey Island, and the sound between the island and the shore is. held to be dangerous in certain conditions of weather. The island is 22 acres in extent, and stands about midway between Kingstown harbour and the beauti- ful bay of Killiney. North of Howth lies Lambay Island,

about 600 acres in area, the property of Lord Talbot de Malahide. Shell-fish, especially lobsters, are caught here in abundance. Small islets lie not far off, the most interesting of which is that known as Inispatrick, noted as the spot upon which St Patrick first landed in Ireland, and where he built his first church. Ireland's Eye, off Howth, is a very picturesque rock standing on about 54 acres of grass land. It has afforded great room for geological disquisition.

The fishery districts are Dublin and Howth. The chief stations are Howth and Skerries, the former of which is much used by the Manx and Cornish fishermen, who resort in considerable numbers to the harbour during the

fishing season. Dublin Bay haddocks and herrings have long been esteemed, and justly, for their superior quality and flavour.

Rivers and Mountains.—The chief river in the county is the Liffey, which rises in the Wicklow Mountains about twelve miles south-west of Dublin, and, after running about 50 miles, empties itself into Dublin Bay. The course of the river is so tortuous that 40 miles may be traversed and only 10 gained in direction. The scenery along the banks of the Liffey is remarkable for its beauty. The mountains which occupy the southern border of the county are the extremities of the great group guarding the adjacent county of Wicklow. The principal summits are the Three Rock Mountain and Garry Castle, the former having an elevation of 1586 feet, and the latter of 1869; and the group formed by Kippure and the Seefin range, Kippure being 2527, and Seefin 2150 feet high. But the grandest features ‘of these hills are the great natural ravines which open in them, the most extraordinary being the Scalp, through which the traveller passes from Dublin to Wick- low.

Agriculture.—Of the 226,895 acres which form the area of the county, 100,236 acres were returned in 1871 as under tillage, 91,503 as pasture, 4716 wood, 15,700 in towns, and 14,470 waste, bog, mountain, and water. The face of the county has indeed changed but little during the century, and the statistics as to the treatment of the soil ex- hibit an almost stationary result. The growth of the towns suburban to the city has made the only appreciable change, and that change has been not inconsiderable. The farms are in general small. Near Dublin, particularly on the southern side of the city, a very considerable portion of the county consists of ornamental grounds, and the rents are proportionately high.

The produce of the crops is generally greater than in any other county,—not so much on account of any natural superiority in the soil, as by reason of the facilities afforded by the neighbourhood of a large city, and the greater expenditure of capital on the land. Of cereals the prin- cipal crops are oats and wheat ; and of green crops, potatoes. In live stock the county is particularly rich in proportion to its extent. The following tables give the acreage of crops and numbers of stock in 1873 and 1876 :—

Oats, Wheat. Potatoes, Beige on

EIS) eapone 16,723 63892 10,107 6826 45,574 IEG aggen 16,009 5646 9,863 6566 49,789 “oh apa Cattle. Sheep, Pigs. Goats. Poultry.

1878…21,098 54,502 88,604 20,082 6245 194,880 1876…20,015 52,770 64,263 17,278 5878 218,531

_ As regards the division of the land, the number of hold- Ings in the county has somewhatdiminished within recent years. In 1853, there were 9016 separate holdings, while in 1876 there were only 8792. According to the Owners’ Returns of 1876, the county was divided in 1874 among 4100 proprietors, of whom 2526, or 614 per cent., held less than one acre of ground, a proportion almost identical with the average of Leinster. From the same

authority it appears that the total area held amounted to 217,457 acres, giving an average of 53 acres per holding (that of the province being 187) ; and the total valuation amounted to £686,794, giving an average of £3, 3s. 2d. per acre, as against 18s. 114d. for the whole province. Fourteen proprietors held more than 2000 acres each, and 57,969 acres in all, or 264 per cent. of the area, viz :— Charles Cobbe, 9662 acres; Earl of Howth, 7377; Sir C. C. W. Domville, 6252 ; George Woods, 4141; Sir Roger Palmer, 3991 ; Lord Langford, 3659 ; Jon Trant Hamilton, 3647; Mrs White, 3422; W. W. Hackett, 3198; Eyre Coote’s representatives, 3107; R. Q. Alexander, 2973 ; Earl of Pembroke, 2269; Lord Annaly, 2139; Marquis of Lansdowne, 2132.

The manufactures of the county are mainly confined to the city of Dublin and its neighbourhood. There is, how- ever, a manufactory of cotton hosiery at Balbriggan of some importance.

Administration, &c.—There are nine baronies in the county :—1l and 2. Balrothery East and West, containing Rush and Lusk (population 1800), Skerries (2236), and Balbriggan (2332); 3. Coolock, containing Clontarf (3442), and several minor villages; 4. Nethercross, con- taining the ancient parliamentary borough of Swords (1008), and the village of Glasnevin ; 5. Newcastle, con taining the village of Lucan, and Newcastle, which was

represented in the Irish Parliament by two members ; 6. Uppercross; 7. Rathdown, containing the towns of Dundrum (540), Blackrock (8089), Kingstown (16,378), Dalkey (2584), and Killiney (2290); 8. Castleknock, in which is situated the Phoenix Park; and 9. Dublin, con- taining the city and many outlying villages. The village of Donnybrook, famous for its fair and accompanying riotous pleasure, is now part of Pembroke township, one of the richest and most beautiful suburbs of the city.

The nine baronies, including the city, are divided into 99 parishes, all within the archdiocese of Dublin. The county proper, excluding the capital, contains 222,709 acres; the rateable property is valued at £700,854 ; the population at the last census (1871) was 158,936; and the number of houses, 28,803. Between 1841 and 1871 the increase of population was nearly 13-5 per cent., although between May 1851 and December 1871 there emigrated from the county 58,774 persons. In 1871, 70} per cent. of the total popula~ tion were Roman Catholics. In the city that denomination forms 79 per cent. The numbers of the last religious census were—Catholics, 111,964 ; Episcopalians, 39,289 ; Presby- terians, 2995; and various, 4688. There are two poor-law unions, Balrothery and Rathdown, but portions of the county are in unions situated in adjacent counties. The average daily number of paupers in the county workhouses in 1875 was 674.

Dublin is the head-quarters of the military district, and of the general commanding-in-chief and staff of Ire: land.

The total number of children receiving education in 1824— 26 was reported ina parliamentary return to be 23,008, In 1853, there were 159 national schools in operation, attended by 28,799 children, and in 1876 there were 52,127 children attending the national schools.

Previous to the union with Great Britain, this county returned ten representatives to the Irish Parliament,—two for the county, two for the city, two for the university, and two for each of the boroughs of Swords and Newcastle. The number of representatives was reduced to five by the Act of Union, one member being withdrawn from the uni- versity, and the boroughs of Swords and Newcastle disfran- chised. The Reform Act of

1832 restored the second member to the university, leaving the representation in other respects unchanged.

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History.—It is stated by Ptolemy that the county Dublin was inhabited by the tribe of the Eblani, who dwelt for the most part in Meath county, but on their settling in Dublin founded the eity Eblana, now presumed to be Dublin. Later writers affirm that the Eblani were driven out by the Danes, who held sway until the battle of Clontarf (1014) resulted in the overturn of their power. When the English landed, the people to the north of the Liffey were known among the Irish as Fingall, or white foreigners, and those living south of the river were ealled Dubhgall, or black foreigners. ‘The Rev. Cesar Otway professed to be able to diseern signs of the different races even as late as his day ; but the modern observer will fail to eatech any marks whereby different portions of the community may be distinguished. ‘

In 1210, King John formed this district into a county, compris- ing the chief portion of country within the English pale. The limits of the county were, however, uneertain, and underweut many changes before they were fixed. Although so near the seat of government, 67,142 acres of profitable land were forfeited in the Rebellion of 1641, and 34,586 acres in the Revolution of 1688. In 1608 the boundaries were definitely marked, the eountry inhabited by the O’Tooles and the O’Byrnes being formed into the county of Wicklow. The absence of any considerable towns decreases the interest in Dublin county, and it has no historic fields to boast of. In 1867 the most formidable of the Fenian risings took place near the village of Tallaght, about seven miles from the city. The rebels, who numbered from 500 to 700, were found wandering at dawn, some by a small foree of constabulary who, having in vain called upon them to yield, fired and wounded five of them; but the great bulk of them were overtaken by the troops under Lord Strath- nairn, who captured them with ease and marehed them into the city.

Plan ot Dublin.

London, 138 miles W. from Liverpool, and 60 miles W. from Holyhead,. in 53° 20’ 38” N. lat. and 6° 17’. 13” W. long., and is situated in the great central limestone district which stretches across the island from the Irish

Sea to the Atlantic Ocean, on the River Liffey, extending to the junc- tion of that river with the Bay of Dublin, the waters of which wash its south suburban shores.

In the reign of James II. the population of Dublin was 64,483 ; in 1728 it had more than doubled ; in 1753 it was 161,000 ; in 1798 Whitelaw estimated it at 182,000; according} to the first census (taken in 1821) it was 185,881; it was 232,726 in 1841, 254,808 in 1861, and 246,326 in 1871. This last decrease is due to the recent

DUBLIN

Sir John Forbes, a distinguished Scotch physician, who visited Ireland in 1852, speaks thus of the county in his Memoranda :— ‘Without leaving the county of Dublin, the antiquary would have no diffieulty in finding numerous objects of interest and instruction, casting light upon the early history of the country. Among the ancient raths, duns, or forts construeted by the native Irish or the Danes, and more probably by both people, for defence or seeurity in positions of natural strength, improved by art and labour, several remain in this county. One at Raheny, although much reduced in its proportions, is still traceable ; several yet more a pen are faintly visible at Coolock ; one near Lucan is furnished with the subterranean vaults and passages not unusually found in connection with the larger specimens ; and another at Shankhill or Rathmichael, near the remarkable natural pass through the mountain called the Scalp, is of greater extent than the others, more commanding in position, and in close proximity to the ancient church, and supposed fragment of a round tower. Numerous sepulchral mounds of the same period also exist scattered through- out the county, occasionally somewhat similar in appearance to the raths, but generally smaller in extent, altogether artificial, and of conical form. Among its most interesting antiquities this county reckons three of the ancient round towers almost peculiar to Ireland,—one at Swords, another at Lusk, forming one of the angles of the church steeple, and a third in the highest state of preservation at Clondalkin.”

DUBLIN, the metropolis of Ireland, in the county of Dublin and province of Leinster, is a county in itself, and a municipal and parliamentary borough ; the area of the former is 3808 acres. It is distant 292 miles W.N.W. from

increase in wealth and the consequent extra-city residence of the traders and merchants. The suburbs of Dublin have wonderfully improved within the past twenty years, and constitute at present the chief of the many attractions which the stranger is wont to admire. The outlying townships of Rathmines and Rathgar, Kingstown and Pembroke, Clontarf and Dalkey, are all inhabited by persons engaged in the commerce of the city. If we include these populations, the city may be said to contain about 330,000 souls, The par- liamentary borough, whose limits are more extensive than those of the municipal borough, covers an area of 5501 acres, and contained in 1871 a population of 267,717 persons, It returns two members to the imperial parliament.

DUBLIN

The rainfall is nearly 33 ‘inches; rain or snow falls on 960 days per annum; and the wind blows from the N. or E. for 120 days. The average death-rate is 27 per 1000.

The plan of the city is singularly simple. The Liffey flows almost through the centre from west to east, and the pridges connect long lines of streets running north and south. The communications between the two sides of the city are ample, there being 9 bridges in a distance of about a mile and a half, and ferries for the two miles of shipping between the last bridge and the mouth of the river. Sackville Street is the finest avenue in Dublin ; the houses, however, are not uniform, and the strect is not long enough for its width, while the Nelson Pillar, itself a beau- tiful object, blocks the view and interrupts the traffic. The memorial consists of a fluted Doric column 120 feet high, raised on a massive pedestal, the four sides of which show The Nile, Copenhagen, St Vincent, and Trafalgar. On the summit is a colossal statue of Nelson, surrounded by a balus- trade, to which there is an ascent by a spiral stair. The O’Connell monument, almost completed by Foley before his decease, is destined for the southern end of Sackville Street ; it will cost about £12,000. On the other side of the Liffey, across Carlisle Bridge, is Westmoreland Street,

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Environs of Dublin.

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with the Bank of Ireland and Trinity College at its southern end. At right angles to Westmoreland Street is Dame Street, unquestionably the best street in the city. The houses are lofty and massive, and more than one of them eolossal. At one end is Dublin Castle, and at the other the great front of the Bank and of Trinity college. ‘The chief drawback to Dublin as a city is the sudden transition from magnificence to meanness, and in no part of it is there freedom from this displeasing contrast. Close by its every splendid edifice is a purlieu, with its unpleasant character- istics. In addition to this, the soil is so oozy that, after even a slight shower it is melted into far-spreading mud- lakes, justifying the conjecture that Dublin was in old times the “Town of the Ford of Hurdles on the Black- water.” The River Liffey, too, which ought to be a source of beauty, is rendered offensive by receiving the drainage of the city. There are numerous elegant houses in the suburbs, surrounded by well-kept gardens. The slighter rivers, the Tolka, the Dodder, and the Tongue, meander through a well-cultivated country ; there is a noble supply of water for domestic purposes ; and lines of tramway run from the heart of tho city to every outlying district. Formerly Dublin was said to be bounded by the circular road, which is nine miles in extent ; but the growth of the

city has far outrun that limit. There are about 820 miles of streets in the borough under the control of the eorpora- tion; the valuation of the borough in 1871 (excluding exemptions, Government buildings, religious houses, é&c.) amounted to £596,000 ; the number of houses inhabited was 23,896, uninhabited 1059, and building 87. The want of a Building Act in Dublin has resulted in the absence in many places of anything like uniformity in the frontage, height, or character of its buildings. a

The condition of the varions orders of the community is perhaps best shown by citing the census returns as to the number of families occupying the four different classes of houses. There were 5035 families in houses of the 1st class, 10,523 families in the 2d elass, 16,819 in the 3d class, and 25,733 in the 4th class. The 58,110 families thus hold 23,896 houses. Another way of estimating Dublin society is by taking the oceupations of the people. In 1871 there were 331 clergymen in Dublin, 286 barristers, 370 attorneys, 49 architects, 215 accountants, 4000 bootmakers, 1660 tailors, 19,500 domestic servants, 83 photographers, 1000 coachmen and cabmen, 1600 drapers and mereers, 1280 carmen and carriers, 936 cabinetmakers, 3500 clerks, 177 civil engineers, 394 fishmongers, 38 glovemakers, 1867 grocers, 11,530 labourers, 4590 milliners, 1477 printers, 31 sculptors, 223 watch and clock makers, 458 wine and spirit merchants.

Judges, lawyers, and doctors may be said to constitute the higher society of Dublin; of the 182 peers of Ireland only two have residences in the capital.

The lord lieutenant lives in Dublin Castle in winter, and in the Viceregal Lodge, Phcenix Park, in summer. He is assisted in the executive by a privy council, nomi- nated by the Crown, and his chief secretary, who must have a seat in the House of Commons. Lords justices govern in the temporary absence of the lord-lieutenant—the lord chancellor, the commander-in-chief, and another privy councillor usually being appointed. Prior to the Act of 1869 disendowing and disestablishing the Jrish branch of the Established Church, the archbishop of Dublin was in- variably named a lord justice ; but in future the archbishop may or may not have a seat at the Council Board.

Dublin is the seat of the Irish courts of law and equity, from which appeal lies only to the House of Lords. The judicial functions are exercised by the lord chancellor, a lord justico of appeal, a vice-chaneellor, the master of the rolls, and four judges in each of the courts of Queen's bench, common pleas, and exchequer. There are also judges (1) in the court of admiralty, (2) in the bankruptcy court, and (3) in the landed estates court for the sale and transfer of estates in Ireland. The recorder's court determines civil bills and eity criminal cases.

Local Government.—The municipality is under the government of the lord mayor and corporation. Previous to the Municipal Reform Act of 1840 the corporation consisted of the lord mayor, 2 sheriffs, 24 aldermen, 124 common couneilmen, 28 sheriffmen, and 96 representatives of the 25 civie guilds. At present the corpora- tion consists of 15 aldermen and 45 councillors, there being one alderman and 3 councillors for each of the 15 wards into whieh the city is divided. An alderman or councillor is annually elected lord mayor. 'The ineome of the body arises from rents on property, eustoms, and taxes. The yield in 1875 was £286,804, the expenditure £255,944, and the debt £337,476. Under an Act passed in 1875 the corporation have the right to forward every year three names of persons suitable for the office of high sheriff to the vieeroy, one of whieh shall be selected by him. 'The lord mayor holds 'a weekly court for debts above 40s. and under £10, and for the settlement of cases between masters and servants. He is also elerk of the markets, and supervises weights and measures and deals with eases of adulteration. A court of conscience determines debts under 40s. and is presided over by the last ex-mayor. A com- petent fire-brigade is maintained by the corporation. The average number of fires per annum is between 50 and 60 ; 15 lives have been lost in ten years ; and property to the value of £485,800 saved in the same period. The eity coroner is a corporate officer. There were 292 inquests in 1875. Under an Act applicable only to Dublin the local rates are collected by a collector-general, and are distributed by him to the different authorities concerned.

Police.—The Dublin metropolitan police is a force peculiar to the city. The remainder of Ireland is protected civilly by the Royal

Irish Constabulary. The police are under the control of two commissioners, and consist of 7 superintendents, 76 inspectors, 641 sergeants, and 840 constables. A local police rate of 8d. in the £1 produces about £30,000 a year; and the taxes on hackney cars, drivers' licences, pawnbrokers' licences, and publicans eertificates, and fines in the police courts, average about £16,000. These two sums (£46,000), together with a Treasury grant averaging £95,000 a year, maintain the foree, and pay the commissioners and superior officers and the four police magistrates. The police are inspectors of the hackney carriages, which number nearly 2000. They carry out the laws affecting the sale of liquor, and the number of public houses in Dublin is 1012. A fair notion of the crime and offences committed in the city is afforded by the following statistics taken from official sources :— Number of persons arrested (1876), 42,439 ; number convicted either summarily or after trial before a superior judge,' 39,580; of those convicted 13,346 (8627 males and 4719 females) were charged with drunkenness ; 88 per- sons were sentenced to penal servitude (68 for five years) ; and 400 were sent to jail. Quarter sessions are held in the eity by the recorder ; and a commission of oyer and terminer is held twice a year by two of the superior judges. = ;

Military.—A large military force is usually maintained in the city of Dublin which is the headquarters of the military district of Dublin and of the staff of Ireland, consistingjof the commander of the forces, adjutant-general, and quartermaster-general. The troops are accommodated in several barracks, the most extensive of which is the Royal Barracks, consisting of five squares, affording quarters for 10 field officers, 83 officers, 2000 non-commissioned officers and privates, and 460 horses, together with a hospital for 260 patients, Richmond Barracks, for infantry, occupies an elec- vated healthy situation, on the banks of the Grand Canal, beyond Kilmainham, forming a} substantial fabric, with extensive courts and yards, covering altogether an area of 18 acres, and furnishing accommodation for 76 officers and 1600 non-commissioned officers and privates, stabling for

25 horses, and a hospital for 100 patients. Portobello barracks, for cavalry and artillery, is on the bank of the same canal, near Harold's Cross, and can accommodate 30 officers and 520 men ; it has stabling for 540 horses, and a large hospital. At Island Bridge, near Kilmainham, there is an extensive artillery barrack, and there is another for artillery at the Pigeon House Fort in the bay. Besides these, there are barracks for infantry in Great Ship Street, near the castle; at Aldborough House, a fine massive building erected in 1765 at a cost of £45,000 ; and at Beggar's Bush, on the South Circular Road. In the Phenix Park is Mackenzie's Fort and magazine. The magazine is surrounded by a dry ditch, and is entered by a drawbridge. It is defended by a dozen 24-pounders,

Poor Law.—There are two poor law unions in the city—North and South, governed by two boards of guardians. The average daily number of paupers in both is 4832, and the annual expendi- ture of both £75,250.

Keligion.—The following table shows the population of the different parishes in 1841, 1851, 1861, and 1871, and the number of Roman Catholics and Protestants of the Episcopal church in each parish (when part is mentioned, the rest of the parish is in Dublin county) :—

Besides the above mentioned religious denominations there were 4517 Presbyterians, 1828 Methodists, 189 Jews, and 4904 of "all other persuasions." The proportion of Catholics to the total popu- lation was equal to 79 per eent.

Education.—The means of education in Dublin are ample. The incessant contests between the various religious denominations have had the effect of imparting energy to all engaged in teaching.

Trinity College, founded by Queen Elizabeth, is the greatest foundation in the country. The corporation now consists of a provost, 7 senior fellows, 26 junior fellows, and 70 scholars. Two studentships, one mathematical and one classical, have been recently added to the honour list. The successful competitor is entitled to £100 a year for seven years ; there are no duties to be fulfilled and no resi- dence is required. A vacancy among the fellows is filled u by the provost and a select number of the fellows, after a very severe examination for ten days in metaphysics, mathe- matics, natural

philosophy, ethics, history, chronology, Latin, Greek, and Hebrew. Fellowships are held for life. Until the year 1840 the fellows were bound to celibacy, but that restriction was then removed. ‘The scholars are chosen from among the undergraduates, after an examination in mathematics or Greek and Latin. The pecuniary ad- vantages attaching to scholarship lasts for four years. Students, after an examination, are admitted as fellow-com- moners, pensioners, or sizars; the last class is limited to thirty, and is partially maintained out of the College funds. Noblemen, noblemen’s sons, and baronets have the privilege of forming a separate order with peculiar advantages, on the payment. of additional charges. The course of general instruction extends over four years, the principal studies of each year being successively mathematics, logic, natural philosophy and astronomy, classics, and ethics ; and four commencements are held every year for the purpose of con- ferring degrees. A medical school is attached to the uni- versity, and also a school of civil engineering ; and diplomas in surgery and civil engineering are granted by the board on the completion of the prescribed courses. The library, which is one of the four scheduled in the Copyright Act, consists of about 190,000 printed volumes and 1500 manuscripts ; and the number is increased annually by about 2000 volumes, partly purchased and partly obtained free under the Act. There are also a botanic garden and a museum. The funds of the College, arising from lands and the fees of the students, are managed solely by the provost and seven senior fellows, who form a board, to which and to the Academic Council the whole government of the uni- versity, both in its executive and its legislative branches, is

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Religions Profession in 1871.

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| 1841. | 1851. | 1861, | 1871. | R lian “lds Mis Catholic. | “Pra committed. The buildings, which include a large extent testants.

of ground, now nearly in the middle of the city, consist of one very large and two smaller squares. In these are the chapel, the hall for examinations, the museum, the library, the dining hall, the ffinting office, and chambers for the

Christ Church ai-) 15 es berties of) ..... 4 *

Grangegorman, pa f

my} 4.857] 4,330 4.412

St Andrew’s | 7,634| — 7,628 4,335 1,129 eb

St Anne’s… | 8,808] 8594 4°61 1‘89 fellows and students. Attached to the buildings is a large St Audoen’ 3,9 5 ye ‘-

Gi Brigden 106291 10°74 nel i337 | | Park for the recreation of the students, aud a smaller St Catherine’s, part io 871! 90.589| * it kas 131g | | enclosure for the provost and fellows. ‘The provost’s resi-

tye Oeneeeenssecereasee i bs ’ ’ ° . (st George’s, part of.| 15,048] 15,884 13,434 3,949 | | dence and the medical school are apart from the main body Pip htie oR il To. ont pyid *4cg | | Of the buildings. The college observatory is at Dunsink, f] A , . é eee, . st Luke’s seemed 4,802] 4419 2/937 235 about five miles north-west of Dublin 3 1¢ 1s amply furnished slark’s, part of…) 15,234] 20,781 16,126 2,548 ; i 7

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oe) a g771 ee first filled by Dr Henry Ussher, and subsequently by Dr LSE POMS incised Baan pm : Brinkley bishop of Cloyne. The Magnetical Observatory | St Peter 1422] 8,636] 10,017 7,381 1,934 ? | se Foter's, part of… 30,210 $4,000 37.605) $8,235 25,288 10,019 of Dublin was erected in the years 1837-8, in the gardens st Thomas's… i 65 37 st

St Werburgh's…..1 "2.969| "a/aa8| "3'174 2,901] 2,309 attached to Trinity College, and at the expense of the | Se BP sesso… 2126) 247,111) 254,808 | 246,396 / 195180 | 39so7 | | UNIVersity. A series of observations was begun in 1838, SS oe ee

and has been continued ever since. The annual income of

DUBLIN

Trinity College is set down as about £65,000 a year. The average number of students on the books is about 1300. By an Act passed in 1873, known as Faweett's Act, all tests were abolished, and the prizes and honours of all grades hitherto reserved for Protestants of the Established Church were thrown open toall. Examinations for women are now held under the direction of the College.

The Queen's University, founded in 1850, has quarters in Dublin Castle; but the three colleges are in Cork, Belfast, and Galway. Dublin has no share in the advan- tages of the university, which are considerable.

The Roman Catholic University derives its entire support from voluntary contributions. There isan annual collection on a certain Sunday in November, and this realizes about £8000. The management is in the hands of the Catholic bishops. 'The medical school in connection with the uni- versity has attained great repute in Ireland.

The Royal College of Science, controlled by the Science and Art Department, is conducted by ten professors. The number of students is seldom greater than 30, amongst whom four royal scholarships and nine royal exhibitions (value £50 for two and three years respectively) are divided. The Parliamentary grant is £6902 per annum. The Royal

Dublin Society and the Royal Irish Academy are devoted |

fo science andart. The one receives £7500 a year, and the other £2480. The Royal Hibernian Academy has £300, and the National Gallery £2340 a year. The Zoological Society, having its gardens in the Phoenix Park, has £500 a year.

Schools. —In' 1871 there were iu the city 336 schools—257 primary and 79 superior. In attendance at the primary were 19,782 Roman Catholics, 4602 Episcopalians, and 842 Presbyterians and others ; in attendance at the superior are 1491 Roman Catholics, [2334 Protestants, and 566 Presbyteriansand others. 'This gives a general total of 29,617.

The education of all classes in Dublin is shown in the following figures :— in 1871, 150,581 of seven years and upwards eould read and write, 24,224 could read but could not write, and 35,633 were illiterate.

Charities. Dublin can boast a goodly number of charities. }There are 118 charitable institutions, sone for the deaf and dumb, the blind, the destitute, the distressed, the unemployed ; some for the education of the reduced, and for the sons and daughters of clergy- men; and some for orphans, for idiots, for convalescent patients. The Drummond Institution, for the orphan daughters of soldiers, was established in 1864 by a Scotch gentleman ramed Drum- mond, who left £20,000 to found the asylum. The Hospital and Free School of King Charles I., commonly called the Blue Coat School, was founded 1670. The school buildings are very handsome, and cost £21,000. The annual income is £4000 a year. The education afforded to 120 boys is of a very superior character. Be- fore the Irish Parliament Houses were erceted the parliament met in the school building. Molyneux Asylum for the blind, a splendid building near the city boundary, affords refuge and instruction to 70 females. There are 30 hospitals, of which the ehief are— The Westmoreland Lock, parliamentary grant £2600; Steevens, parliamentary grant £1300, donations, &c., £4177; the Meath, parliamentary grant £600, city grant £750, donations £1913 ; Cork Street Fever, parliamentary grant £2500, donations £1298; House of Industry Hospitals (3), parliamentary grant £7472, donations £693 ; Rotundo Lying-in, parliamentary grant, £700, city £300, donations £2342 ; Coombe Lying-in, parliamentary grant

. £200, city £260, donations £2167; Incurables, parliamentary grant

£250, city £150, donations £6000; St Mark's Eye and Ear, parlia- mentary grant £100, city £100, donations £735. These 11 hospitals in 1875 admitted 9645 patients, and received from Parliament £15,722, from the cityauthorities £1560, from subscriptions £19,353. Total income of all £36,635. Of the houses supported by voluntary contributions the Adelaide (Protestant), the Mater Miscricordiz, St Vincent's, and the City of Dublin hospitals are the most important. Lunatics are maintained in St Patrick's Hospital, founded in 1745, pursuant to the will of Dean Swift, and conducted by governors appointed under the charter of incorporation. The Richmond Lunatic Asylum, erected near the House of Industry, and placed under the care of officers appointed by Government, recelves

atients from a district consisting of the counties of Dublin, Louth,

eath, and Wicklow, each of these contributing towards its expenses in proportion to the number of patients sent in. Besides

these public establishments for the recovery and safe custody of 'lunatics, those are in the vicinity of Dublin various private asylums.

The principal institution for the blind is Simpson's Hospital, founded by a merchant of Dublin. The income is upwards of £2500 per annum, by which fifty patients are maintained in a large plain edifice situate in Great Britain Street. The apartment ean accommodate a hundredinmates. The Richmond National Institu- tion in Sackville Street was founded in order to instruct the blind in some of the more useful handicraft oceupations. The principal branches taught are weaving, netting, and basket-making. An institution for the maintenance and education of children born deaf and dumb is maintained at Claremont, near Glasnevin. The plan of the Royal Hospital, for decayed and maimed soldiers, was first suggested by the earl of Essex, when lord lieutenant, and carried into effect through the repeated applications of the duke of Ormond to Charles II. The site chosen for it was that of the ancient priory of Kilmainham, founded by Strongbow for Knights Templars. The building, completed in 1684, according to a plan of

Sir Christopher Wren, is an oblong 306 feet by 288, three sides of which are dwelling-rooms, connected by covered corridors. The fourth contains the chapel, the dining hall, and the apartments of the master, who is always the commander of the forces for the time being. The Roman Catholic Church has charge of a number of special charities, some of them educational and some of them for the relief of suffering.

Libraries, &c.—The principal library in Dublin, for the number and value of its books, is that of Trinity College. It is open of right only to graduates of that university, but admission is obtain- able by others by special favour.; It contains about 190,000 printed volumes, and 1500 manuscripts. The King's Inns Library is next in value. The right of reading in it is con- fined to the members of the King's Inns Society,—that is, to barristers, attorneys, and law students. Marsh's Library, attached to St Vatrick's Cathedral by the munificent bequest of Primate Marsh, archbishop of Armagh, and incorporated in 1707, contains a good collection of theological works, and is open to the public ; but, from the very small portion of its funds appropriated to purchase, it is very deficient in modern publications, It possesses some valuable manuscripts. The want of a library easily accessible, and provided with the works most in request, was attempted to be supplied by a society formed in 1791 (the Dublin Library Society), which collected a large number of books in a handsome and well-arranged building in D'Olier Street. Attached to the library is a fine reading-room, well supplied with newspapers. The Library of the Royal Dublin Society contains upwards of 12,000 volumes. It is particularly rich in works on botany, and in those relating to Ireland. It has likewise a gallery of statuary, in which are casts from the Elgin marbles. The library, museum, and gallery are open to the publie,—in happy contravention of the rules, which have been strained in the laudable direction of popularizing self-instruction. The Royal Trish Academy's Library is valuable of. its kind. It contains many ancient manuscripts, and works dealing with science and anti- quities.

Public Buildings.—Dublin has several noble edifices. The first and greatest is the Bank of Ireland, formerly the House of Parliament, which occupies five acres. There are three fronts. 'The principal, towards College Green, a colonnade of the Ionic order, formed of a fagade and two projecting wings, is much admired for the noble simplicity of its elevation. The western front,

a portico of four Ionic columns, is connected with the other by a colonnade of the same order, forming the quadrant of a circle. The eastern front, which was the entrance of the House of Lords, was, by their special wish, a colonnade of the Corinthian order, which the architect found great difficulty in uniting with the other parts. The apartment for the lords, a fine room, is hung with tapestry. , That of the commons, having been burned in 1792, was reconstructed after a more ele- gant design, in the form of a circle surrounded by pillars, between which was a gallery for hearers. This fine hall was taken down by the bank directors, and converted into a square room, now the cash-office. The House of Lords remains in its original condition, and is but seldom used.

Trinity College is in itself a source of legitimate pride to the city. The front is plain and massive. The inner courts are large and well proportioned. On the left is the examination hall, containing full length portraits of the queen founder, of Molyneux, of Edmund Burke, Bishop Berkeley, and other celebrities. On the right stand the chapel and the dining hall, side by side, the former having a very handsome interior, and the latter having portraits of

Grattan, Flood, Yelverton, Lord Rosse, Lord Kilwarden, and other famous Irishmen. In the eentre of the court stands a beautiful campanile. The library contains a gallery 210 feet in length, 41 in breadth, and 40 in height. There are also new buildings in the inner court, in eharacter with the general splendour of the place. The provost’s house close by is one of the finest in the eity.

Dublin Castle presents a rather motley appearanee. ‘The greater portion of it is dingy, being built of brick ; but the chapel and tower are very handsome. The eastle stands on ten aeres, but the apartments are sinall, with the exeeption of St Patriek’s Hall, whieh is used on the occasion of invest- ing knights of the order of St Patriek.

The custom-house is considered one of the ehief ornaments of the city. It was erected at a cost of about £400,009, and opened in 1791. It stands on the north side of the river below Carlisle Bridge, and presents four fronts,

three of whieh may be seen to advantage. The south front, faeing the river, 375 feet in length, is built of Portland stone, finished in the Dorie order, with an entablature and bold projeeting cornice. The other three fronts are composed of granite, and from the centre rises a doine to the height of 125 feet, surmounted by a figure of Hope.

The Four Courts, in whieh the superior courts are held, stands on the site of the ancient Dominiean monastery of St Saviour, on King's Inn Quay. It is an extensive and imposing strueture, ereeted between the years 1786 and 1800, at a cost of £200,000.

The city hall, formerly the royal exchange, is a handsome building. It isin possession of the corporation, and is used for municipal purposes, 'The centre hall contains statues of George III., of Grattan by Chantrey (a superb work), of O'Comnell by Hogan, of Lueas, and of Drummond.

The post-office stands in Saekville Street. It is built of granite, and is about 120 feet high, 225 in length, and 150 in depth. The centre of the front consists of a boldly project- ing portieo of six fluted Ionie columns, supporting an entablature and eorniec ; on the apex is a figure of Hibernia, and Mereury and Fidelity at the sides. The first stone was laid in 1815, and the cost of the pile was £50,000.

Churches.—St Patrick's Cathedral, a noble eclifiee, was restored by the late Sir Benjamin L. Guinness, Bart., at a cost of £130,000; Christ Church Cathedral is now in course of restoration by Mr Henry Roe, and the estimated cost is mueh over £100,000; Mr Roe has also presented a synod house to the Chureh of Ireland at a cost of £27,000; the late Mr Findlater gave the Presbyterian body a beautiful chureh whieht he erected at a eost of £16,000; the Roman Catholies have raised about 16 mag- nifieent edifices in the last twenty years; most of the Protestant parish ehurehes have been either rebuilt or re- stored ; the Unitarians have two houses, one of them of noble aspect; and the Methodists, the Moravians, the Friends, the Baptists, and the Jews have all provided themselves with suitable places of worship. There are no less than 93 churehes of all denominations and a syna- gogue in Dublin, and at least 70 of these are beautiful inodern buildings.

The two cathedral churehes of St Patrick and Christ Chureh are superior to all other edifices in character and interest. The foundation of Christ Chureh, the older build- ing of the two, is attributed to the Danes in 1038; but it dates its elevation to a deanery and ehapter from 1541, The entire length of the nave and choir is 260 feet, that of the transept 110 feet, and the extreme breadth of either 80 feet. Christ Church does not eontain many monuments. Among the most interesting is that of Strongbow, the invader of Ire- land, whose tomb was long the place at which the tenants of the church lands were accustomed to pay their rents. The Monument was injured by the fall of one of the cathedral

walls ; but it was afterwards repaired, and is still to be seen in good preservation, with a smaller tomb by its side, sup- posed to be that of Strongbow's son, who was killed by his father. Synods were oeeasionally held in this church, and parliaments also, before the Commons' Hall was destroyed in 1566 by the accidental explosion of 144 barrels of gun-powder in a neighbouring street. Here also the impostor Lambert Simnel was erowned.

The cathedral of St Patrick was founded in 1190 by John Comyn, arehbishop of Dublin. It was burnt about a hundred years after its first erection, but was again raised from its ruins in increased splendour. At the Reformation it was dissolved, and the building was used for some of the purposes of the courts of justice. Edward VI. eon- templated its change into a university, bnt the project was defeated and a university established elsewhere. In the sueeceeding reign of Mary, St Patriek's Cathedral was restored to its primary destination. The installations of the knights of St Patrick, the first of which took 'place in 1783, were originally held here. 'This eathedral contains the monuments of several illustrious persons, among which the most eclebrated are those of Dean Swift ; of Mrs Hester Johnson, immortalized under the name of "Stella:" of Archbishop Marsh ; of the first carl of Cork ; and of Duke Schomberg, who fell at the battle of the Boyne. The tablet over Schomberg's grave contains what Lord Macaulay calls a "furious libel." In the cathedral may be seen the chain ball which killed St Ruth at the battle of Aughrim, and the spurs whieh he wore

when shot. A fine statue of Sir Benjamin Lee Guinness, Bart., the restorer of the eathedral, stands in the aisle.

The Roman Catholie churches are for the most part old and in poor localities. The new churches are, however, of greater proportions and of considerable beauty. The prin- cipal is the chureh of the Augustinians in Thomas Street. This is perhaps the loftiest building in the city. The pro-eathedral in Marlborough Street is a building of great dimensions, highly ornamented internally in the Grecian style, and having a fine Doric portieo forming the prineipal front. The building was commenced in 1816, at an estimated eost of £52,060. St Paul's, on Arran Quay, is an elegant building in the Ionic style. The church of St Franeis Xavier was erected at a cost of £18,000, from a Roman lonie design.

Places of Amusement, d'c.—Dublin has a winter palace, on the plan of the London Crystal Palaee. The seheme advancing public entertainment failed, and Sir Arthur Guinness, Bart., purehased it from the shareholders for £13,000. It is used now for various purposes. There are three theatres—the Royal (seeond in size only to Drury Lane and Covent Garden), the Gaicty, and the Queen's Theatre. There are two or three musical soeieties, which are supported by the middle elasses; but very little music of a superior character is afforded to the citizens at large.

The Phoenix Park, just touching the north-west boundary, is seven iniles in eireumferenee, and ineludes an area of 1759 aeres, The park is in itself beautiful, and the near- ness of the Dublin and Wieklow mountains adds greatly to its attraetions. The Viceregal Lodge and the Chief Seeretary's Lodge are the only buildings inside the gates. They have little pretension beyond their size.

Monuments.—Vhere are nine of Foley's best statues in Dublin—the Prinee Consort, Grattan, Burke, Goldsmith, Guinness, Stokes, Corrigan, and Lord Carlisle ; and that to O'Connell may be added. 'Three of the Georges have memorials ; Wellington's monument stands in the Phoenix Park, an obelisk 200 feet high, bearing on the sides the names of his victories, and seenes in relief from the greater battles on the pedestal. There are statues to King William,

to Smith O’Brien, to Lord Eglinton, to William Dargan, |

to Nelson (already noticed), and to Thomas Moore.

Commerce.—Dublin has little of the bustle which should mark so large a city, and as a matter of fact Belfast is said to transact a greater general trade. ‘There is, too, a spirit of foolish pride which seeks to disown trade; and the tendency to be poor and genteel in the eivil service, at the bar, in the constabulary, in the army, in professional life, rather than prosperous in business, is one of the most unfortunate and strongly marked characteristics of Dublin society. That this is attributable to the lingermg yet potent influence of an unhappy past is held by some ; while others attribute the weakness to the viccregal office and the effects of a sham court. About the time of the Revolution, the woollen trade flourished in Dublin, and the produce attained a great eelebrity. The cheapness of labour attracted capitalists, who started extensive factories in that quarter of the town known even now as the Liberties. This quarter was inhabited altogether by workers in wool, and, as the city was small, the aristocracy lived close by in noble mansions which are now miscrable memorials of past prosperity. About 1700 the English legislature prevailed on William IIT. to assent to laws which directly crushed the Irish trade. All exportation except to England was peremptorily forbidden, and the woollen manufacture soon decayed. But even 100 years ago there were 5000 persons at work in the looms of the Liberties, where now there arc not a score. About 1715 Parliament favoured the manufacture of linen, and the Linen Hall, now an empty wreck, was built. The cotton trade was soon after introduced ; and silk manufacture was begun by the Huguenots, who had settled in Dublin in considerable numbers after the revocation of the Edict of Nantes. Acts favourable to these enterprises were passed, and they flourished apace. But the old jealousy arose in the reign of George I., and in the reign of George IIT. an Act was passed which tended directly to the ruin of the manufac- ture, The linen trade shared the same fate. Commerce has increased during the past few generations; but Dublin produces nothing for exportation save whisky and porter. The whisky trade has becn greatly extended. Of the 22 distillers and 438 rectifiers in Ireland, the prin- cipal are in Dublin; the three houses of Jameson and Roe and Power may be specially mentioned. In 1874, when the duty was at 10s. per gallon, £322,950 was reccived by the customs. The

porter trade is also very large. The exports in 1875 were 361,465 hogsheads.

The docks in the river have been improved consider- ably within the last quarter of a century. The river has been deepened, wharves have been built, new docks have been constructed; and a basin now almost com- pleted, at a cost of £276,000, will add greatly to the accommodation. The two great lines of railway, the Midland and the Great Southern, have extended their ways to the river's edge, so that traffic is much easier and swifter between the provinces and the boats for England than in former times. In 1875, 544 British and foreign vesscls entcred, and 213 cleared the port of Dublin; while 6850 vessels engaged in the coasting trade entered. The customs dues received in the same ycar amounted to £1,030,000 ; these have remained almost stationary for ten years.

The total value of all exported articles from Dublin in 1875 was £44,157; while the exports from Belfast were valued at £253,340. 'The exports of grain from the city need not be set down, inasmuch as they are intended for other parts of Ireland, and are sent by water. In the following returns for 1868 and 1875, a very remarkable decline in the exports of provisions will be observed, while the exportation of live stock has remained pretty stationary :—

de Vere, whom he also created duke of Ireland.

1868. 1875.

Butter, firkins…..... 245,419 25,481 Bacon, bales, and boxes …... 2,893 1,016 Hams, hogsheads, &c……... 976 175 Beef, do. Oo 2,174 1,540 MonleqWawelses yc .ceccnneccnes ome 4,265 914 NE WiO%, CEYND IG papeaaeucmaneennos eer 191,981 192,055 (S) TeXiR). qanaperendcanteaess Hesciemcc 166,307 313,000 WAVES samaderec eee cniaten ce ivaces 1,606 1,665 Digs 210,263 138,046

The exports in wool and in horses have declined in recent years.

History.—The early history of Dublin is, like the carly history of Ircland generally, made up chiefly of legends. 1t is recorded that the inhabitants of Leinster were defeated by the people of Dublin in the fyear 291; but what so bare a fact can signify is not easy to discover, Christianity was introduced by St Patrick, about 450. We may pass on to the 9th century, when we find the Danes attacking Dublin and taking it. When Tor-Magnus, the Danish king, was slain by Malachy the king of Ireland, the Danes were swept out of Dublin by the lrish from Meath. Then the Danes regained their power, and the contests were incessant until, in 1014, Brian Boroilme, king of Munster, attacked the enemy and fought the battle of Clontarf, in which he and his son and 11,000 of his followers fell. The Irish, however, won the battle, but the Danes re-occupied the city and held footing in Ireland until 1170. Then came the Auglo-Normans. In 1172 Henry H. landed at Waterford, and came to Dublin and held his court there in a pavilion of wicker-work made ‘‘ after the country manucr,” where the Irish chiefs were entcrtained with great pomp, and alliances entered into with them, —‘‘ the pleuty of the English table and the goodly courtesy of the attendants” having done much to reconcile them to their new allies. Vrevious to his departure for England, lfenry bestowed the government on Hugh de Lacy, having granted by charter ‘to his subjects of Bristol his city of Dublin to inhabit, and to hold of him and his heirs for ever, with all the libertics and free customs which his subjects of Bristol then enjoyed at Bristol and through all England.” In 1177 Strongbow, earl of Pembroke, and the chicf leader of the Anglo-Norman forces, died in Dublin of a mortification in one of his feet, and was buried in Christ Church Cathedral, where his monument still remains well preserved, A fresh charter was granted in 1207 by King John to the inhabitants of Dublin, who had not yet made their peace with the neighbour- hood, but, like the settlers in other towns, were at constant feud with the native lrish ; so that two years after the date of this charter, whilst the citizens of Dublin were cclebrating Easter at Cullens- wood, they were set upon by the lrish of the neighbouring moun- tains, and 500 of them killed. The scene of slaughter is still called the Bloody Fields, and Easter Monday denominated Black Monday. On cach succeeding anniversary of that day, with the desire unfor- tunately so prevalent of perpetuating a feud, the citizens marched out to Cullenswood with baimers displayed—‘‘a terror to the native Irish.” In 1216 Magna Charta, a copy of which is to be found in the Red Book of the Exchequer, was granted to the Irish by Henry Ill. 1n

1217 the fee farm of the city was granted to the citizens at arent of 200 marks per annum; and about this period many monastic buildings were founded. 1 1227 the same monarch con- firmed the charter of John fixing the city boundaries and the jurisdiction of its magistrates.

During the invasion of Ireland by Edward Bruce, who landed at Carrickfergus with 6000 meu, in the commencenient of the reign of Edward 11., some of the suburbs were burnt to prevent them from falling into his hand. he inroad of Bruce had been coun- tenanced by the native Irish ecclesiastics, whose seutiments were recorded in a statement addressed to Pope John XXII. Sone notion of the defence made against Bruce's invasion may be gained from the fact that the churches were torn down to supply stones for the building of the city walls. Bruce had seized Greencastle on his march ; but the natives re-took the town, and brought to Dublin the governor who had yielded to Bruce. He was starved to death.

Richard II. erected Dublin into a marquisate in favour of Robert The same monarch entered Dublin in 1894 with 30,000 bowmen and 4000 cavalry, bringing with him the crown jewels; but after holding a parliament and making much courtly display before the native chieftains, on several of whom he conferred knighthood, he returned to Mngland. Five ycars later, enriched with the spoils of his uncle, John of Gaunt, Richard returned to Ireland, landing at Waterford, whence he marched through the counties of Kilkenny and Wicklow, and subsequently arrived in Dublin, where he remained a fortnight, sumptuously entertained by the provost, as the chicf magistrate of the city was then called, till intelligence of the invasion of his kingdom by Bolingbroke recalled him to England.

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In 1534 Lord Thomas Fitzgerald, better known as Silken Thomas (so called because of a fantastic fringe worn in the helmet of his followers), a young man of rash courage and good abilities, son of the Lord Deputy Kildare, believing his father, who was imprisoned in the Tower of London, to have been beheaded, organized a rebellion against the English Government, and marched with his followers front the mansion of the earls of Kildare in Thomas Court, through Dame's Gate to St Mary's Abbey, where, in the council chamber, he proclaimed himself a rebel. On his appear- ing before

the wall with a powerful force, the citizens were induced through fear to give admission to a detachment of his troops to be- siege the castle; but, on hearing that he had met with a reverse in another quarter, they suddenly closed their gates and detained his men as prisoners. He then attacked the city itself; but, find- ing it too strong to be seized by a coup de main, he raised the siege on condition of having his captured soldiers exchanged for the children of some of the principal citizens who liad fallen into his hands. After much vicissitude of fortune, Lord Thomas and others eoncerned in this rebellion were executed at Tyburn in 1536.

At the breaking out of the civil war in 1641, a conspiracy of the Irish septs, under the direction of Rogcr Moore, to seize Dublin Castle, was disclosed by one Owen Connolly on the eve of the day on which the attempt was to have been made, and the city was thus preserved for the king's party ; but the Irish without commenced an indiscriminate extermination of the Protestant population. In 1646 Dublin was besieged, but without success, by the Irish army of 16,000 foot and 1600 horsc, under the guidance of the Pope's nuncio Rinuccini and others, banded together ‘‘ to restore and establish in Ireland the exercise of the Roman Catholic religion." The city had been a in an efficient state of defence by the marquis of Ormond, then lord-lieutenant ; but in the following year, to prevent it falling into the hands of the Irish, he sur- rendered it on conditions to Colonel Jones, commander of the Parliamentary forccs. In 1649 Ormond was totally defeated at the battle of Baggotrath, near Old Rathmines, in an attempt to recover possession, The same year Cromwell landed in Dublin, as commander-in-chief under the Parliament, with 9000 foot and 4000 horse, and procceded thence on his career of conquest.

When James IJ. landed in Ireland in 1689, to assert his right to the British throne, he held a parliament in Dublin, which passed acts of attainder against upwards of 3000 Protestants. The governor of the city, Colonel Luttrell, at the same time issucd a proclamation ordering all Protestants not housekeepers, excepting those following some trade, to depart from the city within 24 hours, under pain of death or imprisonment, and restricting those who were allowed to remain in various ways. Iu the hope of relieving his financial difficulties, the king crected a mint, where moncy was coined of the ‘‘worst kind of old brass, guns, and the refuse of metals, melted down

together," of the nominal value of £1,586,800, with which his troops were paid, and tradesmen were compelled to receive it under penalty of being hanged in case of refusal. Under these regulations the entire coinage was put into circulation. After his defeat at the battle of the Boyne, James returned to Dublin, but left it again before daybreak the next day ; and William III. advancing by slow marches, on his arrival encamped at Finglas, with upwards of 30,000 men, and the following day proceeded in state to St Patrick's Cathedral to return thanks for his victory.

In 1788 a convention of delegates from all the volunteer corps in Ireland assembled in Dublin for the purpose of procuring a reform in parliament ; but the House of Commons refused to enter- tain the proposition, and the convention separated without coming to any practicalresult. In May 1798 the breaking out of a conspiracy planned by the United Irishmen to seize the city was prevented by the capture of Lord Edward Fitzgerald, son of the duke of Leinster and husband of the celebrated "Pamela." Lord Edward died in laa of the wounds reccived in the encounter which preceded his capture. =

n 1800 the Act of Union between Great Britain and Ireland was passed in both parliaments, and on the 1st J anuary following the a standard of the United Kingdom was hoisted on Dublin

astle.

In 1803 an insurrection, headed by Robert Emmett, a young barrister of nuch promise, broke out, but was iminediately quelled, with the loss of some lives in the tumult, and the death of its leaders on the scaffold. In 1848 William Smith O'Brien, M.P. for Limerick, raised a rebellion in Tipperary, and the lower classes in oe were greatly agitated. Owing, however, to timeous and judrfous disposition of the military and police forces the city was saved from much bloodshed. serious of modern conspiracies, that known as the Fenian organiza- tion, came to light. The reality of it was proved by a ship being found laden with gunpowder in the Liverpool docks, aud another with £5000 and 2000 pike heads in Dublin. The Habcas Corpus Act was suspended at one sitting by both Houses of Parliament and about 960 arrests were made in Dublin in a few hours. Dublin

castle was fortified ; and the citizens Hved in a state of terror for several weeks together.

Ju 1867 the most |

Thom's Irish Almanac; Lewis's Topographical Dictionary ; D'Alton's History of the Co. Dublin ; Gilbert's History of the City of Dublin, 8 vols. 1854-59; History of the City of Dublin, by Rev. J. Whitelaw and Rev. R. Walsh, 2 vols. 4to. Lond. 1818. (E. T. L.)

DUBNO, a town in European Russia, at the head of a department in the government of Volhynia, 154 miles west of Zhitomir, in 50° 25' N. lat. and 25° 44' E. long, Occupying a peninsula formed by the River Ivka, it is almost surrounded by water and marsh; and in its eastern corner it is defended by a somewhat dilapidated citadel separated by dry ditches from the rest of the town. It also possesses five Greek churches, of which two—the Transfiguration and the Exaltation of the Holy Rood—were formerly monasteries; it has also a Roman Catholic church and convent, a Jewish synagogue, a hospital for poor Jews, and various other Jewish institutions. Beer, mead, tobacco, bricks, and leather are all manufactured in the town; but a large number of the inhabitants, who are mainly of Jewish

| blood, obtain their living in other places.

Dubno is first mentioned in the chronicles under the name of Duben in 1100, when it formed one of the towns offered to David of Vladi- mir in compeusation for the loss of his principality. In 1498 it re- ceived a charter from the grand duke of Lithuania, which was after- wards changed about 1507 for the Magdeburg rights. The Tatars, against whose attacks it had been fortified in the beginning of the century, laid waste the neighbourhood in 1577, but were gallantly repulsed from the town by Yanush of Ostrog. In 1793 it passed into the posscssion of the Liubomir family, to whom the most of the ground-rent is still due ; in 1795 it was incorporated with Russia, and in 1796 it received its present rank. Population, 7660.

DUBOFKA, a burgh in European Russia, in the government of Saratoff, about 323 miles to the N.N.W. of Tsaritzin, on the right bank of the Volga, near its reception of the river Dubofka, and on the post-road to Astrakhan. With the exception of about 200, all its houses are built of wood; but among its public buildings it numbers four Greek churches, a prison, a large public school, and a hospital capable of containing several hundred patients. Besides leather, tallow, soap, and tobacco, its inhabitants manufacture mustard on a large scale, obtaining the seed partly from their own fields and partly from other districts. They had formerly a very extensive share in the transport trade between the Volga and the Don, which was largely carried on by means of oxen, and supported a number of auxiliary crafts; but the opening of the railway about 1860 struck a sudden and fatal blow at the whole traffic. A great fair, lasting for a whole month, is held in the town every year, and produces a circulation of about 1,000,000 rubles, or upwards of £141,000. Dubofka, already in existence at an earlicr date, was colonized by Cossacks in 1743, and became their chief settlement on the Volga, the residence of their ataman, anc the seat of their military chancery. In 1770 it was fortified with wooden ramparts by Falk. Having given its support to the insur- rection of Pugacheff, it was punished by the removal of 517 of its inhabitants to the Caucasus, where they formed a separate polk, or regiment. Their place was supplied by immigrants from the neighbouring governments and the country of the Little Russians, who were soon led by the advantages of their position to devote themselves exclusively to trade. Population in 1873, 12,737.

DUBOIS, Gumiaume (1656-1723), cardinal, arch- bishop of Cambray, and first minister of France, was born at Brives-la-Gaillarde, in Limousin, September 6, 1656. He was the son of an apothecary, and at twelve years of age was sent to Paris to study in the college of St Michael, where he at the same time served in the household of the principal. He then engaged himself as a private tutor, and at length was appointed preceptor to the young duke of Chartres, afterwards the regent duke of Orleans. Astute, ambitious, and unrestrained by conscience, Dubois ingratiated_ himself with his pupil, and, whilethe gave him

formal school lessons, at the same time pandered to his evil passions, and encouraged him in their indulgence. He gained the favour of Louis XIV. by bringing about the marriage of his pupil with Mademoiselle de Blois, a natural but legitimated daughter of the king ; and for this service he was rewarded with .the gift of the abbey of St Just in Picardy. He was present with his pupil at the battle of Steinkirk, and “faced fire,” says Marshal Luxembourg, ‘like a grenadier.” Sent to join the French embassy in London, he made himself so active that by the request of the ambassador he was recalled. When the duke of Orleans became regent (1715), Dubois, who had for some years acted as his secretary, was made councillor of state, and the chief power passed gradually into his hands. His ambition grew with what it fed on. To counteract the intrigues of Cardinal Alberoni, first niinister of Spain, he suggested an alliance with England, and succeeded in negotiating the Triple Alliance (1717). He was now made minister of foreign affairs. But he coveted the chief dignities of the church no less than ‘political offices; and he impudently prayed the regent to give him the arch- bishopric of Cambray, the richest in France. His demand was supported by George I., and the regent yielded. In one day all the usual orders were conferred on him, and even the great preacher Massillon consented to take part in the ceremonies. His next aim was the cardinalate, and, after long opposition on the part of the Pope, Clement XI., the red hat was given to him by Innocent XTIL. (1721). In the following year he was named first minister of France (August). He was soon after received at the French Academy ; and, to the disgrace of the French clergy, he was named president of their assembly. While the projects of Law were bringing financial ruin upon the kingdom, Dubois was accumulating from various sources an immense private fortune. In addition to his see he possessed the revenues of seven abbeys. He was, however, a prey to the most terrible pains of body and agony of mind. His health was rnined by his debaucheries, and a surgical operation became necessary. This was almost immediately followed by his death, at Versailles, August 10, 1723. His portrait was thus drawn by the duke of St Simon :—‘ He was a little, pitiful, wizened, herring-gutted man, in a flaxen wig, with a weasel’s face, brightened by some intellect. All the vices—-perfidy, avarice, debauchery, ambition, flattery —fought within him for the mastery. Hoe was so consummate a liar that, when taken in the fact, he could brazenly deny it. Even his wit and knowledge of the world were spoiled, and his affected gaiety was touched with sadness, by the odour of

falsehood which escaped through every pore of his body.” In 1789 appeared Vie privée du Cardinal Dubors, attributed to one of his secretaries, and in 1815 his Mémoires secrets et cor- respondance inédite, edited by L. de Sevelinges.

DUBOS, Jean Baptiste (1670-1742), an eminent French author, was born at Beauvais in December 1670. After studying for the church he renounced theology for the study of public law and politics. He was employed by M. de Torcy, minister of foreign affairs, and by the regent and Cardinal Dubois in several secret missions, in which he acquitted himself with great success. He was rewarded with a pension and several benefices. Having obtained these, he retired from political life, and devoted himself to history and literature. He gained such distinction as an author that in 1720 he was elected a member of the French Academy, of which, in 1722, he was appointed perpetual secretary in the room of M. Dacier. He died at Paris on the 23d of March 1742, at the age of seventy-two, repeat- ing as he expired the well-known remark of an ancient, “ Death is a law, not a punishment.” His first work was L’ Histoire des quatre Gordiens prouvée et illustrée par des

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Meédailles (Paris, 1695, 12mo), which, in spite of its ingenuity, did not succeed in altering the common opinion, which only admits three emperors of this name. About the commencement of the war of 1701, being charged with different negotiations both in Holland and in England, with the design to engage these powers if possible to adopt a pacific line of policy, he, in order to promote the objects of his mission, published a work entitled Les Jntéréts de Angleterre mal entendus dans la Guerre présente, Amsterdam, 1703, 12mo. But as this work contained indiscreet disclosures, of which the enemy took advantage, and predictions which were not fulfilled, a wag took occasion to remark that the title ought to be read thus: Les Intéréts de V Angleterre mal entendus par Abbé Dubos. It is remarkable as containing a distinct prophecy of the revolt of the American colonies from Great Britain. His next work was J’ Histoire de la Ligue de Cambray (Paris, 1709, 1728, and 1785, 2 vols. 12mo), a full, clear, and interesting history, which obtained the commendation of Voltaire. In 1734 he published his //vstoire

Critique de Pétablissement de la Monarchie Francaise dans les Gaules, 3 vols. 4to,—a work the object of which was to prove that the Franks had entered Gaul, not as conquerors, but at the request of the nation, which, according to him, had called them in to govern it. But this system, though unfolded with a degree of skill and ability which at first procured it many zealous partisans, was victoriously refuted by Montesquieu at the end of the thirtieth book of the ELsprit des Lois. His Réflexions critiques sur la Poésie et sur la Peinture, published for the first time in 1719, 2 vols. 12mo, but often reprinted in three volumes, constitute fone of the works in which the theory of the arts is explained with the utmost sagacity and discrimination. Like his history of the League of Cambray, it was highly praised by Voltaire. The work was rendered more remarkable by the fact that its author had no practical acquaintance with any one of the arts whose principles he discussed. Besides the works above enumerated, a manifesto of Maximilian, elector of Bavaria, against the emperor Leopold, relative to the suc- cession in Spain, has been attributed to Dubos, chiefly, it appears, from the excellence of the style.

DUBOSSARI, or Novis Dusossart, a town of European Russia, in the government of Kherson, on the left bank of the Dniester, 101 miles from Odessa, in 47° 16’ N. lat. and 29° 9’ K. long. It occupies a picturesque position, is surrounded by fertile fields and gardens, has two churches, a synagogue, and a public hospital, and contains from 7000 to 8000 inhabitants—Moldavians, Malo-Russians, and Jews—who are mainly dependent on the trade in the local wine and tobacco, though they also deal in timber, cattle, and grain. Dubossari was founded in keeping with the terms of the Russian peace of 1795, and received the epithet Novie, or New, to distinguish it from the old town of Dubossar (Tombasari, or Tymbashari), on the right bank of the Dniester, in Bessarabia, which had been of consider- able importance under the Tatar domination.

DUBROVNA, a town of European Russia, in the government of Mogileff, 11 miles east of Orsha, on the highway to Smolensk, in 54° 34’ N. lat. and 30° 41’ 9” E. long. Its wooden houses are ranged for the most part along the left bank of the Dnieper, and in the neighbour- hood, of the two streams Dubrovenka and {[Svinka; and among its public buildings are six orthodox churches, a Roman Catholic chapel, a synagogue, a hospital, and a Jewish

high school supported by Government. The town is mentioned at a pretty early date, and frequently appears in the history of the 16th century. In 1514 it requested to be received into allegiance by Vasili Ivanovitch of Moscow; but after his defeat near Orsha it returned to Lithuania. In 1535 it was burned by Vasili Shuiski ;

and in 1562, 1563, and 1580 it suffered a similar fate. The population, which is predominantly Jewish, amounts to 7600. ;

DUBUQUE, a city of the United States, capital of a county of the same name in Jowa, situated on the right bank of the Mississippi, 155 miles west of Chicago. The business portion occupies a terrace at no great height above the river, and the rest of the city is picturesquely arranged on the bluffs behind. Several of its fourteen churches, besides a so-called cathedral, are edifices of considerable pretensions ; and the building erected by the United States for the custom-house, post-office, and other Government purposes is constructed of marble. The principal educa- tional institutions are the high school and a theological seminary for German Presbyterians. As a port of delivery, a railway junction, and the centre of the lead region of Towa, Dubuque has an extensive and varied trade, and engages in a large number of manufacturing industries ; of lead alone it exports from 10,000,000 to 20,000,000 ib annually. The name of the city is derived from a French

‘Janadian, who received permission from the Spanish Government to carry on mining in the vicinity, and settled on the spot in 1788. The first real settlement was in 1833 ; incorporation as a town was obtained in 1837, and a city charter in 1840. Population in 1850, 3108; in 1873, 22,15].

DUCANGE, Curartes Durresnn, SzignEur (1610- 1688), a most learned historieal and philological writer, was born at Amiens, Deeember 18,1610. His father, who was royal provost of Beauquesne, sent him at an early age to the Jesuits’ College in Amiens, where he soon distinguished himself. Having completed the usual eourse at this seminary, he applied himself to the study of law at Orleans, and afterwards went to Paris, where he was received as advocate before the parliament in August 1631. Meeting with little suceess as a barrister, he returned to his native district, where he

applied himself to the study of history. After the death of his father, Ducange married at Amiens, on 19th July 1638, Catherine Du Bois, daughter of a treasurer of Franee ; and, in 1647, he purchased the office of his father-in-law, the duties of which in no degree inter- fered with the great literary works in whieh he had engaged. The plague, which in 1668 desolated Amiens, foreed him to leave that city. He established himself at Paris, where he continued to reside until his death, which occurred on the 23d October 1688. In the archives of Paris he was enabled to eonsult eharters, diplomas, titles, manuscripts, and a multitude of printed documents, which were not to be met with elsewhere. His industry was exemplary and unremitting ; and the number of his literary works would be incredible, if the originals, all written in his own hand, were not still extant. He was distinguished above nearly all the writers of his time by his linguistic acquirements, his aceurate and varied knowledge, and his critical sagacity. Of his numerous published works noted below the most im- portant are the Glossarium ad Scriptores medic et infime Latinitatis and his Glossarium ad Scriptores medic et infimee Greecitatis, which are indispensable aids to the student of the history and literature of the Middle Ages. To the three volumes of Dueange's Latin glossary three supplementary volumes were added by the Benedictines of St Maur (1733), and a further addition of four volumes was made by Carpentier, a Benedictine, in 1766. The edition published at Paris in that year accordingly consisted of ten volumes. The edition by G. A. L. Henschel (8 vols., Paris, 1840-46)

bes those supplements and further additions by the editor.

_Ducange published the following works :—1. Histoire de l'Em- ie de Constantinople sous les Empereurs Francois. Paris, 1657, olio, 2. Traité Historique du Chef de 8. Jean-Baptiste. Paris,

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we OD 1666, 4to. 3. Histoire de S. Louis, Roi de France, écrite par Jean, sire de Joinville. Paris, 1668, folio. 4. Joannis Cinnami Histo- riarum de rebus gestis a Joanne et Manuele Comnenis libri VI., Grece et Latine, cum Notis historicis et philologicis. Paris, 1670, folio. 5. Mémoire sur le projet d'un nouveau Recueil des Histo- riens de France, avec le plan général de ce

Recueil, inserted in the Bibliotheque Tistorique de la France, by Pere Lelong. 6. Glossa- rium ad Scriptores medie et infime Latinitatis. Paris, 1678, 3 vols. fol. 7. Lettre du Sieur N., Conseiller du Roi, 4 son ami M. Ant. Wion d'Herouval, au sujet des Libelles qui de temps en temps se publient cn Flandres contre les RR. PP. Henschenius et Pape- broch, Jésuites. Paris, 1682, 4to. 8. Historia Byzantina duplici Commentario illustrata. Paris, 1680, fol. 9. Joannis Zonare An- nales ab exordio Mundi ad mortem Alexii Comneni, Greece ct La- tine, cum Notis. Paris, 1686, 2 vols. fol. 10. Glossariuin ad Seriptores medic et infime Grecitatis. Paris, 2 vols. fol. 11. Chronicon Paschale a Mundo condito ad Herachi Imperatoris an- num vigesinum. Paris, 1689, fol. The last work was passing through the press when Ducange died ; and, on his decease, it was edited by Baluze, and published with an ¢loge of the author pre- fixed.' 'His antograph manuscripts, and his extensive and valuable library, passed to his eldest son, Philippe Dufresne, who died unmarried, four years after. Frangois Dufresne, the second son, and two sisters, then received the' succession and sold the library, when the greater part of the manuscripts was purchased by the Abbé Du Champs, whoghanded them over to a bookseller called Mariette, who re-sold part of them to Baron Hohendorf. The re- maining part was acquired by D'Hozier, the gencalogist. But the French Government, aware of the importance of all the writings of Ducange, succeeded, after much trouble, in collecting the greater peices of these manuscripts, which were preserved in the Imperial ibraty of Paris. Among these manuscripts was one entitled Gallia, a work of great erudition, being a history of lrance, divided into seven epochs, with a number of dissertations.

See Feugtre's Lssai sur la vie et les ouvrages de Ducange (Paris,

1852).

DUCAS, Micwart, a Greek historian who flourished under Constantine XII., about 1450. The dates of his birth and death are unknown. He belonged to the illus- trious family of his name that gave several emperors to Constantinople, and he is supposed to have held a high office at the court of Constantine XTJ. After the fall of Constantinople, he was employed in various diplomatic missions by the prinees of Lesbos, where he had taken refuge. IIe was successful in securing a semi-independence for Lesbos until

1462, when it was taken and annexed to Turkey by Sultan Mahomet II. It is known that Dueas survived this event, but there is no reeord of his subsequent life. He is the author of a history beginning with the death of John Paleologus I., and extending as far as the capture of Lesbos in 1462. ‘There isa preliminary chapter of chronology from Adam to John Palzologus I., which is almost certainly by a later hand. Although barbarous in style, the history of Ducas is both judicious and trustworthy, and it is the most valuable source for the close of the Greek empire. ‘The author seems to have possessed an. intimate knowledge of the Turkish language.

The editio princeps was issued by Bullialdus at Paris in 1649 with a Latin version and notes. This edition was reprinted at Venice in 1729. The work was edited by Bekker for the Bonn series of the Byzantine historians (Bonn, 1834). A French translation was incorporated by President Cousin in his Histoire de Constantinople (Paris, 1672). Aun early Italian translation, discovered by Von Ranke at Venice, is appended to the Bonn edition.

DUCHESNE, Anpri (Latin, DuciEnrus or QUERCE- TANUS) (1584-1640), a French geographer and historian, generally styled the father of French history, was born at Ile- Bouchard, in the provinee of Touraine, in May 1584. He was educated at Loudun and afterwards at Paris, where he studied under Julius Cesar Boulanger. From his earliest years he devoted himself to historical and geographical re- search, and his first work, Lgregiarum sew Selectarum Lectionum et Antiquitatum Liber, dedicated to Boulanger,

“and published in his eighteenth year, displayed great erudi- tion. He enjoyed the patronage of Cardinal Richelieu, a native of the same district with himself, through whose influence he was appointed historiographer and geographer to the king. He died in 1640, in consequence of having

been run over by a carriage when on his way from Paris to his country house at Verritre. Duchesne’s works were very numerous and varied, and some idea of his industry may be gathered from the fact that, in addition to what he published, he left behind him more than 100 folio volumes of manuscript extracts. Several of his larger works were continued by his only

son Frangois Duchesne (1616-1693), who succeeded him in the office of historiographer to the king. ‘he principal works of Andre Duchesne are—Les Antiquites et Recherches de la Grandeur et Majesté des Rois de France (Paris, 1608), Les Antiquates et Recherches des Villes, Chiteaua, de., de toute la France (Paris, 1610), Histoire Angleterre, Ecosse, et @Irelande (Paris, 1614), Histoire des Papes jusqu-a Paul V. (Paris, 1619), Histoire des Rois, Ducs, et Comtes de Bourgogne (1634, 2 vols. fol.), Historie Normanorum Scriptores Antiqua (1619, fol.), and Historie Francorum Scriptores (5 vols. fol., 1636-49). Resides these Duchesne published a great number of genealogical histories of illustrious French families, of which the best is said to be that of the house of Montmorency. His Lives of the French Cardinals and of the Saints of France have been published by the Bollandists, Mabillon, and others. He published a translation of the Satzres of Juvenal, and editions of the works of Abelard, Alain Chartier, and Etienne Pasquier.

DUCIS, Juan Francois (August 22, 1733—March 31, 1816), a French dramatic poet, famous more especially for his adaptations of Shakespeare to the Parisian stage of the 18th century. He was born and brought up at Versailles, where his father, originally from Savoy, held the position of a respectable linen-draper ; and all through life he retained the simple tastes and straightforward independence fostered by his bourgeois education. The friendship of Marshal Belleisle procured him an appointment as clerk, and even after he ceased to discharge the duties of his post secured the continuance of hissalary. In 1768 the passion for the theatre which had been growing within him during the previous years found vent in the tragedy of Amedise ; and the failure of this first attempt was fully compensated by the success of his Hamlet in 1767, and of Romeo and Juliette in1772. Cdipe chez Adméte, imitated partly from Euripides and partly from Sophocles, appeared in 1778, and secured him in the following year the chair in the Academy left vacant by the death of. Voltaire. Equally successful was Le Rot Lear in 1783, at the representation of which the author received what was then the rare honour of being called before the curtain. Macbeth in 1783 did not take so well, and Jean sans Peur in 1791 was almost a failure; but Othello in 1792, supported by the acting of Talma, obtained immense applause. The next appearance of the author was no longer as an adapter or imitator of foreign models, but as a dramatist with a plot and characters of

his own contrivance and invention ; and though his contrivance produced nothing more original than the old story of unlawful love between brother and sister ultimately obtain- ing sanction by their supposed kinship being disproved, the poetic charm of the verse and its vivid picturing of desert life secured for Abufar, ow la famille arabe, a flattermg reception. On the failure of a similar piece, Phédor et Waldemar, ou la famille de Siberie, Ducis ceased to write for the stage ; and the rest of his life was spent in quiet re- tirement at Versailles. He had been named a member of the Council of the Ancients in 1798, but he never discharged the functions of the office; and, when at a later date Napoleon wished him to accept some post of honour under the empire, he escaped from his solicitations by a happy brusquerie,— General, do you like wild duck shooting? I am something of a wild duck myself." Amiable, religious, and bucolic, he had little sympathy with the fierce, sceptical, and tragic times in which his lot was cast. " Alas !" he

said in the midst of the Revolution, " tragedy is abroad in the streets; if I step outside of my door, I have blood to my very ankles. I have too often seen Atreus in clogs, to venture to bring an Atreus on the stage." Though actuated by what seems to have been an honest and ardent admira- tion of the great English dramatist, Ducis is not in any deep sense of the word Shakespearian. His ignorance of the English language left him at the mercy of such translators as Letourneur and La Place ; and even this modified Shake- speare had still to undergo a process of purification and correction before he could be presented to the fastidious criticism of French taste. That such was the case was not, however, the fault of Ducis; and his works, defective as they were, did good service in modifying the judgment of his fellow countrymen. He did not pretend to reproduce, but to excerpt and refashion ; and consequently the French play sometimes differs from its English namesake in every- thing almost but the name. The plot is different, the characters are different, the motif different, and the scenic arrangement different. The result is really a new play, and a new play, be it said, with undoubted merits of its own, Le banquet de Vamitié, a poem in four cantos, 1771, Aw Rot de Sardaigne, 1775, Discours de réception & Cacadémie francaise, 1779, Epitre a Vamitié, 1786, and a Recueil de Poésies, 1809,

complete the list of Ducis's publications. An edition of his works in three volumes appeared in 1818 ; Guvres posthumes were edited by Campenon in 1826; and Hamlet, dipe chez Adméte, Macbeth, and Abufar are reprinted in vol. ii. of Didot's Chefs auvre tragiques.

See Campenon, Essai de mémoires sur Ducis, 1824; Onésime Leroy, Etude sur la personne et les écrits de Ducts, 1832, based on Ducis's own memoirs preserved in the library at Versailles ;

Sainte-Beuve, Causeries du lundi, t. vi., and Nouveaua lundis, t. iv.; Villemain, Tableau de la litt. aw XVIIIe. siecle.

DUCK, a word cognate with the Dutch Duycker (Germ. Tauch-ente—and in Bavaria Duck-antl), the general English name for a large number of birds forming the greater part of the Family Anatide of modern ornithologists. Technically the term Duck is restricted to the female, the male being called Drake, and in one species Mallard (Fr. Malart).

The Anatide may be at once divided into six more or less well marked Subfamilies—(1) the Cygnine or Swans, (2) the Anserine or Geese—which are each very distinct, (3) the Anatine or Freshwater-Ducks, (4) those commonly called Fuliguline or Sea-Ducks, (5) the Erismaturine ox Spiny-tailed Ducks, and (6) the Mergine or Mergansers. Of the Anatinw, which may be considered the typical group, we propose to treat here only, and especially of the Anas boschas of Linneeus, the common Wild Duck, which from every point of view is by far the most important species, as it isthe most plentiful, the most widely distributed, and the best known—being indeed the origin of all our domestic breeds. It inhabits the greater part of the northern hemi- sphere, reaching in winter so far as the Isthmus of Panama in the New World, and in the Old being abundant at the same season in Egypt and India, while in summer it ranges throughout the Fur-Countries, Greenland, Iceland, Lapland, and Siberia. Most of those which fill our markets are no doubt bred in more northern climes, but a considerable proportion of them are yet produced in the British Islands, though not in anything like the numbers that used to be supplied before the draining of the great Fen-country and other marshy places. The Wild Duck pairs very early in the year—the period being somewhat delayed by hard weather, and the ceremonies of courtship, which require some little time.

Soon after these are performed, the respective couples separate in search of suitable nesting-places, which are generally found, by those that remain with us, about the middle of March. The spot chosen is sometimes near

a river or pond, but often very far removed from water, and it may be under a furze-bush, on a dry heath, at the bottom of a thick hedge-row, or even in any convenient hole in a tree. A little dry grass is generally collected, and on it the eggs, from 9 to 11 in number, are laid. So soon as incubation commences the mother begins to divest herself of the down which grows thickly beneath her breast- feathers, and adds it to the nest-furniture, so that the eggs are’ deeply imbedded in this heat-retaining substance—a portion of which she is always careful to pull, as a coverlet, over her treasures when she quits them for food. She is seldom absent from the nest, however, but once, or at most twice, a day, and then she dares not leave it until her mate after several circling flights of observation has assured her she may do so unobserved. Joining him the pair betake themselves to some quiet spot where she may bathe and otherwise refresh herself. Then they return to the nest, and after cautiously reconnoitring the neighbourhood, she loses no time in reseating herself on her eggs, while he, when she is settled, repairs again to the waters, and passes his day,listlessly in the company of his brethren, who have the same duties, hopes, and cares. Short and infrequent as are the absences of the Duck when incubation begins, they become shorter and more infrequent towards its close, and for the last day or two of the 28 necessary to develop the young it is probable that she will not stir from the nest at all. When all the fertile eggs are hatched her next care is to get the brood safely to the water. This, when the dis- tance is great, necessarily demands great caution, and so cunningly is it done that but few persons have encountered the mother and offspring as they make the dangerous journey.1 If disturbed the young instantly hide as they best can, while the mother quacks loudly, feigns lameness, and flutters off to divert the attention of the intruder from her brood, who lie motionless ‘at her warning notes. Once arrived at the water they are comparatively free from harm, though other perils present themselves from its inmates in the form of

Pike and other voracious fishes, which seize the Ducklings as they disport in quest of insects on the surface or dive beneath it. Throughout the summer the Duck continues her care unremittingly, until the young are full grown and feathered; but it isno part of the Mallard's duty to look after his offspring, and indeed he speedily becomes incapable of helping them, for towards the end of May he begins to undergo that extraordinary additional moult which has already jbeen mentioned (Brrbs, vol. iii. p. 776), loses the power of flight, and does not regain his full plumage tillautumn. About harvest-time the young are well able to shift for themselves, and then resort to the corn-fields at evening, where they fatten on the scattered grain. To-wards the end of September or beginning of October both old and young unite in large flocks and betake themselves to the larger waters, many of which are fitted with the ingenious applances for catching them known as Decoys. These are worked on all favourable occasions during the winter, but the numbers taken vary greatly—success depending so much on the state of the weather. If long-continued frost prevail, most of the Ducks resort to the estuaries and tidal rivers, or even leave these islands almost entirely. Soon after Christmas the return-flight commences, and then begins anew the course of life already described.

_ The domestication of the Duck is doubtless very ancient, but evidence on this head is exceedingly imperfect. Several distinct breeds have been established, of which the most esteemed from an economical point of view are those known as the Rouen and Aylesbury ; but perhaps the most ——— __.___ a See

1 When Ducks breed in trees, the precise way in which the young get to the ground is still a matter of uncertainty. The mother is sup- posed to convey them in her bill, and most likely does so, but further observation on this point is required.

remarkable"deviation from the normal form is the so-called Penguin-Duck, in which the bird assumes an upright attitude and its wings are much diminished in size. A re- markable breed also is that often named (though quite fancifully) the " Buenos-Ayres" Duck, wherein the whole plumage is of a deep black, beautifully glossed or bronzed, But this saturation, so to

speak, of colour only lasts in the individual for a few years, and as the birds grow older they become mottled with white, though as long as their reproductive power lasts they “ breed true.” The amount of variation in domestic Ducks, however, is not comparable to that found among Pigeons, no doubt from the absence of the competition which Pigeon-fanciers have so long exercised. One of the most curious effects of domestication in the Duck, however, is, that whereas the wild Mallard is not only strictly monogamous, but, as Waterton believed, a most faithful husband—remaining paired for life, the civilized Drake is notoriously polygamous.

Very nearly allied to the common Wild Duck are a con- siderable number of species found in various parts of the world in which there is little difference of plumage between the sexes—both being of a dusky hue—such as Anas obscura of North America, A. superciliosa of Australia, A, paciorhyncha of India, A. mellert of Madagascar, A. xanthorhyncha of South Africa, and some others.

It would be impossible here to enter upon the other genera of Anatine. We must content ourselves by saying that both in Europe and in North America there are the groups represented by the Shoveller, Garganey, Gadwall, Teal, Pintail, and Widgeon—each of which, according to some systematists, is the type of a distinct genus. Then there is the group Aw with its beautiful representatives the Wood-Duck (A. sponsa) in America and the Mandarin-Duck (A. galericulata) in Eastern Asia. Besides there are the Sheldrakes (Zadorna), confined to the Old World and remarkably developed in the Australian Region ; the Musk- Duck (Catrina) of South America, which is often domesti- cated and in that condition will produce fertile hybrids with the common Duck ; and finally the Tree-Ducks (Den- drocygna), which are almost limited to the Tropics. (A. N.)

DUCKWORTH, Sir Joun Tuomas (1748-1817), admiral, was born at Leatherhead, in Surrey, on the 28th February 1748. He entered the navy in 1759, and obtained his commission as lieutenant in June 1770, when he was appointed to the “ Princess Royal,” the flagship of Admiral Byron, in which he sailed to the West Indies, While serving on board this vessel he took part in the engagement with the French fleet under Count D’Estaing. In July 1779 he became commander, and was appointed to the “ Rover” sloop; in

June of the following year he atttained the rank of post-captain. Soon afterwards he re- turned to England in charge of aconvoy. The outbreak of the war with France gave him his first opportunity of obtainmg marked distinction. Appointed first to the ‘‘ Orion ” and then to the “ Queen ” in the Channel Fleet, under the command of Lord Howe, he took part in the three days’ naval engagement with the Brest fleet, which terminated in a glorious victory on the lst June 1794. For his conduct on this occasion he received a gold medal and the thanks of Parliament. He next proceeded to the West Indies, where he was stationed for some time at St Domingo. In 1798 he commanded the “Leviathan” in the Mediterranean, and had charge of the naval detachment which, in conjunction with a military force, captured Minorca. Early in 1799 he was raised to the rank of rear- admiral, and sent to the West Indies to succeed Lord Hugh Seymour. During the voyage out he captured a valuable Spanish convoy of eleven merchantmen. In March 1801 he was the naval commander of the combined force which reduced the islands of St Bartholomew and St Martin, a

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service for which he was rewarded with the order of the Bath and a pension of £1000 a year. Promoted to be vice-admiral of the blue, he was appointed in 1804 to the Jamaica station. Two years later, while cruising off Cadiz with Lord Collingwood, he was detached with his squadron to pursue a French fleet that had been sent to the relief of St Domingo. He came up with the enemy on the 6th February 1806, and, after two hours’ fighting, inflicted a signal defeat upon them, capturing three of their five vessels and stranding the other two. For this, the most distin- guished service of his life, he received the thanks of the Jamaica Assembly, with a sword of the value of a thousand guineas, the thanks of the English Parliament, and the freedom of the city of London. In 1807 he was again sent to the Mediterranean to watch the movements of the Turks. In command of the “ Royal George” he forced the passage of the Dardanelles, but sustained considerable loss in effecting his return, the Turks having strengthened their position, He held the command of the Newfoundland fleet for four years from 1810, and at the close of that period he was made a baronet. In 1815 he was appointed to the chief command at Plymouth, which he held until his death on the 14th April 1817. Sir John Duckworth sat in Parliament for

some time as member for New Romney. DUCLOS, Cartes Pineau (1704-1772), a French author, was born at Dinant, in Brittany, in 1704. At an early age he was sent to study at Paris, After some time spent in dissipation he began to cultivate the society of the wits of the time, and became a member of that club or association of young men who published their joint efforts in light literature under the titles of Recwetl de ces Messveurs, Etrennes de la St Jean, Gufs de Paques, &c. His romance of Acajou and Zirphile, which was composed after a series of plates which had been engraved for another work, was one of the fruits of this association, aud was produced in consequence of a sort of wager amongst its members. Duclos had previously written two other romances, which

were more favourably received—Zhe Baroness de Luz, | -ward events of her life, and to trace the development of her ‘genius, not only because of the abundance of materials she

and the Confessions of the Count de ***, His first serious publication was the History of Louis XJ., which is dry and epigrammatical in style, but displays considerable powers of research and impartiality. The reputation of Duclos as an author was confirmed by the publication of his Considérations sur les Mceurs, a work which is much and justly praised by Laharpe, as containing a great deal of sound and ingenious reflection. It was translated into English and German. The Mémoires pour servir a l Histoire du dix-huitiéme Siécle, which were intended by the author as a sort of sequel to the preceding work, are nevertheless much inferior in respect of both style and matter, and are, in reality, little better than a kind of romance. In consequence of his History of Louis XJ., he was appointed historiographer of France, when that place became vacant on Voltaire’s retirement to Prussia. His Secret Memoirs of the reigns of Lowis XIV. and Louis X V., and his Considerations on Italy, were not published until after the Revolution. The former work is highly spoken of by Chamfort. Duclos became a member of the Academy of Inscriptions in 1739, and of the French Academy in 1747. Of the latter he was appointed perpetual secretary in 1755. Both academies were indebted to him not only for many valuable contributions, but also for several useful regu- lations and improvements. Asa member of the Academy of Inscriptions, he composed several memoirs on the Druids, on the origin and revolutions of the Celtic and French

languages, on trial by battle and proof by ordeal, and on scenic representations and the ancient drama, Asa member of the French Academy, he assisted in compiling the new edition of the Dictionary, which was published in 1762; and he made some just and philosophical remarks on the

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Port Royal Grammar. On several occasions he distinguished himself by vindicating the honour and prerogatives of the societies to which he belonged, and the dignity of the literary character in general. He used to say of himself, “ I shall leave behind me a name dear to literary men.” The citizens of Dinant, whose interests he always supported with zeal, appointed him mayor of their town in 1744, though he was resident at Paris. He was afterwards elected deputy from the commons to the assembly of the states of Brittany; and upon the requisition of this body the king granted him letters of nobility. In 1766 he was advised to retire from France for some time, having rendered himself obnoxious to the Government by the opinions he had expressed on the dispute between the Duc d’Aiguillon and M. de la Chalotais, the friend and countryman of Duclos. Accordingly he set out for Italy ; and on his return he wrote an account of his travels, which is also praised by Chamfort. He died at Paris, March 26, 1772, in the sixty-ninth year of his age. The character of Duclos was singular in its union of impulsiveness and prudence. Rousseau described him very laconically as a man droit et adroit. In his manners he displayed a sort of bluntness in society, which frequently rendered him disagreeable ; and his caustic wit on many occasions created enemies. ‘To those who knew him, however, he was a pleasant companion. A considerable number of his bon mots have been preserved by his biographers. A complete edition of the works of Duclos, including an unfinished autobiography, was published by Desessarts, at Paris, in 10 vols. 8vo, 1806. hak

DUDEVANT, Armantine Lucttu Aurore (1804- 1876), known to all the world as the second, if not the

greatest, of French novelists, by her assumed name of George

Sand, was born at Paris 5th July 1804, and died 8th June 1876. Her life is as fantastic and eventful as any of her fictions, and the main secret of her

success has been her power to clothe in artistic form her varied experiences of men and places.

It is no easy task to set down in a short space the out-

has left behind her, but still more from the subtle way in which she has interwoven fact and fiction. In the Listory of her Life, which covers half a century, the omissions are no less surprising than the revelations, and though she never indulges in the self-illusions of Dichtung und Wahrhett, which perplex or mystify the biographers of Goethe, yet she wisely refuses to satisfy the curiosity of the public on the most delicate episodes of her life. If, to fill up the blanks, we turn to her novels, George Sand justly warns us that in trying to raise the mask and identify her with any

-one of her characters, we shall not only lose our pains, but

show that we mistake the fundamental conditions of art.

Yet by the help of critics to supply the missing clue (and

no writer of this century has so provoked criticism), it is possible to decipher the chief lineaments of the most remarkable woman of this age, and the greatest authoress in the world's history.

Aurore was the daughter of Lieutenant Dupin and of his newly-married mistress Sophie Delaborde, the daughter of a Paris bird-fancier. Her paternal grandfather was M. Dupin de Francueil, a farmer-general of the revenue, who had married Mdlle. Rinteau, widow of Count Horn (a natural son of Louis XV.), and natural daughter of Marshal Saxe, the most famous of the many illegitimate children of Augustus the Strong by the lovely countess of Kénigsmarck. This strange pedigree has been traced in detail by George Sand, and she recognizes it as one of the elements which went to mould her character. She boasts of the royal blood which she inherited through her father, and, disre-

.garding the bar sinister, claims relationship with Charles X.,

and Louis XVIII., and she proclaims herself as frankly a daughter of the people, endowed by nature with the instincts of her class. Her birth itself was romantic. Her father was playing a country dance at the house of a fellow officer, the future husband of Sophie's sister, when he was told that his wife, who had not long left the room, had borne him a daughter. 'She will be fortunate," said the aunt, "she was born among the roses to the sound of music."

Passing by her infantine recollections, which go back further than even those of Dickens, we find her at the age of three crossing the Pyrennees to join her father who was on Murat's staff, occupying with her parents a suite of rooms in the royal palace, adopted as the child of the regiment, nursed by rough old sergeants, and dressed in a complete suit of uniform to please the general.

For the next ten years she lived at Nohant, near Le Chatre in Berri, the country house of her grandmother. Here her character was shaped; here she imbibed that passionate love of country scenes and country life which neither absence, politics, nor dissipation could uproot ; here she learnt to understand the ways and thoughts of the peasants, and laid up that rich store of scenes and characters which a marvellously retentive memory enabled her to draw upon at will. The progress of her mind during these early years well deserves to be recorded. Education, in the strict sense of the word, she had none. A few months after her return from Spain her father was killed by a fall from his horse. He was a man of remarkable literary gifts as wellas a good soldier, and his letters, which are included in her life, show in a less degree the vivid force of descrip- tion and clear insight into character which he bequeathed to his daughter. "Character," says George Sand, "is in a great measure hereditary: if my readers wish to know me they must know my father." On his death the mother resigned, though not without a struggle, the care of Aurore to her grandmother, Mme. Dupin de Francueil, a good representative of the ancien régime. Though her husband was a patron of Rousseau, she herself had narrowly escaped the guillotine, and had only half imbibed the ideas of the Revolution. In her son's lifetime she had, for his sake, condoned the mésalliance, but it was impossible for the stately chatelaine and her low-born daughter-in-law to live in peace under the same roof. She was jealous as a lover of the child's affection, and the struggle

beween the mother and grandmother was one of the bitterest of Aurore's childish troubles.

Next to the grandmother, the most important person in the household at Nohant was Deschatre. He was an ex- abbé who had shown his devotion to his mistress when her life was threatened, and henceforward was installed at Nohant as factotum. He was maire of the village, he managed the estate, doctored the neighbourhood, played picquet with Madame, was tutor to Aurore's half-brother, and, in addition to his other duties, undertook the education of the girl. The tutor was no more eager to teach than the pupil to learn. He, too, was a disciple of Rousseau, believed in the education of nature, and allowed his Emile to wander at her own sweet will. At odd hours of lessons she picked up a smattering of Latin, music, and natural science, but most days were holidays and spent in country rambles and games with village children. Yet even then, though she passed for an ordinary child, somewhat more wayward and less instructed than the average, her special powers had begun to show themselves. Her favourite books were Tasso, Atala, and Paul et Virginie. A simple refrain of a childish song or the monotonous chaunt of the ploughman touched a hidden chord and thrilled her to tears. ee she fell into involuntary trances, saw visions

volces, though, unlike Blake, she never mistook

her day-dreams for realities. She invented a deity of her own, a mysterious Corambé, half pagan and half Christian, and like Goethe erected to him a rustic altar of the greenest

grass, the softest moss, and the brightest pebbles.

From the free out-door life at Nohant she passed at thirteen to the convent of the English Augustinians at Paris, where for the first two years she never went outside the walls. Nothing better shows the plasticity of her character than the ease with which she adapted herself to this sudden change. The volume which describes her con- ventual life is as graphic as Miss Bronte's Villette, but we can only dwell on one passage of it. Tired of mad pranks, in a fit of home-sickness, she found herself one evening in the convent chapel. In a strange reverie she sat through vespers. Time passed unnoticed, the prayers were over, the chapel was being closed.

“*T had forgotten all; I knew not what was passing in me; with my soul rather than my senses, I breathed an air of ineffable sweetness. All at once a sudden shock passed through my whole being, my eyes swam, and I seemed wrapped in a dazzling white mist. I heard a voice murmur in my ear, ‘ Tolle, lege.’ I turned round thinking that it was one of the sisters talking to me—I was alone. I indulged in no vain illusion; I believed in no miracle; I was quite sensible of the sort of hallucination into which I had fallen ; I neither sought to intensify it nor to escape from it. Only I felt that faith was laying hold of me—by the heart, as I had wished it. I was so filled with gratitude and joy that the tears rolled down my cheeks. I felt as before that I loved God, that my mind embraced and accepted that idcal of justice, tenderness, and holiness which I had never doubted, but with which I had never held direct communion, and now at last I felt that this com- munion was consummated, as though an invincible barrier had been broken down between the source of infinite light and the smoulder- ing fire of my heart. An endless vista stretched before me, and I panted to start upon my way. There was no more doubt or lukewarmness. That I should repent on the morrow and rally myself on my over-wrought ecstasy never’once entered my thoughts. I was like one who never casts a look behind, who hesitates before some Rubicon to be crossed, but having touched the further bank sees no more the shore he has just left.”

Such is the story of her conversion as told by herself. It reads more like a chapter from the life of Ste Thérése or Madame Guyon than of the author of Lélie. Yet no one can doubt the sincerity of her narrative, or even the permanence of her religious feelings under all her many phases of faith and aberrations of conduct. A recent critic has sought in religion the clue to her character and the mainspring of her genius. But, except we take religion in the vague sense of the vision and the faculty divine, this is a one-sided view. “Half poet and half mystic” is the verdict she pronounces on herself, and we may add that her element of mysticism was always subordinate to the poetic. “Je fus toujours tourmentée des choses divines,” ever stirred and stimulated, but never possessed by things divine.

Again in 1820 Aurore exchanged the restraint of a con- vent for freedom, being recalled to Nohant by Mme. de Francueil, who had no intention of letting her granddaughter grow up a dévote. She rode across country with

her brother, she went out, shooting with Deschatre, she sat by the cottage doors on the long summer evenings and heard the flax-dressers tell their tales of witches and warlocks. She read widely though unsystematically Aristotle, Leibnitz, Locke, Condillac, and fed her imagination with René and Childe Harold. Her confessor lent her the Genius of Christianity, and to this book she ascribes the first change in her religious views. She renounced once for all the asceticism and isolation of the De Imztatione for the more genial and sympathetic Christianity of Chateaubriand. Yet she still clung to old associations, and on her grandmother's death was about to return to her convent, but was dissuaded by her friends, who found her a husband in the person of M. Dudevant, a retired officer who had turned farmer.

About her husband and her married life George Sand is discreetlytreticent. It was a marriage, if not of love, yet

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of inclination, and the first years of her married life, during which her son and daughter, Maurice and Solange, were born, were at least calm and peaceful, Soon differences arose. Her husband seems to have been neither better nor worse than the Berrichon squires around him; but she found herself mated, if not to a clown, yet toa hobereau whose heart was in his farm and cattle. After nine years of passive endurance she determined to put an end toa connection which had grown intolerable, and in 1831 an amicable separation was agreed upon. Nohant was sur- rendered to the husband, and, taking her daughter with her, she went to seek her fortune in Paris with no provision but an allowance of £60 a year. After vain attempts to support herself by some of those expedients to which reduced gentlewomen are driven, as a last resource she tried litera- ture. At this period she was living in a garret, often unable to afford the luxury of a fire. Repulsed by Balzac and Kératry, she found an employer in Delatouche, the editor of Figaro, and, like herself, a native of Berri, In her life she has done full justice to the rough honesty and jealous affection of her first critic, who treated her much as Dr Johnson treated Fanny Burney. George Sand had neither the wit nor the piquancy to succeed as a writer in Figaro, and at the end of a month her earnings amounted to fifteen francs, But there was on the same staff a young law student already known to her as a visitor at

Nohant. With Jules Sandeau she entered into literary partnership, and under the name of Jules Sand there appeared a novel, their joint work, called Rose et Blanche. Her second novel was written independently, and the famous pseudonym, George Sand, was a compromise between Madame Dudevant, who wished to preserve the joint authorship, and Jules Sandeau, who disclaimed any share in the work. Nothing like Indiana had appeared before in French fiction. The public were wearied with the unreality of the fashionable historical novel, and the realistic humour of Paul de Kock. Balzac's earliest novels gave little promise of his future greatness. In the unknown writer they found one who combined the absorbing passion of Rousseau, the delicate picturesqueness of St Pierre, and the wild grandeur of Chateaubriand, in a living picture of; present times and manners. Like Byron she awoke one morning and found herself famous. Dela- touche was the first to throw himself at her feet and bid her forget all the hard things he had said of her. Sainte-Beuve expressed the approval of the learned, and the public eagerly canvassed the secret of her name, sex, and _ history. Valentine, which appeared two months afterwards, proved that Indiana was not, like so many first novels, a graphic rescript merely of the author's own emotions, but the beginning of an inexhaustible series, in which experience was the raw material woven by imagination and coloured by fancy. In Valentine, written during a visit to Nohant, she draws her inspiration from her native soil, and nowhere has she better described the quiet beauty and pastoral melancholy of the Vallée Noire and the banks of the Indre. Her Bohemian life at Paris—her vie de gamin, as she calls it—in which she adopted not only the dress but the life of a college student, and made the acquaintance of the whole Paris world between the artist and the artisan, is sketched by her in an allegory which is worth quoting if only as a specimen of the simple perfection of her style.

**T care little about growing old ; I care far more not to grow old alone, but I have never met the being with whom I could have chosen to live and die, or if I ever met him I knew not how to keep him. Jisten to a story and weep. There was a good artist called Watelet, the best acquafortis engraver of his day. He loved Marguerite Lecomte, and taught her to.engrave as well as himself. She left husband and home to go and live with him. The world con- demned them; then, as they were poor and modest, it forgot them. Forty years afterwards their retreat was discovered. In a cottage in the

environs of Paris called le moulin jolt, there sat at the same table an old man engraving and an old woman whom he called

his meuntére also engraving. The last design they were at work upon represented the Moulin jolt, the house of Marguerite, with the device Cur valle permutem Sabina divitias operostores. It hangs in my room over a portrait the original of which no one here has seen, For ayear the person who gave me this portrait sat with me every night at a little table and lived by the same work, At daybreak we consulted together on our work for the day, and at night we supped at the same little table, chatting the while on art, on sentiment, on the future. The future broke faith with us, Pray for me, O Marguerite Lecomte!”

Her third novel, Zélze, marks the climax of her rebellion against society. It was written in a fit of deep depression, religious and political, and is a wild dithyramb, the passion- ate wail of a woman whose affections have been blighted, and whose jaundiced eyes see nothing but a lifeless, loveless, godless world. But like Goethe in his Werther she “ rid her bosom of that perilous stuff,” and, though once and again she inveighed against society, she never more lost faith in the moral government of the world.’

Of her unfortunate relations with A. de Musset, and her voyage to Italy in his company, which followed the publica- tion of Lélie, nothing need be said except as they affected her literary career. As the motives of Jndiana and Valentine are an unhappy marriage, so the novels of this period (1833-1835), Jacques, André, and Leone Leoni, are the outcome of an unhappy liaison. Her creed, the opposite of Shakespeare’s, is, that love must alter as it alteration finds, and that no ties are binding but the mutual passion of the hour, ile et lui is a woman’s version of the quarrel between a man and woman, and if true it ought never to have been told. The moral of the tale is worth giving in George Sand’s own words, “God makes certain men of genius to wander in the tempest and to create in pain. I studied you in your light and in your darkness, and know that you are not to be weighed in the balance like other men.” The measure she here metes to De Musset we may fairly measure to her again.

To this Italian journey we owe some of her most charm- ing pictures of} scenery. Venice was the only town she loved for itself, and it exercised over her the same fascina- tion as over Byron, Shelley, and Goethe. The opening scenes of Consuelo are worthy to take rank with “Otway, Radcliffe, Schiller, Shakespeare’s Art,” with the 4th canto of Childe Harold, Shelley’s Lyrics, and Goethe’s Venetian. Epigrams, The Lettres d’un Voyageur mark the calm which succeeded this Sturm und Drang period. They are specially valuable to the student of George Sand, as they give her ‘views of men and things, not refracted and dis- torted by the exigencies of a novel. In Michel de Bourges (the “ Edouard ” of the letters) we make the acquaintance of another of those celebrated men who influenced for a time her life and writings. He conducted the suit which ended in a judicial separation from her husband (1836), and ‘sought to convert her to the extreme republicanism of which he was the foremost advocate and defender. This Lovelace -of politics laid siege to her intellect as persistently as ‘Richardson’s hero (for nine mortal hours he declaimed to _ her, pacing to and fro before her hotel at Bourges, and at Paris he locked her into her own room that she might. reflect at leisure on his suit), but though she coquetted with his communistic theories, her artist nature rebelled against his extravagant radicalism. She sought safety in flight, ‘but Mauprat, which she published this year, bears marks of his influence. The Lettres @ Marcie, of 1837, are a tribute to the broad and noble Catholicism of Lamennais, ° and an eloquent exposition of the doctrine of Christian resignation ; but in Spiridion (1838) she returns to her ‘proper creed, a philosophical theism founded on sentiment rand unfettered by dogma. Consuelo (1844) and Lucretia Floriani (1847) were inspired by Chopin, whose declining jhealth she tended for more than six years with motherly care. \Le Compagnon du Tour de France (1840) and Le mewnier

@’Angibault (1845) are echoes of the socialism of Pierre Leroux. She threw herself heart and soul into the re- publican struggle of 1848, composed manifestoes for her friends, addressed letters to the people, and even started a newspaper. But her political ardour was short-lived ; she cared little about forms of government, and, when the days of June dashed to the ground her hopes of social regenera- tion, she quitted once for all the

field of politics and returned to her quiet country ways and her true vocation ag an interpreter of nature, a spiritualizer of the commonest sights of earth and the homeliest household affections, In 1849 she writes from Berri to a political friend,—“ You thought that I was drinking blood from the skulls of aristocrats. No, I am studying Virgil and learning Latin!”

To a youth of storm and stress succeeded an old age so ealm and happy that it has no history. For more than a quarter of a century she continued year by year to gladden the world by some new creation, and the last of her works, the posthumous Contes d’une Grand’mére, is as fresh and vigorous and far more beautiful than Jndiana. Only once was the serenity of her life troubled. The Journal of a Traveller during the War will be quoted by future historians not only as a record of that agonizing crisis through which the French nation passed, but also as a prophecy of its recovery, which, by the indomitable spirit it expressed, brought its own fulfilment.

In writing the life of Madame Dudevant we have glanced at some of the most important of her works, To chronicle the titles only of all her novels would require an Homeric catalogue. It is only possible to give a general estimate of her style and of her place in French literature. But first we must call attention to her latest group of novels, which we omitted in the life as deserving a separate notice. With Jeanne (1852) began that series of pastorals, or stories of village life, by which George Sand is best known to the English public, and by which, we believe, she will be longest remembered. No description is needed of works so well known as La petite Fadette, La mare au diable, Les Maitres Sonneurs, Le meunier d’Angibault, Nanon, and Frangois le Champi. With these may be classed the fairy-stories which she wrote for her grandchildren in the last years of her life, Le géant Yéous, La reine Coax, Le nuage rose, Les ailes de courage. They are too recent to be much known in England, but we may safely predict that they will be as fainiliar to our grandchildren as La petite Fadette is to us. Without attempting to analyze, we may shortly indi- cate the peculiar charm and originality of her idyllic novels.

1, Like Wordsworth, with the inward eye she sees into the life of things; she seizes with her pencil the visionary gleam ; she shows the mystical influences which emanate from the world of sense, the witchery of the sky,

the quiet soul of the river, the beauty born of murmuring sound, the grey dandes stretching far away to the blue horizon, the deep-meadowed champaigns with orchard lawns and bowery hollows.

2, Like Wordsworth, too, she had found love in huts where poor men dwell, and like him she is “a leader in that greatest movement of modern times, care for our humbler brethren,—her part being to make us reverence them for what they are, what they have in common with us, or in greater measure than ourselves,”

3. To interpret for her readers these pictures of primitive life she has invented a style of her own,—not that, like Fontenelle, she makes her shepherds talk the language of the court, but she expresses the feelings of peasants in words so simple that a peasant might have used them, and yet so pure that they would pass muster with the Académie. Like Courier she js archaic, but her archaisms are not extracted from books, but relics of classical French which still lingered on in the quiet nooks of central France.

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In conclusion, a few words must be said of her style, though much of its delicate harmony must elude a foreign critic, for it is by her style that she will chiefly live. It ig simple and unaffected, yet full of subtle tums and pictur- esque expressions. Her dialogue is sparkling, her narrative clear and flowing, her descriptions exact, and her eloquence grandiose yet never meretricious. Topin is reminded of “the language of Rousseau, with something more of ease and finesse, the grace of Bernadin St Pierre, without his over-refinement, the warmth and eloquence of our greatest orators, and that without effort or straining.” Nisard pronounces George Sand the master of French prose writers. To Thackeray her diction recalled the sound

of country bells falling sweetly and sadly on the ear;

it stirred the nerves of Mill like a symphony of Haydn or Mozart. . 3

One of the greatest of English novelists seems by the name: she has adopted to provoke comparison with George Sand. In psychological analysis and

insight into the problems of modern life, she is at least her equal; in her range of knowledge, in self-control, and in practical common sense she is greatly her superior; but in unity of design, in harmony of treatment, in that purity and simplicity of language so felicitous and yet so unstudied, in all those qualities which make the best of George Sand's novels master pieces of art, she is as much her inferior. George Eliot is a great moralist, a great teacher; George Sand, whatever we may think of her doctrine and her morality, is by universal consent a supreme artist. .

She has stayed in many camps, and lent her pen to many causes, she has had many friends and many lovers, but to one cause only has she remained constant—the cause of human progress; and the only master in whose service she has never wearied is art. (F. 8.)

DUDLEY, a parliamentary and municipal borough of England, in a detached portion of the county of Worcester- shire surrounded by the county of Stafford. It lies in the' centre of the " Black Country," akout eight miles W.N.W. of Birmingham, at a junction on the Great Western railway. The town is generally well-built, its streets are well-paved, and there is a fair supply of water. The principal buildings are the parish church of St Thomas, rebuilt in 1819 at a cost of £23,000, and restored in 1862; several other churches, of which the most recent is St Luke's, erected in 1876 ; the town-hall, the county court, the Guest hospital (formerly the blind asylum), endowed (1868) by Joseph Guest, with a legacy of £20,000 (1861), the school of art, the new dispensary (1868), and the mechanics' institute (1861). Among the educational establishments are a free grammar-school, a subscription library, and a geological society with a small scientific museum. On a hill to the north are the extensive remains of an ancient castle, sur- rounded by beautiful grounds; and in the market-place stands a fountain, erected by the earl of Dudley at a cost of £3000, on the occasion of his marriage. The presence of coal, iron-ore, and limestone gives its peculiar character to the industries of the place. According to the census of 1871, 5442 men were engaged in the iron manu- facture, 1040 as makers of engines or machines, and 3501

in the coal-mines ; while the nail manufacture alone gave

employment to 1267 males and 3019 females, Among the

various articles produced are fire-irons, stoves, shovels, edge

tools, chains, anchors, and especially anvils and vices. The glass-works, brass foundries, and brickworks are also of importance ; and tanning, brewing, and malting are exten- sively carried on. The parliamentary borough has an area of 7715 acres, and returns one member to Parliament. In 1871 the population of the municipal borough, which has

an area of 3680 acres, was 43,782 ;“that of the parlia- ‘mentary borough was 82,249.

DUD—DUE

Dudley castle, according to an unfounded tradition preserved by Camden, was first built about 700 by a Mercian prince called Dodo. It is mentioned in Domesday book as belonging after the conquest to;William Fitz Ansculf. Being held in 1138 for the empress Maud by Ralphe Paganel, it was burnt by Stephen. In 1161 Gervase, Ralphe’s son, founded a priory for Cluniac monks, about a quarter of a mile to the west of the castle, at a spot still dis- tinguished bya few ruins. The lordship was afterwards held by the Somerys, and the Suttons; and from the latter family it was transferred by marriage to the Wards of Bixley. John Ward, sixth Baron Dudley, was in 1763 created Viscount Dudley and Ward ; and in 1827 John William, the fourth viscount, was created Karl Dudley. The title died with him in 1833, but was restored in 1860 in favour of William, his second cousin. The description Sir Amyas Pawlet gives of the town in 1585 is—“ one of the poorest towns 1 have seen in my life.” On its surrender to the Parliament in 1646-7 the fortifications of the castle were demolished, but it continued habitable to 1750, when a fire broke out which reduced it to its present ruinous state. Dudley was enfranchised in 1832 by 2 Will. IV. c. 45; and it received incorporation in 1865. See Booker’s History of Dudley, and Twamley’s History of Dudley Castle and Priory, 1867.

DUDLEY, Earts or. See NoRTHUMBERLAND.

DUEL, a deadly combat between two persons. The word is used in two distinct senses—(1) the judicial combat, a form of trial which prevailed in the Middle Ages, ordained by law as a proof of guilt or innocence ; and (2)

the modern duel, a pre-arranged combat with deadly weapons between two private persons to settle some private quarrel. —

Though duelling is in England obsolete, and in other countries fast obsolescent, yet it must still command our attention as the latest survival of feudalism, and its history will always be studied as one of the most curious develop- ments of medizeval society.

On the origin of the duel a vast amount of perverse ingenuity has been spent. Writers of the 16th and 17th centuries commonly begin their treatises with an account of the combats between David and Goliath, Hector and Achilles, the Horatii and Curiatii, By etymology it is true that duellum is the same word as bellum, and in this sense the origin of the duel must be traced to the earliest condi- tion of society, when every man's hand was against his neighbour. But, in the specialized sense which the word now bears, the duel was a peculiar institution of compara- tively recent origin, a local custom which never spread beyond the limits of civilized Europe. It is easily distin- guished both from the casual affrays of savages and the set battles of the champions of contending nations. An

account of the judicial duel will clearly show that it is the |

direct parent of the modern duel. In the year 501 Gondebald, king of the Burgundians, passed a law authoriz-

ing the wager of battle, and in the preamble he gives his |

reason for introducing this new form of trial. It is that his subjects may no longer take oaths upon uncertain matters, or forswear themselves upon certain. Here is one proof among many that the judicial duel was introduced to

correct the abuses of compurgation by oath. Like the

other ordeals which it superseded, it was a direct appeal to Heaven to vindicate truth and punish falsehood. Like them it was founded on the superstitious spirit of the age, but unlike them it addressed itself to the

martial temper and personal prowess of the nobles. Other ordeals, such as the cross, the corsned, and the oath on the gospels, were

in the hands of the clergy, and were manipulated by them» In the

in the interest of the church or of themselves. wager of battle each man felt that his cause was in his own hands, and, though might was right, yet even this was better than the jugglery of priests. Nor, as Montesquieu has pointed out, was the trial so irrational as it would seem to modern eyes. Among a warlike people cowardice isa sign of other vices, vices which are most hateful and most prejudicial to a simple community, of meanness, lying, and fraud. Itshows an indifference to public opinion, a neglect

of the education of the day, which consisted mainly in the use of arms and warlike exercises. In a word, the law was neither better nor worse than the received morality of the time. From this jurisdiction none was exempt ; women, minors, and ecclesiastics were required to appear by proxy ; and adverse witnesses, and even the judge himself, were liable to be challenged to make good their words by force of arms. Those who are curious to observe the formalities and legal rules of a judicial combat will find them described at length in the 28th book of Montesquieu’s Zsprit des Lois. On these regulations he well remarks that, as there are an infinity of wise things conducted in a very foolish manner, so there are some foolish things conducted in a very wise manner. For our present purpose it is sufficient to observe the development of the idea of personal honour from which the modern duel directly sprang. In the ancient laws of the Swedes we find that if any man shall say to another, ‘ You are not a man equal to other men,” or “You have not the heart of a man,” and the other shall reply, “Iam a man as good as you,” they shall meet on the highway, and then follow the regulations for the combat. What is this but the modern challenge? By the Jaw of the Lombards if one man call another arga, the insulted party might defy the other to mortal combat. What is arga but the dummer Junger of the German student ? Beaumanoir thus describes a legal process under Louis le Débonnaire :—The appellant begins by a declaration before the judge that the appellee is guilty of a certain crime; if the appellee answers that his accuser lies, the judge then ordains the duel. Is not this the modern point of

honour, by which to be given the lie is an insult which can only be wiped out by blood ?

From Germany the trial by judicial combat rapidly spread to every country of Europe. In France it was first confined to criminal causes, but this restriction was removed by Louis IX., who made it legal in civil matters as well, with the one proviso that in cases of debt the amount must exceed twelve deniers. By Philippe le Bel it was again confined in civil cases to questions of disputed inheritance, and forbidden altogether during the war between England and France. In 1385 a duel was fought, the result of which was so preposterous that even the most superstitious began to lose faith in the efficacy of such a judgment of God. A certain Jacques Legris was accused by the wife of Jean Carrouge of having introduced himself by night in the guise of her husband, and thus abused her. A duel was ordained by the Parliament, which was fought in the presence of Charles VI. Legris was defeated and hanged on the spot. Not long after a criminal arrested for some other offence confessed himself to be the author of the outrage. No institution could long survive so open a confutation, Henceforward the duel in France ceases to be an appeal to Heaven, and becomes merely a satisfaction of wounded honour. ‘The last instance of a duel authorized by the magistrates, and conducted according to the forms of law, was the famous one between Frangois de Vivonne de la ChAtaignerie and Guy Chabot de Jarnac. The duel was fought on the 10th of July 1547 in the court-yard of the chateau of St Germain-en-Laye, in the presence of the king and a large assembly of courtiers. It was memorable in two ways. It enriched the French language with a new phrase ; a sly and unforeseen blow, such as that by which De Jarnac worsted La Chataignerie has since been called a coup de Jarnac. And Henry, grieved at the death of his favourite, swore a solemn oath that he would never again permit a duel to be fought. This led to the first of the many royal edicts against duelling.

In England, it is now generally agreed that the wager of battle did not exist before the time of the Norman Con quest. Some previous examples have been adduced, but

on examination they will be seen to belong rather to the class of single combats, between the champions of two opposing armies. One such instance is worth quoting as a curious illustration of the superstition of the time. It occurs in a rare tract printed in London, 1610, Zhe Duello, or Single Combat. ‘‘ Danish irruptions and the bad aspects of Mars having drencht the common mother earth with her sonnes’ blood streames, under the reigne of Edmund, a Saxon monarch, misso in compendium (so worthy Camden expresseth it) bello utriusque gentis fata Edmundo Anglorum et Canuto Danorum regibus commissa fuerunt, qui singulari certamine de summa imperij in hac insula (that is, the Eight in Glostershire) depugnarunt.” By the laws of William the Conqueror the trial by battle was only compulsory when the opposite parties were both Normans, in other cases it was optional. As the two nations were gradually merged into one, this form of trial spread, and until the reign of Henry IIL. it was the only mode for determining a suit for the recovery of land. The method of procedure is admirably described by Shakespeare in the opening scene in Richard II., where Henry of Bolingbroke, duke of Hereford, challenges Thomas duke of Norfolk, and in the mock-heroic battle between Horner the Armourer and his man Peter in Henry VI., and by Sir W. Scott in the Fair Maid of Perth, where Henry Gow appears before the king as the champion of Magdalen Proudfute. The judicial duel never took root in England as it did in France. In civil suits it was superseded by the grand assize of Henry II., and in cases of felony by indictment at the prosecution of the Crown. One of the latest instances occurred in the reign of Elizabeth, 1571, when the lists were actually pre- pared and the justices of the common pleas appeared at Tothill Fields as umpires of the combat. Fortunately the petitioner failed to put in an appearance, and was conse- quently nonsuited (See Spelman, Glossary, s.v. “ Campus”). As late as 1817 Lord Ellenborough, in the case of Thornton v. Ashford, pronounced that “the general law of the land is that there shall be a trial by battle in cases of appeal un- less the party brings himself within some of the exceptions.” Thornton was accused of murdering Mary Ashford, and claimed his right to challenge the appellant, the brother of the murdered girl, to wager of battle. His suit was allowed, and, the challenge being refused, the accused ne a Next year the law was abolished (59 Geo. IIL, c. 46).

In sketching the history of the judicial combat we have traced the parentage of the modern duel. Strip the former of its legality, and divest it of its religious sanction, and the latter remains. We are justified, then, in dating the com- mencement of duelling from the abolition of the wager of battle. To pursue its history we must return to France, the country where it first arose, and the soil on which it has most flourished. The causes which made it indigenous to France are sufficiently explained by the condition of society and the national character. As Buckle has pointed out, duelling is a special development of chivalry, and chivalry is one of the phases of the protective spirit which was predominant in France up to the time of the Revolu- tion, Add to this the keen sense of personal honour, the ‘susceptibility, and the pugnacity which distinguish the French race. Montaigne, when touching on this subject in his essays, says, “Put three Frenchmen together on the plains of Libya, and they will not be a month in company without scratching one another’s eyes out.” The third chapter of @Audiguier’s Ancien usage des duels is headed, “ Pourquoi les seuls Francais se battent en duel.” English literature abounds with allusions to this characteristic of the French nation. Lord Herbert of Cherbury, who was ambassador at the court of Louis XTIL, says, “ There is ‘scarce a Frenchman worth looking on who has not killed

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his man’ in a duel.” Ben Jonson, in his Magnetic Lady, makes Compass, the scholar and soldier, thus describe France, “that garden of humanity” :—

There every gentleman professing arms

Thinks he is bound in honour to embrace

The bearing of a challenge for another,

Without or questioning the cause or asking

Least colour of a reason.

__ Duels were not common before the 16th century. Hallam attributes their prevalence to the barbarous custom of wearing swords as a part of domestic dress, a fashion which was not introduced till the later part of the 15th

century. In 1560 the states-general at Orleans supplicated Charles IX. to put a stop to duelling. Hence the famous ordinance of 1566, drawn up by the Chancellor de l'H6pital, which served as the basis of the successive ordinances of the following kings. Under the frivolous and sanguinary reign of Henry IIL, " who was as eager for excitement as a woman," the rage for duels spread till it became almost an epidemic. In 1602 the combined remonstrances of the church and the magistrates extorted from the king an edict condemning to death whoever should give or accept a challenge or act as second. But public opinion was revolted by such rigour, and the statute remained a dead letter. A duel forms a fit conclusion to the reign. A hair-brained youth named L'Isle Marivaux swore that he would not survive his beloved king, and threw his cartel into the air. It was at once picked up, and Marivaux soon obtained the death he had courted. Henry IV. began his reign by an edict against duels, but he was known in {private to favour them ; and, when De Crequi asked leave to fight Don Philip of Savoy, he is reported to have said, " Go, and if I were not a king I would be your second." Fontenay-Mareuil says, in his Mémoires, that in the eight years between 1601 and 1609, 2000 men of noble birth fell in duels. In 1609 a more effective measure was taken at the instance of Sully by the establishment of a court of honour. The edict decrees that all aggrieved persons shall address themselves to the king, either directly or through the medium of the constables, marshals, &c.; that the king shall decide, whether, if an accommodation could not be effected, per- mission to fight should be given ; that the aggressor, if pro- nouuced in the wrong, shall in any case be suspended from any public office or employment, and be mulcted of one- third of his revenue till he has satisfied the aggrieved party ; that any one giving or receiving a challenge shall forfeit all right of reparation and all his offices; that any one who kills his adversary in an unauthorized duel shall suffer death without burial, and his children shall be reduced to villanage ; that seconds, if they take part in a duel, shall suffer death, if not, shall be degraded from the profession of arms. 'This edict has been pronounced by Henri Martin "the wisest decree of the ancient monarchy on a matter which involves so many delicate and profound questions of morals, politics, and religion touching civil rights" (Histoire de France, x. 466).

In the succeeding reign the mania for duels revived. De Houssaye tells us that in Paris when friends met the first question was, ‘Who fought yesterday ? who is to fight to-day?” They fought by night and day, by moonlight and by torch-light, in the public streets and squares. hasty word, a misconceived gesture, a question about the colour of a riband or an embroidered letter, such were the commonest pretexts for a duel. The slighter and more frivolous the dispute, the less were they inclined to submit them to the king for adjudication. Often, like gladiators or prize-fighters, they fought for the pure love of fighting. A misunderstanding is cleared up on the ground. “ N’im- porte,” cry the principals, “puisque nous sommes ici, battons-nous.” Seconds, as Montaigne tells us, are no

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longer witnesses, but must take part themselves unless they would be thought wanting in affection or courage; and he goes on to complain that men are no longer contented with a single second, “ c’était anciennement des duels, ce sont 4 cette heure rencontres et batailles.” There is no more striking instance of. Richelieu’s firmness and power as a statesman than his conduct in the matter of duelling. In his Testament Politique he bas assigned his reasons for disapproving it as a statesman and ecclesiastic. But this disapproval was turned to active detestation by a private cause. His elder brother, the head of the house, had fallen in a duel stabbed to the heart by an enemy of the cardinal. Already four edicts had been published under Louis XIII. with little or no effect, when in 1626 there was published a new edict condemning to death any one who had killed his adversary in a duel, or had been found guilty of sending a challenge a second time. Banishment and partial con- fiscation of goods were awarded for lesser offences. But this edict differed from preceding ones not so much in its severity as in the fact that it was the first which was actually enforced. The cardinal began by imposing the penalties of banishment and fines, but, these proving ineffectual to stay the evil, he determined to make a terrible example. To quote his own words to the king, “ Il s’agit de couper la gorge aux duels ou aux édits de votre Majesté.” The count de Boutteville, a renommist who had already been engaged in twenty-one affairs of honour, deter- mined out of

pure bravado to fight a twenty-second time. The duel took place at mid-day on the Place Royal. De Boutteville was arrested with his second, the count de Chapelles ; they were tried by Parliament, condemned, and, in spite of all the influence of the powerful house of Montmorenci, of which De Boutteville was a branch, they were both beheaded at Grove, June 21,1627. For a short time the ardour of duellists was cooled. But the lesson soon lost its effect. Only five years later we read in the Mercure de France that two gentlemen who had killed one another in a duel were, by the cardinal's orders, hanged on a gallows, stripped, and with their heads downwards, in the sight of allthe people. This was a move in the right direc- tion, since, for fashionable vices, ridicule and ignominy is amore drastic remedy than death. It was on this principle that Caraccioli, prince of Melfi, when viceroy of Piedmont, finding that his officers were being decimated by duelling, proclaimed that all duels should be fought on the parapet of the Ponte Vecchio, and if one of the combatants chanced to fall into the river hc should on no account be pulled out.

Under the long reign of Louis XIV. many celebrated duels took place, of which the most remarkable were that between the duke of Guise and Count Coligny, the last fought on the Place Royal, and that between the dukes of Beaufort and Nemours, each attended by four friends. Of the ten combatants, Nemours and two others were killed on the spot, and none escaped without some wound. No less than eleven edicts against duclling were issued under le Grand Monarque. That of 1643 established a supreme court of honour composed of the marshals of France ; but the most famous was that of 1679, which confirmed the enactments of his predecessors, Henry IV. and Louis XII. At the same time a solemn agreement was entered into by the principal nobility that they would never engage in a duel on any pretence whatever. A medal was struck to commemorate the occasion, and the firmness of the king, in refusing pardon to all offenders, contributed more to restrain this scourge of society than all the efforts of his predecessors.

The subsequent history of duelling in France may be more shortly treated. The two great Frenchmen whose Writings preluded the French Revolution both set their faces against it. Voltaire had indeed, as a young man, in

obedience to the dictates of society, once sought satisfaction from a nobleman for a brutal insult, and had reflected on his temerity in the solitude of the Bastille! Henceforward he inveighed against the practice, not only for its absurdity, but also for its aristocratic exclusiveness. Rousseau had said of duelling, “ It is not an institution of honour, but a horrible and barbarous custom, which a courageous man despises and a good man abhors.” Then came the Revolu- tion, which levelled at a blow the huge structure of feudalism, and with it the duel, its instrument and apanage. Pauca tamen suberunt prisce vestigia fraudis. With each reaction against the revolutionary spirit and return to feudal ideas the duel reappears. Under the Directory it again became fashionable among the upper classes. Napoleon was a sworn foe toit. ‘“‘ Bon duelliste mauvais soldat ” is one of his best known sayings; and, when the king of Sweden sent him a challenge, he replied that he would order a fencing-master to attend him as plenipotentiary. After the battle of Waterloo duels such as Lever loves to depict werc frequent between disbanded French officers and those of the allies in occupation. The restoration of the Bourbons brought with it afresh crop of duels. Since then they have been chiefly confined to military circles, and a small section of Parisian journalists. Yet a list of duels fought within the last fifty years in France would occupy no inconsiderable spacc, and would include some of the most famous names in literature and politics, tmile de Girardin, Armand Carrel, Lamartinc, Alexandre Dumas, Ledru Rollin, Edmond About, Sainte-Beuve, and M. Thiers. Even at the present hour men like Paul de Cassagnac exer- cise a sinister power, and an editor of the Pays must be an adept with swords and pistols no less than a skilled writer. |

As a complete history of duelling would far exceed the limits of this article, we have preferred to trace in some detail its rise and fall in the country where it has most pre- vailed. We are thus compelled to pass by other nations, and conclude with a brief epitome of its annals at home. Duelling did not begin in England till some hundred years after it had arisen in France. There is no instance of a private duel fought in this country before the 16th century, and they are rare before the reign of James I. A very fair notion of the comparative popularity of duelling,and of the feeling with

which it was regarded at various periods, might be gathered by examining the part it plays in the novels and lighter literature of the times. The earliest duels we remember in fiction are that in the Afonastery between Sir Piercie Shafton and Halbert Glendinning, and that in Kenilworth between Tressilian and Varney. (That in Anne of Geierstein either is an anachronism or must reckou as a wager by battle.) Under James I. we have the encounter between Nigel and Lord Dalgarno. The greater evil of war, as we observed in French history, expels the lesser, and the literature of the Commonwealth is in this respect a blank. With the Restoration there came a reaction against Puritan morality, and a return to the gallantry and loose manners of French society, which is best represented by the theatre of the}day. The drama of Fa te ee pe ee eee

1 Voltaire met the Chevalier Rohan-Chabot at the house of the Marquis of Sully. The Chevalier, offended by Voltaire's free speech, insolently asked the Marquis, " Who is that young man?" "One," replied Voltaire, "who, if he does not parade a great name, honours that he bears." The Chevalier said nothing at the time, but, seizing his opportunity, enveigled Voltaire into his coach, and had him beaten by six of his footmen. Voltaire set to work to learn fencing, and then sought the Chevalier in the theatre, and pyblicly challenged him. A bon-mot at the Chevalier's expense was the only satisfaction that the philosopher could obtain. 'Monsieur, si quelque affaire @intcrét ne vous a point fait oublier lontrage dont j'ai & me plaindre, j'espere que vons m'eu rendrez raison." The Chevalier was said to employ his capital in petty

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the Restoration abounds in duels.) of Queen Anne, we find the subject frequently discussed in the Zatler and the Spectator, and Addison points in his happiest way the moral to a contemporary duel between Mr Thornhill and Sir Cholmeley Dering. 'I come not," says Spinomont to King Pharamond, "I come not to implore your pardon, I come to relate my sorrow, a sorrow too great for human life to support. Know that this morning I have killed in a duel the man whom of all men living I love best." No reader of Hsmond can forget Thackeray's description of the doubly fatal

duel between the duke of Hamilton and Lord Mohun, which is historical, or the no less life-like though fictitious duel between Lord Mohun and Lord Castlewood. Throughout the reigns of the Georges they are frequent. Richardson expresses lis opinion on the subject in six voluminous Ictters to the Literary Repositor. Sheridan, like Farquhar in a previous generation, not only dramatized a duel, but fought two himself. Byron thus commemorates the bloodless duel between Tom Moore and Lord Jeffrey :— Can none remember that eventful day, That ever glorious almost fatal fray,

When Little's leadless pistols met the eye, And Bow Street myrmidons stood laughing by?

As we approach our own times they become rarer in fiction. Thackeray, indeed, who represents an older generation, and the worse side of aristocratical society, abounds in duels. His royal highness the late lamented commander-in-chief had the greatest respect for Major Macmurdo, asa man who had conducted scores of affairs for his acquaintance with the greatest prudence and skill; and Rawdon Crawley's duelling pistols, "the same which I shot Captain Marker," have become a household word. Dickens, on the other hand, who depicts contemporary English life, and mostly in the middle classes, in all his numerous works has only three ; and George Eliot never once refers to a duel. Tennyson, using a poet's privilege, has laid the scene of a duel in the year of the Crimean war, but he echoes the spirit of the times when he stigmatizes "the Christless code that must have life for a blow."

To pass from fiction to fact, a list of the celebrated public men who in the last century have fought duels will suffice to show the magnitude of the evil :—Fox, Pitt, William Pulteney and Lord Hervey, Canning and Lord Castlereagh, the duke of York, the duke of Richmond, Wilkes, Sir Francis Burdett, Grattan, Daniel O'Connell. For particulars we must refer the reader to the respective names.

The year 1808 is memorable in the annals of duelling in England. Major Campbell was sentenced to death and executed for killing Captain Boyd in a duel. In this case it is true that there was a suspicion of foul play; but in the case of Lieutenant Blundell, who was killed in a duel in 1813, though all had been conducted with perfect fair- ness, the surviving principal and

the seconds were all convicted of murder and sentenced to death, and, although the royal pardon was obtained, they were all cashiered. The next important date is the year 1843, when public attention was painfully called to the subject by a duel in which Colonel Fawcett was shot by his brother-in-law Lieutenant Monro. The survivor, whose career was thereby blasted, had, it was well known, gone out most reluctantly, In obedience to the then prevailing military code. A full account of the steps taken by the late Prince Consort, and of the correspondence which passed between him and the duke of Wellington, will be found in the Life of the Prince by Theodore Martin. The duke, unfortunately, was not an unprejudiced counsellor. Not only had he been out him- self, but, in writing to Lord Londonderry on the occasion of the duel between the marquis and Ensign Battier in 1824,

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Passing on to the reign –

he had gone so far as to state that he considered the pro- bability of the Hussars having to fight a duel or twoa matter of no consequence. But though the proposal of the prince to establish courts of honour met with no favour, yet it led to an important amendment of the articles of war (April 1844). The 98th of the articles now in force ordaing that “every person who shall fight or promote a duel, or take any steps thereto, or who shall not do his best to prevent a duel, shall, if an officer, be cashiered or suffer such other penalty as a general court-martial may award.” By the same articles, to accept or to receive apologies for wrong or insult given or reccived is declared suitable to the character of honourable men. Tho effect has been that duels, which had already been banished from civil society, have been no less discredited in the English army. In the German army, on the contrary, the institution survives in full force, and is recognized by law. A full account of the courts of honour to regulate disputes and duels among German officers will be found in The Armed Strength of the German Empire.

Any formal discussion of the morality of duelling is, in England at least, happily superfluous. No fashionable vice has been so unanimously condemned both by moralists and divines, and in tracing its history we are reminded of the words of Tacitus, “in civitate nostra et vetabitur semper et

retinebitur.” Some, however, of the problems moral and social which it suggests may be shortly noticed. That duelling flourished so long in England the law is perhaps as much to blame as society. It was doubtless from the fact that duels were at first a form of legal procedure that English law has refused to take cognizance of private duels. A duel in the eye of the law differs nothing from an ordinary murder. Our greatest legal authorities, from the time of Elizabeth downwards, such as Coke, Bacon, and Hale, have all distinctly affirmed this interpretation of tho law. But here as elsewhere the severity of the penalty defeated its own object. The public conscience revolted against a Draconian code which made no distinction between wilful murder and a deadly combat, wherein each party consented to his own death or submitted to the risk of it, No jury could be found to convict when conviction involved in the same penalty a Fox or a Pitt and a Turpin ora Brown- rigg. Such, however, was the conservatism of English publicists that Bentham was the first to point out clearly this defect of‘the law, and propose a remedy. In his Introduction to the Principles of Morals and Legislation, published in 1789, Bentham discusses the subject with his usual boldness and logical precision. In his exposition of the absurdity of duelling considered as a branch of penal justice, and its inefficiency as a punishment, he only restates in a clearer form the arguments of Paley. So far there is nothing novel in his treatment of the subject. But he soon parts company with the Christian moralist and proceeds to show that duelling does, however rudely and imperfectly, correct and repress a real social evil. “It entirely effaces a blot which an insult imprints upon the honour. Vulgar moralists, by condemning public opinion upon this point, only confirm the fact.” He then points out the true remedy for the evil. It is to extend the same legal protection to offences against honour as to offences against the person. The legal satisfactions which he suggests arc some of them extremely grotesque. Thus for an insult to a woman, the man is to be dressed in a woman’s clothes, and the retort to be inflicted by the hand of a woman. But the principle indicated is a sound one, that in offences against honour the punishment must be analogous to the injury. Doubt- less, if Bentham were now alive, he would allow that the necessity for such a scheme of legislation had in a great measure passed away. That duels have since become extinct is no doubt principally owing to social changes, but it may

be in part ascribed to improvements in legal remedies in the sense which Bentham indicated. A notable instance is Lord Campbell's Act of 1843, by which, in the case of a newspaper libel, a public apology coupled with a pecuniary payment is allowed to bar a plea. In the Indian Code there are special enactments concerning duelling, which is punishable not as murder but as homicide.

Suggestions have from time to time been made for the establishment of courts of honour, but the need of such tribunals is doubtful, while the objections to them are obvious. 'The present tendency of political philosophy is to contract rather than extend the province of law, and any interference with social life is justly resented. Real offences against reputation are sufficiently punished, and the rule of the lawyers, that mere scurrility or opprobrious words, which neither of themselves import nor are attended with any hurtful effects, are not punishable, seems on the whole a wise one. What ina higher rank is looked upon as a gross insult may in a lower rank be regarded as a mere pleasantry or a harmless joke. Among the lower orders offences against honour can hardly be said to exist ; the learned professions have each its own tribunal to which its members are amenable; and the highest ranks of society, however imperfect their standard of morality may be, are perfectly competent to enforce that standard by means of social penalties without resorting either to trial by law or trial by battle.

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Popular Delusions, Duels, and Ordcals; and for a valuable list of authorities, Buckle, History of Civilization in England, vol. ii. p. 137, note 71. (FE. 3)

DUFOUR, Witaetm Hetwricu (1787-1875), a Swiss general, director of the topographical survey of Switzerland, was born at Constance, of Genevese parents temporarily in exile, on the 15th September 1787. During his early studies at Geneva he showed no special capacity, and he took a low place in the entrance examination to the Ecole Polytechnique at Paris, to which he went in 1807. By two years' close study he so greatly improved his position that he was ranked among the first in the exit examina- tion. Immediately on leaving the school he received a commission in the engineers, and was sent to serve in Corfu, which was blockaded by the English. During the Hundred Days he attained the rank of captain, and was employed in raising fortifications at Grenoble for its defence against the Austrians. After the peace that followed Waterloo he retired from the French army on half-pay, and resumed his status as a Swiss citizen. Refusing the offer of a command at Briancon on condition that he would again adopt the French nationality, he devoted himself to the military service of his native land. From 1819 to 1830 he was chief instructor in the military school of Thoune, which had been founded mainly through his instrumentality. Among other distinguished foreign pupils he had the honour of instructing Prince Louis Napoleon, afterwards emperor of the French. In 1827 he was raised to the rank of colonel, and commanded the Federal army in a series of ficld manceuvres. In 1831 he became chief of the staff, and soon afterwards he was appointed quarter- master-general, The most important work of his life was commenced in 1833, when the Diet commissioned him to superintend the execution of a _trigonometrical survey of

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Switzerland. He had already proved his fitness for the task by making a cadastral survey of the canton of Geneva, and publishing a map of the canton in four sheets on the scale of ssigy-. The larger work occupied thirty-two years, and was accomplished with complete success. The map in 25 sheets on the scale of +5joo9 Was published at intervals between 1842 and 1865, and is an admirable specimen of cartography. In recognition of the

ability with which Dufour had carried out his task, the Federal Council in 1868 ordered the highest peak of Monte Rosa to be named Dufour Spitze. In 1847 Dufour received the command of the Federal Army, which was employed in reducing the revolted Catholic cantons to submission. The quickness and thoroughness with which he performed the painful task, and the wise moderation with which he treated his van- quished fellow-countrymen, were acknowledged by a gift of 60,000 francs from the Diet and various honours from different cities and cantons of the confederation. In politics he belonged to the moderate conservative party, and he consequently lost a good deal of his popularity in 1848. In 1864 he presided over the International Conference which framed the so-called Geneva Convention as to the treatment of the wounded in time of war, &c. He died on the 14th July 1875. Dufour was the author of a Mémoire sur Vartillerie des anctens et sur celle du moyen-dge (1840), De la' fortification permanente (1850), Manuel de tactique

pour les officiers de toutes armes (1842), and various other

works in military science.

DUFRENOY, Prerre Armanp, geologist and miner- alogist, was born at Sevran, in the department of Seine-et- Oise, in France, in 1792, and died March 20,1857. After leaving the Imperial Lyceum in 1811, he studied till 1813 at the Polytechnic School, and then, at the age of twenty- one, entered the corps des mines. In conjunction with M. Elic de Beaumont he in 1841 published a great geological map of France, the result of investigations carried on during thirteen years (1823-1836). Five years (1836- 41) were spent in writing the text to accompany the map. The two authors hadalready together published Voyage métal- lurgique en Angleterre (1827, 2d ed. 1837-39), ALémoires

pour servir & une description géologique de la France (1830-

38), and a Mémoire on Cantal and Mont-Dore (1833). Other literary productions of Dufrénoy are an account of the iron-mines of the eastern Pyrenees (1834), a treatise on mineralogy (1844, 2d ed. 1856-60), and numerous papers contributed to the Annales des Mines and other scientific publications, one of the most interesting of which is entitled Des terrains

volcaniques des environs de Naples. Dufrénoy was a member of the Academy of Sciences, a commander of the Legion of Honour, an inspector-general of mines, and professor of geology at L'Ecole des Ponts et Chaussées, and of mineralogy at the Imperial School of Mines, of which latter institution he was the director.

DUFRESNY, Cares Rrvrbre (1648-1728), a French dramatist, better remembered by the comedy of his own life than by any of the numerous plays which he contributed to the ThéAtre Italien and the Théatre Frangais. The fact that his grandfather was an illegitimate son of Henry IV. procured him the liberal patronage of Louis XIV., who not only gave him the post of valet de chambre, but affixed his name now to one lucrative privilege and now to another. The protégé, however, appeared as eager to squander as the king was to bestow; and the pathetic confession of exhausted generosity —"I cannot enrich Dufresny "—was probably taken by the careless spendthrift as a signal com- pliment ; though to one of his friends who consoled him with the remark that poverty is no sin, he replied, " Zé 2s worse." On Louis's death he was almost as necessitous as if Louis had never lived; but he obtained 200,000 francs from the duke of Orleans in answer to an ingenious request

that his highness for his own glory would leave Dufresny in his excessive indigence as a sole example of the condition of the whole kingdom before the golden days of his regency. As if to fumish a piquant commentary on the proverb that poverty makes us acquainted with strange bed-fellows, he married his waslerwoman in discharge of her bill—a whimsicality which supplied Le Sage with all episode in the Diable Boiteux, and was made the subject of a comedy by J. M.. Deschamps—Charles Liviére Dufresny, ow le mariage impromptu. Clever, versatile, and superficial, he obtained in his own day a considerable reputation not only as an author and a wit, but also as a landscape gardener and architectural designer : to his great patron he furnished plans for the park at Versailles, and was appointed in return overseer of the royal grounds, He died at Paris in 1728 in a house—la maison de Pline—which he had built with the regent's bounty. His plays, destitute for the most part of all higher qualities, but abounding in sprightly

wit and pithy sayings, are no longer acted; though a few of the many in the six volumes of his 7'hédére (Paris, 1731) are still read. J/esprit de contradiction (first acted in 1700), Le double vewvage (1702), La coquette du village, and Le mariage fait et rompu are reprinted in the second volume of Didot's Chefs Pauvre des auteurs comiques ; and his con- tributions to theyThéatre Italien, produced in collaboration with Regnard or Biancocelli, may be found in Gherardi's collection,

DUGDALE, Sm Wirt1am (1605-1686), an eminent English antiquary, the only son of John Dugdale, who belonged to an old Lancashire family, but had sold his pro- perty in that county and bought the estate of Shustoke, near Coleshill, in Warwickshire, was born on the 12th September 1605. He received the early part of his education from Thomas Sibley, a curate near Shustoke, and attended from his tenth to his fifteenth year the Free School at Coventry, whence returning to his father, he read with him for some time law and history. In compliance with his father's wish, who was old and infirm, and desired to see him married before he died, he was married at the early age of seventeen to the daughter of a gentleman in the county of Stafford. He lived in his wife's father's house until the death of his own father in 1624, and soon there- after went to reside at Fillongley, near Shustoke, an estate formerly purchased for him by his father. In 1625 he purchased the manor of Blyth, in the parish of Shustoke, and, preferring it asa place of residence, removed thither in 1626. His inclination to the study of antiquities mani- fested itself at an early age, and received its first encourage- ment from Samuel Roper, a barrister of Lincoln's Inn, After his settlement at Blyth Hall he made the acquaintance of some gentlemen interested in antiquities, who enabled him to obtain a sight of the old " deeds and evidences " of the county families of Warwickshire, and " divers antiont writings of consequence," with the view of his writing a history of thatcounty. In 1635 he accompanied Sir Simon Archer to London, and was by him introduced to Sir Henry Spelman, which led to his acquaintance with Thomas, earl of Arundell, then earl marshal of England, by whom he was, in 1638, created a pursuivant of arms extra- ordinary by the name of Blanche Lyon, and in 1639 rouge- crolx pursuivant in ordinary. About this time he agreed to write his work on JMonastery Foundations, and, having a lodging in the Herald's Office, he new spent much of his time in London in

order to augment his collections out of the records of the Tower and other places in the city. In

1641 Sir Christopher Hatton, a member of the House of Commons, dreading the near approach of the revolutionary storm which soon thereafter broke over England, and the ruin that might then ensue, got him to make exact drafts of all the monuments in Westminster Abbey and the principal churches in England, including Peterborough, Ely, Norwich, Lincoln, Newark, Beverley, Southwell, Kingston-upon-Hull, York, Selby, Chester, Lichfield, Tamworth, and ,Warwick. He received and obeyed, in June 1642, the summons of Charles I. to attend him at York, whither, on the outbreak of the revolution, the king had betaken himself for the sake of greater security, Learning the spread of the revolution in Warwickshire, Charles deputed him to summon to surrender the castle of Banbury, in Oxford, and the castle of Warwick, which were being rapidly filled with ammunition and rebels, Banbury obeyed, but Warwick, being better prepared, con- temned the summons and its inmates were proclaimed traitors. He also summoned the city of Coventry ; and, accompanying Sir Richard Willys as guide, he was present at the battle of Cudworth Field, the result of which he communicated to the king. He remained at Oxford with the king till the surrender of the garrison in 1646, and witnessed the battle of Edgehill, of the field of which he made afterwards an exact survey, noting how the armies were drawn up, and where and in what direction the various move- ments took place, and marking the graves of the slain. In November 1642 he was admitted M.A. of’ the university, and in 1644 the king created him Chester-Herauld. While at Oxford he made,a journey to Worcester, where—with the purpose of increasing his collections for his history of Warwickshire—he perused the registers of the bishop and of the dean and chapter; and during his Oxford leisure he applied himself also to the search for antiquities in the libraries and in the private houses. When Oxford sur- rendered he continued his antiquarian researches in London along with Richard Dodsworth for their joint work on the monasteries, which was published successively in single volumes in 1655, 1664, and 1673. At the Restoration he obtained the office of Norroy king-at-arms, and in 1677 was

created garter principal king-at-arms, and was knighted. He died at Blyth Hall, 10th February 1686.

Besides the works on Warwickshire, published in 1656, and Monasticon Anglicanum, republished in 6 vols. in 1817-30, and again in 8 volumes in 1846, Sir William Dugdale is the author of History of St Paul's Cathedral (1658), the Baronage of England (3 vols, 1675-6), and other works of less importanee, His life, written by himself up to 1678, with his diary and eorrespondenee, and an index to his manuscript collections, was edited by William H amper, and published in 1827. —

DUGONG (Halicore), a genus of herbivorous Cetacea, forming, along which the Sea-Cows (Manatus), and the now extinct hytina, the sub-order Sirenia. In this genus the head is small, and is abruptly truncated in front, the snout being remarkably obtuse and furnished with bristles. The intermaxillary bones are enormously developed, and from these proceed two large incisor teeth or tusks, which are well developed in the male, but which in the female are arrested in their growth, and remain concealed beneath the surface. There are never more than five molar teeth on each side of either jaw, or twenty in all, and these are flat on the grinding surface. The flippers are unprovided with nails, and the tail is broad, and differs from that of the manatee in being crescent-shaped instead of rounded. 'The bones are very hard and firm, and take a polish equal to that of ivory. The dugongs frequent the shallow waters of the tropical seas, extending from the east coast of Africa north of the mouth of the Zambesi river, along the shores of the Indian, Malayan, and Australian seas, where they may be seen basking on the surface of the water, or brows- ing on submarine pastures of Alge and Fuci, for which the

thick obtuse lips and truncated snout precminently fit them. They are gregarious, feeding in large numbers in localities where they are not often disturbed. The female produces a single young one at a birth, and is remarkable for the great affection it shows for its offspring, so that when the young dugong is caught there is no difficulty in capturing the mother with it. There are two species—the Indian Dugong (Halicore indicus) and the Australian Dugong (Halicore australis). The former is very abundant along the shores of the Indian Ocean, and is captured in large numbers by the Malayans, who estecin its flesh as a great delicacy ; while the lean portions, especially of young specimens, are regarded by Europeans even as excellent eating. It is generally taken by spearing, the main object of the hunter being to raise the tail out of the water, when the animal becomes perfectly powerless. It seldom attains a length of more than 8 or 10 feet. The Australian Dugong is a larger species, attaining sometimes a length of 15 feet. It occurs ‘along the Australian coast from Moreton Bay to @ape York, and is highly valued by the natives, who hunt for ib with spears, and gorge themselves with its flesh, when they are fortunate enough to secure a carcase. In recent years the oil obtained from the blubber of this species has been largely used in Australia as a substitute for cod-liver oil. It does not contain iodine, but is said to possess all the therapeutic qualities of cod-liver oil without its nauseous taste. A full grown dugong yields from 10 to 12 gallons of oil, and this, according to Bennet, “forms in cold weather a thick mass, and requires to be melted before a fire previously to being used.” According to the same authority, the flesh of the Australian dugong is easy of digestion, the muscular fibre when fresh resembling beef, and when salted having the flavour of excellent bacon. In the earliest Australian dugong fishery, natives were employed to harpoon these cetaceans ; they soon, however, became too wary to allow themselves to be approached near enough for this purpose, and the harpoon was abandoned for the net. ‘The latter is spread at night, and in its meshes dugongs are caught in considerable numbers. The skin is nearly half an inch thick, and can be made into gelatine or glue.. ,

DUGUAY-TROUIN, Rent (1673-1736), a famous French admiral, was the son of a sea captain, and was born at St Malo on the 10th June 1673. He was originally intended for the church, and studied with that view at Rennes and Caen ; but on the breaking out of the war with England and Holland in 1689 he obtained leave to enter the marine. Accordingly he embarked in the capacity of a volunteer on board a small vessel of 18 guns, equipped by his family, and during the first three months his courage was tried by a violent tempest, an imminent shipwreck, the boarding of an English ship, and the threatened destruction of his own vessel by fire. The following year, as a volunteer in a vessel of 28 guns, he carried off the honours in a bloody combat with an English flect of five merchant vessels, The courage he then showed was so remarkable that in 1691, at the-age of cighteen, he obtained the com- mand of a frigate of 14 guns, when, having been thrown by 4 tempest on the coast of Ireland, he burned two English ships in the river Limerick. In 1694 his vessel of 40 guns was captured by the English, and, being taken prisoner, he was confined in the castle of Plymouth, where, however, he made love to the daughter of the jailer, and by her aid managed to escape. He then obtaincd command of a vessel of 48 guns, and made a capture of English yessels on the Irish coast. In 1696 he made a brilliant capture of Dutch vessels, and the king hearing an account of the affair raised him in 1697 to the rank of captain of a frigate. In 1704—5 he desolated the coasts of England. In 1706 he was raised to the rank of captain of a vessel of

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the line. In 1707 he was made chevalier of the order of St Louis, and captured the. greater part of an English con- voy of troops and munitions bound for Portugal. His most glorious action was the capture in 1711 of Rio Janeiro, on which he imposed a heavy contribution. In 1715 he was made chief of a squadron, and in 1728 commander of the order of St Louis and lieutenant-general. In 1731 he commanded a squadron for the protection of French com- merce in the Levant. He died 27th September 1736.

DU GUESCLIN, Berrranp (c. 1314-1380), constable of France, the most famous French warrior of his age, was born of anancient but undistinguished family, at the castle of La Motte-Broon, near Rennes, about

1314, The date is doubtful, the authorities varying between 1311 and 1824. The name is spelt in various ways in contemporary records, eg., Claquin, Klesquin, Guescquin, Glayaquin, &e. The familiar form is found on his monument at St Denis, and in some legal documents of the time. In his boyhood Bertrand was a dull learner, spending his time in open air sports and exercises, and could never read or write. He was remarkable for ugliness, and was an object of aversion to his parents. He first made himself a name as a soldier at the tournament held at Rennes in 1338 to celebrate tho marriage of Charles of Blois with Jeanne de Penthiévre, at, which he unseated the most famous competitors. But this playing at fighting was not enough for his ambition ; and in the war which followed between Charles of Blois and John de Montfort, for the possession of the duchy of Brittany, he served his apprenticeship as a soldier. As he was not a great baron with a body of vassals at his com- mand, he put himself at the head of a band of adventurers, and fought on the side of Charles and of France. dic distinguished himself by a brilliant action at the siege of Vannes in 1342; and after that he disappears from history for some years. In 1351, having shortly before been mad: a knight, he was sent into England with the lords of Brittany to treat for the ransom of Charles of Blois, who had been defeated and captured by the English in 1347. When Rennes was besieged by the duke of Lancaster, in 1356, Du Guesclin forced his way with a handful of men into the town, and successfully defended it till June 1357, when the siege was raised in pursuance of the truce of Bordeaux. For this service he was rewarded with the lordship of Reche d'Airien. At the expiration of the truce he distinguished himself by the defence of Dinan, and here he engaged in single combat with Sir Thomas Canterbury. Shortly afterwards he married ; and about the same time he passed into the service of France, and greatly distin- guished himself at the siege of Melun (1359). In April 1364, in conjunction with Boucicaut, he recovered Mantes and Meulan from the king of Navarre; aud in May he defeated the Navarrese under Captal de Buch at Cocherel, and took their leader prisoner. The king uow created him marshal of Normandy and count of Longueville. At the battle of Auray, in September of the same year, Charles of Blois was defeated and killed, and Du Guesclin taken prisoner, by Sir John Chandos. The grand companies beginning, after the close of the war, to play the part of brigands in France, it was necessary to get rid of them. Du Guesclin was ransomed for 100,000 crowns, and was: charged to lead them out of France.

Ife marched with them into Spain, visiting Avignon on the way, and extorting from the Pope a large sum of money and his absolution. Du Guesclin now supported Henry of Trastamare against. Peter the Cruel, set the former upon the throne of: Castile. (1366), and was made constable of Castile and count of Trastamare. In the following year he was defeated and captured by the Black Prince, ally of Peter the Cruel, at. Najara, but was soon released for a heavy ransom. Once

more he fought for Henry, reinstated him on the throne °

(1369), and was created duke of Molinas. In May 1370, at the command of Charles V., who named him constable of France, he returned to France. War had just been declared against England, and Du Guesclin was called to take part in it. For nearly ten years he was engaged in fighting against the English in the south and the west of France, recovering from them the provinces of Poitou, Guienne, and Auvergne, and thus powerfully contributing to the establishment of a united France. In 1373, when the duke of Brittany sought English aid against a threatened invasion by Charles V., Du Guesclin was sent at the head of a powerful army to seize the duchy, which he did ; and two years later he frustrated by a defensive policy the attempt of the duke with an English army to recover it. Finding in 1379 that the king entertained suspicions of his fidelity to him, he resolved to give up his constable’s sword and retire to Spain. His resolution was at first proof against remonstrance ; but ultimately he received back the sword, and continued in the service of France. In 1880 he was sent into Languedoc to suppress disturbances and brigandage, provoked by the harsh government of the duke of Anjou. His first act was to lay siege to the fortress of Chiteauneuf-Randon, held by the English, strongly garrisoned and well provisioned. A day was fixed con- ditionally for capitulation. Meanwhile the great warrior was smitten with a mortal illness, and died, July 138, 1380. The commander led out the garrison and deposited the keys of the castle on the coftin of the hero. Du Guesclin lost his first wife in 1371, and married a second in 1378, but he left no legitimate children. His remaius were interred, by order of the king, in the church of St Denis, Of

the numerous reeent biographies of Du Gueselin, the most recent is the learned work by D. F. Jamison (Charleston, 1863),

which was translated into French by J. Baissac by order of Marshal Count Randon, minister of war, and published in 1866.

DUHALDE, Jan Baptiste (1674-1743), geographical writer, was born at Paris, February 1, 1674. In 1708 he entered into the Society of Jesus, and some time afterwards he was appointed to succeed Father Legobien, who had been intrusted with the duty of collecting and arranging the letters which they received from their missionaries in different quarters of the globe. He was also for some time secretary to tle famous Father Le Tellier, confessor to the king of France. He died August 18, 1743. Duhalde is represented as a man of mild and amiable character, and as remarkable alike for his unaffected piety and unwearied industry. He was the author of some Latin poems, which do uot evince any superior degree of excellence. The productions for which he is principally distinguished are— (1) Lettres Hdifiantes ct Curieuses écrites des Missions Sitrangéres, which he edited with great ability from the ninth to the twenty-sixth volume inclusive, and which have been translated into English and German; and (2) De- scription géographique, historique, chronologique, politique, et physique de? Empire de la Chine et de la Tartarie Chinoise, Paris, 1735, in four volumes large folio, with figures and an atlas by D'Anville. This work, the first in which China is described with so much exactness and detail, is a beauti- ful specimen of French typography. An English translation by Brookes was published in 1736 in 4 vols.

DUHAMEL, Jean Baptistn (1624-1706), a French astronomer and physician, was the son of an advocate, and was born at Vire, in Normandy, in 1624. He commenced his studies at Cacn, and completed them at Paris. At the age of eighteen he wrote a treatise on the Spherics of Theodosius, and added to it a tract ou trigonometry, designed as an introduction to astronomy. At the age of twenty-one he became curé of N euilly-sur-Marne, but with- out neglecting the duties of his calling, he continued to cultivate the physical sciences with zeal. In 1656 he was

named almoner of tlie king; in 1663 he obtained the dignity of chancellor of the church of Bayeux; and in 1666, when Louis XIV. established the Royal Academy of Sciences, ho was appointed perpetual secretary. He was preparing a history of the Academy when he died, August 6, 1706. He published numerous works on philosophy, divinity, and physical science.

DUHAMEL DU MONCEAU, Henry Louis (1700- 1782), a celebrated French botanist and agriculturist, was the son of Alexandre Duhamel, lord of Denainvilliers, and was born at Paris in 1700. He was placed at the Collége d'Harcourt, but made little progress in his studies, except that, notwithstanding the imperfect manner in which the natural sciences were there taught, he acquired such a taste for these branches of knowledge as led him to attend the lessons of Dufay and Bernard de Jussieu at the Jardin des Plantes. He now spent his time between the capital, where he pursued his botanical studies and held intercourse with scientists, and his estates at GAtinais, where he eniployed his knowledge in arboricultural experiments. Having been requested by the Academy of Sciences to investigate the cause of the disease which was destroying the saffron plant in Gatinais, he discovered that its destruc- tion was owing to a parasitical fungus which attached itself to its roots. 'The work' in which he demonstrated his dis- covery was judged worthy to appear in the transactions of the Academy, and gained him admission to that body in 1728, From then until his death he busied himself chiefly with making experiments in vegetable physiology, and recording and publishing his observations. Having learned from Sir Hans Sloane that madder possesses the property of giving colour to the bones, he fed animals successively on food mixed and unmixed with madder ; and he found that their bones in general exhibited concentric strata of red and white, whilst the softer parts showed in the mean- time signs of having been progressively extended. Froma nuniber of experiments he was led to believe himself ablo to explain the growth of bones, and to demonstrate a parallel between the manner of their growth and that of trees. Along with the celebrated naturalist Buffon, he made numerous experiments on the growth and strength of wood, one of the results of which was that he recommended the bark to be taken off the trees several years before they aro cut down. He experimented also on the growth of the nuistletoe, on layer planting, on smut in corn, and on the production of soda and potash by different vegetables. From the year 1740 he made

meteorological observations, and kept records of the influence of the weather on agricultural production. Having been appointed inspector-general of marine, he applied his scientific acquirements to the improvement of nautical knowledge, subjecting' everything to the%test of facts and experiments. Duhamiel's aim in his researches was rather to be useful than to gratify his own curiosity or to win fame. He made himself accessible to all who sought information from him, and his modesty was as great as lis knowledge. He was scrupulous in the practice of his religious duties. He died August 13, 1782.

His works are generally of an elementary eharaeter, and from the minute details of their information are rather prolix. They number nearly 90 separate publieations, the principal of which are —Traitté des arbres et arbustes qui se cultivent en Franee en pleine terre; Eléments de Varehttecture navale > Traité general des péches maritimes et fluviatiles ; Eléments @agriculture ; La physique des arbres ; Des semis et plantations des arbres et de leur culture; De Pexplotitation des bois; Traité des arbres fruttiers.

DUISBURG, a town of Prussia, at the head of a circle in the government of Diisseldorf, situated at an important railway junction in the country between the Rhine and the Ruhr, and communicating with both rivers by a canal. It has a fine Gothic church—Salvatorkirche—of the 15th century, a. gymnasium, and an orphan asylum, and is also

the seat of a great Protestant Diakonenanstalt, or Deacon's Institute, founded in 1844 by Engelbert, and forming the centre of a large organization for philanthropic action. Its importance, however, is mainly due to the great development of its industry, which deals on an extensive scale with various branches of engineering and the iron manufacture, as well as with cotton—both yarn and cloth—tobacco, sugar, and a number of cheinical stuffs, such as alum, soda, and Prussian blue. Probably known to the Romans as Castrum Deutonis, and mentioned under the Frankish kings as Dispargum, Duisburg early attained the rank of an imperial free town, passed in 1290 to Cleves, and afterwards to Brandenburg, and from 1655 to

1818 was the seat of a university, transferred in the latter year to Diisseldorf. Population in 1871, 30,533.

DUKE (Latin, dux), next to the princes and princesses of the blood royal, and the four archbishops of England and Ireland, the highest order and rank of the British peerage. ‘The title of duke was introduced into England when, by a charter dated 17th March 1337, the lordships, castles, lands, &c., constituting the earldom of Cornwall, were erected byiKing Edward III. into a duchy, and were conferred upon his eldestson Prince Edward of Woodstock, afterwards so well and honourably known as the Black Prince, who thus as duke of Cornwall was the jist English duke. When, in 1343, he was created to the dignity of Prince of Wales, the Black Prince was invested with a coronet,’a gold ring, and a silver rod. And, as duke of Cornwall, he had already been invested with asword. The second of the English dukes was Henry, earl of Lancaster, Derby, and Leicester, and count of Provence, who in 1351 was created duke of Lancaster.

Of the form and enrichment of the princely coronet of the Black Prince no representation or descriptive record is known to exist; nor is it known whether any distinctive coronet was ever assigned to the prince as the ensign of his ducal rank. As now worn, a duke’s coronet has eight golden leaves of a conventional type (commonly called, but without any reason whatever, “ strawberry-leaves ”), set erect upon a circlet of gold, and having their stalks so con- nected as to form them into a wreath. In ‘representations, three only of the leaves, with two half leaves, are shown. Of late years this coronet has inclosed, and in representa- tions is shown to inclose, a cap of crimson velvet, sur- mounted by a rich golden tassel, and lined and guarded with ermine (fig. 1); but, still more recently, this coronet

Ducal Coronets.

is commonly represented, with much better taste, with

neither cap or lining of any kind, as in fig. 2. The opinion 1s prevalent that this distinctive form of coronet appears for the first time placed about the basinet of Prince John of Eltham, the younger brother of Edward IIJ., who died in 1336, in his monumental effigy in Westminster Abbey. That there is no foundation for such a supposed origin of the ducal coronet is evident

from the efligy itself ; since the decorations of the headpiece and of the rest of the armour are precisely the same, and they also are identical with similar decorations that appear in other effigies of about the same date. The decoration, however, that is carved upon the basinet of Prince John may probably have suggested the crest-coronet, which in the 15th century so frequently

o19 supported knightly crests. It must be added that the basinet in the effigy of Prince John certainly once was encircled by a plain narrow fillet, probably of gold, for the reception of which a channel still appears, slightly sunk in the alabaster immediately below the band of conventional leafage that is carved in low relief. The effigy of the Black Prince himself (1376), at Canterbury, exhibits on the basinet a decorative accessory that may possibly have been the prototype of the leaf-crowned circlet restricted to dukes in later times. From the jewelled band or fillet that encompasses this basinet there rise sixteen leaves, with a second series of the same number of trefoils of much smaller size alternating, with the larger leaves, the stalks of the whole being conjoined. These larger leaves differ very slightly from those that are carved upon the armour of Prince John of Eltham, and they are in exact accordance with a favourite form of decorative foliage in general use when the effigy was executed. In his will, Lionel, duke of Clarence, who died in 1368, bequeathed the “two golden circles,” with one of which he states that he himself had been “created a duke,” while with the other his elder brother, the Black Prince, had been “ created a prince.” It may be accepted as certain that for a considerable time the coronets of both dukes and earls were decorated rather after an arbitrary taste than in accordance with any estab- lished rule. Thus, more than a century after the death of the Black Prince, the coronet of John de la Pole, K.G.

duke of Suffolk, has the circlet heightened with fleurs-de-lys alternating with clusters of three small balls. The exact period at which the distinctive enrichments of the coronets of the different orders in the British peerage was determined and established still remains undecided.

In early times, the rank, dignity, and title of duke were directly associated with power, authority, and local posses- sions, which constituted and were inseparable from his dukedom ; but, after a while, these associations

gradually became weakened, and at length for the most part they ceased to exist of necessity, so that at the present day the connection between a duke and the locality that gives the title to his dukedom may be very slight indeed.

This same title, duke, is borne still, with their princely rank and title, by the princes of the royal family, as it was in the days of Edward III. ; but these royal dukedoms, notwithstanding that they constitute peerages and are hereditary, are created chiefly with a view to connect the members of the reigning house with the great cities or with certain provinces of the realm. The old royal dukedom of York is now so far in abeyance that since the last duke of York died without issue no duke of York has been created. The rival royal dukedom of Lancaster since the accession of Henry IV. has been merged in the crown. The duke- dom of Cormwall is held by the heir apparent.

At various periods also, and in different countries, this same title, duke, has been in use to denote certain princes who were the actual sovereigns of small states, or others who, while vassals of some great suzerain, enjoyed in an approximate degree a virtual independence. The term duke, again, was introduced into their English version by the translators of the Old Testament, as a becoming title for certain chieftains and potentates, the Oriental sheiks of a remote antiquity.

A duke in the British peerage, not of royal rank, is styled “ Your Grace,” and he is “ Most Noble ;” his wife is a “duchess,” and she also is styled “ Your Grace,” and is “Most Noble.” All their sons are “ lords,” and all their daughters are “ladies;” but their eldest son bears his father’s “second title,” since each of the higher ranks of nobility has one or more of the lower ranks associated with it; thus a duke’s eldest son always ranks as a marquis, and generally bears that title. The parliamentary mantle

or robe of a duke is scarlet, and has four doublings of ermine. The royal dukes have coronets as princes. The coronet of a duchess is the same as that of her husband.

The titles arch-duke and arch-duchess, grand-duke and grand-duchess, are in use on the Continent, the former in Austria and the latter in Russia, to distinguish the princes and princesses of the imperial families. The title grand- duke has also been applied to certain of the minor Con- tinental independent princes. ©. B.)

DUKINFIELD, a township and local board district of England, in East Cheshire, forming part of the parlia- mentary borough of STALEYBRIDGE, which see.

DULCAMARA, so named from its taste, at first bitter and eventually sweet, is a drug consisting of the dried young branches of Solanum Dulcamara, Bitter-sweet or Woody Nightshade—a woody perennial of the natural order Solanacee. It has a slender shrubby and climbing stein ; flowers in lateral or terminal cymes, with a hypogynous purple corolla, and yellow anthers converging into a cone ; and fruit a red, oval, scarlet berry. For medical purposes the branches are collected in autumn when the leaves are shed. Dulcamara contains an alkaloid solanine, C,,H,,NOj, (Zwenger and Kind), besides a sweet and bitter principle, dulcamarine or picroglycion, and other matters. The drug was formerly supposed to be efficacious in a great variety of complaints. It appears to have some effect on the skin and kidneys, and the infusion is now administered in chronic skin diseases, cachectic conditions of the system, and rheumatic affections.

See D. Cauvet, Des Solanécs, Strasburg, 1864; Garrod, Materia Medica, 4th ed. 1874.

DULCIGNO, a town of Turkey in Europe, in the Albanian sanjak of Scutari, occupying a bold promontory on the Adriatic, eighteen miles W.S.W.‘ of the town} of Scutari. It has a strong castle, is the seat of a Catholic bishop, and numbers about 8000 inhabitants, who are mainly engaged in agriculture, but also carry on a little ship-building fand a certain amount of foreign commerce. The Turkish Olkin, or Olgun, preserves more distinctly the ancient name of Oleiniwm, by which Dulcigno was known to the Romans, who obtained possession of it about 167 B.c. during the war with Gentius, the Illyrian king. In modern history the town is noted for the defeat of the Venetians in 1718; and its inhabitants were long remarkable for their piracies.

DULUTH, a city and lake port of the United States, in the state of Minnesota, advantageously situated at the south-west extremity of Lake Superior, about 150 miles north-east of St Paul. It forms the eastern terminus of the Northern Pacific railroad and the northern terminus of the Lake Superior and Mississippi railroad. A ship canal, 250 feet wide, which has been cut across Minnesota point, gives ready access to the town from the lake. Duluth stands on the side of an acclivity overlooking the lake. It possesses docks, and contains several manufactories. Owing to its position the rise of the town has been very rapid. In 1860 there were not 75 inhabitants, whereas a census in 1875 showed the population to be 5000. It derives its name from Jean Du Luth, a French officer who visited the spot in the 17th century.

DULWICH, a village of England, in the county of Surrey, five miles from London Bridge, remarkable for its college and picture gallery. Tho manor, which had belonged to the Cluniac monks of Bermondsey, was granted by Henry VIIL, in 1541, to Thomas Calton ; and his grandson, Sir Francis Calton, sold it in 1606 to Edward Alleyn, whose name is indissolubly associated with the place by his princely foundation. Dulwich College, or, as he quaintly and piously called it, “ God’s- Gift College ” (see ALLEYN, vol. i, p. 584), was opened with great state on

September 13, 1619, in the presence of Lord Chancellor Bacon, Lord Arundell, Inigo Jones, and other distinguished men. According to the letters patent the almspeople and scholars were to be chosen in equal proportions from the parishes of St Giles (Camberwell), St Botolph without Bishopsgate, and St Saviour’s (Southwark), and “that part of the parish of St Giles without Cripplegate which is in the county of Middlesex.” By a series of statutes signed in 1626, a few days before his death, Alleyn ordained that his school should be for the instruction of 80 boys consist- ing of three distinct classes :—(1) the twelve poor scholars ; (2) children of inhabitants of Dulwich (who were to be taught freely) ; and (3) “towne or foreign schollers,” who were “to pay such allowance as the master and wardens shall appoint.” That it was the founder’s intention to establish a great public school upon the model of West- minster and St Paul’s, with a

liberal provision for university training, is conclusively shown by the statutes ; but he was scarcely dead when his grand project was overthrown, and for more than two centuries the educational benefits of God's Gift College were restricted to the twelve poor acholars. In 1858, however, the foundation was entirely reconstituted by Act of Parliament. The government of the college is now vested in 19 governors, of whom 11 are nominated by the Court of Chancery and 8 elected by the four parishes already mentioned, The first head of the reconstituted college, 'and the first also who has not borne the name of Alleyn, is the Rev. A. J. Carver, D.D. The revenue is at present (1877) more than £17,000 a year, with the prospect of a large and progressive increase. After provision for the expenses of management and the maintenance of the chapel and library, the surplus is divided into four portions, of which three are assigned to the educational and one to the eleemosynary branch of the foundation, The educational foundation comprises two distinct schools, the " Upper" and the " Lower." In the former the curriculum of study, as defined by Act of Parliamont, includes, besides ancient and modern languages and mathematics, drawing and designing, civil engineering, physics, chemistry, and other branches of science; in the latter it is similar to that adopted in so-called middle-class schools. The Upper School contained in 1877 nearly 600 boys, and the Lower 160. The buildings of the Upper School are a splendid pile, designed by Mr Charles Barry, in the " Northern Italian style of the 138th century." They are said to form the most commodious and complete, as probably they have proved the most costly, fabric erected for educational purposes in recent times. The main architectural feature is the interior of the great hall, which will compare advantageously with some of the best college halls at Oxford or Cambridge. There are about 25 acres of playground and cricket-field included within the boundary fence of the college. Dulwich College possesses one advantage peculiar to itself in its splendid picture gallery, bequeathed to the college by Sir P. F. Bourgeois, R.A., in 1811, with a separate endowment of £520 ayear. The pictures most widely known and most highly appreciated are probably the exquisite Murillos and the choice specimens of the Dutch school. The surplus income of the gallery fund is devoted to instruction in drawing and design in the two schools.

See W. Harnett Blanch, Dulwich College and Edward Alleyn,

1877.

DUMANGAS, a town of the Philippines, in the island of Panay, near the mouth of the river Jaluar. It is situated in a fertile plain, and deals in rice, trepang, and pina. Population stated at 25,000.

DUMARSAIS, Ctsan Cuesneau (1676-1756), 4 French philologist, was born at Marseilles, July 7, 1676. His father died while he was yet an infant; and his mother;

by her extravagance, dissipated his patrimony. He was educated in his native town by the Fathers of the Oratory, into whose congregation he entered; but feeling the restraints on his liberty too severe, he left it at the age of twenty-five, and repaired to Paris, where he married, and was admitted an advocate in 1704. He soon, however, quitted the bar, separated from his wife, to whom he gave up the little he possessed, and went to reside with the President de Maisons, in the capacity of tutor to his son. He was afterwards successively tutor to the son of Law, the projector, and the son of the Marquis de Baufremout. It was during this last period that he published the results of his grammatical investigations, which were received with great indifference. On terminating his engagement with the Marquis de Baufremont he opened an establishment for education in the faubourg St Victor, which scarcely afforded him the means of subsistence. He strove to eke out his scanty income by contributions to the Encyclopedia, but his last years were spent in very straitened circumstances. He died at Paris on the 11th June 1756, at the age of eighty. Dumarsais possessed no ordinary talents. His researches are distinguished alike by their accuracy, ingenuity, and depth. As a man, he combined the greatest purity of morals and simplicity of character with a rare degree of manly fortitude in the midst of his misfortunes ; yet during the greater part of his life he was left to languish in obscurity, and his merits scarcely attracted any notice until nearly half a century after his death. His works on philosophy and general grammar, however, are worthy of attention. Of these, the best are his Principes de Gram- mawre and his Histoire des Tropes. D’Alembert and Voltaire both paid a just and discriminating tribute to the merits of Dumarsais. An edition of his works was collected by

Duchosal and Millon, and published at Paris in 1797, in seven vols. 8vo. In 1864, the French Institute proposed a prize for an éloye on Dumarsais, which was gained by De Gérando, whose work was published at Paris in 1805, in 8vo. An earlier éloge by D'Alembert is to be found in the Mélanges de Littérature, and prefixed to the above-mentioned edition of the works of Dumarsais.

DUMAS, ALEXANDRE (1802-1870), one of the most remarkable characters that the 19th century has produced, was the son of General Dumas and of Marie Labouret, an innkeeper's daughter. His father was an officer of remarkable gallantry, who for his dashing exploits had obtained the odd title of the '" Horatius Cocles of the Tyrol." He was a creole, the illegitimate son of the Marquis Davy de la Pailleterie, andof Louise Dumas, a black woman of St Domingo. Long after, his grandson was to excite the laughter of Paris by claiming this title, and assuming the family arms. The general had an insubor- dinate temper, and excited the dislike and suspicion of Napoleon, who sent him back from Egypt to languish in obscurity, and die of disappointment at Villers-Cotterets in the year 1806.

Alexandre Dumas was born on July 4, 1802, at Villers- Cotterets, where he was brought up under the care of an affectionate and pious mother. Some of the most graceful passages of autobiography are to be found in those pages of his memoirs which are devoted to an account of his boyhood, and which present an excellent picture of French country town life. He seems to have been an idle and a troublesome youth, and, though places were found for him with notaries and other functionaries, he could not settle to business. The family means were slender. They were soon almost reduced to poverty ; and in the year 1823 Alexandre set, off for Paris to seek his fortune, where he was to make such good use of his slender opportunities, that within five years his name became famous. Within a few days of his arrival, an old

o21 friend of his father's, General Foy, obtained a clerk's place for him in the duke of Orleans's establishment, worth only £50 a year, but it seemed a fortune. A friend, De Leuven, and he now joined their talents in a light farce called Le Chasse et ? Amour (produced September 22, 1825). This was succeeded by a dramatic piece, written with the assistance of one of his friends, and called Za Noce et 'Enterrement (November 21, 1826), known

in England as the amusing Jllustrious Stranger. Meanwhile the visit of Macready and other English players to Paris had introduced him to Shakespeare, and had set him to work on a grand romantic and historical drama which he called Christine. The young clerk had the boldness to look forward to having it presented on the boards of the first theatre in France, and, with an energy and spirit that should encourage every friendless aspirant, set every resource he could command at work. Charles Nodier introduced him to Baron Taylor, the literary director of the theatre, who, if we are to credit Dumas, was so enchanted with the work that he accepted it and submitted it to the company at once. It is more probable that, from the rather corrupt fashion which then regulated such matters, the privilege was secured by the influence of the duke of Orleans. But it happened that another Christine was supported by even greater influence, and Dumas's had to be withdrawn. In a short time he had written Henri ITI. which was produced (February 11, 1829) with the most extraordinary results, This piece was important as being the first success of the well known " Romantic school." Henri ITT., it is said, brought its author about £2000. But the revolution of July now broke out and interrupted every literary scheme.

It was, however, welcomed by the creole's son, who flung himself with ardour into the struggle. And here begins that double interest in his life, which was as adventurous as that of some of his own heroes, and suggests the career of Benvenuto Cellini. He has, of course, made his own share in the exciting scenes of the Three Days ag conspicu- ous as possible ; and his expedition to Soissons, and almost single-handed capture of a powder magazine, a general, and officers were heartily laughed at and wholly dis- believed. Allowing, however, for embellishment, it is due to him to say that his narrative seems to be true in the main. He was, however, unlucky enough to have cast his lot with the more violent party, which found itself opposed to the Orleans family, and never recovered their favour ; and King Louis Philippe always treated him with a good- humoured contempt.

He now returned to his dramatic labours, and produced Antony (1831), one of the earliest of those gross out- rages on public morality which have helped to make conjugal infidelity the favourite theme of the French drama. But by this time he had found that the slow production of dramas scarcely offered a profitable field for his talents. The successful founding of the

Revue des Deux Mondes tempted him into trying his skill on historical romances, professedly in imitation of Sir Walter Scott. And this would seem to be the first opening of that seam which was to be worked later with such extraordinary profit. Here he introduced that daring system of working up the ideas of others, which he had already carried out in his dramatic labours, his successful pieces of Henri III. and Christine proving to consist of whole scenes stolen from Schiller and other writers almost without changing a word, though the arrangement of the plot and situations are masterly and original. A piece of his, called the Zour de WNesle (produced in 1832), which caused a perfect furore in Paris, led, however, to a more serious charge of plagiarism. In consequence of a duel he was directed to leave France for

|} a time, and set off—in July 1832—on a tour through

a

Switzerland, which suggested to him a series of those odd books of travels made up of long extracts from old memoirs, guide-books, imaginary dialogues, and adventures. _

In 1842 he married an actress named Ida Ferrier, who had performed in his plays ; but the union was not a happy one, and, after a rather extravagant career, the lady retired to Florence, where she died in the year 1859. Hitherto his success, though remarkable, could not be called Euro- pean, and he was not to be distinguished from the crowd of French professional /ittératewrs. But in 1844 the famous Monte Christo appeared, which may be said to have excited more universal interest than any romance since Robinson Crusoe or Waverley. The extraordinary colour, the never- flagging spirit, the endless surprises, and the air of nature which was cast over even the most extravagant situations, make this work worthy of the popularity it enjoyed in almost every country of the world. It was followed by the no less famous Zhree Musketeers. These productions were the more remarkable as they were written from day to day for the readers of a newspaper, and thus

firmly established the feudlleton as a necessary element of French literature. In this, as in other departments where he was successful, Dumas was not original, and only took up the idea of a successful predecessor, Eugéne Sue, whose Juif Lrrant had enjoyed much popularity in this shape.

This triumph made him, as it were, irresponsible in the literary world, and suggested to him a series of whole- sale operations for supplying the public with books, the history of which makes an extraordinary chapter in literature. He contracted for innumerable stories, each of great length, and to be published at the same time, almost any one of which would be beyond the powers of a single writer. In a single year, 1844, he issued some forty volumes, and later on he engaged himself even more deeply to meet these heavy demands. He began by employing one or two assistants, with whose aid he furnished his two great stories; and it may be said that, with his constant supervision and inspiration, his daily direction, suggestion of incidents, manipulation of the ideas of others, consulta- tions, &c., he might almost fairly claim the credit of having written Monte Christo and the Three Musketeers. His most valuable assistant was Maquet. Indeed, the chief credit of Dumas's most important stories has been claimed for him; but as he afterwards often tried his powers alone, and with but poor success, it seems probable that his share in Dumas's works was no more than what has been described. But presently the popular writer found that even this form of partnership was too great a tax upon his time, and he began to proceed upon the simpler process of ordering works from clever young writers, to whom he suggested a subject and perhapsa simple outline of treatment—and then issuing their work with his name. Some care in the selection was at first exercised, but later he accepted any stuff that was brought to him—travels, essays, stories—and endorsed them with hisname. Indeed a volume could be filled with the odd details and complicated ramifications of this system, which was exposed in the most unsparing fashion by Granier de Cassagnac, Jacquet alias " De Mirecourt," and Quérard. Dumas justified his system of appropriating from dead and living authors by a theory of what he called " conquests." 'All human phenomena," he says, 'are public property. The man of genius does not steal, he only conquers. Every one arrives in his turn and at his hour, seizes what his ancestors have left, and puts it into new shapes and com- binations."

In the meantime he was earning vast sums. Leaving the work of composition to his journeymen, he now entered on a new and reckless course, with a view of dazzling his countrymen and gratifying his own Eastern taste. In this view he built a vast theatre for the production of his own

works, and a gorgeous castle at St Germain, on the model of a palace in a fairy tale, on which he lavished every adornment. While these follies were in progress, he suc- ceeded in getting himself attached to the suite of the young duke of Montpensier, then (1846) setting out for Madrid to be married, and received besides a sort of commission from the Government to visit Algeria, with a view to making it popular by a lively account from his pen. He was granted a passage to Oran on board one of the Government mail boats, but, through an awkward misconception, was allowed to divert this vessel from her regular service, and used her for visiting Carthage, Tunis, and other places. On his return there was much scandal, and the ministry was very severely interrogated as to the irregularity of allowing “a contractor for stories ” to make so free with public property. It was explained that this was entirely owing to a misre- presentation of the popular writer’s. Another rebuff, too, was waiting him; for, having completely neglected his engagements to the various newspapers while making this agreeable tour, he found himself engaged in heavy law-suits with no less than seven journals, including the Constttu- tionnel and the Presse. After defending himself in person, a performance that was the entertainment of all Paris, he was cast in damages. This was the beginning of his dis- asters. His theatre, after opening with one of his pieces which took two nights to perform, fell on evil days, and the revolution of 1848 plunged it into difficulties. In these new scenes he was by no means popular, being suspected from his assiduous attendance on the Orleans family. By this time all his best works had been written; and he was now only to attract attention by some extravagant literary somersault or impudent attempt at “ humbugging ” the public. He attempted newspapers like the Mousque- taire, of which he would grow tired after a few numbers, but to every article in which he was ready to attach his name. His next escapade was joining Garibaldi (1860), whose messenger and lieutenant he constituted himself ; and, in reward for some trifling service, he claimed the appoint- ment of “director of the museum and explorations” at Naples, an

office he was presently forced to resign. After this he was reduced to all manner of devices to maintain himself, always borrowing and obtaining money by shifts and pretences which in another could not be called honest. It becomes, indeed, painful to follow the stages in this rapid decay,—-to find him reduced to writing “ puffs” for tradesmen, to exhibiting himself in shop windows, and to introducing grand schemes to the public which it is impossible to read without hearty laughter. A scandalous infatuation, too, was to be associated with his old age, which last excited the contempt pity of all who knewhim. To the last he was full’of schemes, devised with the fertility and roseate imagination of a Micawber ; and to the last, unfor- tunately, he was devoted to pleasure. The result was a break- ing up of his health, and even a decay of his faculties. When the war of 1870 broke out he was removed from Paris to Puys, near Dieppe, and there affectionately attended by his son and daughter. He died on the 5th of December in thesame year. He was even poorer than when he began the:world ; and the brilliant novelist, who had earned more than £10,000 a year, had hardly a sou left. On the 16th April 1872, when the war was over, his remains were removed to Villers-Cotterets, and interred in presence of the leading littératewrs of Paris.

The works that bear Dumas’s name are said to amount tosome 1200 volumes. His dialogue is entirely his own, full of spirit and dramatic propriety—and this, too, in spite of the temptation, to a man paid by the line, to “spin out” his matter to the utmost extent. He left about sixty dramas, of which not more than three or four will be remembered; but two, the Mariage sous Low’s XV. and

Malle. de Beile Isle, belong to the repertoire of the Comédie Francaise. These will always be listened to with delight. His most popular stories have been mentioned, but even now their undue expansion and interminable development, owing to the necessities of the fewilleton system, are found to be serious obstacles to their popu- larity.

He left a daughter, Madame Petel, who has written a few romances, and a son, the well-known “ Alexandre Fils,” who, unlike his father, has been distinguished by slow and careful work. He is best known by his romance

La Dame aux Camélias, which has been translated in every language in which romances are written, and by a number of dramas which deal satirically with the characters, follies, and man- ners of society under the second empire. PF.)

DUMAS, Marrarev, Count (1753-1837), a French general and military historian, was born at Montpellier of a noble family, on the 23d November 1753. He joined the army in 1773, and entered upon active service in 1780, as aide-de-camp to Rochambeau commander-in-chief of the army sent to aid the Americans in their war against England. He hada share in all the principal engagements that occurred during a period of nearly two years. Shortly after the capture of Yorktown, in whicli he took part, he joined the expedition under Vandreuil intended to make an attack on Jamaica. On the conclusion of peace with England in 1783 he returned to France, where he soon afterwards received his commission as major. In 1784 he was sent to explore the archipelago and the coasts of Turkey, a service in which he was engaged for two years, and which he performed with great thoroughness. He was present at the siege of Amsterdam in 1787, where he co- operated with the Dutch against the Prussians. At the Revolution he acted with Lafayette and the constitutional liberal party, whose aim was to effect a complete reform without abolishing monarchy. He was intrusted by the Assembly with the command of the escort which conducted Louis XVI. to Paris from Varennes, where he had been arrested. In 1791 he was appointed to a command at Metz, where he rendered important service in improving the discipline of the troops, and in organizing the first battalion of horse artillery that ‘was formed in France. Chosen a member of the Legislative Assembly in the same year by the department of Seine-et-Oise, he advocated with firmness and eloquence the principles and policy of the constitutional party to which he belonged. In the following year he was elected president of the Assembly. When the extreme republicans gained the ascendancy, however, he became a marked man, and judged it prudent to make his escape to England. Returning after a brief interval under the apprehension that his father-in-law would be held responsible for his absence, he arrived in Paris in the midst of the Reign of Terror, and had to flee to Switzerland to avoid the fate of his friends Barnave and Duport Dutertre. Soon after his return to France he was elected a member of the Council of Ancients. On the triumph of the extreme revolutionists in 1797,

Dumas, being proscribed as a monarchist, made his escape to Holstein, where he enjoyed the hospitality of Count Stolberg. During this exile he wrote the first part of his Précis des Hvénements Militatres, which was published anonymously in monthly numbers at Hamburg in 1800. Recalled to his native country when Bonaparte became first consul, he declined the prefecture of Bordeaux, preferring a military appointment. Intrusted with the organization of the army of reserve at Dijon, he was on the completion of the task appointed chief of the staff to that army. In 1801 he was nominated a councillor of state, and in the same year he was chosen to propose and defend in the Corps Legislatif the formation .of the Legion of Honour, of which order he afterwards

(1810) became grand officer. Attached to the household of Joseph Bonaparte, Dumas went in 1806 to Naples, where he became minister of war. On the transfer of Joseph to the throne of Spain, and the accession of Murat to that of Naples, Dumas rejoined the French army, with which he served in Spain during the campaign of 1808, and in Germany during that of 1809. After the battle of Wagram, Dumas was employed in negotiating the armistice, and ‘he was left by Napoleon at Vienna in order to super- intend the evacuation of Austrian territory by the French troops. In the disastrous Russian expedition of 1812 he held the post of intendant-general of the army, which involved the charge of the entire administrative depart- ment. He shared the horrors of the retreat from Moscow, and the privations he suffered brought on a dangerous ill- ness, from which, however, he recovered after a brief interval of repose at Dantzic. Resuming his duties as in- tendant-general, he took part in the battles of Liitzen and Bautzen. When the decisive defeat of Leipsic occurred, Dumas, who was stationed with the besieged army in Dresden, was employed to negotiate the unavoidable capitulation, the terms of which, though agreed to by the opposing general, were not ratified by the allied sovereigns. Dumas, who had gone to report the matter to the emperor, was consequently arrested and imprisoned in Hungary until peace was concluded in 1814, On the accession of Louis XVIII. Dumas received several important commissions in connection with the administration of the army. He had the entire confidence of the king, and would have been appointed minister of marine but for the adverse influence of the party that had been in exile during the empire. When Napoleon returned from Elba, Dumas at first kept himself in retirement, but

he was persuaded by Joseph Bonaparte to present himself to the emperor, who intrusted him with the task of organizing the National Guards. This brought him into disfavour with the Bourbons, and he was obliged to retire upon half-pay when Louis XVIII. was restored to the throne. He devoted his leisure to the continuation of his Précis des Evénements Militaires, of which nineteen volumes, embracing the history of the war from 1798 to the Peace of Tilsit in 1807, appeared between 1817 and 1826. A growing weakness of sight, ending in total blindness, prevented him from carrying the work farther, but he translated Napier's History of the Peninsular War as a sort of continuation to it. In 1818 Dumas was restored to favour through the influence of Gouvion Saint-Cyr, and admitted a member of the Council of State. In 1828 he was chosen a deputy by the first arrondissement of Paris. After the revolution of 1830, in the events of which he took an active part, Dumas was created a peer of France, and re-entered the Council of State as president of the war committee. He died at Paris on the 16th October 1837. Besides the Précis des Evénements Militaires, which forms a valuable source for the history of the period of which it treats, Dumas wrote autobiographical reminiscences under the title of Souvenirs, which were published posthumously by his son (3 vols. 1839).

DUMBARTON, a western county of Scotland, anciently called Lennox or Levenaux, bounded by the river Clyde and its estuary on the S., by Stirlingshire and Lanarkshire on the E., by Perthshire on the N., and by Loch Long and Argyllshire on the W. It consists of two parts, which are six miles distant from each other, and are separated by part of Lanarkshire. The western or larger district is about 35 miles long from N.W. to 8.E., and 15 broad, the breadth varying from 2 to 13 miles. The eastern district, which is about 12 miles in length from E. to W., and 4 in breadth from N. to §., is completely inclosed by the counties of Stirling and Lanark. This detached part, com-

prising the parishes of Cumbernauld and Kirkintilloch, belonged to Stirlingshire till the earl of Wigton, whose property it was, became heritable sheriff of Dumbartonshire, and annexed it to this county, which, as a whole, contains 270 square miles, or 172,677 statute acres, and is divided into 12

parishes. The county isin shape a crescent, having a convex coast-line of 35 miles, formed by the Clyde on the south for 15, and Loch Long on the west for 20 miles. Along its eastern side for a distance of 24 miles stretches Loch Lomond, the “queen of Scottish lakes,” studded with small islands, which number 30 in all, and most of which, with about two-thirds of the shore, are in Dumbartonshire. There are other fresh-water lakes in the county, but they are of a minor description. The Gare Loch is an arm of the sea about six miles long by one broad, and forms with Loch Long the peninsula of Roseneath, nearly detaching it from the mainland. Besides the Clyde, the only river of any note which can be said to beloug to this county is the Leven, the outlet of Loch Lomond, which, flowing for six miles through a fine valley, joins the Clyde at Dumbarton Castle. The mountainous districts are marked by number- less cascades and lesser streams, falling for the most part into Loch Lomond, of which the chief are the Falloch, Inveruglas, Douglas, Finlas, Fruin, &c. The Kelvin, which skirts the eastern border, drains the detached portion of the county. About two-thirds of Dumbartonshire are hilly and mountainous. The most elevated regions are in the west and north-west, between Loch Long and Loch Lomond, and to the north of Loch Lomond. Ben Voirlich, in the extreme north, attains an elevation of 3092 feet, and Finnart, on Loch Long, is 2500 feet high. While this mountainous character prevails in the north of the county, in the eastern detached district and along the Clyde and the Leven it is lowland—marked, however, by the rising of abrupt emi- nences such as the hills of Kilpatrick and Cardross, and the rocks of Dumbarton and Dumbuck. In scenery it is un- surpassed in Scotland, not only for what it embraces but for the magnificent and extensive views which it commands. The climate varies with the character of the county, but is on the whole salubrious, though much more humid than in many parts of Scotland. The prevailing winds are from the west and south-west, but easterly winds are frequent in the spring months. Frosts are seldom severe, and, except on the mountains, snow never lies long. In the southern districts of the county Old Red Sandstone stretches from Roseneath to Loch Lomond; limestone is found in the higher grounds of Kilpatrick, Dumbarton, and Row; the hills of Dumbuck and Kilpatrick and Dumbarton Rock are composed of trap ; while mica slate, quartz, and tale princi- pally constitute its northern formations. Clay-slate is like- wise found, and has been wrought with success at Luss, Camstradden, and Roseneath. Coal measures also exist, and there are pits for working coal

in several districts, Ironstone is found in considerable quantities in connection with limestone in the parishes of Kirkintilloch and Cumbernauld.

The arable lands of Dumbartonshire, which extend chiefly along the Clyde and the Leven, and are composed of rich black loam, gravelly soil, and clay, are divided into farms ranging from 30 to 300 acres, and in some cases to 700 or 800 acres. From the proximity to Glasgow and other large towns, the farmers have the double advantage of good manure and a ready market for all kinds both of stock and produce; and, under the stimulus of this, great progress has been made. Special attention has been given to the construction of farm buildings, the erection of fences, and the use of proper draining, as well as to the rearing of cattle and the management of dairy stock, principally of the Ayrshire breed. Black-faced sheep and black cattle are pastured on the hilly lands, and Cheviot sheep and

Ayrshire stock on the low grounds. In 1876 Dumbarton- shire had 1717 horses, 13,153 cattle, 71,202 sheep, and 911 pigs. Oats and wheat are grown in considerable quantities; large crops of potatoes are raised; turnips, barley, and beans are also grown. In 1876 there were 9862 acres under corn crops, of which 7930 were under oats and 1140 under wheat, while 4443 under green crops, On the banks and islands of Loch Lomond there are some yew trees of large size, and evidently of a very great age. There are few large estates in the county; the largest being Rossdhu (Sir James Colquhoun, Bart.), 67,041 acres, Strathleven (Mrs Ewing), 9180, Roseneath (duke of Argyll), 6799, and Cumbernauld (Hon. Cornwallis Fleming), 3520. The whole number of landowners having one acre and upwards is 706, possessing 152,968 acres, of the annual value of £251,134.

The banks of the Leven, whose waters as well as being constant are singularly soft and pure, have long been celebrated for their bleaching establishments, dye-works, and print-works. Bleaching was carried on in the Vale of Leven upwards of 150 years ago. The printing of cotton began at Levenfield in 1768, and has for some time been the chief manufacturing industry in Dumbartonshire. There are carried on with great success at Upper and Lower Levenbank Works, located within half a mile of Loch

Lomond, the dyeing and printing of Turkey red cloth and yarn ; at Dalmoonach, the different processes in calico-print- ing; and at Ferry-field, Croftingea, and Dillichip the various departments of the general business are conducted on a large scale. At Milton, in West Kilpatrick, the first factory for machine weaving was erected; and here existed, a century ago, a bleaching and calico printing establishment. At Duntocher, in the same parish, cotton-spinning has been carried on from the beginning of the century, and so extensively as to take rank as the second manufacturing industry in the county. In the town of Dumbarton there are extensive ship-building yards, engine-works, foundries, tanneries, and breweries. At Dalmuir extensive works for the repair of the dredging plant belonging to the Clyde Trust were erected by the trustees in 1867, costing £25,000. A large patent slip for taking on the dredgers used on the Clyde forms part of these works, at which three steam forge- hammers are in constant operation. In 1850 a line of rail- way, already completed from Bowling to Dumbarton, was extended up the Vale of Leven to Balloch. In 1858 the Glasgow railway to Helensburgh was opened, running through Bowling, Dumbarton, and Cardross, and supplying, with the steam communication on the Clyde and the lochs, abundant facilities for every kind of traffic to all parts of the county. The Forth and Clyde Canal, begun in 1768 and opened for traffic in 1775, passes through Dum- bartonshire for more than 16 miles, and is carried over the valley of the Kelvin by an aqueduct. At Bowling there is a harbour with quays, forming a tidal basin of 8} acres.

The county is somewhat rich in antiquities, connected both with the period of the Roman occupation and with that of the aboriginal inhabitants of Scotland. The wall of Antoninus runs along the north of the eastern part and through the south-east corner of the main district to Kilpatrick. Remains of Roman workmanship have been found at Duntocher and in the parish of Cumbernauld, as well as at the castle. The Caledonians, Picts, &«, are commemorated by rude forts and tumuli here and there ; and there are several remains of old baronial castles. Rob Roy’s district lies to the north ; the clans had encounters in Glenfruin ; and the county is associated with the heroic Wallace and Bruce, the latter having built a residence at Card- ross, in which he died. Inmodern times, the first steam navi- gation company in Britain was formed at Dumbarton in 1815 ; Henry Bell, from whose designs the first steamer built

on the Clyde, ‘The Comet,” was constructed, and who indeed was the first to put into operation the idea of employing steam for navigation purposes, lived at Helensburgh, where he died in 1830. A monument to him was erected near Bowling. The celebrated ship-building firm of Napier & Sons had its origin in a smith’s foundry business at Dumbarton.

Several important watering-places, including Helens- burgh, Kilcreggan, Roseneath, é&c., are situated in Dum- bartonshire. ‘The other principal towns and villages are Kirkintilloch, Alexandria, Duntocher, Bonhill, Renton, Dalmuir, .Kilpatrick, Cardross. The leading gentlemen’s seats are Rossdhu (Sir James Colquhoun, Bart.), Roseneath, (duke of Argyle), Garscube House (Sir George Campbell), Tillichewan Castle (J. Campbell), Bonhill Castle, and Shandon (now a hydropathic establishment), built by the late Robert Napier.

The county sends one member to Parliament. Popula- tion in 1801, 20,710; in 1841, 44,296; in 1871, 58,857.

DuMBARTON, a royal parliamentary and municipal burgh and seaport-town of Scotland, capital of Dumbartonshire, is situated at the confluence of the rivers Clyde and Leven, 14 miles north-west from Glasgow. It is a very ancient place, and is said to have been once the capital of a kingdom of the Britons in the vale of the Clyde. Alcluyd, “ the rock upon the Clyde,” was the name of this ancient capital of the Strathclydenses ; but whether it was situated on the site of the present town, or confined within the precincts of the castle, cannot be exactly ascertained. The site had previously been used as a naval station by the Romans, who called it Theodosia. At a subsequent period, Dumbarton was the capital of the earldom of Lennox, but was given up by Earl Maldwyn to Alexander IT., by whom it was erected into a royal burgh in the year 1221, and declared to be free of all imposts and burgh taxes. It afterwards received other charters from succeeding monarchs, and finally it obtained a confirmation of the whole from James VI. Among other privileges conferred was that of levying customs and dues on all vessels on the Clyde from the Kelvin to the head of Loch Long; and ships within these bounds had to pay duties at Dumbarton. “‘ Offers dues” on foreign vessels coming into the Clyde were also levied. In 1700 these rights were

transferred to Glasgow by a contract, but were subsequently vested in a special trust created by successive Acts of Parliament. The town is principally built upon the eastern bank of the Leven, which almost encircles it, and is chiefly composed of one main street, lying in a semi-circular form round the head or west end of the peninsula and parallel to the river. A good stone bridge of five arches, 300 feet long, connects the town with Bridgend, a suburb on the western side of the Leven. The waters of the Leven form the harbour. For seventy years the staple trade of Dumbarton was the manufacture of crown glass, commenced in 1777 and discontinued after the abolition of the glass duty. As many as 300 hands were employed in the business. But for many years its principal trade has been ship-building, and particularly the construction of iron steamers. By situation the most "natural" port on the Clyde, Dumbarton has the distinc- tion of originating in Britain the formation of steam naviga- tion companies. In 1815 a joint-stock company was formed in Dumbarton to run a steamer from that town to Glasgow, and their steamer, the " Duke of Wellington," was built by James M'Lachlan in Dumbarton. The next steamer was built by William Denny in 1820, from which date the ship-building of the town may be said to have started. But it was not till 1844, on the application of Iron to the purposes of ship-building, that the trade assumed the important proportions to which it was raised by the firm of Denny and by others. The Dennystoun Forge

Company, which is amongst the largest and most unique in' Great Britain, both as respects the building itself and the machinery employed, was opened in 1855. Exten- sive harbour improvements were entered upon in 1852, and successfully carried out. In 1874 the total ton- nage of iron vessels launched in Dumbarton amounted to 32,000, in 1875 to 387,000, in 1876 to 17,500. Some of the vessels built in Dumbarton are among the most magnificent employed in the British trade. The General Police Act has been in operation in Dum- barton since 1855. In 1857 the sanction of Parliament was obtained to a bill for extending the municipal boundaries so as to include West Bridgend. The embank- ment of the Broad Meadow, a project which had been entertained for 250 years, was accomplished in 1859, securing for the town a considerable tract of agricultural land and 20 acres

of recreation ground. Since 1860 the burgh has been supplied with water drawn from the Long Craigs. A fine cemetery, a mile from the town, was formed in 1854 ; and the old Dumbarton parish churchyard has been closed by authority since 1856. The disadvantage Dumbarton long laboured under of having access to the river steamers merely by ferry boats is now obviated by a pier recently constructed from the foot of Dumbarton Rock, at a cost of from £8000 to £9000. The situation of Dumbarton Castle is eminently picturesque. The buildings composing the fort are perched on the summit of a rocky mount, shooting up to the height of 206 feet sheer out of the alluvial plain on the east side of the mouth of the river Leven. To the east of the castle there are rocky eminences on the verge of the Clyde, of a similar form, though less iso- lated. The Rock of Dumbarton measures a mile in circumference at the base. It diminishes in breadth near the top, which is cloven into two summits of different heights. The rock is basalt, and has a tendency to columnar formation. Some parts of it have a magnetic quality. The fortress, naturally strong, possesses several batteries, which command a very extensive range. According to a provision in the Treaty of Union, the defences are kept in constant repair, and a garrison is maintained in the castle. The affairs of the burgh are managed by a provost, 2 bailies, and 16 councillors. The county and burgh build- ings are good. Dumbarton joins with Port-Glasgow, Renfrew, Rutherglen, and Kilmarnock in returning a member to Parliament. In 1871 the population amounted to 11,404. (D. M.)
DUMDUM, or DampamA, a town and cantonment in

‘ British India, at the head of an administrative subdivision

in the district of the Twenty-four Pergunnahs, in the presidency of Bengal, with a station on the Eastern Bengal railway, 44 miles N.E. of Calcutta, in 22° 37’ 53” N, lat. and 88° 28’ 1” E. long. It was the head-quarters of the Bengal artillery from 1783 to 1853, when they were trans- ferred to Meerut as a more central station; and its posses- sion of a cannon foundry and a percussion-cap factory pro- cured for it the half jocular name of the Woolwich of India. The barracks—still occupied by small detachments—are brick-built and commodious ; and among the other buildings are St Stephen’s Protestant church, a Roman Catholic chapel, a European and native hospital, a large bazaar, and an English school. The population in 1872 amounted to 5179, of whom 1201 were Mahometans, 1053 Christians,

and 2586 Hindus. The males numbered 3414, the females 1765. It was at Dumdum that the treaty of 1757 was signed, by which the nawab of Bengal ratified the privileges of the English, allowed Calcutta to be fortified, and bestowed freedom of trade ; and in 1857 it was the scene of the first open resistance of the sepoys to the use of greased cartridges.

DUMFRIES, one of the three Scottish border counties, lies in an elliptical form on the north side of the Solway Firth, its other boundaries being Lanark, Peebles, and Selkirk on the N., Roxburgh on the E., Ayr and Kirkcud- bright on the W., and Cumberland on the 8. Its greatest length is fully 50 miles, its breadth 32, its circumference 190, and the area is 1103 square miles or 702,953 acres. The coast-line on the Solway measures 21 miles. Towards this arm of the sea the county slopes down from a high inountain range, by which it is cinctured on the north, the intermediate pace being extremely irregular, lofty hills alternating with wide stretches of table land or rich fertile holms, and in other instances the surface looking like a vast undulating mass that by some natural process had suddenly become ;fixed and rigid. Among the leading features of the county are the three dales by which it is cleft from north to south, and through which run the rivers that give name to them, the Nith, Annan, and Ksk. Over- looking these rise numerous elevations, the highest being Whitecoomb in the east, 2695 feet ; Hartfell in the north, 2651 feet ; Queensberry, also in the north, 2285 feet, which gives to the duke of Buccleuch his secondary title, and the title of marquis to a branch of the house of Douglas ; and Ettrick Pen, 2269 feet, the latter standing sentinel over an extensive district.

The Nith is the chief river of the county. Start- ing from its mountain cradle near Dalmellington, in Ayrshire, it takes a south-westerly sweep, watering the old burgh of Sanquhar, at the head of Nithsdale, and further down the modern village of Thornhill, near which stands the ducal castle of Drumlanrig. As the river proceeds it passes on the one hand Dalswinton, where Patrick Miller made his first fruitful experiments in steam navigation, and on the other the acres of Ellisland, which Robert Burns turned over with his plough. At Auldgirth Bridge, near Blackwood, the dale narrows considerably; then it expands till around and below the burgh of Dumfries it

appears as a spacious plain, with gentle acclivities or bolder eleva- tions rising on every side. The Nith is swelled by numer- ous streams at various stages, its latest and largest acquisi- tion being the Cluden, the confluence taking place about a mile above Dumfries, and the absorbing river reaching the Solway about eight miles below that burgh, its whole course measuring about 50 miles.

An upland spot, where the counties of Lanark, Peebles, and Dumfries converge, gives birth to three streams, accord- ing to the popular saying,

‘*Annan, Tweed, and Clyde ~ All arise from one hillside.”

The first-named river, after a rapid canter from its high- land source, five miles above Moffat, receives several tribu- taries a little south of that town, then proceeds ata leisurely pace down the dale, which, narrowed at first by rocks or ridges, expands into a fertile basin termed “the Howe of Annandale,” studded with hamlets and spangled by the nine lochs of Lochmaben,—that venerable royal burgh, which claims to have been the birth-place of King Robert Bruce, and the prosperous town of Lockerbie occupying conspicuous places on the western and eastern banks ; other rivulets, including the Dryfe (flowing past the scene of a fierce clan battle fought between the Maxwells and Johnstones in 1675), giving increased volume to the stream below Bruce’s burgh, the valley narrowing again as the water grows wider and deeper. When little more than a mile from the sea it passes Annan, the second town in the county, its entire length being nearly 40 miles.

During about a mile of its course the Esk divides Dumfriesshire from Cumberland ; starting from the Selkirk- shire frontier it flows southward past the baronial town of Langholm, and, after being a Scottish stream to the extent

of 30 miles, it enters English ground, waters Longtown, describes a westward curve, and then falls like its two sister streams into the Solway, its entire course extending to about 40 miles.

Besides the lakes in Annandale already referred to, Loch Skene, lying under the shadow of Whitecoomb hill, 1300 feet above sea-level, is the only one

of consequence ; its water finds an outlet by leaping over a rocky height of 300 feet, forming a cascade termed the Gray Mare's Tail. Another small but exceedingly picturesque waterfall in Morton parish is called Crichope Linn.

The chief mineral waters of the county are those of the well at Moffat, and another about five miles distant, called Hartfell Spa, situated in a cleft of the hill from which it takes its name. The former are reckoned beneficial for chronic gout, rheumatism, and liver complaints ; and the latter acts as a mild astringent and powerful tonic. Owing to the great repute of these waters, and the romantic scenery of the surrounding district, Moffat during summer and early autumn becomes a favourite and fashionable place of resort. A small chalybeate at Brow, on the Solway, possesses considerable virtue, and is rendered interesting from the circumstance that it was partaken of by Burns during his last illness, though without avail.

Generally speaking the climate is mild and salubrious, with a mean temperature of 45° Fahr., the average rainfall supplying sometimes more than enough of moisture. The soils are chiefly gravel or sandy loam and clay, except where river and estuary have formed rich alluvial tracts. At no very distant date it was roughly computed that there were 86 square miles of arable land lying along the sea coast, 322 miles chiefly upland, and 598 miles mountainous yielding nothing but heather and game ; but by the applica- tion of bone manure, draining, planting, and green crop husbandry, all this is changed, no fewer than 213,784 acres being under the plough—even the huge expanse of Lochar moss, lying in the parishes of Tinwald, Dumfries, and Torthorwald, becoming by degrees less of a reproach to the agricultural enterprise of its proprietors, though much of the surface of the county still wears a pastoral aspect drawn from one of its chief rural industries, sheep-breeding. In 1876 there were 49,975 acres under corn crops, of which 48,292 were oats and 546 wheat; 25,669 were under green crops, of which 20,747 were turnips ; and 63,762 were in grass under rotation. These figures differ little from those for 1873, except that 1231 acres were then in wheat. With abundance of coal at the two extremities—Sanquhar and Canonbie; with limestone at Kilhead, Closeburn, and Barjarg ; with lead mines at Wanlockhead, the produce of which when undergoing refinement yields a large per- centage of silver; with gold dust and even nuggets of that metal in the same district, but now no longer searched for

systematically, as they were with considerable success in the 16th and 17th centuries; with sandstone quarries in various quarters ; with woollen mills at Langholm ; with numerous manufactures centring in the county town; with some little sea-borne traffic ; and with good salmon fisheries in the Nith, along the Carlaverock shore, and at Annan Water-Foot on the Solway,—the county itself is still essen- tially an agricultural one, and as such it takes high rank.

Early in the 18th century the district breeders of Galloway cattle began to send stock to the south; and, before the current century was far advanced, some 15,000 head of heavy cattle were annually driven from Dumfriesshire and Galloway to the English markets. Forty years ago the number had increased to 20,000, their value on an average being at least £200,000. For some years past Ayrshire dairy cattle and shorthorns have superseded the Galloways on most farms of the county, and its trade in live stock generally has considerably decreased. Few store cattle are

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exported, they being mostly grazed a year or two and fed off ; and similar treatment is given to numerous short-horn yearlings and two-year-olds that are imported from Ireland. Tn 1876 the entire cattle in the county numbered 53,778 head, the sheep 493,020, the horses 7390, the pigs 14,413, —-+these returns varying little from those of 1873, except as regards sheep, which amounted that year to 513,849. The sheep trade of Dumfriesshire, which is of com- paratively recent origin, is now of great extent. Cheviots predominate, the frugal, black-faced breed still occupy- ing the higher sheep walks, while half-bred lambs, the produce of Cheviot ewes crossed by Leicester or other long-wooled rams, are fattened on the richer pasture yielded by low-lying farms, supplemented by turnips in winter, and are thus made ready for the butcher when fifteen months old. For nearly a hundred years pig- feeding has occupied a place in the rural economy of the county. A sum of £50,000 represented its annual trade in pork about sixty years ago. Influenced by large imports of bacon from America, the curing of carcases has of late decreased. In 1876 the number sold in the public markets of the county was under 8000, the value of which, allowing for those disposed off privately, would not exceed £45,000; a few years back the annual value ran

from £70,000 to £75,000. As regards quality and flavour, the Dumfriesshire hams still maintain the high character they have long held in the English markets.

Three leading highways, one in each valley, with numer- ous branch roads, intersect the county. It possesses also ample railway communication,—the Glasgow and South- Western line, completed in 1850, extending through Nithsdale and Lower Annandale, and, soon after passing Gretna Green (famous in days of yore for its matrimonial celebrations), crossing the little border river Sark ; and the Caledonian line, completed in 1849, traversing Moffatdale and Upper Annandale, and also a portion of England as far as Carlisle.

In a Parliamentary Blue Book (1874) the acreage of the county is given at 676,971, and its yearly value (1872) at £595,511, 17s., the owners numbering 4177, of whom 886 possessed more thanfone acre each, the value per acre being 17s. 7d. as compared with 20s. for all Scotland. From the valuation roll for 1876 we learn that the chief proprietor, the duke of Buccleuch and Queensberry, owns 253,514 acres, yielding an annual revenue of £97,840. The names of other leading proprietors, with their extent of land and incomes from it, are—Mr J. J. Hope Johnstone of Annandale, 64,079 acres, with a rental of £28,684; earl of Mansfield, 14,342 acres, £15,938; marquis of Queens- berry, 13,243, £13,982; Mrs Villiers and Viscountess Cole of Closeburn, 13,560, £11,658 ; Sir John Heron Maxwell of Springkell, 13,391, £9023; Mr R. Jardine of Castlemilk, 17,064, £9339; Sir F. J. W. Johnstone of Westerhall, 7714, £7932; and Lord Herries, 5814, £6537. Population of county in 1861, 75,878; in 1871, 74,784.

Dumfriesshire during the Roman occupation formed part of the province of Valentia, which lay between: the walls of Hadrian and Antonine, the British tribes oceupying it being termed the Selgovee. In course of time they were dispossessed by other Celts, the Seoto-Itish ; but the aboriginal Britons shared with the latter, and with the numerous Saxons and the few Normans of a later day, in being the progenitors of the existing inhabitants ; and of them lasting memorials remain in the names of rivers, mountains, and headlands, most of which are- British, ‘‘the nomenclature of the earliest

colonists of the county thus remaining unchanged by the conflicts of race or the flight of ages.” Down to the death of David I., Nithsdale and some other portions of the distriet were still to a large extent Celtic in their people and institutions ; after that king’s reign we begin to read of its historical families, some of whom are still its leading landowners—of its Maxwells, Douglases, Kirkpatrieks, Johnstones, Bruces, Baliols, Comyns, Seotts, Carlyles, Jardines, Murrays, and Crielitons.

Of all the primitive inhabitants numcrous memorials still exist

out in the form of druidical remains, British motes and camps, Roman roads and camps, Anglo-Saxon relics, the chief of the latter being the Runie monument at Ruthwell, which tells the story of the Cross in characters as old as the days of thefHeptarehy. As the eounty is also replete with ‘‘ chiefless eastles breathing stern fare- wells,” and other time-worn tokens of bye-gone ages, it prescnts_a rich field for archeological research. f

Dumrries, beautifully situated on the left bank of the Nith, about eight miles from the Solway Firth, is the capital of the county just described.

The irregular yet decided progress of the town can be traced through the Middle Ages, and more recently till our own day, when it wears an attractive and flourishing aspect. A serious check was given to its prosperity by a visitation of cholera, which cut off more than 500 of its inhabitants in 1832. Since a copious supply of good water was obtained from a neighbouring loch, and other sanitary improvements were introduced, the salubrity of the burgh has been fairly established, and its size and trade—promoted also by its railway intercourse and the establishment of the tweed manufacture—have greatly increased. Few Scotch pro- vincial towns have gone forward with such a gigantic stride during the last thirty years, and its steps in advance have been especially remarkable during the latter half of that period, as shown chiefly by the bustle of its business streets, the formation of new thoroughfares, and the numerous suburban villas which now environ the old burgh proper.

From time immemorial the town has possessed a great weekly cattle market, which, though reduced since 1848 by the establishment of competing markets, and the substitu- tion of sheep for cattle on many

surrounding farms, is still second to none on the north side of the border. The average number of cattle sold on the Sands during five years ending 1872 was nearly 14,000 yearly; in 1876 the number was 18,413, besides 6844 sold at the auction marts. Vast herds are also sent direct south from the railway station. A still larger trade is now done in sheep, the average number offered for sale during five years ending 1872 being 37,000, while 29,980 were sold at market in 1876, and 42,958 by auction. There is also a weekly market for pork, beginning in November and ending about the end of March.

Among the special industries of Dumfries, clog-making and basket-making have long occupied an important place ; its traffic in timber has grown to be immense; a hundred acres of nursery ground help to beautify the town, and supply material for an extensive trade in seeds, flowers, and other plants; the conversion of skins into hides and leather gives labour to about 150 hands; while nearly the same number are engaged at iron works. More extensive than any of these is the hosiery manufacture, which, dating a century back, now gives employment to about 480 hands (including warehousemen), the goods produced ranking as the best in Scotland, and next to those of Hawick in extent. Prior to 1847, however, the prosperity of Dumfries de- pended much on its position as the capital of a rich rural district, which it still is; but soon after that date it began to bulk largely as a manufacturing town in connection with the tweed trade ; and to its development the growth of the burgh in size and opulence is principally due. The principal firm, that of Walter Scott and Sons, usually employs about 1400 workers, with 400 looms and 30,000 spindles. Nearly all the business traffic to and from Dumfries is now carried on by rail, the vessels belonging to the port numbering only two or three, and its revenue—-burdened by heavy interest on a sum borrowed to erect a large sea-dyke, which has been of little benefit—ig in- sufficient to cover the expenditure.

The origin of two places of worship in connection with the Established Church (St Mary’s and Greyfriars’) is noticed below; a third, St Michael’s, is a stately fabric

dating from 1746. (in 1869, it contained a pew which Burns and his family

occupied. The poet's remains rest under a magnificent mausoleum in the surrounding churchyard ; and besides this paramount distinction the cemetery 1s richer with inonumental erections than that of any other provincial town in the United Kingdom. Among the other eccle- siastical buildings are three Free churches, three belong- ing to the United Presbyterians, two to the Congregation- alists, one each to the Wesleyan, the Scottish Episcopal, the Catholic Apostolic, and the Roman Catholic, while two other denominations—the Baptists and Evangelical Union— are also represented. Dumfries has three newspapers, two of them published twice 2 week and one weekly. It has long been able to boast of a well-equipped grammar- school—the Academy. The town possesses its full share of benevolent institutions. Its oldest one, Moorhead's Hospital, erected in 1753, gives accommodation to decayed householders. A hospital for the reception of persons suffering from disease or accident has been in existence since 1778, under the name of the Dumfriesshire and Galloway Royal Infirmary, but the building now used as such, an imposing edifice in the Northern Italian style, was only opened a few years back; 398 patients were treated in 1876, at a total outlay of £2137. Crowning an eminence situated a little southward of the town stands a noble building resembling a Greek cross; this is the Crichton Royal Institution for lunatics, due to the munificence of Dr James Crichton of Friars' Carse, whose bequest of £100,000 was applied in erecting and partly endowing the asylum. Since it was opened, nearly forty years ago, it has been considerably enlarged, and also supplemented (in 1848) by the Southern Counties' Asylum for pauper inmates chiefly; usually the patients number about 500, nearly a third, as middle and upper class patients, being housed in the older portion of the establishment. The old infirmary building is now used as a commercial academy connected with the Marist Brotherhood, and dedicated to St Joseph. In it about 70 youths receive education; be- longing to the establishment there is a novitiate adjoining the Roman Catholic chapel, where 14 members of the order are under training for missionary service at home or abroad. Several of the banking establishments possess a fine appear- ance, but the county buildings in Buccleuch Street (Scotch baronial in design), Greyfriars' Church fronting the head of High Street (Pointed Gothic), and the new infirmary are the most imposing edifices within the burgh. It has a theatre royal, opened in 1792, which was almost entirely reconstructed at a cost of £3000 in 1876, and its interior is now, size

considered, as handsome as that of any similar place of entertainment throughout the kingdom. There is no object in the town that can vie with Devorgilla's Bridge as regards archxological interest. Built of stone about 1280, it had no equal at that period in Scotland, though the popular story which assigns to it thirteen arches is belied by indisputable documents which show that they never numbered more than nine. A second stone bridge was built in 1793-5, at an expense of about £5000; and a small iron foot bridge, which cost nearly £2000, was opened on the closing day of 1875. The associations of Dumfries with Burns, however, and the memorials it possesses of the national bard, draw to it more travellers annually than all its other attractions—scenic, antiquarian, or social.

The town council consists of 25 members, including a provost, 3 bailies, a dean of guild, and a treasurer. Four other royal burghs combine to form a parliamentary con- stituency with Dumfries, namely, Annan, K irkcudbright, Sanquhar, and Lochmaben—theso, "The Five Carlins" of Burns's ballads, being represented by one member. In

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Before the lower interior was reseated | 1861 the population within the royalty was 12,347; in

1871 it had increased to 13,704. As a parliamentary burgh Dumfries includes. Maxwelltown on the opposite bank of the Nith, its population as such amounting in 1871 to

18,826.

History.—The precise circumstances of the origin of Dumfries are but imperfectly known; but the prevailing opinion is that a fortlet built by the Selgove Britons formed the nucleus of the town, an hypothesis that is supported by its name, which, accord- ing to Chalmers, is resolvable into two Gaelic terms signifying a castle among the brushwood. The oldest existing charter is one granted by Robert IJ., dated 1895. Made a royal burgh by William the Lion, Dumfries thereby acquired important privileges ; and another stimulus to its prosperity was supplied when Devor- gilla, daughter of Alan, lord of Galloway, connected that province with the town

by building a stone bridge over the Nith. It was the son of that munificent lady, John Baliol, whom Edward I. of England selected as heir to the Scottish throne from the numerous competitors for it who placed their claims at his disposal. During the troubles that ensued, Nithsdale and Galloway supported Baliol, and on his withdrawal from public life they for the most part favoured the pretensions of his nephew John, the Red Comyn, as opposed to those of Robert Bruce, who drew considerable support from his patrimonial estates of Annandale.

Dumfries figured much in the wars of the period. Whilst the great border castle of Carlaverock was being besieged by an army under the command of King Edward in 1300, the town was visited by him personally, and, as we learn from the Wardrobe Accounts, he lodged with a body of Franciscan friars in a house built for them by Devorgilla, and partly maintained by dues levied at the bridge which owed its existence to her liberality. Six years after- wards, when Edward had smitten down all opposition to his ambitious designs, the monastery which he had visited became the scene of a deed which led to the overthrow of them all. On the 10th of February 13806 Bruce and Comyn were brought together in the streets of the ancient burgh. As they entered the monastery in company, Bruce charged his rival with treachery ; the latter denied the accusation, and the next moment was stabbed to the heart, Kirkpatrick rushing in to ‘‘mak siccar” or complete the deed of slaughter which the lord of Annandale had begun. The blow by which the Red Comyn perished in the house erected by his pious grandmother broke all amicable intercourse between the homicidal baron and the English king; and thenceforward Bruce became thoroughly committed to the national cause, of which he had been previously but a questionable friend. A modern eccle- siastical edifice, St Mary’s Church, occupies a site mournfully associated with the war of independence,—Sir Christopher Seton, husband of Bruce’s sister Christiana, having been there executed by order of Edward I. After peace was restored, the sorrowing widow built upon the spot a little chapel, which her royal brother endowed with a hundred shillings sterling per aunum in order that masses for the soul of the deceased should be said in it ‘for ever.” Another church, Greyfriars’, stands on the site of the old castle of Dumfries, which exchanged owners half a dozen times at least during the same troublous period,—its sufferings by siege or storm indicating but too truly the sad experiences of the town

itself ; and for nearly 250 years afterwards, the proximity of the burgh to the western border exposed it to wasting raids from the English side, carricd on sometimes by freebooting parties, and not seldom also by more formidable hosts with higher objects in view than the burning of the place or the plunder of its inhabitants,— thesc hostile visits, with their retaliatory forays southward, terminating at last in 1551. The longclose connection of Dumfries with the heroic yet turbulent Douglases proved on the whole more hurtful to it than advantageous. Bound up for several generations quite as intimately with the Maxwells of Carlaverock and Ter- regles, the town experienced alternate ‘‘ weal and woe” from the protracted feuds of that family with the Annandale Johnstones.

When the Union with England was under debate, the provost of Dumfries, as its representative in the Scottish Parliament, voted against the measure; and the Articles of Union were publicly burned (Nov. 20, 1706) by a party of Cameronians at the market cross, with the enthusiastic approval of the populace. About nine years afterwards the inhabitants were threatened with a hostile visit from Viscount Kenmure, but they manifested such a bold front that the Jacobite chief acted on Falstaff’s maxim, ‘* Discre- tion is the better part of valour.” Less vigilant during the next rebellion, they allowed the town to be peacefully occupied by the young Pretender, who, converting No. 6 of the tencment ;now used as the Commercial Hotel into a little palace, held high state there for three days towards the close of December 1745. In order at once to recruit his own exchequer and punish the burgh for its loyalty to the house of Hanover, the prince demanded a tribute of £2000 in money ; also 1000 pairs of shoes for his kilted followers, whose foot-gear had nearly vanished during their forlorn journey from the south; and, as if he had been de facto king, he levied the

exeise and appropriated all the moneys possessed by the local Government officials. Influenced by a false alarm, ‘ Bonnie Charlie” made a hurried departure, having first received £1100 of a levy, and carrying with him hostages for the rest. Some years afterwards the burgh was reimbursed by the state for the money contribution, the whole of which had been paid, and

for the shocs actually delivercd, 225 pairs, the compensation amounting to £2848.

In 1264 Alexander II{. planned an expedition to the Isle of Man at Dumfries. The town was visited at subsequent periods by James [V., James V., by the beautiful daughter of the latter monarch, Queen Mary, and by Mary's son, the ‘‘ British Solomon.” On the mrival of James VI., 3d August 1617, he was sumptuously entertained by the magistrates in a house that was known as ‘‘ The Painted Hall ;” afterwards he presented the incorporated trades, seven in number, with a tiny ‘‘war-engine,” the celebrated Silver Gun, the competition for which encouraged the practice of musketry among the craftsmen, and constituted a great septennial festival, the characteristics of which are finely mirrored in a well-known poem by John Mayne, though the wapinschaw itself has not been held since 1831. (W. M‘D.)

DUMONT, Jean, a well-known publicist, was born in J'rance inthe 17th century, the precise date being unknown. He followed the profession of arms ; but, uot obtaining pro- motion so rapidly as he expected, he quitted the service and travelled through different parts of Europe. He stopped in Holland with the intention of there publishing an account of his travels. But in the interval, at the request of his bookseller, he wrote and published several pamphlets, which were eagerly sought after, owing to the uncerenionious manner in which he treated the ministry of France. This freedom having deprived him of all hope of employment in his own country, he thought of forming a permanent establishment in that where he resided, and accordingly commenced a course of lectures on publiclaw. The project succeeded far beyond his expectations; and some useful compilations which he published about the same period made him favourably known in other countries. The emperor appointed him his historiographer, and some time afterwards conferred on him the title of Baron de Carlscroun. He died at Vienna in 1726, at an advanced age. Dumont wrote with facility, but his style is deficient in vigour and correctness ; his works, however, contain a great number of documents valuable for history.

The following is ajlist of the works published by Dumont :—1. Voyages cn Franee, cn Italie, en Allemagne, & Malte, ct en Turquie, Hague, 1699, 4 vols. 12mo; 2. Alémoires Politiques pour servir & la parfaite intelligence de Vhistoire de la Paix de Ryswick, Hague, 1699, 4 vols, 12mo; 3. Recherches modestes des causes de la présente (fuerre, en ce qui concerne les Provinees Unies, 1718, 12mo; 4. Tideueil de Traités allianec, de paix, ct de commerce cnirc les Rois, Princes, et Etats, depuis la Paix de Munster, Amsterdam, 1710, 2 vols. 12mo; 5. Soupirs de [Europe a la vue du projet de paix contenu dans la harangue de la reine dela Grande-Bretagne, 1712, 12mo ; 6. Corps Universel Diplomatique du Droit des Gens, con- tenant un Récucil des Traités de paix, allianee, etc., faits en Europe, depuis Charlemagne jusqu'a présent, Amsterdam, 1626, and follow- ing years, 8 vols. fol., continued after Dumont's death by J. Rousset ; and 7. Batailles gagnées par le Prinee Eugene de Savotc, Ifague, 17238. Dumont was also the author of Lettres Historiques contenant ce que se passe de plus important en Hurope, 12mo. This periodical, which was commenced in 1692, and two volumes of which appeared annually, Dumont conducted 1!.1 1710, from which time it was continued by Basnage and others until 1728. The earlicr volumes are''much prized.

DUMONT, Pierre Ertenne Lovuts (1759-1829), a political writer celebrated chiefly for his literary connection with Mirabeau and Jeremy Bentham, was born on the 18th July 1759 at Geneva, of which his family had been citizens of good repute from the days of Calvin. Shortly after his birth his father died, leaving a widow and four children wholly unprovided for. But the widow, though placed in such destitute circumstances, found means to send Htienne to the college of Geneva, where he distinguished himself both by his ability and by his independent spirit. In a short time he not only defrayed the cost of his own education, but even contributed to the support of the family, by acting as répétiteur, or private tutor to his comrades.

republic of Geneva.

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Having completed his academical course, he took clerical orders; and in the year 1781 he was chosen one of the pastors of the city, where his talents as

a preacher soon attracted general notice, and gave promise of his becoming one of the most brilliant and persuasive of pulpit orators. But the political troubles which disturbed Geneva in 1782 suddenly turned the course of his life into a different channel. He belonged to the liberals or democrats, and the triumph of the aristocratical party, through the interference of the courts of France and Sardinia, made residence in his native town impossible to him, though he was not among the number of the proscribed. He therefore became a voluntary exile, and went to join his mother and sisters at St Petersburg, a city to which many Genevese had resorted. In this he was probably influenced in part by the example of his townsman Lefort, who was the first tutor, minister, and general of the czar. At St Petersburg he filled for eighteen months with great acceptance the office of pastor of the French church. In 1785 he removed to London, Lord Shelburne, then a minister of state, having invited him to undertake the education of his sons. It was at the house of Lord Shelburne, afterwards marquis of Lansdowne, where he was treated as a friend or rather member of the family, that he became acquainted with some of the most illustrious men of the country, amongst whom may be mentioned Fox, Sheridan, Lord Holland, and Sir Samuel Romilly. With the last of these he formed a close and enduring friendship, which had an important influence on his life and pursuits.

In 1788 Dumont visited Paris in company with Romilly. During a sojourn of two months in that city he had alinost daily intercourse with Mirabeau; and a certain affinity of talents and pursuits led to an intimacy between two persons diametrically opposed to each other in habits and in cha- racter. On his return from Paris Dumont formed that con- nection with Jeremy Bentham which exercised a powerful influence over his future opinions, and, as it were, fixed his career as a writer on legislation. Filled with admiration for the genius of Bentham, and profoundly impressed with the truth of his theory, and the important consequences to which it immediately led, Dumont, made it one of the chief objects of his life to recast and edit the writings of the great English jurist in a form suitable for the ordinary reading public. This literary relationship was, according to Dumont’s own account, one of a somewhat peculiar character. All the fundamental ideas and most of the illustrative material were supplied in the manuscripts of Bentham ; Dumont’s task was chiefly to abridge by striking out repeated inatter, to supply dacwne, to secure uniformity of style, and to improve the

French. The following works of Bentham were published under the editorship of Dumont :—7Zraité de lu Législation (1802), Zhéorve des peines et des Récompenses (1811), Zactique des Assemblées législatives (1815), Preuves Judiciaires (1823), and Organization Judiciaire et Codification (1828).

In the summer of 1789, that season of promise and of hope, especially to a Genevese exile, Dumont suspended his labours in England in order to proceed to Paris along with his friend Duroverai, ex-attorney-general of the The object of the journey was to obtain through Necker, who had just returned to office, an unrestricted restoration of Genevese liberty, by cancel- ling the treaty of guarantee between France and Switzer- land, which prevented the republic from enacting new laws without the consent of the parties to this treaty. The proceedings and negotiations to which this mission gave rise necessarily brought Dumont into connection with most of the leading men in the Constituent Assembly, and made him an interested spectator, sometimes even a partici- pator, indirectly, in the events of the French Revolution.

The same cause also led him to renew his acquaintance with Mirabeau, whom he found occupied with his duties as a deputy, and with the composition of his journal, the Courter de Provence, in which he was assisted by Duroverai, Claviére, and other Genevese patriots. Fora time Dumont took an active and very efficient part in the conduct of this journal, supplying it with reports as well as original articles, and also furnishing Mirabeau withspeeches to be delivered or rather read in the assembly, as related in his highly instructive and interesting posthumous work entitled Sowenirs sur Mirabeau (1832). In fact his friend George Wilson used to relate that one day, when they were dining together at a table d’héte at Versailles, he saw Dumont en- gaged in writing the most celebrated paragraph of Mirabeau’s address to the king for the removal of the troops. He also reported such of Mirabeau’s speeches as he did not write, embellishing them from his own stores, which were in- exhaustible. But this co-operation, so valuable for Mira- beau, and so self-devoted on the part of

Dumont, was destined soon to come to an end; for, being attacked in pamphlets as one of Mirabeau’s writers, he felt hurt at the notoriety thus given to his name in counection with a man occupying Mirabeau’s peculiar position, and resolved to re- turn to England, which he accordingly did in 1791.

In the eventful years which followed he continued to live chiefly at Lansdowne House, or at Bowood, where the most remarkable men of Europe were frequent guests. Latterly,

he formed an intimate friendship with Lord Holland, whom

he had known from childhood; and he became a member of the society of familiar friends, the habitual visitors at Holland House, where, during many years, celebrated guests were welcomed of every country, party, religion, and of, every liberal profession or station. In 1801 Dumont travelled over various parts of Europe with Lord Henry Petty, afterwards marquis of Lansdowne, and brought back a fresher acquaintance with the mental occupations of the Continental nations, from whom England had for years been widely separated. But Dumont had then opened anew course of more serious occupations, in the editor- ship of the fworks of Bentham already mentioned. ‘In 1801 he published the Zraité dela Législation, the first fruits of his zealous labours to give order, clearness, and vivacity to the profound and original meditations of Bentham, hitherto praised ‘only by a very few patient readers, and but little better known, even by name, to the English than to the European public. In 1814 the restora- tion of Geneva to independence induced Dumont to return to his native place, and he soon became at once the leader and ornament of the supreme council. He devoted particular attention to the judicial and penal systems of his native state, and many improvements on both are due to him. At the time of his death, he was on the eve of proposing a com- plete code of law, by which he fondly hoped to make the legislation of Geneva an example to Kurope. He died at Milan when on an autumn tour of relaxation in October 1829, in the seventy-first year of his age.

DUMONT D’URVILLE, Jutns SHBASTIEN Ctsar (1790-1842), a French navigator, born in the town of Condé-sur-Noireau, in Normandy. The death of his father, who before the revolution had held a judicial post in Condé,

devolved the care of his education on his mother and his maternal uncle, the Abbé De Croisilles, Failing to pass the entrance examination for the cole Polytechnique, he went to sea in 1807 as a novice on board the “ Aquilon,” and soon attracted the attention of the captain, Maignon, by his studious disposition. During the next twelve years he gradually rose in his profession, and continued through all lts multitudinous vicissitudes to increase his scientific and linguistic acquisitions : botany, entomology, English, German, Spanish, Italian, and even Hebrew and Greek

were added to the more professional branches. In 1820, while engaged in a survey of the Mediterranean under Captain Gauthier of the “Chevrette,” he was fortunate enough to recognize the Venus of Milo in a Greek statue recently unearthed, and to secure its preservation by the report he presented to the French ambassador at Constanti- nople.

See Berthelot’s éloge in Bull. de la Soe. de Géogr. 2d ser. t. xix.; Matterer, Notice necrologique, &c., Paris, 1842 ; Isidore Lebrun, ‘* Biographie,” &c., in Annales Maritimes, t. Ixxviii.; De Barins, ce voyages, &c., Paris, 1844; Lesson, Nottee histor., Rochefort,

1846.

DUMOURIEZ, Cuartes Frangors (1739-1823), gene- ral of the French republican army, was born at Cambray in 1739 of a respectable family of Provenge. His father was a commissary of the royal army, and had acquired some celebrity as a poet ; and from him young Dumouriez

| received his earliest instructions. His studies were con-

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tinued at the college of Louis-le-Grande for three years. In 1757, his father having been attached to the army under D’Estrées about to invade Hanover, he accompanied him to Mauberge, and served with distinction during the Seven Years’ War. In 1763 he attained the rank of captain ; but, in consequence of a reform reducing the numbers of the army, he retired with

a small pension and the cross of St Louis. He afterwards received a subordinate situation in the secret service.

On his return from a pedestrian tour in Italy, he addressed a memorial to the Duc de Choiseul, urging him to embrace -the cause of the Corsicans against the Genoese ; and a public audience which he had with the minister on the subject led to a violent altercation, the result of which was'a lettre de cachet which forced Dumouriez to leave France. But the expedition which he had advised being afterwards resolved on, Choiseul made him an honourable public reparation, and appointed him quartermaster-general of the troops. The political conjunctures of the times offered an unlimited scope for his fertility in diplomatic expedient, and he mingled in all the intrigues of the age. In 1770 he was sent on a secret mission to Poland with the view of neutralizing the efforts of Catherine [I., and suc- ceeded in securing fifty senators for the cause of independ- ence, effected a unity of action among the confederates, and disciplined a militia ; but, when there was some appearance of the resurrection of Poland being effected, Choiseul lost his place, owing to the machinations of the Duc d'Aiguillon and Madame Du Barry, and Dumouriez was recalled to Paris. He was soon, however, sent back on a similar mission by D'Aiguillon. He endeavoured to assist the revolutionists in Sweden, and to raise troops in the Hanse towns to menace Stockholm, but this was contrary to the views of the French cabinet ; and the Duc d'Aiguillon, hav- ing discovered his project, had him arrested and imprisoned in the Bastille for six months. He was afterwards sent to the castle of Caen, from which he was not released until the accession of Louis XVI.

Dumouriez had naturally little inclination to resume the connection with foreign politics which had proved so dangerous, and he accordingly devoted his attention to the internal economy of his own country. He wrote a memoir on the great importance that might be given to the harbour of Cherbourg, one result of which was that he was appointed governor of the place in 1778.

In 1788 Dumouriez was promoted to the rank of major- general. When the revolutionary movement began he pronounced in favour of political reform without breaking with the court. The connections which he held with the

leading men of the Girondist party greatly advanced his political career. At the opening of the second legislative assembly he was appointed minister for foreign affairs in place ‘of Delessart, but he held the position for only three months. During his short tenure of office he exerted him- self to the utmost in reforming abuses, and in introducing the greatest econoniy into every department.

He held for one month the office of minister of war after the dismissal of his colleagues Roland, Servan, and Claviére. Atzlength his own resignation followed, which increased his popularity. When the troops of the coalition advanced against France, he was appointed to the command of the army of the north as lieutenant-general under Marshal Luckner. He made a determined stand against the advance of the allies, which was decisively checked by the defeat inflicted on them at Valmy on the 20th September 1792. This was followed by a campaign in the Austrian Nether- lands, in which Dumouriez was uniformly successful, until he was signally defeated by Coburg in the battle of Neerwinden in January 1793. The execution of Louis had estranged him from the republican party ; and, when in

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consequence of his defeat he was recalled by the Convention and threatened with a charge of treason, he sought refuge in the camp of the Austrians, accompanied by the Duc de Chartres (afterwards Louis Philippe) and his brother.

Lost without hope of return to his native country, Dumouriez wandered a long time an exile in Brussels, England, Switzerland, Germany, Denmark, and St Peters- burg. At last in 1804 he took up his permanent residence in England, where the Government conferred on him a pension of £1200 a year. In 1814 and 1815 he endeavoured to procure from Louis XVIII. the baton of a marshal of France, but was refused. He died at Turville Park, near Henley-on-Thames, on the 14th March 1823. His memoirs, written by himself, were published at Hamburg in 1794. An enlarged edition, under the title La Vee et les Memoires du General Dumouriez, appeared at Paris in

1822. Dumouriez was also the author of a large number of political pamphlets.

DUNABURG, a town of European Russia, at the head of a district in the government of Vitebsk, for the most part on the right bank of the Dwina, 12 miles south-east of Rigajin So” DBN. lat and) 31° 20’ 9” Ei leng., Ht consists of four portions—the main-town or fortress, the old suburb, the new suburb, and on the left bank of the river the village of Grive. The‘fortress is of the first’ class, and forms the most important point in the line of defences of the Dwina; the floating bridge across the river is protected by a splendid ¢éte-de-pont. Among the public buildings are five churches, a Roman Catholic chapel, a Jewish synagogue, a gymnasium, and a theatre; and among the industrial establishments several tanneries and breweries, a saw-mill, a flour-mill, brick and tile works, and limekilns. Its position on the railway between Warsaw and St Petersburg, and its double means of communication with Riga, render the town an important commercial centre, especially for the trade in flax, hemp, tallow, and timber. There are weekly markets and two large annual fairs. Of the 25,674 in- habitants registered in 1861, 7561 were Jews, 3994 Roman Catholics, and 690 Protestants. In_1873 the total popula- tion was 29,613.

Diinaburg was originally founded in 1278 by the Livonian Knights of the Sword, about 12 miles further down the river than its present site, at a spot still known as the Old Castle or Starut Zamok. 1n1559, along with other portions of the territory belong- ing to the order, it was mortgaged by the grand-master Gothard Kettler to Sigismund Augustus king of Poland for the sum of 700,000 guldens ; and two years afterwards it beeame the centre of the new Polish provinee of Infland. Captured in 1576 by Ivan the Terrible, it was again restored to Poland; and in 1582 Stephen Bathori transferred the fortress to its present site. In the 17th century it was held now by the Swedes and now by the Russians ; and in 1656 it ran the risk of losing its old name for that of Borissoglebsk, bestowed by the emperor Alexis Miehacloviteh. Finally incorporated with Russia in 1772, it received its present administrative rank in 1777, and its recognition as a first-class fortress in 1811. In July 1812 the téte-de-pont was vainly stormed by Oudinot, but a few weeks afterwards the town was captured by Maedonald.

DUNBAR, a royal and parliamentary burgh and seaport of Scotland, in the county of Haddington, situated on an eminence near the mouth of the Firth of Forth, 294 miles E.N.E. of Edinburgh by the North British railway. The ruins of the castle, the remains of the Grey Friars' monastery founded in 1218, and a mansion house of the Lauderdale family, are the principal objects of historical interest. The parish church is a fine building of red sandstone, with a tower about 107 feet in height, which forms a well-known landmark to seamen ; it dates only from 1819, but occupies the site of what was probably the first collegiate church established in Scotland, and still preserves the large marble monument of Sir George Home, created earl of Dunbar and March by James VI. in 1605. The town-hall, the assembly rooms, the public schools, the

mechanics' institute and subscription library, and the benevolent institutions require no special notice. The principal source of wealth is the herring fishery, which fosters an extensive curing trade ; but ship-building is also carried on, and there are several iron foundries, breweries, and distilleries, as well as a large paper-mill in the vicinity. The harbour, formerly small and shallow, has been greatly enlarged and improved in the course of the present century, at the joint expense of the town and the Fishery Board ; but the entrance is rendered somewhat dangerous by the number of craggy islets and sunken rocks. Dunbar unites with Haddington, Jedburgh, Lauder, and N orth Berwick in returning a member to Parliament. In 1875-6 the value of real property was £11,832. Population in 1871,

3320.

The castle of Dunbar, mentioned as early as 856, from the strength of its position became of great importance as a bulwark against English invasion, and a town grew up under its protec- tion, which was created a royal burgh by David II. It was captured by Edward I., who defeated the forces of Baliol in the neighbourhood of the town in 1296 ; it afforded shelter to Edward II. on his flight from Bannockburn ; and it was besieged in 1337 by the English under Montague earl of Salisbury, but was successfully defended by Black Agnes of Dunbar, countess of March anda member of the Douglasfamily. In the 15th century it was chosen as herusual residence by

Joanna Beaufort, the widow of James I. of Scotland ; and in the 16th it served on several occasions as a retreat for the unfortunate Queen Mary. An Act of Parliament had been passed in 1488 ordering the demolition of the castle, but it was reserved for the Regent Murray to effect its destruction in 1567. A battle popularly known as the ‘‘race of Dunbar” was fought in 1658 between Cromwell and Leslie, and resulted in the total rout of the Scotch.

DUNBAR, Wr111AM, one of the most distinguished of the early poets of Scotland, is ‘supposed to have been born about 1460. Comparatively little is known about his personal history, but, from an allusion in one of his poems, he seems to have been a native of Lothian! In his fifteenth or sixteenth year he was sent to the university of St Andrews, where he received the degree of B.A. in 1477, and that of M.A. in 1479.

Of the events of his life for nearly twenty years after this we possess little information. He mentions, however, in his poems that he had been employed as a preaching friar of the order of St Francis, and as such had made good cheer in every flourishing town in England had ascended the pulpit at Dernton and Canterbury, and had crossed the sea at Dover, and instructed the inhabitants of Picardy. He also mentions that this mode of life compelled him to have recourse to many a pious fraud, from whose guilt no holy water could clear him. After this he appears to have entered the service of James IV., by whom he was sent on numerous embassies to foreign princes. In 1491 he was residing at Paris, most likely in connection with the Scottish embassy there. The knowledge of the Continent he thus obtained must have had considerable influence in imparting greater strength and energy to his poetical con- ceptions.

In the year 1500 Dunbar obtained from the king a yearly pension of £10, until he should be promoted to one of greater value. Iu 1501 he went to England with the ambassadors sent to conclude the negotiations for the marriage of the young King James with the Princess Margaret, daughter of Henry VII. During the festivities on this occasion Dunbar was styled “the Rhymer of Scot- land,” and received from Henry a present of £6, 13s. 4d. in December, and a similar sum in January of the subse- quent year. On his return to Edinburgh a sum of £5 was paid to him in addition to his salary. In honour of this

Hlyting with Kennedy, line 110.

: a poem to the king he reminds him that he had been employed i only in France, England, and Ireland, but also in Germany, Italy, and Spain. (Notes by Laing, vol. i. app. 263),

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marriage Dunbar composed his well known poem, The Thrissil and the Rois, another in honour of the city of London, and several others in which he described the personal attractions of the young queen. After this he lived much at court writing poems, although at the same time he hoped to obtain preferment in the church.

In 1504 he first performed mass before the king, whose offering on that occasion was £4, 18s., a larger sum than that usually paid on the occasion of a priest's first mass. In 1507 his'pension was augmented to £20, and three years afterwards it was raised to £80, to be paid during his hfe, or until he should be promoted to a benefice of £100 or more. In 1511 he seems to have been in the train of Queen Margaret when she visited the northern part of Scotland, as one of his poems, descriptive of her reception at Aberdeen, is evidently written by an eye-witness.

After the disaster of Flodden, in 1513, Dunbar's fortunes seem to have changed, and no further mention of hin occurs as receiving pension. That he may have obtained church preferment is quite possible, but the probability is that the early death of the king, and the unpopularity of the queen and the little influence she had after her marriage with the earl of Angus, may have led to neglect of Dunbar in his old age. His poems contain many allu- sions to the unequal division of the world's goods. He was alive in 1517, as in that year he wrote a poem on the occa- sion of the Regent Albany passing into France, in which he laments the distracted state of public affairs in Scotland. He is supposed to have died about the year 1520, when he had attained his sixtieth year.

The poems of Dunbar, “the darling of the Scottish muse,” are about a hundred in number, for the most part of no great length. Zhe Thrissil and the lovs, written, as before remarked, on the occasion of the marriage of James IV., is an allegory in which he describes the amity between England and Scotland in consequence of that event. Zhe Golden Targe is a moral poem of great power of imagery, in which the ascendency of love over reason is shown to be general—the golden shield of reason being insufficient to ward off the shafts of Cupid. Zhe Twa Maryit Wemen and the Wedo, a tale in which the poet overhears three females relating their experiences of married life, is an imitation of Chaucer’s Wife of Bath. The Freiris of Berwik, a tale, is also in the Chaucerian style. Zhe Flyting of Dunbar and Kennedy is perhaps the most obscure of his poems, though it seems to have been very popular, and frequently imitated in the 16th century. Several of his smaller poems show a quick appreciation of peculiarities of character, but some of them—such as the tournament, or Justis betwix the Tailyeour and Sowtar—though ludicrous, are very coarse. In one called Of a Dance in the Queenis Chalmer, he describes himself as one of the performers :—

Thain cam in Dunbar the makkar,

On all the flure thair was nane frakkar, And thair he dansit the dirrye dantoun, He hoppct like a pillie wantoun

For luiff of Musgraiffe, men tellis me,

He trippet quhile he tint his pantoun ; A mirrear dance mycht na inan see.

Another Dance, that of the Sevin Deidlie Synnis—in which Mahoun, prince of devils, is described as_holding @ carnival with Pride, Ire, Envy, Covetousness, Idleness, Treachery, Gluttony, each with a train of followers, while a company of fiends stand by enjoying the sport, encouraging

3 There is considerable doubt about the period of Dunbar’s death, as the poem relative to the Regent Albany may have been attributed to him by mistake. Mr Laing has conjectured that he may have accompanied King James, and been killed along with him in the battle of Flodden, where so many ecclesiastics perished. The volume of the accounts of the Treasurer

from 1518 to 1515, which might have settled this and other important points, has been lost.

the performers with various hot applications—is as extrava- gant a piece as can well be conceived. In contrast, however, he wrote several poems of a religious character, ¢.g., Off the Nativitie of Christ ; Of the Passioun of Christ ; Of the Resurrection of Christ; and The Maner of Passyng to Confessioun, Le. ;

More fortunate than Douglas and some of the earlier Seottish poets, Dunbar had the satisfaction of seeing his prineipal works in print. Zhe Thrissil and the Rois, The Golden Targe, The Flyting with Kennedy, and the ballad of Lord Barnard Stewart were printed by Chepman and Myllar in 1508, and are the first specimens of typography that issued from the Seottish press.1 Several of his poems were preserved in the Asloane MS., written in 1575, the Bannatyne MS. 1568, preserved in the Advoeates' Library, the Maitland MS. in the Pepysian Library, and the Reidpeth MS. in the University Library, Cambridge. Of these detached poems some appeared in colleetions edited by Allan Ramsay, John Pinkerton, and Lord Hailes, in the courseof the last eentury, but at length the works of Dunbar were eollected and published in 1834 by Dr David Laing (2 vols. 8vo, with a supplement, 1875), having a biography and valuable illustrative notes. In 1873 a minute analysis of the language of Dunbar was published at Bonn by Dr Johannes Kaufmann of Elberfeld.

DUNBLANE, a market-town in Perthshire, Scotland, formerly the seat of a bishopric, pleasantly situated on the banks of the Allan. Its cathedral is one of the few specimens of Gothic architecture in Scotland which escaped destruction at the Reformation. It is said to have been founded in 1142, and was nearly rebuilt by Clemens, bishop of Dunblane, about 1240. The whole building is of the Early Pointed style of architecture, except the tower, which is Early Norman. The cathedral remains unroofed, with the exception of the choir and chapter house. The choir has been used as the parish church since the Reformation, but lately alterations have been made by the removal of a thick partition wall and galleries, and the erection of a light partition

wall centaining two windows, the gift of Sir William Stirling Maxwell, Bart. One of the bishops of Dunblane was

Leighton, who left his library, which is still preserved, to

the clergy of the diocese. About a mile and a half to the east of the town is Sheriffmuir, where a battle*was fought in 1715 between the earl of Mar, in the command of the troops of the Pretender, and the royal forces under the duke of Argyll. Dunblane has no charter. A sheriff court and commissary courts are held there, and there is a large district prison. There is a market on Thursdays, and several fairs are held annually. At Cromlix, a mile and a half to the north, there are two mineral springs, and not far from the town an elegant hydropathic establishment has been erected. The population in 1871 was 1921.

_ DUNCAN, Anam, First Viscount (1731-1804), an illustrious naval commander, was born July 1, 1731, at Lundie, in Forfarshire, Scotland. After receiving the rudi- ments of his education at Dundee, he was in 1746 placed under Captain Haldane, of the ‘Shoreham ” frigate, and in 1749 he became a midshipman in the “ Centurion.” In 1755 he was appointed second lieutenant of the “ Norwich,” a fourth-rate ; but on the arrival of that ship in America, whither, with the rest of Keppel’s squadron, it had convoyed General Braddock’s forces, he was transferred to the “Centurion.” Once again in England, he was promoted to be second lieutenant of the “ Torbay,” 74, and after three years on the home station he assisted in the attack on the French settlement of Goree, on the African coast, in which he was slightly wounded. He returned to England as first lieutenant of the “Torbay ;” and in 1759 was made a com- mander, and in 1761 a post-captain. His vessel, the

- Of these the only eopy known to exist is preserved in the Advocates’ Library, Edinburgh. This unique volume was reprinted in 1827 under the title The Knightly Tale of Golagrus and Gawane, and other anetent poems printed at Edinburgh by W. Chepman and Androw Myliar in the year 1508, 4to,

“ Valiant,” was Commodore Keppel’s flag-ship in the expe- dition against Belleisle in that year, and also in 1762, when it took an important part in the capture of Havana. In 1778, on the recommencement of war with France, Captain Duncan was appointed to the “Suffolk,” whence before the close of the year he removed to the ‘ Monarch,” one of the Channel Fleet. On January 16, 1780, in an action off Cape St Vincent, between a Spanish squadron under Don Juan de Langara and the British fleet under Sir George Rodney, Captain Duncan in the “ Monarch” was the first to engage the enemy ; and in 1782, as captain of the “ Blenheim,” he took part in Lord Howe’s relief of Gibraltar. From the rank of rear-admiral of the blue, received in 1789, he was gradually promoted until, in 1799, he became admiral of the white. In February 1795 he hoisted his flag as com- mander-in-chief of the North-Sea fleet, appointed to harass the Batavian navy. Towards the end of May 1797, though, in consequence of the wide-spread mutiny in the British fleet, he had been left with only the ‘ Adamant,” 50, besides his own ship the ‘‘ Venerable,” 74, Admiral Duncan proceeded to his usual station off the Texel, where lay at anchor the Dutch squadron of fifteen sail of the line, under the command of Vice-Admiral De Winter. From time to time he caused signals to be made, as if to the main body of a fleet in the offing, a stratagem which probably was the cause of his freedom from molestation until, in the middle of June, reinforcements arrived from England. On October 3 the admiral put into Yarmouth Roads to refit and victual his ships, but, receiving information early on the 9th that the enemy was at sea, he immediately hoisted the signal for giving him chase. On the morning of the 11th De Winter’s fleet, consisting of four seventy-fours, seven sixty-fours, four fifty-gun ships, two forty-four-gun frigates, and two of thirty-two guns, besides smaller vessels, was sighted lying about nine miles from shore, between the villages of Egmont and Camperdown. The British fleet numbered seven seventy-fours, seven sixty-fours, two fifties, two frigates, with a sloop and several cutters, and was slightly superior in force to that of the Dutch. Shortly after mid-day the British ships, without waiting to form in order, broke through the Dutch line, and an engagement commenced which, after heavy loss on both sides, resulted in the taking by the British of eleven of the enemy’s vessels. When the action ceased the ships were in nine fathoms water, within five miles of a lee shore, and there was every sign of an approaching gale. So battered were the prizes that it was found impossible to fit them for future service, and one of them, the “

Delft," sank on her way to England. In recognition of this victory, Admiral Duncan was, on October 21, created Lord Viscount Duncan of Camperdown, and baron of Lundie, with an annual pension of £3000 to himself and the two next heirs to his title. In 1800 Lord Duncan withdrew from naval service. He died August 4,

1804.

See Charnoek, Biographia Navalis, 1794-6 ; Collins, Peerage of England, p. 878, 1812 ; W. James, Naval History of Great Britain, 1822; Yonge, History of the British Navy, vol. i. 1863.

DUNCAN, Tuomas (1807-1845), a distinguished Scottish portrait and historical painter, was born at Kinelaven, in Perthshire, May 24,1807. He was educated at the Perth Academy, and afterwards began the study of the law, which, however, he speedily abandoned for the more congenial pursuit of art. Commencing his new career under the instruction of Sir William Allan, he early attained distinction as a delineator of the human figure ; and his first pictures established his fame so completely, that at a very early age he was appointed professor of colouring, and afterwards of drawing, in the Trustees' Academy of Edin- burgh. In 1840 he produced one of his finest pieces, Prince Charles Edward and the Highlanders entering Edin-

burgh after the Battle of Prestonpans. This painting secured his election as an associate of the Royal Academy in 1843. Inthat same year he produced his no less famous picture of Charles Edward asleep after Culloden, protected by Flora Macdonald, which, like many other of his pieces, has been oftenengraved. In 1844 appeared his Cupid and his Martyrdom of John Brown of Priesthill, the last effort of his pencil, with the exception of a portrait of himself, now in the National Gallery in Edinburgh. He particularly excelled in his portraits of ladies and children. He died at Edinburgh, May 25, 1845.

DUNDALK, a parliamentary borough, scaport, and market-town of Ireland, county Louth, on the south bank of the Castletown river, near its mouth in Dundalk Bay, 50 miles north of Dublin. It consists of one long street

intersected by several shorter ones. The parish church is an old and spacious edifice with a curious wooden steeple covered with copper ; and the Roman Catholic chapel is a handsome building in the style of King's College Chapel, Cambridge. The other public buildings that may be noted are the Exchange Buildings (containing the town hall and a free library), the' county court house and prison, the union workhouse and infirmary, and the cavalry barracks. There are several educational establishments in the town. The municipal government is in the hands of town com- missioners, and the port is under the control of harbour commissioncrs. The county assizes are held in the town, as well as quarter and petty scssions; and it returns one member to Parliament. A brisk trade, chiefly in agricul- tural and dairy produce, is carried on, and the town con- tains some manufactories. Distilling and brewing are the principal industrial works, and there are besides a flax and jute spinning mill, salt works, &c. The port and harbour of Dundalk have recently been undergoing extensive improvements. The course of the river has been straitened, and the bar and harbour deepened, so that vessels of con- siderable draught can now come up to the town. In the reign of Edward II. Dundalk was a royal city, and Edward Bruce proclaimed himself king there in 1315. Popula- tion in 1851, 9995; and in 1871, 11,377. Area, 1386 acres.

DUNDAS, Henry. See MELvILie, Viscount. DUNDEE, a royal and parliamentary burgh and sea- port, is situated on the east coast of Scotland, in the county of Forfar, on the north bank of the Firth of Tay, twelve miles from the confluence of that estuary with the German Ocean. It is the third town in Scotland as regards population, and the second in commercial importance. Its'latitude is 56° 27'N., its longitude 2° 58' W. ; itis distant from Edinburgh 42 miles N.N.E., from Perth 22 miles E., and from Forfar, the county-town, 14 miles S. It extends nearly three miles along the shores of the Tay, and varies in breadth from half a mile to a mile; and the ground gradually rises towards the hill of Balgay and Dundee Law, the summit of the latter being 535 feet above the sea-level. Its general appearance is pleasing and picturesque, and the surround- ing scenery very beautiful.

Dundee is the chief seat of the linen manufacture in Britain, and from a very early time appears to have had a special reputation in this branch of industry. Hector Boece, a native of the town, in his History and Croniklis of

Scotland, thus quaintly refers to it: ‘“ Dunde, the toun quhair we wer born ; quhair mony virtewus and lauborius pepill ar in, making of claith.” It was not, however, till the introduction of steam power, in the beginning of the present century, that there was any remarkable develop- ment of flax-spinning in Dundee. The first work of importance was the Bell Mill (which is still extant), built in 1806 ; and the first power-loom factory was erected in 1836. Side by side with the extension of the linen trade

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has been that of jute spinning and weaving. Large cargoes of this material are imported into Dundee direct from India, and it is manipulated on an enormous scale. In fact, the manufacture of flax, hemp, and jute fabrics constitutes the staple trade of the town, and supports, directly or indirectly, the great bulk of the inhabitants, There are upwards of seventy steam spinning-mills and

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Plan of Dundee. **

7. Town Churches and old Steeple. 8. Town House. 9. Theatre.

10, Music Hall.

11. Custom House.

12. New Graving Dock.

1. Barracks.

2. Volunteer Drill Hall.

3. Prison and Sheriff Court Buildings. 4. High School.

5. Albert Institute.

6. Post-Oftice.

power-loom factories, employing above 50,000 persons. Some of these buildings are of great size and considerable architectural elegance, those of Messrs Baxter, Messrs Cox, and Messrs Gilroy being especially

conspicuous. These three afford employment to above 12,000 hands. The principal textile productions are osnaburgs, dowlas, canvas, sheetings, bagging, jute carpeting, &c.; and the total value of these fabrics annually produced has been estimated at upwards of £7,000,000. Among the other industries of Dundee may be mentioned ship-building, engineering, tanning, and leather manufactures (including shoemaking by machinery), all of which are conducted on a large scale. There are also considerable foundries, breweries, corn and flour mills, and confectionery and fruit- preserving works—Messrs Keiller & Son's " Dundee marmalade" having a most extensive reputation. The prosperity of Dundee is in a large measure due to its commodious harbour and its magnificent docks. The harbour works extend about two miles along the river side, and the docks, five in number, cover an area of 35 acres. Although they cannot compare in extent with those of London or Liverpool, they are probably unsurpassed in the kingdom for stability and convenience. They have cost, from 1815, when the works were begun, to May 1877, £800,000 ; and the harbour revenue amounted in 1876 to £50,751. The principal imports for year ending May 1876 were

DUNDEE

Plax, codilla, and hemp «..!.)...005..00….. 31,300 tons.

EE eed ee leit ncaa dasine av ewes 206,727 « ;,

CaO ec ancidrers Hen ciwiedls stinesansiwietes 146,399 ,,

MAT YRS rc iors (anisole aieiles PSG eee TT | 46,256 loads.

Whale and seal blubber….....005 1,694 tons.

SCR MUSE sis vs sina Aaa eve oe' dct cs'civ else 6,808 ,,

The principal exports were Linen and jute manufactures—first six months 346,472 pieces.

second ,, 19,117 tons.

Bags and sacks first ys FRONT, 032: second _,, 8,853 tons.

YUP: pee od Oo gee een me RE acer cre cin cern a eee? 8,630 ,,

COUR TSIO), IRo u on CUO COC EDR CREE Onc eR RS ee cea omer ee 8,506 ,,

There were built at Dundee, in 1876, 32 vessels with a tonnage of 18,794, and at the end of that year the shipping belonging to the port consisted of

BSG sailing vessels ….....sccrseeeeese tonnage 68,314 OPO A NONS cio fc tioedsa vies da bcceea saws sale deine eatin 17,078

Total 194 tonnage 85,392

Eleven of the steamers are in the seal and whale fishing trade, each making two voyages yearly to the Arctic Seas.

The principal public buildings are the following :—The Town-House, designed by "' the elder Adam," and erected in 1734, a plain but pleasing structure; the Custom-House ; the Post-Office ; the Town Churches, an imposing group, surmounted by a noble old tower ; St Paul's Free Church, with spire 167 feet high; St Paul's Episcopalian Church, designed by Sir G. G. Scott, with spire 211 fect high ; the High School, a fine specimen of Grecian Doric, designed by Angus; Morgan Hospital, erected and endowed by bequest (amounting to nearly £80,000) of the late Mr John Morgan, a native of Dundee, for the board and education of a hundred boys: the Royal Infirmary, a magnificent structure in the Tudor style, designed by Coe and Godwin, and costing abont £15,000; the Lunatic Asylum; the New Orphan Institution ; the Industrial Schools ; the Convalescent Hospital; the Asylum for Imbecile Children ; the Deaf and Dumb Institution, the Royal Exchange; the Clydesdale Bank; the court-house and police buildings, with a fine bold portico ; the Eastern Club, designed by Pilkington and Bell; the Christian Young Men's Association Buildings; the Theatre Royal, drill hall, newspaper offices, and public baths. To these may be added as deserving of notice the Royal Arch, designed by Mr Rochead, and commemorating Her Majesty's visit to Dundee in 1844, and the Albert Institute, a Gothic building in memory of the late Prince Consort (mainly designed by Sir Ct.

Gilbert Scott), and erected, at a cost of upwards of £20,000, on a site purchased for £8000. Bronze statues of George Kinloch, the first M.P. for Dundee in the Reformed Parliament, and James Carmichael, the engineer, have been erected in Albert Square.

The most notable of the few antiquities of Dundee is the “Old Steeple” (dating from the 14th century), 156 feet high, which has been recently restored, under the direction of Sir G. Gilbert Scott, R.A., at a cost of £7000. Dudhope Castle, the old seat of the Scrym- seoures, hereditary constables of the burgh, and grauted by James II. to Viscount Dundee, is now used as bar- racks, The old custom-house, in the Green Market, is @ quaint building of the 16th century. The East Port, the sole relic of the ancient walls, is allowed to stand m commemoration of George Wishart the martyr, who, according to tradition, preached from it during the plague in 1544. The pillar of the old town cross, bearing date 1586, has been re-erected. In High Street, Vault, Castle Court, and Fish Street there still remain a few buildings of the 16th and 17th centuries. But the castle, the mint, and the numerous convents have entirely dis- appeared, the last of the monastic buildings, once occupied

Ddo by the nuns of St Clare, having been demolished only a few yearsago. The old burying-ground (or “ Howff”), now closed, contains many interesting monuments and epitaphs. Three spacious suburban burying-grounds have taken its place—the Western Cemetery, the BERIT

Eastern Necropolis, and the Bal- YO ES gay Cemetery. Till the middle of the present century, or even later, many of the streets were [f narrow and irregular, and many of the buildings unhealthy and unsightly ; but of late a great change for the better has taken place. Under the Improvement Act of 1871, the narrow gorge of the Murraygate has been swept away ; the ugly and tortuous Bucklemaker Wynd has been transformed into the spacious Victoria Road, with the Victoria Bridge at its upper end; and a dense and dingy mass of buildings between Meadowside and Scagate has been replaced by Commercial Street, which, when completed, will be one of the finest civic thoroughfares in Britain. Many improve- menfs still remain to be accomplished, and although the total cost will probably amount to £400,000, it is expected that there will be ultimately a profit on the street

im- provements, By the aid of local building societies a large number of working men’s houses have recently been erected ; and a double line of tramways has been laid from the post-office to the west end of the town.

Dundee is well supplied with recreation grounds. The Baxter Park, 35 acres in extent, designed by Sir Joseph Paxton, was presented by Sir David Baxter to the com- munity in 1863; the pavilion contains a marble statue of the donor by Sir John Stecll, erected by public subscription. The Balgay Park, a picturesque wooded hill commanding fine prospects on every side, was secured by the police commissioners and opened to the public in 1871. Besides these there are the Magdalen Green, the Barrack Park, the Bleaching Green, and Dundee Law. A magnificent pro- menade along the river side between Magdalen Point and the Craig Pier has lately been opened. It is called the Es- planade, and incloses a space of 54 acres, which when filled up will give ample station and traffic accommodation for the Caledonian and North British railways, and leave the public a clear carriage-way and foot-path by the river side. The expense of the undertaking (about £40,000) is borne in nearly equal proportions by the two railway companies and the Harbour Trustees. An extensive abattoir and cattle market have recently becn constructed by the police commis- sioners at the east end of the town. Dundéc has regular and frequent steam-boat traffic with London, Hull, Neweastle, Liverpool, Leith, and Rotterdam. To render communica- tion with the south more direct, the North British Rail- way Company designed the Tay Bridge, a colossal work, completed in 1877 (see Bripezs, vol. iv. p. 340).

The water supply of Dundee is copious and excellent. Thirty years ago works were established at Monikie, but in time the quantity (about 24 million gallons per day) proved insufficient, while the quality deteriorated. The loch of Lintrathen, 20 miles distant, with necessary grounds, was accordingly purchased for £33,108. The surface of the loch, originally 180 acres, has been raised 20 feet, and is now 405 acres in extent; the storage capacity is 257,000,000 cubic feet ; the drainage area, 19,000 acres. The main pipe from Lintrathen, 27 inches in diameter, transmitting 8 million gallons per day, conveys the water to Clatto reservoir, four miles from the town, which has an area of 21 acres, and holds 80 million gallons; two

pipes from Clatto lead to the service reservoirs. The total cost of the works exceeds £305,000,

Arms of Dundee.

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Dundee possesses a large number of benevolent institu-

tions, as well as “ mortifications i (dating from 1656

downwards) for charitable or educational purposes.

Among eminent men who were natives of Dundee may be named Hector Boece or Boethius, historian, born about 1465 ; John and Robert Wedderburn, authors or collectors of the book of Gude and Godlie Ballatis published 1578 ; Sir George Mackenzie, the celebrated lawyer, born in 1636 ; Rev. Jolin Willison, author of Zhe Afilicted Man’s Com- panion, born 1680 ; Viscount Duncan of Camperdown, born 1731; James Ivory, an emineut mathematician, born 1765; and Dr Dick, author of The Christian Philosopher, born 1774. The father of Thomas Hood, author of The Soug of the Shirt, was a native of the town, and Hood’s first literary production appeared in the Dundee Advertiser, about 1816. Robert Nicoll, “Scotland’s second Burns,” at one time kept a circulating library in Castle Street, and William Thom, the Iuverury poet, rests in the Western Cemetery, where a monument was erected by public subscription over his grave,

Statistics.—The terrible havoc resulting from the siege of 1651 greatly ehecked the progress of Dundee, but the following century witnessed the beginning of that rapid and healthy growth which of late years has been so marked. The following figures show the population at successive periods of 30 years since 1755 :—

9 75

In 1876 the births numbered 5231, deaths 3076, marriages 1222. The birth-rate was 37 and the death-rate 22 per 1000.

The rainfall in Dundee for 1876 was 43°12 inches, which is con- siderably above the average, in fact, the highest of any recorded year exeept 1872, when it was 43°70. The number of ‘wet days” in 1876 was 280, being 50 above the average. are westerly.

Previous to 1832, Dundee was grouped with Forfar, Perth, Cupar, and St Andrews in returning a member to Parliament ; the Reform Act gave it the privilege of a meimber for itself, and the Act of 1868 added another. For municipal purposes the town is divided into nine wards, the third of which includes the populous and thriving suburb of Lochee. The town council is composed of the provost, dean of guild, 6 bailies, and 20 councillors; these are also the police and water commissioners. Part of the town being in the parish of Dundee, and part in the united parishes of Liff and Benvie, there are two parochial boards. ‘When the Education Act came into operation (1873) there was elass-room accommodation within the burgh for 17,719 pupils, and since then the school board has built or enlarged 10 schools. In 1877 there was accommoda- tion for 20,615 pupils, and the number of children in the town of school age, that is from 5 to 13 years, was estimated at 21,000. The principal educational institution is the high school, where an excel- lent curriculum is available; and since 1875 classes, taught by professors from St Andrews, have been opendd for the study of chemistry, geology, physiology, and literature.

Tn 1866 the ratepayers cordially adopted the Free Libraries’ Act, and advantage has been largely taken of the privileges thus afforded. ‘The library premises are eentrically situated in Albert Square, and include a lending library, reference library, museum, and picture gallery, adinission being free. In the lending library there are 25,000 volumes, in the reference library 5500. A fine arts exhibition is occasionally held within the free library buildings, and an Art Union for Dundee has just been sanctioned by the Board of Trade.

There are 78 places of worship in the town, which may be classi- fied as follows :—In connection with the Established Church, 16; Free Church, 20; U.P. Church, 11; Congregationalist, 6 ; Episco- palian, 5; Roman Catholic, 4; Baptist, 3 ; other denominations, 18. _ Lochee, a suburb of Dundee, forming part of the municipality, 1s situated about two miles to the north by

the Coupar-Angus road, Till within recent years only a small eountry village, it has now a population of 15,000. It contains several flax and jute factories ,— by far the largest and most eomprchensive in the whole district being the Camperdown Linen Works, belonging to Messrs Cox Brothers and Co. They cover an area of 25 acres, and,employ up- wards of 5000 persons. The most striking external feature, and one of the prominent landmarks in the district, is the stately chimney-stalk (282 feet high) in the style of the Italian eampaniles, built of parti-coloured bricks, with stone cornices,

a; proughty Ferry, three miles distant, towards the mouth of the Firth of Tay, may also be considered as a suburb of Dundee. The name originally Lruch-tay, is belicved to be Pictish, and refers to the castle or fortress, which is mentioned repeatedly during the

The prevailing winds

DUNDEE

wars of the 16th century. Its picturesque ruins coutinued till about 1857, when they were removed to make way for the present fort, which is intended asa defence for the Tay, and which mounts 9 guns, and ean accommodate 60 men.' Broughty Ferry is a burgh under the General Police Act, which was adopted in 1864, and is partly in the parish of Dundee partly in that of Monifieth. Some thirty years ago it was only a fishing village, although designed and partly laid out with a degree of breadth and regularity in the streets which fishing-villages rarely display. The population in 1861 was 3513, in 1871 it was 5707, and now (1877) it is estimated at 8000. There are nine churches of various denominations, the finest, in an architectural point of vicw, being the East Free and the Episcopalian, the lattcr designed by Sir G. G. Scott. Some of the villas on and around Fort Hill, occupicd by Dundce mer- ehants, are exceedingly handsome. Reres Hill and the Castle Green have been acquired by the commissioners of police as recreation grounds for the use of the public.

History.—Dundee is said to have becu at one time called Alectwm, but of this assertion there is no explicit documentary evidence. The earliest authentic mention of the townis in a deed of gift by David earl of

Huntingdon, dated about 1200, which distinctly designated it "'Dunde." The origin of the name is disputed,—some absurdly tracing it to the Latin Donwm Dei, '' the gift of God,' others to the Celtic Dun' Dhia, the Hill of God, others to Dun taw, the hill or fort on the Tay ; the last named derivation is the most probable. Dundee was erected into a royal burgh by William the Lion, and has always been a place of considerable importance, figuring con- spicuously in the early history of Scotland, especially about the time when Bruce aud Baliol were contending for the crown. It was here that Wallace was educated; and here he struck the first blow against the English domination. In the great Reformation movement of the 16th eentury the inhabitants took such a leading and active part as to earn for the town the appellation of '' the Scottish Geneva." Few places have been subjected to more frequent or serious cala- mities. It was twice taken by the English in the reign of Edward 1., again in that of Richard 11., and a fourth time in that of Edward V1. The marquis of Montrose took it by assault, and set part of it on fire in 1645 ; and in 1651 it was besicged by General Monk, and, after an obstinate resistance, was taken by storm, and given up to plunder and massacre. It was then probably the most opulent, and was certainly the best fortified town in Scotland, and many people of note from Ediuburgh and elsewhere had found refuge within its walls. More than one-sixth of the inhabitants and garrison, including the brave governor Lumsden, were put to the sword ; while the plunder was so great as to fill 60 vessels which were seized in the harbour; but, says Gumble in his life of Monk, 'the ships were east away within sight of the town, and that great wealth perished." Notwithstanding the number of burnings and plunderings to which Dundee has been subjected, the collection of charters, couneil-records, and other ancient documents preserved in the archives of the Town House is remarkably interesting and complete. There are characteristic despatches from Edward I. and Edward II., the original charter of King Robert Bruce, dated 1327, a papal order from Leo X., and a Ictter from Qucen Mary, dated 1564, providing for extra-mural interments. (C. C. M.)

DUNDEE, Jonn Grauam or CLAVERHOUSE, VISCOUNT (1643-1689), born in or about the year 1643, was the elder son of Sir William Graham and Lady Jean Carnegie. Of his youth little record has been kept ; but in the year 1665 he appeared in St Andrews as a student of St Leonard's College. His education was upon the whole good, as appears from the varied and

valuable correspond- ence of his later years. Young Graham was destined for a inilitary career; and, having remained in St Andrews for about four years, he proceeded abroad as a volunteer in the service of France. Thereafter, in 1672, le went to Holland, and obtained the post of comet in one of the cavalry regiments of William, prince of Orange. In 1674 he was raised to the rank of captain, as a reward for having rescued the prince from a marsh where his horse had foundered during a retreat. Shortly afterwards, William having at his disposal the command of one of the Scotch regiments in Holland, Graham made application for the post. He was not appointed, and resigned his commission. In the beginning of 1677 he returned to England, bearing, it is said, letters of strong recommendation from William to Charles II. and the duke of York.

Early in 1678 he accepted a lieutenancy in a troop of horse under the command of his relative the marquis of Montrose. Promotion immediately followed. He was ex-

pressly nominated by Charles IT. to the command of one of the newly raised troops of cavalry. From the time, indeed, of his return to Scotland he assumed an influential position. His prestige as a soldier, his uncompromising disposition, and his unmistakable capacity, at once marked him out as a leader upon whom Government could rely. In the end of the year he was despatched with his troop to Galloway to suppress the disorders which prevailed in the district. He had a difficult and unpopular task,—that of carrying out the policy of Lauderdale in the most disaffected part of Scotland. The Act of 1670, imposing the punishment of death and confiscation of goods, was still in operation ; and the Covenanters had for years before Graham’s return to Scotland propounded the theory that opposition to the Government and the actual slaughter of the king were not only just, but a religious duty. Opposition to Lauderdale’s measures, however, was winked at by the duke of Hamilton, and the recent authorized inroad of the Highlanders had widened the area of dissatisfaction. It is not wonderful that the success of Graham in his mission was small. He entered, however, upon his occupation with zest, and inter- preted consistently the orders he received. There is evi- dence, also, that his efforts were

appreciated at head- quarters, in his appointment, jointly with the laird of Earls- hall, to the office of sheriff-depute of Dumfriesshire in March 1679, with powers—specially narrated in his com- mission—anent ‘separation,’ conventicles, “disorderly baptisms and marriages, ” and the like.

For some years thereafter the position of Graham was perhaps as difficult and delicate as one man was ever called upon to occupy. In the midst of enemies, and in virtue of the most erroneous but direct orders of his Government, he combined the functions of soldier, spy, prosecutor, and judge. Shortly after the murder of Arch- bishop Sharp, on 5th May 1679, he was summoned to increased activity. There were reports of an intended gathering in the neighbourhood of Glasgow, and at the head of his dragoons Graham went in pursuit of the rebels, On Sunday the Ist of June, the Covenanters having removed from Loudon Hill to a well-protected position upon the marshy ground of the farm of Drumelog, Graham, who had gone in search of them, advanced. Hindered from the attack by the nature of the ground, he had to wait till the impatience of his adversaries, who were under better leadership than they ever afterwards enjoyed, induced them to commence an impetuous attack. Headed by the youthful Clelland, the Covenanters charged the cavalry, who in a little turned and fled. The loss of the victors was but three men, while thirty-six dragoons were killed, Graham himself having a narrow escape. This was the only regular engagement he had with the Cove- nanters. Small as it was, the result raised an enthusiasm in the bosoms of the victors, and was the beginning of an actual rebellion.

On the 22d June Graham was present at the battle of Bothwell Bridge, at the head of his own troop. Immedi- ately thereafter he was commissioned to search the south- western shires for those who had taken part in the insur- rection. In this duty he seems to have been engaged till the early part of 1680, when he disappears for a time from the record of these stringent measures. His powers during these months were of the most sweeping description ; and it appears that his ample commission was most slenderly used. The gravest accusation against him in reference to this period is that he was a robber.

Graham had for some time been recognized as an adherent of the party who were adverse to measures of leniency and conciliation. During these months he was accordingly despatched to London along with Lord Lin- lithgow to influence the mind of Charles II against the

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indulgent method adopted by Monmouth with the extreme Covenanting party. It is perhaps not to his credit that he succeeded in the object of his mission. He was then in the prime of life, was commandingly handsome in appearance, a lover of sport, and a devoted royalist. Charles seems to have been fascinated by his loyal supporter, and from that moment Graham was destined to rise in rank and honours, On the 21st of April 1680 he obtained a royal grant of the barony of the outlawed Macdowall of Freugh, and the grant was confirmed by subsequent orders upon the Exchequer in Scotland. In April 1680 it appears that his roving commission had been withdrawn by the Privy Council. Ho is thus free from all concern with the severe measures which followed the San- quhar Declaration of 22d June 1680.

The turbulence occasioned by the passing of the Test Act of 1681 required to be quelled by a strong hand; and in the beginning of the following year Graham was again commissioned to act in the disaffected districts. In the end of January he was appointed to the sheriffships of Wigtown, Dumfries, Kirkcudbright, and Annandale. He was besides acting captain of a troop of dragoons—the pernicious com- bination of his offices being thus repeated. He appears further to have had powers of life and death in virtue of a commission of justiciary granted to him about the same time. In his despatches there are indications that he dis- approved of a system of indiscriminate punishment, and desired that severe vengeance should only be executed upon ring-leaders and men of rank. This, however, applied solely to the harshest measures then known to the law, those of torture and death. Where these were involved he preferred, after hunting out and seizing his prisoners, to send them to Edinburgh for trial. But within these limits his methods of procedure in the large districts over which he had control were uncompromising, and, if we suppose him to have had sympathy with his orders, most cruel. He quartered on the rebels, rifled their houses, and, to use his own words, “endeavoured to destroy them by

eating up their provisions.” The effect of his policy, if we believe his own writ, is not overstated as

“Death, desolation, ruin, and decay.”

The result of a bitter quarrel with Sir John Dalrymple confirmed the prestige of Graham, who was not only ac- quitted by the verdict of the Privy Council of the grave charges of exaction and oppression preferred against him, but had the satisfaction of seeing Sir John condemned to fine and imprisonment for interference with his proceedings. On 25th December 1682 he was appointed colonel of a new regiment raised in Scotland, and captain of its leading troop. He had still greater honours in view, and in March 1683 he started for Newmarket to demand an audience of the king. In the preceding January the case of the earl of Lauderdale, late Maitland of Hatton, which involved the question of. his malversations with regard to the Scottish mint, was debated in the House of Lords. Maitland was proprietor of the lands and lordship of Dundee and Dud- hope, and the decree of the lords against him was in March 1683 issued for the sum of £72,000. Graham succeeded in having the property of the defaulter transferred to him by royal grant, and in May the additional honour was conferred upon him of nomination to the Privy Council of Scotland.

Shortly afterwards Claverhouse was appointed to be pre- sent at the sittings of the recently instituted Circuit Court of Justiciary in Stirling, Glasgow, Dumfries, and Jed- burgh. The notable objects of the circuit were the im- position of the test and the punishment of rebels. Several were sentenced to death: During the rest of the year he attended the mectings of council. As a statesman he was

incapable of rising to an independent view of affairs, and was unable to overcome his dutiful obedience to superior orders. Although he had had experience of the most disaffected portions of the country, there is but one record of his having interfered to prevent the accustomed irritating

measures. He declared decisively against the proposal to let loose the Highland marauders upon the south of Scotland.

In June 1684 he was again at his old employment—the inspection of the southern shires ; and in August, after the ambuscade of Enterkine-hill, he was commissioned as second in command of the forces in Ayr and Clydesdale to search out the rebels and report to head-quarters. By this time he was in possession of Dudhope, having on the 10th! of June married Lady Jean, daughter of Lord Cochrane. As constable of Dundee it is recorded to his honour that he re- commended to the Privy Council the remission of extreme punishment in the case of many petty offences. He issued from his retirement to take part in a commission of lieutenancy which perambulated as a criminal court the southern districts ; and in the end of the year he was again in the same region on the occasion of the disturbances in the town of Kirkcudbright.

Shortly after the death of Charles II. (6th February 1685), Graham, through the jealous efforts of Queensberry, incurred a temporary disgrace by his deposition from the office of privy councillor ; but in May he was reinstalled, although it is to be observed that his- commission of justiciary which had expired was not renewed.

In May 1685 he was ordered with his cavalry to guard the borders, and to scour the south-west in search of rebels, By Act of Privy Council, a certificate was required by all persons over sixteen years of age to free them from the hazard of attack from Government officials, Without that they were at once liable to be called upon oath to abjure the declaration of Renwick, which was alleged to be treasonable. While on this mission he pursued and over- took two men—John Brown, and a nephew whom he calls John Brownen. Brown, having refused the abjuration oath, was shot dead. The order was within the authorized power of Graham.

Until 1688 there is little more of note in his career. In 1686 he was promoted to the rank of major-general, and had added to his position of constable the not incon- siderable dignity of provost of Dundee. He appears, however, in the Privy Council in 1688 opposing the pro- posal that Lieutenant-General Douglas should have com- mand of the whole army which had been ordered to England to aid the falling dynasty.

A week or two after his departure with the army his fascinating influence had made itself felt upon James IT, and amid the hurry of events he was created viscount of Dundee on 12th November 1688, From York he went to Salisbury, where he advised James to sterner measures than the feeble-hearted monarch had the courage to adopt. Throughout the vexed journeyings of the king, Dundee is found accompanying or following him, endeavouring in vain to prompt him to make his stand in England and fight rather than flee from the invader. At last James announced his resolve, with the promise that he would send from France an appointment in favour of Dundee to command the troops in Scotland, and arrangements were entered into for communication with the voluntary exile.

Dundee returned to Scotland in anticipation of the meeting of the Convention, and at once exerted himself to increase the waning resolution of the duke of Gordon with regard to holding Edinburgh Castle for the exiled king. He had conceived the idea of forming a rival Convention at Stirling to sit in the name of James IL, but the hesitancy of his associates rendered the design futile, and it was given up. Dundee, however, boldly appeared at the first meeting of

Convention on 16th March 1686, and disclosed a plot which he declared he had discovered against his own life, but the matter after some inquiry was departed from.

On the 18th of March, despising the fears of his promised allies, he left Edinburgh at the head of a company of fifty dragoons, who were strongly attached to his person. He was not long gone ere the news was brought to the alarmed Convention that he had been seen clambering up the west side of the castle rock and holding conference with the duke of Gordon. In excitement and confusion order after order was despatched in reference to the fugitive, and the Conven- tion sat with locked doors to prevent communication with traitors without. Dundee retired to Dudhops. On the 30th of March he was publicly denounced as a traitor, and in the latter half of April attempts were made to secure him at Dudhope, and the residence in Glen Ogilvy to which he had retired. But the secrecy and speed of his move- ments outwitted his pursuers, and he retreated to the north, His

career presents strange peculiarities. It was only in 1678 that he had returned to Scotland from abroad. Yet in the short period of intervening years he had, despite the opposition of his superiors in rank, risen from the post of captain, and the social status of a small Scotch laird, to positions as a soldier and statesman and the favourite of his sovereigns, of the greatest dignity, influence, and wealth. Yet it was in this period that he committed those acts on account of which his memory is loaded with reproach, When the ruling dynasty changed, and he who had so often been commissioned to quell insurrection had himself become an outlaw and a rebel, he supported the cause of his exiled monarch with such skill and valour that his name and death are recorded as heroic.

On his march into the Highlands he commenced among the chieftains the diplomatic policy in which he excelled. General Hugh Mackay was now in the field against him, and what was simply a Highland chase began. Mackay started with a body of cavalry, marched to the north, and having refused reinforcements from the untrained peasantry of Aberdeenshire, pushed the pursuit further and further to the west. Elgin, and latterly Inverness, were occupied by the Government troops. Dundee had in the meantime been scouring the country from Perth, which on the 11th of May he had plundered, to the wilds of Lochaber, to which he had latterly retired. The clans were assembled by the 28th of May, and on the 29th the castle of Ruthven, near Kingussie, was seized. The army of Dundee was now much superior in numbers to that of Mackay, and the prudent general beat a hasty retreat. Having received reinforcements, however, he again advanced northward, and in Strathdon, in the early part of June, it seemed likely that the opposing forces would meet. But the Highland warriors, laden with plunder, were returning homewards, and the army of Dundee was melting away. The outlawed leader again retired, and Mackay conceived his mission at anend. He proceeded westward, and, having garrisoned Inverness, marched to the south.

Throughout the whole of the campaign Dundee was indefatigable in his exertions with the Highland chiefs and his communications with his exiled king. To the day of his death he believed that formidable succour for his cause was about to arrive from Ireland and France. He justly considered himself at the head of the Stewart interest in Seotland, and his despatches

form a record of the little incidents of the campaign, strangely combined with a revelation of the designs of the statesman. It mattered little to him that on the 24th of July a price of £20,000 had been ‘placed upon his head. The clans had begun to reassemble, and he was now in command of a considerable force.

- Mackay, who had visited Edinburgh to report events, re-

turned to Perth, whence, with an army now amounting to about 4000 men, he proceeded to Dunkeld on the 26th of July. While in the metropolis he had endeavoured to secure the Athole interest, and that the castle of Blair should be held for King William. But he was as usual outwitted by Dundee, who, after unsuccessful negotiations with Lord Murray, won over the Athole factor by the pre- sentation of a commission prepared for the occasion. The castle was at once occupied, and at Dunkeld Mackay received intelligence that the design of. his march was frustrated. By ten a.m. of the 27th of July 1689 he was at the entrance to the pass of Killiecrankie.

Dundee had appointed a gathering of the clans at Blair for the 29th; and on the 27th he was at the head of at least 2000 men, including a contingent from Ireland. The reports of scouts that 400 of the enemy had already threaded tho pass roused the impatience of the chiefs. But it was not until he received intelligence that the whole army of Mackay had entered the defile that he gave the order to march. With caution he disposed his troops on the hills to the right of the opposing army, which, making its exit from the gully, was forming onthe haughs. On Mackay’s right and beyond the narrow plain were undulating heights backed by Craig Culloch. On one of these Mackay was astonished to observe the movement of the troops of Dundee. To prevent the enemy from gaining an intervening eminence, he at once ordered a flank movement, and his army marched up the face of the hillock, leaving the Garry in the rear. For several hours the two armies faced each other, Dundee restraining the impatience of his troops, but at eight in the evening the order was given to advance. Mackay had formed his line three deep, while his opponent had arranged his men in battalions with intervals wide enough to prevent the out- flanking of superior numbers. The

Highlanders having dis- charged their firelocks threw them on the ground, and rushed impetuously on the foo. The result was instantane- ous ; Mackay's line was broken and driven helplessly into the gorge. Dundee, at the head of his cavalry, charged the enemy, but, confusion having arisen as to the leadership of the troop, he was not at once followed. The gallant soldier, waving on his men, was pierced beneath the breast- plate by a bullet of the enemy, and fell dying from his horse. Dundee asked " how the day went," and, hearing the answer and the expression of sympathy, replied that "it was the less matter for him seeing the day went well for his master." He was conveyed to tho castle of Blair, where within an hour or two of his death he was able to write a short account of the engagement to King James. The battle, in which the Government forces had lost 2000 men as against 900 of the enemy, was in truth the end of the insurrection. The Highland camp was broken by jealousies, for the controlling and commanding genius of the rebellion was no more.

See Memorials and Letters of Graham of Claverhouse, by Mark Napier, 1859-62, where the literature of the subject is referred to. Lhe work itself must be read with caution. Cs

DUNDONALD, Tuomas Cocurang, TenrH Earn oF (1775-1860), known during his brilliant naval career as Lord Cochrane, was born at Annsfield, in Lanarkshire, on the 14th December 1775. His father, the ninth earl, had great scientific attainments, especially in chemistry, and possessed a 'genius for invention which ruined his fortune Without much benefiting any one. He was so poor that the education of Thomas, his eldest son and heir, was left very much to such volunteer instructors as the parish minister. At the age of seventeen Lord Cochrane joined the navy on board the " Hind," of which his uncle, after- wards Admiral Sir Alexander Cochrane, was at the time captain. His father had previously procured for him a commission in the 79th regiment, but his own preference

for the other branch of the service was so decided that it was found necessary to gratify it. In 1795 he was trans- ferred with his uncle to the frigate "Thetis," which proceeded tothe North American station. Soon afterwards he received his lieutenant's commission; and in 1798 he was sent

to the Mediterranean to serve in the fleet under the command of Lord Keith. He had already begun to show that rare combination of daring and prudence which pro- bably no British naval officer, save Nelson, ever possessed to a greater degree. As commander of the sloop “ Speedy,” to which he was appointed in 1800, he performed a series of exploits in capturing vessels of immensely larger size than his own which are almost without. parallel in the annals of naval warfare. The little “Speedy,” with its miserably weak armament of four-pounders, became the terror of the Spanish coasts, and more than once she was honoured by a frigate being especially detached to capture her. One of the attacks she ingeniously evaded ; another she boldly met (28th February 1801), and actually succeeded in capturing her opponent, the “El Gamo,” a Spanish frigate of 32 guns. Her cruise of thirteen months, during which she took upwards of fifty vessels with 122 guns and 534 prisoners, ended in her own capture by three French line of battle ships, after making so gallant a resistance that the French captain, to whom Cochrane delivered up his sword, at once returned it. After a brief imprisonment, Lord Cochrane was exchanged. The promotion to post- rank, to which he was fully entitled, came somewhat tardily in August 1801; and the persistence with which his claims had to be urged laid the foundation of the bad understand- ing with the authorities at the Admiralty that caused him to be lost to the British service a few years later, while he was still in his prime. Its immediate result being that he was refused further employment, he spent the period of enforced leisure (1802) at the university of Edinburgh, where he wisely endeavoured to repair the defects of his early education. The renewal of hostilities in 1803 brought him the opportunity of such distinction as was likely to be gained in the command of the “Arab,” an utterly unsea- worthy old collier purchased into the navy, in which he was sent to take part in the blockade of Boulogne. The animus against him in official circles was clearly shown when, on his complaining that his vessel was unfit for service, he was sent to the North Sea to protect non- existent fisheries! In 1804, on the advent of Lord Melville to the head of the Admiralty, tardy justice was done by his appointment to the command of the new frigate “ Pallas” (32), in which, after making several valuable prizes within ten days, he entered Plymouth harbour in charge of them with three golden candlesticks, each five feet high, at the mastheads as a sample of the spoils. Before the “ Pallas” was again sent to sea her fortunate captain was returned to Parliament as member for Honiton, partly

through the in- fluence of his fame, but still more through the influence of his prize-money. In her second cruise the “ Pallas,” after convoying a merchant fleet to Quebec, returned to the coast of France, where she cut out and captured several of the enemy’s corvettes, and destroyed many of the signals. In August 1806 Lord Cochrane was transferred to the command of the “ Imperieuse ” (44), in which during the succeeding two years he did immense damage to the enemy’s fleet in the Bay of Biscay and the Mediterranean. One of his most gallant exploits during this period was his defence of Fort Trinidad, near Rosas, which he held for twelve days (November 1808) against overwhelming odds. When he found further resistance impossible he blew up the magazines and returned to his ship.

Meanwhile, though his services were so distinguished, his relations with the Admiralty had not become more friendly. At the general election in May 1807 he had been returned

triumphantly for Westminster in the Radical interest, along with Sir Francis Burdett ; and during a brief interval spent at home, while he was in command of the “Imperieuse,” he had rendered himself still further obnoxious as a critic in Parliament of naval abuses. In 1809, however, the authorities had occasion for a daring service which he alone was found competent and willing to undertake. It had been suggested to them that the French fleet blockaded in Basque Roads might be destroyed by means of fire ships, and the hazardous duty was intrusted to Cochrane. On the night of the 11th April he personally piloted the vessels loaded with explosives to the entrance of the harbour, where they spread such terror that seven French frigates slipped their cables and ran on shore, five of tliem being afterwards destroyed. Unfortunately this first success was not followed up as it ought to have been. Lord Gambier, the commander of the blockading fleet, ignoring tlhe repeated and urgent requests of Cochrane, refused to order a general attack, and thus the opportunity of destroying the whole of the enemy’s ships was lost. Lord Cochrane was bitterly disappointed, and made no attempt to conceal his opinion of the incompetency of his superior, who found himself compelled to demand a court martial. The trial was worse than a mockery ; the court was packed, witnesses were manipulated, and

charts fabricated,—with the scandalous result that Gambier was acquitted and Cochrane by implication disgraced. There was, of course, no further professional employment for one who had been stigmatized as a false accuser. For four critical years Lord Cochrane held no command, and his country lost the services of one of the few naval heroes she has had worthy to be named along with Nelson. In his place in Parliament he did what he could to secure a reform of the many abuses connected with the administration of the navy, and his unsparing criticisms greatly embittered his already un- friendly relations with the Admiralty and the Government. In 1814 an unfortunate concurrence of circumstances, suspicious in themselves though capable of a satisfactory explanation, led to his being accused, along with several others, of a conspiracy to defraud the Stock Exchange, by circulating a false report of the success of the Allies and the death of Napoleon. He had only a week or two before so far overcome the disfavour with which he was regarded by the Admiralty as to secure his appointment to the com- mand of the ‘‘Tonnant,” the flag-ship of his uncle Sir Alexander Cochrane, but he had to resign the position in order to meet the prosecution which the Government were not slow to institute. The trial was conducted before Lord Ellenborough, a noted partisan, who, if he did not, as Cochrane’s friends have insinuated, exceed the limits of his office in order to secure a conviction, certainly showed no favour to the accused, who were all found guilty. Lord Cochrane was sentenced toa fine of £1000, twelve months’ imprisonment, and an hour in the pillory. His ruin and disgrace were completed by his being expelled from the House of Commons, and deprived with the usual humiliating ceremony of; the knighthood of the Bath, which had been bestowed on him after his heroic service at Basque Roads. Popular sympathy, however, was strongly with him. An influential minority of forty-four voted against his expulsion from the House of Commons, and when a new writ vas issued for Westminster he was unanimously returned, no one having ventured to stand against him. A public sub- scription was raised by his constituents for the payment of his fine. His colleague, Sir Francis Burdett, pledged himself to stand along with him in the pillory if that part of the sentence was carried out, and the Government judged 1t prudent to remit it. Lord Cochrane’s conduct was throughout that, of an innocent, if somewhat imprudent, man. At his trial he voluntered a full explanation of the

suspicious circumstances that were urged against him, and after his conviction he took every opportunity of protesting against the injustice that had been done him, and was urgent in his demand for a new inquiry. During the currency of his sentence he contrived to make his escape from prison, and took his seat in the House of Commons, from which he was forcibly removed by the warden and officers of the King's Bench.

At the close of his}imprisonment Lord Coclirane soon found that there was little hope of his being again actively engaged in the service of his native country. The peace that followed Waterloo promised to be enduring, and, even had it been otherwise, he could not expect employment, as his name had been struck off the navy list. When, therefore, the command of the fleet of the republic of Chili was offered to him in 1818, he at once accepted it, finding a congenial task in the endeavour to aida weak state in its struggle for freedom. He arrived at Valparaiso in November 1818; and ina short time afterwards he was ready for action, though the fleet under his command was in every respect miserably weak when compared with that of Spain, to which it was opposed. It seemed almost the characteristic feature of his 'genius, however, that the greater the odds against him the more brilliant the success he achieved, and this was signally exemplified during his career in South America. It is impossible to detail all his marvellous exploits. Two, however, must be specially mentioned as among the most extraordinary achievements in the annals of naval warfare. On the 2d February 1820 he captured Valdivia, a very strongly forti- fied town and harbour in the possession of the Spaniards, the forces under his command consisting of his own single frigate and 250 land troops in three small vessels. The place yielded to the mere terror of his name, the handful of troops that obtained possession of it being insufficient to man its guns or even to keep its civil population in order. In the autumn of the same year he blockaded the harbour of Callao, one of the strongest in the world. Within it, fixed to chain moorings, protected by twenty-seven gun- boats, and covered by the fire of no less than 300 guns in the batteries, lay the Spanish frigate '"' Esmeralda." The ambition of Lord Cochrane was fired by the apparent im- possibility of the task to attempt his favourite exploit of cutting out. The attempt was made on the night of the 5th November, and, in spite of the

apparent impossibility, it was completely successful after a sharp engagement of a quarter of an hour's duration, in the course of which Lord Cochrane was severely wounded. The moral effect of this achievement upon the Spaniards was all that Cochrane had anticipated; they were completely paralyzed, and left their daring opponent undisputed master of the coast. Unfortu- nately, just at the time when he was rendering her these signal services, the jealousies and intrigues of various mem- bers of the Chilian Government were making Lord Cochrane's position uncomfortable, if not untenable. The withholding of prize-money, and even of pay, had nearly caused a mutiny in the fleet, when Lord Cochrane, by tak- ing strong measures to obtain part of what was due to his men, brought on an open rupture between Ifimself and the Government. An invitation from the regent of Brazil to undertake the command of his fleet against the Portuguese was, therefore, accepted as a welcome deliverance. Lord Cochrane entered on his new duties at Rio de Janeiro in March 1822. His services to Brazil were quite as import- ant, though scarcely marked by so many brilliant episodes, as those to Chili, and they were in the end equally ill-requited. His daring capture of Maranham with a single frigate, in July 1823, added a province to the newly- formed empire ; and the value of the accession was acknow- ledged by the title of marquis of Maranham being conferred

upon the captor, along with an estate, of which, however, Lord Cochrane never obtained possession. In fact, both by Chiliand Brazil he was unjustly defrauded of all substantial rewards, and his connection with the new empire which he had done so much to aid in establishing was ignominously terminated by his dismissal from her service in 1825. He had given some provocation to this by his obstinacy in re- fusing to appear at a court-martial, and account for his con- duct in taking the frigate under his command to England without orders. The Brazilian Government itself, however, practically admitted the gross injustice with which it had treated him by awarding him twenty years afterwards the pension that had been agreed upon in the first engagement made with him.

On his return to England Lord Cochrane found himself the object of a popularity that had grown rather than abated during his absence. His great

achievements had been spoken of in the warmest terms in the House of Commons by Sir James Mackintosh, who urged the Government to restore him to his place in the service of his native land. But the time for the redress of his wrongs was not yet ; and, finding inaction impossible, he gladly gave his services to the cause of Greek independence. Appointed by the National Assembly admiral of the Greek fleet, he found himself for the first and only time in his career in a position where success was impossible even for him.{ ,The want of union and discipline among the Greek troops frustrated all his plans, and an attempt to relieve the Acropolis at Athens in 1827 ended from this cause in a disastrous failure, Lord Cochrane only escaping by jumping into the sea. In 1828, after the Great Powers had secured the recognition of the independence of Greece, he returned to England.

With the accession of King William and the formation of a Liberal ministry there came at last a tardy and imper- fect reparation to Lord Cochrane for the injustice he had suffered. He was restored to his rank in the navy, but with this he had to remain content. It.was with bitter and indignant feelings that he found himself compelled to accept a pardon under the Great Seal instead of the new trial he had long and vehemently demanded. And the restoration to his rank was robbed of much of its grace by the facts that the honour of the knighthood of the Bath, of which he had also been deprived, was not restored at the same time, and that the arrears of his pay were withheld. In 1831 he suc- ceeded his father in the earldom of Dundonald. On the 23d November 1841 he became vice-admiral of the blue. Another instalment of the lingering atonement that was due to him was paid in 1847, when the honour of knighthood of the Bath was restored, though, by that strange fatality which seemed to have decreed that no reparation made to him should be complete, his banner was not replaced in the chapel of the order until the day before his burial. In 1848 he was appointed to the command of the North American and West Indian station, which he filled until 1851. Immediately after his return he published Votes on the Mineralogy, Government, and Condition of the British West India Islands. When unfitted by advancing age for active service, he busied himself with scientific inventions for the navy, such as improved poop and signal lights, im- proved projectiles, dc. secret plans which he had detailed to the prince regent nearly fifty years before for the total destruction of an enemy’s fleet, and he offered to conduct in person an attack upon Sebastopol and to

destroy it in a few hours {without loss to the attacking force. ‘That his intellect remained clear and vigorous to the close of his life was shown by the publication in his eighty-fourth year of his Narrative of Services in the Liberation of Chili, Peru, and Brazil (1858), and of his Autobiography, in two volumes, the second of Which appeared just before his death. The literary style

During the Russian war he revived »

of both works is admirably appropriate to the subject, simple, lucid, and dashing ; and the story they tell is one of heroism and adventure that has scarcely its parallel even in romance. The author’s burning sense of his wrongs, and his passionate desire for a thorough vindication, reveal themselves at every turn. If he is not unnaturally blind to the fact that his own imprudence and want of self- command contributed in some small degree to his misfor- tunes, no one will now deny that this “ heroic soul branded with felon’s doom” suffered more cruel and undeserved wrongs than ever fell to the lot of any warrior of his genius and achievements.

Lord Dundonald died at Kensington on the 30th October 1860, and was buried in Westminster Abbey. (w. 8. 8.)

DUNEDIN, a city in New Zealand, in 45° 52’ 12” S. lat. and 170° 32’ 37” E. long., at the head of Otago har- bour, an arm of the sea on the east coast of the South Island. It is the capital of the late province and present provincial district of Otago, and was founded as the chief town of the Otago settlement by settlers sent out under the auspices of the Lay Association of the Free Church of Scotland in 1848. The discovery of large quantities of gold in Otago in 1861 and the following years, and the great increase in the production of wool, have made Dunedin a very flourish- ing place. The city is beautifully situated in an amphi- theatre of hills. The streets, nearly all paved and kerbed, have been made at considerable expense and trouble,—some being carried through swamps and others through cuttings and along embankments. The cost of permanent improve- ments during the last fifteen years has been about £300,000. The town is supplied with pure water, and (since 1862) with gas from works belonging to the corpora- tion. Dunedin is

the seat of a judge of the supreme court, and of a resident minister, who is a member of the Colonial Executive ; and it also has a Waste Lands Board, a body constituted for the purpose of administering the public estate of the provincial district. The city contains some fine buildings, especially two handsome Presbyterian churches, constructed of white stone from Oamaru. ‘The so-called university of Otago, now affiliated with the university of New Zealand, which alone has the power to grant degrees, possesses chairs of classics, mathematics, mental and moral philosophy, as well as lectureships on botany, mineralogy, law, and modern languages. A museum (well built of con- crete) contains an excellent collection of New Zealand flora and fauna, including some fine skeletons of the Dinornis. There is also a scientific body called the Otago Institute, affiliated with the New Zealand Institute. There are three good libraries—one at the supreme court, a second at the university, and a larger one at the Atheneeum—six banks, and several large mercantile houses. The people are mostly of Scotch origin, with a considerable intermixture of immigrants froni England, Ireland, the British colonies, and Germany. All classes are prosperous: except among the extremely limited criminal class, poverty rarely occurs, and absolute pauperism is quite unknown.

Otago harbour, by which the city is approached from the gea, is an inlet about 18 miles long. There is about 22 feet of water on the bar at low tide. Half way up to Dunedin is Port Chalmers, a fine anchorage for the largest vessels, where, owing to the presence of precipitous hills, the land was found too limited in area for a large city. From this point the water grows shallower as it approaches Dunedin. Until lately no vessels drawing more than 10 feet could pass up; but by two years dredging the channel has been made available for steamers drawing 13 or 14 feet, and this depth is gradually being in- creased. The Harbour Board has authority to raise £250,000 by bonds, of which £129,400 has been raised, but £66,000 is still unexpended. The revenue of the

board is £14,500, which is rapidly increasing, as it arises from a munificent landed endowment. A large part of this money is available for works. The harbour was until lately the terminus of a line of large mail steamers

running monthly to San Francisco wa Auckland and Honolulu, butitis now found more convenient to use smaller steamers for the coastal section. It is, however, still the terminus of a line of fine vessels running at intervals of about ten days to Melbourne, and carrying the monthly mail for Suez and England. There is also direct steam communication with Sydney and Hobart Town, and communication wa Auckland with Fiji, All the coasting steamers and many sailing vessels are owned in Dunedin. In 1876, besides tho San Francisco boats, 69 vessels, varying from 250 to 1800 tons, entered the port from places beyond the seas other than Australasia. The greater number of these arrive in the early part of the summer, and load with wool for London. The customs revenue collected in 1876 amounted to £362,335. ‘The municipal debt amounts to £328,000, and the revenue (raised by rates, rents, water and gas works, &e.) to £47,500. The population of the city in the begin- ning of 1877 was about 22,500, and that of the suburbs about 9000, while other towns within a circuit of a few miles bring it up to 35,000.

DUNFERMLINE, a city and royal burgh of Scotland, situated in the western district of the county of Fife, about three miles from Limekilns, the nearest point on the Firth of Forth. It is connected with Glasgow by railway via Stirling, and with Edinburgh, from which it is distant 16 miles, both wa Thornton and by a direct lineconstructed in 1877 to North Queensferry. The town is situated about 300 feet above the sea, on the brow of a slope which ascends from the Forth, and it accordingly commands a very extensive view of the country towards the south. It is intersected from north to south by a deep ravine, at the bottom of which a small stream pursues its tortuous course ; and this ravine is crossed by an earthen mound, on which an excellent street is built. At the east end of the town, on the south side of the turnpike road, is a public park comprising about 36 acres, partly the gift of the late Mr Ker of Middlebank ; and to the north of the road, at a little distance, are the jail, the workhouse, a hospital, and a cemetery, all in close proximity to each other. The county buildings, with their tall and graceful spire 132 feet high; the new corporation buildings, at present (1877) in course of erection, at an estimated cost of £20,000; the now Assembly Hall, capable of accommodating 1500 persons, now being built by a private company at a probable outlay of £10,000 ; the Carnegie Public Baths, finished and opened in 1877, and presented to his native town by Mr Andrew Carnegie of New York ; the Savings Bank ; and the British Linen

Company's Bank are all worthy of notice. But the most interesting building in the town is the Abbey Church. The western portion is the nave of the cathedral of the Holy Trinity, originally erected in tho massive Norman style by Malcolm Canmore about the middle of the 11th century ; it escaped destruction when the rest of the building was demolished by the Reformers on 28th March 1560, served as the parish church till the present century, and now forms a fine vestibule to the New Church. Extensive reparations have been made by the Commissioners of the Woods and Forests, and a number of stained glass windows have been contributed by private individuals, The eastern portion, or New Church—opened for public worship on 30th Sept. 1821—occupies the site of the ancient chancel and transepts, but does not agree in proportions or style with the original edifice. Exactly below the pulpit lic the remains of King Robert Bruce ; in the north transept are buried seven other kings, two queens, and numbers of the nobility ; and in the southern transept, above the vault of the Elgin family, are

monuments in white marble to the Hon. Robert Bruce, tutor to the prince of Wales, and Charles Dashwood Bruce, cousin of the late Lord Elgin, as well as a bust in marble erected by Dean Stanley in memory of his wife Lady Augusta Bruce. The tomb of Queen Margaret, the wife of Malcolm Canmore, lies immediately to the east of the session- house. Of the ancient abbey buildings there still remains the south wall of the Refectory, or Fraters' Hall, with an entire window much admired for its elegant and complicated workmanship. The south-west wall of the palace still stands in testimony of its former stateliness, and an apartment is pointed out by tradition as the spot where Charles I. was born. There are also some slight traces of an ancient tower popularly ascribed to Malcolm Canmore, but in all probability not of so early a date.

Dunfermline has three Established churches, four United Presbyterian, three Free, one Congregational, one Episco- palian, one Evangelical Union, and one Roman Catholic, as well as several places of worship belonging to smaller de- nominations. The Queen Anne Street United Presbyterian Church was founded by Ralph Erskine, and the Gillespie church by George Gillespie. The former of these two great dissenters is commemorated by a statue in front of his church, and a sarcophagus over his grave in the abbey

churchyard ; to the memory of the latter a marble mural tablet is inserted above his resting-place within the abbey. The town is well supplied with means of education in all the ordinary branches ; but there is no special provision for the higher departments of learning.

The staple industry of Dunfermline is the manufacture of table-linens, and in this department it has almost no rival. The weaving of damask was introduced into the town in 1718 by a Mr James Blake, who had succeeded in getting possession of the jealously guarded secret in workshops at Drumsheugh, near Edinburgh, to which he obtained access by feigning idiocy. Till about 1845 the bulk of the popula- tion were engaged on handlooms, but at present only a comparatively small number earn a scanty and precarious subsistence by the old method. The eleven power-loom factories in the town in 1877 give employment to about 5000 persons, of whom a large proportion are females. The annual value of the goods manufactured is about £850,000. Iron and brass foundries, soapworks, and dyeworks are among the minor industrial establishments, and in the vicinity there are about 22 collieries.

Dunfermline returns a member to’Parliament in con- junction with Stirling, Inverkeithing, and Culross. The population of the town was 14,963 in 1871, and is now (1877) 15,839; that of the parish, which, besides the strictly rural district around, includes Limekilns and Charleston, with several colliery districts, was 23,123 in 1871, and is now 24,329, The town is governed by a council con- sisting of 22 members, including a provost, four bailics, and other officials. The revenue of the town, derived prin- cipally from coal-fields, was £7875 in 1876. The number of inhabited houses is 1638; the annual value of real pro- perty, £56,038. There are two newspapers published weekly, and four banks, besides the National Savings Bank.

In spite of the introduction in 1850 of an apparently abundant supply of spring water, a scarcity has since becn felt in dry seasons; and accordingly at present (1877) works are in progress to effect a communication with the River Devon. It is anticipated that the cost of these will be nearly £60,000. Drainage works are also being con- structed, at an estimated cost of £9000, to convey the sewage of the city to the sea at Limekilns. The situation of

Dunfermline is very favourable to health: the birth rate is 40 per thousand, the rate of mortality 18-4, and the marriage rate 8-7,

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Dunfermline derives its name, ‘‘The Town or Fort on the crooked Linn,” from the ravine already mentioned. From an early period it was a favourite royal residence; and in 1070 Malcolm ITI. was there married to Margaret. The Culdees are supposed to have had an establishment in the place ; and the Benedictine priory, founded by Canmore, was raised to the rank of an abbey under David]., who bestowed numerous privileges on the community. In 1244 the abbot received a mitre; and in 1249 Queen Margaret, the patron saint, was canonized. During the winter of 18038 tho court of Edward I. of England wag held in the abbey; and on his departure next year most of the buildings were destroyed by fire. In 1829 King Robert Bruce was interred in the choir of the church. ‘The last royal occupant of the palaco was Charles II., who there signed the National League and Covenant. Shortly after the town was plundered by Cromwell’s soldiers.

DUNFERMLINE, Lorp. See ABeRcRoMBY. DUNGANNON, a parliamentary borough and market- town of Ireland, in the county of Tyrone, standing on an acclivity 8 miles W. of the south-western shore of Lough Neagh, and 94 miles N.W. of Dublin. It consists of a square with diverging streets, and is generally well built. The only public buildings of note are the parish church, with an octagonal spire, a court-house, a market hall, and a college founded by Charles I. Linens are manufactured and coarse earthenware. The town also contains a power-loom weaving manufactory and flour mills. It returns ono member to Parliament. The early history of the place is identified with the once powerful family of the O’Neals, whose chief residence was there. In Dungannon the independence of the Irish Parliament was proclaimed in 1782. The population in 1871 was 3886, of whom 55 per cent. were Roman Catholics ; area, 230 acres. DUNGARVAN, a parliamentary borough, market-town, and seaport of Ireland, in the county Waterford, 125 miles 8.W. of Dublin. It is situated on the Bay of Dungarvan, at the mouth of the Colligan, which divides the town into two parts, connected by a bridge ofa single arch. The eastern suburb is called Abbeyside, where the remains of an ancient keep, erected by the

M‘Graths still exists. The town contains a town hall, a sessions house, a union work- house, a market house, and barracks. Brewing is carried on to a small extent, and there is a steam mill, The borough returns one member to Parliament. Area of town, 392 acres ; of borough, 8499 acres. Population of borough (1871), 7719, of whom 36 per cent. were Roman Catholics.
DUNKELD, a burgh of barony and market-town of Perthshire, Scotland, situated on the north bank of the Tay, 15 miles N.N.W. from Perth. The river is crossed there by a fine bridge of seven arches, begun in 1805 and completed in 1808, at a cost of £42,000. With the exception of the town-hall (erected 1877) and some other modern build- ings, the village consists of narrow and ill-built streets. presenting an antiquated aspect. It is buried among the dark shades of luxuriant trees, and stands in the centre of a valley surrounded by mountains of considerable elevation, which are wooded to their summits. The river, the bridge, the surrounding mountains, and the remains of an ancient cathedral combine to give the town a very romantic appearance. As early as 729 the Culdees had a mon astery at Dunkeld, which was converted into a cathe- dral by David I. in 1127. Its architecture is of a compo- site character, exhibiting features both of the Norman and Pointed styles. The centre of the nave is 120 feet by 60, the walls are 40 fect high, and the aisles 12 feet wide. The choir was founded by Bishop Sinclair in 1350 ; and the tower, which is about 90 feet high, was begun by Bishop Lauder in 1469, and completed by Bishop Brown in 1501. It contains four bells. The cathedral was unroofed at the Reformation, but the choir has been rebuilt, and is now used as the parish church. Beneath the charter-house is the sepulchral vault of the Athole family. In the porch of the church is the tomb of Alexander Stuart, earl of Buchan,

better known as the Wolf of Badenoch, who died in 1394. The most famous of the bishops of Dunkeld was Gavin Douglas, the translator of the @neid. Immediately behind the cathedral stands Dunkeld House, the mansion of the dukes of Athole. The grounds of the ducal residence (which are extensive and picturesque) contain two of the earliest larch trees introduced into Britain; they were brought from Tyrol in 1738. A mile south of Dunkeld, on the other side of the Tay, is the modern village of Birnam, which has sprung up at the railway station. It lies at the foot of Birnam hill,

said to derive its name from the famous wood connected with the fate of Macbeth. The population of the burgh in 1871 was 783.

DUNKERS, or TunxeErs, a sect of American Baptists originating in Germany. The name, as its second form in- dicates, is a nickname meaning dippers, from the German tunken, to dip. From the first the members recognized no other name than “ Brethren.” The founder of the sect was Alexander Mack of Schwartzenau, who, along with oue or two companions, was led to adopt anti-peedobaptist views about the year 1708. It had scarcely assumed organized existence in Germany when its members were compelled by persecution to take refuge in Holland, from which they emigrated to Pennsylvania in small companies in the years between 1720 and 1729. Their first community was established at Germantown, not far from Philadelphia, and other settlements were gradually formed in New England, Maryland, Virginia, Ohio, and Indiana. In the early history of the sect the sexes dwelt apart, and marriage, while not forbidden, was discouraged. Similarly, while the holding of private property was not absolutely prohibited, a certain community of goods was established and maintained by the voluntary action of the members, and it was considered un- lawful to take interest for money. These features have now disappeared, but in other respects the sect retains much of its original character. Every member has the right to exhort and take part in the religious services, and for a con- siderable period no special provision was made for the con- duct of worship. There is now, however, a recognized unpaid ministry of bishops and teachers. There are also deacons and deaconesses. In baptism trine immersion is used. The Lord’s Supper is observed in the evening only, and connected with it are the lavipediwm, or ceremonial feet washing, and the apostolic “ love-feasts.” Putting a literal interpretation on James v. 14, they practise the anointing with oil for the healing of the sick, and many of them will not adopt any other means of recovery. They resemble the Quakers in their plainness of speech and dress, and their refusal to take oaths or to serve in war. Their number, which at one time was estimated at 30,000, has very considerably declined, and the latest account states it at less than 8000. An early offshoot from the general body of Dunkers were the Seventh Day Dunkers, whose distinc- tive principle, as their name imports, was that the seventh day, and not the first day, of the week was the true Sabbath intended to be perpetually and universally observed. Their founder was Conrad

Peysel, one of the first emigrants, who established a settlement at “ Ephrata,” about fifty miles from Pennsylvania, in 1733. This branch of the sect has almost died out.

DUNKIRK, or DunxeErQUE, a strongly fortified seaport town of France, and capital of an arrondissement in the de- partment of Nord, is situated on the Straits of Dover, 40 miles N.W. from Lille, and 194 N. from Paris, in 51° 2’N. lat. and 2° 22’ 32” E. long. It is a well-built town, the streets being large, wide, and regular. It is divided intothree parts— (1) the town proper, which is the centre of trade; (2) the low town, containing the principal industries ; and (3) the citadel, including docks and granaries, and containing the houses of labourers and sailors, Dunkirk is both a naval port and

one of the merchant ports of Paris, and has two harbours, its maritime trade employing about 5000 vessels with a tonnage of 270,000. The docks occupy about 100 acres. It possesses sugar refineries, starch manufactories, distilleries, foundries, and large ship-building yards. The fisheries of the eoast are valuable and extensive. The public build- ings most worthy of notice are the church of St Eloi, recon- structed about 1560 in the Gothic style, with a Corinthian peristyle built in 1783 ; the lighthouse, 170 feet high ; the Beffroi, 300 feet high, surmounted with signals for vessels in distress, and containing a celebrated peal of bells; the exchange, the second story of which is a gallery for pictures, statuary, medals, and curiosities; and the theatre. The principal square contains the statue of Jean Bart by David of Angers.

Dunkirk is said to have originated in a chapel founded by St Eloi fin the 7th ceutury, round which a small village speedily sprung up. In the 10th century Baldwin III., count of Flanders, raised it to the rank of a town. In 1388 it was burned by the English, and in the 16th century Charles V. built a tower for its defence, of which no traces now remain. In 1558 the English, who had for some time held the town, were expelled from it by the French, who in the ensuing year surrendered it to the Spaniards. In 1646 it once morc passed into the hands of the French, who, after a few years’ occupation of it, again restored it to Spain. In 1658 it was retaken by the French and made

over to the English. After the Restoration, Charles II., being in moncy difficulties, sold it to the French king Louis XIV., who fortified it. In 1793 it was attacked by the English under the duke of York, who, however, were compelled to retire from its walls with severe Ioss. ‘The popu- lation in 1872 was 34,342. ‘ DUNKIRK, a lake-port town of the United States, in Chautauqua county, New York, situated on a small bay in Lake Erie, 40 miles south-west of Buffalo. It is an im- portant station onthe Lake railroad, and forms the western terminus of the Erie line ; and by means of the Carrolton railroad it has connection with the Pennsylvania coal-fields. The town occupies an elevated and agreeable position on the lake, and its harbour is free of ice earlier in the spring than the neighbouring port of Buffalo. The industries of the place comprise oil-refining, and the manufacture of glue, flour, and iron-work. Population (1870), 5231. =

DUNMOW, Great, a market-town of England, in Essex, situated on a via militaris, some remains of which still exist. It consists of two good streets, built on an acclivity near the right bank of the Chelmer, 40 miles north-east of London by rail. Its public buildings include a town hall and a literary institute, besides the parish church of St Mary the Virgin, recently restored. Population in 187], 2983. Two miles to the east is the village of Little Dun- now (population, 359), formerly the seat of a priory re- markable for the custom of presenting a flitch of bacon to any couple who could satisfy a jury of six bachelors and six maidens that they had spent the first year of married life in perfect harmony, and had never at any moment wished they had tarried. The institution of this strange matri- monial prize—which had its parallel at Whichanoure (or Winchnor) in Staffordshire, at St Meleine in Brittany, aud apparently also at Vienna—appears to date from the reign of John ; and the only instances recorded of its award occurred in 1445, 1467, 1701, 1751, and 1763. A revival of the custom was effected in 1855 by Mr Harrison Ains- worth, but the scene of the ceremony was transferred to the town-hall of Great Dunmow. For details see Chambers’s Book of Days, vol. ii. p. 748-751 3; and W. Andrews, LNstory of the Dunmow Flitch of Bacon Customs, 1877.

DUNNING, Joun, Baron Asnpurron (1731-1783), an eminent English lawyer, the second son of John Dunning a Devonshire, an attorney, was born at

shburton, October 18, 1731, and was educated at the free grammar-school of his native place, where he distinguished en he come and mathematics. On leaving school he

into his father’s office, where he remained uutil

the age of nineteen, when he was sent to the Temple. Called to the bar in 1756, he came very slowly into practice. He went the Western Circuit for several years without receiving a single brief. In 1762 he was employed to draw up A Defence of the United Company of Merchants of Lingland trading to the East Indies, and their Servants, particularly those at Bengal, against the Complaints of the Dutch East India Company to his Majesty on that subject ; aud the masterly style which characterized the document procured him at once reputation andemolument. In 1763 he distinguished himself as counsel on the side of Wilkes, whose cause he conducted throughout. His powerful argu- ment against the validity of general warrants (18th June 1763) established his reputation, and his professional busi- ness from that period gradually increased to such an extent that in 1776 he is said to have been in the receipt of nearly £10,000 per annum. In 1766 he was chosen recorder of Bristol, and in December 1767 he was appointed solicitor- general, The latter appointment he held till May 1770, when he retired, along with his friend Lord Shelburne. In 1771 he was presented with the freedom of the city of London. From this period he was considered as a regular member of the Opposition, and distinguished himself by many able speeches in Parliament. He was first chosen member for Calne in 1768, and continued to represent that burgh until he was promoted to the peerage. In 1780 he brought forward a motion that the “influence of the crown had increased, was increasing, and ought to be diminished,” which he carried by a majority of eighteen. He strongly opposed the system of sinecure offices and pensions ; but his probity was not strong enough to prevent his taking advan- tage of it for himself. In 1782, when the marquis of Rockingham became prime minister, Dunning was appointed chancellor of the duchy of Lancaster, a rich sinecure ; and about the same time he was advanced to the peerage, by the title of Lord Ashburton. Under Lord Shelburne’s adminis- tration he accepted a pension

of £4000 a year. He died while on a visit to Exmouth, August 18, 1783. Though possessed of an insignificant person, an awkward manner, and a provincial accent, Lord Ashburton was one of the most fluent and persuasive orators of his time. Sir William Jones speaks in the highest terms of his eloquence and wit, and Bentham commended the closeness of his reasoning. Besides the answer to the Dutch memorial, Lord Ashburton is supposed to have assisted in writing a pamphlet on the law of libel, and to have been the author of 4 Letter to the Proprietors of East India Stock, on the subject of Lord Clive's Jaghire, occasioned by his Lordships Letter on that Subject, 1764, 8vo. He was at one time suspected of being the author of the eclebrated Letters of Junius. DUNOIS, Jean (1402-1468), Count of Orleans and Longueville, commonly called the " Bastard of Orleans," a eelebrated French warrior and grand-chamberlain oi France, was the natural son of the duke of Orleans (brother of Charles VI.) and Mariette d' Enghien, Madame de Cany, and was born at Paris the 23d November 1402. He was brought up in the house of the duke, and.in the company of his legitimate sons. THis earliest feat of arms was the sur- prise and rout in 1427 of the English, who were besieging Montargis,—the first successful blow against the English power in France following a long series of French defeats. In 1428 he threw himself into Orleans, and was the principal means of enabling the garrison to hold out until the arrival of Joan of Arc, when he shared with her the honour of defeating the enemy there in 1429. He then accompanied Joan to Rheims, and shared in the victory of Patay. After her death he raised the siege of Chartres and of Lagny, and drove the English from Paris, which he entered in triumph on the 13th April 1436. The English retreated gradually into the Isle of France, and thence into Normandy ; and Dunois, having in 1449 been raised to the rank of lieutenant-general, soon conquered from them the whole

of that province. In 1451 he attacked them in Guienne, taking among other towns Bordeaux, which the English had held for 300 years. At the conclusion of these conquests Charles VII. legitimated him, and gave him} the title of defender of his country, and the office of grand chamberlain ; but on the death of Charles, Louis XI. deprived him of his titles and dignities. He then joined the league of revolted princes, but, assuming the function of

negotiator, and thus securing the favour of the king, he was reinstated in his offices, and named president of the council for the reform of the state. He died 28th November 1468.

DUNOON, a town in Argyllshire, Scotland, situated on the Firth of Clyde, about nine miles west from Greenock, and on the opposite shore. Of recent growth (having been about the beginning of this century a mere fishing hamlet), it is now one of the most extensive and prosperous watering-places on the shores of the Clyde, a condition for which it is much indebted to the late James Ewing of Strath- leven, who first drew attention to its capabilities as an agreeable summer residence. On account of the mildness of the climate that prevails, and the amenity of the situation, it was selected as the site of a convalescent home, which has proved a boon to many of the hard-wrought population of Glasgow and its neighbourhood. On a conical hill close above the main pier stand the fragments of Dunoon Castle, the hereditary keepership of which was conferred by Robert Bruce on the family of Sir Colin Campbell of Loch Awe, an ancestor of the duke of Argyll. Near the hillock is the modern castle of Dunoon. Including the suburb of Kirn, the population at the census of 1871 was 3750.

DUNS SCOTUS, Joun, one of the foremost of the schoolmen, was born in the latter half of the 13th century. The year and place of his birth are both uncertain. For the date 1265 and 1275 have been assigned, without any decisive evidence in favour of either. The form of the sur- name seems to support the claim of Dunse, in Berwickshire, as the place, though the same ground has been pled, with less plausibility it must be admitted, for Downpatrick (Dunum) in Ireland, and for the village of Dunstane in Northumberland. In favour of Dunstane a statement at the close of a manuscript copy of the work of Duns Scotus, contained in the library of Merton College, Oxford, has been quoted ; but this, though it states expressly that the author was born at Dunstane, isinconclusive. The rival claims of England, Scotland, and Ireland have been naturally enough advocated by natives of the three countries respectively, Leland, Dempster, and Wadding, and have been the subject of considerable controversy, into which it would be a waste of time to enter. It isnoteworthy, however, as a curiosity of literature, that Dempster published a quarto volume, the main object of which was to prove by twelve distinct argu- ments that Duns

Scotus was a Scotchman. It is said that when he was a boy his extraordinary ability was observed by two Franciscan friars, who took him to their convent at Newcastle. Whether this be so or not it seems certain that he joined the Franciscan order in early life, and that he studied at Merton College, Oxford, of which he was made afellow. According to Wadding, he became remarkably pro- ficient in all branches of learning, but especially in mathe- matics. When his master, William Varron, removed to Paris in 1301, Duns Scotus was appointed to succeed him as professor of philosophy. His lectures attracted an immense number of students, though the story that in his day the university was attended by no less than 30,000 is probably a gross exaggeration. He was removed to Paris, probably in 1304, though the precise date is uncertain. In 1307 he received his doctor's degree from the university of Paris, and in the same year he was appointed regent of the theological school. His connection with the university was made memor- able by his defence of the doctrine of the Immaculate Concep-

tion, in which he displayed such dialectical ingenuity as to win for himself the title Doctor Subtilis. According to the account that is usually given he refuted one by one no less than two hundred objections urged against the doctrine by the Dominicans, and established his own position by "a cloud" of arguments. The doctrine con- tinued long to be} one of the main subjects in dispute between the Scotists and the Thomists, or, what is almost the same thing, between the Franciscans and the Dominicans. To judge from its subsequent acts, the university of Paris seems to have been deeply and lastingly impressed by the arguments of Duns Scotus. In 1387 it formally condemned the Thomist doctrine, and a century afterwards it required all who received the doctor's degree to bind themselves by an oath to defend the doctrine of the Immaculate Conception. In 1308 Duns Scotus was sent by the general of his order to Cologne with the twofold object of engaging in a controversy with the Beghards and of assisting in the foundation of a university. He was received with great ceremony by the magistrates and. nobles of the city. After a very short residence, however, he died of apoplexy on the 8th November 1308. The story told by Paulus Jovius, that on his grave being opened some time after his death his body was found to

have turned in the coffin, from which it was inferred that he had been buried alive, is generally regarded as fabulous.

Duns Scotus was one of the great leaders of scholastic thought, and, as a full account of his philosophical system must therefore necessarily be given in the general article on ScHoLAStTicisM, a brief indication of its leading points will suffice here. It may be noted at the outset that the philo- sophical position of Duns Scotus was determined, or at least very greatly influenced, by the antagonism that existed between the Dominicans and the Franciscans. Thomas Aquinas was a Dominican, Duns Scotus was a Franciscan ; and hence arose the schism between the Thomists and the Scotists. Aquinas ranks in philosophy with the realists as well as Duns Scotus, but his view in regard to the great philosophical controversy of the Middle Ages was a modified or eclectic one in comparison with that of Duns Scotus, who is the true representative and apostle of scholastic realism. Theologically, the doctrine of the Immaculate Conception was the great subject in dispute between the two parties. There were, however, differences of a wider and deeper kind. In opposition to Aquinas, who main- tained that reason and revelation ;were two independent sources of knowledge, Duns Scotus held that there was no ‘true knowledge of anything knowable apart from theology as based upon revelation. In conformity with this principle he denied that the existence of God was capable of being proved, or that the; nature of God was capable of being comprehended. He therefore rejected as worthless the ontological proof offered by Aquinas. Another chief point of difference with Aquinas was in regard to the freedom of the will, which Duns Scotus main- tained absolutely. He held also inan unqualified form the doctrine of predestination, and he reconciled free-will and necessity by representing the divine decree not as temporally antecedent, but as {immediately related to the action of the created will. He maintained, in opposition to Aquinas, that the will was independent of the understanding, that only will could affect will. From this difference as to the nature of free-will followed by necessary consequence a difference with the Thomists as to the operation of divine grace. In ethics the distinction he drew between natural and theological virtues is common to him with the rest of the schoolmen, among others with his great opponent. (See Aquinas, vol. ii. p. 232-3.) Duns Scotus strongly

upheld the authority of the church, making it the ultimate authority on which that of Scripture depends.

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The works of Duns Scotus were very numerous, though in the collection edited by Luke Wadding, a Franciscan (12 vols, fol., Lyons, 1639), several are ascribed to him without sufficient ground. This edition contains a life full of legends, which was reprinted separately (Mons, 1644). The most important of the works of Duns Scotus consisted of questions and commentaries on the writings of Aristotle, and on the Sentences of Lombard.

For the theology of Scotus see the Summa Theologica cx Scott Oncribus, by Jerome de Fortius, a Franciscan, the Resolutio doctrine Scotice, by F. E. Albergoni (Lyons, 1648), and the Controversie theologice inter S. Thomam et Scotwm, by De Rada, a Spanish Francisean (Venice, 1599). Of iore recent authorities particular value attaches to Baumgarten-Crusius's De Theologia Scotti (Jena, 1896) and an article by Erdmann in the Theologische Studien wnd Kritiken for 1868. On the philosophy of Duns Scotus see Ritter's Yeschichte dcr Philosophie and Ueberweg's Geschichte der Philosophie.

DUNSTABLE, a market-town and, since 1864, a munici- pal borough of England, in the county of Bedford, 33 miles N.W. of London, and 18 miles 8.8.W. of Bedford, with communication by both the North-Western and the Great Norther railways. Its parish church, a fine old building, formerly part of the Augustinian priory, was restored about 1865; the principal points of interest are the richly decorated west front, the ancient monuments of the Chew family, and, among the interior adornments, Sir James Thornhil?s painting of the Last Supper. The five dissenting churches, the temperance hall, sevcral alms-houses, and the Ashton charity and other schools complete the list of public buildings. Straw-plaiting and the making of straw hats and bonnets are the principal industries; and, as a consequence, the female considerably outnumbers the male population. The census of

1861 gave 2712 females out of a total of 4470 inhabitants; and that of 1871, 2702 out of

4558.

From its situation at the junction of the ancient Watling and Icknield Streets, it seems probable that Dunstable was a Roman station, :but its identification, whether with Magiovinium or Durocobrive, is not certainly established. Matthew Paris mentions, in his Lives of the Abbots of St Albans, that about 1110 the play of S. Katharina was acted in the town by direction of Geoffrey, after- wards abbot of St Albans, and thus the name of Dunstable is associ- ated with the very earliest authentic notice of theatrical represen- tation in England. The Augustinian priory, to which it was afterwards indebted for its celebrity, was founded in 1131 by Henry [., and for a long period exercised lordship over the town. From 1227 to 1229 there was a violent dispute between the burghers and the canons, but the claims of the latter were acknowledged by Hubert de Burgh, the justiciary. It was at Dunstable that in

1244 the discontented barons met and ordered the papal nuncio to

leave the kingdom ; and in 1533 the commissioners for the divorce of Queen Catherine sat in the priory. The Annales de Dunstaplia are one of the most valuable of the monastic chronicles still extant. They extend from the inearnation to the year 1297, and are fortunate- ly fullest in the account of contemporary events. The entries from 1210 to 1242 are due to Richard de Morins, the prior. The original is a parchment folio preserved among the Cotton MSS. in the British Museum (Tiberius, A. 10). It was greatly damaged by the fire of 1731, and is consequently slightly imperfect, in spite of the care with which it has been stretched and mended. Hearne pub- lished an edition in 1733 from a fairly accurate transcript by Humphrey Wanley (Harleian MSS. 4886); another by H. R. Luard, from the original MS., oceupies 420 pages of vol. iii. of the Annales Monastic, published by the Master of the Rolls.

DUNSTAN, Sr (924 or 925-988), was born at Glastonbury in 924 or 925, His father, Heorstan, was brother of Ailfheah the Bold, bishop of Winchester; and the tradition that he was connected with the royal house

seems not improbable. As a child he was placed under the care of certain Irish teachers who had settled at Glastonbury ; and he devoted his boyhood to study with a fervour so intense that he at length brought on himself a severe attack of brain fever, the effects of which are apparent in the fantastic visions which troubled his after life. He was still a boy when he entered the houschold of Athelstan, and he was only fifteen or sixteen at the acces-

sion of Edmund; but he had not been long at court before his ambitious and lofty temper had surrounded him with bitter enemies. In all the accomplishments of his time, except those of the warrior, he stood pre-eminent. His memory was stored with the ancient Irish ballads and legends, and he excelled in music, in painting, and even in the mechanical arts. But he soon found that his talents, while making him a favourite in the ladies' bowers, only inflamed the jealousy of his rough, ignorant soldier rivals. He was accused of dealing in witchcraft, was driven with rude force from the court, and, perhaps under the pretext of testing whether he was really wizard or no, was flung into a muddy pond, whence he was glad to escape to the protection of his uncle Ailfheah. The result of this outrage was a second attack of fever, from which he rose to yield to his uncle's persuasions, and take the vows as a monk. It was with great reluctance that he took this step, for he was deeply in love with a lady at court; but the feeling, natural in that age, that his illness was a direct indication of the will of providence, was likely to impress itself with peculiar force upon an imagination such as his, and he was also, doubtless, conscious that the only protection for his physical weakness lay in the power of the church. After his recovery, he spent some time quietly studying and teaching, and practising the austeri- ties which gained him the reputation of a sat; but it was not long before he returned to court. Again his enemies seemed likely to prove too powerful for him. He, how- ever, gained the favour of King Edmund, who created him abbot of Glastonbury when he was about twenty-two years of age. He became principal treasurer of the king- dom, and we

find him a few years later (953), on account of his tenure of that office, refusing an offer of the see of Crediton.

From 946 to 955 the throne was occupied by Edred, whose constant ill health threw the chief power into Dunstan's hands. In 955 Edwy came to the throne; and the party of Edgiva, to which Dunstan belonged, lost its influence. Of the details of the party struggles which ensued we have no trustworthy information ; but one incident of the quarrel between the king and the minister has become famous. Edwy, though then pro- bably a mere boy, was deeply in love with his kinswoman Elgiva, whose mother Ethelgiva, a lady of the highest rank, is accused, with what degree of truth cannot now be determined, of having used the most shameful means to gain power over the young king. What relationship really existed between Edwy and Elgiva is unknown, but 16 was such as to be considered by the churchmen as an insuperable bar to marriage. Edwy, however, defied their opposition. On the evening of his coronation he withdrew from the banquet to the society of Tlgiva. Dunstan was sent by the Witan to recall him, and ex- hibited a violence which may be excused, when we consider that Edwy had both grievously insulted the Witan and openly sought, upon so solemn an occasion, the dangerons society of a girl whom the church forbade him to marry.

A year or so after Ethelgiva and her party triumphed, and Dunstan being outlawed, was obliged to flee to Ghent. In 957, however, a revolt plaeed: Edwy's brother Edgar on the throne of Mercia and Northumbria, and at his court Dunstan resumed his old position of chief minister. He was created bishop (perhaps at first without a see) ; and, in defiance of strict ecclesiastical law, he obtained and held at once the sees of Worcester and London. By the death of Edwy in 959, Edgar gained the sovereignty of Wessex ; and a few months after Dunstan was appointed archbishop of Canterbury.! On the death of Edgar (955),

1 In connection with the coronation of Edgar, Osbern of Canter- bury tells a story intended to exalt the archbishop. The king having

Dunstan’s influence secured the crown for Edward. Buta fierce struggle ensued between Dunstan and his enemies. In 977 the Witan met three times; and the last meeting, that at Calne, was signalized by an accident, which the friends of Dunstan called a miracle. Half the floor of the room in which the Witan was assembled gave way at the moment that Dunstan was making a solemn appeal to God, so that the enemies of Dunstan fell, and Dunstan and his friends remained unhurt. This accident has been ex- plained by reference to the archbishop’s well-known skill in mechanics. During the first few years of the unhappy reign of Ethelred the Unready, Dunstan probably retained some influence in the government ; and it is noteworthy that the year of his death (which took place on the 19th May 988) marks the commencement of the most disastrous invasions of the Danes. ‘Towards the close of his life Dunstan is said to have retired from the court, and his last years were devoted to religious observances and the com- position of sacred music,: his favourite amusement being, as of old, the manufacture of bells and musical instruments.

Dunstan has been frequently painted by historians as one of the most complete types of the bigoted ecclesiastic. If, however, we critically examine the best sources, he will appear to have been statesman much more than ecclesiastic ; and the circumstances which caused him to be honoured by the monks as one of their greatest patrons will become manifest. Even in his lifetime he was believed to be endowed with supernatural power, as is shown by the charge of witchcraft brought against him in his youth, and by the story of the miracle at Calne. His earliest biography, written by a contemporary, represents him as a man of vivid imagination, a seer of visions and dreamer of dreams, a man of unusually sensitive nervous organization, as is indicated by the strange “ gift of tears ” with which he is said to have been endowed; and in this biography we find the first of the tales which became so common of his interviews with the devil, who is said to have tormented him in the form of a bear and in other frightful shapes. By a very common process, there came to be connected with his name a large number of marvellous legends, of which the best known is the story of how the devil appeared to him with impure suggestions while he was working at his forge, and how the saint retaliated by seizing the nose of the great enemy with a pair of red-hot tongs. It is not sur- prising that the monkish writers should exaggerate any services rendered to their order by

an archbishop possessed of so wonderful a reputation. But in fact there is good reason to believe that Dunstan always treated church affairs as subordinate to political considerations. While Ethelwald, the bishop of Winchester, and Oswald, bishop of Worcester, and afterwards archbishop of York, were introducing monks of the strict Benedictine order into their sees in place of the seculars, and doing tlicir utmost to enforce celibacy among the clergy, he allowed the married priests to retain their places in his diocese without interfer- ence. On the other hand, no doubt all Dunstan's influence in church affairs was given to the monastic party, though that influence was exerted with a statesman-like moderation for which he has not received eredit,and it is likely that he did not attain his canonization without performing sub- stantial service to the church. The political services which Dunstan rendered to England were certainly of the first importance. He guided the state successfully during the nine years reign of the invalid Edred. And there is good

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taken the nun afterwards called St Wulfrith as his mistress, Dunstan is said to have vindicated the independence of the church by forbidding him, among other penances, to wear the crown for seven years; but there are several reasons for doubting this story. The question is elaborately discussed in the article ou the ‘‘ Coronation of Edgar," in Mr EH. W. Robertson's Historical Hssays.

reason to believe that he deserves at least as much credit as the king himself for the settlement of Northumbria and the Danes which was effected, for the peace which prevailed, and the glory which was gained, in Edgar's famous reign.

Several works have becn attributed to Dunstan, ineluding a

commentary {on the Benedietine rule, and a Regularis Concordia (published in Reyner's Apostolatus Benedictinorwm and in the New

Monasticon) ; but the real authorship of both of these is doubtful. His reputation as a miracle-worker so Jong outlasted his life, that a traet on the philosopher's stone was published in his name at Cassel in 1649.

The earliest and the most trustworthy of the biographers of Dunstan was ‘‘the priest B.,”” whom some authorities have supposed, though not upon conclusive grounds, to be the scholar Bridferth of Ramsey.! The date of his work is fixed by Prof. Stubbs at about 1000; it is dedicated to archbishop Elfric who died in 1006. The later lives,-—those of Adelard (which consists of lessons intended to be used in the monasteries), of Osbern, Eadmer, and William of Malmesbury,—are of far less valuc, being distorted by prejudice and filled with extravagant legends. The Memorials of Saint Dunstan have been published by Mabillon, and also in the Master of the Rolls’ series, edited, with an introduction, by Prof. Stubbs. Ascholarly essay on Dunstan and his Policy is contained in Mr KE. W. Robertson’s Historical Essays ; and the life of Dunstan is included in Dean Hook’s Lives of the Archbishops of Canterbury. (T. M. W.)

DUNTON, Joun (1659-1735) an eccentric bookseller, publisher, and author, was born at Graffham, in Hunting- donshire, May 4, 1659. In his boyhood he showed great fondness for adventure, and a faculty for getting into and out of scrapes. At the age of fifteen he was apprenticed to Thomas Parkhurst, bookseller, at the sign of the Bible and Three Crowns, Cheapside, London, whose strictness had full exercise in the endeavour to keep in check his wayward tendencies. During the struggle which led to the Revolution, Dunton joined the Whig apprentices, and became the treasurer of that body. In 1685 he became bookseller at the sign of the Raven, near the Royal Exchange, having, after much consideration as to the lady he should select, married a sister of Samuel Wesley. His wife managed his business, so that he was left free in a great measure to follow his own eccentric devices, which now took the form chiefly of writing and rambling. In 1686, probably because he was concerned in the Monmouth rising, he visited New England, where he stayed eight months selling books and observing with interest the new country and its inhabitants. He then made a short excursion to Holland; after which, returning to England, he opened a new shop in the Poultry, in the hope of better times. Here he published weekly the Athenian Mercury, which professed to answer all questions on history, philosophy, love, marriage, and things in general. It enjoyed considerable popularity for some tine, but he discontinued it, after a course of six years, in 1696. His wife died some time after this. He marrieda second time ; but a quarrel about his wife’s property led to a separation,

and, having no one to manage his affairs, he spent the remainder of his life in great poverty. He died in 1735.

He wrote a great many books which are now forgotten, but –

his Life and Errors, on account of its naiveté and as a picture of bygone times, is still read, and his letters from New England were published in America in 1867.

DUPERREY, Louis Istporu (1786-1865), a French navigator and scientific investigator, was born at Paris, entered the navy in 1803, took part in the military opera- tions of 1809 at Brest and Rochefort, and assisted in the hydrographical survey of the coast of Tuscany carried on during that and the following year. From 1817 to 1820 he served under {Freycinet in his great voyage round the world, being intrusted with the hydrographic operations on board the “Urania; ” and he. contributed largely to the preservation of the crew and the scientific collections when Lee LUE

1 This question is fully discussed by Prof. Stubbs in his Introduc- tion to the Memorials of Saint Dunsten; but there are no suflicient data for discovering the author,

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his vessel was wrecked at the Malouin Islands. In 1822 he attained the rank of lieutenant, and was intrusted with the command of the “Coquille,” which during the next three years was engaged in scientific explorations in the South Pacific and along the coasts of South America. ; From this voyage he brought back not only great additions to cartography and important data in regard to the currents of the Pacific, but also numerous pendulum observations, serv- ing to determine the magnetic equator, and to prove the equality of the flattening of the two hemispheres. During the rest of his life he devoted himself mainly to the investiga- tion of terrestrial magnetism ; and the value of his labours was recognized by his admission into the Académie des Sciences in 1842. He died in August 1865.

The following are his principal works :—The Partie historique, the Hydrographic, and the Physique of the Voyage autour du Monde sur la Coquille, Paris 1826-1830 ; and extensive contributions to Becquerel's T'raité de U' Electricité.

DUPERRON, Jacqurs Davy (1556-1618), a celebrated French cardinal, was born at St L6, in Normandy, November 15, 1556. His father was educated fora physician, but on embracing the doctrines of the Reformation became a Protestant minister, and to escape persecution settled at Bern, in Switzerland. Here Jacques Davy received his education, being taught Latin and mathematics by his father, and learning without the aid of any one Greek and Hebrew and the philosophy which was then in vogue. At twenty years of age he came to Paris, and was presented to the king by the count of Matignon ; and, after he had abjured Protestantism, being again presented by Philip Desportes, abbot of Tiron, as a young man without equal for knowledge and talent, he was appointed reader to the king. He was commanded to preach before the king at the convent of Vincennes, when the success of his sermon on the love of God, and of a funeral oration on the poet Ronsard, induced him to take orders. On the death of Mary Queen of Scots he was chosen to pronounce her eulogy, which, though it contained an attack on Elizabeth of England that the king thought it prudent to disavow, tended to advance both the ecclesiastic's fame and fortune. When the Cardinal de Bourbon, at the end of Henry IIL.'s reign, plotted to secure to himself the throne to the prejudice of Henry IV., Duperron is accused of having joined in the plot and re- vealed to Henry IV. its secrets. However that may be, when the plot failed, and Henry IV. mounted the throne, Duperron enjoyed the favour of that monarch, and in 1591 was created by him bishop of Evreux. He con- verted Henry to the Catholic religion; and, after the taking of Paris, accompanied the Cardinal d'Ossat to Rome to obtain the removal of the interdict which had been passed upon France. On his return to his diocese, his zeal and eloquence were largely instrumental in with- standing the progress of Calvinism, and among others he converted Henry Sponde, who became bishop of Pamiers, and the Swiss general Sancy. His success attracted the attention of the church, and he was chosen to represent it at the conference at Fontainebleau in 1600. In 1604 he was sent to Rome as " chargé d'affaires de France ;" and, having hardly arrived when Clement VIII. died, he largely contributed by his eloquence to the

election of Leo XI. to the Papal throne, and, on the death of Leo twenty-four days after, to the election of Paul V. While still at Rome he was named archbishop of Sens, and the same year was made a cardinal. He died at Paris, Sept. 6, 1618. Duperron was a zealous defender of the infallibility and power of the Pope, and of his superiority over a general council. He was pos- sessed of immense energy, and of a ready and convincing eloquence, which he could make available for whatever opinions he thought it prudent to adopt ; and, if he did not

form his opinions solely with a view to his advancement, they certainly adapted themselves in each case with remarkable appropriateness to the different emergencies and turning points of his life. His works were collected after his death, and published in three volumes in 1622-23.

DUPIN, Anpri Marie Juan Jacques; (1783-1865), commonly called Dupin the Elder, a celebrated French advocate, president of the Chamber of Deputies and of the Legislative Assembly, was born at Varzy, in Niévre, on the Ist February 1783. He was educated by his father, who was a lawyer of eminence, and at an early age he became principal clerk of an attorney at Paris. On the establish- ment of the Académie de Législation he entered it as pupil from Niévre. In 1800 he was made advocate, and in 1802, when the schools of law were opened, he received successively the degrees of licentiate and doctor from the new faculty. He was in 1810 an unsuccessful candidate for the chair of law at Paris, and in 1811 he also failed to obtain the office of advocate-general at the court of cassation. About this time he was added to the commission charged with the classification of the laws of the empire, and, after the interruption caused by the events of 1814 and 1815, was charged with the sole care of that great work. When he entered the Chamber of Deputies in 1815 he at once took an active part in the debates, and strenuously opposed the election of the son of Napoleon as emperor after his father’s abdication. At the election after the second restoration Dupin was not re-elected. He defended with great intrepidity the principal political victims of the reaction, among others, in conjunction with Berryer, Marshal Ney; and in October 1815 boldly published a tractate entitled Inbre Défense des Accusés, In 1827 he was again elected a member

of the Chamber of Deputies, and in 1830 took part in counselling the revolution, and in exhorting the citizens to resistance. In August of that year he became a member of Louis Philippe's cabinet, and more than any one else contributed to the formation of the new régime. At the end of 1832 he became president of the chamber, which office he held successively for eight years. On Louis Philippe's abdication in 1848 Dupin introduced the young count of Paris into the chamber, and proposed him as king with the duchess of Orleans as regent. This attempt failed, but Dupin submitted to circumstances, and, retaining the office of procureur-général, his first act was to decide that justice should henceforth be rendered to the " name of the French people." In 1849 he was elected a member of the Assembly, and became president of the principal committee—that on legislation. After the coup d'état of 2d December 1851 he still retained his office of procureur-général, and did not demit it till effect was given to the decrees confiscating the property of the house of Orleans. In 1857 he was offered his old office by the emperor, and accepted it, explaining his acceptance in a discourse, a sen- tence of which may be employed to describe his whole political career. 'I have always," he said, " belonged to France and never to parties." He died 8th November 1865. Among Dupin's works, which are numerous, may be men- tioned Principia Juris Cwilis, 5 vols. (1806) ; Mémoires et plardoyers de 1806 au 1% Janvier 1830, in 20 vols. ; and Mémovres ou souvenirs du barreun, in 4 vols. 1855-57. | DUPIN, Louis Exxiss (1657-1719), a celebrated French ecclesiastical historian, belonged to a noble family in Normandy, and was born at Paris on the 17th June 1657. He received his early education from his father, and had scarcely reached his tenth year when he entered the college of Harcourt, where he graduated as M.A.3 in 1672. Determining to adopt the ecclesiastical profession, he became a pupil of the Sorbonne, and received the degre of B.D. in 1680, and that of D.D. in 1684. About this time he con- ceived the idea of a Bibliotheque Universelle de tous les

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Auteurs Ecclesiastiques, the first volume of which appeared in 1686. The liberty with which he there treated the doctrines of the fathers aroused

ecclesiastical prejudice, and the arch- bishop of Paris condemned the work. Dupin consented to a retractation, but it was suppressed in 1693; he was, however, allowed again to continue it on changing its title, to the extent of substituting Mouvelle for Universelle. He was subsequently exiled to Chatellerault as a Jansenist, but the sentence of banishment was repealed on a new retractation. In 1718 he entered into a correspondence with Wake, archbishop of Canterbury, with a view toa union of the English and Gallican churches ; and, being suspected of projecting a change in the dogmas of the church, his papers were seized in 1719, but nothing was found that could be properly framed into an accusation against him. The same zeal for union is said to have induced him, during the residence of Peter the Great in France, and at that monarch's request, to draw up a plan for uniting the Greek and Roman churches. He died at Paris on the 6th June 1719.

Dupin was a voluminous author. Besides his great work on ecclesiastical authors, mention may be made of Bibliotheque Uni- verselle des Historiens, 2 vols. (1707); L' Histoire del' Eglise en abrégé (1712); and L' Histoire Profane depuis le commencement du Monde jusqu' a present, 4 vols. 1712. ya:

DUPLEIX, Josepu, governor-general of the French establishments in India, was born about the close of the 17th century. The 'son of a rich farmer-general, he was carefully educated, made several voyages to America and India, and in 1720 was named a member of the superior council at Pondicherry. He displayed great business aptitude, and, in addition to his official duties, made large ventures on his own account, and acquired a fortune. In 1730 he was made superintendent of French affairs in Chandernagore, the town prospering under his energetic administration and growing into great importance. His reputation procured him in 1742 the appointment of governor-general of all French establishments in India. His ambition now was to acquire for France vast territories in India ; and for this purpose he entered into relations with the native princes, and adopted a style of Oriental gorgeous- ness in his dress and surroundings. The English ,took the alarm. But the danger to their settlements and power was partly averted by the bitter mutual jealousy which existed between Dupleix and La Bourdonnais, French governor of the Isle of Bourbon, When Madras capitulated to the French in 1746, Dupleix opposed the restoration of the

town to the English, thus violating the treaty signed by La Bourdonnais. He then sent an expedition against Fort St David (1747), which was defeated on its march by the nabob of Arcot, the ally of the English. Dupleix succeeded in gaining over the nabob, and again attempted the capture of Fort St David, but unsuccessfully. A midnight attack on Cuddalore was repulsed with great loss. In 1748 Pondicherry was besieged by the English; but in the course of the operations news arrived of the peace concluded between the French and the English at Aix-la- Chapelle. Dupleix next entered into negotiations which had for their object the subjugation of Southern India, and

he sent a large body of troops to the aid of two claimants

of the sovereignty of the Carnatic and the Deccan. The English were engaged on the side of their rivals. After temporary successes the scheme failed. The conflicts be- tween the French and the English in India continued till 1754, when Dupleix was recalled to France. He had spent immense sums out of his private fortune on account of the French company, but in opposition to their wishes, and vainly attempted to recover them from the Government. ay appears to have died in obscurity and want about

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DUPONT, Pierre (1821-1871), a French song-writer of great popularity, the son of a workman of Provins, was born at Lyons, his mother’s native city, but brought up from childhood under the care of an elderly cousin who occupied the position of priest of Roche-Taillée-sur-Saéne. From the seminary of Largentiéres, where his education was completed, he passed to the uncongenial drudgery of a lawyer’s and banker’s office ; in 1839 found his way to Paris, and got some of his poems inserted in the Gazette de France and the Quotidienne ; and two years later was saved from the conscription and enabled to publish his first volume— Les deux Anges— through the exertions of a Provins kins- man and M. Lebrun. ‘The prize founded by M. de Maillé La Tour-Landry was awarded to him in 1842, and he was employed for some time in connection with the Academy’s great dictionary. The thought of trying his fortune as a writer for the stage was

taking shape in his mind, when in 1847 the success of his peasant song J'av deux grands beefs dans mon étable opened up another prospect of fame; and from that date to hisdcath he confined himself mainly, though not exclusively, to the cultivation of his lyrical faculty. Accompanied, as they often were, by airs of his own invention, many of his songs became in the widest sense popular, and were equally welcome in the worksliop and the drawing-room. His sympathies were much less, however, with the drawing-room than the workshop; and in 1851 he paid the penalty of having become the poet laureate of tho socialistic aspirations of the time by being condemned to seven years of exile from France The sentence was cancelled, and the poet withdrew for a season from participation in politics He died at Paris in 1871. His lyrical poems may very fairly be arranged according to his own classification—rustic and, as far as the writer is concerned, objective, legendary and subjective, patriotic and contemporaneous. They have appeared in various forms— Chants et Chansons, 3 vols., with music, 1852-54 ; Chants et Poésies, 7th edition, 1862; &c. Among the best known are Lé braconnier, Le tisserand, La vache blanche, La chanson du blé, but many others might be mentioned of equal merit,—natural, bold, delicate, and piquant. Dux eclogues, 1864, Fin de la Pologne, 1847, La legende du jusf errant, 1862, written to accompany Doré's engravings, and Muse juvénile, 1859, are separate publications.

See Sainte-Beuve, Causeries dulundi, vol. iv., where an interesting description is given of the style in which the author sung his own

songs in the clubs and political meetings; Ch. Baudelaire, Notice sur P. Dupont, 1849 ; Déchaut, Biographie de Pierre Dupont, 1871.

DUPONT DE L'EURE, Jacques Cuar.es (1767-1855), a French lawyer and statesman, was born at Neubourg, in Normandy, on the 27th February 1767. In 1789 he was an advocate at the Parliament of Normandy. During the republic and the empire he filled successively judicial offices at Louviers, Rouen, and Evreux. He had adopted the principles of the Revolution, and in 1798 he commenced his political life as a member of the Council of Five Hundred. In 1818 he became a member of the Corps Legislatif. During the Hundred Days he was vice-president of the Chamber of Deputies, and when the allied armies entered Paris he distinguished himself by the firmness with

which he asserted the necessity of maintaining the principles of government that had been established at the Revolution. A resolution to that effect which he moved in the chamber was adopted, and he was chosen one of the commissioners to negotiate with the allied sovereigns. From 1817 till 1849 he was uninterruptedly a member of the Chamber of Deputies, and he acted consistently with the liberal opposi- tion, of which at more than one crisis he was the virtual leader. For a few months in 1830 he held office as minister of justice, but, finding himself out of harmony with his colleagues, he resigned before the close of the year and

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resumed his place in the opposition. At the revolution of 1848 Dupont de |'Eure was made president of the provi: sional government as being its oldest member. In the following year, having failed to secure his re-election to the chamber, he retired into private life. He died in 1855 at the age of eighty-eight. The consistent firmness with which he adhered to the cause of constitutional liberalism during the many changes of his times gained him the highest respect of his countrymen, by whom he was styled the Aristides of the French tribune.

DUPONT DE NEMOURS, Pierre Samuet (1739- 1817), a French political economist and statesman, was born at Paris on the 14th December 1739. He studied for the medical profession, but did not enter upon practice, his attention having been early directed to economic questions through his friendship with Quesnay, Turgot, and other leaders of the school known as the Economists. To this school he rendered valuable service by several pamphlets on financial questions, and numerous articles representing and advoeating its views in a popular style in the Journal de PAgriculture, du Commerce, et des Finances, and the Ephémérides du Citoyen, of which he was successively editor. In 1772 he accepted the office of secretary of the Council of Public Instruction from Stanislas Poniatowski, king of Poland. Two years later he was recalled to his native country by the advent of his friend Turgot to power. After assisting the minister in his wisely-conceived but un- availing schemes of reform during the brief period of his tenure of office, Dupont shared his dismissal and retired to Gatinais, in the neighbourhood of Nemours, where he employed himself in agricultural

improvements. During his leisure he wrote a translation of Ariosto (1781), and Mémoires sur la vie de Turgot (1782). He wasdrawn from his retirement by Vergennes, who employed him in prepar- ing, along with the English commissioner Dr James Hutton, the treaty for the recognition of the independence of the United States (1782), and a treaty of commerce with Great Britain (1786). Under Calonne he was admitted to the Conncil of State, and appointed commiissary-general of commerce. During the Revolution period he advocated reform and constitutional monarchy as against the views of the extreme republicans, and was therefore destined for vengeance when the republicans triumphed. After the 10th August 1792 he was concealed for some weeks in the obser- vatory of the Mazarin College, from which he contrived to escape to the country. During the time that elapsed before he was discovered and arrested he wrote his Philosophie de Vunivers. Imprisoned in La Force, he was one of those who had the good fortune to escape the guillo- tine till the death of Robespierre set them free. As a member of the Council of Five Hundred, Dupont carried out his policy of resistance to the Jacobins, and made him- self prominent as a mew.ber of the reactionary party. After the republican triumph on the 18th Fructidor (4th Septem- ber) 1797 his house was sacked by the mob, and he himself only escaped transportation to Cayenne through the influence of M. J. Chénier. In 1799 he found it advisable for his comfort, if not for his safety, to emigrate with his family to the United States. On his return to France in 1802 he declined to accept any office under Napoleon, and devoted himself almost exclusively to literary pursuits. The consideration accorded to him in the United States was shown by his being employed to arrange the treaty of 1803, by which Louisiana was sold to the Union, and by his being requested by Jefferson to prepare a scheme of national edu- cation, which was published in 1812 under the title Sur Péducation nationale dans les Etats - Unis @ Amérique. Though the scheme was not carried out in the United States, several of its features have been adopted in the existing French code. On the downfall of N apoleon in

1814 Dupont became secretary to the Provisional Govern. ment, and on the restoration he was made a councillor of state. The return of the emperor in 1815 determined him to quit France, and he spent the close of his life with

his two sons, who had established a powder manufactory in the state of Delaware. He died near Wilmington, Delaware, on the 6th August 1817.

Dupont's most important works, besides those mentioned above, were his De Vorigine et des progres dune science nowvelle (London and Paris, 1767) ; Physioeratie, ow constitution. naturelle du gouverne- ment le plus avantageux aw genre humain (Paris, 1768) ; and his Observations sur les effets de la liberté du commerce des grains (1760). Dupont was a member of the Institute of France, to which he con- tributed many papers. ym * DUPUIS, CHarues Francois (1742-1809), an eminent French scientific writer, was born of poor parents at Tryé- Chateau, between Gisors and Chaumont, October 26, 1742. His father, who was a teacher, instructed him in mathe- matics and land-surveying. While he was engaged in measuring a tower by the geometric method the Due de la Rochefoucanlt met him, and, being struck with his intelligence, gave hima bursary in the college of Harcourt. Dupuis made such rapid progress in his studies that, at the age of twenty-four, he was appointed professor of rhetoric at the college of Lisieux, where he had previously passed as a licentiate of theology. In his hours of leisure he applied limself to the study of the law, and in 1770 was admitted an advocate before Parliament. Two university discourses which he delivercd, one on occasion of the distribution of prizes, and the other on the death of the empress Maria Theresa, having been printed, were admired on account of their elegant Latinity, and laid the foundation of the author's fame as a writer. Ilis chief attention, however, was devoted to mathematics, the object of his early studies ; and for some years he attended the astronomical lectures of Lalande, with whom he formed an intimate friendship. In 1778 he constructed a telegraph on the principle suggested by Amontons, and employed it in keeping up a correspondence with his friend M. Fortin in the neighbouring village of Bagneux, until the Revolu- tion rendered it necessary that he should destroy his machine to avoid suspicion.

Much about the same time, Dupuis formed his ingenious theory with respect to the origin of the Greek months. In the course of his investigations upon this subject, he com- posed a long memoir on the constellations, in which he endeavoured to account for the want of any resemblance between the groups of stars in the heavens and the names by which they are known, by supposing that the zodiac was, for the people who invented it, a sort of

calendar at once astronomical and rural, and that the figures chosen for the constellations were such as would naturally suggest the agricultural operations of the season. It seemed only necessary, therefore, to discover the clime and the period in which the constellation of Capricorn must have arisen with the sun on the day of the summer solstice, and the vernal equinox must have occurred under Libra. It appeared to Dupuis that this clime was Upper Egypt, and that the perfect correspondence between the signs and their significa- tions had existed in that conntry at a period of between fifteen and sixteen thousand years before the present time ; that it had existed only there ; and that this harmony had been disturbed by the effect of the precession of the equinoxes. He therefore ascribed the invention of the signs of the zodiac to the people who then inhabited Upper Egypt or Ethiopia. This was the basis on which Dupuis established ‘his mythological system, and endeavoured to explain the subject of fabulous history, and the whole system of the theogony and theology of the ancients.

~ Persuaded of the importance of his discoveries, which, however, were by no means eritirely . original, Dupuis

published several detached parts of his system inthe Journal des Savants for the months of June, October, and December 1777, and of February 1781. These he afterwards collected and published, first in Lalande's Astronomy, and then in a separate volume in 4to, 1781, under the title of Mémoire sur (Origine des Constellations et sur VExplication de la Fable par PAstronomic. The theory propounded in this memoir was refuted by Bailly, in the fifth volume of his History of Astronomy, but, at the same time, with a just acknowledgment of the erudition and ingenuity exhibited by the author. Condorcet proposed Dupuis to Frederick the Great of Prussia a8a fit person to succeed Thiébault in the professorship of literature at Berlin; and Dupuis had accepted the invitation, when the death of the king put an end to the engagement. The chair of humanity in the college of France having at the same time become vacant by the death of Bejot, it was conferred on Dupuis ; and in 1788 he became a member of the Academy of Inscrip- tions. He now resigned his professorship at Lisieux, and was appointed by the administrators of the department of Paris one of the four commissioners of public instruction. At the commencement of the Revolutionary troubles Dupuis sought an asylum at Evreux; and, having been chosen a member of the National Convention by the department of Seine-et-Oise, he distingnished himself by the modera- tion of his speeches and public conduct. In the third year of the republic he was elected secretary to the Assembly, and in the fourth he was chosen a member of the Council of Five*Hundred. After the memorable 18th Brumaire he was elected by the departinent of Seine-et-Oise a member of the legislative body, of which he became the president. He had been proposed as a candidate for the senate when he resolved to abandon politics, devoting himself during the rest of his life to his favourite studies. Ife diced September 29, 1809.

In 1794 he published the work by which he is best known, en- titled Origine de tous les Cultes, ow la Religion Universelle (3 vols. 4to, with an atlas, or 12 vols. 12mo.) Though its cireulation was small, it beeame the subject of mueh bitter controversy, and the theory it propounded as to the origin of mythology in Upper Egypt led to the expedition organized by Napoleon for the explor- ation of that country. In 1798 Dupuis published an abridgment of his work in one volume 8vo, which met with no better success than the original. Another abridgment of the same work, cxecuted upon amuch more

methodical plan, was published by M. de Tracy. The other works of Dupuis consist of two memoirs on the Pelasgi, inserted in the Memoirs of the Institute; a memoir ‘‘ On the Zodiae of Tentyra,” published in the Revue Philosophique for May 1806 ; and a Mémotre Hxplicatif du Zodiaque Chronologique et Mythologique published the same year, in one volume 4to. M. Daeier, secretary to the third class of the Institute, delivered his Gloge; and an

— account of his life and writings was published by his widow.

DUPUYTREN, Guititavume, Baron (1777-1835), one of the most distinguished of French anatomists and surgeons, was born October 6, 1777, at Pierre Buffitre, a small town of Limonsin. He was sprung from poor parents, and was furnished with the means of receiving an ordinary education at the Collége de la Marche by some charitable persons to whom he had been introduced. At the newly established

‘cole de Médecine, under Fourcroy, he began the study of medicine with great diligence, and was appointed by com- petition prosector of the faculty when only eighteen years of age. His early studies were directed chiefly to morbid anatomy, which he did much to establish on a scientific basis, though many of his theories were unsound. In 1808 he was appointed assistant-surgeon at the Hétel-Dieu ; and he was appointed professor of operative surgery in succession to Sabbatier in 1811. In 1815 he was appointed to the chair of clinical surgery, and three years later he became head surgeon at the Hétel-Dieu. Many other offices were conferred upon him ; he became inspector of the university, a chevalier and afterwards an officer in the Legion of

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Honour, chevalier of St Michel, baron, member of the Institute, and first surgeon to the king. Dupuytren’s energy and industry were alike remarkable. He visited the Hétel-Dieu morning and evening, performing at each time several operations, lectured to vast throngs of students, gave advice to his out-door patients, and fulfilled the duties consequent upon one of the largest practices of modern times. By his indefatigable activity he amassed a fortune of £300,000, the bulk of which he bequeathed to his

daughter, with the deduction of considerable sums for the endowment of the anatomical chair in the Keole de Médecine, and the establishment of a benevolent institution for dis- tressed medical men. The most important of Dupuytren's writings is his Zveatise on Artificial Anus, in which the principles laid down by John Hunter are happily applied. In his operations he was remarkable for the skill and dexterity with which he overcame the numerous difficulties incidental to so extensive a practice as he enjoyed. He had complete control over his feelings, and great readiness of resource. Instead of attempting to introduce new methods of procedure, he commonly limited himself to modifying and adapting to his particular exigencies the established laws of surgery. He was thus led to invent several new surgical instruments. In private life Dupuytren was cold and reserved ; and this was perhaps increased by his constant struggle against a consumptive tendency, which ultimately carried him off, 8th February 1835. In November 1833 he had suffered a slight shock of apoplexy, but he continued in practice almost until the day of his death.

DUQUESNE, Apranam, Marquis (1610-1688), one of the most distinguished naval officers in the history of France, was born at Dieppe in 1610. Bom in a stirring seaport, the son of a distinguished naval officer, he naturally adopted the profession of a sailor. He spent his youth in the merchant service, and obtained his first distinction in naval warfare by the capture of the island of Lerins from the Spaniards in May 1637. About the same time his father was killed in an engagement with the Spaniards, and the news raised his hatred of the national enemy to the pitch of a personal and bitter animosity. For the next five years he sought every opportunity of inflicting defeat and humiliation on the Spanish navy, and he distinguished him- self by his bravery in the engagement at Gattari (1638), the expedition to Corufia (1639), and in battles at Tarragona (1641), Barcelona (1643), and the Cape de Gata. The French navy being left unemployed during the minority of Louis XIV., Duquesne obtained leave to offer his services to the king of Sweden, who gave him a commission as vice- admiral in 1643. In this capacity he defeated the Danish fleet near Gottenburg and thus raised the siege of the city. The Danes returned to the struggle with increased forces under the command of King Christiern in person, but they were again defeated,—their admiral being killed and lis ship taken. Peace having been concluded between Sweden and Denmark in 1645, Duquesne returned to

France. The revolt at Bordeaux, supported as it was by material aid from Spain, gave him the opportunity of at once serving his country and gratifying his long cherished hatred of the Spaniards. In 1650 he fitted out at his own expense a squadron with which he blockaded the mouth of. the Gironde, and compelled the city to surrender. For this service he was promoted in rank, and received a gift of the castle and isle of Indre, near Nantes. Peace with Spain was concluded in 1659, and for some years afterwards Duquesne was occupied in endeavours to suppress piracy in the Mediterranean. On the revolt of Messina from Holland, he was sent to support the insurgents, and had to encounter the united fleets of Spain and Holland under the command of the celebrated Admiral De Ruyter.

After several battles, in which the advantage was generally on the side of the French, a decisive engagement took place near Catania, on the 20th April 1676, when the Dutch fleet was totally routed and De Ruyter mortally wounded. The greater part of the defeated fleet was afterwards burned in the harbour of Palermo, where it had taken refuge, and the French thus secured the undisputed com- mand of the Mediterranean. For this important service Duquesne received a letter of thanks from Louis XIV., together with the title of marquis and the estate of Bouchet. Owing to his being a Protestant, however, his professional rank was notadvanced. His last achievements were the bombardment of Algiers (1682-3), in order to effect the deliverance of the Christian captives, and the bombardment of Genoa in 1684. On the revocation of the Edict of Nantes Duquesne lost his commission, but he was specially excepted from banishment. He died at Paris on the 2d February 1688.

DURAN, Avaustin (1789-1862), one of the leaders of the literary movement in Spain during the present century, was born at Madrid, where his father held the post of court physician. He lost his mother in childhood, and, instead of being educated in the capital, was sent to the seminary at Vergara, rather to gain strength and health than such mathematics and Latin as his clerical teachers could supply. Thence he returned a firm believer in ghosts, and erudite in the traditions of Spanish romance. In 1817 he joined the university of Seville for the study of philosophy and law, and in due

course was admitted an advocate at Valladolid. From 1821 to 1823 he held a post in the direccion general de estudios at Madrid; but in the latter year he was discarded on account of his political opinions, and it was not till 1834 that he received a new appointment as secre- tary of the board for the censorship of the press, shortly afterwards supplemented by a post in the National Library at Madrid. ‘The revolution of 1840 again led to his dis- missal; but he recovered his position in 1843, and in 1854 attained the rank of director of the library. Next year, however, he retired, and the rest of his life was devoted to his literary work. He died in 1862. shortly after his first discharge from office, that he published his discourse on the influence which modern criticism had exercised on the ancient Spanish theatre (Dzscorso sobre a influjo que ha tenido la critica moderna en la decadencia det teatro antiguo) ; and, though the work was anonymous, it produced a marvellous effect on the tendencies of thenational drama. He next endeavoured to make better known 40 his fellow-countrymen those half-forgotten treasures of their literature, in the collection of which he had spared neither money nor toil. Five volumes of a Jtomancero general appeared from 1828 to 1832 (republished, with considerable additions and improvements, in 2 vols. 1849-1851), and Talia espagola, or a collection of old Spanish comedies, in 3 vols., in 1834. As an original poet the author is best known by a poem in imitation of the style of the 15th century, entitled Las tres toronjas del vergel de amor, or “The Three Citron Trees of the Orchard of Love.”

DURANDUS, Wituetmus (1237-1296), otherwise Durantis or DuRANTI, was born at Puimisson, sometimes written Puimoisson, a small town in the diocese of Beziers, in Languedoc, whence he is sometimes described as a native of Provence. He studied law under Bernardus of Parma, in the university of Bologna, where he was promoted to the degree of doctor. He shortly afterwards migrated to the university of Modena, where he became so famous by his lectures on the canon law that he attracted the notice of Pope Clement IV., who appointed him auditor of the palace, and subsequently-subdeacon and chaplain. In 1274 he ac- companied Pope Gregory X. as his secretary to the Council of Lyons, which is reckoned as the fourteenth general council,

It was in 1828,.

and under the pontificates of several subsequent popes filled many highly responsible offices. He was appointed in 1277 spiritual and temporal legate of the patrimony of St Peter under Pope Nicholas III., and in 1278 took possession, in the name of the same Pope, of the provinces of Bologna and Romagna. In 1281 Pope Martin IV. named him vicar spiritual, and in 1283 governor of the temporalities of the two provinces, in which office he had the direction of the war against the rebellious province of Romagna. The town of Castrum Riparum Urbanatium having been burnt down during the war, he rebuilt it, and renamed it Castrum Durantis. Pope Urban VIII. subsequently gave to this town the name of Urbania, which it bears in the present day. Pope Honorius IV. retained Durandus in the same offices until the end of 1286, when his election to the bishopric of Meude, in Languedoc, was the occasion of his retiring for a short time from the conduct of civil affairs, Durandus, however,‘appears to have remained in Italy, and to have revised at this time several of his works. He refused in 1295 the archbishopric of Ravenna, which was offered to him by Pope Boniface VIIL, and accepted in pre- ference the more arduous office of governor of the province of Romagna and of the march of Ancona. ‘The party of the Ghibellines, however, carried on hostilities against the Holy See with somuch vigour that he found his strength unequal to the exigencies of government ; and, having resigned his office, he retired to Rome, where he died on 1st November

1296.

Durandus was the author of several very learned works. The most famous of them is his Speculum Judiciale. This work is entitled in the printed copies, the earliest of which was published at Rome in folio in 1474, as Speculum Juris ; but all the MSS. have the title of Speculum Judiciale ; and Durandus himself, in his epistle dedicatory to Cardinal Ottobonus Fiesco, afterwards Pope Adrian V., describes it under this lattcr title. It is a practical treatise on civil and canon law, and it earned for its author, when young, the surname of the Father of Practice. Durandus is said to have completed it in 1271, at the age of thirty-four, and he revised it some time between 1287 and 1291. It has since his death ac- quired much celebrity as one of the best

sources of the dogmatic history of law, and the canonists are accustomed to cite Durandus under the bye-name of ‘‘the Speculator.”_Thceoriginal work has been enriched by additions from the pen of John Andree in 1346, and by further additions from the pen of Baldus. An alphabetic table of its contents (Inventorium) was drawn up by Cardinal Beranger in 1306, and the Speculum passed through thirty-eight editions between 1474 and 1678. The next important work of Durandus is his Repertoriwm Aurewm or Breviariwm, which is dedicated to Cardinal Mattheus; Durandus himself in his preface designates this work by the name of Breviarium, but it is described by him in the Preface to the Speculum by the title of Repertorium Aurewm, under which title it is more generally known. It is supposed to have been composed by Durandus in the interval between the first completion and the revision of the Speculum. His Commentarius in Concilium Lugdunense is a work of much interest, as Durandus himself drew up the Decretals, which after his death were inserted in the Sextus. Durandus also wrote a commentary on the decretals of Pope Nicholas III., which is only known to us from the epitaph on his tomb, as preserved by Sarti, and which enumerates all his chief writings, amongst which may bementioncd his Speculwm Legatorum, inserted in the Speculum Judiciale, his Rationale Divinorum Officiorum, which has passed through many cditions, the earliest of which was printed at Mayence in 1459, and a copy of which is stated by the Abbé Pascal to have been sold for 2700 francs. A manu- script of his Pontificale Patrwm, being a treatise on the duties of bishops, is preserved in the National Library of Paris. Durandus the Speculator is sometimes confounded with Durandus of Santo Porciano, bishop of Meaux, who died in 1832, and was the author of two treatises, De Jurisdictiont and De Legebus, andjwith Wilhelmus Durandus, his own nephew, who was the author of a work entitled De modo celebrandi Consilii, and who died in Cyprus in 1328.

DURANGO, a town of Spain, in the province of Biscay 16 miles south-east of Bilbao, at the confluence of the Durango and the Mafiaria. As a military position of some importance it is often mentioned in history ; its church of San Pedro de Tavira is one of the earliest in the Biscayan district ; and that of Santa Ana has some interesting altars constructed by Ventura Rodriguez in 1774, The inhabit-

ants, who number about 2600, are partly engaged in the manufacture of iron and steel, and carry on a trade with Hamburg in chestnuts. The foundation of the town is ascribed to the early kings of Navarre, and in 1153 it obtained the rank of a countship. The decree by which Don Carlos in 1839 ordered all foreigners taken in arms against him to be shot was issued from Durango. DURANGO, sometimes called CruDaD DE VICTORIA, or GuapIANa, a city of Mexico, the capital of the state of Durango, lies near the foot of the south-eastern slope of the Sierra Madre, at a height of 6847 feet above the sea, in 94° 25’ N. lat. and 105° 55’ W. long. It is the centre ofa Noman Catholic bishopric, and possesses a cathedral, ten parish churches, a hospital, Government-buildings, a peni- tentiary, a state prison, a bull-ring, and a large cock-pit. Formerly the seat of a Jesuit college, it still maintains an episcopal seminary, and an institute with literary, legal, and scientific departments. It is well supplied with water by thermal and other springs, which not onlysatisfy the demands of nine public baths, but also fill considerable channels along the streets. Trade is carried on with the northern and north- western states; and, besides a mint, a gold refinery, and other offices connected with the mining operations, there are glass works, printing-presses, and factories for cotton and woollen goods, leather, and tobacco. Durango was founded in 1559 or 1560 by Alonso Pacheco, an officer of the Viceroy Velasco, as a military post for the control of the Chichimecas. It was soon after made an episcopal see, but did not attain any great importance till the discovery of the rich deposits of Guarisamey ; and most of its public buildings were erected at the expense of Zambrano, the owner of the mines. In 1783 it had no more than 8000 inhabitants ; about 1850 they were estimated at 30,000 or 40,000 ; in 1868 they were reduced to 12,449. DURANTE, Francesco, a celebrated Italian composer, and one of the founders of the so-called Neapolitan school of music, was born at Frattamaggiore, in the kingdom of Naples, and not, as has been erroneously stated, in the city of that name. The date of his birth is generally given nine years too late. In reality he was born on March 15, 1684. At an early age he entered the Conservatorio dei poveri di Gest Cristo, at Naples, where he received lessons from Gaetano Greco ; but soon he attracted the attention of the celebrated Alessandro Scarlatti, at that time the head and ornament of another great music school of Naples, the Conservatory of St Onofrio.

Under him Durante studied for a considerable time, and left him only to go to Rome, where, during further five years, he completed his vocal studies under Pitoni. On his return to Naples he obtained the position of chapel-master at the school of St Onofrio, which he occupied till 1742, when he succeeded Porpora as head of the Conservatorio Sante Maria di Loretto, also at Naples. This post he held for thirteen years, till his death in 1755. His fame as a teacher was all but unrivalled, and the most celebrated masters of the earlier school of Italian opera are amongst his pupils. Only Jomelli, Paesiello, Pergolesi, Piccini, and Vinci may be mentioned here. Under him the Neapolitan school of music reached its climax of celebrity, and it was in this school that the great traditions of Italian vocal art were established, the last remnants of which are rapidly dis- appearing from the modern stage. As a composer Durante adhered to the severe style of the early Italian masters. The structure of his choral pieces is surpassed by Handel alone amongst his contemporaries. His instrumentation also shows many new and beautiful effects. A complete collection of Durante's works, consisting all but exclusively of sacred compositions, was presented by Selvaggi, a Neapolitan lover of art, to the Paris library. A catalogue of it may be found in Fétis's Biographie Universelle. The

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imperial library of Vienna also preserves a valuable collec- tion of Durante's manuscripts. Two requiems, several masses (one of which, a most original work, is the Pastoral Mass for four voices), and the Lamentations of the Prophet Jeremiah are amongst his most important settings.

DURAO, Josr pE Santa Rrra, a Brazilian poet, was born at Marianna, in the province of Minas Geraes, in 1737, and died at Lisbon in 1784. He studied at Coimbra, in Portugal, graduated as a doctor of divinity, became a member of the Augustinian order of friars, and obtained a great reputation as a preacher. Having irritated the minister Pombal by his defence of the Jesuits, he retired from Portugal; and, after being imprisoned in Spain as a spy, found his way to Italy, where he became acquainted with Alfieri, Pindemonte, Casti, and other literary men of the time. On his return to Portugal he delivered the open- ing address at the university of Coimbra for the year 1778 ; but soon after retired to the cloisters of a Gratian convent.

At the time of his death he taught in the little college belonging to that order in Lisbon. His principal poem, entitled Caramuru, poema epico do descubrimento da Balua, appeared at Lisbon in 1781, but proved at first a total failure. Its value has gradually been recognized, and it now ranks as one of the best poems in Brazilian literature— remarkable especially for its fine descriptions of scenery and native life in South America. The historic institute of Rio de Janeiro offered a prize to the author of the best essay on the legend of Caramuru ; and the successful competitor published a new edition of Duri&o's poem, There are two French translations, one of which appeared in 1829 in 3 vols. 8vo.

See Adolfo de Varnhagen, Epicos Brazilieros, 1845; Pereira da Silva, Os Varées illustres do Brasil, 1858 ; Wolf, Le Brésil littéraire, Berlin, 1863.

DURAZZO, the ancient Dyrrachium, or Epidamnus, in Turkish Dratsh, and in Slavonian Durtz, a seaport town of European Turkey, in Albania, about fifty miles south of Scutari, on the eastern shore of the Adriatic. It is the seat of a Roman Catholic bishop and a Greek arch- bishop, but in every respect has greatly declined from its former prosperity. The walls are dilapidated; plantain trees are growing on the gigantic ruins of its old Byzantine citadel ; and its harbour, once equally commodious and safe, is gradually becoming silted up. The only features worthy of notice are the quay, with its rows of cannon, and the bridge, 750 feet long, which leads across the marshy stretch along the coast. Such trade as it still possesses 1s mainly carried on with Trieste, and consists in the export of grain, skins, wool, wood, and leeches. The population is esti- mated at 9000.

DURBAN, or more correctly D'UrBay, a town of South Africa, in Natal, in the county of Durban, situated on a sandflat about a mile to the north of the bay of Port Natal, in 29° 52'S. lat. and 31° 2' E. long. It is well laid out with wide tree-shaded streets, carries on a considerable export and import trade, and possesses an Episcopalian

church, two Wesleyan chapels (one for natives and the

other for Europeans), a Government school, a prison, a custom-house, a literary institution, and an agricultural and horticultural society. Durban was founded in 1834 as the capital of the republican colony of Victoria, and its

name was bestowed in honour of Sir Benjamin D'Urban, the governor of the Cape. The population, mostly Eng- lish, was in 1866, 4991.

DUREN, a town of Prussia, at the head of a circle in the province of the Rhine, on the right bank of the Roer, at a railway junction eighteen miles east of Aix-la-Chapelle. Besides two Roman Catholic and two Protestant churches, it possesses three nunneries, a gymnasium, a mining school, and a blind asylum—the Elizabeth Institution—which was

founded in 1845.and in 1863 was made a_ provincial establishment. Woollen goods, paper, and needles are manufactured on an extensive scale ; and flax-spinning, felt- weaving, wire-weaving, rail-casting, and zinc-rolling are also carried on.

Diiren is probably to be identified with the Marcodurum of the Ubii, where they were defeated by Civilisin 69 a.p. It received from Charlemagne the rank of an imperial city, and its claims were confirmed by Rupert in 1407. Pawned by Frederick II. to Count William of Juliers as sccurity for the payment of a debt, it was ultimately incorporated with the duchy of Juliers. Its name fre- quently occurs in the history of the Palatinate. Population in

1875, 14,542,

DURER, Aprecat (147 1-1528), was born at Nurem- berg on the 21st of May 1471; he was therefore six years older than Titian and twelve years older than Raphael. In the history of art, Albert Diirer has a name equal to that of the greatest of the Italians. North of the Alps, his only peer was Holbein. But Holbein was not born till 1497, and lived after 1525 principally in England ; hence in youth he came within the influence of the already matured arts of Italy, and in manhood his best powers were concen- trated on the painting of portraits in a foreign country. Diirer lived a German among Germans, and is the true re- presentative artist of that nation. All the qualities of his art—its combination of the wild and rugged with the homely and tender, its meditative depth, its enigmatic gloom, its

sincerity and energy, its iron diligence and discipline—all these are qualities of the German spirit. And the hour at which Diirer arose to interpret that spirit in art was the most pregnant and critical in the whole history of his race, It was the hour of the Renaissance, of the transition between the Middle Ages andour own. The awakening of Germany at the Renaissance was not, like the other awaken- ing of Italy at the same time, a movement merely intellec- tual. It was, indeed, from Italy that the races of the North caught the impulse of intellectual freedom, the spirit of science and curiosity, the longing retrospect towards the classic past ; but joined with these, in Germany, was a moral impulse which was her own, a craving after truth and right, a rebellion against tyranny and corruption, an assertion of spiritual independence—the Renaissance was big in the North, as it was not in the South, with a Reformation to come. The art of printing was invented at the right time to help and hasten the new movement of men's minds. Nor was it by the diffusion of written ideas only that the new art supplied the means of popular enlightenment. Along with word-printing, or indeed in advance of it, there had come into use another kind of printing, picture-printing, or what 18 commonly called engraving. Just as books, or word-printing, were the means of multiplying, cheapening, and disseminating ideas, so engravings, or picture-printing, were the means of multiplying, cheapening, and disseminat- Ing images which gave vividness to the ideas, or served, for those iguorant of letters, in their stead. Technically, the

art of engraving was a development of the art of the gold- emith or metal-chaser,

and the art of the painter there had always been a close.

alliance, both

same family, and sometimes by one and the same person ; so that there was no lack of hands ready trained, so to

speak, for the new art which wasa combination of the other two, and

he should

Independently written or printed books, separate

ngravi agravings, or sets of engravings, were produced, and found

a ready sale at all the markets, fairs, and church-festivals of the land. Subjects of popular devotion predominated, Figures of the Virgin and child, of the apostles, the evangelists, the fathers of the church, the saints and martyrs, with illustration of sacred history and the Apocalypse, were supplied in endless repetition to satisfy the cravings of a pious and simple-minded people. But to these were quickly added subjects of allegory, subjects of classical learning— confused mythologies of Hercules, Satyr, and Triton—gub- jects of witchcraft and superstition, subjects of daily life, scenes of the parlour and the cloister, of the shop, the field, the market, and the camp; and lastly portraits of famous men, with scenes of court life and princely pageant and ceremony. The emperor Maximilian himself, chivalrous, adventurous, ostentatious, on fire with a hundred ambitions, andabove all withthe desire of popular fame, gave continual employment to the craftsmen of Augsburg and Nuremberg in designing and engraving processional and_ historical representations, which were destined to commemorate him to all time in his double character of imperial lawgiver and hero of romance. So the new art became the mirror, for all men to read, of all the life and thoughts of the age,

The genius of Albert Diirer cannot be rightly estimated without taking into account the position which the art of engraving thus held in the culture of his time. He was, indeed, first of all a painter ; and though in his methods he was too scrupulous and laborious to produce many great works, and though one of his greatest, the Assumption of the Virgin, has been destroyed by fire, and another, the Feast of Rose-Garlands, has suffered irreparably between injury and repair, yet the paintings which remain by his hand are sufficient to place him among the great masters of the world. He has every gift in art except the Greek and the Italian gift of beauty or ideal grace. In religious painting, he has profound earnestness and humanity, and an inexhaustible dramatic invention; and the acces- sory landscape and scenery of his compositions are more richly conceived and better studied than by any painter before him. In portrait, he is equally master of the soul and body, rendering every detail of the human super- ficies with a microscopic

fidelity, which nevertheless does not encumber or overlay the essential and inner character of the person represented. Still more if we judge him by his drawings and studies, of which a vast number are pre- served in private as well as public collections, shall we realize his power in grasping and delineating natural fact and character, the combined gravity and minute- ness of his style, the penetration of his eye, and the almost superhuman patience and accuracy of his line in draw- ing, whether from persons, animals, plants, or landscape, whether with pen, pencil, charcoal, or (which was his favourite method) in colour with the point of the brush. But neither his paintings nor his drawings could by them- selves have won for him the immense popular fame and authority which have been his from his own time to ours; that fame and that authority are due to his pre-eminence in the most popular and democratic of the arts, that of which the works are accessible to the largest number, the art of engraving. In an age which drew a large part of its intellectual nourishment from engravings, Diirer furnished the most masterly examples both of the refined and elabo- rate art of the metal engraver, as well as the most striking

| inventions for the robust and simple art of the wood

engraver.

The town of Nuremberg in Franconia, in the age of Diirer, was a home most favourable to the growth and exercise of his powers. Of the free imperial cities of central Germany, none had a greater historic fame, none a more settled and patriotic government, none was more the

favourite of the emperors, none was the seat of a more active

and flourishing commerce. Nuremberg was the great mart for the merchandise that came to central Europe from the East through Venice and over the passes of the Tyrol. She held not only a close commercial intercourse, but also a close intellectual intercourse, with Italy. Without being so forward as the neighbour city of Augsburg to embrace the architectural fashions of the Italian Renaissance,—nay, continuing to be profoundly imbued with the old German burgher spirit, and to wear, with an

evidence which is almost unimpaired to this day, the old German civic aspect,—she had imported, before the close of the 15th century, much of the new learning of Italy, and numbered among her citizens a Willibald Pirkheimer, a Scbald Schreyer, a Hartmann Schedel, and others fit to hold a place in the first rank of European humanists. The life into which Albert Diirer was born was a grave, a devout, a law-loving, and a lettered life, in the midst of a community devoted to honourable commerce and honourable civic activities, proud of its past, proud of its wealth, proud of its liberties, proud of its arts and ingenuities, and abound- ing in aspects of a quaint and picturesque dignity. His family was not of Nuremberg descent, but came from the village of Eytas in Hungary. The name, however, is German, and the family bearing—an open door—points to an original form of Z'Aiirer, meaning a maker of doors, or carpenter. Albrecht Diirer the elder was a goldsmith by trade, and settled soon after the middle of the 15th century in Nuremberg, He served as assistant under a master goldsmith of the city, Hieronymus Holper, and presently married his master's daughter, Barbara. This was in 1468, the bridegroom being forty and the bride fifteen years of age. They had eighteen children, of whom Albert was the second. The elder Diirer was an esteemed craftsman and citizen, sometimes, it seems, straitened by the claims of his immense family, but living in virtue and honour to the end of his days. The accounts we have of him proceed from his illustrious son, who always speaks with the tenderest reverence and affection of both his parents, and has left a touching narrative of the deathbed of each. He painted the portrait of his father twice, once about 1490, the second time in 1497. The former of these two pieces js in the Uffizj at Florence; tho latter, well known by Hollar's engraving, is in the possession of the duke of Northumberland. A third "Portrait of his Father " by Diirer, in the gallery at Frankfort, is probably so called In error. The young Albert was his father's favourite son. " My father," these are his own words, " toak special delight in me. Seeing that I was industrious in working and learning, he put me to school; and when I had learned to read and write, he took me home from school and taught me the goldsmith's trade." By-and-by the boy found himself drawn by preference from goldsmith's work to painting; and after some hesitation, his father at first opposing his wishes on the ground of the time already spent in learning the former tradc, he was at the age of fifteen and a half apprenticed for three

years to the principal painter of the town, Michael Wohlgemuth. Wohlgemuth furnishes a complete type of the German painter of that age.

for a small price, devotional pieces commissioned by mercantile corporations or private persons to decorate their chapels in the churches,—the preference being usually for scenes of our Lord's Passion, or for tortures and martyrdoms of the saints. In work of this class, the painters of upper Germany before the Renaissance show considerable technical knowledge, and a love of rich and quaint costumes and of landscape, but in the human part of their representa- tions often a grim and debased exaggeration, transgressing all bounds in the grotesqueness of undesigned caricature.

At the head of a large shop with |

numerous assistants, his business was to turn out, generally | Venice or otherwise, Diirer must certainly have come

Wohlgemuth and his assistants also produced woodcuts for book illustration, and probably—though this is a vexed question—engravings on copper. In this school Diirer learnt much, by his own account, but suffered also not a little from the roughness of his companions. At the end of his term under Wohlgemuth, he entered upon the usual course of travels—the NWanderjahre—of a German youth. The direction of these travels we cannot retrace with cer- tainty. It had been at one time his father's intention to apprentice him to Martin Schongauer, of Colmar in Alsace, incomparably the most refined German painter and engraver of his time. To Colmar, among other places, Albert Diirer went in the course of his travels; but Schongauer had already died there in 1488. We also hear of him at Strassburg. It is amoot point among biographers whether towards the end of his Wanderjahre—about the year 1494—the young Diirer did or did not cross the Alps to Venice. On the one hand it is argued that he did; first, because, on the occasion of an undoubted visit to Venice in 1506, he speaks of admiring no longer that which he had vastly admired 'eleven years before ;" secondly, because several careful drawings by his hand from the engravings of Mantegna and other Italian masters, bearing the date 1494, show that in this year he was making a special study of Italian art; and

thirdly, because he has left a number of coloured drawings of the scenery of Tyrol, such as he would have to traverse on the road between Bavaria and Venice, and these show a technical finish and minute- ness of execution, characteristic of his studies at this early period but not later. Those who do not believe in this early visit to Venice reply, first, that the allusion interpreted as above in Diirer's correspondence is too vague and un- certain, and that what Diirer, in 1506, had really 'admired eleven years ago" was probably not the work of Venetians seen at Venice, but of a Venetian artist known as Jacopo de' Barbari, or Jacob Walch, who resided about that time in Nuremberg, and who, we know, had a very considerable influence on the art of Diirer ; secondly, that the prints of Mantegna and other Italians, undoubtedly copied by Diirer in 1494, may very well have been brought to Germany with other wares on sale from Venice, or have been shown him by the same Jacopo de' Barbari; and thirdly, that other landscapes, bearing the date of 1506 or later dates, do in fact show the same technical characteristics as those which are assigned, by the other side in the argument, to 1494. The ques- tion will probably remain open to the end. With re- ference, however, to the third head of the argument, the character of Diirer's early landscape work, it has not been sufficiently observed that his ideal of scenery shows itself fully formed and developed by the time of the publication of his Apocalypse woodcuts and his earliest engravings on copper, that is, about the year 1497; that this ideal back- ground, of alake with castled and wooded headlands sloping down from either side, and sloops afloat in the distance, 1s taken not from the neighbourhood of Nuremberg but from the northern borders of Tyrol—it is the scenery, not of the

| banks of the Pegnitz nor even the Danube, but rather of

the Wiirmsee or the Tegernsee; that to the alps and lakes, therefore, of the Northern Tyrol, whether on his way to

during these travels of his youth.

At the end of May 1494, being twenty-three years old, Albert Diirer returned, at his father's summons, to his native Nuremberg, and within two months was married to Agnes, the daughter of a well-to-do merchant of the town named Hans Frey. It is probable that the marriage had been arranged

between Hans Frey and the elder Diirer while Albert was on his travels ; and possible that a portrait of the young painter very richly habited, executed by himself

in the previous year 1493, and showing him in the first bloom of that admirable manly beauty for which he was afterwards renowned, may have been destined to recommend him to the good graces of the lady. Their marriage was childless. Agnessurvived her husband. The petulance of an old friend of her husband's has unjustly blackened her reputation. Her name has for centuries been used to point a moral, and among the unworthy mates of great men the wife of Diirer was as notorious as the wife of Socrates. The origin of this tradition must be sought in a letter written a few years after Diirer's death by his close friend and life- long companion, Willibald Pirkheimer, in which Pirkheimer accuses Agnes of having plagued her husband to death with her parsimonious ways, of having made him over-work him- self for money's sake, of having given his latter days no peace. But a closer study of facts and documents shows that there is not a jot of evidence to support these splenetic charges, Pirkheimer, when he made them, was old, broken with gout, and disgusted with the world, and the immediate occasion of his outbreak was a fit of peevishness against the widow because she had not let him havea pair of antlers— a household ornament much prized in those days—to which he fancied himself entitled out of the property left by Diirer. On the other hand, there is abundant evidence of the close confidence and companionship that subsisted between Diirer and his wife ; she accompanied him on his journey to the Low Countries in 1521; after his death she behaved with peculiar generosity to his brothers ; it is perfectly probable that Diirer had in her a kind and beloved as well as a care- ful partner; the old legend of his sufferings at her hands must be regarded as completely discredited. So far from being forced to toil for money to the end, he died well off, though he had in his latter years occupied himself more and more with unremunerative pursuits—with the theoretical studies of Perspective, Geometry, Fortification, Proportion, for which he shared the passion of Leonardo, and on which, like Leonardo, he has left written treatises.

For more than eleven years after his marriage, Dtirer lived at Nuremberg the settled and industrious life of his profession. Within this period his masterly powers unfolded and matured themselves. Two important devotional pictures are attributed to his early practice; one a large triptych painted in tempera on linen, now in the gallery at Dresden, the other also an altar-piece with wings, now in the summer palace of the archbishop of Vienna at Ober St Veit ; both probably painted for the Elector Frederick of Saxony. These pictures have been executed, like those of Wohl- gemuth, hastily, and with the help of pupils. (Of painters trained in the school of Diirer, we know the names and characters of Schaiifelein, Springinklee, Hans Baldung Griin, and Hans of Creda A finer, and somewhat later, example of the master's work in this class is the altar-piece painted for the. family of Baumgartner, having a Birth of Christ in the centre and the figure of a knight on either side; thisisnowat Munich. The best of Diirer's energies, both of mind and hand, must have been given in these days to the preparation of his sixteen great woodcut designs for the Apocalypse. The first edition illustrated with this series appeared in 1498. The Northern mind had long dwelt with eagerness on these mysteries of things to come, and among the earliest block-books printed in Germany is an edition of the Apocalypse with rude figures. But Diirer not only transcends all efforts made before him in the representation of these strange promises, terrors, and transformations, these thaumaturgic visions of doom and redemption ; the passionate energy and undismayed simplicity of his imagination enable him, in this order of creations, to touch the highest point of human achieve- ment. The four angels keeping back the winds that they blow not; the four riders > the loosing of the

angels of the Euphrates to slay the third part of men; these and others are conceptions of such force, such grave or tempestuous grandeur in the midst of grotesque- ness, aS the art of no other age or hand has _pro- duced. At the same time, Diirer was practising himself diligently in the laborious art of copper engraving. In the years immediately about or preceding 1500, he produced a number of plates of which the subjects are generally fanciful and allegorical, and the execution is more or less tentative and uncertain. Of several of these, other versions exist by contemporary masters, and it is

disputed in most of such cases whether Diirer's version is the original, or whether, being at that time young and comparatively unknown, he did not rather begin by copying the work of older men; in which case, the originals of such engravings would have to be sought in versions bearing other signatures than Diirer's, One signature of frequent occurrence on German engravings of this time, and among them, on several subjects which are also repeated by Diirer's hand, is the letter W. As to the identity of this W, criticism is much divided. He has been generally identified with one Wenzel of Olmiitz, whom we know to have engraved copies after Martin Schongauer and other masters. Others, again, attribute some at least of the prints signed W to Diirer's teacher Wohlgemuth, and when the same composition is found engraved by each of the two masters, conclude that the younger has copied the work of the elder, Instances are the subjects of the Four Naked Women with Death and the Fiend; the Old Man's Dream of Love ; the Virgin and Child with the Ape, &c. The question is difficult to decide. It seems certain that the work of several different hands is signed with this same initial W; and we are of those who hold that, of the engravers so signing, one, whether Wohlgemuth or not, is avery accomplished master, whose work Diirer, until near the age of thirty, was in the habit of occasionally copying. From another master, again, whose name we have already mentioned, the half Venetian half German Jacopo de' Barbari, Diirer learned much. The Italians had already begun to work out a science of the human structure and of ideal proportions ; and from Jacopo de' Barbari, as Diirer himself tells us, he received in youth the first hints of this science; which he subsequently investigated for himself with his usual persistent industry. These early notions received from Jacopo de' Barbari led to one immediate result of value, the famous engraving of Adam and Eve published in 1504. The figures here, as we can see by many pre- paratory sketches, are planned on geometrical principles, not drawn—as was the common German custom, and Diirer's own in a large majority of his works—direct from the model, with all the crudities of the original faithfully delineated. The background of foliage and animals is a miracle of rich invention and faithful and brilliant execu- tion; the full powers of Diirer as an engraver on copper are here for the first time asserted. In another elaborate engrav- ing which probably soon followed this—the Great Fortune or Nemesis-—the opposite principle is observed; above a mountain valley, of which every detail is rendered in bird's eye view with

amazing completeness, an allegorical figure of a woman rides upright upon the clouds, bearing a cup in one hand and a bridle in the other; in her countenance and proportions there is nothing ideal, there is the most literal and graceless commonness. In his own journals Diirer calls this plate emesis ; it has been conjectured that the piece was composed in allusion to the unfortunate expedition sent by the emperor Maximilian to Switzer- land, in which a number of Nuremberg citizens took part, with Pirkheimer at their head. In the meantime Diirer had been variously exercising his inexhaustible power of dramatic invention on the subjects of Christian story. He had completed the set of drawings of the Passion

of Christ, in white on a green ground, which is known as the Green Passion, and forms one of the treasures of the Albertina at Vienna. He had followed up his great woodcut series of the Apocalypse with preparations for other series on a similar scale, and had finished seven out of twelve subjects for the set known as the Great Passion, and sixteen out of twenty for the Life of the Virgin, when his work was interrupted by a journey which is one of the principal episodes in his life. In the autumn of the year 1505 he went to Venice, and stayed there until the autumn of the following year.

The occasion of this journey has been erroneously stated by Vasari. Diirer’s engravings, having by this time attained a great popularity both north and south of the Alps, had begun to be copied by various hands, and among others by the celcbrated Marcantonio of Bologna, then in his youth. According to Vasari, Marcantonio, in copying Diirer’s series of the Little Passion on Wood, had imitated the original monogram, and Diirer, indignant at this fraud, set out for Italy in order to protect his rights, and having lodged a complaint against Marcantonio before the signory of Venice, carried his point so far that Mare- autonio was forbidden in future to add the monogram of Diirer to copies taken after his works, This account will not bear examination. Chronological and other proofs show that if such a suit was fought at all, it must have been in connection with another set of Diirer’s woodcuts, the first sixteen of the Great Passion on Wood, Direr himself, a number of whose familiar letters written from Venice to his friend Pirkheimer at Nuremberg are preserved, makes no mention of

anything of the kind. Nevertheless something of the kind may probably have been among the causes which determined his journey. Other causes, of which we have explicit record, were ay outbreak of sickness at Nuremberg; Ditrer's desire, which in fact was realized, of finding a good market for the praceeds of his art; and the prospect, also realized, of a commission for an important picture from the German community settled at Venice, who had lately caused an exchange and warehouse—the Yondaco de Tedeschi—to be built on the Grand Canal, and who were now desirous to dedicate a picture in the church of St Bartholomew. The picture painted by Diirer on this com- mission was the Adoration of the Virgin, better known as the Feast of Rose-Garlands ; it was subsequently acquired by the emperor Rudolf IL., and carried as a thing beyond price upon men's shoulders to Vienna; it now exists in a greatly injured state in the monastery of Strachow, near Prague. It is one of Diirer's best conceived and most multitudinous compositions, and ong in which he ainis at rivalling the richness and playfulness of Italian art. Other pictures probably painted by him at Venice are Christ disputing with the Doctors, now in the Palazzo Barberini at Rome, Christ Crucified, in the gallery at Dresden, and a Madonna and Child in the possession of Lord Lothian. These works of the German master were not without influence upon the Italian painters resident at Venice, an influence which we can distinctly trace in some of the early works of Titian, Diirer's letters testify to the high position he held at Venice, and speak of the jealousy shown towards him by some of the meauer sort of artists, the friendship and courtesy by the nobler sort, and especially by the noblest of all, the veteran Giovanni Bellini. He talks of the honour and wealth in which he might live if he would consent to abandon home for Italy, of the Northern winter, and how it will make him shiver. Yet he resisted the seductions of the South, and was in Nuremberg again before the close of 1506. First, it seems, he had made an excursion to Bologna, having intended to take Mantua on the way, in order to do homage to the old age of that Italian master, Andrea Mantegna, from whom he had hiin-

not

self in youth learnt the most. But the death of Mantegna prevented this purpose.

From the winter of 1506 until the summer of 1520, Diirer was again a settled resident in his native town. During

these years his genius and his fortunes were at their height.

Except the dazzling existence of Raphael at Rome, the annals of art present the spectacle of no more honourable or more enviable career. Diirer's fame had spread all over Europe. From Antwerp to Rome his greatness was acknow- ledged, and artists of less invention, among them some of the foremost on both sides of the Alps, were not ashamed to borrow from his work this or that striking combination or expressive type. He was on terms of friendship or friendly communication with all the first masters of the age, and Raphael held himself honoured in exchanging drawings with Diirer, In his own country, all orders of men, from the emperor Maximilian down, delighted to honour him; he was the familiar companion of chosen spirits among statesmen, humanists, and reformers, and had the power to bind to himself with the links of a more than brotherly friendship the leading citizen of the leading city of Germany, Willibald Pirkheimer. His temper and his life were singularly free from all that was jarring, jealous, or fretful. The burgher life of even this, the noblest German city, seems narrow, quaint, and harsh beside the grace and opulence and poetry of Italjan life in the same and the preceding generation; but among its native surroundings, the career of Diiper stands out with an aspect of ideal elevation and decorum which is its own, He is even distinguished from his fellow citizens by the stately beauty of his aspect and the rich elegance of his attire. Every reader will be familiar with the portrait in which he has represented himself at this middle period of life—the nobly formed oval counte- nance, with the short beard, and the long carefully divided locks gurled and flowing over either shoulder, the upright brow, the stedfast penetrating gaze of the large perfectly cut eyes, the long nose somewhat aquiline, and full per- fectly cloven mouth, the strong delicate fingers playing with the rich fur lappet of his cloak.

These years of Diirer's life can best be divided according to the several classes of work with which, during their succession, he was principally occupied. During and after his residence at Venice, he had come to disuse the traditional German practice of painting with the help of a whole school

of assistants and apprentices. The first six years after his return, from 1506 to 1512, are pre-eminently the painting years of his life; in them, working with infinite preliminary pains, and, as it seems almost entirely with his own hands, he produced what are accounted his four capital works,—the Adam and Eve, painted in 1507; of this it has been disputed whether a version at Madrid or one in the Pitti Palace at Florence is the original ; the Ten Thousand Martyrs of Nicomedia, painted for the elector Frederick of Saxony in 1508, and now in the imperial gallery at Vienna; a rich altar-piece representing the Assumption of the Virgin, with portraits of the donor and his wife and other accessory subjects, executed for Jacob Heller, a merehant of Frankfort, in 1509—this was after- wards replaced, at Frankfort, bya copy, and the ori ginal trans- ported to Munich, where it perished by fire in 1674; and lastly, the Adoration of the Trinity by all the Saints, a com- position of many figures commissioned for a chapel dedicated to All Saints in an almshouse for decayed tradesmen at Nuremberg, and completed in 1511—this is now one of the glories of the Belvedere at Vienna. In this same year, 1511, Diirer brought out his three great woodcut books in folio form together —the Apocalypse in a second edition, the Great Passion, and the Life of the Virgin for the first time complete. In 1512, he painted two pictures for his native town, the historical portraits of Charlemagne and the emperor Sigis-

mund, which are now to be seen in the Germanic Museum of Nuremberg. The two or three years next following this are for Diirer years, above all things, of engraving on metal. Of the sixteen pieces composing the Little Passion on Copper, perhaps the best invented and certainly the most brilliantly executed of all his gospel histories, ten were executed in 1512 and the last six in 1513. Of the many devotional figures of the Virgin and Child cut on copper by Diirer at various times of his career, several of the most pathetic and care- fully finished date from about the same timc. Now, also, he began to repeat with greater persistency the experiment, which he had first tried some years before, of working by the method, then newly invented, of the etcher ; that is, of biting the lines of his drawing with acid upon metal instead of cutting them with the burin. And these, again, are the years of those three master-pieces of his mind and hand, the Melancholia,

the Knight with Death and the Devil, and the St Jerome reading in his Cell. These engravings are too well known to need description, The first two, by their earnest and enigmatic significance, have fascinated minds of every class, and given rise to an infinity of discussion. It is nearly certain that in these three plates, of almost the same size, date, and manner, and of equal technical perfection, we have three out of four projected illustrations of the Human Tempera- ments, as they were divided by medieval science—the Mel- ancholic, the Sanguine, the Phlegmatic, and the Choleric. Melancholy being intended to stand at the head of the series (although it is dated 1513, and the Knight 1512), has the numeral I, written after the name Melancholia ; the winged genius, in whom the qualities of this tempera- ment are incarnated, is seated darkly musing among symbolic instruments of science. She seems an incarnation of the new spirit of the age, the spirit of solemn and resolute search. The subject of the Knight, being intended to illustrate the sanguine temperament, has the initial S written in the corner. To some students this stedfast rider has seemed a type of the righteous man undismayed by the powers of darkness that beset him, to others of the evil man whom fate and retribution are about to overtake at last. Some have read the initial S as designating one one of the first soldiers of the Reformation, Franz von Sickengen ; athers as designating one of the most infamous of robber nobles, Sparnecker. But indeed the subject is not thus definitely to be interpreted in either sense ; the piece is but one, and the most pregnant and impressive, interpret it how you will, of the thousand emblems with which the Northern imagination in this age commemorated the power of Death, and proclaimed how he is for ever dogging at the heels of strong and weak, the just man and the unjust alike. St Jerome, the Father of the church to whom Renaissance Christianity turned with the greatest devotion, and whom the labours of Erasmus had made familiar in espe- cial to the humanists of the North, serves as the natural type ofthe phlegmatic or student temperament. No fourth subject seems to have been attempted to complete the set. The reason of this may have been the call which at this time began to be made on Diirer’s industry by another kind of work. The five years between 1514 and 1519 are devoted above all things to woodcut work, on commission from the emperor Maximilian, who had resided for some time at Nuremberg in 1512, and whose personal favour and friend- ship Diirer from that time enjoyed. With the Jearned co- operation of Johannes Stabius, he presently commenced a scheme of design for wood

engraving in honour of Maximilian more yast and laborious than either Burgkmair's schemes of illustration to the Weisskunig or Schiufelein's to the Theuerdank, This is the prodigious work known as the Gate of Honour ; on it, and on the Car of Honour, and on portions of the Triumphal Procession, all of which

belonged to the same great scheme (other portions of the Procession being the work of Burgkmair) Diirer was chiefly engaged for four or five years. One of the most delightful memorials of his activity in the service of the emperor ig the famous Prayer- Book of Maximilian, a volume decorated by Diirer's hand with marginal arabesques of an inex- haustibly quaint and various invention ;ythis is now pre- served at Munich, and is known by more than one modern edition published in facsimile. His few paintings remain- ing from this period show a manifest falling off in labour and completeness from those of the period just preceding, In 1518 the Diet of Augsburg brought Maximilian to that city, and there Diirer was in attendance on him.

In 1519 Maximilian died. In the next year the desire of Diirer to secure from his successars a continuance of the patronage and privileges granted during this lifetime, together with an outbreak of sickness in Nuremberg, gave occasion to the master's third and last journey from his home. On the 12th of July 1520 he set out for the Netherlands, with his wife and her maid, in order to be present at the coronation of the young emperor Charles V., and if possible toa conciliate the good graces of the all- powerful regent Margaret. In the latter part of his aim Diirer was but partially successful. His diary of his travels enables us to follow his movements almost day by day. He travelled by the Rhine to Cologne, and thence by road ta Antwerp, where he was splendidly received and lived in whatever society was most distinguished, including that of Erasmus of Rotterdam. Many portrait drawings of persons who sat to him in these days are preserved. Resides going to Aachen for the coronation, he made excursions down the Rhine from Cologne to Nimeguen, and back overland by Herzogenbusch; to Brussels ; to Bruges and Ghent; and to Zealand with the object of seeing a natural curiosity, a whale reported ashore. The vivid account of this last

expedition given in his diary contrasts with the usual dry entries of interviews and disbursements. A still more striking contrast is the passionate outburst of sympathy and indignation with which, in the same diary, he comments on the supposed kidnapping of Luther by foul play on his return from the Diet of Worms. With- out being one of those who in his city took an. avowed part against the old ecclesiastical system, and probably without seeing clearly whither the religious ferment of the time was tending —without, that is, being properly speak- ing a Reformer—Diirer in his art and all his thoughts was the incarnation of those qualities of the Teutonic character and the Teutonic conscience which resulted in the Reforma- tion; and personally, with the fathers of the Reformation he lived in the warmest sympathy.

On the 12th of July 1521 Diirer reached home again. The remaining seven years of his life were occupied chiefly with the preparation of the scientific writings of which we have already spoken ; with engraving on copper, in a style af consummate care and power, several portraits of his friends, among them the elector Frederick, Pirkheimer, Erasmus, and Melanchthon; and with the execution of those two paintings by which, perhaps, his powers in this highest branch of his art are best known, the figures of St Paul with St Mark and St John with Peter. These are now in the Munich gallery, and exhibit at their greatest Diirer's earnest and pregnant coneeption of character, with a majesty in the types and a grandeur in the gesture and drapery which in his earlier career he had never yet attained. Each apostle or evangelist represents a " tempcrament,"—John the melancholic, Peter the phlegmatic, Paul the sanguine,

and Mark the choleric; and it is characteristic of Dtirer's thought that Peter is put in the background, studying off a book held open by John, the favourite evangelist of the Reformation and of Luther; in this representation of John some have recognized the features of Melanchthon; its likeness to the poet Schiller is a coincidence much more obvious. 'These various classes of work were carried on in the face of failing health. In the canals of the Low Countries Diirer had caught a fever, of which he never shook off the effects. The evidence of this we have in his own written words, as well

as in a sketch which he drew to indicate to some doctor with whom he was in correspondence the seat of his suffering; and again, in the record of his physical aspect—the shoulders already somewhat bent, the features somewhat gaunt, the old pride of the abundant locks shorn away——which is preserved in a portrait engraved on wood just after his death, from a drawing made no doubt not long previously. That death came suddenly, so suddenly that there was no time to call his dearest friends to his bedside, on the night of the 6th of April 1628. Diirer was buried in the vault belonging to his wife's family, but since disturbed, in the burying- ground of St John at Nuremberg. He left a name that will be honoured by the latest posterity, and a place that nothing could fill in the affections of his noblest contem- poraries.

" Ag for Diirer, assuredly affection bids us mourn for one who was the best of men, yet you may well hold him happy that he has made so good an end, and that Christ has taken him from the midst of this time of troubles, and from yet greater troubles in store, lest he, that deserved to behold nothing but the best, should be compelled to behold the worst. Therefore may he rest in peace with his fathers : Amen."

The principal extant paintings of Diirer, with the places where they are to be found, have been mentioned above. Of lis draw- ings, by far the richest collection is in the Albertina Palace at Vienna ; the next richest is probably that of the British Museum, where a large volume, forming part of Lord Arundel's collection, is preserved. By the acquisition of the Posonyi-Hullot collection, the Berlin Museum has now (1877) taken certainly the third place. The Louvre also possesses some good examples, and many others are dispersed in various public collections, as at Munich, Ham- burg, Bremen, Basel, Milan, and Florence, as well as in private hands all over Europe.

The principal editions of Diirer's theoretical writings are these:—

Gromerry AND Perspective.—Underweysung derMcssung mit dem Zirekel wnd Riehtscheyt, in Linien, buen und ganzen Cor- poren, Nuremberg, 1525. A Latin translation of the same, with a long title, Paris, Weichel, 1532, and another ed. in 1555. Again in Latin, with the title Institutionum geometricarum libri quatuor, Arnheim, 1605.

FortiFIcAT10N.—Litliche Underricht zur Befestigung der Schloss, Stadt, und Flecken, Nureniberg, 1527, and other editions in 1530 and 1538. A Latin translation, with the title De wrdibus, areibus, castellisque muniendis ae eondendis, Paris, Weichel, 1535.

Human Provortion.—Hicrin sind begriffen vier Biicher von menschlicher Proportion, Nuremberg, 1548. Latin translation : De Syitetria partium in reetis formis humanorum corporwm librt in latinum conversi, de varietate figurarum, de, libri I, Nur- emberg, 1532.

The private literary remains of Diirer, his diary, letters, &c., were first published, partially in Von Murr's Jowrnal zur Kunst- gesehiichte, Nuremberg, 1785-1787 ; aftcrwards, in Campe's fteli- 'quien von A. Diircr, Nuremberg, 1827 ; and again, carefully edited by Professor Moritz Thausing, in the Quellenschriften fir Kunst- gesehichte und Kunsttechnik, Vienna, 1872.

_ The principal remaining literature of the subject will be found in the following books and treatises, the elaborate monograph of Pro- fessor Thausing being the latest, and by far the fullest and most ingenious of them all:—Ncudorfer, Johann, Schreib- und Rechen- meister zu Niiralerg, Nachrichten liber Kiinstlern und. Werkleuten dasclbst, Nuremberg, 1547; republished in the Vienna Quellenschrift, 1875; Scheurl, Chr., Vita Antonii Kressen, 1515, reprinted in the collection of Pirkheimer's works, Frankfort, 1610; Wimpheling, Epitome rerum Germanicarum, ch. 68, Strassburg, 1565 ; Sandrart, Joachim von, Deutsche Academic, Nuremberg, 1675 ; Doppelmayr,

This is the grave and feeling Requiescat of Luther, | in a letter written to their common friend, Hoban Hesse :— |

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Historische Nachricht von den Nurnbergischen Mathematieis und Kiimstlern, Nuremberg, 1730; Von Murr, Chr. G., Journal zur Kunstgcsehiehte, as above; Bartsch, Adam, Le Peintie-Graveur, vol. vii. Vienna, 1808; Passavant, J. P., Le Peintre-Graveur, vol. iii, Leipzig, 1842; Roth, J. F., Leben Albrecht Direr's, Leipzig, 1791 ; Heller, Das Leben und

die Werke Albrecht Dirers, vol. ii., Bamberg, 1827-1831; Von Eye, Dr A., Leben und Werken Al- brecht Diirer's, 2d ed., Nordlingen, 1869 ; Haussmann, A., Ditrer's Kupferstiche, Radirungen, Holzschnitte und Zeichnungen, Han- over, 1861; Von Zahn, A. Direr's Kunstlchre, Leipzig, 1866 ; Allihn, Max., Dérer-Studien, Leipzig, 1871; Nagler, Ge Y.., Albrecht Diirer und setnc Kunst, Munich, 1827 ; Rettberg, R. von, Niirnberg's Kunstleben, Stuttgart, 1854 ; Rettberg, R. von, Diirer's Kupferstiche und Holzschnitte, Munich, 1876 ; Heaton, Mrs Charles, The History of the Life of Albrecht Diirer of Nuremberg, London, 1872; Scott, W. B., Albrecht Direr, his Life and Works, London, 1872; Thausing, Prof. Moritz, Direr, Geschichte seines Lebens und seiner Kunst, Leipzig, 1876; W. Schmidt in Dohme's Kunst und Kiinstler des Mitielalters und der Newzeit, Leipzig, 1877 ; Giwvres de Albert Ditrer reproduit ct publié par Amand-Durand, texte par Georges Duplessis, Paris, 1877. (S.C.)

DURFEY, Tuomas, more generally known by the familiar name of Tom d'Urfey, an English satirist and song writer, was descended from a family of French Huguenot refugees, and was born at Exeter. The year of his birth is unknown. He was originally bred to the law, which he forsook for the more congenial employment of writing plays and songs. His humour both in writing and in singing the latter procured him access to the highest circles, and made him a favourite even at court. Addison in the Guardian (No. 67) relates that he remembered more than once to have seen Charles IJ. leaning on Tom d'Urfey's shoulder and humming over a song with him. He was a strong Tory and Protestant, and it is said that his songs had consider- able influence in strengthening the cause of his party. His dramatic pieces, numbering upwards of thirty, were well received, but were so licentious that none of them kept the stage after the dissolute period for which they were written. D'Urfey, by imprudence and extravagance, became poor as he grew old ; and having prevailed on the managers of the playhouse to act his comedy of the Dlotteng Sisters for his benefit, Addison wrote the above mentioned paper in the Guardian, with another (No. 82) giving a humorous account of his eccentricities, in order to procure him a full house. He died at an advanced age in 1723. His songs, pub- lished in 6 vols., under the title of Pills to Purge Melan- choly, were reprinted in fac-simile in 1872.

DURHAM, County PawatinE or, one of the northern Plate V. shiresof England. Thecounty is triangularin form, its eastern limit or base being a coast-line exposed to the German Ocean. It is separated from Northumberland chiefly by the Tyne and its tributary the Derwent, and from Yorkshire by the Tees, Towards its western extremity it joins Cumberland and Westmoreland. Its greatest length is 45 miles, and its greatest breadth 36 miles ; and it contains an area of 1012 square miles, or 647,592 acres. It is divided into four wards,—Chester and Easington in the north, and Darlington and Stockton in the south, There were formerly three outlying portions of the county, shown in old maps, and known as North Durham (including Norhamshire and Islandshire), Bedlingtonshire, and Crayke. These were attached to the county as having formed parcels of the ancient " patrimony of St Cuthbert," of which the land between Tyne and Tees was the chief portion.

Physical Features.—The western angle of the county is occupied by spurs of the Pennine chain, and hence is mountainous, with black, naked, and barren regions, from which issue numerous streams flowing to the sea. The elevations vary from 1000 to 2196 feet. There are some beautiful and fertile valleys in the eastern and central parts, pleasantly varied with hill and dale, and alternately appro- priated to corn and pasture. Extensive tracts, principally in the western part of the county, are waste, but rich in minerals. In the southern districts the area of cultivation

has been considerably increased within the last few years. The ancient common fields belonging to the townships are now mostly inclosed. Draining having been carried on to a great extent; there is very little marshy ground left. Near the river Tees, and in some places bordering on the other rivers, the soil is loam or a rich clay. At a farther distance from these rivers it is of an inferior quality, with patches of gravel interspersed. The hills between the sea and an imaginary line from Barnard Castle on the Tees to Alansford on the Derwent, are covered with a dry loam, the fertility of which varies with its depth. From this line westward the summits as well as the sides of the hills are in great part moorish wastes.

At the distance of about three miles from Darlington, at Oxenhall, are cavities in the earth, called “ Hell Kettles.” There are similar natural pits in the neighbourhood of Ripon, and elsewhere. The diameter of the largest is not less than 114 feet, and that of the least 75. About five miles from Hartlepool is one of the most singular clusters of rocks in the north of England, called ‘“ Black Halls,” formed by the force and constant action of the waves, which have separated enormous masses of the magnesian limestone, washing some entirely away, but leaving others standing, like vast towers. In some places the rock is perforated so as to form curious arches.

The only considerable river, beside those just mentioned, is the Wear, which rises in the western hills and flows past Uurham to join the sea at Bishop-Wearmouth and Monk- Wearmouth, which places unite with Sunderland to form one great town. The Team, which gives its name to the Team Valley Railway, is a mere rivulet.

Trees are chiefly confined to the parks and seats of the nobility and gentry; but many plantations have been made of late years. The banks of the rivers and brooks, particularly in the vicinity of Durham, are fringed with wood of long growth and much value, and the deep wooded denes or ravines which open on to the sea-coast, each having a small stream at the bottom, are very characteristic. Castle Eden dene is about four miles in length, and famous for its beautiful trees and wild flowers.

Minerals.—-The western hills are composed of carbonifer- ous limestone, succeeded eastward by millstone grit, coal- measures, magnesian limestone, and new red _ sandstone. The south-east portion of the limestone is covered with sand, resulting from disintegration of the coal-measures and often showing black beds of coal-detritus. The mountain lime- stone contains productive veins of lead ore, which are extensively worked, also zinc ore. The beds of coal in the coal-measures are from 5 to 6 feet thick, and have long been source of enormous wealth. The mines are among the most extensive and productive in the kingdom. At Sunderland the coal trade furnishesemployment for hundreds of vessels, independently of the “keels” or lighters which convey the coal from the termini of the railroads and tramways to the ships. The seams now worked extend horizontally for

many miles, and are from 20 to 100 fathoms beneath the surface. Under almost every seam of coal is a bed of fire-clay, full of roots of primeval forest trees. The basaltic formation known as the “Great Whin Sill” appears in Teesdale, and is also remark- able at Cockfield. A beautiful variety of the mountain limestone known as Frosterley marble, has for many centuries been quarried near Stanhope for decorative purposes, in Durham Cathedral and elsewhere taking the place of Purbeck marble, while in modern houses it is used chiefly for chimney-pieces. Ironstone is extensively worked in the neighbourhood of Swalwell and Winlaton. Some excellent quarries of slate for buildings have been opened in different parts of the county, The neighbourhood of Wolsingham abounds in fine millstones, The N eweastle

grindstones are procured at Gateshead Fell; and firestone of high estimation, for building ovens, furnaces, and the like, is obtained in various parts of Durham, and exported in considerable quantity.

owns. — Besides the city of Durham, the county includes seven ancient boroughs, viz., Hartlepool, Barnard Castle, Bishop Auckland, Darlington, Sunderland, Stockton, and Gateshead. The large villages of Staindrop, Wolsingham, Stanhope, and Sedgefield are “ market towns.” The port of Stockton-upon-Tees is well situated for commerce. Hartlepool, being on a promontory, nearly encompassed by the German Ocean, which forms a capacious bay, to the south of the town is advantageously placed for maritime traffic ; Sunderland and South Shields are also well placed at the mouths of the Wear and Tyne.

No county in England presents a closer network of railways than Durham. The York, Newcastle, and Berwick trunk line enters the country south of Darlington, and continues due north until at Gateshead it crosses the Tyne and enters Northumberland. From this a great many smaller lines diverge to the ports and mineral fields.

Agriculture.— Improvements in agriculture have’sbeen pursued with considerable spirit and success. On some spots of gravelly soil, turnips and barley are grown in almost perpetual succession, a crop of clover being sometimes interposed. The manures are chiefly lime and the produce of the

fold-yard ; and though abundance of sea-weed might be collected on the coast, as it was in medizeval times, the farmers now make but little use of it. The farms are of moderate size, few of them exceeding 200 acres. The largest portion of each is arable, except towards the western extremity of the county, where the whole is pasture. The farm houses are well situated and commodious ; and improve- ments in farming and farming machinery keep pace with the age. The cattle of Durham have long been in great repute ; in point of form, weight, produce of milk, and quickness of fattening, there are none better. The cows yield from 25 to 30 quarts of milk daily. The sheep also stand high in estimation, particularly the Tees-Water breed. The Wear- dale sheep are small, but their mutton is finely flavoured.

The following figures, taken from the Agricultural Returns for 1873 and 1876, show the acreage of the principal crops and the numbers of the live stock in the county in those years :—

Grass Corn ‘ Barley and Green 4 Crops. Wheat. Oats. ier Crops. ‘Turnips. a

1878…99,248 37,669 37,631 18,470 32,803 22,153 50,834 1876…91,109 28,359 35,815 28,070 38,616 22,196 58,170

Horses. Cattle. Sheep. Pigs. IS 7 OM ere 16,204 62,452 224,714 12,053

1876…....17,486 61,028 202,109 12,182

According to the Owners of Land Return, Durham was divided in 1873 among 34,317 separate proprietors, of whom the large proportion of 91 per cent. owned less than 1 acre—the average of England and Wales being 71 per cent. The gross rental of the land amounted to £2,889,152, or an average of £5, 11s. 24d. per acre—as compared with £3, Os. 2d., the average of England and Wales. This unusual value per acre is to be ascribed to the presence of minerals. The proprietors possessing more than 8000 acres were as follows:—duke of Cleveland, 55,837 acres ; Ecclesiastical Commissioners, 26,868 ; Vis- count Boyne, 15,310; earl of Durham, 14,664; marquis of Londonderry, 12,823; earl of Eldon, 11,841; John Bowes, 8313; dean and chapter of Durham, 8089.

Natural History.—Except in the moorlands of the west, only a few scraps of the county have been left in their natural state ; but these portions are of great interest to the student of natural history. The ballast-hills at Shields and Hartlepool are overgrown with aliens, many of which are elsewhere unknown in this country. Nearly fifty different

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‘species have been found. Cypripedium, Epipactis, Pyrola, Ophrys, under the yews of Castle Eden, are visited by butterflies found nowhereelse in England, as Ore‘na blandina, Polyommatus salmacis, and the little moth VIII., and records of red deer in the county may be traced down to the middle of the last century.

Autiquities of pre-Roman date, whether implements of stone or bronze, or sepulchral remains, are scarcely found except in the valley of the Wear. A very remarkable dis- covery was made some years ago at Heathery Burn Cave, near Stanhope, where, under a coating of stalagmite, were preserved a great many bronze weapons and other objects, including almost every article which appears to have been known in Britain at that remote period. One mile north of Eggleston are some remains of an ancient structure called the Standing Stones. This originally consisted of a cairn in the centre, surrounded by a trench, and that again encompassed by a circular arrangement of rough stones, many of which have beeu removed and broken to repair the roads. Near a brook, at a small distance, is a large barrow, crossed from east to west by a row of stones. There are frequent references to “Standing Stones” now gone in old charters, where they are referred to as narking boundaries. The principal Roman remains are connected with the ancient Watling Street, which entered the county by crossing the Tees at Pierse-bridge, and left it on crossing the Derwent just north of Ebchester. The boundaries of the four stations of Pierse-bridge, Binchester, Lanchester, and Ebchester, on the line of this road, may still be clearly discerned, At Lanchester there are considerable remains of masonry, and at Binchester the most perfect hypocaust in the north of England. Chester-le-Street, as its name indicates, occupies the site, now obliterated, of a Roman station, on a subsidiary Roman road ; and there was a camp, still partly to be recognized, on “ Maiden Castle Hill,” near the city of

Durham. Many Roman altars and sculptured stones from Lanchester and elsewhere are preserved in the chapter library at Durham. Roman altars, coins, &c., have been found at South Shields, as well as about the above-mentioned stations. To the Anglo-Saxon period are to be referred portions of the churches of Monk- Wearmouth and Jarrow, and numerous sculptured crosses, two of which are im situ at Aycliffe. The best remains of the Norman period are to be found in Durham Cathedral (the finest Norman building in England) and in the castle, also in some half-dozen parish churches. Of the Early English period are the eastern portion of the cathedral (see below), the fine churches of Darlington, Hartlepool, and St Andrew, Auckland, and portions of a few other churches, The Decorated and Perpendicular

periods are very scantily represented, on account, as is supposed, of the incessant wars between England and Scotland in the 14th and 15th centuries. The principal monastic remains, beside those surrounding Durham Cathedral, are those of its subordinate house or “cell,” Finchale Priory, situated in a lovely valley by the Wear. The most interesting castles are those of Durham, Raby, Brancepeth, and Barnard. There are ruins of castelets, or peel-towers, at Dalden, Ludworth, and Langley Dale. The hospitals of Sherburn, Greatham, and Kepyer, founded by early bishops of Durham, retain but very few ancient features,

The principal noblemen’s seats are Raby Castle (duke of Cleveland), Lambton Castle (earl of Durham), Wynyard Castle (marquis of Londonderry), Ravensworth Castle (earl of Ravensworth), Brancepeth Castle (Viscount Boyne), and Whitham Hall (Sir Hedworth Williamson, Bart.)

The county is divided for parliamentary purposes into two divisions (North and South Durham), each of which returns two members. The northern division includes 20 polling-places, and the southern 33. The population has greatly increased within the last thirty years. In 1851 the inhabitants numbered 390,997 ; in 1861, 508,666 ; and in 1871, 685,089—353,117 males and 331,972 females. The increase between 1851 and 1871 amounts to 723 per cent. enna is estimated at upwards of 850,000 in Lory.

istory.—Before the arrival of the Romans the county formed part of the British territory of the Brigantes, which comprised all between Tyne and Humber. Then it beeame part of the Roman province Maxima Cesariensis. In Anglo-Saxon times it was included in Bernieia, in the kingdom of Northumbria. After the Norman Conquest it gradually acquired in one way or another that peeuliar independence which was attached to ‘‘Counties Palatine.” The bishops of Durham were temporal princes as well as spiritual rulers, exercising most of the royal prerogatives, sueh as paramount pro- perty in all lands, and supreme jurisdiction both civil and military, as in making war, right of forfeiture, levying of taxes, &c. These privileges would be the more readily conceded to this county on account of its remoteness from the metropolis, and its proximity to the hostile kingdom of Scotland, in order that the inhabitants, having justice administered athome, might not be obliged to go out of their county, and leave it open to an enemy’s incursions. For they pleaded privilege not to pass over Tees or T’yne for military service, their special charge being, as was alleged, to keep and defend the sacred body of St Cuthbert, whence they were called ‘‘ Haliwer fole ” (Holy war folk), By an Act passed in the 27th year of Henry VIII. a heavy blow was struck at the regal powers which the bishops of Durham had enjoyed, and at the death of Bishop Van Mildert in 1836, an Act was passed whereby all temporal jurisdic- tions and privileges were deelared to be for ever removed from the bishopric, Up to that time the bishops opened the assizes in person, as being still at the head of the administration of justice, the judges sitting by virtue of the bishop’s writ. Durham is now included in the province of York, and in the north-eastern circuit.

The principal county histories are those by Hutchinson and Surtees, the latter ineomplete, but, so far as it goes, it is a noble work, one of the very best of that class ever published. Murray’s handbooks to the county and to the cathedral, though occasionally inaccurate, are full of interesting and valuable information.

Dvuruam City, a municipal and parliamentary borough of England, and the chief town of the county of Durham, is situated on the River Wear (which is crossed there by four bridges), 14 miles 8. of Newcastle and 60 miles N.N.W. of York. Though there was a small Roman camp at Maiden Castle

Hill, about a mile distant, Durham itself dates only from the end of the 10th century, when the mopks of Lindisfarne rested there with the body of St Cuthbert, after wandering about with it almost all over the north of England. Soon afterwards a church was built by Pishop Ealdhune, and the removal of the see from Lindisfarne thither, together with the growing fame of the incorruptible body of the saint, led to the rise of the city. The rocky peninsula on which Ealdhune's church was founded, about 80 feet above the river, was called Dunholme (Hill Island),

which in Norman times was softened to "' Duresme," whence "Durham." The castle was erected by William the Con- gueror in 1072, across the neck of the peninsula, so as to buard the church and monastery. In 1093 Ealdhune's

Scale of % Mile

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Plan of Durham,

church was rebuilt by Bishop Carileph, who changed the Anglo-Saxon establishment of married priests into a Benedictine abbey:

The Cathedral.—Carileph's grand Norman church still forms the main part of the cathedral buildings; but numerous additions have been made from time to time, the chief of which are—the Galilee or western chapel, of the Transitional period, the eastern transept or " Nine Altars" and the western towers (Early English), and the central tower (Perpendicular). Decorated and Perpendicular win- dows have, as is usual in old churches, been freely inserted. The interior presents the appearance, as Dr Johnson remarked, of "rocky solidity and of indeterminate duration," and combines, we may add, absolutely perfect proportion in all its original parts with a harmonious

magnificence of detail in its massive columns, arches, and stone groining. It has recently been thoroughly cleaned, and supplied with much painted glass and very costly modern fittings, includ- ing a new organ built on the largest scale and of fine tone. Durham Cathedral, or “ The Abbey,” as old-fashioned residents still call it, has long been celebrated and still maintains its reputation for its choral services, as being at least equal to any in England in point of musical execution. This glorious building has been admirably illustrated in Carter’s Plates, and in Billings’s Architecture of Durham Cathedral. Tt is 507 feet in length, by 200 in extreme breadth, with a central tower 214 feet in height, and two smaller ones 138 feet high at the west end. The Galilee or western chapel was built by Bishop Pudsey between 1153 and 1195, and contains the supposed remains of the Vener- able Bede. In the chapel of the Nine Altars are the remains of St Cuthbert, brought to light in 1827. The cathedral library, formerly the dormitory and refectories of

the abbey, contains a number of curious and interesting printed books, and MSS., and the portable altar, vestments, and other relics found in St Cuthbert’s grave.

The see of Durham was long the richest bishopric in England. The total revenue of the dean and chapterduring the seven years ending 1834 amounted to £36,937 a year. On the death of the incum- bent in 1836, at the recom- mendation of the Ecclesiasti- cal Commissioners, the income of the bishop was fixed at @ £8000 per annum—the sur- \S& plus revenues of the see be- ing reserved to form a fund for augmenting the incomes of the poorer bishops.

Castle, d&c.—The castle of Durham consists of a polygonal keep, now reconstructed to form a very inconvenient set of college rooms ; the great hall built by Bishop Hatfield, which in some respects exceeds any hall in the older univer- sities ; the Norman hall, now cut up into rooms; the old Norman crypt chapel; Bishop Tunstall’s chapel, at present in use ; the Black Staircase, built by Bishop Cosin ; and the kitchen, the gate-house, and other offices. These are grouped round a court very irregular in ‘plan, and not less picturesque in general effect. Durham Castle was the chief residence of the bishops of the Palatinate, but is now appropriated to the uses of the

university, with the exception of the state apartments, which are partly reserved for the bishop and for Her Majesty's judges of assize. The univer- sity was opened in 1833 ; an account of it will be found under UNiveErsities. Besides the cathedral, Durham has seven parish churches. There are also places of worship for Roman Catholics, and for various denominations of Protes- tants. The grammar school attached to the cathedral was founded by Henry VIII. in 1541, and possesses eighteen '"king's scholarships," of the annual value of nearly £40 each. There are also several scholarships and exhibitions tenable at the universities, The original school-room is now used by the university of Durham ; the new buildings are beautifully situated to the west of the city, and are very handsome and commodious, including residences for the head and second masters, and a school infirmary. Durham possesses flourishing diocesan training colleges for school- masters and schoolmistresses ; and about four miles to the west of the city is the great Roman Catholic College called St Cuthbert's College, Ushaw, the present representative of the old college at Douai.

The civil corporation of Durham and Framwellgate con- sists of the mayor, six alder- ya men, and eighteen councillors, = with a recorder, a chaplain, and town clerk, two elective auditors, and two elective assessors. On the passing of the Corporation Act, 5 and 6 Will. IV. c. 76, the election of the eighteen councillors was vested in the citizens occupy- ing houses and paying poor and other rates. The coun- cillors so elected have to choose the six aldermen, and the aldermen and councillor have the election of the mayor. Four charters (all, except the third, preserved in the " Hutch" at the Guild Hall) have been! granted to the city by different bishops of Durham : —the first by Hugh Pudsey, confirmed by Pope Alexander IIL, 1179 or 1180; the second by Tobias

Arms of Bishopric,

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Corporation Seal.

Matthew, confirmed by James I.; the third by Nathaniel Lord Crew, 1684 (afterwards redelivered to the bishop, the corporation acting under the second charter); and the fourth by John Egerton, 1780.

Durham can scarcely be said to have any staple trade or manufacture, though it possesses one carpet factory and one large mill for the preparation of ‘“ Durham mustard.” It is now a very different place, socially, from what it was when there were twelve prebendaries with much larger incomes than the six canons now have, and when “The College” was a noted centre for dignified and liberal hospitality. At that time, canonical residence was kept with much more strictness than it is at present, and the prebendary in residence entertained guests of all classes. Noblemen and gentlemen then resided in houses in Fram- wellgate and Elvet, now let out into tenements and serving as the squalid homes of the very poorest class. The Bailey and Old Elvet are, however, still chiefly occupied by the upper classes, and Western Hill is a new and rapidly increasing suburb. The Palace Green is an open space having the cathedral on the south side, the castle, now University College, on the north, the Exchequer Buildings, now the university library, together with Bishop Cosin’s library, on the west, and the museum, alms-houses, and other offices on the east. The museum contains an almost complete collection of British birds. Six out of the seven parish churches are ancient, and possess features of interest. The high banks of the river on which the cathedral and castle stand are richly wooded, and traversed in all directions by well-kept paths, which afford ever-changing views of wood, water, rocks, bridges, the cathedral, the castle, pic- turesque old houses, and terraced gardens.

In 1861 the municipal borough of Durham had within

its area of 880 acres 2007 inhabited houses, with a popu-.

lation of 14,088. In 1871, the number of inhabited houses was 2349, and the population comprised 6956 males and 7450 females, or 14,406 inall. The parliamentary borough, which with an area of 967 acres had 14,833 inhabitants in 1871, returns two members to Parliament. (sere) DURHAM, Joun Grorce Lamston, First EARL oF (1792-1840), born at Lambton

Castle, Durham, on the 12th April 1792, was the eldest son of William Henry Lambton, M.P. for the city of Durham. It is note- worthy that the family to which he belonged had held the Lambton estate in uninterrupted male succession from the 12th century. Educated at Eton, he held for a short time a commission in a regiment of hussars. In 1813, soon after attaining his majority, he was returned to Parliament as representative of his native county. He was an advanced Liberal from the beginning to the end of his political career, and distinguished himself by his uncom- promising opposition to the reactionary measures of the Tory Government. His political position was strengthened by his marriage in 1816 to the eldest daughter of Karl Grey. In 1819 he championed the rights of the people by his denunciation; in the House of Commons and at numerous public meetings, of the coercive measures proposed by the Government against the Chartists. In April 1821 he proposed in the House a scheme of parliamentary reform which was in some points, notably in regard to the redis- tribution of seats, more thoroughgoing than that which was carried eleven years later. The delicate state of his health compelled him in 1826 to proceed to Naples, where he resided for about alyear. He was a proniinent supporter of the Canning administration of 1827, and of that of Lord Goderich by which it was succeeded. When the latter fell to pieces owing to its inherent weakness in January 1828, Lambton's services were acknowledged by his eleva- tion to the peerage as Baron Durham. On the accession -of Lord Grey to power in 1830 Lord Durham obtained the

office of lord privy seal. He was one of a Cabinet com- mittee of four who were intrusted with the preparation of the Reform Bill, the others being Sir James Graham, Lord John Russell, and Lord Duncannon. It was understood at the time that his influence was exerted to make the measure as liberal as possible, and in particular that he wished to introduce the ballot as one of its provisions. In the debates on the bill in the Lords he did not take the leading part that might naturally have been expected from the only peer who had been on the Cabinet committee for its preparation. This was owing partly to his own indifferent health and partly to grief at the death of his eldest son, the Master Lambton of one of Lawrence's most admired portraits. Continued ill-health led him to resign office in March 1833, when he was

raised to the dignity of Viscount Lambton and earl of Durham. In the summer of the same year, however, he was able to undertake a special embassy to the court of St Petersburg, the chief object of which was to secure lenient treatment for the insurgent Poles. In this he was unsuccessful. When the party that had carried reform began to be divided, Lord Durham was generally regarded as a likely leader of the more advanced section, and a strongly radical speech which he delivered at the celebrated Grey banquet at Edinburgh in 1834 helped to strengthen his claims to the position. It took the form of a reply to a previous speech of Lord Brougham, whose enmity Lord Durham thus provoked. In 1837 he accepted the post of ambassador at St Petersburg, which he occupied for about a year. Meanwhile a very serious insurrection had broken out in Canada, and early in 1838 the Govern- ment found it necessary to suspend the colonial constitution and send out a new governor with special powers. Lord Durham was selected to undertake the difficult task, for which his extensive experience and his well-known advanced liberalism were supposed specially to qualify him. Some- what hasty and irascible in his temperament, he unfor- tunately adopted measures which were beyond the powers conferred upon him by the special Act of Parliament under which he had been appointed. These measures were dis- approved of by a vote of the House of Lords on the motion of Lord Brougham, who imported the bitterness of his earlier quarrel with Lord Durham into the debate, and the Government were compelled to disallow the ordinances in which they were embodied. Lord Durham was so deeply incensed at this that he took the extraordinary step of returning home without waiting for his recall, and the Government marked its disapproval of his conduct by directing that he should not receive the customary salute on landing in England. He defended his plan of administra- tion in an able and elaborate report addressed to the queen, and his policy was practically justified by being adopted by his successor. He had returned to England in shattered health, and he died at Cowes, in the Isle of Wight, on the 28th July 1840.

DURIAN (Malay, duri, a thorn), the fruit of Durio zibethinus, a tree of the natural order Sterculiacee, which attains a height of 70 or 80 feet, has oblong, tapering leaves, rounded at the base, and yellowish-green flowers, and bears a general resemblance to the elm. The durio is cultivated in Sumatra, Java, Celebes, and the Moluccas, and northwards as far as

Mindanao in the Philippines ; also in the Malay Peninsula, in Tenasserim, on the Bay of Bengal, to 14° N. lat., and in Siam to the 13th and 14th parallels. The fruit is spherical, and 6 to 8 inches in diameter, approaching the size of a large cocoa-nut ; it has a hard external husk or shell, and is completely armed with strong pyramidal tubercles, meeting one another at the base, and terminating in sharp thorny points; these some- times inflict severe injuries on persons upon whom the fruit may chance to fall when ripe. On dividing the fruit at the

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sutures of the carpels, where the spines arch a little, it is found to contain five oval cells, each filled with a cream- coloured, glutinous, smooth pulp, in which are imbedded from one to five seeds about the size of chestnuts. The pulp and the seeds, which latter are eaten roasted, are the edible parts of the fruit. With regard to the taste of the pulp Mr Wallace remarks, “A rich butter-like custard, highly flavoured with almonds, gives the best idea of it, but intermingled with it come wafts of flavour that call to mind cream-cheese, onion-sauce, brown sherry, and other incon- gruities; . . it is neither acid, nor sweet, nor juicy, yet one feels the want of none of these qualities, for it is perfect as it is.” The fruit, especially when not fresh from the tree, has, notwithstanding, a most offensive smell, which has been compared to that of rotten onions or of putrid animal matter. The Dyaks of the Sarawak river in Borneo esteem the durian above all other fruit, eat it unripe both cooked and raw, and salt the pulp for use as a relish with rice.

See Linschoten, Discours of Voyages, bk. i., chap. 57, p. 102,

fol. Lond. 1598 ; Bickmore, 7’ravels in the East Indian Archipelago, p. 91, 1868; Wallace, The Malay Archipelago, 3rd. ed. 1872.

DURKHEIM, a town in the Palatinate of the Rhine, near the foot of the Hardt Mountain, and at the entrance of the valley of the Isenach, 15 miles north-west of Spire, on the railway between Monsheim and Neustadt. Besides being the seat of various administrative offices, it possesses three churches and a synagogue, a town-hall occupying the site of the castle of the princes of Leiningen-Hartenburg, an antiquarian and a scientific society, a public library, and a high school. It is well known asa resort for invalids,

who may either indulge in the grape-cure or have recourse to the salt-springs of Philippshall in the neighbourhood, which not only supply the bathing establishment, but produce annually about 8000 ewt. of marketable salt. The inhabitants have a good trade in wine, and manufacture oil, tobacco, glass, and paper.

As a dependency of the Benedictine abbey of Limburg, which which was built and endowed by Conrad II., Diirkheim or Thurnig- heim came into the possession of the counts of Leiningen, who in the 13th century made it the seat of a fortress, and in the 14th inclosed it with walland ditch. In the three following centuries it had its full share of the military vicissitudes of the Palatinate; but it was rebuilt after the French invasion of 1689, and greatly fostered by its counts in the beginning of next century. In 1794 its new castle was sacked by the French, and in 1849 it was the scene of a contest between the Prussians and the insurrectionists. The ruins of the abbey of Limburg are still to be seen about a mile S. W. of the town ; and in the neighbourhood rises the Kastanienberg, with the ancient rude stone fortification of the Heidenmauer or Heathen's Wall. Population in 1871, 5572.

DURLACH, a town of Bavaria, in the circle of Carlsruhe, 2% miles by rail from the city of that name, with which it is connected by a canal and an avenue of poplars. It lies on the left bank of the Pfinz, at the foot of the vineyard- covered Thurmberg, which is crowned by a watch-tower ; and it possesses a castle erected in 1565 and now used as barracks, an ancient Rathhaus, a church with an excellent organ, an upper Biirgerschule, an orphan asylum, and in the market-place a statue of the margrave Charles IT. Its in- habitants manufacture tobacco, beer, vinegar, and chicory, and engage in agriculture and gardening. A chalybeate spring is utilized at the bathing establishment of Amalienbad.

Durlach was bestowed by the emperor Frederick on Hernann Vv. of Zahringen as an allodial possession, but afterwards came into the hands of Rudolf of Hapsburg. It was chosen as his residence by the margrave Charles II., in 1565, and retained this distinction till the foundation of Carlsruhe in 1715, though it was almost destroyed by the French in 1688. In 1846 it was

the seat of a congress of the liberal party of the Baden parliament ; and in 1849 it was the scene of an encounter between the Prussians and the

insurgents. Reichenbach the mechanician and Posselt the historian are natives of the town.

DUR—DUS

DURRA, or Inpian Miter, Sorghum vulgare, is a species of grass of the tribe Andropogonee. The terms durra and zurrut are applied to the plant in Arabia; in India it is known as jawari (Hindustani), jowari (Bengali), cholum (Tamil), and jonna (Telugu), and in the West Indies as Negro or Guinea Corn. It is a strong grass, growing to a height of from 4 to 8 or even 16 feet; the leaves are sheathing, solitary, and about 2 inches broad and 24 feet in length; the panicles are contracted, dense, and hermaphrodite ; and the seeds, which are inclosed in husks, and protected by awns, are round, hard, smooth, shining, brownish-red, and somewhat larger than mustard seeds, The plant is cultivated in various parts of India and other countries of Asia, in the United States, and in the south of Kurope. Its culms and leaves afford excellent fodder for cattle; and the grain, of which the yield in favourable situations is upwards of a hundredfold, is used for the same purposes as maize, rice, corn, and other cereals. Allied species are S. bicolor, much valued in India as a forage- plant, and S. saccharatum, commonly called sorghum or Chinese sugar cane, which is extensively cultivated in China, North India, and Africa. The latter species is grown in America chiefly for the manufacture of molasses from its juice, and in France as a source of alcohol. The total qnantity of sorghum molasses made in the United States in 1870 has been estimated at 16,050,089 gallons.

DUSSEK, Joann Lupwie (1761-1812), pianist and composer, was born at Czaslau, in Bohemia, on the 9th February 1761. His father, Johann Joseph Dussek, a musician of high repntation, was organist and choir-master in the collegiate church of Czaslau, and several other members of the family were distinguished as organists. He had thus the most favourable opportunity for the development of the musical talent which he displayed almost from infancy. Under the careful instruction of his father he made such rapid progress that he appeared in public as a pianist at the age of six. A year or two later he was placed as a choir boy at the convent of Iglau, and he

obtained his first instruction in counterpoint from Spenar, the choir-master. When his voice broke he entered on a course of general study, first at the Jesuits' college, and then at the university of Prague, where he tovk his bachelor's degree in philosophy. During his curriculum of two and a half years he had paid unremitting attention to the practice and study of his art, and had received farther instruction in composition from a Benedictine monk. Jn 1779 he was for a short time organist in the church of St Rombaut at Mechlin. At the close of this engagement he proceeded to Holland, where he attained great distinction as a pianist, and was employed by the stadtholder as musical instructor to his family. While at the Hague he published his first works in the form of several sonatas and concertos for the piano. He had already composed at the age of thirteen a solemn mass and several small oratorios, which still exist in manuscript. In 1783 he visted Hamburg, and placed himself under the instruction of Emmanuel Bach. Though he believed him- self to have derived great benefit from this, it may be questioned whether his genius was not fettered rather than stimulated by the enthusiastic veneration with which he regarded his model. From Hamburg he proceeded to Berlin, where his powers as a pianist met with their accustomed recognition. After spending two years in Lithuania in the service of Prince Radziwill, he went in 1786 to Paris, where he remained, with the exception of a short period spent at Milan, until the outbreak of the Revolution, enjoying the special patronage of Marie Antoinette and great popularity with the public. Towards the close of 1789 he removed to London, where three years jater he married a daughter of Dominico Corri, who was

herself a clever harpist and pianist. In London he obtained his greatest success alike as composer, performer, and teacher. Unfortunately, however, he was tempted by the large sale of his numerous compositions to open a music- publishing warehouse in partnership with Montague Corri, relative of his wife. The result was injurious to his fame and disastrous to his fortune. Writing solely for the sake of sale, he composed many pieces that were quite unworthy of his genius; and, as he was entirely destitute of business capacity, bankruptcy was inevitable. In 1800 he was obliged to flee to Hamburg to escape the claims of his creditors. Some years later he was

attached in the capacity of musician to the household of Prince Louis Ferdinand of Prussia, with whom he formed an intimate friendship. On the death of his patron in 1806 he passed into the service of Prince Ysenburg as court musician. In 1809 he went to Paris to fill a similar situation in the household of Prince Talleyrand, which he held until his death in March 1812. Dussek had an important influence on the development of pianoforte music. As a performer he was distingvished by the purity of his tone, the com- bined power and delicacy of his touch, and. the facility of his execution. As a composer he possessed a distinct individuality of style, and, while much that he wrote has little value, his best works rank high among pianoforte classics. His sonatas known as Zhe Invocation, The Farewell, and The Harmonic Elegy, though not equally sustained throughout, contain movements that have scarcely been surpassed for solemnity and beauty of idea. Two operas, which he composed during his residence in London, were failures. | i

DUSSELDORF, a town of Prussia, at the head of a government in the province of the Rhine, on the right

Jagerhof.-”

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| Hi) ype } TH Th Leeann Wii. oH a:

1. Ursula Church. 9, Town fall.

2. Government Buildings. 10. Elector Wilhelm Statue. 3. Court Chur :h. 11. Theatre.

4. St Lambe: t’s Church. 12, Court of Justice.

5. School of Art. 13. Gymnasium.

6. Mint. 14. Maximilian Church.

7. Hauptwache. 15. Garrison Church.

8. Old Castle. 16. Pcst Office.

bank of the river, 25 miles below Cologne. It is divided

into four portions,—the Old Town, the Karlstadt, which dates from 1787 and is called after the electoral prince Charles Theodore, the New Town, which was in process of formation from 1690 to 1716, and the Friedrichsstadt, laid out within recent years. New streets are rapidly stretching out in all directions, and the villages of Penipelfort, Bilk, and Derendorf are already almost in- corporated. Within the area of the town proper there are numerous open grounds and public squares, which prevent the regularity of its plan degenerating into monotony: the market-place, with the colossal bronze statute of the electoral prince Johann Wilhelm, the parade, the Allée Strasse, the King's Alley, and the King's Platz may be specially mentioned. Of the ten churches the most notice- able. are—St Andrew's, formerly the Jesuit or court church, with frescoes by Hiibner, Deger, and Mucke, and the embalmed bodies of several of the electors ; St Lambert's, with a tower 180 feet high, and containing monuments in honour of Duke William IV. and Voetius; and Maximilian's, with frescoes by Settegast and others. Besides the old ducal palace, laid in ruins by the French in 1794, but restored in 1846, the secular buildings comprise the former Jesuit college, now occupied by the administrative offices, a town-house dating from 1567, a penitentiary, a lunatic asylum, several hospitals and infirmaries, a theatre completed in 1875, a music hall, a gymnasium, and a polytechnical school. The town also possesses a library of 50,000 volumes, and is the seat of a great number of commercial and intellectual associations ; but to nothing is it more indebted for its celebrity than to the Academy of Painting. This famous institution, originally founded by the electoral prince Charles Theodore in 1767, was reorganized by King Frederick William in 1822, and has since attained a high degree of prosperity as a centre of artistic culture. From 1822 till 1826 it was under the direction of Cornelius, a native of the town, from 1826 to 1859 under Schadow, and from 1859 to 1864 under Bendemaun. From Bendemann's resignation it con- tinued in the hands of a body of curators till 1873, when Wiscelinus of Weimar was chosen director. The noble collection of paintings which formerly adorned the Diisseldorf gallery was removed to Munich in 1805, and has not since been restored ; but there is no lack of

artistic treasures in the town. The academy possesses 14,000 original drawings and sketches by the great masters, 24,000 engravings, and 248 water-colour copies of Italian originals ; the municipal gallery contains valuable specimens of the local school; and the same is the case with the Schulte collection. The principal names are Cornelius, Lessing, Achenbach, Baur, Tidemann, and Knaus. An annual exhibition is held under the auspices of the Art Union; and the members of the Artist's Society, or Malkasten, as they are called, annually celebrate festivities and masquerades of a remarkable description. Not only is Dtisseldorf situated in the greatest manufacturing province of Prussia, but it is itself the seat of various important industries,— cotton and carpet weaving, irou-founding, wire-drawing, sugar-refining, brewing, distillation, and the making of pianos and carriages. The surrounding country is largely devoted to market-gardening, and the Diisseldorf mustard is in special repute. A very extensive trade is carried on both by river and by rail; the port was declared free in 1829, aud is consequently one of the most frequented on the Rhine. The Diisseldorf Steam-buvat Company maintains regular communication with Mayence on the one hand and Rotterdam ou the other. A little to the north of the town lies the village of Diisselthal, with Count Recke Volmarstein's establishment for homeless children in the former Trappist monastery; and in the suburban village of Pempelfort is the Jagerhof, the residence at one time of

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Prince Frederick of Prussia, and afterwards of the prince of Hohenzollern Sigmaringen. inhabitants was about 8000; by 1831 it was over 23,000. The census of 1861 gave 41,290 (of which 3376 were military) ; that of 1871, 69,348.

Diisseldorf, as the form of the name—the village on the Diissel —clearly indicates, was long a place of small consideration. In 1288 it was raised to the rank of a town by Count Adolf of Berg; from his successors it obtained various privilegcs, and in 1885 was chosen as their residence. After it had suffered greatly in the Thirty Years' War and the war of the Spanish succession, it recovered its prosperity under the patronage of the electoral prince John William of the Palatinate, who dweltiin the castle till the

restoration of Heidelberg. In 1794 the town was violently bombarded by the French ; and after the peace of Luneville it was deprived of its forti- fications. In 1805 it became the capital of: the Napoleonic duchy of Berg ; and in 1815 it passed with the duchy into Prussian posses- sion. Among its celebrities are George and Friedrich Heinrich Jakobi, Schenk, Heine, Varnhagen, Cornelius, Camphausen, and H. von Sybel.

DUTENS, Lovis (1730-1812), a French writer of some celebrity, was born at Tours, of Protestant parents, January 15, 1730. In his youth he devoted himself to poetry ; and in 1748 he composed a tragedy, entitled Zhe Return of Ulysses to Ithaca, which failed in Paris, but was represented with great applause at Orleans. The author, however, soon became sensible of the faults of his work, and abandoned a species of composition in which he found he was not destined to excel. He soon afterwards went to England with an introduction to Pitt, which he had received from a sister of the statesman. His first residence in London was brief, but he soon returned and obtained a situation as tutor in a private family. The father of the pupil was a man of considerable literary and scientific attainments, who instructed him in those branches of knowledge in which he was deficient. In this manner he learnt Greek and mathematics, and studied tle Oriental languages, and Italian and Spanish. Soon after the termi- nation of this engagement he was appointed chaplain and secretary to Mr Mackenzie, the English minister at the court of Turin, and left England in October 1758. In 1760, when Mr Mackenzie returned to England, the secretary remained at Turin as chargé d’affaires, until 1762, when he returned to England and attached himself to the family of Lord Bute, who, before retiring from office in 1763, procured him a pension. Heagain went to Turin as chargé d’affaires ; and during this second mission he under- took the task of collecting and publishing a complete edition of the works of Leibnitz (Geneva, 6 vols. 1769) and wrote hts work on the Discoveries of the Ancients. On again returning to England he attached himself to the duke of Northumberland, who procured him the living of Elsdon, in Northumberland. He accompanied the duke’s son, Lord Algernon Percy, in his travels through France, Italy, Germany, and Holland; and while at Paris he was chosen a member of the Academy of Inscriptions, in 1775. In the same year he was made a fellow of the Royal Society. In 1776 he returned to England, and soon afterwards accompanied Mr Mackenzie and his wife

on a tour to Naples. On his return Dutens was invited by Lord Mount-stuart, who had been appointed envoy extraordinary, to ac- company him to Turin, and found himself for the third time chargé d'affaires [at that court, during a short absence of the envoy. From Turin he went to Florence, and thence to Rome. He was in Paris in 1783, and returned to London the following year. @: The revenue he derived from his living amounting to £800 per annum, together with a considerable legacy left him by Mr Mackenzie, and estimated at £15,000, enabled him to pass the remainder of his life in affluence. He died at London, May 23, 1812.

The principal works of Dutens were his Recherches sur Vorigine des Découvertes attribuées aux Modernes (1766, 2 vols. 8vo) ; Appel aw bow Sens (London, 1777, 8vo), directed in defence of Christi-

In 1780 the number of

anity against the French philosophers, and published anonymously ; Lxplieation de quelques médailles de Peuples, de Villes, et de Rois, Greeques et Pheniciennes (1778, 4to); Hauplieation de quelques médailles du eabinet de Duane (1774, 4to); Troisiéme Dissertation sur quelgwes médailles Grecques et Phenieiennes (1776, 4to); Logique, ou l' Art de raisonner (1778, 12mo) ; Des pierres précieuses et des pierres fines, avec les moyens de les connattre et de les évaluer (1776, 12mo) ; Jtinéraire des routes les plus frequentées, ow Journal dun Voyage aux principales Villes d'Ewrope (1775, 8vo), fre- quently republished ; Considérations Théologiques sur les moyens de réunir toutes les Eglises Chrétiennes (1798, 8vo) ; Huvres melées, containing his most important works published up to the date (London, 1797, 4 vols. 4to); L'Ami des rangers qui voyagent en Angleterre (1789, 8vo); Histoire de ce qui s'est passé pour, le rétablissement dune régence en Angleterre, (1789, 8vo); Recherches sur le tems le plus reculé de Vusage des Voutes chez les anciens (1795) ; Mémoires un Voyageur qui se repose (Paris, 1786, 8 vols. 8vo). The first two volumes of the last named work contain the life of the author, written in a romantic style ; the third bears the title of Dutensiana, and is filled with remarks, anecdotes, and bon-mots. (See memoir of Dutens in the Gentleman's Magazine for 1812.)

DUTROCHET, Rent Joacuim Hernrt (1776-1847), a French physiologist and natural philosopher, was born at Chateau de Néon, Poitou, November 14, 1776, and died at Paris, February 4, 1847. Jn 1799 he entered the military marine at Rochefort, which, however, he soon deserted to join the Vendean army. In 1802 he began the study of medicine at Paris ; and in 1808 he was made physician to Joseph Bonaparte, king of Spain. Appointed chief physician to the hospital at Burgos, he distinguished himself during the prevalence of typhus in that city. He returned in 1809 to France, where he devoted himself to the study of the natural sciences. The number of his scientific publications, which relate to a great variety of topics, is very great. His Recherches sur l'accroissement et la reproduction des végétaux, published in the Mémoires du Muséum d' Histoire naturelle for 1821, procured him in that year the French Academy's prize for experimental physiology. In 1837 appeared his Afémoires pour servir a Vhistoire anatomique et physiologique des végétaux et des animaus, a collection of all his biological papers of any im- portance.

DUVAL, Jurzs (1813-1870), a French economist, was born at Rodez, in the department of Aveyron, received his early education at the college of St Geniez d'Olt, passed as advocate at the age of twenty-three, and for eight years held an official position first at St Affrique and afterwards in his native town. On the pacification of Algeria he took an active part in the foundation of the Union Agricole d'Afrique; and in 1847 he established an agricultural colony in the plain of Siz Obliged by ill health to abandon in 1850 the personal charge of the enterprise, he did not leave the country, but in 1852 became editor of the ficho @' Oran, and from 1858 to 1861 acted as member and secretary of the general council of the province of Oran. Removing to Paris in the latter year, he there devoted him- self to the literary exposition of his views ; and among numerous other enterprises founded and edited till his death the Economiste Francais, a weekly periodical devoted to the treatment of all matters connected with colonization and social reform, which bore his favourite device of libre ea harmonique essor des forces. He was killed at Plessis-les- Tours in a railway accident on the 20th of September 1870, while on his way to his native town.

Besides a series of contributions to the Journal des Débats and the Revuc des Deux Mondcs, he wrote Tableau de UV Algérie (1854), Les colonies et 1 Algérie aw concours général ct national @agriculture de Paris en 1860, Gheel ou une colonie daliénés (1860), Histoire de Vénrigration europénne, asiatique, et africaine au XIX. siécle(1862,— probably his masterpiece, and the work by which he gained the prize offered by the Académie des sciences morales in 1860), Les colonies et la politique coloniale dela France (1864), Des rapports entre la géographie et Péconomie politiques (1864), Mémoire sur Ant. de Mont Chrétien, auteur du premier traité d'éeononvle polrtique

(1868), Notre Pays (1869), Notre planéte (1869). See Levasseur's ** Notice sur J. Duval" in Bulletin de la Soc. de Géogr., 1876.

DUV—DWA

DUVERGIER DE HAURANNE, Jean (1581-1643), abbé of St Cyran, a celebrated French theologian, was born at Bayonne in 1581. He studied theology at the university of Louvain, where he formed an intimate friendship with Jansen, who was his fellow student. After quitting Louvain he went to Paris, where his intimacy with Jansen continued, and with him he pursued with great ardour the study of the fathers. Leaving Paris in 1611, they con- tinued the same studies at Bayonne, where Duvergier received the canonry of the cathedral. When Jansen left Bayonne, Duvergier returned again to Paris, and shortly after his arrival there his inflexible and ascetic character secured for him the esteem of the bishop of Poitiers, who gave him a canonry, and in 1620 made him abbé of St Cyran. He established in the monastery the order of St Benéit in all its rigour ; but his zeal for reform was so great that it awakened opposition, and he found it expedient to quit his diocese and return to Paris. Here he formed a connection with the influential Arnauld family, and along with Angelique Arnauld, directress of the convent of Port Royal, he completely reformed that institution. His rigor- ous asceticism acquiring for him great ascendency over feminine minds, his fame and influence increased with great rapidity, and he soon began to number among his disciples members of the highest classes of society, and to have as his personal friends some of the chief dignitaries of church and state. Soon, however, his enemies came to be as numerous as his

friends. His rigid and domineering dis- position began to alienate from him many of his disciples ; and, taking a leading part in the Jansenist controversy, he excited against himself the peculiar animosity of the Jesuits. At last his views came to be suspected by Richelieu, and he was arrested and thrown into prison at Vincennes, 14th March 1638. No evidence could be obtained from his papers sufficient to criminate him, but to limit his influence he was retained in durance at Vincennes—where, however, he was able to keep up intercourse with his penitents and disciples. On the death of Richelieu he regained his liberty, and resumed his religious duties and his war with the Jesuits with the same energy as before ; but he enjoyed only six months of freedom, dying from a stroke of apoplexy, 10th October 1643.

DWARAKA, Dwarka, or Jicat, a town of British India, in Guzerat, near the extremity of the peninsula of Kattywar, in 22° 15’ N. lat. and 69° 1’ E. long. It is sur- rounded by a wall, has about 2000 permanent inhabitants, and trades in chalk, As the birthplace and residence of Krishna, it is the most sacred spot in this part of India, and its principal temple is visited annually by many thousand pilgrims. The approach from the sea is by a fine flight of stone steps, and the great pyramid rises to a height of 140 feet. Dwaraka is of course frequently mentioned ia te Mahabharata, It was occupied by the British in

DWARF (Saxon dwerg, dweorg; German, Zwerg), a term applied to men, animals, and plants that fail to reach even the mediocrity of growth natural to their respective classes, It is also otherwise applied. In France, for instance, a yolkless egg is termed “un ceuf nain,” or dwarf egg; and an imitation of fine English cloth is called “nain Londrin,” technically “ London dwarf.”

The nanus or pumilo of the Romans might be a dwart by nature or a person dwarfed by cruel art. Inthe former case, his lack of height found compensation in increased strength, as exemplified in the line by Propertius, “ Nanus et ipse suos breviter concretus in artus,” &c.; in the latter, where growth had been early suppressed by the dealers who manufactured monstrosities for fashionable people in Rome, weakness bred

contempt. The manus, or, if he were more than usually diminutive, the nanium, was exposed to

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application of the proverb, “nanus cum sis, cede,” equivalent to “little people must not be in our way!”

Various have been the recipes for dwarfing children from birth. The most effective, according to report, was anoint- ing the back bone with the grease of moles, bats, and dormice. It is also said that pups were dwarfed by frequently washing their feet and backbone ; the consequent drying and hardening of those parts hindered, it was alleged, their extension. In England, the growth of boys intended for riders in horse-races is kept down to some extent by the weakening process of ‘‘ sweating.”

There isa familiar story of a partnership entered into between a dwarfand a giant. The dwarf had the intellect, the giant had the strength; the result of this limited lability was that the giant received all the blows, and the dwarf all the profits. The partnership was consequently broken up.

Tt could not have been for this reason that Stanislas, ex- king of Poland and duke of Lorraine, was so attached to his dwarf, Nicholas Ferry, otherwise known as “ Bebé,” for this dwarf was weak in mind and body. Bébé was one of three dwarf children of peasant parents in the Vosges. He was 3 feet in height, and his fame has not died out at Nancy and the department of the Meurthe. At his death in 1764 he was in his twenty-third year; and, among the fine phrases of which his epitaph is composed, the world is still assured that Bébé was “ chéri du nouvel Antonin.”

But Bébé was not so remarkable a dwarf as Richebourg, who died in Paris in 1858, at the age of ninety. He was only 23 inches in height. In his childhood he was a servant (without especial duty) in the Orleans family. In later years, Richebourg was their pensioner. He is said to have been put to strange use in the Revolutionary period,— passing in and out of Paris as an infant in a nurse’s arms, but with despatches, dangerous to carry, in the little man’s baby wrappings! At present, on the Continent, Russia and Turkey alone have a common sympathy for dwarfs. At the court of the sultan,

should the dwarf, besides being of elfish height, be deaf, dumb, and qualified to.hold a placé

among the official eunuchs, the poor creature is accounted as a priceless treasure. The early history of British dwarfs is less studded with wonders than the record of dwarfs of the classical times. Britain has nothing to compare with Philetas of Cos, the little tutor of Ptolemy Philadelphus. lian would have us believe that Philetas was so light as well as diminutive that he wore leaden weights in his pockets to prevent his

being blown away. Nor does any British chronicle register

such minute marvels as the couple of dwarfs possessed by

Julia, the niece of Augustus, namely, Coropas and Julia's

little handmaid Andromeda. The height of both was 2 feet 4 inches. This, however, was little less than the stature of the Aztec dwarfs who were exhibited (and were publicly married) in London some twenty years ago. It is not that British annals or tradition can be said to be entirely silent on dwarfs as wonderful as A®lian's. The earliest, known by the now generic name of "Tom Thumb," presents himself to us in the ancient ballad which begins with the record that "In Arthur's court Tom Thumb did live." Antiquaries, on probably no better foundation, are content with placing the proto-Thumb at the court of King Edgar. It is certain that such shrunken samples of humanity figured in great festivals, as we see their foreign brethren in some of the pictures of the Italian aud Spanish masters. The first English dwarf of whom there is authentic history was presented to Queen Henrietta by the duchess of Buckingham, as he stept out of a pie at a banquet. This was Jeffery Hudson of Rutlandshire. He was born in 1619, and was only 1} feet high from his eighth year to his thirtieth, after which he grew to the stature of 3 feet 9 inches, and never went beyond it. His life was not made up of court pleasures. He fought two duels,—one with a turkey-cock, a battle recorded by Davenant, and a second with Mr Crofts, who came to the meeting with a squirt, but who in the more serious encounter which ensued was shot dead by little Hudson, who fired from horseback, the saddle putting him ona level with his lofty but unlucky antagonist. Twice was Jeffery made prisoner,—-once by the Dunkirkers as

he was returning from France, whither he had been on homely business for the queen ; the second time was when he fell into the hands of Barbary corsairs. In each case his liberty was soon purchased. But Jeffery died in prison, nevertheless, He was accused of participation in the “ Popish Plot,” and in 1682 this dwarf died in the Gate House, in the sixty-third ear of his age.

Contemporary with Hudson were the two dwarfs of Henrietta Maria, Gibson and his wife Anne. They were married by the queen’s wish ; and the two together measured only a couple of inches over 7 feet, They had nine children, five of whom, who lived, were of ordinary stature. Edmund Waller celebrated the nuptials, Evelyn designated the husband as the “ compendium of a man,” and Lely painted them hand in hand. Gibson was miniature painter to Charles I, and drawing-master to the daughters of James IT., the Princesses Mary and Anne, when they were children. This Cumberland pigmy, who began his career as a page, first in a “gentle,” next in the royal family, died in 1690, in his seventy-fifth year, and is buried in St Paul’s, Covent Garden. The last court dwarf in England was Coppernin, a lively little imp in the service of the Princess (Augusta) of Wales, the mother of George III The last dwarf retainer in a gentleman’s family was the one kept by Mr Beckford, the author-of Vathek: and builder of Fonthill. He was rather too big to be flung from one guest to another, as used to be done at after-dinner tables, when the wine had got the better of common sense.

Of exhibited dwarfs in England, the most celebrated was the Pole, Borulwaski, whom fashion patronized in the last

century and forgot in the present one. He was then a yard and 3 inches in height, and he had a sister shorter than himself by the head and shoulders. Borulwaski was a handsome man, a wit, and something of a scholar. He travelled over all Europe; and he—born in the reign of George II., 1739—died in his well-earned retirement near Durham, in the reign of Victoria, 1837, Borulwaski, buried in the above-named city, lies by the side of the

Falstaffian Stephen Kemble. The companionship reminds one of that of the dwarf skeleton of Jonathan Wild by the side of that of the Irish Giant, at the Royal College of Surgeons, London.

In the year in which Borulwaski died, 1837, the line of publicly exhibited dwarfs was continued by the birth of the existing American pigmy, Charles Stratton, better known as “Gereral Tom Thumb.” In 1844 he appeared in England, where his grace, vivacity, and good humour made him popular, from the royal family to the general public, before whom he acted at the Lyceum Theatre, He also made his appearance on the stage in Paris. After extensive travel in both hemispheres, he again visited England in 1857, but the dwarf man, despite mapy personal and intellectual qualities, was less attractive than the dwarf boy. In the year 1863 the “General” married the very minute American lady, Lavinia Warren (born in 1842), with whom he has seen many lands, and they are now enjoying honourable retirement in their own. (J. DO.)

DWIGHT, Timorny (1752-1817), an eminent American divine, was born at N orthampton, Massachusetts, 14th May 1752. His father, though educated at Yale College, was a merchant, and his mother the third daughter of Jonathan Edwards. His mother began to instruct him almost as soon as he was able to speak, and it ig said that he learned the alphabet at a single lesson, and before Le was four years old was able to read the Bible. In 1765 he entered Yale College, and received his B.A. degree in 1769, shortly after which he went to take charge of a grammar school at Newhaven, where he remained two years. In September 1771 he was appointed tutor in Yale College, where he distinguished himself by the skill with which he taught the higher mathematics. In the same year he began an epic poem entitled the Conquest of Canaan, which was published in 1785. He received his degree of M.A. in 1772, and afterwards pursued his studies with the view of adopting law as his profession, but, changing his intention, was licensed as a preacher of the gospel in 1777, and accepted the office of chaplain to the forces, which post he held for some time. In 1783 he was ordained minister of Greenfield in Connecticut, when he opened an academy which speedily acquired a very high reputation, and attracted scholars from all parts of the Union. He received the degree of D.D. from Princeton College in 1785, and that of LL.D. from New Jersey in 1810. In 1795 he was elected president of

Yale College, and by his judicious management restored that institution to the high place from which it had fallen before his appointment. He died at Philadelphia on the 11th January 1817. Dr Dwight was the author of a considerable number of essays and sermons; and his Theology Explained and Defended in a serves of Sermons was published in 5 vols., with a life of the author, in 1818. Two additional volumes of sermons were published in 1827, and had an extensive circulation both in the United States and in England.

DWINA, a name common to two important rivers of European Russia.

(I.) The Norruern Dwina, or Dvina Sievernaya, be- longs to the basin of the White Sea, and is formed by the junction of the Sukhona and the Yuk, which, rising the former in the south-east and the latter in the south-west of the government of Vologda, meet in the neighbourhood

of Veliki Ustyug, at a height of 300 feet above the sea, in 60° 46’ N. lat. and 46° 20’ E. long. From its mouth, in the Gulf of Archangel, the distance to the confluence of the co-tributary streams is about 400 miles, and to the source of the Sukhona 750 miles. The drainage area is estimated at from 140,000 to 145,000 square miles. Except at the rapids the current of the Dwina is comparatively slow, as the average fall per mile is only 9 inches, Till its union with the Viuchegda, a river which exceeds it in volume, it flows for the most part ina single, well-defined, and permanent channel; but below that point it often breaks np into several branches, and not unfrequently alters its course. In the neighbourhood of Archangel it divides into three distinct arms, which form a regular delta; but of these that of Berezoff alone is navigable for seafaring vessels, and even it is crossed by a bar at the mouth with not more than 144 or 154 feet of water at full tide. Above the confluence of the Viuchegda the breadth is about 1750 feet; below that point it widens out to 3500; and near Archangel it attains more than three times that measure. The river affords a valuable means of inland navigation. From Vologda to Archangel the ordinary passage requires from 10 to 12 days, and the return journey from 6 to 8 weeks. The channel is free from ice for about 174 days in the year.

II. The Sournern Dwina, or Duina Zapadnaya, in German Dina, belongs to the Baltic basin, and takes its rise in a small lake about 800 feet above the level of the sea, in the government of Tver, not far from the sources of the Volga and the Dnieper. In its whole course of about 600 miles it waters the seven governments of Tver, Pskoff, Vitebsk, Mogileff, Vilna, Curland, and Livonia ; and it is calculated that it drains an area of about 65,000 square miles. From Diinaburg to Riga, a distance of 204 miles, there is altogether a fall of 295 feet, of which 105 are in the 46} miles from Jakobstadt to Friedrichstadt. In the lower part of its course the river attairs an ordinary depth of 30 feet, and an average breadth of 1400 feet; but during the spring flood it sometimes rises 14 feet above its usual level, and extends its waters for about a mile. The inundation lasts at Riga from two to ten days. Near the mouth the river is usually free from ice 245 days in the year, and in the government of Vitebsk for 229. It is pavigable from the confluence of the Mezha downwards, but the number of rapids and shallows greatly diminishes its value. No fewer than 62 of the former are counted below Jakobstadt, and among these are some of the most dangerous of all. The passage to'Riga from Velish usually takes thirteen days, from Disna seven, from Diinaburg four, from Friedrichstadt one. Navigation can also be carried on by the following tributaries of the Dwina—the Toropa, the Usviat, the Mezha and Obshei, the Kasplia, the Ulla, and the Bolder-aa. By Ptolemy and Marcian of Heraclea the river is mentioned as the Rhubon or Rhudon ; at a later date it is called the Khezin or Turunt, and till the present day has the name of Polot among the White Russians. The modern designation is said to be due to the Schleswig and Bremen sailors, who were struck by the sandstone hills at the mouth of the river.

DYCE, Atzxanper, (1798-1869), a distinguished dramatic editor and literary historian, was born at Edin- burgh on the 30th June 1798, and, after receiving his early education at the High School of his native city, became a student at Exeter College, Oxford, where he graduated as B.A. Having adopted the clerical profession, he officiated as curate at Lantegloss, in Cornwall, and subse- quently at Nayland, in Suffolk ; and, in 1827, he settled in London. His first books were Select Translations from Quintus Smyrncus, an edition of Collins, and Specimens of British Poetesses. He issued annotated editions of George

Peele, Robert Greene, John Webster, Thomas Middleton, and Beaumont and Fletcher, with lives of the authors and much illustrative matter. He completed an edition of Shirley left unfinished by Gifford, and contributed biogra- phies of Shakespeare, Pope, Akenside, and Beattie to Pickering's Aldine Poets. He has also edited several of Bentley's works, and Specimens of British Sonnets ; and his carefully revised edition of John Skelton, which appeared in 1848, did much to revive interest in that trenchant satirist. In 1857 his edition of Shakespeare was published by Moxon ; and the second edition, a great improvement on the old one, was issued by Chapman and Hall in 1866. Dyce's interest in Shakespeare manifested itself further in such works as Remarks on Collier's and Knight's Editions of Shakespeare, A Few Notes on Shakespeare, and Strictures on Collier's new Edition of Shakespeare. He was intimately connected with several literary societies, and undertook the publication of Kempe's Nine Days' Wonder for the Camden Society ; and the old plays of Z¢mon and Sir Thomas More were published by him for the Shakespeare Society. He was associated with Halliwell, Collier, and Wright as one of the founders of the Percy Society, which aims at publish- ing old English poetry. Dyce also issued Mecollections of the Table-Talk of Samuel Rogers, which has been several times reprinted both in Britain and in the United States. The editions of the dramatists already mentioned were re-issued with many improvements. Dyce died on the 15th May 1869. His reputation rests on his contributions to English literary biography, and on the untiring industry, abundant learning, and admirable critical acumen displayed in his editions of the old English poets. His wide read- ing in Elizabethan literature enabled him to explain much that was formerly obscure in Shakespeare ; while his sound

judgment was a sure check to anything like extravagance

in emendation. His labours resulted in the best text of Shakespeare we possess. While preserving 'all that is valuable in former editions, Dyce has added much fresh matter. The Glossary, which consists of a large volume of 500 pages, is the most exhaustive that has appeared. Not only rare words are explained, but common words when employed with an unusual meaning, phrases, proverbs, old customs, and difficult allusions. The book

is, therefore, an important contribution to philology and to the history of the English language, as well as to the elucidation of the text. The mere number of words in Dyce's Glossary shows a great advance in comprehensiveness. It is calcu-

lated that the Globe Glossary has about 2000 words,

and Staunton's 2500, while Dyco's has upwards of 5000. The meanings of the words, as used by the poet, are accurately given, and are illustrated by literary quotation and linguistic comment. Altogether Dyce's Shakespeare is likely long to remain the standard edition of our English dramatist.

DYCE, Wrtt1am (1806-1864), a distinguished painter, was born in Aberdeen, where his father, a fellow of the Royal Society, was a physician of some repute. He attended Marischal College, took the degree of M.A. at sixteen years of age, and was destined for one of the learned professions. Showing a turn for design instead, he studied in the school of the Royal Scottish Academy in Edinburgh, then as a probationer (not a full student) in the Royal Academy of London, and thence, in 1825, proceeded to Rome, where he spent nine months. He returned to Aberdeen in 1826, and painted several pictures; one of these, Bacchus nursed by the Nymphs of Nysa, was exhibited in 1827. In the autumn of that year he went back to Italy, showing from the first a strong sympathy with the earlier masters of the Florentine and allied schools. A Virgin and Child which he painted in Rome in 1828 was much noticed by Overbeck and other foreign artists. In 1829 Dyce settled in

Edinburgh, taking at once a good rank in his profession, and showing considerable versatility in subject-matter. Portrait-painting for some years occupied much of his time ; and he was particularly prized for likenesses of ladies and children. In February 1837 he was appointed master of the school of design of the Board of Manufactures, Edinburgh. In the same year he published a pamphlet on the management of schools of this description, which led to his transfer from Edinburgh, after eighteen months' service

there, to London, as superintendent and secretary of the then recently established school of design at Somerset House. Mr J. R. Herbert was head-master about the same time. Dyce was sent by the Board of Trade to the Continent to examine the organization of foreign schools ; and a report which he eventually printed, 1840, led to a remodelling of the London establishment. In 1842 he was made a member of the council and inspector of provincial schools, a post which he resigned in 1844. In this latter year, being appointed professor of fine art in King's College, London, he delivered a noticeable lecture, The Theory of the Fine Arts. In 1835 he had been elected an associate of the Royal Scottish Academy ; this honour he relinquished upon settling in London, and he was then made an honorary R.S.A. In 1844 he became an associate, in 1848 a full member, of the London Royal Academy; he also was elected a member of the Academy of Arts in Philadelphia. He was active in the deliberations of the Royal Academy, and it is said that his tongue was the dread of the urbane President, Sir Charles Eastlake, for Dyce was keen in speech as in visage ; it was on his proposal that the class of retired Academicians was established. In January 1850 Dyce married Jane, daughter of, Mr James Brand, of Bedford Hill, Surrey. He died of a cancerous disease in his house at Streatham on 14th February 1864, leaving two sons and two daughters,

Such is a brief outline of the honourable and prosperous career of one of the most learned and accomplished of British painters—one of the highest in aim, and most con- sistently self-respecting in workmanship, His finest pro-ductions, the frescoes in the Queen's Robing-room in the Houses of Parliament, may rightly be called great, and an honour to the country and time which produced them; these frescoes, and the water-glass paintings of Maclise in the same building, would find few rivals in contemporary Continental labours. Generally, however, there is in Dyce's work more of earnestness, right conception, and grave, sensitive, but rather restricted powers of realization, than of authentic greatness. He has elevation, draughtsmanship, expression, and on occasion fine colour; along with all these, a certain leaning on precedent, and castigated semi- conventionalized type of form and treatment, which bespeak rather the scholarly than the originating mind in art. The following are among his principal or most interesting works (oil pictures, unless otherwise stated). 1829: The Daughters of Jethro defended by Moses; Puck. 1830: The Golden Age; the

Infant Hercules strangling the Serpents (now in the National Gallery, Edinburgh) ; Christ crowned with Thorns. 1835: A Dead Christ (large lunette altar-piece). 1836: The Descent of Venus, from Ben Jonson's "Triumph of Love ;" The Judgment of Solomon, prize cartoon in tempera for tapestry (National Gallery, Edinburgh). 1837: Francesca da Rimini (National Gallery, Edinburgh), 1838, and again 1846: The Madonna and Child, 1839; Dunstan separating Edwy and Elgiva. 1844: Joash shooting the Arrow of Deliver- ance (the finest perhaps of the oil-paintings). 1850: The Meeting of Jacob and Rachel. 1851; King Lear and the Fool in the Storm. 1855: Christabel. 1857: Titian's ae Colouring. 1859: The Good Shepherd.

: ohn bringing Home his Adopted Mother ;

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Pegwell Bay (a coast scene of remarkably minute detail, showing the painter's partial adhesion to the so-called ''pre-Raphaelite" movement of that time). 1861: George Herbert at Bemerton. Dyce executed some excellent cartoons for stained glass :~-that for the choristers' window, Ely Cathedral, and that for a vast window at Alnwick in memory of a duke of Northumberland; the design of Paul rejected by the Jews, now at South Keningston, belongs to the latter. In fresco-painting his first work appears to have been the Consecration of Archbishop Parker, painted in Lambeth Palace. In one of the West- minster Hall competitions for the decoration of the Houses of Parliament, he displayed two heads from this composi- tion; and it is related that the great German fresco-painter Cornelius, who had come over to England to give advice, with a prospect of himself taking the chief dircction of the pictorial scheme, told the Prince Consort frankly that the English ought not to be asking for him, when they had such a painter of their own as Mr Dyce. The cartoon by Dyce of the Baptism of Ethelbert was approved and com- missioned for the House of Lords, and is the first of the works done there, 1846, in fresco. In 1848 he began his great frescos in the Robing-room—-subjects from the legend of King Arthur, exhibiting chivalric virtue. The whole room was to have been finished in eight years ;

but ill-health and other vexations trammelled the artist, and the series remains uncompleted. The largest picture figures Hospitality, the admissiou of Sir Tristram into the fellowship of the Round Table. Then follow—Religion, the Vision of Sir Galahad and his Companions; Generosity, Arthur unhorsed, and spared by the Victor ; Courtesy, Sir Tristram harping to la Belle Yseult ; Mercy, Sir Gawaine's Vow. The frescos of sacred subjects in All Saints' Church, Margaret Street, London; of Comus, in the summer-house of Buckingham Palace ; and of Neptune and Britannia, at Osborne House, are also by this painter.

Dyce was an elegant scholar in more ways than one. In 1828 he obtained the Blackwell prize at Aberdeen for an essay on animal magnetism. In 1843-4 he published an edition of the Book of Common Prayer, with a dissertation on Gregorian music, and its adaptation to English words. He founded the Motett Society, for revival of ancient church-music, was a fine organist, and composed a "non nobis " which has appropriately been sung at Royal Academy banquets. His last considerable writing relating to his own art was published in 1853, Zhe National Gallery: its Formation and Management. (Ww. M. R.)

DYEING is the art of colouring in a permanent manner porous or absorbent substances by impregnating them with colouring bodies. Most vegetable and animal bodies are porous or absorbent, and can be dyed; some minerals also, such as marble, can absorb liquid colouring matters; but the term dyeing is usually confined to the colouring of textile fibrous materials by penetration. The superficial application of pigments to tissues by means of adhesive vehicles, such as oil or albumen, as in painting or in some kinds of calico-printing, is not considered as a case of dyeing, because the colouring bodies so applied do not penetrate the fibre, and are not intimately incorporated with it. The mere saturation of textile fibre with a solution of some coloured body and subsequent drying do not constitute

-a case of dyeing, unless the colour becomes in so far

permanently attached to the fibre that it cannot be washed out again by the solvent employed or by common water. In the present article dyeing will be considered only with relation to the vegetable and animal fibrous substances which are commonly used in clothing or furniture,—the less

important arts of dyeing feathers, skins, ivory, wood, marble, &ec., being left over for treatment under other headings.

DYEING

HISTORICAL SKETCH.

That dyeing was practised in the most ancient times is abundantly proved by the frequent mention of dyed colours in the oldest extant writings ; that it was not a common art seems apparent from the uses to which coloured garments were devoted, and the distinction which they conferred upon the wearers. It is probable that such definite and bright colours as the “blue, and purple, and scarlet ” mentioned several times in the book of Exodus, as well as the Tyrian purple so often referred to by Roman writers of the Augustan age, were so costly as not to be available for general and common use. Pliny is the only one of the older writers from whom we might have expected some account of the processes of dyeing employed at his time ; but, except a reference to two or three tinctorial substances, and a description of a process of obtaining several colours by one dyeing operation, which he saw practised in Egypt (see Cattco-PRINTING, vol. iv. p. 684), there is nothing detailed in his writings ;—he in fact formally excuses himself from entering upon the subject as one not worthy of his atten- tion. The Tyrian purple is the only dye treated of at some length in Pliny and contemporary authors; its discovery and employment gave wealth and prosperity to Tyre and Sidon more than 1000 years B.c. In the days of the Roman conquests in the Hast it was reserved under penal statutes for imperial use; its production then declined, and eventually both the material and the art of using it were lost. From Pliny’s description, modern investigators were enabled to rediscover the shell-fish which yielded the dye, but the colours furnished by it were neither so bright nor so permanent as those obtainable from much less costly dyeing materials; and there is reason to conclude that the most brilliantly tinted garments of an Egyptian priest of Isis or Osiris, or the mantle of a Roman emperor, were poor and dull in hue compared with those within reach of a domestic servant of the present time.

From many independent sources —— Homer, Strabo, Herodotus, &c.,—it is clearly shown that the manufacture of coloured tissues was carried on by

the Oriental nations. A knowledge of the art spread slowly westward, but there are few records of its existence to be found from the time of Pliny to about the 13th century. It would appear that the Jews held the secret or the monopoly of the dyeing art during this long period. According to Mrs Merrifield, Benjamin of Tudela relates that when he visited Jerusalem between 1160 and 1173 he found only 200 Jews resident in that city, and these were all engaged in wool-dyeing, which trade was entirely in their hands. Beckmann shows that at the same epoch the art of dyeing in Italy was principally carried on by Israelites. It is in Sicily that we ean first distinctly discern the practice of dyeing in Europe ; afterwards the Italians generally practised it; and in the 13th century dyers formed important guilds in Florence, Venice, and other cities. It is not to be supposed that the art of dyeing was ever completely lost; the records of particular seats of the art only indicate that at such places some special excellence had been acquired which gave them a higher reputation than was enjoyed by others. The domestic records of all modern nations speak of dyers and dyed cloths. Among the ancient laws of Ireland are some which lay down the number of colours that may be employed in the dress of various classes of society, the monarch alone being permitted to wear seven colours ; from which it may be inferred that if the Irish at a very early period were not dyers, they at least had variously dyed garments. Similar facts can be adduced of all countries that possess an early literature.

From the perishable nature of textile substances and their comparatively small intrinsic value, very few ancient

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examples of the dyer’s art have been preserved. We have, however, one account of a‘ cloth containing dyed yarn which may have been in the dyer’s hands in Egypt 1000 years before the Christian era; and we have still in good preservation ecclesiastical vestments containing dyed silks which are certainly 600 to 700 years old. The late Mr Thomson of Clitheroe examined numerous mummy cloths, some of which had a border of blue and fawn-colour made by coloured threads introduced into the loom. The blue, upon examination, was proved to have been dyed with indigo ; other specimens of mummy cloth of a reddish colour appeared to have been dyed with

safflower, though this colouring matter could not be recognized with the same certainty as indigo. Dr Rock, in his catalogue of the textile fabrics in the South Kensington Museum, attributes many of the church vestments there preserved to the 12th and 13th centuries, and in these can be seen silks of all the colours known to dyers up to the middle of the present century, which, though in most cases changed and faded, still present sufficient evidence that dyeing, upon this material at least, was successfully practised in the Middle Ages. It is interesting further to note that in inventories of vestments of the 13th century the silks in the vestments are often designated by their colours, as in a chasuble at St Paul's, London, 1295, which is set down as " purpureo aliquantulum sanguineo," of a purple inclining to blood red. This, as Dr Rock says, is intelligible; but other definitions are not, as "pannus Tarsici coloris," a Tarsus- coloured cloth; it can only be conjectured that it was a purple dyed at Tarsus, and something like the Tyrian purple ; sky-blue silk is named "indicus," probably because it was dyed with indigo.

The earliest account of the processes and materials used by dyers is to be found in a collection of manuscripts in the French National Library, No 6741, known as the manu- scripts of Jehan le Begne. These mostly refer to the art of painting and the making of artists' colours and the modes of applying them, but some describe the preparation and use of dyes. The most interesting of these manuscripts is by Jehan Alcherius (Le Begne was only the copier or com- piler), which from internal evidence cannot be dated later than the year 1410, and some parts of which refer to a period at least thirty years earlier. Among the colouring matters and mordants there mentioned we find iron (the dust or mud from grindstones on which knives are ground) dissolved in vinegar and mixed with alum, green copperas, and gall nuts prescribed as a black colour ; and methods are given for the use of Brazil wood, litmus, indigo, in con- junction with lime and honey, verdigris, alkalies, oxide of tin, kermes, &c., much in the same way as those employed four centuries later by dyers and calico-printers. There are also eleven receipts for preparing colours, for painting on cloth to imitate tapestry,—examples of which (tozles peintes) of the 15th century were exhibited in Paris in 1876. Curiously enough, a certain Fleming named Theo- dore in 1410 brought these receipts to Alcherius from London, where they were in regular use. They are all chemical dyes, and seem to be the

prototypes of the same class of colours employed long subsequently by calico- printers in England and other countries.

The first printed account of dyeing processes was an Italian work. It is referred to under the title Mariegola dell' arte det Tintori, published at Venice in 1429. The writer has never seen a copy of this work, nor does it appear that any exists in the chief libraries of Europe ; an enlarged edition was published in 1510. In 1548 Rosetti wrote an account of dyeing, which was also published at Venice. Copies of this are not very scarce; it is the only one of these early books which is actually known. The so-called Bolognese manrscript translated in Merrifield's

Ancient Practice of Painting, is preserved in the convent of St Salvatore at Bologna, and is said not to be of later date than the middle of the 15th century—that is, about 100 years anterior to the date of Rosetti's work. In this manuscript, in addition to the materials enumerated by Alcherius, mention is made of woad and methods of making indigo from it; of indigo imported from India, called bagadon and lagadel,; of sumach, gall nuts, and lac; of the berries of buckthorn, similar to the Avignon or Persian berries, to be used for yellow ; and of Brazil wood or verzino, sandal wood, and madder for red; and archil for purple. The use of nitric acid to give a yellow colour to silk, and of alum for preparing and mordanting that material, and the subsequent dyeing of it by Brazil wood, are also clearly pointed out. The receipt No. 362 of this manuscript is of interest as showing that the Italian dyers early possessed the method of dissolving indigo by means of the action of honey and quick lime upon it, and used the solution for the blue required in dyeing silk green.

It is very clear, then, from these accounts, and from numerous existing samples of coloured stuffs, that dyeing was well understood in Europe in the 15th century; and that the materials at the command of the dyer were sufficiently numerous and varied to enable him to produce all desired shades of colour. The improvements which took place in the dyeing art from this time until the commence- ment of the present era of artificial colouring' matters were no doubt important in detail,'but not very striking in principle.

The discovery of America was soon followed by the iutro- duction of cochineal (sce vol. vi. p. 97), but this did not enable the dyer to produce any new colours, since it differed from the ancicnt kermes, frequently called grana or grains, only in being ten or twelve times as rich in colouring matter. Logwood or Campeachy was also an introduction from the New World, and greatly enlarged the power of the dyer, though, from the looseness of the colours it yielded, it brought his art into some disrepute ; it was in many respects a new colouring matter, but eventually settled down as the principal ingredient in the common black dye. In mordants, the discovery in Holland in the 17th century of the use of solutions of tin in acid, especially for the scarlet dye with cochineal, was one of the greatest utility. The gradual introduction of the acetates of aluminium and iron to replace the respective sulphates was of more importance to calico-printing than dyeing proper. At the close of the last century Dr Bancroft discovered and introduced quercitron bark from America for dyeing yellows, and this, from its superior richness and less cost, displaced other materials used for that purpose, Of the natural dyes intro- duced in the present century probably the most important Is catechu. The discovery of the use of bichromate of potash as a mordant for woollen goods belongs to the latter half of this century, and has been of the highest benefit to the dyer. We shall not speak in detail of a number of dye- stuffs used by dyers of the present day, which were probably unknown to their predecessors, because most of them are only varieties of what have been long employed. Such, for example, are valonia, divi-divi, and myrobalans, which have no properties different from galls or sumach, and the different red woods, which are merely varieties of the anclently known Brazil woods,

Artificial Colouring Matters.—In the year 1858 com- menced the discovery and application of a series of artificial colouring matters, which have created a distinct era in the history of dyeing. Up to that date the colouring matters used in dyeing were either the spontancous productions of nature or simple preparations of the same. An exception, a a eed be made to this statement in respect of

an blue and the so-called sulphate of indigo, which

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have been largely used as colours in dyeing since the middle

of the last century, and are as truly products of art as any of the modern creations of chemistry. The purple of murexide had only a brief existence as a dye. Mr Perkin was the first to practically produce a dyeing material from aniline, the well-known mauve or purple shade so much in vogue for several years, for a history of which see vol. ii. Dp 48 of the present work. Other discoveries rapidly followed, and in the course of a few years it may be said that a hundred patents were taken out for methods of making artificial colouring matters from aniline and its homologues ; these alkaloid bases, under the transforming hands of chemists, supplied the dyer with every shade and hue which could be desired. Up to 1869 the artificial colours were of one general family, and had many characters in common ; they were very brilliant, very easily applied on fibre of animal origin (silk and wool), required no mordant, and for the most part were very loose and unstable. Imitating more or less closely the colours obtained on tissues from natural colouring matters, they had no similarity of chemical composition, and were in every other respect fundamentally different from them. In 1868 two German chemists, Graebe and Liebermann, by means of a severe synthetical investigation, succeeded in transforming anthracene into alizarin, the latter being identical in chemical composition as well as tinctorial properties with the colouring matter of madder, one of the most anciently known aud most valuable of all natural dye-stuffs (see vol. i. p. 577). This was the first instance in which chemistry had produced one of the old and well-known colours of the dyer; in a short time after its discovery it was made practically available for the trade, and has at this date (1877) almost entirely driven from the market the native product,—accomplishing a revolution which has no parallel in the history of colouring matters, and which is one of the most signal triumphs of modern chemistry. Other natural colouring matters have since then been produced by art, such as indigo and archil, but from some difficulties in their manufacture they have not yet become commercially avail- able.

Mechanical Improvements.—In the art of dyeing, steam power has proved no less serviceable than in other important industries. Its applications are not further alluded to in this article, but in the article upon Catico-

PRinTING (vol. iv. p. 684) some illustrations of modern machinery may be seen.

GENERAL PRINCIPLES oF DYEING.

Although many eminent chemists have worked and written upon the subject, there still remains much difference of opinion as to what actually takes place in dyeing operations. The following general account of the chief cases of dycing will illustrate the principal methods in use, and serve as an introduction to a description of actual processes practised in dye-houses. Afterwards, the attempts made to con- struct a general theory will be briefly considered. The simplest cases of dyeing are those in which only two substances are employed—the fibre to be dyed and the colouring matter—and where the process of dyeing consists in nothing more than leaving the two materials in contact for a certain time ata convenient temperature. Of natural colouring matters few can be practically used in this simple way without some previous chemical treatment. ‘The arti- ficial colouring matters from aniline, however, illustrate this kind of dyeing very well. To obtain the finest shades of mauve, magenta, purple, and numerous other colours upon wool and silk fibre the whole process consists in placing the material in a solution of the requisite colour and of sufficient quantity to give the desired shade ; it absorbs the

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colour, becoming dyed, while the solution is rendered nearly colourless. During the process the fibrous material is kept in a constant state of movement, so that the dye solution shall have equal access to all portions, the temperature employed and time allowed being regulated according to the necessities of the case. The colour absorbed by the fibre has entered into an intimate state of combination with it, since it cannot be washed out again; a true dyeing has taken place. Besides the aniline colours, the older artificial dyes—sulphindigotic acid, picris acid, and one or two others—have the same property of combining directly with wool and silk.

There are other cases of dyeing closely resembling the foregoing, in which the resulting dyed stuff may be considered as being a binary compound of fibre and colouring matter, but in which the methods of application are less

simple. These may be taken generally as consisting in the use of materials or processes which bring a previously insoluble colouring matter into a soluble state ; thus the pink colours of safflower are obtained by the action of an alkali; and the dyes yielded by archil, arnotto, and indigo are also the result of the action of solvents. It is possible that during the process of solution important internal changes may take place in the composition of the above dyes, but if so, they are only of a temporary nature, for there is no reason to sup- pose that the colouring matter attached to the fibre differs in chemical composition from that which is free.

With regard to nearly all other colouring matters, the above simple processes are quite powerless to induce a permanent combination with the fibre. Let wool or silk be immersed at boiling temperature in decoctions of any of the best known natural dye-stuffs, such as cochineal, logwood, madder, quercitron bark, &c., and then washed in water, it will he found that the fibres are simply discoloured, or stained of no definite shade ; they have taken up but a small portion of colour from the decoction, and no real dyeing has taken place. y

Use of Mordants.—To obtain permanent dyes from the

great majority of native colouring materials the intervention of another class of bodies entirely different from either fibrous or colouring matter is found necessary ; these bodies are called mordants. ‘The term mordant is found in Latin and Italian manuscripts of the 12th and 13th century, as the name of an adhesive composition by means of which gold leaf could be attached to wood, marble, or metal ; early dyers appropriated the word to designate a substance by means of which colouring matters could be made to adhere to fibre, and it has been retained in that sense in all modern treatiscs upon dyeing. _ The chief mordants used in dyeing are salts of aluminium, iron, tin, chromium, copper, and a few other metals. When a decoction of a colouring matter, say logwood or cochineal, is heated with a small quantity of a properly chosen salt of one of these metals, it is found that the colouring principle loses its solubility, forms a combination with the metallic salt or its bases, and precipitates to the bottom of the solu- tion, leaving the supernatant liquid nearly or quite colourless. The precipitate is usually called the “ lake ” of the particular metal and colouring matter,

which are probably in a state of chemical combination ; the lakes are insoluble in water, and are only split up again into their constituents by the action of somewhat powerful chemical agents. .

Fibre cannot usually be dyed by means of ready formed lakes, for the reason that they are insoluble in water and not easily soluble in any menstruum which can be safely applied to such material ; they are themselves of too coarse and gross a nature to penetrate the fibre, and when applied toit rest for the most part on the surface, and are therefore easily removable by washing or mechanical friction. It is known, however, that for some colours in calico-printing

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lakes can be applied, but that is only in conjunction with acid salts and at a high temperature, by means of which a sort of solution is obtained while in contact with the fibre itself. The art of the dyer consists in so arranging these three elements—fibre, metallic salts, and colouring matter— that he may obtain the formation of the insoluble coloured lake in the body of the fibre itself, whereby either by the lake being mechanically retained or chemically combined the fibre is permanently colourcd.

Application of Mordants.—There are three principal ways in which the mordant and colouring matter can be put into contact with the fibre, the developments and modifications of which constitute the whole art of dyeing.

1. By the first method, which is by far the most common, the fibrous matter is separately impregnated with the mordant, which is by various mcans decomposed, so as to deposit its base in an insoluble state upon or within the fibre, and afterwards the colouring mattcr is applied. Take, for example, the case of dycing a common black from logwood upon calico, which has no affinity for the colouring matter of the logwood. The first process is to pass the calico through a hot aqueous solution of sulphate of iron, sometimes mixcd with acetate of iron, and to remove the exeess by pass- ing the cloth through rollers; the cloth, either previously dried or not, is then passed through a mixture of lime and water which has the effect of decomposing the iron salts and liberating oxide of iron. A washing in water to remove the

excess of lime or any loosely attached oxide of iron prepares the calico for coming into contact with the logwood. The calico, which has now a buff colour, owing to the attached mordant of oxide of iron, when placcd iu a hot decoction of logwood speedily acquires a dark huc and in about half an hour has become dycd of a dense black colour, and, when smoothed and finished, forms the common black calico of the shops. A variety of other cascs might be adduced; woollen cloth boiled for some time in bichromate of potash solution acquires a ccrtain amount of a salt of chromium, which enablesit to take a black colour from logwood, and other eolours from other dye-stuils. W oollen, boiled with salts of tin, is enabled to dye up a brillant scarlet in decoction of cochineal; boilcd with alum, it will take a great variety of colows in various dye-stuffs. he practice of calico-printing illustrates in a very forcible manner the action of mordants ; by the aid of apparatus described in the article upon that subject, portions of a piece of calico are impregnated with mordants, and these portions alone acquire colour from the dycing solution, and thus designs or patterns are produced upona white ground. ‘The most usual inethod of impregnating the fibrous matter with mordant, consists in hcat- ing it with the required metallic salts, and it will be secn hereafter that easily decomposed salts are those preferably used ; or substances such as chalk, alkalies, or tartar are addcd to some more stable salt, such as alum, to induce the formation of comparatively unstable compounds, which, under the influence of a high temperature and contact with fibrous matter undergo decomposition, —the metallic oxide or some basic insoluble compound of it becoming intimately combined with the fibre, which is then said to be mordanted.

9, A sccond method, less general than that above described, is to apply the colouring matter before the mordant, It is resorted to only with heavy goods which absorb a large quantity of liquid, or with light colours upon other fabrics ; dyes produced in this way are super- ficial in their character, and not so permanent as those produced by the firstmethod. In dyeing by that method it is in many cases cus- tomary to add a small quantity of mordant to the dye-bath when the process is quite or nearly finished, or to pass the dyed goods, as a final operation, through a diluted mordant. ;

3. A third method is to apply the mordant and the colouring matter together to the fibrous substance. In common piecc-dyeing in weak liquids this plan

is seldom followed, on account of the ten- dency to form insoluble lakes in the solution, which, depositing only on the external part of the fibres, give inferior results, alike as to sta- bility of colour, depth of shade, and evenness or regularity of the dye. In calico printing or in padding, this method is of extended appli- cation and the inconveniences expericnced in common dycing arc no! perecptible, owing to the greater conccntration of the mordant- ing salts and the use of thickening matter. Lakcs are very probably forined to some exteut during the preparation of the mixtures, but, the combination taking place in the presence of a fluid made viscous with gum or stareh, the insoluble lake is in au extremely fine state of division; in such a mixture there is always present an acid cr an acid salt, such as acctic acid, oxalic acid, tartaric acid, or alum, chloride of tin, cream of tartar, or binoxalate of potash. These tend, in the first instance, to restrain the formation of a lake, and after- wards, when the fibre and the mixture of mordant and colouring matter are submitted to heat, as in the process ofstcaming or stoving, facilitate the solution of any lake formed, which thus finds entrance into the fibrous matter, and there undergoes combination with it,

owing to decomposition of the mordanting salts, a true dyeing taking place. –

PRACTICAL DYEING PROCESSES.

By the foregoing preliminary observations the reader will have been prepared to comprehend the rationale of the practical processes of dyeing. In order to give a fairly comprehensive account of these, it has been found con- venient to take the colours in the old arrangement of simple and compound colours. Red, blue, and yellow are supposed to be simple or primitive colours ; the methods of obtaining these being given, then follow the colours from mixtures of two of the elementary colours, as green from yellow and blue, orange from red and yellow, and purple from red and blue. The colours not included in the above, and in the dyer’s philosophy made by mixing the three elementary colours, red, blue, and yellow, in different proportions—namely, the browns, greys, and chocolates, and black—will

be conveniently treated of after those sup- posed to result from the mixture of two of the primary colours.

This arrangement, though perfectly arbitrary, is both convenient and consistent as far as regards dyeing; for though modern discoveries in optics may show that pure blue and yellow do not make green, and may in other respects disturb the older ideas concerning primitive and secondary colours, yet the dyer has sufficient justification for retaining the old system, because he can show that his blue and yellow always make green, and that the proper mixture of the so-called simple colours produces a compound shade which can be calculated beforehand from the propor- tion of the respective colours employed.

Lted Colours.

The most important of the red colours produced by dyeing are obtained from cochineal and from madder, the former being used for woollen and the latter for cotton goods. They are both old colours, and have arrived at their present excellence by slow degrees ; they are deep and brilliant, and, as far as regards permanency, hold the highest position among all dyed colours. The processes employed are instructive as illustrating the diversity of treatment required by different fibres and colouring matters.

Red upon wool from cochtncal.—Let it be assumed that the shade ofred required is fine scarlet, such as is worn by officers of the British army, and that the woollen cloth is of finest quality. The cloth first requires purifying from all the adventitious substances which it has acquired in the process of manufacture, in order to prevent eee Me and unevenness in the shade of colour ; this is done by methods described in the article BLuacninc. The only materials required to produce a fast scarlet upon wool are oxide of tin and the colouring matter of cochineal, but it requires much practical skill to bring them into contact properly. After the cloth is cleaned, and while it is still wet from its last washing, it is moyr- danted by boiling it in a solution of a salt of tin with or without cream of tartar. The parts of the boilers not in actual contact with the fire are frequently constructed of pure block tin, or at least all parts out of water should be of this metal, or else protected by wood, or the dyeing vessel should be made entirely of wood and heated by steam pipes; for if the cloth containing the acid solution of tin comes in

contact with a copper or brass surface it acquires a stain which afterwards dyes up an impure colour. What takes place in the course of boiling is that eventually a certain portion of tin, probably in the state of stannic oxide, becomes fixed upon or within the fibres of the wool, and this in a perfectly uniform manner. The tin notin intimate combination with the wool, or lield merely by capillary attraction, is washed off by water before the cloth is brought into contact with the colouring matter.

The mordanted cloth is now brought into a boiler containing finely ground cochineal diffused through a sufficient quantity of water, to which it is usual to add some more tin mordant and tartar ; the cloth is turned continually to prevent folds or creases from interfering with the free access of the dye to all parts of it. The contents of the boiler are heated to the boiling point, and in half an hour or so the liquid becomes nearly colourless, and the cloth is found dyed of a bright red.

DY eT as.

The above may suffice to furnish a general view of the procedure usually followed, and to illustrate the principles involved with regard to numcrous other dyes besides cochineal. ‘To give the general reader a further idea of certain operations practised in the use of that colour (and the description applies more or less to others), the following particulars may be noted.

The tin mordant used for scarlet on wool.—It is now 200 years since the discovery was made of the use of tin with cochineal for dyeing scarlet; it might be thought that by this time the exact kind and quantity of tin solution to be used would have been settled ; there exists, however, the greatest diversity upon this point among practical dyers. The two salts of tin met with in commerce, de- signated by chemists stannous and stannic chlorides, have received various names from dyers. Crystallized stannous chloride igs gencrally known as ‘tin crystal;” the solution of the same as muriate of tin. A single muriate and a double muriate of tin are also distinguished, the difference being in the degree of concentration; but in some parts of the country double muriate ‘of tin is the name given to a solution of stannic chloride, elsewhere called bichloride of tin, and a good deal of confusion is sometimes caused by the various uses of the trivial names of the solution of tin. Experi- ence teaches the dyer that there are scarcely two dye-works in

the world in exactly the same condition with regard to either water and air, or apparatus, or quality of materials, and that the nature and quantities of drugs, mordants, and dye-stuffsused, and the durationand temperatures of the operations which secure admirable results in one place are altogether unsuitable in another. It is, however, clear that by far the greater part of the variations introduced by practical dyers are not really founded upon necessity. Thus although the best colours can be obtained by the use of simple tin solutions manu- factured on the large scale, in nine cases out of ten the operative dyer of scarlet insists upon preparing his own solution, and pretends that he employs special methods aud preparations without which it would never be fit to use; and hence a countless number of tin solutions are in use.

Tin spirits. —The solution of tin used by dyers for the scarlet and for many other colours upon wool, silks, and cotton, are commonly called spirits, or “tin spirits,” a name which is very old, and appears to have originated in the use of nitric and hydrochloric acids to dis- solve the tin, which acids were formerly,‘and are even at’ present, ealled spirits of nitre and spirits of salts. One solution which is a favourite, from the ease with which its metal goes to the wool, is the so-called nitrate of tin (sometimes called “ bowl spirits,” from being prepared in an earthenware bowl) made by dissolving thin metallic tin in moderately strong nitric acid. This is an operation requiring great care and some experience to prevent the formation of insoluble metastannic acid; the tin is added by small portions and gradually, so that the acid does not become hot; the solution takes place quietly, inodorous nitrous oxide is evolved, and ammonia is formed. Ifthe tin be added too rapidly to the acid, red fumes of nitric oxide are evolved, the liquid boils up, becomes thick from separation of metastannic acid, and is utterly useless as a mordant. This so-called nitrate of tin is a very unstable compound, decomposing spontaneously in a few days, so that it has to be prepared just as it is wanted; it is there- fore not au article of commerce. The other very numerous “tin spirits”’ may be said to be solutions of tin in a mixture of nitric and hydrochloric acids ; but the latter acid is sometimes replaced by the chlorides of sodium and ammonium, the resulting mordant being essentially a stannic chloride mixed with stannous chloride. Closely woven and loose woollen fabrics, such as yarn aud flannel, require different tin mordants, as some mordants are more quickly decom- posed than others.

The result of using an easily decomposable mordant such as the nitrate of tin upon closely woven cloth would be the formation of a deposit upon the external fibres of the wool, the interior of the cloth being unaffected. For such cloth, therefore, a tin spirit whichis only slowly decomposed, such as the muriate alone or mixed with tartar, must be chosen, so as to allow of a tolerably thorough saturation of the cloth before the breaking up of the mordant during the boiling. Here it may be observed that good, thick, and finely woven cloth which is dyed in the piece, that is, after weaving, is hardly cver completely dyed through ; this can easily te shown by cutting through the cloth with a sharp knife, when the interior will be seen sometimes nearly white and generally much paler than the exterior ; hence the preference which is given to cloth made from yarn dyed before weaving, the colours of which do not fade so readily as those of piece-dyed goods. Imperfection in the dyeing of the latter can by care, however, be reduced toa minimum, and indark goods is hardly discernible.

Use of tartar along with tin mordant.—The “ tartar” of the dyer is a more or less impure form of the cream of tartar of the shops, or the acid potassium tartrate of chemists. It is in very general use for wool dyeing, and when employed with dye-stuffs plays the part of an acid, and could in fact be replaced by an acid ; in other cases, when used in mordanting, it no doubt acts as a salt, contributing to neutralize the strong mineral acids of the mordant, and rendering them more ready to decompose in the presence of the cloth. In a particular receipt for dyeing scarlet the proportions of materials are

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as follows :—20 ib of tin solution, containing about 20 ounces of metallic tin dissolved in nitrie acid, with the addition of. a little common salt, are used to 100 Ib of woollen cloth. Of the 20 ib of mordant, 18 tb are taken and mixed with a solution in water of 8 tb of crude tartar, and abont 8 ounces of eochineal are added to enable the dyer to form a judgment of the progress of the mordanting. The ingredients having been boiled for a couple of hours, the cloth is rinsed in elean water and placed in another boiler, containing the residual 7 tb of mordant and 6 tb of ground cochineal, which are sufficient to dye up a full scarlet colour; but if the searlet is required to

be very bright, or what is called “fiery” coloured, a further quantity of tartar is added ; this has the effect of somewhat yedueing the depth of colour, and at the same time giving it a yellowish or orange hue, which for certain purposes is much desired.

Use of yellow in scarlet.—It appears that Baneroft, who wrote about the end of the last century, was the first to suggest that the bright fiery searlet, which the dyers found they eould best obtain by using a large quantity of tartar, might be produced more eheaply by adding some yellow colouring matter to the cochineal, or by first dyeing the eloth a light yellow ; he tried the yellow from quereitron bark, and succeeded as far perhaps as was possible with that material. At any rate from his time it has been customary for dyers who do not aim at the highest degree of excellence in the searlet colour to use a purified preparation of quercitron bark, eommercially known as flavine, in conjunetion with eochineal; other yellow colouring matters, such as fustic and turmeric, are also used. An admixture of these substances eheapens the cost of the colour, whieh can be made nearly equal in appearance to that obtained with cochineal alone, but it does not stand wear so well, and is more readily stained by various influences. The best scarlets are still dyed exelusively with cochineal.

Scarlets on wool from lac-dye.—The colouring matter of lac-dye is in its chemical properties and composition very similar to, if not quite identical with that of cochineal. As it is imported into this eountry from India, it is, however, less pure than average qualities of cochineal; and it is probably on account of its impurities that the dyer cannot obtain quite so good results as the best coehineal colours, although if skilful he may approach them very closely. Having been submitted to a preliminary treatment with acid to free it from alumina and other earthy matters used in its prepara- tion, it is then applied exactly in the same way as eochineal. It is extensively used for a second class scarlet, and is believed to be somewhat more durable and stable even than cochineal. The red eloth so much used for military dress is reputed to be prepared mainly with lae-dye.

Crimson red on wool.—This eolour is also dyed with cochineal, but with a mordant of alum instead of tin. Itisa far less important eolour than the

scarlet, and‘compared with it is dull and flat ; it is, thi rich and durable, and combines excellently with other colours.

The mordanting of cloth by means of alum, an operation of capi- tal importance for a large series of colours derived from all varicties of dye-stuffs, must now be noticed.

Aluming of wool.—The method of mordanting with alum, generally called aluming, is practically a-simple process, but the chemical principles involved have given rise to much debate amongst experimenters. The aluming is usually performed by boiling the wool for one or two hours in a solution of common alum mixed with tartar; a certain portion of alumina, or, it may be, of some compound of alumininm, becomes thus intimately eombined with the wool, and forms a basis upon which a coloured lake may be produeed with solutions of colouring matters. The chemical conditions are somewhat different here from those whieh obtain in the case of mordanting with tin; for the disposition of tin salts In dilute solutions to decompose even spontaneously is so manifest that it may readily be supposed that some action on the part of the wool takes place which induces the formation of oxide of tin. The great apparent stability of alum eaused the explanation of its action given by Thenard and Roard to be for a long time aecepted. They held that it was absorbed whole or unchanged by wool, whieh retained it by some undefined power, so that it could not be removed by cold water, and required to be heated twenty times with boiling water to dissolve it ont. In the light of modern tesearches this explanation may be safely rejected as crroneons. What appears to be the true state of the ease was mainly brouglit out by experiments of Havrez, suggested by the celebrated Belgian chemist Stas, and supported by further knowledge of the properties of alum discovered by Tichbourne and Naumann. In fact, alum, eontrary to what was formerly thought, is particularly liable to deeomposition, even when not in contact with fibrous matters which might possibly have an influence upon it. Naumann has shown that by simply heating a solution of alum, saturated in the eold to its boiling point, an insoluble basic compound is soon produced, so that, after prolonged heating, as much as 25 per cent. of the alumina is precipitated, and the liquid is found to have become acid. Beyond this fact it is proved that wool

when placed in a solution of alum, containing pure sulphuric acid, has the property

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of absorbing more acid than alum; this unequal absorption is attri- buted by Havrez to a kind of dialysis, which, together with the ten- deney of the alum to decompose, sufficiently explains the deposition of alumina upon the wool. ‘The action of tartar in aluming, aecord- ing to the same authority, is that of an acid salt, and its addition in- fluences the nature of the mordant deposited in the same way as if an exeess of alum were present, or as if other acid bodies, such as sul- phurie acid, oxalie acid, &e., were added. ‘The insoluble aluminous eompound which separates from solution of alum on prolonged boiling in a glass flask econld not aet as a mordant, being indifferent or passive to colonring matters ; when deposited on fibrous matter it does not adhere, but ean be washed off, or when dry may be shaken off like dust ; this, therefore, is not the alumina mordant, nor do the researehes of Havrez really point out what the alumina mordant is, though they are valuable and suggestive as showing under what conditions either a basie or an acid aluminous deposit is formed. With the former, which is unfavourable for dyeing, a blue colour is given with logwood, anda purplish red with Brazil wood; with the latter, the wool dyes up a violet with logwood, and a pnrer red with Brazil wood. The basie state of the aluming results, it is supposed, from the deposition of hydrate of aluminium upon the wool, and is eaused by having too little alum or too much water, by boiling for too long a time, or by the use of salts which have a neutralizing action upon the alum. It is easily indueed, when the weight of woo] is more than 15 times greater than that of thealum, In other circum- stances the aeid state results, in which the wool is said to fix first hydrate of alumina, and also hydrated sulphuric acid from the sul- phate of alumina, These conclusions of Havrez cannot, however, be aceepted as final or satisfactory; and there is still much to learn upon the principles of aluming and mordanting generally.

The wool being successfully alumed acquires a crimson colour by dyeing in cochineal, but, as before stated, this shade is not of mucli value.

The shades of red between scarlet and crimson reds proper, or eherry reds, are also dyed with tin mordant and cochineal in nearly the same way as the searlet ; but in order to avoid a yellowish tone, the natural eochineal may be mixed with the manufactured or modified material known as ammoniacal cochineal.

Ammoniaeal cochincal.—This is made by treating ground coelii- neal with concentrated aqueous ammonia for several days; the eolouring matter undergoes important changes by this process, an amide is formed, and the effect upon the colouring matter is that tin mordants give with it no longer a scarlet, but rather a violet tone. Ammoniaeal eochineal is much used in fine dyeing for pinks; and according to the proportion in which it is added to ordinary cochineal, the normal searlet shade is gradually brought over to the red and even to the crimson.

Pink or rose colour upon wool.—This shade is obtained from ammoniacal cochineal, mordanting previously in a mixture of tin solution, alum, and tartar; the quantity of tin mordant used is small, the alum being the essential basis.

Other red colowrs upon wool.—The colours mentioned above are from cochineal or its eongener lae-dye ; there are several reds obtain- able from other colouring matters, which, though less important, are still worthy of mention.

Madder red upon wool.—This colour is wanting in brightness, but it is valuable for its stability, and has at times been largely used for common red military cloth. As a basis for browns, ehoeolates, and other dark colours, it is very suitable when its com- paratively high eost is not an objection. To obtain madder red, the wool is boiled for two hours with a mixture of alum, tartar, and tin salt,—8 tb alum, 1 ib tartar, and 4 ounees of the tin solution being taken for 10 tb of cloth; after boiling, the eloth is rinsed in water to remove uncombined mordant, and then dyed with madder, or preferably its derivative garanein, with addition of a portion of tartar; the dyeing may be accomplished in an honr, the depth of eolour varying with the amount of colonring matter used,

Artificial alizarin on wool.—By employing artifical alizarin somewhat better shades of eolour ean be obtained, and even pink colours of much solidity produced. A process for obtaining a fast red on woollen yarn, from alizarin, is as follows :—boil 10 fb wool for an hour and a half with 14 tb sulphate of alumina and $1 tartar ; rinse in water, and then dye with 6 to 7 ounces of artificial alizarin paste containing 10 per eent. of dry matter; commence the dyeing cold, and gradually heat to boiling. Alizarin ean be used asa basis for producing fast brown shades, by adding fustic and extract of indigo after the red has been developed, and if necessary, a further quantity of sulphate of alumina and tartar.

2ed eolours ean also be obtained by using Brazil wood or other red woods instead of madder; they are, however, of a low elass and sel- domemployed. Arehil alone, without mordant, can yield a full crim- son upon wool, but it is not very stable, and is, moreover, expensive.

Aniline reds upon wool.—There are several artificial red dye-stutts, which may be used for wool, but none possesses great excellenee. The only one whieh resembles cochineal in its qualities is the reeently discovered eosine ; this, with an alumina mordant, gives upon wool a very good imitation of cochineal scarlet, but an imita-

tion only, for the eolour fades rapidly in sunlight, and is easily washed out by soap and water. Substances similar to eosine, which have even still more recently appeared in trade, are called eoecine and nopaline; they yield beautiful but perishable red colonrs on wool and silk. ‘ ”

Red colours on cotton. — Turkey red. —Cochineal, whieh is so suit- able a eolouring matter for wool, does not dye satisfactory colours upon vegetable fibres ; but from very remote times the Hindus have possessed a process for dyeing a brilliant and extremely per- manent red upon cotton fabries by means of madder. This process travelled westward through the Levant into Turkey and Grecee, the date of its introduetion into Western Europe going no further baek than the middle of the 18th eentury, at which period Greek dyers were induced to settle in Franee and make known the methods in use for the produetion of this much desired eolour. The name Turkey red, or

Adrianople red, was applied to calico dyed with it at the time that sueh goods eould be obtained only from the East, and it still retains the name. So much was the colour esteemed that in 1765 the Freneh Government circulated a pamphlet deserib- ing the best known methods of dyeing it on yarns, aud some years afterwards, the British Government paid a sum of money to a Frenehman named Papillon, for diselosing the whole process of obtaining it. The dyeing of Turkey red upon eloth and yarn is now extensively earried on in Great Britain, and with great suecess. Turkey red is essentially a madder red with an aluminous basis, but differs from a eommon madder red by containing oil, and it is the fixing and combining of the oil with the fibre and the colour which constitutes its peeuliarity. Divested of details the process of producing Turkey red may be divided into four stages :—(1) the oiling of the cloth ; (2) mordanting with a salt of aluminium ; (3) dycinug with madder, or its equivalents garanein or alizarin; and (4) the brightening of the dyed eolour. The preparation of the eloth with oil is a process used in no other kind of dyeing ; of its utility there can be no doubt, but all the attempts of chemists to explain the rationale of its action have failed. There are many modifications of the method of applying the oil, but the older and more commonly used process is to mix the oil with a dilute solution of potash or soda ash, so as to diffuse it uniformly through the liquid, forming an emulsion ; the oil is not dissolved by the alkalies, nor is it supposed to combine with them, but is simply held in a state of exeessively fine mechanical division. olive oil is most generally used in Europe, that from Mogador, in the north of Africa, being very suitable. Certain kinds of oil do not answer for Turkey red, only those being suitable which, pro- bably from containing free fatty acids or albuminous matters, readily form a milky emulsion with weak alkaline solutions ; other kinds are, however, in use in some places. The eloth to be dyed is steeped in the oily emulsion, wrung out, and dried in a warn stove ; this process is repeated six or eight times, and the eloth is finally washed in weak alkali to remove from it all the oil not intimately united to the fibre. The result of this treatment, which is the most delicate aud important in the Turkey red _proeess, is that the cloth beeomes impregnated with a fatty matter, which by the contact of alkalies and heated air has undergone some ehange from its original state, which is usually called an oxidation, but the nature of which is really unknown. The eloth now possesses a power of attraction for mordants and colouring matters greatly superior to uutreated

eloth ; and further, its physical condition is ehanged so that eolours upon it are more ‘transparent and more vivid than npon ordinary eotton.

The cloth in this state is ready for mordanting, which is done by passing it through a bath of alum, partly neutralized with earbonate of soda or by ehalk, or in a bath of acctate of alumina, the objeet being to obtain a regular deposition of the aluminous base upon the fibre; the excess of mordant is carefully washed away from the cloth, whieh is now ready for dyeing.

The dyeing is accomplished in the ordinary way, by keeping the eloth in continual notion in a vessel containing heated water and the dye stuff, which may be madder, garancin, or artificial alizarin. It is a very general praetice to add a quantity of ox-blood to the water used in dyeing Turkey red. What purpose this fulfils is not known; its colouring matter cannot be supposed to be of any use; its albuininous constituents may have some useful action, but this seems very doubtful; probably its addition is quite superfluous, and is retained from older times, when dyeing was less understood than at present. When the dyeing is completed the colour is a full and deep but dull red, which requires brightening. The brightening Operations consist in removing brownish matters from the dye by boiling in soap and alkalies. To give a still more brilliant colour, the goods are boiled for several hours in a elosed eopper boiler with a mixture of salt of tin with the soap used in the last process of brightening, —oceasionally under a pressure greater than that of the nee, e order to obtain a temperature some degrees higher

An many processes of Turkey red dyeing, the cloth is treated with decoction of gall-nuts, or with sumaeh, after the preparation with oil and before the mordanting ; this enables it more easily

A low quality of

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to absorb and fix the aluminous mordant, but it is not essential, and is most generally omitted.

No allusion has been made to a number of excrementitions and other animal matters, which the old dyers used in the otling process, sueh as sheep-dung, eow-dung, ox-bile, &c.; they can be dispensed with, and were employed probably from caprice and ignorance.

Barwood red.—An imitation of Turkey red is obtained from barwood ; it is much inferior both in beauty and stability to the real celour, but the case with which it ean be dyed, and the less eostly nature of the materials employed, enable it to be sold ata much lower price, and for some purposes it is largely used. Bar- wood is one of the red dye-stuffs of which the colouring matter is very slightly soluble in water ; it is used in a state of fine powder. The cotton to be dyed is impregnated with a tin mordant by any of the means known to dyers, and then boiled with the dye-stull ; the colouring matter as it dissolves is fixed by the mordant, and the proeess is continued until the required shade is obtained. This wood, and a similar material called eamwood, are also employed in woollen dyeing to give brownish reds, and to dye a "' bottom" or foundation for indigo blue colours, by which some economy in indigo is effected, aud a peculiar bloom on the blue is produced.

The class of woods represented by Brazil wood, do not yield good reds upon cotton.

Blue Colours.

The most important of the blue colouring matters is indigo. This: may be said indeed to be the most im- portant of all colouring matters, both as regards the large quantity and monetary value of what is produced and sold, and the permanence and solidity of the dyed colours which it yields. The indigo dye is a manufactured article, prepared in the place of growth of the plant which produces it. The indigo plant could itself be used for dyeing, but from 200 to 250 ib of it would be required to produce the effect of a single pound of the prepared indigo. In England, and many other countries possessing a temperate climate, the species Jsatis tinctoria, or woad, has been cultivated, and has been used from time imme- morial for dyeing blue. Its comparative poverty in colour- ing matter has caused it long since to be disused by dyers as a source of colour; it is, however, employed by them in

the preparation of their indigo vats, but rather as a convenient material to induce fermentation than as a dye.

Indigo is distinguished from nearly all other colouring matters by its complete insolubility per se in water and other ordinary solvents. It dissolves to a very slight extent in heated aniline, petroleum, and acetic acid, which upon cooling redeposit it ; the only real solvent for it is anhydrous acetic acid mixed with a little sulphuric acid, from which water precipitates it unchanged, but this solvent is inapplicable in dyeing. But solubility is an essential condition for dyeing, and means have been found to obtain satisfactory solutions of indigo by circuitous methods which involve the temporary destruction of its blue colour and a change in its chemical composition. By various deoxidizing agents, indigo blue can be changed into a white substance, indigo white, which dissolves with facility in all alkaline liquids, forming a colourless or slightly yellow solution. On exposure to the air or other sources of oxygen, the solution yiclds the insoluble blue indigo, and permanently dyes any fibre which has been saturated with it.

This is the only case in which such a method of dyeing is applicable, and on that account it possesses much interest. We shall now proceed to describe some of the practical methods in use for indigo dyeing.

Fermentation process.—The oldest of these, and one naturally suggested by the method employed in preparing the dye-stuff, is the process of fermentation in contact with lime, or sometimes soda or potash. During this process, gaseous or liquid substances are formed, which have the power of reducing indigo from the blue to the white state, and fitting it for dyeing. This aneicnt method has not been superseded in England at least, being employed at the present day for

nearly all woollen goods dyed with indigo, the consumption of which is greater for woollen than for all othcr kinds of cloth,

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The woad vat.—To a course of lectures upon dyeing, recently delivered by Mr Jarmain before the Society of Arts, we are indebted for the substance of the followingaccount of the woad vat used by the Yorkshire dyers. ‘The materials employed are indigo, woad, madder, bran, and lime. Yor this process as for every other in which it is employed, the indigo must be reduced to the finest possible powder. lt is generally ground mixed with water, in closed revolving east- iron cylinders containing iron rollers or balls, for several days, or until the slime or pulp formed contains no visible particles of the dye-stuff. The proportions of materials employed are :

TEAC OIE MIRCMVOAW sassccesieeiecterssnoctssessesecevescess 5 ewt. SPT UNCRMIIR AH cctivcdait cagarssesteessstecocsiverase¥ee oveacels 18 tb, BULCAIME 1M AVY POWGET.....- c.crercccseserscencsover ess (Sle) ooagnanoseooqs00de c codoadeannngnancnognnocydanaproaGogD 23, Tinh 208) passsbaqadeNdcoocnoodgEnpOnCUDOTOCHOACGuDDONATOCORN HOAD Oh a

The woad is first placed in the dyeing vat nearly filled with water, which is heated to between 140° and 150° F.; after some hours required to soften the woad), the bran, madder, and indigo are added, and half of the whole quantity of lime. In a few hours, if all is right, signs of commotion produced by fermentation will be visible, the liquid will become greenish, and a blue scum will be visible on the surface; a piece of wool is put in asa test, and if in a short time it becomes dyed blue the process is proceeding well ; a little more lime is added, but at intervals, so as not to cheek the progressing fermenta- tion, and, if it should become necessary, the vat is heated up by steam toits original temperature; on the third day the vat should be ready for dyeing. Such a vat as this requires skilful management to control the fermentation; without lime the reduced indigo would not be dissolved; with too mnch lime the fermentation would be stopped. The woad acts as an casily fermentable matter, and furnishes a portion of blue colour; the bran also no doubt is useful, on account of the ease with which it begins and promotes fermen- tation; the madder is probably of no nse at all, its employment being still continued from an old unfounded notion that it gives some of its red colouring matter to the indigo-dyed goods, for the

small amount of saccharine matter present in 24 Ib of madder cannot be held of any importance in the presence of 5 ewt. of woad. “e

A woad vat, when ready for dyeing, consists of a certain depth of a tolerably clear solution of white indigo in lime, and a somewhat voluminous semi-solid mass at the bottom, consisting of the bulk of the woad, the excess of the lime, the insoluble part of the madder, and the impurities always present in indigo, To keep the cloth to be dyed from contact with the muddy bottoms an iron hoop, of the internal diameter of the vat, covered with a network of open meshes is lowered into it and secured ata safe distance from the bottom. +

The pieces to be dycd, after being well cleansed, are placed in the liquor, and kept in constant movement to insure full access of the colourto all parts. The time required to dye, varying from 20 min- ntes to two hours, will depend upon the fineness and weight of the cloth, and upon the depth of colour required; if the goods require it, they are dyedasecondtime. In inoving the pieces about, they must not be brouglit above {the surface of the liquid, for the oxygen of the air would restore the dissolved white indigo to its blue in- soluble state. When the pieces are found to be sufficiently impreg- nated with the dye, they are withdrawn from the vat; at the moment of leaving the dyeing liquor they are seen to be of a yellowish colour, which almost instantly changes into a bright green, then darker grecn, and finally becomes blue through the absorption of oxygen by the white indigo. Loose wool or yarn is dyed by inelosing it in au open and movable network bag.

The vat above described can of course dye only a limited quantity of material, becoming after evcry operation poorer in indigo; but it is not necessary to re-set a vat. The strength of its contents is kept up by constant additions of indigo, lime, and bran; no more woad is added, the quantity used at first being sufficient for about its own weight of indigo. hale

Bran and molasses vat.—Another kind of indigo dye vat, very extensively used on the Continent, and highly spoken of by practical men, is prepared as follows. A vat 6 feet in diameter and 7 fect deep is filled with water warmed to 180° F.; then 44 Ib of ground indigo, 341b crystals of soda (or instead 16 tb soda ash) and 67 Ib of bran, and twelve hours afterwards 2 Ib slacked: lime, are added; in 24 hours the indigo should commence to be

dissolved, and a test strip of stuff plunged in the liquid should be specdily dyed, but some hours longer and the gradual addition of 18 or 20 tb more of lime are required to bring the liquor into its best condition. In this vat, as in the woad vat, the lime controls the fermentation of the bran, and has to be added with care. With each pound of indigo added to replace what has been removed froin the vat during a day's dyeing 4 tb of molasses and } 1b crystals of soda and 3 or 416 lime must be

nsed, By daily replenishing the vat it can be used continually for*

four or five months; at the expiration of that time the bottoms must be removed; the supernatant liqnor containing indigo in solu- tion may be used instcad of water for setting afresh vat. his vat is said to have quite supplanted the old woad and madder vat, molasses being preferable on the score of cheapness and also of solubility.

The soda not being necessary for the solution of the indigo could be omitted in the setting of the vat, but it is reckoned useful in assist- ing the wool to take the dye; for the wool, however well it be bleached, is said to retain some greasy matters that yield to the soda, which thus enables'the indigo to give fuller and faster colours than when lime alone is used.

It is to be observed that the two vats just described are what are distinguished as '' warm vats," being made and worked at a tempera- ture considerably above that of the air,—a condition held necessary for dyeing wool and some kinds of heavy cotton goods. For ordinary cotton dyeing the vats are used cold or at the ordinary temperature of the air, and are prepared in quite a different manner.

Copperas and lime vat.—A strong copperas and lime vat is coin- posed as follows :—

900 gallons of water. 60 Ib green ecopperas, 36 Ib ground indigo. 80 to 901b dry slaked lime.

These materials are well mixed togcther and raked upat intervals for say 24 hours, when the vat is ready for use. The lime decomposes the salt, liberating ferrous oxide, whieh acts upon the indigo, con- verting it into white indigo, which dissolves in the lime water. In large establishments for dyeing calico blue, it is usual to have a series of such vats in a row; the pieces to be dyed are tightly stretched on a frame and dipped in the liquid for from seven to ten minutes, after which they are believed to be as fully saturated as possible ; the frames are next raised into the air, and in a few minutes the bluc colour becomes developed; the same process is then repeated until the required depth of eolour isobtained. By printing certain resisting compositions on the cloth previous to the dipping, white figures can be obtained upon a blue ground, producing what is known as the navy-blue style of print, formerly much worn by the lower elasses in England. By combining suitable mordants with the resisting composition, not only white, but orange, yellow, and green coloured figures can be obtained upon the blue ground; but the production of these is rather a branch of calico printing than of dyeing proper.

Although this kind of vat is most generally used for the lighter

qualities of calicoes, it can also be applied to such woollen goods as merinoes, which are not very closely woven, and also to silks. “’ Hydrosulphite of soda vat.—In 1871 Schiitzenberger and Lalande introduced a new reducing agent applicable to indigo dyeing, the so-called hydrosulphite of soda, obtained by acting upon acid sul- phite of soda with metallic zinc. It possesses the most energctic deoxidizing powers, and in the presence of alkalies almost immedi- ately reduces and dissolves indigo. It has been applied both in dye- ing and in printing indigo colours, but cannot be said to have succeeded in displacing the older kinds of vats, having the disad- vantage of costing much more without producing any apparent improvement in the colour yielded.

By preparing a very strong indigo vat, and thickening the fluid with gum, it is possible to print indigo blue colours in designs, but the many difficulties attending the process have very much restricted its application. ‘

The colour yiclded by indigo, though far from brilliant, is ex- traordinarily permanent, and is much uscd for articles intended to withstand much wear

and rough usage, and also as a basis for the best quality of black upon fine woollen cloth.

Sulphate of indigo.—When indigo is acted upon by concentrated sulphuric acid it forms a solution of the so-called sulphate or extract of indigo, which, though possessing an intensely blue colour, cannot by any means be made to furnish the original dye. This preparation of indigo is applied only in woolandsilk dyeing ; itgives blues which are tolerably bright, but possess none of the stability of those obtained from real indigo. For vegetable fibre it has no affinity whatever either with or without mordants. :

Prussian blue.—This, perhaps the earliest of artificial dyc-stuits, was accideutally discovered in 1710, though not used in dycing for some time afterwards. The simplest method of employingit consists in first impregnating the material to be dyed with peroxide of iron, and then passing it into a solution of yellow prussiate of potash acidified slightly with sulphuric acid. Prussian blue upon silks is thus dyed. The most convenient way of obtaining a deposit of the oxide of iron consists in soaking the silk in a somewhat strong solution of the ordinary dyers' nitrate of iron; in the course of two or three hours a certain quantity of the oxide is found to be intimately combined with the silk; the excess of nitrate isthen washed away and the silk worked in the acidified prussiate bath, when it imme- diately assumes a light azure shade; by repeating the treatment several times any depth of colour may be obtained.

Calico can be dyed in the same way, but both for that and for silk it is usual to add to the iron solution a small quantity of salt of tin, whieh is useful in giving a purplish tone to the blue and preventing the production of a disagreeable greenish tinge.

A deep colour cannot in this way be satisfactorily given to woollen, for which a treatment is adopted depending upon a decomposi- tion of the prussiate by means of heat and acids. For dyeing say 110 ib of merino the following proportions and methods may

be used. Dissolve 9 ib of yellow prassiate of potash in hot water, and add the solution to the required quantity of water ; then add 14% sulphuric acid, 61b sal-ammoniac, and about 6 oz. of crystals of protoehloride of tin; the merino is placed in the mixture, and the temperature of the dye-bath gradually raised to the boiling point in five hours. The blue gradually formed on the cloth requires brightening in a fresh bath consisting of alum, pcrsalt of tin, and creain of tartar, heated to nearly the boiling point. Red prussiate of potash is used in nearly the same way to dye dark Prussian blues upon wool, but as it is more easily decomposed than the yellow prussiate a weaker acid-bath suffices. These blues are frequently finished off with logwood to give them a deeper tone.

Prussian blucs can also be obtained on such woollen goods as merinoes, by a process of padding, and the use of a colour uearly identical with the so-ealled French or royal blue used by calico printers. Amixture ispreparedasfollows. Halfa pound of wheaten starch is boiled with about half a gallon of water; in the thin paste thus made 13 0z. of powdered yellow prussiate are dissolved, and afterwards 6 oz. of tartaric acid ; when the mixture is quite cold 1 tb of prussiate of tin in paste is added, 14 0z. oxalic acid, and 8 oz. sulphuric acid; the whole is well mixed and strained. The woollens to be treated are first ‘‘ prepared,” as it is called, by impregnating them uniformly with oxide of tin, and then the aboyc thickencd mixture is applied by means of rollers, so that it shall be evenly and smoothly spread over the whole stuff; the cloth is then dried and exposed to the action of steam, which causes the acids to react upon the prussiates, and from a nearly colourless mixture develops an intense blue, which is found to be permanently fixed in the fibre.

Aniline blues.—There are several artificial blue dyes made from aniline and similar bodics, which yield very brilliant colours on wool and silk. They can be easily applied, the goods simply requiring to be worked in their aqueous solution until they have acquired a sufficiently dark tinge. An artificial dye called Nichol- son’s blue is differently applicd ; it is dissolved in an alkaline liquid, and forms then a colourless or nearly colourless

solution, with which the goods to be dyed are impregnated; they are then passed into dilnte acids, which devclop the blue colour.

Litmus and logwood blues.—The other substances which have been used for blue colours, such, for example, as litmus, are of little importance, and are now nearly unknown to the practical dyer. A blue can be obtained from logwood which has some resemblance to indigo blue upon wool, but it is of a very low character both as to ow and shade, and is hardly evcr employed by respectable dyers,

Yellow Colours,

Yellow textiles, being less pleasing to the eye, and more readily soiled, are not nearly so much in use as those dyed with the two simple colours blue and red. The cliief yellow dyes, besides fustic, are quercitron bark or its concentrated extract flavine, Avignon or Persian berries, and the now almost disused indigenous product, weld. The general mordant for these is tin, sometimes with addition of alum. One or two illustrations will suffice to show the methods of using them.

Fustie yellow.—Fustic is probably the most generally employcd yellow dye-stuff for wool; it gives yellows inclined to orange. For light shades it is not necessary to mordant the wool; it is simply well cleansed, and then heated with fustic decoction and some cream of tartar. For darker shades the wool is boiled with solution of tin and tartar, washed, and then worked in the decoction of fustic.

Picrie aeid yellow.—Picric acid, onc of the artificial colouring matters, gives pure though not deep yellow shades upon silk and wool without the aid of a mordant, the cleansed material being dyed by working it in a warm solution of the acid.

Chromate of lead yellow.—The yellow most commonly employed for eotton goods is obtained by the use of salts of lead and bichromate of potash. The method of obtaining this colour differs somewhat from any previously described. The eotton, having been properly bleached, is impregnated with a salt of Icad, usually by employing a solution of the acetate or sub-acetate of lead. The goods are next passed into a milkof lime

solution, to which it is pru- dent to add some acetate of lead, in order to prevent the lime from dissolving the oxide of lead at first precipitated; the result of the lime treatment is that oxide of lead is evenly fixed upon the cotton, the excess of lime and lead is then well washed away, and the goods are passed into a solution of bichromate of potash, where they quickly acquire a bright and deep yellow colour, owing to the formation of the well-known pigment chrome yellow. To facilitate the combination, the bichromate of potash is mixed as as much sulphuric acid as suffices to liberate the whole of its : romium as ehromic acid. The yellow-dyed goods require no further treatment than a good washing, the colour being quite fast. This yellow is, however, in very little demand, and in ninety-nine

cases out of a hundred it is immediately converted into an orange, by passing it through boiling lime-water, which produces the basie chromate known as chrome orange, which has alway been in demand for many articles of wear. .

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Compound Colours.

The so-called simple colours—red, blue, and yellow— having now been dealt with, it remains to treat of their combinations, and this may be done briefly, the processes employed being for the most part similar to those already described. The compound shades in Chevreul's cliromatie nomenclature amount to nearly 15,000, and it is very pro- bable that fully that number are produced by the dyers of the present day. For practical treatment, however, the compound colours can be reduced to comparatively few classes. Mixing the simple colours one and one we obtain three compound colours,—blue and yellow give green, blue and red give purple, yellow and red give orange; while there may be a normal green, purple, and orange, it is evident that all the varietics of these several colours will depend upon the proportions of their constituents. If the three simple colours be mixed together, say in equal pro- portions, we may get a normal brown, or even a black; but if in unequal proportions, an immense number of shades, varying from the imagined normal brown to grey and drab, are

produced. Although in many cases compound shades are produced by means of two or more simple colours, there are many natural as well as artificial dye stuffs which yield them ready formed, and frequently purer than they can be otherwise obtained. Most of these will be found mentioned in the following brief notice of practical processes in use,

GREEN CoLouRs. ; *

Lo-kao or Chinese green.—Until about the middle of the presen century there was not an instance known of any green on textiles which was not composed of the two separate colours blue and yellow. About that time some green-dyed cottons, imported into France froin China, attracted the attention of chemists, who were surprised that they could not separate the green into blue and yellow constituents. Inquiries showed that the Chinese employed a green colouring matter called Lo-kao, until then unknown in Europe. It was a costly dye-stuff, selling in China for its weight of silver. Some quantity of it was imported and used in silk-dyeing by the French ; it was not, however, found altogether satisfactory, and has at length been quite abandoned for the aniline greens, which are in every respect preferable.

Aniline green.—There are two or three kinds of artificial green dyes in use, of which that known as methyl-aniline green, applied in silk dyeing, is most in request. ‘lhe so-called iodi ne green has also been somewhat extensively employed for all kinds of fabrics.

These artificial and unstable matcrials are the only dye-stulls for grecn possessed by the dyer, who is compelled to produce the colour by means of blue and yellow elements. The arsenical mineral green and the oxide of chromium green may be just men- tioned as of cxtremely imited employ. ‘he blues used in dyeing grcen are indigo, Prussian blue, and the sulphate of indigo, The ycllows are afforded by Persian berries, quercitron, fustic, or the yellow chromate of lead. The processes employed consist, for the most part, in the separate application of the blue and yellow; for example, in dyeing a fast green upon wool froin indigo and any of the yellow dye-stuffs, the blue is first produced as previously described, and the proper mordant for the yellow is then applied to the cloth, which is afterwards placed in the yellow colouring matter ; the two colours are so intimately mixed as to be indistinguishable even by high magnifying powers. It may be observed that

the reception of the blue does not to any perceptible cxtent diminish the power of the cloth to combine with the yellow.

Prussiate green.—Vrussian blue is employed as a basis in the same manncr, only not being capable of resisting chemical agents so well as indigo bluc, it demands more care. The greens with Prussian blue bases are inore lively than those made with indigo, but are not sofast. Sulphate of indigo is even less stable than Prussian blue. It is, however, cheap and easy of application, and gives rich colours. The greens made with chromate of lead are for the most part con- fined to cotton goods, and are not in much demand.

ORANGE CoLouRs.

For cotton the chief orange-dye is the chromate of lead compound already described. or other materials the orauge colours employed

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DYEING

are nearly always composed of some of the red and yellow dycs mentioned in the preceding pages, such, for instance, as cochineal and fustic, which are applied in one bath, the same mordant serving for both.

Arnotto orange.—A warm solution of arnotto in weak alkalies is used without mordant to impart to silk an agreeable orange shade. Its colour is gencrally considered too yellow, but may be made redder by treatment with weak acids, or by previously giving the silk a light red foundation.

Picric acid orange.—-Another orange on silk can be ‘dyed by superimposing on a light pink a yellow obtained from picric acid.

Nitric acid orange.—Silk can also be permanently stained of a yellowish orange by means of moderately strong nitric acid, which must, however, be applied with great care, since a more than momen- tary coutact would be very injurious to the strength of the fibre. his method of dyeing silk was formerly much used for handker- chiefs ; by protecting certain parts from

the acid with nelted wax or similar resists, white designs were produced upon an orange ground.

PuRPLE CoLours.

The purple colours may be held to include all shades produccd by an admixture of red and blue, such for cxample as lilac, violet, mauve, &c., and are of immense variety.

Aniline purples.—Since their discovery aniline colours have

been almost exclusively. employed for dyeing silk and wool purple, yielding as they do shades which for lustre and purity surpass any obtainable from the older colouring matters, and possessing also a fair amount of stability. An aqueous solution of the dye without mordant is all that is required, and the goods when dyed nced very little subsequent treatment. The aniline purples, violets, and mauves do not dye upon cotton without previous mordanting, and even then are so loose andjunstable that they are only fitted for use where great fixity is not demanded, as for linings of elothing, &c, The most general inordant for the aniline purple colours on cotton consists of a tannate of tin obtained by first steeping the cotton in a solution of tannic acid, or in decoction of gall-nuts, sumach, or myrobalans, all of which contain tannic acid; after a few hours' contact a considerable quantity of tannic acid has become firmly attached to the cotton, and the goods, being-:now treated successively with stannate of soda and dilute sulphuric acid or in other ways, acquire a certain proportion of oxide of tin, and are prepared to receive the colours. _ Madder purple.—But the purple colour par cxcellence upon cotton is obtained from madder or alizarin, the mordant being oxide of iron or a sub-salt of iron deposited on the fibre by treatment with the commercial pyrolignite of iron, commonly called iron liquor. This purple is remarkable for great permanency. It is very largely used in combination with black and white in the best kind of printed calicoes.

Archil purple.—Archil and cudbear are sources of purple colours on wool and silk. The shades produced are rich and beautiful; they are not, however, very permanent, and have been nearly superseded by the aniline colours. Of the few instances that can be cited of stuffs dyed purple by the direct union

of red and blue eolouring matters, the violet or purple woollen cloth used for ecclesi- astical purposes is an example. The indigo colour is first fixed and cleansed, and then the cloth is dyed with cochineal and tin mordants in the way already described for dyeing scarlet. The purple thus obtained is a fast colour, but is very costly, and on that account Is hot much worked.

The common shades of purple, violet, lilac, &c., upon wool are obtained from logwood with a mordant of alum and tartar; the red Woods are sometimes employed in conjunction with logwood for these colours, which are “topped ” with archil to give them more brilliancy,

The extensive range of colours, comprising all the shades of brown, bronze, chocolatc, nut, wood, drab, and grey, which may be considered as compounded of the three elementary colours, Some one of the three predominating, can only be briefly treated of in this article. Most of them are actually produced by the use of dye-stuffs yielding the three simple colours; but there are colour- Ing matters like catechu, which themselves yield brown colours, and others, such as logwood, which may be held to contain two or ag of the simple colours, the blue predominating. A few illus- ‘rations will show how these triply compounded colours are pro- duced by the dyer.

Brown Coxovrs.

Bronze brown on wool.—The wool is mordanted with alum and tartar in the usual way, and is then dyed in a mixture of fustic and madder or other equivalent red and yellow dye-stuffs; for fast colours a blue part can be communicated to it by the indigo vat. For a lower class of colours no indigo is used, but instead, a mixture of yellow wood (fustic or quercitron) with madder for the red, and logwood for the blue part; or again, the sulphate of indigo may be employed for the blue.

Lan brown,—According to Mr Jarmain, the wool is mordanted

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by boiling it for an hour with one per cent. of its weight of bich1® mate of potash ; it is then washed, and transferred to the dyein& vessel, with the

following percentages of its weight of materials :— madder, 3:2; fustie, 4:8; camwood, 2; barwood, 1°75; sumach, 2’‘1; with these materials it is boiled for two hours.

Dark drab.—From the same authority we take the following as the weights required to dye 100 Ib wool, previously mordanted with 1 tb of bichromate of potash:—camwood, 64 Ib; sumach, 2 ib; madder, 24 tb ; fustic, 4 1b ; logwood, 24 ib ; boil for one hour and a half, and afterwards, to darken the colour, pass into water containing 1 Ib of sulphate of iron. :

Biack CoLours.

Black, from a dyer’s point of view, is compounded of the three simple colours, red, yellow, and blue, in a state of concentration ; but in reality the blue predominatcs in all good black colours, and gives them their density and at the same time their lustre. What is called a dead black, crape black, or jet black, is the nearcst approach to a neutral black, but even this would be brownish if the blue did not predominate. It is often extremely difficult to obtain a black dye to suit a particular market. Of tcn picces ap- pearing cqually black to the uninitiated, an cxpert would, perhaps, pronounce one to be sooty, another purple, anotlicr red, another brown, another green, and so on.

We should have to go back some years in the history of dyeing, to find a time when black was actually dyed with the three elementary colours. 1n some processes blue from indigo was first applied, and then, upon an alum mordant, red and yellow from madder and weld respectively; such a colour was unexceptionable for stability, but its great cost caused it to be disused.

At the present day, logwood is the chicf dye-stuff for blacks upon wool or cotton, and gall-nuts and other astringents for silks. Ani- line black, on account of obstacles to its application, cannot be said to have yet established itself in dyeing proper, though it is much and highly valued in calico printing.

Black dyc upon stlk.—Silk easily takes a black by treatment first with decoction of gall-nuts, and subsequently with a salt of iron. For blue blacks the silk is usually first dyed with Prussian blue, and then withgall-nut black.

Extract of ehestnut-wood with an iron mordant gives a good black. 1n modern black silk dyeing, materials are heaped upon the fibre which are not nccessary to its colour, but whicli increase its weight in an extraordinary manner, so as not only to compensate for the loss of 25 per cent. of natural gum in the silk, but even, in some cases, to double or treble the original weight. The silk is, of course, much injured by the ac- cumulation of foreign matters upon it, the fibre becoming harsh and brittle, and soon showing the effects of wear. The chief sub- stances used for weighting are lead salts, catechu, iron, and galls, with soap or fatty matter, to soften in some degree the harshness these occasion.

Black upon wool. —Upon woollen cloth of fine quality, the black is dyed upon a basis of indigo blue, and, from the use of woad for this colour, such blacks are in England called ‘‘ woaded blacks.” The first process, therefore, in producing the best black is to dye the wool in the indigo vat of a tolerably decp shade of blue, and afterwards boil it in a mixture of logwood and sumach, treatingtit with sulphate of iron; the latter process being two or three times repeated, a very perfect and durable black is obtained, provided the indigo basis is sufficiently deep, and only a minimum quantity of logwood lras been employed, say about one-fourth the weight of the sumach.

Common black. —Common blacks upon wool have noindigo in their composition, but are dyed chiefly with logwood and iron salts; the wool and logwood are heated together for some time, and then sul- phate of iron is added to the dye-bath. In other blacks of somewhat better quality, the woollen is boiled for some time with solution of iron, copper, and aluminium salts, together with tartar, and when the mordanting oxides have been fixed, the colour 1s dyed up in logwood. The bichromate of potash mordant can also be used for the black dye, and the cloth can be ‘‘ bottomed ” with camwood or parwood; it is then dyed up with logwood, to which fustie or sumach may be added. ;

Black upon cotton.—Almost the only ordinary blaek in cottoa dyeing is obtaincd from logwood with iron mordant ; sumach 1s sometimes used, and very rarely the black is dyed upon an indigo blue basis by means of sumach or galls and iron. As before stated, aniline black has not yet been practically

applied in dyeing eotton. A common method is to first heat the goods for some hours with decoction of sumach, wash mordant in sulphate of iron, and then dye in logwood; another method consists in fixing an iron basis upon the cotton by the method given above (page 573), and dyeing in logwood, along with a portion of sumach or fustic, according to the shade required.

Velvet dycing.—The most important branch of black dycing upon cotton goods, is that employed for cotton velvets and vel- veteens, in which it is desired to produce a rich lustrons effect; the process is long, tedious, and uncertain, consisting of successive

lications of sumach, sulphate or acetate of iron, sulphate of ma logwood, isto, the end chiefly aimed at being the production of a black with blush or violet bloom. The Manchester dyers formerly held a monopoly of this blue-black upon velvet, as it is called, but of late years the German dyers have shown them- selves very formidable competitors in dyeing this class of goods.

THEORY OF DYEING.

When the great variety of processes employed in dyeing is taken into consideration, it is apparent that there must be some difficulty in constructing a general theory which shall be applicable to every case.

The earlier writers who endeavoured to generalize the principles of the art considered that the particles of colour were mechanically deposited in the pores of the fibre. The use of cheniical substances in dyeing was held necessary only to dilate the pores for the admission of the particles, to prepare the particles for entrance into the pores, or to close up the pores after the colouring particles had entered. Mordants were held to be necessary because they formed cavities in the fibre adapted by their size and shape to receive and retain different kinds of coloured particles. About the middle of the last century Bergmann, observing the dyeing of wool by sulphate of indigo, considered that what took place was a purely chemical action, and that the matter of the wool entered into chemical combination with the dye-stuff, changing it from a soluble into an insoluble substance, and showing therein the power of chemical affinity. From this time the mechanical or physical theory of dyeing was supplanted by a chemical theory, in which all the observed facts were explained by the assumption that chemical forces operated between the fibre and the mordant, or the fibre and the colouring matter. A closer considera- tion by a later generation of chemists of all the phenomena of dyeing and of the nature of the materials employed did not tend to support this theory. About 1840 Dumas, the celebrated French chemist, and Crum of Thornliebank, a skilful chemist and a practical dyer, formally disputed the existence of a chemical action in dyeing, and referred the phenomena to physical causes of attraction on the part of the fibre. Crum confined himself to the single case of the dyeing of cotton, and expressed himself convinced that it was owing either to surface contact of the dye stuff with the cotton or to its entrance into the hollow tubes of the same, the colours produced in the first case not being so stable as in the other, as far as resisting friction went. The power which cotton fibre evidently possesses of appropriating oxides from solutions, as well as colouring matters, such as indigo, was viewed by Crum as a case of surface attraction, similar to the power residing in charcoal of abstracting oxides and colouring matters from solutions, and he declared there was no such thing as a chemical combination between the cellulose of the cotton fibre

and any of the chemical sub- stances or dye materials. To controvert this statement is difficult, for, though the forces at work seem to be chemical forces, the products cannot be proved to be definite chemical compounds. On the other hand, the forces of catalysis, surface attraction, and powers of porous substances which Crum substitutes for the chemical forces of the older theories of dyeing, may be said to be merely names, without definite meaning, for indicating the existence of a class of phenomena not at all understood even at the present day. Dumas views the questions more broadly, and simply declines to accept as chemical phenomena actions which do a produce real chemical compounds. He considers that

yelng 18 more probably owing to a physical property of fibres by which they are enabled a bra fal rif coloured bodies, much in the same way that animal charcoal pel and simply because the nature of the powers exercised y charcoal are not accepted as chemical, and no one knows what they are, dyeing cannot be considered as an effect of

chemical attraction or affinity. He admits, however, that there are some powers at work different from that possessed by charcoal. How is it, he asks, that wool takes up the scarlet dye so well under conditions where silk and cotton are barely tinged with colour? How is it that wool unites with the black precipitate formed with tannin and iron salts, while silk under the same circumstances is so difficult to dye? He asks, finally, how it is that certain colours can be fixed better on some fibres than others; and whether it is not by some special action, not correctly called affinity, but which at any rate is an important force, or the resultant of several forces, that this is affected. But, he continues, to confound chemical affinity, properly so called, with the phenomena of dyeing is to confound two very different things. When silk unites with Prussian blue, or wool with indigo, the action is quite distinct from what takes place when sulphur combines with lead. But, on the other hand, again, fibres are not to be looked upon as acting simply the part of a filter in retaining colours.

Chevreul, at a later date, insists that in the present state of our knowledge the phenomena of dyeing can be explained only upon chemical principles. He admits that colour may be and in practice is frequently deposited upon the external parts of fibres, but there are numerous cases in which a soluble salt is decomposed by fibrous matters, as when silk is steeped in persulphate of iron ; and he cannot consider as anything else than chemical affinity that power which enables a solid body to decompose a solution of elements, themselves united by chemical affinity, and which without the contact of the solid body would have remained in per- fect union. Many other chemists, physicists, and micro- scopists have occupied themselves upon this vexed question, but without evolving any generally acceptable theory of dyeing. The balance of opinion may be said to be in favour of the supposition that as far as regards the animal fibres, wool and silk, there are many cases of dyeing which can only be regarded as effected by chemical powers ; with respect to the vegetable materials cotton and linen, the evidence is less certain, and we must wait for further research and investigation to settle the disputed question.

Books of Reference. —Of the numerous works upon dyeing it may be sufficient to mention Bancroft's Philosophy of Permanent Colours (2d ed. 1813); Berthollet's Lléments de la Teinture, and Ure's transla- tion of the same into English (1841) ; Persoz's Traité de l'impression des Tissus (1846),—a most complete and accurate work for its date ; O'Neill's Chemistry of Calico Printing and Dycing (1860), and Dictionary of Dyeing (1862); Napier's Manual of Dyeing (3d ed. 1875); Schtitzenberger's Zraité des Matidres Colorantes (1867) ; Crookes's Dyeing and Calico Printing (1874); and Crace-Calvert's Dyeing and Calico Printing (1875). Of periodicals specially devoted to the application of colouring matters to textiles there is only one in Great Britain, The Textile Colourist ; Germany has the Férber-Zeitung and the Muster-Zeitung ; in France there are the Moniteur de la Teinture and Le Teinturier pratique. Original articles upon the subject occasionally appear in the chemical journals, and especially in the Bulletins of the Industrial Societies of Mulhouse and Rouen. (C. O'N.)

DYER, Joun, English poet, was born in 1699 or 1700 at Aberglasney, in Carmarthenshire, where his father, Robert Dyer, successfully practised as a solicitor. He was sent to Westminster school to be educated under Dr

Friend, and was destined to succeed to his father’s business. He showed, however, an inveterate dislike to the study of the law, and, having a taste for design, he induced his parents to allow him to adopt the profession of an artist. He wandered about South Wales, sketching landscapes and occasionally painting portraits. In 1726 his first poem, Grongar Lill, appeared in a miscellany published by Richard Savage, the poet. It was an irregular ode in the so-called Pindaric style, but Dyer entirely rewrote it into a loose measure of four cadences, and printed it separately 10 1727.. It had an immediate and brilliant success. Grongar Mill, as it now stands, is a short poem of only 150 lines,

describing in language of much freshness and picturesque charm the view from a hill overlooking the poet’s native vale of Towy. Artless in an affected age, the natural images which crowd upon one another in this charming little poem are as admirable now as when they were written, and hold an assured place in English literature. Dyer’s ambition to succeed as a painter impelled him to visit Italy, and about ten years after the publication of Grongar Hill he seems to have attained this great desire, and to have spent some time in the south of Europe. It was in consequence of this tour that he wrote his next poem, The Ruins of Rome, a descriptive piece in about 600 lines of Miltonic blank verse. In this work the phraseology is pompous and conventional, but there is considerable know- ledge displayed, and the ardour of a true lover of antiquity. The Ruins of Rome appeared in 1740, and increased its author’s reputation. Having fallen into bad health while painting in the Campagna, and finding that he was not destined to excel in the practice of art, he determined to enter into holy orders. In 1741 he was ordained by the bishop of Lincoln, and presented with the living of Calthorpe, in Leicestershire. He was married about this time to a lady descended from the brother of Shakespeare. In 1751 he was translated to the living of Belchford, in Lincolnshire, to which was added in 1752 that of Coningsby. In 1756 he exchanged Belchford for the wealthier incumbency of Kirby-on-Bane. In 1757 he published his longest work, the didactic epic of Zhe Fleece, in four books, of which the first discoursed of the tending of sheep, the second of the shearing and preparation of the wool, the third of weaving, and the fourth of trade in woollen manufactures.

The subject was prosy, and the stately blank verse in which it was discussed gave the poem a ridiculous air. The town took no interest in it, and the wits facetiously prophesied that “Mr Dyer would be buried in flannel.” He did, in fact, very shortly afterwards follow his poemto the grave, for he died of consumption on the 24th of July 1758, leaving a wife and four children. After his . death his genius was defended and his writings analyzed by Scott of Amwell, who published a commentary on Dyer’s poems. The latter were collected by Dodsley in 1770, but they only form one small volume. Grongar Hill has been compared with Sir John Denham’s Cooper’s Lull, which May in some measure have suggested it. These two pieces remain the most important topographical poems in English literature, if we exclude Ben Jonson’s Penshurst. DYNAMICS properly means that science which treats of the action of force. Defining force as that which affects the motion of matter, it appears that the study of dynamics will lead to the consideration of the motion of material systems, and the laws in accordance with which this motion is changed by the mutual actions of the bodies forming such systems. But there is a sense in which we may con- template the geometrical results of the motion of bodies without studying the forces under which, or the time dur- ing which, it takes place; and hence there are many pro- blems which at first sight we might be disposed to include under the head of dynamics, but which also belong to the domain of pure mathematics, and may therefore more pro- perly be considered as a branch of geometry. On the other hand, there is a branch of dynamics which treats of pure motion without taking any account of its subject or the means by which it is produced or changed. In this branch, to which the term kinematics, though first employed by Ampére in a wider sense, may with propriety be confined, it may seem that no consideration of matter or of force ig involved ; but, unlike the class just alluded to, the pro- blems which come under this head involve explicitly the element of time, and it is only after studying the laws of dynamics that we are able to furnish a theoretical measure

of time satisfying the demands of the human mind. Thus any subject in which the measurement of time is involved enters on this account into the domain of dynamics. Measurement of Time.—For ordinary purposes the

rota- tion of the earth furnishes a sufficiently exact means of measuring time, and the observation of the transit of a known star is the best method we possess of determining the error of a clock ; but that the fundamental conception of the measurement of intervals of time is based upon other foundation than the diurnal rotation of our planet at once appears from the fact that we see no inconsistency in asking whether the length of the day is the same now as it was 2000 yearsago. If our primary conceptions of the measure- ment of time were derived from the eartli's rotation, the absolute constancy ofthe length of the day would be amatter of definition. But it is not to the motion of the earth or of any other single body that we are indebted for our highest conception of the measurement of time—it is rather to the dynamical principle expressed in the first law of motion; and hence it is that the theoretical measurement of time, and of other physical quantities which explicitly involve time, must find a place under the head of dynamics. Kinematics may therefore properly be treated as a branch of dynamics, and for its discussion, as well as for the enunication and explanation of the laws of motion, the reader is referred to the article on MECHANICS. f Perhaps there is nothing which appears to present a subject for studysimpler than that afforded by the properties of space, and hence it is that geometry attained so high a reputation and made such rapid advances among the ancients. It was easy to construct material standards of length and by their means to measure approximately the linear dimensions of limited portions of space, the human mind being only too ready to believe in the constancy of the dimensions of the standards constructed ; and thus the properties of space presented a subject which, at the very outset, afforded a facility for investigation which was want- ing in the study of other physical quantities. The great simplification introduced by this belief in the permanence of the dimensions of material standards will be apparent if we consider the position in which we should be placed by the adoption of a different hypothesis. Once admit the supposition that the properties of a figure, as regards dimensions or form, depend explicitly on its position in space, or upon time, either by a process of growth in them- selves or because space is changing its character, and the whole subject of geometry will require reconsideration. Displacement.—A number of points or figures may be connected in accordance with such geometrical conditions that if one or more be displaced in a given manner the displacements of all the others may be determined. The determination of the

displacement of each in terms of the given displacements is a problem in pure mathematics, and the branch of geometry which treats of such questions may be called the science of displacement. If we suppose the figures here contemplated to be material bodies, and the geometrical conditions to be determined by means of material constraints such as links, guides, teeth, and the like, the science of displacement thus applied becomes that of mechanism, and it is only necesary here to call attention to the following statements. First, in the study of dis- placements, or of pure mechanism, no account is taken of any but the geometrical properties of the bodies displaced, while the forces engaged in producing the displacement are entirely neglected: the consideration of the mechanical properties of the materials of which the parts of a machine are constructed, the forces acting between those parts, and the best means of " fitting" them, belongs to applied mechanics and machine construction. Secondly, the ele-

ment of time is altogether left out of consideration ; for,

although it may be argued that the displacement of each part of the system takes place in the same interval of time, and that the geometrical conditions enable us to compare the displacements experienced by different parts during the same time, and thus lead us to a comparison of velocities, yet it must be observed that this is only a comparison amounting simply to a relation between corresponding displacements, and does not involve time explicitly, since the whole displacement roay take place in a time as long or as short as we please, for we do not consider it. More- over, the actual motion of any part may be made uniform or varying in any arbitrary manner without any account being taken of it. In fact it is simply two or more con- figurations of the material system which are compared together, and, though for the sake of distinction we call one the initial and another the final configuration, we might as well distinguish them in any other manner and without stating which follows the other. Indeed we contemplate them as co- existent during the act of comparison. Hence we may complete the science of displacement or pure mechanism without ever considering force, or being able to measure time or even to define equal intervals.

Kinematics.—If to our conceptions of space and of dis—

placement we couple that of time as a measurable quantity, we are led to compare the rates of non-simultancous as well as of simultaneous displacements, and are consequently obliged to measure the rate at which displacement occurs by the change of position experienced in a definite interval of time by the body, figure, or point we are regarding. Rate of change of position measured thus we call velocity. The next step in the same direction is the consideration of the rate at which velocity changes, or acceleration, and thus the association of our conception of space with that of time as a measurable quantity opens up to us that branch of dynamics which we call kinematics.

Matter.—Having considered displacement in connection with the time during which it occurs, the next step leads us to take account of the thing displaced, aud here we are obliged to contemplate matter directly. Matter, like time and space, we do nos attempt to define, but treat it as a primary conception, its more obvious properties making themselves known fo all through daily experience.

force.—The change of the motion of material bodies brings us at once, through the introduction furnished by the first law of motion, to the conception of.force, which niay be defined in terms of three primary quantities, viz., space, time, and matter. The second law of motion expresses the manner in which matter is affected by force, and teaches us how to measure force by the observation of its effects.

The science of dynamics in its restricted sense is that which treats of the consequences arising from the relations of matter to force, and before we can proceed in this science beyond the first step we must become acquainted with the second law of motion, while kinematics requires for its complete development only the first law of motion, its range being thereby sharply defined and separated from that of the rest of dynamics. The laws of motion, like other natural laws, must be understood to express merely the properties of natural bodies as we find them, and within the degree of accuracy to which our experiments can be relied on. We might, of course, have started with any hypotheses we liked respecting the relations of force to matter, and upon these hypotheses and our conceptions of time and space have constructed a purely theoretical system of dynamics. which would

have been perfectly self-con- sistent ; but our conclusions might, or might not, have agreed with observations of natural phenomena. If we found an agreement between the results of the application of our theory to special problems and the solutions of the corresponding problems a3 worked out objectively in nature,

we should have reason to believe that our hypotheses agreed with the facts, or, in other words, that they were true, and we should then raise them to the dignity of natural laws, It is on evidence of this kind that our acceptation of al] natural laws is based. If our conclusions were inconsistent with natural phenomena our system of dynamics would be an abstract, instead of a natural, science—if, indeed, it might be called a science at all—and would be valuable merely as an intellectual exercise. In the case of such an abstract science we are not even bound to adopt the axioms respecting the properties of space which are usually accepted, but may confer upon our " space" any number of dimensions and any properties we please.

Stress.—Thougli the conception of a single force is con- venient, it nevertheless results from a mcre process of mental abstraction. We never meet with a single isolated force in nature, but each is accompanied by an equal and opposite force acting in the same straight line, and when we speak of one without the other we do so merely for the sake of brevity. The third law of motiou implies this statemeut, though it has also a wider signification. The action and reac- tion which are thus always inseparably linked together may be conveniently called a stress, of which the two forces are opposite aspects. Thus it appears that there is nothing in nature corresponding to what we are accustomed to call a single force ; stresses, indeed, abound, and may be produced whenever we please, but we are completely ignorant of their existence except when they change the relative velocities of different portions of matter. Then, and then ouly, do they appeal to our senses.

Statics, —The investigation of the conditions under which a system of stresses produces no displacement of the bodies between which they act constitutes the science of statics, and will be discussed under the hcad of Mecuanics.

Measurement of Force.—Since force can be defined in terms of space, time, and matter, it follows that the measurement of a force ought to involve measurements of these three quantities and of them only. Now it is plain that any force whatever may be chosen as the unit in terms of which other forces should be expressed, provided it is capable of being reproduced at all times and in all places with precision. We all now believe that the quantity of matter in a body is unchanged by changing its position or by the simple lapse of time, and we also believe that the region of space which we inhabit is sufficiently homoloidal to allow us to compare distances in different directions, at different places, and at different times. Moreover, the first law of motion, as has been stated above, provides, when proper precautions are taken, a method of measuring time which satisfies the requirements of the mind, while the rotation of the earth affords a practical measure of time sufficiently exact for the most refined experiments we can execute. Therefore a unit of force which depends only on the units of length, mass, and time will be the same at all places, and, so far as our experience allows us to judge, at all times. Such a unit is termed an absolute unit. Not only force but every other quantity dealt with in dynamical science, as well as every physical quantity

whose relatious to space, mass, and time are known, can be

mcasured in terms of a unit of its own kind which depends only on the fundamental units of length, mass, and time, and is then said to be expressed in absolute measure. The three primary units must be chosen in an arbitrary manner, and their permanence must be considered a matter of definition ; but when these have been once fixed, all the absolute units derived from them are perfectly determinate and invariable. Ifa foot, a pound, and a second be chosen as units, the corresponding absolute unit of force is called a poundal ; while if the primary units be a centimetre, a

.gramme, and a, second, the unit of force is called a dyne

For the definitions of the derived dynamical units and the investigation of their dependence on the fundamental units, the reader may refer to the article on MecHanics.

From what has been said it will appear that the whole difficulty in fixing upon a system of dynamical units lies in the determination of the fundamental units of length, mass, aud time in such a manner that their constancy can be relied upon. The unit of mass offers very little difficulty in this respect. Long experience has taught us which are the inost permanent of the varieties of matter we have at com- mand. We have good reason to believe that a piece of platinum or an alloy of platinum and iridium may be exposed to pure air at ordinary temperatures for an in- definite time without any increase or diminution of its mass whatever. Such a piece of metal may therefore with propriety be chosen as a ‘national standard of mass, the absolute constancy of the quantity of matter constituting it being accepted on definition, as we are unable to test it by any stanlarjl in which we have more confidence than we have in itself. The British and French national standards of mass are of platinum, but the new standards recently coustructed in Paris consist of an alloy of platinum and iridium.

The determination of a unit of length is not so simple as that of the unit of mass. In this case, as in the preceding, we avail ourselves of the properties of a material standard, but we know that however indestructible the standard itself may be its dimensions depend upon the pressure to which it is exposed, its temperature, and in some cases upon other accidents, such as the magnetic force in the neighbourhood, &e, Hence the only course open to us is to determine as far as possible all the causes of variation in the length of our standard, and carefully to define its condition with respect to these variables, so that it shall be a standard only under the circumstances thus defined. Having thus defined the condition of the material standard with respect to all the variables upon which we know its length to depend, we must consider the absolute constancy of its length at all times and places to be a matter of definition until we have discovered other causes which affect it. It has been pro- posed that the wave length cm vacuo of a particular kind of light, as for instance that corresponding to one of the sodium lines, should be taken as the unit of length, and its period as the unit of time. These units are probably more constant than those afforded by any material standards or vibrating springs which we can construct; but a belief in their absolute constancy implies complete confidence in the constancy of the properties of the interstellar medium, and of the sodium molecule.

_ The determination of a satisfactory means of measuring time seems to offer greater difficulties than the measure- ment of mass or of space, though the difficulties are of the Same character as those we have just considered. The great difficulty consists in defining what is meant by the equality of two intervals of time which do not commence simultaneously, Remembering that it is upon the proper- ties of matter alone that we can rely for assistauce, we might construct a spring and define as equal lapses of time those intervals during which this spring executes the same number of vibrations, the temperature, &c., being kept constant. But if we were to construct a number of such springs, though a perfect agreement might obtain between them at first, we should find after a considerable period that the measurements of time derived from different springs did not agree, while our knowledge is in- sufficient to enable us to apply to each the corrections necessary to lead us to a consistent result. Now there may be no reason wliy we should prefer one spring above all the others, and thus it appears that a definition of equal Intervals of time based upon the behaviour of any single

spring is too arbitrary to be satisfactory. If, however, we found a large number of springs, constructed of different naterials and differently affected by temperature and other known causes of variation, continue to give perfectly consistent results, the theory of probability would lead us to place a high value upon the measure of time thus afforded. Now, we have stated that our highest conception of the measurement of time is derived from the dynamical principle expressed in the first law of motion, but when we come to apply this it is impossible to determine a priore whether in the case of two given bodies there is no stress acting between them or between one of them and some third object. Consequently, the only course open to us is to examine the motion of a large number of material systems, making such corrections for the action of stresses which we kuow to be in operation as our theoretical dynamics will enable us to determine ; and, if after this we find that several independent systems afford the same measureinent of time, while those systems which lead to a differeut result disagree also among themselves, we must accept the measurement of time afforded by the first set as the true measure, and attribute the discrepancies manifested by the

other systems to some unknown stresses, which it should be our subsequent business to discover,

Work.—The contemplation of a stress, together with a re- lative displacement of theportions of matter between which it acts, introduces us to the conception of work. If we con- sider a stress, together with the distance through which the solicited bodies are capable of moving relative to oue another in obedience to the stress, the object of our contem- plation is the work which may be done under the given conditions of the system, and this we call energy. The sub- ject of which natural philosophy treats is the transformation of energy, which in all its phases takes place in accordance with two great principles, known respectively as the principles of the conservation and the dissipation of energy. Of these two principles the former rests npon a much higher scientific basis than the latter. Iu order to lose our faith in the principle of the conservation of energy we must give up our belief in the fundamental principles of dynamics expressed in the laws of motion ; but as regards the dissi- pation of energy we can say little more than that all the operations of nature with which we are acquainted take place in accordance with this principle. Clerk Maxwell has, however, shown that it is possible to subvert the prin- ciple of the dissipation of energy by the simple exercise of a sufficiently high order of intelligence. For the statement and discussion of these two principles see ENERGY.

It is the work of the natural philosopher to explain the operations of nature in accordance with the principles of dynamics, and we consider that we understand any pheno- menon when we have shown it to consist of a motion of matter and determined the character of this motion. Thus it is that dynamics forms the foundation of every branch of natural philosophy, and a thorough appreciation of the prin- ciples of conservation and dissipation of energy is the only safe guide in physical investigations. (w. G.)

DYNAMITE (dvvayus, strength), the name applied to various explosive: preparations containing nitroglycerin. The first practical application of nitroglycerin, discovered by Sobrero in 1847, was made by Alfred Nobel, who in 1863 used gunpowder soaked with it for blasting. In 1864 he found that it could be exploded by the initiative detona- tion of fulminating materials ; and in 1867, owing to the uncertainty and danger attending its

employment, he con- ceived the idea of mixing it with some solid and absorbent inert substance. The siliceous infusorial earth called in Germany Kveselguhr proved to be well adapted for this pur- pose, since it took up as much as three times its weight of nitroglycerin without becoming more than damp to the

touch. The mixture of earth and nitroglycerin, to which was added a little alkaline material to neutralize any acid that might be set free by the latter, was termed by Nobel dynamite. Ignited in the open air, dynamite burns slowly, but it is as readily exploded as nitroglycerin itself by means of a detonating fuze; and, though not equal in bursting or breaking power to uncombined nitroglycerin, on accouut of the absorption by its inert constituents of part of the heat developed by the exploding shock, it is greatly superior to gunpowder, instead of which or gun-cotton it 1s employed in blasting coal and stone, removing piles, felling trees, and clearing stumps from forest-land. It may also be used with advantage for the destruction of cannon and for breaking up large iron castings (see Compt. rend., Lxxil. 770). For filling bore-holes its pasty consistency renders 1t a very con- venient material.

In continuous masses dynamite transmits detonation at the rate of from 19,500 to 21,600 feet a second. Con- finement is not requisite for its explosion, and it can be used in damp situations without to any great extent impairing its action. It explodes if heated in a closed brass case, also on sharp percussion when placed between two metallic surfaces; it should not, thereforc, be kept in hermetically sealed receptacles of metal or other very solid material. At alow temperature dynamite loses its tendency to explode by detonation. Another defect is its liability to part with a portion of its nitroglycerin, especially when in contact with porous substances, such as the paper of cartridges and wrappers (see Guyot, Compt. rend., xxii. 688). MM. Girard, Millot, and Vogt have shown (Moncteur scientifique, xiil. 58) that for the manufacture of dynamite the best abgorbents are kaolin, tripoli, alumina, and sugar ; the last, like alum, the material employed in Mr Horsley’s preparation, has the advantage of being separable from associated nitroglycerin by solution in water, Dynamite as made by M. P. Champion

consisted of 20 to 25 parts of nitroglycerin with 75 to 80 parts of finely pulverized burnt clay from glass works (Mon¢t. scvent., xit. 91); and in some explosives sold as dynamite a mixture of sawdust and chalk is substituted for siliceous substances.

See F. A. Abel, On Recent Investigations and Applications of Explosive Agents, 1871; J. Trauzl, Die Dynamite, thre Higensehaf- ten und Gebrauchsweise, Berlin, 1876.

DYNAMOMETER (dvvapus, strength, and pérpov, a measure), an instrument for measuring force exerted by men, animals, and machines. One of the simplest forms, namely, that devised by the mechanician Graham, and im- proved by Desaguliers, was essentially a steel-yard in which the position of the weight on the longer arm indicated the force exerted on the shorter in order to produce equilibrium. The dynamometer invented by Leroy of the French Academy consisted of a metallic tube 10 to 12 inches long, in which was a spiral spring with an attached graduated rod terminat- ing above ina globe. Pressure being applied to the globe, the rod sank into the tube, and thus marked the force employed in compressing the spring. M. Regnier's dynamometer (see Journ. de ? Ecole Polytechnique, tom. ii.) consists of an elliptical steel spring having fixed to one of its arms a semicircular graduated brass plate with central index, and to the other a small lever, which, acting on the index, shows the amount of force exerted in effecting a greater or less approximation of the arms to each other. In a similar instrument contrived by M. Poncelet, the springs are hinged together at the extremities, and separated from each other in proportion to the tension brought to bear upon them. A dynamometer for therapeutical purposes, invented by Dr Hamilton of Long Island College Hospital, consists of an india-rubber bulb filled with coloured water, into which dips a tube closed at the upper end. Pressure being applied to the bulb, some of the water is forced up

into the tube, the graduations upon which show the amount of pressure upon the air within it which is exerted by the water. By the dynamometer of

Colonel Morin a curve is drawn, the area of which represents the product of the force exerted into the space through which it acts, or, in other words, the quantity of work performed in a given time. Details with respect to Morin's, Watt's, and other dynamometers will be found in vol. i. of Laboulaye's Dictionnaire des Arts et Manufactures.

DYRRACHIUM. See Durazzo.

DYSART, a seaport town and royal and parliamentary burgh of Scotland, in the county of Fife, nine miles north- east of Burntisland, with a station on the North British Railway. It consists mainly of three narrow streets with a square in the centre, and on the whole has rather a dull and deserted appearance. In the High Street there are a nuinber of antique houses with inscriptions and dates ; and towards the south side of the town there are remains of an ancient chapel. Besides the old parish church with its tower, there are six places of worship, an old town-house, a mechanics' institute, and a combination poorhouse. The harbour is tolerably good, and there is a wet dock attached. The staple industry is the manufacture of linens and ticks ; but flax-spinning and ship-building are also carried on, and there is a large cxport of coal. To the west of the town is Dysart House, the residence of the earl of Rosslyn. Asa parliamentary borough Dysart is a member of the Kirkcaldy district. The population of the town in 1871 was 2476.

Dysart is mentioned:as carly as 874 at the time of a Danish invasion. Its name is said to be a corruption of the Latin desertum, a desert, applicd to a cave on the sea-shore which was occupied about 440 by St Serf or Sanctus Servanus, to whom at a later date the church was dedicated. From James V. the town received the rights of a royal burgh. In the 15th and 16th centuries it was the seat of a great manufacture of salt, and besides dealing in this article with Holland and other countries, it had a large general trade. For several months in 1559 it was the headquarters of the Lords of the Congregation, and in 1607 it was the scene of those remarkable nieetings of the synod of Fife known in ecclesiastical history as the Three Synods of Dysart. William Murray, a native of the town, was made earl of Dysart either by Charles I. or Charles II., and his eldest daughter aftcrwards assumed the title of countess, and transinitted the dignity to her descendants by the carl of Lauderdale, her second husband.

DYSENTERY (from the prefix dus, and é&epov, the intestine), also called Bloody Flux, an infectious disease with a local lesion in the form of inflammation and ulcera- tion of the lower portion of the bowels.

Although at one time a common disease in Great Britain, dysentery is now very rarely met with there, and is for the most part confined to warm countrics, where it is the cause of a large amount of mortality. –

Dysentery in a sporadic form may occur anywhere, but this variety of the disease is believed to depend on a different cause from that to which it is due where it prevails endemically or spreads as an epidemic ; for, while isolated cases appear capable of being excited by irritating causes which act locally on the alimentary canal, and may thus be developed ont of an ordinary intestinal catarrh, the dysentery of tropical climates is generally regarded as owing its origin to a specific poison of the nature of a miasm or germ, some- what analogous to that which is belicved to be the cause of malignant cholera. How, and under what circumstances, the dysentery poison is generated is still a matter of uncertainty. The frequent association of dysentery with intermittent fever has long been remarked, and has led to the belief on the part of many in a malarial origin for this disease. It is, however, doubtful whether any necessary relationship can be established between them (although a malarial form of dysentery is a well marked variety of the diseasc), since dysentery may be found prevailing where no evidence of malaria can be detected. At the same time

certain characters of climate and soil are known to favour the increase and propagation of dysentery. Long continued high temperature of the air and ground, such as exists in the tropics, together with a soi] of swampy character, are the conditions generally present where dysentery prevails endemically, and where it is propagated as an epidemic these factors are seldom absent. Among other causes well recognized as favouring the spread of epidemic dysentery are impure air and water, improper and insufficient food, unripe fruit, excessive indulgence in alcoholic liquors, and exposure to chills in warm weather, all or many of which have been often found connected with the propagation of dysentery among large bodies of people,

as in the case of armies, where also the disease has been frequently associated with outbreaks of scurvy.

The contagiousness of epidemic dysentery is generally admitted, and it is probable that in this disease as in cholera the vehicle of its transmission is contained in the matter discharged from the bowels of those affected.

Dysentery manifests itself with varying degrees of inten- sity, but in well-marked cases the following are the chief symptoms. The attack is commonly preceded by certain premonitory indications in the form of general illness, loss of appetite, and some amount of diarrhoea, which gradually increases in severity, and is accompanied with griping pains in the abdomen (tormina). The discharges from the bowels succeed each other with great frequency, and the painful fceling of pressure downwards (tenesmus) becomes so intense that the patient is constantly desiring to defecate. The matters passed from the Lowels, which at first resemble those of ordinary diarrhcea, soon change their character, becoming scanty, mucous or slimy, and subsequently mixed with, or consisting wholly of, blood, along with shreds of exudation thrown off from the mucous membrane of the intestine. The evacuations possess a peculiarly offensive odour characteristic of the disease. Although the constitutional disturbance is at first comparatively slight, it increases with the advance of the disease, and febrile symptoms come on attended with urgent thirst and scanty and painful flow of urine. Along with this the nervous depression is very marked, and the state of prostration to which the patient is reduced can scarcely be exceeded. Should no improvement occur death may take place in from one to three weeks, either from repeated losses of blood, or from gradual exhaustion consequent on the con- tinuance of the symptoms, in which case the discharges from the bowels become more offensive and are passed in- voluntarily.

When, on the other hand, the disease is checked, the signs of improvement are shown in the cessation of the pain, in the evacuations being less frequent and more natural, and in relief from the state of extreme depression. Con- valescence is, however, generally slow, and recovery may be imperfect—the disease continuing in a chronic form, which may exist

fora variable length of time, giving rise to much ate and not unfrequently leading to an ultimately fatal result.

Several varieties of dysentery are described in which the symptoms are inodified by the association of the discase with other morbid conditions. Thus the form kuown as Malarial Dysentery is complicated with febrile attacks of an intermittent character, and is frequently attended with hepatic, splenic, and renal affections ; while it is most suc- cessfully treated by remedies which are of value in malarial diseases, such as quinine. Again, in Scorbutic Dysentery the attack is accompanied with the great prostration char- acteristic of scorbutus, and also with dangerous hemorrhage. Malignant Dysentery is the term applied to those cases Where all the symptoms are present in great intensity, and Progress rapidly to a fatal termination. Such cases are

often attended with gangrene and sloughing of the mucous membrane of the affected portion of the bowel.

The dysentery poison appears to exert its effects upon the glandular structures of the large intestine, particularly in its lower part. In the milder forms of the disease there is simply a congested or inflamed condition of the mucous membrane, witli perhaps some inflammatory exudation on its surface, which is passed off by the discharges from the bowels. But in the more severe forms ulceration of tlle mucous membrane takes place. Commencing in and around the solitary glands of the large intestine in the form of exudations, these ulcers, small at first, cnlarge and run into each other, till a large portion of the bowel may be implicated in the ulcerative process. Should the disease be arrested these ulcers may heal entirely, but occasionally they remain, causing more or less disorganization of the coats of the intestines, as is often found in chronic dysentery. Sometimes, though rarely, the ulcers perforate the intestines, causing rapidly fatal inflammation of the peritoneum, or they may erode a blood vessel and produce violent hemor- rhage. Even where they undergo healing they may cause such a stricture of the calibre of the intestinal canal as to give rise to the symptoms of obstruction which ultimately prove fatal.

The occurrence of abscess of the liver in connection with attacks of dysentery is frequently observed. It has been ascribed to the passage of morbid material from the diseased intestine into the liver, but by many high authori- ties is regarded more as a coincidence, depending upon the same climatic causes as those which predispose to the dysentery.

Treatment.— Where the disease is endemic or is prevailing epidemically, it is of great importance to use all preventive measures, and for this purpose the avoidance of all causes likely to precipitate an attack is to be enjoined. Exposure to cold after heat, the use of unripe fruit, and intemperance in eating and drinking should be forbidden ; and the utmost care taken as to the quality of the food and drink- ing water. In houses or hospitals where cases of the disease are under treatment, disinfectants should be freely employed, and the evacuations of the patients removed as speedily as possible. In the milder varieties of this complaint, such as those occurring sporadically, and where the symptoms are probably due to inatters in the bowels setting up the dysenteric irritation, the employment of diaphoretic medicines is to be recommended, and the administration of such a laxative as castor-oil, to which a smal] quantity of laudanum has been added, will often, by removing the source of the miscluef, arrest the attack. In the severer forms of the disease, those, namely, occurring in warm climates, the remedy most to be relied on is ipecacuanha. This drug, which has long been known as possessing special efficacy in dysentery (and was originally introduced into this country from Peru as the radix anti-dysenterica), has proved of signal value in the treatment of the disease in India, and, as shown by Dr Maclean, has diminished the mortality to a remarkable extent. It is administered in full doses of 25-30 grains of the powder, which are repeated in from six to ten hours, gradually lessening the quantity; the effect observable is a diminution in the pain, and in the frequency and offensive character of the stools, along with the accession of profuse perspiration and quiet sleep. Hot opiate fomentations applied to the abdomen are of use in relieving the tenesmus. Ice may be freely taken to allay thirst. The diet should be light, consisting of soups and farinaceous food. In malarial dysentery quinine is the most successful remedy, ipecacuanha being generally found. to be unsuitable; while in scorbutic dysentery the treat- ment must bear reference to the depraved condition of the general health characteristic of scorbutus. In this form

of the disease the fresh bael or bhel fruit (gle Marme- los) is largely used in India. Im chronic dysentery the adininistration of astringents such as Dover’s powder may be of service, but the chicf points to be attended to are the nourishing of the patient and the observance of judicious hygienic measures, such as the duc clothing of the body, the use of tonics, baths, &c. A change to a eooler climate often proves of great value. (Cine)

DYSPEPSIA (from dvs-, and zérrw, to digest), or In- digestion, is one of the most eommon of all complaints, but, from its intimate connection with various other morbid conditions, the term is somewhat vaguely employed, There are comparatively few discases of any moment where some of the phenomena of dyspepsia are not present as associated symptoms, and not unfrequently these exist to such a degree as to mask the real disease of which they are only complications. This is especially the case in many organic diseases of the alimentary canal, in which the symptoms of dyspepsia are often the most prominent. In its restricted meaning, however (and it is to this that the present bricf notice applies), the term is used to deseribe a fnnctional derangement of the natural process of digestion, apart from any structural change in the organs eoncerned in the act. The causes of this ailment are very numcrous, but are generally regarded as bearing referenee cither to the tood, the condition of the gastric juice, or the move- ments of the stomach during the process of digestion.

Among the eauses eonnected with the food are not only the indulgence in indigestible articles of dict, but the too common practice of eating too much of what may be other- wise quite wholesome and digestible, irregular or too fre- quent meals, and imperfect mastication of the food. Sub- stanees which are badly cookcd, or too hot or too cold, the excessive use of condiments, the partaking of too much liquid with a meal, and over indulgenee in tea, tobacco, and alcoholie liquors are likewise fruitful sources of dyspepsia. Morbid states of the gastrie juice readily give rise to dyspepsia. This fluid may be diminished in quantity, or be altered in character by the presenee of too much acid, or by deficiency in its active digestive prineiple, pepsine. These conditions are often connected with actual disease of the mucous

membrane of the stomach, but they may also exist in advaneed life, in depraved states of the general health (as in rheumatism, gout, Bright's disease, anaemia, é&c.), or in eonstitutions weakened by fatigue, over-anxiety, or debauchery. It must, however, be borne in mind that not only the gastric juice but the other digestive fluids, such as the saliva, bile, pancreatic and intestinal juices, may by defects in their amount or quality materially hinder the process of digestion. Further, dyspepsia may be the result of a perverted condition of the natural movements of the stomach during digestion,—whereby, on the one hand, owing to increased activity of its propulsive power, the food may be carried into the intestincs in a half dissolved state, and give rise to many of the symptoms of indiges- tion, or, on the other hand, from a weakened or atonic state of the muscular coats of the stomach digestion may be retarded, and the food retained and excite discomfort and pain consequent on its undergoing fcrmentive and putre-factive changes.

The symptoms of dyspepsia, even when due to a like cause, are SO numerous and diversified in different in- dividuals that probably no description could exactly represent them as they occur in any given case. All that can be here attempted is to mention some of the more prominent morbid phenomena usually present in greater or less degree.

When the attack is dependent on some error in diet, and the dyspepsia consequently more of an acute character, there is often pain followed with sickness and vomiting of

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the offensive matters, after which the patient soon regains his former healthy state. What are commonly known as ‘‘bilious attacks” arc frequently of this character. In the more chronie cases of dyspepsia the symptoms are somewhat different. A sensation of discomfort eomes on shortly after a meal, and is more of the nature of weight and distension in the stomach than of actual pain, although this too may be present. These feelings may eome on after each meal, or only after certain meals, and they may arise irrespective of the kind of food taken, or only after certain articles

of diet. As in most of such cases the food is long retained in the stomach, it is apt to undergo fermentive changes, one of the results of whieh is the aceumulation of gses which cause flatulence and eruetations of an acid or foul character. Occasionally quantities of hot, sour, taste- less, or bitter fluid, or mouthfuls of half-digested food, regurgitate from the stomach. Temporary relief may be obtained when another meal is taken, but soon the uncom- fortable sensations return as before. The appetite is often diminished, but may be little impaired; the tongue is in general large and flabby, and more or less furred, In some forms of this complaint, howcver, particularly Where there is great irritability of tlic stomach, the tongue is abnormally red. There is generally obstinate constipa- tion.

Numerous disagreeable and painful sensations in other parts are experienced, and are indeed often more dis- tressing than the merely gastrie symptoms. Pains in the chest, shortness of breathing, palpitation, headache, giddiness, affections of vision, coldness of the extremities, and general languor are eommon accompaniments of dyspepsia; while the nervous phenomena are specially troublesome in the form of sleeplessness, irritability, despondeney, and hypochondriasis.

A disease of this nature, interfering as it does with the assimilative and nutritive processes, must necessarily exert an evil influence on the general health, and there is reason to belicve that many serious ailments owe their origin to persistent dyspepsia. This is notably the case as regards phthisis; for although dyspeptic symptoms often present themselves as complications induced by the disease, yet it eannot be doubted that long-continued indigestion, particularly.in youth, must have the effect of favouring the oceurrenee of consumption in persons at all predisposed to it.

Dyspepsia appears to be in some eases hereditary. In its chronic form, this disease may long resist treatment, but it is always in some measure influeneed by the diet and regimen and by the oecupation of the patient. Asa rule persons of sedentary pursuits and brain-workers suffer more from dyspepsia than those leading active lives.

As regards treatment only a few general observations can be made. «The careful arrangement of the diet is a matter of first importance. Quantity must be regulated by the digestive capabilities of the individual, his age,

and the demands made upon his strength by work. There is little doubt that the danger is in most instanees on the side of excess, and the rule which enjoins the eessation from eating before the appetite is satisfied is a safe one for dyspeptics. Due time, too, must be given for the digestion of a meal, and from four to six hours are in general required for this purpose. Long fasts, however, are nearly as hurtful as too frequent meals. Of no less importance is the kind of food taken, and on this point those who suffer from indigestion must ever exercise the greatest care. Every article of diet which past experienee has proved to disagree should be shunned, since what may appear trifling indiscretions to this respect are often produetive of great and prolonged suffering. The tables which have been framed to show the relative digestibility of various kinds of food, and which

have been founded largely on the observations of Dr Beaumont in the celebrated case of Alexis St Martin, are only valuable within certain limits when applied to the treatment of dyspepsia. It must be borne in mind that idiosynerasy often plays an important part in digestion, some persons being unable to partake without injury of substances which are generally regarded as wholesome and digestible. Difficulty, too, is often experienced in dealing with dyspeptics from their aversion to, or want of appetite for, those forms of diet which appear most suitable for them. Experience has shown that in this complaint no particular kind of food is absolutely to be relied on, but that in general the best diet is one of a mixed animal and vegetable kind simply but well cooked. The partaking of inany dishes, of highly seasoned or salted meats, raw vegetables, newly baked bread, pastry, and confectionery, are all well known common causes of dyspepsia, and should be avoided. When even the simple dict usually taken is found to disagree, it may be necessary to change it temporarily for a still lighter form, such a3 a milk diet, and that even in very moderate quantity.

General hygienic measures are highly important, since whatever improves the state of the health will have a favourable influence on digestion. Hence regular exercise in the open air, early rising, and the cold bath are to be strongly recommended.

The raedicinal remedies for dyspepsia are exceedingly numerous, aud a few only of them can be mentioned. Attacks brought on by errors in diet are generally relieved by small doses of rhubarb and bismuth, and by the use of small quantities of light and bland food. In clonic dyspepsia the treatment must depend on the cause of the disorder, so far as that can be ascertained. When the dyspepsia is of the atonic form without much irritability of stomach, bitter tonics such as nux vomica, calumba, gentian, or quassia, along with some of the mineral acids taken before, with, or immediately after a meal will be found highly serviceable; while on the other hand, when there is gastric irritation with acid eructations, sickness, and pan, the medicinal hydrocyanic acid along with bismuth, and antacids taken after food will often afford relief. Pepsine is a remedy of undoubted value in many cases of dyspepsia, and appears to supply the place of that ingredi- ent of the gastric juice when it is deficient in amount. It may be given along with a meal, alone, or in conjunction with diluted hydrochloric acid, which also is a remedy of great efficacy in indigestion. Strict attention must ever be paid to the regular action of the bowels, and where laxa- tives are required an aloetic dinner pill, or, what is often better, one of the mineral bitter waters (such as that of Frederickshall) which are now so commonly used, should be had recourse to.

_ The employment of alcoholic stimulants to assist digestion is largely resorted to both with and without medical advice. While it seems probable that in certain cases of atonic dyspepsia, particularly in the feeble and aged, the moderate administration of alcohol has the effect of stimulating the Secretion of gastric juice, and is an important adjuvant to other remedies, the advantages of its habitual use as an aid to digestion by the young and otherwise healthy is more than questionable, and it will generally be found that among them those are least troubled with indigestion who abstain from it. See Puysronocy and Disverics. (J.0.A.)

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DYVEKE, in German often Diivele, and in the Latin chronicles Columbella, the “Little Dove,” the name by which the mistress of Christian II. of Denmark is invari- ably designated. Her father wasa certain Sigbrit Villums, who had been obliged for political reasons to leave his native

country of Holland. Settling at Bergen, he opened an inn, which soon became known for something more than the hospitality of the host or the excellence of his cheer: his daughter's beauty was bush enough for his weakest wine. Valkendorp, the chancellor, did not think it unbe- coming of his priestly character to sound her praise in the ears of the young crown-prince ; and accordingly, when he visited Bergen in 1507, the prince made a point of seeing the "Little Dove" for himself. In matters of this sort there is unquestionably a royal road ; and so having danced with her at a ball or two, he had little difficulty in getting her to leave the inn for a house of her own at Oslo. She followed him to Copenhagen on his accession in 1513, and both her father aud mother obtained unusual influence at court. In 1515 the young king, indeed, was constrained from reasons of state to marry Isabella, the sister of Charles Y.; but in spite of the emperor's remonstrance, his relations with Dyveke and her parents underwent no real alteration till her sudden death in 1517. That she had been poisoned was the natural verdict of the popular feeling ; aud the royal suspicion fell on Torben Oxa, warden of the castle of Copenhagen, who was known to have made love to the girl before she was carried off by the prince; and was it not true that two days before her death he had sent her a present of cherries? It mattered not that the culprit was declared innocent by the royal council: "though his neck were as thick as the neck of a bull it should not save his head," raged the king ; and he kept his word. Such is the story, not altogether authenticated, which has furnished a favourite theme to dramatist and novelist. Samsoé the Danish poet, published his well-known tragedy '' Dyveke " in the close of the 18th century, and it was translated by Manthey into German in 1798. Miinch treated the subject in a semi-historical manner in his Biograph.~~histor. Studien ; Hermann Marggraft's tragedy of Das Tatibchen von Amster~~ dan appeared in 1839, Rickhoff's Dzveke in 1842, Hauch's Wehelm Zabern in 1834, Ida Frick's Sybrecht Wellwums in 1843, and Mosenthal's Diiveke in 1860.

DZUNGARIA, Dsoncaria, or Soncaria, a former Mongolian kingdom of Central Asia, raised to its highest pitch by Kaldan or Bushtu Khan in the latter half of the 17th century, but completely destroyed by Chinese invasion about 1757-59. It derived its name from the Dsongars, or Songars, who were so called because they formed the left wing (dson, left ; gar, hand) of the Mongolian army. Its widest limit included Kashgar, Yarkand,

Khotan, the whole region of the Thian Shan Mountains, and in short the greater proportion of that part of Central Asia which extends from 35° to 50° N. lat. and from 72° to 97° Ki. long. The name, however, is more properly applied only to the present Chinese province of Thian-Shan- pe-lu and the country watered by the Ili. As a political or geographical term it has practically disappeared from the map ; but the range uf mountains stretching north-east along the southern frontier of the Land of the Seven Streams—as the district to the south-east of the Balkhash Lake is called—preserves the name of the Dzungarian Jiange.

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1D

is the second vowel-symbol and the fifth letter in our iD alphabet. In its original form among the Pheenicians it represented the rough breathing—our f. we have seen that A represented the smooth breathing. As the Greeks had the sound f at a very early period, it might have been ex- pected that this symbol would have been taken by them with its original value. But the want of symbols to denote the vowels was apparently felt to be more imperative ; therefore all the Phoenician symbols (corresponding to the Hebrew aleph, he, ayin) were taken to denote the vowel- sounds a, é, o respectively. The form of the symbol E has varied little from the earliest Greek times to our own. In old Latin it is sometimes, but rarely, found in the form ||. The typical sound of E in almost all languages is one of those which we denote generally by a in English, e.g.,in the word fate—that is, one of the simple sounds between A (English ah) and I (English ce), which are pro- duced by raising the tongue gradually from its lowest position (at A) to its highest position (at I) : in this scale of sounds the lips are not employed. The most clearly distinguished of these sounds are (1) that in men, (2) that in fair, (3) that in fate. It will be observed that these sounds have here different symbols; and if these were consistently employed in English we should not have much reason to complain of our spelling; but e has also the I- sound in here and see ; at in wart has the same sound as a in fate ; and a has many sounds. Other languages employ diacritical marks to distinguish these sounds; thus in Italian we have and , called “ open” and “ close ” ¢ respectively ; these correspond very nearly to (2) and (3)

mentioned above. It is probable that the same distinction of sound was given in Latin by employing ae to express the open e-: at least open ¢ is eommonly found in Italian words which were written in Latin with ae, or with e short. It is possible that in Greece a similar distinction of close open ¢ was expressed in early times by the symbols « (epsilon) and 7 (eta) ; but in Attica, at least after 403 z.c., the distinction seems to have been rather quantitative than qualitative. or the history of eta see article H. It is clear that in a perfect alphabet we ought to have at least three distinct symbols between A and I: we ought not to be compelled to distinguish the simplesounds by diphthongs or other modifications. Indeed yet more symbols would be desirable, for there are other sounds in this scale, which, however, are not easily distinguished from the above except by a practised ear.

It is probable that ee in English of the 16th and 17th centuries had the sound still heard in Scotland in words like ell, ze, the simple e in our men pronounced long : this is not unlike the open e, tut the back of the tongue is lower, But ce had acquired its present I sound in the last century.

EACHARD, Joun (1636-1697), an English divine, was born in Suffolk in 1636, and was educated at Catherine Hall, Cambridge, of which he became master in 1675 in succession to Lightfoot. He was created a doctor of divinity in 1676 by royal mandate, and was twice (in 1679 and 1695) vice-chancellor of the university. He died on the 7th July 1697. In 1670 he had published anonymously a humorous satire entitled The Ground and Occasions of the Contempt of the Clergy enquired into in a letter to R. L., which excited much attention and provoked several replies, one of them being from John Owen. These were met by Some Observations, etc., in a second letter to 4. L. (1671), written in the same bantering tone as the

original work. LEachard attributed the contempt into which the clergy had fallen to their imperfect education, their insufficient incomes, and the want of a true vocation, He gave amusing illustrations of the absurdity and poverty of the current pulpit oratory of his day, some of them being taken from the sermons of his own father. He attacked the philosophy of Hobbes in his Mr Hobbs’s State of Nature considered ; in a dialogue between Philautus and Timothy (1672), and in his Some Opinions of Mr Iobbs

considered wn a second dialogue (1673). These were written in their author's chosen vein of light satire, and Dryden praised them as highly effective within their own range. It is noteworthy that Eachard's own sermons were not superior to those he satirized. Swift alludes to him as a signal instance of a successful humorist who entirely failed as a serious writer. A collected edition of his works in three volumes, with a notice of his life, was published in 1774.

EADIE, Joun (1810-1876), theologian and biblical critic, was born at Alva, in Stirlingshire, on the 9th May 1810. Having manifested unusual ability at school, he was sent to the university of Glasgow, where he passed through the usual curriculum in arts. Immediately afterwards he commenced to study for the ministry at the Divinity Hall of the Secession Church, a dissenting body which, on its union a few years later with the Relief Church, adopted the denomination 'United Presbyterian, In 1835 he was ordained to the pastoral charge of the Cambridge Street Secession church inGlasgow. Here he speedily attained a position of great eminence and usefulness, and for many years before the close of his life he was generally regarded as the leading representative of his denomination in the city which has always been its stronghold. Though he had little claim to be called eloquent, and his style was often slovenly, he had many of the other qualities that secure the most useful and enduring kind of popularity. As a preacher he was distinguished by invariable good sense, frequent flashes of happy illustration, masculine piety, deep spiritual earnestness, breadth of sympathy both intellectual and emotional, and—most specifically of all—by the power he had in his expository discourses of conveying the best results of biblical criticism in an intelligible form to a general audience. Behind the carelessness and apparent indifference of his manner, it was not difficult to detect the quick sensibility and tender feeling which were eminently characteristic of the man. Though more than once invited to an important charge elsewhere, Dr Eadie refused to leave Glasgow, in which he found a sphere more exactly suited to his pastoral gifts than he could expect in any other place. In 1863 he removed witha portion of his congregation'to a new and beautiful church at Lansdowne Crescent, where his influence continued unabated until his death.

From his student days Eadie bore a reputation for extensive, if not profound and accurate, scholarship, which he justified and increased during the earlier years of his ministry to such an extent that in 1843 the church to which he belonged appointed him professor of biblical liter- ature and hermeneutics in its Divinity Hall. He held this appointment along with his ministerial charge till the close of his life, and discharged its duties with an efficiency that was universally acknowledged. While his scholarship was not minute or thorough, he was surpassed by few biblical commentators of his day in range of learning, and by still fewer in the soundness of judgment with which his learning was applied. As a critic he was acute and painstaking ;

as an interpreter he was eminently fair-minded. In the professor's chair, as in the pulpit, his strength lay in the tact with which he selected the soundest results of biblical criticism, whether his own or that of others, and presented them in a clear and connected form, with a constant view to their practical bearing. If this last fact gave a non- academic aspect to some portions of his lectures, it rendered them not less interesting and probably not less useful to his auditors. Hadie's merits as a scholar were early acknowledged by the usual honorary university dis- tinctions. He received the degree of LL.D. from Glasgow in 1844, and that of D.D. from St Andrews in 1850.

Busily engaged as he wag in two distinct offices, either of which might well of itself have employed all his enerzies, Eadie nevertheless found time for an amount of work in a third sphere, of which the same thing might be said. His labours as an author would have been more than creditable to one who had no other occupation. Most of his works were connected with biblical criticism and interpretation, some of them being designed for popular use and others being more strictly scientific. To the former class belong the Biblical Cyclopedia, his edition of Cruden's Concord- ance, his Harly Oriental History, and his discourses on The Divine Love and on Paul the Preacher ; to the latter belong his commentaries on the Greek text of St Paul's epistles to the Ephesians, Colossians, Philippians, and Galatians, published at intervals in four volumes, which take a high rank among

exegetical works. His Life of Dr Kitto obtained a deserved popularity. His last work, the History of the English Bible (2 vols. 1876), will probably be the most enduring memorial of his ability as an author. Though not unimpeachable in point of arrangement and style, it contains a fuller and more accurate account of the subject than is to be found anywhere else, and almost every page bears marks of the life-long interest and loving research of the author. His almost unrivalled knowledge of the various English versions, ag well as his ability as a critic and interpreter of the original, led to his being selected as one of the company for the revision of the authorized version of the New Testament, and in this capacity it is understood that he rendered excellent service. Dr Eadie died at Glasgow on the 3d June 1876.

EADMER, or Epmer (in Latin Eadmerus, and by mistake Edimerus and Edinerus), an English ecclesiastic and historian of the Norman period, probably, as his name suggests, of English as opposed to Norman parentage. At an early age he was sent to the Benedictine monastery at Canterbury ; and there he became acquainted with Anselm, at the time of the latter's first visit to England as abbot of Bec. The intimacy was renewed when Anselm was raised to the episcopal see; and thenceforward Eadmer was not so much the archbishop's disciple and follower as his friend and director, and that at last not only by Anselm's private recognition, but by the formal appointment of Pope Urban II. So complete, indeed, was the obedience shown by the great scholastic philosopher and head of the English Church to his self-elected tutor, that—according to William of Malmesbury, De gestis pontificwm Anglorum, lib. ihe is said to have waited for his express permission before he rose from his bed, or even turned from one side to the other. After Anselm's death Eadmer accompanied Radulph, the new archbishop, to Rome in 1119; and on their return in 1120 he was nominated to the see of St Andrews in Scotland. Owing, however, to the refusal of the Scotch to Tecognize the claims put forward by Eadmer and his patron im support of the episcopal authority of the see of Canterbury, he was never formally inducted into the office. He was at Canterbury in 1121, and he spent the latter part of his life as prior of the monastery there. His death is variously assigned to the year 1123 and 1137,

Eadmer has left a large number of works, of which a list is given in Wharton's Anglia Saera, part ii. Most important are his Historice Novorum, in six books treating of his own times down to the death of Radulph in 1122, and his Vita Anselmi, which ranks as one of the chief authorities in regard to the primate. The former was first published by Selden in 1628, the latter at Antwerp in 1551; and both have since been several times reprinted. Of less mark are his lives of Odo, Bregwin, and Dunstan, and of Oswald and Wilfrid of York, and his treatises—formerly ascribed to Anselnm—De quatuor virtutibus que fuerunt in beata Maria virgine, and De Similitudinibus S. Anselmi. Nearly all his works are to be found in an early MS. in the library of Corpus Christi College, Cambridge (C.C.0.C., No 371), and most of them have been reprinted as an appendix to Anselm's Opera by Gerberon, fol. 1675, and by the Benedictine monks of St Maure, fol. Paris, 1721. A number of his letters are preseryed in MSS. Cotton., Otho, A. xii.

See especially Wright, Biographia Brit. Lit. Anglo-Norman Period, 1846; apy Saint Anselm, 1853, pp. 186, 187; Burton, History of Scotland, vol. i. pp.

EAGLE (French Azgle, from the Latin Aguila), the name generally given to the larger Diurnal Birds-of-prey which are not Vultures; but the limits of the subfamily Aquiline have been very variously assigned by different writers on systematic ornithology, and, as before observed (BuzzarD, vol. iv. p. 603), there are Eagles smaller than certain Buzzards. By some authoritics the Laemmergeier of the Alps, and other high mountains of Europe, North Africa, and Asia, is accounted an Eagle, but by others the genus Gypaetus is placed with the Vaultwridew, as its common English name (Bearded Vulture) shows. 'There are also other forms, such as the South-American {/arpyia and its allies, which though generally called Eagles have been ranked as Buzzards. In the absence of any truly scientific definition of the family Aquiline it is best to leave these and many other more or less questionable members of the group—such as the genera Sprzaetus, Corcaetus, Sprlornis, Helotarsus, and so forth—and, so far as space will allow, to treat here of those whose position cannot be gainsaid.

True Eagles inhabit all the Regions of the world, and some seven or eight species at least are found in Europe, of which two are resident in the British Islands. In England and in the Lowlands of Scotland Eagles only exist as stragglers ; but in the Hebrides and some parts of the Highlands a good many may yet be found, and their num- bers appear to have rather increased of late years than diminished ; for the foresters and shepherds, finding that a high price can be got for their eggs, take care to protect the owners of the eyries, which are nearly all well known, and to keep up the stock by allowing them at times to rear their young. There are also now not a few occupiers of Scottish forests who interfere so far as they can to protect the king of birds. But hardly twenty years ago trapping, poisoning, and other destructive devices were resorted to without stint, and there was then every probability that before long not an Eagle would be left to add the wild majesty of its appearance to the associations of the moun- tain or the lake! In Ireland the extirpation of Eagles seems to have been carried on almost unaffected by the prudent considerations which in the northern kingdom have operated so favourably for the race, and except in the wildest parts of Donegal, Mayo, and Kerry, Hagles in the sister-island are said to be almost birds of the past.

Of the two British species the Erne (Icel. Zn) or Sea-

1 The late Lord Breadalbane was perhaps the first large landowner who set the example that has been since followed by others. On his unrivalled forest of Black Mount, Eagles—elsewhere persecuted to the death—were by him ordered to be unmolested so long as they were not numerous enough to cause considerable depredations on the farmers' flocks. He thought, and all who havean eye for the harmonies of nature will agree with him, that the spectacle of a soaring Hagle was a fitting adjunct to the grandeur of his Argyllshire mountain- scenery, and a good equivalent for the occasional loss of a lamb, or the slight deduction from the rent paid by his tenantry in consequence. How faithfully his wishes were carried out by his head-forester, Mr Peter Robertson, the present writer has abundant means of knowing, ,

Eagle (by some called also the White-tailed and Cinereous Eagle)—Haliaetus albicilla—affects chiefly the coast and neighbourhood of inland waters, living in great part on the fish and refuse that is thrown up on the shore, though it not unfrequently takes living prey, such as lambs, hares, and rabbits. On these last, indeed, young examples mostly feed when they wander southward in autumn, as they

Fic. 1.—Sea-Hagle.

yearly do, and appear in England. The adults (fig. 1) are distinguished by their prevalent greyish-brown colour, their pale head, yellow beak, and white tail—characters, however, wanting in the immature, which do not assume the perfect plumage for some three or four years. The eyry is commonly placed in a high cliff or on an island in a lake— sometimes on the ground, at others in a tree—and consists of a vast mass of sticks, in the midst of which is formed a hollow lined with Zuzula sylvatica (as first observed by the late Mr Jolin Wolley) or some similar grass, and here are laid the two or three white eggs. In former days the Sea- Eagle seems to have bred in several parts of England—as the Lake district, and possibly even in the Isle of Wight and on Dartmoor. This species inhabits all the northern part of the Old World from Iceland to Kamchatka, and breeds in Enrope so far to the southward as Albania. In the New World, however, it is only found in Greenland, being elsewhere replaced by the White-headed or Bald Eagle, H. leucocephalus, a bird of similar habits, and the chosen emblem of the United States of America. In the far east of Asia occurs a still larger and finer Sea-Eagle, ZZ. pelagicus, remarkable for its white thighs and upper wing- coverts. South-eastern Europe and India furnish a much smaller species, ZZ. lewcoryphus, which has its representative, H. leucogaster, in the Malay Archipelago and Australia, and, as allies in South Africa and Madagascar, JZ. vocifer and H. vociferoides respectively. All these Eagles may be distinguished by their scaly tarsi, while the group next to be treated of have the tarsi feathered to the toes.

The Golden or Mountain-Eagle, Aguila chrysaetus, is the second British species. This also formerly inhabited England, and a nest, found in 1668 in the Peak of Derby-

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shire, is well described by Willughby, in whose time it was said to breed also in the Snowdon range. It seldom if ever frequents the coast, and is more active on the wing than the Sea-Hagle, being able to take some birds as they fly, but a large part of its sustenance is the flesh of animals that die a natural death. Its eyry is generally placed and built like that of the other British species,! but the

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Fic. 2.—Golden Eagle.

neighbourhood of water is not requisite. The eggs, from two to four in number, vary from a pure white toa mottled, and often highly-coloured, surface, on which appear dif- ferent shades of red and purple. The adult bird (fig. 2) is of a rich, dark brown, with the clongated feathers of the neck, especially on the nape, light tawny, in which imagination seesa “ golden” hue, and the tail marbled with brown aud ashy-grey. In the young the tail is white at the base, and the neck has scarcely any tawny tint. The Golden Eagle does not occur in Iceland, but occupies suitable situations over the rest of the Palearctic Region and a considerable portion of the Nearctic—though the American bird has been, Ly some, considered a distinct species. Domesticated, it has many times been trained to take prey for its master in Europe, and to this species is thought to belong an Eagle habitually used by the Kirgiz Tartars, who call it Bergut or Bearcoot, for the capture of antelopes, foxes, and wolves. It is carried hooded on horseback or on a perch between two men, and released when the quarry is in sight. Such a bird, when well trained, is valued, says Pallas, at the price of two camels. It is quite possible, however, that more than one kind of Eagle is thus used, and the services of A. heliaca (which 1s the Imperial Eagle of some writers?) and of A. mogilak—

1 As already stated, the site chosen varies greatly. Occasionally placed in a niche in what passes for a perpendicular cliff to which access could only be gained by a skilful cragsman with a rope, the writer has known a nest to within ten or fifteen yards of which he rode on a pony. Two beautiful views of as many Golden Eagles nests, drawn on the spot by Mr Wolf, are given in the Ootheca Wolleyana, and a fine series of eggs is also figured in the same work.

2 Which species may have been the traditional emblem of Roman power, and the Ales Jovis, is very uncertain. > es

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both of which are found in Central Asia, as well as in ? South-eastern Europe—may also be employed.

Of the other more or less nearly allied species or races want of room forbids the consideration, but there is a smaller form on whiclia few words may be said. This has usually gone under the name of A. nevia, but is now thought by the best authorities to include three local races, or, in the eyes of some, species. They inhabit Europe, North Africa, and Western Asia to India, and two examples of one of theni—A. clanga, the form which is somewhat plentiful in North-eastern Germany—have occurred in Cornwall. The smallest true Eagle is A. pen- nata, which inhabits Southern Europe, Africa, and India. Differing from other Eagles*of their genus by its wedge- shaped tail, though otherwise greatly resembling them, is the 1. audax of Australia. Lastly may be noticed here a small group of Eagles, characterized by their long legs, forming the genus Nisaetus, of which one species, JV. Jusciatus, is found in Europe. The Osprey (Pandion), though placed by many among the Aquzline, certainly does not belong to that subfamily. (A. N.)

EAR. The simplest form of the organ of hearing is a small sac containing fluid, with the auditory nerve expanded upon it. Sonorous vibrations are communicated to this sic either directly through the hard parts of the head, or at the same tine by a membrane exposed to the surround- ing medium. .Such is the form of ear found in many of the Crustacea and in the Cephalopoda. In the Vertebrata, there is a progressive development and increasing com- plexity from the fishes up to Mammalia. For details as to

the structure of the ear in the different subdivisions of the Vertebrata, reference is made to the articles treating of these, such as AmpuIBIA, Birps, dc. ; and the structure of the human ear will be found fully described in the article Anatomy, vol. i. p. 891. It is the object of this article to describe the phenomena of auditory sensation from the physiological poiat of view.

The sense of hearing is a special sensation the cause of which is an excitation of the auditory nerves by the vibrations of sonorous bodies. A description of sonorous vibrations and of their transmission is given in the article Acoustics; here we shall consider, first, the transmission of such vibrations from the external ear to the auditory nerve, and secondly, the physiological characters of auditory sensation.

I—I1. Transmission in External Ear.—The external ear consists of the pinna, or auricle, and the external auditory meatus, or canal, at the bottom of which we find the membrana tympani, or drum head. In many animals the auricle is trumpet-shaped, and, being freely movable by Muscles, serves to collect sonorous waves coming from various directions. The auricle of the human ear presents Many irregularities of surface. If these irregularities are abolished by filling them up with a soft material such as wax or oil, leaving the entrance to the canal free, experi- ment shows that the intensity of sounds is weakened, and that there is more difficulty in judging of their direction. When waves of sound strike the auricle, they are partly re- flected outwards, while the remainder, impinging at various angles, undergo a number of reflections so as to be directed ito the auditory canal. Vibrations are transmitted along the auditory canal, partly by the air it contains and partly by its walls, to the membrana tympani. The absence of the auricle, as the result of accident or injury, has not clused diminution of hearing. In the auditory canal, waves of sound are reflected from side to side until they reach the membrana tympani. From the obliquity in position and peculiar curvature of this membrane, most of the waves must strike it nearly perpendicularly, and in the most advantageous direction.

2. Transmission in Middle Far.—The middle ear is a small cavity, the walls of which are rigid with the exception of the portions consisting of the membrana tympani, and the membrane of the round window and of the

apparatus filling the oval window. This cavity communicates with the pharynx by the Hustachian tube, which forms a kind of air-tube between the pharynx and the tympanum for tlie purpose of regulating pressure on the membrana tympani. It is generally supposed that during rest the tube is open, and that it is closed during the act of deglutition. As this action is frequently taking place, not only when food or drink is introduced, but when saliva is swallowed, it is evident that the pressure of the air in the tympanum will be kept in a state of equilibrium with that of the external air on the outer surface of the membrana tympani, and that thus the membrana tympani will be rendered independent of variations of atmospheric pressure such as may occur within certain limits, as when we descend in a diving bell or ascend ina balloon. By a forcible expiration, the oral and nasal cavities being closed, air may be driven into the tympanum, while a forcible inspiration (Valsalva's experi- ment) will draw air from that cavity. In the first case, the membrana tympani will bulge outwards, in the second case inwards, and in both, from excessive stretching of the membrane, there will be partial deafness, especially for sounds of high pitch. Permanent occlusion of the tube is one of the most common causes of deafness,

The membrana tympani is capable of being set into vibration by a sound of any pitch included in the range of perceptible sounds. It responds cxactly as to number of vibrations (pitch), intensity of vibrations (intensity), and complexity of vibration (quality or timbre). Consequently we can hear a sound of any given pitch, of a certain intensity, and in its own specific timbre or quality. Generally speaking, very high tones are heard more easily than low tones of the same intensity. As the membrana tympani is not only fixed by its margin to a ring or tube of bone, but is also adherent to the handle of the malleus, which follows its movements, its vibrations meet with con- siderable resistance. This diminishes the intensity of its vibrations, and prevents also the continued vibration of tlic membrane after an external vibration has ceased, so that a sound is not heard much longer than it lasts. The tension of the membrane may be affected (1) by differences of pres- sure on the two surfaces of the membrana tympani, as may occur during forcible expiration or inspiration, or in a patho- logical condition, and (2) by muscular action, due to con- traction of the tensor tympant muscle. This small muscle arises from the apex of the petrous temporal and the car- tilage of the Eustacliian tube, enters the tympanum at

its anterior wall, and is inserted into the malleus near its root. The handle of the malleus is inserted between the layers of the membrana tympani, and, as the malleus and incus move round an axis passing through the neck of the malleus from before backwards, the action of the muscle is to pull the membrana tympani inwards towards the tympanic cavity in the form of a cone, the meridians of which, according to Helmholtz, are not straiglit but curved, with convexity out- wards. When tlie muscle contracts, the handle of the malleus is drawn still farther inwards, and tlius a greater tension of tlic tympanic membrane is produced. On relaxation of the muscle, the membrane returns to its position of equilibrium by its own elasticity and by the elasticity of the chain of bones, This power of varying the tension of the membrane is a kind of accommodating mechanism for receiving and transmitting sounds of different pitch. With different degrees of tension, it will respond more readily to sounds of different pitch. Thus, when the membrane is tense, it will readily respond to high sounds, while relaxation will be the condition most

adapted for low sounds. In addition, increased tension of the membrane, by increasing the resistance, will diminish the intensity of vibrations. This is especially the case for sounds of low pitch.

Helmholtz has also pointed out that the peculiar form of the membrana tympani in man has the effect of increasing the force of its vibrations at the expense of their amplitude.

The vibrations of the membrana tympani are transmitted to the internal ear partly by the air which the middle ear or tympanum contains, and partly by the chain of bones, consisting of the malleus, incus, and stapes. Of these, transmission by the chain of bones is by far the most important. In birds and in the scaly amphibia, this chain is represented by a single rod-like ossicle, the columella, but in man the two membranes—the membrana tympani and the membrane filling the fenestra ovalis—are connected by a compound lever consisting of three bones, namely, the malleus, or hammer, inserted into the membrana tympani, the zncus, or anvil, and the stapes, or stirrup, the base of which fits into the oval window. The lever thus formed has its fulcrum near the short process of the incus, which abuts against the

tympanic wall ; the power is applied at the handle of the malleus, and the resistance is at the base of the stirrup. Both by direct expcrimental observation and by calculation from data supplied by measurement of the lengths of the arms of the lever, Helmholtz has shown that by this arrangement vibrations are diminished in extent in the ratio of 3 to 2, but are inversely increased in force. Considering the great resistance offered to excur- sions of the stapes, such’ an arrangement must be advantageous. It must also be noted that in the transmis- sion of vibrations of the membrana tympani to the fluid in tle labyrinth or internal ear, through the oval window, the chain of ossicles vibrates as a whole and acts efficiently, although its length may be only a small fraction of the wave length of the sound transmitted.

3. Transmission in the Internal Har.—The internal ear is composed of the labyrinth, formed of the vestibule or central part, the semicircular canals, and the coclilea, each of which consists of an osseous and a membranous portion (see vol.i. p. 893). The osseous labyrinth may be regarded as an osseous mould in the petrous portion of the temporal bone, lined by tesselated endothelium, and con- taining a small quantity of fluid called the perilymph. In this mould, partially surrounded. by, and to some extent floating in, this fluid, there is the membranous labyrinth, in certain parts of which we find the terminal apparatus in connection with the auditory nerve, immersed in another fluid called the exdolymph. The membranous labyrinth consists of a vestibular portion formed by two small sac- like dilatations, called the saccule and the wtricle, the latter of which communicates with the semicircular canals by five openings. Each canal consists of a tube, bulging out at cach extremity so as to form the so-called ampulla, in which, on a projecting ridge, called the crista acoustica, there are cells bearmg or developed into long auditory hairs, which are to be regarded as the peripheral end-organs of the vestibular branches of the auditory nerve. The cochlear division of the membranous labyrinth consists of the ductus cochlearis, a tube of triangular form fitting in between the two cavities in the cochlea, called the scala vesttbuli, because it commences in the vestibule, and the scala tympani, because it ends in the tympanum, at the round window. These two scale: communicate at the apex of the cochlea. The roof of the ductus cochlearis is formed by a thin membrane called the membrane of Reissner, while its floor consists of the basilar

membrane, on which we find the remarkable organ of Corti, which constitutes the terminal organ of the cochlear division of the auditory

nerve, and which is fully described in vol.i. p. 894. It ig sufficient to state here that this organ consists essentially of an arrangement of epithelial cells bearing hairs which are in communication with the terminal filaments of this portion of the auditory nerve, and that groups of these hairs pass through holes in a closely investing mem- brane, membrana reticularis, which may be supposed to act as a damping apparatus, so as quickly to stop their movements. The ductus cochlearis and the two scale are filled with fluid. Sonorous vibrations may reach the fluid in the labyrinth by three different ways—(1) by the osseous walls of the labyrinth, (2) by the air in the tym- panum and the round window, and (3) by the base of the stapes Inserted into the oval window.

When the bead is plunged into water, or brought into direct contact with any vibrating body, vibrations must be transmitted directly. Vibrations of the air in the mouth and in the nasal passages are also communicated directly to the walls of the cranium, and thus pass to the labyrinth. In like manner, we may experience peculiar auditive sensations, such as blowing, rubbing, and hissing sounds, due to muscular contraction or to the passage of blood in vessels close to the auditory organ. It has not been satisfactorily made out to what extent, if any, vibrations may be communicated to the fluid in the labyrinth by the round window. There can be no doubt, however, that in ordinary hearing vibrations are communicated chiefly by the chain of bones. When the base of the stirrup is pushed into the oval window, the pressure in the labyrinth in- creases, the impulse passes along the scala vestibuli to the scala tympani, and, as the only mobile part of the wall of the labyrinth is the membrane covering the round window,

/ this membrane is forced outwards; when the base of the

stirrup passes outwards, a reverse action takes place. Thus the fluid of the labyrinth may receive a series of pulses or vibrations isochronous with the movements of the base of the stirrup, and these pulses affect ‘the terminal apparatus in connection with the auditory nerve.

Since the size of the membranous labyrinth is so small, measuring, in man, not more than 4 inch in length by 3th inch in diameter at its widest part, and since it is a chamber consisting partly of conduits of very irregular form, it is impossible to state accurately the course of vibrations transmitted to it by impulses communicated from the base of the stirrup. In the cochlea, vibrations must pass from the saccule along the scala vestibuli to the apex, thus affecting the membrane of Reissner, which forms its roof ; then, passing through the opening at the apex (the helicotrema), they must descend by the scala tympani to the round window, and affect in their passage the membrana basilaris, on which the organ of Corti is situated. From the round window impulses must be reflected backwards, but how they affect the advancing impulscs is not known. But the problem is even more complex when we take into account the fact that impulses are transmitted simultane- ously to the utricle and to the semicircular canals com- municating with it by five openings. The mode of action of these vibrations or impulses upon the nervous termina- tions is still unknown ; but to appreciate critically the hypothesis which has been advanced to explain it, it is necessary, in the first place, to refer to some of the general characters of auditory sensation.

4. Certain conditions are necessary for excitation of the auditory nerve sufficient to produce a sensation. In the first place, the vibrations must have a certain amplitude: if too feeble, no impression will be produced. The minimum limit has been stated to be the sensation caused by the falling of a ball of pith, 1 millegramme in weight, upon a smooth surface, such as glass, from a height of 1 millimetre at a distance of 91 millimetres from the car.

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In the next plaice, vibrations must have a certain duration to be perceived ; and lastly, to excite a sensation of a con- tinuous musical sound, a certain number of vibrations must occur in a given interval of time. The lower limit is about 30, and the upper about 30,000 vibrations per second. Below 30, the individual impulses may be observed, and above 30,000 few ears can detect any sound at all. The extreme upper limit is not more than 35,000 vibrations per second. Auditory sensations are of two kinds—noises and musical sounds. Vovses are caused by impulses which are not regular in

intensity or duration, or are not periodic, or they may be caused by a series of musical sounds occurring instantaneously so as to pro duce discords, as when we place our hand at randont on the key-board of a piano. AMfustcal tones are produced by periodic and regular vibrations. In musical sounds three characters are prominent—intensity, pitch, and quality. Intensity depends on the amplitude of the vibration, and a greater or lesser amplitude of thie vibration will cause a cor- responding movement of the transmitting apparatus, and a corresponding intensity of excitation of the terminal apparatus. Pitch, as a sensation, depends on the length of time in which a single vibration is executed, or, in other words, the number of vibrations in a given interval of time. The ear is capable of appreciating the relative pitch or height ofa sound as compared with another, although it may not as- certain precisely the absolute height of a sound. What we eul an acute or high toue is produced by a large number of vibrations, while a grave or low tone is caused by few. The musical tones which can be used with advantage range be- tween 40 and 4000 vibrations per second, extending thus from 6 to 7 octaves. According to E. H. Weber, practised musicians can perceive a difference of pitcl amounting even to only the j,th of a semitone, but this is far beyond average attainment. Quality or timbre (or Klang) is that peculiar characteristic of a musical sound by which we may identify it as proceeding from a particular instrument or from a particular human voice. It depends on the fact that many waves of sound that reach the ear are really com- pound wave systems, built up of constituent waves, each of which is capable of exciting a sensation of a simple tone if it be singled out and reinforced by a resonator (see Acoustics), aud which may sometimes be heard without a resonator, after special practice and tuition. Thus it appears that the ear must have some arrangement by which It resolves every wave system, however complex, into simple pendular vibrations. When we listen to a sound of any quality we recognize that it is of a certain pitch. This depends on the number of vibrations of one tone, predomiin- ant in intensity over the others, called the fundamental or ground toue, or first partial tone. The quality, or timbre, depends on the number and intensity of other tones added toit. These are termed harmonic or partial tones, and they are related to the first partial or fundamental tone in

a very simple manner, being multiples of the fundamental tone: thus—

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Partial tones. . 1 OC Ge 7 Se 9) 10

vibrations (88 66 99 182 165 198 231 264 297 330

: When a simple tone, or one free from partials, is heard, it slvés rise to a simple, soft, somewhat insipid sensation, as may be obtained by blowing across the mouth of an open bottle or by a tuning fork. The lower partials added to the fundamental tone give softness combined with richness ; While the higher, especially if they be very high, produce a brilliant and thrilling effect, as is cansed by the brass in- struments ofan orchestra. Such being the facts, how may tuey be explained physiologically 4

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Little is yet known regirding the mode of action of the Vibrations of the fluid in the labyrinth upon the terminal apparatus connected with the auditory nerve. There can be no doubt that it is a mechanical action, a trne communt- cation of impulses to delicate hair-like processes, by the niovements of which the nervous filaments are irritated. In the lman ear it has been estimated that there are about 3000 sraall arches formed by the rods of Corti (see ANAToMy). Each arcli rests on the basilar membrane, and Supports rows of cells having minute hair-like processes somewhat resembling cilia. It would appear also that the filaments of the auditory nerve terminate in the basilar membrane, and possibly they may be connected with the hair-cells. At one time it was supposed by Helmholtz that these fibres of Corti were elastic and that they were tuned for particular sounds, so as to form a regular series corres- ponding to all the tones audible to the human ear. Thus 2800 fibres distributed over the tones of seven octaves would give 400 fibres for each octave, or nearly 33 for a semitone. Helmholtz las put forward the ingenious hypothesis that, when a pendular vibration reaches the ear, it excites by sympathetic vibration the fibre of Corti which is tuned for its proper number of vibrations. If, then, different fibres are tuned to tones of different pitch, it is evident that we have here a mechanism which, by exciting different nerve fibres, will give rise to sensations of pitch. When the vibration is not simple but compound,

in con- sequence of the blending of vibrations corresponding to various harmonics or partial tones, the ear has the power of resolving this compound vibration into its elements. It can only do so by different fibres responding to the con- stituent vibrations of the sound,—one for the fundamental tone being stronger, and giving tlie sensation of a particular pitch or height to the sound, and thie others, corresponding to the upper partial tones, being weaker, and causing special though undefined sensations, which are so blended together iu consciousness as to terminate in a complex sensation of atone of a certain quality or timbre. It would appear at first sight that 33 fibres of Corti for a semitone are not sufficient to enable us to detect all the gradations of pitch in that interval, since, as has been stated above, trained musicians may distinguish a difference of ;1;th of a semitone. To meet this difficulty, Helmholtz states that if a sound is produced, the pitch of which may be supposed to come between two adjacent fibres of Corti, both of these will be set into sympathetic vibration, but the one whicli comes nearest to the pitch of the sound will vibrate with greater iutensity than the other, and that consequently the pitch of that sound would be thus appreciated. These theoretical views of Helmholtz have derived much support froin remarkable experiments of Hensen, who observed that certain hairs on the autenne of Afysis, a Crustacean, when observed with a low miscroscopic power, vibrated with certain tones produced by a keyed horn. It was seen that certain tones of the horn set some hairs into strong vibration, and other tones other hairs. ach hair responded also to several tones of the horn. Thus one hair responded strongly to d# and d’g, more weakly to g, and very weakly to G. It was probably tuned to some pitch between d’’ and ag. (Studten tiber das G’ehérorgan der Decapoden, Leipsic, 1863.)

Recent histological researches have led to a modification of this hypothesis. It has been found that the rods or arches of Corti are stiff structures, not adapted for vibrat- ing, but apparently consisting of a kind of support for the hair cells. It is also known that there are no rods of Corti in the cochlea of birds, which apparently are capable never- theless of appreciating pitch. Hensen and Helmholtz have now suggested the view that not only may the segments of the membrana basilaris be stretched more in the radial than

in the longitudinal direction, but different segments may be stretched radially with different degrees of tension so as to resemble a series of tense strings of gradually

increasing length. ach string would then respond to a vibration of a particular pitch communicated to it by the hair-cells. The exact mechanism of the hair-cells and of the membrana reticularis, which looks like a damping appa- ratus, is unknown.

IL. Physiological Characters of Auditory Sensation.—1. Under ordinary circumstances auditory sensations are referred to the outer world. When we hear a sound, we associate it with some external cause, and it appears to originate in a particular place, or to come in a particular direction. This feeling of exteriority of sound seems to require transmission through the membrana tympani. Sounds which are sent through the walls of the cranium, as when the head is immersed in, and the external auditory canals are filled with, water, appear to originate in the body itself, It is probable, however, that the external character of ordinary auditory sensations may be more the result of habit than due to any anatomical peculiarity of the ear itself.

2, An auditory sensation lasts a short time after the cessation of the exciting cause, so that a number of scparate vibrations, each capable of exciting a distinct sensation if heard alone, may succeed each other so rapidly that they are fused into asingle sensation. If we listen to the puffs of a syren, or to vibrating tongues of low pitch, the single sensation is usually produced by about 30 or 35 vibrations per second ; but there can be no doubt, as was first pointed out by Helmholtz, that when we listen to beats of consider- able intensity, produced by two adjacent tones of sufficiently high pitch, the ear may follow as many as 132 intermis- sions per second.

3. The sensibility of the ear for sounds of different pitch is not the same. It is more sensitive for acute than for grave sounds, and it is probable that the maximum degree of acuteness is for sounds produced by about 3000 vibra-

tions per second, that is near fa#. Sensibility as to pitch varies much with the individual and with the training to which he has subjected himself. Thus some musicians may detect a difference of 59’;5th of the total number of vibra- tions, while other persons may have difficulty in appreciat- ing a semitone. This power of appreciating differences of pitch is termed a correct or just ear, and there can be no doubt of its improvement by cultivation. .

4. Hearing with two ears does not appear materially to influence auditive sensation, but probably the two organs are enabled, not only to correct each other’s errors, but also to aid us in determining the locality from whence a sound originates, It is asserted by Fechner that one ear may perceive the same tone at a slightly higher pitch than the other, but this may probably be due to some slight patho- logical condition in one ear. If two tones, produced by two tuning forks of equal pitcli, are produced one near each ear, there is a uniform single sensation ; if one of the tuning forks be made to revolve round its axis in such a way that its tone increases and diminishes in intensity, neither fork is heard continuously, but both sound alternately, the fixed one being only audible when the re- volving one isnot. It is difficult to decide whether excita- tions of corresponding elements in the two ears can be dis- tinguished from each other. It is probable that the resulting sensations may be distinguished, provided one of the generating tones differs from the other in intensity or quality, although it may be the same in pitch.

_ 5. Hitherto we have considered only the audition of a single sound, but it is possible also to have simultaneous auditive sensations, as in musical harmony. It is difficult to ascertain what is the limit beyond which distinct auditory

sensations may be perceived. We have in listening to an orchestra a multiplicity of sensations which produces a total effect, whilc, at the same time, we can with eage single out and notice attentively the tones of one or two special instruments. Thus the pleasure of music may arise partly from listening to simultaneous, and partly from the effect of contrast or suggestion in passing through suc. cessive, auditory sensations.

The principles of harmony belong to the subject of music, but itis necessary here briefly to refer to these from the physiological point of view. If two musical sounds reach the ear at the same moment, an agreeable or disagreeable sensation is experienced, which may be termed a concord or a discord, and it can be shown by experiment with the syren (see Acoustics) that this depends upon the vibra. tional numbers of the two tones. The octave (1:2), the twelfth (1:3), and double octave (1:4), are absolutely consonant sounds ; the fifth (2:8) is said to be perfectly consonant ; then follow, in the direction of dissonance, the fourth (3:4), major sixth (3:5), major third (4:5), minor sixth (5:8), and the minor third (5:6). Helm. holtz has attempted to account for this by the application of his theory of dcats.

Beats are observed when two sounds of nearly the same pitch are produced together, and the number of beats per second is equal to the difference of the number of vibrations of the two sounds. Beats give rise toa peculiarly disagrceable intermittent scnsation, com- parable to what is experienced ou watching a flickering light, and the painful sensation may arise from intermittent irritation of the auditory nerve filaments. The maximum roughness of beats, according to Helmholtz, is attained by 83 per second; beyond 132 per second, the individual impulses are blended into one uniform auditory sensation. When two notes are sounded, say on a piano, not only may the first, fundamental, or prime tones beat, but partial tones of each of the primaries may beat also, and as the difference of pitch of two simultaneous sounds augments, the number of beats, both of prime tones and of harmonics, augments also. ‘he phiysio- logical effect of beats, though these may not be individually distin- guishable, is to give roughness to the ear. If harmonics or partial tones of prime tones coincide, there are no beats; if they do not coincide, the beats produced will give a character of roughness to the interval. Thus in the octave and twelfth, all the partial tones of the acute sound coincide with the partial tones of the grave sound ; in the fourth, major sixth, and major third, only two pairs of the partial tones coincide, while in the minor sixth, minor third, and minor seventh, only oue pair of the harmonics coincide. For details, see Helmholtz, On Sensations of Tone as a Physiological Basis for the Theory of Music, translated by Alexander J. Ellis, London, 1875,

DISEASES OF THE Ear.—Deafness may arise from obstrne- tion of the external ear occasioned by disease of various kinds ; from ulceration, thickening, or perforation of the membrana tympani; from inflammatory affections, both acute and chronic, of the middle and internal ear; from obstruction of the Eustachian tube caused by inflammation of its lining membrane, leading to thickening and accumu- lation of mucus or pus; from diseases of the throat blocking up the end of the Kustachian tube; and, lastly, from disease of the auditory nerve or of the terminal apparatus con- nected with it in the membranous labyrinth. Oévtis, or ear-ache, is an inflammation, usually of a rheumatic nature, of some portion of the external auditory canal. Most fre- quently occurring in weakly individuals, it causes intense pain, which shoots over the head on the affected side. It may lead to the formation of a small abscess in one of thie wax glands found in the passage. Hot applications by fomentations or warm poultices give relief, and if an abcess forms, it ought to be carefully lanced. Otorrhaa is a muco- purulent discharge, often of a foetid odour, from the ears of scrofulous children. It frequently occurs during teething, and it may be one of the sequele of scarlet fever, or measles, or small-pox. When pus flows from the ear, it may come from the membrane lining the deeper portion of the external meatus, or from the middle ear by a hole in the membrana tympani, or from diseased portions of bone near the middle, or internal ear. The treatment, of course, varies according to the cause, bub generally the discharge may be lessened in quantity, and at all events rendered less offensive, by the use of weak 1n-

jections of carbolic acid or of Condy’s fluid. Concretions, consisting of accumulations of wax, often hard and adherent, may block up the external meatus. Frequently these may not impair the sense of hearing, but they give rise to dis- tressing noises of various kinds. They may be got rid by the careful use of injections of soap and hot water. Polypi, usually hard and firm, but sometimes soft and gelatinous, occur in the external meatus. The external ear may become hypertrophied, as in idiots; it may contain concre- tions of urate of soda, as in gout ; and it may be the seat of fibrous tumours. In the insane, large tumours, filled with blood, termed haematoma, sometimes occur. One of the most common causes of deafness in children is

chronic enlargement of the tonsils from repeated quinseys or from a strumous habit. Frequently also the Eustachian tube is occluded, but by passing a delicate catheter along the tube, and sometimes by inflating artificially the tympanum with air, hearing may be restored. It is difficult to diagnose, and still more difficult to treat, diseases of the internal ear, in consequence of its delicacy of structure and inaccessible situation. Pathological states of the internal ear may give rise to distressing enfotic phenomena, such as whizzing, buzzing, hissing, blowing, or clanging sounds; and if they are not relieved by washing out the external ear, or by in- flating the middle ear by the Eustachian tube, or by counter-irritation by means of small blisters or the applica- tion of tincture of iodine behind the ears, nothing more can be done. (J. G. M.) EARL (Latin, comes; French, compte), a title and rank of nobility now the third in the order of the British peerage, and, accordingly, intervening between marquis and viscount. Earl, however, was the highest title and rank of the English nobles post conquestum until the year 1337, when by Edward III. the Black Prince was created duke of Cornwall. The “earl” of England was identical with comte or compte of France ; and, so long as Norman-French continued to be spoken in this country, the English “ earls ” were styled “counts” as well in England as on the Con- tinent. These powerful barons represented and succeeded the Saxon thanes who were ealdormen, their own title evidently having been derived from the jarl of Scandinavia. _ The nature of a modern earldom is readily understood, since it is a rank and dignity of nobility which, while it confers no official power or authority, is inalienable, in- divisible, and descends in regular succession to all the male heirs of the body of the grantee until, on their failure, it merges in the Crown. Not so was it with either the nature or the descent of the ancient earldoms of England. In early feudal times titles independent of office did not exist. The earls, or comites, of those days, therefore, were actual officers, each having supreme authority in his own earldom, or i county,” under the Crown; each one of them also deriving from his earldom a certain fixed revenue, the ossession of which was at once an apanage of his official ignity as earl, and the evidence of his lawful and Tecognized title to it. But an earldom has long ceased to be endowed with any official associations whatever, and has become merely a title by which its owners in male succession inherit and hold the dignity,“third in rank, of a peerage. In like manner, the descent and tenure of the ancient earldoms differed in many highly important particulars

from the simple succession of the modern dignity. In the course of their chequered history, we find ancient earldoms, Instead of passing by a quiet and clearly defined succession from father to son, constantly depending on the rights of female inheritance ; they are seen to have been obtained by many a husband jure waoris; they appear to' have been transferred in an arbitrary manner, or actually to have been divided between coparceners, or to have been retained for @ while by the Crown and let out to farm. At the same

o95 time, under such strange conditions as these, and amidst conflicting vicissitudes, until they finally merged in the Crown, the ancient earldoms retained their vitality. They might descend very irregularly, and become vested in successive families, but still they did not become extinct ; nor were the claims of legal inheritance wholly forgotten or superseded; and, even if for a time they had been latent or had actually been superseded, they emerged under more favourable circumstances, and under fresh arrangements or modifications they were again recognized by the Crown.

An earl is " Right Honourable," and is styled " My Lord." His.eldest sou bears his father's "second title," and therefore, that second title being in most cases a viscounty, he generally is styled " Viscount ;" under all circumstances, however, the eldest son of an earl takes precedence immediately after the viscounts. The younger sons of earls are " Honourable," but all their daughters are " Ladies." In formal documents and instruments, the sovereign, when addressing or making mention of any peer of the degree of an earl, usually designates him " trusty and well-beloved cousin,"—a form of appellation first adopted by Henry IV., who either by descent or alliance was actually related to every carl and duke in the realm. The wife of an earl is a countess; she is " Right Honour- able," and is styled " My Lady."

The coronet of an earl has, rising from a golden circlet, eight lofty rays of gold, each of which upon its point supports a large pearl; also, be- tween each pair of rays, at their & bases, there is a golden conven- tional leaf, the stalks of all these leaves being connected with the rays and with each other so as to form a continuous wreath. In re- presentations, five of the elevated rays with their pearls and four of the leaves are shown. The cap and lining

of the coronet, if worn or represented, are the same as those of the ducal coronet. An earl's coronet without cap or lining is represented in the annexed figure.

In the monumental effigies of noble personages, which yet remain from the Middle Ages, there are many highly interesting representations of the varieties of coronets worn by the earls of those days and by their countesses, before this coronet had assumed its present fixed and definite character. Thus, early in the 15th century, effigies of an earl and countess of Arundel, at Arundel, have very rich coronets. The earl's has a series of leaves and of clusters of three small balls or pearls alternating, all of them being raised to a considerable height above the circlet, the clusters rising rather higher than the leaves. The coronet of the countess differs in having the raised clusters set alternately with single balls or pearls that are less elevated.!

The coronet of a countess now in all respects is the same as that of an earl. The scailet parliamentary robe of an earl has three doublings of ermine. The duke of Norfolk, who is premier duke, as earl of Arundel, Surrey, and Norfolk, is premier earl of England ; also he holds his earldom of Arundel, a feudal dignity (as it was adjudged by

Earl's Coronet.

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1 In his effigy at Warwick, 1439, the crest of Richard Beauchamp, earl of Warwick, rises from a plain circlet that is surmounted by a series of pearls slightly raised, but without any leaves. Still later in the century, 1483, Isabel Plantagenet, countess of Essex, in her brass at Little Easton in Essex, has a series of leaves, no less than thirteen in number, that rise to a uniform slight elevation above the front of an ample coronet; and about the same time, 1487, the coronets of another earl and countess of Arundel have their circlets heightened with an uninterrupted series of architectural conventional leaves, and once more, at Hever, in Kent, the brass to Sir T. Boleyn, K.G., earl of Wiltshire and Ormonde, represents the maternal grand- father of Queen Elizabeth, with the insignia of the Garter, and

wearing a rich coronet, the circlet of which is set with small pearls in contact, not raised, and so numerous that upwards of twenty are displayed.

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Parliament, the 11th of Henry VI. 1433), by the fact of his hereditary possession of Arundel Castle only. As heredi- tary Iarl-Marshal, his Grace of Norfolk is the head of the College of Arms. (C. aR. EARLE, Joun (16012-1665), bishop of Worcester and afterwards of Salisbury, was born at York about 1601. He completed his education at Oxford, first entering Christ Church, and taking his degree of B.A. in 1619. He after- wards passed to Merton College, and graduated M.A. in 1624, He was appointed in 1631 proctor of the university, and the same year became chaplain to Philip, carl of Pembroke, then chancellor of the university. He was soon after presented by this nobleman to the rectory of Bishopstone, in Wiltshire, and, having been introduced to the king, Charles I., was appointed chaplain and tutor to Prince Charles. In 1642 Earle took his degree of D.D., and in tlie following year was elected one of the famous Assembly of Divines at Westminster. But his sympathies with the king and withthe Church of England were so strong thathedeclinedtosit. Earlyin 1643 he waschosen chancellor of the cathedral of Salisbury ; but of this preferment he was soon after deprived. After Cromwell's great victory at Worcester, Earle went abroad, and was named clerk of the closet and chaplain to Charles IJ. He spent a year at Antwerp in the house of Izaak Walton's friend Dr Morley, who became afterwards bishop of Winchester. He next joined the duke of York (James IT.) at Paris, returning to England at the Restoration. He was at once appointed dean of Westminster, and in 1661 was one of the

commissioners for revising the liturgy. At the end of

November 1662 he was consecrated bishop of Worcester, and was translated, ten months later, to the see of Salisbury. During the plague of London Bishop Earle attended the king and queen at Oxford, and there he died, November 17, 1665. LEarle's chief title to remembrance is his witty and humorous work entitled Microcosmography, or a Piece of the World discovered, in Lissays and Characters, which throws light on the manners of the time. First printed in 1628, it became very popular, and ran through eight editions in the lifetime of the author. A new edition with notes and

appendix, containing much interesting matter, by Philip Bliss, was published in 1811. The style is quaint and epigrammatic; and the reader is frequently reminded of Thomas Fuller by such passages as this: “A university dunner is a gentlemen follower cheaply purchased, for his own money has hyr’d him.” Several reprints of the book have been issued since the author’s death ; and in 1671 a French translation by J. Dymock appeared with the title of Le vice. ridiculé. Earle was employed by Charles II. to make the Latin translation of the Kikon Basilike, published in 1649.

‘Dr Earle,” says Lord Clarendon in his Life,‘ was aman of great piety and devotion, a most cloquent and powerful preacher, and of a conversation so pleasant and delightful, so very innocent, and so very facetious, that no man’s conlpany was more desired and loved. No man was more negligent in his dress and habit and mien, no man more wary and cultivated in his behaviour and discourse. He was very dear to the Lord Falkland, with whom he Spent as much time as he could make his own.”

See especially Bliss’s edition of the Microcosmographie, and Arber’s Reprint, London, 1868,

EARLOM, Ricuarp (17 42-1822), English mezzotint engraver, was born in London in 1742. His natural faculty for art appears to have been first called into exercise byadmiration for the lord mayor’s state coach, just decorated by Cipriani. He tried to copy the paintings, and was sent to study under Cipriani. He displayed great skill as a draughtsman, and at the sanie time acquired without assistance the art of engraving in mezzotint. In 1765 he was employed by Alderman Boydell, then one of the most liberal promoters of the fine arts, to make a series of draw-

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ings from the pictures at Houghton Hall ; and these he afterwards engraved in mezzotint. His most perfect works as engraver are perhaps the fruit and flower pieces after the Dutch artists Van Os and Van Huysum. Amongst his historical and figure subjects are—Agrippina, after West ; Love in Bondage, after Guido Reni ; the Royal Acadeniy, the Embassy of Hyderbeck to meet

Lord Corn- wallis, and a Tiger Hunt, the last three after Zoffany ; and Lord Heathfield, after Sir Joshua Reynolds. Earlom also executed a series of 200 facsimiles of the drawings and sketches of Claude Lorraine, which was published in 3 vols. folio, under the title of Ziber Veritatis (1777-1819), Earlom died in London, October 9, 1822.

EAR-RING, an ornament worn pendent from the ear, and generally suspended by means of a ring or hook pass. ing through the pendulous lobe of the ear. The general usage appears to have been to have ear-rings worn in paits, the two ornaments in all respects resembling each other; in ancient times, or sometimes more recently among Oriental races, a single ecar-ring has sometimes been worn, The use of this kind of ornament, which constantly was of great value and sometimes was made of large size, dates from the remotest historical antiquity, the earliest mention of ear-rings occurring in the book of Genesis. It appears probable that the ear-rings of Jacob's family, which he buried with his strange idols at Bethel, were regarded as amulets or talismans, such unquestionably being the estima- tion in which some ornaments of this class have been held from a very early period, as they still are held in the East, Among all the Oriental races of whom we have any accurate knowledge, the Hebrews and Egyptians excepted, ear-rings always have been in general use by both sexes ; While in the West, as well as by the Hebrews and Egyptians, as a general rule they have been considered exclusively female ornaments. By the Greeks and Romans also ear-rings were worn only by women ; and the prevalence of this fashion among the races of classic antiquity is illustrated in a singular manner by the ears of the famous statue of tue Venus de' Medici being bored, evidently for the reception of pendent jewels. Ear-rings invariably occupy important posi- tions among the various remains of ancient and medieval goldsmiths' work that from time to time have rewarded the researches of archeological inquirers. And these early relics, with rare exceptions objects of great beauty and delicacy, never fail to exemplify the artistic styles of their periods, as they were prevalent among the races by whom each individual jewel was produced. LEar-rings of costly materials and elaborate workmanship have been brought to light in considerable numbers in the Troad and in Peloponnesus by Dr Schliemann ; jewels of the same class, of exquisite beauty, and of workmanship that is truly wonderful, have been rescued from the sepulchires of ancient Etruria and Greece by

Signor Castellani ; other ear-rings of gold of characteristic forms have come down to our owl times from the ancient Egyptians; we know well what styles of ear-rings were worn by tle Romans of the empire and by the early Scandinavians ; and recent researches among the burial places of our Anglo-Saxon predecessors in the occupancy of this island have led to the discovery of jewels in considerable numbers, which along their varieties include ear-rings executed in a style that proves the Anglo- Saxons to have made no inconsiderable advance in the arts of civilization. These same ornaments, which never have fallen into disuse, enjoy at the present day a very high degree of favour ; like all other modern jewels, however, the ear-rings of our own times as works of arts can claim no historical attributes, because they consist as well of re- productions from all past ages and of every race as of fanciful productions that certainly can be assigned to no style of art whatever.

HA YT

EARTH, Ficure or tue. The determination of the figure of the earth is a problem of the highest importance in astronomy, inasmuch as the diameter of the carth is the unit to which all celestial distances must be referred. Reasoning, doubtless, from the uniform level appearance of the horizon in any situation in which a spectator can be placed—the variations in altitude of the circumpolar stars as one travels towards the north or south, the disappearance of a ship standing out to sea, and perhaps other phenomena — the earliest astronomers universally regarded this earth as a sphere, and they endeavoured to ascertain its dimensions. Aristotle relates that the mathematicians had found the circumference to be 400,000 stadia. But Eratosthenes appears to have been the first who entertained an accurate idea of the principles on which the determination of the figure of the earth really depends, and attempted to reduce them to practice. His results were very inaccurate, but his method is the same as that which is followed at the present day—depending, in fact, on the comparison of a line measured on the earth’s surface with the corresponding arc of the heavens. He observed that at Syene in Upper Egypt, on the day of the summer solstice, the sun was exactly vertical, whilst at Alexandria at the same season of the year its zenith distance was 7° 12’, or one-fiftieth of the circumference of a circle. He assumed that these places were on the same meridian ; and, reckoning

their distance apart as 5000 stadia, he inferred that the circumference cf the earth was 250,000 stadia.

The Arabs, who were not inattentive to astronomy, did not overlook the question of the earth's magnitude. |The ciliph Almamoum, 814 a.p., having fixed on a spot in the plains of Mesopotamia, despatched one company of astronomers northwards and another southwards, measuring the journey by rods, until each found the altitude of the pole to have changed one degree. But the result of this measurement does not appear to have been very satisfactory. From this time the subject seems to have attracted no attention until about 1500, when Fernel, a Frenchman, measured a distance in the direction of the meridian near Paris by counting the number of revolutions of the wheel of his carriage as he travelled. His astronomical observa- tions were made with a triangle used as a quadrant, and his resulting length of a degree was by a happy chance very near the truth.

The next geodesist, Willebrord Snell, took an immense step in the right direction by substituting a chain of triangles for actual linear measurement. The account of this operation was published at Leyden in 1617. He ineasured his base line on the frozen surface of the meadows near Leyden, and measured the angles of his triangles, which lay between Alkmaar and Bergen-op-Zoom, with a quadrant and semicircles. He took the precaution of com- paring his standard with that of the French, so that his result was expressed in tvises (the length of the toise is about 6°39 English feet). The work was recomputed and reebserved by Muschenbroek in 1729.

In 1637 an Englishman, Richard Norwood, published his own determination of the figure of the earth in a volume entitled The Seaman's Practice, contayning a Fundamental Probleme in Navigation experimentally verified, namely, touching the Compasse of the Earth and Sea and the quantity ofa Deyree in our English Measures. It appears that he observed on the 11th June 1633 the sun's meridian altitude

in London as 62° 1', and on June 6, 1635, his meridian altitude in York as 59° 33'. He measured the distance between these places along the public road partly with a chain and partly by pacing. By this means, through com-

pensation of errors, he arrived at 367,176 feet for the degree—a very fair result.

The application of the telescope to circular instruments was the next important step in the science of measurement. Picard was the first who in 1669, with the telescope, using such precautions as the nature of the operation requires, measured an arc of meridian. He measured with wooden rods a base line of 5663 toises, and a second or base of verification of 3902 toises; his triangulation extended from Malvoisine, near Paris, to Sourdon, near Amiens. The angles of the triangles were measured with a quadrant furnished with a telescope having crogs-wires in its focus. The difference of latitude of the terminal stations was determined by observations made with a sector on a star in Cassiopeia, giving 1° 22’ 55” for the amplitude. The terrestrial measurement gave 78,850 toises, whence he inferred for the length of the degree 57,060 toises.

Hitherto geodetic observations had been confined to the determination of the magnitude of the earth considered as a sphere, but a discovery made by Richer turned the attention of mathematicians to its deviation froin a spherical form. This astronomer, having been sent by the Academy of Sciences of Paris to the island of Cayenne, in South America, for the purpose of determining the amount of terrestrial refraction and other astronomical objects, ubserved that his clock, which had been regulated at Paris to beat seconds, lost about two minutes and a half daily at Cayenne, and that in order to bring it to measure mean solar time it was necessary to shorten the pendulum by more than a line. This fact, which appeared exceedingly curious, and was scarcely credited till it had been confirmed by the subsequent observations of Varin and Deshayes on the coasts of Africa and America, was first explained in the third book of Newton’s Principia, who showed that it could only be referred to a diminution of gravity arising either from a protuberance of the equatorial parts of the earth and consequent increase of the distance from the centre or from the counteracting effect of the ceutrifugal force. About the same time, 1673, appeared the work of Hnyghens entitled De Horologio Oscillatorio, in which for the first time were found correct notions on the subject of centrifugal force. It does not, however, appear that they were applied to the theoretical investigation of the figure of the earth before the publication of

Newton’s Principia. In 1690 Huyghens, following up the subject, published his treatise entitled De Causa Gravitatis, which contains an investigation of the figure of the earth on the supposition that the attraction of every particle is towards the centre.

Between 1684 and 1718 J. and D. Cassini, starting from Picard’s base, carried a triangulation northwards from Paris to Dunkirk and southwards from Paris to Collioure. They measured a base of 7246 toises near Perpignan, and a some- what shorter base near Dunkirk; and from the northern portion of the arc, which had an amplitude of 2° 12’ 9”, obtained for the length of a degree 56,960 toises ; while from the southern portion, of which the amplitude was 6° 18’ 57”, they obtained 57,097 toises. The immediate inference from this was that, the degree diminishing with increasing latitude, the earth must be a prolate spheroid. This conclusion was totally opposed to the theoretical investigations of Newton and Huyghens, and created a great sensation among the scientific men of the day. The question was far too impor- tant to be allowed to remain unsettled, and accordingly the Academy of Sciences of Paris determined to apply a decisive test by the measurement of arcs at a great distance from each other. For this purpose some of the most distinguished

members of their body undertook the measurement of two meridian arcs—one in the neighbourhood of the equator, the

other in a high latitude ; and so arose the celebrated expe- |

ditions of the French Academicians. In May 1735, MM. Godin, Bouguer, and De la Condamine, under the auspices of Louis XV., proceeded to Peru, wherc, assisted by two Spanish officers, after ten years of laborious exertion they measured an arc of 3° 7’ intersected by the equator. The second party consisted of Maupertuis, Clairaut, Camus, Lemonnier, and Outhier, who reached the Gulf of Bothnia in July 1736 ; they were in some respects more fortunate than the first party, inasmuch as they completed the measurement of an are near the polar circle of 57’ amplitude and returned to Europe within sixteen months from the date of their departure.

The measurement of Bouguer and De Ja Condamine was executed with great care, and on account of the locality, as well as the manner in which all the details were conducted, it has always been regarded as a most valuable determina- tion. The southern limit was at a place called Tarqui, the northern at Cotchesqui. A base of 6272 toises was measured in the vicinity of Quito, near the northern extremity of the arc, and a second base of 5260 toises near the southern extremity. The mountainous nature of the country made the work very laborious, in some instances the difference of heights of two neighbonring stations exceeding a mile. The difficulties with which the observers had to contend were increased by the opposition of the more ignorant of the inhabitants, and they were at times in danger of losing their lives. They had also much trouble with their instruments, those with which they were to determine the latitudes proving untrustworthy. But their energy and ingenuity were equal to the occasion, and they succeeded by simultaneous observations of the same star at the two extremities of the are in obtaining very fair results. The whole length of the arc amounted to 176,945 toises, while the difference of latitudes was 3° 7’ 3”. In consequence of a misunderstanding that arose betwecn De la Condamine and Bouguer, their operations were con- ducted separately, and each wrote a full and interesting account of the operation. Bouguer’s buok was published in 1749; that of De la Condamine in 1751. The toise used in this measure was ever after regarded as the standard toise, and is always referred to as the Tovse of Peru.

The party of Maupertuis, though their work was quickly despatched, had also to contend with great difficulties. They were disappointed in not being able to make use of the small islands in the Gulf of Bothnia for the trigonometrical stations, and were forced to penetrate into the forests of Lapland. They commenced opcrations at Tornea, a city situated on the mainland near the extremity of the gulf. From this, the southern extremity of their arc, they carried a chain of triangles northward to the mountain Kittis, which they selected as the northern terminus. In the prosecution of this work they suffered greatly from cold and the bites of flies and gnats. The latitudes were determined by observations with a sector (made by Graham) of the zenith distance of a and 8 Draconis. The base line was measured on the frozen surface of the river Tornea about the middle of the

arc; two parties measured it separately, and they differed by about 4 inches. The result of the whole was that the difference of latitudes of the terminal stations was 57’ 29’“6, and the length of the are 55,023 toises. In this expedition, as well as in that to Peru, observations were made with a pendulum to determine the force of gravity; and these observations coincided with the geodetical results in proving that the earth was an oblate and not prolate spheroid.

In 1740 was published in the Paris M/émoires an account, by Cassini de Thury, of a remeasurement by himself and

Lacaille of the meridian of Paris. With a view to deter. mine more accurately the variation of the degree along the meridian, they divided the distance from Dunkirk to Collioure into four partial ares of about two degrees each, by observing the latitude at five stations. The anomalous results previously obtained by J. and D. Cassini were not confirmed, but on the contrary the length of the degree derived from these partial arcs showed on the whole an increase with increasing latitude. In continnation of their labours, Cassini and Lacaille further measured an arc of parallel across the mouth of the Rhone. The difference of time of the extremities was determined by the observers at either end noting the instant of a signal given by flashing gunpowder at a point near the middle of the are,

While at the Cape of Good Hope in 1752, engaged in various astronomical observations, Lacaille measured an are of meridian of 1° 13’ 17”, which gave him for the length of the degree 57,037 toises—an unexpected result, which has led to the modern remeasurement of the are by Sir Thomas Maclear.

Passing over the measurements made between Rome and Rimini and on the plains of Piedmont by the Jesuits Boscovich and Beccaria, and also the arc measured with deal rods in North America by Messrs Mason and Dixon, we come to the commencement of the English triangulation. In 1783, in consequence of a representation from Cassini de Thury on the advantages

that would accrue to science from the geodetic connection of Paris and Greenwich, General Roy was with the king's approval appointed by the Royal Society to conduct the operations on the part of this country,—Count Cassini, Mechain, and Delambre being appointed on the French side. And now a precision previously unknown was brought into geodesy by the use of Ramsden's splendid theodolite, which was the first to make the spherical excess of triangles measurable. The wooden rods with which the first base was measured were speedily replaced by glass rods, which again were rejected for the steel chain of Ramsden. The details of this operation are fully given in the Account of the Trigono- metrical Survey of England and Wales. Shortly after this, the National Convention of France, having agreed to remodel their system of weights and measures, chose, as applicable to all countries, for their unit of length the ten- millionth part of the meridian quadrant. In order to ob- tain this length precisely, the remeasurement of the French meridian was resolved on, and deputed to Delambre and Mechain. The details of this great operation will be found in the Base du Systeme Métrique Décimale. The are was subsequently extended by MM. Biot and Arago to the island of Iviza.

The appearance in 1838 .of Bessel's classical work entitled Gradmessung in Ostpreussen marks an era in the science of geodesy. Here we find the method of least squares, a branch of the theory of probabilitics, applied to the calculation of a network of triangles and the reduction of the observations generally. This work has been looked on as a model ever since, and probably it will not soon be superseded as such. The systematic manner in which'all the observations were taken with the view of securing final results of extreme accuracy is admirable. The triangula- tion, which is a small one, extends about a degree and a half along the shores of the Baltic in a N.N.E. direction. The compound bars with which he measured his base line may be understood by the following brief description. On the surface of an iron bar two toises in length is laid a zine bar, both being very perfectly planed and in free contact— the zinc bar being slightly shorter than the iron bar. They are united at one end only, and as the temperature varies the difference of length of the bars as seen at the other end varies ; this difference of length is a thermometrical indica-

tion whereby a correction for temperature can be applied to the bars so as to reduce their length to that at the standard temperature. The bars in measuring were not allowed to come into contact, but the intervals left were measured by the interposition of a glass wedge. The results of all the comparisons of the four measuring rods with one another, and with the standards, are elaborately worked out by least squares. The angles were observed with theodolites of 12 and 15 inches diameter, and the latitudes determined by means of the transit instrument in the prime vertical—a method much used in Germany. The formule employed in the reduction of the astronomical observations are very elegant. The reduetion of the triangulation was carried out in the most thorough manner,—the sum of the squares of all the actual theo- dolite observations being made a minimnm. As it is usual now to follow this method (sometimes only approxi- mately) in all triangulations where great precision is required, we here give a brief description of the method. The equations of condition of a triangulation are those which exist between the supernumerary observed quantities and their calculated values, for, after there are just sufficient observations to fix all the points, then any angle that may be subsequently observed can be compared with its calculated value. Ifa triangulation consist of 2+ 2 points, two of which are the ends of a base line, then to fix the n points 2 angles suffice ; so that if m be the actual number of angles really observed, the triangulation must afford m—2n equations of condition. To show how these arise, suppose that from a number m of fixed points A,B,C. . . a new point P is observed, which m points are again observed from P, then there will be formed m—1 triangles, in each of which the sum of the observed angles is = 180° + the spherical excess; this gives at once m —1 equations of condition. The m—2 distances will each afford an equation of the form

PC PB PA _

2p PA PC not, however, limited to three factors. Should P observe the m points and not be observed back, there will be m—3 equations of the above form (they are called side equations). Ina similar manner other cases can be treated. In practice the ratios of sides are replaced by the ratios of the sines of the corresponding opposite angles. To each observed angle a symbolical correction is applied, so that if a be an observed angle anda-+~ the true or most probable angle, sin (a+2)=sin a(1 z cot a), « being a small angle whose

square is neglected. Thus the side equation takes the form B B,2,f: ...B.,=0. In the case of equations formed by adding together the three observed angles of a triangle the co-eflicients are of course unity. The problem then is this: Given » equations

B + Bit, + Pst. +... Buty, =O

Bp’ ae By’ % ae By Xo couches By &m =0

B’+ By, ap By 2s aP p/0 0 Bin om = (i) between m(m>n) unknown quantities 4… .%n, which are the corrections (expressed in seconds of arc) to the observed angles, it is required to determine these quantities so as to render the function wyary?+ wita? + Woy2 + ©. + Wpilim™ 8 minimum, where w,. . .w,, are the weights of the deter- minations of the angles to which the corresponding correc- tions belong. The corrections #,... %m fulfilling this condition of minimum have, according to the theory of least squares, a higher probability than any other system of corrections tbat merely satisfy the equations of condition, Multiply the x equations by multipliers 4, A,, . » » An, and we obtain by the theory of maxima and minima m equa- tions

1,

Wye, = ByAy + By’Ao + ByA3 af on Oo Wy = BA, + Bie + Bo’d3 + .

UnOm = Bury + Bm’Ag + Bm Az temas

The values of x, ... % obtained from these equations are to be substituted in the original equations of condition, and then there will be 2 equations between the 2 multipliers A,...A,. These being solved, the numerical values of A, . . . A, Will be obtained, and on substituting these in the last equations written down, the values of “,.. . %» Will follow. The process is a long and tedious one; but it is inevitable if we wish very good results.

The great meridian arc in India was commenced by Colonel Lambton at Pnnnce in latitude 8° 9’. Follow- ing generally the methods of the English survey, he carried his triangulation as far north as 20° 30’. The work then passed into the able hands of Sir George (then Captain) Everest, who

continued it to the latitude of 29° 30’. Two admirably written volumes by Sir George Everest, published in 1830 and in 1847, give all the details of the vast under- taking. The great trigonometrical survey of India is now being prosecuted with great scientific skill by Colonel Walker, R.E., and it may be expected that we shall soon have some valuable contributions to the great problem of geodesy. The working ont of the Indian chains of triangle by the method of least squares presents peculiar ditficul- ties, but enormous in extent as the work is, it is being thoroughly carried out. The ten base lines on which the survey depends were measured with Colby’s compensation bars. :

These compensation bars were also used by Sir Thomas Maclear in the measurement of the base line in his exten- sion of Lacaille’s arc at the Cape. The account of this operation will be found in a volume entitled Verzfication and Extension of Lacailles Arc of Meridian at the Cape of Good Hope, by Sir Thomas Maclear, published in 1866, Lacaille’s amplitude is verified, but not his terrestrial measurement,

_ he number of stations in the principal triangulation of Great Britain and Ireland is about 250. At 32 of these the latitudes were determined with Ramsden’s and Airy’s zenith sectors. The theodolites used for this work were, in addition to the two great theodolites of Ramsden which were used by General Roy and Captain Kater (and which are now in as good condition as when they came from the hands of the maker), a smaller theodolite of 18 inches diameter by the same mechianician, and another of 24 inches diameter by Messrs Troughton and Simms. Observations for determination of absolute azimuth were made witli these instruments at a large number of stations ; the stars a, 6, and A Ursee Minoris aud 51 Cephei being those observed, always at the greatest azimuths. At six of these stations the probable error of the result is under 0“‘4, at twelve under 0’°5, at thirty-four under 07: so that the absolute azimuth of the whole network is determined with extreme accuracy. Of the seven base lines which have been measured, five were by means of steel chains and two with Colby’s compensation bars. This is a system of six componnd bars self-correcting for temperature. The compound bar may be thus described. ‘I’wo bars, one of brass and the other of iron, are laid side by side, parallel, and firmly united at their centres, from which they are free to expand or contract; at the standard

temperature they are of the same length. Let AB be one bar, A’B’ the other ; draw a line through the corresponding extremities A, A’ to P, and a line through the other extremities B, B’ to Q, make A’P=B’Q, AA’ being = BB’. Now if A’P is to AP as the rate of expansion of the bar A’B’ to the rate of expansion of the bar AB, then clearly the distance PQ will be invariable, or very nearly so. In

the actual instrament P and Q are finely engraved dots at the distance of 10 feet apart. In the measurement the bars when aligned do not come into contact ; an interval of six inches is left between each bar and its neighbour. This small space is measured by an ingenious micrometrical arrangement constructed on exactly the same principle as the bars themselves. The triangulation was computed by least squares. The total number of equations of condition for the triangulation is 920; if therefore the whole had been reduced in one mass, a3 it should liave been, the solu- tion of an equation of 920 unknown quantities would have occurred as a part of the work. To avoid this an approxi- mation was resorted to; the triangulation was divided into twenty-one parts or figures ; four of these, not adjacent, were first adjusted by the method explained, and the cor- rections thus determined in these figures carried into the equations of condition of the adjacent figures. The average number of equations in a figure is 44; the largest equation i3 one of 77 unknown quantities.

Airy’s Zenith Sector is too well known to need deserip- tion. The vertical limb is read by four microscopes; altogether, in the complete observation of a star there are 10 micrometer readings and 12 level readings. In some recent observations in Scotland for latitude the Zenith Telescope has been used with very great success ; it 1s very portable ; and a complete determination of latitude, affected with the mean of the declination errors of two stars, 1s effected by two micrometer readings and four level read- ings. The observation consists In measuring with the telescope micrometer the difference of zenith distances of two stars which cross tlic meridian, one to the north and the other to the south of the observer at zenith distances which differ by not much more than 10’ or 15’, the interval of the tines of transit being not less than one nor more than twenty minutes. The advantages are

that, with simplicity in the construction of the instrument and facility in the manipulation, refraction is eliminated (or nearly so, as the stars are generally selected within 25° of the zenith1), and there is no large divided circle. The telescope, which is counterpoised on one side of the vertical axis, has a small circle for finding, and there is also a small horizontal circle. This instrument is universally used in American geodesy.

The United States Coast Survey has a prineipal triangulation extending for about 9° 30’ along the coast, but the final results are not yet published.

In 1869 was published I’. G. Struve’s Are du Méridien de 25° 20° entre le Danube et la Mer Glaciale mesuré depuis 1816 jusgwen 1855, This work is the record of a vast amount of scientific labour and is the greatest contribution yet made to the question of tle figure of the earth. The latitudes of the thirteen astronomical stations of tiis are were determined partly with vertical circles and partly by means of the transit instrument in the prime vertical. The triangulation, a great part of which, liowever, 13 a simple chain of triangles, is reduced by the method of least squares, and the probable errors of the resulting distances of parallels is given; the probable error of tlie whole are in length is + 6°2 toises. Ten base lines were measured. The sum of the lengths of the ten measured bases is 29,863 toises, so that the average length of a base line is 19,100 fect. The azimuths were observed at fourteen stations. In high latitudes the determination of the meridian is a mitter of great difficulty ; nevertheless tle azimuths at all the northern stations were successfully determined,—the probable error of the result at Fuglences being + 06‘“53.

; a See the volume of the Ordnance Survey, entitled Account of the Principal Triangulation of Great Britain and Ireland, by Captain A. R, Clark, R.E., F.B.S., 1858,

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Mechanieal Theory.

Newton appears to have been the first to apply his own newly-discovered doctrine of gravitation, combined with the so-called centrifugal force, to the question of the figure of the earth. Assuming that an oblate ellipsoid of

rotation is a form of equilibrium for a homogencous fluid rotating with uniform angular velocity, he obtained the ratio of the axes 229 : 230, and the law of variation of gravity on the surface. A few years later Huyghens published an investigation of the figure of the earth, supposing the attraction of every particle to be towards the centre of the earth, obtaining as a result that tlie proportion of the axes shonld be 578:579. In 1740 Maclaurin wrote his celebrated essay on tlie tides, one of the most elegant geo- metrical investigations ever made. He demonstrated that the oblate ellipsoid of revolution is a figure which satisfies the conditions of equilibrinm in the case of a revolving homogeneous fluid mass whose partieles attract one another according to the law of the inverse square of the distance ; he gave the equation connecting the ellipticity with the proportion of the centrifugal force at the equator to gravity, and he determined the attraction on a particle situated any- where on the surface of such a body. Some few years afterwards Clairaut published (1743) his Théorie de la Figure de la Terre, which contains, among other results, demonstrated with singular elegance, a very remarkable theorem which establislies a relation between the ellipticity of the earth and the variations of gravity at different points of its surface. Assuming tliat the earth is composed of concentric ellipsoidal strata having a common axis of rotation, cach stratum homogeneous in itself, but the ellipticities and densities of tlie successive strata varying according to any law, and that the superficial stratum has the same form as if it were fluid, he proves the very important theorem contained in tle equation

te é= zt I

Where g, g’ are the amounts of gravity at tle equator and at the pole respectively, ¢ the ellipticity of the meridian, and m the ratio of the centrifugal force at the equator tog. Clairaut also proved that the increase of gravity in pro- eceding from the equator to the poles is as the square of the sine of the latitude. This, taken with the former tlleorem, gives the means of determining tlie earths ellipticity from observation of the comparative force of gravity at any two places. Clairaut wonld scem almost to have exhausted the subject, for although much has been written since by mathematicians of the greatest eminenee, yet, practieally, very little of importance has been added. Laplace, himself a prince of mathematicians, who had devoted much

of his own time to the same subject, remarks ou Clairaut's work that "the importance of all his results and the elegance with which they are presented place this work amongst the most beautiful of mathematical produe- tions" (Todhunter's History of the Mathematical Theores of Attraction and the Figure of the Earth, vol. i. p. 229).

The problem of the figure of the earth treated as a ques- tion of mechanics or hydrostatics is one of great diffienlty, and it would be quite impracticable but for the circumstance that the surface differs but little froma sphere. In order to express the forces at any point of the body arising from the attraction of its particles, the form of tle surface 1s required, but this form is the very one which it is the object of the investigation to discover; lience the com- plexity of the subject, and even with all the present resources of mathematicians only a partial and imperfeet solution can be obtained, and that not without some labour. We may, however, here briefly indicate the line of reasor- ing by which some of the most important of tle results we

have alluded to above may be obtained. The principles of hydrostatics show us that if X, Y, Z be the components parallel to three rectangular axes of the forces acting on a particle of a fluid mass at the point «x, y, 2, then, p being the pressure there, and p the density, dp = p(Xda + Ydy + Zdz) ;

and for equilibrium the necessary conditions are, that p(Xdaz + Ydy + Zdx) be a complete differential, and at the free surface Xdx + Ydy + Zdz = 0. This equation implies that the resultant of the forces is normal to the surface at every point, and in a homogeneous fluid it is obviously the differential equation of all surfaces of equal pressure. If the fluid be heterogeneous then it is to be remarked that for forces of attraction according to the ordinary law of gravitation, if X, Y, Z be the components of the attraction of a mass whose pvtential is V, then

Xde+ dy + Ude= Quakes Pedy + Fede F

which is a complete differential. And in the case of a fluid rotating with uniform velocity, in which the so-called centrifugal force enters as a force acting on each particle proportional to its distance from the axis of rotation,

the corresponding part of Xdx+Ydy+ Zdz is obviously a complete differential. Therefore for the forces with which we are now concerned Xdz+Ydy+Zdz=dU, where U is some function of x, y, 2, and it is necessary for equilibrium that dp=pdU be a complete differential; that is, p must be a function of U or a function of p, and so also p a function of U. So that dU =0 is the differential equation of surfaces of equal pressure and density.

We may now show that a homogeneous fluid mass in the form of an oblate ellipsoid of revolution having a uniform velocity of rotation can be in equilibrium. It may be proved that the attraction of the ellipsoid a? +y? + 2(1 +2) = c%(1+e¢?) upon a particle P of its mass at x, y, 2 has for components

X=Aze, Y=Ay, Z=Cz, where

1+é¢ e 1 A = 2p CS tan *e — 3)

2 2

CS dnp (+45 -+t tan“*e)

e

Besides the attraction of the mass of the ellipsoid, the centrifugal force at P has for components — aw’, — yw’, 0; then the condition of fluid equilibrium is

(A — w)adec + (A- w*)ydy + Cedz = 0, which by integrating gives

(A — w?\(x? + y?) + C2? = constant.

This is the equation of an ellipsoid of rotation, and there- fore the equilibrium is possible. The equation coincides with that of the surface of the fluid mass if we make

A-@= +, : ‘ 1+eé which gives ‘ ow _ 3 = Go =aih 3 avn ar tan “¢€— a

if we would determine the maximum value of w from this equation, we find that it corresponds to the value of € determined by the condition

tan” *e = Marie? : (1+)(9 + &?) ; hence it may be shown that if the angular velocity exceed

2

that calculated from Imam 0:3247 , equilibrium is impos- Sible for the form of an ellipsoid of revolution. If fall short of this limit, there are two ellipsoids which satisfy the condition of equilibrium ; in one of these the eccentricity is

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greater and in the other ess than 0°93. In the case of the earth, which is nearly spherical, we get by expanding the expression for w? in powers of ¢, rejecting the higher powers, and remarking that the ellipticity e= }

ae wae

Qnp 16° 15°”

Now, if m be the ratio of the centrifugal force at the

equator to gravity there,

Cw?

= ————) + ve mpc — Cw? ™p

In the case of the earth it is a matter of observation that m= 54,5, hence the ellipticity

ex oma 4 231’

so that the ratio of the axes on the supposition of a

homogeneous fluid earth is 230: 231, as announced by

Newton.

Now, to come to the case of a heterogeneous fluid, we shall assume that its surfaces of equal density are spheroids, concentric and having a common axis of rotation, and that the ellipticity of these surfaces varies from the centre to the outer surface, the density also varying. In other words, the body is composed of homogeneous spheroidal shells of variable density and ellipticity. On this supposition we shall express the attraction of the mass upon a particle in its interior, and then, taking into account the centrifugal force, form the equation expressing the condition of fluid equilibrium. ‘The attraction of the homogeneous spheroid ax? + y? + 27(1 + 2e) =c?(1 + 2e), where e¢ is the ellipticity, of which the square is neglected, on an internal particle, whose co-ordinates are x=/, y=0, z=h, has for its x and z components

Nt _ 4 X’= Epp (1 se), Zi =a aph(1+2e),

the Y component being of course zero. Hence we infer

that the attraction of a shell whose inner surface has an

ellipticity e, and its outer surface an ellipticity e+ de, the density being p, is expressed by

142 4

dX!= es mpfde, adaZ =

To apply this to our heterogeneous spheroid ; if we put c, for the semiaxis of that surface of equal density on which is situated the attracted point P, and c, for the semiaxis of the outer surface, the attraction of that portion of the body which is exterior to P, namely, of all the shells which inclose P, has for components

: : mphde.

¢,f 2 16 oy

2 é = 5 = VA ee ee ff B42 Xo “ de ‘ i ‘ 15 oF Gy ” dc de , both ¢ and p being functions of c. Again the attraction of a homogeneous spheroid of

density p on an external point f, & has the components

ne 4 z 3 = 5 Xx 57? i} c3(1 + 2c) — Aec

2.2 2

Nae ‘ sie a and 72 = f2 +h, Now e being considered a function of c, we can at ounce express the attraction of a shell (density ») contained between the surface defined by c+dc, e+de and that defined by ¢, e upon an external point; the differentials with respect to c, viz. dX” dZ”, must then be integrated with p under the integral sign as being a function of ¢. The integration will extend from c=0 toc=c, Thus the components of the attraction of the heterogeneous spheroid VII. — 76

23

where A\=5 <3

27\6

602

upon a particle within its mass, whose co-ordinates are /, 0, h, are

. 4 1 Cy Z x Cy 2) Co X=5 n0f {i pa.c(1t2)—%, [odes) = f pac

0 0

Cy

ya! a ie 4 Z = © xh af ode 2 20), [vate) +5 [pac} i) 0 cy We take into account the rotation of the earth by subtract- ing the centrifugal force fo?=F from X. Now, the sur- face of constant density upon which the point /, 0, A is situated gives (1 —2e)fdf+hdk=0; and the condition of equilibrium is that (X —F)df+Zdh=0. Therefore, (X-—P)h = Zf (1-24), which, neglecting small quantities of the order e? and putting wt? = 42’, gives oe. fa 6 a 6 a 2 =3 f pd. (1 +2)—< 5 [pdled)—z pde=— 0 ; 0 Cy Here we must put now ¢ for ¢,, ¢ for r, and 1+2e under the first integral sign may be replaced by

unity. Two integrations lead us to the following very important differential equation :— de, 2pe?_— de 2Qpe 6 hf de" {pede de a S pede Si) =e

When p is expressed in terms of c, this equation can be integrated. We infer then that a rotating spheroid of very small ellipticity, composed of fluid homogeneous strata such as we have specified, will be in equilibrium; and when the law of the density is expressed, the law of the corresponding ellipticities will follow. If we put M for the mass of the spheroid, then

_ tn

c =5 pa. cX{1+ 2e) ;

0

and putting c=c¢, in the equation expressing the cordition of equilibrium, we find

a co 4 and m= y+ 9?

Co va ; ie pad(ec®) ,

0

Making these substitutions in the expressions for the

2

Mem .

forces at the surface, and putting r=1+e-e e, we get

G cos == { 1-e~5 m+(3 m—20) iy \z

2 a Gsing = = { Lte-5 m+(sm-2) obs,

Here G is gravity in the latitude ¢, and a the radius of ‘ c hi? the equator, Since sec d= 2 (a +e+em) ;

~~ {,_3 Diceee ie G=% {h smt(5m e) sin ro) \,

which expression coutains the theorems we have referred to as discovered by Clairaut.

The theory of the figure of the earth as a rotating ellipsoid has proved an attractive subject to many of the greatest mathematicans, Laplace especially, who has devoted a large portion of his Alécaneque Céleste to it. In English the principal existing works on the subject are Sir George Airy's Mathematical Tracts, where the subject is treated in the lucid style so characteristic of its author, but without the use of Laplace's coefficients, Arclideacon Pratt's Attrac- tions and Figure of the Earth, and O'Brien's Mathematical Tracts ; in the last two Laplace's coefficients are used. In the Cambridge Transactions, vol. viii., is a valuable essay by Professor Stokes, in which he proves, without making auy assumption whatever as to the ellipticity of internal strata, or as to the past or the present fluidity of the earth,

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that if the external form of the sea—imagined to percolate the land by canals—be a spheroid with ellipticity smal] é, then the law of gravity will be that found above.

An important theorem by Jacobi must not be overlooked, He proved that for a homogeneous fluid in rotation a spheroid is not the only form of equilibrium ; an ellipsoid rotating round its least axis may with certain proportions of the axes and a certain time of revolution be a form of equilibrium.?

Local Attraction.

In speaking of the figure of the earth, we mean the surface of the sea imagined to percolate the continents by canals. That this surface should turn out, after precise measurements, to be exactly an ellipsoid of revolution is @ priori improbable. Although it may be highly probable that originally the earth was a fluid mass, yet in the cooling whereby the present crust has resulted, the actual solid surface has been left in form the most irregular. It

is clear that these irregularities of the visible surface niust be accompanied by irregularities in the mathematical figure of the earth, and when we consider the general sur- face of our globe, its irregular distribution of mountain masses, continents, with oceans and islands, we are prepared to admit that the earth may not be precisely any surface of revolution. Nevertheless, there must exist some spheroid which agrees very closely with the mathematical figure of the earth, and has the same axis of rotation. We must conceive this figure as exhibiting slight departures from the spheroid, the two surfaces cutting one another in various lines;~~thus a point of the surface is defined by its latitude, longitude, and its height above the spheroid of reference. Call this height for a moment n; then of the actual magnitude of this quantity we can generally have no information, it only obtrudes itself on our notice by its variations. In the vicinity of mountains it may change sign in the space of a few miles; x being regarded as a function of the latitude and longitude, if its differential coefficient with respect to the former be zero at a certain point, the normals to the two surfaces then will lie in the prime vertical; if the differential coefficient of 2 with respect to the longitude be zero, the two normals will lie in the meridian; if both coefficients are zero, the normals will coincide. The comparisons of terrestrial measurements with the corresponding astronomi~~ cal observations have ever been accompanied with discrepancies. Suppose A and B to be two trigonometrical stations, and that at A there is a disturbing force drawing the vertical through an angle 6, then it is evident that the apparent zenith of A will be really that of some other place A’, whose distance from A is 78, when r is the earth’s radius ; and similarly if there be a disturbance at B of the amount 8’, the apparent zenith of B will be really that of some other place B’, whose distance from B is rd’. Hence we have the discrepancy that, while the geodetical measure- ments deal with the points A and B, the astronomical observations belong to the points A’, B’. Should 8,8 be equal and parallel, the displacements AA’, BB’ will be equal and parallel, and no discrepancy will appear. The non- recognition of this circumstance often led to much per- plexity in the early history of geodesy. Suppose that, through the unknown variations of 7, the probable error of an observed latitude (that is, the angle between the normal to the mathematical surface of the earth at the given point and that of the corresponding point on the spheroid of reference) be «, then if we compare two arcs of a degree

1 See also a paper by Professor Stokes, in the Cambridge and Dublin Mathematical Journal, vol. iv. 1849.

2 See a paper in the Proceedings of the Royal Society, No. 128, 1870, by I. Todhunter, M.A., F.B.S.

each in mean latitudes, and near each other, say about five degrees of latitude apart, the probable error of the resulting value of the ellipticity will be approximately +zf5¢, « being expressed in seconds, so that if « be so great as 2” the probable error of the resulting ellipticity will be greater than the ellipticity itself. It is not only interesting, but necessary at times, to calculate the attraction of a mountain, and the consequent disturbance of the astronomical zenith, at any point within its influence. The deflection of the plumb-line, caused by a local attraction whose amount is ‘Ad, is measured by the ratio of Ad to the force of gravity at the station. Expressed in seconds, the deflection A is

A=12”,447.94 , p

where p is the mean density of the earth, 6 that of the attracting mass,—the linear unit in expressing A being a mile. Suppose, for instance, a table-land whose form is a rectangle of twelve miles by eight miles, having a height of 500 feet and density half that of the earth ; let the observer be two miles distant from the middle point of the longer side. The deflection then is 1”°472; but at one mile it increases to 2°20. At sixteen astronomical stations in the English Survey the disturbance of latitude due to the form of the ground has been computed, and the following will give an idea of the results. At six stations the deflection is under 2”, at six others it is between 2” and 4”, and at four stations it exceeds 4”. There is one very exceptional station on the north coast of Banfishire, near the village of Portsoy, at which the deflection amounts to 10”, so that if that village were placed on a map in a position to correspond with its astronomical latitude, it would be 1000 feet out of position! There is the sea to the north and an undulating country to the south, which, however, to a spectator at the station does not suggest any great disturbance of gravity. A somewhat rough estimate of the local attraction from external causes gives a maxinlum limit of 5”, therefore we

have 5” unaccounted for, or rather which must arise from unequal density in the underlying strata in the surrounding country. In order to throw light on this remarkable phenomenon, the latitudes of a number of stations between Nairn on the west, Fraserburgh on the east, and the Grampians on the south, were observed, and the local deflections determined. It is somewhat singular that the deflections diminish in all directions, not very regularly certainly, and most slowly in a south-west direc- tion, finally disappearing, and leaving the maximum at the original station at Portsoy. |

The method employed by Dr Hutton for computing the attraction of masses of ground is so simple and effectual that it can hardly be improved on. Let a horizontal plane pass through the given station; let 7, be the polar co-ordinates of any point in this plane, and 7, 0, z, the co-ordinates of a particle of the attracting mass ; and let it be required to find the attraction of a portion of the mass contained between the horizontal planes z=0, z=h, the cylindrical surfaces r=7,, 7=7,, and the vertical planes 46=6,, =6,. The component of the attraction at the station or origin along the line 6 =0 is

ae (2 4. 2\3 SA 9? + 27) rot(r2 h?) r (72 +h) By taking r,—7, sufficiently small, and supposing / also small, as it usually is, compared with r, +79, the attraction is

= 6h (sin @,—sin 6,) log

=8(r,—7,)(sin 6,— sin 6;) z ;

Where r=4(r, +7). This form suggests the following pro-

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cedure. Draw on the contoured map a series of equidistant circles, concentric with the station, intersected by radial lines so disposed that the sines of their azimuths are in arithmetical progression. Then, having estimated from the map the mean heights of the various compartments, the cal- culation is obvious.

In mountainous countries, as near the Alps and in the Caucasus, deflections have been observed to the amount of as much as 29”. On the other hand, deflections have been observed in flat countries, such as that noted by Professor Schweitzer, who has shown that, at certain stations in the vicinity of Moscow, within a distance of 16 miles the plumb- line varies 16” in such a manner as to indicate a vast deficiency of matter in the underlying strata. But these are exceptional cases.! Since the attraction of a mountain mass is expressed as a numerical multiple of 8 : p, the ratio of the density of the mountain to that of the earth, if we have any independent means of ascertaining the amount of the deflection, we have at once the ratio p : 6, and thus we obtain the mean density of the earth, as, for instance, at Schiehallion, and more recently at Arthur’s Seat. A com- pact mass of great density at a small distance under the surface of the earth will produce an elevation of the mathe- matical surface which is expressed by the formula

1

i (1+? 2k cos 6)4 = ‘ where a is the radius of the (spherical) earth, a(1 —4) the distance of the disturbing mass below the surface, the ratio of the disturbing mass to the mass of the earth, and a@ the distance of any point on the surface from that point, say Q, which is vertically over the disturbing mass. The maximum value of y is at Q, where it is yap 1-k The deflection at the distance a@ is pk sin (1-442 — 2k cos 6)3″ or since 6 is small, putting h+4=1, cal (2+)3 The maximum deflection takes place at a point whose distance from Q is to the depth of the mass as 1: ,/ 2, and its amount is

=

2 uw 33h?”

Tf, for instance, the disturbing mass were a sphere a mile in diameter, the excess of its density above that of the surrounding country being equal to half the density of the earth, and the depth of its centre half a mile, the greatest deflection would be 5”, and the greatest value of y only two inches. Thus a large disturbance of gravity may arise from an irregularity in the mathematical surface whose actual magnitude, as regards height at least, is extremely small.

The effect of the disturbing mass p on the vibrations of a pendulum would be a maximum at Q; if v be the number of seconds of time gained per diem by the pendulum at Q, and o the number of seconds of angle in the maximum

| deflection, then it may be shown that

oe Se

1In the Philosophical Transactions for 1855 and 1859 will be found Archdeacon Pratt's calculations of the attractions of the Hima- layas and the mountain region beyond them, and the consequent deflection of the plumb-line at various stations in India ; the subject, which presents many anomalies and difficulties, is very fully gone into in his treatise on the figure of the earth. His computed deflections are vastly greater than anything brought to light by observation.

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so that the number of seconds of time by which at the maximum the pendulum is accelerated is about half the number of seconds of angle in the maximum deflection.

Principles of Calculation.

Let a, a' be the mutual azimuths of two points P, Q on a spheroid, k the chord line joining them, yp, p' the angles made by the chord with the normals at Pand Q, ¢, ¢', w their latitudes and difference of ey gies + 4 -1=0 the equation of the surface ; a then if the plane xz passes through P the co-ordinates of P and Q will be

longitude, and

a L=— COS db; a! == 57 C08 ' COS w ,

a : ' We cos ¢' sin w,

a : : a . a5 (1 —¢*) gin @, 2 = at ~¢*) sin ¢',

1

where A=(1—¢* sin? p)3, A’=(1-e? sin? g’)3, and e is the eccen-

tricity. Let f, 9, h be the direction cosines of the normal to that plane which contains the normal at P and the point Q, and

whose inclinations to the meridian plane of P is =a; let also Z,m,m and l’, m’, n’ be the direction cosines of the normal at P, and of the tangent to the surface at P which lies in the plane

passing through Q, then since the first line is perpendicular to each of the other two and to the chord &, whose direction cosines are

proportional to w’- a, y’—y, 2’—2, we have these three equations

I(x’ -2)+9y’ +h?’ — 2) =0 Si+gmt+hn =0 SU+gm’ +h’ =0.

Eliminate f, g, h from these equations, and substitute

.

t= cos » V’=- sin ¢ cosa m= m’ = sin a n = sin v= cos $ COS a,

and we get (a’—x) sin p+y/ cot a—(#-2) cos =0.

The substitution of the values of a, z, x’, 7/, 2 in this equation will give immediately the valuc of cot a; and if we put ¢ ¢’ for the

corresponding azimuths on a sphere, or on the supposition e=0, the following relations exist

cota — cot¢ = eee o cos f’ A cot a’— cot (’=—e g Q cos @ A’

A’ sin —A sin ¢’= sin w Q.

Tf from Q we let fall a perpendicular on the meridian plane of P, and from P lect fall a perpendicular on the meridian plane of Q, then the following equations become geometrically evident :

‘

. ° a ‘ k sin w sin a = — cos ¢’ sin w A

. 5 a . % sin p’ sin a! = 5 008 ~ sin w.

Now in any surface w=0 we have 1 =(~~a) + (y’~~ 9) d -2)? i du du \ aU (x = ae aly’ =y) dy * (-2) = Ti Ti, Yh dz” dy? = p> wdu ; du du (a! — SV) e 2) k da” du? A du \4 ‘te aya da

- cos “w=

cos p=

in the present casc, if we put

1 oe a?

4

ie 2U -2(%*) aq?

az! B-: then

b a pad Re cos w= AU ; cos w= TAU.

Let u be such an angle that

(1 -)? sin ¢ = Asin u cos 6 = Acosu,

KA a a tel

then on expressing x, x’, 2, 2’ in terms of uw and w’, U=1-cos u cos w’ cos w—sin uw sin w’; also, if v be the third side of a spherical triangle, of which two sides are 4m —u and 4n-—w’ and the included angle w, using a subsidiary angle wy such that w + u 2 a

uu —U

. – Vv . sin W sin z =e sin cos

we obtain finally the following equations :— k=2a cos p sin 5

cos M=A sec p sin 5 (oe – Vv cos w =A sec p sin 5

. . a « sin «sin = 5608 w’ sin w . ee 1_ ; sin sin a = — cos usin ow.

These determine rigorously the distance, and the mutual zenith distances and azimuths, of any two points on a spheroid whose latitudes and difference of longitude are given.

By a series of reductions from the equations containing ¢ (’ it may be shown that

ata’=C+ (+ “alg! 9)? cos py sin yt… ,

where ¢» is the mean of @ and ¢’, and the higher powers of ¢ are neglected. A short computation will show that the small quantity on the right-hand side of this equation can never amount even to the ten thousandth part of a second, which is, practically speaking, zero; consequently the sum of the azimuths a+a’ on the spheroid is equal to the sum of the spherical azimuths, whence follows this very important theorem (known as Dalby’s theorem). If ¢, ¢’ be the latitudes of two points on the surface of a spheroid, w their difference of longitude, a, a’ their reciprocal azimuths,

donee ; tan a cot ied i) =! 7 Fs ° sin eee i

The vertical plane at P passing through Q and the vertical plane at Q passing through P cut the surface of the spheroid in two dis- tinct curves. The greatest distance apart of these curves is, if a = the mean azimuth of PQ,

aig cos *, sin 2

16 a heaieaieit Ls. This is a very small quantity; for even in the case of a line of 100 miles in length having a mean azimuth a = 45° in the latitude of Great Britain, it will only amount to half an inch, whilst for a line of fifty miles it cannot exceed the sixteenth part of an inch. ‘The geodesic line

joining P and Q lies wholly between these two curves. If we designate by P’, Q’ the two curves (the former being that in the vertical plane through P), then, neglecting quantities of the order ¢*6°, where 6 is the angular distance of P and Q at the centre of the earth, the geodesic curve makes with P’ at P an angle equal to the angle it makes with Q’ at Q, each of these angles being a third of the angle of intersection of P’ and Q’. The difference of length of the geodesic line and either of the curves P’, Q’ is, s being the length of either,

SE +2 360 e*@” COS* dy Sin? 2ay.

At least this is an approximate expression. Supposing the angle PQ to be as much as 10°, this quantity would be less than one hundredth of an inch.

An idea of the course of a geodesic line may be gathered from the following example. Let the line be that joining Cadiz and St Petersburg, whose approximate positions are

Cadiz. St Petersburg. Witt S62 2QGNehee ss. aree 59° 56’ N. TEGHG) G58 Wein. ene.ss01 30°17’

If G be the point on the geodesic corresponding to F on that one of the plane curves which contains the normal at Cadiz (by “corresponding” we mean that F and G are on a meridian) then G is to the north of F; at a quarter of the whole distance from Cadiz GF is 458 feet, at half the dis-

. 1 See a paper ‘On the course of Geodesic Lines on the Earth’s Surface” in the Philosophical Magazine for 1870,

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tance it is 637 feet, and at three quarters it is 473 feet. The azimuth of the geodesic at Cadiz differs 20” from that of the vertical plane, which is the astronomical azimuth. The azimuth of a geodesic line cannot be observed, so that the line does not enter of necessity into practical geodesy, although many formulz connected with its use are of great simplicity and elegance.

The geodesic line has always held a more important place in the science of geodesy among the raathematicians of France, Germany, and Russia than has been assigned to it in the operations of the English and Indian triangulations. Although the observed angles of a triangulation are not geodesic angles, yet in the calculation of the distance and reciprocal bearings of two points which are far apart, and are connected by a long chain of triangles, we inay fall upon the geodesic line in this manner :—

If A, Z be the points, then to start the calculation from A, we obtain by some preliminary calculation the approximate azimuth of Z, or the angle made by the direction of Z with the side AB or AC of the first triangle. Let P, be the point where this line inter- sects BC; then, to find P,, where the line cuts the next triangle side OD, we make the angle BP,P, such that BP, P,+ BP; A=180°. This fixes P,, and P, is fixed by a repetition of the same process ; soforP,, P;.... Nowitis clear that the points P,, P,, P; so com- puted are those which would be actually fixed by an observer with a theodolite, proceeding in the following manner. Having set the instrument up at A, and turned the telescope in the direction of the computed bearing, an assistant places a mark P, on the line BO, adjusting it till bisected by the cross-hairs of the telescope at A. The theodolite is then placed over P,, and the telescope turned to A; the horizontal circle is then moved through 180°. The assistant then places a mark P, on the line CD, so as to be bisected by the telescope, which is then moved to P,, and in the same manner P, is fixed. Now it is clear that the series of points P,, Py, P; approaches to the geodesic line, for the plane of any two consecutive elements Pr: Pn, Pn Pr4i contains the normal at Pr.

From the formule which we have given above, expressing the mutual relations of two points P, Q on a spheroid, we may obtain the following sqlution of the problem: Given the latitude @ of P, with the azimuth a and distance s of Q, to determine the latitude and longitude of Q and the back azimuth a’,

Let an a

oP _cot™y ain 2a” 4(1—e) * oa e* 93 e G= 1A) cos? @ cos? a ; (,(’ arealways veryminute quantities even for the longest distances ; then, putting x=90° – 9, an a’ + ¢(—w_sin $(x«-6-¢’) cot 2 2 sin 4(«+0+¢/) 2 a+

e+ w _ cos (x —-6~ ¢’) %) cos $(*e+0+¢’) s sin $(a’+ ¢- a) 62 oe >» —$= —_— 7 (a *) 5 p sin 4(a’+ ¢+-a) ag oe 2 % a p is the radius of curvature of the meridian for the mean titude a(p+¢’). ‘These formule are approximate only, but they ate sufficiently precise even for very long distances.

tan

cot &

2

Meridian Ares. a The length of the are of meridian between the latitudes $, and py

_ fs de (1l-e*)do C= dd = es ee ie 1 Py

instead of using the excentrici i = wa me ricity, put the ratio of the axes = _ £2

(1+2n cos 2p + n2)$ °

Pi This, after integration, gives

8

b =(Ltnt+7 742 ni) ay — (3n+ Bn? +n) a + (Gn?+ Pn) Oy

3 35

— he 3 (55%) as »

8

605

where

A= Pz — Py

a, = sin (py — $1) cos (Py + $3)

a= sin 2(p,—-“p,) cos 2(¢2+ >)

a3= Sin 3(p_— $1) COS 3(p_+ >) The part of s which depends on n? is very small; in fact, if we calculate it for the longest arc measured, the Russian arc, it amounts to only an inch and a half, therefore we omit this term, and put

for ; the value

(1 +n+4 n®) Oy — (82+ 3n?) a+ (Fn?)ag Now, if we suppose the observed latitudes to be affected with errors, and that the true latitudes are $,2,, do%,; and if further we suppose that ,+dn is the true value of a—b:a+0, and that n, itself is merely a very approximate numerical valne, we get, on making these substitutions and neglecting the influence of the cor- rections x on the position of the arc in latitude, 7.¢., on ¢,+ 9,»

f=(1 +m +2 ni) My — (3, 803) 4 (2ni)ay oF {(14+3) My — (8+ 67) a+ (7) aby \ dn

ap L+m,—8n, day ;

dary here day=%.—%,; and as } is only known approximately, put 6,= b(1+w); then we get, after dividing through by the coeflicient of day, Which is=1+ 7 — 37, cos (py — $1) COS (2 — $), an equation of the form 7,=x%,+h+fut+gv, where for convenience we put v for dn.

Now in every measured arc there are not only the extreme stations determined in latitude, but also a number of intermediate stations, so that if there be 7+1 stations there will be 7 equations

Vy =H + fut gyv+t hy Wy = Hy + fq + Jy0 + hy

aj = 2 +fiutgivth 6

In combining a number of different arcs of meridian, with the view of determining the figure of the earth, each arc will supply a number of equations in w and v and the cor- rections to its observed latitudes. Then,

according to the method of least squares, those values of w and v are the most probable which render the sum of the squares of all the errors « a minimum. The corrections # which are here applied arise not from errors of observation only. The mere uncertainty of a latitude, as determined with modern instruments, does not exceed a very small fraction of a second as far as errors of observation go, but no accuracy in observing will remove the error that may arise from local attraction. This, as we have seen, may amount to some seconds, so that the corrections # to the observed latitudes are attributable to local attraction. Archdeacon Pratt, in his treatise on the figure of the earth, objects to this mode of applying least squares first used by Bessel; but certainly Bessel was right, and the objection is groundless.

Comparisons of Standards.

In determining the figure of the earth from the arcs of meridian measured in different countries, one source of uncertainty was, until the last few years, the want of com- parisons between the standards of length in which the ares were expressed. This has been removed by the very extensive series of comparisons recently made at South- ampton (see Comparisons of Standard of Length of England, France, Belgium, Prussia, Russia, India, and Australia, made at the Ordnance Survey Office, South- ampton, 1866, and a paper in the Philosophical T’ransac- tions for 1873, by Lient.-Col. A. R. Clarke, C.B., R.E., on the further comparisons of the standards of Austria, Spain, the United States, Cape of Good Hope, and Russia). These direct comparisons, which were carried out with the highest attainable precision, are of very great value. The length of the toise has three independent determinations, viz., through the Russian standard double toise, the Prussian toise, and the Belgium toise,—giving for the length of the

| toise, expressed in terms of the standard yard of England,

EE ee a TT

606 EAK TE

through the Russian standard …..... 639453216 ft. 0 oy ETUSSIQM. yg aveacre 6°39453708 ft. ie Selon mnie ee 6°389458215 ft.

By combining all the different comparisons made in England and on the Continent on these bars, by the method of least squares, the final value of the toise is 6°39453848 ft. (log = 0°8058088656), from which the greatest divergence of the three separate results specified above is only half a millionth of a toise, corresponding to ten feet in the earth's radius. From the known ratio of the toise and the mietre, 864000 ; 443296, we get for the metre 3°28086933 ft. (log = 0°5159889356).

That the close agreement between the determinations of the toise is not due to chance will be seen from the fact that the comparisons of the Prussian toise with the English standard involved 2340 micrometer readings and 520 thermometer readings, extending over twenty-five days, the probable error of the resulting length of the toise being + 0°00000015 yard. The probable error of the deter- mination of the Belgian toise is + 0°00000027 ; that of the Russian double toise +0'00000031, With regard to the metre, there is an independent determination resulting from the comparison of the platinum metreof the Royal Society, —

a large number of observations giving for the length of the |

metre 3°28087206 feet, which differs from the former result by about one millionth part. But this determination, involving the expansion of the bar for 30° of temperature, and being dependent on some old observations of Arago, cannot be allowed any weight in modifying the result obtained through the toises.. The Russian standard, com- pared at Southampton, was that on which the length of their base lines and therefore their whole arc depends.

Calculation of the Semiaxes.

We now bring together the results of the various meridian ares, omitting many short ares which have been used in previous determinations, but which on account of their smallness have little influence in the result aimed at.

The data of the French arc from Formentera to Dunkirk are—

A r ists

Stations ee ag ee

° 5 “ Feet.

Formentera…..... 988 39 53°17 Pane NIOUMETOUY 0 eee 41 21 44°96 98267104 BancelOma:,..cc::0000 0+ 41 22 47:90 988701°92 Carcass@nie.n5,..... 48 »b2 54:80 1657287°93 Panto… cesses 48 50 47°98 371082718 DUMP ee ccccmeenccc.s Dl et eohaal 4509790‘84

The latitude of Formentera as here given is taken from the observations of M. Biot, recorded and computed in the third volume of his T’ratté Elémentaire d’ Astronomie physique.

The latitude of the Pantheon, given in the Base du Sysiéme Métrique Déeimal (ii. 413), is 48° 50’ 48-86. In the Annales de UObservatotre Imperial de Paris, vol. viii. page 317, we find the latitude of south face of the observatory determined as 48°50’ 11°71. The Pantheon being 35”°38 north jof this, we thus get a second determination of its latitude. The mean is that given above.

The distance of the parallels of Dunkirk and Greenwich, deduced from the recent extension of the triangulation of England into France, in 1862, is 161407°3 feet, which is 3°9 feet greater than that obtained from Captain Kater’s triangulation, and 3°2 feet less than the distance calculated by Delambre from General Roy’s triangulation. The following table shows the data of the English are with the distances in standard feet from Formentera.

. t a Feet.

Formentera…....5 – an

Greenwich…..... 51 28 38°30 4671198°3 E-AIAQ) L700, cobsuenbeduanoue 92 138 26°59 4943837 °6 COMIOU ssesca 1 sso 58 27 29:50 5394063°4 Kellie ANT. os satis voc 56 14 53°60 6413221°7 Sil aay… o0tsssse san 57 27 49°12 6857323‘3 SORA OLE jo cn a0 vediens 60 49 37:21 8086820°7

The latitude assigned in this table to Saxavord is not the directly observed iatitude, which is 60° 49’ 38’“58, for there are here a cluster of three points, whose latitudes are astronomically determined ; and if we transfer, by means of the geodesic connection, the latitude of Gerth of Scaw to Saxavord, we get 60° 49’ 36°59; and if we similarly transfer the latitude of Bulta, we get 60° 49’ 36’°46. The mean of these three is that entered in the above table.

For the Indian arc in long. 77° 40’ we have the follow- ing data :—

A 4 Wy Feet. EUS sonssiccna, Meee» ncn alee Be Putchapolliam,..... 10 59 42°:276 1029174°9 Dodagoontah…..... 12 59 52°165 1756562°0 WNamthabad ..cs.css00- 15 5 58°562 2518376‘3 Daumergida …..... 18 38 15:292 8591788°4 Ta Kalk Wea… ++... 21 5 51532 4697329°5 KSaligmput secre ee i eleleZey 5794695°7 IMAMAMAR. «ececcsseess cs 29 80 48°322 7755835 °9

The data of the Russian are (long. 26° 40’) taken from M. Struve’s work are as below :—

Ks ‘ i Feet.

Staro Nekrassowka.. 45 20 2°94 aon

WiodGltl …..~~..., @f 1 QAaeos 616529°81 SsuprunkowzZi,,,..... 48 45 3:04 1246762717 Kremenetz…....~~. 0 , 50 8 49°95 1787551°48 velit seteeeeeecepeete: 62 2 42°16 2448745 °17 Nemesch …....0006 54 39 4°16 38400312°63 VACOWSHAME ..5..000r8 ere 56 80 4:97 4076412 :28 DORPATIS. s.c8ccc ese ve 58 22 47°56 4762421°43 Hogland:.....:.0. .» 160) ab 29°64 5886135 °39 Kilpimaki…....00 62 38 5°25 631790567 MORNCA, 00. . .caseaeceses 65 49 44°57 7486789‘97 StWOPOIVA! .....00606. 68 40 58:40 8530517 ‘90 Fuglenes….....006 70 40 41-28 9257921‘06

From the are measured by Sir Thomas Maclear in long. 18° 30’, we have

: , Feet. North End …....00. 29 44 17°66 2 Heerenlogement Berg. 381 58 9°11 811507°7 Royal Observatory…. 33 56 3°20 1526386°8 Mat IOP...

sssitvieeee 34 18 32°13 1682583°3 (CASE 1 Hort ensrndasdenon 84 21 6:26 1678375°7 And, finally, for the Peruvian arc, in long, 281° 0’, = ” Feet. ROTC (Ul ass: «xe amen -3 4 32:°068 ie COTEOBGU ...0icavcescss 0 2 31°387 1131036°8

Having now stated the data of the problem, we may either seek that ellipsoid which best represents the observations, or we may restrict the figure to one of revolution. It will be con- venient to commence with the supposition of an ellipsoidal figure, as on so doing we can, by a slight alteration in the equations of minimum, obtain also the required figure of revolution, It may be remarked that, whatever the real figure may be, it is certain that if we presuppose 1b an eliipsoid, the arithmetical process will bring out an ellipsoid, which ellipsoid will agree better with all the observed latitudes than any spheroid would, therefore we do not prove that it is an ellipsoid; to prove this, arcs of longitude would be required. There is no doubt such ares will be shortly forthcoming, but as yet they are not available.

The first thing that occurs to one in considerlug a0 ellipsoidal earth is the question, What is a meridian curve! It may be defined in different ways: a point moving On the surface in the direction astronomically determined as “‘north” might be said to trace a meridian; or we may define it as the locus of those points which have a constant longitude, whose zeniths lie in a great circle of the heavens, having its poles in the equator; we adopt this definition. Let a, b,c be the semiaxes, c being the polar semuaxls. The equation of the ellipsoid being

Oe as

e fp a’ if P be any point on the surface, the direction cosines of the normal at P are proportional to

Kak Ti

ee OP OF,

dz’ dy’ dz’ a? JR” @? and if }r—¢ be the angle between this normal and the minor axis, so that ¢ is the latitude of P, we have

Hence the equation to a “ parallel” in which the latitude ¢ is constant is

ee

Sara Copa 0). So that in an ellipsoidal earth the parallel is no longer a plane curve. Let longitude be reckoned from the plane of az, As there are two species of latitude, astrouomical and geoceutric, so there are in the ellipsoidal earth two species of longitude, geocentric (called w) and astronomical (called w). Couceive a line passing through the origin in the plane of the equator and directed toa point whose longitude isda+w. The direction cosines of that line are—sin o, cos w, aud 0. Those points of the surfacs whose normals are at right angles to this line are in the meridian whose longitude is w; the condition of perpeudicularity is expressed by

te = ®=0;

and this, in fact, is the equation of the meridian, which is still on the ellipsoidal hypothesis a plane curve. The geocentric and astronomical longitudes are connected by the relation

@ tan w=? tan w.

This meridian curve is an ellipse whose minor semi-axis is c, and of which the semi-axis major is some quantity 7 intermediate between a and 0, such that

I) {e087 40 Ysin? 2 rt v Take two quantities 7,%, such that a(1-—7)=0%1+7)=k2, then k®?=71-7 cos 2u); and take » such that r—c

T+E and substitute the value of 7, neglecting the square of 7; this gives

,

k-c i n 7 ee cos 2u.

Now we have to determine not only the three scmi-axes a, b, c, but

the longitude of a. Let ~, be the longitude of one of the measured

meridian arcs, w%) the longitude of a, then, for that are,

k-c 4

k+¢ ia

= ee cos 2u,+ 9 sin 2u

k+ C ~P Lag q 1?

where 4p=1 cos 2u,, 4q¢=7 sin 2u,.

The normal at P does not pass through the axis of rotation, so that the observed latitudes on an ellipsoid are not exactly the quantities which should be used in the ordinary method of cx- pressing the length of a meridian arc in terms of the latitudes,

utit may be shown that this consideration may be neglected.

The data we have collected forin 35 equations between the 40 x-corrections to the observed latitudes, and the four unknown quantities determining the elements of the ellipsoid. Suppose n, to be an approximate value of the ratio k-e: k+c, so that

v= cos 2(u, — Up)

Where 7 is a small correction to Ny, and suppose ¢, to be an approximate value of ¢ so that c=c, (1+¢), then the four toknown quantities are p, q,7,¢. The result of making the sum of the squares of the 40 corrections a minimum is

Feet. Metres. a = 20926350 = 6378294:0 b= 20919972 = 6376350-4 ¢ = 20853429 = 6356068‘1

607

a—c 1 b-c_ Jd 26507" “ “ails a—b 1 ~¢ 3269°5 Longitude of @.,.....200% 15° 34’ East.

The meridian of the greater axis passes, in the Eastern Hemisphere, through Spitzbergen, the Straits of Messina, Lake Chad in North Africa, and along the west coast of South Africa,—nearly corresponding to the meridian which passes over the greatest quantity of land in that hemi- sphere. In the Western Hemisphere it passes through Behring's Straits and through the centre of the Pacific Ocean. The meridian (105° 34' E.) of the minor axis of the equator passes near North-east Cape on the Arctic Sea, through Tong-king and the Straits of Sunda, and corresponds nearly to the meridian which passes over the greatest amount of land in Asia; and in the Western Hemisphere it passes through Smith Sound, the west of Labrador, Montreal, between Cnba and Hayti, and along the west coast of South America, nearly coinciding with the meridian that passes over the greatest amount of land in that hemisphere.

The length of the meridian quadrant passing through Paris, in the ellipsoidal figure given above, is 10001472°5 metres, showing that the leugth of the ideal French standard is considerably in error as representing the ten-millionth part of the quadrant. The minimum quadrant, in longitude 105° 34', has a length of 100000245 metres. The probable error of the longitude of the major axis of the equator given above is of course large, as much perhaps as + 15°, .

It has been objected to this figure of three unequal axes that it does not satisfy, in the proportions of the axes, the conditions brought out in Jacobi's theorem. Admitting this, it has to be noted, on the other hand, that Jacobi's theorem contemplates a homogeneous fluid, and this is certainly far from the actual condition of our globe, indeed the irregular distribution of continents and oceans suggests as possible a sensible divergence froin a perfect surface of revolution.

If we limit the figure to being an ellipsoid of revolution, we get rid in our equations of two unknown quantities, and the result may be expressed thus : —

Feet. Metres. a= 20926062 = 6378206'4 c = 20855121 = 6356503 8

e:@=293'98 : 294°98 .

As might be expected, the sum of the squares of the 40 latitude corrections, viz., 153°99, is greater in this figure than in that of three axes, where it amounts to 138°30. In the Indian arc the largest corrections are at Dodagoontah, +3’°87, and at Kalianpur, — 3°68. In the Russian arc the largest corrections are +3”°76, at Tornea, and — 3°31, at Staro Nekrassowka. Of the whole 40 corrections, 16 are under 1:0, 10 between 1’°0 and 2”.0, 10 between 2”°0 and 3-0, and 4 over 30. For the ellipsoidal figure the probable error of an observed latitude is + 1-42; for the spheroidal it would be very slightly larger. This quantity may be taken therefore as approximately the probable amount of local deflection.

In 1860, the Russian Government, at the instance of M. Otto Struve, imperial astronomer at St Petersburg, invited the co-operation of the Governments of Prussia, Belgium, France, and England, to the important end of connecting their respective triangulations so as to form a continuous chain under the parallel of 52° from the island of Valentia on the south-west coast of Ireland, in longitude 10° 20’ 40” W., to Orsk on the river Ural in Russia. This grand undertaking was at once set in action, but up to the present

time there are portions of the work still Incomplete. On the part of England the triangulation was, in 1862, carried through France into Belgium; and the difference of longitude of Greenwich and Valentia was determined by the Astronomer Royal by means of electric telegraph signals. Although in theory the determination of differences of

longitude by electric telegraph signals may appear extremely-

simple, yet. practically there are very many sources of error which have to be sought out and eliminated by a proper arrangement of the observations. The system has now been brought to such perfection that the astronomical amplitude of arcs of longitude can be determined with nearly as much accuracy as those of latitude, and in a few years the data of the problem of the figure of the earth will thus receive many additions. precision arrived at, the difference of longitude of Green- wich Observatory and Harvard

Observatory, U.S.A., has been three times determined with the following results :—

h. m. 8. 1866 by Anglo-American Cable…..... 4 44 81:00 1870 by French Cable to Duxbury…..... 4 44 38099 1872 by French Cable to St Pierre…..... 4 44 30°96

But the different determinations of the velocity of transmission of signals prescnt great anomalies.

Pendulum Observations.

In Clairaut's theorem we have seen that if g' be gravity in the latitude of ¢, g its value at the equator, then gy =g(1+q sin'). If the same pendulum be swung in different latitudes then the square of the number of vibrations will be proportional to gravity. Hence, if N be the number of vibrations of an invariable pendulum per diem at the equator, N' the number in latitude , then N?=N*(1+q sin'). Thus g can be obtained by observa- tions on the same pendulum in different latitudes, and since q=3m—e and m is known, e will at once follow. The pendulum which makes 86400 oscillations per diem in London is observed to lose 136 vibrations at the equator and gain 79 at Spitzbergen.

The limits of space at our disposal here prevent our going into the subject of pendulum experiments, and it seems unnecessary to repeat the investigations that have already been based upon the older pendulum observations. See Airy's Migure of the Earth, Baily's paper in the Memos of the Royal Astronomical Society, General Sabine's Account of Huperiments to determine the Figure of the Harth by means of the Pendulum vibrating seconds in Different Latitudes, 1825, and a valuable paper in the Cambridge Philosophical Transactions, 1849, by Professor Stokes. The pendulum gives an ellipticity certainly some- what greater than that resulting from arcs of meridian, ViZ., zg. Animmense number of pendulum observations are now being made at the astronomical stations of geodesical surveys in Germany, Russia, and India, which, when fully published, will throw light more perhaps upon the local variations of gravity than on the figure of the earth, The observations made at the various stations of the Indian meridian are bring to light a physical fact of the very

highest importance and interest, namely, that the density of the strata of the earth’s crust under and in the vicinity of the Himalayan Mountains is less than that under the plains to the south, the deficiency increasing as the stations of observation approach the Himalayas, and being a maximum when they are situated on the range itself. This accounts for the non-appearance of the large deflections which the Himalayas, according to Archdeacon Pratt’s calculations, ought to produce. The Indian pendulum observations also throw some light on the relative variations of gravity at continental, coast, and island stations, showing that, without a single exception, gravity

As an example of the

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at the coast stations is greater than at the corresponding continental stations, and greater at island stations than at coast stations. The ellipticity of the earth hag also been deduced from the motion of the moon, the quantity e—gm entering as a coefficient in the expression for the moon’s latitude. The resulting value of the ellipticity is zb7th (Airy’s Tracts, p. 188). A value of the ellipticity may also be derived from the precession of the equinoxes, but as this depends on the assumed law of density in the interior of the earth it is not of much importance.

Elements of the Figure as a Solid of Revolution. @= 20926062 : 6-=20855121 .

If p be the radius of curvature of the meridian in latitude ¢, p’ that perpendicular to the meridian, D the length of a degree of the meridian, D’ the length of a degree of longitude, r the radius drawn from the centre of the earth, V the angle of the vertical, then

Feet. p =20890606‘6 -106411°5 cos 2p +225°8 cos 4 p =20961607‘3 — 85590°9 cos 2p + 45:2 cos 4p D = 364609°87 – 1857°14 cos 2 + 3°94 cos 4 D’= 365588°48 cos@— 810°17 cos 86 + 0°39 cos 5p Log ~ =9‘9992645 + ‘0007874 cos 2 — 0000019 cos 4p V =700“‘44 sin 29-1719 sin 49. (A. R. C.)

EARTHQUAKE. Although the terrible effects which are often produced by earthquakes have in all ages forced themselves upon the attention of man, it is nevertheless only within the last thirty years that the phenomena have been subjected to exact investigation. A new science has been thus established under the name of seismology (cewpos, an earthquake). This branch of knowledge, how- ever, has hitherto attracted but few students, and its de- velopment in England has been almost exclusively due to the researches of Mr Robert Mallet. References to his principal works will be given at the end of this article.

Accounts of earthquakes are to be found scattered through the writings of many ancient authors, but they are, for the most part, of little value to the seismologist. There is a natural tendency to exaggeration in describing such phenomena, sometimes indeed to the extent of import- ing a supernatural element into the description. It is true that attempts were made by some ancient writers on natural philosophy to offer a rational explanation of earthquake phenomena, but the hypotheses which their explanations involved are, as a rule, too fanciful to be worth reproducing at the present day. It is therefore unnecessary to dwell upon the references to seismic phenomena which have come down to us in the writings of such historians and philoso- phers as Thucydides, Aristotle, and Strabo, Seneca, Livy, and Pliny. Nor is much to be gleaned from the pages of mediseval and later writers on earthquakes, of whom the most notable are Fromondi (1527), Maggio (1571), and Travagini (1679). In this country, the earliest work worthy of mention is Dr Robert Hooke’s Discourse on Harthquakes, written in 1668, and read at a later date before the Royal Society. This discourse, though contain- ing many passages of considerable merit, tended but little to a correct interpretation of the phenomena in question. Equally unsatisfactory were the attempts of Priestley and some other’scientific writers of the last century to connect the cause of earthquakes with electrical phenomena. The great earthquake of Lisbon in 1755 led the Rev. John Michell, professor of mineralogy at Cambridge, to turn his attention to the subject ; and in 1760 he published in the Philosophical Transactions a remarkable essay on the Cause and Phenomena of Earthquakes. Regarding the earth as having a liquid interior covered by a comparatively thin crust, he conceived that waves might be generated iu this subterranean liquid,

and.that such waves by shaking the flexible crust would produce the shocks of an earthquake.

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His illustration of the movement of the ground is that of a loose carpet thrown into undulations by being shaken at one corner. Although Michell's hypothesis is still accepted, in a modified form, by some geologists, it should be remembered that many arguments of considerable weight have been urged by modern physicists against the doctrine of a liquid nucleus and a thin crust. Whatever the merits of Michell's theory, he failed to understand the true nature of wave-motion, and the way in which it is transmitted during an earthquake shock. Modern seismologists believe that an earthquake is a vibratory motion propagated through the solid materials of the earth, much in the same way that sound is propagated by vibrations in the atmo- sphere. It appears that this view was first suggested by Dr Thomas Young in his Lectures on Natural Philosophy, published in 1807. The development of this view, especially in its quantitative results, lies at the very base of seismology. In 1846 Mr Mallet communicated to the Royal Irish Academy his first paper "On the Dynamics of Earthquakes ;" and in the following year the late Mr Hopkins, of Cambridge, presented to the British Association a valuable report in which earthquake-phenomena are dis- cussed in some detail. Since that date the great advances in this country have been made by Mr Mallet, assisted occasionally by the Rev. Professor Haughton and other mathematicians.

Even at the present day, after all that has been written on the subject, but little is really known as to the origin of earthquakes. Probably several distinct causes should be recognized, for it is hardly to be supposed that all sub- terranean disturbances, differing as they do so widely in intensity and in duration, should be referable to one common mechanism. Any great concussion, even upon the surface, is competent to produce tremors which may be regarded as diminutive earthquakes ; thus the great landslip at the Rossberg in Switzerland in 1806 was accompanied by a local quaking of the ground. Volger and Mohr have suggested that some of the small earthquakes which have been felt in Germany may be referred to the falling-in of the roof of enormous subterranean cavities formed by the long-

continued solvent action of water on deposits of rock- salt, limestone, and gypsum. Such causes, however, can have given rise to only very petty shocks, and must be quite subordinate to subterranean disturbances of a more general character. The late Mr Poulett Scrope was led to refer most earthquakes to “ the snap and jar occasioned by the sudden and violent rupture of solid rock-masses, and perhaps the instantaneous injection into them of intumescent molten matter from beneath.” He believed that the rupture of the rocks was due to expansion of deeply seated masses of mincral matter, consequent upon either increased temperature or diminished temperature. It is argued, however, by Mr Mallet, on mechanical principles, that such fractures could produce only very weak impulses ; but he believes that some earthquakes, especially those marked by long continued tremors, may be due to the movement and crushing of rock masses by tangential pressures produced by secular cooling of the earth. Steam has always been a favourite agent with seismologists, since it is clearly com- petent to produce great effects by its sudden generation or by its sudden condensation. It has been suggested that water, finding its way through fissures in the earth’s crust, might reach highly-heated rocks and remain quietly, in the spheroidal] condition, until a local reduction of temperature suddenly caused it to flash into steam. After all, the origin of earthquakes is probably to be regarded as part only of a much wider question. Whatever causes are competent to produce volcanic action are, in all likelihood, equally competent to produce the ordinary manifestations of seismic energy. A relation is clearly traceable between

the geographical distribution of voleanoes aud the chief earthquake-areas ; and although it is not for a moment to be supposed that the volcano and the earthquake stand to each other in the relation of cause and effect, it is never- theless highly probable that they represent merely different expressions of the same subterranean forces.

Whatever may be the real origin of the earthquake shock, it is convenient to regard its effects as proceeding from a concussion or sudden blow delivered underground at some definite centre. This centre of impulse is called the seismic focus. It must be borne in mind, however, that such a centre, so far

from being anything like a mathe- matical point, is in nature a subterranean region, which in many cases is no doubt of very large dimensions, measuring perhaps some miles in diameter.

From the seismic centre waves are propagated in all directions through the solid materials of the earth's crust ; and if the focus be situated beneath the sea, the vibrations of the ground will be accompanied by undulations of the water. Those waves which pass through the elastic materials of the earth consist, for the most part, of Jongt- tudinal vibrations, like those of atmospheric sound-waves, and consequently not like ordinary water-waves. In the sound-wave the air is alternately condensed and rarefied, the molecules advancing and retreating in the line of direc. tion in which the wave is travelling. In a water-wave, on the contrary, the molecules of liquid rise and fall, or rather describe closed curves in planes which are transverse to the direction in which the undulation or wave-form advances. According to Mr Hopkins, both orders of vibra- tion—longitudinal and transversal—coexist in the earth- quake-wave, and call for investigation. When, for example, the molecules of an iron bar are disturbed by a blow delivered at one end, both kinds of vibration are generally excited, and hence two waves are sent through the bar,— the longitudinal, however, having a much greater velocity than the transversal wave. But it may be doubted whether the seismologist need concern himself with any but longi- tudinal vibrations. For, admitting that small transversal vibrations are generated at the seismic focus, it is probable that they would be cut off to a great extent during trans- mission from stratum to stratum. Indeed, the planes of junction between the several beds in stratified deposits would hinder the transmission of transversal vibrations travelling in a direction normal to the strata. Hence Mr Mallet maintains, that in studying the effects of an earth- quake, attention may be restricted, without danger of error, to the longitudinal or normal vibrations, the transversal or tangential vibrations being neglected.

Around the seismic centre, or mean focal point, the molecules of the rock will first be squeezed together by the concussion, and then separated by virtue of the elasticity of the solid medium ; the onward motion is then rapidly taken up by the next set of molecules, which in like manner are pushed against each other, and then spring apart. In this way the pulse, or form of the wave, may be propagated to an enormous distance, whilst the

excursions of the individual particles are confined within very narrow limits. It is therefore of great importance to distinguish between the transit of the wave and the movement of the material particles. Each molecule may move only through a few inches, but the undulation may travel for hundreds of miles. The distance through which the individual particles oscillate is called the amplitude of the wave. After the Neapolitan earthquake of 1857 Mr Mallet found from actual observa- tion at a place called Polla, situated nearly above the seismic centre, that the amplitude of a wave which caused certain fractures in masonry could not have been more than 24 inches. He is thus led to believe, contrary to the opinion of most geologists, that earthquakes are not great agents of

permanent elevation. That elevation has been frequently observed after an earthquake is a fact beyond question ; thus, Captain Fitzroy found, after the South American earthquake of 1835, that a part of the isle of Santa Maria, in the Bay of Concepcion, had been raised upwards of 10 feet, and, although this elevation was followed by a slow subsidence, it is believed that the land was permanently left considerably higher than its level before the occurrence of the catastrophe. Mr Mallet, however, would refer such alteration of level to the action of elevatory forces accom- panying the earthquake, but not to the direct transit of the earth-wave.

From the density and the modulus of elasticity of a given rock, it is possible to calculate the velocity with which a vibration would travel through such a medium. Bnt the rate deduced by calculation usually exceeds very greatly that actually observed in an earthquake, To determine the rate of transit through various rocks, Mr Mallet and his son Dr J. W. Mallet conducted many years ago a series of experiments, at the instance of the British Association. A mile was carefully levelled and measured on sand in Killiney Bay, near Dublin, and by explosion of gunpowder the velocity of transmission through this damp sand was observed. This sand was selected as a medium likely to give a minimum velocity, whilst an assumed maximum velocity was observed by experiments on the granite of Killiney Hill. The velocity in sand was about 825 feet, and in solid granite 1665 feet

per second. These figures are much lower than those obtained from theoretical con- siderations, and it is believed that the difference is due to loss of speed occasioned by the discontinuity of the rock, even the solid granite being always more or less affected by joints. The velocity deduced from these experiments accords tolerably well, however, with that observed during earthquake-shocks. Thus the velocity of shock during the Lisbon earthquake of 1755 is computed to have been about 20 miles per minute, or 1760 feet per second. This velocity of the vibration, or wave of shock, is of course to be carefully distinguished from the velocity of the oscillat- ing particles. The mischief of the shock depends in fact on the rate at which the earth-molecules are moving, and this is vastly inferior to that of the wave. Thus Mr Mallet calculated from his observations in Naples that the shock of the great earthquake of 1857 had a mean velocity at the surface of 788 feet per second, whilst the greatest velocity of the wave-particles was never more than 15 feet per second, and in many places was very much less, Yet this low velocity is quite sufficient to produce effects of the most disastrous kind upon solid objects exposed to the shock.

If the earth were a homogeneous solid, perfectly isotropic —that is to say, possessing equal elasticity in all directions —the waves of alternate compression aud expansion would take the form of a series of concentric spherical shells around the seismic focus as acommon centre. As a matter of fact, however, the crust of the earth is made up of rocks varying greatly in physical properties, each having its own density and elasticity, whilst the rocks themselves are fissured in all directions. Symmetry of wave-surface is therefore hardly to be expected ; for the waves will neces- sarily have greater velocity in one direction than in another, whilst the transit of the wave may be interrnpted by breach of continuity in the transmitting medium. The points at which a wave-shell reaches the surface form a curve which 1s conveniently called a coseismal line. It is obviously the line along which an earthquake shock will be simultane- ously felt, and where the waves will emerge at the same angle. Since the wave-shells are not concentric spheres, the coseismal curves cannot be concentric circles,

It may readily be supposed that the greatest effect of an earthquake, at least in shaking a building np and down,

will be felt at that point of the surface which is situated vertically over the centre of impulse. A line joining this point with the earthquake-focus is termed the seismic vertical, and the wave travelling to the surface along this vertical has a shorter path than that of a wave emerging at any other point. Just as the seismic focus is, in nature, not a single point, but a considerable space, so the seismic vertical is not a single line, but rather a succession of parallel lines drawn vertically from every point of the focal area to the surface. The mean of these lines may be taken as the seismic vertical. In the neighbourhood of this line the waves emerge at very “steep angles, and indeed fora considerable area may be regarded as practically vertical in direction. As the distance from the seismic vertical increases, the angle of emergence becomes less and less: but it is evident that since the focus is seated beneath the surface, the path of an emergent wave can never be perfectly horizontal, unless indeed it be that of a reflected wave.

Almost any object which has been overthrown or projected by an earthquake-shock may afford direct information as to the path of the wave along the surface. For when the vibration is trans- mitted to such a solid body as an upright column, the particles are pushed together and then pulled apart in the line of wave-transit. It is clear too that half the excursion of each particle is executed in the same direction as that in which the wave is travelling, and half in the opposite direction. Each particle of the object when first disturbed moves with the wave, and its velocity increases from zero to the maximum, this maximum being reached at one quarter of the total vibration ; then the velocity diminishes from the maximum to zero, which it attains at the end of half the oscillation. During this first semi-phase, therefore, the vibration has been in the direction in which the wave moves. After the first half oscillation has been executed, movement begins afresh, but this time in the contrary direction, attaining its maximum at the end of the third quarter, and then falling again to zero when the vibration is completed. Hence during the first semi-phase, the motion of the particles is in the same sense or direction as that of the wave, and during the second semi-phase in the opposite direc- tion. But in consequence of the inertia of the body its apparent movement if free, will be in a direction contrary to that of the wave during the first semi-phase. Whatever the direetion of

overthrow, however, it will always be in the dine of wave-transit. Hence the azimuthal direction of the wave is easily found.

Whenever any two wave-paths, not in the same right line, ean be thus traced on the surface, the position of tlie seismic vertical may be immediately determined. For this line must pass through the point of theirin- \B DB tersection. If, for example, it is found by observation on bodies displaced by the shock that one wave moved in the direction AB (fig. 1), whilst another had a path along CD, it is only necessary to mark on the surface the point O, at which these azimuths miet, and the seismic focus will be vertically beneath such a point. The point indicates, in fact, the centre on the surface from whieh the waves radiated. Practically it is found that the several wave-paths of an earthquake do not diverge from a single point, for reasons already indicated; but intersections of the paths are crowded together in the neighbourhood of the mean vertical,

It is easy to understand that the greatest amount of mechanical damage is not to be expeeted immediately above the fucns, although this is the point nearest to the origin of impulse. It is true, the shock passing directly upwards along the seismic vertical might destroy the roof or floor of a building, but it would not tend directly to overturn the walls or prodnce lateral disturbanee. In fact, the side-thrust will be greatest in waves which reach the surface at small angles, and are therefore necessarily at great distances from the scismic vertical. But the energy of the wave diminishes as the square of the distance along the normal inereases. Hence there must be some definite position npon the surface beyond which advantage of direction is counterbalanced by loss of energy. Indeed it is generally possible after an earthquake to trace a zoue of maximum.disturbance, where the damage to the shaken country has been greatest. The line indicating this maximum is termed the meizoseisnvic curve, whilst lines along which the overthrow of objects may be regarded as practically the same are known as isosetsmic curves. After what has been already said, it is hardly necessary to remark that these lines are not true circles, nor indeed are they in all cases regular closed curves, .

Fig. 1.

EARTHQUAKE

Fractures and fissures in walls which have been rent by an earth- quake, are of great value to the seismologist, since they often indicate the direction in which the waves emerge at the surface. The interpretation of such phenomena, in some cases very compli- cated, has been ably discussed by Mr Mallet, who applied the results with excellent effect to his observations on the Neapolitan earthquake. If it is possible to find, from such indications, the direction in which any two waves emerged at the surface, the depth of the seismic focus is easily determined. For since the waves radiate from this focus, any two wave-paths when produced back- wards will meet at the seismic centre. It has already been shown how easily the vertical is found, and when this is known the deter- mination of the focus is simplified, for as the vertical itself repre- sents one-wave path it is necessary to find only one other. Let O fig. 2) be the seismic focus, and OA the seismic vertical; if a

Fig. 2,

wave, OB, emerge at the surface B, at an angle 6, it is evident

that AO=AB. tan @.

To find the depth of the focus, it is consequently only necessary to know the angle of emergence of a wave at a given station, and the distance of this station from the seismic vertical. As the stations A and B are comparatively near each other, the earth’s sphericity may be neglected, and the surface between the two regarded as practically a horizontal plane.

Where several wave-paths are known, several values of AO will be obtained, and as the seismic centre is not a point, like O, but a eavity of determinate magnitude, the average of these different values must be taken to represent the mean focal depth. After the great Neapolitan earthquake of 1857, Mr Mallet, aided by the Royal Society, spent some months in carefully examining the country which had been visited by the shock; and in 1862 he published an elaborate report in which his observations were fully discussed. By determining the wave-paths at twenty-six stations in every azimuth aronnd the seismic vertical, he was enabled to deduce the important fact that the mean focal depth of the earthquake was about 53 geographical miles. Similar principles have since been applicd by Dr Oldham to an examination of the results of an earthquake which occurred in

Cachar in India, on January 10, 1869; and he has found that the seismic focus there must have had a depth of about 30 miles. This coincides very nearly with the depth which Mr Mallet believes to be the maximum at which any earthquake is likely to originate in our planet.

When the centre of disturbance is seated beneath the sea, as appears to have been the case with that which produced the great earthquake of Lisbon in 1755, a water-wave is generated; but since this has less velocity than the earth-wave, it does not roll in upon the shore until after the shock has been felt on land. The height of the sea-wave depends on the depth of the water. During the Lisbon earthquake the wave at.Cadiz was as much as sixty fect in height. It is this great sea-wave which, breaking upon the shore after the earthquake-shock, generally completes the work of devastation. At first the water retires from the land, but in a few Moments the gigantic wave rolls in, and sweeps all before it. The earthquakes which are so frequently felt on the western coast of South America are generally terminated in this manner ; and the great tidal wave which accompanied the earthquake of May 1877, wrought dreadful havoc at Arica, Iquique, and other towns on the coast.

In addition to the waves “propagated through earth and sea, it commonly happens that waves are transmitted through the air and thus produce sound, ‘I’hese sound-waves, travelling at the rate of about 1100 feet per second, may reach the observer either simul- tancously with the shock or before it or even after it. They pro-

ably result from sudden fracture and dislocation of rock-masses, or ftom subterranean explosions.

Almost every object disturbed by an earthquake may be made to yield, when properly questioned, more or less

information with respect to the direction and intensity of shock. Special instruments termed seismometers have, however, been constructed for this purpose, and have assumed considerable variety of form. Perhaps the simplest seismometer is that suggested by Mr Babbage, consisting merely of a bowl of some viscid liquid like treacle. On the passage of a shock the

liquid rises up one side of the vessel, leaving its mark to indicate rudely the direction and extent of motion. As a modification of this simple instrument Mr Mallet proposed the use of a common wooden tub having its inside rubbed with chalk, and half filled with coloured water. An apparatus devised by Professor Cacciatore, of Palermo, and much used in Italy, is constructed with a shallow dish having eight notches in the side, and containing mercury up to the level of the lips. When any oscillation occurs, the liquid is spilt into a series of cups placed under the notches; and the quantity ejected, which may be readily weighed, gives some notion of the intensity of the shock. Since the notches face the four cardinal points and bisecting rhumbs, the direction in azimuth is approximately obtained. Mr Mallet suggested a convenient form of seismometer in the shape of a system of four L-shaped glass tubes having the upper ends closed and the horizontal limbs directed to the cardinal points. The tubes are partially filled with mercury, and the horizontal component of any shock causes the mercury to move in the lower limbs ; whilst the vertical component is determined by the motion of quicksilver in a U-shaped tube. In both cases, the movement of the liquid columu is registered by means of indexes.

All these instruments depend for thcir indications on tlic displacement of liquids by the shock of the earthquake. But it is obvious that the oscillations of solid bodies may be equally well employed in seismometry. Thus a pendulum free to move in all directions will be set vibrat- ing by a shock, and may be made to record the direction and extent of its vibration by means of a stile below the bob, which moves over a bed of fine sand in a propcerly- shaped dish. Two pendulums are somctimes used, as pro- posed by Santi. One pendulum vibrates in a vertical plane directed north and south, and the other in one striking east and west,—the arcs traversed in these planes being registercd by means of a tracing-stile affixed to the bob. Professor J. Forbes employed an inverted pendulnm, or rod fixed at its base and weighted above, carrying at its free end a pencil or tracer by which any oscillation could be recorded. A modification of the inverted pendulum was proposed by Mr Budge of Valparaiso, in which the pendulum when moved by the first shock was kept in position at the end of a semioscillation, by means of a pawl working in a ratchet on the base of the vibrating body.

Such seismometers as those previously noticed require to have their indications observed after each shock. Several ingenious instruments have, however, been con- structed on self-registering principles, so that however often they are disturbed, each movement leaves a permanent record. The first of these self-registering scismometers was devised by Mr Mallet, and described in 1846. Both the horizontal and the vertical element of a shock are recorded by the movement of mercury in a system of glass tubes, the tubes being placed in a galvanic circuit so arranged that contact is broken by displacement of the liquid. As long as the circuit remains complete, a pencil traces a line on ruled paper wound round a cylinder rotated by clock-work, but the motion of the mercury intercepts the current and thus breaks the line. ‘Two forms of “ ball seismometer ” are also due to the ingenuity of the same investigator. In one of these instruments, two heavy metul balls are placed on slightly inclined plancs supported by a cast-iron table, the axis of which passes through a vertical

spiral spring. During the passage of an earthquake wave the spring is compressed and the balls displaced,—their displacement breaking contact in an electric circuit which had previously been completed through the balls. That ball which first moves gives the time at which the shock commences, whilst the other gives the elements of the shock. Two such instruments are necessary to form one seismometer, the two being placed at right angles to each other.

An elaborate electro-magnetic seismograph has been con- structed by Professor Palmieri, and has done good service in the observatory on Mount Vesuvius. The vertical move- ments are recorded by a helix of copper wire, the lower end of which is caused by even the slightest shock to dip into a.basin of mercury, and thus complete a galvanic circuit. An electro-magnet, brought into action when the connce- tions are completed, strikes an alarm bell which calls an attendant, and also stops a clock, so that the instant at which the shock occurs is permanently marked. At the same time a second electro-magnet releases the pendulum of another clock, which being thus set in motion unrolls a band of paper, while a pencil continues to mark upon the paper as long as the shock lasts. To record the vertical element a system

of four U-shaped tubes is employed, the tubes being placed in different azimuths. Each limb is partly filled with mercury, and any oscillation in the level of the liquid is indicated by movement of a little float con- nected with an index. The oscillation of the quicksilver also completes a galvanic circuit, and brings into action the electro-magnets already described.

Although the limits of this article forbid reference to some other seismometers, such as that of Kreil of Vienna, mention should certainly be made of one instrument which is marked by its extreme simplicity. Its construction, which is due to Mr Mallet, will be understood by reference to fig. 3. Two sets of right cylinders are turned in some

hard material, such as boxwood. The cylinders are all of the same height, but vary in diameter. Two planks of wood are fixed to a level floor, one having its length in a north-and-south, and the other in an east-and-west direction. The cylinders stand upright on the planks in the order of their size, with a space between each pair greater than their height, so that when one pillar falls it does not strike its neighbour. The surrounding floor is covered up to the level of the planks with dry sand. When a shock passes, Some of the cylinders are overturned, the number depend- ing on the velocity of the wave. Suppose the shock knocks over the narrow-based cylinders 4, 5, 6, leaving Nos. 1, 2, 3 standing ; then the velocity of the horizontal component must have been greater than that needed to overturn No. 4, but not great enough to overturn No. 3. Hence the velocity (V) can be approximately obtained by using a formula due to Professor Haughton, viz. :

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2 2 Sst, Vi= ae -g Na? + 0X1 — cos 6) ;

where a is the altitude of the column, } the diameter of its base, and 6 the angle formed by the side and a line drawn through the centre of gravity to the extremity of the base. The direction in azimuth is indicated by the position in which the overturned pillars are found, since the bed of sand prevents rolling. It is possible to obtain the exact time at which the shock commences by connecting the narrowest-based pillar with the pendulum of a clock go ag to stop it at the instant of overthrow. Where the angle of

wave-emergence is very steep, this instrument is not to be recommended, since it ignores the vertical element of the shock.

Catalogues of earthquakes, showing their distribution in time and space, have been constructed by Mallet, Perrey, Von Hoff, Cotte, and other seismologists. The most complete of these statis. tical works is the catalogue raisonné compiled by Mr R. Mallet and his son, Dr J. W. Mallet, and published by the British Associa. tion between the ycars 1854 and 1858. This includes notices of all recorded earthquakes from 1606 3B.c. to 1842 A.D., and is thence carried on to 1850 from Perrey's annual catalogues. Between 6000 and 7000 scparate carthquakes are recorded as having occurred in almost every part of the world, both on land and at sea. But though seismic energy may thus become sensible at any point of the earth's surface, there are, as everyone knows, certain regions peculiarly subject to earthquakes; and it is, in fact, possible to trace seismie bands of variable width following the great lines of elevation which divide the occanic basins.

It is now several years since Professor Alexis Perrey, of Dijon, sought to trace a relation between the occurrence of earthquakes and the age of the moon. By careful analysis of his catalogue he believed that he had established the facts—that earthquakes occur more frequently at the syzygies than at the quadratures, that their frequency increases at the perigee and diminishes at the apogee of the moon, and that shocks are more frequent when the moon is on the meridian than when 90° fromit. Such a connection between seismic phenomena and the phases of the moon would accord with Zantedeschi's views on the existence of a terrestrial or terrene tide, views which were based, however, on the old hypothesis of a liquid nucleus in the earth, covered by a thin crust.

From Mallet's discussion of his catalogue for three centuries, he

was led to detect definite periods of maximum energy. Thus it is

| found that the greatest number of earthquakes are recorded about

the middle of each century ; whilst a second epoch, less powerful than the first, occurs towards the close of the century. According to Perrey there is a

preponderance of earthquake-shocks at particular seasons, the equinoxes and solstices, which he terms ‘critical epochs.” Mallet’s analysis of a large catalogue showed a decided maximum about the winter solstice, but Perrey’s other epochs were less marked. In the present state of our knowledge it would be rash to regard seismic force, whatever it may be, as a distinctly periodic force, or to insist upon any of those relations between earthquakes and metcorological phenomena which have sometimes been discussed.

Aunual reports on earthquakes have been published for many years by Professor Fuchs. During the year 1876 he recorded 104 earthquakes, which were distributed among the months as follows :— In January 10, February 10, March 14, April 8, May 7,‘June 7, July 8, August 5, September 7, October 14, November 5, December 9. In the preceding year 97 earthquakes were noticed, occurring as follows :—In January 15, February 7, March 12, April 7, May 9, June 10, July 6, August 5, September 8, October 2, November 9, December 12.

Brpriograrny.— The First Principles of Observational Seismology, by Rs Mallet, 2 vols. 8vo, London, 1862. (This contains the Report on the Neapolitan Earthquake of 1857). Mallets four “ Reports on the Facts and Theory of Earth- quake Phenomena,” -in Reports of the British Association, 1850 to 1858, (The Harthquake Catalogue is the 3d report of this series), Mallet’s chapter “On Observation of Earthquake Phenomena” in the Admiralty Manual of Scientiic Inquiry, 1849; his Introduction to the translation of Palmieri’s Vesuvius, 1873; and several papers in the Philosophical Transactions and Transactions of the Royal Irish Acudemy. Report on the “ Geological Theories of Elevation and Earthquakes,” by W. Hopkins, in Rep. Brit, Assoc. for 1847; several Reports on Earthquakes in Scotland by Dr Bryce, in Rep. Brit. Assoc.; Oldham and Mallet on the ‘‘Cachar Earthquake,” in Quart. Journ. Geol. Soc., xxviii. p. 255, 1872; Scrope’s Volcanos ; Lyell’s Principles of Geology, and Phillips’s Vesuvius ; Perrey’s “ Memoirs,” in Jfém. de l’Acad. de Dijon, Comptes Rendus, &c.; Boccardo’s Sismopirologia, Genoa, 1869; Fuchs’s “ Berichte tiber die vulkanischen Ereignisse des Jahres 1876,” &c., in Mineral. Mittheilungen, Vienna. (F. W. B.*)

EARWIG, a name, sanctioned by common error, applied under various modifications in different languages (eg. Auricularia, Perce-oreille, Ohr-wurm, Oorblazer, Ormask, Oerentvist, Gusano del oido, &c.) to the somewhat osculant insects comprised in the old Linnean genus Forficula,—an

error arising in the first instance probably from their invariable habit of secreting themselves in any cavity, of which they always endeavour to reach the innermost re- cess (instances being known of the common species hiding itself in the ear of a person sleeping in the open air), and strengthened by the popular exaggerated idea of the strength and attributes of the anal forceps peculiar to these insects.

Earwigs have been for some time of uncertain position in classifi- eation, having been even considered as worthy of the rank of a spe- cial separate order (Labidoures, Duméril ; Dermaptera, corrected to Dermatoptera, Leach ; and Huplexopiera, eorrected to Huplectoptera, Westwood), but they are now generally reeognized as forming a family, Forficulide or Forficularie, of the Orthoptera (the Locusts, Grasshoppers, Crickets, Cockroaches, Mantis, &c.) They have much the facies of the Brachelytra or Staphylinide in the Coleoptera (Beetles), from which order they differ in their pupa being active, resembling the perfect insect except in possessing only rudimentary wings, &c.; also in the method of folding and neuration of the ile wings, the possession of an anal forceps, and, as in the other Orthoptera, in the additional external lobe to their maxille. From all the other Orthopicra, apart from the anal foreeps, they differ in having horizontal elytra eovering the wings in repose as in beetles, and in the female not possessing a corneous ovipositor, and from most of them in the hind legs being not formed for jumping.

Of distinet species 250 are recognized, comprised in 84 genera (of which some are apparently needless) ; but it is highly probable that this represents a mere outline of the group, as seareely any naturalists make them an object of study, and their geographical distribution is very extended. ‘There are about 200 species in the eollection of the British Museum alone, mostly unnamed, and not specially colleeted. They are found in the whole of

Europe, in Syria and Asia Minor, Central Asia, Hindustan, Ceylon, Indo-China, China and Formosa, the Malay Archipelago, the Philip-

ines, North, West, and South Africa to the Cape itself, Egypt,

anzibar, Mauritius, Kamtehatka, Newfoundland, the North American States from New York to California (but comparatively rare, according to Packard), Mexico, Florida, Central Ameriea and the West Indies, South Anicrica from Columbia to Chili, New Guinea, North Australia, Tasmania, and New Zealand ; and species occur in sueh isolated localities as Madeira, the Canaries, St. Helena, Woodlark Island, the Solomon and Sandwich Isles, and Kergue- len's Island. As regards pre-historie times, a few fossil species have been found in the territories of Solenhofen, Gningen, and Italy in the Old World, and of the Rocky Mountains (Colorado) in the New. Seven species have been recorded from Great Britain, of which two are universally common, viz., Forficula auricularia, the typieal earwig, and the smaller Labia minor. The former of these is found all over Europe, in Armenia, the Caueasus, and other parts of Asia, and in the eastern United States, being also recorded from Japan ; and the latter occurs in Europe, Western Asia, and North America. Another species, Lubidura riparia, extends over the entire Old World.

All are of comparatively small size, and nearly all of ob- Scure colours, mostly various shades of brown or dull yellows and reds: one South American species is white; another, from the Amazon, has blue metallic elytra, which are metallic also in another from Penang; a fourth exotic Species is yellow, with black stripe ; and several have opaline or iridescent wings. Eccentricity of development is shown chiefly in the forceps, which in a Nicaraguan species are as long as the rest of the body ; in another South American form the abdomen is laterally toothed; a third has very long legs, being almost tipuliform; Apachys has the body as thin as cardboard.

Sexual differences are shown in the male by the greater development and armature of the forceps, or the tubercu- lated abdomen, which is composed of nine distinct segmeuts, whereas only seven are evident iu the female. The forceps have been observed to be used in arranging the wings, and are also supposed to be used as weapons of offence and defence, though it is difficult to understand how they could be of any practical acsistance for

either purpose. The lower wings lave long attracted attention from their unexpectedly large size and fan-like structure; in the accompanying figure, a is the Magnified open wing of the common earwig,) the saine of the natural size, and ¢ the wing closed, also of natural size. Although possessed of such ample organs of flight, Porficula

auricularia has seldom, if ever, been observed to make use of them, though there is evidence that it does fly ; but the other common British species, :

Labia minor, is frequently seen on the wing, being often mis- taken for a brachelytrous beetle. It may be observed, that the possession of wings is apparently sexual in some cases, and that some species arecntirely apterous.

Some few instances have been recorded of earwigs being carnivorous, devouring the larve and pupz-of wild bees and even their own species; but the majority are in a normal state certainly eaters of vegetable matter, congre- gating under bark, and destroying flowers, fruit, &c., often to a considerable extent. An instance of their adaptability to circumstances is afforded by Mr H. W. Bates's discovery of a large white species (above referred to) very common on white sandy beaches of the Brazilian river Parad, at Caripi, with a white Zetracha anda white mole cricket ; this white- ness was permanent, and must not be confused with the light colour of recently disclosed individuals.

The female of the common earwig has long been noted for an exhibition of remarkable maternal instinct in defend- ing her progeny, not only brooding over her eggs, but. caring for her newly hatched young.

The chief writers on Forficulide are Dohrn, in the Stettiner entomologische Zeitung for 1862 and following years, and quite reeently, S. H. Seudder, in the Proceedings of the Boston Natural History Society, vol. xviii., the latter being the first to diseuss these insects in a colleetive form. (E. C. R.)

EASEMENT, in English law, is a species of servitude or limited right of use over land belonging to another. It is distinguished from a profit, which is a right to take the soil of another, while an casement is a right to use the soil

or the produce of the soil in a way tending to the more convenient enjoyment of another piece of land. Thus a right of way is an easement, a right of common is a profit. Besides rights of way the most important easements are water-cowrses (as where a person has a right to divert a flow of water), the right to discharge water, &c., upon a neighbour's land, and the right to restrain such a use of land as would obstruct the access of light and air to an ancient window.

EASTBOURNE, a watering-place on the Sussex coast, 66 miles from Londou by railway. It is situated about three iniles to the east of Beachy Head, the loftiest head- land on the English Channel. It once consisted of three parts :—the old village of East Bourne, a mile inland; South Bourne, lying back from the shore; and Seahouses, facing the beach; but these distinctions are now almost obliterated, and numerous handsome terraces and detached houses have more or less united the three old hamlets into one town. Besides the parish church of St Mary's, a building of some antiquity, there are four chapels of ease in Eastbourne. A pier was erected in 1868. 'The popu- lation, which is rapidly increasing, was 10,361 in 1871.

EASTER, the annual festival observed throughout Christendom in commemoration of the Resurrection of our Lord Jesus Christ. The word Haster—Anglo-Saxon, Eastre, Foster ; German, Ostern—like the names of the days of the week, is a survival from the old Teutonic mythology. According to Bede (De Temp. Rat., c. xv.) it is derived from Lostre, or Ostdra, the Anglo-Saxon goddess of spring, to whom the fourth month, answering to our April—thence called Hostur-monath—was dedicated. This month, Bede informs us, was the same as the '' Mensis Paschalis," when " the old festival was observed with the gladness of a new solemnity,"

Wing of Earwig.

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The name by which Eastcr is known among the Romance nations— French pdques,; Italian, pasgua ; Spanish, pascua—is derived through the Latin pascha, and the Greek adoxa, from the Chaldee or Aramean form, 8ND2 pascha', of the Hebrew name of the Passover festival, ND3, pesach, from MDB, "he passed over," in memory of the great deliverance when the

destroying angel “passed over the houses of the children of Israel in Egypt when he smote the Egyptians,” Exod. xii. 27. An erroneous deriva- tion of pascha is given by some of the early fathers of the church, eg., Irenzeus, Tertullian, &c., to whom Hebrew was an unknown tongue, from the Greek récyew, “ to suffer, ” as being the period of our Lord’s sufferings. St Augustine (in Joann. Tract. 55) notices this false etymology, and shows how similarity of sound had led to the crror, and gives the true derivation.

There is no trace of the celebration of Easter as a Christian festival in the New Testament or in the writings of the apostolic fathers. The sanctity of special times or places was an idea quite alien from the early Christian mind; too profoundly absorbed in the events themselves to think of their external accidents. “The whole of time is a festival unto Christians because of

the excellency of the good things which have becn-

given,” writes Chrysostom, commenting on the passage 1 Cor. v. 7, which has been erroneously supposed to refer to an apostolic observance of Easter. Origen also in the same spirit (Contr. Celsum, viii. 22) urges that the Christian who dwells on the truths of Christ as our Pass- over and the gift of the Holy Ghost, is every day keeping an [aster and Pentecostal feast. The ecclesiastical his- torian Socrates (//ist. Hccl., v. 22) states with perfect truth that‘neither Christ nor his apostles enjoined the keeping of this or any other festival. “The apostles,” he writes, “had uo thought of appointing festival days, but of pro- moting a life of blamelessness and piety ;” and he attributes the introduction of the festival of Easter into the church to the perpetuation of an old usage, “ just as many other cus- toms have keen established.” This is doubtless the true Statement of the case. The first Christians, being derived from, or intimately connected with, the Jewish Church, naturally continued to observe the Jewish festivals, though il a new spirit, as commemorations of events of which these had been the shadows. The Passover, ennobled by the thought of Christ the true Paschal Lamb, the first-fruits from the dead, continued to be celebrated, and became the Christian Haster. Thus the human instinct which every- where craves for the commemoration of marked epoclis in the personal, social, ecclesiastical, or national life, found its legitimate gratification in the public celebration of

the events which are the foundation of the Christian faith. But though the observance of the Paschal festival at a very early period became the rule in the Christian church, a differenee as to the time of its observance specdily sprang up between Christians of Jewish and Gentile descent, which led to a long-continued and bitter controversy, and an un- happy severance of Christian union. No rule as to the date of the Easter festivals having been laid down by authority, Christians were left to follow their own in- stincts. These were naturally different in the Jewish and Gentile churches. The point at issue really was the date of the termination of the Paschal fast. With the Jewish Christians, whose leading thought would be the death of Christ as the true Paschal Lamb, this fast would end at the same time as that of the Jews, on the 14th day of the moon, at evening, and the Easter festival would immedi- ately follow, entirely arrespective of the day of the week. With the Geutile Christians, on the other hand, unfettered by Jewish traditions, the first day of the week would be identified with the Resurrection festival, and the preceding

Friday would be kept as the commemoration of tle Cruci- fixion, irrespective of the day of the month, the fast continu- ing with increasing strictness till the midnight of Saturday. With the one, therefore, the observance of the day of the month, with the other the observance of the day of the week, was the ruling principle. The chief point was the “keeping ” or “ not keeping” the 14th day of the moon corresponding to that of the month Nisan. Those who, adopting the Jewish rule, did so keep the 14th day were called Terpadexdérirat, Terpadirar, Quartodecimani, and were stigmatized as heretics. In the absence of any authorita- tive decision as to the day to be observed and the proper mode of calculating it, other discrepancies arose, which led to controversies and dissensions which, in the words of Epiphanius (Panar., Heer. lxx.), distracted the church, and became a source of mockery and ridicule to the unbelievers, “ Some, ” he writes, “began the festival before the week, some after the week, some at the beginning, some at the riddle, some at the end, thus creating a wonderful aud laborious confusion.”

This diversity of usage was gradually brought to an end by the verdict of the Church of Rome. The Roman Chris- tians adopted the ordinary Gentile usage, which, within certain limits, placed the observance of the Crucifixion on a Friday, aud that of the Resurrection on the following Sunday. A decretal of Pope Pius I., c. 147—the genuine- ness of which, however, is by no means established—pro- nounces that “ the Paseh should be celebrated on the Lord’s Day by all.” His successor Anicetus was equally firm upon the point. Polycarp, the veuerable and sainted bishop of Smyrna, who, according to Irenzeus (apud Euseb., 1. Fh, v. 24), visited Rome in 159 with this object, failed to induce Anicetus to conform to the Quartodeciman usage, which Polycarp had inherited from his master, the Apostle John. Anicetns declined to permit the Jewish custom in the churches under his jurisdiction, but made no seruple of communicating with those who adopted it, and allowed Poly- carp to celebrate the Eucharist at Rome. Between thirty aud forty years after this visit (197) the same question was controvertcd in a very different spirit between Victor, bishop of Rome, and Polycratcs, bishop of Ephesus, the aged metropolitan of proconsular Asia. This province was the only portion of Christendom that still maintained the Quartodeciman usage, which had been dropt even by the churches of Palestine and Alexandria. Victor’s despotic demand that the Asiatic churches should adopt the Roman system having been met by Polycrates with a courteous but firm refusal, Victor proceeded to ex- communicate him and all who held with him. So sweep- ing a measure shocked the Christian world. Irenzus remonstrated with the bishop of Rome, and ultimately the Asiatic churches were allowed to retain their usage unmolested. (Euseb., 2 2, v. 23-25.) We still find the Quartodeciman usage springing up from time to time in various plaees, but it never took permanent root, and at the time of the Council of Niceea (325) the Syrians and the Antiochenes were the solitary champions of the Jewish rule. The scttlement of this controversy was one among the causes which led the emperor Constantine to summon that council. The consent of the assembled prelates was unanimous. All agreed that Easter should be kept on one and the same day throughout the world, and that none should hereafter follow the blindness of the Jews (Socr, Hl. H., i. 9). Nothing, however, was said as to the deter- mination of the day. This was practically left to be calculated at Alexandria, the home of astronomical scienee, and the bishop of that see was to announce it annually

to the churches under his jurisdiction and to the bishop of Rome, by whom it was to be communicated to the Western churches,

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But although measures had thus becn apparently taken to secure uniformity of observance, some centuries elapsed before all discrepancy ceased. A more intricate question remained to be solved, viz., how the full moon on which Easter depended was to be predicted. The Niccne decrees had effectually crushed the feeble remnants of the @uartodeciman usage. It was established as a rule that Easter must be kept on a Sunday, but there was no general agrecment as to the cycle by which the festival was to be calculated, —some churches adopting one rule, some another. We learn from St Ambrose (/pist. 23) that in 387 the churches of Gaul kept Easter on March 21, while the churches of Italy postponed it to April 18, and those of Egypt a week later still, to April 25; and it appears from an epistle of Leo the Great (£pist. 64 ad Marcian.) that in 455 there was eight days' difference between the Roman and Alexandrine Easter. Similar discrepancies are mentioned by Gregory of Tours in the year 577, nor did they disappear from the Gallican Church till the 8th century, although by a canon of the fourth Council of Orleans (541) it had been ordained that the Easter festival should be kept at the same time by all, according to the tables of Victorius. The ancient British Church observed the 84 years' cycle which they had originally received from Rome, and their stubborn refusal to give it up caused much bitter controversy between the fathers of Iona and the Latin missionaries. These latter unfairly attempted to fix the stigma of the Quartodeciman heresy on their opponcnts, and they are sometimes even now spoken of as adopting the Asiatic modc of calculation, and false inferences are thence drawn as to the Eastern origin of the British Church. This, however, is quite erroneous. The early British and Irish Church always commemorated the Crucifixion on a Friday and the Resurrection on a Sunday. The only difference between them and the Romish Church was in the cycle adopted for the computation of the festival,—the British Church really adhering to the cycle originally adopted by the Romish Church itself, which had been superseded by the more accurate calculations of Victorius of Aquitaine (457), and of Dionysius Exiguus (525). This led to a double Easter being observed by the adherents of the two churches. Thus, as we

learn from Bede (ecl, Hist., iii. 25), in 651 Queen Eanfleda, adopting the Roman rule, was fasting and keeping Palm Sunday while her husband Oswy, king of Northumbria, was celebrating the Easter festival. This diversity of usage was put an end to in the kingdom of Northumbria in the council of Streaneshalch, or Whitby (654); and the Roman rule was finally cstablished in England by Arch- bishop Theodore in 669. This rule may be thus briefly stated. aster day is the first Sunday after the 14th day (not the full 1oon) of the calendar moon which happens On or next after March 21. This calendar moon, however, 18 not the moon of the heavens, nor the mean moon of the astronomers, but an imaginary moon created for ccclesias-

tical convenience in advance of the real moon (see Prof.'

De Morgan's article in Companion to the Almanac, 1845). After nine centuries a fresh discrepancy in the observance of Haster between the Roman and the English Church was caused by the refusal in England to adopt the Gregorian reformation of the calendar, 1582, apparently for no other reason than that the alteration had originated at Rome. This difference was happily put an end to in 1752, when what is known as "the New Style" was adopted in the United Kingdom. The churches of Russia and Greece, and the Oriental churches generally, adhere tenaciously to the unreformed calendar, so that their Easter is nearly a fort- night later than that of the rest of the Christian world.

_The rules on which the calculation of Easter is based are given in the article CALENDAR (vol, iv. p. 675).

Easter day, as commemorating the central fact of our religion, has always been regarded as the chief festival of the Christian year, and has keen from the earliest times observed with a stately and elaborate ceremonial. It is not, however, the purpose of this article to enter on the ritual observances of Easter, nor on the many curious and interesting popular customs—of which the sending of Pasch eggs, or Easter eggs, is onc of the most wide-spread—with which it is‘connected in all Christian nations. For these last the reader may consult Brand’s Popular Anti- quities, one’s Lvery Day Book, and Chambers’s Book of Days. Ey:

EASTLAKE, S1r Cuartes Lock (1793-1865), an emi- nent painter who became president of the Royal Academy in London, was born on 17th November 1793 in Plymouth, where his father, a man of uncommon gifts but of indolent temperament, was solicitor to the Admiralty and judge ad-vocate of the Admiralty Court. Charles was educated (like Sir Joshna Reynolds) at the Plympton grammar-school, and in London at the Charterhouse. Towards 1809, partly

through the influence of his fellow-Devonian Haydon, of

whom he became a pupil, he determined to be a painter; he also studied in the Royal Academy school. In 1813 he

‘exhibited in the British Institution his first pictnre, a work

of considerable size, Christ restoring life to the Daughter of Jairus. In 1814 he was commissioned to copy some of the paintings collected by Napoleon in the Louvre ; he returned to England in 1815, and practised portrait-paint-ing at Plymonth. Here he saw Napoleon a captive on the “ Bellerophon ;” froma boat he made some sketches of the emperor, and he afterwards painted, from these sketches and from memory, a life-sized full-length portrait of him, which was pronounced a good likeness; it belongs tovthe marquis of Lansdowne. In 1817 Eastlake went to Italy ; in 1819 to Greece ; in 1820 kack to Italy, where he remained altogether fourteen years, sojourning chicfly in Rome and in Ferrara. Subjects of banditti and peasant-life engaged his pencil mostly from 1820 onwards. Jn 1827 he exhibited at the Royal Academy his picture of the Spartan Isidas—who (as narrated by

Plutarch in the life of Agesilaus), rushing naked out of his bath, performed prodigies of valour against the Theban host. This was the first work that attracted much notice to the name of East- lake, who in consequence obtained his election as A.R.A.; in 1830, when he returned to England, as R.A. In 1850 he succeeded Shee as P.R.A. (his only worthy competitor being Landseer, with the elder Pickersgill and George Jones besides, to mark the poor estate of British art, or of its official representatives), and, as usual, he was knighted. Prior to this, in 1841, he had been appointed secretary to the Royal Commission for decorating the Houses of Parliament, and he retained this post until the commission was dissolved in 1862. In 1843 he was made keeper of the National Gallery, a post which he resigned in 1847 in consequence of an unfortunate purchase that ronsed much animadversion; in 1855, director of the same in. stitution, with more extended powers. During his directorship he purchased for the gallery 155 pictures, mostly of the Italian schools. He became also a D.C.L. of Oxford, F.R.S., Chevalier of the Legion of Honour, and member of various foreign academies. In 1849 he married Miss Elizabeth Rigby, a lady of some literary distinction. In 1865 he fell ill at Milan; he died at Pisa on 24th December in the sarne year, and hes buried at Kensal Green.

As a painter, Eastlake was gentle, harmonious, diligent, and correct; lacking fire of invention or of execution ; eclectic, without being cxactly imitative ; influenced rather by a love of ideal grace and beauty than by any marked bent*of individual power or vigorous originality. Among

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his principal works (which were not numerous, 51 being the total exhibited in the Academy) are :—1828, Pilgrims arriving in sight of Rome (repeated in 1835 aud 1836, and perhaps on the whole his chef d’ewvre); 1829, Byron’s Dream (in the National Gallery) ; 1834, the Escape of Francesco di Carrara (a duplicate in the National Gallery); 1841, Christ Lamenting over Jerusalem (ditto); 1843, Hagar and Ishmael; 1845, Comus; 1849, Helena; 1851, Ippolita Torelli; 1853, Violante; 1855, Beatrice. heads, of a refined semi-ideal quality, with something of Venetian glow of tint, are the most satisfactory specimens of Eastlake’s work to an artist’s eye. He was an accomplished and judicious scholar in matters of art, and published, in

1840, a translation of Goethe's Theory of Colours, in 1847 (his chief literary work) Materials for a History of Ou- Painting, especially valuable as regards the Flemish school ; in 1848, Contributions to the Literature of the Fine Arts ; in 1851 and 1855, translated editions of Kugler's History of the Italian School of Painting, and Handbook of Painting.

Sir Charles Eastlake was a man of middle height, spare form, reddish complexion, bright hair (scanty in advanced life); of unassuming and rather courtier-like bearing ; reluctant to oppose or offend, but with a strong sense of official duty. He was a neat and appropriate speaker, and filled his presidential and other offices with great credit in the eyes of all who appreciate moderation and cultured finish in the speech and bearing of a public man.

WASTON, a borough of the United States, and capital of Northampton county, Pennsylvania, is situated on the right bank of the Delaware immediately above the cou- fluence of the Lehigh, 54 miles north of Philadelphia. The town is very systematically arranged in spite of the irregularity of the ground on which it is built ; the water supply from the Lehigh river is abundant, and a strong pressure is obtained by the elevated position of the reservoirs. As the centre of a rich agricultural and mineral district, with free communication both by land and water, Easton has considerable activity at once in trade and manufacture. Among its establishments the borough contains breweries, tanneries, carriage factories, iron foundries, a rope-walk, and an oil-factory; and South Easton, on the other side of the Lehigh, has a cotton- factory, a rolling-mill, and railway engineering works. The principal buildings are the farmers' aud mechanics' institute, the free reading room, and the Presbyterian or Lafayette college, which was founded in 1831, and in 1872 had 25 teachers and 259 students. 'The borough, laid out in 1738, was incorporated in 1789. Population in 1870, 10,987 ; or, if South Easton be included, 14,154.

EAST SAGINAW, a city of Saginaw county, Michigan,

United States, is situated on the Saginaw river, about 90 miles N.N.W. of Detroit. It extends about three miles along the river, with a breadth of nearly a mile. It is the principal depdt of the salt and lumber trade of the Saginaw valley, and possesses foundries, boiler-shops, saw-mills, and shingle-mills.

It is the terminus of the Saginaw Valley and St Louis Railway, while a branch of the Flint and Pere Marquette Railway radiates here to Buy city and another to Caro, Tuscola county. On the opposite bank of the river is the Jackson, Lansing, and Saginaw line. East Saginaw was incorporated as a village in 1855, and obtained a city charter in 1859. Population in 1870, 11,350. EAU DE COLOGNE, a perfume, so named from the city of Cologne, where its manufacture was first established by an Italian, Giovanni Maria Farina, born in 1685, and by other members of his family, some of whom made it according to a method due to one Paul Feminis. In 1874 there were in Cologne 35 establishments for the preparation of the perfume, 28 of which were in the hands of persons

These female.

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bearing the name of Farina. Eau de Cologne consists of a solution of various essential oils in strong alcohol. The purity and thorough blending of the ingredients are of the greatest importance in the process of manufacture. It was originally prepared by making a spirituous infusion of certain flowers, pot-herbs, drugs, and spices, and adding thereto, after distillation, definite quantities of several vege- table essences. See Laboulaye, Dictionnaire des Arts Manufactures, vol. i, s.v. “ Parfumerie.”

EBEL, Hermann Witnerm (1820-1875), a distin- guished philologist, was born at Berlin, May 10, 1820. He displayed in his early years a remarkable capacity for the study of languages, and at the same time a passionate fond- ness for music and poetry. At the age of sixteen he became a student at the university of Berlin, applying himself especially to philology, and attending the lectures of Boeckh, Music continued to be the favourite occupation of his leisure hours, and he pursued the study of it under the direction of Marx. Inthe spring of 1838 he passed to the university of Halle, and there began to apply himself to comparative philology under Pott. Returning in the following year to his native city, he continued this study as a disciple of Bopp. He took his degree in 1842, and, after spending his year of probation at the French Gymnasium of Berlin, he resumed with great earnestness his

language studies, About 1847 he began to study Old Persian. In 1852 he accepted a professorship at the Beheim-Schwarzbach Insti- tution at Filehne, which post he held for six years. It was during this period that his studies in the Old Slavic and Celtic languages began. In 1858 he removed to Schnedei- niiihl, and there he discharged the duties of first professor for ten years. He was afterwards called to the chair of comparative philology at the university of Berlin. The most itaportant work of Dr Ebel in the field of Celtic philology is his revised edition of the Grammatica Celtwa of Professor Zenss, completed in 1871. This had been pre- ceded by his treatises—De verbi Britannict futuro ac con junctivo (1866), and De Zeussii curis positis in Grammatica Celtica (1869), He made many learned contributions to Kiilin's Zeitschrift fir vergleichende Sprachforschung, and to Schleicher's Beitrdge zur vergleichenden Sprachforschung ; and a selection of these contributions was translated into English by Sullivan, and published under the title of Celts Studies (1863). Ebel contributed the Old Irish section to Schleicher's Zndogermanische Chrestomathie (1869). Among his other works must be named Die Lehnwérterder Deutschen Sprache (1856). He died at Misdroy, August 19, 187.

EBERHARD, surnamed im Bart (Darbatus), count and afterwards first duke of Wiirtemberg, was born December: 2, 1445. He was the second son of Count Ludwig I, who died in 1450; and he succecded his elder brother, Ludwig II., at the age of twelve (1457). The guardian- ship of the young count was assumed by his uncle, Count Ulrich, and he had for tutor the learned Jolin Nauclerus. Coveting power and careless of learning, he profited little by the learning of his tutor; and at the age of fourteen he ~ succeeded in throwing off the restraint of the guardianship, and assumed the government. But instead of discharging its duties he thought only of indulging his passions, and fora time led a wild, reckless life. By some means he was brought to serious reflections, and we find him, accord- ing to a custom which had not become wholly extinct, undertaking in 1468 the pilgrimage to Jerusalem. He also visited Italy, and made acquaintance with some of the most famous scholars of the age. His marriage with Barbara, daughter of Lodovico di Gonzaga, contributed to the amend- ment and elevation of his character. He began to study and to take a practical interest in the promotion of the new learning, and at the instigation of his wife he founded, in 1477, the university of Tiibingen. Hither came, in 1481,

the young advocate Jolin Reuchilin, who leetured on Greek at tle university and took his degree of doetor of laws. Count Eberhard conceived a great liking fur hima, appointed him his private seeretary, and named him eouneillor. Iu the spring of 1482 Eberhard, aeeompanied by Reuchilin, visited Rome, had an audienee of Pope Sixtus IV., and received from him the Golden Rose. On his return he visited Florence, and enjoyed the society of the group of scholars gathered around Lorenzo de' Mediei. It was in the same year that Eberhard, by the treaty of Minzingen, put an end to the evils which had arisen from a division of the county made in 1437 between his father and his uncle Ulrieh, as representatives of the two lines of Uraeli and Stuttgart, and seeured the future indivisibility of Wiirtemberg, and the right of primogeniture in his own family. 'The treaty was made under the guarantee of the empire, and was sanctioned by an assembly of prelates, knights, and landed proprietors. By a limitation of the power of the prinee agreed to at the same time, Count Eberhard teeame the foundsr of the constitution of Wiirtemberg. He made Stuttgart his place of residenee, and retained Reuehlin in his service till his own death. Eberhard sympathized with the desire that was daily strengthening for a thorough reformation in the chureh ; and in his own dominions he rendered great services by his regulation of eonvents. Some of these institutions he secularizel, Though a lover of peace, he knew how to bear the sword when war was neeessary; and by his eourage, wisdom, and fidelity to lis engagements he seeured the esteem and friendship of the emperors Frederick IIT. and Maximilian I., as well as that of other prinees of his time. He was one of the leading members of the Grand Swabian League formed in 1488, and took part in the liberation of Maximilian, then king of the Romans, from his imprisonment at Brnges. In reeognition of his great services the emperor at his first diet, held at Worms in 1495, raised Eberhard, without any solicitation on his part, to the dignity of duke, confirming at the same time all the possessions and prerogatives of his house. Duke Eberhard did not live long to enjoy his new dignity. He dicd at Tiibingen on the 25th of February 1496. He had two children by his marriage ; but these died in their infaney, and with him the line of Uraeh became extinet.

EBERHARD, Aveust Gorrios (1769-1845), a German poet and miseellaneous writer, was born at Belzig, near Wittenberg, in 1769, and died at Dresden on the 13th May 1845. He studied theology at Leipsie; but some stories he contributed to periodieals having proved sueecss- “ful, he devoted himself to literature. Among his earlier works were Jila’s Blumenkérbchen (1792); List um List, oder was ein Kuss nicht vermag,; Ferdinand Werner, der arme Plitenspieler (1802); Prinz Fet lof (1804); and Ischariot Krail’s Lehren und Thaten (1807), For a time he was associated with Becker in the editorship of his Zuschenbuch and his Hrholungen, for both of whieh lhe wrote numerous tales and sketches. His claim to permanent literary fame, however, depends almost exclusively on his Hannchen und die Kiichletn (1822), a charmingly graceful narrative poem li ten parts, whieh has passed through amany editions, and been translated into most of the languages of Europe. An English translation by James Cochrane was published in 1854, In his Der Erste Mensch und die Erde (1828), a poem written in hexameters, the narrative of the ereation 18 given with dignity and spirit. After the death of Vater in 1826, Eberhard sueceeded to the editorship cf the Jahrbuch der hduslichen Andacht, a well-known German edueational annual. The miseellancous pocins (Vermischte Gedichte) of Eberhard appeared in two volumes in 1833, and his eollected works (Gesammelten Schriften) in 29 volumes in 1830-1.

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EBERHARD, Jowayn Avcustrus (1739-1809), an eminent German theologian and philosopher, was born at Halberstadt, in Lower Saxony, August 31, 1739. His father, a man of considerable literary attainments, was the singing-master at the ehurch of St Martin’s in that town, and also teacher of the sehool of the same name. Young Eberhard was educated partiy at home and partly in his father’s sehool. In the seventeenth year of his age he went to the university of Halle to study theology. Towards the end of 1759 he returned to his native town, and became tutor to the eldest son of the Baron Von der Horst, to whose family he attached himself for a number of years. In 1763 he was appointed eon-reetor of the school of St Martin’s, and seeond preacher in the Hospital Chnreh of the Holy Ghost ; but he soon afterwards resigned these offiees, and followed his patron to Berlin. The advantage he enjoyed of being introduced by the baron into the

best company tended to polish his manners, and to form, even at an early period, a style of writing which served as a model to many of his eontemporaries. His residence at Berlin gave him an opportunity of extending his knowledge, and of eultivating the acquaintanee of some of the most eminent literary men in Germany. Amongst these were Nicolai and Moses Mendelssohn, with whom he assoeiated upon terms of intimate friendship.

In 1768 he aeeepted the situation of preacher or chaplain to the workhouse at Berlin, along with that of preacher in the neighbouring fishing village of Stralow. The income from these livings was small; but his objeet was to eontinue at Berlin, and he had at the same time the promise of further preferment upon the first vaeaney. He now applied with renewed ardour to the study of theology, philosophy, and history, the first fruits of whieh soon appeared in his Neue Apologie des Socrates (1772), a work occasioned by an attack which was made on tlie sentiments contained in the fifteenth ehapter of Marmontel's elisarius by Peter Hofstede, a elergyman of Rotterdam, who, with a mis- directed industry, raked up the viees of the most eelebrated eharaeters in the pagan world, and maintained the patristie view that even their virtues were only splendida peccata. Eberhard stated the arguments for the broader view with great aeuteness and learning, and is therefore entitled to rank as one of the founders of rationalistie theology in Germany. The Apology itself, whieh constitutes but a small part of the book, is esteemed a master-pieee of clear, dignified, and persuasive eloquenee. The whole work exhibits mueh reading and philosophical refleetion ; but the liberality of his reasoning gave great offenee to many of the strietly orthodox divines of his time, and is believed to have obstrueted his preferment in the eliureh.

In 1774 he was appointed to the living of Charlottenburg ; and he employed the leisure he had in this situation in preparing a seeond volume of his Apology, which appeared in 1778. In this he not only endeavours to obviate some objections which were taken to the former part, but eon- tinues his inquiries into the doctrines of the Christian religion, religious toleration, and the proper rules for inter- preting the Scriptures. Perceiving that is further pro- motion in the ehureh would be attended with diffieulty, he resulved, although reluetantly, to accept the situation of professor of

philosophy at the university of Halle, whieh beeame vaeant in 1778 by the death of G. F. Moier. As an aeaderieal teacher, however, he was unsueeessful. His powers as an original thinker were not equal to his learning and his literary gifts, as was shown in his opposition to the philosophy of Kant.

On his arrival at Halle, the philosophical faeulty presented him with a diploma as doctor in philosophy and master of arts. In 1786 le was admitted a member of tlie Berlin Academy of Seienees; and in 1805 the king of

Prussia conferred upon him the honorary title of a privy- councillor. In 1808 he obtained the degree of doctor in divinity, which was given him as a reward for his theo- logical writings. He died January 6, 1809.

Eberhard's attainments in philosophy and literature were

extensive and profound. He was master of the learned languages, spoke and wrote French with facility and correctness, and understood English, Italian, and Dutch. He had read a great deal, was thoroughly versed in the philosophical sciences, and possessed a just and discriminat- ing taste for the fine arts. He was a great lover of music, and was himself a proficient in the art. ' The following is a list of his works:—Newe A pologie des Socrates, &c., 2 vols. 8vo0, 1772-8; Allgemeine Theorie des Denkens und Lmpfindens, &c., Berlin, 1776, 8vo, an essay which gained the prize assigned by the Royal Society of Berlin for that year; Von dem Begriff der Philosophie wnd thren Theilen, Berlin, 1778, 8vo,—a short essay, in which he announced the plan of his lectures on being appointed to the professorship at Halle; Zobschrift auf Herrn Johann Thunmann Prof. der Weltweisheit wid Beredsam- keit auf der Universitit zu Halle, Halle 1779, 8vo ; Amyntor, eine Geschichte in Briefen, Berlin, 1782, 8vo,—written with the view of counteracting the influenee of those sceptical and Epicurean prin- ciples in religion and morals then so prevalent in France, and rapidly spreading amongst the higher ranks in Germany ; Ueber die Zeichen der Aufklirung einer nation, &c., Halle, 1783, 8vo; Theorie der

Schénen Kunste wnd Wissenschaften, &c., Halle, 1783, 8vo, 3d ed. 1790; Vermischte Schriften, Halle, 1784; Neue Ver- misehte Schriften, Ib. 1786 ; Allgemeine Geschichte der Philosophie, &c., Halle, 1788, 8vo ; 2d ed. with a continuation and chronological tables, 1796 ; Versuch einer Allgemeinen-Deutschen Synonymik, &e. Halle and Leipsic, 1795-1802, 6 vols, 8vo, long reckoned the best work on the synonyms of the German language (an abridg- ment of it was published by the author in one large volume 8vo, Halle, 1802); Handbuch der Aesthetik, &c., Halle, 1803-1805, 4 vols. 8vo. Besides the works above mentioncd, Eberhard con- tributed a nuinber of small tracts and essays to various periodical and scientific publications, and translated several foreign works. He was also the editor of the Philosophical Magazine, Halle, 1788- 1792, and of the Philosophical Archives, Halle, 1793-1795. These two periodical works, which are now little rcad, were instituted for the purpose of controverting the metaphysical principles of Kant, and of vindicating the doctrines of Leibnitz and Wolf. Frederick Nicolai published a memoir on the life and charactcr of Eberhard, Berlin and Stettin, 1810, 8vo. See also K. H. J érdens, Lexicon Deutscher Dichter wnd Prosaisten.

EBERT, Friepricu Apotr (1791-1834), a very eminent bibliographer, was born at Taucha, near Leipsic, July 9, 1791. He received his early education partly from his father, preacher to the Georgenhaus at Leipsic, and partly at the Nicholas School. At the age of fifteen he was appointed to a subordinate post in the town library of Leipsic, in which his literary tastes, early awakened, were fostered and strengthened. He studied theology for a short time, first at Leipsic and afterwards at Wittenberg, but, by the advice of a friend, renounced it in favour of history. After the*close of his academical studies, he made his appearance as an author by the publication in 1811 of a work on public libraries, and in 1812 of another work entitled Hierarchic in religionem ac literas commoda. In the following year he took part in the reorganization of the Leipsic University Library, and in 1814 was appointed secretary to the Royal Public Library of Dresden. The same year he published /. Taubmann’s Leben und Verdienste, and in 1819 Zorquato Tasso, a translation from Ginguené with annotations. Anxious to turn to good account the rich resources open to him in the Dresden library, he undertook the work on which his reputation chiefly rests, the Allgemeines bibliographische Lexikon, the first volume of which appeared in 1821, and

the second in 1830. This was the first work of the kind produced in Germany; but nevertheless it had a higher aim and a more scientific character than its non-German precursors. In 1823 Ebert was called to the post of chief librarian and professor at Breslau, and at the same time was offered that of librarian to the duke of Brunswick at Wolfenbiittel. He accepted

the latter. But early in 1825 he returned to Dresden ag public librarian; he was soon after named private librarian to the king, and in 1828 chief librarian and aulic councillor. Among his other works are— Die Bildung des Bubliothekars (1820), Geschichte und Beschreibung der Konglichen ofentlichen Bibliothek in Dresden (1822), Zur LHandschriftenkunde (1825-27), and Culturperioden des oberstichsischen Mittelalters (1825). Ebert was a contribu- tor to various journals and encyclopzdias, and took part in the editing of Ersch and Gruber's great work. He died at Dresden, November 13, 1834, in consequence of a fall from the ladder in his library a few days before.

EBINGEN, a town of Wiirtemberg, in the circle of the Schwarzwald, on the Schmieha, a left-hand tributary of the Danube, 22 miles south of Tiibingen and 37 miles west of Ulm. It has rather more than 5000 inhabitants, who are engaged in woollen-weaving, stocking-weaving, hat-making, bleaching, and cattle-dealing.

EBIONITES, a Christian sect which was separated from the general Christian church about the end of the 2d century. The origin of the name has been much disputed, some deriving it from Ebion as the founder of the sect, and others from the Hebrew word (2%) meaning poor. For the former opinion the authority of Tertullian is quoted, who makes references to the existence of such a person as Ebion ; but as counterbalancing these references there has to be considered—-1st, that Tertullian being careless and inaccurate, and having no knowledge of Hebrew, may have merely fallen into the error of assuming that the sect took its name from that of a person; 2d, that no mention is made of the existence of such a person either

by Ireneus or by Origen, and that any references to him by Epiphanius and later writers are probably borrowed from Tertullian; and 3d, that the name Ebionites had a very general signifi- cation, and represented a natural Judaizing tendency which must have had a more comprehensive beginning than that originating in an individual influence. Those who derive the name from the Hebrew word explain it in two ways— as applicable either to the poverty of the doctrines of the Ebionites, or to the poverty of their circumstances. Un- doubtedly the name was applied to them with the former significance by their enemies, but it is more probable that they employed in a bad sense a name already existing, than that they coined it to suit their purpose. ‘hat the term was originally applied to the circumstances of the Ebionites Seems the only probable supposition ; and the argument in support of it may be stated thus:—That the early Christians, both Jewish and heathen, were designated the poor; that the poverty of the Jewish Christians continued longer than that of the heathen Christians, and Origen states that they in particular were named the poor (EBuwvator xpnpatilovaw ot dd Jovdaiwy rév “Inodvy ds Xpwtov mapadseSaevor) ; and that, as the Judaizing Christians came gradually to be the only Jewish Christians who required to be distinguished from the heathen Christians, they retained the name. The fathers show a very imperfect knowledge of the origin, history, and doctrines of the Ebionites, but there cannot be any doubt that at first all Judaizing Christians went under that name. In the New Testament there 1s evidence of the existence of such a party, though it had not then developed into a recognized sect. ‘This apparently did not happen till after the second destruction of Jerusalem and the founding of the heathen colony of Ailia Capitolina, when the emperor Hadrian banished from the neighbourhood all Jews who still retained their national peculiarities. As to the particular opinions of the Ebionites the statements of the fathers are somewhat contradictory, and this for the threefold reason— that by the isolation of the Ebionites from the general church the information obtain- able regarding them could only be imperfect ; that under

the general name Ebionites a good many varieties of opinion are included; and that their opinions varied at different periods of their history. The term

Ebionites is used by some writers to include the Nazarenes, who, while recognizing the binding obligation of the Mosaic law on all Jews, did not regard it as binding on heathen Christians (see Nazarenes); but at an early period the stricter Ebionites must have separated themselves from the Nazarenes, who soon became merged in the general church. Of Ebionites proper Origen distinguishes two classes—those who affirm and those who deny the miraculous birth of Jesus: and in this he is followed by Eusebius. The extreme Ebionites, according to Origen, were only distinguishable from common Jews by the acceptance of the moral teaching of Christ ; while those Ebionites who admitted the miraculous birth of Christ did not recognize His divinity proper, but believed that with His human nature the spirit of an angel or archangel, or even of Adam, was incorporated. Both classes of Ebionites seem to have had these points in common :—lst, They emphasized the unity of God; 2d, they affirmed the universal obligation of the Mosaic economy ; 3d, of the books of the New Testament they réceived as genuine ouly the gospel of St Matthew; 4th, they denounced St Paul as a separatist ; and 5th, they believed that Jerusalem was yet to be the city of God, and some of them at least believed in Christ's millennial reign. In the time of Eusebius the Ebionites inhabited chiefly the coasts of the Dead Sea, but they dwelt also in Rome and Cyprus. They vanished from history in the end of the 4th or begining of the 5th century.

The ancient authorities on the Ebionites are Ireneus, Hyp- peo Eusebius, Tertullian, Origen, and Theodoret. In modern iterature there are—Gieseler, in Stdudlin und Teschirner's Archiv fir iiliere wnd newere Kirchengeschichte, vol. ii, Leipsic, 1820 ; Credner in Winer's Zeitschrift fiir wissenschaftl. Theologie, Sulzbach, 1829; Baur, De Ebionitarwm origene et doctrina ab Esswis repetenda (Tibinger Osterprogramm von 1831) ; Hilgenfeld, Dice Clementinischen Recognitionen, Jena, 1848; the article "Ebjoniten" in Herzog's Real Encyclopadie ; and Mansel's Givostic Heresies of the First and Second Centuries, London, 1875.

EBOLI, or Evont, a town of Italy, in the province . of Principato Citeriore and district of Campagna, situated about thirteen miles from Salerno, on an elevated site commanding a fine prospect over land and sea. It has an ancient castle belonging to the princes of Angri, and its church of St Francis of Assisi contains a curious picture of the Crucifixion by Roberto di

Oderisio. Between the town and the Silarus or Sele are the ruins of the ancient Eburi, a place of municipal rank; and the river is still spanned by a bridge of fine Roman construction. Popula- tion, 8947.

EBONY (éevos), the wood of various species of trees of the genus Diospyros and natural order Lbenacew, found in the tropical parts of Asia and America. The best kinds are very heavy, are of a deep black, and consist of heart- wood only, On account of its colour, durability, hardness, and susceptibility of polish, ebony is much used for cabinet work and inlaying, and for the manufacture of pianoforte keys, knife-handles, and turned articles. Ceylon ebony is furnished by D. Ebenum, which grows in great abundance throughout the flat country west of Trincomalee. The tree is distinguished from others by the inferior width of its trunk, and its jet-black, charred-looking bark, beneath which the wood is perfectly white until the heart is reached (See Baker, Hight Years' Wanderings in Ceylon, p. 293, 1855), The wood is stated by Sir J. E. Tennent to excel that obtained from D. recticulata of the Mauritius and all other varieties of ebony in the fineness and intensity of its dark colour. Although the centre of the trees alone is

employed, reduced logs 1 to 3 feet in diameter can readily"

be procured. Much of the East Indian ebony is yielded by the species D. Melanoxylon, a large tree 8 to 10 feet in cir- cumference, with irregular rigid branches; oblong or oblong-lanceolate, entire leaves ; white flowers, having a 5- cleft calyx; and a round, pulpy berry, containing 2-8 seeds. The bark of the tree is astringent, and mixed with pepper is used in dysentery by the natives of India. The wood of D. Ebenaster, the species called by the Singhalese Cadooberia, is black, with rich brown stripes ; it is not so durable and heavy as the true ebonies. That of JD. tomentosa, a native of North Bengal, is black, hard, and of great weight. D. montana, another Indian species, pro- duces a dark wood, variegated with white-coloured veins, D. quesita is the tree from which is obtained the wood known in Ceylon by the name Calamander, derived by Pridham from the Singhalee kalu-mindrie, black-flowing. Its closeness of grain, great hardness, and fine hazel-brown colour, mottled and striped with black, render it a valuable

material for veneering and furniture-making. Cochin- China ebony is believed to be the wood of a species of Maba, a genus of Ebenacee. What is termed Jamaica or West Indian ebony and probably also the green ebony of commerce are produced by Brya Hbenus, a leguminous tree or shrub, having a trunk rarely more than 4 inches in diameter, flexible spiny branches, and orange-yellow, sweet- scented flowers. ‘The wood is greenish-brown in colour, heavier than water, exceedingly hard, and capable of receiving a high polish.

From the book of Ezekiel (xxvii. 15) we learn that ebony was among the articles of merchandise brought to Tyre; and Herodotus states (iii. 97) that the Ethiopians every three years sent a tribute of 200 logs of it to Persia. Ebony was known to Virgil as a product of India (Geor., ii. 116), and was displayed by Pompey the Great in his Mithridatic triumph at Rome. By the ancients it was esteemed of equal value for durability with the cypress and cedar (see Pliny, Wat. Hist., xii. 9, xvi. 79). According to Solinus (Polyhistor, cap. lv. p. 3538, Paris, 1621), it was employed by the kings of India for sceptres and images, also, on account of its supposed antagonism to poison, for drinking-cups. The hardness and black colour of the wood appear to have given rise to the tradition related by Pausanius, and alluded to by Southey in Zhalaba, i, 22, that the ebony tree produced neither leaves nor fruit, and was hever seen exposed to the sun.

EBRO (in Latin berus),‘the principal river of Spain, rises in the Cantabrian Mountains, near Reinosa, in the province of Santander, flows in a general south-east direction through Old Castile, Navarre, Aragon, and Catalonia, and falls into the Mediterranean about 80 miles south-west of Barcelona, in 40° 41’ N. lat. and 0° 50’ E. long., forming by its delta a very considerable excrescence on the otherwise regular outline of the coast. It has a total length of about 340 miles, and its drainage area is calculated at 31,445 square miles. Already a noble stream when it breaks through the pass of Horadada, it becomes navigable about Tudela; but its value as a means of communication 1s almost neutralized by the obstacles in its channel, and sea- faring vessels cannot proceed further up than Tortosa. The great Imperial Canal, commenced by the emperor Charles V., proceeds along the right bank of the river from a point about three miles below Tudela, to the monastery of Monte Terero, five miles below Saragossa ; and the San

Carlos Canal affords direct communication between Amposta at the head of the delta and the harbour of Los Alfaques. The principal tributaries of the Ebro are—from the right hand the Jalon with its affluent the Jiloca, the Huerva, the Aguas, the Martin, and the Guadalope ; from the left the Aragon, the Gallago, and the Segre with its elaborate system of coufinent rivers,

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ECARTE (French, écarté, separated, disearded), a game at cards, of modern origin, probably first played in the Paris salons, in ‘the first quarter of the 19th century. It is a development of a very old eard game ealled la triomphe, or French-ruff (Académie des Jew, various editions ; Cotton and Seymour, Compleat Gamester, various editions ; and Paul Boiteau D’Ambly, Les Cartes & jouer, Paris, Hachette, 1854).

carté is generally played by two persons, but a pool of three may be formed, the player who is out taking the place of the loser, and the winner ef two consecutive games winning the pool. At French écarté (but not at English) bystanders who are betting may advise the players, by pointing to the eards they desire them to play, and the loser of the game goes out and one of the rentrants takes his plaee, unless the loser is playing la chouette (i.e., taking all the bets that are offered), when he does not have to resign his seat if he loses.

A. pack of cards is used from which the small cards (from the two to the six both inclusive) are removed. The players cut for deal, the highest having the choice. The dealer gives five eards to his adversary and five to himself, by two at a time to each and by three at a time to each, or vice versa. The eleventh card is turned up for trumps. If it is a king, the dealer scorcs one.

The non-dealer then looks at his cards. If satisfied with them he plays, and there is no discarding , if not satisfied he proposes. The dealer may either accept or refuse. If he accepts each player discards face downwards as many cards as he thinks fit, and fresh ones are given from the undealt cards or stock, first to complete the non-dealer’s hand to five, then to complete the dealer’s, Sunilarly, a second proposal may be made, and so on, until one

player is satisfied with his hand. If the dealer refuses the hand is played without discarding.

If the non-dealer announces that he holds the king of trumps, lic scores one; and similarly, if the dealer holds the king and announees it, he scores one.

The non-dealer, being satisficd with his liand, leads a eard. The dealer plays a eard to it, the two cards thus played forming a trick. The winner of the trick leads to the next, and so on. The highest card of the suit led wins, the eards ranking king (highest), queen, knave, aee, ten, nine, eight, seven. Trumps win other suits. The second to play to a trick must follow suit if able, and must win the trick if he ean, whether by trumping or otherwise.

The scores are for the king (as already explained), and for the majority of tricks. The player who wins thrce tricks scores one for the point, if he wins all five tricks, he scores two for the vole. If the non-dealer plays without proposing, or the dealer refuses the first proposal, and fails to win three tricks, the adversary scores two, but no more even if he wins the vole. The game is five up.

Hints To Prayers.—The following hints, which merely

touch on the elements of the play, may be of serviee to beginners :— _ Shuffle thoroughly after every deal to prevent the cards packing Mm suits, otherwise the trump card is not unlikely to be of the Same suit as those preceding it, which are in the dealer’s hand. It is an act of courtesy to the adversary to shuffle your own pack well, to save him the trouble of making your cards.

Do not look at your hand when dealer, until aftcr the non-dealer has deeidcd whether he will propose or not. The countenance or

manner, often betrays the nature of the hand. “A not announce the king until in the act of playing your first card.

Propose quickly, as hesitation exposes the nature of the hand. In order to be quick, the hands which should be played without proposing, called jeua de regle, ought to be thoroughly known.

ney are as follows :—

1. All hands with threc trumps, whatever the other cards.

2. Hands with tio trumps which contain also—

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a. Any three cards of one plain suit ;

b. Two cards of one plain suit, one being as high as a queen ;

c. Two small cards of one suit, the fifth card being a king of an. other suit ;

d, Hands intermediate hetween 0 and c, ¢.¢., with higher cards in one plain suit, and lower in another, ¢.g., two trumps, knave, ace of one suit, and nine or eight of another ; or ace, ten of one suit, and ten of another ; or ten, nine of one suit, and knave of another ; _ é@ Three cards of different suits, as high as king, knave, and a small card, or cards of equal value in different suits, as king, aee, nine; or king, and two tens; or two queens; or queen, knaye, ace ; or three knaves.

3. Hands with one trump, which contain also—

a. King, queen, knave of one suit, and a small card of another ;

b. Four cards of one suit headed by king ;

c. Three cards of one suit headed by queen, and queen of an- other suit.

4, Hands with no trump, which contain three qucens or cards of equal value in different suits, c.g., four court cards.

5. Hands from which only two cards can be discarded without throwing a king or a trump.

Holding cards which make the point certain, propose, as you have the chance of a refusal, and one good card taken in may give you the vole. If you hold a jeu de regle, and one of the trumps is the king, it is gencrally

right to propose, as your adversary, if he accepts, cannot then take the king. But, except in the case of the king, the value of the trumps does not affect the proposal hands, as the game is not to lead trumps originally (without the king), unless you have three, but to keep them for trumping, and for this purpose high trumps are no better than low ones,

When discarding, throw out all cards except trumps and kings.

If your adversary proposes you should accept, unless you are guarded in three suits (a queen being a sufficient guard), or in two suits with a trump, or in one suit with two trumps. Hence the tule not to discard two cards, unless holding the king of trumps, applies to the dealer.

The hands with which to refuse are the same as those with which to play without proposing, except as follows :—- =

1. Two trumps and three cards of one plain suit should not be played unless the plain suit is headed by a court card.

2, One trump and a ticrce major is too weak, unless the fifth card is a court card. With similar hands weaker in the tierce major suit, accept unless the fifth card is a queen.

3. One trump and four cards of a plain suit is too weak to olay.

: 4, One trump and two queens is too weak, unless beth queens are singly guarded.

5. One trump, queen of one suit, and knaye guarded of another should not be played unless the queen is also guarded, or the card of the fourth suit is a court card.

6. One trump, a king and a queen, both unguarded, should not be played, unless the fourth suit contains a card as high as an aee.

Four court cards without a trump are too weak to play, unless they are of three different suits, ‘efuse with thtec queens, if two are singly guarded ; otherwise, accept.

Lead from your guarded suit, and lead the highest. An ex- eeption to this rule is with two small trumps, a guarded queen, aud a small card of another suit, when the single card should be led.

When playing a weak hand after a refusal, with no hope of the point and fear of losing the vole, lead the strongest single ecard, unless you have a king.

If the strong suit led is not trumped, persevere with it, unless with king of trumps, or queen (king not having been announced), or knave, ace, when lead a trump before continuing your suit. Also, when playing for the vole with a weak trump and high cards, change the suit each time to avoid a ruff. Having made three tricks, then lead the trump. ‘

You should not lead trumps at starting, cven if your best suit, unless you hold king, or queen, knave, or knave, ace, with court cards out of trumps. Holding three trumps, the two best being in sequence, lead a trump. ‘

If cards are refused, it-is better to lead from two small cards in sequence, than from a high tenace.

If you have won two tricks, your opponent oue, and you hold a trump and a plain card, lead the plain card ; but if your adversary has won two tricks and you win the third, lead the trump.

If you make two tricks and have the queen and two small trumps (the king having been announced against you), by leading a small trump you must win the point.

The score has to be considered. If the dealer is at four, and the king is not in your hand nor turned up, play any cards without proposing which give an even chance of three tricks, ¢. g-y a queen, a guarded knave, and a guarded ten. The samc rule applies to the dealcr’s refusal, but he ought to be protected in three suits, 64. three knaves, or a knave and two guarded tens. At the adverse

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seore of four, and king not being in hand or turned up, any hand with one trump should be played, unless the plain cards are very small and of different suits. Further, the rule to ask for eards with the point certain does not hold at the adverse score of four, unless king is in hand or turned up.

If the non-dealer plays without proposing when he is four to three, and the dealer holds the king he ought not to mark it. The same rule applies to the non-dealer after a refusal, if the dealer is four to three.

At the score of non-dealer three, dealer four, the dealer should refuse on moderate cards, as the player proposing at this score must have a very bad hand.

At four a forward game should not be played in trumps, as there is no advantage in winning the vole.

Laws or Ecarré,—The following laws are abridged from the revised code adopted by the Turf Club :—

Outting.—1. A cut must consist of at least two cards. Card exposed in cutting, fresh cut. Dealing.—2. Order of distribution of cards, whether by three and two, or vice versa, once selected, dealer must not change it during game. If changed, or wrong number of eards dealt, non-dealer, before he looks at his hand, may claim fresh deal. 3. Dealer turning up more than one card, non-dealer, before looking at his hand, may seleet either for trump, or may claim fresh deal. 1f he has looked at his hand there must be a fresh deal. 4. Faced card diseovered in pack before trump card is turned, fresh deal. 5. Dealer exposing own cards in dealing, no penalty; exposing non-dealer’s cards, non-dealer, before looking at his hand, has option of fresh deal. 6. Deal out of turn, discovered before trump turned up, void ; after, too late to rectify. 7. Misdeal discovered after trump card turned, and before proposing or playing, non-dealer has option of fresh deal. 1f deal stands, dealer cannot mark king turned up, and uon-dealer having superfluous cards discards them; dealer having superfluous cards, uon-dealer draws and looks at them; either having too few cards, hand is completed from stock. 8. Hither player playing with wrong number of cards, adversary has option of fresh deal. Marking king.—9. King turned up may be marked any time before trump card of next deal is turned; king in hand must be announced

before playing first card, or if king is card first led by non-dealer before being ae to, or cannot be marked ; if king is card first played by dealer, it must be announced before he plays again. 10. Player announcing king when he has not got it, and playing a card without declaring error, adversary may correct seore and have hand played over again. _If offender wins point or vole that hand, he scores one less than he wins. Proposing.— 11. Proposal, acceptance, or refusal made cannot be retracted. Discarding.—12. Cards discarded must not be looked at. 13. Kither player taking too many cards, and mixing any with his hand, adversary may claim fresh deal. If deal stands, adversary draws superfluous cards, and may look at them if offender has scen any of the cards given. Non-dealer asking for less cards than he discards, dealer counts as tricks all cards that cannot be played to. Same rule for dealer, but if he discovers error before playing a card, he may complete hand from stock. 14. Dealer giving more or less cards than asked for, non-dealer may claim fresh deal. If deal stands, non-dealer with too many cards diseards superfiuous ones; with too few, has hand completed from stock. 15. Faced card in stock after disearding, players may look at it; it is put aside and uext card given. 16. Cards exposed in giving cards to non-dealer, he has option of taking them or of having next cards; dealer exposing his own cards, no penalty, 17. Dealcr turning up top card after giving cards, cannot refuse second discard. 18. Dealer accept- ing when too few cards in stock to supply both, non-dealer may take cards, and dealer must play his hand. Playing.—19. Card led in turn cannot be taken up again. Card played to a lead can ouly be taken up prior to another lead, to save revoke or to correct error of not winning trick. Card led out of turn may be taken up ee to its being played to. 20. Player naming one suit and eading another, adversary has option of requiring suit named to be led. 1f offender has none, no penalty. 21. Player abandon- ing hand, adversary is deemed to win remaining tricks, and scores aecordingly. Revoking, and not winning trick.—22. For either of these offences same penalty as in law 10. Incorrect packs.—23. Deal in which discovery made, void ; preceding deals good. By- standers.—24. If players declare to play English écarté, bystanders, betting or not, not allowed to make reinarks or give advice, nor to play out gaine of player resigning. If bystander makes remark which affects score, player prejudiced may call on him to pay his stakes and bets. 25. At French écarté, those betting may correct . advice (by pointing only), or play game of player who

Sce Académie des Jeux (various editions after the first quarter of the 19th century); Hoyle's Games (various editions about same dates); Ch. Van-Tenac et Louis Delanoue, Traité du Jeu de UEcarté, Paris, 1845 (translated in Bohn's Handbook of Games, London, 1850); " Cavendish, Zhe Lars of Ecarté, adopted by the Turf Club, with a Treatise on the Game London, 1878. (i. J.)

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ECBATANA (Greek, 'Exfdrava), or, as it is found in ABschylus, 'AyBarava, a name applied by the classical writers to several and possibly to no fewer than seven dis- tinct sites,—the capital of Media Atropatene, the capital of Media Magna, the citadel of Persepolis, a Syrian city on Mount Carmel, the Assyrian castle of Amadiyah, the Arsacidan stronghold of Europus, and the city of Ispahan. This diversity of application doubtless arises from the fact that the word was a descriptive epithet ; but its derivation has not been. ascertained, and it is even possible that under the Greek disguise we may have two totally distinct originals. According to the usual hypothesis the meaning is

treasury, or place of assemblage, from the Old Persian

hagmatan. The Median use of the name is the only one of special moment, involving, as it does, a difficult question of identification, It has long been admitted on all hands that the modern Hamadan, a town of Persia at the foot of the Elvend Mountains, occupies the site and preserves the name of the great city of Eicbatana, which was the summer residence of the Persian kings from the time of Darius Hystaspis to the Greek conquest, and afterwards became the capital of the Parthian empire. But the further identification of this Ecbatana with the Ecbatana of Herodotus, still maintained by some authorities, has been disputed by Sir Henry Rawlinson, who locates the latter city at Takht-i-Suleiman, a conical hill about half-way between Hamadan and Tabriz, which agrees in its main topographical features with the Herodotean description, and is still covered with extensive ruins of ancient date. There it was at least possible for the Median monarch Deioces to surround his palace with seven concentric walls of different colours, rising one behind the other; but, if the site of Hamadan be adopted, this part of the account, recently shown by the similar arrangement at

Borsippa to be so probable in itself, raust be relegated to the region of myths. One or other of the cities is possibly mentioned in the Old Testament as Achmatha or Amatha ; in the Apocrypha the name frequently occurs in the form of Ekbatana.

See Sir Henry Rawlinson's " Memoir on the site of the Atropa- tenian Eebatana," in Journ. of the Roy. Geogr. Soc., 1841 ; Canon G. Rawlinson's Herodotus, vol. i. 1875, p. 226.

ECCARD, Jowannes (1553-1611), a celebrated com- poser of church music, was born at Mihlhausen on the Unstrut, Prussia, in 1553. After having received his first musical instruction at home, he went, at the age of eighteen, to Munich, where he became the pupil of Orlando Lasso, one of the greatest masters of the Vranco-Belgian school. In his company Eccard is said to have visited Paris, but in 1574 we find him again at Mihlhausen, where he resided for four years, and edited, together with Johanu von Burgk, his first master, a collection of sacred songs, called Crepundia sacra Helmboldi (1577). Soon afterwards he obtained an artistic appointment in the house of Jacob Fugger, the great Augsburg banker, and in 1583 he became assistant conductor, and twelve years later first chapel-master, at Kénigsberg in Prussia. In 1608 he received a call to Berlin as chief conductor of the elector's chapel, but this post he held only for three years, owing to lis premature death in 1611. LEccard's works consist exclusively of vocal compositions, such as songs, sacred cantatas, aud chorales for four or five, and sometimes for seven, eight, or even nine voices. Their polyphonous structure is a marvel of art, and still excites the admiration of musicians. At the same time his works are instinct with a spirit of true religious fecling. They have indeed a religious and historic significance beyond their artistic value. The im- portant position of music in the service of the Reformed churelies is well known. It was derived from, and there- fore appealed again to, the feelings of the people. Luther himself recognized the elevating influence of the art by

cultivating it with zeal and success. His setting of the beautiful words " Hin' feste Burg ist unser Gott" is still regarded by the Germans as tlicir representative national hymn. LEccard and his school are in the same way

inseparably connected with the history of the Reformation. Of Eccard's songs a great many collections are extant; for an cnumeration of the old and rare editions the reader is referred to the works by Winterfeldt, who has devoted great care to the study of Eccard, and by Doring (Choral- kunde, p. 47).

ECCELINO, or Ezzenivo pa Romano (1194-1259), fourth of the name, a famous Ghibelline chief, was born April 25, 1194. The family traced its origin to Eccelin, a knight who about 1036 followed the cmperor Conrad IT. into Italy, and received from him among other fiefs that of Romano, in the neighbourhood of Padua. LEccelino IV. was the elder of the two sons of Eccelino III, surnamed the Monk, who divided his little principality between them in 1223, and diedin 1235. In his youth Eccelino displayed the dauntless courage and the power of dissimulation which characterized him through life. In 1226, at the head of a party of Ghibellines, he got possession of Verona, and was appointed podestat. He became one of the most faithful servants of the great emperor Frederick II., who by a charter granted in 1232 confirmed him in his possessions. Four years later (1236) he invited Frederick to enter Italy to his assistance, and in August met him at Trent, Eccelino was soon after besieged in Verona by the Guelfs, and the siege was raised by the emperor. Vicenza was next stormed, and the government was given to lccelino. In 1237 the latter marched against Padua, became master of the city by capitulation, and crushed the spirit of the people by remorseless cruelty. The same year he took part in the siege of Mantua, and made himself master of Trevisa. On the return of Frederick to Italy he joined him with a large force, and contributed to the great victory over the Guelfs at Cortenuova (November). In the follow- ing year he strengthened his connection with the emperor by marriage with Selvaggia, his natural daughter. In 1239, after entering Padua with Frederick, he wasexcommunicated and declared deprived of his estates by the Pope. But he still went on fighting and augmenting his dominions and perpetrating such incredible cruelties that the emperor, it is said, would fain have been rid of him. Neverthcless Eccelino was among the auxiliaries of Frederick at the siege of Parma in 1247. At the time of Frederick's death, in 1250, Eccelino, who had been named vicar-imperial of all the districts between the Trentine Alps and the river Aglio, had cxtended his authority from the Adriatic to the environs of Milan. We had married asecond wife in 1249. At

length (1256) a crusade against this foe of the church was proclaimed by Pope Alexander IV., and a powerful league was formed, which the Venetians joined. Padua was soon lost to him ; but in 1258 he defeated the army of the league and reduced Brescia. In 1259 he was called to Milan by the Ghibelline party and attempted to march on the city. He was, however, encountered by his enemies at Cassano, September 16, 1259, and was severely woundcd and taken prisoner. His troops then disbanded. The great leader was resolved not to survive his fall, nor would he make his peace with the church. He tore the bandages from his wounds, refused to take food, and died at Soncino, September 26,1259. By the death of his brother Alberico about a year later the family became extinct, and their possessions were distributed among the conquerors. The character of Eccelino is thus drawn by Mr Kington in his History of Frederick the Second (i. p. 503):—“ He was bold, clear-sighted in politics, and staunch to the side he had chosen as his own. He had a most commanding intellect, and his counsels were sure not to be slighted. He was a

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first-rate soldier, and could overawe hig enemies with a glance. He was, however, superstitious, as many found to their cost. Covetous of power, he was unscrupulous as to the means by which it was won or kept. His merciless cruelty and his callousness to human suffering brand him as an encmy to mankind.” In the Divina Commedia (Inferno, xii.) Eccelino is seen amongst those who expiate the sin of cruelty in the lake of blood in the seventh circle of hell, –

ECCHELLENSIS, or Ecurzensis, ABRAHAM, a learned Maronite, whose surname is derived from Eckel in Syria, where he was born towards the close of the 16th century. He was educated at the Maronite college in Rome, and, after taking his doctor’s degree in theology and philosophy, became professor of Arabic and Syriac in the college of the Propagandists. Called to Paris in 1630 to assist Le Jay in the preparation of his polyglot bible, he contributed to that work the Arabic and Latin versions of the book of Ruth and the Arabic version of the third book of Maccabees. A quarrel with Gabriel Sionita, one of lis coadjutors, whose work he had revised, led to a

sharp controversy in which De Flavigny took part. He retuned to Rome in 1642, but resumed his residence in Paris in 1645. Being invited by the Congregation of the Propaganda to take part in the preparation of an Arabic version of the Scriptures, he went again in 1652 or 1653 to Rome, where he died in 1664. LEcchellensis published several Latin translations of Arabic works, of which the most important was the Chronicon Orientale of Ibu-ar Rahib (Paris, 1653). He was engaged in an interesting controversy with Selden as to the historical grounds of episcopacy, in the course of which he published his Hutychius Vindicatus, sive Responsio ad Seldeni Origines (Rome, 1661). Conjointly with Borelli he wrote a Latin translation of the 5th, 6th, and 7th books of the Conics of Apollonius of Perga (1661).

ECCLES, a populous village of England, in the county of Lancaster, four miles west of Manchester by railway, and practically an outlying suburb of that city. The parish church of St Mary, an ancient structure, was enlarged and extensively repaired in 1863-4; and several dissenting places of worship have been built in the present century. The cotton-manufacture is extensively carried on in the immediate neighbourhood. Previous to the Reformation the monks of Whalley Abbey had a grange at what is still called Monks' Hall ; and in 1864 many thousands of silver pennies of Henry III. and John of England and William I. of Scotland were discovered near the spot. Ainsworth, the author of the Latin and English dictionary so long familiar to English students, was born at Eccles in 1660 ; and it was at the vicarage that the Right Hon. William Huskisson expired on 15th September 1830 from injuries received at the opening of the Liverpool and Manchester Railway.

ECCLESTA, in Grecian antiquity, the general assembly of Athenian citizens, who met from time to time to discuss public affairs. Ecclesiz were of two kinds, ordinary and extraordinary. The first of these were held, according to tlie laws of Solon, four times in each prytany, or period of thirty-five days ; while the others were only summoned on some pressing emergency. When any measure of unusual importance was to be publicly debated, the people were summoned from the country by special messengers. An assembly thus convened was called a cataclesia. Much discussion has taken place as to the exact days of the month on which the ecclesiz were held ; but the result has only been to prove either that there

were no days invariably fixed for them, or that we have no data by which to deter- mine accurately what these days were. In Ulpian it 18 stated that when there were three assemblies a-month, the first fell on the eleventh, the second on the twentieth, and

the third about the thirtieth of the month. The likelihood is that they were held at regular intervals though the days were not absolutely fixed. Ecclesia were originally held in the Agora or Forum. The place of meeting was subse- quently removed to the Pnyx, and afterwards to such of the greater temples as might be most convenient. The Pnyx lay to the west of the Areopagus, and commanded an extensive view. It was partly within the city walls, and had an area of about 12,000 square yards. On its northern side, cut out of the solid rock, was the bema or hustings from which the speakers addressed the people. From this tribunal a splendid view of the principal buildings of the city might be had. The right of assembling the people lay with the prytanes, or presidents of the senate or Council of Five Hundred, who both advertised beforehand the busi- ness to be discussed, and on the day of meeting sent round a crier to remind the citizens that their presence was required. In times of war, however, or other national crises, the generals of the army sometimes assumed this privilege, though it was necessary for them in doing so to give notice of their intention by a public proclamation. They also sometimes claimed the right of preventing the ecclesia from assembling ; but their claims to this privilege were not generally recognized. Such of the citizens as re- fused to attend were fined, and six magistrates called lexiarchs were appointed to collect the fines. To assure a full meeting, the custom was ultimately introduced of pay- ing the poorer classes a small sum for their attendance. This sum was originally an obolus, but after the time of Pericles it was raised to three. According to the usual order the proceedings of an ecclesia were commenced by a lustration or ceremonial purification of the place of assembly. The victims sacrificed were usually sucking pigs, whose blood was sprinkled round the boundary of the assembly. The crier next offered up a prayer to the gods for guidance, after which the business for which the assembly had been convened was introduced. According to the laws of Solon, the crier first called upon citizens above fifty years of age to speak and then upon all others ; but this

distinction was afterwards abolished, and the discussion was open from the commencement to all citizens of whatever age. The vote was generally taken by show of hands. In certain special cases, however, such as those affecting individual rights,

the ballot was used. The decision to which the assembly

came was called a psephisma. The ecclesia was sometimes adjourned from one day to the next, and it generally broke up at once if any of those present declared that he had Seen an unfavourable omen or if thunder and lightning oceurred. The word ecclesia came to mean any assembly regularly convened, and in New Testament Greek it is used to denote the assembly of Christians in any particular place, or the Christian church.

ECCLESIASTES, T’nr Boox or, has been handed down by Hebrew tradition as one of the three canonical books of Solomon, son of David, the other two being Proverbs and the Song of Songs, or Canticles,

_ Two different practices have obtained from time immemorial as to the position of this book in the Bible. According to one, which is preserved in the MSS. and edi- tions of the Septuagint, and is followed by the MSS. and editions of the Vulgate, Ecclesiastes is the second in the order of the five books which, according to the Alexandrian Jews and the Greek and Latin churches, was written by Solomon. The order of these five books in the Alexandrian and Sinaitic Codices and in the MS. Bible of Charles the Bold, cirea 850 (British Museum) is Proverbs, Ecclesi- astes, Canticles, Wisdom, and Ecclesiasticus. According to the other practice the book in question is separated from those which are supposed to belong to the same author, and 18 Joined for liturgical purposes to the other four Megilloth.

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Thus in the oldest dated MS. of the entire Hebrew Bible yet known (1009), now in the imperial library of St Petersburg, it is the third of the five Megilloth, viz., Ruth, Canticles, Ecclesiastes, Lamentations, and Esther. Though this order is also to be found in the Spanish and Italian MSS., it is by no means universal. Additional MS. 15,250 of the British Museum not only puts Ecclesiastes before Canticles, but places Ruth before the Psalms.

In the fourteen pre-Reformation German translations of the Bible (1462-1518), and in Wycliffe's English version, where the five Solomonic books are still kept together, the order of the Septuagint and Vulgate is followed, as is also the case in the English Catholic version (Douai, 1610). Luther, who was the first to remove Wisdom and Ecclesi- asticus from this group, and place them with the other so- called Apocryphal books at the end of the Old Testament, has left Ecclesiastes as second in the order of the Solomonic writings. In our first English translation of the entire Bible (1535) Coverdale followed the example of the great Continental Reformer. Hence this narrower group and this position of Ecclesiastes in the succeeding English Bibles, and in the present Authorized Version.

There is hardly another book in the Bible which has called forth somany commentaries and suffered as much at the hands of expositors as Ecclesiastes. Nearly 350 years ago Luther remarked,—" Difficult as this book is, it is almost more difficult to clear the author of the visionary fancies palmed upon him by his numerous commentators than to develop his meaning." What would this sagacious Reformer have said if he could have seen the countless speculations of which it has been the subject since his days. We are positively assured that the book contains the holy lamentations of Solomon, together with a prophetic vision of the splitting up of the royal house of David, the destruc- tion of the Temple, and the Captivity ; and we are equally assured that it is a discussion between a refined sensualist and a sober sage. Solomon publishes in it his repentance, to glorify God and to strengthen his brethren; he wrote it "when he was irreligious and sceptical during his amours and idolatry." 'The Messiah, the true Solomon, who was known by the title of son of David, addresses this book to the saints ;" a profligate who wanted to disseminate his in- famous sentiments palmed it upon Solomon. It teaches us to despise the world with all its pleasures, and flee to monasteries ; it shows that sensual gratifications are men's greatest blessing upon earth. It is a philosophic lecture delivered to a literary society upon topics of the greatest moment ; it is a medley of heterogeneous fragments belong- ing to verious authors and different ages. It describes the beautiful order of God's moral government, showing that all things work together for good to them that love the Lord; it proves that all is disorder and confusion, and that the world is the sport of chance. It is a treatise on the summum bonum, itis "a chronicle of the lives of the kings of

the house of David from Solomon down to Zedekiah.” Its object is to prove the immortality of the soul; its design is to deny a future existence. Its aim is to comfort the unhappy Jews in their misfortunes ; and its sole purport is to pour forth the gloomy imaginations of a melancholy misanthrope. It is intended “ to open Nathan’s speech (1 Chron. xvii.) touching the eternal throne of David;” and it propounds by anticipation the modern dis- coveries of anatomy and the Harveian theory of the circula- tion of the blood. ‘It foretells what will become of man or angels to eternity ;” and, according to one of the latest and greatest authorities, it is a keen satire on Herod, written 8 z.c., when the king cast his son Alexander into prison.

1 For an historical account of the interpretation of Ecclesiastes, with detached specimens of these conflicting views, see Ginsburg, Commentary on Ecclesiastes, pp. 27-293, London, 1861.

One of the causes which have contributed to obscure the design of this book is the name Jeclesiastes. This title Preacher, which ascribes to Solomon an office foreign to the Old Testament, has been given to it by the Septuagint and Vulgate in accordance with a Jewish tradition, and has been adopted alike by the pre- and post-Reformation authorized versions of the Scriptures. The Jewish tradition in question is to be found in the Midrash Rabba on Eccl. i. 1, where we are told that “Solomon was ealled Coheleth == Ecclesiastes, because lis discourses were delivered in the Cahal = Ecclesia.” Hence the title in the Alexandrian ver- sion, which was followed by the Latin Authorized Version, and is reproduced in Wrycliffe’s Bible “the boc of Ecclesiastes, that is to sey, boc of talker to the people.” Hence, too, Luther’s title Prediger, which is followed in our first printed English Bible “ the boke of the Preacher, otherwyse called LEcclesiastes” (Coverdale, 1535), and which is perpetuated in our Authorized Version. This title, however, is contrary to the grammatical form of the word Coheleth, as well as to the usage of the root from which it is derived. It has arisen froma desire on the part of the Jewish synagogue to exhibit Solomoa in the garb of a penitent eonfessing his sins, and, by detailing his bitter experience, warning the people publicly to avoid the thorny path he has pursued and walk in the ways of righteousness. Laudable as this desire is, it

perverts the historico-exegetical import of the book, and is contradicted by the signification of the name.

Coheleth is the participle feminine Kal of Adéhal, which primarily means to call, to call together, to collect, to assenrble. The verb occurs about forty times in the Hebrew Bible, and is invariably used for assembling or gathering people together, especially for religious worship. Hence the name means a collectress, or an assembleress of people into the presence of God, a female gatherer of an assembly to God. This meaning of the name is fully confirmed by another Jewish tradition, which is embodied in the Afidrash Yalkut (Eccl. i. 1), and is exhibited in the ancient Greek versions of Aquila and Symmachus. Chapter i. 12 tells us that Solomon is meant by this designation, since he was the only son of David who was king over Israel in Jerusalem. The feminine and symbolic appellation arises from the

fact that in chapter vil. 27 of this very book Solomon is. depicted as personified Wisdom, who appears herself in Prov.

1. 10, vill. 1, &e., as Coheleth, or the female gatherer of the people. This symbolie name is, moreover, intended to indicate the design of the book itself, and to connect Soloraon's endeavours here with his work recorded in 1 Kings vii. Solomon, who in 1 Kings vii, is described as gathering (Smp*) the people to hold eommunion with the Most High in the place which he erected for this purpose, is here again represented as the gatherer (nonz) of the far-off people of God. As he retains his individuality, he sometimes describes his own experience, and sometimes utters the words of Wisdom, whose organ he is,

The design of this book, as indisated in the symbolic title of its hero, is to gather God's people, who were led astray by the inexplicable difficulties in the moral govern- nent of the world, into the community of God. Coheleth shows them the utter insufficiency of all human efforts to obtain real happiness—that it cannot be secured by wisdom, pleasure, industry, wealth, and prudence, but that it eonsists in the calm enjoyment of our lct, in resignation to the dealings of Providenee, in the service of the Most High, and in looking forward to a future state of retribution, when all the present mysteries shall be solved, and when the Righteous Judge shall render to every man xecording to his deeds, whether they be good or evil.

Instead of writing an elaborate metaphysieal disquisition

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to refute the various systems of happiness which the differ. ent orders of mind and the different temperaments had con- structed for themselves, Solomon is introduced as narrating his painful experience in all his attempts. He shows how he had vainly striven to divert the longings of his soul by various experiments, and the only solution which can pacify the perplexed mind when eontemplating the unfathomable dealings in the moral government of the world.

The theme or problem of the book is given in ehapter i. 2-11. On the assumption that there is no hereafter, and that the longing soul is to be satisfied with the things here, Coheleth declares all human efforts to satisfy the longings of the soul to be utterly vain (chap, 1. 1, 2), since conscious man is more deplorable than unconscious nature, for he must speedily quit this life, whilst the earth abides for ever (4); the objects of nature depart and retrace their course again, but man disappears and is for ever gone (5-11).

In eorroboration of the allegation in the prologue, and to show the utter failure to satisfy the eravings of the soul with mere temporal pleasures, Coheleth tells us that, with all the resources of a great monarch at his eommand (chap, i. 12), he applied himself assiduously to discover by the aid of wisdom the nature of earthly pursuits, and found that they were fruitless (13-14), since they eonld not alter destinies. Hence, when he reflected upon the large amount of wisdom which he had acquired, he came to the conelu- sion that it is utterly useless (16-17), for the accumulation of it only increased his sorrow and pain (18). Wisdom having failed, Coheleth resolved to try pleasure, to see whether it would yield the desired happiness, but he soon found that this too was vain (chap. ii. 1), and hence denounced it (2). After procuring every imaginable pleasure (8-10) he found that it was utterly insufficient to impart lasting good (11). He then compared wisdom with pleasure, the two experiments he had made (12); and though he saw that the former had a decided advantage over the latter (13, 14a), still he also saw that it does not except its possessor from death and oblivion, but that the wise man and the fool raust both die alike and be forgotten (140-

16). This melaneholy thought made hit hate both life and the wealth which he had acquired by wisdom and

industry, and which, to aggravate matters, he perchance

light leave to a reckless fuol (17-21). It eonvinced im that man has nothing from his toil but wearisome days and sleepless nights (22, 23), and that there is therefore nothing better for man than to enjoy himself (24a), Soon, however, he found that this too is not in the power of man (24), 25). God gives this power to the righteous and withholds it from the wicked, and it is after all only transitory (2).

Having shown the failure of wisdum, knowledge, and enjoyment to calm the distracted mind which broods over the problem that, whilst the objects of nature depart and re- trace their steps, again man vanishes and is for ever for- gotten, Coheleth now shows the vain efforts of industry to satisfy the restless longings of the soul. All the events of life are immutably fixed (chap. iii. 1-8); labour is therefore fruitless (9). Even the regulations to human labour which God has prescribed in harmony with this fixed order of things man in his ignorance often mistakes (10, 11}: Nothing is therefore left but the enjoyments as one finds them. But this, too, as has already been shown, is a gift of God (12, 13), who has fixed everything to make man feel his utter dependence on and fear the Lord (14, 15). The success of the wicked does not militate against this conclusion, for there is a day fixed for righteous retribution (16, 17). But even if all terminates here, and man and beast have the same destiny (17-21), this only shows all the more that the enjoyment of life is our only portion

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(22). Such a desperate conclusion, however, makes death preferable to a toilsome life (iv. 1-3),—a life speut in exertions to battle with the pre-ordained order of things, a life expended in labours which either arise from jealousies and fail in their end (4-6), or are prompted by avarice and defeat themselves (9-16). But as God has thus ordained the order of things, we ought to serve him (17-v. 6), trust to his protection under oppression (7, 8), and remember that the rich oppressor has not even the comfort of the poor labourer (9-11), and often brings misery upon his children and himself (12-

16). This again brings Coheleth to the mournful conclusion that nothing is left but to enjoy the few fleeting years of life, which is a gift of God (17-19). Coheleth now shows that neither the much-coveted wealth nor the highly-praised prudence suffices to secure tlie desired happiness and solve the melancholy problem of life that the same failure attends wealth (vi. 1-9), for the rich man cannot over-rule the order of Providence, nor forecast what will be for his happiness (10-12). The same is the case with the prudential or common sense view of life. Coheleth thought to secure happiness by acquiring and leaving a good name (vi. 1-4), by listening to merited re- buke (5-9), not indulging in a repining spirit. He would also submit to Divine Providence (10-14), be moderate in his religious practices (15-20), not meddle with the opinions of others (21, 22), seeing that higher wisdom is unattain- able (23, 24), and submit to the oppressive powers that be, convinced that the mightiest tyrant will ultimately be punished (viii. 1-9), for, though righteous retribution is momentarily suspended which causes wickedness to triumph, God will eventually administer justice (10-13). But as he found that the fortunes of the righteous and the wicked are often reversed all their lifetime, he had to relinquish this common-sense view of life as utterly insufficient to calm the longings of the soul, and recurred to his repeated conclusion that there is nothing left for man but to enjoy the fleeting things of this life (14, 15). Before propounding his final conclusion, Coheleth gives a résumé of his investigations. Since it is impossible to fathom the work of God by wisdom, seeing that even the

‘righteous and wise are subject to this inscrutable Provi-

dence just as are the wicked (viii. 16-ix. 2) ;—for all must die alike and be forgotten, and have no more participation in what takes place here (3-6), and we are therefore to indulge in pleasures here, since there is no hereafter (7-10); success does not always attend the strong and the skilful (11, 12); wisdom, though advantageous in many respects, is often despised and defeated by folly (13—x. 3); we are to be patient under snfferings from rulers who by virtue of their power often pervert the order of things (4-7), since Opposition may only increase our sufferings (8-11); the exercise of prudence will in the long run be miore ad- vantageous than folly (12-20); we are to be charitable, though the recipients of our charity often appear ungrate- ful, since some of them may after all requite us (xi. 1, 2); we are

always to be at work, not allowing ourselves to be deterred by imaginary failures, since we know not which of our efforts may prove successful (3-6), and thus make life as agreeable as we can, since this is the only scene of enjoy- ment, and the future is all vanity (7, 8);—yet, seeing that even all this does not satisfy the higher craving of the soul, and still leaves conscious man in a more deplor- able state than unconscious nature, for the objects of nature depart, retrace their course again, while man disappears and is for ever forgotten—Coheleth at last comes to the conclusion that the enjoyment of this life, combined with a belief ina future judgment, does secure real happiness for man (9,10). Weare therefore to live from our early years in the fear of God and of a final judgment, when the Right- eous Judge will rectify all present inequalities (xii. 1-7).

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The wisest and most painstaking Coheleth found by experience that all human efforts to obtain real happiness are vanity of vanities (xii. 8-10), that the sacred writings alone contain the clue to it (11, 12), that there is a Righteous Judge who takes cognizance of all we do, that He will in the great Day of Judgment try the conduct of us all, and that we are therefore to fear Him and keep His commandments (13, 14).

From this analysis of its contents it will be seen that the book consists of four parts, with a prologue and epilogue. The prologue and epilogue are distinguished by respectively beginning with the same phrase (i. 1, xti. 8) and ending with two marked sentences (i. 11, xii. 14). The prologue, which consists of chapter i. 1-11, propounds the grand problem of the book ; whilst the epilogue, which consists of chapter xii, 8-12, gives the solution proposed by Coheleth. The four sections, which are respectively indicated by the recurrence of the same formula or refrain, viz., ii. 26, v. 19, and viii. 15, give the result of each experiment or group of efforts to satisfy the cravings of the longing soul, apart from the conclusion at which Coheleth arrived.

Coheleth fills up a gap in the Old Testament lessons. Throughout the Hebrew Scriptures virtue and vice are spoken of as being visibly rewarded on earth. God declares at the very giving of the law that He will show mercy to thousands of those who love Him and keep His commandments,

and visit the iniquity of those who hate Him to the third and fourth generation (Exod. xx. 5, 6). The whole of Lev. xxvi. and of Deut. xxviii. are replete with promises of earthly blessings to those who will walk in the way of the Lord, and threatenings of temporal afflic- tions upon those who shall transgress His law. The faith- ful fulfilment of these promises and threatenings in the early stages of the Jewish history convinced every Israelite that "'God judgeth the righteous, and God is angry with the wicked every day," and afforded asource of consolation to which the righteous resorted when the power of the wicked threatened destruction (1 Sam. xxiv. 13-16, xxvi. 23; Pss. vii., ix., lii.). Like a net of fine threads is this doctrine spread over the entire Old Testament (comp. Pas. evil, 1,°2) xxv. 1, 2eexxvuil. 1-3; saev:; live 7-93 dy. 0-24; Xc.; cxXil.; emmy. 3; cxxvil.; cxl); exh 10% Prov, x. 6; xi. 5-8, 19; xii. 7; Hag. ii, 15-20; Zech, i. 2-6; viii, 9-17; Malachi ii. 17). By limiting the bar of judg- ment to this side of the grave, the Old Testament yielded no explanation of, or succour under, the distracting sight of the righteous suffering all their life, and then dying for their righteousness, and of the wicked prospering and pro- longing their days through their wickedness, It was under such despairing circumstances that Psalms xxxvil., xlix., and xxiii, were written. But these very Psalms endeavour to allay the prevailing scepticism in the moral government of God, by declaring that the righteous shall ultimately prosper and prolong their days wpon the earth, and that the wicked shall suddenly be cut off in great misery. Hence the recurrence of this perplexity passing over into despair when these reassurances and consolations were not realized by experience, and when the sufferers, however conscious of their innocence, were looked upon as rejected of God in consequence of some secret sin, The book of Job, which so successfully combats the latter notion by showing that afflictions are not always a proper test of sin committed, only confirms the old opinion that the righteous are visibly rewarded here, inasmuch as it represents their calamities as transitory, and Job himself as restored to double his original wealth and happiness in this life.

Under the Persian and Ptolemeian dominion over Palestine, the political affairs of the Jews were such as to render the incongruity between the destinies of men and

their morals still more striking. Hence people began to

arraign the character of God. ‘¢ Every one that doeth evil : Is good in the sight of Jehovah, he delighteth in them, Or where is the God of justice ?”—Mal. 11. 17. ‘*It is vain to serve God, ‘And what profit is it that we keep his ordinance And walk mournfully before Jehovah of Hosts ? For now we pronounce the proud happy ; They also that work wickedness are built up; They even tempt God, yet they are delivered.””—Mal. iii. 17, 18.

Under these circumstances, when the inheritance of the Lord, which was to be the praise and the ruler of all the earth, was reduced and degraded to the rank of a mere province ; when her inhabitants were groaning under the extortions and tyranny of hirelings ; when her seats of justice were filled by the most venial and corrupt men (Eccl. iii, 16); when might became right, and the impunity and success with which wickedness was practised swelled most alarmingly the ranks of the wicked (viii. 10, 11); when the cherished faith in temporal retribution was utterly subverted by the melancholy experience of the reversion of destinies; when the longing minds of the despouding people, released from the terrors of the law, began to import as well as to construct philosophic systems to satisfy their cravings (xii. 12), and to resort to various other experiments to obtain happiness, Coheleth disclosed a new bar of judgment in the world to come. There the Judge of the quick and the dead will rectify all the inequalities which take place here.

On the Continent, where Biblical criticism has been cul- tivated to the highest degree, and where Old Testament exegesis has become an exact science, the attempt to prove that Solomon is not the author of Ecclesiastes would be viewed in the same light as adducing facts to demonstrate that the earth does not stand still. In England, however, some scholars of acknowledged repute still adhere to the Solomonic authorship. Their principal argument is that the unanimous voice of tradition declares it to be so. We at once concede the fact. The Jewish Synagogue undoubt- edly believed that Solomon wrote Canticles when young, Proverbs when in middle life, and Ecclesiastes in his old age (Midrash Yalkut, Eccl. i. 1), and the Christian church has simply espoused the Jewish tradition. But with all due deference, we submit that tradition has no authority whatever to

determine points of criticism. It is an acknowledged fact that the ancients, both Jews and Christians, and indeed the leaders of thought to the beginning of the 16th century, had not the slightest appreciation of peculiarities of style. The different shades of meaning in which the same expression is used by different authors, the variations in forms, phrases, con- structions, and sentences which obtained at diverse periods, and which supply definite data to philologists, and have been reduced toa science in modern days, began only to be noticed at the time of the Reformation, when the vital power of criticism was first applied to traditional dogmas, The spell of tradition once broken, thinking men soon began to recognize the literary style and the respective artistic merits of the component parts of the Bible. Hence Luther already declared, “Solomon did not write the book of Ecclesiastes ; it was compiled by Sirach, at the time of the Maccabees… .. It is, like the Talmud, made up of many books, which perhaps belonged to the library of King Ptolemy Euergetes in Egypt.” No impartial student, with even a moderate knowledge of the genius of the Hebrew language, can fail to gee the striking difference in the style of the pre- and post-exile books of the Old Testa- ment. In the case of Ecclesiastes the difference is still more unmistakable. Of the vocabulary and phrases in Keclesiastes a part is to be found in the post-Babylonian

biblical writings, and that only in the Chaldee portions ; whilst another part has no parallel in the Bible, but ig only to be met with in the Mishna, the Talmud, and other post- biblical productions. Unless, therefore, it is maintained that the Hebrew of the Bible, which extends over a period of several thousand years, and purports to exhibit the styles

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| of a number of writers who lived in different districts, is

unlike any other known literary language, that it had no development and no epochs in its literature, the striking Rabbinic complexion of Ecclesiastes must assuredly stamp it as the latest composition in the Old Testament, Those who know the ultra-orthodoxy of the eminent Hebrew scholar, Professor Delitzsch, will feel the convincing power of this fact when they

find that he assigns to Ecclesiastes the latest date of any book in the Hebrew Bible, because it is written in this unquestionably late language. We have abstained from adducing any other arguments derived from its contents, because this appears superfluous, An intelligent reader even in the English translation can see that the representation of Coheleth as indulging in sensual enjoyments and acquiring riches and fame in order to ascertain what is good for the children of men (chap, ii. 3-9; ili, 12, 22, &c.), making philosophical experiments to discover the swmmum bonum, is utterly at variance with the conduct of the historical Solomon, and is an idea of a much later period ; that the recommendation to individuals not to resent a tyrannical sovereign, but to wait for a general revolt (chap. viii. 2-9), would not proceed from King Solomon ; that the complaint about the multiplication of profane literature (chap. xii. 12) could only have been made ata time when the Jews became acquainted with the Greek writings and Alexandrian philosophy. The book, however, is of Palestinian origin, as is evident from the frequent allusion to rain (xi. 3, xii. 2), which does not fall in Egypt; the reference to the Temple and its worship (iv. 7) ; and the mention of “ the city ” (viii. 10), though, from the remark m2, in the city (v. 7), it would seem that the writer did not live in Jerusalem itself but in the neighbourhood.

From the records we possess of the discussions on the Hebrew canon we see that at the synod at Jerusalem, circa 65 a.D., and at a subsequent synod in Yabne, circa 90 A.D., the question was still an open one whether Ecclesiastes was ‘canonical. The school of Shammai then decided against its canonicity, whilst the school of Hillel passed it as canonical (Mishna Yadaim, iii. 5, iv. 6; Lduyoth, v. 3). The reasons assigned for its rejection, as given in the Talmud, are that chap. ii. 2, vii. 3, and viii. 5 contradict each other, and that the book does not exhibit any signs of its being inspired (Sabbath 30 b, Megilla 7 a). Accord- ing to the Midrash Rabba on Eccl. xi. 9, the advice to enjoy sensual pleasures was considered as contradicting the law of Moses (comp. Eccl. xi. 9 with Numb. xv. 39) and inclining to heresy. The admonition, however, to fear God and the doctrine of a future judgment were urged in its favour and ultimately prevailed. The sages showed that the contradictions were apparent only, and the book was declared canonical (Aboth d’ R. Nathan, cap. i.). Hence it passed over into the Christian church as a part of the canon.

Literature.—The most important commentaries on Ecclesiastes which furnish the best materials for forming an independent opinion on thisavowed]y difficult book are—Knobel, Commentar tiber das Buch Koheleth, Leipzig, 1836; Ewald, Qéhélet, in Die Dichter des Alien Bundes, 2d ed. vol. ii. 267, &c., Gottingen, 1867; Hitzig, Der Pre- diger Salomo im Kurzgefassten exegetischen Handbuch zum alten Lestameni, vol. vii., Leipzig, 1877; Stuart, 4 Commentary om Ecclesiastes, New York, 1851; Elster, Commentar iber den Prediger, Gottingen, 1855; Graetz, Koheleth, Leipzig, 1871 3 Delitzsch, Hoheslied und Koheleth, Leipzig, 1875. The last two give complete vocabularies of the post-Babylonian diction of the book. For history of the interpretation see Ginsburg, Coheleth, commonly calle the Book of Ecclesiastes, London, 1861. (C. D. G.)

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ECCLESIASTICAL COMMISSION. This is a stand- ing commission invested with very important powers, under the operation of which extensive charges have been made in the distribution of the revenues of the Church of England. It was one of the results of the vigorous move- ments for the reform of public institutions which followed the Reform Act of 1832. In 1835 two commissions were appointed “ to consider the state of the several dioceses of England and Wales, with reference to the amount of their revenues and the more equal distribution of episcopal duties, and the prevention of the necessity of attaching by commendam to bishoprics certain benefices with cure of souls; and to consider also the state of the several cathedral and collegiate churches in England and Wales, with a view to the suggestion of such measures as might render them con- ducive to the efficicncy of the estabiished church, and to provide for the best mode of providing for the cure of souls, with special reference to tlie residence of the clergy on their respective benefices.” Aud it was enacted by 5 and 6 Will. IV. c. 30 that during the existence of the commission the profits of dignities and beneficcs without cure of souls becoming vacant should be paid over ‘to the treasurer of Queen Anne’s Bounty. In consequence of the recommen- dation of these commissioners, a permanent commission was appointed by 6 and 7 Will. IV. «. 77, for the purpose of preparing and laying

before the king in council such schemes as should appcar to them to be best adapted for carrying into effect the alterations suggested in the report of the original commission and recited in the Act. The new commission was constituted a corporation with power to purchase and hold lands for the purposes of the Act, notwithstanding the statutes of mortmain. The first mem- bers of the commission were the two archbishops and three bishops, the lord chancellor and the principal officers of state, and three laymen named in the Act. Bya later Act (3 and 4 Vict. c. 118) all the bishops, the chiefs of the three courts at Westminster, the master of the Rolls, and the judges of the Prerogative Court and Court of Admiralty, und the deans of Canterbury, St Paul's, and Westminster were added to the commission ; and power was given to the crown to appoint four, and the archbishop of Canter- bury to appoint two additional lay commissioners. The Jay commissioners are required to be " members of the United Church of England and Ireland, and to subscribe a declaration to that effect." Five are a quorum; but two bishops at least must be present at any proceeding under the common seal of the commission, and if only two are present they can demand its postponement to a subsequent meeting, Paid commissioners, under the title of church estates commissioners, are also appointed—two by the crown .and one by the archbishop of Canterbury. These three are the joint treasurers of the commission, and con- stitute, aloug with two members eppointed by the commis- sion, the church estates committee, charged with all busi- ness relating to the sale, purchase, exchange, letting, or Management of any lands, tithes, or hereditaments. The commission has power to make inquiries and examine Witnesses on oath. The schemes of the commission having, after due notice to persons affected thereby, been laid before the Queen in Council, may be ratified by orders, specitying the tinies when they shall take effect, and such orders when published in the London Gazette have the same force and effect as Acts of Parliament.

The recommendations cf the commission recited in 6 and 7 Will. TV. e. 97 are too numerous to be given here. They inelude an exten- Sivé re-arrangement of the dioceses, equalization of episeopal ineome, providing residenees, &. By 8 and 4 Viet. c. 118 the fourth Teport of the original eommissioners, dealing chiefly with eathedral and collegiate ehurches, was earried into effect, a large number of

eanonries being suspended, and sinecure benefiees and dignitics suppressed,

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The emoluments of these suppressed or suspended offices, and the

surplus income of the episeopal sees, eonstitute the fund at the disposal of the eommissioners. By 23 and 24 Viet. e. 124, on the avoidanee of any bishoprie or arehbishoprie, all the land and emolu- ments of the see, exeept the patronage and lands attached to houses of residenee, beeome, by Order in Council, vested in the commissioners, who may, however, reassign to the see so mueh of the land as may be sufficient to secure the net annual ineome named for it by statute or order. All the profits and emoluments of the suspended eanenries, &e., pass over to the eommissioners, as well as the separate estates of those deaneries and canonries which are not suspended. Out of this fund the expenses of the commission are to be paid, and the residue is to be devoted to inereasing the effieieney of the chureh by the augmentation of the smaller bishopries and of poor livings, the endowment of new ehurches, and employment of additional niinisters. _ The substitution of one central corporation for the many local and independent eorporations of the chureh, so far at least as the management of property is eoneerned, was a constitutional ehange of great importance, and the effeet of it has undoubtedly been to correet the anomalous distribution of eeelesiastieal revenues by equalizing incomes and abolishing sinecures. At the same time it is regarded as having made a serious breach in the legal theory of ecelesiastieal property. ‘‘The important prineiple,” says Cripps, “on which the inviolability of the ehurech establishment depends, that the ehureh generally possesses no property as a eorporation, or which is applieable to general purposes, but that such particular eeelesiastical corporation, whether aggregate or sole, has its property separate, distinct, and inalienable, aceording to the inten- tion of the original endowment, was given up without an effort to defend it” (Law Relating to the Church and Clergy, p. 46).

ECCLESIASTICAL LAW generally means the law of the church, in countries where an established religion is recognized by the state, but ina more general sense it would include the whole body of the law relating to religion. It is in this sense that the phrase is used by American lawyers, and it is only in this sense that it can be used of Ircland since the disestablishment of the state church in that country. The relation of the ecclesiastical law to the rest of the law, especially in respect of legislation and judicature, is one of the most important points in the con- stitution of a country. Where the Roman Catholic religion is recognized by the state the jurisprudence of the canon law prevails, but the relations between the Papal See and the state are governed by special conventions, or concordats. See Canon Law.

The ecclesiastical law of England is remarkable for its complete dependence upon the authority of the state. The Church of England cannot be said to have a corporate existence nor even a representative assembly. The Con- vocation of York and the Convocation of Canterbury are provincial assemblies possessing no legislative or judicial authority. The ecclesiastical judicatories are for the most part officered by laynien, and the last court of appeal is the Judicial Committee of the Privy Council. In like manner changes in the ecclesiastical law are made directly by Parliament in the ordinary course of legislation, and in point of fact a very large portion of the existing ecclesiastical law consists of Acts of Parliament.

The sources of the ecclesiastical law of Engiand are thus described by the leading text writer on this subject :}—“ The ecclesiastical law of England is compounded of these four main ingredients—the civil law, the canon law, the common law, and the statute law. And from these, digested in their proper rank and subordination, to draw out one uniform law of the church is the purport of this book. When these laws do interfere and cross each other, the order of preference is this:—‘ The civil law submitteth to the canon law; both of these to the common law ; and all three to the statute law. So that from any one or more of these, without ail of them together, or from all of them together without attending to their comparative obligation, it is not possible to exhibit any distinct prospect of the English ecclesiastical constitution.’ Under the head of

statute law Burn includes ‘the Thirty-nine Articles of Religion, agreed upon in Convocation in the year 1562 : and in like manner the Rubric of the Book of Common Prayer, which, being both of them established by Acts of Parliament, are to be esteemed as part of the statute law.’”

The first principle of the ecclesiastical law is the assertion of the supremacy of the crown, which in the present state of the constitution means the same thing as the supremacy of Parliament. This principle has been maintained ever since the Reformation. Before the Reformation the ecclesiastical supremacy of the Pope was recognized, with certain limitations, in England, and the church itself had some pretensions to ecclesiastical freedom. The freedom of the church is, in fact, one of the standing provisions of those charters on which the English constitution was based. The first provision of Magna Charta is quod ecclesia Angli- cana libera sit. By the various enactments of the period of the Reformation the whole constitutional position of the church, not merely with reference to the Pope but with reference to the state, was definitely fixed. The legislative power of Convocation was held to only, and even to that extent required the sanction and assent of the Crown. The common law courts controlled the jurisdiction of the ecclesiastical courts, claiming to have “ the exposition of such statutes or Acts of Parliament as concern either the extent of the jurisdiction of these courts or the matters depending before them. And tlere- fore if these courts either refuse to allow these Acts of Parliament, or expound them in any other sense than is truly and properly the exposition of them, the king’s great courts of common law may prohibit and control them.”

The design of constructing a code of ecclesiastical laws was entertained during the period of the Reformation, but never carried into effect. It is alluded to in various sta- tutes of the reign of Henry VIII, who obtained power to appoint a commission to examine the old ecclesiastical laws, with a view of deciding which ought to be kept and which ought to be abolished; and in the meantime it was enacted that “such canons, institutions, ordinances, synodal or provincial or other ecclesiastical laws or juris- dictions spiritual as be yet accustomed and used here in the Church of England, which necessarily and con- veniently are requisite to be put in ure

and execution for the time, not being repugnant, contrarient, or derogatory to the laws or statutes of the realm, nor to the prerogatives of the royal crown of the same, or any of them, shall be occupied, exercised, and put in ure for the time within this realm" (35 Henry VIII. c. 16, 25 c. 19, 27 c. 8),

The work was actually undertaken and finished in the reign of Edward VI. by a sub-committee of eight persons, under the name of the Keformatio Legum Licclesiasticarum, which, however, never obtained the royal assent. Although the powers of the 25 Henry VIII. c. 1, were revived by the 1 Elizabeth c. 1, the scheme was never executed, and the ecclesiastical laws remained on the footing assigned to them in that statute,—so much of the old ecclesiastical laws might be used as had been actually in use and was not repugnant to the laws of the realm.

The statement is, indeed, made by Sir R, Phillimore that the 'Church of England has at all times, before and since the Reformation, claimed the right of an independent church in an independent kingdom, to be governed by the Jaws which she has deemed it expedient to adopt." This position can only be accepted if it is confined, as the authorities cited for it are confined, to the resistance of interference from abroad. If it mean that the church, as distinguished from the kingdom, has claimed to be governed by laws of her own making, all that can be said is that the claim has been singularly unsuccessful. From the time of the Reformation no change has been made in the law of

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the church which has not been made by the king and par- liament, sometimes indirectly, as by confirming the regoly- tions of Convocation, but for the most part by statute, The list of statutes cited in Sir R. Phillimore's Licclesiastical Law fills eleven pages. It is only by a kind of legal fiction that the church can be said to have deemed it expedient to adopt these laws.

The terms on which the Church Establishment of Ireland was abolished by 32 and 33 Vict. c. 42 may be mentioned, By sect. 20 the present ecclesiastical law is made binding on the members for the time being of the church, “ag if they had mutually contracted and agreed to abide by and observe the same;” and by section 21 it is enacted that the ecclesiastical courts shall cease after 1st J anuary 1871, and that the ecclesiastical laws of Treland, except so far as relates to matrimonial causes and matters, shall cease to exist as law. (E. B.)

ECCLESIASTICUS. See Apocryrma.

ECHIDNA, or Porcupine ANT-EATER (Lichidna hystrix), one of the four known species of Monotremata, the lowest order of Mammalia. It isa native of Australia, where it chiefly abounds in New South Wales, inhabiting rocky and mountainous districts, where it burrows among the loose sand, or hides itself in crevices of rocks. In size and appearance it bears a considerable resemblance to the hedgehog, its upper surface being covered over with strong spines directed backwards, and on the back inwards so as to cross each other on the middle line. The spines in the neighbourhood of the tail form a tuft sufficient to hide that almost rudimentary organ. The head is produced. into a long tubular snout, covered with skin for the greater part of its length, The opening of the mouth is small, and from it the echidna puts forth its long slender tongue, lubricated with a viscous secretion, by means of which it seizes the ants and other insects on which it feeds, It is entirely destitute of teeth. Its legs are short and strong, and form, with its broad feet and large solid nails, power- ful burrowing organs. In common with the other mono- tremes, the male echidna has its heel provided with a sharp hollow spur, connected with a secreting gland, and with muscles capable of pressing the secretion from the gland into the spur; but as the animal has never been observed to use this in defending itself, the spur probably serves some other purpose than that of offence or defence, It is a nocturnal or crepuscular animal, generally sleeping during the day, but showing considerable activity by night. When attacked it seeks to escape either by rolling itself, into a ball, its erect spines proving a formidable barrier to its capture, or by burrowing into the sand, which its power- ful limbs enable it to do with great celerity. “ The only mode of carrying the creature,” says Bennet (Gatherings of a Naturalist in Australasia) “ is i; one

of the hind legs, when it may be removed to any place with great facility, for an attempt to seize it by any other part of the body, from its powerful resistance and the sharpness of tlie spines, will soon oblige the captor to relinquish his hold.” They are exceedingly restless in confinement, and constantly endeavour by burrowing to effect their escape. From the quantity of sand and mud always found in the alimentary canal of the echidna, it is supposed that these ingredients must be necessary to the proper digestion of its insect food. The only other members of this family are the Short-spined Echidna (Hehidna setosa), confined to Tasmania, and differ- ing from the former species chiefly in the shortness of its spines, which are nearly hidden by the long harsh fur, and the Echidna Bruijniima new species discovered in 1877 in the mountains on the north-east coast of New Guinea, at an elevation of 3500 feet. By many naturalists the generic term Echidna has lately been abandoned in favour

| of Zachyglossus of Illiger,

ECHINODERMATA

‘ ECHINODERMATA (from éyivos, a hedgehog or sea- urchin, and d¢pya, skin), a class of marine animals which constitutes with the class Scolecida the sub-kingdom Annuloida of Huxley, or, according to some authorities, is a distinct sub-kingdom of the Invertebrata. Familiar ex- amples of the Echinodermata are the Sea-urchins, Star- fishes, Feather-stars, and Sea-cucumbers of the coasts of Britain. The characteristics of the group may be briefly summarized thus. The adult presents a more or less marked, although never perfect, radial symmetry of parts ; the larva, in most instances, is bilaterally symmetrical. The perisome or dermis develops a calcareous skeleton of numer- ous interlocking plates or of detached plates or spicules. The muscular tissue consists chiefly of unstriped fibres. The intestinal canal terminates in a distinct anal aperture. An aquiferous or ambulacral system of organs, regarded as homologous with the water-vascular system of the Scolecida, is generally present; and there is a nervous system con- sisting of a ganglionated circular or polygonal cord, which surrounds the cesophagus, and sends off branches parallel with and superficial to the ambulacral canals. are in the majority of cases distinct,

and the reproductive organs are generally placed symmetrically with respect to the radially disposed skeleton,

In all Echinodermata of which the life-history has been worked out, the larva, echinopadium, or, as it has been termed by Sir Wyville Thomson, the pseud-embryo, pro= duced from the egg is, with but one or two exceptions, ovoid, free-swimming, and provided with cilia, which become after a time confined to one or more bilaterally symmetrical bands running transversely or obliquely to the long axis of the body, and frequently borne on pro- cesses of the same. In the Asteridea and Holothuridea the larva is vermiform and devoid of skeleton; in the Echinidea, it is pluteiform (Latin, pluteus, a pent-house, or breast-work), and has a continuous calcareous skeleton,. passing into and affording support to the body pro- cesses. A stomach, with an cesophagus and intestine, which make with each other an angle open towards the ventral side of the body, is early developed in the Echinoderm larva. The peritoneal cavity and ambula- cral system of vessels are developed from diverticula of the alimentary canal. A tube formed by an involution of the integument of the pseud-embryo ta one side of the dorsal line may remain connected with the ambu- lacral system of the adult as the madreporic canal. “In the Echinidea, Asteridea, Ophiuridea, and Crinoidea the body-wall of the adult is formed from the blastema; the larval body, more or less of the intestine, and, when present, the skeleton are cast off or absorbed into the new organism, and another mouth appears in the centre of the circular vessel. It is by this peculiar metagenetic mode of development of the Echinoderm within its larva that the class Echinodermata is specially allied to the orders Z’urbel- laria and Teniada of the class Scolecida,

The Echinodermata may be divided into the following orders :—(I.) Hchinidea, or Sea-urchins ; (IL) Asteridea, or Star-fishes ; (III.) Ophiwridea, or Sand-stars; (IV.) Crinoidea, or Feather-stars ;»(V.) Cystidea ; (VI.) Edrio- asterida ; (VII.) Blastoidea ; (VIII.) Holothuridea, or Sea-slugs. Of these orders V., VI., and VII. have been extinct since the Palzozoic period. By some authorities the Edrioasterida are included with the Cystidea.

Order I.—Ecuiyipza.—The body in the Echinidea is spheroidal, oval, discoid, or heart-shaped, and the shell, test, or perisome bears numerous

spines. A common European type of the group is the species Psammechinus (Echinus, L.) esculentus (see fig. 1). In certain forms (Scutellide) the test 4s perforated by slit-like apertures, and curiously lobed or digitate (fig. 2). With few exceptions the test is a rigid

The sexes |

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structure of numerous plates united by their edges. In the Lchinothuride, however (Calveria, Phormosoma, and the ex-

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Fria. 1.—Psammechinus esculentus.

tinct Hchinothuria and Lepidocentrus), and also in the Palw- ozoic genera Archeocidaris, Lepidesthes, and Lepidech inus, the plates of the corona overlap, so as to resemble the per istu- mial plates of Crdaris. The plates are composed of a dense calcareous network, consisting chief- ly of calcium carbonate.

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with an epidermis, and is produced mainly by calcification of the meso- derm, it is to be re- garded as an internal shell or endo-skeleton. In the typical recent echini the walls of the corona or main body of the shell, when freed from spines, are seen to consist of five zones or areas, the ambulacra (Latin, ambulacrum, a walk), composed of double rows of pentagonal plates, and alternating with five other double rows, the interambulacra. In the Palzeozoic forms, which con- stitute the sub- order Perischoe- chinideof M‘Coy,

Fig, 2.—Rotula augusti.

Fic. 8.—Echinus gracilis.

the interambula- a, ambulacral plates; 0, poriferous zone; ¢, inter- erum is made up ambulacral plates. (After Agassiz.)

of more than twa rows of plates, of which the intermediate and gentral are hexagonal in form (see figs. 3and4). In the

Fia. 4.—Stomechinus intermedius. a, portion of ambulacral area; 8, poriferous zones; 6, two interambulacral

plates; d, primary tubercles. (After Wright.)

genera Melonites and Oligoporus there are extra ambulacral as well as interambulacral plates. The ambulacra, which

are usually narrower than the interambulacra, have near their outer edge small shield-like spaces, wmbones, bounded by a more or less elevated wall, and perforated by pairs of small orifices or pores for the protrusion of the feet or pedicels, each pair of pores corresponding to one of the pore plates—the primitive ossicles which commonly unite to form the ambulacral plates. The ambulacra are either homogeneous, z.¢., composed of similar elements gradually diminishing in size towards the poles of the test, or (as in the Spatangoida and most of the Clypeastroida) are hetero-geneous, having the upper portion petaloid in shape, and the lower with pores scattered in areas not always confined to the ambulacral plates, or arranged in ramifying fasciz. In the Spatangoida the anterior unpaired ambulacrunt is commonly obsolete (see fig. 5). In the Oolitic genus

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Fic. 5,—Spatangus purpureus,

Dysaster, the two postero-lateral ambulacra, forming the biwium, are separate from the rest, and converge over the anal opening; while the three anterior, the trivium, uhite at the apical disk (see fig. 8). The growth of the urchin in length is effected by the formation of new plates at the apical end of the corona, and in breadth by additions to the margins of the plates. On the surface of the plates are tubercles of different sizes, each with a knob or elevation, sometimes crenulated, by which the acetabulum of the spine is attached (see figs. 4 and 5). The presenceor absence in the tubercle of a central perforation for the passage of a ligament for the spine is an important dis- tinguishing character in various groups of fossil echini. The spines in the young state are ciliated; like the plates of the test theyare composed of a calcareous network, and are inter- penetrated and covered by the perisome, which contains the muscular fibres by which they are moved. They are short in the Clypeastroida and Spatangoida, and of various lengths in the Hchinoida, and offer a considerable diversity of form and ornamentation. Dr Gray (Ann. of Nat. Hist., i. p. 414) mentions the

discovery in Sicily of the fragment of a spine of an echinus, the circumference of which was nearly 14 inches, and the length more than 8 inches. In Porocidaris purpu- rata, a deep-sea form, the spines are | paddle-shaped, and very flat, and are serrate on the edges; in Cwlopleurus the long curved spines resemble the antenne of certain beetles, Scattered over the surface of the test, and more especially on the oral membrane, are the Piteusazaitn we pedicellariz, generally regarded as Pecu- open; b, closed. (After liarly modified spines ; these, when well ean

developed (fig. 6), consist of a long flexible stem, fur-

Fig. 6.—Pedicellaria of

ing the apical ends of the ambu-

nished at the summit with a forceps of three pincers or prongs, which snap together, and seize firm hold of any object that comes in their way. They serve for the removal from the neighbourhood of the shell of dirt of all kinds, aud apparently also for defence. Calveria Jenestrata has pedicellariz with four valves. In some Spatangoid genera the corona bears symmetrical bands of minute tubercles with attached spines, the semite or Jas- cioles, distinguished, according to their position with re spect to the anus or to the apical or the marginal termi- nations of the petaloid ambulacra, as sub-anai, curcum-anal, intrapetalous, and peripetalous. The spines of the semite have a thick integumentary covering, and except at the enlarged apex, are closely studded with cilia. Lovén hag shown the occurrence, in all Echinidea but Ctdaris, of another kind of appendages of the test, possibly sensory organs, to which he has given the name of spheridia, These are button-like, spheroidal bodies, seldom above 545th inch in length, furnished with a short stalk, and noimally articulated with small projecting tubercles on the plates of the ambulacra and peristome. Sometimes they become concealed by a layer of the test, in which there remains only a fine external fissure. At the summit or apical pole of the test isa space occupied by the ocular and genital plates, which in the Hchinoida (Endocyclica) encircle the anus with its anal plates. The five genital plates, which are opposite the interambulacra, or interradial in position, are perforated by apertures for the

exit of the reproductive products. In the Clypeastroida and Spatangoida (Exo- cyclica), in which the anus is eccentric, and exterior to the apical disk, one of the genital plates is usually imperforate (fig. 7). The five ocular plates are situated radially, crown-

lacra; on the surface of each is a depression, having a pore for an ocellus or eye-spot. Always, except in the Clypeastride, the right antero-lateral genital plate, or, in other words, that situated to the right of the anterior anibu- lacrum of the trivium, is larger than the others, and bears the convex, perforated madreporic tubercle or madreporite. In the Clypeastroida this is most fre- quently extended over the other apical plates. The hinder genital plate, with apparently one exception, is wanting in the Spatangida, its place being occupied by the madreporite. The Paleozic Echinidea differ from the more modern forms by the greater number of perforations of their ocular and genital plates. At the base of the test is the mouth with its buccal membrane and plates. The species Leskia mirabilis (the type of the sub- family Leskiade, family Spatangide) has both mouth and anus closed by converging triangular valves. In the Hchinowda and Clypeastroida the mouth is central in position, and pro- vided with teeth; in the Spatangoida it is eccentric and edentulous. The teeth resemble those of Rodents in form, and are arranged in hard wedge-shaped sockets or alveolt, which by their union form a pentagonal cone. As the outer substance of the tooth is harder than the inner, it is less readily worn away, and thus always presents a sharp edge. Each alveolus is composed of two halves united in the middle line, and each half, again, consists of a superior and inferior portion. The alveoli are inter-radial in position, or opposite the interambulacra. They are connected by transverse muscular fibres, and alternate with superiorly placed, thickish, radial structures, the rotul@ or falces, which, in the Hchinoida, bear each a bifurcated piece, the radws. This skeletal niouth- apparatus is commonly known as

Fia. 7.—Echinocyamus pu- sillus.

Upper surface (a), showing four genital pores, and lower surface (6), with anus half-way between mouth and posterior border.

ECHINODER MATS

“ Aristotle’s lantern.” The calcified internal arched pro- cesses termed auricule, at the oral end of the ambulacra in the ELchinoida (of the interambulacra in Cidaris), regarded as homologous with the internal ambulacral ossicles of the Asteridea and Ophiuridea, are formed each of two pieces. From the top of the auriculz pass retractor muscles to the outer edge of the alveoli. The oral skeleton is provided also with protractors proceeding from the alveoli to the lower interambulacral edge of the corona, besides special muscles connected with the radii. In the Clypeastroida arched (in C’daris unarched) processes are given off from the ambulacral plates, at the sides of the ambulacral canals ; and in the Clypeastroid genus Scutella the dorsal and ventral walls of the corona are connected by vertical calcareous plates or trabeculae. None of the above-mentioned internal calcareous processes is developed in the Spatangorda. The mouth communicates by a tortuous cesophagus with the stomach. The intestine forms a sort of festoon on the inner side of the shell, and is attached to it by a mesentery.

Of the internal organs of the Echinidea the most import- ant and characteristic are those constituting the ambulacral system. These are (1) a circular or slightly pentagonal vessel placed around and traversed by the cesophagus, on the inside of the alveoli, and between the nervous and blood-vascular rings ; (2) cacal appendages of this vessel, called Polian vesicles (absent in the Clypeastroida and Spatangoida), answering to the racemose appendages of the Holothuridea ; (3) the membranous or calcareous madreporic canal, termed also the sand-canal, which runs nearly vertically through the axis of the body, and, communicating with the exterior by the madreporic tubercle, supplies water to 1; (4) vessels radiating from 1 along the parietes of the body, and opening eventually into basal sacs, or ampulle, proceeding from the canals of the pedicels shortly above their origin. Tn the vessels of the ambulacral system is contained a watery fluid strained from the perivisceral cavity. The pedicels, which may vary considerably in shape, are tubular structures, usually terminated by a sucking-disk ; they have contractile, muscular walls, and are capable of being protruded beyond the extremities of the spines. They subserve locomotor, tactile, or branchial functions. The corpusculated perivisceral fluid is kept in motion by the cilia clothing the lining membrane of the ‘body and the viscera, Where modified pedicels or ambulacral gills are

absent, as in the Lichinoida, the Cidaride excepted, aeration of that fluid is apparently promoted by branchial develop- ments from the peristome, the hollow stems of which com- Municate with the body-cavity. The nervous system con- sists of a slender, pentagonal, red or violet hoop around the gullet, superficial to the circular ambulacral vessel, with five ganglia sending off as many cords, which, passing out between the alveoli, take a course similar to that of the ambulacral radial canals, giving off fine side branches which pass in their course through the ambulacral pores, pro- bably supplying the pedicels, spines, and pedicellarice, and terminate eventually in the pigmented eye-spots. Principal vessels of the pseud-hemal or blood-vascular system of the Echinidea appear to be two trunks, the one on the dorsal, the other on the ventral side of the alimentary canal; these, according to Hoffmann, com- municate either directly or by a distinct trunk with the Wwater-vascular ring.

From an examination of Echinus sphera, Psammechinus miliaris, Loxopneustes lividus,' and Amphidetus cordatus, Perrier deter- Mined that, as maintained by Hoffmann, the circulatory and aqui- sous systems are identical; that the so-called "heart" is only a gland, which opens by a canal into a funnel-shaped space bounded

by the lining membrane of the test and the madreporite'; that the |

Fal proceeding from the water-vascular 'ring is distributed upon e first loop of the intestine, forming there ramifications which

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unite with those of the intestinal vein; and that the vein has no communication with the water-vascular ring, but is connected by ten branches and by its two extremities with a collateral canal, which floats freely in the perivisceral cavity beneath the intestine. Further, he found that the ambulacral vessels and their branches terminate blindly, the circulation consisting simply in a to-and-fro movement of their contents.

The reproductive organs are large racemose glands, situated beneath the upper termination of the inter- ambulacra, and opening externally by the genital pores. The sexes are distinct. The spermatozoa have vibratile filaments ; the egg is fecundated after leaving the body of the female, and in about eight hours undergoes complete yelk-division.

The pseud-embryo or echinopedium, at first ciliated and spheroidal, becomes after a time wedge-shaped; at its broad end appears the mouth or pscudostome, and at the other the anus or pseudoproct. Simultaneously with these the skeletal rods and ciliated bands of the pluteus begin to be produced. The develop- ment of the ambulacral system commences with the formation of a sac which lies to the left of the junction of the psend-embryonic gullet and stomach, and is prolonged into a canal opening by a pore on the dorsal surface of the larva. The blind end of the sac becomes a quinque-petaloid rosette, from which radiate the ambu- lacral vessels; a new mouth is formed in the centre of this, at the bottom of a depression in the integument of the pseud-embryo, and the canal of the sac becomes the madreporic tube. The skele- ton of the pluteus separates, as development proceeds, into several pieces, and is by degrees discarded, whilst its processes atrophy, and the body assumes the rounded form of the embryo urchin. This, however, has in many cases to undergo sundry important changes before its resemblance to the adult is complete. Thus in the young of species of Spatangus the peristome is almost central, and is pentagonal in form. In the Echinoida, before the appearance of the anus in the embryo, its place is ocenpied by a single plate, the sub-anal, and the anus appears near its border, towards the posterior right ambulacrum. It lies within a circle formed by five imperforate pieces, the future genital plates, and these again ate surrounded by five imperforate ocular plates, with intervening ambulacral plates. The central anal aoe persists in the family Salenide among the Echinoida. If it be considered as homologous with the dorso-central plate of Marsupites, or the basalia of the calyx in other Crinoids, the genital plates correspond to the parabasalia, and the ocular to the first radialia.

The food of the Echinidea consists either of seaweed, and‘ small shell-fish and crustaceans, which are conveyed to the mouth by the pedicels, or, as in the case of the edentulous forms, of sand aud earth containing nutritive

material. In the species Anochanus sinen- sis, one of the Cassidulide, Grube discovered the presence of an incu- batory chamber at the apical pole of the test, containing embryos in various stages of their growth. Certain species, as observed by Cail- liaud, Deshayes, and Lory, have the power at a very early age of drill- ing for themselves burrows in the hardest rocks, such as granite and

it,

- anidsen is made to the echinus in the writings of Aristophanes, Horace, Martial, and other classical authors. ‘By the ancients it was considered a delicacy, and the common species Psammechinus (Echinus, L.) esculentus, Ag., especially in spring, when the ova are matured, is still eaten in some parts of Europe. Sir Robert Browne, in his Vulgar Errors, mentions a notion formerly current that the spines of the echinus were a remedy for the stone, and “films in horses’ eyes.” They are put to practical use in some countries as slate-pencils. ;

Various systems of classification have been adopted for the Echinidea. In the following scheme the principal groups are arranged chiefly according to the position of the anal opening and the nature of the ambulacra.

Sub-order I.—TxEsseLATA. Echinidea with interambulacra of more than two rows of plates.

Sub-order I].—Tyrica. Echinidea with interambulacra of but two

rows of plates.

Group I.—RecuLarta or EnNpocycrica. Mouth central or sub- central ; anus usually central and opposite the mouth, and never exterior to apical disk.

A. Anus central. i. Shell round.

Cidaride. Tubercles smooth, perforate, peristome unnotched; anal plates ten; auricule inclosed; bniecal branchiz absent.

Diadematide. Tubercles crenulate, perforate, peri- stome notehed, spines hollow. Allied forms are the fossil Hemicidaride, La 2

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Arbaciade. Tubercles smooth, imperforate; four large anal plates ; auricule closed.

Fchinide, Tubercles imperforate, or perforate and crenulate ; anal plates numerous ; pairs of pores in ranks of three, four, or more.

ii. Shell oval or elliptical. Echinometride. Pores in ranks of five or six pairs. B, Anus eccentric through intervention of one or several super- numerary apical plates.

Salenide. All fossil forms, with exception of Salenta

rarispina.

Group II.—IRREGULARIA or Exocyciica. Anus eccentric, not within the apical disk. A. Ambulacra simple, not petaloid.

Galeritide. Mouth central; shell globular or sub- pentagonal ; a single apex at which the ambulacra converge, }

Dysasteride. Mouth eccentric ; shell ovoid or heart- shaped; two apices, at which the bivium and trivium respectively converge.

B. Ambulacra more or less petaloid. i. Dental apparatus present.

Clypeastride. Shell more or less flattened, sub-penta-

onal.

Scutellide. Shell depressed, discoidal, often digitate or perforated; lower surface with ramifying grooves.

ii. Dental apparatus absent.

Cassidulide. Mouth central or nearly so; peristome sub-pentagonal.

: Spatangide. Mouth eccentric, transverse or reniform. To the group Regularia must be added the Cretaceous and Recent family of Echinothuridw. The Echinidea are represented in Palzo-

(2 in fig. 8), Melonites, Oligoporus, and Lepidesthes (see Quart Jour. Geol. Soc., xxx. 807). The Echinide and Dysasteride occur first in the Trias, and are represented by numerous species in Mesozoic strata; the Salenide, Galeritide, and Cassidulide make their earliest appearance in rocks of Jurassic, and the Spa. tangide, including the sub-family Ananchytide, in rocks of Cre. taceous age. The accompanying figures represent fossil forms of Echinidea characteristic of various strata. Some account of the distribution in space of the Echinidea, together with that of other classes of the Echinodermata, will be found at page 278 of the present volume. See also Sir Wyville Thomson, Proc. Koy. Soc., xx. 1879,

Order JI.—AsrertpEa.—The Asteridea, or Star-fishes have mostly a star-shaped body, composed of a central disk and five or more rays. The common British species of Solaster, S. papposus (fig. 10), has ordinarily 13 rays;

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Fia. 10.—Solaster papposus (upper surface),

S. helianthoides, a South American species, has as many as 34, the extinct S. Moretoni of the Great Oolite had 33, and another fossil species, of Devonian age, [Helianthaster Rhenanus, had 16 rays. The rays are sometimes very short (fig. 11), or altogether wanting, the body having

Fic. 8.—Fossil Echinidea.

1. Pulechinus sphericus, Seouler; Carboniferous, Ireland.

2. Avcheocidaris Urii, Flem. (spine and intermediate plate); Carboni-Jerous, Ireland.

8, Cidaris glandifera, Goldf. (spine); Jura, Mount Carmel.

4. Hemicidaris intermedia, Flem. ; Corallian, Calne.

5. Salenia petalifera, Desm.; U. Greensand, Wilts.

6. Dysaster ringens, Ag ; Inferior Oolite, Dorset.

7. Hemipneustes Greenovii, Forbes; U. Greensand, Blackdown.

&. Catopygus carinatus, Goldf.; UV. Greensand, Wilts.

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Fria. 9.—Fossil Echinidea.

1. Cidaris florigemma, with s ine, a, and single am magnified, 6 (after Wright); Coral Rag. ae 2. Ananchytes ovatus, Lam.; U. Chalk, Europe, 3. Pygaster Semisulcatus, Ph.; Inf. Oolite, Cheltenham. 4. Galerites albogalerus, Lam.; U. Chalk, Kent. 5. Scutella subrotunda; Miocene, Malta.

zoic strata by the Tesselata or Perischoechinide, Palechinus (see 1

in fig. 8), Perischodomus, Lepidechinus, Eocidaris, Archeocidaris

Fia. 11.—Astrogonium phrygianum (upper surface).

the form of a pentagonal disk. In the Brisingide they may attain a Jength of many feet. The perisome I the Asteridea is coriaceous, and consists of an ectoderm with a thin ciliated cuticle, a muscular mesoderm which contains calcareous skeletal plates or ossicula, and an

ECHINODERMATA

internal ciliated epithelium. Studding the perisome are numerous spines, attached to the ossicula on the dorsal surface aud to those bordering the

ambulacral grooves ; sometimes also there are tufts of bristles, the paxille, The pedicellari are attached to the perisome and spines, and are either sessile or provided with short foot-stalks. Ex- cept in one group, they have two blades only, which are moved by divaricator and adductor muscles.

~The lower or oral surface of the star-fish with the ambu- lacra corresponds to the ambulacral, the aboral or ant- ambulacral surface to the interambulacral areas of the echinus. The deep ambulacral grooves which occupy the middleof the lower face of each ray are formed each bya series of plates, the vertebral ossicles, articulated to one another by their inner opposed ends, and united by their lower or outer ends to rows of plates, the adambulacral ossicles, which form the margins of the grooves, and are themselves succeeded by one or more series of marginal ossicles (fig. 12). The outer ends of the innermost pairs of ambulacral ossicles unite round the mouth to form five crests, which bear spines and pedicellariz. On the aboral sur- face of the body are the tergal plates (fig. 13). Transverse muscular fibres unite the lateral halves of the arm-segments ; similar fibres supply the floor of the ambulacral groove; besides' these there are intervertebral Fra. 18.—Tergal skeleton of and interambulacral longitudinal Asterias rubens. muscles. The ambulacral grooves % connecting pieces; 0, spine- are nearly filled with the Scbexfosk a ere or pedicels, which have a nervous external and muscular internal layer, are usually cylindrical in form and furnished with terminal sucking-disks, and communicate by ducts passing through the ambulacral pores with vesicles lying above the .ambulacral ossicles and opening into the ambulacral canal of the ray. In the common star-fish, Asterias (Asteracanthion) rubens the pores form a zig-zag line on each side of the ambulacral groove, and. the pedicels passing through them thus come to be four- rauked (fig. 14). They are formed by notches or semi-

Fia. 12.—Section of ray of Astropecten aurantiacus. a, vertebral ossicles; 6, adambulacral ossicles;

c, d, marginal ossicles; e, paxille. (After Gaudry.)

Fia. 14.—Asterias rubens.

a, 4-ranked pedicels; 6, end of pediccl, magnified.

Pores incised one on the distal and the other on the oral | tion appears to be effected by means of water supplied ‘ — Til — fa

surface of each ambulacral ossicle, and lying alternately external and internal to one another in position on succes- sive ossicles (fig. 15). The mouth, which is devoid of dentary apparatus, is situ- ated in the middle ey of a membranous %% disk in the centre %» of the oral surface. It leads by a short gullet into the stomach. The stomach in most star-fishes is produced into five sac- culated prolongations (cardiac sacs); above these it con- tracts, but again widens to form the pyloric sac, this gives rise to five tubes, which open out in each ray into a pair of parallel diverticula having numerous cecal dila- tations, and connected by a mesentery with the antam- bulacral perisome. The pyloric sac in most cases leads into a short intestine terminating in an anus situated in the left posterior interradial space. In

Fig. 15.—Ossicles of ambulacral groove of Asterias rubens, viewed from above. a, pore for pedicel.

Fria. 16.—Antambulacral surface of Asterias rubens.

a, madreporite; a’, the same magnified; 6, anus. (Ophidiaster, Echinaster)

there are several interradially placed madreporic tubercles. The doubly involuted madre- poric canal is invested by the peritoneal membrane, which incloses a sinus, or “ heart,” as it has been termed; it passes downwards into a pentagonal circum-oral ring which gives off the five radial canals occupying the upper- most part of the ambulacral grooves. The circum-oral ring may or may not possess Polian vesicles, A dorsal or aboral ring has been described as communicating with the “ heart,” and sending off interradial branches to the genital glands, the products of which, in the case of star- fishes devoid of external genital apertures, it has been supposed they are the means of removing. The genital glands are racemose masses placed interradially in pairs; their processes sometimes extend a considerable distance into the arms. The nervous system consists mainly of a circular canal around the gullet, with five ambulacral trunks opening into it at their inner ends. The ambulacral neural trunk in each ray underlies a strong band of transverse fibres, by which it is separated from the am-

bulacral canal above. At the extremity of the ray the nerve terminates in an eye and its tentacle. The eyes are small processes of the ectoderm, having a convex surface or cornea containing a large number of simple, conical, pigmented ocelli. In the peritoneal cavity and ambulacral vessels is a watery fluid containing corpuscles, Respira-

perisome. The dermal skeleton of the arms is constituted

to the interior by fine closed tubuli or dermal branchie usually of a ventral or superambulacral row of plates, a

between the plates of the perisome. In Solaster water can enter the body-cavity by the interbrachial cribriform plates

through which the genital ducts pass,

Among the Asteridea several modes of development have been observed. In some species reproduction appears at times to be effected by division of the rays. The species Pteraster militaris hatches its young in a special pouch on the dorsal surface. The larva on leaving its egg is oval, but subsequently assumes a penta- gonal form, and the provisional mouth comes to be placed at one of the body angles. The central mouth and stomach afterwards developed open into each other at the time that the young star-fish leaves the maternal pouch. In other cases the breeding-chamber may be formed by the bringing together of the bases of the rays, and the ciliated embryo develops at its anterior end club-shaped tubercles, by which it can attach itself to the breeding-cham ber or to submarine objects. Until these processes appear the breeding- chamber remains closed. In general, the larva of the Asteridea begins life as a lobed and ciliated pseud-embryo, a common form of which is the Bipinnaria. Another form, the Brachiolaria, is distinguished principally by three tuberculated processes at the anterior end of the body. The ambulacral vessels of the adult are developed in the pseud-embryo from a portion of one of the diverticula of the stomach in which originate the peritoneal cavity and the whole or great portion of the mesodermic structures,

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Fra. 18.—Ophiopholis bellis, upper surface.

dorsal median or antambulacral row, and two side rows of spinous imbricated plates. More rarely the perisome of the arms is leathery in consistence, and bears small plates, of which the ventral are the largest, aud perforated with a double line of pores. The internal axial skeleton is formed by the vertebral or axial ossicles (fig. 19), the right and left halves of which are united by a longitudinal suture. The axial ossicles are articulated to one another by means of peg-and-socket joints. On the lower surface of each, cor- responding to a depression on_ its dorsal surface, there is a groove for the passage of a radial ambulacral vessel and a nerve. The innermost of , the axial ossicles is in two articulated ° IN, halves, and the neighbouring halves of Fra. 19.— iia out every two arms are connected with a“ >; Ophiolepis, (After couple of interambulacral pieces, with Miiller.)

the inner edges of which is articulated A, adoral surface; B, abe: a single ossicle, the torus angularis. poorest en ‘The last-mentioned bears the papilla _ tacle. angulares, and beneath these the pale angulares, which are short flat processes, moved by muscles, and serving as teeth (see fig. 20). Right and left of the origin of each arm, within the body disk, on the ventral side, is an elongated ussicle, which in the Euryalide unites at the margin of the disk with an arched piece running towards the centre of the dorsal surface. The mouth is in the centre of the ventral face, and at each of its angles is a pair of tentacles. It leads into a simple ; sac-like heii Fig. 20.—Mouth skeleton of Ophioderma

canal, which is without ongicauda. (After — anus. ‘The medreporic 4 ¢ tt sn ae angulariss canal, the walls of groove for nerve-ring; m, peristomial plates; which are strengthened ° P*!® angulares h with calcifications, leads from the surface of one of t : interradially situated scuta buccalia on the ventral side 3 the disk into a circular ambulacral canal, upon which oe ; minute plates, the homologues of the Holothuridean oL careous ring. Opening into the circular ambulacral canal,

and corresponding in position to the madreporic canal, there

The Asteridea are classed by M. Edmond Perrier as follows :-— Diviston I. Pedicellarie pedunculated ; pedicels (except in Labidiaster and Pedicellaster) quadriserial. ASTERIIDZ. Ex. Asterias (Asteracanthion), Heliaster, Calvasterias, Anasterias, Labidiaster, Pedicellaster.

Diviston II. —Pedicellariz sessile ; pedicels ordinarily biserial. i. Dorsal skeleton reticulate. EcuinasTeripa. Ex. Acanthaster, Solaster, Echinaster, Cribrella. i. Dorsal skeleton of longitudinal series of rounded or quad-rangular ossicles ; integument generally granulated. Linck1ava. Ex. Ophidiaster, Linckia, Scytaster. iii. Skeleton, at least of lower surface, of tesselated ossicles ; dorsal and ventral marginal plates very distinct. GONIASTERIDZ. Ex. Pentagonaster, Goniodiscus, Goni- aster, Culcita, Asterodiscus, Choriaster. iv. Skeletal ossicles imbricated; with spines on the free border, or rounded and completely covered with small spines, ASTERINIDA, Ex. Palmipes, Asterina, Nepanthia. . Skeleton of paxille. ASTROPECTINIDA. Ex. Cheetaster, Luidia, Astropecten, Archaster, Ctenodiscus. 1. Dermal investment supported by spines radiating from the prominent skeletal ossicles. PreRASTERIDA. Ex. Pteraster. : i. Arms long, straight, distinct from disk, with minute spines on dorsal surface. BRIsINGIDaA. Ex. Brisinga.

Distribution in time of Asteridea (fig. 17).—The Asteridea are

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represented in the Lower Silurian series of strata by the genera Hdriaster, Pale. aster (ranging to Carboniferous), Stenaster, Teniaster, and Urasterella ; inthe Upper Silurian by Glyptaster, Paleeasterina, Paleocoma, Petraster,

Palmipes, Lepi- daster, and T’rochitaster ; in the Devonian by Aspidosoma, Ptilonaster, Asterias (also in Carboniferous), and Helianth- aster; in the Carboniferous by Schen- aster and Cribellites; by Pleuraster in the Trias; by Yropidaster in the Lias ; and by Astropecten with other still living genera in the Lias and Oolites. The Cretaceous strata are more especially characterized by species of the recent genera Oreaster, Astrogoniuin, Goniodis- cus, and Stellaster.

Order IIZ.—Opuivrrpsza. The 1. Lepidaster Grayi, Forbes: Brittle-starg (fig. 18) have a general U. Silurian, Dudley. ne Tesemblance to the Aste- Z. Ludlow rock, Salop. ridea. The body consists of a central disk with five or more

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prolongations of the stomach, Spines and Bates, en hooks (considered to be the phen tlie of Pedicellarizs of the Asteridea), are developed in the

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are usually four interradially placed Polian vesicles. The necks of the Polian vesicles and the ambulacral ring give off the diverticula termed by Simrock vasa ambulacralia cav. From the ambulacral ring proceed, the five radial canals between the superambulacral plates and the axial ossicles. In front of each ossicle they give off right and left branches to the pedicels. These are tentacle-like, devoid of basal vesicles, and, except in the Zuryalide, pass out through openings between the superambulacral and lateral plates. The nervous system consists of an oral ring, which supplies a branch to each arm, running superficial to its radial ambulacral canal. Between the nerve and the latter isa neural canal. The genital organs are pairs of racemose glands attached to the inner dorsal surface of the disk ; their products are shed into the perivisceral cavity, whence they make their way through the genital clefts between the origins of the arms,

Hermaphrodism has been observed in the species Ophiolepis squa- mata; and in some genera, as Ophiocoma and Ophiactis, scissiparous reproduction occurs. According to Liitken, this at an early age is more especially exhibited by the six-rayed forms. In certain cases development takes place

within the egg, without any free pseud- embryonic stage; but most generally metamorphosis from a pluteiform larva takes place. The bilaterally symmetrical skele- ton of the pluteus consists of eight radially diverging calcareous rods. The development of the embryo commences with the pro- duction of two cylindrical solid bodies, one on each side of the gullet, which form cellular blastemic masses, one behind and another in front of the stomach, and a third to the left of the pseudostome. The ambulacral system of the adult is developed from the last of these, which unites with the mass in front of the stomach to form the ventral portion of the body, whilst the posterior mass furnislies the dorsal portion.

The Ophiuridea may be classified as follows :—

Sub-order I—OPHIURIDA. Arms unbranclied ; ambulacral furrows covered with plates; genital clefts ordinarily five; habit creeping.

A. Oral clefts armed. (i.) No papille angulares.

OPHIODERMATIDZ. Buccal scutes trigonal; disk granulated. Ex. Ophiuwra (Ophioderma), Ophio- cheta, Ophiopsammus.

OPHIOLEPIDZ. Buccal scutes pentagonal; disk scales naked, Ex. Ophiolepis, Ophioceramis, Ophiopus.

AMPHIURIDHZ. Disk rugged and scaly; ray-plates spinous. Kx. Amphiwra, Ophiacantha, Ophiopholis, Ophiostigma, Ophiactis.

OPHIOMYXID&. Disk naked; rays clothed with soft integument. Ex. Ophiomyxa, Ophioscolex,

(ii.) Papille angulares present.

OrHiocomips&. Disk covered with solid plates. Ex. Ophiocoma, Ophiomastix, Ophiarthrum.

B. Oral clefts unarmed.

OPHIOTHRICIDZ. Radial plates very large. Ophiothrix, Ophiocnemis, Ophiogymna.

Sub-order IL—EURYALIDA. Arms simple or ramified, and capable of being rolled up towards the mouth ; ambulacral furrows covered by soft integument. Spines are not present, but there are tufts of papille on the ventral surface of the arms ; genital clefts ten.

ASTROPHYTIDA. Astrophyton, Trichaster, onyx, Asteromorpha, Asteroporpa.

Distribution in time of Ophiuridea.—The following Paleozoic genera are commonly referred to the Ophiuridea :—Protaster (Lower Silurian); Palwodiscus, Acroura, and Eucladia (Upper Silurian); Eugaster (Devonian of New York). Ophiura (?) occurs in the Carboniferous Limestone of Russia. In the Muschelkalk occur Aspidura and Aplocoma, and in higher Secondary strata Ophio- derma, Ophiocoma, Amphiura, and other genera.

The Ophiuridea and Asteridea possess, in a marked degree, the power exhibited by the whole of the Echinodermata of Teproducing lost portions of the body. The former have 1e-

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ceived the name of “Brittle-stars” on account of the remark- –

able facility with which species of the genus Ophiocoma not merely cast away their arms entire, but, at will, rapidly break them into little pieces. The same property has been noticed in the genus Lwidia emong the star-fishes, 1a the Crinoidean genus Comatula, and the Synaptide

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among the Holotburidea, Writing of a species of Luidia, Prof. E. Forbes remarks: “ The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite un-conscious of its suicidal powers, I spread it out on a rowing bench, the better to admire its form and colours. On attempting to remove it for preservation, to my horror and disappointment, I found only an assemblage

of rejected members. My conservative endeavours were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by a diskless arm and an armless disk.” Major Fred. H. Lang relates (Nature, Oct. 12, 1876), that during a dredging expedition in Torbay, presuming on the fact that as a rule he could take up the specimens of Comatula rosacea and Ophiocoma rosula he had captured without occasioning their dis- memberment, he “ put about a hundred of the two sorts into a sponge-bag; but this was asking too much of them;” for on reaching home he found “that both Feather-stars and Brittle-stars had converted themselves into a mass of mince-meat! It would have been difficult to find a single portion of an arm a quarter of an inch long.”

Order I Vi—CrinoipEA.—The body in the Crinoidea is cup-shaped or bursiform, and its base always in the young state and usually in the adult is attached by the apical pole either directly or, as more commonly, by **™ means of a calca-

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dorsal wall of the body or calyx is formed of poly- gonal plates arti- culated by their edges, and the su- perior or ventral face or disk, which may be either flat or arched, is form- ed either by a perisomal mem- brane, occasionally strengthened with scattered calcifica- tions, or, as in the

Tesselata, by regularly arranged plates, tegminalia, resembling those of the inferior wall. At the border of

the calyx are 2-18, usually 5, arms or brachia, which are movable, and can be

closed together over the oral disk (fig. 22). Between them, commonly in the centre of the disk, is the mouth, and near it, in one of the interradial spaces, is the anus.

It has been shown by Sir Wyville Thomson, (Phil. Trans. vol. clv. pt. 2), that the skeleton of Antedon rosaceus may be divided into two systems of plates, the radial and the perisomatic, the former including the articuli of the stem, the centro-dorsal plate, the radial plate, and the joints of the arms and pinnules, and the latter the basal, oral, and anal plates, and the interradial and other | plates or spicule developed in the disk-membrane. ‘“‘ The body of

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Fia. 21.—Pentacrinus caput-Medusz, (After

Guttard.)

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the pentacrinoid is at first, while yet included within the pseud- embyro, and during its earliest fixed stage, surrounded and inclosed by plates of the perisomatic system alone.” The predominance of the perisomatic system in the calyx of the older Crinoids and forms allied to them is hence a fact of considerable interest to the embryo- eke stem is made up of numerous

ossicles articulated and interpenetrated by elastic fibres and soft connective tissue. It is attached at its distal end by a root-like expansion, or by numerous, filamentous, branched cirri, having joints similar to those of the stem. Other and unbranched cirri are attached in whorls to many of the ossicles of the stem, Through the centre of the stem runs a canal containing a soft solid substance. In the adult -Antedon, as has been pointed out by Dr Carpenter (Proc. Roy. Svc., cag 1876), the medullary portion of the ee Crinoidal axis passes up through a Fra. 22.—Cyathocrinus pentangular five-chambered dilatation tuberculatus, (After of its cortical portion within the centro- ©!4fuss.)

dorsal plate, and, reaching the cavity of the calyx, forms the pedicle by which chiefly the basal or dorsal surface of the visceral mass is attached to the calyx. The pedicle enters into the axial canal and passes through out its entire length, more or less imbedded in its walls, to the commencement of the subtentacular canals, where it apparently becomes continuous with the generative plexus of the disk. The stem varies in length, being short in Apiocrinus, long in Pentacrinus , it is round and sometimes moniliform in most Paleozoic Crinoids, but in Platycrinus compressed as it nears the calyx; in Woodocrinus it tapers from the calyx downwards. In the Paleozoic Crinoids the articulations of the ossicles radiate from the central canal, which is larger than in the more modern forms. In the Mesozoic genera the articular facets are commonly united by crescentic or stellate ridges. In the Silurian genus Periechocrinus the ossicles of the stem are alternately thicker and thinner. The calyx, which may be regarded as formed of the uppermost ossicles of the stem, is composed of several series of plates, The lowest of these is commonly formed by 2-6 pieces, the basalia, which in Rhizocrinus appear to be re- presented by a single central plate. The basalia in the Lesselata are succeeded by the parabasalia or sub-radialia ,; after the basalia or these come one or more rows of plates (in Rhuzocrinus three), the radialia (see fig. 23). In Pentacrinus the radialia seem to form the com-

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mencement of the calyx. Supported ze e3 by the radialia are series of arm Esis Plates, or brachialia, from the upper- ¢° 2228 most of which, as in Pentacrinus, Ss

may bifurcate the palmaria. The Fa — al ossicles of the arms are sometimes aR AM, 2 single, sometimes united by syzyqies, tw D> or immovable sutures. In the Silu- af) > GG Gi, rian genera Anthocrinus and Crota- a (TN locrinus the subdivisions of the arms @%Q, are very numerous, and by their lateral Z G articulation form web-like expansions. The arms of Poteriocrinus plicatus Fic. 23.—Dissection of bifurcate 4 times, giving 80 rays; the calyx of Lecanocrinus a number of plates in that species Hall)" em as been estimated at 1300 (see J. – i G. Grenfell, Rep. Brit ang 1876, "central baalin sae oe p. 65). In the calyx of the Tesse. "alias 47, interradiala, lata there are plates, interradialia, present between the radialia, In Antedon the central portion of the viscera ig contained in a basin formed by the Ist, 2d, and 3d radialia, and by the lst and 2d pairs of brachialia, and the basal

ECHINODR RAAT &

segments of the pinnules borne by the second; and the calycine cavity is completed by the perisome uniting the

basal segments of the arms.

Where, as in the Articulata,

represented by the modern Crinoids, the disk is more or less membranous, four or five deep furrows radiate upon its sur- face from the mouth, which pass on to the oral surface of the arms and extend to the extremity of their pinnules, They carry the hollow ambulacral tentacles, which pass

out through pores in the perisome.

In 1865 Mr J.

Rofe demonstrated (Geol. Mag., ii. 245) in the case of seve. ral genera of Tesselate Crinoids from the Mountain Lime- stone (Actinocrinus, Amphoracrinus, Cyathocrinus, and Platycrinus) that the groove on the upper surface of the

| arms divides at their base into two channels— (1) a superior

channel passing up beneath (in some cases partly within) the plates of the dome or disk to its apex, and there uniting with an internal circular aperture, probably the mouth; and (2) an inferior channel which goes direct into the visceral cavity. These channels, since their discovery by Mr Rofe, have been shown to be generally present in the Tesselate Crinoids. The superior channels, on the supposi- tion that the central opening is a mouth, doubtless served for the supply of food and of water for respiration 3; whilst the inferior channels probably gave passage to the motor muscles of the arms, and placed the visceral cavity in con- nection with the ovaries, if the latter, as in modem

Crinoids, were situated in the arms.

In the Paleozoic

genus Hhodocrinus the arm is cylindrical, and without a groove on the upper surface, but immediately below its

upwards under the dome.

| base is situated the orifice of a passage which turns What in the Paleozoic Crinoids

is commonly regarded as the anal opening, is situated at the extremity of a proboscidiform tube (fig. 24) inter- radially placed, and often of great length—as much as 4} inches in Poteriocrinus plicatus. In existing Crinoids there

are two apertures in the disk—the mouth, usually central, as in Lhzzo- erimus, and the interradially situated anus. The mouth is closed by lobes of the perisome, the oral valves, which may contain calcareous plates.

Between these run the oral or ainbulacral grooves from the mouth to the arms. In Antedon (Comatula) the alimentary canal passes obliquely downwards from the mouth, then horizontally, and after more than a complete turn bends up- wards again, and ends in a rectal cham- ber terminating in a spout-like promi- nence. Between the exterior of the mucous wall of the alimentary canal and its peritoneal covering is the in- tramural space. The double wall of the canal is strengthened by calcareous disks; and it is bythe folding of the inner side of the wall, and the resultant piling

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together of layers of these plates that Fra. 24. —Dendrocn- the vertical columella is produced. The ™S a

body cavity is lined by a smooth 4: calyxs B, proboscis peritoneal membrane. The ambulacral furrows are bordered by plates, the ambulacral or marginal lamella, as in Rhizocrinus and Pentacrinus, or, as in Antedon, by elevated ridges of the perisome, produced at the edge into a series of small lobes or valvules, and having grouped on their inner side the pedicels, The epithelial floor of the grooves, there is good reason to believe, is lined with cilia, which, like those of the gullet, serve to create currents in the water

and thus to bring into the mouth Diatomacez, spores of

Algz, minute Entomostraca, and other nutritive material. In .Antedon, as has been: shown by Dr Carpenter

ECHINODERMATA

(fig. 25), the tentacles communicate at their bases with a common trunk, the tentacular canal. Beneath this, but having no communication with it, lies the subtentacular canal, which is usually divided by a more or less incomplete septum. Each of the subtentacular canals is con- tinuous with a branch of the arial canal, which communicates with the deeper portion of the perivisceral cavity by means of a minute pore situated nearly at the centre of the lower surface of the visceral mass, and partly occupied by the pedicel before referred to. As the axial canal ex- tends downward through the visceral mass it comes into contiguity with the pyq. 95. — section of alimentary canal, and opens into it by arm of Antedon rosa- irregular passages. There is in the any (After Carpen- as * third canal, the coeliac, which te, i canal, giving is a continuation of the body-cavity ‘ofr interal

branches to or coelom, and is separated from the, [he srecular (sensory ?) subteutacular canal by a transverse subtentacular canals; gr, partition, At the junction of this Sina; m, muscess am partition with the septum of the sub- eee tentacular canal there is a passage, cord from quinquelocular the genital canal, in which lies the °8

cellular cord known as the generative rachis, in connection with the visceral genital tissue. Enlargements of the rachis in the pinnules constitute the genital glands of the Crinoidea, the products of which may or may not be dis- charged by special orifices. Towards the extremity of the pinnules, in Antedon, the partition between the coeliac and subtentacular canals thins away, and becomes finally obso- lete, thus possibly affording a means for the circulation of the nutritive fluid of the body, the subtentacular canals constituting an arterial or distributive and the coeliac a venous or collective system of vessels.

From the arms the tentacular canals proceed inwards to unite with a circular canal situated around the gullet, and having connected with it numerous short processes similar to the vasa ambulacralia cavi of the Ophiuridea (see page 635). There is no madreporic tubercle, and the madreporic canal is apparently unrepresented in the Cri- noidea. Respiration seenis to be effected by the tentacles, and in Comatula also by the access of water through pores in the oral perisome, communicating with a series of sinuses below its under surface by means of funnel-shaped canals, The central organ of the nervous system in Aztedon, accord- ing to Carpenter, is the dilated cortical portion of the axis of the stem within the centro-dorsal plate, which supplies branches to the cirri and the arms, and corresponds pro- bably with the axial sheath which, in Pentacrinus, sends off cords at the nodes of the stem into the whorls of cirri (see fig. 21). A fibrillar band underlying the epithelial floor of the brachial furrows is regarded by Ludwig as a nerve -—“‘an afferent rather than a motor nerve” (Carpenter).

The development commences with the formation from the egg of an oval morula, which acquires four hoop-like ciliated bands, and a posterior terminal tuft of cilia. An endadermal sac or archenteron tesults from an invagination of the blastoderm between the third and fourth ciliated bands ; and from this three diverticula, two lateral and one ventral, take their rise,

the remainder of the archenteron becoming an alimentary cavity communicating with an anterior

esophagus. ‘The lateral diverticula are transformed into peritoneal sac8, One on the dorsal the other on the ventral side of the alimen-

tary cavity, and their walls coming in contact produce a circular |

mesentery. In the ventral diverticulum the ambulacral vessels have their origin. Around the alimentary cavity, when the Pseud-embryo is scarcely a line in length, there are formed two areles, each of five calcareous plates, which eventually become the oral and basal ossicles of the calyx. From the centre of the posterior circle extends a row of eight calcareous rings, the future stem of the Crinoid, surrounding a backward prolongation of the dorsal

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peritoneal sac. At the posterior extremity of the row is a cribriform disk, by,which the young Crinoid subsequently attaches itself. The sarcodie body of the pseud-embryo begins to shrink, the pseudostome vin – two lower bands of 49 cilia disappear, and afterwards iG the two ae bands, and the hor i embryo then becomes fixed to –

a stone, seaweed, or some other object. A new mouth is formed in the centre of the disk by the separation of the oral plates, and the intestine by the production of a diver- ticulum of the alimentary cavity. In the early Pentacri- noid stage of Comatula the basals rest upon the centro- dorsal segment, but become at length metamorphosed into a single piece, the rosette; and the centro-dorsal segment by degrees increasing in size, the first radials come to rest upon its enfolded lip. During the same period, after the forma- tion of an anus, the oral and basal plates disappear. The development of the dorsal cirri takes place as the proximal joint of the column enlarges Lge ba — Te Fig. 26.—Pentacrinoid larval forms of six months, when about 4 an Comatula, natural size and magni- inch in diameter, the young fied.

Comatula detaches itself from its stalk, and is then able to swim by means of its arms. The Pentacrinoid larval form'of Comatula (fig. 26), previous to his discovery of the ultimate stages of its growth, had been termed by Vaughan Thompson Pentacrinus europoeus.

The Crinoidea are classified as follows :—

Order I. TussenaTa. Calyx completely formed of calcareous plates, oral face without ambulacral furrows.

Family. Tesselata. Ex. Oyathocrinus, Actinocrinus.

Order II. ArticuLATA. Oral face of calyx usually membranous or sub-membranous, with ambulacral furrows,

Family 1. Pentacrinide. Always attached. Ex. Pentacrinus, Rhizocrinus.

Family 2. Comatulide. Attached only in the young state. Ex. Antedon, Phanogenia. The Cretaceous genus Marsupites appears to have been unattached.

The Crinoidea are represented by Glyptocrinus, Eucalyptocrinus, Marsupiocrinus, Taxocrinus, Ichthyocrinus, Periechocrinus, Cupres-socrinus, Poterigcrinus, Woodgcrinus, Cyathocrinus, Rhodocrinus,

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Fic. 27.—Fossil Crinoidea.

Crotalocrinus rugosus, MilL; U. Silurian, Dudley. Poteriocrinus (joint of column); Carboniferous, Yorkshire. Encrinus entrocha; LZ. Muschelkalk, Germany.

Apiocrinus Parkinsoni, Mill.; Bradford Clay.

Pentacrinus basaltiformis, Mill.; Zéas, Lyme.

Marsupites ornatus, Mill.; Chalk, Sussex.

Comatula Glenotremites (upper surface of body).

Comatula (lewer surface); Chalk, Sussex. As P Eugeniacrinus quinquedactylus, Schl.; Ozxfordian, Wiirtemberg. Bourgueticrinus ellipticus, Mill.; Chalk, Kent.

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and numerous other genera in Paleozoic strata, where their remains, especially in the Carboniferous series, are often the chief constituents of vast masses of compact limestone.!' From their form the insulated articuli of the stem have come to be known as entrochi, screw- stones, or whcel-stones, and in the north of England, as "' St Cuth-

1 On Crinoidal Limestone, see J. Rofe, F.G.8., Geol, Mag., x. p. 262,

bert's beads." Among the various forms by which the Crinoidea were represented during the Mesozoic period, towards the close of which they diminished materially in number, are Hnerinus (Muschelkalk); Hxtracrinus, Pentacrinus (Lias) ; Comatulidea (Rhetic); Apiocrinus, Miullerierinus, Hugeniacrinus, and such forms as Saccosoma and Pterocoma, related to Comatula (Jurassic) ; and Bourgucticrinus, Marsupites, and (?) Comatulide (Chalk). The Tertiary genera are but few. They include Bourgueticrinus and Cainocrinus (London Clay), and Comatula (Coralline Crag.). Pen- tacrinus, Rhizocrinus (allied to Apiocrinus and Bourgueticrinus) and the related forms Bathycrinus and Hyocrinus, the sessile genus Holopus, Actinometra, and Comatula are living forms.

Order V.—Cystipea.—The body in the Cystidea is in most cases rounded, and is covered with polygonal plates; it is attached by a stem, and may be provided with arms or pinnules developed from the upper or oral surface. The stem is short, usually similar to that of the Crinoidea in construction, but with- out cirri; the joints are rounded, and sometimes moniliform, and usually become broader but thinner towards the base of the body. In Ateleocystites (see H. Woodward, SSy ane Geol. Mag. 1871, p. 71) the calyx is com- S=3S8 pressed laterally, and shows sculpturing similar to that

of the plates of the peduncu- lated Cirripedia. The plates of the calyx are pentagonal, hexagonal, or imperfectly triangular, and are closely united together ; they vary in number, and in Spheeronites (1 in fig. 28) are very numerous. In Cryp- tocrinus the calyx is composed of three rows

Fia. 28.

: ‘ Cystidea. of plates, which may be regarded as basalia, 1. spheronites aur-

parabasalia, and radialia. According to antium, Wahl; Z. 2 Silurian, Sweden.

Professor E, Forbes (Mem. of the Geolog. 2. Pseudocrinus bi- Survey of Great Britain, 1848, vol. ii. part F*Sian Ded: 2), the following series of plates may be ley. generally distinguished :—a basal series; subovarian, centro- lateral, and supra-ovarian series on a plane below, on the same plane with, and ona plane above the ovarian pyramid respectively; ci7ca-ovarian . plates or ossicles, encir- cling that structure; and rw oral plates, immediately ~~ surrounding the mouth, which vary considerably in number(fig.29). The plates are frequently. (7\ ornamented with grooves and tubercles. Arms aud pinnules are not uni- versal. In Comarocystites punctatus, Billings, hs the Fie. 29, — Echinoencrinus armatus ; arms are free; sometimes dissection and projection of plates. they are wanting, and the (After Forbes.) pinnules are attached to a basal ; ee subovarian i 10-14, centro- E ateral; 15-19. supra-ovarian; c¢, genital the upper portion of the pyramid and plates. Plates i, 5, 14, and calyx, Comm only the 45 bear semi-rhombs. arms resemble ambulacra, and are reflected towards the base of the calyx, and closely applied to its surface. Pores on the antambulacral surface may be absent (C’ryptocrinus), irregularly scattered (Caryocrinus), in pairs (Spheronites), or, as in Pseudocrinus (2 in fig. 28), Hchinoencrinus, and other genera, slit-like, and arranged to form “ pectinated thombs,” or ‘ hydrospires,” the two halves of each rhomb being on separate plates.

_ In Caryocrinus ornatus there are thirty pectinated rhombs, con- sisting each of a number of parallel internal flat tubes communicat- ing at both ends with pores opening internally. The rhombs in Plewrocystites are not tubular as in Caryocrinus, but are made up of numerous parallel inward folds of an exceedingly thin part of

the test. Again in Paleocystites tenuiradiatus the whole surface bears rhombs, which, when uninjured, have a complete though very

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thin calcareous covering, and communicate by a small pore at their base with the body-cavity. (See Billings, dnn. and Mag. of Nat. Hist. 1870, p. 259-61.)

What is usually regarded as the mouth is situated in the centre of the ventral surface of the calyx, opposite the point of attachment of the stem, and from it radiate the furrows for the arms, when those appendages are present, It is apparently small and circular in Spheronites,; in Caryocystites it is transversely elongated and lobed; in Hemicosmites elevated on a proboscis; in Echinoencrinus usually longitudinal and bordered by peculiar plates. A small perforation alongside the mouth, considered to be the anus, is generally present. It has sometimes, as in Lichinoencrinus (fig. 30) and Apiocystites, the form of “an

(After Forbes.)

Fic. 30.—Echinoencrinus armatus. a, mouth ; }, anal aperture ; and ¢, ovarian pyramid of the same, enlarged,

arched or crescentic groove terminating apparently at each end with a pore, and having united with it, or placed a little below it, an orifice in the middle line of a suture, as if in the junction of two oral plates ” (Forbes). Almost invari- ably, on the oral portion of the body, interradially placed, is a round or aval aperture covered by a pyramid of 5 or 6 triangular valves. This in the opinion of most authorities is probably the ovarial orifice ; but according to Mr Billings it is an oro-anal aperture, the central opening or mouth ahove mentioned being an “ambulacral orifice.” Cystidea first occur in strata of Cambrian age. They especially cliaracterize the Lower and Upper Silurian series of rocks, and apparently died out in the Carboniferous epoch.

Order VI.—EDRIOASTERIDA.—Under this head are grouped such forms as Jdrioaster, Agelacrinites, and Hemicystites. The shape is that of a

rounded star-fish or flattened echinus with a concave base. ‘There is an ovariau pyramid, but stem and arms are wanting, and the ambulacra communicate by perforations with the calycine cavity. The Edrioasterida are exclusively Paleozoic. Their nearest living ally is the Australian species Hyponome Sarsu, Lov., which approaches Agelacrinites in form.

Order VII.—BuastowEa.—In this group of fossil Echinoderms the bud-shaped or prismatic, armless, and closely plated calyx is supported on a short, jointed stem. Of the three basal plates in Pentremites two are double ; succeeding the basals is a row of five pieces, and into the deep clefts of the upper portion of these fit the lower ends or apices of the ambulacra; a third series of five small, deltoid, inter- radial plates occupy the spaces between the oral portions of the ambulacra. The ambulacra, or “ pseudambulacral areas,” present a superior surface formed by a double series of ossicles running from a median line to the border, where they support pinnules; beneath the ossicles is usually 4 lanceolate plate formed in many if not all species of Pentre- mites of two contiguous plates, and edged by a simple row of trausverse pieces, which are pierced with marginal pores.

Each row of pores opens below into one or more flat canals, or, according to the definition of Billings (Am. and Mag. of Nat. Hist., vol. v. 4th ser. p. 263), mto 4 “ hydrospire ” consisting of “an elongated internal sac, one side of which is attached to the inside of the shell [or

Fra. 81. Pentre- mites florealis.

test], while the side opposite, or towards the central axis of

the visceral cavity, is more or less deeply folded longi- These internal canals, as sug-

tudinally ” (see fig. 32). gested by Rofe, may possibly represent the tubes under the dome of the Crinoidea. In Codonaster the ambulacra are confined to the upper portion only – of the calyx. Pores and attached Pp DP tubes are wanting; but there are striated structures between the arms, similar in appearance and probably also in function to the pectinated rhombs of the

Cystidea, their ridges, as first shown by Rofe (Geol. Mag., 1865, ii p. 251), being the tops of a series of folds of a thin test or mem- brane, which were perhaps “ respira- tory sacs, lined with cilia, and constructed of a porous test, through which air from the water could pass by diffusion.” The expanded ends of the neighbouring tubes of each two ambulacra form at the summit of the test four double and two single apertures commonly termed “ ovarian orifices ;” between the two latter there is usually a third, apparently anal, opening. In Zlewtherocrinus there are three paired, and two single pores only. ‘The Blastoidea, which are (}) represented by Pentremites in Upper Silurian strata, attained their principal development during the Carboni- ferous epoch, at the close of which they seem to have become extinct.

Order VITI.—Hototruvripea.—The Holothuridea, Sea- slugs, Trepangs, or Sea-cucumbers (figs. 33 and 34) have a

Fia. 32.—Transverse sec- tion of ambulacrum of Pentremites Godoni, x38, (After Billings,)

1, lancet plate; g, ambulacral

grove; p,p, pores leading into the canals, c, ¢.

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Fic, 34.—Holothuria tubulosa. long, cylindroid, sometimes flattened body, which is without shell, and is brown to purplish-red in cclour. The peri- some, which is unciliated, is composed of three layers,— a structureless epidermis, a cellular dermis, and an internal elastic layer. The two interior layers contain calcareous

spicule, which vary much according to the species, and may take the shape of perforated disks, wheels, anchors, and hooks (fig. 35). Rarely the dorsal integument may develop an armature of overlapping plates (Psolus), which may bear spines (Hchinocucumis). Underlying the perisome is a layer of circular muscular fibres, some of which pass into the mesenteries; a second internal set of five simple or paired bands of longitudinal mus- cular fibres are at- tached at one end to the radial pieces of the calcareous oral ring, Fic. 35.—Spicules of Holothuridea.. (After and supply branches Semper.)

to the oral tentacles, a and 6, anchor and anchor-plate of Synapta indi-

q visa, Semper; c, spicule of Chirodota rigida, Sem- and at the » other BES per; d, wheel-spicule of Chirodota vitiensis, inserted into the Griiffe;‘e, spicule of Thyone chilensis, Semper; sphincter of the anus J, 9, h, anchors and anchor-plate of Synapta Go- It is by means of the

deffroyi, Semper; spicule of Rhopalodina lageni-

formis, Gray. longitudinal muscles that the Holothurid, when irritated, effects the discharge of its viscera at the hinder extre- mity of its body. In the midst of a circle of tentacles, five or multiples of five in number, is the mouth, which is without dental apparatus, The tentacles vary considerably in shape, and may be cylindrical, shield-shaped, pinnate, ov ramified. They serve as organs of touch, of nutrition, and occasionally also of locomotion. The alimentary canal is simple, and usually longer than the body, so as to be two or three times folded on itself; it is attached to the interior surface of the body by mesenteries, and may termi- nate in a cloaca. Its walls are composed of an external layer of circular, and an internal layer of longitudinal muscular fibres, and an innermost cellular lining. In com- mon with the peritoneal surface of the body, it is ciliated. Two, or more rarely four or five, branched processes of the cloaca, the respiratory trees or water-lungs, are ordinarily present, and are connected to the body-wall by a mesentery or by threads (fig. 36). They appear to be excretory in function, water being continually passed into and out of them through the contractile cloaca, Their ulti- mate ramifications terminate in minute openings, by means of which they appear to have com- munication with the peritoneal cavity. In Zchinocucumes the re- spiratory trees are only single- branched. In Syrapta, in which they do not occur, there are funnel- shaped ciliated

bodies attached to the mesentery of the alimentary canal, The respiratory tree occu- pying the ventral left interradial z space has been observed in many 7; cases to be surrounded by a plexus Fy, 36. — Diagrammatic of the pseudhzemal system of vessels, section of a Holothurid. What are termed Cuvierian organs , CO Sees are appendages of the cloaca, which, tary canal: a, d, respiratory according to Semper (feisen im gmbuiactalring; g tentacles: Archipel der Philippinen, i. pp. 139, — , longitudinal muscle. 140), are muscular, and can be used as a means of de- fence, being capable of protrusion externally. The main trunks of the pseudhzemal system, which is often exceed- ingly complex, are two vessels, one on the dorsal, the other on the ventral face of the intestine, which are con- nected with each otber by capillary reticulations. The calcareous ring surrounding the gullet, already referred to,

consists usually of five interradial, and five notched or per- forated radial plates united by muscles—the homologues of the auricule of the Echinidea. A circlet of plates, in certain species, surrounds the anus. The fluid filling the various canals of the ambulacral system contains nucleated cells. The ambulacral circular vessel lies behind the calcareous ring ; it gives off from one to five or more Polian vesicles, also one or more madreporic canals. Calcareous spicule are contained in the wall of the madreporic canal, and often it is terminated at the free end by a cribriform plate similar to a madreporite. By means of the madreporic canal the ambulacral vessels communicate with the peritoneal cavity. From the ambulacral ring there proceed five, sometimes more tentacular canals, which supply czcal branches to the ten- tacles, and usually, also, five ambulacral canals, which give rise to as many rows of pedicels situated in most cases radially, and forming a dorsal bivium and ventral trivium. Sometimes, as in Psolus, the pedicels are irregularly dis- persed over the whole perisome, or they may be met with only on the lower surface of the body, where they subserve locomotion. In JJolpadia and its allies there are ambula- cral canals, but no pedicels ; in the Synaptide the canals are wanting. The sexual organs are one or two groups of branched tubuli, which open either on the dorsal surface or between the two dorsal tentacles. Except in the Synaptida, and apparently also the Liodermatidiw, the sexes are dis- tinct. The nervous

system consists of a circular cord, lying above the ambulacral ring, and giving off five apparently hollow branches, which pass through holes or notches in the radial plates of the calcareous ring, to pro- ceed down the centre of the longitudinal muscular bands of the body.

Development is direct in Holothuria tremula and Pentacta dolt- olum; and a species of Synapta is viviparous. The majority of the Holothuridea undergo metamorphoses, during which, however, no portion of the echinopxdium is discarded. By invagination of the morula an intestinal cavity is produced, into which an ecto- dermic invagination opens, forming the upper portion of the alimentary canal. The cilia that at first clothe the body commonly become limited to a doubly bent band, the larva developing into an auricularia, which has sac-like processes, and occasionally spicules, but never a skeleton. Growing less transparent, the auricularia loses its lateral processes, the mouth disappears, and the larva teaches the ‘‘pupa-stage,” in which the body is surrounded by five ciliated hoops. A new mouth with tentacles is now developed, the ciliated bands are lost, and the animal attains the same shape as the adult. The peritoneal cavity and the ambulacral system both originate in a cecal process of the archenteron or primitive endo- dermal sac, which, separating from the latter, forms what has been termed the vaso-peritoneal vesicle. This gives off a process which opens on the dorsal surface, and which eventually furnishes the madreporic canal. A portion of the vesicle remains in con- nection with this process, and is transformed into the ambulacral vessels; the other portion becomes two sausage-shaped vesicles at the sides of the alimentary canal, above and below which they grow together, and form a continuous space, the future peritoneal cavity. The inner and outer wall of the chamber thus resulting become attached respectively to the parietes of the body and to the alimentary canal, and mainly contribute to the production of their peritoneal and muscular layers.

The Holothuridea are creeping in habit; some, however, of the Synaptidee are able to swim. The apodal forms move themselves by contractions of the body, and by means of their tentacles. The Holothuridea derive their nourishment from the sand which they swallow, and from Diatomaces, Foraminifera, and other minute marine organisms. Among the internal parasites of the Holo- thuridea are small fishes of the genus Fierasfer,

embryos of the gasteropod Entoconcha mirabilis, and Copepod crustaceans (Pin- notheres), Certain species of Holothuria are much esteemed in China _ ee and constitute an important article of commerce with that

The Holothuridea may be grouped as follows :—

ion APNEUMONA., Respiratory trees and Cuvierian organs absent; mouth and anus at opposite ends of the body ; ambulacral canals five ; hermaphrodite.

GL.) Synaptide, “Pedicels absent. Ex, Synapta, Chirodota.

sa Taian dee Pedicels present. Ex. Echinosoma.

ie ETRAPNEUMONA. Respiratory trees four; body flask-

+ Mouth and unus at the same end of it, the former surrounded

oO 2

by ten tentacles and ten calcareous plates, the latter by as many papille and plates; five ambulacra diverge from the anal, and five from the oral region of the body; pedicels in two rows, ix, Rhopalodina lageniformis only =the class Diplostomidea of Semper.

Il]. DIPNEUMONA. Respiratory trees two; Cuvierian organs present ; mouth and anus polar ; pediccls single-ranked.

(1.) Liodermatide. Pedicels absent ; tentacles shield-like, cylin-

drical, or branched. Ex. Liosoma, Haplodactyla, Molpadia,

(2.) Dendrochirote. Tentacles branched. Ex. Thycne, Phyllo-

phorus, Ochnus, Psolus.

(8.) Aspidochirote. Tentacles shield – like.

Stichopus, Sporadipus, Holothuria.

Mr C. Moore, F.G.8. (Rep, Brit, Assoc., 1872, p. 117), has de- scribed wheel-like spicule of four species of Chirodota, one from the Inferior Oolite, one from the Upper Lias, and two froi the Middle Lias. ‘‘ They are formed of a number of minute wheel-spokes, varying from 5 to 18, which start from a central axis, and are sur. rounded on the outside by a wheel-tire; on the inner edge of some Species are a series of very minute teeth, extending over the central cavity.” Mr R. Etheridge, jun. (in the Memoirs of the Geol. Surrey of Scotland, Explanation of Sheet 23, 1878), has called ‘attention to the discovery by Mr J. Bennie, survey-collector, of similar organ- isms in the Lower Carboniferous Limestone group of E. Kilbride, and in shales of the Upper Limestone group of Williamwood, near Glasgow.

Ex. 4 spidochtr,

BIBLIOGRAPNY.—The following are some of the more important treatises on the Echinodermata :—Tiedemann, Anatomie der Réhrenholothurie, &c., Heidelb. 1820; Miller, A Natural History of Crinoida, 1821; J. V. Thompson, “ On Pentacrinus europeeus,” Edinb. New Phil. Journ., xx., 1886; L. Agassiz, Monog. d’ Echinodernes, &c., Neuchatel, 1838-42,—see also Compt, rend., xxiii, 1846, xxv., 1847; L. Agassiz and Desor, ‘“ Catalogue Raisonné,” &c., Ann. sc. nat., 3d serics, Vitals, viii, 1846-47 ; E. Forbes, A Historyof British Starfishes, d&c., 1841; see also Mem, of the Geolog. Survey of Great Britain, ii., 1848; D’Orbigny, Hist. des Crinoides, 1841; J. Miiller, ‘‘Ueber den Bau von Pentacrinus caput-Medusx,” Abhanal. der Berl. Akad., 1841; 1d., ‘‘ Ueber die Larven und die Entwickelung der Echino- dermen,” 7b., 1846, 1848-52, 1854 (see Huxley in Ann. of Nat. Hist., 1851) ; 1d., ‘‘ Ueber die Gattung Comatula,” 7b., 1847; 1d., Ueber Synapta digitata, &c., Berlin, 1852; J. Miiller and Troschel, System der Asteriden, Brunsw. 1842; De Quatrefages, “Mém, sur. la Synapte de Duyernoy,” Ann. sc. nat. 1842; Austin, A Monag. on Recent and Fossil Crinoida, 1844; Von Buch, “ Ueber Cystideen,”

ECHO, in Greek mythology, one of the Oreades 4 mountain nymphs. The word denotes mere sound; a0 the stories told of her are so transparent that they can scarcely be said to belong to the class of fully-develope myths, As Selene to the Greek was clearly the moon, 4 Echo was the being who could

not speak until he spoken to, and then could only repeat the last words) a speaker. This venalty is said to have been inflicted up

Ep.C l= baie

her by Hera, whom the nymph by her chatter had prevented from discovering the sports of Zeus among her sister Oreades. Another tale relates that Echo fell in love with Narcissus, who was deaf to her entreaties, and that in her grief she wasted away until nothing remained but her bones and her voice. The name Narcissus, again, denotes one who is oppressed by lethargy, and thus the story becomes a counterpart to that of Selene and Endymion. Another legend speaks of her as being loved by Pan, the Latin Favonius, the soft and purifying breeze, and represents her lover as seeking in vain to see her form, although everywhere he hears her voice.—Ovid, Jet. iii. 356 et seg.; Paus. ix. 31, 6.

For Ecuo, in physics, see Acoustics, vol. i. p. 107.

ECIJA, a city of Spain, in the province of Seville, 53 miles E.N.E. of the city of that name, on the left bank of the Jenil, Xenil, or Genil, the ancient Singulis, a tributary of the Guadalquivir. The river, thus far navigable, is there crossed by a fine old bridge; and the antiquity of the town betrays itself both by the irregularity of its arrangement, and by its wallsand gateways, and its numerous inscriptions and other relics. Among its public buildiags it numbers six parish churches, seven nuunneries, thirteen secularized convents, two hospitals, a theatre, a foundling asylum, and barracks. The principal square is surrounded with pillared porticoes, and has a fountain in the centre; and along the river bank there runs a fine promenade, planted with poplar trees and adorned with statues. From an early period the shoemakers of Ecija have been in high repute throughout Spain; and woollen cloth, flannel, linen, and silks are manufactured in the town. The vicinity is fertile in corn and wine, and cotton is also cultivated to some extent. The heat is so great that the spot has acquired the sobriquet of El Sarten, or the Frying-pan of Andalusia, Keija, called Estija by the Arabs, is the ancient Astigis, which was raised to the rank of a Roman colony with the title of Augusta Firma, and, according to Pliny and Pomponius Mela, was the rival of Cordova and Seville. If local tradition may be believed, it was visited by the apostle Paul, who converted his

hostess Santa Xantippa; and, according to one version of his life, it was the see of the famous Crispin. Among its modern celebrities the most remarkable is Luis Valez de Guerara, the dramatist. Population 27,216.

ECK, Jonann Mater von (1486-1543), the most in- defatigable and important opponent of Martin Luther, was born 13th November 1486, at Eck in Swabia. His father was @ peasant, who becoming bailift of the village, added Eek to the family name Maier. The son entered in lis eleventh year the university of Heidelberg, from which he went to Tiibingen, where he took his master of arts degree in his fourteenth year, and afterwards studied theology. He then went to Cologne, and afterwards to Freiburg, where, besides studying jurisprudence and mathematics, he taught philosophy. In 1506 he published a work on logic. From this time he appears to have devoted his attention chiefly to theology ; and his skill and versatility in scho- lastic disputations having attracted considerable notice, the duke of Bavaria, in 1510, presented him to the chair of theology in the university of Ingolstadt. In 1515 he took part in a public disputation at Bologna, and in 1516 in one at Vienna, on both occasions gaining great admiration. In 1518 he circulated privately his Obelescr against Luther's thesis on the mass. Luther intrusted his defence to Carlstadt, who, besides answering the insinua- tions of Eck in 400 distinct theses, declared his readiness to mect him in a public disputation. The challenge was accepted, and the disputation took place at Leipsic in the following year. It lasted for three weeks, and Luther as Well as Carlstadt opposed himself to Eck. The general

impression was that victory rested with Eck ; but apparently success only embittered his animosity against his opponents, for from that time his whole efforts were devoted to Luther's overthrow. He induced the universities of Cologne and Louvain to condemn the Reformer's writings, and in 1520 went to Rome to obtain strict regulations against what he called the " Lutherans." He returned with the celebrated papal bull against Luther's writings, and with the commission to publish it, but at Leipsic met with so bad a reception from the inhabitants, that he was com- pelled to take refuge in the Pauline convent. Eck took a leading part in the Augsburg diet of

1530, and in the con- ferences at Worms in 1540 and at Ratisbon in 1541. He died in 1543. He is said to have been a bad linguist, and notan able theologian, but to have possessed great readiness and fluency, a retentive memory, and remarkable dexterity in sophistical argumentation. Among his numerous writ- ings is a translation of the Bible, which was written to supersede that of Luther, but met with no success. ECKERMANN, Joun Prrer (1792-1854), friend of Goethe, and editor of his works, was born at Winsen in Hanover, in 1792. After serving as a volunteer in the War of Liberation (1813-1814), he obtained an appoint- ment in the war office at Hanover. At the age of twenty- five he became a student at the gymnasium of Hanover, and afterwards at the university of Gottingen, returning to Hanover in 1822. His acquaintance with Goethe began in the following year, when he sent to him the manuscript of his Beitrdge zur Poesie. Soon afterwards he went to Weimar, and was appointed private secretary to the poet. For several years he was also engaged as tutor to the son of the grand duke. In 1830 he travelled in Italy with Goethe's son. In 1838 he was named councillor of the grand duchy and appointed librarian to the grand duchess. Eickermann is chiefly remembered for the important contributions to our knowledge of the great poet contained in his Gesprache mit Goethe, the first and second parts of which appeared in 1836, and the third in 1848. This work was first trans- lated into English by Margaret Fuller, and published at Boston, U.S.,tin 1839. Another English translation, by John Oxenford, appeared in London in 1850. It has been translated into almost all the European languages, not excepting Turkish. To Eckermann Goethe intrusted the publication of his posthumous works (1832-1833). He was also joint-editor with Riemer of the complete edition of Goethe's works in 40 vols. (1839-1840). Lckermann died at Weimar, December 3, 1854. ; ECKERSBERG, Cart Vinuetm (1783-1853), Danish painter, was born in South J utland in 1783. He became successively the pupil of Abildgaard and of David. From 1810 to 1813 he lived at Paris under the direction of the latter, and then proceeded, as an independent artis', to Rome, where he worked until 1816 in close fellowship with Thorwaldsen. His paintings from this period —The Sparten Boy, Bacchus and Ariadne, and Ulysses— testify to the influence of the great sculptor over the art of Eckersberg. Returning to Copenhagen, he found pon easily able to take the first place. among — ie Danis painters of his time, and his portraits especially were in

extreme popularity. It is claimed for Eckersberg by the

native critics that ‘he created a Danish colour,” that is to

was the first painter who threw off conventional tones a ne raaudeteie tal landscape, in exchange for the pes atmosphere and natural outlines of Danish scenery. but Denmark has no heroic landscape, and Eckersberg 1n losing the golden common-places scarcely succeeds 1n being i ful, His landscapes, however, are pure and true, while in his figure-pieces he is almost invariably conventional 7 old-fashioned. He became the president of the Danis

Academy of Fine Arts in ad a ig _ 1853.

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ECKHART, JoHANNEs, or, according to the general designation, Meister Eckhart, the first of the great specula- tive mystics, flourished during the latter part of. the 13th century and the early part of the 14th. Extremely little is known of his life; the date and place of his birth are equally uncertain. According to some accounts, he was a native of Strasburg, a town with which he was afterwards closely connected ; according to others, he was born in Saxony. Trithemius, one of the best authorities, speaks of him merely as “Teutonicus.” 1260 has frequently been given as the date of his birth ; it was in all probability some years earlier, for we know that he was advanced in age at the time of his death, about 1327. He appears to have entered the Dominican order, and to have acted for some time as professor at one of the colleges in Paris, His reputation for learning was very high, and in 1302 he was summoned to Rome by Boniface VIII., to assist in the controversy then being carried on with Philip of France. From Boniface he received the degree of doctor. In 1304 he became provincial of his order for Saxony, and in 1307 was vicar-general for Bohemia. In both provinces he was distinguished for his practical reforms and for his power in preaching. In what manner he ceased to hold his high office we do not know; indeed, several years of his life about this time are a complete blank. Towards 1325 we hear of him as preaching with great effect at Cologne, where he gathered round him a numerous band of followers. Before this time, and in all probability at Strasburg, where he appears to have been for some years, he

had come in contact with the Brcuarps (g. v.) and Brethren of the Free Spirit, whose fundamental notions he may indeed be said to have systeniatized and expounded in the highest form to which they could attain. In 1327 the opponents of the Beghards laid hold of certain propositions contained in Kckhart's works, and he was summoned before the Inquisition at Cologne. The history of this accusation is by no means clear. Eckhart appears, however, to have made a conditional recantation—that is, he professed to disavow whatever in his writings could be shown to be erroneous. Further appeal, perhaps at his own request, was made to the Pope, and in 1329 a bill was published condemning certain propositions extracted from Eckhart's works. But before its publication Eckhart was dead. The exact date of his death is unknown. Of his writings, several of which are enumerated by Trithemius, there remain only the Sermons and a few tractates. 'Till recently the majority of these were attributed to Tauler, and it is only from Pfeiffer's careful edition (Deutsche Mystiker d, XIV. Jahrhunderts, val. ii., 1857) that one has been able to gather a true idea of Eckhart's activity. From his works it is evident that he was deeply learned in all the philo- sophy of the time. He was a thorough Aristotelian, but by preference appears to have been drawn towards the mystical writings of the neo-Platonists and the pseudo- Dionysius. His style is unsystematic, brief, and abounding in symbolical expression. His manner of thinking is clear, calm, and logical, and he has certainly given the most complete exposition of what may be called Christian pantheism,

Eckhart has been called the first of the speculative mystics; but such a designation requires some qualification. Within the Christian church from the time of Erigena there had been a constant stream of what must be called mysticism, originating for the most part from the writings of the neo-Platonists and of Dionysius the Areopagite. This tendency may be noted in Bonaventura, in Albert (under whom Eckhart is said to have studied), and in Aquinas ; it is more prominent in Hugo and Richard of St Victor, though with them it took a practical rather than a Speculative direction. But in all these writers, with the

partial exception of Hrigena, who occupies a quite peculiar position, the mystical element was in strict subordination to the church doctrines, which might be speculatively symbolized, but were not thereby explained or rationalized, In KEckhart's writings and preaching, on the other hand, the element of mystical speculation for the first time comes to the front as all-important. By its means the church doctrines are made intelligible to the many, and from it the church dogmas receive their true significance. It was but natural that he should gradually diverge more and more widely from the traditional doctrine, so that at length the relation between his teaching and that of the church appeared to be one of opposition rather than of reconciliation. Eckhart is thus in truth the first who attempted with perfect freedom and logical consistency to give a speculative basis to religious doctrines.

It is not possible to expound in detail how Eckhart endeavours to explain the main principles of the Christian faith, but it is necessary to note the two most important points in* his as in all mystical theorics. These are first, his doctrine of the divine nature, and second, his explanation of the relation between God and human thought. The two are logically connected, and a complete exposition of his theory might start from either his theology or his psychology. Lasson, the author of a most valuable monograph on Eckhart, adopts the latter course, but for many reasons the other appears the most systematic.

The fundamental thought from which Eckhart's theology starts is that of the Absolute or Abstract Unity as the only real existence, Apart from God no thing has real being. But this Absolute is, for Eckhart, the Deus absconditus, the 0ebs &yvworros of the neo-Platonic theology. With Dionysius the Areopagite, Eckhart deseribes this divine essence, the Godhead, asabsolutelywithout predicates ; all deter- minations are limitations whieh destroy its infinite being. The Godhead is incomprehensible, inexpressible. It is in truth nothing; yet as the most real of beings it must be conceived as absolutely potential, as containing in itself the origin and final end of all things. This Godhead is not God as known to us. From the Godhead the triune God procecds or is evolved. At this point, at the transition between the divine absolute and the personal deity, Kekhart is face to face with the crucial difficulty of all speculative mysticism, and it

is of interest to compare his method of solution with that adopted by later thinkers of like tendeneies, ¢.g., Boehme and Baader. In the Godhead, as in everything, according to Eckhart, there must be distinguished matter and form, or, as they are here called, essence and nature. The matter or essence is the potentiality, what the thing is in itself; the form or nature is that whieh it becomes as au object for others, The Godhead reveals itself in the personal God, the Father. For the Godhead is a spiritual substance, and ‘as such can only become real by conseious- ness, by reflection on self, by self-expression. ‘That which reflects and expresses isthe Father. The Son is the Word, or expression through and in which the Father becomes self-conscious. As there is here no distinetion of time or space, Father and Son are in very truth one. The Father eternally begets the Son, and the return of the Son into the Father in love and mutual will is the Spirit. The Father is not before the Son; only through the begetting “of the Son, only through arriving at self-consciousness, docs He become the Father.

The genesis of the Son from the Father involves also, according to Eekhart, the produetion of the world of things. For God is reason, and in reason is contained the ideal world, the world of creatures, not in time and space, which becomes materialized. In the Son are all things made, but only, Eckhart is careful to point out, in ideal form. He holds strongly to the so-called Platonic view that, over and above sensible things, there exists a realm of ideal forms or exemplars, to be apprehended by pure thought, through thought freed from the limitations of space and time. How this ideal world is related to the world of real things he does not show, nor does he explain the apparent independence of the material universe. When, therefore, Eckhart speaks of the world as neces- sary to the divine existence, of God as loving Himself in ereated things,’ and of all things being God, he must be understood to speak of this ideal world, not of things as known to us.

As all things have arisen from God, so all things desire to returm into the unity of the divine being. Repose in God is the final end of all things. In man, the noblest of created things, this return is brought about. In man, specially, there is the faculty of supra- rational cognition, the power of reaching to the absolute, the ground both of God and of the universe. This peculiar power, called

by Eckhart the spark (Finklein, Scintilia), isin truth God working inman. In cognition of God, God and man are one; therc is no distinction of knower and known, and hence, as opposed to empirical knowledge, it may be called faith. In such faith, there is involved not only reason, but will, for the divine illumination becomes operative or takes real cffect through the will.

To attain to full union with God is the final end of activity, and the means, it is clear, must be the resignation of all individuality. Absolute quietism appears to be the only method whereby the birth of the Son in the soul may be brought about. When this state has been reached, then the human soul is one with God ; its will is God's; no evil can be wrought byiit; it cannot sin. The practical consequences which would flow from such a doctrine, and which did appear among the Brethren of the Free Spirit, were evaded, rather than overcome, by Eckhart. For, according to his teaching, all the above applies only to the ''spark" in the soul; the other faculties may be reasonably and legitimately employcd about other and temporal matters. By. this loop-hole, also, he escapes the doctrine that works are entirely ineflicacious. He is careful to hold the balance between inward feeling and outward action, and on this point his teaching is important in relation to the later Reformation thinkers,

On the specifically theological doctrines of Eckhart, such as Grace, Incarnation, the Fall, Redemption and Sin, it is not possible to enter in brief compass. A most adequate account of them will

be found in Lasson's monograph above referred to.

The most important of the many works upon Eckhart are—Pfeiffer, Deutsche Mystiker, vol. ii.; Martensen, Meister Eckhart, 1842; Bach, Meister Eckhart der Vater der Deutschen Speculation, 1864; Lasson, Meister Eckhart der Mystiker, 1868; Ullmann, Reformatoren vor der Reformation, 1842; Preger, Geschichte d.

Deutschen Mystik, i., 1874.

ECKHEL, Joseph Hitarius (1737-1798), one of the most distinguished numismatists, was born at!Enzersfeld in Lower Austria, January 13, 1737. His father was farm-steward to Count Zinzendorf, and he received his early education at the Jesuit's College, Vienna. Here at thie age of fourteen he was admitted into the order, still pursu- ing his studies with earnestness, and especially devoting himself to antiquities and numismatics. After being engaged as professor of poetry and rhetoric, first at Steyer and afterwards at Vienna, he was appointed in 1772 keeper of the cabinct of coins at the Jesuit's College, and in the same year he went to Italy for the puipose of personal inspection and study of antiquities and coins. At Florence he was employed to arrange thie collection of the grand duke of Tuscany ; and the first fruits of his study of this and other collections appeared in his Vwmd Veteres Anecdoti, published ml 7 75. 1773, Eckhel was appointed by the empress Maria Theresa professor of antiquities and numismatics at the university of Vienna, and this post he held for twenty-four years. He was in the following year made keeper of the imperial cabinet of coins, and in 1779 appeared his Catalogus Vindobonensis Numorum Veterum. ckhel's great work is the Doctrina Numorum Veterum, in 8 vols., the first of which was published in 1792, and the last in 1798. The author's rich learning, comprehensive grasp of his subject, admirable order and precision of statement in this master- piece drew from Heyne enthusiastic praise, and the acknow- ledgment that Eckhel, as the Corypheus of numismatists, had, out of the mass of previously loose and confused facts, constituted a true science. A volume of Addenda, prepared by Steinbiichel from Eckhel's papers aftcr his death, was published in 1826, Among the other works of this great Scholar are—Choix de Pierres gravées du Cabinet Imperial des Antiques (1788), a useful school-book on coins entitled Kuregefasste Anfangsgriinde zur alten Numismatik (1787), of which a French version enlarged by Jacob appeared in 1825, &c. Eckhel died at Vienna, May 16, 1798.

ECLECTIC (from éxAéyw, I select), a term of which the most important application is in philosophy, denotes a thinker whose views are borrowed partly from one, partly from another, of his predecessors. It perhaps requires to be noted ,that, where the characteristic doctrines of a philosophy are not thus merely adopted, but are the modified products of a blending of the systems from which it takes its rise, the philosophy is not properly eclectic.

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The history both of ancient and of modern eclecticism shows that eclecticism naturally springs up when, while literary culture makes the doctrines of the chief philo- sophies familiar and preserves an interest in philosophy, the first pursuit of thinkers is not purely speculative truth.

In the 2d century B.c., a remarkable tendency toward eclecticism began to manifest itself. The longing to arrive at the one explanation of all things which had inspired the older philosophers became less earnest; the belief, indeed, that any such explanation was attainable began to fail; and thus men, not feeling the need of one complete logical system, came to adopt from all systems the doctrines which best pleased them. In Panetius we find one of the earliest examples of the modification of Stoicism by the eclectic spirit ; and about the same time the same spirit displayed itself among the Peripatetics.

The philosophy that took root in Rome, where philo- sophy never became other than a secondary pursuit, was naturally for the most part eclectic; of this Cicero is the most striking illustration,—his philosophical works consisting of a mixture, with little or no blending, of doctrines borrowed from Stoicism, Peripateticism, and the scepticism of the Middle Academy. And, not to mention numerous names of minor importance, eclecticism had another representative at Rome in the school of Sextius and Sotion, who were half Stoic, half Pythagorean.

In the last stage of Greek philosophy the eclectic spirit produced remarkable results outside the philosophies of those properly called eclectics. Thinkers chose their doctrines from many sources—from the venerated teaching of Aristotle and Plato, from that of the Pythagoreans and of the Stoics, from the old Greek mythology, and from the Jewish and other Oriental systems. Yet, it must be observed that neo-Platonism, Gnosticism, and the other systems which are grouped under the name Alexandrian, were not truly eclectic, consisting, as they did, not of a mere syncretism of Greek and Oriental thought, but of a mutual modification of the two. It is true that several of the neo-Platonists professed to acccpt all the teaching both of

Plato and of Aristotle, but, in fact, they arbitrarily interpreted Aristotle so as to make him agree with Plato, and Plato so as to make his teachings consistent with the Oriental doctrines which they had adopted, in the same manner as the schoolmen attempted to reconcile Aristotle with the doctrines of the church. Among the early Christians, Clement of Alexandria, Origen, and Sinesius were eclectics in philosophy.

The eclectics of modern philosophy are too numerous to name. Of Italian philosophers the eclectics form a large proportion. Among the German we may mention (though details cannot here be given) Wolf and his followers, as well as Mendelssohn, Eberhard, Platner, and to some extent Schelling, whom, however, it would be incorrect to describe as merely an eclectic. In the first place he cannot be denied the praise of originality ; and, in the second place, it is not so much that his views of any time were borrowed from a number of philosophers, as that his thinking was influenced first by one philosopher then by another. — ;

But, during the present century, the term eclectic) has come to be specially applied to a number of French philo- sophers who differ considerably from one another. Of these the earliest were Royer-Collard, who was mainly a follower of Reid, and Maine de Biran; but the name is still more appropriately given to the school of which the most distinguished members are Victor Cousin, Théodore Jouffroy, Damircn, St Hilaire, Rémusat, Garnier, and Ravaisson. Cousin, whose views varied considerably at different periods of his life, not only adopted freely what pleased him in the doctrines of Laromiguitre, Royer-Collard, and Maine de Biran, of Kant, Schelling, and Hegel, and of

the ancient philosophies, but expressly maintained that the eclectic is the only method now open to the philosopher, whose function thus resolves itself into critical selection and nothing more. ‘Hach system,” he asserted, “is not false, but incomplete, and in reuniting all incomplete systems, we should have a complete philosophy, adequate to the totality of consciousness.” But this assumes that every philosophical truth is contained somewhere in the various philosophies ; and if, as it would be surely rash to deny, there still remains philosophical truth undiscovered, but dis-

coverable by human intelligence, it is evident that eclecti- cism is not yet the only philosophy. For a discussion of the question how far the above dicta of Cousin represent his own method of philosophizing we must refer the reader to the article Cousin. Lclecticism gained great popularity, and, partly owing to Cousin's position as minister of public instruction, became the authorized system in the chief seats of learning in France, where it has given a most remark- able impulse to the study of the history of philosophy.

ECLIPSE. See Astronomy,

ECSTASY (ékoracis, from éornps, to put out of its place, to alter), a term applied toa morbid mental condition, in which the mind is entirely absorbed in the contemplation of one dominant idea or object, and loses for the time its normal self-control. With this there is commouly associ- ated the prevalence of some strong emotion, which manifests itself in various ways, and with varying degrees of intensity, Tlis state resembles in many points that of catalepsy already described, but differs from it sufficiently to consti- tute it a separate affection. The patient in ecstasy may lie in a fixed position like the cataleptic, apparently quite un- conscious, yet, on awaking, there is a distinct recollection of visions perceived during this period. More frequently there is violent emotional excitement, which may find ex- pression in impassioned utterances, and in extravagant bodily movements and gesticulations. This disease usually presents itself as a kind of temporary religious in- sanity, and has frequently appeared as an epidemic. It is well illustrated in the celebrated examples of the dancing epidemics of Germany and Italy in the Middle Ages, and the Convulsionnaires of St Medard at the grave of the Abbé Paris in the early part of the last century, and in more re- cent times has been witnessed during periods of religious excitement in this country. This disorder is highly contagious, and readily spreads by imitation. As a disease it is more curious than important, and for its treatment requires the judicious exercise of moral influences rather than medical remedies, although these also, as in the case of similar ailments, may often be used with advantage.

ECUADOR, or, in full, La Repusiica pEL Ecuapor, an independent state of South America, traversed by the equator, from which it takes its name, and bounded on the N. by the United States of Colombia, E. by Brazil, 8. by

Peru, and W. by the Pacific Ocean (see plate xi. vol. i.). Its area cannot be stated with any close approximation to accuracy, for large districts along the frontiers are equally claimed by Ecuador and the neighbouring powers ; and even within the limits of undisputed possession no systematic survey has been undertaken. According to Villavicencio, the area is only 127,205 English square miles ; but F. Hanemann, quoted by Behm and Wagner (Bevolk- erung der Krde, 1874, p. 76), makes it 248,580 by plani- metric calculation on the basis of H. Kiepert's map in his Handatlas, 1872. Kiepert places the eastern limit at 70° W. of Greenwich, but does not assign to Ecuador the dis- puted territory along both sides of the Marafion. The population was stated by Villavicencio at 1,108,082 in 1857, exclusive of 200,000 " wild" Indians; but an official esti- mate for the same year is quoted by Wappius, which gives only 881,943, exclusive of 150,000 " wild" Indians, and

even this he thinks is probably too high. His opinion is go far confirmed by the memoir of the minister Leon, published in 1875 at Quito, according to which the total population, exclusive of about 200,000 Indians, was 866,137. The Galapagos Islands, an uninhabited group with an area of 2951 square miles, are dependent on Ecuador.

Mountains.—The great South American chain of the Andes traverses Ecuador from south to north, and forms the predominant factor in its physical constitution. Its two Cordilleras run parallel with each other, and inclose an elevated longitudinal valley about 40 miles wide and 300 miles long, which is divided by the transverse ridges, or nudos, of Tiupullo and Assuay into the three great basing of Quito, Ambato, and Cuenca, which are again subdivided by inferior ridges into irregular sections. The eastern Cordillera attains in several of its summits a height of more than 18,000 feet ; the western has only one (Chim- borazo) which exceeds 17,500, The Quito plain lies 9500 feet above tle sea, Ambato 8500, and Cuenca 7800: the last two are comparatively barren and melancholy, while the first, though so much the loftiest of the three, is clothed with luxuriant vegetation. The altitude of the Tiupullo or Chisinche ridge, stretching across from Cotopaxi to Iliniza, is 11,500 feet, and that of the Assuay ridge about

13,500. Both the western and eastern slopes of the cliain are marked by magnificent valleys of erosion; the former, which con- tains at least six successive terraces, has an average gradient of 275 feet per mile, while that of the latter is only 125. Granitic, gneissoid, and schistose rocks are the main materials of the gigantic pile ; the summits are capped with trachyte and porphyry, and the sides are strewn with immense beds of gravel and, voleanic debris. | Nowhere in the Whole Andean system do the individual mountains attain so magnificent a development as in the Ecuadorian section. Around the valley of Quito alone there are twenty noble volcanic summits, presenting a beautiful variety of form,—here a perfect and there a truncated cone, there a jagged and blasted crest, and there again a smooth and snow-covered dome,

In the Eastern Cordillera the following arc capped with perpetual snow—Cayambi, Antisana, Cotopaxi, Llanganati, Sincholagua, Sangai, Sara-urcu, Tunguragua, Collanes, and Assuay; in the Western—Chimborazo, Iliniza, Casalagua, Cotacachi, Pichincha, Corazon, Ataeazo, Chiles, Carahuirazo, Yana-urcu, and Quilindafia. Imbabura may either be assigned to the eastern range, or perhaps, more properly regarded as the eommon point of junction. It is situated at the northern end of the great central valley, attains a height of 15,029 feet, and is remarkable for its vast eruptions of mud and water, the most extensive of which took plaee in 1691. The name, equivalent to the “fish-producing,” from imba, fish, and bura, mother, is supposed to refer to the quantities of Pimelodus cyclopum said to have been contained in its discharges—a phenomenon, how- ever, which has been ealled in question by Wagner, after a seareh- ing investigation into the origin of the report. Cayambi (or by mistake, Cayamburo) is situated exactly on the equator, and is thus distinguished, as Humboldt observes, from every other snow-capped. mountain in the world. It is the loftiest summit in the eastern Cordillera, and spreads out at the base over a very extensive area. Antisana rises with a double dome to the height of 18,880 feet, and presents the proof of its former aetivity in its magnifieent lava-streams, of which one, according to Orton, is ten miles long and five hundred feet deep. It may now be elassed with the apagados, though Humboldt saw smoke issuing in 1802. On the side is the famous tambo of Antisana at a height of 13,300 feet above the sea. To the next two peaks—Sineholagua and Rumi- fiagui, respeetively 16,360 and 15,608 feet in height—comparatively little

attention has been paid, perhaps from the rivalry of their southern neighbour Cotopaxi. This magnificent mountain has already been briefly described (vol. vi. p. 480). It is the loftiest aetive voleano in the world. The slope, according to Orton, 18 30°, aeeording to Wagner 29°, the north-western side being very slightly steeper than the south-eastern. The apieal angle 18 122° 30'. On the east it is covered with snow, but on the west it is usually kept bare by the aetion of the trade winds. _ Its crater, estimated by Wagner as less than that of Mount Etna, is bordered by a band of traehytic roek, forming a blaek coronet above the white. On the southern slope, at a height of 15,059 feet, a small

eone of porphyritic andesite, called ed Picacho, the beak, or Cabvza del Inca, the Inca's head, lifts its bare cliffs for above a thousand feet, and from its general appcaranee gives some show of reason to the tradition which regards it as the original summit of the moun- tain blown off at the first eruption in 1532. The present summit is usually envcloped in clouds ; and even in the clearest month of the year it becomes visible only for eight or ten days. ''On the Tacunga plateau," says Wagner (WV. Reisen im trop. Amerika, p. 514), 'at a height of 8000 Paris feet the prevailing direction of the wind is meridional, usually from the south in the morning, and frequently from the north in the evening; but over the summit of Cotopaxi, at a height of 18,000 feet, the north-west wind always

revails throughout the day. The gradually-widening volcanic cloud continually takes a south-eastern direction over the rim of the crater; at a height, however, of about 21,000 feet, it suddenly turns to the north-west, and maintains that direction till it reaches a height of at least 28,000 feet. There are thus from the foot of the volcano to the highest level attained by its smoke-cloud three quite distinct regular currents of wind."

The principal product of the Cotopaxi eruptions is pumice stone ; and the flanks of the mountain are covered with deep beds of this material mingled with trachytic rocks. In the vicinity fragments of. obsidian are found in great profusion. Llanganati or Cerro Hermoso has been little visited except by natives in search of the golden treasures of the Incas believed to be hid in one of its lakes ; and even thcir curiosity was quenched by the mysterious

fate of Padre Longo. Its height is 17,843 feet, and it is said by Villavi-eencio to contain large quantities of pyrites. In regularity of

structure the cone-shaped summit of Tunguragua is similar to’

Cotopaxi. It attains an altitude of 16,685 feet above the Pacific ; and, inasmuch as it rises directly from a plain only 5700 feet above the sea, and is connected with the Cordillera only by a cuchilla or ‘‘knife-edge” from its southern side, it has a much greater apparent elevation than many a mountain that really over- tops it. Its slope is 38°. A cataract fed by the snows on the summit descends 1500 feet in three leaps; and an enormous basaltic lava-stream, black and smooth and barren as when first it cooled,‘may be traced in a north-east direction across the channel of many achafing torrent. The most notable cruption was in 1777. Whether the mountain is now to be classed with the apagados appears doubtful. In 1832 Dr Terry reported that smoke was almost always ascending from the top; Spruce saw smoke issuing from the western side in 1857; two years later Wagner could find no trace of activity though he ascended several times to the snow- line; but since that date Prof. Orton, on the authority of Dr Taylor of Riobamba, reports a continual fuliginous discharge. E1- Altar is of very irregular shape, consisting of eight snow-clad peaks, the highest of which is 17,735 feet in height. According to an account accepted by Humboldt, there existed at the time of his visit an ancient Quichua manuscript with a description of a terrific catastrophe by which Capac-urcu, the ‘‘ Chief Mountain ”—for so the natives call El-Altar—was blown into its present picturesque con- fusion, and lost the rank it had previously held of the loftiest summit in all the Andes; but more modern inquiries throw the gravest doubt on the trustworthiness of Humboldt’s informant, and the manuscript has never been scen by Kuropcan eyes, The crater, surrounded by a stecp and jagged wall of rocks, is remarkable as the bed of the only real glacier known ta exist in the Ecuadorian Andes. Sangai, which brings the list of the summits of the Eastern Cordillera to a close, is perhaps the most restless volcano in the world. Since the Spanish conquest three hundred years ago it has been in uninterrupted activity. Small outbursts of lava, accompanied by explosions of steam andJreports as of platoon- firing, succeed each other at intervals usually of 10 or 15 minutes, the fiery discharge shooting about 700 or 800 feet above the rim of the crater. From

time to time, especially during the Tainy season, the symptoms become more violent, the gigantic jet of molten rock leaps up 2000 feet, the explosions are louder and more terrible than the cannonading of armies, and the noise of the thunders amidst the clouds is answered by still more awful bramdos from the inferno below. Though of exceptional interest to the physical investigator, not only on account of this perpetual activity, but also on aecount of its peculiar position in the Andean range, Sangai, by reason of the difficult and dangerous country by which it is surrounded, has been but rarely visited by European travellers. Wisse and Garcia Moreno, and afterwards Schmarda, attempted the ascent. Our knowledge of Chimborazo, the most southern of the predominant summits of the Western Cordillera, has on the other hand received continuous augmentation from explorer aftcr explorer. The ‘‘ Mountain of Snow ”—for such is the meaning of Chimpu-raza, the original form of the name—attains, according to Humboldt, a height of 21,420 feet,! and was long regarded as theculminating point of the Andes. The fact that it only makes the plumb-line deviate 7” or 8” shows that it is probably hollow; and there is no doubt the now silent peak was once eloquent with i i ne

1 Reiss and Stiibel make it only 20,697 feet.

volcanic thunders. The magnificence of its mass, imposing though it be from almost any point of view, can be fully appreciated only from the Pacific. The summit has never been reached; Humboldt attained to a height of 19,381 in 1802; Bolivar afterwards exceeded this limit ; and Bossingault and Hall reached 19,682 in 1831. Access can be obtained either by Chillapullo or by the arenal— a stretch of sand and gravel about three miles in length which crosses the N.W. side of the mountain at an elevation of more than 14,000 feet. In ascending by the arenal the traveller can reach about 16,219 feet above the sea on horseback, and pursue his difficult path on foot till about 19,693 ; taking the other route he sleeps at the hacienda about 12,664 fect, may proceed to a height of 15,770 by his mule, and attains his furthest limit at 16,777. ‘o the north of Chimborazo, and separated from it only by a narrow valley, Carahuairazo, or, as the Indians call it, Chimborazo’s Wife, rises to a height of 16,748 fect. It owesits

present diminished stature and picturesque profusion of peak and erag to the sudden collapse of its hollow summit in 1699. Quirotoa, still further north, is supposed to have suffered a similar fate. It now contains in its hollow summit an extensive lake, which, according to Velasco and Villavicencio, has frequently, and most noticeably in 1740, been covered with flames. The height is calculated at about 13,510 fect. llinizais a magnificent mountain with two pyramidal peaks, of which the loftiest rises 17,395 feet above the sea. In the 18th century it was trigonometrically measured by the French Academician Bouguer ; and Wagner suceeeded in reaching within 800 feet of the top, and was only prevented by a sudden storm from complet- ing the ascent. Mules can only be used to a height of 13,200 feet. The geological phenomena furnish no evidence of any volcanie activity either from the summit or the sides. Corazon, so called from its heart-shaped appearance, is equally destitute of a crater. Its summit, 15,796 feet above the sea, has been reached by La Condamine and Bouger, Humboldt and Bonpland, and José Caldas. Atacazo, about 16,000 feet in height, has nothing very remarkable in its appearance or history. According to Wagner, it has no activity, and from its weather-worn aspect seems of older date than its mightier neighbour Pichincha. ‘The summit of the latter, the ‘‘ Boiling Mountain,” presents three groups of rocky peaks, of which the most westerly, Rucu-Pichincha or Old Pi- chincha, alone displays volcanic activity. The crater, believed to be the deepest on the face of the globe, consists of a funnel-shaped basin 2500 feet deep, 1500 feet wide at the bottom, and upwards of a mile wide at the mouth. The inner sides rise in some places vertically, in others. with an angle of 20°; the exterior of the cone has an angle of 30°. Bouger and La Conda- mine reached the brink in 1742; Wisse and Moreno entered the crater in 1844; and Farrand and Orton have descended to the bottom, the latter in 1867. Orton gives a thrilling description of his exploit. He found that the real cone of eruption was an irregular heap 250 feet in height and 800 feet in diameter, contain- ing about seventy vents. The temperature of the vapour within the fumarole was 184°, and water boiled at 189°. There have been five eruptions of Pichincha since the Spanish conquest—in 1539, 1566, 1577, 1587, and 1660. The second covered Quito three feet deep with ashes and stones. The last, happily, broke down the western side of the crater, so that in any future outburst Quito will probably be safe. Since the carthquake of August 1867, the mountain has sent forth dense masses of black smoke, and large quantities of fine sand. Of

Cotocaelu, a conical summit 16,288 fect high, and Chiles, a truncated cone about 16,200 feet high, compara- tively little is known. ‘The latter is situated on the frontiers of Ecuador, and its northern neighbour Cumbal lies in the territory of Colunibia.

Rivers.—-The surplus waters of the eastern versant in Ecuador all find their way to the great head-stream of the Amazon; those of the western form a large number of independent rivers disemboguing in the Pacific. The Napo, which claims the first place, rises in the eastern defiles of Cotopaxi and Sincholagua—the principal source being the Rio del Valle, which traverses the Valle Vicioso. The river is still 1450 feet above the sea-level at the village of Napo, 858 at the mouth of the Coca, 586 at the mouth of the Aguarico, 500 at the mouth of the Curaray, and 385 where it joins the Marafion. The current, as observed by Orton in the month of November, was s1x miles an hour at Napo ; in the course of the next eighty miles the river falls 350 feet, and produces a fine series of rapids ; and from Santa Rosa downwards the rate is not less than four miles an hour. The breadth of the stream, which is only 120 feet at Napo, has increased to 1500 feet by the time it reaches Coca, and near the end of its course is little less than afull mile. The junction with the Maraiion takes

place by several distinct mouths. For some distance beyond the mouth of the Coea the channel is navigable for steam-boats, and the natives proceed in canoes as far as the Cataract del Cando, 3332 feet above the sea-level. The Curaray rises in the Llanganati Cordillera, and flows almost parallel with the Napo till their point of confluence, a dis- tanee of 490 miles. The waters are rendered unpalatable by a reddish slime in tlie lower part of its course, where the current is very gentle. The Aguarico, formed by the union of the Cofanes, San Migucl, and Azuela, whieh descend from the Pimampiro Cordillera in the northern limits of the country, has a course of about 420 miles. The Coca, rising in the neighbourhood of Cayambi and the Guamani Mountains, reeeives the Maspa and the Cosanga, flows eastward along the line of the equator as far as 76° 10’ W. long, turns southward, takes a leap of 137 feet, and maintains the same direetion till it reaches the Napo rather as a rival than a tributary. The Napo system thus drains a

district extending from 1° N. to 3° 8. lat. and from 78° 10’ to 73° 50’W. long. The only other Ecuadorian tributary of the Marafion that has any claim to special notice is the Pastassa. Instead of having its head-waters in the eastern slopes of the Eastern Cordillera, as is the case with most if not all of the rivers already deseribed, it rises in the central plateau, within the shadow of Cotopaxi, forces its way through the range to the north of Tunguragua, and flows south-eastwards past the roots of Sangai, augmented from stage to stage by the numerous torrents that are fed by the eternal snows. It bears the name of Patate till its janction with the Chambo in the neighbour- hood of Baiios, and is not recognized as the Pastassa above the Agoyan falls. As early as 1741 it was navigated without difficulty by Don Pedro Maldonado; and it is believed that it would afford a passage for steamboats for a distanee of 314 miles. Mr Simson, one of the most recent explorers of eastern Hcuador, gives a graphic account of the terrific floods to which its mountain tributaries, and more especially the Topo, are subject. The rise of the waters is sometimes so sudden, and their fury so irresistible, that trading parties are imprisoned for weeks in the narrow strip of land between one torrent and the next; and the whole country is traversed in the line of the currents by long ridges, or cuchillas, produced by the disintegration and removal of all the intermediate tracts. The same, indeed, holds true more or less of the whole eastern slope of the mountains aud of the upper sections of all the rivers. On the western versant of the Eeuadorian Andes there are three river systems of considerable size—the Mira, the Esmeraldas, and the Guayaquil. The first has its head-waters—the Rioblaneo, the Pisco, and the Puntal— in the vicinity of Imbabura, breaks through the Western Cordillera, reeeives from the left the San Pedro, Paramba, Cachiyaeu, Chachavi, Canumbi, and from the right the San Juan, Gualpi, and Nulpe, and empties itself by several mouths into the Paeific near the island of Tumaeo. The second, which is the largest of the three, collects its abundant waters fron Cotopaxi and Sincholagua, the transverse ridge of Tiupullo or Chisinehe, Liniza, Pichincha, and Cayambi. The Cotopaxi tributary, known as the Rio Pedregal, forms three beautiful caseades, the highest of which is about 220 feet. To the Guayaquil system belong the Daule, the Babahoyo, and the Yaguachi, with their numerous tributaries,—the Daule rising in the Sandomo ridge, the Babahoyo in the slopes of the Western Cordillera, and the Yaguachi in the skirts of Chimborazo. They are all navigable for some distance inland by steamer,

and are of great importanee in connection with the transport of native produce to the port of Guayaquil. Floods are usual in the rainy season, and vast stretches of country are laid under water. In the Daule the tide is felt at Candelaria,

25 miles inland. Along the coast, between the mouth of the Esmeraldas and the Gulf of Guayaquil, a large number of streams find their way to the sea; but as they all have their sources in the comparatively insignificant line of hills that runs north and south about 25 or 30 miles inland, they are themselves comparatively insignificant.

Lakes.—While Keuador can boast of nothing worthy of the name of an inland sea, it possesses a large number of lakes, either lying in the laps and extinct craters of the Andes, or formed in the lowlands by the overflowings of its rivers. ‘To the former class belong San Pablo, at the foot of Imbabura, 5 miles in cireumference; Cuy-cocha, on the south-east skirt of Cotocaehi, 10,200 feet above the sea, and thus one of the highest lakes in the world; Yaguar-cocha, or “ Lake of Blood,” not far from Ibarra ; Quirotoa, about 4600 feet in diameter ; Colta, to the east of Riobamba, with a powerful whirlpool in the centre; and Colay, to the south of Riobamba, which exhales gases poisonous enough to stupefy the birds that attempt to cross, and tlius helps to fill the larder of the Indians in its neighbourhood. ‘The largest specimens of the second elass lie along the Napo. ‘Thermal springs are mentioned in numerous localities;—as at Belermos and San Pedro del Tingo, north-east of Quito; at Cachillacta, in the distriet of Nanegal ; in the skirts of Rumifiagui ; at Timbugpoyo, near Tacunga ; on the slopes of Chimborazo ; and at Bafios, near the foot of Tunguragua.

Minerals.—Ecuador is less rich in minerals, especially in the precious metals, than any other of the South American states. Silver, gold, iron, mercury, lead, tin, zinc, copper, antimony, manganese, alum, sulphur, and salt are all said to be found; but very few of these exist in sufficient quantity to affect the destinies of national industry. Gold mixcd with silver has long been obtained in the neighbourhood of Zarume, in the province of Loja, and it is gathered by tlie Indians from the river beds in the Napo and Canelos territory, and more particularly from the Bobonaza. The gold of the Canelos

is about 22 carats fine, and that of the Napo 20. The town of Azogues derives its name from its prolifie quicksilver mines; and similar deposits are worked within the city of Loja. In the pueblo of Simiatug, to the south-east of Riobamba, the natives inanufacture salt from brine springs, and export it under the name of sal de Tomavela ; the produce of Salinas—a name which tells its own tale—in Imbabura, finds its way to,Colombia. Coal of good quality occurs in the province of Cuenea and also on the banks of the Napo near Puea- ureu, the " Red Mountain." Marble,' alabaster, gypsum, slate, and other industrial roeks are*obtained in various localities; beautiful rock crystal is worked at Chongon, in the provinee of Guayaquil; and in the coast districts there exist considerable deposits of asphalt.

Climate.—The deseription already given of the position and vertical' arrangement of the country implies the main characteristics of Ecuadorian climate. The snow-line varies eonsiderably in the different seasons of the year, as well as according to the form and situation of the individual mountain. Wagner found it in May on Cotocaehi, 15,788 feet high; on Guagua-Piehineha in June, 15,741; on Moze- Pichincha in May, 15,762; on Iliniza in December, 15,494 ; on Carahuirazo in January, 15,858; on Tunguragua in Feb- ruary, 15,613 ; and on El-Altar in February, 15,854. The greatest differenee, aecording to his observations, existed between the south side of Cotopaxi (15,279 feet) and the north side of Chimborazo (15,914). This elevation of the snow-line—so great when compared with its European position—of course renders possible the existence of veget- able and animal life at a correspondingly great height. While St Bernard's, the highest point of permanent human habitation in Europe, is only 8377 feet above the sea, most

of the towns and villages of the central plateaux from Ibarra to Cuenca lie between 8500 and 9500 feet ; many of the huts of the cattlemen are at a height of from 11,500 to 12,800; and the loftiest of these, at Cunayaco, on the north side of Chimborazo, in 1° 28' §. lat., stands no less than 13,396 above the sea. The temperature of these upland districts is of course comparatively low. " At Quito," says Professor Orton, "it is never either spring, summer, or autumn, but each day is a combination of all three." The

thermometric mean is 58° 8’; the range in the 24 hours about 10°, the annual maximum 70°, and the annual minimum 45°. In the lower coast-region the tropical position of the country is the main factor, and accordingly at Guayaquil we find the thermometric mean is 83°, and during the rainy season the oppressive and pestiferous air “reminds the geologist of the steam- ing atmosphere of the Carboniferous period.” The rainy season, or ¢nvierno, in Ecuador continues from December to May, with a short period of dry weather called the veranillo shortly after the December solstice. The rest of the year forms the verano, or summer, which, however, is in like manner interrupted by a little rainy season called the wmernillo, or Cordonazo de San Francisco, after the September equinox. The mean annual rainfall at Quito is 70 inches. In the coast region the two seasons are not very distinctly marked : in the invierno the sky is some- times perfectly cloudless, while during the verano there occasionally falls a continuous drizzle called gartia, Accord- ing to Villavicencio, a gradual diminution of rain has been observed in this district of irregular seasons, and he predicts the assimilation of its climate to that of the rainless coasts of Peru. On the eastern side of the Andes, on the other hand, rain occurs almost at any time of the year, and almost every morning the woods are watered with the gentle showers of the rocio, During the verano the Cordilleras and mesas are visited by violent hail-storms, and winds of almost in- credible force sweep across the wintry scene. In its relation to human health the climate of the upland region is inter- esting. Goitre is common; and it is found necessary to maintain three large hospitals for lepers. Tubercular disease of the lungs, on the contrary, is said to be com- pletely unknown 8000 feet above the sea, while it is one of the most frequent of diseases in the coast districts of Tropical America. The effects on the human organism of the ascension of the loftier summits are very variously described, Owing doubtless to individual differences of constitution. One thing seems established,—that the pugnacious instincts both of men and the lower animals are greatly weakened. Botany.—The flora of the Quitonian plateau has been well explored by various European botanists, and more especially by Dr Jameson of ‘the university of Quito;! that of the western slopes and lowlands is less perfectly ascer- tained; and that of the richly-wooded country stretching eastward from the Andes is still in great part undescribed. From the coast of the Pacific upwards to a height of about 3000 or 4000 fect, the vegetation is distinctively tropical, Including among

its ecomonical species the banana, the Sweet potato, rice, maize, the bread-fruit tree, indigo, cotton, cocoa, the yam, the mandioc, and the sugar cane. Most of these become rare above 3000 feet, but a few, like the sugar cane, are cultivated as high as 8000. Few parts of the world can vie in richness of vegetation with the alluvial valley of Guayaquil, which in the matter of fruit trees alone produces cocoa-nuts, pine-apples, pome- stanates, shaddocks, oranges, lemons, apricots, chirimoyas, pultas, granadillas, tunas, mangos, pacays, and many others of lesg importance. Between 6000 and 10,000 feet above the sea the European cereals are successfully cultivated, ee ee

. * See his Synopsis Plantarum Aiquatoriensium, 2 vols,

along with the chick-pea, the broad-bean, the cabbage, the quinoa (Chenopodium Quinoa), potatoes, Oxalis, Basella, and Tropwolum. Wheat will not form the ear lower than at 4500 feet, or ripen higher than at 10,500; but barley and rye can be grown at astill greater elevation. The oak, the elm, the ash, and the beech never descend lower than to 5500 feet, and are seldom found higher than 9200. Further up, the larger forest trees, except the pine, begin to disappear ; but the Hscallonia myrtalloides is met with at an elevation of 13,000; and the shrubby Befarias ascend 400 or 500 feet higher. In the treeless region that lies between 11,600 and 13,800, or in other places between 12,000 and 14,000 feet, the similarity of the vegetation to that of the corresponding European region is, according to Wagner, especially striking. In the paramos of Chimborazo, Pichincha, [liniza, &c., the relation of characteristic genera to those identical with genera in the Alpine flora of Europe is as 5 to 4; and the botanist might almost suppose him- self in the Upper Engadine. As the region of cryptogams does not properly begin till about 17,000 feet on Cayambi and Chimborazo, most of the summits of the Cordilleras, failing, as they do, to reach this elevation, yield a consider- able harvest of phanerogamous plants. Boussingault discovered a species of saxifrage (Saxifraga Boussingaultt) at a height of nearly 16,000 feet on Chimborazo, and Wagner found the trachytic rocks of Pichincha, Iliniza, and other peaks, far above the snow line, covered in many places with the gonda-plant, or Culcit’um nivale, H. The species in these upper regions are frequently very remarkable, and a

large number of strangely-modified forms have been col- lected from the craters of the volcanoes.

In its forest-lands alone Ecuador possesses almost inesti- mable resources, Seven different species of cinchona are known to exist within its borders; the Ceroxylon andi- cols and many lesser specics of palm abound on both sides of the Cordilleras; and redwood, Brazil wood, palo de cruz, guaiacum or holy wood, ebony, cedar, and aguana are a few of the more usualtimber trees. In the dripping forests of the west grows the sindi-caspi, which forms excellent fuel even in its moistest condition, Copal, dragon's blood, india-rubber, storax, and several valuable dye-stuffs are obtained from indigenous plants. The cabaya for 'agave, the chambini palm, cc,, yield textile fibres ; and the leaves of the toquilla (Carludowca palmata) and the mocora, a cocoa-nut-like trec, furnish material for the well-known hats.

Zoology.—The fauna of Ecuador does not present a great variety among the mammalia; but the birds, and still more the insects, are very numerous. The jaguar, the puma, the ounce, and the ocelot are the chief representatives of the cat tribe ; monkeys of various species are common ; the four characteristic animals of the Andean range, the llama, the guanaco, the vicuiia, and the alpaca, are fairly abundant ; large herds and flocks of European cattle and sheep are found in the rich pasture) of the paramos; and. horses, asses, and mules are reared in sufficient numbers to be articles of export. Few rivers are more densely peopled with alligators than the Guayaquil and Hsmeraldas ; and several of the largest species of snakes are natives of the warmer regions of the country, though in the Cordilleras and plateaus the reptilia are very rare. The condor, the turkey-buzzard, the gallinazo, the crane, and the pelican are among the larger birds ; and ducks, pheasants, and partridges are not uncommon. Of the lesser birds perhaps none appears in such number and such striking variety of form and colour as the humming bird, which is found fre- quently at a great height on the mountains. The flautero or flute-bird is especially noticeable for the artistic character of his song. That the entomologist finds a rich harvest of coleopterous insects in the low countries is in keeping

Consti- tution.

Justice.

with what might be expected ; butterflies are so numerous in some parts as even to surprise the veteran collector ; and in certain favoured regions, mosquitoes, sand-flies, and the equally troublesome piums seem nearly as prolific as their ancient congeners in Egypt. The silkworm has been successfully introduced, but bee-keeping is as yet practically unknown. ‘The ichthyology of Ecuador, and more parti- cularly that of the rivers of the Amazon system, is very partially ascertained ; but the species of the two versants seem to be quite distinct. According to Wagner’s investi- gations the distribution is mainly vertical, and to the N. of Chimborazo alpine forms go as high as 13,400 Paris feet ; the forms of the lower region (or under 1000 feet), are closely connected with those of Brazil and Guiana; more peculiar genera appear in the middle region, (from 1000 to 7000 feet), and the upper region is exclusively occupied by characteristic and frequently very strangely-shaped genera ; the number of species is comparatively small, and that of individuals great only in the lower parts of the rivers. Produce and Industries. —The principal article of foreign export is cocoa, of which two kinds especially are distin- guished in the market—the fine “up-river” quality and the so-called Machala quality. Spain is the greatest purchaser, then England, Germany, and Peru and Chili. In 1874 the total quantity that left the country was 250,216 quintals, valued at 2,752,381 pesos, or, taking the peso as equal to 4s, 2d., £573,412. The collection of india-rubber is becoming an important trade; and pupils trained at the Government expense have been sent into the various provinces to superintend the introduction of indigo cultivation. Cotton, not proving a profitable investment, is being somewhat neglected: the export in 1874 was only 440,091b, valued at 35,208 pesos. The other articles, arranged in the order of importance, were—coffee, 10,652 Ibs, at 245,014 pesos; Cinchona bark, 981,132, at 196,226 pesos; vegetable ivory, 7,148,192 tb, at 142,963 pesos; straw hats, 7600 dozen, at 91,200 pesos ; sole-leather, 19,744 pieces, at 88,848 pesos; dried skins to the amount of 43,115 pesos; bamboos to the amount of 23,002; and small quantities of sarsaparilla, algarroba, tamarinds, to- bacco, pita, orchilla, rice, mats, and saibo-wool.

1857 the national debt amounted to 16,370,000 piastres (or £3, 274,000), of which £1,824,000 was tlic English loan contracted in 1855.

Artificial means of communication are still for the most Commun, part in a very primitive condition, though few countries have cation, | so little reason to be content with their natural highways by land |

or water. Many of the roads, even between important centres of population, are mere mule-tracks, altogether impassable in bad weather it may be for weeks or months at a time; while the violent torrents which have so frequently to be crossed often present

nothing better than more or less elaborate bridges of rope, similar | to the jhuler or zampur of the Kashmirians. The'simplest of these i is the taravita, consisting of a single tight rope, with or without a travelling rope by which the passenger or his luggage may be i

hauled across ; the most complex is the chimba-chaca, a rude pro- totype of the regular suspension bridge, constructed of four or five { ropes of agave-root fibre, supporting transverse layers of bamboos. { The best are hazardous to all except a practised foot, and they go out of repair in a few years. Since the middle of tke century something has been done to improve this state of affairs; and a very great deal more has always been about to be done. According to Moreno's address to congress in 1878, Ecuador had at that time 30 miles of railway, nearly 200 miles of cart-road with sub-stantial bridges, and about 250 miles of roads fit for the ordinary mule-traffie of the country. Wheeled conveyances are almost unknown, especially in the inland districts, the transport of goods of evcry description being effected by porters or mules. The first catriage was introduced into Quito in 1859, and the owner had to pay a tax for his innovation. : om | With the partial exception of such rude forms of belief as still Religion.' linger among the semi-civilized Indians, the only religion professed by the Ecuadorian populations is the Roman Catholic. Nowhere in modern times have Jesuits and priests had it more their own way. Even in 1876 Dr Borrero, the " liberal" president, thought it expedient to declare that he would protect the religion of his fathers, which he belicved "had not an enemy in all Ecuador." Twoyyears before, in spite of the extremely depressed state of the finances, ten per cent. of the part of the church

revenue belonging to the state was assigned to the Pope as an annual offering. ‘The oath of a Protestant has no value in a court of justice ; and it was regarded as an extraordinary stretch of liberality to allow the formation of a Protestant burial-ground at Quito in 1867. Monkish orders that lost their influence in Europe centuries ago still flourish in Quito—Trinitarians, Dominicans, Augustinians, Brown Franciscans, Black Franciscans, Lazarists, &. According to Villavicencio, the number of the regular clergy at the time he wrote was 415, of the secular clergy 524, and of nuns 891. Quito is the seat of an arch- bishop; and there are bishoprics for Cuenca, Loja, Ibarra, Rio- bamba, Guayaquil, and Manabi. , Education has hitherto been left in the hands of the clergy, and Educatio| primary education is consequently in a very defective condition. There has long been a university at Quito with about a dozen professors and nearly 800 students; and in 1875 the Ecuador academy was instituted in the city in accordance with the decree of the Spanish academy of Madrid. There are colleges im several of the larger towns, and nearly 600 schools exist through- out the country. ‘The normal school at Guayaquil is open to Indian children. 4 For administrative purposes the country is divided into eleven Province provinces—Azuay, with 149,108 of a population in 1871; Chimbo- razo, 110,860 ; Pichincha, 102,281; Guayas, 87,427; Imbabura, 77,879 ; Leon, 76,140 ; Tunguragua, 78,148 ; Los Rios, 61,922; Loja, 60,784 ; Manabi, 59,098 ; Esmeraldas, 8000. Besides the capital, whose inhabitants arc variously estimated from 35,000 to 80,000, the largest cities are—Guayaquil, from 20,000 to 25,000 ; Tacunga, from 16,000 to 20,000 ; Cuenca, about 25,000 ; Riobamba and Ibarra, both perhaps about 16,000; Ambato, about 10,000; Otavalo, about 8000 ; Guaranda, 8000 ; and Cotacachi, 4000. ; Antiquities.—Throughout Ecuador there are still considerable Anti- remains of the architectural and artistic skill of the ante-European quittes. | period, At Cafiar, to the north-east of Cucnca, stands the Inca- pirca, a circular rampart of finely hewn stone, inclosing an open area with a roofless but well-preserved building in the centre; not i far offis the Inca-chungana, a very much smaller inclosure, probably the remains of a pavilion ; and im the same neighbourhood the image of the sun and a small cabinet arc carved on the face of a rock called Inti-huaicu. On one of the hills running from Pichincha to the Esmeraldas there are remains at Paltatamba of a temple and a conical tower, the buttresses of a bridge composed of stone an bitumen, portions of a great causeway, and numerous tombs from which mummics and plates of silver

have been obtained. At Han- tuntaqui similar sepulchral mounds, called tolas, may be seen, a8 well as traces of military structures. On the plain of Callo, near Cotopaxi, at a height of 8658 feet, the ruins of an Incarial pa Pachusala, are utilized by the hacienda ; and a conical hill at its side is supposed to be of artificial construction. The remains 0 another fortress and palace are preserved at Pomallacta, and in thé

neighbouring pueblo of Achupallas an ancicnt temple of the sun now serves as parish church.

History.—The territory of the present republic of Ecuador, when first it becomes dimly visible in the grey dawn of American history, appears to be inhabited by upwards of fifty independent tribes, among which the Quitus seem to hold the most important position. About 280 A.D. a foreign tribe is said to have forced their way inland np the valley of the Esmeraldas ; and the kingdom which they founded at Quito lasted for about 1200 years, and was gradually extended, both by war and alliance, over many of the neighbouring dominions. In 1460, during the reign of the four- teenth Caran Shyrt, or king of the Cara nation, Hualcopo Duchisela, the conquest of Quito was undertaken by Tupac Yupanqui, the Inca of Peru ; and his ambitious scliemes were, not long after his death, successfully carried out by his son Huaina-Capac, who inflicted a decisive defeat on the Quitonians in the battle of Hatuntaqui, and secured his position by marrying Pacha, the daughter of the late Shyri. By his will the conqueror left the kingdom of Quito to Atahuallpa, his son by this alliance ; while the Peruvian throne was assigned to Huascar, an eldcr son by his Peruvian consort. War svon broke out between the two kingdoms, owing to Huascar’s pretensions to supremacy over his brother ; but it ended in the defeat and imprisonment of the usurper, and the establishment of Atahuallpa as master both of Quito and Cuzco. The fortunate monareh, however, had not long to enjoy his success ; for Pizarro aud his Spaniards were already at the door, and by 1538 the fate of the country was sealed. As soon as the confusions and rivalries of the first occupation were suppressed, the recent kingdom of Quito was made a presidency of the Spanish vice-royalty of Peru, and no ehange of importance took place till 1710. In that year it was attached to the

viceroyalty of Santa Fé; but it was restored to Peru in 1722. When, towards the close of the century, the desire for independence began to manifest itself throughout the Spanish eolonies of South America, Quito did not remain altogether indif- ferent. The Quitonian doctor Eugenio Espejo, and his fellow- citizen Don Juan Pio Montufar, entered into hearty co-operation with Narifio and Zea, the leaders of the revolutionary movement at Santa Fé; and it was at Espejo's suggestion that the political association called the Escuela de Concordia was instituted at Quito. lt was not till 1809, however, that the Quitonians made a real attempt to throw off the Spanish yoke ; and both on that occasion and in 1812 the royal general succeeded in crushing the insurrec- tion. In 1820 the people of Guayaquil took up the cry of liberty ; and in spite of several defeats they continued the contest, till at length, undcr Antonio José de Sucre, who had been sent to their assistance by Bolivar, and reinforced by a Peruvian contingent under Andres de Santa Cruz, they gained a complete victory on May 22, 1822, in a battle fought on the side of Mount Pichincha, at a height, of 10,200 feet above the sea. Two days after, the Spanish president of Quito, Don Melchor de Aymeric, capitulated, and the independence of the country was secured. A political mnion was at once effected with New Granada and Venezuela on the basis of the republican constitution instituted at Cucuta in July 1821,—the triple confederation taking the name of Colombia.

A disagreement with Peru in 1828 resulted in the invasion of Keuador and the temporary occupation of Cuenca and Guayaquil by Peruvian forces ; but peace was restored in the following year after the Ecuadorian victory at Tarqui. In the early part of 1830 a separation was effected from the Colombian federation, and the country was proclaimed an independent republic. General Juan José Flores was the first president, and in spite of many difficulties, both domestic and foreign, he managed to maintain a powerful position in the state for about 15 years. Succeeded in 18385 by Vicente Rocafuerte, he regained the presidency in 1839, and was elected for the third time in 1843; but shortly afterwards he accepted the title of generalissimo and a sum of 20,000 pesos, and left the country to his rivals. One of the most important measures of his second presidency was the establishment of peace and friend- ship with Spain. Roca, who next attained to power, effected a temporary settlement with Colombia, concluded a convention with England against the slave trade, and made a commercial

treaty With Belgium. Diego Noboa, elected in 1850 after a period of great confusion, recalled the Jesuits, produced a rupture with New Granada by recciving conservative refugees, and thus brought about his own deposition and exile. The democratic Urbina now became practically dictator, and as the attempt of Flores to reinstate Noboa proved a total failure, he was quickly succeeded in'1856 by General Francisco Robles, who, among other progressive measures, secured the adoption of the French system of coinage, weights, and Measures. He abdicated in 1859 and left the eountry, after refus- ing to ratify the treaty with Peru, by which the defender of Guaya- quil had obtained the raising of the siege. Dr Gabriel Garcia Moreno, professor of chemistry, the recognized leader of the con- Servative party at Quito, was ultimately elected by the national Convention of 1861. Distrust in his policy, however, was excited by the publication of some of his private correspondence, in which he spoke favourably of a French protectorate, and the army which

he sent under Flores to resist the encroachments of Mosquera, the president of New Granada, was completely routed. His first resig- nation in 1864 was refused; but the despotic acts by which he sought to establish a dictatorship only embittered his opponents, and in Sept. 1865 he retired from office. While he had endeavoured to develop the material resources of the country, he had at the same time intro- duced retrograde measures in regard to religion and education. The principal event in the short presidency of his successor, Geronimo Carrion (May 1865-Nov. 1867), was the alliance with Chili and Peru against Spain, and the banishment of all Spanish subjects. Several important changes were made by congress in the period between his resignation and the election of Xavier Espinosa, Jan. 1868: the power of the president to imprison persons regarded as dangerous to public order was annulled ; and the immediate naturalization of Bolivians, Chilians, Peruvians, and Colombians was authorized. Espinosa had hardly entered on his office when, in August 1868, the country was visited by an earth- quake, in which 30,000 people are said to have perished throughout South America. The public buildings of Quito were laid in ruins ; and Ibarra, Otavalo, Cotacachi, and several other towns were completely destroyed. Next year a revolution at Quito, under Moreno, brought Espinosa's

presidency to a close ; and though the national convention appointed Carvajal to the vacant office, Moreno succeeded in securing his own election in 1870 for a term of six years. His policy had undergone no alteration since 1865: the same persistent endeavour was made to establish a religious despotism, in which the supremacy of the president ‘should be subordinate only to the higher su- premacy of the clergy. The tyranny, however, came to a sudden end in August 14th 1875, when the president was assassinated in Quito, by three of his private enemies. The consequent clection resulted in the appointment of Dr Borrero, who, in his address to congress, Deccmber 1876, promised ‘‘to maintain, during the tenure of the responsible office to which he had never aspired, full political liberty and the freedom of the press.” An insurrection headed by Veintemilla, the military commandant of Guayaquil, had already broken out; and on the 14th December the Government forces under Aparicio were completely routed at Galte.

See Ulloa, Relacton hist. del Viaje, Madrid, 1748; Caldas, Seminario de la Nueva Granada, Paris, 1749; Velasco, fist. del reino de Quito, Quito, 1789 (French, by Ternaux-Compans, Paris, 1840); Humboldt and Bonpland, Voyages aux régions équinox. du nouveau continent, 1799, &c.; Villavicencio, Geograsia de la Rep. del Ecuador, New York, 1858; Richard Spruce, ‘“ Visit to the Cinchona forests on the western slopes of the Quitonian Andes,” in Journ. of the Proc. of the Linnean Soc. 1860; Pritchett, ‘‘ Explor. in Ecuador in the years 1856 and 1857,” in Journ. of Roy. Geog. Soc. 1860; Spruce, ‘On the Mountains of Llanganati,” and Prof. Jameson, ‘Journey from Quito to Cayambe in 1859, in Journ. Roy. Geog. Soc., 1861; Viscount Onffroy de Thoron, Amérique équatoriale, 1865; Haussarek, Four Years among Spanish Americans, London, 1868; Juan Leon Mera, Qjeada histo- rico-critica sobre la poesia Ecuadoriana, Quito, 1868; Wagner, Naturwissensch. Reisen im trop. Amerika, Stuttgart, 1870; Orton, The Andes and the Amazon, 1870; Flemming in the Globus, 1871 and 1872; Reiss and Stiibel, ‘‘ HOhenmesaungen in Siid Amerika,” in Zeitsch. der Gesells. fiir Erdkunde su Berlin, 1874; ‘*Die Zustinde in der Rep. Ecuador,” in Das Ausland, 1875; Dr W. Reiss, ‘‘ Bericht diber eine Reise nach dem Quilotoa und dem Cerro Hermoso,” in Zedisch. der Deutsch. Geol. Gesells., 1875; Vadet, “ L’Equateur,” in Z’Explorateur

géographique et commerciale, 1875; Simson, “Notes of Journeys in the Interior of South America,” in Proc. of Roy. Geog. Soc., 1877. (H. A. W.)

EDAM, a town of the Netherlands, in the province of North Holland and arrondissement of Hoorn, about 11 miles north-east of Amsterdam, and hardly a mile from the present limits of the Zuider Zee, at the junction of two branch canals. It has a fine town-house, an exchange, and a fish-market, and one of its two Reformed churches is adorned with stained glass, and ranks among the most beautiful buildings of the kind in the province. Ship- building, rope-spinning, and salt-boiling are carried on, and the place gives its name to a well-known description of “sweet-milk” cheese—Zoetemelks Kaas. It was at Edam that nearly the whole of Admiral De Ruyter’s fleet was con- structed. Population of the commune in 1869, 5152, and of the town 3356. fe *

EDDA, the original signification of which is “ great-

randmother,” is the title given to two very remarkable collections of old Icelandic literature. Of these only one bears that title from antiquity ; the other is named dda by a comparatively modern misnomer. The only work known by this name to the ancients was the miscellaneous

roup of writings attributed to Snorri Sturluson (1178— 1241), a scholar of Jon Léftsson, ‘and the greatest name in old Scandinavian literature. It is believed that the Hdda, as he left it, was completed about 1222. Whether he gave this name to the work is doubtful ; the title first occurs in the Upsala Codex, transcribed about fifty years after his death. ‘The collection of Snorriis now —— ao Prose

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or Younger Edda, the title of the Lider Zdda being given to a kook of ancient mythological poems, discovered by the Icelandic bishop of Skalaholt, Brynjulf Sveinsson, in 1643, and erroneously named by him the Ldda of Semund.

1. The Prose Edda, properly known as Ldda Snorra Sturlusonar, was arranged and modified by Snorri, but actually composed, as has been conjectured, between the years 1140 and 1160. It is divided into five parts, the Preface or Formali, Gylfaginning, Bragaredur, Skdldska- parmal, and Ldttatal. The preface bears a very modern character, and simply gives a history of the world from Adam and Eve, in accordance with the Christian tradition. Gylfaginning, or the Delusion of Gylfi, on the other hand, is the most precious compendium which we possess of thie mythological system of the ancicnt inhabitants of Scandi- navia. Commencing with the adventures of a mythical king Gylfi and the giantess Gefion, and the miraculous formation of the island of Zealand, it tells us that the Aisir, led by Odin, invaded Svithjod or Sweden, the land of Gylfi, and settled there. It is from the Ynglingasaga and from the Gylfaginning that we gain all the information we possess about the conquering deities or heroes who sct their stamp upon the religion of the North. Advancing from the Black Sea northwards through Russia, and west- ward through Esthonia, the AZsir seem to have overrun the south lands of Scandinavia, not as a horde but as an immigrant aristocracy. The Eddaic version, however, of the history of the gods is not so circumstantial as that in the Ynglingasaga ,; it is, on the other hand, distinguished by an exquisite simplicity and archaic force of style, which give an entirely classical character to its mythical legends of Odin and of Loki. The Gylfaginning is written in prose, with brief poetic insertions. The Bragared ur, or sayings of Bragi, are further legends of the deities, attributed to Bragi, the god of poetry, or toa poet of the same name. The Skdldskaparmdl, or Art of Poetry, commonly called Skdlda, contains the instructions given by Bragi to Agir, and con- sists of the rules and theories of ancient verse, exemplified in copious extracts from Eyvindr Skaldaspillir and other eminent Icelandic poets. The word Skdldskapr refers to the form rather than the substance of verse, and this treatise is almost solely technical in character. Tt is by far the largest of the sections of the Zdda of Snorri, and com- prises not only extracts but some long poems, notably tie Thorsdrapa of EHilifr Gudrinarson and the Haustlaung of Thj6sdlfr. The fifth section of the dda, the [Tdttatal, or Number of Metres, is a running technical commentary on the text of Snorri’s three poems written in honour of Hakon, king of Norway. Affixed to some MS. of the Younger Edda are a list of poets, and a number of philologi- cal treatises

and grammatical studies, These belong, however, to a later period than the life of Snorri Sturlu- son.

_ The three oldest MSS. of the prose Hdda all belong to the be- ginning of the 14th century. The Wurm MS. was sent to Ole Wurm in 1628; the Codex Regius was diseovered by the inde- fatigable bishop Brynjulf Sveinsson in 1640. The most impor- tant, however, of these MSS. is the Upsala Codex, an octavo volume written probably about the year 1300. There have been Several good editions of the Edda Snorra Sturlusonar, of which perhaps the best is that published by the Arme-Magnean Society

in Copenhagen in 1848, in two vols., edited by a group of seholars under the direetion of Jén Sigurdsson.

2. The Elder Hdda, Poetic Lidda, or Semundar Edda hins froda was entirely unknown until about 1643, when it came into the hands of Brynjulf Sveinsson, who, Puzzled to classify it, gave it the title of Hdda Semundi multiscit. Semund Sigfusson, who was thus credited with the collection of these poems, was a scion of the royal house of Norway, and lived from about 1055 to 1132 in Ice- land. The poems themselves date in all probability from

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the 8th or 9th centuries, and are many of them only frag- ments of longer heroic chants now otherwise entirely lost. They treat of mythical and religious legends of an early Scandinavian civilization, and are composed in the simplest and most archaic forms of Icelandic verse. no one of them is mentioned. collected from oral tradition; and the fact that the same story is occasionally repeated, in varicd form, and that some of the poems themselves bear internal evidence of being more ancient than others, proves that the present

The author of It is evident that they were

collection is only a gathering made early in the Middle

Ages, long after the composition of the pieces, and in no

critical spirit. Sophus Bugge, indeed, one of the greatest living authorities, absolutely rejects the name of Seemund, and is of opinion that the poetic Edda, as we at present hold it, dates from about 1240. There is no doubt that it was collected in Iceland, and by an Icelander.

The most remarkable and the most ancient of the poems in this priceless collection is that with which it commences, the Véluspd, or Prophecy of the Vélva or Sibyl. In this chant we listen to an inspired prophetess, “seated on her high seat, and addressing Odin, while the gods listen to her words.” She sings of the world before the gods were made, of the coming and the meeting of the Aisir, of the origin of the giants, dwarfs, and men, of the happy beginning of all things, and the sad ending that shall be in the chaos of Ragnarok. The latter part of the poem is understood to be a kind of necromancy,—according to V igfusson, “ the raising of a dead vélva;” but the mystical language of the whole, its abrupt transitions and terse condensations, and above all the extinct and mysterious cosmology, an acquaintance with which it presupposes, make the exact interpretation of the Véluspdé extremely difficult. The charm and solemn beauty of the style, however, are irresist- ible, and we are constrained to listen and revere as if we were the auditors of some fugual music devised in honour of a primal and long-buried deity. The melodies of this earliest Icelandic verse, elaborate in their extreme and severe simplicity, arewholly rhythmical and alliterative, and return upon themselves like a solemn incantation. Ldvamdil, the Sayings of the High One, or Odin, follows next ; this contains proverbs and wise saws, and a series of stories, some of them comical, told by Odin against himself. The Vafthraédnismdl, or sayings of Vafthrésnir, is written in the same mystical vein as Véluspd ; in it the giant who gives his name to the poem is visited by Odin in disguise, and 1s questioned by him about the cosmogony and chronology of the Norse religion. Grimnismdl, or the Sayings of Grimmnr, which is partly in prose, is a story of Odin’s imprisonment and torture by king Geirréd. 2dr Skirnis, or the J ourncy of Skirnir, Harbardsli6d, or the Lay of Harbar’, Mymis-kuia, or the Song of Hymir, and Gigisdrekka, or the Brew- ing of Cigir, are poems, frequently composed as dialogue, containing legends of the gods, some of which are so ludicrous that it has been suggested that they were intentionally burlesque. Zhrymskvida, or the Song of Thrym, possesses far more poetic interest ; it recounts 1n language of singular force and

directness how Thor lost his hammer, stolen by Thrym the giant, how the latter refused to give it up unless the goddess Freyia was given him in marriage, and how Thor, dressed in women's raiment, personated Freyia, and, slaying Thrym, recovered his hammer. Alvissmdl, or the Sayings of Alvis, is actually a philological exercise under the semblance of a dialogue between Thor and Alvis the dwarf. In Vegtamskwida, or the Song of Vegtam, Odin questions a vélva with regard to the meaning of the sinister dreams of Balder. Ligsmdl, or more properly Régsthula, records how the god Heimdall,

disguised as a man called Rig, wandered by the sea-shore, where he met the original dwarf pair, Ai and Edda, to

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whom he gave the power of child-bearing, and thence sprung thie whole race of thralls ; then he went on and met with Afi and Amma, and made them the parents of the race of churls ; then he proceeded until he came to Fadir and Modir, to whom he gave Jarl, the first of free men, whom he himself brouglit up, teaching him to shoot and snare, and to use the sword and runes. It is much to be lamented that of this most characteristic and pictur- esque poem we possess only a fragment. In LHyndluljod, the Lay of Hyndla, the goddess Freyia rides to question the volva Hyndla with regard to the ancestry of her young paramour Ottar; a very fine quarrcl ensues betwecn the prophetess and her visitor. With this pocm, the first or wholly mythological portion of the collection closes. What follows is heroic and pseudo-historic. The Vélundarkrida, or Song of Volundr, is engaged with the sufferings and adventures of Vélundr, the smith-king, during his stay with Nidud, king of Sweden. Volundr, identical with the Anglo-Saxon Wéland and the German Welant, is sometimes confounded with Odin, the master-smith. This poem contains the beautiful figure of Svanhvit, the swan-maiden, who stays seven winters with Volundr, and then, yearning for her fatherland, flies away home through the dark forest. Helgakvida Liérvards Sonar, the Song of Helgi, the Son of Hidrvard, which is largely in prose, celcbrates the woving by Helgi of Svava, who, like Atalanta, ends by loving the man with whom she has fought in battle. Two Songs of Helgi the Hunding’s Bane, J/elgakvid’a Hundingsbana, open the long and very important series of lays relating to the two heroic families of the Vélsungs and the Niblungs. Including the poems just mentioncd, there are about twenty distinct pieces in the poetic Hada which deal more or less directly with this chain of stories. It is hardly necessary to give the titles of these poems here in detail, especially as they are, in their present form, mani- festly only fragments of a great poetic saga, possibly the earliest coherent form of the story so universal among the Teutonic peoples. We happily possess a somewhat later prose version of this lost poem in the Vélsungasaga, whiere the story is completely worked out. In many places the prose of the Vélsungasaga follows the verse of the Eddaic fragments with thc greatest precision, often making use of the very same expressions. At the same’time there are poems iu the Hdda which the author of the saga

does not seem to have seen. But if we compare the central portions of the myth, namely Sigurd's conversation with Fafmir, the death of Regin, the speech of the birds and the meeting with the Valkyrje, we are struck with the ex- treme fidelity of the prose romancer to his poetic precursors in the Stgurdarkvida Fafnisbana ; in passing on to the death of Sigurd, we perceive that the version in the Vélsuxgasaga must be based upon a poem now entircly lost. Of the further extension of the myth and its corrup- tion into the romantic cpic of Der Nibelunge Nét, this is hot the place*for discussion. Suffice to say that in no modernized or Germanized form does the legend attain such an exquisite colouring of heroic poetry as in these earliest fragments of Icelandic song. A very curious poem, in some MSS. attributed directly to Semund, is the Lay of the Sun, Sélarli6d, which forms a kind of appendix to the poetic Hdda. In this the spirit of a dead father addresses his living son, and exhorts him, with maxims that resemble those of Z/évamdil, to righteousness of life. The tone of the poem is strangely confused between Christianity and Paganism, and it has been assumed to be the composition of a writer in the act of transition between the old creed and the new. It may, however, not impossibly, be altogether spurious as a poem of great antiquity, and may merely be the production of some [celandic monk, anxious to imitate the Eddaic form and spirit. Finally Forspjalls-

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Yoo , or the Preamble, formerly known as the Song of Odin's Raven, is an extremely obscure fragment, of which little is understood, although infinite scholarship has been expended on it. With this the poetic Kdda closes.

The principal MS, of this Hdda is the Codex Regius in the Royal Library at Copenhagen, written eontinuously, without regard to prose or verse, on 45 leaves. This is that found by Bishop Brynjulf. _ Another valuable fragment exists in the Arne-Magnean collection in the University of Copenhagen, consisting of six leaves. These are the only MSS. older than the 17th eentury which eon- tain a colleetion of the aneient mythico-heroic lays, but fragments oceur in various other works, and especially in the Zdda of Snorri. The poetie Edda was translated into English verse by Amos Cottle in 1797 ; the poet Gray produced a version of the Vegtamskvida ; but the

first good translation of the whole was that published by Benjamin Thorpe in 1866. An exeellent edition of the Ieelandic text has been prepared by Th. Mobius, but the standard of the original orthography will be found in the admirable edition of Sophns Bugge, Norren Fornkvedi, published at Christiania in 1867. (E. W. G.)

EDELINCK, Gerarp (1649-1707), one of the greatest copper-plate engravers, was born at Antwerp in 1649. Tke rudiments of the art, which he was to carry to a higher pitch of excellence than it had previously reached, he acquired in his native town under the engraver Cornelisz Galle. But he was not long in reaching the limits of his master's attainments; and then he went to Paris to improv: himself under the tcaching of De Poilly. This master likewise had soon done all lic could to help him onwards, and Edelinck ultimately took the first rank among line engravers. His excellence was generally acknowledged ; and having become known to Louis XIV. he was appointed, ou the recomniendation of Le Brun, teacher at the academy established at the Gobelins for the training of workers in tapestry. He was also entrusted with the execution of several important works. In 1677 he was admitted member of the Paris Academy of Painting and Sculpture. The work of this great engraver constitutes an epoch in the art. His prints number more than four hundred, and it is asserted that amongst them there is no work of poor or middling quality, although many of lis subjects were poor and unworthy of the high art which he lavished upon them. Edelinck stands above and apart from his predecessors and contemporarics especially in this that he excelled, not in some one respect,{but in all respects,—that while one engraver attaincd excellence in correct form, and another in rendering light and shade, and others in giving colour to their prints and the texture of surfaces, he, as supreme master of the burin, possessed and displayed all these separate qualities, and that in so complete a harmony that the eye is not attracted by any one of them in particular, but rests in the satisfying whole. Edelinck was the first to break through the custom of making prints square, and to execute them in the lozenge shape. Among his most famous works arc a Holy Family, after Raphael ; a Penitent Magdalene, after Charles le Brun ; Alexander at the Tent of Darius, after Le Brun; a Combat of Four Knights, after Leonardo da Vinci; Christ surrounded with Angels; St Louis praying; and St Charles Borromeo before a crucifix,— the last three after Le Brun. Edelinck was especially good as

an engraver of portraits, and executed prints of many of the most eminent persons of his timc. Among these are those of Le Brun, Rigaud, Philippe de Champagne (which the engraver thought his best), Santeuil, La Fontaine, Colbert, John Dryden, Descartes, &e. He died at Paris in 1707. His younger brother John, and his son Nicholas, werc also engravers, but did not attain to his excellence.

EDEN Hebrew (112, denoting pleasure or" delight), was the first residence of Adam and Eve according to the Old Testament Scriptures. The passage in which its geographical position seems to be indicated (Gen. ii. B14) has been from the earliest times tlie subject of a discussion as ingenious and elaborate as it has been fruitless, Its

general position is given as " eastward," 7.e., to the east of the place where the narrative was written. Of the four rivers mentioned the Euphrates is undoubtedly the same which is still known by that name, and the Hiddekel has been almost universally identified with the Tigris. The object of commentators who have sought to put a literal construction on the passage has, therefore, been to identify the Pison and the Gihon, by finding two rivers which together with the Euphrates and the Tigris fulfil the condi- tion stated in Gen. ii. 10, And a river went out of Eden to water the garden; and from thencezit was parted and became into four heads." As there is no river which forms a common source for the Euphrates, the Tigris, and two others, recourse has been had to a strained construction of one kind or other. Josephus, for example, supposes the river which is the common source to have been the ocean stream which surrounds the earth, and identifies the Pison with the Ganges and the Gihon with the Nile; and in this he is followed by many of the fathers. Calmet, Rosen- miiller, and others, again, suppose the river which is the common source to have been a region of springs, and, by making the Pison and the Gihon mountain streams, place the site of Eden in the highlands of Armenia. Calvin, Huet, and Bochart place Eden in lower Babylonia, on the supposition that the Pison and tlie Gihon are the two channels by which the united rivers Euphrates and Tigris enter the Persian Gulf. Luther and others, such as Clericus and more recently Baumgarten, have hazarded the supposi- tion that the flood altered

the course of the streams, and thus rendered it impossible to identify the locality of Eden from the description given in Genesis. These may suffice as specimens of the almost innumerable solutions that have been offered of what is now generally admitted to be an insoluble problem. On the theory that the narrative in Genesis is veritable history to be literally interpreted, it is impossible to fix the geographical position of Eden with any approach to certainty. This impossibility fully accounts for the immense variety of the conjectures that have been put forward. It deserves mention as a curiosity of criticism that the site of Eden has been assigned by different writers to each of the four quarters of the globe, and that the particular localities specified have ranged from Scandinavia to the South Sea Islands. The allegorical interpretations, which have been offered in great variety from the time of Philo downwards, are, of course, not hampered with any geographical difficulties. Philo supposes Eden to be a symbol of the soul that delights in virtue, the river which is the source to be generic virtue or goodness, and the four rivers to be the specific virtues of prudence, temperance, courage, and justice. Origen finds in the subject an excellent opportunity for applying his favourite allegorical method, and supposes Eden to be heaven, and the rivers wisdom. Similar interpretations, with individual variations, are given by several of the fathers who are prone to allegorize. In modern times Coleridge is perhaps the most celebrated of those who have interpreted the story of Eden as an allegory. It is to be observed, however, that this mode of explaining the narra- tive has found even less favour with recent interpreters than that which accepts it as literal history, meeting the obvious difficulties as best itcan. The undoubted tendency of later criticism has been to discard alike the theory of literal history and the theory of allegory in favour of another, according to which the story of Eden is a mythical tradition of a kind similar to that which is to be found in the early sacred literature of most nations. According to this view the true explanation is to be sought for in a careful comparison of these various traditions as preserved in sacred Seriptures, early histories, inscriptions, and otherwise. See Apam, vol. i. p. 135-6, and PenTaTewcu.

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EDEN, Tae HoxovraBie Emity (17 95-1851), novelist and miscellaneous writer, was the seventh daughter of the first Lord Auckland, and was born in 1795. Happily gifted by nature, her literary faculties and tastes were fostered by a liberal education. In 1835 she accompanied her brother, Lord Auckland, to India, on his appointment as governor-general, and remained with him during his term of office, which covered the period of the Afghan war, Returning to England in 1841, she made herself favourably known as a writer by the publication, three years later, of her Portraits of the Princes and People of India. She was also author of two novels entitled the The Semi-detached House and The Semi-attached Couple, which first appeared anonymously under the editorship of Lady Theresa Lewis. In these works she gives clever and amusing delineations of Anglo-Indian life and manners as she saw them. In 1866 was published a series of her letters to her sister written from India, and entitled Up the Country. Her private journal, at present unpublished, is said to be still more attractive and full of sparkling anecdote and graphic sketches. Another volume entitled Letters from India, edited by her niece, the Hon. Eleanor Eden, was published in 1872. For many years Miss Eden lived at Kensington, and her house was one of the most frequented centres, of London intellectual and fashionable life, She afterwards removed to Richmond, and there died, August 5, 1869. Her eldest sister Eleanor ‘attracted the warm affection of William Pitt, who, however, did not feel justified in making her an offer of marriage. This was, it is supposed, the only love-passage in Pitt’s history. She afterwards married Lord Hobart, and died in 185).

EDENTATA, an order of placental mammals charac- terized by the total absence of median incisor teeth. Such teeth as are found in edentate species are composed entirely of dentine and cement, without enamel ; they likewise grow for an indefinite period, and are consequently without root ; and so far as yet discovered there is no displacement of the first teeth by any second set except in a few of the armadiiloes. This order contains the sloths, armadilloes, and ant-eaters.

EDESSA, the ancient capital of Macedonia, previously known as Aige, was situated 46 miles W. of Thessalonica on the banks of a beautiful stream in the very centre of the kingdom, and at the head of a defile commanding the approaches from the sea-coast to the interior of the country. It was the

original residence of the Macedonian kings; aud even after the seat of government was removed to the more accessible Pella, it continued to be the burial-place of the royal family. At the celebration of his daughter's marriage in the town, Philip IJ. was murdered by Pausanias in 336 B.C. His greater son Alexander was buried at Memplis through the contrivance of Ptolemy ; but the bodies of his granddaughter Eurydice and her husband Arrhideeus were removed by Cassander to the ancestral sepulchre. On the occupation of the town by Pyrrhus the royal tombs were plundered by the Gallic mercenaries. The modern city of Vodena is built on the site of Edessa, and preserves a few unimportant remains of ancient buildings. The names Aig and Edessa were both probably given in allusion to the full-flowing streams that form one of the principal features of the situation; and Vodena is certainly derived from the Slavonic voda, water. Full details in regard to the position of the city may be found in Tozer, The Highlands of Turkey, vol. i. ;

EDESSA, or, as it is now called, Urfa or Orfa, a city of Northern Mesopotamia, on the Daisun, a left-hand tributary of the Euphrates, 55 miles W. of Diarbekir and 59 E. of Biredjik, in 37° 21' N. lat. and 39° 6' E. long. It is sur rcunded with walls and towers, well preserved on the northern side, has narrow but comfortable and cleanly

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streets, and displays in its bazaar not only the native woollen stuffs, pottery, and silver work, but also a consider- able variety of European goods. In the principal square there is a large mosque dedicated to Abraham, who, accord- ing to Mahomietan legend, was slain in the city ; and in its immediate vicinity is a pond shaded by fine pomegranate, plain, and cypress trees, and tenanted from time immemorial by sacred fish. The only ancient remains are those of a tower ascribed by tradition to Nimrod; but in the neigh- bourhood there exist extensive catacombs with numerous inscriptions of an early date. The prevailing language is Turkish, though more than three-fourths of the inhabitants are Christian. The population was estimated about 1796 by Olivier as from 20,000 to 24,000; by Bucking- ham at 50,000; and, in 1873, by Chernik at 40,000. There are two mission establishments, an American and a French, aud in connection with the

former a school with about 250 pupils. The outskirts are occupied by melon- gardens, vineyards, and mulberry plantations.

Nothing is known of the origin of Edessa. It has hecn suggested that probably the early inhabitants were Sabseans, and that the sacred fish originally belonged to the worship of Atergatis. _Accord- ing to the Targum of the psendo-Jonathan, Jerome, and Ephraem Syrus, the city is to be identified with the Erech of Gencsis x. 10, and the local tradition of thé Arabs and Jews makes it the same as Ur of the Chaldees; but there is no historical basis for either identification, though the former has received the support of Michaelis, Buttmann, and Von Bohlen, The first authentic mention of the city connects it with Selcucus, who appears to have greatly increased its prosperity, and was probably the bestower of the name by which it is best known in history. This, according to Stephanus, was taken from the Maccdonian Edessa, from the abundance of the water in both cities, but a modern etymologist recognizes the Syrian Haditha or New Town. Another designation, Callirhoe, found in the ancient writers, undoubtedly alludes to its fountain ; and it is at least possible that this may be the derivation of its modern name—Urhoi among the Syrians, Er Roha among the Arabs, and Orfa among the Turks and Christians. In the time of Antiochus VII., about 135 B.c., the city became the seat or centre of the Osrhoenic kingdom, founded by Orhoi-Bar-Khevyo, and governed for centuries by a series of elective monarchs. Of these the eighth in succession, Abgar Bar-Abgar, fought against Lucullus, but afterwards sided with the Romans; the fifteenth Abgar Uchomo is famous for the legendary eorrespondence with Christ reported by Eusebius. The city was plundered by Trajan’s general Lusius Quietus, and the kingdom became tributary in 116. Restored by Hadrian it was finally abolished by Caracalla in 217, and a Roman military colony was established with the title of Colonia Marcia Edessorum. Meanwhile Christianity had been taking fast root in the city, the first ehurch having been built as early at least as 202. By the time of Julian, the wealth of the Christians was sufficient to attract his revengeful cupidity ; and in the course of the following eentury, the number of monasteries alone ‘is said to have exceeded 300. Great theological schools were established, and the eity, in fact, became one of the chief seats of Oriental learning. Most famous of all was the Schola Persica or Persian School ; but its professors having adopted the Nestorian heresy were expelled by

Martyrus the bishop, and the building was destroyed in 489, and replaced by St Mary's Church. The pros- perity of the eity gradually disappeared during the next five eenturies, as it passed successively into the hands of the Arabs and the Seljuks. J'rom the latter it was captured in 1097 by Baldwin de Bouillon, and for the next fifty years it continued an independent Christian countship. Baldwin's successors were his cousin Baldwin II. (1100-1118), Jocelin de Courtenay, surnamed the Great (1118- 1181), and Jocelin II. (1181-1144). The negligence of this last count permitted the eity to fall into the hands of Zengi of Mosul, and in 1466, the attempt of the inhabitants to recover their indc- pendence brought down the vengeance of Zengi's successor Nur-cd- din. The sultans of Egypt and Syria obtained possession in 1181, the Byzantines in 1234, the Mongolians under Tamurlane about 1393, the Turkomans and the Persians at a latcr date, and finally the Turks in 1637.

See Assemani Biblioth. Orient. vol. i. where the "Chron. Edessenum" is re-

printed; Th. L. Bayer, Historia Osrhoéna et Edessena ex nummis illustrata, St Petersburg, 1734.

EDFU, in Coptish Atbo, from the old Egyptian Tebu, a village of Upper Egypt, in the province of Said, situated about a third of a mile from the left bank of the Nile, 55 miles below the cataracts of Syene, in 24° 58' 43" N. lat. It is inhabited by about 2000 Arabs and Copts, engaged

for the most part in the manufacture of earthenware, which finds ready sale all through Egypt, and is remarkable for the similarity it retains to the ancient pottery represented on themonuments. To the Egyptologist the spot is of extreme interest, as furnishing the most perfect specimen of an ancient Egyptian temple, full details in regard to which may be found in the article ARCHITECTURE, Vol. ii. p. 389. By the Greeks aud Romans the city to which this splendid building belonged was known as Apollinopolis Magna, the god to whom the temple was dedicated being identified with the Greek Apollo. Under the later empire it was the see of a bishop and the head-quarters of the Legio IJ. Trajana.

See Belzoni, Narrative, 3d ed., 1822; Wilkinson, Zgypt and Thebes, 1843; Lepsius, Ueber cine hicroglyphische Inschrift am Tempel von Edfw, Berlin, 1855; Mariette, PFowtlles cxécutées cn Egypte, &c., @apres les ordres du viecrot, 1867.

EDGEWORTH, Marra (1767-1849), the creator of the novel of national manners and moral purpose, was the daughter, by his first wife, of Richard Lovell Edgeworth noticed below. She was born at Hare Hatch, Berkshire, in 1767, and did not see Ireland till she was twelve years old. She was educated by her father, who devoted himself with great enthusiasm to the intellectual ad- vancement of his children. In most of her literary undertakings Miss Edgeworth had the advantage of ler father's criticism, who also wrote introductions to her novels, "It is my business," he used to say, " to cut and correct: yours to write on." Many tales and essays were written by Maria for private pleasure before publication was thought of. Practical Education (1798) was a joint work by father and daughter. In 1800 appeared Castle Rackrent, which at once made for her a reputation as a national novelist. This was followed soon after by Belinda, and by the Essay on Lrish Bulls, published in partnership with her father, and intended to familiarize the English public with Irish humour and pathos. The work is so thoroughly the joint-product of two minds, that Miss Edge- worth, in writing her father's life, cannot tell distinctly which parts are his, but says that passages in which classical allusions and quotations occur must be her father's, as she was " entirely ignorant of the learned languages " (Memoirs, second edition, ii. 315). In 1804 appeared Popular Tales; in 1806 Leonora ; in 1809 the first instal- ment of Fashionable Tales, which were finished in 1812; in 1814 Patronage; and in 1817 Harrington, Ormond, and Convic Dramas, which failed on the stage. The death of her father, in that year, recalled her from novel writing to fulfil the sacred duty of completing his Memoirs, which were given to the world in 1820, and of which a second edition was called for in 1821. In 1822 appeared Josa- mond, a Sequel to Harly Lessons, a work published earlier with contributions from Mr Edgeworth's pen. In August 1823 Miss Edgeworth visited Sir Walter Scott at Abbots- ford, where she remained a fortnight ; and Scott repaid this visit at Edgeworthtown exactly two years afterwards. In 1825 Miss Edgeworth further continued her tales for the young by the publication of Harry and Lucy. In 1834 appeared ZHelen, a Tale, her last and one of her best novels;,

and she afterwards wrote Orlandino, a book for children. Her Letters for Literary Ladves were suggested by a correspondence between Thomas Day and her father as to the propriety of ee oy in which the

mer stoutly maintained the negative. reine Bageworth died on the 2Ist of May 1849, after having lived to see her works take rank as English classics. Her influence was deep and lasting. Sir Walter Scott confesses that he was anxious to do for Scotland what Miss Edgeworth had done for Ireland; and it 1s said that O'Connell regretted deeply that one so powerful did not serve Ireland as an agitator. Her society was courted by

the most distinguished of her contemporaries; and countless tourists, wlio visited her, returned home charmed by her lively conversation and by the domestic virtues which brightened the home of which she was the centre. With Scott she was on terms of the closest inti- macy ; Byron admired her works, in spite of his sarcastic reference to ' Miss Edgeworth's novels stepping from their covers ;? and Lord Macaulay was one of her most enthusiastic worshippers. ' Among all the incidents," says Mr Trevelyan, " connected with the publication of his Ifistory, nothing pleased Macaulay so much as the gratification that he contrived to give to Maria Edgeworth, as a small return for the enjoyment which, during more than forty years, he had derived from her charming writ- ings." Macaulay mentions Miss Edgeworth's name in a note, in which he describes her delineation of King Corny, in Ormond, as " that admirable portrait." Miss Edgeworth, in a letter to Dr Holland, speaks of the " self-satisfaction, vanity, pride, surprise, I had in finding my own nate in a note."

Castle Rackrent, the first and one of the most character- istic of her novels, is lit up throughout with sunny Irish lmmour, Sir Condy complaining that he " was very ill used by the Government about a place that was promised him and never given, after lis supporting them against his conscience very honourably" (1857 edition, p. 39). Leonora has a painful plot. It treats of the seduction of an attached hnsband by a professed friend of his wife. Leonora's forbearance, however, and her decp-seated love for her husband prove, in the end, too much for the hollow professions and vaunted " sensibility " of Olivia. The Tales of Fashionable Life include ELnnui, The

Dun, Maneuvring, Alineria, Vivian, The Absentee, Madame de Fleury, and Emilie de Coulanges. Ennui is a powerful story, and relates how the earl of Glenthorn was cured of the disease which gives its name to the book. There are several fine character studies, including the Earl; M‘Leod, the cool, but faithful, Scotch agent; witty Lady Geraldine; Christy, the blacksmith; and Ellinor, the Irish foster nurse, who said, on one occasion, that “ if it plased God, she would like to die on a Christmas day, of all days, becaase the gates of Heaven, they say, will be open all that day, and who knows but a body might slip in wnknownst ?” (1857 edition, p. 231). Zhe Dun portrays, with a realism almost too painful, the dreadful privations undergone by the poor who are unable to get in the money justly their due. Mancuvring depicts the efforts of Mrs Beaumont, a clever, scheming, deceitful woman, to marry her son and daughiter contrary to their inclinations. For a while all seems to go well with Mrs Beaumont, until she is herself entangled in her net of white lies, and finally thoroughly outwitted. Her character, and that of Mr Palmer, a wealthy merchant from Jamaica, are worthy of the author’s high reputation. Almeria traces the rise of the worldly spirit in the breast of a young girl, and the debasing con- sequences of a passionate pursuit of fashion for its own fake, unredeemed by any ennobling feature. Vivian is an admirably told story, and illustrates the terrible evils which sometimes arise from indecision of character. Vivian, the undecided, brilliant, young noble; Russell, the faithful tutor ; Wharton, the unscrupulous politician and voluptuary ; self-willed Lord Glistonbury ; prim Lady Glistonbury ; and vivacious Lady Julia seem to start from the canvas. Zhe Absentee, considered by many as Miss Edgeworth’s master- Piece, is written to expose the misery entailed on the tenantry by the Irish gentry, who deserted their native country for London, and abandoned their affairs to be managed by unscrupulous agents. The characters are among the most life-like in the annals of fiction. Lady Clonbrony makes herself exquisitely ridiculous in her vain

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endeavours to act the fine English lady; Lord Colambre, the hero of the novel, travels, under an assumed name, among his father’s tenants in Ireland, finds out how rudely they have been oppressed, and champions their cause so skilfully as to win over even Lady Clonbrony ; Lady Dashfort

and her daughter are wonderfully real representa- tions of heartless women of fashion ; the sufferings of the Trish peasantry are drawn with a loving and masterly pencil ; and the gencral sadness of the work is relieved by such humorous sketches as Colonel Heathcock, Sir Terence O'Fay, and Larry Brady, whose inimitable letter closes the book. Macaulay considered the scene in which Lord Colambre discovers himself to his father's tenantry the best passage of the kind since the beginning of the 22d book of the Odyssey. This is very high praise, especially when we remember that Macaulay seems to have read almost every novel—so much was he fascinated by narrative composition. Madame de Fleury is the story of a French lady who set up a school in Paris for neglected girls. The school came to grief at the great Revolution; and its benevolent founder had to fly to England, where she was supported mainly by donations from the girls, who were instigated by Victoire, the heroine of the book. Ultimately her return to France was secured by Basile, Victoire's lover, who had obtained influence with his general through his valuable engineering knowledge. 'milie de Coulanges describes the mortifica- tions two French refugees had to undergo in living with Mrs Somers, an excessively ill-tempered English lady, who was generous enough with her money, but neglectful of kindness of a more delicate order. Mrs Somers's incessant outbursts of temper and reconciliations with Emilie, to be followed inevitably by fresh quarrels, are somewhat weari- some reading. Zhe Modern Griselda, a story treating of the attempts of a wife to bring her husband to abject submission, manifests fine satiric power, and great liveli- ness—thedialogue being particularly animated. Patronage, which is in the same vein as the J'ales of Fashionable Life, rather disappointed the critics, who concluded that Mr Edgeworth had written considerable parts of it. This, however, is expressly denied by Miss Edgeworth (Memoirs, ii. 323). Ormond is an Irish tale, and ranks among the best of Miss Edgeworth's works. It shows how a youth, whose education had been neglected, and whose temper was naturally impetuous, managed to reach true nobility of character. King Corny, Ormond, Sir Ulick O'Shane, Moriarty Carroll, Dora, and Mademoiselle O'Faley are masterly creations. There is a true Irish ring abont the book, although it is composed in the purest English. Helen is a novel of thrilling interest, and displays greater passion and a finer insight into the more subtle moods of the human mind than any of Miss Edgeworth's previous works. The moral is that falsehood and deceit almost invariably bring misery in their train. Although on a more

elaborate scale than her other books, Helen sur- passes them all in grace, charm, and lightness of touch. Such powerfully conceived characters as Lady Davenant, Helen, Cecilia, Peauclerc, Churchill, and the Clarendons, leave an indelible impression on the memory.

Miss Edgeworth's novels are distinguished by good sense, humour, and an easy flowing style. As the construction of a plot is not her strong point, she is generally more successful in tales than in lengthy novels. The vivacity of her dialogues is extraordinary 5. and in them her characters reveal themselves in the most natural way possible. Her books are character-studies, rather than in- tenscly interesting narratives. Sobricty of judgment is seen throughout ; and passion, romance, and poetry rarely, if ever, shed their lustre on her pages. Three of her aims were to paint national manners, to enforce morality, and to teach fashionable society by satirizing the lives of the idle and worldly. She ex- pressly calls some of her stories ‘‘ Moral Tales”; but they all fall under this category. The two poles of thought in regard to the moral tendency of Miss Kdgeworth's works are well represented by Robert Hall, the eminent Baptist preacher, and Monsieur Taine.

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Miss Edgeworth ‘‘does not,” says Tall, ‘attack religion or inveigh against it, but makes it appear unnecessary by exhibiting perfect virtue without it. No books ever produced so bad an effeet on my own mind as hers. I did not expect any irreligion there : I was off my guard; their moral echaraeter beguiled me: I read volume after volume with eagerness; and the evil effects of them I experienced for weeks” (llall's Works, vol. i. Bohn's edition, 1846, appendix, note A). Monsieur Taine, again, says that ‘this regular presence of a moral intention spoils the novel as well as the novelist. It must be confessed a volume of Thackeray has the eruel misfortune of recalling the novels of Miss Edgeworth” (English Literature, Criticism on Thackeray). To Robert Hall's eriticism it is to be objeeted that a novel is searcely the place to explain and inculeate the systematic theology of the evangelical sehool; while we must eoneede to Taine and the French critics that to burden a novel with a moral, or other special purpose, is artistically a blemish, especially when it is professedly made an aim as in

Miss Edgeworth’s ease. She remarks very beautifully of Sir Walter Scott, that ‘‘ his morality is not in purple patches, ostentatiously obtrusive, but woven in through the very texture of the stuff” (Helen, 1838 edition, 123)—a statement which scarcely holds true of herself. Still, strong national tendencies must be allowed to assert themselves in fiction, and there ean be no doubt that the didactic or moralizing tendency is dceply seatcd in the English-speaking peoples.

No writer teaches a more admirable practical philosophy than Miss Edgeworth; and she reaches her object by making her eharacters natural, and capable, as well as worthy, of imitation. She plainly belongs to the realistie school of fiction ; and it is in- teresting to remember that her Tales are expressly founded on a earefully thought out philosophy of education. She thus gives no eountenanee to the popular fallaey that teaching is a mere trick or knack, rather than a science resting on well-ascertained mental phenomena. Few novelists display less extravagance than Miss Edgeworth. We feel that her minor characters especially are genuine fiesh and blood. Sometimes the hero or heroine of the story is liable to the charge of being the incarnation of a single quality, rather than a man or woman. Ilowever, in the case of one who writes with a didactie purpose, this is almost inevitable. Miss Edgeworth has drawn attention to the less brilliant faeultics of humanity, and always prefers to be useful, where others would have endeavoured to be striking. In her pages the heroic virtues give place to prudence, industry, kindness, and sweetness of temper. There are few instances of overwhelming emotions or tumultuous passions in her works ; and it is remarkable how little the love of nature appears. She never uses material which does not yield some direet moral lesson. All this is the natural consequence of Miss Edgeworth’s method and utilitarian aim. But, working under such self-imposed conditions, she has done wonders. Her represen- tations of the humour, pathos, and generous character of the Irish peasantry are an imperishable monument of her genius. Nor is it fair to depreciate the English novels in comparison, Helen being quite equal to any of her distinctively national tales. The freshness of her stories, her insight into character, lively dialogues, originality of invention, and delightfully clear style render it quite possible to read her works in succession without any sense of weariness. As a painter of national life and manners, and an illustrator of the homelier graces of human character, Miss Edgeworth is

surpassed by Sir Walter Scott alone; while as a direet moral teacher she has no peer among novelists. Among the many sweet memories her unsullied pages have bequeathed to the world, not the least precious is her own noble character, which ever responded to all that is best and most enduring in human nature.

In 1832 4 collected edition of Miss Edgeworth's novels was published in London in 18 volumes:—J. Castle Rackrent; Essay on Irish Bulls; Essay on Self-Justifi- cation. II, Forester; the Prussian Vase; the Good Aunt. IJ/. Angelina; the Good French Governess; Mademoiselle Panache; the Knapsack, IV. Lame Jervas; the Will; the Limerick Gloves; Out of Debt, Out of Danger; the Lottery; Rosanna. V. Murad the Unlucky; the Manufacturers; the Contrast; the Grateful Negro; To-morrow. VI, Ennui; the Dun. V1. Maneuvring; Almeria. VIII, Vivian. IX, Tha Absentee. X. Absentee (concluded); Madame de Fleury; Emnilie de Coulanges; the Modern Griselda. XI. and XII. Belinda. XIII. Leonora; Letters. XIV. and XV. Patronage. XVI. Comic Dramas, XVII. Harrington; Thoughts on Bores. XVIII. Ormond, 'To this list are to be added Essays on Practical Education, written in conjunction with Mr Edgeworth (1798), Helen (1834), and numcrous stories and books for children. In 1848 a new collected edition of

Miss Edgeworth's works appeared in London in nine volumes; and, aftcr her death, an edition was published in ten volumes, with steel engravings. (T. GI.)

EDGEWORTH, Ricuarp Lovett (1744-1817), father of the subject of the foregoing notice, and her associate in Imany literary undertakings, was born at Bath in 1744. The greater part of his life, however, was spent at Edgeworthtown, or Edgeworthstown, in the county of Longford, Ireland, where the Edgeworth family had been Settled for upwards of 150 years. He was of gentle blood—his father being the son of Colonel Francis Edge-Worth, and his mother, Jane Lovell, being the daughter of

Samuel Lovell, a Welsh judge. Richard's mother taught him to read at a very early age; his young imagination was nurtured on the beautiful stories in the book of Genesis and on Shakespeare's characters of Coriolanus and

Julius Cvesar; and, when he was only seven years old, a Mr Deane explained to him the uses and structure of several pieces of machinery, a circumstance to which he ever afterwards traced his strong love for mechanical science, The Rev. Patrick Hughes initiated him in Lilly's Latin Grammar—an office he also performed for Goldsmith, who was born on the property of the Edgeworths—and_his public education began, in August 1752, in a school at Warwick. He subsequently attended Drogheda school, then reputed the best in Ireland; and, after spending two years at a school in Longford, entered Trinity College, Dublin, in April 1761, from which he was transferred to Corpus Christi College, Oxford, in October of the same year. While still at college, he made a runaway match, marrying at Gretna Green one of the daughters of Mr Paul Elers, an old friend of his father, by whom he had a son, who was born before Edgeworth reached his twentieth birth-day, and his daughter Maria. Shortly after the birth of his son, he and his wife went to Edgeworthtown, where he met a severe trial in the death of his mother. Her dying advice to him, to "learn how to say no," was the germ of Viwan, one of Miss Edgeworth's best novels, For some time after this Edgeworth devoted himself to scientific reading and ex- periments ; and he claims to be the reviver of telegraphic communication in modern times (J/emctrs, second edition, i. 144). His home was now at Hare Hatch, in Berkshire, where he endeavoured to educate his son according to the method explained in Rousseau's Hmile. In later lite, how- ever, he saw reason to doubt many of Rousseau's views (Memozrs, ii. 374), At the same time he went on keeping terms at the Temple, and formed the greatest friendship of his life with Thomas Day—an able man, of noble character, excessively eccentric, and known to all boys as the author of Sandford and Merton, which was written at Edge- worth's suggestion. In 1769, on the death of his father, he gave up the idea of being a barrister; but, instead of immediately settling on his Irish estate, he spent a con- siderable time in England and France, mainly in Day's company. In Lyons, where he resided for about two years, he took an active part in the management of public works intended to turn the course of the Rhone. He was summoned to England by the death of his wife, with whom his autobiography tells us plainly he was not happy. Edgeworth hurried to Lichfield, to Dr Erasmus Darwin's, one of his greatest friends, and at once declared his passion for Miss Honora Sneyd, which had been the cause of his flight to France two years before. They were married (1773) in the cathedral, and after residing

at Edgeworthtown for three years, settled at Northchurch, in Hertfordshire. When six years of great domestic happiness had elapsed, Mrs Honora Edgeworth died, after recommending her husband to marry her sister Elizabeth —which he did, on Christmas Day 1780. In 1782 Edgeworth returned to Ireland, determined to improve his estate, educate his seven children, and ameliorate the condition of the tenants. Up to this point Edgeworth has told his own story. The rest of his life is written by his daughter, and opens with an account of the improve- ments he effected, and a lengthy panegyric on Mr Edge- worth as a model landlord (Memozrs, ii. 12-36). In 1785 he was associated with others in founding the Royal Irish Academy ; and, during the two succeeding years, mechanics and agriculture occupied most of his time. In October 1789 his friend Day was killed by a fall from his horse, and this trial was soon followed by the loss of a daughter, who had just reached her fifteenth

year. The first thing that broke the monotony of his grief was the arrival of Dr Darwin's poem, the Botanic Garden, about which the author says, "It was your early approbation that contributed to encourage me to go on with the poem" (JZemoirs, ii. 118). In 1792 the health of one of Edgeworth's sons took him to Clifton, where he remained with his family for about two years, returning in 1794 to Edgeworthtown. Ireland was, at that time, harassed by internal disturbances, and threats of a French invasion, and Edgeworth offered to establish telegraphic communication of his own invention throughout thecountry. This offer was declined. A full account of the matter is given in Edge- worth's Letter to Lord Charlemont on the Telegraph, and his apparatus is explained in an " Essay on the Art of Convey- ing Swift and Secret Intelligence," published in the sixth volume of the ZYransactions of the Royal Irish Academy. In the autumn of 1797 Mrs Edgeworth fell a victim to de- cline. Practical Education, a work which embodied the experience of the authors in dealing with children, was pub- lished in 1798. " So commenced," says Miss Edgeworth, "that literary partnership which, for so many years, was the pride and joy of my life" (Jfemoirs, ii. 170). In the same year Edgeworth married Miss Beaufort, and was elected M.P. for the borough of St John's Town, Longford. The same year, too, saw a hostile landing of the French and a formidable rebellion;

and for a short time the Edgeworths took refuge in Longford. The spring of 1802 brought the depressing announcement of Dr Darwin's death ; and the winter of that year was spent by the Edgeworths in Paris, where, among many friends, they particularly valued M. Dumont. On his return home he was gratified by Government accepting of his telegraphic apparatus, which worked admirably. In 1802 appeared the Lssay on Irish Bulls by Mr and Miss Edgeworth; and in 1806 Edgeworth was elected a member of the Board of Commissioners to inquire into Irish education. From 1807 till 1809 much of his time was spent on mechanical experiments and in writing the story of his life. In 1808 appeared Professional Education, and in 1813 his Lssay on the Construction of Roads and Carriages. He died on

the 13th of June 1817, and was buried in the family |

vault in Edgeworthtown churchyard.

Many of Edgeworth's works were suggested by his zeal for the education of his own children. Such were Poetry} Explained for Young People, Readings on Poetry, A Rational Primer, and the parts of Karly Lessons contributed by him. His speeches in the Irish Parliament have also been published ; and numerous essays, mostly on scientifie subjects, have appeared in the Philosophical Lransaetions, the Transaetions of the Royal Irish Academy, the Monthly Magazine, and Nicholson's Journal. The story of his early life, told by himself, is fully as entertaining as the continuation by Maria, as it contains less dissertation and more ineident. (T. GI.)

EDINBURGH, County or, or Mip-Lorutay, one of the lowland counties of Scotland, is situated between 55° 39' 30″ and 50° 59' 20" N. lat., and between 2° 52' and 3° 45' 10" W. long. It is bounded on the N. by the Firth of Forth, ou the N.W. by Linlithgowshire or West-Lothian, on the S.W. by Lanarkshire, on the 8. by Peebles and Selkirk, and on the E, by Roxburgh, Berwick, and Haddington or East-Lothian. The area comprises 362 square miles, or 231,724 acres.

The surface of the county presents a great variety of scenery. The Pentland Hills advance boldly from the south-west to within five miles of the sea, rising toa relative height of from 1000 to 1300 feet, The loftiest summits are Scald Law (1898 feet), Carnethie (1890), West and East Cairn Hill (1844

and 1839), and West Kip (1806). They generally present a rounded appearance, and are covered with heath or grass. The south-eastern corner of the county is occupied by the Moorfoot Hills, which form a continuation of the Lammermuirs, and attain iu Blackhope

| Sear a height of 2136 feet.

Of more or less isolated emi- nences throughout the county it is enough to mention the Braid Hills and Blackford Hill to the S. of the city, Arthur's Seat towards the E., Corstorphine Hill about two miles to the W., and Dalmahoy Crags about seven miles to the S.W.

With the exception of the Gala, which rises on the south-east side of the Moorfoot Hills and flows south to join the Tweed, and the partial exception of the Tyne, which after a course of about seven miles passes into Haddingtonshire, all the streams, we cannot say the rivers, find their way to the Firth of Forth. The Esk (the largest) drains the district between the Pentlands and the Moorfoot Hills, and falls into the sea at Musselburgh. The southern branch has its sources near Blackhope Scar, receives the Redside and Middleton Burus, and flows past Newbattle Abbey ; the northern rises in the Pentlands, and proceeds through much picturesque scenery, past Penicuik, Roslin, Lasswade, and Eskbank ; and the union of the two streams takes place a short distance below Dalkeith, within the grounds of Dalkeith Palace. The Braid Burn from Capelaw Hill passes between the Braid Hills and Blackford Hill, and reaches the sea at Portobello. The Water of Leith, with its head streams on the western slope of the Pentlands, flows past Balerno, Currie, Juniper Green, Colinton, Edinburgh, and Leith, The Almond, which has its origin in Lanark- shire, and its right-hand tributary the Breich Water, form the boundary between Mid-Lothian and Linlithgowshire, Most of these streams, and especially the Esk and the Water of Leith, afford a large amount of water-power, well-pre- served by means of artificial dams and embankments. The deep ravines which in some places they have formed in the Carboniferous strata through which they flow conceal spots of romantic beauty, in striking contrast to the immediately continguous scenery. The only lake is that at Duddingston, near Edinburgh; but there are several ex- tensive reservoirs connected with

the water supply of the city, viz.—Threipmuir, Loganlee, Harelaw, Clubbiedean, and Torduff in the Pentlands, and Gladsmuir and Rosebery on the South Esk. The Cobbinshaw reservoir, situated at the head of the Bog Burn, a tributary of the Almond, is used for the supply of the Union Canal.

The geology of Mid-Lothian is of interest, not only from its intrinsic characteristics, but also as the subject of investigation of many of the most famous among Scottish geologists—Hutton, Hall, Jamieson, Cunningham, Hugh Miller, Fleming, and others. The DLammermuir and Moorfoot Hills are a continuation of the Silurian table- land of the south of Scotland, and consist mainly of strata of greywacke, grit, and shale, greatly contorted, broken, and altered in position. Sandstones, grits, shales, and mud-stones of the Upper Silurian occur in three very limited areas in the Pentland Hills, in the midst of Lower Old Red Sandstone formatious. They are abundantly fossili- ferous, especially on the North Esk,—Chondrites verisimilis, Amphispongia oblonga, Protaster Sedgwickii, Pterygotus acuminatus, various Strophomenas, and Huomphalus funatus being among the characteristic forms. The Lower Old Red Sandstone formations just mentioned are a massive series of grits, conglomerates, and volcanic rocks, resting unconform- ably on the Upper Silurian series ; the Upper Old Red Sand- stone is found only in a few small patches in the hollows of the Lower Silurian. All the four series into which it is usual to divide the Carboniferous system are well represented. The Calciferous Sandstone series breaks up into two groups :~-the former consisting of reddish sandstones, and forming the south-western eminences of the Pentland Hills and nearly the whole site of the city of Edinburgh ; while the latter comprises white and grey sandstones, shales, limestone, and coal, and furnishes a good portion of the

mineral wealth of the county. The Carboniferous Lime- stone series consists of strata of white and grey sandstones, shales, fire-clays, coal, and encrinal limestone,—one section being known as the “ Edge coals” from the almost vertical displacement of the beds. The strata of the Millstone Grit are not very extensive—only appearing in a narrow band round the central part of the Dalkeith coal-field, and in a limited area to the south of Penicuik. The

history of the igneous rocks whichare sporadically distributed through the county is still matter of dispute,—the main question debated being whether the volcanic activity which has left its traces took place exclusively in the Carboniferous period, or broke out again later. The spot round which the discussion has principally been maintained is Arthur's Seat, which is the centre of the intrusive movement, although considerable masses of intrusive basaltic rocks make their appearance in many other localities. Diorite is the principal rock of Corstorphine Hill, and occurs also to the west of Ratho. Marks of glacial action may be observed at Corstorphine, Granton, Arthur's Seat, and. on the Pentland Hills; and large beds of boulder-clay are present in the lower districts. Boulders of distant transport are rather rare, but a few apparently from the Ochils or even the Grampians may be discovered.! i

The cultivated condition of the county is incompatible with a varied or remarkable fauna ; but the botanist finds arich harvest of smaller plants. Arthur's Seat and the Queen's Park, in spite of their proximity to the city, yield a considerable number of very rare specimens.

Details may be sought in Professor Balfour's (lora of

Edinburgh.

The climate naturally differs in different districts, accord- ing to elevation and distance from the sea. From obser- vations made at Inveresk, 90 fect above the sea-level, which may be taken as fairly representative, the annual mean of the barometer has only once fallen as low as 29°68 in the twenty-one years from 1855 to 1875, and usually ex- ceeds 29°85. The maximum cold ranged from zero in 1860 to 22° in 1872; the maximum heat from 73° in 1862 to 88° in 1868 and 1873 ; and the mean annual temperature from 44° in 1855 to 48:2° in 1868. The average temperature of the six summer months beginning With April reached 55°8° in 1868, and sank to 51'6° in 1872. The annual rainfall varied from 16°50 inches in 1870 to 32°89 in 1862; and the number of fair days from 162 in 1872 to 247 in 1869. The greatest rainfall takes place in August at Edinburgh, Meadowfield, and Bonnington; but in January in the Pentlands. According to observations made at Inveresk over a period of 15 years, the wind blew from the N. 31 days, N.E. 40, E. 22, 8.E. 24, 8. 51, 8. W. 119, W. 56, and N.W. 24. The N.E. and E. winds prevail in March and April, and especially in the

neighbourhood of the city are remarkable for their cold and blighting character. Snow seldom lies long except in the uplands; but night frosts occur even as late as the beginning of June, severe enough to destroy the young shoots of the seedling trees in the nursery grounds? On the shores of the Firth, along the Almond and Esk, and in some of the richer flats the grain

1 See Fleming's Lithology of Edinburgh ; Hugh Miller, Edinburgh and its Neighbourhood ; Maclaren, Sketeh of the Geology of Fife and the Lothians ; Arch. Geikie, The Geology of Edinburgh and its Neighbour- hood, 1871; Sheet No. 32 of the one-inch Geol. Survey Map, with the accompanying memoir ; and several other papers in the Transac- tions of the Edinburgh Geological Society.

2The mildness of the winter is well illustrated by the fact that Mr M'‘Nab of the Royal Botanic Gardens reported 138 species of flowers in bloom on New Year's Day 1874, of which 35 were winter or spring flowers, and 103 summer or autumn flowers. The Galanthus nivalis, or common snowdrop, blossoms, according to an average of 20 years, on the 25th of January, the Hepatica triloba on the 31st, and the Rhododendron nobleanum on the 25th of February.

crops ripen early; two miles nearer the hills and 200 fect higher the harvest is ten days later; and at an elevation of 600 feet another week at least intervenes.

The total area in cereals in 1876 was 88,189 acres. The quantity of wheat grown is gradually diminishing, occupying in 1876 only 4456 acres in contrast to 10,123 in 1856. The average produce in the more fertile districts is 831 bushels per acre, in the poorer districts from 24 to 25 bushels. The roots of the plant are in some seasons attacked severely by the larve of the crane-fly (Tipula oleracca), and the ears sometimes suffer from the wheat-midge. Of other cereals there were in barley 10,123 acres in 1856, and 11,982 in 1876 (the return varying from 42 to 48 bushels); and in oats 23,121 in 1865, and 21,311 in 1876. Beans declined from 802 aeres in 1866 to 467 in 1876. The area of sown grasses has greatly extended, being

26,907 acres in 1866, and in 1876, 31,869. The grass-seed is usually put in with the barley crops. Near the city sewage-farming has been carried on to a remarkable extent. The Craigentinny meadows between the city and the sea, compris- ing 200 acres, have been under sewage cultivation for upwards of 30 years. The produce, now consisting principally of natural grasses, is sold at from £16 to £28 per acre, and the whole realizes from £3000 to £4000 per annum. About 80 acres are under similar treatment at Loehend, 70 acres at Dalry, and 16 at the Grange. The total produce of the whole area under irri- gation is estimated at £6000. 'The acreage of turnips in 1856 was 14,517, in 1876, 138,342. About 16 or 18 tons of swedes, or 22 or 23 tons of common turnips, is considered a good crop for first-rate land. Potatoes hold much the same position as in former years, though the demand for them is not so great. A con- siderable quantity is despatehed to England for seed purposes, while the seed required in the county is obtained from Perth, Lanark, or the neighbouring counties. The number of cattle was in 1862, 18,018, in 1876, 18,661. In the neighbourhood of Edinburgh especially, dairying forms a very important industry : the number of milch cows in the county is probably 11,000 or 12,000, of which 1800 or 2000 are kept in the town or suburbs, and supply about half of the milk necessary for the local con- sumption. Sheep are returned as—113,479 in 1866, and 168,565 in 1876. Very few horses are bred in the county, but several of the studs are of excellent character. The Clydesdale blood pre- dominates. Pigs form a very sinall item in the list of stock ; and the poultry yard is of distinct importance only in the farms in the neighbourhood of the city. The crop rotations vary considerably in different districts. Oats, potatoes, wheat, turnips, barley, and hay or pasture is a common order ; while a five-course shift of oats, potatoes and turnips, barley or wheat, hay, pasture, or a six-course shift (oats, beans, wheat, turnips, barley, grass), is used elsewhere. The average size of farms is 131 acres. According to the returns, out of a total of 1012 holdings 477 did not exceed 50 acres, 116 lay between 50 and 100, 294 were over 100 and under 800, 75 were from 300 to 500, and only 50 were more than 500. Leases of nineteen years are common ; the change of proprietor is as frequent as that of the tenants, and in some eases the same tenant has con- tinued to hold a farm under six or eight successive landlords. The average value of the arable land is caleulated at from 40 to 55 shillings the acre; that of the upland pastures at from 10 to 15 shillings. The whole of the county has been drained more or less thoroughly, and

some portions twice over. Tiles and small stones began to be laid about 1830, with a distance between the drains of about 36 fect ; and since 1845 deeper drains, with pipes and collars, have been put into the intermediate furrows. Great improvements have been effected not only in the farm-houses and steadings since 1885, but also in the cottages for the labourers, which now for the most part contain a sitting-room and two or even three bedrooms. Steam thrashing-machines and grinding mills are not uncommon. ‘The reaping-machine has been generally adopted within the last 20 years, except for very difficult ground, or where the crop has been laid by wind or rain. The assistance of the steam plough has hitherto been very partially obtained.

‘he nursery grounds of Mid-Lothian are more extensive than those of any other county of Scotland ; and in the variety and quantity of their productions they are equal to any in Britain. Io orchards proper there are devoted about 72 acres; and no less than 775 acres, mainly in the vicinity of the city, are devoted to market gardening. Further details on the whole subject of Mid-Lothian agriculture may be found in Thomas Farrall s paper in Trans. of Highland and Agricultural Society, 1877.

lt appears from the Owners and Heritages Return, 1872-73, that the county, exclusive of Edinburgh and Leith, was divided among 3287 owners, holding land the yearly value of which amounted to7£5$1,603. Of the owners 78} per cent. possessed less than 1 acre, and the average value per acre over all was £2, 11s. 3d, There were 9 proprietors holding upwards of 5000 acres, V1Z., Earl of Rosebery (Dalmeny), 15,568 ; Sir G. D. Clerk (Penicuik), 12,696; Robert Dundas (Ariston), 10,184 ; the Stair family (Oxenfoord), 9609; Heirs of Alex. Mitchell (Stow), 9038; Earl

of Morton (Dalmahoy), 8944; G. K. IE. Vairholm, 6200 ; Charles Cowan (Loganhouse), 5677 ; John Borthwick (Crookston), 5239. The duke of Buccleuch’s property, though comprising only 3541 acres, is the highest on the valuation roll (£28,296), with the ex- ception of that of the railway companies.

Minerals.—Though not a mining district par excellence, Mid-Lothian possesses a considerable amount of mineral wealth. There are 19 colleries, which in 1876 employed 2179 persons and raised 715,803 tons of coal. With the exception of 90,000 tons raised in the parish of West- Calder, this was all obtained in the valley of the Esk. In its general character the coal does not differ from ordinary Scotch coal ; but a large quantity of the best cannel coal, used for making gas, is procured at Niddrie Colliery, and from the marqnis of Lotlian's mines at Newbattle and Dalkeith, The depth of the pits varies from 50 to 180 fathoms. On the east side of the Esk the strata lies at an angle of from 10° to 14°; those on the west side, at Niddrie and Gilmerton, at from 60° to 90°. Of blackband ironstone about 61,262 tons were raised in 1876, principally in the parishes of Lasswade and Penicuik; and 25,172 tons of fire-clay were obtained in the county. In the vicinity of West-Calder there is a large amount of shale, containing from 20 to 30 gallons of oil per ton. The extraction of the oil by distillation in retorts was introduced about 1862. About 258,278 tons were raised in 1876, Limestone is of frequent occurrence :—at Esperton in the south ; at Cousland, Crichton, Burdiehouse, and Gilmerton, near Edinburgh; at the Camps, in Kirknewton parish; and at Muireston and Levenseat, stillfurther west. Freestone is quarried at Craigleith, Redhall, Hailes, and Craigmillar. From Craigleith was obtained the greater part of the stone for the new town of Edinburgh; Hailes furnishes an ex- cellent material for pavements and stairs; and Craigmillar has been appropriated by the builders of the new docks at Leith. Barnton Mount supplies large blocks of whin- stone, which have been exported to England for docks, and even to Russia for fortifications; the causeway stones for the streets of Edinburgh are mainly procured from the quarries at Ratho; and a large number of smaller quarries for the supply of road-metal are scattered throughout the county.

Manufactures.|\—Owing its origin no doubt to the development of literature and publishing in the metropolis, the chief manufacturing industry in Mid-Lothian is paper- making. There are 22 paper mills in the county, most of them large' and extensive works; and their aggregate annual production is 18,500 tons of writing and printing, aud 5000 tons of coloured and wrapping paper. The most important mills, some of them dating from the beginning of the last century, are situated on the North Esk between Penicuik and Musselburgh, all producing writing and printing papers; while

on the South Esk at Newbattle coloured papers are manufactured. On the Water of Leith there are eight separate mills, aswell as one near Mid-Calder, and another at Portobello. An ancient vat-mill, called Peggy's Mill, still exists at Cramond, producing hand-made hosiery papers, &c. There is a carpet factory on the Esk at Roslin; and the well-known establishment at Lasswade, where velvet-pile and tapestry carpet was produced under Whytock's patent, is now removed to Bonnington. The manufacture of gunpowder is also carried on at Roslin, the works being distributed in the recesses formed by the sudden bends of the river. The Fushiebridge works have been discontinued. Iron foundries exist at Dalkeith, Westfield, Loanhead, Penicuik, Millerhill, and the suburbs of Edinburgh ; brick and tile-works at Portobello, Millerhill, Newbattle, Bonnyrigg, and Rosewell ; and candle works at

ae : ' From this enumeration

the inanufactures of the city are ex- cluded,

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Dalkeith and Loanhead. Leather also is manufactured at Dalkeith.

Besides the Scottish metropolis, the county contains the following towns and villages :—-Leith and Granton, both flourishing seaports; Portobello, a watering-place about three miles to the east ; Mnsselburgh, an agricultural and fishing town near the mouth of the Esk; Dalkeith, a market-town and borough of barony ; Corstorphine, with a convalescent hospital and an ancient collegiate church con- taining several tombs of the Forrester family, who became possessors of the fee in 1371; Ratho, erected in 1404 into a principality for the eldest son of the Scottish king; Cramond, formerly a place of much more importance than now; Mid-Calder, with a church of considerable antiquity, adorned with the armorial bearings of the Sandilands family;? West-Calder, Balerno, Currie, Juniper Green, and Colinton, all manufacturing villages ; Liberton, deriving its name from the lepers who once were its principal inhabitants ; Gilmerton, mainly inhabited by coal-miners and carters ; Lasswade, Loanhead, Roslin, and Penicnik.

The population of the entire county in 1871 was 328,379, of whom 153,892 were males and 174,487 females. Excluding the boroughs of Edinburgh, Leith, Portobello, and Musselburgh, the population of the county proper numbered in 1851, 57,843 persons, and in 1871, 74,126, indicating an increase of 28 per cent. within that period. This increase occurs principally in the parishes of West- Calder, Lasswadc, Colinton, Dalkeith, and Kirknewton.

Antiquities.—It is believed that Cramond was once a Roman scaport ; aud various objects of Roman art have been discovered in the vicinity and upwards along the bank of the Almond. On several heights are remains of carly military works—the most important being that on Dalmahoy Hill, Braidwood Castle in the parish of Penicuik, and the so-called Castle Greg on the Harburn estate in Mid-Calder parish. ‘‘ Hirdehouses ” have been discovered at Crichton Mains, at Borthwick Castle, near Middleton House, &c., the first being especially in- teresting from the fact that some of the stones bore the marks of Roman masonry. ‘There are hut-circles and a lull fort on Kaimes Hill, near Ratho ; a large tumulus, with three upright stones, at Old Liston; a smaller tumulus at Newbattle; a kistvaen at Carlowrie; and standing stones at Lochend, at Comiston (the Caiy stone), and several other places. The most remarkable of all per- haps is the “ Cat Stane,” on the Brigs farm near Kirkliston, which, according tu an ingenious hypothesis of Sir James Young Simpson, marks the burial place of the grandfather of Hengist and Horsa. (See Proceedings of the Anti- quarian Society of Scotland, 1855, 1873, 1875.)

The following are among the most interesting of the residential and ecclesiastical buildings in Mid-Lothian, not within the limits of the larger towns and villages. Roslin Chapel, founded by the St Clairs in 1446, is one of the most highly decorated specimens of Gothic architecture in Scotland, and presents a remarkable combination of peculi- arities. Roslin Castle, the seat of the St Clairs, is a fine ruin, occupying a peninsular rock on the banks of the Esk, and must have been a very strong position before the days of cannon. Hawthornden, a little further down the stream, is interesting as the residence in the 17th century of Drummond the poet, as well as for the strange caves in the rock on which it is built. Dalhousie Castle, the seat of the earl of Dalhousie, is a modernized building of castellated style on the

banks of the South Esk ; and Newbattle Abbey, the seat of the marquis of Lothian, occupies the site of the ancient Cistercian monastery a few miles down thie stream. Craigmillar Castle is a fine ruin on a knoll three

2 See Proc. of Scot. Antig. Soc.. 1862.

miles to the south of Edinburgh, which formerly was the residence of the Preston family, and afforded shelter on various occasions to Queen Mary. Borthwick Castle, also a temporary residence of the unfortunate queen, is a double tower on Middleton Burn, still bearing the marks of Cromwell's cannon balls, Crichton Castle, a mile and a quarter to the east, was the residence of the well- known family which produced the celebrated Sir William Crichton, and its ruins show " the builders' various hand." Dalmahoy Castle, near Ratho, is the seat of the earl of Morton, and preserves, besides other valuable antiquities, the only extant copy of the Bible of the Scottish Parlia- meut, and the original warrant for committing Queen Mary to Loclileven. Melville Castle, near Lasswade, the seat of the earl of Melville; Colinton House, the scat of Lord Dunfermline ; Calder House, the seat of Lord Torphichen ; Riccarton, belonging to Sir William Gibson Craig, Bart. ; and Lauriston Castle, once occupied by John Law of Mississippi notoriety, may also be mentioned. 'Temple, on the South Esk, was at one time the chief seat of the Knights Templars in Scotland.

The history of the county is of little importance apart from that of the city of Edinburgh. Traces of early Celtic occupation still remain in such names as In- veresk, Almond, Leith, Dalry, Dalmahoy, Dalkeith, &c.; though by far the greater proportion of the villages, hamlets, and castles have received their present designation from Saxon possessors. The termination ton is very fre- quent. Within the county lie the battlefields of Borough- muir, where the English were defeated by the earl of Murray in 1334; Pinkie, near Inveresk, where the duke of Somerset inflicted tremendous loss on the Scotch; and Rullion Green, on the eastern slopes of the Pentlands, where the Covenanters were routed by the royal trocps under General Dalziel.

EDINBURGH, the ancient capital of Scotland, is situated in the county of Mid-Lothian or Edinburgh, to the south of the Firth of Forth. The Royal

Observatory, which is built on the summit of the Calton Hill, in the north-castern quarter of the city, is in 55° 57’ 23” of N, lat., and 12™ 43° 05* of time W. long. of the meridian of Greenwich.

The site of Edinburgh is altogether remarkable as that of a large city, and is the chief source of its peculiar char- acteristics. It occupies a group of hills separated by deep “ravines, and is the central feature of a landscape of rare beauty. The county of Mid-Lothian forms towards the sonth-cast a wild hilly district, diversified with fertile cultivated tracts, but, over an exten- sive area, broken in- toa rough pastoral country, rising at |~ various points to |\ /. upwards of 2000 |# feet above the level | of the sea. On the x north it is bounded |g 4 by the Firth of |> Forth, from the \ shores of which the | ground slopes gra- dually towards the |. south till it merges | A in the range of the |; Pentland Hills, with its contour diversi- fied by various un- dulations and abrupt heights. On this irregular ground, amid the outlying spurs of the Pentlands, a bold cliff of trap-rock, which rises through the sandstone strata

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Environs of Edinburgh.

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of the district, appears to have early attracted attention from its capacity for defence. Maitland, the earliest historian of the city, says, ‘ The situation of Edinburgh plainly shows that its origin is owing to the castle;” and from its standing in St Cuthbert’s parish, which surrounds the castle rock, he assumes that the first settlement was in the low ground to the north-west. From this a road anciently led up past the Well-House Tower, along the northern slope of the Castle Hill. By this access Queen Mary and other royal visitants rode up to the castle on various public entries, and then returned through the town, by way of the High Street and Canongate, to Holyrood. Symeon of Durham, under the date 854 a.p., includes Edinburgh among the churches and towns of Northumbria within the bishopric of Lindisfarne, and this is supposed to refer to the church of St Cuthbert. But the first erection of the Magh dun fortress, or “ Maiden Castle,” on the summit of the rock, must have tempted the natives of the district to seek the

protection of its defences. Hence at an early period a hamlet grew up along the ridge which slopes from the castle rock towards the valley at the base of Salis- bury Crags, distinct from the Kirk-town of St Cuthbert.

In the reign of Malcolm Canmore the Castle of Edinburgh included a royal palace. There his pious queen, Margaret, the grand-niece of Edward the Confessor, died in 1693. It continued to be a royal residence during the reigns of her three sons, and hence the first rapid growth of the upper town may be referred to the 12th century. The parish church of St Giles is believed to have been erected on its present site in the reign of Alexander I., about 1110, and the luge Norman keep of the castle, built by his younger brother, David I., continued to be known as David's Tower till its destruction in the siege of 1572. Before his accession to the Scottish throne, David I. had been earl of Huntingdon, having acquired that manor and earldom in England by his marriage with Matilda the heiress of Waltheof, earl of Northumberland. He conse- quently frequented the English court, and became familiar with the military and ecclesiastical architecture introduced by the Anglo-Norman kings; and soon after his accession to the Scottish throne he founded the Abbey of Holyrood, which from an early date received the Scottish*court as its guests. But notwithstanding the attractions of the abbey and the neighbouring chase, the royal palace continued for centuries to be within the fortress, and there both the Celtic and Stuart kings frequently resided. Edinburgh was long an exposed frontier town within a territory only ceded to Malcolm II. about 1020; and even under the earlier Stuart kings it was still regarded as a border stronghold. Hence, though the village of Canongate grew up beside the abbey of David I., and Edinburgh was a place of sufficient importance to be reckoned one of the four principal burghs as a judicatory for all commercial matters, nevertheless, even so late as 1450, when it became for the first time a walled town, it did not extend beyond the upper part of the ridge which slopes eastward from the castle rock. But the mural defences of the town were an evidence of wealth and growing prosperity ; and no sooner was it surrounded with protecting walls than its rapid increase led to the growth of an extensive suburb beyond their limits.

The other three royal burghs associated with Edinburgh were Stirling, Roxburgh, and Berwick ; and their enact- ments form the earliest existing

collected body of the laws of Scotland. But the determination of Edinburgh as the national capital, and as the most frequent scene of parlia- mentary assemblies, dates from the assassination of James I. in 1436. Of the thirteen Parliaments summoned by that sovereign, only one, the last of them, was held at Edin- burgh. But his assassination that same year, in the Black-friars' monastery at Perth, led to the abrupt transfer of the

court and eapital from the Tay to the Forth. The corona- tion of James II. was celebrated in Holyrood Abbey instead of at Scone ; and the widowed queen took up her residence, with the young king, in the Castle of Edinburgh. Of fourteen Parliaments summoned during this reign, only one was held at Perth, five met at Stirling, and all the others at Edinburgh; and, notwithstanding the favour shown for Stirling as a royal residenee in the following reign, every one of the Parliaments of James ITI. was held at Edinburgh. James IJ. showed speeial favour to Edinburgh by eonferring on it various privileges relating to the holding of fairs and markets, and the levying of customs ; and by a royal eharter of 1452 he gave it pre-eminence over the other burghs. Further immunities and privileges were eonferred on it by James III.; and by a preeept, known as the Golden

merehandise landed at the port of Leith. Those privileges were renewed and extended by various sovereigns, and speeially by a general charter granted to the city by James VI. in 1603, the year of his aecession to the English throne.

James ITI. was a great builder; and, in the prosperous era whieh followed on his son's aecession to the throne, the new town of the 15th century spread over the open valley to the south, with the Cowgate as its chief thoroughfare. But the death of James IV. in 1518, along with other disastrous results of the battle of Flodden, brought this era of prosperity to an abrupt close. The citizens hastened to eonstruct a second line of wall, inclosing the Cowgate and the heights beyond, sinee occupied by the Greyfriars' Church and Heriot's Hospital, but still excluding the Canongate, as pertaining to the Abbey of Holyrood. The new wall long determined the

limits of the town. For upwards of two centuries after its ereetion the requisite

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Plan of Edinburgh.

accommodation for the inereasing population was seeured by erowding buildings on every available spot within the protection of the walls, displacing the earlier structures by lofty piles of building within the straightened area, and projecting from them overhanging additions of timber. By those means the northern and southern slopes of the ridge along which the main street of the old town was formed were crowded with the picturesque alleys and closes which contributed so much to the peculiar aspect which the aneient eity still retained when in 1808 Seott thus pictured it :— “Such dusky grandeur clothed the height, Where the huge castle holds its state, And all the steep slope down, Whose ridgy back heaves to the sky, Piled deep and massy, close and high, Mine own romantic town.” Within this ancient civic area stand the collegiate church of St Giles—for a time the cathedral of the diocese of Edinburgh,—the Parliament House and law courts, and

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the eivie Couneil Chambers. Here also in earlier years of the present century stood the old Tolbooth, or Heart of Mid-Lothian, and other buildings of note, including mansions of the Scottish nobility, and even of royalty. But it forms a mere historic nucleus of the modern city, whieh for a eentury past has been extending over the neighbouring heights, northward towards the ancient sea- port of Leith, and southward and westward to the

lower slopes of the Pentland Hills. The area included wills the parliamentary boundary extends to 4179 acres, or 63 square miles; but, owing to its singularly irregular site, while the lower parts of the city stand little more than 100 feet above the level of the sea, the higher parts rise 1m some places to 250 feet, and the summit of the eastle rock is 383 feet above the sea.! Within the same civic

1 The extensive building operations engaged in by the corporation at the beginning of the century were the main cause of the a of the city in 1833, when the property of the corporation was valu

area, and entirely surrounded and in part encroached on by its streets, is the Calton Hill, occupied by the Royal Astronomical Observatory, om

the floor of which stands at a height of 349 feet above the sea; and beyond the narrow yalley, in which the Canongate and the Palace of Holyrood lie, Arthur's Seat and Salisbury Crags rear their lofty cliffs in boldly picturesque outline, the highest summit rising to the height of 822 feet, and affording a magnificent prospect: over land and sea. Bridges connect the different ridges on which the city is built, with crowded thoroughfares underneath. Many of the public buildings occupy lofty terraces, and thereby show to greater advantage than their architectural designs would otherwise secure for them. The valley between the Old and the New Town, and the slopes of the castle rock, are laid out as public gardens; and the Calton Hill and Arthur's Seat furnish promenades and carriage drives of unequalled variety and beauty as the public

Arms of Edinburgh.

parks of a large city. Fine white freestone abounds in |

the immediate neighbourhood, and furnishes abundance of the best building material; while the hard trap-rock, with which the stratified sandstones of the coal formation have been extensively broken up and overlaid, supplies good materials for paving and roadmaking.

Thus on a locality seemingly ill-adapted for the site of a great city, there has gradually arisen one which compares to advantage with the most picturesque and beautiful among the capitals of Europe. Sir David Wilkie came to it in 1799 fresh from a Fifeshire manse, to begin the studies in the Edinburgh school of design which ultimately secured for him his high fame as an artist. When he returned to it in later years, familiar with all that European art had to disclose, he thus gave utterance to his matured impressions :—

“What the tour of Europe was necessary to see elsewhere I now find congregated in this one city. Here are alike the beauties of Prague and of Salzburg ; here are the romantic sites of Orvietto and Tivoli ; and here is all the magnificence of the admired bays of Genoa and Naples. Here, indeed, to the poetic fancy may be found realized the Roman Capitol and the Grecian Acropolis.”

The name of Edinburgh is a memorial of the intrusion of a new people, when, in the beginning of the 7th century, the race of Ida reared the fortress of Edwin’s-burgh on the rocky height, and thereby established the Anglian power on the Forth. But this Teutonic invasion was not the first occupation of the site. Camden aimed at identifying it with the Srpardaedov Irepwrdv of Ptolemy ; and although this has been rejected by later Roman antiquaries, the convergence of Roman roads towards the place, the traces of Roman art discovered from time to time within the old civic area, and the evidence of two Roman seaports, at Inveresk and Cramond, both connected with it by roads of Roman structure,—all tend to confirm the idea that Edinburgh was one of the sites occupied by the Roman invaders. On their withdrawal it remained an important stronghold on the southern frontier of the Pictish kingdom. One learned Anglo-Saxon scholar, the Rev. D. H. Haig, in his Anglo-Saxon Conquest of Britain, has identified it as the Hill of Agned, the scene of Arthur’s victory of Cat Bregion.

For centuries after the founding of the Anglian kingdom of Northumbria, the lowlands extending from the Forth to the Tweed continued to be a debatable land held by uncertain tenure; it was toa large extent settled anew

at £271,658 against a debt of £425,195, which was compounded for by. the issue of 3 per cent. bonds of annuity—the loss to the creditors thus

amounting to 25 per cent. of their claims.

by Anglo-Saxon and Norman colonists under Malcolm Canmore and his sons. Edinburgh accordingly remained a frontier post beyond the Forth, until it became the capital of the Stuart kings. Then, for the first time, it rose into importance asa town. It shared in their triumphs, and bore the chief brunt in their repeated disasters ; and, even after their forfeiture of the crown, some of its most picturesque associations are with the Stuart claimants for the throne of their ancestors. Nevertheless Edinburgh continued till near the close of the 18th century to be circumscribed within the narrow bounds of the ancient city and the burgh of Canongate, with the main street extending along the height of the slope from the Castle to Holyrood Palace, and the Cowgate as the only other thoroughfare admitting of the passage of wheeled carriages. Hence the vehicle in general use was the sedan chair, by means of which the Scottish nobility and gentry paid fashionable visits in the narrow wynds of their ancient capital, and proceeded in full dress to the assemblies and balls, which were conducted with the most aristocratic exclusiveness in an alley on the south side of the High Street, which still bears the name of the Assembly Close.

Beyond the walls of the ancient city lay the burghs of Calton, Easter and Wester Portsburgh, the villages of St Cuthbert’s, Moutrie’s Hill, Broughton, Canonmills, Silver- mills, and Deanhaugh—all of which have been successively swallowed up in the extension of the modern city. The ancient seaport of Leith, though a distinct parliamentary burgh, governed by its own magistrates, and electing its own representative to Parliament, has already extended its buildings, at one point at least, so as to_conjoin with those of the neighbouring city.

The progress of Edinburgh during’ the present century has been remarkable in many ways. In 1801 the popula- tion, including the Canongate and other extra-mural suburbs, but exclusive of Leith, was 66,544 ; in 1871 it had risen to 196,979. But the characteristics of the city and its population are peculiar. From an early date the special associations with the national literature have been identified with the ancient capital. Barbour, indeed, the contemporary of Chaucer, was archdeacon of Aberdeen; and the royal

author of the King’s Quair is chiefly associated with Perth; but in the following reign Edinburgh had become the favourite residence of the Scottish kings. One of the foremost charges against James III. was that he preferred the society of artists and musicians to that of the rough barons of his court. Under the patronage of his son, the printing press was first set up at Edinburgh in 1507. At the court of Holyrood, so long as James IV. reigned, the rivalry of rank and genius involved no conflict. Of the three great poets of the reign, Dunbar is believed to have been a grandson of the earl of March ; Walter Kennedy was a younger son of the first Lord Kennedy ; Gawin Douglas the third son of the earl of Angus; and Dunbar enumerates six or seven other literary contemporaries. In his Remonstrance to the King, he notes among the servitors of his royal master glazing-wrights, goldsmiths, lapidaries, apothecaries, painters, and printers; and some of his own poems appear to have been among the first works issued from the Edinburgh press by the Scottish Caxton, Walter Chepman. Gawin Douglas, the author of the Palace of Honour, and the translator of Virgil, was provost of the collegiate church of St Giles; and Roull, another literary contemporary named by Dunbar in his Lament for the Makaris, is believed to have been provost of the neigh- pouring collegiate church of Corstorphine. In the following reign Sir David Lindsay was the leader among the literary men of the Scottish capital ; and in 1554 his famous Satire of the Three Estates was enacted in the presence of the court, at Greenside, a natural amphitheatre on the north

west side of the Calton Hill, whieh appears to lave been the favourite tilting ground, and gencral arena for public displays,—including even the burning of heretics and witches.

The names of Knox (died 1572), Buchanan (1582), Alexander Montgomery (1605), Drummond of Hawthornden (1649), Allan Ramsay (1757), Smollett-(1771), Fergusson (1774), and Burns (1796), carry on the literary associations of the Scottish eapital nearly to the close of the 18th century, when various eauses eombited to give them a new significance and value. In the later years of the 18th and the beginning of the 19th century the university of Kdinburgh was distinguished by teachers who gave it a

prominent rank among the European schools of science and letters ; while members of the legal faculty disputed with them in friendly rivalry. Gregory (died 1701), the Monros (the elder 1767, the second 1817), Cullen (1790), Black (1799), Playfair (1819), Dugald Stewart (1828), and Leslie (1832), all figure amoxg the professors of the university ; while David Hume (1776), Adam Smith (1790), Rubertson the historian (1793), Henry Maekenzie (1831), and others of the same literary eirele gave ample range to its intel- Icctual triumphs. To this succeeded the era of Marmion and The Lady of the Lake, followed by the Waverley Novels, and Blackwood's Magazine and the Ldinburgh Review, when Scott, Wilson, Brougham, Jeffrey, Cockburn, and Chalmers gave the eharaeter to the literary society of Edinburgh which won for it the name of Modern Athens. To this the actual correspondence of its site to that of Athens no doubt also contributed. Various travellers have noted the resemblance between the distant view of Athens from the Augean sea, and that of Edinburgh from the Firth of Forth. The popular recognition of this unfortunately tempted the citizens to aim at a reproduction of the Parthenon of Athens on the summit of the Calton Hill, in commemora- tion of Wellington and his brothers in arms, by whom the victory of Waterloo was made the harbinger of peace to Kurope. The abortive scheme, as an ineompleted project, undesignedly reproduces the ruin of the ancient Acropolis.

Literary taste and eulture still eharaeterize Edinburgh society ; but—apart from the exceptional influences of pre- eminent genius —the eauses which largely contributed to give it so special a character no longer exist. In Seott's early days a joarney to London was beset with difficulties, and even dangers ; whereas railways have now brought it within a few hours' distance, and Seottish artists and literary men are tempted to forsake Edinburgh for the great eentre of all national activities. Nevertheless, the influence of the past survives in many ways. Edinburgh is not a manu- facturing eity, but retains even now something of the character of the Scottish capital, as the resort of those whose means enable them to enjoy in ease and eomfort its social amenities, without indulging in the costly gaieties whieh a London season involves. The supreme courts of law hold their sittings in Edinburgh, and still retain some of the most characteristic features impressed on them when remodelled by James V. in 1532. The Court of Session has the lord president as its head; and the High Court of

Justiciary is presided over by the lord justice-general and the lord justice-clerk. The judges, as senators of the College of Justice, have also the title of lord, not infre- quently coupled with that of their landed estate—as Fountainhall, Kaimes, Hales, Monboddo, Woodhouselee, or Colonsay; and the advocates and writers to the signet—as the two leading branches of the Seottish legal profession are styled,—help to give a legal tone to the society of the Scottish capital.

The university, with the medical sehools and other edu- cational institutions, have long added to the attractions of Edinburgh. As a school of art it has also acquired a

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special charaeter ; and the names of Runeiman, Nasmyth, Raeburn, Wilkie, Allan, M‘Culloch, Watson Gordon, Harvey, and Drummond (without referring to living painters and sculptors) are all familiar, and some of them eminently dis- tinguished in art. A school of design was established at Edinburgh in 1760 by the Honourable Board of Trustees for Manufactures, at which Raeburn, Wilkie, Allan, and other leading Scottish artists, along with many others of less note, obtained their preliminary training. With its aid the application of art to manufacturing design and decoration has received an important stimulus. Steel and wood engraving have also largely benefited by the same facilities ; and this in its turn has aided in fostering the printing press as a special branch of trade for which Edin- burgh has long been eelebrated. In early days the names of Chepman, Millar, Bassandyne, Charteris, Hart, Watson, and Ruddiman figure among its eelebrated typographers; and more reeent enterprise has added to the reputation of the Edinburgh press.

But although a large nuemployed population, in close proximity to a eoal-field and to the fertile’ Lothians, and with the eommand of the chief seaport of the east of Seot- land, gives a stinulus to important industries, the Scottish eapital lays no elaim to rivalry with Glasgow or Dundee as a manufacturing town. The unique beauty of its site, and the abundance of fine building material, while they have fostered the desire for developing its architectural features have begot a disinclination to encourage such manufactures as would tend to interfere with the amenities of the city. The

anxiety with which these are guarded eommands the sympathy of all elasses of the community. The distinctive eontrast between the Old and the New Town is kept ever in view. The predominant character of the former is a seemingly lawless picturesqueness, resulting from the ex- treme irregularities of the sites occupied by its most prominent buildings on the abrupt slopes of the ridge whien is crowned by the aneient fortress. The symmetrical for- mality of the New Town is all the more effective from the eontrast which it thus presents to the older districts of tlic city. In most of the old historical cities of; Europe the stranger reealls the contrast as he proceeds from modern to older districts ; but in Edinburgh he ean look down on thie eity from the castle, the Calton Hill, or Arthur Seat, and view the whole spread out like a map before him; ot, as le traverses the beautiful terrace of Prinees Street, adorned with statues, mouuments, and public buildings, he looks across the fine pleasure grounds in the intervening valley to the quaint old town with its still older castle.

The improvements effected on the Old Town during the past forty years, while they bave swept away many iute- resting]iistorieal remains, have on the whole resulted in a more effective development of its picturesque features. During the same perind the New Town, and the still more recent extensions to the west and south, have been carried out with a eareful eye to the general results ; and alike in the Old and the New Town the advantageous sites of the chief public buildings largely contribute to their architec- tural effect.

The Castle—The central feature of Edinburgh is the castle, which ineludes structures of very diverse dates. The oldest of its buildings, occupying the very summit of the rock, is St Margaret’s Chapel, an interesting relic, belonging at latest to the reign of Queen Margaret’s youngest son, David L, and by some good authorities believed to be the actual ehapel in whieh the queen of Malcolm Canmore wor- shipped. Next in interest are the ancient hall and other remains of the royal palace, which form two sides of the quadrangle styled palace yard, and oceupy the summit of the rock towards the south. These buildings include the apartments occupied by the regent, Mary de Guise, and

her royal daughter, Queen Mary, and the room in which James VI. of Scotland and I. of England was born. Here also is the Crown Room, in which are deposited the Scottish regalia, or ‘The Honours of Scotland,” as they are called, along with a bzautiful sword of state presented to James IV. by Pope Julius II., and the jewels restored to Scotland on the death of Cardinal York, the last of the Stuarts. The arsenal, a modern building on thg west side of the castle rock, is capable of storing 30,000 stand of arms. In the armoury a display of arms of various dates is made; and on the Argyll battery, immediately to the south of St Margaret’s Chapel, stands a huge piece of ancient artillery, ealled Mons Meg, of which repeated mention is made in Scottish history.

Holyrood Palace, the venerable abode of Scottish royalty, was originally an abbey of canons regular of the rule of St Augustine, founded by David I. in 1128. The rnined nave of the abbey church still retains portions of the original structure. Conjoined to this is a part of the royal palace erected by James IV. and V., including the apartments occupied by Queen Mary, and the scene of the murder of Rizzio in 1566. The abbey suffered in repeated English invasions. It was sacked and burnt by the earl of Hertford in 1544, and again pillaged and left in ruin by the same invaders in 1547, almost immediately after the accession of Edward VI. to the English throne. Ina map of 1544, preserved among the Cotton MSS. in the British Museum, th present north-west tower of the palace is shown standing apart, and only joined to the abbey by a low cloister. Beyond this is an irregular group of buildings, which were replaced at a later date by additions more in accordance with a royal residence. But the whole of this later struc- ture was destroyed by fire, while in occupation by the soldiers of Cromwell, in 1650; and the more modern parts of the present building were commenced during the Protectorate, and completed in the reign of Charles IT. by Robert Mylne, in accordance with a design of Sir William Bruce of Kinross. They include the picture gallery, 150 feet in length, famous for its fanciful array of 106 mythical portraits of Scottish kings, the reputed descendants of King Fergus I., but also adorned with a remarkable tryptic, painted about 1484, containing portraits of James ITI. and his queen, Margaret of Denmark, and believed to have formed the altar-piece of the collegiate church of the Holy Trinity, founded by the widowed queen of James II. in 1462, and only demolished in 1848. The picture gallery is interestingly associated with

festive scenes during the brief presence of Prince Charles Edward in Edinburgh in 1745; and in it the elections of representative peers for Scotland take place. The exiled Comte d'Artois, after- wards Charles X. of France, had apartments granted for the use of himself and the emigrant nobles of his suite, on their escape from the first French Revolution, and they continued to reside in the palace till August 1799. When driven from the French throne by the revolution of 1830, the same unfortunate prince once more found a home in the ancient palace of the Stuarts. In the interval between those two visits it was graced by the presence of George TV. in 1822; and it has been repeatedly occupied for brief Periods by Queen Victoria and the Prince Consort. A beautiful fountain, the design of which is a restoration of the ruined fountain in the quadrangle of Linlithgow Palace, which stands in the centre of the outer court of Holyrood, and forms a memorial of the interest evinced by Prince Albert in the ancient Scottish palace.

Phe Parliament House, in which the later assemblies of the Scottish estates took place, until the dissolution of the Parliament by the Act of Union of 1707, has ever since been set apart as the place of meeting of the supreme courts oflaw. The great hall, with its fine open-timbered oaken

roof, under which the last Scottish Parliament assembled still stands, and forms the ante-room of the advocates and other practitioners, and of their clients, during the session of the supreme courts. But the surrounding buildings, including the court-rooms, the Advocates' and the Signet Libraries, are all modern additions. The Advocates' Library is the largest and the most valuable library in Scot- land. It was founded in 1682, at the instance of Sir George Mackenzie, king's advocate under Charles IL, and then dean of the faculty, and has been augumented by (mportant gifts. It is regarded with just pride as the national library, and is one of the five libraries entitled by the Copyright Act to receive a copy of every work printed in Britain, The number of volumes now included in the collection is estimated to amount to 260,000. The Library of the Society of Writers to the Signet contains upwards of 50,000 volumes, and, although more private in its character, it has always been available for research by literary students.

Lhe General Register House for Scotland, which stands at the east end of Princes Street, is an important adjunct to the supreme courts; and, in its ample provisions for the registry and safe-keeping of all deeds and judicial records, it compares favourably with the system in voguein England. Not only is there adequate accommodation, in fire-proof chambers, for all Scottish title-deeds, entails, contracts, and mortagages, and for general statistics, including births, deaths, and marriages, but there also are deposited all the ancient national records, the full historical value of which is only now beginning to be generally appreciated. The general record department is in charge of the lord clerk register and keeper of the signet, assisted by a deputy clerk register, a deputy keeper of the records, a curator of the historical department, and other officials.

The Royal Institution, a fine structure of the Grecian Doric order, surmounted by a colossal statue of the Queen, executed in stone by Sir John Steell, furnishes official accommodation for the Board of Trustees for Manufactures, and the Board of Fishery, and also for the School of Art and Statue Gallery of the Royal Institution, the Museum of National Antiquities, and the libraries and public mect- ings of the Royal Socicty and the Society of Antiquaries of Scotland. This beautiful building is thus made the centre of varied intellectual activity, in artistic culture and design, scientific, historical, and archeological research, as well as in the practical application of the fine arts, and of the newest disclosures in science, to the manufacturing and trading interests of the whole nation. punta’

Among those the National Museum of Antiquities claims special attention. The Society of Antiquaries of Scotland was founded in the year 1780 by a body of noblemen and gentlemen, who held their first meetings at the house of the earl of Buchan ; andalmostimmediately after its founda- tion they devoted themselves to the formation of an Archeological Museum. The history of the early years of the society is a curious commentary on the manners of the Scottish capital a century ago. With the dukes of Montrose and Argyle, the earls of Buchan, Bute, Fife, and Kintore, and many of the leading Scottish gentry among its active members, a suitable hall secured for the meetings of the society in the Cowgate was successively exchanged for others in Webster’s Close, and Gourlay’s Close, Lawn- market—the reason assigned for abandoning the latter being that the alley was too

narrow to allow of the members reaching the society's hall in their sedan chairs, After passing through various vicissitudes, and occupying more than one hall in the New Town, it was found that the collections of the society had attained to a magnitude and value which rendered it no longer possible for a private society to do justice tothem, Archeological investigations,

moreover, have now come to occupy a no less important relation to the researches of science than to the study of history ; and in many of the capitals of Europe similar collections are promoted as objects of national importance. Negotiations were accordingly entered into with the Government in 1849 and subsequent years, which resulted in the appropriation of the galleries in the Royal Institution, formerly devoted to the exhibitions of the Royal Scottish Academy, to the reception of the collections of the Society of Antiquaries of Scotland as a National Museum of Antiquities. The council of the society, with the addition of two members of the Board of Trustees as representatives of the Crown, continue to have the charge of the collections, which are open to the public, like the British museum and other national collections. The museum is specially rich in Scottish antiquities, illustrative alike of prehistoric archeolozy, of Roman, Celtic, and Teutonic remains, and of medieval civil and ecclesiastical art; and its native and foreign collections of primitive antiquities are arranged with a view to illustrate modern archeological science, by the comparative classification of numerous examples of primitive flint, stone, and bronze relics, sepulchral pottery, implements and weapons, and of personal ornaments of gold, silver, and bronze. The society publishes its proceedings annually, and from time to time issues its transactions, embodying the more important historical and archeological treatises submitted to its meetings, in the quarto volumes of the Archceologia Scotica.

The Royal Socety of Edinburgh was incorporated by royal charter in 1783, for the encouragement of philosophical inquiry and scientific research. Its extensive library and other collections are accommodated in the apartments occupied by it in the Royal Institution buildings ; and its proceedings and transactions are now voluminous, and embody many important scientific papers.

The Royal Scottish Academy of Painting, Sculpture, and Architecture, was instituted in 1826, and incorporated by royal charter in 1838, on the model of the Royal Academy of London. Subsequent to the completion of the Royal Institution buildings the central range of galleries was appropriated to the annual exhibitions of the Academy ; but in August 1850 Prince Albert laid the foundation-stone of the National Gallery, a building exclusively devoted to the promotion of the fine arts in various ways, including the accommodation of the Royal Scottish Academy, and which has also greatly contributed to the architectural beauty of the city. The low valley, or ravine, which separates the Old from the New Town, is not only spanned by the North and Waverley Bridges, but is also crossed midway by a huge earthen viaduct, formed by depositing the materials excavated for the foundation of the houses erected on the neighbouring terrace of Princes Street. This, which long formed an unsightly blemish, was at length utilized for the improvement of the city, as the site of the Royal Institution building. But there still remained in the rear a huge excrescence styled the Earthen Mound, cumbered with temporary buildings, and an eyesore to all who appreciated the amenities of the general view. The property of this as a building site was acquired by the Board of Trustees under an Act of Parliament, which vested it, and the buildings erected thereon, in the Board, subject to the Lords Commissioners of the Treasury; and in 1854 the new galleries were completed. The building is of the Greek Jonic order, thereby pleasantly contrasting with the more massive Doric of the Royal Institution building ; and the view of the two, as seen from East Princes Street, grouping together with the Castle, the Free Church College, and the masses of the Old Town buildings rising behind, is singularly striking and effective. The National Gallery provides for the public display of a fine national

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collection of paintings and sculpture, acquired by purchase and bequest, for the annual exhibitions of the Royal Scottish Academy, and for the Life Academy and other schools specially designed for the advancement of the fine arts in Scotland.

The University of Edinburgh was founded in 1582, by a royal charter granted by King James VI., and its rights, immunities, and privileges have

been remodelled, ratified, and extended at various subsequent periods. In 162] an Act of the Scottish Parliament ratified to the university of Edinburgh all rights and privileges enjoyed by other universities in the kingdom, and those were renewed under fresh guarantees in the Treaty of Union between England and Scotland, and in the Act of Security. Important changes have since been made on the constitution of the university by an Act of the British Parliament passed in 1858. But while the college, as such, bears the name of the College of King James, or King's College, and James VI. is spoken of as its founder, it originated in the liberality of the citizens of Edinburgh. William Little of Craigmillar, and his brother Clement Little, advocate, along with James Lawson, the colleague and successor of Knox, may justly be regarded as the true founders of the college. In 1580 Clement Little gave all his books, amounting to 300 volumes, for the beginning of a library, and this was augmented by other valuable benefactions, one of the most interesting of which was the library of Drummond of Hawthornden, the friend of Ben Jonson—a collection rich in choice specimens of our rarer early literature. The University Library now contains about 139,000 printed volumes, and above 700 volumes of MSS., many of which are of great interest and value.

The buildings of the university occupy the site of the ancient collegiate church of St Mary in the Field, or the Kirk of Field, as it was familiarly termed. The present structure is a classical building, inclosing an extensive quadrangle. The older parts of it, including the east front, are from the design of Mr Robert Adam; but his plans were revised and modified with great taste by Mr W. H. Playfair, with a view to the completion of the building; and the whole is now finished, with the exception of a cupola designed to surmount the east front, for which the

requisite funds have been bequeathed to the university.

This edifice affords accommodation for the lecture rooms 1 the four faculties of arts, law, medicine, and theology, and for the museums and library. But although entirely reconstructed on a greatly enlarged scale during the present century, they have already proved to be inadequate for the requirements of this celebrated school of science and letters ; and extensive new buildings are now in progress at Teviot Row, designed to

accommodate the departments of science and medicine, and to leave the older building exclusively for the departments of arts, law, and theology. The new build- ings will accordingly include a university convocation hall, class-rooms, laboratories, dissecting rooms, and museums. In connection with this, the Loyal Infirmary is also m progress of completion, on a new site, and on a greatly en- larged scale, with operating theatre and other requirements in connection with the medical school, and with all the most modern improvements in the arrangement and construe- tion of hospitals. or this a site nearly adjoining to that of the new college buildings, previously occupied by George Watson's Hospital, has been selected. It embraces a large area between the Heriot's Hospital grounds and the Meadows, and separated by the fine avenue of the Meadow Walk from the new medical schools. By this means the important requisites of free air and the immediate vicinity of extensive pleasure grounds are secured; and thus the primary object of the infirmary as a benevolent institutio2 for minister'ng to the wants of those afflicted with disease,

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or suffering from injuries, is efficiently combined with its indispensable uses as a school for clinical instruction and practical training in the healing art.

The Royal Botanical Garden is another important adjunct to the university as a school of science. The professor of botany is regius keeper of the garden ; but its special requirements necessitate its removal from the crowded centre of the city. It has accordingly undergone four suc- cessive changes of site since its foundation in 1670 by Sir Andrew Balfour and Sir Robert Sibbald. It now occupies a fine area of 27 acres on the north side of the city, in Inverleith Row. This is carefully laid out with a special view to botanical instruction. It includes a herbarium and palm houses, with an extensive range of hot-houses, a museum of economic botany, a lecture room, and othcr requisites for the students of botany who attend here the lectures of the professor during the summer term.

The Royal Observatory, which las already been referred

to as one of the architectural adornments of the Calton Hill,'

also constitutes an important adjunct to the university. The astronomer royal for Scotland holds along with that office the professorship of practical astronomy.

Museum of Science and Art.—One other important insti- tution of practical instruction, in intimate connection with the university, is the Museum of Science and Art, situated immediately to the west of the university building, and in direct communication with it. The first keeper of the museum, Dr George Wilson, was also professor of technology in the university, but the chair has not been filled since lis deuth, though his successor in the charge of the museum delivers lectures from time to time in the large lecture room in the east wing of the building, which is capable of accommodating about 800 sitters. The Museum of Science and Art embraces not only the objects of science included in the departments of geology, mineralogy, palzeontology, and natural history, as well as other allied sciences, but also of industrial art, and of the raw productions of com- merce, illustrative of nearly all the chief manufactures of Great Britain, and of many foreign countries.

Royal College of Surgeons.—The museum and lecture rooms of the Royal College of Surgeons are accommodated in a handsome classical building in Nicolson Street, in the iinmediate vicinity of the university buildings. The College of Surgeons is an ancient eorporate body, with a charter of the year 1505, and exercises the powers of instructing in surgery and of giving degrees. Its graduates also give‘lectures on the various branches of medicine and Science requisite fur the degree of doctor of medicine, and those extra-academical courses are recognized, under certain restrictions, by the university court, as qualifying for the degree. The museum contains a valuable collection of anatomical and surgical preparations adapted to the ad- vancement of the study of surgical science.

Royal College of Physicians.—The Royal College of Physicians is another learned corporate body, organized as such, with special privileges by a charter of incorporation granted to them by Charles IT. in 1681. The meetings of the body take place in their hall, a handsome building on the terrace overlooking the Queen Strect Gardens, where they have a valuable

library and a museum of materia medica. But the eollege as a body takes no part in the educational work of the university.

The three older Scottish universities of St Andrews, Glasgow, and

berdeen were all founded in the 15th century, by the authority of papal bulls, and derived their original endowments chiefly from the liberality of influential eeelesiastics, who had large revenues and ehureh property at their disposal. They originated a part of that grand coneeption of the 15th eentury, which aimed at organizing the learning of the age into local branches of one university system, embracing the whole scholarship of Christendom, and recognizing

the graduates of all universities as members of one corporate brother- hood, co-extensive withthe Christian world. The Scottish univer- sities still differ from those of Oxford and Cambridge in perpetuat- ing some curious relies of this cosmopolitan university system.

The first conception of the University of Edinburgh is also duc to a learned Scottish ecclesiastic, Robert Reid, bishop of Orkney, a favourite councillor of Jamcs V., who died at Dieppe in 1558, —as was believed from poison,— when on his way home, after fulfilling his duties as one of the commissioners for the marriage of the Queen of Scots to the Dauphin of France. He left a bequest of 8000 merks towards the founding of a college at Edinburgh, and is stated by the historian of the family of Sutherland to have destined a much larger sun for the same purpose, but it was diverted by the earl of Morton to his own use. The above-named bequest was only recovered after long delay, when, in 1581, it was appropriated to the purchase, from the provost of the Kirk of Field, of the grounds now occupied by the university buildings. ‘he cireum- stances attendant on the death of this first benefactor of the University remind us of the ecclesiastical changes already in pro- gress in the 16thcentury. The actual foundation of the University of Edinburgh dated subsequent to the Reformation ; and it is honourably distinguished among the national universities of Great Britain as the creation of the citizens themselves.

The Royal Charter granted by James VI. in 1582 contemplates a university on a wide basis, with tie conditions necessary for liberal study, and arrangements suited to the progress of modern scicnee; and it is wonderful how much has been accomplished in spite of the meagreness of the whole endowment. By the Univer- sities (Scotland) Act of 1858, provision is made for the better government and discipline of the Seottish universities, and that of Edinburgh was materially affeeted by its operations. The civic origin of the university had placed the patronage of the chairs, and the supreme control of the university, to a very considerable extent in the hands of the city corporation. The administration of the responsible duties thus devolving on the town council reflects, on the whole, great credit on the city ; and its exercise of the patronage of university chairs was abundantly justified by the high rank attained by the university under the distinguished professors selected by it. But the university had long outgrown the healthful operation of such anomalous relations; and by the new Act, it has been remodelled as a eorporation, consisting of a chancellor, vice- chancellor, rector, principal, professors, registered graduates and alumni, and matriculated students. The chancellor is elected for life by the general council, of which he is head; and the rights of the city as the original founder of the university have been reeog- nized by giving to the town council the election of four of the seven eurators, with whom rests the appointment of the prineipal, the sole patronage of seventeen of the chairs, and a share in other appointments. For further details see UNIVERSITIES.

New College-—One of the proceedings consequent on the disruption of the Church of Scotland in 1843, and the formation of the Frec Churcli, was the establishment of New College at Edinburgh, in connection with that ehurch. As originally projected, it was designed to include scientific and literary as well as theological chairs. Since then, however, this and the other colleges of the Free Church of Scotland, established at Aberdeen and Glasgow, have assumed the more limited character of purely theological colleges—though in that of Edinburgh a ehair of natural science is still retained. New College Buildings, designed in the pointed style of the 16th eentury, are erected on the site of the palace of Mary de Guise, and include a hall for the general assembly, or supreme court of the church. They occupy a prominent site at the head of the Mound, imme- diately in the rear of the N ational Gallery ; and the two central towers, with a lower one in the same style, attached to

the church at the north-east angle, contribute to give elevation to the fagade which has been aptly designed to harmonize with the lofty surrounding buildings of the Old

wn. note United Presbyterian Church has also its theological hall for the training of its ministers. The building hitherto occupied for the accommodation of the students, and also for the meetings of its church eourts, is situated in Queen Street; but in September 1877 the New Edinburgh Theatre, in Castle Terrace, was purchased with the view of being eonverted to those uses.

Literary Institutions.—Next door to the United Pres- byterian premises in Queen Street is the Philosophical

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Institution, of which Mr Thomas Carlyle is president. The lending library of this institution is extensive and valuable, and its annual winter courses of lectures are of a high character, and command great popular interest. _ The Edinburgh Literary Institute, formed on a nearly similar basis, has its building in South Clerk Street, in the southern part of the city.

Schools. —The public seminaries of Edinburgh, including the hospitals and other charitable foundations chiefly directed to the training and education of youth, are upon a very liberal scale. The High School of the burgh dates its existence from an early period in the 16th century. The Burgh Record, under date March 12, 1554, contains an order for the building of the grammar school on the east side of the Kirk of Field Wynd. At a later date, and down to the present century, it occupied the site of the Blackfriars' monastery founded by Alexander II. in 1230. But in the year 1825 the foundation stone was laid of the beautiful classical building which now occupies a prominent site on the southern slope of the Calton Hill. It was originally, and till a comparatively recent date, a purely classical school; but it now furnishes systematic instruction in all the departments of a liberal

and commercial educa- tion, including the ancient and modern languages, the natural sciences, mathematics, &c.

The Edinburgh Academy, which was established in 1824, and incorporated by royal charter of George IV., is a proprietary school under the superintendence of a board of directors elected by the subscribers. It is arranged into two divisions, the classical and the modern school, for the senior classes. It has established a high character for its classical training, and has already taken an honourable rank among the public schools of Great Britain, by the dis- tinctions achieved by its pupils both at the English and Scottish universities.

Charitable Foundations.—Foremost among the charitable foundations for the education and training of youth is George Heriot's Hospital, founded by the jeweller of James VI. of Scotland and I. of England, who at hig death in 1624 left his estate in trust to the magistrates and ministers of Edinburgh for the maintenance and education of poor fatherless sons of freemen of the city. The build- ing erected for the purposes of the charity is a noble quadrangular edifice, enriched with the elaborate details of the transitional style of domestic architecture of the earlier Stuart kings of England. It occupies a commanding site on the summit of a ridge known of old as the High Riggs, lying between the Grassmarket and the Meadows, and forms a striking feature in the view of the city from various points. 180 boys are maintained on the foundation, 120 resident, and 60 non-resident. Those among them who give proof of diligence and ability are afterwards maintained during a full course of four years at the ulliversity; and those who are apprenticed to trades are also provided with funds for five years, amounting in all to £50 sterling, with an additional £5 on proof of good behaviour at the close.

The popular character of Heriot's Hospital, and the effective arclitecture of its building, have largely influenced the disposition of later charitable bequests in Edinburgh, somewhat to the detriment of the university. Following the example of the jeweller of King James, successive benefactors have founded George Watson's Hospital, the Merchant Maiden Hospital, the Trades' Maiden TTospital, the Orphans', John Watson's, Donaldson's, and Stewart's hospitals—all more or less modelled on the

original founda- tion. Several of their buildings are also possessed of con- siderable architectural beauty, foremost among which is Donaldson's Hospital, the founder of which amassed a large fortune as a printer, and bequeathed nearly the whole of it in trust for the erection and endowment of a hospital for

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the maintenance of poor boys and girls. The trustees have taken advantage of the liberty of choice permissible under such terms to select one-half of the children admitted to the hospital from the class of the deaf and dumb, The building has accommodation for 300 children. In 1877 it contained 214, of whom 120 were boys and 94 girls, Of those 70 of the former and 45 of the latter were deaf and dumb. Experience has thus far tended to show that the constant intercourse between the deaf mutes and their more fortunate companions exercises a beneficial influence on both.

George Watson's Hospital, founded by the bequest of another citizen in 1738, and the Merchant Maiden Hospital, founded so early as 1605, were designed to extend to the sons and daughters of merehants of Edinburgh similar advantages to those which the Heriot's Hospital secured for burgesses' sons. The Trades Maiden Hospital provided for burgesses' daughters, and John Watson's, Daniel Stewart's, and other similar institutions provided in like manner for the maintenance and education of poor children of various classes. But the multiplication of such charities threatened to outgrow the legitimate wants of the community, and needlessly to withdraw many children from the healthful influences of home training. Hence a growing feeling of the abuses of the system, at the very time when the revenues of Heriot's Hospital were greatly increased in consequence of the extension of the New Town over its lands, at length led to an appheation to Parliament for power to modify the disposition of the surplus revenue. By the Act thus obtained the governors of that institution were empowered to expend such surplus funds in erecting and maintaining ele- mentary schools for the free education of poor children of deceased burgesses and freemen, and generally of the children of poor citizens of Edinburgh. There are now eighteen of those Heriot foundation schools, in

different parts of the city, divided into the two classes of juvenile and infant schools, giving free education, and, in certain cases of extreme poverty, also a sum of money in lieu of maintenance, to 4400 boys and girls.

The example thus set has been followed by the governing bodies of other similar institutions. The Merchant Company, as trustees of the George Watson's, Merchant Maiden, Gillespie's, and Stewart's charities, taking advantage of powers given by the Endowed Institu- tions (Scotland) Act, obtained power to convert the George Watson's Hospital into a sehool; and since then, they have sold the building and grounds to the corporation of the Royal Infirmary, and the New Infirmary is now in progress on the site. The Edinbureh Merchant Company's Schools now include the George Watson's College-Schools, in which ample provision is made for furnishing a liberal educa- tion for boys, qualifying them for commercial or professional life, for the civil service, and for entering the university. Bursaries are also offered for competition, which secure a free enjoyment of the entire course of studies to the successful competitors, and furnish the sum of £25 annually, for four years, after leaving the schools. A similar institution provides corresponding advantages for girls ; and the Edinburgh Educational Institution, or Ladies' College, in like manner furnishes a high-class education in the ancient and modern languages, mathematics, the natural sciences, and in music and other more strictly feminine accomplishments; and bursaries and other prizes, of like valuc to those offered for competi- tion in the College Schools, are placed within reach of the ablest and most diligent female students,

Experience has, therefore, amply confirmed the wisdom of the course thus pursued in the readaptation of this class of charities to the wants of the aye; and the example of Edinburgh is likely to influence other cities where similar endowments are, in some cases at least, very partially turned to useful account,

Edinburgh is otherwise well provided with both public and private schools, to which pupils resort, not only from many parts of the kingdom, but from the colonies. The Fettes College was apparently designed by the terms of the will of its founder, Sir William Fettes, to correspond very nearly to Heriot's Hospital. But the trustees have so far modified that idea as to

establish a college for boys modelled after the great public schools of England, and designed to furnish a liberal education in the fullest sense of the term. The college building which has been erected at Comely Bank, the estate of the founder, on the north side of Edinburgh, is a structure of an imposing and stately character in the semi-Gothic style of architecture prevalent both in France and Scotland in the 16th century.

The Church of Scotland Training College, the Free Church Normal School, Merchiston Academy, occupying

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the antique tower of Napier, famous as the inventor of logarithms, and the Watt Institution and School of Arts, all merit notice among the more iniportant educational institutions; and under the Edinburgh School Board efficient schools are now in operation in various districts of the city, mostly lying beyond the range of the Heriot's schools.

Charities. Among the public charities of the city the Trinity Hospital, no longer maintained as a hospital with resident pensioners, now expends its income in pensions of from £10 to £20, to 172 poor burgesses, their wives, or children, not under the age of fifty years. The benevolent branch of the Gillespie's Hospital endowment is similarly administered. The Chalmers' Hospital, founded by George Chalmers in 1836, destined for the reception of the sick and hurt, stands on the southern slope of Lauriston, over-looking the Meadows, and at no great distance from the New Royal Infirmary, to which it is a useful adjunct. In addition to those, it may suffice to name the Convalescent House—where, in a pleasant country home near Corstor- phine, the convalescents of the Infirmary are transferred from the surgical or fever wards of that hospital to healthful fresh air,—the Royal Hospital for Sick Children, the Home for Crippled Children, the Hospital for Incurables, the Royal Maternity Hospital, along with other kindred institutions. The Royal Asylum for the Insane is at Morningside, on the southern outskirts of the city; and the Royal Blind Asylum, and the Deaf and Dumb Benevolent Society, each provide for the special classes indicated by their names.

Prisons.—The different city prisons are grouped together on the southern terrace of the Calton Hill, styled of old the Dow Craig, so as to form a very striking feature in the general view of the city from various points. They are con- structed in a semi-castellated style; and the house of the governor of the jail, built on the summit of a rock overlook- ing the whole, and on the very edge of a bold perpendicular cliff, looks not unlike one of the old castles familiar to the voyager on the Rhine.

The General Post-Office is the central office for Scotland, alike for postal and telegraphic service, and the building devoted to those purposes is a large and effective structure in the Italian style of architecture, at the east end of Princes Street, directly opposite to the Register Office.

General Assembly of the Church of Scotland.—During the establishment of Episcopacy in Scotland, Edinburgh was the seat of a bishop, and the ancient collegiate church of St Giles rose to the dignity of a cathedral. The annual Meeting of the General Assembly of tlle Church of Scotland at Edinburgh is now the grand public manifestation of the predominance of Presbyterianism as the national church. Annually in the month of May a nobleman, commissioned to act as the representative of the Queen, takes up his abode at the Palace of Holyrood, and proceeds from thence in state to the High Church, and thence to the Assembly Hall on the Castle Hill, as the lord high commissioner to the General Assembly of the national church. The lord provost and magistrates loyally offer to him the keys of the city. Levees, receptions, and state dinners revive in some degree the ancient glories of Holyrood ; and, as the General Assembly of the Free Church and the Synod of the United Presbyterian Church are usually held at the same time, the Streets of Edinburgh present a singular aspect to a stranger.

Places of Worship —The buildings set apart as places of worship by the various denominations include 30 belonging to the Church of Scotland, 29 to the Free Church, 23 to the United Presbyterian Church, 14 to the Episcopal Church, and about 30 others to different religious deno- minations, including a Jewish synagogue.

St Giles’s Church.—Among the buildings dedicated to the worship of the different denominations, the ancient collegiate church of St Giles is the most important, alike in its architecture and its historical associations. The Regent Murray, the marquis of Montrose, and Napier of Merchiston are distinguished among the eminent men interred in the ancient church, by monuments marking their tombs. The

‘choir, which has recently been cleared of encumbering

galleries, and tastefully fitted up with oaken stalls, and a fine carved pulpit of Caen-stone, is a beautiful example of the ecclesiastical architecture of the 15th century; and the fine Gothic crown which surmounts the central tower forms one of the most characteristic features in every view of the city. The domes, towers, and spires of the various churches add to the general effect of the city, and in some cases they even present an imposing aspect from their ele- vated and commanding sites. But none of them is of sufficient importance to invite notice for any special architectural beauty, though several are works of merit. By the bequest of Miss Walker of Coates and Drumsheugh, who died in 1871, funds have been set apart for the erec- tion of a cathedral for the use of the Scottish Episcopal Church. The plans have been prepared by Sir G. Gilbert Scott, in the Early Pointed style of the 14th century, and include a nave, choir, transepts, and chapter-house. If completed according to the approved design, it will be the largest and finest church erected in Scotland, if not in Britain, since the Reformation.

Monuments.—The monumentsand statues whichadorn the city are of a peculiar character, and contribute to the singular aspect which Edinburgh presents to the eye of a stranger. The fame of Sir George Mackenzie, David Hume, Dugald Stewart, Playfair, Burns, and Scott is commemorated in the case of each by an effective monumental structure dedicated to his memory. Of these the most remarkable is the monument erected by public subscription in memory of Sir Walter Scott, which stands in the eastern division of the Princes Street Gardens. ‘The design, which was furnished by a young architect, Mr G. W. Kemp, is that of a spiral Gothic cross, of great elegance both in outline and in details. A marble statue of Scott, by Sir John Steell, is placed under the central canopy; and the prin- cipal niches are occupied by figures of characters in Scott’s writings. The Nelson

monument, a lofty castel- lated turret which crowns the highest cliff of the Calton Hill, though of questionable architectural taste, 18? a striking feature in the general view of the city; and the Melville monument, a graceful and well-proportioned column 136 feet in height, surmounted by a colossal statue of Viscount Melville, first lord of the admiralty under Pitt, rises from the centre of St Andrew Square, and terminates the eastern vista of George Street, with a repro- duction, in its proportions and general outline, of the celebrated Trajan colunin at Rome. Distant half a mile from this, at the west end of George Street, Charlotte Square furnishes a corresponding site for the monument of Prince Albert, from the design of Sir John Steell. A central pedestal, which sustains the equestrian statue of the – Prince Consort, has at each of the four angles at its base a group of figures representing different classes of the com- munity paying honour to him; and bas-reliefs, executed, like the statues, in bronze, illustrate characteristic incidents in the Prince's career. George Street is further adorned at the intersection of two of the intermediate streets between St Andrew and Charlotte Squares, with colossal bronze statues by Chantrey of George TV. and Pitt. The beautiful garden terrace of Princes Street, on which the Scott monument stands, also affords appropriate sites for the statues of Allan Ramsay, John Wilson, and other distinguished Scotchmen; at other prominent. points in

the Old and New Towns are equestrian statues of Charles IL, the duke of Wellington, and John, fourth earl of Hopetoun; and also statues of the duke of York, Lord Melville, &c. The monument to the poet Burns, erected on a prominent site on the southern terrace of the Calton Hill, isin the style of a Greek peripteral temple inclosing a cella designed to form the shrine of a fine marble statue of the poet executed by Flaxman. But it proved to be too confined to afford a satisfactory view of the statue. This has accordingly been replaced by a bust from the chisel of Brodie; and the statue, after being placed for a time in the university library, now forms a prominent feature among the works of sculpture in the National Gallery.

Manufactures—The principal manufactures may be classed under the following respective heads :—(1) Print- ing, lithographing, engraving,

bookbinding, and _ type- founding ; (2) brewing, distilling, coopering, and manu- facture of aerated water; (3) furniture work, paper- hanging, and coach-building ; (4) india-rubber work; (5) machinery and brassfounding; (6) tanning; (7) glass work ; (8) confectionery.

The city is supplied with water from various extensive reservoirs formed in the valleys of the Logan Water, the Bavelaw Burn, and the North Esk, in the Pentland Hills, lying to the south of the city. A bold project was started in 1872 for securing an inexhaustible supply by bringing in the water from St Mary's Loch, a beautiful lake about three miles in length, at the head of the Vale of the Yarrow, in Selkirkshire ; but the plan met with consider- able opposition, and was abandoncd fora less comprehensive measure, sanctioned by Parliament in 1874, whereby additional reservoirs have been constructed in the neigh- bouring valleys, and an adequate supply of water secured for the growing requirements of the city.

The population of the parliamentary borough of Edin- burgh amounted in 1831 to 136,294, in 1851 to 160,309, and in 1871 to 196,979 (89,245 males and 107,734 females). In 1877 the population was estimated at 218,729; and the annual value of real property was £1,538,738. The city returns 2 members to parliament, and its corporation consists of a lord provost, 6 bailies, a convener of the trades, a dean of guild, and 32 councillors.

Reference may he made to W. Maitland's History of Edinburgh (1753), Arnot's fistory of Edinburgh (1789), R. Chambers's Tradi- tions of Edinburgh (1824), and D, Wilson's Memorials of Edinburgh in the Olden Time (1846-48), (D. W.)

EDMUND, Sr (c. 1190-1240). Edmund Rich, arch- bishop of Canterbury, was born about the close of the 12th century, at Abingdon, then the seat of a great Benedictine convent. He was one of six children. His father was a rich trader and man of the world, his mother a pious woman, who carried out remorselessly the ascetic conception of a religious life. She fasted much and slept little, wore a hair chemise and iron stays, and made her household so uncomfortable by her arrangements that her husband, with her consent, retired to a monastery at Kynesham, as likely to be a more enjoyable home. The story of Edmund's birth and early years is strewn with marvel and miracle. 'Trained by his mother, he caught her ascetic spirit, and became a willing imitator of her self-tormenting ways. At the age of twelve he was sent to a school at Oxford, where he studied diligently, but continued his ascetic exercises. Naturally susceptible in a high degree to the charm of beauty, he nevertheless vowed a vow of celibacy, and espoused himself to the Blessed Virgin Mary. At Oxford he was prostrated by a brain fever; his mother attended him, and by her desire he received the clerical tonsure. Shortly after, his father apparently being dead, he was sent to Paris to study at the university. He was

called home to attend his mother on her death-bed; and during the next twelve months he lived in retirement in the convent of Merton, in Surrey. He then returned to Oxford, and at once took an honourable place among the teachers of the university, which he retained for some years. He is distinguished as one of the scholars who introduced the study of Aristotle ; and he heartily co-operated with those who were striving to recover for Oxford the popularity and prosperity as a place of study which it had recently lost, in consequence of a disturbance (1209) between town and gown, and the migration of students and masters in very large numbers. Edmund ultimately resolved to devote himself to theology, was ordained priest, and took his degree in divinity. ' He is the first of our archbishops," says Dean Hook, " to whose name we find the title of S8.T.P.'attached—the first doctor of divinity." About 1222 he was appointed treasurer of Salisbury Cathedral, and in this office, which he held about eleven years, and to which the prebend of Calne was attached, he endeared himself alike

to rich and poor. In 1227 Dr Edmund was one of the preachers of the sixth crusade. In 1233 he was elected to the vacant primacy. Three elections had previously been made by the chapter, which the Pope for various reasons had refused to confirm ; and this, the fourth, was made by the Pope's suggestion, as a compromise acceptable to "'Pope, king, and monks," says Fuller, "three cords seldom twisted in the same cable." The pallium was sent to England without waiting for the decision of the chapter. The position of the primate was at that time one of peculiar difficulty, and it was with unfeigned reluctance that Edmund accepted it,—feeling, says Lingard, " that the timidity of his conscience would not suffer him to acquiesce in the dis- orders of the age, and that the gentleness of his temper did not fit him for the stern office of a reformer." The new archbishop attached himself and steadfastly adhered to the national party, whose great object was to insure the independence of the kingdom, the maintenance of the Great Charter, and the exclusion of foreigners from civil and ecclesiastical offices. Early in 1234, before his consecration, he convened a council at Westminster, by which a remon- strance was addressed to the king, requiring him, on pain of the censures of the church, to dismiss his foreign councillors, especially Peter des Roches, bishop of Winchester, through whose influence tle strongholds of the kingdom were then in the hands of foreign mercenaries. The consecration of the archbishop was celebrated at Canterbury on the 2d April 1234, and the king was present with all his court. One week later the primate held a second council, and was commissioned by it to threaten the king with excommunication if he did not comply with the terms of the former council. This measure was effectual. The archbishop was then sent into Wales to negotiate a peace with the Prince Llewelyn. In May he held a council at Gloucester, and here was accomplished a temporary reconciliation between the king and the people. In January 1236 the primate had the costly privilege of a royal visit, Henry ITI. going to Canterbury to await the coming of his bride-elect, Eleanor of Provence; and on the 14th the marriage ceremony was performed by the arcli- bishop. A few days later he officiated at the coronation of the queen. But the hopeless divergence of aims betwee the king and the archbishop, aud the inflexible courage and decision of the latter, induced Henry to apply secretly to the Pope, Gregory IX., to send a legate to reside m England, whose authority might nullify that of the arcl- bishop. Meanwhile, the latter issued, in 1236, his constitu- tions, which are of no little interest on account of the indications they furnish of

the state of the church and of general society. The picture is nota flattering one. Jn 1237 arrived the legate, Cardinal Otho, who at once won

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his way into the royal favour. In November he held a council at St Paul's, but failed to carry his main points against the opposition of the clergy. He stood high, however, with the king, and used or abused his prerogatives for effecting his own purposes. Archbishop Edmund now found himself in opposition to both the king and the Pope ; and his position was rendered still more difficult by his ex- communication of Simon de Montfort and his bride Eleanor, sister of the king, whose marriage after having taken a vow of perpetual widowhood he felt bound to condemn. In 1238, with a view to obtaining the support of the Pope for his project of monastic reform, Edmund went to Rome. But in this mission he failed. Not only was his purpose frustrated, but he was treated with marked insult by the Pope; and he retnrned to England sad at heart and burdened with pecuniary difficulties. He soon found that he was reduced toa cipher; he saw the Papal exactions continually growing—" vexed," says Fuller, '' at the poll- ing and peeling of the English people "—and saw that the legate's great object was to crush him. In 1240, therefore, he left England, and took up his abode at the abbey of Pontigny, in France, where Thomas Becket and Stephen Langton had previously found an asylum, At his landing he was met by the queen of France, who brought her sons, among them (St) Louis, to receive his blessing. His health was now broken down, and he " sighed out the remainder of his life " in quiet retirement, broken only by occasional preaching. Becoming weaker and weaker, he removed, for the sake of a better climate, to the priory of Soissy, and there he died, November 16, 1240. His tomb, within a year, began to be famous for miracles; and in 1246, after Inuch resistance on the part of the Pope, the archbishop, the staunch foe of Papal extortions, was canonized. He left a work entitled Speculum Lcclesic, which he appears to have completed at Pontigny.

Two eontemporary biographies of St Edmund are extant, one by his brother Robert Rich, the other by Bertrand, prior of Pontigny,

the usual admixture of miraculous and incredible details being found in their accounts. (W. LR. C.)

EDMUND, or Eapmunp (840-870), the last of the kings of East Anglia, was born in 840. He was chosen by Offa as his successor when that king resigned and retired as & penitent to Rome. ‘The just and holy man”—so Simon Durham describes Edmund—began his reign over the Kast Angles in 855, and ruled peacefully and unevent- fully till his kingdom was invaded by the Danes in 870, when in a battle with Ingvar he was defeated and taken prisoner. The Anglo-Saxon Chronicle says: ‘“ The same winter King Edmund fought against them, and the Danes got the victory and slew the king, and subdued all the land, and destroyed all the minsters which they came to.” Abbo of Fleury, who writes a life of Edmund, relates the Story of his death on the authority of Dunstan, who heard it from the lips of Edmund’s sword-bearer, The Danes sent messengers to Edmund, who was dwelling at Hagilsdun (near the present Hoxne), upon the river Waveney, offer- ing to allow him to reign under them on condition that he abjured his religion and divided with them his treasures. Edmund refused these conditions, and being taken prisoner, was bound to a tree, and, after being scourged with whips and pierced with arrows, was finally beheaded. The manner of his death raised him to a place in the roll of martyrs and saints; and on the spot where his head 1s said to have been miraculously discovered a church was erected, which was succceded by one of the richest Monasteries of England, that of Bury St Edmunds. Here the remains of Edmund are said to have been interred. —

EDMUND, or Eapmunp I. (AtHELtNc), (922-946), king of the Mercians and West Saxons, was the son of Edward the Elder, and succeeded his brother Athelstan in 941,

being then, it is said, only eighteen years of age, but having already gained the esteem of the people by his courage shown three years before at the battle of Brunanburh. When he succceded his famous brother, the Northumbrians, judging the opportunity favourable, brought over Anlaf from Ireland, and set him up as theirking) The Danes of the kingdom joined them, and the result of the campaign was that Edmund was compelled to make a treaty, by which he ceded a large portion of his territory to his enemy. Two years afterwards, however, on the death of Anlaf, he not only

freed his kingdom, but also subdued the Britons of Cumbria or Cumberland, and bestowed their lands on Maleolm J. of Scotland, on condition of his co-operating with him in military service. On the 26th May 946 an outlaw named Leof had slipped into the banqueting-hall of Edmund, who was celebrating the festival of St Augustine at Pucklechurch in Gloucester, and the king in sndden anger, or because he suspected his designs, endeavoured to remove him, whereupon the outlaw plunged a dagger into his bosom and killed him.

EDMUND, or Eapmunp IL, (989-1016), son of Ethelred, and the last of the line of West Saxon kings, called on account of his boldness and great strength Ironside, was, on the death of Ethelred the Unready, in April 1016, proclaimed king by the citizens of London and such of the Witan as were in the city. At that very time Canute the Dane was preparing an expedition against London, and he was proclaimed king by the Witau of England, which met at Southampton. In command of a magnificent fleet he anchored before London, and by cutting a ditch round that part of the city not washed by the Thames, completely surrounded it; but the citizens, fighting with great valour, repulsed all his attacks. Meanwhile Edmund was acknowledged by the West Saxons, who flocked from every quarter to his standard; and determining to make a diversion in favour of London, he met and defeated the enemy at Pen, near Gillingham, in Dorsetshire. Canute was forced to raise the siege of London, and enconntering Edmund at Sceorstan, in Wilts, would have been signally defeated, had not the traitor ealderman Edric raised the head of a fallen thane which resembled that of the king, and called to the Saxons to flee, for their king was dead. Edmund, who was on the top of a hill, saved his subjects from flight by taking off his visor and showing his countenance; but from the disorder into which they had been thrown by the untoward incident they were unable to follow up their victory, Canute retained possession of the field of battle, but stole away during the night and resumed the siege of London. Afterwards the Danes were defeated at Brentford on the Thames, and at Otford in Kent, and fled to the Isle of Sheppey; but being recruited, they met Edmund at Assandun (Ashdown, in Essex), where a battle was fought which virtually decided the fate of the West Saxon kings. Through a second act of treachery on the part of Edric, who fled at the decisive moment of thie battle, with the portion of the army that he commanded, the Saxons were signally defeated, and their

chief nobles left dead on the field. Edmund, undaunted by his great losses, wished still to continue the struggle, but Edric and the Witan persuaded him to be reconciled to Canute, and to consent to a division of the kingdom. Edmund retained London and all England south of the Thames, together with East Anglia and Essex, Canute taking possession of the other and larger portion. Edmund died on the 30th November of the same year, some affirm by the hand of Edric. He was buried in the great minster of Glastonbury, and ou his death Canute became sole king of England.

EDOM. See IpuMEi.

EDRISI, Iprist, or ALpRisI, the most eminent of the Arabian geographers, flourished in the 12th century. The

various parts of his life afford subjects of controversy rather than of precise information. The place and even the country in which he was born is the first subject of dis- pute. A Nubian and an Egyptian origin have both been assigned to him on the basis of a doubtful reading in his work, which speaks of “the Nile of Egypt which cuts our land.” In 1663 Bochart stated that he had found in a manuscript of Leo Africanus that Edrisi was born at Mazara, in Sicily, in 1098. Next year, however, the manuscript ‘was edited by Hottinger, in an appendix to his Bibliothecarius Quadripartitus, and it then appeared that the person supposed to be Edrisi was there named Esseriff Essachalli. Esseriff, or Scheritf, is indeed a usual appella- tion of Edrisi, but as it is only an honorary title and not a proper name, it does not help the identification. The most positive assertion on the subject is that of Casiri, who says (Bibliotheca Arabico-Hispanica, ii. 9), that if Edrist, as appeared probable, were the person designated by the Mahometan writers as Abu-Abdallah Mohamad Ben Mohamad Ben Abdallah Ben Edris, he was born at Septa, or Ceuta, on the coast of Morocco, in 493 a.n. (1099 a.p.) Cuasiri not only qualifies his statement, but he does not mention the authorities from which it is derived ; so that its acceptance rests only upon the confideuce reposed in his learning and accuracy. LEdrisi was long a mighty name in Northern Africa, but in 919 the dynasty was subverted by Mahedi Abdallah, and the proscribed wrecks of the family, according to D’Herbelot, afterwards sought refuge in Sicily. If we may trust the information of Casiri,

Edrisi pursued his studies at Cordova, and from the accurate description he has given of Spain, it is probable that he had travelled through a great part of that country, Various circumstances prove that he removed to Sicily, and began to compose his great work under the patronage, and indeed at the express desire, of Roger IT., king of that island. It was completed about 548 a.y. (1153 a.p.)

His work has appeared under various titles. The first and fullest seems to have been, The going out of a Curious Man to explore the Regions of the Globe, its Provinces, Islands, Cities, and their Dimensions and Situation. This is sometimes abbreviated. Sionita published it under the name of Relaxation of the Curious Mind ; but the alternative title of Nubian Geography, which he and his companion imposed, is altogether arbitrary. It contains a full descrip- tion of the whole world, as far as it was known to the author, who is said to have received reports from a number of learned explorers despatched expressly to collect infor- mation for his usc. The world is divided into seven climates, commencing at the equinoctial line, and extending north- wards to the liniit at which the earth was supposed to be rendered uninhabitable by cold. Each climate is then divided by perpendicular lines into eleven equal parts, beginning with the western coast of Africa and ending with the eastern coast of Asia. The whole world is thus formed into 77 equal square compartments. The geo- grapher begins with the first part of the first climate, including the western part of Central Africa, and proceeds eastward through the different divisions of this climate till he finds its termination in the Sea of China. He then returns to the first part of the second climate, aud so proceeds till he reaches the cleventh part of the seventh climate, which terminates in the north-eastern extremity of Asia. The inconveniences of the arrangement are obvious; but the author appears to have been writing an illustrative treatise to accompany an actual representation of the world which he had engraved on a silver disk or possibly a silver globe.

Two valuable manuscripts of Edrisi exist in the Bibliothéque Nationale at Paris, and other two in the Bodleian Library. The first of the English MSS., which was brought over from Egypt

by Greaves, is written in the Arabic character peculiar to Northern Africa, It is illustrated by a map of the known world, and by 338 other maps, containing each part of a climate, so that there are maps only for the first three climates. The second manuscript, brought by Pococke from Syria, is written in the Arabic character used in that country, and bears the date of 906 A.1L, or 1500 a.p. It consists of 320 leaves, and is illustrated by one general and 77 particular maps, the latter conscquently including all the parts of every climate. The general map was published by Dr Vincent in his Periplus of the Erythrean Sea. A copy ot Edrisi's work in the Escorial was destroyed by the great fire of 1671.

The geography of Edrisi, in the original Arabic, was printed at Rome in 1592, at the Mediccan press, from a manuscript preserved in the grand-ducal library at Florence. Both the paper and print- ing are exceedingly neat, but the volume swarms with typographical errors and forms only a clumsy epitome of the original work. The description of Mecca, which is unaccountably omitted, has been supplied by Pococke from his manuscript. In most biblio- graphieal works this inipression has been characterized as one of the rarest of books ; but Adler, in a visit to Florence, found in the palace there 1129 copies, which were exposed to sale at a moderate rate. In 1619, two Oriental scholars, Gabriel Sionita and Joannes Hezronita, published at Paris a Latin translation of Edrisi's work, bearing the title of Geographia Nubiensis; but it is far from accurate, particularly in the proper names. George Hicronymus Velschius, a German scholar, had prepared a copy of the Arabic original, with a Latin translation, which he purposed to have illustrated with notes; but death prevented the execution of his design, and his manuscript remains deposited in the university library of Jena. Casiri (Bib. Ar. Hisp., ii. 18) mentions that he had determined to re-edit this work, but he appears never to have exeeuted his intention. The part relating to Africa, pre-eminent certainly in point of importance, was very ably edited in 1796 by Hartmann, who collected together all the notices relating to each particular country, and annexed the statements of the country- men and contemporaries of Edrisi, so that his work forms nearly a complete body of Arabian geography, as far as relates to Africa. He afterwards published {ispania, 3 vols., Marburg, 1801-1818.

A translation into French of the entire work, based on one of the MSS. of the Bibliothéque Nationale, was published by M. Jaubcrt in 1840, and forms volumes v. and vi. of the Reewetl de Voyages issued by the Société de Géographie ; but a good edition o1 the original text is still a destderatum. A number of Oriental scholars at Leyden determincd in 1861 to undertake the task: Spain and Western Europe were assigned to Professor Dozy; Kastern Europe aud Western Asia to Doctor Engelmann; Central and Eastern Asia to Defrémery; and Africa to Professor Goeje. The first portion of the work appeared in 1866, under the title or Description de lV Afrique et de Espagne par Edrisi, texte arabe publeé par R. Dozy et M. J. de Goeje ; but the other collaborators have hitherto found it impossible to furnish their quota.

EDUCATION.

This article is mainly concerned with Origins «

the history of educational theories in the chief crises of Edueatio

their development. It has not been the object of the writer to give a history of the practical working of these theories, and still less to sketch the outlines of the science of teaching, which may be more conveniently dealt with under another head. The earliest education is that of the family. The child must be trained not to interfere with its parents' convenience, and to acquire those little arts which will help in maintaining the economy of the household. It was long before any attempt was made to improve generations as they succeeded cach other. The earliest schools were those of the priests. As soon as an educated priesthood had taken the place of the diviners and jugglers who abused the credulity of the earliest races, schools of the prophets became a necessity. The training required for ceremonials, the common life apart from the family, the accomplishments of reading and singing, afforded a nucleus for the organization of culture and an opportunity for the efforts of a philo- sopher in advance of his age. Convenience and gratitude confirmed the monopoly of the clergy. The schools of Judea and Egypt were ecclesiastical. The Jews had but little effect on the progress of science, but our obli- gations to the priests of the Nile valley are great indeed. Much of their learning is obscure to us, but we have reason to conclude that there is no branch of science in which they did

not progress at least so far as observation and careful registration of facts could carry them. They

were a source of enlightenment to surrounding nations. Not only the great lawgiver of the Jews, but those who were most active in stimulating the nascent energies of Hellas were careful to train themselves in the wisdom of the Egyptians. Greece, in giving an undying name to the literature of Alexandria, was only repaying the debt which she had incurred centuries before. Education became secular in countries where the priesthood did not exist as a separate body. At Rome, until Greece took her conqueror captive, a child was trained for the duties of life in the forum and the senate house. The Greeks were the first to develop a science of education distinct from ecclesiastical training. They divided their subjects of study into music and gymnas- tics, the one comprising all mental, the other all physical training. Music was at first little more than the study of the art of expression. But the range of intellectual educa- tion which had been developed by distinguished musical teachers was further widened by the Sophists, until it received a new stimulus and direction from the work of Socrates. Who can forget the picture left us by Plato of the Athenian paleestra, in which Socrates was sure to find his most ready listeners and his most ardent disciples? In the intervals of running, wrestling, or the bath, the young Pheedrus or Thezetetus discoursed with the philosophers who had come to watch them on the good, the beautiful, andthe true. The lowest efforts of their teachers were to fit them to maintain any view they might adopt with acuteness, elegance, readiness, and good taste. Their highest efforts Were to stimulate a craving for the knowledge of the unknowable, to rouse a dissatisfaction with received opinions, and to excite a curiosity which grew stronger with the revelation of each successive mystery. Plato is the author of the first systematic treatise on education. He deals with the subject in his earlier dialogues, he enters into it with great fulness of detail in the Republic, and it occu- pies an important position in the Zaws. The views thus expressed differ considerably in particulars, and it is there- fore difficult to give concisely the precepts drawn up by him for our obedience. But the same spirit underlies his whole teaching. He never forgets that the beautiful is undistin- guishable from the true, and that the mind is best fitted to solve

difficult problems which has been trained by the enthusiastic contemplation of art. Plato proposes to intrust Cducation to the state. He lays great stress on the influence of race and blood. Strong and worthy children are likely to spring from strong and worthy parents. Music and gymnastics are to develop the emotions of young meu during their earliest years,—the one to strengthen thcir character for the contest of life, the other to excite in them varying feelings of resentment or tenderness. Reverence, the ornament of youth, is to be called forth by well-chosen fictions; a long and rigid training in science is to precede discussion on more important subjects. At length the goal 1s reached, and the ripest wisdom is ready to be applied to the most important practice.

The great work of Quintilian, although mainly a treatise on oratory, also contains incidentally a complete sketch of a theoretical education. His object is to show us how to form the man of practice. But what a high conception of practice is his. He wrote for a race of rulers. He incul- cates much which has been attributed to the wisdom of a later age. He urges the importance of studying individual dispositions, and of tenderness in discipline and punishment. The Romans understood no systematic training except in Oratory. In their eyes every citizen was a born commander, and they knew of no science of government and political economy. Cicero speaks slightingly even of jurisprudence. Any one, he says, can make himself a jurisconsult in a Week, but an orator is the production of a lifetime. No Statement can be less true than that a perfect orator is a

perfect man. But wisdom and philanthropy broke even threugh that barrier, and the training which Quintilian ex- pounds to us as intended only for the public speaker would, in the language of Milton, fit a man to perform justly, wisely, and magnanimously all the offices, both public and private, of peace and war. ;

Such are the ideas which the old world has left us. On one side man beautiful, active, clever, receptive, emotional, quick to feel, to show his feeling, to argue, to refine ; greedy of the pleasures of the world, perhaps a little neglectful of its duties, fearing restraint as an unjust stintiung of the bounty of nature, inquiring eagerly into every secret, strongly attached to

the things of this life, but elevated by an unabated striving after the highest ideal; setting no value but upon faultless abstractions, and seeing reality only in heaven, on earth mere shadows, phantoms, and copies of the unseen. On the other side man practical, energetic, eloquent, tinged but not imbued with philo- sophy, trained to spare neither himself nor others, reading and thinking only with an apology ; best engaged in defend- ing a political principle, in maintaining with gravity and solemnity the conservation of ancient freedom, in leading armies through unexplored deserts, establishing roads, fortresses, settlements, the results of conquest, or in order- ing and superintending the slow, certain, and utter annihila- tion of some enemy of Rome. Has the modern world ever surpassed their type? Can we in the present day produce anything by education except by combining, blend- ing, and modifying the self-culture of the Greek or the self-sacrifice of the Roman ?

The literary education of the earliest generation of Christians was obtained in the pagan schools, in those great imperial academies which existed even down to the 5th century, which flourished in Europe, Asia, and Africa, and attained perhaps their highest development and efficiency in Gaul. The first attempt to provide a special education for Christians was made at Alexandria, and is illustrated by the names of Clement and Origen. The later Latin fathers took a bolder stand, and rejected the suspicious aid of heathenism. ‘Tertullian, Cyprian, and Jerome wished the antagonism between Christianity and Paganism to be recognizcd from the earliest years, and even Augustine con- demned with harshness the culture to which he owed so much of his influence. The education of the Middle Ages was either that of the cloister or the castle. They stood in sharp contrast to each other. The object of the one was to form the young monk, of the other the young knight. We should indeed be ungrateful if we forgot the services of those illustrious monasteries, Monte Cassino, Fulda, or Tours, which kept alive the torch of learning throughout the dark ages, but it would be equally mistaken to attach an exaggerated importance to the teaching which they pro- vided. Long hours were spent in the duties of the church, and in learning to take a part in claborate and useless ceremonies. A most important part of the monastery was the writing room, where missals, psalters, and breviaries were copied and illuminated, and too often a masterpiece of classic literature was effaced to make room for a treatise of

one of the fathers or the sermon of an abbot. The discipline was hard ; the rod ruled all with indiscriminating and impartial severity. How many generations have had to suffer for the floggings of those times! Hatred of learn- ing, antagonism between the teacher and the taught, the belief that no training can be effectual which is not repul- sive and distasteful, that no subject is proper for instruction which is acquired with ease and pleasure,—all these idols of false education have their root and origin in monkish cruelty. The joy of human life would have been in danger of being stamped out if it had not been for the warmth and colour of a young knight's boyhood. He was equally well

Christi- anity.

Midate Ages.

Brethren of the Common Life.

broken in toobedience and hardship, but the obedience was the willing service of a mistress whom he loved, and the hardship the permission to share the dangers of a leader whom he emulated. The sevenarts of monkish training were Grammar, Dialectics, Rhetoric, Music, Arithmetic, Geometry, Astro- nomy, which together formed the trivwwm and quadrivium, the seven years' course, the divisions of which have pro- foundly affected our modern training. One of the earliest treatises based on this method was that of Martianus Capella, who in 470 published his Satyra, in nine books. The first two were devoted to the marriage between Philology and Mercury, the last seven were each devoted to the consideration of one of these liberal arts. Cassiodorus, who wrote De Septem Disciplinis about 500, was also largely used as a text book in tlie schools. Astronomy was taught by the Cisio-Janus, a collection of doggrel hexameters like the Propria que muribus, which contained the chief festivals in each month, with a memorza technica for recollecting when they occurred. The seven knightly accomplishments, as historians tell us, were to ride, to swim, to shoot with the bow, to box, to hawk, to play chess, and to make verses. The verses thus made were not in Latin, bald imitations of Ovid or Horace, whose pagan beauties were wrested into the service of religion, but sonnets, ballads, and

cauzonets in soft Provencal or melodious Italian. In nothing, perhaps, is the difference between these two forms of education more clearly shown than in their relations to women. A young monk was brought up to regard a woman as the worst among the many temptations of St Antony. His life knew no domestic tenderness or affection. He was surrounded and cared for by celibates, to be himself a celibate. A page was trained to receive his best reward and worst punish- ment from the smile or frown of the lady of the castle, and as he grew to manhood to cherish an absorbing passion as the strongest stimulus to a noble life, and the contempla- tion of female virtue, as embodied in an Isolde or a Beatrice, as the truest earnest of future immortality.

Both these forms of education disappeared before the Renaissance and the Reformation. But we must not suppose that no efforts were made to improve upon the narrowness of the schoolmen or the idleness of chivalry. The schools of Charles the Great have lately been investi- gated by Mr Mullinger, but we do not find that they materially advanced the science of education. Vincent of Beauvais has left us a very complete treatise on education, written about the year 1245. He was the friend and counsellor of St Louis, and we may discern his influence in the instructions which were left by that sainted king for the guidance of his son and daughter through life. The end of this period was marked by the rise of univer- sities. Bologna devoted itself to law, and numbered 12,000 students at the end of the 12th century. Salerno adopted as its special province the study of medicine, and Paris was thronged with students from all parts of Europe, who were anxious to devote themselves to a theology which passed by indefinite gradations into philosophy. The 14th and 15th centuries witnessed the rise of universities and academies in almost every portion of Europe. Perhaps the most interesting among these precursors of a higher culture were the Brethren of the Common Life, who were domiciled in the rich meadows of the Yssel, in the Northern Nether- lands. The metropolis of their organization was Deventer, the best known name among them that of Gerhard Groote. They devoted themselves with all humility and self-sacrifice to the education of children. Their schools were crowded. Bois-le-due numbered 1200 pupils, Zwolle 1500. For a hundred years no part of Europe shone with a brighter lustre. As the divine comedy of Dante represents for us the learning and piety of the Middle Ages in Italy, so the

EOUCARILOR

Imitation of Thomas & Kempis keeps alive for us the memory of the purity and sweetness of the Dutch com- munity. But they had not sufficient strength to preserve their supremacy among the necessary developments of the age. They could not support the glare of the new Italian learning ; they obtained, and it may be feared deserved, the title of obscurantists. The Epistolee Obscurorum Virorum, the wittiest squib of the Middle Ages, which was so true and so subtle in its satire that it was hailed as a blow struck in defence of the ancient learning, consists in great part of the lamentations of the brethren of Deventer over the new age, which they could not either comprehend or withstand

The education of the Renaissance is best represented by the Renais- name of Erasmus, that of the Reformation by the names of sie.

Luther and Melanchthon. We have no space to give an account of that marvellous resurrection of the mind and spirit of Europe when touched by the dead hand of an extinct civilization. The history of the revival of letters belongs rather to the general history of literature than to that of education. But there are two names whom we ought not to pass over. Vittorino da Feltre was summoned by the Gonzagas to Mantua in 1424; he was lodged ina spacious palace, with galleries, halls, and colonnades decorated with frescoes of playing children. In person he was small, quick, and lively—a born schoolmaster, whose whole time was spent in devotion to his pupils. We are told of the children of his patron, how Prince Gonzaga recited 200 verses of his own composition at the age of fourteen, and how Princess Cecilia wrote elegant Greek at the age of ten. Vittorino died in 1477. He seems to have reached the highest point of excellence as a practical schoolmaster of the Italian Renaissance. Castiglione, on the other hand, has left us in his Cortigiano the sketch of a cultivated nobleman in those most cultivated days. He shows by what precepts and practice the golden youths of Verona and Venice were formed, who live for us in the plays of Shakespeare as models of knightly excellence. Four our instruction, it is better to have recourse to the pages of Erasmus. He has written the most minute account of his method of teaching. The child is to be formed into a good Greek and Latin scholar and a pious man. He fully grasps the truth

that improvement must be natural and gradual. Letters are to be taught playing. The rules of grammar are to be few and short. Every means of arousing interest in the work is to be fully employed. Erasmus is no Ciceronian. Latin is to be taught so as to be of use—a living language adapted to modern wants, Children should learn an art—painting, sculpture, or architecture. Idleness is above all things to be avoided. The education of girls is as necessary and important as that of boys. Much depends upon home influence; obedience must be strict, but not too severe. We must take account of individual peculiarities, and not force children into cloisters against their will. We shall obtain the best result by following nature. It is easy to see what a contrast this scheme presented to the monkish training,—to the routine of useless technicalities enforced amidst the shouts of teachers and the lamentations of the taught.

Still this culture was but for the few. Luther brought | g tion.

the schoolmaster into the cottage, and Jaid the foundation of the system which is the chief honour and strength of modern Germany, a system by which the child of the humblest peasant, by slow but certain gradations, recelves the best education which the country can afford. The

precepts of Luther found their way into the hearts of his _

countryman in short, pithy sentences, like the sayings of poor Richard. The purification and widening of education went hand in hand with the purification of religion, and these claims to affection are indissolubly united in the minds of his countrymen. Melanchthon, from his editions

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of school books and his practical labours in education, eared

the title of Preceptor Germania. Aristotle had been dethroned from his pre-eminence in the schools, and Melanchthon attempted to supply his place. He appreciated the importance of Greck, the terror of the obscurantists, and is the author of a Greek grammar. He wrote elementary books on each department of the ¢triviwn—grammar, dialectic, and rhetoric. He made some way with the studies of the guadriviwm, and wrote Initia doctrine

Physica, a primer of physical science. He lectured at the university of Wittenberg, and for ten years, from 1519 to 1529, kept a schola privata in his own house. Horace was his favourite classic. His pupils were taught to learn the whole of it by heart, ten lines at a time. ‘The tender refined lines of his well-known portraits show clearly the eharacter of the painful, accurate scholar, and contrast with the burly powerful form of the genial Luther. He died in 1560, racked with anxiety for the church which he had helped to found. If he did not carry Protestantism into the heart of the peasant, he at least made it acceptable to the intellect of the man of letters.

We now come to the names of three theoretical and practical teachers who have exercised and are still exercis- ing a profound effect over education. The so-called Latin school, the parent of the gymnasium and the lycée, had spread all over Europe, and was especially flourishing in Germany. The programmes and time tables in use in these establishments have come down to us, and we possess notices of the lives and labours of many of the earliest teachers. It is not difficult to trace a picture of the education which the Reformation offered to the middle classes of Europe. Ample materials exist in German histories of educa- tion. We must confine ourselves to those moments which were of vital influence in the development of the science. One school stands pre-eminently before the rest, situated in that border city on the debatable land between France and Germany, which has known how to combine and reconcile the peculiarities of French and German culture. Strasburg, besides a school of theology which unites the depth of Germany to the clearness and vivacity of France, educated the gilded youth of the 16th century under Sturm, as it trained the statesmen and diplomatists of the 18th under Koch. John Sturm of Strasburg was the friend of Ascham, the author of the Scholemaster, and the tutor of Queen Elizabeth. It was Ascham who found Lady Jane Grey alone in her room at Bradgate bending her neck over the page of Plato when all the rest of her family were following the chase. Sturm was the first great head master, the progenitor of Busbys if not of Arnolds. He lived and worked till the age of eighty-two. He was a friend of all the most distinguished men of his age, the chosen repre- sentative of the Protestant cause in Europe, the ambassador to foreign powers. He was believed to be better informed than any man of his time of the complications of foreign politics. Rarely did an envoy pass from France to Germany Without turning aside to profit by his experience. But the chief

energies of his life were devoted to teaching. He drew his scholars from the whole of Europe ; Portugal, Poland, England sent their contingent to his halls. In 1578 his school numbered several thousand students; he Supplied at once the place of the cloister and the castle. What he most insisted upon was the teaching of Latin, not the conversational lingua franca of Erasmus, but pure, elegant Ciccronian Latinity. He may be called the intro- ducer of scholarship into the schools, a scholarship which 88 yet took little account of Greek. His pupils would write elegant letters, deliver elegant Latin speeches, be familiar, if not with the thoughts, at least with the language of the ancients, would be scholars in order that they might be gentlemen. Our space will not permit us to

trace the whole course of his influence, but he is ir all probability as much answerable as any one for the euphuistic refinement which overspread Kurope in the 16th century, and which went far to ruin and corrupt its literatures, Nowhere perhaps had he more effect than in England. Our older public schools, on breaking with the ancient faith, looked to Sturm as their model of Protestant education, His name and example became familiar to us by the exertions of his friend Ascham. Westminster, under the long reign of Busby, received a form which was generally accepted as the type of a gentleman’s education. The Public School Commission of 1862 found that the lines laid down by the great citizen of Strasburg, and copied by his admirers, had remained unchanged until within the memory of the present generation. Ratichius was born in Holstein in 1571. He anticipated some of the best improvements in the method of teaching which have been made in modern times. He was like many of those who have tried to improve existing methods in advance of his age, and he was rewarded for his labours at Augsburg, Weimar, and Kéthen by persecution and imprisonment. Can we wonder that education has improved so slowly when so much pains has been taken to silence and extinguish those who have devoted themselves to its improvement? His chief rules were as follows. 1. Begin everything with prayer. 2. Do everything in order, following the course of nature. 3. One thing at a time. 4. Often repeat the same thing. 5. Teach everything first in

the mother tongue. 6. Proceed from the mother tongue to other languages. 7. Teach without compulsion. Do not beat children to make them learn. Pupils must love their masters, not hate them. Nothing should be learnt by heart. Sufficient time should be given to play and recreation. Learn one thing before going on to another. Do not teach for two hours consecutively. 8. Uniformity in teaching, also in school books, especially grammars, which may with advantage be made comparative. 9. Teach a thing first, and then the reason of it. Give no rules before you have given the examples. Teach no language out of the gram- mar, but out of authors. 10. Let everything be taught by induction and experiment. Most of these precepts are accepted by all good teachers in the present day; all of them are full of wisdom. Unfortunately their author saw the faults of the teaching of his time more clearly than the means to remove them, and he was more successful in forming precepts than in carrying them out. Notwith- standing these drawbacks, he deserves an honourable place among the forerunners of a rational education.

John Amos Comenius was the antithesis to Sturm, and Comenius,

a greater man than Ratke. Born a Moravian, he passed a 1 wandering life, among the troubles of the Thirty Years' War, in poverty and obscurity. But his ideas were accepted by the most advanced thinkers of the age, notably in many re- spects by our own Milton, and by Oxenstiern the chancellor of Sweden. His school bookswere spread throughout Europe. The Janua Linguarum Reserata was translated into twelve European and several Asiatic languages. His works, espe- cially the Didascalia magna, an. encyclopeedia of the science of education, 'are constantly reprinted at the present day; and the system which he sketched will be found to foreshadow the education of the future. He was repelled and disgusted. by the long delays and pedantries of the schools. His ardent mind conceived that if teachers would but follow nature instead of forcing it against its bent, take full advantage of the innate desire for activity and growth, all men might be able to learn all things. Languages should be taught as the mother tongue 1s taught, by conversations on ordinary topics ; pictures, object lessons, should be freely used; teaching should eee in pox aa eae or nd happy life. omenius included in his course elegant, a ppy oe

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the teaching of the mother tongue, singing, economy, and politics, the history of the world, physical geography, and a knowledge of arts and handicrafts. But the principle on which he most insisted, which forms the special point of his teaching, and in which he is followed by Milton, is that the teaching of words and things must go together hand in hand. When we consider how much time is spent over new languages, what waste of energy is lavished on mere preparation, how it takes so long to lay a foundation that there is no time to rear a building upon it, we must con- clude that it is in the acceptance and development of this principle that the improvement of education will in the future consist. Any one who attempts to inculcate this great reform will find that its first principles are contained in the writings of Comenius. But this is not the whole of his claim upon our gratitude. He was one of the first advocates of the teaching of science in schools. His kindness, gentleness, and sympathy make him the forerunner of Pestalozzi. His general principles of educa- tion would not sound strange in the treatise of Herbert Spencer.

The Protestant schools were now the best in Europe, and the monkish institutions were left to decay. Catholics would have remained behind in the race if it had not been for the Jesuits. Ignatius Loyola gave this direction to the order which he founded, and the programme of studies, which dates from the end of the 16th century, is in use, with certain modifications, in English Jesuit schools at the present day. In 1550 the first Jesuit school was opened in Germany; in 1700 the order possessed 612 colleges, 157 normal schools, 59 noviciates, 340 residences, 200 missions, 29 professed homes, and 24 universities. The college of Clermont had 3000 students in 1695. Every Jesuit college was divided into two parts, the one for higher the other for lower education,—the studia superiora, and the studia inferiora. The

studia wnferiora, answering to the modern gymnasium, was divided into five classes. The first three were classes of grammar (rudiments), grammar (accidence), and syntax, the last two humanity and rhetoric. The motto of the schools was lege, scribe, loguere,—you must learn not only to read and write a dead language, but to talk. Purism was even more exaggerated than by Sturm. No word might be used which{did not rest upon a special authority. The composition of Latin verses was strongly encouraged, and the performance of Latin plays. Greek was studied to some extent; mathematics, geography, music, and the mother tongues were neglected. The stwdia swperiora began with a philosophical course of two or three years. In the first year logictwas taught, in the second the books of Aristotle de celo, the first book de generatione, and the Me- teorologica. In the third year the second, book de generati- one, the books de anima, and the Metaphysics. After the completion of the philosophical course the pupil studied theology for four years. The Jesuits used to the full the great engine of emulation. Their classes were divided into two parts, Romansand Carthaginians; swords, shields, and lances hung on the walls, and were carried off in triumph as either party claimed the victory by a fortunate answer. It would be unfair to deny the merits of the education of the Jesuits. Bacon speaks of them in more than one passage as the revivers of this most important art. Quum talis sis utinam noster esses. Descartes approved of their system; Chateaubriand regarded their suppression as a calamity to civilization and enlightenment. They were probably the first to bring the teacher into close connec- tion with the taught. According to their ideal the teacher was neither inclosed in a cloister, secluded from his pupils, nor did he keep order by stamping, raving, and flogging. He was encouraged to apply his mind and soul to the mind and soul of his pupil; to study the nature, the disposition,

the parents of his scholars; to follow nature as far as pos- sible, or rather to lie in wait for it and discover its weak points, and where it could be most easily attacked, Doubtless the Jesuits have shown a love, devotion, and self. sacrifice in education, which is wortly of the highest praise; no teacher who would compete with them can dare do legs, On the other hand, they are open to grave accusation, Their watchful care degenerated into surveillance,

which lay-schools have borrowed from them; their study of nature has led them to confession and direction. They have tracked out the soul to its recesses, that they might slay it there, and generate another in its place; they educated each mind according to its powers, that it might be a more subservient tool to their own purposes. They taught the accomplishments which tle world loves, but their chief object was to. amuse the mind and stifle inquiry; they encouraged Latin verses, because they were a convenient plaything on which powers might be exercised which could have been better employed in understanding and discussing higher subjects ; they were the patrons of school plays, of public prizes, declamations, cxaminations, and other exhibitions, in which the parents were more considered than the boys ; they regarded the claims of education, not as a desire to be encouraged, but as a demand to be played with and propitiated ; they gave the best education of their time in order to acquire confidence, but they became the chief obstacle to the improvement of education; they did not care for enlightenment, but only for the influence which they could derive from a supposed regard for enlightenment. Whatever may have been the service of Jesuits in past timcs, we have little to hope for them in the improvement of education at present. Governments have, on the whole, acted wisely by checking and suppressing their colleges. The ratio studiorum is antiquated and difficult to reform. In 1831 it was brouglit more into accordance with modern ideas by Roothaan, the general of the order. Deckx hus successor has, if anything, pursued a policy of retrogression. The Italian Government, in taking possession of Rome, found that the pupils of the Collegio Romano were far below the level of modern requirements.

It may be imagined that, by this organization both Catholics and Protestants were apt to degenerate ito pedantry, both in name and purpose. ‘The school-master had a great deal too much the best of it. The Latin school was tabulated and organized until every half hour of a boy’s time was occupied ; the Jesuit school took posses- sion of the pupil body and soul. It was, therefore, to be expected that a stand should be made for common sense in the direction of practice rather than theory, of wisdom

instead of learning. Montaigne has left us the most Nov

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delightful utterances about education. He says that the 1592

faults of the education of his dey consist in over-estumating the intellect and rejecting morality, in exaggerating memory and depreciating useful knowledge. He recommends a tutor who should draw out the pupil’s own power aul originality, to teach how to live well and to die well, to enforce a lesson by practice, to put the mother tongue before foreign tongues, to teach all manly exercises, 0 educate the perfect man. Away with force and compulsion,

with severity and the rod. John Locke, more than +163

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hundred years afterwards, made a more powerful an systematic attack upon useless knowledge. ls theory 0 the origin of ideas led him to assign great importance to education, while his knowledge of the operations of the human mind lends a special value to his advice. ‘ treatise has received in England more attention than 1 deserves, partly because we have so few books written Upon the subject on which he treats. Part of his advice 1s use less at the present day; part it would be well to follow, a at any rate to consider seriously, especially his condemna

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tion of repetition by heart as a means of strengthening the memory, and of Latin verses and themes. He sets before himself the production of the man, asound mind in a sound body. His knowledge of medicine gives great value to his advice on the earliest education, although he probably exaggerates the benefits of enforced hardships. He recom- mends home education without

harshness or severity of discipline. Emulation is to be the chief spring of action; knowledge is far less valuable than a well-trained mind. He prizes that knowledge most which fits a man for the duties of the world, speaking languages, accounts, history, law, logic, rhetoric, natural philosophy. He inculcates the importance of drawing, dancing, riding, fencing, and trades. The part of his advice which made most impression upon his contemporaries was the teaching of reading and arithmetic by well-considered games, the discouragement of an undue compulsion and punishment, and the teaching of language without the drudgery of grammar. In these respects he has undoubtedly anticipated modern discoveries. He is a strong advocate for home education under a private tutor, and his bitterness against public schools is as velie- ment as that of Cowper.

Far more important in the literature of this subject than the treatise of Locke is the T'ractate of Education by Milton, "the few observations," as he tells us, 'which flowered off, and are, as it were, the burnishings of many studious and contemplative years spent in the search for civil and religious knowledge." This essay is addressed to Samuel Hartlib, a great friend of Comenius, and probably refers to a project of establishing a university in London. "T will pot you out," Milton says, "the right path of a virtuous and noble education,—laborious, indeed, at first ascent, but else so smooth and green and full of goodly prospects and melodious sounds on every side, that the harp of Orpheus 1s not more charming. This is to be done between twelve and one-and-twenty, in an academy containing about a hundred and thirty scholars, which shall be at once school and university,—not needing a remove to any other house of scholarship except it be some peculiar college of law and physics, where they mean to be practitioners." The important truth enunciated is quite in the spirit of Comenius that the learning of things and words is to go hand in hand. The curriculum is very large. Latin, Greek, arithmetic, geometry, agriculture, geography, physiology, physics, trigonometry, fortification, architecture, engineering, navigation, anatomy, medicine, poetry, Italian, law both Roman and English, Hebrew with Chaldee and Syriac, history, oratory, poetics. But the scholars are not to

€ book-worms. They are to be trained for war, both on foot and on horseback, to be practised " in all the locks and gripes of wrestling," they are to "recreate and compose their travailed spirits with the divine

harmonies of music heard or learnt.” “In those vernal seasons of the year when the air is calm and pleasant, it were an injury and a Sullenness against nature not to go out and see her riches, and partake in her rejoicing with heaven and earth. I should not then be a persuader to them of studying much then, after two or three years that they have well laid their grounds, but to ride out in companies with prudent and Staid guides to all the quarters of the land.” The whole treatise is full of wisdom, and deserves to be studied again and again, Visionaryjas it may appear to some at?first Sight, if translated into the language of our own day, it will © found to abound with sound practical advice. “ Only,”

iulton Says in conclusion, “I believe that this is not a bow for every man to shoot who counts himself a teacher, but will require sinews almost equal to those which Homer gave Ulysses ; yet I am persuaded that it may prove much More easy in the essay than it now seems at a distance, and much more illustrious if God have so decided and this

age have spirit and capacity enough to apprehend.” Almost while Milton was writing this treatise, he might have seen an attempt to realize something of his ideal in Port Royal. What a charm does this name awaken !

valley! Here we find, for the first time in the modern world, the highest gifts of the greatest men of a country applied to the business of education, Arnauld, Lancelot, Nicole did not commence by being educational philosophers. They began with a small school, and developed their method as they proceeded. Their success has seldom been surpassed, But a more lasting memorial than their pupils are the books which they sent out, which bear the name of their cloister. The Port Royal Logic, General Grammar, Greek, Latin, Italian, and Spanish Grammars, the Garden of Greek Roots which taught Greek to Gibbon, the Port Royal Geometry, and their translations of the classics held the first place among school books for more than a century. The success of the Jansenists was too much for the jealousy of the Jesuits. Neither piety, nor wit, nor virtue could save them. A light was quenched which would have given an entirely different direction to the

education of France and of Europe. No one can visit without emotion that retired nook which lies hidden among the forests of Versailles, where the old brick dove-cot, the pillars of the church, the trees of the desert alone remain to speak to us of Pascal, Racine, and the Mére Angélique. The principles of Port Royal found some supporters in a later time, in the better days of French education before monarchism and militarism had crushed the life out of the nation. Rollin is never mentioned without the epithet bon, a testimony to his wisdom, virtue, and simplicity. Fénelon may be reckoned as belonging to the same school, but he was more fitted to mix and grapple with mankind.

No history of education would be complete without the Francke.

name of August Hermann Francke, the founder of the school of Pietists, and of a number of institutions which now form almost a suburb in the town of Halle to which his labours were devoted, The first scenes of his activity were Leipzig and Dresden; but in 1692, at the aze of 29, he was made pastor of Glaucha near Halle, and professor in the newly established university. Three years later he commenced his poor school with a capital of seven guelders which he found in the poor box of his house. At his death in 1727 he left behind him the following institutions :—a pedagogium, or training college, with 82 scholars and 70 teachers receiving education, and attendants; the Latin school of the orphan asylum, with 3 inspectors, 32 teachers, 400 scholars, and 10 servants; the German town schools, with 4 inspectors, 98 teachers, 8 female teachers, and 1725 boys and girls. The establishment for orphan children contained 100 boys, 34 girls, and 10 attendants. A cheap public dining table was attended by 255 students and 360 poor scholars, and besides this there was an apothecary’s and a bookseller’s shop. _Francke’s principles of education were strictly religious. Hebrew was included in his curriculum, but the heathen classics were treated with slight respect. The Homilies of Macarius were read in the place of Thucydides. As might be expected, the rules laid down for discipline and moral training breathed a spirit of deep affection and sympathy. Francke’s great merit, however, is to have left us a model of institutions} by which children of all ranks may receive an education to fit them for any position in life. The Franckesche Stiftungen are still, next to the university, the centre

of the intellectual life of Halle, and the different schools which they contain give instruction to 3500 children. “a

We now come to the book which has had more influence Rousseau.

than any other ou the education of later times, The Hmile

of Rousseau was published in 1762. It produced an.

Yet Port- how few of us have made a pilgrimage to that secluded Royal.

astounding effect throughout Europe. Those were days when the whole cultivated world vibrated to any touch of new philosophy. French had superseded Latin as the general medium of thought. French learning stood in the same relation to the rest of Europe as German learning does now ; and any discovery of D’Alembert, Rousseau, or Maupertuis travelled with inconceivable speed from Versailles to Schonbrunn, from the Spree to the Neva. Kant in his distant home of Konigsberg broke for one day through his habits, more regular than the town clock, and stayed at home to study the new revelation. The burthen of Rousseau’s message was nature, such a nature as never did and never will exist, but still a name for an ideal worthy of our struggles. He revolted against the false civilization which he saw around him; he was penetrated with sorrow at the shams of government and society, at the misery of the poor existing side by side with the heartlessness of the rich. The child should be the pupil of nature. He lays great stress on the earliest education. The first year of life is in every respect the most important. Nature must be closely followed. The child’s tears are petitions which should be granted. The naughtiness of children comes from weakness ; make the child strong and he will be good. Children’s destructiveness is a form of activity. Do not be too anxious to make children talk ; be satisfied with a small vocabulary. Lay aside all padded caps and baby jumpers. Let children learn to walk by learning that it hurts them to fall. Do not insist too much on the duty of obedience as on the necessity of submission to natural laws. Do not argue too much with children ; educate the heart to wish for right actions ; before all things study nature. The chief moral principle is do no one harm. Emile is to be taught by the real things of life, by observation

and experi- ence. At twelve years old he is scarcely to know what a book is; to be able to read and write at fifteen is quite enough. We must first make him a man, and that chiefly by athletic exercises. Educate his sight to measure, count, and weigh accurately ; teach him to draw; tune his ear to time and harmony ; give him simple food, but let him eat as much as he likes. Thus at twelve years old Kmile is a real child of nature. His carriage and bearing are fair and confident, his nature open and candid, his speech simple and to the point; his ideas are few but clear; he knows nothing by learning, much by experience. He has read deeply in the book of nature. His mind is not on his tongue but in his head. He speaks only one language, but knows what he is saying, and can do what he cannot describe. Routine and custom are unknown to him; authority and example affect him not; he does what he thinks right. He understands nothing of duty and obedience, but he will do what you ask him, and will expect a similar service of you in return. His strength and body are fully developed ; he is first-rate at running, jumping, and judging distances. Should he die at this age he will so far have lived his life. From twelve to fifteen Emile's practical education is to continue. He is still to avoid books which teach not learning itself but to appear learned. He is to be taught and to practice some handicraft. Half the value of education is to waste time wisely, to tide over dangerous years with safety, until the character is better able to stand temptation. At fifteen a new epoch commences, The passions are awakened; the care of the teacher should now redouble ; he should never leave the helm. Emile having gradually acquired the love of himself and of those immediately about him, will begin to love his kind. Now is the time to teach him history, and the machinery of society, the world as it is and as it might be. Still an encumbrance of useless and burdensome knowledge 1s to be avoided. Between this age and manhood Emile learns all that it is necessary for him to know. It is, per-

haps, strange that a'book in"many respects so wild and fantastic should have produced so great a practical effect, In pursuance of its precepts, children went about naked, were not allowed to read, and when they grew up wore the simplest clothes, and cared for little learning except the study of nature and Plutarch. The catastrophe of the French Revolution has made the importance of Emile less apparent to us. Much of the heroism of that time is doubtless due to the exaltation produced by the sweeping away of

abuses, and the approach of a brighter age. But we must not forget that the first generation of Emile wag just thirty years old in 1792 ; that many of the Girondins, the Marseillais, the soldiers and generals of Carnot and Napoleon had been bred in that hardy school. There is no more interesting chapter in the history of education than the tracing back of epochs of special activity to the obscure source from which they arose. Thus the Whigs of the Reform Bill sprang from the wits of Edinburgh, the heroes of the Rebellion from the divines who translated the Bible, the martyrs of the Revolution from the philosophers of the Encyclopzedia,

The teaching of Rousseau found its practical expression Base', in the philanthropin of Dessau, a school founded by 1723 Basedow, the friend of Goethe and Lavater, one of the two 1790, prophets between whom the world-child sat bodkin in that | memorable post-chaise journey of which Goethe has left us an account. The principles of the teaching given in this establishment were very much those of Comenius, the com-)

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bination of words and things. An amusing account of thein- struction given in this school, which at this time consisted of only thirteen pupils, has come down to us, a translation of which is given in the excellent work of Mr Quick on — educational reformers. The little ones have gonethroughthe | oddest performances. They play at “word of command.” Eight or ten stand in a line like soldiers, and Herr Wolke

is officer. He gives the word in Latin, and they mush | do whatever he says. or instance when he says “claudite oculos,” they all shut their eyes; when he says “circumspicite,” they look about them; “ imitamini sutorem,” they draw the waxed thread like cobbler. | Herr Wolke gives a thousand different commands in the drollest fashion. Another game, “ the hiding game,” may also be described. Some one writes a name and hides it from the children, the name of some part of the body, or

of a plant or animal, or metal, and the children guess what

it is. Whoever guesses right gets an apple or a piece of cake; one of the visitors wrote “ intestina,” and told the children it was part of the body.

Then the guessing began,

one guessed caput, another nasus, another os, another manus, pes, digiti, pectus, and so forth for a long time, but one of them hits it at last. Next Herr Wolke wrote the name of a beast or quadruped, then came the guesses, leo, ursus, camelus, elephas, and so on, till one guessed rightib was mus. Then a town was written, and they guessed | Lisbon, Madrid, Paris, London, till a child won with St | Petersburg. They had another game which was this. | Herr Wolke gave the command in Latin, and they imitated

the noises of different animals, and made the visitors laugh | till they were tired. They roared like lions, crowed like cocks, mewed like cats, just as they were bid. Yet Kant found

a great deal to praise in this school, and spoke of its influence as one of the best hopes of the future, and as ‘the only school where the teachers had liberty to act according to their own methods and schemes, and where they were in free communication both among themselves and with all learned men throughout Germany.”

A more successful labourer in the same school was Salzmann, who bought the property of Schnepfenthal near Gotha in 1784, and established a school there, which still exists as a flourishing institution. He gave full scope to

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EDUCATION

the doctrines of the philanthropists ; the limits of learning were enlarged; study became a pleasure instead of a pain; scope was given for healthy exercise; the school became light, airy, and cheerful. A charge of

superficiality and weakness was brought against this method of instruction; but the gratitude which our generation of teachers owes to the unbounded love and faith of these devoted men cannot be denied or refused. The end of the 18th century saw a great development given to classical studies. The names‘of Cellarius, Gesner, Ernesti, and Heyne are perhaps more cele- bratedas scholars than asschoolmasters. Tothem we owe the great importance attached to the study of the classics, both on the Continent and in England. They brought into the schools the philology which F. A. Wolf had organized for the universities. Pestalozzi, on the other hand, was completely and entirely devoted to education. His greatest merit is that he set an example of absolute self- abnegation, that he lived with his pupils, played, starved, and suffered with them, and clung to their minds and hearts with an affectionate sympathy which revealed to him every minute difference of character and disposition. Pestalozzi was born at Zurich in 1746. His father died when he was young, and he was brought up by his mother. His earliest years were spent in schemes for improving the condition of the people. The death of his friend Bluntschli turned him from political schemes, and induced him to devote himself to education. He married at 23, and bought a piece of waste land in Aargau, where he attempted the cultivation of madder. Pestalozzi knew nothing of business, and the plan failed. Before this he had opened his farm-house as a school; but in 1780 he had to give this up also. His first book published at this time was Whe Lvening Hours of a Hermit, a series of aphorisms and reflections. This was followed by his masterpiece, Leonard and Gertrude, an account of the gradual reformation, first of a houseliold, and then of a whole village, by the efforts of a good and devoted woman. It was read with avidity in Germany, and the name of Pestalozzi was rescued from obscurity. His attempts to follow up this first literary success were failures. The French invasion of Switzerland in 1798 brought into relief his truly heroic character. A number of children were left in Canton Unterwalden on the shores of the Lake of Lucerne, without parents, home, food, or shelter. Pestalozzi collected a number of them into a deserted con- vent, and spent his energies in reclaiming them. ‘I was,” he says, “from morning till evening, almost alone in their midst. Everything which was done for their body or soul proceeded from my hand. Every assistance, every help in time of need, every teaching which they received came immediately from me. My hand lay in their hand, my eye tested on their eye, my tears flowed with

theirs, and my laughter accompanied theirs. They were out of the world, they were out of Stanz ; they were with me, andI was with them. Their soup was mine, their drink was mine. I had nothing, I had no housekeeping, no friend, no servants around me ; I had them alone. Were they well I stood in their midst; were they ill, I was at their side. I slept in the middle of them. I was the last who went to bed at night, the first who rose in the morning. Even in bed I Prayed and taught with them until they were asleep,—they Wished it to be so." Thus he passed the winter, but in J une 1799 the building was required by the French for a hospital, and the children were dispersed. We have dwelt especially on this episode of Pestalozzi's life, because in this devotion lay his strength. In 1801 he gave au exposition of his ideas on education in the book Mow Gertrude teaches her Children. Tis method is to proceed from the easier to the more difficult. To begin with observation, to pass from poservation to consciousness, from consciousness to speech.

*n come measuring, drawing, writing, numbers, and so

reckoning. In 1799 he had been enabled to establish a school at Burgdorf, where he remained till 1804. In 1802, he went as deputy to Paris, and did his best to interest Napoleon in a scheme of national education; but the great conqueror said that he could not trouble himself about the alphabet. In 1805 he removed to Yverdun on the Lake of Neufchatel, and for twenty years worked steadily at his task. He was visited by all who took interest in educa- ticn,—Talleyrand, Capo d'Istria, and Madame de Stael. He was praised by Wilhelm von Humboldt and by Fichte. His pupils included Ramsauer, Delbriick, Blochmann, Carl Ritter, Frobel, and Zeller. About 1815 dissensions broke out among the teachers of the school, and Pestalozzi's last ten years were chequered by weariness and sorrow. In 1825 he retired to Neuhof, the home of his youth; and after writing the adventures of his life, and his last work, the Swan's Song, he died in 1827. Ashe said himself, the real work of his life did not lie in Burgdorf or in Yverdun, the products rather of his weakness than of his strength. {t lay in the principles of education which he practised, the development of his observation, the training of the whole man, the sympathetic application of

the teacher to the taught, of which he left an example in his six months' labours at Stanz. He shewed what truth there was in the principles of Comenius and Rousseau, in the union of train- ing with information, and the submissive following of nature ; he has had the deepest effect on all branches of education since his time, and his influence is far from being exhausted.

The Emile of Rousseau was the point of departure for an awakened interest in educational theories which has continued unto the present day. Few thinkers of eminence during the last hundred years have failed to offer their contributions more or less directly on this subject. Poets like Richter, Herder, and Goethe, philosophers such as Kant, Fichte, Hegel, Schleiermacher, and Schopenhauer, psychologists such as Herbart and Beneke, have left direc- tions for our guidance. Indeed, during this time the

science of education or pedagogics, as the Germans call it, Padago- It has gics.

may have been said to have come into existence. attracted but little attention in England; but it is an important subject of study at all German universities, and we may hope that the example given by the establishment of chairs of education in the Scotch universities may soon be followed by the other great centres of instruction in Great Britain. the Roman goddess to whom the father dedicated his new-born child, in token that he intended to rear it to manhood, He lays great stress on the preservation of individuality of character, a merit which he possessed himself in so high a degree. The second part of Welhelm Meister is in the main a treatise upon education. essays of Carlyle have made us familiar with the mysteries of the pedagogic province, the solemn gestures of the three reverences, the long cloisters which contain the history of God's dealings with the human race. The most characteristic passage is that which describes the father's return to the country of education after a year's absence. As he is riding alone, wondering in what guise he will meet his son, a multitude of horses rush by at full gallop. 'The monstrous hurly-burly whirls past the wanderer ; a fair boy among the keepers looks at him with surprise, pulls in, leaps down, and embraces his father." He then learns that an agricultural life had not suited

his son, that the superiors had discovered that he was fond of animals, and had set him to that occupation for which nature had destined him.

The system of Jacotot has aroused great interest in this Jacotot.

country. Its author was born at Dijon in 1770. In 1815 he retired to Louvain and became professor there, and director of the Belgian military school. He died in 1840, His method of teaching is based on three principles ;—

Jean Paul called his book Levana, after Richter.

The Gocthe.

Herbert Spencer,

Mr Bain.

1. All men have an equal intelligence ;

2. Every man has received from God the faculty of being able to instruct himself ;

3. Every thing is in every thing.

The first of these principles is certainly wrong, although Jacotot tried to explain it by asserting that, although men had the same intelligence, they differed widely in the will to make use of it. Still it is important to assert that nearly all men are capable of receiving some intellectual education, provided the studies to which they are directed are wide enough to engage their faculties, and the means taken to interest them are sufficiently ingenious. The second principle lays down that it is more necessary to stimulate the pupil to learn for himself, than to teach him didactically. The third principle explains the process which Jacotot adopted. To one learning a language for the first time he would give a short passage of a few lines, and encour- age the pupil to study first the words, then the letters, then the grammar, then the full meaning of the expressions, until by iteration and accretion a single paragraph took the place of an entire literature. Much

may be effected by this method in the hands of a skilful teacher, but a charlatan might make it an excuse for ignorance and neglect.

Among those who have improved the methods of teaching, we must mention Bell and Lancaster, the joint- discoverers of the method of mutual instruction, which, if it has not effected everything whicli its founders expected of it, has produced the system of pupil-teachers whicli is common in our schools. Froebel also deserves an honour- able place as the founder of the Kindergarten, a means of teaching young children by playing and amusement. His plans, which have a far wider significance than this limited development of them, are likely to be fruitful of results to future workers.

The last English writers on education are Mr Herbert Spencer and Mr Alexander Bain, the study of whose writ- ings will land us in those regions of peedagogics which have been most recently explored. We need not follow Mr Spencer into his defence of science as the worthiest object of study, or in his rules for moral and physical training, except to say that they are sound and practical. In writing of intellectual education, he insists that we shall attain the best results by closely studying the develop- ment of the mind, and availing ourselves of the whole amount of force which nature puts at our disposal. The mind of every being is naturally active and vigorous, indeed it is never at rest. But for its healthy growth it must have something to work upon, and, therefore, the teacher must watch its movements with the most sympathetic care, in order to supply exactly that food which it requires at any particular time. In this way a much larger cycle of attainments can be compassed than by the adoption of any programme or curriculum, however carefully drawn up. It is no good to teach what is not remembered ; the strength of memory depends on attention, and attention depends upon interest. To teach without interest is to work like Sisyphus and the Danaides. Arouse interest if you can, rather by high means than by low means. Butit is a saving of power to make use of interest which you have already existing, and which, unless dried up or distorted by injudicious violence, will naturally lead the mind into all the knowledge which it is capable of receiving. Therefore, never from the first force a child’s attention; leave off a study the moment it becomes weari- some, never let a child do what it does not like, only take care that when its liking is in activity a choice of good as well as evil shall be given to it.

Mr Bain’s writings“on education, which are contained in some articles in the Fortnightly Review, and in two articles in Mind (Nos, v. and vii.) are extremely valuable. Perhaps

the most interesting part of them consists in his showing how what may be called the “ correlation of forces in man” helps us to a right education. From this we learn that emotion may be transformed into intellect, that sensation may exhaust the brain as much as thought, and we may infer that the chief duty of a schoolmaster is to stimulate the powers of each brain under his charge to the fullest activity, and to apportion them in that ratio which will best conduce to the most complete and harmonious develop-

ment of the individual.

Tt seems to follow from this sketch of the history of Concu. education that, in spite of the great advances which have sion. been made of late years, the science of cducation is still far in advance of the art. Schoolmasters are still spending their best energies in teaching subjects which have been universally condemned by educational reformers for the last two hundred years. The education of every public school is a farrago of rules, principles, and customs derived from every age of teaching, from the most modern to the most remote. It is plain that the science and art of teach- ing will never be established on a firm basis until it is organized on the model of the sister art of medicine. We must pursue the patient methods of induction by which other sciences have reached the stature of maturity; we must discover some means of registering and tabulating results; we must invent a phraseology and nomenclature which will enable results to be accurately recorded; we must place cducation in its proper position among the sciences of observation. A philosopher who should succeed in doing this would be venerated by future ages as the . creator of the art of teaching. |

It only remains now to give some account of the very Biblio- large literature of the subject. graphy.

The history of education was not investigated till the beginning of the present century, and since then little original research has been made except by Germans. Whilst acknowledging our great obligations to the German historians, we cannot but regret that all the investigations have belonged to

the same nation. For instance, one of the best treatises on education written in the 16th century is Muleaster’s Positions, which has never been reprinted, and is now a litcrary curiosity.

Mangelsdorf and Ruhkopf attempted histories of educa- tion at the end of the last century, but the first work of | note was F, H.Ch. Schwarz’s Geschichte d. Erziehung (1818). . A. H. Niemeyer, a very influential writer, was one of the first to insist on the importance of making use of all that has been handed down to us, and with this practical object . in view he has given us an Ueberblick der allgemeinen Geschichte der Erziehung. Other writers followed; but from the time of its appearance till within the last few years, by far the most readable and the most read work on the history of education was that of Karl von Raumer. Raumer, however, is too chatty and too religious to pass for “ wissenschaftlich,” and the standard history is now that of Karl Schmidt. The Roman Catholics have not | been content to adopt the works of Protestants, but have histories of their own. These are the very pleasing sketches of L. Kellner and the somewhat larger history by Stoeckl. When we come to writers who have produced sketches or shorter histories, we find the list in Germany @ very long one. Among the best books of this kind are Fried. Dittes’s Geschichte and Drdse’s Péidagogische Characterbilder, An account of this literature will be found in J. Chr. G. Schumann’s paper among the Pédago- gische Studien, edited by Dr Reiss. For biographies the pedagogic cyclopedias may be consulted, of which the first is the Encyklopddie des gesammten Erziehungswesens of K. A. Schmid, a great work in 11 or 12 vols. not yet completed, although the second edition of the early vols.

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is already announced. The Roman Catholics have also begun a large encyclopedia edited by Rolfus and Pfister. No similar work has been published in France, but a Cyclopedia of Hducation in one volume has lately been issued at New York (Steiger,—the editors are Kiddle and Scherr), and in this there are articles by English as well as American writers. In French the LYsquisse d’un systéme complet d’ Hducation, by Th. Fritz (Strasburg, 1841), has a sketch of the history, which as a sketch is

worth notice. Jules Paroz has written a useful little ZZsto’re which would have been more valuable if it had been longer.

In English, though we have no investigators of the history of education we have a fairly large literature on the subject, but it belongs almost exclusively to the United States. The great work of Henry Barnard, the American Journal of Hducation, in 25 vols., has valuable papers on almost every part of our subject, many of them trans- lated from the German, but there are also original papers on our old English educational writers and extracts from their works. This is by far the most valuable work in our language on the history of education. The small volumes published in America with the title of “ History of Education” do not deserve notice. In England may be mentioned the article on education by Mr James Mill, published in the early editions of the Hncyclopedia Britannica, and Mr R. H. Quick’s most excellent Hssays on Hducational Reformers, published in 1868. Since then Mr Leitch of Glasgow has issued a volume called Practical Educationists, which deals with English and Scotch reformers, as well as with Comenius and Pestalozzi. Now that professorships of education have been established we may hope for some original research. ‘The first professor appointed was the late Joseph Payne, a name well known to those among us who have studied the theory of educa-

tion. The professorship was started by the College of Preceptors. At Edinburgh and at St Audrews professors

have since been elected by the Bell Trustees.

Valuable reports as to the state of education in the various countries that possess a national system were presented to the English Schools Inquiry Commission in 1867 and 1868, by inspectors specially appointed to investigate the subject. The reports on the Common School System of the United States and Canada by thie Rey. James Fraser, on the Burgh Schools in Scotland by D.R. Fearon, and on Secondary Education in France, Germany, Switzerland and Italy, by Matthew Arnold, are inclnded in Parliamentary Papers [3857], 1867, and [3966 v.], 1868.

_The following isa list of some useful bookson education generally :— Herbart, Allgemeine Pédogogtk, Gottingen, 1806 ; Schwarz, Lrzic-

hangslehre, 2 Auf. 1829; Diesterweg, Wegweise fiir Deutsche Lehrer, 1873; Niemeyer, Grundsiitze der Erzichung und des Unterrichts, Halle, 1836; Beneke, Hrziehungs und Unterrichtslehre, 1882; Graefe, Allgemeine Pidagogih, 1845; Waitz, Allgem. Pada- gogik, 1852 ; Herbert Spencer, Education-—Intelicctual, Moral, and Physical. On special pointson the history of education :—Grasberger, Eraiehung und Unterricht in Classischen Alterthum B ONS Mai sj) Platon's Erzichungslehre, Minden and Leipsie, 1883 ; Dic Bruder- schaft des gemcinsamen Lebens, by Delprat, translated into German, Leipsic, 1840 , Heppe, Das Schulwesen des Mittelalters, Marburg, 1860 3 The Schools of Charles the Great, by Mullinger, 1877 ; Ros- min, Vittorino da Feltrc, 1801; Weicker, Das Schulwesen der Jesuiten, Halle, 1863. The works of Comenius and other education- ists are most casily accessible in the Paudagogisehe Bibliothek, edited by Karl Richter, Leipsic (now in course of publication); J.

amsauer, Kurze Skizze meincs Paidagogischen Lebens, Oldenburg, 1838 ; H. Blockmann, Heinrich Pestalozzi, Leipsic, 1846 ; Krieger, Jacotot's Lehrmethodc, Zweibriicken, 1830.

To these may be added :—M. Bréal, Quelqucs mots sur Pinstruction publique, 1874; Dr James Donaldson's Lectures on Education, 1874; A. Droze's Charakterbilder, 4th ed., 1872 ; Dittes, Gesch. de Hrzie- hung, 8d ed., 1878; M. and R. L. Hdgeworth's Practical Hdueator, Isted., 1778; Marenholz-Biilow's Erinncrungen an F., Frobel, trans- lated by Mrs Horace Mann, Boston, U.S.; R. de Guimp's Histoire de Pestalozwi, 1874; Isaac Taylor, Home Education; F. H. Kohle's

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Grundziige der cvangelischen Volksschulerzichung, Breslau, 1873; L. Kellner's Lrziehungsgeschichte; H. Lantoine, Histoire del' Enscigne- ment secondaire cn France, 1874; J. 8S. Mill, Inaugural Address at St Andrews; Pillans's Contributions to Edueation; J. Faroz, Histoire universclle de la pédagogie ; Rollin, Traité des Etudes ; Kriisi, Life of Pestalozzi; Dr Arnold, Miscellaneous Works; Dr Stow, Training System, 11th ed., 1859; A. Stéckl's Lehrbuch der Geschichte der Pddagogik, Mainz, 1876; T. Tate, Philosophy of Education ; Abbot's Teacher ; F. A. Wolf, Ucber Erziehung,

edited by Korte, 1835; L. Wiese, German Letters on English Education, 1877; Bohn, Kurzge- Jasste Geschichte der Pidagogth. @: Bi)

Law Relating to Education.

To the foregoing historical statement may be added some account of the different systems of education administered by statute in the United Kingdom :-—

Lingland.—Until quite recently there was no public provision for education in England, and even now it is only the elementary education of the people that can be said to be jregulated by the law. Parliament has indeed taken cognizance of the institutions founded for the higher education. The universities and the endowed schools have been enabled by various statutes to adapt themselves more completely to the wants of the times; but they still retain their character of local, and one might almost say private, corporations, Their administration is subject to the control of no state authority, and in districts where such institu- tions do not exist there is no public provision for supple- menting the deficiency. Elementary education, until the Act of 1870, was in the same way dependent on voluntary enterprise or casual endowment.

The first approach to a public system of education was by means of grants in aid of private schools, administered by a committee of the Privy Council. This system is not superseded by the Education Act of 1870, but means are taken to ensure the existence in every school district of a “sufficient amount of accommodation in public elementary schools.” The school district is the borough or parish, except in the case of London and Oxford. When the amount of school accommodation ina district is insufficient, aud the deficiency is not supplied as required by the Act, a school board shall be formed and shall supply such deficiency. Every elementary school is a public school in the sense of the Act if it is conducted according to the regulations in section 7, which in substance are :—

1. It shall not be required, as a condition of any child being admitted into, or continuing in the school, that he shall attend or abstain from attending any Sunday school, or any place of religious worship, or that he shall attend any religious observance or any instruction in religious subjects, in the school or

elsewhere, from which observance or instruction he may be withdrawn by his parents, or that he shall, if withdrawn by his parents, attend the school on any day sct apart for religious observanee by the religious body to which his parent belongs.

2. Time for religious observance or instruction in the schoo must be at the beginning or end of school meeting, and must be shewn in a time table conspicuously posted in the school.

3. School must be open to inspection, exeept that the inspector is not to incuire into religious knowledge.

4. School must be conducted in accordance with the conditions required to obtain a parliamentary grant.

Whicn the Education Department are satisfied after inquiry that the supply of public elementary schools as thus defined is in any district insufficient, they may cause a school board to be formed, as they may also (1) when application is made to them to that effect by the persons who would be the electors if there were a school board (in a borough by council), and (2) when they are satisfied that the managers of an elementary school are unwilling or unable to maintain it, and by its discontinuance the supply for the district will become insufficient. The body of the Act describes the constitution, powers, duties, and revenues of school boards, as in the following brief summary :—

1. Constitution.—The school board is a corporation with perpetual succession and common seal, and power to hold land without licence in mortmain. It is elected by the burgesses in a borough, and by

the ratepayers in a parish, each voter having a number of votes equal to the number of vacancics, having the right to give all or any number of such votes to any one candidate, and to distribute them as he pleases. The number of members varies from 5 to 15 as may be determined. The London school board is elected under special regulations.

2. Powers and Duties.—Every school board, for the purpose of providing sufficient public school accominodation for their district, may provide or improve schoolhouses and supply school apparatus &c., and purchase or take on lease any land or any right over land. Sect. 20 contains regulations under which the compulsory purchase of sites may be made. The schools provided by the board must eomply with the following conditions :—(1) They must be public elementary schools, in the sense defined above ; (2) No religious catechism or religious formulary, which is distinctive of any particular denomination, shall be taught in the schools. The board may delegate their powers (except that of raising moncy) to managers. Any breach of these regulations may subject the board to being declared in default by the Education Departinent, who will thereupon nominate a new board. The fees of children attending board schools arc to be fixcd by the board, with the consent of the Department, but the board may remit fees on account of poverty for a renewable period not exceeding six months, and it is ex- pressly declared thatj‘‘ such remission shall uot be deemed to be parochial relief’? given to the parent. Further, free schools may be established where the Education Department are satisfied that the poverty of the inhabitants is such as to render them necessary. Section 25 enables the board to pay the fees of poor children attend- ing any public elementary school, but ‘‘no such payment shall be made or refused on condition of the child attending any public elementary school other than such as may be selected by the parent (sic), and such payment shall not be deemed to be parochial relief.” This clause, which excited a vast amount of opposition in Parliament, was repcaled by 39 and 40 Vict. c. 59 (see infra).

3. Revenwes.—The expenses of the board are to be paid from a fund called the school fund, constituted primarily by the fees of the children, moneys provided by Parliament, or raised by loan, or received in any other way, and supplemented by the rates, to be levied by the rating authority. In providing buildings, &c., the board may borrow money so as to spread the payient over several years, not exceeding fifty. (See, as to this power, Elementary Educa- tion Act 1873, § 10.)

School boards may by a bye-law require the parents of all children between five and thirteen to attend school, and it is a reasonable excuse (1) that the child is receiving efficient instruction in some other manner, or (2) is

prevented by sickness, or (3) that there is no public elementary school within such distance not exceeding three miles as the bye-laws may prescribe. Breaches of any such bye-law may be recovered in a summary manner, but the penalty shall not exceed five shillings including costs.

Finally, it is provided that in future no parliamentary grant shall be made to any school which docs not come within the definition of ‘public elementary school in the Act.” Such grant shall not be made in respect of religions instruction, aud shall not exceed in any case the income of the school from other sources. No connexion with a religious denomination is necessary, and no prefercnce is to be given to a school on account of its being or not being a board school, Otherwise the minutes of the Committee of Council govern the adminstration of the grant, such minutes to lie one month on the table of both Houses of Parliament before coming into force.

The Elementary Education Act, 1873, amends the Act of 1870 in several particulars not necessary to be specified here.

The Elementary Education Act, 1876, which came into operation on the Ist January 1877, declares that it shall be the duty of the parent of every child (meaning thereby a child between the ages of five and fourteen) to cause such child to receive efficient clementary instruction in reading, writing, and arithmetic,—-the duty to be enforced by the orders and penalties specified in the Act. The employment of children under the age of ten, or over that age without a certificate of proficiency or of previous due attendance at a certified efficient school, is prohibited unless the child is attending school in accordance with the Factory Acts, or by bye-law under the Education Acts. Section 10 sub- stitutes for section 25 of the Act of 1870 the following :—

‘* The parent, not being a pauper, of any child, who is unable by reason of poverty to pay the ordinary fee for such child at a public elementary school, or any part of suchfee, may apply to the guardians having jurisdiction in the parish in which he resides; and it shall

2 Elementary school” is defined to be one in which elementary education is the principal part of the education there given, and at which the fees do not exceed ninepence per week.

be the duty of such guardians, if satisfied of such inability, to pay the said fee, not exceeding threepence per week, or such part thereof as he is, in the opinion of the guardians, so unable to pay.”

This payment subjects the parent to no disqualification or disability, and heis entitled to select the school. The following new regulations are made as to the parliamentary grant. A child obtaining before the age of eleven a certificate of proficiency and of due attendance, as in the Act mentioned, may have his school fees for the next three years paid for him by the Education Department—such school fees to be calculated as school-pence. The grant is no longer to be reduced by its excess above the income of the school, unless it exceeds 17s. 6d. per child in average attendance, but shall not exceed that amount except by the same sum by which the income of the school, other than the grant, exceeds it. Special grants may be made to places in which the population is small. Other clauses relate to industrial schools, administrative provisions, &e,

Scotland.—Previous to the Education (Scotland) Act of 1872, the public eleméntary education rested on the old parochial system, supplemented in more recent times by the parliamentary grants from the Committee of Council on Education. Under the old law the heritors in every parish were bound to provide a schoolhouse, and to con- tribute the schoolmaster’s salary, half of which, however, was legally chargeable on tenants.”

The Education Act of 1872 establishes for a limited number of years a Board of Education for Scotland, to be responsible to the Scotch Education Department of the Privy Council, on which its functions are ultimately to devolve. The board makes an annual report to the department.

A school board must be elected in every parish and burgh as defined in the Act. The number of members (between five and fifteen) is fixed by the Board of Educa- tion, and no teacher in a public school is eligible. The election is by cumulative vote, and disputed elections are to be settled by the sheriff. The school board isa body corporate. Existing parish, burgh, and

other schools, established under former Acts, are to be handed over to the school board.

The school board, acting under the Board of Education, shall provide a sufficient supply of school accommodation, and in determining what additional amount is necessary, existing efficient schools are to be taken into account, whether public or not. Provision is made for the trans- ference of existing schools to the school board.

The clauses as to the school fund, and the power of the board to impose rates and to borrow money, are similar to those in the English Acts, and it is declared that sunk funds for behoof of burgh or parish schools shall be administered by the board, and that the board shall be at liberty to receive any property or funds to be employed in promoting educa- tion. Schoolmasters in office at the passing of the Act are not to be prejudiced in any of their rights, but all future appointments shall be during the pleasure of the board, who shall assign such salaries and emoluments as they think fit.

Sections 56-59 relate to the qualifications of teachers. A principal teacher in a public school must possess a certificate of competency or an equivalent as defined in the Act.

Section 62 contains provisions for the maintenance by the school board of higher class public schools in burghs, which are as far as practicable to be released from the necessity of giving elementary instruction, so that the funds may be applied more exclusively to the instruction on the higher branches. And when by reason of an endowment or otherwise a parish school is in a condition to give

instruction in the higher branches, it may be deemed to be a higher class school and managed accordingly.

2 The following are the Acts relating to education in Scotland pe in the Education Act of 1870 :—Act of Scots Parliament, 1696 (1st King William) ; 43 Geo. IIL. e. 54; 1 and 2 Vict. e. 87, and 24am 25 Viet. e. 107.

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Parliamentary grauts are to be made (1) to school boards, (2) to the managers of any school which is efficiently contributing to secular education, No grant shall be made in respect of (1) religious instruction, (2) new schools, not being public schools, unless it appcars that they are required, regard being had to the religious belief of the parents of (the children for whom they are intended, or other special circumstances of the locality. Section 68 is the conscience clause, and it may be mentioned that the preamble of the Act states that it is expedient that managers of public schools should be at liberty to continuc the custom of giving "instruction in religion to children whose parents did uot object, with liberty to parents, without forfeiting any of the other advantages of the schools, to elect that their children should not receive such ,instruction." Section 69 .imposes on parents the duty of providing elementary instruction for children between five and thirteen, and the parochial board shall pay the fee for poor parents. Defaultcrs may be prosecuted ; and persons receiving children into their houses or workshops shall be deemed to have undertaken the duties of parents with reference to the education of children. A certificate of the child's proficiency by an inspector protects the parcnt or employer from proceedings under the Act. Other clauses relate to the non-educational dutics imposcd by various Acts on schoolmasters (now transferred to registrars), and to the ''Schoolmasters' Widows' Fund," to which new masters are not required to contribute.

The Education Board, continued by Order in Council to 6th August 1877, has been further continued by statute to 6th August 1878.

Ireland.—The public"elementary school system depends on grants made to the lord-lieutenant, to be expended under the direction of commissioners norainated by the Crown, and named " The Commissioners of National Education." The commissioners were incorporated by this name in 1845, with power to hold land to the yearly value of £40,000, The following statement, taken from the rules and regula- tions of the commissioners appended to their report for 1873, exhibits the leading points of the system as contrasted with that now established in England and Scotland.

"The object of the system of national education is to afford combined literary and moral and separate religious instruction to children of all

persuasions, as far as possible in the same school, upon the fundamental principle that no attempt shall be made to interfere with the peculiar religious tenets of any description of Christian pupils. It is an earnest wishof Her Majesty's Government and of the commissioners that the clergy and laity of the different oo denominations should co-operate in conducting national schools."

The commissioners grant aid either' to vested schools (7.¢. schools vested in themselves, or in local trustees to be Maintained by them as national schools) or to non-vested (.¢., private schools), and the grant may be towards pay- ment of salary or supply of books, or, in the case of vested schools, towards providing buildings.

The local government of the national schools is vested in the local patrons or managers thereof, aud the local patron is the person who applies in the first instance to place the School in connection with the board, unless otherwise Specified. The patron may manage the school by himself or bya deputy. If the school is controlled by a committee or vested in trustees, they are the patrons. A patron may nominate his successor, and in case of death, his legal representative if he was a layman, and his successor in oftice

if he was a clerical patron, will be recognized by the com- |

missioners, The local patrons have the power of appoint- ing and removing teachers, subject to a rule requiring three months' notice to the teacher. Every national school must be visited three times a year by inspectors.

In non-vested schools, the commissioners do not in general make any conditions as to the use of the building after School hours ; but no national school house shall be employed at any time, even temporarily, as the stated place of divine Worship of any religious community, and no grant will be Made to a school held in a place of worship. In all National schools there must be secular instruction four hours a day upon five days in the week. Religious instruc- tion must be so arranged that each school shall be open to

the children of all communions, that due regard be had to parental right and authority, and that accordingly no child shall receive or be present at any religious instruction of which his parents or guardians disapprove. In non-vested schools it is for the patrons and local managers to determine Whether any and what religious instruction shall be given. In all national schvols, the patrons have the right to permit the Scriptures to be read; and in all vested schools they must afford opportunities for the same, if the parents or guardians require it. (E. RB.) EDWARD, or Eapwarp L, king of the Anglo-Saxons, was the eldest son of Alfred the Great, and succeeded his father, by the voice of the Witan, 26th October 901. He was then about thirty years of age, and had already in 893 distinguished himself by inflicting a disastrous defeat on the Danes at Farnham. His election to the throne was disputed by his cousin Ethelwold, who, leaguing himself with the Danes of Northunbria, waged with varying success a civil war of four years' duration. It was brought to a close in 906 by Ethelwold's death in battle, when Edward concluded a peace with the East Anglians and Northumbrians. The pacification was not, however, of a very satisfactory nature, and was not of long continuance, for in 910 Edward "sent out a force of West Saxons and Mercians, who greatly spoiled the army of the north," and in 911 the Danes, receiving large reinforcements from France, made repeated attacks on Wessex and Mercia, Against this common enemy Edward and his sister Ethelfleda, who became " lady of Mercia" in 912, formed conjoint measures. Ethelfleda drove the Danes from Mercia, and to secure her conquests erected the fortresses of Bridgenorth, Stafford, Tamworth, and Warwick ; while Edward, by adopting the same methods in Hast Anglia and Essex, gradually accomplished the com- plete subjugation of tlle Danes. On the death of Ethelfleda in 922 he annexed Mercia to his own crown, and became king of all England south of the Humber. But this was not the whole result of his victories, for the Danes of Northumbria, the Welsh, the Scots, and the Britons of Strathclyde, either from dread of his power or from desire for his protection, voluntarily chose him to be their "father and lord." He died in 925, Inferior to his father in the higher moral and intellectual qualities, Edward manifested gifts superior to his as a Jegislator and warrior ; and under him the Anglo-Saxon rule attained a fame and influence to which it had never before made a near approximation. EDWARD, or Eapwarp II., surnamed the Martyr, an Anglo-Saxon king, succeeded his father Edgar in 975, at the age of about tlirteeen years. He

was the elder son of Edgar, and is said to have been recommended by him as his successor; but the party in the state opposed to the monks supported nevertheless the claims of his younger brother Ethelred, son of Elfrida, and only seven years of age. ‘The influence of Dunstan was, however, sufficiently great to overbear all opposition, aud in a somewhat summary fashion he presented Edward to the Witan at Winchester, and consecrated him king. During his short reign the only circumstances worthy of notice are the quarrels between the two parties in the state, and the rapid decline of the authority of Dunstan and the monks. The death of Edward, which occurred in 978, was the result of a base act of treachery on the part of Elfrida. He was re-

‘turning exhausted from the chase at Wareham when he

was lured to her residence, and was stabbed in the back while partaking of hospitality before her palace gate, EDWARD, or Eapwarp IILI., king of the Anglo-Saxons, surnamed, on account of his reputation for superior sanctity, the Confessor, was the son of Ethelred II. and Emma, daughter of Richard I. of Normandy, aud was born at Islip, Oxfordshire, probably in 1004. On the election of Swend to the throne of England in 1013, Emma with VIT. — 86

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her husband and family took refuge in Normandy; and Edward, notwithstanding the marriage of Emma to Canute in 1017, continued to reside at the Norman court, until he was recalled to England by MHardicanute in 1041. Hardicanute died in 1042, and “ before the king was buried, all folk chose Edward to be king at London ;” but partly from his own unwillingness to accept the crown, and partly from the opposition of the Danes who came into England with Canute, his coronation did not take place till April 1043. The chief agent in overcoming his scruples, and in quelling all murmurs of opposition against his election, was Godwin the West Saxon carl, whose influence was at that time paramount in England. The exact nature of the rela- tions between Godwin and Edward lias been the subject of considerable discussion; but the most probable view of the matter is that, until after the marriage of Edward to Edgitha, daughter of Godwin, in 1045, these were on the whole cordial and friendly, but that gradually the king’s preference of Normans to Anglo-Saxons, his necessary

friendship with Leofric of Mercia and Siward of Northum- bria, and his growing dread of Godwin's ambitious charac- ter, led to misunderstanding and distrust. It was, probably, at the instigation of Godwin that Edward, on lis accession to the throne, deprived his mother Emma of her possessions, and caused her to live in retirement at Winchester, and that he banished from the kingdom the chief Danish partisans who opposed his election. For the first eight years his reign was comparatively tranquil, the only circum- stances worthy of mention being a threatened invasion by Norway, the ravages committed by pirates in Kent and Essex, and the outlawry of Sweyn, son of Godwin, for the seduction of the abbess of Leominster. In 1051, Eustace, count of Boulogne, in endeavouring to quarter his followers on the town of Dover, was resisted by the burghers, and a quarrel ensuing, several Normans were slain. The king, on hearing Eustace's account of the affair, with- out further inquiry, commanded Godwin to chastise the town by military execution. Godwin demanded a trial : but the king, incited it is said by Robert, archbishop of Canterbury, summoned a meeting of the Witan at Gloucester, not for the purpose of inquiring into the affair at Dover, but to pass judgment on Godwin for his contumacy. Ultimately, Godwin thought it prudent to leave the country and take refuge in Flanders. It was during his absence that William, duke of Normandy, visited England ; and if this prince did not then receive the promise of the crown from Edward, his ambition to possess it and his hopes of success were doubtless confirmed by his visit, There seems to have been general regret at Godwin's absence; and encouraged by the assurances he received from Iingland, he gathered a fleet, and uniting with Harold, appeared before London. The king endeavoured to oppose him, but was obliged to yield to the wishes of his subjects, and Godwin and his sons were reinstated in their posses- sions. When her father left England, Edgitha had been deprived of her property and sent to the royal abbey of Wherwell, but on his return she was restored to her former position. Godwin died in 1053, and after his death Harold attained to great influence, and virtually ruled the kingdom in the name of Edward. Towards the end of 1065 Edward's health began rapidly to fail. Hehad rebuilt the ancientabbe y of Westininster, and his only wish was to be present at its consecration, which was to take place on the 28th December, but over-exertion on some previous festival days was too inuch for his remaining strength. His share in the ceremony had to be performed by deputy, and he died 5th January 1066. It was his last wish that Harold

should succeed him on the throne. The virtues of Edward, it has been said, were monastic rather than kingly. His aims were just and righteous, and he showed his interest in his subjects by the

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preparation of a digest of the laws of the kingdom, and by the repeal of the Danegeld, or war tax; but his weak character and his feeble interest in worldly matters caused the real government of the kingdom during his reign to be placed almost entirely in the hands of favourites.

See Palgrave’s History of the Anglo-Saxons, Green’s History of

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the English People, and especially Freeman's Norman Conquest, vol. ll.

EDWARD I. (1239-1307), king of England, was the son of Henry ITT. of England, and of Eleanor, daughter of the count of Provenge, and was born at Westminster, June 16, 1239. In 1252 he was named governor of Gascony in room of Simon de Montfort, with whom Henry was dis- satisfied; and in 1254, by his marriage with Eleanor, daughter of Alphonso X. of Castile, he secured to the English for a time undisputed possession of that province. At the battle of Lewes, 13th May 1264, Edward, by the impetuosity of his attack, at first defeated the barons with great slaughter, but by his too great rashness in pursuit failed to give the king proper support in another part of the field, and was thus the cause ultimately of the utter rout of the royal forces. He was taken prisoner, but escaping by a clever stratagem, he joined with the earl of Gloucester, and inflicted a disastrous defeat on De Montfort and his sons at Evesham, August 3, 1265. In 1269, at the request of the Pope, he undertook a crusade to the Holy Land. He reached it in 1270, and in 1271 he captured Nazareth and massacred all the Turks found within its walls. In revenge, perhaps, for this act, an assassin, on June 12, 1272, stabbed him in three places with a poisoned arrow; but his vigorous constitution triumphed over his injuries and he completely recovered. In the same year his father died, and he was proclaimed king. He had arrived at Sicily when the news reached him, but instead of going direct to England, he crossed over to Italy, and thence into France, where in a tournament his followers quarrelled with those of the count of Chalons, and he slew the count in single combat. He landed in England August 2, 1274, and was crowned on the 19th. In October of the same year he issued writs to inquire into the state of the realm, and the next year there were passed the laws called the Statutes of Westminster, which reformed many of the abuses of the feudal system, secured freedom from undue influence in the election of sheriffs and other justices, and threatened with penalties certain oppressive acts on the part of the barons. In 1277 he conquered Wales and caused Llewelyn to sue for peace; but in 1280, a Welsh war again broke out, which continued till the death of Llewelyn in 1282. Edward's plan to obtain money for the expenses of this war, by summoning for consultation in 1283 representatives of the shires, the boroughs, and the church, was the germ of the English House of Commons, although the first properly constituted

Parliament did not meet till 1295. A less ereditable method of raising money was the banishment, in 1280, of the Jews from England, on condition that the clergy and laity submitted to a tax of a fifteenth. Two other important decisions were the consequence of his money difficulties : —in 1297 he refused submission to the bull of Boniface VIII. forbidding the clergy to be taxed on their ecclesiastical revenue, and in 1299 he was obliged to con- firm the charters conferring on the people the right to fix their own taxation. In 1290 Queen Eleanor died, and 10 1293 Edward entered into negotiations for a marriage with Margaret, sister of Philip IV. of France; but on account of an act of treachery on the part of the French, these negotiations were broken off for a time, and the ree did not take place till 1299. From 1295 the affairs “ Scotland occupied his chief attention. In 1292 he ha decided the claims of the candidates for the Scottish crown

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in favour of Baliol, on condition that the latter acknow- ledged him as lord paramount, and on the breaking out of

war with France he demanded his assistance. On Baliol’s refusal, and on learning that he had entered into a treaty with France, Edward in 1296 captured Berwick, defeated the Scots at Dunbar, took the castles of Roxburgh, Jedburgh, Edinburgh, Dumbarton, and Stirling, and, receiving at Perth Baliol’s unconditional surrender, sent him prisoner to the Tower. In 1297 Wallace headed a rebellion of the Scots, and defeated the English with great slaughter at the battle of Stirling bridge ; but next year the Scots suffered an overwhelming defeat at Falkirk,

and only prevented the further success of the English by:

laying waste their own country. In 1299 and 1300 Edward’s attempts at invasion met with little success on account of opposition from his barons, In 1301 he in- vaded Scotland for the fifth time, but at the request of the king of France granted it a truce. In 1304 he compelled its submission, and excepted from the amnesty granted to the Scotch nobles Sir William Wallace, who was captured and executed in 1305. In 1307, toavenge Bruce’s murder of Comyn and his attacks on the English, Edward resolved on a seventh invasion, and, though in great bodily weak- ness, determined

to lead his army in person ; but his almost unexampled labours had already undermined his vigorous health, and he died 7th July 1307, at the village of Burgh: on-the-Sands, on the fifth day of his march northwards from Carlisle. He had given orders that his dead body should be carried before the army until his enemies were conquered; but his son Edward made no endeavour to fulfil his wish. The body was escorted to Waltham, and was buried at Westminster on the 27th October. In Edward were united in a rare degree both the physical and mental qualities of a great general; and he is one of the few English kings, and perhaps the first, who can lay claim to the higher qualities of statesmanship. The measures which he passed for the government of his own kingdom, and the conces- sions he made to the demands of his subjects, almost entitle him to be called the founder of England's constitutional freedom ; while the far-seeing wisdom of his foreign policy was shown by his sacrificing his influence in France in order to quell the opposition to his authority in Scotland. That his claims on Scotland were altogether just can scarcely be affirmed; but that he clearly saw the necessity of a union of Scotland and England, and devoted his whole efforts to the attainment of this end, is perhaps his highest title to honourable remembrance. His harsh manner of attaining lis end, and the cruel punishments he exercised on those Who sought to thwart his efforts, may be excused partly On account of the times in which he lived, and partly as arising from the just vexation of a stern and eager nature; and they are somewhat counter-balanced by the righteous- Ness and clemency with which he governed Scotland at the periods when it was under his rule.

See Hallam's Ifiddie Ages; Pearson's ITistory of England during the Early and Middle Ages, vol. ii.; Longman's Leetwres on the History of England, vol. i.; Stubbs's Early Plantagenet Kings ; Hill Burton's History of Seotland, vol. ii.; and Green's Short History of the English People.

EDWARD IL. (1284-1327), king of England, fourth son of Edward I. and of Eleanor, was born at Carnarvon, April 29, 1284, and became heir-apparent in 1285. His first title Was earl of Carnarvon, but in 1301 he was created earl of Chester and prince of Wales. His personal character, and the whole tenor and tendency of his reign, may perhaps be best described as the opposite of those of his father. Though Not the slave of any of the worst vices, and not without natural abilities, he was weak, indolent, and faithless;

and his. utter incompetence for the position in which fortune had placed him requires no other proof than the fate which

finally overtook him. His first acts after the death of his father foreshadowed his future career. He at once recalled Piers Gaveston, a favourite whom his father had banished from the court, and created him earl of Cornwall, caused his father's body to be buried at Westminster, and, after rejoining the army for a few days, returned again to London, and for six years made no serious effort to prosecute the war with Scotland. Previous to his coronation he went to France to be married to Isabella, daughter of Philip IJ, ; and by appointing Gaveston guardian of the kingdom during his absence, and loading him with honours and presents on his return, he roused the animosity of the nobles to such a height that it was only on his promising to agree to certain demands that might be submitted to him at a future Parliament, that they con- sented to his coronation. It took place 25th February 1308. Until the nobles rose in rebellion in 1312, and executed Gaveston at Warwick castle, the favourite formed a perpetual subject of dispute between the nobles and the king, and was alternately banished and recalled according to the king's exigencies. In 1311 Parliament confirmed the report of the "Committee of Ordinances" appointed to reform the abuses of the administration. The king nominally agreed to act in accordance with the report, but by a saving clause secured to himself full liberty to evade the principal enactments, the result of which was a series of quarrels with the nobles, becoming more serious each succes- sive time, followed by reconciliations increasing gradually in hollowness till the end of his reign. Robert Bruce took full advantage of the internal difficulties of England, and in 1314 had reconquered the principal strongholds of Scotland with the exception of Stirling castle. For its relief Edward raised an army of 100,000 men, but suffered a ruinous defeat at the battle of Banndckburn, 24th June 1314. Edward made no further effort of importance against the Scots till 1319, when he besieged Berwick, which Bruce had taken, but was compelled to raise the siege, and concluded a two years' truce with Scotland. After the death of Piers Gaveston, the place of favourite with the king was occupied by Hugh Despenser. He was banished by Parliament in 1321, but soon returned; and, provoked at this, the barons under Lancaster

declared war, but were defeated and Lancaster executed in March 1322. In 1323 a fourteen years' truce was concluded with Scotland. In 1324 Edward was persuaded to send the queen to France in order to settle some disputes with the French king. She succeeded in her mission, but refused to return home, on account, she affirmed, of previous ill- treatment by her husband, although doubtless intrigues with Roger Mortimer had something to do with her refusal. From France she went to Flanders, and, raising a small army against the king, landed at Orwell in Suffolk, 22d September 1326. -The whole nation flocked to her standard, Despenser was executed, and young Edward was appointed guardian of the kingdom. In 1327, the king was formally deposed by Parliament, and his son elected in his stead. A plot was formed against the deposed monarch in the same year, and he was murdered with great cruelty at Berkeley Castle on the 27th September. (See the same writers for this reign as for the last.)

EDWARD IIT. (1312-1377), king of England, the eldest son of Edward IJ. and of Isabella, was born at Windsor, November 13, 1312. He was appointed guardian of the kingdom October 26, 1326, and received the crown February 1, 1827. On the 24th January 1328 he was married to Philippa, daughter of the count of Hainault. During his minority the government of the kingdom was intrusted to a body of guardians with Henry of Lancaster at their head, but was virtually usurped by Roger Mortimer, until the king, irritated by his arrogance, caused him to be

seized at Nottingham on the 15th October 1330, and con- veyed to the Tower. Hc was executed at Tyburn on the 29th November. It is said to have been chiefly through Mortimer's influence that, on the 24th April 1328, a peace was concluded between England and Scotland, the chief provisions of which were that the Scots agreed to pay England the sum of £20,000, and that Edward agreed definitely to recognize the independence of the Scotch crown. The treaty was very unpopular in England, and it is not surprising, therefore, that, when Edward Baliol in 1332 made his attempt to mount the Scotch throne, Edward III. gave him indirect assistance, and that after Baliol's dethronement in 1333 an invasion of Scotland was resolved on. On July 19 Edward defeated the Scots at the battle of Halidon Hill, and

receiving as the result of his victory the submission of the principal Scotch nobles, he annexed the whole of Scotland south of the Forth to his own crown, and allowed Baliol to reign over the remainder as titular king. Soon after, Baliol was again a fugitive, but was again aided by Edward to mount a nominal throne. After a short period of peace Edward in July 1336 ravaged and burned Scotland as far as Aberdeen, but growing complications with France compelled him in the same year to return to England. Though he' professed to have a claim, through his mother, on the French throne against Philip of Valois, that claim was left in abeyance until several acts of aggression on the part of Philip brought about a rupture between the two kings. The count of Flanders, at Philip's instigation, had broken off commercial relations with England; French privateers were daily com- mitting ravages on English commerce ; Aquitaine was con- tinually threatened by desultory attacks ; and Philip, though he hesitated to accept the responsibility of being the first to declare war, scarcely attempted to conceal his endeavours to throw that responsibility on Edward. Edward sailed for Flanders July 16, 1338, and at Coblentz held a conference with the emperor Louis V., at which the latter appointed him his vicar-general, and gave orders for all the princes of the Low Countries to follow him in war for the space of seven years. In 1339 Edward laid siege to Cambrai, but soon afterwards raised the siege and invaded France. Philip advanced to meet him, but declined battle, and Edward concluded his first campaign without achieving anything to compensate him for its cost, In 1340 he defeated the French fleet before Sluys, and after landing in France laid siege to Tournai, but before he succeeded in capturing it he was induced through money difficulties to conclude a truce of nine months with France. In 1342 a truce for two years was concluded between England and Scotland, and at the end of the same year Edward again set out on an expedition against France, but at the intercession of the Pope he agreed to a truce. Shortly after his return to England a great tournament was held by him at Windsor in memory of King Arthur. In 1346 he set sail on the expedition which resulted in the great victory of Crécy and the capture of Calais ; and in 1348 he again concluded a truce with France. This year and the following are darkly memorable in English annals from the outbreak of the " black death," which spread terror and desolation throughout the whole country, but on account of the reduction it made in the population, was the ultimate cause of the abolition of serfdom and villanage in England. From this time

Edward as a warrior retires somewhat into the background, his place being taken by the prince of Wales (See Epwarp tHe Brack PRINCE), who in 1356 won the battle of Poitiers, and took King John prisoner. In 1359 Edward again invaded France, and in 1360 he signed the peace of Bretigny, according to which the French agreed to pay for King John a ransom of three million crowns, and Edward renounced his title to

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the throne of France, but retained his full sovereignty over the whole of the ancient duchy of Aquitaine, the counties of Ponthieu and Guignes, and the town of Calais, Peace was again broken in 1369 by Charles of France, and when he concluded a truce with England in 1375 all of France that remained in Edward's hands was Bayonne and Bordeaux in the south, and Calais in the north. The last years of Edward's reign forma sad and gloomy close to a career which had had a vigorous and energetic commence- ment, and had afterwards been rendered illustrious by great achievements. His empire in France was virtually over- thrown; the vast expenditure which had had such a fruitless result was sorely burdening his subjects, and awakening increasing discontent; and he himself, through the gradual decay of his mental faculties, had become a mere tool in the hands of Anne Travers and of ministers whose only aim was their own aggrandizcement. In 1367 the " Good Parliament" virtually seized the helm of the state from the hands of the king and his ministers, It compelled Anne Travers to swear never to return to the king's presence, suspended the ministers Latimer and Lyons, protested against the means then adopted for raising taxes, and de- manded a vigorous prosecution of the war. The Black Prince was the chief agent in urging these reforms, but his death, in the midst of the Parliament's deliberations, for a time rendered almost abortive the good work he had begun. Edward died 21st June 1377. The splendour of his reign belongs properly rather to the people than to tke monarch. Both in his home and forcign relations he showed con- siderable prudence and sagacity, and he may be allowed the merit of having endeavoured as much as possible to keep on good terms with his subjects; but under him the pro- gress of constitutional reform was due either to his money difficulties or to events entirely beyond his control. Although endowed with high courage and daring, there is no proof that he possessed more than average ability as a

general. His expeditions were planned on a scale of great mag- nificence, but he entered on his campaigns without any definite aim, and his splendid victorics were mere isolated achievements, won partly by good fortune, but chiefly by the valour of Welsh and Irish yoemen and the skill of English archers.

See History of Edward the Third, by W. Longman (1869) ; Edward ITI., by Rev. W. Warburton, M.A. (1876); Pearson's

England in the Fourteenth Century (1876) ; and essay on Edward III., by E. A. Freeman (Essays, first series).

EDWARD IV. (1441-1483), king of England, was the second son of Richard duke of York, and was born at Rouen, April 29, 1441. His father was appointed protector of the kingdom during the incapacity of Henry VI., and having in 1460 laid claim to the throne as a | descendant of Edward III., was named by Parliament successor of Henry VI. on condition that le allowed Henry to retain his tlirone. As an heir had been born to the king, it was only natural that Queen Margaret should seek to resist this proposal. She accordingly raised an army against the duke of York, and he was defeated and slain at the battle of Wakcfield, December 30, 1460. Edward, who was at that time in Wales, on hearing of his father's death resolved to avenge it, and gathering a mixed army of Welsh and English, defeated the earls of Pembroke and Ormond at Mortimcr's Cross in Hereford, February 7, 1461, On February 17, Queen Margaret defeated the Yorkists at St Albans ; but Edward, notwithstanding her victory, hav- ing united his forces with those under Warwick entered London, and, being received by the citizens with loud shouts of welcome, was proclaimed king 4th March 1461. But he could not permit himself to enjoy his dignities 10 idle security. King Henry had escaped and joined the army of the queen, which, having withdrawn to the north,

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was to the number of about 60,000 encamped at Towton, about eight miles from York. Here Edward and Warwick met the queen's forces, and a battle of great obstinacy ensued, which, notwithstanding the arrival of a reinforce- meut to Margaret in the middle of tlie battle, ended in her utter defeat.

Henry and Margaret fled to Scotland, and on the 28 June Edward was crowned at London. Margaret after- wards escaped to France, from which country in 1462 she made two separate attempts to retrieve the fallen fortunes of her house, but these, as well as one made by Henry in 1464, proved utterly abortive. In May 1461 Edward was secretly married to Elizabeth, daughter of Richard Wood- ville, Lord Rivers, and widow of Sir John Gray ; and hay- ing in the September following publicly acknowledged her as his queen, he grievously disappointed and displeased his chief supporter, the earl of Warwick, who had been nego- tiating for the marriage of Edward with the sister of Louis XI. of France. Though from this time secretly bending all his energies to accomplish Edward's overthrow, Warwick skilfully concealed not only his inteutions but even his share in overt acts; and it was not till 1369 that, receiving intelligence of the success of an insurrection secretly fomented by him in Yorkshire, he showed his hand by taking the king prisoner near Coventry. Shortly after, Edward either escaped or was allowed his freedom ; aud in 1470 he defeated the rebels near Stamford, and com- pelled Warwick to make his escape to France. Here the earl, through the good offices of Louis, was reconciled with Queen Margaret, and agreed to invade England in behalf of her husband. Landing at Dartmouth, he soon had an army of 60,000 men. Edward, taken by surprise and unable to raise a force sufficient to oppose him, fled to Holland ; and Warwick, having released Henry, again got him acknowledged king. Edward in his turn adopted the tactics that had been successful against him. In 1471 he landed at Ravenspur, and professing at first to resign all claims to the throne, and to have no further aim than merely to recover his inheritance as duke of Y ork, he soon collected sympathizers, and then, throwing off all disguise, issued proclamations against Henry and Warwick. He marched without opposition direct to London, and after entering it and taking Henry prisoner, advanced against the army which had been collected to oppose him. The encounter took place at New Barnet, April 14, when the party of Warwick were defeated and Warwick himself was slain. On the same day Margaret with her son Edward, now eighteen years of age, had landed at Weymouth, but on May 4 she was defeated at Tewkesbury and taken prisoner, Her son either perished in battle, or was slain shortly after- wards by the order of the king ; and her husband Henry died in the Tower on May 21, the evening of the day on Which Edward re-entered London. Secure at home, Edward now turned his

thoughts on foreign conquest. In 1475 he formed an alliance with Charles of Burgundy against Louis, but on landing on the Continent with a large army he learned that the duke and Louis had come to an understanding, and prudence compelled him to enter into a seven years' treaty with the power he had hoped to conquer. Shortly after this, the duke of Burgundy having died, Clarence, the brother of Edward, wished to marry Mary, the duke's daughter and heiress; but Edward, perhaps on account of chagrin at the former deceit of lr father, refused his consent to the suit. Exasperated at his

rother's conduct, Clarence took no pains to conceal his anget, and Edward thought it necessary to impeach him of treason before the House of Lords, He was condemned to death, February 7, 1478, and on February 17 was executed in the Tower, but with so great secrecy that the Manner of his death is unknown. Edward died April 9, 1483. The beauty of his person and the freedom of his

manners rendered Edward a great favourite with the lower aud middle classes, but there appears to have been little in his character to awaken real esteem. He had certainly an ability for subtle scheming and intrigue, but his memory is connected with no act conferring any benefit. of importance on his country, and it is tarnished by several deeds of ruthless cruelty, and by the helpless self-indulgence into which he sank during his later years. . On account of the unsettled nature of the country during his reign, the influence of Parliameut on the affairs of the kingdom became virtually suspended ; while the antipathy and con- tentions between the two parties of the nobles made it almost a necessity that that party which supported the ki ng should be unable to present any strong resistance against undue exercise of authority on his part. 'The result was the inauguration of that form of despotism known as the New Monarchy.

EDWARD V. (1470-1483), king of England, was the son of Edward IV. and of Elizabeth, and was born in the sanctuary of Westminster Abbey, November 4, 1470. As soon as Edward IV. was dead his brother Richard, duke of Gloucester (see Ricwarp III), acting so far in accordance with the late king's wishes, secured possession of the person of the young king, and was appointed by Parliament protector of the realm. He had previously

arrested Ear] Rivers, the young king's uncle, and Lord Richard Gray his half-brother, and his next step was to accuse Lord Hastings, president of the royal council, of designs on his life, and to have him executed almost immediately afterwards on Tower Green. The way being now cleared for a full declaration of his designs, he caused it to be decided at a mecting of the Lords and Commons that the marriage of Edward IV. had been invalid ou account of the existence of a precontract ; and, receiving a petition to act in accordance with this decision and assume the crown, he after a very slight reluctance consented to do so. Edward V. and his brother were confined in the Tower. Shortly after it was known that they were dead, but though it was the general conviction that they had been murdered, it was uot till twenty years afterwards that the manner of their death was discovered. Brackenburg, the constable of the Tower, had refused to obey the command of Richard to put the young princes to death, but complied with a warrant ordering him to give up the keys of the Tower for one night to Sir James Tyrrel, who had agreed to provide for the accomplishment of the infamous act. He gave admittance to two assassins hired by him- self, who smothered the two youths under pillows while they were asleep.

For Edwards IV. and V. see Green's Short History of the English

People, the Houses of Lancaster and York, by James Gairdner, and 'Konig Richard III." in Pauli's Aufsdtze zur Englischen Geschichte.

EDWARD VI. (1537-1553), king of England, was the son of Henry VIII. and of Jane Seymour, and was born at Hampton Court, 12th October 1537. "Till he came to six years old," he says in his journal, "he was brought up among the women." He was then transferred to the direction of several masters, who instructed him in Latin, Greek, French, philosophy, and divinity. In his tenth year he was created prince of Wales and duke of Cornwall, and very shortly afterwards he succeeded to the throne on the death of lis father, 28th January 1547, The will of Henry, for the protection of the young king, had named merely a council of regency, but that council immediately chose Edward, earl of Hertford, as protector, and on the 16th February ordered that lie should be created duke of Somerset. 'The leanings of the protector were strongly Protestant, and he inaugurated his

protectorate by the repeal of various Acts whose tendency was to support the waning influence of the Church of Rome, and by additional

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legislation in favour of Reformation principles.

the Scots at the battle of Pinkie Cleugh, September 10,

1547, and next year captured Haddington ; but, on account of growing dissensions at home, he was compelled to

give up all farther attempts against Scottish independence.

His brother, who had been created Lord Seymour of

Sudeley and made lord admiral of England, was suspected of being at the head of a plot to overturn his authority,

and with something of bravado admitted as much as was

sufficient to criminate himself, although he refused to answer in regard to the more serious charges. In the House of Lords a bill was framed against him which passed

the House of Commons almost unanimously, and, it being

assented to by the king shortly afterwards, he was executed on Tower Hill, March 20, 1549. the distress consequent on the depreciation of the currency and the wasteful expenditure of the court awakened a general discontent, which in different parts of the kingdom broke out into open insurrection. The protector, instead of repressing the rebellion by vigorous measures, gave con- siderable concessions to the demands of the populace, his sympathy with whom he openly admitted. By such an avowal he necessarily alienated the nobility, and they speedily planned his overthrow. The council, headed by Dudley, earl of Warwick, declared against him, deposed him, and imprisoned him in the Tower, October 14, 1549. He regained his freedom shortly afterwards, but a plot which he was concocting for the overthrow of Warwick having prematurely come to light,

he was again arrested in 1551, and being convicted of high treason, he was executed on Tower Hill, January 22, 1552. The king, who, except where his religious convictions were concerned, was a mere puppet in the hands of the faction which at any time was paramount, yielded his assent to the execution, apparently without any feelings of compunction. Warwick, some time before this created duke of Northumberland, now exercised absolute sway over the affairs of the kingdom, but he was hated by the populace, and distrusted even by the friends who had raised him to power. He found it necessary, therefore, to take further steps to guarantee the stability of his authority. The king was dying rapidly of consumption, and his sister Mary being heir to the throne, Northumber- land could not hide from himself the probability that his own overthrow would follow her accession. He therefore took advantage of the king's strong religious prejudices to persuade him to make a will, excluding Mary and Elizabeth from the succession to the throne on the ground of their illegitimacy, and nominating as his successor Lady Jane Grey, who was married to the duke's eldest son. The arbitrary urgency of Northumberland and the religious obstinacy of Edward prevailed over the strong objections of the judges, and letters patent being drawn out in accordance with the king's wishes, passed under the Great Seal, and were signed by the chief nobles, including, although! only after repeated endeavours to alter Edward's deterntination, Cranmer, archbishop of Canterbury. Edward jdied July 4, 1553. There were some suspicions that his death had been hastened by Northumberland, but although his malady showed at last some symptoms of poisoning, it is now believed that these were caused by accidental administrations of over-doses of mineral medicine. The early age at which Edward VI. died makes it impos- sible to form a confident estimate of his character and abilities. The exceptional talent which he manifested in certain respects may have been due largely to the

In the following summer

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Though England was in a somewhat unsettled state, this did not prevent him from planning an expedition against Scotland, on account of that power

refnsing to fulfil a former treaty by which a marriage had been agreed upon between Mary Queen of Scots and Edward. He defeated

precocity caused by disease. He was undoubtedly highly accomplished, but there is some reason for suspecting that he was defective in force of character, and that he was too much of a recluse to have become a successful ruler, His own writings show that he was fully aware of the abuses which had crept into the administration of affairs, and that he was conscientiously desirous that they should be remedied; but they leave it uncertain whether he had the practical sagacity to discern the true causes of these evils, and whether he had sufficient energy to remedy them eyen had he known the proper remedies.

The Writings of Edward VI. (including his Journal), edited with Historical Notes and a Biographical Memoir by John Gough Nichols, have been printed in two vols. by the Roxburgh Club (London,

1857). See also Hayward's Life of Edward VI. and Froude's History of England, vols. iv. and vy.

EDWARD tue Brack Prince (1330-1376), son of Edward III. of England, and of Philippa, was born at Woodstock, June 15, 1830. In 1337 he was created duke of Cornwall. He was appointed guardian of the kingdom during the king's absences in France in 1338, 1340, and 1342, and on his return in 1343 was created prince of Wales. In 1346 he accompanied his father's fourth expedition against France, when the division led by him bore the chief brunt in the battle of Crécy. In 1350 he shared with his father the glory of defeating the Spanish fleet at the battle of ‘‘ L'Espagnols-sur-Mer.” In 1355 he commanded the principal of the three armies raised by the English for the invasion of France, and landing at Bordeaux captured and plundered the chief of its southern towns and fortresses. In the year following he gained the great victory of Poitiers, and took King John prisoner ; and returning to England in 1357, he entered London in triumphant procession, accompanied by his illustrious captive. During the pause of arms which followed the treaty of Bretigny he was married to his cousin Joan, commonly called the Fair Maid of Kent, of whom he was the third husband, This event took place in 1361. Shortly after, he was created duke of Aquitaine, and he set sail for his new dominions in February 1363.

Here his life was spent in comparative quietude until Pedro, the deposed monarch of Castile, sought his assistance to remount the Spanish throne. Trusting to Pedro's promises to defray the cost of the expedition, the Black Prince agreed to his request. He marched across the Pyrenees, defeated Don

.Henry with great slaughter at the battle of Navarette, and

two days afterwards, along with Don Pedro, entered Bruges in triumph. Don Pedro, however, speedily forgot the promise of payment which his distresses 'had induced him to make, and after the Black Prince had waited some months in vain for its fulfilment, he was compelled to return to his duchy, having lost four-fifths of his army by sickness alone. To defray his expenses he found it necessary to impose on Aquitaine a hearth tax, and the Gascon lords having complained to the king of France, he was summoned in 1369 to Paris to answer the complaint. He replied that he was willing and ready to come, but it would be with "helm on head, and with 60,000 men." War was con- sequeitly again declared between England and France, Two simultaneous invasions of English territory were planned by the French—the one under the duke of Anjou, the other under the duke of Berri. The latter laid siege to Limoges, which by the treachery of its bishop basely surrendered. Enraged almost to madness, the prince swore by the "soul of his father" that he would recover

'the city, and after a month's siege fulfilled his oath. °

Surprising the garrison by the springing of a mine, he carried the city by assault, and massacred without mercy every man, woman, and child found within us walls. This terrible act' of cruelty, attributable, 1t 1

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only charitable to suppose, partly to the irritation of ill health, and possibly to chagrin arising from the pre- sentiment that the English power in France was now ou the wane, is the one blot on his fair fame. It closed also his military career, for he was compelled in 1371, by the advice of his physicians, to return to England. From this time his constitution was utterly broken, but he lingered on to witness the loss of his duchy to England, and also to originate the measures of the " Good Parliament," although his death

prevented their com- pletion. He died at Westminster, 8th June 1376. He was buried at Canterbury Cathedral, where his mailed effigy may still be seen.

See Longman's Life and Times of Edward ITI.; Edward IIT. by Rev. W. Warburton, M.A.; Pauli's Aufséitze eur Englischen

Geschichte (Edward, Der Schwarze Prinz), Leipsic, 1869; and Creighton's Edward the Black Prince.

EDWARDES, Str Herzert Benzamin (1819-1868), major-general in the East Indian army, one of the noblest names on the roll of the soldier-statesmen of the British Indian empire, was born at Frodesley, in Shropshire, November 12, 1819. The family was of high standing. Sir Herbert's father was Benjamin Edwardes, rector of Frodesley, and his grandfather Sir John Edwardes, baronet, eighth holder of the title, which was conferred on one of his ancestors by Charles J. in 1644. After receiving his early education at a private school, he was sent to King's College, London, to complete his studies. Through the influence of his. uncle, Sir Henry Edwardes, he was nominated in 1840 to a cadetship in the East India Company ; and on his arrival in India, at the beginning of 1841, he was posted as ensign in the First Bengal Fusileers. He remained with this regiment about five years, and during this period gave proof of that " great capacity for taking pains" which is the characteristic of genius. He mastered the lessons of his profession, obtained a good knowledge of Hindustani, Hindi, and Persian, and attracted attention by the political and literary ability displayed in a series of letters which appeared in the Delhi Gazette. In November 1845, on the breaking out of the first Sikh war, Edwardes was appointed aide-de-camp to Sir Hugh (afterwards Viscount) Gough, then commander- in-chief in India. On the 18th of the following month he served at the battle of Moodkee, and was severely wounded. He soon recovered 'sufficiently to resume his duties, and fought by the side of his chief at the decisive battle of Sobraon (February 10, 1846), which closed the war. He was soon afterwards appointed third assistant to the con- missioners of the Trans-Sutlej Territory ; and in January 1847 was named first assistant to Sir Henry Lawrence, the resident at Lahore. Lawrence became the great exemplar of the young hero, who looked up to him with the aitectionate reverence of a

disciple and a son, and in later years was accustomed to attribute to the influence of this “father of his public life” whatever of great or good he had himself achieved. He took part with Lawrence in the Suppression of a religious disturbance at Lahore in thie Spring of 1846, and soon afterwards assisted him in reduc- ing, by a rapid movement to Jummoo, the conspirator Imaum-ud-din. In the following year a more difficult task Was assigned him,—the conduct of an expedition to Bunnoo, a tributary Afghan district, in which the people would uot tolerate the presence of a collector, and the revenue had Consequently} fallen into arrear. By his rare tact and fertility of resource, Edwardes succeeding in completely conquering the wild tribes of the valley without firing a shot, a victory which he afterwards looked back upon with More satisfaction than upon other victories which brought 4M more renown. His fiscal arrangements were such as to obviate all difficulty of collection for the future. In the

spring of 1848, in consequence of the murder of Mr Vans Agnew and Lieutenant Anderson at Mooltan, by order of the Dewan Moolraj, and of the raising of the standard of revolt by the latter, Lieutenant Edwardes was authorized to march against him. He set out immediately with a small force, occupied Leia on the left bank of the Indus, was joined by Colonel Cortlandt, and, although he could not attack Mooltan, held the enemy at bay and gave a check at the critical moment to their projects. He won a great victory over a greatly superior Sikh force at Kineyree (June 18), and received in acknowledgment of his services the local rank of major. In the course of the operations which followed near Mooltan, Edwardes lost his right hand, by the explosion of a pistol in his belt. On the arrival of a large force under General Whish the siege of Mooltan was formed, but was suspended for several months in conse- quence of the desertion of Shere Singh with his army and artillery. Edwardes distinguished himself by the part he took in the final operations, begun in December, which ended with the capture of the city, January 4, 1849 For his services he received the thanks of both houses of parliament, was promoted major by brevet, and created C.B. by special statute of the order. The directors of the East India Company conferred on him a gold medal and a good service pension of £100 per annum. After the con- clusion of peace Major Edwardes came to

England for the benefit of his health, married during his stay there, and wrote and published his fascinating account of the scenes in which he had been engaged, under the title of 4 Year on the Punjab Frontier iv 1848-1849. His countrymen gave lim fitting welcome, and the university of Oxford con- ferred on him the degree of D.C.L. In 1851 he returned to India and resumed his civil duties in the Punjab under Sir Henry Lawrence. In November 1853, he was entrusted with the responsible post of commissioner of the Peshawur frontier, and this he held when the Mutiny or Sepoy War of 1857 broke out. It was a position of enormous difficulty, and momentous consequences were involved in the way the crisis might be met. Edwardes rose to the height of the occasion. He saw as if by inspiration the facts and the need, and by the prompt measures which he adopted he rendered a service of incalculable importance, by effecting a reconciliation with Afghanistan, and securing the neutrality of the Amir and the tribes during the war. So effective was his procedure for the safety of the frontier that he was able to raise a large force in the Punjab and send it to co-operate in the siege and capture of Delhi. In 1859 Edwardes once more came to England, his health so greatly impaired by the continual strain of arduous work that it was doubtful whether he could ever return to India. Dnring his stay he was created K.C.B., with the rank of brevet colonel; and the degree of LL.D. was conferred upon him by the university of Cambridge. arly in 1862 he again sailed for India, and was appointed commissioner of Ambala and agent for the Cis-Sutle] states. He had been offered the governorship of the Punjab, but on the ground of failing health had declined it. In February 1865, he was compelled finally to resign his post and return to England. A second good service pension was at once con- ferred on him; in May 1866, he was created K.C. of the Star of India, and early in 1868 was promoted major- general in the East Indian army. It was known that he had been for some time engaged on a life of Sir Henry Lawrence, and high expectations were formed of the work ; but he did not live to complete it. He died in London, December 23, 1868. Sir Herbert Edwardes, great in council and great in war, was singularly beloved by personal friends, and was generous and unselfish to a high degree. He was also a man of deep religious convictions,

and naturally desired and hoped for the evangelization of India. But his zeal was under the restraint of knowledge, and he knew how. to reconcile private aspiration with public duty. Like Sir John Lawrence, he advocated toleration for the native religious systems, and at the same time deprecated Government support of them in any way. “Tndia,” says a writer in the Pall Afall Gazette, “has produced many great men, some of whom have done more for their country, but there were few upon whom the stamp of genius was more visibly impressed than upon Herbert Edwardes.” The life of Sir Henry Lawrence was completed by Mr Herman Merivale, and was published in 1873. EDWARDS, Bryan (1748-1800), the well-known historian of the West Indies, was born at Westbury, in Wiltshire, on the 21st of May 1743. His father died in 1756, and his education and maintenance were undertaken by his maternal uncle, Zachary Bayly, a wealthy West Indian merchant. He had been placed by his father at the school of a dissenting clergyman in Bath, where he received a careful training in English composition; his uncle’s agent, however, removed him to a French boarding school, on discovering that he had received no instruction in classics. Edwards went out to Jamaica to join his uncle, in whom he seems to have found everything he could desire,—the most eulightened mind, the sweetest temper, and the most generous disposition. To this was added a truly paternal regard for himself, which was returned with all the warmth of filial affection, His uncle, finding him possessed of literary talents, but deficient in classical acquirements, engaged a Mr Teale, a clergyman and formerly master of a free grammar-school, as resident tutor for him. The relationship proved a very agreeable one to both teacher and pupil, though the training imparted was somewhat fragmentary. A large proportion of their time was spent in tasting the beauties of Dryden and Pope, and in laughing at the comic sallies of Molitre. Edwards, upon the whole, acquired during this period smal] Latin and less Greek; but he continued to practise composition both in prose and verse, and the two companions sent occasional pieces to the colonial newspapers. On the death of his uncle Edwards succeeded to his property; and, in 1773, he became heir to the much larger estate of Mr Hume, also of Jamaica. In 1784 he published Thoughts on the Proceed- tags of Government respecting the Trade of the West Indian Islands with the United States of America. This was followed by a speech delivered at a free conference between the Council and Assembly at Jamaica, held November 25, 1789, on the subject of

Wilberforce’s propositions con- cerning the slave trade. It was in 1793, however, that he published his great work, on which he had been many years engaged, entitled Z/istory, Civil and Commercial, of the British Colonies in the West Indies, 2 vols. 4to. On the question of slavery and the slave trade he naturally took the planter’s view, but he expressed himself with modera- tion and candour. In 1796 he published, in one volume quarto, a lLislory of St Domingo, wluch had then excited a deep interest, on account of the insurrection of the slaves, and the consequent establishment of an independent negro government. In 1801 a new edition of both these works was published, in three vols. 8vo, under the general title of History of the West Indies. A fifth edition issued from the press in the year 1819. When Mungo Park returned from his celebrated journey in Africa, Edwards, from his oral information, drew up a report of it, which was sub- mitted to the African Society, and published in their Transactions, Park afterwards incorporated the greater part of this into the general narrative of his Z’raveds, in preparing which he availed himself much of the assistance and suggestions of Edwards. After a lengthened residence in Jamaica Edwards returned to England, and in 1796

became M.P. for the borough of Grampound, which he continued to represent till his death, July-15, 1800. He left a short narrative of his life, which was prefixed to the edition of his history published in 1801.
EDWARDS, Gerorce (1693-1773), a celebrated antiquarian and ornithologist, was born at Stratford, in Essex, on the 3d April 1693. He was originally apprenticed to a tradesman in Fenchurch Street, London; but obtaining by accident access toa number of books on natural history, painting, astronomy, and antiquities, he lost his inclination for mercantile pursuits, and acquired a desire for foreign travel. In 1716 he visited the principal townsin Holland, and two years afterwards travelled in Norway and Sweden. In 1719 he went to Paris for the purpose of studying its natural history collections, and during his stay in France he made two journeys of a hundred miles each, the first to Chalons in Charapagne, and the second on foot to Orleans and Blois. On his arrival in England he closely pursued his favourite study of natural history, applying himself to drawing and colouring such animals as fell under his notice, Birds first engaged his

particular attention, and having purchased some of the best pictures of them, he madea few drawings of his own, which were admired by the curious, who encouraged the young naturalist by paying a good price for his early labours. In 1731 he made an excursion to Holland and Brabant, where he collected several scarce books and prints, and had an opportunity of examining the original pictures of several great masters, at Antwerp, Brussels, Utrecht, and other cities. In December 1733, by the recommendation of Sir Hans Sloane, the pre- sident of the college of physicians, he was chosen librarian to that body, and had apartments assigned him in the college. Here he had the opportunity of a constant recourse toa valuable library filled with scarce and curious books on the subject of natural history, which he so assiduously studied. By degrees he became one of the most eminent ornithologists in his own or any other country. He published the first volume of the Z/istory of Birds in 1748, a second volume in 1747, a third in 1750, and a fourth in 1751. In 1/58 he continued his labours under a new title, that of Glean- ings of Natural History. A second volume of the gleanings was published in 1760, and a third in 1764, The two works contain engravings and descriptions of more than six hundred subjects in natural history not before described or delineated. He likewise added a general index m French and English, which was afterwards perfected with the Linnean names by Linnzeus himself, who frequently honoured him with his friendship and correspondence. In 1750 he received the gold medal of the Royal Society, given annually on St Andrew's day to the author of any new discovery in art or nature. He was, a few years afterwards, elected fellow of the Royal Society, and of the Society of Antiquarics, London, an also a member of many of the academies of sciences and learning in different parts of Europe. After the publication of his last work, having arrived at his seventieth year, and finding his sight beginning to fail, aud his hand losing 1s wonted steadiness, he retired from public employment to a little house which he had purchased at Plaistow. The conversation of a few select friends, and the perusal of a few select books, were the amusement of the evening of his life ; and now and then he made an excursion to some of the principal cities in England, particularly to Bristol, Bath, Exeter, and Norwich. His general health began to fail some years before his death, which took place on the July 23, 1773. – EDWARDS, Jonatuan (1703-1758), the most . F guished metaphysician'and

divine of America, was the son 0 the Rev. Timothy Edwards, and of Esther, daughter of the Rev. Solomon Stoddard, of Northampion, and was born at

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East Windsor, Connecticut, October 5, 1703. He was the only son in @ family of eleven children, of whom four were older than himself. Even in his very carly years the religious instruction communicated to him by his parents seems to have engaged a large share of his interest, and to have exercised a strong influence on his character. In a state- ment of his religious views in youth, he says, “I had a variety of concerns and exercises about my soul from my childhood,” and also, “from my childhood up my mind had been full of objections against the doctrine of God’s sovereignty.” In his eighth or ninth year he experienced, he tells us, “‘ two remarkable seasons of awakening ;” but these objections against the doctrine of God’s sovereignty continued to trouble him more or less until about his 17th year, “ when,” he says, “ I seemed to be convinced and fully satisfied as to this sovereignty of God, and his jus- tice in thus eternally disposing of men, according to his sovereign pleasure, but never could give an account how or by what means I was convinced, nor in,the least imagined;at the time, nor a long time after, that there was any extra- ordinary influence of God’s Spirit in it.” Until he entcred college his education was conducted by his father, with the occasional assistance of his elder sisters, At the age of six he began the study of Latin, and in that language, as well as in Greek and Hebrew, he attained to considerable proficiency. In September 1716 he entered Yale College. He took his B.A. degree in 1720, but, with a view to prepara- tion for the ministry he continued his residence at college for two additional years. In 1718 he read Locke on the Human Understanding, and it was from its perusal that his intense passion for abstract thought was first kindled. He declared that it had afforded him “ far higher pleasure than the most greedy miser finds when gathering up hand- fuls of silver and gold from some newly discovered treasure.” He received licence to preach in 1722, and in August of that year, on the invitation of a number of ministers in New England, he went to preach to the Presbyterians in New York, where he continued eight months. He was in- vited by the congregation to continue with them per- manently, but on account of doubts as to his future use- fulness in that particular sphere, he declined their invitation, and returned to

his father’s house at East Windsor. Here he prosecuted his studics in theology and metaphysics till June 1724, when he was appointed tutor in Yale College. About this time he completed the series of seventy resolutions begun during his preparation for the ministry, and designed to “regulate his own heart and life.” No, 11 of thesc may be mentioned as specially characteristic:—‘ Resolved, when I think of any theorem in divinity to be solved, immediately todo what I can towards solving it, if circuinstances do not hinder.” He resigned his tutorship in September 1726, on receiving an invitation from Northampton to become colleague and successor to his grandfather, the Rev. Samucl Stoddard, and in February 1727 he was ordained to that Office. In the following July he was married to Sarah, daughter of the Rev. James Pierrepoint, of Newhaven. He continued at Northampton till June 22, 1750, when, on account of a dispute that had arisen from an attempt on his part to prohibit some of the younger members of his congregation from perusing certain books, which in his Opinion were obsccne, he found himself compelled to resign his charge. On learning of his resignation some of his friends in Scotland advised him to settle in that country, and he was also invited to a church in Virginia, but he ac- cepted in preference to cither invitation the proposals made to him by the “Society in London for Propagating the Gospel in New England,” that he should become Missionary to the Housatonnuck Indians, wlio were settled at Stockbridge, Berkshire Co., Massachusetts. The nature of his work now left him in possession of considerable

leisure, of which he made use to such advantage that, within the six years of his residence at Stockbridge, he completed four of his principal treatises, including that on the Freedom of the Will, which was published in 1754. On account of the fame which this work acquired for him he was in 1757 called to succecd President Burr of Princeton College, New Jersey. He was installed February 16, 1758, but was scarcely spared to enter upon the perfor- mance of his duties. On account of the prevalence of small-pox in the neighbourhood, he submitted to inocula- tion and the disease taking an unfavourable turn, he died on the 28th March. Edwards says of himself that he possessed “a constitution in many respects peculiarly unhappy, attended with flaccid solids, vapid, sizy, and scarce fluids, and a low tide of spirits,

often occasioning a kind of childish weakness and contemptibleness of speech, presence, and demeanour.” Notwithstanding this unhappy constitution, he was throughout life a laborious student, often prosecuting, pen in hand, his arduous metaphysical researches for thirteen hours daily. As an orator he some- times held not only the feelings but the intellects of his hearers completely under his sway. ‘The extraordinary influence which he thus exercised was not due to any personal advantages, for even when his oratory was most effective the ‘contemptibleness of his speech and deraeanour ” still remained, although it was no longer felt by his hearers, nor to any special excellences of style, for though his language conveyed his nieaning without ambiguity, it did so not only without any of that peculiar felicity of arrangement which is usually one of the chief clements of successful oratory, but in a bald, even in a lumbering and awkward, manuer. His eloquence was simply intense moral carnestness, expressed in the form of what, in more senses than one, might be called “ merciless logic.” His writings present a very remarkable conjunction of apparently contradictory qualities, a conjunction attribut- able partly to a peculiar combination of natural mental characteristics, and partly to a habit of solitariness which rendered him almost completely ignorant of the dominant tendencies of contemporary thought, and placed him almost beyond the reach of any external influences fitted to aid him in freeing himself from the shackles of past systems. The outstanding features of his character were undoubtedly his sense of reverence and his passion for ratiocination. In one respect these two opposite characteristics combined to produce a harmonious result, namely, to impress him with an almost overwhelming conviction of the claims of duty. His awe of the Supreme Power was in one aspect of such a nature as to seem consistent only with the grossest superstition, but from the very fact that it was the awe of an intellect, within the sphere of logic, so keen and penetrating, it was necessarily a moral awe, an awe which intensified that sense of duty whose requirements his logical faculty revealed with a distinctness which admitted of no fallacy or evasion. It was his overwhelming convic- tion of duty which gave to his system, theological, moral, and metaphysical, what unity it possesses. That unity is, however, nothing more than seeming; the positive and negative elements are held apart in different spheres ; if they were brought into contact the necessary result would be an utterly destructive explosion. The basis of his whole system is the “sovereignty of God;” and of his conviction of God’s

“sovereignty ” he tells us that of how or by what means he arrived at it he could give no account. This mysterious and unaccountable conviction he, however, endeavours to justify by a protracted logical process, with- out being at all conscious of any incongruity between means and end, ‘This unconsciousness is due to the fact that the strength of his original conviction prevented him from dis- cerning the real difficulties he had to surmount. We have VII. — 87

thus presented to us the spectacle of a mystic endeavouring to expound his belief by a mere process of reasoning, almost mathematical in its cold and definite precision and in its rigour. Jt is quite possible that his strong pre- possessions would in any case have prevented him from estimating at their proper importance the new problems that were beginning to appear on the horizon of con- temporary thought, but, so far from having given these problems the attention necessary in order to understand them, he was) scarcely aware of their existence. The impulse he received from Locke’s Essay on the Human Understanding did not lead him to seek full acquaintance with the whole circle of the philosophical speculation of his time,—partly no doubt because his circumstances prevented him from doing so, but partly also because he had a strong bias towards the ‘pursuit of solitary trains of thought. In his essay on the /reedom of the Will he confesses having never read Hobbes; and although he mentions in a letter having read one of Hume’s works, this would appear to have been subsequent to the publication of the essay on the Freedom of the Will, and its perusal does not seem to have impressed him with any idea of its author’s exceptional metaphysical ability, for he merely says of it and of some other books, “I am glad of an opportunity to

read such corrupt books, especially when written by men |

of considerable genius, that I may have an idea of the notions which prevail in our country.” He was scarcely conscious of the presence of the new influence which was then stirring the stagnant waters of speculation; but it certainly influenced him unconsciously, and compelled him to check his vague unrest by more stedfastly clinging to his old convictions. He

succeeded in doing so, but not without the exercise of constant watchfulness, for, apart from any

immediate external influence, his strong and eager logical |

faculty seems often as if bent on carrying him beyond the bounds of traditional opinion, and requires frequently to be pulled up with a certain measure of abruptness.

The theological system of Edwards emphasized all the sterner ;

features of Calvinism and revealed them in strong relief, Calvinism in its original form was founded on ‘“God’s sovereignty ”

a logical completeness not previously attempted. ment he employs to establish his propositions is unanswerable as against the Libertarians of his time, for he shows conclusively that their plight is, if anything, rather worse than his own; but when he seeks to go beyond this very circumscribed sphere he involves himself in a labyrinth of scholastic quibbling, where all that seems to present itself is only a choice of two evils,—either to remain for ever utterly bewildered by the contradictory paths which open up before him, or by selecting one of them to wander irre- vocably beyond the bounds of wliat he recognized as orthodox. We have an example of this when he endeavours to prove that though men are born utterly depraved, God is not the author of their depravity. His theory is that Adam was originally possessed

of two principles,—one which may be called natural, being the |

mere principles of human nature, or as it is called in Scripture the jlesh, and another called the supernatural principle, or as in Scrip- ture the divine natwre. When Adam ate of the tree of forbidden fruit the divine nature was withdrawn from him, and thus his nature

became corrupt without God infusing any evil thing into it. ‘‘So,” »

says Edwards, ‘‘does the nature of his postcrity ; they come into the world mere flesh, and entirely under the government of natural and inferior

principles.” Here it will be seen, not only that Edwards appears to very little advantage as a reasoner, but that he is in imminent peril of overthrowing the central position of his own system ; for, first, if to represent sin as a merely negative quality in any degree solves the difficulty of God being its author, it does go at the cxpense of denying to it a real existence ; and secondly, to re- present men as born into the world “mere flesh” entirely destroys the distinction, so essential to Edwards’s system, between “moral and natural inability.” He soon, however, escapes back to his old position although not by the way he set out. ‘If any,” he says,

should object to this that, if the want of original righteousness be thus according to an established course of nature, then why are not principles of holiness, when restored by divine grace, also com-

extreme statements regarding { unable to proceed a step in his argument without committing him- and ‘‘man’s depravity by nature,” but the |

inferences implied in these statements are set forth by Edwards | in their terrible and repulsive aspects with a thoroughness and }

The argu- ©

municated to posterity, I answer, the divine law and establishments of the Author of nature are precisely settled by Him as He pleaseth, and limited by His wisdom.”

The moral theory of Edwards is but a corollary from his theolo- gical system. Virtue he places in love or benevolence towards being in general, or more accurately in a ‘‘ disposition to benevolence towards being in general,” for he does not mean to affirm that ‘‘ every virtuous act must have universal existence for its direct and immediate object,” but merely that ‘no affections towards parti- cular persons or leings are of the nature of true virtue, but such as arise from a generally benevolent temper.” He shows that this love cannot be primarily a ‘‘love of complacence,” that is, a love having any regard to excellence in the object, for that “would be going in a circle, and the same as saying that virtue consists in love to virtue,” and that

it cannot consist in ‘gratitude, or one being benevolent to another for his benevolence to him,” because ‘‘this implies the same inconsistence;” cgnsequently that ‘the first object of a virtuous benevolence is being simply considered, and, if being simply considered, then being in general.” There is, however, ‘‘a second object of a virtuous propensity of heart, namely, benevolent being, for one that loves being in general will necessarily value good-will to being in general.” ‘True virtue must, therefore, chiefly consist in love to God, for ‘‘he that has true virtue, con- sisting in benevolence to being in general, and in benevolence to virtuous being, must necessarily have a supreme love to God both of benevolence and complacence.” This theory he applies to support the theological dogma that no one whose virtuous acts are not the result of real conscious love to a personal God can possess any tre righteousness, or be in any other moral condition than that of utter depravity. As to the merits of the thcory in itself, these are not helped by the form in which it is stated. Being in general, being without any qualities, is too abstract a thing to be the primary cause of love. The feeling which Edwards refers to is not love, but awe or reverence, and, moreover, necessarily a blind awe. Properly stated therefore, true virtue, according to him, would con- sist in a blind awe of being in general, and a love of complacency to those who possess a blind awe of being in general—only this would be inconsistent with his definition of virtue as existing in God. In reality, as he makes virtue merely the second object of love, his theory becomes identical with that utilitarian theory with which the names of Hume, Bentham, and Mill are chiefly associated ; but it is utilitarianism necessarily expressed in very awkward terms, because these are hampered by its derivation from certain theological

wrinciples, and its necessary connection with a theological belief.

nlike Hume and Mill, he deduccs his theory primarily from certain scholastic propositions regarding God’s purpose in the creation of the world. He accepts the Scripture statement that God makes himself his own chief end, and he endeavours by scholastic reason- ing to!show the ‘‘ reasonableness ” of his doing so. He is, however,

self to such pantheistic statements as that ‘‘ God’s existence, being infinite, must be equivalent to universal existence,” and that “the eternal and infinite

Being is in effect being in general, and com- prehends universal existence." He is, therefore, obliged to confess that ‘‘there is a degree of indistinctness and obscurity in the close consideration of such subjects," and to fall back ‘on revelation as the surest guide in these matters ;" although ‘affirming at the same time that, in his endeavours ‘‘to discover what the voice of reason is so far as it can go," he has been successful in ‘‘ obviating cavils insisted on by many."

The fame of Edwardsis associated chiefly with his treatise on The Freedom of the Human Will. The will is defined by him as that by which the ‘‘mind chooses anything." By ‘determing the will" he means ‘‘ causing that the act of the will or choice should be thus and not otherwise." And, ‘‘ with respect to the inquiry, What determines the will?" he answers, ‘It is that motive which as it stands in the view of the mind is the strongest." Liberty, according to him, belongs not to the will itsclf, but to the person, and the liberty which any one possesses is merely liberty to act as he wills. Any other kind of liberty, he affirms, implies three sw pposi- tions :—(1) ‘‘A self-determining power in the will," (2) " Indiffer- ence,—that previous to the act of volition the mind is in a state of equilibrium;"’ and (8) ‘‘Contingcuce,—that events are not necessarily connected with their causes." These suppositions, as involving in different forms denials of the law of causality, are severally shown to bejabsurd. That Edwards demonstrates the position of his opponents to be utterly untenable must without the least qualifica- tion be admitted; but he is unconsciously equally successful in overthrowing his own theological position. "Accordingly Edwardss theory of the will, like his ethical theory, is now held only by those who, in regard to the supreme power, are agnostics. His theory differs in no respect from that of John Stuart Mill, except that his statement of the law of causality isa little confused, an that he gives a different account of the origin of our knowledge of causality. He so far anticipated Hume as to recognize that by cause is often meant ‘‘any anteccdent with which a consequent event is so connected that it truly belongs to the reason why the

proposition which affirms that event is true, whether it has any positive influence in producing it or not." There is, of course, some confusion here,

as the word ‘‘reason”’ is, inthe position in which it stands, ambiguous, showing that Edwards never properly grasped. the distinction between causality and mere sequence ; and further differing from Hume in reeognizing that there are causes which have a positive influence in producing their effects, his state- ments are rendered additionally perplexing by his unconsciously making use of either signification of the word eause, according to the exigencies of his argument. Thus he makes our knowledge not only of the law of positive causality but of mere sequence to depend not on experience but on a primary intuition ‘‘implanted by God in the minds of all mankind,” which is virtually a con- tradictionin terms. There is also the further difficulty as to how, con- sistently with his theory in regard to the will, he can hold any other dovtrine regarding causality than that it is that mere sequence which experience enables us to believe in; for it seems impossible that we can have a primary intuition of causality unless from the conscious- ness of our own casual energy.

That part of Edwards’s argument in which he most decidedly fails is-his endeavour to reconcile his theory of the will with his own views in regard to moral agency, and more particularly in regard to the nature of reward and punishment. John Stuart Mill admits that, on his own theory, the only ends that can justify punishment are the benefit of the offender himself and the pro- tection of others, and the only “feeling of accountability” he con- tends for is that ‘‘ caused by the experience of punishment.” It has been disputed whether even the kind of punishment contended for by Mill is on his theory justifiable, but he has endeavoured to obviate objections to it by distinguishing between what he calls ‘modified fatalism’? and what he ‘calls the ‘‘true doctrine of causation.” The distinction is similar to that drawn by Edwards between ‘‘ moral” and ‘‘natural” necessity. It may be questioned whether Mill’s doctrine of causality leaves room for this distinction, but undoubtedly Edwards’s.doctrine does not ; for by tracing our knowledge of causality not to experience but to a primitive intuition, he becomes not merely a ‘‘determinist,” but a ‘‘necessitarian.” Whether the doctrine of the will held by Edwards, Hume, and Mill be the correct one, or whether the true solution of the problem or its true statement is to be found in some form of the transcen- dental philosophy which received its great impulse from Kant, it is not our province to inquire ; but there need be no hesitation in affirming both that Edwards is successful in pe that the doc-

trine of the freedom of the will must be stated in different terms and justified by different methods than those employed up to his time, and that, on account of his attempting to build on principles so widely removed from each other as to be utterly irreconcilable, his own well-planned structure, notwithstanding extraordinary ap- plications of architectural skill, inevitably collapses.

The collected works of Jonathan Edwards, including a large number of sermons, were first published at Worcester, Mass., 1809, in 8 vols. 8vo. Among various other editions afterwards published may be mentioned that by his relative Sereno E. Dwight, 1830, in 10 vols., containing a memoir by Dr Dwight. This edition, with an introductory essay by‘Henry Rogers, was published at London in 1840, in two yols. Edwards’s principal treatises are: —Religious Affections (1746) ; Life of Brainerd (1749) ; reedom of the Will (1754); God’s Last End in the Creation of the World (1755); Original Sin (1758); the uncompleted History of Redemption (1777); aud Nature of Virtue (1788). There is an intercsting skctch of Edwards’s life, character, and opinions in Leslie Stephen’s Hours in a Library (2d series, 1876). (I. F. H.)

EDWARDS, Ricuarp (1523 17-1566 2), a musician and writer of interludes, was born in Somersetshire, studied at Corpus Christi College, Oxford, took his master of arts degree in 1547, entered at Lincoln’s Inn, and was appointed in 1561 a gentleman of the royal chapel and master of the singing boys. He probably died about the end of 1565, as his epitaph was written by Turberville in the following year. A “tragedy” from his pen—-possibly, in spite of the designa- tion, the comedy of Damon and Pithias—was acted before Queen Elizabeth at Christmas 1564; and on September 3, 1566, the same honour was accorded to his Palamon and Arcite. The latter play was never printed, and like most of the author’s productions is now lost, but the former, entered at Stationers’ Hall in 1567-8, appeared in 1571 with the title of “The excellent Comedie of two the moste faithfullest freendes, Damon and Pithias,” was reprinted in 1582, and may be found in Dodsley’s Old Plays, vol, i, and Ancient British Drama, vol.i. It is written in rhymed lines of rude construction, varying in length and neglecting the cesura, and, according to A. W. Ward, it is “one of the clumsiest of our early plays, both

in action and in language.” Its principal subject is tragic, but it 1s interlarded with scenes of vulgar and witless farce. A

number of the author’s shorter pieces are preserved in the Paradise of Dainty Devices, first published in 1575, and reprinted in the British Bibliographer, vol, iii. ; the best known are the lines on May, the Amantiwm Ire, and the Commendation of Music, which has the honour of furnish- ing a stanza to Romeo and Juliet. The Historie of Damocles and Dionise is assigned to him in the 1578 edition of the Paradise. In his own day Edwards was held in the highest estimation. ‘ He united,” says Warton, “all those arts and accomplishments which minister to popular pleasantry; he was the first fiddler, the most fashionable sonneteer, the readiest rhymer, and the most facetious mimic of the court.”

See, besides the numerous authorities given by Allibone in Diet. of Brit. and Amer. Authors, the Shakespeare Soe. Papers, vol. ii. art. vi.; Ward, English Dram. Literature, vol. i.

EDWIN, or Eapwine, king of Northumbria, was the son of Ailla, king of Deira, and was born about 586. At the death of Aflla, in 588, Ethelfrid, king of Bernicia, ffilla’s brother-in law, usurped the throne of Deira, and united the two kingdoms Deiiw und Bernicia, under the name of Northumbria. Edwin ultimately found shelter with Reedwald of East Anglia, who, in 617, defeated and slew Ethelfrid near the river Idle, and enabled Edwin to mount the Northumbrian throne. In 625 Edwin’ married Ethelburgha, daughter of Edbert, king of Kent. She had been converted to Christianity, and, at her desire, Paulinus, a Christian missionary, was allowed to enter Northumbria. Not long after Paulinus’s arrival, Eumer, an envoy of the king of Wessex, made an attempt to assassinate Edwin, who was only saved by Lilla, one of his thanes, throwing him- self between him and the assassin’s weapon. The thane was killed, and the sword passing through his body inflicted also a dangerous wound on the king. The queen about the same time was seized by the pangs of childbirth, and,was so alarmed on account of what had happened that she aud her infant were for a time in imminent danger. Paulinus offered up prayers for their recovery, and Edwin was so much impressed by the seeming answer to the petition, that, though he did not at

once adopt the Christian faith, he permitted the infant and twelve of hisShousehold to be baptized. He also declared to Paulinus that if he should succeed in overthrowing the West Saxons, against whom he had determined to make war, he would himself become a Christian, and receive the rite of baptism. After his victorious return he renounced his heathen gods, but it required all Paulinus's powers of persuasion to get him finally to adopt Christianity, and to give it his sanction as the religion of Northumbria. Ultimately, however, he convened a council of his nobles to ask their advice, and when they unanimously declared for the new religion, Coifi, the high priest, at once offered to destroy all the heathen places of worship throughout the land. This was done, and in 628 the Northumbrians flocked in crowds to be baptized by Paulinus. While the introduction of Christianity into Northumbria is the circumstance most worthy of mention in Edwin's reign, it was also remarkable in other respects. So strict was his administration of justice, that it was said that "a woman with her babe might walk scatheless from sea to sea in Edwin's day." He was also the first real Bretwalda, although Ailla, his father, first laid claim to the title. He compelled the sub- mission of the West Saxons, conquered Anglesea and Man by his fleet, and received tribute from all the king- doms south of the Humber, with the exception of Kent. To guard his northern dominion he erected the fortress of Edinburgh or Edwin's burgh. In 633 Penda, king of Mercia, taking advantage of a reaction that was setting in in favour of the old paganism, determined to resist Edwin's authority, and combining with Cadwallader, king of the

Western Britons, defeated and slew him at the battle of Heathfield. *

See Palgrave's History of the Anglo-Saxons, and Green's Short History of the English People.

EDWY, Eapwic, or EpwiIn, surnamed the Fair, an Anglo-Saxon king, was the son of Edmund I., and suc- ceeded his uncle, Edred, on the throne in 955, being then from 16 to 18 years of age. His immediate rule was limited to Wessex, his younger brother Edgar reigning over Mercia with the title of sub-king. On account of the re- lation in which Edwy stood to Dunstan, abbot of Glaston- bury, it is impossible, from the narratives that have been

transmitted to us, to arrive at any certainty as to the inter- pretation to be given to his character, and to the main facts of his reign. It is said that on the day of his coronation he retired early from the banquet to the apartment of Elgiva, whom he undoubtedly recognized as his wife, but who, according to the monks, was related to him within the prohibited degrees ; and that Dunstan, abbot of Glaston- bury, enraged at the affront thus put upon the church, followed him, and not without violence dragged him back to the banqueting hall. Hither for this particular mani- festation of authority, or kecause the king was opposcd to his policy of substituting monks for secular canons and was unable to restrain his domineering spirit, Dunstan was de- prived of his officesand banished from the kingdom. The Mercians, however, revolted, and, proclaiming Edgar sole king, recalled Dunstan to their dominions. It is said also that Odo, archbishop of Canterbury, instigated a plot for separating Elgiva from Edwin, that she was sent to Ireland where her face was disfigured with hot searing irons, and that on her escape to England she was again seized and put to death by torture at Gloucester ; but the monks affirm that the lady who was subjected to this treatment was not Elgiva, but her mother Ethelgiva, who was also the mistress of the king. Edwy died in 958.

EECKHOUT, GeErpranp VAN DEN (1621-1674), a painter, born at Amsterdam on the 19th of August 1621, entered early into the studio of Rembrandt. Though a companion pupil to F. Bol and Govaert Flinck, he was inferior to both in skill and in the extent of his practice; yet at an early period he assumed Rembrandt’s manner with such success that his pictures were confounded with those of his master; and, even in our day, the Resurrection of the Daughter of Jairus, in the Berlin Museum, and the Presentation in the Temple, in the Gallery of Dresden, have been held to represent worthily the style of Rembrandt. As evidence of the fidelity of Eeckhout’s imitation we may cite his Presentation in the Temple, at Berlin, which is executed after Rembrandt’s print of 1630, and his Tobit with the Angel, at Brunswick, which is com- posed on the same background as Rembrandt’s “Philosopher in Thought.” Eeckhout not merely copies the subjects; he also takes the shapes, the figures, the Jewish dress, and the pictorial effects of his roaster. It is difficult to form an exact judgment of Eeckhout’s qualities at the outset of his career. His earliest pieces are probably those in which he more faithfully reproduced Rembrandt’s

peculiarities. Exclusively his is a tinge of green in shadows marring the harmony of the work, a certain gaudiness of jarring tints, uniform surface, and a touch more quick than subtle. Besides the pictures already mentioned we should class amongst early productions on this account, the Woman taken in Adultery, in the Museum of Amsterdam ; Anna presenting her Son to the High Priest, at the Louvre; the Epiphany, at Turin; and the Circumcision, at Cassel, Eeckhout matriculated early in the Quild of Amsterdam. A likeness of a lady at a dressing table with a string of beads, in possession of Mr Von Stummer, at Vienna, bears the date of 1643, and proves

that the master at this time possessed more imitative skill than genuine mastery over nature. As he grew older he succeeded best in portraits, a very fair example of which is the historian Dappers (1669), in the Stidel collection. Eeckhout occasionally varied his style so as to recall in later years the “small masters” of the Dutch school. Waagen justly draws atteution to his following of Terburg in Gambling Soldiers, at Stafford House, and a Soldiers’ Merrymaking, in the collection of the Marquis of Bute, A Sportsman with Hounds, probably executed in 1670, now in the Vander Hoo gallery, and a Group of Children with Goats (1671), in the Hermitage at St Petersburg, hardly exhibit a trace of the artist’s first education, Amongst tle best of Eeckhout’s works Christ in the Temple (1662), at Munich, and the Haman and Mordecai of 1665, at Luton House, occupy a good place. Eeckhout died at Amsterdam on the 22nd of October, 1674.

EECLOO, the head town of a district in the province of East Flanders, Belgium, is situated near tle Lieve, 1] miles N. W. of Ghent. “It is a neat, clean, and well-built town, and possesses a variety of industries, among which are woollen and linen mills, manufactories of tvbacco, chocolate, soap, and starch, breweries, and distilleries, It las also a considerable timber, grain, and cattle trade, Population in 1874, 10,200.

EEL, a name applied more or less generally to all the species of Jfurcenide, a family of soft-finned apodal fishes, but more specially applicable to the species belonging to the sub-family Angudllina, The body throughout the

family of eels is greatly elongated and of snake-like form. The ventral fins are awanting in all the species, while in certain forms, as the Murena, the pectoral fins are also absent. The skin is thick and soft, and is covered over with a glutinous secretion which gives the cel its proverbial slipperiness, It is also sufficiently tough to enable it to be stripped entire from the body, and in some countries the skin is thus used as a bag or purse. Scales, disposed in groups, are present in the eels belonging to the geuus Anguilla, but they are so buried beneath the outer layer or scarf skin as not to be apparent, while in such forms as the conger they are altogether awanting. The bronchial openings are small, and lead into a sac, from which another sac is given off. The gills are thus exposed but slightly to the drying influence of the atmosphere, and it is owing to this, and to the slimy condition of the skin, that eels can exist for a considerable time out of water. According to Dr Giinther, the Murenide comprise 26 genera and 230 species, inhabiting the seas and fresh waters of temperate and tropical regions. Of these only the true eels, Anguilla, inhabit fresh water, although most of the latter are likewise marine.

Although abounding in almost every river, lake, and estuary in Europe, little was known until recently of the life-history of the fresh-water eels. With regard to their origin Aristotle believed that they sprang from the mud, Pliny that they took their rise from portions of the skin scraped off the parent body, while horse hairs and May-dew have both been regarded as fertile sources of eels. Until quite recently, they were regarded by naturalists 8s viviparous, a mistake which probably arose from the fre- quent presence of parasitic worms, supposed to be the young, in their bodies, and the absence of anything exactly resenibling milt and roe as usually found. Like all other Teleostean fishes they are oviparous, the milt and roe occur- ring in the same position, but differing considerably ™ appearance from those elements in other fishes. The spawn of the eel is generally deposited in sand and mud at the mouths of rivers, and in harbours where the water 1s brackish. To reach these spawning grounds, eels migrate 12 autumn down the river channels, and at those times they

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are taken in large numbers by various devices, such as the “eel-buck” of the Thames, a wooden framework supporting wicker baskets, the mouths of which are opposed to the stream, and which are so constructed that the fish when once inside is unable to extricate itself. When there are obstacles in the way of their getting to the sea, eels are known to deposit their spawn in the beds of fresh-water streams, but it is still doubtful whether this may not also occur in cases where the sea is quite accessible. els are peculiarly averse to cold, and the fact that the temperature of the brackish waters of estuaries is always higher than that of unmixed salt or fresh water is an additional reason for their seaward migration on the approach of winter. In performing this journey the darkest nights are chosen, the moonlight being sufficient to stay their progress. During the cold of winter they lose their appetite and become torpid, large numbers of them congregating togetlier for the sake of the additional warmth thus obtained, and burying themselves to a depth of 12 to 16 inches in places where the receding tide leaves them dry. In such places they are taken in large nnmbers by means of eel-spears. In Somersetshire, according to Yarrell, ‘‘the people know how to find the holes in the banks of the rivers in which eels are laid up, by the hoar frost not lying over them as it does elsewhere, and dig them out in heaps.” In spring, the migration of the young eels up thie rivers takes place, the parents, according to some observers, performing a similar journey. This migration takes place from February to May, according to the temperature, and some idea of the vast numbers of young eels which annually pass up our rivers may be formed from the fact that 1800 of them, each about 3 inches long, have been observed to pass a given point on the Thames in a single minute. This monster procession of elvers, as these young eels are called, is known on the Thames as ee/-fare, and usually takes place about the beginning of May; and at these times, unfortunately, they are often caught in countless numbers in sieves, especially on the Severn, cartloads of them being sometimes seen forsale in the Exeter market. This upward migration, unlike that of autumn, is performed entirely by day, and it is carried through in spite of obstacles apparently insuperable to a fish. Eels have been known to climb up steep ascents, 20 feet above the water, showing great skill and ingenuity in availing themselves of whatever natural aids the locality might afford. Couch tells of a remark- able case in the neighbourhood of Bristol, where the elvers passed from one stream to another by means of a trec which stood between, and the branches of which

dipped into the water of the lower. Ascending by tliese, tlie eels dropped from the branches on the opposite side into the upper stream. In some parts of Ireland the fishermen place haybands on the rocky parts of the river-courses, in order to facilitate the upward progress of the eels. The most effectual obstacle, however, to their advance in either direc- tion is found in a muddy or polluted state of the water ; and old eels, to get rid of such nauseous conditions, have been known to leave the water and travel for considerable distances in search of purer surroundings. Whien confined also in ponds they often show their migratory instinct by leaving these in the night time, and attempting to make their way to the nearest river or to the sea.

_Like most animals that pass the winter in a torpid!con- dition, eels are exceedingly voracious during the summer months, occasionally eating vegetables, but generally preferring such animal food as young fishes, worms, and the larvee of insects ; they have also been known to devour much larger creatures, as water-hens, rats, and snakes. Although their food is thus very various, it is essential that it be fresh, eels at once rejecting whatever their keen sense of smell detects as tainted. Eels were held in great esteem

by the Greeks and Romaus, and enormous prices were sometimes paid for them; by the Egyptians, on the other hand, they were held in abhorrence. Their snake-like appearance has had much to do with the prejudice enter- tained by many people against eels, and to this may be attributed the fact that in Scotland this valuable fish is almost wholly rejected as an article of food. Their value in this respect lias, however, been recognized in England from very early times, the taste for eels having probably been acquired during the Roman occupation, The Vener- able Bede states that England in his time was famous for its salmon and eel fisheries, and Ely is said to have got its name from the abundance of the eels in that fenny neigh- bourhood. Eels are very largely consumed in London, the greater proportion of these, numbering about 10 millions, being brought alive annually from Holland in welled boats. The greatest eel-breeding establishment in the world is that at Commachio on the Adriatic, where an immense swamp, bounded and fed

by two of the mouths of the river Po, 140 miles in circumference, has been utilized for this purpose. The industry is very ancient, having yielded in the 16th century an annual revenue to the Roman Pontiffs, in whose territory it was, of £12,000. The eels are cooked at Clommachio, and forwarded to the principal towns of Italy.

The best known and most widely distributed fresh-water species is the Sharp-nosed Kel (Anguilla vulgaris). It occurs, according to Dr Giinther, in Europe to 64° 30’ N. lat., in the Mediterranean region, and in North America, but neither in the Danube, nor in the Black and Caspian Seas. Like all other eels it is of comparatively slow growth, but often attains a large size, measuring sometimes 5 feet in length, and weighing in such cases from 20 to 30 ib. Few eels, however, weigh more than 6 tb. They are belicved to be long-lived, one authentic instance being known of an eel which was at least 31 years old. The colour of the specics is generally dark olive-green on the upper surface, becoming lighter on the sides, and white beneath; but the colour depends somewhat on the nature of the stream it inhabits, those obtained in pure water being known as silver cels from the lightness of their colour, while those found in muddy rivers are darker.

The Conger (Conger vulgaris) is the only British species of scaseel. It differs from the true eels in having the upper jaw projecting beyond the lower, and in the entire absence of scales. It is abundant in all parts of the British coasts, especially on rocky ground, and attains a length of 10 feet, weighing in large examples over 100 1b. The conger is exceedingly voracious, feeding on other fishes, and not sparing even its own kind. Its jaws are strong and well-armed, and the capture of a large specimen is not unattended with danger to the fisherman. Its tail is exceedingly sensitive and prehensile, the conger being able with this organ to grasp the gunwale of the boat, and by a sudden contraction of the muscles to throw itself overboard, a smart blow on the tail, however, is sufficient to prevent the possibility of this occurrence. The conger is peculiarly sensitive to cold, and during sevcre frosts it is often taken floating helplessly on the surface of the sea. Mr F. Buckland states that in 1855 thousands of congers were found floating upon the water; they could progress readily in any direction on the surface, but could not descend, and consequently fell an easy prey to the boat- men. In this way,no less than 80 tons were captured. “‘ The action of

the frost," he says, "' caused the air in their swimming bladders to expand so much that the ordinary muscles could not expel it at will." The chief conger fisheries are on the south and west coasts of England, but these are not ngarly so productive now as they formerly were. The flesh is not held in much esteem.

The Electric: Eel (Gymnotus electricus) belongs to a different faniily of apodal fishes (Gymnotide). In it both caudal and dorsal fins are entirely awanting, and the anal fin is very long, forming a fringe from the throat to the extremity of the tail. It attains a length of 5 or 6 feet, and frequents the marshes of Brazil and the Guianas, where it is regarded with terror, owing to the formidable electrical apparatus with which it is provided, and which extends along each side of the lower portion of the tail. When this natural battery is discharged in a favourable position, it is sufficiently powerful to kill the largest animal ; and, according to Humboldt, it has been found necessary to change the line of certain roads, owing tothe number of horses that were annually killed in passing through the pools frequented by the gymnoti. These eels are eaten by the Indians, who, before attempting to capture them, seek to exhaust their electrical power by driving horses into the ponds. By repeated discharges upon these, they gradually expend this marvellous force ; after which, being defence- less, they become timid, and approach the edge for shelter, when they fall an easy prey to the harpoon of the Indian. It is only after long rest and abundance of food, that this fish is able to resume the use of its subtle weapon. (J. G1.)

EFFIGIES, Monumentat.—In the course of the twelfth century the idea appears, for the first time, to have been carried into effect that the figure of a deceased personage should be represented by effigy upon his monu- mental memorial. These earliest attempts at commemora- tive portraiture were executed in low relief upon coffin-lids of stone or purbeck marble, some portions of the designs for the most part being executed by means of incised lines, cut upon the raised figure. Gradually, with the increased size and the greater architectural dignity of monumental structures, effigics attained to a high rank as works of art, so that before the close of the 13th century, very noble examples of figures of this order are found to have been

executed in full relief ; and, about the same period, similar figurcs also began to be engraved, either upon monumental

slabs of stone or marble, or upon plates of metal, which |

were affixed to the surfaces of slabs that were laid in the pavements of churches. Engraven plates of this class, known as “ Brasses,” continued in favour until the era of the Reformation, and in our own times their use has been revived. It seems probable that the introduction and the prevalence of flat engraven memorials, in place of com- memorative effigies in relief, were due, in the first mstance, to the inconvenience and obstruction resulting from increasing nunibers of raised stones on the pavement of churches ; while the comparatively small cost of engraven plates, their high artistic capabilities, and their durability combined to secure for them the popularity they unques- tionably enjoyed. It will be kept in remembrance that, if considerably less numerous than contemporary incised slabs and engraven brasses, effigies sculptured in relief, and with some exceptions in full relief, continued for centuries to constitute the most important features in more than a few medieval monuments. In the 13th century, it must be added, their origin being apparently derived from the en- deavour to combine a monumental effigy with a monumental cross upon the same sepulchral stone, parts only of the human figure somctimes were represented, whether in sculpture or by incised lines, as the head or bust, and occasionally also the feet; in some of the early examples of this curious class the cross symbol is not introduced, and after a while half-length figures became common.

Except in very rare instances, that most important element which may be distinguished as genuine face-portraiture is not to be looked for, in even the finest sculptured effigies, earlier than about the middle of the 15th century. In works of the highest order of art, indeed, the memorials

of personages of the most exalted rank, from an early period in their existence effigies may be considered occasionally to have been portraits properly so called; and yet even in such works as these an approximately correct general resemblance but too frequently appears to have been all that

was contemplated or desired. At the same time, from the first, in these monumental effigies we possess con- temporary examples of vestments, costume,! armour, weapuus, royal and knightly insignia, and other personal appointments and accessories, in all of which accurate fidelity has been certainly observed with scrupulous care and minute exactness. Thus, since the monumental] effigies of England are second to none in artistic merit, while they have been preserved in far greater numbers, and generally in better condition than in other countries, we may claim to possess in unbroken continuity an unrivalled series of original personal representations of the successive generations of our predecessors, very many of them being, in the most significant acceptation of that term, veritable contemporaneous portraits.

Till recently esteemed to be simply objects of antiquarian curiosity, and at no distant period either altogether disregarded or too often subjected to injurious indignity, the monumental effigies of England still await the formation of a just estimate of their true character and their consequent worth in their capacity as authorities for face-portraiture. In the original contract for the con- struction of the monument at Warwick to Richard Beauchamp, the fifth earl, who died in the year 1439, it is provided that an effigy of the deceased noble should be executed in gilt bronze, with all possible care, by the most skilful and experieuced artists of the time ; and the details of the armour and the ornaments of the figure are specified with minute particularity and precision. It is remarkable, however, that the effigy itself is described only in the general and decidedly indefinite terms— “an image of a man armed,” ‘There is no provision that the effigy should even be “an image” of the earl; and much less is there a single word said as to its being such a “counterfeit presentment” of the features and person of the living man, as the contemporaries of Shakespeare had learned to expect in what they would accept as true portraiture. The effigy, almost as perfect as when it left the sculptor’s hands, still bears witness, as well to the conscientious care with which the conditions of the contract were fulfilled, as to the eminent ability of the artists employed. So complete is the representation of the armour, that this effigy might be considered actually to have been equipped in the earl’s own favourite suit of the finest Milan steel. The cast of the figure also evidently was studied from what the earl had been when in life, and the countenance is sufficiently marked and endowed

with the unniistakable attributes of personal character. Possibly such a resemblance may have been the highest aim in the image-making of the period, somewhat before the middle of the 15th century. Three- quarters of a century later, a decided step further m advance towards the requirement of fidelity in true portraiture is shewn to have been taken, when, in his will (1510 a.v.), Henry VII. spoke of the effigies of himself and of his late queen, Elizabeth of York, to be executed for their monument, as “an image of our figure and another of hers.” The existing effigies in the Beauchamp chapel and in Henry VII.’s chapel, with the passages just quoted re eee ee __™

1 Jt is well-known that the costume of effigies, almost as 4 rule, represented what was actually worn by the remains of the person ogm- memorated, when prepared for interment and when lying in state } and, in like manner, the aspect of the lifeless countenance, even i not designedly reproduced by medieval ‘‘image ” makers, may, long have exercised a powerful influence upon their ideas of consistent monumental portraiture.

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from the will of the Tudor king and from the contract made by the executors of the Lancastrian earl, with remarkable significance illustrate the gradual development of the idea of true personal portraiture in monumental effigies, during the course of the 15th and at the com- mencement of the 16th century in England. A glance upwards naturally first rests on the royal effigies still preserved in this country, which commence in Worcester Cathedral with King John. This earliest example of a series of effigies of which the historical value has never yet been duly appreciated is rude asa work of art, and yet there is on it the impress of such individuality as demonstrates that the sculptor did his best to represent the king. Singularly fine as achievements of the art of the sculptor are the effigies of Henry III., Queen Alianore of Castile, and her ill-fated son Edward II., the two former in Westminster Abbey, the last in Gloucester Cathedral ; and of their fidelity also as portraits no doubt can be entertained. In like manner, the effigies of Edward III. and his queen Philippa, and those of their grandson Richard II. and his first consort, Aune of Bohemia (all at Westminster), and of their

other grandson, the Lancastrian Henry, whose greater might made his better right to Richard's throne, with his second consort, Joan of Navarre, at Canterbury— these all speak for themselves that they are true portraits. Next follow the effigies of Henry VII. and Elizabeth of York,—to be succeeded, and the royal series to be completed, by the effigies of Queen Elizabeth and the hapless Mary Stuart, all of them in Westminster Abbey. Very instruc- tive would be a close comparison between the two last- 'named works and the painted portraits of the rival queens, especially in the case of Mary, whose pictures differ so remarkably from one another.

As the 15th century advanced, the rank of the personage represented and the character of the art that distinguishes any effigy will go far to determiue its portrait qualities. Still later, when more exact face-portraiture had become a recognized element, sculptors must be supposed to have aimed at the production of such similitude as their art would enable them to give to their works ; and accordingly, When we compare effigies with painted portraits of the same personages, we find that they corroborate one another. The prevalence of portraiture in the effigies of the 16th and 17th centuries, when their art generally underwent a palpable decline, by no means raises all works of this class, or indeed the majority of them, to the dignity of true portraits; on the contrary, in these effigies, as in those of earlier periods, it is the character of the art in each parti- cular example that will go far to determine its merit, value, and authority as a portrait. In judging of these latter effigies, however, they must be estimated by the Standard of art of their own era ; and, as a general rule, the eiligies that are the best as works of art in their own

class are the best also and the most faithful in their |

portraiture. The earlier effigies, evidently produced in the teat majority of instances without any express aim at exact portraiture, as we now employ that expression, have nevertheless strong claims upon our veneration. Often their sculpture is very noble; and even when they are rudest as works of art, there rarely fails to be a rough gtandeur about them, as exhibited in the fine bold figure of Fair Rosamond's son, Earl William of the Long Sword, Which reposes in such dignified serenity in his own cathedral at Salisbury. These effigies may not bring us closely face to face with the more remote

generations of our ancestors, but they do place before us true images of what the men and women of those generations were. Observant students of monumental effigies assuredly Will not fail to appreciate the singular felicity with which

the medieval sculptors adjusted their compositions to the.

recumbent position in which their “ images ” necessarily had to be placed. Equally worthy of regard is the manner in which not a few monumental effigies, and particularly those of comparatively early date, are found to have assumed an aspect neither living nor lifeless, and yet im- pressively life-like. The sound judgment also, and the good taste of those early sculptors, were signally exempli- fied in their excluding, almost without an exception, the more extravagant fashions in the costume of their era from their monumental sculpture, and introducing only the simpler but not less characteristic styles of dress and appointments. In all representations of monumental effigies, it must be kept in remembrance that they represent recumbent figures, and that the accessories of the effigies themselves have been adjusted to that position. With rare exceptions, when they appear resting on one side, these effigies lie on their backs, and as a general rule (except in the case of episcopal figures represented in the act of benediction, or of princes and warriors who sometimes hold a sceptre or a sword) their hands are uplifted and conjoined as in supplication. The crossed-legged attitude of numer- ous armed effigies of the era of mail-armour has been sup- posed to imply the personages so represented to have been crusaders or Knights of the Temple ; but in either case the supposition is unfounded, and inconsistent with unquestion- able facts. Much beautiful feeling is conveyed by figures of ministering angels being introduced as in the act of sup- porting and smoothing the pillows or cushions that are placed, in very many instances, to give support to the heads of the recumbent effigies. The animals at the feet of these effigies, which frequently have an heraldic significance, enabled the sculptors, with equal propriety and effectiveness, to overcome one of the special difficulties inseparable from the recumbent position. In conclusion, it remains only to remark upon the masterly treatment of outline composition which so

honourably distinguishes the earlier examples of the engraven effigies in monumental brasses. (c. B.) EGBERT, or Ecaperut, king of the West Saxons, was born about 775, and laid claim to the throne in 786, but Brihtric was elected, and he was compelled to take refuge with Offa, king of Mercia. Although Offa refused to surrender him when requested by Brihtric, he declined to give him further protection. Egbert thereupon fled to France, and took up his residence at the court of Charlemagne; and it is doubtless to the training he received from that great general and statesman that the success of his reign in Wessex is in a large measure to be traced. When Brihtric was poisoned by his queen Edbrugha in 800, Egbert was recalled and ascended the West Saxon throne. From his reign may be dated the supremacy of the West Saxon kings in England. In 823 he defeated Beornwulf, king of Mercia, at Ellandun (near Wilton) ; and in the same year he united Kent, Essex, and Sussex to his crown, and compelled East Anglia to acknowledge him as its over-lord. In 827 he compelled the ‘submission of Mercia, and leading an army into Northumbria received its submission without trial of battle. In 828 he conquered Wales, and thus the isle of

Britain, with the exception of the Picts, the Scots, and the

Strathclyde Welsh, acknowledged a West Saxon king as its over-lord. During the last period of his reign his kingdom was subjected to repeated attacks by the Danes. In 832 they ravaged Sheppey, and in 833 defeated Egbert at Carrum (thought by some to be Charmouth, in Devon), but in 835 he gained a great victory over a united force of Danes and Welsh at Hengestesdun, in Cornwall. He died in 836. EGEDE, Hans (1686-1758), the first missionary of Greenland, was born in the vogtship of Senjen, in Norway, on the 31st January 1686. In his 22d year he became pastor at Waagen, in the bishopric of Drontheim, but the

study of the chronicles of the northmen having awakened in him the desire to visit the colony of northmen in Green- land, and to convert them to Christianity, he resigned his charge in 1717; and having, after great difficulty, obtained the sanction and help of the Danish Government in his enterprise, he set sail with three ships from Bergen on the 3d May 1721, accompanied by his wife and children. He landed on the west coast of

Greenland on the 3d July, but found to his dismay that the northmen were entirely superseded by the Esquimaux, in whom he had no particular interest, and whose language he would be able to master, if at all, only after years of study. But, though compelled to endure for some years great privations, and at one time to see the result of his labours almost annihilated by the ravages of small-pox, he remained resolutely at his post. He soon gained the affections of the people, and succeeded gradually in converting many of them to Christianity, and in establishing a considerable commerce with Denmark. Ill-health compelling him to return home in 1734, he was inade principal of the seminary at Copenhagen, in which workers were trained for the Greenland mission; and from 1740 to 1747 he was superintendent of the mission. He died in 1758. He is the author of a book on the natural history of Greenland.

EGEDE, Pavut (1708-1789), son of the preceding, ac-

companied lis father to Greenland, assisted him in his labours there, and acted as his successor from 1734 to 1740. On his return to Denmark he became professor of theology in the mission seminary, and afterwards was superintendent of the Greenland mission. He published a Greenland-Danish-Latin Dictonary (1750), Greenland Grammar (1760), and Greenland Catechism (1756). In 1766 he completed the translation, begun by his father, of tlle New Testarnaent into the Greenland tongue; and in 1787 he translated Thomas & Kempis. In 1789 he pub- lished a journal of his life in Greenland.

EGER, the chief town of a circle in the kingdom of Bohemia, is situated on the river Eger, and lies at the foot of one of the spurs of the Fichtelgebirge. It possesses an upper gymnasium and a real-school. In the townhouse, which at that time was the burgomaster’s house, Walleu- stein was murdered, 25th February 1634. His sword and writing table are exhibited in the town. Among the industries of Eger are the manufacture of cloth of various sorts, hats, and shoes. Population in 1869, 13,390.

Previous to the middle of the 12th century Eger and the Egergau formed an allodial possession of the counts of Vohburg ; but they were added to the imperial domains on the marriage of Adelheid of Vohburg with Frederick I. After being repeatcdly transferred from the one power to the other,

according to the preponderance of Bohemia or the empire, the town and territory were finally incor- porated with Bohemia in 1350, after the Bohemian king became the emperor Charles IV. Scveral imperial privileges, however, continued to be enjoyed by the town till 1849. It suffered severely during the Hussite war, during the Swedish invasion in 1631 and 1647, and in the War of the Austrian Succession in 1742. (See Griiber, Die Kayserbury zu Eger, 1865; Drivok, Aeltere Geschichte der Deutschen Reiehstadt Eger und des Reichsgebietes Egerland, 1874.)

EGG, the name given to the body formed in the female reproductive organs, which, when impregnated by the male element, gives origin to the young of animals. Although differing widely among themselves in form and structure, the eggs of all animals are found to consist of the same essential parts, viz., the germ cell, the yolk, and the yolk membrane, one chief difference between them consisting in the relative quantity of the yolk element present, this apparently depending on the degree of development which the young attain before leaving theegg. Thus birds, which leave the shell in a highly developed state, have in their eggs a large quantity of yolk, besides the albumen or ‘“‘ white,” which is added to the egg before it receives the outer calcareous covering, and which, along with the yolk,

serves as a storehouse of food for the young chick during the process ofineubation. In insects, on the other hand, which leave the egg in the immature condition of larvae, the yolk is comparatively small, as it is also in mammals, whose eggs or ova are exceedingly minute, and which owe the high development they attain before birth to nourishment drawn directly from the parent. ‘The majority of animals are oviparous,—that is, the eggs leave the body of the female and are hatclied outside; a few are ovo-viviparous, the eggs being retained in the oviduct until the young are ready to leave ; while mammals are viviparous, the young, after leaving the egg, attaining considerable development before birth, in the womb of the female. In oviparous animals the egg, within certain limits, is proportional in size to that of the adult form to which it gives origin; the larger the bird, for example, the larger, as a rule, is the egg, This, however, is not without

exceptions; thus the egg of tlie guillemot is as large as that of the eagle, and ten times larger than that of the raven, although guillemot and raven are of nearly equal size.

Owing to the fluid nature of the contents of eggs, they are generally roundish in form, although in this respect they also offer considerable variety ; thus the eggs of owls and of turtles are nearly spherical, those of.ducks, crocodiles, and snakes oval, and those of most sea-fowl pear-shaped, The external covering is generally more or less smooth, as in the eggs of birds, but in the case of insects they exhibit the most varied markings, being covered with spies, tubercles, and pits, often symmetrically arranged. Con- siderable diversity also exists in the composition of the outer covering of the egg in oviparous animals; in snakes and lizards it consists of a parchment-like membrane not unlike the inner coating of a hen's egg; in birds, turtles, and crocodiles, there is a hard calcareous shell; in cartilaginous fishes, as sharks and rays, the egg in passing through the oviduct is imbedded in a four-sided horny case, from the corners of which tendrils are given off, by which the egg-capsule is moored to floating sea-weed. These, after the escape of the young fish, are often cast upon the shore, where they are familiarly known as " mermaids' purses." The external covering of the eggs of osseous fishes, as salmon and trout, is exceedingly tough and elastic, "rebounding," says Mr Frank Buckland, "from the floor like an india-rubber ball;" aud this no doubt prevents them from being crushed in the gravelly beds of the running streams in which they are deposited. The eggs of frogs and toads are surrounded with a tough layer of albuminous substance, which expands in water into a transparent jelly. The eggs of the frog occur in great masses, piled together like miniature cannon balls, while those of the toad are con- nected together so as to resemble strings of beads. Among many molluscous animals the eggs are provided with an additional covering or nédus, consisting of a leathery pouch or cup, coutaining a large number of eggs. These capsules are either attached singly, by little stalks, to the rocks as in the common purpura (Purpura lapillus), or are extruded in a compound mass as in the whelk (Buccentwm undatum), Those of the latter were named by Ellis "sea wash balls, from being used by the sailors instead of soap to wash their hands, and are common objects on the sea-shore. The greatest variety exists in the number of eggs produced by different animals, and even among forms

allied to each other. Thus the common snail produces only from thirty to fifty eggs at a time, while other mollusks, as the whelk, deposit their spawn in tens of thousands. Among insects, the white ant is pre-eminently prolific, the queen being said to lay about sixty eggs in a minute, or upwards of 80,000 in a day, and as this probably continues for two years, it is estimated that the total number of her eggs amounts to fifty millions. Among mollusks the spawn OF

spat, a8 it is called, in a single mature oyster, numbers 1,800,000. Among vertebrate animals, fish are the most prolific; the eggs or roe, as they are called, however, often fail to get fertilized by the mzlt of the male, and great quantities are also eaten by fishes and crustaceans, so that they do not increase so rapidly as might be supposed from the enormous number of their eggs. Thus in trout and salmon there are over a thousand eggs to every pound of their weight. According to Buckland (ish Culture) a roach weighing # ib was found to contain 480,480 eges; a herring weighing } tb, 19,840; a turbot of 8 ib weight, 385,200 ; and a cod of 20 ib, 4,872,000. Large quantities of the roe of the cod are used in France as food, and also as bait in the sardine fishery. The sturgeon is also exceed- ingly prolific, the eggs usually forming one-third of the entire weight of the creature ; and in Russia these, in a pre- pared form known as caviare, are much esteemed as a table delicacy. ‘The number of eggs in reptiles and birds is com- paratively small, the common English snake depositing 16 to 20 of these in such situations as dung-hills, where they are left to be hatched by the heat generated in the decom- posing mass. The crocodile buries about 25 eggs on the muddy banks of the rivers it frequents, and the turtle leaves the ocean to deposit from 150 to 200 on the shores of such oceanic islands as Ascension. The eggs of the crocodile are considered a luxury by the natives along the banks of the Nile, while those of the turtle are regarded as special delicacies by people of more refined tastes. Of birds, the most prolific in eggs are those domesticated forms which have been carefully selected by man for centuries, with a view to the improvement of their egg-laying capacity. The chief of these are the duck, which lays an egg daily during the season extending from March to July, and the barn-door fowl, which produces annually about 120 eggs. The rearing of the latter for egg-

producing purposes has now become an important industry in France and Belgium, and in a customs' return just issued (July 1877) it is stated that eggs were imported into Britain last year to the extent of 753 millions, valued at £2,620,000. The number has increased 41 per cent. since 1872, and it is now nearly seven times what it wasin 1856. Besides these, the eggs of the turkey, the guinea fowl, the partridge, and other gallinace- ous birds are in great request as articles of food. The eggs of the guillemot are also occasionally offered for sale in our markets, while these and the eggs of other species of sea- fowl form an important article of food among the western islands and along the north-western sea-coast of Scotland. The largest eggs are those produced by the emu and the ostrich, a single ostrich egg weighing as much as three dozen eggs of the barn-door fowl. These are eaten in Africa both by the natives and by Europeans. From two to five female ostriches are said to deposit their eggs (10 in number) in one nest, and the natives by removing, during the absence of the female, a few of these at a time, taking care not to touch them with their fingers, but using sticks to prevent amy taint of their presence being left behind, get them to continue depositing eggs for a considerable time to supply the place of those removed. The shells are used through- out Africa as drinking-cups. The egg of the moa, some Specimens of which have been found buried in New Zealand,

'Smuch larger than that of the ostrich, measuring in one '

Specimen 10 inches in length and 7 inches broad. A still arger egg has been found fossil in Madagascar, the produce of the extinct epiornis, and having a capacity equal to that of 148 eges of the common fowl. –

4 See Hewitson, Colowred Illustrations of the Eggs of British Birds, vo, 8d ed., London,"1856 ; C. F. Morris, 4 Natural History of the Nests and Eggs of Birds, 3 vols., London ; Lefévre, Atlas des eufs des oiseaus d Europe, 8vo, Paris, 1845 ; Brewer, North American Oology, 4to, Washington, 1859; Bideker, Die Eier der Europé- tschen Vogel, Leipsic, 1863. (Jel

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EGG, Aveustus Lrorotp (1816-1863), a painter, was born on 2d May 1816, in Piccadilly, London, where his father carried on business as a gun-maker.

He had some schooling at Bexley, and was not at first intended for the artistic profession ; but, developing a faculty in this line, he entered in 1834 the drawing class of Mr Sass, and in 1835 the school of the Royal Academy. His first exhibited picture appeared in 1837 at the Suffolk Street Gallery. In 1838 he began exhibiting in the Academy, his subject being a Spanish Girl; altogether he sent twenty-seven works to this institution. In 1848 he became an associate, and in 1860 a full member, of the Academy. In 1857 he took a leading part in selecting and arranging the modern paintings in the Art-Treasures Exhibition in Manchester. His constitution being naturally frail, he went in 1853, with Dickens and Wilkie Collins, to Italy for a short trip, and in 1863 he visited Algeria. Here he benefited so far as his chronic lung-disease was concerned; but, riding out one day exposed to a cold wind, he caught an attack of asthma, which cut him off on 26th March 1863, at Algiers, near which city his remains were buried.

Egg was a gifted and well-trained painter of genre, chiefly in the way of historical anecdote, or of compositions from the poets and novelists. As years progressed, he developed in seriousness of subject-matter and of artistic treatment ; and at the time of his death he might be ranked among our best painters in his particular class—clever, skilled, and observant—although he had not any marked originality of point of view or of style. Among his principal pictures may be named :—1843, the Introduction of Sir:Piercie Shafton and Halbert Glendinning (from Scott's Ifonastery) ; 1846, Buckingham Rebuffed; 1848, Queen Elizabeth dis- covers she is no longer young; 1850, Peter the Great sees Catharine for the first time ; 1854, Charles I. rais- ing the Standard at Nottingham (a study); 1855, the Life and Death of Buckingham; 1857 and 1858, two subjects from Thackeray's Hsmond ; 1858, Past and Present, a triple picture of a faithless wife; 1859, the Night before Naseby; 1860, his last exhibited work, the Dinner Scene from Lhe Taming of the Shrew. The National Gallery contains one of his earlier pictures, Patricio entertaining two Ladies, from the Diable Boiteux; it was painted in

1844.

Egg was rather below the middle height, with dark hair and a handsome well-formed face; the head of Peter the Great (in the picture of Peter and

Catharine, which may be regarded as his best work, along with the Life and Death of Buckingham) was studied, but of course considerably modified, from his own countenance. He was manly, kind- hearted, pleasant, and very genial and serviceable among brother-artists ; social and companionable, but holding mainly aloof from fashionable circles. As an actor he had uncommon talent. He appeared among Dickens's company of amateurs, in 1852 in Lord Lytton's comedy Wot so Bad as we Seem, and afterwards in Wilkie Collins's Frozen Deep, playing the humorous part of Job Want.

EGINHARD is best :known as the biographer of Charlemagne. His name is variously spelled in manu- scripts. Einhardus, Einhartus, Ainhardus, Heinhardus, are the earliest forms. In the 10th century it was altered into Agenardus, and out of this form arose Eginardus and Eginhardus. The French and English languages have adopted this later form; but it is unquestionably wrong, and the weight of authority is for Kinhardus or Einhartus. The circumstances of his life are involved in considerable obscurity, owing partly to the want of information and partly to the doubtfulness or indefiniteness of our authorities. According to the statement of Walafridus Strabo, a contemporary, he was born in the district which is watered by the river Maine in the modern duchy of Hesse-

Darmstadt. Teulet has disputed the genuineness of the document in which the statement is contained, because "it exists only in one manuscript of the 15th century, and it contains an evident anachronism." The anachronism, however, is a mistake on the part of Teulet, for he understands by " pedagogium Sancti Bonifacii" a school taught by St Boniface, whereas it plainly means a school in the monastery of St Boniface, as Jaffé takes it. The date of his birth can only be conjectured, but it must be some- where about the year 770 a.p. His parents were noble, and probably their names were Einhart and Engilfrit. He was educated at the monastery of Fulda. There is documentary evidence that he was resident in that place in the years 788 and 791. Owing to his intelligence and ability he was transferred from the monastery by its abbot Baugolfus to the palace, where he became intimate with the emperor and his family, and received commissions of

great trust and importance. His removal to the palace took place not later than 796.

He was entrusted by the emperor with the charge of public buildings. He thus became one of the imperial ministers, and resided with the emperor at Aix-la-Chapelle. In reference to his artistic skill he received the Scripture name of Beseleel (Exod. xxxi. 27, and xxxv. 30/7), according to a fashion then prevalent of giving aucient names to con- temporaries. Some suppose that he constructed the basilica at Aix-la-Chapelle and the other buildings mentioned in chapter xvii. of his Life of Charlemagne, but there is no express statement to that effect. The emperor employed him in 806 as legate to Rome to obtain the Pope's signature to a will which he had made in regard to the division of his empire. Hence the inference has been drawn that he was the emperor's secretary ; but no contemporary ascribes this office to him.

It was owing to Eginhard's influence that in 813 Charlemagne made his son Louis partner in the empire. Louis, on becoming sole emperor, proved grateful to Eginhard, retained him in the office of head of public works, made him tutcr to his son Lothaire in 817, aud showed him every mark of respect.

Eginhard married Imma, a noble lady, a sister of Bernharius, who was bishop of Worms and abbot of the monastery of Wizenburg. Later tradition converted Imma into the daughter of Charlemagne, and invented a romantic story in regard to the marriage of Eginhard and Imma.! It is doubtful whether he had any offspring. Eginhard addresses a letter to a person called Vusgin, whom he styles "fili," "mi nate." These expressions and the tenderness of the language almost compel the belief that Vussin was his son; but as Vussin is never mentioned in several deeds in which his interests would have been concerned, and in which the names of Eginhard and Imma appear, some have supposed that Vussin was merely a spiritual son.

On January 11, 815, Louis bestowed on Eginhard and his wife the domains of Michelstadt and Mulinheim in the

1 The story of his courtship, although apocryphal, deserves to be noticed, as it frequently appears in literature. He is said to have made a practice of

visiting the emperor’s daughter secretly by night, On one of these occasions a fall of snow occurred which made it im- possible for him to walk away without leaving footprints that would have led to his detection. The risk was obviated by an expedient of Einma, who carried her lover across the court-yard of the palace on her back. The scene was witnessed from a window by Charlemagne, who related it next morning to his counsellors and asked their advice. The severest punishments were suggested for the clandestine lover, but Charlemagne rewarded the devotion of the pair by consenting to their marriage, The story is inherently improbable, and it is further discredited by the facts that Eginhard himself does not mention Emma among the number of Charlemagne’s children, and that a story

similar in its details has been told f Henry ITI. of a daughter of the emperor

Odenwald on the Maine. In the document conveying this property to him he is simply called Einhardus, but ina document of June 2, 815, he is called abbot, Tn becoming abbot he did not dismiss his wife. After this period we find him at the head of several monasteries, Blandigny of Ghent, Fontenelle in the diocese of Rouen, St Bavon of Ghent, St Servais of Maestricht, and St Cloud (but not the St Cloud near Paris), and he had also charge of the church of St John the Baptist at Pavia.

Eginhard began to grow tired of the intrigues and troubles of court life, and in 830 finally withdrew to Mulinheim, which he named Seligenstadt, where he had erected a church to which he had transported the relics of St Marcellinus and St Peter. His wife helped him in all his efforts, and her death in 836 caused him bitter grief, The emperor Louis visited him in his retreat the same year, probably to console him, but Eginhard did not long survive his wife, for he died March 14, 840.

Eginhard was a man of culture. He had reaped the benefits of the revival of education brought about by Charlemagne, and was on intimate terms with Alcuin. He was well versed in Latin literature, and knew Greek. He was very small in body, a feature on which Alcuin wrote an epigram. His most famous work is his Vita Caroli Magni, written in imitation of the Lives of Suetonius. It is the most reliable account of Charlemagne that we have, and

a work of some artistic merit. It was written soon after the death of the great emperor. It was very popular in the Middle Ages. ertz collated upwards of sixty MSS. for his edition.

The other works of LEginhard are—(1) Annales Francorum, extending from 741 a.p. to 829 a.p.; some doubt their authenticity, without good reason; (2) Epistole, handed down only in one MS., now at Laon and of considerable importance for the history of the times; (3) Mistoria Translationis Beatorum Christi Mart yrum Marcellin et Petri, written in 830, and giving a curious narrative of how the bones of the martyrs were stolen and conveyed to Seligenstadt, and what miracles they wrought. To this is added a poem on the same subject. A treatise written by him, De Adoranda Cruce, has not come down to us.

The literature on Eginhard is very extensive, almost all who deal with Charlemagne, early German literature, and early French literature treating of him. The fullest and best accounts are given by Tenlet and Jaffé in their editions.

The modern editions of Eginhard's works are by Pertz in vols. i. and ii. of his Monuwmenta Germanie Historica, Hanover, 1826- 1829; Teulet, Hinhardi omnia qua extant Opera, Paris, 1840; Migne, Patrologice Latina, ton. 104, Paris, 1866 (the Life of Charle- magne is in vol. 97); and Philip Jaffé in vol. iv. of lis Bibliotheca Rerum Germanicarum, Berlin, 1867. 'Teulet's is the handiest and most complete edition, and he deserves special praise in connection with the letters. Pertz and Jaffé published the Life of Charle- magne separately for the use of schools. Teulet gives a full account of all previous editions, of the MSS., and of translations. Some of the other editions contain bibliographical references, A transla- of the Life of Charlemagne has appeared in English by W. Glaister, London, 1877. (J. D.)

EGLANTINE (E. Frisian, egeltiere; French, aiglanter), a name for the sweet-brier, Rosa rubiginosa, and for i. lutea, another species of Lindley's tribe of ose Rubiginose, and apparently the 2. Hglanteria of Linneus. The signification of the word seems to ke thorn-tree or thorn- bush, the first two syllables probably representing the Anglo-Saxon egla, egle, a prick or thorn, while the termina- tion is the Dutch tere, taere, a tree (see Wedgwood, Diet. fing. Etymology). Eglantine is frequently alluded to in the

writings of English poets, from Chaucer downwards. Milton, in L’ Allegro, 1. 48, is thought by the term “ twisted eglantine ” to denote the honeysuckle,

HKGL—EGR

EGLINTON, Arcurpatp Witt1am Montcomerig, THIRTEENTH Ear oF (1812-1861), lord lieutenant of Ireland, was born at Palermo, September 29, 1812. He was the grandson of Hugh, the twelfth earl, and only son of Archibald, Lord Montgomerie, who at the time of his son’s birth held a diplomatic post in Sicily. He was only in his eighth year when he succeeded to the title and estates on the death of his grandfather, in December 1819. The young earl was educated at Eton College ; and for some time his chief object of interest was the turf. He hada large racing stud, and won success and a reputation in the sporting world. In 1839 his name became more widely known in connection with a tournament which he projected, and which was held at his seat in August of that year. At this attempted revival of medieval pageantry, one of the knights was Prince Louis Napoleon, afterwardsemperor ofthe French. The earl of Eglinton was a staunch adherent of the Conservative party, and, on the formation of the first Derby administration in February 1852, he was called from his comparative retirement to fill the office of lord lieutenant of Ireland. He retired with the ministry in the following December, having by the manliness of his character, his affability, and his princely hospitality made himself one of the most popular of Irish viceroys. On the return of the earl of Derby to office in February 1858, the earl of Eglinton was again appointed lord lieutenant, and discharged the duties of this post till June 1859. Before his second retirement he was created earl of Winton in the peerage of the United Kingdom. He had been elected in 1852 lord rector of Glasgow University. The earl was twice married; first, in 1841, to Theresa, widow of Captain R. H. Cockerell, R.N., by whom he had four children. The countess died in December 1853; and in 1858 the earl married the Lady Adela Capel, only daughter of the earl of Essex. He lost his second wife in December 1860, and died suddenly himself at St Andrews, October 1, 1861. He was succeeded in the earldom by his eldest son, Archibald William, Lord Montgomerie.

EGMONT (Ecmonp), Lamorat, Count or, Prince of Gavre (1522-1568), was born in Hainault in 1522. He was the younger of the two sons of John IV., count of Egmont, by his wife Francisca, princess of Gavre, and succeeded to the title and estates on the death of his elder brother Karl, about 1541. In this year he served his apprenticeship as a soldier in the expedition of the emperor Charles V. to Algiers, distinguishing himself in command of a body of cavalry. In 1545 he married Sabina of Bavaria, sister of the Elector Palatine, and the wedding was celebrated with great pomp at Spiers in the presence of the emperor. Soon afterwards Egmont was invested with the order of the Golden Fleece. He accompanied the emperor in the various campaigns and progresses of the following years, was with him at the unsuccessful siege of Metz (1553), and in 1554 was sent to England as head of an embassy to seek the hand of Queen Mary for Philip (II.) of Spain. He was present at their marriage solemnized shortly after at Winchester. In the summer of 1557 Count Egmont was appointed commander of the Spanish cavalry in the war with France; and it was by his vehement persuasion that the battle of St Quentin was fought. The victory was determined by the brilliant charge which he led against the French. The reputation which he won at St Quentin was raised still higher in 1558, when he

encountered the French army under De Thermes at |

Gravelines, on its march homewards after the invasion of Flanders, totally defeated it, and took Marshal de Thermes and many officers of high rank prisoners. The battle was fought against the advice of the duke of Alva, and the victory made Alva Egmont’s enemy. But the count now became the idol of his countrymen, who looked upon him

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as the saviour of Flanders from devastation by the French. He was nominated by Philip stadtholder of the provinces of Flanders and Artois. At the conclusion of the war by the treaty of Cateau Cambrésis, Egmont was one of the four hostages selected by the king of France as pledges for its execution. As stadtholder he now showed some sympathy with the popular discontent excited by the Spanish Government, and particularly by Cardinal Granvella, minister to the regent Margaret. As a member of the council of state he joined the prince of Orange in a vigorous protest addressed to

Philip (1561) against the proceedings of the minister; and two years later he again protested in conjunction with the prince of Orange and Count Horn. He was invited by Philip to go to Spain to confer with him on the subject of the remonstrance, but he declined. Egmont, however, who was a strict Catholic, afterwards spoke in less hostile terms of the minister; and, at the same time that he was courting the favour of the middle classes, he was becoming more a favourite at the court of the regent. In January 1565 he accepted a special mission to Spain to make known to Philip to some extent the state of affairs in the Netherlands and the demands of the people. At Madrid the king gave himan ostentatiously cordial reception, and all the courtiers vied with each other in lavishing profes- sions of respect upon him. But earnest discussion of the real object of the mission was evaded by the king, and Egmont had to return to the Netherlands loaded only with fine words of flattery and promise. At the very same time instructions were sent to the regent to abate nothing of the severity of persecution, and the Inquisition was re- established. Egmont was indignant, and the people were in a state of frenzied excitement. In 1566 a confederation of the nobles (Les Gueux) was formed, the document con- stituting it being known as the Compromise. Egmont then withdrew to his government of Flanders, and showed him- self, after some vacillation, an unscrupulous supporter of the Spaniards and fierce persecutor of heretics. In the summer of 1567 the duke of Alva with an army of veterans arrived in the Netherlands, to supersede the regent Margaret, and to crush with the strong hand the popular opposition. One of his first acts was the treacherous seizure of Counts Egmont and Horn, who were imprisoned at Ghent. A sham process was begun against them, and after some months they were removed to Brussels, where sentence was pronounced by Alva himself on the 4th June 1568. Egmont was declared guilty of high treason and condemned to death, It was in vain that the most earnest intercessions had been made in his behalf by the emperor Charles Ve; the order of the Golden Fleece, the states of Brabant, the electors of the empire, and the regent herself. Vain, too, was the pathetic pleading of Egmont’s wife, who with her eleven children was reduced to want, and had taken refuge ina convent. Egmont was beheaded at Brussels the day after the sentence was pronounced, June 5. He met his end with calm resignation; and in the storm of terror and exasperation to which this tragedy gave rise Egmont’s failings were forgotten, and he and his fellow victim to Spanish tyranny were glorified in the popular

imagination as martyrs of Flemish freedom. This memorable episode proved to be the prelude to the famous revolt of the Netherlands, the issue of which was independence. Goethe made it the theme of a tragedy. In 1865 a monument to Counts Egmont and Horn, by Fraiken, was erected at Brussels. |

Full details may be found in Bercht's Geschichte des Grafen Egmont (1810); Clouet's Eloge historique du Comte d' Egmont (1828) ; Prescott's History of Philip IT. (1855-59) ; Motley's Aése of the Dutch Republic (1856) ; and Juste's Le Comte d'Egmont et le Comte de Hornes (1862).

EGRET. See Heron.

Plate VI.

HEGYPT

GYPT is a country at the north-eastern extremity of

Africa, bounded on the N. by the Mediterranean

Sea, on the 8. by Nubia, on the E. by Palestine, Arabia, and the Red Sea, and on the W. by the Great Desert.

The name of Egypt in hieroglyphics is Kem, which

becomes Kemi in demotic, a form preserved in the Coptic

KHxXLeE (Sahidic), KHALI (Bashmuric), and "HALT (Mem- phitic), with unimportant variants. The sense is 'the black (land)," Egypt being so called from the blackness of its cultivable soil. :

In Hebrew Egypt is called Mizraim, 0°0$'P, a dual, some- times used as a singular.? It describes the country with reference to its two great natural divisions, Upper Egypt and Lower Egypt, or the Delta. In the prophets Mazor, WS), occurs as the singular form, and means Lower Egypt, Pathros being used for Upper Egypt.2 Thus Mizraim may be compared to the two

Sicilies, though some- times we find Mizraim for the lower country where we should expect Mazor. (Gesen. Z'hes. s. v. Mizraim.) The meaning of Mazor is probably the "fortified," rather than the "border," referring to the natural strength of the country.

The Greek Atyurros first occurs in the Homeric writings. In the Odyssey it is the name of the Nile (masculine) as well as of the country (feminine). Afterwards it is not used for the river. No satisfactory Egyptian* or Semitic origin has been proposed for it. The probable origin is the Sanskrit root gup, "to guard," whence may have been formed dgupta, " guarded about," a similar sense to Mazor.5

The Hebrew Mazor is preserved in the Arabic Misr, i¢)

42, pronounced Masr in the vulgar dialect of Egypt.

1 Of. Plut. De Iside et Osiride, cap. 38. Dr Brugsch objects to the idea that Kem may be connected with the biblical patriarchal name Ham DM (forming part of poetic names of Egypt in the Psalms:—'" the land of Ham," cv. 23, 27, cvi. 22; ''the tents of Ham," Ixxviii. 51), on the ground that itis philologically difficult to connect the Egyptian K with 1 (Geogr. Inschr., i. p. 74, note*). This objection would be valid were the case one of a Semitic word transcribed in ancient Egyptian ; it is not so where we have a root which is common, as this may be, to both (¢f Bunsen's Egypt's Place, v. 757, 758). The meaning of the Hebrew root OM is "' hot, warm." The Arabic root

= signifies "it became hot," and describes blackness as a result = Stu- of heat; and the word $las "black mud" also occurs,

- The use of Mizraim as the proper name of an individual appears to be as early as the time of Ramses IJ. Mazrima occurs as the name of a Hittite, the brother of the king (Brugsch, Geogr. Inschr., ii. 25, pl. xviii. 77). The Hebrew dual form is similarly transcribed in Mahaneméa, Mahanaim (ii. 61, pl. xxiv. 22), a word not actually dual, and the Aramaic dual also in Neharina, the Hebrew Naharaim (i. pl. ix. 333).

3 Pathros may take its name from the Pathyrite Nome, so called from its metropolis, P-hat-har (Brugsch, Geogr. Inschr., i. 188, 189, pl. xxvii. 839). As this nome contained Thebes, it might have a signi-

fication like Thebais. De Rougé prefers p-to-res, ‘‘ the country of the south,” or Upper Egypt. (Six Premieres Dynasties, Mém. del Inst., Xxv. li, 281),

“ Dr Brugsch has conjecturally identified Atyumros with Ha-ke-ptah, the sacred name of Memphis, from which the westernmost branch of the Nile, the Canobic, with its two mouths, the Canobic and the Bol- bitine, those best known to the early Greeks, seem to have been called (Geogr. Inschr., i. 83).

® The apparent relation of Alyurros to aiyumids, a vulture, might seem to suggest a mythological origin for the proper name. M. Pictct has, however, most ingeniously traced both to gup, to guard, though his supposition that the name originally was connected with the Shep- herd rule in Egypt must be regarded as hazardous (Origines Indo- Hwropéennes, i. 459,seqq.). It is better to consider it a translation of Mazor, as Ne?Aos of Shihor,

It occurs in the Koran as the name of Egypt (xliii. 50), but has been applied to the country and to its chief capitals since the Arab conquest, El-Fustat, now called Masr-el- ’Ateekah, or Old Masr, and El-K4hireh, the Cairo of the Europeans.®

By the Greeks and Romans Egypt was usually assigned to Asia, though some gave it to Libya, or Africa. This difference was owing to the adoption of the Nile as the division of the two continents, which would naturally have given half of the country to each continent.

In ancient times Egypt was the country watered by the Nile north of the First Cataract, the deserts on either side being assigned to Arabia and Libya.” The Egyptian name, “the black land,” is only applicable to the cultivable land, The Misr of the Arabs is distinctly restricted to the same territory, the adjoining deserts being called the deserts of Egypt. Physically, ethnographically, and politically, the two tracts are markedly different, but it is now usual to treat them as a single country.

PHYSICAL GEOGRAPHY, PRODUCTIONS, AND INHABITANTS,

The political advantages of Egypt, in situation, natural strength, and resources, can hardly be overrated. It lies in the very route of the trade between Europe and Asia, and that between Africa and the other two continents. It is the gate of Africa, and the fort which commands the way

from’ Europe to the East Indics. The natural ports on the Red Sea and the Mediterranean, selected and improved by the wisdom of Alexander and the Ptolemies, whose enter- prises have been eclipsed by those of M. de Lesseps in our own days, have always been enough for its commerce, which the great inland water-way of the Nile has greatly aided. The inhabited country, guarded by deserts and intersected in Lower Egypt by branches of the Nile and canals, in Upper Egypt closely hemmed in by the moun- tains on either side, is difficult to reach and to traverse; at the same time its extreme fertility makes it independent of supplies from other lands, and thus easier to defend. The ancient wealth and power of Egypt should occasion us no wonder, nor even that the country still prospers in spite of centuries of Turkish misrule,

“The extent of the cultivated land in Egypt [Mr Lane calculates] to be equal to rather more than one square degree anda half; in other{words, 5500 square geographi- cal miles. This is less than half the extent of the land which is comprised within the confines of the desert; for mmany parts within the limits of the cultivable land are too high to be inundated, and consequently are not cultivated ; and other parts, particularly in Lower Egypt, are occupied by lakes, or marshes, or drifted sand. Allowance also must be made for the space which is occupied by towns and villages, the river, canals, &c. Lower Egypt comprises about the same extent of cultivated land as the whole of Upper Egypt.”® Since the date when this was wnitten,

Yu ata

§In the Arabic lexicons yma is placcd under the root yaa

. ° * s43 19 66 which in the second conjugation has the sense ‘‘he built cities, hs

commanded a city should be a capital ;” but we also find yaaa

“red mud,” the term used meaning both red and reddish brown. ; 7 Probably the oldest southern boundary was at Silsilis, near Gebel- es-Silsileh. (8 Mrs Poole, Englishwoman in Egypt, i. 85,86. Mr Lane “made his calculation

from a list of all the towns and villages in Egypt, and the =. tent of cultivated land belonging to each. This list is appended to De

DIVISIONS. |

1844, the extent of cultivated land has increased. This has been chiefly due to works of irrigation in Lower Egypt, the increased cultivation of cotton, and the greater facility of transport. The increase cannot, however, be very large.

Divisions.—The ancient like the modern LEgyptians followed the natural division of the country into two tracts, the valley of Upper Egypt and the plain of Lower Egypt. The names in hieroglyphics are to-res, the “ south land” (compared, with the article prefixed, p-to-res, to Pathros by M. de Rougé), and to-mehit, the “north land.” The two were divided by the southern boundaries of the highest nomes of Lower Egypt, the Memphite and Heliopolite, and thus the political boundary was somewhat south of the position where the valley extends into the plain. The most southern nome of Upper Egypt was called that of Nubia, and began at Silsilis. The Greek and Roman division excludes the Memphite Nome from Lower Egypt.

It is not known at what date Egypt was first divided into the provinces called Nomes. They are noticed in in- scriptions of Dynasty IV. (Brugsch, Geogr. Inschr., i. 93), and their symbol occurs in the name of Hesp-ti, “ the two nomes,” fifth king of Dynasty I., Manetho’s Usa- phaidos.1 The hieroglyphic name is hesp. In late in- scriptions the term (p-)tesh occurs, which is also the demotic form, and the origin of the Coptic (Zd. i. 94, 95). The number of nomes is somewhat different in the various ancient Egyptian lists, all of which, except fragments, are of the Graeco-Roman age. Probably the number varicd at different times. Dr Brugsch conjectures the true number to be forty-two, considering the forty-two judges of the dead (Ritwal, ch. 125) as called from the chief towns of the kingdom to a great tribunal (Geogr. Inschr., i. 99), which he thinks represents the earthly court described by Diodorus Siculus (i. 75.)—(@eogr. Inschr., i. 124.)

There was a double system of names for the nomes,— the sacred, usual in hieroglyphics, and the vulgar, taken from the capitals, and preserved in Greek in transcriptions or translations. In consequence of this double

system the identification of the hieroglyphic names with those of the Greeks and Romans is not alwayscertain. This is the case in Lower Egypt, where the form of the country makes it hard to determine the exact geographical relation in- tended by any order. On account of this difficulty, and because the hieroglyphic names are of inferior importance in the geography of Egypt, they are not here given. (See Brugsch, Geogr. Inschr., i. 93, seqq.)

By the Greeks and Romans Egypt was divided into the Delta or lower country, and the Thebais or upper country. The third division, the so-called Middle Egypt, first occurs in Ptolemy as the Seven Nomes, “Exrd, vomot, or Hepta-

Sacy’s Abd-Allatif, It was made in the year of the Flight 777 (a.D. 1375-6), [recording the census of 715, A.D. 1815-6], and may be rather underrated than the reverse. The estimate of M. Mengin (Histoire de U Egypte, ti. 342-344) shows that in 1821 the extent of the eultivated land was much less; but since that period considerable tracts of waste land had been rendered fertile” (Englishwoman in Egypt, i. 85, note). In the Description de I’ Egypte there is an excellent memoir on the super- ficies of that country by Col. Jacotin, who computes the space which the Nile does or can water or fertilize, including its bed, north of the first cataract, at 9582°39 square geographical miles, of which but 5626°59 were in a state of cultivation or fit for cultivation. The space actually under cultivation was found by M. Esteve to be 5469°86 square miles, but it is stated that 2735°07 more may have been anciently cultivable, of which much might be reclaimed. Description de 1 Egypte, xviii. ii. 101, seqgg. The close agreement of Mr Lane’s estimate with Col. Jacotin’s shows that the bases of both were accurate, and the difference from M. Mengin’s may be explained by the disasters which preceded the establishment of Mehemet Ali as pasha.

1M. de Rougé has already noticed the possibly commemorative character of two other not much later royal names, Kakau and Bi-n-nuter (Siz Prem. Dyn., 248, 244), and this may therefore perhaps have been of the same kind.

nomis, ‘Exravopis. This new division, and the transfer of the Memphite Nome from Lower Egypt to the Heptanomis, are the chief innovations, for the fanciful divisions of Lower Egypt in Ptolemy are no doubt theoretical.

The following list of the nomes is taken from Parthey’s’ Vocabularium Coptico-Latinum, compared with the same author’s Erdkunde des alten Aegyptens, Berl. Akad., 1858, The authorities are Herodotus, Agatharchides, Strabo, Pliny, Ptolemy, the coins of the nomes struck under Trajan, Hadrian, and Antoninus Pius, the last indicated by the abbreviation Nu., and other sources. The letters L., H., and T. indicate Lower Egypt, the Heptanomis, and the Thebais, as the divisions to which nomes thus designated are known to belong.

L. Alexandrie, ’AActavdpéwy xdpas vouds, Ptol. Nu. . Andropolites, ’AvdporoAtrns, Ptol., formerly Gyneeopolites. . Antxopolites, *AvraomoAlrns, Plin. Ptol. Nu. . Autinoites, *Avtivotrns, Ptol. . Anysius, ’Avdctos, Her. . Aphroditopolites Hept., ’A@poditomoAltns tav Enrrd Nopor, Strab. Ptol. Nu. : a Theb., ’Agpod:tomoAlirns tis OnBaldos, Plin. tol. . Aphthites, “Apéirns, Her. . Apollopolites, Plin., *AroAAwvoroAlrns, Nu. . Arabieus, Plin., *ApaBias vouds, Ptol. Nu. Arsinoite duo, *Apowwotra: 540, Strab. Plin. Ptol. Nu. . Arsinoites Aig, inf., Plin., the same as Heroopolites, Plin. . Arsinoites Hept., “Apowotrns, Strab. Nu., the samc as Croco- dilopolites, Plin. . Athribites, *A@p:Birns, Her. Strab. Ptol. Nu.; Atharrabites, Plin. . Bubastites, BouBaorlrns, Her. Strab. Plin. Ptol. Nu. . Busirites, Bovoiptrns, Her. Strab. Plin. Ptol. Nu. . Cabasites, KaBactrns, Plin. Ptol. Nu. . Chemmites, Xeupulrns, Her., later Panopolites, Plin. Ptol. Nu. . Coptites, Korrirns, Plin. Ptol. Nu. . Croeodilopolites, Plin., the same as Arsinoites Hept., Strab. Nu. . Cynopolites, KuvomoAfrns, Strab. Plin. Ptol. Nu. . Diospolites Magnus, AtomoAitrns Méyas, Nu. . Diospolites, Plin., ArowoAfrns, Ptol. Nu. . Gynxeopolites, Fuvanumorirns, Strab. Plin. Nu., later Andro- polites ? Hammoniacus, Plin., the same as Oasites ? . Heliopolites, ‘HAtomoaAfrns, Strab. Plin. Ptol. Nu. Heptacometis (?), Erranwy—, Nu. . Heraeleopolites, Plin., ‘HpaxAcomoairns, Agutharch. Ptol. Nu., ‘Hparredrys, ‘Hparrewrtinds, Strab. . Hermonthites, ‘Epuwv6trys, Plin. Ptol. Nu. . Hermopolites, ‘Epuomoatrns, Plin. Ptol. Nu., ‘EppouroXirns, Agathareh. . Heroopolites, Plin., the same as Arsinoites Aig. inf. Hypselites, “Ypnalrns, Ptol. Nu.

Latopolites, AaromoAtrns, Plin. Nu. Leontopolites, AcovroroAirns, Strab. Plin. Ptol. Nu. Letopolites, AnrowoAlrns, Strab. Ptol. Nu. Libyx, A:Bdns vouds, Ptol. Lycopolites, AveomoAtrns, Agathareh, Plin. Ptol. Nu. . Mareotis, Plin., Mapedrov vous, Ptol. Nu. Marmarice, Mapuapirys vouds, Ptol. . Memphites, Meugfrys, Plin. Ptol, Nu. Mendesius, Mevdnotos, Her. Strab. Plin, Ptol. Nu. Menelaites, Meveaatrns, Strab. Plin. Ptol. Nu. Metelites, Mernafrns, Plin. Ptol. Nu. Momemphites, Mwpueudlrys, Strab. Myecphorites, Muexqopirys, Her. Natho, Nad, Her., the same as Neut, Ptol. Nu.? Naueratites, Plin. Nu. Neut, Neo't, Ptol. Nu., the same as Natho, Her.? Nitriotes, Nerpidrns, Strab. Oasitee duo, *Oactra: S00, Plin. Ptol. Ombites, Plin., ?OuBirns, Nu. Onuphites, 'Ovovgirns, Her. Plin. Ptol. Nu. . Oxyrynchites, 'Ofvpuyxirns, Agathareh. Strab. Plin. Ptol. Nu. Panopolites, MavoroAlrns, Plin. Ptol. Nu., the same as Chem- mites, Her. . Papremites, Nampnulrns, Her. . Pathyrites, Ma@up{rns rijs OnBatdos, Papyr. Anast., the same as Phaturites, Plin. ? Pelusiacus ? Nu. Pemptites, Meurrirns, Steph. Byz., the same as Phthemphu ? . Perithebse, TMep:67 8a, the same as Thebarum nomus, or its eastern part (Peyron, Pap. Taurin. i. 51). . Phagroriopolites, daypwpioroAirns, Strab.

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See Hammoniacus, Plin.

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. Pharbethites, @apBadirns, Her. Strab. Plin. Ptol. Nu.

Phaturites, Plin., the same as Pathyrites ?

. Phthemphu, $6enpovd, Plin. Ptol. Nu.

Phtheneu, Nu., Ptenethu, Plin., 6evdrov, I'tol.

Phylace vel Schedia, @vAakh, Sxedia, Agatharch. See Mene- laites,

. Prosopites, Mpeowrirns, Her. Strab. Plin. Ptol. Nu.

. Ptenethu, Plin. See Phtheneu. ab,

. Saites, Zalrns, Sairixds, Her. Strab. Plin. Ptol. Nu.

. Schedia, Agatharch. See Phylace.

. Sebennytz duo, ZeBevvirns tvw rémwy, SeBevvirys ndrw rérwv,

Ptol.; Sebennytes, Her. Strab. Plin. Nu.

. Sethroites, SeOpwirys, Strab. Plin. Ptol. Nu.

Tanites, Tavirns, Her. Strab. Plin. Ptol. Nu.

Tenthyrites, Tentyrites, Tevévpirns, Agatharch. Plin. Ptol. Tevrupirns, Nu.

Thebanus, @nBatos, Her.

Thebarum, @yBav vouds, Ptol., OnBatkds, Her.

. Thinites, @:virys, Plin. Ptol. Nu.

. Thmuites, @povirns, Her.

. Xoites, Zolrys, Plin. Ptol. Nu.

It is very remarkable that the Arsinoite Nome of the Heptanomis does not appear in the hieroglyphic lists, because Sebek, the cro- codile-headed divinity there worshipped was, at least in later times, disliked in most parts of Egypt (Brugsch, Hist., 2 ed., 109,

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See Perithebe.

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The Wotitia Dignitatum, composed under Theodosius IL, a.p. 408-450, gives a new a division of Egypt into four provinces—Aigyptus, Augustamnica, Arcadia, and Thebais. Roughly the first comprised all Lower Egypt except the part east of the Delta, which was assigned to the second, and Arcadia appears to have succeeded the Heptanomis (Parthey, Erdkunde, 518, taf. vii.)

About the time of Justinian I. this division is found to be further developed, according to the statements of Hierocles. Egypt contained six eparchies:—1. Egypt Proper, Aiyurriaxyj, the west of Lower Egypt to the Sebennytic branch of the Nile; 2. The First Augusta, Adyovora a', the north-eastern part of Lower Egypt to the Syrian border; 3. The Second Augusta, Avyovara f', the territory southward of the First Augusta; 4. Arcadia, 'Apxadéa, the earlier Heptanomis ; 5. The Nearer Thebais, OnBais 4 eyywra, extending to Panos, or Panopolis, and including the Great Oasis ; 6. The Upper Thebais, @nBats 7 advo, as far as Philew. The division into nomes had evidently been almost effaced at this time (Zd. 520, taf. ise).

The Copts preserved the oldest division of the country, and called Lower Egypt, the Northern Region, EM OUT

(Mem.), £¢@0T, dc. (Sah.), Upper Egypt, the Southern Region, PHC (Mem.), SA PHC (Sah.) The names of the nomes were also known to them, and are given by Champollion in LZ' Egypte sous les Pharaons.

Like the Copts, the Arabs generally know of but two divisions, the names of which are such as the people of the desert would naturally give to the country watered by the Nile. Lower Egypt is called Er-Reef, the cultivated, or fertile, and Upper Egypt, Es-Sa'eed, the happy, or for- tunate. o

Under the Memlook sultans of the Bahree dynasty, as we learn from the list appended to De Sacy's Abd-Allatif, re- ferring to a.H. 715 (a.p, 1315-6), the provinces of Egypt were less numerous than the ancient nomes. They are for Lower Egypt—the territory of Cairo and the provinces of Kalyoob, the

Sharkeeyeh, the Dakahleeyeh, Ed-Dimyat, the Gharbeeyeh, Menoof, Abyar and Benee-Nasr, the Boheyreh, Fooweh, Nesterawiyeh, Alexandria, and E1-Geezeh ; and for Upper Egypt—the provinces of Atfeeh, the Feiyoom, Behnesé, Ashmooneyn, Manfaloot, Asyoot, Akhmeem, and Koos. At the time of the French occupa- tion the provinces had been reduced in number to sixteen, and the division of the Middle Provinces introduced, thus reviving the Heptanomis, The Northern Provinces, El-

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Akaleem el-Bahreeyeh, were the Gharbeeyeh, that of Er- Rasheed, the Boheyreh, that of El-Mansooreh, the Manoo- feeyeh, that of Ed-Dimyat, the Sharkeeyeh, the Kalyoo- beeyeh, and that of El-Geezeh. The Middle Provinces, E]- Akaleem el-Wustaneeyeh, were that of Atfeeh, the Feiyoom, and those of Benee-Suweyf or Behnesé, and of El-Minyeh or Ashmooneyn.1 The Southern Provinces, El-Akaleem el-Kibleeyeh, were those of Asyoot, Girga, and Kind, There is no doubt that these provinces sometimes correspond to the ancient nomes, though generally composed of the territories of more than one. (Cf Jomard in Deser. de UEgypte, 2d ed. ix. 594, 595.) By Mehemet Ali a new division was formed into districts governed by a mudeer, of which Lower Egypt, including a small portion of the Middle Provinces, contained four, and the rest of Egypt three. At the present time Egypt is divided into fifteen provinces, each governed by a mudeer.

I. Lower Eayrr—

I wBohevrolienecsss.cus- chief town, Demenhoor, 2. El-Geezeh…..... El-Gcezeh. 3. Kalyoobecyeh…..... a0 Kalyoob. 4, Sharkeeyeh…..... op Zagazeeg. 5. Menoofeeyeh…... ... AG Sheybeen. 6. Gharbeeyeh…..... ap Tantah.

7. Dakahleeyeh …..... – Mansoorah.

IJ. Mippiz Eeyetr— 1. Benee-Suweyf and

Hei ort – Benee-Suweyf.

2. El-Minyeh and 2 ATs

a ” El-Minyelp (double province) 1M. Urprr EqyetT—

Hs SEU El asi cvs cian weal of Asyoot.

DEG Geers oaisee osasesen .; Soohag.

3. Kiné and Kuseyr…. 5 Kiné. (double province)

WO Sri Oia ees. . ceins

—Edmond (Z’ Egypte, 269, 270).

It will be readily understood that much confusion pre- vails as to the divisions of the country, more especially at times when an arbitrary administrative division has been used side by side with a popular one, depending upon what nature and artificial aids, such as canals and dikes, have done to map out the country.

The general appearance of Egypt is remarkably uniform. The Delta is a level plain richly cultivated, and varied alone by the lofty dark-brown mounds of ancient cities, and the villages in groves of palm-trees, standing on mounds often if not always ancient. We sometimes see groves of palm-trees besides those around the villages, but other trees are, except insome parts, rare. In Upper Egypt the valley is in as rich @ state of cultivation, but very narrow and bounded by mountains of no great height, which hem it 1n. They form the edge of the desert on either side of the valley, which has been cut through a rocky table-land by theriver. They rarely take the form of peaks. Sometimes they approach the river in bold promontories, and at others are divided by valleys with the beds of torrents which flow only at very long intervals. The bright green of the fields, the reddish-brown or dull green of the great river, and the tender tints of the bare yellow rocks, beneath the deep blue sky, always form a beautiful view. In form the landscape varies little and is not remarkable; in colour its qualities are always splendid, and under a general uniformity show continual variety.

Climate.—The climate of Egypt, being remarkably equa- ble, is healthy to those who can bear great heat, and who avoid the unwholesome tracts of the country, such as the ee este

1M. Jomard states that the older appellations were used for the two provinces of Benee-Suweyf and El-Minyeh, though these towns had succeeded the earlier chief places after which the provinces were named,—Descr. de U Egypte, ix. 594.

northern coast, where there are extensive salt-marshes. Upper Egypt is healthier than Lower Egypt. The least healthy time of the year is the latter part of autumn, when the inundated soilis drying. In the desert, at a very short distance from the cultivable land, the climate is uni- formly dry and unvaryingly healthy. Egypt, however, is unsuitable as a permanent residence to Europeans who do not greatly modify their mode of life;' and it is almost impossible to rear European children there ; but if they arrive after the age of ten or a little more they do not usually feel its ill effects.2 As a resort for invalids Egypt cannot be recommended without caution. Persons suffering from asthma and bronchitis are likely to gain benefit from a Nile-voyage, unless the season is unusually cold. The eliniate of the desert does not in all casessuit them, the small particles of sand which are inhaled increasing the irritation. The desert air is undoubtedly good for consumption, and a wise plan is to encamp near Cairo, or still better to find some kind of house within the limits of the desert; and there arc ancient sepulchral grottoes at Thebes and other sites which afford excellent quarters for any one who will take the pains to build a court and a few rooms in front of them. A Nile-voyage cannot be so safely recommended. The climatc on the river itself is more changeable than else- where, and often in winter far colder than is good for delicacy of the lungs. No one should visit Egypt in the winter without heavy as well as light clothing.

The atmosphere is remarkably dry and clear, except on the sea-coast ; and even the humidity which is the conse- quence of the spreading of the inundation is scarcely felt but by its rendering the heat more oppressive. Sometimes a white fog, very dense and cold, rises from the river in the morning, but it is of rare occurrence and short duration. The heat is extreme

during a great part of the year, but it is chiefly felt when accompanied by the hot winds of spring and the sultry calm of the season of the inundation. The winter is often comparatively severe in its cold, especially as the‘domestic architecture is intended to protect rather from heat than cold. ‘The general height of the thermometer in the depth of winter in Lower Egypt, in the afternoon and in the shade is from 50° to 60°; in the hottest season it is from 90° to 100°, and about 10° higher in the southern parts of Upper Egypt” (fod. Ey., Introd.) _ On the coast of the Mediterranean rain is frequent, but in other parts of Egypt very unusual. At Cairo there is generally one heavy storm in the winter, and a shower or two besides, the frequency of rain having increased since the growth of Ibrahim Pasha’s plantations between the city and the river. At Thebes a storm occurs but once in about four years, and light rain almost as rarely.

The wind most frequently blows from the N.W., N., or N.E., but particularly from the first direction. The propor- tionate prevalence of these winds to those from all the other quarters, in the year, is about 8 to 3; but to those from the S., S.E., and S.W., about 6 to 1. (Clot-Bey, Apercu Général sur I’ Egypte, i. p. 30.) The northerly winds are the famous Etesian winds of Herodotus (ii. 20), which enable boats constantly to ascend the Nile against its strong and rapid current, whereas in descending the river they depend on the force of the stream, the main-yard being lowered, These winds also cool the temperature during the summer months. The southerly winds are often very Violent, and in the spring and summer, especially in April and May, hot sand-winds sometimes blow from the south, greatly raising the temperature, and causing especial suffering to Europeans. The famous Simoom, properly

- Beer, wine, and all alcohol should be very sparingly used, and little meat eaten in the hot season.

: One resident at Alexandria adopted with success the method of sending her children to sea as soon as any weakness showed itself.

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called Samoom,? is a much more violent hot sand-wind, which is more usual in the desert than in the cultivated tracts, but in either occurring only at long intervals. It is a kind of hurricane, most painful to experience, and in- jurious in its effects. (Znglishwoman in Hoypt, i. 96, 97.) The zdbd'ah is a common but remarkable phenomenon, It is a very lofty whirlwind of sand resembling a pillar, which moves with great velocity. Mr Lane measured some with a sextant, and found them to be between 500 and 700 feet in height, and one to have an altitude of 750 feet. When crossing the Nile a zéba'ah frequently capsizes any boat which may be in its way, and of which the main-sheet is tied by the carelessness of the boatmen instead of being held. (Jd, loc. cit.; Modern Egyptians, chap. x.) It may be mentioned that a sudden gust of wind from a valley in the mountains is equally dangerous when the sheet is tied, and a third danger is the attempt to move during a southerly gale, when the long shallow Nile-boat is easily cauglit broadside and capsized.

One of the most interesting phenomena of Egypt is tle mirage, which is frequently seen both in the desert and in the waste tracts of uncultivated land near the Mediterra- nean; and it is often so truthful in its appearance that one finds it difficult to admit the illusion.

Diseases.—Notwithstanding the fineness of the climate, the stranger who visits Egypt is struck by the signs which lie sees everywhere of the prevalence of many serious diseases, and in the first half of this century he might have witnessed the effects of a great epidemic of the plague or the cholera. Yet he should remember the poverty of thie great mass of the inhabitants and the insufficiency of their food (both due to the selfish rapacity of the Government), the insufficient training of the native medical practitioners, the false system of many of the foreigners established in the country, and the reluctance of the natives to take medical advice. Ophthalmia when neglected is frequently followed by blindness, and dysentery in the same circumstances is very often fatal.

The plague has been the greatest scourge of Egypt. We cannot tell whether the pestilences mentioned by Manetho as having occurred in the reign of one of the most ancient kings were the same as the modern plaguc; it seems, however, to be alluded to in the Bible as peculiarly Egyptian (Zech. xiv.

18). In 1835 there was an epidemic of plague of extreme severity, during which there died in Cairo a number of the inhabitants equal to the whole adult male population (Afodern Egyptians, Intro- duction). ‘The last occurrence of the disease was in 1843, when the mortality was comparatively insignificant. The immunity which Egypt has enjoyed for more than thirty years, in which interval there would ordinarily have been several plagues, has bcen attributed to the sanitary measures of the Egyptian Government, and no doubt these may have somewhat contributed to this result. It should, however, be remembered that the plague is always imported into Egypt, and that there have been no severe epidemics of undoubted plague elsewhere in the period.

This disease has usually first appeared in the east and south coasts of the Mediterranean, and part of the north coast, and when epidemic seems to pursue a similar course to the cholera in advancing steadily from place to place. In Egypt it usually appears first at Alexandria in the winter

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3 Of the term samoom Mr Lane writes, ‘‘In the present day it is commonly applied to a violent and intensely-hot wind, generally occurring in the spring or summer, in Egypt and the Egyptian deserts usually proceeding from the south-east or south-south-east, gradually darkening the air to a deep purple hue, whether or not (according to the nature of the tract over which it blows) accompanied by clouds of dust or sand, and at length entirely concealing the sun; but seldom lasting more than ahout a quarter of an hour or twenty minutes,” —Arabic Lexicon, s.v., pt. iv. 1420,

or spring, and if the earliest cases occur towards the close of the year, one may be sure of a plague of great severity and long continuance. At first the cases are generally few, but they gradually increase, and in the hottest weather attain their maximum. The disease is not long in travelling from Alexandria to Cairo, but it rarely ascends much higher up the river, and has seldom been known at Thebes in modern times. Many medical writers have denied the contagious character of the plague, in particular Clot-Bey, a French physician, who was long chief medical officer of the Egyptian

Government, and who published a treatise on the subject (Clot-Bey, De la Peste); yet the evidence on the other side is too strong to be rebutted. An epidemic of plague is greatly to be dreaded in the present circumstances of Egypt. Rapid communications would readily bring the disease to Europe, and the interests of commerce would stand in the way of the reasonable precaution of quarantine. It is stated that the plague is endemic in the marshes of Chaldea. Surely it would be well if the European Governments were to appoint a com-

mission for the investigation of the disease and to ascertain |

what, if any, is the value of the sanitary measures of the Turkish Government.

Dysentery is an extremely common malady, and causes very large mortality. It may usually be traced to a careless course of diet, and especially to eating uncooked vegetables, unripe fruit, or other unwholesome food, and to drinking brackish water. Mr Lane has published a mode of treat- ment which has been attended with extraordinary success (Modern Egyptians, App. E. of all later editions). Asiatic cholera visited Egypt in its westward course on the first two occasions of its appearance in Europe. According to the Government returns, which were probably below the truth, nearly 200,000 persons perished from the disease in all Egypt during the great cholera of 1848. It is remark- able that after each of these great epidemics the disease appeared a second time, but with far less destructive results. Among the diseases most dreaded by the Euro- pean residents is liver-complaint. These who abstain from alcoholic drinks, or use them with extreme moderation, escape the complaint altogether, or suffer from it in a com- paratively mild form. Hemorrhoids and herniz are among the commonest maladies. Skin diseases have been at all times very prevalent in Egypt. Leprosy is now well known, but not common, unlike elephantiasis, which in more than one form has numerous victims. Small-pox was formerly very severe, but it has been checked in its virulence by vaccination. The so-called guinea-worm occurs, but it is perhaps not indigenous.

Of the diseases of the eye, ophthalmia is the most formidable, from its prevalence and malignant character ; yet perhaps no malady more readily

yields to treatment if promptly used. Where the predisposition exists, a slight cause, such as the irritation occasioned by a grain of dust or sand, is enough to produce an inflammation, which, if not checked, inflicts a lasting injury if it does not produce blindness. or this disease Mr Lane has published a very eflicacious mode of treatment (Mod. Hy., App. E).

Clot-Bey affirms that pulmonary consumption is ex- tremely rare among the native inhabitants (Apercu, ii. 372), yet another physician asserted (but not in print) that he had met with not a few cases in a short practice. Asthma aud bronchitis are among the common disorders. The occurrence of coup-de-soleil is not unusual, but it is rarely attended with fatal results, probably on account of the sobriety of the people. Madness is common, generally in the form of idiocy. Maniacs alone are confined 3 idiots are regarded with much respect as saints, and it is probable that some persous feigu idiocy to become objects of popular veneration, supported by alms. One of the Memlook

sultans, Kafaéoon, following the example of Saladin (Abul- fede Annales, ed. Reiske, iv. 30, 31) founded a madhouse, or maristan, at Cairo, which was still used thirty years ago (Englishwoman in Egypt, i. 166). Its inmates were subse- quently transferred to a modern hospital. Nervous affec- tions are uncommon, probably owing to the calm life which the inhabitants lead. Rheumatism is of more usual occurrence; but, according to Clot-Bey, gout is unknown (Apergu, ii, 377). It is well worthy of notice that, although ownerless dogs are very common in Cairo and the other towns, and watch-dogs are kept by the villagers, canine madness and hydrophobia are unknown; but Clot-Bey is probably in error when he says that rabies has never been observed in Egypt (id. ii. 78), for the Coptic prayer-books contain a prayer to be used for a persou suffering from hydrophobia,! aud this is not likely to have been derived from a foreign source. (For an account of the diseases of Egypt, see Clot-Bey’s Apercu Général aud De la Peste, and Descr. de 0 Egypte, xili. 29),

Geology.—In considering the geology of Egypt, its deserts claim our first notice. By a desert is generally uuderstood a wide plain of shifting sand; but this is usually an erroneous description of such a tract, and especially inapplicable to the deserts which border the valley of the Nile. These are raised mountain regions, the surface of which is often covered with sand, debris, and pebbles, intersected by valleys, and diversified, in the case of the western desert, by some oases.

On both sides of the Nile the mountains are limestone, until a little above Thebes, where the sandstone commences. At the First Cataract red granite and other primitive rocks burst through the sandstone beneath the bed of the Nile, and for a considerable space on the east, obstructing the course of the river by numerous small islands and rocks, and thus forming the rapids. In several places, chiefly on the eastern side, the mountains approach the river, and sometimes reach it. They are always utterly devoid of vegetation, and, except the granite, generally of a yellowish or reddish colour, though in some places they are greyish. Near the Cataract the sandstone mountains are partially covered with bright yellow sand in drifts. The mountains on both sides near the river are usually about 300 feet in height, and rarely much loftier. The highest point on the western bank at Thebes is four times that altitude. If one leaves the river and ascends the mountains, he finds a great rocky tract before him, the only easy paths through which are along valleys often very winding. The eastern desert gradually rises uutil about midway between the Nile and the Red Sea, where primitive rocks burst through the later formation, and the loftiest of them, a granite mountain called Gebel-Ghareb (about lat. 28°), attains the height of about 6000 feet. In this portion of the desert are porphyry, breccia, and basalt rocks, which were anciently much prized for purposes of architecture aud sculpture. The western desert is of a lower elevation, and is principally remarkable for its oases, which are deep valleys containing alluvial soil, but they are little productive except in dates. Their beauty and fertility have been naturally much exaggerated. Notwithstanding the inequalities of their surface, it is evident that the deserts rise towards the Red Sea, attaining their greatest height in the penn sula of Sinai, which is but a continuation of the same tract.

The most remarkable geological change which has been observed to have taken place in Egypt is one still in opera- tion, the depression of the northern shore notwithstanding

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1 This is stated on the authority of the late Rev. J. R. T. Lieder of

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the constant deposit of the Nile, and the corresponding | elevation of the southeri part of the isthmus of Suez. The consequence of this change of level has been the ruin of places on the shore of the Mediterranean, the extension of the salt-marshes, and the drying up of a considerable part of the northernmost portion of the Gulf of Suez. The bed of the Red Sea may be traced for several miles north of Suez, which now stands at the head of the western gulf; and places far north of that town were on the coast in historic times.

The form of the plain and valley inclosed by the deserts is remarkably regular. In Lower Egypt the cultivable land little exceeds the limits of the ancient Delta, but greatly exceeds those of the space between the two remain- ing branches of the Nile. The northern coast is pro- tected by shoals and a low range of sand-hills. To the south of these are extensive salt marshes and lakes, or waste tracts, and beyond, the cultivated land. ‘The deserts on either side are of low elevation. To the east of the ancient Delta, a valley, the Wadee-et-Tumeylat, is in course of being reclaimed by the Sweet-Water Canal.

The form of the valley, or Upper Egypt, may be best seen on the map; its leading peculiarities may here be noticed. Its course is nearly north and south until just within the border of the Thebais, when it takes a south-easterly direction as far as the town of Girga, and then turns due east as far as Kiné, from which town it resumes ts former direction. ‘The mountains

and desert on the western side throughout Upper Egypt, that is, above Cairo, are generally further from the river than those on the eastern side, which frequently reach to the water's edge. The difference is most remarkable as far as the town of Farshoot, by the course of the river about 350 miles above Cairo, and about 70 miles below Thebes. Near Farshoot begins a con- tinuous series of canals, which flow parallel to the Nile, and near the Libyan chain, until they terminate in Lower Egypt, not far north of Cairo. Above Farshoot, the eastern mountains recede as far as a little above Thebes, and the western mountains gradually approach the Nile. Halfway between Thebes and the First Cataract, the cultiv- able soil is equally narrow on each bank. The greatest breadth of the cultivable land, all of which is not now cultivated, on the western bank seldom exceeds about 8 or 10 miles, and on the eastern bank, about 3 miles, but it is usually much narrower.

There isin Upper Egypt one striking deviation from the uniform character of the country. About 70 miles above Cairo, by the course of the Nile, an opening in the Libyan range leads to a kind of oasis, the Feiyoom, a fertile tract, lying in a hollow of the desert, and having at its further extremity a great lake of brackish water.

The Nile—The chief natural feature of Egypt is the Nile, and the great phenomenon of the country the yearly inundation, With the ancient inhabitants the river had, according to their usage with such names, its two appellatious, sacred and common. The sacred name was Hapi, the same as that of one of the four genii of Amenti (Hades) and of the bull Apis. The probable meaning is "the concealed" (Brugsch, Geogr. Inschr., i. 77). The pro- fane name was Atur, or Aur, usually with the epithet aa, the great, The two forms, of which the first appears to be the older, the second the younger, mean " river," as is equally the case with the demotic and Coptic forms of Aur (Id. p. 78). There are at least three names of the Nile in the Bible,—Yedr (8, WN), the same as the Egyptian name last mentioned, and probably of Egyptian derivation ; Shichdr (WY, Tiny, TINY), " the black ; " and " the river of Egypt," 09199 702, The "torrent," or 'brook of Egypt" (Ory st2 22), spoken of as the western limit of Palestine, and so the eastern limit of Egypt, is either a desert stream

at Rhinocorura, now El’Areesh, or the Pelusiac or eastern- most branch of the Nile.}

The Greek and Roman name Netdos, Nilus, is certainly not traceable to either of the Egyptian names of the river, nor does it seem to be philologically connected with the Hebrew ones. It may be, like Shichér, indicative of the colour of the river, for we find in Sanskrit, Nila, “ blue,” probably especially ‘dark blue,” also even black, as Nilapan‘ka, “black mud.” The two great confluents of the Nile are now called the Bahr-el-Abyad, or “ White River,” and the Bahr-el-Azrak, or “ Blue River,” and the latter most nearly resembles the Nile in Egypt. Asalready noticed, Atyuzros, in the Odyssey, is the name of the Nile (masc.) as well as of the country (fem.).

The Arabs preserved the classical name of the Nile in the

ws o proper name En-Neel adJS, or Neel-Misr_ pra \a5, the

Nile of Misr (Egypt). The same word signifies indigo.?

The modern Egyptians commonly call the river Hl-Bahr, “the sea,” a term also applied to the largest rivers, and the inundation “ the Nile,” En-Neel; and the modern Arabs call the river Bahr-en-Neel, “ the river Nile.”

The course of the Nile has already been noticed in speak- ing of the form of the Nile valley. In ancient times the Delta was watered by seven branches ; now there are but two, the other ancient branches being canals not always navigable, The ancient branches were, beginning at the west, the Canobic, Bolbitine, Sebennytic, Pathmitic, Mendesian, Tanitic, and Pelusiac, of which the modern Rosetta and Damietta branches represent the Bolbitine and

Pathmitic.

The mean breadth of the river in Upper Egypt may be put at from half a mile to three-quarters, except where large islands increase the distance. In the Delta the branches are generally narrower.

A remarkable change has been ascertained to have occurred in the level of the Nile above Gebel-es-Silsileh, (near the ancient Silsilis, more than 80 miles south of Thebes), and throughout part of Nubia. Indications of this change were first observed by Professor Lepsius, who dis- covered hieroglyphic inscriptions on rocks at the Cataract of Semneh, not far above the Second Cataract, showing that the river attained a much higher level in the time of Dynasties XII. and XIII. before B.c. 2000. He gives the difference of the mean water-level at Semneh as 7°30 metres, or 23°94 feet English. He observes that the whole level of Upper Nubia was anciently greater, and similarly that of Lower Nubia between the First and Second Cataracts, but that in this second tract the present level was attained since the time of Thothmes III. of Dynasty XVIII. (Auszug aus einen Schreiben des Hrn. Lepsius an Hrn. Ehrenberg, Phile, 10thSept. 1844.) Sir Gardner Wilkinson pursued the inquiry in a paper in which he argued that the cause of the change of level which he traced in the Upper Thebais was the breaking of a rocky barrier at Gebel-es-Silsileh, where the low mountains on either side confine the river to a narrow channel (Trans. R. Soc. Lit., n.5., ive),

The water of the Nile differs considerably in appearance and purity at various seasons of the year. A little after midsummer it becomes very turbid, and not long afterwards a EE Se OS

1 ‘The manner in which this term is used (Num. xxxiv. 5 ; Josh. xv. 4, 47; 1 K. viii. 65; 2 K. xxiv. 7; Is. xxvii. 12), to designate the boundary of Egypt and Palestine, precisely as Shichér is employed (Josh. xiii, 8; 1 Chr. xiii. 5), would be conclusive as to their identity, were it not that the country between the Pelusiac branch and Rhino- corura is a waste region, which may have been wholly considered as boundary.

2 «© Pn-Neel is the river (lit. the inundation) of Egypt: Es-Saghanee says —‘ But as to the neel [indigo] with which one dyes, it is an Indian word Arabicized’” (The Misbah of El-Fetyoomee). vi .

it assumes a green colour for more than a fortnight, owing to the quantity of vegetable matter which it brings down from its uppercourse. It then resumes its turbid character for the period of the rise, and retains it, though in a less degree, for the remaining portion of the year, until the following midsummer. The water is extremely sweet, particularly in its turbid state. A careful filtration destroys its peculiar flavour, and the best method is to allow it to settle in the porous jars manufactured in the country. It is very wholesome, except during the short period at which it is green. The turbid appearance, great- est during the rise and inundation, is owing to the presence of large quantities of earthy matter, which are annually deposited. This deposit or mud of the Nile has been analyzed by M. Regnault. The specimen was dry, and taken from a canal which conducted the waters of the inun-

dation. He obtained the following results :— ; SN MeRUe betsy rar sro vivasersaaenenatreerene tamer coer, di MO aac asian «4 sip on tiene dusideneteomere saints oe 09 DOO TON Gi ssc avrnnesceanmenen nouns somamnctoaes 06 PAM rr use teens, vsseeiees aeatoen agenemen enna 04 CarpOnate OL WMACMOBIB «6.5 :2..00+000d uedeerennaets 04 Cmuivetmate Of Mle….c8.cceseetades amines ante 18 SONDRA sso cones ene eee eae “48

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M. Regnault remarks that the quantities of silica and alumen vary according to the places whence the mud is taken, and that on the banks of the Nile it contains much sand, but when carried by the waters of the inundation to distant tracts it loses a quantity of sand in propor- tion to the distance, so that, when the distance is very con- siderable, the argillaceous matter is nearly pure; and thus the soil presents this matter in the different degrees of purity which the arts of pottery and brick-making require (Deser. de U Egypte, xx. 162-164).

The Nile shows the first signs of rising in Egypt about the time of the summer solstice. At Khartoom, where the White and Blue Niles join, the beginning of the increase is observed early in April (Clot-Bey,*Apergu, i. p. 36, 37). The slowness of the rise in the earlier stage causes this difference, Usually the regular increase does not begin in Egypt until some days after the summer solstice, and the inundation begins about two months after that solstice. The river attains its greatest height at, or not long after, the autumnal equinox, and then, falling more slowly than it had risen, sinks to its lowest point at the end of nine months, when it remains stationary for a few days, until it begins again to increase. he inundation continues rather longer than it naturally would do, because the waters are retained for some time upon the lands by closing the mouths of the canals (see the table, Descr. del' Egypte, xviii. 1. 630, segg., for the details of the state of the Nile, from July 2, 1799, to April 10,1800). The river's banks being a little higher than the rest of the cultivable soil, the water is conveyed by canals or cuttings, and does not pour over the banks.

The inundations vary considerably, and, by either failing or rising to too great a height, cause much damage and distress. In the Description de l Egypte (xviii. i. 626-629) there is a table of 66 inundations, of which 11 were very high, 30 good, 16 feeble, and 9 insufficient. This table was taken from the official records of the Nilometer on the island of Er-Rédah, near Cairo, and comprehends the in- undations of A.u, 1150-1215 (a.p. 1737-1800).

The Nile rises about 40 feet at the First Cataract, about 36 at Thebes, about 25 at Cairo, and about 4 at the Rosetta and Damietta mouths during a good inundation (Englishwoman in Egypt, i. 89; Descr. de ULgypte, xviii. 1. 576, 577). When it is said, however, that the river has attained to a certain height in feet or cubits, the height at the Nilometer of Er-Rédah above-mentioned is meant 3 and

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by ancient writers, that of the river at Memphis, which was situate on the western bank, a little higher than Ep. Rédah. If the river do not attain a greater height than

18 or 20 feet, the rise is scanty; if only 2 or 4 feet more,

insufficient ; if it attain to 24 feet, or a greater height, not exceeding 27 fect, the inundation is good; but a higher rise must be characterized as a destructive flood (Deser, de VEgypte, xviii. i. 616), Sometimes the inundation has failed altogether ; as for seven years (a.H. 457-464) in the reign of the Fatimee caliph El-Mustansir bi-ll4h, when there was a seven-years' famine (see below, page 752) ; and low inundations always cause dearths. Excessive inundations, on the other hand, produce, or at least foster, the plague and murrain ; so that a variation of a few fect is productive of the most serious consequences.

The current, when the Nile is low, has been estimated at about 2 miles in the hour, and at about 3 miles an hour when it is high. The volume of water which the Nile pours into the Mediterranean in 24 hours is as follows, according to M, Linant :—

Cubic Metres. by the Rosetta Branch, 79,582,551,728

During the low Nile, by the Damietta Branch, 71,083,840,640

150, 566,392,368

od ; or by the Rosetta Branch, 478,317,838,960 During the high Nile, by the Damietta Branch, 227,196,828, 480

705,514,667,440

—(Clot-Bey, Apergu, i. 41),

Although the water is abundantly charged with alluvium throughout the year, and especially during the inunda- tion, the annual deposit by the river, except under extra- ordinary circumstances, is very much smaller than might be supposed. Various computations have been made as to the exact

deposit left in a century on the land, but they have not usually differed above an inch. If, however, we com- pare the quantity of deposit on certain very ancient struc: tures, of which we know the date, we shall find that the amount has materially differed in various places. Such dif- ferences are the natural results of irregularities in the river's course, of the strength or weakness of the current at parti- cular places, of the nature of the country, and many other disturbing causes. The mean ordinary rate of the increase of the soil of Egypt has been calculated by Mr Lane as about 45 inches in a century. M. Girard, in the Deser, de ?Hgypte, makes it "very nearly" 126 millimétres, or 4°960 English inches, (For a remarkable instance of rapid deposit, see the Hnglishwoman in Egypt, i. 132-134, and plan, p. 126.)

The cultivable land of Egypt must be regarded as wholly the deposit of the Nile, but it is vain to attempt a calcula- tion of the period at which this process began, since we cannot conclude that the same rate has always obtained, and we must suppose that the causes at first in operation were very different from those which now regulate the phenomenon,

At the time of the French occupation of Egypt it was found that the cultivable soil occupied only 6921 square miles, or somewhat more than two-thirds of the whole space included between the deserts; but the quantity actually under cultivation did not exceed 5500 square miles, or six-elevenths of the entire surface. This proportion has since not materially changed. It was not always so, and the deficiency of the population is the principal cause that so large a proportion of the svil which might possibly be brought into a state of culture is left uncultivated.

Throughout Egypt the cultivable soil does not present any very great difference, being always the deposit of the river ; it contains, however, raore sand near the river than at a distance from it. Towards the Mediterranean, its

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quality is injured by the salt with which the air is im- pregnated, and therefore it is not so favourable to vegeta- tion. 'This condition, however, is not usually found far south of the sea, or the sait-marshes and lakes, which

in- tervene for the most part between it and the land. In Lower Egypt we find the greater portion of the neglected tracts principally to the east and west of the modern Delta, and in its northern pertion. In Upper Egypt the narrow- ness of the valley, and the more numerous population, pre- serve the country in a better state of cultivation, and the soil ig somewhat richer. The largest uncultivated tracts lie on the western bank, where the valley is broadest, and in places where the great canal running parallel to the Nile has fallen into a state of neglect.

Condition of the Country.—Although some of the accounts of the classics may be deemed exaggerated when they speak of the population and prosperity of Egypt, we cannot accuse them of errors, except in the number of towns and of the inhabitants of the country; for the monuments show us how rich was Egypt under native rulers, and indicate to what causes this condition may reasonably be assigned. From the time at which the Great Pyramid was built to the Persian invasion, a period of between 2000 and 3000 years, the population of Egypt and its extent of cultivated land far exceeded what they are in the present day. The country does not seem to have been over-peopled ; and many causes conduced to prevent this, particularly the serious wars in which the Pharaolis engaged, The long and desolating struggles with the Assyrians and Persians inflicted a severe blow on the in- terests of the country. Under the Macedonians it recovered much of its former prosperity; and when the Romans held Egypt, it was one of their most productive provinces, and a granary of the empire. During the Roman rule various poli- tical causes contributed to the decline of the population. After the Muslim conquest this decay continued almost uninterruptedly until the time of the Fatimees ; but from that time until the Turkish conquest the rulers of the successive independent dynasties generally governed the country with a regard for its interests, and cannot be accused of the systematic tyranny and misrule of the Turkish pashas. There was a temporary recovery under the independent or semi-independent Memlook rulers before the French invasion; and in spite of much of the Turkish system the country has again made good progress during the government of the family of Mehemet Ali. To over- taxation, forced labour, and needless wars,—in other words, government in a Turkish sense,—must be attributed the present misery of the peasant population, and the want of hands enough to cultivate the soil.

__ Physical causes have had far less to do with the impover- ishment of Egypt than political ones. The elevation of the tract north of the Gulf of Suez, with the depression of the north coast of Egypt, has much diminished the cultivable soil inthe Delta, by increasing the salt lakes and marshes which ovcupy its northern portion. There is, however, no greater fallacy than to suppose that the sands of the deserts have done injury by encroaching upon the alluvial tracts, and that once fertile regions are buried beneath them. In some places undoubtedly they have encroached upon the cultivable land, particularly where, as in the case of the canal of the Red Sea, the neglect of the Government had Withdrawn the inundation, but no sooner was the Sweet Water Canal opened than fertility returned. On the other hand the deposit of the Nile has been constantly, in almost every part of the country, encroaching upon the deserts and diminishing their extent. It is neglect that has permitted the sand to drift over the soil where there have been no labourers‘to cultivate it. Above Gebel-es-Silsileh, in Upper Egypt, the change in the level of the river has placed cul-

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tivable soil almost wholly beyond the reach of the inunda- tion, and thus made agriculture very laborious, but this is only for the space of about 40 miles in Egypt, where the ex- tent of the cultivable soil must always have been small on account of the narrowness of the valley. The failure of five of the seven branches of the Nile is partly due to the neglect of the Government, as they might all have been re- tained as constantly running canals; and the decay of the great canal which runs parallel to the Nile throughout the chief part of Upper Egypt is traceable to the same cause.

Under the government of Mehemet Alia great engineer- ing work was begun with the view of bettering the condi- tion of Egypt. This was the construction of a barrage across both branches of the Nile at the point of the Delta, in order to regulate the inundation, and thus render the country more fertile and easy of cultivation. After being abandoned this work is now to be completed, Its opera- tion will on the whole be beneficial, although undoubtedly the power to be thus acquired by the khedive, of regulat- ing the inundation for the benetit of his lands without re- ference to small

proprietors, will be productive of much injustice, Egypt can never regain her ancient prosperity without a radical reform. The country has been governed under the Turks upon the system of getting the maximum of revenue from a peasantty allowed the minimum of sus- tenance. This is what is meant by the high-flown phrases one hears about the welfare of Egypt. The welfare of the population has never been contemplated. The frugal peasantry are kept at starvation-point, and no one prospers but the tax-gatherers of all grades, who constitute the richer class. Yet Egypt is better governed than the other pro- vinces of the Turkish empire which enjoy a purely Turkish administration, for it is held not on the uncertain tenure of an ordinary pashalik, but as a copyhold which it is the interest of the tenant to keep in decent repair.

Agriculture.—Under the Pharaohs Egypt was an agricultural country, and both commerce and manufactures were comparatively unimportant. The main energies of the people were expended in turning to the best account a soil of unexcelled richness, annually watered and renewed by the river. This natural policy was the true one for the prosperity of the country. From the sculptures and paintings of the tombs, we form a clear idea of the agricul- ture of the ancient Egyptians, while the classical writers sive us information respecting the tenure of land, and the laws affecting the cultivators. _

In the representations of the tombs which picture the daily life of the great proprietors of land, we learn what especial attention they paid to the processes of agriculture. We see them constantly overseeing the labourers, and thus watching the interests of their lands. They were espe- cially anxious to conduct the water of the Nile over those tracts which were not above its level ‘at different periods of the year, and to raise it by manual labour to the higher portions of the land. In their canal-system they displayed mechanical skill, as well as in the construction of dams and dikes to retain the water upon the lands; but for raising water they seem to have been contented with the rudest contrivances, Indeed we know of but two methods that were employed in raising water,—the use of the simple machine called in the present day the shadoof, and buckets carried by men. The ordinary shadoof still employed is of the same form as that used by the ancient Egyptians. It consists of a pole resting upon a beam placed across two columns of brick or mud, and having at one extremity a weight, and at

the other a rude bowl-shaped bucket suspended by a stick. A man stands beneath it, and pull- ing down the bucket to the water raises it again, assisted by the weight. (For the ancient form of the shadoof, see Anc, Eg., ii. 4; for the modern, Mod. Ly., chap. xiv.)

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Immediately after the water of the inundation had sub- sided, the land was ploughed or broken up by the hoe, and sown, the seed being sometimes trodden in by goats driven over the field for the purpose. Wheat being the most important field-produce, we find the various agricultural processes connected with it frequently represented. Be- sides the ploughing and sowing, the harvest is depicted, the reapers cutting the wheat just below the ear, the ears being carried in nets or baskets by men or on asses to the thrashing-floor, where they were thrashed by kine. Some- times the wheat was bound in sheaves. The same or simi- lar processes with reference to other kinds of grain are portrayed in the tombs, in which we also find curious repre- sentations of the vineyards and gardens. was not the least valuable part of an estate. Egypt was famous for its wines in the days of the Greeks and Romans; and it is evident that wine must have been prized in earlier times from several kinds being enumerated in the inscrip- tions, and from its always being seen at the feasts. Besides the vine, other fruit-trees were cultivated, and especially the date-palm. The gardens were often extensive, and were laid out with great formality, partly in consequence of their being watered in the same manner as the fields generally, and contained tanks for fish as well as for purposes of inunda- tion. The Egyptians paid great attention to preserving fish, and the produce of the fisheries of one great artificial lake, that of Mceris, formed an important branch of the revenue. There were also tracts left to reeds, which, if not planted, were at least carefully maintained, on account of their value for manufactures, and as covers for wild-fowl.’

Diodorus Siculus states that anciently the land was the property of the priests, of the king, and of the military class (i. 73), and the monuments leave little room to doubt that such was generally the case; for though there were no castes, the upper classes consisted of priests and military officers, and the son usually followed his father’s profession. It is stated in the Bible

that Joseph purchased the whole of the land of the Egyptians for food during the famine, and gave them seed to sow it, claiming a fifth of the produce as the king’s right. The land of the priests alone was not purchased.

The agriculture of the modern Egyptians differs little from that of the old inhabitants. In one respect it is the converse: the ancients excelled in the management of dikes and dams, and raised water only by the simplest methods ; the moderns, while they have paid less attention to the great canals, and the means by which they were regulated, have employed more ingenious methods of artificial irrigation. The deficiency of population has partly caused the decay of many of the canals and dams and dikes, and has at the

same time necessitated the economizing of human labour,

for which that of cattle has been in a great measure sub- stituted.

Of the machines the most common is the shddoof, already described, but there are also two kinds of water-wheels.

The more usual of these is that called the sdkiych, which is-

composed ofa horizontal wheel turned by a pair of cows or bulls, or by one, and connected with a vertical wheel which ig onthe same axis as another around which are earthen pots in which the water is raised and poured into atrough. The tAboot is a similar machine, which differs from the sdkiyeh principally in having a hollow wheel instead of the wheel with pots, in the jaunts or fellies of which the water is con- veyed. Sometimes a katweh is employed, which is a bucket like that of the shadoof, having four cords by which two men dip it into the river or canal and raise the water. (Mod. Hy., ch. xiv.) Steam-pumps are now largely used.

- The ‘rei’ lands (or those which are naturally inundated) are,

with some exceptions, cultivated but once during the year. After the waters have retired, about the end of October or beginning of

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November, they are sown with wheat, barley, lentils, beans, lupins chick-peas, &c. This is called the ‘shitawee’ (or winter) season, But the ‘ sharakee’ lands (or those which are too high to be subject to the natural inundation), and some parts of the rei, by artificial irrigation are made to produce three crops every year; though not ali the sharakee lands are thus cultivated. The lands arti- ficially irrigated produce, first, their shitawee crops, being sown at the same period as the rei lands, generally with wheat or barley. Secondly, in what is called the ‘seyfee,’ or in the southern part of Egypt the ‘kcydee’ or ‘ geydec’ (that is, the summer) season, commencing about the vernal equinox, or a little later, they are sown with millet (‘durah seyfee’), or with indigo or cotton, &e, Thirdly, in the ‘demeerch’ scason, or period of the rise of the Nile, commencing about or soon after the summer solstice, they are sown with millet again, or with maize (‘durah shamee’), &c., and thus crowned with a third harvest. Sugar is cultivated throughout a large portion of Upper Egypt; and rice in the low lands near the Mediterranean.” —Alod. Eq., l.c.

The culture of cotton was introduced by Mehemet Ali with a view to promote his manufacturing schemes, and the Turkish grandees have found it a source of temporary profit. During the American War the profit was at its height, but subsequently it declined. The necessity of con- structing dams to exclude the Nile water from the cotton- growing fields has rendered the inundations destructive, and the speculation seems on the whole to have injured the welfare of Egypt.

The agricultural implements of the modern Egyptians are rude in construction, and similar to those anciently employed in the country. One of these, however, was not known to the earlier inhabitants. This is the nérag, a machine “in the form of a chair, which moves upon small iron wheels or thin circular plates, generally eleven, fixed to three thick axle-trees, four to the foremost, the same number to the hindmost, and three to the intermediate axle-tree. This machine is drawn in a circle by a pair of cows or bulls over the corn.” It is employed to separate the grain of wheat, barley,

&c., and to cut the straw, which is used for fodder. (Mod. Eg.,1.c.) The ancient Egyptians, as before remarked, generally cut the wheat near the ear.

An Egyptian garden is a miniature Egypt. It is inter- sected by numerous small channels which are filled by one or more water-wheels. By these channels the water is spread over the garden, divided by them into many square compartments, edged with ridges of earth. This system of course makes it very difficult to keep a garden in good order, and no great variety of flowers is cultivated.

Though Mehemet Ali was very desirous to encourage manufactures, he did not endeavour enough to apply modern science to the improvement of agriculture. Ibra- him Pasha, who succeeded him, always maintained that the country should be agricultural rather than manufactur- ing, and introduced important improvements during his father's government. This system has been steadily pur- sued by the present ruler.

Before the time of Mehemet Ali a kind of feudal system prevailed, and much of the land was held by small pro- prietors under the protection of the great emeers. By the massacre of the Memlooks, the pasha destroyed feudalism, and by arbitrarily seizing almost all the landed property, rendered private tenure of land a most rare condition. He allotted to those whom he thus unjustly dispossessed annual pensions for life, as the only compensation for an act of tyranny to which even the history of Egypt scarcely affords a parallel (Mod. Hy., ch. iv.). Those whose lands were not confiscated yielded them up through fear, and buried their title-deeds, which are yet so concealed. A system of government in which the supreme authority overlooks such acts, and subordinate governors perpetrate them, in defiance of the Muslim code and Arab jurispru- dence, demands the most thorough and searching reform.

Lakes,—Egypt has always been famous for its lakes,

LAKES. |

which have either aided commerce, or supplied the inhabi- tants of the country with fish and wild fowl, or with valuable vegetable productions, or assisted in regulating the effects of the inundation. All have enriched the

land in some one of these ways, and thus they have been important sources of its natural wealth.

Beginning our examination at the north-western extremity of Egypt, we first observe the lake now called Boheyret-Maryoot,! and anciently Lake Mareotis. This is an extensive salt marsh rather than a lake, except during the inundation, when its contents are augmented by filtra- tion. Anciently this lake was navigable, and thus con- tributed to the commercial importance of Alexandria. The country around was cultivated, and produced the famous Mareotic wine. ‘The relations of various travellers show that it was still a lake during the 15th and 16th, and even towards the close of the 17th century; and Villamont in 1590 mentions that in his time the fisheries produced a considerable sum (Descr. de l Egypte, xvi. 201). When, however, the French army conquered and occupied Egypt (1798-1801) they found its basin to be “a sandy plain, of which the lower portion retained the rain-water, which remained there for a great part of winter” (Jd. 200, 201). On the 4th of April 1801 the English army, which was co-operating with that of the Grand Vizir against the French garrison of Alexandria, cut the dikes of the canal of that city, and admitted the waters of the Lake of Aboo-Keer into the ancient bed of Lake Mareotis, in-order to cut off the water supply of the besieged (d. 201, 202). The basin of the lake being partially inhabited, some loss of life and property was the result of this act, which has reasonably been much called in question. The unhealthiness of Alexandria is also traceable to the formation of this marsh. The precedent thus set has been twice imitated, first by the Turks in 1803, and a second time by the English army under General Fraser in 1807. At the present day the lake or marsh is unprofitable, and its shores are uncultivated and uninhabited, the whole wearing the most dreary aspect.

To the north of Lake Mareotis is situate that of Aboo- Keer, Boheyret-Aboo-Keer. It isthe northernmost portion of the other lake, from which it is separated by the Mah- moodeeyeh Canal (which here occupies the line of the older Canal of Alexandria), and the embankments or dikes which form its banks. It is very small, nowhere measur- ing 10 miles across, and extremely shallow, usually not exceeding 3 feet in depth. The water is salt, being chiefly derived from the sea, from which the lake is separated by a

narrow strip of land on the western side, and on the eastern by a similar strip of far less breadth, the shore of the memorable Bay of Aboo-Keer.

To the east of the Lake of Aboo-Keer is that of Atkoo, Boheyret-Atkoo. It spreads when full nearly to the town of Rosetta, and is separated from the sea by a narrow neck of land on which stands the large village of Atkoo. Its extent varies according to the quantity of water which it receives from the inundation (Deser. de lEgypte, xvi.

The great Lake of El-Burullus begins a little to the eastward of the Rosetta Branch, and stretches to some- What beyond where the canal which was anciently the Sebennytic Branch enters it, and passing through it Teaches the sea. Like the other northern lakes, it is separated from the Mediterranean by a narrow strip of land, the coast of Egypt. It is throughout very shallow (/d. 205). It is chiefly known for its water-melons, which are

1“ Boheyreh,” (pronounced ‘‘ Boheyret”? when followed by a Genitive) signifies “a little sea,” being the diminutive of ‘‘ bahr,” “a sea,” and is applied to large lakes, smaller ones ‘receiving the appellation “birkeh.” The distinction is not always maintained, for the great lake of the Feiyoom is called Birket-el-Karn.

yellow within instead of being red or pink, and come into season after those grown on the banks of the Nile.

The easternmost of the lakes of Egypt is Boheyret-el- Menzeleh, which greatly exceeds the others in size. It extends from very near the Damietta Branch of the Nile to the mouth of the old Tanitic Branch, now called the canal of El-Mo’izz, which passes through the lake to the sea. It also receives the waters of the canals which were once the Mendesian and Pelusiac Branches. The northern shore is separated from the sea by an extremely narrow strip of land. At its south-eastern extremity is a long marshy creek extending into the desert. Its average length is about 40 miles, and its average breadth about 15. The depth is greater than that of the other

lakes, and the water is salt, though mixed with fresh. Upon the surface are numerous islands, and the whole lake abounds in reeds of various kinds. It supports ‘a considerable population of rude fishermen, who dwell in villages on the shore and islands, and live upon the fish of the lake. The reeds are cover for water-fowl of various kinds, which the travel- ler sees in great numbers, and wild boars are found in the marshes to the south. (Mod. Hy. and Thebes, i. 446.)

The Lake Serbonis, well known in former times as having swallowed up those passing over its marshes con- cealed by shifting sands, is now dry, and cannot be any longer included in the list of the lakes of Egypt.

Besides the lakes above mentioned are those called the Bitter Lakes, which should rather be termed marshes, occupying part of the ancient bed of the Red Sea between Suez and Lake Menzeleh, and also the Natron Lakes. The latter, which are very small, are situate in a valley of the western desert, not very far from the river: they will be

| noticed below.

In Upper Egypt there is but one lake of importance. It is the Birket-el-Karn, or Lake of El-Karn, at the ex- tremity of the Feiyoom, which is, as already mentioned, an oasis on the western side of the river, to which an opening in the mountains leads. The lake is about 35 miles long, and its widest part a little exceeds 7 miles, according to Sir Gardner Wilkinson, while in several places it is considerably narrower. About the middle is a single island. The depth is not great, for the same author, who “sounded in several places,” “found what is considered the deepest part to be only 284 feet” (Mod. Egypt and Thebes, ii, 344-5), Its level is far below that of the Nile, as the bank of the river at Benee-Suweyf, at the entrance of the valley leading to the Feiyoom, is upwards of a hundred feet higher than the water of the lake (id. 346). The shores are barren or uncultivated; the northern is desert and bounded by sandy mountains ; the southern was in ancient times partly cultivated. The water is brackish and unwholesome, though the fishermen, of whom there are a few, drink it.

The famous Lake Meeris lay between the Feiyoom and the Nile, not far from the river. It was an artificial work executed by Amenemhat IIL, of

Dynasty XII. The irrigation of neighbouring tracts was regulated by it, and its fisheries formed an important part of the revenue. After the subjugation of Egypt by the Romans its dikes were neglected, and by degrees it became ruined. Its position and extent were considered doubtful, until M. Linant's excellent memoir, published by the Egyptian Society of Cairo, established these points most satisfactorily from the remains of its basin, which are yet traceable (Mémoire sur le Lac Moeris, Soc. Eg., 1843).

Canals.—The canals of Egypt deserve especial attention from their great importance in extending the beneficial influence of the inundation. In Lower Egypt we find, beginning from the west, first the Mahmoodeeyeh Canal, which connects Alexandria with the Rosetta Branch, taking

a similar direction to that of the ancient canal which it las succeeded. It was dug under Mehemet Ali; and although not quite 50 miles in length, and not 100 feet broad, about 12,000 labourers are said to have died in ten months while the work was in progress (Znglish- woman in Egypt, i. 47, 48). This is well known to be a tolerably accurate statement of the losses experienced by the unfortunate workmen, and is only one of the many instances which the history of our own times affords of that reckless disregard of human life, which is one of the worst traits of Turkish character.!

Between the Rosetta and Damietta Branches are several canals, some of which are of importance, particularly the short canal of Manoof connecting the two branches not far from the point of the Delta. 'To the east of the Damietta Branch are others, of which the most remarkable occupy the beds of the Tanitic and Pelusiac Branches, which have been cleared to a sufficient extent to form canals. The former of these, which lics to the westward of the other, is called the Canal of El-Mo'izz, the first Fatimee caliph who ruled in Egypt, having been dug by his orders, and the lattcr bears the name of the Canal of Abu-l-Munegga, a Jew who executed this work, under the caliph El-'-Amir, in order to water the province called the Sharkeeyeh. The last-mentioned canal is connected with the remains of that which ancicntly joined the Nile and the Red Sea. Of this important work the greater part was destroyed through ueglect, but it has been restored, as the Swect-Water Canal, in order to supply the establish- ments on the Suez

Canal with fresh water. It was of the Pharaonic times, having been begun by Ramses II., or Sesostris, continued by Neku II. and by Darius Hystaspis, and at length finished by Ptolemy Philadelphus.

The extent and character of the great canal called the Bahr-Yoosuf, or River of Joseph, which runs parallel with the Nile on its western side, from a little below Cairo to near Farshoot, a distance by the river of about 350 miles, render it the most important work of the kind in Egypt. It is a continuous series of canals rather than one canal. Although the Joseph whence it takes its name is the cele- brated Saladin, or Saldh-ed-deen, yet it is related that he merely repaired it, aud it is not doubted to be of a much earlier period. Most probably it was executed under the Pharaohs, In the present day it is not navigable except during the season of the inundation, and at other times is dry in various places. Its restoration would not be a work of extreme difficulty, and would greatly benefit the commerce and agriculture of the country, perhaps more than any other undertaking of the kind.

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‘A note from the eighth edition of this work is here reprinted in substance : —-Writers on the East have not generally been careful to distinguish the Turkish and Arab national character, and the former has thus had the advantage of the virtues of the latter, which has received in return the odium of the other’s vices. he remarkable character- istics of Arab character are high honour, generous hospitality, and humanity, coupled with much deceit in small matters not considered points of honour, carelessness as to religion, though not irreligion, and a love of plunder. The Turkish character is as strongly marked by treachery, often of the blackest kind, little hospitality, particularly to strangers, cruelty and disregard of human life, bigotry as to their religion, which is now giving way to deism, and the same love of plunder which is so common among the Arabs, as well as darker vices unknown to them, which have rendered the Turkish name a bye-word in the East, as well as in the West. The conquests of the Arabs were not marked by desolation; their rule preserved the philosophy of Greece, which was welcome at the court of Baghdad when unknown in Europe. Arab art was due to them, and though long maintained under Turkish rule, at last perished through it. The rule of the Turks is traced by ruined cities, and

whole provinces laid waste : literature has forsaken its most famous seats, Constantinople, Athens, Alexandria, and Antioch ; the arts have decayed. Until they held Egypt and Mesopotamia, these were the richest countries of the world, now they are half deserts. All these are facts which can be proved.

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Vegetable Products—Egypt differs from most other countries in having neither woods nor forests. Besides the palm groves, we rarely see even a grove of trees, except in Lower Egypt. The largest common trees are acacias, sycamore-fig-trees, and mulberry-trees, all of which are frequently planted on each side of the great roads near Cairo q and the imost beautiful trees are the date-palm and the banana. The beauty of the palm is, however, in a great measure owing to art, for its lowest branches are annually cut, which causes it to grow high, and renders its head of elegant form. When wild, this tree has a far inferior appearance, being low, and having long ragged branches reaching to the ground ; and its dates are small and poor in flavour. The Theban or dém-palm is a very different tree, having two great branches, each of which divides into two other branches, a subdivision which continues still farther. The weeping-willow, myrtle, elm, and cypress are found in the gardens and plantations, with various trees bearing the fruits to be next mentioned; and the tamarisk is to be seen everywhere.

The most common of, the fruits are dates of various kinds, which are sold half-ripe, ripe, dried, and pressed in their fresh moist state in mats or skins. Many different sorts are enumerated as known in Egypt. The dependencies, however, and not Egypt, produce the finest of these dates. The hotter and drier climates of the Oases and Lower Nubia best suit the date-palm; and the pressed dates of Seewah, the ancient Oasis of Jupiter Ammon, are among the most esteemed. The grape is a common fruit, but wine is not made from it on account of the prohibi- tion of Mohammad. The Feiyoom is celebrated for its grapes, and chiefly supplies the market of Cairo, The most common grape is white, of which there is a small kind far superior to the ordinary sort. The black grapes are large, but comparatively tasteless.

‘The vines aro trailed on trelliswork, and form agreeable avenues in the gardens of Cairo ; but little attention is paid to their culture, the common fault of Egyptian agriculture and gardening, due to the generosity of nature and the indolence of the inhabitants.

The best known fruits, besides dates and grapes, are figs, sycamore-figs, and pomegranates, apricots and peaches, oranges and citrons, lemons and limes, bananas, which are believed to be of the fruits of Paradise (being always in season), different kinds of melons (including some of aromatic flavour, and the refreshing water-melon), mul- berries, Indian figs or prickly pears, the fruit of the lotus, and olives. Many of these are excellent, especially the figs and melons. The trees and plants which produce most of them are chicfly confined to the gardens, ‘The cactus bearing the Indian fig is extremely common, and forms the hedges of gardens and plantations.

The general plan of an Egyptian garden has been already described. Although seldom in good order, such a garden is often picturesque, having a few date-palms and bananas, and perhaps overlooked by one of those houses of the old style of architecture which are rapidly disappearing. No great variety of flowers is cultivated. Among the more usual are the rose (which has ever been a favourite among the Arabs), the jasmine, narcissus, lily, oleander, chrysan- themum, convolvulus, geranium, dahlia, basil, the hinne plant (Zawsonia alba, or Egyptian privet, which is said to be a flower of Paradise), the helianthns, and the violet.

The vegetables, &c., are very common and of various kinds, so that we cannot wonder that the Children of Israel longed for them in the desert. The principal are beans, pease, vetches, lentils (of which a pottage is made, which is the common food of the Nile boatmen), lupins, chick-pease, the loobiyeh (Dolichos lubia), fenugreek, mal- lows, the bamiyeh (Hibiscus esculentus), spinach, purslain,

melookheeyeh (Corchorus olitorius), leeks, onions, garlic, celery, parsley, chicory, cress, radishes, carrots, turnips, colocasia, lettuce, cabbage, fennel, gourds and cucumbers (both of several kinds), the tomato, the egg-fruit or

bading4n (black and white), caraway, coriander, cumin, aniseed, and red pepper.

The chief field-produce is wheat (which is more grown than any other kind of corn), barley, several sorts of millet, maize, rice, oats, clover, pease, the sugar-cane, roses, two species of the tobacco-plant, and cotton, now largely cultivated. The sugar-cane is extensively cultivated, and excellent sugar is manufactured from it. There are fields of roses in the Feiyoom, which supply the market with rose-water. The tvbacco produccd in Egypt is coarse and strong compared with that which is used by the middle and upper classes and imported from Syria and Turkey. That of Syria is considered the best. Of textile plants, the principal are hemp, cotton, and flax; and of plants used for dyeing, bastard saffron, madder, woad, and the indigo plant. The intoxicating hasheesh, which some smoke in a kind of water-pipe formed of a cocoa-nut, two tubes, and a bowl, seldom used for any other narcotic, is not, as has been erroneously supposed, opium, but hemp. The effectis most baneful. The leaves of the hinné plant are used to impart a bright red colour to the palms of the hands, the soles of the feet, and the nails of both hands and feet, of women and children, the hair of old ladies, and the tails of horses. Indigo is very extensively employed to dye the shirts of the natives of the poorer classes, and is, when very dark, the colour of mourning ; therefore, women at funerals, and generally after a death, smear themselves with it. Oil is extracted from the seeds of the cotton plant, hemp, colewort, the poppy, the castor-oil plant, sesame, and flax. The high coarse grass called halfeh (Poa cynosuroides) grows in great quantity in waste places and among ancient ruins.

Many kinds of reeds are found in Egypt, though, if

we compare the representations in the ancient tombs with what we see in the present day, it is evident that they were formerly much more common. That they should be wasted away was prophesied by Isaiah (xix. 6, 7). The famous byblus, or papyrus, from which paper was manufactured, appears to be nearly, if not quite extinct, since Sir Gardner Wilkinson had never seen it (Mod. Hy. and Thebes, i. 441). M. Delile, in his excellent account of the Egyptian flora, merely mentions it by name in his list as the Cyperus Papyrus, called in Arabic berdy, and found at Damietta, but gives no figure

of it. The lotus, greatly prized for its flowers by the ancient inhabi- tants, is still found in Egypt, though it is not common. The French naturalist above mentioned enumerates three Species which formerly grew in that country, one with white flowers, another with blue, and a third with rose- coloured, the last of which is now extinct there. On the botany of Egypt, see Boissier, Mora Orientalis, in pro- gress, _ Animals.—The zoology of Egypt is not of remarkable interest, although it contains some very curious points. The absence of jungle and vf forest, and the little cover thus afforded to beasts of prey, as well as other wild animals, partly causes this; and we observe few birds of beautiful plumage for the same reason.

One of the most characteristic of the beasts is the camel, Which is more at home in the dry climate of Egypt than elsewhere out of his native deserts. It has been remarked,

: 4 Cyperus Papyrus, Linn,—Arab. berdy, Damiate.” Description : UKgypte, tom. xix. 71. Other Cypert are described at pp. 25-6 and 130-2 of the same volume.

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| persons of the middle and lower classes.

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degenerates when removed into a city or a cultivated tract, that the former commonly becomes mangy, and the latter experiences a physical and moral degradation. Tlie Egyptian camel is of the one-humped kind, which has been erroneously called the dromedary, whereas the dromedary is,merely a swift camel standing in the same relation to the ordinary camel that our saddle-horse does to our cart-horse. Camel’s flesh is for the most part eaten only by the peasants and the Arabs of the desert ; by the Copts it is considered unlawful food.

It is very remarkable that no representation of the camel has been found in the sculptures and paintings of the Egyptian monuments, among the very numerous figures of the animals of Egypt both tame and wild, and of those brought from foreign lands as presents. It does not appear to have been

introduced into other African countries until after the Christian Era (comp. Desnioulins, Afém. lu a ? Institut, 28 Juin 1823); but it was known to the Egyp- tians, although it is by no means certain that it was one of their domestic beasts. Two passages in the Bible which speak of camels in the possession of Pharaohs (Gen. xii. 16 ; Ex. ix. 3) refer to the time at which foreign tribes had been settled in Egypt; and perhaps the camel was peculiarly the animal of one or all of those tribes, and, as they were hated by the Egyptians, it may have been oniitted in the representations of the monuments.

To modern Egypt the camel is very valuable, since the traffic with Syria, Arabia, Western Africa, and Ethiopia is to a great extent carried on by caravans. But the ancient Egyptians appear to have derived their wealth more from tributary presents than from commerce, to have allowed their land commerce to be much in the hands of forcign merchants, like those who brought Joseph into Egypt, and to have left even their sea commerce partly at least to foreigners.

The horse is not known to have been used in Egypt be- fore the time of the Empire. Thenceforward the horses of Egypt were famous, and the armies of the Pharaohs were noted for their war-chariots. From Egypt, Solomon, and in his time the kings of the Hittites and the kings of Syria, had horses and chariots (1 K. x. 28, 29). And long after, when first the kingdom of Israel and then that of Judah endeavoured to throw off the yoke of the great kings of the East,and made alliance with Egypt, they put their trust in Pharaoh’s horses (Isa. xxxi. 12eain the representations of battles fought by the kings of the Empire we see no Egyptian cavalry, but only chariots, called “horse” in the inscriptions. At later times they may have had cavalry, properly speaking, of their own, and perbaps at all times among the mercenary or auxiliary forces.

In the present day the horses of Egypt are of a very indifferent breed, and the best that one sees in that country have been brought from Arabia and Syria, but these are seldom of great excellence. It is indeed surprising to find few really good horses in a country bordering on Arabia; and not many years ago this was still more remark- able, though not during the existence of the Memlooks. The finest Arabs, however, are kept in the background by

their possessors, partly for fear of the “ evil eye,” and partly, in the case of all but the highest dignitaries, to.avoid their forcible seizure by those of greater rank and power.

The Egyptian ass holds a middle place between that of Great Britain and the wild ass, which is more swift of foot than the horse. It is tall and handsome, docile, and having excellent paces, particularly a quick and easy amble. Thus it is well suited to the narrow streets of the towns of Egypt, and is therefore commonly used for riding by The mules are

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handsome, but noted for vice, and for not being sure- footed.

The cattle are short-horned, rather small, aud, as of old, very beautiful, speaking artistically. ‘They are ex- ceedingly quiet in disposition, and much valued for agri- cultural labour by the people, who therefore very rarcly slaughter them for meat, aud then only for the Franks. Buffaloes of an uncouth appearance and of a dark slaty colour, strikingly contrasting with the neat cattle, abound in Egypt. When voyaging on the Nile, one often sees them standing or lying in the river by herds. ‘I’hey are very docile, and the little children of the villagers often ride them to or from the river. They are sometimes slaughtered, but their flesh is tough and coarse. Sheep (of which the greater number are black) and goats are abundant in Egypt, and mutton is the ordinary butcher’s meat. Swine are very rarely kept, and then almost wholly for the Franks, the Copts generally abstaining from eating their meat. It appears that the ancient Egyptians, though not forbidden this flesh, rarely ate it, perhaps because it is extremely unwholesome in a hot climate.

The Muslims consider dogs unclean, and therefore those of Cairo and most of the towns are half-wild and without masters, living upon offal, and upon food thrown to them by humane persons. In the villages, however, and particularly in the Thebais, their case is better, for they are kept as guards to protect live-stock from thieves, and from hyenas and other wild animals, which come from the deserts by night in quest of prey. The common dog of Egypt is generally of a sandy colour and strong,

though not remarkable for courage; but in Upper.

Egypt, about Thebes, there is a fierce breed of dogs with wiry hair, generally black, and much esteemed for courage by their masters. Cats are as numerous in Cairo as dogs, and many of them are as homeless. They arc, however, liked by the natives, who assign as their reason that Mohammad was fond of cats. This may perhaps be regarded as a relic of the veneration in which they were held by the ancient Egyptians. Itis nota little curious, that there is at Cairo a royal foundation for the support of destitute cats. The author of this charity was the famous Memlook sultan, Edh-Dhahir Beybars, whose humane intentions have of late years been sadly neglected by the trustees.

The wolf, fox, jackal, and hyena chiefly inhabit the deserts and waste places of Egypt, and lurk in the ancient tombs and deserted quarries. The wild cat is also found in that country, though it is not common. The weasel

abounds in Cairo, and is proverbial for its mischievous and |-

revengeful disposition, and rats and mice are not among the least of the plagues. The ichneumon, jerboa, hare, and lyrax are likewise natives of Egypt or its deserts, and the tame rabbit is kept for food.

The beasts of the chase of the Egyptian deserts are autelopes of various kinds, and the wild ass, esteemed by the Arabs and Persians to be the prince of game, which is found in the southern part of the Eastern Desert. The most beautiful of the antelopes is the gazelle, which is often tamed and kept in the large courts of the houses of Cairo. In Lower Egypt, principally in the desolate marshes near the Mediterranean, the wild boar is found and occasionally hunted. It is, however, a timid animal, so that the sport is not, like boar-hunting elsewhere, exciting and dangerous.

From the representations in the tombs we see that in old times the hippopotamus was one of the wild beasts”of the country. It has now retreated above the First Cataract, the southern boundary of Egypt. The croco- dile has retreated in the same manner, and instead

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ofzbeing found throughout the Nile in Egypt, is rarely seen even in Lower Nubia, The name of the island of Elephantine, situate a little to the north of the First Cataract, bearing the same signification in hieroglyphies as in Greek, makes it probable that at some remote period elephants were found in Upper Egypt, though now they are not seen north of Abyssinia.

In exploring the tombs and dark parts of the temples the traveller is annoyed by crowds of bats, which extinguish his candle, fly into his face, and cling to his clothes, some- times rendering examination impossible without a lantern. One species is very large, but the common one is small,

Birds of prey are numerous in Egypt, and of many kinds, Of the most remarkable are three species of large naked- necked vultures—the Arabian, the sociable, and the fulvous ; as well as the smaller species called the aquiline vulture. The aquiline vulture has a feathered neck, and when standing is by no means a handsome bird, but it is much to be admired when on the wing from the contrast of the black and white of its plumage, and the steady manner in which it soars in circles. Perhaps the bearded vulture breeds in the most lofty parts of the desolate moun- tains of the Eastern Desert; for when the French army was in Egypt, one of these birds was killed. It is said to have been of extraordinary size, measuring more than 14 Parisian feet, or more than 15 English, from point to point of its expanded wings. Several species of eagles and falcons, two kinds of hawks, the common buzzard, and the moor- harrier live in Egypt, or visit that country, according as they are migratory, erratic, or sedentary. The common kite abounds at Cairo, and is one of the chief scavengers of the city, the others being the crow, the aquiline vulture, the half-wild dog, and the cat. The ruins and tombs of Egypt, and the modern houses, scarcely ever in perfect repair, shelter owls of various kinds.

The Spanish sparrow, which differs little from that of Britain, the water-wagtail, linnets, and larks are among thie birds of Egypt. The kind of kingfisher which is commonly seen on the Nile, perched on some eminence, and darting suddenly to seize a fish, is very inferior in its plumage, which is speckled, black and white, to the common king- . fisher, which is also occasionally seen. The- beautiful hoopoe is among the least rare birds, and there are also three species of bee-eaters. The hoopoe may be’ often seen in

Cairo, where it is regarded with some reverence, as the bird of Solomon. Crows of the kind which we call the Royston crow are very numerous at Cairo. Birds of the swallow tribe, the wood-pecker, and the cuckoo are also known in Egypt. :

In the metropolis, in the towns and villages, and in the fields, no bird is more comnion than the pigeon, tame or wild. Pigeon-fancying is a favourite amusement of all classes at Cairo, and in the villages the pigeon-houses are often loftier than the huts upon which they are raised. Tourists on the Nile inflict great loss on the poor peasantry by recklessly shooting these tame birds. Wild turtle-doves build in the courts of the houses of the capital. These courts often serve for the purpose of poultry-yards, which fowls wander about without any care being taken of them, except that food is occasionally thrown to them. They are consequently meagre, and produce vety small eges. Turkeys, ducks, and geese are kept in the same manner.

Quails migrate to Egypt in great numbers ; and sand- grouse, called by the natives kata, from their cry, are common in the deserts. ‘There also the Arabs, like the ancient Egyptians, hunt the ostrich, A red-legged partridge is likewise found in Egypt. ;

The islands of the Nile, the sand-banks which appear when the river is low, the lakes and marshes, the sheets

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of water caused by the inundation, and the mountains near

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Bees are kept in Egypt, and their honey is much prized

the river, are the favourite resorts of many kinds of wading | by the inhabitants, who usually eat it in a clarified state.

and of web-footed birds.

Of the waders the most interesting would be the sacred ibis of Egypt, if that bird be now found there. But it does not appear certain that only one species was anciently held sacred, and if so that this is the Lbs relagiosa of Cuvier now known in Egypt. The Egyptian plover is famous on account of the story, which modern observation has con- firmed, related by Herodotus respecting it and the croco- dile. Among the most common waders are the spur-winged plover, the snow-white egret, which has been erroneously called the ibis, and the pelican. The cormorant, too, is often seen, as are wild geese and ducks, both of several kinds.

Of the many reptiles the crocodile occupies the first place. It is seldom observed in the present day in Upper Fgypt. Some years ago it was usual south of Asyoot to see several crocodiles basking in the sun in the heat of the day on a sand-bank; at the approach of a boat they would quickly plunge into the stream. They rarely attack a human being, but it is unwise to bathe in the river at places where they are reputed to be fierce, and to bathe at any distance from a boat in the part of Upper Egypt where they are found. It is said that the crocodile's common mode of attacking a person on shore, who is near the river's edge, is to approach stealthily and sweep him into the stream by a blow of his tail, the great weapon of all the lizard-tribe. The smaller saurians are found in great numbers: of these a species of chameleon may be mentioned,

Serpents and snakes are among the most common reptiles, and are of various kinds, including the deadly cerastes and cobra di capello. The house snakes, however, which are numerous at Cairo, are harmless.

Fishes abound in the Nile and in the Lake Menzeleh. The modern inhabitants of the country are partial to fish as food, but they say that only those fishes which have scales are wholesome. The fishes of the Nile are generally insipid in comparison to those of the sea ; though a few of them, particularly the bultee (Labrus niloticus, Linn.), the kishr (Perca nilotica), and the binnee (Cyprinus bynni, Arted.), are of a delicate flavour.

One of the commonest insects is the dangerous scorpion. Its sting is very painful, and, if no remedy is applied, sometimes fatal, particularly if a

person is stung in the heel! Large spiders are abundant, including more than one species of solpuga, incorrectly called tarantulas by the Europeans, and believed by the natives to be very Venomous, but this is most likely an error. Egypt bas ever been famous for what may be termed insect-plagues, but not to the extent that has been asserted by some modern travellers. Caution will enable one partially to escape the attacks of fleas and bugs, and altogether to avoid the more dreaded insect usually spoken of with them. Beetles of various kinds are found, including that which Was anciently held sacred, the scarabaeus. Locusts are seldom seen, and very rarely in large numbers. When, however, such is the case, they commit great havoc in the fields and gardens, reminding one of the account of the plague of locusts which preceded the Exodus, and the re- markable passage in the book of Joel (ii. 1-11) describing an invading army as a destructive flight of locusts. Some- times they merely cross the valley of Upper Egypt, and leave the mark of their passage in desolated fields, entirely stripped of verdure; and at other times they spread them- selves for days, or even weeks, over the cultivated lands, committing far more extensive mischief.

1A little ipecacuanha, made into a paste with water and applied

externally to the place stung, has produced, in the many instances in Which the writer has known it used, almost _instant relief. sn

It is inferior to that of England, and also to the famous Greek honey. Butterflies and moths of many kinds are observed in the fields. There are plantations of mulberry trees in the eastern part of Lower Egypt, for the rearing of silk-worms. The manufacture of silks was a Government monopoly, but has lately ceased to be so. The silks of Egypt are generally inferior to those of Syria and other Eastern countries, though some have been produced of great excellence. Among the other insects may be men- tioned the common fly, rightly deserving a place among the plagues of Egypt, as does also the mosquito, which, how- ever, is not found throughout the country.

Ancient Inhabitants.—In the following remarks on the ancient Hgyptians great assistance has been derived from the valuable work of Sir Gardner Wilkinson on their Manners and Customs, which has made us better acquainted with them than we are with any other people of antiquity. From

the representations of their monuments, and from the mummies which have been unrolled, we can form an accurate idea of the personal characteristics of the ancient Egyptians. In consequence of a misconception of a passage in Herodotus (ii. 104), and confused notions respecting the inhabitants of Africa, it has been often sup- posed that the Egyptians were very nearly allied to the negro race. A careful examination of the most distinct data in our possession has, however, produced a far different result; and it is now acknowledged that they were more related to the Caucasian than to the negro type. It has also been shown that most of the modern inhabitants have preserved many of the characteristics of their ancient pre- decessors, and that it is, therefore, erroneous to suppose that they are chiefly of Arab origin, although the intermix- ture of Arab blood has so much changed the national type that it would not be safe to describe the earlier people from the appearance of the present. Neverthe- less, one is often struck, among the remains of ancient monuments, by the similarity of an early representation to some one of the natives standing by, priding himself upon an Arab origin, and repudiating the reproach that he is of the race of Pharaoh.

Judging from the monuments and mummies, the coun- tenance of the ancient Egyptians was oval, and narrower in the case of the men than of the women. The forehead was small and somewhat retiring, but well-shaped ; the eyes large, long, and generally black; the nose rather long, and with a slight bridge ; the mouth expressive, with rather full lips, and white and regular teeth; the chin smal] and round, and the cheek-bones a little prominent. The hair was long, full, crisp, somewhat harsh, and almost always black. The beard was worn in so artificial a mode that one cannot judge whether it was full or not. The skin of the men was dark brown; that of the women varied from olive to pink flesh-colour in different persons. The colour of the women was natural, and the darker hue of the men the result of exposure to the sun, and the scantiness of their clothing explains why their faces were not darker than the rest of their bodies.

The dress of the ancient Egyptians did not much vary at different periods. Under Dynasty LV. it was, however, simpler than under the Empire. As most monuments re- main of the Empire, the dress of the inhabitants at that time will be described, and this description will apply, in its main particulars, to the earlier and later times of their ancient history.

The men of all classes either had shaven heads, with skull-caps, or wore their own hair, or wigs, very full, and in numerous plaits or curls, falling to the shoulders, but sometimes much shorter and in the form of a bag; there

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is, indeed, reason to suppose that the practice of shaving the head was universal, except among the soldiers. All the hair of the face was also shaven, except in the cases of kings and great persons, who had a small formal beard, possibly artificial, beneath the chin,

The king was distinguished from his subjects by the richness of his apparel. His head-dress was sometimes his own hair, or the wig, alone; and at others he wore the high crowns of Upper and Lower Egypt, the former being a kind of conical helmet, and the latter a short cap with a tall point behind, worn outside the other. He is also occasionally represented with another form of high cap. The figure of an asp, the emblem of royalty, is often tied just above his forehead, His beard was about three inches long, and one inch broad and deep, and formally plaited.

The simplest royal dress was a kilt, usually reaching nearly to the knees, rather full in front, having a girdle above, from which hung before a broad band, richly ornamented, and peculiar to the king, like the lion’s tail (natural or artificial) which was attached to it behind, and reached nearly tothe ground. Sometimes a large and full shirt was worn over the kilt, descending almost to the ankles, and having wide sleeves reaching to the elbow: this outer dress is occasionally simply a skirt. Both these dresses were usually of white linen, and the outer dress was apparently very fine and transparent. Sandals were worn on the feet, and the ornaments were armlets, bracelets, both flat and broad, and deep necklaces.

The ordinary costume of men of the upper and middle classes was the same as that of the king, the short kilt, with sometimes the long shirt or skirt of fine linen above it, tied in various forms. Their beards were very short, scarcely exceeding an inch in length, and of a formal square shape, and they wore the full hair or wig, or a skull-cap. They generally went barefoot, but

sometimes used sandals. The priest was occasionally clad in a leopard’s skin, either tied or thrown over the shoulder, or worn as a shirt, the fore-legs forming sleeves. Military personages are often represented with helmets, and sometimes with short coats or corslets of plate-mail. The royal princes were dis- tinguished by a side-lock apparently curiously plaited.

The men of the lower class wore the kilt and girdle alone, or, especially when engaged in laborious work, went altogether naked. They shaved the head and face, and had no head-covering but the skull-cap. The soldiers had kilts of different kinds, and coats or corslets of plate-mail, and either wore full hair or helmets.

The dress of the queen consisted of a tight skirt, descend- ing to the ankles, supported by shoulder-straps, and bound at the waist by a girdle, with long ends falling in front. Over this was usually worn a full shirt of fine linen, with wide sleeves reaching below the elbows, and having a broad skirt falling to the ground. It much resembles the upper dress of the king, or of men of the richer classes. The queen was distinguished by her head-dress, which was in the form of a vulture with outspread Wings, the bird’s head projecting over the forehead, and the wings falling on either side, while the tail extended behind. Sometimes the queen is also known by the royal asp above her forehead, and at other times she is represented with various forms of head-dress. The queen also wore sandals, (For illus- trations of royal dress see Costums, vol, vi., p. 457 —8.)

The dress of ladies was the same as that of the queen, without the distinguishing ornaments, but they frequently appeared in the under garment or skirt alone. The women of the lower class wore that garment only, and some- times it was much shorter than that of the ladies, parti- cularly When they were engaged in manual labour. The women’s hair was worn in the same manner as the me’s, but it was of greater length, usually reaching about half-

way from the shoulders to the waist, being rarely longer, and sometimes much shorter. It was ornamented in various ways, but the general form was always the same,

The children of all ranks were very simply dressed, when clad at all, though those of rich persons were some- times attired as their elders. Boys were distinguished by the side-lock, which the princes, as before mentioned, wore in a peculiar fashion,

Leligion.—The credit which the Egyptian priests enjoyed in antiquity for a knowledge of philosophy led to the expectation among modern scholars that, when hieroglyphics were read, the world would recover a lost body of human speculation, The first results disappointed this expectation, but later studies have gone far to justify it. The state- ment of what those studies have achieved may be divided into the two main subjects—the teaching as to the gods and that as to man's duties and destinies, rites and ceremonies coming under both heads.

Had the Egyptians any idea of one God ?—~in other words, is their religion a complex structure raised upon a recognized monotheistic foundation? The Egyptian religious writings are held by M. de Rougé to give an affirmative answer to this question. They speak of one supreme being, self-existent, self-producing, the creator of heaven and earth, called the double god or double being, as the parent of a second manifestation. From the idea of a supreme deity, at once father and mother, producing a second form, probably originated a first triad like the triads of father, mother, and son frequent in Egyptian mythology. To the local divinities the attributes of this supreme deity are given, as though they were mere personifications : that they were originally so is, however, not certain. Ra, the sun, is indeed spoken of as this supreme being, but this appears to have been a later phase of opinion. (De Rougé, " Etudes sur le Rituel Funéraire," Rev, Arch., n.8., 1. 356 seqgg.) It was probably an attempt to substitute a popular materialistic belief for a philosophical creed. A significant instance of this tendency is perhaps seen in thie endeavour of a king of Dynasty XVIII. to abolish all wor- ship but that of the solar disk—sun-worship in its most material form.

A very ancient moral tract, the papyrus of Ptah-hotep, composed under Dynasty V., although a purely Egyptian work, mentioning Osiris and a divinity who may be a form of Osiris, yet speaks constantly of God as if the author had the idea of one God.!

It also appears from one remarkable fact that this idea prevailed in Egypt before the conversion of the nation to Christianity. The Copts took care to eliminate from their vocabulary all the words connected with the religion of their forefathers, substituting for them Greek equl- valents. Their term for God is, however, not Greek but Egyptian, nox, the hieroglyphic neter. They also used it for heathen objects of worship, god or goddess. These uses must therefore have been prevalent in the vulgar dialect when it was first written in Coptic.

Though it cannot reasonably be doubted that the Egyptians had a distinct idea of monotheism, this idea was mixed up with the basest polytheism. The double character which we perceive in the race and the language, both partly Nigritian, partly Semitic, is equally evident in the religion. Every town in Egypt had its sacred ee ee ee eee

1 “T/idée abstraite de la Divinité intervient fréquemment dans le texte, comme si l’auteur avait la notion de l’unité et de V indivisibilite divine. Mais cette maniére de parler n’appartient pas exclusivement & cet antique document. On la rencontre fréquemment dans les textes plus modernes et notamment au Ritucl. D’ailleurs Je nom d’Osiris et celui de Dieu double crocodile’ suffisent pour nous démontrer que nous avons affaire 4 un monument de pure origine égyptienne.”’ Chabas, ‘* Le plus ancien livre du monde,” Rev, Arch. xv, 16.

animal, or fetish, and every town its local divinities. As the animal worship was associated with higher ideas by the union of an animal’s head with the body of a man in the figures of divinities, so the local divinities were connected with the monotheistic idea by intermediate forms, principally identifying them with Ra, who thus was the generally received form of the notion of one god. Accord- ing to this view monotheism was not the parent of poly- theism, but in a later phase connected with it.

One great change affected the essential ideas of the Egyptian religion. For many centuries Seth, specially the divinity of Lower Egypt, who seems to have represented then, as certainly afterwards, the destructive power of nature, held a place in the Pantheon, although regarded as the adversary of Osiris and thus of mankind, whom, how- ever, he finally befriends. He seems thus to have a charac- ter of necessary evil. At length, after the Empire, he was expelled from the Pantheon. This may have been because the worship of Seth was repugnant to a reigning house of Asiatic origin, which might have held the Persian dualism which identified physical and moral evil. It may have been because Seth had been considered to be the divinity of the eastern neighbours of Egypt, and with their success and the fall of Egyptian supremacy had come to be thought hostile to that country. If this were the cause, the kings who proscribed his worship could have had no relation to the nations supposed to reverence Seth. In effect the change identified physical and moral evil and destroyed the earlier philosophical notions on the subject, besides introducing some confusion into the Pantheon.

Herodotus speaks of orders of gods, Manetho of divine dynasties. The explanation is to be found in the worship at each town of a cycle of gods. This cycle is called “the society of the gods,” or “the nine gods.” M. de Rougé does not admit the second rendering except as a plural of excellence (“ Etudes,” Itev, Arch., n.s., i. 237), The num- ber varies at different places and in different lists at the same place, but is always nearly or exactly nine. The Egyptians themselves explained this cycle as the self- development of Ra; the other gods were in this view his attributes (De Rougé, I.c. 236,237 ; Rit. xvii. 2,3). Two forms of the cycle acquired the highest importance as repre- senting the systems of the learned men of Memphis and Thebes, the successive great capitals of Egypt.! ay two systems are thus given by, Professor Lep- sius? ;—

Mopmruite System. THEBAN§SYSTEM.

1. Ptah ($04, “Hoatotos.) 1. Amen (“Aupov, Zebs.) 2. Ra (“HAuos.) 2. Mentu (Mévé.) 3. Atmu (Todu.) 3. Shu (Sas) 4, Shu. Tefnet. Tefnet. 4, Seb (Kpédvos) 5. Seb. Nut (‘Péa.) Nut. 5. Hesiri “Ooipis, Aidvuovs), and | 6. Hesiri. (6.) Hes (lows, Anuhrnp.) Hes. 6. (7.) Set (340, Tuday), and | 7. Set.

Nebti (Né@6us.) Nebti. 7. (8.) Har (*Opos,’ AwéAdwv), and | 8. Har. Hat-har (’A@édp, ’Adpodirn.) Hat-har. 9. Sebek.

Tennet [consort of Mentu ?] Penit (or Pit?) [consort of Atmu ?]

The views of Professor Lepsius on the origin and consti- tution of these systems, with such modifications as later

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1 These have been called the systems of Memphis and Thebes. The local cycle of Memphis was, however, not the system of Manetho which has been called Memphite, and has a distinct local character (Brugsch, Geogr. Inschr., i. 237).

? Shu, true spelling since discovered, is here put for Mu.

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researches have suggested, may now be given. We first observe that the two systems are but variations, and may be treated as one. They consist of male divinities, most of whom are associated with goddesses. These goddesses hold an inferior place, and are not to be counted in reckon- ing the number of the order, except perhaps Isis, whose importance is much greater than that of the others. An examination of the various forms of the two systems immediately suggests that they increased in course of time, Ptah and Amen, the chief gods of Memphis and Thebes, having been added for state reasons. The order thus reduced consists of two groups, the group of Ra, and that of Osiris. The group of Ra is wholly of solar gods, the group of Osiris begins with Seb and ends with Hathor. Sebek then stands alone, but he is wanting in the older lists, and is only an addition of the Theban system.

The solar group consists of Ra, or else Mentu and Atmu, and Shu. Mentu and Atmu are merely a division of Ra into his two chief phases, the rising and the setting sun, the sun of the upper and of the lower world. Both are

solar divinities (Brugsch, Geogr. Inschr., i. 254.) Shu, the solar light, is the son of Ra or of Mentu or Atmu; Tefnet, the goddess associated with him, is the daughter of Ra.

The Osiris group is not genealogically connected with the solar group. The central point of the group is found in Osiris, with his consort Isis and his opponent Seth. Seb and Nut are merely extensions of the group npwards. They are, however, spoken of as parents of the gods, showing that they represent the commencement of a series. Osiris, Isis, Seth, and Nephthys were usually considered their children, and Horus, the child of Osiris and Isis. Hathor is associated with Horus, but her genealogical place is not clear. It is, however, certain that she is of the family of Osiris. The characteristics of this group are predominantly cosmic ; this is true of the myth of Osiris, and consequently of the whole group, aud is especially evident in the cases of Osiris and Isis, Seth, and Seb and Nut. |

How did these two groups come to be united in a single series? Professor Lepsius argues that this was due to the influence of Thinis, the oldest Egyptian royal seat, from which the first historic king Menes came to Lower Egypt and founded Memphis. Thinis ata very early time merged into the more famous Abydos. Abydos was the great seat of the worship of Osiris, which spread all over Egypt, establishing itself in a remarkable manner at Memphis. All the mysteries of the Egyptians and their whole doctrine of the futnre state attach themselves to this worship. Osiris was identified with the sun, and the union of the two groups was thus not forced. Both had indeed a common origin. Sun-worship was the primitive form of the Egyptian religion, perhaps even pre-Egyptian. The first development was the myth of Osiris, due to the importance of Thinis, just as the rise of Memphis put Ptah, an abstract idea of intellectual power, even before Ra. So the rise of Thebes introduced Amen, who was identified in the form Amen-ra with Ra, and as an intellectual principle placed before the physical solar powers. This argument derives great weight from the relative position given to the two groups, the solar divinities coming first, and from the circumstance that the religious reform under Dynasty XVIII. suppressed everything but material sun- worship, as though this had been the primitive belief of Egypt.? M. de Rougé, in his examination of the Egyptian Ritual, comes to a similar but more definite result in treating

3 See Lepsius, Ueber den ersten Aegyptischen Gétterkreis und seine geschichtlich-mythologische Entstehung,” Berl, Akad., 1851.

of the mythological elements of the important seventeenth chapter. He traces the solar gods to Heliopolis, and considers the Osiris myth as probably derived from Abydos, and added ata later time. Professor Lepsius does not admit the Heliopolite origin of the solar group, on account of the small political importance of Heliopolis. Yet the circumstance that the chief divinities of that city, which had the sacred name Pe-ra, the abode of Ra, were Atmu, Shu, and Tefnet (it, xviii. 4, ap. Brugsch, Geogr. Inschr., i. 254, cf. 255) seems conclusive.?

Some account may now be given of these divinities in the order of the lists, the later additions being noticed last and then lesser divinities. It will be impossible to give more than the simplest particulars, and many names in the Pantheon must be omitted altogether.

Ra, the sun, is usually represented as a hawk-headed man, oecasionally as a man, in both eases generally bearing on his head the solar disk, round whieh the ureus, symbolic of royal power, is sometimes coiled. His symbol is either the solar disk or the hawk. Ra had the most general worship of any Egyptian divinity, except Osiris. The worship of Osiris under his own name was more common than that of Ra under his, but this was in some degree compensated for by the union of Ra with other gods besides solar ones, such as Amen, Num, Sebek, forming the compound divinities Amen-ra, Num-ra, Sebek-ra (Lepsius, Est. Aeg. Gétterkreis), and by his being the type of sovereignty, so that each king was a Ra son of Ra, This importance of his worship was due to the adoption of Ra as the leading representative of the supreme being, from whom indeed he is sometimes undistinguishable in the Ritual, though as already noticed this does not seem to have been the primitive opinion, for there are evidences of his inferiority to the supreme god and to Osiris (De Rougé, ‘‘ tudes,” Rev. Areh., n.s., i. 358). In the religious paintings he is the supreme being, carrying on in his eourse a constant warfare with and triumph over evil, repre- sented by the great serpent Apap, a wholly evil being, not a divinity. His career resembles that of Osiris, but with notable diffcrences. Ra is purely solar. He is rarely

associated with any consort, and if so assoeiated his consort is a female Ra (Lepsius, Erst. Acg. Gétter- kreis). He is always vietorious. He proteets mankind, but has nothing in common with them. Osiris on the other hand is only solar beeause he is the beneficent power of nature. He is con- stantly associated with Isis. He has a life-long conflict with a inaleficent power, his brother or son Seth, who is not wholly evil. Vanquished and killed he recovers his life and wins, butit is rather Horus his son who wins, and Horus, a sun-god, is the direct link with Ra in the Osiris family. Osiris protects mankind because his life resembled theirs: if he did not live on earth, at least his tomb was shown there. At Heliopolis two animals sacred to Ra were reverenced, the black bull Mnevis, sacred to Ra and Atmu, and the Phenix (Bennu) sacred to Ra. Both are connected with Osiris, the bull by the worship of Apis at Heliopolis, the Phenix as also representing Osiris (Brugsch, Geogr. Insehr., i, 257, 258). In addition the sacred Persea-tree was revcrenced at Heliopolis,

In the attempt under Dynasty XVIII. to establish sun-worship in an original or ideal simplicity, the only representation is the solar disk with the ureus entwined round it, and rays ending in human hands, one of which offers the symbol of life to the worshipper. The great sun-temple then founded contained no statue whatcver (Lepsius, Hirst. Aeg. Gotterkreis).

Mentu and Atmu may best be noticed together as merely two phases of Ra, representing, as already stated, the rising and the setting sun, the sun of the upper and the lower world. Their twin- character is seen in the eireumstance that Mentu was worshipped at Southern An (Hermonthis) and Atmu at Northern An (Helio- polis, the On of the Bible). Mentu, or Mentu-ra, is represented as Ra with the tall plumes of Amen, Atmn in a human form. Both cannot be distinguished from Ra except that probably their attri- butes were more restricted, and while Mentu seems to be within limits identical with Ra, the human form of Atmu may perhaps hint a relation to Osiris.?

1 “Tl est facile d’apercevoir, dans tous ees caracteres, les symboles osiriaques, qui composaient probablement la doctrine primitive d’ Abydos, Se superposant aux emblemes d’Héliopolis” (Rev. Areh., n. s., i. 359, 360). M. Mariette, on the other hand, writes “ Originairement Osiris est Je soleil

nocturne, il est la nuit primordiale ; il précéde la lumiére ; il est par conséquent anterieur 4 Ra, le soleil diurne” (Jfus. Boulag, 1869, 100).

: a Shu is, however, not mentioned among the divinities of Heliopolis in the great Papyrus of Ramses III. Records of the Past, vi. 52 seqq.

>In the 17th chapter of the Ritual the justified dead is called in his new condition Tum, equivalent to Atmu. This may be merely

Shu is light, and is a type of celestial force, for he is represented supporting the goddess of heaven. M. de Rougé remarks that it is curious to find in this ancient cosmogony the principle of force identified with the luminous principle (‘Etudes,” Rev. Areh., i. 235, 236). His figure is human and he sometimes bears on his head the ostrich-feather, which, though the initial of his name, musthere haye its symbolical sense of ‘‘truth.” The relation of light and truth jg not less remarkable than that of lightand force. Tefnet, associated with Shu in the cycle, is represented with the head of a lioness, This is the most common compound form of Egyptian goddesses, as the hawk-headed of the gods. Both are conneeted with solar worship. The lioness was probably chosen as the highest form of the family to which the luminous-eycd cat, onc of the most popular of the saered animals, belonged.

Seb stands at the head of the family of Osiris. He is repre. sented in human form like his consort Nut. They are called ‘‘ father of the gods” and ‘‘bearer of the gods.” Seb was the god of the earth (De Rougé, Ibid. 288), and Nut the goddess of heaven. Her name means the abyss, though curiously the primordial abyss is called, in ch. xvii. of the Ritual, nu, in the masculine (Ibid,

359).

Osiris, in Egyptian Hesiri, is usually represented as a mummy, wearing the royal cap of Upper Egypt, which may indicate the Thinite origin of his worship, or that, as Horus and Seth were the special divinities of Upper and Lower Egypt, so he was particularly connected with the upper country. His cap is usually flanked by ostrich plumes, which probably have a reference to Ma-t the goddess of truth and justice. The myth of Osiris is the most interesting because the most human part of Egyptian mythology. It is im-

possible to attempt a full aeeount of it: the materials have yet to be gathered. We cannot accept the treatise On Isis and Osiris as representing the older form of the myth. In different documents Wwe seem to trace its growth, and notably do we find in those later than Dyn. XXII. the change due to the altered theory of good and evil. Yet the general outlines are the same in what we may leason- ably hold to be the earliest documents. It is these that are, as far as possible, used here.

Osiris is essentially the good prineiple: hence his name Un- nefer, the good being, rather than the revealer of good (Maspero, Histoire Anctenne, 38). Like Ra he is the ereator, and like him in perpetual warfare with evil. His brother, or son, Typhon, Seth (Set), is his opponent. They are light and darkness, physical good and evil, the Nile and the desert, Egypt and the foreign land. Osiris is certainly moral good, Seth is to a certain extent moral evil. Throughout the Ritual they are in conflict for right and wrong, for the welfare and destruction of the human soul. Inch. xvii. which was preserved intact from a remote age, this conflict appears. Seth is, however, not there distinetly named as the opponent of Osiris, exeept in the glosses, whieh may be as old or (like the case of the Mishna and the Gemara) older than the text, and onec in the text he appears as joining with Horus his adversary in aceomplishing the final condition of the deceased who had reached the abode of happiness (ver. 35); and on the other hand, one gloss explains the executioner of souls to be Seth, but otherwise Horus the elder, brother of Osiris, who is buta variation of the younger Horus (ver. 83). Yet the opposition of Osiris and Seth is a perpetual combat. Osirisis vanquished, He is cut in pieces and submerged in the water. Watehed by his sisters, Isis his consort and Nephthys the cou- sort of Scth, he revives. Horus his son avenges him, and with the aid of Thoth, or reason, he destroys the power of Seth, but does not annihilate him. The myth is a picture of the daily life of the sun, combating darkness yet at last succumbing to it, to appear again in renewed splendour, as the young Horus a solar god triumphs over Seth. Itis also a picture of human life, its perpetual conflict and final seeming destruction, to be restored in the new youth of a brighter existence. In this view suffering is not wholly evil, but has its benefieent aspeet in the accomplishment of final good. There are two ways of explaining the origin of this myth. ither we may regard Osiris as the sun of the night, and so the protector of those who pass away into the realm of shades, or we may

suppose that once taken as the type and ruler of mankind in the after state, the hidden sun was naturally chosen to represent him, the sun being with the Egyptians the source and governor of all life. Those who make the solar idea the first form of the myth have to explain its specially human aspect, and particularly why we seo no such aspect in any deep sense in the ease of Atmu the sun 0 the night in the group of solar divinitics. 2.

It will be casily seen how such a story took hold of the affections of the Egyptians. Osiris was the type of humanity, its struggles, its sufferings, its temporary defeat, and its final victory. The liv- ing, and still more the dead, were identified with him. Under his nainc, without distinction of sex, they passed iuto the hidden place HE) NUATONG CIS URC ELC E EE OCD e eae ee e

beeause the word ¢wm has the sense man, and may be thus a play upon the name of the divinity (cf De Rougé, “ Etudes,” 350, 351), but it is more likely that Tum is here used as Osiris everywhere to indicate the divine quality of the justified.

(Amenti), the divine world below (Ker-neter), to be protected by him in their conflict with Seth and his genii, and to have their final state determined by him as their judge. It was to Osiris that the prayers and offerings for the dead were made, and all sepulchral inscrip- tions, except those of the oldest period, are directly addressed to him. As Isis is a form of the female principle, Osiris, the sun and the Nile, was considered in one phase to be the male principle. The Osiris of Mendes was the name of this form, which was more especially known by the name of Mendes.

The three most famous of those more sacred animals which were worshipped as individuals, not as a class, were the bulls Apis and Mnevis and the Mendesian goat. Of these Apis and the Mendesian goat were connected with the worship of Osiris. Manetho says that all these animals were first reckoned among the gods under a very early Egyptian Pharaoh, Kaiechés, in Egyptian Ka-kau, second king of Dyn. II! It is very characteristic of the Egyptian religion that the reverence for Osiris should have taken this grossly-material form.

The bull Apis, who bears in Egyptian the same name as the Nile, Hapi, was worshipped at Memphis. Here M. Mariette discovered a series of the tombs of these bulls, with tablets recording the reigns in which they were buried, and in several cases further exact par- ticulars of date, thus affording important chronological evidence. Apis was considered to be the living emblem of Osiris, and was thus conneeted with the sun and the Nile, and the chronological aspect of both explains his being also connected with the moon. On the death of an Apis, a successor was sought for and recognized by certain marks. He was then inaugurated and worshipped during lis lifetime. (See Arts.)

Sarapis, or Scrapis, in Egyptian Hesiri-Hapi, is the defunct Apis, who has become Osiris. The great extension of the worship of Sarapis, after the importation of his statue by Ptolemy I., was merely a devclopment of long existing Egyptian ideas. Hence the rapid spread and great popularity of this worship. (See SERAPIS.)

The Mendesian goat had no special name. He is called the Ram. He was considered an emblem of Ra and Shu as well as of Seb and Osiris, but probably he was chiefly sacred to Osiris, and in his solar aspect, which would thus introduce the relation to the more markedly solar gods. The seat of his worship was Mendes in the eastern part of the Delta, where Dr Brugsch has discovered a very interesting stele of the reign of Ptolemy II., Philadelphus, giving the history of the finding and inauguration of a sacred ram, and of the honour paid to him and to his temple. His worship was similar to that of Apis, ut of’a grosser form, inasmuch as the goat or ram was a symbol of the productive force of nature.”

Isis, or Hes, represented as a woman bearing on her head her emblem the throne, or the solar disk and cow’s horns, is the female form of Osiris. Unlike Ra, the Osiris family have consorts ; but no one is so distinctly as Isis a counterpart and of equal importance. Though the place of Isis is not as significant as that of Osiris in the inyth to which they belong, she is necessary to it, and this is pro- bably the reason why she attained an importance beyond the other Egyptian goddesses except only Hathor, who is but another Isis.

Seth, the Egyptian Set, usually called by the Greeks Typhon, is represented with the head of a fabulous animal, having a pointed snout and high square ears. He was the brother or son* and oppo- nent of Osiris, the divinity of the enemies of Egypt, and the chief of the powers which fought with the human soul in the after life. Hecertainly represents physical evil. It would be easy to account for his worship in Egypt were it not for his appearing as the cnemy of gods as wellas of men. There is indeed something illogical in his holding a place in the Pantheon, which gains consistency by his expulsion, though the consequent confusion of moral and physical evil was detrimental to ethical ideas. It is remarkable as showing the Egyptian notion of Scth while he was still worshipped, that in the Tombs of the Kings at Thebes, those whose names are composed with his, Setce J. and II, and Set-nckht, use instead the name of Osiris. This seems to have been sometimes done afterwards by a change in the inscriptions, but still at the time when the tombs were first completed, and thus while the revercnce of Seth, as is shown ene eee

1M, de Rougé has noticed that the name of this king, ‘‘ the male of males” or ‘‘the bull of bulls,” may be conneeted with the cultus of the sacred bulls, while that of Bindthris, his suecessor, eontains a symbol, the ram, interchangeable with the goat, which makes it look like a second commemorative medal (Six Prem. Dyn., 248, 244). If this be so the names of these early Pharaohs must have been takeu on their accession or on some remarkable event, like the throne-names after the introduction of that second name. A change of name during aking’s reign for a religious reason is seen in the ease of the sun- worshipping Amenoph IV., who took the name of Khu-en-aten. ’

- Records of the Past, viii. 91 seqgg., where the stele of Mendes is translated.

8 It has been usual to call Seth the brother of Osiris ; Dr Brugsch prefers to style him his son (Hist., 2 ed. p. 20, 22). This double relationship is the key to the similar position of Horus, and the identity of Hathor and Isis.

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by these royal names, was in full bloom (Lepsius, Z£rst. Aeg. Gétterkreis). The subsequent change of opinion as to Seth, his identification with moral evil, and his consequent expulsion from the Pantheon have been already noticed. In consequence his figure and name are usually effaeed on the monuments, and other gods take his place in the cycles in which he had a position. In later times Seth is the enemy of all good, feared and hated, but no longer reverenced. The date of the change is as yet undetermined. It has .been usually assigned to the Bubastite kings who composed Dyn. XXII. M. Mariette has discovered the curious faet that one of those kings, a hitherto unknown Osorkon, altered the figure of Seth in the legends of Ramses II. at Tanis to that of a Set-Ra (Afusée Boulak, p. 273). Was this the beginning of the change ?

Nephthys, or Nebti, the sister of Osiris and Isis, and consort of Seth, does not, as far as the Egyptian documents tell us, share his character. Itis rather as the sister of Isis that she there appears, aiding her in her labours to recover and revive Osiris. Thus like Isis she isa protector of the dead, and her figure and worship escaped the fate of those of Seth.

Horus, or Har, is in the cycles the son of Osiris and Isis. There is also a Horus the elder, Haroéris, Har-oer, brother of Osiris, and a Horus the child, Harpocrates, Har-pe-khruti, son of Osiris and Isis, and two other forms, Har-Hut, the Horus of Hut or Apollino- polis Magna, and Har-em-akhu, ‘‘ Horus in the horizon.” Horus is generally hawk-headed, and thus a solar god connected with Ra. This connection is perhaps strongest in the form Har-em-akhu, worshipped at Heliopolis sometimes even as Ra-Har-em-akhu. The most interesting form is that of Horus as the son and avenger of Osiris. Osiris being identified with the sun of the night, Horus is naturally the sun of the day. From this identification arose the idea of an infant Horus as the rising sun. As Horus took the place of Osiris in the contest with Seth, he became the elder Horus, to be on an equality with his opponent, who seems oftener the brother than the son of Osiris. Specially Horus is the ruler of Upper Egypt, and the typical king of Egypt as muchas Ra. It is indeed so hard to distinguish Horus from Ra that it seems im- possible to hold any opinion but that they had their origin in separate religious systeins.

Hathor, Athor, or Hat-har, whose name means “the abode of Jorus,” is hard to distinguish from Isis. She was worshipped with Isis at Dendarah (Diimichen, Bawurkunde der Tempelanlagen von Dendera, 8, 4) and Dr Brugsch even supposes the local goddess to have been Isis-Hathor (Geogr. Inschr., i. 202, 203), but this he has not proved, for the representations and titles are different for the two goddesses (cf. Diimichen, /.¢.). The cow was sacred to both Hathor and Isis, and both wear the disk and ecow’s horns. Tathor in the form of a cow plays an important part in Amenti (cf. Diimichen, ibid. 21; Mariette, Ifusée Boulag, 118, 119). Curiously she is more widely reverenced than even Isis. She is really the female counter-part of Osiris. She was, like him, worshipped throughout Egypt, and the great temple of Adfoo contains a lst of over three hundred names of the goddess in her local forms (Diimichen, ibid. 20). Still more remarkably, in late times, the cow, here the symbol of Hathor, not seldom takes the place of the name of Osiris as applicd to women deceased: instead of taking the form of Osiris, they take that of Hathor (Jbid. 21). It is characteristic of the Egyptian religion that this irregularity should occur, and we may well hesitate to attempt to define the place of Hathor in the Pantheon (Mariette, Musée Boulag, 118), though M. Diimiehen has made this endeavour in a very intcresting passage, that could be aceepted had he given sufficient authority from the monuments, and not shown traces of the influence of Greek interpretation, besides too great a tendency to reason on the negative evidence of the simple statemeuts of the earlier monuments (lbid. 20, seqq.).

Phtha, or Ptah, the Egyptian Hephestus, is the first to be noticed of the divinities introduced into the chief cycles after their formation. His name is one of the Egyptian words which can be recognized letter for letter in Hebrew (MDB ‘‘he opened, began,” and (Piel) ‘‘earved’’); and the sense is similar. Ptah is thus the divine architect (ef. Brugsch, Histoire, 2d ed., 21). He was the chief god of Memphis, worshipped under a human form, sometimes as a pigmy, supposed to be an embryo. He was the creative force, but seemingly not asthesun. Though when connected with the local form of Osiris worshipped at Memphis under the name Sekeri-Hesiri, and then called Ptah-Sekeri-Hesiri, he is sometimes hawk-headed, this is rather with a reference to Horus than to Ra. Perhaps Professor Lepsius’s view that he is put before Rain the Memphite form of the cycle as an abstract idca of

intellectual power is the true one. If so, it seems probable that the worship of Ptah was of foreign origin.

Ammon, the Egyptian Amen, ‘the hidden,” probably owed his importance to the greatness of Thebes, the chief Egyptian scat of his worship. He seems to derive his characteristics from his association with other gods. As Amen-ra he takes the qualities of

- 4 Diimichen considers Hathor as the female principle to be identical with Isis (Bawurkunde von Dendera, 20).

the sun; as Amen-ra ka-mut-f, “the husband of his mother,” he takes those of Min or Khem, the productive principle. Rarely he has the ram-headed form that Greek notions would lead us to expect.

Rebek, the crocodile-headed god, seems to have held a similar place to Seth. There may have been a time when he was reverenced throughout Egypt, but in the Graeco-Roman pcriod he was a local divinity so disliked in most parts of Egypt that, as already noticed, the Arsinoite nome where he was worshipped does not appear in the geographical lists. His sacred animal the crocodile was held in abhorrence and hunted wherever Sebek was not reverence: (¢f. Brugsch, Hist., 2d. ed., 106, 107).

Thoth, or Tauut, is the head of the second cycle in the two principal forms of the cycles. As the chief moon-god he thus takes an inferior place corresponding to that of Ra. He is generally represented as ibis-headed, and frequently bears the disk and crescent of the moon. He is the god of letters and of the reckoning of time, and thus sometimes has solar attributes. The ibis and the cynocephalus were sacred to him. As the deity of wisdom he aids Horus in his conflict with Seth, and records the judg- ment of the deceased before Osiris. He appears in Pheenician mythology, though not at a period early enough for us to infer that his worship was not borrowed from Egypt. Yet it is not impossible that here, as in the case of Plitha, we have a trace of early Eastern influence. It is at least remarkable that the great seat of his worship, Hermopolis Magna, bearing in ancient Egyptian the civil name Sesennu, also Pe-sesennu and Ha-sesennu, Eight, or the

Abode, or House of Hight, is called in Coptic QYRLOVN, or CYSLOVIN R(=CNAY, two), where the numeral eight ap-

proaches the Semitic form (Brugsch, Geogr. Insehr., i. 219). Was the change in the Coptic numeral due to an ancient form of the name of this celebrated city ?

Ma-t, the goddess of truth, succeeds Thoth in a fragment of the list of the dynasties of the gods in the Turin chronological papyrus. She is characterized by the ostrich-feather, the emblem of truth, upon her head. She thus corresponds to Shu, holding the corre- sponding place. Thoth is called her husband (Lepsius, Kénigsbweh, taf. iii, 22), but she is not his consort at Hermopolis (Brugsch, Geogr. Insehr., i. 220). She isthe daughter of the sun. Her place in the myth of Osiris is very important, for it is in her hall, where she is called the Two Truths, that the deceased are judged.

Anubis, or Anup, jackal-headed, probably heldin one system the next place to Ma-t. He belongs to the family of Osiris, being called the son of that divinity. He presided over mummification. In the earliest sepulchral inscriptions the divinity addressed is Anubis, not Osiris. No reason has yet been discovered for this, There can be little doubt that Osiris was always intended, and that the earliest inscriptions, for some reason connected with the Egyp- tian reticence as to this divinity, address Anubis.

The four genii of Amenti were inferior divinities connected with embalming. They were called Amset, Hapi, Tiu-mut-f, and Kebh- senuf, The vases found in Egyptian tombs which bear covers in the forms of the heads of these genii were intended to contain the viscera of the mummy, as it was held to be of importance that every part of the body should be preserved.

The rest of the principal Egyptian gods may now be noticed as far as possible in the order of theirimportance. It must, however, be remembered, that we are likely to be misled by the abundant monuments of Upper Egypt, and the scantiness of those of Lower Egypt, and that therefore we cannot yet decide which were insig- nificant members of the Pantheon.

Chnuphis, or Khnum, represented with a ram's head, and to whom the ram was sacred, is the soul of the universe, and thus is spoken of as the creator (Mariette, Afusée Bowlag, 112). He was specially worshipped in Nubia, and at the First Cataract, with his

consort Sati, the goddess of the inundation (Brugsch, Geogr. Lnsch.,.

i. 150, seqg). He is closely connected with Amen.

The Egyptian Pan, the god of Panopolis, or Chemmis, was Min, ot Khem, the productive principle, a form of Osiris. He was worshipped at Panopolis with a form of Isis as his consort (Brugsch, ibid., 212, seqg.) It is remarkable that he was connected with Amen at Thebes, for the myth of Amen and that of Osiris are singularly apart.

Mendes, or Ba-neb-tet, is merely a local form of Osiris, lord of Mendes, connected with the worship of the sacred ram, or Mende- sian tg (Brugsch, tbid., 267, 268, 271, 272 ; Reeords of the Past, viii. 91).

Neith, or Nit, worshipped at Sais, identified by the Greeks with Athena, is one of the few goddesses who held the first place in local worship. From the idea of a supreme being, single and sclf- producing, arose that of a female aspect of this being. Thus Khnum is called, as representing this being, ''the father of fathers, the mother of mothers" (Mariette, Musée Boulag, 118). This would suggest the personification of a female principle. This principle seems specially represented by the higher goddesses, like Neith, who is called 'the mother who bare the sun, the first born, but not

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begotten, born" (Brugsch, Geogr. Insehr., i. 247). She wears the crown of Lower Egypt, where she was principally worshipped.

Pakht, or Sekhet, and Bast, are two forms of one goddess diffi- cult to distinguish. ‘They are both usually lioness-headed, though sometimes they have the head of the cat, their sacred animal, Pakht was worshipped at Memphis as the consort of Phtha ; Bast seems to have held a place at her city Bubastis like that of Neith at Sais. The monuments identify Hathor with Bast, and Isis with both Pakht and Bast, Hathor being called “Lady of Bubastis,’” while Isis is spoken of as ‘‘ bringing misfortune as the goddess Pakht, bringing peace as the goddess Bast” (Champ., Not. Man. 192, ap. Brugsch, Geogr. Inschr., i. 276). Pakht and Bast thus represent a double nature, not unlike the two principles in the Osiris myth (Mariette, Musée Boulag, 1106 ; Brugsch, Geogr. Insehr., i. 275, 276). Pakhtand Bast were identified with Artemis (Brugsch, ibid., 224, 275).

Mut, the ‘‘mother,’’ consort of Amen-ra at Thebes, is, as her name implies, another embodiment of the female principle, though not in so important a form as Neith, so far as our present knowledge goes.

Khuns, worshipped at Thebes as the son of Amen and Mut, isa lunar divinity wearing the disk and crescent of the moon, his hair being plaited in the side-lock of a child. Sometimes he is hawk- headed, and thus connected with the sun. As a divinity mainly lunar his inferior place is accounted for.

The goddess Suben, identified with Eileithyia or Lucina, was worshipped at the town Eilethyia. She was especially the mother- goddess, and the goddess of southern Egypt; her symbol, that of maternity, was the vulture (Mariette, Musée Boulag, 121).

The goddess corresponding to Suben was Uati, or Buto, who was the protector of the north, and whose emblem was the ureus serpent.

Onuris, or Anhcr, was the local deity of the ancient city of Thinis, His functions are not clearly defined.

Imhotep, identified by the Greeks with Asculapius, was the sou of Ptah and Pakht, and with them formed the triad of Memphis. He is probably the god of the sciences, and similar to Thoth (Mariette, did. 117, 118).

The Nile as a divinity bears the same uame as the sacred Mem- phite bull, Hapi, probably meaning ‘‘the concealed.” He is represented as a man with pendent breasts, to indicate the fertility of the river. A hymn to the Nile by Enna, who flourished under Menptah, the successor of Ramses IJ. (Dyn. X1X.), shows how completely even an inferior Egyptian divinity was identified with the supreme god, and with the principal members of the Pantheon (Seleet Papyri, xx.-xxiii., cxxxiv.—cxxxix.; Maspero, Hymme ait Nil, a critical edition, and Records of the Past, iv. 105, seqg., au elegant translation by the Rev. F. C. Cook). :

The Egyptian divinities were frequently associated in triads, temples being dedicated to one of thesc lesser cycles, consisting of father, mother, and child. The child is almost always a son. It is extremely difficult to make out a local triad in several cases, where there were two chief local divinities, or where the chief divinity wasa goddess. At Thebes the triad was Amen-ra, Mut, aud Khuns; at Memphis, Ptah, Pakht or Sekhet, and Imhotep ; at; Ombos there were two triads, Sebek, Hathor, and Khuns, and Haiuer, Tasen-nefert, and Pnebto-pkhrut ; the triad of Nubia and at Elephantine was Num, Sati, and the goddess Ank-t ; at Apollino- polis Magna, Har-Hut, Hat-har, and Har-pkhrut ; at Latopolis, Num, Nebuut, and Har-pkhrot; at Hermonthis, Munt, Ra-ta, and Har-pkhrut ; and Osiris, lsis, and Horus, throughout Egypt. The third member of the triad always belongs to an inferior rank, and is sometimes a child-god (khrut), as will be observed in the three cases in which Har-pkhrut (Harpocrates) occurs, and the similar instance of Pnebto-pkhrut. Much of our knowledge of the Egyptian triads is founded on late documents of the Ptolemaic and Roman temples, aud it is possible that the idea may have not been as much developed in earlier times. The whole subject requires a careful investigation.

The Egyptian notions as to the cosmogony are too closely identified with mythology to be very clearly defined. It seems, however, that they held that the heavenly abyss

was the abode of the supreme deity, who there produced —

the sun and the moon as well as the rest of the Pantheon. Yet it is stated in one gloss in the Ritual that the abyss itself was the supreme deity. (cf. De Rougé, “ Etudes, Rev. Arch, n.8., i. 235, seqg.). The aspect of the passages

of the Ritual in which these ideas are developed seems as if due to the attempt to introduce philosophical ideas into the mythology, as though the Egyptians had some notion of the origin of things independent of that mythology. ‘ d

The worship of the Egyptian deities was public an

private—that of the temples and that of the tombs. Every fown,had at least one temple dedicated to the chicf divinity of the place, with certain associated gods, and usually, if not always, a living symbol in the form of a sacred animal supposed to be animated by the chief local divinity. The services were conducted by priests, and on occasions by the king, and by scribes, who sometimes formed a college and lived at the temples, the various duties of which required the services of learned men. It is probable that the common people had a very smiall share in the religious services, the most important of which took place in the smaller inner chambers, which could never have admitted many worshippers. The outer courts, and still more the great inclosures containing the whole group of temple-buildings, must, however, have been the chief public resort for business and pleasure. ‘There were no other public build- ings, or, apparently, market-places. Like the modern mosque, the temple must have been the chief centre of the population.

The worship in the tombs was not local. It was always connected with Osiris or a divinity of the same group, and had the intention of securing benefits for the deceased in the future state. It took place in the chapel of each tomb of the wealthy; and though properly the function of the family, whose members officiated, the inscriptions invite all passers-by, as they ascend or descend the Nile, overlooked by the sepulchral grottoes, to say a prayer for the welfare of the chief person there buried.

The sacrifices were of animals and vegetables, with liba- tions of wine, and burning of incense. Human sacrifice seems to have been practised in early periods. The monuments do not mention it, but Manetho speaks of its having been abolished, at least at one place, by Amésis, no doubt the first

king of Dynasty XVIII. The reference is probably to some barbarous usage during the great war with the Shepherds.

The origin and destiny of man in the Egyptian religion is now known to us on the authority of its own documents, which in the main confirm what Greek writers had already Stated on the subject. The aspect of the Egyptian teaching is either that of a simple theory, which was afterwards mythically interpreted, or of a union of such a theory with a superstition existing side by side with it. In the famous seventeenth chapter of the Jtual it is possible, as De Rougé has done with extraordinary skill, to extract from the text a consistent theory which the glosses confuse by the mythological turn they give to the simple statements of the text. Notwithstanding this difficulty, it is suffi- ciently clear that the Egyptians attributed to the human soul a divine origin, that they held that it was throughout life engaged in the warfare of good and evil, and that after life its final state was determined by judgment according to its doings on earth. Those who were justified before Osiris passed into perpetual happiness, those who were condemned into perpetual misery. The justified took the name of Osiris, the judge, wnder which they indeed already appeared for judgment.

Had this plain outline been left unfilled by the pricsts, the Egyptians might have been credited with a lofty

1 According to Plutarch, Manetho stated that human sacrifices were anciently practised at Eilethyia (De Js. et Osir. i. cap. 73); whereas Porphyry says, on the same authority, that Amésis abolishedt hem at Heliopolis (De Adstin., p. 199). As, however, according to Porphyry they were sacrificed to Hera, who would well correspond to Suben, goddess of Eilethyia, not to any goddess of Heliopolis, it is probable that Heliopolis is an error for Hilethyia (“HAsod wéAce for EiAnéulas Act, as in the other passage where this is a correction for Id:@uas méAc1), but the two citations are very different. According to Por- phyry, Amésis substituted waxen figures for the victims. The figure called the ‘‘ Bride of the Nile,” now annually thrown into the river at the cutting of the Canal of Cairo, is said to represent a girl annually Sacrificed in former times,

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philosophy. Unfortunately, however, a thousand super- stitions took the place of the attempt to lead an honest life. In the tombs we find every one who could pay for a sculptured record characterized as justified, every mummy already an Osiris. How was this determined? Possibly there was a council held, which decided that the deceased could be treated as one who was certain of future happiness. It is, however, rnore probable that the learning certain prayers and incantations, the performance of ceremonies, and the whole process of embalniing, together with the charms attached to the mummy, and prayers said by those who visited the tomb, were held to secure future happiness. In reading the Avtual we are struck by the small space given to man’s duties as compared with that filled by incantations and charms. The human mind must have lost sight of the value of good and seized upon the multifarious equivalents which needed nothing to be done by way of either self-restraint from evil or active bene- volence. ‘Thusas we look at the documents we see a noble idea lost in a crowd of superstitious fancies ; as we look at the Egyptians as they lived, we trace the effect of the in- domitable good, and yet find it always greatly alloyed with evil. The Egyptian idea of the future state is the converse of that of Socrates. It is no little incident of human weakness, like the request to sacrifice a cock to Ausculapius, which injures but does not destroy a harmonious whole ; a mere glimpse of truth is seen through thick mists peopled with the phantoms of the basest superstition.

In the long course of ages the Egyptian ideas as to the future state seem to have undergone changes, not in them- selves, but in the manner in which they were regarded. The vast labour expended on the Pyramids, and their solid simplicity, are in striking contrast with the elaborate religious representations of the tombs of the kings of Dynasties XIX. and XX. So, too, the sculptures on the walls of the tombs of subjects of the earlier kings, representing the everyday life of duty and pleasure, give place to funereal and religious scenes in the later periods. These were fashions, but they show the changed mood of the national mind. It is only in a tablet of the age of the Ptolemies that Greek ideas assert their pre- dominance in a touching

lament addressed from the land of shades, which no longer speaks of active happiness, but in its place of purposeless oblivion (Birch, “Two Tablets of the Ptolemaic Period,” Archcologia, xxxix. 22, 23).

Laws and Government.—We are gradually gaining an in- sight into the Egyptian laws. This is principally due to M. Chabas, the third volume of whose J/élanges Egyptolo- giques mainly cousists of essays, nearly all by himself, on texts relative to the administration of justice under the Pharaohs. His general results confirm the accuracy of what Diodorus Siculus and Plutarch state on the subject. It was to be expected that their evidence would have been good as to matters which could not have been easily mis- understood, and which must in the case of Diodorus have been personally observed. In this matter the two sets of authorities may fairly be combined.

The government of Egypt was monarchical. It was determined as early as the rule of Dynasty IL, according to Manetho, that women could reign. Accordingly we find instances of queens regnant. ‘Their rule, however, seems to have been disliked, and they are passed over in the lists made under Dynasty XIX., when, it may be ob- served, the royal family seems to have been affected by Shemite influences. The royal power can scarcely have been despotic, although under certain kings it became so. It is sufficient to compare Assyrian and Babylonian with Egyptian history and documents to perceive a marked difference. ‘The earliest monuments indicate a powerful local aristocracy holding hereditary functions, Those of

the Empire (Dynasties XVIiI.-XX.) scarcely indicate any such class. Even the princes are no longer a royal clan, but the children of the reigning sovereign. The whole system of government rests with the king, who appoints all the functionaries and dismisses them at his pleasure. Hence arose a vast and corrupt bureaucracy, to which the decay of Egypt may have been mainly due. At all times the country was governed by nomarclis and lesser officers. In the earliest period these were local magnates whose office was at least sometimes hereditary, and whose interest it was to promote the welfare of their districts. Under the Empire governments seem to have been mere places of profit given by favour and held by force and corruption, according to the ‘Turkish method.

The laws were administered by judges appointed by the king. It is certain that commissions for an occasion were thus formed. We do not know that there were judges ap- pointed for life; but it is probable that such was the case, as it must have been the duty of a class to be thoroughly acquainted with the written laws. A legal scribe may, however, have been attached to each commission.! All the particulurs of each case, though not necessarily submitted in writing, were recorded, and the decision was written. The process was conducted with great care, and the culprit examined on his oath. The punishments probably were not extremelysevere. For murder, but not for manslaughter, death was the penalty. Adultery was severely punished, perhaps rather by custom than by law. Theft was rigor- ously prosecuted. For sacrilegious theft the criminal was punished with death. The laws relating to debt are not yet well known. They appear to have been complicated by a system of loans and pawning, and to have been sub- ject to modifications. Of the tenure of land we know little. The temple-lands seem to have been held in perpetuity, and this was probably the case with private domains in the earliest period (De Rougé, Sta Prem. Dyn., 255, note 1).

Army.—We know little as yet of the organization of the Egyptian army, but much of its arms and mode of conduct- ing warfare. It consisted from very early times of foreigners as well as Egyptians. The Egyptian troops seem to have been a military caste, though not in the strictest sense, and to have had certain lands allotted to them. There were two main divisions of the army, —a chariot-force, in which each chariot contained an archer and a charioteer, and was drawn by two horses; and a force of foot-soldiers variously armed, chiefly heavy infantry, armed with shield and spear, sword, axe, or mace, and light infantry, with bow, and axe or falchion, as well as slingers. It may be noticed that flint-tipped arrows were used in the chase. We know nothing of the military manceuvres, but it is evident that the troops were drilled to move in formations, and that the art of besieging was as well understood as by the Assyrians, in the mode of attacking tlie enemy’s fort as well as in that of protecting the soldiers.

Manners and Customs.—The subjects of the walls of the Egyptian tombs and the hieratic papyri tell us much of the domestic life of the ancient people. The education in the earliest age seems to have been more manly

aud more simple than in that of the Empire, when the college of a temple or the ininiature court of a great officer was the school instead of the estate of the landed proprietor. This system, however, gave almost his only chance of advance-

- M. Chabas has given the constitution of a tribunal under Dynasty XX. It was held at the great assizes of Thebes, and presided over by the poliarch, with nine inferior judges, including his three assessors, who were a royal controller, a majordomo, and another royal controller, the frst prophet of Amen-ra and an inferior prophet, a royal scribe, a captain of cavalry, an ensign of the navy, and the commandant of the city. ‘The last was the prosecutor, and was himself condemned by the tay Judges on the acquittal of the defendants (Ifélanges, iii. i. 131,

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ment to a poor mau’s son, for the very highest posts were open to the successful scholar. (Cf, Brugsch Hist. 2d ed. 16,17.) Circumcision was practised from tlie earliest times, but apparently not as a religious rite and not until the earlier years of childhood had passed. Of the education of girls there is no indication, but, as they afterwards shared the public life of men, and even held posts of importance in the priesthood, it could not have been neglected. It has not been proved that the Egyptians had any definite marriage law. We find, how- ever, that they married but one wife, who is termed the lady of the house, and shares with her husband the honours paid to the deceased. Concubinage was no doubt allowed, but it is seldom that we find any trace of children more numerous than those of legitimate wives could be. The family of Ramses IT. is an instance of an Oriental house hold, and the fifty-two children of Baba, whose tomb is found at Hilethyia, may also be cited, though the term children may in this case include other descendants (¢. Brugsch, «bid. 176, 177). Ordinarily the aspect of the family is that which it wears in civilized countries. The women were not secluded, and, if they did not take the place of those of republican Rome, it was due to faults of national character rather than the restraints of custom,

There was no separation into castes, although many occupations were usually hereditary. As there was no noble caste, there was nothing to prevent the rise of naturally able persons but the growth of the official class, which gradually absorbed all power and closed the avenues to success. The corruption of this class has been remarkably shown by the researches into the Egyptian administration of justice by M. Chabas, who cites lists of robbers of tombs and houses containing the names of scribes and priests, besides a higher grade of servants (Mélanges, iii.i. 144, seqq.). There are other indications of the social condition of Egypt under the Empire in the complaints of the lower class against the brigandage to which they were subject on the part of persons who found means to interest the highest functionaries, and so escape merited punishment. At the same time it is to be remembered that they had the right of direct appeal to the king (Jéid. 173-216). This part of the picture of Egyptian life is strikingly like that of China, and the dislike of foreigners is consistent with the comparison. The lower class being uneducated, and for the niost part very poor, was held in contempt by the higher, and this was especially the case with labourers and herdsmen. All handicrafts were considered unworthy of a gentleman, and even tle sculptor and painter were not raised above this general level. The only occupations fit for the upper class were priestly, civil, and military, and the direction of architectural and other works which required scientific knowledge, not skill of hand. The servants were of a higher grade than the labourers : not so the slaves, who were generally captives taken in war.

~ The everyday life of the ancient Egyptians is abundantly represented in the pictures of the tombs from the earliest monumental age to that of the Empire. The rich passed

‘much of their time in hospitality, giving feasts at which

the guests were entertained in various ways. The host and hostess sat together, as did other married people, and the other men and women generally were seated apart. The seats were single or double chairs, but many sat on the ground. Each feaster was decked with a necklace of flowers by the servants, and a lotus-flower wie bound to the head, on which was also placed a lump of ointment. Small tables were set before the guests, 4 which were piled meat, fruits, cakes, and other food, – wine-cups were carried round. Before the repast, hire musicians and dancers entertained the company, and often this seems to have been the sole object of invitation.

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These two kinds of entertainment are precisely what are customary at the present day in Egypt. Among the aimuse- ments of the ancient Egyptians was witnessing the perfor- mance of various gymnastic feats. They had several games, one of which probably resembled draughts. Under the old kingdom the chief occupations of the rich seem to have been those of a country life, in its duties, the superintendence of husbandry, of the taking stock of flocks and herds, and of the shipment of produce, and the examination of fisheries, or again in seeing to the efficient work of the people of the estate who were engaged in any craft ; and the pleasures of country life filled up the leisure. In ancient times Egypt had far more cover for wild fowl than now. Thus we see from the subjects of the tombs that the rich Egyptian was in the habit of going into the marshes in a canoe, generally with some of his children, to spear the hippopotamus, or more frequently to knock down birds with the curved throw-stick. In fowling, a cat was sometimes used as a retriever. At other times he fished in his ponds, or shot or coursed with hounds various animals of the antelope kind. Every rich man in the age of the Empire had a chariot, generally drawn by two horses, which he usually drove himself, standing up in it. The life of the ladies was not unlike that of the men, except that they only joined in the sports as spectators, They seem to have passed their time in household matters, in visiting, and in the simplest country pleasures. Occasionally they

rode in heavy cars drawn by oxen. Their manners appear to have been indolent and luxurious. Among the lower orders the lighter work usually fell to the women. Both men and women led hard lives, having scanty clothing and poor food ; yet the genial climate, in which the wants of the labourer must always have been few, rendered their condition not so painful as one might suppose.

Language and Lnterature.—The language of the people was the Egyptian, the later form of which, after they had become Christians, is called Coptic. Comparative philology has not yet satisfactorily determined its place. There can be no doubt that it is related to the Semitic family, but it has not yet been proved to belong to it. The grammatical structure is distinctly Semitic, and many roots are common to the Semitic languages. On the other hand, the Egyptian has essential characteristics which detach it from this family. It is monosyllabic, and its monosyllabism is not that from which scholars have endeavoured to deduce Semitic, but rather such as would belong to a decayed condition. This monosyllabism is like that of Syriac. Dr Brugsch strongly affirms the affinity of the Egyptian to the Indo-Germanic as well as the Semitic languages (Hist., 2 ed. 6), but the former relation has to be proved. It has been supposed that the monosyllabism of the Egyptian is due to its having in part originated from a Nigritian source (Genesis of the Earth and of Man, 2d ed. 255, seqq.). Certainly this is a characteristic of some Nigritian languages, and the want of any large agreement in the vocabulary would be sufficiently {explained by the changes that the languages of savage nations undergo from the absence of a literature. It can therefore scarcely yet be asserted with Dr Brugsch that the Egyptian has no analogy to the African languages (.c.), by which, no doubt, he intends those which have no Semitic element. The problem will probably be solved either by a careful study of all the African languages which show traces of Semitic structure side by side with those that are without such traces, or by the discovery of the unknown element in Egyptian in the Akkadian or some other primitive language of Western Asia, which cannot be called Semitic in the recognized sense of the term. During its long history the language underwent little change until it became Coptic. It had two dialects—those of Upper and Lower Egypt,

(Brugsch, ¢bid.); and by degrees a vulgar dialect was formed which ultimately became the national language not long before the formation of Coptic. One curious innova- tion in the Egyptian language was the fashion under the Ramses family of introducing Semitic words instead of Egyptian ones. From the manner in which these words are spelt it is evident that the Egyptians at that time had no idea of a Semitic element in Egyptian, for they always treat them as foreign words and retain the long foreign forms, The chief change in Coptic was the introduction of many Greek words, especially to supply the place of religious terms eliminated from the vocabulary. The inscribed and written character of Egyptian was the hieroglyphic, a very complex system, which expressed ideas by symbols or by phonetic signs, syllabic and alphabetic, or else by a combination of the two methods, From this was formed the hieratic,a running hand, or common written forn1 of the hieroglyphic, principally used for documents written ou papyrus. Its oldest records are uot equal in age to the earliest hieroglyphic inscriptions, but probably it 1s not much later in origin. The demotic or enchorial writing' is merely a form of hieratic used for the vulgar dialect, and employed for legal documents from the time of Dyn. XXVI. downwards. The Coptic is written with the Greek alphabet, with the addition of six new letters and a ligature, these letters being taken from the demotic to ex- press sounds unknown to Greek. For further details see the article HIEROGLYPHICS.

Much ancient Egyptian literature has come down to us, and it must be allowed that from a literary poiut of view it has disappointed expectation. What it tells is full of interest, but the mode of telling rarely rises to the dignity of style. So unsystematic is this literature that it has not given us the connected history of a single reign, or a really intelligible account of a single campaign. The religious documents are still less orderly than the historical. It is only by the severe work of some of the ablest critics during the last fifty years that from those disjointed materials a consistent whole has been constructed.

The most important religious work is the Juneral Ritual, or Book of the Dead, a collection of prayers of a magical character referring to the future

condition of the disembodied soul, which has already been noticed. It has been published by Dr Lepsius (Das Todtenbuch der Aegypter) and M. de Rougé (Ltetuel Funéraire), and translated by Dr Birch (Bunsen's Lgypt's Place, v.). De Rougé, in his most interesting papers in the Ltevue Archéologique (n.s.), has done the utmost that a splendid critical faculty and an unusual mastery of language could achieve to present parts of the work in the most favourable form. Still it must remain a marvel of confusion and poverty of thought. Similar to the Ritual is the Book of the Lower Hemisphere. The other religious works and inscriptions are of a wider range. The temple inscriptions indeed are singularly stilted and wanting in variety ; but the papyri contain some hymns which are of a finer style, particularly that to the Nile by Enna, translated by Canon Cook (Lecords of the Past, 1v. 105), and that to Ra- Harmachis, translated by Dr Lushington (ibid. viii. 129) and Professor Maspero (Histoire Ancienne, 32, seqg.). The moral writings have a higher quality than the religious, if we may judge from their scanty remains. The historical writings fall into two classes according to their official or unofficial character. Those that are official present the worst form of the panegyrical style, the others are simple though wanting in method. The letters are of more interest, from their lively portrayal of ancient Egyptian manners. In works of fiction there is a greater degree of skill, and in the "Tale of Setnau" (Records of the Past, iv.) we even find touches of humour. Egyptian literature

is not without its merits, but it has that want of lofty ideas and of charm which is characteristic of the litera- ture of nations which have written very much and have had no other means of addressing mankind. Science.— Fresh information is being constantly acquired as to the knowledge of science possessed by the ancient Egyptians. Their progress in astronomy is evident from their observations, and still more from the cycles they formed for the adjustment of different reckonings of time. Their knowledge of geometry is attested by their architecture, and by a document on the lands of the temple of Adfoo; and the annual inundation must have made careful surveys and records necessary for the preservation of landed property. Very

great mechanical skill must have been needed to move the vast blocks used in their buildings, sometimes for very long distances, in part by difficult land- routes, and then to place them in position, Considering the want of iron, and of any but the very simplest mechanical appliances, the achievements of the Egyptian architects are an enigma to modern science (Brugsch, ist., 2d ed. 52). Chemistry and metallurgy had also made great progress. The hardening of the bronze tools with which they cut granite is a proof of this, and the manner in which Moses destroyed the golden calf is another evidence. Medicine and surgery were much studied, and the Egyptians were in those sciences only inferior to the Greeks. Arts.—Of the arts architecture claims the first place, sculpture and painting being subservient to it among the Egyptians. Temples were not built to contain statues, but statues were set up to adorn temples, of which they were a part, and the walls were covered with sculptures and paintings which had a decorative purpose. The group of these arts may therefore be considered as a whole, and thus the principle they expressed may be best discovered. This principle seems not to have been accidental, but a deliberate choice. The country and climate afforded the best means of symbolizing the leading idea of the Egyptian religion in the material forms of art. Life after death was that idea, and it found expression in the construction of tombs as lasting as the rocks on which they rested. The pyramid is the first form of Egyptian art, and modifications of its form, in truncated pyramids, are seen in the main outlines of all later edifices or excavations. ‘The decora- tions were subordinated to the idea of commemoration, and thus every building was at once religious and historical in its purpose. To this the Egyptian monuments owe a reserved grandeur that is not affected by the symmetrical qualities of hieratic art nor by the use of strongly contrasted colours. The art is always dignified, and the colours, being seen either in strong sunlight outside the monuments, or in dim twilight within them, are never glaring. The effect is exactly what was intended, and would probably not have been produced had the art been more advanced, In the whole range of ancient art Egyptian may take its place next after Greek. Indeed in some instances it excels Greek, as when in animal forms the natural is subordi- nated to the ideal. The lions from Gebel Barkal, pre- sented by the fourth duke of Northumberland to the British Museum, are probably the finest examples of the idealization of animal forms that any age has produced. From these observations we may form some idea of the character of the ancient

Egyptians, They were religious, but superstitious ; brave without cruelty, but tyrannical ; hospitable, but not to strangers. In dress they were plain, but luxurious in their ornaments ; simple in their food, but given to excess in wine, With respect for family ties, they were careless in their morals. The women enjoyed great freedom, yet their character does not seem to have been higher than it is among their descendants, subject to the lowering influence of the hareem seclusion, Though the

chief object of every man’s life was the construction of his tomb, and the most costly personal event was the funeral, the Egyptians were singularly mirthful, delighting in music and the dance, and so given to caricature that even in the representation of a funeral ceremony the artist cannot omit a ludicrous incident. The double origin of the race seems as apparent here as in their physical type and their religion, The generous qualities of the Shemite are being perpetually perverted by the inferior impulses of the Nigritian ; and again the bright elements of the Nigritian character are strangely darkened by the shadow of the gloomy tendency of the Shemite.

The industrial arts were carried to a high degree of excellence by the ancient Egyptians. In weaving and all the processes connected with the manufacture of linen they have never been surpassed. Their pottery was excellent in quality and suitable to its various purposes, and their glass but slightly inferior to that of the Greeks. In the making of furniture, and instruments of music, vessels of metal, alabaster, and other materials, arms and domestic imple- ments, they showed great taste and skill, and their influence on Greek art through the Phcenicians is undoubted, though they did little more than afford suggestions to more skilful artists of Hellas.

The Egyptians had a great variety of musical instruments, the number of which shows how much attention was paid to the art. Various kinds of harps are represented, played with the hand, and of lyres, played with or without the plec- trum, and also a guitat. There are other stringed instru- ments,’for which it is difficult to find a modernname. The Egyptians had also flutes, single and double pipes, the tam- bourine of various forms, cymbals,

cylindrical maces, drums of different kinds beaten with the hands or sticks, the trumpet, and the‘sacred sistrum. The military music was that of the trumpet, drum, and cylindrical maces; but almost all the instruments were used in the temple services. Itis impossible to form any conjecture as to the character of the music, unless we may suppose that with many of the old instruments the modern inhabitants have preserved its tra- dition. It may therefore be mentioned that they are ignorant of harmony, but have fineness of ear and of execu- tion, The musicians often sang or danced while they played. The dances of both men and girls were of various kinds, from what may be called feats of agility to slow move- ments. The dancers were chiefly girls, whose performances evidently resembled those of their modern successors, and whose clothing was even more transparent or scanty.

Ceremonies.—We know little of the private festivities of the ancient Egyptians. In particular no representation of a marriage ceremony has yet been discovered on the monm- ments. The greatest ceremony of each man’s life was his funeral. The period of..mourning began at the time of death, and lasted seventy-two days ora shorter time. Dur- ing this time the body was embalmed and swathed in many linen bandages, the outermost of which was covered with a kind of pasteboard, which represented the deceased, in the form we call a mummy, as a labourer in the Elysian fields, carrying the implements of husbandry, the face and hands being alone seen, and the rest of the body being painted with subjects relating to the future state, and bearing a principal inscription giving the name and titles of “the Osiris, justified.” The viscera were separately preserved in vases having covers in the forms of the heads of the four genii of Amenti. The mummy was inclosed in a case of wood having the same shape, and this was again inclosed, when the deceased was a rich man, within either another wooden case, or more usually a sarcophagus of stone, sometimes of the same form as the mummy, but generally rectangular, or nearly so. The mummy was then placed on a sledge, drawn by oxen or by men, and was frequently taken

to the bank of the river, or the shore of a sacred lake, which

was to be crossed in order to reach the place of burial. A

sacred boat carrying the mummy, attended by mourners, was towed by another boat, and followed by others contain- ing mourners, offerings, and all things necessary for the occasion (Ane. Liy., pl. 83-86). On reaching the tomb the sarcophagus was placed in a sepulchral chamber, usually at the bottom of a pit, and offerings for the welfare of the deceased were made in a chapel in the upper part of the tomb. One tomb sufficed for cach family, and sometimes for some generations ; and in the case of the less wealthy, many were buried in the sepulchral chambers of a single pit, above which was no structure or grotto. It has been already noticed that,according to Diodorus, every one was Judged by a legal tribunal before the right of burial was permitted, and of this there may be a survival in the practice of the modern Egyptians, which prescribes that a witness must answer for the good character of tle deceased before his burial (Afodern Egyptians, ch. xxviii). After the burial, offerings were made at stated times each year by the family, and the chief in-

scription begged the passer-by to say a prayer for the good

of theinhabitant of the tomb. These customs led to many abuses, The maintenance of the costly prescribed offerings must have been most inconvenient, and for this and other purposes the burial-grounds were peopled by a tribe of hungry professional embalmers and lower priests, who made their living not only by their profession but also by fraud and even theft. Yet we must admire the generosity with which the Egyptians lavished their riches upon the most tender form of affection. They were repaid not merely by a natural satisfaction, but also by the wholesome recognition that there are unselfish and unproductive uses for wealth. MopeErn INHABITANTS.

[Mr Lane in 1834 estimated the population of Egypt at less than 2,000,000, and gave the following numbers as nearly those of the several classes of which it is mainly composed. :—

Muslim Egyptians (felldheen or peasants, and towns-

9 |) ene Smee NOTRE CA Ero ueiies 1,750,000 Christian Egyptians (Copts).....:sseeeee seers ees 150,800 7Osmanlecs, Or TUKS.....cseccesesesseeeee eer sees , 10,000 STIAMIS... 2.20005 PeooasdonncopdondHobunndoousenso0000d00006 5,000 | ca RE. pceoo an papsadoeABsbonEbeecos 0obConDbobadodeRnEuECOOL 5,000 PMMCTIVATIS...00.0cs esc ccscencsscsveccronetersisesesssoeeons 2,000 358) 9 Gop bonbsoCODSEBRB BB GHE scbObospcnnpadoOobodnnonisc0c000n 5,000

the remainder, exclusive of the Arabs of the desert, num- bering about 70,000 (Afod. Hy., Introduction).

The last official return (1876) estimates the population of the various provinces as follows :—

Egypt Proper (Upper, Middle, and Lower)..... 5,252,000

S/O. anddeaSippapoSeebnes oonpeebepoonoebtocuebo5e cend8n0d 1,000,000 PUNO... sce rssens sve rercwsrerrseses sesnccoeveccons 5,000,000 EPEC 5. ..00cats sae snecenvarevsecvvsensses sosess 5,700,000

Of the present population of Egypt, the Muslims con- stitute seven-eighths, and nearly four-fifths of that of the metropolis ; and to this class, and more particularly to the people of Cairo, the following sketch of personal characteristics and customs will relate, save in some few cases, which will be distinguished from the rest.

In describing the personal characteristics of this remark- able people, Mr Lane, in the first chapter of Zhe Manners and Customs of the Modern Egyptians (which was written just before European influence was felt in the country, and still deservedly ranks as the only book of authority on the subject), says :—

“In general the Muslim Egyptians attain the height of about 5 feet 8 or 5 feet 9 inches. Most of the children under 9 or 10 years of age have spare limbs and a distended abdomen; but as they

grow up their forms rapidly improve. In mature age most of them are remarkably well-proportioned; the men muscular and robust;

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the women very beautifully formed, and plump; and neither sex is too fat. Ihave never seen corpulent persons among them, cxeept- ing a few in the metropolis and other towns, rendered so by a life of inactivity. In Cairo, and throughout the northern provinces, those who have not been much exposed to the sun have a yellowish but very clear complexion, and soft skin; the rest are of a consider- ably darker and coarser complexion. The people of Middle Egypt are of a more tawny eolour, and those of the more southern pro- vinces are of a decp bronze, or brown complexion—darkest towards Nubia, where the climate is hottest. In general the eountenance of the Muslim Egyptians (I here speak of the men) is of a fine oval form: the forehead of moderate size, seldom high, but generally prominent; the eyes are deep sunk, black and brilliant; the nose is straight, but rather thick; the mouth well-formed; the lips are rather full than otherwise; the teeth particularly beautiful; the beard is commonly black and eurly, but scanty. I have seen very few individuals of this race with grey eyes; or rather, few persons supposed to be of this race; for Iam inclined to think them the ofispring of Arab women by Turks, or other foreigners. The Fellaheen, from constant exposure to the sun, have a habit of half- shutting their eyes; this is also eharacteristie of the Bedawees. Great numbers of the Egyptians are blind in one or both eyes. They generally shave that part of the cheek which is above the lower jaw, and likewise a small space under the lower lip, leaving, however, the hairs which grow in the middle under the mouth; or, instcad of shaving these parts, they pluck out the hair. They also shave a part of the beard under the chin. Very few shave the rest of their beards, and none their moustache. The former they suffer to grow to the length of about a hand’s-breadth below the chin (such at least is the general rule, and such was the custom of the Prophet), and their moustache they do not allow to become so long as to incommode them in eating and drinking. The practice of dyeing the beard is not common; for a grey beard is much respected. The Egyptians shave all the rest of the hair, or leave only a small tuft (called

‘shoosheh’) wpon the erown of the head….. From the age of about 14 to that of 18 or 20 [the women], are generally models of beauty in body and limbs; and in eountenance most of them are pleasing, and many exceedingly lovely; but soon after they have attained their perfect growth, they rapidly decline.” The relaxing nature of the elimate, and other predisposing causes, eontribute to render many of them absolutely ugly at the age of 40. ‘In the Egyptian females the forms of womanhood begin to develop themselves about the ninth and tenth year: at the age of 15 or 16 they generally attain their highest degree of perfection. With regard to their complexions, the same remarks apply to them as to the men, with only this difference, that their faces, being gcne- rally veiled when they go abroad, are not quite so much tanned as those of the men. They are characterized, like the men, by a fine oval countenance, though in some instances it is yather broad. The eyes, with very few exceptions, are black, large, and of a long aliunond-form, with long and beautiful lashes, and an exquisitely soft, bewitching expression—eyes more beautiful ean hardly be conceived: their charming effect is much heightened by the con- cealment of the other features (however pleasing the latter may be), and is rendered still more striking by a practice universal among the females of the higher and middle elasses, and very common among those of the lower orders, which is that of blackening the edge of the eyelids both above and below the eye, with a black powder called “Koll,”

Both sexes, but especially the women, tattoo several parts of the person, and the Jatter stain their hands and feet with the red dye of the hinne.

The dress of the men of the upper and middle classes consists of cotton drawers, and a cotton or silk shirt with very wide sleeves. Above these are generally worn @ waistcoat without sleeves, and a long vest of silk, called kaftén, which has hanging sleeves, and reaches nearly to the ankles. ‘The kaftdn is confined by the girdle, which is a silk scarf, or cashmere or other woollen shawl. Over all is worn a long cloth robe, the gibbeh (or jubbeh) somewhat resembling the kaftan in shape, but having shorter sleeves, and being open in front. The dress of the lower orders is the shirt and drawers, and waistcoat, with an outer shirt of blue cotton or brown woollen stuff; some wear a kaftan. The head-dress of all is the turban wound round a skull- cap. ‘This cap is usually the red cloth fez, or tarboosh, but the very

poor wear one of coarse brown felt, and are often without the turban. Many professions and religions, &c., are distinguished by the shape and colour of the turban, and various classes, and particularly servants, are marked by the form and colour of their shoes ; but the poor

go usually barefoot. ‘The ladies wear a shirt and drawers, a very full pair of silk trousers, and a close-fitting vest with hanging sleeves and skirts, open down the front and at the sides, and long enough to turn up and fasten into the girdle, which is generally a cashmere shawl; a cloth jacket, richly embroidered with gold, and having short sleeves, is com- monly worn over the vest. The hair in front is combed down over the forehead and cut across in a straight line ; behind it is divided into very many small plaits, which hang down the back, and are lengthened by silken cords, and often adorned with gold coins and ornaments. A small tarboosh is worn on the back of the head, sometimes having a plate of gold fixed on the crown, and a handkerchief is tastefully bound round the temples. The women of the lower orders have trousers of printed or dyed cotton, and a close waistcoat. All wear the long and elegant head-veil. This is a simple “ breadth” of muslin, which passes over the head and hangs down behind, one side being drawn forward over the face in the presence of a man. A lady’s veil is of white muslin, embroidered at the ends in gold and colours; that of a person of the lower class is simply dyed blue. In going abroad the ladies wear above their indoor dress a loose robe of coloured silk without sleeves, and nearly open at the sides, and above it a large envelop- ing piece of black silk, which is brought over the head, and gathered round the person by the arms and hands on each side. A face-veil entirely conceals the features, except the eyes; it is a long and narrow piece of thick white muslin, reaching to a little below the knees. The women of the lower orders have the same out-door dress of different materials and colour. Ladies use slippers of yellow morocco, and abroad, inner boots of the same material, above which they wear, in either case, thick shoes, having only toes. The poor wear red shoes, very like those of the men. Among the upper classes, however, the dress is rapidly becoming assimilated to that of Europeans in its most preposterous form.

In religion the Muslim Egyptians are Sunnees, profess- ing the creed which is commonly termed “ orthodox,” and are principally of the persuasion of the Shéfe’ees, whose celebrated founder, the imém Esh-Shafe’ee, is buried in the great southern cemetery of Cairo. Many of them are, however, Hanafees (to which persuasion the Turks chiefly belong), and in parts of Lower, and almost universally in Upper, Egypt, Malikees.

The civil administration of justice is conducted in four principal courts of judicature,—that of the Zabit, or chief of the police, where trivial cases are summarily disposed of; the Divan el-Khedivi, in the citadel, in which the khedive or his deputy presides, and where judgment is given in cases which either do not require to be referred to the two other courts yet to be mentioned, or which do not fall within their province; the Divan el-Mahkemeh, the court of the cadi (kadee), or chief judge, wlio must bea Hanafee, and who was formerly a Turk sent annually from Con- stantinople, but is now appointed by the khedive, and paid a fixed salary of 4000 napoleons a year; and that of the muftee of the Hanafees, or chief doctor of the law, who decides all cases of difficulty. There are besides five minor mahkemehs, or courts, in Cairo, and one in each of the neighbouring towns of Boolék and Masr El’Atcekah, from which cases are always referred to the court of the kadee; and each country town has a native kadee, whose authority is generally sufficient for the villages around. The Council of the ’Ulemd, or learned men, consists of the sheykh, or religious chief, of each of the four orthodox persuasions, the sheykh of the great mosque called the Azhar, who is of the persuasion of the Shafe’ees, aud is sometimes its sheykh, the kddee, and the chief (nakeeb) of the Shereefs, or descendants of the Prophet, with several

other persons, This body was until lately very powerful, but now has little influence over the khedive, Cairo ig divided into quarters (Harah), each of which has its sheykh, who preserves order among the people ; and the whole city is partitioned into eight larger divisions, each having a sheykh called Sheykh et-Tumn. Various trades also have their sheikhs or chiefs, to whom reference igs made in disputes respecting the craft; and the servants

have similar heads who are responsible for their behaviour. The country is divided into governments, as before stated, each presided over by a Turkish officer, having the title of mudeer, and subdivided into districts under the control of native officers, bearing the titles "'Mamoor" and "6 Nazir," A responsible person called Sheykh el-Beled (or "sheykh of the town" or " village") presides over each small town and village, and is a native of the place. It must also be mentioned that the Sa'eed, or Upper Egypt, is governed by a pasha, whose residence is at Asyoot. N otwithstanding the consistent, able, and in many respects commendable, code of laws which has been founded on the Kordn and the Traditions, the administration of justice is lamentably faulty. As is the custom throughout the East, judgment in Egypt is usually swayed by bribes, and a poor man's case is generally hopeless when his adversary is rich, To this rule there have been some notable exceptions, and the memory of a few virtuous judges is cherished by the people; but such instances are very rare. The moral and civil laws observed by the Muslim Egyptians, being those of El-Islam, will be noticed elsewhere. A great abuse formerly existed in Egypt in the system of consular jurisdiction. Natives were compelled to sue a foreigner before the latter's consul, and in nine cases out of ten lost their cause, Simi- larly it was very difficult for a foreigner of one nation to obtain justice against one of another nation at the latter's consulate. This abuse has now been done away. At the instance of Nubar Pasha, and after the deliberations of a European commission, three Courts of First Instance at Alexandria, Cairo, and Ismailia, and a Court of Appeal at Alexandria, were established in 1876, presided over by mixed benches of Europeans and natives, the former being the majority, and employing a new code based on the Code Napoléon, with such additions from Muslim law as were possible, These courts decide all cases between the Govern- ment or native subjects and foreigners, and between foreigners of different nationalities; and there can be no doubt that they will exercise a great influence for good on the administration of justice in Egypt. It is to be hoped that in course of time they may supersede the old native system in all causes. At present they do but supersede the consular system.

It is very worthy of notice, that in Cairo, as in some other Muslim cities, any one may obtain gratuitously an elementary education, and he who desires the fullest attain- able education may receive that also without the

payment of a single fee, by joining a class of students in a collegiate mosque. The elementary instruction which most boys re- ceive consists chiefly of reading, and learning the Koran by heart ; day-schools, as charitable institutions, abound in Cairo, and every town possesses its school; a trifling fee to the fikee (or master) is the only expense incurred by the scholars. Girls are seldom taught anything beyond needle- work. The children of both sexes, except those of the wealthy, have generally a very dirty and slovenly appear- ance ; and often intentional neglect is adopted to avert the effects of the “ evil eye,” of which the Egyptians entertain great dread. The children of the upper classes are exces- sively indulged, while the poor entirely neglect their offspring. The leading doctrines of El-Isl4m, as well as hatred for all religions but their own, and a great rever- ence for their parents and the aged, are early inculeated.

MODERN INHABITANTS. |

This deference towards parents cannot fail to strike every foreigner who visits Egypt, and does not cease with the children’s growth, presenting an example well worthy of imitation in the West. Circumcision is observed at about the age of five or six years, when the boy is paraded, gene- yally with a bridal procession, on a gaily caparisoned horse, and dressed in woman’s clothes. Some parents, however, and most of the learned, prefer a quieter and less expensive ceremony (Modern Egyptians, chap. xxvii.).

It is deemed disreputable for a young man not to marry when he has attained a sufficient age; there are therefore few unmarried men, Girls, in like manner, marry very young, some even at ten years of age, and few remain single beyond the age of sixteen ; they are generally very prolific. The bridegroom never sees his future wife before the wed- ding night, an evil which is somewhat mitigated by the facility of divorce. A dowry is always given, and a marriage ceremony performed by a fikee (a schoolmaster, or one who recites the Koran), in the presence of two wit- nesses ; the ceremony is very simple, but constitutes a legal marriage. ‘he bridal of a virgin is attended with ereat festivity and rejoicing, a grandee’s wedding some- times continuing eleven days and nights. On the last day, which should be that terminating with the eve of Friday, or of Monday, the bride is taken in procession to the bride- groom’s house, accompanied by

her female friends, and a band of musicians, jugglers, wrestlers, &c, As before stated, a boy about to be circumcised joins in such a procession, or, frequently, a succession of such boys. A Muslim is allowed by his religion four wives ; but advantage is rarely taken of this licence, and very few attempt to keep two wives in one house; the expense and discomfort which polygamy entails act, therefore, as a restriction to its general adoption. A man may, however, possess any number of concubine slaves, who, though objects of jealousy to the legal wife, are yet tolerated by her in consideration of her superior position, and conceded power over them, a power which she often uses with great tyranny; but certain privileges are possessed by the concubine, especially if she have born a son to her master. Such slaves are commonly kept only by grandees, the generality of the Muslim Egyptians being content with one wife. A divorce is rendered obligatory by the simple words “Thou art divorced,” and a triple divorce is irrevocable under ordinary circumstances. The hareem system of appointing separate apartments to the women, and secluding them from the gaze of men, is observed in Egypt as in other Muslim countries, but less strictly. Mr Lane (ibid. ch. vi.) says— “T believe that in Egypt the women are generally under less restraint than in any other country of the Turkish empire; so that it is not uncommon to see females of the lower orders flirting and jesting with men in public, and men laying their hands upon them very freely. Still it might be imagined that the women of the higher and middle classes feel themselves severely oppressed, and are much discontented with the state of seclusion to which they are subjected ; but this is not commonly the case; on the contrary, an Egyptian wife who is attached to her husband is apt to think, if he allow her unusual liberty, that he neglects her, and does not sufficiently love her ; and to envy those wives who are kept and watched with greater strictness.” ‘The females of an Egyptian household hever sit in the presence of the master, but attend him at his meals, and are treated in every respect as inferiors. The mother, however, forms a remarkable exception to this rule ; in rare instances, also, a wife becomes @ companion to her husband. On the other hand, if a pair of Women’s shoes are placed outside the door of the hareem apartments, they are understood to signify that female visitors are within, and a man is sometimes thus excluded

from the upper portion of his own house for many days. Ladies of the upper or middle classes lead a life of extreme inactivity, spending their time at the bath, which is the general place of gossip, or in receiving visits, embroidering, and the like, and in absolute dolce far niente. It is there- fore no cause for wonder that their tone of morals is generally low. Both sexes are abstemious in their food, though fond of pastry, sweetmeats, and fruit. The principal meals are breakfast, about an hour after sunrise ; dinner, or the mid-day meal, at noon; and supper, which is the chief meal of the day, a little after sunsct. Coffee is taken at all hours, and is, with a pipe, presented at least once to each guest. Tobacco is the great luxury of the men of all classes in Egypt, who begin and end the day with it, and generally smoke all day with little intermission. Many women, also, especially among the rich, adopt the habit. Men who can afford to keep a horse, mule, or ass, are very seldom seen to walk, and numberless excellent asses are to be hired in Cairo. Ladies always ride asses and sit astride. The poorer classes are of course unable to observe the hareem system, but the women are in general carefully veiled. Some of them keep small shops, and all fetch water, make fuel, and cook for their households. The food of the poor is very meagre ; flesh meat is rarely tasted by them, and (besides bread) dates, raw cucumbers, and onions are their common food, with soaked beans, roasted ears of Indian corn, &c. .

In their social intercourse the Muslim Egyptians are regular, and observe many forms of salutation and much etiquette ; yet they are very affable, entering into conversa- tion with strangers at shops and elsewhere. Their courtesy and dignity of manner are very striking, and are combined with ease and a fluency of discourse. Of their mental quali- fications Mr Lane (ibid. ch. xiii.) remarks—“The natural or innate character of the modern Egyptians is altered, in a remarkable degree, by their religion, laws, and government, as well as by the climate and other causes; and toform a

just opinion of it is therefore very difficult. We may, how

ever, confidently state that they are endowed, in a higher degree than most other people, with some of the more important mental qualities, particularly quickness of apprehension, a ready wit, and a retentive memory. In youth they generally possess these and other intellectual powers ; but the causes

above alluded to gradually lessen their mental energy.” Their principal virtues are piety and strong religious feeling, a strict observance of the injunctions of El-Islim, and a constantly professed sense of God’s presence and over-ruling providence, combined, however, with religious pride and hypocrisy. Their com- mon discourse is full, of asseverations and expressions respecting sacred things, often, however, used with a levity which it is difficult for a person unacquainted with their feclings casily to reconcile with their respect for God. They entertain an excessive reverence for their Prophet ; and the Koran is treated with the utmost respect—- never, for example, being placed in a low situation—and this is the case with everything they esteem holy. They are fatalists, and bear calamities with perfect resignation to the Divine will. ‘Their filial piety and respect for the aged have been before mentioned, and benevolence and charity are conspicuous in their character ; poverty is there- fore not accompanied by the distressing circumstances which too frequently attend it in Europe. Humanity to dumb animals is another virtue, and cruelty is openly discounte- nanced in their streets, even to unclean animals ; this is, however, unfortunately wearing off in consequence of their intercourse with Franks. Their affability, cheerfulness, and hospitality are remarkable, ‘as well as frugality and temperance in food and drink, scrupulous cleanliness, a love of country, and honesty in the payment of debt, It should

be added, however, that the Egyptians rarely, if ever, excr-

cise their social virtues but towards persons of their own

persuasion and country. stinacy, and licentiousness, especially amoug the women,

cupidity (mitigated by generosity), envy, a disregard for the truth, and a habit of cursing. Murders, and other

grave crimes of this nature, are rarely committed, but petty thefts are very common. “The Arabic spoken by the middle and higher classes

in Cairo is generally inferior, in point of grammatical cor-

rectness and pronunciation, to the dialects of the Bedawees of Arabia, and of the inhabitants of the towns in their im- mediate vicinity, but much to be preferred to those of Syria, and still more to those of the Western Arabs" (Lane, ebcd. ch. ix.). The language varies in Upper and Lower Egypt, and is more correct inland tlian near the Mediterranean.

In the decay of Arab literature, Cairo still holds the chief place as a seat of learning, and its university, thie Azhar, is undoubtedly the first of the Eastern world. Its professors teach "grammatical inflexion and syntax, rhetoric, versification, logic, theology, the exposition of the Kur-an, the Traditions of the Prophet, the complete science of jurisprudence, or rathcr of religious, moral, civil, and criminal law, which is chiefly founded on the Kur-4n and the Traditions, together with arithmetic as far as it is use- ful in matters of law. Lectures are also given on algcbra, and on the calculatious of the Mohammadan calendar, the times of prayer, &c." (Lane, 2bid.). The students, as already remarked, pay no fees, and the professors receive no salaries. The latter maintain themselves by private teach- ing, and by copying manuscripts, and the former in the same manner, or by reciting the Koran. 'The students are now said to amount to the number of 11,000. Except the professors of literature, few Egyptians are taught more than to read and write ; and of these, still fewer can read and write well. The women, as before mentioned, are very rarely taught even to read.

Science is but little studied, and barbers generally prac- tise medicine and surgery. Mehemet Ali endeavoured to improve this state of things, by sending young men to Europe for the purpose of scientific study, and by establish- ing various schools, with the same object, in Egypt. His improvements have been continued by the present khedive, Ismail Pasha, with some success.

In common with other Muslims, those of Egypt have very many superstitions, some of which are peculiar to themselves. 'Tombs of saints abound, one or more being found in every town and village; and no traveller up the Nile can fail to remark how every prominent mountain has the sepulchre of its patron saint. The great saints of Egypt are the imam Esh-Shafe'ee, founder of the persuasion called after him, the seyyid Ahmad El-Bedawee, and the seyyid Ibraheem Ed-Dasookee, both of whom were

founders of orders of dervishes. The former of these two is buried at the town of Tanta, in the Delta, and his tomb attracts many thousands of visitors annually to his prin- cipal festival; the latter is also much revered, and his festival draws together, in like manner, great crowds to his birthplace, the town of Ed-Dasook. But, besides the graves of her native saints, Egypt boasts of those of several members of the Prophet's family ; the tomb of the seyyideh Zcyneb, daughter of 'Alee, that of the seyyideh Sckeeneh, daughter of Kl-Hoseyn, and that of the seyyideh Nefeeseh, great-grand-daughter of El~~Hasan, all of which are held in high veneration. The mosque of the Hasaneyn (or that of the "two Hasans") is the most reverenced shrine in the country, and is believed to contain the head of El~~ Hoseyn. As connected with the superstitious practices of Egypt, dervishes must be mentioned, of whom there are many orders found in that country, the following being the

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most celebrated :—(1) the Rifé'eeyeh, and their sects the 'Ilwaneeyeh and Saadeeyeh; (2) the Kadireeyeh; (3) the Ahmedeeych, or followers of the seyyid Ahmad E- Bedawee, and their sects the Beiyoomeeyeh, ShaarAweeyeh, Shinnaweeyeh, and many others ; and (4) the Bardhimeh, or followers of the seyyid Ibraheem Ed-Dasookee. 'These are all presided over by a direct descendant of the caliph Aboo-Bekr, called the Sheykh El-Bekree. The Saadeeyeh are the most famous for charming and eating live serpents, &c., and the "Ilwaneeyeh for eating fire, glass, de. The Egyptians firmly believe in the efficacy of charms, a belief which is associated with that in an omnipresent and over- ruling Providence. Thus the doors of houscs are inscribed with sentences from the Koran, or the like, to preserve from the evil eye, or avert the dangers of an unlucky threshold ; similar inscriptions may be observed over most shops, while almost every one carries some charm about his person, Among so superstitious a people, with whom, as we have already seen, science is in a very low state, it is not to be

wondered that the so-called sciences of magic, astrology in the place of astronomy, and alchemy in that of chemistry, are in a comparatively flourishing condition,

Since the time of the Turkish conquest, the arts in Egypt have rapidly fallen into decay; tls is partly attributable to the deportation of most of the skilled artificers of Cairo to Constantinople by the sultan Selim, but it is mainly owing to the misrule of the Turkish pashas, who have successively domineered over this unfortunate country. Cairo contains the most splendid specimens of Arab architecture of any part of the Arabian empire ; but at present new buildings are erectcd after the Constan- tinopolitan model, or, what is still worse, the purely European—both styles immeasurably inferior to the Arab, and very ill suited to the requirements of the climate. In like manner, every other kind of native art is gradually perishing ; and it is to be feared that even should the people be relieved from oppression and bad government, their industry will be encouraged rather to adopt imaginary improvements imported from Europe, than to cultivate the beautiful taste of their ancestors. The manufactures of the present inhabitants of Egypt are generally inferior to those of other Eastern nations, their handicrafts are clumsy, and the inevitable results of tyranny are every- where evident; nevertheless, the curious shops, the markets of different trades (the shops of each trade being

generally congregated in one street or district), the easy

merchant sitting before his shop, the musical and quaint. street-cries of the picturesque venders of fruit, sherbet, water, &c., with the ever-changing and many-coloured throng of passengers, all render the streets of Cairo a delightful study for the lover of Arab life, nowhere else to be seen in such perfection, or with so fine a background of magnificent buildings.

Among the luxurious habits of the Egyptians must be classed the immoderate use of tobacco (as before mentioned) and coffee. They are, however, rarely guilty of the vice of drunkenness, wine being prohibited by the Koran. Eaters of opium, and smokers of hemp, called hasheesh, are not uncommon, though they are always of the dregs of the people. The bath isa favourite resort of both sexes and all classes. In Cairo alone are upwards of sixty public baths, and every good house has a private bath. Their amuse-

ments are generally not of a violent kind, being rather im keeping with the sedentary habits of the people, and the heat of the climate. They are acquainted with chess, draughts, backgammon, and other games, among which is one peculiar to themselves, called Mankalah, and played with cowries. The game of the gereed requires great bodily exertion; and wrestlers, dsc., are found in the country, though not Music is the most favourite recreation

of the people of Egypt ; the songs of the boatmen, the religious chants, and the cries in the streets are all musical. the former are both instrumental and vocal, the latter (called ’Almeh, pl. ’Awalim) generally vocal. The ’Awalim are, as their name (“‘Jearned”) implies, generally accom- plished women, and should not be confounded with the @hawazee, or dancing-girls. There are many kinds of musical instruments, ‘The music, vocal and instrumental, is generally of little compass, and in the minor key; it is therefore plaintive, and strikes a European ear as somewhat monotonous, though often possessing a simple beauty, and the charm of antiquity, for there is little doubt that favourite airs have been handed down from remote ages. The prophet Mohammad condemned music, and its pro- fessors are in consequence lightly esteemed by the generality of Muslims, who nevertheless scruple not to cnjoy their petformances, and resort to the coffce-shops aud to private festivities, where they are almost always to be found.

The Ghawédzee (sing. Ghazceyeh) form a separate class, very similar to the gypsies. They always intermarry among themselves only, and are all brought up to the yenal profession. Their performances are too well known to need a description here, but it should be observed that the religious and learned Egyptians hold them to be improper. They dance in public, at fairs and religious festivals, and at private festivities, but not in respectable houses, whether before the men or the ladies. Mehemet Ali banished‘them to Isné, in Upper Egypt ; and the few that remained, occasionally dancing in Cairo, called them- selves ’Awdlim, to avoid punishment. A most objection- able class of male dancers also exists, who imitate the dances of the Ghawazee, and dress in a kind of nondescript female attire. Not the least

curious of the public per- formances are those of the serpeut-charmers, who are generally Rifd’ee, or Saadee dervishes. Their power over serpents has been doubted by most European travellers, yet their performances remain unexplained ; and apparently they possess means of ascertaining the haunts of these and other reptiles, and of alluring them forth ; they, however, always extract the fangs of venomous serpents. Jugglers, rope-dancers, and farce-players must also be mentioued. In the principal coffee-shops of Cairo are to be found reciters of romances, surrounded by interested audiences. hey are of three classes, and recite from sevcral works, among which was formerly included the Thousand and One Nights; but manuscripts of the latter have become so rare as to render it almost impossible to obtain a copy.

The periodical public festivals are exceedingly interest- ing, and many of the remarkable observances with which they abound are passing away. The first ten days of the Mohammadan year are held to be blessed, and especially the tenth; and many curious and superstitious prac- tices are observed on these days, particularly by the women. ‘The tenth day, being the anniversary of the martrydom of El-Hoseyn, the mosque of the Hasaneyn Is thronged to excess, mostly by women. Following the order of the lunar year, the next festival is that of the Return of the Pilgrims, which is the occasion of great rejoicing, many having friends or relatives in the caravan. The Mahmal, a kind of covered litter, first originated by the celebrated queen Sheger-ed-Durr, is brought into the city in procession, though not with as much pomp as when it caves with the pilgrims. These and other processions have lost much of their effect since the extinction of the Memlooks, and the gradual disuse of gorgeous dress for the retainers of the officers of state. A

regiment of regular infantry makes but a sorry substitute The Birth of

for the splendid cavalcade cf former times,

EGYPT

There are male and female musical performers ;

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the Prophet (Moolid en-Nebec), which is celebrated in the beginning of the third month, is the greatest festival of the whole year. During nine days and nights its religious ceremonies are observed at Cairo, in the open space called the Ezbekeeyeh. Next in time, and also in importance, is the Moolid El-Hasaneyn, commemorative of the birth of El-Hoseyn, and lasting fifteen days and nights ; and at the same time is kept the Moolid of Es-Salih Eiyoob, the last king but one of the EHiyoobee dynasty. In the seventh month occur the Moolid of the seyyideh Zeyneb, and the commemoration of the Meardg, or the Prophet's miraculous journey to heaven. Early in the tenth month (Shaaban), the Moolid of the imam Esh-Shafe'ee is observed ; and the night of the middle of that month has its peculiar customs, being held by the Muslims to be that on which the fate of all living is decided for the ensuing year. Then follows Ramadan, the month of abstinence, a severe trial to the faithful ; and the Lesser Festival (El-'Hed es-Sagheer), which commences Showwal, is hailed by them with delight. A few days after, the Kisweh, or new covering for the Kaabeli at Meecca, is taken in procession from the citadel, where it is always manufactured, to the mosque of the Hasaneyn to be completed; and, later, the caravan of pilgrims departs, when the grand procession of the Mahmal takes place. On the tenth day of the last month of the year, the Great Festival (El-'Eed el-Kebcer), or that of the Sacrifice, closes the calendar.

The rise of the Nile is naturally the occasion of annual customs, some of which are doubtless relics of antiquity; these are observed according to the Coptic year.!_ The com- mencement of the rise is fixed to the night of the 11th of Ba-ooneh (Payni), the 17th of June, and is called that of the Drop (Leylet en-Nuktah), because a miraculous drop is then supposed to fall, and cause the swelling of the river. The real rise commences at Cairo about the summer solstice, or a few days later ; and on about the 3d of July a crier in each district of the city begins to go his daily rounds, announcing, in a quaint chant, the incrcase of water in the Nilometer of the islaud of Er-Rédah. When the river has risen 20 or 21 feet, he proclaims the Wefa en-Neel, " Com- pletion " or " Abundance of the Nile." On the following day, the dam which closes the canal of Cairo is cut with much ceremony, and this is the signal for letting the inundation over the surface of the country. A pillar of earth before the dam is called the " Bride of the Nile," and Arab his- torians relate that this was substituted, at the Muslim con- quest, for a

virgin whom it was the custom annually to sacrifice, to ensure a plentiful inundation. A large boat, gaily decked out, representing that in which the victim used to be conveyed, is anchorcd near, and a gun on board is fired every quarter of an hour during the night. Rockets and other fireworks are also let off, but the best, strangely, after daybreak. The governor of Cairo attends the ceremony of cutting the dam, with the kddee and others. The crier continues his daily rounds, with his former chant, excepting on the Coptic N ew-Ycar's Day, when the cry of the Wefnd is repeated, until the Saleeb, or Discovery of the Cross, the 26th or 27th of September, at which period, the river having attained its greatest height, he concludes his annual employment with another chant, and presents to each house some limes and other fruit, and dry lumps of Nile mud.

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1 Jt may be mentioned here that the period of the hot winds, called the Khamaseen, that is, "The Fifties," is calculated from the day after the Coptic Easter, and terminates on the day of Pentecost, and that the Muslims observe the Wednesday preceding this period, called ''Job's Wednesday," as well as its first day, when many go into the country from Cairo, "to smell the air.' This day is hence called Shemm en-Neseem, or "the smelling of the zephyr." The 'Ulema observe the same custom on the first three days of tle spring quarter.

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This brief account of the modern Egyptians would be incomplete without a few words concerning the rites attendant on death. The corpse is immediately turned towards Mecca, and the females of the househuld, assisted by hired mourners, commence their pecultar wailing, while fikees recite portions of the Koran. The funeral takes place on the day of the death, if that happen in the morn- ing ; otherwise on the next day. The corpse, having been washed and shrouded, is placed in an open bier, covered with a cashmere shawl, in the case of a man; or in a closed bier, having a post in front, on which are placed female ornaments, in that of a woman or child. The funeral procession is headed by men called "' Yemeneeyeli," chanting the profession of the faith, followed hy male friends of the deceased, and a party of schoolboys, also chanting, generally from a poem descriptive of the

latter state. ‘Then follows the bier, borne on the shoulders of friends, who are relieved by tie passers-by, such an act being deemed highly meritorious, On the way to the cemetery the corpse is generally, in Cairo, in the case of the northern quarters of the city, carried either to the Hasaneyn, or, if the deceased be one of the “Ulema, to the Azhar; or, in the case of the southern quarters, to the seyyideh Zeyneb, or some other revered mosque. Here the funeral service is performed by the imam, or minister of the mosque, and the procession then proceeds to the tomb. In the burials of the rich, water and bread are dis- tributed to the poor at the grave; and sometimes a buffalo or several buffaloes are slaughtered there, and the flesh given away. ‘The tomb is always a vault, surmounted by an oblong stone monument, with a stele at the head and feet; and a cupola, supported by four walls, covers tle whole in the case of sheykhs’ tombs and those of the’ wealthy. During the night following the interment, called the Night of Desolation, or that of Solitude, the soul being believed to remain with the body that one night, fikees are engaged at the house of the deceased to recite various portions of the Kordn, and, commonly, to repeat the first clause of the profession of the faith, “‘ There is no deity but God,” three thousand times. The women alone put on mourning attire, by dyeing their veils, shirts, &c., dark blue, with indigo; and they stain their hands, and smear the walls, with the same colour. Everything in the house is also turned upside down. The latter customs are not, however, observed on the death of an old man. At certain periods after the burial, a khatmeh, or recitation of the whole of the Koran, is performed, and the tomb is visited by the female relations and friends of the deceased. The women of the fell4heen (or peasants) of Upper Egypt observe some strange dances, &c., at funerals, which must be regarded as partly relics of ancient Egyptian customs.

For further information see, in addition to Lane’s dZodern Egyptians, his translation of the Thousand and One Nights, and particularly the notes to it, and the Hnglishwoman in Egypt, by Mrs Poole.

The native Christians of Egypt, or Copts, are chiefly descended from the ancient Egyptian race; and, as they rarely marry with other races, they preserve in their coun- tenances a great resemblance to the representations of the tombs and temples. Their dress and customs are very similar to those of the Muslim Egyptians, but their reserve towards persons of another

persuasion renders a knowledge of their peculiar observances exceedingly difficult. The causes which produced the separation of their church, and the persecutions they suffered, will be noticed in the historical portion of this article. Under Mehemet Ali they were relieved of much cppression, and the immunities then granted to them they still enjoy. The neglected appearance of their houses, and their want of personal cleanliness, are in strong contrast to the opposite habits of the Muslims, and

European residents generally prefer the latter as domestic servants,

The Jews, of whom there have always been great num- bers in Egypt, appear to be even more degraded there than in other countries. ‘They are held in the utmost abhorrence by the dominant race, and often are treated with much cruelty and oppression. Many are bankers and money- changers, &c. ‘The quarter of the Jews in Cairo is ex- ceedingly filthy, and would give a stranger the notion that they labour under great poverty. But such is not the case: the fear of the Muslims induces them to adopt this outward show of misery, while the interiors of many of their houses are very handsome and luxurious. (E. S. P.—8, L, P.)]

CHRONOLOGY AND History.

Before giving a sketch of the history of Egypt it is necessary to speak of Egyptian chronology. The difficulty of this subject has increased with the new information of the monuments. The statements of ancient writers were easily reconciled with half knowledge, but better information shows discrepancies which are in most instances beyond all present hope of solution. It may be said that we know something of the outlines of the technical part of Egyptian chronology ; but its historical part is in a great measure mere conjecture before the times when we can check the Egyptian lists by their synchronisms with Hebrew and Assyrian history.

Dr Brugsch, in the second edition of his Histocre @’ Egypte, frankly admits the growing difficulty of Egyptian chronology in terms which account for his not having continued his Matériaux pour servir & la reconstruction du Calendrier, the opinions of which are modified in the later work. Baron

Bunsen completed his Lgypt's Place, but in the progress of the work made a great change in his theories. Professor Lepsius alone has maintained his views, as stated in the Chronologie and Kénigsbuch, of which the general correctness has not been disproved, although in any new work it would be necessary greatly to modify the details. The words, already referred to, of Dr Brugsch, which close the introduction to his History. (2d ed.), may be cited in justification of the differences between the present article and that of the last edition of the Encyclopedia. "Ein comparant cette edition avec la premiére, le lecteur impartial reconnaitra facilement que nous avons remanié complétement le premier travail, et de plus, que nous nous sommes abstenu de fournir des hypothéses auxquelles seulement le temps et des découvertes futures pourront substituer les faits" (p. 3).

The Egyptians divided the civil day into 24 hours, 12 of the natural day and 12 of the night, counted from 1 to 12 during each period. Ordinarily the civil day began during the night, whick was indifferently reckoned as belonging to the preceding or following day. Probably the beginning was at midnight. In the astro- nomical tables of the Tombs of the Kings the civil day probably begins with the night, and the reckoning is from the first hour, or six hours before midnight. The indication is, however, not con- clusive, as the tables are of nights only, but one term used makes it highly probable (Brugsch, Matériaux, 103). We also find the so- called heliacal rising of Sothis indicated as marking the beginning of the New Year, but this may merely denote that the phenomenon characterized New Year's day of the original Egyptian year, or of the fixed year, not that the civil day began with the 11th hour of night (cf. Id., 99 seqq.; Ideler, Handbuch der Chronologie, i. 100-102).

The Egyptian month was of thirty days. (The monthsare usually known by Greek names occurring in Greek documents, which were taken from the cultus connected with the months, and are thus the Egyptian sacred names. They are 1. Thoth, 2. Phaophi, 3. Athyr, 4. Choiak, 5. Tybi, 6. Mechir, 7. Phamenoth, 8. Pharmuthi, 9. Pachon, 10. Payni, 11. Epiphi, 12. Mesori, after which came the five Epagomen. The names were applied to the Vague and Alexandrian years. The ancient Egyptians had a different system of names. With them the months were allotted to three great seasons of four months each, of which the months were called 1st, Qnd, 3rd, and 4th.

‘These seasons are called “sha,” inundation, “ner,” winter, and ‘“‘shema’ summer. The second and third

isnot certain. If, however, it was so, we should have a difficulty in deciding to exactly which four months each season applied. It may be remarked that, according to the Copts, there are four months from the supposed beginning of the rise of the Nile, a few days before the summer solstice, to the end of the inundation. If this were the ancient reckoning, and the rendering ‘‘inundation ” be correct, “winter” would be the cold season, and “summer” would correspond to spring and early summer. In support of this hypothesis it may be observed that the so-called heliacal rising of Sothis on the 20th of July marked the beginning of the Egyptian year, although in the year commonly in use this phenomenon passed through all the seasons, and further that in the earliest times of Egyptian history this phenomenon occurred about the time of the summer solstice, and the conventional beginning of the rise of the Nile, the three phenomena probably marking the beginning of the first season when the calendar was instituted! (cf. on the seasons, Brugsch, Matériaux, 34 seqq.).

The common year of the ancient Egyptians is that which has been called the Vague Year, because on account of its length of 365 days it fell short of a tropical or a sidereal year, and thus passed through all the seasons. ‘That this year was that in which the inscriptions are usually dated before the introduction of the Alex- andrian year under Augustus appears from the Decree of Canopus (Hierog. 1. 18, Greek 1. 86, 37).

The Egyptians also used afixed year dated from the so-called heliacal rising of Sothis, July 20. It contained 365 days, and was adjusted by the addition of another day for every four years. It is uncertain how far back this year was in use. The Calendar of Medeenet Haboo, of the time of Ramses III., begins with the rising of Sothis, or, if we accept Dr Brugsch’sexplanation, with its festival (Aatériaua, p. 84). a at the time of this monument the phenomenon ell on the Ist Thoth of the vague year, or within the month ; or if the festival be intended, it may be used as a conventional indica- tion of New Year’s day in a typical form (Zid. p. 84, 85). In the Roman period, after the Alexandrian year had come into use, there are double dates in the

Alexandrian and Sothiac calendars, but the common Egyptian notation of the months does not appear to have been usually applied to the Sothiac year. An exception is noticed by Dr Brugsch (Zid. p. 98), and another instance in which the month-name Tybi appears to be used for the Sothiac calendar, while an Alexandrian name is employed for the corresponding month of the Alexandrian calendar (Ibid. p. 92,17. See on the whole subject, Brugsch, Matériaux).

The inconvenience of the vague year in relation to the festivals, on account of their connection with natural phenomena, led Ptolemy 111. Euergetes to reform the calendar by intercalating a day after every fourth year before the year next following (Decree of Canopus, Hierog. 1. 22, Greek 1. 48-45). Obviously this arrest of the common year was more convenicnt than the change to a fixed year already in use beginning ata different season. This new style was abandoned and the old resumed, but how soon we do not know.

Under Augustus a fixed year, called the Alexandrian, beginning on the 29-30th August of the Julian year, superseded the vague year. According to Lepsius, the Era of Augustus at Alexandria dated z.c. 30, but the first year of the new calendar, prolepti- cally, B.c. 26, when the 1st Thoth vague corresponded to 30th August of the proleptic year of Augustus. The new reckoning, however, in his opinion could not have been introduced before B.C. 8, and was probably introduced A.p. 5. (See Lepsius, Ucber einige Beriihrungspunkte der Aegyptischen, Griechischen, und L6- mischen Chronologie, Berl. Akad., 1859). Although it is quite

ossible that Augustus adopted a proleptic synchronism of the igyptian and Roman years for the official Egyptian year, thus dating back his reform, yet it is more probable that there was some special reason for choosing the particular Egyptian year selected, which, moreover, was not the first of the Era of Augustus. Brugsch has put forward a theory, which is the more remarkable in its bearing on this question as it is of wholly independent origin. He has shown reasons for supposing that a year beginning on the 25-29th August was in use in Egypt from the time of Dynasty VI. It must be admitted that many of his correspondences are of the Roman period, and therefore’probably refer to the Alexandrian‘year ; but others cannot be so

cxplained, and it seems probable that the year which under Augustus superseded the vague year was already in use long before (Matériaux, p. 17 seg.). The Alexandrian year Superseded the vague year, and has remained in use to our times, never having been wholly supplanted by the!lunar year of the Arabs; but it has now given way to the Gregorian calendar.

At the time of Dynasty XII. the Egyptians used four years. These Dr Brugsch holds to be the vague year, 2 solar year, a lunar year, and a lunar year with an intercalation (Z/7st., 2nd ed, 98-99). The second of these years no doubt was the Sothiac, the

‘If the agreement of the sidereal and tropical phenomena marked the institution of the year, a very remote date would be needed, but we cannot tell how nearly accurate the earliest observations were, nor do we know where they were made, end this ia the ease of the rising of Sothis is an additionat element of uneertainty.

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yenderings are undoubted; the first, which is that of Dr Brugsch, j

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beginning of fwhich had au original connection with the summer solstice, and the duration .of which was probably the Egyptian measure ofa solar year. The lunar years would seem to be true lunar years, if we are to accept M. Gensler’s theory that the Egyp- tians had discovered a’method of adjusting their solar calendar with a lunar year by the intercalation of a month eleven times in thirty years (Id. 73). That the Egyptians at a later time used four years is evident from the Calendar of Isné, in which three beginnings are mentioned, that which stands at the head of the document and is of the Sothiac year, a beginning of the ‘‘year of the ancients” on the 9th of Thoth, and another New Year’s day on the 26th of Payni (Brugsch, Matériaux, 19-22). This calendar is attributed by Lepsius to the reign of Claudius, but Brugsch can only decide that it is of the Roman period (Id. 88, cf. 22). If it is much later than the time fixed by Lepsius, the second commencement may be of the vague year, which began July 28 in a.p. 101-104. It. is not probable that it is earlier than the introduction of the

Alexandrian year, which, however, isunnoticed. Thus at least four years were probably in use in Egypt under the Romans.

No Era has been found in the Egyptian inscriptions. They always, if they date at all, date by the year of the reigning sovereign. There is but one instance of a reckoning of the nature of an era. It is the statement of the interval between two distant reigns in the stele in which, under Ramses II., an interval of four hundred years after a Shepherd king is mentioned, or more strictly, following the analogy of ordinary dates, the 400th year of the earlier king, as though he were still living. This, however, is not a strictly Egyptian document (Records of the Past, iv. 36). Similarly the coins of the Ptolemies, except one class, present no era ; even those bearing the name of Ptolemy Soter, struck in Palestine and Phoenicia under Ptolemy Philadelphus and Ptolemy Euergetes, are dated by the regnal years of the kings who struck them. There are indeed coins dated by an era, probably struck at some town of Phoenicia, but these follow a foreign usage which otherwise is not foundin the foreign coinage of the Ptolemies. It is therefore not surprising that the Egyptian cycles mentioned by ancient writers are not traceable on the monuments. One of these, the Sothiac Cycle, consisting of 1460 Sothiac and 1461 vague years, or the period in which the vague year passed through one Sothiac year, was probably used by the astronomers, but we have no indication of its having been known earlier than the first century B.c., when Geminus writes that the Egyptian festivals pass through the whole year in 1460 years (Isag., c. 6, Petav., Uranologiwm, 33). Censorinus fixes the beginning of a Sothiac cycle in A.D. 139 (c. 21), in the third vague year or second Alexandrian of the reign of Antoninus Pius. Curiously the Alexandrian coin commemorating in a symbolic manner this event {is of the sixth year of this emperor. Theon, writing during the cycle beginning A.D. 139, speaks of the previous period as the Era of Menophrés (ap. Biot, Rech. sur plus. p. de Vastr., p.181 sceq., 808 seg. » Sur las période Soth. 18, 129 segqg.) Itis therefore generally supposed that a cycle Le eer B.C. 1822 com- menced in the reign of a Menptah, usually identified with the king of that name of Dynasty XIX. This is possible but not certain. Other cycles rest on less distinct evidence, and for the present we must be content to accept Brugsch’s cautious judg- ~ ment on the whole subject.” 1

The historical chronology of ancient Egypt if less obscure than: the technical is even fuller of difficulty. Our chief authorities are— (1) the Egyptian historian Manetho, who gave a list of thirty dynasties, and the length of each, with in some cases the duration of the individual reigns, (2) the similar list of the Turin Papyrus of Kings, and (8) various data of the ‘monuments. Manetho’s list is unhappily in a very corrupt condition. It appears, however, that his method is generally not strictly chronological. As far as we know, he makes up the sum of each dynasty, except Dynasty XIL., of the individual reigns, where these are stated, taking no account of the overlapping of some of them. He seems to have given larger sums in three great groups. These again are made up of the sums of dynasties, and if any were in part or wholly contemporary, they are treated as successive. According to Syncellus, he stated the duration of the dynasties to be 3555 years. If this number, which suspiciously enough is given apart from the dynastic list, came down correctly to the Byzantine chronographer, many hundred years must be cut off from the totals of the dynasties as they now stand for contemporary dynasties or kings. The Turin Papyrus is unfortunately in a far worse state than Manetho’s list, but it is valuable as confirming and correcting it. The system of reckoning seems, however, to have been more strictly chronological than Manetho’s usual method. The various data of the monuments are as yet of little value beyond affording evidence that Manetho’s numbers

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2d] y a eu des savants qui ont eru decouvrir un autre expédient pour fixer plusieurs dates de l’histoire d’Egypte en se servant du caleul astronomique. Le regne d’un roi Ménophreés sous lequel, d’apres une tradition des aneiens, une nouvelle période sothiaque a reeommeneé, apres la date du lever de I’étoile Sirius, Ja Sothis des Egyptiens, yapportée sous trois rois du nom de Ramses sur des monuments eontemporains de leur époque, et & la fin quelques autres indieations de nature astronomique, ont donné lieu & des ealeuls trés-eompliqués sans que laeritique ait dit son dernier mot sur leur valeur historique.” (//ist., 2nd ed. 27.)

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must be reduced, and as supplying fragments of historical chronology which may ultimately be united into a complete system. It has indeed been supposed that they enable us to construct an approxi- mative chronology on genealogicalevidence. This system, however, breaks down where we can test it, and it is therefore dangerous where it must stand alone. The great genealogy of the official archi- tects gives 21 generations from the contemporary of Setee I. (Dynasty XIX. 2), to the contemporary of Darius I. (XXVII. 3); and thus, allowing three generations to a century, we should bring the birth of Setee and the beginning of Dynasty XIX. to about B.v. 1200.1 It is, however, quite certain that, reckoning from the synchronism of Sheshonk I., or Shishak, with Rehoboam, we must allow for the intervening period at least a century more. The historical events require this. We must therefore suppose that generations, cither of hciresses or of other persons who did not hold the office of architect, are dropped. If this method of computing by genealogies thus fails where we have a genealogical list, obviously it cannot be applied to dynastic lists which we do not know to be genealogical. The average length of reigns is usually different from and less than that of generations, and we cannot tell the inost probable average Iength of reigns without knowing]the law of succession of the country, and its political conditions in the period under consideration. It is therefore especially hazardous thus to measure the Egyptian chronology before Dynasty XVIII., at which time ascending genea- logical evidence fails us. (See, however, Brugsch, Hist., 2 ed. 25-27.)

The preceding observations will prepare the reader to find in the following pages no definite chronological system for the period before the synchronism of Egyptian and Hebrew history at the beginning of Dynasty XXII. The essay would, however, be incom- plete without a shortlaccount of the chronological views of the leading Egyptologists. M. Mariette accepts Manetho’s numbers with some modifications, and makes all the dynasties but one consecutive. He thus dates the beginning of Dynasty I. B.c. 5004. Dr Brugsch, fol- lowing the genealogical method, proposed by Prof. Lieblein, and treat- ing the reigns of the Tablet of Abydos as generations, but making an exception for the distracted age of the XIII.-XVII. Dynasties, when he adopts a series of years derived from Manetho, places the beginning of Egyptian history cir. B.c. 44007 (Hist., 2d ed. 179).

Professor Lepsius adopts the 3555 years as the true duration of

the thirty dynasties, and thus lowers the date in question to B.C. 3892. He reduces the length of the dynasties by making some in part or in whole contemporary.2 M. Chabas proposes with much hesitation the 40th century B.c. (Ktudes sur U' Antiquité Historique, 2ed. 15, 16). The following table gives the date of the beginning of each dynasty according to M. Mariette and Professor J.epsius. The less definite schemes of Dr Brugsch and M. Chabas cannot be tabulated in the same manner. tet

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Prof. Lepsius.

B.C. 3892

M. Marictte.

Dynasty J: B.C. 5004

I 4751 8639 Tl. 4449 8388 IV. 4985 8124 Wa 8951 2840 VI. 8708 2744 Vil. 3500 2592 VIII. 3500 2522 Ix, 3358 2674- es $249 2565 ' ri 2428 xa t — « 2880 X11, 2851 21386 ove 2398 2167 XV, 2101 xu} 2214 { 1842 XV 1708 ima } XVIIL of, Mariette. XIX. 1462 1443 oe Om 1288 1269 XX1. 1110 1091 Olli, 980 961 XX111 810 787 XXIV. 721 729 XXV. 715 716 XXVI 665 685 XXVI1I 597 525 XXVIII 406 525 XX1X 399 399 oti eX, 378 378 econd Persian Conquest… \ an sii

Dr Brugsch escapes this difficulty by adding to the gencalogy the reigns of Dynasty XVIII. (Hist., 2,ed. 26) as generations, and as these reigns had a shorter average length than generations, he recovers lost time.

2 The apparent disagreement of this date and that given p. 27 as the result of the genealogical method is due to the higher date given in the table cited above to the beginning of Dynasty XVIII. on chronological data (for XVII. read XVIII. p. 180). _ The lower date of this epoch is due to the strictly genealogical method in Ene earlier statement, but it must be admitted that the difference is large.

It must be remarked that he modifies the numbers of Manetho;where they can beteeta bymonumental evidence, but in the great periods for which thatlevidence ails he is forced to accept them as they have come down to us. This system is

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There are two weak points in all these systems. They rest to a greater or less degree upon numbers either occurring but once or due to a single authority. The sum of 3555 years, which is the foundation of Professor: Lepsius's system, occurs in but a single passage, and the samie is the case with the round number of 500 years adopted by Dr Brugsch for the doubtful period of Dynasties XIW.-XVII.; it is taken from Manetho's 511 years of the Shepherd dominion. How if both these numbers are corrupt? If they are not their escape is a marvel, considering to what authors and copyists we owe them. Again, the sums of most individual dynasties rest on Manetho's*sole authority, and his lists are in a state which is at present hopeless. Itis equally unfortunate that while certain dynasties are represented by monuments from which Manetho's lists can be verified, others have left little or no records. Thus we have no monuments of Dynasties I.-III. until the close of the last. Then there is an abundance of monuments of Dynasties IV., V., VI. A blank follows without a monument that we can assign to Dynasties VII., VIII., [X., X. Records reappear under Dynasty XI.; of Dynasty XII. they are abundant. Under Dynasty XIII. they become scanty, and of XIV., XV., XVI., XVII. there are but a few, which may be of XV., XVI., or XVII. We have therefore three blank periods, the age before known monuments, the interval of Dynasties VII.—-X., and that of Dynasties XIII.-XVII. It is significant that whereas M. Mariette's reckoning exceeds that of Professor Lepsius 1112 years in the whole sum of the thirty dynasties, the excess is no less than 966 years in the sums of Dynasties VII.-X. and XIII.~~XVII. Such a ditference between two such great authorities is a proof of the want of even probability for solving this part of the problem. Dr Brugsch, in applying the genealogical method to the lists of the monuments for the first and second blanks, while he rejects it for the third, is manifestly unwary. The evidence~~

~~of the Turin Papyrus proves that we must not apply any such method to the third blank. How do we know that it can be applied to the other two? It may be argued that Manetho's numbers for the reigns of the first blank are probable, but neither his lists nor the monuments throw any light on those of the second, to which, notwithstanding, Dr Brugsch allows no less a period than about 500 years. His system has also the special fault that it rests on the supposition that the Egyptian reigns are equivalent to gene~~ rations, which, as already shewn, is by no means proved.

In the following sketch of Egyptian history no dates before the Christian Eva will be given until the beginning of Dynasty XVIIL, when approximative chronology becomes possible. Where, how- ever, we may reasonably conjecture the length of a particular part of history, this will be stated. 4

The traditional age in Egypt is extremely obscure. History begins with the First Dynasty. The earlier period with Manetho, who is supported by the Turin Papyrus, is mythological, the age of the divine reigns, an idea also traceable in the monuments which treat certain divinities as sovereigns. This age is held to be spoken of on the monuments as that of the Shesu-har, the servants, fol- lowers, or successors, of Horus, who, in mythology, aid him in his combats with Seth (Chabas, Ant. Hist., 7, 8; Brugsch, Hist., 2d ed. 23). Manetho completely divests the time of any historical character by making it cyclical. It might be supposed that the Egyptians had some idea of records actually dating from this age, if we could accept M. Chabas's reading of the Ptolemaic inscription relating to the plan of the temple of Dendarah, in which it is stated that the original plan was found in the time of Pepi, of Dynasty VI., in ancient characters on a skin of the time of the Shesu- har. It appears, however, from the context that this im scription was of the time of Khufu, of Dynasty IV., and consequently the parallel expression is merely used to denote remote antiquity (Diimichen, Bawurkunde der Lempelan- lagen von Dendera, 15, taf. xvi.; 18, 19, taf. xv.; of, on the other side, Chabas, Ant. Hist., 2d ed. 7, 8).

Egyptian mythology has not been found to contain any allusion to a deluge, nor to have any connection with the Mosaic narrative in reference to the cosmogony and the early conditions of the human race. Similar terms have

been pointed out, but the leading facts are wanting. Thus the Egyptian ideas of their prehistoric age have a strang? isolation by the side of those of most other nations of remote civilization, which agree in one or more particulars with the narrative of Genesis. Discoveries may, however, modify this view.

HISTORY. |

In Egypt stone implements have been recently discovered. Owing, however, to the abundance of historical monuments, the prehistorical remains have scarcely received due atten- tion. We do not yet know whether these implements were used by the Egyptians or by savage tribes who may have made incursions into their territory. We find, however, the use of flint arrow-heads in the historical period from the paintings at Benee-Hasan (Dynasty XIL.).

It isimpossible to conjecture the duration of the prehis- toricage in Egypt. M. Chabas has proposed a space of 4000 years before the First Dynasty as sufficient for the develop- ment of the civilization which had already attained maturity in the time of the Fourth Dynasty (Ant. Hist, 9,10). We are, however, so entirely ignorant of the causes of this civilization, and so unable to decide how far it was native to the soil of Egypt, that it is safer to abstain from any attempt to compute a period of the length of which the historical Egyptians themselves do not appear to have had any idea.

With Menes, in Egyptian Mena, the “stable,” the history of Egypt begins. It istrue that Manetho states cautiously of his successors of the Second Dynasty certain things that are evidently legendary. This must be the natural result of a want of monumental evidence, and a consequent dependence on tradition. At present no monuments are known before the time of the last king of Dynasty ITI., and this may be the limit at which inscribed contemporary re- cords began. It is, however, agreed by all Egyptologists that the founder of the Egyptian state is no legendary per- sonage. AJ] we know of him wears the air of history, and is consistent with the conditions in which a state would have been formed. Menes was of Thinis, in Upper Egypt, and consequently the first two dynasties are called Thinite. Thinis, or This, in Egyptian Teni, was perhaps only a quarter of the more famous Abydos. Certainly it was ob- secured by the near neighbourhood of the sacred city. Menes, having gained the sovereignty of Egypt, which probably

before his time was divided into two states, founded the city of Memphis. In order to gain sufficient room for the site he changed the course of the Nile by constructing a dike, which turned the stream more to the east, M. Linant believes that this dyke is probably represented by that of Kusheysh. The great temple of Ptah, at Memphis, was then founded ; and there can be no doubt that the seat of government was, under Menes, or not much later, removed to the new city. Menes:made laws and waged a successful war. After along reign of sixty-two years he was killed by a hippopotamus. All this has a perfectly historical aspect. Only a legislator and warrior, and so a mighty hunter, could have set upon a stable basis the long-lasting fabric of Egyptian polity. The main qualities of the man who did this could not have been forgotten at Memphis, which was great and flourishing, the chief seat of Egyptian learning and wealth, before the close of the Third Dynasty. The reproach that Menes corrupted the primitive simplicity of the Egyptians is probably a perverted tradition, like that Which changed the tyranny of Khufu and Khafra to impiety. In later times Menes was reverenced with other kings, but as far as we know had no special worship, a con- dition suitable to his historical character, now universally admitted.

Athothis, either Tota or Atot, the first or second succes- sor of Menes, is related to have founded the palace at Memphis, and, being a physician, to have written anatomi- cal books. A medical papyrus in the Museum of Berlin, composed under Ramses II. (Dynasty XIX.), curiously illus- trates the second statement. It contains a portion said to have been copied from a very ancient papyrus discovered in the time of Hesp-ti, or Usaphaidos, a later king of the First Dynasty, and to have been subsequently taken to Senta, or

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mids of which we know the use.

Sethenes, of the next line (Brugsch, Hist., 2 ed., 42). Under Uenephes, the fourth Thinite king, a great famine, the first recorded, ravaged Egypt. He is also said to have raised the pyramids near Kochome. As Kakem is the‘monumental name of the part of the Memphite necropolis around the

Serapeum, and north of the Pyramid of Steps of Sakkarah, Dr Brugsch and others are disposed to consider that pyramid, which isa very archaic structure among pyramids, to be here intended. The use of the plural “ pyramids” by Manetho does not stand in the way of the identification, as we know a case in which a small pyramid was built at the same time as a large one. We do not know the original purpose of the monument. Under the early dynasties it was used as the burial-place of the bulls Apis. As, how- ever, their worship was introduced under Dynasty IL., it may have been at first a royal sepulchre, like all other pyra- Under Semempses, the seventh king of the dynasty, Manetho speaks of many wonders and a very great plague. Thus the two chief scourges of Egypt appear in this remote age, suggesting a large population, and consequently the length of the period preceding the accession of Menes.

With Boethos, or Butau, the Second Dynasty begins. Manetho relates that in his time a great chasm opened at Bubastis and many perished. Frequent as volcanic shocks are in Egypt, it is long since an earthquake has been experi- enced in that country. There are, however, :reasons, from the manner in which monuments have fallen and the records of earthquakes in Palestine in antiquity, for supposing that Egypt was anciently more subject to such calamities than in latertimes. The next king, Kaiechos, Kakau, introduced the worship of the bulls Apis at Memphis, and Mnevis at Heliopolis, and of the Mendesian goat, and his name appears to commemorate these innovations, probably a necessary step owing to the increase of population, for animals locally worshipped were thus restricted in number. We also notice that already Heliopolis and Mendes, besides Thinis, Memphis, and Bubastis had been founded. Under the next king, whose name, Binothris, Bainnuter, was pro- bably commemorative of the new worship at Mendes, we read that a law was passed that women could hold the sovereign power. This might in a semi-barbarous con- dition be a relic of polyandry, but in Egypt the civiliza- tion of Dynasty IV. forbids such an explanation, and we must rather regard this new law as a proof of advance- ment. In consequence we find a’few reigns of queens in the Egyptian lists, but only one of them, Sebek-neferu- ra (Dynasty XII.), appears in those of the monuments. Succession through an heiress was, however, carefully respected, and it was perhaps for want of a son that Binothris made this edict. It may be chance, but Manetho calls each king of Dynasty I. after

Menes, son of his predecessor, whereas under Dynasty II. he drops this characterization. Nothing more is told of this line but two marvels, that under Manetho's seventh king, Nephercheres, the Nile was fabled to have flowed mixed with honey for eleven days, and that the eighth, Sesochris, was said to have had a height of 5 cubits and 3 palms, which is not improbably a confused account of a colossal statue.

'The royal house now changed by the accession of Dynasty III., the first of Memphites. Manetho relates how, under its head, Necherophes or Necherochis, the Nebka of the monumental lists, the Libyans revolted from the Egyptians but returned to their allegiance terrified by a sudden increase of the moon. It is useless to speculate on the character of the phenomenon which, unless it be legendary, was probably an eclipse ; but the glimpse we thus obtain of an Egyptian dominion beyond the Nile valley at this remote age is most valuable. In Genesis the Lehabim, or Lubim, appear as a race kindred to the Egyptians. In the

Egyptian inseriptions they are called Rebu, or Lebu, and appear on early monuments as a dark people. Under the Empire they have Caueasian charaeteristics. The change was probably due to the great maritime migrations of the Pelasgie tribes, in whieh the Libyans had an important share. To the next king, Tosorthros, Manetho assigns the

invention of building with hewn stones and' eultivation of

letters, and says that for his medieal knowledge the Egyptians called him Aisculapius. If the Pyramid of Steps dates from an earlier king, the first statement must be qualified, though it is to be remarked that the difference of constructive skill between that monument, if so early, and the works of Dynasty IV., would almost justify the historian; and again the discovery of inseriptions of a less aeeurately ordered kind than those of Dynasty IV. may support the seeond statement; the third seems at variance with the Memphite worship of the Egyptian Adsculapius, Imhotep. On the monuments contemporary history begins with the last king the lists assign to this dynasty, Senoferu, probably Manetho's last but one, Sephuris. We may now take a retrospect of theage. It is in some respeets euriously

primitive in eomparison with that which immediately follows it. Dr Brugseh has remarked the general absence inthe kings' names of the name of Ra, afterwards essential to throne- names, whieh from the medallic eharaeter of some of these they seem to have been, and the equally general absence of the names of other gods, Ra oceurring once in the three dynasties and Sekeri once. Again he has observed the some- what plebeian aspect of these names, as proper to men who sternly ruled the masses. Mena is "the stable," he who resists ; Tota, "he who strikes ;" Senta, "the terrible ;" Huni," he who strikes." Senoferu is "the betterer." As "the striker of the peoples," for so he is ealled in his in- scription at Wadee Magharah, in the Sinaitie peninsula, he is a foreign eonqueror.!

From Senoferu, at the close of Dynasty ITI., to the end of Dynasty VI., we have a suceession of contemporary monuments by whieh history ean be reeonstrueted, not only in its politieal events, but in those details of the eondition of the population whieh make an essential part of all real history. Under Senoferu we find great material prosperity, and the arts already in that eondition of excellence which makes the Pyramid age in some respeets the most remarkable in the annals of Egypt. We also find foreign eonquest, not as in the time of the Empire for glory, but with the view of extending the Egyptian rule to eountries whose produets were valuable for the arts. It is thus that this Pharaoh is the earliest who has left a tablet in the Sinaitie peninsula, where perhaps he, as Dr Brugseh thinks, was the first to plant military eolonies to proteet the workers in the mines of copper and the valuable blue stone called "« mafkat," and this idea is supported by his being afterwards worshipped there. He is also the first king whose pyramid is found with its special name on the monuments, Dr Brugseh thinks it is that now ealled the Pyramid of Meydoom, near which ehapels of tombs bearing his name have been diseovered, and a group consisting of two statues, remark- able as a splendid speeimen of Egyptian arehaie art. The subjeets, it may be remarked, were usually buried near the pyramid of the reigning king. Senoferu the betterer left a good name as a beneficent king, and his worship was main- tained until the Ptolemaie period.

Khufu, the Suphis I. of Manetho and Cheops of Hero-

- The chronological length of this first unknown period in the thirty dynasties cannot be determined, In the Turin Papyrus three durations of reigns are preserved. They are each less than Manetho's numbers of the same reigns, however we fit the two lists together. It is further remarkable that while the length of Dynasty I. gives nearly a generation of 33% years to each reign (253-8 = 31-6) that of

Dynasty II. gives almost ex: i +9=33°5; 297, Te, oe 33)" most exactly this average (302, Afr. +9=33°5 ;

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dotus, immediately succeeds Senoferu in the lists of the monuments, so that he may be regarded as the legitimate head of Dynasty IV. The list of that dynasty is as fol- lows:—Khufu, Ratatf, Khafra, Menkaura, Shepseskaf, eorresponding to eight kings in Manetho, in whom algo the order is different, Ratatf (Ratoises) following' Menkanra (Mencheres), a natural eonsequenee of the association in fame of the builders of the three most celebrated pyramids, Khufu, Khafra, and Menkaura? ff

The age of the pyramid-builders is the most brilliant before the Empire. We ean judge from the royal tombs of the magnificence of the kings, and from the sepulchres around of the wealth of the subjects. The construction of the pyramids has perhaps been unduly marvelled at: we should know in what other manner the kings employed the vast amount of manual labour at their disposal, if we would estimate how mueh they eould have effeeted by it in pyramid-building in the long period of time for which they ruled. Ifthe two reigns of Khufu and Khafra extended over more than a eentury and a quarter, we may measure what we know them to have done against the works of other states during a like interval, and the eomparison reduees our wonder.

The regal power at this time seems to have been very strong. So at least may we infer from the phraseology of the inseriptions, and from the faet

that the kings threw much, if not all, of the foree of the nation into personal monuments for their own memorial. Never in later times is the royal tomb the ehief objeet of the king's reign, or is he so eompletely detaehed from the welfare of Egypt. The pyramids with their priesthoods are proofs that then the Pharaoh was more positively worshipped than ever after- wards,

It must, however, be admitted that the great men whose tombs are planned around the pyramids enjoyed abundant wealth and ease. Their time was passed not in war or in state affairs, but in the management of large estates, probably royal gifts, and in superintending the handierafts of their people, and giving no small share of their leisure to the pleasures of the ehase, to hospitality, and to the enjoyment of musieal performanees. In the ehapels of their tombs these oeeupations of everyday life are portrayed. There is no sign of war, no great military class. It is true that the common folk seem to have been very poor, but their life in that land of abundanee is at least represented as happy. On the other hand, it is significant that the nobility include

a large number of the royal family, and that the king is i nO ee ee —™

? The numbers of Manetho are irreconcilable with those of the Turin Papyrus assigned by scholars to this period. There is evidence that they cannot be considered to be consecutive in the inscription which mentions a lady, a Queen Mertitefs, as a great favourite of Senoferu and Khufu and attached to Khafra. M.de Rougé remarks that she must have been very old at the time of Khafra (Six Prem. Dyn., 256 seqq.); but in the list of Manetho the intervening reigns (Ratoises 25, Suphis [I1.] 66) amount to 91 years. If we allow her to have been 14 years old at the end of the reign of Senoferu and to have lived a year into that of Khafra, her age would not be less than 106 years. This 18 very near the extreme limit of human life in the Egyptian inscriptions, 110 years, and it is based on the minimuin of time possible in the case. Thelength of early kings' lives in the Turin Papyrus supports this view. Probably the reigns overlapped one another. This idea is supported by the two chief chambers in the Great Pyramid, which has already made M. de Rougé suspect that it was 'the. tomb of two kings (Id. 261, note 1). A sound argument for the chronology of the time might be found in the size of the three chicf pyramids. A pyramid was the great work of a king's reign,

and it was so constructed that it might be continually increased in size and yet easily completed at any time. The Great Pyramid would indicate a reign of maximum dura- tion; so, too, the Second; whereas the Third would, in its original size, mark a shorter time. By this method we should be induced to accept Manetho's numbers for Khufu, 63 years, and Khafra, 66, but to doubt the long reign of Menkaura, 63. It would be reasonable on the other evidence to make Ratatf contemporary with Khufu or Khafra,

not represented in the tombs, and when he is spoken of it is in terms of the most distant respect. Similarly there isan extraordinary reserve as to worship. Religious subjects are wanting, and the religious inscriptions are usually limited to the formula of dedication. The priesthood is already numerous, but it is connected with the service of the chapels of the pyramids. In the vast court a baneful bureaucratic class is already growing, in future to destroy the welfare of the people. |

The reign of Khufu is principally marked by the building of the Great Pyramid. We learn from a curious inscription of a later date that he rebuilt the temple of Isis, near the Sphinx, carved out of the rock by some earlier king, and that he made a pyramid for the Princess Hent-sen in the same neighbourhood. 'The charge of impiety which the Jocal tradition reported by Herodotus brings against Khufu thus fails, and the charge of tyranny associated with it, may be equally groundless. 'The cost of life in building the Great Pyramid can scarcely be compared with that of a long war under conditions resembling those of modern China, It should be noted that Khufu, as well as Khafra and Ratatf, were still objects of worship under Dynasty XXVI. (Brugsch, Hist., 2d ed. 57, 58). The only record of foreign conquest is a tablet in the peninsula of Sinai, commemorating what was probably no more than a suc- cessful maintenance of the posts already there established to guard the mines.

The reign of Khafra is commemorated, like that of Khufu, by the royal sepulchre and the tombs of subjects.

From the latter we are able to contradict the tradition of

his hostility to the national religion, in which Herodotus associates him with Khufu. The most interesting remains of the time are the statues of this king found in a well near the Sphinx, into which they were probably thrown either by a foreign invader or by early Christians or by Arabs, rather than iu a popular revolt after his death (¢f, however, Maspero, Histoire Ancienne, 73), A statue and a bust of Khafra from this find have been published by M. de Rouge (Sie Prem. Dyn., pl. iv. v.). Both are remarkable works, showing a naturalistic style that makes them far superior to later statues. The king's head is evidently a portrait, and the type is more Caucasian than the generality of later subjects.

Menkaura, or Mencheres, the Mycerinus of Herodotus, and the founder of the Third Pyramid, does not seem to have been specially reverenced in later times, in contradic- tion to the report of Herodotus. It is, however, interest- ing, in connection with the tradition of his support of religion, that the Egyptian Iitwal speaks of its 64th chapter as found by Har-tot-ef, son of Mencheres, at Hermopolis Magna, when he made an inspection of the temples of Egypt, and brought as a precious document to the king (Brugsch, J/ist., 2d ed. p. 59, 60). It would thus appear that the Ritwal was not then completed, and Manetho's statement that Suphis I., Khufu, wrote the sacred book may be another hint as to its date. It may also be Noticed that the queen of Khafra was priestess of Thoth (Siz Prem. Dyn., 277 seqg.), and a noble, probably son of Khafra, was high-priest of Thoth at Hermopolis, a opnty held by another prince in the same reign (/d. 280,

The most interesting record of Menkaura is his wooden mummy-case, found by General Howard Vyse in the Third Pyramid. In the disappointing silence of those vast monu- ments, without a single ancient Egyptian writing save the graffiti of workmen and the inscriptions of native visitors, this solitary record of the time is the one authoritative voice from the royal sepulchres, and it tells us in its short archaic formula that the whole myth of Osiris in its rela- tions to human destiny was already matured. The king

as Osiris has become divine and has vanquished his enemies (Brugsch, Hist., 2d ed., 58, 59).

The next family, Dynasty V., continued to rule at Memphis.! Of its sovereigns we know but little. The last but one, Asga, is the first Pharaoh whom we know to have had two names, the throne-name as well as the ordinary one. ‘To his son Ptah-hotep is assigned the ancient moral treatise already noticed in speaking of Egyptian literature, which is on the whole the best fruit of Egyptian thouglit that time has spared. ‘The last king, Unas, varied the form of royal tombs, by constructing the great truncated pyramid now called Mastabat-Faraoon, or Pharaoh’s Seat, north of the Pyramids of Dahshoor. (Jd. 67.)

The Sixth Dynasty was probably a family of a different part of Egypt.? It has left many records which indicate less centralization at Memphis than those of the earlier sovereigns, and mark the beginning of wars for predatory purposes and extension of territory. This change is accompanied by a less careful style of sculpture, and less pains in the excavation of the tombs, as though the Egyptians were gaining a larger horizon, or, it may be, exchanging religion for ambition. The interest of the dynasty centres in the undoubtedly long reign of Pepi, second or third king of the line, and the inscription of Una. In this inscription we first read of great wars, and foreign conquered nations are spoken of by name. A military system had already begun, for we read how the king sent with Una an officer and soldiers to transport a sarcophagus for the royal tomb from the quarries of Tura. A war is then undertaken against the nomads of the eastern desert—the Amu (Shemites ?) and the Herusha, “ those who are on the sand.” An army is levied from the whole population of Upper and Lower Egypt, as though there were no military caste. Negroes are also enrolled from several countries mentioned by name, which must have been subject to Egypt, and are drilled by Egyptian officers, including priests. Una is appointed generalin chief. Five separate expeditions are conducted by him into the country of the Herusha. It seems an error to suppose that this nation were Arabs of the desert, for the Egyptian general cut down their vines and their fig-trees (?) Another expedition was conducted by water against the same nation in a country called Takheba? (De Rougé) or Terehba? (Brugsch), which M. de Rougé conjectures may be Arabia Petraa, or a part of Syria,

remarking that it was near Egypt, for the expedi- tions seem to have been annual. The external activity of the reign of Pepi is also attested bya tablet at Wadee Ma- gharah, and his public works by many inscriptions, among which we must not omit the occurrence of his name at Tanis, and inthe inscription relating to the building of the temple of Dendarah. He founded a city called the “City of Pepi” in Middle Egypt, which has wholly disappeared, and tombs of lis time are found in various parts of the Nile valley. His pyramid, which, like Memphis, was called the “ good station,” Men-nofer, was probably at the ancient capital, and may be one of the two great pyramids of Dahshoor, which

1 This Dynasty appears to have consisted of nine kings, who pro- bably reigned nearly 200 years (Brugsch, Hist., 1 ed., 288).

2 Manetho assigns to Dynasty VI. a duration of 203 years. The monumental lists, themselves in disaccord, the Turin Papyrus, and the contemporary inscription of Una, show that Manetho’s list is here hopelessly corrupted. Una was in office under the immediate or second predecessor as well as under the immediate successor of Pepi, usually identified with Phiops, to whom the Egyptian historian assigns a reign of 100 or possibly 94 years. M. de Rongé has seen this difficulty, and discussed without finally resolving it (Siz Prem. Dyn., 361 seqq.). M. Maspero has proposed a most ingenious restoration of the dynasty, on the idea that Neferkara is the long-lived Phiops, and that his family- name must therefore have been Pepi (7ist. Anc., 96). This conjec- ture seems to us to be confirmed by the name of the later Neferkara Pepi of the Tablet of Abydos being qualified by the title “‘seneb,” as if to distinguish him from an earlier king of otherwise identical name.

are of later date than Dynasty IV., if we may judge from their structure, and both of which from their size imply reigns of the greatest prosperity and of long duration. ” Pepi was succeeded by his son Merenra. The new king made Una governor of Upper Egypt, and employed him to bring blocks of granite from Elephantine for his pyramid, and in various other works of which the inscription already referred to gives most curious details. He was charged to obtain wood, which was provided by the prince of four

Ethiopian nations already. mentioned among those furnish- ing negroes to the great army of Pepi: We thus learn that tributary Ethiopia was ruled by a native prince or princes under the governor of Upper Egypt, who also had the power of establishing posts in the dependency. Una made four docks and timber-yards in Ethiopia for build- ing boats, and attached a chapel to each. We roay thus expect to find some record of Egyptian rule at this early time, long before the complete reduction of Lower Nubia, in territories far south; for the timber-growing country does not begin for some distance within the tropics. Merenra was followed by his younger brother Neferkara, and, according to Manetho, the dynasty ended with the beautiful Queen Nitocris, whose name appears in the Turin Papyrus, but whose exact historical place is not certain. If she was buried in the Third Pyramid, of which Manetho, according to the copyists, makes her the builder, she enlarged the original work of Mencheres, and certainly no pyramid is so evidently not merely a double structure but one of double design. Nitocris is almost the only Egyptian whose historical character has been lost in a succession of legends. One version of her story is the most ancient form of that of Cinderella; in another, she still bewitched the Arab of the Middle Ages when he approached her pyramid (¢f. Maspero, I/ist. Anc., 94). With the later part of Dynasty VI. the second great chasm in Egyptian history begins, and we have no monu- ments to guide us until the time of Dynasty XI. Accord- ing to Manetho, Dynasties VII. and VIII. were of Mem- phites, and IX. and X. of Heracleopolites, the Diospolite or Theban line comprising Dynasties XI., XII., and XIII. Whether the dynasties which intervened between the Vith and XIIth were contemporary or successive, and how much time they occupied, cannot yet be proved. In the Tablet of Abydos, a series of kings unknown from other monuments follows Dynasty VI., and precedes two kings of Dynasty XI. In the Chamber of Kings of El-Karnak other and earlier kings of Dynasty XI. are named, with curious indications that it was first but a local line. To the period of the earlier kings of Dynasty XI. belongs Entef-aa, who reigned at least fifty years. It would appear that the Memphite kingdom waned, and that another line

arose at Thebes, the house of the Entefs and Mentuhoteps. —

The power of these kings gradually increased, and at last one of them reunited under a single rule the whole of Egypt. (Maspero, Hist. Anc.,

98,99.) Probably the Heracleopolite

line, Dynasties IX., X., was a local house contemporary

with the Memphites or Thebans, or both.

With Dynasty XIT.1 the Theban line was firmly estab- lished over all Egypt. In the circumstances referred to in the “Instructions” of Amenemhat L., its first king, to his son Usurtesen I., we have a glimpse into the unquiet condition of the country when the line arose (/d., 101). Similarly the custom of associating the heir apparent as king with his father, the peculiarity of this dynasty, indi- cates the dangers that then surrounded the throne (c. Id. 105).

It is to the grottoes of Benee-Hasan that we owe most of

1 The length of Dynasty XII. appears to have been 213 years 1 m. z f oe Ueber die Zwilfte Aegyptische Kénigsdynastie, Akad. erl, :

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our knowledge of the manners and arts of Egypt under Dynasty XII., and much of its history is there told in the memoirs of a family of governors under thie first five kings of this house. No one can have examined these beautiful tombs without being struck by the advance in architecture which they show, and the evidence of prosperity and cultivation afforded by their paintings. The subjects re- semble those of the tombs of the earlier dynasties, but there is a greater variety, partly due to a more luxurious condition of society, partly to a more flexible art. It is sufficiently evident that the preceding dynasty (XI.) cannot have been weak, and the country under its rule distracted. A time of prosperity must have preceded this bright period of Egyptian history.

Amenemhat I., probably a successful minister of an earlier king (Brugsch, Hist., 2d ed., 79, 80, 84), had an active and prosperous reign, ruling like Pepi beyond Egypt to the south, and occupying himself in the construction of various monuments. As the head of a new line he paid special attention to the boundaries of territories, to the regulation of the inundation, and to the confirmation of hereditary governors (Benee-Hasan inser. ; Brugsch, Hist, 2d ed., 94,95). A very curious view of the state of Egypt in his time is given us by the story of Sanehn in a hieratic papyrus of the Berlin Museum (translated by M. Goodwin, in Records of the Pust, vi. 181, seqqg.). It is the history of an Egyptian who fled from the king and took refuge with a neighbouring prince, whose territory unhappily we cannot as yet determine, and after a long sojoumm sought his sovereign's pardon and returned home to be taken into the favour of Amenemhat. The reception of the fugitive abroad, his home-sickness, and the kindness of the Pharaoh, who at the same time is described in terms of the most abject respect, form an interesting picture, and one re- markably illustrating several events in the history of Egypt.

Under Usurtesen I., the co-regent and successor of Amenemhat I., Egypt had reached its highest prosperity after the age of the pyramid-builders of Dynasty IV. The obelisk which still marks the site of Heliopolis, a fragment of a statue at Tanis, inscriptions on the rocks of the Sinaiti¢ peninsula, and a stele from Wadee Halfeh, recording foreign conquests in the south, now in the Naples Museum, attest the spleudour of this reign. The records of private individuals are, however, its most instructive memorials. Mentuhotep has given us a picture of the power and status of an Egyptian prime minister, holding all or nearly all the functions of the members of a modern cabinet, a position singularly parallel to that of Joseph, to the detail that even great men bowed before him. 'To his stele we owe the in- formation that he gained successes against the Asiaties, the Herusha, and the negroes. (Brugsch, Hist., 2d ed., 91, seqgq.

a Amenemhat IJ. and Usurtesen II., the next kings, there is little to relate but that Egypt continued to prosper. It was under Usurtesen III. that a great step in advance was made by the fixing of the boundaries of the Egyptian dominion beyond the Second Cataract, at Semneh and Kummeh, where this king built sanctuaries and fortresses, and placed great boundary-marks in

the form of tablets. These in their inscriptions define the limits of the kingdom, and regulate the passage of negroes by the river (Zd., 102). Here and throughout Nubia, Usurtesen was worshipped in subsequent times. He had introduced 4 settled government into the country, which long after was virtually a part of Egypt rather than a dependency. His successor Amenemhat ITI. is chiefly famous for his great engineering works. That care which the first Amenemhat bestowed on the regulation of the inundation seems to have been the great object of his reign. The rocks of Semneh and Kummeh bear registers of the height of the Nile in several

years of]1is reign. His great enterprise, the most successful of its kind ever carried out in Egypt, was the construction of a vast artificial reservoir, Lake Meeris, in the province now called the Feiyoom, which received the waters of the Nile by a canal, and after the inundation spread them over the country. Its fisheries were also very valuable. Through the neglect of ages the site of Lake Mocris was forgotten until, in our time, M. Linant traced it. Near the lake, Amenemhat III. built the famous Labyrinth, of which the remains were discovered by Dr Lepsius during the Prussian Expedition to Egypt, and there raised a pyramid. The use of the Labyrinth is unknown ; the pyramid was no doubt the royal tomb. Its moderate dimensions and the vast size of the lake show a remarkable contrast to the earlier great pyramids, with apparently no corresponding work of public usefulness. At the time which produced the Lake Mceris civilization had reached a point far above that of the age of Khufu, perhaps the highest Egypt has ever known. Of the short reigns of Amenemhat IV. and Queen Sebek-nefru-ra we know nothing, but that with the latter the dynasty came to a close.

With the accession of Dynasty XIII. we reach the third chasm in the Egyptian monumental records. This line, Theban like its predecessor, but with a special favour for Middle Egypt (cf. Brugsch, Hist., 2d ed. 115), seems to have ruled all Egypt. Its power, however, was evidently weakened, either by external war or by internal dissension. Many monuments may have been lost or may yet lie hid in the mounds of towns of Middle Egypt, but the scantiness of records of public works is a proof of its weakness. Where are its tablets in the quarries? In the Turin Papyrus are preserved the

lengths of several of the reigns of its kings, who generally bore the names Sebek-hotep or Nefer-hotep. ‘The longest reign is 13 years, and but oue other reaches 10, the total of 13 reigns being but 48 years 22 days, and 6 sums of months and 7 of days effaced. Putting the total at 50 years, the allowance for each reign is under 4 years. This must have been a time of disturb- ance, but not necessarily of disastrous wars ; for if we com- pare the rule of the second line of Memlook sultans we obtain au average reign of 5 years each. This we know to have been the consequence of domestic disturbance, and not of great public disasters at home or abroad. Dynasty XIV., of Xoites, the next in Manetho’s list, is the first which had certainly its capital in the Delta. Beyond this fact we can only conjecture its importance and chrono- logical place.

The invasion and conquest, at leastin part, of Egypt by the Hyksos, or Shepherd Kings, is undoubtedly the chief cause of the obscurity of this age. ‘The event did not happen until at least some time after the beginning of Dynasty XIIIL., for the eighteenth king of that line in the Turin Papyrus, who bears the significant name Mer-mesha, “the general,” has left a record at Tanis near the eastern frontier, which was probably the chief city of at least one dynasty of the invaders.

Manetho, as cited by Josephus, allows for the stay of the foreigners in Egypt a period of 511 years, which has been supposed to be about the interval beween Dynasty XII. and Dynasty XVIII., by which they were expelled. This number, however, rests upon the single evidence of Josephus, and is moreover probably made up of sums of dynasties, which would render its evidence doubtful. A better means of measuring the period would be afforded by the monumental evidence that a Shepherd king ruled 400 years before Ramses II. could we place this foreign sovereign. All that can be said as to the chronology is that Dynasty XV. and XVI. were probably of Shepherds, and Dynasty XVII. was certainly Theban. J udging from

the numbering, it is probable that there was a break in the

Theban succession, and that the two Shepherd dynasties were successive, the Xoites perhaps being but a provincial line.t

The story of the Hyksos is thus told by Manetho. Under a king called Timaios, or Timaos (not recognized in the list or on the monuments), certain invaders from the East conquered Egypt without a battle, destroying the temples and slaying or enslaving the people. At length they made one of themselves, Salatis by name, king, who ruled at Memphis, and made all Egypt tributary. For the better protection of the eastern border he rebuilt and fortified the city Avaris, in the Sethroite nome in Lower Egypt, where he kept a great force of soldiers. He was succeeded by other kings mentioned by name, who, and their descendants, held Egypt for 511 years. After this

the kings of the Thebais and of the rest of Egypt rose against' the Shepherd rule, and a great and long war was waged, until Misphrag- muthosis drove the Shepherds out of all Egypt except Avaris, where his son Tuthmosis besieged them, and failing to take the place agreed to a capitulation, ou the condition that they should be allowed to leave the country. Accordingly they went through the desert to Judwa and founded Jerusalem. They were called Hyksos, or Shepherd kings, and, according to some, they were Arabs.

This narrative, notwithstanding a general confirmation from the monuments, is evidently not wholly correct. In particular it is inconsistent with all other evidence in attributing the foundation of Jerusalem to the Shepherds, which: is evidently the result of an endeavour to connect their departure with the Exodus. Manetho seems to have preserved two Egyptian theories of the Exodus, which both explained that event as the retreat of eastern invaders. M. Mariette's researches in the ruins of Tanis have brought to light monuments of the Shepherds, and led to the dis- covery of others elsewhere, while M. de Rougé and other scholars have explained Egyptian documents connected with the war of independence. From these different sources we learn that the foreigners were of the Shemite ora kindred type, resembling the modern inhabitants of the north-east of Lower Egypt, who still retain the peculiarities already noticed by Greek writers. Though their conquest may have been marked by violence, we find them in their own monuments using and cultivating the manners and civilization of Egypt, and even giving a new and characteristic development to its art in their costly monoliths of granite, which show from their material that their rule extended to the southern boundary of Egypt. The war of independence arose between Apepee, one of their later kings, who is described as worshipping Seth only, and one of the three Theban kings called on the monuments Ra-skenen Taa, at this time apparently a tributary prince. The war, contrary to Manetho's statement, does not seem to have been of long continuance, having been brought toa successful end by Aahmes, first king of Dynasty XVIII, between whom and Ra-skenen Taa no great length of time can have elapsed. Manetho's text is again erroneous in making the conqueror Tuthmosis (Thothmes IV.), son (grandson) of Misphragmuthosis (Thothmes TTL), siaeth OO

1 ‘The Tablet of 400 Years states that this period elapsed from some point in the reign of the Shepherd king Set-aa-pehti Nub to some point in that of Ramses If., and again Apepee, whose name corresponds to

the Apophis of Manetho, almost immediately preceded Dynasty XVIII.

Apophis is mentioned among the only Shepherd kings Manetho names. In the passage preserved by Josephus these are called the first Shep- herd rulers, who very properly compose the first Shepherd dynasty, the XVth, in the epitome of Africanus; though Eusebius transfers them to Dynasty XVII., perhaps knowing they immediately preceded Dynasty XVIII. In Africanus, Dynasty XVI. is of Shepherds and XVII. of Shepherds and Thebans. If the identification of Apepee with the Apophis of Dynasty XV. were certain we might have a rough measure of the time of the Shepherd rule, but this is not proved.

and fifth sovereigns of Dynasty XVIII. in his list; but this may be a confusion due to copyists, as there is other evidence that he placed the conquest of the Shepherds under Amosis, or Aahmes. The expulsion of the foreigners was not so complete as Manetho would have us imagine. Several names in their territory remained Shemite, or the population non-Egyptian, and under Dynasty XIX. the prejudice that appears in Dynasty XVIII. seems almost removed.

It must be here noticed that Dr Brugsch has copied a remarkable inscription, from the tomb at Hilethyia of Baba, whom he assigns to the latter part of Dynasty XVII, in which mention is made of a famine of successive years. “ A famine having broken out during many years, I gave corn to the town during each famine.” There are but two known instances in history of a famine in Egypt lasting several years, the seven years’ famine of Joseph and the seven years’ famine of the Fatimee caliph El-Mustansir, Dr Brugsch has, therefore, argued with high probability that Baba records the famine of Joseph, and that the old tradi- tion that Joseph governed Egypt under the Shepherd King Apophis is a true one (cf. supra, p. 735, note 1), To this we shall recur in speakiug of the Exodus. (See Brugsch, fist., 2 ed. 174, seqg.)

The beginning of Dynasty XVIIL (x.c. 1600-1500 1) is marked by two great events, the union of divided Egypt under one head, and the victorious end of the great war with

the Shepherds.! Aahmes, probably a Theban prince, appears.

to have secured the supreme rule over the various princes of Egypt, without abolishing their rights, and to have gained Ethiopian support by his marriage with Nefru-ari, daughter of a king of Ethiopia. He then directed his whole power to the final liberation of Egypt. The tomb at Eilethyia of Aabmes son of Abuna, an officer of the Egyptian flotillas, in an inscription relating his services, throws light on the events of this war. He passed his early youth in the fortress of Hilethyia, one of the strong posi- tions where the kings of Dynasty XVII. rallied their subjects. In the reign of Aahmes he was made officer of the ship called the “Calf.” Later he went to the flotilla of the north to fight. It was during the siege of the fortress of Avaris. He served in the vessel “ Ruling in Memphis,” a name no doubt given to commemorate the addition of the ancient capital to the dominions of Aahmes. An engagement took place on the water near Avaris. Subsequently Avaris was taken, and the young officer carried off three captives, whom the king granted him as slaves. This was in the fifth year of Aahmes; in the next we read of the conquest of Sharuhan, the Sharuhen of the book of Joshua, in the south-west of Palestine, The memoir then adds that, after having slain the Shepherds of Asia, the king undertook a successful expedition against an Ethiopian country. (See Brugsch, Z/ist., 1 ed. 80, 81.) This narrative, while generally confirming Manetho’s story, corrects it insome particulars. It states that Avaris was taken, not that it capitulated, and indicates a pursuit of the enemy within the territory of Palestine, where they were again conquered in a city which they attempted to hold. The Ethiopian expedition was a reassertion of the Egyptian dominion to the south. Two tablets in the Turd quarries record how, in the twenty-second year of his reign, Aahmes restored the temples which had fallen into decay,

- 1 The chronology of Dynasty XVIII. is not yet fixed. Manetho’s list is here in a very corrupt state. Certain numbers can be corrected or confirmed by the monuments, and if we provisionally accept the others, we obtain a sum of not greatly over two hundred years for the

line, supposing it to end with the accession of Ramses I. It must, however, be remembered that those numbers which are provisionally accepted are manifestly unsafe. ‘I’he suni may be more nearly determined when we know the place of the Shepherd-king Nuh, whose reign was 400 years before that of Ramses II. —

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the blocks being removed by bulls under the charge of Phoenicians? (Fenkhu) (Brugsch, Uist, 2 ed. 173, 174). It may be recollected that the Phcenicians appear as skilled smiths and masons in the time of Solomon, and that as early as the Exodus they were already great metal- workers. :

From the time of Aatmes till the close of Dynasty XX. we may reckon the rise, fulness, and decay of the Egyptian Empire. It is a period of abundant monuments, sculptured and painted, and of many papyri, rich in records of the history, manners, and religion of Egypt. The state of the country miay be glanced at in this place, where the Shepherd period closes, so as not to break the continuity of the subsequent history.

The sudden growth of prosperity at home and power abroad which marks the early reigns of Dynasty XVIIL is truly surprising. The Egypt of Dynasty XVIL is broken up and only slowly reuniting ; that of Dynasty XVIII. is at once solidly bound together, and soon to engage in designs of world-dominion never hinted at in earlier times, These conditions were the result of a great national war, in which the country discovered her hidden force, and was not content to use it only so far as was needful to make a strong Egypt like thatof Dynasty XII. Having conquered her foreign rulers at home, she desired to add their native lands to her own dominions. The first effects of these designs were the enrichment of Egypt. In the early reigns of this house the wealth of the subjects as of the king rapidly grew. From the simple monuments of Dynasty XVIL. and the first kings of Dynasty XVIIT. there is a sudden advance to richness and splendour. Egypt was, however, becoming a military state. The king is constantly more powerful, and his

public works more magnificent ; the subjects, notwithstanding the luxury of individuals, have not that solid princely strength that we admire in those of the Pyramid kings and Dynasty XII The appearance of the horse under this dynasty is most significant. The beasts of burden, the ox and ass, now yield in importance to the war-horse, and the landed proprietor journeys in his car whose ancestor went afoot staff in hand. Thus the military man succeeds the farmer. The priest is no longer a great man who has assumed sacerdotal functions, but one of a class immensely extended, reaching from the highest dignitaries, one of whom, strengthened by hereditary power, could at last seize the throne, down to the menial class who lived upon the superstitions of the people. To carry on the government there grew side by side with soldiers and priests a vast official body, clever, ambitious, and unserupu- lous, which rapidly on the true bureaucratic principle in- volved the administration in an entanglement which must have mainly led to the decline of the Empire. Justice, which was difficult at home, must have been almost impos sible abroad, We now cease to hear of hereditary nomarchs studying the welfare of provinces to which they were attached by ancestral connection. All posts went by the royal favour, The common people fared ill in this age. Their function was to supply soldiers for the army and navy, and at first to take their share in the construction of public works; their only hope was to rise in the official class. Handicrafts and all labour were beneath a gentleman ; hence no one could rise to his grade but through success at the schools, which were open to every one, and where @ boy of talent had his chance of a career (cf. Brugsch., Hist, 1 ed. 16, 17).

Of the administration of provinces and conquered states we know little. Lower Ethiopia had always been io as a part of Egypt; this system was extended souk At first the eastern states only paid tribute. _Uliiea garrisons were placed in Palestine and Phoenicia Caine : Hist. 1 ed. 135). Compared with the Assyrians t

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Egyptians were civilized conquerors, and the sculptures of their battles do not represent any scenes of extreme cruelty. They do not, however, seem to have known the art of effectually holding their acquisitions, which had to be

reconquered over and over again, until the inevitable tide of conquest on the other side set in, and the Empire fell.

On examining the earliest monuments of Dynasty XVIII. we arestartled by their astonishing resemblance to those of Dynasty XI., a resemblance which would, had we no historical evidence on the other side, justify the leap of the Tablet of Abydos from Dynasty XII. to XVIII. This may be partly explained as a renaissance of art due toa royal descent traced rather to Dynasty XI. than Dynasty XII. Similarly under Dynasty XXVI. there was a renaissance of the art of the age of the early Memphite Dynasties. We must also not lose sight of the local character of Egyptian art and its intense conservatism, which may have preserved an aucient type through many centuries. The early art of Dynasty XVIII. has this char- acter of a survival ; that of Dynasty XXVI. is clearly a modern imitation.

The art of this age is in some respects the finest Egypt produced ; it is, perhaps, best about the time of Thothmes Il. and Amenophis IL., the middle of Dynasty XVIII. It is inferior in naturalism to the art of Dynasty IV., and in delicacy to that of Dynasty XIT., but it has a certain splendour before wanting. After it had attained its highest point it slowly declined, partly from a decay in the vigour of the national character, perhaps more from the vast size of the later monuments, which must have led to a neglect of finish in the details, though this neglect can only be seen by one who is thoroughly acquainted with the Egyptian styles. At all times there is an invincible patience in the mastery of material and the execution of detail. The temples, not the kings' tombs, are now the largest and most costly edifices ; though a compromise with the old idea is effected by making grand temples as sepulchral chapels in religious connection with the royal tombs, comme- morating in their sculptures the events of the reigns. The tombs of subjects do not maintain the proportion the earlier ones hold to the royal sepulchres. Their paintings have less of daily life, and religion takes a greater and growing place on the walls. We have, however, a multi- tude of interesting scenes, which show us a life more luxurious in the many than that of earlier times, but not as splendid in the few. There is more of feasting, of music, and the dance, less of country life and the welfare of the retainers. The royal tombs are now grottoes deeply cut in the rock, and the

pictures of their walls are religious, the historical part being left to the funereal temples.

Amenhotep or Amenophis J., son of Aahmes and his Ethiopian queen, carried on the Ethiopian wars. It is of his son, the next king, Thothmes I., that the great eastern campaigns are first recorded. He advanced as far as the Euphrates, and must therefore have subdued, or at least marched through, the greatest part of Phoenicia and Syria. The prosperity of Egypt at this time is shown by the splendid works he executed in the great temple of Amen-ra at Thebes, the earliest of their kind that we can trace, and apparently the beginning of the series which was only to cease with the fall of the Empire. The employment of captives in public works was the main means by which they could be carried out. Probably after a time all that Egypt could do was to furnish men for the army, and in even this she failed when the dynasty came to an end. Before his death Thothmes if, had associated with him on the throne his daughter Hatshepu, or Hatasu (Maspero, Hist. Anc., 201), who succeeded him with her elder brother and husband Thoth- mes II. Her power is an evidence of the importance the

Egyptians attached to the female line. At the same time their dislike to be governed by a queen is evident in the attempt she subsequently made to assume the character of a king, being represented in male attire, a circumstance to which the monuments present no parallel.

After the seemingly uneventful reign of Thothmes IL, Hatshepu was associated, apparently as regent, with her younger brother Thothmes III., and usurped the sole power. It is in this time that she appears as a king. She continued the works of the temple of Amen-ra, where the great obelisk and its fallen fellow bear her name. Her most interesting achievement was an expedition to Punt, either the Somdlee country or Arabia Felix. She collected a fleet on the Red Sea, and herself commanded it. The people accepted her rule, and she brought back great tribute, including small spice-trees, which she planted at Thebes. The glimpse we thus gain into the state of the civilization of the spicegrowing countries at this remote age is most

valuable, and explains the facility with which the southern dominions of Egypt were held. The nations in this direction were not masses of barbarous tribes, but their civilization did not take the direction of the pursuits of war.

Hatshepu had reigned about twenty-one years when Thothmes III. succeeded her. He carefully effaced her name on the monuments, substituting that of his brother and his own, and reckoned his reign from her accession. Whether he thus included his brother's reign or not we do not know. With the sole reign of Thothmes III. a series of great expeditions begins, from the records of which we have great insight into the condition of Syria and Palestine about the 15th century B.c.

It will be well here to glance for a moment at the Egyptian geography of this territory. There is great difficulty in explaining it, probably due to the different names apparently given to the same countries and peoples at one and the same time or at different times. We may, however, gain somewhat in clearness by observ- ing that more than one important geographical name can only be an Egyptian appellative. Thus the Shasu, who were wander- ing Arabs of the desert, who moved up as now into Palestine for pasturage or on predatory excursions, are nothing but ‘‘ rob- bers.” Most other names may be probably identified with Semitic equivalents. Syria is called Khal: this word is connected with Syria by the late equivalent Asher (¢. Maspero, ist. Anc., 181, note 1), which shows that the Egyptians then identified Syria and Assyria. The great nation of Syria in the time of Thothmes Ill. was the Ruten. These may be the Shemites of the stock of Lud, and may be also the Lydians in a primitive seat. Under Ramses II. the Kheta, a northern division of the Hittites, held the political position of the Ruten, as though the Ruten had migrated. ‘As the Ruten probably represent the Arameans, so the Hittites represent the Canaanites. The Pheenicians appear to be the Kefa : in the time of Thothmes III. they held an insular position in the Mediterranean, probably Cyprus; under Ptolemy IIL., they give their name to Phenicia. They are clearly the Biblical Caphtorim. The Philistines do not appear until the time of Ramses III. None of the primitive nations whom the Bible men- tions as supplanted in the period before Joshua have been traced on the monuments, nor is there any clear notice before the time of Sheshonk I. (Shishak) of the Terahites. The period of Thothmes Ill. is one of Aramean supremacy, that of Ramses II. of Ca- naanite; together they well correspond

to the age before the Israelite conquest, while the condition of the time of Ramses ITI. suits the latest age of the Judges. The names of towns present less difficulty. Many are traceable in Biblical geography, and here but one indication occurs which may point to Israelite occupation.

The Egyptian conquests on the east being tributary, there were constant revolts on the accession of new sove- reigns. It was thus that Thothmes IIL, on becoming sole ruler, had immediately to reduce the Ruten and their neighbours. This caused the series of eastern campaigns, which began in the twenty-second year, very early in his sole reign, and certainly extended to the forty-second, during which whole time there was seldom a year of repose. The history of these wars is told in the Annals of Thothmes ITI, which contrast favourably with those of the Assyrian kings,

lf they were marked by barbarity, there is no boast of ought but conquest and the levying of tribute. The tribute no less than a contemporary painting shows the great material civilization of the Asiatic states. Throughout, the Ruten are the most formidable enemies; the Kheta only appear. ‘The first great achievement was the defeat before

Megiddo of a confederacy led by the prince of Ketesh, or }

Kadesh on the Orontes. In the battle only 83 of the enemy were killed, and 340 taken prisoners ; but the magnitude of the success is proved by the capture of 2232 horses, 924 chariots, and the speedy surrender of Megiddo. This town, as in Josiah’s time, was the key of the route to the Euphrates, and on its capture the king of the Ruten and the king of Assur are mentioned as becoming tributaries. In the course of the wars Kadesh was captured twice, and the king of Egypt marched as far as Nineveh, and the name of Babelis mentioned. The reign of Thothmes was also marked by expeditions in Ethiopia, and then we first meet with the supposed Egyptian name of the Danai, with whom he came in contact during some expedition in the Mediterranean. Great buildings commemorate this active reign, and we have a glimpse of the personal character of the king in the eccentric

architecture of one of his additions to the temple of Amen-ra at Thebes. After arcign of 54 years 11 months, reckoning from the accession of Hatshepu, Thothmes III. was succeeded by his son Amenophis II.

The accession of the new king was marked by a war in Assyria, in which he captured Nineveh. An incident of his eastern campaigns is remarkable for its Oriental barbarism. He brought back to Egypt the bodies of seven kings whom he had slain with his own hands, The heads of six were placed on the walls of Thebes; the seventh was sent to remote Napata in Ethiopia to be hung on the walls to strike terror into the negroes. After a prosperous but probably short reign, Amenophis II. was succeeded by his son Thothmes IV., of whom we only know that he main- tained his father's empire during a reign that probably did not exceed the nine years assigned to him by Manetho.

Amenophis ITI. succeeded his father, and, during a long and it seems mainly pacific reign, occupied himself in great architectural works. Two temples at Thebes owe their origin to him, that on the western bank, which was the funereal temple of his tomb in the western valley beyond, and of which little now remains but the two great statues in the plain, the Vocal Memnon and its fellow, and also the temple of E]-Uksur on the eastern bank. In his time the dimensions of the structures of the earlier kings are surpassed, and the proportions of the greatest monuments of the Empire are almost attained. Probably he was the first of the family after Aahmes who took a foreigner to wife. On the great scarabeei which commemorate his marriage with Queen Tai, we are informed that his rule extended from Mesopotamia to Southern Ethiopia.

Amenophis IV., the son of this foreign marriage, is the most perplexing character in ancient Egyptian history. Under his mother's influence he introducéd a new religion, the worship of Aten, the solar disk, and after a time whiolly suppressed the national religion, even changing his name to Khu-n-aten. he founded a new city_in Middle Egypt, where he con- structed a chief temple to Aten, and near which his officials excavated their tombs in the mountain. The type under which the king and his family and subjects are represented is unlike any other in Egyptianart. They are all of emaci- ated and distended figure, and surpassing ugliness. The king is treated with

a servile respect nowhere else seen on the monuments. His troops are mixed with foreign mercen- aries. But we do not hear of foreign expeditions; every one 18 occupied in the duties of the new religion, without poly- theism or idols. Flowers are the chief offerings and adorn the

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temple throughout ; hymns chanted to the sound of harps are the form of worship. Was this a foreign religion, or an Hgyptian restoration of primitive belief? If it were Egyptian why was the sun called Aten, not Ra? The king was the son of a foreigner, and his type and that which marks his court, probably because some were of his mother’s race, and art assumed the fashionable type for the rest, is not recognizable in any of the characteristic representations of foreign races, It is neither Ethiopian nor Shemite nor Libyan. The names of his mother and of her parents, the name of the sun-god, which is Egyptian, and the character of the worship, do not as far as we know point to any of these races. . Certainly they are not Semitic. For race and religion we must probably look beyond the horizon of the Egyptian conquests. The type is not without an Indian aspect, and the religion has in its simplicity and the character of its worship a striking likeness to Vedism. Khu-n-aten had seven daughters and no son. His successor Ai was his foster-brother and the husband of his eldest daugliter. Under him the national religion was tolerated. Two other sons-in-law succeeded. Their line then or soon after came to an end, on the accession of Har em-heb, or Horus, who claimed to be the legitimate successor of Amenophis III., either by descent or on account of the innovations of Khu-n-aten, who with the kindred kings does not appear in the monumental lists, in which Har-em-heb is seen as the immediate successor of Amenophis ITI. The same order is followed in Manetho’s list, in which the house of Khu-n-aten follows Horus. What time this line lasted we do not know. Probably it did not exceed a generation. Horus occupied himself in destroying the monuments of Khu-n-aten and his succes: sors, and no doubt in fully

restoring the national religion. Another family gained the throne after the reign of Horus, that of the Ramessides, forming Dynasties XIX. and XX.!_ Ramses I., who seems to have been of Lower Egyptian extraction, and not impossibly connected by ancestry with the Shepherd kings, seized the royal power, maintained his authority abroad by campaigns in the south and the east, and concluded a treaty of peace with the king of the Hittites. After a very short reign he left the crown to his son Setee I., or Sethos, who strengthened his rights by marrying Tai, a granddaughter of Amenophis III. Ramses IT., the son of this marriage, thus became legitimate king, and Setee made him his colleague at a very early age, no doubt to conciliate the Egyptians, a position at first ignored, evidently owing to the difficulty of defining it, but which ended in the virtual abdication of Setee (Maspero, Hist. Anc., 215-217), The troubles that preceded the reign of Ramses J. must have weakened the foreign dominion of Egypt. Wars in the east occupied the earliest years of Setee. The Kheta had now succeeded to the Ruten in the supremacy of Northern Syria. Although Setee conquered the Kheta and captured Kadesh, now their chief town, the war ended by the conclusion of a second treaty between the Egyptian and Hittite kings. It is not necessary to suppose, with M. Maspero (Hist. Anc., 215), that the Egyptian Empire was already waning, because it was thus barred off from Further Asia and obliged to meet the Hittite king on ee 1 The chronology of Dynasty XIX. presents one great difficulty. We cannot determine the length of the reign of Setee I. Manetho assigns him more than 50 years, which is most improbable, as Ramses reigned 67 years, and his father and mother were married before his fathers succession. Ramses dates from his accession as sole king, and there- fore we cannot include a period of co-regency in the Manethonian numbers for Sethos. The size and beauty of Setee's tomb would imply a reign of not under 30 years. The length of the Dynasty cannot have been less than 180 years, and was perhaps as much as 150. 4 comprised three generations and the rest of the probably long lile ©

the king (Setee II.) whose birth marked the third, which would give 100 + 40 ?) about 140 years for the total-duration.

THE EMPIRE. |

equal terms. The conditions were no doubt changed from those of the time of Thothmes III., but the list of the con- federacy which the next king of the Kheta led against Ramses II., compared with that which Thothmes defeated at Megiddo, shows that the Kheta could bring into the field much more formidable allies than did the Ruten. More- over there was a change in the foreign policy of Egypt. Phenicia and Palestine were ruled by means of a chain of fortresses held by Egyptian garrisons. (Brugsch, J/ist., 1 ed 135; Maspero, fst. Axc., 215.) If the Empire was narrowed in its limits, it was more solidly ruled; and this is quite consistent with the conclusion of a treaty with the Kheta. As a builder Setee I. is only equalled by Ramses Il. He constructed the great hall of columns of EI- Karnak, on the outside of the north wall of which he com- memorated his victories in a series of most interesting sculptures. His splendid tomb is in the Valley of the Tombs of the Kings.

Ramses II. is without doubt the greatest figure in the long line of the Pharaohs, and at the same time he is the one of whose character we have the best idea. His early training was in war and in government, for it cannot be a pure figure of speech by which the tablet found near Dakkeh in Nubia says that when he was but ten years old no monuments were executed without his orders (Brugsch, Hist., 1 ed. 137). This position was due to his superior right to the throne. Before the death of Setee I. the maritime nations of the Mediterranean made a descent on Egypt. The Shardana, or Surdones, and the Tuirsha, or Tyrseni, allied with the Libyans in this enterprise. Ramses defeated them so effectually that they do not seem to have again attacked Hgypt till the reign of his son Menptah, about seventy years or more later. The captives of the Shardana instead of being employed in public works were enrolled in the king’s guard. After an expedition against Ethiopia, Ramses, on the death of Setee, returned to Egypt. arly in his sole reign the peace between the Egyptians and the Hittites was broken. The king of the Hittites formed a great confederacy. The nations of Asia Minor, the Mysians, the Lycians, the Dardans, the people of Ilium, are found in the list of the poem of Pentaur, the Egyptian Ramesseid, which appropriately records the oldest war in which Troy had a part. To bring together the army of the confederates time.must have been needed. Probably the war was determined on by the Hittites on the accession of thenew king. The great campaign was that of the fifth year of Ramses. The

decisive battle was preceded by a repulse, when the Egyptian army, deceived by the Arabs (Shasu), were suddenly, while on the march, attacked and routed by the enemy, who numbered no less than 2500 war- chariots. It was only by the personal bravery of Ramses that the Egyptians escaped destruction. This incident is the main subject of the poem of Pentaur. But on the next day the great battle was fought; the confederates were beaten and retreated into Kadesh. The Hittite king now sued for peace, which was granted. It was speedily broken. In his eighth year Ramses took Shalam, probably Salem or Jerusalem, Maram (Merom), and Tapur (Dabir ? near Mount Tabor), Bethanath, and Kamon. In his eleventh year he captured Ascalon. The war does not seem to have been ended until the Hittite king Khetasar proposed conditions of peace which he brought to Ramses written on a silver tablet. The treaty concluded on these bases in the twenty- first year of Ramses is sculptured at El-Karnak. It is a most interesting document, being an alliance offensive and defensive, with articles of extradition, remarkable for their humanity, and others for the protection of commerce (Maspero, Hist. Anc., 222, 223). Both kings swore to ob- ‘Serve the compact, which was a renewal of the previous treaties. It is remarkable that in this document the Hittite

prince, instead of being called the “vile chief of the Kheta,” is now the “ great king,” the style given to Ramses also, The eldest daughter of the Hittite king was taken in marriage as queen by Ramses, in whose twenty-third year Khetasar visited his son-in-law in Egypt. This alliance does not seem to have been broken for full a century, and then by conquerors who overcame the resistance of the Kheta and carried them with them. The remainder of the reign of Ramses appears to have been undisturbed by great wars, and given up to those vast buildings which are found throughout Egypt and Nubia, and which give him the first place among the architect Pharaohs. About, the thirtieth year of his reign, his fourth son, the eldest surviving, was made regent, and on the death of this prince in the fifty- fifth year, Menptah the thirteenth son, now heir, took this post, holding it for the rest of his father’s reign, which ended in the sixty-seventh year. Ramses

must then have been at least near a hundred years old, perhaps more.} He married three queens, and apparently had by them 23 sons and at least 13 daughters. The whole number of his children was 170, of whom 111 were sons and 59 daughters. All are styled princes or princesses, but probably only the children of queens had the right of succession. i

Menptah succeeded Ramses II. There are but few monu- ments of his reign. The principal event they relate is a great incursion into the Delta of the maritime nations of the Mediterranean allied with the Libyans. By this time the Pelasgic tribes had wrested the dominion of the sea from the Pheenicians. Some causes, perhaps famines, had already disposed them to move from Asia Minor and the Greek islands, seeking new establishnients in Egypt. The attempt that Ramses II. defeated in the lifetime of Setee I, was now renewed, apparently on a more formidable scale. The king of the Rebu (Libyans), with the warriors ef several tribes joined the Shardana (Sardones), the Shaka- lasha (Sikels), the Leku (Lycians), the Tuirsha (‘Tyrseni), and the Akaiusha (Acheans). They had already entered Egypt and spread themselves over the west of the Delta, where they intended to settle, when the Egyptian forces attacked them and put them to rout after a battle of six hours’ duration. It is remarkable that in this confederacy the Shakalasha and Akaiusha are added to the former list, and the Leku, who were in the Hittite confederacy against Ramses II., now appear on the west. Everything indicates the growing strength of the maritime nations and that power of united action which marked the period of the Trojan War. For the time the invasion was checked, but the Empire was evidently failing. The Hittites, indeed, were true to the treaty, and during famine were supplied with corn from Egypt, and the external provinces seem to have continued quiet. But side by side with the kingly power that of the high priests of Ameu-ra had grown to for- midable dimiensions, owing probably to the interest Ramses II: and Menptah showed for Lower Egypt, which put the weight of Thebes on the side of the highest local function- ary. Menptah was not immediately followed by his son Setee II. There intervened two reigns, those of Amen- meses and Siptah, the first of the Ramses family by descent, the second, apparently, by marriage. They appear to have

1M. Maspero thinks Ramses II. was at least 50 in the 21st year of his reign (Hist. Anc., 250). This would make him at least 96 at the time of his death,

and 30 at his accession. The latter age is barely reconcilable with the fact of three of his sons of the restricted class, which is evidently composed of the children of successive queens, being engaged in the campaign of the 5th year. Putting his marriage at 16, we must allow at least 4 years for the birth of these three sons, and cannot suppose the youngest to have gone to war in his chariot under the age of 14. If so (16+4+14=) 34 is the lowest age for the fifth year, and 29 for the accession, or 49 for the 21st year. But it is obvious that probability is against these extreme limits, and the fact that Ramses outlived twelve of his sons of the shorter list is in favour of a greater age, as

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been of a branch holding a local principality. Setee II. suc- ceeded them and restored the legitimate line. His reign closed in anarchy. There was no longer one king: the chiefs of the nomes ruled and engaged in civil war. A worse period followed. A Syrian, Arisu by name, became chief of the nomarchs, society was dissolved, and the temple- services neglected. We are as yet unable to say how this revolution began. It seems to have had nothing to do with foreign wars, but to have been brought about by internal weakness. The time it lasted must have been long, according to the Papyrus of Ramses III., from which alone we know of it. There “many years” are assigned to the period of the nomarchs and “years” to the rule of the Syrian.

As the Exodus is now generally held to have occurred in the later years of Dynasty XIX., its place in Egyptian history may best be here noticed. The view referred to was first carefully worked out by Prof. Lepsius. It rests upon chronological and historical grounds. Manetho, apparently adopting a tradition, placed the Exodus in the reign of Menptah. The number of generations assigned in the Bible to the interval from the Exodus to Solomon would bring the former event to about the same time. This approximative date is in accordance with that of the Rabbinical chronology, B.c. 1314-13. The coincidence is, however, valueless, for the interval from the Exodus to the building of Solomon’s Temple, in the Rabbinical chronology, is that of the Hebrew text, 480 years. The date of the Exodus should therefore be about B.c. 1480. The difference between 1480 and

1314-13 is caused by an error in the date of the building of the Second Temple, which is put B.C. 354, only 46 years before the date of Alexander's death, which is dated B.c. 308, or 15 years too late. There is thus a mistake of more than a century in so cardinal a date as the building of the Second Temple. If an event of this importance, occurring only 800 years before the drawing up of the chronology, is thus incorrectly dated, and a period of Jewish history obliterated, surely the date of the Exodus cannot rest upon any accurate information. The historical grounds are far stronger than the chronological. Manetho, relating, if we may trust Josephus, a current tradition (ixép dv 8 6 Mavebdv ob ék rOv map' Aiyurriow ypappdarov, GAN', WS a'TOS wpordynkev, x TOY ddeardTWS pvOoAo0youpevev mposteDetkev, Vorepov eSeheyEw Kara pépos, kK. T. A. Contr. Ap., 16), and Josephus is here confirmed by the evidence which the narrative shows of historical inaccuracy, has given an account of the Exodus from an Egyptian point of view, This story is the fullest version of one current in various forms in antiquity. As Manetho tells it, the chief points are these. King Amenophis, identified by him with Menptah, who occurs in his lists as Amenophis and Ammenephthis, determined, under the advice of a priest of the same name as himself, Amenophis the son of Papis, to cleanse Egypt of all lepers and other unclean persons, whom, accordingly, he set to work in the quarries. On their petition he gave them the city Avaris, left in ruins by the Shepherds. Having occupied the city, they chose one of themselves, a priest of Heliopolis, by name Osarsiph, as their ruler, who changed his name to Moyses. He made laws particularly directed against the Egyptian religion, and sent messengers to Jerusalem to the Shepherds, who had been expelled by the Egyptians, asking their aid and promising to give them their old territory Avaris, and to assist them to subdue Egypt. Accordingly the Shepherds invaded Egypt, when Amenophis came against them, but for superstitious reasons did not fight them, and withdrew to the friendly king of Kthiopia, in whose country he remained thirteen years, his ally protecting the southern Egyptian border. Meanwhile the people of Jerusalem and the un- clean Egyptians ravaged Egypt, and destroyed everything connec'ed with the national religion. Afterwards Amenophis

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and his son Sethos, also called Ramesses, returned and expelled the Shepherds and the unclean people. Charemon gives a similar account with the same name for the king, Lysimachus and Tacitus vary in calling the king Bocchoris,

The Egyptian evidence for the date of the Exodus would place it about this time. The geographical inquiries of Lepsius have been carried on by Brugsch, who, in a paper read before the Oriental Congress, has identified the prin- cipal geographical names of the narrative of the oppression and of the Exodus (Brugsch, Z'Hxode). In particular, Rameses is shown to have been another name of Tanis, The occurrence of this name in Genesis and Exodus is most important as bearing on the date of the Exodus, for it is almost certain that it was given by Ramses II., who rebuilt the great temple of the town. Another eardinal piece of evidence is the mention of the 'Aperiu, or 'Apuriu, as engaged in public works under Ramses IE. and later kings, but not after Dynasty XX. In this name that of the Hebrews has been recognized. If the identification were certain we should have much reason for dating the oppression under Ramses II., which would accord with the Exodus under Menptah.

The difficulties of this theory are not slight. On the chronological side Manetho's date is only dependent on a tradition, and we cannot fix the chronology of the dynasty, B.c. 1300 for Menptah being about the middle point in a doubtful two centuries, The evidence of the Hebrew genealogies therefore is not conclusive for a date identical with that of Menptah, which we cannot yet say is irreconcilable with the chronology founded on the interval of 480 years from the Exodus to the building of Solomon's Temple. If, however, the genealogies are to be taken as a guide for the chronology up to the Exodus, Egyptologists prefer for the period of the sojourn the longer intervals stated in the Hebrew text to the very short ones that would result from the genealogical method. Still greater difficulties arise when we give a critical examina- tion to Manetho's story. It reads like a perverted narra- tive of the calamities which closed Dynasty XIX., for we cannot suppose two conquests by Asiatics and two ex- pulsions, one by Menptah and Setee II., the other by Set- nekht, who subdued the Syrian, nor resort to

the violent hypothesis that the Papyrus of Ramses III. attributes to Set-nekht that which Setee II. achieved. The name of Amenophis is suspicious, the two names of his son Sethos, ‘‘whiojis Ramesses,” still more so; the recall of the Shep- herds from Jernsalem, and the easy conquest of Egypt without a battle, all read like a legend founded on a fusion of the two periods of Eastern occupation. There is, moreover, another suspicious circumstance in the occurrence of the name of Bocchoris in two versions of the story. This would either point to Bocchoris of Dynasty XXIV., in whose time it is quite possible that there was a large number of Israelite fugitives in Egypt, or to some other king of the same or a similar name; we do not, however, know of any earlier Bocchoris. It may be reasonably asked whether this story has anything to do with the Exodus. Those who hold that it has yet, in common with all Egyptologists, argue, when they examine the Biblical data, on the ground of the minute accuracy of many of these data. If, then, thet wo narratives, that of Manetho and that of the Papyrus of Ramses IIT, relate to the Exodus, it may reasonably be inferred that the Manethonian 1s 4 faulty and distorted one. It is, however, quite possible that Manetho may have known when the Exodus happened, and yet may have confused it with an event of the same period. The argument from the Biblical data that Ramses II. ruled during the oppression of the Israelites 1s very strong, though it may be conjectured that a redactor has substituted the later name Rameses for the earlier Zoat.

THE ExoDvs. |

The name of the ’Aperiu, if certainly that of the Hebrews, would be decisive, but it is not a proper Egyptian equivalent, and so exact are the transcriptions of Semitic geographical nanies into Egyptian, that upon them mainly depends the theory of the sounds of the Egyptian alphabet developed by M. de Rougé and adopted by Dr Brugsch. Here, again, the evidence is inconclusive.

The arguments which would place the Exodus in any other period of Egyptian history are but slight. There is indeed the remarkable occurreuce of a name similar to that of Jacob, or identical with it, in a record of the conquests of Thothmes III.4. This may only be a reminiscence of Jacob, as M. de Rougé suggests, but it would be more natural to take it to indicate

that the Exodus was anterior to the time of Thothmes, and there are other names in the list which may possibly point to the same conclusion.! Yet the preponderance of evidence is at present greatly in favour of the occurrence of the Exodus towards the close of Dynasty XIX. It is uot, however, necessary to accept the date of Prof. Lepsius, in our present state of un. certainty as to the chronology of Dynasty XIX. It is also not a necessary consequence of accepting this historical synchronism, that we should take Manetho's narrative of the Exodus as more than his identification with it of an event of the same period. These may seem but unsatis- factory results of the great erudition which has been bestowed on tltis question. We refrain from speaking more positively when a discovery may at any moment render speculation needless. :

If the Exodus took place towards the close of Dynasty X1X., when did the period of oppression and the govern- ment of Joseph fall? The reckoning by generations would place Joseph in the later part of Dynasty XVILI., and the oppression under Ramses II. downwards. It is, however, very generally acknowledged that this method of computa- tion is not consistent with the growth of the Israelites from a family to a nation during the sojourn in Egypt. Scholars are therefore disposed to choose a reckoning by years. Here the Biblical data give either 430 years exactly for the sojourn and 400 for the oppression, or else 215 years for the sojourn. The longer periods are those generally pre- ferred. If we reckon by them, the government of Joseph would have fallen under the last Shepherd king, and the oppression would have probably begun under Aahmes, to be greatly increased in intensity under Ramses IT.

Set-nekht, a chief probably of the line of Ramses IT., overthrew the Syrian intruder and again restored the Egyptian monarchy. His short reign, which begins Dynasty XX.,2 was probably entirely occupied in reorganiz- ing the administration of Egypt. Ramses IIT., whom his father had already made his colleague (Maspero, Z/tst. Anc., 262), succeeded toa united Egypt but a distracted Empire. Evidently in the time of anarchy every province and tributary state had fallen away. The new king was equal to the effort of repelling invasion at home and reconquering lost territory abroad. In his fifth year he defeated the Libyan tribes who had invaded the west of Lower Egypt.

1 Tn this list [akab-aar is read by M. de Rougé as representing Jacob- el, a form like Nathaniel for Nathan (Rev. Arch., n.s. iv., 370).

- The chronology of Dynasties XX. and XXI. is extremely obscure. We know that Ramses III. reigned 32 years, and Ramses XI. or XII. upwards of 32 years. The six successors of Ramses III. probably had very short reigns, as all but the second and sixth were certainly sons of that king, and the sixth probably. The other kings are represented by few monuments. Her-har, however, may have had a longer reign, the sculptures of the temple of Khons at Thebes giving this impression. There does not seem, however, to be any ground for a duration of more than a century until the Tanites of Dynasty XXI. rose into power. The latest Theban kings probably held a local and con- stantly diminishing authority for part of the time of the Tanites, of whom the records are extremely scanty and the chronology consequently obscure. Two centuries is a probable measure of the whole interval.

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In his eighth, he met another attack from the opposite quar- ter. The Taanau(Danai?) and the Takkaru (Teucrians), who now first appear, forming with the Tuirsha (Tyrseni), Wa- shasha (Oscans?), Shakalasha (Sikels), Leka (Lycians), and Pelesta (Philistines), a great confederation, which attacked the east of Egypt by seaand land. Their army conquered and carried with it the Kheta and neighbouring tribes. Their fleet, manned by the Takkaru and Shardana, reached Egypt at the same time. The Egyptian army and fleet encountered and defeated them. This campaign, and parti- cularly the sea-fight, form the subjects of interesting reliefs in the great sepulchral temple built by Ramses III in western Thebes. In his eleventh year a’second invasion of the west of Egypt, by the Libyans, aided by the Tuirsha and the Leka, was equally unsuccessful. The eastern provinces and tributary states were recovered, and an expedition was sent to the Somdalee country on the eastern coast of Africa or Arabia Felix. This last great conqueror finally preserved Egypt from the maritime nations. The course of their migrations seems to have been changed. All that remained of their invasions were the Philistine settle- ment in Palestine and one of the

Mashuasha, a Libyan tribe, in the Delta, from whose race the Egyptians drew mercenaries (Maspero, //ist. Anc., 266). The importance of these forces is evident in the Biblical notices of Egypt of the time of the Hebrew kings.

The historical value of the Egyptian notices of the primi- tive populations of the Mediterranean is being more and more perceived. It is at first perplexing that we find the nations afterwards settled in well-known seats either far to the east or in constant movement. Yet the key thus afforded to the earliest Greek colonization is most valuable, and it is significant of the historical character of the documents that new names appear, as we should expect, in such a manner as to explain the confusion of the Greek terms, which speak of Achwans and Danai, Dardans and Teucri, at the same time indifferently, whereas the Egyptian documents show that they are not interchangeable. Ramses III., besides constructing the magnificent temple at Medeenet Haboo, enriched the temples of Egypt with splendid gifts, during a prosperous reign of thirty-two years. The later kings of the dynasty do not appear to have achieved any- thing remarkable. They maintained the Empire, but their authority at home waned, while that of the high-priests of Amen grew until, towards the close of the dynasty, Her- har, one of these high-priests, gained the royal power. Probably the close of the dynasty was occupied by a struggle between tho last Ramesside kings and the high-priests, as well as by the addi tional distraction caused by the rise of another line, Dynasty XXI., of Tanite kings. Probably the Tanites ultimately gained the sole authority. The high-priests of Amen-ra, about this time, certainly not later than the rise of Dynasty XXIL, retreated to Ethiopia, where they founded a kingdom, of which the capital was Napata. The Pharaoh whose daughter Solomon married was, if Manetho’s numbers are correct, Psusennes IL, Har- Psiunkha, last king of Dynasty XXI. He seems to have endeavoured to restore the military power of Egypt, for he made an expedition into Canaan and captured the town of Gezer, which he gave to his daughter, Solomon’s

ueen. : During the later period of the Empire, partly through marriages of the Pharaohs, partly in consequence of the large employment of mercenaries, chiefly Libyans, great settlements of foreigners, Asiatic as well as African, were established in Egypt. So far from the Shemites being

then disliked, a multitude of Semitic words were introduced into Egyptian, and it even became the fashion to give a Semitic form to native words (Maspero, Hist. Anc., 337, 338). A Shemite family, settled at Bubastis, or in the Bubastite

nome, succeeded by the command of mercenaries and by alliances with the Tanite family in establishing a new royal line, Dynasty XXIL, which is remarkable for its foreign names. The royal names Sheshonk, Osorkon, Takelot are all either Assyrian or Babylonian. Still more striking is the name Nemrut, or Nimrod, borne by non-kingly members of the family. Probably it came from the further East,

Sheshonk I., the Shishak of the Bible, may have gained the royal power peacably. His son Osorkon married the daughter of the last king of the Tanite Dynasty, to whom Sheshonk succeeded. He seems early to have entertained the design of restoring the Egyptian rule in the East, for he received Jeroboam when he fled from Solomon. The revolt of the Ten Tribes enabled him to carry out this pro- ject, and late in his reign he marched against Rehoboam, and returned with the treasures of the Temple and the palace. A remarkable sculpture at the temple of El-Karnak gives a list of 130 names of towns and peoples conquered by Shishak in this expedition. Long as is the list, it is not like the rolls of the conquerors of the Empire. The items are far less important, and the Hagarenes recur several times, as if to record the subjugation of a series of small Bedawee tribes. Cities of Judah and Israel appear in the list, but the towns in the kingdom of Jeroboam seem to be Levite and Canaanite, and it is probable that the Israelite king was not averse to their uverthrow. With this occurrence we gain the first good chronological footing in Egyptian history. The Hebrew chronology is indeed not as yet fixed. The Assyrian monuments seem to in- dicate a reduction of at least twenty-three years in the ordinary dates. The invasion of Shishak is ordinarily dated B.c. 971, but may thus have to be lowered to about B.c. 948; and as it probably took place in about the twentieth year of the Egyptian king’s reign, his accession may be dated approximately B.c. 967.

The government of Egypt under the kings of Dynasty XXII. underwent an important change. They made the high-priesthood of Amen-ra an office of a prince of the family, usually the eldest son, and gave high governments to other princes. Thus the power of the Pharaoh ultimately became merely nominal, and Egypt resolved itself into an aggregate of principalities. A further cause of decay was the import- ance of the Libyan mercenaries which each of the princes commanded. Under a new dynasty, XXIII, said to be of Tanites, but probably kindred to the Bubastites, Egypt was, for a time at least, reunited under a single rule, but towards its close the process of disintegration had already again set in, and the country was divided among nearly twenty princes, at least four of whom took the royal insignia (Maspero, /Zist. Anc., 378 seqq.).

Among these small princes but one was capable of attempt- ing to reunite Egypt under his rule. This was Tafnekht, Tnephachthos, prince of Sais, who reduced great part of the country, and would probably have achieved complete success, had not the yet unconquered princes called in the priest-king of Napata, Painkhi Meriamen. While Egypt had declined, Ethiopia had constantly risen, and at this time part of the Thebais owed it allegiance. Piankhi, the descendant of the priest-kings of Thebes, was not unwilling to recover his ancient dominions. In one brilliant campaign he defeated Tafnekht and his allies, captured their strong- holds, and obtained the sovereignty of Egypt, leaving the small princes to rule as his vassals. The ancient Empire was thus in part restored, but as it was ruled from Ethiopia, and the little princes constantly strove for independence, it had no real durability. Piankhi was succeeded by Kashta, who was probably an Ethiopian, owing his throne to his intermarriage with a princess of the Theban line.

Bokenranf, or Bocchoris, son and successor of Tafnekht, no doubt seizing this occasion, was able to carry out the pro-

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ject of his father and make himself king of Egypt. After a short reign marked by energy and prudence he perished in a fresh Ethiopian invasion. Shabak, or Sabakon, con- quered Egypt, and having taken Bokenranf in his capital, Sais, put him to a cruel death. It was no longer an Egyptian prince who ruled at Napata; all the circumstances we know of Shabak and his dynasty indicate an Ethiopian line, governing Egypt as a conquered country, not as their ancient territory. Still Shabak's connection with the priestly line was not forgotten. His sister,Queen A meniritis, governed Thebes, and the power of the local rulers was limited, not destroyed. Hoshea, king of Israel, sent presents to Shabak,1 who was subsequently drawn into a confederacy of Syrian and other princes against Sargon king of Assyria, but, as in all these wars, the Ethiopian king was a tardy ally. His capital lay too far south, and in crossing the eastern border of Egypt he left the ill-affected princes of the Delta in the line of his communications. He therefore came into the field too late, and it was but little east of Egypt that he met the Assyrians and experienced a disastrous defeat at Raphia. He lost great part of Egypt, in which the small princes again established themselves, now as vassals of Assyria, Shabak only retaining Ethiopia and part of Upper Egypt. Shabatok, or Sebichus, was the son and successor of Shabak. He made himself supreme king in Egypt, but appears to have lost Ethiopia to Tahraka. Towards the close of his reign the Egyptian dynasts joined in an alliance against Sennacherib, who had recently succeeded Sargon. The confederates were defeated, or made their submission one byone. The Egyptian princes lost a battle in southern Palestine, in the territory of their ally Hezekiah, who was the last in the East to submit. But the Egyptians again advanced, encouraged by Tahraka, king of Ethiopia, who marched to their support. No battle was fought. The Assyrians moved against the Egyptians, but in one night the invading army perished,and Sennacherib fled to Nineveh. The tradition of the Egyptians agrees with Biblical history in relating the destruction of the Assyrians as miraculous ; and it should be noted that for the rest of his reign Sen- nacherib never ventured again to invade Palestine. During this interval of respite Tahraka entered Egypt, slewShabatok, and made himself master of the whole country (B.c. 692). After tweuty years of what seems to have been a peace- ful reign, the Assyrian war began afresh, Esarhaddon, son abd successor of Sennacherib, resolving on the subjugation Tahraka was vanquished and fled to Napata, and Memphis and Thebes were taken. The country was divided between twenty princes, with Neku I. of

Sais as their chief. The fortresses were garrisoned with Assyrian troops (B.c.672). In a few years, however, Tahraka returned, defeated the Assyrians, and captured Memphis. In com- memoration of the earlier subjugation or of this one, the Ethiopian king puts the name of Egypt among those of con- quered nations not only at Napata but also at Thebes (Maspero, Hist. Anc., 427; Brugsch, Hist., 1 ed., 244, 245). Soon after Esarhaddon abdicated in favour of his son Asshur-bani-pal, who speedily invaded and reconquered Egypt, driving out Tahraka and restoring the tributary princes. As soon, however, as he had left, a conspiracy broke out, and these chiefs sent emissaries to Tahraka. They were overcome by the Assyrians, and Neku and two others sent in chains to Nineveh, before Tahraka conld come to their aid. But he again reconquered Thebes and Memphis. Asshur-bani-pal now made a politic use of the Egyptian party, treated Neku with honour, and sent him back to Egypt as ruler of Sais, giving a second principality to his son Psametik. Neku returned to find that Tahraka lr ll eee

1 With this transaction Shabak's record at El-Karnak of the tributes of Syria has been connected (Maspero, Hist. Anc., 390). =

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had left Kgypt (s.c. 666). Urdamen, Tahraka's son-in-law and successor, held Upper Egypt, and at once attacked the Assyrians, captured Memphis from them, and took Neku, whom he put to death, while Psametik fled into Syria. Asshur-bani-pal now invaded Egypt, defeated Urdainen, and sacked Thebes, carrying the whole population captive. The twenty principalities were again set up, but Psametik was not the chief.

After a time the Egyptian princes became independent of Assyria, but they had once more to submit to an Ethiopian invader, Nouat-Meiamen, who reconquered the country without much difficulty, but does not seem to have long held it. -The Saite prince Psametik, whose ambition excited the jealousy of the other dynasts, at last achieved the object for which his predecessors had pertinaciously fought. By the aid of Carian and Ionian mercenaries he

ut down his rivals, and by a marriage with the niece of Shabak rendered his line legitimate. This alliance with a princess only a generation younger than the first Ethiopian king brings into striking relief the vicissitudes which Egypt underwent during the Assyrian wars. Calamities were crowded into those years which usually occupy centuries. Yet under the new king, who. was the real founder of Dynasty XXVI., Egypt rapidly recovered, and during the rule of his successors it was for the first time since the Empire strong and united, enjoying a true national existence. Public works of all kinds were carried on with energy. Art, which had fallen under the Bubastites and their followers, now suddenly revived, and with its recovery the ideas of the primitive dynasties came iuto fashion. The style of the age may be best compared with that of Dynasties IV. and V. It is, however, wanting in vigour, using elongated forms and abundant details. Still it has an elegance and a mastery of material which show that Egypt had not lost the true feeling of its art, in spite of the disastrous wars which had threatened the overthrow of all the institutions of the country.

Psametik I., or Psammetichus, employed his long reign in strengthening Egypt and in restoring the temples and making additional monuments. He recovered from Ethiopia a part of Lower Nubia, and made a successful ex- pedition into Philistia. His designs of conquest were, how- ever, frustrated by a wholesale desertion of Egyptian troops, caused by jealousy of the Ionian and Carian mercenaries to whom Psametik owed his throne. The mutineers, whose number Herodotus puts at 240,000 men, were too strong to be resisted, and deaf to the king’s intreaties marched to Ethiopia and received lands from the king of that country. All that the Egyptian sovereign could do was to form a new army and build a fleet. He thus missed the opportunity afforded by the decline of Nineveh of winning back the influence Egypt had long lost in the East. An interesting memorial of his reign is the Greek inscription on one of the colossi of Aboosimbel, in Nubia, recording the visit of mer- cenary and Egyptian troops.

Neku II.,8.c. 611, sonand successor of Psametik, inherited his father’s energy but not his prudence. He attempted to complete an enterprise of the Empire and connect the Red Sea with the Nile, and so with the Mediterranean, by a canal. Under his orders Phoenician seamen circumnavi- gated Africa. Less fortunate was his attempt to recover the

eastern rule of: Egypt. He marched against Megiddo, still the key to the route to the Euphrates. Here he was met by the forces of Josiah, king of Judah, with whom he unwillingly fought. Josiah was slain, and the king of Egypt advanced to Carchemish on the Euphrates. Thus the Egyptian Empire was for a moment restored. There was no great eastern rival to contest its supremacy. Assyria had fallen, Babylon was not yet firmly established, a‘ter about three years Nabopolassar, the king of Babylon,

sent his son Nebuchadnezzar against the Egyptians. At Carchemish the armies met. Neku was defeated, and the Egyptian rule in the East finally destroyed. Soon after the king of Egypt died, leaving his throne to his son Psametik II., B.c. 595, whose short reign was only marked by an expedition against the king of Ethiopia. The next king, Psametik’s son, Uahabra, or Apries, the Pharaoh Hophra of Scripture, B.c. 590, inherited the energy and ambition of the Saite house. His accession was the signal for a general confederation of Palestine and Pheenicia against the king of Babylon. The war was speedily ended by the capture of Jerusalem, which Uahabra in vain endeavoured to prevent. He was, however, successful at sea. His Greek ships beat the Phoenician fleet of Nebuchadnezzar, and for a time he held the Phcenician coast, and aided Tyre in a resistance of thirteen years against the Babylonian besiegers. A great disaster lost Uahabra his throne. He engaged in a war with the Greeks of Cyrene. His Egyptian troops were defeated. _ The native soldiers believed that he had planned their destruction that he might put mercenaries in their place. They revolted and chose Aahmes, or Amasis, king, Amasis defeated the mercenary troops of Uahabra and de- throned him, B.c, 571. It is to this time that the conquest of Egypt by Nebuchadnezzar is assigned by Josephus. The silence of Herodotus and the other Greek historians, and the prosperity of Egypt under Amasis, have induced modern scholars to suppose that Josephus based his state- ment on the prophecies of Jeremiah and Ezekiel, If, however, we read between the lines of the story of Herodotus, we need some other cause than the disaffection of the Egyptian troops to account for the sudden success of Amasis, and especially for his easy defeat of the mercenaries with a

discouraged native force. Again, the conquests of Egypt by the Assyrians, though predicted by Isaiah and noticed as past by Nahum, are unrecorded by Herodotus and the Greeks. The prosperity of the country in the reign of Amasis might as easily follow a Babylonian conquest as that under Psametik I. followed the terrible Assyrian wars. The scantiness of the native records of Nebuchadnezzar's reign leaves us without Babylonian evidence.

Amasis took to wife a grand-daughter of Psametik I. and his heiress-queen Shapentap, thus legitimatizing h's pretensions, He greatly embellished the temples of Egypt. It may be that, as in the time of Psametik L, they needed restoration. His foreign policy was marked by energy and caution. He transferred the Ionian and Carian mercenaries to Memphis itself as a force of guards. He granted the Greeks the free use of Naucratis as a Hellenic settlement and trading port. He conquered Cyprus, and kept up the influence of Egypt in Phcenicia, He had friendly relation with the Greek states, and instead of conducting an expedition against the Babylonians during their Empire or acainst the rapidly rising power of the Persians, he joined in an alliance of which Orcesus, king of Lydia, was the head, and agreed to furnish him with an Egyptian con- tingent in his war with Cyrus. After the fall of Croesus other wars kept Cyrus from any designs on Egypt, and it was not until the accession of his son Cambyses that the Persians could attempt its reduction. Meanwhile Amasis died, leaving the crown to his son Psametik JIL, the Psammenitus of Herodotus, who, after a single well-fouglit battle near Pelusium, and the capture of Pelusium and Memphis, lost his kingdom, B.c. 525.

Cambyses, as we learn from the narrative of the Egyptian priest Uta-har-sun of Sais, at first adopted the style of a Pharaoh, and was initiated into the mysteries of Neith at Sais. It was not until the failure of an expedition against the Oasis of Ammon, and of another directed by himself against the Ethiopian kingdom of Napata, that Cambyses, probably aware of the satisfaction the Egyptians must have

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felt at these reverses, changed his policy, and vented his rage upon the monuments and objects of worship in Egypt. The Saite priest, in general terms, describes this as a time of calamity such as had never before befallen

his country. Cambyses left Egypt, which was so completely crushed that the subsequent usurpation of the Magian was marked by no revolt. One of the first cares of Darius I. was to charge Uta- har-sun with the restoration of the disordered country. Ina visit to Egypt at the moment when a revolt had broken out, he pacified the people by supporting their religion, in the most marked contrast to Cambyses. For the rest of his reign he endeavoured to promote the commercial welfare of Egypt, in particular opening the canal from the Nile to the Red Sea. In the Great Oasis he built a temple to Ammon. It was not until the very close of his reign that the Egyptians rose against his rule, and expelled the Persians, choosing as king Khabbash, whose name has been discovered in the Sarapeum. The revolt lasted but three years, and Xerxes I. suppressed it with severity. Achamenes, the brother of Xerxes, was made satrap. Egypt did not again rise until the troubles which marked the accession of Artaxerxes I. The insurrection was led by Inaros, prince of Marea, who immediately concluded an alliance with the Athenians. Supported by 200 Athenian triremes, he defeated and slew the satrap Achzemenes, and besieged in the citadel of Memphis the remnant of the Persian army, which, though it included Egyptian soldiers, held out until the attacking force was drawn off by a fresh Persian army. The Egyptians and their allies were now driven to the island of Prosopitis, and there besieged for eighteen months. At last Inaros was taken and put to death; Amyrteeus, an Egyptian who reigned with him, fled to the marshes, where he long maintained himself. Artaxerxes, after this serious revolt of six years, modified the adminis- tration of Egypt, recognizing Thannyras, son of Inaros, and Pausiris, of Amyrtzeus, as vassal kings. The govern- ment was, however, held by a Persian satrap; these were merely local princes.

An Amyrtzus, probably son of Pausiris (Maspero, //%st. Anc., 562), revolted, and on the death of Darius IL, B.c. 404, made Egypt virtually independent. He is the one king of Dynasty XXVIII, Saite, His successor, Naifaau- rut I., founded Dynasty XXIX. of Mendesians, z.c. 399.

With him the monuments, silent since the rising of Khab- |

bash, again give us information, and under the next dynasty show that the Saite art still lived in spite of the misfor- tunes the country had undergone.

The Mendesians Nai- faaurut and Hakor are chiefly known for the part they took in aiding the enemies of Persia. Hakor was followed by Naifaaurut II., and then the sovereignty passed to Dynasty XXX. of Mendesians, the last native Egyptian line. The first of these kings, Nekht-har-heb, or Nectanebes I., came to the throne when a Persian invasion was immi- nent, B.c. 378. Hakor had already formed a powerful army, largely composed of Greek mercenaries. har-heb intrusted to the Athenian Chabrias. The Persians, however, succeeded in causing his recall and in gaining the services of his fellow-countryman Iphicrates. The invading army consisted of 200,000 barbarians under Pharnabazus and 20,000 Greeks under Iphicrates. After the Egyptians had experienced a reverse, Iphicrates counselled an imme- diate advance on Memphis. His advice was not followed by Pharnabazus; the Egyptian king collected his forces and won a pitched battle near Mendes. Pharnabazus retreated, and Egypt was free,

Nekht-har-heb was succeeded by Tachos or Teos, whose short reign was occupied by a war with Persia, in which the king of Egypt secured the services of a body of Greek mercenaries under the Spartan king Agesilaus and a fleet under the Athenian general Chabrias. He entered

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Phoenicia with every prospect of success, but having offended Agesilaus, he was dethroned in a military revolt which gave the crown to Nekht-nebf, or Nectanebes IL, the last native king of Egypt. At this moment a revolt broke out. The prince of Mendes almost succeeded in overthrowing the new king. Agesilaus defeated the rival pretender, and left Nekht-nebf established on the throne, But the opportunity of a decisive blow against Persia was lost. The new king, Artaxerxes ITI. Ochus, determined to reduce Egypt. A first expedition was defeated by the Greek mercenaries of Nekht-nebf, but a second, commanded by Ochus himself, subdued Egypt with no further resistance than that of the Greek garrison of Pelusium. Nekht-nebf, instead of endeavouring to relieve them, retreated to Memphis and fled thence to Ethiopia, B.c. 34017 Thus miserably fell the monarchy of the Pharaohs

after an unex- ampled duration of nearly 3000 years, or as some think far longer. More than 2000 years have since passed, and though Egypt has from time to time been independent, not one native prince has sat on the throne of the Pharaohs. “There shall be no more a prince of the land of Egypt” (Ezek. xxx. 13) was prophesied in the days of Apries as the final state of the land.

The causes of the downfall of Egypt are sufficiently evident in the previous history. The weakness of the later Thebans fostered divisions. The Bubastites aided the natural tendency of the country to break up into small principalities. The Ethiopians, while they brought a new force to resist the Assyrians, increased the divisions of Egypt, which had to choose to which of two foreign empires it would submit. The Saites restored nationality, but they maintained it at the cost of alienating the native troops, and thus could not effectually resist Persia, Although their gallant struggles brought out the fighting qualities of the Egyptians, these Pharaohs could never venture on a great war without Greek mercenaries. Hence constant discontent and an inharmonious military system. At length the native energy was worn out.

The barbarian Ochus used his success mercilessly, rivalling the worst acts of Cambyses. Under him and his successors Egypt made no movement, and when Alexander entered the country as the conqueror of Persia he was welcomed as a deliverer. The Persian governor had not forces enough to oppose him, and he experienced nowhere even the show of resistance. He visited Memphis, founded Alexandria, and went on pilgrimage to the oracle of Jupiter Ammon. He then organized the government under two officers, who from their names appear to have been a Greek and an Egyptian. He left the Egyptians satisfied with his reverence for their religion, and for the rest of his reign the country remained a peaceful province of his great empire. With Alexander, the Macedoniav dominion began. It lasted for 302 years, after the Empire the brightest period of Egyptian history, during the whole of which no general native revolt broke out. From this time the Egyptian local princes, who for five centuries, except only during the rule of Psametik and his house, had caused all the divisions of Egypt, disappear from the scene. ‘This final settlement was probably due to the policy of Alexander, under whose successors we see the real govern- ment of the country, with its centre in the Greek city he had founded, and the control of

the army and navy, intrusted to Greeks; whereas the native religion was protected, but wholly left to the Egyptian priests, except so far as the king himself acted as one of the priesthood. Thus the foreigners had all the true power, while the natives were satisfied with a semblance of it, and the local importance this semblance gave to their functionaries. Routes of trade were actively pushed, and works of public benefit carried out, and the Egyptians grew more and more

wealthy, in Egyptian towns, where a Greck was rarely seen, and the king only appeared in the character of a Pharaoh to show respect to the religion of the country. The Jearned men of both races drew nearer together, and Greek speculation had its effect on Egyptian thought. The less cultivated settlers were attracted by the native superstitions, and at last the Alexandrian was far more an Egyptian than even a Macedonian.

On the division of Alexander's dominions, Egypt fell to the share of Ptolemy, son of Lagus and Arsinoé, a con- cubine of Philip's, whose son he was supposed to have been. Of all Alexander's generals he was the most far-sighted. Instead of aiming at the rule of the empire, he secured the least exposed province and employed its resources rather for defence than offence. One of his first acts was to divert the burial of Alexander from Macedon to Egypt. The body was taken to Memphis, but under Ptolemy's successor it was removed to Alexandria, so that the conqueror rested in the city he had founded. His first conquest was the Qyrenaica (B.c. 322), a valuable province outside the field of the contests of his rivals, yet greatly useful for naval enterprises against them. Yet he did not declare himself independent ; as a subject of the phantom kings Philip Arideeus and Alexander igus, he inscribed their names in his restorations of Egyptian temples, and alone of all the generals struck money in the name of A%Qgus so long as that last heir of Alexander lived. He was not long left in undisturbed occupation of his government. The regent Perdiccas, finding that Ptolemy was engaged in a league agaiust his authority, marched into Egypt, B.c. 321; but the resistance of Ptolemy and a mutiny in the invader's army, which resulted in his death, delivered Egypt from this danger. The succeeding years were occupied in aitempts to add Ccele-Syria and

Pheenicia to the Egyptian dominions, which can scarcely be considered rash when we remember the importance of these provinces to the security of Egypt against invasion, and for winning of the mari- time supremacy of the castern Mediterranean. During this time Cyprus was mide a dependency, and the Cyrenaica, which had revolted, was finally reduced by Ptolemy's stcp-son Magas. A great calamity now arrested the growing power of Egypt, when Demetrius, son of Antigonus, defeated Ptolemy in a sea-fight off Salamis of Cyprus (z.c, 306). Antigonus then assumed the royal diadem, and Ptolemy followed his example. Antigonus and Demetrius immediately attacked Egypt, but without success; and Ptolemy, rapidly recovering his strength, aided the Rhodians when besieged by Demetrius (B.c. 305-4). It is related that when the siege was raised the Rhodians gave Ptolemy, as their "preserver," the title of Swrjp. This appears in his hieroglyphic inscrip- tions as his distinctive title, and upon the coins of his successors struck in his name in Pheenicia. After this Ptolemy again attempted without success the conquest of Cele-Syria and Pheenicia, but ultimately seized and held Cyprus, B.c. 295, which thus became a part of the Egyptian monarchy for nearly its whole duration. His later ycars Were passed in consolidating lis power. Scleucus was master of a Syrian empire, too firmly ruled to be attacked with any cliauce of success, and stretching too far eastwards to make its master aggressive on the Egyptian border. The government of Egypt was assured by the care taken to Maintain and increase the Greek element in the country. Alexandria was made a seat of Hellenic culture, and if it is not absolutely certain that Ptolemy founded the Library and the Museum, he undoubtedly gathered the necessary jutellectual materials. The great Greek colony of Ptolemais, in the Thebais, was established. Thus tlie ative and foreign elements were kept apart, conflicts avoided, and strong Hellenic centres secured. The

Egyptians were flattered by the arrival of the image of Sarapis from Sinope and the spread over Egypt, under the king's influence, of a Hellenic form of their religion. The king's portrait on his coins shows us him in old age, and is distinguished by resolution, keenness, and craft.

Having ruled thirty-eight ycars, the old king abdicated in favour of his young son Philadelphus, chosen to the prejudice of his elder brothers (B.c. 285), and died two years later (B.o. 283).

Ptolemy Philadelphus ruled for thirty-eight years of almost undisturbed peace. His half-brother Magas, probably soon after the death of Ptolemy Soter, declared himself king in Cyrenaica, and attempted to invade Egypt. Ptolemy remained on the defensive, and at last a treaty was signed by which Ptolemy, heir of the Egyptian crown, and Berenice, heiress of Cyrenaica, were betrothed, Magas retaining the power if not the name of king. Philadelphus was also fortunate in recovering Phoenicia and Ccele-Syria. This probably took place not much before B.c. 266, for that is the earliest date in the series of coins struck at Tyre during his reign. He secured the friendship of the Phoenician and Palestinian coast-towns, by granting them a degree of autonomy, for their coins, though dated in his reign, were struck at each town, and bear not his name but that of his father. In Egypt he paid great attention to the extension of commerce. He reopened the canal of the Red Sea and established a desert route from Coptos to Berenice on the coast which he had founded. He made war in Ethiopia, but according to his custom he was content to be on friendly terms with tle Ethiopian king Ergamenes. His Ethiopian expedition led to lis establishing a station for the purpose of securing a supply of elephants for war. An ambassador was sent to India. Thus the trade of Ethiopia, Arabia, and India was secured for Egypt, and continued to enrich it for eighteen centuries. Not less wisely Philadelphus made Alexandria, with the Museum and Library, the heart of the learning of Greece. Many cities were founded by him, or like Ptolemais in Galilee, refounded. In his long reign there was little expenditure but such as was calculated to enrich his empire. At his death his dominions equalled those of his father. He held Cyprus, much of the coast of Asia Minor, the Cyclades, and part of Ethiopia and Arabia. The Cyrenaica was only to be separated for the life of Magas. He twice married. His second wife was Arsinoé IL., his full sister, whom he married in accordance with Egyptian rather than Greek notions. She was a woman of great beauty and force of character, and much loved by her husband. The character of Philadelphus is marked by the craft rather than the force of his father’s; but he inherited to the full his love of literature and his love of pleasure, both undisturbed by warlike ambition. He is the last representative of the old Greck “tyrannos,”

whom Pindar has made known to us, rather than oue of the restless “ diadochot.” –

Ptolemy Euergetes, son of Philadelphus and Arsinoé L., by his accession, B.C. 247, reunited the Cyrenaica to the Egyptian empire. A quarrel between Egypt and Syria ‘nmediately broke out. The Syrian king Antiochus I. had married a daughter of Philadelphus. She was now put away, and, as well as Antiochus, murdered by her rival, his first wife Laodice, who set up her son Seleucus II. Ptolemy invaded Syria, which he speedily subdued, and then following the traditions of Egyptian conquest, he passed the Euphrates and reduced the whole of the eastern dominions of Seleucus. He returned to Egypt with vast treasures, including the statues of the gods which Cambyses had carried away, and which he restored to the temples. ‘At sea he was equally fortunate, and the maritime territories of Egypt in the eastern Mediterranean were greatly enlarged. For a moment the old Egyptian Empire was again revived

in larger proportions, extending from the Thracian coast to Ethiopia, from Cyrene to the border of India. The eastern provinces speedily returned to the Syrian rule, and Ptolemy was content with a moderate accession of territory on that side. He, however, retained his Greek conquests and pushed far south in Abyssinia. Euergetes was not merely a warlike king. He cared for literature, and more than his predecessors laboured to please the Egyptians. He is the first Ptolemy whose Egyptian structures are worthy of the wealth of the country. Art had lost its ancient delicacy, yet the sumptuous architecture of this age merits admira- tion as showing a new though somewhat false develop- ment of the ancient style. His reform of the native calendar, as recorded in the Decree of Canopus, is another mark of his wise interest in Egypt. He was fortunate in his marriage with Berenice IT., who as queen of Cyrene is the first Egyptian queen who has the same regal style as her husband. Having reigned twenty-five years he left his kingdom to his son.

Ptolemy Philopator, who began to reign Bc. 222, immediately on his accession put his mother Berenice and others of his nearest kindred to death, and, leaving the management of the state to Sosibius, abandoned himself to luxury. Antiochus ITI., king of Syria, seized the oppor- tunity to wrest from Egypt all the eastern provinces. Ptolemy at length took the field himself in defence of Egypt, and defeated Antiochus at Raphia, where his success was greatly due to the courage of Arsinoé IIL. his sister and wife (B.c. 217). By this victory Ccele-Syria and Phoenicia were recovered. Ptolemy returned to his former life, and Arsinoé was put to death. He left his kingdom, greatly weakened by bad administration and growing dis- affection, to a child, Ptolemy Epiphanes. The other two Macedonian kings, Philip V. and Antiochus III, now allied themselves to despoil Egypt of the provinces. Every- thing but Cyprus and Cyrene was taken, and the Egyptian ministers only saved the country by having called in the aid of Rome. The Republic had long been friendly to the Ptolemies, and nothing suited her policy better than a pro- tectorate of Egypt. Accordingly M. Aimilius Lepidus was sent as regent to Alexandria, and Antiochus was commanded to restore what he had conquered. It was finally settled that Ptolemy should marry Cleopatra, daughter of the Syrian king, and that she should take back Ccele-Syria and Pheenicia, From this time Rome ruled Egypt with reference to her own eastern policy. The kingdom of the Ptolemies was not allowed to fall, but it was kept within the most moderate limits. Consequently the weak kings were supported and the strong kings thwarted in every way. Egypt could not rid herself of a bad ruler or enjoy the full advantage of a good one. The rest of the minority of Ptolemy was marked by a serious revolt in Lower Egypt, put down with great difficulty. In Bc. 196, when but thirteen or fourteen years old, the young king was crowned at Memphis, when the decree of the Rosetta Stone was issued. The place of coronation and the terms of the decree show a policy of conciliation towards the Egyptians which‘the revolt probably rendered especially necessary. The marriage of Ptolemy and Cleopatra I. took place B.c. 193-2, but the dowry was not handed over. Ptolemy con- tinued true to the Romans in their war with Antiochus, but was not allowed to act as their ally, and gained nothing in the subsequent treaty. Another revolt broke out in Lower Egypt, and was cruelly suppressed, B.c. 185. Ptolemy perished by poison in 8.c. 181,.leaving two sons surnamed Philometor and Energetes, who ruled Egypt in succession. Epiphanes inherited the weakness and cruelty of his

father, and with him Egypt lost for a time her influ- ence in the affairs of the world.

Cleopatra I., who like Berenice II. was queen as heiress,

now became regent for Ptolemy Philometor, and ruled well until her death, about B.c.174. The ministers then made war on Antiochus IV. (Epiphanes) for the disputed provinces, The Egyptian forces were defeated, Egypt invaded, and Ptolemy seized (B.c. 170). His younger brother, Euergetes IL., with an audacious courage that marks his whole career, declared himself king at Alexandria, where Antiochus be- sieged him in vain, and Roman ambassadors interfered for his protection. Antiochus retired, leaving Philometor ag king at Memphis. The two brothers now made terms, agreeing to a joint rule. Antiochus again invaded Egypt, and marched to Alexandria, but was forced to retire by the resolntion of a Roman ambassador, M. Popillius Leenas (B.c. 168). From this time Egypt was more than ever in the hands of the Romans, and in consequence of the manner in which Philometor had yielded to Antiochus while Euergetes had resisted his pretensions and depended on their support, we find them constantly aiding Euergetes, whose abili- ties, if equal to those of Philometor, were weighted by a perfidious and cruel disposition. It was not long before Kuergetes succeeded in driving Philometor from Alexandria, The fugitive went to Rome B.c. 164, and the senate agreed toreinstate him. Euergetes was spared by his brother, and the Roman deputies obtained for him the kingdom of Cyrene, where he occupied himself in ceaseless plots to ob- tain Cyprus, assisted by the active support of Demetrius I. of Syria and the unjust diplomatic aid of the Roman senate, Philometor had the courage to oppose his brother, who in- vaded Cyprus with Roman ambassadors ordered to settle him in the government of the island. Philometor defeated and took him prisoner, but again spared his life, and left him the kingdom of Cyrene (z.c. 154). The Romans did not interfere with this settlement.

The part Demetrius I. had played in the war in Cyprus led Philometor to take the side of the usurper Alexander I. (Balas), to whom he gave his

daughter Cleopatra to wife (B.c. 150). When Demetrius II. endeavoured to recover his father’s kingdom Ptolemy advanced to the support of Alexander, but thinking him treacherous, he turned his arms to the aid of the legitimate king. Rapidly subduing the country, Ptolemy entered Antioch and was hailed king of Syria, to the crown of which he had a claim as descended maternally from the Seleucid line; but he admitted the higher right of Demetrius, whom he aided in resisting an invasion by Alexander. In a decisive victory Ptolemy was thrown by his horse and mortally injured (z.c. 146).

It was in the reign of Philometor that Onias founded the temple at Onion in Egypt, which tended to increase the importance of the Jewish colonies and to separate the Alexandrian from the Palestinian school.

With this king the power of Egypt finally fell. He was the last Ptolemy who had the capacity to rule amidst the growing difficulties of the time. In his wars he showed courage and generalship, in his dealings with Rome caution and decision, in his rejection of the Seleucid diadem moderation and justice, in his treatment of his brother and his subjects au extraordinary clemency and humanity.

Cleopatra II., the sister and widow of Philometor, put their son on the throue.! Euergetes at once marched from{Cyrene to Alexandria. The Romans as usual took his part, and stopped the war on the condition that Euergetes should marry his brother’s widow. The young king was instantly put to death. Ptolemy reigned as he =| begun: Alexandria was depopulated by his cruelties, though the rest of Egypt seems to have fared better in consequence of his want of ambition. He divorced Cleopatra II. to

1 There is difficulty as to his name. In Egyptian document aT pator precedes or follows Philometor (Lepsius, Berl. Akad. ae 3 seqg.); but in a Greek inscription in Cyprus the later place is si@ (Hogg, J., ‘‘ Insers. from Cyprus,” R. S. Lit., 2 ser., Vil. 387, 8€99:)+

marry her daughter, his niece, Cleopatra III. In B.c. 130 he was driven out of Egypt by a revolt, and Cleopatra II. became queen. In revenge he put to

death their son. Cleopatra having asked the aid of Demetrius II., Ptolemy was recalled, p.c. 127, and for the rest of his reign adopted a more conciliatory policy. He engaged in war against Demetrius II., and supported the usurper Alexander IL., against whom he subsequently turned, apparently with reason. ‘The reconciliation with the Seleucids led to the recall of Cleopatra II., with whom Ptolemy now reigned. He died z.c. 117, in the fifty-fourth year from his first accession. This king, the worst of the Ptolemies, as Philometor was the best, is significantly known by the nickname Physcon, or Fat-paunch, but he was also called by his subjects the Ill-doer, Kakergetes, instead of the Well- doer, Euergetes. Some of his latest coins present, instcad of the idealized head of Ptolemy, the founder of the line, bloated and cruel features which can only be those of Physcon. His oue good quality was a hereditary love of letters.

Cleopatra IIT., surnamed Cocce, widow of Euergetes and heiress of Philometor, succeeded, and, in deference to the popular will of the Alexandrians, associated with her Ptolemy Soter II., surnamed Lathyrus, or Lathurus, her elder son, instead of Ptolemy Alexander I., the younger, whom she preferred. They ruled together with little con- cord, and at length Cleopatra expelled her colleague, who had been the real sovereign, and recalled Alexander from Cyprus, where he had already ruled independently for seven years (B.c. 107). Cyrene was probably lost to Egypt about this time. Physcon had left this kingdom to his base son Ptolemy Apion, who is generally supposed to have at once succeeded. The coins, however, show that the latest Cyrenaic coinage of Physcon was continued by Lathyrus. Cleopatra III. now ruled with a stronger authority, but by degrees Alexander gained the upper hand, and ultimately dissensions arose which ended by his causing her death (z.c. 89): this occasioned troubles which lost him his throne, and brought about the recall of his brother (z.c. 89). During the interval Lathyrus had ruled in Cyprus, and both brothers had engaged on opposite sides in the wars of the Seleucid princes. As king of Egypt, Lathyrus had to subdue a native revolt, the first we know to have happened in Upper Egypt in the time of the Ptolemies. Thebes seems to have been its centre, and here the insurgents stood a siege of nearly three years, when the city was taken and reduced to the ruined state from which it has never since risen. Lathyrus died in B.c. 81. He appears to have been weak and cruel, with some qualities as a politician and general. He left one legitimate child,

a daughter, Berenice III., who succeeded him. Her step-son, Alexander II., son of Alexander I., came from Rome as Sulla's candidate, and married her. The nuptials were almost immediately followed by the murder of the queen by her husbaud's order, and his deserved death in @ popular tumult which was thus excited (p.c. 80). In default of legitimate issue, two base sons of Lathyrus now shared the Egyptian dominions, the elder, Ptolemy Neus Dionysus, surnamed Auletes, the Flute-player, taking Egypt, and his younger brother Ptolemy acquiring Cyprus. Auletes inherited the vices without the ability of Physcon, and having spent great sums in obtaining the recognition of the senate, who probably would not readily part with the claim based on the legacy which either Alexander I. or I. had made of his kingdom to the Romans, he wearied the patience of his subjects by heavy taxation, and was expelled by the Alexandrians B.c. 58. His wife Cleopatra Y. and daughter Berenice IV. now reigned together, but, on the death of the elder, the younger became sole queen. Berenice was twice married, first to Scleucus, a pretended Seleucid,

whom she put to death, and then to Archelaus. With the support of Gabinius, proconsul of Syria, Auletes at length recovered Egypt, B.c. 55. He punished his daughter with death, and in B.c, 51 his troubled reign came to an end. At this time his family consisted of two sons and two daughters, —the famous Cleopatra and Arsinoé, all of whom in turn exercised regal power, three in Egypt. Ptolemy, the elder son of Auletes, and Cleopatra VI, his elder daughter, succeeded in accordance with their father's will, which the Roman senate ratified. In z.c, 48 her brother expelled Cleopatra, who fled into Syria. Advancing to conquer Egypt by force of arms, she was met by her brother's forces near Pelusium. Here it was that Pompey, after the ruin of his cause, was assassinated by order of Ptolemy's ministers as he sought the king's protec- tion. Czesar, following Pompey, reached Alexandria. Here Cleopatra, giving up her ideas of war, made her way to Cesar and secured his interest. After a struggle with the Egyptian ministers, who almost succeeded in overpower- ing Ceesar's small forces, and who ultimately had the support of young Ptolemy, who escaped from the

Romans, the Egyptians were defeated and the king drowned (z.c. 47). Cleopatra now became queen, associated with a phantom king, the younger Ptolemy. In B.c, 45 she went to Rome with her brother and young Ptolemy Czesar, her son by the dictator, wishing to be acknowledged Czesar's wife, and that the boy should be made his heir, Next year Cesar was murdered, but by his will his nephew Octavius became his heir, Cleopatra's son, his only surviving child, being neces- sarily set aside. The queen determined to secure for her son Egypt at least, and made away with her unfortunate brother. She nextappears when, after the battle of Philippi, the triumvir Antony made his progress through Asia Minor. It was necessary that the queen of Egypt should couciliate the ruler of the Eastern world. Cleopatra resolved to govern him. As Cesar seven years before, Antony now was instantly captivated by the Egyptian queen, She was past thirty, but if her beauty had waned her wit had grown. Her portrait on her coins is that of a woman of intellect and charm, not of beauty. A broad head with wavy hair, an aquiline nose, large deep-set eycs, and a full eloquent mouth, is supported by a long slender throat. To these personal qualities she added a mind singularly cultivated, ready discourse in several languages, and, what that so often lacks, as rcady wit. She took Antony to Alexandria and governed the East for him. While her power waxed his waned. Asia Minor was overrun by Q. Labienus at the head of a Parthian army, and Palestine and Pheenicia by another led by Pacorus, the Par- thian king's son. In Italy Antony's adherents were routed. He now resolved to attack Italy itself, and a great war was only averted by the armies, which forced the generals to conclude a peace (z.c. 40). Octavia, his rival's sister, was given in marriage to Antony, and for three ycars Cleopatra lost her power. In Bc, 36 Antony deserted Octavia and returned to Alexandria and the Egyptian queen. With the exception of an unsuccessful Parthian campaign and an inglorious Armenian one, Antony effected nothing. He was amused by the luxurious life of Alexandria ; and, while Cleopatra maintained her Egyptian rights and ruled with Ptolemy Cesar, she shared Antony's government of the East, appearing as queen with him as triumvir upon the coins of Antioch. In xs.c. 32 Octavian declared war against Cleopatra, and Antony took his revenge by divorcing Octavia. Then followed the conflict in the Adriatic for the world's empire, in which Antony's old military skill failed him, and Cleopatra, leaving the battle, perhaps through a woman's fear, drew him

away also (pc. 31). Arrived at Alexandria, Cleopatra showed more energy than Antony, and, when Octavian reached

Egypt, more policy. Antony, on the false news of the Sy Pty : : queen's death, stabbed himself; and Cleopatra, finding Octavian resolved to make her walk in his triumph, perished by her own hands in some unknown way. Thus Egypt became a Roman province, B.c. 30. The young Ptolemy Cesar, in spite of his double claim, perished by the command of Octavian, but the beautiful Cleopatra, Antony's daughter by the queen, was generously taken by his divorced wife Octavia, brought up with her own children, and married to a king, Juba II. of Mauretania. With their son Ptolemy, whom Caligula put to death a.p. 40, this great line came to an end. Its genius ended with Cleopatra. The dislike of the Romans for her has tended to give the moderns too low an estimate of her abilities. When we see what Egypt was under Auletes and under her we are astonished to perceive how much she accomplished by her management of Cesar and of Antony. After all the other independent states had been absorbed by Rome, Egypt was raised from a mere protected province to be once more a kingdom, and at last Alexandria became again a seat of empire. But the task Cleopatra set herself was beyond accomplishment; the more she tured Antony into an imperial ruler the less could he control the Roman armies by which he governed. Thus the fabric she had raised was rotten at the base, and with her fall it disappeared.

The history of Egypt under the Romans being that of a provinee, and the most interesting events matters of ecclesiastical history, may here be told very briefly. Worn out by the cruelty and avarice of a succession of bad rulers, the country must have wel- comed the Romans almost as it had welcomed Alexander, and so soon as it was known that the native religion would be protected, all discontent must have vanished. The temples were still the care of the rulers. Art had indecd fallen very low, yet it con- tinued to produce buildings with a certain rich grandeur, that did not begin to give place to Greco-Roman structures till the time of Hadrian and the Antonines.

4ilius Gallus, prefect of Egypt under Augustus, was ambitious to enlarge the provinee by foreign conquest. He failed in an ex- pedition into Arabia

Felix, but repelled an Ethopian invasion, and in return penetrated as far as Napata, the capital of Queen Candace, which he captured. In later reigns the chief events were troubles connected with the Jewish population. In the time of Vespasian, the temple Onias had founded was closed, and a great Jewish revolt in the reign of Trajan, which was not easily suppressed, cost the Jews the privileges which, in common with the Greek population, they had enjoyed above the native inhabitants. Hadrian twice visited Egypt (A.p. 130,134). He renewed the old privileges and granted new ones. The foundation of Antinoé shows how low the nation had then fallen. Under Antoninus Pius, a Sothiac Cyele began (A.D. 189). In the next reign, Avidius Cassius, prefect of Egypt, having ior a serious revolt, usurped the purple, and was acknow- ledged by the armies of Syria and Egypt. On the approach of Marcus Aurelius, the adherents of Cassius slew him, and the clemency of the emperor restored peace. After the downfall of the house of the Antonines, Pescennius Niger, who commanded the forces in Egypt, was proclaimed emperor on the death of Pertinax (a.p. 193). Severus overthrew his rival (A.D. 194), and, the revolt having been a military one, did not punish the provinee, but gave great privileges to the Alexandrians. In his reign the Christians of Egypt suffered the first of their many persecutions. When Christianity was planted in the country we do not know, but it must very early have gained adherents among the learned Jews of Alexandria, whose school of thought was in some respects ready to welcome it. From them it rapidly passed to the Grecks. Ultimately, the new religion spread to the Egyptians ; their own creed was worn out, and they found in Christianity a doctrine of the future life, for which their old belief had made them not un- ready ; while the social teaching of Christianity came with special fitness to a subject race. The history of the Coptic Version has yet to be written. It presents some features of great antiquity, and, unlike all others, has the truly popular character of being written in the three dialects of the language. Side by side there grew up an Alexandrian Chureh, philosophic, disputative, ambitious, the very centre of Christian learning, and an Egyptian Chureh, ascetic, contemplative, mystical. The two at length influenced one another; still we can generally trace the philosophic teachers to a Greek origin, the mystics to an Egyptian.

Caracalla, in revenge for an affront, massacred the population of Alexandria. Under Decius the Christians again suffered from per- Secution.

When the Empire broke up in the weak reign of Gal- lienus, Emilianus was made emperor by the troops at Alexandria ;

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but, after a short and vigorous reign, Was conqucred by the forees of Gallienus. Zenobia, queen of Palmyra, after an unsueeessful invasion, on a second attempt conquered Kyypt, which she added to her empire, but lost it when Aurelian made war upon her (A.D. 272). The province was, however, unsettled, and the con- quest of Palmyra was followed in the same year by the suppres- sion of a revolt in Egypt (a.p. 278). Probus, who had governed Egypt for Aurelian and Tacitus, was subsequently chosen by the troops to sueceed Tacitus, and is the first governor of this province who obtained the whole of the Empire. The country, however, was still disturbed, and under the reign of Diocletian, in a.p, 299, a formidable revolt had broken out, led by Achilleus, who as em- peror took the name Domitius Domitianus. Dioeletian, finding his troops unable to determine the struggle, came to Egypt aut reduced the strongholds of the country. After he had left, Domi. tianus again raised his standard and captured Alexandria, but Diocletian returning to Egypt took the city and put his rival to death (A.D. 297). This revolt has very distinctly the character of a native rising, for it was not localized in Alexandria, but spread over the country.

The reign of Diocletian is the tuming-point in the history of the Egyptian Church. The edict of a.p. 308 against the Christians, and those which succeeded it, were rigorously carried out in Egypt, where Paganism was still strong, and face to face with a strong and united church. Galerius, who suececded Diocletian in the govern- ment of the Kast, implacably pursued his policy, and this great persecution did not end until the persecutor, perishing, it is said, of the dire malady of Herod and Philip 11. of Spain, sent out an edict of toleration (A.D. 811). The Copts date from the aceession of Diocletian (A.p, 284), which they call the Era of Diocletian or of the Martyrs.

By the Ediet of Milan (A.p. 818), Constantine, with the agree. ment of his colleague Licinius, acknowledged Christianity as having at least equal

rights with other religions, and when he gained sole power he wrote to all his subjeets advising them, like him, to become Christians (4.D. 824). The Egyptian Church, hitherto free from schism, was now divided by a fierce controversy, in which we see two Greck parties, rather than a Greek and an Egyptian, in conflict. The Council of Nicaea was called together (a.D. 325) to determine between the orthodox and the party of the Alexandrian presbyter Arius. At that council the native Egyptian bishops were chiefly remarkable for their manly protest against enforcing celibacy on the clergy. The most conspicuous controversialist on the orthodox side was the young Alexandrian deacon, Athanasius, who returned home to be made archbishop of Alexandria (A.D. 326). For the long period during which he presided over the Chureh of Egypt, his history is that of the struggle of the two parties, Four times expelled by the Arians, and once by the emperor Julian, he employed each banishment for work in the cause to whieh he was devoted, and on each restoration he used his success with a moderation in marked contrast to the persecuting policy of his enemies. His name and person were at last known to the whole empire, which unconsciously recognized in him an ecelesiastical ruler of Christendom, rather than the chief prelate of a province. He was more a man of action than of thought, more an adminis- trator than a student, but his intrepid patience, his moderation, und his indomitable energy, all directed to the welfare of the church and to no personal ends, gave him an influence never after- wards obtained without the support of avast ecclesiastical maehinery. His is the latest character which was formed upon the model of St Paul’s, and the most remarkable of his age. He died A.p. 373, at the moment whenan Arian persecution began. The reign of Theodosius]. witnessed the overthrow of Arianism, which was followed by the suppression of Paganism, against which a final ediet was promulgated A.D. 390. Iu Egypt, the year before, the temple of Sarapis at Alexandria had been destroyed, and to the same period we must assign the beginning of a partial destruction of those Egyptian temples which had escaped the Persian conquerors. Generally the Coptic Christians were content to build their churches within the ancient temples, plastering over or effacing the sculptures which were nearest to the ground and in the way of the worship- pers. They do not seem to have been very zealous in the work of destruction. ‘The native religion was already dead and they had no fear of it. The prosperity of the church was the sign of its decay, and before long we find perseeution and injustice dis- gracing the

seat of Athanasius. Cyril the patriarch of Alexandria expelled the Jews from the capital with the aid of the mob, and by the murder of the beautiful philosopher Hypatia marked the lowest depth to which ignorant fanaticism eould descend. A schism now produced lengthened civil war, and alienated Egypt from the empire. The Monophysites, after a struggle of two eel- turies anda half, beeame utterly hostile to the Greek rule. It was in these circumstances that a country which, remote ,fronl the great conflicts that destroyed the Western Empire. and threatened the existence of the Eastern, had enjoyed uninter- rupted freedom from an invader since its conquest by Zenobia, and had known no rebellion since that of Achilleus, fell without a

eonflict when attacked by Chosroés (A.D. 616). The success of Heraclius restored Egypt to the Empire and for a time it again reeeived a Greck governor. ‘The Monophysites, who had_taken advautage of the Persian occupation, were persecuted and their patriarch expelled. The Arab eonquest was welcomed by the native Christians, but with it they eeased to be the Egyptian nation. Their language is still used in their churches, but it is no longer spoken, aud its literature, which is wholly ecelesiastieal, has been long unproductive.

The decline of Egypt was due to the purely military government of the Romaus, and their subscquent alliance with the Greek party of Alexandria which never represented the country. Under weak emperors, the rest of Egypt was exposed to the inroads of savages, and left to fall into a eondition of barbarism. Leelesiastical dis- putes tended to alienate both the native population and the Alex- andrians. Thus at last the country was merely held by armed force, and the authority of the governor was little recognized beyond Alexandria, exeept where garrisons were stationed. There was no military spirit in a population unused to arms, nor any disinelination to be relieved from an arbitrary and perseeuting rule. Thus the Muslim conquest was easy.

[In the year 639 of our Era, or the eighteenth of the Flight,! Egypt was invaded by the Muslims, under the celebrated “Amr Ibn-El-As (or El-Asee). Entering the country from Syria, at the head of only 4000 men, he besieged Pelusium, and took it after thirty days. This town was considered the key of

Egypt on the Syrian frontier, and its capture was, therefore, au important advantage, which opened the country southwards to the Arab general. He marched thence to ’Kyn-Shems, the ancient Heliopolis, where he found the Greeks collected in force, and commanded by John Mukowkis, or rather John the Mukowkis, or Gureyg the Mukowkis,? the governor of Memphis, a native Egyptian. They offered a vigorous defence, but were put to the rout, and ’Amr advanced to the banks of the Nile and laid siege to Egyptian Babylon, afortress of great strength, and garrisoned by a Roman legion. Here he received two reinforcements of 4000 Muslims each, and after a protracted siege of seven months he took the place by assault. In an enemy’s country, and far from all supplies, the small army of the Arabs was still ina critical position and unable to push on against the capital, Alexandria, when the enmity of rival Christians and the perfidy of Mukowkis decided the balance in their favour, The persecutions which the Copts had suffered had greatly embittered them against the Greeks, and, as Gibbon observes, had “converted a sect into a nation, and alienated Egypt from their religion and government.” Mukowkis, who governed Memphis, was in heart a Mono- physite, and had also withheld the tribute due at Constanti- nople; and both he and his Coptic brethren, after the first resistance, hailed the new invaders as their deliverers from the Greek yoke. On the fall of Babylon they entered into

1 The. years of the Muslim era, the Hijrah, or Flight of Mohammad from Mecca, are generally used in this portion of the history, as they are more convenient to Oriental scholars. The principal dates are, however, given according to both methods of eomputation.

The authorities upon whieh this sketch of the history of Egypt under Muslim rule is based are these :—Eutychius, Annales ; the Kémil of Ubn-el-Atheer (ed. Tornberg); Abu-l-Fida, Annales Musle- mici (ed. Reiske); El-Makreezee’s Khitat; El-Ishakee (MS.) ; Ab-ul- Mahdsin; Ibn-Khallikén’s Biogr. Dict. (trs. De Slane) ; Es-Suyootee’s Kitéh Husn el-Mohddarah (MS.) and Ta-reekh El-Khulafa; }l- Makreezee’s Kitub-es-Sulook (trs. Quatremére); Bahd-ed-Deen’s Vita Saladini (ed. Schultens); El-Gabartee’s Annals (MS.) ; Wiistenfeld’s Die Statthalter von Aegypten zur Zeit der Chalifen (1876) ; Weil’s Geschichte der Chalifen; Quatremére’s Vie de Moezz-li-din- Allah, aud Mémoires géogr. et. hist. sur U Egypte; Michaud’s

ist. des Crotisades ; Joinville’s Vie de Saint Louts ; Marcel ; Mengin’s Hist. de v Egypte; Sir R. Wilson’s History of the British Expedition ; Lane’s Jfodern _o s Mrs Poole’s Englishwoman in Egypt; M‘Coan’s Egypt asitis; &c.,

- Mukowkis, meaning a kind of ring-dove, seems (aceording to the Kamoos) to have been the symbol of the governor of Egypt under the Greeks, just as the hawk was the symbol of the Pharaohs. Gureyg may also be written Jureyj, but the former, representing the Egyptian pronuneiation of the letter jeem, is preferred in this article in this and similar instances,

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a treaty with the Arabs, engaging to pay to them a poll-tax of two deenars on every adult male, and agreeing to furnish them with supplies and assistance while completing the subjugation of the country. Having concluded this treaty, and founded the city of El-Fustat on the site of his first encampment on the banks of the Nile, with the mosque known by his name,’Amr marched against Alexandria ; and after overcoming many obstacles, and disputing the whole way with the Greeks, who conducted their retreat, in the face of a victorious army, with great ability, in twenty-two days. he appeared before it. continued to arrive from Syria to strengthen the besieg- ing force ; but the defence was as obstinate as the attacks of the Muslims were brilliant, and was protracted for fourteen months. the metropolis of Egypt, the first city of the East, capitn- lated ; but it is said that tlis conquest was only achieved

Fresh warriors

At length, on the 10th December 641,

with the sacrifice of 25,000 Muslims. Abu-l-Farag relates that ’Amr, wishing, at the earnest request of John thie Grammarian, to spare the famous Library, wrote to the caliph (khaleefeh) Omar, asking his instructions respect- ing it, and that he answered: “‘ As to the books you have mentioned, if they contain what is agreeable with the book of God, in the book of God is sufficient without them ; and if they contain what is

contrary to the book of God, there is no need of them; so give orders for their destruction.” The historian adds, that they were burnt in the public baths of the city, and in the space of six months were consumed.2 The conquest of the rest of Egypt was soon effected, and the various strongholds successively fell into the hands of the invaders.

Amr governed the country with much wisdom for four years, but was dismissed by Othman, who appointed in his place *Abd-Allah Ibn-Saad Ibn-Abee-Sarh. The latter reduced Alexandria, which had been retaken by the emperor Constans II., and pushed his conquests beyond Africa Proper. He died at Asealon, in the year 36, having governed eleven years. His successor’s rule was short, and the next vieeroy, Mohammad, son of the caliph Aboo-Bekr, on assuming the reins of goverument acted with such tyranny towards the followers of ’Othmdan, that Mu’awiych was compelled to dis- patch ’Amr to Egypt with a foree from Syria, and a great battle was fought in A.u. 38 between the two armies of Muslims, in which *Amr was again victorious. As a reward for this service, he was a sceond time appointed governor of Egypt, and he died there at the age of ninety years, in A.U. 43.

From this time to A.D. 868, or for rather more than two centuries, Egypt was governed by a succession of viceroys, appointed by the ealiphs of Damaseus and Baghdad. Their period was distinguished by intestine troubles and a constant ehange of rulers, resulting from the eaprice of the caliphs or the vicissitudes of their fortunes. Here we may mention, that shortly after the overthrow of the Amawee (‘‘Ommiade”) Dynasty of Damascus, and the aeeession of the house of ’Abbas, which ruled at Baghdad, the city of El- Askar, immediately to the north-east of El-Fustat, was founded, and the seat of government removed thither. The site is without the walls of modern Cairo, and is marked by extensive mounds of rubbish.

In A.v. 868 (A.u. 254) Ahmad, the son of Tooloon, a Turkish slave who held a high office at Baghdad, was appointed governor of the province of Mier by the ealiph El-Moatezz, and two years after of that of Alexandria also, by his suceessor Fl-Muhtedee. His temporal allegianee to the ealiph soon became merely nominal, and he was virtually sovereign of Egypt; but

at the same tiie lie endeavoured to avoid a complete rupture by eontinuing the prayer for the Prince of the Faithful in the mosques, and the mention of his name on the coins whieh he struek. Later in his reign, however, he forbade the mention of the next ealiph's brother and eolleague E]-Muwaffik in the prayers and statc-documents of Egypt, and E1- Moatemid, who was a weak prinee, was prevailed on to denounce ita a nN

3 This tradition is, we believe, only mentioned fully by Abu-l-Farag, but he was a Christian, and Muslim writers would eonsider it an occur- rence of no importance. Abd-el-Lateef merely says, " Here was the library which 'Amr Ibn-El-'As burned by permission of Omar ;" and El-Makreezee, speaking of Pompey's Pillar, says, ' It is said that this pillar is one of those which stood in the portico of Aristotle, who there taught philosophy, and that his academy eontained a library which Amr Ibn-El-'As burned by direetion of Omar." See Englishwoman in Egypt, vol. 1, 40, seqg.

him publicly asa traitor from the pulpits throughout his dominions. Yet that he secretly favoured him is proved by his vain attempt to escape to Egypt from the tyranny of his warlike brother. Almad founded the dynasty of the Benee-Tooloon, which lasted for a period of 37 years. He bnilt the royal city of El-Katae', between El- 'Askar and Mount Mukattam, enriched it with splendid buildings, and constituted it the seat of his government. Its site is now covered with ruins, only his great mosque remaining a proud ex- ample of his wealth and mnagnificence, still the largest mosque of Cairo, and, as presenting the earliest specimens of the pointed arch, noteworthy in the history of architecture. The reign of this vigor- ous and wise prince was remarkable for prosperity at home and conquests abroad. He took Barkah, and in Syria in 264 cap- tured Damascus, Hims (Emessa), Hamah, and Aleppo ; after which he proceeded to Antioch, and the governor refusing to surrender, he took that city by storm. He then advanced towards Tarsus, but his supplies failing he was compelled to retire. About five years later, Lu-lu, his deputy and governor of Aleppo and other towns in Syria and in Mesopotamia, revolted and entered into a league with El-Muwaffik. It was apparently aftcr an expedition against this rebel that Ahmad died, in the year 270 (A.D. 884). During the latter years of his reign, he lad abandoned

that sim- plicity of life which had distinguished his youth, and had given himself up to boundless luxury. At his death, there was found in his treasury ten millions of deenars, and his establishment was dis- covered to consist of 7000 mounted memlooks, 300 picked horses for his own use, a body-guard of 24,000 slaves, besides 6000 asses and miules, 10,000 eamels, and 100 wherries. By what oppression the revenue necessary to maintain such a household was raised some idea may be formed, when it is stated that at the time of his death 18,000 persons were eonfined in Ibn-Tooloon's prisons.

Khumaraweyh, on the death of his father, was appointed his successor by the army, he being then twenty years old, and he inherited a kingdom extending from the Euphrates to Nubia. He fought a battle with the forces of the ealiph, commanded by a son of El-Muwaffik (afterwards the caliph Kl-Moatadid), betwecn Damascus and Ramleh; in which his army gained the victory, although he himself, nevcr having seen a battle before, fled the scene of action in a panic, drawing a large part of his troops after him. But he soon reversed the independent policy of his father, and making peace with the ealiph in 273 he not only put the latter's name with that of his brother El-Muwaffik in the public prayers, but entirely omitted his own ; thougl it must be allowed he did not pursue the same scrvile eourse in his coinage. On the accession of E~~Moatadid in 279, Khumaraweyh continued his con~~ ciliatory policy and offered his daughter Katr-en-Neda (Dewdrops) in marriage to the caliph's son. In 282 he made an incursion into the Greek territory, and died at Damascus. It is said that he was fearful of assassination ; to avoid which he had trained a lion to guard him while he slept on his bed of quicksilver. His fears were Justified ; for he was put to death by his women, or according to some by his eunuchs.

His eldest son, Geysh Abu-l-'Asakir, not yet fourteen years old, succeeded him. This prince was killed in less than eight months: his youth, which rendered him unfit to govern, occasioned his fall ; for he had discarded from his society those who were in favour with his father, and associated with none but worthless men. He was succeeded in 283 by his brother Haroon, the principal events of whose rule were a grcat tempest and earthquake in Egypt in 286, and a treaty which he eoncluded with the caliph, by which the provinces of Awdsim and Kinnesreen were ceded to him and the anual tribute from Egypt was fixed at 450,000 deendrs.

Hercigned upwards of eight years, but gave himself up to pleasure, and, as some say, was put to death in 292 by his uncles Sheybin and Adee, sons of the founder of the dynasty, the former of whom suc- ceeded to the government. In the meantime, at the instigation of the generals of Haroon, Mohammad Ibn-Suleyman, a scribe of Lu-lu, advanced against Egypt with a numerous and heavily equipped army. Sheyban went forth to meet him with all the forces he could muster, but numbers of his troops descrted to the invader, and he was soon compelled to surrender. Mohammad Ibn-Suleyman burned El-Kataée', and sacked El-Fustat, reducing the women to slavery, committing many atrocitiés, and exiling the family of Ahmad Ibn-Tooloon, with all their adherents (A.H. 292, A.D. 905).

Having thus completed his conquest, and restored the province of Egypt to the house of 'Abbas, Ibn-Suleyman yielded the govern- ment to '"Eest En-Nosharee, appointed by El-Muktefee. He died in 297, and was followed by Tekeen El-Gezeree, under whose rule ligypt was invaded by the forces of 'Obcyd-Allah El-Mahdee, first prince of the dynasty of the Fatimees, which had succeeded the Benee-l-Aghlab in the dominion of Northern Africa. His general Hubasheh, having taken Barkah, advanced (in 302), with an army of 100,000 men, to Alexandria, which he found deserted, ard thence marched to the Feiyoom, where Tekeen, reinforced with troops from El-Irak, gave battle, and defeated the enemy in a sanguinary con- flict. In the following year, he was succeeded by Abu-l-Hasan Zekee Er-Roomee, in whose time El-Mahdee again attempted the conquest

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of Egypt with an army under the eommand of his son, Abul. Kasim ; Alexandria fell into his hands in 307 ; its inhabitants fled and Zekee cntrenchcd himself in El-Geezeh, on the western bank of the Nile, and shortly afterwards died. In this emergeney Tekeen was reinstated in his office; and a flect of twenty-five sail was sent from Tarsus by the caliph, which meeting with the flotilla of the enemy off Resheed almost annihilated it, Tekeen meanwhile, had defeated the Africans, but without decisive cflect. At length, being twice reinforced from Baghdad, he drove Abu-Kasim back to Barkah. After rendering this important service Tekeen was

again recalled. Three other governors were then suc. cessively appointed ; but the troops revolting, and much sedition and rapine ensuing, Tekeen was once more despatched to Egypt where he remained until his death in the year 321 (a.p. 983).

He was followed by Aboo-bekr Mohammad El-Ikhsheed Ibn-Ta- ghag, afterwards the founder of the dynasty of the Ikhsheedees, who was almost immediately superseded by another governor ; and for one year more Egypt continued to be a province of the caliphs of Baghdad. In the year 328, El-Ikhsheed again succecded to the government. About this time little remained to the caliph of his once broad empire beyond the province of Baghdad, and even there his power was but nominal. Khurasan, Fars, Karman, Rei, Ispahan, Mosul, and the provinces of Mesopotamia, were either in a state of revolt, or nearly or wholly lost to him. Spain was governed by the Dynasty of Umeiyeh, and Africa by that of El-Mahdec ; and we have seen the distracted state of Egypt since the fall of the Benee-Tooloon. El-Ikhsheed availed himself of these circumstances to make himself the independent sovereign of Egypt and Syria, continuing, however, to acknowledge the spiritual supremacy of the ealiph. Shortly after, he defeated the forces of El-Mahdee, who had again made an inroad into the country: and in 327 he was decorated by Er-Radee with the title of El-Ikhsheed, a name borne by the rulers of the province of Ferghaneh in Transoxania, from whom he was descended. In the following year Ibn-Raik subdued a great ey of Syria, and having taken Damascus advanced to the fron- tier of Egypt, where after a very severe engagement he was utterly routed and pursued by the troops of El-Ikhsheed as far as Damas- cus. There, however, the fortune of war turned against El-Ikh- sheed, and for a time he was deprived of the province of Syria, though he subsequently regained possession of it. During his reign, the caliphs of Baghdad were daily losing power, and in the year 333, El-Muktefee wrote to him lamenting i miserable state ; whereupon El-Ikhsheed immediately repaired to him at Rakkah with valuable presents and offered him assistance and an asylum in Egypt, of which the caliph was too timid to avail himself. About this time, also, he conducted a war with various success against Scyf-ed-Dowleh the Hamdanee, who had attacked Syria.

| He died at Damascus in 334 (A.D. 946), in the 66th year of his age,

and was buried, as were his sons, in the mosque of Omar at Jerusalem.

Of El-Ikhsheed's two sons and successors, Abu-l-KAsim Oongoor (who died in 349), aud Abu-l-Hasan 'Alee, little is known, their vizir Kafoor, a black eunuch, being the actual ruler. In the reign of the former, in the year 348, a great fire occurred in El- Fustat, which destroyed 1700 houses and much merchandise. Kafoor succceded to the throne in 355, and was acknowledged throughout Egypt, Syria, and the Higaz. He ruled with great ability, and was a patron of literature ; his name is eelebrated by the poet El-Mutanebbee, who was his boon-companion, and whom, as well as other learned men, he rewarded with magnificent presents. On his death in 357, internal dissensions respecting the succession of Abu-l-Fuwaris, a son of 'Alee, presented a favourable opportunity ip the Fatimec caliph to renew the often-rcpeated invasions 0

gypt.

"Hitherto, with few exceptions, the most notable of whieh are the reigns of Ibn-Tooloon, Khumaraweyh, El-Ikhsheed, and Kafoor, the Muslim rulers of Egypt had not much benefited the country, or rescued it from the anarchy and troubles in which it had beeome involved under the Lower Empire. But the incidents of the time are so little known that they have been deemed worthy of more mention in this article than perhaps their importance would other- wise warrant. From the period at which we have uow arrived, however, the annals of Egypt contain much important matter, and are so closely interwoven with the events of the Crusades as to render thein deeply interesting to the student of European history. The rise of the schismatic caliphs of Africa is a remarkable episode in the early days of El-Isl4m, and most of the princes of that dynasty were not unworthy of their successors, the renowned Sala- din and his family, and the Memlook sultans.

In the ycar 358 (A.D. 969) El-Mo''izz li-deeni-Iléh, the fourth Fatimee caliph, equipped a large and well-armed force, with @ formidable body of cavalry, the whole under the command of Abu- 1-Hoseyn Géhar el-Kéid, a native of Greece, and a slave of his father El-Mansoor. This general, on his arrival near Alexandna, received a deputation from the inhabitauts of El-Fustat, charged to negotiate a treaty. Their overtures were favourably

entertained, and the conquest of the country seemed probable without bloodshed.

FATIMER CALIPHS. |

But, while the conditions were being ratificd, the Ikhsheedees pre- yailed on the people to revoke their offer, and the ambassadors on their return were themsclves compelled to seek safety in flight. Géhar lost no time in pushing forward. Before El-Geezeh a partial combat took place ; several days were passcd in skirmishes, and at length he forced the passage of the Nile a few miles south of that town, at the head of his troops. Herc the Ikhsheedees offered a brave resistance ; the greater part were left dead on the field, and the remainder, taking what valuables they conld carry off, ficd from El-Fustat. ‘The former mediators were now brought to in- tercede for the inhabitants and the women of the fallen dynasty, and to the honour of the African general it is related that they were pardoned and the city was peaccably occupicd. The submission of the rest of Egypt was secured by this victory; and all the Higaz, including the holy cities, and the Yemen, speedily acknowledged the authority of the Fatimee El-Mo’izz. In the year 359 Syria was also added to his dominions, but shortly after was overrun by the Karmatees (Carmathians), the troops of El-Mo’izz met with several reverses, Damascus was taken, and thosc lawless free- booters, joined by the Ikhsheedees, advanced to *“Eyn-Shems. In the meanwhile, Géhar had fortified Kl-Kahireh,! or Cairo (the new capital which he had founded immediately north of El-Fustat), and taken every precaution to repel the invaders ; a bloody battle was fought on Friday, the Ist of Rabeea el-Owwal, in the year 361, before the city walls, withont any decisive result. On the follow- ing Sunday, however, Gdhar obtained a great victory over the enemy, who experienced a reverse more complete than any before suffered, and the camp and baggage fell into the hands of the conqueror. ;

At the earnest solicitations of his lieutenant, who had ruled Egypt both ably and justly, with almost absolute authority, Hl- Mo’izz at length determined to remove his court to his new kingdom. In Ramadan 362, he entered El-Kahireh, bringing with him the bodies of his threc predecessors and vast treasure. El- Mo’izz reigned about two years in Egypt, dying in the year 365. He is described as a warlike and ambitious prince, but, notwith-

standing, he was especially distinguished for justice and was fond of learning. He showed great favour to the Christians, especially to Severus, bishop of El-Ashmooneyn, and the patriarch Ephrem; and under his orders, and with his assistance, the church of the Mu'allakah, in Old Misr, was rebuilt. He executed many useful works, (among others rendering navigable the Tanitic branch of the Nile, which is still called the canal of El-Mo'izz), and occupicd himself in embellishing El-Kahireh. Gdhar, when he fonnded that city 'built the great mosque named El-Azhar, the university of Egypt, which to this day is crowded with students from all parts of the Muslim world. The principal event of his reign in Egypt was the second irruption of Hasan the Karmatce. The enemy, as on the former occasion, rcached 'Eyn-Shems ; but now he gained more advantage over the African troops. Although he was twice defeated in diffcrent parts of Egypt, and constantly harassed in his advance, the capital was closely besieged by him, and its defenders were driven across the fosse. Thus straitened, E~~Mo'izz had re~~ course to stratagem, and succeeded in bribing Hasan Ibn-F]-Garrah (who, with a body of the tribe of Tei, fought with the Karmatecs) to desert them in the heat of the next battle. The result of this plan was snecessful, and again Hasan was defeated and compclled to flee. This event, which occurred in the year 363, relieved Egypt of another invader, an ally of Hasan, by name Abd-Allah Ibn-'Obeyd- Allah (formerly governor of Syria under Kéfoor), and obtained for the arms of El-Mo'izz various successes in Syria.

F}-'Azeez Aboo-Mansoor Nizar, on coming to the throne of his father, immediately despatched an expedition against the Turkish ehief El-Eftekcen, who had taken Damascus a short timc pre- viously. Géhar again commanded the army, and pressed the siege of that city so vigorously that the enemy ealled to their aid the Karmatecs. Before this united army he retired by little and little to Ascalon, where he prepared to stand a siege ; but being reduced to great straits, he purchased his liberty with a large sum of money. On his return from this disastrous campaign, El-'Azeez took the command in person, and meeting the enemy at Ramleh, was victorious after a bloody battle; while E~~Eftekcen, being betrayed into his hands, was with Arab magnanimity reccived with honour and confidence, and ended his days in Egypt in afflu~~ ence, EJ-'Azeez followed his father's example of liberality. It is even said that he appointed a Jew his vizir in Syria, and a Christian to the same post in Egypt. These acts, however, nearly cost him

his life, and a popular tumult obliged him to disgrace both these officers. After a reign of twenty-one years of great intcrnal prosperity he died (A.H. 386) in a bath at Bilbeys, while prepar- ing an expedition against the Greeks who were ravaging his pos- Sessions in Syria. a a A a ee, ee

1The modern Cairo was originally called El-Mansoorceyeh ; El-Mo'izz, how- ever, changed its name to that of El-Kdhireh, by reason of an omen at its foundation. For details respecting this and the other capitals of Egypt under the Muslims, see the sketch in the Englishwoman in Egypt, vol. i, 124, segg. –

in which the author has availed herself of the valuable MS. notes of Mr Lane.

El-'Azeez was distinguished for moderation and mildness, but his son and successor rendered himself notorious for very oppo- site qualities. El-Hakim bi-amri-llah Aboo-'Alee Mansoor began his reign, according to Muslim historians, with much wisdom, but afterwards acquired a character for impiety, eruelty, and nnreasoning extravagance, by which he has been rendered odious to posterity. He is described as possessing at once ''courage and boldness and cowardice and timorousness, a love for learning and vindictiveness towards the learned, an inclination to righteousness and a disposition to slay the rightcous;" and this character is fully borne out by lis many extravagances, Of his cruelty numerous anecdotes are told us, especially in the discharge of his functions as Mohtesib, or '* regulator of the markets and of the weights and measures," an office which he assumed, and in which he became the terror of the inhabitants. But his crnelty was surpassed by his impiety. He arrogated to himself divinity, and commanded his subjects to risc at the mention of his name in the congregational prayers, an edict which was obeyed even in the holy cities, Mecca and Medinah. He is most famous in connection with the Druses, a sect which he founded and whieh stili holds him in veneration and believes in his future return to the earth. He had made himself obnoxious to all classes of his subjects, when, in the year 397, he nearly lost his throne by foreign invasion. Hisham,

surnamed Aboo-Rekweh, a descendant of the house of Umeiyeh in Spain, took the province of Barkah with a considerable force and subdued Upper Egypt. The caliph, awarc of his danger, immediately collected his troops from every quarter of the king- dom, and marched against the invader, whom, after severe fight- ing, he defeated and put to flight. Hisham himself was taken prisoner, paraded in Cairo with every aggravation of cruelty, and put to death. El-Hakim having thus by vigorous measurcs averted this danger, Egypt continued to groan under his tyranny nntil the year 411, when he fell by domestie treachery. His sister Seyyidet-el-Mulook had, in common with the rest of his subjects, incurred his displeasure; and being fearful for her life, she secretly and by night concerted measures with the emeer Seyf-ed-Dowleh, chief of the guard, who very readily agreed to her plans, Ten slaves, bribed by 500 deenars each, having received their instructions, went forth on the appointed day to the desert tract south- ward of Cairo, where El-Hakim, unattended, was in the habit of riding, and waylaid him near the village of Hulwdn, where they put him to death.

He was succeeded by his son, Edh-Dhahir (commonly pro- nounced Ez-Zéhir) bi-ll4h Abu-l-Hasan ’Alee, who ruled with justice and moderation for nearly sixteen years. In 414 Aleppo was taken by Salih Ibn-Mardds; and although he was defeated and slain by an Egyptian force sent against him, a son, Shibl-ed- Dowleh, yet retained possession of that city. At this time also Hasan, of the tribe of Tei, before mentioned, had made himself master of Ramleh; and indeed from this caliph’s reign we may date the decline of the Fatimee powcr, especially in Syria.

In the ycar 427, El-Mustansir bi-llah Aboo-Temeem Ma’add came to the throne at the age of seven years. His reign occupied a long period, rendered remarkable by the unparalleled troubles which befell Egypt. It commeneed prosperously with the defeat and death of Shibl-ed-Dowleh. Aleppo was taken, and the submission of the rest of Syria followed ; and the general who had conducted the expedition against that provinec assnmed its government. On his death, Mo’izz-ed-Dowleh, a brother of Shibl-ed-Dowleh, retook Aleppo in 438; but the various fortunes of this prince and his nephew Mahmood, from this time and during the calamities of Egypt, are too complicated and subordinate to claim a place here. In the western provinces, the rebel El-Mo’izz (the third successor of Yoosuf Ibn-Zeyree,

who was appointed governor on the conquest of Egypt), was punished by an irrmption of wild Arab tribes in the pay of E]-Mustansir. m7

In the year 450 (a.p. 1058), the Fatimee caliph was publicly prayed for in Baghdad,—a remarkable event, of which the im- mediate cause was briefly as follows. El-Besaseeree, a powerful Turkish chief exercising unbounded authority in that city, had fallen into disgrace, and received supplies of men and money from the caliph of Egypt; and while the Seljookee sultan Tughnil-Beg espoused the cause of the ’Abbasee ealiph, his brother lbraheem Eynal revolted, jomed Fl-Besaseeree, and defeated Tughril-Beg. El-Besdseeree entered Baghdad, in which the combat eontinued to rage; and the unfortunate city was devastated by massacre and pillage. El-Mustansir was solemnly declared Prince of the Faith- ful, and the insignia of the legitimate caliph was sent to E1-Kahireh. The success of K~~Besaseeree, however, was but transient ; Tughril~~ Beg had, in the meantime, defeated and killed his brother Ibra- heem; he then entered Baghdad in Dhu-l-Kaadah 451, and despatched a force against El-Besasceree, who fell in a battle near ¥l-Koofeh.

A persecution of the Christians of Alexandria oceurred about this time ; and in 454 eommenced a desolating struggle between the blacks and the Turks, both of whom had become numerous in

Egypt. The former were succoured by the mother of E]-Mustansir,

herself a negress, while the command of the latter was taken by Nasir-ed-Dowleh Ibn-Hamdan, a general of El-Mustansir, more than once governor of Damascus, and at this period governor of Lower Egypt. To this man’s unscrupulous ambition was due much of the trouble which ensued. After many battles the Turks succeeded in destroying the power of their adversarics, and their leader assumed almost absolute authority, while they not only ex- torted from the caliph immense sums of money and treasure, but even rifled the tombs of his predecessors for the valuables which they contained. At the same time the bulk of the valuable library of the Fatimees was dispersed by these brigands. But the very

power of Nasir-ed-Dowleh threatened his overthrow. His sense of |

security in his position rendered him regardless of the support of the Turks ; and when at length his schemes for the deposition of i~~Mustansir brought matters to a crisis, a large portion of the army declared against him. Defeated and driven from the metro~~ polis, he succeeded in possessing himself of Lower Egypt, and a terrible civil war raged between the eontending parties. But an even heavier calamity afflicted Egypt. For seven successive years the inundation of the Nile failed, and with it almost the entire subsistence of the country, while the rebels intereepted supplies of grain from the north. El-Makreezee informs us that El-'Askar and Ki-Kataé' were depopulated, and that half the inhabitants of El-Fustat perished, while in Kl-Kdhireh itself the people were reduced to the direst straits. Bread was sold for 14 dirhems the 1 fb loaf; and all provision being exhausted, the worst horrors of famine followed. The wretched people resorted to cannibalism, and organized bands kidnapped the unwary passenger in the desolate streets by means of ropes furnished with hooks and let down from the latticed windows. In the year 462 the famine reached its height. It was followed by a pestilence; and in the midst of these horrors, Nasir-ed-Dowleh advanced on El-Kdhireh at the head of an enormous army ; he was induced to withdraw by the promise of large concessions, only to repeat the attack, and finally to make himself master of the city, after having inflicted a signal defeat on the caliph, who became only the nominal ruler of Egypt, a condition which lasted until the assassination of this powerful rebel in the year 465.

While these events were oceurring in Egypt, Syria was in a con- tinual state of anarchy and war. A distinguished gencral, the emeer E]-Guyoosh Bedr-ed-Deen El-Gemalee, held the government of Damascus during these times; and now El-Mustansir wrote, recalling him to assume the office of vizir of Egypt. On the eondition of being allowed to bring with him a veteran force, he, happily for the country, obeyed the summons, and to his talents was owing the restoration of order and even prosperity which followed. By a massacre of emeers at a grand banquet shortly after his arrival, and by numerous executions, he subdued all opposition in the capital ; and in a scries of brilliant victories he annihilated the savage hordes who infested the country throughout its whole extent, having either been called to the aid

of the con- tending parties, or voluntarily taken advantage of the universal confusion to commit their lawless ravages.

In concluding this necessarily extended notice of the reign of Fl- Mustansir, the invasion of Aksees with an army of Turkumans, Kurds, and Arabs, in the year 469, must be mentioned. Spread- ing devastation around them, they encamped near El-Kahireh; and in the first engagement defeated the forces of E1-Gemdlee ; but fortune favouring him in a second battle, the enemy was totally routed with immense earnage.

K}-Mustansir reigned 60 ycars, and died in the year 487. He was a weak prince, solely given up to pleasure. El-Gemdélee had governed with almost absolute authority and great ability for a period of 20 years, dying only a few days before the caliph. While admiring El-Gemalee's talents, we cannot but condemn his severity. He built the mosque which gives its name to the mountain immediately S.K. of the citadel of Kl-Kahireh (Gehbel-El-Guyooshee), and the second wall of the city, with its three principal gates, Bab-Zuweyleh, Bab-en-Nasr, and Béb-cl-Futooh. These gates, which are very fine speciinens of architecture, are said to be the work of three Greek brothers.

El-Mustaalee bi-llah Abu-l-Kasim Ahmad succeeded his father ; but a son of El-Gemalee, El-Afdal, had the principal management of the affairs of the kingdom. This caliph's reign is memorable for the First Crusade. l-Afdal had taken Jerusalem from the Turks in the year 491 (A.D. 1098); and a few months later it yielded to the Crusaders, after a siege of 40 days. El-Afdal arrived shortly after its fall with a reinforcement of 20,000 men, but he was defeated in the battle of Ascalon. Later, an Egyptian army, commanded by Saad-ed-Dowleh, was worsted by Baldwin, count of Edessa, and the general was killed in the action. From this period, with the exception of some efforts made in the next reign, to the time of Saléh-ed-deen ("Saladin"), Egypt was too much oceupied with intestine troubles to equip expeditions against the various parties who now struggled for the possession of Syria. El Mustaalee died in the year 495. He is stated to have been a Sunnee, a strange anomaly in a dynasty of Shiya'ees,

His son E]-A'mir bi-ahkami-llah Aboo-'Alee Mansoor came to the throne at the age of five years, and until his arrival at man- hood the government was econdueted by El-Afdal. The first act of the caliph, however, on taking it into his own hands, was to put his ministcr to death, and appoint in his stead a man whose wickedness obliged him to imprison him and afterwards condemn him to death. 'The rule of El-A'mir was chiefly remarkable for his impiety and tyranny, and for the successes of the Crusaders, who, having reduced many of the principal eoast-towns in Syria, medi. tated the eonquest of Egypt, and crossed the frontier, but were deterred from the prosecution of their enterprise by the illness of Baldwin, whose death took

place at El-Areesh, on his way back to Jerusalem, EJ-A'mir was put to death in 524, at the town of EI- Geezeh, it is said by partisans of El-Afdal, whose son then usurped the entire government, setting up, as caliph, El-Hafidh li-deeni. lah Abd-El-Megeed, a grandson of El-Mustansir (El-Amir having left no male issue), but without the usual ceremonies of installation, This vizir, Aboo-'Alee Ahmad, even forbade the mention of E]- Hafidh in the public prayers, and inserted his own name in his stead. He perished in a popular tuinult, roused by his extortions and arbitrary rule, and El-Hafidh was duly declared caliph and received the oaths of allegiance. After the death of Ahmad, he successively appointed three other vizirs; but these proving equally refractory, he at length dispensed with that office altogether, He reigned nearly 20 years. The licentiousness of his son and successor, Edh-Dhafir bi-aadai-llah Aboo-Mansoor Isma'eel, occa- sioned his death in four years and seven months at the hand of his vizir Kl-' Abbas.

El-Faiz bi-llah Abu-l-Kasim 'Kesa Ibn-'Alec was, on his accession in 549, only five years of age, and the history of his times pre- sents merely the contentions of rival vizirs, of, whom the chief were E]-Melik Ks-Salih Tataé Ibn-Ruzzeyk, aud his competitor El-'Abbas, before named. 'The latter, finding his power failing, gathered together the wealth he had amassed and fled to Syria, where he fell into the hands of the Crusaders, who stripped him of all that he had and detained him a prisoner. Eventually he was given up to Tataé and crucified over the gates of the palace.

El-Faiz died in the year 555, and El-'Adid li-deeni-lah Aboo- Mohammad Abd-Allah, a grandson of El-Hafidh, and the last of the Fatimee ealiphs, was raised to what was then but the shadow of a throne, the entire power being in the hands of Tataé, who by his oppression and cruelty well-nigh rendered El-'Adid, by nature benevolent and wise, as tyrannical as himself. He was assassinated after a year by the secret orders of the caliph, and the latter to conceal his agency in this act installed his son F}-'Adil in his place. At this time the well-known Shawir was governor of the Sa'eed (or Upper Egypt), a post next in importanee to that of prime minister. During the last three reigns the vizirs had been rapidly increasing in power; and the annals of the period are entirely oceupied with the rise and fall of potent grandees, all eager for a post which conferred on its possessor the supreme authority. At length, in the reign of this unfortunate prince, they consummated the

ruin of the dynasty and overwhelmed themselves in its fall. In 558 El-’Adil dispossessed Shawir of his government, and the latter had immediate reeourse to arms, marched against his enemy, and succeeded in putting him to death. He then constituted himself vizir, but in his turn was compelled to flee from a more powerful rival, Ed-Dirgham. Noor-ed-Deen (Noureddin), the sultan of Damascus, received the fugitive with favour ; and in the course of the next year (559) despatched an ariny to Egypt, under the command of Asad-ed-Deen Sheerkooh, to reinstate him. In the meantime Ed-Dirghdm had been busy putting to death the great men of the empire ; and having thus weakened his power, he offered but a feeble resistance, was over-thrown ina battle near the tomb of the Seyyideh Nefeeseh, on the S. of El-Kahireh, and Shawir was restored. No sooner, however, was this effected, than he forgot the engagements into which he had entered with Noureddin, and threw off his allegiance to him. Sheerkooh retired to the Sharkeeyeh, and occupied the town of Lilbeys, and thence threatened Shawir. In this position of a the latter had recourse to the Crusaders, who willingly responde to his call, and Amaury, king of Jerusalem, arrived with a or siderable force. With these allies, Shawir besieged his former protector in Bilbeys, until, hearing of Noureddin’s successes Me the Franks iu Syria, they negotiated a peace, and permuttec Sheerkooh to withdraw from Egypt. About two years later, Noureddin, determined on punishing the treachery of Shawi, again sent Sheerkooh into Egypt with a great army, and we panied by his nephew, the famous Saladin. Shawir agam ee to strengthen himself by an alliance with Amaury, from W he received the first intelligence of the meditated i : Apprised of this knowledge of his movements, Shect ae changed his course from Bilbeys, entered the valley of the ; : at some distance above Cairo, and erossing the river mar i northwards to El-Geezeh. Here he cndeayoured to ni people against Shawir and his Frank confedcrates ; and ha se some measure succeeded when the superior forces of the enemy

eompelled him to retreat southwards as far as El-Babeyn, near Ashmooneyn, where he risked an engagement, and gained a complete victory. This suceess opened to the invaders the greater part of Kgypt, and Alexandria itself fell into their hands. Saladin was placed in that city with a

numerous garrison, and his unele departed to subdue the rest of Egypt. The Crusaders, how- ever, at onee closely invested Alexandria, and so pressed the siege for three months, as to oblige Sheerkooh to eome to its relief. An honourable compromise was effected, by whieh the Syrians agreed to resign their conquests and evaeuate Egypt. But fresh troubles were in store for this unfortunate eountry. Amaury, irritated at the result of a eampaign in which he had only lost, determined on an expedition against his recent ally ; and, entering Egypt, took Bilbeys, putting its inhabitants to the sword, and laid siege to El-Kahireh, his course being marked by,;the most dreadful barbarities. On his approach, the ancient eity of El-Fustat was set on fire by order of the vizir, to prevent it falling into the enemy's hands, and it continued burning somewhat more than fifty days. El-'Adid now earnestly sought the aid of Noureddin; and that monarch, actuated by religious zeal against the Franks, who had already felt his power in Syria, aud by the desire of conquest, onee more Rsatehed Sheerkooh. In the meantime negotiations had been opened with Amaury to raise the siege of El-Kahireh, on payment of an enormous sum of money; while, however, the conditions were yet unfulfilled, the approach of the Syrian army indueed him to retreat in all haste. Sheerkooh and Saladin entered the eapital in great state, were received with honour by the caliph and with obsequiousness by the perfidious Shawir, who was eontriv- ing a plot which was fortunately discovered and for which he,paid with his head. Sleerkooh was then appointed vizer by El-' Adid, but dying very shortly, he was sueceeded in that dignity by Saladin 564 (A.D. 1169). .

For the short period which elapsed before Saladin's assump- tion of the title of sultan a few words will suffice. One of his first acts was to put to death the ehief of the eunuehs, and a revolt of the blacks resulted; a combat took place in El-Kahireh in the street called Beyn-el-Kasreyn; and the maleoutents being worsted, the disturbances were quelled. Baha-ed-Deen Karakoosh, a white eunuch, who afterwards played a prominent part in the reign of Saladin, was appointed to the vacant post. This gave the vizir great influence in the palace, of which he jndi- eiously availed himself. In 565 we hear of Amaury with Greek allies unsuecessfully besieging Damietta; and in the following year, Saladin conducted an expedition against the Franks to Asealon and Ramleh. In, 567, by order of Noureddin, he sup- pressed the name of El-'Adid in the congregational prayers, and substituted that of the

’Abbasee ealiph, a masterly stroke of policy to secure the adhesion of the orthodox Muslims. The last of the Fatimees was lying dangerously ill, and his relations eon- eealed from him his degradation. He died without the knowledge of it, and with him perished an illustrious but unfortunate dynasty.

Saladin was thus relieved of the most serious obstacle on his way to the throne; yet he dared not throw off his allegiance to the sultan of Damascus, but prudently waited fora favourable opportunity. Noureddin’s suspicion was already aroused, and he died (in 569) while secretly pre- paring to proceed in person to Egypt. Saladin almost immediately proclaimed himself sultan of Egypt, and inaugurated his reign with a series of brilliant successes. With the conquest of El-Mo’izz, Egypt again took an important place among the nations; and by the wars of Saladin it became the nucleus of a great empire. But military glory was not the sole aim of this prince and his Successors. The patronage they continued to extend to letters and the arts had the most beneficial effect upon the civilization of the country.

Saladin, whose full appellation was El-Melik En-Nasir Nalth-ed-deen Yoosuf Ibn-Eiyoob, acquired his greatest renown by his campaigns against the Crusaders in Syria. As these belong, however, more properly tu the history of those wars than to that of Egypt, they will be more briefly noticed in this place than would otherwise be necessary. The youth of El-Melik Es-Sdlih Isma’eel, the son and suc- cessor of Noureddin, and the consequent confusion which prevailed in his dominions, gave Saladin a fair pretext to occupy Damascus, as the guardian of the young prince, and enabled him to wrest from him his kingdom. He thus considerably enlarged his territory, made himself master of & great portion of Syria, and continued to consolidate his power in those parts until the year 572 (a.p, 1178), when

Philip, count of Flanders, laid siege to Antioch, and Saladin entered Palestine. Having encamped before Ascalon, the Egyptian troops ravaged the neighbouring country, and set fire to Joppa, until at length Baldwin the Leper, king of Jerusalem, issued from Ascalon and gave them battle. The

result was disastrous to Saladin: his army was totally routed, and he himself fled alone on a dromedary. After this, however, he gained some partial advantages over the Christians, till a terrible' famine induced him two years later to conclude a truce with the king of Jerusalem and to retire to Egypt.

In the year 576 he again entered Syria and made war on Kilij-Arslan, the Seljookee sultan of Anatolia, and on Leon, king of Armenia, the Cilicio-Armenian kingdom, both of whom he forced to make terms of peace. Not long after his return, Saladin departed from Egypt (a.H. 578) to prosecute a war with the Crusaders in which neither side desired peace. Their hostility was aggravated by the following circumstances. A vessel bearing 1500 pilgrims had been wrecked near Damietta, and its passengers captured; and to the remonstrances of the king of Jerusalem the sultan replied by complaining of the constant inroads made by Renaud de Chatillon. At this time the latter turbulent chief undertook an expedition against Eyleh, and for this purpose constructed boats at Karak and conveyed them on caniels to the sea; but this flotilla was repulsed, and the siege raised by a fleet sent thither by El-Adil (" Saphedin "), the brother of Saladin, and then his viceroy; and a second attempt was still more unfor- tunate, the Christian captives on that occasion were sacri- ficed in the valley of Mina. Having threatened Karak, Saladin encamped at Tiberias, and ravaged the territory of the Franks; he then besieged Beyroot, but in vain; and thence turned his arms against Mesopotamia and subdued the country, but the city of Mosul successfully resisted him. In the meanwhile, the Crusaders contented themselves with miserable forays across the enemy's borders, and made no serious preparations for the return of their redoubtable antagonist. The latter, having been almost everywhere suc- cessful in Mesopotamia, took Tell-Khalid and 'Eyn-Tab in Syria and obtained possession of Aleppo; he again be- sieged Karak, ravaged the territory of Samaria, and later received the fealty of the lord of Mosul, but not thekeys of the city. ;

In the year 582 (1186 of our era) war again broke out between Saladin and the Crusaders. The sultan had respected a truce into which he had entered with Baldwin the Leper, and Renaud, before named, was the first to break it. 'The capture by the latter of a rich caravan enraged Saladin, who despatched orders to all his lieuten- ants and vassals, summoning them to assist in the " Holy War." He marched (A.p. 1187) from Damascus to

Karak, and there laid close siege to Renaud ; at the same time a large body of cavalry under the command of his son, E~~Afdal, advanced on Nazareth; and here a body of 130 Knights Hospitallers and Templars, seconded by a few hundred foot soldiers, and encouraged by the heroic Jacques de Maillé, marshal of the Temple, by their devotion im~~ mortalized their memory. Only the Grand Master of the Temple and two of his knights escaped from the unequal struggle. Soon after, Saladin approached in person at thie head of an army of 80,000 men; and the Christians with their whole force encountered him ou the shore of the Lake of Tiberias. The result of the battle which ensued was the heaviest blow which had yet fallen on the Crusaders. Weakened by thirst, shaken by the flight of a part of their troops on the second day of combat, and overwhelmed by numbers, the knights fought with desperate courage, but at length were forced to the hills of Hitteem. A multitude fell in this bloody fight, and among the prisoners were Guy VII. — 95

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de Lusignan (the king of Jerusalem and successor of Baldwin), with his brother and Renaud de Chatillon. The number of prisoners is almost incredible; and the massacre of many of them is an indelible stain on the glory of the. generally merciful Saladin, ‘Tiberias, Ptolemais (Acre), Nabulus, Jericho, Ramleh, Caesarea, Arsoor, Joppa, Beyroot, and many other places successively fell into the hauds of the conqueror. Tyre resisted his attacks: but Ascalon surrendered on favourable terms, and the fall of Jerusalem crowned these victories. The great clemency of Saladin on this occasion is chronicled by Christian historians, though it is but slightly mentioned by the Muslims, who took offence at the mercy shown to the euemies of their faith.

After these events Tyre was again besieged, and when about to capitulate was relieved by the arrival of Conrad, son of the marquis of Montferrat. The valiant defence of the town wearied Saladin, who turned his arms against Tripoli; but here he met with no better success. Bohe- mond, prince of Antioch, and at that time possessor of Tripoli also, was, however, glad to obtain a truce of eight months ; and some strongholds (among others Karak) were taken. But now the fortune of war turned against the sultan. The ever-

memorable siege of Acre, maintained with equal constancy by both Christians and Muslims, lasted upwards of two years, and attracted the attention of the whole ,western world. At length the immense rein- forcements received by the besiegers, and the presence of Richard Coeur de Lion of England and of Philip II. of France, enabled them to overcome all resistance, and the standards of the Cross floated on the ramparts of the city (A.D. 1191). A horrible act of barbarity was here perpe- trated: 2700 Muslim captives were massacred in cold blood, in consequence of Saladin's having failed to fulfil the terms of the capitulation; and the palliative plea of the heat of an assault cannot be urged in extenuatiou of this enormity. Richard has been accused of being its author ; but Michaud believes with reason that it was decided on in a council of the chiefs of the Crusade. On another occasion, however, that king was certainly guilty of similar cruelty.

After a period of repose and debauchery, the army of the Crusaders, commanded by Richard, directed its march towards Jerusalem. Saladin harassed his advance on every point, rendered the cities and strongholds defenceless, and ravaged the country. Richard, nevertheless, was ever victorious ; his personal bravery struck terror into the Muslims, and he gained a signal victory over the sultan in the battle of Arsoor. But dissensions among the chiefs of his army and the uncertain temper of the commander himself debarred the Crusaders from the attainment of their great object, the deliverance of the Holy City; and when all the coast from Joppa to Tyre was in the hands of the Christians, and the army of Saladin was threatened with disorganization, a treaty was concluded, and Richard set sail on his return to England. The glory acquired by Saladin, and the famous campaigns of Coeur de Lion, have rendered the Third Crusade the most memorable in history, and shed a lustre on the arms of both Muslims and Christians greater than they ever attained in those wars, – either before or afterwards.

Saladin died about a year after the conclusion of this peace (A.H. 589 or 1193 of our Era) at Damascus, at the age of fifty-seven years. Ambition and religious zeal appear to have been his ruling passions; he was comrageous, magnanimous, and merciful, possessed of remarkable military talents and great control over himself. His generosity to the vanquished and his faithful observance of his passed word are lauded by the historians of the Crusades;

the former brought on him much obloquy among his own fierce soldiers, and is a trait in his character Which is worthy of note in the annals of a time when this

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virtue was extremely rare. While engaged in the conduct of his continual wars, he was not unmindful of the welfare of Egypt, and during his reign many public works were executed. Of these we may mention especially the citadel of Cairo, with the magnificent buildings which, until very recently, it contained ; the third wall of the city; and the repair of the great canal called the Bahr Yoosuf, a very important and useful work. From the year 578 until the period of his death he had not entered Egypt; but his brother El-Melik El'Adil Seyf-ed-deen (Saphedin) and other princes of his family successively governed that country, and the eunuch Kardkoosh, who also defended Acre, held a large share of authority.

On the death of Saladin, his extensive dominions were divided chiefly among his sons, and Egypt fell to the lot of one of them, El-Melik El-'Azeez Imad-ed-Deen 'Othman, The grandees sup- ported his claim to the throne, and he proved himself worthy of their choice. In conjunction with El-'Adil, we find him warring against the leaders of the Fourth Crusade. He reigned nearly six years, and was succeeded (in 595) by his son El-Mansoor Moham- mad, whose uncle El-Afdal was compelled to relinquish the government of Damascus and assume the regency of Egypt. Dis agreement among the sons of Saladin had occurred soon after that monarch's death, and now hastened the rise of El-'Adil, who, by his military talents and other remarkable qualities, had excited the fears of even his brother. With the view of checking his growing ascendancy, El-Afdal formed an alliance against him with Edh- Dhahir, another son of Saladin and lord of Aleppo, and besieged him in Damascus ; but coming to strife, they raised the siege in 597. This attempt proved fatal to the power of El-Afdal. He was pur- sued to Egypt, in his turn besieged in El-Kahireh, and forced to flee, and El-'Adil was proclaimed sultan. Having dethroned El-

Mansoor, he speedily recovered Damascus from the hands of the confederate brothers, and Syria with Egypt acknowledged his supremacy. El-’Adil (as Saphedin) is especially known by his opposition to the Fourth and Sixth Crusades, the former of which took place before his accession to the throne. He repulsed the Christians near Nabulus, captured Joppa, and encountered the enemy between Tyre and Sidon. He was there defeated with heavy loss, and Sidon, Laodicea, Gibleh, and Beyrout were taken. But the Crusaders wasted their strength before the fortress of Thoron. El- Adil raised the siege of that place, and although afterwards he met with a reverse near Joppa, his adversaries bought a dear victory ; and, having come to terms of peace, they returned to Europe. In the year 600 (A.D. 1204) he departed to Syria with the object of securing Jerusalem against threatened attacks, and concluded a truce which he offered to renew when about to expire ; and to prove his pot faith, he strengthened that offer by promising to cede ten castles to the Christians. These overtures were refused, and the Muslim army drove the newly arrived king of Jerusalem, Jean de Brienne, back to Europe. Those who remained then professed their willingness to accede to conditions of peace, and we do not again hear of El-’Adil in Palestine until 614 (a.p. 1217), when he was once more called thither to oppose the Crusaders; but a serious invasion of Egypt by these troublesome adventurers hastily recalled its king, and he died of grief, it is said, on hearing of the advantages gained by them.

El-Kamil immediately (615) came to the throne, and took the most energetic measures for the protection of his kingdom. In the meantime, the Franks had besieged Damietta both by sea and land ; and, notwithstanding every effort for the relief of the place, its garrison was forced to capitulate. El-Kémil summoned to his aid the princes of his family, and with every available man watched the enemy’s movements. Flushed with success, Jean de Brienne commenced his march on the capital; and with the characteristic carelessness of the Crusaders he took no measures to secure supplies. His advance was stopped at the junction of the canal of Ashmoon with the Nile, where he found El-Kamil in a very strong position. Encamped on the opposite shore, the invaders depended for supplies on Damietta and its immediate district; but the inundation of the Nile gradually obstructed land-carriage, and El-Kamil, skilfully availing himself of this natural ally, caused boats to be carried ovel- land to the enemy’s rear, and, thus cut off by land

and water, they were compelled to attempt a retreat. At Beyramoon, however, @ further progress was found to be impossible, the inundation ha covered the level country, and the sultan’s boats blockaded the Nile. The Franks surrendered, and evacuated Damietta, but not — Egypt had suffered severcly from the ravages they committe : The town of El-Mansoorah was founded on the site of El-Kémil : camp, and commemorates his energy and sagacity. The ti: Crusade was invited by the same sultan who had thus suffered y an invasion of the Franks. In a.p. 1228, El-Kémil invoked a aid of Frederick IJ, against his brother El-Moadhdham, lord ©

Damaseus, and, in consequence of this alliance, Jerusalem, with Bethlehem and the places between it and Joppa and Aere, Nazareth and the territory of Thoron and Sidon, with its dependeneies, was eeded to Frederick on the 20th of Feb. 1229. Between these two monarchs existed the most friendly relations, presenting a curious speetacle in the midst of the intrigues and hatred of their subjects for each other, and endangering their popularity and even their lives. After various expeditions against his brother and his sue-eessors, E]-Kamil gained possession of Damaseus, and died there in the year 635 (A.D. 1238). He was distinguished by military talents and rare moderation, and was also a learned man, a patron of the arts, and a good king.

His son, El-Melik El-’ Adil the Younger, was deelared sultan of Egypt and Syria, with the eonsent of the nobles, and he speedily banished those ministers whose counsels he feared, and appointed ereatures of his own. Oppressed by his tyranny, and impoverished by his extravagance, the people called his brother Es-Salih Negm- ed-Deen Eiyoob to the throne ; and he deposed and imprisoned El- *Adil in the year 637, and to replenish his exhausted treasury, ordered all who had received presents from the late sultan to restore them to his successor. In the next year serious disturbanees broke out in Syria; ‘Imad-ed-Deen, who had taken Damaseus in the reign of El-’Adil, formed an allianee with the Franks, and purposed the conquest of Egypt; the hostile armies met at Acre, and the Muslim soldiers of ’lmad-ed-Deen deserting to the banner of Fs-Salih Eiyoob, the Frankswere routed. Negotiations for peace were then attempted, but these failing, the Franks

were again induced to take the field by the cession of Jerusalem and other places. The king of Egypt, on his part, ealled to his assistance the Tatars of Kharesm, who took Jerusalem and overran Syria. In the next campaign (642) they were joined by the army of Es-Salih, under the command of his favourite slave Beybars, or Bibars, who was destined to play a eonspieuous part in Egyptian history. At Gaza the allied army met the Franks, eager to avenge themselves on the Khares- mees for the horrible atrocities of which they had been guilty in the preeeding cainpaign, and willingly joined by the Muslim prinees of Damascus, Hims, and Karak ; on the first day the battle raged With unabated fury from daybreak to sunset, and was eontinued on the morrow until the prinee of Hims, having lost 2000 men, gave way and fled towards Damaseus. Tlie Christians maintained the unequal fight with great eonstancy, and were only vanquished after the greater number had fallen. In these eneounters 30,000 men (Christians and Muslims) were either killed or taken prisoners. Various successes followed this victory, Jerusalem was taken by the Egyptians, and Es-Salih laid siege to Damaseus in person. The city having eapitulated on favourable conditions, his fierce allies, enraged at the loss of pillage, quarrelled with him, and soon after joined his rebellious subjeets. Damaseus was reduced to the direst straits, but again fortune favoured Es-Sdlih. He hastened from Egypt, whither he had returned, and totally defeated the enemy. Other advantages were gained by his commander Fakhr-ed-Deen over the Franks in 645.

Although attacked by illness, the sultan was once more called to Syria to quell fresh troubles; but at Damascus news reached him of the threatened invasion of Egypt by the Crusaders under St Louis, and he travelled back in great suffering from his malady. Damietta, which he rightly judged would be the first point of attack, was strengthened and well stored, and its defence was intrusted to Fakhr-ed-Deen. On Friday, June 4, a.p. 1249, the French anehored before the place, and the next day landed opposite the camp of the Egyptian general, who offered but slight opposition, and in the eourse of the next night betrayed his trust and retreated southwards. His army was preeipitately followed by the entire population of Damietta, and this important town with its stores fell into the hands of the invaders without a blow. Fakhr-ed-Deen nearly lost his life for this aet of cowardiee, and fifty-four of his principal offieers were put to death. In the meantime the sultan’s illness gradually increased, but nevertheless he caused himself

to be removed to the town of El-Mansoorah, whieh he fortified, and there he expired on Nov. 21, at the age of forty-four, and after a reign of ten years. He it was who introdueed the Bahree Mem- looks, a body of Turkish slaves, who composed his body-guard, and eventually usurped the supreme power. Their name Bahree (or ** of the river ”) originated in their being trained and quartered on the island of Er-Rédah, where the sultan had built a palace.

The French were advaneing southwards, and, notwithstanding the preeautions of Sheger-ed-Durr (the widow of Es-Salih, whio assumed the regency), were apprised of the death of the sultan. Many partial actions took place on the march, and on Dec. 19, their army appeared before I1-Mansoorah, the scene of the disaster of Jean de Brienne. Skirmishing continued until Shrove Tuesday, when, a traitor having shown the enemy a ford over the eanal of Ashmoon, they surprised the eamp and town. Very severe fighting ensued, Fakhr-ed-Deen fell early in the struggle, and the plaee was hearly lost, when the Bahree Memlooks led by Beybars furiously charged the assailants, and completely turned the fortune of the day. The morrow witnessed another battle,

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Crusaders, and a succession of misfortunes followed. Tooran-Shah, on hearing of the death of his father, travelled in all haste from Mesopotamia to Egypt, and having reaehed the camp assumed the command. He had recourse to the stratagem whieh had proved so suecessful under the direetion of El-Kamil, and cut off the supplies of the enemy. This, eoupled with disease, soon reduced St Louis to great straits, and he sent to propose a truce, but not coming to terms he resolved on retreating to Damietta. A memorable con- flict took place by land and water, and St Louis with his troops surrendered themselves prisoners of war.

Tooran-Shah now gave himself up to debauchery, offended his nobles by bestowing his favours only on certain ereatures whom he had brought with

him from Mesopotamia, and alarmed the queen by forcing her to render him an account of his father's wealth. Sheger-ed-Durr appealed to the Memlooks, a conspiracy was formed, and the snltan was attacked in his palace. He fled to a pleasure- tower built on the banks of the Nile, which was set on fire in the presenee of his army, the wretehed king, from the summit, in vain promising to abdieate. He perished miserably, and his eorpse lay unburied for many days on the bank. On his accession he had strangled a brother, and his fate deserves no pity.

Sheger-ed-Durr (vulgarly ealled Shegeret-ed-Durr), herself a slave, and the first of the Dynasty of the LBahree, or Turkish Memlooks, sueeeeded to the throne; and *Izz-ed Deen Eybek was appointed commander of the forces. After many delays, St Louis agreed to pay 400,000 livres as a ransoin for himself and his army, 200,000 to be paid in Egypt, and the remainder on the fulfilment of certain stipulations at Acre : Damietta was surrendered and Egypt evaeuated. Thus ended the last invasion of Egypt by the Crusaders. Sheger-ed-Durr, in order to strengthen herself on the throne, shortly after married the emeer Eybek, and caused him to be proelaimed sultan, with the title of El-Melik El-Mo'izz, in the year 648. The followers of the late Es-Salih, however, obliged Eybek to associate with himself in the sovereignty a young prinee of the family of Eiyoob, El-Melik El-Ashraf Mudhaffar-ed-Deen Moosa. En-Nasir, a son of 'El-'Azeez, invaded Egypt, and after many com- bats was driven back to Syria, but the country continued ,in a very unsettled state. The chief of the adherents of the fallen dynasty was arrested by Eybek ; and Beybars and other leading men hav- ing repaired to the citadel to demand satisfaction, his bloody head was thrown to them from the framparts, and in terror they fled to Syria. El-Ashraf was then cast into prison, and there he died. But Eybek soon roused the jealousy of his beautiful and ambitious wife ; and he was assassinated by her orders (655, A.D. 1257). In her turn she was beaten to death, not many days after, by the wooden clogs of the female slaves of another wife of Eybek, and her eorpse was exposed for three days in the moat of the eitadel.

El-Melik El-Mansoor Noor-ed-Deen 'Alee, son of Eybek, was now raised to the throne, and Beybars being apprised of the death of his rival attempted to regain his power in Egypt; but Kutz, the viceroy of Kybek and also of his son, attaeked and routed him; and he soon after (657) desposed El-Mansoor,

and declared himself sultan. El-Melik El-Mudhaffar Kutz began his reign by putting to: death El-Mansoor and Sharaf-ed-Deen, the able minister of the last Eiyoobee kings and of the first of this dynasty. A reign thus eruelly eommeneed ended tragieally. Kutz was diverted from these severe measures by the advanee of Hoolagoo, grandson of Genghis-Khan, who, with a formidable army, overran El-‘Irak and Syria. By great efforts ‘Kutz raised a eonsiderable foree and marelred to meet him. ‘The intelligence of the death of the Moghul emperor had, however, in the meantime recalled Hooldgoo, who left Ketboogha to encounter the Egyptian sultan. The battle declared in favour of the latter, and Syria was restored to his rule. Returning in triumph to Egypt, he was assassinated on the frontier by Beybars in the year 658, and this Memlook (who had but recently fought under his banner against the Tatars) was forthwith ehosen by the emeers to be his suecessor.

The brilliant reign of El-Melik Edh-Dhahir Beybars El-Bun- dukdaree is so perplexed and full of ineident as to render a con- cise aceount of it very difficult. It began with the reduction of a revolt in Syria. The rebels were supported by a Tatar army under Hooldgoo, but Beybars was everywhere vietorious, and Damascus surrendered at diseretion. Having subdued all opposition in this quarter, he endeavoured to improve the condition of Egypt, abolished the exorbitant imposts under whieh the people groaned, and welcomed to his eourt Ahmad, son of the caliph Edh-Dhahir, who was deelared Prince of the Faithful with the title of El- Mustansir bi-ll4h, and furnished with a small foree, by which he hoped to establish himself in Baghdad. He was, however, repulsed by the Tatars and put to death. The suceeding line of caliphs, possessed of spiritual, but no temporal authority, remained at the eourt of the Memlook sultans until the Turkish eonquest. From this time, Beybars continned to extend and eonfirm his rule. His first expedition was to Syria against the Christians, and the Church of the Nativity at Nazareth was destroyed. Thence he went to the fortified town of Karak, which had more than once resisted the attacks of Saladin, but opened its gates to the Memlook conqueror,

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and its territory was added to his dominions. A great scarcity atllicted Cairo in 662, and Beybars threw open the Government stores, and strove in every way to alleviate the suffcrings of his subjects.

In 663 he again entered Syria, and took Cesarca and Ursoof ; and in the next year he commenced a series of campaigns against the Christians, notwithstanding the earnest remonstranccs of the kings of France, of Aragon, and of Armenia. To raise the neces- sary funds for the expenses of the war, he took occasion from the occurrence of many incendiary fires in Cairo, during his absence, to mulct their co-religionists of the sum of 500,000 deenars, osten- sibly to repair the damage caused by these fires. He tlireatened Acre, and took Safad; and relieved from the apprehensions caused by the advance of the Tatars by the death of Hooldgoo and the retreat of his army, Beybars despatched a force which effected the conquest of Armenia, and penetrated to the borders of Anatolia, a transient success which was speedily annnlled by the advent of Abaka Khan, the son of Hoolagoo. In the next war, Beybars again attacked the Christians, burning their churches and enslaving the people. He took Antioch, with horrible carnage, advanced to Hims and Hamah, and thence returned to Cairo. After a cam- paign against the Tatars, he ravaged the country around Acre (the constant object of his attacks), and the ‘‘ Assassins,” so long the terror of dynasties, submitted to his power. About this time the Tatars renewed their inroads and besieged Beyrah; and in the year 671 Beybars took the ficld against them with two armies, one commanded by himself in person, the other by Kala-oon El-Elfee. In the battle of Beyrah the sultan was completely vietorious, and the Tatars fled to the mountains of Kurdistan. In consequence of this victory, Armenia again fell into his hands, and was given up to pillage. Abakd Khan afterwards was again repulsed at Beyrah. Nubia also about this time acknow- ledged the authority of Beybars. He died at Damas¢us in the year 676, after another expedition against Anatolia, attended with various success, in which the Tatars were lcagued against him. Great military talents, coupled with the most indefatigable activity, Beybars certainly possessed, but he used his conquests unmercifully ; on many occasions he ravaged whole provinces, and sacked many towns, putting great numbers of the inhabitants to the sword. The melancholy annals of the Crusades bear ample testimony to this fact ; and while the example of other monarchs, and of the Franks themselves, may be urged as

some palliation, nevertheless his bar- barity remains an indelible blot on his eharacter. In Egypt he endeavoured to reform abuses and suppress vice ; and numerous public works were executed by his orders. Damictta was razed and rebuilt farther inland ; and the mouth of the Nile was protected by a boom against sudden invasion. He repaired the fortifications of Alexandria and the Pharos, the mosque El-Azhar in Cairo, and the walls of the citadel, and built the great mosque known by his name to the north of the city.

The son and successor of Beybars, El-Melik Es-Sa'eed Barakeh Khan, was exiled after a short reign of two years, aud a younger brother El-'Adil Selamish, raised to the throne, Kald-oon El-Elfec acting as regent. This Memlook had married a daughter of Bey- bars, and was consequently nearly allied to the sultan. He never- theless conspired against him, and was soon proclaimed king by the title of El-Melik El-Mansoor. Distinguished in former wars, he achieved many successes during his reign of ten years. On his accession he despatched an army to reduce disturbances in Syria, and took Damascus. Peace was thus established in that province ; and in the year 680 he in person defeated a very superior force of Tatars and raised the siege of Rahabeh. Later in his reign (in the year 688) he besieged Tripoli, which for nearly two centuries had been in the possession of the Christians and was very rich and flourishing. The town was sacked and its unfortunate inhabi- tants put to the sword. His memory is still preserved in Cairo by his lospital and mad-house adjoining his fine mosque in the principal street of the city. This charitable institution he is said to have'founded as an expiation for great severity towards the citizens in enforcing an obnoxious edict. His son, El-Ashraf Khaleel, rendered himself famous by the siege and capture (in the year 690) of Acre, the last stronghold of the Crusaders in Syria. Many thousands of its inhabitants were massacred; and 10,000 who pre- sented themselves before the sultan and demanded quarter were slaughtered in eold blood. Healso took Erzeroom in 691, and two years after was assassinated in Egypt (A.D. 1294).

El-Melik En-Nasir Mohammad, another son of Kald-oon, suc- ceeded him at the age of nine years.. The regent Ketboogha, how- ever, followed the example of Kala-oon, and usurped the sove- reignty, with the title H]-Melik El-'Adil. Pestilence and famine were followed by war with the Tatars, who

again ravaged Syria. Ketboogha despatched an army against them, but the valour of his troops was unable to withstand overpowering numbers, and Lageen, Kald4-oon's governor in Syria, was driven into Egypt with an immense crowd of fugitives. Ketboogha was deposed on the allegation that he had not commanded in person, and El-Melik El-Mansoor Lageen was elevated in his stead. In little more than

two years this king was deposcd in a conspiracy. His character was amiable, and he deserved a better return for the cquity and kindness he showed to his subjects.

A short period of confusion then ensued, during whieh an emeer was proclaimed king. En-Nasir Mohammad, however, was at length recalled from his cxile at Karak, and restored in the year 698. Having firmly established himself in Egypt, he led an army against the Tatars, but met with a scvere reverse in the plains of Hims ; a second expedition proved more fortunate, and En-Nasir, then only nineteen years of age, gained a bloody and decisive vietory over the enemy near Damascus, in the year 702, The battle lasted threc days ; during the first two the result was not decisive, although En-Nasir held the field; on the third day the Tatars were utterly routed and pursued for many hours, The sultan on his entry into Cairo after this achievement was preceded by 1600 prisoners, each one carrying the head of a comrade slain in the combat, and 1000 other heads were borne on lances in the procession. En-Nasir reigned until the ycar 707, when he went to Karak and voluntarily abdicated. He had long struggled against the control of two powerful emeers, Beybars and Silar; and in despair of throwing off their ascendcncy, he then openly yielded the reins of government to those who had long really held them. Since this prince's accession the Christians and Jews of Egypt suffered the most severe persecution (excepting that of El-Hakim) which had yet befallen them. In the year 700, they were ordered to wear blue and yellow turbans respectively, and forbidden to ride on horses or mules, or to receive any Government employment. The people took advantage of these measures to destroy many churches and synagogues. The churches continued shut for about a year ; but some of those which had been destroyed were afterwards rebuilt at the request of, Lascaris and other, princes.! Another event of this period was a great earthquake which half ruined Cairo, giving it the

appearance of a city demolished by a siege; Alexandria and other towns of Egypt, as well as Syria, also suffered from it considerably.

On the abdication of En-Ndsir, El-Melik El-Mudhaffar Rukn- ed-Deen Beybars II. was saluted sultan; but ere long En-Nasir recovered lus courage, and having collected an army marched to Damascus, where he was acknowledged, and thence to Egypt, entcring Cairo without opposition. El-Mudhaffar had fled at his approach, and, never a favourite of the people, he was attacked on his exit from the metropolis, by a crowd of the citizens, who loaded him with abuse, and pelted him with stones. El-Nasir now for the third tine ascended the throne of Egypt, and took the entire authority into his own hands. The remainder of his life was a period of profound peace, during which he occupied himself in im- proving his dominions, and in embellishing Cairo, But another persecution of the Christians occurred in 721, and all the principal churches in Egypt were destroyed by certain fanatieal Moslems. The sultan threatened a general massacre of the inhabitants of Cairo and El-Fustat; the Christians, lowever, took revenge themselves by setting fire to very many mosques and houses m the metropolis; much tumult ensued, and many Christians and Muslims were executed. The threats of the mob induced En- Nasir to permit the people to murder and plunder any Christian whom they might nieet in the streets; and the oppressive rules before enacted were rigorously enforced, and made even more degrading. ,

The sons of En-Nasir followed him in succession, but the reigus of most of them were short and troublous. El-Mansoor Seyf-ed- Deen Aboo-Bekr, El-Ashraf ’Ali-ed-Dcen Koojook, En-Nasir Shi- hab-ed-Deen Ahimad, Es-Salih ’Imad-ed-Decn Isma’cel, El-Kamil Zeyn-ed-Decn Shaaban, and El-Mudhaffar Zeyn-ed-Deen Haggee were only raised to the throne to be either exiled or put to death. After these, the sultan Hasan deserves notice. He was deposed by his brother, Es-Salih Salah-ed-Deen, whose minister was Sheykhoon, a man well known to students of Egyptian subjects; but he soon regained his authority, reigned seven years, and at length fell by the swords of his memlooks in the splendid mosque which he built in the open space beneath the citadel of Cairo. Four more Memlook kings bring the history to the accession of a uew dynasty. These were El-Mansoor Nasir-ed-Deen Haggee (son of El-Mud- haffar), deposed in six months ; El-Ashraf Shaaban

(son of Hasan); an unfortunate prince, whose reign passed away amid the in of the fainéant caliphs and the struggles of the now too powerful emcers,by whom he was ultimatcly strangled; his son, El-Mansoor ’Ala-ed-Deen, the victim of similar troubles, in whose time the celebrated Barkook rose to the regency; and Es-Salih Haggee, Hl brother of the last king. Exiled by Barkook, who was proclaime sultan, he unsuccessfully endeavoured to rceover his throne m the year 784; in 790 (A.D. 1388) he was restored, but he was soon once more dethroned, this time with the loss of his life. .

The sultan Edh-Dhahir Seyf-ed-Deen Aboo-Sa’eed Barkook was ee eee ee ee ee

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now undisputed master of Egypt. He was the first prince of the Dynasty of Burgee or Cireassian Memlooks. As the preceding dynasty was founded by the Turkish Memlooks of Es-Salih Kiyoob, go this dynasty was composed of the Circassian slaves whom those kings from time to time bought with the view of strengthening their power. They were originally placed in garrison-towns, and hence their name Burgee, signifying ‘‘of a tower or eastle.” It is worthy of remark that, while many of the sultans of both these dynasties held an insecure tenure of power, inany of the former met with a violent death, but few of the latter. The reign of Barkook is memorable for his war with Teemoor, or Teemoor-leng, eommonly called by us Tamerlane, who had extended his conquests towards his dominions, but found him not unprepared, for he had foreseen the threatened danger. In the year 795, Kara-Yoosuf, lord of Kl-Medeeyeh, and Ahmad lbn-Uweys, sultan of Baghdad, fled to his court forsueeour. The inhabitants of Mdessa had been put to the sword, and Aleppo was menaced with a similar cata- strophe, when Barkook at the head of his army eame to its relief. Ahmad was reinstated in Baghdad, as a vassal of Barkook; and soon after the

’Othmanlee Bayezeed, commonly called by us Bajazet, eoncluded a treaty with the sultan of Egypt. His designs against India diverted Teemoor from his projects in Syria, but Barkook con- tinued vigilant and by cvery means sought to insure the safety of his kingdom. He died suddenly in 801, much beloved by his subjects and regarded by less powerful chiefs as their strongest bulwark against the Tatar monarch. He was called ‘‘Sheykh” for his wisdom and learning, and combined with these qualitics those of a skilful general and a good king. He was active, wary, and provident, and possessed the military talents of Beybars with- out his severity. He seems to have been fond of riches and dis- play, and he eertainly left his treasury in a very flourishing oo besides mueh wealth in stores, slaves, horses, and the ike.

His son, El-Mclik En-Nasir Abu-s-Sa’ddat Farag, fell a prey to intestine troubles and the inroads of the invader. He had over- come a revolt of the governor of Syria, when Teemoor again threatened that province. Kara-Yoosuf and Ahmad sought refuge with the son of their former proteetor, and Farag’s refusing to betray his guests gave oceasion to the enemy to continue the war ; a battle was fought, Farag was defeated, Aleppo aud Hims fell into the hands of the victor, and the Egyptian forces returned aud were concentrated in Egypt, Intimidated, however, by the fall of his ally Bajazet, Farag sent an embassy to Teemoor with preseuts and oflers of amity, and at length concluded a peace at the sacrifice of territory. Teemoor died in the year 807 (A.D. 1405), and Farag was preparing an expedition to recover his Syrian possessions, when he Was surprised in his palace by an insurrection, headed by his brother, *Abd-el-’ Azeez, and compelled to take to flight. The people believing that he had perished proclaimed El-Mansoor ’Abd-el-’Azeez his successor, In the space of less than three months, however, he was deposed in favour of Farag, who theneeforth reigned at Damascus, until the caliph El-Musta’een bi-llah, at the instigation of the emeer Sheykh El-Mahmoodee, who had raised an army, boldly deelared himself sultan, by an appeal to religion gained numbers to his side, instituted criminal proceedings against Farag on the plea of the exactions which he had been forced to levy for the conduct of the war against Teemoor, and accomplished his death. Farag was beheaded in the month of Safar in the year 815, and his corpse was left unburicd. Abu-l-Mahasin gives him the vharacter of an extravagant, crnel, and voluptuous king.

El-Musta’een bi-lah, with the title of El-Melik El-’ Adil Abu-l- Fadl, began his reign well; but he had appointed El-Mahmoodee his vizir as a reward for his serviees, and this powerful and Vigorous chief soon obliged him to abdicate and eventually exiled him to Alexandria, where he passed the remainder of lis days.

E]-Melik El-Mu-eiyad Abu-n-Nasr Sheykh El-Mahmoodee (origin- ally a memlook of Barkook’s) waged three successful wars in Syria, in the first of which he was guilty of a breaeh of faith in putting to death the governor of Damascus and part of the garrison of that city, after they had surrendered on promise of safety. He rcigned peacefully in Egypt, and his name is recorded as that of a king who studied the happiness of his subjects and favoured the learned, who counted him among theirnumber. But he was avaricious ; although one might judge the contrary from his beautiful mosque and the minarets over the Bab-Zuweyleh in Cairo, held to be among the ehief ornaments of the city.

Threc kings followed in rapid suceession :—El-Mudhaffar Ahmad, a son of El-Mu-eiyad, under two years of age at his accession, Edh- Dhahir Tatar, and his infant son, Es-Sélih Mohammad, who was deposed by Barsabay Ed-Dukmakce. This Memlook assumed the title of El-Melik E]-Ashraf, and worthily eontinued the prosperous leign of El-Mu-eiyad. In power and virtue he ranks seeond only to Barkook among all the kings of this dynasty. He is known in European history by his expedition in 827 (A.D. 1424) against John Ill., king of Cyprus, who became his vassal, and by the part he took, about seven years later, in the dissensions of the house of Savoy and the government of Cyprus. He ruled for seventeen

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years with great elemency, and died in 841. El-’Azeez Yoosuf, his son, was deposed by El-Mansoor Aboo-Sa’ced Jakmak El-’Ala-ee, a good prinee, and a patron of the learned. After a peaceful reign he abdicated at the age of about eighty years in favour of his son, El-Mansoor Abu-s-Sa’adat ’Othman, who was over- thrown by the intrigues of the ealiph El-Kaim bi-amri-lah, and was succeeded by an aged Memlook, El-Ashraf-Abu-n-Nasr

Kynal, followed by his son, El-Mu-eiyad Shihab-ed-Deen Abu-l- Fet-h Ahmad, Edh-Dhahir Seyf-ed-Deen-Khéshkadam, a Greek by birth, superseded him, reigning himself for seven years, with equity and benignity, presenting a contrast to the cruelty and oppression of his appointed suceessor, Ed-Dhahir Aboo-Sa'eed Bilbay El-Ald-ee, which caused the latter's fall and the elevation of the sultan Aboo-Sa'eed Temerbeg Edh-Dhahiree, who, in his turn, was deposed to make room for El-Ashraf Kait Bey, a prince who deserves especial notiee for his struggles with the Turks, whereby the conquest of Egypt by the Porte was deferred for a few years. After a period of quiet which followed his aceession, he was alarmed by the victory gained by Mehemet Il. over his ally the king of Persia, and posted a eonsiderable foree on the frontier of Syria. The suecesses of the conqueror of Constantinople made him desire to abdicate; but the emeers prayed him to defend his rights, and he consequently preparcd for the war. The death of Mehemet, and the dissensions between Bajazet I]. and Jem (or Zizim) temporarily relieved him of these apprehensions. The fall of Jem, however, and his arrival at the Egyptian court, implicated the Memlook sultan in the quarrel; and on the final overthrow of this prince Kait Bey made sure of a war with the more fortunate Bajazet, and himself began aggressive measures, intercepted the Turkish earavan of pilgrims, and an ambassador from India who was on his way to Constantinople with presents, and took Tarsus and ange A remonstranee from Bajazet was answered by a successful aftack on his Asiatic commander, 'Ala-ed-Dowleh. In the meantime Tarsus and Adaneh were recovered from him; but the emeer El-Ezbekee, to whom was entrusted the conduct of all future wars, being despatched against these towns, retook them, defeated an army sent to chastise him, and annexed Karamania. Another force was speedily equipped, and took the field in 893 ; conditions of peaee were refused, aud considerable suceess attended the Turkish arms. El-Ezbekee was, therefore, again ordered to Syria; a Turkish squadron conveying troops was dispersed, and at Tarsus he gave battle. The result was at first unfavourable to the Memlooks, whose commander, however, rallied them under eover of the night, and suceeeded in surprising and totally defeat- ing the Turks. Long negotiations followed this vietory ; and at length Kait Bey, who was always most anxious for peace, ceded the disputed towns of Tarsus and Adaneh, and secured repose during the rest of his days. He died in 901, having designated El- Melik En-Ndsir Abu-s-

Sa’ddat Mohammad as his successor. This weak and barbarous king was put to death aftcr four years, during whieh he was deposed, and Kainsooh, surnamed Khamsameeych, and Edh-Dhéhir Abu-n-Nasr Kausooh were successively installed. The first reigned but eleven days, and the latter abdicated after five months of great difficulty and danger. On the death of En- Nasir, El-Ashraf Kansooh Janbalat was elevated to the throne, but six months sufficed to accomplish his fall, and he was fortunate in preserving his life. The next sultan, El-Melik El’ Adil Too- man Bey, was acknowledged both in Egypt and Syria. He, how- ever, was overthrown and killed in a few months.

The Memlooks now compelled Kansooh El-Ghooree to assume the dangerous dignity, with the title of El-Melik El-Ashraf. This prince very unwillingly yielded. His previous life shows hin to have been both virtuous and learned ; and he proved himself to be an able ruler. After an unesucessful expedition against the Portu- guese in the East, he reigned in peace until the year 915, when Kurkood, the father of Selim I., the Turkish sultan, obtained his protection and assistance. Events similar to those which accompanied the end of Jem followed; and Selim availed himself of a pretext to declare war against Egypt. The first reverse whieh the Egyptians suffered occurred to an army commanded by ’Ala-ed- Dowleh, formerly defcated by Kait Bey, but now in the pay of El- Ghooree. The winter was passed by the latter in preparing ener- getieally for the inevitable struggle, and in the spring he advanced in person. Selim, on his part, pretended to march towards Persia ; but at the same time he sent to demand of El-Ghooree wherefore he opposed his passage and commanded in person on the frontier. El-Ghooree replied that his was merely an army of observation, and that he was desirous of mediating between Selim and Isma’ecl Shah. Selim, however, rapidly advanced, refused to listen to an attempt at negotiation, and was met by E1-Ghooree on the plain of Marj-Dabik, near Aleppo. A long and sanguinary battle ensued, and victory declared for neither side, until Kheyr Bey, eommand- ing the right wing, and El-Ghazalee the left, of the Egyptian army, basely deserted to the cnemy with their troops. The centre then gave way and fled in utter confusion, notwithstanding the efforts of the sultan to rally them. He was trampled to death by his routed cavalry, while (according to some) in the act of prayer,

This event took place on the 26th of Regeb 922 (A.D. 1516). With his death Egypt lost her independence. The shattered remains of the army collected in Cairo. Tooman Bey, a nephew of the deceased king, was elected sultan, and at once determined on every resis- tance to the conqueror. His general in Syria, H~~Ganbardee, dis~~ puted the road with Selim step by step, and Tooman Bey awaited his arrival near Cairo. Between Kl-Khankah and the metropolis, at the village of Er-Reydaneeych, the opposing armies joined battle, on the 29th of Zu-l-Heggeh (January 1, 1517). The fall of a favourite gencral, Sinan Pasha, infuriated the Turks, and the brilliant bravery of the Memlooks availed them not. Immensc numbers of them were slain by their enemies in the pursuit, and the survivors reunited in Cairo. El-Ganbardee, however, sacrificed his fame by joining the victor. The Turkish army paused for rest ; and time was thus given to Tooman Bey to hire Arabs at a great cost to replenish his thinned ranks. Selim now passed to the west of Cairo, A night surprise conducted by Tooman failed, but he succeeded in putting to the sword a great many Turks. He fortified himself in the city, and a house-to-house combat en- sued, the Memlooks' defending every foot with the energy of despair ; the citadel fell by assault, and the unfortunate Tooman effected his escape towards Alexandria; but on the way le was taken by Arabs, given up to El-Ganbardee and another, and brought in chains to Selim, who at first received him with honour, but afterwards falsely accused him of couspiring against him, and, with the cruelty and perfidy characteristic of his race, hung him over the Bab-Zuweyleh, the place of execution for common male- factors, Thus miserably perished the last independent ruler of Egypt, who possessed the best qualities of his line, and whose noble defence of his kingdom would have secured to him the commisera- tion of any but a Turk.

In reviewing the period during which Jeypt was governed by independent Muslim princes, it is Mécessary to consider the spirit of the times and the people over whom they ruled. They succeeded to the government of countries worn out by incessant warfare, overrun by savage hordes, and debased by the rule of the Lower Empire. Egypt had long struggled against the slavery to which it was con- demned, and the history of the last three dynasties of Pharaohs evinces the patriotism which yet animated her people.

But the successive tyranny of the Persians, the Greeks, and the Romans appears to have annihilated their nationality; and when the Arabs invaded the country, these causes, combined with religious strife, induced the people to afford to the conquerors every assistance in their power. But the changeful rule of the leutenants and the troubles of the caliphs debarred Egypt (except at times under the Benee-Tooloon and the [khsheedeeyeh) from profiting by the enlightenment of the race who held the dominion over it, until the conquest by the Fatimees. The caliphs of that dynasty contributed in a great degree to restore to Egypt some portion of its ancient prosperity, and with the house of Eiyoob it attained its greatest military glory under the Muslims; but the edifices erected during the rule of the two dynasties of Memlook kings, the libraries collected in Cairo at that period, and the learned men who then flourished would point to it as the age in which literature and the arts were cultivated with the most success, a sure evidence of the internal prosperity of any country. This is the more surprising when we consider the state of Syria, which had long before their accession fallen a prey to intestine wars and the ravages of the Tatars, the Crusaders, and other invaders, and also bear in mind the constitution of their government, in which the more powerful chiefs were constantly aiming at the supreme authority ; and the practice of purchasing memlooks, and rearing them in the households of the great to enable their masters to maintain their ascendency augmented the number of these aspirants to the throne. These slaves were, unlike the Bahrees (who were the Turkish Memlooks of Es-Salih Eiyoob), chiefly Circassians, who afterwards composed the Second (or Bur- gee) Dynasty. Many of the Memlovk sultans rivalled in military achievements the great Saladin, and even penetrated further than he in their foreign expeditions. In Cairo are still seen the finest specimens of Arab architecture, almost all dating during the period comprised under the domination

of the two Memlook dynasties; the libraries of the mosques, and the private collections of that city, though grievously injured since the Turkish conquest, are or very recently were the best and most considerable of thoge

of Egypt or Syria; and, as before remarked, the university El-Azhar is still, owing to the fostering care of these sultans, the principal seat of learning of the Eastern world, In this sketch of the history of Egypt we have given no account of the state of commerce, taxation, &c., under the Muslims. Those only who have read the Arab histories of this and other Eastern countries can appreciate the general fallacy of the conclusions based on their authority.

It would be tedious and unprofitable to follow the details of Turkish misrule and tyranny which are from this time presented to the student of Egyptian history. Although Selim had apparently destroyed the power of the Memlooks, he thought it wise to conciliate them, and to appoint twenty-four beys over the military provinces of that number into which he divided Egypt, subject to the supreme control of a pasha, whose council was formed of seven Turkish chiefs (djiklees), while one of the beys held the post of Sheykh el-Beled, or Governor of the Metro- polis, an officer who becaine an object of hatred to the other chiefs, This system was begun by Selim, and com- pleted by his successor. For nearly two centuries the successive pashas were mostly obeyed; but the ambition of becoming Sheykh el-Beled was the fruitful cause of intrigue and murder. The Memlooks who then held power in Egypt were called the Ghuzz, that being the name of the tribe to which they are said to have at first generally belonged ; and they continually bought slaves, of Circassian or Georgian race, to supply the place of children, for they did not intermarry with natives of Egypt, and women of more northern climates are generally either barren or bear sickly offspring in that country. Thus they lacked the surest source of power ; few possessed any family ties; but at the same time the slaves in general were remarkably faithful to their patrons. After two centuries, the beys gradually increased in power, until the autho- rity of the pasha was almost nominal, and the govern- ment became a military oligarchy. This brings us to the rise of the celebrated Ali Bey. He was created Sheykh el-Beled in a.p. 1177; but, having revenged himself on an old enemy who had assassinated Ali’s master, to whom he owed his elevation to the rank of bey, he shortly after fled to Syria, and took refuge with the governor of Jerusalem, and thence went to Acre, where the Sheykh Dhahir became his friend; and that same year he returned to Cairo in his former capacity of Sheykh el-Beled. In 1179 his enemies again compelled him to flee, and he betook himself this time to

El-Yemen, once more to return to Egypt; after which be gained increased power. His favourite memlook, Mohammad Aboo-Dhahab, proved ungrateful, aud, while enjoying the highest power, entered into a conspiracy against his life ; but after receiving the presents of the hostile beys, he denounced them to his inaster, who would not listen to warnings of his meditated treachery.

In the year 1182 (a.v. 1768) the Porte demanded the assistance of Ali Bey in the Russian war, an order which he was.about to obey, when he was apprised of the depar- ture of a messenger with a firman demanding his head, he having been falsely accused at Constantinople of intending to aid the Russians and throw off his allegiance. He caused the bearer of this order to be waylaid and pub to death, and having possessed himself of the firman, he con-

1 Tt should, however, be mentioned that many of the most precious

of their contents are plunder brought from the libraries of mosqites in Syria, as is proved by seals which they bear,

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yened the beys, showed them the document, and aided by those of his own household persuaded the council to expel the pasha, and declare Egypt independent. The Sheykh Dhahir took part in this rebellion, and the pasha of Damascus was beaten by him between Mount Lebanon and Tiberias. A period of good but vigorous government and of tranquillity followed these events in Egypt, notwithstand- ing the very heavy imposts levied for the replenishment of the treasury ; and Ali’s generals gained for him extended power abroad. Mohaminad Aboo-Dhahab was despatched to Arabia, and entered Mecca, where the Shereef was deposed; and another bey traversed the eastern shores of the Red Sea. After the expedition to Arabia, Mohammad Bey marched into Syria to assist the Sheykh Dhahir against the Porte, and the co-operation of the Russians was demanded. A successful campaign terminated before the walls of Damascus, the siege of which was abandoned when nearly brought to a close, and Mohammad Bey returned

with large forces to Egypt. This man, loaded with benefits by his patron, now openly rebelled ; and being joined by Ali's enemies, at the head of whom was Ismail, chief of the guard, he advanced on Cairo, and Ali escaped to his steady ally, Sheykh Dhahir, the prince of Acre. These events took place the year 1186. Mohammed Bey was then declared Sheykh el-Beled. Ali Bey, in the meanwhile, in conjunction with his ally, gained various advantages in Syria, and, on the information that his return was desired in Egypt, he collected a small force, assisted by Sheykh Dhahir and a Russian squadron, and determined on attempt- ing to recover his power. He, however, fell into an ambuscade near Es-Saliheeyeh, and was wounded by one of his memlooks named Murad (afterwards Murad Bey), carried to the citadel, and poisoned by Mohammad Bey. Thus terminated the career of the famous Ali Bey, a man whose energy, talents, and ambition bear a strong resem- blance to those of the later Mehemet Ali,

Mohammad Bey continued Sheykh el-Beled, tendered his allegiance to the Porte, and was invested with the pashalik. He then entered Syria, and severely chastised Sheykh Dhéhir, taking Gaza, Joppa, and Acre itself. Joppa was taken by assault, and suffered a massacre of its inhabitants, and Acre was pillaged. At the latter place the pasha suddenly died. His mosque in Cairo is the latest fine specimen of Arab architecture, and is not unworthy of its better days.

The chief competitors for power were now Ismail, Ibrahim, and Murdd, the first of whom was speedily expelled, the contest continuing between the two latter beys. Ibrahim at length succeeded in causing himself to be pro- claimed Sheykh el-Beled, and Murad contented himself with the office of Emeer el-Hagg, or chief of the pilgrims; but this arrangement was not destined to be of long continuance ; a violent quarrel resulted in a recourse to arms, and that again in a peace of three years' duration, during which the two beys held an equal sway. In the year 1200 the Porte despatched Hasan Capitan (properly Kapoodan) Pasha (or High Admiral), with a Turkish force, to reduce the turbu- lent Memlooks to obedience, and to claim the annual tribute. Murad Bey was defeated at Er-Rahmaneeyeh, and the Turks advanced to Cairo, desolating the country, and acting according to their almost invariable practice on such oceasions. The metropolis opened its gates to Hasan Pasha, who determined on pursuing the beys to Upper

Egypt, whither he despatched a large portion of his army, and a sanguinary conflict took place. But a war with Russia re- called this commander to Constantinople. Ismail was again created Sheykh el-Beled, and he held that post until the terrible plague of the year 1205, in which he perished, and hence it is commonly called the “ Plague of Ismail.” His death caused the return of Ibrahim and Murad; and

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eight years after, intelligence of the arrival at Alexandria of a French army of 36,000 men, commanded by General Bonaparte, united these chiefs in a common cause.

On the 18th May 1798, this expedition, consisting of 13 sail of the line, 6 frigates, and 12 vessels of a smaller size, sailed from Toulon, and made the coast of Egypt on the Ist July. The troops were landed near Alexandria, and the city fell by assault on the 5th of that month. The French conquest and occupation of Egypt belong to Enropean history ; a recapitulation of the princi- pal events of the period will therefore suffice in this place. The Memlooks affected to despise their antagonist, and hastened to chastise him: at Shibirrees they attacked the French and were repulsed; but, nothing discouraged, they collected all their forces, exceeding 60,000 men, under the command of Murad, and entrenched themselves at Embabeh, opposite Cairo. Here was fought the battle which has been dignified with the name of that of the Pyramids. European tactics completely bewildered the Memlooks : their famous cavalry was received on the bayonets of the French squares ; a galling fire of grape and musketry mowed down their ranks ; and of this great army only about 2500 horse escaped with Murad Bey, while 15,000 men of all arms fell on the field of battle. Having made himself master of Cairo, Bonaparte despatched General Desaix to effect the conquest of Upper Egypt, and the success of the Eastern expedition seemed secured. But, ten days after the victory of Embabeh, the battle of the Nile annihilated the French fleet in Aboo- Keer (Aboukir) Bay, and most materially influenced the future conduct of the war. On this point, Napoleon him- self says, “La perte de la bataille d’Aboukir eut une grande influence sur les affaires d’Egypte et méme sur celles du monde; la flotte Francaise sauvée, l’expédition de Syrie n’éprouvait point d’obstacles, Vartillerie de

siége se trans- portait sdrement et facilement au-deld du désert, et Saint-Jean-d'Acre n'arrétait point Varmée Frangaise. La flotte Frangaise détruite, le divan s'enhardit 4 déclarer la guerre nla France. L'armée perdit un grand appui, sa position en Egypte changea totalement, et Napoléon dut renoncer x Vespoir d'asseoir & jamais la puissance Francaise dans VOccident par les résultats de l'expédition d'Egypte."! The disastrous expedition into Syria, undertaken for the purpose of frustrating the efforts of Sir Sydney Smith before Alexandria, and of Jezzir Pasha, who was advancing from Acre, still further obscured Napoleon's prospects in the Hast, and the victory soon after obtained by him over the Ottoman army at Aboo-Keer, the second defeat of Murad Bey, and various successes over the Turks, enabled the French general Kiéber (Napoleon having left for Europe after the first of these events) to set on foot negotiations for an honourable evacuation of the country. But when the convention was already signed, and the French were about to quit Cairo, Lord Keith signified to Kléber that Great Britain would not consent to the terms of the treaty ; and although this refusal was afterwards rescinded, Kléber considered that the. withdrawal came too late: he totally defeated 70,000 men under the grand vizir at Heliopolis, and returned to Cairo to quell an insurrection of the inhabitants. This distinguished officer was about this time assassinated in the garden of his palace by a fanatic, who was impaled in the great square (then a lake) called the Fzbekeeych, in Cairo, and miserably lingered for the space of three days before death put an end to his sufferings. Under Kléber's administration, Egypt began to resume its former prosperity: by his conciliatory and good govern- ment much prejudice against the ['rench was overcome ; by ceding a part of Upper Egypt to Murdd, he gained the good will of that chief, who gave him no cause to regret

1 Napoleon, ALémoires, t, il,

the Institute of Egypt collected the valuable mass of information embodied in the " great French work," the Description de ? Egypte.

On the death of Kléber, General Menou succeeded to the command, and although he afterwards conducted the defence of the country with much valour, yet to his in- judicious administration, and his want of military

talent, we must mainly ascribe the determination of the British Government to attempt the expulsion of the French from Egypt, and the rapid success of the campaign that ensued. On the 2d of March 1801 an army under Sir Ralph Abercroniby arrived in Aboo-Keer Bay, and made good a landing in the face of a well-disposed French force, which offered every possible resistance. The memorable battle of Alexandria, in which Abercromby fell, decided the fate of the war. A bold march, executed with talent, effected the capitulation of Cairo; Alexandria surrendered on the lst of September, and the French sailed from the shores of Egypt in the course of that month! General Hutchinson had taken the command of the English expedition, after- wards reinforced by a detachment from India under General Baird; and the army of the grand vizir, and that of the capitan-pasha, with the troops of Ibrahim Bey (Murad having died of the plague), had co-operated in the measures which led to the evacuation of the country by Menou.

The history now requires that we should mention the early career of a man who subsequently ruled the destinies of Egypt for a period of nearly forty years. Mehemet Ali Pasha was born in a.H. 1182 (4.p. 1768-9) at Cavalla, a small sea-port town of Albania. On the death of his father, in early life, he was brought up in the house of the governor of the town, who, as a reward for military prowess, gave him his daugliter in marriage. By her he had, it is said, his three eldest sons, Ibrahim,? Toosoon, and Ismail. Having attained the rank of biluk-bdshee (or head of a body of infantry), he became a dealer in tobacco, until, in his thirty-third year, he was despatched to Egypt with his patron’s son, Ali Agha, and 300 men, the contingent furnished by his native place to the Turkish expedition against the French ; and soon after his arrival in that country he succeeded, on the return of Ali Agha, to the command, with the nominal rank of beefibashee (or chief of a thousand men).

Soon after the evacuation of Egypt by the French, that unfortunate country became the scene of more severe troubles, in consequence of the unwarrantable attempts of the Turks to destroy the power of the Ghuzz. In defiance of promises to the English Government, orders were trans- mitted from Constantinople to Hoseyn Pasha, the Turkish high admiral, to ensnare and put to death the principal beys. Invited to an entertainment, they were, according to the Egyptian contemporary historian El-Gabartee, attacked on

board the flag-ship; Sir Robert Wilson and M. Mengin, however, state that they were fired on, in open boats, in the bay of Aboo-Keer. They offered an heroic resistance, but were overpowered, and some made prisoners, some killed, while some, including the afterwards celebrated ’Osman Bey El-Bardeesee, escaped in a boat, and sought refuge with the English, who at that time occupied Alexandria. General Hutchinson, informed of this treachery, imme- diately assumed threatening measures against the Turks, and in consequence, the killed, wounded, and prisoners

1 Very many of the French had either married Muslim women, or bought concubine slaves of the same faith, whom, on their departure, they left behind them; and these unfortunates were forthwith tied up in sacks and drowned.

? Ibrahim is, however, believed by many, or most, to have been the wife’s son by a former husband.

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this politic step ; while under his auspices the “savans” of | were given up to him.

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Such was the commencement of the disastrous struggle between the Memlooks and the Turks.

Mohammad Khusruf was thie first pasha after the expulsion of the French. The form of govermment, how- ever, was not the same as that before the French invasion, for the Ghuzz were not reinstated. The pasha, and through him the sultan, endeavoured on several occasions either to ensnare them or to beguile them into submission ; but these efforts failing, Mohammad Khusruf took the field, anda Turkish detachment 14,000 strong, despatched against them to Demenhoor, whither they had descended from Upper Egypt, was defeated by a small force under El-Elfee; or, as Mengin says, by 800 men left by El-Elfee under the command of El-Bardeesee. Their ammunition and guns fell into the hands of the Memlooks.

In March 1803 the British evacuated Alexandria, and Mohammad Bey El-Elfee accompanied them to England to consult respecting the means to be adopted for restoring the former power of the Ghuzz. About six weeks after, the Arnaoot (or Albanian) soldiers in the service of Khusruf tumultuonsly demanded their pay, and surrounded the house of the defterdar, who in vain appealed to the pasha to satisfy their claims. The latter opened fire from the artillery of his palace on the insurgent soldiery in the house of the defterddr, across the Ezbekeeyeh. The citizens of Cairo, accustomed to such occurrences, immediately closed their shops, and the doors of the several quarters, and every man who possessed any weapon armed himself. The tumult continued all the day, and the next morning a body of troops sent out by the paslia failed to quell it. Tahir, the commander of the Albanians, then repaired to the citadel, gained admittance through an embrasure, and, having obtained possession of it, began to cannonade the pasha over the roofs of the intervening houses, and then descended with guns to the Ezbekeeyeh, and laid close siege to the palace. On the following day, Mohammad Khusruf made good his escape, with his women and servants and his regular troops, and fled to Damietta by the river. This revolt marks the commencement of the rise of Mehemet Ali to power in Egypt, and of the breach between the Arnaoots and Turks which ultimately led to the expulsion of the latter.

Tahir Pasha assumed the government, but in twenty- three days he met with his death from exactly the same cause as that of the overthrow of his predecessor. He refused the pay of certain of the Turkish troops, and was immediately assassinated. A desperate conflict ensued between the Albanians and Turks ; and the palace was set on fire and plundered. The masters of Egypt were now split into these two factions, animated with the fiercest animosity against each other. Mehemet Ali became the head of the former, but his party was the weaker, and he therefore entered into an alliance with Ibrahim Bey, and ‘Osman Bey El-Bardeesee.

siderable body of Turks, and being in possession of Damietta, was enabled to offer an obstinate resistance. After much loss on both sides, he was taken prisoner and

brought to Cairo; but he was treated with respect.

The victorious soldiery sacked the town of Damietta, and were guilty of the barbarities usual with them on such occasions.

A few days later, Ali Pasha El-Tardbulusee landed at Alexandria with an imperial firman constituting him pasha of Egypt, and threatened the Beys, who now were virtual masters of Upper Egypt, as well as of the capital and nearly the whole of Lower Egypt. Mehemet Ali and El- Bardeesee therefore descended to Rosetta, which had fallen into the hands of a brother of Ali Pasha, and having recovered the town and captured its commander, El-Bardeesee purposed to proceed against Alexandria ; but the troops required arrears of pay which it was not in his power to give, and the pasha had cut the dyke between the Lakes of Aboo-Keer and Mareotis, thus rendering the approach to Alexandria more difficult. El-Bardeesee and Mehemet Ali therefore returned to Cairo. The troubles of Egypt were now increased by an insufficient inundation, and great scarcity prevailed, aggravated by the exorbitant taxation to which the beys were compelled to resort in order to raise money to pay the troops; while murder and rapine prevailed to a frightful extent in the capital, the riotous soldiery being under little or no control. In the meantime, Ali Pasha, who had been behaving in an out-rageous manner towards the Franks in Alexandria, received a khatt-i-shereef from the sultan, which he sent by his secretary to Cairo. It announced that the beys should live peaceably in Egypt, with an annual pension each of fifteen purses and other privileges, but that the govern-ment should be in the hands of the pasha. To this the beys assented, but with considerable misgivings; for they had intercepted letters from Alito the Albanians, endeavour- ing to alienate them from their side to his own. Deceptive answers were returned to these, and Ali was induced by them to advance towards Cairo at the head of 2500 men. The forces of the beys, with the Albanians, encamped near him at Shalakan, and he fell back on a place called Zufeyteh. They next seized his boats conveying soldiers, servants, and his ammunition and baggage ; and, following him, they demanded wherefore he brought with him so numerous a body of men, in opposition to usage and to their previous warning. Finding they would not allow his troops to advance, forbidden himself to retreat with them to Alexandria, and being surrounded by the enemy, he would have hazarded a

battle, but his men refused to fight. He therefore repaired to the camp of the beys, and his army was compelled to retire to Syria. In the hands of the beys, Ali Pasha again attempted treachery. A horseman was seen to leave his tent one night at full gallop ; he was the bearer of a letter to ’Osmén Bey Hasan, the governor of Kiné. This offered a fair pretext to the Memlooks to rid themselves of a man whose antecedents and present conduct proved him to be a perfidious tyrant. He was sent under a guard of forty-five men towards the Syrian frontier ; and about a week after, news was received that in a skirmish with some of his own soldiers he had fallen mortally wounded.

The death of Ali Pasha produced only temporary tran- quillity; in a few days the return of Mohammad Bey El-Elfee (called the Great or Elder) from England was the signal for fresh disturbances, which, by splitting the Ghuzz into two parties, accelerated their final overthrow. An ancient jealousy existed between El-Elfee and the other most powerful bey, El-Bardeesee. The latter was now supreme among the Ghuzz, and this fact considerably heightened their old enmity. While the guns of the citadel,

those at Masr El-’Ateekah, and even those of the palace of El-Bardeesee, were thrice fired in honour of El-Elfee, pre- parations were immediately commenced to oppose him. His partisans were collected opposite Cairo, and El-Elfee the Younger held El-Geezeh ; but treachery was among them ; Hoseyn Bey El-Elfee was assassinated by emissaries of El:Bardeesee, and Mehemet Ali, with his Albanians, gained possession of El-Geezeh, which was, as usual, given over to the troops to pillage. Inthe meanwhile El-Elfce the Great embarked at Rosetta, and not apprehending opposition, was on his way to Cairo, when a little south of the town of Manoof he encountered a party of Albanians, and with difficulty made his escape. He gained the eastern branch of the Nile, but the river had become dangerous, and he fled to the desert. There he had several hair- breadth escapes, and at last secreted himself among a tribe of Arabs at Ras-el-Wadee. A change in the fortune of El- Bardeesee, however, favoured his plans for the future. That chief, in order to satisfy the demands of the Albanians for their pay, gave orders to

levy heavy contributions from the citizens of Cairo ; and this new oppression roused them to rebellion. The Albanians, alarmed for their safety, assured the populace that they would not allow the order to be executed ; and Mehemet Ali himself caused a pro- clamation to be made to that effect. Thus the Albanians became the favourites of the people, and took advantage of their opportunity. Three days later they beset the house of the aged Ibrahim Bey, and that of El-Bardeesee, both of whom effected their escape with difficulty. The Memlooks in the citadel directed a fire of shot and shell on the houses of the Albanians which were situated in the Ezbekeeyeh ; but on hearing of the flight of their chiefs, they evacuated the place ; and Mehemet Ali, on gaining possession of it, once more proclaimed Mahomet Khusruf pasha of Egypt. For one day and ajhalf he enjoyed the title ; the friends of the late Tahir Pasha then accomplished his second degradation,! and Cairo was again the scene of terrible enormities, the Albanians revelling in the houses of the Memlook chiefs, whose hareems met with no mercy at their hands. These events were the signal for the reappear- ance of El-Elfee.

The Albanians now invited Ahmad Pasha Khursheed to assume the reins of government, and he without delay pro- ceeded from Alexandria to Cairo. The forces of the partisans of El-Bardeesee were ravaging the country a few miles south of the capital and intercepting the supplies of corn by the river ; a little Jater they passed to the north of Cairo and successively took Bilbeys and Kalyoob, plunder- ing the villages, destroying the crops, and slaughtering the herds of the inhabitants. Cairo was itself in a state of tumult, suffering severely from a scarcity of grain, and the heavy exactions of the pasha to meet the demands of his turbulent troops, at that time augmented by a Turkish de- tachment. ‘The shops were closed, and the unfortunate people assembled in great crowds, crying Y4 Lateef ! Ya Lateef! ‘“O Gracious [God] !” El-Elfee and Osman Bey Hasan had professed allegiance to the pasha ; but they soon after declared against him, and they were now approaching from the south; and having repulsed Mehemet Ali, they took the two fortresses of Tura. These Mehemet Ali speedily retook by night with 4000 infantry and cavalry; but the enterprise was only partially successful. On the following day the other Memlooks north of the metropolis actually penetrated into the suburbs; but a few days later were defeated ina battle fought at Shubra, with heavy loss

nnn nee 1 Khusruf Pasha afterwards filled with credit several of the highest offices at Constantinople. He died on the 1st of February 1855. He was a bigot of the old school, strongly opposed to the influences of Western civilization, and consequently to the assistance of France and England in the Crimean war.; eons | VIL — 96

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on both sides. This reverse in a measure united the two great Memlook parties, though their chiefs remained at enmity. El-Bardeesee passed to the south of Cairo, and the Ghuzz gradually retreated towards Upper Egypt. Thither the pasha despatched three successive expeditious (one of which was commanded by Mehemet Ali), and many battles were fought, but without decisive result.

At this period another calamity befell Egypt ; about 3000 Delees arrived in Cairofrom Syria. ‘These troops had been sent for by Khursheed in order to strengthen himself against the Albanians ; and the events of this portion of the history afford sad proof of their ferocity and brutal enormities, in which they far exceeded the ordinary Turkish soldiers aud even the Albanians. Their arrival immediately recalled Mehemet Ali and his party from the war, and in- stead of aiding Khursheed was the proximate cause of his overthrow.

Cairo was ripe for revolt; the pasha was hated for his tyranny and extortion, and execrated for the deeds of his troops, especially those of the Delees: the sheykhs enjoined the people to close their shops, and the soldiers clamoured for pay. At this juncture a firman arrived from Constanti- nople conferring on Mehemet Ali the pashalic of Jiddeh; but the occurrences of a few days raised him to that of Egypt.

On the 12th of Safar 1220 (May 1805) the sheykhs, with an immense concourse of the inhabitants, assembled in the house of the kadee; and the ’Ulema, amid the prayers and cries of the people, wrote a full statement of the heavy wrongs which they had endured under thie adininistration of the pasha. The ’UJema, in answer, were desired to go to the citadel; but they

were apprised of treachery; and on the following day, having held another council at the house of the kadee, they proceeded to Mehemet Ali, and informed him that the people would uo longer submit to Khursheed. “Then whom will ye have?” said he. ‘ We will have thee,” they replied, ‘to govern us according to the laws; for we see in thy countenance that thou art possessed of justice and goodness.” Mehemet Ali seemed to hesitate, and then complied, and was at once invested. On this, a bloody struggle commenced between the two pashas. Cairo had before experienced such conflicts in the streets and over the housetops, but none so severe as this. Khursheed, being informed by a messenger of the insurrection, immediately laid in stores of provisions and ammunition, and prepared to stand a siege in the citadel. Two chiefs of the Albanians joined his party, but many of his soldiers deserted. Mehemet Ali’s great strength lay in the devotion of the citizens of Cairo, who looked on him as their future deliverer from their afflictions ; and great num- bers armed themselves, advising constantly with Mehemet Ali, having the seyyid Omar and the sheykhs at their head, and guarding the town at night. On the 19th of the same month, Mehemet Ali besieged Khursheed. Retrenchments were raised, and the lofty minaret of the mosque of the sultan Hasan was used as a battery whence to fire on the citadel; while guns were also posted on the mountain inits rear. Afterthe siege had continued many days, Khur- sheed gave orders to cannonade and bombard the town; and for six days his commands were executed with little interrup- tion, the citadel itself also lying between two fires. Me- hemet Ali’s position at this time was very critical : his troops became mutinousfor their pay; the sildhdar, who had com- manded one of the expeditions against the Ghuzz, advanced to the relief of Khursheed ; and the latter ordered the Delees to march to his assistance. The firing ceased on the Friday, but recommenced on the eve of Saturday and lasted until the next Friday. On the day following, news came of the arrival at Alexandria of a messenger from Constantinople. The ensuing night in Cairo presented a curious spectacle ;

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many of the inhabitants gave way to rejoicing, in the hope that this envoy would put an end to their miseries, and fired off their weapons as they paraded the streets with bands of music. The silahddr, imagining the noise to be a fray, marched in haste towards the citadel, while its garrison sallied forth, and commenced throwing up retrenchments in the quarter of ’Arab-el-Yesdr, but were repulsed by the armed inhabitants and the soldiers stationed there; and during all this time, the cannonade and bombardinent from the citadel, and on it from the batteries on the mountain, continued unabated.

The envoy brought a firmd4n confirming Mehemet Ali, and ordering Khursheed to repair to Alexandria, there to await further orders; but this he refused to do, on the ground that he had been appointed by a khatt-i-shereef, The firing ceased on the fullowing day, but the troubles of the people were rather increased than assuaged; murders and robberies were daily committed by the soldiery, the shops were all shut and some of the streets barricaded, While these scenes were being enacted, EJ-Elfee was besieging Demenhoor, and the other beys were returning towards Cairo, Khursheed having called them to his assistance.

Soon after this, a squadron under the command of the Turkish high admiral arrived in Aboo-Keer Bay, with despatches confirmatory of the firman brought by the former envoy, and authorizing Mehemet Ali to continue to discharge the functions of governor for the present. Khursheed at first refused to yield; but at length, on con- dition that his troops should be paid, he evacuated the citadel and embarked for Rosetta.

Mehemet Ali now possessed the title of Governor of Egypt, but beyond the walls of Cairo his authority was everywhere disputed by the beys, who were joined by the army of the silahdar of Khursheed; and many Albanians deserted from his ranks. To replenish his empty coffers he was also compelled to levy exactions, principally from the Copts. An attempt was made to ensnare certain of the beys, who were encamped north of the metropolis. On the 17th of August 1805, the dam of the canal of Cairo was to be cut, and some chiefs of Mehemet Ali’s party wrote, informing them that he would go forth early on that morning with most of his troops to witness the ceremony, inviting them to enter and seize the city, and, to

deceive them, stipulating for a certain sum of money 4s a reward. The dam, however, was cut early in the preceding night, without any ceremony. On the following morning, these beys, with their memlooks, a very numerous body, broke open the gate of the suburb El-Hoseyneeyeh, and gained admittance into the city from the north, through the gate called Bab el-Futooh. They marched along – principal street for some distance, with kettle-drums behin each company, aud were received with apparent joy by the citizens. At the mosque called the Ashrafeeyeh they separated, one party proceeding to the Azhar and the houses of certain sheykhs, and the other continuilg along the main street, and through the gate called Bab Zuweyleh, where they turned up towards the citadel. Here iy were fired on by some soldiers from the houses ; and ee this signal a terrible massacre commenced. Falling i towards their companions, they found the bye-streets close ; and in that part of the main thorouglifare called Beyn-er Kasreyn, they were suddenly placed between iO Thus shut up in a narrow street, some sought refuge in t e collegiate mosque E]-Barkookeeyeh, while the remainder fought their way through their enemies, and escaped a the city-wall with the loss of their horses. Two memloo! had in the meantime succeeded, by great exertions, a giving the alarm to their comrades in the quarter x i Azhar, who escaped by the eastern gate called Bab ¢

themselves up in the Barkookceyeh.

nearly naked, and about fifty were slauglitered on the spot ; and about the same number were dragged away, with every brutal aggravation of their pitiful condition, to Mehemet Ali. Among them were four beys, one of whom, driven to madness by Mehemet Ali’s mockery, asked for a drink of water; his hands were untied that he might take the bottle, but he snatched a dagger from one of the soldiers and rushed at the pasha, and fell covered with wounds. The wretched captives were then chained and left in the court of the pasha’s house; and on the following morning the heads of their comrades who had perished the day before were skinned and stuffed with straw before their eyes. One bey and two others paid their ransom and were released; the rest, without exception, were tortured and put to death in the course of the ensuing night. Righty-three heads (many of them those of

Frenchmen and Albanians) were stuffed and sent to Constantinople, with a boast that the Memlook chiefs were utterly destroyed. Thus ended Mehemet Ali's first massacre of his too confid- ing enemies.

The beys, after this, appear to have despaired of regain- ing their ascendency; most of them retreated to Upper Egypt, and an attempt at compromise failed. El-Elfee offered his submission on the condition of the cession of the Feiyoom and other provinces; but this was refused, and that chief gained two successive victories over the pasha's troops, many of whom deserted to him.

At length, in consequence of the remonstrances of the English, and a promise made by El-Elfee of 1500 purses, the Porte consented to reinstate the twenty-four beys, and to place El-Elfee at their head ; but this measure met with the opposition of Mehemet Ali and the determined resistance of the majority of the Memlooks, who, rather than have El-Elfee at their head, preferred their present condition ; for the enmity of El-Bardeesee had not subsided, and he commanded the voice of most of the other beys. In pursuance of the above plan, a squadron under Salih Pasha, shortly before appointed high admiral, arrivedat Alexandria on the lst of July 1806, with 3000 regular troops, and a successor to Mehemet Ali, who was to receive the pashalik of Salonica. This wily chief professed his willingness to obey the commands of the Porte, but stated that his troops, to whom he owed a vast sum of money, opposed his depar- ture. He induced the Ulema to sign a letter, praying the sultan to revoke the command for reinstating the beys, persuaded the chiefs of the Albanian troops to swear allegiance to him, and sent 2000 purses contributed by them to Constantinople. El-Elfee was at that time besieg- ing Demenhoor, and he gained a signal victory over the pasha's troops; but the dissensions of the beys destroyed their last chance of a return to power. El-Elfee and his partisans were unable to pay the sum promised to the Porte ; Salih Pasha received plenipotentiary powers from Constan- tinople, in consequence of the letter from the 'Ulema; and, on the condition of Mehemet Ali's paying 4000 purses to the Porte, it was decided that he should continue in his post, and the reinstatement of the beys was abandoned. Fortune coutinued to favour the pasha. In the following month, El-Bardeesee died, aged forty-eight years ; and soon after, a scarcity of provisions excited the troops of El-Elfee to revolt. That bey very reluctantly

raised the siege of Demenhoor, being in daily expectation of the arrival of an English army; and at the village of Shubra-ment he was

attacked by a sudden illness, and died on the 30th of Thus was the pasha and shortly

after he defeated Shaheen Bey, with the loss to the latter

January 1807, at the age of fifty-five. U relieved of his two most formidable enemies ;

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Ghureiyib. A horrible fate awaited those who had shut Having begged for quarter and surrendered, they were immediately stripped

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of his artillery and baggage and 300 men killed or taken prisoners.

On the 17th of March 1807, a British fleet appeared off Alexandria, having on board nearly 5000 troops, under the command of General Fraser ; and the place, being disaffected towards Mehemet Ali, opened its gates to them. Here they first heard of the death of El-Elfee, upon whose co-operation they had founded their chief hopes of success ; and they immediately despatched messengers to his suc- cessor and to the other beys inviting them to Alexandria. The British resident, Major Misset, having represented the importance of taking Rosctta and Er-Rahmaneeyeh, to secure supplies for Alexandria, General Fraser, with the concurrence of the admiral, Sir John Duckworth, detached the 31st regiment and the Chasseurs Britanniques, under Major-General Wauchope and Brigadier-General Meade, on this service; and these troops entered Rosetta without encountering any opposition ; but as soon as they had dis- persed among the narrow strects, the garrison opened a deadly fire on them from the latticed windows and_the roofs of the honses. They effected a retreat on Aboo-Kcer and Alexandria, after a very heavy loss of 185 killed and 262 wounded, General Wauchope and three officers being among the former, and General Meade

and seventeen officers among the latter. The heads of the slain were fixed on stakes on each side of the road crossing the Ezbekeeyeh in Cairo.

Mehemet Ali, meanwhile, was conducting an expedition against the beys in Upper Egypt, and he had defeated them near Asyoot, when he heard of the arrival of the British. In great alarm lest the beys should join them, especially as they were far north of his position, he immediately sent messengers to his rivals, promising to comply with all their demands, if they should join in expelling the invaders ; and this proposal being agreed to, both armies marched towards Cairo on opposite sides of the river.

To return to the unfortunate British expedition. The possession of Rosetta being deemed indispensable, Briga- dier-General Stewart and Colonel Oswald were despatched thither, with 2500 men. For thirteen days a cannonade of the town was continued without effect; and on the 20th of April, news having come in from the advanced guard at El-Hamad of large reinforcements to the besieged, General Stewart was compelled to retreat; and a dragoon was despatched to Major Macleod, commanding at El-Hamad, with orders to fall back. The messenger, how- ever, was unable to penetrate to the spot ; and the advanced guard, consisting of a detachment of the 71st, two companies of tho 78th, one of the 35th, and De Rolles's regiment, with a picquet of dragoons, the whole mustering 733 men, was surrounded, and, after a gallant resistance, the survivors, who had expended all their ammunition, became prisoners of war. General Stewart regained Alexandria with the remainder of his force, having lost, in killed, wounded, and missing, nearly 900 men. Some hundreds of British heads were now exposed on stakes in Cairo, and the prisoners were marched between these mutilated remains of their

countrymen.

The beys became divided in their wishes, one party

being desirous of co-operating with the British, the other with the pasha. These delays proved ruinous to their cause ; and General Fraser, despairing of their assistance, evacuated Alexandria on the 14th of September. From that date to the spring of 1811, the beys from time to time relinquished certain of their demands; the pasha on his part granted them what before

had been withheld; the province of the Feiyoom, and part of those of El-Geezeh and Benee-Suweyf, were ceded to Shaheen; and a great portion of the Sa’eed, on the condition of paying the land- tax, to the others.** Many of them took up their abode in

(correctly Dunkulah), where the venerable Ibraham Bey died in 1816, at the age of eighty. As their numbers thinned, they endeavoured to maintain their little power by training some hundreds of blacks ; but again, on the approach of Ismail, another son of the pasha of Egypt, sent with an army to subdue Nubia ‘and Sennar, some re- turned to Egypt and settled in Cairo, while the rest, amounting to about 100 persons, fled in dispersed parties to the countries adjacent to Sennar.

Mehemet Ali, being undisputed master of Egypt, at the reiterated commands of the Porte despatched in 1811 an army of 8000 men, including 2000 horse, under the com- mand of Toosoon Pasha, against the Wahhdbees. After a successful advance, this force met with a serious repulse at the pass of Safra and Judeiyideh, and retreated to Yembo’. In the following year Toosoon, having received reinforcements, again assumed the offensive, and captured Medinah after a prolonged siege. He next took Jiddeh and Mecca, defeating the Wahhdbees beyond the latter place and capturing their general. But some mishaps followed, and Mehemet Ali, who lad determined to conduct the war in person, left Egypt for that purpose in the summer in 1813. In Arabia he encountered serious obstacles from the nature of the country and the harassing mode of warfare adopted by his adversaries. His arms met with various fortune ; but on the whole his forces proved superior to those of theenemy. He led a successful expe- dition in the Hijdz, and, after concluding a treaty with the Wahhiabee chief, Abd-Allah, in 1815, he returned to Egypt on hearing of the escape of Napoleon from Elba.

He now confiscated the lands belonging to private individuals, merely allowing them a pension for life, and attempted to introduce the European system of military — tactics. A formidable mutiny, however, broke out in the metropolis, the pasha’s life was endangered, and he sought refuge by night in the citadel, while the soldiery committed many acts of plunder. The

revolt was reduced by presents to the chiefs of the insurgents, and Mehemet Ali very honourably ordered that the sufferers by the late disturb- ances should receive compensation from the treasury. The project of the “ Nizim Gedeed,” as the European system is called in Egypt, was, in consequence of this commotion, abandoned for a time. ;

Soon after Toosoon returned to Egypt, but Mehemet Ali, dissatisfied with the treaty which had been concluded with the Wahhabees, and with the non-fulfilment of certain of its clauses, determined to send another army to Arabia, and to include in it the soldiers who had recently proved unruly. This expedition, under Ibrahim Pasha, left in the autumn of 1816. After several unimportant advantages, Ibrahim sat down before the town of Er-Rass ; but three months’ exertions proving unavailing, he raised the siege, with the loss of nearly half hisarmy. Notwithstanding, he advanced on the capital, Ed-Dir’eeyeh, by slow but sure steps. The last place before reaching that city offered a brave resist ance, and Ibrahim, in revenge, caused all its inhabitants to be put to the sword, except a number of women and children, the former of whom were spared not from motives of pity. Ed-Dir’eeyeh fell ‘after a five months’ siege, in the course of which an explosion destroyed the whole of the besiegers’ powder ; and had the Wahhdbees been aware of the extent of the disaster, few, we may believe, would have escaped to tell the tale, ’Abd-Allah, their chief, was taken, and with his treasurer and secretary was sent to Constantl- nople, where, in spite of Ibrahim’s promise of safety, and of Mehemet Ali’s intercession in their favour, they were paraded and put to death. At the close of the year 1819, Ibrahim returned to Cairo, having conquered all present opposition in Arabia, but without having broken the spirit of the Wahhabees.

Cairo, but tranquillity was not secured ; several times they met the pasha’s forces in battle, and once gained a signal victory. arly in the year 1811, the preparations for an expedition against the Wahhdbees in Arabia being complete, all the Memlook beys then in Cairo were invited to the ceremony of investing Mehemet Ali’s favourite son, Toosoon, with a pelisse and the command of the army. As on the former occasion, the unfortunate Memlooks fell into the snare. On the Ist of March, Shaheen Bey and the other chiefs (one.only excepted) repaired with their retinues to the citadel; and were courteously received by the pasha. Having taken coffee, they

formed in proces- sion, and, preceded and followed by the pasha's troops, slowly descended the steep and narrow road leading to the great gate of the citadel; but as soon as the Memlooks arrived at the gate it was suddenly closed before them. The last of those who made their exit!before the gate was shut were Albanians under Salih Koosh. To these troops their chief now made known the pasha's orders to massacre all the Memlooks within the citadel ; therefore, having returned by another way, they gained the summits of the walls and houses that hem in the road in which the Memlooks were incarcerated, and some stationed themselves upon the eminences of the rock through which that road is partly cut. Thus securely placed, they commenced a heavy fire on their defenceless victims; aud immediately the troops who closed the procession, and who had the advantage of higher ground, followed their example. Of the betrayed chiefs, many were laid low in a few moments ; some, dismounting, aud throwing off their outer robes, vainly sought, sword in hand, to return, and escape by some other gate. The few who regained the summit of the citadel experienced the same cruel fate® as the rest (for those whom the Albanian soldiers made prisoners met with no mercy from their chiefs or from Mehemet Ali), but it soon became impossible for any to retrace their steps even so far; the road was obstructed by the bleeding bodies of the slain Memlooks, and their richly caparisoned horses, and their grooms. 470 Memlooks entered the citadel; and of these very few, if any, escaped. One of these is said to have been a bey. Aceording to some, he leapt his horse from the ramparts, and alighted uninjured, though the horse was killed by the fall; others say that he was prevented from joining his comrades, and discovered the treachery while waiting without the gate. He fled and made his way to Syria. This massacre was the signal for an indiscriminate slaughter of the Memlooks throughout Egypt, orders to this effect being transmitted to every governor; and in Cairo itself, the houses of the beys were given over to the soldiery, who slaughtered all their adherents, treated their women in the most shameless manner, and sacked their dwellings. During the two following days, the pasha and his son Toosoon rode about the streets, and endeavoured to stop these atrocious pro- ceedings ; but order was not restored until 500 houses had been completely pillaged. In extenuation of this dark blot on Mehemet Ali's character, it has been urged that he had received the order for the destruction of the Memlooks from Constantinople, whither the heads of the beys were sent. It may be

answered to this plea, that on other occa- sions he scrupled not to defy the Porte.

A remnant of the Memlooks fled to Nubia, and a tran- quillity was restored to Egypt to which it had long been unaccustomed, and which has rarely been interrupted since. In the year following the massacre, the unfortunate exiles were attacked by Ibrahim Pasha, the eldest son of Mehemet Ali, in the fortified town of Ibreem, in Nubia. Here the want of provisions forced them to evacuate the place ;.a few who surrendered were beheaded, and the rest went further south and built the town of New Dongola

MEHEMET ALI. |

The pasha, since his return from Arabia, had turned his attention to the improvement of the manufactures of Egypt, and engaged very largely in commerce. The results of these attempts are stated in other places, but the important work of digging the new canal of Alexandria, called the Mahmoodeeyeh, must here be again mentioned. The old canal had long fallen into decay, and the necessity of a safe channel between Alexandria and the Nile was much felt. Such was the object of the canal then excavated, and it has on the whole well answered its purpose ; but the sacrifice of life was enormous, and the labour of the unhappy fellahs was forced. Towards the accomplishment of a favourite project, the formation of the Nizam Gedeed, a force was ordered to the southern frontier of Egypt, and the conquest of Senn4r was contemplated in order to get rid of the disaffected troops, and to obtain a sufficient number of captives to form the nucleus of the new army. The forces destined for this service were led by Ismail, then the youngest son of Mehemet Ali ; they consisted of between 4000 and 5000 men, Turks and Arabs, and were despatched in the summer of 1820. Nubia at once submitted, the Shageeyeb Arabs immediately beyond the province of Dongola were worsted, and Senndr was reduced without a battle. Mohammad Bey, the defterddr, with another force of about the same strength, was then sent by Mehemet Ali against Kurdufan with alike result, but not without a hard fought engagement. In 1822 Ismail was, with his retinue, put to death by an Arab chieftain named Nimr; and the defterdar, a man infamous for his cruelty, assumed the command in those provinces, and exacted terrible retribution from the innocent inhabitants.

In the years 1821 and 1822 Mehemet Ali despatched both ships and men (the latter about 7000 or 8000 Albanians and Turks) to the Morea, Cyprus, and Candia, to aid the Porte in reducing the Greek insurrection; and he continued to take part in that struggle, his fleet being engaged at Navarino, until the English insisted on the evacuation of the Morea in 1828 by Ibrahim Pasha. In 1822 an army of disciplined troops was at length organized: 8000 men (chiefly slaves, from Senndr and Kurdufin) were trained by French officersat Aswin. Of the vast numbers seized in the countries above named, many died on the way ; those who were not eligible were, with the women, sold in Cairo, and in the remainder were incorporated many fellahs. Colonel Séves (Suleyman Pasha), a Frenchman who after wards became a Moslem, superintended their organization ; great numbers of the blacks died, but the Egyptians proved very good troops. Many thonsands were pressed in conse- quence, and they now constitute the bulk of the army. In 1823 the new conscripts amounted to 24,000 men, com- posing six regiments of infantry, each regiment consisting of five battalions of 800 men, and the battalions of eight companies of 100 men.

In 1824 a native rebellion of a religious character broke out in Upper Egypt, headed by one Ahmad, an inhabitant of Es-Sdlimeeyeh, a village situate a few miles above Thebes. He proclaimed himself a prophet, and was soon followed by between 20,000 and 30,000 insurgents, mostly peasants, but some deserters from the Niz4m, for that force was yet in a half-organized state and in part declared for the impostor. The insurrection was crushed by Mehemet Ali, and about one-fourth of Ahmad’s followers perished, but he himself escaped and was never after heard of. Few of these unfortunates possessed any other weapon than the long staff (nebboot) of the Egyptian peasant; still they offered an obstinate resistance, and the combat resembled a massacre. Inthe same year war was once more made on the Walihabees, who had collected in considerable numbers. The 2d regiment was sent on this service, and it behaved in a very creditable manner.

= But the events of the war with the Porte are perhaps the most important of the life of Mehemet Ali. The campaign of 1831 had ostensibly for its object

the castigation of ’Abd-Allah, pasha of Acre; the invading force consisted of six regiments of infantry, four of cavalry, four field-pieces, and a greater number of siege-guns, the whole under the. command of Ibrahim Pasha, while the fleet, conveying provisions, ammunition, &c., was to accompany the army by sea. The terrible cholera of 1831, however, stayed the expedition when it was on the eve of departing ; 5000 of its number died, and it was not until early in October of the same year that it started. Little opposition was encountered on the way to Acre, whither Ibrahim had gone by sea, and that place was invested on the 29th of November. The artillery of the besieged was well served ; an assault in the following February was repulsed, and the cold and rain of a Syrian winter severely tried the Egyptian troops. A second assault in like manner failed, and Ibrahim was called away to repel Osman Pasha, governor of Aleppo. The latter, however, hastily decamped without giving him battle, and Ibrahim, deeming this advantage sufficient, retraced his steps towards Acre. He then pushed the siege with fresh vigour, and stormed the city on the 27th of May ; 1400 men fell in the breach, and the garrison was found to be reduced to about 400 men. The fall of Acre was followed by negotiation. Mehemet Ali evinced a disposition for peace, but demanded tlle government of Syria, and the Porte, in consequence, denounced him as a traitor. On his part, Ibrahim pushed his successes ; Damascus was evacuated at his approach, and the battle of Hims, fought on the 8th of July 1832, decided the superiority of the Egyptian army, and the advantage of disciplined troops over an irregular force, although very disproportionate in numbers. The enemy composed the advanced guard of the Turkish army, 30,000 strong, and the Egyptians numbered only 16,000 men. After this victory, Ibrahim marched to Hamdah, and thence to Aleppo (which had just before closed its gates against the Turkish general-in-chief, Hoseyn Pasha, whose troops became rapidly disorganized), forced the defiles of Beyldn, and pursued the fugitive Turks to Adaneh. About the same time an Egyptian squadron had chased the sultan’s fleet into Constantinople. Diplomacy was, at this point, again resorted to, but without any result; the sultan depended on his fleet to protect the capital, and determined to risk another engagement with the victorious enemy. The charge of this venture was intrusted to Resheed Pasha, the grand vizir. In the meantime, Ibrahim Pasha had gained the pass of Taurus, and having beaten the Turks at Oulou-Kisl4k, he hesitated not to give battle to Resheed Pasha at the head of about 60,000 men, his own army

being less than half that strength; the battle of Kooniyeh, on the plains of Anatolia, proved utterly disastrous to the Porte; in the confusion of the fight, and the darkness of a thick day, the grand vizir was made prisoner, his army routed, and Constantinople was within six marches of the victor, without an army to oppose his passage. The capital of the Ottoman Empire, in imminent danger by sea and land, was then intrusted to the keeping of its hereditary enemy, as the last resource of the sultan Mahmood, and a Russian fleet and army were sent thither. Negotiations were in consequence opened, and on the 14th of May 1833 a treaty was concluded between Mehemet Ali and the Porte, by which the whole of Syria and the district of Adaneh were ceded to the former, on condition of his paying tribute. With this terminated the war, but not the animosity of the sultan. Ibrahim, by excessive firmness and rigour, speedily restored security and tranquillity to the – greater part of Syria; but some years later, the attempt of Mahmood to get the better of his vassal, and the consequent

disaster experienced by his arms at Nezeeb, entailed fresh complications, and the interference of Great Britain ended in the restoration of Syria to the Porte in 1841. Mehemet Ali had placed all his reliance on the co-operation of France, and to its desertion of his cause, and his confidence in its assistance, either moral or material, must be ascribed the unfortunate issue of the war. That the Syrians, in general, preferred the rule of Mehemet Ali to the tyranny of pashas appointed from Constantinople may be safely averred; but we cannot close this account of his possession of that province without animadverting on the horrible cruelties perpetrated by Ibrahim Pasha, or warning our readers not to give credence to tlie unmeasured praise bestowed by many on the Lgyptian troops there engaged. Conceding that they were superior soldiers to the Turks, it must be borne in mind that they were veterans, dis- ciplined and led by the French officers and an able general ; their opponents were destitute of any European discipline, badly officered, and discouraged by the disasters in Greece, It has, moreover, been stated on good authority, that Ibrahim owed much of his success to the placing of artillery in the rear of his troops, with orders to fire on them should they show symptoms of wavering.

After the peace of 1841 Mehemet Ali gave up all great political projects, and solely occupied himself in improve- ments, real or imaginary, in Egypt. He continued to prosecute his commercial speculations, and manufacturing, educational, and other schemes. The barrage of the Nile, still uncompleted, was commenced by his direction, and in 1847 he visited Constantinople, where he received the rank of vizir. In the year 1848, however, symptoms of im- becility appeared; and after a short space Ibrahim was declared his successor, but died after a brief reign of two months.

Mehemet Ali survived Ibrahim, and died on the 3d of August 1849. Many and conflicting have been the opinions entertained of this remarkable man, for such at least all acknowledge him to have been. His massacre of the Memlooks has been the great point of attack by his enemies; but that, as well as many of his other acts, must be ascribed to his boundless ambition, not to in- nate cruelty; for he proved himself to be averse to un- necessary bloodshed. That he really esteemed European civilization may be doubted; but his intelligent mind could not fail to perceive that therein lay his great strength, and of this he availed himself with consummate ability. To his firm government Egypt is indebted for the profound tranquillity which it has long been its good fortune to enjoy. A traveller of any nation or faith may traverse it in its length and breadth with greater safety than almost any other country out of Western Europe; and the display of fanaticism has been rigorously punished. While, however, Egypt has benefited by the establishment of order, the people have suffered most severe exactions. The confisca- tion of private lands has been before mentioned; to that arbitrary act must be added the seizure of the lands of the mosques, the impesition of heavy taxation, and a system of merciless impressment. In fact, the condition of the Egyptian fellah lias rarely been as wretched as it is at the present day. Mehemet Ali also misunderstood the real resources of Egypt, which are certainly agricultural; he dealt a severe blow to native produce by endeavouring to encourage manufacturing industry, and by establish- ing enormous Government monopolies, a measure which crushed the spirit of the agriculturists. His military and governing abilities were assuredly very great, and his career is almost unequalled in Turkish history. Had it not been for the intervention of Great Britain, his Syrian successes over the Porte would probably have rescued Egypt from the wretched condition of a Turkish

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province. But the firman of 1841 entailed the loss of all his military power, the army was reduced to 18,000 men, and the navy condemned to rot in the harbour of Alexandria ; while Mehemet Ali, failing to gain the great object of his ambition, the establishment of an independent dynasty, and being compelled to look on his then living family as his only heirs, thenceforth confined himself to measures of less importance, and did not prosecute even these with his former energy.

The entire constitution of the government of Egypt is the work of Mehemet Ali. With a few exceptions, he destroyed all former usages, and introduced a system partly derived from European models. The army and navy are of his creation, so are the taxation, the regulation of import and export duties, &c., quarantine laws, the manufactories, colleges, and the ministry. Some of these institutions are useful, others both vexatious and ill-caleulated for the country. The colleges of languages and medicine, and the printing-press at Boolak, are among the former, and are ex- ceedingly praiseworthy efforts in a right direction ; and in the same category must be placed many minor improve- ments, in which Mehemet Ali showed himself to be far in advance of his countrymen ; while, weighing his chequered life and numerous disadvantages of position and nation, his moral character, enlightened mind, and distinguished ability must place him high among the great men of modern times.

Ibrahim was succeeded by his nephew ’Abbas, son of Toosoon. This miserable voluptuary, and withal bigoted though ignorant Muslim, utterly neglected the affairs of government and solely consulted his own gratification. During his reign all the great works begun by Mehemet Ali were suspended. It was a time of deliberate retrogression, and his sudden death in July 1854 was welcomed by all true Egyptians as the removal of the country’s curse. His successor, Said Pasha, the fourth son of Mehemet Ali, endeavoured to pursue his great father’s policy and to carry out his aims. He had not, however, the strength of char- acter or the health needed to meet the serious difficulties of the task, and he will chiefly be remembered for the abolition of some of the more grinding Government

monopolies, and for the concession of the Suez Canal. It was reserved for his nephew, the present khedive, to attain all and more than all that Mehemet Ali had designed for his conntry,

The reign of Ismail promises to be the beginning of a new era for Egypt. A man of undoubted ability, pos- sessed of unusual energy in administration, fully jappre ciative of the importance of Western civilization, fired with the ambition proper to a grandson of Mehemet Ali, the khedive is a ruler suchas Egypt has scarcely seen since the Arab conquest, His first step was to remove, as far as possible, the irksome control of the Porte, At great cost he obtained an imperial firman in 1866, removing almost all the old treaty restrictions, granting him the title of khedive

1 The Dynasty of Mehemet Ali. I. Mehemet Ali,

d. 1849. |) a | | ; Ii. Ibrahim, Ismail, Toosoon. Hoseyn. Talim. Mehemet d. 1848. Ali. | IV. Said, d. 18638. | III. Abbas, Toosoon, d. 1854. d. 1876. | Ahmad, Y. IsMAIL. Mustafa, d. 1858. l d, 1875. | | mn. Hasan. 8 other i

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(pron. khedeev), and settling the succession on the eldest son; and in 1872 another firma4n made him virtually an independent sovereigu.

Having thus obtained for himself and his dynasty a settled regal rank, Ismail turned his attention home- wards, and began a series of reforms such as no previous governor of Egypt ever contemplated. He re-established and improved the administrative system organized by Mehemet Ali, and which had fallen into decay under ’Abbds’s indolent rule ; he caused a thorough remodelling of the customs system, which was in an anarchic state, to be made by English officials ; in 1865 he bought the Egyptian post-office, and placed it under the direction, with full powers, of an official froma St Martin’s le Grand, who has brought it into admirable working order; he re-organized the military schools of his grandfather, and lent his willing support to the cause of education in every way. Public works have largely engaged the attention of the khedive. Railways, telegraphs, lighthouses, the harbour works at Suez, the breakwater at Alexandria, have been carried out under his personal auspices by some of the best contractors of Europe. If

there is a fault to be found in this Europeanizing of Egypt, it is that the practical zeal for medern civilization leaves no room for the honourable respect due to the unique antiquities of the country. It is true that ancient Egypt is protected by the care of Mariette Bey, but the art of the Arabs is suffered to decay, nay, is even purposely demolished, to make room for modern French gewgaws. A recent writer tells us that a new street cuts through about a mile of the “old Arab rookeries,” and gravely advances the opinion that the opera house and the public gardens and the other meretricious abominations that have been set up in Cairo are worthy of a second class European city! Still, terrible as is the vandalism now going onin Egypt, there can be little doubt that the present policy of the khedive will add greatly to the prosperity and health of the people. At the same time, future generations will gain at the fearful expense of the present. The funds required for these public works, as well as the actual labour, have been remorselessly extorted from a poverty-stricken population; and there is probably no peasant now existing whose condition is worse than that of the long-suffering Egyptian fellah.

One of the greatest reforms that Egypt owes to its present ruler is the abolition of the old system of consular juris- diction, and the substitution of mixed courts, where Euro- pean and native judges sit together to try all mixed cases without respect to nationality. These courts were estab- lished in 1876 on the suggestion of the wisest of Egypt’s statesmen, Nubar Pashia, and on the recommendation of an international commission A code based on the Moham- madan law and tle Code Napoléon has been drawn up, which seems thoroughly suited to the needs of the position ; and the best results may be looked for from this reform. It were greatly to be desired that the jurisdiction of these courts should be extended so as eventually to supersede the old native system. At present they only take the place of the consular courts.

In recent times the khedive has annexed a large territory to the south of Khartoom, now extending about as far as Gondokoro, and which will doubtless shortly include the lakes of Victoria and Albert Nyanza. The expedition was at first commanded by Sir Samuel Baker, with very unsatisfactory results; and great relief was felt when the continuation of the work of conquest was intrusted to Colonel Gordon, au officer in whose

character and ability the fullest confidence is placed. The khedive has professed himself anxious to put down the Nile slave-trade, and that he is really desirous of seeing the traffic ended is shown by the full powers he has given Colonel Gordon for the

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suppression of it in the heart of the slave-country. What the result will be it is hard to foretell ; but the good faith of the khedive and the determination of Colonel Gordon are now beyond a doubt. Quite recently (Aug, 14, 1877) a convention between the British and Egyptian Governments for the suppression of the slave-trade has been signed, imposing stringent penalties on the importa- tion of slaves into Egypt, and extending the power of search in the case of suspected vessels.

Altogether it may be belicved that a better time is beginning for Egypt. (E.8.P,—S.L.P.) |

TOPOGRAPHY AND MONUMENTS.!

The northern coast of Egypt is low and barren, presenf- ing no features of interest, and affording no indication of the character of the country which it bounds. It is a barrier, generally of sand-hills, but sometimes of rock, for the most part wholly destitute of vegetation, except where grow a few wild and stunted date-palms. Immediately behind are desolate marshy tracts or extensive salt lakes, aud beyond, the fertile country. The last is a wide plain, intersected by the two branches of the Nile, and by many canals, of which some were anciently branches of the river, and having a soil of great richness, though in this particular it is excelled by the valley above. The only inequalities of the surface are the mounds of ancient towns, and those, often if not always ancient, on which stand the modern towns and villages. The palm-trees are less numerous, and not so beautiful as in the more southern part of the country, but other trees are more common. ‘Tlie houses and huts of the towns and villages are of burnt brick near the Mediterranean

; but as the climate becomes drier, and the occurrence of rain far less frequent, the use of crude brick obtains, until near the point of the Delta it is very general. The mosques even of the towns are rarcly remarkable for architectural beauty in the tract tothe north of Cairo. The palaces or villas of the Turkish grandees, which are not uncommon, have, however, a light and picturesque appear- ance, though their style is not good. The deserts which inclose the plain on both sides are rocky tracts of very slight elevation, having their surface overspread with sand and other debris.

Of the towns on the northern coast, the most western, Alexandria, called by the natives El-Iskendereeyeh, is the largest and the most important. It was founded in the year Bc, 332 by Alexander the Great, who gave it the form of a Macedonian mantle (chlamys). The ancient city occupied tlie space between the sea and Lake Mareotis, being about four miles in its greatest length, and a little less than a mile in its greatest breadth. he island of Pharos was likewise inhabited, and was joined to the continent by the mole called the Heptastadium. The Heptastadium and the island divided the bay into two harbours. These were spacious, and although the western, anciently called Portus Eunosti, but now the Old Port, is difficult to enter, and the eastern, Magnus Portus, or the New Port, is not so deep and is less secure, they are, except Port Said, by far the best anchorages on this coast of Egypt. |

Alexandria, which partly occupied the site of the ancient Rhacotis, a place of little importance, naturally speedily increased in consequence, and became the emporium of the trade between Europe, Arabia, and India, After the death of Alexander the city became the capital of the Ptolemies. By the Ptolemies Alexandria was adorned with palaces and

1 The following account of the topography and monuments of Egypt is mainly based on Mr Lane's MS. '* Description of Egypt," which the writer of this article used as his guide to the monuments during his residence in that country,

of great magnificence, for which they did not scruple to despoil more ancient edifices of some of their chiefest orna- ments. While its commercial

importance increased, it became a cclebrated seat of learning, with the greatest library of antiquity, through the wise interest with which the Greek kings regarded science and letters. Under the Ptolemies, however, the inhabitants, who were chiefly Greeks, became very troublesome to their rulers, like most commercial populations, and their turbulence was _ ill restrained by the weakness of the later sovereigns of that line. From the time of the Roman conquest, B.c. 30, until it was taken by the Arabs, a.p. 641, Alexandria sensibly declined, partly in consequence of its being a provincial capital, instcad of a royal residence, but chiefly because of the unruly disposition of its inhabitants, and their violent religious and political disputes, which at last resulted in the seat of government being transferred to the fortress of Egyptian Babylon, near the modern Cairo, which became in some sort the capital. During this period it had bcen distinguished for the learning of its ecclesiastics, and the strong part which they took in the theological differences of the early church. Under the Muslims Alexandria never regained the position of metropolis of Egypt, and its importance, with some fluctuations, waned until the dis- covery and consequent adoption of the route to India by the Cape of Good Hope almost withdrew the main cause of its prosperity. Recently, however, the resumption of the overland route has greatly benefited this city, and although it was not made the capital, it became the favourite residence of Mehemet Ali, which in like manner contributed to its welfare,

The older part of the town of Alexandria stands upon the Heptastadium, now much wider than it was anciently; but the recent part, where are the houses of the European mer- chants, occupies the site of a portion of the ancient city, which was nearest tothe mole. The most striking edifice is the castle on the island of Pharos, containing a lighthouse, which has succeeded to the more famous Pharos of antiquity. Here also is the pasha’s palace, as well as a lesser Pharos. The houses of the town are built of stone, or have their lowest story cased with that material, and the portion above built of brick plastered and whitewashed. The residences of the European merchants and consuls and the richer Turks and natives are spacious and well-built, somewhat in the modern Italian style, but have no claims to architectural beauty. The mosques are not remark- able, but the English church will, if ever completed, be a great ornament to the town. The population of the town is estimated at over 200,000. One of the favourite

projects of Mehemet Ali was the fortification of Alexandria, which has been thus rendered so strong that if well garrisoned it could not be invested by a force of less than about 40,000 men,

The ancient remains are very scanty and of little interest, compared to those which are seen on the sites of other Egyptian towns. Two objects are conspicuous, one of the obelisks commonly called “ Cleopatra’s Needles,” and the great column known as “ Pompey’s Pillar.” The former is a fine obelisk of red granite nearly 70 feet in height, bearing ‘hieroglyphic inscriptions with the names of Thothmes III., Ramses IL, and a later king. Beside it was a fallen obelisk of the same dimensions, its fellow, now (Oct. 1877) on its way to England. They were brought here from some ancient temple during the Roman rule. Pompey’s Pillar is in like manner of red granite, and its shaft is about 70 feet high, the whole column being nearly 100 feet in height. Its pedestal bears a Greek inscription in honour of the emperor Diocletian.

_ Proceeding to the east of Alexandria, the first place of importance is Er-Rasheed, called by the Europeans Rosetta,

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a considerable town on the west bank of the Rosctta branch of the Nile, anciently the Bolbitine. Before the cutting by Mehemet Ali of the Mahmoodeeyeh Canal to connect Alexandria with this branch of the river, Rosetta was a place of greater importance than now, as in consequence of the decay of the old canal of Alexandria, the overland trade from India chiefly passed through it. It is a well-built town, having sone gardens, and is in many respects more agrecable than Alexandria. Its population is stated to be 15,000. A little to the north of the town is’ the boghaz, a bar of sand stretching across the mouth of the river, and rendering it often impassable; and between it and Rosetta is an old fort called Fort St Julien by the French, who repaired it during their occupation of Egypt, when one of their officers discovered the Rosetta Stone, the famous trilingual tablet which afforded the clue by which hieroglyphics were interpreted.

In ascending the Rosetta branch, the first place of inte- rest is the site of Sais, sai, on the eastern bank, marked by lofty mounds, and the remains of massive walls of crude brick, which were those of a great inclosure in which the chief temple and doubtless other sacred edifices stood. The goddess Nit or Neith was the divinity of the place, and a great festival was annually held here in her honour, to which pilgrims resorted from other parts of Egypt. Sais was remarkable for the learning of its priests, and was the royal residence of the Saite kings (Dynasties XXIV., XXVI.) A modern village here is called ‘“ S4-el-Hagar,” or “Sais of the Stone,” a name which perhaps alludes to the famous monolith described by Herodotus.

In the interior of the modern Delta no remains of import- ance have been discovered, though there are many ancient sites marked by mounds. The chief towns are E]-Mahalleh el-Kebeereh, not far from the Damietta branch, about forty niles from the sea; Tanta, nearly in the middle of the Delta ; and Manoof, farther south. Of these Tanta is best known as the birth-place of a Muslim saint, the seyyid Ahmad El-Bedawee, in whose honour three festivals are annually kept, the greatest of which attracts more pilgrims than any other in Egypt, and is in this respect second alone to the pilgrimage to Mecca. The festivals of Tanta are rather distinguished by riot than piety, and recall the revelries of Bubastis and Canopus.

Several places of interest are found on the course of the Damietta branch, the old Phatnitic or Pathmetic. First of these is the town whence it takes its name, Dimyat, called by the Europeans Damietta, which stands not far from the mouth of the branch, on its eastern side. In the time of the crusades it was a strong place, and regarded as the key of Egypt. It was taken and retaken by the contending forces, and formed the basis of the operations of St Louis in the unfortunate eighth crusade. Shortly afterwards the sultan Edh-Dhahir Beybars, in a.p. 1251, razed it and rebuilt it on the present site somewhat farther from the sea. It is a flourishing town, and has a population of 29,000 inhabitants. The next place of importance is the town of El-Mansoorah, founded by. El- Melik El-Kamil, the nephew of Saladin, during the sixth crusade, to commemorate, as its name imports, his success over the invading army of Jean de Brienne. A little to the south of El-Mansoorah, on the opposite or western bank, at a short distance from the river, are the remains of a very remarkable temple of the goddess Isis, and the mounds of

the town of Iseum. Although the temple 1S entirely thrown down, as though by a natural convulsion, but probably by human violence, its plan may be partly traced and its date ascertained, as the materials have not bcenremoved. It was, unlike most Egyptian temples, built altogether of granite, and was about 600 feet in length and 200 in breadth. The materials must have been transported

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from Syene, a distance by the river, on which they were doubtless floated, of more than 600 miles. Bearing in mind this circumstance, and the difficulty of both working and sculpturing so hard a material, this temple must be considered to be one of the most costly in the country. The earliest name which has been found here is that of Nekht-har-heb (Dynasty XXX.), but the most common one is that of Ptolemy Philadelphus. A little to the south of this site, on the same bank, is the small town of Semennood, anciently Sebennytus; and a short distance farther, on the same side, is the village of AbooSeer, the ancient Busiris, named after Osiris, who, with Isis, was here worshipped. Herodotus mentions among the great festivals that of Isis held at Busiris, but this was more probably kept at Iseum, which was not far. For a long distance there is nothing of interest until we reach Tel-Atreeb, where the site of the town of Athribis is marked by high mounds, with remains of ancient houses and sonie blocks of stone.

To the eastward of the Damietta branch, in the broad cultivated tract or the desert beyond, are some places worthy of note. The most eastern of these is the site of Pelusium, which was, in the times of the Pharaohs of Dynasty XXVI., the key of Egypt towards Palestine. No important remains have been discovered here. Between this site and the Damietta branch are the mounds of ‘Tanis, or Zoan, Z’AN, ZAR, where are considerable remains of the great temple, the most remarkable of which are several fallen obelisks, some of which are broken. From their inscriptions, and those of other blocks, it has been ascer- tained that the temple was as ancient as the time of Dynasty XII., and was much beautified by Ramses LI. and other kings of that time and the subsequent period. Tanis was onthe eastern bank of the Tanitic branch of the Nile, now called the Canal of the El-Mo’izz, On the

same side of the same branch, but far to the south, was the city of Bubastis, PE-BAST, the site of which is indicated by very lofty mounds, in which may be traced the remains of its great temple, which was eutirely of red granite. Here was held the festival of the goddess Bast, or Bubastis, which attracted great crowds of pilgrims, and is ranked by Herodotus first of the festivals of Egypt. Not far south, and on the borders of the desert, is Bilbeys, which was a place of some importance as a frontier-town in the time of the Eiyoobee princes. Still farther south are the mounds of Onion, the Jewish city founded by the high priest Onias, where was a temple closed by Vespasian not long after the overthrow of Jerusalem. The site is called Tell-el- Yahoodeeyeh, or "' The Mound of the Jewess."

At the point of the Delta is the unfinished barrage, which, by crossing both branches of the river, will regulate the inundation above and below this point. The river here becomes broader than in its divided state, and long continues so. A little south of the point of the Delta, on the eastern bank of the river, near the village of El- Matareeyeh, not far north of Cairo, is the site of the ancient Heliopolis, or On, AN, the City of the Sun, marked by a solitary obelisk, and crude brick ridges formed by the ruins of a massive wall. 'he obelisk bears the name of Usurtesen I, the second king of Dynasty XII., in the simple inscription which runs down each of its sides. It is of red granite, and nearly 70 feet in height. The city was famous rather for the learning of its college than for its size, and the temple of the sun was held in high veneration. Many famous Greek philosophers studied here, and much of their earliest knowledge of natural science was no doubt derived from their Egyptian instructors.

Boolak, the port of Cairo, is a flourishing town, having two remarkable mosques. It was built A.H. 713, in the reign of the sultan Mohammad Ibn Kalé-oon. Here M.

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Mariette has founded the national "' Musée Boulaq," a splendid collection of Egyptian antiquities.

Cairo is the fourth Muslim capital of Egypt ; the site of one of those that have preceded it is, for the most part, included within its walls, while the other two were a little to the south. ’Amr, the Muslim conqueror of the country, founded El-Fustat, the oldest of these, close to the fortress of Egyptian Babylon, the seat of government at that time. Its name signifies “the Tent,” as it was built where “Amr had pitched his tent. The new town speedily became a place of importance, and was the residence of the Naibs, or lieutenants, appointed by the orthodox and Ommiade caliphs. It received the name of Masr, properly Misr, which was also applied by the Arabs to Memphis and to Cairo. It declined after the foundation of El-Kahireh, but never became altogether deserted, for a small town, called Masr El’Ateekah, or “Old Masr,” occupies, in the present day, part of what was its area in its time of prosperity. Shortly after the overthrow of the Ommiade Dynasty, and the establishment of the ’Abbasee, the city of El Askar was founded (s.H. 133) by Suleyman, the general who subju- gated the country, and became the capital and the residence of the successive lieutenants of the “Abbasee caliphs. El- ’Askar was a small town adjacent to El-Fustat, of which it was a kind of suburb. Its site is now entirely desolate. The third capital, El-Katdé’, or El-Katayé’, was founded about A.w. 260, by Ahmad Ibn-Tooloon, as his capital. It continued the royal residence of his successors ; but not long after the fall of the dynasty, and the subsequent Ikhsheedees, the seat of government was transferred by the Fatimees to a new city, El-Kahireh, El-Kataé’, which had been sacked on the overthrow of the Tooloonees, rapidly decayed. A part of the present Cairo occupies its site, and contains its great mosque, that of Ahmad Ibn-Tooloon.

Géhar el-Kaid, the conqueror of Egypt for the Fatimee caliph El-Mo’izz, founded a new capital, a.H. 398, which was named El-Kahireh, that is, “the Victorious,” a name corrupted into Cairo. This town occupied about a fourth part, the north-eastern, of the present metropolis. By degrees it became greater than El-Fustat, and took from it the name of Misr, or Masr, which is applied to it by the modern Egyptians. It continually increased, so as to include the site of El-Katdé’ to the south, and of the old town of El-Maks to the west. The famous Saladin built the Citadel on the lowest point of the mountain to the east, which immediately overlooked El-Kataé’, and he partly walled round the towns and large gardens within the space now

called Cairo. Under the prosperous rule of the Memlook sultans this great tract was filled with habitations; a large suburb to the north, the Hoseyneeyeh, was added ; and the town of Boolak was founded. After the Turkish conquest (A.D. 1517) the metropolis decayed, but its limits were the same; with the present dynasty it has somewhat recovered. * ies

Cairo is of an irregular oblong form. Its greatest length is about three miles, and its average breadth about a mile and a half, and its dimensions do not fall very much short of these in any part. M. Jacotin (Description de VEgypte, xviii. u. 111) estimates the superficies of Cairo at 793 hectares, or about 3 square miles. This surface is not, how- ever, entirely occupied by houses, for it contains the Citadel and various extensive gardens and open spaces, as well as lakes. Most of the streets are extremely narrow, and the markets generally crowded, so that the stranger usually acquires a delusive idea of the density of the popu- lation. Mr Lane states the population to have been 240,000 before the great plague of 1835, and adds that the deficiency, equal to not less than one-third of the inhabit- ants, caused by that terrible visitation, would be speedily supplied from‘the villages. (Jodern Egyptians, Introduc-

tion.) Sir Gardner Wilkinson, in his Modern Egypt and Thebes (i. 256), published in 1843, gives the population at about 200,000 ; and Mrs Poole, writing in 1842, estimates it at about 240,000 (Znglishwoman in Egypt, i. 136); but Clot-Bey (Apereu Général, i. 204), whose work appeared in 1840, states the much higher amount of about 300,000 souls. ‘The census of 1847-8 states the more moderate number of 253,541 inhabitants, and in this instance it is not likely to have been far wrong. We may fairly suppose that during the time of comparative prosperity that followed the great plague of 1835, the population gradually increased to about 250,000, and that the cholera in 1848, and the conscriptions occasioned by the Crimean War, somewhat diminished its amount, which in the subsequent time of peace rose to the present sum of about 350,000. Of the population of 240,000, in Mr Lane’s estimate, about 190,000 were Muslim Egyptians, about 10,000 Copts, 3000 or 4000 Jews, and the rest, strangers from various countries. ‘The adult male population was about one-third of the whole, or 80,000 persons, of whom 30,000 were merchants, petty shopkeepers, and artisans, 20,000 domestic servants, and 15,000 common labourers, porters, &c.; the remainder chiefly consisting of military and civil servants of the Government. (Modern Hgyptians, l. c.) Cairo is still the most remarkable and characteristic of Arab cities. The beauty of its religious and domestic architecture, before the recent innovations, is unexcelled elsewhere. The edifices raised by the Moorish kings of Spain and the Muslim rulers of India may have been more splendid in their materials, and more elaborate in their details; the houses of the great men of Damascus may be more costly than were those of the Memlook beys ; but for purity of taste and elegance of design both are far excelled by many of the mosques and houses of Cairo. These mosques have suffered much in the beauty of thieir appearance from the effects of time and neglect; but their colour has been often thus softened, and their outlines rendered the more picturesque. What is most to be admired in their style of architecture is its extraordinary freedom from restraint, shown in the wonderful variety of its forms, and the skill in design which has made the most intricate details to harmonize with grand outlines. Here the student may best learn the history of Arab art. Like its contemporary Gothic, it has three great periods, those of growth, maturity, and decline. Of the first, the mosque of Ahmad Ibn-Tooloon in the southern part of Cairo, and the three great gates of El-Kahireh (the old city),

the Bab- en-Nasr, Bab-el-Futooh, and Bab-Zuweyleh, are splendid examples. The leading forms are simple and massive, with in the mosque horse-shoe arches. The decoration is in friezes, and its details of conventionalized foliage. The second period passes from the highest point to which this art attained to a luxuriance promising decay. The mosque of Sultan Hasan, below the Citadel, those of Mueiyad and Kald-oon, with the Barkookeyeh, in the main street of the old city, and the mosque of Barkook in the Cemetery of Kait Bey, are instances of the earlier and best style of this period. The forms, though still massive, are less simple, and they are admirably adapted to the necessities of space. ‘The decoration is in conventionalized foliage of the most free forms, balanced by exquisite geometrical patterns. Of the last style of this period, the Ghooreeyeh, in the main street of the old city, and the mosque of Kait Bey in his cemetery, are beautiful specimens, They show an elongation of forms and an excess of decoration in which the florid qualities predominate. Of the age of decline the finest monument is the mosque of Mohammad Bey Aboo- Dahab, in the old city. The forms are now poor, though not lacking in grandeur, and the details are not as well adjusted as before, with a want of mastery of the most suitable

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decoration. The usual plan of a congregational mosque is a large, square, open court, surrounded by colonnades, of which the chief, often with more rows of columns, faces Mecca (eastward), and has inside its outer wall a decorated niche to mark the direction of prayer. In the centre is a fountain for ablutions, often surmounted by a dome, and in the eastern colonnade a pulpit and a desk for readers. When a mosque is also the founder’s tomb, it has a richly ornamented sepulchral chamber. Of domestic architecture there are a few precious fragments before the age of decline; but most specimens are of the latest period of that age. These are marked by a singular fitness and great elegance in the interiors. The decoration, though inferior to that of the mosques of the best style, is charming for variety and beauty of pattern. See Cazro, and also ARCHITECTURE, vol. i. pp. 445-44.

To the east of Cairo is a bold spur of the mountains known as El-Gebel El-Mukattam. Beneath it, and to the north of the Citadel, is the Cemetery of Kait Bey, remark- able for the splendid tombs of the Memlook sultans. The most beautiful of these is that of Kait Bey, from which the cemetery takes its name, but those of the sultan Barkook and of El-Ghooree must not be passed by unmentioned, At a little distance to the north-east is the Gebel-el-Ahmar, or ‘Red Mountain,”,and southward of this, petrified wood in large quantities is seen strewn on the surface of the desert. The space between Cairo and the Nile, varying from a mile to a mile and a half in breadth, is occupied by plantations ,which were made by Ibrahim Pasha during his father’s rule. Formerly this side of thie city was, as the other three are still partially, bounded by lofty mounds of rubbish; these he caused to be removed, and by doing so conferred a great benefit upon the inhabitants, as well as by planting with trees the intervening space. By irrigating this tract very freely with a steam-engine he considerably lessened the good he had effected, rendering the western part of the city somewhat damp. To the south of Cairo is a great cemetery containing the tomb of the Imaém Esh-Shafe’ee, and also an aqueduct, built by the sultan El-Ghooree, which conducts water from the Nile to the Citadel; and further south, the Roman fortress of Egyptian Babylon, now called Kasr-esh-Shema, at present chiefly occupied by a Coptic convent, as well as the small town of Masr El-’Ateekah, which is all that remains of the famous metropolis El-Fust4t. It contains no remarkable edifices: in its immediate neighbourhood, however, is the oldest mosque in Egypt, that of Amr, the Muslim conqueror, but it has been so frequently repaired and almost rebuilt that it is impossible to form any idea of its original appearance. Opposite to Masr El Ateekah, from which it is separated by a very narrow branch of the Nile, is the island of Er- Rédah, containing the famous Mikyds, or Nilometer.

The chief place on the western bank near Cairo is the small town of El-Geezeh, opposite Masr El’Ateekah. El- Geezeh is best known as having given its name to the most famous group of Pyramids, the chief monuments of Mem- phis, which stand on the slightly elevated border of the low Libyan range, not more than a quarter of a mile beyond the limit of the cultivated land.

The city of Memphis, meN-Norsr, “ the good sta- tion,” stood on the western bank of the Nile about ten miles above Cairo. It was founded by Menes, the first king of Egypt. The kings and people who dwelt there chose the nearest part of the desert as their burial-place, and built tombs on its rocky edge, or excavated them in its sides. The kings raised pyramids around which their subjects were buried in comparatively small sepulchres. ‘The pyramids were grouped together, and often there is a long distance from one group toanother. Although many pyramids have been nearly or wholly destroyed, yet, as the largest undoubt-

edly remain, the general features of the necropolis cannot be much changed. From the Citadel of Cairo we obtain a good view of the several groups. Tirst, opposite to us, but a little to the south, are the three great Pyramids of El-Geezeh, two of which exceed all the others in magnitude ; at-some distance farther south we see those of Aboo-Seer, likewise three in number, of smaller dimensions, and, not so far beyond them, the great Pyramid of Sakkarah, called from its form that of Steps, with smaller pyramids in its neighbourhood. ‘Farthest of all, after a wider interval, are the two large Pyramids of Dahshoor, which approach in size the two great structures of El-Geezeh. There are more to the south as far as the Feiyoom, the last being that of El- Lahoon, but none above the Pyramids of Dahshoor can be inzluded within the Memphite necropolis. That great tract extended, if we measure from thie ruined Pyramid of Aboo- Ruweysh, somewhat to the north of those of El-Geezeh, to the sonthernmost Pyramid of Dahshoor, throughout a space of nearly twenty miles, in almost every part of which some sepulchres have been discovered, while it cannot be doubted that many more await a fortunate explorer.

The road to the pyramids of El-Geezeh from the town is through cultivated fields diversified by villages in palm- groves, As we approach them, these structures do not give us that idea of size that we had expected from our first distant view; and until we stand at their feet we do not appreciate their vastness. But as we endeavour to scan the height of the Great Pyramid, when about to begin its ascent, we fully realize a result that human labour has not achieved elsewhere. The very dimensions (a height of about half a

thousand feet, four sides each measuring the seventh of a mile) are in themselves gigantic; but when we know that this huge space is almost solid, containing a few chambers so small as not to be worthy of consideration in calculating its contents, we discover that no monuments offman's raising elsewhere afford any scale by which to estimate its greatness. The Pyramids, except one or more small ones, were tombs of kings. Each had its name and a priest attached to it, for whose functions there was a chapel at some distance in front of the entrance.

The Great Pyramid, "the Splendid," was the mausoleum of Khufu, or Cheops, of Dynasty IV. The present per- pendicular height of the structure is, according to General Vyse, 450 feet 9 inches, and the side of its present base 746 feet. It is about 30 feet lower than it was originally, in consequence of the casing stones and much of the outer masonry having been torn off; and its base is likewise smaller. General Vyse gives the former height at 480 feet 9 inches, and the side of the former base at 764 feet. Like all the other pyramids, it faces the cardinal points. At the completion of the pyramid the faces were smooth and polished, but now they present a series of great steps formed by the courses of stone, and are in some places (par- ticularly in the middle of each face, and at the angles, and about the entrance) much broken. 'The ascent is easy though fatiguing, and the traveller is amply rewarded by the view which he obtains from the platform, about 32 feet square, at the summit. The prospect of the fertile plain and valley on the one side, and of the undulating barren surface of the Great Desert on the other, as well as of the pyramids and tombs beneath, is alike remarkable from its character and the associations which it calls up. The examination of the interior is no less interesting. All other tombs but the Memphite pyramids, and those which were simply pits, were not closed, the upper chamber

being intended for the performance of funeral rites when the family of the deceased visited his sepulchre. 'These pyramids, however, were most carefully closed. The

chambers which contained the bodies of the king, and of those (doubtless of his family) who were sometimes buried

in the same structure, are without sculptures, and scarcely ornamented in any way, being usually wholly plain. The passages leading to them are only large enough to admit a sarcophagus, and after the king's burial were closed by the lowering of heavy stone portcullises, and the block- ing up of the entrance. The desired object was security, and we must not, therefore, expect beauty or grandeur in chambers constructed for this purpose, although we cannot fail to admire their massive and gloomy aspect.

The entrance of the Great Pyramid is not far from the middle of the northern face, 49 feet in perpendicular height from the base. The fallen stones and rubbish have, however, raised a mound which reaches nearly to the entrance, the masonry about which having been torn down, we gain some idea of the construction of the pyramid. In this manner the passage has lost somewhat of its length. The passage itself is 3 feet 11 inches high, und 3 feet 54 inches wide, and is lined with fine limestone. It descends at an angle of 26° 41'! Ata distance of 63 feet 2 inches from the beginning of the roof of the present entrance, a second passage commences from this, taking an ascending direction. 'The entrance of this new passage is obstructed by great blocks of granite which entirely fill it, and have been passed by means of an excavation around them. We thus enter the ascending passage, which is of the same breadth and height as the former, and inclines at an angle of 26° 18'. The stones which line its roof and sides are very rough, and it has evidently been left unfinished. After ascending this passage for a distance of 109 feet 7 inches, we reach the Grand Passage, which, from its greater dimensions, presents a comparatively imposing appearance, It ascends at the same angle as the last, while a horizontal passage runs beneath it to a chamber to be subsequently mentioned. Just within the Grand Passage is the mouth of the Well, an irregular pit, partly excavated in the'rock, leading to the lower portion of the first passage. Its object was probably to afford an exit to the workmen who; had been engaged in closing the ascending passage. The Grand Passage is 6 feet 10 inches in width at its base, 28 feet high, and 156 feet long. 'The blocks which compose its . sides gradually approach, every course above the second projecting a little, and on each side is a stone bench. At the end of this passage a horizontal one begins, of much smaller but unequal dimensions, and 22 feet 1 inch in length, leading

to the Grand Chamber, commonly called the King's Chamber, which it euters at the eastern end of 'ts north side. This, which is the principal sepulchral chamber (unless, indeed, there be an undiscovered one of greater importance), is lined with red granite, and measures in length 34 feet 3 inches, in width 17 feet 1 inch, and in height 19 feet l inch. It is altogether plain, and contains only a sarcophagus of red granite, which is equally unadorned, Above this chamber are five small ones, which may be called entresols, evidently designed to lighten the pressure of the superincumbent masonry, particularly as the uppermost of them has a pointed roof. Four of these were discovered by the late General Howard Vyse, who found in them quarry-marks, bearing, in two varieties, the name of Khufu, the royal builder of the pyramid. These chambers are reached with difficulty, and chiefly by forced passages. The horizontal passage beneath the Grand Passage must now be described. 'This is but 3 feet 10 inches high, and EE ee

1 See Sir John Herschel's '' Observations on the Entrance Passages in the Pyramids of Gizeb," in Vyse's Pyramids of Gizeh, vol. it. 107-109. The different angles of the entrance passages of other pyramids, and the circumstance that they were always closed at the completion of the buildings, show that the fact of this one's having pointed, at a supposed date of its erection, to a Draconis, which was then the pole-star, is not to be regarded as more than accidental, Nevertheless, as above mentioned, the pyramids face the cardinal points.

3 feet 54 inches wide, for the first 92 fcet of its length, and then we descend a step and find the passage to be 5 feet 8 inches high for 17 feet 11 inches farther, until it enters the '* Queen's Chamber," as it is usually called, at the eastern corner of its north side. This chamber is 18 feet 9 inches long, and 17 feet broad, and its extreme height is 20 feet 3 inches. It has a pointed roof, of great blocks of stone, inclined upwards and meeting in the middle. Within it is the entrance of a forced passage. The remainder of the first passage, beyond where the first ascending passage leads to the most interesting parts of the structure, is still to be noticed. It continues below the forced entrance to the ascending passage for a distance of 239 feet 10

inches, being cut through the rock on which the pyramid is built. For this space its inclination and proportions do not change, but it then becomes horizontal for 27 feet, terminating at the entrance of an excavated chamber 46 feet in length, and 27 feet 1 inch in breadth, but of irregular and inconsiderable height. There is no doubt that this chamber was left unfinished at the closing of the pyramid. Beyond it the passage continues, opposite to where it entered the chamber, aud extends horizontally 52 feet 9 inches into the rock in the same direction.

The Second Pyramid, which bore the name of " the Great," and was the tomb of Khafra, or Chephren (Dynasty IV.), stands at a short distance to the south-west of the Great Pyramid, which does not very much exceed it in magnitude, though far superior in its construction. It has a base of 690 feet 9 inches square, and is 447 feet 6 inches in height, being more steep than its larger neighbour. A great part of its casing having been preserved, extending about a fourth of the distance from the summit, the ascent is very difficult, especially as when one has climbed on to the cased portion he can see nothing of the lower part of the building, and thus feels as if upon a pyramid in the air. There are two entrances, both in the north side, from which, and other peculiarities, it is possible that the building was originally much smaller than now, and that, after its first completion, it was enlarged, and a new entrance and sepulchral chamber added.

The Third Pyramid, '"'the Superior," the tomb of Menkaura, or Mycerinus, is almost in a line with the other two, and of much smaller dimensions, being only 203 fcet in height, and 354 feet 6 inches square at the base. It is constructed beautifully, and in a costly manner, and in these respects is unexcelled, if equalled, by any other pyramid. 'The exterior was anciently cased altogether, or in part, with granite, but this has been generally torn off. General Vyse opened it, and found that it had been previously ransacked. In it he discovered a very beautiful sarcophagus (which was unfortunately lost at sea ou its way to England), as well as part of a mummy-case, bearing the name of King Menkaura, and a mummy, not certainly the king's, both of which are now in the British Museum. 'This confirms the statement of Herodotus that it was the tomb of Mycerinus. Manetho says that it was built by Queen Nitocris (Dynasty VI). This apparent inconsistency is explained, as Bunsen remarks (Hgypt's Place, ii.

165, seg., 210, seg.), by the construction of the pyramid, which has two principal chambers, and was evi- dently enlarged after its first completion, so that we may reasonably suppose that it is the sepulchre of both Men- cheres and Queen Nitocris.

Near the three large pyramids are six smaller ones ; three of these are near the east side of the Great Pyramid, and three on the south side of the Third Pyramid. They were probably the tombs of near relations of the kings who founded the great pyramids. The space around the pyramids is occupied by very numerous tombs, some built of stone, others excavated in the sides of the rock on which

the pyramids stand, while others are simply pits with sepulchral chambers leading from them. The most interesting of these occupy a square bounded on the east by the Great Pyramid and on the south by the Second, and are mostly the sepulchres of the subjects of Khufu and other kings of Dynasties IV. and V. These tombs, which are of inconsiderable dimensions in comparison with many at Thebes and elsewhere, are all built of stone, and have inclined walls, so as to resemble truncated pyramids. They usually contain a chapel, or more rarely chapels, the walls

}of which are decorated with most remarkable painted

sculptures, portraying the everyday life of the Egyptians at that remote age, with short inscriptions of an explanatory character. The absence of representations of the gods and subjects clearly connected with religion is note- worthy. Other similar tombs stand to the east and south of the Great Pyramid ; and in the former direction are the principal sepulchral grottoes hewn in the side of the elevated rocky tract on which the pyramids stand. Some of these excavations bear similar representations to those of the other tombs already mentioned. ‘To the east of the Second Pyramid is the Great Sphinx, called in Egyptian “hu,” emblem of Hor-em-akhu, ‘‘ Horus in the horizon,” one of the most characteristic monuments of this wonderful necropulis, of an earlier date than the Great Pyramid. It is a recumbent androspliinx, or man-headed lion, 188 feet 94 inches in length, hewn out of a natural emi- nence in the solid rock, some defects of which are supplied by a partial stone-casing, the legs being likewise added. Steps lead down to its front, where are a sanctuary and tablets, but these are covered by the

sand, which, after the hollow has been cleared, speedily fills it again. Not far to the westward of the Sphinx is the remarkable excavation known as Campbell's Tomb, discovered by Gencral Vyse, chiefly consisting of a large pit surrounded by a trench. The causeways leading to the Great Pyra- mid and to the Third, the former of which greatly excited the admiration of Herodotus, are well worthy of a careful examination. The only pyramid which stands to the north of this group is that of Aboo-Ruweysh, which is in so ruined a condition as scarcely to deserve a visit. It lies about five miles to the north of the Great Pyramid.

Southward of the Pyramids of El-Geezeh, the first objects of interest are those forming the similar group of Aboo-Seer, of much smaller dimensions, the largest being about the size of the Third Pyramid. They are on the elevated edge of the Libyan chain, about seven miles from the Third Pyramid, and are four in number, three being large, and the fourth very small. The Northern Pyramid of Aboo-Seer appears to have been the tomb of Sahura of Dynasty V., and the Middle Pyramid is the tomb of Ra-n- user of the same line.

About two miles farther in the same direction are the Pyramids of Sakkarah, the greatest and most remarkable of which is called the Pyramid of Steps. The tract around them appears from the number of the tombs to have been the principal burialplace of Memphis, to which it 1s near. The Pyramid of Steps has a height of 196 feet 6 inches, and its base formerly measured on the north and south sides 351 feet 2 inches, and on the east and west 393 feet 11 inches. Within it are numerous passages and a gallery, which must, for the most part, have been made subse- quently to the completion of the structure. In the centre is a very lofty and narrow chamber, and near it a small one, which was lined with blue tiles. In the latter was an inscription containing the title of the bulls Apis. Under the old monarchy those sacred animals were here entombed. It is thought that this pyramid was constructed by Uenephes of Dynasty I. If Manetho be correct in assigning the introduction of the worship of Apis to a later king, this

pyramid, if of Uenephes, was originally a royal sepulchre. In the tract between the Pyramids of Sakkdrah and Aboo-Seer are the remains of the

Sarapeum, and the burialplace of the bulls Apis, both discovered by M. Mariette. They are inclosed by a great wall, having been connected, for the Sarapeum was the temple of the defunct Apis. The tombs are in subterranean gallerics or in separate excavations which contain many sarcophagi, in which thie bulls were en- tombed. Not the least important result of this discovery is the certainty that Sarapis wus a form of Osiris, and that his name was Hesiri-hapi, or Osiris-Apis (Brugsch, Reiseberichte aus Aegypten, 27, seqg.), as Sir Gardner Wilkinson had long previously suggested (Materia [iero-

glyphica, 21, and Vocab. MS. addition) The other pyramids are of comparatively little interest. There are

also some curious private tombs, among which may be par- ticularized a large grotto excavatcd in the face of the rock overlooking the valley, which is remarkable for being vaulted on the principle of the true arch, but without a key-stone. It is of the time of Psammetichus I. of Dynasty XXVL., being, as Sir Gardner Wilkinson remarks, one of the two earliest known examples of the arch in stone, though, as he adds, there are brick arches at Thebes of the timc of Amenophis I. of Dynasty XVIIT. (Afodern Egypt and Thebes, i. 368-9).

The site of Memphis is marked by mounds in the culti- vated tract to the east of the Pyramids of Sakkdrah, and near the village of Meet-Raheeneh. Of the great temple of Ptah, its tutelary divinity, tlicre are no remains above ground, except a few blocks of stone and some broken statucs, one of which is a fine colossus of Ramscs IL1., which most probably stood in ancient times before one of the principal entrances of the temple. It is of white chert, and beautifully executed, representing the king in a stand- ing posture. It has fallen to the ground, and has lost part of its Icgs; nevertheless it has suffercd incon- siderable damage elsewhere, so as to be still one of the finest specimens of Egyptian art. The original height was more than 40 feet. ‘This colossus is the property of the British nation, but no steps have been taken to remove it to this country. As Sir Gardner Wilkinson remarks, “when the Turks have burnt it for hme, it will be regretted” (Modern Egypt and Thebes, i. 373). The site of Memphis being in the cultivated tract, and near the modern capitals of Egypt, its monuments have alike suffered from

the destructive power of nature, and from the barbarism of those who have used them as quarries or de- faced them from motives of fanaticism. The Pyramids have not escaped man's violence, but their vastness has generally defied his attacks.

At a distance of about five miles to the south of the Pyramid of Steps is the northernmost of the Pyramids of Dahshoor, an interesting group, of the history of which nothing certain is known. To their north is a vast trun- cated pyramid, the sepulchre of Unas, last king of Dynasty V., anciently called "the Most Beautiful Place, " now Mastabat Faraoon, or " Pharaol's Seat." Two of the Pyramids of Dalshoor are of stone, and three of crude brick. The former exceed in size all the other pyramids except the First and Second of El-Geezeh, and have re- markable chambers within them. The Northern Stone Pyramid has a base of 700 feet, and a hcight of 326 feet 6 inches, and has lost somewhat of its size, having originally measured 719 feet 5 inches, and 342 fect 7 inches. Some of the casing remains. It has an entrance in the northern face, leading to three chambers of similar construction to the Grand Passage in the Great Pyramid. The Southern Stone Pyramid is distinguished by the peculiarity of its form and by having two entrances, one in the eastern face and the other in the northern. The lower portion has an

eis: angle of 54° 14' 46", but the inclination then changes to 42° 59' 26." It has been supposed that it was suddenly completed, having been originally planned to be much loftier, but the method in which the pyramids were built renders this unlikely; and it seems rather to haye been given this form to gratify a whim of the founder, especially as the entrances in different faces afford another peculiarity. Its base is 615 feet 8 inches, and its height 319 feet 6 inches. At its southern side is a small brick pyramid. The Northern and Southern Brick Pyramids of Dahshoor are to the east of those already described. They are now in a very ruined state, being merely mounds of crude brick : one of them is probably the Pyramid of Asychis mentioned by Herodotus.

Among the earlier explorers of the necropolis of Memphis was Belzoni, by whom the Sccond Pyramid was opened. General Howard Vyse first

undertook a complete examination of the series of pyramids, and having secured the assistance of Mr Perring, carried out this project with well-merited success. Professor Lepsius, the head of the Prussian expedition, opencd many tombs in the Memphitc necropolis, and has published in his magnificent work (Denkmdler aus Aegypten und Aethiopien) the most interesting sculptures which they contain. M. Mariette, aided by the French Government, discovered tie Sara- peum and the tombs of the bulls Apis, and has since continued his researches under the authority of the khedive.

The voyage up the Nile from Cairo may now be described. Not far south of Masr El-Ateekah, the moun- tain aud desert approach very near the river on that side, and soon after the wide opening of a valley is seen. Beyond it is a bold promontory of the eastern range, which first gradually recedes and then becomes parallel with the river for some distance, leaving but a narrow strip of cultivated land. Behind the village of Turd, the ancient Troja, are the quarries named after it, and a little farther to the south are those of El-Maasarah. These quarries are great excavated chambers and passages, which are entered by large square apertures in the steep face of the mountain. Hence were taken the finer blocks of limestone employed in the construction of the Pyramids of El-Geezeh. Tablcts in both quarries record the quarrying executed under diffcrent sovereigns. South of the quarries the character of the eastern bank continues unchanged, and presents no remarkable object until we reach the promontory of the Sheykh Aboo-Noor, which will be subsequently mentioned. The western bank, on the contrary, is broad and fertile, abounding in villages, and above its palm-groves rise in the distance the massive forms of thc long series of pyramids. Considerably beyond those of Dahshoor, which may be considered as the most southern in tlie Memphite necropolis, are the two Pyramids of El-Metaneeyeh, which are too small to be seen from the river, and yet farther the solitary Pyramid of Meydoom, commonly called the False Pyramid. Dr Brugsch thinks it very probable that it was the tomb of Senoferu, last king of Dynasty ITI. It is a structure of great size, having a base of about 400 feet, and a height of about 310 feet. In consequence of blocks having been pulled off its sides for building purposes, it has the appear- ance of being built in two degrees, the lower of which is much greater than the upper, while the fallen stones around its base make it seem as if raised upon an emineuce to in- crease its apparent size, and hence itsname. ‘The entrance has not been discovered. Its

position, rising alone above the rich valley and desert beyond, without any object by which to measure‘its size, render this pyramid, especially when seen from some distance across a broad part of the river to the north, a very striking object. There is nothing else worthy of a visit on the western bank until

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we reach the town of Benee-Suweyf, about seventy miles by the course of the river from Cairo.

Benee-Suweyf is a busy town, being the port of the Feiyoom. A road leads hence to that province, in a north- westerly direction. After crossing the great canal called the Bahr-Yoosuf, we pass through the opening in the Libyan range which leads to the Feiyoom, leaving on our right the ruined brick Pyramid of El-Lahoon, so called from an adjacent village.

The Feiyoom, including its lake, is a pear-shaped tract (its narrowest part being to the west), extending into the desert, and measuring in its greatest length about thirty miles, and in its greatest breadth about twenty. The part now cultivated is more than two-thirds of this extent from the east. At the north-western extremity is the great lake of El-Karn, which is long and narrow, and fills the northern portion of the valley. A branch of the Bahr-Yoosuf flows through the opening leading to the Feiyoom. This canal soon spreads into many streams, two of which, after joining into a single course, carry off the superabund- ant waters of the inundation into the lake of El-Karn, while they contribute with the others to irrigate the cultivable tracts.

The site of the famous Labyrinth first claims our notice after entering the Feiyoom. Its position may be known by a ruined crude brick pyramid, that of Hawarah, which is spoken of by both Herodotus and Strabo, and may be called the Pyramid of the Labyrinth. The remains of the Labyrinth itself, which had been previously known, were first carefully examined by the Prussian expedition headed by Professor Lepsius, in 1843. The structure was so ruined, however, that the results were not as decisive as might have been hoped. Yet the plan was to some extent made out, and the building shown to have contained a great number of very small chambers, as ancient writers had said; and tlie discovery of royal names of Dynasty XIL.,

particularly of Amencmhat III., to whom Manetho ascribes the founding of the Labyrinth, leaves little doubt that this king was the Meris who built the Labyrinth, according to the classic writers. The use of this building has not been distinctly ascertained. Manetho indeed makes it to have been the founder's tomb, but it is most probable that he was buried in the pyramid, which, however, the Egyptian historian may have regarded as part of the Labyrinth, as it is evidently connected with that structure.

Not far beyond the site of the Labyrinth is the capital of the province, usually called ''El-Medeeneh," or '" the City," and 'Mcdeenet-el-Feiyoom," "the City" or 'Capital of the Feiyoom," close to the mounds of the ancient Arsinoé, or Crocodilopolis. It is a small but flourishing town. The only monuments of antiquity in its neighbourhood are the remains at Beyd4hmoo somewhat to the north, and the great broken tablet at Begeeg, at a smaller distance to the south. 'The former are two struc- tures supposed by some to be pyramids, and the latter, which is a record of the time of Usurtesen I, is usually called an obelisk, but it must rather be regarded as a very tall and narrow stele or tablet, upwards of 40 feet in height.

In this part of the Feiyoom, to the north of EI- Medeeneh, may be traced the remains of that remarkable hydraulic work the Lake Meris. M. Linant, a French enginecr, was the first to determine the position and character of this famous work of antiquity ; and the results of his investigations are in accordance with the opinions of some who had previously: noticed the subject in published works (Mémoire sur le Lac Moeris," Soc. Eg., 1843). The object of the Lake Mceris was to regulate the irrigation of the Feiyoom, anciently the Crocodilopolite Nome, and

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afterwards the Arsinoite; and it was valuable on account of its fisheries. Itseems rather to have deserved the name of a very large reservoir than that of a lake. Notwith- standing the drying up of the Lake Mceris, the Feiyoom is still an important and fertile province. It produces very large quantitics of grapes ; and the fields of roses, cultivated for the sake of rose-water, present a remarkable appear- ance.

The great Lake of El-Karn is perhaps the most interest- ing object in this partof Egypt. Its name, Birket-el-Karn, signifies “The Lake of the Horn,” or “ Projection,” by which an island is intended, and not its general form, as has been supposed. It is, according to Sir Gardner Wilkinson, about 35 miles long and about 7 broad at its widest part, and is not deep, as far as has been ascertained. The water is brackish and unwholesome, though derived from the Nile, which has at all seasons a much higher level. It is bounded on the south by tracts in a state of cultivation, or deserted for want of labourers, though anciently cultivated, and on the north by the Libyan desert, above which rises a bold range of mountains; and it has a strange and picturesque wildness. Its northern shore was anciently cultivated, at least in part, but is now entirely waste. Near the lake are several sites of ancient towns, and the temple called Kasr-Karoon distinguishes the most important of these. That temple, however, being devoid of sculpture, and doubtless of the Roman period, could not attract attention except in a region barren of monuments. After this cursory view of the Feiyoom we may return to the Nile and continue our soutliward course.

Not far south of Benee-Suweyf the eastern chain is washed by the river at the picturesque promontory of the Sheykh Aboo-Noor, whose tomb stands on its summit. From this point as far as the town of Manfaloot the mountains on the east are close to the Nile, leaving a narrow space of cultivable land, or none at all, while the western bank is far broader than before. For forty miles nothing remarkable attracts the eye except the lofty mounds of ancient towns, until one sees the well-proportioned miuaret of a mosque in the large village of Semeloot, said to have been erected by the architect of the mosque of Sultan Hasan at Cairo. Not far beyond, the river washes the picturesque cliffs of Gebel-et-Tcyr, or the Mountain of Birds, part of the eastern range. Upon its summit stands a Coptic convent, called the Convent of the Virgin, Deyr-el- ’Adra. One of the monks of this convent usually climbs down the steep face of the mountain by a dizzy path, and swims to the traveller’s boat to solicit alms as a fellow Christian. In this part of Egypt we first begin to notice the entrances of grottoes in the face of the eastern nioun- tains, but none of these for some distance are known to be of any interest. Not far beyond Gebel-et-Teyr is the town of El-Minyeh, on the western bank, a place wearing @ cheerful aspect. Opposite El-Minyeh are quarries and sepulchral grottoes, the most remarkable of the latter being ata

site called El-Kém-el-Abmar, or “the Red Mound. These2are of the age of Dynasties IV. and VI., but they have sustained so much damage in modern times that they do not repay a visit, except from one who is a student of hieroglyphics. A governor of El-Minyeh, an ignorant Turk, used these ancient tombs as quarries ; and had it not been for the interference of Mr Harris of Alexandria, the more important grottoes of Benee-Hasan would have shared the same fate at his hands.

The first noteworthy objects above El-Minyeh are the sepulchral grottoes of Benee-Hasan, which are inferior to none in Egypt for beauty and interest. They are excavated in the face of the eastern mountains, which are here very low and sloping, and separated from the river by a small extent of debris and desert, and a very narrow strip of

cultivable land. The grottoes are almost in a line near the summit of the mountain, and at no great height above the river. The two northernmost are remarkable for hav- jng porticoes, each supported by two polygonal columns of an order which is believed to be the prototype of the Doric. Most of the grottoes are adorned with sculptures and paintings, which portray with eminent truthfulness and character the manners of the Egyptians of the remote period at which they were executed, for they are tombs of nomarchs and other governors of Dynasty XII. They generally consist of a chapel of large dimensions, having sometimes a portico before it, and a niche with seated figures of the chief persons buried in the tomb at the extremity, and have pits leading to sepulchral chambers. The principal apartment is sometimes supported by pillars cut out of the rock, and vaulted. Its walls bear representations of the diversions of the occupant during his lifetime, and of his varied occupa- tions, in scenes depicting hunting, fishing, games, feasts, the processes of agriculture, and the like. The figures of beasts and birds, more especially the latter, are characterized by a remarkable fidelity and beauty, and there can be no doubt that Egyptian art had attained a greater excellence at this time than it possessed under Dynasty IV. A little to the south of these grottoes, in a ravine, is the Speos Artemidos, a small rock-temple of Sekhet or Pakht, the Egyptian Diana, and some sepulchres of little interest.

A few miles to the south of the Speos Artemidos are two sites, one on either side of the river, which were marked, in the present century, by most important monuments, which have since been destroyed by the Turks. That on the western side, near the large village of El- Ashmooneyn, the ancient Hermopolis Magna, was part of a@ magnificent portico, bearing the names of Philip Aridzus, Alexander Augus, and Ptolemy I., all that stood of the temple of Thoth; and on the opposite side of the river were considerable remains of the edifices of the town of Antinodpolis founded by Hadrian. While we regret the destruction of such interesting records, we must not charge either the Turks or the native Egyptians with all the mis- chief of this kind which is perpetrated, and our sorrow is increased by the reflection that to European travellers, principally Englishmen and Americans, must be assigned no small share in the destruction or mutilation of the monuments, which in the case of educated men is nothing less than a crime.

A short distance south of Antinodpolis is the town of Mel- lawee, on the western bank, and a little farther, on the other side of the river, the promontory called Gebel-esh-Sheykh Sa’eed, which is honeycombed with grottoes, some of which are shown by their sculptures to be very ancient, but are so ill preserved as to require but a short examination. A little beyond, however, in the district of Tell-E]’Amdérineh, or the Mound of El’Améarineh, a small fertile tract where the eastern mountains recede, noted, like Benee-Hasan, for the turbulent and thievish propensities of its inhabitants, are most curious remains of a very ancient town. It was the capital of Khn-n-aten, the sun-worshipper of Dynasty XVIII, and was no doubt destroyed by Horus, and not subsequently rebuilt. In the mountain behind it are very interesting sepulchral grottoes, in which were buried the courtiers of this king, and from them we obtain much information respecting his religion, a very pure form of sun-worship. The representations are chiefly of the king, his queen, and their children, distributing presents to the soldiers and others, of acts of worship to the sun, and of the temple of the sun as well as gardens and villas.

On the western bank of the Nile, a little to the south of Tell-el’Amarineh, is the small town of Deroot-esh-Shereef, supposed to be on the site of the Thebaica Phylace, which guarded the northern boundary of the Thebais.

miles to the south is the town of Manfaloot, on the same side of the river, which has a decayed appearance from the manner in which the stream has encroached upon and washed away part of it. Opposite to Manfaloot in the eastern range are extensive crocodilemummy catacombs. There is nothing of note during the next 25 miles of the river's course, which is very winding, until we reach the village of El-Hamra, the port of Asyoot. This town, the capital of Upper Egypt, or the Sa'eed, that is, of the whole country above Cairo, lies inland, about two miles from El- Hamra, in a richly cultivated plain. Asyoot, with its beautiful mosques, two of which, one of the Memlook style, and the other of the Turkish, are not unworthy of comparison with those of the metropolis, and its Con- stantinopolitan palace, surrounded on three sides by ver- dant fields, and having behind it a fine rounded spur of the western chain, which here, for the first time, is near the river, presents a picturesque aspect as the traveller approaches it. On entering Asyoot he is not disappointed, for the excclllence of the goods and provisions sold in the well-built chief market, and the solid look of the houses, indicate activity and prosperity. And it is not a little remarkable that this was an important town some 4000 years ago, and has thus outlived Thebes and Memphis, Tanis and Pelusium. The ancient Egyptian name was Ssut, or probably Ssiut, but the Greeks called it Lycopolis, on account of the worship of the wolf- or jackal-headed divinity of the place, a form of Anubis. In the mountain behind Asyoot are some ancient grottoes, one of which is of great size, but their sculptures have unfortunately suffered much. The view of the valley and the town beneath is an ample reward for the ascent.

Thirty miles farther by the river, on the eastern bank, is the village of Kaw-el-Kebeereh, where was anciently Antezopolis. The interesting remains of the temple of Anteous, which stood here early in the present century, have entirely disappeared through the encroachment of the river, and also, it is believed, from having been used as a quarry by the Turks. A few miles beyond, the lofty part of the eastern range called the Gebel-esh-Sheykh-El-

Hareedee from a famous Muslim saint, hems in the river on one side for a short distance. It soon, however, retires again, and the valley on that side becomes broader than nsual. Here, a short way from the river, stands the small town of Akhmeem, the ancient Chemmis, or Panopolis. No remains of importance mark this site. About 22 miles farther by the course of the river, on the western bank, is the important town of Girg', which was, until a compara- tively recent period, the capital of the Sa'eed. The rise of Asyoot, however, and the agency of the river which is gradually washing it away, have contributed to its decline, and it wears a dilapidated aspect.

The city of Abydos was a few miles from Girga, In a south-westerly direction on the border of the desert, here separated from the Nile by a broad cultivated tract. Close to it was Thinis or This, the town of Menes. Two interest- ing edifices render Abydos worthy of a visit. They are both dedicated to Osiris, the chief divinity of the place. The southernmost of these isa temple of Osiris, in which we find the names of Ramses IT. and his father Setee 1. The other structure is smaller, and in a worse state of preser- vation than the other temple, and among its sculptures are the same names, those of Setee I. and Ramses II. Hence was taken the famous list of Pharaohs known as the Tablet of Abydos, which is now one of the most valuable objects in the British Museum, and M. Mariette has since dis- covered a corresponding tablet in the other temple, happily complete. In the desert near by are many sepulchres, remarkable on account of the interesting antiqnities which haye been discovered by clearing them out. 'The sanctity

of Abydos as a reputed burial-place of Osiris rendered this a favourite necropolis of the ancient Egyptians from very early times, particularly under Dynasty XIL.

At a distance of more than 40 miles from Abydos, but in nearly the same latitude, is the village of Dendarah, on the left, here the southern, bank of the Nile. Before reaching it we pass the small town of Farshoot at the roouth of the great canal called the Bahr-Yoosuf, and the large village of Hoo, marking the site of Diospolis Parva. Opposite the latter place are some sepulchra) grottoes in the eastern chain, called those of Kasr-es-Seiyad,

which is believed to occupy the position of Chenoboscion. They contain names of kings of Dynasty VI, but the representations which occupy their walls are not of unusual interest. At Dendarah is the first well-preserved and unencumbered temple that is seen in a voyage up the Nile, that of Athor, the Egyptian Venus, who presided over the town of Tentyra, or Tentyris, the capital of the Tentyrite nome. It stands on the mounds of the town about a mile and a half fromthe Nile. From it we gain a good idea of Egyptian religious architecture under the Greck and Roman dominions.

The temple is surrounded by a great wall of crude brick, entered by astone portal adorned with sculptures represent- ing the emperors Domitian and Trajan, engaged in acts of worship before several divinities. The portico to which it leads is about 135 fect in width, and is one of the richest and most beautiful structures of the kind. It is supported by twenty-four columns, four deep, nearly 50 feet in height, and having a diameter of somewhat more than 7 feet at the thickest part. ‘The capitals have a full face of Athor sculptured on each of their four sides, and above these a kind of shrine. The three columns on each side of the entrance are connected by an intercolumniation. The portico, like the rest of the temple, is of higher merit as regards its architecture than its sculpture, for the latter art had declined under the Greek and Roman rule to a much greater degree than the former. The sculptures are of the same kind as on the portal, representing offerings made by some of the earlier Ceesars ; and on the ceiling are various mystical subjects, probably of an astronomical import, and the famous Zodiac frora which an extravagant idea of the antiquity of the temple was deduced before hieroglyphics were interpreted. The greater part of the back wall of the portico was the front of the teniple before this portion was added. This inner part consists of three considerable chambers, an isolated sanctuary, and numerous small apart- ments. ‘The first of these is a hall, supported by a double row of columns, three on each side, of a rather heavy form, for they have, beneath the capital formed of the block with the faces of Athor and the shrine, another capital of a cup shape. This hall is entered by a doorway in the middle of the back wall of the portico, and passing through it we reach a second and third chamber of the same breadth but shorter, and then the sanctuary. ‘This chamber is much narrower, and is isolated by a passage running round it. On each side of the chambers and passage are many small apartments, two passages to the exterior, and two

staircases ; and there are singular inclined passages in the walls, two of which are entered from the sides of the portico. The whole interior is covered with sculptures and inscriptions of a religious character, stating in a systematic manner the use of each chamber in the temple-worship. The royal names have not always been filled in, the rings remaining vacant ; but when they have been sculptured, they are generally those of the last Cleopatra, and Ptolemy Cesar, her son by Julius Cesar. On the roof of the temple to which the staircases lead, there are a sort of chapel aud some small chambers, one of which is very interesting, because its sculptures relate to the myth of

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Osiris.“ The exterior of the temple is as completely covered with sculptures as the interior. Among the figures repre- sented here are those of Cleopatra aud Ptolemy Ozsar; but they cannot be supposed to convey any resemblance, since they belong not alone to a conventional art, but almost to its lowest period. ‘There are two smaller temples near the great temple of Athor, one of Isis, and the other of the kind called a Typhonium. Both are of the Roman time. See admirable account of the temple in Mariette’s Monuments of Upper Egypt, 125 seqg.

On the opposite side of the Nile, a little above Dendarah, is the town of Kine, between which and Arabia some traffic is carried on by the route through the desert to El- Kuseyr on the Red Sea. The best of the porous water bottles which are used throughout Egypt are manufactured here; and the great water-jars, called “ bellasee,” which the women carry, are made at the large village of Bellas, a few miles higher on the western bank. Opposite to Bellas is the village called Kuft or Kift, marking the site of the important town of Coptos, which was the emporium on the Nile of the Arabian and Indian trade under the Ptolemies; and, somewhat to the south, is the inconsiderable town of Koos, the ancient Apollinopolis Parva, which succceded to the trade of Coptos, under the Muslims, until Kiné supplanted it. On the western bank, a little higher, is the small town of Nakédeh, which the people call Nagadeh, where are Roinan Catholic and Coptic convents. A

short distance beyond Nakddeh are the northernmost of the remains of Thebes. ‘

The monuments of Thebes do not present from afar the imposing appearance of the Pyramids of Memphis. Placed for the most part ata distance from the Nile, as well as from one another, and having on the western side the picturesque form of a much higher mountain than any near Memphis rising behind them, they do not strike those who see them from the river. Most of them are not indeed visible from the Nile except when it is at its height. The stately colonnade of the temple of El-Uksur, incorrectly called Luxor, on the very bank, is, however, not unworthy the magnificence of Thebes, and when one approaches the other monuments his utmost expectations are exceeded by the grandeur of El-Karnak, the beauty of the temple of Ramses II., and the mystery of the Tombs of the Kings. Nowhere else are the mythology, the history, the very life and manners of the Egyptians of old times so vividly brought before the eye as in the sculptured and {inscribed monuments of the capital of the Empire. ;

Thebes, or Diospolis Magna, is called in the hieroglyphic inscriptions Ap-t, or, with the article prefixed, T-ap, whence Thebes, and Nu-Amen, the city of Amen, the No-Amon or No of the Bible. The date of its foundation is unknown, but there are remains of the time of Dynasty XL, the first of Diospolite kings. Under the sovereigns of Dynasty XII. it must have become a place of importance, but it probably declined during the troubles of the Shepherd period. With Dynasty XVIII. it attained its highest prosperity, and maintained it during Dynasties XIX. and XX. To this period its greatest monuments belong. Then its decline evidently commenced; but from the manner In which Homer mentions it (JJ. ix. 381-4), Thebes must have been still a great city inhisdays. After this it suffered severely from the violence of the Assyrians and Persians, and lastly of Ptolemy Lathyrus; so that in Strabo’s time the Thebans inhabited villages as now, and there was no longer @ city (Geogr., xvii. 1).

The monuments of Thebes, exclusive of its sepulchral grottoes, occupy a space on both sides of the river, of which the extreme length from north to south is about two miles, and the extreme breadth from east to west about four. The

city was on the eastern bank, where is the great temple, or rather collection of temples, called after El-Karnak, a modern village near by. The temple of El-Karnak is about half a mile from the river, in the cultivable land. More than a mile to the soutli-west is the temple of El-Uksur, on the bank of the Nile. On the western bank was the suburb bearing the name Memnonia. The desert uear the northernmost of the temples on this side, the Setheum, almost reaches the river, but soon recedes, leaving a fertile plain generally more than a mile in breadth. Along the edge of the desert, besides the Setheum, are the Rameseum of El-Kurnch, and, less than a mile farther to the sonth- west, that of Medcenet-Haboo, and between them, but within the cultivated land, the remains of the Amenophium With its two gigantic seated colossi. Behind these edifices rises the mountain, which here attains a height of about 1200 feet. It gradually recedes in a south-westerly direc- tion, and is separated from the cultivated tract by a strip of desert in which are numerous tombs, partly excavated in two isolated hills, and two small temples.

The temple of El-Uksur is nearest of the cdifices to the river, and but an appendage to the great group of El-Karnak. It takes its name from the small town of Kl-Uksur, or Abu-l-Hagg4g, which is built in and around part of it, thus injuring its effect, and rendering examina- tion difficult. It differs from most Egyptian temples in not facing the river, but this is accounted for by its connection with the temple of El-Karnak, from the southern approaches to which a long avenue of sphinxcs (now wholly ruined) leads to it, ending at its entrance. This is a massive propylon, or portal with wings, 200 feet in width, before which is a very fine obelisk of red granite. Its fellow, which stood on the western side, was rernoved by the French to Paris in 1831, and now adorns the Place de la Concorde. Both have beautifully cut Meroglyphic inscriptions. The height of that which remains is about 80 feet. It is adorned with three vertical lines of hieroglyphics on each side, bearing the titles of Rainses IT. The other obelisk differs from this only in being slightly shorter. Close to the winged portal are three seated statues of red granite representing Ramses IT.; a fourth has been destroyed. The wings of the portal are covered with sculptures of remarkable interest, representing occnr- rences in the war of Ramses II. with the Kleta or Hittites, in his fifth

year. On the left wing is depicted the defeat by the Egyptians, led by their king, of the confederate peoples under the walls of the Hittite stronghold called Ketesh, cr Kadesh, on the Orontes. The king is repre- sented, according to the Egyptian custom, of a gigantic Size, standing in his chariot, which he has urged into the midst of the hostile force, whose warriors fall by his well- directed arrows. The Egyptians, on the other hand, sustain no luss. On the right wing is represented the Egyptian camp. This has been sculptured over another subject, of which part may be now seen, owing to the falling out of the plaster with which it had been filled. All these repre- sentations are in sunk relief, and beautifully executed.

The entrance to the temple is contracted by a modern wall, through the small door of which we pass into a great court choked by the huts of the town, among which stands @ mosque. The court is surrounded by a double row of columns, the capitals of which have the form of the bud of the papyrus. A ruined portal with wings forms the end of this court, and with it begins the older part of the edifice, which has a more southerly direction ; and its southernmost part in like manner turns a little more in

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that direction, that is, from the river, though not so remarkably. Some deviation was probably rendered necessary by the course of the Nile. The second court is much obstructed by rubbish; nothing is seen of it but a magnificent central avenue of fourteen columns, having capitals of the bell-shaped flower of the papyrus. The columns are about 60 feet in height, of fine form, and elegantly sculptured. They were raised by Amenophis ITL., whose name is the oldest which occurs on them and in the rest of the temple. Behind this is another court, which has a double row of columns on each side, and at its enda portico supported by columns four deep. This court 1s much ruined. Beyond it are several chambers of the time of Amenophis ITI., and in the midst of them an iso- lated sanctuary, the sculptures of which bear the name of Alexander /Zgus, in whose reign it was built, in the place, no doubt, of one destroyed by the Persians under Cambyses or Ochus, as Sir Gardner Wilkinson remarks (Afodern Egypt and Thebes, ii. 245). Most of these apartments are in a dilapidated state.

Although there is an approach to the temple of El-Karnak from that of El-Uksur, the grand entrance was towards the river, and from that direction it should be entered. This extraordinary assemblage of buildings consists of a grcat temple and several smaller structures, surrounded by a massive crude brick wall. There are other remains similarly inclosed, which were connected with the great temple.

The grand entrance is through a propylon more than 360 feet wide, for this is its measure above the rubbish which is piled up around it. It was never sculptured, nor was its surface smoothed. It presents, therefore, a rude appearance, and is much rnined, a great part of the left or northern wing having been demolished. The court of which the propylon forms the front measurcs 329 feet in width and 275 in length, having on each side a gallery with a single row of columns; and a double colonnade, of which one column alone stands, formed an avenue from its entrance to that of the lypostyle hall beyond. On the right side a temple of older date interrupts the side gallery, extending 50 feet into the court. Its front is formed by a propylon, about 90 feet wide, on cach wing of which Ramses III. is portrayed in the act of slaying prisoners before Amen-ra. The interior of this temple consists of a court, which has on cach side a row of Osiridean pillars, and at the end another row of such pillars with columns behind them, a hall or portico supported by cight columns, next to the court, and, beyond, other apartments. Nearly all the sculptures are of the reign of Ramses IIL, but the names of later sovereigns cccur. On the other side of the great court isa small structure which may be called a chapel, or three chapels. ‘The most interesting sculptures in this part of the group of temples are outside the castern portion of the south wall of the great court, for here is the famous list of countries and towns subdued by Sheshonk I., or Shishak, the head of Dynasty XXII. Among the names is that thought to be the kingdom of Judah, and those of several places in the dominions of Rehoboam and Jeroboam I. At the end of the court is a fine portal, the wings of which are much ruined. This is the entrance to the great hypostyle hall, the most magnificent work of its class in Egypt. Its length is 170 feet, and its width 329 ; it is supported by 134 columns, the loftiest of which are nearly 70 feet in height, and about 12 in diameter, and the rest more than 40 feet in height, and about 9 in diameter. The great columns, 12 in number, form an avenue through the midst of the court from the entrance, and the

others are arranged in rows very near together or. cach side. There is a transverse avenue made by two rows of the smaller columns being placed farther apart than the

rest. This great hall is therefore crowded with columns, and the effect is surprisingly grand. The spectator, being generally unable to see beyond the columns which are immediately around him, perceives the vast dimensions which, if viewed from a distance, might lose their effect. The forest of columns seems interminable in whatever direction lie looks, producing a result unsurpassed in any other Egyp- tian temple. ‘The partial ruin of its stone roof, and of some of the columns, renders the hall the more picturesque, and makes us wonder at the force which must have been expended in attempting to demolish it. This grand hall was built by Setee L, Dynasty XIX., and sculptured partly in his reign and partly in that of his son and successor Ramses Il., who has sometimes effaced his father’s name to sub- stitute his own. It commemorates, not in its grandeur alone, but also by its sculptures, the magnificence and power of these two great Pharaohs. The sculptures of the interior of the walls represent these kings making offerings to the gods, and the like subjects occupy the columns. Far more interesting are those which adorn the exterior of the walls, and record the achievements of the same kings, those of Setee I. being on the north wall, and those of Ramses II. on the south, The former are of much greater interest than the latter, as far as we can judge, and in this respect inferior to none in Egypt. The scenes on the north wall are arranged in three compartments, of which the upper one has been nearly destroyed. In these scenes the king is represented of a gigantic size, charging in his chariot, and putting to the rout his enemies, capturing their strongholds, and returning home in triumph. The chief nations are the Kheta or Hittites; the Ruten (Luten), at this time a great nation of Syria; the Shasu, or Arabs ; the Khalu, Syria, or Syrians ; and Remenen, Armenia. Among the captured places is Ketesh, in those days the most impor- tant stronghold between Egypt and Mesopotamia. There is also a long list of countries, cities, and tribes, conquered or ruled by the king, among which we find Vaharina, that is Aram-naharaim, or

Mesopotamia, Kesh, Kush, or Ethiopia, &e. The battle-scenes of Ramses IT. on the south wall do not, as far as they are seen, equal these in interest. Here also is a list of the king's conquests and possessions, and on the west side of a wall which joins this one at right angles, forming the side of a court of the southern approach to the temple, is a representation of the capture of Askelena or Ascalon, and an inscription recording the treaty between Ramses IT. and the Kheta, concluded in the twenty-first year of his reign. The back of thehypostyle hall is formed by a ruined propylon bearing the name of Amenophis III., and then'at a distance of about 50 feet is another propylon, entirely ruined. In the space betwcen these propyla, which was a court, stands a beautiful obelisk of red granite, upwards of 70 feet high, raised by Thothmes I. The fragments of its fellow, which was more to the north, strew the ground, Behind the second of these propyla is another granite obelisk, 108 feet high, and according to M. Mariette the loftiest known (Monuments of Upper Egypt, 170). This great obelisk of El-Karnak is a monument of Queen Hatshepu of Dynasty XVIII, and an inscription on its pedestal records the period which elapsed (nineteen months) from the time that it was begun to be cut in the quarry until its completion in the queen's sixteenth year, The fellow of the great obelisk, which stood to the south of it, has been broken, and its fragments occupy its place. Beyond the great obelisk is the chief sanctuary, a structure almost entirely of granite, divided into two apartments, which was built under Philip Aridzus, in the place, no doubt, of one destroyed by Cambyses or Ochus. The space between the hypostyle hall and this sanctuary is extremely ruined, the huge stones being piled up in heaps as though an earthquake had overthrown the temple. But this

destruction was probably due to human violence. Behind the sanctuary are fragments of a very ancient part of the temple, bearing the name of Usurtesen I, Dynasty XII, Considerably farther is a large oblate building of the time of Thothmes II, which affords a remarkable example of architectural caprice, its columns having inverted shafts and capitals, and its

cornices being likewise inverted, Behind this and a stone wall of inclosure are ruined chambers, and far beyond, directly behind the centre of the great temple, in the crude brick wall of inclosure, is a hand- some portal, never finished, bearing the name of Nectanebes IT.

The southern approach to the temple of El-Karnak from that of El-Uksur is, as before mentioned, by a ruined avenue of sphinxes, which ends near the great structure, and two other avenues begin. The westernmost of these, which is of colossal rams, conducts to a temple situate not far to the south-west of the first court of the great temple: we approach it through a stately portal bearing in its inserip- tions the name of Ptolemy Euergetes I. The front of the temple, before which was another avenue of rams, is a propylon, which is almost uninjured. Behind it is a court having a double row of columns on each side and at the end, and again behind this is a hall supported by eight columns, and many small chambers. This temple was dedicated to Khuns, the third member of the Theban triad, It was begun under Dynasty XX., and continued by the high-priest kings. A small edifice having sculptures of the time of the Greek and Roman rule stands on the west of the court of this temple.

The avenue of sphinxes which branches off at the same place as the avenue of rams leading to the temple of Khuns takes an easterly direction and ends where another begins at right angles to it, which connects the southern courts leading to the great temple with a separate inclosure. The latter contains a lake which has the shape of a horseshoe, and the remains of the temple of Mut. At the northern extremity of the avenue, which is of criosphinxes, is a propylon form- ing the front of a large court ending in a second pru- pylon, which, like the other, is much ruined. Beyond this, but not in exactly the same direction, after a vacant space, the approach continues through two smaller propyla, the second of which is nearly destroyed. Each fronts a court, and at the end of the secondof these courts was the great side entrance to the temple. The first and second propyla were, like the criosphinxes, monuments of King Har-em-heb, or Horus, of Dynasty XVITI., and were partly built of materials of a temple or palace of the sun-worshipping kings whom he overthrew. The third propylon is more ancient, for it bears the name of;Thothmes III. and Amenophis IL, as well as of subsequent kings; the age of the fourth is not certain; the name of

Ramses II. occurs here, but it may have been founded before his time. There is an inclosurce in the angle formed eastward by the third and fourth propyla with the great temple, which contains a sacred lake.

Adjoining the great crude-brick wall of inclosure at its north-eastern portion is another containing the ruins of an important temple. The chief approach is through a stately portal of the Ptolemaic period, in the crude-brick wall. The temple to which it conducted was very beautiful and costly, as we can judge from its remains, which show with how much violence it was destroyed. It seems to have been founded under Dynasty XVIII. There are two small temples or chapels, one of the time of Achoris and the other of that of Nectanebes I. and IL. in the same inclosure. Another crude-brick inclosure of small dimensions, near the south-east corner of that of the great temple, contains some unimportant remains of a small edifice.

This brief description will convey some idea of the magnitude of the temple of Amen-ra at Thebes, with its

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appendages; but no one who has not seen that wonder- ful assemblage of ruins can picture to himself the massive- ness of its castle-like propyla, the grandeur of its hall of columns, the beauty of its great obelisk, and the sublimity of its heaped-up ruins. Of the city of Thebes there are scarcely any remains. Doubtless its edifices were of perishable materials.

Beginning our examination of the monuments of the western bank, where was the great suburb of the Memnonia, from the northward, the first object of interest is the Setheum, a small temple of Setee I., which the natives call Kasr-Er-Rubeyk, at the ruined village of El-Kurneh. A portico, originally supported by ten columns, of which two have fallen, extends along the whole front of the puilding. Three entrances lead to the interior of the temple: the middle one of these is the door of a hall having twelve columns. From this apartment we pass into several small chambers, which are of little interest, like the ruined chambers which we enter from the northern door. Thesouthern door is the entrance of a separate part of the edifice, which

contains a small hall supported by two columns, and three chambers behind it, the middle one of which was a sanctuary or chapel, devoted, as its sculptures show, to the worship of Ramses L., the father of Setee I. The inscriptions of the temple tell us that it was dedicated to Amen-ra by its founder Setee I., and continued by bis son Ramses IJ., and his grandson' Menptah. It was the funereal chapel of the tombs of Ramses I. and Setee i

The great temple of Ramses Il, which may be called the Raineseum of El-Kumeh, but is commonly though incorrectly known as the Memnonium, is situate at a dis- tance of about a mile to the westward of the Setheum, and is like it on the edge of the desert, which here is much farther from the Nile. Notwithstanding that its condition is much more ruined than that of other edifices of Thebes, the beautiful architecture of what remains, and the historical interest of its spirited sculptures, render it altogether second alone in its attractions to the great pile of El-Karnak. A propylon, 225 feet in width, of which a great part has been thrown down, forms the front of the edifice. Through its portal we enter a spacious court 180 feet wide and 142 long. It had originally a double colonnade on either side, every column of which has been destroyed, while tlic side walls have been entirely demolished and the end wall partially. Ou the back of the propylon are sculptured a battle and other scenes of a campaign in the king's eighth year. In this court is one of the most wonderful objects at Thebes, a colossal statue of Ramses IL, broken in pieces, exceeding in its weight and equalling in its dimen- sions any other known Egyptian statue. It was of a single block of red granite, and must have been transported hither from the quarries of Syene, notwithstanding that its weighé was, according to Sir Gardner Wilkinson's computation, about 887 tons, 54 ewt. (Modern Egypt and Thebes, ii. 144, 145). It was 60 feet in height, representing the king seated on his throne, and was placed on the left side of the entrance to the second court. Of that court, happily, there are more remains than of the first. Its width was about 170 feet and its length about 140, so that it was not much smaller than the other court. It had a double colonnade on each side and at the end, and but a single colonnade at the front. These were of columns having capitals of the form of the papyrus bud, except eight of the ten form- ing the front row, that is, all of that colonnade but the two extreme columns, and, in like manuer, the correspond- ing ones of the opposite row, which were Osiridean pillars, formed of a square block, having in front a

figure of Ramses as Osiris. Many of the columns and pillars have been demolished; but those which yet stand enable us to judge how magnificent this part of the temple must have

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been. On what remains of the front wall of the court, that is, on its northern half, are very remarkable sculptures. Here is a great scene representing a battle between the Egyptians, led by Ramses II., and the Kheta or Hittites, near the strong city of Ketesh. The king of Egypt is portrayed routing the chariots of the enemy, who flee in disorder towards Ketesh, across a double moat, beyond which and beneath the city a strong force of regular infantry endeavours to protect their retreat. This was doubtless the decisive action of the campaign against the confederates, which must be regarded as the most important of the wars which distinguished the reign of Ramses IJ. Higher up on the same wall is a procession of priests bear- ing small statues of kings, the first of which is that of Menes, the earliest sovereign of Egypt, the second of a Munt-hotp, of Dynasty XI, and the subsequent ones of the kings of Dynasties XVIII. and XIX., as far as Ramses II., with whom the series ends.

Next to the second court is a hypostyle hall, which is the most admirable part of the temple. It measures 100 feet in length and 133 in breadth, and originally contained forty-eight columns in eight longitudinal rows, each con- sisting of six columns. A central avenue is formed by twelve lofty columns, about 36 {feet high, which have capitals of the shape of the papyrus flower; while the columns on each side, about 24 feet high, have capitals of the shape of the bud of the same flower. The elegance of the form and tlie justness of the proportions of all these columns is not equalled in any, other Egyptian temple, and render this hall one of the most beautiful structures of its kind. Happily, although much injured, it has suffered less from violence than the first and second courts. On its front wall, to the left as one enters, are curious sculptures, representing the rout of a hostile force, and the capture of a town, the walls of which the Egyptians ascend by

means of scaling ladders : Ramses IT. and six of his sons lead the army. On the end wall are religious subjects, and a series of the sons and daughters of Ramses IT., whose legitimate offspring they seem to have been, twenty-six in number, twenty-three sons and three daughters. At the temple of Wadee-es-Suboo'a, in Nubia, a much larger number of children of this king were represented.

Beyond the hypostyle hall are two smaller chambers, the first of which is entered by a doorway in the middle of the end wall of the hall. It is supported by eight columns, and has on its walls representations of mythological sub- jects. Itis chiefly remarkable, however, for its astronomical ceiling, one of the most precious records of ancient Egyptian science. Behind this is a ruined chamber, which seems to have been of the same dimensions, The other apartments which must have adjoined these are entirely demolished. This temple was the chapel of the king's tomb. The description which Diodorus Siculus gives from Hecatzus of Abdera of the Tomb of Osymandyas agrees best with the Rameseum of El-Kurneh ; and the mention of the sacred library is in accordance with the character of the sculptures of the first chamber beyond the hypostyle hall, as well as with the statement in several papyri that they were written by the scribes in this temple, in which, or attached to which, was a kind of college (Lepsius, Chronologie der Aegypter, i. 39, 53).

To the south-west of the Rameseum of El-Kurneh, at a distance of less than half a mile, a mound just within the cultivable plain marks the site of a magnificent temple of Amenophis III., which may be called the Amenophium, and which, there is reason to believe, was destroyed by Of the obelisks and colossi which stood on either side of the approach of the Amenophium, all are thrown down except the two gigantic statues, one of which '+s known as the Vccul Memnon. 'The latter indeed, was

broken, but afterwards restored. These colossi stand about a quarter of a mile to the south-east of the mound where are the scanty remains of the temple. They are of hard gritstone, monolithic, and about 47 feet in height, with pedestals about 12 feet high. They represent Amenopliis III. seated on his throne. Smaller though eolossal standing statues of the king's mother,

Queen Mut-em-wa, and of his wife, Queen Tai, rest against the space between the sides of the throne and the legs of the great statues, one at either extremity ; while there are remains of two other statues of Queen Tai, of smaller size, standing between the feet of each colossus. The colossi are a little less than 60 fect apart, a distance judiciously chosen, so that they should neither seem smaller than they actually are, by being placed too far from each other, nor should be so near as to appear but a double statue.

The Vocal Memnon is the more northern of the two statues. It was broken in the midst either by the barbarism of Cambyses, or by an earthquake, more probably tlic former (comp. Paus. Afétic. i, 42), but long afterwards repaired, It presents in consequence a very shattered appearance, and the other colossus gives us a better idea of what the pair must anciently have been, Many Greek and Latin inscriptions on the Vocal Statue record the visits of those who were with Hadrian, and of others, and relate that they heard the voiceof Memnon. There is thus satis- factory evidence to show that some sound was frequently heard here at sunrise ; and the only dispute is whether it was produced by a physical cause, or was an imposture of the priests. That it was a natural occurrence does not seem impossible from the examples we have of sounds resembling that which is described as having been heard here by the ancients,

Less than half a mile from the mound of the Ameno- phium, in a south-westerly direction, within the desert, is the group of temples known as those of Medeenet-Haboo. This name is that applied by the Arabs to a town, which appears to be that called Papa in the Roman times. The ruins of its houses obstruct the temples, more especially the larger of the two. The smaller temple is nearer to the river, to the eastward of the other. We first enter a ruined court, which was never completed, and which had a eolonnade of which two columns alone yet stand, at its end, a little before the first propylon of the temple, which bears the names of Ptolemy Lathyrus and Auletes among the

sculptures of its gateway. Beyond this is a court which .

had a colonnade on each side, anda propylon, much smaller than the other at the end. Most of its columns have fallen, and the propylon has also suffered much. On the latter we see the names of Tahraka, or Tirhakah the

Ethiopian, and later sovereigns. Beyond this is another court, and then the chambers of the temple. The chief of these is an isolated sanctuary, with a gallery around it having square pillars and fluted columns like those of certain of the tombs at Benee-Hasan, The sanctuary is ornamented with sculp- tures of sovereigns of Dynasty XVIIL., including Queen Hatshepu. —

To the south of this temple is a very remarkable struc- ture, which differs from any other ancient monument in Egypt. It is supposed to have been a palace.) After passing between what secm to have been lodges, we arrive at the main part of the edifice. This consists of two towers on each side of a court, ending in another tower,

1 The size and character of the only chambers in the temples which could have been used for habitation render it most improbable that any but priests and scribes resided in them; and it is most likely that the royal abodes were usually extensive pavilions constructed of no stronger materials than the houses of the people, and this view the representations of the tombs seem to support. Tke temples, however, were called palaces,

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beneath which is a gateway conducting to the great temple. On.the front of each of the two towers first mentioned Itamses IIT. is represented slaying his enemies before Amen-ra, and below is a series of captured chiefs, The inscriptions that reroain tell us that these are the chiefs of the Kheta, or Hittites, the Amari, or Amorites, the Takkaru, or Teucrians, the Shardana of the sea, or Sardones, the Tuirsha of the sea, or Etruscans, and of other peoples. On the walls of the chambers are curious sculptures usually supposed to represent the private life of Ramses ITI., but probably of a mythological import. Among these the king is portrayed playing at a game like that of draughts with a goddess, while another stands by him.

The great temple of Medeenet-Haboo is directly behind the palace through which was, as already mentioned, the approach to it, and is a monument of the same king, Ramses III., a sovereign inferior alone as a conqueror to Ramses Il, the greatest ruler of Egypt. Both the magnificence of its architecture, and the high interest of its sculptures, render it one of the most interesting edifices at Thebes,

The first propylon cannot be less than 200 feet wide, It is partly destroyed, and much of it is hidden by the re- mains of the town, On its wings the king is represented slaying prisoners before the gods, and acts of worship are also depicted. The court, of which this propylon is the front, is about 110 feet in length and 135 in breadth, and has a colonnade on either side, forming a gallery. The gallery on the right side consists of seven Osiridean pillars, that on the left of cight columns having capitals of the form of tle papyrus-flower, affording a remarkable example of the irregularity of Egyptian architecture. At its end is a second propylon, on the left wing of which Ramses III. is represented bringing captives of the Takkaru, or Teucrians, before Amen-ra. Passing through the granite portal of this propylon we enter the second or peristyle eourt, the finest part of the temple, This court measures about 123 feet in length, and about 133 or somewhat more in width, thus exceeding in size the first court, contrary to the usual practice of ancient Egyptian architects, It has a single colonnade at the front and on either side, and a double one at the end. The colonnade at the front and that facing it are each of eight Osiridean pillars, while that behind the latter is of columns with capitals of the papyrus-bud, and the side colonnades consist each of five similar columns, one of which, on the left side, has fallen. The Christian inhabitants of the town, the ruins of whose ehurch are seen in the court, defaced many of the sculptures, and particularly the Osiridean pillars ; neverthe- less the general effect is not lost, and one is struck by a simple grandeur, which is unsurpassed in any similar Egyptian structure. The sculptures of the walls are of especial interest. On the back of the left wing of the propylon a series of sculptures relating to the wars of Ramses III. begins and extends along the wall on the left side of the court. The rout of the Rebu or Lebu, the Libyans, is depicted, the triumphal return of the king, the bringing of prisoners before him on the field of battle, and the like; and besides these are subjects portraying cere: On the right side-wall is a curious representation of the celebration of the

Panegyry of Amen-ra Ka-mutt, which, from the detail in which it is given, affords us con- siderable insight into the manner in which such solemnities were kept (Ane. Hy., iv. pl. 76), On the end wall, and on part of each side wall, are depicted the many children of Ramses ITT. A door in the end wall conducts to the inner part of the temple, which occupies but little less space than the two courts just described. It is in a very ruined condition.

TOMBS AT THEBES. |

The seulptures of the exterior of this edifice next claim our attention, none of which have been mentioned except those which occupy the face of the first propylon. On the north-eastern wall is a remarkably interesting series of scenes in the wars of Ramses ITI., equalling in the import- ance of their subjects and the boldness with which they are executed any other records of the kind in Egypt. In the first representation, which is to the extreme right, we seo Ramses III. going to war; in the second is depicted tlic rout of the Tamhu, a Libyan people ; and in the third, prisoners of the Tamhu and Mashuasha, also Libyans, arc brought before the king, while scribes count the hands, “c., which have been cut from the slain, showing their number to have been 12,535. Then weapons are counted for dis- tribution to the troops. Then we see troops setting forth. The next scene is a great battle with the Takkaru or ‘Teucrians, whose army is defeated by the Egyptians. The Yakkaru fight in chariots of two liorses and in waggons drawn by fouroxen. Mercenaries or allies of the Shardana, Sardones, fight in the army of Egypt. The scene which follows this is one of the most spirited of Egyptian seulp- tures, and if compared with similar Assyrian reliefs, slows the great superiority of the best Egyptian art over that of Assyria. The king, who is passing through a marshy country in his chariot, encounters three lions, and having smitten two of them with his javelins, turns round to meet the third which is about to spring. The next subject, thie most remarkable of the series, represents the sea-fight, in which the Egyptian flect defeated that of the Shardana and the Takkaru, while Ramses and his army fought them from the shore. Ramses then receives the praises of Its warriors, and the hands of the slain are brought before him and numbered. Next he leads prisoners, who are of the Takkaru and Rebu, before tle gods of Thebes. The other battle-scenes of the series represent tlie capture of strong places, the carrying away of captives, &c. On thie end wall the king is portrayed

setting forth on an expe- dition, and on the other side wall, the south-west, is a long eilendar, which appears to occupy the whole wall, This temple was no doubt connected in purpose with the royal tomb. Not far from the Rameseum, to the southward, is a small Ptolemaic temple containing tliree chambers. Farther in the same direction is a great lake. More than half a mile in a south-westerly direction from the lake is another small temple of Roman times, having an isolated sanctuary and other chambers.

The private and royal tombs must now be briefly noticed, but from their great number, and the variety of the paint- ings which oeeupy their walls, it will not be possible to give as detailed an account of tlem as lias been given of the other monuments. Two temples which are situate in the necropolis likewise require a notice. The tombs, as before mentioned, oeeupy some of the space at the foot of the mountains, or are excavated in their sides towards thie valley, and in two isolated hills, except the Tombs of the Kings, which are cut in the sides of two secluded valleys to the westward.

Beginning from the north, we first see the entrances of grottoes in the low spur of the Libyan chain behind the Setheum. Several of these have a series of square apertures, caving pillars to support the roof, so as to form a kind of portico, behind which is a chamber or chambers, having pits, from which open other chambers for sepulture. Some grottoes here, and others extending towards the Rameseum, are inhabited by tle people of El-Kurneh, whose village is ruined. At the foot of the mountains, as well as on their least steep sides, here and throughout tne neeropolis, are the entrances of many mummy-pits. On the spur above mentioned are brick pyramids, for the most part nearly destroyed; and in the wide tract beyond, the

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oil Asaseef, where the mountains reeede, are very remarkable sepulchres of the time of Dynasty XXVI. ‘These are ex- tensive excavations, profusely sculptured almost entirely with liucroglyphies, having before their entranees open courts hewn in the roek, and entered through crude-brick propyla, from which walls of inclosure of the same material extend around the courts, The largest of these, and indeed of all those known at Tliches, is the tomb of Pet- amen-apt, a priest whose date is not fixed, but who probably lived after the fall of the Ramessides. Sir Gardner Wilkinson says that “ the

area of the actual excavation is 22,217 square feet, and with the chambers of the pits 23,809, though, from the nature of its plan, the ground it occupies is nearly one acre and a qnarter" (Modern Ligypt and Thebes, ii. 222). Almost all the. passages and chambers are covered with lieroglyphic inscriptions on a small scale, and the few seulptures are of a religious character. At the end of the Asaseef is a temple which was approached by a very loug avenue of sphinxes now entirely demolished. The temple is at the base of a steep cliff, and is partly excavated in tle rock, and partly built of masonry. The bmilt portion is almost wholly destroyed. A portal of red granite which formed its entrance yet remaius, bearing the name of Thothmes ITI., cut over the erased name of Queen Hatshepu. A second granite portal stands behind this, almost close to therock. At some distance to the left of this are two small chambers, one of which is remarkable for the form of its roof, which is vaulted by lioizontal stones, of which the two uppermost meet in thie centre, all being cut internally, so as to form an arch. The excavated part of the temple consists of an oblong chamber of moderate dimensions, another of smaller size with a cell on each side, and at the end a sanctuary. All these, except the sanctuary, are of the time of Queen Hat- shepu and Thothmes III, and lave vaulted roofs. The sanctuary bears Ptolemaic sculptures, affording a remark- able contrast to the delicate style of those of the chambers which lead to it, and it is flat-roofed. This temple was probably sepulchral.

The isolated hill of the Sheykh'Abd-El-Kurneh (probably a mistake for 'Abid-El-Kurnch, meaning " the Devotee of El-Kurneh"), presents a singular appearance from the plain, as on that side it is honeyeombed by the entrances of tombs. Several of these, like some of those first mentioned, have portieoes before them hewn in the rock, and many liave very interesting paintings, representing scenes of domestic life, funeral ceremonies, arts, trades, Xe., in their chapel or chapels. These have unfortunately, suffered greatly from the disgraceful Vandalisra of European travellers, and the eupidity of the natives which they have encouraged. Farther towards Medeenct-Haboo is a similar isolated hill, called Kurnet-Mara'ee, which contains a few grottoes of the same description, and in the valley between this and the main mass of mountain are many other in- teresting grottoes. At one extremity of this valley, at some distance behind the Rameseum, is a small edifice with a high inclosure of crude-brick walls.

It is a temple of Athor, of the Ptolemaic period, and has a small portico and three chambers, in one of which, the side chamber to the left, is a curious sculpture, of which the subject is thie judgment of a soul by Osiris. Henee we may infer that this was a temple attached to the necropolis. Beyond the other extremity of this valley is the seeluded valley called that of the Tombs of the Queens, from its containing the sepulchres of queens and princesses of Dynasties XVIIL, XIX., and XX. These are similar to the Torabs: of the Kings, but are not large, nor are the subjects on their walls, which seem generally of little interest, well preserved.

A long and winding valley, the eutrance to which is an

opening in the mountains bchind the Setheum, leads to two other valleys, that of the Tombs of the Kings, and the Western Valley. Both these contain royal sepulchires, but those of the former are the more important. The sepulchres in the Valley of the Tombs of the Kings are twenty-five in number. Nineteen are the mausolea of kings, of a queen with her consort, and of a prince, all of Dynasties XIX. and XX. One tomb is without sculpture, and there is likewise an unsculptured passage running for a considerable distance into the mountain, which may be regarded as an uncompleted tomb. M. Mariette has found the tombs of functionaries in this valley (Jfon., 234). Their plan is always the same in its main particulars, but they differ greatly in extent, in con- sequence of having been begun at a king's accession, or even before (for one of them is the tomb of an heir-apparent), and continued throughout his reign, like the pyramids of Memphis. 'Their paintings and painted sculptures likewise do not present remarkable varieties, for they are almost wholly of a religious character, and principally refer to the future state. These subjects are taken from the Book of the Lower Hemisphere, treating of the course of the sun in the twelve hours of the night, and so in the nether world. They are interesting for the manner in which they illustrate the Egyptian religion, and for the beauty of their execution; but their intricate nature forbids any detailed description of them in the present article. The plan of one of the most interesting sepulchres may, how- ever, be described. The tomb of Setee I., commonly called Belzoni's, since that explorcr first opened it since ancient times, is in

the freshest state of preservation, except in its outer part, although the miserable barbarism of modern travellers is yearly lessening its beauty. We enter by a staircase, and pass along a steep passage, which ends in a deep pit, now filled up. Thus far the subjects and inscriptions which occupy the walls are unfinished, showing that the tomb was not completed. Immediately beyond the pit, the part discovered by Belzoni begins with a hall 26 feet by 27, supported by four square pillars, the walls of which are covered with very beautiful painted sculp- tures, including the celebrated procession of the four races. To the right of this is another chamber, supported by two columns, the decorations of which were never begun, having only been drawn in outline. From the left side of the former chamber we descend a flight of steps, which leads to a passage, another flight of steps, and then another passage, endiug in a chamber 17 feet by 14, from which we pass into a hall 27 feet square, having six square pillars, and on either side a small chamber. ‘This forms the portico of the great sepulchral hall, the most splendid part of the tomb, which is of an oblong form, 19 feet in length and 30 in breadth, with an arched roof. In the midst, in a depression, was a splendid sarcophagus of alabaster, now in the Soane Museum, and on its removal blocks of stone were found filling up the entrance of an inclined descent, which was cleared for 300 feet by Belzoni, without its ter- mination being discovered. It is not impossible that the king was buried in a chamber at the end of this passage. The great sepulchral hall is covered with beautiful painted

sculptures, and on its cciling are astronomical or astrological

representations, resembling the astronomical ceiling of the Rameseum of El-Kurneh.

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[TOMBS OF THE KINGS,

The tomb of Ramses IIT. is among the most splendid of the royal sepulchres. Its length a little exceeds 400 feet, but from the nature of the rock its sculptures are less delicately executed than those of the tomb of

Setee J. In cells on either side of its passage, a little within the entrance, are interesting paintings illustrating manners and customs, in one of which is the celebrated representa- tion of the harpers. :

The tombs which have been found in the Western Valley are only four in number, and but two of these contain paintings, those of Amenophis III. and of King Ai, the sun-worshipper who succeeded Khu-n-aten. The former is decorated with paintings in a very good style, but unfortunately they have sustained much damage; the latter is historically interesting as a record of an obscure king, but its paintings are of poor execution.

Nowhere, perhaps, are we so forcibly struck by the feel- ing of the ancient Egyptians with respect to death and the future state as in the Valley of the Tombs of the Kings, and in the sepulchres themselves. The desolateness of the spot, apart from all signs and sounds of life, fitted it for the solemn use to which it was assigned ; and those long dark passages, and lofty chambers, on whose walls we see the awful punishments of the wicked and the rewards of the good, fitly unveil the most secret mysteries of the Egyptian religion.

Not far south of Thebes, on the western bank, is the large village of Armeut, the old Hermonthis, where stands a picturesque temple built by Cleopatra. It has two courts with colonnades, and three chambers around which was also a colonnade, of which but one column now stands. It is of small dimensions, having been the “‘‘T’yphonium ” attached to the great temple of Mentu, the divinity of the place, which has been razed. On the other bank of the river, a little higher, at Tdéd, anciently Tuphium, is a small Ptolemaic temple. Not far beyond, and about 20 miles above Thebes, by the course of the stream, are the “‘ Gebeleyn, ” or “‘ Two Mountains,” ou the western side of the river, where the sandstone begins. The town of Isné, the ancient Sne, called by the Greeks Latopolis, is likewise situate on the western bank, about twelve miles higher, and is remarkable as containing a very fine Egyptian monument, the portico of its great temple of Kueph. This is in the heart of the modern town, and was much choked with rubbish until cleared by Mehemet Ali. It is supported by. twenty-four lofty and massive columns, six in front, and four deep, having capitals of various forms, of which those alone in corresponding positions on opposite sides are of the same

description, a deviation from regularity of which we do not see examples previous to the Greek rule. The columns and walls are covered with minute sculptures of the bad style of the period when the portico was erected, -— that of the Cesars. It contains the hieroglyphic names of Claudius, Vespasian, Titus, and other emperors as late as Severus. The back is, however, more ancient, for it bears the name of Ptolemy Philometer, being the front of the older temple of which nothing more is known for certain to remain. Upon the ceiling is a zodiac, from which this monument was supposed to have been of very great antiquity before the interpretation of hieroglyphics had been discovered. On the other bank of the Nile, on the site of Contra Latopolis, is a small temple of the Ptolemaic and Roman periods.

A few miles above Isnt, where both the Libyan and Arabian chains approach the river, are the curious remains of Eilethyia (so written in Egyptian geography). There is a small temple of the Ptolemaic time, and two little sacred edifices of the period of the Pharaohs, but the most interesting monuments are the tombs and the fort. The former, which are excavated in a hill, are very remark-

able as illustrating history as well as everyday life, lus- bandry, é&c.; and in one of them is the very curious inscription of its oceupant Aahmes, chief of the mariners, recording his services to early kings of Dynasty XVIII. The fort is a large inclosure of crude-brick,! whieh was a place of importance as early as the Shepherd war, for it is mentioned as the ‘ Tort of Suben,” that is of Eileithyia, in a part of the inseription above mentioned, relating to the time of that war. or Lucina (Eileithyia), wlio was especially regarded as the protector of Upper Egypt.

Having proceeded about twelve miles to the southward we reach the large village of Adfoo or Edfu, which represents thetown called by the Greeks Apollinopolis Magna, the great temple of whieh yet stands in a comparatively perfect state, and is one of the most stately monuments of ancient Egypt, although of a time at which art had greatly declined. It was dedieated to Har-hut, the god of the place, whom the Greeks ealled

Agathodemon. Mounds of rubbish around it, as well as the huts of the village, injured its effect, until it was lately eleared by M. Mariette.

The great propylon which forms the front of the temple measures about 226 feet in width, and is, like the rest of the cdifice, ina good state of preservation. ‘The sculptures upon its face represent acts of worship by Ptolemy Auletes, who is portrayed slaying prisoners.

The portal between the wings of this propylon is the entranee to the temple, of which the first part is a great court about 161 feet long and 140 broad, with a colonnade along its front and each side, of columns with various capitals supporting covered galleries. At the end is a portico having eighteen columns, six in front and three deep, about 82 feet broad and 46 long, measured within, beyond which are a hall and passages and other chambers, the most im- portant of which is an isolated sanctuary. The wall of the great court is continued so as to inclose the further portion of the temple, leaving a passage around it. The seulptures show that it was begun by Ptolemy Philopator and eompleted at the end of the Greek monarehy, though an insignificant additional subject was added by Claudius. Not far from the great templeis a smaller one of the sort called Typhonia, containing two chambers, aronnd whieh runs a gallery supported by Typhonian columns.

About twenty-three miles above Adfoo the mountains on either side, which had for some distance confined the valley to a narrow space, reach the river and contract its course. They are low, but steep and picturesque, and in their western side are seen the entrances of excavations. They are called Gcbel-es-Silsileh, a name derived from the earlier Silsilis. The most interesting of the excavations is a rock- temple in which is portrayed the defeat of a negro nation by King Har-em-heb, or Horus, of Dynasty XVIIL ; here, also, are subjects depicting acts of worship paid to Nilus and Sebek. ‘To the southward of this, and also facing the river, are the entrances of several exeavated tombs, the representations in which are not of a remarkable character. Beyond these are three chapels of the time of Dynasty XIX. On the opposite side are very important quarries, where much of the materials of the great temples was cut, especially under the Eightecnth and subsequent Dynasties.

Beyond Gebel-es-Silsileh, although the mountains recede, the tract of cultivated land is extremely narrow, and some- times the desert touches the river: this is partly owing to the sinking of the level of the stream, which, as already mentioned, was very aneiently restrained by some barrier at Silsilis. About eleven miles above that place is the

res Ss 1 For an account of the Egyptian system of fortification, see Wilkin-

son in Trans. Soc, Lit., nu, s., iv.; and Popular Account of Ancient Ligyptians, i, 407-409.

The goddess of the place was Suben

extremely picturesque temple of Ombos, placed on a rocky eminence called “Kém-Umboo,” “the Hill of Umboo.” It stands within a great inclosure of crude-brick walls, which we see on every side, except that towards the river. There is a portal in this wall of the time of Queen Hat- shepu and Thothmes III. The great temple is double, one- half having been dedicated to the worship of Sebek, and the other to that of Har-oer, or Aroéris, It consists of a portico of fifteen columns, of which two have fallen, the foremost being connected by a wall of intereolumnia- tion having two entrances, and behind, there is a smaller portico and remains of chambers, including the two sanctuaries, The earliest name here is that of Ptolemy Philometor (Modern Egypt and Thebes, ii. 282), unless Champollion be right in saying that the name of Epiphanes. is also found in the temple (Lettres, 173), and it appears to have been completed by Ptolemy Auletes. There were also remains here of a smaller Ptolemaic temple which have been washed away by the river.

Nothing remarkable oceurs between Ombos and Syene, a distanee of about twenty miles. The valley is confined to a very narrow space by the mountains, which take bold forms on both sides near the latter place. Just before we reach it, we see the island of Elephantine, wherc is the famous Nilometer of the Romantime. The town of Aswan, which represents the

aneicnt Syene, stands amid palm-trees on the eastern bank opposite to Elephantine. It is a considerable place, of greater political than commercial importance, and has succeeded to an older town of the same name, the ruins of which occupy the river's bank and a granite hill to the south. Among them may be mentioned a pier, which has a well, most probably the Nilomcter construeted by 'Amr, the Muslim conqueror of Egypt. In the ruined town is also a small temple of Roman date. Farther to the south is its extensive Arab cemetery, which is full of eurious tombstones bearing in-seriptions in Cufic characters. In the granite hills to the eastward are the quarries whence were taken the obelisks and very many of the statues which adorned the Egyptian temples.

The bed of the river above Aswdn is obstructed by numerous rocks and islands of granite, one of the latter of which, that of Saheyl, is interesting on aceount of the numerous hieroglyphic tablets and inscriptions at its southern part. 'This island is almost a mile and a half above Aswan, and at the distance of another mile from it begin the rapids called the First Cataract, caused by the granite rocks, which almost entirely choke the river. The cataract is so inconsiderable, that during the inundation boats favoured by a strong northerly wind can pass it without aid, though at other times it is necessary to hire uatives, who drag them through, but then the principal rapid has a fall of only five or six feet (Modern Egypt and Thebes, ii, 294), and that is not perpendicular. Never- theless the roaring of the troubled stream, and the red granite islands and rocks which stud its surface, through which the boat threads its way, give the scene a wild picturesqueness, until we reach the open stream, less than two iniles farther, and the beautiful isle of Phila suddenly rises before the cyes, completely realizing our highest idea of a sacred place of anciont Egypt. ~

Philze is beyond the proper limits of Egypt, but as it is usual to describe it in noticing Aswan and the rapids, some account will here be given of its very beautiful and interesting monuments. The island is very small, being only a quarter of a mile long, and about 500 feet broad. On its granite rock is a little alluvial soil and some vegeta- tion, with a few date-palras, but its verdure has been exaggerated, and to this it little owes its beauty. It was highly reverenced by the ancieut Egyptians as a burial-

place of Osiris. On the east side is a small but very picturesque temple, now hypzthral, of the Greek and Yoman time, and unfinished. It is 48 feet in width and 63 in length, and has 14 columns with capitals of various forms, connected by intercolumnal walls. The great teraple of Isis stands to the westward of this. Its front is formed by a propylon, before which is a kind of court, to be after- wards described. The portal bears the name of Nectanebes II., but the wings were added by the Ptvlemies, making the entire width about 122 feet. Through the portal we enter a court, on the right side of which is a gallery fronted by columns, behind which are several small chambers, and on the left side is a separate small temple of Athor, the main entrance to which is by a door and passage in the left wing of the great propylun. This small temple begins with a portico having four columns with the faces of Athor sculptured in high relicf upon each of their sides above the capitals. Beyond this are three chambers behind one another, above the door of the first of which is a Greek dedication by Ptolemy Euergetes II., and the two Cleopatras. The temple was, however, begun by Epiphanes. The court of the great temple, that of Isis, is bounded by a second propylon of smaller dimensions than the first, forming the entrance to the portico, which is a very elegant structure raised on ten columns, eight of which are at the back and one on each side. It is partly hypethral, an open space being left between the two columns last mentioned. The beautiful forms of the columns and the bright reniains of colour on them and the walls, with the effect of the sunlight through the aperture of the roof, produce a charming effect. Behind this hall are several small apartments, one of which, reached by a staircase, contains very curious sculptures relating to the story of Osiris. The temple appears to have been begun by Ptolemy Philadelphus (whose nameis the earliest found there), and was continued under the Roman empcrors. The court before the teraple remains to be noticed. It is bounded by two galleries with columns in front. One of these is about 250 feet long, and is built close to the western side of the isle, terminating at a small temple of Athor near its southern end. ‘This edifice, which is much ruined, was supported by columns with faces of Athor above their capitals, of which six stand; it was raised by Nectanebes II. The eastern gallery, which is shorter than the other, is not parallel with it, and thus shows that this court was not part of the

great temple, but rather an approach to it. The other remains are of minor import- ance, and the same may be said of the ruins of a temple on the neighbouring large island of Bigé,

A few words must be said respecting the eastern and western deserts. The latter is remarkable for two valleys besides those called the Oases. The first of these valleys is that of the Natron Lakes to the westward of the Delta, containing four monasteries, the remains of the famous anchorite settlement of Nitriz. To the southward of this, and parallel to it, is a sterile valley called the Balir- bela-Ma, or “ River without Water.” Yet farther to the southward is the Little Oasis (Oasis Parva), about 100 miles from the Nile in 29° E. long., nearly due west of tlhe town of Bahnesc. It contains remains of little interest. Within 200 miles due south of this oasis is another, of which the usual apellation is Wah ed-Dakhileh, where, near the town of Hl-Kasr, is an Egyptian temple of the Roman period. This, according to Sir Gardner Wilkinson, is the most flourishing of the oases. Abont half-way between this oasis and the Nile at Thebes lies the Great Oasis (Oasis Magna), Here, near the town called EI- Kharigeh, the ancient Hibe, is a great temple of Amen built by Darius I. and in the same oasis are other ruins of the period of the Ptolemies and Cesars, The Oasis of

Jupiter Ammon, that of Seewah, is not far from the coast at a great distance to the westward, and it is not properly included in Egypt. Various Arab tribes occupy this desert, besides the settled inhabitants of the oases,

In the eastern desert must be mentioned the town of Es- Suweys, or Suez (15,000 inhabitants), anciently Arsinod, at the head of the gulf to which it gives its name. To the southward, a little below 29° lat., are the secluded Coptic convents of St Antony and St Paul, near the sea. Farther south are the porphyry quarries of Gebel-ed-Dukhan, ex- tensively worked under the Romans, and the granite quarries of Gebel-el-Fateereh. Considerably more to the south, at El-Hammamat, on the old way from Coptos to Philoteras Portus, are the Breccia Verde quarries, which were much worked from very carly times, and have interesting hieroglyphic inscriptions. At Gebel

Zabarah are emerald mines, now abandoned as unproductive. At the various mines, and on the routes to them and to the Red Sea, are some small temples and stations, ranging from the Pharaonic to the Roman period. Along the shore of the sea are the sites of several ancient ports, the most important of which were Myos Hormos and Berenice, and also the modern town of El-Kuseyr. The northern part of this desert is occupied by the Ma'dzee Arabs and smaller tribes as far as the Kuseyr road, beyond which are the 'Abébdeh, an African tribe very different from the Arabs in appezrance; and to the south of these, to the east of Lower Nubia, is the Bisharce tribe, a people also of African race.

STATIstics.?

[In Egypt, as has been well said, Z'/tat c'est le Khedive. So far as the country itself is concerned the khedive is its personal, absolute, and independent sovereign; but his relations with the Porte are somewhat less simple. When Selim I. of Turkey conquered Egypt at the beginning of the 16th century, the Memlook power was still too strong for coraplete subjection, and Selim was obliged to allow his new subjects liberal terms. Egypt still .retained practical autonomy, the government being in the hands of a council of Memlook beys, presided 'over by a pasha, whose duty it was to look to the annual tribute paid to the Porte, but who possessed little or no actual power. This system was continued till the French occupation, and was re-established when the English army evacuated the country. The Memlooks were still the virtual governors of Egypt, until their massacre by Mehemet Ali. The ambitious designs of this pasha opened the eyes of the Porte to the dangers incurred by so lax a control of a governor unshackled by the council of beys. Menaced with the loss of Syria as well as Egypt, the cause of the sultan was espoused by four of the Great Powers; and the Treaty of 1840, confirmed by the Convention of 1841, limited Mehemet Ali's power to the vice-royalty of Egypt, hereditable by the eldest male of his family, ordered the continuation of the customary tribute, restricted the military and naval strength of the viceroy, and imposed certain other conditions, thus reducing Egypt once more to the state of a Turkish province. But in the reign of the present ruler a change has taken place in the relations between the sultan and his viceroy. A series of expensive negotiations with the Porte, ending with the raising of the tribute from

£376,000 to £675,000, procured for Ismail Pasha the title of Khedive, and the right of succession from father to son. The limitation of the Egyptian army

1 For much of the information contained in the present section, the writer is indebted to the industrious work of Mr J. C. M‘Coan, Zgypt as it is, though he has thought it necessary to check it with official reports and other authoritics: but it must always be remembered that Egyptian like all Oriental] statistics can be accepted only with reserve.

and other restrictions which still remained were removed in 1872 by. another firman, confirming all the rights previously granted, and giving the khedive every substantial attribute of sovereignty, except only the jus legationis, The khedive is therefore virtually an independent sovereign, holding his power on the easy tenure of tribute and military aid in case of war.

The real work of governing is entirely performed by the present energetic and able sovereign. ‘The merely formal business is transacted by a Privy Council and eight ministers—the agents, not the rulers, of the khedive. The Privy Council, presided over by the Prince Hérétier Mehemet Tawfik Pasha, and consisting of the ministers, the Sheykh el-Isl4m, and some other functionaries, examines and reports to the khedive on the work of the several departments. The eight ministries are those of (1) Finance, (2) Foreign Affairs, (3) Interior, (4) War, (5) Marine, (6) Commerce, (7) Public Works and Agriculture, and (8) Public Instruction. Besides these there are the sub-departments of the Customs and Post-Office.

The provincial administration (exclusive of the separate governors of the eight ‘“cities”) is divided among the mudeers of the fourteen prefectures, the Feiyoom now being one, each subdivided into departments and com-munes, or cantons including several villages, governed by ma-moors, ndzirs, or sheykhs el-beled, appointed by the Government and assisted and checked by councils of agri- culture and an administrative council for each canton.

In 1867 the Assembly of Notables was revived, consist- ing of village sheykhs, &c., elected by the communes and meeting once a year to receive from the Privy Council a report of the twelvemonth's administration. Although the Assembly has not yet attained to the full dignity of parliamentary power, it has considerable weight in the control of state measures.

By the Convention of 1841 the Egyptian army was limited to 18,000 men, but this was raised to 30,000 by the firmin of 1866, and now all restrictions have been done away. The present force may be placed at an average peace strength of 30,000 men, regulated, however, on a short service system, so that not more than half this number are generally at one time with the colours, This army consists of 18 regiments of infantry, 3 battalions each; 4 battalions of riflemen ; 4 regiments of cavalry, 6 squadrons each; 4 of field artillery, 6 batteries each (2 mounted); 3 of garrison artillery; and 3 battalions of pioneers. The infantry are armed with the Remington rifle; the cavalry with revolver aud lance, or sabre and carbine; the field artillery with 100 Krupp guns and 50 smooth-bore. Besides these there is areserve of 30,000 men, and an irre- gular contingent of 60,000 mounted Bedawees. The army is raised by conscription, irregular levies being held every two or three years. All Egyptians of any creed are liable to conscription, except only the inhabitants of Cairo and Alexandria ; but immunity may be purchased by payment ofa tax. The monthly pay ranges from 20 piastres (= 4s. 2d.) for a private, to £5 (Egyptian) for a captain, £40 for a full colonel, and £75 for a full general. Under the training of French and American officers, the army has been brought into an admirable state of discipline and efficiency.

The Egyptian navy hardly deserves notice. It consists at present of 2 frigates, 2 corvettes, 4 gunboats, and 2 sloops, all unarmoured.

Mehemet Ali devoted considerable attention to the estab- lishment of colleges and military schools, besides sending young men to Europe for purposes of scientific study. In Cairo and its environs he founded several elementary schools of a higher order than the native schools of the same class ; a school of languages; a printing press at Boolak, from

which many valuable publications have issued ; and a school of medicine at Kasr-el-'Eynee, between Cairo and Masr-el- 'Ateekah, which has done excellent work. At El-Khankah and in its neighbourhood he placed a military hospital, a school of medicine, a veterinary college, an infantry school, and a school of music; at El-Geezeh a cavalry school; and at Tura one of artillery. These and similar establishments were well designed and ably carried out. When Mehemet Ali's ambitious designs were defeated in 1840 by the action of the Powers, his educational reforms languished, and under 'Abbas the schools were closed and everything returned to the old system. Said Pasha endeavoured to revive Mehemet Ali's improvements; but it was reserved for the present khedive entirely to carry out his grand-father's designs. Besides the revived and newly created military schools, there are two systems of education in Egypt—by the schools established and supported by the Government, and by the old system of mosque education and Arab primary schools,—besides the numerous establish-ments of the non-Muslim communities. The Government schools are nine in number—the Polytechnic, Book-keeping and Surveying, Law and Languages, Industrial, Medical, Midwifery, two preparatory schools at Cairo, and one at Alexandria. Besides these the Government supports a

'school for the blind, a normal school, two girls' schools,

three industrial schools, and 23 municipal schools. At the Polytechnic School the course extends over six years, and includes the higher mathematics, chemistry, physics, geology, mechanics, geography, history, drawing, Arabic, and English or French.

Of the mosque colleges, the greatest, not only in Egypt but in the whole Mohammadan world, is the Azhar, where over 11,000 students, coming from every quarter of the Muslim empire, are instructed by 325 sheykhs in the old curriculum of Muslim acquirement. The Arab primary schools, 4000 or 5000 in number, are the regular providers of education for the felldheen, who pay either nothing at all, or a merely nominal sum,'for being taught to read and recite the Koran, and sometimes writing and very elemen- tary arithmetic. How greatly the educational system in Egypt has been enlarged of late years may be judged from the fact that, under Said Pasha it hardly

cost the Govern- ment £4000 a year, whilst the educational budget (exclusive of the military schools) now reaches the sum of £40,000, to which the khedive adds £12,500, making a total of £52,500.

Of the schools of non-Muslim communities the Copts have 16, the Greeks 4, the Armenians 1, and the Jews several academies. Besides these there are two undenominationl "Universal Schools," of foreign foundation, where a moderate education, without religious instruction of any kind, is given to all comers, and many schools founded by the American Board of Missions, and Miss Whately's admirable British Mission School. The proportion of girls' schools is extremely small, but their existence, and the fact that they receive the warmest support of one of the wives of the khedive, is a hopeful sign.

The public works carried out in Egypt during the present reign would fill a long catalogue, without reckoning the Suez Canal, for an account of which see CANAL, vol. iv. p. 789. Railway communication has been established between Alexandria, Cairo, Ismailia, Suez, Damietta, the Feiyoom, and Asyoot, the various lines covering over 1200 miles. A Sooddn railway, from Wadee Halfeh to Hannek, and from near Dunkalah to Khartoom, involving costly and difficult engineering for a length of more than 1000 ntiles, has been begun with the view of shortening the passage to India, and bringing the produce of the rich southern soil into easier connection with Cairo; these works are, however, at present at a standstill. -'The canal

system has been greatly enlarged and improved, but a still better result is anticipated from the barrage of the Nile, a plan projected by M. Mougel and now about to be carried out for the khedive by Mr Fowler. In 1871 the work of building a breakwater to defend the New Harbour at Alexandria from the seas caused by the constant southi- west winds was begun. 'The outer breakwater extends above two miles across the mouth of the harbour, inclosing an area of 1400 acres of calm water. The structure rises 7 feet above the highest sea-level, and is of a uniform width of 20 feet. Harbour works have also been constructed at Suez. At a cost of over £180,000,

fourteen fine light- houses have been erected, seven on the Mediterranean aud seven on the Red Sea, whereas at the beginning of the reign of the khedive there was but one. Telegraph lines (begun by the enterprise of Said), have been set through- out Egypt, covering nearly 6000 miles, and putting Alexandria into direct communication with Khartoom ; and this branch of the public service is managed by English officials, Submarine telegraphs also bring Egypt into communication with Candia and thence with Constanti- nople and Otranto,and with Malta aud thence with England, France, &c. The post-office was bought by the Govern- ment in 1865, and under the management of an English post official has been greatly improved. In about 70 towns and villages offices have been established, and several mails a day are despatched from the chief places.

The manufactures of Egypt have been in a declining state for several centuries. Mehemet Ali tried to promote them, by establishing large manufactories of cotton, silk, and woollen goods, tarbooshes, dc., and, especially in Upper Egypt, sugar-refineries. Ibrahim Pasha was much opposed to his father’s policy, and in pursuance of his own views he laid out extensive plantations of olive and other trees, erected powerful steam-engines for the irrigation of his lands, and on all his estates endeavoured to encourage agriculture. It cannot be doubted that had he lived the correctness of his conviction that Egypt is an agricultural, not a manufacturing, country would under his rule have been fully verified. Mehemet Ali introduced cotton and largely cultivated it; the Turkish grandees found that from it they could extract more gain than from other field produce, and large tracts were speedily devoted to its culture. The necessity, however, of excluding the waters of the Nile has caused several destructive inundations; and so long as the cotton growth remained a monopoly of the pasha it was no means of enrichment to the producer. Now, however, that the monopoly is abolished, the trad2 in cotton is greatly increasing, and this produce will undoubtedly become every year a more important item in the wealth of the country. The old restrictions upon agri- culturists have been more or less done away; and the Government, whilst not wholly abandoning Mehemet Ali’s views on manufactures, is yet alive to the paramount importance of affording every encouragement to agriculture.

The cotton crop in 1875 extended over 871,847 feddans (=acres, neatly) and produced 2,615,541 quintals (of 110%) of ginned staple, 1,954,555 ardebbs (of 5 bushels) of seed, and 3,749,446 loads of cotton sticks, altogether reaching a total value of about

twelve millions and a quarter. The wheat crop in the same year was estimated at 6,662,632 ardebbs, of the value of

E£7,995,158 ; maize (durah), 10,502,715 ardebbs, = E£8,193,000 ;

beans, 4,575,273 ardebbs, = K£4,575,273 ; barley, 3,103,085 ardebbs, = E£2,394,000 ; rice, 98,521 ardebbs, = E£738, 908. The other crops of Egypt are chiefly clover, sugar-cane, flax, hemp, tobaceo, triacs and indigo.

The revenue is derived chiefly from the land-tax, the tax on date-trees, trade licences, the customs, the tobacco duty, railways, and the Mukabalah (of which an account will be given), and village annuities. Of these the land-tax is the principal item, amounting to nearly half the total revenue ; but this will be considerably reduced when the Mukabalah

comes to an end (in 1885). The whole revenue may at present roughly be placed at £10,500,000. It is very difficult to estimate the exact amount of direct taxation on the population. One writer places it at 25s, per head per annum; whilst a recent report states that, including the Mukabalah, the annual payment of taxes has lately reached £4! It is certain the taxation at present exceeds the possible returns of the land, and that the fellAheen are compelled to borrow money to pay the taxes. ‘The items of expenditure may thus be roughly summarized :—general public administration, £1,300,000; civil list, £600,000; tribute to the Porte, £700,000; army, £700,000; the the rest being devoted to the payment of the debt.

The following is an abridgment of the Egyptian budget for 1876 :—

Revenue. Purses, TFET GASG cso ea cinisex rocvencte co eeen een Gee 839,500 Maxson Wate-treesy.cGUISTOMS rey vsosnacetinienssuniscasne cence eee 124,737 gee S 5. eters aeicss ceneheresiseasanceeenee eee 193,207 TIGGHAS, POS, EC). «cee scasearsecsnsscceernece nee By S118) ELL eat sinstasunsicinuiea oinciutes o San eac ss sai de eee en 56,000 PLOW ACEO vec sccacenl in: ctv sacicess ee eee 51,483 Ocitomevamongidtplesy weer eee 345,276 IS KeLoyo Lig) TRE ICH Sa ongeedcadeen Rennonontonande sso noc 30,000

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Appointments of the Cabinet Ministers, &c……. 219,156

Various pensions and other expenditure ……. 78,518 Conseil d'Htat, Court of Appeal, Court of First… 3,249 Instanee at Cairo, and Chamber of Notables ….. i Tprelar TROOP ah. 5.082. citecareecosd senses ven 5,792 Egyptian Museum, Ismailia Canal, Archives, Pro- 6.633 VISIONS, WSEOLES, BCs, sciwas. «scvadins sven : CUSTOMS 8. vigssisscsviencaieae) neeneuiesjacle meee teh tere eee 5,823 POVGto i A GeitS . gsec scot tees Penaicenonoeecnee | 2,881

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Damictta, Rosetta, Suez, &c., with Octroi…..... 79,008 Mxpenses of tlle Rooznameh…...25….s.0000seoaeneenena 38,989 Locks, barrages, Soodan Railway, &¢..... Peco 90: 48,581 Interest on Rooznameh Bonds…….c08 cessesageeees 18,000 Interest on Suez Canal Shares ….....ss:ececcsesesseseeees 19,500 Annuities and loans (redemptions and interest)..... 982,151

1,751,451

During the last fifteen years Egypt has acquired the eno- mous national debt of about £80,393,000. The attempt to Europeanize the country has entailed a vast expenditure. Public works have been carried out at an altogether unnecessary rate of speed, and Evropean contractors have been employed who have not scrupled to drive bargains ex- ceedingly favourable to themselves and ruinous to the Egyptian Exchequer. To these causes of expenditure must be added the dishonesty and extravagance of the Government officials, the waste of money on works which have proved unproductive and useless, and the heavy damages given against the khedive in the extraordinary award of the late emperor Napoleon as arbitrator in the dispute with the Suez Canal Company. To meet the heavy expenses resulting from these causes, five loans have from tine to time been raised.

The first was borrowed by Said Pasha in 1862, and amounted to only £3,292,800 nominal, to be repaid in thirty years, interest 7 per eent., and sinking fund 1 per eent. The present viceroy then raised the 1864 loan of £5,804,200 nominal, with interest and sinking fund at 7 and 3°87 per eent., redeemable in 15 years. The next loan, of 1868, redeemable in 1898, was for £11,890,000 nominal (of whieh only £7,193,334 was received), with apparent

interest and sinking fund of 7 and 1 per cent., really 11°56 and 1°68 per cent. on amount received, or altogether 13 per ceut.

annual charge. £32,000,000 at 7 and 1 per cent. interest and sinking fund; but, as only £20,062,658 was received, the interest and sinking fund became really 11 and 1°62 per cent. The aetual amount received was, however, slightly increascd by part being paid in Egyptian Trcasury bonds. Besides these, in 1866 a railway loan had been raised, of the nominal amount of £3,000,000 at 7 per cent. This was repaid in ,6 annual instalments of £500,000 each, the last being in January 1874. Two loans secured on the Daira estates of the khedive have been transfcrred to the state for value received; these are the Anglo-Egyptian loan of 1865 for £3,000,000 at 9 per cent. interest, with smking fund of 3°27 per cent; and the Mustafa-Pasha loan of 1867 for £2,080,000 at 9 and 3°4 per eent. interest and sinking fund.

The khedive raised also a personal loan secured on his private estates (Daira) in 1870 ; £5,000,000 was received, for which £7,142,860 was to be paid back in twenty years, with interest at 7 per cent on this nominal amount. ‘‘None of the Egyptian loans,” Mr Cave observes, ‘cost less than 12 per cent. per annum, while some cost more than 13} per cent. per annum, and the railway loan even 26°9 per cent. per annum, including sinking funds.”

These loans hardly sufficed to meet the necessities for which they were raised, and the exorbitant interest charged on the nominal sums, of which the khedive received little more than half, effectually crippled the resources of the country. In 1871 another fatal step was taken. A measure was passed by which a landowner might redeem half his land-tax in perpetuity by paying six years’ tax in advance, either in one payment or in six yearly instalments. As, however, few but the wealthiest proprietors could afford this additional charge on their incomes, the six instalments were commuted into twelve, a discount of 84 per cent. being allowed on each instalment. This composition tax is called the “ Mukabalah.” By this measure the Govern- ment, for tlie sake of tle immediate possession of about £27,000,000, will sacrifice from 1885 onwards about £2,500,000 annually of certain revenue. For the over- taxed felldAheen the change is most advantagcous, if only they can avail themselves of it; for the Government it nearly resembles suicide.

In 1875 the khedive procured a temporary respite from his difficulties by the sale of the Suez Canal shares to the British Government ; and then, at last aware of the critical state of his finances, and of the incompetence of Easterns to mend it, His Highness requested the British Government to provide him with some experienced financier to carry out a thorough reform. In December the Right Honourable Stephen Cave, M.P., accompanied by Colonel Stokes, R.E., and clerks, was sent out, and after some months’ examina- tion wrote an elaborate report ou the Egyptian finances. But after Mr Cave’s departure, and the publication of his report, Egyptian credit fcll still lower, till in 1876 the khedive, finding himself totally unequal to meet tlie demands of his creditors, and weary of renewing bonds at ruinous rates, suspended payment for a time. A French scheme was then urged upon him with so mucli insistance that on May 7 he adopted

it in a decree which announced the consolidation of all the state and Daira loans, and the distribution of a bonus of 25 per cent. to holders of treasury bonds. These bonds had then reached a sum exceeding £20,000,000, and were held chiefly by French firms. The arrangement speaks for itself. It was immediately quashed by the firm action of the English Stock Exchange ; and the Right Honourable G. J. Goschen, M.P.,and M. Joubert were sent out to attempt the adjustment of the affairs of Egypt. The result was a scheme which the khedive accepted, and which may shortly be described as follows: the private Daira debt was separated from the state debt; the three small loans of 1864, 1866, and 1867 were reserved to be paid off by the Mukabalah; the bonus on the treasury bonds was cut down to 10 per cent.; and £17,000,000 was converted into a preference stock, secured on railways and harbour dnes. The state debt was thus divided into three classes :— unified debt of £59,090,000, interest 7 percent., reduced till 1885 by

7 BG Yet

The loan of 1873 was for the nominal amount of |

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a sinking fund of 1 percent; preference stock, £17,000,000, interest 5 per cent.; and the three short loans, interest 7 per cent., redeemable at 80 instead of 100, and to be paid off by the Mukabalah. Besides these, there is the private Daira debt of the khedive. The scheme is perhaps the best that can be devised under the present perplexing conditions; and if the Egyptian Government can maintain its revenue and will hold to its engagements there is every probability that the debts will be paid off at the appointed times. When the Mukabalah falls in in 1885 the three short loans will (presumably) have been paid off. The preference debt is to be redeemed in 65 years by the opera- tion of a sinking fund of £35,744 a year, and the unified debt in the same time and after a similar manner. With a view to insure the carrying out of these reforms, the khedive has appointed English and French comptrollers- general, who are intrusted with the collection of the revenue and the appropriation of it to the purposes settled by the financial scheme. A European Commission of the Public Debt has also been appointed for receiving the revenue devoted to the payment of the debt charges ; and another commission, composed of three Europeans and two

natives, controls the railways and the port of Alexandria. So long as the present arrangement is held to, and if no unforeseen decrease takes place in the revenue, the financial position of Egypt may be considered hopeful. The khedive has been the subject of much censure at the hands of his bond-holders. It must however be remembered that he received but half of the sums supposed to have reached him. Of the £45,000,000 received he has paid back over £30,000,000 in interest, &c., and £10,000,000 went in the Suez Canal indemnity, so that ouly £4,000,000 could have been squandered. That the khedive is no financier is obvious; but he seems honestly determined to pay his debts, and if there was any dishonesty in the matter of the loans it was not on the khedive's side.

The principal exports from Egypt are cotton, cereals, and sugar. In 1875, 163,912,3361b of raw cotton was exported to Great Britain, at the value of £6,668,340; and the total cotton export is estimated at over two millions and a half of quintals. Of beans, 490,257 ardebbs were exported in 1875; of wheat, 836,997 ardebbs ; of sugar, 986,000 quintals. Maize, barley, flax, natron, dates, hinné, and other produce forin less important items in the list' of exports. The total value of exports isestimated at between twelve and thirteen million of pounds. The imports are estimated at, about five millions and a half of pounds and consist chiefly of manufactured goods, coals, oil, wine, machiucry, &c. Of the whole commerce about 70 per cent. is with Great Britain. There ig also a considerable transit trade, which, however, has necessarily diminished since the opening of the Suez Canal.

The Egyptian measures are—the fitr, or space measured by the extension of the thumb and first finger ; the shibr, or span; aud the cubit (of three kinds, = 222, 25, and 264 inches). The measure of land is the fedddn, very nearly equal to the English acre, subdivided into 24 keerdts, and each of these into 330 (formerly 3334) kasabehs, or rods, the kasabeh being a square measure with side of 22 kabdehs, each equalling 6} inches. The ardebb is equal to about 5 bushels, and is divided into 6 weybebs, and cach weybeh into 24 rubas.

The weights are these: —

64 kamhahs (or grains of wheat), or 48 habbehs (or grains of

barley) =1 dirhem (=48 gr. Troy).

12 dirhems=1 wukeeyeh or ounce (=about 575 gr.)

12 wukeeyehs=1 ratl or pound (=15 oz. 18 dr. avoir.)

22 ratls=1 wukkah or oke (=2tb.)

36 wukkahs=1 kantar or cwt. (=99Ib.)

¥4 keerats=1 mithkal or weight of a deenar (=72 gr.)

The French metrical system has been established by the khedive, but has not yet been generally adopted.

The standard unit of currency is the kirsh, or piastre (=about 24d.), which is coined in gold pieces of 5, 10, 90, 25, 50, 100 piastres ; silver of 1, 24, 5, 10, 20 piastres.

Copper coins of 5, 10, 20 paras (or faddahs, 40° to the piastre) and 1 piastre are also coined. ‘The kees, or purse, of 500 piastres, is equal to about £5, 2s. 6d. The khazneh, or treasury, consists of 1000 purses. 974 piastres are given for the English pound sterling. Besides the regular

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Egyptian currency, European coins of all kinds are commonly employed in Egypt, especially the English sovereign, the French Napoleon, the Venetian sequin, the Spanish doubloon and dollar, the 5-frane piece, and the Constantinople coins. (s. L. P.) | (R. 8. B.)

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EHRENBREITSTEIN, a small town in Prussia, in the circle of Coblentz, situated on the right bank of the Rhine, and connected with the town of Coblentz by a bridge of boats, is of importance as possessing a magnificent fortress erected upon a precipitous rock 401 feet above the Rhine. ‘The castle which occupied the site of the modern building is said to have been presented in 636 by the Franconian king Dagobert to the archbishops of Treves. It was twice taken by the French—in 1631 and 1799; and at the peace of Lunéville in 1801 they blew it up before evacuating it. At the second Peace of Paris the French paid 15,000,000 francs to the Prussian Government for its restoration, and the works begun in 1816 were completed in ten years. The town possesses a few ships, and has a wine and carrying trade. In 1875 the population, in- cluding the garrison, was 4901. See CoBLENTz.

EIBENSTOCK, a town in Saxony, in the circle of Zwickau, is situated on the borders of Bohemia, 16 miles 8.S.E. of Zwickau. It possesses chemical

and tobacco manufactories, and tin and iron works. Lace-making was introduced in 1775 by Clara Angermann. It has also a large cattle market. Population in 1875, 6553.

EICHENDORFY, Joseru, Fre1mErr von (1788-1857), a German poet and romance-writer, was born at Lubowitz, near Ratibor, in Prussia. He studied law at Halle and Heidelberg from 1805 to 1808. After a visit to Paris he went to Vienna, where he resided until 1813, when he joined the Prussian army as a volunteer. When peace was concluded in 1815 he left the army, and in the following year he was appointed to a judicial office at Breslau. He subsequently held similar offices at Dantzic, K6nigsberg, and Berlin. Retiring from the public service in 1844, he afterwards resided successively in Dantzic, Vienna, Dresden, and Berlin. He died at Neisse on the 26th November 1857. Eichendorff was one of the most distin- guished of the later members of the German romantic School. His genius was essentially lyrical, and he was deficient in the distinctive dramatic faculty. On. this

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account he is most successful in his shorter romances and dramas, where constructive power is least called for. His first work, a romance entitled Ahnung und Gegenwart, appeared in 1815. This was followed at short intervals by several others, among which the foremost place is by general consent assigned to Aus dem Leben eines Taugenchts (Berlin, 1824), which has often been reprinted. Of his dramas may be mentioned Lzzelin von Romano, a tragedy (1828) ; Meterbeths Gliick und Ende, a tragedy (1828) ; and Die Freier, a comedy (1833). He also translated Calderon's Geistliche Schauspicle (1846) from the Spanish. Eichendorff's lyric poems were of a very high order, and many of them were set to music by composers of eminence. In the later years of his life he published several valuable works on subjects in literary history and criticism, such as Ueber die ethische und religidse Bedeutung der neueren romantischen Poesie in Deutschland (1847), Der deutsche Roman des 18, Jahrhundert in seinem Verhiltniss zum Christenthum (1851), and Geschichte der poetischen Later- atur Deutschlands (1856). An edition of his collected works in six volumes appeared at Leipsic in 1870. EICHHORN, Jonann Gortrriep (1752-1827), an eminent scholar, historian, and writer on biblical criticism, was born at Dorrenzimmern, in the duchy of Hohenlohe- Oehringen, on the 16th October 1752. Here his father was minister, but shortly after the birth of Johann he was ap- pointed superintendent of the state school in Weikershemm. At his father's school and at the gymnasium at Heilbronn young Eichhorn received his early education. In 1770 he entered the university of Géttingen, where he remained till 1774. In 1774 he received the rectorship of the gymnasium at Oehrdriff, and in the following year was made professor of Oriental languages at Jena. On the death of Michaelis in 1788 he was elected ordinary professor of philosophy at Gottingen, where he lectured not only on the Oriental languages and on the exegesis of the Old and New Testa- ments, but also on general history. In 1811 he was made doctor of theology, in 1813 joint-director of the Royal

Scientific Society of Gottingen, and in 1819 Geheimer Justizrath of Hanover. His health was shattered by an attack of inflammation of the lungs in the year 1825, but he regularly continued his prelections to a large number of students until attacked by fever on the 14th June 1827. He died on the 27th of that month. Eichhorn is the author of a good many historical works, but it is asa biblical critic that he is best known. He may almost be said to have originated the science of biblical criticism, for he first properly recognized its scope and the problems it had to solve, and began many of its most important discus- sions. He was the first to see the necessity of finding a firm historical foundation for everything in Christianity that was to be accepted as fact. Preliminary to his endeavours towards this end, he took for granted that all the so-called supernatural facts relating to the Old and New Testaments were explicable on natural principles. He sought to judge them from the stand-point of the ancient world, and to account for them by the supersti- tious beliefs which were then generally in vogue. He did not perceive in the biblical books any religious ideas of much importance for modern times; they interested him merely historically, and for the light they cast upon antiquity. Thesupernatural element which they contained he attributed partly to the artificial delusions of magic, and partly to the natural delusions of a superstitious time. He regarded as ungenuine many books of the Old Testament and some of the Epistles, and he was the first to suggest that the Gospels were compiled by later writers from documents which have now perished. He did not appreciate as sufficiently as Strauss and the Tiibingen critics the difficulties which a natural theory has to sur- mount, nor did he support his conclusions by such elaborate and niinute discussions as they have deemed necessary, but he may be justly denominated the founder of their school of biblical criticism.

His principal works were—Geschichte des Ostindisehen Handels vor Mohammed, Gotha, 1775; Allgemeine Bibliothek der biblisehen Liter- atur (10 vols. Lpz. 1787-1801) ; Hinleitung in das Alte Testament (5 vols, Gott. 1824); Einleitung in das Neue Testament (5 vols. Gott. 1824-27); Hinleitung in die apokryphisehen Schriften des Alten Testaments (Gott. 1798); Commentarius in apocalypsin Joannis (2 vols. Gott. 1791); Die Hebr. Propheten (3 vols. Gott. 1816- 20) ; Allgemeine Geschichte der

Cultur und Literatur des neuern Europa (2 vols. Gott. 1796-99) ; Litertrgeschichte (1st vol. Gott. 1799, 2d ed. 1818, 2d vol. 1814); Geschichte der Literatur von ihrem Anfange bis auf die newesten Zeiten (6 vols. Gott. 1805-12); Ueber- sieht der Franzisischen Revolution (2 vols. Gott. 1797); Welt- geschichte (8d ed. 5 vols. Gott. 1819-20) ; Geschichte der drei letaten

Jahrhunderte (8d cd. 6 vols. Hanover, 1817-18) ; Urgesehichte des erlauchten Hauscs der Welfen (Hanover, 1817).

EICHHORN, Kart Frreprice (1781-1854), a son of the preceding, and a learned writer on jurisprudence, was born at Jena on the 20th November 1781. He entered the university of Gottingen in 1797. In 1805 he obtained the professorship of law at Frankfurt-on-the-Oder, holding it till 1811, when he accepted the same chair at Berlin. On the call to arms in 1813 he became a captain of horse, and he received at the end of the war the decoration of the Iron Cross. In 1817 he was offered the chair of law at Got- tingen, and, preferring it to the Berlin professorship, taught at Gottingen with great success till ill health compelled him to resign in 1828. His successor in the Berlin chair having died in 1832, he again entered on its duties, but resigned it two years afterwards. In 1832 he also received an appointment in the ministry of foreign affairs, which, with his labours on many state committees and his legal researches and writings, occupied him till his death in J uly 1854. Eichhorn is regarded as one of the principal autho- ritics on German constitutional law. His chief work is Deutsche Staats- und Rechtsgeschichte, 4 vols. In company first with Savigny and Goschen, and then with Riidorf, he edited the Zeitschrift fiir geschichtliche Rechtwissenschafe.

He is the author besides of Hinlettung in das deutsche Privatrecht mit Einschluss des Lehnrechts and the G’rundsétze des Kirchenrechts der kath. und evang. Religionsparter im Deutschland,

EICHSTADT, or E:cusrart, originally Histet, a town in the Bavarian district of Franconia, is situated in a deep valley on the Altmiihl, about 35 miles south of Nuremberg, It is inclosed by walls, and has a very antique

appearance. It is the seat of a bishop, and since 1838 of the appeal court of Middle Franconia, The making of stoneware, iron smelting, brewing, and weaving constitute its chief in- dustries. It possesses a good many educational institutions. Among its principal buildings are the palace occupied by the dukes of Leuchtenberg, with its beautiful park, and con- taining a celebrated Brazilian cabinet ; the town-house ; the cathedral, containing some beautiful paintings and windows, and the grave of Wilibald, the first bishop and founder of the town ; and the church of St Walpurgis, under whose altar the bones of the saint of that name are said to rest. Near the town is the famous stronghold Wilibaldsburg, occupying the site of a Roman castle, and built for a bishop's residence by St Wilibald in 740.

Eichstadt was founded by St Wilibald in 745. The bones of St Walpurgis were brought to the town in 871, and from that time it became a great resort of pilgrims. Through the death of Count von Hirschberg in 1305, the bishopric became one of the richest foundations of Germany. It was secularized in 1802, became a principality of E. Bavaria in the same year, and still in the same year passed into the possession of Duke Ferdinand of Tuscany, who again transferred it to Bavaria in 1805. In 1817 it was assigned to the duke of Leuchtenberg. It lost its principality in 1854. The populution in 1875 was 7136.

EIDER (Icelandic, Zur), a large marine Duck, the Somateria mollissima of ornithologists, famous for its down, which, from its extreme lightness and elasticity, is in great request for filling bed-coverlets. This bird generally fre- quents low rocky islets near the coast, and in Iceland and Norway has long been afforded every encouragement and protection, a fine being inflicted for killing it during the breeding-season, or even for firing a gun near its haunts, while artificial nesting-places are in many localities contrived for its further accommodation. From the care thus taken of it in those countries it has become exceedingly tame at

its chief resorts, which are strictly regarded as property,

and the taking of eggs or down from them, except by authorized persons, is severely punished by law. In appearance the Hider is somewhat clumsy, though it flies fast and dives admirably. The female is of a dark reddish-

brown colour barred with brownish-black. The adult male in spring is conspicuous by his pied plumage of sable beneath, and creamy-white above: a patch of shining sea- green on his head is only seen on close inspection. This plumage he is considered not to acquire until his third year, being when young almost exactly like the female, and *t ig certain that the birds which have not attained their full dress remain in flocks by themselves without going to the breeding-stations. The nest is generally in some con- venient corner among large stones, hollowed in the soil, and furnished with a few bits of dry grass, seaweed, or heather. By the time that the full number of eggs (which rarely if ever exceeds five) is laid the down is added. Generally the eggs and down are taken at intervals of a few days by the owners of the “ Eider-fold,” and the birds are thus kept depositing both during the whole season ; but some experi- ence is needed to insure the greatest profit from each com- modity. Every Duck is ultimately allowed to hatch an egg or two to keep up the stock, and the down of the last nest is gathered after the birds have left the spot. The story of the Drake’s furnishing down, after the Duck’s sup- ply is exhausted, is a fiction. He never goes near the nest. The eggs have a strong flavour, but are much relished by

both Icelanders and Norwegians. In the Old World the Eider breeds in suitable localities from Spitsbergen to the Farn Islands off the coast of Northumberland—where it is kuown as St Cuthbert’s Duck. Its food consists of marine animals (mollusks and crustaceans), and hence the young are not easily reared in captivity. The Eider of the New World differs somewhat from our own, and has been described as a distinct species (S. dresseri). Though much diminished in numbers by persecution, it is still abundant o the coast of Newfoundland and thence northward. In sreenland also, Hiders are very plentiful, and it is supposed that three-fourtlis of the supply of down sent to Copenhagen comes from that country. The limits of the Eider’s uorthern range are not known, but the late Arctic Expedi- tion does not seem to have met with it after leaving the Danish settlements, and its placc is taken by an allied species, the King-Duck (S. spectabzlis), a very beautiful bird which sometimes appears on the British coast. The female greatly resembles that of the Eider, but the male has a black chevron on his

chin and a bright orange prominence on his forehead, which last seems to have given the species its English name. On the west coast of North America the Eider is represented by a species (S. v-nigrum) with a like chevron, but otherwise resembling the Atlantic bird. In the same waters two other fine species are also found (8. Jischert and 3S. stellert), one of which (the latter) also inhabits the Arctic coast of Russia and East Finmark and has twice reached England. The Labrador Duck (8S. labradoria), which is now believed to be extinct (see Brrps, vol, iii. p. 735), also belongs to this group. (A. N.)

EILENBURG, a town of Prussia, in the province of Saxony, government of Merseburg, and circle of Delitzsch, is situated on an island formed by the Mulde, about 184 iniles north-east of Leipsic, The principal structures are the hospital, the infirmary, three churches, and the castle. From the last-meutioned, formerly known as Ilburg, and in the time of Henry the Fowler an important post of defence against the Sorbs and Wends, the town received its name. The industries include the manufacture of chemicals, cloth, quilting, calico, cigars, and agricultural; implements, bleaching, dyeing, wax-refining, brick-making, and trade in cattle. In the neighbourhood tis the irou-foundry of Erwinhof. The population was 10,312 in 1875.

ETNBECK, or Ermpecx, a town of Prassia, in the landrost of Hildesheim, and province of Hanover, formerly chief town of tlie principality of Grubenhagen, is situated on the Ilmc, 39 miles south of Hanover. It possesses a cathedral, five churches, a Jewish synagogue, a pro- gymnasium and other schools, and several endowed in- stitutions. Among the manufactures are linen and woollen goods, spun stockings, carpets, sugar, Jeather, cigars, chemicals, and beer, for which last the place was once famous. Population in 1875, 6384.

Einbeek owes its rise to the frequent pilgrimages made in early times to the ‘‘ Blood of the Saviour” at the eathedral chapel. It was a fortified Hanse town, and in 1542 joined the Smalealdic League. On Mareh 24, 1626, it was taken by Pappenheim, and on October

14, 1641, by Piccolomini; and during the Scven Years’ War it was repeatedly occupied by the Freneh.

EINSIEDELN, a town in the canton of Schwyz, in Switzerland, situated in the valley of the Sihl, eight miles N.N.E. of Schwyz. ° The Benedictine abbey of Einsiedeln, founded about the middle of the 9th century, was several times partially or wholly destroyed by fire. The present edifice, in the Italian style, was erected in 1704-19, and Stands at an elevation of 2985 feet above sea-level. It contains a library of 40,000 volumes, 1190 manuscripts, and 1015 incunabula, and in connection with it are a priests' seminary, a gymnasium, and a lyeccum. The emperors Otto the Great and Henry II. made valuable presents to the abbey, and in 1274 Rudolf of Hapsburg

created the abbot a prince. The treasury was plundered by the French in 1798. The abbey has for centuries been noted for its sacred image of the Virgin, which brings to it yearly an average of 150,000 pilgrims, chiefly on the 14th of September. Most of the buildings of Einsiedeln are inns for the entertainment of the pilgrims, with whom the inhabitants traffic in missals, sacred pictures, rosaries, crucifixes, and medallions. The Reformer Zwingli preached at Hinsiedeln in 1516-18, and not far from the town is the house where Paracelsus is said to have been born. Popula- tion about 7650.

EISENACH, the chief town of the Eisenach circle and of the administrative department of Saxe-Weimar- Eisenach, lies in a romantic district at the north-west end of the Thuringian wood. It is situatcd on the Horsel, at the junction of the Thuringian and Werra railways, and 44 miles west from Weimar. In its neighbourhood is the Wartburg, where Luther on his return from the Diet of Worms was imprisoned, and where from May 1521 to March 1522 he devoted himself to the translation of the Bible. Ona high rock on the south side of the town are the ruins of the castle of Madelstein. LEisenach is the birth-place of Sebastian Bach, and he and Luther werc educated at its gymnasium, then the Latin school. Among the public buildings may be mentioued the tower of St Nicholas, the castle, rebuilt in 1742, and the town-house, erected in 1641. isenach has a manufactory for cotton cloth, and a large woollen and several other mills. Popula- tion in 1875, 16,163.

EISENBERG, a town in the west circle of the duchy of Saxe-Altenburg, and 24 miles W.S.W. of Altenburg, It is very old, aud has changed possessors more than once, but was joined to Saxe-Altenburg in 1826. It possesses an old castle anda beautiful church. Its industries are principally woollen and porcelain manufactures, linen-weaving, and shoe-making. Population in 1875, 5509.

EISENBURG, or Vas VARMEGYE, a county of Western Hungary, on the Styrian frontier, inclosed on the north, east, and south by the counties of Sopron, Veszprim, and Szala, and on the west by the Styrian circle of Gratz. Its area is 1536 geogr. square miles. Though mountainous in the west and south, the land is generally fertile. The chief river is the Raab, which receives the Pinka, Sorok, Gyongyés, and other streams. The natural and agricultural products consist of coals, mineral waters, quicksilver, corn, wine, fruit, and tobacco. Game, wild fowl, and fish are also plentiful. The population in 1870 amounted to 331,602, of whom nearly three-fourths were Roman Catholics, the rest chiefly Protestants and Jews. According to nationality about 140,000 are Magyars, 120,000 Germans, and the remainder Croatians and Slovaks, The principal town is Szembathely or Stein-am- Anger.

EISENSTADT, or Kis-Marton, a royal free town of East Hungary, in the varmegye or county of Sopron or Oeden- burg, in 47° 51’ N. lat. and 16° 30’ E. long., is situated at the foot of the Leitha mountain range, not far from the west bank of Lake Neusiedl, 26 miles §.E. of Vienna. The town is famous as being the seat of Prince Eszterhazy, whose castle of Kis-Marton is one of the finest palaces in Hungary. It was built by Prince Paul, palatine of Hungary, in 1683, but was improved and added to in 1805. The park, which is very large, has a fiue orangery, and several con- servatories, containing many thousand varieties of exotic plants. The town itself is walled round, and has three main streets, with an old church, a town-hall, hospitals, and monasteries of the Brothers of Charity and of the Franciscans. To the north of the town there are exten- sive zoological gardens, The population in 1870 amounted to 2476.

EISLEBEN (Latin, Jslebia), the chief town of the Mansfield circle, in the government of Merseburg, province of Saxony, Prussia, is situated on the railway from Halle to Nordhausen and Cassel, 18 miles west from Halle. It con- sists of an old and a new town, the former being surrounded by walls. In the vicinity are extensive copper and silver mines, and the town itself possesses smelting furnaces, several breweries, and manufactories of linen, tobacco, and saltpetre. Among its principal buildings are—the old castle; the church of St Andrews, which contains numerous monu- ments of the counts of Mansfield; the church of St Paul and St Peter, in which is the font where Luther was baptized ; the Royal Gymnasium, founded by Luther shortly before his death in 1546; and the hospital. Hisleben is celebrated as the place wliere Luther was born and died. The house in which le was born was burned in 1689, but was rebuilt in 1693 as a free school for orphans ; that in which he died has lately been renovated, and his death- chamber is still preserved.

The first mention of Eisleben dates from the 11th century. During the insurrection of the peasants in 1525, it was partly destroyed, and it was immediately after this that the new town was founded. In 1780, when the couniship of Mansfield became

extinet, Eisleben came into the possession fof Saxony, and in 1815 of Prussia. The population in 1875 was 14,378.

EISTEDDFOD, Yr (plural Zisteddfodau), the national bardic congress of Walcs, the objects of which are to encourage bardism and music and the general literature of the Welsh, to maintain the Welsh language and customs of the country, and to foster and cultivate a patriotic spirit amongst the people. This institution, so peculiar to Wales, is of very ancient origiu.! The term Listeddfod, however, which means “a session ” or “ sitting,” was probably not applied to bardic congresses before the 12th century.

The Eisteddfod in its present character appears to have originated in the time of Owain ap Maxen Wledig, who at the close of the i4th century was elected to the chief sovereignty of the Britons on the departure of the Romans. It was at this time, or soon afterwards, that the laws and usages of the Gorsedd were codified and remodelled, and its otto of “Y gwir yn erbyn y byd” (The truth against the world) given to it. “Chairs” (with which the

Eisteddfod as a national institution is now inseparably connected) were also established, or rather perhaps resuscitated about the same time. The chair was a kind of convention where disciples were trained, and bardic matters discussed pre- paratory to the great Gorsedd, each chair having a distinc- tive motto. There are now existing four chairs in Wales,— namely, the "royal" chair of Powys, whose motto is "A laddo a leddir" {He that slayeth shall be slain); that of Gwent and Glamorgan, whose motto is " Duw a phob daioni" (God and all goodness); that of Dyfed, whose motto is "Calon wrth galon," (Heart with heart); and that of Gwynedd, or North Wales, whose motto is" Iesu," or "O Iesu! na'd gamwaith" (Jesus, or Oh Jesus! suffer not iniquity).

The first Eisteddfod of which any account seems to have descended to us was one held on the banks of the Conway in the 6th century, under the auspices of Maelgwn Gwy- nedd, prince of North Wales. Maelgwn on this occasion, in order to prove the superiority of vocal song over in- strumental music, is recorded to have offered a reward to such bards and minstrels as should swim over the Conway. There were several competitors, but on their arrival on

1 According to the Welsh Triads and other historical records, the Gorsedd or assembly (an essential part of the modern Kisteddfod, from which indeed the latter sprung) is as old at least as the time of Prydain the son of Aedd the Great, who lived many centuries before the Christian era. Upon the destruction of the political ascendency of the Druids, the Gorsedd lost its political importance, though it seems to have long afterwards retained its institutional character as the medium for preserving the laws, doctrines, and traditions of bardism.

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the opposite shore, the harpers found themselves unable to play, owing to the injury their harps had sustained from the water, while the bards were in as good tune as ever. King Cadwaladr also presided at an Eisteddfod about the middle of the 7th century.

Griffith ap Cynan, prince of North Wales, who had been born in Ireland, brought with him from that country many Irish musicians, who greatly

improved the music of Wales. During his long reign of 56 years he offered great en- couragement to bards, harpers, and minstrels, and framed a code of laws for their better regulation. He held an Eisteddfod about the beginning of the 12th century at Caerwys in Flintshire, ‘‘to which there repaired all the musicians of Wales, and some also from England and Scot- land.” For many years afterwards the Eisteddfod appears to have been held triennially, and to have enforced the rigid observance of the enactments of Griffith ap Cynan. The places at which it was generally held were Aberffraw, formerly the royal seat of the princes of North {Wales ; Dynevor, the royal castle of the princes of South Wales ; and Mathrafal, the royal palace of the princes of Powys ; and in later times Cacrwys in Flintshire received that honourable distinction, it having been the princely resi- dence of Llewelyn the Last. Some of these Eisteddfodau were conducted in a style of great magnificence, under the patronage of the native princes. At Christmas 1107, Cadwgan, the son of Bleddyn ap Cynfyn, prince of Powys, held an Eisteddfod in Cardigan Castle, to which he invited the bards, harpers, and minstrels, “the best to be found in all Wales ;” and “he gave them chairs and subjects of emulation according to the custom of the feasts of King Arthur.” In 1176 Rhys ab Gruffydd, prince of South Wales, held an Eisteddfod in the same castle on a scale of still greater magnificence, it having been proclaimed, we are told, a year before it took place, ‘‘over Wales, Eng- land, Scotland, Ireland, and many other countries.”

On the annexation of Wales to England, Edward I. deemed it politic to sanction the bardic Eisteddfod by lus famous statute of Rhuddlan. In the reign of Edward ITI. Ifor Hael, a South Wales chieftain, held one at his man- sion. Another was held in 1451, with the permission of the king, by Griffith ab Nicholas at Carmarthen, in princely style, where Dafydd ab Edmund, an eminent poet, sig- nalized himself by his wonderful powers of versification in the Welsh metres, and whence “he carried home on his shoulders the silver chair” which he had fairly won. Several Eisteddfodau were held, one at least by royal mandate, in the reign ot Henry VII. In 1523 one was held at Caer- wys before the chamberlain of North Wales and others, by virtue of a commission issued by Henry VIII. In the course of time, through relaxation of bardic discipline, the profession was assumed by

unqualified persons, to the great detriment of the regular bards. Accordingly in 1567

ueen Elizabeth issued a commission for holding an Kis- teddfod at {Caerwys in the following year, which was duly held, when degrees were conferred on 55 candidates, includ- ing 20 harpers. From the terms of the royal proclamation we find that it was then customary to bestow “a silver harp” on the chief of the faculty of musicians, as it had been usual to reward the chief bard with ‘‘a silver chair.” This was the last Eisteddfod appointed by royal commis- sion, but several others of some importance were held during the 16th and 17th centuries, under the patronage of the earl of Pembroke, Sir Richard Neville, and other influential persons. Amongst these the last of any parti- cular note was one held in Bewper Castle, Glamorgan, by Sir Richard Basset in 1681.

During the succeeding 130 years Welsh nationality was at its lowest ebb, and no general Eisteddfod on a large scale appears to have been held until 1819, though several

small ones were held under the auspices of the Gwyned- digion Society, established in 1771,—the most important being those at Corwen (1789), St Asaph, (1790), and Caerwys (1798).

At the close of the Napoleonic wars, however, there was a general revival of Welsh nationality, and numerous Welsh literary societies were established throughout Wales, and in the principal English towns.

1820, Wrexham ; 1821, Carnarvon; 1822, Brecon; 1823, Car- marthen ; 1824, Welshpool; 1826, Brecon; 1828, Denbigh ; 1832, Beaumaris; 1834, Cardiff; 1835, Llanerchymedd ; 1836, Liverpool ; 1838, Merthyr; 1839, Liverpool; 1840, Abergavenny ; 1842, Swansea; 1845, Abergavenny ; 1849, Aberffraw ; 1850, Rhuddlan ; 1851, Tremadoc ; 1858, Liverpool and Portmadoc ; 1854, Festiniog; 1855, Dinas Mawddwy, Machraeth, and Morriston ; 1858, Llangollen (memorable for its archaic character, and the attempts then made to revive the ancient ceremonies and restore the ancient vestments of druids, bards, and ovates); 1859, Merthyr; 1860, Denbigh ;

1861, Conway and Aberdare ; 1862, Carnarvon ; 1863, Swansea and Rhyl; 1864, Llandudno; 1865, Aberystwith ; 1866, Chester ; 1867, Carmarthen; 1868, Ruthin; 1869, Llanerchy- medd ; 1870, Rhyl; 1871, Towyn; 1872, Portmadoc; 1873, Mold; 1874, Bangor; 1875, Pwllheli; 1876, Wrexham; and 1877, Carnarvon.

Besides these, innumerable local Eisteddfodau have been been held during the last 50 years,

To constitute a provincial Histeddfod it is necessary that it should be proclaimed by a graduated bard of a Gorsedd a year and a day,before it takes place. A local one may be held without such a proclamation. A provincial Eisteddfod generally lasts three, sometimes four days, during which thousands of persons of all classes and from all parts of Wales and many English towns attend. Many of these being unacquainted with the Welsh language, a large portion of the public proceedings are conducted in English, A president and a conductor are appointed for each day. The proceedings commence with a Gorsedd meeting, opened with sound of trumpet and other ceremonies, at which candidates come forward and receive bardic degrees after satisfying the presiding bard as to their fitness. At the subsequent meetings the president gives a brief address ; the bards follow with poetical addresses ; adjudications are made, and prizes and medals with suitable devices are given to the successful competitors for poetical, musical, and prose compositions, for the best choral and solo singing, and singing with the harp or "' Pennillion singing"! as it is called, for the best playing on the harp or stringed or wind instruments, as well as occasionally for the best specimens of handicraft and art, In the evening of each day a concert is given, gene- rally attended by very large numbers. The great day of the Histeddfod is the "chair" day—usually the third or last day —the grand event of the Eisteddfod being the adjudication on the chair subject and the chairing aad investiture of the fortunate winner. This is the highest object of a Welsh bard's ambition. The ceremony is an imposing one, and is performed with sound of trumpet. See Critic Liverature, vol. v. pp. 318, 319, and for authorities, p. 327. (R. w.*)

1 According to Jones's Bardic Remains, 'To sing ' Pennillion' with a Welsh harp is not so easily accomplished as may be imagined. The singer is

obliged to follow the harper, who may change the tune, or perform variations ad libitum, whilst the vocalist must keep time, and end precisely with the strain. The singer does not commence with the harper, but takes the strain up at the second, third, or fourth bar, as best suits the ‘peunill’ he intends to sing. : Those are considered the best singers who can adapt stanzas of various metres to one melody, and who are acquainted with the

twenty-four measures according to the bardic laws and rules of composition,”

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EJECTMENT, in English law, was an action for the re- covery of the possession of land, together with damages for the wrongful withholding thereof. In the old classification of actions, as real or personal, this was known as a mixed action, because its object was twofold, viz., to recover both the realty and personal damages. The form of the action as it prevailed in the English courts down to’the Common Law Procedure Act, 1852, was a series of fictions, among the most remarkable to be found in the entire body of English law. The following outline is condensed from the work of Mr Sergeant Adams :—A, the person claiming title to land, delivers to B, the person in possession, a declaration in ejectment, in which C and D, fictitious persons, are plaintiff and defendant. C states that A has devised the land to him for a term of years, and that he has been ousted by D. A notice signed by D informs B of the proceedings, and advises him to apply to be made defendant in D’s place, as he, D, having no title, does not intend to defend the suit. If B does not so apply, judg- ment will be given against D, and possession of lands will be given to A. But if B does apply, the court allows him to defend the action only on condition that he admits the three fictitious averments—the lease, the entry, and the ouster—which, together with title, are the four things necessary to maintain an action of ejectment. This having been arranged, the action proceeds, B being made defendant instead of D. The names used for the fictitious parties were John Doe, plaintiff, and Richard Roe, defendant, who was called the casual ejector. The explanation of these mysterious fictions is this. The writ of ejectione firme was invented about the beginning of the reign of Edward III. as a remedy to a lessee who for years had been ousted of lis term. It was a writ

of trespass, and carried damages, but in course of time the courts of common law added thereto “a species of remedy neither warranted by the original writ nor demanded by the declaration, viz., a judg- ment to recover the term and a writ of possession there- upon,” The next step was to extend the remedy to cases of disputed title to freeholds. This was done indirectly by the claimant entering on the land and there making a lease for a term of years to another person ; for it was only a term that could be recovered by the action, and to create a term required actual possession in the granter. The lessee remained on the land, and the next person who entered even by chance was accounted an ejector of the lessee, who then served upon him a writ of trespass and ejectment. The case then went to trial as on a common action of trespass ; and the claimaut’s title, being the rea] foundation of the lessee’s right, was thus indirectly determined. These proceedings might take place without the knowledge of the person really in possession ; and to prevent the abuse of the action a rule was laid down that the plaintiff in ejectment must give notice to the party in possession, who might then come in and defend the action. When the action came into general use as a mode of trying the title to free- holds, the actual entry, lease, and ouster which were necessary to found the action were attended with much inconvenience, and accordingly Lord Chief-Justice Rolle during the Protectorate substituted for them the fictitious averments already described. The action of ejectment 1s now only a curiosity of legal history. Its fictitious suitors were swept away by the Common Law Procedure Act of 1852.

Act, 1875, all actions are begun and carried on in the same manner, and an action for the recovery of land will, with very few exceptions, proceed in the same manner as any other action.

EKATERINBURG, or YEKATERINBURG, a town of Asiatic Russia, at the head of a department in the province of Perm, on the Siberian highway, about 238 miles to the south-east of Perm, in 56° 49’ N. lat. and 60° 35’ E. long. It is situated near the eastern skirt of the Ural Mountains, and occupies both banks of the Isset, which is there crossed by a dam and forms a valuable reservoir for industrial pur- poses. In 1834 it was made the seat of a suffragan bishop, and it has long been the head-quarters of the

administration of the mines, not only for the immediate neighbourhood, but also for the Bogosloff, Goroblagodat, Perm, Zlato- ustoff, and Kam-Votkin districts. The streets are broad and regular, and several of the houses of palatial propor- tions, There arc two cathedrals—St Catlerine's founded in 1758, and Epiphany in 1774, with more tlian adozen churches and a monastery, two gymnasiums, a departmental school, a city infirmary, a workmen's hospital, an almshouss, a children's home, a prison, a theatre, and a museum opened in 1853. Besides the Government mint for copper coinage, which dates from 1735, the Government engineering works, and the imperial factory for the polishing of malachite, jasper, marble, porphyry, and othcr ornamental stones, the industrial establishments comprise tallow-factories, soap-works, glue-works, rope-works, distilleries, pottcries, and carriage factories. The trade is very exten- sive, especially in cattle, grain, iron, woollen and silk stuffs, and colonial wares ; and besides a weekly market there are two annual fairs, The population in 1860 numbered 19,832, mostly belonging to the Greek Church, only 47 being Catholics, 198 Protestants, and 36 Mahometans ; in 1871 it had increased to 25,233.

Ekaterinburg took its origin from the mining establishments founded on the spot by Peter I. in 1723, and received its name in honour of Catharine 1. Its development was greatly promoted in 1763 by the Siberian highway, which till then had passed by Verkhoturie, being diverted so as to pass through it; and the gradual extension of mining operations in the district has maintained its prosperity. In 1781 the town was transferred from the Tobolsk department to the government of Perm, and in 1863

passed from the jurisdiction of the Administration of Mines to the ordinary civil jurisdiction.

EKATERINODAR, the chicf town of the Russian government of Kuban, on the right bank of the Kuban, near the confluence of the Karasuk, in 45° 3' N. lat. and 38° 30" E. long., 1400 miles from St Petersburg and 555 north-west of Tiflis, It is badly built on a swampy site exposed to the inundations of the river ; and its houses, with few exceptions, are slight structures of wood and plaster. Six churches, a gymnasium, two schools, and a hospital are the principal public buildings. Nonc of the industrial establishments, which comprise soap-works, tanneries, brick-works, and potteries, are of

more than local importance ; but there is a fair trade in horses, cattle, sheep, wool, and fish. In the neighbourhood is a large garden and orchard maintained by the Government for the encouragement of horticulture. The town dates from the reign of Catherine IJ., when in 1792 the Zaporogian Cossacks were transferred to the Kuban district. In 1860 the population amounted to 9620, mainly Cossacks ; in 1871 it was 17,622.

EKATERINOSLAFF, or EKATERINOSLAVSKAYA GUBER- NIE, a government of Southern Russia, which Jies partly to the W. of the Dnieper, stretches E. to the Donetz and tle Kalmius, and in the S. reaches the Sea of Azoff between the mouths of the Berda and the Kalmius. It is watered by the Dnieper for 220 miles, and bounded by the Donetz for 132. The district of Rostoff, lying round the head of

the Gulf of Taganrog, though naturally a portion of the Country of the Don, is also assigned to Ekaterinoslaff. According to tle military survey, the area of the govern- ment is 26,095 square miles, or 59,185 square versts ; according to Schweizer, only 25,644 square miles, or 58,338 square versts, Its surface is a steppe-like plain, relieved here and there by considerable elevations, and traversed by deep ravines and river courscs. The most important range of hills, or those forming the water-shed between the tribu- taries of the Donetz and the independent affluents of the Sea of Azoff, attains no grcater height than 530 feet above sea-level. A line drawn from near the mouth of the Orel parallel with the Dnieper as far as the town of Ekaterinoslaff, and thence to the village of Karakub on the Kalmius, divides the government into two geological dis- tricts, of which the south-western is distinguished by crystalline and the north-eastern by sedimentary rocks. Of the former the predominant variety is gneiss, inter- rupted by numerous upheavals of granitc, syenite, diorite, and serpentine. The latter belong to several different formations. Carboniferous strata occupy the greater part of the districts of Slavianoserbsk and Bakhmut and part of Pavlogradsk and Alexandrofsk; Permian’strata occur within a very limited area in Bakhmutsk; Cretaceous strata form a narrow strip along the northern boundary of the government from Bakhmutsk to the confluence of the Orelka and the Orel; and Tertiary strata extend through nearly all the district

of Novomoskoff and the southern part of Pavlogradsk. ‘The mineral deposits of the govern- ment are of great value. Anthracite and_coal‘are dis- tributed along the northern Donetz, the Lugan, the Miuschik, the Kalmius, and various other streams. The quantity of coal obtained in 1861 exceeded 1,200,100 puds. Jron ore is present in the same districts, and is successfully worked in several places, as at the Government establishments on the Lugan. Excellent whetstone is procured in the Slavionoserbsk district, and transported throughout Russia. Asbestos, millstones, gypsum, marl, and rock salt, as well as building materials, are among the minor products, There are altogether about 200 lakes in the government, the largest, which is called the Soleni Liman or Salt Lagoon, though the water is fresh, has an area of nearly three square miles; and next in size is the Tememitz lake near Rostoff. The soil is for the most part very fertile, and agriculture is the principal occupation. Whcat is the staple cereal, and forms an important article of export; but rye, barley, and millet are cultivated for local consumption and distillation. Since about 1850 the culture* of flax has attained considerable importance ;_ wild rape-seed is also exported, and in small quantities hemp and the sunflower are grown. The sloe thorn is very abundant, and the fruit is manufactured into a wine called Terevka. The German colonists of Khorlitz and Alexandrovka and the Greeks of Mariupol cultivate tobacco—the former principally a poor American variety for local consumption, the latter Turkish for export. Potatoes are grown only in gardens, as to plant them in the fields is regarded as prejudicial. Horticulture is poorly developed, but there are beautiful public gardens at Taganrog and Ekaterinoslaff, the Petrofski park in the former city being also the oldest inthe government. About 7,209,000 acres, or 45 per cent. of the territory of the government, is devoted to pasturage ; and in 1861 there were 2,670,000 sheep, 730,000 neat, 200,000 horses. Only about two per cent. of the surface is occupied by wood, and even that is almost exclusively confined to the river courses, especially of the Samara and the Dnieper. The trees are almost exclusively deciduous, oak pre- dominating, and elm, larch, black poplar, poplar, and aspen occurring. VII. -— 100

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In 1860 the total population was 1,138,749, and in 1867, 1,281,482. At the former date there were about 35,000 Greeks, more than 23,000 Jews, more

than 20,000 Germans, 19,000 Arme- nians, 9000 Moldavians and Wallachians, 7000 Poles, 7000 Lithu- anians, 500 Servians, and 5000 Gipsies ; while the Little Russians and the Great Russians stood to each other in the ratio of 88 to 17. Upwards of 5500 were Russian dissenters or Raskolniks, 20,318 Protestants, and 7040 Catholics. Two eities only, Rostoff and Taganrog had more than 20,000 inhabitants ; four, Ukatcrinoslaff, Nakhiehevan, Bakhmut, and Petrokovka, had upwards of 10,000; and several, such as Novomoskofsk, Pavlograd, Mariupol, and Azoff had more than 5000. e

EKATERINOSLAFF, @ town of European Russia, capital of the above government, is situated on the right bank of the Dnieper, at a height of 210 feet above the sea, 984 miles from St Petersburg and 600 from Moscow, in 48° 21’ N. lat. and 34° 4’ E, long. If the suburb of Novi Koindak be included, it cxtends for upwards of four miles along the river, and its average breadth is about 14 miles. The oldest part lies very low, and is consequently much exposed to floods. Contiguous to the town on the north-west is the royal village of Novi Maidani or the New Factorics, and in the south-east Kazannaya Mandrikovka. Only about 200 houses arc built of stone. The bishop’s palace, eight churches, a Raskolnik place of worship, a syna- gogue and four Jewish oratories, a gymnasium, a library, and several benevolent institutions, make up the list of the public buildings. The house now occupied by the Nobles’ Club was formerly occupied by Potemkin. Among the industrial establishments arc brickworks, foundries, flour-mills, and numerous tallow-boileries and soap-works. The general trade is rather restricted by the position of the town above the rapids of the Dnieper; but there is a very extensive trade in wood, Three yearly markets are held, at the largest of which the movement amounts to upwards of 2,200,000 roubles. Population in 1861, 18,881, of whom 3472 were Jews; in 1871, 24,267.

On the site of the town of Ekatcrinoslaff there formerly stood the Polish eastle of Koindak, built in 1635 by the French general Beauplan. The Cossacks, having destroyed the castle, founded the villages of Old and New Koindak and Polvitza. In 1786, the town was established by Potemkin, and in the following year the empress, Catherine II., with her own hand laid the foundation stone of the Cathedral of the Transfiguration. The schemes of

Potemkin for the extension of the city were neglected after hig death, and Paul I. changed the very name into Novo Rossiesk. The original name was restored in 1802, and the eity raised to its present rank. In 1830, the cathedral was built on the site originally proposed, but aeeording to a less extensive scale.

‘ EKHMIN, or Axumin, a town of Upper Egypt, a short distance from the right bank of the Nile, between two and three miles above Suhag. It is a place of about 3000 or 4000 inhabitants, has several mosques and two Coptic churches, maintains a weekly market, and manufac- tures shawls and checked cotton. Outside of the walls are the ruins of two ancient temples, one of which, identified by an inscription of the 12th year of the emperor Trajan as that of Pan, was regarded by Abulfeda as among the most important in Egypt. nad

Ekhmin, in Coptish Khmin or Shmin, is the ancient Chemmis or Panopolis, chief town of the Chcmmite nome in the Thebaid, and, according to Strabo, inhabited by skilful stone-cutters and linen-weavers. It was reputed one of the oldest eities in the country. Herodotus particularly mentions a temple of Perseus, and asserts that the inhabitants celebrated gymnastic games in honour of this hero; but it has not been ascertained to whieh of the Egyptian gods this aceount should be assigned. Panopolis probably decayed with the rise of Thebes, and long after it suffered greatly at the hands of the Arab invaders. At the time of Pocoeke’s visit in 1788, it was still the seat of a powerful emir, who extended his protection to the Coptic Catholies ; but the dynasty is long ago extinet, leaving nothing but its traditions and sepulchres behind. Nonnus, the Greek poet, was born at Chem- mus in 410, and Nestorius died and was buricd there about 447.

EKRON, in the Septuagint and Apocrypha Accaron (Axxapév), a royal city of the Philistines, identified with

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the modern Syrian village of Akir, five miles from Ramleh, on the southern slope of a low ridge separating the plain of Philistia from Sharon. Though

included by the Israelites within the limits of the tribe of Judah, and mentioned in Judges xix. as one of the cities of Dan, it was in Philistine possession in the days of Samuel, and apparently main- tained its independence. According to the narrative of the Hebrew text, here differing from the Septuagint and Josephus, it was the last town to which the ark was transferred before its restoration to the Israelites. Its maintenance of a sanctuary to Beelzebub is mentioned in 9 Kings i, At the time of the Crusades it was still a large village ; but now, according to Porter, it contains only 50 mud houses, and has no visible remains of antiquity except two finely built walls.

ELAGABALUS. See Hetiocapatus.

ELAM. This is the name given in Scripture to the province of Persia called Susiana by the classical geographers, from Susa or Shushan its capital. In one passage, how- ever (Kzra iv. 9), it is confined to Elymais, the north-western part of the province, and its inhabitants distinguished from those of Slhushan, which elsewhere (Dan. viii. 2) is placed in Elam. Strabo (xv. 3, 12, &c.) makes Susiana a part of Persia proper, but a comparison of his account with those of Ptolemy (vi. 3, 1, &c.) and other writers would limit it to the mountainous district to the east of Babylonia, lying between the Oroatis and the Tigris, and stretching from India to the Persian Gulf. Along with this mountainous district went a fertile low tract of country on the western side, which also included the marshes at the mouths of the Euphrates and Tigris and the north-castern coast land of the Gulf. This low tract, though producing large quan- tities of grain, was intensely hot in summer; the high regions, however, were cool and well watered. The whole country was occupied by a variety of tribes, all speaking agglutinative dialects allied to each other and to the so- called Accadian language of primitive Chaldea, but in very different stages of civilization. The most important of the tribes were the natives of southern Susiana, called Auzan in the cuneiform inscriptions, who established their capital at Susa, and founded a powerful monarchy there at a very early date. Strabo (xi. 13, 3, 6), quoting from Nearchus, seenis to include them under the Elymeans, whom he associates with the Uxii, and places on the frontiers of Persia and Susa; but Pliny more correctly makes the Kulzeus the boundary between Susiana and Elymais (W. //, vi, 29-31). The Uxii are described as a robber

tribe in the mountains adjacent to Media, and their name is appareutly to be identified with the title given to the whole of Susiana in the Persian cuneiform inscriptions, Uwajd, or “ Aborigines.” Uwaja is probably the origin of the modern Khuzistan, though Mordtmann would derive the

latter from 5: “a sugar-reed.” Immediately border-

ing on the Persians were the Amardians or Mardians, in whom we may see the Apharsathchites and Apharsites of Ezra iv. 9,as well as Khapirti or Khalpriti, the name givell to Susiana in the Protomedic cuneiform texts, which are written in the agglutinative dialect of the Turanian Medes and northern Elamites. Khapirti appears as Aipir in the inscriptions of Mal-Amir. Passing over the Messabate, who inhabited a valley which may perhaps be the modern Mah-Sabadan, as well as the level district of Yamutbal or Yatbur (with its capital Duran or Deri) which separated Elam from Babylonia, and the smaller districts of Characene, Cabandene, Corbiana, and Gabiene mentioned by classical authors, we come to the fourth principal tribe of Susiana, the Cissti (Aisch., Pers., 16 ; Strab. xv. 3, 2) or Cosseei (Strab. xi. 5,6 ; xvi. 11, 17; Arr., Znd., 40; Polyb. v. 54, dsc.), the Cassi of the cunciform inscriptions. 5e

ELAM

important were they, that the whole of Susiana was some- times called Cissia after them, as by Herodotus (i1, 91; v. 49, &e.). In fact, Susiana was only a late name for the country, dating from the time when Susa had been made a capital of the Persian empire. The Accadians called it Numma, “the highlands” (compare the Vogul nwman, “high”), or Subarti, with the same meaning, and of this the Semitic Elam (from nby) was only a translation. Such was also the signification of the native Khapir or Aipiy, also written Khnbur, which is made synonymous with Subarti (comp. Eber, Gen. xi. 14). The Assyrian inscrip- tions have disposed of the suggestion, first made by J. Miller and Lassen, that Elam is a corrupt form of the Indo-European Airyama.

The principal mountains of Elam were on the north, called Charbanus and Cambalidus by Pliny (vi. 27, 31), and tclonging to the Parachoathras chain. In the inscrip- tions they have the general name of “monntains of the east,”

which extended into Media, where “ the mountain of _ Nizir,” or “the mountain of the world,” the present mount Elwend, was belicved to be the spot on which the ark had rested, and the cradle of mankind. There were numcrous rivers flowing into either the Tigris or the Persian Gulf. The most important were the Ulai or Euleus (Kiran) with its tributary the Pasitigris, the Choaspes (Kerkhah), the Coprates (river of Diz called Itite in the inscriptions), the Hedyphon or Hedypnus (Jerrdhi), and the Oroatis (ZZindyan), besides the monumental Surappi and Ukni, or “ white river,” perhaps to be identified with the Hedyphon and Oroatis, which fell into the sea in the neighbourhood of the Caldai of Bit-Yagina, of Khindar, and of the Gambulai, in the marshy region at the mouth of the Tigris. Shushan or Susa, the capital, now marked by the mounds of Shusk, stood near the junction of the Choaspes and Euleus (see Susa); and Badaca, Madaktn in the inscriptions, lay between the Shapur and the river of Diz. Among the othcr chief cities mentioned in the inscriptions, may be named Naditu, Khaltemas, Din-sar, Dubilu, Bit-imbi, Khidalu, and Nagitu on the sea coast. Here, in fact, lay some of the oldest and wealthiest towns, the sites of which have, however, been removed inland by the silting up of the shore. The monumental Dilvun, for instance, which according to Sargon was an island 30 caspu from the land, is now probably represented by Dunder Dellim.

The civilization of southern Elam was of very great antiquity. The Aceadai or ‘‘ Highlanders,” who founded the eities and civiliza- tion of primeval Chaldea, descended from its mountains, earrying with them the picture-writing which afterwards developed into the euneiforin syllabary. An examination of the syllabary shows us that the only animals with which they were acquainted wero the ass, the ox, the sheep, the gazelle, the antelope, the bear, the wild bull, the dove, the snake, the fly, the flea, the moth, the bee, and different species of fish,—horses, called the ‘‘animals of the east,” being a subsequent importation. Neither the palm nor the vine were known before their emigration into Babylonia ; indeed, Strabo states that the vine was first introduced into Susiana by the Mace- donians. ‘The different tribes of the country were constantly invading Babylonia, and from time to time imposed their dominion upon it. About 2280 B.c. (according to the date furnished by Assur-bani-pal), the Elamite king Cudur-nankhundi earried away the image of the goddess Nana from Babylonia to Shushan, and in Gen. xiv. we find Chedorlaomer or Cudur-

lagamar suzerain of the Babylonian princes, Cudur-mabug, the son of Simti-Silkhak, king of Yamutbal, founded a dynasty in Chaldea, which lasted for two generations, his son Rim-Agu or Eri-Acu (Arioch) of Larsa being afterwards conquered by Khammuragas. Khammuragas himself was a Cassite, and the dynasty he founded at Babylon, which he made for the first time the capital of the country, con- tinued for several centuries, and was only overthrown at last by the Assyrian monarch, Tiglath-Adar, in 1270 B.c. Another Cassite dynasty had ruled Babylonia at a very much earlier time, and one of its kings, Agu-kak-rimi, had restored the great temple of Bel at Babylon. Elamite raids reeommenced within a few years after

the overthrow of the second Cassite dynasty, Elamites from time to time appear as kings of Babylonia, and about 1200 n.c. the

whole country was ravaged and desolated by the Elamite Crdnr- nankhundi If. Revenge for this, however, was shortly afterwards taken by the Babylonian Nebuchadrezzar. Subsequently, we find. Elam and Babylon in alliance against the growing power of Assyria, and in the 8th and 7th centuries B.c., when Babylonia was alternately under the sway of the Assyrian princes and of Chaldean and other adventurers from the districts on the Persian Gulf, Elam played a large part in its political history. Tiglath-Pileser IL, in 745 B.c., first overran the sca-coast as far as the Ukni, and in 721 Sargon met Khumba-nigas the elamite in battle at Duran, and drove him across the Assyrian frontier. After the establishment of the Assyrian empire in the west and north, the reduction of Babylonia to a dependent province beeame a neeessity, and this involved the weakening and final conquest of the powerful kingdom of Elam itself. The struggle lasted through the reigns of four Assyrian kings, Sargon, Sennacherib, Esarhaddon, and Assur-bani-pal, and the overthrow of Elam was eventually effected only by the help of internal discord and civil war. In 710, Sutruk-nankhundi was driven from Yatbur and Rasi, on the Babylonian frontier, and his Babylonian ally Merodach-baladan left to lis fate. In 704 the Elamites and Babylonians were defeated at Cis by Sennacherib, and in the following year the Cassi in the north- east were reduced to submission. In 697 B.c., the flect of Senna- cherib pursued Merodach-Baladan_and his

followers to Nagitu and Khilman, at the mouth of the Enleus, where the Elamites had given them shelter; the emigrants and their Susian allies wero scattered, and the towns burned. Meanwhile, Cudur-nankhundi, the Elamito monarch, had marched into Babylonia; he was driven back, however, by Sennacherib, 34 of his cities were destroyed, and he himself fled from Madaktn to Khaidala. Three months after ho dicd, and his brother and suecessor, Umman-miuan, at once began to collect allies from all sides, and to prepare for resist- anee. The terrible defeat at Khalule in 692, however, broke the power of Elam, and made Babylonia an Assyrian province. Umman-aldas I. remained on friendly terms with Esarhaddon, but his murder by his two brothers, Urtaki and Teumman, eaused the war-party to recover its aseendeney, and Urtaki made an un- successful raid into Babylonia, On his death, his brother Teum- man suceeeded, in virtuc of tho law by which the crown passed to the brother and not to the sons of the deecased monarch, and almost immediately provoked a quarrel with Assur-bani-pal by demanding the surrender of his nephews, who had taken refuge at the Assyrian court. The Assyrians followed the Elamite army to Shushan, where a battle was fought on the Euleus, in which the Elamites were defeated, Teumman was captured and slain, and Umman-igas, the son of Urtaki, made king, his younger brother Tammaritu being assigned the district of Khidalu. Umman-igas afterwards assisted in the revolt of Babylonia, but Tammaritu raised a rebellion against him, defeated him in battle, eut off his head, and seized the crown. Tammaritu marehed to Babylonia ; while there, his officer Indabigas, made himself king at Shushan, and drove Tammaritu to the coast, where he fled to Assur-bani-pal.

-Indabigas was himself defeated and killed by a new pretender,

Umman-aldas II., who was opposed, however, by three other rivals, two of whom maintained themselves in the mountains until the Assyrian conquest of the eountry, when Tammaritu was first restored and then imprisoned, Elam being wasted with fire and sword. The return of Umman-aldas led to a fresh Assyrian in- yasion; the Elamite king fled from Madaktu to Dur-undasi, Shushan and other cities were taken, and the Vlamites utterly routed on the banks of the Itite. ‘The whole country was reduced to a desert, Shushan was plundered and razed to the ground, 32 statues of its kings ‘‘of

silver, gold, bronze, and alabaster ” being earried off, and Susiana was made an Assyrian province in 640 p.c. The language of the Hebrew prophets seems to imply that Elam recovered its independence, but was again eonquered by Nebuchadrezzar ; on the fall of the Babylonian empire it passed to Persia, the Susian king Abradatas, mentioned in Xcnophon’s romance of the Cyropadia (vi.), being probably unhistorieal. Darius formed it into a satrapy, with a tribute of 800 talents (Hat. iii. 91). Shushan or Susa was rebuilt, and became the capital of the empire. Twice at least, however, the Susianians attempted to revolt in the early part of the reign of Darius, under Assina or Atrines, the son of Umbadara, and Martiya, the son of Issainsakris, who called himself Immanes ; but they gradually came to be eom- pletely Aryanized, and their old agglutinative dialects were in course of time supplanted by the Aryan Persian from the south- east.

Among the Elamite divinities may be mentioned Lagamar or Lagamal, and Armannu, the seerct title of Susinak, ‘‘the god of Shushan,” who was believed to go every year to Dilvun. His oracle stood just outside the city, and his image was held too sacred to be seen by the cyes of a mortal.

See Loftus, Chaldea and Susiana, 1857; Oppert in the Transactions of the Oriental Congress, 1854, and Records of the Past, vii. 79, 1877; and Sayce on the « Cuneiform Inscriptions of Elam and Media’ in the Transactions of the Society of Biblical Archxology, tii. 2, 1874. (A. TE

ELAND (Boselaphus oreas) is the largest and most valuable member of the antelope family. It is fully equal to the horse in size, standing six feet high at the shoulders, and measuring nine feet from the nose to the root of the tail. In robustness of build it resembles the ox, and forms the type of the bovine subdivision of antelopes. Its neck is thick, and is furnished with a prominent dewlap, fringed with long hair. Except on the ridge of the back the fur is short, and is usually of a reddish fawn colour above and white beneath. Its horns are about 20 inches in length, nearly straight, and in the male are surrounded throughout the greater part of theirlength with a spiral wreath ; in the female they are more slender, and the spiral ridge is indistinct or absent. The eland isa native of South Africa, where it roams in considerable herds over the open plains, “ rejoicing,” says a recent traveller,

“ in the belts of shaded hillocks, and in the isolated groves of Acacia capensis, which, like islands in the ocean, are scattered over many of the stony and gravelly plains of the interior.” It is slow in its movements as compared with the other antelopes, and is readily captured, while in disposition it is exceedingly gentle, and thus seems eminently adapted for domestication. It breeds readily in confinement, and herds of elands have already been introduced into various parks in Britain. Its flesh is highly prized as an article of food, resembling beef, it is said, in grain and colour, but being more delicate and better flavoured. The eland is remarkable for the quantity of fat which it takes on, exceeding in this respect all other large game. The carcase of a single individual weighs from 1500 to 2000 ibs. The eland was formerly abundant in the neighbourhood of Cape Town, but is now rarely found within the colony, and should man not succeed meanwhile in domesticating it, there is reason to fear that a valuable source of animal food will be lost to him by the speedy extermination of the eland.

i LA—ELA

EL-ARAISH, L’Araisn, or in French LARACHE, a town of Morocco on the Atlantic coast, about 45 miles §, of Tangier, is picturesquely situated on a rocky height to the south of the embouchure of the Wady Loukhus or Lixus, It is the seat of a military governor, and has a number of well-kept though practically useless defences. The impress of Spanish occupation is still evident, and all the main points described in the 17th century by Pidon de Saint Olon can easily be distinguished—such as the church, the fort of St Jacques, the castle of St Etienne with its four cupolas, the Jew’s Tower, and the castle of Notre Dame d’Europe, now the Kasba or citadel. The market-place ig surrounded with arcades of monolithic sandstone pillars, In spite of the bar at the entrance of the river preventing the passage of all vessels of more than 150 tons, the port is one of the most frequented on that part of the coast. The exports, gradually increasing in value, consist mainly of millet, dra, and other cereals, canary-seed, beans, pease, cork, and wool. In 1875, 136 vessels entered and cleared, 26 being British and 58 Spanish. The population of the town at the same date was estimated at 5000, of whom nearly 4000 were Mahometans, about 1000 Spanish-speaking Jews, and 60 Christians.

Though the name of El-Araish is comparatively modern, and is mentioned neither by El-Bikri nor by Edrisi, it seems not improbable from a passage in Scylax that the site of the town was occupied by a Libyan settlement atan early date; and about 3 miles up the river there still exist on the hill of Tchemmish very considerable ruins of the Punico-Roman city of Lixus. The modern town was finally taken from the Portuguese in 1689 by Mulei Ismael after a five months' siege ; in 1785 it was attacked by the French, and in 1829 saw the destruction of the Morocco fleet by the Austrians. mes in connection with the Spanish mission was maintained till 1822.

i See Barth, Wanderungen durch die Kustenlinder des Mittelmeeres, 1849; Rohlf's Adventures in Morocco, 1874; Tissot, ,“ Itinéraire de Tanger & R'bat,” in Bull. de la Soc. de Géogr., 1876.

PLAS TI CiT”:

1s LASTICITY of matter is that property in virtue of

which a body requires force to change its bulk or shape, and requires a continued application of the force to maintain the change, and springs back when the force is removed, and, if left at rest without the force, does not remain at rest except in its previous bulk and shape. The elasticity is said to be perfect when the body always requires the same force to keep it at rest in the same bulk and shape and at the same temperature through whatever variations of bulk, shape, and temperature it be brought. A body is said to possess some degree of elasticity if it requires any force to keep it in any particular bulk or shape. It is convenient to discuss elasticity of bulk and elasticity of shape sometimes separately and sometimes jointly.

2, Hvery body has some degree of elasticity of bulk. If a body possesses any degree of elasticity of shape it is called a solid; if it possesses no degree of elasticity of shape it is called a fluid,

3. All fluids possess elasticity of bulk to perfection. Probably so do all homogeneous solids, such as crystals and glasses. It is not probable that any degree of fluid pressure (or pressure acting equally in all directions) on a piece of common glass, or rock 'crystal, or of diamond, or on a crystal of bismuth, or of copper, or of lead, or of silver, would make it denser after the

pressure is removed, or put it into a condition in which at any particular intermediate pressure it would be denser than it was at that pressure before the application of the extreme pressure. Malleable metals and alloys, on the other hand, may have their densities considerably increased and diminished by

hammering and by mere traction. By compression between the dies used in coining, the density of gold may be raised from 19°258 to 19°367, and the density of copper from 8535 to 8916 ;! and Mr M‘Farlane’s experiments quoted below (section 78), show a piece of copper wire decreasing in density from 8°91 to 8°835 after successive simple tractions, by which its length was increased from 287 centimetres to 317 centimetres, while its modulus of rigidity decreased from 443 to 426 million grammes per square centimetre, Later experiments, recently made for this article by the same experimenter, have shown augmen- tation of density from 8°85 to 8°95, produced by successive tractions which elongated a piece of copper wire from weighing 16-4 grammes per metre to weighing 135 grammes per metre, the wire having been first annealed by heating it to redness in sand, and allowing it to cool slowly. Augmentation of density by traction is a some- what surprising result, but not altogether so when we con- sider that the wire had been reduced to an abnormally small density by the previous thermal treatment (the ‘“‘annealing”). The common explanation of these changes of density in metals, which attributes them to porosity, – is probably true; by porosity being understood a porous structure with such vast numbers of the ultimate molecules in the portions of the solid substance between pores or interstices that these portions may be called homogeneous in the sense that a crystal or a liquid can be called homogeneous (compare section 40 below).

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1 Seventh Annual Report of the Deputy-Master of the Mint, p. 435 quoting as authority Percy’s Metallurgy of Copper. Tondon, 1861.

i AS Pte rd i

4, The elasticity of shape of many solids is not perfect : it is not known whether itis perfect for any. It might be expected to be perfect for glass and

rock crystal and diamond and other hard, brittle, homogeneous substances; but experiment proves that at all events for glass it is not so, and shows on thie contrary a notable degree of imperfec- tion in the torsional elasticity of glass fibres. It might be expected that in copper and soft iron and other plastic metals the elasticity of shape would be very imperfect ; experiment shows, on the contrary, that in copper, brass, soft iron, steel, platinum, provided the distortion does not exceed a certain limit in each case, elasticity of shape is remarkably perfect, much more perfect than in glass. It is quite probable that even in the softer metals—azinc, tin, lead, cadmium, potassium, sodium, &c.—the elasticity of shape may be as perfect as in tle metals mentioned above, but within narrower limits as to degrec of distortion. Accurate experiment is utterly wanting, to discover what is the degree of imperfection, if any, of the elasticity of any metal or alloy, when tested within sufficiently narrow limits of distortion.

5. The “viscosity of metals” described below (sections 21— 25) does not demonstrate any imperfectness of elasticity according to the definition of section 1, which is purely statical. The viscosity of solids may (for all we yet know by experiment) depend, as does the viscosity of fuids, upon a resistance varying with the velocity of the change, and vanishing when the velocity of the change ts zero, that is to say, when the body is at rest in any configuration ; if so, the elasticity of the substance concerned is perfect within the limits of the experiment in question. If, on the other hand (as the discovery of elastic fatigue described below seems to indicate may be to some degree the case), the loss of energy from the vibrations in the experiments described is due to a dependence of the elastic resilient force upon previous conditions of the substance in respect to strain, the ‘viscosity ” would be continuous with a true imperfect- ness of static elasticity. Hcre, then, we have a definite question which can be answered by experiment only :—Con- sider a certain definite stress applied to a solid substance ; as, for example, a certain “couple” twisting a wire or rod; ora certain weight pulling it out, or compressing it lengthwise; ora certain weight placed on the middle of a beam supported by trestles under its ends. Let it be applied and removed a great many times, and suppose it to be seen that after each application and rcmoval of the stress the body comes to rest in exactly the same configuration as after the previous application or removal of the stress. If now the body be left to itself with the stress removed, and if it be

found to remain at rest in the same configuration for minutes, or hours, or days, or years after the removal of the stress, a part of the definition of perfect elasticity is fulfilled. Or, again, if the stress be applied, and kept applied with absolute constancy, and if the body remain permanently in a constant con- figuration, another item of the definition of perfect elasticity is proved. When any such experiment is made on any metal, unless some of the softer metals (section 4) is to be excepted, there is certainly very little ¢f any change of con- figuration in the circumstances now supposed. The writer believes, indeed, that nothing of the kind has hitherto been discovered by experiment, provided the stress has been considerably less than that which would break or give a notable permanent twist, or elongation, or bend, to the body, that is to say, provided the action has been kept decidedly within the limits of tle body's elasticity as commonly understood (sections 7-20). Mr J. T. Bottomley, with the assistance of a grant of money from the British Association, has commenced making arrangements for secular experi- ments on the elasticity of metals, in the tower of the

T97 university of; Glasgow, to answer this question in re- spect to permanence or non-permanence through minutes, or hours, or days, or years, or centuries. If several gold wires are hung side by side, one of them bearing the smallest weight that will keep it approximately straight, another wire =}; of the breaking weight, another wire > of the breaking weight, and soon; the one of them bearing 1° of the breaking weight will probably, in the course of a few hours or days, show very sensible elongation. Will it go on becoming longer and longer till it breaks, or will the time-curve of its elongation be asymptotic? Even with considerably less than 3% of the breaking weight there will probably be a continually augmenting elongation, but with asymptotic time-curve indicating a limit beyond which the elongation never goes, but which it infinitely nearly reaches in an infinite time. It is not probable that a gold wire stretched by y/5 of its present breaking weight, or by 4 of its present breaking weight, or even by 4 of its present breaking weight, would break in a thousand or in a million years. The existence of gold ornaments which have been found in ancient tombs and cities, and have preserved their shapes for thousands of years without running down glacier-wise (as does brittle pitch or sealing-wax in the course of a few years in moderately warm climates), seems to prove that

for gold (and therefore leaves no doubt also for many other metals) the time-curve is asymptotic, if indeed there is any slow change of shape at all after the application of a moderate stress well within the limits of elasticity. Egyptian and Greek statues, Etruscan vases, Egyptian obelisks, and other stone monuments with their engraved hieroglyphics, flint implements and boulders, and inountains with the geological evidence we have of their antiquity, prove for stones, and pottery, and rocks of vari- ous kinds, a permanence for thousands and millions of years of resistance to distorting stress.

6. The complete fulfilment of the definition of perfect elasticity is not proved by mere permanence of the extreme configurations assumed by the substance when a stated amount of the stress is alternately applied and removed. This condition might be fulfilled, and yet the amount of elastic force might be different with the same palpable configuration of the body during gradual augmentation and during gradual diminution of the stress. That it is so in fact is proved by the discovery of viscosity referred to below ; but it is not yet proved that if, after increasing the stress to a certain definite amount, the body is brought to rest in the same palpable configuration as before, the amounts of stress required to hold it in this configuration are different in the two cases. If they are (section 1) the elasticity is imperfect; if they are not the elasticity is perfect within the limits of the experiment (compare section 36 below).

7, Limits or Exasticiry—Zlasticity of Shape.—The degree of distortion within which clasticity of shape is found is essentially limited in every solid. Within sufficiently narrow limits of distortion every solid shows elasticity of shape to some degree—some solids to perfec- tion, so far as we know at present. When the distortion is too great, the body eithcr breaks or receives a permanent bend (that is, such a molecular disturbance that it does not return to its original figure when the bending force is removed). If the first notable dereliction from perfectness of elasticity is a breakage, the body is called brittle,—if a permanent bend, plastic or malleable or ductile. The metals are generally ductile; some metals and metallic alloys and compounds of metals with small proportions of other substances, are brittle; some of them brittle only in certain states of temper, others it seems

essentially brittle. The steel of before the days of Bessemer and Siemens is a remarkable instance. When slowly cooled from a bright

red heat, it is remarkably tough and ductile. When heated to redness and cooled suddenly by being plunged in oil or water or mercury, it becomes exceedingly brittle and hard (glass-hard, as it is called), and to ordinary observation seems incapable of taking a permanent bend (though pro- bably careful observation would prove it not quite so). The definition of steel used to be approximately pure. tron capable of being tempered glass-hard, and again softened to different degrees by different degrees of heat. Now, the excellent qualities of iron made by Bessemer's and Siemens's processes are called steel, and are reckoned best when encapable of being tempered glass-hard, the possibility of brittlencss supervening in the course of any treatment which the metal may meet with in its manufacture being an objection against the use of what was formerly called steel for ship's plates, ribs, stringers, &c,, and for many applications of land engineering, even if the material could be had in sufficient abundance.

8. Liurrs or Exasticrry (continueD)—Jlasticity of Bulk.—If we reckon by the amount of pressure, there is probably no limit to the elasticity of bulk in the direction of inercase of pressure for any solid or fluid; but whether continued augmentation produces continued diminution of bulk towards zcro without limit, or whethcr for any or every solid or fluid there is a limit towards which it may be reduced in bulk, but smaller than which no degree of pressure, however great, can condensc it, is a question which cannot be answered in the present state of science. Would any pressure, however tremendous, give to gold a density greater than 19°6, or to copper a density greater than 9:0, after the pressure is removed (scction 3 above) ? But whether the body be fluid or a continuous non- porous solid, it probably recovers the same density, how- ever tremendously it may have been pressed, and probably shows perfect elasticity of bulk (section 3 above) through the whole range of positive pressure from zero to infinity, provided the pressure has been equal in all directions like fluid pressure. As for negative pressure, we have no know- ledge of what limit, if any, there may be to the amount of force which can be applied toa body pulling its surface

ont equally in all directions. The question of how to apply the negative pressure is inextricably involved with that of the body's power to resist, The upper part of the mercury of a barometer adhering to the glass above the level corre- sponding to the atmospheric pressure is a familiar example of what is called negative pressure in liquids. Water and other transparent liquids show similar phenomena, another of which isthe warming of water above its boiling point in an open glass or metal vessel varnished with shellac. Attempts to produce great degrces of this so-called negative pressure are baffled by what secms an instability of the equilibrium which supervenes when the negative pressure is toomuch augmented. It isa very intcresting subject for experimental inquiry to find how high mercury or water or any other liquid can be got to stand above the level corre- sponding to the atmospheric pressure in a tall hermetically sealed tube, and how. many degrees a liquid can, with all precautions, be warmed above its boiling point. In each case it seems to be by a minute bubble forming and expanding somewhere at the boundary of the liquid, where it is in contact with the containing vessel, that the possible range of the negative pressure is limited, judging from what we see when we carefully examine a transparent liquid, or the surface of separation between mercury and glass, in any such experiment. The contrast of the amounts of negative pressure practically obtainable or obtained hitherto in such experiments on liquids (which are at the most those correspouding to the weight of a few metres of the substance), with that obtainable in the case of even the weakest solids, is remarkable; and as for the strongest,

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consider for instance (sec. 22 below) 17 nautical miles of steel pianoforte wire hanging by one end. When a cord, or rod, or wire of any solid substance hangs vertically, the negative pressure (for example, 23,000 atmospheres in the case just cited) in any transverse section is equal to the weight of the part hanging below it. It is an interesting question not to be answered by any experiment easily made or even devised,—How much would the longitudinal pull which can be applied to a cord, rod, or wire without break- ing it be augmented (probably augmented, but possibly diminished) by lateral pull applied all round the sides so as to give equal negative pressure in all dircctions ?

9. Limits or Evasticrry (continuEp)—Hlasticity of Shape for Distortions not Uniform through the Substance, and for Compound Distortions ; and Elasticity correspond- ing to Co-existent Distortion and Change of Bulk :—

Example 1.—A round wire twisted, or a cylindrical shaft trans. mitting revolutional motive in machinery, presents, as we shall see (sec. 64), an instance of simple distortion, but to different degrees in different parts of the substanec, inereasing from the axis where it is zero, uniformly to the surface where it is greatest.

Lxample 2.—Hlongation of a wire or rod by direet pull, is (sec. 23) an instanee of a compound distortion co-existing with a rarefaction of the substance, both distortion and rarefaction uniform throughout.

kxample 3.—Shortening of a column by end pressure is an in- stanee of a similar eompound distortion eombined with eondensa- tion of the substance, both distortion and condensation uniform throughout.

Example 4.—Flexure of a round wire or of a bar, or beam, or girder, of any shape of normal seetion, by opposite bending eonples applied at the two ends, is an instanee in which one-half of the sub- stance is stretehed, and the other half shortened with exactly the same coinbination of distortions and ehanges of bulk as in examples 2and 3. The strain is uniform along the length of the bar, but varies in the eross section in simple proportion to distanee from a eertain line (see. 62) through the centre of gravity of the seetional area, whieh, in the case of a round bar, is the diameter perpendieular to the plane of curvature.

The limits of elasticity in the cases of these four examples are subjects of vital importance in practical mechanics, and a vast amount of careful and accurate observation and experiment, which has given much valuable practical information regarding them, has been gone through by engineers, in their necessary dealings with questions regard- ing strength of materials, Still there is great want of definite scientific information on the subject of limits of elasticity generally, and particularly on many elementary questicns (section 21 below), which force themselves upon us when we endeavour to analyze the molecular actions concerned in such cases as the four examples now before us. Some principles of much importance for guidance in

practical as well as theoretical deductions from observa- tions and experiments on this subject were set forth twenty- nine years ago by Professor James Thomson, in an article published in the Cambridge and Dublin Mathematical Journal for November 1848. Nothing is to be gained either in clearness or brevity by any other way of dealing with it than reproducing it in extenso. It is accordingly given here, with a few changes. made in it with its author's coucurrence.

It constitutes the following sections, 10-20.

"On the strength of materials, as influenced by the existence or non-existence of certain mutual strains! among the particles composing them. By James Thomson, M.A., College, Glasgow.

10. 'My principal object in the following paper is to show that the absolute strength of any material composed of a substanee possess- ing duetility (and few substanees, if any, are entirely devoid of this property) may vary to a great extent, according to the state of tension or relaxation in which the particles have been made to exist when the material as a whole is subject to no external strain.

11. '* Let, for instance, a round bar of malleable iron, or a piece of iron wire, be'made red hot, and then be allowed to cool. Its ve a ee ae

11 Note added Nov. 1877.] More nearly what is now called stress than what Is now caiied strain is meant by "strain" in this article, which was written before Rankine's introduction of; the word stress, and distinct definition of the word strain (sce chap. i. of Mathematical Theory below).

articles may now be regarded as being all completely relaxed.

et, next, one end of the bar be fixed, and the other be made to revolve by torsion, till the particles at the eircumferenec of the bar are strained to the ntmost extent of which they can admit, without undergoing a permanent altcration in their mutual eon- nexion.! In this condition, equal elements of the eross section of the bar afford resistances proportional to the distances

of the elements from the centre of the bar; since the particles are dis- placed from their positions of relaxation through spaces which are proportional to the distances of the particles from the centre. The couple which the bar now resists, and which is equal to the sum of the couples due to the resistances of all the elements of the section, is that which is commanly assumed as the measure of the torsional strength of the bar. For future reference, this couple may be denoted by L, and the angle through which it has twisted the loose end of the bar by ®.

12. ‘The twisting of the bar may, however, be carried still farther, and during the progress of this proeess the outer particles will yield in virtue of their duetility, those towards the interior successively reaching their elastic limits, until, when the twisting has been sufficiently continued, all the particles in the section, except those quite close to the centre, have been strained beyond their elastic limits. Hence, if we suppose; that no change in the hardness of the substanee composing the material has resulted from the sliding of its particles past one another, and that therefore all small elements of the section of the bar afford the same resist- ance, no matter what their distances from the centre may be, it is easy to prove that the total torsional resistance of the bar is $ of what it was in the former case; or, according to the notation already adopted, it is? now $ L.

13. “If, after this, all external stress be removed from the bar, it will assume a position of equilibrium, in which the outer particles will be strained in the direction opposite to that in which it was twisted, and the inner ones in the same direction as that of the twisting, the two sets of opposite couples thus produced among the partieles of the bar balaneing one another. It is easy to show that the line of separation between the particles strained in one direction and those in the other is a cirele whose radius is § of the radius of the bar. The particles in this line are evidently subject to no strain 4 when no external couple is applied. The bar

1 “T here assume the existence of a definite ‘ elastic limit, or a limit within which, if two particles of a substance be displaced, they will return to their original relative positions when the disturbing force is removed, The opposite conclusion, to which Mr Hodgkinson seems to have been led by

some interesting experimental results, will be considered at a more advanced part of this paper.”

2 [Note added October 1877.] This supposition may be true for some solids; it is certainly not true for solids gencrally. A piece of copper or of iron taken in a soft and unstrained condition certainly becomes “ harder’’ when strained beyond its first limits of elasticity, that is to say, its limits of clasticity become wider; and a similar result will probably be found in ductile metals generally. Thus the resistance of the outer elements will be greater than those of the inner elements in the case described in the text, until the torsion has been pushed so far as to bring about the greatest hardness in all the elements at any consider- able distance from the axis. It may be that before this condition has been attained the hardening of the outer elements will have been overdone, and they may have begun to lose strength, and to have become friuble and fissured. Tho principle set forth in the text is not, however, vitiated by the incorrectness of a supposition introduced merely for the sake of numerical illustration.

3 ‘To prove this, let r be the radius of the bar, 7 the utmost force of a unit of area of the section to resist a strain tending to mako the particles slide past ono another, or to resist a shearing strain, as it is commonly called. Also, let the section of the bar be supposed to be divided into an infinite number of con- eentrie annular clements,—the radius of any one of these being denoted by x and its area by 27 xdzx.

‘*Now, when only the particles at the circumference are strained to the utmost, and when, therefore, the forces on equal areas of the various clements are pro-

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portional to the distances of the elements from tlie centre, we have We for the

force of a unit of area at the distance of x fromthe centre, Hence the total tan- gential force of the element is

x =2radx. ,? and the couple due to the same clement is

.

1

=o. Qarvdk. 1 = Qaey —. ail 3 a

and therefore the total couple, which has been denoted above by L, is hy =20n =f ada, ret

that is SETA sy te oe (Rs

Next, when the bar has been twisted so much that all the particles in its section afford their utmost resistance,twe have the total tangential force of the element 2araxdz. 1, and the couple due to the same element

=x. Qrada.n=2aryn. cde. Hence the total couple due to the entire section i

z” = 20 f Vdx= Zr? .

0

But this quantity is $of the value of L in formula (a). That is, the couple

which the bar resists in this ease is $ L, or $ of that which it resisted in the

former case.” ; : , 4“ Or at least they are subject to no strain of torsion, either in the one direction

or in the other; though they may be subject to a strain of compression or cx-

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with its new molecular arrangement may now be subjected, as often as we picase,® to the couple $ L without undergoing any farther alteration, Its strength to resist torsion, in the direction of the couple L has therefore been considerably increased. Its strength to resist torsion in the opposite direction has, however, by the same process, been much diminished; for as soon as its free extremity has been made to revolve backwards through an angle® of 3 © from the position of equilibrium, the particles of the eireumference will

have suffered the utmost distortion of which they can admit without undergoing permanent altera- tion. Now, it is easy to prove that the couple required to pro- duce a eertain angle of torsion is the same in the new state of the bar as in the old.’ Henee the ultimate strength of the barwhen twisted backwards is represented by a couple amounting to only 3 L. But, as we have seen, it is 4 L when the wire is twisted forwards. That is, then, The wire in its new state has twice as much strength to resist torsion in one direction as it has to resist it the other.

14, ‘* Principles quite similar to the foregoing, are applicable in regard to beams subjected to cross strain, As, however, my chief object at present is to point out the existence of such principles, to indicate the mode in which they are to be applied, and to show their great practical importance in the determination of the strength of materials, I need not enter fully into their application in the case of cross strain. The investigation in this case closely resembles that in the ease of torsion, but.is more complieated on account of the different ultimate resistances afforded by any material to tension and to compression, and on account of the numerous varieties in the form of section of beams which for different pur- poses it is found advisable to adopt. I shall therefore merely make a few remarks on this subject.

15. ‘*‘Ifa bent bar of wrought iron or other ductile material be straightened, its particles will thus be put into such a state that its strength to resist cross strain, in the direction towards which it has been straightened, will be very much greater than its strength to resist it in the opposite direction, each of these two resistances being entirely different from that which the same bar would afford were its particles all relaxed when the entire bar is free from ex- ternal strain, The actual ratios of these various resistances depend on the comparative ultimate resistances afforded by the substanec tofcompression and extension, and also, in a very material degree, on the form of the section of the bar. I may, however, state that in general the variations in the strength of a bar to resist cross strain, which are occasioned by variations in its molecular arrange- ment, are much greater even than those whieh have already been pointed out as oceurring in the strength of bars subjected to torsion.

16. ‘* What has already been stated‘is quite sufficient to account for many very diseordant and perplexing results which have been arrived at by different experimenters on the strength of materials. It seareely ever oceurs that a material is presented to us, either for experiment or for application to a practieal use, in which the particles are free from great mutual strains. Processes have already been pointed out by which we may at pleasure produce eertain peculiar strains of this kind. These, or other {processes producing somewhat similar strains, are used in the manufacture of almost all materials. Thus, for instance, when malleable iron has received its final conformation by the process termed cold swaging, that is, by hammering it till it is cold, the outer partieles exist in a state of extreme compression, and the internal ones in a state of extreme tension. The same seems to be the case in east iron when it is taken from the mould in whieh it has been cast. The outer portions have cooled first, and have therefore contraeted, while the inner ones still continued expanded by heat. The inner ones then contract as they subsequently cool, and thus they, as it were, pull the outer ones together. That is, in the end the outer ones are in a state of compression and the inner ones in the opposite condition. ;

17. **The foregoing principles may serve to explain the true

tension in the direction of the length of the bar.” [That they are so fs proved by experiments made for the present article by Mr Thomas Gray in October 1877]. “This, however, does not fall to be considered in the investigation of the ext.”

‘ 5 “This statement, if not strictly, is at least extremely nearly true, since from the experiments made by Mr Fairbairn and Mr Hodgkinson on cast-iron (sce various Reports of the British Assoctation), we may conclude that the metals are influenced only in an extremely slight degree by time. Were the bars composed of some substance, such as sealing wax, or hard pitch, possessing a sensible amount of viscidity, the statement in the text would not hold good.”

6 [Note added October 1877.] This assumes that the limits of elasticity in a substance which has already been straincd beyond its limits of clusticity are equal on the two sides of the shape which it has when in equilibrium without disturbing force—a supposition which may be true or may not be

true. Ex- periment is urgently needed to test it; for its truth or falseness is a matter of much importance in the theory of elasticity.

7 “To prove this, let the bar be supposed !to!be divided into an infinite number of elementary concentric tubes (like the so-called annual rings of growth in trees). To twist each of these tubes through a certain angle, the same couple will, be required, whether the tube is already-subject to the action of a couple of any moderate amount in either direction or not. Hence, to twist them all, or, what is the same thing, to twist the whole bar, through a certain angle, the same couple will be required whether the various elementary tubes be or be not relaxed, when the bar as a whole is free from external strain.”

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ease of an important fact observed by Mr Eaton* Hodgkinson in his valuable researches in regard to the strength of cast iron (Report of the British Association for 1837, p. 362). He found, that, contrary to what had been previously supposed, a strain, however small in comparison to that which would occasion rupture, was sufficient to produce a sct, or permanent change of form, in the beams on which he experimented. Now thisis just what should be expected in accordance with the principles which I have brought forward; for if, for some of the causes already pointed out, various

arts of a beam previously to the application of an external force face been strained to the utmost, when, by the application of such force, however small, they are still farther displaced from their positions of relaxation, they must necessarily undergo a permanent alteration in their connexion with one another, an alteration permitted by the ductility of the material; or, in other words, the beam as a whole must take a set. y

18. ‘*In accordance with this explanation of the fact observed by Mr Hodgkinson, I do not think we are to conclude with him that ‘the maxim of loading bodies within the elastic limit has no founda- tion in nature.’ It appears to me that the defeet of elasticity, which he has shown to occur even with very slight strains, exists only when the strain is applied for the first time; or, in other words, that if a beam has already been subjected to a considerable strain, it may again be subjected to any smaller strain in the

same direction with- out its taking a set. It will readily be seen, however, from Mr Hodgkinson's experiments, that the term 'elastic limit,' as com- monly employed, is entirely vague, and must tend to lead to erroneous results.

19. ''The considerations adduced seem to me to show clearly that there really exist two elastic Limits for any material, between which the displacements or deflexions, or what may in general be termed the changes of form, must be confined, if we wish to avoid giving the material a set, or, in the case of variable strains, if we wish to avoid giving it a continuous succession of sets which would gradually bring about its destruction ; that these two elastic limits are usually situated one on the one side and the other on the opposite side of the position which the material assumes when subject to no external strain, though they may be both on the same side of this position of relaxation ;? and that they may there- fore with propriety be called the superior and the inferior limit of the change of form of the material for the particular arrangement which has been given to its pees ; that these two limits are not fied for any given material, but that, if the change of form be continued beyond either limit, two new limits will, by means of an alteration in the arrangement of the particles of the material, be given to it in place of those which it previously possessed ; and lastly, that the processes employed in the manufacture of materials are usually sueh as to place the two limits in close contiguity with one another, thus causing the material to take in the first instance a set from any strain, however slight, while the interval which may afterwards exist betweeu the two limits, and also, as was before stated, the actual position assumed by each of them are determined by the peculiar strains which are subsequently applied to the material.

20. '*The introduction of new, though necessary, elements into the consideration of the strength of materials may, on the one hand, seem annoying from rendering the investigations more com- plicated. On the other hand, their introduction will really have the effect of obviating difficulties, by removing erroneous inodes of viewing the subject, and preventing contradictory or incongruous results from being obtained by theory and experiment. In all investigations, in fact, in which we desire to attain or to approach nearly to truth, we must take facts as they actually are,

not as we might be tempted to wish them to be for enabling us to dispense with examining processes which are somewhat concealed and intricate but are not the less influential from their hidden character.”

21, Passing now to homogeneous matter (sec. 38), homogeneously strained (chap. ii. of Math. Theory below),

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1+ ¥or further information regarding Mr Hodgkinson’s views and experiments see his communications in the Zransactions of the Sections of the British Association for the years 1843 (p. 23) and 1844 (p. 25), and a work by him, en- titled Experimental Researches on the Strength and other Properties of Cast Iron, 8vo., 1846.”

2 “Thus if the section of a beam be of some such form as that shown in either of the accompanying figures, the one rib or the two ribs, as the case may be, being very weak in comparison to the thick part of the beam, it may readily occur that the two elastic limits of deflexion may be situated both on the same side of the position assumed by the beam when free from external force. For if the beam has been sup- ported at its extremitics and loaded at its middle till the nib A B has yielded by its ductility so as to make all its particles exert their utmost tension, and if the Fie.1 load be now gradually removed, the particles at B may 1S come ae be compressed to the utmost before the load has been entirely re- moved. = :

ELASTICITY

we are met by physical questions of great interest regarding limits of elasticity. Supposing the solid to be homogeneously distorted in any particnlar way to nearly the limit of its elasticity for this kind of distortion, will the limits be widened or narrowed by the superposition of negative or positive pressure equal in all directions produc- ing a dilatation or a condensation? It seems probable that a dilatation would narrow the limits of elasticity, and a condensation widen them. This, however, is a mere guess : experiment alone can answer the question. Take again a somewhat less simple case. A wire is stretched by a weight to nearly its limits of longitudinal elasticity ; a couple twisting it is applied to its lower end—Will

this either cause the weight to run down and give the wire a permanent set, or break it? Probably,—yes ; but experi- ment only can decide. ‘The corresponding question with reference to a column loaded with a weight may have the same answer, but not necessarily so. Experiment again is wanting. A wire hanging’stretched by a light weight, merely to steady it, is twisted to nearly its limit of torsional elasticity by a couple of given magnitude applied to its lower end ; the stretching weight is increased—- Will this cause it to yield to the couple and take a permanent set? Probably, — yes. [Certainly yes, for steel piano-forte wire experimented on by Mr M‘Farlane to answer this question since it was first put in type fur the present article.] If so, then the limits of torsional elasticity of a wire bearing a heavy weight are widened by diminishing or taking off the weight; and no doubt it will follow continuously that a column twisted by opposing couples at its two ends will have its limits of torsional elasticity widened by the application of forces to its two ends, pressing them towards one another. Experiments to answer these questions would certainly reward the experimenter with definite and interest- ing results.

22. Narrowness or Limits or Exasticrry—Solids.— The limit of elasticity of metals, stones, crystals, woods, are so narrow that the distance between any two neighbour- ing points of the substance never alters by more than a small proportion of its own amount without the substance either breaking or experiencing a permanent set, and there- fore the angle between two lines meeting in any point of the substance and passing always through the same matter is never altered by more than a small fraction of the radian,? before the body either breaks or takes a permanent set. By far the widest limits of elasticity hitherto discovered by experiment, for any substance except cork, india-rubber, jellies, are those of steel pianoforte wire. Take, for example, the piano-forte wire at present in use for deep-sea soundings. It is No. 22 of the Birmingham wire gauge, its density is 7:727, it weighs 0°34 gramme per centimetre, or 6°298 kilogrammes per nautical mile of 1852°3 metres, and therefore its sectional area and diameter are ‘0044 square centimetre and ‘0244 centimetre. It bears a weight of 106 kilogrammes, which is equal in weight to about 31 kilometres of its length, and when this weight is alternately hung on and removed the length of the wire varies by gg of its amount. While this elongation takes place there is a lateral shrinking, as we shall see (section 47), of from 4 to =3, of the same amount.

93, Consider now in the unstrained wire two lines through the substance of the wire at right angles to one another in any plane through or parallel to the axis of the wire 10 directions equally inclined to this line. When the wire 18 pulled Jengthwise the two vertical angles bisected by the length of the wire become acute, and the other two obtuse by a small difference, as illustrated in the diagram (fig. 2), Met Nowy 8 oe ee ee ee ee

3 The radian is the angle whose arc is equal to radius ; it is equal to 577.29). cas

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where the continuous lines represent a portion of the unpulled wire, and the dotted lines the same portion of the wire when pulled. The change in each of the augles would be <4, of the radian in virtue of the elongation were there no lateral shrinking, and about 41, of the radian in virtue of the lateral shrink- ing were there no elongation. Thewhole change experienced by each of the right angles is therefore actually (scction 37) getaso or about {3, of the radian, or 0°84. This is an extreme case. In all other cases of metals, stones, glasses, erystals, the substance either breaks or takes a permanent bend, probably be- fore it experiences any so great angular distortion as a degree; and except in |// si the case of steel we may roughly regard

the limits of elasticity as being some- thing between >g/5y and zgq in respect to the linear elongation or contraction, and from +4, of a degree to half a de- gree in respect to angular distortion.

24, On the other hand, gelatinous substances, such as india-rubber and elastic jellies, have very wide limits of elasticity. A vulcanized india-rubber band, for instance, is capable of being stretched, again and again, to eight times its length, and returning always to nearly its previous condition when the stress is removed. A shape of transparent jelly presents a beautiful instance of great degrees of distortion with seemingly very perfect elasticity. All these instances, india-rubber and jellies, show with great changes of shape but slight changes of bulk. They have, in fact, all, as nearly as experiment has hitherto been able to determine, the same compressibility as water.

25, Cork, another body with very wide limits of elasticity (very imperfect elasticity it is true) is singular, among bodies seemingly homogencous to the eye, in its remarkably easy compressibility. It is, in fact, the only seemingly homogeneous solid which shows to the unaided eye any sensible change of bulk under any practically applicable forces. A sutall homogeneous piece torn out of a cork may, by merely pressing it between the fingers, be readily com- pressed to half its bulk, and a large slab of cork in a Bramah press may be compressed to 51, of its bulk. An ordinary bottle cork loaded with a small piece of metal presents a very intercsting appearance in au Oersted glass compressing vessel; first floating, and when compressed to 20 or 30 atmospheres sinking, and shrivelling in bulk very curiously; then on the pressure being removed, expanding again, but not quite to previous bulk, and floating up or remainiug down according to the amount of its load.

The divergencies presented by cork and gelatinous bodies in opposite directions from the regular elasticity of hard solids form an interesting subject, to which we shall return later (section 48).

26. Lxquids.—In respect to liquids, there are no limits of elasticity so far as regards the magnitude of the positive pressure applied or conceivably applicable; but in respect to the magnitude of negative pressure, and in respect to the magnitude of the change of bulk, whether by negative or positive pressure, there are probably very decided and not very wide limits. Thus water, though condensed >1., of its bulk by 2000 atmospheres in Per-kins's! experiments corrected rougbly for the ecompres-

Fig. 2.

! Transactions of Royal Society, June 1826, "On the Progressive Compression of Water by high degrees of force, with some trials of its effects on other liquids," by J. Perkins. Communicated by W. H. Wollaston, M.D., V.P.R.S.

-depending on the velocity of the change.

sion of his glass “ piezometer,” which is very nearly at the rate of yz$yo per atmosphere found (section 75 below) more accurately by subsequent experiments for moderate pressures up to 20 or 30 atmospheres, may be expected to be compressed by much less than 3 of its volume under a pressure of 7000 atmospheres. How much it or any other liquid is condensed by a pressure of 10,000 atmospheres, or by 20,000 atmospheres, is an interesting subject for experimental investigation.

27. Gases.~-In respect to rarefaction, and in respect to proportionate condensation, gases present enormously wider limits of elasticity than any liquids or solids,—in fact no limit in respect to dilatation, and in respect to condensation adefinite limit only when the gas is below Andrews’s “critical temperature.” If the gas be kept at any temperature above that critical temperature, it remains homogeneous, however much it be condensed; and therefore for a fluid above the critical temperature there is, in respect to magnitude of pressure, no superior limit to its elasticity. On the other hand, if a fluid be kept at any constant temperature less than its critical temperature, it remains homogeneous, and presents an increasing pressure until a certain density is reached ; when its bulk is further diminished it divides into two parts of less and greater density (the part of less density being called vapour, that of greater density being called liquid, if it is not solid) and presents no further increase of pressure until the vaporous part shrinks to nothing, and the whole becomes liquid (that is to say, homo-geneous fluid at the greater of the two deusities) or else becomes solid—the question whether the more dense part is liquid or solid depending on the particular tempcrature below the critical temperature at which the whole substance is kept during the supposed experiment.

28. The thermo-dynamic reasoning of Professor James Thomson, which showed the effect of change of pressure in altering the freezing point of a liquid, leads to analogous considerations regarding the effect of continuous increase or continuous decrease of pressure upon a mass consisting of the same substauce partly in the liquid and partly in the solid state at one temperature. The three cases of transi- tion from gas to liquid, from gas to solid, and from liquid to solid, present us with perfectly definite limits of elasticity, —the only perfectly definite limits of elasticity in nature of which we have any certain knowledge.

29. Viscosity of Fluids and Solids.—Closely connected with limits of elasticity, and with imperfectness of elasticity, is viscosity, that is to say, resistance to change of shape The full dis- covery of the viscosity of liquids and gases is due originally to Stokes ; and his hypothesis that in fluids the force of resistance is in simple proportion to the velocity of change of shape has been subsequently confirmed by the experi- mental investigations of Helmholtz, Maxwell, Meyer, Kundt, andjWarburg. The definition of a fluid given in section 2 above may, by section 1, be transformed into the . following :—A fluid is a body which requires no force to keep it in any particular shape, or—A fluid is a body which exercises no permanent resistance to a change of shape. The resistance to a change of shape presented by a fluid, evanescent as it is when the shape is not being changed (or vanishing when the velocity of the change vanishes), is essentially different from that permanent resistance to change of shape, the manifestation of which in solids constitutes elasticity of shape as defined in section 1. Maxwell's admirable kinetic theory of the viscosity of gases points to a full explanation of viscosity, whether of gases, liquids, or solids, in the consideration of econfigura- tions and arrangements of relative motions of molecules, permanent in a solid under distorting stress, and temporary in fluids or solids while the shape is being changed, in

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virtue of which elastic force in the quiescent solid, and viscous resistance to change of shape in the non-quiescent fluid or solid, are produced.

30. Viscosity of Metals and Fatigue of their Elasticity.—

Experimental exercises performed by students in the physical laboratory of the university of Glasgow, during the session 1864-65, brought to light some very remarkable and interesting results, proving a loss of energy in elastic vibrators (sometimes as much as two or three per cent. of energy lost in the course of a single vibration in one direc- tion) incomparably greater than anything that could be dne to imperfections in their elasticity (section 1), and showing also a very remarkable fatigue of elasticity, according to which a wire which had been kept vibrating for several hours or days

through a certain range came to rest much quicker when left to itself than when set iu vibration after it had been at rest for several days and then immediately left to itself. Thus it was found that the rates of subsid- ence of the vibrations of the several wires experimented on were generally much less rapid on the Monday mornings, when they had been at rest since the previous Friday, than on other days of the week, or than after several series of experiments had beeu made on a Monday. The following statement (sections 31-34) is extracted from a short article by W. Thomson, in the Proceedings of the Royal Society for May 18, 1865, containing some of the results of these observations. \° 31. “ Viscosity.—By induction from a great variety of observed phenomena, we are compelled to conclude that no change of volume or of shape can be produced in any kind of matter without dissipation of energy. Even in dealing with the absolutely perfect elasticity of volume presented by every fluid, and possibly by some solids, as for instance homogeneous crystals, dissipation of energy is an inevitable result of every change of volume, because of the accompany- ing change of temperature, and consequent dissipation of heat by conduction or radiation. The same cause gives rise necessarily to some degree of dissipation in connection with every change of shape of an elastic solid. But estimates founded on the thermodynamic theory of elastic solids, which I have given elsewhere,! have sufficed to prove that the loss of energy due to this cause is small in comparison with the whole loss of energy observed in many cases of vibration. I have also found, by vibrating a spring alternately in air of ordinary pressure and in the exhausted receiver of an air-pump, that there is an internal resistance to its motions immensely greater than the resistance of the air. The same conclusion is to be drawn from the observation made by Kupffer in his great work on the elasticity of metals, that his vibrating springs subsided much more rapidly in their vibrations than rigid pendulums supported on knife-edges. The subsidence of vibrations is probably more rapid in glass than in some of the most elastic metals, as copper, iron, silver, aluminium ;? but it is much more rapid than in glass, marvellously rapid indeed, in some metals (as for instance zinc),? and in india-rubber, and even in jiomogeneous jellies.

32. “ The frictional resistance against change of shape must in every solid be infinitely small when the change of shape is made at an infinitely slow

rate, since, if it were finite for an infinitely slow change of shape, tlere would be

1 “On the Thermo-elastic Properties of Solids,” Quarterly Journal of Mathematics, April, 1855.

2 We have no evidence that the precious metals are more elastic than copper, iron, or brass. One of the new bronze pennies gives quite as clear a ring as a two-shilling silver piece tested in the usual manner,

- Torsional vibrations of a weight hung on a zinc wire subside so rapidly, that it has been found scarcely possible to count more than twenty of them in one case experimented on,

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infinite rigidity, which we may be sure* does not exist in nature. Hence there isin elastic solids a molecular friction which may be properly called viscosity of solids, because, as being an internal resistance to change of shape depending on the rapidity of the change, it must be classed with fluid molecular friction, which by general consent is called viscosity of fluids. But, at the same time, it ought to-be remarked that the word viscosity, as used hitherto by the best writers, when solids or heterogeneous semi-solid semi- fluid masses are referred to, has not been distinctly applied to molecular friction, especially not to the molecular friction of a highly elastic solid within its limits of high elasticity, but has rather been employed to designate a property of slow continual yielding through very great, or altogether unlimited, extent of change of shape, under the action of continued stress. It is in this sense that Forbes, for instance, has used the word in stating that ‘ viscous theory of glacial motion,’ which he demonstrated by his grand observations on glaciers. As, however, he and many other writers after him have used the words plasticity and plastic, both with reference to homogeneous solids (such as wax or pitch even though also brittle, soft metals, &c.) and to heterogeneous semi-solid semi-fluid masses (as mud, moist earth, mortar, glacial ice, &c.), to designate the property common to all those cases experiencing, under continued stress, either quite continued and unlimited change of shape, or gradually very great change at a diminishing (asymptotic) rate through infinite time, and as

the use of the term plasticity implies no more than does wscostty any physical theory or explanation of the property, the word viscosity is without inconvenience left available for the definition I propose.

33. “To investigate the viscosity of metals, I have in the first place taken them in the form of round wires, and have chosen torsional vibrations, after the manner of Coulomb, for observation, as bcing much the easiest way to arrive at definite results. In every case one end of the wire was attached to a rigid vibrator with sufficient firmness (thorough and smooth soldering I find to be always the best plan when the wire is thick enough) ; and the other to a fixed rigid body, from which the wire hangs, bearing the vibrator at its lower end. I arranged sets of observations to be made for the separate comparison of the following cases :—

(a) “The same wire with different vibrators of equal weights to give equal stretching-tractions but differeut moments of inertia (to test the relation between viscous resistances against motions with different velocities through the same range and under the same stress).

(6) “The same wire with different vibrators of equal moments of inertia but unequal weiglits (to test the effect of different longitudinal tractions on the viscous resistance to torsion under circumstances similar in all other respects).

(c) “The same wire and the saine vibrator, but different initial ranges in successive experiments (to test an effect unexpectedly discovered, by which the subsidence of vibra- tions from any amplitude takes place at very different rates according: to the immediately previous molecular condition, whether of quiescence or of recurring changes of shape through a wider range). i.

(d) “Two equal and similar wires, with equal and similar vibrators, one of them kept as continually as possible in a state of vibration, from day to day; the other kept at rest, except when vibrated in an experiment once a day (to test the effect of continued vibration on the viscosity of a metal). ‘

34. “ Results,—(a) It was found that thie loss of energy LEE eee

4 Those who believe in the existence of indivisible, infinitely strong and infinitely rigid, very small bodies (finite hard atoms!) deny this.

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a single vibration througli one range was greater the greater the velocity (within the limits of the experiments) ; but the difference between the losses at low and high speeds was much less than it would have been had the resistance been, as Stokes has proved it to be, in fluid friction, approximately as the rapidity of the change of shape. The irregularities in the results of the experiments which up to this time I have made seem to prove that much smaller vibrations (producing less absolute amounts of distortion in the parts of the wires most stressed) must be observed before any simple law of relation between molecular friction and velocity can be discovered.

(v) “When the weight was increased, the viscosity was always at first much increased ; but then day after day it gradually diminished and became as small in amount as it bad been with the lighter weight. It has not yet been practicable to continue the experiments long enough in any case to find the limit to this variation.

(c) “The vibration subsided in aluminium wires much more rapidly from amplitude 20 to amplitude 10, when the initial amplitude was 40, than when it was 20. Thus, with a certain aluminium wire, and vibrator No. 1 (time of vibration one way 1‘757 second), the number of vibrations

counted were in three trials— oa Vibrations. Subsidence from 40 initial amplitude to 20…..... 56 64 64 Aud from 20 (in course of the same experiments) 96 98 96

The same wire and the same vibrator showed— Subsidence from 20 initial amplitude to 10 (avenge: Ot four Trials)... cais…c.escecsene ses Again, the same wire, with vibrator No. 2! (time of vibration one way 1‘236), showed in two trials—

re eR

112 vibrations.

Vibrations.” Subsidence from 40 initial amplitude to 20…..... 54 52 Arc contimted, from 20to 10.05 ..sivcsersnosncansses 90 90

Again, same wire and vibrator, —

From initial amplitude 20 to 10 . . 108 (mean of eight trials). This remarkable result suggested the question (d).

(d) “In a wire which was kept vibrating nearly all day, from day to day, after several days very much more mole- cular friction was found than inanother kept quiescent ex- cept during eacli experiment. Thus two equal and similar pieces of copper wire were put up about the 26th of April, hanging with equal and similar lead weights, the upper and lower ends of the two wires being similarly fixed by solder- ing. No. 2 was more frequently vibrated than No. 1 for a few days at first, but no comparison of viscosities was made till May 15. Then

No. 1 subsided from 20 initial range to 10 in 97 vibrations.

No. 2 gave the same subsidence in 77 vibrations.

During the greater part of May 16 and 17, No. 2 was kept vibrating and No. 1 quiescent, and late on May 17 expcri- ments with tke following results were made :—

Time per Vibration. No. 1 subsided from 20 to 10 after 99 vibrations in 237 secs., 2°4 a9 29 9? 98 9 235 22 2 2 99 ‘ 29 39 98 i a9 5 235 2? oe No. 2 subsided from 20 to 10 after 58 vibrations in 142 ,, 2°45 39 99 99 60 Wh 147 9? 2°45 29 29 99 57 9? 139 ae 2°45 i 5 60 . iy, 2°48

[Addition, May 27, after the reading of the paper. |—No. 1 has been kept at rest from May 17, while No. 2 has been kept oscillating more or less every day till yesterday, May 26, when both were oscillated, with the following results :—

Time per ~ Vibration. j No. 1 subsided from 20 to 30 after 100 vibrations in 242 secs., 2°42 No, 2 3 os 44 or 45 vibrations……... 2°495

35. The investigation was continued with much smaller degrees of maximum angular distortion, to discover, if nem

1 Of same weight as No. 1, but different moment of inertia.

possible, the law of the molecular friction, the existence of which was demonstrated by these experiments. Two ques- tions immediately occurred :—What is the law of sub- sidence of range in any single series of oscillations, the vibrator being undisturbed by external force? and (ques- tien (a) of § 33 above) what is the relation between the law of subsidence in two scts of oscillations having different periods, with the same elastic body in the same circum- stances of elastic force, as for instance the same or similar metallic wires with equal weights hung upon them, per- forming torsional oscillations in different times on account of the moments of inertia of the suspended masses being different ?

36. So far as the irregularities depending on previous conditions of the clastic substance allowed any simple law to be indicated, the experimental answer to the first question for degrees of angular distortion much smaller than the palpable limits of elasticity was the CompouND Interest Law, that is to say,—Zhe diminutions of range per egual intervals of time or per equal numbers of oscilla- tions bore a constant proportion to the diminishing range ; or, The differences of the logarithms of the ranges were pro- portional to the intervals of time.

The only approach to an answer to the second question yet obtained is that the proportionate losses of amplitude in the different cases ure not such as they would be if the molecular resistance were simply proportional to the velocity of change of shape in the different cases. Ifthe molecular friction followed this simple law, the proportionate diminu- tions of range per period would be directly as the square roots of the periods, or per equal intervals of time they would be inversely as the square roots of the periods. Instead of the proportion being so, the loss was greater with the longer

periods than that calculated according to the law of square roots from its amount in the shorter periods. It was in fact as it would be if the result were wholly or partially due to imperfect elasticity, or “elastische Nach-wirkung ” — elastic after-working — as the Germans call it (compare section 6 above). To form a rough idea of the results, irrespectively of thie ultimate molecular theory (which is to be looked for in the proper extension of Maxwell’s kinetic theory of viscosity of gases), consider a perfectly elastic vesicular solid, whether like a sponge with communications between the vesicles, or with each vesicle separately inclosed in elastic solid : imagine its pores and interstices filled up with a viscous fluid, sucli as oil. Static experiments on such a solid will show perfect elasticity of bulk and shape ; kinetic experiments will show losses of energy such as are really shown by vibrators of india-rubber, jelly, glass, metals, or other elastic homogeneous solids, but more regular, and following more closely the compound interest law for single series and the law of relation to square roots of periods stated above for sets of oscillations in different periods. In short, according to Stokes’s law of viscosity of fluids, our supposed vesicular vibrator would follow the law of subsidence of a simple vibrator experiencing a resistance simply proportional to the velocity of its motion, while no such simple law is applicable to the effects of the internal molecular resistance in a vibrating elastic solid.

37. Tooke’s Law.—A law expressed by Hooke with Latin tersenees in the words Ut tensio sic ws is the foundation of the mathematical theory of the elasticity of hard solids. By ¢ensio here is meant not force (as is generally meant by the English word tension), but an elongation produced by force. In English, then, Hooke’s law is that elongation (understood of an elastic solid) is proportional to the force producing it. It is, of course, to be extended continuously from elongation to contraction in respect to the effect, and from pull to push in respect

to the cause ; and the experiments on which it is fonnded prove a perfect continuity from a pulling force to a smaller force in the same direction, and from the less force to zero, and from zero of pulling force to different degrees of push or positive pressure, or negative pull. Experimental proof

merely of the contenwty of the phenomena through zero of force suffices to show that, for djinitely small positive or negative pulls, positive or negative elongation is simply proportional to the positive or negative pull ; or, in other words, positive or negative contraction is proportional to the positive or negative pressure producing it. But now must be invoked minutely accurate experimental measurement to find how nearly the law of simple proportionality holds through finite ranges of contraction and elongation. The answer happily for mathematicians and engineers is that Hooke's law is fulfilled, as accurately as any experiments hitherto made can tell, for all metals and bard solids each through the whole range within its limits of elasticity ; and for woods, cork, india-rubber, jellies when the elongation is not more than two or three per cent., or the angular dis- tortion not more than a few hundredths of the radian (or not more than about two or three degrees). The same law holds for the condensation of liquids up to the highest pressures under which their compressibility has hitherto been accurately measured. [A decided but small deviation from Hooke's law has been found in steel pianoforte wire under combined influence of torsion and longitudinal pull by Mr M'Farlane in experiments made for the present article after this section was in type. Sec section 81.]

Boyle's law of the "spring of air shows that the augmentation of density of a gas is simply proportional to the augmentation of the pressure, through the very wide ranges of pressure through which that law is approximately enough fulfilled. Hence the infinitesimal diminution of volume produced by a given infinitesimal augmentation of pressure varies as the square of the volume, and the proportionate diminution of volume (that is to say, the ratio of the diminution of volume to the volume) is proportional to the volume, or inversely proportional to the density. Andrews's experiments on the compressibility of a fluid, such as carbonic acid, at temperatures slightly above the critical temperature, and of the gas and of liquids at tem- peratures slightly below the critical temperature, are in- tensely interesting, not merely in respect to the natural history of elasticity, but as opening vistas into the philoso- phy of molecular action.

We cannot expect to find any law of simple propor- tionality between stress and change of dimensions, or pro- portionate change of dimensions, in the case of any elastic or semi-elastic " soft " solids, such as cork on one hand

or india-rubber or jellies on the other, when strained to large angular distortions, or to large proportionate changes of dimensions. The exceedingly imperfect elasticity of all these solids, and the want of definiteness of the substance of many of them, renders accurate experimenting unavail- able for obtaining auy very definite or consistent numerical results ; but it is interesting to observe roughly the forces required to produce some of the great strains of which they are capable without any total break down of elastic quality ; for instance, to hang weights successively on an india- rubber band and measure the elongations. This any one may readily do, and may be surprised to find the enormous increase of resistance to elongation presented by the attenu- ated band before it breaks.

38. Lomogencousness defined.—A body is called homo- geneous when any two equal, similar parts of it, with corresponding lines parallel and turned towards the same parts, are undistingnishable from one another by any difference in quality. The perfect fulfilment of this condi- tion, without any limit as to the smallness of the parts,

though conceivable, is not generally regarded as probable, for any of the real solids or fluids known to us, however seemingly homogeneous. It is held by all naturalists that there is a molecular structure, according to which, in com- pound bodies such as water, ice, rock-crystal, &e., the con- stituent substances lie side by side, or arranged in groups of finite dimensions, and even in bodies called simple (that is those not known to be chemically resolvable into other substances) there is no ultimate homogeneousness. In other words, the prevailing belief is that every kind of matter with which we are acquainted hasa more or less coarse-grained texture, whether (as great masses of solid brick-work or stone-building, or as natural sandstone or granite rocks) having visible molecules, or (as seemingly homogeneous metals, or continuous crystals, or liquids, or gases) having molecules too small to be directly visible, or measurable but not wndiscoverably small,—really, it is to be believed, of dimensions to be accurately determined in future advances of science. Practically the definition of homogeneousness Inay be applied on a very large scale to

masses of building or coarse-grained conglomerate rock, or on a more moderate scale to blocks of common sandstone, or on a very small scale to seemingly homogeneous metals ;1 or on a scale of extreme, undiscovered fineness, to vitreous bodies, continuous crystals, solidified gums, as india-rubber, gum-arabic, &c., and fluids.

39. Isotropic and Aolotropic Substances defined.—The substance of a homogeneous solid is called dsotropic when a spherical portion of it, tested by any physical agency, exhibits no difference in quality however it isturned. Or, which amounts to the same, a cubical portion, cut from any position in an isotropic body, exhibits the same qualities relatively to each pair of parallel faces. Or two equal and similar portions cut from any positions in the body, not subject to the condition of parallelism (section 38),are undistinguishable from one another. A substance which is not isotropic, but exhibits differences of quality in different directions, is called colotropic.2 The remarks of section 38 relative to homogeneousness in the aggregate, and the supposed ultimately heterogeneous texture of all substances, however seemingly homogeneous, indicate cor- responding limitations and uon-rigorous practical interper- tations of isotropy and zolotropy.

40. Isotropy and olotropy of different sets of proper- ties.—The substance of a homogeneous solid may be iso- tropic in one quality or class of qualitics, but solotropic in others. Or a transparent substance may transmit light at different velocities in different directions through it (that is, be doubly-refracting), and yet a cube of it may (and does in many natural crystals) show no sensible difference im 1ts absorption of white light transmitted across it perpendl- cularly to any of its three pairs of faces. Or (as a erystal which exhibits dichroism) it may be sensibly seolotropie relatively to the absorption of light, but not sensibly double-refracting, or it may be dichroic and doubly-refract- ing, and yet it may conduct heat cqually in all directions. Still, as a rule, a homogeneous substance which is seolotropic for one quality must be more than infinitesimally wolotropic for every quality which has directional character admitting of a corresponding ceolotropy. –

41. Moduluses of Hlasticity.—A modulus of elasticity 18 the number obtained by dividing the number expressing 4 stress? by the number expressing the strain* which 1t pro- duces. A modulus is called a principal modulus when aes sesame a_i alge clea cee

1 Which, however, we know, as proved by Deville and Van Troost, are porous enough at high temperatures to allow very free pene of gases. Helmholtz and Root find percolation of platinum by hydro gen at ordinary temperature (Berl. Sitzungsbericht).

2 Thomson and Tait's Natural Philosophy, section 676. __

3 Mathematical Theory, below, chap. 1. 4 Thid.

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the stress is such that it produces a strain of its own type. |

(1.) An isotropic solid has two principal moduluses— a modulus of compression and a rigidity.

(2.) A crystal of the cubic class (fluor-spar, for instance) has three principal moduluses,—one modulus of com- pression and two rigidities.

(3.) An zolotropic solid having (what no natural erystal has, but what a drawn wire has) perfect isotropy of physical qualities relative to all lines perpendicular to a certain axis of its substance has three principal moduluses,— two determinable from its different compressibilities along and perpendicular to the axis, or from one compressibility and the "Young's modulus" (section 42) of an axial bar of the substance, or determinable from two com- pressibilities; and one rigidity determinable by measurc- ment of the torsional rigidity of a round axial bar of the substance.

(4.) A crystal of Iceland spar -has four principal moduluscs,—three like those of case (3), and another rigidity depending on (want of complete circular symmetry, and) possession of triple symmetry of form, involving sextuple elastic symmetry, round the crystalline axis.

(5.) A crystal of the rectangular parallelepiped (or “tessaral”) class has six distinct principal moduluses which, when the directions of the principal axes are known, are determinable by six single observations, —three, of the three (generally unequal) compressibilities along the three axes; and three, of the three rigidities (no doubt generally unequal) relatively to the three simple distortions of the parallelepiped, in any one of which one pair of parallel rectangular faces of the parallelepiped become oblique parallelograms,

(6.) An solotropic solid generally has six principal moduluses,! which, when a piece of the solid is presented without information, and without any sure indication from its appearance of any particular axis or axes of symmetry of any kind, require just twenty-one independent observations for tlie determination of the fifteen quantities specifying their types, and the six numerical values of the moduluses themselves,

42. “ Young’s Modulus,” or Modulus of Simple Longi- tudinal Stress—Thomas Young called the modulus of elasticity of an elastic solid the amount of the end-pull or end-thrust required to produce any infinitesimal elongation or contraction of a wire, or bar, or column of the substance multiplied by the ratio of its length to the elongation or contraction. In this definition the definite article is clearly misapplied. There arc, as we have seen, two moduluses of elasticity for an isotropic solid,—one measuring elasticity of bulk, the other measuring clasticity of shape. An interesting and instructive illustration of the confusion of ideas so often rising in physical science from faulty logic is to be found in “ An Account of an Experiment on the Elasticity of Ice: By Benjamin Bevan, Esq., in a letter to Dr Thomas Young, Foreign Sec. R. 8S.” and in Young’s “ Note ” upon it, both published in the 7’ransac- tions of the Royal Society for 1826. Bevan gives an interesting account of a well-designed and well-cxecuted experiment on the flexure of a bar, 3°97 inches thick, 10 inches broad, and 100 inches long, of ice on a pond near Leighton Buzzard (the bar remaining attached by one end to the rest of the ice, but being cut free bya saw along its sides and across its other end), by which he obtained a fairly accurate determination of “the modulus of ice”;? and says that he repeated the experiment in various ways on ice bars of various dimensions, some remaining attached by

1 Mathematical Theory, chap. xvi. * The result is given in the Table of Moduluses, sec. 77, below,

one end, others completely detached, and found results agreeing with the first as nearly “as the admeasurement of the thickness could be ascertained.” He then proceeds to compare “ the modulus of ice ” which he had thus found with “the modulus of water,” which he quotes from Young’s Lectures as deduced from Canton’s experiments on the compressibility of water. Young in his “ Note” does not point out that the two moduluses were essentially different, and that the modulus of his definition, the modulus determinable from the flexure of a bar, is essentially zero for every fluid. We now call “Young’s modulus” the particular modulus of clasticity defined as above by Young, and so avoid all confusion.

43, Modulus of Rigidity.—The “modulus of rigidity ” of an isotropic solid is the amount of tangential stress divided by the deformation it produces,—-the former being measured in units of force per unit of the area to which it is applied in the manner indicated by the annexed diagram (fig. 3), and the latter by the variation of eacli of the four right angles ireckoned in fraction of the radian. By drawing either diagonal of the square in the diagram we see that the distorting stress repre- sented by it gives rise to a normal traction on every sur- face of the substance perpen- dicular to the squareand parallel to one of its diagonals, and an equal normal pressure on cvery surface of the solid perpendicu- lar to the square and parallel to the other diagonal; and that the amount of each of these normal forecs® per unit of area is equal to the amount per unit areca of the tangential forces which the diagram indicates. The corresponding* geometrical proposition, also easily proved, is as follows: A strain compounded of a simple extension in once set of parallels, and a simple con- traction of equal amount in any other set perpendicular to those, is the same as a simple shear in either of the two sets of planes cutting the two sets of parallels at 45°, and the numerical measuring of this shear or simple distortion is equal to double the amount of the elongation or contrac- tion, each reckoned per unit of |length.

Hence we have another definition of ™ modulus of rigidity ” equivalent to the preceding :—The modulus of rigidity of an isotropic substance is the

amount of normal traction or pressure per unit of area, divided by twice the amount of elongation in the direction of the traction or of contraction in the direction of the pressurc, when a piece of the substance is subjected to a stress producing uniform distortion. .

44.5 Conditions fulfilled in Elastic Isotropy.—To be elas- tically isotropic, a spherical or cubical portion of any solid, if subjected to uniform normal pressure (positive or nega- tive) all round, must, in yielding, experience no deforma- tion, and therefore must be equally compressed (or dilated) in alldirections. But, further, a cube cut from any position in it, and acted on by tangential or distorting stress in planes parallel to two pairs of its sides, must experience simple deformation, or “shearing” parallel to either pair of these sides, unaccompanicd by condensation or dilatation,®

Tig. 3.

3 The directions of these forces are called the ‘‘ axes” of the stress, The corresponding directions in the corresponding strain are called the axes of the strain.

4 Mathematical Theory, chap. vi.

5 This, with several of the following sections, 44-51, is borrowed, with but slight change, from the first edition of Thomson and Tait’s Natural Philosophy, by permission of the authors.

§ It must be remembered that tie cnanges of figure and volume we are concerned with are so small that the principle of superposition is

and the same in amount for all the three ways in which a stress may be thus applied to any one cube, and for different cubes taken from any different positions in the solid. Hence the elastic quality of a perfectly elastic, homogene- ous, isotropic solid is fully defined by two elements,—its resistance to distortion and its resistance to compression. The first has been already considered (section 43), The second is measured by the amount of uniform pressure in all directions per unit area of its surface required to pro-

duce a stated very small compression. The numerical reckoning of the first is the compressing pressure divided by the diminution of the bulk of a portion of the sub- stance which, when uncompressed, occupies the unit volume. It is sometimes called the “ elasticity of bulk,” or sometimes the “ modulus of bulk-elasticity,” sometimes the resistance to compression. Its reciprocal, or the amount of compression on unit of volume divided by the compressing pressure, or, a8 we may conveniently say, the compression per unit of volume per unit of compressing pressure, is commonly called the compressibility.

45. Strain produced by a single Longitudinal Stress (subject of Young’s Modulus).—Any stress whatever may! be made up of simple longitudinal stresses. Hence, to find the relation between any stress and the strain produced by it, we have ouly to find the strain produced by a single longitudinal stress, which, for au isotropic solid, we may do at once thus :—A simple longi- tudinal stress P is equivalent to a uniform dilating tension }/ in all directions, compounded with two x distorting stresses, each equal to 3P, and having a common axis in the line of the given longitudinal stress, and their other two axes Fig. 4. any two lines at right angles to one another and to it. The diagram (fig. 4), drawn in a plane through one of these latter lines and the former, sufficiently indicates the syn- thesis,—the only forces not shown being those perpendicu- lar to its plane.

Hence if m denote the rigidity, and & the modulus of compression, or the modulus of bulk-elasticity (being the same as the reciprocal of the compressibility), the effect will be an equal dilatation in all directions, amounting, per unit of volume, to

4P k

(1),

compounded with two equal distortions, each amounting to

P e eign dt vee Sahl and having (section 43, footnote) their axes in the directions just stated for the axes of the distorting stresses.

46. The dilatation and two shears thus determined may be conveniently reduced to simple longitudinal strains by following the indications of section 43, thus :—

The two shears together constitute an elongation amount-

: f, — : ing to r in the direction of the given force P, and equal

contraction amounting to = in all directions perpendicu-

lar to it. And the cubic dilatation i

dilatation, equal in all directions, amounting to ao.

implies a lineal

applicable 3 SO that if any distorting stress produced a condensation, an opposite distorting stress would produce a dilatation, which is a violation of the isotropic condition.

? Mathematical Theory, chap. viii.

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On the whole, therefore, we have

; : la ; santa lincar clongation=P(5+ 9; in the direction of the applied stress, and

aerauton |

| ; 5 (3).

linear contraction =P (;—;.), in all directions per

pendicular to the applied stress. F ” » ™* Ink 47, Hence “ Young’s Modulus” ==— 3k+n

ends of a column, bar, or wire of isotropic material are acted on by equal and opposite forces, it experiences a lateral 3k —2n 2(3k-+n) dilatation, each reckoned as usual per unit of lineal measure. One specimen of the fallacious mathematics re- ferred to in chap. xvi. of the mathematical theory below is a celebrated conclusion of Navier's and Poisson's that the ratio of lateral contraction to elongation by pull without transverse force is 4. This would require the rigidity to be 2 of the resistance to compression, for all solids; which was first shown to be false by Stokes? from many obvious observations, proving enormous discrepancies from it in many well-known bodies, and rendering it most improbable that there is any approach to a constancy of ratio between rigidity and resistance to compression in any class of solids. Thus clear elastic jellies and india-rubber present familiar specimens of isotropic homogeneous solids which, while differing very much from oue another iu rigidity ('stiffness "), are probably all of very nearly the same com- pressibility as water, which is about s7}95 per atmosphere. Their resistance to compression, measured by the reciprocal of this, is obviously many hundred times the absolute amount of the rigidity of the stiffest of those substances. A column of any of them, therefore, when pressed together or pulled ont, within its limits of elasticity, by balancing forces applied to its ends (or an india-rubber band when pulled out), experiences no sensible change of volume, though very sensible change of length. Hence the propor- tionate extension or contraction of any transverse diameter must be sensibly equal to half the longitudinal contraction or extension ; aud such substances may be practically regarded as incompressible elastic solids in interpreting all the phenomena for which they are most remarkable. Stokes gave reasons for believing that metals also have in general greater resistance to ¢ompression, in proportion to their rigidities, than according to the fallacious theory, although for them the discrepancy is very much less than for the gelatinous bodies. This probable conclusion was soon experimentally demonstrated by Wertheim, who found the ratio of lateral to longitudinal change of lineal dimensions, in columns acted on solely by longitudinal force, to be about 4 for glass and brass ; and by Kirchhoff, who, by a well-devised experimental method, found '387 as the value of that ratio for brass, and '294 for iron, For copper it is shown to lie between '226 and '441, by experiments* quoted below, measuring the torsional and longitudinal rigidities of copper wires.

48, All these results indicate rigidity Jess in proportion to the compressibility than according to Navier's and Poisson's theory. And it has been supposed by many naturalists who have seen the necessity of abandoning that theory as inapplicable to ordinary solids that it may be regarded as the proper theory for an ideal perfect solid, and as indicating an amount of rigidity not quite reached 10 any real substance, but approached to in some of the ae a reaver

2¢On the Friction of Fluids in Motion, and the Equilibrium and Motion of Elastic Solids," Trans. Camb. Phil. .Soc, April 1845, Fee also Camb. and Dub. Math. Jour., March 1848.

3 "On the Elasticity and Viscosity of Mctals" (W. Thomson), Proc. R. S., May 1865.

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lineal coutraction equal to of the longitudinal

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most rigid of natural solids (as, for instance, iron). But it is scarcely possible to hold a piece of cork in the hand without perceiving the fallaciousness of this last attempt to maintain a theory which never had any good foundation. By careful measurements on columns of cork of various forms (among them, cylindrical pieces cut in the ordinary way for bottles), before and after compressing them longitudinally in a Bramah's press, we have found that the change of lateral dimensions is insensible both with small longitudinal contractions and return dilatations, within the limits of elasticity, and with such enormous longitudinal contractions as to 4 or 4 of the original length. It is thus proved decisively that cork is much more rigid, while metals, glass, and gelatinous bodies are all less rigid, in proportion to resistance to compression, than the supposed " perfect solid"; and the practical invalidity of the theory is experimentally demonstrated. By obvious mechanism of jointed bars a solid may be designed which shall swell laterally when pulled, and shrink laterally when compressed, in one direction, and which shall be homo- geneous in the same sense (article 40) as crystals and liquids are called homogeneous.

49, Modulus of Simple Longitudinal Strain.—In sec- tions 45, 46, we examined the effect of a simple longitudinal stress in producing elongation in its own direction, and contraction in lines perpendicular to it. With stresses substituted for strains, and strains for stresses, we may apply the same process to investigate the longitudinal and lateral tractions required to produce a simple longi- tudinal strain (that is, an elongation in one direction, with no change of dimensions perpendicular to it) in a rod or solid of any shape.

Thus a simple longitudinal strain ¢ is equivalent to a cubic dilatation e without change of figure (or linear dilata- tion 4¢ equal in all directions), and two distortions consist- ing each of dilatation 4¢ in the given direction and con- traction de in each of two directions perpendicular to it and to one another. To produce the cubic dilatation ¢ alone requires (section 44) a normal traction ke equal in all directions. And, to produce either of the distortions simply, since the measure (section 43) of each is Je, requires a distorting stress equal to » x $e, which consists of tangential tractions each equal to this amount, positive (or drawing outwards) in the line of the given elongation, and negative (or pressing inwards) in the perpendicular direction. Thus we have in all

normal traction =(4+4n)e, in the direction of the given

strain, and normal traction=(k- 3n)e, in every direction perpen- (4) dicular to the given strain. Hence the modulus of simple longitudinal strain is k + $n.

50. Weight-Modulus and Length of Modulus.—Instead of reckoning moduluses in units of force per unit of area, it is sometimes convenient to express them in terms of the weight of unit bulk of the solid. A modulus thus reckoned, or, as it is called by some writers, the length of the modulus, is of course found by dividing the weight-modu- lus by the weight of the unit bulk. It is useful in many applications of the theory] of elasticity," as, for instance,'in this result, which is proved in the elementary dynamics of waves in an elastic solid or fluid (chap. xvii. of the Mathematical Theory, below) :—tlie velocity of trans- mission of longitudinal! vibrations (as of sound) along a bar of cord, or of waves of simple distortion, or of simple longitudinal extension and contraction in a homogeneous

1 It is to be understood that the vibrations in question are so,much spread out through the length of the body that inertia does not sensibly influence the transverse contractions and dilatations which (unless the substance have in this respect the peculiar character presented by cork, section 48) take place along with them.

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isotropic solid, or of sound waves in a fluid, is equal to the velocity acquired by a body in falling from a height equal to half the length of the proper modulus? for the case ;—that is, the Young's Modulus (srr) for the first case, the modulus of rigidity (n) for the second, the modulus of simple longitudinal strain (4+ $7) for the third, the modulus of compression & for the fourth, Remark that for air the static "length-modulus of compression " at constant temperature is the same as what is often techmni- cally called the " height of the homogeneous atmosphere."

51. In reckoning moduluses there must be a definite understanding as to the unit in terms of which the force is measured, which may be either the kinetic unit or the gravitation unit for a specified locality, that is, the weight in that locality of the unit of mass. Experimenters hitherto have stated their results in terms in the gravitation unit, each for his own locality,—the accuracy hitherto attained being scarcely in any cases sufficient to require corrections for the different intensities of gravity in the different places of observation.

The most useful and generally convenient specification of the modulus of elasticity of a substance is in grammes- weight per square ceutimetre. This has only to be divided by the specific gravity of the substance to give the length of the modulus. British measures, however, being still unhappily sometimes used in practical and even in scientific statements, we too often meet with reckonings of the modulus in pounds per square inch or per square foot, in tons per square inch, or of length of the modulus in feet or in British statute miles.

The reckoning most commonly adopted in British treatises on mechanics and practical statements is pounds per square inch. The modulus thus stated must be divided by the weight of 12 cubic inches of the solid, or by the

product of its specific gravity into °4337,3 to find the length of the modulus in feet.

To reduce from pounds per square inch to grammes per square centimetre, multiply by 70°31, or divide by ‘014223. French engineers generally state their results in kilogrammes per square millimetre, and so bring them to more convenient numbers, being zog/g990 Of the incon-

2 In sections 73-76 we shall see that changes of temperature produced by the varying stresses cause changes of temperature which, in ordinary solids, render the velocity of transmission of longitudinal vibrations sensibly greater than that calculated by the rule stated in the text, if we use the static modulus as understood from the definition there given; and it will be shown how to take into account the thermal effect by using a definite static modulus, or kinetic modulus, according to the circumstances of any case that may occur.

3 This decimal being the weight in pounds of 12 cubic inches of watcr, The one great advantage of the French metrical system is that the mass of the unit volume (1 cubic centimetre) of water at its temper- ature of maximum density (3°°945 C.) is unity (1 gramme) to a sufficient degree of approximation for almost all practical purposes. Thus, ac- cording to this system, the density of a body and its specific gravity mean one and the same thing; whereas on the British no-system the density is expressed by a number found by multiplying the specific gravity by one number or another, according to the choice of a cubic inch, pint, quart, wine gallon, imperial gallon, cubic foot, cubic yard, or cubic mile that is made for the unit of volume; and the grain, scruple, gunmaker’s drachm, apothecary’s drachm, ounce ‘l’roy, ounce avoirdupois, pound Troy, pound avoirdupois, stone (Imperial, Ayrshire, Lanarkshire, Dumbartonshire), stone for hay, stone for corn, quarter (of a hundredweight), quarter (of corn), hundredweight, or ton that is chosen for unit of mass. It is a remarkable phenomenon, belonging rather to moral and social than to physical science, that a people tending naturally to be regulated by common sense should voluntarily condemn themselves, as the British have so long done, to unnecessary hard labour in every action of common business or scientific work related to measurement, from which all the other nations of Europe have emancipated themselves.

Professor W. H. Miller, of Cambridge, concludes, from a very trustworthy comparison of standards by Kupffer, of St Petersburg, that the weight of a cubic decimetre of water at ten- perature of maximum density is 1000°013 grammes,

veniently large numbers expressing moduluses in grammes weight per square centimetre, but it is much better to reckon in millions of grammes per square centimetre.

52. ‘ Resilience” is a very useful word, introduced about forty years ago (when the doctrine of energy was beginning to become practically appreciated) by Lewis Gordon, first professor of engineering in the university of Glasgow, to denote the quantity of work that a spring (or elastic body) gives back when strained to some stated limit and then allowed to return to the condition in which it rests when free from stress. The word “resilience ” used without special qualification may be understood as meaning extreme resilience, or the work given back by the spring after being strained to the extreme limit within which it can be strained again and again without breaking or taking a permanent set. In all cases for which Hooke’s law of simple propor- tionality between stress and strain holds, the resilience is obviously equal to the work done by a constant force of half the amount of the extreme force acting through a space equal to the extreme deflection.

53. When force is reckoned in “ gravitation measure,” resilience per unit of the spring’s mass is simply the height that the spring itself, or an equal weight, could be lifted against gravity by an amount of work equal to that given back by the spring returning from the stressed condition.

54. Let the elastic body be a long homogeneous cylinder or prism with flat ends (a bar as we may call it for brevity), and let the stress for which its resilience is reckoned be positwe normal pressures on its cnds. The resilience per unit mass is equal to the greatest height from which the bar can fall with its length vertical, and impinge against a perfectly hard horizontal plane without suffering stress beyond its limits of elasticity. For in this case (as in the case of the direct impact of two equal and similar bars

meeting with equal and opposite velocities, discussed in Thomson and Tait's Natural Philosophy, section 303), the kinetic energy of the translational motion preceding the im- pact is, during the first half of the collision, wholly converted into potential energy of elastic forcc, which during the second half of the collision is wholly reconverted into kinetic energy of translational motion in the reverse direc- tion. During the whole time of the collision the stopped end of the bar experiences a constant pressure, and at thie middle of the collision the whole substance of the bar is for an instant at rest in the same state of compression as it would have permanently if in equilibrium under the influence of that pressure and an equal and opposite pressure on the other end. From the beginning to the middle of the collision the compression advances at a uniform rate through the bar from the stopped end to the free end. Every particle of the bar which the compression has not reached continues moving uniformly with the velocity of the whole before the collision until the compression reaches it, when it instantaneously comes to rest. The part of the bar which at any instant is all that is compressed remains at rest till the corresponding instant in the second half of the collision.

55, From our preceding view of a bar impinging against an ideal perfectly rigid plane, we see at once all that takes place in the real case of any rigorously direct 'longitudinal collision between two equal and similar clastic bars with flat ends, In this case the whole of the kinetic energy which the bodies had before collision reappears as purely translational kinetic energy after collision. The same wonld be approximately true of any two bars, provided the times taken by a pulse of simple longitudinal stress to run through their lengths are equal. Thus if the two bars be of the same substance, or of different substances having the same value for Young's modulus, the lengths must be equal, but the diameters may be unequal, Orif the Young's

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modulus be different in the two bars, their lengths must (Math. Theory, chap. xvii.) be inversely as the square roots of its values. To all such cases the laws of " col- lision between two perfectly elastic bodics," whether of equal or unequal masses, as given in elementary dyn- amical treatises, are

applicable. But in every other’case part of the translational energy which the bodies have before collision is left in the shape of vibrations after collision, and the translational energy after collision is accordingly less than before collision. The losses of energy observed in common elementary dynamical experiments on collision between solid globes of the same substance are partly due to,this cause. If they were wholly due to it they would be independent of the substance, when two globes of the same substance are used. They would bear the same proportion to the whole energy in every case of collision between two equal globes, or again, in every case of collision between two globes of any stated proportion of diameters, provided in each case the two which collide are of the same substances; but the proportion of translational cnergy converted into vibrations would not be the same for two equal globes as for two unequal globes. Hence when differences of proportionate losses of energy ‘are found in experiments on different substances, as in Newton’s on globes of glass, iron, or com- pressed wool, this must be due to imperfect elasticity of the material. It is to be expected that careful experiments upon hard well-polished globes striking one another with such gentle forces as not to produce even at the point of contact any stress approaching to the limit of elasticity, will be found to give results in which the observed loss of translational energy can be almost wholly accounted for by vibrations remaining in the globes after collision.

56. Examples of Restlience.—Hxzample 1.—In respect to simple longitudinal pull, the extreme resilience of stecl pianoforte wire of the gauge and quality referred to in section 22 above (calculated by multiplying the breaking weight into half the elongation produced by it according to the experimental data of section 22) is 6066 metre-grammes (gravitation measure) per ten metres of the wire. Or, whatever the length of the wire, its resilience is equal to the work required to lift its weight through 179 metres.

Example 2.—The torsional resilience of the same wire, twisted in either direction as far as it can be withont giving it any notable permanent set, was found to be equal to the work required to lift its weight through 3 metres.

Hxample 3.—The extreme resilience of a vulcanized india-rubber band weighing 12°3 grammes was found to be equal to the work required to lift

its weight through 1200 metres. This was found by stretching it by gradations of weights up to the breaking weight, representing the results by aid of a curve, and measuring its area to find the integral work given back by the spring after being stretched by a weight just short of the breaking weight,

57. Flecure of a Beam or Rod.—In the problem of simple flexure a bar or uniform rod or wire, straight when free from stress, is kept in a circular form by equal oppos- ing couples properly applied to its ends. The parts of the bar on the convex side of the circle must obviously be stretched longitudinally, and those on the concave side contracted longitudinally, by the flexure. It is not obvious, however, what are the conditions affecting the lateral shrinkings and swellings of ideal filaments into which we may. imagine the bar divided lengthwise. Earlier writers had assumed without proof that each filament, bent as it is in its actual position in the bar, 1s elongated or contracted by the same amount as it would be if it were detached, and subjected to the same end pull or end compression with its sides quite free to shrink or

expand, but they had taken no account of the lateral shrinking or swelling which the filament must really ex- perience in the bent bar. The subject first received satis- factory mathematical investigation from St Venant.! He proved that the old supposition is substantially correct, with the importaut practical exception of the flat spring referred to in section 59 below. His theory shows that, in fact, if we imagine the whole rod divided parallel to its length into infinitesimal filaments, each of these shrinks or swells laterally. with sensibly the same freedom as if it were separated from the rest of the substance and subjected to end pull or end compression, lengthening or shortening it in a straight line to the same extent as it is really lengthened or shortened in the circular arc which it becomes in the bent rod. He illustrates the distortion of the cross section by which these changes of lateral dimensions are necessarily accompanied in the annexed diagram (fig. 5), in which

either the whole nor- ° mal section of a rect- : angular beam, or a rect- ke angular area in the

normal section of a beam of any figure, is represented in its strained and unstrained figures, with the central point O common to the two. ‘The flexure is in planes perpendicular to

YOY,, and is concave , upwards (or towards X),—G, the centre of curvature, being in the directio® indicated, but too far to be included in the diagram: The straight sides AC, BD, and all straight lines parallel to them, of the unstrained rectangular area become con centric arcs of circles concave in the opposite direction, their centre ‘of curvature H being (articles 47, 48) for rods of india-rubber or gelatinous substance,or of glass or metal, from 2 to 4 times as far from O on one side as G is on the other. Thus the originally plane sides AC, BD of a rectangu-

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lar bar become anticlastic? surfaces, of curvatures — and p

— in the two principal sections, if o denote the ratio of

lateral shrinking to longitudinal extension. A flat rectangular, or a square, rod of india-rubber [for which o amounts (section 47) to very nearly 4, and which is susceptible of very great amounts of strain without utter loss of corresponding elastic action] exhibits this pheno- menon remarkably well.

58. Limits to the bending of Rods or Beams of hard solid substance.—For hard solids, such as metals, stones, glasses, woods, ivory, vulcanite, p:pier-maché, elongations and con- tractions to be within the limits of elasticity must gene- rally (section 23) be less than zg. Hence the breadth or thickness of the bar in the plane of curvature must gene- rally be less than z$9 of the diameter of curvature in order that the bending may not break it, or give it a permanent bend, or strain it beyond its “limits of elas- ticity.”

59. Exceptional case of Thin flat Spring, too much bent to fulfil conditions of section 57.—St Venant’s theory shows that a farther condition must be fulfilled if the ideal filaments are to have the freedom to shrink or expand as ex- plained.in section 57. For unless the breadth AC of the bar (or diameter perpendicular to the plane of flexure) be

1 Mémoires des Savants Etrangers, 1855, “De la Torsion des Prismes, avec des considérations sur leur Flexion,” &e. , 2 See Thomson and Tait’s Natural Philosophy, vol. i, § 128.

very small in comparison with the mean proportional between the radius OH and the thickness AB the distances from YY, to the corners A’, C’ would fall short of the half thickness, OE, and the distances to B’, D’ would exceed it, by differences comparable with its own amount. This would give rise to sensibly less and greater shortenings and stretchings in the filaments towards the corners than those supposed in the ordinary calculation of flexural rigidity (article 61), and so vitiate the result. Unhappily, mathematicians have not hitherto succeeded in solving, possibly not even tried to solve, the beautiful problem thus presented by the flexure of a broad very thin band (such as a watch spring) into a circle of radius comparable with a third proportional to its thickness and its breadth.

60. But, provided the radius of curvature of the flexure is not only a large multiple of the greatest diameter, but also of a third proportional to the diameters in and _per- pendicular to the plane of flexure; then, however great may be the ratio of the greatest diameter to the least, the preced- ing solution is applicable ; and it is remarkable that the necessary distortion of the normal section (illustrated in the diagram of article 57) does not sensibly impede the free lateral contractions and expansions in the filaments, even in the case of a broad thin lamina (whether of pre- cisely rectangular section, or of unequal thicknesses in different parts). *

61. Lleaural Rigidities of a Rod or Beam.—The couple required to give unit curvature in any plane to a rod or beam is called its flexural rigidity for curvature in that plane. When the beam is of circular cross section and of isotropic material, the flexural rigidity is clearly the same, whatever be the plane of flexure through the axis, and the plane of the bending couple coincides with the plane of flexure. It might be expected that in a round bar of eolotropic material, such as a wooden rod with the annual woody layers sensibly plane and parallel toa plane through its axis, would show different flexural rigidities in different planes,—in the case of wood, for example, different according as the flexure is in a parallel or perpendicular to the

annual layers. This is not so, however ; on the contrary, it is easy to show, by an extension of St Venant's theory, that in the case of the wooden rod the flexural rigidity is equal in all planes through the axis, and that the plane of flexure always agrees with the plane of the bending couple, and to prove generally that the flexure of a bar of eolotropic substance, and composed it may be of longitudinal fila- ments of heterogeneous materials, is precisely the same as if it were isotropic, and that its flexural rigidities are calculated by the same rule from its Young's modulus, provided that the zolotropy is not such as (section 81) to give rise to alteration of the angle between the length and any diameter perpendicular to the length when weight is hung on the rod, or on any longitudinal filament cut from it. Excluding then all cases in which there is any such oblique zolotropy, we have a very simple theory for the flexure of bars of any substance, whether isotropic or eeolotropic, and whether homogeneous or not homogeneous through the cross section.

62. Principal Flecural Rigudities and Principal Planes of Flexure of a Beam. —The flexural rigidity of a rod is. generally not equal in different directions, and the plane of flexure does not generally coincide with the plane of the bending couple. Thusa flat ruler is much more easily bent in a plane perpendicular to its breadth than in the plane of its breadth ; and if we apply opposing couples to its two ends in any plane through its axis not either perpendicular or parallel to its breadth, it is obvious that the plane in which the flexure takes place will be more inclined to the plane of the breadth than to the plane of the bending couple. Very elementary statical theory, founded on St

Venant's conclusions of section 57, shows that, whatever the shape and the distribution of matter in the cross section of the bar, there are two planes at right angles to one another such that if the bar be bent in either of these planes the bending couple will coincide with the plane of flexure. These planes are called principal planes of flexure, and the rigidities of the bar for flexure in these planes are called its principal flexural rigidities. When the principal flexural rigidities are known the flexure of the bar in any plane oblique to the principal planes is readily found by supposing it to be bent in

one of the principal planes and simultaneously in the other, and calculating separately the couples required to produce these two component flexures. The positions of the principal planes of flexure, the relative flexural rigidities, and the law of elongation and contraction in different parts of the cross section, are found according to the following simple rules :—~

(1.) Imagine an infinitely thin plane disc of the same shape and size as the cross section loaded with mattcr in simple proportion to the Young's modulus in different parts of the cross section. Let the quantity of matter per unit area on any point of the disc be equal to the Young's modulus on the corresponding point of the rod when the material is heterogeneous: on the other hand, when the material is homogeneous it is more convenicnt to call the quantity of matter unity per unit area of the disc. Considering different axes in the plane of the disc through its centre of inertia, find the two principal axes of greatest and least moments of inertia, and find the moments of inertia round them.

(2.) In whatever plane the bar be bent it will experience neitlier elongation nor contraction in the filament which passes through the centres of inertia of the cross sections found according to rule (1), nor in the diameter of the cross section perpendicular to the plane of flexure.

(3.) Thus all the particles which experience neither elongation nor contraction lie in a cylindrical surface perpendicular to the plane of flexure, and through the centres of inertia of the cross sections. All the material on the outside of this cylindrical surface is elongated, and all on the intcrior is contracted, in simple propor- tion to distance from it : the amount of the elongation or contrac- tion being in fact equal to distance from this neutral surface divided by the radius of its curvature.

(4.) Hence it is obvious that the portions of the solid on the two sides of any cross section must experience mutual normal force, pulling them towards one another in the stretched part, and press- ing them from one another in the condensed part, and that the amount of this negative or positive normal pressure per unit of area must be equal to the Young's modulus at the place, multiplied into the ratio of its distance from the neutral line of the cross section to the radius of curvature.

The sum of these positive and negative forces over the whole area of the cross section is zero in virtue of condition (2). Their couple resultant has its axis perpendicular to the plane of curvature when this line is either of the principal axes (3) of the cross section; and its moment is clearly equal te the moment of inertia of the material disc (1) divided by the radius of curvature. Hence the principal flexural rigidities are simply equal to the principal moments of inertia of this disc ; and the principal flexural planes are the planes through its principal axes and the length of the bar; or taking the quantity of matter per unit area of the disc unity for the case of a homogeneous bar, we have the rule that the principal rigidities are equal to the product of the Young's modulus into the principal moments of inertia of the cross sectional areas, and the principal planes of flexure are the longitudinal planes through the principal axes of this area.

63. Law of Torsion —One of the most beautiful applications of the general equations of internal equilibrium of an elastic solid hitherto made is that of

M. de St Venant to “the torsion of prisms.” In this work the mathematical methods invented by Fourier for the solution of problems regarding conduction of heat have been most ingeniously and happily applied by St Venant to the problem of torsion. To reproduce St Venant’s mathematical investigation here would make this article too long (it occupies 227 quarto

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pages of the Mémoires des Savants Ltrangers) ; bee statement of some of the chief results is given (sections 65-72), not only on account of their strong scientific interest, but also because they are of great practical value in engineering ; and the reader is referred to Thomson and Tait’s Natural Philosophy, sections 700-710, for the proofs and for further details regarding results, but much that ig valuable and interesting is only to be found in St Venant’s original memoir.

64. Torsion Problem stated and Torsional Rigidity defined.—To one end of a long, straight prismatic rod, wire, or solid or hollow cylinder of auy form, a given couple is applied in a plane perpendicular to the length, while the other end is held fast : it is required to find the degree of twist produced, and the distribution of strain and stress throughout the prism. When the moment of the couple is unity, the amount of the twist per unit length divided by the moment of the couple is called the torsional rigidity of the rod or prism. ‘This definition is founded simply on the extension of Hooke’s law to torsion discovered experimentally by Coulomb, according to which a rod or wire when twisted within limits of torsional elasticity exerts a reactive couple in simple proportion to the angle through which one end is turned relatively to the other. The internal conditions to be satisfied in the torsion problem are that the resultant action between the substance on the two sides of any normal section is a couple, in the normal plane, equal to the given couple. This problem has not hitherto been attacked for solotropic solids. Even such a case as that of the round wooden rod (section 61) with annual layers sensibly parallel to a plane through its length, will, when twisted, experience a distribution of strain compli- cated much by its xclotropy. The following statements of results are confined to rods of isotropic material.

65. Torsion of Circular Cylinder.—For a solid or hollow circular cylinder, the solution (given first, we believe, by Coulomb) obviously is that each circular normal section remains unchanged in its own dimensions, figure, aud internal arrangement (so that every straight line of its particles remains a straight line of unchanged length), but it is turned round the axis of the cylinder through such an angle as to give auniform rate of twist equal to the applied couple divided by the product of the moment of inertia of the circular area (whether annular or complete to the centre) into the modulus of rigidity of the substance.

For, if we suppose the distribution of strain thus specified to be actually produced, by whatever application of stress is necessary, we liave, in every part of the substance, a simple shear parallel to the normal section, and perpen- dicular to the radius through it. ‘The elastic reaction against this requires, to balance it (section 43), a simple distorting stress consisting of forces in the normal section, directed as the shear, aud others in planes through the axis, and directed parallel to the axis. The amount of the shear is, for parts of the substance at distance r from the axis, equal obviously to rr, if r be the rate of twist reckoned im radians per unit of length of the cylinder. Hence the amount of the tangential force in either set of planes is 277 per unit of area, if 2 be the rigidity of the substance. Hence there is no force between parts of the substance lying on the two sides of any element of any circular cylinder coaxal with the bounding cylinder or cylinders ; and consequently no force is required on the cylindrical boundary to maintain the supposed state of strain. Aud the mutual action between the parts of the substance on the two sides of any normal plane section consists of force in this plane, directed perpendicular to the radius through each point, and amounting to x7r per unit of area. The moment of this distribution of force round the axis of the cylinder is (if do denote an element of the area) xzffdor?, or the

product of xr iato the moment of inertia of the area round the perpendicular to its plane tirough its centre, which is therefore equal to the moment of the couple applied at either end.

66. Prism of any shape constrained to a Simple Twist.— Farther, it is easily proved that if a cylinder or prism of any shape be compelled to take exactly the state of strain above specified (seetion 65) with the line through the centres of inertia of the normal sections, taken instcad of the axis of the eylinder, the mutual action between the parts of it on the two sides of any normal section will be a couple of whieh the moment will be expressed by the saine formula, that is, the product of the rigidity, into the rate of twist, into the moment of incrtia of the section round its centre of inertia. But for any other shape of prism than a solid or symmetrical hollow circular cylinder, the supposed state of strain requires, besides the terminal opposed eouples, force parallel to. the length of the prism, distributed over the prismatic boundary, in proportion to the distance PE along the tangent, from each point of the surface, to the point in which this line is cut by a perpendicular to it from O the eentreof inertia of the normal section. To prove this let a normal section of the prism be represented in the annexed diagram (fig. 6). Let PK, representing the shear at any point P, close to the prismatic boundary, be resolved into PN and PT along the normal and tangent respectively. The whole, shear PK being equal to rr its eomponent PN is equal to rr sin w or r.PE. The corresponding eomponent of the required stress is nr. PE, and involves equal forces in the plane of the diagram, and in the plane through TP perpendieular to it, each amounting to nr. PE per unit of area,

An applieation of force equal and opposite to the distri- bution thus found over the prismatic boundary, would of course alone produce in the prism, othcrwise free, a state of strain which, eompounded with that supposed above, would give the state of strain actually produced by the sole application of balancing eouples to the two ends. The re- sult, it is easily secn, consists of an increased twist, together with a warping of naturally plane normal sections, by infinitesimal displacements perpendicular to themselves, into certain surfaces of anticlastic eurvature, with equal opposite curvatures. In bringing forward this theory, St Venant uot only pointed out the falsity of the supposition admitted by several previous writers, and used in praetice fallaciously by engineers, that Conlomb’s law holds for other fornis of prism than the solid or hollow circular cylinder, but he discovered fully the nature of the requisite correction, reduced the de- termination of it to a problem of pure mathematics, worked out the solution

fora great variety of important and eurious cases, compared the results with observation in a manner satisfactory and interesting to the naturalist, and gave con- clusions of great value to the practical engineer.

67. “ Hydrokinetic Analogue to Torsion Problem.1—We take advantage of the identity of mathematical conditions in St Venant’s torsion problem, and a hydrokinetic problem first solved a few years earlier by Stokes,? to give the following statement, which will be found very useful in estimating deficiencies in torsional rigidity below the amount caleulated from the fallacious extension of Coulomb’s law :—

I nn et

1 Extracted from Thomson and Tait, sections 704, 705. 2“ On some cases of Fluid Motion,”—Camb, Phil. Trans,, 1843.

Fig. 6.

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Conceive a liquid of density 2 completely filling a closed infinitely light prismatie box of the same shape within as the given elastie prism and of length unity, and let a eouple be applied to the box in a plane perpendicular to its length. The effective moment of inertia of the liquid’ will be equal to the correction by which the torsional rigidity of the elastic prism, calculated by the false extension of Coulomb’s law, must be diminished to give the true torsional rigidity.

“ Farther, the aetual shear of the solid, in any infinitely thin plate of it between two normal sections, will at each point be, when reckoned as a differential sliding (section 43) parallel to their planes, equal to and in the same direction as the velocity of the liquid relatively to the containing box.”

68. Solution of T’orston Problem.—To prove these pro- positions and investigate the mathematical equations of the problem, the process followed in Thomson and Tait’s Natural Philosophy, seetion 706, is first to show that

the conditions of sections 63 are verified by a state of strain compounded of (1) a simple twist round the line through the centres of inertia, and (2) a distortion of each normal section by infinitesimal displacements perpendicular to its plane; then find the interior and surface equations to determine this warping ; and lastly, calculate the actual moment of the couple to which the mutual action between the matter on the two sides of any normal section is equivalent.

69. St Venant's treatise abounds in keautiful and instructive graphieal illustrations of his results, from which the following are selected :—

(1.) Elliptic Cylinder.~~—The plain and dotted curvilineal arcs are (fig. 7) "con~~ tour lines" (coupes topographiques) of the section as warped by torsion; that is to say, lines inwhich it is eut by a series of parallel planes, each perpendicular to the axis. The arrows indicate the – direction of rotation Fig. 7. ; in the part of the prism above the plane of the diagram.

Ee

3 <¢That is, the moment of inertia of a rigid solid which, as will be proved in vol. ii., may be fixed within the box, if the liquid be removed, to make its motions the same as they are with the liquid in it,"

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(2.) Contour lines for St, Venant's " étoile & quatre points arrondis."—This diagram (fig. 8) shows the contour lines, in all respects as in case (1), for the case of a prism having for section the figure indicated. The portions of curve outside the continuous closed curve are merely indications of mathematical extensions irrelevant to the physical

roblem.

(3.) Contour lines of normal scetion of triangular prism, as warped by torsion, shown as in case (1) (fig. 9),

Fig. 9.

(4.) Contour lines of normal sections of square prisms, as warped by torsion (fig. 10),

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Conceive —:

x \ Canvex a ~~ \

Fig, 10,

~ (5.) Diagram of St Venant’s curvilineal squares for which torsion problem is algebraically solvable.—This diagram (fig. 11) shows the series of lines represented by the equation a+ y ~ a(at ~ 6a°y2?+44)=1-—a, with the indicated values for a, It is remarkable that the values a =0‘5 anda = ~ 3(./2

~1) give similar but not equal curvilineal squares (hollow sides and acute angles), one of them turned throngh half a right angle relatively to the other.

70. Lorsional Rigidity less in proportion’ to sum of principal Flexural Rigidities than according to false extension (section 66) of Coulomb’s Law. —Inasmuch as the moment of inertia of a plane area about an axis through its centre of inertia perpendicular to its plane is obviously equal to the sum of its moments of inertia round any two axes through the same point, at right angles to one another in its plane, the fallacious extension of Coulomb’s law, referred to in section 66, would make the torsional rigidity of a bar of any section equal to the product of the ratio of the modulus of rigidity to the Young’s modulus into the sum of its flexural rigidities (section 61) in any two planes at right angles to one another through its length, The true theory, as we have seen (section 67), always gives a torsional rigidity less than this. How great the deficiency

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may be expected to be in cases in which the figure of the section presents projecting angles, or considerable pro- minences (which may be imagined from the hydrokinetic

Fig. 11.

analogy given in section 67), has been pointed out by M. de St Venant, with the. important practical application, that strengthening ribs, or projections (see, for instance, the second of the annexed diagrams), such as are intro- duced in engineering to give stiffness to beams, have the reverse of a good effect when torsional rigidity or strength is an object, although they are truly of great value in increasing the flexural rigidity, and giving strength to bear ordinary strains, which are always more or less flexural. With remarkable ingenuity and mathematical skill he has drawn beautiful illustrations of this important practical principle from bis algebraic avd transcendental solutions.

(4,)9] . (8.) Star with four Square withacute rounded points, anglesand hollow being a curve of !

aS (1.) § Square with eurved

Rectilineal corners and hollow Equilateray

_ Square, sides; being curve ; g S triangle. a=0‘4, of $ 788 (3). sides. | aa aie ‘7783. “5874. “60000,

8276. 6745, “72552.

Fic, 12.—Diagrams showing torsional rigidities.

Thus, for an equilateral triangle, and for the rectilineal and three curvilineal squares shown in the diagrams (fig. 12), he finds for the torsional rigidities the values stated. The — number immediately below the diagram indicates in each case the fraction which the true torsional rigidity is of the old fallacious estimate (section 66),—the latter being the product of the rigidity of the substance into the moment of inertia of the cross section round an axis perpendicular to its plane through its centre of inertia, The second number indicates in each case the fraction which the torsional rigidity is of that of a solid circular cylinder of the same sectional area,

71. Places of greatest Distortion in Twisted Prisms.—M. de St Venant also calls attention to a conclusion from his solutions which to many may be startling, that in hs simpler cases the places of greatest distortion are those points of the boundary which are nearest to the axis of the twisted prism in each case, and the places of least distortion those farthest from it. Thus in the elliptic cylinder the

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substance is most strained at the ends of the smaller principal diameter, and least at the ends of the greater. In the equilateral triangular and square prisms there are longitudinal lines of maximum strain through the middles of the sides. In the oblong rectangular prism there are two lines of greater maximum strain through the middles of the broader pair of sides, and two

lines of less maximum strain through the middles of the narrow sides, The strain is, aS we may judge from the hydrokinetic analogy, ex- cessively small, but not evanescent, in the projecting ribs of a prism of the figure shown in (2) of section 69, It is quite evanescent infinitely near the angle, in the triangular and rectangular prisms, and in each other case, a3 (5) of section 69, in which there is a finite angle, whether acute or obtuse, projecting ‘outwards. This reminds us of a general remark we have to make, although consideration of space may oblige us to leave it without formal proof.

72. Strain at Projecting Angles, evanescent ; at Re-entrant Angles, infinite ; Liability to Cracks proceeding from Re- entrant Angles, or any places of too sharp concave curva- ture—A solid of any elastic substance, isotropic or eolotropic, bounded by any surfaces presenting projecting edges or angles, or re-entrant angles or edges, however obtuse, cannot experience any finite stress or strain in the neighbourhood of a projecting angle (trihedral, polyhedral, or conical); in the neighbourhood of an edge, can only experience simple longitudinal stress parallel to the neigh- bouring part of the edge ; and generally experiences infinite stress and strain in the neighbourhood of a re-entrant edge or angle ; when influenced by any distribution of force, exclusive of surface tractions infinitely near the angles or edges in question. An important application of the last part of this statement is the practical rule, well known in mechanics, that every re-entering edge or angle ought to be rounded, to prevent risk of rupture, in solid pieces designed to bear stress. An illustration of these principles is afforded by the concluding example of torsion in Thomson and Tait’s section 707; in which we have the complete mathematical solution of the torsion problem for prisms of fan-shaped sections, such as the annexed forms (fig. 13).

The solution shows that when the solid is continuous from the circular cylindrical surface to its axis, as in (4), (5), (6), the strain is zero or infinite according as the, angle between the bounding planes of the solid is less than or greater than two right angles as in cases (4) and (6) respectively.

73. Changes of Temperature produced by Compressions or Dilatations of a Fluid and Stresses of any kind in an Hlastic Solid.—F rom thermodynamic

theory! it is concluded that cold is produced whenever a solid is strained by oppos- ing, and heat when it is strained by yielding to, any elastic force of its own, the strength of which would diminish if the temperature were raised'; but that, on the contrary, heat is produced when a solid is strained against, and cold when it is strained by yielding to, any elastic force of its own, the strength of which would increase if the temperature were raised. When the strain is a condensa- tion or dilatation, uniform in all directions, a fluid may be

1 W. Thomson on ‘‘ Thermo-elastic Properties of Matter,” in Quarterly Journal of Mathematics, April 1855 (republished in Phil. Alag. 1877, second half year.)

included in the statement. Hence the following propo- sitions :—

(1.) A cubical compression of any elastic fluid or solid in an ordinary condition causes an evolution of heat; but, on the contrary, a cubical compression produces cold in any substance, solid or fluid, in such an abnormal state that it would contract if heated while kept under constant pressure. Water below its temperature (3°°9 Cent.) of maximum density is a familiar instance. (See table of section 76.)

(2.) If a wire already twisted be suddenly twisted further, always, however, within its limits of elasticity, cold will be produced; and if it be allowed suddenly to untwist, heat will be evolved from itself (besides heat generated externally by any work allowed to be wasted, which it does in untwisting). It is assumed that the torsional rigidity of the wire is diminished by an elevation of temperature, as the writer of this article had found it to be for copper, iron, platinum, and other metals (compare section 78).

(3.) A spiral spring suddenly drawn out will become lower in temperature, and will rise in temperature when suddenly allowed to draw in. [This result has been ex- perimentally verified by Joule (‘‘ Thermodynamic Proper- ties of Solids,” Z’ans. Roy. Soc., 1858) and the amount of the effect found to agree with that calculated, according to the preceding thermodynamic

theory, from the amount of the weakening of ‘the spring which he found by experiment. |

(4.) A bar or rod or wire of any substance with or with out a weight hung on it, or experiencing any degree of end thrust, to begin with, becomes cooled if suddenly elongated by end pull or by diminution of end thrust, and warmed if suddenly shortened by end thrust or by diminu- tion of end pull; except abnormal cases in which with constant end pull or end thrust elevation of temperature produces shortening; in every such case pull or diminished thrust produces elevation of temperature, thrust or di- minished pull lowering of temperature.

(5.) An india-rubber band suddenly drawn out (within its limits of elasticity) becomes warmer; and when allowed to contract, it becomes colder. Any one may easily verify this curious property by placing an india-rubber band in slight contact with the edges of the lips, then suddenly extending it—it becomes very perceptibly warmer: hold it for sometime stretched nearly to breaking, and then suddenly allow it to shrink—it becomes quite startingly colder, the cooling effect being sensible not merely to the lips but to the fingers holding the band. The first published statement of this curious observation is due to Gough (Memoirs of the Literary and Philosophical Society of Man- chester, 2d series, vol. i. p. 288), quoted by Joule in his paper on “ Thermodynamic Properties of Solids ” (Transac- tions of Royal Society, 1858). The thermodynamic con- clusion from it is that an india-rubber band, stretched by a constant weight of sufficient amount hung on it, must, when heated, pull up the weight, and, when cooled, allow the weight to descend: this Gough, independently of thermo- dynamic theory, had found to be actually the case. The experiment any one can make with the greatest ease by hanging a few pounds weight on a common india- rubber band, and taking a red-hot coal in a pair of tongs, or a red-hot poker, and moving it up and down close to the band. The way in which the weight rises when the red- hot body is near, and falls when it is removed, is quite startling. Joule experimented on the amount of shrinking per degree of elevation of temperature, with different weights hung on a band of vulcanized india-rubber, and found that they closely agreed with the amounts calculated by Thomson’s theory from the heating effects of pull,

and cooling effects of ccasing to pull, which he had observed in the same piece of india-rubber.

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74, The thermodynamic theory gives one formula! by which the change of temperature in every such case may be calculated when the other physical properties are known :—

tep |, b= sip? where 6 denotes the elevation of temperature produced by the sudden application of a stress p ; t, the teraperature of the substance on the absolute thermodynamic scale,? the change of temperature @ being supposed to be but a very small fraction of ¢ ; e, the geometrical effect (expansion or other strain) produced by an elevation of temperature of one degree when the body is kept under constant stress ; K, the specific heat of the substance per unit mass under constant stress ; p, the density ; and J, Joule's equivalent (taken as 42400 centimetres). In using the formnla for a fluid, » must be normal pressure equal in all directions, or normal pressure on a set of parallel planes, or tangential traction on one or other of the two sets of mutually perpendicular parallel planes which (section 43) experience tangential traction when the body is subjected to a simple distorting stress; or, quite generally, » may be the proper numerical reckoning (Mathematical Theory, chap. x.) of any stress, simple or compound. When p is pressure uniform in all directions, e must be expansion of bulk, whether the body expands equally in all directions or not. When > is pressure per- pendicular to a set of parallel planes, e must be expansion in the direction opposed to this pressure, irrespectively of any change of shape not altering the distance between the two planes of the solid perpendicular to the direction of p. When 7 is a simple tangential stress, reckoned as in section 43, e must be the change, reckoned in fraction of the radian, of the angle, infinitely nearly a right angle, between the two sets of parallel planes in either of which there is the tangential traction denoted by p. In cach of these cases p is reckoned simply in units of force per unit of area. Quite generally p may be any stress, slinple or compound, and e must be the component (Math. Th., chaps. vill. and ix.) relatively to the type of », of the strain produced by an elevation of temperature of one degree when the body is kept under constant stress. The constant stress for which KK and e are reckoned ought

to be the mean of the stresses which the body experiences with aud without ». Mathe- matically speaking, p is to be infinitesimal, but practically it may be of any magnitude moderate enough not to give any sensible difference in the value of either K or e, whether the “constant stress” be with » or without », or with the mean of the two: thus for air p must be a small fraction of the whole pressure, for instance a small fraction of one atmosphere for air at ordinary pressure; for water or watery solutions of salts or other solids, for mercury, for oil, and for other known liquids » may, for all we know, amount to twenty atmospheres or one hundred atmospheres without transgressing the limits for which the preceding formula is applicable. When the law of variation of K and e with pressure is known, the differential formula is readily integrated to give the integral amount of the change of temperature produced by greater stress than those for

1 W. Thomson, “Dynamical Theory of Heat” (§ 49), Trans. R.S.E., March 1851, and ‘‘ Thermoelastic Properties of Matter,” Quarterly Journal of Mathematics, April 1855 (republished Phi. Afag. 1877, second half year).

2 Thid., Part vi. §§ 97, 100, Trans. R.S.H., May 1854. Accord- ing to the scale there defined on thermo dynamic principles, inde- pendently of the properties of any particular substance, ¢ is found, by Joule and Thomson’s experiments, to agree very approximately with temperature centigrade, with 274° added,

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which the differential formula is applicable. For air and other permanent gases Boyle’s law of compression and Charles’s law of thermal expansion supply the requisite data with considerable accuracy up to twenty or thirty atmospheres. The result is expressed by the forniula

t+0 (P+p\

ee a where & denotes the ratio of the thermal capacity, pressure constant, to the thermal capacity, volume ‘constant, of the gas, a number which thermodynamic theory proves to be approximately constant for all

temperatures and densities, i any fluid approximately fulfilling Boyle’s and Charles’s aWs ; P and ¢ the initial pressure and temperature of the gas ; p the sudden addition to the pressure ; and, as before, 6 the elevation of temperature.

For the case of » a small fraction of P the formula gives

O=(b-1)5¢ «2. . (2)

It is by an integration of this formula that (1) is obtained.

For common air the value of & is very approximately 1-41, Thus if a quantity of air be given at 15° C. (¢= 289°) and the ordinary atmospheric pressure, and if it be compressed gradually up to 32 atmospheres, or dilated to yz of an atmosphere, and perfectly guarded against gain or loss of heat from or to without, its temperature at several different pressures, chosen for example, will be according to the following table of excesses of temperature above tlic primitive temperature, calculated by (1).

TABLE SHOWING EF¥Fects or Pressunn ON TEMPERATURE. Air given at temperature 15° Cent, (289° absolute).

Weenies Gke ‘Elevation of temperature Lowering of temperature,

: roduced by com- Value of roduced by dilata- ee a piensa, i, nt Book a 2 95° 4 7 4 221 ; 125 |

8 389 4 166

16 612 te 196 82 911 gy 219

But we have no knowledge of the effect of pressures of several thousand atmospheres in altering the expansibility or specific heat in liquids, or in fluids which at less heavy or at ordinary pressures are “ gases.”

75, When change of temperature, whether in a solid or a fluid is produced by the application of a stress, the corresponding modulus of elasticity will be greater in virtue of the change of temperature than what may be called the static modulus defined as above, on the understanding that the

temperature if changed by the stress is brought back to its primitive degree before the measurement of the strain is performed. The modulus calculated on the supposition that the body, neither losing nor gaining heat during the application of the stress and the measurement of its effect, retains the whole change of temperature due to the stress, will be called for want of a better name the kinetic modulus, because it is this which must (as in Laplace's celebrated correction of Newton's calculation of the velocity of sound) be used in reckoning the elastic forces concerned in waves and vibrations in almost all practical cases. To find the rati of the kinetic to the static modulus remark that ¢6, according to the notation of section 74, is the diminution of the strain due to the change of temperature 6. Hence if M denote the static modulus (section 41), the stram actually produced by it when the body is not allowed either

to gain or lose heat is 'i —e6, or, with 6 replaced by its

value according to the formula of section 74,

LkasMilerre

Dividing p by this expression we find, for the kinetic modulus

i 1 a ae M JK' see Wm in Mes 2 te?M" cot

76. For any substance, fluid or solid, it is easily proved, without thermodynamic theory, that

MWK. MN' where K denotes the thermal capacity of a stated quantity of the substance under constant stress, and N its thermal capacity under constant strain (or thermal capacity when the body is prevented from change of shape or change of volume). Tor permanent gases, and generally for fluids approximately fulfilling Boyle's and Charles's laws as said above, i is proved by thermodynamic theory to be approxi- mately constant, and its value for all gases for which it has been measured differs largely from unity.

On the other hand for solids whether the stress considered be uniform compression in all directions or of any other type, the value of 2 or * differs but very little from unity; and the difference is far from constant at different

temperatures (in the case of water it is zero at 3°*9 Cent., and varies as the square of the difference of the temperature from 3°°9 at all events for moderate differences from this critical temperature, whether above or K N ’ and the value of 6 by the formula of sec. 74, for different fluid and solid substances at the temperature 15° Cent. (289° absolute scale). The first table is for compression uniform in all directions ; the second, necessarily confined to solids, is for the stress dealt with in “ Young’s Modu- lus,” that is, normal pressure (positive or negative) on one set of parallel planes, with perfect freedom to expand or con- tract in all directions in these planes. A wire or rod ea longitudinally is a practical application of the atter.

below it). The following tables show the value of x or

THERMODYNAMIC TABLE I. Pressure equal in “all direections—Ratio of Kinetie to Statie Bulk-

Modulus. Temperature 15° C, (289° absolute). J=42400 centi- metres. | Elevation 4 of Tempera- Ther- ture pro- | Length of Dedueed mal duced by a Bulk- value of Capa- | Expansi-| Pressure Modulns MW K Substance. city per| bility of one _M tN unit = é gramme ary M N ; mass per square | jin centi- |— (1-7 BM) = K, Cae metres. is Yo = 5K: ATs 237 – =:0035 -000100 843000 1:41 Distilled water, 1-000 |:00015 000001022} 23× 10* 1:0084 | Alcohol, *6148):00106 |:0000117 16 × 106 1:24 | Ether, 5157/00155 — |:0000205 13 × 106 1:75 Bisulphide of ‘ earbon, “2206 oe as 13 × 106 con _ Mercury, 0290/:00018 |:0000423 41 × 106 1°45 Glass, flint, ‘1770|:000025 |-000000962| 144 × 108 1:00846 Brass, drawn,| ‘09391):0000545 |-00000396 126 × 108 1:028 moveely se mh os aa 240 × 108 ne Tron, . . | 1098|-0000395 00000245 | 193×108 1:0192 Copper, . . | ‘0949):0000545 00000391 | 194×106 1:0320

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THERMODYNAMIC TABLE II.

Pressure parallel to one direction in a solid—Ratio of Kinetic to Statie Young’s Modulus. Temperature 15° C. (289° absolute).

Lowering |of Tempera- Ther- ture pro- Deduced mal duced by a Length of yalue of cee Capa- | Expansi- et coun? MW’ K] ar j YW SLOGIL oie ees vanEapee Ne sa gramme M mu ON er square ale S 2¢ M\—) oe geitineite p =| 1— 5K =) te ~ SK : . . Zinc, -0927 |:0000294 |00000216 | 124× 106 . 100794 MDa, 0514 |-000022 |:00000292 56 × 1068 1:00861 Silver, 0557 |:000019 |:00000233 71 ×108 /1:00315 Copper, 0949 |:000018 |:00000129 | 186×106 1:00317 Lead, 0298 |:000029 |-00000675 16 × 106 1:00314 Glass, ‘177 {10000080 |:000000308 | 208 × 108 1:00516 Tron, ‘1098 |:000018 |:00000081 | 246 × 108 1:00253 Platinum, 0314 00000187 75 × 108 1:00120

0000086

77. Experimental Results.—The following tables show determinations of moduluses of compression, of Young’s modulus, and of moduluses of rigidity by various experi- menters and various methods. It will be seen that the Young’s moduluses obtained by Wertheim by vibrations, longitudinal or transverse, are generally in excess of those which he found by static extension; but the differences are enormously greater than those due to the heating and cooling effects of elongation and contraction (section 76), and are to be certainly reckoned as errors of observation. It is probable that his moduluses determined by static elongation are minutely accurate ; the discrepancies of those found by vibrations are probably due to imperfections of the arrangements for carrying out the vibrational niethod : —

TABLE OF MoDULUSES OF COMPRESSIBILITY.

——

Moduluses ; of com- ee | Substance. Dinca wiate ae | Authority. per square centimetre. ee eee, ee Distilled water WODEOS x LOS Wo 2s Alcohol , 12°38 × 108 0° Amaury and : alse Ge | eye Descamps, Ether 9‘48×108 | 0° $| Comptes Ren- | as : c SO 7 S212 || ee | dus, tome xvii. Bisulphide of carbon 16°3× 108 | 14° || p. 1564 (1869). Mercury c DO LgO DG ORs Mlb zay) 423 × 108 Everett’s 22diws- Glass. irae Ss Soe | trations of the Another specimen 354 x By on Cantenetras Steel. , : : 1876 × 10° re { weaittieae

Tron : é 1485 x pee “11 geeond System Copper . 1717 × 10 =| |. of Unite, é Wertheim Brass, different speci- {— ae os } AG jet : ms Chim., 1848.

a cn nner

TaBLE OF MopULUSES OF RIGIDITY.

Modulus of Rigidity

Substance. oe oe ate Authority. | centimetre,

7 Wertheim Glass, different specimens. | Mean 150 × 106 Annales” Brass, different speeimens Mcan 350 × 10% de Chimie,

1848,

Glass ; : 5 6 243 × 10° Another specimen 240 × 10° | | Everett’s Z77. Brass, drawn 373 × 108 of the Centi- Steel ; ; : : 834 × 10° }| metre-Gramme- Tron, wrought . 5 : 785×108 | | Seeond System Copper… : : ae x bi of Units.

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Substanee,

lron or steel

Wood ; :

Stone . . .

Slate , . 6

ike ‘ . Brass, east . 4

» Wire , . Bronze, or gun metal Copper, east ‘

” shect °

on bolts .

” wires 0 lron, east, 5

lron, wrouglit, plates

», bars and bolts

tue Steel, plates . °

sy DEUS) 6

Lead, sheet . Tin, east . Zine . . Ash , c Beech . Birch , 6 . Cedar of Lebanon Fir, red pine Spruce

Tir, larch Mahogany .° Oak, European ,

Sycamore . . Teak, Indian : Lead, east , . ” ” Tin, east. .

Ly Cadmium, drawn

ae Gold, drawn .

” ”

Silver, drawn . ”

” Zne, eommon, drawn

ie) rds Palladium , .

a” Copper, drawn ,

” ”

oe) annealed

bap! a)

a? a) Platinum wire, fine

ted ied 0 1» Medium a3 ”) Lit)? a? iD », thick ” rs

Iron wire, common

Steel, east, drawn

oY yy

” ” Steel wire, English, drawn . :

” Steel wire, common, tempered blue . English steel, pianoforte wire . ;

Copper wire

Density,

11-215 7404

8665

21°166

21°275

21°259

7‘553 7717

{ 7°718

8°9 {

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TABLE OF MoDULUSES AND STRENGTHS.

Young’s Modulus.

Gramimnes per square eentimetre,

Abt 2100 × 106

105 × 106 to 280 × 106 Abt 350 × 106

910 × 106 to 1120× 106

645 × 106 1001 × 106

696 × 106

1195 × 106 { 984 × 106

to 1610 × 106 2040 × 106 2040 × 106 to 2958 × 108 51× 106

113 × 106 95 × 106 116 × 106 84 × 106 118 × 106 113 × 106 79 × 106 88 × 108 103 × 106 73 X106 169 × 106 177 × 108 198 × 106 199 × 106 417°2 × 106 464 × 106 542 × 106 609 × 106 813 × 106 864 × 10° 860 × 106 736 × 106 782 × 106 758 × 106 873 × 166 879 × 106 955 X 106 1175 × 106 1239 × 106 1245 × 106 1251 × 106 1254 × 106 1052 × 10° 1183 × 106 1254 × 106 1593 × 108 1618 × 10° 1704 × 108 1715 × 10° 1716 × 108 1581 × 108 1616 × 108 1861 × 10° 1955 × 108 1825 × 108 1982 × 108 1881 × 10° 2071 × 108 1944 × 108

1804 × 10°

2049 × 10°

1150 <0

to1200 × 106

Length Modulus,

Abt 9,000,000 ft.

4,000,000

to 10,000,000 ft. Abt 5,000,000 ft,

s

21,000,000 ft.

1G SOe

ems,

56 X 10° ems.

63 × 10° ems,

44 × 10°

ems,

71× 10° enis, 124 × 108

ems,

104 × 10° ems.

139 × 10″ ems,

118 × 10° ems,

75 X 10° ems,

246 × 10° ems,

244× 10% ems.

243 × 10° ems,

265 × 10° ems,

Tenacity: in grammes per square

eentimetre,

127 × 104 343 × 104

252 × 104 134 × 104 211 × 104 253 × 104 422 × 104

94× 104 { to 204 × 104 359 × 104 422 × 104 \ to 492 × 104 563 × 104 703 X 104 to 914. x 104 23 × 104 32 × 104 (49 to 56) x 104 120 × 104 81×10! 105 × 104 80 × 104 91× 104 87 × 104 68 × 14 105 × 104 105 × 104 91× 104 105 × 104 22 × 104

41°6 × 104

(266 to 284) x 104 296 × 104 158 × 104

272 × 104

410 × 104 316 × 104

350 × 104

(625 to 651) x 104 838 × 104

(859 to 991) x 104

2362 × 104

Length Modulus of Extreme Rupture in Nein : Llastie centim0tres : .,| Elonga- (or Tenacity} “|; (ion, in terms of Weight of Unit-Bulk.)

00198 00344 “003562 0036

a ‘00116 Es “00224 r 00324 a “00451 i 0106

00853 “00905 “0235 + 00771 0077

‘00861 ‘0120

6102 *0125 . 00621

‘0012

001

15×10 | “0034 28 × 104 ‘OO£1 23 ×10! ‘0018 a3×10t | “0023 46×10% | -0033 35 × 104 003 17 108 ‘0022 95 ×10! “0034 108 × 104 125 × 104 °0050 306×10# | -0115

Resilience) Resili- pereubic| ence centi- er metre in ie Authority, Motibod of cats MSs in Determination, metre- | centi- grammes. metres, se |DeT, Young! | Probably flexure (Young’s Works, ann si vol. ii. p, 183), Ly a? Rankine’s aio AD ‘Rules and Tables,” ano .» | Bevan, Flexure (see § 42), 1236 on Cae 5905 e. tules and Tandles, 4562 Son aa erg oe) Bea ” oD) Sis ”

7480 2)

879 on an mae. 9 5120 AN cine 2»

1310 3

518 ap stele ” one ” 6370 a5

3455 3

4752 ” ‘ 9410 “9 3510 ”

3347 35

2927 ne ; 6265 0g { 5352 AD ! 5670 py 3262 ae “Og 12 | Wertheim, | By direct elong. | ,, » tvans, vibr, 4 < – » longitud. ,, j 28 aR » trans, ne an » longitud, ,, a5 », trans, oF we ” » long. oy 250 A » direct elong. a » trans. vib. ee Pn 1 long: 3; | 575 – » direct elong, | 5 » trans, vib. f see ” ” long. ” 204 . » direct elongaay ap » trans, yibi ; aod 5 1y HONE rid, of » , direet elong. 46 5 » trans. vib. 756 9 » direct elong. a » trans, vib, a re, + LONE ane 531 a » direct elong. | an » trans, vib, ‘ tee ” +» long. 4 182 he » {rans. 4, fA +7 LOLs ap 1 direct elong. 3? +4 trans, ” 9 ‘oO long. ” 4 – » trans, vib. | Ama AN) ” long. ” 1450 Ay +, direct elong: ” ih ” . », trans, vib. Ht Sp » long. » 2945 af » direct elong. 4s » trans. vib. 0 3 long. | a » direet elong. 17600 /D.M‘Farlane| ,, ” ”

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fb Asi i

78. A question of great importance in the physical theory of the elasticity of solids, “ What changes are produced in the moduluses of elasticity by permanent changes in its molecular condition,” has occupied the attention, no doubt, of every “ naturalist ” who has studied the subject, and valuable contributions to its answer by experiment had been given by Wertheim and other investigators, but solely with reference to Young’s modulus. In 1865 aun investiga- tion of the effect on the torsional rigidity of wires of different metals, produced by stretching them longitudinally beyond their limits of elasticity, was commenced in? the physical laboratory of the university of Glasyow in its old buildings in 1865. The following description of experi.

1aents and table of results is extracted from the paper by |

W. Thomson “On the Elasticity and Viscosity of Metals,” already quoted (section 30), with reference to viscosity aud fatigue of elasticity.

‘To determine rigidities by torsional vibrations, taking advan- tage of an obvious but most valuable suggestion made to me by Dr Joule, I used as vibrator in each case a thin cylinder of sheet brass, turned true outside and inside (of which the radius of gravitation must be, toa very close degree of approximation, the arithmetic mean of the radii of the outer and inncr cylindrical surfaces),! supported by a thin flat rectangnlar bar, of which the square of the radius of gravitation is one-third of the square of the dis- tunce from the centre to the corner. The wire to be tested passed per- pendicularly through a hole in the middle of the bar, and was there firmly soldered. he cylinder was ticd to the middle of the bar by light silk thread so as to hang with its axis vertical. after having been suspended and stretched with just force enough to make it as nearly straight as was necessary for accuracy, was vibrated. Then it was stretched by hand (applied to the cross bar soldered to its lower end) and vibrated again, and stretched again, and so on till it broke.” The cxperiments were performed with great care and accuracy

by Mr Donald M‘Farlane. | ‘The results, as shown in the accompanying table, were most surprising.”

The highest and lowest rigidities found for copper in the table are as follows :—

Highest rigidity 473 × 10°, being that of a wire which had been softened by heating it to redness and plunging it into water, and which was found to be of density 8°91.

Lowest rigidity 393°4 × 10%, being that of a wire which had been rendered so brittle by heating it to redness surrounded by powdered charcoal in a crucible and letting it cool very slowly, that it could searcely be touched without breaking it, and which had been found to be reduced in density by this process to as low as 8°674. Thi wires used were all commercial specimens—those of copper being all, or ncarly all, cut from hanks supplied by the Gutta Percha Company, having been selected as of high electrie conductivity, and of good mechanical quality, for submarine cables.

It ought to be remarked that the change of molecular condition produced by permanently stretching a wire or solid cylinder of wetal is certainly a change from a condition which, if originally isotropic, becomes zolotropic as to soine qualities,? and that the changed condi- tions may therefore be presumed to be wolotropic as to elasticity. If so, the rigidities corresponding to the direct and diagonal distortions (indicated by No. 1 and No. 2 in fig. 14) must in all proba- bility become different from one another when a wire is permanently stretched, instead of being equal as they must be when its substance is isotropic. It be- comes, therefore, a question of extremc interest to find whether rigidity No. 2 is not increased by this process, which, as is proved by the experiments above described, diminishes, to a very remark- able degree, the rigidity No. 1. The __|. _\! most obvious experiment, and indeed the ist only practicable experiment, adapted to Fig. 14. answer this question, for a wire or round bar is that of Cagniard- Latour, in which an accurate determination of the diflerence produced in the volwme of the substance is made by applying and removing longitudinal traction within its limits of elasticity. With the requisite apparatus, which must be much more accurate

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1 It is exactly the square root of the mean of their squares. . 2 For example , see paper “ On Electrodynamic Qualities of Metals,

Philosophical Transactions, 1856, by W. Thomson.

Kach wire, |

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than that of Cagniard-Latour, a most important and intcrest- ing investigation might be made. The results, along with au accurate determination of the Young’s modulus for the particular case, give (sec. 47) the modulus of compression, and the rigidity No. 2. Regnault suggested the use of hollow instead of solid cylinders, to be subjected to longitudinal pull, and (after the inanner of the bulb and tube of a thermometer) a capillary tube to aid in measuring changes of volume of the hollow; and Wert- heim, adopting this excellent suggestion, obtained scemingly very accurate results for brass and glass, which are given in the tables of section 77.

Moment|.Time of | _ Rigidity in Length | Volume of pee grammes weight) Substanee, ee ba ee Density. is or (halt Vetlenets’e metres. | metres. Vibra- ae dal Me Qar313Wk tor Wk, tT grev2.

ey 60°3| 11845 | 2764) 81771] 114 [241 ×108 Zinc # 304°9 | 2°351 | 7°105) 31896} 4°31 359°6 ×10° Brass oe | meee ae wan | AT OES: scater® 0 248°3 a — 5°456 | 354°8 ×10° i Zouso 1703) | TSksOsi eee 5°96 | 35071 ×106 Copper {2435-0 15°30 8°91 | 88186 |16°375 | 448-7 ×108 ” ” ” ” 61412 |20°77 448°4 ×108 Copper? | 214:4/1°348 | 8°864| 31771] 5:015 | 433-0 ×10° 3 i ” », | 61412) 6°982 | 4381°8 ×10% | Copper? | 143°7; °9096 | 8°674| ... Syke | Sepals) Copper® | 286°8) ... .«. | 20612] 4°245 | 442°9

×106 a 291 a Ss fF 4°375 | 485°6 × 108 ae 293 i nee 6 4°417 | 486°2 ×104 3 296‘1 ee a 7 4°500 | 483°8 ×10° me 300°0 } 3 4°588 | 434:°0 ×10 a 303°4 300 a 4°646 | 487°8 × 108 ns 309°3 we io 4°833 | 428°6 ×10 ii 313°2 Bas wide 5 4:931 | 427°5 ×108 a 317°4/ 1°962 | 8-835) ,, 5°040 | 425°9 × 108 Copper® | 315°6) ... ... | 81771} 8155 | 442°3 × 108 – BED || oon for 4 O°42p | teze 08 96 951°9| ‘827 | 8872} ,, {10°463 | 4286 ×10° Copper’ | 253°2!1°580 | 8°91 a» |) 5285 | 47259 «x 108 55 262°8 bee as 5°640 | 464°3 × 108 : 270°4 5°910 | 460°4 ×108 D0 278°7 6°20 458°5 ×108 . 287 °9 6°5325| 455°0 × 10° is oie 6°8195| 451°0 ×10° is 308°8 a ve 7°3075) 448°9 ×10 Copper’ | 256°5| 1°6145 | 8°90 4°2226| 463°5 ×10° Dé 267°9 ae sea 4°5625| 453°3 × 10° i 280°1 ee ae .. (MEO15 | 24ibeo x 108 » 29202 ee ie tes 5°240 | 445°5 × 10° Pe 301°9 5‘5382 | 488°2 ×10 Soft Iron®} 316°8 6°655 | 791°4 «108 af S22ell 6°88 TSB 3S 0″ – 385°1 a Bo = T30L |hiaeo) XlOw ns 347°4 or 5a aes 7°768 | 7666 ×108 si S650) 1357 | C7 ia. 8°455 | 756°0 ×108 Platinnm | 39°4/ °1745 |20°805| 20612] 2°05 | 622°25× 108 Gold 65°9] °1825 /19°8 10902 QR esl Ole Silver 75°7| °1185 |10°21 | 10967 Oe Le

Remarks.

1 Only forty vibrations from initial are of convenient amplitude could be counted. Had bcen stretched considerably before this

experiment. Igo viscous that only twenty vibrations could be counted

Broke in stretching.

3 A piece of the preceding stretched.

4’Ihe preceding made red-hot in a crucible filled with powdered charcoal and allowed to cool slowly, became very brittle: a part of it with difficulty saved for the experiment. ;

5 Another piece of the long (2485 centims.) wire ; strétched hy successive simple tractions. ;

6 A finer gauge copper wire; stretched by successive tractions.

7 A finer gauge copper wire, softened by being heated to redness and plunged in water.

8 Another length of 260 centimetres cut from the same, and similarily treated.

2 One piece, successively elongated_by simple tractions till it

broke. VII. — 103

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79. The following tables show certain effects of differ-

ent temperatures on the Young’s Modulus, rigidity-modulus,

and modulus of compressibility of water :—

Young’s Modulus in million grammes weight per square Substance. Density. centimetre,

15° 100° 200° edd Pa me 11 232 173 163 ats Gold 18°035 558 531 548 Silver . 10°304 715 727 637 Palladium 11225 979 ea oa Copper 8936 1052 983 786 Platinum . se 21:‘083 1552 1418 1296 Steel, drawn, English . 7622 1728 2129 1928 Cast steel 7°919 1956 1901 1792 Iron, Berry . 1 0oe 2188 1770

2079

The above results are from Wertheim’s “ Mémoires ” on Elasticity, Ann. de Chim. et Phys., tom. xii. (1844).

The change in the rigidity-modulus produced by change of temperature was investigated by Kohlrausch. He found that it is expressed by the formula n=x, (1 —at— G7), where 7, denotes the value of the rigidity-modulus at 0° C., m its value at temperature ¢, and a, 8 coefficients the values of which for iron, copper, and brass are as follows:—

a B APs, ena tae et 0°000447 0°00000052 COPPER ividioibis scot 0°000520 0*00000028 aS LA ee itis seat ie se 0°000428 0°00000186

Moduluses of Compressibility of Water ut Different Temperatures,»

Modulus of compressibility in grammes per square centimetre.

Temp. Cent. Authority.

°o

20°6 × 108 20°2 × 108 20°7 × 108 21°5 × 108 21°6 × 108 22°4 × 106 22°6 × 108 22‘8 × 108 23’°3 × 108 23’°5 × 108

Grassi, Ann, de Chim., tom. Xxxi, (1851).

Ore CO DO RE EE EE WWRMOWORHO SSNSSKHOEN

80. Tempering soft tron by long-continued stress, ~~— Preliminary experiments by Mr J. T. Bottomley towards the investigation promised in section 5 above have dis~~ covered a very remarkable property of soft iron wire respect- ing its ultimate tensile strength. Eight different specimens, tested by the gradual application of more and more weight within ten minutes of time in each case until the wire broke, bore from 43} to 46 tb (average 45°2) just before breaking, with elongations of from 17 per cent to 22 per cent. Another specimen left with 43 Ib hanging on it for 24 hours, and then tested by the gradual addition of weights during 25 minutes till it broke, bore 49} ib before breaking, with elongation of 15 per cent. Another left for 3 days 11 hours 40 minutes with 43 ib hanging on it, and then tested by the gradual addition of weights during 34 minutes till it broke, bore 515 ib just before breaking, with elongation of 14°5 per cent, Another specimen of the same wire was set up with 40 tb hanging on it on the 5th of July 1877, on the 6th of July 3 ib were added, on the 9th 13 tb more, and on the 10th ? Ib more, making in all on this date 45} Ib. Thenceforward day by day, with occasional intervals of two days or three days, the weight

LG . Bias, a The modulus is a minimum at temperature of maximum density.

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HEAS TICE:

was increased first by half a pound at a time, and latterly by a quarter of a pound at a time, until on the 3d of Sep- tember the wire broke with 57} tb (elongation not re- corded). This gradual addition of weight therefore had increased the tensile strength of the metal by 26°7 per cent. !

81. Haperiments made for this article.—There are many subjects in the theory of elasticity regarding which information to be obtained by experiment only is greatly wanted. Several of these have been pointed out above (section 21), and while this article was being put in type, experiments were made in the physical laboratory of the university of Glasgow with a view of answering some of the questions proposed. Mr Donald M‘Farlane, besides making the experiments referred to in sections 3 and 21, in- vestigated the effects of applying different amounts of pull to a steel pianoforte wire which had been twisted to nearly its limits of elasticity, and which was kept twisted by means of a couple. The results proved a deviation from Hooke’s law by showing a diminution of the torsional rigidity, of about 1°6 per cent., produced by hanging a weight of 112 ib on the wire. Of this 1-2 per cent. is accounted for by elongation and by shrinkage of the diameter, leaving ‘4 per cent. of diminution of the rigidity-modulus. |

It was also found that when the wire was twisted far be- yond its limits of elasticity, and then freed from torsional stress, a weight hung ou it caused it to untwist slightly. When the weight was removed and reapplied again and again, the lower end of the wire always turned in the same direction as the permanent twist when the weight was re- moved, and in the opposite direction when it was applied. This result shows the development of zolotropic quality in the substance of the wire, according to which a small cube cut from any part of it far out from the axis, with two sides of the cube parallel to the length, and the other two pairs of sides making angles of 45° with the length, would show different compressibilities in the directions perpendicular to the last-mentioned pairs of sides.

Another very interesting result, discovered in the course of these experiments, was that when a length of five metres of the steel wire, with a weight of 39 tb hung upon it, was twisted to the extent of 95 turns, it became gradually elongated to the extent of 5, of the length of the wire ; when farther twisted it began to shorten till, when 25 turns had been given (in all 120 turns), the weight had risen from its lowest position through nearly zy5 of the length of the wire, so that the previous elongation had been diminished by about + of its amount.

Experiments were also made by Mr Andrew Gray and Mr Thomas Gray for the purpose of determining the effects of various amounts of permanent twist in altering the rigidity-modulus and the Young's modulus of wires of copper, iron, and steel. A copper wire, of 3°15 metres 10 length and '154 centimetre diameter, No, 17 B.W.G., which had a rigidity-modulus of 442 million grammes per,square centimetre to begin with, was found to have 420 after 10 turns, showing a diminution in the modulus of jy of its own amount. The diminution went on rapidly until 100 turns of permanent twist had been given, when the modulus was as low as 385. The diminution of the modulus continued with further twist, but very slowly, up to 1225 turns, when the modulus was found to be 371, showing @ diminution to the extent of } of its original value! There was little farther change until 1400 turns had been given, when the modulus began to increase. At 1525 turns its value was 373, and at 1625 it was 377. Twenty turus more broke the wire before another observation of the tor- sional elasticity was made.

A piece of iron wire of nearly the same length, about three metres, but of smaller diameter (087 centimetre), showed continued diminution of torsional rigidity as far as

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1350 turns of permanent twist, when the dimiutionn had amounted;to 14 per cent. of the primitive value, 36 turns more broke the wire before another determination of torsional rigidity had been made.

The steel pianoforte wire also showed a diminution of torsional rigidity with permanent twist, and (as did the copper wire) showed first a diminution and then a slight augmentation. The amount of the diminution in

the steel wire was enormously greater than the surprisingly great amount which had been discovered in the copper wire, and the ultimate augmentation was considerably greater in the steel than what it had been in the copper before rupture. Thus after 473 turns of permanent twist the torsional modulus had diminished from 751 million grammes per square centimetre to 414! 95 more turns of permanent twist augmented the rigidity from 414 to 430, and when farther twisted the wire broke before another observation had been made. The vibrator used in these experiments was a cylinder of lead weighing 56 tb, which was kept hanging on the wire while it was being twisted, and in fact during the whole of about 100 hours from the beginning of the experiment till the wire broke, except on two occasions for a few minutes, while the top fastening which had given way was being resoldered. The period of vibration was augmented from 39°375 seconds to 5:19 seconds by the twist. The wire took the twist very irregularly, some parts not beginning to show much signs of permanent twist till near the end of the experiment. |

In two specimens of copper wire of the same length and

gauge as those described above, the Young's modulus was |

found to be increased 10 per cent. by 100 turns of permanent twist.

Five metres of the steel pianoforte wire, bearing a weight of 39 ib, was in one of Mr M'Farlane's experiments twisted 120 turns, and then allowed to untwist, and 384 turns came out, leaving the wire in equilibrium with 817 turns of permanent twist. Its Young's modulus was then found not to differ as much as 4 per cent, from the value it had before the wire was twisted,

MATHEMATICAL THEORY OF ELASTICITY.! Part I,.—On STRESSES AND STRAENS.? CuaptTer I.—Jnitial Definitions and Explanations. ,

Def. A stress is an equilibrating application of force to a body.

Cor. The stress on any part of a body in equilibrium will thus signify the force which it experiences from the matter touching that part all round, whether entirely homogeneous with itself, or only so across a portion of its bounding surface.

Def. A strain is any definite altcration of form or dimensions experienced by a solid.

Examples.—Equal and opposite forces acting at the two ends of a wire or rod of any substance constitute a stress upon it. A body pressed equally all round —for instance, any mass touched by air on all sides—experiences a stress, A stone in a building experiences stress if it is pressed upon by other stones, or by any parts of the structure, in contact with it. Any part of a continuous solid mass, simply resting on a fixed base, experiences stress from the surrounding parts in ccnsequence of their weight. The different parts of a ship in a heavy sea experience stresses from which they are exempt when the water is smooth.

If a rod of any substance become either longer or shorter, it is said to experi- ence astrain. If a body be uniformly condensed in all directions it experiences astrain. lf a stone, a beam, or a mass of metal ina building, or in a piece of framework, becomes condensed or dilated in any direction, or bent, or twisted, or distorted in any way, it is said to experience a strain, to become strained, or often in common language, simply “to strain.” A ship is said to “strain” if in launehing, or when working in a heavy sca, the different parts of it expericnce relative motions.

Cuarrmr I].—Homogencous Stresses and Homogeneous Strains.

Def. A stress is said to be homogeneous throughout a body when equal and similar portions of the body, with corresponding lines

1 The substance of Chap. 1.-XV1. of this part of the present article was read before the Royal Society by Prof. Wm. Thomson, M.A., F.R.8., April 24, 1856, and published in the Zransactions. Chap. XV11., containing the mathematical theory of Waves in an zolotropic or isotropic elastic solid, isnew.

2 These terms were first definitively introduced into the Theory of Elasticity by Rankine, and have been found very valuable in writing on the subject. 1t will be scen that there is a slight deviation from Mr Rankine’s definition of the word “stress.” It is here applied to the direct action

experienced by a body from the matter around it, and not, as proposed by him, to the elastic reaction of the body equal and opposite to that action.

parallel, experience equal and parallel pressures or tensions on cor- responding elements of their surfaces.

Cor. When a body is subjected to any homogeneous stress, the mutual tension or pressure between the parts of it on two sides of any plane amounts to the same per unit of surface as that between the parts on the two sides of any parallel plane; and the former tension or pressure is parallel to the latter.

A strain is said to be homogeneous throughout a body, or the body is said to be homogeneously strained, when equal and similar portions, with corresponding lines parallel, experience equal and similar alterations of dimensions.

Cor. All the partieles of the body in parallel planes remain in par- allel planes, when the body is homogeneously strained in any way.

Examples-—A long uniform rod, if pulled out, or a pillar loaded with a weight, will experienee a uniform strain, exeept near its ends. There will be a sensible heterogeneousness of the strain, because of the end attachments, or other cir- cumstances preventing the ends from expanding latcrally to the same extent as the middle does.

A piece of cloth held in a plane, and distorted so that a warp and woof, instead of being perpendicular to one another, beeome two sets of parallels cutting one another obliquely, experiences a homogeneous strain. The strain is heteroge- neous as to intensity, from the axis to the surface of a cylindrical wire under torsion, and heterogeneous as to direction in different positions in a circle round the axis,

Cuarter IITI.—On the Distribution of Foree in a Stress.

Theorem.—In every homogencous stress there is a system of three rectangular planes, each of whieh is perpendicular to the direction of the mutual force between the parts of the body on its two vides.

For let P(X), P(Y), P(Z) denote the components, parallel to X, Y, Z, any three rect- angular lines of reference, of the force experienced per unit of surface at any por- tion of the solid bounded by a plane parallel to (Y, Z); Q(X), Q(Y), Q(Z), the corre- sponding components of the foree experienced by any, surface of the solid parallel to (Z, X); and R(X), R(Y), R(Z), those of the force at a surface parallel to (X, Y). Now, by considering the equilibrium of a cube of the solid with faces parallel to the planes of reference (fig. 15), we see that the couple of forces Q(Z) on its two faces perpendicular to Y is balanced by the couple of forces R(Y) on the faces perpendicular to Z, Hence we must have

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4 ate QZ =RM). Similarly, it is seen that R(X) =P(2), and P(X) = Q(X).

For the sake of brevity, these pairs of equal quantities (being tan- gential forces respectively perpendicular to X, Y, Z) may be denoted by T(X), T(Y), T(Z).

Consider a tetrahedral portion of the body (surrounded it_may be with continuous solid) contained within three planes A, B, C, through a point O parallel to the planes of the pairs of lines of reference, and a third plane K cutting these at angles a, B, 7 respectively ; so that as regards the areas of the different sides we shall have

A=Keosa, B= K cos £,

The forces actually experienced by the sides A, B, C have nothing to balance them exeept the force actually experienced by K. Hence those three forces must have a single resultant, and the force on K must be equal and opposite to it. If, therefore, the force on K per unit of surface be denoted by F, and its direction cosines by J, m, n, we have

E.K.1 =P()A+TOB+TO)C,

F.K.m=T(Z)A+QY)B+T®C,

F.K.2 =T(Y)A+T(X)B+R(Z)C; and, by the relations between the cases stated above, we deduce

Fl =P(X) cos a+T(Z) cos B+T(Y) cosy,

Fm=T(Z) cos a+Q(Y) cos B+T(X) cosy,

Fn =T(Y) cos a+T(X) cos 8+ R(Z) cosy. Hence the problem of finding (a, B, -y), 80 that the force F (1, m, 2) may be perpendicular to it, will be solved by substituting eos a, cos B, cos y for J, m, m in these equations. By the elimination of cos a, cos B, cos +y from the three equations thus obtained, we have the well-known cubic determinantal equation, of which the roots, necessarily real, lead, when no two of them are equal, to one and only one system of three rectangular axes having the stated property.

C=Keosy.

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Def. The three lines thus proved to exist for every possible homogeneous stress are ealled its axes. The planes of their pairs are ealled its normal planes; the mutual forces between parts of the body separated by these planes, or the forces on portions of the bounding surface parallel to them, are ealled the principal tensions.

Cor. 1. The Principal Tensions of the stress are the roots of the determinant cubie referred to in the demonstration.

Cor. 2. Ifa stress be speeificd by the notation P(X), &c., as ex- plained above, its normal planes are the principal planes of the surface of the second degree whose equation is

P(X)X2+Q(¥)¥24R(Z)Z2+-2T(X)VYZ+2T(Y)ZK+409T(Z)XY=1;

and its principal tensions are equal to the reeiproeals of the squares of the lengths of the semi-prineipal-axcs of the same surfaee (quan- tities whieh are negative of course for the principal axis or axes whieh do not cut the surfaee when the surface is a hyperboloid of one or of two sheets).

Cor. 3. The ellipsoid whose equation, referred to the rectangular axes of a stress, is

(1 — 2eF)X2+- (1 — 2eG)¥2+-(1— 2eHl)Z2 = 1,

where F, G, H denote the principal tensions, and ¢ any infinitely small quantity, represents the stress, in the following manner :—

From any point P in the surface of the ellipsoid draw a line in the tangent plane half-way to the point where this plane is ent by a perpendieular to it through the eentre; and from the end of the first-mentioned line draw a radial line to meet the surface of a sphere of unit radius coneentrie with the eliipsoid. The tension at this point of the surface of a sphere of the solid is in the line from it to the point P; and its amount per unit of surface is equal to the length of that infinitely small line, divided by e.

Cor, 4. Any stress is fully specified by six quantities, viz., its three principal tensions (F, G, H), and three angles (6, ¢, y) or three numerical quantities equivalent to the nine direction cosines specifying its axes.

CuaPrer IV.— On the Distribution of Displacement in a Strain.

Prop. In every homogeneous strain any part of the solid bounded by_an ellipsoid remains bounded by an cllipsoid. ‘

For all particles of the solid in a plane remain in a plane, and two parallel planes remain parallel. Consequently every system of eonjugate diametral

planes of an ellipsoid of the solid retain the property of conjugate diametral planes with referenee to the altered curve surface eontaining the same particles. This altered surface is therefore an ellipsoid.

Prop. There is a single system (and only a single system, except in the cases of symmetry) of three rectangular planes for every homogeneous strain, which remain at right angles to one another in the altered solid.

Def. 1. These three planes are called the normal planes of tlie strain, or simply the strain-normals. Their lines of intersection are ealled the axes of the strain. The elongations of the solid per unit of length along these axcs or perpendicular to these planes are ealled the Principal Elongations of the strain.

Remark. The preceding propositions and definitions are not limited to infinitely small strains, but are applieable to whatever extent the body niay be strained.

Prop. If a body, while experiencing an infinitely small strain, be held with one point fixed and the normal planes of the strain parallel to three fixed rectangular planes through the point O, a sphere of the solid of unit radius having this point for its eentre becomes, when strained, an ellipsoid, whose equation, referred to the strain-normals through O, is

(L—2.v)X? + (1—2y)¥? + (1—22)Z? = 1,

if x, y, z denote the elongations of the solid per unit of length, in the directions respeetively perpendicular to these three planes; and the position, on the surface of this ellipsoid, attained by any par- ticular point of the solid, is such that if a line be drawn in the tangent plane, half-way to the point of intersection of this plane with a perpendicular from the eentre, a radial line drawn through its extremity cuts the primitive spherical surface in the prinitive position of that point.

Cor. 1. For every stress, there is a certain infinitely small strain, and conversely, for every infinitely small strain, there is a eertain stress, so related that if, while the strain is being aequired, the centre and the strain-normals through it are unmoved, the absolute displacements of particles

belonging to a spherical surface of the solid represent, in intensity (aceording to a definite eonvention as to units for the representation' of foree by lines) and in direction, the foree (reckoned as to intensity, in amount per unit of area) ex- perieneed by the enclosed sphere of the solid, at the different parts of its surfaee, when subjected to the stress.

Cor. 2. Any strain is fully specified by six quantities, viz., its three prineipal elongations, and three angles (@, ¢, w), or nine

direction cosines, equivalent to three independent quantities speci- fying its axes,

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Def. 2. A stress and an infinitely small strain related in the manner defined in Cor. 1, are said to be of the same type. The ellipsoid by means of whieh the distribution of force over the sur- face of a sphere of unit radius is represented; in one case, and by means of whieh the displacements of particles from the spherical surface are shown in the other, may be ealled the geometrical type of either.

Cor, Any stress- or strain-type is fully specified by jive quantities, viz., two ratios between its principal strains or elongations, and three quantities specifying the angular position of its axes.

Cuarrer V.—Conditions of Perfeet Concurrence between Stresses and Strains.

Def. 1. Two stresses are said to be coincident in direction, or to be perfectly eoneurrent, when they only differ in absolute magni- tude. 'The same relative designations are applied to two strains differing from one another only in absolute magnitude.

Cor. If two stresses or two strains difler by one Leing reverse to the other, they may be said to be negatively coincident in direc. tion, or to be directly opposed or directly contrary to one another,

Def. 2. When a homogeneous stress is such that the normal component of the mutual force between the parts of the body on the two sides of any plane whatevcr through it is proportional to the augmentation of distance between the same plane and another parallel to it and initially at unity of distance, due to a certain strain experienced by the same body, the stress and the strain are said to be perfectly concurrent ; also to be coincident in direction. The body is said to be yielding directly to a stress applied to it, when it is acquiring a strain thus related to the stress; and in the same eircumstances, the stress is said to be working directly on the body, or to be aeting in the same direetion as the strain.

Cor. 1. Perfectly coneurrent stresses and strains are of the same type.

U5 2. If a strain is of the same type as the stress, its reverse will be said to be negatively of the same type, or to be directly opposed to the strain, A body is said to be working directly against a stress applied to it when it is acquiring a strain directly opposed to the stress ; and in the same eircumstances, the matter round the body is said to be yielding directly to the’ reactive stress of the body upon it.

Cuaprrer VI.—Orthogonal Stresses and Strains.

Def. 1, A stress is said to act right across a strain, or to act orthogonally to a strain, or to be orthogonal to a strain, if work is ucither done upon nor by the body in virtue of the action of the stress upon it while it is acquiring the strain.

Def, 2. Two stresses are said to be orthogonal when either coin- cides in direction with a strain orthogonal to the other.

Def. 3. Two strains are said to be orthogonal when either coin- eides in direction with a stress orthogonal to the other.

Laamples.—(1) A uniform cubical’eompression, and any strain involying no alteration of volume, are orthogonal to one another.

(2) A simple extension or contraction in parallel lines unaeeomp.nied by any transverse extension or contraetion, that’ is, “a simple longitudinal

strain," is orthogoual to any similar strain in lines at right angles to those parallels, '

(3) A simple longitudinal strain is orthogonal to a " simple tangenti:l strain" } in whieli the sliding is parallel to its direction or at right angles to it.

(4) Two infinitely small simple tangential strains in the same planc,2 with their direetions of sliding mutually inelined at an angle of 45°, are orthogonal to one another,

(5) An infinitely small simple taugential strain is orthogonal to every infinitely small simple tangential strain, in a plane eitlier parallel to its plane of sliding or perpendicular to its line of sliding.

Cuarrer VII.—Composition and Resolution of Stresses and of Strains.

Any rumber of simultaneously applied homogeneous stresses are equivalent to a single homogeneous stress which is ealled ther resultant. Any number of superimposed homogeneous strains are equivalent to a single homogeneous resultant strain. Infinitely small strains nay be independently superimposed ; and in what follows it will be uniformly understood that the strains spoken ol are infinitely small, unless the eontrary is stated.

Exramples—(1) A strain consisting simply of elongation in one set of paralicl lines, and a strain consisting of equal contraction in a direction at right angles Ble it, applied together, constitute a single strain, of the kind which that dese ibe in Example (3) of the preceding chapter is when infinitely small, and is called a plane distortion, or a simple distortion. It is also sometimes called a simple tangential strain, and when so considered, its plane of sliding may be regarded as either of the planes bisecting the angles between planes normal to the lires of the component longitudinal strains, : ;

(2) Any two simple distortions in one plane may be reduced to a single simple distortion in the same plane. ;

(3) Two simple distortions not in the same plane have for their resultant a strain which is a distortion unaceompanied by change of volume, and which

may be called a compound distortion, ee

(4) Three equal longitudinal elongations or eondensations in three directions

1 That is, a homogeneous strain in which all the particles in one plane remain fixcd, and other particles are displaced parallel to this plane. a.

2«The plane of a simple tangential strain,” or the plane of distortion in a simple tangential strain, is a plane perpendicular to that of the particles sup- posed to be held fixed, and parallel to the lines of displacement of the others.

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at right angles to one another are equivalent to a single dilatation or condensa- tion equal in all directions. The single stress cquivalent to three equal tensions

or pressures in directions at riglit angles to one another is a negative or positive pressure equal in all directions,

(5) If a certain stress or infinitely small strain be defined (Chapter III. Cor. 38, or Chapter IV.) by the ellipsoid (1+ A) X24 (1+ B)¥2+ (14+ C)Z?4 DYZ+EZX+FXY=1 “ and another stress or infinitely small strain by the ellipsoid! (1+A’)X2+(1+- BY Y2+ (14+C)Z24+-D’YZ+ E’‘ZN+P’XY=1, where A, B,C, D, E, F, &c., are all infinitely small, their resultant stress or styain is that represented by the cllipsoid

(14A-+A)X?+ (14+ B+B’)¥?2+(14+-C+092Z24 (D+ D9YZ+ (E+ E)ZX + (FLE)XY=1,

. CHarrer VIII.—Speeification of Strains and Stresses by their Components aceording to chosen T’ypes.

Prop. Six stresses or six strains of six distinct arbitrarily chosen types may be determined to fulfil the condition of having a given stress or a given strain for their resultant, provided those six types are so chosen that a strain

belonging to any one of them cannot be the resultant of any strains whatever belonging to the others.

For, just six independent parameters being required to express any stress or strain whatever, the resultant of any set of stresses or strains may be made identical with a given stress or strain by ful- filling six equations among the parameters which they involve ; and therefore the magnitudes of six stresses or strains belonging to the six arbitarily chosen types may be determined, if their resultant be assumed to be identical with the given stress or strain.

Cor, Any stress or strain may be numerically specified in terms of numbers expressing the amounts of six stresses or strains of six arbitrarily chosen types which have it for their resultant.

Types arbitrarily chosen for this purpose will be called types of reference. The specifying clements of a stress or strain will be called its components according to types of reference. The specifying elements of a strain may also be called its coordinates, with reference to the chosen types.

Examples,—(1) Six strains in cach of which one of; the six edges of a tetra- hedron of the solid is elongated while the others remain unchanged, may be used as types of reference for the specification of any kind of strain or stress. The ellipsoid representing any one of those six types will have its two circular

sections parallel to the faeces of the tetrahedron which do not contain the stretched side.

(2) Six strains consisting, any one of them, of an infinitely small alteration cither‘of one of the three edges, or of one of the three angles between the faces, of a parallelepiped of the solid, while the other five angles and edges remain un- changed, may be taken as types of reference, for the specification of either stresses or strains. In some cases, as for instance in expressing the probable elastie properties of a crystal of Iceland spar, it night possibly be eonvenient to use an oblique parallelepiped for such a system of types of reference; but more frequently it will be convenient to adopt a system of types related to the defor- mations of a cube of the solid,

Cuarrer IX.—Orthogonal Types of Reference.

Def. A normal system of types of reference is one in which the strains or stresscs of the different types are all’six mutually ortho- gonal (fifteen conditions). A normal system of types of reference may also be called an orthogonal system. The elements specify- ing, with reference to such a system, any stress or strain, will be called orthogonal components or orthogonal coordinates.

Eramples.—(1) The six types described in Example (2) of Chapter VIII. are clearly orthogonal, if the parallelepiped referred to is rectangular. Three of these are simple longitudinal extensions, parallel to the three sets of rectangu’ar edges of the parallelepiped. ‘The remaining three are plane distortions parallel to the faces, their axes bisecting the angles between the edges, ‘They constitute the system of types ot reference uniformly used hitherto by writers on the theory of elasticity.

(2) The six strains in which a spherical portion of the solid is changed into ellipsoids having the fullowing equations—

W1+A)X2+-Y24-72 =]

X24 (14+ B)Y¥24+72=1

X24 Y24 (14+C)Z2=1

X24 Y¥2+4-724 DYZ=1

N24 Y2—724 EZX=1

X24 ¥24224FXY=1) are of the same kind as those considered in the preceding example, and there- fore constitute a normal system of types of reference. The resultant of the strains specified, according to those equations, by the clements A, Bb, C, D, E, F,

is a strain in which the sphere becomes an ellipsoid whose equation—see above, Chapter VII. Ex. (5)—is

(1+A)X2+4 (14 B)Y¥2+4 (14+0)Z?4+ DYZ+EZX+FXY=1.

(8)! A compression equal in all directions (I.), three simple distortions hay- ing their planes at right angles to one another and their axes2 bisecting the angles between the lines of intersection of these planes (II.) (IIL) (IV.), any simple or compound distortion consisting of a combination of longitudinal strains parallel to those lines of intersections (V.), and the distortion (VI.), con- stituted from the same elements which is orthogonal to the last, afford a system of six mutually orthogonal types which will be used as types of reference below in expressing the elasticity of cubically isotropic solids. (Compare Chapter X. Example 7 below.)

1 This example, as well as (7) of Chapter X., (5) ofsXI., and the example of Chapter XII. are intended to prepare for the application of the theory of Principal Elasticities to cubieally and spherically isotropie boaies, in Part IL, Chapter XV. ; j

2 The ‘axes of asimple distortion” are the lines of iis two component longi- tudinal strains.

CHAPTER X.——On the Measurement of Strains and Stresses.

Def. Strains of any types are said to be to one another in the same ratios as stresses of the same types respectively, when any particular plane of the solid acquires, relatively to another plane parallel to it, motions in virtue of those strains which are to one another in the same ratios as the normal components of the forces between the parts of the solid on the two sides of either plane due to the respective stresses,

Def. The magnitude of a stress and of a strain of the same type are quantities which, multiplied one by the other, give the work done on unity of volume of a body acted on by the stress while acquiring the strain.

Cor. 1. If a, y, 2% & m, ¢ denote orthogonal components of a certain strain, and if P, Q, R, S, T, U denote components, of the same type respectively, of a stress applied to a body while acquiring that strain, the work done upon it per unit of its volume will be

Prt+Qy+Rz+SE+Ty+U%.

Cor. 2. The condition that two strains or stresses specified by

(x, y, 2% & m, ¢) and (a’, 9’, 2, &, 7’, ¢’), in terms of a normal system of types of reference, may be orthogonal to one another.is

aa ty +22 + EE + nn + Ce =0.

Cor. 3. The magnitude of the resultant of two, three, four, five, or six mutually orthogonal strains or stresses is equal to the square root of the sum of their squares. For if P, Q, &c., denote several orthogonal stresses, and F the magnitude of their resultant ; and x, y, &c., a set of proportional strains of the same types respectively, and r the magnitude of the single equivalent strain, the resultant stress and strain will be of one type, and therefore the work done by the resultant stress will be Fr. But the amounts done by the several components will be Px, Qy, &c., and therefore

- Fr=Px+Qy+é&e. Now we have, to express the proportionality of the stresses and strains, gs Q E

*=ée=-. e Y¥ , Each member must be equal to

P2 + Q2 4+ &e. . Px + Qy+ &e.’ and also equal to Pa + Qy ar ec: a+ y? + &e,°

F _ P2 + Q? + &. sate , Hence =e —=1 which gives F? = P? + Q? + &e. and _ =~

r 3p 927 wc. Which gives 7? = x2 + y? + &e.

Cor. 4. A definite stress of some particular type chosen arbi- trarily may be called unity; and then the numerical reckoning of all strains and stresses becomes perfectly definite.

Def. A uniform pressure or tension in parallel lines, amounting in intensity to the nnit of force per unit of area normal to it, will be called a stress of unit magnitude, and will be reckoned as positive when it is tension, and negative when pressure.

Examples.—(1) Hence the magnitude of a simple longitudinal strain, in which lines of the body parallel to a certain direction expcrience clongation to an ex- tent bearing the ratio x to their‘original dimensions, must be called x.

(2) The magnitude of the single stress equivalent to three simple pressures in directions at right angles to one another each unity is —,/3; a uniform com- pression in all directions of unity per unit of surface is a negative stress equal to ,/3 in absolute value.

(3) A uniform dilatation in all directions, in which lineal dimensions are aug- mented in the ratio 1:1 + 2, is a strain equal in magnitude to 24/3; or a uni-

a form ‘‘ cubie expansion” E is a strain equal to V3

(4) A stress compounded of unit pressure in one dieec‘ion and an equal tension in a direction at right angles to it, or which is the same thing, a stress com- pounded of two balancing couples of unit tangential tensions in planes at angles of 45° to the direction of those forces, and at right angles to one another amounts in magnitude to 4/2.

(5) A strain compounded of a simple longitudinal extension x, and a simple longitudinal condensation of equal absolute value, in a direction perpendicular to it, is a strain of magnitude x,/2; or, which is the same thing (if o =22z),a simple distortion such that the relative motion of two planes at unit distances parallel to cither of the planes bisecting the angles between the two planes mentioned above is a motion o parallel to themselves, is a strain amounting in

magnitude to o5 ‘

(6) If a strain be such that a sphere of unit radius in the body becomes{an ellipsoid whose equation is

(1 — A)X? ++ (1 — B)Y? + (1 ~ 0)Z2 — DYZ — EZX ~ FXY = ny

the values of the eomponent strains corresponding, as explained in Example (2 of Chap, IX., to the different coefficients respectively, are

D E F Ay RB RC, oS yy 4 +3 +4 a De Ba 22°

For the components corresponding to A, B, C are simple longitudinal strains, in which diameters of the sphere along the axes of coordinates become elongated from 2 to 2+ A,2+4 B, 2+ C respectively; D is a distortion in which diameters in the plane YOZ, bisecting the angles YOZ and Y'OZ, become respective y elongated and contracted from 2 to 2 – aD, and from 2 to 2 — 4D; and so fur

the others, Hence, if we take 2, 1,2, &, n, ¢ to denote the magnitudes of six

component strains, according to the orthogonal system of types described in Examples (1) and (2) of Chap. [X., the resultant strain equivalent to them will be one in which a sphere of radius 1 in the solid becomes an ellipsoid whose equa- tion is '

(1-24) X24 (1—2y)¥2+ (1 —22)Z?—-2 / AEYZ + nZX+ CXY) =1, and its magnitude will be

JY (a+ y? +224 E2424 C2).

(7) The specifications, according to the system of reference used in the pre- ceding Example, of the unit strains of the six orthogonal types defined in Example 3) of Chap. 1X. are respectively as follows :—

Sit |e Te iars (,) <5 a J, 0} 0! 0 (I) 1 eS Cet 2 Peer S (II1.) oi ole) ol oh 2 (IV.) Dh bat ah) eal, Bee (V.) ti m n 0 0 0 (VI) v m) wn 0 0 0

where J, m, n, i', m', n' denote quantities fulfilling the following conditions: — 2+m? +n? =1, 7 +m +n =0, W +mm'+nn'= 0, 124m'? +n/2=1, U +n' +r =0. (8) If (1—2eP)X?24(1—2eQ)¥2+4(1—2eR)Z?2— 2e4/2(SYZ+TZX+UXY) = 1 be the equation of the cllipsoid representing a certain stress, the amount of work done by this stress, if applied to a body

while acquiring the strain represented by the equation in the preceding example, will be Pe+Qyt+Rze+SE+Tn+UC. Cor. Hence, if variables X, Y, Z be transformed to any other set (X’, Y’, Z’) fulfilling the condition of being the coordinates of the same point, referred to

another system of rectangular axes, the coefficients x, y, 2, de, 7, Y,, 2, &e., in two homogeneous quadratic functions of three variables,

(1 — 2a) X24 (1 — 2y)¥2 + (1 — 22) Z2 — 24/2(EYZ-+4+nZX + (XY)

(1 — 2a) X24 (1—2y)¥®+ (1 — 22) 22-2 UE YZ-+n,ZX+¢,XY),

and the corresponding coefficients x’, y’, 2’, &c., 2, y’,, 2, &c., in these func- tions transformed to 2’, y’, 2’, will be so related that

ale byl y bed + EE ny FOC 0a, + yy, +22, + EE, +n, +6, 3

or the function xx,+ yy, +22, +€£,+nn,+CZ, of the coefficients is an “invariant” for linear transformations fulfilling the conditions of transformation from one to another set of rectangular axes. Since v-+y-+z2 and 2,+y,+2, are clearly in- variants also, it follows that AA,+BB,+CC,+2DD,+2EE,2FF, is an inyariant function of the coefficients of the two quadratics AX2-BY2+0Z2?4+2DYZ4+ 2EZX+2FXY

and A X2+BY24+C,Z?42D YZ+2E,ZX+2F,XY, which it is easily proved to be by direct transformation.

This is the simplest form of the algebraic theorem of invariance with which we are concerned,

and

CuaPreR XI.—On Imperfect Conewrrences of two Stress or Strain Types.

Def. The concurrence of any stresses or strains of two stated types is the proportion which the work done when a body of unit volume experiences a stress of either type, while acquiring a strain of the other, bears to the product of the numbers measuring the stress and strain respectively.

Cor. 1. In orthogonal resolution of a stress or strain, its com- ponent of any stated type is equal to its own amount multiplied by its concurrence with that type; or the stress or strain of a stated type which, along with another or others orthogonal to it, have a given stress or strain for their resultant, is equal to the amount of the given stress or strain reduced in the ratio of its concurrence with that stated type. |

Cor. 2. The concurrence of two coincident stresses or strains is unity; or a perfect concurrence is numerically cqual to unity.

Cor. 8. The concurrence of two orthogonal stresses and strains is zero.

Cor. 4. The concurrence of two directly opposite stresses or strains is — 1.

Cor. 5. If x, y, 2% & 1 ¢ are orthogonal components of any strain or stress 7, its concurrences with the types of reference are respectively

= &.

r

2 :

i] ro Y? ni eh a

e r T. & where r= (ty ++ Ett. Cor. 6. The mutual concurrence of two stresses or strains is

W +mm’ +nn! +d! + wp! + ov’,

if 7, m,n, A, mw, » dencte the coneurrences of one of them with

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six orthogonal types of reference, and 7’, m’, n’, d’, pw’, v’ those of the other.

Cor. 7. The most convenient specification of a type for strains or stresses, being in general a statement of the components, according to the types of

reference, of a unit strain or stress of the type to be specified, becomes a statement of its concurrences with the types of reference when these are orthogonal.

Lzamples.—(1) The mutual concurrence of two simple longitudinal straing or stresses, inclined to one another at an angle 0, is cos? 0.

(2) The mutual concurrence of two simple distortions in the same plane, whose axes are inclined at an angle to one another, is cos? —sin? 6, or 2 sin (45° — 0) cos (45° — 8).

Hence the components of a simple distortion 6 along two rectangular axes in its plane, and two others bisecting the angle between these taken as axes of component simple distortions, arc

O(cos? 6 — sin?) and 6.2 sin cos 0 respectively, if @ be the angle between the axis of elongation in the given dis- tortion and in the first component type.

(3) The mutual concurrence of a simple longitudinal strain and a simple dis- tortion is ;

/2.cos a cos f, if a and £ be the angles at which the direction of the longitudinal strain is inclined to the line bisecting the angles between the axes of the distortion; it is also equal to

a (cos? db — cos? Wy),

if ¢ and Wy denote the angles at which the direction of the longitudinal strain is inclined to the axis of the distortion. (4) The mutual concurrence of a simple longitudinal strain and of a uniform

‘ 1 dilatation is ve ©

(5) The specifying elements exhibited in Example (7) of the preceding Chapter are the concurrences of the new system of orthogonal types described in Example (3) of Chap. IX. with the ordinary system, Examples (1) and (2), Chap. IX,

Cuaprer XII.—On the Transformation of Types of Reference for Stresses or Strains.

To transform the specification (a, y, 2, t, n, ¢) of a stress or strain with reference to one system of types into (a, Wg, Ws, 4) Lys Xp) with reference to another system of types. Let (a, 0), ¢, ¢1, fis 91) be the components, according to the original system, of a unit strain of the first type of the new system; let (ag, bg, Ce, a, fo Gs) be the corresponding specification of the second type of the new system; and so on. Then we have, for the required formule of transformation—

LAA Lp AgLe+Aglg+AglytAsXs+Agag , Y = 0,2 + doMo+ b3H3 +b44+d5Xl5 +b6%¢ , GH Me +GoXotGalat Islet Gsls+9 gre. Example.—The transforming equations to pass from a specification (, ¥, 2 &, n, © in terms of the system of reference. used in Examples (6) and (7), Chapter X., to a specification (o, ©, n, ¢, , w)in terms of the new system

described in Example (3) of Chapter LX., and specified in Example (7) of Chapter X., are as follows :—

1

= gt te +Tw,

1 ,

y= Wart etm wy,

1

r= gr tna nw ’

F=f, n=n, C=o3 where, as before stated, 7, m, », i’,Yn’, n’ are by quantitics fulfilling the conditions 2+m?2 +n? =1, tim +n =0, Va4m/2 +n/2=1, Us+tm +n =0, i +nun’+nn’=0,

Parr I].—On tur DyNAMICAL RELATIONS BETWEEN STRESSES AND STRAINS EXPERIENCED BY AN ELAstic SOLID.

CHArTER XIII.—Jnterpretation of the Differential Equation of Energy.

In a paper on the Thermo-elastic Properties of Matter, published in the dre number of the Quarterly Mathematical Journal, April 1855, and republished in the Philosophical Magazine, 1877, second half year, it was proved, from general principles in the theory of the Transformation of Energy, that the amount of work (2) re- quired to reduce an elastic solid, kept at a constant temperature, from one stated condition of internal strain to another depends solely on these two conditions, and not at all on the cycle of varied states through which the body may have been made to pass In effecting the change, provided always there has been no failure in

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the elasticity under any of the strains it has experienced. Thus for a homogeneous solid homogeneously strained, it appears that is a function of six independent variables a, y, z, &, 7, G by whieh the condition of the solid as to strain is specified. Hence to strain the body to the infinitely small extent expressed by the variation from (x, y, 2, & 7, ¢) to (c+ dx, yt+dy, 2+dz, &+dt, n+dn, ¢+dQ), the work required to be done upon it is

dw dw dw dw

eg a a oe acs The stress which must be applicd to its surface to keep the body in equilibrium in the state (x, y, 2, &, 7, ¢) must therefore be such that it would do this amount of work if the body, under its action, were to acquire the arbitrary strain dx, dy, dz, di, dy, d¢; that is, it must be the resultant of six stresses:—one orthogonal to the five strains dy, dz, dt, dyn, d¢, and of such a magnitude as to do the

dw dw

dw work Tae when the body acquires the strain dx; a second or- thogonal to dx, dz, dt, dn, d¢, and of such a magnitude as to do w the work ay dy when the body acquires the strain dy; and so on.

If a, b, c, f, y, h denote the respective concurrences of these six stresses, with the types of reference used in the specification (z, y, 2, én, ¢) of the

strains, the amounts of the six stresses which fulfil those conditions will (Chapter XI.) be given by the equations

-ldw, g.1¢, pide

a dv b dy c dz’

1 dw ‘ 1 dw _1 dw, is =f cé Ts y dy ~h ae’

and the types of these component stresses are determined by being orthogonal to the fives of the six strain-types, wanting the first, the seeond, &c., respectively.

Cor. If the types of reference used in expressing the strain of the body eonstitute an orthogonal system, the types of the component stresses will coincide with them, and each of the coneurrences will be unity. Hence the equations of equilibrium of an elastie solid referred to six orthogonal types are simply

hwo dw dw oe” Uh? ee

dw we dW _ dw

a a U= dg

Cuarrer XIV.—Reduction of the Potential Function, and of {the ahi of Equilibrium, of an Elastic Solid to their simplest orms.

If the eondition of the body from which the work denoted by w is reckoned be that of equilibrium under no stress from withont, and if x, y, 2, & 7, ¢ be chosen each zero for this condition, we shall have, by Maclaurin’s theorem,

w=Ho(a, Y, 2, En, O+Hs@, % 2, &, 1, O+ &e.,

where H,, H;, &c., denote homogeneous funetions of the second : : lw di : order, third order, &c., respectively. Hence Pe aa &c., will each be a lincar function of the strain coordinates, together with func- tions of higher orders derived from H,, &c. But experience shows (section 37 above) that, within the elastic limits, the stresses are very nearly if not quite proportional to the

strains they are eapable of producing ; and therefore H,, &c., may be neglected, and we

have simply w= Tig(z, y, 2, = hh ¢).

Now in general there will be twenty-one terms, with independent coefficients, in this function; but by a choice of types of reference, that is, by a linear transformation of the independent variables, we may, in an infinite variety of ways, reduce it to the form

w= 3(Aa? + By? + C22 4+ VE2-+ Gy?-+ C2), The equations of equilibrium then become

a i, ee qk ey. ener a 6 C1 ee Tes, val 9 f gy h

the simplest possible form under which they can be presented. The interpretation can be expressed as follows.

Prop. An infinite number of systems of six types of strains or stresses exist in any given elastic solid such that, if a strain of any one of those types be impressed on the body, the elastic reaction is balanced by a stress orthogonal to the five others of the same system.

CHAPTER XV.—On the Six Principal Strains of an Elastic Solid.

To reduce the twenty-one coefficients of the quadratic terms in the expression for the potential energy to six by a linear transforma-

tion, we have only fifteen equations to satisfy ; while we have thirty disposable transforming coefficients, there being five independent elements to specify a type, and six types to be changed. Any further condition expressible by just fifteen independent equations may be satisfied, and makes the transformation determinate. Now the condition that six strains may be mutually orthogonal is ex- pressible by just as many equations as there are different pairs of six things, that is, fifteen. The well-known algebraie theory of the linear transformation of quadratic functions shows

for the case of six variables—(1) that the six coefficients in the reduced form are the roots of a ‘‘ determinant” of the sixth degree necessarily real ; (2) that this multiplicity of roots leads determinately to one, and only one system of six types fulfilling the prescribed conditions, unless two or more of the roots are equal to one another, when there will be an infinite number of solutions and definite degrees of isotropy among them; and (8) that there is no equality between any of the six roots of the determinant in general, when there are twenty-one independent coefficients in the given quadratic.

Prop. Hence a single system of six mutually orthogonal types may be determined for any homogeneous elastic solid, so that its potential energy when homogeneously strained in any way isexpressed by the sum of the products of the squares of the components of the strain, according to those types, respectively multiplied by six determinate coefficients.

Def. The six strain-types thus determined are called the Six Principal Strain-types of the body.

The coneurrences of the stress-components used in interpreting the differential equation of energy with the types of the strain- coordinates in terms of which the potential of elastieity is expressed, being perfeet when these constitute an orthogonal system, each of the quantities denoted above by @, b, ¢ f, g, h, is unity when the six principal strain-types are chosen for the coordinates. The equa- tions of equilibrium of an elastic solid may therefore be expressed as follows :—

iN S=me,

Q=By, T=Gy,

n= Cz; U=Hg,

where 2, ¥, 2%, & 7, (denote strains belonging to the six Principal Types, and P, Q, R, 8, T, U the components according to the same types, of the stress required to hold the body in equihbrium when in the condition of having those strains. The amount of work that must be spent upon it per unit of its volume, to bring it to this state from an unconstrained condition, is given by the equation

w=2(Aa®+ By? + C2+ FE? + Gry? + HQ),

Def. The cocfficients A, B, C, F, G, H are called the six Prin- cipal Elasticities of the body.

The equations of equilibrium express the following proposi- tions :—

Prop. Ifa body be strained according to any one of its six Prin- cipal Types, the stress required to hold it so is directly concurrent with the strain.

Examples—(1) Jf a solid be eubically isotropic in its clastie propertics, as erystals of the ewbical class probably are, any portion of it will, when subject toa uniform positive or negative normal pressure all round its surface, experience a uniform condensation or dilation in all directions. Ilenece a uniform econdensa- tion is one of its six principal strains. Three plane distortions with axes bisecting the angles between the edges of the cube of symmetry are clearly also principal strains, and since the threc corresponding principal elasticities are equal to one another, any strain whatever compounded of these three is a principal strain. Lastly, a planc distortion whose axes coincide with any two edges of the cube, being clearly a principal distortion, and the prineipal elasticities corresponding to the three distortions of this kind being equal to one anotlier, any distortion compounded of them is also a principal distortion.

Hence the system of orthogonal types treated of in Examples (3) Chap. IX., and (7) Chap. X., or any system in which, for (II.), (1I1.), and (IV.), any three ortho- gonal strains compounded of them are substituted, constitutes a system of six Principal Strains in a solid eubically isotropie, There are only three distinct Principal Elasticities for such a body, and these are—{A) its modulus of compres- sibility, (B) its rigidity against diagonal distortion in any of its principal planes (three equal elasticities), and © its rigidity against reetangular distortions of a cube of symmetry (two equal elasticities).

(2) In ‘a perfectly isotropic solid, the rigidity against all distortions is equal. Tience the rigidity (B) against diagonal distortion must be equal to the rigidity (C) against rectangular distortion, in a cube; and it is easily seen that if this condition is fulfilled for one set of three rectangular planes for

which asnbstance is isotropic, the isotropy must be complete. The conditions of perfeet or spherical isotropy are therefore expressed in terms of the conditions referred to in the pre- ceding example, with the farther condition B=C.

A uniform condensation in all directions, and any system whatever of five orthogonal distortions, constitute a system of six Principal Strains in a spheri- cally isotropic solid. Its Principal Elasticities are simply its Modulus of Compres- sibility and its Rigidity.

Prop. Unless some of the six Principal Elasticities be equal to one another, the stress required to keep the body strained other- wise than according to one or other of six distinct types is oblique to the strain.

Prop. The stress required to maintain a given amount of strain is a maximum or a maximum-miniimum, or a minimum, if it is of one of the six Principal Types.

Cor. If A be the greatest and H the least of the six quantities A, B, C, F, G, UW, the principal type to which the first corresponds is that of a strain requiring a greater stress to maintain tt than any

stress than any other strain of equal amount in the same body. The stresses corresponding to the four other principal strain-types have each the maximum-minimum property in a determinate way.

Prop. If a body be strained in the direction of which the coneur- renees with the principal strain-types are 1, m, 7, A, p, v, aud to an

amount equal to 7, the stress required to maintain it in this state

will be equal to 97, where = (A224 Bem? + C2n? + F8\24-G2 24 WZ)?

and will be of a type of which the concurrences with the principal

types are respectively Al Bm Cn FX Gu Hy 2″ O60 gO 10. Prop. A homogeneous elastie solid, crystalline or non-crystal- line, subject to

magnetic force or free from magnetie force, has

neither any right-handed or left-handed, nor any dipolar, properties

dependent on elastie forecs simply proportional to strains.

Cor. The elastie forees concerned in the luminiferous vibrations of a solid or fluid medium possessing the right- or left-handed property, whether axial or rotatory, such as quartz crystal, or tartarie acid, or solution of sugar, either depend on the heteroge- neousness or on the niagnitude of the strains experienced.

Hence as they do not depend on the magnitude of the strain, they do depend on its heterogeneousness through the portion of a mediwir containing a wave.

Cor. There cannot possibly bc any characteristic of elastic forces simply proportional to the strains in a homogeneous body, corre- sponding to certain peculiarities of erystalline form which have been observed,—for instanee corresponding to the plagiedral faces dis- eovered by Sir John Herschel to indicate the optical character, whether right-handed or left-handed, in different specimens of quartz erystal, or corresponding to the distinguishing characteristics of the erystals of the right-handed and left-handed tartarie acids obtained by M. Pasteur from racemic acid, or corresponding to the dipolar characteristies of form said to have been discovered in electric crystals.

Cuaprer XVI.—

It is easy to demonstrate that a body, homogeneous when regarded on a large scale, may be constructed to have twenty-one arbitrarily preseribed values for the eoefticients in the expression for its potential energy in terms of any prescribed system of strain co- ordinates. This proposition was first enunciated in the paper on the Thermo-elastic Properties of Solids, published April 1855, in the Quarterly Mathematical Journal alluded to above. We may infer the following.

Prop. A solid may be constructed to have arbitrarily preseribed values for its six Principal Elasticities and an arbitrary orthogonal system of six strain-types, specified by fifteen independent cle- inents, for its principal strains: for instance, five arbitrarily chosen systems of three rectangular axes, for the normal axes of five of the Principal Types ; those of the sixth consequently in general distinct from all the others, and determinate; and the six times two ratios between the three stresses or strains of each t pe, also determinate. The fifteen equations expressing (Chap. V1.) the inutual orthogonality of the six types determine the twelve ratios for the six jtypes, and the three quantities specifying the axes of the sixth type in the particular ease here suggested : or generally the fifteen equations determine fifteen out of the thirty quantities (viz. twelve ratios and eighteen angular coordinates) specifying six Prineipal Types.

Cor. There is no reason for believing that natural crystals do not exist for which there are six unequal Principal Elasticities, and six distinct strain-types for which the three normal axes constitute six distinet sets of three principal rectangular axes of elasticity.

It is easy to give arbitrary illustrative examples regarding Prin- cipal Elasticities: also, to investigate the prineipal strain-types and the equations of clastie foree referred to them or to other natural types, for a body possessing the kind of symmetry as to elastic forees that is possessed by a erystal of Iceland spar, or by a erystal of the ‘‘tesseral class,” or of the ineluded ‘cubieal class.” Such illustrations and developments, though proper for a students’ text book of the subject, are unnecessary here.

For applications of the Mathematical Theory of Elasticity to the question of the earth’s rigidity and elasticity as a whole, and to the equilibrium of elastic solids in gencral, which are beyond the seope of the present article, the reader is referred to Thomson and Tait’s Natural Philosophy, §§ 588, 740, 832, 849, and Ap- pendix C,

CuAPreR XVII.—Plane Waves in a Homogeneous Aolotropic Solid, A plane wave in a homogeneous elastic solid is a motion in which every line of particles in a plane parallel to one fixed plane ex-

He At TiC df By

other strain of equal amount; and the principal type to which the last corresponds is that of a strain which is maintained by a less

periences simply a motion of translation—but a motion differing from the motions of particles in planes parallel to the same. Let OX, OY, OZ be three fixed rectangular axes ; OX perpendicular to the wave front (as any of the parallel planes of moving particles referred to in the definition is ealled), and OY, OZ in the wave front. Let x+u, y+, 2+w be the coordinates at time ¢ of a par- ticle which, if the solid were free from strain, would be at (a, y, 2). The definition of wave motion amounts simply to this, that U,V, Ww are funetions of and ¢.

The strain of the solid (Chap. VII. above) is the resultant of a

simple longitudinal strain in the direction OX, equal to

two differential slips dv

au dx? and

om parallel to OY and OZ, constituting

simple distortions, of which the numerical magnitudes (Chap. X.) are

a, and 04/3. dc Put then du dv dw i == I= pats I= CT he) Ll): dx g ne i Teale § (1);

and let W denote the work per unit of bulk required to produce the strain represented by this notation. We have (Chap. XV.)

W=} (AE? + By? +CV-+2Dy0 + 2EVE+2FEn) « . . (2),

where A, B, ©, D, E, F denote moduluses of elasticity of the solid. Let p, g, r denote the three components of the traction per unit area of the wave front. We have (Chap. XV.) p=AE+En E e/a IC Be Os a t/t =KE Dy + CK Now let & 7, ¢ be taken such that AE+Fn+ E(=ME SMe Gite 7c ss 2 0 + ee EE +Dn+CY=MQj the determinantal cubic gives three real positive values for M, and with M ae to any one of these valnes, (4) determine the ratios

(3),

E:m:¢. Hence when the solid is strained in any one of the three ways thus determined we have du dv cho =M_— =M— r= re 4 dx’ = dx’ ~ dz 6)

The three components of the whole force due to the tractions on the sides of an infinitely small parallelepiped 8x, dy, 3: of the solid are elearly (Win dq que Gisere e 6x. 6y0z , = ox.dyoz, and Ps ad f . (6), and therefore, if p be its density, and consequently p3z dy Sz its inean, the equations of its motion are d?u «dp dv ~ dq (wo dr ze Pyamde Pedr Paede ° + – @

These, putting for p, g, r their values by (5), beeome

du dtu d?y dy a2 dt Pde” aa Pae—Nagr eq@=Mage + + + @ And by (4) and (1) we have Au+(Fu+Ew)./2=Mu Fu (Bo Dw)/2= Mva/2 \ Lu + (Dv+Cw) /2=Mw,/2 Let M,, M,, M3 be the three roots of the determinantal cubic, and 5, ¢; 6, C2; 03, ¢3, the corresponding values of the ratios «, ~ determined by (9). The complete solution of (8), subject to

(9), is

Bo (DS

=U, +Ug+ug VY =by tty +dotte+bgttg 1 =Cy lly +Cotlg +Cgttg M, M, my =A(2+ty-— +F, (2-1/1) ie 1p

y= tatty”) +F, (2-1)

as =fa(etev”?) oF (s-1/™2)

Jv Fi, fos Fos far Fy denoting arbitary functions. Hence we con- elude that there are three different wave-velocities,

ven ; My Fs , p p’” p and three different modes of waves, determined by equations (9).

where « « tO);

Waves in an Isotropic Solid.—If the solid be isotropic, we have B=C D=E=F=0 oo M,=A, Moa=M,=B

» (I)

ELA—ELB

Hence, instead of three different waves with different velocities, we have just two,—a wave (like that of sound in air or other elastic fluid) in which the motions are perpendicular to the wave front, and the other (like the waves of light in an isotropic medium) in whieh the motions are parallel to the wave front.

Waves in an Incompressible Solid (Aolotropic or Isotropic).—If the solid be incompressible, we have A= oo, and w must be zero.

Hence W=Br?+CC+2Dn¢; and by a determinantal quadratic, instead of cubie, we find two wave-velocities and two wave-modes, in each of which the motion

is parallel to the wave front. In the case of isotropy the two wave velocities are equal.

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It is to be noticed that M,, M,, M, in the preceding investigation are not generally true ‘* principal moduluses,” but special moduluses corresponding to the particular plane chosen for the wave front. In the partieular case of isotropy, however, the equal moduluses M,, M, of (11) are principal moduluses, being each equal to the modulus of rigidity, but M, is a mixed modulus of compressibility and rigidity—not a principal modulus. In the case of incompressi- bility, the two moduluses found from the determinantal quadratic by the process indicated above are not principal moduluses gene- rally, because the distortions by the differential motions of planes of particles parallel to the wave front must generally give rise to tangential stresses orthogonal to them, which do not influence the wave motion, (W. TH.)

ELATERIUM, a drug consisting of a sediment deposited by the juice of the fruit of Acbaliwm Hlaterium, the squirt- ing cucumber (see vol. vi. p. 688.) To prepare it, the fruit is sliced lengthwise and slightly pressed ; the greenish and slightly turbid juice thus obtained is strained and set aside ; and the deposit of elaterium formed after a few hours is collected on a linen filter, rapidly drained, and dried on porous tiles at a gentle heat. laterium is met with in commerce in light, thin, friable, flat or slightly incurved opaque cakes, of a greyish-green colour, bitter taste, and tea-like smell. The best kind is the English, prepared at Hitchin, Market Deeping, Mitcham, and else-

where ; the Maltese is generally very inferior, Elaterium is an exceedingly powerful hydragogue and drastic

purgative, and not unfrequently produces vomiting. Its active principal is elaterin, a crystallizable body of the formula C.,H,,0,.

ELBA, the AiaAia of the Greeks, and Ilva of the Romans, is an island in the Mediterranean Sea, forming part of the Italian province of Livorno, and lying about 6 miles from the mainland of Italy, from which it is separated by the channel of Piombino, and about 34 miles E. of Corsica. It has a very irregular coast outline, is 18 miles long and 24 to 103 miles broad, and has a total area of nearly 90 square miles. It is throughout mountainous, and the highest point, Monte Capanne, is 2925 feet above sea-level. The western portion of the island is granitic, the eastern consists mainly of the sandstone locally known as verrucano, which in some places passes into a tale slate. In the vicinity of Porto Ferrajo the hills are cretaceous. The climate is mild, and, except at some spots on the coast, healthy. Springs are numerous, and the soil is not infertile; but agriculture and cattle-rearing are neglected, and_ there are no manufactures. Wine, wheat, aloes, dyer’s lichen, and olives and other fruits are produced. The sardine and tunny fisheries, and the manufacture of sea-salt are of some importance; but the principal industry is mining. The iron mines are mostly in the vicinity of Rio Inferiore, and yield abundance of ore, chiefly hematite, of excellent quality. On account of the lack of fuel the ore is not smelted on the island, but is shipped direct to Follonica on the neighbouring coast of Italy, and to the ports of France and England. Marble, alabaster, sulphur, and ores of tin, lead, and silver are

among the other mineral products. The principal places in Elba are the chief town Porto Ferrajo, with about 5000 inhabitants, the residence of Napoleon from May 4, 1814, to February 26, 1815, Rio Ferrajo, San Pietro, Porto Longone, and the village of Capoliveri. The population of the island in 1871 was 21,755.

nauts, in quest of Circe, are said to have loaded at ao ae aes now Porto Ferrajo, in Elba. The island was early famous for the richness of its mincs, alluded to by Virgil (xn. x. 178). Itwas attacked by Phayllus with a Syracusan fleet, 453 3.c., and subsequently by Apelles, who is stated to have subjugated it. In the 10th century it became a possession of the Pisans, from whom it was taken by the Genoese in 1290. It fell

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eventually into Spanish hands, came in 1736 under the jurisdiction of Naples, and in 1801 was ceded to the king of Etruria by the treaty of Lunéville. It was united to France in 1808, made over to Napoleon by the Treaty of Paris in 1814, restored to Tuscany in the following year, and in 1860 annexed to Italy.

ELBE, the Albis of the Romans and the Labe of the Bohemians, a large river of Germany, with a total length of 705 miles, and a drainage area of about 55,000 square miles. It rises in Bohemia not far from the frontiers of Silesia, on the southern side of the Riesengebirge or Giants' Mountains, in 50° 46' N. lat. and 15° 32' E. long. Of the numerous small streams (Seifen or Flessen, as theyare named in the district) whose confluent waters compose the infant river, the most important are the Weisswasser, or White Water, and the Elbseifen ; the former rises to the 8.W. of the Schneekuppe in the White Meadow, and the latter in a stone fountain in the Elb Meadow. Augmented successively by the Adler, the Iser, the Moldau, and the Eger, it cuts its way through the Mittelgebirge of Bohemia, traverses the sandstone mountains of Saxon Switzerland, and with a general N.W. direction continues to meander through Saxony, Anhalt, and Hanover, until at length it falls into the German Ocean about 53° 5' N. lat. and 8° 50' E. long. The principal towns on its banks are Leitmeritz, Pirna, Dresden, Meissen, Torgau, Wittenberg, Magdeburg, Witten- berge, Harburg, Hamburg, and Altona.

Formerly 3 entrepots (Pirna, Dresden, and Magdeburg), 35 tolls, and numerous corporations of privileged watermen, opposed almost insurmountable obstacles to the navigation ; the Austrians and the Saxons alone could navigate the Upper Elbe, that is, from Magdeburg to where it ceases to be navigable, and the Prussians aud Hamburgers had the sole privilege of navigating the Lower Elbe. But new regulations were introduced by a convention con- cluded! on the 138th June 1821 between all the bordering states, viz., Austria, Saxony, Prussia, Hanover, Denmark (for Holstein and Lauenburg), the grand duchy of Mecklenburg-Schwerin, and the three principalities of Anhalt. Every merchant, to whatever bordering state he might belong, was allowed with his own vessel and crew to navigate the whole course of the river without interruption ; the 35 tolls were reduced to 14; the heavy dues which were levied upon goods of the jfirst necessity were reduced to one for the cargo (Elbe Toll) and another for the ship (Recognt- tionsgebiihrer) ; and each state was bound to watch over the portion of river which passed through their territories, and to preserve it from everything injurious to commerce or navigation. It was also arranged that a commission should meet from time to time for the revision of the tariff, &c., and the investigation of all matters connected with the utilization of the river. By the second of these commissions, which met at Dresden in 1842, an additional Naviga- tion Act was published in 1844; in the third, at Magdeburg in 1850, it was proposed by Austria to remove the Elbe tolls altogether, but Hanover and some other states refused ; in the fourth, at Ham- burg, 1858, the same objections still carried the day ; but in 1861 the fifth commission decided that only one common toll for all the riparian states should be left at Wittenberge ; and after numerous difficulties, the federative council of the German empire succeeded in securing the complete freedom of the river in 1870. A compensa- tion of 1,000,000 thalers was granted to Mecklenburg-Schwerin, and of 85,000 to Anhalt.

ELBERFELD, a manufacturing town of Rhenish Prussia in the government of Diisseldorf, situated in the narrow valley of the Wupper, about 19 miles E. of the town of Diisseldorf on the Berg and Mark railway. Though for the

most part of modern erection, it has a large number of irregular and narrow streets, and altogether presents rather an unprepossessing appearance ; the very river, polluted as it is with the refuse of dye-works and factories, rather

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Plan of Elberfeld,

1. Post Office. 6. Catholic Church. 2. Townhouse. 7, Hospital.

3. Evangel. Luth. Church. 8. Gasworks.

4. Evangel. Reformed Church. 9. Poorhouse,

5. Barracks, 10. Old Market,

increasing the unseemliness. The newer quarters, however, must be excepted from this description, and many of the public buildings are large and handsome. Of these the most important are the town-house, in the modern Romanesque style, the provincial court, the exchange, the post office, the orphanage, the lunatic asylum, St Joseph’s hospital, the infirmary, the Female Society’s hospital, the railway company’s offices, the gymnasium, and the technical school. The educational institutions include 27 popular schools where no fees are paid, and the whole system of relief

for the poor is so well arranged that it has excited imitation in several towns in Germany. A great variety

of textile fabrics in cotton, wool, and silk are manufactured on an extensive scale ; and besides dye-works and chemical works of proportionate importance, there may be mentioned button-factories, lace-factories, a brewery, a foundry, and soap-works, The town is the seat of a considerable number of industrial, philanthropic, intellectual, and religious institutions, among which the most noticeable are the public library, the museum, and the Berg Bible Society. The inhabitants are mainly Protestants, with a strong tendency towards pietism ; but the Roman Catholics number upwards of 14,000, and the Jewish community has recently erected a new synagogue. The Hlberfelder Zeitung and several other newspapers are published in the town. In 1840 the population was 31,514; in 1864, 63,300; and in 1875, 80,599.

The site of Elberfeld was marked in the 12th century by a castle belonging to the lords of Elverfeld, which was afterwards united with the Berg possessions, and held by the family of Nesselrode ; but it was not till the 16th century that the nucleus of the present industrial development was formed by the establishment on the banks of the Wupper of a number of bleachers, who obtained a monopoly in 1532. Municipal rights were granted in 1610, a great increase of the manufactures effected in the beginning of the 18th century, silk-weaving introduced in 1760, and the dyeing of Turkey red commenced in 1780. .

See Coutelle, Elbenfeld, topographisch-statistische Darstellung, EYberfeld, 1853; Langewiesche, Elberfeld und Barmen, Barimen, 1863.

ELBEDF, a town of France in the department of Seine Inférieure, 13 miles 8. of Rouen, on the left bank of the Seine, with a station on the railway between Oissel and Serquigny. It has three parish churches, a Protestant place of worship, a town-house with a natural history museum, a public library, a hospital, an industrial society, an archeological society, and a chamber of arts and sciences. The churches of St Etienne and St Jean are both of some antiquity, and preserve stained glass of the 15th and 16th

centuries. The town is one of the principal seats of the woollen manufacture in France: more than half of the inhabitants are directly maintained by the staple industry, and numbers more by the auxiliary crafts. As a river-port it has a brisk trade in the produce of the surrounding district as well as in the raw materials of its manufactures. A suspension bridge communicates with St Aubin, and steam-boats ply regularly to Rouen. The population, which was only about 4600 in the end of last century, amounted in 1831 to 10,258, and in 1872 to 22,563. If the quasi- suburban towns of Caudebec-lés-Elbeuf, Saint-Pierre-lés- Elbeuf, and St Aubin-jouxte-Boulleng be included, this great industrial congeries will comprise upwards of 39,000 inhabitants.

Elbeuf is an old town, and the site was probably occupied during the Roman period. In the 14th century it was made a countship, and in 1554 it passed by marriage to Duke René of Lorraine. By King Henry III. it was raised to the rank of a duchy in favour of Charles, grandson of Claude of Lorraine, but the dukes of Elbeuf made no figure in history, and in 1763 the title passed to the house of Harcourt. The town and its industries were greatly patronized by Colbert ; but the revocation of the Edict of ‘Tathan soon after neutralized the beneficial effects of his regulations, and it was not till 1814 that the removal of Belgian competition gave the new impetus which is still at work. In that year there were 80 factories producing goods to the value of 25 millions of francs ; in 1840 the factories numbered 200, and the value of the goods amounted to 40 or 45 millions.

ELBING, a seaport town of Prussia, at the head of a circle in the government of Dantzig, 36 miles E.S.E. of the city of that name, on the Elbing, a small river which flows into the Frische Haff about four miles from the town, and is united with the Nogat or eastern arm of the Vistula by means of the Kraffohl canal. The old town was formerly surrounded by fortifications, but of these only a few fragments remain. There are seven Evangelical, one Roman Catholic, and two Mennonite churches, a synagogue, a gymnasium founded in 1536, with a public library of

22,000 volumes, an orphan-asylum, several hospitals, and numerous charitable institutions. Of these last a number owe their existence to the bequests of an Englishman, Richard Cowle, who settled in the town in 1810

and died at Dantzig in 1821. The manufacturing industry is extensive and varied, producing, among the rest, iron goods, iron ships, and machinery, sail-cloth, woollen cloth, leather, paper, tobacco, starch, vitriol, and vinegar; and the transit trade has received a considerable increase by the opening of the Overland canal (1846-1861).

The existence of Elbing is due to a colony of Liibeck traders who settled under the protection of the castle of the Teutonic Knights in 1237. Invested with the Liibeck rights, and afterwards admitted into the Hanseatic confederation, the settlement was highly prosperous, and in 1335 greatly extended its limits by laying outa New Town. In 1434 it paid allegiance to Poland, and in 1454 was made the seat of a waiwode ; but in 1525 it was captured by Albert of Brandenburg, Grand Master of the Teutonic Order. After various vicissitudes, it came at last to Prussia in 1772— decadent and declining ; and its present prosperity is of quite recent date. Population in 1875, 33,572.

ELCHE, a town of Spain, in the province of Alicante, six miles from the sea, on the river Vinalapo. [t has three churches, as many monastic buildings, a hospital, barracks, and an old episcopal palace; but there is nothing of architectural interest except perhaps the portico of Santa Maria. The costume and physiognomy of the inhabitants, the narrow streets and flat-roofed white-washed houses, and more than all the thousands of palm-trees in its gardens and fields, give the place a strikingly Oriental aspect, and reuder it unique among the cities of Spain. The cultivation of the palm is indeed the principal occupation ; and though the dates are inferior to those of Barbary, the annual value of the crop is about £14,000. The blanched fronds are also sold in large quantities for the processions of Palm- Sunday ; and after they have received the blessing of the priest, they are regarded throughout Spain as certain defences against lightning.

Elche is identified with the ancient Ilici or Ilici of the Contestani, which under the Romans obtained the rank of a colony with the jus Italicum. In 1882 it was attacked by the Moors of Granada, ae pokes against it ‘‘iron balls through fire.” Population

»734.

ELDAD BEN MALCHI, also surnamed Ha-Dani, Abu- Dani, Daud-Ha-Dani, or the Danite, a Jewish traveller of the 9th century of the Christian era, chiefly interesting on account of the light (or darkness) which his writings throw on the question of the Lost Tribes. The date and place of his birth are not accurately known; but he was a native either of South Arabia or of Media. About 860 he set out with a companion to visit his Jewish brethren in Africa and Asia. 'Their vessel was wrecked, and they fell into the hands of cannibals ; but Eldad was saved from the inhuman fate of his comrade, first by his leanness and afterwards by the opportune invasion of a neighbouring tribe. He spent four years with his new captors, was ransomed by a fellow- countryman, continued his journey as far, according to one interpretation of his story, as China, spent several years at Kairwan in Tunis, and died on a visit to Cordova in Spain. The work which goes under his name is written in Hebrew, and consists of six chapters, probably abbreviated from the original form of the narrative. It was first printed at Constantinople in 1518 ; and the same recension afterwards appeared at Venice in 1540 and 1605, and at Jessnitz in 1722. A Latin version by Genebrard was published at Paris in 1563, under the title of Hldad Danius de Juders clausis eorumque in Aithiopia imperio, and was afterwards incorporated in the translator's Chronographia Hebreorum, a German version appeared at Prague in 1695, and another at Jessnitz in 1723, In 1838 M. Carmoly edited and trans- lated a fuller receusion which he had found in a MS. from the library of Eliezer Ben Hasan, forwarded to him

by Daud Zabach of Morocco. Both forms are printed by Dr Jellinek in his Beth-Ha-Midrash, vols. ii. and iii., Leipsic, 1853-55. One of the most curious passages in the work is the account of the Levites, who, says the author, were miraculously guided to the land of Havila, and are there protected from their enemies by the inystic river Sabbation, which on the Sabbath is calm and involved in delusive mists, and on the other days of the week runs with a fierce and fordless current.

See Bartolocwi, Bibliotheca Magna Rabbinica, vol. i.; Fiirst, Biblio- theca Judaica ; Graetz, Geschichte der Juden, vol. v.; Rossi, Dizionarto degli Ebrei ; and Kitto's Biblical Cyclopedia, 3d edition, sub nomine.

ELDER, the name of an office both in the Jewish and in the Christian church, which is used in modern times only by Presbyterians. As first applied, among the ancient Jews, for example, it had no doubt a literal fitness, indicating the responsibility and authority that naturally accrue in any community to those advanced in age. As the office gradu- ally came tu be fixed in its character and limited in the number of its occupants, the name lost something of its literal fitness, the responsibility and authority becoming attached to it without regard to the age of the occupant. In this respect the kindred terms alderman, senator, &c., have had a similar history. In the Old Testament usage of the word it is impossible to fix any exact point of time at which it passed from its primary or etymological to its secondary or official sense, as the process was a gradual one, and old age continued to be a leading qualification for the office long after it had ceased to be essential. In Exodus iii. 16 elders are mentioned as a recognized official body among the Israelites, and in subsequent notices (Ex. xix. 7; Ex. xxiv. 1; Deut. xxxi. 9) they appear as the represen- tatives of the whole body of the people. In Numbers xi. 16, 17, seventy elders, to be chosen out of the entire body, were set apart " to bear the burden of the people " along with Moses. It is unnecessary to enter here into any dis- cussion of the moot question of the connection of this Mosaic council of seventy with large though undefined legislative and executive powers with the Sanhedrim as it existed at the time of Christ. From the time of the institu- tion of the Mosaic council the elders are mentioned at each successive stage of Jewish history. After the settlement in Canaan they acted as the administrators of the laws in every city (Deut. xix. 11-12; xxi 3-9, 19 ; xxii. 15-21); and references to them are frequent during the period of the judges and the kings, during the captivity, and after the restoration. In the New Testament the word is used to denote both an order of the Jewish economy and an office of the Christian church. Its precise significance in the latter usage is the main subject in the standing contro- versy between Episcopalians and Presbyterians, and a state- ment of the arguments on either side belongs properly to the articles on Episcopacy and Presbytery respectively. Reference must also be made to the article on Presbytery for a full statement of the qualifications, duties, and powers of elders in a preskyterian church. It may be noted here that while the New Testament word presbyteros denotes, according to the admission of the adherents of all forms of church government, those especially set apart to the pastoral

office, whatever else it may be held to include, its English equivalent edder is used as an official designation only in the presbyterian church. According to the presby- terian theory of church government there are two classes of elders, teaching elders, or those set apart specially to the pastoral office, and raling elders, who are laymen, chosen generally by the congregation, and set apart by ordination to be associated with the pastor in the oversight and govern- ment of the church. When the word is used without any qualification, it is understood to apply to the latter class alone.

ELDER (Ang.-Sax. ellarn,; Ger. Holunder, Fr. surean), the popular designition of the deciduous shrubs and trees constituting the genus Sxwmucus of the natural order Caprifoliacee. The Black-berried or Common Elder, 8. nigra, the bourtree of Scotland, is found in Europe, the north of Africa, Western Asia, the Caucasus, and Southern Siberia ; in sheltered spots it attains a height of over 20 feet. The bark is smooth ; the shoots are stout and angular, and the leaves glabrous, pinnate, and generally oval or elliptical. The flowers, which form corymbose cymes, with five main branches, have a cream-coloured, gamopetalous, five-lobed corolla, five stamens, and three sessile stigmas; the berries are purplish-black, globular, and three- or four- seeded, and ripen about September. The elder thrives best in moist, well-drained situations, but can be grown in a great diversity of soils. It is propagated by young shoots, which after a year are fit for transplantation. It is found useful for making screen-fences in bleak, exposed situations, and also as a shelter for other shrubs in the outskirts of plantations. By clipping two or three times a year, it may be made close and compact in growth. The young trees furnish a brittle wood, containing much pith ; the wood of old trees is white, hard, and close-grained, and polishes well, and is employed for shoemakers’ pegs, combs, skewers, mathematical instruments, and turned articles. Young elder twigs deprived of pith have from very early times been in request for making whistles, popguns, and other toys.

The elder was known to the ancients for its medicinal properties, and in England the inner bark was formerly administered as a cathartic. The flowers (sambuci flores) contain a volatile oil, and are reputed to be

diaphoretic in properties; they serve for the preparation of an ointment (unguentum sambuct), and for the distilla- tion of elder-flower water (agua sambuct), used in confectionery, perfumes, and lotions. The leaves of the elder are employed to impart a green colour to fat and oil (unguentum sambuct foliorum and olewm viride), and the berries for making wine, a common adulterant of port. ‘The leaves and bark emit a sickly odour, believed to be repugnant to insects. Christopher Gullet (Phil. Trans., 1772, xii. p. 348) recommends that cabbages, turnips, wheat, and fruit trees, to preserve them from caterpillars, flies, and blight, should be whipped with twigs of young elder. Accord- ing to German folk-lore, the hat must be doffed in the presence of the elder-tree; and in certain of the English midland counties a belief was once prevalent that the cross of Christ was made from its wood, which should therefore never be used as fuel, or treated with disrespect (see Quart. Rev., cxiv. 233), It:was, however, a common medieval tradition, alluded to by Ben Jonson, Shakespeare, and other writers, that the elder was the tree on which Judas hanged himself ; aud on this account, probably, to be crowned with elder was in olden times accounted a disgrace. In Cymbeline (act iv. s. 2) “the stinking elder ” is mentioned asa symbol of grief. In Denmark the tree is supposed by the superstitious to be under the protection of the ‘‘Elder-mother :” its flowers may not be gathered without her leave ; its wood must not be employed for any household

furniture ; and a child sleeping in an clder-wood cradle would.

certainly bestrangled by the Elder-mother.

S. nigra virescens is a varicty of S. nigra having white bark and green-coloured berries ; some ornamental varieties have blotched leaves. ‘The Scarlet-berried Elder, §. racemosa, is the handsomest specics of its genus. It is a native of various parts of Europe, growing in Britain to a height of over 15 feet, but often producing no fruit. The Dwarf Elder or Danewort, S. Ebulus, a common European species, reaches a height of about 6 fect. Its cyme is hairy, las three principal branches, and is smaller than that of S. nigra; the flowers are of a dull purplish hue, All parts of the plant are cathartic and emetic.

ELDON, Joun Scort, Baron, and afterwards Earn oF (1751-1838), lord high chancellor of England, was born at Newcastle on the 4th June 1751. His grandfather, William Scott, of Sandgate, a suburb of Newcastle, was clerk to a “fitter ”””—a sort of water-carrier and broker of coals, His father, whose name also was William, began life as an apprentice to a fitter, in which service he obtained the freedom of Newcastle, becoming a member of the guild of Hoastmen ; later in life he became a principal in the business, aud attained a respectable position as a merchant in

Newcastle, accumulating property worth nearly £20,000 He was twice married ; his second wife, the mother of John Scott, says Lord Campbell (Lord Chancellors, vol. vii. p. 4), ‘‘was a woman of such superior understanding, that to her is traced the extraordinary talent which distinguished her two sons, William and John—-Lord Stowell and Lord Eldon.” It may be mentioned that William and John had each of them a twin sister. ote.

The boys were educated at the grammar school of their native town, where, however, they scarcely gave promise of the splendid careers which they were destined to run. Jolin Scott was not remarkable at school for application to his studies, though his wonderful memory enabled him to make good progress in them; he frequently played truant, and was whipped for it, robbed orchards, and indulged in other questionable school-boy freaks; nor did he always come out of his scrapes with honour and a character for truthfulness. When John had finished his education at the grammar school, his father thought of apprenticing him to lis own business, to which an elder brother Henry had already devoted himself ; and it was only through the in- terference of William, who bad already obtained a fellow- ship at University College, Oxford, that it was ultimately resolved that he should continue the prosecution of his studies. Accordingly, on the 15th May 1766, John Scott entered University College as a commoner, with the view of entering the church, and obtaining a college living, In the year following he obtained a fellowship, graduated B.A. in 1770, and in 1771 won the prize for the English essay, the only university prize open in his time for general com- petition. Itdoes not appear, however, that he

distinguished himself at college any more than he had done at school by any severe application to study. It was not till after his marriage that he first concentrated his energies on the con- genial study of law.

His wife was the eldest daughter of Mr Aubone Surtees, a Newcastle banker. John Scott first met her at Sedgefield Church, in the county of Durham, and a strong attachment sprang up between them. ~~The Surtees family objected to the match, and attempted to preveut it ; but the fire once kindled was not to be put out. On the 18th November 1772, Scott, with the aid of a ladder and an old friend, carried off the lady from her father's house in the Sandhill, across tle border to Blackshiels, in Scot~~ land, where they were married. The father of the bridegroom objected not to his son's choice, but to the time he chose to marry; for it was a blight on hisson's prospects, depriv- ing him of his fellowship and his chance of church prefer- ment. But while the bride's family refused to hold inter- course with the pair, Mr Scott, like a prudent man and an affectionate father, set himself to make the best of a bad matter, and received them kindly, settling on his son £2000. John returned with his wife to Oxford, and continued to hold his fellowship for what is called the year of grace given after marriage, and added to his income by acting as a private tutor. After a time Mr Surtees was reconciled with his daughter, and made a liberal settlement on her. John Scott's year of grace closed without any college living falling vacant; and with his fellowship he gave up the church, and turned to the study of law. He became a student at the Middle Temple in January 1773, and in February took his degree of M.A. at Oxford. In 1776 he was called to the bar, inteuding at first to establish himself as an advocate in his native town, a scheme which his early success led him to abandon, and he soon settled to the practice of his profession in London, and on the Northern Cireuit. Thus, at last, had he started on the high road to the chancellorship, having narrowly escaped becoming @ coal-fitter, a country parson, a provincial barrister, and,

accorling to one account, a retailer of figs and raisins.

ELDON

In the autumn of the year in which he was called to the bar his father died, leaving him a legacy of £1000 over and above the £2000 previously settled

on him. He was already an excellent lawyer, and succeeded fairly well on his first circuit, though not so well as to satisfy him of the safety of attempting a London career. He therefore took a house in Newcastle, with the view of establishing himself there, but, still delayed to leave London; and his prospects there suddenly improving, he assigned the Newcastle house to his brother,Henry. In his second year at thie bar his prospects began to brighten. His brother William, who by this time held the Camden professorship of ancient history, and enjoyed an extensive acquaintance with men of eminence in London, was in a position materially to advance his interests. Among his friends was the notorious Bowes of Gibside, to the patronage of whose house the rise of the Scott family was largely owing. Bowes having con- tested Newcastle and lost it, presented an election petition against the return of his opponent. Young Scott was re- tained as junior eounsel in the case, and though he lost the petition he did not fail to improve the opportunity which it afforded for displaying his talents. This engagement, in the commencement of his second year at the bar, and the dropping in of occasional fees, must have raised his hopes ; and he now abandoned the scheme of becoming a provincial barrister. A year or two of dull drudgery and few fees followed, and he began to be much depressed. But in 1780 we find his prospects suddenly improved, by his appearance in the case of Ackroyd v. Smithson, which became a leading case settling a rule of law; and young Scott, having lost his point in the inferior court, insisted on arguing it, on appeal, against the opinion of his clients, and carried it before Lord Thurlow, whose favourable con- sideration he won by bis able argument. The same year Bowes again retained him in an election petition; and in the year following Scott greatly increased his reputation by his appearance as leading counsel in the Clitheroe election petition. From this time his success was certain. In two years he obtained a silk gown, and was so far cured of his early modesty that he declined accepting the king’s counselship if precedence over him were given to his junior, Mr Erskine, though the latter was the son of a peer and a most accomplished orator. He was now on the high way to fortune. His health, which had hitherto been but indifferent, strengthened with the demands made upon it ; his: talents, his power of endurance, and his ambition all expanded together. He enjoyed a considerable practice in the northern part of his circuit, before parliamentary com- imittees, and at the Chancery bar, and was in sight of the honours and emoluments of the solicitor and attorney generalships. By

1787 his practice at the Equity bar had so far increased that he was obliged to give up the eastern half of his circuit (which embraced six counties), and attend it only at Lancaster.

. Shortly after taking the silk gown, he entered Parliament for Lord Weymouth's close borough of Weobley, which Lord Thurlow obtained for him without solicitation. In Parliament he gave a general and independent support to Pitt. His first parliamentary speeches were directed against Fox's India Bill. They were unsuccessful. In one he aimed at being brilliant; and becoming merely laboured and pedantic, he was covered with ridicule by Sheridan, from whom he received a lesson which he did not fail to turn to account. In 1788 Pitt conferred upon him the honour of knighthood and the office of solicitor- general ; and at the close of this year he attracted attention by his speeches in support of Pitt's resolutions on the state of the king (George III., who then laboured under a mental malady) and the delegation of his authority. It is s2id that he drew the Regency Bill, which was introduced

in 1789. In 1793 Sir John Scott was promoted to the office of attorney-general, in which it fell to him to conduct the memorable prosecutions for high treason against British sympathizers with French republicanism,—amongst others, against the celebrated Horne Tooke. These prosecutions, in most cases, were no doubt instigated by Sir Johu Scott, and were the most important proceedings in which he was ever professionally engaged. He has left on record, in his Anecdote Book, a defence of his conduct in regard to them. A full account of the principal trials, and of the various legislative measures for repressing the expressions of popular opinion for which he was more or less responsible, will be found in Twiss's Public and Private Life of the Lord Chancellor Eldon, and in the Lives of the Lord Chancellors, by Lord Campbell. In 1799 the office of chief-justice of the Court of Common Pleas falling vacant, Sir John Scott's claim to it was uot overlooked ; and after seventeen years' service in the Lower House, he entered the House of Peers as Baron Eldon. In Febrnary 1801, the ministry of Pitt was succeeded by that of Addington, and the chief-justice now ascended the woolsack. The chancellorship was given to him professedly on

account of his notorious anti-Catholic zeal. From the Peace of Amiens (1801) till 1804, Lord Eldon appears to have interfered little in politics. In the latter year we find him conducting the negotiations which resulted in the dismissal of Addington and the recall of Pitt to office as prime minister. Lord Eldon was continued in office as chancellor under Pitt ; but the new administration was of short duration, for on the 23d of January 1806 Pitt died, worn out with the anxieties of office, and his ministry was succeeded by a coalition, under Lord Grenville. The death of Fox, who became foreign secretary and leader of the House of Commons, soon, however, broke up the Grenville administration ; and in the spring of 1807, Lord Eldon once more, under Lord Liverpool's administration, returned to tlie woolsack, which, from that time, he con- tinued to occupy for about twenty years, swaying the Cabinet, and being in all but name prime minister of England. It was not till April 1827, when the premier- ship, vacant through the paralysis of Lord Liverpool, fell to Mr Canning, the chief advocate of Roman Catholic emancipation, that Lord Eldon, in the seventy-sixth year of his age, finally resigned the chancellorship. When, after the two short administrations of Canning and Goderich, it fell to the duke of Wellington to construct a Cabinet, Lord Eldon expected to be included, if not as chancellor, at least in some important office, but he was overlooked, at which he was much chagrined. Notwith- standing his frequent protests that he did not covet power, but longed for retirement, we find him again, so late as 1835, within three years of his death, in hopes of office under Peel. He spoke in Parliament for the last time in July 1834.

In 1821 Lord Eldon had been created earl by George IV., whom he managed to conciliate, partly, no doubt, by espousing his cause against his wife, whose advocate he had formerly been, and partly through his reputation for zeal against the Roman Catholics. In the same year, his brother William, who from 1798 had filled the office of judge of the High Court of Admiralty, was raised to the peerage under the title of Lord Stowell.

Lord Eldon's wife, his dear " Bessy," his love for whom is a beautiful feature in his life, died before him, on the 28th June 1831. By nature she was of simple character, and by habits acquired during the early portion of her husband's career almost a recluse. Two of their sons reached matnrity,

—John, who died in 1805, and William Henry John, who died unmarried in 1832. Lord Eldon himself survived almost all his immediate relations. His brother William died in 1836, He him

self died, in London, in his eighty-seventh year, on the 13th January 1838, leaving behind him two daughters, Lady Frances Bankes and Lady Elizabeth Repton, and his grandson, who succeeded him, ‘ When his remains lay in state in Hamilton Place,” says Lord Campbell, ‘large numbers of all classes went to see the solemn scene; and when the funeral procession, attended by the carriages of the princes of the blood, many members of the peerage, and all the dignitaries of the law, blackened the way, dense crowds stood uncovered, respectfully gazing at it as it passed.” His remains were interred in the family vault in the chapel of Kingston, in Dorsetshire. The fortune which he left behind him exceeded in amount half a million of money.

Lord Eldon was no legislator,—his one aim in politics was to keep in office, and maintain things as he found them; and almost the only laws he helped to pass were laws for popular coercion. For nearly forty years he fought against every improvement in law, or in the con- stitution,—calling God to witness, on the smallest proposal of reform, that he foresaw from it the downfall of his country. Without any political principles, properly so called, and without interest in or knowledge of foreign affairs, he maintained himsélf and his party in power for an unprecedented period by his great tact, and in virtue of his two great political properties—of zeal against every species of reform, and zeal against the Roman Catholics. To pass from his political to his judicial character is to shift to ground on which his greatness .is universally acknowledged. His judgments, which have received as much praise for their accuracy as abuse for their clumsi- ness and uncouthness, fill a small library. But though intimately acquainted with every nook and cranny of the English law, he never carried his studies into foreign fields, from which to enrich our legal literature ; and it must be added that against the excellence of his judgments, in too many cases, must be set off the hardships, worse than in- justice, that arose from his protracted delays in pronouncing them. A consummate judge and the narrowest of politicians,

he was Doubt on the bench and Promptness itself in the politicalarena. For literature, as for art, he had no feeling. What intervals of leisure he enjoyed from the cares of office he filled up with newspapers and the gossip of old cronies. Nor were his intimate associates men of refinement and taste ; they were rather good fellows who quietly enjoyed a good bottle and a joke ; he uniformly avoided emcounters of wit with his equals. He is said to have been parsimonious, and certainly he was quicker to receive than to reciprocate hospitalities ; but his mean establishment and mode of life are explained by the retired habits of his wife, and her dislike of company. His manuers were very winning and courtly, and in the circle of his immediate relatives he is said to have always been lovable and beloved. ‘“ He is one,” says Miss Martineau, “ that after times will not venerate ; but fortunately for the fame of the larger num-

ber of the great ones of the earth, there is a vast neutral ground between veneration and contempt.”

“Tn his person,” says Lord Campbell, “ Lord Eldon was about the middle size, his figure light and athletic, his features regular and handsome, his eye bright and full, his smile remarkably benevolent, and his whole appearance pre- possessing. The advance of years rather increased than detracted from these personal advantages, As he sat on the judgment-seat, ‘the deep thought betrayed in his fur- rowed brow,—the large eyebrows, overhanging eyes tliat seemed to regard more what was taking place within than around him,—his calmness, that would have assumed a character of sternness but for its perfect placidity,—his dignity, repose, and venerable age, tended at once to win confidence and to inspire respect’ (Townsend). He had a voice both sweet and deep-toned, and its effect was not injured by his Northumbrian burr, which, though strong, was entirely free from harshness and vulgarity.”

EL DORADO, that is, in Spanish, “The Golden,” a mythical country long believed to exist in the northern part of South America. The origin of the legend has been’ variously explained, some supposing that the micaceous quartz in the valley of the Essequibo was mistaken for gold ore, while others find the nucleus of the story in the fact that tle high-priest of Bogota’

was accustomed to sprinkle himself with gold dust, which was afterwards washed off in a neighbouring lake. It hardly seems necessary, however, to accept either or indeed any theory of explanation: the minds of the Spanish explorers had been dazzled by the wealth of their earlier conquests, and the most brilliant imagi- nation seemed to have a possibility of fulfilment. Martinez, a Spaniard, who had been set adrift on the sea, asserted that he was flung on the coast of Guiana, and conducted inland to a city called Manoa, which was governed by « king in alliance with the Incas, and lavished the precious metals on its roofs and walls. Orellana, who passed down the Rio Napo to the valley of the Amazon in 1540, also brought back an account of a land of fabulous wealth ; and Philip von Hutten, who led an exploring party from Coro, on the coast of Caracas, during the period from 1541 to 1545, believed he had caught sight of the golden splendours of the city of his search. In spite of the failure of expedition after expedition, and notably of that undertaken in 1569 by Gonzalo Ximenez de Quesada from Santa Fé de Bogota, the fable continued a potent allurement for adventurous spirits, and even in the beginning of the 17th century exerted a master-influence on the schemes of Sir Walter Raleigh. Traces of the pseudo-discoveries of Martinez and his compeers disfigured our maps till the time of Humboldt, who proved that the great lake of Parima to the east of Manoa was almost as fabulous as the city itself; and the name of El Dorado remains a permanent gain to our metaphorical vocabulary. Allusions more or less direct to the legend abound in European literatures, one of the most detailed being the well-known chapter in Voltaire’s Candide.

END OF VOLUME SEVENTH.

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ENCYCLOPAEDIA BRITANNICA

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DICTIONARY

‘ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME. Vijt

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ENCYCLOPZDIA BRITANNICA.

ELE-ELE

H LEANOR, of Aquitaine (1122-1204), queen of France

and afterwards of England, was the daughter of William IX., the last duke of Guienne, and was born in 1122. She succeeded her father in 1138, and was married the same year to Louis VII. of France. Her lively and somewhat frivolous manners, and her love of pleasure, did not fit her for the society of a husband who was naturally austere, and who from religious conviction had adopted many ascetic habits. They became gradually estranged, and in the Holy Land, whither she had accompanied Louis in 1147, their quarrels became so frequent and so bitter that at last a divorce was agreed upon, which on their _re- turn from France was completed under the pretext of kin- ship, 18th March 1152. Six months afterwards she gave her hand and her possessions to Henry of Navarre, who in 1155 mounted the throne of England as Henry II. That the duchy of Guienne should thus become permanently annexed to the English crown was naturally displeasing to Louis, and the indirect consequence of his displeasure was protracted wars between France and England. In other respects also the marriage had unhappy consequences. The infidelities of Henry, and the special favours he showed to one of his mistresses, so greatly roused Eleanor’s jealousy, that she incited her son Richard to rebellion, and also in- trigued with her former husband to get him to lend his in- fluence to the great league formed against Henry in 1173. Her son had fled to Louis, and she was preparing to follow him when she was arrested and placed in confinement, where she remained till the death of her husband in 1189. As soon as he died she regained her liberty, and reigned as regent until Richdrd’s arrival from France. She also held this position during Richard’s absence in the Holy Land, for which he left in 1190. After his escape in 1194 from the captivity which befell him as he was returning home, she retired to the abbey of Fontevrault, where she died April 1, 1204,

ELEATIC SCHOOL, a Greek school of philosophy, so called because Elea was the birth-place or residence of its chief representatives. Parmenides,

who was born at Elea probably about the year 515, was the first completely to develop the Eleatic doctrines; but his philosophy has a very close connection with that of Xenophanes, who was born more than a century earlier. Xenophanes, indeed,

has been described as the founder of the school, and though that title is with more strictness to be given to Parmenides, it may not incorrectly be applied to him. The philosophy of Xenophanes took its rise in a strong antagonism to the popular anthropomorphic mythology ; aud, though it con- tains part, it is far from containing the whole, of the Eleatic doctrine as maintained by Parmenides and his followers. Its chief doctrines were that “the One is God,” and that God is self-existent, eternal, unchangeable, immovable, of the same substance throughout, and in every respect incomparable to man.

The Eleatic philosophy is founded upon the doctrine of a complete severance and opposition of thought and sense. Truth is in no degree attainable by sense ; sense gives only false appearances, non-being: it is by thought alone that we arrive at the knowledge of being, at the great truth that “the All is One,” eternal, unchangeable; or rather, as Hegel rightly interprets the Eleatics, thought 7s being. No distinction is drawn by Parmenides between thought and material being; the “ One and All,” indeed, is described materially as a perfect and immovable sphere. The notions of creation, change and destruction, diversity and multipli- city, time and space, and the various sensations, are all mere false appearances of sense, which thought shows to be contradictory and false. Upon a very common con- fusion of the word exist with the verb to be, which does not necessarily imply existence, he founded his argument against the possibility of creation : creation cannot be, for being cannot arise out of non-being ; nor can non-being be. Again, there can be no difference or change except in appearance, for a thing cannot arise from what is different from it. But this side of the Eleatic argument was more completely developed by Zeno. In the second part of his poem, Parmenides, notwithstanding his assertion of their falseness, does offer an explanation of the facts of conscious- ness. Of this part of his theory, however, we have only very incomplete knowledge. It stands altogether distinct from his main doctrine. It is materialistic, like nearly all the other early Greek explanations of the universe. The universe (that is, the apparent universe) is, he says, made up of two elements, one of

which he describes as heat and light, the other as cold and darkness. Of these elements all men are composed, and their thinking varies as the proportions

in which these elements are mixed in their composition. Even the dead body feels cold and darkness.

Zeno, born in the beginning of the 2d century B.c., the fellow-townsman, disciple, and adopted son of Parmenides, is famous for his attempts to prove that the notions of time, space, motion, multiplicity, sight, sound, &c., are self- contradictory and unthinkable. His paradoxes were stated with a subtlety which has forced thinkers even of distinc- tion, who were opposed to his main position, for instance, Sir William Hamilton, to admit some of them to be un- answerable. Against motion Zeno directed several argu- ments, the most celebrated being that of Achilles and the tortoise, which are founded upon the confusion of that which is infinitely divisible with that which is infinite. Against space Zeno argued that any space, however large, must be in a larger space, this larger space again in a still larger, and so on ad infinitum. Against the manifold he argued (1) that the manifold, being divisible into the infinitely small, ¢.¢, into that which has no magnitude, can itself have none, as divisions that have no magnitude must make up a whole without magnitude ; and (2) that, being divisible into an infinite number of parts, it must be infinitely large. Against sound he argued—and he applied similar reasoning to sight—that, as you cannot hear a single grain of corn fall, you cannot hear the sound of a number of grains falling, the sound of the falling of the number of grains being made up of the sounds of the falling of each grain. Thus Zeno sought to prove that thought and sense are opposed, and that the latter, con- tradicting itself, proves itself unworthy of the consideration of the philosopher.

The last of the Eleatic teachers was Melissus of Samos, the friend of Heraclitus, who was probably born somewhat later than Zeno. We only possess fragments of his works, preserved by Simplicius and collected by Brandis. His modifications of the doctrines of his master, Parmenides, are

not important, with the exception of his assertion of the infinity, the unlimitedness, of “ the One and All,” and his distinct insistance upon the doctrine that the “ One and All” is immaterial, unextended, without parts.

See the separate articles XENOPHANES, PARMENIDES, and ZENO.

ELECAMPANE (M. Lat., Znula Campana), a perennial composite plant, the Znula Helentwm of Linnzeus, which is common in many parts of Britain, and ranges throughout central and southern Europe, and in Asia as far eastwards as the Himalayas. Its stem attains a height of from 3 to 5 feet ; the leaves are serrate-dentate, the lower ones stalked, the rest embracing the stem; the flowers are yellow, and 2 inches broad, and have many rays, each three-notched at the extremity. The root, the radix inulw of pharmacy, is thick, branching, and mucilaginous, and has a warm bitter taste anda camphoraceous odour. For medicinal purposes it should be procured from plants not more than two or three years old. Besides znulin, Cj,H 9049, a body isomeric with starch, the root contains, according to Kallen, two crystallizable substances—helenin, C,H,O, and alantcam- phor, C,,)H,,0. By the ancients the root was employed both as a medicine and as a condiment, and in England it was formerly in great repute as an aromatic tonic and stimulant of the secretory organs. ‘ The fresh roots of elecampane preserved with sugar, or made into a syrup or conserve,” are recommended by Parkinson in his Theatrum Botanicum as “very effectual to warm a cold and windy stomack, and the pricking and stitches therein or in the sides caused by the Spleene, and to helpe the cough, shortnesse of breath, and wheesing in the Lungs.” As a drug, however, the root is now seldom resorted to except in veterinary practice. In France and Switzerland it is used in the manufacture of absinthe,

ELECTIONS. The law of parliamentary and municipal elections in England is now governed as to procedure by the 35 and 36 Vict. c. 33 (the Ballot Act, 1872), and as to disputed returns by the 31 and 32 Vict. c, 125 (Par- liamentary Elections Act, 1868) and 35 and 36 Vict. c. 60. See Batior and BRIBERY.

The inquiry into a disputed parliamentary election was formerly conducted before a committee of the House of Commons, chosen as nearly as possible from both sides of the House for that particular business. The decisions of

these tribunals laboured under the suspicion of being prompted by party feeling, and by the above-named Act of 1868 the jurisdiction was finally transferred to Her Majesty's judges, notwithstanding the general unwillingness of the bench to accept a class of business which they feared might bring their integrity into dispute. In future no election shall be questioned except in accordance with the provisions of this Act. Section 11 of the Act orders, enter alza, that the trial of every election petition shall be conducted before a puisne judge of one of the common law courts at West-minster aud Dublin; that the said courts shall each select a judge to be placed on the rota for the trial of election petitions; that the said judges shall try petitions standing for trial according to seniority or otherwise, as they may agree; that the trial shall take place in the county ot borough to which the petition refers, unless the court should think it desirable to hold it elsewhere. The judge shall determine "' whether the member whose return is com- plained of, or any and what other person, was duly returned and elected, or whether the election was void," and shall certify his determination to the Speaker. When corrupt practices have been charged the judge shall also report (1) whether any such practice has been committed by or witli the knowledge or consent of any candidate, and the nature thereof ; (2) the names of persons proved to have been guilty of any corrupt practice ; and (3) whether corrupt practices have extensively prevailed at the election.

Questions of law may be referred to the decision of the Court of Common Pleas. The report of the judge is equivalent to the report of an election committee under the old system. Petitions may be presented by the follow-ing persons :—(1) some person who has voted or had the right to vote at the election; (2) some person claiming to have a right to be returned or elected; (3) some person alleging himself to have been a candidate. The trial of a petition shall be proceeded with notwithstanding the acceptance by the respondent of an office of profit under the Crown, and notwithstanding the prorogation of Parlia- ment ; though it would appear that the dissolution of Parliament abates a petition. The judge appointed to try a petition shall be received with the same state as a judge of assize in an assize town. The costs and expenses of the petition shall be paid by the parties in such manner

and such proportions as the court or judge may determine, \” N regard being had to the discouragement of needless expense * *

by throwing the burden thereof on the parties by whom it

chas been caused, whether they are on the whole successful

or not. When a returning officer has wilfully neglected to return a person found on petition to have been entitled to be returned, such person may sue the officer (within one year of the act complained of, or six months of the trial of the petition), and shall recover double the damage he has actually sustained, together with full costs of suit.

To meet the additional work imposed on the English courts of common law by this Act, power was given to appoint an additional judge to each of them. Section 58 applies the provisions of the Act, with certain modifications, to Scotland.

This, like the Ballot Act, is a continuing Act.

Petitions against municipal elections are dealt with in 35

Intro- duction.

Thales, 600 B.C.

Animal elec- tricity.

415 A.D.

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and 36 Vict. c. 60. The election judges under the last described Act appoint a number of barristers, not exceed- ing five, to try such petitions. No barrister can be appointed who is of less than fifteen years standing, or a member of Parliament, or holder of any office of profit (other than that of recorder) under the Crown; nor can any barrister try a petition in any borough in which he is recorder or in which he resides, or which is included in his circuit. The barrister sits without a jury. The provisions are generally

similar to those relating to parliamentary elections in the former Act. ‘The petition may allege that the election was avoided as to the borough or ward on the ground of general bribery, &c., or that the election of the person petitioned against was avoided by corrupt practices, or by personal disqualification, or that he had not the majority of lawful votes, And no election shall be questioned by any other process whatsoever for a matter for which it might have been questioned under this Act.

rae PRECITY

HE word Electricity is derived from the Greek word HAextpov, meaning amber. The term was invented by Gilbert,! who used it with reference to the attractions and repulsions excited by friction in certain bodies of which amber may be taken as the type. To the cause of these forces was given the name Electricity; and out of the study of these and kindred phenomei:a arose the science of electricity, of which it is the purpose of the present article to give a brief outline.

‘The science has been divided into three branches— Electrostatics, which deals with electricity at rest ; Hlectro- kinetics, which considers the passage of electricity from place to place; and Electromagnetism, which treats of the relation of electricity to magnetism. We shall, however, make no attempt to adhere to this division, but shall exhibit the different parts of the subject in such order and connection as seems most clear and natural in the present state of the science. For the sake of the non-scientific reader we prefix a brief history? of the science of elec- tricity, wherein mention is made of some of the more striking electrical discoverics and of the steps by which our knowledge of the subject has advanced to its present coudition.

HISTORICAL SKETCH.

The name of the philosopher who first observed that amber when rubbed possesses the property of attracting and repelling light bodies has not been handed down to our times. Thales of Miletus is said to have described this remarkable property, and both Theophrastus (321 z.c.) and Pliny (70 A.D.) mention the power of amber to attract straws and dry leaves. The same

authors speak of the lapis lyncurius, which is supposed to be a mineral called tourmaline, as possessing the same property. The electricity of the torpedo was also known to the ancients. Pliny informs us, that when touched by a spear it para- lyzes the muscles and arrests the feet, however swift; and Aristotle adds that it possesses the power of benumbing men, as well as the fishes which serve for its prey. The influence of electricity on the human body, and the elec- tricity of the human body itself, were also known in ancient times. Anthero, a freedman of Tiberius, was cured of the gout by the shocks of the torpedo; and Wolimer, the king of the Goths, was able to emit sparks from his own body. Eustathius, who records this fact, also states that a certain philosopher, while dressing and

1 De Magnete Magneticisque Corporibus.

2A portion of this historical sketch was written by Sir David Brewster, and formed the introduction to his article ‘‘ Electricity ” in last edition of the Encyclopedia. It has been modified by suppres- sions and alterations here and there, and by large additions at the end which were thought necessary to make it suit the present state of science, For the sake of the student in search of original sources of information, pretty copious reference to such has been added through- out. Valuable for information of this kind the student will find Riess’s Reibungselectricitét, Young’s Natural Philosophy, Wiede- mann’s Galvanismus, and the recent work on electricity by Prof. Mascart, of the Collége de France,

undressing, emitted occasionally sudden crackling sparks, while at other times flames blazed from him without burning his clothes. Such are the scanty gleanings of electrical knowledge which we derive from the ancient philosophy ; and though several writers of the Middle Ages have made occasional references to these facts, and even attempted to speculate upon them, yet they added nothing to the science, and left an open field for the researches of modern philosophers.

Dr Gilbert of Colchester may be considered as the Gilbert

founder of the science, as he appears to have been the first philosopher who carefully repeated the observations of the ancients, and applied to them the principles of philosophical investigation. In order to determine if other

bodies pos- sessed the same property as amber, he balanced a light metal-lic needle on a pivot, and observed whether or not it was affected by causing the excited or rubbed body to approach to it. In this way he discovered that the following bodies possess the property of attracting light substances :— amber, gagates or jet, diamond, sapphire, carbuncle, rock-crystal, opal, amethyst, vincentina or Bristol stone, beryl, glass, paste for false gems, glass of antimony, slags, belemnites, sulphur, gum-mastic, sealing-wax of lac, hard resin, arsenic, rock salt, mica, and alum. These various bodies attracted, with different degrees of force, not only straws and light films, but likewise metals, stones, earths, wood, leaves, thick smoke, and all solid and fluid bodies. Among the substances which are not excited by friction Gilbert enumerated emerald, agate, carnelian, pearls, jasper, calcedony, alabaster, porphyry, coral, marble, Lydian stone, flints, hematites, smyris (emery or corun- dum), bones, ivory, hard woods, such as cedar, ebony, juniper, and cypress, metals, and natural magnets. Gilbert also discovered that the state of the atmosphere affects the production of electricity ; dryness with north or east wind being a favourable condition, while moisture with south wind is unfavourable. An account of Gilbert's experiments will be found in his book De Magnete, lib. il. cap. 2.

(1540- 1603).

Robert Boyle added many new facts to the science Boyle of electricity, and he has given a full account of them in (1627-

his Experiments on the Origin of Electricity. . By means of a suspended needle, he discovered that amber retained its attractive virtue after the friction which excited it had ceased; and though smoothness of surface had been regarded as advantageous for excitation, yet he found a diamond which in its rough state exceeded all the polished ones and all the electrics which he had tried, having been able to move a needle three minutes after he had ceased to rub it. He found also that heat and ¢ersion (or the clean-ing or wiping of any body) increased its susceptibility of excitation; and that if the attracted body were fixed, and the attracting body movable, their mutual approach would still take place. To Gilbert's list of "electrics" Boyle added the resinous cake which remained after evaporating one-fourth part

of good oil of turpentine, the dry mass which remains after distilling a mixture of petroleum and

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Otto von Guericke

(1602- 86).

Newton

(1643- 1727).

Hawks- bee,

1705.

Stephen Gray

(1696- 1736).

4

strong spirit of uitre, glass of lead, caput mortuum of amber, white sapphire, white amethyst, diaphanous ore of lead, carnelian, and a green stone supposed to be a sapphire.

To these discoveries of Boyle his contemporary Otto von Quericke added the highly important one of electric light (Experimenta Nova Magdeburgica, lib. iv. cap. 15). Having cast a globe of sulphur in a glass sphere, and broken off the glass, he mounted the sulphur ball upon a revolving axis, and excited it by the friction of the hand. By this means he discovered that light and sound accom- panied strong electrical excitation, and he compares the light to that which is exhibited by breaking lump sugar in the dark. With this powerful apparatus Guericke verified on a greater scale the results obtained by his predecessors, and obtained several new ones of very considerable import- ance. He found that a light body, when

once attracted by an excited electric, was repelled by it, and was in- capable of a second attraction until it had been touched by some other body ; and that light bodies suspended within the sphere of influence of an excited electric possessed the same properties as if they had been excited.

To our illustrious countryman Sir Isaac Newton the science of electricity owes some important observations. He used in his electrical experiments a globe of glass rubbed by the hand instead of the sulphur globe of Von Guericke. It would appear that Newton was the first to use glass in this way (Optics, query 8th). We owe also to Sir Isaac a beautiful experiment on the excitation of elec- tricity which has since become very popular. Having fixed a round dise of glass in a short brass cylinder, he placed small pieces of thin paper within the cylinder and upon a table, so that the lower surface of the glass was one-eighth of an inch distant from the table. He then rubbed the upper surface of the glass, and he observed the pieces of paper “leap from one part of the glass to the other, and twirl about in the air.” This experiment, after a previous unsuccessful trial, was repeated by the Royal Society in 1676 (Brewster’s Life of Newton, p. 307).

Francis Hawksbee, one of the most active experi- mental philosophers of his age, added many new facts to the science. In 1705 he communicated to the Royal Society several curious experiments on what he calls “the mercurial phosphorus.” He showed that light could be produced by passing common air through mer- cury placed in a well-exhausted receiver. The air rushing through the mercury, blew it up against the sides of the glass that held it, “appearing all around like a body of fire, consisting of abundance of glowing globules.” The phenomenon continued till the receiver was half full of air. ‘These phenomena had been observed in the Torricel- lian vacuum before Hawksbee’s time, and various explana- tions suggested. He suspected that they were. due to electricity, and remarked their resemblance to lightning. Like Newton he used a revolving glass globe rubbed by the hand to generate electricity. Besides the experiment above alluded to he made many others on the electric light and on the attractions of electrified bodies. Descrip- tions of these will be found in his Phystco-Mechanical Hizperiments, 1709, and in several memoirs in the Philo- sophical Transactions about 1707.

About the same time Dr Wall (Phil. Trans., 1708) observed the spark and crackling sound accompanying the electrical excitation of amber, and compared them to thuuder and lightning.

One of the most ardent experimentalists of his time was Stephen Gray, a Fellow of the Royal Society. In his first paper, published in 1720, he showed that electricity could be excited by the friction of feathers,

hair, silk, linen, woollen, paper, leather, wood, parchment, and gold-beaters' skin. Several of these bodies exhibited light in the dark, especially after they had been warmed ; but all of them attracted light bodies, and sometimes at the distance of eight or ten inches. An epoch was made in the history of electricity by the discovery of Gray in 1729, that certain bodies had, while others had not, the power of conveying electricity from one body to another, 2.e, in modern phrase, conducting it. Gray experimented with a glass tube, into the ends of which were fastened two corks ; into one of these he fastened a fir rod, and to the end of the rod an ivory ball. On rubbing the glass he found that the ball attracted the light bodies as vigorously as the glass itself. He made a variety of experiments with rods of different length, and with a packthread, by which he suspended his ball from the balcony of an upper story of his house, all with the same result. He then attempted to carry the electricity horizontally on a packthread which he suspeuded with hempen strings; but the experiment failed. On the occasion of a repetition of the experiments at the house of his friend Wheeler, silk strings were suggested as a support, and found to answer, while metal wires failed. Gray and Wheeler were thus led to the con- clusion that it was the material of the supports that was in question, and that whereas packthread had, silk had not the power of transmitting electricity to a distance. Gray and Wheeler managed, by supporting a packthread by silk loops, to convey electricity from a piece of rubbed glass to a distance of 886 feet. The con- ducting power of fluids, and of the human body, was established by Gray. He also made many curious experi- ments on the electrical properties of

resinous cakes, which he allowed to cool and harden in the ladles in which they had been melted. For an account of these and others the student is referred to memoirs in the Philosuphical Trans- actions for 1731, 1735, &c.

Desaguliers made many experiments confirming Gray's Desagu conclusions, and found that bodies that have the property liers.

of being electrically excitable by friction, or electrics per se, have not the power of conduction; whereas conductors are not electrics per se. These terms, introduced by him, were useful in bringing into concise and scientific language the discoveries of Gray.

While Gray was pursuing his career of discovery in Dufay

England, M. Dufay, of the Academy of Sciences, and su- (1699-

perintendent of the Royal Botanic Gardens, was actively 1789).

employed in the same researches. He found that all bodies, whether solid or fluid, could be electrified by an excited tube, by setting them on a glass stand slightly warmed, or only dried; and that those bodies which are in themselves least electrical received the greatest degree of electricity from the approach of the glass tube. He repeated the ex- periments of Gray, confirming his results, and found that electricity was transmitted more easily along packthread when it was wetted, and that it might be supported upon glass tubes in place of silk lines. In this way he conveyed it along a string 1256 feet long. He suspended by silken strings and electrified a child as Gray had done ; and hav- ing suspended himself in a simila® manner, he discovered that an electrical spark, accompanied with a crackling noise, took place when any other person touched him, and he has described the prickling sensation like the burning from a spark of fire, which is at the same time felt either through The great discovery of Dufay, however, was that of two different kinds of electricity.

He fully recognized the importance of this fundamental vitreous fact, and gave the name of witreous electricity to that which and is produced by exciting glass, rock-crystal, precious stones, Tesinous:

of resinous to that which is produced by exciting resinous

hair of animals, wool, and many other bodies ; and the name ae

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sudden shock in his arms and breast, and thus established

HISTORY. |

hodies, such as amber, copal, gum-lac, silk, paper; thread,

and a number of other substances. The characteristic of | the efficacy of the Leyden jar. those two electricities was, that a body with vitreous elec- Sir William Watson made some important experiments Sir Wm. tricity attracted all bodies with resinous electricity, and | at this period of our history (Memoirs in Phil. Trans. Watson repelled all bodies with vitreous electricity; while a body | about 1747). He succeeded in firing gunpowder by the oe with resinous electricity attracted all bodies with vitreous | electric spark ; and by mixing the gunpowder with a little i electricity, and repelled all bodies with resinous electricity. | camphor he discharged a musket by the same power. He Two electrified silk threads, for example, repel each other, | also fired hydrogen by the electric spark; and he kindled and also two electrified woollen threads, but an electrified | both spirits of wine and hydrogen by means of a drop silk thread will attract an electrified woollen thread. Hence | of cold water, and even with ice. In the German experi- it is easy to determine whether any body possesses vitreous | ments the fluid or solid to be inflamed was set on fire by or resinous electricity. If it attracts an electrified silk | an electrified body ; but Sir William Watson placed the thread, its electricity will be vitreous ; if it repels it, it will | fluid in the hands of an electrified person, and set it on fire be resinous. by causing a person not electrified to touch it with his

Gray repeated and varied the experiments of Dufay, | finger. Sir William Watson first observed the flash of and made many newones. Like Hawksbee and Dr Wall, | light which attends the discharge of the Leyden phial, aud he

recognized the similarity between the phenomena of | it is to him that we owe the present improved form of the electricity and those of thunder and lightning ; and he | Leyden phial, in which it is coated both without and within expresses a hope “ that there may be found out a way to | with tinfoil. Dr Bevis indeed had suggested the outside collect a greater quantity of electric fire, and consequently to | coating, and at Smeaton’s recommendation, he coated a pane increase the force of that power, which, by several of these of glass on both sides, and within an inch of the edge, with experiments, si licet magnis componere parva, seels to be | tinfoil ; but still the idea of coating the jar doubly belongs of the same nature with thunder and lightning.” to Sir William Watson.

Bore, The discoveries which we have now recounted began to A party of the Royal Society, with the president at their Experi- 7 rouse the activity of the German and Dutch philosophers. | head, and Sir William Watson as their chief operator, ments of ‘ ‘‘o the electrical machine used by Newton and Hawksbee, entered upon a series of magnificent experiments, for the ie ’

Professor Boze of Wittenberg added the prime conductor, | purpose of determining the velocity of the electric fluid, Socety which at first consisted of an iron or tin tube supported by | and the distance to which it could be conveyed. The ; a man standing upon cakes of rosin ; but it was afterwards | French savans had conveyed the influence of the Leyden suspended by silken strings. Professor Winkler of Leipsic | jar through a circuit of 12,000 feet ; and in one case the substituted a cushion in place of the hand for exciting the | basin at the Tuileries, containing about an acre of water, revolving globe ; and Professor Gordon of Erfurt, a Seotch | formed part of the circuit ; but the English philosophers Benedictine monk, first used a glass cylinder, eight inches | made a more complete series of experiments, of which the long and four broad, which he caused to revolve by means following were the results :— of a bow and string. By these means electrical sparks of | 1. That in all their operations, when the wires have been properly great size and intensity were produced, and by their aid | conducted, the electrical commotions from the charged phial have various combustible substances, both fluid and solid, were been very considerable only when the observers at the extremities ‘nflamed. In 1744 M. Ludolph of Berlin succeeded in of the wire have touched some substance readily

conducting elec- So a be ee eceede tricity with some part of their bodies. firing, by the electrical spark, the ethereal spirit of Fro- 9. hat the electrical commotion is always felt most sensibly in benius. Winkler did the same by a spark from his finger ; those parts of the bodies of the observers which are between the and he succeeded in inflaming French brandy and other conducting wires and the nearest and the most non-electric sub- + : stance, or, in other words, so much of their bodies as comes within

weaker spirits after they had been heated. Gordon kindled } the electrical circuit. spirits by a jet of electrified water. Dr Miles inflamed | 3. That on these considerations we infer that the electrical power phosphorus by the electric spark ; and oil, pitch, and | is conducted between these observers by any non-electric substances sealing-wax, when strongly heated, were set on fire by ph oo aes between them, and contribute to form similar — We refer the student for lists of the works 4. That the electrical commotion has been perceptible to two or of the philosophers just mentioned to the admirable biblio- | more observers at considerable distances from each other, even as graphy given by Young, atural Philosophy, p. 515. far as two miles. –

Jeyden hese striking effects were all produced by the electricity 5. That when the observers have been shocked ut the end of two

phial, obtained immediately from an excited el tae but @ erent miles of wire, we infer that the electrical circuit is four miles, viz.

1745 y cited electric ; but a great | two iniles of wire, and the space of two miles of the non-electric

step was now made in the science by the discovery of a method of accumulating and preserving electricity in large quantities. The author of this great invention is not dis- tinctly known ; but there is reason to believe that a monk of the name of Kleist, a person of the name of Cuneus, and Professor Muschenbroeck of Leyden had each the merit of an independent inventor. The invention by which this accumulation was effected was called the Leyden Jar or Phial, because it was’ principally in Leyden that it was either invented or tried. Having observed that excited electrics soon lost their electricity in the open air, and that their loss was accelerated when the atmosphere was charged with moisture or other conducting materials,

Muschenbroeck conceived that the electricity of bodies might be retained by surrounding them with bodies which did not conduct it. In putting this idea to the test of experiment, he electri- fied some water in a glass bottle, and a communication having been made between the water and the prime con- ductor, the assistant, who was holding the bottle, on trying to disengage the communicating wire, received a

matter between the observers, whether it be water, earth, or both.

6. That the electrical commotion is equally strong, whether it is conducted by water or dry ground.

7. That if the wires between the electrifying machine and the observers are conducted on dry sticks, or other substances non- electric in a slight degree only, the cffects of the electrical power are much greater than when the wires in their progress touch the ground, or moist vegetables, or other substances in a great degree non-clectric.

8. That by comparing the respective velocities of electricity and sound, that of electricity, in any of the distances yet experienced, is nearly instantaneous.

In the following year these experiments were resumed with the view of ascertaining the absolute velocity of electricity at a certain distance, and it was found " that through the whole length of a wire 12,276 feet the velocity of electricity was instantaneous."

The theory of positive and negative electricity which was afterwards elaborated by Franklin, was distinctly announced by Sir W. Watson. He laysit down as a law that in elec- trical operations there is an aftlux of " electric fluid" to the globe and the conductor, and also an efflux of the same

Franklin

(1706- 90).

matter from them. In the case of two insulated persons, the one in contact with the rubber and the other with the conductor, he observed that either of them would communi- cate a much stronger spark to the other than to any by- stander. The electricity of the one, he says, became more rare than it is naturally, and that of the other more dense, so that the density of the electricity in the two insulated persons differed more than that between either of them and a bystander.

A variety of interesting experiments were made about this time by Le Monnier, Nollet, Winckler, Ellicott, Jallabert, Boze, Menon, Smeaton, and Miles, In 1746 Le Monnier confirmed the result previously obtained by Gray, that electricity is communicated to homogeneous bodies in proportion to their surfaces only. Boze dis- covered that capillary tubes which discharged water by drops afforded a continuous stream when electrified. The Abbé Nollet (£ssai sur [’Hlectricité, 1746; Recherches, 1749; Lettres, 1753), the friend and coadjutor of Dufay, ascertained that electricity increases the natural evapora- tion of fluids, and that the evaporation is hastened by placing them in non-electric vessels. Jallabert confirmed the result previously obtained by Watson, that electricity passes through the substance of a conducting wire, and not along its surface. Smeaton found that the red hot part of an iron bar could be as strongly electrified as the cold parts on each side of it. Dr Miles kindled com- mon spirits by a stick of black sealing-wax excited by dry flannel. Ellicott conceived that the particles of the electric fluid repel each other, while they attract those of all other bodies. Mowbray concluded that the vege- tation of two myrtles was hastened by electrifying them,— a result which Nollet confirmed in the case of vegetating seeds. The Abbé Menon found that cats, pigeons, spar- rows, and chaffinches lost weight by being electrified for five or six hours, and that the same result was true of the human body ; and hence it was concluded that electri- city augments the insensible perspiration of animals.

A high place in the history of electricity must be allotted to the name of Dr Benjamin Franklin of Phila- delphia. His researches did much to extend our theoreti- cal aud practical knowledge of electricity, and the clearness und vigour of his style made his writings popular, and spread the study of the subject.

One of the first labours of the American philosopher was to present, in a more distinct form, the theory of posi- tive and negative electricity, which Sir W. Watson had been the first to suggest. He showed that electricity is not created by friction, but merely collected from its state of diffusion through other matter by which it is attracted. He asserted that the glass globe, when rubbed, attracted the electrical fire, and took it from the rubber, the same globe being disposed, when the friction ceases, to give out its electricity to any body which has less. In the case of the charged Leyden jar, the inner coating of tinfoil had received more than its ordinary quantity of electricity, and was therefore electrified positively or plus, while the outer coating of tinfoil having had its ordinary quantity of electricity diminished, was electrified negatively or minus.

Hence the cause of the shock and spark when the jar is-

discharged, or when the superabundant plus electricity of the inside is transferred by a conducting body to the de- fective or minus electricity of the outside. This theory of the Leyden phial Franklin established in the clearest

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it copiously from an electrified body. Hence he was fur- nished with a simple method of collecting electricity from other bodies; and he was thus enabled to perform those remarkable experiments which we shall now pro- ceed to explain. Hawksbee, Wall, and Nollet had succes- sively suggested the similarity between lightning and the electric spark, and between the artificial snap and the natural thunder. Previous to the year 1750 Franklin drew up a statement, in which he showed that all the general phenomena and effects which were produced by electricity had their counterpart in lightning. After wait- ing some time for the erection of a spire at Philadelphia, by means of which he thought to bring down the electricity of a thunder-storm, he conceived the idea of sending up a kite among the clouds themselves. With this view he made a small cross of two small light

strips of cedar, the arms being sufficiently long to reach to the four corners of a large thin silk handkerchief when extended. The corners of the handkerchief were tied to the extremities of the cross, and when the body of the kite was thus formed, a tail, loop, and string were added to it. The body was made of silk to enable it to bear the violence and wet of a thunder-storm. A very sharp pointed wire was fixed at the top of the upright stick of the cross, so as to rise a foot or more above the wood. A silk ribbon was tied to the end of the twine next the hand, and a key suspended at the junction of the twineand silk. In company with his son, Franklin raised the kite like a common one, in the first thunder-storm, which happened in the month of June 1752. To keep the silk ribbon dry, he stood within a door, taking care that the twine did not touch the frame of the door ; and when the thunder-clouds came over the kite he watched the state of the string. A cloud passed without any elec- trical indications, and he began to despair of success. He saw, however, the loose filaments of the twine standing out every way, and he found them to be attracted by the ap- proach of his finger. The suspended key gave a spark on the application of his knuckle, and when the string had be- come wet with the rain, the electricity became abundant ; a Leyden jar was charged at the key, and by the electric fire thus obtained spirits were inflamed, and all the other electrical experiments performed which had been formerly made by excited electrics. In subsequent trials with another apparatus, he found that the clouds were some- times positively and sometimes negatively electrified, and so demonstrated the perfect identity of lightning and elec- tricity. Having thus succeeded in drawing the electric fire from the clouds, Franklin conceived the idea of protecting buildings from lightning by erecting on their highest parts pointed iron wire or conductors communicating with the ground. The electricity of a hovering or a passing cloud would thus be carried off slowly and silently; and if the cloud was highly charged, the lightning would strike in pre- ference the elevated conductors.

The most important of Franklin’s electrical writings are his Laperiments and Observations on Electricity made at Philadelphia, 1751-54; his Letters on Electricity, and various memoirs and letters, Phil. Trans., 1756, 1760, &c.

About the same time that Franklin was making his kite experiment in America, D'Alibard and others in France had erected a long iron rod at Marli, and obtained results agreeing with those of Franklin. Similar investigations were pursued by many others, among whom Father Bec- caria deserves especial mention.

These experiments were often dangerous, and in one case Death of a fatal accident occurred. Professor Richman of St Peters- Rich- burg had erected on his house an iron rod to collect the 1758 electricity of thunder-clouds. On the 6th August 1753, °'°" during a thunder-storm, he was observing, along with his friend Sokolow, the indications of an electrometer which

manner, by showing that the outside and the inside coat- ing possessed opposite electricities, and that, in charging it, exactly as much electricity is added on one side as is subtracted from the other. The abundant discharge of electricity by points was observed by Franklin in his ear- liest experiments, and also the power of points to conduct

formed part of his apparatus, when a tremendous thunder- clap burst over the neighbourhood. Richman bent to ob- serve the electrometer; while in this position, his head being a foot from the iron rod, Sokolow saw a globe of bluish fire about the size of the fist shoot from the iron rod to the professor's head, with a report like that of a pistol. I'he shock was fatal ; Richman fell back upon a chest and instantly expired. Sokolow was stupified and benumbed, and the red hot fragments of a metallic wire struck his clothes, and covered them with burnt marks.

One of the most diligent labourers in the field of electri- cal science was an Englishman, John Canton (Pil. Trans., 1753-54). Before his time it had been assumed as indis- putable that the same kind of electricity was invariably pro- duced by the friction of the same electric,—that glass, for example, yielded always vitreous, and amber always resin- ous electricity. Having roughened a glass tube by grind- ing its surface with cmery and sheet lead, he found that it possessed vitreous or positive electricity when excited with oiled silk, but resinous electricity when excited with new flannel. He found, in short, that vitreous or resinous electricity might, in certain cases, be

developed at will in the same tube, by altering the surfaces of the tube and the exciting rubber. Removing the polish from one half of the tube, he excited the different electricities with the same rubber at a single stroke, and, curiously enough, the rubber was found to move much more easily over the rough than over the polished half. Canton likewise dis- cofered that glass, amber, sealing-wax, and calcareous spar were all electrified positively when taken out of niercury ; and hence he was led to the important practical discovery that an amalgam of mercury and tin was most efficacious in exciting glass when applied to the surface of the rubber. Canton discovered, and toa certain extent ex- plained by the then prevalent theory of “electrical atmo- spheres,” the fundamental fact of electrification by induc- tion. He also found that the air in a room could be electrified positively or negatively, and might remain thus electrified for a considerable time.

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ing being then drawn out of the other, they appeared more or less inflated, and exhibited the attractions and repulsions of electrified bodies. Two white silk stockings, or two black ones, when put on the same leg and taken off, gave no electrical indications. When a black and a white stock- ing were put on the same leg, and after ten minutes taken off, they were so much inflated when pulled asunder, that each showed the entire shape of the leg, and at the dis- tance of a foot and a half they rushed to mieet each other.

‘* But what appears most extraordinary is, that when they are separated, and removed at a certain distance from eaeh other, their electricity does not appear to have been in the least impaired by the shoek they had in meeting. They are again inflated, again attract and repel, and are as ready to rush together as before. When this experiment is performed with two black stockings in one hand, and two white in the other, it exhibits a very eurious speetaele ; the repulsion of those of the same eolour, and the attraetion of those of different colours, throws them into an agitation that is not un- entertaining, and makes them eateh each at that of its opposite colour, at a greater distance than one would expect. When allowed to eome together, they all unite in one mass. When separated, they resume their former

appearance, and admit of the repetition of the experiment as often as you please, till their electricity, gradu- ally wasting, stands in need of being reeruited.

Symmer likewise found that a Leyden jar could be charged by the stockings either positively or negatively, according as the wire from the neck of the jar was pre- sented to the black or the white stocking. When the electricity of the white stocking was thrown into the jar, and then the electricity of the black one, or vce versa, the jar was not electrified at all. With the electricity of two stockings he charged the jar to such a degree that the shock from it reached both his elbows ; and by means of the electricity of four silk stockings he kindled spirits of wine in a tea-spoon which he held in his hand, and the shock was at the same time felt from the elbows to the breast. Symmer has the merit of having first maintained the theory of two distinct fluids, not independent of each other, as Dufay supposed them to be, but co-existent, and, by counteracting each other, producing all the pheno- mena of electricity. He conceived that when a body is said to be positively electrified, it is not simply that it is pos-

Peccaria Beccaria, a celebrated Italian physicist, kept up the

(1716- spirit of electrical discovery in Italy. He showed that | sessed of a larger share of electric matter than ina natural

81). water is a very imperfect conductor of electricity, that | state, nor, when it is said to be negatively electrified, of a its couducting power is proportional to its quantity, and | less; but that, in the former case, it is possessed of a larger that a small quantity of water opposes a powerful resist- | portion of one kind of electricity, and in the latter, of a ance to the passage of electricity. He succeeded in larger portion of the other; while a body, in its natural making the electric spark visible in water, by discharging | state, remains unelectrified, because there is an equal amount shocks through wires that nearly met in tubes filled with | of the two everywhere within it. water. In this experiment the tubes, though sometimes Contemporary with Symmer were Delaval, Wilson, eight or ten lines thick, were burst in pieces. Beccaria | Cigna, Kinnersley, Wilcke, and Priestley (for the works of likewise demonstrated that air adjacent to an electrified | these electricians consult Young). Delaval found that the body gradually

acquired the same electricity, that the’ sides of vessels that were perfect conductors were non- electricity of the body is diminished by that of the air, and | conductors, and that animal and vegetable bodies lost their that the air parts with its electricity very slowly. He con- | conducting power when reduced to ashes. Wilson con- sidered that there was a mutual repulsion between the | cluded that when two electrics are rubbed together, the particles of the electric fluid and those of air, and that in harder of the two is generally electrified positively and the passage of the former through the latter a temporary | the other negatively, the electricities always being opposite. vacuum was formed. Beccaria’s experiments on atmosphe- Cigna made many curious experiments by using silk rical electricity are of the greatest interest to the meteor- | ribbands in place of the silk stockings of Symmer. Kin- ologist. For farther account of his work, see his Zettere | nersley, the friend of Franklin, made some important dell’ Hilettr.. 1758 ; Experimenta, 1772; and letters, &., experiments on the elongation and fusion of iron wires, in Phil. Trans. about 1770. when a strong charge was passed through them in a state

Sinbe, The science of electricity owes several practical as well | of tension (Phil. Trans., 1763); he also experimented

as theoretical observations to Robert Symmer (Phil. 7’rans., about 1759). In pulling off his stockings in the even- ing, he had often remarked that they not only gave a

on the disruptive discharge in air. Wilcke brought to light many phenomena respecting the electrification pro- duced by the melting of electric substances.

crackling noise, but even emitted sparks in the dark. The The pyro-electricity of minerals, or the faculty possessed Pyro-

electricity was most powerful when a silk and a worsted by some minerals of becoming electric by heat, and of elec- stocking had been worn on the same leg, and it was best | exhibiting negative and positive poles, now began to attract pia Se iS.

the notice of philosophers. There is reason to believe

exhibited by putting the hand between the leg and the that the lyncwrium of the ancients, which, according to

stockings, and pulling them off together. ‘The one stock-

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(1724- 1806).

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Theophrastus, attracted light bodies, was the tourmaline, a Ceylon mineral, in which the Dutch had early recog- nized the same attractive property, whence it got the name of Aschentrikker, or attractor of ashes. In 1717 M. Lemery exhibited to the Academy of Sciences a stone from Ceylon which attracted light bodies; and Linnzeus, in mentioning the experiments of Lemery, gives the stone the name of Lapis Electricus. The Duke de Noya was led in 1758 to purchase some of the stones called tourma- line in Holland, and, assisted by Daubenton and Adanson, he made a series of experiments with them, a description of which was published. The subject, however, had en- gaged the attention of Aipinus, a celebrated German philo- sopher, who published an account of them in 1756. Hitherto nothing had been said respecting the necessity of heat to excite the tourmaline; but it was shown by AMpinus that a temperature between 993° and 212° Fahr. was requisite for the development of its attractive powers. Benjamin Wilson (Phil. Trans., 1763, é&c.), Priestley, and Canton continued the investigation; but it was reserved for the Abbé Haiiy to throw a clear light on this curious branch of the science (Z’raité de Mineralogie). He found that the electricity of the tourmaline decreased rapidly from the summits or poles towards the middle of the crystal, where it was imperceptible; and he discovered that if a tourmaline is broken into any number of frag- ments, each fragment, when excited, has two opposite poles. Haitiy discovered the same property in the Siberian and Brazilian topaz, borate of magnesia, mesotype, preh- nite, sphene, and calamine. He also found that the polarity which minerals receive from heat has a relation to the secondary forms of their crystals,—the tourma- line, for example, having its resinous pole at the

summit of the crystal which has three faces, and its vitreous pole at the summit which has six faces. In the other pyro- electrical crystals above mentioned, Haitiy detected the same deviation from the rules of symmetry in their second- ary crystals which occurs in tourmaline. Brard discovered that pyro-electricity was a property of the axinite; and it was afterwards detected in other minerals. In repeating and extending the experiments of Hatiy, Sir David Brewster discovered that various artificial salts were pyro-electrical ; and he mentions tartrate of potash and soda, and tartaric acid, as exhibiting this property in a very strong degree. He also made many experiments with the tourmaline when cut into thin slices, and reduced to the finest powder, in which state each particle preserved its pyro-electricity ; and he showed that scolezite and mesolite, even when de- prived of their water of crystallization and reduced to powder, preserve their property of becoming electrical by heat. When this white powder is heated and stirred about by any substance whatever, it collects in masses like new fallen snow, and adheres to the body with which it is stirred. (For Sir David Brewster's work on pyro-electricity see Trans. RSH, 1845; Phil, Mag., Dec. 1847; Edin- burgh Journal of Science, Oct. 1824 and 1825).

In addition to his experiments on the tourmaline, AMpinus made several on the electricity of melted sulphur 3 and in conjunction with Wilcke, he investigated the subject of electric atmospheres, and discovered a beautiful m 1 of charging a plate of air by suspending large wooden boards coated with tin, and having their surfaces near each other and parallel. Aupinus, however, has been principally distinguished by his ingenious: vheory of electricity, which he has explained and illustrated ina separate work (7'en- tamen Theorie Llectricitatis et Magnetismi) which ap- peared at St Petersburg in 1759. This theory is founded on the following principles. 1. The particles of the elec- tric fluid repel each other with a force decreasing ag the distance increases. 2. The particles of the electric fluid

attract the particles of all bodies, and are attracted by them, with a force obeying the same law. 3. The electric fluid exists in the pores of bodies; aud while it moves without any obstruction in non-electrics, such as metals, water, &c., it moves with extreme difficulty in electrics, such as glass,

rosin, &c. 4. Electrical phenomena are pro- duced either by the transference of the fluid from a body containing more to one containing less of it, or from its attraction and repulsion when no transference takes place.

The electricity of fishes, like that of minerals, now be- Elec- The ancients, as we ticity have seen, were acquainted with the benumbing power of °

gan to excite very general attention.

the torpedo, but it was not till 1676 that modern naturalists attended to this remarkable property. The Arabians had long before given this fish the name of raad or lightning ; but Redi was the first who communicated the fact that the shock was conveyed to the fisherman by means of the line and rod which connected him with the fish. Lorenzini published engravings of its electrical organs; Reaumur described the electrical properties of the fish ; Kampfer compared the effects which it produced to lightning; but Bancroft was the first person who distinctly suspected that the effects of the torpedo were electrical. In 1773 Walsh (Phil. Trans., 1773-5) and Ingenhousz proved, by many curious experiments, that the shock of the torpedo was an electrical one; and Hunter (Pil. T'rans., 1773-5) examined and described the anatomical structure of its electrical organs. Humboldt (Ann. de Chim. et de Phys. , i. 15), Gay-Lussac, and Geoffroy pursued the subject with success ; and Cavendish (Phil. 7'rans., 177 6) constructed an artificial torpedo, by which he imitated the actions of the living animal. The subject was also investigated by Todd, Sir Humphrey Davy (Phil. Zrans., 1820); John Davy, and Faraday (Zp. Res., vol. ii.). The power of giving electric shocks has been discovered also in the Gymnotus electricus,! the Malapterurus electricus,? the Trichiurus electricus,? and the Vetraodon electricus. The most interesting and the best known of these singular fishes is the G'ymnotus or Surinam eel. Humboldt gives a very graphic account of the combats which are carried on in South America between the gymnoti and the wild horses in the vicinity of Calabozo.

Among the cultivators of electricity Henry Cavendish is Caven-

entitled to a distinguished place. Before he had any to the Royal Society a similar theory of electrical pheno- mena. As, however, he had carried the theory much further, and considered it under a more accurate point of view,

he did not hesitate to give his paper to the world (Phat. Trans., 1771). Cavendish made some accurate experi- ments on the relative conducting power of different sub- stances. He found that electricity experiences as much resistance in passing through a column of water one inch long as it does. in passing through an iron wire of the same diameter 400,000,000 inches long, whence he con- cluded that iron wire conducts 400,000,000 times as well as rain or distilled water. He found that a solution of one part of salt in one of water conducts a hundred times better than fresh water, and that a saturated solution of sea-salt couducts seven hundred and twenty times better than fresh water. Cavendish likewise determined by nice experiments that the quantity of electricity on coated glass of a certain area increased with the thinness of the glass, and that on different coated plates the quantity was as the area of the coated surface directly, and as the thick- ness of the glass inversely. Although electricity had been employed as a chemical agent in the oxidation and fusion of metals, yet it is to Cavendish that we owe the first of those brilliant inquiries which have done so much for the

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knowledge of the theory of Apinus, he had communicated ee

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Galvani jet — 98) and Volta

(1745- 1827).

Coulomb

(1736- 1806).

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advancement of modern chemistry. By using different proportions of oxygen and hydrogen, and examining the products which they formed after

explosion with the elec- tric spark, he obtained a proportion of which the product was pure water (Phil. Trans, 1784-5). The decom- position of water by the electric spark was first effected by Paets Van Troostwijk and Deiman ; improved methods of effecting it were discovered and used by Pearson, Cuth- bertson, and Wollaston (Phil. Trans., 1801).

The great discovery made by Galvani in 1790, that the contact of metals produced muscular contraction in the frog, and the invention of the voltaic pile, in 1800, ty Volta led to the recognition of a new kind of electricity called Gal- vanic or Voltaic Electricity, which is now proved to be identical with frictional electricity. The chemical effects of the voltaic pile far transcend those of ordinary electricity. In 1800 Nicolson and Carlisle discovered the power of the pile to decompose water; and in 1807 (Dakerian Lecture) Sir Humphry Davy decomposed the earths and the alkalies, and thus created a new epoch in the history of chemistry.

Contemporaneous with Cavendish was Coulomb, one of the most eminent experimental philosophers of the last century. In order to determine the law of electrical action, he invented an instrument called a torszon balance, which has since his time been universally used in all delicate researches, and which is particularly applicable to the measurement of electrical and magnetical actions. A&pinus and Cavendish had considered the action of elec- tricity as diminishing with the distance; but Coulomb proved, by a series of elaborate experiments, that it varied, like gravity, in the inverse ratio of the square of the distance. Dr Robison had previously deter- tained, without, however, having published his experi- ments, that in the mutual repulsion of two similarly electrified spheres, the law was slightly in excess of the inverse duplicate ratio of the distance, while in the attraction of oppositely electrified spheres the deviation from that ratio was in defect; and hence he con- cluded that the law of electrical action was similar to that of gravity. Adopting the hypothesis of two fluids, Coulomb investigated experimentally and theoretically the distribution of electricity on the surface of bodies, He determined the law of its distribution between two con- ducting bodies in contact; he measured the density of the electricity at different points of two spheres in contact; he ascertained the distribution of electricity among several spheres (whether equal or unequal) placed in contact in a straight line ; he measured the distribution of electricity on the

surface of a cylinder, and its distribution between a sphere and cylinder of different lengths but of the same diameter. His experiments on the dissipation of electri- city possess also a high value. He found that the momen- tary dissipation was proportional to the degree of electrifi- cation at the time, and that, when the charge was mode- rate, its dissipation was not altered in bodies of different kinds or shapes. : The temperature and pressure of the atmosphere did not produce any sensible change; but he concluded that the dissipation was nearly proportional to the cube of the quantity of moisture in the air. In examining the dissipation which takes place along imperfectly insu- lating substances, he found that a thread of gum-lac was the most perfect of all insulators ; that it insulated ten times as well asa dry silk thread ; and that a silk thread covered with fine sealing-wax insulated as powerfully as gum-lac when it had four times its length. He found also that the dissipation of electricity along insulators was chiefly owing to adhering moisture, but in some measure also to a slight conducting power. For the memoirs of Coulomb sve Mém. de Math. et Phys. de ? Acad. de Sc., 1785, &c.

PRES PweICci;nT y

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Towards the end of the last century a series of experi- Laplace, ments was made by Laplace, Lavoisier, and Volta (Phil, La-_ Trans., 1782, or Collezione dell’ Op.), from which it ap- 7″ peared that electricity is developed when solid or fluids Vojta,

bodies pass into the gaseous state. The bodies which were to be evaporated or dissolved were placed upon an insu- lating stand, and made to communicate by a chain or wire with a Cavallo’s electrometer, or with Volta’s condenser, when it was suspected that the electricity increased gra- dually. When sulphuric acid diluted with three parts of water was poured upon iron filings, hydrogen was disen- gaged with a brisk effervescence ; and at the end of a few minutes the condenser was so highly charged as to yield a strong spark of negative electricity’ Similar results were obtained when charcoal was burnt on a chafing dish, Volta, who happened to be at Paris when these experi- ments were made, and who took an _ active part in them, subsequently observed that the electricity produced by evaporation

was always negative. He found that burning charcoal gives out negative electri- city ; and in other kinds of combustion he obtained dis- tinct electrical indications. Jn this state of the subject Saussure (Voyage dans les Alpes, t. ii, p. 808, et seq.) undertook a series of elaborate experiments on the electri- city of evaporation and combustion, In his first trials he found that the electricity was sometimes positive and sometimes negative when water was evaporated from a heated crucible of iron; but he afterwards found it to be always positive both in an iron and a copper crucible. In a silver and a porcelain crucible the electricity was nega- tive. The evaporation of alcohol and of ether in a silver crucible also gave negative electricity. Saussure made many fruitless trials to obtain electricity from combustion, and he likewise failed in his attempt to procure it from evaporation without ebullition. Many valuable additions were about this time made to electrical apparatus, as well as to the science itself, by Van Marum, Cavallo, Nicholson, Cuthbertson, Brooke, Bennet, Read, Morgan, Henley, and Lane ; but these cannot here be noticed in detail.

Saus- sure.

The application of analysis to electrical phenomena may Applica-

be dated from the commencement of the present century. Coulomb had considered only the distribution of electri- city on the surface of spheres ; but Laplace undertook to investigate its distribution on the surface of ellipsoids of revolution, and he showed that the thickness of the coat- ing of fluid at the pole was to its thickness at the equator as the polar is to the equatorial diameter. Biot (Z’’raité de Physique Exp. e Math.) has extended this investigation to all spheroids differing little from a sphere, whatever may be the irregularity of their figure. He likewise determined analytically that the losses of electricity form a geometrical progression when the two surfaces of a jar or plate of coated glass are discharged by successive contacts ; and he found that the same law regulates the discharge when a series of jars or plates are placed in communication with each other. Itis

tion of analysis to elec- tricity.

Biot.

to Poisson (Adém. de Inst. Math. et Phys., 12, 1811, &c.) Poisson.

however, that we are mainly indebted for having brought the phenomena of electricity under the dominion of analy- sis, and placed it on the same level as the more exact sei », Assuming the hypothesis of two fluids, he deduced theorems for determining the distribution of the electric fluid on the surface of two conducting spheres when they are either placed in contact or at any given distance. The truth of u.ese theorems had been estab- lished by experiments performed by Coulomb long before the theorems themselves had been investigated.

Voltaic electricity had now absorbed the attention of experimental philosophers. The splendour of its phe- nomena, as well as its association with chemical discovery, contributed to give it popularity and importance ; but the

discoveries of Galvani and Volta were destined, in their turn, to pass into the shade, and the intellectual enterprise of the natural philosophers of Europe was directed to new branches of electrical and magnetical science. Guided by Magnetic theoretical anticipations, Professor H. C. Oersted of Copen- action of haven (Haperimenta circa effectum conflictus electrica mm electric Gexm magneticam) in 1820 discovered that the elec- ue il trical current of a galvanic battery, when made to pass covered through a platinum wire,acted upon a compass needle placed by below the wire. He found that a magnetic needle placed Oersted. in the neighbourhood of an electric current always places itself perpendicular to the plane through the current and the centre of the needle; or, more definitely, that a magnetic north pole, carried at a constant distance round the current in the direction of rotation of an ordinary cork-screw advancing in the positive direction of the current, would always tend to move in the direction in which it is being carried. Electro: | Scarcely had the news of Oersted’s discovery reached dyna- France when a French philosopher, Ampére, set to work to i develop the important consequences which it involved. ey Physicists had long been looking for the connection be- theory, tween magnetism and electricity, and

had, perhaps, inclined to the view that electricity was somehow to be explained as a magnetic phenomenon. It was, in fact, under the influence of such ideas that Oersted was led to his discovery. Ampére showed that the explanation was to be found in an opposite direction. He discovered the ponderomotive action of one electric current on another, and by a series of well-chosen experiments he established the elementary laws ef electrodynamical action, starting from which, by a brilliant train of mathematical analysis, he not only evolved the complete explanation of all the electro- magnetic phenomena observed before him, but predicted many hitherto uuknown. The results of his researches may be summarized in the statement that an electric current in a linear circuit of any form is equivalent in its action, whether on magnets or other circuits, to a magnetic shell bounded by the circuit, whose strength at every point is constant and proportional to the strength of the current. By his beautiful theory of molecular currents, he gave a theoretical explanation of that connection between electri- city and magnetism which had been the dream of previous investigators. If we except the discovery of the laws of the induction of electric currents made about ten years later by Faraday, no advance in the science of electricity can compare for completeness and brilliancy with the work of Ampére. Our admiration is equally great whether we contemplate the clearness and power of his mathematical investigations, the aptness and skill of his experiments, or the wonderful rapidity with which he elaborated his dis- covery when he had once found the clue. Recent In 1821 Faraday, who was destined a little later to do progress so much for the science of electricity, discovered electro- of : F oo ; electro. Magnetic rotation (Quarterly Journal, xii.), having suc- dyna- ceeded in causing a horizontal wire carrying a current to mics, rotate continuously across the vertical lines of a field of magnetic force. The experiment was very soon repeated in avariety of forms by De la Rive, Barlow, Ritchie, Sturgeon, and others ; and Davy (Phil. Trans.), in 1823, observed that, when two wires connected with the pole of a battery were dipped into a cup of mercury placed on the pole of a powerful magnet, the fluid metal rotated in op- posite directions about the two electrodes. The rotation of a magnet about a fixed current and about its own axis was at once looked for, and observed by Faraday and others. The deflection of the voltaic are by the magnet had been observed by Davy in 1821 (Pil. Trans.); and in 1840 Walker observed the rotation of the

luminous discharge in a vacuum tube. Jor many beautiful experiments on the

influence of the magnet on the strata, &c., in vacuum tubes, we are indebted to Pliicker, De la Rive, Grove, Gassiot, and others who followed them.

One of the first machines in which a continuous motion Electro- was produced by means of the repulsions and attractions ™agnetic | between electromagnets and fixed magnets or electro- ““8”% magnets was invented by Ritchie (Phil. Trans., 1833). ; The artifice in such machines consists in reversing the polarity of one of the electromagnets when the machine is near the position of equilibrium. For a general theory of these machines, showing the reasons why they are not useful as economic motive powers, see Jacobi (Mémoire sur V’ Application de UElectro-magnétisme au Mouvement des | Machines, Potsdam, 1835), and Joule (Mech. Mag., xxxvi.). Electro-magnetic engines have, however, found a restricted . use in scientific workshops, such as Froment’s, in driving telegraphic apparatus, dc.

In 1820 Arago (Ann. de Chim. et de Phys., t. sv.) and Magnet- Davy (Annals of Philosophy, 1821) discovered indepen- ization ; dently the power of the electric current to magnetize iron os euse and steel. Savary (Ann. de Chim. et de Phys., t. XXX1V., current. 1827) made some very curious experiments on the alter- nate directions of magnetization of needles placed at differ- ent distances from a wire conveying the discharge of a Leyden jar. The dependence of the intensity of magnet- ization on the strength of the current was investigated by Lenz and Jacobi (Pogg. Ann., xlvii., 1839), and Joule found that magnetization did not increase proportionately with the current, but reached a maximum (Sturgeon’s Ann. of ZI.

iv. 1839). The farther development of this subject, which

really belongs to magnetism, has been carried on by

Weber, Miiller, Von Waltenhofen, Dub, Wiedemann, Quin-

tus Icilius, Riecke, Stoletow, Rowland, and others. The . use of a core of soft iron, magnetized by a helix surround-

ing it, has become universal in all kinds of electrical ap-

paratus. Electromagnets of great power have in this way

been constructed and used in electrical researches by Brewster, Sturgeon, Henry, Faraday, and others.

The most illustrious among the successors of Ampcre was Recent Wilhelm Weber. He greatly improved the construction of Progress the galvanometer, and invented the electro-dynamometer. eet To these instruments he applied the mirror scale and tele- gyn. scope method of reading, which had been suggested by mics. Poggendorff, and used by himself and Gauss in magnetic measurements about 1833. In 1846 he proceeded with his improved apparatus to test the fundamental laws of Am- pére. The result of his researches was to establish the truth of Ampéce's principles, as far as experiments with closed circuits could do so, with a degree of accuracy far beyond anything attainable with the simple apparatus of the original discoverer. The experiments of Weber must be looked upon as the true experimental evidence for the theory of Ampere, and as such they form one of the corner-stones of electrical science.

While experiment was thus busy, theory was uot idle. In Theory

1845 Grassmann published (Pogg. Ann., Ixiv.) his Veue of Theorie der Electrodynamik, in which he gives an elemen- °le¢tre- tary law different from that of Ampére, but leading to the ie . same results for closed circuits. Inthe same year F. BE. i Neumann published yet another law. In 1846 Weber announced his famous hypothesis connecting electro- statical and electrodynamical phenomena. Much _ has been written on the subject by Carl Neumann, Riemann, Stefan, Clausius, and others. Very important are three memoirs by Helmholtz, in Crelle's Journal (1870-2-4), in which a general view is taken of the whole question, and the works of his predecessors are critically handled. We shall have occasion, in the body of the article, to refer to the dynamical theory of Clerk Maxwell, which promises to effect a revolution in this part of electrical science.

| ‘Thermo- elec- tricity.

Magnet- ism of . rotation,

Induc- tion of electric currents (Fara- day).

ELECT

By his discovery of thermo-electricity in 1822 (Pogg. Ann., vi.), Seebeck opened up a new department He found that when two different metals are joined in circuit there will be an electric current in the circuit if the junctions are not at the same temperature; he arranged the metals in a thermo-electric series, just as Volta and his followers had arranged them in a contact series. Cumming (Annals of Phil., 1823) found that the order of the metals was not the same at different temperatures. This phenomenon has been called thermo-electric inversion. In 1834 Peltier dis- covered that if a current be sent round a circuit of two metals in the direction in which the thermo-electromotive force would naturally send it, then the hot junction is cooled, and the cool junction heated. This effect, which is reversible, and varies as the strength of the current, is called the Peltier effect. Sir W. Thomson made many experiments on thermo-electricity, and applied to the experimental results the laws of the dynamical theory of heat. His reasonings led him to predict a new thermo-electric phenomenon, the actual existence of which he afterwards verified by an elaborate series of very heau- tiful experiments (Phil. Trans., 1856). He has giventa general theory of the thermo-electric properties of niatter, taking into account the effect of structure, &c. His experi- mental researches have been ably continued by Professor Tait, who, guided by theoretical considerations to the conjec- ture that the curves in what Thomson called the “ thermo- electric diagram”! must be straight lines, made an extended series of experiments, and showed that they were in general very approximately either straight lines or made up of pieces of straight lines. Our knowledge of thermo-electri- city has been advanced by Becquerel, Magnus, Matthiessen, Leroux, Avenarius, and others. Thermo-electric batteries of considerable power have been constructed by Markus, Noé, and Clamond, and employed more or less in the arts.

In 1824 Arago (Ann. de Chim. et de Phys., t. xxvii. &c.) made a remarkable discovery, which led ultimately to re- sults of the greatest importance. He found that when a magnetic needle is suspended over a rotating copper disc the needle tends to follow the motion of the disc. This phenomenon, which has been called the " magnetism of ro- tation," excited great interest ; Barlow (Phil. Trans., 1825), Herschel, Seebeck (Pogg. Ann., vii., 1826), and Babbage (Phil. T'rans., 1825) made elaborate researches on the sub- ject ; and Poisson (Jém. de U'Acad., vii., 1826) attempted to give a theoretical explanation in his memoir on magnet- ism in motion. 'The true explanation was not arrived at until Faraday took up the subject a little later. We may mention, here, however, the experiments of Pliicker, Matteucci, and Foucault on the damping of the motions of masses of metal between the poles of electromagnets. The damping of a compass needle suspended over a copper plate, observed by Seebeck (/.c.), has been taken advan- tage of in the construction of galvanometers.

In 1831 Faraday began, with the discovery of the induc- tion of electric currents, that brilliant series of experi- mental researches which has rendered his name immortal. The first experiment which he describes was made with two helices of copper wire wound side by side on a block of wood, and insulated from each other by intervening layers of twine. One of these helices was connected with a gal- vanometer, and the other with a battery of a hundred plates, and it was found that on making and breaking the battery circuit a slight sudden current passed through the galvanometer in opposite directions in the two cases. He also discovered that the mere approach or removal of a circuit carrying a current would induce a current

1 A mode of representing the phenomena of thermo-electricity which has been greatly developed and improved by Tait.

in a neighbouring closed circuit, and that the motion of magnets produces similar effects. To express in a concise manner his discoveries, Faraday invented his famous conception of the lines of magnetic force, or lines the direction of which at any point of their course coincides with that of the

magnetic force at that point. His discovery can be thus stated :—Whenever the number of lines of force passing through a closed circuit is altered, there is an elec- tromotive force tending to drive a current through the cir- cuit, whose direction is such that it would itself produce lines of force passing through the circuit in the opposite direction. Nothing in the whole history of science is more remarkable than the unerring sagacity which enabled Faraday te disen- tangle, by purely experimental means, the laws of such a com- plicated phenomenon as the induction of electric currents. The wonder is only increased when we look to his papers, and find the first dated November 1831,? and another January 1832, in which he shows that he is in complete possession of all the general principles that are yet known on the subject. Faraday very soon was able to show that the current developed by induction had all the properties of the voltaic current, and he made an elaborate comparison of all the different kinds of electricity known,—- statical, dynamical or voltaic, magneto-, thermo-, and animal elec- tricity,— showing that they were identical so far as experi-

ment could show. In 1833 Lenz madea series of important Law of

researches (Pogg. Ann., xxxi., 1834, xxxiv., 1835), which, among other results, led him to his celebrated law by means of which the direction of the induced current can be pre- dicted from the theory of Ampére, the rule being that the direction of the induced current is always such that its electromagnetic action tends to oppose the motion which produces it. This law leads to the same results as the prin- ciples of Faraday. The researches of Ritchie and Henry about this time, and of Dove a little later, are also of im- portance. In 1845 F. E. Neumann did for magneto electric induction what Ampere did for electrodynamics, by developing from the experimental laws of Lenz the mathematical theory of. the subject (Abh. der Berl. Akad. der Wissenschaft, 1845-7). He discovered a function which has been called the “potential” (of one linear current on another or ou itself), from which he deduced a theory of induction completely in accordance with ex- periment. About the same time Weber deduced the mathematical laws of induction from his elemeutary law of electrical action, which, as we have already seen, he applied to explain electrostatic and electromagnetic action. In 1846 Weber, applying his improved instruments, arrived at accurate verifications of the laws of induction, which by this time had been developed

mathematically by Neumann and himself. In 1849 Kirchhoff determined experimentally in a certain case the absolute value of the current induced by one circuit in anuther; and in the same year Edlund made a series of careful experiments on the currents of self and mutual induction, which led to the firmer estab- lishment of the received theories. Helmholtz gave the mathematical theory of the course of induced currents in various cases, and made a series of valuable experiments in verification of his theory (Pogy. Ann., Ixxxiii., 1851). Worthy of mention here are also the experiments and reasonings of Felici in 1852. In the Philosophical Maga- zine for 1855, Sir W. Thomson investigated mathematically the discharge of a Leyden jar through a linear conductor, and predicted that under certain circumstances the dis- charge would consist of a series of decaying oscillations, This oscillatcry discharge was observed in 1857 by Fedder- sen (Pogg. Ann., cviiil.) The lawof Weber has been applied

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2 The first experiment seems to have been actually made on the 29th , August 1831. See Bence Jones's Life of Faraday, vol. ii. p. 1.

Lenz.

Mathe- matical theory.

Mag- neto- electric ma- chines.

Ohm's law.

by Kirchhoff to the case of conductors in three dimensions. The most important of all the recent contributions to this part of electrical science is the theory of Clerk Maxwell, which aims at deducing the phenomena of the electromag- netic field from purely dynamical principles with the aid of the fewest possible hypotheses (Phil. Trans., 1864; Llec- tricity and Magnetism, 1873). He has established the gene- ral equations which determine the state of the electric field, and he has by means of these equations constructed an electromagnetic theory of light, which is full of suggestions for the

philosopher, whether speculative or experimental. The theory of Helmholtz, and his valuable criticisms on the works of those that have laboured in this department, are to be found in three memoirs already alluded to. Magneto-electricity has been largely applied in the arts. One of the first machines for producing electricity by induction was made by Pixii. It consisted of a fixed horseshoe armature wound with copper wire, in front of which revolved about a vertical axis a horseshoe mag- net. The machine was furnished with a commutator for delivering the alternating currents in a common direction. By means of this machine Faraday and Hachette decomposed water and collected the disengaged gases separately. Many variations of this type of ma- chine were constructed by Ritchie, Saxton, Clark, Von Kttingshausen, Stohrer, Dove, Wheatstone, and others, In 1857 Siemens effected a great improvement by in- venting the form of armature which bears his name. The next improvement was to replace the fixed magnets by electromagnets, the current for which was furnished by a small auxiliary machine. Wilde's machine (1867) is of this kind. Siemens, Wheatstone, and others sug- gested that the fixed electromagnet should be fed by a coil placed on the armature itself, so that starting from the residual magnetism of the armature the ma- chine goes on increasing its action up to a certain point. lLadd's machine (1867) is constructed on this principle. The most recent of these machines is that of Gramme, the peculiarity of which is that the coil of the armature is divided up into a series of coils arranged round an axis, the object being to produce a continuous instead of a fluctuating current. It has been proposed of late to employ electromagnetic machines in lighting streets and workshops, and the experiment has been tried with some success. They have been employed for some time back in lighthouse work. The most important inductive appa- ratns for the physicist is the induction coil or inducto- rium, which has been brought to great perfection in the workshop of Ruhmkorff. Poggendorff (Annalen, 1855) Suggested several improvements in this kind of appa- ratus. Fizeau, who added the condenser (1853), Fou- cault, who designed the interrupter which bears his name (1855), and Ritchie, who devised the plan of dividing the coil into sections by insulating partitions, have all aided in bringing the instrument to perfection. Very powerful machines of this kind have been constructed. A large one in the Polytechnic Institution, London, gives a 29-inch spark, and one recently constructed by Apps for Mr Spottiswoode gives a spark of 42 inches. The mathe- matical theory of magneto-electric machines has been

treated by Maxwell (Proc. Roy. Soc., 1867). He has also given a theory of the action of the condenser in the induc- oe (Phil. Mag., 1868). Two papers by Strutt (now Lord Rayleigh) in Phil. Mag., 1869-70, are very interest- ing in connection with the same subject. a 5 ae ae pow ne G. §. Ohm rendered a great service fea rok ah electricity by publishing his mathematical y of the galvanic circuit (Die Galvanische Kette mathematisch bearbeitet). Before his time the quantita- tive circumstances of the electric current had been indicated

in a very vague way by the use of the terms “ intensity” and “ quantity,” to which no accurately defined meaning was attached. Ohm’s service consisted in introducing and defining the accurate notions—electromotive force, current strength, and resistance. He indicated the connection of these with experiment, and stated his famous law that the electromotive force divided by the resistance is equal to the strength of the current. The theory on which Ohm based his law may be and has been disputed, but the law itself and the applications which Ohm and others have made of it are in the fullest agreement with all known facts. The merit of Ohm really con- sists in having satisfactorily analysed a great group of phenomena which had up to his time baffled all those who attempted the task. How great his service was is easily seen when we remark the progress of those who adopted his ideas as compared with those who for a time hesitated to do so, Ohm was guided in his mathematical work by analogy with the problem of the flux of heat, and intro- duced for the first time into the theory of the pile, the equivalent of the modern word potential. Ohm’s word was electroscopic force or tension (Spannung), and he showed that the fall of the potential is uniform along a homogencous linear conductor. He considered that the potential was analogous to the temperature, and the flow of electricity to the flow of heat, so that the former just as much as the latter obeys the law of continuity. Ohm verified his theo- retical conclusions with thermo-electric piles, and he ob- served, as Erman (Gi/b. Ann., 1801) had done before him, the differences of potential at different points of the cir- cuit. Davy, Pouillet, and Becquerel laboured at the experimental verification of Ohm’s law, and a

great body of evidence was given by Fechner in his Jfaasbestim- mungen tiber die Galvanische Kette (1831). The law of the fall of potential was verified by the elder Kohlrausch, who employed in his researches Volta's condenser and Dell- mann's electrometer (Pogg. Ann., lxxv., 1848). Later researches of a similar nature were made by Gaugain and Branly. Among recent investigations bearing un Ohm's law,

the most remarkable is the verification for electrolytes by

Kohlrausch (the younger) and Nippoldt. They. principally used alternating currents in their researches, which were furnished by a "'sine inductor," the measuring instrument employed being the electro-dynamometer of Weber. In the report of the British Association for 1876 an account is given of some experiments,' in which the testing of this law seems to have been carried to the limit of experimental resources. It must now be allowed to rank with the law of gravitation and the elementary laws of statical electricity as a law of nature in the strictest sense. Many remarkable applications of Ohm's law have been made of late, in par- ticular to linear conductors by Ohm, Poggendorff, and especially Kirchhoff (Pogg. Ann., 1845-7-8). The works of Helmholtz, Smaasen, and Kirchhoff on conduction in three dimensions must also be mentioned. Very import- ant, on account of the experimental results with which they deal, are the calculations of Du Bois Reymond (Pogg., \xxi., 1845) and Riemann (Werke, Leipsic, 1876) on Nobili's rings, and of Kirchhoff (Pogg., lxvii., 1848), W. R. Smith (Proc. Roy. Soc. Edin., 1869-70), Quincke, Stefan, Adams, and others on conduction in plates. Theo- retical applications to thé varying currents in submarine cables of great interest have been made by Thomson (Phil. Mag., 1856) and Kirchhoff (Pogg. Ann., 1857), while practical researches of the greatest importance to tele- graphy have been made on this and kindred subjects by Faraday, Wheatstone, Guillemin, Varley, Jenkin,and others.

Great improvements in galvanometers and galvanometry

1 Suggested mainly by Prof. Clerk Maxwell, and carried out by tha present writer.

Electro- motive force, re- sistance, and current strength,

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ERC Cnt Y

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HISTORY. | Measure- have been made in our time. One of the first to use an; connect its poles with a ‘Thomson’s clectrometer, and ment of electro-magnetic instrument for measuring or indicating | compare the deflection thus obtained with that due to current. currents was Schweigger, who in 1820 invented the | some standard electromotive force. Another very satis- an “= inultiplier.” Nobili used (1825) the astatic “multiplier” | factory method is Latimer Clarke’s modification of Poggen- ’ with two needles, which is sometimes named after him. | dorfi’s compensation method (see Maxwell, 413). It is Becquerel (1837) used the electromagnetic balance, which | likewise not difficult to measure by a variety of methods, was’employed in an improved form by Lenz and Jacobi. | the most satisfactory being that of Mance (Maxwell, 411), Pouillet invented the sine and tangent compasses (1837). | the internal resistance of a battery when it is only traversed The defects of the latter instrument were pointed out by | by a feeble current. But the measurement of the electro- Poggendorff, and remedies suggested by him as well as | motive force and internal resistance of a battery working a Wheatstone and others. Weber effected great improve- | strong current has hardly as yet been achieved with success ; ments in the construction and use of galvanometers, | not that we undervalue the ingenious and important adapted them for the measurement of transient currents, methods of Paalzow, Von Waltenhofen, Beetz (Wiede- and elaborated the method of oscillations which had been | mann, i. § 181), and Siemens (Pogg. Ann., 1874). The much used by Fechner. In 1849 Helmholtz invented the | concordant results of the last two are indeed very tangent compass with two coils which bears his name. | remarkable. Still all these methods are more or less Great improvements in delicacy and promptness of action | affected by the fact that the electromotive force of a have been made by Sir William Thomson in galvanometers | battery depends on the current which it is sending (see destined for the measurement of resistance, and for indi- | Beetz in Pogg. Anm., cxlii.). cating the feeble currents of submarine cables. The “crown of cups” of

Volta was the parent of a Batteries. Rest. The measurement of resistance has been carried to great | great many other arrangements for the production of ance perfection, chiefly owing to the labours of those who have | voltaic electricity. These had for their end either com- measure: busied themselves in perfecting the electric telegraph. | pactness or diminution of the internal resistance by en- ment. Among such the highest place must be assigned to Sir | larging the plates; we may mention the batterics of Charles Wheatstone; his memoirs in the Philosophical | Cruickshank (1801), Wollaston (1815), and Hare (1822). Transactions (1843) gave a great impulse to this depart- | In 1830 Sturgeon introduced the vapital improvement ment of our science. He invented the rheostat, which | of amalgamating the zinc plates. In 1840 Smee used underwent several niodifications, but is now superseded by | platinum or silver plates instead of copper; by platinizing the resistance box which was first used by Siemens. The} these he avoided to a considerable extent polarization by earlier methods of Ohm, Wheatstone, and others for} adhering hydrogen. In 1836 Daniell invented the two- measuring resistance were defective, because they de-| fluid battery which bears his name. ‘This battery is the pended on the constancy of the battery which furnished | best constant battery hitherto invented, and is, under the current. These defects are completely obviated in the | various modifications, largely used in practical and scien- more modern “null methods,” which may be divided | tific work. In the same year Grove invented his well- into two classes—those which depend on the use of the | known battery, which surpasses Daniell’s in smallness differential galvanometer introduced by Becquerel, and | of internal resistance and in electromotive force, although, those which are modifications of the Wheatstone’s bridge | on the other hand, it is more troublesome to manage and method, invented by Christie and brought into nse by | is unsuited for long-continued action. Cooper, in 1840, Wheatstone. As examples of the latter, we may mention | replaced the expensive platinum plates of Grove’s battery the methods of Thomson, and of Matthiessen and Hockin, | by carbon, This modification was introduced in a prac- for measuring small resistances, and Thomson’s method for | tical form into the battery of Bunsen (1842), which is measuring the resistance of the galvanometer (see Max-| much used on the Continent, and combines to a certain well’s Electricity and Magnetism, pp. 404, 410). Many | extent the advantages of Grove and Daniell. Among the determinations of the specific

resistances of metals and | more recent of one-fluid batteries may be mentioned the alloys have been made by Davy, Ohm, Becquerel, Matthies- | bichromate battery of Bunsen and the Léclanché cell. It sen, and others. To Matthiessen in particular science | is impossible here even to allude to all the forms of battery is indebted for great improvements in method and a] that have been invented. We may, however, in passing large body of valuable results in this department. The | notice the gravitation batteries of Meidinger and Varley, metals have been arranged in a series according to | and the large tray cell of Sir William Thomson. their conducting powers; and this series is found to Following up the discoveries of Nicholson, Carlisle, be nearly the same for electricity as for heat. The | Davy, and others, Faraday took up the investigation of conductivity of metals decreases as the teniperature iu- | the chemical decompositions effected by the electric current. creases, the rate of decrease being nearly the same for | In 1833 he announced his great law of electro-chemical most pure metals, but much smaller and more variable for | equivalents, which made an epoch in the history of this alloys, which, on the other hand, have in general a large | part of electricity. He recognized and for the first time specific resistance. The earlier attempts to measure the | thoroughly explained the secondary actions which had resistance of electrolytes were not satisfactory, owing to | hitherto masked the essential features of the phenomenon. insufficient allowance for polarization. In later times this | Faraday's discovery gave a new measure of the current, difficulty has been overcome or avoided, and concordant | and he invented an instrument called the voltameter, results have been obtained by Beetz, Paalzow, Kohlrausch, | which was much used by those who followed out his Nippoldt, and Grotrian. The three last, using the electro. | discoveries. Space fails us to notice in detail the labours dynamometer and sine inductor, have made elaborate re- | of those who verified and developed Faraday's discovery. searches, establishing among many other interesting re-| De la Rive, Becquerel, Soret, Buff, Beetz, Hittorf, Mat- sults that the conductivity of electrolytes increases with | teucci, Daniell, Miller, and many others have worked in the temperature (Pogg. Ann., 1869-74). this field. Klectro- , The measurement of the electromotive force and that of Many theories of electrolysis lave been given. That of Theories a internal resistance of batteries in action are problems which, | Grotthuss (1805) has been held under various modifi- of elec- internal LL their most general form, are

inextricably connected. It | cations by many physicists; but none of these theories wont: resist- 28 Casy to measnre with considerable accuracy the electro- | have done more than give us a convenient mode of repre- ance. Motive force of an open battery. We have merely to | senting experimental results. Clausius (Pogg. Ann,

14

ci, 1857) has published a remarkable molecular theory of electrolysis, which is free from some of the objections to the views of Grotthuss and his followers.

The advances made in the experimental study of electro- lysis reacted on the theory of the galvanic battery. It was now recognized that the cause of the inconstancy of batteries is the opposing electromotive force due to the existence of the products of decomposition at the plates of the battery. Gautherot, in 1802, observed the polarization current from electrodes which had been used for electrolysis. Ritter confirmed his discovery, and con- structed on the new principle his secondary pile. Ohm also experimented on this subject. Fechner and Poggen- dorff suspected the existence of a transition resistance (Uebergangswiderstand) at the places where the chemical products were evolved. But the experiments of Lenz, Beetz, and others soon showed that a vera causa existed in the electromotive force of polarization amply sufficient to explain their results. The influence of the strength of the current, the size and nature of the plates, time, &c., on polarization have been investigated by many physicists, among whom are prominent Beetz and Poggendorff. Determinations of the electromotive force of polarization have been made by Daniell, Wheatstone, Poggendorff, and Beetz, and recently by Tais and others. Among recent labours on polarization are to be mentioued those of Helmholtz and his pupils. We must not omit to notice here the gas battery of Grove, and the powerful secondary piles which have recently been constructed by Plante. We refer those interested in these and kindred sub- jects to the exhaustive accounts in Wiedemann’s Gal- vanismus, Justice to all contributors to our knowledge is impossible in our limited space.

Contact This is perhaps the place to mention the great battle and che- that raged so long between the upholders of the two rival aoe theories of the

action of the pile. Volta and his imme- of the diate successors held that the current was due to the pile. electromotive force of contact between the dissimilar

metals in the circuit, the function of the electrolyte being simply to transmit the electricity, there being no contact force between metals and liquids. The upholders of the chemical theory sought for the origin of the current in the chemical affinity between the zinc and the acid or their equivalents in the battery, and, in the first instance at least, denied the existence of the contact force of Volta. It was soon shown, however, on the one hand, that there was a contact foree between metals and. liquids, and, on the other, that an electric current could be generated with- out a heterogeneous metallic circuit at all.

Later holders of both theories modified their views as experiment established the necessity for so doing. Ohm and Fechner and other Continental philosophers inclined to a modified contact theory, and Sir William Thomson at present lends his weighty authority to that side. On the other side are the great names of Faraday, Becquerel, and De la Rive. The contact theorists devoted their attention more to the electrostatic phenomena of the pile, while the chemical theorists studied with great minuteness the phenomena of electrolysis, so that both theories have rendered good service to science. Now-a-days most physicists probably recognize too well the defects of both theories to think it worth while to attack either, and take refuge more or less in eclecticism.

There was one point which the older adherents of the contact theory overlooked, the importance of which was cise more or less dimly perceived by their chemical opponents. the con. Lhis was, in modern language, the question, where does the servation energy come from which appears as kinetic energy in the ofen- moving parts of electromagnetic engines, as heat in the con- ergy. ducting wires, through which a current is being driven,and so

Polariza- tion.

Applica- tion of the prin-

forth? It was not until the dynamical theory of heat had been perfected that the first answer to this question was given. Joule (Phil. Mag., 1841) had arrived experimentally at Joule's the law which regulates the generation of heat in couduc- !2w. tors by the electric current, and his law was verified by Lenz and Becquerel, both for metals and electrolytes. Reasoning from Joule's law on the case where the whole of the energy appears in the form of heat, Thomson (Pil. Mag., 1851) established the important theorem that the electroniotive force of an electro-chemical apparatus 1s,

in absolute measure, equal to the mechanical equivalent

of the chemical action ou one electro-chemical equivalent of the substance. Calculations of the electromotive force of a Daniell's cell, from the results of Joule, Andrews, and Favre and Silbermann, have given numbers agreeing with the direct measurements of Bosscha. The total amount of the electro- motive force in the circuit having been thus satisfactorily determined, the question between the rival theories is re- duced to the determination of the seat of this foree—At which of the junctions does it act ?

Besides his great services in other branches of electricity, Electro- Faraday did much to advance electrostatics. His experi- statics. mental investigations on electrostatic induction are of great interest, and his discovery of the effect of the medium between the electrified bodies opened out a new aspect of the phenomenon quite unsuspected by those who held too closely to the thevries of action at a distance. He introduced the term specific inductive capacity, and measured the capacity of several solid substances, show- ing that in these it was much greater than that of air. He conceived that his results were at variance with any theory of action at a distance, and gave a theory of his own, which accounted for all his facts, and whicli guided him in his investigations. Matteucci and Siemens adopted the views of Faraday, and the latter introduced refined methods for measuring specific inductive capacities. Such measurements have been made in Jater times by Bar- clay and Gibson for paraffin, and by Silow for certain fluids. The most

remarkable result thus obtained, how- ever, are those of Boltzmann, who succeeded not only in detecting but in actually measuring the differences between the specific inductive capacities of different gases. Faraday had looked in vain for such differences, and concluded that the specific inductive capacity was the same for all gases. The phenomenon of the residual discharge was recognized and experimented on by Faraday. Kohlrausch, Gaugain, Wiillner, and others have also experimented on it; and quite recently Mr Hopkinson has obtained some very interesting results regarding the superposition of residual discharges. These results are analogous to the curious phenomena of “elastic recovery” observed by Kohlrausch.

Sir W. Snow Harris was a very able experimenter, and did much to improve electrostatical apparatus. He used the electrical balance and the bifilar suspension balance in- vented by hiraself. On the strength of his results he ques- tioned the soundness of the views of Coulomb. The work of Harris on the influence of the surrounding medium ou the electric spark is of great importance. Faraday made a series of beautiful experiments on this subject, and arrived at a body of results which still form a good portion of the established facts on this subject. Very important in this connection are the measurements of Sir W. Thomson of the electromotive force required to produce a spark in air between two conductors, which he has found to be dis- proportionally smaller for large distances than for small.

The luminous phenomena attending the electric dis- charge, especially in vacuum tubes such as those of Geiss- ler, are exceedingly beautiful, and have of late formed a favourite subject of experimental study. Many interesting results have been obtained, the significance of which we may

not yet rightly comprehend. Among the older labours in this field we may mention those of Pliicker and Hittorf, De la Rive, Riess, Gassiot, and Varley. But even as we write our knowledge of the subject is extending, and we refrain from referring to more modern results; for historical sketching—a difficult task in any case—is unsafe in an open field like this, where some

apparently insignificant fact may contain the germ of a great discovery. We may here mention the experiments of Wheatstone on the velocity of electricity, valuable less for the results he obtained than for the ingenious application of the rotating mirror, then used for the first time, which has since been applied with much success in the study of the electric discharge.

One of the greatest names in electrical science is that of tiess. In his classical research on the heating of wires by the discharge from a battery of Leyden jars, he did for elec- tricity of high potential what Joule did for the voltaic current. The electro-thermometer which he used in these researches was an improvement on the older instruments of Kinnersley and Harris. Riess repeated and extended the experiments of Coulomb, and effected many improvements in the apparatus for electrostatical experiments. His Rezbungs- clectrictdt is a work of great value, and was for long the best book of reference open to the experimental student. Happily we have now another in the recently published work of M. Mascart.

Sir William Thomson revolutionized experimental elec- tricity by introducing instruments of precision. Chief among these are his quadrant and absolute electrometers. His portable electrometer and water-dropping apparatus are instruments of great value to the meteorologist in the study of atmospheric electricity, a science which he has done much in other ways to forward. Besides this, we owe to him many valuable suggestions for electrical apparatus and ex- perimental methods, some of which have been carried out by his pupils.

The theory of statical electricity has made great progress since Poisson's time. Among its successful cultivators we may mention Murphy (Electricity, 1833), and Plana (1845). The latter went over much the same ground as Poisson, extending his results. It was, however, by Green (Hssay on The Application of Mathematical Analysis to the Theories of Electricity and Magnetism, 1828; or Mathematical Papers, edited by N. M. Ferrers), a self-taught mathemati- cian, that the greatest advances were made in the mathema- tical theory of electricity. '" His researches," as Sir William Thomson has observed, " have led to the elementary pro- position which must constitute the legitimate foundation of every perfect mathematical structure that is to be made from the materials furnished in the experimental

laws of Coulomb. Not only do they afford a natural and complete explanation of the beautiful quantitative experiments which have been so interesting at all times to practical electri- cians, but they suggest to the mathematician the simplest and most powerful methods of dealing with problems which, if attacked by the mere force of the old analysis, must have remained for ever unsolved." One of the simplest appli- cations of these theorems was to perfect the theory of the Leyden phial, a result which (if we except the peculiar action of the insulating solid medium, since discovered by Faraday) we owe to his genius. He has also shown how an infinite number of forms of conductors may be invented, so that the distribution of electricity in equilibrium on each may be expressible in finite algebraical terms,—an immense stride in the science, when we consider that the distribu- tion of electricity on a single spherical conductor, an unin- fluenced ellipsoidal conductor, and two spheres mutually influencing one another, were the only cases solved by Poisson, and indeed the only cases conceived to be solvable by mathematical writers. The work of Green, which con-

tained these fine researches, though published in 1828, had escaped the notice not only of foreign, but even of British mathematicians ; and it is a singular fact in the history of science that all his general theorems were re- discovered by Sir William Thomson, Chasles and Sturm, and Gauss (see Reprint of Thomson's papers). Sir Wil- liam Thomson, however, pushed his researches much further than his fellow-labourers. He showed that the experimental results of Sir William Snow Harris, which their author had supposed to be adverse to the theory of Coulomb, were really in strict accordance with that theory in all cases where they were sufficiently simple to be sub- mitted to calculation. He was guided in his earlier in- vestigations by an analogy between the problems involved in steady flux of heat and the equilibrium of electri- city on conductors. He showed in 1845 how the pecu- liar electric polarization discovered by Faraday in. di- electrics, or solid insulators subjected to electric force, is to be taken into account in the theory of the Leyden jar, so as to supply the deficiency in Green's

investigations. We also owe to Sir William Thomson new synthetical methods of great elegance and power. The theory of electric images, and the method of electric inversion founded thereon, constitute the greatest advance in the mathema- tical theory of electrostatics since the famous memoir of Green. These lie has applied in the happiest manner to the demonstration of propositions which had hitherto re- quired the resources of the higher analysis, and he has also found by means of them the distribution on a spherical bowl, a case of great interest in the theory of partially closed conductors, which had never been attacked or even dreamt of as solvable before. The work of Professor Clerk Maxwell on Electricity and Magnetism, which appeared in 1873, has already exerted great in- fluence on the study of electricity both in England and on the Continent. In it are fully given his valuable theory of the action of the dielectric medium. He regards the electrical forces as the rcsult of stress in the medium, and calculates the stress components which will give the observed forces, and at the same time account for the equilibrium of the medium. The striking discovery re- cently made by Mr Kerr of Glasgow, of the effect on polarized light exerted by a piece of glass under the action of strong electric force, is of great import- ance in connection with Maxwell's theory, and realizes a cherished expectation of Faraday, of whom Maxwell is the professed 'exponent. We must allude here once more to Maxwell's electromagnetic theory of light, the touchstone of which is the proposition that in transparent media, whose magnetic inductive capacity is very nearly equal to that of air, the dielectric capacity is equal to the square of the index of refraction for light of infinite wave length. Although, as perhaps was to be expected, owing to disturbing influences such as heterogeneity, this proposition has not been found in good agreement with experiment in the case of solids, yet for liquids (Silow, Pogg. Ann., clv. clviii.) and gases (Boltzmann, bid. clv.) the agreement is so good as to Jead us to think that the theory contains a great part of the whole truth.

In the earlier stages of the science several units were in- Absolute troduced for the measurement of quantities dealt with in units.

electricity. As examples of these we may mention the wire of Jacobi, and the mercury column of Siemens, a metre long, with a section of a square millimetre, which at given temperatures furnished units of resistance; the

Daniell’s cell, which furnished the unit of electromotive force, the chemical unit of current intensity, &c. All these units were perfectly arbitrary, and there was no con- nection of any kind between them. The introduction of a rational system of unitation, based on the fundamental

Funda- mental experi- ment.

uuits of time, mass, and length, was one of the greatest steps of our time. The impulse came from the famous memoir of Gauss, Intensitas Vis Magnetice Terrestris ad Mensuram absolutam revocata, 1832. In conjunction with Weber, he introduced his principles into the measure- ment of the earth’s magnetic force. ‘To Weber belongs the credit of doing a similar service for electricity. He not only devised three different systems of such units—the electrodynamical, the electrostatical, and the electromag- netic-—but he carried out a series of measurements which practically introduced the last two systems. The funda- mental research in this subject is to determine in electro- magnetic measure the resistance of some wire from which, by comparison, the electromagnetic unit of resistance can be constructed. Measurements of this kind were made by Kirchhoff in 1849; more carefully in two different ways by Weber in 1851; by the committee of the Bri- tish Association in 1863, &c.; by Kohlrausch in 1870; and by Lorenz in 1873. Accounts of these important re- searches will be found in Wiedemann and Maxwell, and in the collected reports of the British Association on “ Elec- trical Standards.” The ratio of the electrostatic to the electromagnetic unit of electric quantity is a velocity (ac- cording to Maxwell’s electromagnetic theory of light it is the velocity of light), the experimental determination of which is of the greatest theoretical and practical import- ance, Such determinations have been made by Weber and Kohlrausch in 1856, by Maxwell in 1868, and by Thom- son in 1869. he results are not so concordant as might be desired, but the research is a very difficult one.

For convenience in practice the British Association com- mittee have recommended certain multiples of the absolute unit, to which they have given names—eg., the Ohm, the Volt, the Farad, &c. These have become current toa great extent among practical electricians in this country. For

practical purposes, an empirical standard of electromotive force has been introduced by Latimer Clark, whose value in volts is given as 1457. [t is very important, in order to be able to reduce chemical to absolute measure, to know accurately the electro-chemical equivalent of water. Values for this have been found by Weber (1840), Bunsen (1843), Casselman (1843), and Joule (1851). Kohlrausch (1873) made a careful determination of the electro-chemical equi- valent of silver, from which the electro-chemical equivalent of water can be calculated.

GENERAL SKETCH OF PHENOMENA

If a piece of glass and a piece of sealing-wax be each rubbed with a dry woollen cloth, it will be found that both the glass and the wax have acquired the property of attracting indiscriminately any small light body in the neighbourhood; and it will be further observed, in many cases, that the small bodies, after adhering for. a little to the glass or wax, will be again repelled.

These actions have at first sight a likeness to the at- tractions and repulsions of magnetic bodies, but they are sufficiently distinguished from these—1st, By their origin, — being excited by friction and other causes in a great variety of bodies, whereas magnetic action is powerfully exhibited and communicated only by certain varieties of iron and iron ore, by nickel and cobalt, and ky certain arrangements which we shall have to mention by-and-by; 2d, By the nature of the bodies acted on; for these may be, in the case of excited glass or wax, light particles of any substance, whereas the only bodies powerfully acted on magnetically are either magnets or their equivalents, or iron, nickel, and cobalt ; and 3d, By the fact that every magnet has two poles possessing opposite properties, whereas

an electrified body may have similar properties in every part of its surface.

If the experiment were carefully tried it would be found that a piece of glass excited as above repels another piece of glass similarly excited, but attracts an excited piece of’ wax. A convenient way of exhibiting these actions, which also brings under our notice another fact of fundamental importance, is as follows. Two gilt balls of elder pith are fastened to the ends of a light needle of shellac, which is balanced horizontally on a point carried on a

vertical stand (fig. 1). To the stand a stop is fixed for con- venience, to prevent the needle from spinning more than half Q—__ round. If we touch the ball A with a piece of excited glass, and B with a piece of excited sealing-wax, and touch a ball C, fastened to a shellac stem, with a piece of excited glass, then C will chase A = away till it is brought up by Fig. I. the stop, while it will, on the other hand, attract B. If, again, C be touched with a piece of excited wax, it will attract A and repel B.

Pieces of glass or wax excited in this way are said to be Defini- electrified, and the balls which by contact have acquired tion of properties similar to those of the originally electrified bodies *lecttit: are said to be electrified by conduction. _

; and con-

It appears from the above experiment that the electrifi- duction. cations of glass and sealing-wax, when rubbed with wool- len, have opposite properties, which they communicate to bodies brought into contact with them. A body which has similar electrification to a piece of glass rubbed with wool- len is said to be vitreously or positively electrified; a body with similar electrification to a piece of sealing-wax rubbed with woollen is said to be resinously or negatively electri- fied. The result of the above experiment may then be summarized thus :—

Bodies sintilarly electrified, whether positively or nega- tively, repel each other.

Bodies oppositely electrified attract each other.

We have seen that a pith ball becomes, by contact with a Condue. positively electrified piece of glass, itself positively electrified. tors and If we take two pith balls, electrify one of them positively, 202°? and then touch both simultaneously by a piece of thin —_— wire, suspended by white silk, and test them with the electroscopic needle described above, they will be found both positively electrified; each will repel A and attract B, though less powerfully than the originally electrified ball did, before the connection between them was made. The success of the experiment will be found inde- pendent of the length or shape of the wire, and will be equally good with

silver, gold, iron, Jead, or any other metal. But, if we use a thread of glass or shellac to con- nect the balls, the electrification of the first ball will be found unaltered, and the second will remain neutral—that is, it will not attract or repel another neutral ball, and will equally attract both balls, A and B, of the electroscopic needle. The difference in the power of transmitting elec- trical properties from one body to another, or of aiding in electrification by conduction, leads us to divide all sub- stances into two classes—conductors, which do very readily, and non-conductors, which do not, or do not very readily, transmit electrification from one body to another. If we connect an electrified conductor by means of another con- ductor to a very large conducting body, such as the earth, it will be found that so much electrification has been carried away from the small body that it is left sen- sibly neutral. If, accordingly, we wish a conducting Insule body to preserve its electrification unaltered, we must sup- tion and port it on some non-conducting substance. When thus isle supported the body is said to be insulated, the non-con- ‘”™

Induc- tion.

Use of terms “Flectri- city,” &e.

PROVISIONAL THEORY. |

ducting support being called the cnsulator, a name which has ou that account been given to non-conductors gene- rally.

We have remarked above that a neutral pith ball attracts equally the positive and negative balls of the electroscopic needle ; this leads us to re- mark, more explicitly than we have hitherto done, that an electrified body in general and in the first instance attracts a neutral or unelec- trified body. The explana- tion of this action is that the originally neutral body in presence of the electri fied body becomes itself electrified for the time. It is said to be electrified by «induction, and it is very easy to show, by using large bodies, not only that the originally neutral body is actually electrified, but that it is oppositely electrified in different parts. Thus (fig. 2) A and B are two bodies suitably insu- lated and placed one above the other. If B be originally neutral, and A be positively electrified, then the lower end of B will be negatively, and the upper end positively electri- fied ; as may be

easily shown by exploring with a small posi- tively electrified pith ball suspended by a dry white silk thread ; the little ball will be attracted towards the lower end of B, and repelled from the upper. If we remove the body A, or, which (as we have seen) amounts to the same thing, connect it with the earth, and so “discharge” its electrification, we shall find that all traces of electrical ac- tion in B have disappeared—.e., the small positively elec- trified pith ball will be attracted everywhere; and, if we discharge it too, it will neither be attracted nor repelled anywhere.

Fig: 2.

Provisional Theory.

Before going further into detail, it will be convenient to give a working theory of electrical phenomena, so far as we have considered them. The use of such a theory at the present stage is to enable us to co-ordinate and classify the results of experiment, and to furnish a few leading principles under which we may group results which appear to be due to a common cause. Such a theory is invaluable as a memoria technica for experi- mental results, and is useful in sugyesting directions for experimental inquiry; but in framing it we must be careful to make it contain as little as possible beyond the results of actual experiment, and in using it we must be on our guard against allowing it to prepossess our minds as to what may be the ultimate explanation of the phenomena we are considering.

Following the caution of Coulomb and the example of Sir William Thomson, we shall avoid the use of the term electrical fluid, and substitute instead the more succinct and less misleading word electricity. We suppose that a body which exhibits electrical properties (as above defined) has associated with its mass a certain quantity of something which, without attempting further definition, we shall call electricity. Of our right to use the word quantity here we shall give experimental justification by-and-by, and then the question of the appropriate unit will (vide infra, “ elec- tric quantity”) be discussed. We may suppose that elec-

tricity is distributed throughout the whole mass of a body, and speak of electrical ‘“‘ volume density,” meaning the quan- tity of electricity in an element of volume divided by the element of volume. We shall also speak of an element of elec- tricety, meaning the electricity in an element or very small portion of a body. In certain cases we shall find that electricity resides on the surface of a body; electrical “ surface density” then means quantity of electricity on an element of surface divided by the element of surface, and element of electricity the electricity on an element of surface.

For shortness, we shall denote positive or vitreous electricity by the mathematical sign+, and resinous or negative electricity by the sigu—, remarking that the choice of the signs is arbitrary, and reserving for the pre- sent the question of how far we may associate with these signs the corresponding mathematical ideas.

We shall assume that every element of electricity repels every other element of the same sign, and attracts every other element of opposite sign. The precise law of this force will be investigated further on.

This force considered as acting on any element of elec- tricity we shall call an electric force. In perfectly con- ducting substances electricity moves with perfect freedom under any electromotive force, however small. In perfect non-conducting substances electricity will not move under any electromotive force, however great. Any case in nature lies somewhere between these extremes, but into questious of gradation, &c., we do not enter for the present.

When the forces due to other electrical elements acting on the electricity in any element of a body have a resultant, that resultant acts on the element itself, and is called the ponderomotive force, to distinguish it from the electro- motive? (or electric) force which tends to move + electri- city in one direction and — electricity in the opposite direction.

When a body is neutral, we shall assume that it coutains equal and equally distributed quantities of + and — elec- tricity, and we shall further suppose those to be practically unlimited in amount. A-+electrified body is then to be conceived as a body which has excess of + electricity and a — electrified body as one which has excess of — electricity. Communication of+

electricity to a body is in accordance with this to be regarded as equivalent to the abstraction of an equal amount of — electricity, and conversely.

It is easy to see that the above assumptions will explain in a general way the phenomena already described. Thus the + electricity of the electrified pith ball C acting on the +electricity of the ball A of the electroscopic needle repels it, and this force by our assumption is equally exerted on the matter of A, therefore A tends to move away from C, and will do so as long as it is free to move. The action on the — electrified ball B is similarly explained. Conduction and discharge to earth may be explained In a similar manner.

The attraction of an electrified body (+ let us sup- pose) A on a neutral insulated body B is thus explained. The + electricity on A (fig. 3) attracts the — electri- city in B and repels the + electricity, so that, though there is still on the whole as much + elec- tricity as — electricity, yet the distribution is no longer the same, for, the electricity being free to move, the — electricity under the attraction approaches A until the non-conducting air

Fig. 3.

1 It might be well to use the term “ electric force” here, for “elec- tromotive force” is afterwards used to mean the line integral of a force

(see below, p. 24). VIll. — 3

Electro- scopes and electro- meters.

Cou- lomb’s torsion balance,

and the attraction of the separated + electricity on B stops it, and the + electricity recedes in similar fashion. When electrical equilibrium has been attained the action of the + electricity of A on the — electricity of B will exceed its action on the + electricity of B, which is on the whole more distant,! the electromotive force on the electricity of B will be on the whole attractive, and hence the pondero- inotive force on B, will be also attractive.

The above explanation involves of course the general explanation of electrification by induction.

Experimental investigation of Electrical Quantity, Distribution, and Force.

In what follows we shall suppose that we have an instrument which will serve as an electroscope and to some extent as an electrometer; that is, which shall tell us readily whether a body brought into communication with it is +or — electrified or not at all, and also enable us to tell when one body is more strongly electrified + or — than another.

The gold-leaf electroscope of Bennet or the dry pile electroscope of Bohnenberger will meet these require- ments, and have been much used in electrical researches. We shall, however, suppose that we are using the rudimen- tary form of Themson's electrometer constructed by Elliot Brothers for lecture-room experiments, which is now much used in England, and answers very well. For a description of these and other electroscopes and electro- meters, see article ELECTROMETER.

We shall also assume for the present that we have the means of producing and communicating to any body as much of either kind of electrification as we please, and pass on to consider the data of experiment regarding the distribution of statical electricity in conducting bodies. We are thus at the very outset brought face to face with the idea of electric quantity.

Electric Quantity.

We have to explain how the introduction of the term quantity into electrical science is justified by experiment, and how we can multiply and subdivide quantities of electricity. Although it is no doubt possible to introduce the notion of quantity independently of the measure of electric force, yet the most convenient and practical measure of quantity de- pends on the measurement of force, and the absolute electrostatic unit of quantity is stated in this way. We are naturally led, therefore, to combine with the study of quantity and distribution the experimental study of the laws of electric force.

We shall have occasion to allude to two leading experi- mental methods that have been used in investigating the present subject. These might be called the old method and the new.

The old method, which did so much for electrical science in the master hand of Coulomb, depended on the use of the torsion balance and proof plane, both invented by Coulomb himself. This method was used by Reiss and others up to Faraday's time.

Michell, about Coulomb's time or a little before, first suggested the idea of measuring small forces by the torsion of a wire. He proposed to apply the method to measure the attraction of gravitation between two bodies of moderate size, thus finding the mean density of the earth, and the method was actually carried out by Cavendish; but Cou- lomb was in all probability unaware of Michell's suggestion. He made careful preliminary experiments (the first of the Kind) on the torsion of wires, and found that the couple

1 It is here tacitly assumed that the attraction between two elements of electricity decreases as the distance between them increases.

required to twist a straight wire through a given angle varies as the angle of torsion multiplied by the fourth power of the diameter of the wire directly, and as the length of the wire inversely (Mém. de V'Acad., 1784).

The balance used by Coulomb in most of his experiments is represented in figure 4.

ABDC is a cylinder of glass 1 foot in diameter and 1 foot high.

This cylinder is closed by a glass lid pierced centrically and eccen- trically by two openings, each about 20 lines wide. Into the middle opening is cemented a glass tube @ 2 feet high, to the upper end of which is fitted a torsion head; the sepa- (9 rate parts of the head |} are shown larger at the |} sidé of the figure. H is |] a collar cemented to the iF glass tube; MO a metal

|f disc, divided on the edge |f into 360 degrees; this | disc is fastened to a tube ~ N, which slips into the collar H. K isa button whose neck turns easily in a hole in MO; tothe lower part of the button is fastened a small clamp, which seizes the wire of the balance. Jisan arm with a small projecting a a ae Ng cle Fic. 4.—Torsion Balance. This piece has a fiducial mark on it, which enables us to read off the position of the arm on the graduated edge of MO. The horizontal arm bd consists of a silk thread or fine straw covered with sealing wax terminated by a thread of shellac at 6 about 18 lines long, which carries a pith ball 2 or 3 lines in diameter. At the other end of the arm is a vertical disc of oiled paper, which serves as a counterpoise to the pith ball, as a damper to the oscillations, and as an index by means of which the position of the horizontal arm can be read off on a graduation carried round the glass cylinder. The eccentric hole in the cover of the balance allows the introduc- tion of the fixed ball a; this is carried on a shellac stem fastened to a clamp P, which by means of fiducial marks can he placed in a fixed position on the cover. The wire in Coulomb's balance was of silver, about 30 cm. long. Its diameter was '0085 cm., and it weighed about 003 gm. He found by the method of oscillations that a couple equivalent to the weight of '17 milligramme, acting at the end of an arm a decimctre long, would keep the wire twisted through 360°.

Besides this form of balance Coulomb used others, some more delicate for electroscopic purposes, and others less so, but of larger dimensions, into which be could introduce electrified bodies.of considerable size.

Faraday used Coulomb's balance, and Snow Harris used the bifilar balance, which is a modification of Coulomb's. In the second volume of his Experimental Researches, however, Faraday gives a general method of experiment- ing, which to a great extent has superseded the older method. This may be called the "cage method;" it de- pends for its success on the use of some delicate instrument for measuring differences of potential; this was supplied by the quadrant electrometer of Sir William Thomson, which has thus completely revolutionized the whole system of electrostatic measurement.

Faraday's experiment was as follows (Zxp. Res., vol. ii. p. 279) :—

Let A (fig. 5) be an insulated hollow conductor with an opening Cage Faraday used a pewter ice pail,? method.

to allow admission to the interior. 104 in. high and 7 in. in diameter Connect the outside of A with one electrode of an electrometer E, which may for most purposes be the rudimentary form of Thomson's electrometer mentioned above. : Connect the other electrode of the electrometer with the earth. Jf now we introduce a positively electrified body, say a brass ball C,

= A cylinder of wire gauze will answer equally well, and allows the experimenter to see better what he is doing. Such a cylinder we shall call for shortness an " electric cage."

suspended by a white silk string, we shall find that the electro- nieter needle is deflected through a certain angle, the spot of light going a certain distance to the right, say, of the scale. It will be found that, provided the ball C is more than a certain depth (about 3 in. in Farady's ex- periment) below the mouth of the pail, no further motion of the ball, right or left, up or down, will affect the indications of the elec- trometer. It will also be found that the same indications will be got to whatever point of the outside of the pail the electrometer wire is attached. If we diminish or increase the + electrification of C, the electrometer deflection will diminish or increase accordingly. If we introduce a negatively electrified ball C', the deflection will be to the left, and everything else as before. If C gives a certain positive (right) deflection, and C' an equal (left) deflection, then if we introduce © and C' together, the deflection will be zero. If

Cand C' be both + electrified and give equal + deflections, then introduced together they will give a double + deflection, and if three such balls, all giving equal + deflections, be introduced together, they will give a treble + deflection.

It is obvious that this experiment of Faraday's not only gives a very ready test of the electrical state of bodies, but at once suggests the notion of

electrical quantity, and a theoretically possible electrostatic unit. Suppose, in fact, we take for our test the deflection of a Thomson's electro- meter of given sensibility, then we might specify as a unit of electrical quantity the quantity of + electricity on or ina brass ball of given size, which will produce with a given cage a certain given deflection of the electrometer.

To make this definition useful we must have the means of transferring a given charge from one body to another, and charging a body with any multiple or submultiple of our unit, and of charging a body with any multiple or sub- multiple of the unit of uegative electricity, which we may define as the quantity of — electricity which will just annul the action of the unit of + electricity in the electric cage.

All these requirements may be satisfied by suitably mo- difying Faraday's experiment.

We saw that we might move the ball about in the middle of our electric cage without affecting the electrometer de- flection ; we find, moreover, that when we withdraw the electrified ball without touching the cage, the needle returns tozero. If, however, before withdrawing the ball we cause it to touch the inside of the cage, the electrometer deflec- tion remains the same as before, and after the ball has been removed the deflection is still the same, while if we examine the ball, we find that all traces of electrification have disap- peared.

_ To transfer a given quantity of electricity—If we pro- vide ourselves with two cages, a large one G, and a small one H, and take a ball CO, electrified positively with unit quantity as above defined, then testing C in cage G, in connection with the electrometer, we get a certain de- flection D. If now we transfer the clectrification of C to H, by the process just described, and then put H inside G, we shall get the same deflection D as before. It appears, therefore, that we can transfer electrification from one body to another without loss; we thus fulfil one of our require- ments, and give an additional justification of the use of the word quantity in the present case.

To get any multiple or submultiple of the electric unit.— We may repeat the process above performed on the small cage H by touching its inside with

the ball C, again electri- fied to unit quantity. All the electrification will pass to H

Fig. 5.

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as before, and if we now test H in G we shall get a deflec- tion 2D. We can in this way get any multiple we please of the unit charge. If we take the elec-

trified brass ball C and touch it by a per-

fectly equal neutral ball C’, on introducing

C into G we shall get deflection 4 D; if we

touch C again by C’, previously rendered

neutral, we shall get deflection { D, and so

on; if we had touched C semultuneously, as

in fig. 6, with two equal neutral balls, we

should have got deflection 4 D, and so on. get any submultiple of our unit charge.

To get agiven multiple and submultiple of the negative untt.—This is possible when we can get a quantity of — electricity, which will just destroy the action of a given quantity of + electricity in the electric cage. If we intro- duce our given quantity of + electricity into the cage H, without allowing the conductor carrying it to touch the cage and at the same time put the outside of the cage in communication with the ground, then if we remove the conductor with the given quantity of + electricity and put it in G, it will give the same + deflection as before, while H tested in the same way will give a negative deflec- tion exactly equal to the former, and if both

be introduced together there will be no deflection. We can, therefore, in this way get a — quantity equal and opposite to a given + quantity.?

Fig. 6. We can thus

Electrical Distribution.

Experiments had been made before Coulomb's time to determine what effect the nature of a body has on electri- cal distribution. Gray and White concluded, from an experiment with two cubes of oak, one hollow and the other solid, "that it was the surface of the cubes only which attracted." Le Monnier? showed that a sheet of lead gave a better spark when extended than when rolled together. These experiments point to the conclusion that electrical distribution in conducting bodies depends merely on the shape of the bounding surface.

We may make experiments confirmatory of this conclu- sion with the electric cage. If we electrify a brass sphere A, and then touch it with another sphere B, and test the electrification of B in the cage, we shall find that the amount of electricity taken by B is always the same, what- ever its material may be, so long as the radius of its exter- nal surface is the same. Experiment is unable to detect any difference in this respect between a solid sphere of lead and the thinnest soap-bubble of the same radius. Coulomb took a large cylinder of wood, in which he made several holes four lines in diameter and four lines deep. Having electrified the cylinder and insulated it, he examined its electrical condition by means of the proof-plane. This instrument, so much used by Coulomb, consisted merely of a small disc of gilt paper (in this case a line and a half in diameter) fastened to the end of a needle of shellac. The disc is applied to any point of a body whose electrifi- cation we wish to test so as to be in the tangent plane to the surface of the body. Assuming for a moment, what we shall by-and-by prove, that electricity resides on the surface of bodies, it is natural to suppose that the proof- plane, when placed as described, will form part of the bounding surface, and will therefore take up as much elec- tricity as was originally on the part of the surface which it

1 The substance of the above and a good deal of what follows is taken from Maxwell's Electricity and Magnetism, vol.i. We recommend the student to

read his remarks on quantity, § 35, venturing to suggest, as an illustration of the transmission of energy by action at a distance, the case of two bar magnets, in which the energy of vibration is trans- mitted and retransmitted periodically. See Tait's Recent Advances in Physical Science, p. 179,

2 Mascart t. i. p. 90.

Hollow sphere experi- Inent.

Frank- lin's experi- ment.

Biot's experi- ment,

covers. If now we remove the proof-plane in the direction of the normal, keeping it, as nearly as possible, parallel to the surface, the electricity will not leave it; but we shall carry safely away all that it had when in contact with the surface of the body. We may return to the con- sideration of the proof-plane when we come to study mathematically the laws of electrical distribution.

In the experiment with which we are now concerned, Coulomb used a very delicate balance (a force of zy55 of a milligramme was sufficient to keep the wire twisted through 90°). When the proof-plane was applied to any point of the external surface of the wooden cylinder, and then introduced into the torsion balance, it repelled the electrified ball of the balance with great force. When it was carefully introduced into one of the holes, made to touch the bottom, and then carefully withdrawn so as not to touch the edge of the hole, it produced no appreciable effect on the balance.

Coulomb varied this experiment as follows. He insu- lated and electrified a hollow sphere of metal (fig. 7), and by carefully introducing a proof-plane through a small opening tested the electrical condition of the interior surface. He found no sensible trace of electricity inside, except very near the edge of the small opening. Hence we conclude that if the sphere had been closed entirely there would have been no electrification in- side. Many experiments have been made to illustrate the proposition that electricity

resides entirely on the surface of conductors. Franklin put a long chain inside a metal teapot, which he insulated and electrified. When he seized the chain by a hook at theend = of a glass rod and pulled it out of the teapot he observed thata pair of pith balls, suspended side by side from the teapet, collapsed more and more as the chain was drawn out, and he concluded that the electrification of the teapot, being now spread over a greater surface, had become weaker.

The following experiment of Biot's has become classical. A spherica] conductor A (fig.8) is supported on an insulat- ing stem D. Band Care two hollow hemispheres fastened to insulating handles Eand F. When these are fitted together they form a sphere some- what larger than A, with a small hole in it through which the stem D can pass. If we electrify A very strongly, so that : when put in the electric Fig. 8. cage it powerfully deflects the electrometer, and then close B and C over A, and make either B or C touch it, then separate B and C, and test A, B, and C in the cage, we shall find that all the electricity has gone from A and spread itself over B and C.

'The following is an ingenious experiment of Faraday's,

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involving the same principle. AB (fig. 9) is a wire ring SUP- Fara- ported on an insulating stand ; C is a conical muslin bag day's e fitted to the ring with two strings fastened to the vertex of perimen' the cone, giving the experimenter the means of quickly turning the bag inside out. If the bag be electrified in the first position in the figure and tested with the proof- plane and electric cage, it will be found that the outside only is electrified. If we turn the bag inside out and test it, we shall find as befure that what is now the outside, and was formerly the inside, is alone electrified. The electricity has thus passed through the bag so as to be on the outside in both cases. ;

Before leaving for a time tne question of the distmbution of electricity on conductors, it may be well to warn the student to accept with due reserve the proposition that electricity resides entirely on the surface of conductors, and to remind him that such a proposition is from the nature of the case

incapable of direct experimental proof, for we cannot operate in the substance of a mass of metal. Some of the experiments we have quoted bear more directly on the question than others. Coulomb's experiment, for instance, shows, strictly speaking, merely that electri- city avoids cavities and re-entrant angles, Again, in Fara- day's experiment with the linen bag, we have not clearly defined what we mean by the outside of the body. The proposition has on the whole been suggested rather than proved. Its meaning will become clearer as we go more and more into the theory of distribution,! and we shall meet with it by-and-by as one of the first propositions in the mathematical theory.

Laws of Electric Force.

Before proceeding to give an account of Coulomb's quantitative experiments on electrical distribution, we shall describe shortly the methods by which he arrived at the laws of electric force, and did for electricity what Newton did for astronomy, z.e., laid the foundation for a mathema- tical theory of the subject based on the hypothesis of action at a distance,

In this research Coulomb used the form of balance Experi- which we described above. The clamp holding the fixed mental ball of the balance is so adjusted that the centre of the ~— ball falls in a horizontal line through zero of the gradua- oar " tion on the glass cylinder and the prolongation of the sus- elemen- pending wire; the torsion button is turned till its arm is tary law at zero; the disc, button and all, is then turned till the force disc on the arm and the centre of the movable ball are in a line with the zero of the lower graduation. The fixed ball, which had been removed to allow of the last adjust- ment, being replaced, and the movable ball having come to rest in contact with it, both are electrified by means of a small metal ball carried on an insulating stem of shellac. The balls repel each other, and the movable ball takes up a certain position of equilibrium ; the corresponding angle is read off. The torsion button is then turned through an angle which is noted, so as to bring the balls nearer together. The new position of the beam is again read off ; this may be repeated a third time, We are then in pos- session of data from which we can draw conclusions as to the law of electrical force at different distances.

Let us assume that the force between two elements of positive electricity (supposed collected at two points, technically speaking, “regarded as physical points”) varies inversely as the square of the distance between them. It will be shown in the mathematical | theory that two spheres wniformly? electrified, as we shall at present

1 One additional caution may be useful, viz., not to confound this proposition with another of fundamental importance, of which we can | give direct experimental proof of the most conclusive nature “‘ that | there is no electrical action inside a hollow conductor containing no charged hodies.”’

& This condition is not absolutely satisfied in any experiment; it is approximately satisfied in Coulomb’s experiment.

mally on the end of a small shellac needle, which was hung Law of up, so as to be horizontal, on a fibre of raw silk attached attrac- to a horizontal scale. An insulated conducting globe was 4″ eas c : tested by set up with its centre in the same vertical plane as the) nog scale, and in the same horizontal plane as the centre of the of oscil-

small disc. ‘The globe and disc were oppositely electrified, lations.

LAW OF FORCE. |

assuine the two balls in the balance to be, repel each other, as if their electricity were collected at their centres. * Let ¢ be the angle of equilibrium in any case, 7 the angle of tor-

able ball (we suppose OF=OM); OK is perpendicular to FM. Then FM? « sin? –

Hence moment of the force on M about

(> os —

sion. O (fig. 10) is the centre of the beam, a M7 0 M

F and M the centres of the fixed and mov- Fig. 10.

Ox , and the torsonial couple «7+.

: € sin?

Hence in the three cases the value of (7 +e) sin a tan =A (say)

- must be the same, if the law of the inverse square agree with the experiments.

Coulomb made many experiments of the kind we have

described. The following is the result which he has given of one such :— Observed. Calculated. | Difference. | ¥ € = ice Sd ee 0 86° 0’ 36° 0’ ae 126° 18 0 13:16 6’

567 8 30 9 34

The third column is obtained from the two preceding. A is calculated by putting r= Oande = 36° in the formula

(tr + «€) sin 5 tan yuA-

Then using this value of A and the observed value of 7, the formula is employed to find ¢ in the two second cases. The agreement between the observed and calculated values of « is the test of the truth of the law we have assumed. The agreement in the second line is as good as can be expected when possible errors of experiment are considered. It will be seen, moreover, that the calculated is in excess of the observed value, which is what we ought to expect, owing to the loss of electricity which goes on during the time con- sumed in the experiment. That there is such a loss may be proved experimentally by simply leaving the movable ball to itself after any of the three operations ; it will be seen to move slowly towards the fixed ball. We shall re- turn hereafter to this loss of electricity, with regard to the exact nature of which authorities are not quite agreed.! In the third line the agreement is less good, but here the proximity of the balls renders the supposition of unifor- mity no longer even approximately allowable.

The mutual repulsion tends to drive the electricity on each ball farther from the other ball, and thus the action between the balls is as if the electricity on each were collected at points be- yond the centre, so that the observed repulsion must be less than that calculated on the supposition of uniformity

and the period of oscillation of the needle was found by observing the duration of 15 swings. The time of oscilla- tion follows the pendulum law, and varies inversely as the square root of the force acting on the needle, hence the duration of 15 oscillations will vary inversely as the square root of the force, ¢.e. directly as the distance between the centres of the globe and disc, if the law of the inverse square hold. Coulomb's experiment gave the following results :—

Ratio of distance to duration.

Duration of 15 oscillations.

Distance of centres of globe and disc.

7-29 |

9 20 18 41 2-28

24 | 60 2°50 |

The numbers in the third column ought to be all equal. The deviation from equality are not greater than can fairly be explained by loss of electricity and errors of observation.

Coulomb also investigated, both by means of the torsion balance and by the method of oscillations, the relation be- tween electric force and quantity.

He electrified the two balls of the torsion balance by simultaneous contact with another ball, and observed the angle of equilibrium; he then halved the quantity on the fixed ball by touching it with an equal neutral ball, and reduced the torsion till the angle of equilibrium, and, in consequence, the distance between the balls was the same as before; he found the torsional couple in the second case to be somewhat less than half what it was in the

first. He therefore concluded that the force between two elements of electricity varies as the product of the quantities.

Coulomb’s experiments were repeated, and his results confirmed by Riess,? and by Marié-Davy.? Experiments which, when properly interpreted, lead to the same results, were made by Snow Harris,* and by Egen.®

We have then arrived at this general law of electric force :—

If two quantities q, 7 of electricity be supposed collected State- at two points, whose distance is d, the force between them ment

q7 .

acts in the straight line joining the points and «x 2

So far, this law might be merely an approximation to the truth. Later on, however, it will be seen to be logically deducible from experiments which in delicacy infinitely surpass those just described. ‘The law of Coulomb is in fact established as certainly as the law of gravitation itself.®

of distribution.

Coulomb also made experiments with the torsion balance to test whether the law of the inverse square applies to the attraction as well as to the repulsion of electrified bodies. His experiments confirmed the law; but the

By means of the law now given the wntt of electrical quan- Degini- tity can be defined in a satisfactory and practical manner. tion of This unit we now state to be that quantity of positive elec- absolute tricity which, when collected into a point, repels with unit “ett

of force an equal quantity similarly collected into a pownt a

difficulty of operating is much greater in this case than in the former. He therefore adopted another method of experimenting. A small conducting disc was fixed nor-

1 This is only one of the many experimental difficulties which beset the use of the torsion balance, one of the most difficult of all instru- ments to use successfully. To appreciate the skill and sagacity of Coulomb in this and other matters, the student must read more de- tailed accounts (Riess and Mascart, or Mémoires de l'Acad., about 1785) of his labours than we can give here. He will be richly re- paid for his trouble. Nothing is better calculated to rouse the failing enthusiasm of the tyro in experimental electricity than a perusal of the works of Coulomb, unless it be to read the Experimental Researches of Faraday.

at unt distance from the former.

If we take centimetre, gramme, and second as our units of length, mass, and time, the unit force will be that force which in a second generates in a gramme of matter a velocity of a centimetre per second.

2 Reibungselectricitét, Bd. i. p.94. 3 Mascart, i. p. 67.

4 Phil. Trans., 1834 and 1836. In connection with which we call the attention of the student to the classical paper of Sir W. Thomson, Reprint of Papers on Electrostatics and Magnetism, p. 15 sqq

5 Riess, Bd. i. p. 94.

6 We suppose, of course, that we are dealing always with one and the same dielectric throughout.

The law of electric force between two quantities g and q' now becomes

The unit of quantity which we have just defined is called the electrostatic unit, in contradistinction to the electromagnetic unit which we shall define hereafter.

Since the dimension of unit of force is [LMT—*], where L,M,T symbolize units of length, mass, and time, we have for the dimension of unit of electrical quantity [Q]

(a) = [o”]=[xAea™. Quantitative Results concerning Distribution.

Tt has already been indicated that electricity in equili- brium resides on the surface of conducting bodies. We must now review shortly the experimental method by which this surface distribution has been more closely investigated. We shall state here some of the general principles arrived at, and one or two of the results, reserving others for quota- tion when we come to the mathematical theory of electrical distribution.

The most important experiments are due to Coulomb. He used the proof-plane and the torsion balance. Riess, who afterwards made similar experiments, used methods similar to those of Coulomb.

Allusion has already been made to the use of the proof- plane, and it has been stated that when applied to any part of the surface of an electrified body, it brings away just as inuch electricity as originally occupied the part of the sur- face which it covers. If, therefore, we electrify the mov- able ball of the torsion balance in the same sense as the body we are to examine, and note the repulsion caused by the proof-plane when introduced in place of the fixed ball after having touched in succession two parts of the surface of the body, we can, from the indications of the balance, calenlate the ratio of the quantities of electricity on the plane in the two cases, and hence the ratio of the electrical densities at the two points of thesurface. We suppose, of course, that the proof-plane is small enough to allow us to assume that the electrical density is sensibly uniform over the small area covered by it. In some of his experiments Riess used a small sphere (about two lines in diameter) instead of the small disc of the proof-plane as Coulomb used it. The sphere in such cases ought to be very small, and even then, except in the case of plane surfaces, its use is objec- tionable, unless the object be merely to determine, by twice touching the same point of the same conductor, the ratio of the whole charges on the conductor at two different times. The fundamental requisite is that the testing body shall, when applied, alter the form of the testing body as little as possible,! and this requisite is best satisfied by a small disc, and the better the smaller the disc is. The theoretically correct procedure would be to have a small portion of the actual surface of the body movable. If we could remove such a piece so as to break contact with all neighbouring portions simultaneously, then we

should, by testing the electrification of this in the balance, get a perfect measure of the mean electric surface density on the

removed portion. We shall see that Coulomb did employ a method like this.

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- It is evident from what we have advanced here that the use of the proof-plane to determine the electric density at points of a surface where the curvature is very great, e. g., at edges or conical points is inadmissible. If we attempt to determine the electrical density at the vertex of a cone by applying a proof-sphere there, as Riess did, we shall very evidently get a result much under the mark, owing to the blunting of the point when the sphere is im situ. We should, on the other hand, for an opposite Teason, get too large a result by apply-

ing @ proof-plane edgewise to a point of a surface where the curvature 13 continuous,

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[ELECTRIC DISTRIBUTION.

There are various ways of using the torsion balance in researches on distribution. We may either electrify the movable ball independently (as above described), or we may electrify it each time by contact with the proof-plane when it is inserted into the balance. {t must be noticed that the repulsion of the movable ball is in the first case proportional to the charge on the proof-plane, but in the second to the square of the charge, so that the indications must be reduced differently.

In measuring we may either bring the movable ball toa fixed position, in which case the whole torsion required to keep it in this position is proportional to the charge on the proof-plane (or to its square, if the second of the above modes of operation be adopted), or we may simply observe the angle of equilibrium and calculate the quantity from that. It is supposed, for simplicity of explanation in all that follows, that the former of the two

alternatives 1s adopted, and that the movable ball is always independently charged.

The gradual loss of electricity experienced more or less by every insulated conductor has already been alluded to. This loss forms one of the greatest difficulties to be encoun- tered in such experiments as we are now describing. If we apply the proof-plane to a part of a conductor and take the balance reading, giving a torsion 7, say, and repeat the observation, after time ¢, we shall get a different torsion T.) owing to the loss of electricity in the interval. This loss, partly if not mainly due to the insulating supports, depends on a great many circumstances, some of which are entirely beyond even the observation of the experimenter. We may admit, however, what experiment confirms within certain small limits, that the rate of loss of electricity is propor- a Ty,

tional to the charge, and we shall call (the loss per

unit of time on hypothesis of uniformity) the coefficient of dissipation (6), This coefficient, although, as we have im- plied, tolerably constant for one experiment, will vary very much from experiment to experiment, and from day to day ; it depends above all on the weather.

Supposing we have determined this coefficient by such an observation as the above, then we can calculate the torsion 7, which we should have observed had we touched the body at any interval ¢’ after the first experiment; for we have, provided ¢’ be small,

7 =7,- 6 =7,4+ 6-7’). if ’=4 ¢, we have — a(T} ate To).

Coulomb used this principle in comparing the electric densities at two points A and A’ of the same conductor. He touched the two points a number of times in succession, first A, then A’, then A again, and so on, observing the cor- responding torsions 7, 7,’, Ta, T),&c., the intervals between the operations being very nearly equal. He thus got for

In particular,

the ratio of the densities at A and A’ the values ate wil

29 all

a These value h ae se values ought to be

ry

equal: the mean of them was taken as the best result.

In certain cases, where the rapidity of the electric dissi- pation was too great to allow the above method to be applied, Riess used the method of paired proof-planes. For a description of this, and for some elaborate calculations on the subject of electrical dissipation, the reader is referred to Riess's work. :

The cage method is well adapted for experiments on distribution. The proof-plane, proof-sphere, or paired proof-planes may all be used in conjunction with it. If the cage be fairly well insualted, and a tolerably deli- cate Thomson's electrometer be used, so that the cage may

be made large, and the surface density on its outside there- fore small, there will be little loss of the external charge ; and the method has this advantage, that dissipation from the proof-plane inside the cage does not affect the result of the measurement in hand, it being indifferent, gua effect on the electrometer, whether the electricity inside the cage be on the proof-plane, in the air, or elsewhere, provided merely it be inside. The state of the cage as to electrified

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Riess made a series of experiments on cubes, cones, &c. ; but as these are not of theoretical interest, the calculation in such cases being beyond the powers of analysis at present, and as the use of the proof-plane or sphere with bodies where edges and points occur is not free from objection, we

content ourselves with referring to Riess's work for an account of the results.

Coulomb made a series of experiments on bodies of Cou-

different forms, which he bnilt up out of spheres of different lomb's sizes. or out of spheres and cylinders. These are of very on great interest. partly on account of the close agreement of 5. oom. some of the results with the deductions subsequently made posite by Poisson from the mathematical theory, and partly on conduc-

account of the clearness with which they convey to the *™

air, &c., is easily tested by the electrometer at any time. Coulomb's Results. —If we electrify a sphere, and test the electrical density at two points of its surface. experiment will show, as would be expected from the symmetry of the body, that the density at the two points is the same. If we test the electric density at

any point of a sphere, and then halve its charge by division with an equal neutral sphere, and test the electric density again, we shall find it half what it was before. The electric density at any point is therefore propor- tional to the whole charge on the sphere, or to the mean density, meaning by that the whole charge divided by the whole surface of the sphere.

If, instead of a sphere, we operate with an ellipsoid generated by the revolution of an ellipse about its major axis, we shall find that the electric density is not uniform us in the case of the sphere, but greater at the sharp ends of the major axis than at the equator, and the ratio of the densities increases indefinitely as we make the ellipsoid sharper and sharper. This leads us to state a principle of great importance in the theory of electrical distribution, viz., that the electrical density is very great at any pointed part of a conductor.

If we determine the ratio of the densities at two points of an ellipsoid,! diminish the charge, and redetermine the same ratio, we shall find that, although the actual densities are diminished, the ratio remains the same; and if we determine the density at any point of the ellipsoid, and then halve its

charge by touching it with an equal and similar ellipsoid (they must be placed with their axes in the same straight line, and made to touch at the poles),? and redetermine the density at the same point as before, we shall find that the density in the second case is half that in the first. We have in fact, in general, the im- portant proposition that—

The density at any point of a conductor is proportional to the whole charge on the conductor, or, what is the same, to the mean density.

The following case given by Coulomb is interesting ; it shows the tendency of electricity towards the projecting parts, ends, or points of bodies. The conductor was a cylinder with hemispherical ends,—the length of the cylin- der being 30 inches, its diameter 2 inches. Coulomb gives the following results :—

Distance from end. | Density.

5 in. 1:00 2 1°25 ly 1:80

0 2°30 |

The density at the end is thus more than twice that at the middle.

Other results, taken from Coulomb's unpublished papers, may be found in Biot,? Mascart, or Riess. His results for a circular disc we shall quote further on.

! We suppose in all these experiments that we are dealing with a single body, sufficiently distant not only from all electrified bodies but from all neutral conductors to be undisturbed by them. This condi- tion is essential.

2 It would not do to make the pole of one touch the equator of the other, or to place them otherwise unsymmetrically, 3 Traité de Physique.

mind the general principles of electric distribution. His method in most cases was to build up the conductor and electrify it with all the different parts in contact, and then after separating the parts widely, to determine the

mean density or the whole amount of electricity on each part by the proof-plane or otherwise.

For spheres in contact he found the following results,— 8, Q, 0; 8’, Q’, o’ denoting the surface, quantity of elec- tricity, and mean surface density for the two spheies respec- tively.

From this it appears that although the whole amount of electricity on the large sphere is greater than that on the small, yet the mean density for the smaller sphere is greater than for the larger. The above result also affords an experimental illustration of the action of the earth in discharging a conductor connected with it. Comparing the conductor to the small sphere and the earth to the large sphere of 62 times the superficial area of the sinall one, if we start with charge Q on small sphere and then put the two in contact, the charge on the small sphere will be reduced to aa Q, so that the mean density is dimin- ished in the ratio 1: 38-6. This ratio increases indefinitely

as the ratio increases. These results are in satisfactory

agreement with Poisson’s calculations. Coulomb was led by his observations to assign 2 as the limit of the ratio of the mean densities when the ratio of the diameters of the spheres is infinitely great ; the mathematical theory gives

2

% or 1-65.

Coulomb also determined the density at the apex or smaller end of the body formed by two unequal spheres in

contact. The following are his results, the mean density of the larger sphere being unity :—

Density at apex. Ratio of radii.

Observed. Calculated. 1 Wi 2 IPG) 1°83 4 2°35 2°48 3 3°18 3°09 bs 4-00

When two equal spheres are placed in contact the dis- tribution will of course be the same in each; Couloinb found that, from the point of contact up to a point on the surface of either sphere distant from it by about 20°, no trace of electricity could be observed ; at 30°, 60°, 90°,

Defini- tions.

180° respectively, the electric density had the relative values ‘20, ‘77, ‘96, 1:00. When the spheres are unequal the distribution is no longer alike on each. On the small sphere it is less uniform, and the density at the point of the small sphere diametrically opposite the point of con- tact is greater than anywhere else on the body. The distribution on the larger sphere is more uniform than on the smaller, and the more unequal the spheres are the more uniform is the distribution on the larger, and the amaller the unelectrified part in the neighbourhood of the point of contact.

The following results of Coulomb are useful illustrations of distribution on elongated and pointed bodies :—

Three equal spheres (2 in. diameter) in contact, with their centres in the same straight line: the mean densities were 1°34, 1°00, 1°34 on the spheres 1, 2, and 3 respectively.

Six equal spheres as before: mean densities on 1, 2, and 3 = 1°56, 1°05, 1°00.

Twelve equal spheres : 1°14, 1°00.

Twenty-four equal spneres : 1°75, 1°07, 1°00.

Large (8 in. diameter) sphere with four small (2 in.) spheres applied to it, all the centres in line: the mean density on large sphere being 1, that on the small one next it was °60 that on the extreme small one 2°08.

Large sphere 1, and twenty-four (2 to 25) small ones: mean densities on 1, 2, 18, 24, 25=1°00, 60, 1°28, 1°46, 2°17.

mean densities on 1, 2, and 6=1°70,

mean densities ou 1, 2, and 12=

MATHEMATICAL THEORY OF ELECTRICAL EQUILIBRIUM.

We take as the basis of our theory the assumptions already laid down under the head Provisional Theory, and in addition the precise elementary law of electrical action established by Coulomb. We shall also suppose that we have only perfect conductors and perfect non-conductors to deal with, the medium being in all cases the same, viz., air. When we have to deal with electrified non-con- ductors we shall suppose the electrification to be rigid, 1.¢. incapable of disturbance by any electric force we have to consider.

In our mathematical outline we have in view the requirements of the physical more than the mathematical student, and shall pass over many points of great interest and importance to the latter, for full treatment of which we must refer him to original sources, such as the classical papers of Green, the papers of Sir William Thomson, and the works of Gauss. Of peculiar interest mathematically is the elegant and powerful memoir of the last—Allgemeine Lehr- satze in Beziehung auf die im verkehrten Verhdltnisse des Quadrats der Entfernung wirkenden Anzichungs- und Abstossungskrdafte, in which will be found detailed discussions of the continuity of the integrals used in the potential theory, &. The works of Green and Thomson are too well known in this country to require farther remark.

When, in what follows, we speak of the electric field, we mean simply a portion of space which we are considering with reference to its electrical properties ; it will be found conducive to clearness to regard that space as bounded. In general the natural boundary would be the walls of the experimenting room; but, for mathematical purposes, we shall, unless the contrary is stated, suppose our field to be bounded by a sphere of radius so great that the action at a point on its circumference due to an electrified body in the field is infinitely small.

The resultant force at a point in the electric field is the force which would be exerted ona unit of + electricity placed there without disturbing the

electrical distribution else- where. It is plain that the resultant force has a definite magnitude and direction at every point in the field, and consequently is in modern mathematical language a vector. A curve drawn in the field such that its tangent at every point is in the direction of the resultant force at that point is called a dine of force. We can draw such a line through every point of space, and if we suspend at any point a

small conducting needle, it is obvious, from what we have already laid down. about induction, that it will take up a position very nearly parallel to the line of force ; so that if we start from any point and carry the centre of the needle always in the direction in which the needle points we should trace out a line of force.

The potential at any point is the work done by a unit of + electricity in passing from that poiut to the infinitely distant boundary of the electric field, the electric distri- bution being supposed undisturbed. It is usual to call the infinitely distant boundary a place of zero potential. Zero is to be understood in the sense of “ point or posi- tion from which we reckon.”?

Consider two points P,Q, infinitely near each other Force in in the field, and draw a curve from P passing through terms of

Q to o. Then, if F be the component parallel to PQ of the resultant force at P, we have by our definition F.PQ=Vp— Va;

or in differential notation

Fds=-dV, hence F= WV (1), ds and eS Fds=/, (Xdu+ Ydy+ Zdz) . (2),

where V denotes the potential at P, and X,Y,Z the components parallel to the co-ordinate axes of the resultant electric force. We clearly have as particular cases of (1)

dV _ av a 3

We may remark that, in all cases which we shall consider at pre- sent, the work done in passing from any point to any other point is the same whatever the intermediate path of our exploring unit. Hence V as above defined is a single valued function, and the for- mule (8) gives the components of resultant force when V is known,

The work done by a unit of + electricity in passing by any path from P to Q is called the electromotive force from P to Q; itis obviously equal to the difference of the poten- tials at the two points. Thus

Q V,—Vo=/p (Kde + Ydy + Zaz) (4).

is the electromotive force from P to Q.

Suppose we concentrate m units of electricity at any point P, and require the potential due to this at a point Q, distant D from P. Applying (2), and, since any path to 0 may be chosen, taking the integral along the production of PQ to «, we get

lo JD F D

If we have auy number of discrete points with charges m,, mo, Mg,..... at distances D,, Dy, Ds,..... from Q, since the work done by the exploring unit under the action of the whole is got by adding up the work done under the action ef each part separately, we clearly have

(5).

he yl oe y= re al | hae p (6). From this we may pass to thecase of a continuous volume distribu- tion. If p be the volume density at the point &¢, and V the potential at xyz, we have

Vafff erat (7);

where D denotes + JE —2)*+(n-y)+(¢—2)*, and the integral is to be extended over every part of the field where there is any charge,—or, which is the same thing, over the whole field, on the understanding that p=0 where there is no charge.

If, as will generally be the casc, the electricity is distributed on a surface in such a way that on an element dS of surface there is a quantity odS of electricity, where o is a finite surfacc density, then

ve {fF os)

where D has the same meaning as before, and the integral is ex- tended all over the electrified surface or surfaces.

_ It may be well here to warn the reader that measurement of potential is relative, just as much as measurement of distance is, and to caution him against the fallacious idea of absolute zero of potential.

Expres- sion

of V in

terms of definite

integrals, —

Continu- ity of V.

Surface integral of elec- tric in-

Equa- tion of Laplace and Poisson.

ELECTROSTATICAL THEORY. |

We may make here the important remark that, so long as p or o is not infinite, the integrals in (7) and (8) are finite and continuous. This depends on the fact, which we cannot stop to prove, that the part of the potential at P, contributed by an infinitely small portion of electricity surrounding P, is infinitely small. :

In practice, therefore, the electric potential is always continuous; for although we may in theory speak of discrete points and electrified lines where finite electri- fication is condensed into infinitely small space, yet no such cases ever occur in nature. It may also be shown for any electrical system of finite extent, that, as the distance of P from O, any fixed point at a finite dis- tance from the system is increased – indefinitely, the potential at P approaches more and more nearly the

value where M is the algebraical sum of all the

uf

D ’ electricity in the system, and D the distance of P from O. Hence at any point infinitely distant from O, V=0. –

We next proceed to prove the following proposition, which will form the basis of the subsequent theory :—

The surface integral of electric induction taken all over the surface inclosing any space is equal to 4x times the alge- braical sum of all the electricity in that space.

By the electric induction across any element of the sur-

- face (taken so small that the resultant force at every point

of it may be regarded as uniform) is meant the product of the area of the element into the component of the result- ant force in the direction of the normal to the element which is drawn outwards with respect to the inclosed space. Thus dS being an element of surface, ¢ the angle between the positive direction of the resultant force Rand the outward normal v, and E the sum of all the electricity in the inclosed space, the proposition in symbols is— Lf ReosedS = 4r E > fon

We shall prove it in the manner most naturally suggested by the theory of electrical elements acting at a distance, by first showing that it is true for a single element ¢ either outside or inside the surface. Let us suppose e to be at a point P, fig. 11, within 8, which for greater generality we may suppose to be a re-entrant surface. Draw asmall cone of vertical solid angle dw at P, and let it cut the surface in the elements QR, Q’R, Q’R’; let the outward normals to these be QM, Q’M’, Q’M”. The ele- ments of the surface integral contri- buted by QR, Q’R’, Q’R” are obviously QRe cos € wPR?

op &c. ; but QR = Gee ° Fig. IME PR? irpn__doaPR QR’= – de – , and Q’R’=”“—. . hence the three elements COS € COS €

of the integral become +edw,—edw, +edw ; and the sum is eda. Adding now the contributions from all the little cones which fill up the solid angle

of 4m about P, we get

S/R cos edS=effdw=4re. Had the point P been outside, the numbers of emergences and entrances would have been equal, the contribution of each cone zero, and on the whole

Jf R cosedS=0.

Combining these results, we see that the proposition is true for a single element. Henve, by summation for all the elements, we can at once extend it to any electrical system ; for all the elements external to S give zero, and all the internal elements give 4r3e=4rE.

Let us apply the above proposition to the space enclosed by the infinitely small parallelepiped whose centre is at ayz, and the co-ordinates of whose angles are x+3dz, yi4dy,zi}dz. Thecon- tributions to the surface integra] from the two faces perpendicular to

ay . dx dV dV dz op ade

a oa) dues aid i ; a

Adding these and the four parts from the remaining sides, and cquat- ing to 4apdxdydz, which is the 4K in this case, we have GY GNC Py

the x-axis are -(

or, as it is usually abbreviated, V°V +4ap= . (10).

ZLB SCT Y

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Equation (10), originally found by Laplace for the case p=0, and extended by Poisson, has been called the characteristic equation of the potential. It may be applied at any point where p is finite and the electric force continuous. It might be shown by examining the inte-

grals representing X, Y,Z,and a , &c., that the clectric force is con-

tinuous wherever there is finite volume density. Equation (10) may be looked on either as an equation to determine the potential when p is given, or as an equation to determine p whenV is given. We shall have occasiou to use it in both ways.

The characteristic equation cannot be applied in the form (10) when the resultant force is discontinuous. This will be found to be the case at a surface on which electricity is distributed with finite surface density. Let us consider the values of the resultant force at two points, P and Q, infinitely near each other, but on opposite sides of such a surface. Resolve the resultant force tangentially and normally to the surface. If we consider the part of the force which arises from an infinitely small] circular disc, whose radius, though infinitely small, is yet infinitely great compared with the distance between P and Q, we see that infinitely little is contributed to the tangential component at P or Q by this disc, while it can be readily shown that the part of the nor- mal component arising therefrom is 27o, directed from the disc 7m each case, when o is the surface density. Hence, since the part of the resultant force arising from all the rest of the electrified system obviously is not discontinuous be- tween P and Q, the tangential component is continuous when we pass through an electrified surface, but the normal com- ponent is suddenly altered by 47.

For a thorough investigation of these points the reader is referred to Gauss or Green. We can arrive very readily at the amount of the discontinuity of the normal force by applying (9) to the cylinder formed by carrying an infinitely short generating line round the element dS, so that one end of the cylinder is on one side of dS and the other on the other, the lateral dimensions being infinitely small, but still infinitely greater than the longitudinal. The only part of the integral which is of the order of dS is the part arising from the

two ends ; hence if N,N’ be the value of the normal components on the two sides of 8, we clearly get

(N-N’) dS=4aedS, or N-N’=4re. If V,, V, denote the potentials on the two sides of S, and »,, v, the

normals to dS, drawn towards these sides respectively, then we may

obviously write our equation ay, , ay, rs + ae (11).

Written in this form the equation has been called the surface char- acteristic equation of the potential. It may be looked upon as a surface condition, which must be fulfilled by the values of V on the two sides of an electrified surface on which the surface density o is given, and where, in consequence, there is discontinuity in the first differential coefficients of V ; or it may be looked on as an equation to determine o when V, and V, are given.

We have seen that we can draw through every point of the electric field a line of force. A surface constructed so that the potential at every point of it has the same value is called an equepotential or level surface. We can obviously draw such a surface passing through every point of the field. It is clear, too, that the line of force at every point must be perpendicular to the level surface passing through that point. For since no work is done on a unit of + electricity in passing from one point of a level surface to a neighbouring point, there can be no component of the resultant force tan- gential to the surface; in other words, the direction of the resultant force is perpendicular to the surface. This is ex- pressed otherwise by saying that the lines of force are orthogonal trajectories to the level surface.

If we take a small portion of a level surface, and draw through every point of the boundary a line of force, we shall thus generate a tubular surface which will cut orthogonally every level surface which it meets. Such a surface is called a tube of force.

Let a tube of force cut two level surfaces in the elements dS and dS’. Apply to the space contained by the part of the

VITlL — 4

+4ro=0

Condi-

tions at

an elec- trified surface.

Surface

charac- teristic

equation.

Level

surface.

Tubes of

force.

tube between the surfaces our fundamental equation (9). We thus get, since there is no normal component perpen- dicular to the generating lines of the tube,

RdS — R’dS’ = 0, (12), provided the tube does not cut through electrified matter between the two surfaces. Here R and R’ denote the resul- tant force at dS and d’S, which are supposed so small that the force may be considered uniform all over eachof them. It appears then that the product of the resultant force into the area of the normal section of a tube of force ts constant for the same tube so long as it does not cut through electrified matter ; or what amounts to the same, the resultant force at any point of a tube of force varies inversely as the normal section of the tube ut that point.

If we divide up any level surface into a series of sinall elements, such that the product RdS is constant for each element and equal to unity, and draw tubes of force through each small element, then the electric induction through any finite area of the surface is equal to the number of tubes of force which pass through that area; for if » be that number, we have, summing over the whole of the area—

SRdS =n (13), the left hand side of which is the electric induction through the finite area. duct RdS for each tube of force, that if this is true for one level surface it will be true for every other cut by the tubes of force. It is

evident that the proposition is true for any surface, whether a level surface or not, as may be seen by projecting the area considered by lines of force on a level surface, and applying to the cylinder thus formed the surface integral of electric induction, it being remarked as obvious that the same number of tubes of force pass through the area as through the projection. This enables us to state the proposition involved in equation (9) in the following manner :—

The excess of the number of tubes of forces whichleave a closed surface over the number which enter is equal to 4a times the algebraical sum of all the electricity within the surface.

(V.B.—The positive direction of a line of force is that direction in which a unit of + electricity would tend to move along it.) This proposition enables us to measure the charge of a body by meaus of the lines! of force. We have only to draw a surface inclosing the body, and very near to it, and

Import- aut pro- perty of tubes of force

Rds

Raise

Charge mea- sured by tubes of force,

count the lines of force entering and leaving the surface. |

If the number of the latter, diminished by the number of the former, be divided by 47, the result is the charge on the body.

If we apply (13) to a portion of an equipotential surface so small that R may be considered uniform over the whole of it, we may write

n R= a (14);

or in words :—The resultant force at any point is equal to the number of lines of force per unit of area of level surface at that point, meaning thereby the number of lines of force which would pass through a unit of area of

level sur- face if the force were uniform throughout, and equal to its value at the point considered.

We are now able to express by means of the lines of force the resultant force at any point of the field, and the charge in any element of space. The electrical language thus constructed was invented by Faraday, who continually used it in his electrical researches. In the hands of Sir William Thomson, and particularly of Professor Clerk Max- well, this language has become capable of representing, not

Result- ant force mea- sured by lines of forse.

ee 1 Here we drop the distinction between line and tube of force. We shall hereafter suppose the lines of force to be always drawn so as to

form unit tubes, and shall speak of these tubes as lines of force, thereby following the usual custom.

It is clear, from the constancy of the pro- |

only qualitatively but also quantitatively, with mathematical accuracy, the state of the electric field. It has the additional advantages of being well fitted for the use of the practical electrician, and of lending itself very readily to graphical representation.

It will be convenient, before passing to electrical applica- tions, to state here another general property of the potential which follows from our fundamental proposition.

The potential cannot have a maximum or minimum value Maxi- at a point where there is no electricity. mum or

For if a maximum value were possible, we could draw round the oa point a surface at every point of which the potential was decreasing Pp ;

outwards ; consequently at every point of this surface the normal re component of the resultant force in the outward direction would be .

positive, and a positive number of lines of force would leave the as” surface. But this is impossible, since, by our hypothesis, there is no SP®° electricity within. Similarly there could be no minimum value.

From this it follows at once that ¢f the potential have the Case of same value at every point of the boundary of a space in which space there is no electrified body, then the potential is constant bee throughout that space, and equal to the value at the boundary. a a For if the potential at any point within had any value greater or less than the value at the boundary, tlis would be a case of Maximum or minimum potential at a point in

free space, which we have seen to be impossible.

In order that there may be electrical equilibrium in a

perfect conductor, it is necessary that the resultant electric force should be zero at every point of its substance. For if it were not so at any point the positive electricity there would move in the direction of the resultant force and the negative electricity in the opposite direction, which 1s incon- sistent with our supposition of equilibrium. This condition must be satisfied at any point of the conductor, however near the surface. At the surface there must be no tangential component of resultant force, otherwise electricity would move along the surface. In other words, the resultant force at the surface must be normal ; its magnitude is not other- wise restricted ;? for by our hypothesis electricity cannot penetrate into the non-conducting medium.

These conditions are clearly sufficient. We may sum them up in the following single statement :—

Lf the electricity in any conductor ts in equilibrium, the Condi- potential must have the same value at every point in its tion of

substance, ait for 1f the poteutial be constant, its differential coefficients bea

are. zero, so that inside the conductor the resultant force vanishes. Also the surface of the-conductor is a level sur-

- face, and therefore the resultant force is everywhere normal

to it. This constant value of the potential we shall hence- forth speak of as the potential of the conductor.

Since the potential is coustant at every point in the Elec- substance of a charged conductor, we have at every point tricity Vv2V =0, and hence by the equation of Poisson p=0; that Ts!4e

2 : 7 oO th is, there is no electricity in the substance of the conductor. — We thus get, as a theoretical conclusion from our hypothesis, the result already suggested by experiment, that electricity resides wholly on the surface of conductors.

If we apply the surface characteristic equation to any point of the surface of a conductor, we get

La ae | ~ Gn dy Sm? (15),

which gives the surface density in terms of the resultant _ R force and reciprocally. °~ Gn

We may put this into the language of the lines of force by saying that the charge on any portion of the surface of a conductor is equal to the number of lines of force issuing from at divided by 4z.

Since the surface of a conductor in electric equilibrium

- Of course in practice there is an upper limit, at which disruptive

i discharge occurs.

ELECTROSTATICAL THEORY. |

Thee weiter ¥

Z¥

Voon- is always a level surface, it follows, from what we have | ducted in a space inclosed by a perfectly conducting enve- | —— already proved about a space bounded by a surface of con- | lope, the potential of this envelope would be the natural conduc. Stant potential, that, znside a hollow conductor the potential | zero of our reckoning. tor. as constant, provided there be no electrified bodies within. It will be useful to analyse more closely the distribution io me yse. “f ‘This is true, no matter how we electrify the conductor or | on a system of conductors, in order to see how far the what electrified bodies there may be outside. Hence, if | above data really determine the solution of the electrical we inclose any conductor A completely within another B, | problem. For this purpose the following proposition is then electrify B and put A in metallic communication with | useful. If ¢,, e&,....¢, be the charges at the points Principle it, A will not become charged either + or —; for, A being | 1, 2,.... of any system, and V the potential at P, ofelec- at the same potential as B, electricity will not tend to flow | and if V’ be the potential at P due to ¢,’, ¢,.... @’ at —_ from the one to the other. ‘his is in reality Biot’s! ex-| 1, 2,....m, then the potential at P due to ¢,+e,,, “oe periment with the hemispheres, to which we have already | ¢,+¢,,....at 1,2,....is V+V’. This principle fol- alluded ; only the point of view is slightly changed. ‘The | lows at once from the definition of the potential as a sum most striking experiment ever made in illustration of the | formed by the mere addition of parts due to all the single present principle is that described by Faraday in his | elements of the system. Hxperimental Researches. He constructed a hollow cube Applied to a system of conductors in equilibrium, it (12 feet in the edge) of conducting matter, and insulated | may evidently be stated thus: If E,, E,,....E, and it iv the Jecture-room of the Royal Institution. We quote | Vj, V,,.... V, be the respective charges and potentials in his own words the part of his description which bears | for the conductors 1, 2,3…. inastate of equilibrium, on the present question :— oper, 22) Ee and PV>, VY,,-... V, “eerresponding “1172. I puta delicate gold-leat electrometer within the cube, and | charges and potentials for another state of equilibrium, en charged the oe Meee outside communication, very strongly | then E,+ Ey «1+. beet Be Vit y.

8. ; : :

to Clerk Maxwell’s Electricity, vol. i. § 74. This must be | VY ee eee Ma ae = pt ae eae = ae, : ° minimum value o ana since we Know at a MInJMUM valine = by far the most satisfactory evidence for the exists, there must bea solution of this equation. It can, moreover, law of the inverse square; for the delicacy of the tests | be shown, by a method which we shall apply below to the more involved infinitely surpasses that of the measurements | general problem, that there is only one solution of v?V=0 con- made with the torsion balance; and now that we have sistent with the given conditions, and this will of oe a : – Ee : that which makesI a minimum. If our mathematical methods es of greatly increased sensitiveness, like Thom- were powerful enough to determine V, we might proceed to son 5 a ie: age the experimental evidence | find the surface density for each conductor by means of the formula might be still further strengthened. i dV Geaeeal Tn the problem to determine the distribution of elec | ° 47 dv’ Hiner tise older Uieaeo iu eer ee problem tricity in a given system of conductors, the data are in : ! aV of elec- most cases either the charge or the po ee ; by means of the integral – 7 ff qe: In very few cases Ne ge potential for each con distribue ductor. If the conductor is insulated it can neither give | indeed could we actually find these cnarges ; we have, however, de- tion. nor lose electricity, its charge is therefore given. If, on monstrated their existence and shown that our problem is definite. the other hand, it be connected with some inexhaustible] – La 2 vey. Jer ees . Source of electricity at a constant potential, its potential Bec eevee Oe Sy eae eats 2 —_ ae . ; Corresponding to the data 0,1,0,.... 0 for the potentials cients of is given. Such a source the earth is assumed to be: and i i : 2 of 1, 2,...7, we should get a series of charges 99 1, Qo9)—» » Capacity we shall henceforth take the potential of the earth as a : eu qi Yo ny ANd SO OD 3 9) 3, Yoo 9g3--- are called the coefficients of 204 ‘2- 2 2 41D 22 2) 233 duction.

zero, and reckon the potential of all other bodies with reference to it. If all our electrical experiments were con- = es

i The experiment was first made by Cavendish. There is an account of it in his hitherto unpublished papers.

e Faraday was looking for what he called the absolute charge of matter ; incidentally the experiment illustrates the point we are dis- cussing,

2

| charges on them will be g,,V,, 7,5V;

self-induction or capacity for the conductors 1, 2, 3,...; G1 99 Y1 3, &e., are called the coefficients of induction of 1 on 2, 1 on 3, &c. It is obvious that these coefficients depend solely on the form and relative position of the conductors. It follows, from the principle of the superposition, that, if 1, 2,...m be at the potentials V,, 0,0… 0, then the Gaiv «We

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may construct then a series of states of equilibrium repre- sented thus :—

Potential, | Vi | _9 | 9 feeange s pas | ,

Charge, | %1V1 | GeV | %3Vi | | MnV Potential, | 9 | Ve Pe ooo | 0

Charge, | doi1Vo | YooVe | Ga3Ve i. er reee

and so on. Superposing all these, we get a system in equilibrium, in which the potentials are Vip Voss > Vegene the charges Ey =%11VitdiVet «++ 9ni1Vn Ey =%0Vi% oVet eee a Qn2Vn &e. =&e.,

. (18);

It appears therefore that the 2n quantities h,, &c., Vj, &c., are connected by 7 lincar equations; so that when x of them are given, the rest can be determined in terms of these in a definite manner.

Returning then to our general problem, we see that, when either the charge or the potential is given for cach conductor, the electrical problem is determinate, and a solution is given by the linear equations of (18). The potential at any point of the field can be written down very easily. Suppose in fact 7, to be the value at the point P of the function V which we determined in solving the case where the potentials 1, 0, 0,....0 are given for

1, 2, ... m, v, the corresponding function for the case 0,1, 0,...0,and soon. Then the potential at P in the general case is obviously

V=Vyx, 4+ Vout… + Vite –

where %, Ua >. + % are all known functions, and V,, Va,--- V, are all either given, or determined in terms of given quantities by the equations (18).

It is very easy to show that there is no other solution of the problem than the one we have found.

Suppose in fact that V’ isa function different from V, which satisfies all the conditions of the problem. Consider the function U=V-V’, since V and V’ both satisfy the equation v?V=0, we have v?U=0. Also at surfaces where V is given U=0. At surfaces where V is not giveu, we have U=constant — constant=

sete ; and, sinee in this case the charge will be given, we shall ave ;

adv ay’ 1U Pe we =f [Z® ; and therefore /; a =0.

Now we have

adV dV’\o Pe – 15 y3, Vij vs (ae a) &e. ¢ dadydz dU, dU)? dUl2) goduds ime dx + dz #

+ iy

ALS UdS Sf fss 2Udadydz.

The first term vanishes for all the surfaces,—for some beeause U = 0,

for others because U is eonstant and Sf ods = 0; and the second

term vanishes because v?U =0.

Hence the integral on the left hand must vanish, and that too element by element, since every element is positive. Hence we must have

(19),

dv qv’ dv av’ av aw da” dx’ dy dy’ dz dz- Henee V and V’ can only differ by a constant. But sueh differ-

ence is precluded by the boundary conditions. Henee the func-

tions are identical ; in other words, there is but one solution to the problem we have proposed.

It is very easy to show, by methods of which we have already had an example, that the value of V thus found

makes the integral if (dV ave aI) \ae\ + Gel Sl

a minimum. Now, we shall show directly that this inte-

ELeoT K rores

| ELECTROSTATICAL THEORY.

gral represents the potential energy of the system. It follows, therefore, that the distribution which we have

found is in stable equilibrium.

Tf we solve the equations (18), we shall get Vi=Pi1 Eyer Het — Pay En ae cee aca e+ + Dag Ene –

Cc.

(20).

we inight obviously have Coefii- arrived at by first principles. The physical meaning of the cients of ; . : ; potential coefficients P, 3, P19, and Pin IS very obvious ; | they are the potentials, corresponding to a state of equilibrium, in which the charges on l, 2, 3,....% are 1, 0,0… and 80 ON. P11) Py ++ &C., are called coefficients of potential ; and, mutatis mutandis, all the remarks already made about dy 1 &¢., apply to them. Many

interesting and 1m- portant theorems have been proved about these coefficients, for which we refcr the reader to Maxwell (Hectricoty, vol, i. chap. 2), whose treatment of the subject we have in the main been.following, One of these, of great importance, ‘ we shall prove here, because it leads us to state a very important general theorem, which we shall have occasion to use again.

The mutual potential energy of two electrical systems, Theorem A and B, is the work done in removing the two systems ofmutual to an infinite distance from each other, the internal arrange- ae nent of each system being supposed unaltered during the a process. It is clear that we may suppose either that A is fixed and B moves off to infinity, or that B is fixed and A moves ; the work done in both cases is, by Newton’s third law of motion, the same. This is sometimes expressed by saying that the potential of A on Bis the same as that of Bon A.

In fact, the expression for the mutual potential energy is

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ap: where g is any element of eleetricity belonging to A, and q’ any element belonging to B, and D is the distance between them, the

summation being extended so as to include every pair of elements. We may arrange (21) as follows :—

fe

D

each group belonging to a point in B, or, as we may write it, Qs Vitds Vot &e., or 3q’V.

A set of equations which

(21),

n+ +o 2 =~ + &.,

We may also arrange (21) in the form

q = cis Yo a + &e.,

each group belonging to a point in A. Henee we have the follow-

{ Ing equalities :—

== 1 —syy’ = V 255 Sq

The first and last of these expressions are called respectively the potential of Aon B, and the poteutial of B on A, and this equality explains the statement nade above.

The two systems A and B may be different states of equi- librium of the same system, if we choose. In this casc we may still farther modify the expression in (22), and write

V2.7 + Vo%e9′ + &e. = V1’S,9+ Ve’S.9+ &e. (See Gauss, J.¢.)

So that we may state the proposition thus :—If E,, E,, io ae, Vien Veale obey. . H,, Vas Voy – «+ Meee be the respective charges and potentials of the conductors in two different states of equilibrium, then we have

(22),

SE’V = SEV’ (23). If we take for the two states of the system E | & 12 fa | 2: | Me Vv iL 0 a es

77

equation (23) becomes | ; U2) Sra (24),

|

_ place here,

ELECTROSTATICAL THEORY. |

or, in words, the coefficient of induction of 1 on 2 is equal to Q=1 5 ey aei= i= Sp LE, (27) r=1 s=] r=1 s=1

that of 2 on 1.

There is one more general theorem on electrical distribu- tion which, from its great practical importance, deserves a Suppose we take a hollow conductor of any form, place any electrical system inside it, and connect the conductor with the earth, then equilibrium will be estab- lished, in such a way that the potential of every portion of the conductor is zero. Now, the potential being zero at all infinitely distant points, we may regard the outside space as inclosed by a surface of zero potential; hence the potential at every point in this space must be the same, and there can be no electrical action anywhere outside.

Again, removing the internal system, let us place any system outside the conductor, and, besides, charge it to any desired extent, keeping it insulated this time. Then the outer and inner surfaces of the conductor will be level surfaces ; and, since there is no electricity inside the inner surface, the potential in the interior will be constant.

So that Q is a homogeneous quadratic function of the potentials or of the charges. If, therefore, we increase the potentials of alJ the conductors, or the charges of all the conductors in any ratio, we increase thereby the potential energy in the duplicate of that ratio.

We can by a transformation, which is a particular case of a theorem of Green’s, obtain a very remarkable volume integral for the potential energy of an electrical system.

Let V denote the potential at any point in the field. -Consider Green’s

the integral

eS) al * at

where the integration is to be extended throughout the whole of the space unoccupied by conductors. We have by partial integration

avi, A av, av ; iia WV (dedyde = Sf Vo aya Sf) /{ Vey daly de,

2

) dead,

2

4 av dy

Hence the external.system, in a state of equilibrium, exerts and two similar equations. Hence no action whatever within. Now we may evidently, with- a dv|? dV 7 av 2’ indude out mutual disturbance, superpose such an internal and 8a SI) fi dx | * dy| ~ dz .

external system as we have described, and still get a system in equilibrium. It is, moreover, clear that we can in this way satisfy the most general conditions that can be assigned. Hence, since we know that there can be only one solution of the problem of electrical equilibrium, the synthetical one thus obtained represents the actual state of affairs. When, therefore, a hollow conductor with any external and internal systems is in equilibrium, the equili- brium of the internal is independent of that of the external system.

Moreover; if we draw any surface zz the substance of the hollow conductor, no lines of force cross it in one direction or the other; therefore the whole amount of electricity within must be zero ; in other words, the charge on the in- ternal surface of the conductor is equal and opposite to the algebraical sum of the charges on all the bodies within.

i dV 1 = = Ge’= Vv? Vdidydz, a S| VG* S// olan

where the surface integration extends over the surface of all the conductors, and it is to be noticed that dy is drawn from the con- ductor into the

insulating medium. If p and o@ be volume and surface densities,

1 av

~ 4a dv’ Thus we get adv? avi’

aS/f (Bl +s de aff voas+s ff /Vpdadya:

This result includes a more general case than our present one; for it shows that the potential energy of an electrical system is given by the integral on the left hand side in all

c= and p=-7-v°V.

)adodyde

(28).

Elect- These propositions contain the principle of what are ; See . – tical called electrical screens, z.¢e. sheets of metal used to defend eee “ini = sabe ha So ek ap _ screens. electrical instruments, &c., from external influences. On Sacaietis. “4 ean * “ gee C i pe +3 – the practical efficiency of gratings in this way, see Maxwell eas t : net di ; d i, A ent _ as : cen 2 | (§ 203); on the application to the theo f lichtnine | Statements would include that case as well. present, i conductors, see a ie by him in the re sii the British ee ae ae pO rey eeime, Sr X Boasts 3 tee 3 Pc ncintic m re ae y p surface and in the substance of each conductor, so that the If we take the simple case where there is no external et name Wane atin Y ie Mees ESEN. wale We | system, but only a charge on the hollow conductor, we get poaglioe yd ORI BE ed ann Sree ews Way Stee | a complete explanation of Faraday’s ice-pail experiment. sanitary i ee _ Potential The potential energy of a system of charged conductors Q=— Sf 48 + VY) 4 av \deedyde Sar dx| dy| dz|?

_ energy of ig the work required to bring them from a neutral state to

a system _ of con- – ductors.

the charges and potentials which they have at any time. The state of zero potential energy here contemplated is of course that in which there is an

equal amount of + and — electricity everywhere in the system, or, as we might put it, the state in which there is no electrical separation. Now if Q denote the potential energy of the system, we have with the notation of (21)

1

== Sh Radu (29), R being the resultant force at any point of the field, and dv the element of volume. It is clear that we may if we like extend the integration over the whole field, since in the substance of any conductor R=0.

When we know the potential energy of an electrical sys- Force tem it is very easy to find the force which resists or tends to tending

q-2xit . (25), produce any change of configuration. Two particular cases to pro- are of common occurrence and of considerable interest. pte

the summation including every pair of elements in the

pair First, let the charges on all the conductors be kept con- oongoy- system. If the system be in equilibrium, then, reasoning ‘

stant. Let the variable which is altered by the supposed ration. change of configuration be ¢, and let © be the correspond-

ing force! tending to increase ¢. Then, since no energy

is supplied from without, if we suppose the displacement made infinitely slowly, so that no kinetic energy is gene- rated, we have

as above, it is obvious that SEV is just twice , oe inas-

much as each pair of elements will come in twice. Hence we get

Q=33EV . (26).

This is an expression of the greatest importance. We can

eee : 1 Or generalized force component, ¢.¢., the amount of work per give it various forms; by means of (18) and (20) we get

unit of @ done in increasing ¢.

Cases where problem has been solved.

Lillipsoid.

30

b5 + 5Q=0 (30). Be ——- 3 (51). |

Referring to the second of the expressions in (27), we see that this may be writtcn

From this it is evident that in similarly electrified states of the same system the force tending to produce a given displacement varies as the square of the electrification. It is important to remark that in the present case the sys- tem tends to move so that its potential energy is decreased.

Secondly, let us suppose that the potentials of the dif- ferent conductors are kept constant during any displace- ment, energy being supplied from without.

We shall suppose the change made in two steps. First, we shall suppose the given displacement to take place while the charges remain constant. On this supposition the force exerted will, to the first order of small quantities, be the same as that exerted when we suppose the potential not to vary; hence

$3p+42E3V=0. Next, supply energy from without so that the potentials become again Vj, Ve, &., . .. and the charges E,+5E,, E,+5E,, &c. The final result will be the same, to first order of small quantities, as if

the two changes had been made simultaneously. Now, applying the theorem of mutual potential energy to the two states of our system,

By ad Be |... ana je ees a \verov vero Vi Vas nee le = oe we have =(E, +5E,) (V,+5V,)=3(EV), hence SESV= —SVdE (2); dV dE dQ therefore @= —- es

din aae” const.) (33). By (27) this may be written ona F Sv ite * Ca eer “do

The energy supplicd from without is 4{ 3(E+8E)V- 2E(V+8V) } =}$25EV — 2ESV = — SESV = 2639 = 280, by (32).

In other words, when the potentials of a system are kept constant by supply of energy from without, the system tends to move so as to increase the potential energy of electrical separation, and the amount of energy supplied from without is double this increase. If we suspend side by side two balls, each connected with the positive pole of a battery, the other pole of which is connected with the ground, the balls will tend to separate, and in separating they will gain with reference to gravity a certain amount 8Q of potential energy; the charges on the balls will also in- crease to an extent representing an increase of electrical potential energy 5Q, and the batteries will be drawn upon for an amount of 26Q.

The problem of electrical equilibrium has been com- pletely solved in very few cases. We proceed to give a short sketch of what has been done in this way, which may indicate to the reader what is known on this head.

We can deduce the distribution and potential in the case of an ellipsoid from known propositions about the attrac- tious of ellipsoidal shells of gravitating matter.

Consider an ellipsoidal shell, the axes of whose bounding sur-

faces are (a, b, c) (a+da, b+db, c+dc), where o_O _& =u. The

; b potential of such a shell at any internal point is constant, and the equipotential surfaces for external space are ellipsoids confocal with (a, b,c). (See Thomson and Tait, §§ 519 sqq.) Hence if we dis- tribute electricity on an ellipsoid (a, b, c) such that its density at every point is proportional to the thickness of the shell formed by the similar ellipsoids (a,b,c) (a+da,b+db,c+de), the distribution will be in equilibrium. Thus if ¢=Aép, where @ is the thickness at any point and p the volume density of the shell; then the quantity of electricity on any element dS is A times the mass of the correspond- ing element of the shell; and if Q be the whole

quantity of elec- tricity on the ellipsoid, Q=A times the whole mass of the shell.

ELECT RIGS Pe

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The mass of the shell is $rpd(abc) = 4apabep, therefore Q= A4apabep. Also @=pp Where p is the perpendicular from the centre of the ellipsoid ou the tangent plane. Whence we get

oa 22 4rabe

that is, the density at any point varies directly as the distance of the tangent plane at that point from the centre.

Returning again to our ellipsoidal shell, we know that the result- ant force at any external point P due to this shell is to that due to a ‘confocal shell” passing through the point in the ratio of the masses. Let the volume density in the two be p, and let the perpendicular on the tangent plane at P to the confocal (Var+a, VB +a, V2 +a) through P be w Then the thickness of the shell at Pis ww, and the force at P due to the shell 4rpyo. Hence the force due to the original shell is

4 Lee (a) dy ON (BAPE FAE+A) – a

dy being an element of the normal at P. Nowif 2,y,z be the co- ordinates of P, we have, by differentiation of

(34) ;

ied yf a2 Btn Barat@tn fi 2. 2 2 gue 2ydy ave _ = 7 ue waa. +n bF+rA CHA (a?7+a)? (B?+a)?2 (c?+a)

Suppose we take dx, dy, dz in the direction of the normal, then wx : de= dvs &c., and the last equation reduces to

dA=2wdy. Hence from (a) we get Qrpuabcda N@HA(P FANE +A) | Integrating this from A to oo, and remembering that the potential vanishes

at an infinite distance, we get es dn

Ce ES NCEN si

V=2ouabc

We pass from this to the electrical case by putting for 4rpuadc, which is the mass of the shell, Q, which represents the quantity of electricity on the ellipsoid. We thus get

7 Q ad dn a 2 TRIE MTTT

which gives the potential due to a charge Q on an isolated ellipsoid abc at any point on the confocal (./a2+2, /62+X, /2+X). It is obvious that, of the three confocals at P, that is meant which belongs to the same family as (a, 8, c), €.g., if (a,b,c) be an ellipsoid, as opposed to a hyperboloid of one or two sheets, then (RY ee ND Jd) must be an ellipsoid.

If we put A=0, we get the value of the potential V, at

(35),

Now = is what we have defined above as

« Vo the capacity of the ellipsoid ; we get therefore in the recipro- cal of the integral

the surface.

il 2 dr 2/, V (a? + A)(B + AE +A) (36),

an expression for the capacity of an isolated ellipsoid.

In the particular case of an ellipsoid of revolution, the Plane-

above integral, which is in general an elliptic integral,

can be found in finite terms. In the case of a planetary

ellipsoid, a=b>c; and we find for the capacity v e-e

im -e

(37),

where e¢ is the least angle whose tangent is aa.

If we make c=0, then e=0 ; and the planetary ellipsoid Circular reduces to a circular disc, the capacity for which is there- disc.

2a, 5 1 : fore =i that is, Ts71 that of a sphere of the same radius

1 This demonstration was suggested by that given by Thomson (Reprint of Papers, p. 10) to establish a slightly different formula.

_ Ovary _ ellipsoid.

Sase of “iwo spheres. oisson’s inalysis,

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(for the capacity of a sphere is obviously equal to its | radius). Cavendish had arrived by experiment at the

137 (see Thomson’s Reprint, p. 180), a very remark-

able result for his time. It is very easy, by taking the limit of the right hand side of (34), to find the expression for the density at a distance r from the centre of the disc ; it is

value a

Q v °— traf Ba 2 Jeae oo In the case of an ovary ellipsoid, a=bVe a? from which several limiting cases may be deduced.

Formula (34), applied to a very elongated ovary ellip- soid, shows us that the density at the pointed ends is very great compared with that at the equator. The ratio of the densities in fact increases indefinitely with the ratio

of the longest to the shortest dimension. We have in such an infinitely elongated ellipsoid an excellent type of a pointed conductor.

The effect of a point or an edge on a conductor may be very easily shown by drawing a Series of level surfaces, the first of which is the surface of the conductor itself, which has, say, an edge on it. The consecutive surfaces have sharpness of curvature correspouding to the edge, which gets less and less as we recede from the conductor. ‘The level surfaces at an infinite distance are spheres. ‘Tracing, then, any tube of force from an infinite distance, where the sections of all are equal, inwards towards the discon- tinuity, we see that the section becomes narrower as the curvature of the level surfaces sharpens, and at a mathe- matical edge the section is infinitely small, and therefore the force is infinitely great. At a mathematical point this is doubly true. At such places the force tending to drive the electricity into the insulating medium becomes infinite. In practice the medium gives way, and disruptive discharge of some kind occurs.

We can find the distribution on a spherical conductor in- fluenced by given forces, such for instance as would arise from rigidly electrified bodies in the neighbourhood.

The method of procedure would be as follows :—Let U be the potential of the rigidly electrified system alone at any point of the sphere. Then the problem is to determine a function V, which shall satisfy the equation yv7V at every point of space, and have the value C—U at the surface of the sphere, where C is a constant to

be determined by the conditions of the problem. Expand C-U in series of surface harmonics, aud let the result be

(39) ;

C-U=y 914 72 &e. (a). Then the value of V is Ve~tn e ly inside the sph – lees phere . . (8), and Way i v2 +720 see >. OMGhiGe ., (y). T r r

For these evidently satisfy Laplace’s equation, have the given value (a) at the surface of the sphere, and are finite and continuous everywhere. From (g) and (y), by means of the surface characteristic equation, we can deduce

an expression for the density at any point of the sphere, and for the whole charge. If the latter is given we have a condition to determine C; if, on the other hand, the value of the potential of the sphere were given, then this would be the value of C.

The case of two mutuallyinfluencing spheres was treated by Poisson in the famous memoir which really began the mathematical theory of electricity. We regret that we cannot afford space for more than a mere sketch of his methods.

Consider the potentials due to the distributions on each sphere. Let a and 6 be the radii of the two spheres, r and 7’ the distances |

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ol

of any point P from their respective centres, and « and wp’ the cosines of the angles r and 7’ make with the line joining the centres of the spheres. Since the distributions are evidently symmetrical about the central line, we can obviously expand the potentials due to each distribution in zonal harmonics relative to the cor-

responding sphere. Hence, if 4ra@ (My =) denote potential due to

sphere a at any point inside it, we have

r r 7? Anap (4 Z)=Art AQ Alaa aR oc (a). The potential at any external point is a al? a| AoF +A,Q; 7 A,Q. T ae (B); which may be written sn o(By =) : Sinilarly we have fot the other sphere : A vi hi Perio nial m ? 4) = Bo Bor ; + BQ;) (y) 2 rs for the potential at any internal, and 4 ae (KB, Sy for the

7

potential at any extcrnal point. The whole potential, then, will be given by

(3 o(ut) («7) i rT tf

at any point external to both spheres. b? pio oon Also Vatrag(u, i) tt ® (eso) inside @; and 2 di . ° V= 4a ro) CG) + sie u’-5) inside 0.

Now, the conditions of the problem require that the values of V in the two last cases shall be constant. Our functions are, there- fore, to be determined by the equations

ee via

ik ag(? 2)

Q2 a , a =o (me)+ bb KT) g which are to be satisfied with obvious restrictions on r and 7’ in each case. Reverting, however, to the expressions (a), (8), (y), &c., we see that we need not solve the problem in the general form thus suggested ; for it will be sufficient if we determine the constants Ag, Ay, &e., Bo, By, &c. Now, if we make w=1, u’=1,—that is, consider only points on the central line,—then Q,=1, Q,=1, &c., Q)/=1, Q,.’=1, &c.4 Ay, A, &c. By, B,, &c., are the coefficients oe

7

Yr

(8),

al @ Of === Tr

potentials inside the spheres a and b. Henee, if f (2) and a

2 Bu 5 we. sand Y

, &c., in the expressions for the

F (5) denote the valucs of @ (2) , ® (#5) , When p= 1 a

and u«’=1, we need only solve the equations

(==)

where we have replaced 7 and 7’ by their values c—7’ and c-7, ¢ being the distance between the centres of a and’. Poisson then eliminates the function F, by choosing a new variable £, such that

(e),

ie =— , and remarks that we may give to & any value between +aand — a, and therefore we may write r for £; we thus have the same variable in both the equations, and F (==) which occurs in both may be eliminated. The result is

ac-—ar gb

ofa) +s os (see) ee Ge

This is the functional equation on which depends the solution of the problem of two mutually influencing spheres.

Poisson treats very fully the case of two spheres in contact ; for which case, taking a=1, the above equation becomes

a b sri Te ect SOP > sratnaca’ (eaten) 1+b-7 ae

1 We are, of course, assuming aquaintance with the properties of spherical harmonics,

Plana and Roche.

Synthe- tical me- thod of Green.

He finds a solution,

ope alta. bh uals 1) ¢ ae-*) f® artic —— dé « « (0).

0

It is then easy to find F®, and write down the general -expressions for the potential. Poisson goes on to show that the density at the point of contact of the spheres is zero. He finds, for the

mean density on the two spheres 1 and 6 respectively,

1

1

ccm sae. piled 1+06 tau

0

this being, in fact, the value of f (0), sal

h 6 it fee wae nf f24

0

He shows that the calculation of the ratio B of A to B inay be reduced to the caleulation of the first of these integrals only. For the difference 41b2B—4aA between the charges on 1 and 6 he finds the elegant expression

4n*bh 1.

Teh 148? from which it follows that the whole charge is always greater on the sphere of greater radius. He then calculates the value of B for various values of b, and its limit for }=0, and next the ratio of the densities at the two points diametrically opposite the point of contact, and finds for the mean density on each of two equal spheres in contact A=h log 2. He also calculates for this last case the ratio of the greatest to the mean density. In the case of two unequal spheres, the ratio of the greatest density on the smaller to the mean density on the larger is found for various values of 6. He then passes on to investigate the densities for various values of pu.

All these results are compared with the measurements of Coulomb, and found in satisfactory accordance with them. In his first memoir, Poisson considers the case where the distance between the spheres is great

compared with the radii; and in a subsequent memoir he considers the case of two spheres at any distauce.

Plana (Sur la distribution de Vélectricité & la surface des deux Spheres, Turin, 1845) extended the calculations of Poisson, using much the same methods. He also caleu- lated approximately the mean densities in the case of several spheres in contact, and arrived at results which agreed satisfactorily with the experiments of Coulomb. For a table of his results, see the end of the first volume of Riess's Reibungselectricitit. An account of the work of Roche, who also followed in the footsteps of Poisson, will be found in Mascart, t. i. p. 290 sqq.

The researches of Green led him to a very valuable synthetical method, by means of which we can construct an infinite number of cases where we can find the electri- cal distribution. Suppose that we take any distribution whatever of electricity, for which we know the potential at any point, and consequently the level surfaces. Take any level surface, or parts of level surfaces, inclosing the whole of the electricity, and suppose these level surfaces to become actual conducting sheets of metal. Suppose the electrical distribution inside to be mgid, and connect the sheets of metal with the earth, so as to reduce them to potential zero. The sheets will become charged in such a way that the whole potential at every point in them and external to them is zero. Let now U-be the potential at any external point due to inside distribution, and V that due to the charge on the sheets, then we have everywhere on or cutside the sheets, U+ V=0, or V= —U. Now U is constant at every point of each sheet ; hence V is so also. Hence the distribution to which V is due is an equilibrium distribution per se. Removing now our internal distribution, and changing the sign of that on the sheets, we have a distribution of electricity in equilibrium on a

set of conductors of known form, the potential of which at any external point is V=U, where U is known. Also the potential V is clearly constant inside every conductor. Hence, applying the characteristic surface equation, we get for the density at any point of any of our conductors the expression
_1 a

4n dy"

We might make this a little more general, and state our result thus :—IJf we distribute on a level surface or sur- faces of any electrical system, completely iclosing that system, electricity with surface density at every port

c==<7- 5 this distribution will of itself be in equilt- brium, and the potential at any external point will be kU.

We have given a physical demonstration of this import: ant theorem. ‘The mathematical reader will easily see the application to this case of the general reasoning about the solution of V2V=0, of which we have already given examples. For a simple but interesting case of this general theorem, see Thomson and Tait’s Vatwral Phile- sophy, vol. i. § 508.

To Sir William Thomson we owe the elegant and Methods powerful methods of “ Electric Images” and “ Electric te Inversion.” By means of these he arrived, by the use of aon simple geometrical reasoning, at results which before had pectrie required the higher analysis. We shall endeavour to images, illustrate these by two simple examples. We do not follow the methods of the author (for which, see his papers), but take advantage of what we have already laid down.

Let A be any point outside a sphere (fig. 12) of radius a, and centre GC. Let AC=f, and take B in CA

2

such that CB-CA=a?, or CB=5 . thenit J “

is easily proved that, if P be any point on the sphere,

=F Wt. AP f Fig. 12. Hence if E be any quantity of electricity, we have a ee: AP BP ;

Therefore, if we place a quantity E of electricity at A, and a quan- tity – 3 at B, the sphere will be a level surface of these two, that,

namely, for which the potential is zero. Another level surface of the system is evidently an infinitely small sphere surrounding A. Hence it follows, from the theorem of Green which we have just discussed, that a distribution of electricity on the sphere, the

R density of which is given by o=7— (where R is the resultant force

due to E and— 7 E at any point of the sphere), together with a

quantity E at A, gives a system in equilibrium, the potential due to which at any point outside the sphere is the same as that of E at

A, and -3i at B.

It appears, therefore, that the action of the electricity induced on the uninsulated sphere by the electrified point A is equivalent at all external points to the action of

—*Bat B, The electrified point B is called by Sir Wil- liam Thomson the electrical image of A inthe sphere. Itis a

Fe and we can very easily find the density at any point.

In fact, resolving along CP, which we know to be the direction of resultant force, the forces due to A and B, we get

obvious that the whole charge on the sphere is —

a Boe .enlPAe ra cos CPB AP? BP?

Electric inver-

sion.

ELECTROSTATICAL THEORY. |

_ E /u2+AP?~~f?\ fE Pes?) (ft~~@)E AP\ 2aAP— /~ @AP? 2fAP ~~” ahP* gu 2 . (40). 4raA P3

We might have any number of external points and find the image of each. We should thus get a system which might be called the image of the external system. The distribution induced in an uninsulated sphere by such an external system could easily be found by adding up the effect of each external element found by means of its image. Similar methods might also be applied to an in- ternal system. The solution can be generalized without difficulty to the case where either the charge or potential of the sphere is given.

Suppose the charge Q given ; superpose on the distribution found

a

above a uniform distribution of amount Q+ ? E. This will pro-

E duce a constant potential ae = all over the sphere, and therefore

will not disturb the equilibrium. We have thus got the required distribution of the given charge Q under the influence of A. The density of any point is given by

= ee a Be 4dnaf- 4maAP

So far the method of images is simply a synthetical method for obtaining distributions on a sphere. But Sir William Thomson has shown us how to convert it into an instrument for transforming any electrical problem into a variety of others.

f P be any point (fig. 13), O a fixed point, and P’ be taken in OP such that OP.OP’ =a?, Q then P’ is called the inverse of P with respect to O, which

(41).

=

. 4a?

is called the origin of inver- a

sion, or simply the origin; @

is the radius of inversion. We ° ae may! thus invert any locus of Fig. 13.

points into another locus of points, which we may call the inverse of the former. Let P, Q and P’, Q’ be any two points and their inverses. Let us

suppose that there is a charge E at Q, and a charge FE’ at Q’, which is the image of E in a sphere with radius a and centre O ; so that

= 50E: Let V and V’ be the respective potentials of E and E’ at Pand P’. Then we have obviously

Ait 2

7 Owe

where OP=r, OP’=r’. It is very easy to show that, if ds, dS, dv, o, p, be elements of length, surface, and volume, and surface and volume densities, and the same symbols with dashes the inverses ot these, then we have

dg at et as at,

ds 7 ai? qgQ— 74 WC

By means of these equations it is easy to invert any electrical system. Take, for example, the case of any con- ductor in electrical equilibrium ; then, since its potential is everywhere constant, it inverts into a surface distribu- tion, the potential at any point of which distant r’ from

6 ae a : the origin is by (42) ~~; C, where C is the constant poten~~

tial of the conductor. The surface density at any point of the system is found from that of the corresponding point on the conductor by the equation

ee

1 For the general properties of curves and their inverses, the reader may consult Salmon’s Solid Geometry. He will have no difficulty in proving for

himself such as we shall require here,

Again, if we consider the system thus found, it is obvious that, if we place a quantity —aC of electricity at the origin, this will make the potential at every point of the system zero, and we have a solution_of the case of an uninsulated conductor, whose surface is the inverse of that of the given conductor, under the influence of an electrified point.

As an example of the use of this method, let us invert the uni- form distribution on a sphere with respect to an origin on its cir- cumference, the radius of inversion being the diameter of the

sphere. The sphere inverts into an infinite plane, touching at the other end A of the diameter through the origin. Let C be the

potential on the sphere so that o= Seq? Where d is the diameter.

Hence the density at any point P on an infinite plane influenced by a quantity — Cd of electricity placed at a point O distant d from it is given by a0 =. « Qa’

Again, inverting points inside the sphere, for which the poten- tial is constant, we get the potential due to the distribution on the infinite plane, at points on the other side from the inducing point, the result being

which is the same as that duc to dC atO. Hence the potential at a point on the same side as O is that due to a quantity dC placed at O’, where O’A=OA. 0?! isin fact the image of O. If we write Q for — Cd, then we get

, —~Qd o ap et (48). V Cait ed

These results might of course have been deduced as particular cases of a sphere and point.

Many beautiful applications of these methods will be found in the Reprint of Sir William Thomson's papers and in Maxwell's Electricity and Magnetism. 'Two of these are of especial importance. Adopting the method of succes- sive influences given by Murphy (Llectricity, 1833, p. 93), and conjoining with it the method of images, Sir William Thomson treated the problem of two spheres. For his results, see Reprint, pp. 86-97. At the end of that paper two valuable tables are given—lI. 'Showing the quantities of electricity on two equal spherical conductors of radius r, and the mutual force between them, when charged to potentials u and v respectively ;" II. " Giving the potentials and force when the charges D and E are given." The ratio of w to v in the first case and of D to Ein the second is also given, for which at a given distance there is neither attraction uor repulsion. An interesting experiment on this curious phenomenon is described in Riess, Bd. i. § 186. For an application of dipolar co-ordinates to the problem of two spheres, see Maxwell.

Thomson also applied his methods to determine the dis- tribution on spherical bowls of different apertures, See Reprint, p. 178 sqg. His numerical results on p. 186 are extremely interesting, as affording a picture of the effect of gradually closing a conductor, and are of great value in giving the experimenter an idea as to what aper- ture he may allow himself in a vessel which he desires should be for practical purposes electrically closed.

Spherical bowl.

It would lead us too far to discuss here the analytical Conju- method of conjugate functions, and the allied geometrical &t¢

method of inversion in two dimensions. these, with important applications, will be found in Max- well, vol. i. § 182 sgq.

We shall conclude our applications with a brief notice of a few of the ordinary electrostatical instruments, refer- ring the reader for an account of some others to the article ELECTROMETER.

If two plates be placed parallel to each other, and one

VII. — 5

A full account of ti

unc- ions.

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Parallel of them raised to potential V, while the other is connected plates. with the earth, then there will be certain charges E and F on the two plates. If p and r be the coefficients of self- induction for A and B, and q the coefficient of mutual induc- tion, then in the present case E=pV, F=aV, and the energy of the distribution is obviously Q=hEV—apV*, so that the work done by completely discharging the con- denser «V?. If we suppose the plates very large com- pared with the distance between them, then we may treat the case, for all points not very near the edge, as if

the plates were infinite.

In this case the lines of force are straight, and the number of lines of force which leave any area on A is equal to that of those which enter the opposite area on B. Hence the surface densities on the plates are equal and — “oo Also we clearly have

o (44).

4a 4nd For the number of lines of force which cross any unit of area parallel to the plates is constant, and therefore the resultant force is con-

stant at every point between the plates. Principle It appears, therefore, from (44) that if we make the dis- of accu- tance between our plates very small, the density on the mula- inner surface will be very great, and the whole charge on ee ak very great. An apparatus of this kind for collecting large quantities of electricity at a moderate potential is called an accumulator or condenser. One of the first instru- ments of this kind was Franklin’s pane, which consisted of two sheets of tinfoil pasted opposite each other on the two sides of a pane of glass. There is of course a practical limit to the increase of capacity in such arrangements, because a spark will pass when

the insulating medium is too thin. The greater dielectric strength of glass makes it more convenient than air for an insulating medium, and we shall see by-and-by that it has other advantages as well. When the plate A is of finite size there will in general be a distribution of electricity on the back comparable with the charge which A would hold at potential V if B were absent. When the distance between the plates is small, by far the greater portion of the capacity is due to the Condens- presence of B. Advantage of this principle has been taken ing in the condensing electroscope of Volta, which is an ordin- eet ary gold-leaf apparatus, except that the knob is replaced by a circular dise on which is placed another disc fitted with an insulating handle; the discs are covered with a thin coat of varnish which serves as an insulating medium. If we connect with either disc, say the lower, a source of electricity of feeble potential V, and connect the upper disc at the same time with the earth, then a large quantity of electricity at potential V collects on the lower disc. Now remove all connections, and lift away the upper disc. The capacity of the lower disc is thereby enormously di- minished. Therefore, since the charge is unaltered, its potential must rise correspondingly ; and the gold leaves may diverge very vigorously, although a simple connection with the lower disc alone would scarcely have moved them. This instrument is of great use in all cases where we have an unlimited supply of electricity at feeble potential. Sir Guard William Thomson has devised an accumulator of measur-

ring able capacity, called the Guard Ring Accumulator, which itor. 18 @ modification of the arrangement we are discussing.

AB (fig. 14) is a flat cylindrical metal box, the upper end of which is truly plane, and has a circular aperture, into which fits, without touching, a plane disc C, which is supported on the bottom of the box by in- Cc

sulating supports, so that its ao B upper surface is in the same plane with the lid of the box. ‘

Fig. 14.

DE is a metal disc which can be moved by a screw through measured distances, always remaining

parallel to AB. When desired, C can be put in communication with AB. It may then be regarded as forming part of an infinite plate, so that if AB be at potential V, and DE at potential zero,

then the surface density on C will be equal top , where d@ is the distance between the plates; and if A be the area of C the whole amount of electricity on C is a . If now we break the connec- tion between C and the box and discharge the box, we are left with a known quantity of electricity on C, viz. a

The most usual and for many purposes the most con- Leyden venient form of accumulator is the Leyden jar. This is Jar. merely a glass jar (fig. 15) coated to a certain height out- side and inside with tinfoil. The mouth of the jar is stopped with a cork or wooden disc, which serves the double pur- pose of keeping dirt and moisture from the uncovered glass inside, and of carrying a wire in metallic connection with the inside coating, which passes up through the stopper and ends in a metal knob. If the glass of the jar be very thin, we may find the distribution on the two coatings by neglecting the curvature ; the electric density on the inner surface of the two coatings will then be the same as in the case of parallel plates, If, therefore, the inner coat- ing be at potential V, and the outer at potential zero,

the density on the inner coating will be = » and that on

In the particular case we are consider-

~

the outer — Tr’

ing the inner coating forms very nearly a closed conductor, so that there will be very little electricity on its inner sur- face, and there will also be very little on the wire and knob compared with the amount on the surface of the inner coating which is next the glass. We may therefore put

for the whole electricity on the inner coating ae where 8 T

is the extent of its surface. The capacity C of the jar is

then given by S Cale ee 4nd, is Green calculated to a first approximation the effect of the curva- ture on the capacity, and found that, if R and R’ be the greatest and least radii of curvature of the inuer coating at any point, then the densities on the inner and outer coatings are given by

v aif a} 145(a+B) } (46), and consequently the capacity of the inner coating by al aS oie in| Tl) (xr e)} io

In any case, C being a constant, we have charge E= CV Battery and energy Q=}CV* Hence if we connect the inner of jars coatings of ~ similar jars, and charge them to potential V, are all the outer coatings being at the same time connected with the earth, we have, E and Q representing tle whole charge and energy,

E=nCV

(48).

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=5 ov

If we discharge such a battery of ~ jars into another of n’ similar jars, by connecting the knobs together, and the outer coatings to earth in each case, we have, U being the common potential after discharge,

nCV =nCU +2”‘CU n

and. a rrr . (49). There is therefore a loss of energy represented by $nCV? —4(n+7’)CU2, : nn that is Tn +n) CcVv2 . (50)

Battery in series.

Cascade.

Free and

bound elec- tricity.

ELECTROSTATICAL THEORY. |

Ud n ; In other words, an aes th part of the potential energy

v+n is lost. When a battery of jars is discharged through a circuit in which there is a fine wire of large resistance, the greater part of the potential energy lost in the dis- charge appears as heat in the fine wire. Miess made elaborate experiments on the heating of wires by the dis- charge in this way, and the results of his experiments are in agreement with the formule which we have just given, (See Heating Effects.)

We may also arrange a battery of jars by first charging each separately to potential V in the usual way, and then connecting them in series, so that the outer coating of each jar is in metallic connection with the inner coating of the next. In such an arrangement of jars, it is obvious that in passing from the outer coating of the last at potential zero to the inner coating of the first, the potential will rise to ~V. When we come to discharge such a series, the electromotive force to begin with is »V, so that for any purpose in which great initial electromotive force is required this combination has great advantages over n jars abreast. The “striking distance,” for instance, we, the greatest distance at which the discharge by spark will just take place through air, is much greater. On the other hand, the quantity of electricity which passes is less, being only CV instead of nCV ; the whole loss of potential energy in a complete discliarge is, however, the same.

The case which we have been discussing must be care- fully distinguished from that of a series of jars charged by “cascade,” where x uncharged jars are connected up in succession as in last case, and the first charged by con- nection with the electric machine to potential V, while the outer coating of the last of the series is connected to earth, and the rest of the jars insulated. The whole electro- motive force in this case is clearly only V, and, if all the jars be similar, the potential difference between the coatings

in each is —; the charge on the inner coating of the first is

: 2

therefore — and the whole potential energy only gO n

The arrangement is, therefore, not so good as a single jar fully charged by the same machine. It was fancied by Franklin, who invented this method of charging, that some advautage was gained by it in the time of charging, the notion being that the overflow was caught by the successive jars and that electricity was thereby saved. Charging by cascade was treated by Green. Some of the experiments of Riess bear on the matter (vide Mascart, §§ 190, 191), which, after all, is simple enough.

In the theory of accumulators, or condensers as they are often called, much stress has been laid on the differ- ence between “free” and “bound” electricity. To illus- trate the meaning of these terms, let us take a case where the calculations can be carried out in detail.

Suppose we have two concentric spherical shells, an inner, A, and an outer, B. Let the outer radius of A be a, and the inner and outer radii of B be 6 and ¢, so that the thickness of the latter is ¢—6. We shall suppose that we can, when we please, connect the inside spherc with the earth. It is clear that there can never be any electricity on the inner surface of A. Let the charges on the other surfaces in order be E, F, G._ Let us suppose in the first in- stance that A is at potential V, and B at zero, Then we have to find E,F,G. Draw a surface in the substance of B; no lines of force cross it, therefore the whole amount of electricity within is zero. Hence F=—E. Also, considering the external space, which is inclosed between two surfaces of zero potential, we see that G=0. Thus,

since A is at potential V, we have fe z=V- a _ ab nv _ ab E a V = pV (where == | ; 2 (ub).

In this case, then, there is no electrification on the outside of 183, and an electric pendulum suspended there would give no indication,

Fig eC wis tC ri X

Let us now connect A with the carth, so that its potential becomes zero ; we have now to find the charges and potentials, our datum being that the whole charge on B is-E.

As before, we have F’= — EH’, but G is no longer zero. however, F’+G’=-E. Hence G’-H’=-E.

We have,

la f Also, since A is at zero potential, —~ = —_ ; U _ therefore G’ — —2& ; -FP=F= Vee ; G= ack Pp pre pre : : G’ —cpV The potential of B is aa Pec

In this process, therefore, a quantity E—E’, or ree V, of electri-

city has flowed away to earth from A, and a quantity == V has passed from the inner to the outer surface of B, whilc the potential has altered, on A from V to 0, and on B from 0 to V.

Suppose now we connect B with the earth, thus reducing it to zero potential. Since the charge on A remains the same, and that on the inner coating of Bis equal and opposite to it, it follows that

now the charges on A, &c., are #4 V, a V, 0, where g denotes g

—es

pre: and the potentials of A and B are t Vand0. Aftcranother

“ ay &c., and the

pair of such operations the charges will be Ee

—\2 = potential, V ; after a third, charges, Sal d V, &c., and potential, a &

_

4 V. Hence the charges and potentials go on decreasing in geo-

metrical progression. Amounts of electricity flow away from A progr = 3 vi

equal to gV, qt V5 v7 Ve av &c., in the successive operations,

and equal amounts of opposite signs are discharged from B. The sum of all these discharges is the whole original charge on A, for

em, 28 gv(1+%+4

+ &e, ad. inf.) ey WE, c

Hence by an infinite number of alternate connections we shall finally discharge the jar completely. The elec- tricity which flows out at each contact is called the “ free electricity,” and that which remains behind the “ bound electricity.” The quantity which we have denoted by p Capacity is clearly the capacity of a spherical Leyden jar; it in- of spheri- creases indefinitely as the distance between the conduct- °! Ja”. ing surfaces decreases, and is very nearly proportional to the surface of the inside coating, when the distance is small compared with the radius of either surface.

It is very easy to extend our reasoning to any con- denser.

If, in fact, 11, G25 Yee be the coefficients of self and mutual in- duction for the armatures, then this potential after operating n

2 = 5 –

times as above is (=) V, the charges, al Bs) wy and 2 _ 11 Y22 G11 Tae nal fie) V,and the amounts of electricity which leave 1 7711 Vee

n je We must not omit one more interesting case. If we Coaxial have two infinite coarial cylinders of radii a@ and 6 cylinders. (> > a), then obviously the potential is symmetrical about the common axis, and Laplace’s equation becomes av 1 av ape ap ap The integral of thisis V=C logr+D. Let the inner cylinder be at potential V,, the outer at potential V,, then log ¢ V, log a—V, log} Nereis log oaks b ge aes ; Hence the surface density on the inner cylinder is given by ig VV,

i 5 %11%o2 — Y ne Yie and 2 in the nth operation are -+gq,, {|
———————————+> =

1 I 911 Yoe respectively.

(52).

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and the capacity per unit of length of same is i rt . (58).

4 6

2a log |

This result has important applications in the theory of telegraph cables, and to a form of graduated accumulator, invented by Sir William Thomson, and used by Messrs Gib- son and Barclay in their experiments on the specific induc- tive capacity of paraffin (see Maxwell, vol. i. § 127).

ON THE INSULATING MEDIUM.

It has been assumed hitherto that the medium inter- posed between the conductors in the electric field is in all cases air—the most prevalent of all dielectric media ; or, where any other medium actually occurred, as in the case of the Leyden jar, it has been assumed that the result is the same as if the glass were replaced by air.

. Experimenters soon recognized, however, that the capa-

Fara- day’s experi- ments.

city of a Leyden jar depends very much on the quality of the glass of which it is made. But the nature of this action was very little understood, until Faraday showed by a number of striking experiments that the dielectric has a specific function in all phenomena of induction.

Faraday used in his experiments two identical pieces of apparatus, which were virtually two spherical Leyden jars. The outer coating EF (fig. 16) was divided into two hemispheres, which could be fitted together air-tight. The lower hemisphere F was fitted to a perforated stem, provided with a stop-cock G, so that it could be screwed to an air- pump while the apparatus was being exhausted, and afterwards screwed into a foot H. The upper hemisphere was pierced by a tube, into which was cemented a shellac plug B. C is a metal wire passing down through B, which supports the hollow metal sphere D, forming the inside armature, and earries the metal ball A, by means of which D can be charged and discharged. To give an idea of the size of the ap- paratus, it may be mentioned that the diameters of the inner and outer spheres were 2°33 in. and 3°57 in. re- spectively. Two jars were made on the above pattern, as nearly alike as possible. The equality of their capa- – cities was tested as follows. Both were filled with air at the same temperature and pressure. Apparatus I. was theu charged, by bringing A in communica- tion with the knob of a Leyden jar, while the coating EF was connected toearth. I. and II. were then placed at a moderate distance from each other, as

Fig. 16. symmetrically as possible with respect to the observer and other external objects, the outer armatures in both cases being in con-

ducting communication. with the earth. The ball of I. was touched by a small proof sphere, the repulsion of which on the movable ball of a Coulomb balance was measured; after a short interval this measurement was repeated. The balls of I. and II. were then brought into communication, and the charge divided between the internal armatures. The ball of II. was immediately tested as before, and then the ball of I. again. Finally I. and Il. were discharged and tested for permanent ‘‘stem effect.” The result of one such series of measurements was

Li}... Saal. oo. Pee Hol6 oy. eee 129s «ele o ee

Neglecting the slight dissipation of the charge, and taking account only of the ‘‘stem effect’’ in I., we see that the charges on I. and II. after division are represented by 122 and 124, each of which is not far from the half of the whole disposable charge in I., viz., 124°5; so that the capacities of the two jars must be equal, This will perhaps be clearer if we consider what would happen were the capacities unequal. Let the capacities be C and C’, the potential of I. before division V, and the common potential after U, the charge on I. Q, and on I. and Il. g and ¢’ after division. Then Q=CV, g=CU, ¢’=C’U, and q+¢7=Q. The indication of the torsion balance is proportional to the charge of

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[THE DIELECTRIC.

the proof sphere, that is (owing to the symmetry of the arrange- ments), to the potential of the knob with which it was in contact ; or at all events this is true if we consider only readings taken from the knob of the same jar, and that is all we shall ultimately want. But (C+C’) U=CV; hence CC V¥=-U C U

Hence the ratio of the capacities is equal to the ratio of the excess of the first over the last reading to the last reading, both being taken from the knob of I. Thus, taking the uncorrected values in the above experiment, the ratio of the capacities would be (250 — 124)+122, 7c. 1°02. By various experiments of this kind, Faraday convinced himself of the equality of his two jars. To test the sensibility of his method, he reduced the distance between the lower hemispheres and the ball in IJ. from ‘62 in. to ‘485 in., by introducing a metal lining. The capacity of I]. was then found to be 1°09 (the mean of two observations). He next com- pared the capacities of the jars when the lower half of the space between the armatures of one of them was filled with shellac. The ratio of the capacities was found to be 1°5 (mean of several experiments), the shellac jar having the greater capacity.

It appears, therefore, that, other things being equal, the Specitic capacity of an accumulator is greater when the insulating inductive

medium, or, as it is called, the “dielectric,” is shellac, than when it is air. The ratio of the capacity in the former case to that in the latter’ is called the Specific Inductive Capacity of shellac. This we shall in general denote by K. According to this definition, air is taken as the standard, and its specific inductive capacity is unity. Properly speaking, we ought to state the temperature and pressure of the air; we may assume 0° C. as our temperature, and the average atmospheric pressure (760 mm.) as our standard barometric pressure. | It is easy to obtain an approximate value of K from the above resuit for the shellac apparatus. Remembering that the shellac occupies only one hemisphere, and assuming that the lines of force are not disturbed at the junction of the air and shellac, we have, if p denote the ratio of the capacities, 14k. 5 lee This gives for shellac K=2:~~0, the real value being pro~~ bably greater. Similar experiments gave for glass and sulphur K = 1-76 and 2.24 respectively. Thus the specific inductive capacities of shellac, glass, and sulphur are considerably larger than that of air. Faraday was unable to find any difference in this respect

and K=2p-1.

‘between the different gases, or in the same gas at different

temperatures and pressures, although he made careful experiments in search of such differences.

It would lead us too far to discuss in detail the pre- cautions taken by Faraday to remove uncertainty from his experimental demonstration of the existence of a specific dielectric action. The reader will find a minute descrip- tion in Faraday’s own surpassingly lucid manner in the eleventh series of the Hxperimental Researches.

His discovery of the action of the medium led Faraday to invent his well-known theory of the dielectric. Ac- cording to him, the fundamental process in all electrical action is a polarization of the ultimate particles of matter ; this polarization consists in the separation of the positive and negative electricities within the molecules, exactly as the two magnetic fluids are supposed to separate in the theory of magnetic induction. In this view a dielectric is supposed to consist of a number of perfectly conducting particles, immersed in a medium or menstruum, which is either a non-

conductor or a very imperfect conductor. When electrical action starts, the two electricities separate in the molecules ; but, in the first instance at least, there is no interchange of electricity between different molecules.

1 Jt must be noticed that the assumption is tacitly made that the air is to be replaced by shellac everywhere, or at least wherever there are lines of force.

capacity,

Fara- day’s theory.

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Faraday assumed that the electrical action is propagated | ing” value of the specific inductive capacity are at variance from molecule to molecule by actions whose sphere of | with those of subsequent experimenters who have worked immediate activity is very small. He denied the existence | with more delicate instruments.

of “action at a distance,” and regarded his results about | In their experiments on the specific inductive capacity Gibson induction iu curved lines as at variance with it. Thomson! | of paraffin, Gibson and Barclay® employed a method due.to and showed, however, that Faraday’s results were perfectly | Sir William Thomson, in which an instrument called the Barclay: Platymeter is used in conjunction with the quadrant elec-

THE DIELECTRIC. |

Platy- meter.

‘

‘ Siemens. t

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Gaugain.

consistent with the theory of action at a distance, pro- vided the polarization of the dielectric be taken into account, and that the mathematical treatment of the subject is identical with Poisson's theory of induced magnetism. The theory of action at a distance as ap- plied to this subject will be found under MacGnerism. Helmholtz, whose memoirs we have already mentioned, takes this view of the matter. We do not propose to follow Faraday's theory any further at present; its main features are involved in Maxwell's theory, to which we shall afterwards allude.

W. Siemens? examined and confirmed the conclusions of Faraday. He used voltaic electricity in comparing the capacities of condensers. By means of a kind of self-acting commutator? (Selbstthdtige Wippe), the armatures of the condenser were connected alternately with a battery of Daniell's cells and with each other; so that the condenser was charged and discharged about 60 times per second.

Figure 17 gives a scheme of the arrangement. F and G are two insulated metal screws, with which the vibrat- ing tongue E of the Wippe comes alter- nately into contact; CD and AB are the armatures of the con- denser, H the battery, and K the galvano- meter. Theory indicates, and experiment confirms, that the deflec- tion will be the same whether the galvanometer is put in the charge or in the discharge circuit. The former arrangement is that indicated in the figure.

The amount of electricity which flows through the galvanometer each time the condenser is charged, is pro- portional to the product of the capacity C of the condenser and the electromotive force E of the battery. E is propor- tional to the number of cells in the battery. If, therefore, the speed of the Wippe be constant, the galvanometer deflection, or its sine or tangent as the case may be, will be proportional to EC. By varying E and C inde- pendently, we can verify the laws that regulate the charge of condensers. If we keep E the same, and the speed the same, we can compare the capacities of two condensers, or of the same condenser with two different dielectrics, and thus find the specific inductive capacities of various sub- stances with respect to air. Siemens found that C is independent of E, and concluded that the effect of solid dielectrics on the capacity of a condenser is not to be

explained by a penetration of the electricity into the dielectrics. We shall give some of his values of the specific inductive capacity farther on.

Gaugain* studied the effect of the insulator on the capacity of condensers. He used in his researches the discharging electroscope (see art. ELECTROMETER), an in- strument which does not at first sight look likely to lead to very accurate results, but which seems to have worked satisfactorily in his hands. Many of Gaugain's results concerning the gradual increase of the charge are very interesting ; their bearing on theory is difficult to estimate, however, owing to the mixture of effects due to surface and body conduction. His results concerning the "limit-

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fig. 17,

1 Camb. and Dub. Math. Jowrn., 1845, or Reprint of Papers, p. 15.

2 Pogg. Ann., cii., 1857. .

3 For a description of this instruam ent, see Wiedemann's Galvanismus, Bd. i. § 451.

4 Ann. de Chim. et de Phys., 4 ser. t. ii. (1862).

trometer. They found for the specific inductive capacity of paraffin 1:97, and showed that this value alters very little, if at all, with the temperature.

The most extensive measurements of this kind that have been made of late are those of Boltzmann ® and Schiller.'

Boltzmann used a sliding condenser, whose plates could be Boltz- Plates of different ™*"™

placed at measured distances apart. insulating materials were introduced between the parallel plates of the condenser, so as to be parallel with them and at different distances from one of them. –

According to the mathematical theory, the capacity of the con- denser is independent of the position of the plate, and varies inversely as m — n +k j

plates of the condenser, and 7 the thickness of the plate of insulat- ing material whose specific inductive capacity is K. In other words, the plate may be supposed replaced by a plate of air of thickness = lf therefore A denote in absolute measure the reciprocal of the capacity of the condenser, then

r=G(m-n4 e),2

K where G is a constant.

where 7 is the distance between the

The capacity of the condenser was mea- sured by charging it with a battery of 6 to 18 Daniell's cells, and then dividing its charge with the electrometer. One pole of the battery and one armature of the condenser are connected to earth. The other pole of the battery is first connected with the electrode A of the electrometer, whose other electrode B is connected to earth. Let the reading thus obtained be E, then E is proportional to the potential of the battery pole. The condenser is next charged by connecting its insulated armature with the battery; the battery connection is then removed, and the electrode A of the electrometer, which has meanwhile been connected with the earth, is now con- nected with the condenser. If C be the capacity of the condenser, C' that of the electrometer (in certain cascs artificially increased), we have, if F be the common potential of the condenser and con- nected parts of the electrometer, (C+C')F=CH, and C= FC' enF 2 ~ E-F?' ~ =

But F is proportional to the second reading of the electrometer, hence A is known in terms of C'.. As only relative measures are wanted, C' is not required. Boltzmann made a variety of experi- ments, all of which confirmed the theory, and showed the applica- bility of the above formula.

If we make three measurements, first with the plates at distance m,; secondly, at distance m., with only air between in each case; and thirdly, at

distance mz, with an insulating plate of thickness n between, we have, if A,, Ag, Ag be the corresponding values of A,

Fo agi BS ae Ga eae Ms ~ My,” K G

The advantage of this procedure is that only differences of m,, m, m3 come in, and no absolute length has to be measured. Measure- ments were also made with condensers, in which there was no air between the armatures and the insulating plates; in them the armatures were formed by means of mercury. To give an idea of the agreement of the results by different methods, we give K for paraffin as determined on plates of different thickness; with the ordinary condenser, K = 2°28, 2°34, 2°31 for plates I., II., and 1Il.; and K = 2°81, 2°33 for plates I. and II. used with mercury armatures,

or

and — mg +m, tn) em,

Boltzmann convinced himself that, in the case of ebonite, Effect of paraffin, sulphur, and rosin, the time during which the time.

condenser was charged was without sensible influence. He found that the result was the same whether the charge

5 Phil. Trans., 1871.

6 Pogg. Ann., cli., 1874, or Sitzb. der Wiener Akad., \xvii.

7 Pogg. Ann., Clii.

8 It is supposed that the plates are near enough to allow us to neglect the effect of the rims.

Schiller.

Method of elec- trical oscilla- tions.

Silow. Results for fluids.

was instantaneous or lasted for a considerable time. The case was different with the imperfect insulators, glass, stearine, and gutta percha, for which he has given no results. To test still farther the influence of the time, Boltzmann measured the attraction between a sulphur and a metal sphere—first, when the latter was charged continu- ously positive or negative, and, secondly, when it was charged positive for yfth of a second, negative for the next ~ijth, and so on; he found the attraction to be the sane in both cases, provided the charges without respect to sign were equal. This experiment establishes beyond a doubt the existence, in the case of sulphur, of a specific di- electric action, which is fully developed in less than x3 oth of a second. From experiments of this kind values of K were deduced, which agreed fairly well with those obtained by other methods. A very important result which he obtained was, that for a certain crystallime sphere of sul- phur the values of K were different in the directions of the axes, being 4°773, 3°970, and 3811 respectively. The result realizes an expectation of Faraday.t

Schiller employed two methods—the method of Siemens, which we have already described, in which the duration of charge was from goth to Ath of a second, and the method of electrical oscillations devised by Helmholtz. In the latter method K is given by the equation K = (T? — T,”) + (T2—T,?), where T,, T, T’, are the periods of oscillation of a certain coil, firstly, by itself, secondly, when con- nected with an air-condenser, and thirdly, with the same condenser when the air is replaced by the insulator to be tested (see below, p. 82). In this method the duration of charge varied from zpigqth to sdooth of a second.

The following table gives some of the results of Boltzmann and Schiller :—

| Boltzmann. |

Schiller. |

White mirror glass.. |

Ebonite …..c.ce0: 3°15 276 | 221 Paraffin (clear) .... 2°32 1°92 ; 1°68 Do. (milky)... 2°47 1°81 Sulphur ….. eer 3°84 2s ‘ ee TROERIN Goncsteonossoonede | Qeoo ‘ ae { ei Indiarubber (pure).. ° – 284 | 212 | Do. (vuleanized) ‘ 2°94 PAG!) | 6°34 5°88

The first column of Schiller’s results was obtained by Siemens’s method, the second by the method of oscillations. It will be seen that the shortness of the time of charge has affeeted the value of K in the last column, reducing it considerably in all cases. Boltz- mann’s results are on the whole the largest obtained by any physicist ; he attributes this to the care with which he constructed his plates. Gibson and Barclay found 1°97 for paraffin, and Siemens 2°9 for sulphur.

Among the more recent researches on the theory of dielectrics may be mentioned those of Rood,? whose results for crystals are interesting, and Wiillner,? who has studied the course of induction when the charge is maintained for a considerable time.

There are very few fluids which are sufficiently good insulators to allow an easy determination of their specific inductive capacity. Measurements have, however, been made by Silow.t He used (1) Siemens’s method, and (2) a method in which he observed the deflection of a quadrant electrometer corresponding to the same potential, first, when the quadrants were filled with air, and secondly, when they were filled with the fluid to be examined; the ratio of the latter deflection to the former is the specific inductive capacity of the liquid.

The instrument actually used was a glass vessel, inside which were pasted pieces of tinfoil corresponding to the quadrants of

1 Kap. Res., 1689.

2 Pogg. Ann., clviii., 1876.

3 Pogg. Ann., N.F.i., 1877.

4 Pogg. Ann., clvi., 1875; clvii., 1876.

Thomson's electrometcr. The shape of the needle was also slightly different. A fine silver wire replaced the bifilar suspension, and the deflections were read off by means of a scale and tclescope. The necdle and one pair of quadrants were connected with the earth,

aud the other pair of quadrants charged to a constant potential by-

connection with a battery. The results were for oil of turpentine by method (1), 1°468; by (2), 1°473; for a certain specimen of petroleum, by (1), 1°489; for another specimen, by (2), 1°428; for benzol, by (1), 1°488.

In the researches in which Siemens's method was used, the speed of the commutator was varied considerably, but no effect was thereby produced on the value of K, which is therefore, within certain limits at least, independent of the duration of the charge.

Perhaps the most important of all the recent additions to our knowledge in this department is due to Boltzmann,° who has succeeded in detecting and measuring the decrease of the specific inductive capacity of gases when rarefied.

The principle of his method is as follows. Suppose we have an ordinary air-condenser inside a receiver, which we can exhaust at will. Let one of the armatures A of the condenser be connected with a battery of a large number x of cells (Boltzmann used about 300 Daniell's), while the other armature B is connected with the earth. lf we now insulate B, and if the condenser does not leak, then on connecting B with the electrometer no deflection will be indicated. If, however, we increase the number of cells by onc, the potential of A will increase from np to (n+1)p, while that of B will rise from 0 to an amount which is proportional to p. Let the corresponding electrometer reading be 8. Suppose now that we altcred the specific inductive capacity of the gas from K, to K,, both armatures being insulated, A originally at potential np, and B at potential ; the potential of A will, by the mathematical theory, become

1

IS the battery of n cells, the potential of A becomes again 2p. If we then connect B with the electrometer we shall get a deflection a proportional to

LEG, ae aif np (1 – a) hence we have =E = n(m)- Let us now assume, what experiment shows to be the case, that

the increase of K is very nearly proportional to the pressure, then, b, and b, denoting the manometric reading in millimetres corre- sponding to K, and K,, we may write

es

760) °

aw Ab, = K, =0(1 +754). K, =0(1 +

Here a is a constant, the meaning of which is very simple, if we assume our law of proportionality to hold up to absolute vacuum ; in fact, 1-+a is in that case the specific inductive capacity® of the gas at 760 mm. pressure, at the temperature ¢ of observation, and 1+a(1+a) is the corresponding coefficient at 0°C. The formula written above becomes therefore

_ ai Bn(b,-—b,)° In this way Boltzmann arrived at the following values

for /K at 760 mm. pressure, and temperature 0° C.:—for air, 1:000295; carbonic acid, 1:000473; hydrogen, 1:000132; carbonic oxide, 1:000345; nitrous oxide, 1000497 ; olefiant gas, 1:000656; marsh gas, 1:000472. These results are of great importance in connection with the electromagnetic theory of light.

np, while that of B remains zero. If now we reconnect A with

ie =

Residual Discharge.

When an accumulator, whose dielectric is glass or shellac, is charged up to a moderately high potential, and one armature insulated, a gradual fall of the potential occurs. This fall is tolerably rapid at first, but it gets slower and slower till at last it reaches a certain limit, after which it remains sensibly constant for a considerable time. This fall is not entirely due to loss by conduction or convection of the ordinary kind, for we find that if an accumulator that has been charged to potential V, and has been allowed to stand till the potential has fallen considerably, be again charged up to potential V, then

5 Pogg. Ann., lv., 1875. 6 kK is now taken to be =1 for absolute vacuum.

Gases, Boltz- mann,

Pheno-

mena, of latent

charge.

RESIDUAL DISCHARGE. |

the rate of loss is much less than before, being now very nearly constant, and not far from the limit above nientioned It would appear, therefore, that this constant limit, which on favourable days is very small, represents the loss due to convection and conduction in the usual way, and that the larger varying loss is due to some other cause. When an accumulator, let us say a Leyden jar, has been repeatedly charged up to potential V, until the rate of dissipation has become constant, we shall say that it is saturated. If we discharge a saturated jar, by con- necting the knob for a fraction of a second with a good earth communication, and then insulate the knob, the outer coating being supposed throughout in connection with the earth, we find that the instant after the discharge the potential of the knob is zero; after a little, however, it begins to rise, and by and by it reaches a value which is a considerable fraction of V, and has the same sign. This phenomenon justifies the assumption we made as to the peculiar nature of the variable loss of potential experienced by a freshly charged jar. The charge which reappears in this way subsequent to the instantaneous discharge is called the

residual discharge! If at any time during the appearance of the residual charge the jar be discharged, the potential of the knob becomes for a short time zero, but begins to rise again ; and this may be repeated many times before all trace of charge disappears. Faraday made a variety of experiments on the subject, and established that whenever a charge of positive electricity disappeared or became latent in this way, an equal negative charge disappearcd in a similar way. He concluded that the cause of the phenomenon was an actual penetration of the two electricities (Lup. Res., 1245) by conduction into the dielectric. This is not the view which is favoured by the best authorities of the present day; it is indeed (see Maxwell, Wlect. and Mag., vol. i. § 325) at variance with the received theories of conduction, and alike untenable, as far as we know, whether we adopt the theories of Weber, of Maxwell, or of Helmholtz. Faraday established that time was a necessary condition for the development of the phenomenon; and he was thus enabled to eliminate its

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39

conclusion has been questioned, however.? He separated by a graphical method the loss by latent charge from the loss by conduction, &c., and found that the amount of charge whach becomes latent, or, which amounts to the same thing, the loss of potential owing to the forming of latent charge in a gwen time, is proportional to the initial potential so long as we operate with the same jar.

Kohlrausch recognized the insufficiency of Faraday's His explanation of the residual charge, and sought to account theory.

for it by extending Faraday's own theory of the polariza- tion of the dielectric, The residual charge is due according to him to a residual polarization of the molecules of the dielectric, which sets in after the instantaneous polarization is complete, and which requires ¢éme for its development. This polarization may consist in a separation of electricity in the molecules of the dielectric, or in a setting towards a common direction of the axes of a number of previously polarized molecules, analogous to that which Weber assumes in his theory of induced magnetism. It is easy to

see that such a theory will to a great extent account for the gradual reduction of the potential of a freshly charged jar, and the gradual reappearance of the residual charge.

If the charge, and consequently the potential, of the jar were kept constant at Q,, the residual charge tends to a limit pQ, (p const.). Kohlrausch assumes that the difference 7—pQ, between the residual charge actually formed and the limit decreases at a rate which is at each instant proportional to this difference, and further- more, to a function of the time, which he assumes to be a simple power. In any actual case, where the jar is charged and then insulated, the charge varies, owing to conduction, &c., and to the formation of residual charge, so that the limit of rt is continually varying, and we must write Q;for Q), Q: denoting the charge at time ¢. The equation for residual charge is then

© (re DQ) = — BEM PQe— 12) « From this he deduces the formula _) gmt r= p(Qe- Que HH) 5

which he finds to represent his results very closely. m has very nearly the same valuc (—0°5744, or —4 nearly) in all his experi- ments, p had the values 0°4289, 0°5794, 0°2562; and 6b 0:0397, 00223, 0°0446 in his three cases.

Kohlrausch called attention to the close analogy between Anajo- the residual discharge and the “elastic recovery” (elastische gous Nachwirkung) of strained bodies, which had been investi- pheno- gated by Weber‘ in the case of a silk fibre, and which has ™”* of late excited much attention. The instantaneous strain

influence in the experiments on the specific inductive capacity of sulphur, glass, and shellac. The phenomenon is most marked in the last of these; and in spermaceti, which relatively to these is a tolerably good conductor, the

phenomenon is very marked, and develops very rapidly.

ina Franklin’s pane, one side of which was coated with tinfoil in the usual way, while the other was silvered like a piece of looking-glass He showed, by taking measure- ments with an electrometer and a galvanometer, that the

ratio of the free or disposable charge to the potential is con- stant. By the disposable charge is meant the charge which is instantaneously discharged when the knob of the Jar 1s connected with the earth. This ratio is the capacity of the jar, and it appears that it is independent of the “residual” or “latent” charge. He showed that the “latent” charge is not formed by a temporary recession of the electricity to the uncovered glass about the neck and upper part of the jar; and that it does not to any great extent depend on the material used to fasten the armature to the glass, or on the air or other foreign matter between them. On the other hand, his results led him to suspect that the “latent” charge depended on the thickness of the glass, being greater for thick plates than for thin. This

1 When we think of the ceased to etfect the

charge.” 2 Pogg.

part of the charge that has disappeared, i.¢., potential of the knob, we may talk of the “latent This part of the charge is sometimes said to be absorbed. Ann., xci., 1854,

Tnvesti- _ Kohlvausch? studied the residual disharge in an ordinary which follows the application of a stress is analogous to the | —? Leyden jar, ina jar whose outside and inside coatings were — mi of lg Ae ae big gradually ee st rausch, 26 One time quicksilver and at another acidulated water, and | W2!¢2 follows to the gradual formation of the latent or

residual charge. The sudden rcturn to a position near that of unconstrained equilibrium corresponds to the in- stantaneous discharge, and the slow creeping back to the original state of equilibrium to the slow appearance of the residual discharge. Another analogy may be found in the temporary and residual or subpermanent magnetism of – soft iron or steel. If we wish to make the analogy still more complete, we have only to introduce the permanent polarity of tourmaline, the permanent set of certain solids when strained, and the permanent magnetism of hard steel. The phenomena of polarization furnish yet another analogy.

In justifying the introduction of a power of the time Effect of into his equation for the residual discharge, Kohlrausch duration makes the

important remark that the time which a residual ofcharge.

charge of given amount takes to reappear fully may be different according to the way that charge is produced. The charge reappears more quickly when it is produced in a short time by an initial charge of high potential, than when produced by a charge of lower potential acting

3 Wiillner, Pogg. Ann., N.F. i. pp. 272, 369. 4 De fili bombycini vi elastica, Gottinge, 1841.

Max- well’s theory.

Hopkin- son’s experi- ments.

Electric currents.

“the common potential, we must have U=—”

pears, therefore, that the potential of a has fallen by

longer. He suggests that the same thing may be true of elastic recovery. He does not allude to the fact (possibly he was unware of it) that two residual charges of different sign may be superposed and reappear separately, although the possibility of this is to a certain extent involved in his remark. The analogous elastic phenomenon has reccntly been observed by F. Kohlrausch.

Maxwell! has shown that phenomena exactly like the residual discharge would be caused by conduction in a hete- rogeneous dielectric, each constituent of which by itself has not the power of producing any such phenomenon, so that the phenomenon in general might be due to ‘‘ heterogeneity ” simply.

_ Hopkinson has lately made experiments on the residual discharge of glass jars. residual charges of opposite signs, and he suggests theories analogous to those of Kohlrausch and Maxwell. He finds that his results cannot be represented by the sum of two simple exponential functions of the time, and

concludes, therefore, that heterogeneity must be an important factor in the cause of the phenomenon.

The polarities of the different silicates of which the glass is

composed rise or decay with the time at different rates, so that during insulation the difference of potential between the armatures E would be represented by a series 3° Ae~Aet – If, therefore, we charge a jar positively for a long time, and then negatively for a shorter time, the second charge will reverse the more rapidly changing polarities, while the sign of the more sluggish will not be changed ; when, therefore, the jar is discharged and insulated, the iirst- mentioned polarities will decay more quickly at first and liberate a negative charge, and, finally, as the more sluggish also die away, a positive charge will be set free. Hopkinson also made the impor- tant observation that agitation of the glass by tapping accelerates the return of the residual discharge.

ON THE PASSAGE OF ELECTRICITY THROUGH BODIES.

We have hitherto supposed elcctricity to be either immovably associated with perfectly non-conducting matter, or collected on the bounding surfaces of conducting and non-conducting media in such a way that the force tend- ing to cause it to move is balanced by an invincible resist- ance. We have now to consider what happens when there is a finite unbalanced resultant force at any point in a conducting medium. If a conducting sphere of radius a be charged with Q units of positive electricity, its potential

will be 2. Connect this sphere by a long thin wire,

whose capacity may be neglected, with another uncharged sphere of radius 6, then we know that the potentials of the two spheres become equal; and since what we call electricity is subject to the law of continuity, the whole charge on the two spheres must be the same as before. Hence if U be

ag It ap-

b es a _ — —_—— + weak and an amount Ran of positive electricity

has passed from a to 6, and also a a part of the

electric potential energy has disappeared. In accordance with our hypothesis that electricity obeys the law of con- tinuity like an incompressible fluid, we explain this transference of electricity by saying that an electric cur- rent has flowed through the wire from the place of higher to the place of lower potential. We define the intensity or strength C of the current as the quantity of electricity which crosses any section of the wire in unit of time. Owing to the law of continuity the current intensity is of course the same at every point of a linear conductor.

1 Electricity and Magnetism, §§ 327 sqq.

PEE CTRICIS

He observed the superposition of

[sLECTRIC CURRENT.

In the case which we have just given, the whole transference takes place in so short a time that we cannot study the phenomenon in detail. It is obvious that C will vary rapidly from a large initial value, when the difference

between the potentials of the spheres is 2, to zero when

they are at equal potentials. It is possible, by replacing the wire by wetted string or other bad conductor, to prolong the duration of the phenomenon to any extent, so that CG should vary very slowly; and we can imagine cases where C would remain constant for a long time. Machines for producing a continuous or “ steady ” current have been invented in considerable variety, the first of the kind having been the Pile of Volta. Of such machines we shall have more to say when we come to discuss Electro- motive Force. We have seen, in the case of our sphcres, that the passage of the electric current was accompanied by a loss of potential energy. The question thus arises, Applica what becomes of the energy after the current dies away, !? and the equalization of potential is complete? This leads Peon us to look for transformatious of energy depending on the vation of electric current, or, in other words, to look for dynamical energy. effects of various kinds due wo

it. Accordingly we find the passage of the electric current accompanied by magnetic phenomena, sparks, heating of the circuit, chemical decom-positions, mechanical effects, &c. All these are observed

in the discharge of the Leyden jar and other electrostatic reservoirs of potential energy. Exactly similar effects,

some more, others less powerful, are observed accompany-

ing the current of the voltaic battery and other machines

which furnish a steady flow of electricity. In all such

cases we have (1) a source of energy, (2) a flux of electricity,

(3) an evolution of energy in different parts of the circuit.

We reserve the consideration of (1) for the present, as being

the most difficult, and devote our attention to (2) and (3).

Ohm's Law applied to Metallic Conductors.

We have already seen how to measure the strength of Measure. an electric current in a linear conductor. According to ment of the definition we gave above, the unit current strength cua would be that for which a unit of electricity passes each section of the conductor in unit of time. If the unit of electricity is tle electrostatic unit, this is called the electro- statical unit of current. We have supposed above that the current consists in the transfer of a certain amount of + electricity in a certain direction, which we shall call the positive direction of the current, and this for most purposes is convenient. We must remember, however, that no dis- tinction can be drawn between the transference of +Q units of electricity in one direction and the transference of —Q units in the opposite direction ; for we have no experimental evidence on which such a distinction can be founded.

We may measure the current by any one of its various Electro: effects. 'The method most commonly used, both for indi- magnetic cating and measuring currents, is to employ the mag-™*™™ netic effect. According to Oersted's

discovery, a magnetic north pole placed in the neighbourhood of a straight current is actcd on by a force such that, if the pole were to continually follow the direction of the force, it would describe a circle round the current as an axis, the direction of rotation being that of the rotation of a right-handed cork-screw which is traversing a cork in the positive direction of the current. If, therefore, we have currents of different strength in the same wire, the force exerted on a magnet which always occupies the same position relatively to the wire will be a measure of the current.

The force exerted ou the magnet may be found by balan- cing it against known forces, or by allowing the magnet to oscillate under it and finding the time of oscillation. It

oum’s LAW. |

is easy, by applying the law of continuity to niultiple circuits, to verify that the measure of current intensity thus got is proportional to the electrostatic measure. Thus let AB (fig. 18) be a cireuit splitting up into two exaetly similar branches BCDG, o D BEFG, and uniting again at G. Then, since elec- tricity beliaves like an in- 4 compressible fiuid, it is obvious that any current of intensity C in AB will split up into two currents ry each of intensity $C in CD we and EF. By placing a ad ; magnet in similar positions at the same distance with respect to AB, CD, and EF, it will be found that the magnetic action in the last two positions is just half that in the first. Electro. The appropriate unit in magnetic measurements of magnetic current intensity is that current which, when flowing in a unit. circular are of unit radius and unit length, exerts unit of force on a unit north pole placed at the centre of the arc, the unit north pole being such that it repels another equal north pole at unit distance with unit force. This is called the electromagnetic unit of current intensity. Uniess the contrary is stated, all our formule are stated in terms of this unit.

To facilitate the detection and measurement of currents by mag-

Galvano.-

strength. we shall find that the potential at A is higher than that at B by a certain quantity E, which we may call the electromotive force between A

and B, and we may suppose E for the present to be measured in electrostatic units.

If we examine the value of the ratio 4 for different posi-

tions of the points AB, we shall find that it varies directly as the length of linear conductor between A and B, provided the section of the conductor is everywhere the same. If we try wires of different section, but of

the same length and the same inaterial, we find that z is

inversely proportional to the sectional area; in fact we

| Be may write oak qn-Boe (1) C w ‘

where 7 denotes the length of the wire, w its section, and & a constant depending on its material, temperature, and physical condition generally. This is Ohm’s law.

In whatever unit measured, R is called the resistance of the conductor. The unit of resistance can always be con- ceived as established by means of a certain standard wire. The unit of electromotive force is then such that if applied at the end of the standard wire it would gencrate a unit current in the wire. The constant & is called the specific resistance of the material of which the wire is made; it is obviously the resistance of a wire of the matcrial of unit length and unit section.

‘Dimen- In the electrostatic system of unitation the unit of E is the work sions of done by a unit particle of + electricity in passing to infinity from units. the surface of an isolated sphere of radius unity charged with an electrostatic unit of +eleetricity. The dimension of E is [qu-*] ’ where [Q] is the dimension of the eleetrostatie unit of quantity

PE ore Fo ry

meter, netic means, an instrument called a galvanometer is used. It con- sists of a coil of wire, of rectangular, elliptical, or circular section, inside which is suspended a magnetic needle, so as to be in equi- librium parallel

to the eoil windings under the magnetie action of the earth, or of the earth and other fixed magnets. When a current: passes through the coil a great extent of the circuit is in the imme- diate neighbourhood of the magnet, and the magnctic action is

thus greatly accumulated. See article GALVANOMETER. ‘Electro- If we connect two points A and B of a homogeneous motive linear conductor, every point of which is at the same N ee temperature, by two wires of the same metal to the elec- ‘andcur- trodes of a quadrant electrometer, then, if a steady current rent C (measured in electrostatic units) be flowing from A to B,

(see p. 22), [a] = [uimer-*]. Hence the dimension of E is [u2 MT | . The unit of C we have already diseussed; its dimension is [qr]=[12a4 Tiga From these results, and equa-

tion (1), it follows that the dimension of R is mae tees, tliat of the reciprocal of a veloeity. We shall show hereafter that, if C

, eee ee sete [or peat be measured in electromagnetie units, its dimension is [LaMir |;

hence that of Q is [Léa? |, the unit of Q being the quantity of

elcctricity conveyed across any section by the unit current. Also ECT’ = work done in time T in conveying C units of + electricity from potential V-+E to potential V, whence [ECT] = dimension of

energy =(L MT “a . Henee l= [uiuir |. In this case then [R|-[ur””] ; so that in electromagnetie measure R has the

dimension of a velocity.

We ean put the equation (1) into another form, which suggests Ohm’s at once the generalization of Ohmn’s law for any eonductor. Con- law gene.

sider two points P and Q on a linear conductor, at a distance dx ralized, from each other, x being measured in the direction of the current.

Let the potentials at P and Q be V and V+aV, then E=-dV. Lf w denote the eurrent per unit of area of the section, then C=wa,

kdx

and sinee J=dxz we have R=—~. Substituting these values in

(1) we get

(2),

where X is the component eleetric foree at P in the direetion of the eurrent. Since the eleetrie current is of the nature of a flux, it is determined at any point of a conductor by the flux components wow, representing the quantities of electricity which in unit of time cross three unit areas perpendicular to three rectangular axes drawn through P. If X,Y,Z be the components of the electric force at P, then the general statement of Ohm's law for a homogeneous isotropic conduetor is :. x Z a ea ea In such a eonductor the resistance of a small lincar portion of given dimensions, cut out of the substance any where or any how, will be the same. It is conccivable, however, that the resistance of such a small portion would be different if cut in different directions at any

U=- 5

(3).

point, in which case the conductor would be xolotropic. The most general statement of Ohm's law would then be w=TX+ pV + Goh in = Q3X+72Y +7,Z (4), Hons of w=pyX+qQY+73h — ion.

where 7), &c., p,, &c., q), &c., are constants for any one point. If they are the same for all points, the body is said to be homogeneous; if they vary from point to point, the body is said to be hetero- geneous. If we may liken our conductor to an arrangement of linear conductors (see Maxwell, §§$

297, 324, vol. i.), then it may be shown that the skew system of (4) becomes symmetrical, inasmuch aS P1=%, Po=Un, P3=Qq- The great majority of the substances with which the electrician has to deal are, however, isotropic; and unless the experiments of Wiedemann on certain crystals point to xolotropic conduction, we do not know of any case which has been experimentally examined. The reader will find interesting deve- lopments of the subject in Maxwell, vol. i. § 297 sqq.

A very important remark to be made with regard to the equa- tions (4) is that, being linear, the principle of superposition applies. Thus, if w,v,w be the current components due to clectric forces X,Y, Z and w',v',w' similar components for X', Y', Z', then the current for X+ X', Y+ Y', Z+Z' is givenbyw+w,vt+v,w+w. It is obvious, moreover, that (4) are the most general equations that can be written down to connect current with electromotive force, subject to the condition that the currents due to superposed elec- tric forces are to be found by the superposition of the eurrents due to the separate forces.

Besides the equations (4), u,v,w are subject like any other flux components to an equation of continuity. This equation, investi- gated in the usual manner, is

du 4 dv

ae 5 dx dy dz dt ees ot mn

where p is the electric volume density at the time ¢. Ata surface

of discontinuity (5) must be replaced by

(6),

where u,v,w, and w',v',w' are components of flux on the first and seeond sides of the surfuee, 7,m,n the direetion eosincs of the normal

VIL: — 6

(u—w)l+ (0 o)m+ (w—w'n— 22 =0

Results of Ohm’s

drawn from the first to the second side, and o the electric surface

density at time #. ? is If te consider the particular case of homogeneous isotropic

resistances of the zinc, the water, and the copper respec- tively. Now, denoting Vy— Vp, the potential difference, or as it is sometimes called, the “ contact force ” between

media, and suppose further that X= — “ Y= ae Zs -= » | Zn and Cu by Exc, and so on, let us add the above three these equations reduce to equations ; a a oe Bea=C(R’ +R” 8) PV &V. BV .dp , = Ezgo Eaz+ Eca =C(+ : me de dy d& tea = 1 eae (7), Here E is called the whole electromotive force of the circuit, ~. Cet ee being the sum of all the discontinuities of potential, and – ; “ i, a ae eee (8). taken with their proper signs, or, what is equivalent to the

1

In the last equation V, and V, are the potentials on the two sides of a boundary between media of specific resistance ky, and ky.

In the particular case of steady motion, the right-hand sides of (7) and (8) are zero. The analytical treatment of problems about steady currents is therefore precisely analogous to that of problems about electrostatical equilibrium, steady flow of heat, hydrodyna- mics, &c.: to every solution in one such physical subject corre- sponds a solution in each of the others. Many valuable details on this subject are to be found in Thomson’s papers on electrostatics and magnetism.

The consequences of Ohm’s law have been followed out mathematically, and verified in a variety of cases.

same thing, the whole amount of work which would be done by a unit of + electricity, in passing round the whole circuit once, supposing it to get over the discon- tinuities without gain or loss of work. Defining E in this way, we may extend Ohm's law to a heterogeneous circuit, the resistance R being now the sum of all the resistances of the different parts, or the whole resistance. In accordance with this definition, if we take two points, p and q (fig. 19) in the Cu and Zn respectively, the whole electromotive force will be V, — V,+Ezc and the current will be given by

as eee

law. We ghall notice a few which are interesting, either from | where R is the whole resistance of py. V,—V, is some- the accuracy of the experimental results, or from the | times called the "external," and Ez, the "internal " electro- interest or practical importance of some method or prin- | motive force. If p,q include more than one contact of ciple involved. 3:3 : ; heterogeneous metals, we have only to add on the left- Applica- _ Im the case of a steady current in a uniform linear con- | hand side of (10) the corresponding internal electromotive tion to ductor, say a wire, it is obvious that the potential must | force for each discontinuity.

= fall uniformly in the direction in which the current is If p and q be connected by wires of the same metal, conduc. flowing. Hence, if we suppose the wire stretched out | say copper, to the electrodes of a Thomson's electrometer, tors, straight, and erect at different points lines perpendicular | then the electrometer will indicate a potential difference, to it, representing the potential at each point, the locus of | V,—V,+Ezc, and not V,—V, as might at first sight be the extremities of these lines will be a straight line. suspected.! No electricity can flow through the electro- This may be arrived at by integrating equation (5), which be- | meter, hence the copper wire attached at p, and the pair of comes in this case oT =0, x being measured along the wire sup- quadrants to which m leads (we may suppose the —— : i : made of copper, but in reality it does not matter, see below, posed to be straight; we thus get for the potential V, at any point | Origin of Electromotive Force), will be at potential V,. But

distant x from the origin, at which potential is Vo, Z 2 P Ck owing to the contact force between the Zn and Cu at gq, the Vee Ape, ae ree wire from g

and the quadrant to which it leads will be at If V be taken as ordinate, this represents a straight line, the potential Va — Exe. It appears, therefore, that the electro- tangent of whose inclination to the x-axis is— ~~, or—wk meter indication corresponds to the whole electromotive – ; force between p and gq, and is proportional to the whole Voltaic We cannot apply Ohm's law at the junction of two resistance between p and g, no matter what metals the circuit. different substances. The condition of continuity of | I"cwt may include.? This conclusion was verified by

course applies; in other words, if the flow has become steady, the current is the same at all points of the circuit,

Kohlrausch. His method rested on the principle of Volta's condensing electroscope. .

He used an accumulator consisting of a fixed plate B, and an Verifica- equal movable plate A, which could be lowered to a very small tion by fixed distance from B, and raised to a considerable distance, so as Kohl-

whether homogeneous or not. We shall see, when we come to discuss electromotive force, that there is a con-

stant difference between the potentials at two points in- The rausch.

finitely near each other, but on opposite sides of the boundary between two conductors of different material. If we knew this potential difference for each point of heterogeneous contact in the circuit, we could draw the complete potential curve for the circuit by applying Ohm's law to each conductor separately. The diagram (fig. 19) represents (on the con- Vv

tact theory, as held ® by Ohm, see Origin of Electromotive Force) the fall of potentials andthe discontinuities Ml a ey ire ae

Zn

to touch a fixed wire leading to a Dellmann's electrometer. plate A was lowered and connected with p, while g and the fixed plate were connected with the ground; the connection with p was then removed, and A raised, its

potential thereby greatly increasing owing to its greatly diminished capacity. This increased potential was measured by the electrometer, with which A was in connection through the fixed wire. In one of Kohlrausch's experiments, he found for the electromotive force between a fixed point of the metallic circuit and four points, such that the resistance between each adjacent pair was very nearly equal, the values 0°85, 1°81, 2°69, 3°70; the values calculated by Ohm's law were 0°93, 1°86, 2°80, 3°73. He also examined the fiuid part of the circuit, and still found a good agreement between theory and experiment. (See Wiedemann, § 102.)

The laws of current distribution in a network of linear Network

in a voltaic circuit, Fig. 19.

1 ‘ circuits were first studied by Kirchhoff. He laid down ° !mem consisting of zinc, water, and copper, in which the current

bec, saith pial Lid, ‘col condue- general principles which are very convenient in prac- jor.

flows from Cu to Zn across the junction of the metals. We assume for the present that Ohm's law applies to the liquid conductor.

Let us denote by Va, Vp, &c. the potentials at Q and R, &c., or what is the same thing, the ordinates BQ, BR, &c., in our diagram. Then applying Ohm's law to the homo- geneous parts of the circuit, we have Vy—Va=OR, Ve—Vs=CS, Vz-— Vy=CR', where R', S, R", denote the

tical calculations.

I. The algebraical sum of all the currents flowing from any node of the network is zero.

IT. If we go round any circuit of the network, then no

1 It is supposed that all the wires are at the same temperature.

2 This more general statement follows at once from the above reasoning in conjunction with Volta's law (cf. below, Origin of Elec- tromotive Force).

matter how many meshes it may include, or what con-

ductors may branch off at different parts, we have E=R,C,R,C, ... RaCn,

where E is the whole internal electromotive force, and R,,

R,....C,,C,... are the resistances and current strengths

in the different parts of the circuit.

The first of these principles is simply the law of con- tinuity, and the second is got at once by applying equation (10).

We give here an investigation of the currents and potentials in a Glatieonkc of conductors. ‘The method and notation are taken from Maxwell, vol. i. § 280. Let A,, Ay, ...An be ™ points, con- nected’ by a network of 4n(n-—1) conductors (that being the number of different pairs of eonductors that can be selected from the 2). Let Cp, Enq, Kpg denote the current strength, internal electromotive force, and conductivity, t.e., the reciprocal of the resistance, for the conductor A, Ag. Let, moreover, the potential at A, be P,, and the current of electricity which enters the

system there be Q, It is obvious from our definitions of the symbols that

Kpq=Kpq, Cpg=—Cop, Epg= — Egy,

and, by the condition of continuity, that

QitQot 2+. +Qn=0. At the point Ap we have

Cri + Cpo + ae & +Cyon=Qp Gj . a (a). Now

Cpq= Kpq(Pp — Pg+ Eng) (8). Hence (a) becomes

Kpi(P, — Pp) + Kpo(P2- Pp) ... « Kpn(Pn— Pp) — Kyi pi Bie Oo esos KpnEon * Qp C (y).

The symbol Ky, does not occur in this equation, and has no mean- ing as yet. Let us define it to mean- (Kp, + Kyo… . Kpn), where Kyp does not occur. Then we have

Kn Kyp...+K +... and, multiplying by P,~-P,, Kyi(Pp—-P,) + «3. + Kyp(Pp — Py)... Kon (Pp-P,) = 0. Adding this last equation to (y) we get Kpi(P, ~~Py) + Kpo(P.~~ Pr) +... + Kpn(Pn—P,) = Ky, Ep, oe el + KpnEpn- (Oy pace (e). In this equation the term whose coefficient is Kp, of course vanishes. By giving p all possible values except 7, we get a set of n—1 equations to determine the »—1 quantities P,- P,, P,~~P,, &c. Hence if M,, denote the minor of K,,r in the determinant A = (Ky, Ky… .. Knn);1 and if Mrp denote the minor of Kp, in M,,, we have (Pp~~ P,)Mrr = {Ky 1Fy,+K, sig +...

+ {Ky1Ey1+KygEyo + 2~ Q} Merop

oy Foo ee 2 (Gs where of course F,, and E,, are zero, and Myrrp does not occur. This expression is linear in the letters E and Q, and the principle of superposition holds, as we saw it ought to do in all applications

Apogee =) Osh oO)

+ KinEin- Qi } Mrrip

of Ohm’s law. Consider the particular case in which all the Qs and Es vanish ? exeept Him and Em: (= —Fim), we then have the case of a linear

eircuit in which an electromotive force Em is introduced into

A,A,,. We get from (¢) J Kim Eum Pe = P= Me (Myrip oa Yay) ’ and KimEin ; Pe Pe a ey Bava) Hence Kim Ein Pp- Py= i (Merip — Morty — Meemp + Mevna) ; and K Kim Fawn Cyg = ——— (Myrip — Myrig ra Iie =F be eee (n) :

Similarly, if Cum be the current in AiAm due to an electro- Motive force Ep, in A,,, we get

Im t ie a ee ae ee Se LY | ae

d ‘This determinant has many properties of interest to the mathe- matieal student; ¢g., in our notation BeBe. . = Mm, Mersp — Merip= Myper a Moptr 3 &e. &c.

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Now, since A is a symmetrical determinant, Myrip = Myrpt, &c., and the expressions within brackets in (n) and (6) are identical. Hence follows the important proposition :—

If an electromotive force equal to unity, acting in any conductor A,A,, of a linear system, cause a current C to flow in the conductor A,A,, then an electromotive force equal to unity, acting in A,A,, will cause an equal current C to flow in A,A,,. If we suppose all the conductors of the system except A:Am and ApA, removed, and A;A, and A.A, joined by two wires, in such a way that for electromotive force unity in AyAm the current in ApAg is C then the conductivity of the circuit which we have thus constructed would be KinK. a> (Merpt = on = Myrgi Sa Mau) 3 this might be called the reduced conductivity of the system with respect to ApA, and AyAm. When the expression within brackets vanishes, the conductors ApA, and A;A, are said to be conjugate. Conju- The reduced resistance in this case 1s infinite, and no electromotive gate con-

force in A:A», however great, will produce any current in ApAg, ductors. and reciprocally.

Similarly, we may prove that if unit current enter a linear system at A; and leave it at An, the difference of potential thereby caused between A, and A, is the same as that caused between A, and Am, when unit current enters at Ap and leaves at Ag. (See Maxwell.)

The case of several wires forming a multiple arc very Multiple often occurs in practice. Ry are. Let AB, CD (fig. 20) be two parts of a circuit whose resistances are R and §, and let the cir- cuit branch out between Fig. 20.

B and C into three branches of resistances R,, R,., Rg.

We have Vs—- Vc = R,C, => B,C, = R,C;, and

ee QF ierery? “os BR, ER,

Also Va- Vp = Va- Vp t+ Va- Ve + Ve- Vn =(R+p+8)C, where =a eR, Ry’ Ry”

Hence the current in each branch is inversely propor- tional to the resistance, that is directly proportional to the conductivity ; and the reduced conductivity of the multiple arc is equal to the sum of the conductivities of its branches. These statements are obviously true for any number of branches.

Some of the most important applications of the theory Roars

of linear circuits occur in the methods for comparing ance resistances. The earliest method for doing this consisted measure- simply in putting the two conductors, whose resistance it ™ents was required to compare, into @ circuit which remained otherwise invariable ; if the current, as measured by a galvanometer, was the same, whichever conductor was in the gap, it was concluded that their resistances were equal. The difficulty in this method is that the electromotive force and internal resistance of the battery are supposed to remain constant, a condition which it is excessively hard to fulfil.

This difficulty can be avoided by using a differential galvanometer, or the arrangement of conductors called Wheatstone’s bridge. The differential galvanometer differs Differen- from an ordinary one simply in having two wires wound tial gal- side by side instead of a single wire. If we pass equal ee currents in opposite directions through the two wires, the action on the needle is zero, provided the instrument be perfectly constructed. If the currents are unequal, the indication will be proportional to the difference of the current strength.

If the coils are not perfectly symmetrical, but such that

Wheat- stone’s bridge.

the deflection! due to a current c in one is me, and in the other nc, where mand n are the “ constants” of the two coils, then the deflection for currents ¢, and Cy is mc, — Ny,

Fig. 21 gives a scheme of the arrangement for measuring resistances with this instrument. V is the battery in- serted in the com- mon branch ED of the two circuits, which convey cur- rents dividing off at D, and going in opposite direc- tions round the coils of G. If we wish to measure the resistance of a wire, it is inserted at AB by means of binding screws or mercury cups, and the resistance of the other circuit is varied until there is no deflection; then AB is replaced by a known resistance, which is made up until there is zero deflection as before.

It is obvious that the only requisite here is that the resistances of EFK, EA, BL, and the galvanometer coils should remain constant. Variations in the electromotive force or internal resistance of the battery do not affect the result.

The method whieh we have thus sketched is the best way of using the differential galvanometer, and it does not matter even if the eoils are not exactly symmetrical. Let the constants of the coils M and N be mand», so that the defleetion due to currents c, and c, in Mand Nis me,—nc,. Let the resistance from E to D in the single branch be B, and in the eircuits EFK and EABL, whieh pass round M and N respectively, R and S+U, U being the resistance between A and B, whieh is such that the deflection is zero. Then

0 = me, — Ney = mS+U)-—2R tS

Fig. 21.

(2),

where E is the electromotive foree of the battery, and D=(R+8+0U0)B+ RS +0).

Suppose we substitute U’ for U, and arrange U’ so that we have again zero deflection. Then

= | m(S +?) aR fT

- . (8).

From a and B we get U=U’.

For farther details econeerning this metnod, sce Maxwell, vol. i. § 346, and Sehwendler, Phil. Mag., 1867.

The differential galvanometer method was much used br Becquerel and others, but it is now entirely superseded as a practical method in this country by the Wheatstone’s bridge method. Suppose we have a circuit ABDO of four conductors. Insert a galvano- meter G between B and C; and a battery between A and D. * Adjust say the resistance AB until the galvanometer in BC indicates no current. The bridge is then said to be balanced, and the potentials at B and C must be equal. But the whole fall of potential from A to D along ABD is the same as that along ACD; hence if the

fall from A to B is to be equal to that from A to C, we must have

Fig. 22.

Ral

8, U? : where R,8,T,U are the resistances in AB, BD,CA,DC. This is the condition that BC and AD be conjugate. “We might have deduced it as a particular case of the general theory given above. Hence if we know the resistances 8,T,U, we

ee il

1 The deflections are supposed small.

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get in termsof these R = ae S is often called the standard

resistance, and T, U the arms of the bridge or balance. The sensibility of this arrangement may be found practi- cally by increasing or decreasing R so as to derange the balance. The largest increase which we can introduce without producing an observable galvanometer deflexion measures the sensibility of the bridge.

If we had a given set of four conductors, and a battery and galvanometer of given resistance, then it may be shown (see Maxwell, vol. i. § 348) that the best arrange- ment is that in which the battery or galvanometer connects the junction of the two greatest resistances with that of the two least, according as the former or the latter has the greater resistance. The practical problem might take another form. We might have given a resistance, and have at our disposal known resistances of any desired magnitude to form our bridge. We might also suppose further that we had given the total area of the plates cf our battery, and the dimensions of the channel in which the galvano- meter wire was to be wound. We may neglect the thick- ness of the silk coating, or assume that it is proportional to the thickness of the wire.

Then, B and G being the resistances of the battery and galvano- meter, the eleetromotive force E «VB, and the number of turns in the galvanometer ocV G.

Let us put S=yR, T=zR, and U=yzR. These resistances would balanee ; let us however put (1+z)R in the braneh AB in- stead of R, the others being unchanged, and ealeulate the effeet on the galvanometer in G, which we put proportional to the current in BO, and to the number of turns on galvanometer. Then, from equation (7) (or Maxwell, vol. i, 349), we find that the deflection 6 varies as

yen BG : (1+y)(1+2)BG +y1 +2PBR+e(1+y)YGR+ye(1t+y)(1+2)R? : in order that § may be a maximum, we must have G{(l+y)(1+2)B+a1+ y)R} =y(l+2PBR+yAl+y\(1 +2z)R? (a),

B{(l+y(1+2)G4+y1+ zPR} =el+yPGR+ye(1+y)\(1+2)R? (8), BG=2R? ‘ (y)s BG=yR? (8).

a and B give at onee by addition and subtraction B_al+y? G y(1+z)

Bazlt¥R 1+z

and BG=yzR?,

or . (e),

1+2

OY ity” Combining the four equations (y), (8), (€), (¢), we get y=z=landB=G=R=S8=T=U.

It appears, therefore, that when all the resistances on the bridge are at our disposal, we ought to make them all equal to the resistance to be measured, or come as near this as we can; ¢g., if we had a very small resistance to measure, we should make the arms of the bridge sniall, and take a small-resistance in preference to a high-resistance galvanometer.

In order to carry out measurements of resistance with ease we must possess a series of graduated resistances, with which we can compare any unknown resistance, and of which we can make the arms of our balance, &c. Again, if the measurements of one electrician are to be of any use to another, there must be a common standard. It would be most convenient to have only one standard for all nations, and this standard might be either arbitrary, like the standard of length, or absolute in some sense such as we have defined above. Arbitrary standards have at different times been proposed by Jacobi and others. The mercury standard of Siemens, to which we alluded in the historical sketch, has obtained great prevalence on the Continent. The British Association unit or ohm is an absolute unit,

- (¢).

Arrange. ment for maxi-

mum sen:

sibility.

Stand- ards of resist- anee.

Rheo- stat.

ens

Resist- ance boxes.

RESISTANCE MEASUREMENT. |

inasniuch as it professes to represent in electromagnetic measure a velocity of 10° centimetres per second, or, taking the original definition of a metre, an earth quadrant per second. It happens, by a curious accident, that the mercury unit and the ohm are very nearly equal, the latter being expressed in terms of the former (according to Dehms and Hermann Siemens; see Wiedemann, Bad. ii. 2, § 1074) by the number 1:0493.

One of the earliest instruments for furnishing a graduated resistance was the rheostat, brought into use by Wheat- stone, but also invented independently by Jacobs at St Petersburg about 1840.

It consisted of two cylinders of equal diameter, one of wood and one of brass. A wire, whose extremities were in connection with the metallic axes of the cylinders, was wound in opposite directions ronnd the cylinders. The axes of the cylinders were connected with two binding screws by means of sliding contacts. The part of the wire which does not lie on the metal cylinder is the only part that produces resistance between the binding screws ; and, by winding and unwinding, we can increase or diminish the resistance continuously to a known extent, means being provided for measuring the angular rotation of the metal cylinder.

We shall not stop to consider the defects of this instru- ment, which is now never used for delicate work. Its place is taken by resistance boxes, containing coils of wire whose resistances are different multiples of the unit of resistance (in this country always the ohm). ‘The reader will find a full account of the methods by which the standards are reproduced in the

collected reports of the Committee on Electrical Standards. The usual material for the wire of resistance coils is German silver. Most of the copies of the ohm issued by the British Association were made of an alloy of two parts of silver to one of platinum. ‘The great advantage of alloys is that the varia- tion of resistance with temperature is small for them; in the PtAg alloy, for instance, it is less than a tenth of the value for an average pure metal. ‘To secure insulation the wires are carefully coated with silk, and after winding the coil is immersed in melted paraffin. To get rid of electro-magnetic and inductive effects, the wire on resistance-coils is doubled on itself before being wound, so that, when a current passes through the coil, there are always two equal aud opposite currents at each point. ‘The terminals are formed by stout pieces of copper rod, whose resistance is either included in the coil, or is so small that it may be neglected. The conuections for small resistances are managed by means of mercury cups, with pieces of amalgamated copper at the bottom, on which the copper electrodes are made to press.

For ordinary purposes the coils are arranged in a box (fig. 23), the terminals being stout pieces of brass fixed on the ebonite lid ;

Fig. 23.

conical brass plugs inserted between these pieces serve to throw the coils in and out of circuit. The box represented in fig. 23 is specially arranged for use in Wheatstone’s bridge. In E,F,G we have a series of coils, 1000, 100, 10, 10, 100, 1000; these are used for the arms of the bridge. In A,C,D there are sixteen coils, 1, 2, 2, 5,, 10, 20, 20, 50, &c., which give us any resistance of a whole number of ohms from 1 up to 10,000. In actual use the resistance to be measured is inserted between A and G, D and E are connected by a stout piece of copper, the galvanometer is inserted between F and

A, and the battery between E and G. The resistances of the arms of the bridge are taken equal, and as near the resistance to be measured as

possible. In this way the resistance of any conductor may be very quickly found to an ohm. If it is desired to go farther, we may proceed thus. Suppose that we have found that a resistance lies between 5 and 6, put in the arm FE 100, and in FG 10, let the resistance in DCA, when there is a balance, be 5/7, then the resistance of the conductor is 7°, x 57, or 5°7. Similarly we might go to a second place of decimals by putting 1000 in FE and 10 in FG. There is a limit, however, to this process, because the increase in the resistance of the arm decreases the ‘‘ sensibility” of the bridge. Another method is to balance as nearly as possible, and then interpolate by taking the deflection of the galvanometer. Suppose, for instance, in the above case, that, with 5 ohms in DCA, the deflection was 21 in one direction, and, with 6 ohms, 9 in the other direction, then, taking the deflection proportional to the deviation from balance (see formula for 5 above), we have

: yl ta: =p.) —6r7 . resistance +55 Gy

We might also construct small graduated resistances ; and this would enable us to use smaller arms in the bridge, and thus increase the “sensibility” when used to measure small resistances. Owing to the multiplication of con- nections, there is a limit to the ordinary resistance box arrangement. ‘The difficulty may be evaded to a certain extent by using conductivity boxes, according to Sir W. Thomson’s suggestion, where the resistances are arranged abreast, so that a small alteration of the resistance is brought about by adding on a very great resistance to the multiple are. The rheostat principle has been used by Poggendorff in his rheocord for producing small resist- ances. He stretches two platinum wires side by side; on these is strung a hollow box filled with mercury, whose longitudinal motion is read off on a scale. If this arrange- ment be thrown into any circuit by means of two binding screws connected with adjacent terminals of the wires, the parts of the two wires up to the bridge give a small resist- ance, which may be adjusted at pleasure.

Condne- tivity

oxes, rheocord, &e.

In the quicksilver agometer of Muller (Wiedemann, i.

§ 160), the resistance is formed by a column of mercury of variable length. We may remark here that difficulties equally arise in constructing very large resistances. To get such within reasonable compass the wire must be ex- ceedingly thin and the insulation very good. Messrs Warden and Muirhead have wound coils of fine wire, giving a resistance of 100,000, and have constructed in compact form resistance boxes up to 1,000,000, or a megohm, and beyond. They have also given practical form to a suggestion of Phillips to utilize the resistance of carbon, by drawing fine pencil lines on ebonite or glass ; they mix plumbago with the pulp in the ordinary process of paper manufacture, and thus produce a species of carbon paper. A strip of this about 21 in. long and ‘5 in. broad gives a resistance of about 50,000. This seems a valuable invention; but we are net aware how far it has stood the test of practical use.

Selenium and tellurium have been proposed as material for high resistances, but owing to the variability of their resistance under the action of light, &c., they are unfit for the purpose.

The best method for comparing resistances with great

Fig. 24.

accuracy is the modification of Wheatstone’s bridge intro- duced by Kirchhoff (fig. 24),

Kireh- hoff’s gradu- ated wire, &e.

Foster’s method.

Methods of Mat- thiessen and Hoc- kin and of Sir W. Thom- son.

KL is a platinum-iridium wire, DK and HL are stout copper terminals id which it is soldered, DAE, Len FBH are eo copper pieces with binding screws and terminals for mercury cups, ig beads of which resistances R,T,U,S can be inserted at D,E,F,H. A, B, and G are binding screws for the battery wires and one end of the galvanometer wire. The other end of the

galvanometer wire is screwed to a spring contact piece fixed toa sliding block at P: when the button of this block is depressed, contact is made with KL, at a spot which is definite to an eighth or tenth of a millimetre. Platinum iridium is chosen for KI, because it is hard and tough, not liable to be scratched or abraded by the con- tact piece, does not oxidize or amalgamate with mercury, and changes very slightly in resistance when the temperature alters. The wire must be calibrated to find what correction, if any, must be applied for variation of resistance per unit of length at different parts ; for methods of doing this see Matthiessen and Hockin; Brit. ‘Assoc. Reports on Electrical Standards, p. 117 ; or Foster, Journ. of Society of Telegraphic Engineers, 1874.

Kirchhoff’s arrangement may be used in the ordinary way after we have made special experiments to determine the resistance of the connections, &c. Professor Foster (l.c.) has given a very useful method, by which the ditfer- ence of two resistances can be got independently of the resistances of the connections. Suppose we wish to find the difference between R and 8, which we suppose so near each other that, with the arms T and U approximately equal, there will be a balance when P is somewhere on KL. Let the reading for the position of the block be 2, taken from left to right. Interchange R and §, balance again, and let the new reading be x (we suppose the difference between R and § so small that P is still on KL); then, if ~ be the resistance of unit length of KL, R-S = pa! — 2).

For, if a represent the resistance of the connections in DK, p

the same for the other end of the wire, and if T and U include the resistance of the invariable connections, then we have R+atux T

S+B+y(l-a2) U’ where J=length of KL. Hence

R+atye _ T R+S+at+fBt+pl T+U° Similarly Stata R+S+at+B+el T+U’ therefore R-S=p(2’- 2). If we have to find the resistance of a thick cylindrical

body, what is really wanted is the ratio of the current strength to the difference of potential between the two ends, when the current flows parallel to the axis at every point. The last condition is not generally

fulfilled. It is obviously not so in the case where the cylinder is joined up with a thin wire. In cases where we wish to compare the specific resistance of two metals which we possess in cylindrical pieces, we get over the difficulty by observing the potential at a point at some distance from the end of

the piece, where the flux is parallel to the axis at all points of the section.

Matthiessen and Hockin used the following method for this pur-

pose (fig. 25). The two pieces XZ, YZare soldered together and con- nected in circuit with

two resistance coils A and C, and a graduated wire PR as before. 8, S’ are two sharp edges, at a measured distance apart, fixed

in a piece of ebonite * = ” or hard dry wood, ;

and connected with Fig. 25.

mercury cups. TT’, T’ is a similar arrangement for YZ. The

her psa al is inserted between S and Q, and the position of Q is ound for balance ; then the terminal is shifted to 8’, and if necessary the resistances A and C altered, so as to keep their sum constant, until balance is again found. The same is donc for Tand TY. Then, XS denoting the resistance between X and S, and Aj, C, the values of A and C in the first case, and so on, we have

FLROTRICIresS

[ELECTRIC CURRENT.

XS_A)+PQ, XS” *Ay+PQ, xt.. ££’ Se” Bee where R=A,+C,+PR=A,+0,+PR Hence SS’* Ag- A, +9,Q5 xe h Similarly TY A,-A,+Q,Q, ae R Therefore

SS’_A,- A, +Q,Q,

TT A,-A;+Q,Q, ° This gives us the ratio of the resistances between SS’ and TT”. The niethod does not depend for its success on the goodness of the contacts at SS’, &c. Another ingenious arrangement for effecting a similar purpose is due to Thomson, and will be found described in Maxwell, vol. i. § 351.

In measuring very large resistances, such as the insula- tion resistance of a telegraph cable, it is convenient to use the quadrant electrometer. One end of the cable is con- nected with one electrode of a condenser, the other end of the cable is insulated, and the other electrode of the condenser put to earth. The condenser is charged, and the difference of potential between its electrodes measured by means of the electrometer. If E,, E, be the value of the difference at the beginning and end of an interval of ¢ seconds, and if S be the capacity of the condenser in electromaguetic measure, then the resistance of the cable is

t S(log-E, — loge)

in electromagnetic measure. If the condenser itself leaks, we must determine its resistance by insulating the electrodes and operating as before. Then, regarding the circuit in the first experiment as a multiple arc, composed of the insulation of cable and the dielectric of condenser, the true conductivity of the cable envelope is the difference of the conductivities obtained in the two cases. Several other methods might be used to compare metallic resistances, but they are of small importance compared with those we have now been describing.

The reader who desires information concerning the ap- plication of Ohm’s Jaw to conductors other than linear will find the sources sufficiently indicated in Wiedemann’s Galvanismus; some of them have been alluded to in the Historical Sketch.

Application of Ohmn’s Law to Electrolytes.

In our discussion of Ohm’s law, we have hitherto had in view principally the metallic part of the voltaic circuit. We now turn our attention more particularly to the fluid parts. It is of no importance in the present connection whether the fluid forms part of the “battery” or “ elec-

tromotor,” or whether it is inserted outside the battery ; the only difference in these two cases is, as we shall here- after see, that in the former case energy is being absorbed by the current, and in the latter it is being evolved. In many respects the properties of the metallic and fluid parts of the circuit are alike: the electromagnetic action is the same for both; heat is also developed in the body of the conductor, whether metallic or fluid, according to the same law. But there is one peculiarity about a large class of fluids which has no analogue in purely metallic conduction, viz., that in them the passage of a steady current of elec- tricity is invariably accompanied by chemical decomposi- tion, definite in kind and quantity. To such fluid sub- stances Faraday gave the name of electrolytes.

For example, suppose we fill a small beaker with a solution of zine chloride (ZnCl,), and suspend in the liquid two strips of pla- tinum foil (called electrodes), at a moderate distance apart. Let a current enter at one of these strips, which we shall call the anode, and leave at the other, which we shall call the cathode. It will be

Resist- ance

measure-

ment with electro- meters.

Electro- lytic con ction.

Fara- day’s law of conduc- tion.

His law of elec- tro-che- mical equiva- lents

Polariza- tion and transi- tion resist- ance.

ELECTROLYTES. | ey err i Cr T Y AW

found that the solution continues to decompose so long as the cur- | actual electromotive force of polarization ; for, if we dis- rent passes, zine appearing at the cathode, and chlorine Byte engage our electrolytic cell from the battery, and connect Fea ihe an Genes PPS conics no | ats

electrodes with a galvanometer, a current is indicated, It is obviously essential in an electrolyte that it should — ya through ve cell oe oe to be a compound in some sense or other. It is not, however, | th original current. oo eee Aunt ot sce true that all compound bodies are electrolytes. Fluidity | S!#10n resistance, but must arise from an — electro- is also a necessary condition, whether attained by heating sea ae se ae “ch Ka poe bd neal to the melting-point, or by dissolving in water or other See ar – a sr 2 s uy om y “4 : a

solvent. Faraday established as a law, to which there ap- | ©#! analogy. we attempt to loree water throug harrow capillary tube, or through a wide vertical tube

pear to be few, if indeed any, exceptions,—that all sub- cate pal ier EMRE zs — . ductors, but | #84inst gravity, there is an opposing force : stances which in the solid state are very bad con . But, when we remove the pressure, the water has a ten-

conduct on being heated to the melting-point, are electrolytes, dency to return in the latter case, but none in the former

, ;

le., are decomposed by the passage of the electric current. The f : er a 4] , ie isnowmat ¢ former case represents a transition resistance, the Naraday thought that periodide of mercury, fluoride latter an electromotive force of polarization.!

lead, and some other bodies were exceptions to this law : , : : a ,

ee ‘later researches seem to have Seblishod that this is Without denying the ae oe transition resistance,

not so. (Cf. Huperimental Researches, 414, 439, 1340, | We See that an electromotive force of polarization actually

&e., and Wiedemann’s Galvanismus, i. § 191, &c.) The | ©xists. In some cases, oe oe epsail

conductivity of electrolytes in solution also increases rather | SU/phate, my 15 voryoama 4 serene, 27, a electrodes in dilute sulphuric acid, it may considerably

quickly with increase of temperature, while the conduc- : Be: +s . ee exceed the electromotive force of a Daniell's element. tivity of metallic conductors, on the other hand, diminishes, Wie Wire; i) to tis point, Been [ns

but more slowly, as the temperature rises. a . | 2 permanent current fiually flows through the electrolyte : in considering the passage of the current ee but there are cases where the existence of such a curreut

trolytes, it is convenient to distinguish two cases. First, leecaeavexta HAGHAG- oMUNELcCneeteibioniat acenc- let there be a steady, or at least permanent current, and a | "OU'G Violate F ne ' : ; oy continuous evolution of the products of electrolytic decom- F Pia Sie ee ae ye pods pe ee B,e . : : elow, p. if @ curre ; » ani : position (these are called the "cons," anion and cation at the dCt is absorbed in the cell, d being constant. Suppose, farther, anode and cathode respectively). Zhe amount of ion that that the excess of the intrinsic energy of the ions, in the state in appears at an electrode in a second is equal to the strength of | which they are being delivered in the electrolytic cell, over that the current (supposed constant during a second) multiplied Ma og gr a when as aes ae ie ee en 4 a < o z * * ° pass or a time an amount o energy Wt W1 evolved. ut 1 by a constant called the electrochemical equivalent of the ton w>d, this cane 20 on tiag any ent dha an sliort,

: : . how feeble the current may be, otherwise more energy would be chemical equivalent, account being taken of the "valency" | evolved in the cell than js absorbed in the battery. of the ion. (See art. ELECTROLYSIS.)

For instance, if C be the strength of the current in the illustra- tive case above, then the amount of zinc deposited at the cathode in time ¢ will be 2Cz, and the amount of chlorine liberated at the anode cCt, where z and ¢ the electrochemical equivalents of zinc and

If we insert an electrolytic cell containing dilute sulphuric acid along with a galvanometer into a circuit in which there is a single cell of Daniell, we

observe the galvano- meter needle swing out vigorously, and then settle down to a small and gradually decreasing deflection. The current ultimately becomes zero ;? but the time it takes to do so may be considerable, and varies with the nature of the electrodes. If we remove the battery after the current has stopped, and connect the polarized cell with the galvano- meter, we observe an initial swing very nearly cqual to the former but in the opposite direction, and a corresponding deflection, which after a time disappears entirely. Although, as a rule, a sensible time eclapses before the polarization reaches its maximum, yet it is important to.remark that it may rise to a very considerable fraction of the maximum in a very short time indeed. Edlund? found that in a ccr- tain case the electromotive force of polarization reached 0°57 of a Daniell in about 2, of a second. Bernstein has recently arrived at results of asimilarkind. He found, for instance, that platinum plates, polarized to 1°85 of a Daniell, fell, when the resistance of the circuit was 7-46 Siemens units, to 157 in 00111 sec* This rapidity of the rise and fall of the polarization is of very great importance, and has, we think, been overlooked by some experimenters.

In cases where the polarization does not reach its maxi- mum, no liberation of gas or other ion is observed, such as is seen with a permanent current, and it might of course be denied that chemical decomposition takes place at all. We shall, however, assume that Faraday's law holds for this case also, and assert that the current in the first instance actually passes through the liquid and produces chemical decomposition, according to the same law as a permanent current, and that this goes on until the accumu-

ae 6 ; : : chlorine, and z:¢:: 9: 85°5, zine being divalent. If a cell con-

taining lead chloride (PbCl,) were also inserted into the circuit, the same amount of chlorine would be liberated at the anode, and the amount of lead precipitated at the cathode would be pCt, where PS BRE R ie > 85°5, 4.6. 3: 108°5 : 82°5: 85-5

As the electrochemical decomposition ("electrolysis J) goes on, the surface of the electrodes is altered. In some cases the ion is merely deposited on the electrode, in other cases it combines more or less intimately therewith; but in general there is an alteration of the nature of the con- tact, and a consequent alteration of the electromotive force at the surface of the

electrode, Experiment shows that this electromotive force, in a great many cases, tends to oppose the passage of the current. So that if we insert an electrolyte into any circuit, the current starts with a certain value, and falls more or less quickly, until it reaches a limit at which it remains steady. The opposing electromotive force of “ polarization,” as it is called, has then reached its maximum, and the deposition of the ions goes on without further alteration of the contact surfaces. It is obvious that this limit may be reached under a variety of different cir- cumstances (wide infra, p. 86). There is also another pheno- menon, the possibility of which we must not overlook, viz., an alteration of resistance, owing to the presence of the ions at the electrodes. This resistance, due to the ions, has been called the “transition resistance.” The enfeebling of the current by the electromotive force of polarization might, as far as the observed result is concerned, be due entirely to an increase of resistance, or to a transition resist- ance, and such was the explanation given by the earlier physicists. It is easy, however, to show that there is an

1 Maxwell, Electricity, vol. i. § 266. ® For an exception to this statement see below, p. 87. 3 Pogg. Ann., Ixxxv., 1852, 4 Pogg. Ann., clv., 1875.

Mea- gure- ment of electro- lytic resist- ance. Hors- ford.

Beetz.

lation of the ions has generated an opposing electromotive force, equal to that of the battery, when of course the cur- rent must stop. We cannot justify this position very easily by direct experiment; yet there are many facts to support it, and so long as it is tenable it seems to afford the most philosophical view of the matter. a

Having explained the phenomena of polarization so far as is necessary for our immediate purpose, we now proceed to inquire how far experience justifies the application of Ohm’s law to electrolytes, or, which is much the same thing, to examine how far the methods of different physicists for measuring electrolytic resistance have led to concordant results.

One of the earliest methods, in which polarization was eliminated, was that of Horsford1 He filled a rectangular trough with the electrolyte, and inserted in the trough two electrodes very nearly fitting the cross section. These electrodes could be set at different measured distances apart. They were coated on the further side with nou- conducting substance, so that the current could flow between the opposed sides only. In this way he secured that the stream lines in the neighbourhood of the electrodes should depend as little as possible on the distance between them. This trough was inserted in the battery circuit along with a tangent galvanometer ; then the distance between the plates was decreased, and a metallic resistance R inserted in the circuit, so as to bring the current to the same strength as before. The current being the same in both cases, it is assumed that the polarization in both is the same, in which case the resistance of a length of the electrolyte equal to the difference of the distances between the elec- trodes in the two cases is equal to R. Knowing the section of the trough, we might calculate from R the specific resis- tance of the electrolyte. If the values arrived at be the same when deduced from different lengths of the electrolyte, and for different strengths of current, it may be concluded that Ohm's law applies. The application of this method requires the passage of a permanent current, in consequence of which the ions appear at the electrodes, and the solution in the neighbourhood becomes altered; so that it is difficult to make certain that the polarization is exactly the same in the two cases, and that no resistance of transition is gene- rated. Matters may be mended a little by passing the current for the same time in both cases ; but this is scarcely a satisfactory remedy. Still valuable results were obtained with this method by Horsford and Wiedemann; the latter, in applying it to silver and copper solutions used electrodes of silver and copper respectively, whereby the polarization to be eliminated was very much reduced.

Taking advantage of the discovery of Matteucci and Du Bois Reymond,? that carefully amalgamated zinc electrodes in a neutral? solution of zinc sulphate are not polarizable, Beetz' determined, by means of Wheatstone's bridge, the resistance of various solutions of this electrolyte.

The liquid was inclosed in a eylindrical tube, 29°7 cm. long, with a mean section of 1'4051 sq. cm. Amalgamated zinc plates were applied to the ends of the tube, and fastened on by india-rubber collars. The ends were then

inserted tightly into openings in the sides of two bottles which were filled with the solution (the same as that contained in the tube). The thick electrodes leading to the discs, and the backs of the zinc discs themselves, were lacquered, to insulate them from the liquid in the bottles. The whole apparatus was immersed in a trough of water, which could be heated to any desired temperature.

In the course of his experiments Beetz demonstrated the absence of polarization when amalgamated zinc electrodes are used, and

eliminated the transition resistance by boiling the electrodes in zinc sulphate, and transferring them to the ends of the tube without exposure to the air.

Beetz farther proposed to find the specific conductivity of other

electrolytes in terms of that of zinc sulphate, by experimenting on

1 Pogg. Ann., 1847. 2 Monatsber. der Berl. Akad., 1859. 3 Patry, Pogg. Ann., cxxxvi., 1869. 4 Pogg. Ann., cxvii., 1862.

closed circuits consisting entirely of the electrolyte to be examined. He tried damping experiments for this purpose, but the effects to be observed turned out too small for accurate observation.

Paalzow® inclosed the electrolyte to be examined in a Paalzow,

siphon, the two ends of which dipped into vessels of porous clay also filled with the electrolyte. The clay vessels were immersed in beakers filled with zinc sulphate, at the bottoms of which were placed large amalgamated zinc discs, which formed the electrodes. The only polarization or transition resistance to be feared is that at the boundary of the two liquids, and this is very small, What little remained was eliminated, as in Horsford’s method, by taking differences.

The resistance of the whole arrangement was measured by means of Wheatstone's bridge, and then the siphon was replaced by a shorter one filled with the same liquid. If R,, R, be the resistances found in the two cases, R,—R, is obviously the resistance of a length of the electrolyte equal to the difference between the lengths of thesiphons. If R,', R,' be similar values obtained when the elec- trolyte is replaced by mercury, then the specific resistance of the

electrolyte is —1——?,, that of mercury being taken as unity.

R/=R,'

The most important of all the recent researches on the Kohl- are those of F. Tausch

application of Ohm's law to electrolytes Kohlrausch and Nippoldt. In order to avoid the effects of polarization, electromagnetic machine. nearly as the sine of the angle of rotation, and could be sent in rapid succession through the electrolyte. The whole quantity of electricity that passes in the first part of any altcrnation is exactly equal and opposite to that which passes in the second ; hence equal quantities of the two ions (say H and QO) will be separated at each elec- trode. If the H, and O combine to form water, it as obvious that, on the whole, there will be no resultant elec- tromotive force of polarization either way; and if they coexist side by side without combining, there will still be no resultant electromotive force, provided the electrodes be exactly similar. There are two advantages in this method. There is no evolution of gas or other ion, and consequently no alteration of the solution and electrode, such as goes on with a constant current. We have, besides, another great advantage, which is denied ® us with constant currents,— viz., that by increasing the size of the electrode, we can diminish the effects of polarization.

The whole amount of clectricity which passes in each induction current is the same, and consequently the whole amount of ion deposited on the electrode is the same; hence, if we increase the surface of the electrode, the density of the deposit is decreased in an inverse ratio. Now, the researches of Kohlrausch and Nippoldt have shown' that, within certain limits, the electromotive force is proportional to the surface density of the deposit.

Hence, by sufficiently increasing the surface of the electrodes, the polarization may be made as small as we please.

In the earlier experiments platinum electrodes, having a surface

of 1°08 cm. were used, and it was found that each induction cur- rent of the magneto-electric machine deposited on each square

inillimetre of the positive electrode only eso c.cm. of oxygen. ? ?

It was therefore expected that the polarization would be insensible, and that the electrolyte would behave like a metallic resistance. The magneto-electric machine and the electrolyte were connected up with an electrodynamometer, and it was found that the deflec- tion of the suspended coil of the electrodynamometer was scarcely sensible when the machine made 10 revolutions per second, although it was 15 scale divisions when the electrolyte was replaced by 70 Siemens units. On the other hand, when the velocity reached 77 revolutions per second, the deflection was much greater with the electrolyte than with 70 Siemens units. It was found, however, that when the surface of the electrodes was increased. to 29 cm. a metallic resistance could be found, which gave the same deflection (within errors of observation) as the electrolyte for speeds varying from 4°8 to 76°9 revolutions per second.

5 Pogg. Ann., cxxxvi., 1869.

6’The advantage gained even with constant currents by increasing the size of the electrodes is, however, appreciable (see below, p. 88).

? Pogg. Ann., 1878, and “‘ Jubelbd.,” 1874.

they used the alternating currents of an Sine gm These currents varied very ductor.

ouM’s LAW. |

The above results seem to compel us to one or other of two conclusions,—either that Ohm’s law does not apply to rapidly alternating currents, where

the maximum of polar- ization is not reached, or else that the electromotive force of exceedingly small deposits of the ions must be very considerable. The fact that, under certain conditions, the electrolyte is apparently a better, and under others, appa- rently a worse conductor than a certain metal wire, seems at first sight rather to point to the former conclusion. On the other hand, the result with the 29 cm. electrodes, is a direct verification of Ohm's law. Kohlrausch, therefore,

ELC ici TY

| the deflection will be tle same as if there were no extra

current and no polarization. So that, for any given electromagnetic machine, working at any given speed, a certain electrolytic arrangement can be found, which will exactly eliminate the effect of self-induction, and thereby render the efficiency of the machine a maximum. It is obvious too that, with a given electrolytic cell, the deflec- tion reaches a maximum when Pp pe FS Qavpg— su?' this maximum was actually observed by Kohlrausch (/.c.).

adopted the latter conclusion, and justified his doing so by special researches on the electromotive force of small gas deposits. He showed that, with the currents he used,

Having due regard to these circumstances, Kohlrausch Test of and Nippoldt found that Ohm's law was applicable to Ohm's their alternating currents, for electromotive forces varying lw

the electromotive force is proportional to the surface density of the deposit, and estimated that the products of decom- position of ; mg. of water per square metre would gene- rate an electromotive force equal to that of a Daniell's cell. It is of the greatest importance to remark that the polarization effects, from which this result is deduced, must

have arisen and disappeared in some cases in much less .

than 4, of a second. The anomalous behaviour of the electrolyte with small electrodes is explained by K ohlrausch by taking into account the self-induction of the circuit.

time.

motive force of polarization at time ¢ is —p/ tdt, where p is the |

0

electromotive force generated by the passage of a unit of electricity ; ‘ : – its value depends on im slags and on the electrode being, oleleris | small value, it may happen, especially for tolerably high speeds,

paribus, nearly inversely proportional to the surface of the latter. |

Let 2 be the number of revolutions of the machine per second, and | ‘Mice anata oh h -derabl ; repays ; j i n through a considcrabie range of speed, an € – let are; then we may represent the electromotive force of the in ee . 2

machine at time ¢ by ad sin™ ¢, and the electromotive force

- 7

of self-induction by – 9g, where & and g are constants, the

latter being the coefficient of self-induction of the circuit (see

Flectromagnetism, p.76). If w be the whole resistance of the

circuit, we may write

_ £ . § di : wi=— sin ——_— g—p fi a7 oe! ex —_

or . . Gi, th _ kx ox Nella + pr ae.

Neglecting disturbances that die away very soon after starting the |

machine, we get for the value of 7,

5 ww > sin —z T yo

= ? wrt ~~. = y =F.

where the origin of timc has been thrown back by

Lees Oy aed ween s(S~9%) y

; 1

The deflection a of the dynamometer is proportional to = ‘2 dt,

0

and may be written An?

= 2 a

w +(— 2xng | 5

Kohlrausch found that this formula completely accounted for all the peculiarities in the behaviour of the electrolyte (for the numerical verifications see the papers quoted). We see that the deflection is increased or diminished by

the insertion of the electrolyte, according as 2 is greater

1 /p p or less than = of a? and, if n=1+. /., the insertion of

w 8g’

the electrolyte makes no difference. Again, if — Fe 2 g

|

from over 4 to under +4, of a Grove’s cell. By nsing the constant current of an iron-copper thermo-electric pair, they found Ohm’s law applicable to zinc sulphate with amalgamated zinc electrodes, when tlie electromotive force was reduced to qagigay Of a Grove’s cell.

It is important to remark that the fact that the electro- lyte behaves like a metallic conductor through a consider- able range of velocities of the sine inductor, is not a conclusive proof that the last trace of polarization has

, ‘ | been eliminated, A little consideration will show that the electromotive force due |

to this cause always opposes the electromotive force of polarization, — when the current strength is a simple harmonic function of the – Let ¢ denote the current strength, reckoned positive in a _ given direction, then, according to Kohlrausch’s law, the electro- |

In fact, let x be the resistance of the electrolyte, W that of the rest of the circuit, and w the metallic resistance that gives the same electrodynamometer deflection for » revolutions of the inductor per second, then the above formula gives

soit ~ sweat” Sat] — We w\Pl~ 8×22]?

since we suppose & very nearly = w. If now p be reduced to @ very that 5 oes 1s very small compared with pg, in which case x -w will

electrolyte will be replaceable by a wire whose resistance is less than the real resistance of the electrolyte by a small constant quantity. The earlier results of Kohlrausch and Nippoldt for sulphuric acid, in which they used 29 cm. electrodes, were affected with an error due to this cause, amounting to about 4 per cent. In the later experiments of Kohlrausch

| and Grotrian,! this error was finally eliminated by “ pla-

tinizing” the platinum electrodes. Kohlrausch had found

| that, with “ platinized” electrodes of only 1 sq. cm. sur-

face, the polarization of the currents of his sine-inductor was insensible; he therefore concluded that, with 25 sq. cm. platinized electrodes, the residual polarization would be finally eliminated. To make quite certain, he

instituted three tests, which were carried out on the method used in all the later experiments on this subject.?

The Wheatstone's bridge arrangement was adopted. Fig. 26 gives a scheme of the arrangement. The fiuid and a rheostat occupy ee two arms of the bridge, | the remaining two con- | | tain each 100 Siemens 1 units; A is the fixed | and B the suspended | coil of the electrodyna- | | mometer, and S the | sine-inductor. /

In this way, (1) S the resistance of a ~ receiver with 25 cm.

Fig. 26.

platinized electrodes was found, when filled first with H,SO, of maximum conductivity, and secondly, with NaCl, the driving weight of the inductor being varied, so as to

give speeds of 10 to 100 revolutions. The results, reduced

1 Pogg. Ann., cliv., 1875. 2 Kohlrausch and Grotrian, Pogg. Ann., cliv., 1875 ; Kollrausch,

Ibid., clix., 1876. VIII. — 7

Battery resist- ance,

Difficul- ties in measur- ing.

reading to the second is

50

to a common temperature, were, for the Hys0,, V7.3, | 141°64, 141°52, 141-53, 141-55, and, for the NaCl, ——," 366-27, 366°23, 366-25, 366°21 Siemens units, with the driving weights 5, 7°5, 10, 15, 20 kgr. respectively. (2) The resistance of a solution of zinc sulphate was found, first, in Beetz's manner with constant current and amalgamated zine electrodes ; secondly, using alternating currents and the same electrodes as before ;: thirdly, with alternating currents and the platinized electrodes; the three results reduced

to a common temperature gave 537°49, 537°41, 537-20. The greatest divergence from the mean might have been caused by an error of »‘5 degree in the temperature measurement. The agreement may therefore be pronounced complete. We think that it must be con- ceded that the experimental methods just described have solved in a satisfactory manner the problems involved in the determination of electrolytic resistance. We have dwelt on them so long partly because nearly all the in- formation on the subject we possess has been obtained by their means, and partly because they present points of great theoretical interest.

Another method has been employed by Ewing and Macgregor.? The electrolyte was inclosed in a narrow tube with wide ends, in which were set platinum electrodes. This arrangement was inserted in a Wheatstone’s bridge, and its resistance measured in the usual

way: The precautions against polarization consisted in operating

with currents of very short duration, sent through the bridge by

means of a ‘‘rocker”’ worked by hand ; the resistances in the arms

of’ the bridge were also made large, in order to reduce the rate of polarization as uch as possible; another essential feature of the – method is the use of a ‘dead beat” galvanometer with a mirror of | very small moment of inertia. The paper of Ewing and Macgregor has formed the subject of a somewhat bitter criticism by Beetz,* to which Macgregor has replied.‘

Battery Resistance.—I{ the electromotive force and in- ternal resistance of a battery in action were the same, whatever the external resistance, there would b2 no difh- culty in finding the internal resistance by Ohm’s method. We have simply to give two different values to the external resistance, and measure the current in the two caseX The electromotive force does not appear in the ratio of the two current measures; hence, knowing this ratio, we can find the internal resistance. Or we may use an electrometer, and measure the difference of potentials between the two poles of the battery, first, when the external resistance is infinite, secondly, when the external resistance is R. Then, if 7 be the internal resistance, the ratio of the first electrometer R+r

R

, by Obm’s law; hence r

can be found,

Unfortunately, however, the electromotive force of a battery is not independent of the external resistance. In general, when a battery is circuited through a small resis- tance, its electromotive force is much smaller than when the external resistance is very great. This arises from the polarization set up by the passage through the battery of its own current, and possibly in some degree from other causes as well. There is also reason to believe that the internal resistance of the battery is a function of the cur- rent. This being so, it is clear that a theoretically satisfac- tory determination of battery resistance cannot be arrived at by such methods as we have described. Since, however, the increase of the electromotive force is very slow after the external resistance has reached a certain value, and since the alteration of the internal resistance takes some slime, We can get in many cases measurements sufficiently accurate for practical purposes, A variety of methods have been devised with this object, and applied mostly to the so-called constant batteries. It must be remembered however, that there is something indefinite in the term in- a ee eee

1 No observation made for NaCl in the first case. 2 Trans. R.S.E., 1873. * Pogg. Ann., cliv. 4 Proce. R.S.E., 1875.

ELECT RICIACe=

[ELECTRIC CURRENT.

ternal resistance, unless the circumstances be given under which it is found. In the method of Von Waltenhofen, the battery is “compensated ” by another battery so ar- ranged that no current passes through it; and then this arrangement is slightly altered, so that a very small current passes through the battery. This amounts to finding the internal resistance for very small currents. The method of Beetz also involves the principle of compensation ; two batteries are used, but the one whose resistance is to be found is compensator and not compensated, The circuit of the compensator is joimed for an instant, and then the compensated battery is thrown in. ‘The assumption in the method is that the electromotive force is the same in the first instaut whether the battery is closed through a resistance R ora resistance R’. The results seem to justify the assumption, and to establish the practical value of the method ; but there are clearly limits to its application which it would not be very easy to define. Beetz himself shows that the electromotive force of a battery is greater when it is compensated than when it is compensating. A similar objection may be urged against the method of Siemens, which again gives good results when properly used. We refer the reader interested in this matter to the sources of information already quoted (see Historical Sketch), and

content ourselves with an accountof Mance’s method, which, Mance’s although subject to the same objection as all the others, is method,

very convenient for rough purposes, and is much employed in this country.

Let A, B, C, D be four resistances arranged in circuit, B being the battery whose resistance isrequired. Insert a galvanometer between

A PAN AB and CD, and a circuit which-can be closed and opened by means

AS yA of a key between AD and BC. We thus have an ordinary Wheat- stone’s bridge, with a key in place of a battery, and a battery in place of the ordinary resistance to be measured. Owing to the pre- sence of the battery, there will be a current through the galvano- meter, which will deflect the needle ; this deflection is compensated by means of a magnet, and the needle brought back to zero. Then the resistances A, C, D are arranged so

that the galvanometer ts not affected when the key circuit is opened or closed; when this is so the key and galvanometer circuits are conjugate, and we have AC— BD =0, from which we can find B, since A, C, D are known. In practice, however, it is impossible in the great majority of cases to fulfil the direction printed in italics. Suppose for a moment we had arranged the resistances so that AC— BD is very nearly but not quite zero, and suppose we close the key circuit, which had been formerly open, then, since this is not conjugate to the battery circuit, the external resistance opposing the battery is reduced; hence its electromotive force falls, the current through the galvanometer is altered, and the deflection of the needle alters. At the same time there is a current owing to the fact that AC— BD is not exactly zero. These two effects may either conspire or oppose each other. No data, so far as we know, have been obtained which would enable us to tell how quickly this fall in the electromotive force of any given battery comes on. In practice we see a sudden jerk of the galvanometer, and then a slow swing. The former is due to the deviation of the bridge from balance, and the latter to the alteration of the electromotive force. It is casy to decide which is which, for the direction of the former can be changed by making AC – BD positive or negative, while the direction of the latter is not affected in this way. This disturbing effect is very great with one-fluid batteries ; it would, for instance, be a hopeless undertaking to measure in this way the resistance of a cell of Smee while sending a large current. The effect is not so great with a Daniell's cell, and can be reduced ad libitum, by intro- ducing metallic resistance into the battery circuit. The effect having been thus reduced within reasonable limits, we operate thus: —Arrange the bridge until the deflection owing to deviation from balance~is opposite to that due to the change in the electromotive force; then, by gradual adjustment, work down the initial jerk to nothing, so that the needle appears to start off on its slow swing without any perceptible struggle. When this state of matters is

reached, there is a balance, and Bas Then subtracting from B

the resistance put into the battery circuit, we get the resistance of the battery. Ofcourse this does not solve the problem of finding the resistance of any battery sending any current ; but we believe that as much can be done in this way as in any other. Various modifi- cations of Mance's method

have lately been proposed, but their practical advantages over the original method have scarcely as yet been established.

Order of condue- tivity.

RESISTANCE. |

On Resistance in General.

We have drawn no distinction between statical and dynamical electricity in our application of Ohm’s law, and no such essential distinction has ever been proved to exist. In proportion as a body is a good conductor for galvanic electricity, it is a bad insulator for statical electricity. In general, however, bodies which are good enough insulators to retain a charge of statical electricity are so bad conduc- tors that it is with difficulty that we can compare their

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chloric acid, &c., which are very bad conductors, if not.

absolute non-conductors.

Before leaving this part of our subject, it will be inte- resting to throw together a few of the general principles that have been arrived at, and to give a few numerical results, which will convey to the reader an idea of the posi- tion of the different classes of bodies in the scale of con- ducting power. mann’s Galvanismus.

For farther details we refer to Wiede-

Metals.—(1.) It was remarked by Forbes that the order of con- Specific ductivity is the same for electricity as for heat. The measurements resist- of Wiedemann and Franz have established that the ratio of the ance and conductivities for heat and for electricity is very nearly constant, tempera-

not only for pure metals, but also for alloys. (See Wiedemann’s ture co- Galvanismus, bd. i. § 194.) = efficient « (2.) The conductivity of the pure metals decreases as the tem- ofmetals..

conductivities by means of the voltaic current. On the other hand, it is difficult by means of statical electricity to compare satisfactorily the conductivities of very good conductors, Determinations of the last- mentioned kind have, however, been made by Riess (vide infra,—Heating

Metals. Highest in the order of conductivity stand the metals resistance goes on increasing with a smaller temperature coefficient and their alloys. In this class of bodies the passage of the | than before. This is in accordance with the fact, that both the . e . e,e . . . . , electric current is unattended by chemical decomposition, | specific conductivity and temperature coefficient of mercury arc and the conductivity decreases as the temperature increases. ae those of ee oe a im we pene slog oe Along with the metals may be ranked a few other bodies, eo mecce Ec eee ee ee ec ; ae decrease of resistance at the melting-point. According to the re- which have anomalous conductivity, but cate not decomposed; | sults of L. de la Rive, the resistance “of metals in general is about such as graphite, red phosphorus, chloride and oxide of doubled in passing the melting-point. We should therefore expect lead under the melting-point, various sulphides and selenides, pe Lee pee of frozen mercury to be about 3°31, that of : : aoe silver being 100. tellurium, and selenium, In the great majority of the Alloys.—(1.) Matthiessen found that the metals could be divided Alloys. bodies included ” this supplementary class the conduc- | into two classes, according to the conducting properties of their tivity increases with the temperature ; the last two present | alloys: several anomalies, to which we shall refer farther on. a. Lead, Tin, Cadinium, and Zine, ‘ Electro. A second class of bodies is formed by those which are 8. Most of the other metals— Bismuth, Antimony, Plati- lytes, : : num, Palladium, Iron, Aluminium, Sodium, Gold, decomposed by the electric current. The specific conduc- Copper, Silver. tivity of these is much lower than that of the metals, and , ; Lie it increases when the temperature is raised. ‘To this class ia me wabeuhe HOLS, SRatlicnspee entice, i alowed belong, when in solution or in the melted state, most simple | ductivities of the two components of any alloy ; and let s=———_, binary compounds composed of equal equivalents of

two — _vkt+vk ‘ : = , be called th fi ty, and me: elements, and compounds derived from these by “ double cae eee ities ioe Ge decomposition” (see, however, art. ELECTROLYSIS); also ee ay of yo a poe of any ous on of class ie 5 C oa) Wi any other 0 € same Class, Nave very neal’ y the mean specuic Some sulphides which have a2 Bs alous i conductivity, gravity and conductivity calculated by the above formule. and glass and some bodies like it, which in the melted Alloys of a metal a with a metal 8 have specific gravity and con- state, and in the soft state preceding fusion conduct as | ductivity always less than.the mean. If a metal a is alloyed with electrolytes, a considerable percentage of 8, the conductivity is not much altered, Non-con- Non-conductors, on the other hand, are:—All gases and se cee, ee ave! ey oc, ductors, :

Effects), and the results agree with those obtained by other methods. The insulating power of a substance depends practically to a great extent on the nature of its surface. The dissipation of statical electricity by insu- lating supports is due, in most cases, almost entirely

to the conducting power of a thin surface layer of mois-.

ture condensed from the atmosphere, or of some product of chemical decomposition caused by exposure to the

air, or of dust or other foreign matter accidentally de-

posited. As far as high specific resistance is concerned, paraffin, shellac, ebonite, and glass at ordinary tempera- tures would all be about equally good insulators; but in practice they stand in the order in which we have named them. Paraffin and shellac surpass the other two in their power of preserving for a long time a clean dry surface ;

ebonite is very good for a time, but ultimately its surface

beconies covered with a layer of sulphuric acid, arising from the decomposition of the material; glass, again, is very hygroscopic, although white flint glass, when kept dry by artificial means, is said to be one of the best insulators kuown.

vapours, whether at ordinary pressures or in what is called a vacuum, diamond, sulphur, amorphous phosphorus, amorphous selenium, fluid chlorine, bromine, solid and

melted iodine, bichloride and biniodide of tin, sulphuric

anhydride, solid silicic acid, oxide of iron, oxide of tin; most compounds that are not binary, that is, do not consist of an equal number of equivalents of two components, ¢.g., many organic compounds—etherie oils, resins, wood fibre, caoutchouc ; also “ binary compounds” in the solid

‘state. To these may be added pure water, pure hydro-

perature riscs from 0° to 100° C., the rate of decrease becoming smaller towards the upper limit. Matthiessen expresses the con- ductivity by the formula k=k,(1~ a6+ 67), where k, denotes the

conductivity at.0° C., @ the temperature, and a and § constants. * He found that a and 6 had nearly the same value for all pure-

metals in the solid state, with the exception of thallium and .

iron, and gives as the mean values for pure metals a=0°00376470, B=0°0000083402. The values for iron are a=0°0051182, 8=0°000012915; for mercury, a= 0007443, B=0-0000008263. Although there can be no doubt about the general agreement in the formule for the different pure metals, yet the actual formula

arrived at is purely empirical and must be used only between 0°.

and 100° C.

If we carried its application beyond, it would give a nlinimuni conductivity for pure metals about 300° C.

The direct

experiments of Miiller and Siemens give no indication of such a

minimum. The latter represents the results of his experiments (extending in some cases as far as 1000° C.) by means of the for- mula r=aVT+ ST -—-y, where r is the specific resistance, T the ab- solute temperature, a, B, y constants. this kind for platinum, Siemens has constructed a pyrometer for

Relying on a formula of:

determining the temperature of furnaces by means of resistance .

measurements.

(3.) As we have seen, the specific resistance of pure metals goes on increasing continuously as the temperature rises. At the melt-: ing-point there is a sudden rise in the resistance, and after that the

Alloys of the metals 8 among themselves have in general a con- ductivity much inferior to that of either component. The con- ductivity remains constant through a considerable range of per- centage, but rises very quickly as the percentage of either metal approaches 100. ‘This property is very marked in an alloy of gold and silver. Matthiessen recommended an alloy of two parts by weight of gold to one of silver for the reproduction of the standard of resistance. The resistance of such an alloy would be very slightly affected by small variations in its composition.

Mercury, and melted metals generally, are not subject to the foregoing laws. A very small percentage of another even worse conducting metal raises the conductiyity of mercury, Lut the

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addition of larger quantities of the foreign metal lowers the con- ductivity. as

(2.). The formule for the temperature variation for alloys of the metals a among themselves agree very closely with the mean for- mule calculated from the volume percentages. – ‘

If P denotes the fraction of itself by which the conductivity at 0 exceeds that at 100° for an average pure metal (P=0°29307), and R the same fraction, observed in the case of any alloy for which the observed and mean or calculated conductivities at 0° and 100° are

ke according to Matthiessen, the following

k., Koo and Kens Kyp9—then relation holds for alloys of metals a among themselves, and metals

B among themselves:— = PB: B sa kjoo? #100»

or, which is the same thing, R,, &c., denoting resistances,

Rioo- R= Ryoo- R,. he: For alloys of « with 8, the observed value of P is in general greater than that calculated by this formule.

Effect of Other Physical Conditions affecting the Resistance of Solid Bodies. physical —Besides temperature, a variety of other circumstances affect the condi- specific, resistance, of metals, As a, general rule, metals are. worse

conductors, in the hard, than in the soft state. ‘Tempering steel increases, its resistance, considerably, but subsequent heating and gradual cooling reduces the resistance again. ‘The resistance of a wire stretched. by a weight. is increased, more than can. be accounted for by the mere decrease of the section… Winding.on a bobbin. has the same.effect. The finer a metal is drawn into wire, the. greater is its.specific. resistance in the case of iron, the smaller in the case of copper. Magnetization has also in certain cases been found to affect. the resistance, ‘These effects. were studied, by Sir William Thomson; the results. of his researchas are given in his Bakerian Lecture, Phil. Trans., 1856, The experiments are very instructive, and many. of them well worth repeating now that we have more delicate apparatus. The miost. curious, case of alteration of resist- ance ig that of tellurium, and selenium, We have already men- tioned that selenium in the amorphous state is a non-conductor. After continued heating it passes into the. crystalline state and con- ducts, Sale found? that the conductivity of this crystalline form of selenium is greatly affected by light, and that, too,

differently by light of different colours. Prof. W. G. Adams? has lately made a

series of experiments on the subject, and concludes that there is an

action of light, which varies as the square root of the illuminating

tion.

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[RESISTANCE.

power, and is distinct from any heating effect. He found the resis- tance of selenium in one case diminished by a fifth when it was exposed to the light of a certain parafiin lamp; the change in tellurium under similar circumstances was yyth. He found that the passage of a strong current through seleninm sets up a kind of polarization, which opposes a current in the same direction as that which produced it, and aids a current in the opposite direction. This led him to suspect that the action of light might of itself start a current in the selenium, and he found that under certain circum- stances this is the case.

Fluids.—The verification by the experiments of Kohlrausch and Nippoldt of Ohm's law for electrolytes, through a, wide range of electromotive force, has greatly increased the interest of all data relating to the resistance of this class of conductors. We have no difficulty in working with electrolytes whose composition aud physi- cal state is perfectly definite, a thing next to impossible in the case of solids. Hence the resistance of an electrolyte has, far beyond the resistance of a solid metal, a value as datum for physical specula- tions concerning the ultimate properties of matter, which underlie Ohm's law. Werefer the reader to Wiedemann's Galvanismus for an account

of the earlier results in this department of Pouillet, Hankel, Becquerel, Horsford, Wiedemann, Becker, Lenz, and Saweljew. We recommend to his notice particularly the careful experiments of Beetz on zinc sulphate (his temperature determinations are the most extensive of the kind), also the researches of Paalzow, who examined the conductivity of various mixtures of twe solutions, the conduc- tivities of which had been separately determined. He finds that if R and RB’ be the resistances of the components, the resistance, of the

‘ j RR : a mixture is not Rak’ © that the current is not divided between

the liqnids as if they were metals in inultiple arc; nor is it the mean of R and R’, but it lies nearer the smaller of the two. A similar result was arrived at by Ewing and Macgregor.‘

Kohlrausch and Grotrian® have made the most recent as well as the most extensive investigations ; and we shall best describe the present state of scientific knowledge on this subject. by giving an analysis of their results and conclusions. Their experiments deal with the chlorides of the metals of the alkalies and alkaline earths. Kohlrausch has also examined a number of the commoner acids. For convenience we have transcribed the diagram given by Kohl- rausch, which embodies certain of the results obtained by himself and Grotrian. Fig. 1 of the diagram gives the conductivities ® (,) at

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Diagram illustrating Electrical Conductivity.

18° C. the ordinates represent ky, x 105, except for acetic and tar- taric acid, where they represent k,, x 107 and ky, x 10° respectively, the abscisse represent percentages by weight in the solution of HCl, H,SO,, NH,Cl, &c. In fig. 2 the values of the temperature

1 For recent experiments on this subject see Proc. R. S., Dec. 1876, and J une 1877. Authorities for some of the other facts stated will be found in Wiedemann, i. § 207.

mags Ae ie ta Proc R. S., 1873. 3 Proc. R. S8., vols. xxiii, xxiv. xxv.

Ak

coefficient for 18°C. are given by the ordinates, the abscisss

4 18

being percentages as before. For convenience of drawing the coeffi- cient: of acetic acid is decreased by 0°01.

The curves which appear in the diagram include all the distinct varieties; and it will be seen that in all cases the conductivity varics

4 Trans, R.S.E., 1873. 5 Pogg. Ann., cliv., 1875, and clix., 1876. 6 Mercury is the standard. : . : ,

Specific resist- ance and tempera- ture co- efficient of elect- ~olytes,

RESISTANCE. |

continuously with the concentration, an approach to zero for infinitely weak solutions being indicated in all cases. The chlorides may be divided into two classes. (1.) CaCl, and MgCl, reach maximum conductivities 1968 × 10-8, 1810 × 10-%, at 18° C. for percentages 24 and 19°8 respectively, in each case short of saturation. LiCl] pro- bably does the same, and NaCl appears to reach a maximum between 23°9 p.c. and its saturation

percentage 26°5. (2.) KCl, NH,Cl, SrCl,, and BaCl, increase in conducting power up to the point of saturation.

Taking the best conducting solutions, the order of conductivities is NH,Cl, KCl, NaCl, LiCl, CaCl,, SrCl,, BaClz, MgCl,, the alkaline chlorides heading the list. A 25 p.c. solution of NH,C1 is in fact half as good a conductor as the best acid solution known.

It was found that, if the conductivity for small percentages be represented by kK=xp – «‘p”, so that « may be called the specific con- ductivity in watery solutions, then « varies inversely as the specific gravity, that is, directly as the ‘‘ specific volume.”

The temperature coefficients for the chlorides are very nearly in- dependent of the temperature. There isa slight increase for higher temperaturcs, which is most marked in the case of highly concen- trated and viscous solutions of CaCl,, MgCl..

For weak solutions the coefficients are all very nearly equal ; at 18° C. the extreme valuc for 5 p.c. solutions lies between zg (for LiCl) and @; (for NH,Cl). There is a tendency, as seen by the curves, to a value 2g, or 022 for very weak solutions. It will be noticed (see table below) that this coefficient is much larger than ‘0039, which is about the corresponding number for a pure metal.

When the perceutage is increased from five upwards, the tem- perature coefficient for 18° C. decreases at first for all the chlorides ; it reaches a miniinum for NaCl, CaCl,, MgCl,, which belong to class (1); but there is no minimum for KCl, NH,Cl, BaCl,, which belong to class (2), and have no maximum conduetivity.

‘The acids investigated were nitric, hydrochloric, sulphuric, phos- phoric, oxalic, tartaric, and acetic. In every case, except that of oxalic acid, a maximum conductivity was obtained. The order in which we have named the acids is that of the conductivity of the best conducting solutions at 18°C. ; for the first three we have respectively %,,10®=7330, 7174, 6914, the corresponding percen- tages being 29°7, 18°3, 30°4, so that the maxima are very nearly equal, and the maximum percentages not far apart. The curve

for sulphuric acid is exceedingly remarkable. Between 0 and 100 p.c. of H,SO,, it shows two maxima. The first minimum occurs at the percentage corresponding to the hydrate H,SO,+ EHEOm The conductivity corresponding to H,SO, is also a minimum; for when SO, is added, causing supersaturation, the conductivity again in- creases, there must therefore be at deast one more maximum, since melted SO, isa non-conductor. There is no peculiarity in the curve corresponding to the hydrate 2H,0 + H,SO,, which is distinguished from H,O+H,SO, in not being crystallizable. A striking simi- larity in the case of sulphuric and acetic acid is remarked between the curves of resistance and of solidification temperature ; wherever the latter is high, the formeris so also; there isa maximum in both cases for H,O+H,SO, and for H,SO,, and a minimum in both cases near 92°5 p.c.; the other minima do not agree so well.

A remarkable relation is given, which appears to connect the resistance of the monobasic acids HCl, HBr, HI, and HNO,. If any percentage be multiplied by the specific gravity of the solution, and divided by the molecular weight of the acid, the result is thenum- ber of molecules (7) in unit of volume of the solution. On forming a table of resistances with » for argument, it was found that for solutions with the same », whether of HCl, HBr, HI, 01 HNOs, the conductivity is the same. ‘This appears very clearly from the dotted curve in fig. 3 of the diagram, calculated from the different acids, the regularity of the curve, and in parts the coincidences, are very marked. This result may be stated thus :—In solutions containing an equal number of molecules, whether of HNO, HCl, HBr, or HI, the components of electrolysis under equal electromotive forces pass in opposite directions with equal relative velocities, }

The temperature coefficients for the four monobasic acids are nearly equal, and nearly independent of the concentration. The same increase of temperature coefficient with increase of concentration as was noticed in the case of viscous chloride solutions appears also in the viscous acid solutions of phosphoric, tartaric, and sulphuric acid. It is also found that where the conductivity is a minimum, the temperature coefficient is correspondingly great; so that, with increasing temperature the maxima and minima tend to get smoothed out, It appears also that the proximity of the maxima for H,SO,, HNO,, HCl, becomes more marked as the temperature rises.

The existence of the maxima in most cases, and of the minima in the sulphuric acid curve, led Kohlrausch to suggest the principle that no stable chemical compound in a pure state is a conductor, and that mixture of at least two such compounds is necessary for conduction. He mentions many instances of this principle, ¢g., water, sulphurous acid, carbonic acid, acetic acid, melted boracic

! A similar law might be stated for the chlorides, but it holds only for very weak solutions.

acid, chromic acid, anhydrous SO,, &c. In a recent paper? he gives some very interesting results concerning the conductivity of pure water and other bad conductors. The lowest conductivity he got for water was 71 (Hg=10!”). This was after careful purifica- tion and repeated distillation in glass, and finally in platinum vessels, After standing under a glass bell jar for 4°38, 20, 78, and 1060 hours, the water rose in conductivity from 78 to 138, 350, 850, and 3000 respectively. He calculates that, if pure water were a non-conductor, the presence of 0°1 mgr. per litre of HCl would be suflicient to account for the gbserved conductivity. He also found conductivities for SnCl, (<)’200, alcohol (commercial distilled) 30, acetic acid (glacial melted) 4, ether (<) °8. Among recent researches of interest may be mentioned Braun’s attempt to measure the con- ductivity of melted salts, and Grotrian’s‘ on the relation between the viscosity and the electric conductivity of electrolytes. For the speculationsof Kohlrausch, Hankel, Beetz, Wiedemann, and Quincke on the ultimate nature of electrolytic resistance, see the papers of the first-mentioned, or Wiedemann’s Galvanismus, Ba. i. § 484 sqq.

Gases.—We are not aware that any experiments have hitherto Gases,

established that any gas or vapour at ordinary temperature aud pressure isaconductor. Boltzmann5 has arrived at the negative result that air at ordinary tempcrature and pressure must have a specific resistauce at least 10° times that of copper. Sir William Thomson has, we believe, arrived at a

similar result for steam ; and recent experiments by Prof. Maxwell® on air, steam, mercury, and sodium vapour (at high temperatures) have led him to a similar negative conclusion. It was found, however, that the heated air from a Bunsen's burner conducts remarkably well." The so-called unipolar conductivity of flames presents many anomalies, which have becn examined by various experimenters. For the literature see F, Braun, Pogg. Ann., 1875.

It would appear, therefore, that the loss of electricity from in- sulated conductors at moderate potentials, observed by Coulomb – and Riess, cannot be due to conduction or conveetion by the air, but must arise almost wholly from the insulating supports. War- burg, who has experimented much on this subject, appears to-be of the same opinion (vide Boltzmann, J.c. p. 415). Warley has latcly investigated the passage of the current of a large number of Daniell's cells through a Geissler's (hydrogen?) tube. He found that it required 323 cells to start the current, but that once it was started it could be maintained by 308 cells; the current which flowed was proportional to the excess of the number of cells over 304. Thus, for 317=804+18 the current was proportional to 25}, for 330 = 304+ 26 it was proportional to 51. Accordingly, if Ey be a con- stant, and R another constant (the resistance of the gas?) we get for the electromotive force E, required to send a current I, E=K, +RI. E, is analogous to the electromotive force of polarization. For further details about the resistance of diclectrics we refer the reader to Maxwell's Electricity and Magnetism, vol. i. § 366 sqq.

_The following table will give an idea of the conducting power of General different bodies ; 7 denotes the specific resistance in C.G.S. units (to table.

reduce to ohms divide by 10%) ; a is the percentage of itself that r increases in the case of metals and decreases in the case of elec- trolytes per deg. C.; ¢ is the temperature at which 7 is given.

t tp a | Silver (annealed)..... 20° 1521 37 « | Copper (annealed)..... 20 1615 "38 | >» (hard! drawn…..... 20 1652 = * Platinum (annealed) ..... 20 9158 Tron! (aunealed):,....2…..... 20 9827 TIhead (onessed)i-.. <2. ~~ete~~) 20 19850 38 Mercury (liquid)..... 20 21170 04 Germianssilvet: 2 .:.~~.c.~~.s-0- 20 96190 07 HeoO, (Hie. SOMD).....22:. 18

139×109 | 1°5 J. 2) ee 18 25× 102 | TES ZnSO, (max. soln.).....) 10 | 26°60× 108 | 23 TEC SKO), ((OUERe) botdneeencongeon=o: 18 {120°20×109 | 4:2 TEL{O) (F003) Rosnoosenseeccoacecd: 18 135 × 108 (CHISS reer cae sisresciccwiss sles stan 200 227 × 10% Mee a ee 400 735 ×10 Giibia MeKONAr.. .1.0 cesses 24 353 × 107! peel tem eii cesta 0 7 × 1074

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2 The residual conductivity he would attribute to residual impuri- ties, or, as in the case of H,SO, and melted salts, to dissociation, where- by the solution becomes in reality a mixture of different compounds. —Pogy. Ann., clviii. 1876. 3 Pogg. Ann., cliv., 1875.

4 Pogg. Ann., clvii., 1876; clx., 1877.

5 Pogg. Ann., cly., 1875. § Unpublished results.

7 Herwig (Pogg. Ann., 1874) has recently concluded from some ex- periments that Hg vapour does conduct in a certain anomalous way. His experiments were complicated by the conductivity of the glass tubes containing the heated vapour; steps were taken, however, to eliminate this. Considerable doubt hangs over the whole subject.

Tisrup- tive dis- charge.

54

On the Passage of Electricity through Insulators.

Hitherto we have divided bodies into conductors, through which electricity passes under the influence of any electro- inotive force, however small, and non-conductors or wsulators, through which electricity will not pass, no matter how great the urging force. In practice, however, when the value of the electromotive force reaches a certain limit, electricity does pass through a non-conductor. A discharge of elec- tricity taking place suddenly in this way through a non- conductor is called a “disruptive discharge.” The power of a non-conductor to resist up to a certain limit the passage of electricity

through it has been called its dvelectric strength. The dielectric strength of any medium is greater the greater the electromotive force it will stand, when placed say between two parallel metal plates arranged in a given way, before it is broken through by the disruptive discharge. We shall by and by attach a definite quanti- tative signification to the term, but the general notion will be sufficient for the present.

Although it may be found when both phenomena have been more fully analysed, that conductive and disruptive discharge are really two different aspects of one and the same phenomenon, yet for the experimenter they are two distinct things, which must not be confounded.

This would be the place to set forth the quantitative rela- tions which regulate the electromotive force required to pro- duce disruptive discharge, tle quantity of electricity that passes under given circumstances, and the dielectric strength of different media; in fact, to lay down for disruptive dis- charge a law corresponding to the law of Ohm for metallic and electrolytic conduction. The present state of electrical science, however, does not permit us to do this in a satis- factory manner. Experiment has not as yet led to a single dominant principle, like Ohm's law, which will account for all the phenomena of disruptive discharge. The best theory of the subject is Faraday's, which will be gone into under " disruptive discharge in gases." Observationand experi- ment, on the other hand, have been occupied for the most part with the various transformations of energy which ac- company the disruptive discharge. We prefer, therefore, to discuss the whole matter under the single head " disrup- tive discharge."

TRANSFORMATIONS OF ENERGY ACCOMPANYING THE ELECTRIC CURRENT.

Under this nead we propose to discuss (to use a word of Rankine's) the energetics of electricity. It may be objected that this heading might have been put over a good deal of what has gone before, and we shall, for con- venience, treat certain matters under it which, in a strictly logical division, would have found a place elsewhere. If we had formed a definite conception of what we call elec- tricity—had, for instance, assumed that it isa material finid, having inertia like other fluids, then no doubt the energetics of the subject could have been much extended. As it is, we think

that advantage is to be gained by associating in our minds the experimental laws which we are now to arrange under the above heading.

We shall consider (1) the heat developed in metallic and electrolytic conduction, and at the junctions in heteroge- neous circuits ; (2) the mechanical, sonnd, heat, and _parti- cularly light effects accompanying disruptive discharge ; (3) the energy of magnetized iron and steel, and of electric currents in the neighbourhood of the electric current (electro-magnetism) ; (4) the energy of the electrotonic state, or electrokinetic energy (magneto-electric induction), In this list ought to be included the potential energy of chemical separation, which would come under the head of electrolysis. At present, however, electrolysis is quite as much a chemi-

cal as an electrical subject, and it has been found convenient to treat it in a separate article (see ELEcTRoLysis). Some points in connection with it have already been touched upon, and a few more will come up in (5), which treats of sources of electromotive force, and deals with the ques- tion, whence comes the energy which is evolved in the voltaic circuit ? a question the answer to which is for the most part experimental and practical —the only one, in fact, that the state of electrical science permits us to give.

Heating Effects.

It is easy to show, by a variety of simple experiments, Develop.

that a current of electricity heats a conductor through Hee | eat mn circuit,

which it passes. In the case of moderately strong currents the heat developed is perceptible to the touch; the wire may, in the case of very strong currents, be raised to a white heat ; it may melt, and even be volatilized. In the case of very weak currents, the heating effect may be de-monstrated by passing the current through the spiral of a delicate Breguet’s thermometer. We find, when we examine the experimental data on the subject, that heating effects may be conveniently divided into two distinct

classes. In the first of these the fundamental law is that the de- velopment of heat in any part of a linear circuit varies as the resistance of that part multiplied by the square of the current. In the second class the development of heat varies as the first power of thecurrent. The heating effects of the first class are obviously independent of the direction of the current, and are irreversible; and the more we examine them the more they appear to correspond to the loss of energy by the frictional generation of heat in ordin- ary machines. In the language of the dynamical theory of heat, the part of the energy of the electric current which disappears in this way is said to be dissipated. The effects of the second class change their sign when the direction of the current is changed ; so that, if anywhere there was evolution of heat when the current flows in one direction, then, when the current is reversed, there will be absorption of heat to an equal extent. We shall find that we have great reason to believe that such effects are strictly reversible! In order to get a satisfactory founda- tion for the simple theoretical views which we have thus indicated, it is essential to be able to separate the two classes of effects. Now, this is possible to a very great extent even in practice. The effects of the first class in- crease much more rapidly with the strength of the current than those of the second, so that, by sufficiently increasing the current, we can make the effects of the second class as small a fraction of the whole heating effect as we please; while, on the other hand, by sufficiently decreasing the current, the preponderance of the second class may be increased to any desired extent. We shallin what follows suppose the two classes of effects separated in this way.

Discharge of Statical Electricity.—One of the earliest Heating

attempts to study the heating effects of the electric dis- charge was niade by Kinnersley. thermoelectrometer, which consisted of a closed glass vessel, in which were fixed two metal balls communicating with electrodes outside the vessel. The bottom of the vessel was filled with a little coloured fluid, which com- municated with a tube having a vertical arm rising outside tlle vessel. When a spark passed between the balls, the heat developed caused the air to expand and force the liquid into the vertical tube, the rise of level in which indi- cated the degree of expansion, and, by inference, the amount of heat developed in the spark.

Sir Wm. Snow Harris? revived this instrument of Kin-

nersley's, and improved it by stretching a fine wire between

1 That is, in the thermodynamic sense. ? Phil. Trans., 1827. ,

effects of dis-

He constructed an charge

HEATING EFFECTS.] FG WOerwiei1 T Y

the terminals inside the vessel, so that the heat measured was now that evolved in a metallic conductor.

With this improved instrument he made a number of valuable ex- periments on the heating of wires by the discharge of a Leyden battery, whose charge was measured by a Lane's electrometer. As- suming that the heat developed varies inversely as the conductivity of the.wire (which is not the case), he arranged the metals in a series which agrees with that given later by Riess, although the numbers given do not properly represent the conductivities owing to the erroneous assumption on which they are deduced. Harris observed that the specific conductivity of alloys is often less than that of either metal, and that a very small admixture of another metal con- siderabiy reduces the conductivity of pure copper. He also arrived at the result that the amount of heat developed in a wire varies as the quantity of electricity which passes in the discharge, but seems

55

The alterations of pressure are registered automatically on a revolving drum, after the manner of the pulse-registering instrument of Marey. One advantage of this instrument is that it gives a representation of the course of the tem- perature in the apparatus.

In most of his experiments Riess used batteries of Leyden jars. The jars were all as nearly as possible alike, and the inner armatures were in general connected together. The quantity of electricity given to the battery was

measured by means of a Lane’s jar, the balls of which were placed at a distance of about a line apart. The battery was then dis- charged through the thermo-electrometer along with any external circuit connected with it,

to have concluded that the amount of battery surface used had no

Tees It is of great importance in such experiments as we are General effect.

now describing to examine what happens at the place where pre eg

‘ Riess, Riess made two very important improvements on the | the circuit is closed. This closure is effected by bringing **“°”** |Thermo- thermoelectrometer by substituting spirals for the straight | two metallic balls into contact. But before contact is jclectro- wire of Harris, and by inclining the tube containing the reached, a spark passes in which sound, light, and heat are jmeter. Jiquid so as to be nearly horizontal. The sensibility of the given forth,—in a word, energy evolved. When the resis-

instrument was thus greatly increased. Riess took up the whole question of the heating of wires, and investigated it thoroughly.

The actual instrument which he used is represented in figure 27 (taken from his Reibungselectricitat). It consists of a glass tube of

Fig. 27.

narrow bore, 16 to 17 inches long,

to which is blown a glass globe 3 to 4 inches in diameter. This tube is partially filled with some coloured fluid which confines the air in the globe ; a wide reservoir at the other end of the tube allows the fluid to accumulate without sensible change of level. The stand of the instrument consists of two pieces hinged together, so that the tube can be placed at a small in- clination to the horizon. The rest of the instrument will be under- stood from the figure. Details concerning the manipulation will be found in the Reibwngselectricitét, Bd. i. § 410. When the fine wire is heated by a current of electricity, the heat developed is divided between the wire and the air; the expansion very quickly reaches a maximum, and the level of the liquid in

the fine tube becomes stationary for a moment. If m be the number of scale divisions between its original and final positions, we have (see Riess, J.c., or Mascart, t. i. § 325)

Ton A(1 tow) and H=mA(CW+B) (1), | tances of these be R and §, the resistance of the whole j . | circuit may be taken tobe R+S. The law to which the General where T denotes the amount by which the temperature of the wire experiments of Riess led can be expressed by means of the law. would have risen had no heat

left it, and H the whole amount of heat developed by the current. Cand W are the mean specific heat and weight of the wire, and A and B constants, which depend on the make of the instrument, and on the initial temperature and pressure of the air.

A very convenient form of thermoelectrometer, called the thermometre inscripteur, has been used by Mascart (i.c.).

ane ee ee

1 Phil. Trans., 1834,

tance of the circuit is small, this spark passes at a consider- able distance, and is very intense, no matter how quickly the conductors are brought together. The energy consumed in this case is a considerable fraction of the whole energy

-given out by the discharge. ‘ If, however, the resistance of

the circuit through which the discharge takes place be con- siderable, the electricity takes longer to accumulate sufii- ciently to raise the electromotive force between the balls tu the discharging limit. We may, therefore, by operating quickly, get the balls very nearly in contact before the spark passes. In this case the spark is much less intense, and the fraction of the whole energy which appears in it is very small, Riess made some very valuable experiments on this point. He arranged an air-break in the circuit of the thermoelectrometer, which he could widen or narrow at pleasure, and discharged his batteries through this circuit in the usual way.

He found that as the gap is widened the amount of heating in the thermometer is at first increased, but after a certain length of break is attained it decreases again. It must be remembered that we have now two air breaks in our circuit of discharges, the discharging break and the inserted break, One effect of the inserted break is to diminish the intensity of the spark at the dischargiug break, and cause a decrease of the energy which appears there. On the other hand it makes the discharge of the battery cncomplete, so that part of the potential energy is not exhausted. It is very likely to the Opposition of these two effects that the pcculiarity observed by Riess is due. Mascart has observed a similar phenomenon in disruptive discharge through oil of turpentine. At all events Riess showed that, when the inserted break was not longer than Yoths of a line, the heating in the thermometer was the same as when there was no break at all. Hence, if we make the resistance of our circuit so great that the spark at the discharger is not longer than Yoths of a line, the energy consumed there may be neglected.

The resistance of the connections belonging to the

battery and the thermometer were always very small com- –

pared with that of the thermometer wire, and the wire, if any, inserted outside the thermometer ; so that, if the resis-

formula

(2),

where Q is the amount of electric potential energy which has disappeared, and H the amount of heat (measured by its dynamical equivalent) developed in the wire of the thermometer, whose resistance is S.

In the case of the complete discharge of a battery of n

S H=57 52

06

jars, each of capacity C, if ¢ be the whole charge, we get immediately, from (48) of Mathematical Theory (p. 34),

2

Q=s> and S_, le ee H=R55″ 3Cn’ * – Hence, if we keep the thermometer and inserted wires the

same, the thermometer indications will be proportional to

2 e e ZY. or, in words—the heat evolved in the whole or in any vi)

given part of the circuit is proportional to the square of the battery charge directly, and to the number of jars (i.e., to the battery surface) inversely.

If the thermometer wire remain the same, while the length, section, and material of the inserted wire is varied, then, r being the specific omer 2 the length, and p

4r

the diameter of that wire, R= Then, according to

ap? * (3), the heat develoned in the thermometer is given by H-—4~_ (4, 1+ Bey

where A and B are constants.

If, again, we use two wires of the same material of lengths 7 and /’ and diameters p and p’, and make two ob- servations with these for inserted and thermometer wires respectively and vice versa, then, if H, aud H, be the heat evolved in the two cases,

717 (5),

since R+S is the same in the two cases.

When the discharge is not complete, we have only to substitute for Q in (3) the appropriate expression for the exhaustion of the electric potential

energy. Similarly we may find the heating effect caused by the discharge of a battery of jars arranged in series and charged by cascade in Franklin's manner (p. 35). If we discharge through a multiple arc, we may assume that the discharge divides itself between the branches in the ratio of the conductivities, so that the conductivity of the whole arc is the sum of the conductivities of its parallel branches, On these principles it is easy to calculate the heat generated in the whole circuit or in any branch of the are.

All the cases we have alluded to were treated experiment- ally by Riess, and satisfactory agreement with formula (2) established in every case.

By means of formula (4) he compared the specific con- ductivities of a variety of metals. A and B were determined, and a standard wire of platinum of given length kept in the thermometer ; the wires to be compared with it were inserted in the outside circuit, and the heating in the thermometer observed. From the result the specific con- ductivity (in terms of platinum) of the wires could be cal- culated, their dimensions being known. The results agree very well with those got by other means.!

Compari- son of conduc- tivities.

Heating Heating by Constant Current.—The heating effect of the effects of . : o : constant Current furnished by a voltaic battery was recognized as

current, 2 distinct and often very remarkable phenomenon for a considerable time before any definite quantitative law was established regarding it. Davy? experimented on wires of the same dimensions but of different materials, and found that the metals could be arranged in the following order :— silver, copper, lead, gold, zinc, tin, platinum, palladium, iron,—those standing nearer the beginning of the list

es less heated by a given current than those nearer the end.

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1 See Wiedemann's Galvanismus, Bd. i 194 2 Phil. Trans., 1821 a :

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{MEATING EFFECTS.

Joule? was the first, however, to establish a definite law connecting the amount of heat evolved per second with the current strength and the resistance of the wire. He wound the wire in which the heat generated was to be measured round a glass tube which was immersed in a calorimeter. The resistance of the water is so great that we may assume without sensible error that the whole of the current passes through the wire. The temperature of the water was de- termined by means of a mercury thermometer immersed in the calorimeter. The amount of heat developed in the wire per second could then be found by the usual calori- metric methods, The strength of the current was mea- sured by means of a galvanometer inserted in the battery circuit along with the wire. By experiments of this kind Joule established that the amount of heat generated in a given time varies directly as the product of the resistance of the wire into the square of the strength of the current. So that, if we choose our units properly, we may write

ives GC (6),

where R is the resistance of the wire, I the strength of the current, and H the quantity of heat generated in time ¢.

The experiments of Joule were repcate’l with increased precau- tions against error by Becqucrel,* Lenz,5 and Botto. Becquerel allowed the wire to disengage heat till the calorimeter reached such a temperature that the loss of heat by radiation and convection, &c., was just equal to the gain from the wire, so that the tempera- ture became stationary. The current was then stopped, and the loss of heat per second found by observing the fall of temperature in the calorimeter. Botto used an ice calorimeter. Lenz® made a series of very careful experiments with a calorimeter, in which the liquid used was alcohol, which isa much worse conductor than water. He first cooled his apparatus a few degrees below the temperature of the surrounding air, and then allowed the current to gencrate heat in the wire till the temperature of the whole calorimeter (which was kept uniform by agitation) had risen to an equal number of degrees above the temperature of the air. The current was then stopped, and the time ¢ which it had flowed

noted. According to Joule’s law, tRI? ought to be constant, and it was found to be so very nearly. A very convenient instrument for demonstrating and measuring the heat generated by the electric current in a wire is the galavano- thermometer of Poggendorff, which consists simply of an alcohol thermometer with a large bulb, into which is let a spiral of fine wire. The heat generated is deduced from the expansion of the alcohol, which is measured by means of a scale fastened to the stem of the thermometer. The value of the graduations is found by com- parison with an ordinary thermometer. The thermoelectrometer of Riess might also be used in a similar way.

Heating in LHlectrolytes.—Joule’s law applies also to electrolytes. The phenomenon, however, is not so simple as it generally is in the case of metallic conductors. Dis- turbances arise, owing to the heat evolved and absorbed in the secondary actions that take place at the electrode ; and superadded to this we have in all probability an ab- sorption or evolution of heat corresponding to the Peltier effect between different metals, of which we shall have to speak directly. Joule eliminated these disturbing influ- ences by using a solution of copper sulphate with copper electrodes. In this case copper is dissolved from one elec. trode and deposited on the other, so that if we except the slight difference in the states of aggregation of the dis- solved and deposited copper, the secondary processes are exactly equivalent, and must compensate each other. Joule? found that in a certain solution of CuSO, 5°50 units of heat were generated in a certain time, while in a wire of equal resistance 5°88 units were generated by an equal cur- rent in the same time. In asimilar manner E. Becquerel® found that a current, which would produce a cubic centi- meter per minute of explosive gas, generated in certain solutions of CuSO, and ZnSO, 0°213 and 0°365 units of

8 Phil, Mag., 1841.

5 Pogg. Ann., \xi., 1844. § Wiedemann’s Galvanismus, Bd. i. § 670.

7 Phil. Mag., 1841. 8 Ann. de Chim. et de Phys., 1843.

4 Ann. de Chim. et de Phys., 1843.

Jouly’y law, Metals,

Electro:

lytes.

Peltier effeet,

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heat ; while the same current would have generated in wires of equal resistance 0:26 and 0°32 units respectively.

Reversible Heating Effets.—Peltier! was the first to discover an effect of this nature. He found that, when an electric current passes over a junction of antimony with bismuth, the order of the metals being that in which we have named them, there is an evolution of heat at the junc- tion; and, when the current passes in the opposite direc- tion, there is an absorption of heat, so that the temperature of the junction falls. Here, therefore, there is an effect which cannot vary as the square of the current strength, but must be some function of the current strength, whose principal term at least is some odd power.

The Peltier effect, as it is now called after its discoverer, may be

demonstrated by inserting a soldered junction of antimony and bismuth into a Riess’s thermoelectrometer. When the current

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the thermopile, and polarize it, as it were. Then, when we remove the battery and close the pile, we get a return cur- rent, which might be called the polarization current of the thermopile.

In general the Peltier effect is, as we have scen, mixed up with Joule’s effect, and makes itself felt by producing a disturbance at the junction. Thus Children® found that, when a strong current passed through two mercury

cups joined by a thin platinnm wire, so that the wire became red hot, the temperature of the mercury in the cups next the + pole of the battery rose to 121° F., while in the cup next the ~ pole the temperature was only 112°F. Frank- enheim' studied the two effects together. He made a Peltier's cross of the pair of metals to be examined, passed a current I through the cross first in one direction and then in the other, and deter- mined by means of a delicate galvanometer the thermoelectric cur- rent generated in each case, which is very nearly i aa to the heat produced. If a and } be the heat from Joule and Pel- tier effects respectively, and 7 and 7 the observed thermoelectric currents, then 7=C(a+6), 7=C(a—b); whence a=(7+7')+2C, and

>> goes BiSb, the fluid will rise in the stem, indicating absorption of | b=(¢-—7)+2C. In this way he found that a was proportional to : > ' ; ee. > I?, and6tolI. Thus the whole heat developed may be expressed heat; when it goes SbBi, the fluid will fall, indicating evolution by al2451. We get in this way a verification of the results both

of heat. Or we may use Peltier's cross, which consists ot two pieces, one of bismuth 1}B', and the other of anti- mony AA', soldered together in the form of a cross (fig. 28). A and B are connected by a wire through a gal- vanometer G. A' and B' are con- nected with a battery C through a commutator D, by means of which the current can be sent either from A' to B' or from B' to A' through the junc- tion. The thermoelectric current in- dicated by the galvanometer shows that

of Joule and of Yon Quintus Icilius.

Further experiments have been made on this subject by Thomson Edlund and Le Roux; and Sir W. Thomson was led by a effect.

remarkable train of reasoning to discover another rever- sible heating effect. We prefer to leave these matters for the present, to return to them when we consider thermo- electric sources of electromotive force.

The Peltier effect between metals and liquids and other reversible effects will also come up again under the Origin of Electromotive Force.

Theoretical Deduction of the Formule.—The above for- Theory mulz for the heat developed in wires by statical and dyna- of heat- mical electricity may be deduced from a common formula, 8

the junction is heated in the first in- stance and cooled in the second.

Fig. 28, By leading the current of a Grove's cell for five minutes through

> effects.

Laws of Peltier effect.

a BiSb junction, Lenz? succeeded in freezing a small quantity of water which had been placed in a hole in the junction, and previ- aime to 0° C. The temperature of the ice formed fell to

The Peltier effect is different for different pairs of metals. Peltier and Becquerel® found that the metals could be ar- ranged in the following order :—

Bh Gs,* Pt, Pb, Sn, Cu, Au, Zn, Fe, Sb.

Tf the current pass across a junction of any two of these metals, cold or heat is generated according as the current passes the metals in the direction of the arrow or in the opposite direction ; and the Peltier effect between the metals is greater the farther apart they are in the series. We shall see later on that this is none other than the thermoelectric series,

Von Quintus Icilius® showed that the Peltier effect is

which can be deduced from Ohm's law.

Let P, Q be two points of a linear circuit, and let E be the differ- ence between the potentials at P and Q, then, if there be no other electromotive force in the portion PQ, the work done by a unit of +electricity in passing from P to Q is E. Hence, if I be the strength of the current, so that Id¢ units of electricity pass from P to Q in time dt, then the amount dw of work done by the current in time dé is EIdt. But, by Ohm's law, E=RI, hence

dw= Ride . (7).

Since the whole of this work is spent in heat, we may for w write H, which denotes the heat® generated in PQ. If the current be constant, we get immediately H=RI*¢, which is Joule's law (6). If the current be variable, H=/RI°dt, from which we may very easily deduce the formula for the discharge of a battery of Leyden jars. For, applying Ohm's law to the whole circuit whose resist- ance is R+S8S, we have, if U denote the potential of the inside

coatings at time ¢, I=_—.. _ Also the capacity of each of the

R+S8 jars being C, we have for the eharge g'=nCU, and fa

directly proportional to the strength of the current. He a passed a voltaic current through a tangent galyvanometer =nU Hence

(serving to measure it) and a thermopile of 32 BiSb couples. ; 2

The current was allowed to pass for a fixed time, then the H=R f Padt= ~ 2OR a, a

battery was removed and the thermoelectric current of the * she 2 < a

pile measured by means of a delicate mirror galvanometer. =a: nae ot (8),

The current of the battery heats the pile in part uniformly according to Joule's law: this causes no unequal heating of the junction, and therefore no thermoelectric current ; and in part unequally, so that one set of junctions are cooler and the other warmer than the mass of the metal: this causes a thermoelectric current, which, since the tempera- ture differences are small (see below, p. 97), may be taken to be proportional to the temperature difference, that is, to the double of the Peltier cffect at each set of junctions.

_ It is interesting to note the analogy here with the polar- ization of an electrolytic cell. We turn a battery on to

1 Ann. de Chim. et de Phys., 1834. 2 See Wiedemann's Galvanismus, Bd. i. § 689. 3 Ann. de Chim. et de Phys., 1847. 4 Gs=German Silver. ® Pogg.

Ann., Ixxxix. 1853.

where g and V have the same meanings as in (3). (8) agrees with (3), except that we have reckoned the heat developed in a portion of the circuit whose resistance is R instead of S, as in (3). It appears, therefore, that the theoretical formula (7), when properly interpreted, covers both cases.

If there were a junction of heterogeneous metals in the part PQ of the circuit, at which the potential suddenly fell by an amount 1, then work equal to MId¢t would be done by the current in pass- ing over the junction, and we should have to write

(9).

adW=RPdt+m1d . ‘ Had there been a rise of potential at the junction, we should have

written — 11 instead of +. _ If all the work done at the junction is transformed into heat, W =H as before, and for a constant current,

H=RkI%t+01¢ (10).

6 Phil. Trans., 1815. 7 Pogg. Ann., xvi. 1854. 8 Measured, of course, in dynamieal equivalents.

The first term is Joule’s, the second Peltier’s effect. Here the coefficient of the Pelticr effect appears as an electromotive force. We shall return to this again.

Glowing, Melting, Volatilization, &c.—If a wire lost none of the heat generated in it, then, for the same current, the rise in its temperature during a given time would vary as its specific resistance directly, and as the product of its specific heat and density into the fourth power of its diameter

inversely. Thus, T, 1, ¢, p, d denoting these quantities in the order named above,

L To cpa * If we have a given battery of electromotive force E, and a circuit connected with it of resistance R, and we insert a wire of length / specified in other respects as

: E 4] above, the current will be Ris' where 8=—, . Ifthe S

diameter of the wire be given, then Soc d; and Toc (ie??

which is a maximum when R=§, that is, when the length of the wire is such that its resistance is equal to that of

the rest of the circuit. Owing to our ignorance of the exact law of cooling, and

of the manner in which the resistance and specific heat of most metals change at very high temperatures, it is very difficult to predict beforehand to what temperature a given current will raise a given wire. It is, as may be supposed, still more difficult to predict the effect of a given discharge from a Leyden battery. According to Riess, the pheno- menon of glow in this case is complicated by concomitant effects of specific nature.!

If we assume Newtou's law of cooling, 7.¢., that the heat given out is proportional to the surface of the wire and to the elevation T of its temperature over that of the surrounding medium, then, I denoting the strength of the constant current which heats the wire, we have, when a constant temperature has been attained, I?=const. x T@3, for wires of same length and material but differ- ent diameters. If we compare the apparent brightness of the wires, by causing them to illuminate a screen at a constant distance off, and assume that the light given out is proportional to Td, then, if two wires of diameters d, and d, have the same apparent brightness, T,d,=T,d,, and I{-+-d} = I;—d. In other words, the strength of current requisite to bring a wire of given length and material to a given brightness of glow varies directly as its diameter. A law of this nature is, of course, merely a rough approximation; Muller and Zéllner, however, have made

experiments which agree with it within certain limits. The method of Zollner is interesting (see Wiedemann's Galvanismus).

The temperature of a glowing wire is very sensitive to external circumstances, such as air currents, &. These effects may be very strikingly shown by balancing the wire in a Wheatstone's bridge against a resistance of thick wire, a strong current being sent through the bridge.

The behaviour of the wire in different gases is very remarkable. If a wire which is glowing in air be suddenly immersed in a jar of hydrogen or coal gas, the brightness will be very much reduced, in fact, in most cases the glow will entirely disappear." This is owing to the greater cooling power of hydrogen, of which evidence is furnished by the experiments of Dulong and Petit. The cooling power of different gases was shown by Grove. Ne arranged a platinum wire in # glass tube, which could be filled with different gases. The current of the same battery was sent through the wire and through avoltameter. When the tube was filled with hydrogen or olefiant gas, the amount of gas evolved in the voltameter per minute was 7°7 and 7°0 cubic inches respectively. The numbers for the other gases experimented on varied from 6°6 to6°1. They stood in the following order : —CO, CO,, O, air (2 atmos.), N, air (1 atmos.), air (rarefied), Cl. Experiments of a similar nature were made on liquids. Clausius carried out a calculation of the cooling effect of different gases, and found that the experimental results could be satisfactorily accounted for.¢*

When the strength of the current is sufficiently increased, the wire ultimately fuses, or even volatilizes. The pheno menon 1s in general complicated. In air, for instance, the

1 Reibungselectricitat, Bd. ii. $§ 557 sqq.

2 Grove, Phil. Mag., 1845, or Wied. Galv., Bd. i. 679. 2 Poggendorff, Pogg. Ann., 1xxi., 1847.

4 Wied. Galv. (J. ¢.), or Pogg. Ann., Ixxxvii., 1852.

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wire burns, and the oxidization once started may take a greater share in raising the temperature than the current does, so that the destruction of the wire may take place under certain circumstances with a current, which, under other conditions, would scarcely make it glow. When dis- charges from a Leyden battery are used it is very difficult, if not altogether impossible, to get melting unaccompanied with mechanical disaggregation of the wire. The reader who wishes for further information concerning these matters, will find the sources sufficiently indicated in Wiedemann, Riess, and Mascart.

This department of electricity is very fruitful in Popu We shall quote one or experl-

popular lecture-room experiments. two of these, and refer the reader to popular treatises for more of the same kind.

On a sheet of thin card-board is pricked a design, generally what is understood to be a portrait of Franklin, two pieces of tinfoil are pasted on the ends of the card by way of electrodes, and between these a piece of gold leaf is laid. On the other side of the card is placed a piece of white paper or silk. The whole is then tightly screwed up between two boards. When an electric discharge is sent through the gold leaf it volatilizes, sending the disintegrated particles through the holes in the card-board. In this way an im- pression of the portrait is obtained.

If a current be caused to heat a pretty long thin platinum wire to dull redness, and a portion of the wire be cooled by applying a piece of ice to it, the remainder of the wire will glow much more brightly than before; whereas, if a portion be heated by a spirit-lamp, the reverse effect takes place. The reason is that the current is strengthened in the one case by the decrease of the resistance in the cooled part, and weakened in the other by the increase of resistance where the wire is heated.

When two curved metal surfaces rest upon each other, a current passing from the one to the other encounters considerable resistance at the small area of contact. The heat developed in consequence of this causes the parts in the neighbourhood to expand very quickly when the contact ismade. This very often gives risc to rapid vibra- tory movements in the conductors. The

Trevelyan rocker® can be worked in this way (see art. Huar), bells rung, &c. The best known experiment of the kind is Gore's railway. This consists of two concentric copper hoops, whose edges are worked very truly into the same plane.

The Voltaic Arc.—When two electrodes of volatile or Electric readily disintegrable material forming the poles of a power- light.

ful battery (say 30 or 40 Grove's cells) are brought into contact and then separated, the current continues to pass across the interval, provided it is not too great. ducting medium appears to be a continuous supply of heated matter, suspended in glowing gas or vapour. This phenomenon seems to be more akin to the subject we are now discussing than to the disruptive discharge of which we shall speak by-and-by. The light thus generated with a large battery, especially wheu electrodes of graphitic carbon are used, is brilliant in the extreme. It was thus that Davy first obtained the phenomenon.' With a battery of 2000 cells he obtained a luminous are 4 inches in length, and when the carbons were placed in an exhausted receiver the arc could be lengthened to 7 inches.

The fact that the electrodes must be brought in contact in order to start the light is quite in accordance with what we know of the extremely small striking distance of even very powerful batteries. When the contact is made, the place where the electrodes touch, owing to itssmall section, is intensely heated ; the matter begins to volatilize, and then the current is kept up by the quickly increasing clond of metallic

5 Wied. Galv., Bd. i. § 726.

6 This motion has been attributed to electromagnetic action. Suck an explanation is quite inadmissible.

7 Phil. Trans., 1821. According to Quetclet, Curtet observed the light between carbon points in 1802. Wied. Galv., Bd. i. § 783.

The con- '

vapour and disintegrated matter. With a battery of 60 Grove's cells the arc once started has a certain persistence, for we may break the current for ,,th of a second or so, and the light will start again when the current is turned on afresh, We may start the light without bringing the electrodes into contact by causing a spark from a Leyden jar or an iuductorium to pass across the interval. _Exami- If an image of the voltaic arc be thrown on a screen by 'uation of means of a lens, its constitution can be examined very) Wie readily. Four distinct parts at once strike us;—first, the dazzling white positive carbon, which assumes a crater-like shape after the current has passed for some time; second, the more pointed and if anything less brilliantly-white negative carbon, which is in general strewed with little beads of melted or at least softened carbon; third, the ceutral core or streak of glowing matter, which has a white appearance, though it is considerably less brilliant than the carbon; fourth, the globe-shaped aureole which surrounds the whole, whose brilliancy is greatly inferior to that of the other parts, and whose colour depends on the surrounding gas. If the electrodes be horizontal, the arc is in general curved upward by ascending air currents, its form is also affected in general by the earth's magnetic action. The hollowing out of the positive electrode is obviously due to a transfer of matter in tlie direction of the current. It is very easy to prove by a variety of conclusive experi- ments that there is such a transfer, mainly in the direction of the current, but also in part in the opposite direction. If we take a platinum point for positive, and a platinum plate for negative electrode, the matter carried to the plate forms a series of rings on it like the colour riugs of Nobili. [f, on the other hand, the platinum plate forms the positive elec- trode, a series of slight excavations are formed where the matter has been toru away. There can be no doubt that the disintegration of the electrodes plays a very important part in the formation of the arc, for if we saturate the car- bons with volatile matters, the brilliancy of the arc, the ease with which it forms, and its maximum length for given battery power are greatly increased. It is probably owing, in part at least, to the tearing away of matter at the posi- tive electrode that the temperature there is in general highest. This effect is very marked in some cases. If we take a platinum point and a plate of the same metal for electrodes, the point glows through a considerable length when it is positive, but only at the end when ~~it is negative. Again, when the light is generated between two platinum wires held crosswise at a small distance apart, the glowing portion is much longer~~

~~on the positive electrode than on the negative. Light~~ The electric ight is the only artificial light whose bril- is _ lianey can compare with thesun. Measured by its actinic chemi- P . Bee : cal, ang Properties simply, it is not so very far behind the great heating luminary; its spectrum is longer towards the violet, and it powers. has accordingly great advantages when it is required to pro- duce fluorescence (see art. Lieut). Its great chemical power is also shown by the readiness with which it induces the combination of hydrogen and chlorine; by means of it underground buildings, such as the catacombs, have been successfully photographed. Its illuminating powers have for a considerable time been employed in lighthouses, the current for its maintenance being furnished by powerful electromagnetic machinery, and it is now proposed to employ the Gramme machine and the electric lamp to light streets and public buildings, manufactories, &c. It was used for war purposes during the last siege of Paris, and in the Russo-Turkish war on the Danube; and further applications to torpedo warfare have been contemplated. In most of these applications of the electric light it is important that the arc should be of constant length, and maintain a fixed posi- tion. Owing to the uncqual consumption of the carbons, special

appliances are required to secure the fulfilment of these conditions, The best known and perhaps the most efficient of the older electric lamps is that devised by Foucault. It consists of a piece of clock- work, which moves the carbons towards each other with relative speed nearly equal to that at which they are consumed, The ma- chinery is controlled by a detent worked by an electromagnet, which is excited by the current which feeds the arc. When- the carbons are too far apart the electromagnet is weakened and releases the detent. The machinery then moves the carbons until the current is strong enough to enable the electromagnet to apply the detent again. This apparatus works well cnough for lecture-room and other pur- poses, but has not given perfect satisfaction in industrial applications, Accordingly many devices have been proposed, more especially of late years, to supersede it. One of the simplest and it would appear most effective of these is the electric candle of Jablochkoff. This consists simply of two carbons, separated from each other by a plate of kaolin. The arc passes between the carbons, and plays over the kaolin, which gradually melts away like the wick of a candle, and by its incandescence greatly helps the brightness of the light.?

The heating powers of the electric arc are no less remark- able; platinum and iridium melt in it like lead, and vola- tilize. In this way the spectra of the glowing vapour of these metals can be projected on ascreen. Almost nothing seems to resist the elevated temperature of the arc. Des- pretz generated it in vacuo by means of 500 to 600 cells of Bunsen, and observed pieces of carbon volatilize like a piece of heated iodine, while the carbon vapour condensed on the walls of the receiver in the form of a crystalline powder. Flint melted to a glassy mass, and boron behaved sunilarly, while cylinders of retort carbon softened and bent into an 8-form.

The voltaic arc behaves in many respects like an ordinary electric current. It is affected by the magnet, for instance, as an ordinary current would be. Owing, however, to the variety of transformations of energy taking place, it is difficult to estimate accurately the resistance and electro- motive force of the arc. Edlund made experiments which seemed to show that a certain minimum electromotive force in every case was necessary for the maintenance of a con- tinuous arc, yet the arc does not appear to consist of a series of disruptive discharges, for its image in a rotating mirror is a uniform band. It would seem, therefore, as if polar- ization in some form or other were present. Edlund, in fact, found that when a galvanometer was substituted for the battery by which the arc was formed a considerable current was obtained, which might have an origin similar to that of electrolytic polarization, or be a thermoelectric effect.2 For further details on these and other matters con- nected with the electric light, we refer the reader to the admirable account of Wiedemann, Galvanismus, Bd. i. § 701 sqq.), from which most of the above is taken.

Disruptive Discharge, Light Effects, &c.

A definite meaning has already been attached to the term disruptive discharge; the object of the present section is to consider this phenomenon a little more closely in several particular cases. The disruptive discharge proper is In general accompanied by sound, heat, light, and me- chanical effects, very often by all four. The attendant luminous phenomena liave absorbed by far the greatest share of the attention of experimenters, partly, no doubt, ou account of their great variety and wonderful beauty. It would bea hopeless task to endeavour, within the limits set us here, to give even a

meagre summary, not to speak of a critical account, of all the experiments and observations that have been made on this subject. The scientific investigator will find sufficient guide for his reading in the three standard treatises of Riess, Wiedemann, and Mascart. Riess is particularly interesting in his account of the older

1 See Nature, Sept. 1877.

? Wiedemann explains Edlund's results by means of an "Uebergangswiderstand." It is difficult to understand how in this way a return current could arise.

Pheno- mena of disrup-

tive dis- charge.

Theoreti- cal eon- sidera- tions.

Dielee- tric strength. Striking distance.

v

GO 'rie CTR re oy [DISRUPTIVE DISCHARGE,

experiments; Wiedemann, on the other hand, gives cla- borate accounts of the more modern results of De la Rive, Pliicker, Hittorf, and others.

When induction is exerted across a dielectric, we may consider the action at any point of it in one or other of two ways. We may regard the resultant electromotive force arising from the action at a distance of all the free electricity in the field as tendiug to separate the two elec- tricities in the molecules of the dielectric. In this view, we might measure the dielectric strength of the medium by the value of the electromotive force, when the electricity is on the point of passing from one molecule to the next. We might, on the other hand, consider, with Faraday and Maxwell, that the dielectric is the seat of a peculiar kind of stress, consisting of a tension p along the lines of force, and an equal pressure perpendicular to them, p being equal to = R2 (Maxwell, vol. i. § 104). We shall adopt the latter

alternative, and when we speak of tension hencefor- ward it means *. R2. In this view the dielectric strength

ua may be defined as that tension under which the dielectric just begins to give way. The reader who prefers the other way of looking at the matter will find no difficulty in translating any statement from the one language into the other.

We have started by considering any point of the di- electric, and it is obvious that the dielectric (supposed homogeneous) will first give way at that point which first reaches the limiting tension =; just as an elastic solid begins to give way where the stress first reaches the breaking limit. It may be proved, however, that R? can- not have a maximum value at any point where there is no free electricity, which shows us at once that the point at which the limiting tension is first reached must always be on some electrified surface, in general therefore on the sur- face of one of the conductors of the system.1 Disruptive discharge, thus begun at the surface of a conductor, spreads out into the dielectric. Its farther course is influenced by a variety of circumstances very hard to define in the great majority of cases.

An attempt will be made by-and-by to give an idea of the varieties of luminous discharge that arise in this way; meantime we concentrate our attention on a feature common t» all disruptive discharges, viz., the definite limiting tension at which under given circumstances they begin.

Dielectric Strength of Gases.—The earlier measurements bearing on this subject were conducted under circumstances which render a comparison of the results with the theory, as ab present developed, very difficult. Harris found that the striking distanee between two balls connected with the armatures of a condenser was directly proportional to the charge of the condenser as measured by a Lane’s jar. Riess used a Leyden battery, and varied the number of jars and the charge of the battery. The balls of his spark micrometer were of diameters 5°7 and 4°4 lines respectively, while the distance between them varied from 0°5 to 2°5 lines. Under these circumstances, he found the striking distance to be proportional to the charge of the battery directly, and to the number of jars inversely. The results of Harris and Riess might be summed up in the statement that the

striking distance between two balls connected with the armatures of a condenser varies as the electro- motive force or difference of potential between the arma- tures. This result is purely empirical, and must not be extended beyond the experimental limits within which it

1 The dielectric is supposed to be homogeneous. Prof. Maxwell has pointed out that exceptions might occur in the case of a weak dielectrie

interposed between two strong ones, ¢.g., a current of hot ai 5 through cold. 6 1 Gos ent of hot air passing

was found. Even Riess's experiments themselves show that the striking distance increases more rapidly than the difference of the poteutials.

The experiments of Knochenhauer? led to a similar result. Gaugain® made experiments of the same kind through a wider range of striking distances, and found, in conformity with the result of Riess, that, with balls of 10 or 15 mm. diameter, the striking distance is proportional to the potential difference between the balls, when the distance between them lies between 2 and 5 millimetres. Beyond these limits the ratio of potential difference to striking dis- tance falls off; whereas, for smaller distances, it increases very rapidly. He also found that the deviation from the law of Harris and Riess is more marked when unequal spheres (83 mm. and 10 mm.) are used, and still more when a ball (3 mm. diam. used as +electrode) and a disc (35 mm. diam.) were used as electrodes. Experiments leading to similar conclusions are cited by Mascart,* who finds that, for spheres of diameter 3 to 5 centimetres, the striking distance for given potential difference is sensibly the same; whereas for plates, both the striking distance and the law of the whole phenomenon is different. The same experimenter examined the striking distances between two equal balls (3 cm. diam.) from 1 mm. up to 150 mm. 'Taking the potential difference for one millimetre as unity, he found for 10, 20, 40, 80, 150 mm. the potential differences 8°38, 11°8, 15°9, 20°5, 23°3. The deviation from proportionality is obvious; the potential differences in fact tend to beeome constant. Wiedemann and Rihlmann, in their experiments on the passage of electricity through gases (see below, p- 61), made some experiments on the influence of the form and distance of the electrodes. They used two brass balls of 13°8 and 2°65 mm. diameter respectively, and sent between them the dis- charges of a Holtz

machine. The distance (5) between the nearest points varied from 3 to 22°3 mm. ‘They found that the quantity of electricity (y) required to produce discharge, could be represented

by the formule y=A- 4 and y=C + D8’, according as the larger

sphere formed the positive or negative electrode. The constants A, B, C, D depend on the pressure, which varied in these experi- ments between 25 and 60 mm. of mercury.

In most of the experiments that have just been de- Sir W. scribed the effect of the form of thie electrodes and the Thom-

surrounding conductors could not be estimated theoreti- soni

are simple have been made by Sir Wm. Thomson. The spark was taken between two parallel plates of consider- able area; one of these was plane, and the other very slightly curved, to cause the spark to pass always at a definite place. The electrical distribution on the opposing surfaces can be found (see above, Math. Theory of Elec- trical Equilibrium), as if the plates were plane and of in- finite extent. This distance between the plates was measured by a micrometer, the contact reading being deterniined by observing when the electricity ceased to pass between the plates in the form of a spark. The potentials were measured in absolute electrostatic (C.G.S.) units, by means of Thomson’s absolute electrometer (see art. ELECTROMETER). The limiting tension or dielectric strength is given in each case in grammes per centimetre, the formula for calculating it being y2 P= 8a x 981-40?’

in which V represents the potential differcnce or electro- motive force between the plates, and d the distance in centimetres. If we take the older view of Poisson’s time that the action of the electricity on the surface of a con- ductor is simply a fluid pressure, then p represents that pressure.

If we could consider the air betwecu the plates as a homogeneous dielectric, then, for air at a given pressure (and temperature?) and given state of dryness, p, which measures its dielectric strength, would have a constant value independent of the distance between the plates, and V would be

proportional to d. A glance at Sir Wm. Thomson's® tables shows that this is not the case. For a

2 Mascart, t. i. § 463, or Pogg. Ann., lviii. 3 Mascart (J.¢.). 4+. 1. § 478. ' 5 Proc. R.S., 1860, or Reprint, p. 247. 6 Reprint, pp. 252, 258.

cally. Experiments in which the theoretical conditions mea

distance of '00254 cm., p=11'290, whercas for a distance "1524, p= '535. It appears, therefore, that the dielectric strength of a thin stratum of air is much greater than that of a thick one. It is very difficult to understand why this should be so. "Is it possible that the air very near to the surface of dense bodies is condensed, so as to become a better insulator; or does the potential of an electrified conductor differ from that of the air in contact with it, by a quantity having a maximum value just before discharge, so that the observed difference of potential of the conduc- tors Is in every case greater than the difference of potentials on the two sides of the stratum of airby a constant quan- tity equivalent to the addition of about '005 of an inch to the thickness of the stratum?"! It is remarkable that the limiting tension should be so small, somewhere about half a gramme per sq. cm., as compared with the atmospheric pressure, which is about 1032 gm. per sq. cm.

A series of absolute measurements of the potential re- quired to produce a spark between equal spheres at different distances has been made by Mascart. The method em- ployed was very ingenious."

Lifect of Pressure, Temperature, §c., on the Dielectric

he Strength of Gases.—The dielectric strength of a given gas UC.

depends on its pressure, or at all events on its density. Harris, who experimented on this subject, inclosed two balls in a receiver which could be exhausted to any required degree, and connected them with the armatures of a battery of jars. He found that the charge which had to be given to the battery in order to produce a spark between the balls was proportional to the density of the air in the receiver, while it seemed to be

independent of its temperature. This amounts to asserting that the difference of potentials re- quired to produce a spark between the balls is proportional to the density of the gas and independent of its tempera- ture. Since we keep the distance between the balls the same throughout, this statement is equivalent to saying that the dielectric strength of a gas varies directly as its density, and does not depend on the temperature. Masson, using the method which Faraday had employed in com- paring the dielectric strength of gases (wide infra) arrived at the same conclusion as Harris. Knochenhauer, however,

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61

s aud J positive. | $ and / negative.

Gas. a B | Mean. a B Mean RUM SERCO LCE IG AOL EOE 0°60 | 0°79 | 0-69 ,; 0°59 | 0-68 | 0°63 Oxy Sete nc. eee Os 05605) 0550) 7.0250 10252) 10-51 INR ROEEM sa soococonoee! OSH | Dos | Oxl | Od || Wen ye Ored Hydrogen'..... .-...| Or308) 0744″ | O37 | 0825 170830 | 0°27 Carbonic acid…..... | 0°56 | 0°72 | 0°64 | 0°58 | 0°60 | 0°59 Olefiant BAS. oes 0-64 | 0°86 | 0°75 | 0°69 | 0-77 | 0°73 Coal gas….....-., 0°37 | 0°61 | 0-49 | 0-47 | 0°58 | 0:52 Hydrochloric aeid. | 0°89 | 1:32 | 1°10 | 0°67 | 0°75 | 0°72

It will be seen that the different gases present consider- able variety, and cannot be classified in any way so as to connect the dielectric strength with any other physical pro- perty. The numbers given cannot be regarded as measuring the dielectric strength, owing to the disturbing influences which cause the inequality of a and 8. This inequality is not by any means small; e¢.g., for air the uncertainty amounts to about 32 percent. These experiments show very clearly that the sign of electrification of the surface at which the discharge begins has a great effect on the limiting tension. 'The discharge passes much more readily from a small ball to a large one when the former is nega- tive than when it is positive. Faraday made a variety of experiments to elucidate this point, and he was driven to the conclusion "that, when two equal small conducting

surfaces equally placed in air are electrified, the one posi- Positive tively the other negatively, that which is negative can aud ne- discharge to the air at a tension a little lower than that S4tive

required for the positive surface, and that, when discharge does take place, much more passes at each time from the positive than from the negative surface.”

The inequality of a and 6 may be due to various causes, among which may be mentioned the charging of the glass of the receiver, dust, &c., in the air, heating of the air, and the presence of finely divided metal dispersed by pre- ceding sparks. The last of these causes would account to a considerable extent for the fact that the sparks show a tendency to persist in a path once opened, and that the interval B—a is less for the negative spark, which starts at a smaller limiting tension, and may therefore be sup- posed to produce less mechanical effect.

Wiedemann aud Riihlmann have recently taken up this Wiede-

subject in a research which has already been alluded to. mann : : : nena The gas and the spark terminals were inclosed in a eylindrieal Riihl-

metal receiver with rounded ends. A small window allowed the

experimenting with pressures ranging from 3 to 27-4 inches of mercury, found that for a given interval the difference of potentials required to produce disruptive discharge was

proportional to the pressure increased by a small constant Ey

quantity.

Faraday, in the 12th and 13th series of his Lxperimental Tesearches, examines this subject ; and the reader who de- sires to have a clear idea of what the issues involved really are will do well to begin by carefully studying Faraday’s results, and still more his views on this matter. Faraday directs his attention to the specific behaviour of different gases.

The gas to be examined was introduced into a receiver in which were arranged two balls s and J, of diameters 0°93 in. and 2°02 in. respectively, at a constant distanee 0°62 in. apart. Two balls, S and L, of diameters 0°96 in. and 1:95 in., were placed on suitable insulating supports outside the receiver. S and s were eonnected with an electric machine, and J and L to earth. The distance » between S and L could be varied at will;if it was greater than a certain value 6, the sparks always passed between s and Zin the receiver; if it was less than a eertain value a, they always passed between S and Lin the outer air. It might have been expected that a and 8 would be equal, or at least very nearly so, z.e. that there would be one dcfinite value of u, for which the spark would hesitate between the alternative intervals. ‘This is not so, however, Nor again is the value of w the same when s and J are negative as when they are positive, The following table will illustrate these points, as well as the relations of the different gases :—

1 Maxwell, Electricity and Magnetism, vol. i. § 57. 2 Electricité, t. i. § 481,

light from the spark to fall on a rotating mirror fixed on the axis of a Holtz machine, which furnished the electricity. The images of the sueccssive sparks were observed by means of a heliometer. One-half of the divided object-glass was moved until one of the images of one discharge coincided with one of the images of the next; then a similar coincidenee was brought about by displacing the half-lens in the opposite direction. The difference (y) of the two readings on the mierometer of the heliometer measures the rotation of the disc of the Holtz maehine between the two sparks. Preliminary experiments showed that the amount of electricity furnished by the machine while the disc moves through a given angle is independent of the angular velocity of the disc. It varies from day to day, however, aceording to the quantity of moisture in the air and the arrangement of the machine ; but, on the principle just laid down, correction can easily be made by taking the reading each day of a galvanometer through whieh the current of the machine is sent. It follows, therefore, that y is proportional to the quantity of elec. tricity which passes at cach discharge throngh the gas, and by means of a galvanometer observations on different days can be compared.

It was found that at the lowest pressures worked with (‘5 to ‘25 mm. of mercury) the discharge of the Holtz niachine was still discontinuous; and that in all the ex- periments the tension at the electrodes was such that tho discharge was independent of the nature of the metal,—in

3 Abh. d. k. Stichs. Gesellsch., 1871, or Wiedemann, Galv. ii, 2, § 933, &e,

High pres- sures.

Minimum strength.

Strength of va- cum.

other words, that the disintegration of the electrode played

no essential part in the discharge.

The quantity of electricity required to effect a discharge, other things being equal, increases with increasing pressure. This increase is at first rapid, then slower, and at high pressures it is nearly proportional to the increase of pressure. Tt was found that y could be expressed with sufficient accu- racy in terms of the pressure p by the empirical formula, y=A+Bp – Cp’, in which the constants A, B, C depend on the size and insulation of the electrodes, their distance

apart, and so on.

They arrange the gases in the following order of dielectric strength :— hydrogen, oxygen, carbonic acid, air, nitrogen. It is not a little remarkable that this is the order given by Faraday in the second column (the best) of the results we quoted above.

They find, in agreement with Faraday, that a greater quantity of electricity is required to bring two unequal spheres to the discharging point when the small one is positive than when it is negative. When two equal spheres are used, the value of y is least when both are insulated, sreater when the

positive sphere is uninsulated, and very inuch greater when the negative one is uninsulated.

All this is in aceordance with theory, provided we assume with Faraday that the limiting tension is greater at positive than at nega- tive surfaces. For example, suppose the surface densities eorrespon- ding to the limiting positive and negative tensions to be P and N (P>N), and consider the case of two equal spheres of radius a, at so

Ae great a distance ¢ apart that { 7) may be neglected, then by taking

c three conseeutive images the reader will easily find that the eharges which must be given to either ball in the case where both spheres are insulated and equally charged, and to the negative ball in the

case where the positive ball is uninsulated, and to the positive ball

2

when the negative ball is uninsulated, must be (a – a2)4naiN :

4ra2N , 4ra2P, respectively, in order to produce discharge. The discharge begins at the negative ball in the first two cases, and at the positive ball in the third, and the quantities are obviously in ascending order of magnitude when P is >N.

The dielectric strength goes on increasing when the pressure is raised above the atmospheric pressure. Cailletet! found that a powerful induction coil worked by eight large Bunseu cells was powerless to effect discharges across $ mm. of dry gas at a pressure of 40 or 50 atmospheres.

On the other liand, however, the dielectric strength does not diminish indefinitely as the pressure decreases, but reaches a minimum.

Morren and De la Rive? have sought to determine this minimum dielectric strength by measuring by means of a galvanometer the mean intensity of the current sent through the gas by an indue- torium so arranged that only the direct induction current passes ; they thus obtain what they call a

minimum resistance. Morren gives the pressures corresponding to this minimum for various gases; they lie between 0*l and 3°0 mm. It may be questioned whether any very definite meaning can be attached to results of this kind; for the discharge is discontinuous, and resistance in the proper sense of the term cannot be spoken of.

It is clear, however, that a minimum dielectric strength must exist; for, if we go on improving our vacuum, we find that our ordinary machinery fails to send electricity through any considerable length of the exhausted space.

Morgan' seemis to have been the first to discover that the electric spark would not pass in a vacuum. Having carcfully boiled the mercury in a barometer tube, so as to remove the last traces of moisture, he found that the inductive discharge caused by electri- fying a piece of tinfoil on the outside of the tube would no longer pass to the mercury, and cause the luminous phenomena usually secn under such circumstances. Masson repeated this experiment in a more satisfactory form. Gassiot* greatly improved the exhaus- tion of vacuum tubes by filling them with CO,, pumping out as usual, and then absorbing the residual gas by fusing a piece of KHO previously inserted into the tube. He constructed tubes in

1 Mascart, t. i. § 187.

2 Wied se 3 Phil. Trens., 1785. jiedemann, Bad. ii. § 952.

- Phil. Trans., 1859.

STLECTRICeese

[DISRUPTIVE DISCHARGE,

this way which had sufficient dielectric strength to insulate the pole of his great battery of more than 3500 Zn. Aq. Cu. eells. Hittorf and Geissler® have constructed vacuum tubes (by pumping with a Geissler's pump, and heating the whole to 400° to 500° C.) in which the opposition to the discharge of an interval of 4 mm. between two platinum electrodes was greater than that offered by 15 or 20 centimetres of ordinary air.

Different Forms of the Discharge in Gases.—We have said Progress

that the subsequent progress of the disruptive discharge when once begun is influenced by a great variety of circum- g

stances. The beginning of the discharge evolves heat, charge,

which rarefies the neighbouring air, and therefore weakens its dielectric strength. Owing to this cause the discharge once started tends to go on. Again, if any considerable quantity of electricity escapes into the ruptured dielectric at the first burst, this relieves the tension at the surface of the conductor. On the other hand, the progress of part of the electricity towards the opposing conductor raises the tension at the surface of the latter, so that disruptive dis- charge is provoked or helped there. If the initial tension is considerable, or the quantity of electricity which passes to begin with very great, glowing metal particles are shot forth into the dielectric, causing a reduction of its strength, which will be very different in different directions. Motions of the air play a great if not a preponderating part in many forms of the discharge. The electrification, &c., of the walls of the tube, and the form of the electrodes and of the tube, both in the neighbourhood of the electrodes and at a distance from them, are as important in their influence on the continuance of the discharge as they are on its start. And, last but not least, much depends on the way the electricity which produces the discharge is furnished,—on the nature of the electromotor, in short. Although we have not yet exhausted the influencing conditions, we have pro- bably said enough to convince the reader that little aid is to be hoped for in this matter from considerations a priort. There is a great deficiency even in proximate principles to guide us in the maze of experimental detail; and although most of the experiments are beautiful beyond all conception, yet the mere narration would scarcely interest the reader. Our description of the department will, therefore, consist simply in going round the boundary.

The luminous appearances may be roughly classed under the forms of spark, brush, glow and convective discharge, and dark discharge.

At the ordinary atmospheric pressure the disruptive dis- Spark.

charge between two conductors at a moderate distance apart takes place in the form of a brilliant sharply-bounded streak of light, whose apparent breadth is in general small. For small distances the spark is straight, aud has the appearance of being thicker, or at least more brilliant, at the ends than inthe middle. When the distance is considerably increased the spark assumes the characteristic zig-zag form seen ill forked lightning. It seems occasionally to ke absolutely broken by perfectly dark spaces. The duration of the dis- charge in this form, more especially when the resistance of the discharging circuit is very small, as tested by a rotat-

ing mirror, appears to be exceedingly short.

We have taken photographs of the sparks of a Holtz's machine by simply moving the camera containing the sensitized plate vertically upwards past the electrodes of the machine. The result 1s a column of perfect photographs, quite unblurred by the jarring, &c., of the camera stand. Again, if a dise painted with white and black sectors be caused to rotate very rapidly, it appears in ordinary light to have a uniform grey colour; but when it is viewed by the light of an electric spark the sectors are seen exactly as if the disc were at rest, which proves that the illumination lasts for a very short time. Masson founded on this experiment a beautiful method for measuring the intensity of the light given out by the spark. A description of his apparatus, with an aeeount of his results, will be found in Mascart.

The colour of the spark in air is bluish,® but at the same

5 Pogg. Ann., 1869. 6 Faraday, Hap. Res., 1422.

3rush,

time its great brilliancy gives an impression of whiteness. | In nitrogen the appearance is much as in air, only the colour tends more to bluish purple, and the spark is more sonorous. In oxygen the spark is whiter and less brilliant than in air; in hydrogen crimson-coloured; in carbonic acid greenish ; in hydrochloric acid white, and never broken by dark parts; in

coal gas green or red, with occasional dark parts. If the spark be carefully examined, especially when the pressure is greater than an atmosphere, it will be seen that the central bright streak is surrounded by an envelope, of somewhat nebulous form, and of a lavender- blue colour. This envelope tends to spread over the nega- tive electrode, where it is more conspicuous as compared with the central streak than elsewhere. This envelope ap- pears to be due to the glowing metal particles torn from the electrodes. It has, unlike the central streak, a sensible duration, on account of which it happens in many cases that a much greater quantity of electricity passes through it than through the infinitely more brilliant but less endur- ing part of the discharge. The envelope can be actually separated from the streak by a current of air properly directed, or by the action of a magnet (vide injra, p.

74).

When the discharge in air at the atmospheric pressure takes place between a salient but not pointed part of one conductor and another conductor of considerable surface (e.g. between one sphere 2 cm. diameter and another 13 em. diameter), the luminous appearance very often takes a characteristic form, which has been called the brush dis- charge. The name is to a considerable extent descriptive of the phenomenon; if the word broor had been applied it would have been even more appropriate, and a rough idea of the variety of forms the brush may assume will be obtained by thinking of the various forms of the domestic article in question. At the surface of the smaller conductor appears a short, straight, luminous stem differing in appear- ance very little except in brightness from a spark. From this radiate a series of twig-like branches of much inferior brilliancy, having a purplish-violet colour. ‘These sub- divide in many cases into still smaller ramifications, and are ultimately lost in the medium. When the large conductor is either altogether absent or very distant, the general ten- dency of the branches is to spread outwards more and more in all directions ; but when the large conductor is brought nearer, the branches have a tendency to bend down towards it, so that the whole assumes an ovoid shape. ‘The brush is generally accompanied by a crackling or hissing sound, or even a musical note. On approaching the hand or a con- ductor of extended surface, the pitch of this sound rises con- siderably. This at once suggests that the brush is an inter- mittent phenomenon. That this really is so was

clearly proved by Wheatstone in one of the earlier applications of his rotating mirror.!_ Wheatstone saw in his mirror not one image of the brush, but several arranged in succession at regular intervals. Each of these images corresponds to a single discharge, and each appears less complicated than the brush as viewed by the unaided eye, which is, in reality, a superposition of a considerable number of brushes, the number depending on the time taken by a light impression to fade on the retina. At the same time each individual image is a little drawn out in the direction of motion of the mirror, which shows that the brush has a sensible duration, Faraday speculates very acutely concerning the nature of the brush discharge (see Hap. Res., 1425 sqq.). He finds that, although it is generally accompanied by a current of air, yet it is not always or necessarily so. He also care-

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fully illustrates the difference between the positive and

negative brush. If we have a small ball on the end of a

a ao Ul ere ? Phil. Trans., 1834, &c.

wire projecting freely into the air, the positive brushes? ob- tained from it are much larger and finer than the negative brushes so obtained. Again, if we charge a large metal ball positively, and bring an uninsulated metal point up to it, a star appears on the point, which gets brighter and brighter as the point approaches the sphere, but the form does not change until the distance is very small. If the sphere be charged negatively, the star appears as before when the distance is considerable, but at a mode- rate distance (1 to 2 inches) a brush forms, and when the distance is still farther reduced a spark passes. It seems, therefore, that the negative discharge keeps its form un- changed under considerable variety of influencing circum- stances, whereas the form of the positive discharge is more readily affected. The explanation of these differences he finds in the fact, which he established by experiments already alluded to, that the limiting tension is smaller at positive than at negative surfaces; so that, ceteris paribus, the negative discharge occurs oftener than the positive discharge ; but, on the other hand,

when the latter does occur, more electricity passes. This, no doubt, accounts for the lower pitch of the sound of the negative brush, and the greater extent and brilliancy of the positive one. Faraday found great differences in the character of the brush in different gases; in none apparently does it reach the brilliancy attained in air or nitrogen. He also observed that rarefac. tion up to a certain point favoured the production of brushes.

When discharge takes place from the rounded end of a Glow.

wire projecting freely into the air, the brush is very often replaced by a quiet phosphorescent glow, which covers a greater or less extent of the end of the wire. The noise which accompanies the brush is entirely absent in this form of the discharge, and the means by which the brush can be analysed into a series of successive discharges give no cor- responding result for the glow. In the rotating mirror it simply stretches out into a uniform band of light. The glow is therefore either a continuous discharge or an intermittent discharge of incomparably shorter period than the brush. Diminishing the discharging surfaces favours the produc- tion of glow.? Increase of power in the electric machine which is furnishing the electricity has a similar effect. Rarefaction of the air has also a great effect in facilitating the production of glow, especially in the case of negative glow, which is extremely hard to produce in air at common pressures. In Faraday's opinion, the star which is ob- tained with a positive sharp point is a positive glow; but he thinks it not improbable that the negative star is not a negative glow, but a small negative brush. The glow is invariably associated with a current of air to or from (generally both) the glowing conductor. Everything that favours this air-current increases the glow; e.g., a brush may sometimes be converted into a glow by properly directing an air-current near it. Again, everything that prevents or retards the formation of an air-current has a similar effect on the glow: a glow can be converted into a brush in this way. Lastly, everything which tends to prevent abrupt variation of the tension favours the glow, and everything having an opposite tendency is destructive of it. Faraday concludes, therefore, that the glow is due to a gradual discharge by convection, in which the agents are the particles of the gas. The order of the appearance of spark, brush, and glow at positive and negative surfaces is, in gencral, the same; but the gradation is different. Positive spark does not

pass into brush so soon as negative spark does; but, on the other hand, positive brush turns to glow long before negative brush.

- By positive brush, of course, is meant brush emanating from a positively charged surface. 3 Hap. Res., 1527.

Convec- tive dis- charge.

Dark interval.

Pheno- mena in rarefied gases.

64 Tet CTR Terr? se | [DISRUPTIVE DISCHARGE.

Intimately connected with the glow is the convective discharge, if indeed they are not degrees of the same phenomenon. “The electric glow is produced by the constant passage of electricity through a small portion of air in which the tension is very high, so as to charge the surrounding particles of air which are continually swept off by the electric wind, which is an essential part of the phenomenon.”! Now: there seems little reasou to doubt tbat at lower tensions? discharge of this kind may ocenr without the luminous phenomenon at the surface of the conductor. If this be so, then the convective dis- charge is only a different degree of the glow discharge.

Discharge by convection plays a very important part in all clec- trostatical experimenting. The air in the neighbourhood of an electrified conductor gets charged, forming an electrical atmosphere, which surrounds the conductor, being more extensive in the neighbourhood of salient angles than elsewhere. Such electrical atmospheres are often a source of great inconvenicnce in the labora- tory and lecture-room when delicate electrical experiments are in progress. ; ,

A curious little instrument, called the electrical tourniquet or windmill, depends for its action on the electrical wind which accompanies convective discharge. A small rectangular cross, with equal arms, is made of light wire ; the extremities of the arms are bent through aright angle in the plane of the cross, so as to point all one way. The little cross thus made is poised, like a compass needle, on a vertical wire connected with an electrified conductor.

Convective discharge takes place at the points, giving rise to an electrical wind, the reaction of which causes the little machine to revolve with great rapidity. If the experiment be con- ducted in the dark, a glow usually appears on the revolving points. The expcriment also succeeds when the cross is immersed in a non-conducting liquid.

We have already alluded to the dark spaces that some- times appear in the spark in. gas at the atmosplicric pres- sure. Faraday observed that a phenomenon of this kind was very common in coal gas. When the discharge takes place in highly rarefied gas, a dark space of this kind almost always separates the positive from the negative light, its situation having a certain degree of fixity with respect to the negative, but not to the positive electrode. It is very difficult to form an idea of the exact nature of the discharge which takes place in this space. Discharge there undoubtedly is of some kind; and pending further investigation, Faraday called it the dark discharge. The fact that its real nature is still undiscovered amply justifies the separate name. Faraday found that it occurred in dis- charges that pass almost instantaneously, and concluded that it could hardly be due to convection of tke ordinary kind, which requires time. De la Rive and Hittorf have made out many peculiarities connected with its appearance in vacuum tubes, the phenomena in which we now attempt briefly to describe,

A variety of forms niay be given to the vessel in which the rare- fied gas to be experimented on is inclosed.

_ One of the most common used to be the electric egg, which is simply an oval glass vessel furnished with two small inetal spheres for electrodes; the stems which carry these clectrodes pass air-tight through tubes cemented to the ends of the vessel; the stem which supports the whole is perforated and fitted with a stop-cock, so that the apparatus can be exhausted to any required extent and then temporarily closed. The commonest of all instruments of this kind now-a-days is the Geissler tube This is simply a glass tube, into which are fused two electrodes of platinum or other metal; a capillary tube allows the apparatus to be connected with an air- pump, and exhausted; when this is done, the capillary tube is sealed up by means of a spirit-lamp. A very common form of such tube is the spectrum tube (see art. Lieut), consisting of two wider parts, connected by a capillary part, in

which the light of the discharge is much more intense than elsewhere. Complicated tubes of all kinds have also been constructed as electric toys.

The reader must not forget that the form of the tube exercises a great influence on the phenomena, whether at the positive or negative electrode. In the summary description that follows the

; Maxwell, Electricity and Magnetism, i. § 55. The reader will not forget the exact seuse in which we use the word tension, Of course, low tension does not mean low potential.

electric egg is referred to, unless it is otherwise stated. We fur- ther assume that the electromotor used gives currents in onc direc- tion only. A Holtz machine would satisfy this condition, within certain limits at least.

When the gas is rarefied to a considerable extent, the spark loses its sharp outline, becomes interspersed with nebulous portions, and by-and-by loses its characteristic form altogether. As the rarefaction goes on, the discharge ceases to reach from the positive to the negative electrode. The latter now displays a patch of lavender-blue light,) separated from the positive light by a dark interval, the | length of which depends on the distance between the elec- | trodes. In certain cases the positive light terminates in a cup-shaped depression, whose concavity is turned towards the negative electrode. As the rarefaction is still further increased, the positive light tends more and more to fill the tube, although in general it recedes from the nega- tive electrode, over which, on the other hand, the beauti- ful lavender glow spreads more and more, exhibiting at the same time a growing tendency to fill a limited space surrounding the electrode. At a still higher degree of rarefaction, the positive light, which now occupies a con- siderable space, and takes a shape more or less correspond- ing to that of the inclosing vessel, is divided transversely into a number of cup-shaped striz, separated from each other by darker intervals. These strize vary in form and appearance considerably, according to circumstances. In the neighbourhood of the positive electrode, their con- cavity is turned towards the positive electrode; but towards the other end of the positive light, the concavity may be turned the other way, especially in the electric eggs. The positive light, in vacuum tubes, shows there- fore the same remarkable variability, and the negative light the same measure of stability that Faraday

remarked in gas at ordinary pressures. ‘he colour of the positive light varies very much in different gases; in nitrogen and air its rosy-red colour contrasts very sharply with the blue of the negative light. The negative light is remarkable for its power of producing fluorescence. It is very depen- dent as to its extent on the form and size of tle uncovered surface of the electrode; anything placed on the electrode cuts it off sharply, as if the light were projected from the electrode and stopped by the obstacle. Disintegration of the negative electrode also goes on very rapidly, so that, after a vacuum tube has been used for some time the glass all round the negative electrode is blackened, browned, &c., as the case may be, with a deposit of finely divided metal. The quantity as well as the quality of this depcsit depends very much on the nature of the metal; it is smallest with aluminium, which is on that accouut much used for electrode terminals. The negative light occasionally shows one, two, or even three stratifica- tions; but in this respect it never equals the positive light. When the rarefaction is carried to the utmost, both positive and negative lights fall off greatly in splen- dour. The negative light contracts more and more in upon the electrode, arid confines itself even there to a small patch near the end, showing, however, a tendency to pass along the axis of the tube towards the positive elec- trode. The positive light, on the other hand, gradually draws inwards, till at last it is only a star on the end of the electrode, which now disintegrates, owing to the great tension.

The temperature at the two electrodes is, in general, very Tempe- different. The true explanation of this difference has not mature of been made out, although it is doubtless connected with the i

. . 5 : rodes. equally unexplained differences in the light phenomena. A general rule has been laid down, that the temperature of the negative electrode is always higher when the dis- charge takes place through the gas alone, and the tempera-

to play a more essential part in the phenomenon than was perhaps previously expected. Spottiswoode, in fact, seems to incline to the view that all discharges having a dark interval are really stratified, although, owing to their rapid motion, tle strata may not be distin- guishable by the eye alone.

In connection with this subject it may be well to mention Wheat- the early experiments of Wheatstone,® to determine the so- stone’s called velocity of electricity in conducting circuits, Six (1Dy 0 halls, 1, 2, 3, 4, 5, 6, were arranged in a straight line on a Velocity board; 2 and 5 were connected with the coatings of a of elec- charged Leyden jar; discharge passed by spark from 2 to ticity.

DISRUPTIVE DISCHARGE. |

ture of the positive electrode higher when the discharges | pass mainly through particles of disintegrated metal, ‘The former case is commoner in vacuum tubes, where the negative electrode may get white hot, and even melt, while the positive electrode remains quite dark, The latter case is exemplified in the voltaic arc, in which great disinte- gration of the positive electrode is accompanied by a higher temperature there. Attempts have been made to investigate the temperature in different parts of the tube, and it seems to have been made out that the temperature

is lower in the dark intervals than elsewhere,

1, then through a large metallic resistance to 3, thence by

Alter- When the electromotor is an induction coil, which fur- | spark to 4, then through a large metallic resistance to 6, nating nishes discharges alternately in opposite directions, there | and thence by spark to 5. It was found, as Feddersen ie will be a mixture of positive and negative light at each | observed later, that the introduction of the metallic resist- with electrode, unless the maximum tension corresponding to | ance increased the duration of the sparks at all the inter- induc- the inverse discharge be so small that the direct discharge | vals, so that the images in the mirror were lines of small torium. alone can break through. If, however, the tube be | length; but, in addition, the spark between 3 and 4 began examined by means of a rotating mirror, or if it be itself | a little later than the sparks at 1, 2 and 5, 6, which were fastened to a rotating arm, the images of the different | simultaneous. From this the velocity of electricity has discharges will be separated, and it will be seen that the | been calculated, by taking the interval + between the sparks appearances at each electrode alternate. to be the tume which the electricity takes to travel through the With Again, when

a Leyden jar is discharged through a | metal wire between the intervals. Faraday long ago pointed Leyden vacuum tube, the appearances at the two electrodes are | out that this interval depends on the capacity of the wire, jane often very much alike, particularly when the resistance of | and may vary very much according to circumstances. It is the discharging circuit is very small. When the resist- | very great in submarine telegraph wires for instance (vide ance is increased by introducing a column of water or | supra, p. 36). Accordingly, the values of the so-called lengths of wetted string, the appearances are similar to | velocity of electricity, which have been found by different those indicated in our summary description. The reason | observers, differ extremely. of this is fully explained by the observations of Feddersen. The sketch we have just given of the disruptive discharge He examined the spark of a Leyden jar by means of a | in rarefied gases must be regarded as the merest outline. rotating concave mirror. The machine which drove the | There are many points of great importance to which we mirror had a contact-maker, which brought on the dis- | have not even alluded. Hittorf's investigation on what charge when the mirror was at a definite position ; the | las been called the "resistance" of different parts of a image of the spark was thus thrown by the mirror on a | vacuum tube during the discharge has not been mentioned, piece of ground glass or a photographic plate, properly although it led to results of much interest, which must placed to receive it. He found that the discharge assumed | come to be of great importance when the clue to an explana- three distinct characters as the resistance of the discharging | tion of the whole phenomena has been found. The reader circuit was gradually decreased. who desires to study the matter will find in Wiedemann an Fedder- 1. The discharge was zntermittent, that is to say, consisted of a | excellent account of Hittorf's work, with references to the sen's _ series of partial discharges all in the same direction, following each | original sources. We have not so much as raised the deli- results. other at more or less irregular intervals. cate and difficult questions concerning the spectroscopic

2. When the resistance was reduced to a certain extent, the dis- charge became continuous. The image of the spark on the plate had then the form of an initial vertical strip, with two horizontal strips extending from each end, and gradually thinning off to a point.

characteristics of the discharge. A good part of this sub- ject belongs indeed more properly to the science of Light.

Miscellaneous Effects, chiefly Mechanical.—Owing to the Kinners- heat suddenly developed by the electric spark, and perhaps !ey’s ex- to a specific mechanical effect as well, there is a sudden PO meet

The vertical strip indicates a single initial spark, and the horizontal bands the finite duration of the light from the glowing metal par-

ticles, &c., near the electrodes.

3. When the resistance is very small, the discharge is oscillatory, t.€., consists of a succession of discharges alternately in opposite directions. These oscillations are due to the self-induction of the discharging circuit; we shall examine the matter more carefully under Klectromagnetic Induction.

It is obvious that when the discharge is either ¢ntermittent or continuous, the luminous phenomena will be of the normal form sketched above, but when the discharge is oscillatory there will be a mixture of positive and negative appearances at each electrode, the independent existence of which cannot be detected by the

dispersion in all directions of the particles of the dielectric. This commotion may be shown very well by means of Kin- nersley’s older form of the thermo-clectrometer; or Gauss’s instrument may be used if we replace the thin wire by a couple of spark terminals. When the spark passes, the liquid in the stem sinks suddenly through a considerable distance, even if the spark be of no great length (2 to 3 mm.).

Very curious effects are obtained when aun electric spark is repeated Strive several times at a little distance above a plate strewed with finely from powdered chalk. After a time the chalk is seen to be divided by a con- network of fine lines, resembling the markings on shagreen. If a cussion.

unaided eye. This is the place to remark that it is rarely that the discharge is of the simple form (2), ¢.¢., consists of asingle continuous discharge;

in by far the great majority of cascs it consists of a series of partial discharges. With the inductorium, both varieties (1) and (3) may occur according to the length of the air space, the resistance of the whole secondary circuit, aud so on. A number of very beautiful experiments have been made to illustrate these principles, which it would take us beyond our limits to describe. Good summaries of the results of Felici, Cazin and Lucas, Donders and Nyland, Ogden

plate of glass be covered with powdered charcoal, and the spark passed through the powder, it arranges itself in a scries of striz closcly resembling those scen in a vacuum tube.

The power of the spark to induce chemical combination (in particular, combustion) is due no doubt mainly to its

high temperature.

The discharge through non-conducting liquids may take Dis- place in the form of spark or brush. The brush, however, charge in is poor compared with that obtained in air, and is very hard *™¢s-

Rood and Alf. Mayer, will be found in Mascart and Wiedemann. Recent researches of a very important character have been made by Willner’ and Spottiswoode? on the discharge in vacuum tubes. They employ the rotating mirror. It would be premature to attempt to sum up or criticise their results, suffice it to say that they show an amount of agreement which augurs well for the future of this branch of electrical science. The striz seem, according to them,

3 Phil. Trans., 1834.

4 A better statement would be “the time that elapses before sufficient electricity has reached 3 and 4 to raise the tension at their nearest points to the disruptive limit,”

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“leree. 3. S8., 1875-6, 7.

1 Pogg. Ann., “Jubelbd.,” 1874.

Lullin’s experi- ment.

Dis- charge in solids.

Surface electri- fication.

to get. When thespark passes, pressure is suddenly trans- mitted through the fluid in all directions, and if it be in- closed in a tube the tube is generally broken, even when the spark is by no means long. When the surface of the liquid is free, a considerable portion is usually projected into the air, The convective discharge is very marked in liquids, If two small balls connected with the electrodes of a Holtz’s machine in action be dipped in paraffin oil at a small distance apart, the whole liquid is thrown into violent motion by the convection currents, runs up the wires which lead to the balls, and spouts off in little jets,

There is also a distinct heaping up of the liquid between the balls, and if one of them be gradually withdrawn from the liquid, for a centimetre or so it raises a column after it, which adheres until the machine is stopped. It is very probable that other effects due to the alteration of the apparent surface tension, owing to the difference of electrical stress in the air and oil, are present in these phenomena, but this is hardly the place to discuss the matter.

The electric discharge passes with great facility through card-board and other bodies of loose texture. In all pro- bability the air in such cases has quite as much to do with the resulting effects as the solid body.

A curious experiment of this kind is often made. Two points are arranged so as to touch the opposite sides of a piece of card-board. If the points be opposite each other, the discharge passes straight through, leaving in the case of small charges a tiny hole with burnt edges. If, however, the points be not opposite each other, the perforation occurs in the neighbourhood of the negative point. The peculiarity is no doubt connected with those

differences betwcen positive and negative discharges in air which we have several times noticed above. In fact, it is found that in an exhausted receiver the card is pierced at a spot very nearly equidistant from the two points.

In other cases the main part of the dielectric strength depends on the solid material. The power of such bodies to sustain the electrical tension is often very considerable. Yet there is a limit at which they give way. A thickness of 6 centimetres of glass has been pierced by means of a powerful induction coil.

In such experiments special precautions have to be taken to prevent the spark from gliding over the surface of the glass instead of going through; this is managed in some cases by embedding the glass along with the terminals of the coil in an electrical cement of considerable insulating power; in ordinary experiments, however, It is in general sufficient to place a drop of olive oil round one of the terminals where it abuts on the glass. The appearance of the perforations depends considerably on the quantity of electricity that passcs in the discharge. In some cases the glass cracks or even breaks in pieces. In some large blocks we have seen a perforation in the form of several independent threads, each of which had a sort of beaded structure, which may possibly be in some way ana- logous to the stratifications in vacuum tubes.

Discharge along the Surface of a Body, Dust Figures, and Dust Images.—The class of phenomena referred to under this head are remarkable for the methods by which they are usually demonstrated. They were at one time much studied on account of the light they were supposed to throw on the nature of the so-called electric fluid or finids. Though no longer regarded in this light, they have reference to an extremely important and comparatively little studied subject, viz. the distribution of electricity over the surface of non-conductors. It is easy to see that the demonstration of surface electrification on insulators is beset with difficulties of a peculiar kind. A very con- venient method is to project on the surface a powder elec- trified in a known way ; this powder clings to the parts oppositely electrified to itself, and avoids those similarly electrified, so that the state of the surface is seen at once. Lycopodium seed and powdered resin have been used in this way ; they are sifted through linen cloth, the lyco- podium becoming

thereby weakly positive, and the powdered resin strongly negative, If the lyeopodium be used, it covers both positive and negatively electrified patches, only the latter more thickly than the former.

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The powdered resin, on the other hand, covers the positive

[DISRUPTIVE DISCHARGE,

and avoids the negative regions. The most effective powder, however, is a mixture of flowers of sulphur! and red lead. In the process of sifting, the red lead powder becomes positively and the sulphur negatively electrified, and the powders separate themselves. The sulphur colours positive regions yellow, and the red lead colours negative regions red. The result is very striking; and the test is found to be very delicate.

The dust figures of Lichtenberg are one of the best Lichten- known instances of the kind of experiment indicated berg's

above. a non-conducting plate, with its point very near to or in contact with the plate. A Leyden jar is discharged into the needle, and the plate is then tested with the powder. If the electricity communicated to the needle was positive, a widely extending patch is seen on the plate, consisting of a dense nucleus, from which branches radiate in all directions. If negative electricity was used, the patch is much smaller and has a sharp circular boundary entirely devoid of branches. This difference between the positive and negative figures seems to depend on the presence of the air; for the difference tends to disappear when the experiment is conducted in vacuo. Riess explains it by the negative electrification of the plate caused by the fric- tion of the water vapour, é&c., driven along the surface by the explosion which accompanies the disruptive discharge at the point. 'This electrification would favour the spread of a positive, but hinder that of a negative discharge. There is, in all probability, a connection between this phenomenon and the peculiarities of positive and negative brush and other discharge in air; Riess, indeed, suggests an explanation of the latter somewhat similar to the above,

There is another class of figures, to which Riess gives the name of electric images, of which the following may be taken as a type. A signet or other engraved piece of metal is placed on a plate of insulating material, and steadzly electrified by means of a dry pile or otherwise positively or negatively for half an hour or so. When the metal is removed ‘and the plate dusted, an exact figure of the stamp appears, consisting of a red or yellow background on which the engraved lines stand out free from dust. There is no difference between positive and negative electricity here as far as form is con- cerned, and the colour of the figure indicates charge on the plate opposite to that on the metal. The phenomenon appcars to be due simply to the electrification of parts of the non-conducting surface opposite the metal.

A sharp-pointed needle is placed perpendicular to a8

ures, C.

Another class of phenomena, to which Riess gives the name Figures secondary, depend, not on the electrification of the surface, but on of Kar- permanent alterations produced by the discharge, whether in the sten.

form of spark or otherwise. Sometimes these are directly visible to the eye or touch, ¢.g., the roughening and discoloration which mark the path of the spark over a polished glass surface. In some cases they are chemical alteratious, which may be shown by means of the proper reagents, ¢.g., the separation of the potash in the spark traces on glass. In certain cases they become evident on breathing upon the glass; of this description are the images of Kars- ten. A piece of mirror glass is placed on an uninsulated metal plate, and on the glass is placed a coin or medal. Sparks are taken for some time between the coin and an electric machine, and then the glass plate is removed and breathed upon. A representation of the coin then appears on the glass, often complete to the smallest detail. The reader who is interested in these matters, historically or otherwise, will find a variety of information, with directions how to find more, in Riess’s Reibungselectricitat, Bd. ii. § 739 sqq.

Electromagnetism and Electrodynamics?

Mention has already been made of the discovery of Oer- sted, that the electric current exerts a definite action on a magnetic needle placed in its neighbourhood. This dis- a

1 First used by Villarsy in 1788.

? Throughout this section the reader is supposed to be familiar with the experimental laws of magnetism (see art. Macnetism). If he desires fully to understand the mathematical developments that occur here and there, an occasional reference to the analysis used in the

cca of magnetism will also be necessary, if he is not already familiar with it.

Am- pére's re- lation to Oersted.

Funda- mental prin- ciple.

covery formed the starting-point of that division of electrical science with which we are now todeal. It was natural, once the action of a current? on a magnet was observed, to look for the reaction of the magnet on the current, and after seeing two currents act on the same magnet, it was reason- able to expect that the currents would act on each other. Yet it may be doubted whether the first of these results is a legitimate deduction from the discovery of Oersted, and the second certainly is not so. Before we can apply the prin- ciple of the equality of action and reaction we must be quite certain of the source of the whole of any action to which the principle is to be applied. Again, two bodies A and C may act on B owing to properties acquired by virtue of B's presence, so that in the absence of B they need not neces- sarily act on each other. A good example is the case of two pieces of perfectly soft iron, each of which will act. on and be acted on by a magnet, but which will not act on each other when the magnet is not near them.

The questions thus raised by Oersted's discovery were experimentally settled by Ampere. He found that a magnet or the earth (which behaves as if it were a magnet) acts on the current, and the direction of these actions is found to be consistent with the principle of equality of action and reac- tion.

As no experimental fact has yet been quoted against the application of this principle in such cases, we shall assume it henceforth. Ampére also discovered the action of one electric current on another, and thereby settled the second question. We may conclude, therefore, that the space surrounding an electric current is a field of magnetic force just as much as the space around a magnetized body.

The next step is to determine the distribution of magnetic force, or what amounts to the same thing, to find a distri- bution of magnetism which shall be equivalent in its mag- netic action to the electric current. This also was com- pletely accomplished by Ampére. In expounding his results we shall follow the order of ideas given by Maxwell,? which we think affords the simplest view of the matter, and is the best practical guide that we know of through the somewhat complicated relations to which the subject intro- duces us. We shall in addition give a sketch of the actual course which was followed by Ampere, and which is adhered to by the Continental writers of the present day.

It results alike from the fundamental experiments of Ampére and the elaborate researches of Weber, to both of which we shall afterwards allude, that an electric current circulating in a small plane closed circuit, acts and is acted upon magnetically exactly like a small magnet placed per- pendicular to its plane at some point within it,' provided the moment of the magnet be equal to the strength of the current multiplied by the area of the circuit,* and its north pole be so placed that the direction of the axis of the magnet (from S-pole to N-pole), and the direction in which the current circulates are those of the translation and rotation of a right-handed (ordinary) screw which is being screwed in the direction of the axis. In this statement we have spoken of a small closed circuit. The word " small" means that the largest dimensions of the circuit must be infinitely smaller than its distance from the nearest magnet or electric current on which it acts, or by which it is acted on.

_ We may break up our small magnet into a number of similar magnets, and distribute them over the area of the small circuit, so that the sum of the moments of all the mag- nets on any portion w of the area is wi, where 2 is constant. We thus replace the cireuit by a " magnetic shell " of strength

1 “Current” is used here and in corresponding cases as an abbre- viation for the ‘‘the linear conductor conveying a current.”

: Electricity and Magnetism, vol. ii. §§ 475, &c.

3 Naturally the centre of the area if it is symmetrical.

4 We shall see directly what system of units this statement pre- supposes.

t, which, if we choose, may be represented by two layers parallel to the area, one of north the other of south mag- netism, the surface density of which is +0, where 0 is the distance between the layers.®

Startmg from the principle thus laid down we can derive

all the laws of the mutual action of magnets and electric ee

currents.

Consider any finite circuit ABC (fig. 29). Imagine it filled with a surface of any form, and a network of lines drawn on the surface as in the figure, di- viding it up into por- tions, such as abcd, so small that they may be regarded as plane. It is obvious that any current of strength 7 circulating in ABC may be replaced by a series of closed cur-

Fig. 29.

rents, each of strength 7 circulating in the meshes (such as abcd) of the network on the surface ; for in each line such as bc we have two equal and opposite currents circulating

whose action must be nil. Now, we may replace each of the small circuits by a magnet as above, or by a magnetic shell of strength i, The assemblage will constitute a magnetic shellof strength? filling up the circuit, whose magnetic action, at every point external ® to the shell will be the sameas

that of the current. The north side of the shell is derived from the direction of the current by the right-handed screw relation given above.

If dS be an element of the surface of a magnetic shell of strength 7, D its distance from P, and @ the angle which the positive direction of magnetization (which is normal to dS) makes with D, then the magnetic potential' at P is

given by _tff os 0 v= ys ae

the integration extending all over S.

When properly interpreted this double integral is found to represent the " solid angle" subtended at P by the surface S, or, as it may also be put, by the circuit ABC which bounds it. Hence, solid angles subtended by the north side being taken as positive, and the usual conventions as to sign adhered to, we may write

s V=te, where wo is the solid angle in question,

We see, therefore, that the potential of a magnetic shell at any point P is equal to the product of the strength of the shell into the solid angle subtended by its boundary at P. Now the potential of such a shell is continuous and single-valued at all points without it. (With points within it we are not now concerned, since the action of the current at such points is not the same as that of the shell.) If, therefore, a unit north pole start from any point P and return to the same, after describing any path which does not cut through the shell, z.e., does not embrace the current, the work done by it will be nd. Let us now examine what happens if the path cuts through the shell S. Take two points P and Q, infinitely near each other, but the one P on the positive side, the other Q on the negative side of the

(1),

(2),

6 The reader who finds difficulty with the magnetic shell may adhere to the small magnet; it will be found sufficient for most practical purposes. ;

6 ‘This limitation is the equivalent of the limitation smalJ applied to the elementary plane circuit, and follows therefrom. :

7 We need scarcely remind the reader that all the definitions of potential, &c., in the theory of electrostatics apply here if we substi- tute -+ and — magnetism for + and — electricity, The unit of + magnetism is sometimes called a unit north pole.

Finite circuit a

magnetic shell.

Poten- tial of shell.

Linear circuit in magnetic field.

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shell. In passing from P to Q, without cutting the shell, the solid angle w decreases by 4x infinitely nearly. Now, during the passage from Q to P we may not represent the action of the current by S, but nothing hinders us from representing its action by another shell S’, which does not pass between Q and P, but is at a finite distance from either of them; for it will be remembered that the shell which represents the action of a current 2 is definite to this extent merely—that its strength is z, its boundary 1s the circuit, and it does not pass through the point at which the action is being considered. But infinitely little work, owing to the action of 9’, is done in passing from Q to P. Hence the work done by a unit pole in going once completely round any path which embraces the current once 1s 47.

To reconcile this result with the continuity of the mag- netic potential of a linear circuit, for the existence of which we have now furnished sufficient evidence, we must admit that the potential of a linear circuit at any point P is V=t(wo+4nr), where is any integer. In other words, V is a many-valued function differing from 7 times the solid angle subtended at P bya multiple of 47. Tf we pass along any path from P and return thereto, the difference of the values of V, or the whole work done on the journey, is zero if the path does not embrace the circuit, 4m if it embraces! it » times.

The considerations enable us to determine the action of any closed current on a magnetic pole, and consequently on any magnetic system. We have next to find the action on a linear circuit when placed in any given magnetic field, whether due to magnets or electric currents. This we do by replacing the circuit acted on by its equivalent magnetic shell.

If the potential at any point of the magnetic field be V, then the

potential energy of a magnetic shill S, of strength 7, placed in the field is given by

; dV dV ON Nee a=iff (1o a nr) ass) 2 as);

where (1, m, 2) are the direction cosines of the positive direction (south to north) of the normal to the element dS. Since, so long as the magnetic force considered is not due to S itself, there is none of the magnetism to which V is due on 8S, we may write —a, — 6,

dV dV av —e for rm dy' ao where a, 0, ¢ are the components of the

magnetic induction.? Then, if N= (/(lat+mb+ne)dS (t.c., =the surface integral of magnetic induction, or the number of lines of magnetic force which pass through the circuit), we may write

M=-iN (4).

From this expression for the potential energy of the equivalent magnetic shell we can derive at once the force tending to produce any displacement of the circuit regarded as rigid.

Thus let be one of the variables which detcrmine the position of the system, then the force tending to produce a displacement do is given by $d6+dM=0, or

aN gah

Hence the work done during any displacement of a closed circuit, in which the current strength is 7, is equal to 7 times the increase produced by the displacement in the number of lines of force passing through the circuit.

The force tends, therefore, to produce the displacement or to resist it, according as the displacement tends to increase or to diminish the number of lines of force passing through the circuit. It is evident, therefore, that a position of stable equilibrium will be that in which the number of linés of magnetic force passing through the circuit is a

(5).

1 On the space relations involved here see Maxwell, vol. i. § 17, &c.

2 Magnetic induction is used here in Maxwell's sense. It coincides in meaning with ‘‘ magnetic force” at points where there is no mag- netism. ‘‘ Line of force” in Faraday's extended sense is synonymous with ‘‘ line of induction” in Maxwell's sense.

maximum. If that number is a minimum, we have a case of unstable equilibrium.

Maxwell? has shown how we may deduce from the above theory the force exerted on any portion of the circuit which is flexible or otherwise capable of motion. “If a portion of the circuit be flexible so that it may be displaced independently of the rest, we may make the edge of the shell capable of the same kind of displacement by cutting up the surface of the shell into a sufficient number of portions connected by flexible joints. Hence we conclude that, if by displacement of any portion of the circuit in a given direction the number of lines of induction which pass through the circuit can be increased, this displace- ment will be aided by the electromagnetic force acting on the circuit.” ;

From these considerations we may find the electromagnetic force acting on any element ds of the circuit. Let PQ (fig. 30) be the element ds _belong- ing to the arc AB of any circuit. Let PX be the direction of the magnetic induction 4 at P, and B its magnitude. It is obvicus that no motion of PQ in the plane of PQ and PX will increase or diminish the number of lines of

force passing / through the cireuit ; con- sequently no work will be done in any such dis- placement. Hence the resultant electromagnetic force R must be perpen: dicular to the plane QP. Let PR be a

Fig. 30.

small displacement perpendicular to this plane, the work done in the displacement is R.PR, and the number of lines of force cut through is z times the rectangular area PQR multiplied by the com- Lace ¥® sin 6 of the magnetic induction perpendicular to it. Hence we have

Rx PR=itdsx PRx Bsine, R= ids sin 6 (6).

Hence the resultant electromagnetic force on the ele- ment ds may be determined as follows :—Take P¥ in the direction of the resultant magnetic induction (magnetic force) and proportional to 7%, and take PQ in the direction of ds and proportional to it ; the electromagnetic force® on the element of the circuit is proportional to the area of the parallelogram whose adjacent sides are P# and PQ, and is perpendicular to it. The force in any direction making an angle # with the direction of the resultant is of course Reos¢. The following consideration is convenient for determining which way the resultant force acts. It is obvious that the force on the element will be the same to whatever circuit we suppose it to belong, so long as the direction and strength of the current in it is the same. Take, then, a small circuit PQK perpendicular to the lines of magnetic induction (magnetic force) near PQ, in such a way that the direction of the current in PQK (as deter- mined by the direction in PQ) is related to the direction of the magnetic induction in the same way as rotation and translation in right-handed screw motion ; ‘then the ele- ment PQ tends to move so that the number of lines of force passing through PQK increases.®

a.

3 Electricity and Magnetism, vol. ii. § 490.

4 «* Resultant magnetic force,” if there is none of the magnetism pro- ducing it at P. :

5 We need scarcely remind the reader that this is a ponderomotive force acting on the matter of the element of the circuit. There is no question of force acting on the current or the electricity in it.

6 From this may be derived the following, which is often very con- venieut. Stand with feet on PQ and body along the positive direction of the line of magnetic force and look in the direction of the cur-

| rent, then the force is towards the right hand.

¥

Action on ele- ment of circuit,

Vector _ poten- | tial, &c.

ELECTROMAGNETISM. |

Several other ways of remembcring this direction might be given. Although the above may sound arbitrary and look clumsy at first, yet we have found it more convenient in practice than some others we have tried.

We may extend what has been said above to the case where part of the magnetic force, it may be the whole of it, is due to the current in the circuit itself; for we might suppose the magnetic field to be that due to a shell whose boundary coincides infinitely nearly with the circuit. It the circuit is rigid, there will of course be no motion caused by its own action ; but if it be flexible, there may be rela- tive motions; in fact each portion will move until the number of lines of force that pass through the circuit is the greatest possible consistent with the geometrical con- ditions.

It is an obvious remark, after what has been said, that the potential energy of the magnetic shell which repre- sents a current depends merely on its boundary, or, in other words, that the magnetic induction or the number of lines of magnetic force which pass through a circuit depends merely on its form. Hence we should expect to find some analytical expression for the surface integral of magnetic induction depending merely on the space relations of the circuit ; in other words, we should expect to find a line integral to represent it. And when the field is that of another circuit, we should expect to find a double line integral for the mutual potential energy of the two repre- sentative shells! We shall describe briefly how these ex- pectations are realized.

In the first place, a vector may be found which has the property that its line integral taken round any circuit is equal to the surface integral of magnetic induction taken over any surface bounded by the circuit.2_ This vector has been called by Maxwell the ‘‘ vector potential” (#). Let its components be F, G, H. Then applying the definition to small areas dydz, dzdx, dudy, at the point xyz perpen-

dicular to the three axes,? a, b, c being components of magnetic induction as before, we get

ae _ att dz dx’

aG dF

c= — oe (7).

These equations might be used to determine F, G, H, and would lead to amuch more general solution than is here required. ‘The following synthetical solution is simpler.

_ Consider a magnetized particle sv at O (fig. 31). Let the positive direction of its axis be OK, and let its moment be m. The = resultant force due to sv at any point P is in a plane passing through OK; hence the vector & = potential @ at P must be per- pendicular to this plane. Let its direction be taken so as to indicate a rotation round OK, which with translation along OK wonld give right-handed

screw motion. Describe a . sphere with O as centre and n OP (=D) as radius. Let PQ

be a small circle of this sphere “ whose pole is K. Consider the 5 line integral round PQ, and Fig. 31.

the surface integral over the spherical segment PKQ. Since @ is the same at all points of PQ by symmetry, the former is 2rDsineu, and the latter is

i

’ It is important to remark here that we say ‘‘of the two represen- tative shells,” not ‘‘of the two circuits,” or “‘ of the two currents ”’ (see below, p. 76).

- The mathematical idea concerned here seems to have been origin- ally started by Prof. Stokes; it is deeply involved in the improve- ments effected in the theories of hydrodynamics, elasticity, electricity, &e., by Stokes, Thomson, Helmholtz, and Maxwell. ;

3 It is to be noted that the rectangular axes here used are drawn thus :—o2 horizonal, oz’ vertical (in plane of paper say), and oy from

z the reader; thus— ; M4 In this way rotation from y to z and trans-

lation along ox give right-handed screw Motion, and so on in cyclical order,

ELbERCTHmACTT Y

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Equating these we get for vector potential of sn at P

- (8),

Qamsin2é ae | ae ae w= Dp sin @

its direction being that already indicated. Suppose now the particle sn placed at Q(wxyz) so that the direc- tion cosines of sn are A, w, v. Let the coordinates of P be, n, ¢; also

let QP=D=+ VW(é-2)*+(n-y)?+(¢-z)2. Then the direction > of of nl cosines of QP are Jae 5 De > De » where p= p> 2nd we get

for the component of the vector potential at P

(9);

and two similar expressions for G and H.

The vector potential of a magnetized body may be got by com- Expres-
pounding the vector potentials of the different elements; hence, IA, sion for
Iu, Iv being the components of magnetization at any point of the vector

body, we get poten- dp dp = fu yet wz Sf f’ (z Pasty

tial,

and two similar expressions forG and H. The first part of our problem is thus solved.

Let us, in the second place, apply the above result (10) to the case of the two shells which are equivalent to two currents. In a HIn) _ aly) &c.; hence the

dz dy volume integral in (10) reduces to a surface integral, and

F= ah //, 5 (un – vm)as (11),

where 1, m, ” are the direction cosines of the outward normal to dS. Now the magnetic shell of thickness + and strength 7 is a lamel- larly magnetized body of constant intensity=i+7. It may be looked upon as bounded by two parallel surfaces normal every- where to the lines of magnetization, and by an edge generated by lines of magnetization. At every point on either of the parallel surfaces we have therefore =A, m=p, n=v; and at the edge t= 24 — y%, ond similarly for m and 1, the double integral in (11) belonging to either of the parallel surfaces vanishes, and there remain only the parts on the edge which give

dx dy dg de _. flaz wwe ~~ae)~~*(nas) te

= — 12 vita

dy : : +p—“ + y—=0. (12) gives the vector potential

ds ds

at (én¢) due to a magnetic shell S. Let (&¢) be any point on the boundary of another shell S, of strength 7, and let do be the element of arc of the

boundary, then

% dt dn d¢

is the magnetic induction through S’ due to S with the sign changed, in other words, the mutual potential energy M. Putting for F,G,H their values by (12), we have

iw ffl (a2 & , dy an, de ae == fs (4s de * ds da ‘ ds do

=f [SS dso a ae Oe eo a ee

where ¢ is the angle between ds and de.

The result of (14) realizes the second of our expectations. The double integral arrived at is of great importance, not only in the theory of electrodynamics, but also as we shall see in the theory of the induction of electric currents.

Hitherto we have spoken only of closed circuits, and con- sidered merely the action of a circuit regarded as a whole. When we did speak of the force on an element of a circuit, Am- we deduced this force directly from the state of the mag- pére’slaw netic field in its immediate neighbourhood. There is an deduced. order of ideas, however, in which the mutual action of two circuits is considered to be the sum of all the mutual actions of every element in one circuit on every element in the other. Now, we can easily show, by means of (14), that a system of elementary forces of this kind can be found which will lead to the same result for closed circuits as the theory given above.

Let the circuit S’ be supposed rigid and fixed, and let the circuit S be movable in any way with respect to 8’; it may even be flexible.

(10),

lamellar distribution of magnetism

Hence every element of

Ir F=357|

é dx since AZ

Double line in- tegral

f ‘ (14), or M

) dade

Action on magnetie pole.

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Denote the angles between the positive directions of do and ds and the direetion of D from de to ds by 6’ and @, then we have

dD ; dD al eal e0sé pa (15). dD dD #D ES ay ae!” ate By means of these we get ance maw /) D za (16).

The part which is a eomplete differential has been left out, beeause it disappears when the integration is carried round closed circuits, as we always suppose it to be. Consider now the work done ina

aD 3) , and ds, but

de’ “ds not dc; we have = ee ea

ds 8 1 dDdD = M= — i’ peal et gs 6M |S a sDdods +d! iw oe

fat ff 20 (BD _gD Vinay

small displacement whieh altcrs D and 8,

1 dD dD

D doe \ ds ds ds a5 idD dD dis 0 Se ae eee

The parts containing $s disappear in this expression, and if the rest be arranged by integration by parts as usual, we get : SM -—fR8Ddsdo=0 . (17),

Sahrone “Erase 2 cos € —— 8 €0s or Hence the electrodynamical action of the two circuits is completely accounted for by supposing every element do to attract every element ds with a force ti dsdar

D? (2 eos e— 8 e€0s @ eos) We may therefore use this elementary formula whenever it suits our convenience to do so.

It is very easy to obtain a similar elementary formula, which is very often useful, for the action of an element of a circuit on a unit north pole.

We have seen above how to find the action on an element PQ

(ds) of a eireuit in a given magnetic field. Let the field be that due to a unit north pole N (fig. 82). Then the magnetie induetion at

P is in the direction NPK, and is equal to a if NP=D. Henee by (6) the foree R on PQ! is perpendicular to NP and PQ, is in the

(18).

direetion PM shown in the figure, and is equal to pa Now, by the prineip of ‘‘aetion and reaetion,” the foree on N is R in the xt A x M / % \ ea A ie ae x ot Kee ‘ Am’ Fig. 32.

direction PM’ opposite to PM, ie is equal to a foree R aeting at N in a dircetion NM’’parallel to PM’, together with a eouple whose moment is Rx PN, and whose axis is perpendicular to NP and in the plane NPQ. Nowa simple caleulation, whieh we leave to the reader, will show that for any closed eircuit the resultant of all the eouples thus introdueed is nd; henee, since we deal with elosed cireuits only, we may neglect the couple.

The force exerted by a closed circuit on a unit north pole may therefore be found by supposing each element ds to act on the pole with a force equal to

tds sin @ p2 whose direction is perpendicular to the plane containing the pole and the element, and such that it tends to canse rotation round the element related to the direction of the current in it by the right-handed screw relation.

- (19),

? PQ is supposed to be drawn Jrom the reader.

ELEOTRIVE?S

| ELECTROMAGNETISM.

Comparison of Theory with Experiment.—The best veri- Agree- fication of the theory which has just been laid down con- ment of sists in its uniform accordance with experience. We pro- er ceed to give a few instances of its application, adopting perience,

now one, now another, of the equivalent principles deduced

from it.

We have already remarked that the lines of magnetic Straight force in an electric field due to an infinite straight current current. are circles having the current for axis. It is easy to deduce from the fact that there is a magnetic potential that the force must vary inversely as the distance from the current.

This may also be proved by meaus of the formula (19) ; in faet, the resultant foree at P is given by T os * _ 109 _ cosee?@ ag=” :

d®eosecé (20)s

5 sin @ ; R=i1 D>? asa

0

d being the distance of P from the eurrent. Let AB (fig. 33) be a very long straight current, and Parallel

pog an element ds of a parallel cur- ‘s currents, rent, having the same direction as AB. If we draw the line of force (a circle with C as centre) though O, the _ = > ae tangent OR is the direction of the *_ To 7k force at O; hence by (6) and (20), 3: iy the force on pog is 54s, and acts in A the direction OC; poq is therefore ee attracted. If the current in pog be reversed, the force will have the same numerical value, but will act in the direction CO. Hence two parallel straight conductors attract or repel each other according as the currents in them have the same or opposite directions. >— Let AB (fig. 34) be an infinitely long (or very long) Inclined >> ; currents,

current, CD a portion of a current inclined to it, and passing very near it at O. If the plane of the paper contain AB and CD, then at every point in OD the magnetic force is perpendicular to the plane of the paper and towards the reader, at every point in OC perpendicular to the plane of the paper and from the reader; hence at the elements P and Q the forces acting will be in the direction of the arrows in the figure, and CD will tend to place itself parallel to AB. If both the currents be re- versed, the action will be unaltered; but if the current in CD alone be reversed, it will move so that the acute angle DOB increases. Hence it is often said that cur- rents that meet at an angle at- tract each other, when both flow to or both flow from the angle, but repel when one flows to and the other flows from the angle.

Fig. 34.

These actions pee ww WOE may be demon- S&== QG GQ S Am- strated in a great Fig. 35. pere’sap- variety of ways. paratus.

Figure 35 shows an arrangement for demonstrating the attraction or repulsion of parallel currents, whjeh is essentially that first used by Ampere.

ELECTROMAGNETISM. |

EBLE Sete iF Y rai

tion with the screw s and the cup g. B isa light conductor,’ con- | and what we are about to advance will apply to a solenoid sisting of two parallelograms of wire, in which the current circulates | whose axis is a curve of any form.

in opposite directicns, the objeet of which is to eliminate the magnetic action of the earth. The conductor is hung in the cups

pand q, so as to be easily movable about a vertical axis. C is a frame on which several turns of wire are wound, so that when a current is passed through, we have anum- ber of parallel condue- tors, all of which act in the same way on the vertical branch wv of the movable conductor. Ow- ing to the opposite direc- tions of the currents in the tube and the wire inside it, there is no

Let there be nds of the circular currents (each of area X) in the are ds of the axis of the solenoid. As we sup- pose the distribution to be uniform, x is constant. We may suppose each current to be placed at the middle of a

aa at length = of the axis, which it occupies for itself. Hence, pau if each circular current be replaced by a shell of thickness Tae , the surface densities of the magnetism on each of these – shells will be +22, and the north magnetism of each shell

will coincide with the south magnetism of the next; so that the whole action at points external to the solenoid reduces to the action of a quantity nA of magnetism spread over one end of the solenoid, and a quantity — nid

spread over the other. The positive or north end of the

aetion on yz due to that part of the apparatus. Itis clear, therefore, that : the action of C on wy will prevail and determine the motion.

The action of straight conductors, making an angle with each other, may be shown by means of the conductor D, represented in fig. 86, which may be fitted to the stand shown in fig. 35.

In a very large class of practical cases, circular circuits play an important part. The most convenient way of dealing with these, as a rule, is to replace them by the equivalent magnets or magnetic shells. The action of a circular circuit may be represented by two layers of north and south magnetism, whose surface densities are +77, where ¢ is the strength of the current and 7 the distance between the layers. For details concerning the calcula- tions in

a variety of cases, we refer the reader to Maxwell’s Electricity and Magnetism, vol. ii. cap. xiv.

We may ealeulate the force exerted (see fig. 37) by a circular eurrent AB on a unit north pole at its centre C, as yy a follows. Replace the current by two discs AB and 7 A’B’, of north and south magnetism, the distance be- tween whieh is 7 ; the surface densities are +7+7 and -t+r. The first of these exerts a repulsive force 2ni+7, the second an attractive force

Qni-br(1 — cos$A’C’B) ; hence the resultant repulsive force is QricostA’C’R’+7=2ri+r, r being the radius of the disc. Hence a unit of length ®’ B of the current exerts a force 7+r? at the distance 7. Fig. 37.

solenoid is obtained, as usual, from the direction of the current, by means of the right-handed screw relation. If X be very small, or if the system acting on, or acted upon by, the solenoid is at a distance very great compared with the dimensions of A, then we may suppose the representa- tive magnetisin concentrated at the ends of the axis of the solenoid.

Hence the particular arrangement of electric currents, which we have called a solenoid, acts and is acted on exactly like an ideal linear magnet (whose poles coincide with the ends of its axis).

Thus the north pole of a magnet or solenoid repels the north end and attracts the south end of a solenoid; a solenoid tends to set under the action of the earth, its north end behaving like a magnetic north pole, and so on.

Fig. 36.

Cireular circuit.

In a cylindrical bobbin wound to a uniform depth with silk- Cylin- covered wire we have an arrangement which is equivalent to a drieal number of solenoids all having a common axis. Each of these bobbin. solenoids may be replaced by the equivalent terminal discs of posi- tive and negative magnetism, and the external action of the whole thus caleulated. The magnetie disc at each end will, of eourse, not be of uniform density,? but if the points acted on be at a distance whieh is infinitely great compared with

the lateral dimen- sions of the bobbin, we may eollect the magnetism at the ends of the axis ; the quantities will be

a wart

eee pes mee,

7,

o

~

mnt (a? +ab+6?),

where @ and 0 are the outer and inner radii of the shell of wire, m the number of layers in the depth, and 2 the number of turns per unit of length of each layer. The magnetic moment of the bobbin is therefore

Unit of | It follows therefore that the statement of our funda- current mental principle (p. 67) involves a unit of current strength strength. such that unit length of the unit current, formed into an arc whose radius is the unit of length, exerts a unit of force on a unit pole placed at the centre of the arc. From this statement and the definition of a unit negative pole it follows at once that the dimension of the unit of current is [LAM?T-“}.

One arrangement of circular currents has become famous from the part it plays in Ampére’s theory of magnetism. A wire wound into a cylindrical helix, such as that represented in figure 38, the ends of the wire being returned paral- lel: to the axis of the helix, and bent into pivots, Cones HA Or KX XK XX) pére’s stand (fig. JUV UUU JVUUUU 35), 18 called a Fig. 38. solenoid. The conductor thus formed is obviously equi- valent to a series of circular currents disposed in a uni- form manner perpendicular to a common axis. In the case represented in figure 38, this axis is straight; but the name solenoid is not restricted to this particular case,

1 Aluminium is often used,

mots (a?+ab+6%),

where p denotes the number of turns in each layer, and mp the whole number of turns on the bobbin.

The above is a simple case of the kind of calculation weber’s on which Weber founded his verification of Ampére’s experi- theory. He did not, however, replace the circular currents ™en’s- by the equivalent magnetic distributions, but calculated Aah directly from Ampére’s formula (18). jadohoban.

The instrument (electrodynamometer) which he used in his experiments was invented by himself. It consists essentially of a fixed coil and a movable coil, usually sus- pended in the bifilar manner, and furnished with a mirror, so that its motions about a vertical axis can be read off in the subjective manner (see art. GALVANOMETER) by means of a scale and telescope. Two varieties of the instrument were used by Weber. In one of these (A), the movable coil was suspended within the fixed coil; in the other (B), the movable coil was ring-shaped, and embraced the fixed coil, which, however, was so supported that it could be arranged either inside the movable coil or outside it at any distance and in any relative position with respect

Solenoid,

2 The reader will casily find the law for himself.

Experi-

REECTRICTRS

and Savart, and Laplace showed that it followed from their result

[BLECTROMAGNETISM.

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to it. We do not propose to go into detail respecting Weber’s experiments, but merely to indicate their general character and give some of the results.

Those desiring further information will find it in §§ 1-9 of the Llectro-dynamische Maasbestimmungen. ;

Weber first showed that the electrodynamic action between two parts of a piece of apparatus traversed by the same current varies as the square of the current. Apparatus A was arranged with the plane of its fixed coil in the magnetic meridian. The movable coil was concentric with the fixed one, but its plane was perpendicular to the magnetic meridian. The current of 1, 2, or 3 Grove's cells was sent through the fixed coil and through the suspended coil; but as the deflection with this arrangement was too great, the latter was shunted by connecting its terminals by a wire of small but known resistance, A measurement of the first power of the strength of the current was found by observing the deflection produced by the current in the fixed coil on a maghet suspended in its plane at a convenient distance north of it. After the necessary corrections were applied, the following results were obtained :-—

as the square of the distance. The fact that a circular current acts on a magnetic pole at its centre in the same way as a zig-zag cur- rent which is everywhere very nearly coincident with it, leads, when properly interpreted, to the conclusion that the force varies as sind. In this way formula (16) was originally arrived at, inde- pendently of Ampére's theory,

A great variety of instances might be given magnet on a current. The earth, for instance, acts on a circular current, hung up on Ampére's stand: the current, being movable about a vertical axis, will turn until the maximum number of the earth's lines of magnetic force pass through it—i.e., it will set with its plane perpendicular to the magnetic meridian, in such @ way that the current, looked at from the north side, goes round in the opposite direction to the hands of a watch.

A very simple way of showing the action between magnets and currents was devised by Dela Rive. Asmall plate of copper and a small plate of zinc are connected together by a wire passing through a cork and making a circuit of several turns; the cork is placed in a vessel containing dilute sulphuric acid, and floats on the surface,

n D M

MW’ Diff. 3 | 440-038 108-426 1087144 — 0282 2} 198°255 72°398 72°589 +0°191 1| 50-915 36-332 36-786

+0°454 . Ue SS eS ee

where n is the number of cells, D the electrodynamic force on

the suspended coil, expressed in an arbitrary unit, M the force on

the magnet, M’ the force on the magnet calculated from VD by”

means of a constant multiplier. The agreement between M and M’ is within the limits of experimental error.

In another series of experiments Weber used the apparatus B described above. The suspended coil was arranged with its axis in the magnetic meridian, and the fixed coil set up with its axis perpendicular to the magnetic meridian. Experiments were made with the centres of the two coils coincident, and with the ceutres in the same horizontal plane, at distances of 300, 400, 500, and 600 millimetres, the fixed coil being, in one set of experiments, east or west from the suspended coil; in another set, north or south. In the present series of experiments the strength of the current was measured hy means of a magnet acted on, not by the fixed coil, but by another coil in circuit with it. After proper corrections, the following results were arrived at :—

d P Pp Q Q’

0 22.960 22680 22960 22680

300 189°93 189°03 ja ul Tite 400 77°45 77°79 84°77 84°74 500 39°27 39°37 18°24 18°31 600 22°46 22°64 ane ie

where @ is the distance between the centres of the coils, ~~P the couple! exerted on the movable coil when the direction of that distance is perpendicular to the meridian, Q the couple when it is in the meridian. P’ and Q’ arc the values of the same couples cal~~ culated from the theory of Ampére. The agreement here again is as near as could be expected.

Weber further showed that the defleetions (v, w) of the suspended coil, calculated by means of the formule

tan v =ad-3+ pd

tan w = gad + yd-5 in the two cases where the centres of the coils were at a considerable distance apart, agreed with observation within the limits of experi- mental error. Now these formula are identical with those estab- lished by Gauss for two magnets with their axes placed like the axes of the coils. This agreement therefore is an experimental proof that the coils are replaceable by magnets.

On the whole, therefore, the experiments of Weber? confirm the theory of Ampére, as far as experiment can test it. They form, therefore, a sufficient basis for the proposition on which we founded our theory ; for this proposition leads to the same result for closed circuits as the theory of Ampbre.

The action of any current on a magnetic pole, and hence on any

ments of Magnet, may be calculated either by replacing the circuit by an Biot and equivalent shell or by means of formula (19). We have already

_ Bavart.

found this action in the particular case of an infinitely long straight current. This result was originally found experimentally by Biot

1 Reduced to a standard current st sun. strength by means of the magnet

- Fer another verification by Cazin, see Wiedemann, Galv., Bd. ii. § 44.

carrying the little circuit about with it. under the earth’s action, and’ may be chased and turned about, &.,

by amagnet, After wha’ has been already said, however, such experiments offer no new point of interest.

Electromagnetic Rotations. —It is obvious that no

tinuous rotation of a magnetized body. For, suppose an elementary magnet, whose action may be-represented by two poles of strengths + m, to describe any path and to return exactly to its former position ; either it has or has not embraced the circuit in its path; if it has not, no work has been done on either pole ; if it has embraced the circuit n times, an amount of work 4nmzi has been done on the north pole, and an amount —4nmzz on the south; on the whole, therefore, no work has been done on the magnet. As any magnetized body may be conceived to be made up of such elementary magnets, it is obvious that it is impos- sible for such a body to 1vtate continuously, doing work against friction,' &ec.

The same is obviously true if we replace the magnet by ap invariable system of electric currents.

If, however, part of the electric circuit is movable with respect to the rest, and communicates therewith by means of sliding contacts or the like, continuous rotation of part of the circuit may occur. Again, if by any artifice the magnet can be transferred every revolution from one side of the current to the other, continuous rotation of the magnet may result. Lastly, if the direction of the current in some part of the apparatus be always reversed at a certain stage of the revolution, continuous motion may ensue.

Rotations of the first and second class were first dis- covered by Faraday, and the ground principle of most of the pieces of apparatus used in demonstrating them is that originally used by him.

One of the simplest cases is the rotation under the action of the vertical component of the earth's magnetic force. Let ABC (fig. 39) be a horizontal circular condne- tor, OP a conductor pivoted at O, having sliding contact at P with ABC. Let a current z enter ABC at A, and leave it at P, flowing through PO to O and thence to the battery again. The magnetic force at any element dr of OP is perpendicular to OP and to the plane of ABC, hence the electro- magnetic force on the element will be in the plane of ABC, in the direction of the arrow p,* and will be equal to – iRdr (R= vertical component of earth's Fig. 39. force). Hence the moment about O of the forces acting on OP is

A

B

/iRrdr, i.e. $OP?Ri, which is independent of the position of OP.

OP will therefore rotate about O, with an angular velocity which will go on increasing until the work lost by friction, &c., during each revolution is equal to rOP?R¢.

in a i ei ee

3 Maxwell, vol. i., §§ 486 and 491. 4 We are here supposed to be in southern latitudes,

Such a circuit will set

that the force exerted by an element of the current varies inversely ”

of the ‘action of a Earth’s

action, a

De la Rive’s floating battery.

On rota-

‘invariable system of electric currents can produce con- tious in

general,

Fara- day’s ap- paratus,

‘Rotation

~ and NP=D,

_. dicular to NP and PQ,

appara. tus,

ELECTROMAGNETIS©M. | ‘ Amptre has given a general theory of the rotation of a circuit under

5 J »— . . .

the action of a magnet. Let AB (fig. 40) be any circuit, which we may suppose. connected with the axis of the mag- net, but free to rotate about it.- We suppose the magnet replaced by quanti- ties +m of.magnetism at its poles.. Take the axis of the magnet for axis of 2, and the: other axes as in the figure, O being the centre of the magnet, and let ON=OS=c. Let PQ be any are ds of AB, and let the coordinates of P be x, ¥, 2; then if 2, m, m be the direction cosines of NP, we have Di=x, Dm=y, Drn=z-e; also the direction cosines of Pp,. which is perpen-

Fig. 40.

dy dz force exerted by the pole N on P, are { 1 FD

and is the direction of the +sinQPK, &c. Hence by formula (6) the components of the force acting on PQ are

mf dy png

Hence, if K denote the moment of these forces about OZ, we have

from the north pole alone 1) 2 (nt mit) y}.

dz. = me. ids, &e. –

. » fds dz K=imi pe (e

If we substitute the values of J, m, n this reduces to

K =mi as 5 (“5 °)—_mé yan. If therefore B,, a, By, a» denote the angles BNZ, ANZ, BSZ, ASZ, we have, adding the results from both poles, K=mi (cos B, — cos a ~ cos By + C08 ag) (21).

It follows from this remarkable formula that the couple K tending to turn a part AB of an electric circuit about the axis of a magnet depends merely on

the position of the ends A and B.

In particular, ‘if A coincide with B, ie. if AB form a closed circuit, or if A and B both lie on parts of the axis not included between N and S,! the couple will be nil, and there will be no rotation.

The application of this formula to cases where there are sliding contacts at A and B not lying on the axis presents no difficulty ; we leave it to the reader.

Several of these rotations may be exhibited by means of the apparatus represented in figure 41. ABC is a horizontal coil of wire

Fig. 41.

1 We might consider what would happen if A or B lay on NS, but

the case never arises in practice, for all m i é rises ets h i (see on this subject Wiedemann, Bd. ii, $119). | edmaauae

ERE‘ CerRL CL T Y

terminating at the binding screws a,b. FG is a ring-shaped trongh of mercury for the sliding contacts. A wire connects the mercury with the binding screw d. DE is an upright support screwed into a metal base D in connection with the binding screw c, and ter- minating above in a mercury cup E. When required, DE can be replaced by the shorter supports D’E’ and D”E”. HLK is a support for a screw L, which carries an adjustible centre.

1. Poise in the cup E the wire stirrup MN, so that the ends just dip in the. mercury trough. Then, if a strong current be sent from c tod, MN will rotate (in northern latitudes) in a direction opposite to the hands of a watch. .

2. If we fix a vertical magnet ns” to DE by means of a clip at Y, then the rotation will take place with a weaker current in the same direction as before, if the north pole of the magnet be upwards (as shown in figure), but in the opposite direction if the magnet be reversed.

3. Reversing the current alone in either of the last two cases causes the direction of rotation to be reversed.

4, The magnet may be removéd and a current sent from a to } round ABC in the direction opposite to the hands of a watch. The result is the same as for the magnet with its north pole upwards. If the current in ABC is reversed, the rotation is reversed; and so on.

5. The support D’E’ with the two magnets ns, n’s’ may be screwed into D instead of DE, the wire P now dipping into the mercury. If the current be sent from ¢ to d, the vertical current in D’E’ will act on s and s’, and cause the magnet to rotate in the direction of the hands of a watch. This rotation is reversed if the current go from d to 6.

6. We may consider any magnet of finite size as made up of a series of magnets like ms and n’s’ arranged about an axis. ence, if we replace D’E’ and the magnets D’E” by the single magnet supported by means of the pivot L”, there will still be rotation.

Figure 42 represents a very elegant piece of apparatus devised by Faraday, to show the ro- tation at once of a magnet and of a movable conductor. The rotating pieces are the magnet sn, which is tied to the copper peg at the bottom of G by means of a piece of string, and swims round the vertical current buoyed up by the mercury in G, and the wire DE, which is hinged to D by a thin flexible wire, and

E swims round the pole of rl Zz AA ‘4 WEISS QR TR the vertical magnet 7’s’. 7 ee I. C[WUGQiie

Another apparatus in- ; vented by Balbe, and Fig. 42. known by the name of Barlow’s wheel, is represented in figure 43. A current is caused to pass from the mercury trough C along the radius of the disc A through the field of magnetic force due to tho

Fig. 43.

horse-shoe magnet NO. The result is that the wheel rotates in the direction indicated by the arrow.

Fluid conductors may also be caused to rotate under Fluid ro- We mentioned in our historical tations.

the action of a magnet. sketch the experiment by which Davy demonstrated this rotation in the case of mercury. A variety of such experi- ments have been since devised. The following is a simple one. Fill a small cylindrical copper vessel with dilute sulphuric acid and set it upon the north pole of a power- ful electromagnet. If a thick zine wire be connected by a piece of copper wire to the copper vessel, and then im- mersed in the acid so as to be in the axis of the vessel, a current is set up in the liquid which flows radially from the zinc to the copper across the lines of force. The VIIL — 10

Action of magnet on elec- tric dis- charge.

Rotation of elec- tric dis- charge.

Pliick- er’s

experi- ments.

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liquid therefore rotates in the direction of the hands of a watch,

Magnetic Action on the Electric Discharge in Gases.—A large number of very interesting results have been obtained concerning the behaviour of the electric discharge In a field of magnetic force. We can only make a brief allu- sion to the matter here. The key to the phenomena lies in the remark that the electric discharge in vacuum tubes may be regarded as an electric current in a very flexible elastic conductor. It is clear that such a conductor would be an equilibrium if it lay in a line of magnetic force passing through both its fixed ends. Again, if the flexible conductor be constrained to remain on a given surface, it will not be in equilibrium until it has so arranged itself that the resultant electromagnetic force at each point is perpendicular to the surface. At each point, therefore, the magnetic force must be tangential to the surface.

A perfectly flexible but inextensible conductor, two points of which are fixed, will take such a form that the electromagnetic force at each point is balanced by the tension. Le Roux fastened a thin platinum wire to two stout copper terminals, and caused it to glow by passing a current through it. When the terminals were placed equatorially between the fiat poles of an electromag- net, the wire bent into the form of a circular are joining

the terminals. When the terminals were placed axially,

it assumed a helical form. Stokes, Proc. R. S., 1875.) The behaviour of the light emanating from the positive pole may be explained in general as lying between the two cases which we have just discussed. One of the most remarkable of these phenomena is the rotation of the discharge discovered by Walker, and much experimented on by De la Rive. This may be exhibited by means of the apparatus shown in fig. 44, consisting essentially of an exhausted vessel, one of the electrodes in which is ring-shaped; a bar of soft iron, covered with some insulating material, is passed through the ring and fixed to the stand. When this apparatus is placed on the pole of a powerful magnet, the discharge ro- tates as a wire hinged to the upper elec- trode would do. Fig. 44. Owing to the distinct character of the negative light, the action of the magnet on it is different from that on the positive light. Pliicker found that the general character of the phenomena may be thus described :— The negative light is bounded by magnetic curves that issue from the electrode and cut the walls of the tube. The two diagrams in fig. 45 will convey an idea of the

(See also Spottiswoode and

Fig. 45. appearance of the phenomenon. Although much tempted

1 Loci having this property were called by Pliicker epipolic curves.

to follow the subject further, we must be content to refer the reader to the interesting papers of Plicker? and Hittorf.3 An excellent summary will be

found in Wiede- mann.

Ampere’s Method.—Before quitting the subject of Am-

electromagnetism, it will be useful, for the sake of com- pee parison, to give a brief sketch of the method of Ampere, °°

or rather of that modification of the original method now commonly found in Continental books, which was suggested by Ampére himself, in a note to the Théorie des Phéno- menes Electrodynamiques, Ampere starts with the idea that the electrodynamic action of two circuits is the sum of the actions at a distance between every pair of their elements. He supposes, as the simplest and most natural assumption, that the force between two elements is in the line joining them. Besides this assumption, his theory rests on four ex- periments. The first of these shows that, when a wire is doubled on itself, the electrodynamic action of any current in it is nil, ‘The second experiment shows that this is also true, even if one of the halves of the wire be bent or twisted in any way, so as never to be far removed from the other. The third experiment proves that the action of any closed circuit on an element of another circuit is perpendicular to the element. In the fourth experiment it is shown that the force between two conductors remains the same when all the lines in the system are increased in the same ratio, the currents remaining the same. From the assumption, together with the first experiment, it fol- lows that the force between two elements is proportional to the product of the lengths of the elements, multiplied by the product of the strengths of the currents and by some function of the mutual distance and of the angles which determine their relative position. Hence it may be shown, from the fourth experiment, that the force between the elements must vary inversely as the square of the distance between them. ‘The second experiment shows that we may replace any element of a circuit by the projections of the element va three rectangular axes. From these results it is found that the force between ds and de must be Aii’dsde D2 The constant & is then determined from the result of the

(cos « — k cos 6 cos 6’).

ry.

third experiment ; and it is found that & must be equal

to 2. The formula is thus completely determined, with the exception of A, which depends on the unit of current which is chosen. ‘The action of a closed circuit on an element is then calculated, and a vector found, which Ampere calls the “ directrix,” from which this action can be found in exactly the same way as we derived this same action from the magnetic induction. The theory is then applied to small plane circuits, solenoids, and so on.

As was remarked in the historical sketch, a variety of other elementary laws may be substituted for that of Ampére, all of which lead to the same result for closed circuits.

Maxwell has presented Ampére’s theory in a more general form, in which the assumption about the direction of the elementary action is not made. Neglecting couples, he finds for the most general form of the components’ of the force exerted by do on ds,

1 /dD dD d2D\ ., dQ’ .., Rape (Rae? dae) Waste + Dasa date in the direction of D, and S= -—~W’dsdo ? S= 5 1t’dsdo da ds

‘in the direction of ds and de respectively.

2 Pogg. Ann., ciii., civ., cv., evii., cxiii., 1858, &e. 3 Pogg. Ann., cxxxvi., 1869.

4 Details respecting these experiments, and other matter connected

General: ization of theory.

Aetion of

ELECTROMAGNETIC INDUCTION. |

In these expressions Q is a function to be determined only by further assumption. Q= constant gives Ampére’s

formula; Q= — = gives the formula of Grassmann, and

so on. We may in fact construct an infinite variety of different elementary formula. The reader interested in this subject may consult Wiedemann, Bd. ii. §§ 26, 27, 45-54, &c., and Tait, Proc. R.S.E., 1873.

In our account of the magnetic action of electric cur-

soft iron. rents no mention has been made of the effect of the proxi-

Fara- A brief account has already been given (see Historical | wards, the positive direction te Sketch, p. 11) of Faraday's discovery! of the induction of | round' is ADCB, and the wes of electric currents. The results he arrived at may be summed | number of lines of foree Fic. 47 Be | through it is ZAB.BC. If a hs up as follows. 8: tion. : bea é BC shde on DC and AB parallel to itself through a small distance Let there be two linear cireuits, ABKE (the primary) and CDG | Bp' in time +, Z. AB.BC increases by Z.CB.BB'; hence the elec- 5 pence) by portions of which, AB and OD, are parallel, tromotive force is Z.BC.BB'-7, and acts in the direction ABCD. wee Bear Cae CCRC, : : If v be the velocity of BC, we may write for the electromotive force I. When a current is started in AB, a transient current flows | 7 Bo.y, That is, the electromotive force at any instant is propor- through CD in the opposite direction to the current in AB; when! tional to the velocit the current in AB is steady, no current in CD can be detected ; a 2 owe when the eurrentin AB is stopped, a transient eurrent flows through The law of Faraday leads to a complete determination CD in the same direction as the current in AB. These currents in | of the induced current in all cases. We may regard it as CD are said to be induced, and may be called inverse and direct resting on the experiments of Faraday, and of those who currents respectively, the reference being to the direction of the foll a A eat his It 7 primary. Both inverse and direct currents last for a very: short | *SROWSS CHE fee resins : time, and the quantity of electricity which passes in each of them Another view of the matter of great importance Was Theory of is the same. enunciated independently and about the same time by Helm- If. If the circuit AB, in which a steady current is flowing, be | Helmholtz? and Sir William Thomson.4 holtz and eaused to approach CD, an inverse current is thereby indueed in — e rhe , : . Thom- CD; when the circuit AB, under similar circumstances, recedes Let a circuit carrying a current © move In an invariable Ma8- gon. from OD, a direct current is

induced in CD. We have already | Detic field, so that the number of lines of magnetic foree passing mentioned that when AB is at rest, and the current in it does not | thTough it is increased by dN, then the work * done by the electro- vary, there is no current inCD. AB has been supposed to approach | Magnetic forces on the cireuit is by Ampére’s theory idN ; also, if and recede from CD, but the same statement applies when CD = be ag ea “y ~ a _——* ee — ae» approaches and recedes from AB. ime dt. Now i e the electromotive force of the battery whic III. When a magnet is magnetized or demagnetized in the | Malntains the current 7, the whole energy supplied is Eidé; hence neighbourhood of a cireuit, or approaches or recedes from the eir. | We Must have ; mae ae cuit, the effect is the same as if an equivalent? current approached si a wath or receded from the circuit. For example, imagine a small circular — as _. : ‘ : andt={ E _ . (28). cireuit placed horizontally, and a vertical bar magnet lowered in dt] BR the axis of the circuit with its north pole pointing down upon the ‘ : aN , : — cireuit, the magnet may be replaced by a series of coaxial cireular | Hence there is an electromotive force – qj i the moving circuit. currents (see above, p. 71), and the motion will induce a current aN F , passing round the circuit against the hands of a watch. Now 7 is the rate of increase of the number of lines of foree pass Faraday showed how the direction of the induced current | ing through the circuit. can be predicted when the variation of the magnetic field We have therefore deduced the law stated above from or the motion of the conductor in it is known, and he gave, | Ampére’s theory and the principle of the conservation of in his own manner, indications how the magnitude of the energy ; at least we have done so for the case of induction current could be inferred. by permanent magnets, and the same reasoning will also fax. Maxwell has thrown the law of Faraday into the follow- | apply to the case where the alteration of the magnetic field, ‘ell’s ing form — The total electromotive force acting round a owing to the induced current in the primary circuit, is so pee circuit at any instant is measured by the rate of decrease | small that it may be neglected.

mity of soft iron. Under the magnetic action of the electric cireuit soft iron is magnetized inductively. The distribution of the lines of force is in general greatly affected thereby. The general feature of the phenomenon is a concentration of the lines upon the iron. By the proper use of this effect electromagnetic forces of great power may be developed. It is not easy to

give a mathe- matically aecurate account of the action, owing to our ignorance of the exact law of magnetic induction in power- fully paramagnetic bodies. The discussion of this subject, however, belongs to Magnetism (which see).

The Induction of Electric Currents.

of the number of lines of magnetic force which pass through it.”

EERE CPWRIC IT Y

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circuit, together with the number of lines of magnetic force which pass through the circuit, is a constant quantity.”

For “number of lines of force” may of course be sub- stituted the equivalent expressions, “ induction through the circuit,” or “surface integral of magnetic induction,” taken over any surface bounded by the circuit.

Some care must be taken in determining the positive direction round the circuit. The following is a correct process :—Assume one direction (D, fig. Rr 46) through the circuit as positive, then the positive direction round ® is deter- mined by the right-handed screw rela- tion; if the number of lines of force reckoned positive in direction D is de- Fig. 46, creasing, then the electromotive force is in direction R; if that number is increasing, the electromotive force is in the opposite direction.

This will be clearer if we consider the following simple example. Let ABCD (fig. 47) be a horizontal reetangular circuit (AB next the reader). In a northern lati- tude, the vertical component Z of the earth’s magnetic force is downwards; if, therefore, the positive direction through the circuit be taken down-

We have now the means of stating in a convenient form Electro- It is the magnetie

the electromagnetic unit of electromotive force.

electromotive force of induction in a circuit the number of it of 4 : : et ; electro- lines of magnetic force through which is increasing at motive

the rate of one per second. force. 3 Ueber die Erhaltung der Kraft, 1847.

4 Rep. Brit. Ass., 1848, and Phil. Mag., 1851.

> All the quantities are supposed to be measured in electromagnetic absolute units.

§ We may suppose this work spent in raising a weight, Ke,

_ Or, integrating with respect to the time :—“The time Integral of the total electromotive force acting round any

2 a with Ampére’s theory, may be found in Maxwell, vol. ii. § 502, &c., and in almost any Continental work on experimental physics.

1 Hzp. Res., ser. i, ii., (ix.), xxviii., xxix., 1831-32, 1851. The general statement in the text is given for the reader’s convenienee, and is not meant to be historieal.

Equivalent in the sense of produeing the same magnetie field.

Electro- kinetic energy.

76 Hired T ® 1 Ome

In the case where the field is due to a current 7’, we have by formule (4) and (14) of last division NEw 28). = = = (24),

© dsdo extended all over the two

where M now stands for circuits. M, which depends merely on the configuration and relative position of the two circuits, is called the coefficient of mutual in- duction. ;

An application of the principle of the conservation of energy of great importance was made by Sir William Thomson to the case of two electric

circuits of any form,

Theory of +, which the currents are kept constant.

Thom- son.

Case of two cir- cuits.

Let two such circuits, the currents in which are ii’, be displaced so that the coefficient of mutual induction M increases by dM. Let us suppose that the currents 4 and 7’ are maintained by two constant batteries of electromotive forces E and E’, and that the motion takes place so slowly that the currents may be regarded as constant throughout. If R and R’ be the resistances of the circuits, Hdd the mechanical equivalent of the whole heat generated, and Kd the whole expenditure of chemical energy in the batteries in time dt,

H=R2+R72, and K=Hi+ E’”, K ~~H=<«E~~ Ri) + ({E- R77).

Now, applying (23), , : a

an ee TDP a TN &

Ri=E-7 TE and R% 4 a

whence

or, a8 we may write it,

(K-Hidt=2dM . . . . (25). Now ivdM is the work done by the electromagnetic forces during the displacement which we may suppose spent in lifting a weight.

Hence, when two electric currents are allowed slowly to approach each other, being kept constant and doing work the while, over and above the work which is spent in generating heat in the conductors, an amount of energy is drawn from the batteries equivalent to twice the work done by the electromagnetic forces.

There remains therefore an amount of work as yet unaccounted for. What becomes of it? The answer is, that the energy, or, as Sir W. Thomson calls it, the “ me- chanical value,” of the current is increased. But how increased? When a material system (and we may consider the two circuits, the batteries, the lifted weight, &c., as such) is left to itself, it moves so that its potential energy decreases. In this case, therefore, there must have been an increase of kinetic energy somewhere. This energy may be called the electrokinetic energy of the system; according to Maxwell’s theory, this kinetic energy has its seat in the medium surrounding the wire. The energy thus stored up is accounted for in the increased development of heat, &c., when the two currents are broken in succession.

Returning now to our general law of induction, let us write down in the most general form the equations which determine the course of the currents in two circuits (A, B), in which the form and relative positions of the circuits, as well as the current strengths, are variable. The number of lines of force which pass through a circuit depends partly on neighbouring circuits, partly on the circuit itself. Re- taining the notation used above, we may, in the case of two circuits, write the first part Mz’, and the second part Li; where L is a double integral of the same form as M, only both elements ds and do now belong to the same circuit. We have, therefore, for the whole number of lines of force passing through the circuit A, M:’+Li. Similarly we we for B, Mi+Nv’. We have therefore by our general

aw,

ae E – 5 (M’+L2)=Ré ila (26). E’- (Mit N)=RY

These are the general equations for the induction of two circuits, The electromotive force of induction in A can be

[uLECTROMAGNETIC INDUCTION,

divided into two parts: one of these, viz., Festa) is due

to the circuit B, the other £ (Lz) is due to the circuit A

itself, and is called the electromotive force of self-induction. Lis called the coefficient of self-induction for A. Similarly

£ (Ni) is the electromotive force, and N the coefficient

force of self-induction for B. Tf we have only one circuit then M = 0, and the equation for the course of the current is

ay… 4 1p Gy ibd) = Re ;

here there is only self-induction.

F, E. Neumann, to whom belongs the honour of first Theoryef stating with mathematical accuracy the laws of induction, Neu- adopted a foundation for his theory very different from the ie one chosen above. His method was based on the law of [enz, Lenz, enunciated very soon after the great discovery of Faraday, which lays down that, in all cases of induction by the motion of magnets or currents, the induced current has a direction such that its electromagnetic action on the inducing system tends to oppose the motion producing it.

Besides its historical importance, this law affords a very convenient guide in many practical applications of the theory of induction. ‘The reader will find no difficulty in verifying it on the elementary cases given at the beginning of this division. It can be deduced at once from our general law. Consider any circuit in which a current ais flowing, and let the direction of the current be the positive direction round the circuit. Suppose the circuit to move so that the number of lines of force passing through it increases, this is the way the circuit would tend to move under the electromagnetic forces when traversed by a current i; but the electromotive force of induction is in the negative direction round the circuit by the general law, and would therefore produce a current opposite in direction toz. The electromagnetic action on this current would be opposite to that on 7, that is, would tend to hinder the displacement.

It is a curious fact that a law exactly like this had been announced shortly before Lenz by Ritchie, only with the direction of the action 7éversed in every case.

The results of Neumann are identical with those given above. The double integral M, which is here called the co- efficient of mutual induction of two circuits, Neumann calls the mutual potential of the two circuits, and what has been called above the coefficient of self-induction of a circuit he calls the potential of the circuit on itself. Accounts of his theory will be found in Wiedemann's Galvanismus, and in most Continental works on electricity.

Experimental Verification of the Laws of Mutual Induction.

—It will be observed that, in the law of induction for linear circuits, no statement is made respecting the material or thickness of the circuit in which the electromotive force of induction acts, or of the non-conducting medium across which induction takes place.

Faraday showed that the material of the circuit has no effect." Experi- He found, for instance, that when two wires of different metals were ments by joined and twisted up together, as in fig. 48, so as to be insulated Faraday. from each other, no in-

duced current could bb *~—??°co0tuae=aase obtained by passing the s

arrangement between the Fig. 48.

poles of a powerful magnet. The same result was obtained when one of the branches of the circuit was an electrolyte. Lenz® connected two spirals of wire in circuit with each other, and placed first one then the other, on the soft iron keeper of a horse-shoc magnet; so long as the number of turnson each spiral was the same, the induced

a

1 Pogg. Ann., 1884. 2 Exp. Res., 193, &c., 1832; also 3143, &c., 1851. 3 Pogg. Ann., 1835.

current was the same, no matter what the material or thickness of the wire in each spiral. Since in this case the whole resistance of the circuit was

always the same, the electromotive force of induction must have been the same.

We conclude, therefore, that the electromotive force! of induction is independent of the material, and also of the thickness of the wire, so long as the latter is so small that we may consider the wire as a linear circuit.

Lenz made quantitative determinations of the induced current by meaus of the above arrangement.

The soft iron keeper, with a coil of » windings, was rapidly detached from the maguet, and the first swing a of a galvanometer in circuit with the coil was measured. The quantity of electricity

which passes in the induced current is measured by sin 3a, provided the whole duration of the current is small compared with the time

‘of oscillation of the galvanometer needle (see art. GALVANO-

Effect of medium.

Weber’s experi- ments,

METER). Again, when the keeper is attached to the magnet, very nearly all the lines of magnetic induction? pass through the keeper; heuce the number of lines of induction which pass through the coil is very nearly proportional to the number of windings, and therefore, if the resistance of the circuit be kept the same, the whole amount of electricity which passes will be proportional to 2. In the actual experiment the wire was wound and unwound from the keeper, so that the whole resistance did remain the same. The following is a set of Lenz’s results :—%

aca nEEEREREnrnny emer

No.of Windings. 2 4 8 12 16 20 sin da 0°0491 | 0°1045 | 0°2156 | 0-3319 | 0°4470 | 0°5594

OO | OO LL |

Sin ja+m | 0°0245 | 0-0261 | 0-0270 | 0:0276 | 0-0279 | 0-0280

The value of sin4a+m is very nearly constant. It increases a little as the number of windings increases, as ought to be the case, for, although most of the lines of induction pass through the keeper,

yet all do not, and a few more are included when the number of

turns is increased.

Faraday made special investigations in search of the efect of the medium across which induction is exerted. He found* that no effect on the integral current was pro- duced by inserting shellac, sulphur, copper, &c. between the primary and secondary coils. The insertion of iron or any strongly magnetic body, of course, produces an effect, because the distribution of the lines of magnetic force is thereby altered, and therefore, by our general law, the electromutive force of induction will be correspondingly affected. We conclude, therefore, that the electromotive force of induction is independent of the medium across which it is exerted.5

It must be remarked, however, that in the case of con- ducting media, the statement is subject to a certain limita- tion, the nature of which follows from the law of induction itself. For there will be induced currents in the interven. ing medium if it be a conductor, and these currents will disturb the lines of force while they continue to flow. These currents are transient, however, so that their integral effect on the number of lines of force passing through the secondary is zero. It is obvious, therefore, that, if we replace “ electromotive force” by “ time integral of electro- tive force extended over the whole time that the induction currents last,” the statement will still be true. The only effect, therefore, of interposed conducting media is on the tvme which the induced currents take to rise and fall.

Weber® applied his electrodynamometer to test the laws of induction.

The suspended coil was caused to oscillate when there was no current either in it or in the fixed coil, and the logarithmic decre-

! Of course, the same is not true of the current of induction, which depends on the resistance of the cireuit, >In Maxwell’s sense; we might say

Faraday’s sense ; see art. MAGNETISM. 3 Wiedemann, Bad. ii. § 706. 4 Exp. Res., 1709, &e., 1838. ° Other investigators have sought for such effects, and some have affirmed their existence; but there is no body of concurrent testimony ou the point. 5 Maasbestimm., $10 and SAG:

“‘lines of magnetic force” in

Ee tarivrt fT x

ment’ of its oscillations carefully determined. This decrement, due to the friction of the air, &c., was found to be constant for different lengths of the are of oscillation. coil were next connected so that constant current was sent through the fixed coil. rents were now generated in the suspended coil, whose electrody- namic action coustantly opposed its motion. logarithmic decrement was still constant, but greater than before. Weber therefore concluded that the induced current at each instant was proportional to the velocity of the coil. Since the resistance does not vary, this is in accordance with the general law.

7

The terminals of the suspended it formed a closed circuit, and a Induction cur-

It was found that the

Weber further showed that the induced current is the same

whether it is produced by a current in the fixed coil or by a magnet, which exercises the same electromagnetic action as that current on the suspended coil, when the latter is traversed by a current of unit strength.

The electrodynamometer may also be used to demonstrate the

equality of the whole amounts of electricity which pass in the direct and inverse currents. secondary coil whose primary is being ‘“‘made and

broken” be passed through both coils of the instrument, there will be a detlec-

If the induced currents from a

tion, since the action depends on the square of the current; but if the induced current be sent through the suspended coil alone, and

a constant current be sent through the fixed coil, there will be no

deflection, which shows that the quantities of electricity passing in

the alternate currents of the secondary coil are equal and of opposite sign.

Felici (1852 and 1859) made an extended series of Felici, experiments on the laws of induction. He used null methods, and his experiments bear a resemblance in some respects to the electrodynamical experiments of Ampere. Maxwell® has given a summary of Felici’s results,

It is found, for instance, that the electromotive force of induc- tion of a circuit A on another B is independent of the material or section of the conductors, that it is proportional to the current in A and to the number of windings in B. The induction of A on B is the same as that of Bon A, when the inducing current ¢ is the samme in both cases. Any portion of A or B may be replaced by a zig-zag portion, which nowhere deviates far from it. In pairs of circuits geometrically similar, the electromotive force of induction is proportional to the linear dimensions, and so on.

If B be so situated with respect to A that starting or stopping a current in A produccs no induced current in B, Bis said to be con- Jugate to A. There are an infinite number of such coujugate posi- tions of B ; and Felici shows that, if B be moved from one of these P, into another P, very quickly, no effect is produced on the gal- vanometer. If B be moved from P, to any position P (not a con- jugate position), the effect on the galvanometer is the same as if the current ¢ were suddenly started in A, B being in the position P.

All these results are direct consequences of our general law, and indeed might be used as a foundation for it.9

In his later researches on electromagnetic induction Fara- (series xxvii. and xxix,), Faraday develops in consider- day's ex.

| able detail his ideas on the connection between the lines Ploring

of magnetic force and the induced current, and gives in- me, a creased precision to the experimental methods that flow therefrom. He points out the great value of methods, such as the use of iron filings, for exhibiting in a visible form the course of the lines of magnetic force. He also insists on the great use ofa small moving circuit, which can be used to explore the magnetic field under circumstances which render the application of other methods impossible.

The direction of a line of force may be determined in various ways by means of the moving conductor. Maxwell20 gives four such ways :—(1) if a conductor be moved along a line of force parallel to itself, it will experience no electromotive force ; (2) if a conductor calrying a current be free to move along a line of force, it will show no tendency to do so; (8) if a linear conductor coincide with a line of force and be moved parallel to itself in any direction, it will experience no electromotive force in the direction of its length ; (4) if a linear conductor carrying an electric current coincide in direction with a line of magnetic induction, it will not experience any mechanical force.

In these rescarches Faraday treats at eonsiderable length Unipolar a case of the induction of electric currents, to which Conti- induc- nental writers have given the somewhat mysterious name tion. of "unipolar induction." It belongs to a class of cases on

se

7 See art. GALVANOMETSR. 8 Vol. ii. § 586; see also Wiedemann, Bd. ii. § 709. ® See Maxwell, Zc. 10 Vol. ii. § 597.

which they have rightly dwelt as being in a sense the reverse of the electromagnetic rotations. The following theory of the phenomenon will make this clearer : —

Referring back to figure 40, let AB be part of a conducting cir- cuit arranged as there described, and let it be caused to move in the direction Pp. ‘Then if EK be the electromotive force in the circuit in the direction AB, N the number of lines of force passing through the circuit, @ the angle through which AB moves (from X to Y). about OZ, we have, by our general law,

en ~~ dt do dt taN Now, by Ampére’s theory, K= G5 » hence (p. 73) __Kd¢g ~ § @&

de (97).

= —m (cos B, — COS ay— COS By + COS ay)

Tience, if the conductor AB be caused to move with given angular velocity about the magnet SN, in that direction which it would take under the action of the magnet if it carried a current 7, then there will be an electromotive force of induction along the circuit of which AB forms part, whose direction is opposite to that of 7, and whose magni- tude is found by dividing the couple acting on AB (when traversed by 7) by z, and multiplying it by the given angu- lar velocity. This result is a beautiful instance of the law of Lenz.

A great variety of experimental arrangements may be imagined to realize the case thus described. Every appa- ratus devised to produce an electromagnetic rotation may be used to illustrate it.

The following case may be taken as typical. SN (fig. 49) isa bar magnet whose action may be represented by two poles, N and 8. At the middle point of its axis is fixed a disc BA, against which presses the terminal of a wire CA in metallic connection with the axis N through the pivot at S. If CA be caused to ‘ rotate in the direction of the arrow 2, the disc : standing still, there will be an induced current ‘, in CABC in the direction of the arrow g. If at CA and the dise revolve together, there will : be no current. If

CA stand still, and the disc rotate in the direction of the arrow, there will be a current in the opposite direction; for this is clearly the same as if the disc stood still, and CA rotated in the opposite direction.1 The electromotive force in each case is indepen- dent of the form of CA, andis given by 2m(1 —cosa)w, where m is the strength of the pole N, a the angle ANB, and » the angular velocity.

It is well to remind the reader that the lines of force are closed curves, every one of which passes up the axis of the magnet from 8 to N, and back through the outside medium to S. If this be for- gotten, and an attempt be made to determine the electromotive force of induction by considering the motion of the disc, an error will easily be made. If we take the simpler course above, and comer the motion of the conductor, there is then no. danger of mistake. <

Cc Fig. 49.

Coils In most of the experiments we have hitherto been de- with iron scribing, the object has been to obtain indications of the core. — direction of the currents of induction, or to measure the electromotive force of induction under definite circum- stances ; if, however, we desire to exhibit the effects of induction in a striking manner, in order to convey belief to the spectator, or to serve some practical purpose, recourse is had to a different kind of apparatus. We may wind our primary and secondary coils on bobbins, and insert the former within the latter, so as to get the greatest possible

1 Tf the reader wish for a proximate rule for the direction of the electromotive force of induction, the following will serve. Stand with the body in the line of magnetic force with the head pointing in the positive direction, look im the direction in which the part of the

circuit on which the feet are is moving ; the E. M. F. along the circuit is towards the right hand.

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number of turns of wire into proximity. The number of turns on the primary is usually made small, in order that the current in it may not be weakened by a large resist- ance, and that its coefficient of self-induction (see below) may be small. Mention has already been made of the effect of soft iron in increasing the number of lines of force that pass through a circuit. It is easy to see that it will produce a corresponding effect in strengthening induction. The precise amount of it is very hard to calculate, owing to the irregularities in the magnetization and demagnetiza- tion that arise from residual magnetism. The question ‘belongs, however, to magnetism. The effect can be de- monstrated practically by observing the alteration in the inductive action produced by inserting a bundle of iron wires? into our primary coil.

The physiological effects of induced currents are very Physio-

striking ; indeed, the nerve and muscle preparation of the logical physiologist affords a very delicate method for detecting olfecias them. If the human body form part of the circuit of the secondary coil of such an induction apparatus as we have just indicated, and the primary current be stopped and started in rapid succession, say by stripping one terminal of the circuit on a toothed wheel attached to the other, a sensation is experienced which, with a moderately powerful apparatus furnished with a core, is so painful and peculiar that the patient is not likely to forget either it or its cause. The tetanic muscular contractions produced in this way have formed the subject of much physiological investiga- tion, of which an account will be found in the proper place (see article PaysioLoGy).

The flat spirals of Henry, formed of flat bands of copper insulated from each other with silk ribbon, are also very convenient for demonstrating the existence of induced currents.

The most powerful inductive apparatus for furnishing large quantities of electricity are the various magneto- electric machines which have now been brought to great perfection (see Historical Sketch).

By means of these and similar appliances, all the effects of the electric current and the electric discharge may be shown in the greatest perfection.

Induction by Discharge of Statical Hlectricity.—The Indue- phenomena of induction can be exhibited with the tran- tion by sient current of electricity in the discharge of a Leyden jar — or other accumulator of statical electricity. There is a charge. difficulty in exhibiting the effect, owing to the great differ- ences of potential between different parts of the circuit, which render the application of a coil of silk-covered wire useless. A common way of getting over the difficulty consists in cutting two spiral grooves in two flat ebonite dises. Wires are embedded in these, and they are then put together with a thin plate of glass between, so that the spirals are opposite each other. When a jar is discharged through one spiral, an induction current passes in the other, and may be indicated by a galvanometer, or, better still, by a frog preparation. The induced current is, however, in general a complicated phenomenon, owing to the oscillatory nature of the discharge (see above, p. 65).

It would lead us too far to go into these and kindred subjects : the reader who desires to pursue the matter will find excellent accounts in Mascart, t. ii. §§ 611-825, and Riess, Bd. ii. §§ 780-906. Particularly interesting are the researches of Verdet, an account of which will be found in his works, along with many indications of what others have done in the same field.

Induced Currents of Higher Orders.—Induced currents may in their turn induce other currents, and these again

- The iron is broken up into wires to prevent the formation of in- duced currents in the body of the metal. These currents retard the rise of the induced currents.

Induced others, and so on.1 This can be brought about by forming | inductive effects are obviously heightened when the cur- currents part of the

secondary circuit of one inductive apparatus | rent is wound into a spiral form ; if, however, the spiral = — into the primary of the next, and so on. As may be | were wound double, and the current sent through the two orders,

supposed, the successive induced currents diminish very rapidly in strength, and require special means for their detection. But the phenomenon also goes on increas- ing in complicacy. Suppose we start the current in the first primary, there is a single inverse current of the “first order” which rises and then falls; there will, there- fore, be two currents of the “ second order ”— first a direct, then an inverse; each of these rising and falling causes two currents of the third order, and so on in geometric progression. These currents have been detected in certain cases by means of their physiological action and their mag- netizing powers. The latter effects present some points of interest in connection with magnetism, but we cannot spare space for the matter here. Self-Induction.—The existence of self-induction has been deduced as a theoretical consequence of the general law of induction. It was not so discovered, however. It was first arrived at by Faraday? from experimental considera-

wires in opposite directions, the inductive effects would annul each other, and, in fact, with this arrangement the spark and shock are extremely small.

Faraday demonstrated the existence of these electromo- His ex. tive forces by means of the currents which they produce peri- in derived circuits? when the battery contact is broken ™ents.

or made.

He used the arrangement given in figure 50. A galvanometer was inserted at G, and the needle stopped by pins properly placed

from deviating as urged by the branch of the battery current from

B to F, but left free to move in the opposite direction. It was found that the needle deviated sharply he

Jenkin’s tions, The observation from which he started was the self-induction, cause a single eell to produce decomposition of water a following fact communicated to him by Mr Jenkin, who had and evolution of gas, which it could not do alone consistently with “shortly before discovered it :—Although it is impossible | the conservation of energy. This may be managed‘ by inserting at with a short circuit of wire and a single battery cell to | A (fig. 50), instead of the contact breaker, the coil of an electro- obtain a shock by makin g and breaking contact, yet a very magnet, and placing the decomposing cell in DE. Let contact be ful shock is obtained if the coil of an electrom ‘ made and broken at G (say by an automatic break); when the con- powertu ; iis toa ie agnet | tact is made the current flows through the coil and through BF, be included in the circuit. This may when it is broken the electromotive force of induction added to be shown thus :—Let ZC (fig. 50) be that of the battery enables the current to pass through the cell and a battery of a single cell, CABDEF a liberate the ions. At the make there is no such effect; there iroutt: wtih & ecacd branch BF in which results therefore continued chemical decomposition. bd at G the human body, &c., may be in- Edlund® investigated the integral electromotive forces of Edlund’s serted. Contacts can be made and self-induction at the opening and closing of a circuit, and measure- broken at A, very rapidly if need be, by showed that they are equal. His experimental arrangement Anon of means of a toothed wheel. When BDEF is very ingenious :— current. consists of a short single wire, nothing G (fig. 51) is a differential galvanometer, A a coil whose self-in- particular is felt at G, but when the coil duction is to be examined, C a wire wound in a zig-zag® so as to of an electromagnet is inserted in DE, . have no self-induction. The battery the patient at G experiences a series of Hy a6. E is connected at B and D with the ere ble: hex thar cbtaiwed) £ th circuit composed of G, A, and C, so rer 6 sie compatamie be- Tel. © arren 10nd © {that the currents in BedCD and secondary coil of an inductive apparatus in the manner | BiaAD pass round the coils of G in already described. opposite directions. The resistance C i If the cross circuit be done away with, a powerful spark Pe Renee ee – a | yh a ’g ‘ e . : 10n e ne € . oat: 1s obtained at A on breaking contact, but none on making. current be stopped by breaking the eae This spark is particularly bright if a mercury contact be | circuit EB at K, the electromotive force

used, owing to the combustion of the mercury. If, how- ever, the electromagnet be removed from DX, and a short wire substituted, the spark becomes quite insignificant, al- though the whole circuit may be now very hot, owing to the increased current. Faraday found that the same effect, ouly smaller, was produced when a simple helix without a

‘ core was substituted for the electromagnet ; and a similar

effect, only still smaller, was obtained when a very long straight wire was used. Faraday soon recognized that these effects are consequences of the laws at which he had arrived in his first series of researches on induction. When the current is rising in a circuit, the number of lines of magnetic force passing through it is on the increase, hence an electromotive force is generated which opposes that of the battery, and causes the current to rise slowly ; again, when the current begins to decrease the number of lines of force begins to decrease, and an electromotive force of induction is called forth which tends to prolong the current. We have, therefore, a weakening of the electromotive force at starting and an exaltation at stop- ping, which accounts for the absence of the spark or shock at make, and the presence of one or other at break. Such

1 Some physicists have called these currents induced currents of the second and third orders, &c. * Exp. Res., 1048, &c., 1834.

is applied even when there is no alternative circuit. rents are then the defect or excess of the currents at the make and break, considered with reference to the steady current.

due to the self-induction of A causes an extra current to flow round the circuit AabBcdCD, traversing the coils of Gin the samme direction. We there- fore get a deflection D,. In a similar manner if we make coutact at K we get another deflection D,, due to the starting of the current in A. There is no difficulty in showing that, if E,, E, be the time intégrals of the electro- motive force in the two cases, then

Fig. 51.

One of the difficulties encountered in such experiments is the increase of the electromotive force of the battery E when it is left open for a time; this causes the extra cur- rent at make to be greater than that at break. Rijke, who made experiments similar to those of Edlund, avoids this difficulty by circuiting the battery, when BK is broken,

3 These currents are sometimes called extra currents, and the name The extra cur-

4 De la Rive, Wiedemann, Bd. ii. § 740. 5 Pogg. Ann., 1849. 6 The best arrangement would be to use insulated wire and double

it on itself.

Max- well's method.

80

through a resistance equal to the effective resistance from Eto K. Further details concerning the method and results of these experiments may be found in Wiedemann, Bd. ii. § 744, &e. A very convenient method for exhibiting and measuring the extra current is obtained by using a Wheatstone's bridge instead of a differential galvanometer. Let the bridge be balanced as usual, so that when the battery circuit is made, and the galvanometer circuit made after- wards, there is no deflection. If one of the resistances be wound so as to have a large coefficient of self-induction, and the galvanometer circuit be completed before the battery is thrown on, then, owing to the self-induction, the galvanometer needle will be suddenly deflected.

Let AC, CD, DB, BA be four conductors of resistance S, Q, P, R, arranged as a Wheatstone's bridge (see fig. 22), with a battery be- tween A and D, and a galvanometer G between B and C. Let L be the coefficient of self-induction of the coil S. Then, A, C, &c., denoting the potentials at A, C, &c., x and y the currents in AC and AB, and z the current in G, we have

d A-C=Sy+Lq, A-B=Re, C-D=Qy+2),

&c. Eliminating, as in Maxwell, vol. i. p. 399, or above, p. 43, we get

PS-QR+PLS os

where 2 is a separated symbol, and D' is the determinant of the

: d S. system of resistances with S+ 4, written for S. We may there-

(28),

—

fore write a a D =D+HLz>

D being the ordinary detcrminant, and H a function of PQR, &c., which we need not determine. Equation (28) may therefore be

written dz ak De+ HL, =PL7z (29), provided the bridge be balanced, 4. if PS—QR be zero. Suppose

now the galvanometer circuit is closed, and then the battery circuit closed; then, integrating equation (29), from the instant before the battery is thrown in up to a time 7 when all the currents have be- come steady and no further current flows through the galvanometer,

we get _ pf zdt=PLE,

0

PLE

or ca SP a) (30),

-

where 2 denotes y zat, i.e. the whole amount of clectricity that

0

flows through the galvanometer owing to the induced current. If now we derange the balance in the bridge by increasing S by a small quantity x, and decreasing Q by as much, we get asteady current through the galvanometer given by

__P+Reb

D Hence pa ae ” z (P+R)z ee

Now, if 8 be the first swing of the galvanometer needle, owing to the induction current, a the deflection under the steady current, and it the time of oscillation of the needle under the earth’s force alone (T is supposed to be so large that the duration of the induced current is very small compared with it); then it may be shown that

la (82).} Z t : Hence a (P+R)eT singe L= Prtana Cs.

We thus get L in terms of quantitics which can be easily measured. This methed of finding L is due to Maxwell.

7 : c ; Certain corrections would in general be necessary in practice, but we need not discuss them here.

PLaec TRIiCa ae

[ELECTROMAGNETIC INDUCTION.

The application of the equations (26) to determine the Calcula. march of the current in certain simple cases leads to results “ons of of great interest. Helm-

holtz, Suppose that an electromotive force E begins to act in a circuit of resistance R and coefficient of self-induction L. The equation for the current strength 7 at any time ¢ after it has begun to act, is

dt 4 C= = : qt kis (34) 5 a | -~k The integral of this is 7= Ro =o 1h) fe 8 6 5 4 (BY),

the constant of integration being determined by the condition

i=F(=steady current) when ¢=oo. Hence the current starts with the value zero, and in-

creases continuously till it reaches the steady value 5:

a oe , : : The part — pe ©‘ is due to self-induction, and is called

the extra current. Tle whole amount of electricity passing in this part of the current is

(36).

is of the same dimension as ¢, and is Timecon- 5 ‘ 5 stant of called the time constant of the coil. According as the time oon

constant is greater or less, the longer or shorter time will the current take to rise to a given fraction of its steady value. If we desire therefore to prolong the induction and to increase it as well, we must make L large and R small, two conditions which in the extremes are inconsistent. Cal- culations of the form of coil for maximum inductive effects might be made, but this is not the place to enter on them.

Next, let the electromotive force E suddenly cease to act, the resistance of the circuit being unchanged. This may be realized experimentally within certain limits by throwing the battery out of the circuit, and at the same time substituting for it a wire of equal resistance. It is easy to show as above that the extra current at a time ¢ after E ceases to act is

The quantity –

and the whole amount of electricity which passes is + +3 :

Helmholtz,?2 who was the first to treat this subject both Experi-

experimentally and mathematically, operated as follows :— ae of (1) The battery was thrown into the circuit, and after a time ¢ the nol

circuit was broken.

(2) The battery was thrown in, and after a time ¢ replaced by a circuit of equal resistance.

These changes were effected by means of a system of levers, which it is not necessary to describe here. An account of the apparatus will be found in the paper quoted.

The amount of electricity which passes through the circuit is measured by a galvanometer whose time of oscillation is long com- pared with ¢. In the first case the amount is

in the second

because here the two extra currents just countcrbalance each other.

The observed value of B in each case enables us to calculate ¢. E and R being found by separate observations, one observed value of A enables us to calculate L. Using these values of E, R and L, a series of values of ¢, and hence A, can be calculated from the observed valucs of B, and the result compared with the observed value of A. The agreement between theory and experiment was sufficiently close to justify the application of the principles from which the above formule were deduced. Among these principles may be mentioned the validity of Ohm's law for transient currents,

The reader will find in the original paper details concerning the above and other similar results arrived at by Helmholtz.

2 Pogg. Ann., 1851.

ELECTROMAGNETIC INDUCTION. |

| Twofixed The case of two circuits of invariable form and position | circuits. is of great interest, from the light it throws on the action | of the induction coil. We shall suppose that we have no soft iron core, and that the hreak in the primary is instan- taneous. The latter condition is very far from being realized in practice, even with the best arrangements, so

that our case is an ideal one. Let i and j be the current strengths in primary and secondary,

Rand § the resistances, L, M, N the coefficients of induction, E the electromotive force in the primary. The equations are

dt Oy ee 3 Lata +Ri=E – (37),

di Gane Mz +NZ +9=0 (38). It is easy, in the first place, to show that. the whole amounts of electricity which traverse the secondary at make and break of the primary are equal but of opposite signs. In fact, if we integrate (38) from the instant before make to a time when the induction currents both in primary and secondary have subsided, we get

; M ME [i=

where I denotes the steady current in the primary. Similarly integrating over the break, we get

— in fi + 31> oR

In the second place, if we assume the break instantancous, we can find the initial value of the direct current in 8. Thus integrate! (38) from the instant before break to the time 7 after it, + being 1 finitely short compared with the duration of the induction currents, then

. (39).

:

~MI+Nj)+S/jdt=0.

0

Now the last term may be neglected, because 7 is infinitcly small and 7 is not infinite, hence we lave, for the initial value of d;

(40).

It is very easy now to determine the farther course of the current in. The equation for 7 reduces to

DG grig. N pier : and we get, using (40), j-tpe (41). The direct induced current (current at break), therefore, starts in our ideal case with an intensity which is to the intensity of the steady current in the primary as the coefficient of mutual induction of the coils is to the coefficient of self-induction of the secondary, and then dies away in a continuous manner like any other current left to itself in a circuit of given resistance and self-induction. Since we have already given enough of these calculations to serve as a specimen, we content ourselves with stating the result for the current at make. Owing to the self-induction of R, &c., the current in R rises continuously from zero to the value I; the induced current in S therefore begins also from zero, rises to a maximum, and then dies away. The mathematical expression for it contains,asmight beexpected, two exponential terms.

llectro- inetie said concerning the electrokinetic energy of two moving ‘nergy. circuits, to examine what becomes of the energy in the case

of two fixed circuits of invariable form.

Equations (87) and (88) may be uscd if, for generality, F be written instead of 0 in (38), so that there is electromotive force (say of constant batteries) in both circuits. Multiplying (37) by i and (38) by j, adding, and integrating from the time before E and F begin to act to a time + when the currents have all become steady, we get

! The reader might suppose that this process of integration might be equally applied to (37). Tbis is not so, however, owing to the vari-ability of R at the break.

Hie © tan icry’T y

It is instructive, in connection with what has already been

Th 7 Va (Ei-R@)dt+/ (Ej ~ S72)de= HL + 2M 4 NZ2) . (44).

0 0

In words, the excess of the chemical energy exhausted in the batteries over the amount of energy which appears as heat in the circuits is $(Li? +2My+Nj%), which we denote by K. Similar remarks to those made at p. 76 apply here. K is the amount of electrokinetic energy stored up in the medium surrounding the circuits during the time that E and F are raising the currents against self and mutual induction.

If we integrate similarly over the break of both currents, we find the defect of the chemical energy exhausted under the heat evolved in the circuit to be again K. Much of the energy thus discharged from the system at break usually appears in the spark.

Electrical Oscillations. —Helmholtz? seems to have been Electri- the first to conceive that the discharge of a condenser might ¢@l oscil- consist of a backward and forward motion of the electricity '#t™s- between the coatings, or of a series of electric currents alternately in opposite directions. Sir William Thomson 3 1 took up the subject independently, and investigated mathe- sory. matically the conditions of the phenomenon.

Let g be the charge of the condenser at time ¢, C its capacity,

E the difference of potentials between the armatures, ¢ the current

in the wire connecting the armatures, R its resistance,4 L the co- efficient of self-induction. Then we have

q=CE ,

hom- ?

'=

dt' adi : and Litki-E, ; dq Rd 1 Ay atte tpoI~9 Oo 8 6 4 (48).

The solution of this equation is tmeed (Aem*+ Bem): F

R [ee 9 o— | Aand B are constants to be determined by the conditions 7=Q and Ao when ¢=0. Two distinct cases arise.

(1.) Let R be greater than y “2 ; then the exponentials in (44)

(44),

where

are real, the discharge is continuous, all in one direction, and in- volves no essentially new featurcs.

(2.) Let R be less than

solution is q=e ™ (A cos nt+B sin nt),

where m has the same meaning as before, but m stands now for

1 R? : a oe LG 7 a° If we determine A and B by the initial conditions, we get g—e™’(cosnt-+ % sin nt)Q (45). The current is given by eee t=Kpo® “sin nt, (46).

It follows from these equations that, when R ay Ss , the

charge of one armature of the condenser passes through a serics of

oscillations. The different maxima are _mT _ Im _ amir OF — Qe nm» Qe m3 Qe nm 9 &e., occurring at times 1. 2a on 0 ’ eae ees a) &e. n n n

2 Die Erhaltung der Kraft, 1847.

3 Phil. Mag., 1855. This paper is a very remarkable one in many respects. The methods used in the beginning to arrive at the equation (43) are well worth the reader’s study.

***R here must be understood to represent the mean resistance of the circuit during the discharge.**

VIII — 11

Experi- ments of Fedder- sen, &c.

Induc- tion in

82

When the charge has any of these maximum values, | zero. The current maxima form a similar descending series, the times of occurrence being She 437 6 @4+fr 8 baw a be tis

ee mS. kg a a ia aes

the current is geometric

é Le) where @ is the acute angle tan SS

The interval between any positive and the next negative maxi-

im: shar, ; is therefore -. mum, whether of charge or current, is the &

We need uot insist on the evident importance of this result, Thomson, in his original paper, points out the various applications of which it is capable. He predicts the phenomena afterwards observed by Feddersen ; 1n fact, he suggests the use of Wheatstone's mirror to detect it. Its bearing on the anomalous magnetization of steel needles by jar discharges, and on the anomalous evolution of gas by statical discharges, when electrodes of small surface are used (in Wollaston's manner), are also dwelt upon.

Several physicists have taken up the experimental in- vestigation of this matter. Feddersen's experiments realize the case above discussed, if we abstract the disturbance owing to the air interval, of the effect of which it is not easy to give an accurate account. Feddersen's results are in good general agreement with theory. He finds, for in- stance, that the critical resistance at which the discharge begins to assume the oscillatory character varies inversely as the square root of the capacity of the battery from which the discharge is taken. A good account of the

researches of Paalzow,! Bernstein,? and Blaserna, and of the older researches of Helmholtz,? remarkable for the use of his pendulum interruptor, will be found in Wiedemann, §§ 801, dc. Schiller, in a very interesting paper,* describes a variety of mcasurements of the period of oscillation, and the damping of the alternating currents in a secondary coil, when the current of the primary is broken. By means of the pendulum interruptor of Helmholtz (for descrip- tion of which see his paper) the primary is broken, and at a measured interval thereafter the secondary circuit, which contains a condenser and a Thomson's electrometer, is also broken. 'The deflection of the electrometer indicates the charge of the condenser at the instant when the secondary is broken. The interval between two null points sepa- rated by a whole number of oscillations can thus be found, and hence the time of oscillation of the coil calculated. The agreement of Schiller's results with calculation is very remarkable, and must be regarded as a highly satisfactory proof of the validity of the theoretical principles involved.

Induction in Masses of Metal and Magnetism of Rota- tion.—Hitherto we have dealt only with linear circuits ;

masses of but it is obvious that currents will also be induced in a

metal.

Experi- ments of Pliicker and Fou- cault,

mass of metal present in a varying magnetic field. If the variation of the field be due to relative motion between the mass of metal and the system to which the field is due, the electromagnetic action of the induced currents will oppose the motion. Many instances might be given of this principle. If a magnet be suspended over a copper disc, or, better still, in a small cavity inside a mass of copper, its vibrations are opposed by a force due to the induced curreuts which for small motions varies as the angular velocity of the needle. Accordingly, it comes much sooner to rest than it would do if suspended in the air at a distance from conducting masses ; it moves beside the copper as if it were immersed in a viscous fluid. Pliicker suspended a cube of copper between the poles of a powerful electromagnet, and set it spinning

about a vertical axis ; directly the magnet was excited it stopped dead. Foucault arranged a flat copper disc between the

1 Pogg. Ann., 1861.

2 Pogg. Ann., 1871. 3 Monatsber. der Bert. Akad., 1874.

4 Pogg. Ann., 1874.

flat poles of an electromagnet placed at such a distance apart as in rotation by means of a driving gear. magnet was not excited, the driver had comparatively little work to do; but as soon as the magnet was excited, the work required to keep up any considerable velocity greatly increased. 'The additional work thus expended appears in the heat developed in the disc by the induced currents. Tyndall demonstrates this very neatly by causing a small cylindrical vessel of thin copper filled with fusible metal

just to admit it between them. The disc was set So long as the

to rotate between the poles of an electromagnet, when

enough heat is quickly developed to melt the metal.

On the other hand, when a mass of metal moves in the Arago's neighbourhood of a magnet, the electromagnetic action 0 the induced currents will cause the magnet to move, if 1 be free to do so. axis horizontal over a disc which can be set in rotation about a vertical axis, owing to the electromagnetic action of the induced current, the needle will tend to rotate in

Thus, if we suspend a magnet with its

the same direction as the disc. If the velocity be great enough, or the needle be rendered astatic, it may be carried round and round

continuously. This action was discovered by Arago, and excited the attention of many

f experi- t ment.

philosophers, till it was at last explained by Faraday (see Fara-

Historical Sketch). Many of the

once seen to support the conclusion that the phenomenon is simply a case of Lenz's law. Thus Snow Harris found that the deflecting couple on a suspended needle varied approximately as the velocity of the disc directly, and as the square of the distance of the needle from the disc inversely. It was also found that the action of the disc was directly proportional to the conductivity of the metal of which it was made, an exception occurring in the case of iron, whose action was disproportionately great. Cutting radial slits in the disc diminished the action very much.

Besides the component tangential to the disc, it is found that there is a repulsive normal action on the pole of the magnet, and also a radial action, which may be towards or from the centre of the disc, according as the pole is nearer or farther from the centre of the disc. These actions look at first sight somewhat more difficult to explain; but a little consideration will show that the laws of induction account for these also.

Let us first suppose the induced currents to appear and die away instantly after the small motion of the disc which produces them (we may suppose the motion of the disc to take place by an infinite number of small jumps). Thus the currents of induction are obviously symmetrical with respect to the diameter through the foot of the perpendicular from the magnetic pole on the disc, and we may roughly re- present the elec. tromagnetic ac- tion by a magnet apie perpendicu- ar to the diameter at a certain dis- tance from the centre of the disc, itssouth pole point- ing in the direc- tion of the disc's motion if the inducing pole be a north pole. Let OX (fig. 52) be the direction of the diameter in the

Fig. 52. same vertical plane as the pole, NS the representative magnet,

OY being the direction of motion. By our present supposition the inducing pole M lies in the plane of ZOX, in which case it is obvious that the resultant action reduces to a tangential com- ponent T parallel to OY.

_ But, owing to the inductive action on each other of the currents in the disc, the induced currents do not rise and fall instan- taneously, but endure fora sensible time. We may roughly represent

observations made by day's

Faraday's predecessors, and some made by himself, are at _—

Conser-

vation of the whole, a very satisfactory answer.

energy.

Contact force.

Contact of metals, Volta's

_ experi- _Ments,

ELECTROMOTIVE FORCE. |

the effect of this by supposing the representative magnet NS carried onwards a little with the disc, or, which amounts to the same thing, we may suppose the pole M to lag a little behind at M' (lying, say, on MM' perpendicular to ZOY.) The action of N will now preponderate, and the resultant force on M' will be in the direction M'F. This force, when resolved parallel to OY, OZ, OX, gives a tangential component as before, a repulsive normal com- ponent, and a radial component, which will be directed to or from the centre of the disc, according as the representative magnet lies farther from or nearer to the centre of the disc than the foot of the perpendicular from M'.

The original explanation of rotation magnetism (Faraday, Exp. Res., 81, &c.) should be consulted by the reader who wishes to pursue the subject. An account of the researches of Nobili, Matteucci, and others will be found in Wiedemann, Bd. ii. § 860, &. The mathematical theory has been treated by Jochmann, who neglected the inductive action of the currents on each other (Crelle's Journ., 1864; Pogg. Ann., 1864; also Wiedemann, J.c.). A complete theory of the induction of currents in a plane conducting sheet has been arrived at by Maxwell by means of an extremely elegant application of the method of images (Proc. R.S., 1872; also Electricity and Magnetism, vol. ii. §§$ 668, 669).

On the Origin of Electromotive Force.

It retains for us now to view the transformations of energy which take place in the voltaic circuit from the other side, and to inquire whence comes the energy that is evolved in so many different forms by the electric current. Two distinct questions are here involved, First—What form of energy is being absorbed, and at what part of the circuit does the absorption take place? Secondly—-Where is the electromotive force which drives the current situated ?

To the first of these questions experiment has given, on The electric circuit is, indeed, one of the best instances of the great law of conservation, which states that the appearance of energy anywhere is always accompanied by the disappearance somewhere of energy to an equal amount. No general dis- cussion of this first question is necessary; it will be suffi- cient to indicate the application of the general principle when we deal with particular instances.

Unfortunately the answers, both experimental and theoretical, that have been at different times given to our second question, are not so concordant as could be desired. The reader is, therefore, cautioned against accepting with- out due examination! anything that may be here advanced.

Perhaps the most general principle concerning the origin of electromotive force recognized by physicists of the present day is the following :—

When two different substances are in contact, there exists in general an electromotive force at the surface of separation, tending to displace electricity across that surface.

This electromotive force is commonly called the “ electro- motive force of contact,” or simply the “contact force.” In the particular case of two conductors in contact, the effect of this force would simply be to maintain a certain differ- ence of potential between them.

Although the earliest known case of electrification—viz. amber rubbed with woollen cloth—is an instance in point, and although many experiments on electrification by the friction of different substances were made, yet this prin- ciple was not recognized fully till the experiments of Galvani and Volta directed the attention of men of science to the matter.

Volta was the first to demonstrate clearly the existence of the contact force in the case of metals. A simplified form of his fundamental experiment is the following. The

1 This applies particularly to any indications of the views of living physicists.

upper and lower plates of a condensing electroscope (see above, p. 34) are made of different metals, say copper and zinc. Let the upper plate be laid upon the lower, and the metallic contact ensured by connecting them for an instant by means of awire. If the upper plate be now lifted verti- cally upwards, the gold leaves of the electroscope diverge, indicating that the zinc plate is now positively electrified to aconsiderable potential. This is explained as being due to the contact force at the junction of the copper wire with the zinc plate, by virtue of which the zine is at a higher potential than the copper. Suppose the upper plate to be connected with the earth, then if E be the contact force, the potential of the zinc plate is E. Now E is very small, but as

soon as the upper plate is raised the potential of the lower plate is increased in the same ratio as its capacity

is diminished; hence the divergence of the leaves. Volta found that le could arrange the metals in series, thus— A Rn ree a 0 ROS aaicssieance | 1 eae SS LY aa ie DHE arene UP, | Wee saree | 3 |

such that, when any metal is placed in contact witli one below it in the series, it takes a higher potential ; and he found that the electromotive force between any two metals in the series is the sum of the electromotive forces between every adjacent intervening pair. Thus, if Zn|Pb denote the electromotive force from lead to zinc, we get from the above table,

Zn|Pb=5, PbiSn=1, Zn\Sn = Zn|Pb + PhiSn=6, Pb|Cu=Pb|Sn+ Sn/Fe + Fe|\Cu=6,

and so on.

It follows from Volta's law that, if a number of metals be connected up in series, the difference of potentials be- tween the extreme metals is independent of the intermediate metals, and, in particular, is zero if the extreme metals be the same. We cannot, therefore, have a resultant electro- motive force in a closed circuit consisting of metals merely. This is entirely in accordance with experiment, provided the temperature be the same everywhere.

While one party of physicists neglected or attempted to explain away Volta's contact force, another took up the investigation, and endeavoured to obtain precise measure- ments of it in different cases. Careful experiments of this

Law of Volta,

Experi-

kind were made by Kohlrausch? and Gerland,* by a method jpents by

due to the former.

Kohl-

A condenser is used whose plates are made of the metals tausch.

to be tested, say zinc and platinum, The plates are first placed parallel to each other at a very small distance apart, and touched simultaneously with a wire (say of platinum). A difference of potentials is thereby established, so that if the potential of the Pt be zero that of the Zn is Zn|Pt. (Here we neglect the contact force between air and zinc and between air and platinum. No experimental proof that we know of has been given in support of this, see below, p. 85). In consequence of this difference of potentials the Zn plate becomes positively charged. The wire is now removed, the plates of the condenser separated to a considerable distance, and the Zn plate connected with one electrode of a Dellmann's electrometer, the other elec- trode of which is connected to earth. The reading is pro- portional to the potential difference Zn|Pt increased in the ratio in which the capacity of the Zn plate has been decreased by the separation. Hence, if A be the reading,

Zn|Pt=aA (1). The condenser plates are now brought into their former position, and connected through a Daniell's cell, consisting

2 Pogg. Ann., 1858. 3 Pogg. Ann., 1868.

Gerland and Hankel.

of a strip of zinc immersed in a porous vessel filled with zinc sulphate, which is itself immersed in a vessel containing copper sulphate, into which dips a strip of copper. In the first instance, the copper strip is connected with the ziuc plate, and the zinc strip with the copper plate of the con- denser. 'The difference between the potentials of the con- denser plates is easily found by an application of Volta's law! to be D + Zn|Pt, where D denotes the difference between the potentials of the two pieces: of copper forming the terminals of a Daniell's cell; lence if B be

the electro- meter reading, after removing the Daniell and separating the plates as before, we have D+ Zn|Pt=aB @):

If we councct up the Daniell the opposite way with the condenser, then we get a reading C, such that

D-Zn|Pt=aC . (3). From (2) and (3) we get Ba€ Zn|Pt= ED (4),

which gives the contact force ZnjPt in terms of the electromotive force of a Daniell. From (1), (2), (3) we get

B-C=2A, an identical relation which the observations ought to satisfy, and which, therefore, affords the means of testing their accuracy.

In this way Kohlrausch found for ZnjCu the value ‘48D, or in other words, that the contact force from copper to zinc is about equal to half the electromotive force of a Daniell’s cell. As an instance of the general nature of the results, we give two series of numbers from the observations of Kohlrausch. The contact force is between zinc and the metal mentioned in first column in each case, and Zn|Cu is taken = 100.

ree a! | 100 100 BRAD SI cs a fy i. 115 aa ean? 105 109 i age aie | 406 123 Fe 75 —

In the second set of experiments the metals were care- fully cleaned, whereas in the first set they may have been a little oxidized. This may very well account for the differences, for Kohlrausch found oxidized zinc strongly negative? to freshly cleaned zinc. In fact, he found Zn|ZnO = about *4Zn|Cu.

In order to test Volta’s law, a further series of observations was made, giving the contact force between iron and several metals. The following table gives the results observed directly and calculated from the table last given :—

Calculated.

Observed.

It will be seen that, with the exception of the values for Fe|Cu, the agreement is very fair.

It is not necessary to give here the results of Gerland and Hankel. The latter made a great number of very careful experiments. He showed that the results depend

1 The truth of which, therefore, is assumed. The assumption of course is justified a posteriort.

2A metal is said to be negative to another when it assumes the lower potential in contact, and positive when it assumes the higher potential.

3 Abh, der Kinigl. Stichs. Gesellschaft, 1861, 1865.

BEG Ess

on the nature of the surface of the bodies, being different when the surface is filed and when it is polished with rouge or other powder. His tables also show the gradual change effected in the contact force when the plates are exposed to the action of the air.

[ELECTROMOTIVE FORCE.

According to Volta, the contact forces between metals Liquids

and liquids are either very small, and do not follow the same law as the contact forces between metals, or else are abso- lutely non-existent. Subsequent observers, however, de- monstrated the existence of contact forces in this case also, but showed that they do not obey Volta's law like the con- tact forces in the case of metals.

Becquerel 4 placed the fluid to be examined in a capsule Beeque- The capsule was placed on the Fel, &.

of the metal, say copper. upper plate of a condenser consisting of two copper plates in connection with a gold-leaf electroscope. The fluid and the lower plate of the condenser were touched each with a finger for a short time, and then the upper plate was removed. The divergence of

the gold leaves was taken to indicate the contact force. In this way Becquerel found that zinc, copper, and platinum were mostly negative to alkaline solutions ; but the metals were in general positive to concentrated sulphuric acid. It is obvious, however, that the result of the experiment is complicated by the contact of the hand with the liquid and with the metal of the condenser.

Similar objections apply to the results of Pfaff> and Peclet.®

Buff' made the lower plate of his condenser of the metal to be examined, of zinc for example; upon this was laid a thin glass plate on which was spread a thin layer of the liquid to be examined, or a piece of filter paper soaked with it. A zinc wire was used to bring the liquid and the lower plate of the condenser into communication; this wire was then removed and the glass plate with the liquid lifted. The divergence of the leaves was taken to indicate the contact force between zinc and the liquid. Although this method is an improvement on the methods of Becquerel and Peclet, it is still unsatisfactory, owing to the presence of the glass.

The most extensive and at the same time most careful Hankel's

experiments at present on record are those of Hankel.®

The fluid (L) to be examined was placed in a wide- mouthed funnel. The condenser was formed by the surface of the liquid and a copper plate, which could be placed parallel to it at a very short distance apart, and raised as usual, The stem of the funnel was bent at a right angle twice, and ended in a wider portion, into which dipped a strip of the metal (M) to be examined. M was connected for a moment by a platinum wire with the copper plate and also with the earth. The wire was then removed, the plate was raised, and its potential determined by means of Hankel's dry pile electroscope. The reading (A) is proportional to CujPt+PtIM+ MIL, or, by Volta's law, to CuM+ML, Hence

Cn|[M+M|[L=aA . In the next place, the funnel is emptied and a plate of the metal M placed onits mouth. The copper plate is lowered so that

it is at the same distance as before, contact estab- lished by means of the platinum wire, and so on. The reading being B, we have Cul/M=aB.

The plate of M is replaced by a plate of zinc, and the experiment repeated, and we have, C being the third read- in

ad CulZn=aC.

4 Ann. de Chim. et de Phys., 1824. 8 Ann. de Chim. et de Phys., 1841. 7 Ann. der Chem. u. Pharm., 1842. 8 Abh. der. Kénigl. Stichs. Gesellschaft, 1865.

5 Pogg. Ann., 1840.

Thom- son's de- monstra- tion of contact force.

ELECTROMOTIVE FORCE. |

From these three results we get

A-B is

It is not necessary to quote Hankel's results here. The reader may refer to Wiedemann's Galvanismus, or to Hankel's paper.

Sir William Thomson has given a new proof of the existence of Volta's contact force as follows.! A ring is formed, one-half of which is copper the other half zine. This ring is placed horizontally, and a needle made of thin sheet metal is so balanced as to form a radius of the ring. If when the needle is unelectrified it be adjusted so as to be over the junction of the two metals, then, when it is positively electrified, it will deviate towards the copper, and when negatively electrified, towards the zinc. Again, if a whole, instead of a half needle as above, be suspended over a disc made of alternate quadrants of zinc and copper, or, better still, inside a flat cylindrical box constructed in a similar way, so that when the needle is unelectrified its axis coincides with one of the diameters in which the disc is divided, then when the needle is positively electrified it will take up a position such that its axis bisects

the copper quadrants; if it be negatively electrified, its axis will bisect the zinc quadrants.

Thomson has also given an elegant demonstration of the contact force between copper and zinc by means of an

CulZn .

_ apparatus which is a modification of his water-dropping

Clifton.

apparatus.? A copper funnel is placed in a cylinder of zine, and drops copper filings at a point near the centre of the cylinder. The filings are charged negatively by induction as they fall, owing to the excess of the potential of the zinc cylinder over that of the copper. If therefore the filings be caught in an insulated metal can, they will communicate to it a continually increasing negative charge, while the zinc cylinder and the copper funnel will become charged more and more positively.

Thomson finds, in agreement with Kohlrausch, that, when the copper and zinc are bright, the electromotive force of contact is abont half that of a Daniell's cell. When the copper is oxidized by heating in air, the contact force is equal to a Daniell or more. He has gone a step farther, and shown that when two bright pieces of copper and zinc are connected by a drop of distilled water, their potentials are as nearly as can be observed the same.?

The subject of contact electricity has been taken up quite recently by Clifton. He experiments on the contact force between a metal and a liquid by a method which is a simplification of Hankel's.

Two horizontal plates are used of the metal M; the liquid L is placed in a glass vessel on the lower plate and connected with the lower plate by a strip of the same metal which dips into it. The upper plate is lowered to a distance of 0-1 or 0°2 mm. from the surface of the liquid, which acts as the lower surface of the condenser, and the upper plate and lower plate are counected by a copper wire. The difference of potential

between the two surfaces of the condenser is therefore M|L. The copper wire is then removed, the upper plate raised, and its potential measured with a Thomson's electrometer. In this way a contact force equal to the thousandth part of Zn|Cu can be detected.

Clifton finds zinc and copper to be both positive to water to about the same degree, and both very slightly negative to dilute sulphuric acid. He concludes therefore that zinc and copper dipping in water will be at the same potential. This he verifies directly, finding that any difference of

1 Proc. Lit. and Phil. Soc. 2 Reprint, p. 324. 4 Proc. R. S., June 1877.

of Manchester, 1862,or Reprint, p. 319. 3 Jenkin, Electr. and Mag., § 22.

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potential, if it exist, 1aust be less than 00079 of the elec- tromotive force of a Daniell. 'The result of Sir William Thomson is therefore confirmed.

There are many other points of interest in Clifton's paper, but, as the results are given in most instances as preliminary, we need not discuss the matter farther.

Before leaving this subject, it may be well to notice that Source of there is one point which is not touched by all these ex- uncer-

periments, viz., the question whether there is or is not a contact force between metals or even liquids and air. It has not yet been shown that the results of the experiments which are supposed to demonstrate that Zn|Cu is about half the electromotive force of a Daniell could not be equally well explained by supposing the difference of potential to be> CulA+AjZn+CujZn, whence CulZn is very small compared with CujA and A/Zn. This supposition would not invalidate Volta's law; nor would

it contradict Clifton's results, for we have, in accordance with his experi- ments, on the new hypothesis,

Aq|A+CulAq + Aq|Cu= Aq|A+ Zn|Aqg + AJZn, therefore, transposing,

Zn|Aq + Aq|Cu+CulA+ AjZn = 0,

which, according to the new hypothesis, means that copper and zinc immersed in water are at the same potential. In this view, the important part of the contact force usually observed between zinc and copper would be CujA + AjZn,° which must therefore, by Sir Wm. Thomson's result, be the same as Cu|Aq + Aq/Zn.

It is not very easy to see how this point is to be settled by direct measurements of eleetromotive force. Supposing, however, that it were settled, and that the contact force between two given metals A and B, and between each of them and a given liquid L, were known, then the differ- ence of potentials between the two metals when immersed in any liquid could be predicted in all cases, and also the initial electromotive force tending to send a current through a circuit made by connecting the metals together and dip- ping them into the liquid.

tainty.

A number of cases of this kind have been investigated Ger-

by Gerland ;' but satisfactory agreement between theory and observation has been attained in but a few cases. Researches of this kind are beset with a double array of almost insuperable difficulties.

The direction of the initial resultant electromotive force in any circuit of two metals and one fluid may be found by observing the first swing of a galvanometer through which the circuit is suddenly connected. Considerable precau- tious must be taken to obtain consistent results, and when all care has been taken, it is not found that the results of one observer always agree with those of unother. This is scarcely to be wondered at, when we consider the difficulty of making sure that in

two different experiments we are operating with absolutely the same metals and fluid in absolutely the same conditions as to surface.

When the current tends to pass from one metal to an- other through the liquid in which they are immersed, the former metal is said to be positive to the latter. If the whole electromotive force in the circuit be the sum of all the contact forces at the various junctions, then it follows easily that we ought to be able to arrange the metals in a series, such that any one in the series is positive to any following one and negative to any preceding when both are dipped in the same liquid. It does not follow that the order of the series is the same for different liquids; this would be so if the metallic contacts alone were operative.

Many electromotive series of this kind have been given by different experimenters; but they have lost much of their

5 A stands for air. § See Maxwell's Electricity, vol. i. § 249. 7 See Wiedemann, Bd. i. § 36.

land's results.

86

Electro- interest now that the theory of metallic contact, pure and motive simple, is given up. The following set is given by Fara- Series. Two

metals ; and one H2S04 liquid. (dil.)

HNO;

yes KHS. K2S5

KuO.

— ———a

| | Pb | Zn |

It will be seen that the order of the metals is not the saine for different liquids.

Just as between different metals and between metals and liquids there is a contact force, so there is a contact force between different liquids. The direct observations of this contact force are very few and uncertain. One thing, however, is settled, viz., that the contact forces between liquids do not universally at least obey the law of Volta, or, at all events, do not form a consistent series with the metals ; for a great variety of circuits of one metal aud two solutions have been discovered in which the resultant initial electromotive force is not zero. Faraday? has even found cases of this kind with one metal and two different strengths of the same solution.

The cell of Becquerel is a favourite illustration of such a circuit. It consists of a porous vessel filled with a solution of potash and immersed in a beaker containing nitric acid ; two strips of platinum immersed in the potash aud nitric acid respectively form the plates. The current goes in the cell from the potash to the nitric acid. The following additional examples are taken from Wiedemann.® ene The current flows from the metal through the liquids in metal the order namied to the same metal again. For brevity, andtWO the metal is named only once.

Contact of two liquids.

liquids. Metal. Ist Fluid. 2d Fluid.

Pt KHO Acids

Vege CuSO, Dil. H,SO, Pt NaCl ZnCl,

Pt NH; CuSO,

L CaCl, Dil. HNO, M Conc. H,S0,4 HNO,

R KCy HNO,

L stands for Zn, Cu, or Pt. Cu, Fe, Pb, Sn, or Ag. Ni, Bi, Pt, Hg, Pd, Sb, Fe, C, Ag, Zn, Cu, Cd, or Sn.

M 5

R 39

Two A great variety of active voltaic circuits have been formed metals with two liquids and two metals. The best known class of flauide, cases is that in which the metals are in contact, as in the

two-fluid batteries of Daniell, Grove, and Bunsen. But

Faraday* gives a list of some thirty cases in which the fluids and metals are placed alternately, so that there is no metallic contact. He marks the following combinations as powerful :—

Iron Diluted nitric acid. Platinum | Green nitrous acid. Do. Hydrochloris acid. Do. Do. do. Do. Solution of com. salt. Do. Do. do. Copper | Potassium sulphide. Tron Dil. nitric acid. Do. Strong nitric acid. Do. Do do.

It must be carefully noticed that the galvanometer indi-

1 Exp. Res, 2012.

2 Hap. Res., 1975. 3 Galvanismus, Bd. i. § 63. . ae

+ Exp. Res., 2020.

cation in the first instant only is to be considered. After the first rush of electricity the direction even of the current may alter. Above all, no conclusion concerning the value of the initial electromotive force is to be drawn from measurements of the subsequent current. Quantitative Measure determinations of the electromotive force in many of the

ments of above cases have been made by various methods, of which electro- an account will be found in Wiedemann's Galvanismus, a Bd. i. § 230. The most convenient plan is to use Thomson's } quadrant electrometer, Lippmann's capillary electrometer, or some other instrument which allows us to measure the electromotive force while no current is passing through the cell. The galvanometer may also be used as in Latimer Clark's modification of Poggendorff's compensation method.

The apparatus may be arranged according to the scheme Method

in fig. 53. ABC denotes part of the resistance in the of Pog- circuit of the battery K; the circuits ApELB, AgFMC —_ each contain a gal- 'aes: * 'Lathan vanometer, a cell, 2 Clark. and a key. 'The

cells E and F are so arranged as to tend to send currents in the same directions as K, but the re- sistances AB, AC are so adjusted that when the key L or the key M is de-

Fig. 53.

pressed, no current is indicated by p or ¢. When this is so, we must obviously have E= Va— Vs, F=V,— Vo, &e., Va, Vs, Ve denoting the potentials at A, B, and C. Hence, if P,Q, R denote the resistances in AB, AC, and in the whole circuit of K,

'ig EKE=— RK:

If K were a constant battery, and its internal resistance were either known or else so small as to form only an in- appreciable fraction of R, then each of the equations just written might be used singly, and we might operate with one cell and one galvanometer, comparing the electromotive force of the cell with K. In general, however, this will not be possible, and then we have, eliminating K and R,

gE. ¢

Fr 6’ from which we get the ratio of E to F independent of the variation of K and R. We can by this method therefore find the ratio of the electromotive force of a given com- bination to that of a standard cell, when no current is pass- ing through either. The process would be perfect in practice if a standard cell could be constructed whose abso- lute constancy could be relied on.

Contact force from polarization—The flow of electri- city through the cell is accompanied by a deposition of the products of chemical decomposition on the plates, which alters the surface contact forces. This constitutes the phenomenon of polarization, which we have already par- tially studied. It will be useful to consider a little more in detail some of the forms in which it is met with.

The products of electrolysis which accumulate at the Varieties electrodes may be simply held in solution or precipitated, of polar- or they may combine chemically with the solutiun ; they ina may be deposited as a crust on the electrode, or they may enter into more or less intimate connection with it. Several of these different effects may occur together; but in almost all cases the result is the same, viz. a great weakening of the current after the first instant or so. This weakening of the current might be due either to a transition resistance caused by the alterations at the electrodes, or to an op-

Transi- tion re- sistance,

Gas polariza- tion.

posing electromotive force arising from the alteration of the contacts. The former was the explanation adopted in the earlier researches of Poggendorff and Fechuer; but there can be no doubt about the existence of the latter effect, and Lenz showed that it was sufficient to account for the facts observed. It has been usual, therefore, to neglect the transition resistance altogether in the great majority of cases. It is certain, however, that it really exists in some instances. Consider the case of two electrolytic cells containing concentrated sulphuric acid, the

electrodes being in the one copper plates, in the other platinum plates. Either of these cells inserted into a voltaic current will weaken the current, but for different reasons. In both cases hydrogen is freed at the negative electrode, and reduces sulphur from the strong acid, the effect of which is not great either way, for if the negative electrode be replaced by a fresh plate the weakening of the current remains, At the positive electrode oxygen is evolved, which oxidizes the copper in the one case and is deposited on the platinum in the other,—in both cases replacing the positive electrode by a fresh plate will cause momentary increase in the current ; but the copper plate which served as positive electrode if tested against a fresh copper plate gives very little return current, whereas the positive plati- num plate similarly tested gives a very powerful one. In the one cell the weakening of the current was due to the resistance of a crust of non-conducting copper oxide, in the other it was due to the contact force at tlie surface of the oxygenated platinum.!

The polarization which arises from the deposition of gas on the electrodes is, if we except the case where peroxides are formed, by far the most powerful form, and has been much studied ever since voltaic batteries were used. Ex- periments like the one just quoted prove decisively that the electromotive force has its seat at the surface of the electrode itself, and is due to local alterations there. The certainty of this fact gives the study of the phenomenon great theoretical importance, since we may hope thereby to arrive at some idea of the nature of the contact force.

It is also certain that in most cases each electrode con- tributes separately to the whole electromotive force, for if we remove the polarized plates the adhering gas goes with them, and each plate is found to be electrically different when tested against a fresh or unpolarized plate. We may also take measures to remove the deposited gas by washing the plates with water, potash, or nitric acid, or by igniting them; and it is found that the more energetic the chemical agency thus employed the more thoroughly is the polarization destroyed.

It seems clear, therefore, that it is the mere fact of the presence of the gas on the electrode in some form or other which causes the electrical difference. We may go still further and produce the phenomenon by depositing gas by means other than electrolytic. If a piece of platinum foil be immersed in hydrogen it absorbs the gas, as has been shown by Graham. A piece of foil thus treated is positive to a piece of freshly ignited foil when both are placed in dilute sulphuric acid. The same result is obtained by satu- rating the liquid in the neighbourhood of the foil with hydrogen.? The activity thus conferred on the plate may be again destroyed by immersing it in chlorine or bromine, or even in oxygen, by igniting it, and so on. Similarly, if _we dip a fresh piece of foil into chlorine or bromine, it will become negative to a fresh plate. The effect obtained by dipping the foil in oxygen in the ordinary state is very small, the oxygen deposited by electrolysis must therefore be in a different state to that condensed during mere im-

: Wiedemann, Bd. i. § 455. “ See Macaluso’s experiments, Wiedemann, Nachtréye, § 53.

mersion in the gas. This is probably due to the fact that electrolytically generated oxygen contains ozone (see art. ELECTROLYSIS); and in accordance with this we find that a platinum foil ozonized by being held in the electric brush proceeding from a charged conductor, or rubbed with phosphorus, is negative to a fresh plate in dilute sulphuric acid.

The gas battery of Grove is a remarkable instance of the electro- Grove’s Two long glass tubes A gas The battery.

motive properties of gas-coated metals. and B are arranged in the two necks of a Woulfc’s bottle. upper ends of the tubes are closed, but pierced by two platinum wires, to which are fastened two long strips of platinum foil (which are sometimes platinized)? reaching to very near the lower ends of the tubes. The bottle and part of the tubes are filled

with some liquid, say dilute sulphuric acid, and hydrogen introduced into B and oxygen into A. This may be very conveniently done by sending an electric current from A to B and decomposing the dilute acid, but it may be done in other ways as well. This arrangement has an electromotive foree comparable with that of a Daniell's cell (see below, p. 88), and if the original volume of hydrogen in B be twice that of the oxygen iu A it will continue to send the current through a closed circuit, the gas gradually disappearing in the tubes until none is left, when the current stops. These gas elements may be connected up in series, &c., and used like ordinary battery cells.

If the tube B be filled with ordinary hydrogen and A with liquid only, a current in the same direction as before is observed; but the liquid in A is decomposed and hydrogen evolved, which produces au opposing electromotive force and stops the current. If A contain oxygen and B fluid only, the eurrent lasts for a very short time unless the oxygen contain ozone. This is in accordance with what we have already seen.

Grove* has given an electromotive scries for the different gases and metals as follows:—

Chlorine. Metals which do Alcoliol.

Brominc. not decompose Sulphur.

16s water. Phosphorus.

Nitri — 4 Camphor. Carbonie oxide. wet UES ss Volatile oils. Hydrogen.

Carbonic acid. Olefiant gas. Metals which dec-

Nitrogen. Ether. compose watcr.

In this series any meniber is positive to any preceding member.

We have already remarked that the polarization in many Electro. cases comes on very rapidly. In cases where the electro- lytic

motive force of the battery is not sufficient to produce a continuous evolution of gas, the current after the first rush dies away very rapidly. There are cases, however, in which a small current continues to flow for a very long time, Such currents are not accompanied by any visible evolution of gas, and it is clear that they could not be so accom- panied, for, if the electromotive force of the battery be under a certain limit, the amount of chemical energy absorbed by the current per unit of time is less than the intrinsic energy of the ions liberated in a unit of time. It was originally supposed, therefore, that, besides this electrolytic conduction proper, fluids conducted to a slight extent like metals. But Helmholtz® has shown that no such assumption is necessary, and has pointed out that when the fluid holds gas in solution a sort of electrolytic conduction may take place which involves, it is true, libera- tion of the ions, or at least of an ion, but so that the final result does not imply absorption of more energy than the battery can furnish per unit of time in accordance with Faraday's law of electrolytic conduction.

Suppose, for instance, that the dilute sulphuric acid in an ordinary voltameter held Hin solution. When the current passes, O appears at the anode and unitcs with the H in solution to form water; a corresponding quantity of H is thereby liberated at the eathode, which is either absorbed by the platinum electrode or diffuses to- wards the anode, to combine in its turn with the appearing oxygen. It is obvious that the liberation of the ion in such a case does not involve absorption of energy to the extent necessary when both H and O are disengaged from water. A current might therefore be kept up under such circumstances for a long time by an electro-

3 This is best accomplished by washing the foils in hot nitric acid, and then using them to decompose a solution of platinic chloride with the current of two cells of Grove.

- **Phil. Trans., 1845. > Pogg. Ann., 1873.**

Maxi- mum of polariza- tion.

motive force under that of a cell of Daniell. Helmholtz has given the name of electrolytic convection to this species of electrolytic conduction. He has shown that the phenomenon comes to an end when the liquid is perfectly freed from gas. The absorption of the gases by the electrodes plays a great part here, and gives rise 1n gas-free liquids to a phenomenon analogous to the residual discharge. When the battery is first turned on, a rush of electricity takes place, then there is a small current which gradually dies away. The first rush is like the instantaneous charge of a condenser; the small current which arises from the slow penetration of the ions into the platinum corresponds to the formation of latent charge. When the voltameter is disconnected from the battery and discharged through a galvanometer, we have a first rush due to the part of the ions accumulated on the surface of the platinum, and then a gradually decreasing current due to the emergence of the gas which had penetrated into the metal. When the electromotive force which presses the gas into the electrode isremoved, the absorbed gas will move very nearly in accordance with the ordinary law of diffusion, and the rate of its reappearance will depend very little! on the electromotive force at the surface of the electrode. Consequently the residual current furnished by such an apparatus will not depend on its external resistance. A sudden increase of the external re- sistance will simply cause the current to diminish until sufficient

surface density has been attained to raise the electromotive force to the value required to keep up the same current as before through the increased resistance; and the converse will happen if the external resistance be decreased.

This passage of the gas into the substance of the electrode has, at the instance of Helmholtz, lately been investigated by Root.2 He finds that in certain cases, when only one side of a platinum foil is exposed to electrolysis, the deposited gas, whether H or O, actually passes through and produces the corresponding polarization on the other side of the foil.

It might at first sight be expected that in all cases where the electromotive force in the circuit is sufficient to pro- duce continual

evolution of the ions the polarization would be the same. This is not by any means the case, however, owing to the fact that the final state of the liberated ions varies with the strength of the current, or, more correctly speaking, with the current density, a.e., the amount of electricity which crosses unit section of the electrode in unit time. When H, and O are being liberated from dilute H,SO, this depends mainly on the formation of vari- able quantities of ozone and H,O,. This variation of the physical state and intrinsic energy of the liberated ions, is a fact of the greatest importance in the art of electro- metallurgy. A better instance could not be given than Gore's electrolytic modification of antimony, whose intrinsic energy is strikingly manifested by its explosive properties.

The effect of enlarging the surface of the electrode in diminishing the polarization in the case where the maxi- mum polarization is not reached was noticed above (p. 48). It has also the effect of diminishing the maximum of polarization in the case where the ions are completely set free. Platinizing has the same effect. Thus Poggendorff* found for the maximum polarization 2°12 to 2°32* for bright platinum plates, while it was only 1°83 to 1°85 for platinized plates. The effect of platinizing on the hydrogen and oxygen polarization was about equal for strong currents, but greater on the hydrogen polarization when the current was weaker. On the other hand, by using small platinum points to decompose water in Wollaston's manner, Buff found the polarization as high as 3°31.

Poggendorff ® and Crova7 have investigated the depen- dence of the maximum of polarization on the current density. It follows from their researches that it can be

represented by A — Be. I being the current density. It would appear that the maximum of polarization is decreased by increasing the temperature of the cell. The

1 Within certain limits, of course. 2 Pogg. Ann., 1876.

3 Wiedemann, Bd. i. § 480; Pogg. Ann., 1847.

4 Unless otherwise stated, our unit of the electromotive force is for the present the electromotive force of a Daniell's cell.

5 Wiedemann, Bd. i. § 473; Pogy. Ann., 1867.

8 Pogg, Ann., 1864. 7 Ann. de Chim. et de Phys., 1863.

effect, however, in some cases at least which have been adduced to prove this, might be explained by the decrease

£ the internal resistance of the cell. Agitating the electrodes, stirring the liquid in their neigh-

bourhood, or any other process which tends to dissipate the deposit on the electrode, leads, as might be expected, tio a diminution of the polarization. pressure in retarding or helping electrolysis might be appreciable in certain cases. chemical equivalent of the ions, during liberation under a pressure p, increases in volume by 2, then during the pass- age of a unit of electricity work to the extent py is done ; the electromotive force required to free the ions must there- fore have a part equal to pv which may increase or de- crease as the process goes on. obey Boyle's law very nearly, then pu is constant, so long as the temperature remains the same; so that we cannot expect, within reasonable limits, to check the electrolysis of dilute sulphuric acid by conducting it in a closed vessel.®

The effect of increased

Suppose that an electro-

If the ions be gases which

We have repeatedly drawn attention to the rapidity with Rapidity

which the polarization decays in the first few instants after of de- the plates are connected through a circuit of moderate resis ance. Direct proofs of this have been given by Beetz® and Edlund? decays much more rapidly thau the hydrogen polarization, which is not to be wondered at, considering the greater readiness of platinum to absorb hydrogen; with palladium electrodes the difference would doubtless be still more marked. 'The reader may also consult an interesting paper on this subject by Bernstein!! who concludes that in a certain case the polarization diminished by % to 7' of its value in about »3, of a second,

t. Polariza- tion

The former shows that the oxygen polarization

There seems to be little reason to doubt the substantial

accuracy of the facts just mentioned ; and the reader will not fail to see the application to the theory and practice of the measnrement of the electromotive forces of inconstant electromotors, a category under which, unfortunately for" the electrician, all known voltaic batteries must be classed. The remark applies with double force to the measurement of the electromotive force of polarization. ments of the latter have been made. give the reader a general idea of the magnitudes involved ; into a discussion of the methods we cannot enter here.

Many measure- We quote a few, to

Hydrogen and Oxygen Polarization of bright Platinum Plates. Numeri-

ae — cal re- Whole Polarization.| H Polarization. i Polarization. Observer. sults, Oe se | Es W heatstone. 2°56 as = Buff. 2°31 115 1-16 Svanberg. 2°33 1°16 1°16 Poggendorff. ae ou Reetz.

ee

Polarization of Platinum Plates with different Gases compared with the Eleetromotive Force of Platinum Plates with the same Gases against a fresh Platinum Plate in Grove's Gas Battery.

Gas Polarization. Pt.G!Pt. if “hel ‘161 Br *329 323 Cl “505 “466 H 910 “814 Cl and H | 1°375 1°335

Other matters of great interest are stated

See also the instructive analysis of the phenomena of polariza- 9 Pogg. Ann., 1850.

8 Maxwell, vol. i. § 263. there. tion in §§ 294-271.

10 Pogg. Ann., 1852; see also Wiedemann, Bd. i. § 495 ; &c.

11 Pogg. Ann., 1875. 12 From Wiedemann, Bd. i. § 478.

18 Beetz, quoted in Wicdemann; Pogg. Ann., 1858.

Polariza- tion in gencral.

Joule’s results.

| a oe Cae

Polarization of various Metals measured with Thomson’s Quadrant Electrometer.}

ELECTROMOTIVE FORCE. |

a ee No. of Cells in Hydrogen Plate. | Polarization. Lohagat Baihery.

Oxygen Plate, |

Freshly ignited Pt. Pt 1:64-2°30 1-8 Ft Pd 1°50-1°85 1-4 Pd Pt 1°60-1‘91 1-4 Pt Fe 2°16 3 Fe IPE 0 3 Fe Fe 0 3 Al Al ils 1-6

fe en

Although the polarization by gas deposits has absorbed so much of the attention of plrysicists, it is by no means a solitary instance. The phenomenon is universal. It ap- pears even with zinc plates in zinc

sulphate, and copper plates in copper sulphate. The nearest approach to unpo- larizable electrodes.is the case of amalgamated zinc plates in zinc sulphate, originally discovered by Du Bois Rey- mond. When the sulphate solution is neutral, the polart- zation, as may be shown by immersing a large number of plates in series in the solution, is extremely small.

For an account of polarization at the surface of two liquids observed by Du Bois Reymond, and other kindred matters, and for many other facts which we have passed over in silence, the reader may consult Wiedemann's G'al- vanismus. Some account will be found in the article Exectrotysis of the remarkable phenomenon of the "passivity of iron, and of the powerful polarization arising from the formation of superoxides, on which depends the action of the secondary pile of Planté."

Application of the Laws of Energy to the Voltaic Circuit. —In the classical series of researches by which Joule laid the foundations of the laws of energy, a considerable share of attention is devoted to the energetics of the electric current. Guided by the great idea which he was gradually developing, Joule made experimental determinations of the amount of energy of various kinds evolved in the electric circuit. We have already seen how he measured the quantity of heat developed in a metallic conductor, and in an electrolyte.2 This quantity was found to vary as the product of the resistance of the conductor into the square of the current strength, account being taken of disturbances at the electrodes in the case of electrolytes.

These disturbances were considered in the first memoir and allowed for. The accuracy of the view taken of them, to which Joule was led by the opinion of Faraday, that the solution of the oxide in the voltaic cell had no active share in producing the electric current, was justly ques- tioned, implicitly by Sir Wm. Thomson? in 1851, and ex- plicitly by Bosscha' in 1859.

Ina later memoir, however,* Joule made a direct experi- mental investigation of these secondary effects, and shows how they can be accounted for. His results have not been shaken by subsequent

investigators; and the general con- clusions to be drawn from them are not in the least affected by the theory of secondary action, which is suggested in the paper. 'These, so far as we are now con- cerned with them, are as follows :—

" Ist. In an electrolytic cell there are three distinct obstacles to the voltaic current. The first is resistance to conduction ; the second is resistance® to electrolysis without chemical change' [arising simply from the presence of

1 Tait, Phil. Mag., 1869. This method is in some respects one of

an ee oe Lee of the kind. iu. Mag. – 3 Phil. Mag., 1851 (2), p. 554.

4 Pogg. pes eviii. p. 319. all

5 Mem. Lit. and Phil. Soc. Manchester, 2d ser. vii., 1843.

8 This resistance is, in more modern language, an " opposing electromotive force."

7 The meaning of " without chemical change" will be seen directly.

ioe OG [TY 89

chemical repulsion] ;® and the third is resistance to electro- lysis, accompanied by chemical changes.

"2d. By the first of these (the resistance to conduction) heat is evolved exactly as it is by a wire, according to the resistance and the square of the current; and it is thus that a part of the heat belonging to the chemical actions of the battery is evolved. By the second a reaction on the intensity® of the battery occurs, and wherever it exists heat is evolved exactly equivalent to the loss of heating power in the battery arising from its diminished intensity. But the third resistance differs from the second, inasmuch as the heat due to its reaction is rendered latent, and thus lost to the circuit.

“3d. Hence it is that, however we arrange the voltaic apparatus, and whatever cells of electrolysis we include in the circuit, the whole caloric of the circuit is exactly accounted for by the whole of the chemical changes.

“4th. As was discovered by Faraday, the quantity of current electricity’® depends upon the number of atoms which suffer electrolysis in each cell; and the intensity depends on the sum of chemical affinities. Now both the mechanical and heating powers of a current are (per equiva- lent of electrolysis in any one of the battery cells) propor- tional to its intensity. Therefore the mechanical and heating powers of the current are proportional to each other.

“5th. The magnetic electrical machine enables us to con- vert mechanical power into heat by means of the electric currents which are induced by it; and I have little doubt that, by interposing an electromagnetic engine in the circuit of a battery, a diminution of the heat evolved per equiva- lent of chemical change would be the consequence, and this in proportion to the mechanical powers obtained.”4

The above statement of Joule’s contains, in a form which seems to us neither ambiguous nor obscure, an exposition of the leading experimental principles of the energetics of the electric circuit. Besides the papers of Joule we have mentioned, two others on the electrical origin of the heat of chemical combination ought to be read in connection with this snbject.13 The now famous tract of Helmholtz, “‘ Ueber die Erhaltung der Kraft,” which appearcd in 1847, shortly after these papers of Joule, did much, by its able statement of the issues, to advance this branch of electrical science, and should be consulted by every thorough student.

An extremely important contribution to the experimental evidence for the law of energy in the case of electric cur- rents was furnished by the researches of Favre.1# He uses a calorimeter, which is virtually a mercury thermometer with an enormous bulb, into which are inserted a nuniber of test-tube shaped vessels all opening outwards. When a heated body is placed in one of these vessels its heat is quickly

communicated to the mercury in the calorimeter, and the amount of heat thus communicated is measured by the expansion of the mercury, which is measured as usual by noting the displacement along a capillary tube. Into one of the recesses of the bulb of this calorimeter containing a quantity of dilute sulphuric acid was intro- duced 33 grm. of granulated zinc. The heat evolved during its dissolution was 18682 units (gramme-degrees C.). Five of the recesses were then furnished with dilute sul- phuric acid of the same strength as before, and into them were put five elements of Smee (amalgamated zinc and

8 The brackets here are ours; they contain Joule's theoretical view, | with which we are not now concerned. 9 In modern phrase, " electromotive force." 10 That is, current strength. 11 This he experimentally verified, Phil. Mag., 1843. 12 Of, Verdet, Théorte Mécanique de la Chaleur, § 327. 13 Ppil, Mag., 1842 (1), and 1843 (1). 14 Ann. de Chim. et de Phys., 1854.

Vi. — 12

Favre's re- searches.

Theory of Sir

Thom- son's law.

platinized copper). These were joined up in circuit by | means of very thick copper wire, and the heat developed during the solution of 33 grm. of zinc observed as before. The result was 18674 units, ze., almost exactly the same as before. A small electromagnetic engine was next 1n- troduced into the circuit, and the heat observed, first, when it was at rest; secondly, when it was in motion, but consuming all its energy in heat owing to friction, &e. ; and thirdly, when it was doing work in raising a weight. The quantities of heat in the three cases were 18667, 18657, and 18374 units respectively. In the first four experiments, therefore, the heat developed in the circuit is sensibly the same, the mean being 18670; the heat developed in the last case is less than this

by 296, which is the equivalent of the potential energy conferred on the raised weight. From this result the value of the mechanical equivalent of heat ought to be 443. This differs considerably from the best value | (423 to 425), but not more so than might be expected from experimental errors.

Dynamical Theory of the Electromotive Force of the Battery.—In two very important papers published in the Philosophical Magazine for 1851, Sir William Thomson laid the foundations of the Dynamical Theory of Electro- lysis, one of the objects of which, to use very nearly his own words, is to investigate, for any circuit, the relation between the electromotive force, the electrochemical equi- valents of the substances operated on, and the dynamical equivalent of the chemical effect produced in the consump-

tion of a given amount of the materials, and by means of this relation to determine in absolute measure from experi- mental data the electromotive force of a single cell of Daniell's battery, and the electromotive force required for the electrolysis of water.

The relation sought for is found as follows. Let E be the electromotive force! of the battery. Then, by the definition of electromotive force, E is-the whole work done in the circuit by a unit current during a unit of time. This work may appear as heat developed in the conductors or at the junctions according to the laws of Joule and Peltier, as the intrinsic energy of liberated or deposited ions, as work done by electromagnetic forces, as '" local heat " in the battery (see below, p. 91), or otherwise. Let e be the electrochemical equivalent of any one of the elements which take pirt in the chemical action from which the energy of the current is derived, z.¢., the num- ber of grammes of that element which enter into the chemical action during the passage of unit current for a second; and let 6 be the thermal equivalent of that amount of chemical action in the battery into which exactly a gramme of the element in question would enter,—in other words, the amount of heat that would be developed were the whole energy of the amount of chemical action just indicated spent in heat. Then it is obvious that the energy of the chemical action that takes place in the battery during the passage of

unit current for a unit of time is Je@, where J is Joule's equivalent. Hence, by the principle of conservation, we must have

E=Je6 ; or, in words, the electromotive force of any electrochemical apparatus is, in absolute measure, equal to the dynamical equivalent of the chemical action that takes place during the passage of unit current for a unit of time.

The value of J is known, being 4156 × 104 in absolute units. The value of e has been found by various experi- menters (see below, p. 104), the most accurate result being probably that deduced from the experiments of Kohl- rausch, viz. e=*003411 for zinc.

ee our quantities are measured, of course, in C. G. S. absolute units.

We may find 6 by direct calorimetric experiments on Caleuls. the heat developed in the circuit, In this way Joule tionfrom found for the thermal equivalent of the chemical action of best de- a Daniell's cell during the solution of 65 grammes of zinc Mie 47670 (grm. deg. C.), and Raoult, by a somewhat similar circuit, process, obtained the number 47800. 'These give for the heat equivalent of the chemical action during the solu- tion of 1 grm. zinc 733 and 735 respectively. Substitut- ing these values in our formula, we get for the electro- motive force of Daniell's cell in absolute C. G. 8. units 1-639 × 108 or 1:042 × 10°.

But we may proceed in a totally different way to find Caleut.

the value of 6. Direct observations have been made on tion from the heat evolved in a great variety of chemical actions, chemical and from these experiments we can calculate, with a con- =" siderable degree of accuracy, the value of 0, and thus deduce the electromotive force of a battery from purely chemical data. This method of procedure must of course be adopted if we wish to test the dynamical theory. Now, neglecting refinements concerning the state in which the copper is deposited, the state of concentration of the solu- tion, &c., the chemical action in a Daniell's cell may be stated to be the removal of the Cu from CuSO, in solu- tion, and the substitution of Zn in its place. Now, Favre

and Silberman have found for the heat developed in this chemical action 714 (grm. deg. C.) per grm. of zine. This will give, by the above formula, for the electromotive force of Daniell's element 1:012×10*% The chemical action might also be stated as the combination of zinc with oxygen, and the solution of the zine oxide thus formed in sulphuric acid, the separation of copper oxide from sulphuric acid, and of the copper from the oxygen. The quantity of heat evolved in the first two actions per grin. of zinc is, according to Andrews, 1301 + 369 = 1670 (grm. deg. C.), and that absorbed in the last two actions 588+293=881. Hence 0=789; this gives 1:118 × 10%. Professor G. C. Foster? has calculated from Julius Thom- sen's experiments values 805, 1387, and 617 of 6 for the cells of Daniell, Grove, and Smee respectively; the values of the electromotive forces corresponding to these are 1141 × 10%, 1°966× 10°, and '875×10*% These results are in fair agreement with the different values of the electromotive force obtained from direct experiment.

It follows from Thomson's theory that a certain mini- Limit of mum electromotive force is necessary to decompose water; electro- and he calculated from the data of Joule that this mini- ™otve mum was 1-318 times the electromotive force of a Daniell's 7″ y cell. Favre and Silberman found for the heat developed iysiil in the formation of H,O 68920, from which we conclude that the minimum electromotive force required to electro- lyse water is 68920+47800, 7.2, 1°44 times that of a Daniell's cell.4

Development of Heat at the Electrodes.—In a remarkable y,oca) paper,' which we have already quoted, Joule investigated heat. directly the disturbing effect of the electrodes on the heat

2 Wiedemann, Bad. ii. 2, § 1118.

3 Everett, Illustrations of C. G. S. System of Units, p. 77. No reference to the source is given.

4 Verdet (Théorie Méc. de la Chaleur, tom. ii. p. 207) states that Favre was the first to point this out, but gives no citation. I+ seems unlikely

that Favre considered the matter so early as 1851. (See Violle's bibliography at the end of Verdet's volume.)

5 Mem. Lit. and Phil. Soc. Manchester. ser. 2, vol. vii., 1848. This paper seems to have been in a great measure lost sight of. In his earlier papers (Pogg. Ann., ciii. § 504, 1858) Bosscha says he had not seen it. Poggendorff, in a note, p. 504, appreciates it in a manner which appears to us unjust. This may have arisen from misunderstanding of Joule's terminology, however. Verdet (Chaleur, tom. ii. p. 204; does not seem to have been acquainted with it. It is mentioned in the bibliography by M. J. Violle, however, under 1846, which is the date of the volume of the Memotrs in which it was published. The paper was actually read Jan. 1843.

HhLeoOewrI Cir y 91

ELECTROMOTIVE FORCE. |

Joule's developed in an electrolyte. His method was as follows. ; motive force of a Daniell's cell, and subtract the values of Local method. 4 coil of wire whose resistance was known in terms of a|L thus found from 4%, we get results which are not far heat and certain standard was inserted in the circuit of six Daniell's | from constant. The mean of the values of Z—L is 1-36, hn

the thermal equivalent of which is 64800, which is not motive very different from 68900, the heat evolved in the com- force,

elements, and the heat evolved in it carefully measured by immersing it inacalorimeter. The resistance of the rest of

Joule's results,

the circuit, including that of the battery, was found by interpolating a known resistance in the circuit and observ- ing, by means of a tangent galvanometer, the ratio in which the current was reduced. (The assumption is here made that the electromotive force of a Daniell's cell is constant for different currents.) Knowing the heat evolved in a part

of the circuit of known resistance, and knowing the resistance of the whole circuit, the heat evolved accord- ing to Joule's law in the whole circuit during the oxida- tion of 65 grammes of zinc can be calculated from the indications of the tangent galvanometer previously com- pared with a voltameter. Hence the thermal equivalent © of the work done by the electromotive force of a Daniell's cell during the solution of 65 grm. zinc can be found. 'The value of © arrived at by Joule in this way is 47670 (grm. deg. C.).

Electrolytic cells of various construction were then in- serted into the circuit. The electromotive force resisting the passage of the current through the cells was found by taking the number of battery cells just sufficient to pro- duce electrolysis, observing the current, then increasing the number of cells by one and observing the current again. If 2 be the current in the first case, corrected to bring it to the value it would have had if the resistance of the whole circuit had been the same as in the second case, and Jj the current in the second case, then, E being the

'number of battery cells used in the first case, the electro-

motive force Z opposing the current is given by

Z=E—.,

OSH

the unit being the electromotive force of a Daniell's cell. Z being known and assumed constant for different currents witbin certain limits, the resistance of the whole circuit, electrolyte included, can be found by Ohm's method as above. The amount of heat H which ought to be de- veloped in the electrolyte by Joule's law can then be calculated. The amount of heat H' actually developed was observed. Jt was found that H' is in general greater than H, the difference per electrolysis of 65 grm. zinc with various electrodes is shown in the following table :—

Electrode.

bination of 2 grm. of H with 16 grm. of O to form water. It appears, therefore, that the local heat corresponds to the excess of the electromotive force of polarization over the electromotive force requisite to separate water into its component gases. In other words, the work done by the current against this residual electromotive force is accounted for by the local heat H'- H developed in the cell (see Joule's statement above, p. 89). A glance at the column Lin the above table shows that this residual electromotive force depends greatly on the nature of the electrodes. Thus whien the positive and negative electrodes are plates of platinum and zinc respectively the residual electromotive force is 1°39, whereas with platinized silver plates it is only '34. Local heat and the corresponding electromotive force play a very important part in the working of batteries. Owing to this cause there is an evolution of heat in the cell itself which varies with the strength of the current, and uses up a certain definite fraction of the energy furnished by the solution of the zinc. By sufficiently increasing the external resistance, the amount of heat developed zn the cell according to the law JH=RI? can be made as small a fraction as we please of the whole heat thus developed ; but the amount of local heat generated in the cell during the solution of 65 grm. zinc is not greatly altered in this way, at least not in a cell of Daniell, or in any other of the so-called constant batteries. Did our space permit we might quote a great variety of experimental results to illustrate the principles we have been discussing. Most of these investigations are due to tle French physicists Favre and Silbermann, whose researches have greatly advanced this department of the science of energy.

Very copious extracts from the memoirs of these and other physicists who have worked in this department will be found in Wiedemann, Bd. ii. 2, §§ 1121 sgg. The reader who desires to follow this interesting subject to the sources will find his labour much lightened by referring to M. J. Violle's excellent bibliography of the mechanical theory of heat, appended to the second volume of Verdet's Théorie Mécanique de la Chaleur, Much has been done for the theory of the subject by a series of papers on the mechanical theory of electrolysis by Bosscha,? in which the somewhat complicated phenomena involved are analysed

i a nl in a remarkably clear and able way. Any reader who Rt Amg. Zn 2°81 66300 1°39 1°42 desires to know what has been done in this department Pt | Pt 2°47 53000 1-11 1°36 will do well to consult these papers. We quote the fol- < ah, ie i be; i lowing as an example of Favre and Silbermann's results Favre i : – : a Pi el 1-90 26700 56 1°34 and of the calculations of Bosscha. a

The heat evolved in a cell of Smee? and in platinum

ae mann 1 Platinized.

wires of different lengths through which it was circuited posscha.

The electrolyte in all these cases was dil. H,SO,, excepting the last case, where it was a solution of potash of sp. g. 1-063. In all the cases the chemical process is finally the Same or very nearly so, viz., the freeing of the elements of water, hydrogen and oxygen, in the ordinary gaseous! state, and the transference of a certain quantity of H,SO, from the negative to the positive electrode, or of alkali in the opposite direction. Yet the values of H'-H (which we may call the local heat) are very different. It will be seen, however, that the values of H'— H and Z rise and fall together; and, if we calculate the electromotive forces (L corresponding to thevalues of H' — H, by dividing by 47670,

which was found for the thermal equivalent of the electro—

1 The amount of oxygen that finally escapes in the active state as ozone is very small,

was measured with the following result :—

Freat in cell. | Heat in wire. Length of wire. | Heat in cell calc.

13127 4965 25 mm. | 13523 11690 6557 Bt aes 11788

10439 7746 100 ,, 10188 8992 9030 200 ,, 9048

The heat in each case is that evolved during the libera- tion of 1 grm. of hydrogen in the cell. If we assume that the whole heat in the cell and in

the wire is generated according to Joule's law, and calculate on this hypothesis the resistance of the cell in mm. of the wire, we should get

2 Pogg. Ann., ci., ciii., cv., cviii., 1857, &c. 3 Amalgamated zinc and platinized copper.

values varying from 66 to 200 mm. If, however, we assume, in accordance with the principles explained above, that a constant fraction of the whole energy per sri. of liberated hydrogen appears as local heat in the cell, then, Q denoting the whole heat which appears in the cell, L the local heat, H the heat in the wire, R the resistance of the cell, S+that of the wire, we have

Q-L_R

"a and it is found that on making R=32°3 and L=7589, this formula will represent the results of experiment very fairly. The last column in the above table gives the value of Q thus calculated. In general so good an agreement is not to be expected, because L may aud does vary with

the proportion of hydrogen which gets away from the electrode in the active state diifers according to circum- stances. Bosscha's theory is that it is the intrinsic energy thus carried away from the electrode that appears as local heat. Similar remarks apply of course to oxygen, the active form of the gas being probably ozone. As a verifica- tion of the theory, the fact is cited that at the surface of a plate of carbon, which possesses in an eminent degree the power of reducing ozone to the ordinary state, the residual electromotive force and local heat are very small. At all events the theory of "chemical resistance" is held to be inadequate to explain the facts ; for calculating from some results of his own, combined with those of Lenz and Saweljew, he finds for the residual electromotive force at electrodes of

the strength of the current. Pt Fe Cu " "

Electrical Measure of Chemical Afinity.—In a paper® sent to Mea. the French Academy to compete for a prize offered for the best essay gure- on the heat of chemical combination, Joule elaborates an ingenious ment of method for measuring chemical affinity. By direct observation itis chemical ascertained how much heat is developed in a given time in a certaiu affinity. standard coil of wire, when it is traversed by a current whose Joule,

with some metals than with others, the answers become less satisfactory. We meet, in fact, with considerable divergence of opinion.

Joule's view was that the effect is due to the affinity of

This is endorsed

the metal of the electrode for oxygen. to a certain extent by Sir William Thomson, who puts the matter thus;1—"In a pair consisting of zinc and tin the electromotive force has been found by Poggendorff to be only about half that of a pair consisting of zine and copper, and consequently less than half that of a single cell of Smee's, There is therefore an immense loss of mechanical effect in the external working of a battery composed of such elements, which must be compensated by heat produced within the cells. I believe, with Joule, that this compensa-

ting heat is produced at the surface of the tin in con-

sequence of hydrogen being forced to bubble up from it, instead of the metal itself being allowed to combine with the oxygen of the water in contact with it. A most curious result of the theory of chemical resistance is that, in ex- periments (such as those of Faraday, Lp. Res., 1027, 1028) in which an electric current passing through a trough con- taining sulphuric acid is made.to traverse a diaphragm of an oxidizable metal (zinc or tin) dissolving it on one side and evolving bubbles of hydrogen on the other, part (if not all) of the heat of combination will be evolved, not on the side on which the metal is being eaten away, but

on the side at which the bubbles of hydrogen appear. It will be interesting to verify this conclusion by comparing the quantities of heat evolved in two equal and similar electro- lytic cells in the same circuit, each with zine for negative electrode, and one with zinc the other with platinum or platinized silver for the positive electrode.”?

Bosscha dissents from the theory of “chemical resistance” thus expounded, and advances a different explanation. According to him, the local heat arises from the energy lost by the liberated ions in passing from the active to the ordinary state. We know that the hydrogen which is being liberated at the surface of an electrode can effect reductions which hydrogen in the ordinary state cannot accomplish , it is liberated in fact in a state of greater in- trinsic energy than usual. It is this excess of intrinsic energy which appears as local heat, and gives rise to the residual electromotive force in electrolysis, Different metals possess in very different degrees the power of re- ducing active hydrogen to the ordinary state; and therefore

1 Phil. Mag., 1851 (2), p. 556. 2 The effect here predicted was afterwards observed by Thomson

himself, Rep. Brit. Assoc., 1852, and later still by Bosscha, Pogg. Ann., ciii. p. 517.

strength is measured by means of a tangent galvanometer. Then three readings of the tangent galvanometer are taken—first, when the galvanometer alone is in circuit with the battery, secondly, when the standard coil is also inserted, thirdly, when an electro- lytic cell is inserted instead of the coil. The amount of the ions liberated and the heat evolved in the cell during a given time is also observed in the last case. If A, B, C be the readings of the galvanometer in the three cases, and if a be the resistance of a metallie wire capable of retarding the current equally with the electrolytie cell, then we easily get, taking the resistance of the standard coil as unity,

na(ATOB (A—B)C°

Now if the resistance x were put in the place of the electrolytic cell, the current would be the same; hence by Faraday's law the amount of chemical energy absorbed in the battery would be the game. Also the heat evolved in the rest of the circuit, excluding 2, would be the same. It follows, therefore, that the heat H which would be evolved in x is the equivalent of the whole energy given out in the electrolytic cell. If therefore we subtract from H the heat K which actually appears in the cell, the remainder H-K is the heat equivalent of the intrinsic energy of the liberated ions ; and, provided they appear finally in the * ordinary"'® condition, H-K is the heat which would be developed when they are allowed to combine.

In this way Joule found for the heat evolved in the combustion of 1 grm. of copper, zinc, and hydrogen respectively 594, 1185,

83553.

Galvanic Batteries—It would be inconsistent with our general plan to attempt an exhaustive discussion of all the different electromotors which depend for their energy on chemical action. Wiedemann's Galvanismus, or books on telegraphy and other arts in which electricity is applied to technical purposes, may be consulted by the reader who wishes for fuller information. A brief discussion of some typical batteries will, however, be useful, were it only to illustrate the principles we have just been laying down.

All the earlier batteries were one-fluid batteries. The

ee

3 Noticed in the Comptes Rendus, Feb. 1846, and published at length in Phil. Mag., 1852.

4 Notice that it is not said that « is equal to the resistance of the electrolyte. Bosschain the papers we have quoted, either from not having seen the paper we are now analysing, or through a misunder-standing, accuses Joule of error here. The reasoning (Pogg. Ann., ci. p. 540) which he seems to quote from Joule is not to be found in this or in

any other of Joule's papers that we know of. Polarization és taken into account by Joule (see Phil. Mag., 1852 (1), p. 485). The criticisms of Verdet, who seems to follow Bosscha, are equally ground- less (Théorie Mécanique dela Chaleur, t. ii. p. 204).

5 This word is left purposcly a little vague, and is used to avoid a long discussion of points which need not be raised here,

— One-fluid batteries.

Tocal There are two capital defects to which all one-fluid batteries Tt cannot be said that any of the batteries we have Two- action are more or less subject. In the first place, whether there described, or in fact any battery on the one-fluid system, a at. is or is not external metallic connection between the plates, | Satisfies to any great extent the requirements of a constant ne 'on, 4 certain amount of chemical action goes on at the surface | electromotor, which are to give the same electromotive of the zinc, which consumes the metal without aiding in | force whatever the external resistance, and to preserve that the production of the current. 'To this is given the name | electromotive force unaltered for a considerable time. The of local action. It is supposed to arise from inequalities | best solution of the problem to construct a constant battery in the zinc, on account of which one portion of the metal | is the two-fluid principle invented by Daniell; and on the is electropositive to a neighbouring portion; hence local | whole, the best application of that principle is the cell currents arise causing an evolution of hydrogen at some | originally given by him. This consists essentially of a places and solution of the zine at others. In the second | plate of copper immersed in a saturated solution of copper place, when the battery is in action, there is always sulphate, and a plate of zinc immersed in dilute sulphuric an evolution of hydrogen at the copper or electro- | acid or zinc sulphate, the copper solution being sepa- negative plate of the cell, a certain amount of which | rated from the other by some kind of diaphragm, usually adheres to the plate and causes a strong electromotive | a porous vessel of unglazed earthenware. The chemical force of polarization. The first of these evils is re- | action consists of the solution of the zinc plate to form medied to

a great extent by amalgamating the zinc | zinc sulphate, the formation of zinc sulphate at the dia- plate. We thus reduce the surface metal to a fluid condi- | phragm, and the deposition of copper at the copper plate ; tion everywhere, and thereby eliminate differences of hard- | thus :— ness and softness, crystalline structure, and soon. The Zn §80,2Zn 80,Zn | S0,Cu S0,Cu Cu oldest method was to use zinc amalgam for the electro- ae Zn80, ZnSO, Zn | SO, CaSO, GaCu. negative metal; but it is now universally the custom to . : an a re amalgamate the surface of the zinc plates simply, which | The evolution of hydrogen and the polarization arising may be done by rubbing them with mercury under dilute | therefrom are thus avoided. sulphuric acid. No such effective cure has been found for A very common arrangement of this cell is a porous vessel, con- Da- the hydrogen polarization.. Smee introduced the plan of | taining the copper plate and the sulphate of copper, with a small niell's nsing instead of tho copper plates thin leaves of platinum | £%8 0 arse etystals to keep the sluion stuated, Mis rexel ctomen = silver foil, which are platinized by the process already | of zinc sulphate, in which is placed the zinc plate. With a little described (p. 87). This, in accordance with what we have | care to keep the cell clean by occasionally removing some of the already seen, diminishes the polarization.) A similar | zine solution and diluting to prevent incrustation, to feed the result is obtained by using for the electronegative plate | C°PPe solution, so that it may not get weak and deposit hydrogen : ¢ : ‘ instead of copper on the copper plate, to keep down the level of cast Iron or graphite ; the action of the latter is much | ihe copper solution, which is constantly rising by osmose (see improved by steeping it in nitric acid. art. ELECTROLYsis), and a few other obvious precautions, a bat- Oxidiz- This last fact introduces us to a new principle for im- | tery of Daniell's cells will furnish a very nearly constant cur- ing proving the action of batteries, viz., the use of an oxidizing | tert ane Keep a peaked for fh ee) ee an iS ee “se the agents. agent to get rid of the iyeiteren: poldtization. Wiliow thes|| am tie ecdiee SRE Cdn GE eee

ELECTROMOTIVE FORCE. |

plates usually consisted of zinc and copper, and the exciting fluid was in general sulphuric acid. Various improvements were made by Cruickshank, Wollaston, Hare, and others, in the way of rendering the battery more com- pact, and of reducing its internal resistance by enlarging the plates. Hare carried the last-mentioned improvement. to great lengths; by winding up together in a spiral form sheets of copper and zinc, insulated from each other by pieces of wood, plates of 40 or more square feet surface were obtained. In this way the internal resistance was very much reduced, and powerful heating effects could be obtained. When small internal resistance is no object, the cells of the battery may be filled with sand or sawdust, moistened with the dilute acid. In this form the battery is more portable.

plates of a Smee's battery have been exposed to the air for some time, it is always found that the current is much more energetic than usual just after the first immersion. The improvement is of course only temporary, for the stock of oxygen is soon exhausted, and on raising the plates and dipping them again emmediately, the phenomenon does not appear. Davy found that dilute nitric acid acted better than dilute sulphuric acid as an exciting fluid, and the cause of this is the action of the HNO, on the hydro- gen evolved at the copper plate. Good instances of this kind of action are furnished by the bichromate battery of Bunsen and the Léclanché cell, which occupy a sort of middle position between one and two fluid batteries.

The bichromate cell consists of an amalgamated zinc plate, usu- ally suspended between two parallel carbon plates, so that it can be raised or depressed at pleasure. The bichromate solution is made,

1 Fleeming Jenkin gives '47 volt as the available electromotive force of Smee's cell. The electromotive force when the circuit is broken is much greater. See above, p- 90.

according to Bunsen, by mixing 605 parts of water with 61°8 of potassium bichromate and 116 of sulphuric acid. The electro- motive force of the bichromate cell is very great to start with (more than twice that of a Daniell's cell), but it falls very quickly when the external resistance is small. The cell recovers pretty quickly how- ever, and may be used with advantage where powerful currents of short duration are often wanted. In the cell of Léclanché the electronegative metal is replaced by a porous vessel filled with carbon and pounded peroxide of manganese. The exciting liquid used is chloride of ammonium. Chloride of zinc is formed at the zine plate, and ammonia and hydrogen appear at the negative plate ; the latter reduces the MnO,, so that H,O and Mn,O, are formed, while the ammonia is partly dissolved and partly escapes. This element is tolerably constant if it be not used to produce very strong currents, but its great merit consists in being very permanent; for it will keep in condition for months with very little attention, furnishing a current now and then when wanted ; hence its exten- sive use in working electric bells, railway signals, and so on.

vessel, the result of which is a deposit of copper on the zinc, and other mischiefs, which stop the action of the cell altogether.

Daniell's clement has been constructed in a great variety of forms, to suit various purposes. The sawdust Daniell, invented by Sir Wm. Thomson! (1858), is very convenient when portability is desired. In this form the copper plate, soldered to a gutta- percha covered wire, is placed at the bottom of a glass vessel and covered with crystals of copper sulphate ; over these wet sawdust is sprinkled, and then more sawdust, moistened with a solution of sulphate of zinc, upon which is laid the zinc plate. The cell of Minotto is very similar to this.

In these batterics the sawdust takes the place of the porous diaphragm, aud retards the interdiffusion of the fluids. Inanother class of batteries, of which the element of Meidinger may be taken as the type, the diaphragm is dispensed with altogether, and the action of gravity alone retards the diffusion. In Meidinger's cell the zinc is formed into a ring, which fits the upper part of a glass beaker filled with zinc sulphate. At the bottom of this beaker is placed a smaller beaker, in which stands a

ring of copper, with a properly insulated connecting wire. The mouth of the beaker is closed by a lid, with a hole in the centre, through which passes the long tapering neck of a glass balloon, which is filled with

- **Jenkin, Electricity and Magnetism, p. 224.**

Grove's element.

Cells of Bunsen, &e.

See- beck's dis- covery.

crystals of copper sulphate ; the narrow end of this neck dips into the small beaker, the copper sulphate runs slowly out, and being specifically heavier than the zine sulphate, it collects at the bottom about the copper ring. :

Yet another form of Daniell's element is the tray cell of Sir William Thomson, which consists of a large wooden tray lined with lead, the bottom of which is covered with copper by electrotyping. The zinc is made like a grating, to allow the gas to escape, and is enveloped in a piece of parchment paper bent into a tray- shape, the whole resting on little pieces of wood placed on the leaden bottom of the outer tray. Sulphate of copper is fed in at the edge of the tray, aud sulphate of zine is poured into the parchment. The zines in these elements are some 40 centi- metres square, so that the internal resistance is as low as 0°2 ohm.

One of the best known in this country, and perhaps the most used of all the two-fluid cells, is the element of Grove. This differs from Daniell's element in having nitric acid with a plati- num electrode in the porous cell, instead of the copper solution and the copper electrode of Daniell's clement. The hydrogen evolved at the platinum is oxidized by the nitric acid, and the polarization thus avoided. The nitrous fumes given off by the chemical action are very disagreeable, and also very poisonous, so that it is advisable to place the battery outside the experimenting room

or in a suitable draught chamber. The electromotive force of Grove's cell is a good deal higher than that of Daniell's, and its internal resistance is very much less, '25 ohm being easily attained with a cell of moderate dimensions. On this account the cell is much used for working induction coils, generating the electric light, and so on, notwithstanding that it is troublesome to fit up, and must be renewed every day.

In Bunsen's element the platinum foils of Grove are replaced by carbon. The prime cost of the battery is thus considerably re- duced, the more so now that carbons for the purpose have become articles of commerce. The electromotive force of the element thus altered is as great as, or with good carbons even greater than, in Grove's original form; but the internal resistance is greater. There is a difficulty sometimes in obtaining good connection with the carbons, and trouble arises from their fouling; but the fact that this cell is a universal favourite in Germany proves its practical] utility. It is comparatively little used in this country.

In the cell of Marié Davy, which is, or was, much used for tele- graphic purposes in France, the copper solution and copper plate of Daniell are replaced by a watery paste of protosulphate of mercury, into which is inserted a carbon electrode. The electromotive force of this cell is said to be about 1°5 volts,' and its internal resistance to be greater than that of Daniell's cell.

Besides these, various bichromate elements of merit might be described; but we have dwelt long enough on this subject already.

The following table of Latimer Clark's, quoted by Maxwell, will give the reader an idea of the relations as to electromotive force of the commoner elements :—

Daniell…... H,S0,+ 4Aq | CuSO, 1°079 Do. H,80,+12Aq | CuSO, 0°978 Do. H,S0,+12Aq | Cu(NO3)q 1:000

Bunsen…... H,S0O,+12Aq | HNO, 1°964 Do. H,S0,+12Aq | HNO,(sp.g. 1°38)| 1°888

GIOVE.» 5.556 H,S0,+ 4Aq | HNO, 1956

Snot Sie SS ee The electromotive force is stated in volts, and the solutions in the third column are concentrated, unless it is otherwise stated.

Thermoelectricity.—We have already alluded to the law of Volta, according to which there can be no resultant electro- motive force in a circuit composed solely of different metals ; and it will be remembered that we added the condition that all the junctions must be at the same temperature. Seebeck was the first to discover? that this law is subject to exception when the junctions are not all at the same temperature. If we form a circuit with an iron wire and a copper wire, and raise the temperature of one of the junctions a little above that of the other, a current flows round the circuit, passing from copper to iron over the hotter junction ; similarly, if we solder together a piece of bismuth and a piece of antimony, and connect the free ends with the copper wires of a galvanometer, then when the junction of the bismuth and antimony is heated the galvanometer indicates a current passing from bismuth to antimony over the hot junction. It will be perceived that the second of

1 Jenkin, Electricity and Magnetism, p. 225. ‘ : Pogg. Ann., vi. 1826. The discovery was made about 1821 or

822.

HEREC TRACES

our two illustrative instances is more complicated than the first, inasmuch as three metals enter into the circuit in- stead of two. altered by the intervention of the copper wire (abstraction being made of its resistance), provided the temperatures of the points where it joins the bismuth and antimony re- spectively be the same. mental proof of this assertion by inserting between the pieces of bismuth aud antimony a piece of copper wire so

| ELECTROMOTIVE FORCE.

Nevertheless the experimental result is not

It is easy to give a direct experi-

that the circuit now is Bi.Cu.Sb.Cu. Bi. ; if the junctions of

the inserted wire with the bismuth and antimony be raised

to the same temperature as the BiSb junction in our second

experiment, and the junctions with the copper wire of the

galvanometer be at the same lower temperature as before,

the total electromotive force in the circuit will be the same ; and, provided the resistance of the circuit has not been sensibly increased by the interpolation of the copper wire, the galvanometer indication will also be the same as before The same result is obtained however many different metals we insert between the bismuth and antimony, provided the temperatures of all the junctions be the same and equal to that of the BiSb junction in the original experiment.

The law of Volta therefore still holds if stated thus: A series of metals whose junctions are all at the same temperature may be replaced by the two end metals of the series without altering the electromotive force in any circuit of which the serves forms a part.

It is not unlikely that the above statement of the fundamental facts concerning thermoelectromotive force has suggested to the reader two notions:—lIst, that the phenomena may be completely explained by a contact force at the junctions of the metals which is a function of the temperature of the junction; and 2d, that this con- tact force is the true contact force of Volta. It is perhaps as well to mention even at this early stage that the first of. these notions is certainly not correct, and that the second is not admitted by some of the greatest authorities on the subject.

Seebeck examined the thermoelectric properties of a large Thermo- number of metals, and formed a thermoelectric series, any electric metal in which is thermoelectrically related to any following one as bismuth (see above) is to antimony, the electro- motive force in a circuit formed of the metals being ceterzs

paribus greater the farther apart they are in the series.

The following is a selection from Seebeck's series :—

Bi. Ni. Co. Pd. Pt. Cu. Mn. Hg. Pb. Sn. Au. Ag. Zn. Cd. Fe.Sb.Te. ,

This series has only a general interest, and is not to be re- garded as in any way absolute. Seebeck himself showed the great effect that slight impurities and variations of physical condition may have on the position of a metal in the series. Some specimens of platinum for instance. come between zinc and cadmium. Another instance of the same kind is afforded by iron: Joule® found the following order to hold —cast iron, copper, steel, smithy iron.

Thermoelectric series have been given by Hankel, Thomson, and others, but we need not reproduce them here. It may be well, however, to direct the attention of the reader to the properties of metallic sulphides and of alloys which in many cases occupy extreme positions in the thermoelectric series. Alloys present anomalies in their thermoelectric properties somewhat similar to those already noticed in our discussion of their conductivity. These properties have been much studied with a view to practical applications in the construction of thermopiles. Cousider- able progress has been made in this direction (see above p. 11), notwithstanding the fact that many of the alloys ° most distinguished for their thermoelectric power are very brittle and have a tendency to instability under the con- tinued action of heat.*

3 Phil. Mag., 1857. 4 For further information consult Wiedemann, Galv., Bd. i § 593, &e.

Thermo- electro- motive force.

Experi-

ELECTROMOTIVE FORCE. |

Many measurements of the electromotive force of thermo- electric couples have been made by Matthiessen,! Wiede- mann,” E. Becquerel,* and others, but the results are of nc great value owing to the effect of impurities and the want of sufficient data to determine all the thermoelectric con- stants of any one couple (see below, p. 99). Numerical data, such as they are, will be found in Wiedemann, Fleeming Jenkin’s Electricity and Magnetism, or Everett’s Illustrations of the Centremetre-gramme-second System of Units. It will give the reader an idea of the order of the magnitudes involved to state that the electromotive force at ordinary temperatures of a BiSb conple is somewhere about 11700 C. G. 8.4 absolute units when the difference between the temperatures of the junctions is 1° C. The corresponding number for a CuFe couple is 1600 or 1700.

Thermoelectric currents, or at least what may very likely be such, have been obtained in circuits other than purely metallic, e. g., in circuits containing junctions of metals and fluids,> metals and melted salts, fluids and fluids.? The phenomena in all these cases are complicated, and the results more or less doubtful; so that no useful purpose could be served by discussing the matter here. The same remark applies to the curious electrical phenomena of flames,® of which no proper explanation, so far as we know, has as yet been given.

The experiments of Magnus? have shown that in a

ments of Circuit composed entirely of one metal, every part of which

Magnus.

Effects of strain,

‘In his Bakerian Lecture, along with

is in the same state as to hardness and strain, no thermo- electromotive force can exist, no matter what the varia- tions of the section or form of the conductor or what the distribution of temperature in it may be (so long as there is neither discontinuity of form nor abrupt variation of temperature),

This statement is of great importance, as we shall see, in the theory of thermoelectricity. Its purport will be all the better understood if we dwell for a little on the three limitations which accompany it.

The great effect of the hardness or softness and crystalline or amorphous structure of a metal on its electric properties was observed by Seebeck soon after the discovery of thermo- electricity.1° The effect of temper in wires may be shown very neatly by the following experiment due to Magnus. On areel formed by crossing two pieces of wood are wound several turns of hard-drawn brass wire softened in a number of places adjacent to each other on the reel, The free ends of the wire being connected with a galvanometer, aud the parts of the wire lying and soft portions being heated, a thermoelectric current of considerable strength is obtained, whose direction is from soft parts to hard across the beated boundaries. Effects of a similar kind were obtained with silver, steel, cadmium, copper, gold, and platinum. In German silver, zinc, tin, and iron, the current went from hard to soft across the hotter boundary.

Sir William Thomson made a number of experiments on the effect of strain on the electric properties of metals. The results, some of them very surprising, are contained ; many other things of great importance for the student of thermoelectricity.

T'wo of his experiments may be described as specimens.

1 Pogg. Ann., 1858. 3 Ann. de Chim. et de Phys., 1864.

- **That is, roughly, '000117, if we take for our unit the electro-motive force of a Daniell's cell,**

Ss RS a Faraday, Henrici, Gore, and others; see Wiedemann, 5 Andrews, Phil. Afag., Phil. Mag., 1864. 7 Nobili, Wiedemann, Becquerel; see Wiedemann, J. ¢. a See Wiedemann, J. c. ° Pogg. Ann., 1851. Pogg. Ann., 1856, Phil, Trans., 1856.

2 Galv., Ba. i. § 590.

1837; Hankel, Wiedemann (2. ¢.), Gore,

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They afford convenient lecture-room illustrations of the subject under discussion. (1.) A series of copper wires A, B, ©, D, E, F, G, &c., are suspended from a horizontal peg. A and B, C and D, E and F, &c., are connected by short horizontal pieces of copper wire, all lying in the same

‘horizontal line, and B and C, D and E, F and G, &e., are

connected by a series of pieces lying in another horizontal line below the former. An arrangement is made by means of which the alternate wires A, C, E, G, can be more or less powerfully stretched, while B, D, F, &c., are comparatively free. A piece of hot glass is applied to heat either the upper or lower line of junctions. A thermoelectric enr- rent is then observed passing from the stretched to the unstretched copper across the hot junctions. This thermo- electric current increases with the traction up to the break- ing point. But the most remarkable point that comes out in such experiments is that when we free the wire after powerful traction, leaving it with a permanent set, there is still a thermoelectric current ; but the direction is now from the soft or unstrained towards the permanently strained parts across the hot region. (2.) Iron gives similar results, only the direction of the current is

in each case opposite to that in the corresponding case for copper. The following experiment exhibits this in a very elegant manner. One end of a piece of carcfully annealed iron wire is wound several times round a horizontal peg, the free end being slightly stretched by a small weight, and connected with one terminal of a galvanometer. The other end of the wire is wound a few times round one side of a rectangular wooden frame, the free end being stretched by a small weight and connected with the other terminal of the galvanometer. The parts of the wire on the peg or the part on the frame is then heated, and weights are hung to the frame. As the weight increases, the deflection of the galvanometer goes on increasing, If we stop a little short of rupture, aud gradually decrease the weight, the deflection of the galvanometer gradually decreases to zero, changes sign before the weight is entirely removed, and finally remains at a considerable negative value when the wire is again free.

These experiments of Sir Wm. Thomson's were repeated Le Roux, The results of the two experimenters are &.

by Le Roux. not very concordant. This may be due to differences in the qualities of the materials with which they worked, or to the fact that Le Roux}? worked at higher mean tem- peratures than Thonison.}8

Le Roux also repeated the experiments of Magnus, Abrupt confirming his general result, but adding the two last varia-

qualifications given above. He found, contrary to the result of Magnus, that when a lateral notch is filed in a wire and one side heated, there is in general a thermo- electric current, which is greater, up to a certain limit, the deeper the notch. He also found that when two wires of the same metal, with flat ends, are pressed together, so that one forms the continuation of the other, and the wire on one side of the junction is heated, no current is ob- tained ; but he observed a current in all cases where there was dissymmetry,—e.g., where an edge of one end was pressed on the flat surface of the other, where the wires overlapped or crossed, or where the chisel-shaped end of one wire fitted into a notch in the end of the other, and the axes of the wires were inclined, and so on.

Whether a very abrupt variation in temperature in a continuous part of a metallic wire would produce a thermo- electromotive force is a question which possesses little physical interest, since it is impossible to realize th

12 Ann. de Chim. et de Phys., 1867.

13 Wiedemann, Bd. i. § 610. It appears from a note at the end of Le Roux's paper (/.c.) that Sir Wm. Thomson has lately repeated some of his experiments and confirmed his former results.

Thermo- electric inver= sion. Cum- ming.

imagined conditions. There can be no doubt, however, that, when the two unequally heated ends of a wire com- posed of the same metal throughout are brought together, a thermoelectric current is in general the consequence. Such currents were, it appears, observed by Ritter! in 1801, when cold and hot pieces of zinc wire were brought into contact. Becquerel, Matteucci, Magnus, and others have experimented on this subject. The results obtained are, no doubt, greatly influenced by the state as to oxida- tion, &c., of the surfaces of the metals experimented on, as has been pointed out by Franz and Gaugain. The experimental conditions are, in truth, very complicated, and a discussion of the matter would be out of place here.2 We may mention, however, that, at the instance of Professor Tait, Mr Durham? made experiments on the transient current which arises when the unequally heated ends of a platinum wire are brought into contact. It was found that the first swing of a galvanometer of moderately long period was proportional to the temperature difference and independent of the mean temperature through a con- siderable range.

Cumming, who experimented on thermoelectricity about the same time as Seebeck, and apparently independently, discovered the remarkable fact that the thermoelectric order of the metals is not the same for high temperatures as for low. He found that, when the temperature of the hot junction in a circuit of iron and copper, or iron and gold, is

gradually raised, the electromotive force increases more and more slowly, reaches a maximum at a certain temperature T, then decreases to zero, and finally changes its direction. The higher the temperature of the colder junction, so long as it is less than T, the sooner the reversal of the electromotive force is obtained. If the temperature of the hot junction be T'+7, where 7 is small, then the reversal of the electromotive force takes place when the temperature of the colder junction is T-r. lf both junctions, A and B, be at the temperature TPethen either heating or cooling A will cause a current in the same direction round the circuit, and etther heating or cooling B will cause a current in the opposite direction.

The reversal of the current may be shown very conve- niently in the manner recommended by Sir Wm. Thomson.*

A circuit is formed by soldering an iron wire to the copper terminal wires of a galvanometer. Tf one junction be at the temperature of the room and the other at 300° C. or thereby, a current flows from copper to iron across the hotter junction ; but, if we raise the temperature of both junctions over 300°C., one being still a little hotter than the other (which can be managed by keeping both in a lamp flame, one in a slightly hotter place than the other), then the current will flow from iron to copper across the hot junction, If both junctions be allowed to cool, the difer- ence between their temperatures remaining the same, the current will decrease, becoming zero when the mean tempe- rature of the two junctions is about 280° C.; and, on still further lowering the mean temperature, it will set again in the opposite direction, 7.e., from copper to iron across the hot junction. The fundamental facts of thermoelectric in- version were confirmed by Becquerel,® Hankel,° Svanberg,' &c.; but the matter rested there till it was taken up® by Sir Wm. Thomson? in the course of his classical researches on the applications of the laws of thermodynamics to phy- sical problems.

1 Wiedemann, Bd. i. § 627. 2 Consult Wiedemann, Bad. i. $ 627, &c., and Mascart, t. ii. § 932, &c. 3 Proc. R.S.#., 1871-2. 4 Bakerian Lecture, Phil. Trans., 1856, p. 699. 2 Ann. de Chim. et de Phys., 1826. 6 Pogg. Ann., 1844. ; Pogg. fips sabe cf. Wiedemann, Bd. i. § 623. sequence, it

appears, of aremark of Joule's, of. Proc. R.S.E., 1874-5, p. 417. ; 9 Trans, ate cot

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account of in a similar manner.

The application of the second law is of a more hypo- thetical character. It is true that the Peltier effects, as we may for shortness call the heat absorption and evolution at the junctions, are reversible in this sense that we might suppose the thermoelectric current, whose energy arises wholly or partly from the excess of the heat absorbed at the junction A over that evolved at the junction B, used to drive an electromagnetic engine and raise a weight ; and that we might suppose the potential energy thus obtained again expended in sending, by means of an electromagnetic machine, a current in the opposite direction round the circuit, absorbing heat at B, evolving heat at A, and thus restoring the inequality of temperature. This process, however, must always be accompanied by dissipation of energy, (1) by the evolution of heat in the circuit accord- ing to Joule's law, and (2) by conduction from the hotter towards the colder parts of the wires. The first of these effects varies as the square of the current strength, while Peltier's effect varies as the current strength simply ; so that the former might be made as small a fraction of the latter as we please by sufficiently reducing the current, and thus, theoretically speaking, eliminated. The second form of dissipation could not be thus got rid of, and could only be eliminated in a circuit of infinitely small thermal but finite electric conductivity, a kind of circuit not to be realized, as we know (see above p. 51). Still it seems a reasonable hypothesis to assume that the Peltier effects, and other heat effects if any, which vary as the first power of the strength of the current, taken by themselves are subject to the second law of thermodynamics. Let us now further assume that all the reversible heat effects occur solely at the junctions, Let I, II' denote the heat (measured in dynainical equivalents) absorbed and evolved, at the hot and cold junctions respectively in a unit of time by a unit current. Let E be the electromotive force of an electromotor maintaining a current I, in such

a direction as to cause absorption of heat at the hot junction. Then, if R be the whole resistance of the circuit, we have, by Joule's law and the first law of thermodynamics,

ied wi, th supposing the whole of the energy of the current wasted in heat. Hence we get

‘ E4+n-Ir

j=. (2). It appears then that, owing to the excess of the absorption of heat at the hot junction over the evolution at the cold junction, there arises an electromotive force IT — II’ helping to drive the current in the direction giving heat absorption at the hot junction. We may suppose (and shall hence- forth suppose) that E=0, and then the current will be maintained entirely by the thermoelectromotive force.

If we now apply the second law, we get nt TW os. Ua

@ and 6 being the absolute temperatures of the hot and cold junctions. Hence

3);

|

or, in other words, II=Cé@, where C is a constant depend-

Thom- son,

ELECTROMOTIVE FORCE. |

ing only on the nature of the metals. In accordance with this, the thermoelectromotive force in the circuit would be O(9-—6); that is, it would be proportional to the difference between the temperatures of the junctions. Now this conclusion is wholly inconsistent with the existence of thermoelectric inversions. We must therefore either deny the applicability of the second law, or else seek for rever- sible heat effects other than those of Peltier. This line of reasoning, taken in connection with another somewhat more difficult, satisfied Sir Wm.

Thomson that reversible heating effects do exist in the circuit elsewhere than at the junctions. ‘These can only exist where the current passes from hotter to colder parts of the same wire or the reverse. Thomson was thus led to one of the most astonishing of all his brilliant discoveries; for he found, after a series of researches distinguished alike for patience and experi- mental skill, that an electric current absorbs heat in a copper conductor when it passes from cold to hot, and evolves heat in iron under similar circumstances. ‘This phenomenon was called by its discoverer the electric con- vection of heat. He expressed the facts above stated by saying that positive electricity carries heat with it in an unequally heated copper conductor, and negative electricity carries heat with it in an unequally heated iron conductor. The first statement is perhaps clearer ; the value of the one given by Thomson consists in the suggestion which it con- veys of a valuable physical analogy with the transport of heat by a current of water in an unequally heated pipe.

If two points AB of a uniform linear conductor, in which a current I is flowing from A to B, and evolving heat, be kept at the same constant temperature, but for the electric transport of heat the temperature distribution would be symmetrical about a point of maximum tem- perature half way between A and B. Owing to the electric transport of heat, the maximum will be shifted towards A in iron, towards B in copper.2- This remark contains the principle of the experiments made by Thomson to detect the new effect.

Predic- tion of Thom- son effect.

Experi- mental verifica- tion.

The first experiment in which the effect was satisfactorily estab- }

lished was made with a conductor ABCDEFG, formed of a num- ber of strips of iron bound together at A, C, E, and G, but opened out widely at B, D, and F, to allow these parts to be thoroughly heated or cooled. At C and E small cylindrical openings allowed the bulbs of two delicate mercurial thermometers to be inserted in the heart of the bundle of strips. The part D of the conductor was kept at 100° C. by means of boiling water, and the parts B and F were kept cool by a constant

stream of cold water. The current from a few cells of large surface was sent for a certain time from A to G, then for the same length of time from G to A, and soon. In this way the effects of want of symmetry were eliminated, and the result was that the excess of the temperature at E over that at C was always greatest when the current passed from G to A; whence it follows, as stated above, that a current of positive electricity evolves heat in an iron conductor when it passes from cold to hot.

Le Roux 3 has made a series of interesting experiments on the Thomson effect in different metals. He found that the effect varies as the strength of the current, and gives the following numbers Tepresenting its relative magnitudes in different metals. In lead the effect is insensible.

Le Roux.

We may now apply the mathematical reasoning given above, taking into account Thomson's effect,

S* eS SS eee 1 Trans. R.S. E., 1851.

2 See Verdet, Théorie Mécanique dela Chaleur, t. ii. 250. ® Ann, de Chim. et de Physi, 1867, os

Suppose for simplicity we have a circuit uf two metals only. Let Equa-

the cifrent go from A to B over the hot junction, and let the heat tions of absorbed in passing from a point at temperature to a neighbour- Thom- ing point at temperature +d@ in A be o,d@ per unit of current son, per unit of time ; let o,d@ be the corresponding expression for B. Then it is obvious, from the result of Magnus (see above, p- 95), that o, and o, can be functions of the temperature merely ; they depend, of course, on the nature of the metal, but are independent of the form

or magnitude of the section of the conductor. The first and second laws now give respectively

0

Ean-m+/,? (o,- 01) do (4),

,

0=5- gt

(5),

where E is the whole thermoelectromotive force, and 1 and I' are the same functions of and ' respectively. By differentiation we get from (5)

d@ (M\ , oy-o9_ – 5i(F) = tO whence we easily get on E= 9%

.4 oer Be

or Ht _ dE

] dé

This last equation enables us to determine E in terms of II, and conversely,

When the difference between the temperatures of the junctions is very small, equal to d6 say, the thermoelectro- motive force is

Il a eo (8).

The coefficient ; by which we must multiply the small

temperature difference to get the electromotive force is called by Thomson the thermoelectric power of the circuit. If we have a circuit of three metals, A, B, O, all at the same temperature 6, then we know that Ngo+Nca+Map=0, Has ac _ Tao

(4) @ 4] * & (9);

or, in other words, the thermoelectric power of B with respect to A is equal to the difference between the thermo- electric powers of a third metal C with respect to A and B respectively. A

Thus far we have been following Thomson. But as yet Tait's we have no indication how o, the coefficient of the Thomson conjec- effect, depends on the temperature. Thomson himself t™ seems (see his Bakerian Lecture, 1. c., p. 7 06) to have ex- pected that o would turn out to be constant. Certain considerations concerning the dissipation of energy led Tait, however, to conjecture that o is proportional to the absolute temperature. If we adopt this conjecture, Thomson's equations give us at once the values of the Peltier effect and the electromotive force in the circuit, If o, =1,0, o,=k,0, we get from (6) and (7) successively*

Tl=(k,-k,)(Qj9-0)0 « . . . ' (10), E= (h, ~ k)(0 – 6') {0,.- 4(0 +6} so (11),

where 6, is the neutral temperature. Also, since in a circuit of uniform temperature there are no Thomson effects, and the sum of the Peltier effects is zero, we get for any three metals

(Kg — Heg)093+ (Hg — ey)031 + (hey — hq), g=0. (12).

Taking up the idea of a thermoelectric diagram origi- Thermo. nally suggested by Thomson, Tait has shown how to repre- electric sent the above results in a very elegant and simple manner, diagram Suppose we construct a curve whose abscissa is the abso- 4¢¥elop-

: : ed by lute temperature @, and whose ordinate is the thermo- Tait. electric power of some standard metal with respect to the

eee 4 Tait, Proc. R. S. Z., 1870-1-2. VIL — 13

whence

metal we are considering, then, from what has been shown (10), Tait's conjecture leads to the result that this curve 1s a straight line; and if the standard metal be lead, for which, according to Le Roux's results, the Thomson effect is zero, then the coefficient k of the Thomson effect 1s the tangent of the inclination of the representative line to the axis of abscisse. And not only s0, but it follows from formule (9) and (7) that, if A'AN, B'BN (fig. 54) be the

Fig. 54.

lines corresponding to two metals, say Cu and Fe (of which the former is above the latter in the thermoelectric series at ordinary temperatures), and if AB, A'B' be the ordinates corresponding to 6 and 6', then the electromotive force ina circuit of the two metals whose junctions are at the tempera- tures 6 and @', tending to send a current from Cu to Fe across the hotter junction, is represented by the area ABB'A'. The Peltier effects at the two junctions are represented by the rectangles ABba and A'B'b'a', and the Thomson effects, in the Gu-and Fe respectively, by AA'DC and BB'GF, or by AA'a'a and BB2'b, which are equal to these. At N, where the lines intersect, the Peltier effect vanishes. N therefore is the neutral point ; and, if the higher tempera- ture lie beyond it, the electromotive force must be found by taking the difference of the areas NA'B' and NAB, and soon. All the phenomena of inversion may be studied by means of this diagram, and the reader will find it by far the best means for fixing the facts in his memory.

Experi- For several years back Tait! and his pupils have

ments of been engaged in verifying the consequences of this con-

Tait, &c. jecture; and it has been shown, first, for temperatures within the range of mercury thermometers, and latterly for temperatures considerably beyond this range, that the hypothesis accords with experience. The methods em- ployed by Tait in his experiments at high temperatures are of great interest and importance. One of these was to con- struct a-curve whose ordinate and abscissa are the simul- taneous readings of two thermoelectric circuits whose hot and whose cold junctions are kept at common tempera- tures. It is a consequence of the

foregoing assumption that the curve thus obtained ought to be a parabola. Very good ~~parabolas were in many cases obtained. In some cases, however, the curves, so far from being parabolas, were actually curves having points of contrary flexure. This anomaly led Tait to the discovery of the astonishing fact that the Thomson effect in iron changes its sign cer~~ tainly once at a temperature near low red heat, if not a second time near the melting point. It was found that the inflected curves could be represented by piecing to- gether different parabolas. Hence the line for iron in the

1 Trans. R, S. E., 1878.

thermoelectric diagram is a broken line made up of two if not three straight pieces. was very strikingly shown the alloys PtIr or PtCu.

[ELECTROMOTIVE FORCE.

This peculiarity of the iron line by forming circuits of iron with Such circuits exhibit two or even three neutral points (see fig. 55). Another very elegant

Fig. 55.

method of verification consisted in using along with an iron wire a multiple wire of Au and Pd, the resistances uf whose branches could be modified at will. It is easy enough to show that the line for the Au-Pd wire is a straight line, passing through the neutral point of Au and Pd, and such that it divides the part of an ordinate lying between the Au and Pd lines in the ratio of the respective conductivities of the Au and Pd branches. Thus, by in- creasing ratios of the conductivities of the Pd and Au branches from 0 up to 0, we can make the Au-Pd line sweep through the whole of the space between Au and Pd (fig. 55), and thus explore the part of the Fe line lying in the space. We get in this way first one neutral point, then two, then one, and then none in our Fe, Au—Pd circuit.

Tait has pointed out that, by using Ptlr and Fe, keeping the hot and cold junctions at the two neutral a temperatures, excess of the heat absorbed in the hotter iron over that alone. developed in the colder. The electromotive force is repre- sented by the area inclosed by the part of the zigzag on the Fe line cut off by the PtIr line (fig. 55). A similar case of thermoelectromotive force without Peltier effects may be obtained with three metals, such as Fe, Cd, Cu, whose neutral points lie within reasonable limits. The electromotive force in this case is represented by the triangle between the three lines.

We subjoin a table, calculated by Professor Everett from Tait's Tait's

diagram. The thermoelectric power is given in electromagnetic results. (C.G.8.) units, in terms of the temperature (¢) in centigrade

degrees, by means of the formula a+ At, where a and B have the tabulated values :—

a B

— 266})— 4°29

— 234)— 2°40

= 214)\— 1°50 Pt Ir (5p.c. Ir)|—- 662 }+0°55 AGL ca duswiivaxaeaant = 283 \)— 1°02 Bo: Gao, O— $96 4:1 B4 Oe… co. 1a. nsean: — 136|— 0°95. Do. (6 do. Y= 709 | 4-068 |] PD: .....-2.~~2creens + O|+ 0°00 Do. (15 do.)j~~ 577 WE OROO WSN) c.cscetewecenenar = 43)\— 0°85 Pibisobts.s.cecs.c a SG eeu Ad! "ees Sacepieeeetes + 77\|—- 0°39 Pt hard… = 260-020 swath a. -nemeonereeecers + 625 |+ 3°59 IG WL. \aekacenes = F440 i IN toullaoe Oh ace: 2204 | 5°12) tae ee — 2241+4- 0°95 || Do. 250° t0310°C.|+ 8449 | — 24°10 German silver} +1207 | 5:12 Do. from 340° C.|- 307 }+ 5°12

We need scarcely warn the reader that the results in this table must not be rashly applied to any specimens of the metals taken at random. The temperature limits lie between 18° C. and 420° C.

It would be extremely interesting to compare the results

and. Current

we get a current maintained solely by the oon effects

ELECTROMOTIVE FORCE. |

Com- of absolute measurements of the Peltier effect with Tait's parisonof theory ; but, unfortunately, no data that we know of are ree available for the purpose. It is absolutely necessary for measure- this purpose to have heat measurements and determina- ments. tions of the lines of the metals in the same specimens. The data of Edlund! and Le

Roux are quite useless for such a purpose. One result of Le Roux's is, however, interesting. He finds for the amount of heat developed at the junction BiCu, the values 3°09 and 3:95 at 25° C. and 100° ©. respectively. Since the neutral temperature of BiCu is very high, the Peltier effect ought, according to Tait's theory, to vary as the absolute temperature. The absolute temperatures corresponding to 25° C and 100° C. are 298° and 373°, and we have 3:95~+3°09 =1-:278, while 373+298=1°252; the agreement between these numbers bears out the theory so far.? Seat of General Considerations regarding the Seat of Electromo- electro- tive Force——Before proceeding to notice the remaining Fe cases of the origin of electromotive force, in which the

phenomena are more complicated, and the experimental conditions less understood, it may be well to call attention to a principle that appears to hold in most of the cases already examined. In most of these cases the seat of the electromotive force appears to be at the places where energy is either taken in or given out in the circuit.®

It is very natural to ask ourselves what the consequences would be if we applied this principle to the voltaic circuit. It would probably be admitted by most that the energy in the voltaic circuit is taken in mainly at the surface of the electropositive metal. This admission, taken in conjunc- tion with the general principle above stated, leads us to the conclusion that the electromotive force resides mainly at the surface of the electropositive metal. The absorption or evolution of energy at the junction of the dissimilar metals is quite insignificant, and we should, on the same view, deny that any considerable part of the electromotive force resides there.

This view appears to be at variance with the theory of metallic contact, as now held by Sir William Thomson and others; and the burden of explaining the experiments made by him and others on the contact force of Volta is doubt- less thrown on those who adopt this view. The position of such would very likely be that there is an uneliminated source of uncertainty in all these experiments' (see above, p. 85). On the other hand, those who adopt the con- tact force of Volta at the junction of copper and zinc as

the main part of the electromotive force of Daniell's

element are under the necessity of distinguishing this from the electromotive force corresponding to the Peltier effect, which must be a distinct effect, since it is but a very small fraction of that of a Daniell's cell.

We are, however, so very ignorant of the nature of the motion which is the essence of the electric current that the very form in which we have put the question may be misleading. If this motion be in the surrounding medium, as there is great reason to believe it to be, it would not be surprising to find that speculations as to the exact locality of the electromotive force in the circuit were utterly wide of the mark. The very language which we use implies a certain mode of analysing the problem which may be altogether wrong. The only thing of which we can as yet be sure is that the mathematical equations deduced

1 Wied. Galv., Bd. i. § 694.

- **Since the above was written further experimental evidence in sup-yort of the theory has appeared. See Naccari and Bellati, Aéti del R. Ist. Veneto di Sc. Litt. ed Arti, November 1877.**

3 Maxwell, vol. i. § 249. By "being taken in," in the case of heat for instance, is meant " disappearing as heat and appearing as electro-kinetic energy." In athermoelectric circuit this transformation occurs wherever there is Peltier or Thomson effect,

4 Maxwell, Z.c.

from Ohm's law and other proximate principles are in

ex t accordance with experiment.

Pyroelectricity.—Some account of this interesting subject has Pyro- already been given in the Historical Sketch at the beginning of this elec- article. It will be well, however, to state here some of the conclu- tricity. sions of those who have recently investigated the matter. It seems now to be settled that it is not merely high or low temperature, but change uf temperature, which gives rise to the electrical phenomena of pyroelectric crystals. The propertics exhibited by tourmaline may be described thus. One end A of the crystal is distinguishable from the other end B by the dissymmetry of the crystalline form.

A is called the analogous pole of the crystal, and B the antilogous

pole. Wheu the temperature of the crystal is increasing uniformly throughout, the analagous pole is positively electrified and tle antilogous pole negatively electrified. When the temperature is decreasing uniformly throughout, the analogous pole is negative

and the antilogous pole positive. This law was originally dis- covered by Canton,® but it seems to have been lost sight of again Canton. and rediscovered both by Bergman and by Wilcke in 1766. When the Wilcke. temperature is uniform, the positive and negative regions are sym- Berg- metrically distributed about the central zone of the crystal, which man.

is neutral. If the ends be unequally heated, this synimetry no

longer obtains. It must not be forgotten that complications may

arise from the crystal becoming electrical as a whole by friction, usually positive, like most other vitreous bodies.

Gaugain® made a series of interesting experiments on the elec- Gaugain. trical properties of tourmaline, and concluded that a tourmaline whose temperature is varying may be compared to a voltaic battery of great internal resistance, consisting of an infinite number of cells, each of infinitely small electromotive force; so that the electro- motive force is proportional to the length of the tourmaline, and its internal resistances is proportional to the section inversely and to the

length directly. He also concluded that the amount of elec- tricity furnished by a tourmaline, while its temperature varies either way between two given temperatures, is always the same.

In order to explain the properties of the tourmaline, it has been Thom- supposed? that the crystal is naturally in a state of electrical pola- son's tization, like that assumed by Maxwell in a medium; under the theory. influence of electromotive force, or more nearly (since no sustaining force having an external origin is supposed) like that of a permanent maguet. The intensity of this polarization is supposed to be a function of the temperature. Supposing the tourmaline to remain for some time at the same temperature, a surface layer of electricity would be formed, which would completcly mask the electrical polarization of the crystal, inasmuch as it would destroy all external electrical action. This neutralization would be instantly effected by running the crystal through the flame of alamp. If, however, the temperature increase, then the polarization will, let us say, increase, so that the surface electrification no longer balances it.

We shall thus get polar electrical properties of a certain kind. If the temperature decrease, the polarization will decrease, and we shall thus get polar properties of the opposite kind.

In many pyroelectric crystals there are more than one electric axis, so that we have several analogous and corresponding antilo- gous poles. An enumeration of the various crystals in which pyroelectric properties have been found, and a discussion of the peculiarities in their crystalline form, belongs more properly to the science of Mineralogy. Much has been done in this department by KGhler,® Gustav Rose and Riess,? and Hankel.1° For some very in- teresting researches by Friedel see Annales de Chimie et de Physique,

1869.

Frictional Electricity.—In accordance with the general principle Contact laid down at the beginning of this section, we should expect to find of non- an electromotive force at the surface which separates two different conduc- non-conducting media, just as we have found it at the

boundary of tors. two different conducting media. The effect of such a contact force would be very different however in the former of these cases, from what we have seen it to be in the latter. In the case of non-con- ductors the electricity cannot leave the surface of separation, but will simply accumulate on the two sides of it, till the force arising from electrical separation is equal to the contact force. On separ- ating the bodies, in certain cases, we may carry away with us these surface layers of electricity, and it is an obvious consequence of our principles that the clectrifications of parts of the two bodies that have been in contact must be equal and opposite. While the bodies are in contact the difference of potential between the layers of electricity corresponding to very considerable surface density may be very small, just as in Volta's condensing electroscope (see above,

p- 84); but when we separate the bodics work is done against the electrical attractions, and the potential increases enormously.

5 Phil. Trans., 1759. 6 Mascart, t. ii.

7 Thomson, Phil. Mag., 1878, p. 26; or Nichol's Cyclopedia of the Physical Sciences, 1860.

8 Pogg. Ann., xvii., 1829.

8 Abh. der Berl. Akad., 1886 and 1848. :

10 Pogg. Ann., xlix., 1, lvi., 1840-2; also cxxxi., cxxxii., 1867, &e.

Fric- tional series. Wilcke.

Faraday.

Peclet's experi- ments.

Contact of con- ductor with non- condue- tor.

Fric- tional ma- chines.

These hypothetical results tally very well with the electrical phenomena observed when non-conducting bodies are lightly rubbed together; and the above is nearly the explanation that most physicists of the present day would probably give (if they gave any) of what is called the " frictional gencration of electricity.

All experimenters are agreed that equal quantities of positive and negative electricity appear in this case as in every other case of electrical separation ; an experiment to prove the contrary would have to be very demonstrative indeed before it would now be accepted as conclusive. A single case of exception would revolu- tionize our fundamental ideas completely. The reader should consult on this point Faraday's Experimental Rescarches, scries Xi. GJ ii.

The other consequences of our hypothesis are by no means so firmly established. One of these is that we ought to be able to arrange non-conducting bodies in a series such that any body rubbed with one below it in the series becomes positive, and rubbed. by one above it negative. '

Many electricians have attempted to establish such electro- motive seriés, but the experimental conditions (see the admirable remarks of Riess, Reibungselectricitat, § 907) are so complicated that nothing absolute has been attained. Yet it would appear that, if we could make sure that we were always dealing with definite materials under definite surface conditions, electromotive series could be constructed in which every different body would have a fixed position. As it is, the body bearing the same name in the lists of different experimenters was in all probability not exactly of the same maitcrial in all cases, and (we might say certainly) was not under the same surface conditions. We refer the reader to Riess (l.c.) for an admirable résumé of the work of different elec- tricians in this department. Mascart has given a very interesting account of the matter (t. ii. § 834, &c.) from a more modern point of view. From these sources, together with indications in Young's Lectwres on Natural Philosophy, the reader will be able to follow up the literature of this somewhat uninviting department of elec- tricity.

We give two instances of frictional electromotive series which may be useful in giving the reader a general idea how different bodies stand.

The following is Wilcke's series! (1758) :—Glass, woollen cloth, feathers, wood, paper, shellac, white wax, ground glass, lead, sul- phur, metals.

Faraday? gives—cat and bear skin, flannel, ivory, feathers, rock crystal, flint glass, cotton, linen, white silk, the hand, wood, shellac, metals (iron, copper, brass, tin, silver, and platinum), sulphur. ,

To which Riess adds (in order) the highly negative bodies—gutta-percha, electrical paper,® collodion, gun cotton.

Considered as evidence for the contact hypothesis, the experiments of Peclet seem to be important. He used an apparatus which was virtually a Nairne's machine (see below, p. 101), in which the rubber could be varied at will. His gencral conclusions are quite in accordance with the contact theory. He found, for instance, that for the great'majority of materials the quantity of electricity gener- ated was independent of the pressure and of the breadth' of the rubber, and varied as the angular velocity of the cylinder, and it even appeared to be the same for rolling friction as for sliding fric~ tion, so long as the material of the rubber was unchanged.

Besides the case of two non-conductors, we might consider the case of a conductor and a non-conductor in contact. Much of what has just been said would apply to this case also, an excellent example of which is furnished by a frictional electrical machine of the ordinary construction when the cushions are well furnished with amalgam. This is the place to give a short account of these time- honoured pieces of electrical apparatus. For a history of them we cannot do better than refer to Mascart® (J.c.), who has devoted much attention to the theory as well as the history of electrical machines in general.

A very common form of machine, called Ramsden's, is pictured in fig. 56. It consists, like all other frictional machines, essen- tially of three parts—(1) the rubbed or moving body, (2) the rubbers, and (8) the collectors and prime conductors. In the pre- sent instance the rubbed body is a dise of glass, which can be turned about a horizontal axis by means of a suitable handle. The efficiency of the machine depends very

much on the quality of the glass of which the disc is made. According to Mascart, glass of old manufacture is superior to the more modern specimens, owing to the smaller proportion of alkali in the former ; it appears, however, that the disc improves in most cases with age and use. Many

1 According to Riess, the earliest. 2 Hap. Res., 2141.

- **The parchment-like paper obtained by treating ordinary paper with concentrated sulphuric acid.**

: That is, the dimension of the rubber perpendicular to the axis of rotation.

5 A few notices of the earlier machines will be found in the Histori- eal Sketch.

other materials have been proposed to replace glass, which is some- what costly when large discs are required. Ebonite has been tried a good deal of late, and .

has great advantages so far as its electrical pro- perties are concerned ; but it has the disad- vantage that it warps very readily if heated incautiously, and its surface will not keep good for any length of time. Owing to decom- position under the action of light, a layer of sul- phuric acid forms on the surface, after which it is very difficult to restore the electrical virtue so remarkable in the new material, although wash- ing with hot water or immersion in a blast of steam are said to be effective in some degree.

The rubbers consist of two rectangular pieces of wood, hinged to sup- ports attached to the framework of the mae. SSS — one a as lag Fic. 56. —Ramsden's electrical machine. that they can be made to clip the plate with any required pressure. The rubbing surfaces are usually formed of

leather, stretched as smooth and flat as possible (oiled silk is sometimes used, but it is not so durable). Before the leather cushions are fit for use, they must be carefully coated with amalgam. The amalgam most commonly used is Kienmayer's, which is a composition of two parts of mercury with one of zinc and one of tin. A great variety of different compounds of this kind have been used by different electricians, bisulphide of tin being a general favourite. The amalgam must be powdered as finely as possible, all grit being carefully removed. The cushions are then to be lightly smeared with lard, and worked together till the surface is very smooth and the greasiness almost gone; then the amalgam is to be carefully spread over them, and the surfaces again worked together till a uniform metallic surface is attained ;6 they are then ready for use. The amalgam aids the action of the machine in two ways,—first, by presenting a surface which is highly negative to glass ; secondly, by allowing the negative electricity evolved by friction to flow away without hindrance from the points of contact. In order to secure the second of these advantages still more perfectly, the cushions should be carefully connected by strips of tinfoil, or otherwise, with knobs, which can be put to earth during the action of the machine.

The collectors are two stout metal forks bestriding the glass disc at the ends of a horizontal diameter. They are armed, on the sides next the glass, with rows of sharp points, which extend across the rubbed part of the dise. The prime conductor in the specimen we are describing forms a metal arch rising over the framework of the machine, and insulated from the sole by two glass pillars. Various forms are given to this part of the machine, according to the fancy or convenience of the experimenter. One important thing to be seen to is, that there be no salient points on it which might facilitate the dissipation of electricity by brush, convective, or spark discharge. :

After what has been said, the action of the machine requires little explanation. The disc, electrified positively by contact with the amalgam, carries away a positive charge, whose poteutial rises rapidly as it leaves the cushion,—so high, in fact, that there is a tendency to discharge to the air, which is prevented by covering the excited parts of the disc by pieces of oiled silk. When the highly charged glass comes

opposite the points of the collector, owing to the inductive action, negative electricity issues from the points and neutralizes the charged plate, which at this point is vir- tually inside a closed conductor. The result of this is that the prime conductor becomes positively charged. The neutralized parts of the disc now pass on to be rubbed by the other cushion, and so on. The electricity goes on accumulating in the prime conductor until the potential is so great that discharge by surface conduction, or by spark, takes place between the collectors and the cushion, or between the collectors and the axis.

af it is desired to obtain negative electricity from a machine with a glass disc, we have simply to connect the prime conductor to earth, insulate the cushions, and collect the electricity from them.

We have said that there is a limit to the potential to which the

—

5 Mascart, J.c.

ELECTROMOTIVE FORCE. |

charge on the prime conductor can be raised. We can never get a longer spark from the machine than the length of the interval

‘between the collector and the cushion or the axis, as the case may

Nairne’s machine,

_frictional machine appeared.

be. The limiting potential can, however, be increased by insulat- ing the axis of the machine, or making the axis itself wholly or partially of insulating material, and by using only one rubber and one collector,, and placing them at the extremities of a diameter. The machine of Le Roy, often called Winter’s machine (fig. 57), is

Fic. 57,—Le Roy’s machine,

constructed on this pattern. We get, of course, ceteris paribus, only half as much electricity per revolution with a machine of this kind as with Ramsden's; but the spark is longer, in consequence od Sa greater insulation between the cushion (A) and the collector

The cylinder machine, also called Nairne's machine, was one of the first machines in which all the essential parts of the modern It consists of a glass cylinder, which

'can be turned about a horizontal axis by a multiplying gear, or (as is – how more usual) by means of a winch handle simply. The cushion

Friction of powders, &e,

is affixed to one horizontal metal cylinder, and the collector to another. It is necessary to insulate the axis in this machine, owing to its proximity to the ends of the conductors. Positive or negative electricity can be obtained with equal readiness by insulat- ing either of the conductors, and connecting the other with the earth.

Those who desire more minute information concerning the functions jof the different organs of the frictional machine, are referred to Mascart, tom. ii. § 834, &c. In the same place will be found a description of the famous machine with double plates con- structed by Cuthbertson for Van Marum, and still to be seen in Teyler's Museum at Haarlem. A description of another of Van Marum's machines will be found in the article '« Electricity" in the Encyclopedia Metropolitana. We take this opportunity of calling the scientific reader's attention to that article, which con- tains a great quantity of very valuable matter. Much of the work of the earlier electricians that we have been obliged to pass over in silence is fully described there.

_ Electric machines have also been constructed of less costly mate- rials than glass or even vulcanite—of cloth and paper, for instance —for an account of these, see Riess, Bd. ii. §§ 936, 937.

Many experiments have been made on the electrification of sifted powders. e have already, in describing Lichtenberg's figures, alluded to

some cases of this kind. As a rule, either the results are very uncertain, or the conditions of the experiment very com- plicated, so that the experiments are, in most cases, more curious than valuable, from a scientific point of view. Such as desire it will find abundant indications of the sources of information in Riess, Bd. i. §§ 938 sqg., and Ency. Metrop., art. ‘“ Electricity,” §§ 193 sqgg. One case of this kind, however, was so famous in its day, that we ought to mention it. In the year 1840 a workman at N ewcastle, having accidentally put one hand in the steam which was blowing off at the safety valve of a high-pressure engine boiler, while his other hand was on the lever of the valve, expe- rienced a powerful electric shock in his arms. Armstrong investi- gated the matter, and was led to construct his famous hydroelectric machine. This apparatus consists simply of an insulated boiler

for generating high-pressure steam, fitted with a series of nozzles,

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kept cool by a stream of water. The steam issues from these nozzles and impinges on a conductor armed with points for collect- ing the electricity. The boiler gets electrified to a high potential, and a torrent of dense sparks may be drawn from it. The machine far surpassed any ordinary electrical machine in the quantity of electricity furnished in a given time. By means of it water was decomposed, and the gases collected separately. It was reserved for Faraday to trace the exact source of the electromotive force. He demonstrated, by a series of ingenious experiments, that the electrical action arose from the friction of the particles of water in the condensed steam against the wood of the nozzles.1

Remaining Cases.—Of these the most important are atmospheric Miscel- electricity,? which belongs pro erly to meteorology, animal elec- janeous tricity, comprehending the study of the properties of the electrical yesults, fishes, and the electric phenomena of nerve and muscle. We have already indicated the literature of the former subject, and the latter belongs, for the present at least, to physiology. Evaporation, com- bustion, and in fact chemical action generally, have been brought forward by some experimenters as sources of electromotive force. About the last of all there is, of course, in one well-known case no doubt. As to the experiments generally alluded to under the other two heads—in particular, those of Laplace and Lavoisier, Volta, Pouillet, and others—there has been considerable difference of opinion, and we need not occupy space here with fruitless dis- cussion of the matter.? Similar remarks apply to the electrification caused by pressure, cleavage, and rupture.

Machines founded on Induction and Convection.A—The oldest Blectro-

electric machine on this principle is the electrophorus of Volta, phorus. 1775. This consists of a plate of resinous matter (now usually vulcanite) backed by a plate of metal, and a loose metal plate, which we may call the collector, fitted with an insulating handle. The vulcanite is clectrified by flapping it with a cat-skin, the collector is placed upon it, uninsulated for a moment by touching it with the finger,® and then lifted by the insulating handle. The collector plate is then found to be charged (positively) to a high potential, and sparks of some length may be drawn from it. The explanation of the action of the electrophorus is simple enough, if we keep clearly in view the experimental fact that the surface elec- trification of a non-conductor, like vulcanite, will not pass to a metal plate in contact with it under ordinary circumstances. If the surface density of the electrification be very great, discharge to the metal may no doubt take place ; and if the collector be kept for a very long time in contact with the vulcanite, it is said that it may become negatively electrified. In the normal state, however, the negative electricity of the vulcanite remains upon it, and the thin layer of air intervening between it and the collector forms the dielectric in a

condenser of very great capacity, so that a quantity of electricity collects on the lower surface of the condenser very nearly equal to that on the vulcanite. The difference of potential between the plates is very small (just as in Volta's condensing elec- troscope, see above, p. 34). When the collector is raised it carrics away the positive charge—the potential of which, owing to the decrease in the capacity of the collector, rises enormously. It is to be noticed that the potential of the charge on the vulcanite rises to a corresponding extent. This remark partly explains the re- markable fact that, when the collector is kept on the excited vulcanite, its electrification may be kept for a long time (for weeks under favourable circumstances), whereas it speedily dissipates if the vulcanite be left uncovered. According to Riess, the fact that a plate of metal laid on an excited piece of glass tends to preserve its electrification was discovered by Wilcke in 1762. '

If each time we charged the collector it were discharged by con- tact with the interior surface of a hollow conductor A, it is obvious that we could raise A by a sufficient number of such contacts to as high a potential as we please, provided it were sufficiently well insulated. This remark brings Volta's electrophorus into the pre- sent category of electrical machines.

In the rest of the induction machines to be described the excited dielectric is dispensed with, and an electrified conductor substituted in its place.

The earliest apparatus that involved the principle of such machines appears to have becn Bennet's doubler.® The principle of this Bennet's apparatus may be explained thus. Let A and C be two fixed discs, doubler, and B a disc which can be brought at will within a very short dis- tance of either Aor C, Let us suppose all the plates to be equal, and a ES i IN Bs OS

1 Hap. Res., ser. xviii. 2075.

2 See Riess, § 1028 sgg., and Thomson's papers in Reprint already alluded to ; also Ency. Metrop., art. " Electricity," § 219, for bibliography of older investigators.

3 See Riess, §§ 943 sqq.

4 This highly-descriptive title is Sir William Thomson's.

> In most modern specimens this is rendered unnecessary: by a brass pin, which is in metallic connection with the metal backing of the vulcanite, and comes up flush with the surface of the vulcanite, so as' to touch the collector when it is in situ.

6 Phil. Trans., 1787,

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let the capacities of A and C in presence of B be each equal to p, and the coefficient of induction between A and B, or C and B, be gq. Let us also suppose that the plates A and C are so distant from each other that there is no mutual influence, and that p' is the capacity of one of the discs when it stands alone. A small charge Q is communicated to A, and A is insulated, and B, uninsulated,

is brought up to it; the charge on B will be – ao, B is now unin- sulated and brought to face C, which is uninsulated ; the charge on C will be ¥Q. C is now insulated and connected with A, which

is always insulated. B is then brought to face A and uninsulated, so that the charge on A becomes 7Q, where

rast (144).

ptp

A ig now disconnected from ©, and here the first operation ends. It is obvious that at the end of » such operations the charge on A will be 7"Q, so that the ria 2 goes on increasing in geometrical progression. If the distance between the discs could be made in- finitely small each time, then the multiplier 7 would be 2, and the charge would be doubled each time. Hence the name of the apparatus.

Darwin, Cavallo, and Nicholson! devised mechanism for effect-

_ ing the movements which in Bennet's instrument were made by Darwin. hand. Cavallo's was a reciprocating movement, but in the machines Cavallo. of Darwin and Nicholson the motion was continuous and rotatory. Nichol- Nicholson's doubler is a very elegant instrument. A drawing of it oe is given by Mascart (t. ii. § 845)[; the specimen there represented

is very like one which was found among the late Professor Willis's ' apparatus, and is now in the Cavendish Laboratory at Cambridge. still more elegant machine is " Nicholson's spinning condenser," which bears a remarkable resemblance to the induction machine of Topler.2 A description, with a figure, will be found in the Encyclopedia Metropolitana, art. " Electricity," § 112.

It is obvious that if any conductor be connected with the part of any of these machines corresponding to the conductor A in the above description, and the potential of A be raised to any small positive or negative value,® we can by means of the machine in- crease the charge, and therefore the potential, up to any required amount. We have, in fact, an electric machine which may be used for all the ordinary purposes. It was not with this view, however, that these pieces of apparatus were first invented, but rather for the purpose of demonstrating small electric differences. In this they were but too successful, for it was found that it was impossible to prevent them from indicating electric differences unavoidably arising within the apparatus itself. It was this difficulty no doubt that led to their being ultimately abandoned, and for a time forgotten, although they were once in high favour. Of late, however, they have been taken up as electromotors with great success.

Typical _ The type of all these machines is an arrangement of the following convecto- description. A conductor or carrier C, ora serics of carriers, is inductive fastened upon the circumference of an insulating disc. At the ends machine, of a diameter are two hollow conductors, A and B, embracing the dise on both sides, so that twice in the course of a revolution the carrier is virtually in the interior of a hollow conductor.

Inside each conductor are two springs: one of these is in metallic connec- tion with the conductor, and may be called the receiving spring ; the other, called the inductor spring, is insulated from the con- ductor, and is connected either to earth or with the corresponding spring belonging to the other conductor. Suppose A to be at a small positive potential, and B at zero potential; starting with C in connection with the inductor spring inside A, it becomes negatively electrified and carries away its charge; it next comes in contact with the receiving spring in B, and, being now part of the interior of a hollow conductor, it parts with the whole of its charge to B; then it passes on and is charged positively at B's inductor spring ; then discharges to A at A's receiving spring ; and soon. The positive and negative charges are each a little increased every revolution, and the difference of potentials accord- ingly augmented. This is the principle of Varley's machine* (1860), and of Thomson's mouse mill and replenisher® (1867); it

is virtually that of Bennet's doubler. Water- Closely allied to these machines is Thomson's water-dropping dropping potential equalizer. This consists of an insulated reservoir of machine, water, with a long pipe, from the nozzle of which water is allowed to break in drops. It is obvious that if the potential of the reser- voir be above that of the air surrounding the spot where the water . breaks into drops, each drop will carry away with it a positive charge, and this will go on till the potentials are equalized. This device was introduced by Thomson in observations on atmospheric

1 Phil. Trans., 1788. 2 Pogg. Ann., 1865.

By connecting the conductor with the positive or negative pole of a small galvanic battery, for instance.

- **Jenkin, Elect. and Mag., cap. xix. © Described in the art, ELECTROMETER,**

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[BLECTROMOTIVE' FORCE.

electricity. The burning match which he uses in conjunction with the portable electrometer acts in the same way. He has also constructed a water-dropping electric machine on a similar prin- ciple. Two streams of water break into drops inside two inductors connected with the internal armatures of two Leyden jars, A and B ; the drops from each inductor fall into a receiver connected with the other inductor. A very small difference of potential between the jars starts or reverses the action of the apparatus ; in fact, it will in general start of itsclf, and very soon sparks are seen passin. between the different parts, and the drops are scattered in all directions by the strong electrical forces developed.

The most remarkable, as well as the most useful, of all -these Holty's machines is that of Holtz. Here the convectia is effected by machine, means of a disc of glass, which is mounted on a horizontal axis F (fig. 58), and can be made to rotate with considerable angular velocity by means of a multiplying gear, part of which is seen at X. Close behind this glass disc is fixed another vertical disc of glass, in which are cut two windows, B, B. On the side of the fixed dise next the rotating disc arc pasted two sectors of paper, A, A, with short blunt points attached to them, which run out into the windows towards the rotating disc, without quite touching it. Two metal combs CU are placed on the other side of the rotating

Fig. 58.—Holtz's machine.

disc (that nearest the reader), the teeth being put opposite the parts of A, A which lie towards the windows. The combs are fixed to metal shanks, which pass through a stout horizontal bar of ebonite. One of these shanks terminates in a couple of balls at E,

_and the other carries a sliding electrode D with a long ebonite

handle. The framework which carries the horizontal ebonite bar and supports the fixed plates, &c., will be understood from the figure.

"The machine, as originally constructed by Holtz, contained only the parts we have described. Poggendorff doubled all the parts (except, of

course, the electrodes D and E), The figure represents Ruhinko:/'s modification of this construction. Behind the fixed disc there is another fixed disc, with windows and armatures like the first, and, beyond that, another movable disc mounted on the axis F. The combs are double, as will be seen from the figure. To start the machine, D and E are brought together, and one of the armatures (or one pair), say the right hand one, is electrified in any manner, let us say positively, and the disc set in rotation. After a little time a hissing noise is heard, and the machine becomes sensibly harder to turn, as if the disc were moving through a resisting medium. If the room be dark, long curved pencils of blue light will now be seen issuing from the points of the left hand comb, and running along the surface of the disc in a direction opposite to its motion, while little stars shine upon the points of the right-hand comb. After this state has been reached, the balls D,E may be separated, and a continuous series of brush discharges will take place between them, even when the distance is very con- siderable. If two Leyden jars, L, L, be hung upon the conductors which support the combs, the outer coatings being connected by a conductor M, then a succession of brilliant and sonorous sparks will take the place of the brushes. Instead of using the two jars L, L, we may connect D and E with the internal and external arma- tures of a condenser; it will then be found that, as we augment the capacity of the condenser (the angular velocity of the disc being constant), the frequency of the sparks diminishes, while their brilliancy increases, If we insert a high resistance galvano- meter between D and E, it will indicate a current flowing from D

i

® Pogg. Ann., 1865.

ae

ELECTROMOTIVE FORCE. |

to E, the intensity of which, under given atmosphcric conditions and given state of the machine, will vary as the angular velocity, being independent, within very wide limits, of the resistancc! between D and E. é :

It is not difficult to give a general account of the action of this machine, although it is very hard to assign the precise importance of the individual parts, very slight modifications of which greatly affect the efficiency. Suppose D and E in contact; the right- hand armature, charged +, acts by induction on the right-hand conib, causing — electricity to issue from the points upon the disc. At the same time the positive electricity of the right comb passes through DE to the left comb, and issues from its teeth upon the parts of the disc at the other end of the horizontal diameter. This + electricity electrifies the left armature —by induction, + electri- city issuing from the blunt point upon the further side of the rotating disc. The charges thus deposited on the disc are carried along, so that the upper half is clectrified — on both sides, and the lower half + on both sides, the sign of the electrification being reversed as the disc passes between the combs and the armature by the electricity issuing from the combs and from the armatures. If it were not for dissipation in various ways, the electrification every- where would obviously go on increasing ; but in practice a station- ary condition is soon attained, in which the loss from the arma- tures is just balanced by the gain owing to the action of the blunt points. After this, both sides of the disc are similarly electrified, the upper half? always —, the lower always + ; + electricity con- tinually issuing from the points of the right comb, — electricity from the points of the left. This is, of course, accompanied by a current of + electricity from right to left through DE.

The machine of Holtz, as we have described it, is somewhat tion of Uncertain in its action in our moist climate ; but a slight modifica- Holtz's tion of it gives excellent results. Upon the axis X is fixed a dise machine. °f ebonite, large enough just to reach between the paper armatures.

" This disc is fitted with a small rubber attached to the frame of the apparatus, and forms a small electric machine, which keeps the armatures continually electrified. The whole is inclosed in a glass case, with a beaker of sulphuric acid to dry the air. There is a machine of this kind at present in the Cavendish laboratory at Cambridge, which never fails when the auxiliary apparatus is at all in good order.

A very remarkable-phenomenon often occurs when the electrodes of ~~Holtz's machine are in connection with the armatures of a con~~ denser of considerable capacity, and are so far separated that a spark does not pass. The machine charges the condenser up to a certain point, and then the condenser discharges along the surface of the disc. If the experiment be conducted in a dark room, a flash of light will be seen to pass along the surface of the disc, and thereafter it will be observed that the long positive brushes have shifted from one comb to the other ; after a little the condenser discharges again, and the brushes will now be seen in their old place, and so on. This phenomenon, though interesting to study, is often inconvenient in practice. To prevent it, Holtz introduced the diagonal conductor which is seen on many machines. For an account of this, and for other details concerning these machines, we refer the reader to Mascart, t. ii. § 847 sqgq., whose account of the more obvious principles of this apparatus is among the most lucid we have seen. His account of the experiment of causing one Holtz's machine in action to turn the disc of another by the electri- cal reaction is of peculiar interest.

Indue- Electromagnetic Induction Machines.—The type of these is the

tion coil, duction coil or inductorium, sometimes called Ruhmkorff's coil, after the great Parisian instrument-maker who first brought the in- strument to perfection. The object of such machines is to obtain great electromotive force from sources which furnish large quan- tities of electricity, but have only small electromotive force. _ The principles on which the action is founded has been sufficiently indicated above in our section on the induction of electric currents. We have also given in the Historical Sketch (p. 12) some notices of the literature of the subject ; a brief enumeration of the essential parts of the machine is all that is neccssary here.

We have first the primary coil—of thick wire and few windings, so as to have a small resistance and a small coefficient of self induc- tion ; the secondary coil surrounding the primary is of thin wire (> mm. or so), with many windings, the length in large machines being often 100,000 metres. In order to avoid the danger of dis- ruptive discharge between

parts of the insulated wire, the coil is divided up by insulating septa, so that parts at very different poten- tials are separated. In the centre of the primary is placed a bundle of iron wires; this greatly strengthens the action, and a good deal depends on the quality of the iron, which should be very soft. The interruptor is simply a lever, worked by the coil itself or by an electromagnet separate from the coil, by means of which the circuit

Modifica-

1 We speak of resistances of 1 to 10,000 or 100,000 ohms.

- **The line of division is not horizontal, however, if, indeed, it be exactly a diameter. See Mascart.**

® Compare Carré's machine, Mascarl, t. ii. § 856,

Bie Cereree Cir Y

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of the primary is made and broken automatically. A variety of forms have been given to the part of the apparatus; the interruptor of Foucault is a very common one.* For some purposes a break driven by clock-work is used. The condenser, a very important part of the apparatus, is made of a number of sheets of tinfoil, interleaved with sheets of oiled silk or varnished paper. One set of leaves of the condenser is connected with one side of the break, and the alternate set with the other side. The function of the con- denser is to provide a way for the electricity when the eircuit is broken, and thus to prevent the intense spark of the extra current in the primary, which destroys the contact surfaces of the break, and, what is worse, prolongs the fall of the primary current, and thereby reduces the average electromotive force of the induction current. :

Other devices have been tried for effecting the same object as the condenser, such as inserting a fine metallic wire or an electrolyte as an alternative circuit to the break; and these answer the purpose to a

considerable extent. An important improvement affecting this part of the apparatus has recently been introduced by breaking the primary circuit between the poles of a magnet, the effect of which is that the spark is suddenly drawn aside (blown out as it were). A considerable increase of striking distance between the poles of the secondary results from this arrangement.

ABSOLUTE MEASUREMENTS.

We have already indicated the considerations which determine the fundamental units in the two systems that have come into prac- tical use. We ought uow to explain how practical standards can be constructed to represent these fundamental units, or at least known multiples of them. It is necessary to have such standards in order that we may be able to measure electrical quantities in absolute measure by simple and expeditious methods of comparison, it being obviously impossible in practice to make absolute measure- ments directly on all occasions.

Electrostatical System.—By means of Thomson's absolute electro- Measure meter we can determine any electromotive force in absolute measure. of In this way Thomson found the electromotive force of Daniell's E, M. ¥. battery to be 00374 C.G.S. electrostatical units.®

By using the absolute electrometer (see art. ELECTROMETER), or Resist- another that had been compared with it, we could by the method ance. given above, p. 46, find a resistance (which was large enough to suit the method) in electrostatical measure.

Then, having standards of electromotive force and resistance, we Current, could easily measure a current in electrostatic measure by applying Ohm's law. The same thing might be done by constructing the standard of quantity, which is the charge on an isolated sphere of unit radius charged to unit potential. By comparing the throw of a galvanometer when unit quantity is discharged through it with the deflection produced by any current, we could determine the latter in absolute measure by observing the time of oscillation of the

galvanometer and the logarithmic decrement of its oscillation (see Maxwell, vol. ii. § 749).

Among the absolute measurements in the present system of units, Di- we must not omit to mention Sir Wm. Thomson's determinations electric of the dielectric strength of different thicknesses of air. From strength. these, and from the measurement of the electromotive force of Daniell's cell just mentioned, he concluded that a Daniell's battery of 5510 elements would be competent to produce a spark betwecn two slightly curved metallic surfaces at 4 of a centimetre asunder in ordinary atmospheric air.®

Electromagnetic System.—The great majority of the absolute Electro- determinations hitherto made have reference to this system. We magnetic make no attempt here to instruct the reader concerning the details of measure. this subject; such an attempt would lead us into technical particulars intelligible only toa few scientific men. We are fortunate, however, in being able to refer the English reader to two books which contain in a collected form all, or nearly all, the requisite information, viz. Maxwell's Electricity and Magnetism, and the collected Reports of the Committee of the British Association on Electrical Standards,"

As a specimen of the theoretical considerations involved, the Resist- reader may take Maxwell's method for determining the coefficient ance. of self-induction of a coil (given above, p. 80). If we know the value of L (in centimetres) from calculation, then equation (33) might be used to find «in absolute measure. This would not bea practicable method, inasmuch as the calculation of L would be difficult if not impossible ; we might, however, determine L by comparison® with a coefficient of mutual induction which could be calculated.

The earliest absolute measurement of the resistance of a wire (by Kirch-

hoff.

- **See Wiedemann's Galv., or Du Moncel, Notice sur l' Appareil de Ruhmkor ff.**

5 Reprint of Papers, § 305, &c. § Reprint of Papers, § 340.

7 Such as wish to go deeply into the matter must read the Maas-bestimmungen of Weber.

8 Maxwell, vol. ii. § 756.

Weber.

B. A. com- mittee.

Kohl- rausch.

Lorenz.

Calori- metric method.

Curreut.

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Kirchhoff in 1849) was of the kind just alluded to; that is to say, it involved the comparison of a resistance with a coefficient of mutual induction, the time measurement being that of the period of oscillation of a galvanometer.

Weber used two methods,—(1) the method of transient currents,

in which he measured the throw of a galvanometer caused by the –

current from an earth inductor of knotvn area when it was turned about a vertical axis, so that the number of the earth's lines of force through it increased from zcro to a Maximum; and (2) the method of logarithmic decrements, in which he observed the time of oscillation and the logarithmic decrement of a magnet in a galvano- meter of known constant. In the last of these two methods the horizontal

component of the earth's horizontal force comes in directly, and the magnetic moment of the galvanometer magnet must be determined, which is a matter of great difficuity.

The determination of the British Association committee was carried out by Messrs Maxwell, Balfour Stewart, and Fleemmg Jenkin, and the result of it was the construction of a standard called the ohm, which professes to represent a velocity of an earth quadrant per

second (10°), The method they used is due to Sir Wm. Thom-

son. It consists essentially in causing a coil of wire of known dimensions to rotate about a vertical axis, and observing the deflec- tion of a magnet of very small moment suspended at its centre.

In a recent determination, F. Kohlrausch! has combined the two methods of Weber, and thereby avoided some of the difficulties which arise in either method used by itself. His value for the Earth quadrant

Second

According to Dehms and Hermann Siemens, the resistance of the coil called the ohm is equal to 10493 mercury units. According to Kohlrausch, therefore, the actual British Association standard is 1:0196 Earth quadrant

Second determination of the British Association Committee is out by nearly 2 per cent. :

Lorenz? has, still more recently, made a determination of the value of the mercury unit in absolute measure. He causes a copper disc to rotate inside a coil of known dimensions. The two ends of a circuit C are kept in' contact with the axis and circumference respectively of this disc. At two points A and B of C, the resistance between which is R, are attached the two terminals of the coil of wire, in circuit with which is also a battery. A sensitive galvano- meter is placed in the circuit C, and the angular velocity of the disc is adjusted till this galvanometer indicates no current. If 2 be the number of revolutions per second, and

E the electromotive force of induction per unit of inducing current, calculated from the dimensions of the coil, then the resistance R is equal to nE in electromagnetic measure. ‘

The result obtained by Lorenz for the value of the mercury unit

is ‘9337 Earth quadrant ; this would make the value of the B. A. Second =

standard °9797 fo ea Second

There is thus considerable discordance between the different results. It is a curious fact that the mean of the result of Kohl- rausch and Lorenz gives for the value of the B. A. standard -9996 Earth quadrant ,

Second

progress, and it is to be hoped that the doubt which hangs over the matter will be dispelled.®

Besides these methods, there is yet another of a totally different character, originally suggested by Thomson in 1851, in his paper on the ‘*‘ Mechanical Theory of Electrolysis.” This method con- sists in measuring the amount of heat developed in a wire by a current the square of whose strength is known in electromagnetic measure. If we know the mechanical equivalent of heat with sufficient accuracy, we can calculate from these results the resist- ance of the wire in absolute measure by means of Joule’s law. Measurements of this nature have been made by Von Quintus Icilius,* Joule, and H. Weber.® z

We can, by means of a tangent galvanometcr, find the value of any current in electromagnetic measure (see art, GALVANOMETER). If the resistance of the circuit be found, by comparison with the

resistance of Siemens’s mercury unit is 0°9717

in absolute measure; or, in other words, the

Fresh determinations are, however, in

1 Pogg. Ann., Ergbd., 1878. 2 Pogg. Ann., 1873. 3 Since the above was written, an account has appeared of a new determination by H. Weber of Zurich. His results, from three distinct

methods, differ by less than z)455, and give 9550×109 — for the sec.

Siemens unit. This would make the B. A. unit 1°0014 × 109 —

4 Pogg. Ann., 1857. ; 5 Brit. Assoc. Rep., 1867. 8 Dissertation, Leipsic, 1863, quoted in Wiedemann, Bd. ii. § 1109.

ohm or other absolute standard, we can determine the value of the electromotive force in the circuit by Ohm's law. Measurements of this kind have been made by Bosscha,'? by Von Waltenhofen, F. Kohlrausch, and Latimer Clark. The results of Kohlransch® for the cells of Daniell and Grove, when no current is passing, are 1138×105 and 1942×10° C.G.S. units respectively. Latimer Clark ® gives 1110 × 10° and 1970 × 10° for the same constants. The results, of course, depend on the constitution of the cells.

Taking the number of electromagnetic units in an electrostatic unit to be 3×10!°, we get from Tlhomson's electrostatic measure- inents for the electromotive force of Daniell's element 1120 × 10° in C.G.S. units.° The agreement among the different results is so far good.

The determination of the electrochemical equivalent of some Electro- elementary substance in this system of units is of great import- chemical ance. Determinations exist by Weber, Bunsen, Casselmann, Joule, eqniva- aud F. Kohlrausch. The result of the last is no doubt the best, lent, as he combined with his voltametric experiments a determination of the horizontal component of earth's magnetic force, which is the most uncertain factor in the result. According to his result, one C.G.S. unit of electricity deposits 011363 (+ 000002) gm. of silver.

From this we get for the electrochemical equivalent of water "0009476.

Ratio of Electrostatic to Electromagnetic Unit.—If we measure Measure. the same quantity of electricity first in electrostatic and then

in ment of electromagnetic measure, the fundamental nnits of mass, length, the and time being the same in both cases, the ratio of the two funda- measures will vary directly as the magnitude of the unit of length, mental and inversely as the magnitude of the unit of time adopted. This velocity, ratio may therefore be regarded as a velocity which will remain the same whatever three fundamental units we adopt.1!

This velocity was found by Weber and Kohlrausch by the direct Weber process of measuring the same quantity of electricity, first in terms and of the one unit and then in terms of the other. This result was Konhl-

81x tor, rausch. Sec.

Five other methods will be found described by Maxwell, vol. ii. Maxwell § 768 sqqg. Two of these have actually been carried into execn- Thom. tion,—one by himself, the other by Sir Wm. Thomson. The gon,

results for the fundamental velocity are 28°8 × 10° — and 282×109 <*: respectively. 8°2 × 10 = respectively.

THEORIES OF ELECTRICAL PHENOMENA.

Throughout this article we have limited ourselves as much as Specula-

possible to an exposition of the experimental facts of electricity. tive Where mathematical developments have occurred, they have theories, in most cases been simply deductions from some principle or &c. principles well established by experience. To have made our survey of the present state of electrical science complete, we ought to have added a section on the different attempts which live been made by the doctors of the science to penetrate a little farther into the secrets of the hidden mechanism by which electrical phenomena are brought about. But any attempt at a review of this kind must be relinquished. We refer the reader to our indications of the literature (Historical Sketch, p- 10). The most important work in this department lies at hand for the English reader in Professor Clerk Maxwell’s Treatise on Elec- tricity

and Magnetism.’* Particularly important are his theory of electric displacement and its application to statical as well as to current electricity ; his investigation of the stresses in the medium, by which the electrostatical forces on the one hand, and the electro- magnetic forces on the other, may be produced; the application of the theory of displacement to the case of electrical equilibrium when the dielectric medium is not everywhere the same; the dynaniical theory of the electromagnetic field ; and the electromag- netic theory of light. Maxwell gives, at the end of his work, a most instructive summary of the different speculative theories. The student who desires to pursue this department farther will do well to master this summary at the outset. (G. CH.)

7 Whose result has already been quoted. It is too low, on account of polarization.

8 Pogg. Ann,, 1870, and Ergbd., 1874.

9 Everett, [dustrations of C. G. S. System of Units, § 125, or Journ. Soc. Tel. Eng., 1873.

10 Everett, Zc.

11 Maxwell, Elect. and Mag., vol. ii. § 768.

12 We have followed throughout the views expounded in this work; and we are also under great obligations to its author for his advice on many points. For aid in collecting facts we are indebted mainly to the works of Riess, Wiedemann, and Mascart. Without their aid many sections of this article could not have been written. Wiede- mann’s treatise, in particular, lightened our task by the extent of its information and the profusion and accuracy of its references to origi- nal authorities for the facts in electrical science.

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ELECTROLYSIS. A very slight acquaintance with the phenomena of conduction of electricity by different bodies shows us that conductors may be arranged in two very distinct classes. In one the passage of electricity produces no change in the chemical composition of the substance, unless indeed the electromotive force be so great that disruptive discharge occurs, or SO large an amount of heat is generated that chemical effects ensue ; the con- ductivity diminishes slowly as the temperature rises, and if the resistance of the rest of the circuit be small compared with that of the substance under consideration, an amount of heat is produced in the latter equivalent to the energy expended by the sources of electricity. To this class of conductors probably belong all solids, with the exception of hot glass, which conducts with decomposition at a temperature below the fusing point. The conductivity differs enormously in the different cases ; those which con- duct most readily are the metals, alloys, the chemical elements generally, and some few metallic oxides and sul- phides (Faraday, Hxp. Ees., 440, ser. iv.; Skey, Chem. News, xxiii.). Besides fused metals Faraday added one liquid, fused periodide of mercury, to the list, but subse- quently gave reasons for considering that it was misplaced (Exp. Res., 691, ser. vii.). The other class of conductors presents a remarkable contrast to the one just described. In these the passage of electricity results in the chemical decomposition! of the substance of the conductor at the points where the electric current? enters and leaves the body ; a rise of temperature produces in such bodies a very con- siderable increase in the conductivity, but the specific resist- ance of even the best conducting among them is always very great compared with that of the metals. (for details see article Enzctricity, p.46 sgg.) Only part of the energy of the circuit is spent in heating the conductor, as a trans- formation of energy takes place in the chemical and mole-

- **cular actions at the points where the current enters and**

Typical electro- lytic action,

leaves the conductor.

It is the behaviour of the second class of bodies under the influence of the electric current that we have now to discuss. The physical side of the subject has already been considered in the article Etecrricrry; so we shall principally confine our attention to the phenomena of electrolysis which bear on the laws and principles of chemistry. Before going further it will be necessary to introduce the technical terms which have now become familiar, and, in order to be definite, we will consider somewhat closely a particular instance of electrochemical decomposition of the simplest type. :

The cell in which the action takes place consists of a wide tube of hard glass, bent into a V-shape ; into this is introduced some silver chloride, which is kept fused during the experiment; into the liquid in one leg of the tube is dipped a platinum wire connected with the negative pole (zinc) of a battery? of 3 or 4 Grove's cells, and into that in

1 We have not space here to discuss whether or not conduction in electrolytes is always attended with decomposition, although the question has engaged the attention of many writers on the subject. The reader who wishes for information upon the point may consult Faraday, Eup. Res. 966-9874, ser. viii.; Despretz, Compt. Rend., t. xlii. p. 707; De la Rive, Archives, t. xxxii. p. 88; Logeman and Van Breda, Phil. Mag. [4], viii. 465 ; Buff, Ann. d. Chem. u. Pharm., Ba. xciv. s. 15; Foucault, Compt. Rend., t. xxxvii. p. 580; De la Rive, Ann, de Chimie, [8], t. xlvi. p. 41; Favre, Compt. Rend., lxxiii. p. 1463; Helmholtz, Berlin Monatsbericht, 1878, Nachtrag zum Juliheft; and, for a summary of results, Wiedemann, Galv., Bd. i. § 314-316, and Nachtrag, 36, § 334,

- **The standard direction of the current is taken, as usual, to be from the copper through the wire to the zinc of an ordinary 7inc- copper cell.**

et ig not necessary to use a voltaic battery,—any source of elec- tricity serves,—but either a voltaic or a thermoelectric battery is usually employed, since these so conveniently supply a large quantity of electricity, with an electromotive force sufficient for the purpose.

HLECTROLYSTs

the other a piece of graphite or gas carbon connected with the positive pole of the same battery, We will suppose a galvanometer introduced into the circuit, and that the current strength as indicated thereby is, roughly speaking, constant, so that the quantity of electricity which passes can be measured roughly by the time occupied in passing. After the circuit has been closed a short time, bubbles of chlorine will begin to come off from the carbon, while pure silver is deposited upon the platinum wire, but except at these points no alteration will take place at any part of the fluid. Jf the platinum wire with the attached silver be weighed at intervals, it will be found that the amount deposited after the current has become constant is propor- tional to the time, ¢.e., to the amount of electricity which has passed through the liquid. The same will be true of the chlorine if collected in the other leg of the tube, due allowance being made for the small bubbles retained by the carbon, &c, And the amount of chlorine will be chemically equivalent to the amount of silver; thus for every 108 grammes of silver on the platinum there will be 35° grammes of chlorine set free in the other leg of the tube. Moreover if the current be varied by varying the number of battery cells, it will be found that the amount of decom- position in a given time is proportional to the current, that is, again, to the quantity of electricity which traverses the substance. ;

Faraday, who was the first to define the laws which hold in electrochemical decomposition, introduced, for the sake of precision, a system of nomenclature which has since been generally employed. Wishing to regard the terminals corresponding, in any similar case, to the carbon and platinum in the above experiment merely as the “doors” by which the electricity enters and leaves the liquid, he denominated tliem electrodes, and, comparing the ‘ path” of the current to those of the currents which may produce terrestrial

magnetism, and hence to the course of the sun, he called the homologue of the carbon (where the current, so to speak, "'rose," or entered) the anode, that of the platinum (where the current "set," or left) the cathode. The component parts, no matter how complex, into which the liquid was decomposed, corresponding to the Ag and Cl of the above, received the name of "ions "—that com- ponent which went down with the current to the cathode, and there either was set free or combined with the cathode or the surrounding liquid, being the cation, and that which went up against the current, and appeared or promoted some chemical action at the anode, the anion. Moreover, the substance decomposed was called an electrolyte, and the process itself electrolysis. (Faraday, Hxp. Res., 662 sqq.)

The phenomena which occur at the electrodes when the ions there set free react upon the electrode or the surround- ing fluid, so that the resulting products of electrolysis are not the ions themselves, are called secondary actions.

The anion and the cation are frequently called the negative and positive ion respectively. Similarly the cathode and anode are termed the negative and positive electrodes; Daniell denoted them the platinode and the zincode, but these terms have fallen into disuse.

Of the bodies which are capable of electrolytic conduc- tion nearly all, if not all,areliquids. Faraday (Lup. Res., 433, 1340) apparently obtained some chemical decomposition in sulphuret of silver and a few other salts when solid, but this did not alter his opinion that the mobility secured in the fluid state, either by fusion or by solution, was necessary to the phenomena of electrolysis; and his view, which he supported by experiments on ice and other solids that conduct when fused (Zxp. Res., 380-397, 419-428), still obtains. Electrolytic action doubtless sometimes takes place in gases, but accurate investigation of the subject is difficult on account of the extreme mobility of the particles

Nomen: clature.

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What bodies are elec trolytes.

E Legere ysis

and the danger of confusing electrolytic effects with effects due to disruptive discharge by convection. Gases have, however, been decomposed by the silent discharge, as CO, into CO +0.

From Faraday's time attempts have continually been made to classify strictly, according to their chemical com- position or constitution, the liquids capable of electrolytic conduction, but hitherto without very much success. It must be remembered that, as the resistance of a liquid increases, the tests of electrolytic conduction become less and less sensitive. We can consider a body an electrolyte if we can (1) collect the products of decomposition, or (2) demonstrate their presence on the electrodes by means of the return current due to polarization. If the resistance be very great the former method becomes evidently very difficult, and in the latter complications are introduced which cannot here be discussed (see Execrriciry). On the other hand, we might easily be misled into consider- ing a body an electrolyte from the presence of mere traces of a foreign substance. Thus at one time water was regarded as the only electrolyte, but it is found that the purer the water is the less does it conduct electricity, and now Kohlrausch and Nippoldt have shown that the presence of one 10-millionth of H,SO, would be sufficient to account for its observed conducting power, so that the weight of evidence goes to show that water itself is not an electrolyte at all.

It is not, then, surprising that views on the question of what constitutes an electrolyte have changed considerably. Davy and the older chemists, as mentioned above, considered water to be the only electrolyte ; Faraday, by electrolysing fused chlorides, &c., dissipated these notions, but still re- garded water as the electrolyte which was decomposed when acids were subjected to the electric current, and his general conclusion was that an electrolyte must be a compound con- sisting of an equal number of chemical equivalents of its elements, that is, in modern notation, must be of the type M®@R® where x and y are the atomicities or valencies of the elements whose atomic weights are

represented by M and R, and thus that two elements would by uniting form only one electrolyte (Zap. Fes., 679-701, 830). The oxygen salts for which Faraday assigned no law were in- cluded by Daniell in the same formula as binary compounds, of which the part R acting as anion was no longer an element but a compound; thus ZnSO, was shown to be split up by electrolysis into Zn and SO,; in that case y would represent the basicity of the acid forming the salt.

This hypothesis lacks definiteness, on account of the varia- tion of the atomicity of the elements, and falls through altogether in the case of copper and iron, which form each two chlorides, (CuCl,,Cu,Cl,), (FeCl,,Fe.Cl,), both electrolytes, and in consequence Wiedemann ((ralv., Bd. i. §§ 295, 346a, 418 (5)) modifies the statement of the hypothesis, and considers that for a body to be an electrolyte it must be capable of formation by double decomposition from one of the simple binary electrolytes, the exchanging atoms or groups of atoms forming the ions of the new compound. Thus silver acetate gives, by double decomposition with sodium chloride, silver chloride'and sodium acetate. Sodium acetate and silver chloride are therefore electrolytes of which Ag, Cl, Na, C,H,O, are the respective ions. This hypo- thesis may be illustrated by a great number of instances :— the case of the decomposition of uranium compounds, as UOC] into UO and Cl, isa very good example. But Wiedemann's view would indicate that a body, in order to be an electrolyte, need but be one of a " series of salts," and we then see no reason for excluding the hydrogen salts from the class ; thus H,O and HCl can be easilv formed by double decomposition, yet the former is, when pure, one of the worst liquid conductors, while the latter as liquefied

| good conductor.

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gas is apparently not decomposed even by 5640 cells of De la Rue's chloride of silver battery, but gives vibrations indicating very high resistance.!_ Bleekrode has also shown that, of all the pure liquefied hydrogen acids, only HCN is an electrolyte. On the other hand, liquefied NH,, which is not formed, so far as we are aware, by double

decomposi- tion, is electrolysable by only a moderate battery of Bunsen's cells, giving a blue liquid at the cathode. Moreover, Buff (Ann. d. Chem. und Pharm., Bd. cx.) has electro- lysed molybdic and vanadic anhydrides after the manner MoO, = MoO, +0, but these bodies are not obtainable by double decomposition with a simple electrolyte.

Miller (Zlements Chem., i. § 282 (v)) considers that an electrolyte must be a combination of a conductor and a non- conductor, and so the majority of electrolytes are. But alloys behave to a certain extent as electrolytes when fused (see Wied., Galv., Bd. i. § 328), and SnCl,, though consist- ing of a conductor and a non-conductor, is not an electro- lyte ; so that this classification is not exclusive.

It would therefore appear that the condition does not lie in the chemical constitution of the body, but rather in its molecular state, and to this points the fact that two non- conductors, as H,O and HCl, on being mixed form a very In addition to this, quantitative measure- ments of the resistance of electrolytes show that, in the case of many salt and acid solutions, there is a point of con- centration below saturation, for which the conductivity is a maximum. This would scarcely be the case if one alone of the bodies were the conductor.

The liquids which do not conduct are very various, including, besides oils and resins and other organic bodies, benzine, iodide of sulphur, carbon disulphide, glacial acetic acid, fused boracic anhydride, antimonic oxide and oxy- chloride, the higher halogen salts of tin, liquid sulphurous anhydride, pure water, and pure halogenacids. For others see article ELectRicity, p. 51.

In the description of the phenomena, in the typical case Fara- of electrolysis given above, it was stated that the amount of ay'slaw

chemical decomposition in any time is proportional to the whole quantity of electricity which passes through the

or a single electro-

liquid in that time ; this is true in all cases of electrolysis, lyte.

and was established by Faraday (Zap. es., v. 505, and ser. vii.). It forms part of the general law to which his name is attached, but we prefer to consider it separately for reasons that will appear when we discuss the statement of that law. We may put it thus:—Jf W be the mass of an electrolyte,2 decomposed by the passage of a quantity E of elec- tricity, then, as long as the ions remain of the same nature,

CST ie ge ep ee 1),

where K is a constant dependent only on the nature of the electrolyte, and therefore independent of the nature or size of the electrodes and of any secondary actions which may take place.

It is evident that if we can prove the truth of this law Volta- for one electrolyte, with ions which do not vary with varia- meters.

tions of electromotive force, we shall have a very con- venient means of measuring the total amount of electricity which s through any circuit in a given time by in- troducing such an electrolyte into the circuit, and measur- ing the amount of decomposition in the given time. Fara-

1 Bleekrode and Dela Rue, Proc. Roy. Soc., xxv. p. 328. In fact, dis- ruptive discharge occurs by convection currents, or, if the electrodes be sufficiently near, by spark. Similar phenomena may be observed by immersing the poles of a Holtz machine in paraffin oil.

2 In what follows, the term electrolyte is used in its most general sense, to signify any liquid or mixture of liquids through which the current passes, and not necessarily one definite chemical compound. Hence the necessity for the condition that the ions shall not vary, as in mixed electrolytes ions for high clectromotive forces are different front those for low (vid. in/.),

Determi- nation of the ions,

day demonstrated the truth of the law in the case of dilute sulphuric acid by experiments with vessels in which the products of decomposition of the dilute acid between platinum electrodes could be conveniently collected, either separately or together, and measured (Eup. Res. T14- 728.) Such an instrument he called a volta-electrometer, and subsequently a voltameter. After demonstrating that the amount of de- composition was independent of the size of the elec-trodes, he con- nected up two voltameters A and B, in multiple arc, as in the accom- panying diagram, and then passed the whole current through a third C, and found that the amount of decom- position in C was equal to the sum of the amounts in A and B. He therefore applied the voltameter! to measure quantities of electricity in other cases.

Various forms of voltameter have been employed (see Wiedemann, Galvanismus, Bd. i. § 317-319). The most accurate is the silver voltameter of Poggendorff, which con- sists of a vertical rod of silver with the lower end immersed in a solution of silver nitrate contained in a platinum vessel; the silver is connected with the positive, the platinum vessel with the negative pole of the battery, and the amount of decomposition is ascertained by weighing the platinum vessel with the attached silver before and after the experiment. Buff directly proved the truth of equation (1) for such an instrument by electrolysing silver nitrate solutions of different strengths between silver electrodes. The currents employed were varied for different experiments, and were measured by a tangent galvanometer, and the quantity E of electricity was deduced by observing the time of passage of the current. (Ann. d. Chem. u. Pharm., xciv. 15.)

We have, then, in order to demonstrate generally the law expressed in equation (1), to measure the amount of the ions set free in any case of electrolysis, while the amount of electricity is measured at the same time by means of a voltameter included in the circuit. But the measurement of the amount of ions liberated is not always an easy task ; in the great majority of cases secondary actions (see above, p- 106) occur, the primary results of electrolysis are obscured, and in order to determine the nature and amount of the ions special apparatus and further investigation are necessary.

Since the ions are liberated at the electrodes the products of secondary action will remain in the immediate neighbour- hood if the action be not too long continued. We may therefore determine the ions by collecting any gaseous pro- ducts, ascertaining the loss or gain in weight of the electrodes, and analysing the electrolyte in the immediate neighbourhood of the electrodes, taking care thet the pro- ducts at the two do not mix by gravitation, by diffusion, or otherwise.

For instance, if a fused chloride (eg., PbCl,) be electrolysed with platinum electrodes, no chlorine will be

Diagram showing connection of voltameters.

- **Many corrections have to be applied to the observations with a water voltameter in consequence of—{1) the formation of ozone in the collected oxygen; (2) the formation of H,O,; (3) the solution of the evolved gases in the water, varying with different strengths of acid, and greater for oxygen than hydrogen ; (4) the re-combination of the oxygen and hydrogen if in contact with platinum (see Wied. Galv., L.c.). A diagram and description of the water voltameter will be found in any of the numerous works on the subject.**

evolved at the anode, although Pb will be deposited at the cathode ; but if the liquid round the anode be analysed, for every 414 grammes of lead at the cathode will be found 339 grammes of PtCl, round the anode. Now the platinum must have been derived from the anode, which will be found to have lost 197 grammes in weight, consequently the 142 grammes of Cl were derived by the electrolysis from the PbCl,, and hence PbCl, is electrolysed as Pb + Cl,.

In order to separate the fluids at the two electrodes, various forms of apparatus have been employed. For fused electrolytes a W-shaped tube, which can be divided after the fluid has solidified, is sufficient; with solutions, how- ever, where the solvent introduces uew complications the separation is more difficult, owing to the “ migration of the ions”

and other causes which will be considered below. Daniell and Miller (Phzl. T'rans., 1844) used a cylindrical glass vessel separated into three compartments by porous clay diaphragms, the two end compartments containing the electrodes, and having tubes for conducting away gaseous products; while Hittorf, in a classical series of experiments (Pogg. Ann., [xxxix. xcviii. cili. cvi.), used a number of bell-shaped glass vessels fitted to each other with india- rubber washers, the electrodes being inserted in the bottom and top vessels respectively. The lower end of each bell was covered with membrane to prevent mixing of the pro- ducts; the whole apparatus was filled with the electrolyte to be decomposed; and the products at the two electrodes were known to be separated if the composition of the fluid in one of the intermediate bells remained the same through- out the experiment.

Great numbers of experiments have been made by differ- ent experimenters in one or other of the ways mentioned, and they have thus proved that, whatever the electrodes, and whatever the electromotive force, the secondary action at the electrodes has no effect upon the amount of chemical

decomposition,? and therefore the law of equation (1) always holds.

We can give here but a few examples of secondary Second- A very good account will be found in Wiedemann, ary ac- Bd. i. § 326-385, with, however, the drawback of the use 4

action.

of an obsolete chemical notation.

(1.) The ions themselves are set free, but separate into component parts. 'That this is the case with oxygen salts, which are separated into the metal and a complex anion which is resolved into oxygen and an anhydride, was pointed out by Daniell (Phil. Trans., 1839), who gave to the SQ,, derived as electro-negative ion from sulphates, the naine of oxysulphion, and soon. Many similar cases occur in electrolyses of organic compounds. Thus potassium acetate is elec- trolysed originally as KC,H,0,=K+C,H,0, ; but the anion splits up (partly at least) thus :

2C,H,0,=C,H,+2CO,. Allthe potassium salts of the fatty acids behave similarly, so that this becomes a gene- ral method of preparing the normal paraffins.

(2.) The tons appear in an abnormal molecular state. The deposit of copper in Gladstone and Tribe's ZnCu couple is a black crystalline powder (see p. 114). The most important instance, however, is the formation of ozone in the oxygen liberated at the anode by the electrolysis of acid solutions, which was recognized by Schénbein in 1840, although the smell and powerful oxidizing properties of the gas evolved had previously been noticed by Franklin and Van Marum. The amount of ozone, though very small, may be recognized by all the ordinary tests (KI, indigo, &c.); it diminishes with rise of the temperature at which the electrolysis takes place, and is above 2 per cent. when the electrolyte dilute H,SO, is cooled by ice and salt, and the electrodes are platinum-iridium wires (Soret). With dilute H,SO, at 6° C., 100 c.c. of oxygen contained *00009 gramme ozone, and '00027 gramme at a mean temperature of —9° C.; dilute H,CrO, gave at 0° C. -00052 gramme per 100 ¢.c. of oxygen (Soret), The amount varies with the different acids, solutions of chromic and permanganic acids giving the largest percentage.

These points are of importance in correcting observations by the water voltameter.

2 Of course, if the products of decomposition be allowed to accumu- late until the electrode is surrounded with an envelope of liquid differ- – ing from the original electrolyte, the whole character of the decomposi- tion changes.

Electro-

ELE GT RYOLL YS8.1 8

. The molecular state of the deposit varies very much with the density of the current, 7.¢., the current strength per unit area of elec- trode (Bunsen, Pogg. Ann., xci. 619). With small current density the metals are deposited as well-shaped crystals ; on increasing the density,

reguline metal (similar to the metal when smelted) is obtained, but with great density the deposit is amorphous, botry- oidal, or pulverulent. With some metals, the molecular state differs with the solutions from which they are deposited. Thus silver from dilute solution of the nitrate, with great current density, appears as a black powder, becoming grey-white and crystalline when the cur- rent ceases (Wied., Galv., Bd. 1. § 336a) but from solution of potas- sium silver cyanide it is electrolysed as reguline metal. Gold and platinum exhibit a similar behaviour. For a good instance of amorphous deposit, see the account of Gore's explosive antimony in his Hlectrometallurgy, p. 103.

(3.) The tons very frequently react upon the electrodes and produce in some cases very interesting chemical actions. If the cation and cathode are both metals, an alloy of the two is the usual if not universal result. This is well known in the case of the electrolysis of many metals and salts with mercury electrodes, and thecombina- tion of the hydrogen set free by elertrolysis with electrodes of pal- ladium, nickel, and iron may be similarly regarded ; and perhaps the compounds derived when ammonium salts are decomposed with a mercury cathode. Copper, when deposited on platinum, alloys with it to a certain extent, the alloy penetrating to a considerable depth (Gore, Electro-metallurgy, p. 47). Faraday noticed the com- bination of tin and lead with platinum electrodes in the electrolysis of the fused salts of those metals.

The action of the anion upon the anode furnished Faraday with an accurate and convenient means of estimating the amount of chemical decomposition produced by a definite quantity of clec- tricity, and thereby of confirming the law given by equation (1) (Lup. Res., 807-822). Thus by varying the anodes, while the cathode remained the same, in the decomposition of acidulated water he found the amount of hydrogen liberated at the cathode, and there- fore the chemical decomposition, independent of the nature of the electrodes; and by electrolysing various chlorides, as of silver, tin, lead, with an anode of the same metals respectively, he was enabled to determine very accurately the amount of chlorine separated. We shall have more to say on the bearing of this hereafter. The oxygen liberated by the electrolysis of acidulated water frequently unites with the anode; even if this is of

carbon it becomes oxidized to CO and CO,; this was noticed by Faraday (Exp. Res., 744), and is interesting as showing the active state of the oxygen when separated.

But perhaps the most interesting examples of the action of the

capillary ions on the electrodes are furnished by the capillary phenomena

pheno- mena,

exhibited by mercury in contact with dilute acid, on the passage of the current. If we have a drop of water upon a surface of Hg, and the water be connected with the positive, while the Hg is con- nected with the negative pole of a battery, the water will gather itself up into a spherical drop, and on reversing the current will spread itself overthe metal. This phenomenon is supposed by Wiede- mann to be due, in the former case, to the reduction of a film of oxide on the surface of the Hg by the liberated H, thereby giving a cleaner surface with a higher capillary constant, and, in the latter, to the oxidation of the surface 'by the liberated oxygen, and this view is borne out by numerous experiments. Thus a reducing agent, such as crystal of sodium thio- sulphate (Na,S,0,), intro- duced into the drop of water produces similar contraction of the drop, while an oxidizing agent, as K,Cr,O,, produces on the con- trary a similar dispersion. A drop of Hg in dilute sulphuric acid, connected with the positive pole of a battery, while the negative electrode is near it, extends toward that electrode on the passage of the current, becoming covered with a film of suboxide, which then dissolves in the H,SO,, and leaves again a bright surface, when the drop returns to its original position, and a series of oscillations are thus set up (see Wied. Galv., i. 368 sqq.). With solutions of alka- line cyanides containing mercury Gore obtained oscillations pro- ducing sounds (Elec.~~Metall., p.197; Proc. Roy. Soc., 1862). It was observed by Erman that a drop of mercury in a horizontal tube, with dilute acid on both sides, moved at the passage of the electric current through the tube towards the negative electrode. These phenomena have been investigated further by Lippmann (Pogg. Ann., cxlix. 547, trans. in Phil. Mag. [4] xlvii. 281). One of the forms of his apparatus is as~~

~~follows. A glass tube A, drawn out toa short capillary point of about +3, mm. radius, con~~ tains mercury which penetrates into the fine point and partly fills it, the remainder being filled with dilute H,S0O,, into which the capillary opening dips; below the electrolyte is a surface of mercury, serving as the positive electrode, sufficiently broad for the capillary effects there to be neglected. The negative electrode is the mercury in the tube A. Lippmann showed by this apparatus that, in order to compensate the change in the capillary constant of the mercury produced by a definite electromotive force of polarization, a definite increase of pressure on the mercury in A is required. As for an #lectromotive force

of polarization equivalent to a Daniell cell the |

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compensating pressure was 260 mm., and as the quantity of elec- tricity required to polarize the electrodes is very small, this apparatus, when once it has been graduated by observing the compensating pressure for known electromotive forces, may evidently be employed as a sensitive and convenient electrometer for electromotive forces less than the maximum of polarization of the electrodes.

We may mention one other example of the action of the ions Passiv- An iron wire is usually attacked by dilute ity.

upon the electrodes. ; HNO, (sp. gr. 1:3); but if previously to its being immersed in that liquid it is employed as the anode in the electrolysis of diluted oxygen acids, the nitricacid has no longer any effect upon it, not even tarnishing the surface, and the wire differs from ordinary iron in being strongly electro-negative to it, and indeed to copper, in dilute acids (Martens, Pogg. Ann., xi. 121). It is then said to be in the passive state, and is considered to be covered with a film of oxide which is strongly electro-negative, and insoluble in dilute nitric acid (Faraday, Phil. Mag., ix. p. 60, 1836, x. p. 175, 1837; Beetz, Pogg. Ann., \xii. 234, lxiii. 415). De Regnon, however (Comptes Rendus, xxix. 299), attributes the phenomena to polariza- tion. This peculiar state may be induced by various processes ; Keir (Phil. Trans., 1790) observed it when an iron

wire was dipped into strong nitric acid (sp. gr. 1°5), by which its surface is not attacked. A more dilute solution has the same effect (Schonbein, Pogg. Ann., xxxviii. 444), if the wire be immersed several times, or if the solution contain chromic or sulphuric and permanganic acids (Boutmy and Chateau, Cosmos, xix..117). Jron when dipped in very strong solution of AgNOg does not precipitate the silver, and is electro-negative even to that metal. Another method of render- ing iron passive, evidently the same in priuciple as the one first mentioned, is to touch the iron wire immersed in dilute nitric acid, by carbon, platinum, or other electro-negative element itself in contact with the liquid; and on the contrary, passive iron becomes active if it be touched by a body electro-positive to it, as copper or zine. Ifa passive wire be partly immersed in the dilute acid, and an active wire in contact with it be slowly introduced into the liquid, the latter becomes passive too ; but if they touch under the surface, both are rendered active. Iron is rendered passive also by heating in a current of oxygen or an oxidizing flame until it is tarnished On the other hand, the passive metal becomes active under the influence of any reducing action upon its surface, whether by deposition of H upon it by electrolysis, by heat- ing the metal in a reducing flame, or by abrading the surface. One modification of the electrolytic method is to touch the metal in dilute nitric acid, for a moment, with a copper wire. The point touched becomes immediately active, and therefore electro-positive to the rest, and so currents are set up from active to passive metal through the acid, which accordingly reverse the state of both parts, and a curious series of oscillations result, ending in the whole becoming active. (Schonbein, i.c. Compare these with the phenomena of alternation of passive and active states of iron, and of the oxidized and bright surfaces of amalgamated zine described by Joule, Phil. Mag., 1844, i. 106).

Iron is not the only metal which behaves thus. Nickel, cobalt, tin, bismuth, and even copper, all exhibit similar phenomena in strong HNO, and as positive electrodes ; and aluminium thus treated is electro-negative even to passive iron (see Wiedemann, Galv., Bd. i. § 589-542).

(4.) The ions act upon the fluid surrounding the electrodes. Second-Actions of this kind in both fused and dissolved electrolytes nearly ary ac- always occur unless the ions combine with the electrodes ; thus per-tions.

chlorides, if such exist, are formed from the chlorides, and per-chlorates from chlorates at the anode (Kolbe). At the cathode the secondary actions are cases of reduction; thus if solution of potassic iodide be electrolysed, corresponding to 1 equivalent of iodine at the anode, there will appear not only 1 equivalent of H, at the cathode, but an equivalent of KHO as well, so that the potassium liberated from the iodine must have acted upon the water and formed KHO. If ammonium chloride be electrolysed, the chlorine at the anode reacts upon the NH,Cl, giving free nitrogen and nitrogen-chloride. The electrolysis of ammonium nitrate is still more interesting, as NH, and H are separated at the cathode, where the hydrogen reduces the nitric acid of the nitrate, and nitrogen is evolved, while at the anode NO, is deposited, which forms with the water nitric acid and oxygen, the latter reacting upon the ammonia of the nitrate, again evolving nitrogen, so that that element appears at both poles,—at one mixed with ammonia, at the other with oxygen (Miller). Some of the reactions investigated by Kolbe and Burgoin with organic salts are very interesting, but more exclusively to the chemist. The oxidizing and reducing actions are very powerful, as the bodies probably act in the “ nascent statc.”

Solutions of acetate and nitrate of lead, wher electrolysed by currents of small density, deposit at the positive electrode hy- drated peroxide of lead as a black powder. If a polished iron plate be used as the anode, the deposit shows prismatic colours depending on the thickness, and the process has been applied in the arts to colour metallic toys, under the name of metallochromy. If a fine wire as cathode be placed vertically above the anode plate,

the colours are arranged in circles long known as Nobili’s rings. Similar phenomena are exhibited by salts of bismuth, nickel, cobalt, and manganese, all of which are precipitated as peroxides, usually

hydrated (Wernicke, Pogg. Ann., cxli. 109), upon the anode by the action of the oxygen liberated by the passage of electricity. Silver is also thrown down as a black peroxide, together with some oxygen from a solution of sulphate and nitrate, and iron behaves

. somewhat similarly in an ammoniacal solution of the protoxide in

Mixed Instructive and important cases of secondary action occur when electro- the electric current is made to traverse a mixture of several solu- | the vessel A is rm equivalent, and the entire gain of SOj in B is lytes. tions. Magnus (Pogg. Ann., cii. 23) determined by experiments aod on dilute CuSO, solution, in an apparatus with a porous diaphragm | —— equiv. The experiment shows that the entire gain of copper of clay, colloid paper, or animal membrane, specially arranged that | . oe is 276 X ‘63 dike oka of. A 2 . +. ; the lines of flow should be parallel, and the current density panna De x “63 g., and the gain of SO, in a 24 × 96 g.; an uniform, that there was a limiting value of the density above r solution _— ae which both copper and ee ee at the cathode, ei ea toate ‘5 Aa EST) Se ae ea, an ee ali below only copper. His results show that this density is inde- REED aay . pendent of lenigeh of the electrolyte and material of the electrodes, Py = 724, 80 that, of the CuSO, decomposed, 72‘4 per but varies directly as the size of the electrodes. The specific | cent. is taken from A, and 27°6 per cent. from B, and the solution resistance of the constituents, as well as the relative position of the | round the cathode is weakened much faster than that round the two ions in the ‘electro-chemical series” (vid. inf.), are of great | anode. This will be observable by the depth of the blue colour of importance, the electro-negative metal always appearing first. the solution. If the anode be of copperand be vertically above the In order to determine whether the current traversed both elec- | cathode, the effect is well seen; for although the total amount of trolytes or only one, Hittorf (Pogg. Ann., ciii. 48), with the | CuSO, in solution remains constant, the difference of colour at the apparatus above described (p. 108), electrolysed mixed solutions of | two electrodes is very apparent, and, if the action be continued, potassium chloride and iodide in different proportions, and arrived | strong dark-blue solution drops down in thin streams from the at the important conclusion that for all

densities the current | anode through the more dilute (Magnus). traversed both electrolytes, as it were in multiple aro (though the The value of » differs for different salts, and usually for solutions resistance of the mixture apparently bears no definite relation to | of the same salt of different strengths, though in some cases, as – the resistances of its constituents except for some of the haloid | K,SO,, KNO,, NaCl, and KCl, the variations for great difference of salts); but the products liberated depend on the secondary action | concentration are very slight. The following table shows a few of at the electrode, and hence on the current density. The formation | the results obtained by Hittorf, with the apparatus described of an envelope of liquid of altered composition would also intro- | above, by which errors due to diffusion were avoided. 'The numbers duce complications (Smee, Phil. Mag., xxv. 437). Buff, by experi- | . ' et 7 n-1 , menting on solution of HCl, with a small amount of H, SO,, sub- | ™ the third column indicate what is called above Gn beens the total stantially confirms Hittorf's results (Ann. d. Chem. uw. Pharm., cvs } excess in equivalents of the anion in the vessel containing the anodes 156). ; ; > . : . corresponding to a decomposition of one equivalent of salt; or, These considerations are, of course, especially useful in effecting | except in the last few cases, that part of the salt decomposed which' the deposition of alloys by electrolysis. The possibility of so doing | is taken from the vessel containing the cathode. appears to depend upon the composition of the solution employed. An acid solution of Cu and Zn deposits only copper, but the addition of potassium cyanide determines the deposition of brass. ee Gore (Electro-metallurgy, p. 51) points out that, in order to deposit containing one an alloy of two metals, there must be no clectric separation when the gramme of salt. 'two metals are in contact with the liquid; if indeed such were the case, a deposit of the two metals, say of Cu and Zn, would im- mediately act asa CuZn couple (see p. 114), and the electro-nega- tive metal alone would be deposited at the expense of the electro- positive. Migra- Although the amount of a salt decomposed by the passage of a tion of given quantity of electricity is the same whether the salt be fused the ions. or dissolved in alcohol, water, or other solvent, yet the presence of

consider from what part of the solution the salt has been removed.

1

Suppose that of the CuSO, decomposed > th was taken from the

vessel B, and therefore mths from A, The result of electrolysis

may then be exhibited thus (assuming that no diffusion takes place through the diaphragm) :—

vacuo. : : : a Pa Such secondary actions vary very conspicuously with the density nA. ,

of the current and the temperature. Bunsen (Pogg. Ann., xci.) s

electrolysed solution of chromic chloride, and by increasing the | | Before Electrolysis | 7 g. CuSO,4. y g CuSO,

current density obtained in succession H, Cr,03, CrO3, and metallic Cr at the cathode ; the reason for this is evidently that with high current densities the supply of ions in any time is greater than can take part in secondary action, and hence some of the original ion is deposited. Arise of temperature favours chemical action, and promotes rapid mixture of the ions with the solution at the same time; so the higher the temperature the greater is the current density required to isolate the ions. From concentrated sulphuric acid, for instance, below 80° only H and O are obtained ; between 80° and 90° oxygen is given off at the anode, while at the cathode H and S, due to reduction of H,SO, by hydrogen, appear; above 90° sulphur alone is deposited at the cathode (Warburg, Pogg. Ann., exxxv. 114).

the solvent produces an important effect upon the electrolyte, which should not be lost sight of in quantitative experiments. The phenomenon is known as the “ migration of the ions” (Hittorf), or the *‘unequal transfer of the ions” (Miller). Suppose, for example, we electrolyse a solution of CuSO, containing ‘16 gramme of salt per cubic centimetre, in a vessel separated by a porous diaphragm into two

portions A and B. Let electricity be passed through the solution between platinum electrodes from B to A, until 1°59 grammes of CuSO, have been decomposed. Then—

(1.) 1°59 g. of CuSO, has been removed from the solution ; (2.) °63 g. of Cu has been deposited on the platinum cathode ;

(2-"— 1:59 g. CuSO,+ y-=.159 g. CuSO,+

63 g. Cu, including Cu deposited.

After a i

If the volumes of the two vessels are equal, « and y are of course equal, since the fluid is originally homogeneous. : n—-1 nv

96 g. SO,4, including oxygen collected.

Hence A will gain 63 g. Cu, and lose 96 g. SO,.

1 ~1

B will lose py 08 8 Cu, and gain =———-96 g. SO4.

We may therefore state the result thus :—For every equivalent of copper deposited upon the cathode the entire gain of copper ir

CdI, in alcohol …. ZnIy in alcohol

The iodides of zinc and cadmium are anomalous, but it may bé supposed that they are decomposed as double salts thus :—

2CdI,=Cd+ (CdI,I1,) , 8CdI,=Cd (2 CdI,+1,).

or

(8.) °16 g. of O has been evolved at the anode, and *80 g. of SO, absorbed there by the water of the solution.

Now, had the electrolyte been a single fused compound, no com- plication could have arisen; the liquid remaining must still have been homogeneous (except for the presence of the ions near one or other electrode). But when the salt is dissolved, it is important to

The total increase in the amount of an ion in one part of a vessel Electro- divided by a porous partition is also affected by a mechanical yection transference of the electrolyte through the pores of the diaphragm, or endo generally in the positive direction of the current, which is very mose. noticeable in cases of electrolytes of high resistance. This was dis- covered by Reuss in 1807, and observed by Porret soon after-

Motion of

foreign

bh GPereiy sis

wards; it has been investigated by Wiedemann (Pogg. Ann.,

Ixxxvii, 821), and Quincke (Pogg. Ann., exiii. 513). The former worked with a porous cell, and estimated the effect either by the quantity of the electrolyte which passed through the wall of the cell, the pressure remaining constant, or by the risc of pressure in the porous cell measured by a merenry manometer. A current of moderate intensity through distilled water caused 17°77 g. of the electrolyte to pass through the diaphragm towards the cathode in a quarter of an hour, and with a 19 per cent. solution of CuSO,, a pressure of 176-5 mm. was observed in the cell containing the cathode, due to the enrrent of a battery of Danell's eclls. Quincke, 'however, employed, instead of a porons cell, a capillary tube without diaphragm, open at one end, and connected with a reservoir at the other containing one electrode, while the other electrode consisted of one of several pieces of platinum wire, sealed into the tube in various positions. His current was obtained from either a Leyden battery or 40 to 80 Grove's cells. The two ways of experimenting gave concordant results, and showed that the pressure on the cathode vessel varies as the electromotive force between the elec-

trodes, and so diminishes with the resistance if the current be kept constant. It is also, in Quincke's apparatus, inversely proportional to the square of the diameter of the tube, and, for tubes of the same sectional area, is greatly increased by increasing the perimeter. The direction of motion is, as stated above, usually towards the cathode, aud is immediately reversed on a reversal of the current, and stops when the circuit is broken. The rate of transfer is increased by coat- ing the tube with shellac; it is different for different fluids, and with certain specimens of absolute alcohol, and with turpentine oil, the direction is reversed, unless in the latter case the tube is coated with sulphur, when the direction is as before.

Intimately connected with these phenomena is the motion of solid particles contained in fluids of high resistance. Faraday

particles, observed the motion of silk threads in water, and Jiirgensen

Faraday's

law for different electro- lytes,

made many experiments on the subject with a capillary tube in the form of three sides of a rectangle with bulbs at the two corners which contained the electrodes; in one was a porous diaphragm as well. Quincke (J.c.) used a similar apparatus to this, as well as the one described above, and observed by means of a

microscope a double motion of partieles of starch contained in water

subjcet to the action of an electric machine. Near the sides of the tube the particles moved towards the negative electrode, but in the middle in the opposite direction; on turning the machine more quickly the particles near the sides gradually lost their velocity, and then began to move towards the positive electrode in common with those in the middle. So that it is highly probable that near the sides the particles are in the first instance carricd along by the motion of the fluid there, but on increasing the current the friction of the liquid in contact with the tube prevents its velocity increas- ing so fast as that of the particles in

the opposite direction, and ultimately the motion of the particles in that direction becomes apparent. Similar phenomena are obscrved with many finely divided bodies suspended in water, as gold, copper, graphite, silica, felspar, sulphur, lycopodium, &c., as well as minute drops of liquid, as OS, and oil of turpentine, and. bubbles of oxygen, marsh gas, &¢. All these are urged in water towards the positive electrode, but in oil of turpentine the direction is reversed except in the case of par-

ticles of sulphur; the direction is also reversed for silica in carbon disulphide,

Considering now our first equation W = KE established, K being, as stated, dependent only on the nature of the electrolyte, we proceed to examine the constant K and its value for different electrolytes. The primary investigation is due to Faraday, who found that if A and B be two electrolytes, and if a quantity E of electricity decomposes a mass X of A and Y of B, then X and Y are chemically equivalent, that is, are the amounts of A and B which would take part in a double decomposition between them. According to this view we have for any electrolyte W = pe, where y is the amount of the electrolyte chemically equi- valent to 1 gramme of water, and ¢ is the number of grammes of water decomposed by a unit of electricity, and is called the electrochemical equivalent of water. This appears to be always true, but the law as usually stated refers to the amounts of the ions separated. The most general statement which the facts allow is the following, known as Faraday's law:—In any electrolytic decomposition whatever, the mass w of one at least (usually of each) of the tons, sumple or complex, separated by the passage of a quan- tty of electricity E, is chemically equivalent to the amount of hydrogen separated by the same quantity of electricity in a water voltameter, and hence w=tahE, where m ts the chemi-

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cal equivalent of the ion, and h the electrochemical equivalent of hydrogen.

Since water contains {th its weight of hydrogen h=1e. |

Faraday admitted as electrolytes only bodies containing an equal number of equivalents of their components, and accordingly found that the amount of either ion was equi- valent to the hydrogen evolved in a voltameter included in the circuit. Theseventh series of Hxperimental Researches was devoted to proving this most important law. Two methods were adopted—(1) by collecting and measuring the products

of decomposition, a voltameter being included in the circuit, and (2) by introducing an anode with which the anion could combine (as for instance a Pb anode in fused PbCl,, a silver one in fused AgCl), and determining the loss in weight of the anode. By these means the law was proved for simple fused electrolytes, such as the chlorides, &c. Daniell extended it to oxygen salt solu- tions, and showed that they were decomposed into a metal aud a complex ion, this last splitting up into oxygen and an anhydride which united with water to form the corre- sponding acid, eg.,

ZnS0,= Zn + (SO, + 0).

Matteucci and E. Becquerel added a large amount of evi- dence in defence of the law, which was demonstrated with great accuracy {to } per cent.) by Soret (Ann. de Chim. et de Phys., [3] xlti. 257) for a series of copper salts; and by Buff for great variations of current strength with silver compounds.

So long as we confine ourselves to normal ‘salts there is little difficulty about the statement of the relation; even with such compounds as the series of phosphates, the double cyanides, &c., which are decomposed as in the following table, the amount of either ion may be considered equi- valent to the Ht of the voltameter.

Anion corresponding

Electrolyte. Go Hbin voltamoter Cation. Observer. ‘

1

NAPOgessesseeeees =a050. Na. P,0;, 02 7 % NagP207…..000 wade is . Na, PQs. TO, 10 ‘ : & | NagHPOs su… meet eee ee | Na, Daniell and Miller 3 (si (4 Ey ay. Phil, Trans, 3 | NalHINH,PO… Baas 1 2. Na. 1844, p. 1 KiFeGyg…..:... — 24-Cy. K. KAgCy2 AgCy+Cy, 2 . is Rae: Nn BONE +75! Hittorf.

Faraday’s law is nearly always true for both ions, but there are, as Bequerel’s before stated, examples of elements forming two series of

electroly- modifi- In these cases the tion,

sable salts, especially when dissolved in water. electronegative ton is usually equivalent to the H of the voltameter, or we may consider that the chemical] equivaleut of the positive ion varies, while that of the negative ion remains unchanged in the dif- ferent combinations; so that ferric chloride may be regarded as a dichloride with formula feCl,, where fe=2Fe; cuprous chloride euCl,, where cu=2Cu, and so on. Considerable confusion, too, arose from the arbitrary numbers for chemical equivalents which formerly obtained, and which caused such compounds as Al,Cl,, SbClz, AuCl,, to appear anomalous, and warranted E. Becquerel (Ann. de Chim. et de Phys, [8] t. xi. p. 178) in considering that gencrally the amount of electro-negative ion alone was equivalent to the H of the voltameter.? This was borne out by his electrolysis of 2N,0,, 7PbO, 3H,O, and N,O,, 2PbO, H,O, which gave 7 and 4 an equivalent of Pb at the cathode respectively ; but the law as thus modified fails in the case of K,Cr,0,, which gives K+(CrO,40) both in the melted and dissolved state, and in that of Na,S,, which gives Na(S, +48), and also for basic acetate of lead.

1 This oxygen is sct free.

2 The well-known deposit of silver in electro-plating is due to second- ary action of the K.

3 The chemical equivalents of Al, Sb, Au were taken to be 13:5, 67, 98 respectively, instead of 9°1, 40°6, 65°5 as now.

a

Electro- lysis of

solutions Other by means either of porous septa,

in con- tact.

Electro-

chemical aSsign

equiva- lents.

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Faraday's law receives striking confirmation from the electro- lysis of several solutions arranged in series in contact with each asbestus wicks, or siphon tubes. Each liquid then acts as an electrode to the adjacent ones, and so at the junction we have separated the anion of one electro- lyte and the cation of the next. 'These in general unite, and if the resulting compound be insoluble, a precipitate 1s thrown down. Faraday thus precipitated magnesia from its sulphate by electrolys- ing a solution of that salt in contact with water, the current passing from the salt solution to the water. Now, in all cases in which the ions unite at the junction, and do not appear free at all, the amount of the cation of one liquid must be chemically equivalent to that of the anion of the succeeding one, and hence obey Faraday's law. Many of the decompositions and combinations thus effected are very interesting, a list showing in a tabulated form the results of experiments by Hisinger and Berzelius, Davy, Daniell, Miller, and others will be found in Wiedemann (Galv., Bd. i. § 368). We can only mention one example which is of theoretical importance. nth the positive electrodc be in solution of iodic acid which 'is in contact with dilute sulphuric acid containing the cathode, then at the sur- face of separation there will be formed I and SO,, or H and S0,, according as the I observed at the negative electrode in the elec- trolysis of HIO, solution is an ion or due to secondary action. By the union of the two ions at the junction the latter is shown to be the case; therefore. iodic acid is electrolysed as H, + (1,0; +0).

We gather at once from the truth of Faraday's law that we can to each ion an electrochemical equivalent (which may be referred to as E.C.E.), which will enable us to determine at once the amount of the ion which will be separated by a given quay of electricity. With the notation already used the E.C.E. of an ion =} me. The value of e—the amount of water decomposed by one C.G.S. electromagnetic unit of electricity— from experi- ments of Weber, Joule, Bunsen, Casselmann, and

Kohlrausch is 00093 gramme (Wied. Galv., Bd. iii. § 1077-1079). The quantity m is one of the chemical equivalents of the ion, usually that deduced from its most stable salts; some metals, indeed, with two series of salts have two E.C.E.s. The following table of the elements gives the values of m and the E.C.E.s in absolute units, as far as they have been experimentally determined. Since m bears a simple ratio to the atomic weight, its value can be corrected by the results of chemical analysis. ;

Table of Electrochemical Equivalents.

Atomic Weight. Electrochemical Equivalent in Hydrogen units (m). E.C.E, in grammes per C.G.S. unit of Elec.

1

= ome. Atomic Weight. Hydrogen units (m). E.C.E. in

1

= 9 me.

Element, absolute units

00094 eee

: 00305

-00083

-01018

“00404 “00878

eee

01116 *00237 00452 00165

-00666 -02108

“00305

-00610

“00336

7 12()(2)

27°5(1)

{700

100)

Every complex ion has also a definite electrochemical equivalent, usually coinciding with its chemical equivalent. The E.C.E. of an electrolyte is the sum of the.E.C.E.s of its component ions.

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32°5(1)(?) ©)

1 Faraday, Exp. Res., ser. vii. 2 Renault (1.c. infra). 3 Either these elements have not been obtained as ions by electrolytic action, or ak experiments are wanting. unsen.

ELECTR OD sts

Renault® determined the E.C.E.s by an inverse method. He observed the amount of the metal which, forming the negative pole of a battery with various electrolytes, gave a current equivalent to that produced by the dissolution of a definite amount of zinc in a ZnPt cell, the two currents passing through a differential galvano- meter, and thus compared the amounts of elements which generate the same quantity of electricity in combining. It is perhaps neces- sary to observe that the electrolytic reactions taking place in a gal- vanic cell which generates a current are in every way identical with those due to a current from an external source sent through the electrolyte. In the former case, the energy of chemical affinity at the electrodes is transformed into the

energy of electrical separa- tion, and in the latter the converse is the case.

The Electrochemical Series.

It is evident from all the examples we have given that it is Electro. notan accident whether anion will appear at the anode or cathode ; chemical the cations have been all more or less similar in character, and series,

were either metals or more allied to the metals than the corre- sponding anions, which were bodies like Cl, Br, I, CN, 0, &c. Faraday (Exp. Res., 847) was accordingly led to consider that an element or radicle was unalterably either an anion or a cation ; this, however, was contradicted by the fact that the same element may act as an anion in one solution and a cation in another, as is the case with iodine, which in KI is an anion, but from a solution of iodine bromide (IBr) appears at the cathode. The electrolysis of alloys® points in the same direction, so that the conclusion is suggested to us that "anion" and "cation" have only relative meanings, and that we might arrange the elements in a series such that, in a compound of an element A with any one of those above it, A would appear as a cation, but in a compound with — any of those below, as an anion. To do this by purely electro- lytic means is out of the question, as binary electrolytes do not exist for each pair of elements. As' far, however, as the series can be thus made out, it is found that, as a rule, if two elements A and B, such that A is above B in the series, be immersed in a simple electrolyte, as dilute H,SO,, and connected by means of a wire, the current flows from B to A through the liquid. Hence in unknown eases we may observe the direction of the cur- rent when the two elements are immersed in an electrolyte, say H,SO,, and determine the relative position in the series." With the series thus roughly formed, it is observed that the wider two elements are apart the greater is the chemical affinity between the two, and thus that if we have a compound MR, where M is the electro-positive element, a more clectro-positive element M' having a greater affinity for R than M tends to replace M from the com- pound, and a more clectro-negative element R' tends to replace R as iron replaces copper

from CuSO,, and chlorine iodine from KI. This further assists us in forming an electrochemical series of the elements, but it is still not very strictly arranged, and many of the members of the series are placcd by their analogy to elements whose positions are known. Moreover, it is supposed that the relative position of two elements may vary with the temperature. Thus carbon which is used in batteries as the negative element, is ata full red heat electro-positive even to potassium, or at least reduces the carbonate of that element. Jablochkoff (Comptes Rendus, Dec. 3, 1877) describes a cell of which the positive element is coke. The electrolyte is fused sodium or potassium nitrate, and the negative element is a cast-iron vessel containing the fused salt. The current. is from coke to cast-iron through the nitrate, and the electromotive force 2 to 8 volts. Berzelius's final series stands thus :—

Electro-negative.

Oxygen. Boron. Mercury.. Thorium. Sulphur. Carbon. Silver. Zirconium. Selenium. Antimony. Copper. Aluminium. Nitrogen. Tellurium. Bismuth. Didymium. Fluorine. Tantalum. Tin. Lanthanum. Chlorine. Titanium. Lead. Yttrium. Bromine. Silicon. Cadmium. Glucinum. Todine. Hydrogen. Cobalt. Magnesium. Phosphorus. Gold. Nickel. Calcium. Arsenic. Osmium. Tron. Strontium. Chromium. Indium. Zine. Barium. Vanadium. Platinum. Manganese. Lithium. Molybdenum. | Rhodium. Uranium, Sodium. Tungsten. Palladium. Cerium. Potassium.

Electro-positive.

5 "Vérification expérimentale de la réciproque de la loi de Faraday, sur la décomposition des électrolytes," Paris, 1867; Ann. de Chim..{4] xi. 187.

6 Alloys of tin and lead, potassium and sodium, sodium amalgam, gold amal gam, and fused cast-iron havc all been shown to suffer chemical decomposition on the passage of the electric current (Wied. Galv., i. § 328).

7 This is not always conclusive evidence, as the direction of the current for the same two elements sometimes varies with the electrolyte employed, as will be seen by referring to the list of chemico-electric serics in Gore, Electro-metal- lurgy, p. 66. The boracic acid scries is peculiarly anomalous.

- Pia

- i i a loss of — equivalent of electro- Hype of Clectrolysis has mainly to deal with the two points—(1) that the equivalent of anion set es. =) se a. : i | Grott- ions appear iso Po the ee = (2) Lae – — at the | lyte due to the translation ; and hence the whole increase in a4 j same time is conducted between theelectrodes. From the behaviour : : ; i | aieie of electrolytes in contact on the passage of the current we conclude | Mount of anion free and combined round the anode is (1- n) that if we had a series of cells consisting alternately of KCl and | equivalent. The same results are obtained if the second supposition NaCl, the result of electrolysis might be represented thus :— be made. Hence the m here used is identical with the n used above in Before electrolysis, the account of the phenomena of migration of the ions. D'Almeida KCl, NaCl, KCl, NaCl ; considered that the phenomena were due to the fact that round the abner it ' ee positive electrode an envelope of free acid was formed by electrolysis, 4 —-K NaCl, KCl, NaClCl+. and that this became a second electrolyte in contact with the salt oie, : solution. It is also evident that by supposing the salt to be electro- Now, we may suppose similar effects to occur if the cells were | lysed in a hydrated state, ¢.¢. combined with a number of molecules all identical, and farther we may consider the collection of molecules | of water which may travel with either the anion or cation, an ex- in any electrolyte as such a series of cells in contact, and argue the planation of the phenomena may be arrived at (Burgoin, Bull. Soc. electrolytic process to be a series of decompositions and recombina- | Chim. [2] xvii. 244). Hittorf explained the remarkable cases of tions along a line of molecules resulting finally in the decomposition | the iodides of zinc and cadmium by a somewhat similar assump- of molecules at the electrodes alone. The decomposition of any | tion (v. supra, p. 110). ; oxygen salt would be similar, with the exception that the one ion F. Kohlrausch

(Nacht. v. d. K. Ges. d. Wiss., Gottingen, 17 Mai Exten- is complex. Thus 1876, 4 April 1877) has recently pointed out a most remarkable sion by a relation between the migration constants and the conductivities of Kohl- ~ZnSO,, ZnSO,, ZnSO,+ extremely rr yo —— ae ee rausch. ee ; ae amounts of haloid or oxygen salts. us if 1, 7, be the conduc- might represent the decomposition of zine sulphate. _This idea of | tivities of such ahaa ce two salts MR, MR° containing one alternate decompositions and recombinations was originally sug- | component M the same in both, and if 1, %» be the corresponding gested by Grotthuss in 1805, who, however, attributed the separation migration constants of the ion M, then Kohlrausch shows that the to attractions, due to the electrodes, varying inversely as the square ey Wr": ; of the distance. Faraday (Exp. Res., 481-563, series iv.) discusses the | equation Caz 3 holds with remarkable accuracy for many salts. theory, and, while denying the attractions of the electrodes defends The watiies fi, th ave called the "specie moleoula® oonductivi- the idea of decomposition and reformation, chiefly against Dela Rive _ ee, P t aud Riffauit and Chompré, and considers that the effect of the passage | ties" of the solutions, and are defined by the equation 7= —, where of the current is due to a change of the chemical affinities of the : : as ; a nll components of the electrolyte, and he points out (1348 sgq., ser. jo7 1s the specific conductivity of a very dilute solution at 18° C. viii.) that the decomposition is probably preceded by a polarized | poferred to mercury, and p is the ratio of the number of grammes state of the particles, as explained by him in his theory of electro- | of salt per unit of volume of solution to its electrochemical equiva- static oe . ne s skort pe A mee tiles (Proc. | lent in hydrogen units. The results are in accordance with the eee gk leone ae 'CnsO ip hypothesis that the conductivity of an electrolyte is proportional to observed that copper was deposited on the ends facing the anode, so berg ber es en a pen . eeoyp = while gas : ae

HBEOTReL YSIS

Radicles as NH, and SO, behave as elements, and have each a definite position in the series. Theory of Electrolysis, Any hypothesis which seeks to account for the phenomena of

(Pogg. Ann., Ixxxix.) has expanded it to explain the migration of the ions in salt solutions investigated by him. He supposes that the molecules are equal distances apart, and that the ions

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Hence the whole increase in the amount of the cation, free and

1 ,

combined, due to electrolysis is m equivalent. In the portion containing the anode we shall have—(1) a gain of one

of a solution of the compound of the two ions agreeing very closely with the experimental determinations of Kohlrausch and Grotrian.

when separated travel with diffcrent velocities to the points of recombination, and consequently those points are not the middle points between pairs of adjacent molecules. He thus considers that

In order to explain the conduction of electricity during electrolysis Hypo- several hypotheses have been suggested, which involve the idea thesis of of continuity of electricity, even in the molecules. On this view condue- the elementary atoms when recombining carry with them a certain tion.

1

the cation travels yh of the distance between molecules while the

ji anion travels (1- eh of the distance.

If then we suppose the ions separated at the electrodes to be removed, we may imagine the positions of the particles in the medium of solution before and after electrolysis to be represented by Core Be x ai respectively, thus (where n= 4) :—

the effect will be the same as if (1) the particle nearest the negative electrode were removed, and all the other particles in the line moved

towards that electrode th of the distance between the particles, or as if (2) the particle at the positive electrode were removed, and all the rest shifted { 1- >)th part of the distance between the particles

towards it. Ifwe suppose the solvent separated by a porous wall into two portions, we shall have after electrolysis in the portion containing the cathode (on the first supposition) corresponding to deposition of one equivalent of hydrogen in the voltameter—

(1) a gain of one eqnivalent of cation deposited ; (2) a loss of one equivalent of salt since the decomposed mole- cules are supposed taken from there ;

1

(3) a gain of jy equivalent of salt due to translation.

quantity of electricity, which, indeed, by Faraday's law, must be the same for every group of atoms constituting a chemical equiva- lent. Berzelius, for example, considers that when two atoms, ¢.g., H and Cl, unite to form HCl, electric distribution takes place similar to that of magnetism in a bar magnet, H being the posi- tive pole, Cl the negative. The hypothetical positive pole is then attracted by the negative electrode, and the attraction is so great at the electrode itself as to overcome the chemical affinity of the H for Cl, and separation is the result, while the electricity of the electrode and of the H combine and are neutralized. The liberated chlorine atom then behaves in the same way towards its next neighbour, and so the current of electricity is set up.

For an account of the allied theories see Wiedemann, I.c., and see Hypo- also Clerk Maxwell's remarks upon the subject (Elec. Mag., vol. i. thesis of These hypotheses nearly all involve the idea, more Clausius.

§ 259 sqq.). or less defined, of a statical molecule, ¢.¢,, a molecule at rest relatively to other molecules, and consisting of relatively fixed atoms; but while we regard heat as the energy of molecular motion, this notion of a molecule cannot be sustained, and accordingly the above

hypo- thesis can serve, as Maxwell suggests, merely to give precision to our ideas. Clausius (Pogg. Ann.,ci. 338), however, has applied the kinetic hypothesis of the constitution of bodies to electrolysis, and from his suggestions we can form some eonception of the method of proceed – ing in electrolytic action. He supposes the molecules in the ordi- nary state to be in a state of agitation, and the atoms composing the molecules to be also in motion, sometimes separating, some- times recombining with other separated atoms, so that decomposi- tion and recombinations are continually going on, but in no definite direction. The mean result is an apparent state of equilibrium. When, however, an electromotive force acts upon the electrolyte,

no matter how small it is, it causes the atoms, when liberated as usual, to tend in one direction, viz., along the lines of force. Hence the collection of the ions at the electrodes, where they will separate if the electromotive force be sufficient to prevent them reacting and again recombining,—in other words, sufficient to bear the polariz- ation. This, though by no means a complete theory, is indeed applicable to ultimate atoms, and is the only one which admits decomposition for all electromotive forecs, Clausius shows that the finite electromotive force is necessary to maintain the ions in the free state at the electrodes.

One theory, which we must mention because it accounts at once for conduction, the migration of the ions, and "electric endosmose," is that due to Quincke (Pogg. Ann., cxiii., extended in cxliv.), who con- siders the ions of each molecule charged with quantities of electri- city «and e'; then the force K tending to separate the ions from each

other is the electromotive force per unit of length of the electrolyte, and is

dv = (Be-B’e’), where B and B’ are constants, and 7

- a where @ is the current intensity, g the g sectional area of the clectrolyte, and & its specific conductivity; so

that K = a (Be-B’e’), and electrolysis takes place when this

is greater than the force of chemical affinity. This is a weak point of the theory, as a finite electromotive force would be required to produce any decomposition or polarization.

The forces on the ions when separated, and hence their respective velocities, will be proportional to e and ¢’. This will account for the migration of the ions, for which e and e’ are supposed unequal and of different signs in all cases except ZnI and Cdl, &c., for which

consequently

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(1 – 5) is greatcr than unity; for these « and e’ may be of the same

sign. If, on the other hand, e be the amount of free electricity on a molecule of the electrolyte (supposed of high resistance) in contact

‘ dv, ; : with the glass, then – B > e will represent the force urging the fluid

in the positive direction of the current, and perhaps producing endosmose, since e will be positive except for turpentine oil. So the motion of particles may be similarly explained by supposing e to be the charge on them due to contact with the fluid; this is negative with particles in water, and positive for all particles exccpt sulphur in turpentine oil. The results thus obtained will be found to agree closely with the expcriments mentioned above (p. 111); and the quantitative results also agree, since the force on a particle

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equals Boge and therefore varies as the current density 7, and

inversely as the conductivity &.

An application of electrolysis, which has already proved to be of great value in chemistry, has been introduced of late years by Gladstone and Tribe. 1n apaper read before the British Association in 1872 (Trans. of Sections, p. 75, see Proc. Roy. Soc., vol. xx. p. 218) they showed that although zinc alone does not decompose distilled. water, yet if zinc foil be immersed in dilute solution of cupric sulphate, and be thereby coated with metallic copper, which is thrown down as a black crystalline powder, containing traces of zinc only if the time of immersion be very long (Journal Chem. Soc,, 1873, p. 452), and if the zine copper couple thus produced be immersed in distilled water at ordinary temperature, about 4 cc, of H can be collected per hour. The hydrogen is seen by the microscope to collect upon the copper crystals, while the zinc is oxidized, and forms a hydrate. The rate of evolution of hydrogen varies with the temperature ; the relation may be exhibited by a curve very similar to the curve of tension of water vapour. Gladstone and Tribe have found this a powerful method of acting upon many organic bodies, particularly the halogen compounds of the alcohol radicles. In all cases either new reactions were set up, or the temperature at which reaction takes place was very much lower than with ordinary zinc (see the series of papers by Gladstone aud Tribe in the Jour. Chem. Soc., 1878-6). To the chemist the ZnCu couple affords an exceedingly convenient way of arranging electrolysis, since the whole may be contained in one vessel. For the copper in the arrangement, gold or platinum may with great advantage be substituted by immersing zinc foil in solutions of the chlorides.

This easily explains the well-known custom of generating hydro- gen from zinc and sulphuric acid, to which a little CuSO, is added ; and the "local action" in battcries, when currents pass from one part to the other of the same mass of metal and consequently energy is expended for which no external equivalent is obtained, may be similarly referred to the difference of composition of the metals in the two places. It should be remembered that Davy suggested the preservation of the

copper sheathing of ships by attaching plates of Zn; the same object is now achieved by using an alloy of the two metals.

The application of the principle of the conservation of energy to electrolysis has already produced valuable results 3 research, how-

ever, in this direction is rendered difficult on account of the great number of circumstances which have to be taken into account, in computing the balance of energy expended and work done ; the chemical composition and physical state of the electrolyte, the molecular condition of the ions, and the secondary actions at the electrodes have all to be taken into account. For a notice of the preseut state of this branch of the subject the reader is referred to the article ELECTRICITY. (W. N2 Ss

ELECTRO-METALLURGY, a term introduced by the late Mr Alfred Smee to include all processes in which elec- tricity is applied to the working of metals. Jt is far more appropriate than the French equivalent galvanoplastie, or the German Galvanoplastik, since the metals are certainly not rendered plastic under galvanic action, though it is true that in electrotypy, which forms one branch of electro-metallurgy, the metal is deposited in moulds, and can thus be used to reproduce works of plastic art.

Tt was observed as far back as the beginning of the present century that certain metals could be “ revived ” from solutions of their salts on the passage of a current of electricity. The germ of the art of electro-metallurgy may undoubtedly be traced to the early experiments of Wollaston, Cruickshank, Brugnatelli, and Davy ; but it re- mained undeveloped until the late Professor Daniell devised that particular form of battery which bears his name, and which he described in the Philosophical Transactions for 1836. A Daniell’s cell consists, in its usual form, of a copper vessel containing a saturated solution of blue vitriol or sulphate of copper, in which is placed a porous cylinder

containing dilute sulphuric acid ; a rod of amalgamated zinc is immersed in the acid, and on the two metals being connected by means of a conductor, electrical action is im- mediately set up. The zinc, which forms the positive or ~ generating element, is dissolved, with formation of sulphate of zinc; whilst the blue vitriol is reduced, and its copper deposited, in metallic form, upon the surface of the copper containing vessel, which forms the negative or conducting element of the combination. Any one using this form of battery can hardly fail to observe that the copper which is thus deposited takes the exact shape of the surface on which it is thrown down, and indeed presents a faithful counter- part of even the slightest scratch orindentation. Mr Dela Rue incidentally called attention to this fact in a paper published in the Philosophical Magazine in 1836, but it does not appear that any practical application was at the time suggested by this observation. Indeed, the earliest notice of electro-metallurgy as an art came from abroad two or three years later.

Sturgeon's Annalsof Electricity for March 1839 contained a letter from Mr Guggsworth, announcing that Professor Jacobi, of St Petersburg, had recently discovered a means of producing copies of engraved copper-plates by the agency of electricity. This was the first news of the new art which appeared in England, and it evidently referred to the paper which Jacobi communicated to the St Petersburg Academy of Sciences on October 5, 1838, and in which he explained his process. In the Athenceum of May 4, 1839, there was a short paragraph relating to Jacobi's discovery, and public attention in this country was thus drawn to the subject. Only four days after the appearance of this paragraph, Mr Thomas Spencer, of Liverpool, gave notice to the local Polytechnic Society that he would read a paper on a similar discovery of hisown. This paper was not read, however, until September 13; and although the author wished to describe his process before the British Asso- ciation at Birmingham in August, it appears that his communication was never brought before the meeting. In Mr Spencer's paper, which was eventually published by the Liverpool Polytechnic, he states that his attention was first directed to the subject by mere accident : he had used a copper coin, instead of a plain piece of copper, in a

modification of Daniell's cell, and on removing the deposited metal he was struck with the faithful copy of the coin which it presented, though of course the copy was in intaglio instead of relief. Yet even this observation was allowed to remain unproductive until another accident called his attention to it afresh. Some varnish having been spilt upon the copper element of a Daniell's cell, it was found that no copper was thrown down upon the sur- face thus protected by a non-conducting medium ; hence it was obvious that the experimentalist had it in his power to direct the deposition of the metalas he pleased; and this led Mr Spencer to prosecute a series of experiments by which he was at length able to obtain exact copies of medals, engraved copper plates, and similar objects. It should be mentioned that between the date on which he announced his paper and the date on which it was actually read, Mr C. J. Jordan, a printer, described experiments which he had made in the preceding year very similar to those of Spencer. This announcement was made in a letter published in the London Mechanics' Magazine for June 8,

1839, It thus appears that three experimentalists were close upon the same track about the same time, but it is generally admitted that among these competitors Mr Spencer has the merit of having been the earliest to bring his process to perfection, and to demonstrate its practical value.

Soon after the appearance of Mr Spencer's paper, it became a fashionable amusement to copy coins, seals, and medals by the new process. 'These copies in metal are termed electrotypes. The apparatus employed in the early days of the art, and which may still be conveniently used for small electrotypes, is similar in principle toa single Daniell's cell. It usually consists of a glazed earthenware jar containing a solution of sulphate of copper, which is kept saturated by having crystals of the salt lodged ona perforated shelf, so that they dip just below the surface of the solution. A smaller porous cylinder, containing very dilute sulphuric acid, in which a rod of amalgamated zinc is placed, stands in the jar, and is therefore surrounded by the

solution of sulphate of copper. The object to be copied is attached by a copper wire to the zinc, and is immersed in the cupric solution. It thus forms the negative element of a galvanic couple, and a current of electricity passes from the zinc through the two liquids and the intervening porous partition to the object, and thence back to the zinc through the wire, thus completing the circuit. During this action, the zinc dissolves, and sulphate of zinc is formed; at the same time the copper solution is decomposed, and its copper deposited upon the metallic surface of the object to be coated,—-the solution thus becoming weaker as it loses its copper, but having its strength renewed by con- sumption of fresh crystals of blue vitriol. To avoid the complete incrustation of the metal or other object, one side of it is coated with varnish or some other protective medium, so that the deposition of copper takes place only on such parts as are exposed. The deposit may be easily removed when sufficiently thick, and will be found to present an exact counterpart of the original, every raised line being represented by a corresponding depression. To obtain a facsimile of the original it is therefore necessary to treat this matrix in the same way that the original was treated, and this second deposit will of course present the natural relief. Another method consists in taking a mould of the original coin in fusible metal, and then depositing copper upon this die, so as to obtain at once a direct copy of the original.

Considerable extension was given to the process by a discovery, apparently trivial, which was first announced by Mr Murray at a meeting of the Royal Institution in January 1840, He found that an electro-deposit of metal

electricity.

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could be formed upon almost any material if its surface was rendered a conductor of electricity by a thin coating of graphite or “ black-lead.” Instead, therefore, of copying a coin in fusible metal, or indeed in any metallic medium, it is simply necessary to take a cast in plaster-of-Paris, wax, gutta-percha, or other convenient material, and then to coat the surface with finely-powdered black-lead, applied with a camel-hair

pencil. Medals in high relief, with much undercutting, or busts and statuettes, may be copied in electrotype by first taking moulds in a mixture of glue and treacle, which forms an elastic composition capable of stretching sufficiently to permit of removal from the object, but afterwards regaining its original shape.

About the same time that Murray suggested the use of black-lead, Mr Mason made a great-step in the art by introduciug the use of a separate battery. Daniell's cell, in consequence of its regular and constant action, is the favourite form of electric generator. The copper cylinder of this arrangement is connected with a plate of. copper placed ina trough containing a solution of sulphate of copper, to which a small quantity of free sulphuric acid is commonly added ; whilst the zinc rod of the cell is con- nected with the objects on which the copper is to be deposited, and which are also suspended in the bath of cupric solution. The current enters the bath at the surface — of the copper plate, which is the anode or positive pole of the combination, and passes through the solution to the suspended medals which constitute the cathode or negative pole. As fast as the copper is thrown down upon these objects, and the solution is therefore impoverished, a fresh supply is obtained by solution of the copper plate; this copper is consequently dissolved just as quickly as the electrotypes are produced, and no supply of crystals is needed, as in the case of the Daniell cell. The great advantage of using a separate battery is that several objects may be coated at the same time, since it is only necessary to attach them to a metal rod in connection with the battery. Almost any form of galvanic arrangement may be employed by the metallurgist as a generator of But as the exciting liquid in a battery needs to be replenished from time to tine, and as the zinc plates also wear out, its use is attended with more or less incon- venience in the workshop, and the electro-metallurgist has therefore turned his attention to other sources of electricity. Indeed, as far back as 1842, when the art was but in its infancy, a patent was taken out by Mr J. S. Woolwich for the use of a magneto-electrical apparatus ; and of late years powerful machines in which electricity is excited by means of magnetism have been introduced into electro-metallurgical establishments. When a bar of soft iron, surrounded by a coil of insulated copper wire, is rotated between the poles of a magnet, a

current of electricity is induced in the coil at every magnetization and demagnetization of the core. By means of a commutator, these alternating currents in opposite directions may be converted into a constant stream of electricity, available for the deposition of metals by electrolysis. The armatures are rotated by mechanical means, such as the use of a steam-engine, and hence the electricity is ultimately produced by conversion of mechanical work.

In the machine constructed by Mr Wilde, which has been largely employed by electro-metallurgists, a small magneto-electric apparatus, with permanent magnet, is employed to excite the electromagnet of a much larger machine. The induced current of the second machine is stronger thau that of the first in proportion as the electro- magnet is more powerful than the permanent magnet ; this second current may then be used to excite another electro- magnet, and hence by means of this principle of accumula- tion, currents of great energy may be obtained. The

armatures in these machines are contructed on Siemens's principle, and consist of long bars of iron magnetized transversely, and having the wire wound longitudinally. During the rotation of the armature, so much heat is developed that special means are taken to prevent its accumulation. In another form of Wilde's machine, a vertical disk carrying a number of coils, each with its own core, is caused to rotate between two rings of magnets. A powerful machine, with multiple armatures of this kind, is used by Messrs Elkington at Birmingham, and is capable of depositing 44 ewt. of copper every 24 hours.

Another recent modification of the magneto-electric machine used by electro-metallurgists is that invented by M. Gramme. A ring of soft iron carrying a large number of coils of insulated copper wire is caused to rotate between the poles of a fixed horse-shoe magnet, and the currents induced in the coils are collected by two metallic disks, whence they may be drawn off for use in electro-deposition. As the core is circular, the magnetization proceeds con- tinuously, and hence the

current is uniform; but as both poles of the magnet are used, two opposite continuous currents are simultaneously produced.

Thermo-electricity is another source of electromotive power of which the practical worker has availed himself. In 1843 a patent was taken out by Moses Poole for the use of a thermo-electric pile in place of a voltaic battery, but it is only within the last few years that such a source of electricity has beeu introduced into the workshop. The best-known form of thermopile is that devised by M. Clamond of Paris. One element is formed of tinned sheet-iron, and the other of an alloy composed of two parts of zinc to one of antimony. A large number of these pairs, insulated from each other, are arranged in circular piles around a central cavity, in which their junctions are heated by means of a Bunsen burner. The ease with which such an apparatus can be manipulated recommends this source of electricity to the electro-metallurgist.

Having procured a supply of electricity from one or other of these sources, the electro-metallurgist applies it

either to the deposition of a metal upon a matrix or to the |

coating of one metal by another. Hence the art of electro- metallurgy divides itself into two branches, one being called electrotypy, and the other being generally known as electro- plating. In an electrotype the reduced metal is separated from the mould on which it is deposited, and forms a dis- tinct work of art; whilst in electro-plating the deposited metal forms an inseparable part of the plated object.

It has already been explained how electrotypes are generally taken. One of the most important branches of this art is that of producing copper duplicates of engravings on wood. A cast of the block is first taken in wax or in gutta-percha, and when cold the surface of this mould is brushed over with black-lead; by means of a wire, the black-leaded mould is suspended in a bath of sulphate of copper connected with a battery, and in the course of a few hours a sufficiently thick plate of copper is deposited. The copy, on removal from the mould, is strengthened by being backed with type-metal ; it is then planed

smooth at the back, and mounted for use on a wooden block. This process is now carried out ona large scale, since it is found that a greater number of sharp impressions can be obtained from the electro than from the wood. For rotary printing machines the electrotypes are curved. Set-up type is also sometimes copied thus instead of being stereotyped, the electro-deposited copper being harder than the stereo metal.

Copper is sometimes thrown down as a thin coating upon plaster busts and statuettes, thus giving them the appearance of solid metal. In Paris, too, it is now common to give a thin coat of electro-deposited copper to exposed iron-work, such as gas-lamps, railings, and fountains. 'The iron is

first painted, then black-leaded, afterwards electro-coppered, and finally bronzed. Cast-iron cylinders used in calico- printing are also coated with copper by a single-cell arrangement ; and it has been suggested to coat iron ships in a similar manner. Usually, however, the electro-plater has to cover the baser metals with either silver or gold.

Electro-plating was introduced very soon after the dis- covery of the art of electro-metallurgy, the earliest in- vestigators being Messrs G. R. and H. Elkington, Mr Alexander Parkes, and Mr John Wright in this country, and M. de Ruolz in France. It was Mr Wright who first employed a solution of cyanide of silver in cyanide of potassium, and this is the solution still in common use. It should be borne in mind that the cyanide of potassium is a very dangerous poison, The objects to be silver-plated are usually made of German silver, which is an alloy of copper, zinc, and nickel. Before being placed in the depositing vat, the articles must be thoroughly cleansed. Grease is removed by a hot solution of caustic potash, and mechanical cleaning is commonly effected by means of a bundle of fine brass wires, known as a "scratch-brush ;" the brush is mounted on a lathe, so as to revolve rapidly, and is kept moist with stale beer. Articles of copper, brass, and German silver are usually prepared by being dipped in different kinds of " pickle," or baths of nitric and other acids. To insure perfect adhesion of

the coating of silver, it is usual to deposita thin film of quicksilver on the surface, an operation which is called "quicking." The quicking liquid may {be a solution of either nitrate or cyanide of mercury. After being quicked, the articles are rinsed with water, and then transferred to the silver-bath, where they remain until the deposit is sufficiently thick. The quantity of silver must depend upon the quality of the article: one ounce of silver per square foot forms an excellent coating, but some electro-plated household goods are turned out so cheap that they must carry but the merest film of silver. The vatsin which the electro-plating goes on were fornierly made of wood, but are now usually of wrought iron. Plates of silver are suspended from a rectangular frame connected with the positive pole, whilst the articles to be plated are suspended by wires from a similar smaller frame communicating with the negative pole. Large articles are suspended from wires, looped at the end, and protected in tubes of glass or india-rubber, whilst small articles may be placed in wire eages or in perforated stoneware bowls. On removal from the depositing vat, the plated objects are usually dipped in hot water, then scratch-brushed with beer, again washed with hot water, and finally dried in hot sawdust. A bright silver surface, requiring no further treatment when removed, may be obtained by adding to the silver bath a very small proportion of bisulphide of carbon.

Electro-gilding is effected in much the same way as electro-silvering. It is found, however, that magneto- electricity cannot be employed with advantage. Various gilding solutions are in use, but preference is usually given to the double cyanide of gold and potassium, originally introduced by Messrs Elkington. 'The solution is generally used hot, its temperature ranging from 130° Fahr. to the boiling-point. If the object to be gilt is not of copper, it is usual to coat it with an electro-deposit of copper before submitting it to the gilding solution. The coating of gold is generally very thin, and only a few minutes' exposure to the hot solution is necessary to effect its deposition. Wher the solution is fresh, a copper anode may be employed, its place being taken by a small gold electrode after the solution has been in work for some time. The presence of copper in the solution imparts a full reddish colour to the

electro-deposit of gold; and the tone of the metal may also be modified by the presence of salts of various otker

ELECTROMETER. An electrometer, according to Sir Defint- Wm. Thomson, who is the greatest living authority on this tion of subject, and has done more than any one else to perfect t™*

metals, such as those of silver. Sometimes only part of an object is to be gilt, such as the inside of a silver-

plated cream-jug ; in this case the vessel would be filled with the gilding solution, in which the anode of the battery is immersed. Gold is sometimes deposited not as a coating upon other metals, but as an electrotype in gutta-percha or in plaster moulds ; small objects of elaborate workmanship being thus produced in solid gold, without the workman- ship of the chaser and engraver.

Although copper, silver, and gold are the metals to which the attention of the electro-metallurgist is usually restricted, it should be remembered that he is also able to obtain electro-deposits of a very large number of other metals. Many of these are not practically used, but one of them has of late years become of considerable importance. This is the metal nickel. In 1869 Dr Isaac Adams of Boston, United States, patented a process for depositing nickel from solutions of various double salts; but Dr Gore had many years previously employed similar salts in England, and had published the results of his experiments. The deposi- tion of nickel, especially from the sulphate of nickel and ammonium, is now carried out on a large scale both in England and in the United States. The metal is deposited as a very thin but excessively hard coating, and has the advantage of not readily tarnishing or corroding even in a moist atmosphere. Hence it has become common to electro- nickel iron and steel objects for use on board ship, as well as gun-barrels, sword-scabbards, harness furniture, gas- burners, and various articles for household use.

fron, like nickel, may be deposited from its double salts, and excellent results have been obtained by Klein, of St Petersburg, with the double sulphate of iron and ammonium. Engraved copper-plates are much harder when faced with electro-deposited iron than when unprotected, and they consequently yield a much larger number of im- pressions before losing their sharpness. Plates for printing bank-notes have been treated in this way.

Not only can the electro-metallurgist deposit simple metals, such as those noticed above, but he is able likewise to deposit certain adloys, such as brass, bronze, and German silver, The processes by which this can be effected are not, however, very generally used.

Among the minor applications of electro-metallurgy we may mention the process of electrotyping flowers, insects, and other delicate natural objects. These are first dipped for a moment in a warm solution of nitrate of silver in alcohol, and then exposed to a reducing liquid, such as a solution of phosphorus in bisulphide of carbon ; an electro. deposit may then be thrown down upon this metallized surface. Daguerreotypes are sometimes improved by coat- ing them with a very delicate film of electro-deposited gold. Again, in some of the modern photographic processes for printing, copper electrotypes are taken directly or indirectly from the bichromatized gelatine. Of late years, too, a method of refining crude copper by means of electro- metallurgy has been introduced, and is now successfully carried out on a large scale. Slabs of blister-copper are plunged into a solution of sulphate of copper, and form the anodes of a battery ; the copper then dissolves, and is de- posited in a condition of great purity at the opposite pole, most of the impurities sinking to the bottom of the depositing vat. The process should be restricted to copper which is free from any metals likely to be deposited along with the metal under purification, .

It has been considered desirable not to include within the limits of this article any of the numerous formule for preparing the solu- tions used by electro-metallurgists. For these, and for other details see the treatises of G. Gore (1877), J. Napier (5th ed., 1876), A Watt (5th ed., 1874), A. Smee (8rd ed., 1851), and G. Shaw (1844); C. V. Walker's

Llectrotype Manipulation (1850) ; and H. Dirck's History of Electro-metallurgy (1863). ce We. R.*)

this kind of physical apparatus, is 'an instrument for measuring differences of electric potential between two con- ductors through the effects of electrostatic force."

The modern electrician is far more concerned with measurements of electric potential than with measurements of electric quantity; and consequently all modern electrometric instruments are suited for direct measure- ments of the former kind. _It is only indirectly that such instruments measure electric quantity. With the older electricians it was otherwise ; and some of the earliest electrometers were designed for the direct measurement of quantity.

Such was the measuring jar of Lane, represented in fig. 1 (after Lane's Riess). Disa Leyden jar, fastened to a stand in such a way that jar.

its outer armature can be insulated or connected to earth at will. The inner armature is in good metallic connection with the knob C. A horizontal metal piece A is mounted on a glass pillar, and carries another knob, which can be set at any required distance from C by means of a screw and gra- duation. The piece A is connected with the outer armature of the jar by a thin wire B contained in a glass tube. This last piece was added by Riess,? whose arrangement of the apparatus we have been describing. One way of using the in- strument is as follows. The balls are set at a convenient distance apart, the stand is carefully insulated, and the outer armature of the jar connected with the battery of jars or other system to be charged, and the inner armature with the source of electricity, say the prime conductor of an electric machine. The electricity accu- mulates on the inner armature till a certain difference of potential between C and A is reached, and then a certain quantity g of elec. tricity passes from C to A in the form of a spark, after which a quantity g remains distributed between the outer armature and the accumulator which is being charged. This process is continued, and as each spark passes, a quantity g is added to the charge on the outer armature and accumulator. Hence if the capacity of the outer armature be negligible compared with that of the

accumu- lator, the charge of the latter will be proportional to the number of sparks between the balls. The measuring jar may also be used to measure the overflow of electricity from one armature of an accumulator when the other is connected with an electric machine. In this case the outer coating of the jar is connected with the earth, and C is connected with the armature of theaccumulator. There is no occasion to discuss minutely here the corrections necessary in the latter method of using the apparatus ; on these and kindred points

Fia. 1.—Lane's Jar.

1 Phil. Trans., 1769.

- **The object of the fine wire is to absorb the energy of the discharges, and prevent the disintegration of the metal of the balls which renders the action of the apparatus irregular (see Riess, Reibungselectricitat, § 386).**

ing elec- class of instruments. ; , troscope. fashioned) gold-leaf electroscope, with the addi-

electro- principle.

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consult the account given by Mascart, Traité d' Hlectricité Statique, tom. i. §§ 313-316, and Riess, Zc.

The torsion balance of Coulomb is another instrument suited for the direct measurement of electrical quantity. For its eonstruction and use see the artiele ELECTRICITY, p. 18.

The discharging electroscope of Gaugain belongs to the present It eonsists (fig. 2) of an ordinary (old-

tion of a small knob B, eonnceted with the metal sole of the instrument, and standing a little to one side of one of the leaves. The charge on any conduetor is measured by connecting it with the knob A through a

sufficient length of wet cotton to retard the discharge properly. When a certain amount of electricity has reached the gold leaf, it is attracted to the knob B and is discharged; it then falls back, is recharged, then discharged by contact with B a second time, and so on. It is found that the same quantity of eleetricity is discharged at each contact if the ON process be properly regulated ; so that the whole Fy¢, 2, ~~Dischare~~ eharge on the conductor is measured by the jing Electroseope. number of oscillations of the gold leaf required

to discharge it completely.?

The rest of the instruments (save one) to be described may be classified under the three heads given by Sir Wm. Thomson in his valuable report on electrometers,? viz., (1) repulsion electrometers, (2) attracted disc electrometers, and (3) symmetrical electrometers.

I. Repulsion Eleetrometers.—The electroscopic needle of Gilbert is the oldest specimen of a repulsion electroscope. The linen threads of Franklin, and the double pendulum used by Canton, Du Fay, and others, which was an improvement thereon, are typical of another species of electroscope coming under the same

enus. ‘ Cavallo’s electroscope® (fig. 3) embodies the double pendulum It consists of two fine silver wires loaded with small pieces of cork or pith, and suspended inside a small glass cylin- der. Through the cap which closes the cylinder passes the stout wire from which the pendulums are suspended. This wire ends in a thimble-shaped dome A, whieh comes down very nearly to the cap ; the out- side of the cap and part of the wire are eovered with sealing wax, and the object of the dome is to keep moisture from the stem, so that the electroscope eould be used in the open air even in rainy weather. To add to the sensitive-

Fig, 3.—Cavllo’s Electroseope. ness of the instrument two strips of tinfoil are pasted on the glass

at B and C opposite the pith balls.

was used by Saussure.*

pith ball pendulums. By far the most perfect forin of electroscope on the double

An electroscope similar to this Volta used a pair of straws instead of the

gold-leaf pendulum principle is the gold-leaf electroscope of Bennet.' Fig.

4 represents a modern form of this instrument. The gold leaves are gummed on the two sides of a flat piece of metal earried by a stout stem, whieh passes through the top of a glass shade and ends in a flat disc. By means of this disc we may convert the instru- ment into Volta's condensing electroscope (already described, see ELEctTRIcITY, p. 34). Inside the glass shade, and rising well over the leaves, stands a cylinder of wire gauze, which ought to be in inetallic connection with the earth, or with some conductor whose potential is taken as the standard of reference. The introduction of the wire cylinder is due to Faraday, and is an essential improve- ment ; it is absolutely necessary, in fact, to convert the instrument into a trustworthy indieator of differences of potential. It serves the double purpose of protceting the leaves from external disturbing influences, and of ensuring that the instrument always indicates the difference between the potcntial of the body connected with the

? There is a correction for residue, see Maseart, t. i. § 317, &c.

3 Brit. Assoc. Rep. 1867, or Reprint of Papers on Electrostatics and Magnetism, § 343. 31777 2

4 Riess, $$ 49 and 50. 5 Phil. Trans., 1787.

'given to A; B is charged with g units

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leaves and another definite potential. ~ Thus, if we insulate the sole. of the electroscope, and connect A with the leaves, and B with the gauze, the divergence of the leaves corresponds to the difference between the

potentials of A and B, and will always be same for the same potential difference. Hence, if the divergence of the leaves were read off by means of a properly constructed scale, the instrunient might be used as a rough electrometer. The value of

Fic. 4.—Bennet's Electroseope. Fig. 5.—Henley's

Eleetrometer.

the graduation would of eourse have to be determined by experi- ment. Peclet did, as a matter of fact, use the gold-leaf electroscope in this way.

The electrometer of Henley," sometimes called Henley's quadrant electrometer (fig. 5), may be taken as the type of single pendulum electroscopes. It consists essentially of a pendulum A hinged to a vertical support C, which carries a vertical graduated semicircle B, by means of which the deviation of A from the vertical can be read off. This form of electroscope is, or was, much used for indicating the state of electrification of the prime conductors of electric machines. The stem is screwed into the conductor, and the divergence of the pendulum indicates roughly the charge.

The sine electrometer of August, represented in fig. 6, is a modi- fication of the single pendulum electroscope, analogous in principle to Pouillet's sine compass. A is a pendulum suspended by two threads to secure motion in one plane; B is a ball fixed to the case, and connected with a suitable electrode. Any charge is

of electricity; the case is turned through an angle ¢ in a vertical plane until the distance between A and B is the same as it was when both were neutral; then, if the charge on A be always the same,

go« sing.

This instrument is interesting on ac- count of the principle employed in its construetion ; but we are not aware that it has ever been used in practice. Another class of instruments, in which the movable part is a horizontal arm turning about a vertical axis, nay be looked upon as the

descendants of Gilbert's electro- seopic needle. The electrometer of Peltier and its modification into a sine electrometer (by Riess) are instrnments of this class. Descriptions of both will be found in Mascart, §$ 291 and 292. Dellmann's electrometer (fig. 7) is constructed on a_ principle similar to that applied in the two instruments last named. D isa needle, formed of light silver wire, suspended by a fine glass fibre from a torsion head A. Below the needle is a piece of sheet metal NE, divided half through by a notch in the middle, and then bent in opposite directions on both sides of the notch, so that, when looked at end on, it appears like a Y. Underneath NE isa

Fic. 6.—Sine Eleetrometer.

6 Tt was by no means safe to take this for certuin in the old instru-

ments, owing to the electrification of the glass, e Phil. Trans., 1772:

Henley's electro- meter.

Pendu- lum sine electro- meter.

Dell- manil,

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graduated disc PL, through the centre of which passes a glass tube F supporting NE, so that it can be raised or depressed by a lever G. Inside F is a spring by means of which the lever H, which scrves as electrode, can be connected or disconnected at will with the metal piece NE. The whole contained in a metal case B, the lid of which is of glass, so that the position of the needle D on the graduation PL can be read off by meaus of the lens M. To use the instrument, the case is connected with the earth, the needle is brought nearly at right angles to NE, and NE is raised by

it will be understood from fig. 8. C is an insulated disc, over which is suspended another disc, hung from the arm of a balance, and connected with the earth. A weight w is put in a scale attached to the other arm of the balance. The insulated disc is connected with the internal armature B of a Leyden jar, whose outer armature is in connection with the suspended disc. Elec- tricity is conveyed to B, and the quantity g measured by a small Lane's jar A, until the electric attraction at C is just sufficient to turn the balance. Snow Harris found that wx qg®. This and other laws established by him agree with the mathematical theory as developed in the article ELEcTRIcITY.?

Great improvements have been effected in this kind of electro- meter by Sir Wm. Thomson—(1) by his invention of the " guard ring" or " guard plate ;" (2) by using the torsion of a platinum wire for the standard force; (8) by devising proper means for attaining a definite standard potential, and by protecting the vital parts of the electrometer from extraneous disturbance ; and (4) by introducing sound kinematical principles into the construction of the movable parts.

In order to illustrate these points it will be well to describe the Thom- portable electrometer (fig. 9), one of his simpler instruments, in son's detail, portable

The principal electrical parts of this electrometer are sketched in electro-

Snow

Fria. 7.—Dellman's Electrometer.

means of G till the needle is in contact with it ; then the electrode K is brought into communication with NE, and the body whose charge or potential is to be measured is connected with K. The connection with K is then suppressed, aud NE lowered; and the needle, now free, is repelled by NE, If, by means of the torsion head, we bring the needle along to a fixed position relative to NE, the electrical couple will be proportional to the square of the charge communicated to NE and D, 2.¢., to the square of the potential of the body connected with K,

provided the capacity of the electro- meter be negligible compared with that of the body. Hence the potential is measured by the square root of the torsion on the fibre when the needle isin a given position,

The form of Dellmann's electrometer we have just described was that used by Kohlrausch.! It has been simplified by its inventor, and applied in his important investigations on atmospheric elec- tricity.

Coulotnl's balance might be used as an electrometer on the repul- sion principle. Special care would, however, be necessary to avvid or to allow for disturbances arising from the case of the instrument, which ought under any circumstances to be coated wholly or par- tially with tinfoil on the inside, according to Faraday's plan. Sir Wm. Thomson did, in fact, design an electrometer of this descrip- tion, and has given tables (Reprint of Papers, § 142) for reducing its indications. -'This type of electrometer has not come into general use.

Il. Attracted Disc Eleetrometers.—The first idea of this kind of

Fra. 8.—Snow Harris's Disc Electrometer.

instrument is due to Sir Wm. Snow Harris. One of the instrn-

Harris, ments in which he carried out the principle and the mode of using

———— 1 Pogg. Ann., 1842 and 1852.

fig 10. HH isa plane dise of metal (called the "guard plate'') meter. g g Pp

kept at a constant po- tential by being fixed to the inner coating of a small Leyden jar MM (fig. 9), which forms the case of the instru- gS ment. At F a square hole is cut out of HH, and into this fits, as nearly as it can without danger of touching, a square piece of alumi- nium foil as light as is consistent with proper stiffness. One side of this disc is bent down, and then runs out hori- zontally into a narrow stem ending in a

stirrup L—the whole being not unlike a spade. The sole of the stirrup con- [sists of a fine hair, which AR. :

H ~ SSG SS SSS SS SEE moves up and down be- SS E fore a vertical enamelled

piece bestridden by the is 9.—Section of Thomson's Portable

fork of the stirrup, On Soeomeven the enamel are two small dots very near cach other. When the hair seen through a small convex lens appears straight, and bi- sects the distance between the dots, the stirrup is said to be in the sighted position, The alumi- nium spade is suspended on a hori- zontal platinum wire stretched by platinum springs at its two ends, and is carefully balanced with its' centre of, gravity in the line of suspension, so that the only force other than electric that can affect it is the torsion of the wire, which acts like the string in the toy called the "jumping frog," or like the hair rope in the catapulta of theancients. The spade is so arranged that F is as nearly as possible in the same plane with the guard plate when the hair is in the sighted position. It is the torsional couple exerted by the wire in this position that forms the standard force. The remaining important electrical part is the plane horizontal dise G. It is essential to the action of the instrument that we should be able to move the disc G parallel to itself and to HH through measured distances. The mechanism by which this is accomplished is a remarkable instance of the application of geometrical principles to mechanism, and the reader will do well to read Thomson's " Lesson to the instrument makers" on this subject in the Reprint of his papers, § 869. The glass stem which carries G is fixed into the lower end of a hollow brass cylinder ; in the upper end of the cylinder is fixed a nut AC, through which works a carefully cut screw ending in a rounded point B of polished steel. The point B rests on a horizontal agate plate let into a foot which projects from —— NOR

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ViLtd

Fig. 10.

- **Sce also Reprint of Sir Wm. Thomson's Papers, § 158.**

Absolute

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a strong vertical support fastened to the brass lid of the jar MM (fig. 9), and passes through a slit in the hollow cylinder. This vertical piece is fitted on one side with two V notches, into which the hollow cylinder is pressed by a spring fastened to the lid and bearing half way between the Vs, and on the other side with a rect- angular groove in which slides the vertical part of a knee-piece D, in rigid connection with the hollow cylinder. D prevents the cylinder from turning round, but allows it to move vertically ; it also carries a fiducial mark running opposite a graduation on one edge of the groove, by means of which whole turns of the screw are read off, fractions being estimated by means of a drum head. The nut AC is arranged in two parts, with a spring between them, to prevent "lost time" and secure steadiness (for details, see paper cited above.)

The disc G is connected by a spiral of fine platinum wire with the main electrode 8, which is insulated from the lid of the box by a glass stem. 'The arrange- : ment of this electrode is worthy of notice, and will be understood from fig. 11. The dome T is called the um- brella; its use is obvious. A similar, only less perfect, device was noticed in Ca- vallo's electroscope. The vital parts of the instrument are all inside the coated jar, and therefore removed from dis- turbing influences; only it is necessary to remove some of the tinfoil opposite the hair in order to see it. The effect of this is counteracted by means of a screen of fine wire.

The use and the theory of the instrument are very simple. The body whose potential is to be measured is connected with the um- brella, which is raised in

Fig. 1].

order to insulate the main electrode from the case, the last being supposed to be in connection with the carth. Let v he the poten- tial of the inner coating of the jar, the disc, and guard plate, V that of the body and G, and d the distance between G and H when

the hair is in the sighted position. Then, since F may be regarded as forming part of an infinite plate,} if its surface be S its potential energy will be 4Se(v – V) (see Etectricity, p. 34), ¢.¢., S(v-V)}? 8rd * Hence the attraction f on F will be given by

S(v— Vv)? a See

Here f is a constant, depending on the torsion of the suspending wire of the aluminium balance ; hence, A® standing for 84f-S, 7.¢., A being a constant depending on the construction of the instrument,

we have < O=VeRd we 2%.) . tee 20). If we now depress the umbrella, so as to bring G to the potential of the earth, and work the screw till the hair is again in the sighted portion, we have, d' being the new reading of the screw, OmEW 5's (e's et ye ee) Hence, from (2) and (8), VeA=-@), a ee 2 oo) 1 We thus get V in terms of A and the difference of two screw read- ings, so that uncertaintics of zero reading are eliminated. The value of A must be got by comparison with a standard instrument, if absolute determinations be required. Thomson's absolute electrometer (fig. 12) is an adaptation of the

electro- attracted disc principle for absolute determinations. We give merely

meter.

an indication of its different parts, referring to Thomson's paper (J.¢.) for details. Bis an attracting disc, which can be moved parallel to itself by a screw of known step (¢y in. or thereby). A is a guard plate, in the centre of which is a circular balance-disc of aluminium suspended. on three springs, and connected by a spiral of light platinum wire with A.

The disc can be raised or depressed into definite positions by mcans of a screw (the kinematical arrange- ments in connection with these screws are similar to that in the portable electrometer). A hair on the disc, an object lens h, a fiducial mark, aud an eye lens 7 enable the observer to tell when

ae i Seen delim iainnts i Matis sic

1 Those who desire to know the de imati gree of approximation here should consult Maxwell, Electricity and Megollien ae i. § 217.

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this disc is in such a position that its lower surface is plane with lower surface of A. y y are the halves of a box which screens the dise from electric disturbances. An idiostatic guage (consisting of an aluminium lever with guard plate, hair, and lens, as in the portable electrometer), placed over a plate F in connection with the guard plate, enables the observer to tell when the guard plate and the inside coating of the instrument (which forms a Leyden jar as in the portable instrument) are at a certain definite potential. And finally, a small instrument called the "replenisher " enables

ea a JO10STA ric

Fic. 12.—Thomson's Absolute Electrometer.

him to raise or lower the potential of A till this definite potential is reached.

A short description of the replenisher will be in place here. is represented pretty clearly at E (fig. 12). in the form of cylindrical segments, are insulated from each other: by a piece of ebonite ; the left hand one is in connection with the guard plate, the right hand one with the case of the instrument (and therefore with the outer coating of the jar). A vertical shaft, which can be spun round by means of a milled head, carries two metal flies on the ends of a horizontal arm of vulcanite. Two small platinum springs (the front one is seen at ¢) are

arranged so as to touch the flies simultaneously in a certain position just clear of the shields. Let us suppose the left shield along with A to be posi- tively electrified, and the flies to be in contact with the springs ; ¢ being close to the left shield, the front fly will be electrified — and the back fly +. Suppose the shaft to revolve against the hands of a watch lying face up on the cover of the electrometer. The front fly carries off its— charge, and, when near the middle of the right shield, comes in contact with a spring connected with the shield. Being thus practically inside a hollow conductor, it gives up its — charge to the shield. At the same time the back fly gives up its +charge to the left shicld. The result of one revolution therefore is to increase the + and—charges on the respective shields, or, in other words, to increase the difference of potential between them. By giving the machine a sufficient number of turns, the potential of A may be raised as much as we please ; and, by spinning in the opposite direction, the potential can be lowered ; so that, once Ais charged, it is easy to adjust its potential till the hair of the gauge is in the sighted position. .

To work the instrument, the electrode m of the lower plate B is

It Replen- Two metal shields, jsher.

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connected with the guard plate to avoid all electrical forces on the | thus ascertain how far the weight of w grammes depresses the balance ; the hair of the balance is brought to the sighted position, | balance. The weight is now removed, and the balance left at a : distance above A equal to that just found.

Qa eee) A is now charged, and its potential | adjusted till the hair of the gauge in-

dicates that the standard potential v is reached. Let it now be required to measure the difference between the poten- tials V and V’ of two conductors. Con- nect first one and then the other with n, and work the lower screw till the hair of the balance is sighted in each case, and

let the screw Teadings reduced to centi- Fie. 14 g. 14.

fee metres be d and d'. Then, since the coe force on the disc in each case is gw, where g is, the acceleration — produced by gravity in a falling body in centimetres per second, we

have by (1)

V-Va(@-d), fo. o,

where S denotes the area of the balance disc, or rather the mean of the areas of the disc and the hole in which it works. We thus get the value of V – V' in absolute electrostatic C. G. S. units.

Ill. Symmetrical Electrometers.—Two instruments fall to be Dry pile described under this head,—the dry pile electroscope, and Thomson's electro- quadrant electrometer. The idea common to these instruments scope. is to measure differences of potential by means of the motions of an electrified body in a symmetrical field of force. In the dry pile electroscope, a single gold leaf is hung up in the field of force, between the opposite poles of two dry piles, or, in later forms of the instrument, of the same dry pile. The original inventor of this apparatus was Behrens, but it often bears the name of Bohnen- berger, who slightly modified its form. Fechner introduced the ; important improvement of using only one pile, which he removed

from the immediate neighbourhood of the suspended leaf. The Fig. 13, - Dry Pile Electroscope. poles of the pile are connected with two discs of metal, betwecn which the leaf hangs. This arrangement makes it easier to secure and the upper screw reading taken ; then a weight of w grammes | perfect symmetry in the electric field, and allows us to vary the is distributed symmetrically ou the disc, the balance brought up | sensitiveness of the instrument by placing the metal plates at again by working the screw, and the reading again taken. We different distances from the leaf. In order to muke the attainment

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Fig. 15.—Elevation and Section of Thomson's Quadrant Electrometer.

of perfect symmetry still more easy and certain Riess! added a Hankel? still f i i arther improved the dry pile electro ivi ae ry to re po cg ene which can be made to touch the | a micrometric movement 5 the foe by culsieie & Fane bbe a Ri ms . pai Pe nant = nabs Re re- | battery with a large number of célls for the uncertain etl vary tig : i electried. thistorm of the | dry pile, and by using a microscope with a divided Y pel with the varivuus improvements, is represented in | the motions of the gold leaf. "With these re eal coe g. 13. Electrometer of great delicacy and considerable range. Some of the

ee

1 Reibungselectr., § 16.

® Mascart, § 272, or Pogg. Ann., 1858. VL — 26

Quadrant

electro- meter.

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experiments in which Hankel used it are alluded to in the article ELECTRICITY. ; oN

In the quadrant electrometer of Sir Wm. Thomson, which is the most delicate electrometric instrument hitherto invented, the moving body isa horizontal flat necdle of aluminium foil, surrounded by a fixed flat cylindrical box (fig. 14), which is divided into four in- sulated quadrants A, B, C, D. The opposite pairs A, D and B, C are connected by thin platinum wires. The two bodies whose potentials are to be compared are connected with the two pairs of quadrants. If A and B be their potentials, and C the potential of the needle, it may be shown (see Maxwell, Electricity and Magnetism, § 219) that the couple tending to turn the needle from A to B is

a(A—B){[C-2(A+B)} . . . (6),

where a is a coustant depending ou the dimensions of the instru- ment. If C be very great compared with 3(A +B), asit usually is,

then the couple is . aC(A-B) . (7)

simply ; in other words, the couple varies as the difference between the potentials of the quadrants. Some idea of the general distribu- tion of. the parts of the actual instrument may be gathered from fig. 15, which gives an elevation and a section of the instrument. The case forms a Jeyden jar as usual in Thomson’s electrometers ; the internal coating in this instance is formed by a quantity of coneentrated sulpliuric acid, which also keeps the inside of the instrument dry. The quadrants are suspended by glass pillars from the lid of the jar, and one of these

pillars is supported on a sliding piece, arranged on strict kinematical principles, so as to be movable in a horizontal direction by means of a micrometer screw Y. This motion is used to adjust the position of the necdle, when charged, so that its axis may fall exactly between the quad- rants A, C, and B, D. A glass stem OC, rising from the lid of the jar into a superstructure called the ‘lantern,” supports a metal piece Z, to which is fastened a metal framework fitted with supports and adjustments for the bifilar suspension of the needle. A fine platinum wire drops from the needle into the sulphuric acid, thus connecting the needle with the inside coating of the jar. This tail wire is also furnished with a vane, which works in the acid and damps the oscillations of the needle. A stout aluminium wire rises from the needle, carries a light concave mirror T, and ends in a cross piece to which are attached the suspension fibres. The aluminium stem and the platinum tail wire are defended from electrical disturb- ances by a guard tube, which is in metallie connection with the piece Z, and also, by means of a platinum wire, with the acid; it is through this, by means of the “temporary electrode” P, that the inside of the jar is charged. The two principal electrodes are P and M. Connected with Zis a metal disc S, attracting the alu-

minium balanee of a gauge like that of the absolute electrometer. This gauge is well seen in the bird’s-eye view given in fig. 16. A

¥ (

Fie. 16.—Thomson’s Quadrant Electrometer—Bird’s-eye view.

teplenisher, like that in the absolute electrometer, is fitted to the lid of the jar, and by means of it the potential of the needle can be adjusted till the hair of the guage is in the sighted position.

The deflections of the instrument are read off by means of an image formed by the mirror T on a scale at the distance of a metre or So, the object being a wire which is stretched below the scale in a slit illuminated by a lamp. Within certain limits the deflections are proportional to the deflecting couple, z.¢., to the difference between é

quadrants A, D and B, C; but where this is not so, the instrument can easily be graduated experimentally.

For many purposes, especially in the lecture room, an instrument

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so complicated as the above is unnecessary and undesirable. A simpler form (fig. 17) of quadrant electrometer is now manufactured by Elliot Brothers, and answers most ordinary purposes very well. Capillary Electrometers.—Elec- we trometers have recently been con- structed by taking advantage of the fact that the surface tension of mereury is greatly affected by the hydrogen deposited on it when it is the negative electrode in contact with dilute sulphuric acid (see ELECTROLYSIS, p. 109). A quantity of mercury is placed in the bottom of a test tube, and communicates with a platinum electrode let in through the bottom of the tube; on the mercury is poured dilute sulphuric acid, and into this dips a tube drawn out into a capillary ending. This tube contains mercury down to a = certain mark on the capilla a eS eos the remainder being annie' Fig. 17. —Quadrant Electroniecter. with acid which is continuous with that in the test tube. So long as the mercury in the test tube is simply in metallic connection with that in the upper tube, the position of the mercury in the capillary part is stationary ; but if an electromotive force be intro- duced into the external circuit, acting towards the test tube, then hydrogen is deposited on the small mereury surface, its surface tension increases, and the pressure in the tube must be considerably mereased to maintain the mercury at the mark. This increase of pressure is proportional to the electromotive force within certain limits, hence we can use this arrangement as an electrometer. Electrometric Measurement.—Several examples of electrometric measurement will be found in the article ELecrriciry (pp. 18, 37, 38, 42, 46, &c.). We recommend in this connection the study of the sections on atmospheric electricity in Sir Wm. Thomson's Re- print of Papers on Electricity and Magnetism, and sections 220 and 229 in Clerk Maxwell's Electricity and Magnetism. We have been drawing throughout on Thomson's Report on Eleetrometers and Eleetrometrie

Measurements, but it will not be amiss to draw attention to it once more. (G. CH.)

ELEMI. The resin thus termed in modern pharmacy is obtained by incising the trunk of a species of Canarium found in the Philippine Islands. It is a soft, more or less translucent, adhesive substance, of granular consistency and fennel-like smell, and colourless when pure, but sometimes grey or blackish from the presence of carbonaceous and other impurities. When exposed to the air it becomes yellowish in tint, and harder. It consists mainly of essen- tial oil, and of an amorphous and a crystalline resin, the former easily soluble in cold, and the latter only in hot alcohol. Elemi is used chiefly in the manufacture of spirit aud turpentine varnishes, which it enables to dry without cracking. As a constituent of a stimulating ointment, it has found a place in British pharmacopcias. In the Philippines it is employed for caulking ships, and is kneaded with rice-husks for torches (see Jagor, Reisen in den Philippinen, p. 79, Berlin, 1873). The word elemi, like the older term animi, appears to have been derived from enhemon (Greek, &o.pov), the name of a styptic medicine said by Pliny to contain tears exuded by the olive-tree of Arabia. This tree, according to Flickiger and Hanbury, is probably to be identified with the Boswellia frereana of Birdwood, which flourishes in the neighbour-

I 4app- mann's capillary electro. meter,

hood of Bunder Marayah, west of Cape Gardafui (seo

S. B. Miles, Journ. R. Geog. Soc., xlii. p. 64). Mexican or Vera Cruz elemi, formerly imported into England, is afforded by the species Amyris elemifera, Royle; Mauritius elemi by another tree, Colophonia Mauritiana, D. C.; and Brazilian elemi by several species of Jcica. For a paper "On the Chemistry of Elemi," see Fliickiger, Year-Book of Pharmacy, 1874, p. 496.

ELEPHANT (Llephantide), a family of pachydermatous mammals belonging to the order Proboscidea, containing only a single existing genus and two species—the sole sur- viving representatives of the entire

order. The elephants are characterized by great massiveness of body, constituting

them the largest of living terrestrial mammals, by peculiari- ties in their dentition, and by the possession of a lengthened proboscis or trunk. The latter organ is a huge prolonga- tion of the nose and upper lip, measuring usually from 6 to 8 feet in length, and almost wholly composed of a mass of muscles, numbering, according to Cuvier, nearly 40,000, and curiously interlaced, so as to produce the greatest diversity of motion. Its extremity contains the two open- ings of the nostrils by which the elephant breathes when swimming, as it sometimes does, with only the tip of its trunk above the surface, aud through which it can fill the channels of its trunk with water, the flexibility of that organ enabling it to pour the liquid into its mouth or to squirt it over the surface of its body. By a peculiar valvular arrangement the water is prevented from penetrating into the bony nostrils. The extremity of the trunk is produced on the upper surface into a finger-like process, and ends beneath in a thick tubercle which acts the part of thumb to the prolongation above, while the whole is exquisitely en- dowed with the sense of touch, and so forms an organ of prehension comparable in many respects to the human hand. With it the elephant collects its food and drink, discovers the snares that are often set in its path, strikes its antago- nist to the ground, and gives vent to its rage in a shrill trumpet-like sound, hence the French name of trompe for the proboscis, corrupted in our language into trunk. With- out it the animal is helpless, being unable even to feed itself; and, as if conscious of the vital importance of this organ, the elephant is exceedingly cautious in using it, pre- ferring when in combat with the tiger to fight with its trunk carried aloft, out of reach of its antagonist's claws. When the trunk is injured the elephant becomes furious with rage and pain, and can no longer be controlled by its rider.

The teeth of the elephant consist of two incisors, or tusks, as they are called, in the upper jaw, and six molars on each side of either jaw. The permanent tusks are preceded by small milk teeth, which, however,

give place to their successors before the end of the second year. The tusks, proceeding from a permanent pulp, continue to grow during the elephant's lifetime, and sometimes attain enormous size, examples having been known to weigh from 150 to upwards of 200 fb each. They consist almost entirely of ivory—a remarkably fine and elastic form of dentine—and are hollow for a considerable part of their length. They are also deeply imbedded in the skull; thus a tusk, about 8 feet long and 22 inches in girth, was found by Sir Samuel Baker to be imbedded to a depth of 31 inches. The tusks are invariably best developed in the male sex, and are regarded by Darwin as sexual weapons. Their almost vertical posi- tion, however, and the inability of the elephant to raise its head above the shoulder, render their use as offensive weapons somewhat difficult ; nevertheless they are certainly employed as such in fighting with the tiger, the mode of using them depending, says Darwin, "on their direction and curvature"—thus the elephant has been known to toss a tiger to a distance of 30 feet with its tusks, when these were turned upward and outward, while it seeks to pin its foe to the ground when these organs have the usual down- ward direction. The tusks are largest in the African species, which feeds principally on the foliage and the succulent roots of trees, and in this species they are often used as levers in uprooting mimosa trees, whose crown of foliage is beyond the reach of the upturned trunk. Ip Ceylon, on the other hand, where the elephant lives chiefly on grass and herbage, tusks are generally absent in both sexes. The bullets occasionally found imbedded in the solid ivory have evidently been shot into the upper part of the tusk, and, getting lodged in the pulp cavity, have been

into the solid part of the tooth. The molar teeth consist of aseries of transverse plates, composed of dentine, and coated with a layer of enamel, the whole bound together by the substance known as crusta petrosa, or cement. Hach of these materials, possessing a different degree of hardness, wears away at a different rate from the others, and the uneven surface necessary for the proper trituration of the food is thus produced. Although the elephant may be said to have altogether six molars on each side of either jaw, at no time can more than one and

a portion of a second be seen. These molars are not deciduous in the ordinary sense, but they grow from behind forward, and as the anterior part of the front molar gets worn away by degrees, its successor is gradually cutting its way through the gum, from which, however, it does not wholly emerge until the tooth in front has almost disappeared. This progression of the molar teeth continues throughout the greater part of the elephant's life, so that it may be said to be always teething. Six of such molars, each composed of a greater number of plates than its predecessor, are said to suffice it for life. The massiveness of the skull, and its height in front, to which the elephant owes something of its sagacious aspect, is due not to the great size of the brain—which is relatively small—but to the enormous development of the bones of the cranium, rendered necessary in order to give attachment to the powerful muscles of the head and trunk, The presence of large air cells, however, in the cranial bones, renders the skull light in proportion to its enormous bulk. The eyes in the elephant are small, and its range of vision, owing to the shortness and slight flexibility of its neck, is somewhat circumscribed; this, however, is of secondary importance to an animal living generally in dense forests, where the prospect is necessarily limited, and in the elephant is compensated for by exceeding keenness in the senses of hearing and smell. Its stomach resembles that of the camel in having a chamber which can be cut off from the proper digestive cavity for the storing of water; this is capable of holding 10 gallons. The con- tents of this chamber it is able to convey into its trunk, should it wish to indulge its body in the luxury of a shower bath. The elephant is an unwieldy creature, weighing fully 3 tons, and supported on colossal limbs, which from their straightness and apparent want of flexibility—an effect pro- duced by the greater nearness of the knee and elbow to the ground than in most animals—were for centuries supposed either to be jointless, or to have such joints as could not be used. Such evidently was Shakespeare's belief when he wrote— '*The elephant hath joints, but not for courtesy ; His legs are for necessity, not flexure."

This delusion was further supported by the fact that the elephant often sleeps standing, its huge body leaning against a tree or rock. In lying down it does not place the hind legs beneath it, as is generally the case,

but extends them backwards after the manner of a persou kneeling. By this method the elephant can raise its huge weight with little perceptible effort. The feet are furnished with five toes, completely enveloped in a tegumentary cushion, and with four or five nails on each of the front feet, and three or four on the hind ones, according to the species. The skin of the elephant is thick and soft, and of a dark brown colour. With the exception of a few hairs on certain parts of its body, it is naked, although individuals found in the elevated districts of Northern India are said to be more hairy than those inhabiting warmer regions, while the young everywhere, according to Tennent, are at first covered with a woolly fleece, especially about the head and shoulders, approximating in this respect to the mammoth which inhabited the Palearctic region during

carried down by the growth of successive layers of ivory | Pleistocene times. From such facts Darwin regards it as

probable that existing elephants have lost their hairy covering through exposure to tropical heat. The elephant continues to grow for upwards of 30 years, and to live for more than 100, there being well-authenticated cases of elephants that lived over 130 years in captivity. The female is capable of breeding after 15 years, and produces a single young one, rarely two, at a birth, the period of gestation extending over nearly 21 months. The young elephant sucks with its mouth, and not, as was formerly supposed, with its trunk.

Elephants are polygamous, associating together in con- siderable herds, under the guidance of a single leader, whom they implicitly follow, and whose safety, when menaced, they are eager to secure. These herds often do great damage to rice and other grain fields in cultivated districts, trampling under foot what they cannot eat. A slight fence is, however, generally sufficient to prevent their inroads, the elephant regarding all such structures with the greatest suspicion, connecting them probably, in some way, with snares and pitfalls. At times this usually inoffensive animal is subject to fits of temporary fury, and an elephant in “must,” as this frenzied condition is termed, is regarded as

the most dangerous of animals. When an elephant, from whatever cause, leaves the herd to which it belongs, it is not allowed to join the ranks of another, but ever after leads a solitary life. Those individuals are known as " rogues ;" being soured in temper by exclusion from the society of their kind, they become exceedingly ferocious, attacking Without provocation whatever crosses their path.

Fra. 1.—African Elephant (Elephas africanus). (From specimen in Zoological Gardens, London.)

There are two existing species of elephants—the African and the Asiatic. The African Elephant (Elephas africanus) differs in so many important particulars from the Asiatic form as to have been placed by many naturalists, and ap- parently with sufficient reason, in a separate genus—

4oxodon. The enamel on the crown of its molar teeth is arranged across the surface in lozenge-shaped figures, Instead of the nearly parallel transverse ridges of the other species. Its ears are enormously large, completely cover- ing the shoulder when thrown back ; they have been known to measure 34 feet in length and 24 feet in width. Its forehead also is convex, and its back concave, while in the other the forehead is almost flat, and the back convex. The African elephant ranges over the whole of Africa south of the Sahara, with the exception of the Cape, where it formerly abounded, but from which it has been driven by man. In height it somewhat exceeds the Asiatic species, although never standing more than 11 feet high at the shoulders. Its tusks are also heavier, and occur in both

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sexes, although in the female they are comparatively small, a male tusk usually weighing about 50 Ib, while that of the female rarely exceeds 10 tb, " The tusks of the African elephant," says Baker, "are seldom alike. As a man uses his right hand in preference to his left, so the elephant works with a particular tusk which is termed by the traders el-hadam (the servant); this is naturally more worn than the other, and is usually about 10 ib lighter." They roam among the long grass on the open

plains, in the neighbour- hood of water, of which both species are excessively fond, feeding on the leaves and roots of trees, and using their tusks to overthrow such as are too strong to be pulled — down by their powerful trunks. The traveller just quoted states that he has observed trees 4 feet 6 inches in circum- ference, and about 30 feet high, thus uprooted. He was assured by the natives, however, that in such cases the elephants assisted each other. Until comparatively recent times the natives of Africa hunted the elephant exclusively for its flesh, of which they are particularly fond ; but since the arrival of the Arab traders, the natives, who formerly regarded the tusks as mere bones, and left them to rot along with the rest of the skeleton, have discovered the value of ivory, and this has led to the destruction of these animals on a much larger scale than formerly. England alone imports 1,200,000 Ib of ivory aunually, in order to obtain which, the lives of probably 30,000 elephants are sacrificed ; and it has been estimated by a recent writer on this subject that, in order to supply the demand for ivory throughout the world, at least 100,000 individuals are annually slain. As the elephant is the slowest breeder of all known animals, should the slaughter continue on its present scale, the total extinction of tusk-bearing elephants

Fic, 2.—Asiatic Elephant (Elephas indicus).

is probably not far distant. The African elephant was in ancient times domesticated by the Carthaginians, who em- ployed it in their wars with Rome. It was this species which crossed the Alps with Hannibal, and which the Romans, after the conquest of Carthage, made use of in war, in the amphitheatre, and in military pageants. No African race has since succeeded in reclaiming this highly in- telligent and naturally docile animal—a fact often quoted in proof of the general inferiority of the negro race. Although common in Europe during the ascendency of the Roman empire, for centuries after it was almost unknown ; and it was only in 1865 that the Zoological Society of London obtained a pair for their gardens. These are still living. The Asiatic Elephant (Elephas indicus) inhabits the wooded parts of the Oriental region, from India and Ceylon eastward to the frontiers of China, and to Sumatra and Borneo. It chiefly abounds in the jungle, and probably on this account

is less active and fierce than the African form. It is not, however, partial, as was at one time supposed, to low grounds and sultry heat, abounding, in India and Ceylon, principally among the hilly and even mountainous districts,

where the cold is often considerable. It is exceedingly surefooted, and shows remarkable sagacity in its choice of a route over mountain districts. It feeds largely on grass, aud, according to Tennent, the stems of plantain, stalks of sugar-cane, and the feathery tops of bamboo are irresist- able luxuries, and fruits of every description are eaten vora- ciously. The tusks grow toa considerable size in the male, but are wanting in the female; while in the Ceylon elephant, which by Schlegel, Tennent, and others is con- sidered as forming, with the Sumatran elephant, a distinct species (Hlephas swmatranus), tusks are also absent in the female, and only exceptionally present in the male. The latter, however, generally has a pair of upper incisors, known as "tushes," about a foot long, and one or two inches in diameter. The domestication of the Asiatic elephant dates from time immemorial, the earliest records in which it is mentioned showing that it was then chiefly employed in war. Elephants thus figured in the armies of the kings of India, when these monarchs sought to repel the invasions of Alexander the Great and of Tamerlane ; but, however formidable looking, they could not withstand the impetuous dash of well-armed and well-disciplined troops. The sabres of the invaders, aimed at their trunks, rendered the elephants totally unmanageable, and, in tlie confusion that ensued, they generally did more harm to their own side than tothe enemy. Great wooden towers, capable itis said of accommodating 32 soldiers, were usually fastened to the back of the war elephant, and under cover of these the archers aimed their shafts. Since the introduction of fire- arms, the elephant has become still less serviceable as an " arm of war," and is now only employed in dragging heavy artillery, and in the transport of baggage.

Elephants have been known to breed in captivity, and were thus bred, according to A'lian, in ancient Rome, but such an event in India or

Ceylon is of the rarest occur- rence, although in Ava, probably owing to the fact that the females are allowed to roam in the woods in a semi-wild state, such births are common. Domesticated individuals, in India and Ceylon, have thus been all reclaimed from the wild state, and the gaps caused by death can only be filled by fresh captures. Single wild males are often caught through the agency of tame females acting as decoys. When it is sought to capture whole herds, the Hindus and Singalese construct, in the heart of the forest, a vast inclosure known asa keddah or corral, formed of the trunks and branches of trees, with an opening on one side, into which the herd is driven. This, however, can only be accomplished by thousands of beaters making an extensive circuit round the haunts of the elephants, and gradually narrowing the circle until a comparatively limited area is completely inclosed. Around this, in order to diminish the chances of escape, fires are kindled at frequent intervals, and at last the beaters, with a general rush, and carrying lighted torches, close in upon the elephants, and the affrighted creatures, seeing no way clear except in the direction of the inclosure, make for it with all speed, and enter the corral. Once they are inside, the entrance is barricaded, and the entrapped elephants rush wildly about in the vain hope of finding a means of escape. When completely exhausted, they seek the centre of the inclosure, and there await motionless the progress of events. Several tame elephants, each bearing a mahout or keeper, and with a nooser following behind on foot, then enter the corral, and, the tame elephants mingling freely with the wild captives, the latter are put off their guard, and an opportunity is given to the attendant on foot to pass the noose of a rope, the other end of which is attached to the neck of one of the tame elephants, over each of its legs in succession. It is then securely tied to the trunk of a tree, The process of training, in which kindness and severity

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both play a part, occupies a comparatively short period, being greatly hastened by the sagacious co-operation of tame individuals. ‘ This assistance,” says Tennent, “ can generally be dispensed with after two months, and the captive may then be ridden by the driver alone, and after three or four months he may be intrusted with labour, so far as

regards docility." Males are generally more difficult to tame than females, and "rogues" are the most difficult of all; the worst, however, may be reclaimed by patience and kindness. In captivity elephants are subject to a great variety of diseases, and their rate of mortality is exceed- ingly high, more than half of those employed in the Government service of Ceylon dying after a single year of servitude. Their great strength, sagacity, and docility render them valuable as beasts of burden, and they have been largely employed in the East in road-making and bridge-building, being used for dragging timber, moving A powerful elephant is able, it is said, to lift and carry on its tusk a log of wood weighing half a ton. Having regard to the great expense of their maintenance, a working elephant consuming daily about 2 cwts. of green stuff and half a bushel of grain, as well as to their frequent illnesses, their employment is now considered less economi- cal than that of horses, and consequently their use as beasts of burden is gradually decreasing. In India, however, the elephant is largely employed in hunting the tiger, the sportsman stalking this feline game from the comparative security of the howdah fixed on its back, while its motions are directed by the mahout seated on its neck.

White elephants are merely albinos. They are extremely rare, and great store is set upon them among the in- dependent kingdoms of Further India—the chief white elephant at the court of Siam ranking next to the queen, and taking precedence of the heir apparent! Although not an object of worship in those countries, the white elephant is considered a necessary adjunct to royalty, the want of it being regarded as ominous; and in the 16th century a protracted war was waged between Siam, Pegu, and Aracan, in the course of which five kings were killed, for the possession of a particular white elephant.

Although now containing only two living forms, the family of elephants was in past geological periods much richer in species,—fossil remains of no fewer than 14 species of the genus Hlephas, and a still larger number belonging to the allied genus Jastodon having been found in the Tertiary formations, to which their remains are confined. The earliest elephants occur in the Miocene deposits of Northern India. In the Pliocene period they make their appearance in Europe, the most

noteworthy species of that time being the Elephas antiquus, a southern form, which, surviving the rigours of the Glacial period, continued on into Pleistocene times. During the latter period elephants first appear in America, such forms as the Mammothi (Elephas primigenius) ranging over the northern regions of both hemispheres. The mammoth is undoubtedly the most interesting of all the extinct elephants, owing partly to its having co-existed with man, as is proved by the numerous flint implements and other human utensils found along with its remains, and also to the perfect state of preservation in which these have been found. At the beginning of the present century, a Siberian hunter dis- covered an entire mammoth, frozen in a block of ice, and another has since been found,—both so perfectly preserved that microscopic sections of some of the tissues were able to be made. These specimens showed that this huge creature, unlike existing elephants, was thickly clad ina covering of long dark hair, mixed at the roots with shorter hair of a woolly texture, that it possessed a mane, and that it had tusks of enormous length curved upwards to fully $ths of a circle. Its remains are found abundantly in Eng-

land, and throughout the greater part of Northern Europe and Asia. They are specially abundant in Siberia, where the tusks are so plentiful and so well preserved as to form an importaut article of trade, supplying, it is said, almost the whole of the ivory used in Russia. In Malta the remains of two pigmy elephants—the one 44 feet high at the shoulder and the other only 3 feet—have been discovered. The mastodons differed from the true elephants chiefly in their dentition, having a greater number of molars, and having these crowned with prominent tubercles arranged in pairs; they had also tusks in both jaws, those in the lower, however, never attaining great length, and often falling out during the lifetime of the mastodon.

See S. de Priezac, Hist. des éléphants, Paris, 1650; Petrus ab Hartenfels, Elephantographia curiosa, 1715; Bowring, Siam, tts Kingdom and People, vol. i. p. 219; Livingstone's 7'ravels, passim ; " Hist. militaire des éléphants," in Rev. des D. Mondes, being a résumé of Armandi,

Hist. mil. des éléph., 1848 ; Gaidoz, “ Les éléphans ala guerre, ibid. 1874; De Blainville, Ostéographie: Des éléphants ; Clift ‘On the fossil remains of two new species of Mastodon,” in Geol. Trans., vol. ii. 2d series; Morren, Alémoire sur les ossements fossiles d’éléphant trouvés en Belge; H. Falconer, “ Mammoth and Elephant,” in Geol. Journal, 1865, and Paleontological Memoirs and Notes, 1868. G2Gr)

ELEPHANTA ISLE, called by the natives Gharipur, a small island betweeu Bombay and the mainland, is situated about seven miles from Bombay, 18° 57’ N. lat. and 73° E. long. It is nearly five miles in circumference, and the few inhabitants it contains are employed in the cultivation of rice, and in rearing sheep and poultry for the Bombay market. The island was, till within recent times, almost entirely overgrown with wood; it contains several springs of good water. But it owes its chief celebrity to the mythological excavations and sculptures of Hindu super- stition which it contains. Opposite to the landing-place is a colossal statue of an elephant, cracked and muti- lated, from which the island received from the Portuguese the name it still bears. Ata short distance from this is a cave, the entrance to which is nearly 60 feet wide and 18 high, supported by pillars cut out of the rock; the sides are sculptured into numerous compartments, containing repre- sentations of the Hindu deities, but many of the figures have been defaced by the zeal of the Mohametans and Por- tuguese. Inthe centre of the excavations is a remarkable bust, thought to represent the Hindu Triad, namely, Brahma the Creator, Vishnu the Preserver, and Siva or Mahadeva the Destroyer, but now supposed by some to be a triform representation of Siva alone. The heads are 6

feet in length, and are well cut, and the faces, with the.

exception of the under lip, are handsome. The head-

dresses are curiously ornamented; and one of the figures.

holds in its hand a cobra di capella snake, whilst on the cap are, amongst other symbols, a human skull and a young infant. On each side of the Trimurti is a pilaster, the front of which is filled up by a human figure leaning on a dwarf, both much defaced. There isa large

com- partment to the right, hollowed a little, and covered with a great variety of figures, the largest of which is 16 feet high, representing the double figure of Siva and Parvati, named Viraj, half male and half female. On the right is Brahma, four-faced, on a lotus,—one of the very few representations of this god which now exist in India; and on the left is Vishnu. On the other side of the Trimurti is another compartment with various figures of Siva and Parvati, the most remarkable of which is Siva in his vindictive character, eight-handed, with a collet of skulls round his neck. On the right of the entrance to the cave is a square apartment, supported by eight colossal figures, containing a gigantic symbol of Mahadeva or Siva cut out of the rock. In a ravine connected with the great cave are two other caves, also containing sculptures, which, however, have

been much defaced owing to the action of damp and the falling of the rocks. This interesting retreat of Hindu religious art is said to have been dedicated to Siva, but it contains numerous representations of other Hindu deities. It has, however, for long been a place, not so much of worship, as of archzological and artistic interest alike to the European and Hindu traveller. It forms a wonderful monument of antiquity, and must have been a work of incredible labour. Archzeological authorities are of opinion that the cave must have been excavated about the tenth century of our era. The island is much frequented by the British residents of Bombay ; and during his tour in India in 1875, the Prince of Wales was entertained there at a banquet. (See Rousselet's L'Inde, and Fergusson's History of Architecture.)

ELEPHANTIASIS (synonyms, Elephantiasis Arabum, Barbados Leg, Boucnemia), a term applied to a disease which is characterised by a peculiar over-growth of the skin and subjacent textures. This condition appears to arise from repeated attacks of inflammation of the skin and con- current obstruction of the veins and lymphatic vessels of the part. It may attack any portion of the body, but most commonly occurs in one of the legs, which becomes so enlarged and disfigured by the great thickening of its textures as to resemble the form of the limb of an

elephant, whence the name of the disease is derived. The thickening is due to excessive increase in the connective tissue, which results from the inflammatory process, and which by pressure on the muscles of the limb causes them to undergo atrophy or degeneration. Hence the limb becomes useless. This disease is most frequently seen in tropical climates. When affecting the scrotum it frequently produces a tumor of enormous dimensions. There is in general little pain attending elephantiasis, which is essentially a chronic disease. The health, however, ultimately suffers, and serious constitutional disturbance is apt to arise. In the earlier stages of this disease great relief or even a cure may be effected by the persistent employment of wet bandages applied tightly to the limb from the toes upward, as recommended by Hebra. Ligature of the main artery of the affected limb has also been employed successfully, while amputation, which was formerly the only remedy employed may occasionally be called for. In the case of tumors such as those already referred to the only remedy is excision. This disease is totally different from the so- called Hlephantiasis Grecorum, or true leprosy, which will be afterwards described.

ELEUSINIA, a festival with mysteries in honour of the goddess Demeter and her daughter Persephone, so named, it was supposed, from the celebration of the most ancient of these festivals at Eleusis. The institutional legend con- nects the festival at Eleusis directly with the mythical in- cidents arising out of the rape of Persephone, known pre- eminently as Kore or the Maiden. Mourning bitterly for the loss of her child, who has been borne away by Hades or Aidoneus to the regions beneath the earth, the goddess Demeter wanders over sea and land in a vain search, until she comes to Eleusis. Here seated on a stone, and absorbed in her grief, she is accosted by the daughters of the Eleusin- ian king Celeus, and by them brought into his house, where she finds a home and becomes the nurse of his only son Demophoon. To make the child immortal she plunges him each night into a bath of fire; but before the work is done, the process is seen by his mother Metanira. Her terror excites the wrath of the mysterious stranger, who, throwing off her garment of humiliation, exhibits herself in all her majesty, and, rebuking the folly which has marred the fortunes of Demophoon, promises to prescribe the rites to be celebrated in the

temple which is to be built to her honour on the hill above the fountain. In this temple she

takes up her abode; but the grief from which she had been roused for a while by the jests and sarcasms of the serving niaid Iambe again settles down upon her; and the earth, sympathizing with the Mourning Mother, refuses to yield her fruits until Zeus sends Hermes, his messenger, to the unseen land, and the maiden is restored to her mother at Eleusis, a name which means simply the trysting-place. The myth was thus localized in the little town, which retained its religious pre-eminence aftcr it had been included in the Athenian state. Here was to be seen the stone on which the goddess was seated when the daughters of Celeus addressed her; here was the hill on which she bade them raise her shrine, and the well Callichorus, with its overshadowing olive tree, near which she had rested. Here also were the homes of Eumolpus, Triptolemus, and Diocles, whose descendants retained for ages their hereditary functions in the mysteries which attended the great annual festival. In the same way each incident in the legend was reproduced in the feast or in its accessories. Rude and coarse raillery addressed to the passers-by repre- sented the rough jests of the maid Iambe; the posset of barley-meal mingled with water and mint, which the goddess drank in the house of Celeus, was still given to her worshippers ; while the torch by which Hecate had guided her during part of her wanderings had its place in the ritual of the feast, every portion of which had thus her august sanction.

In later times, when Eleusis had lost its political in- dependence, a temple of the goddess at Athens, called the Eleusinion, became to some extent the rival of the shrine ut Eleusis ; but the dignity of the ancient sanctuary was still marked by the solemn procession yearly made to it from Athens, during the greater of the two Eleusinian festivals. To this feast it would seem that at first Athenians only were admitted, the origin of the lesser festival being ascribed to a request made by Hercules to be initiated before his descent into Hades. Strangers being, it was said, excluded from the mysteries, the lesser Eleusinia were

instituted to extend the benefit to all Greeks who might wish to share it. The great feast, celebrated yearly during the month of Boedromion (Sept.—Oct.), lasted nine days. 'The first day bore the name dyvppds, the day of gathering at Athens for those who had been initiated in the lesser mysteries. On the second day, which was named from the cry "Adade utorat, the myste went in procession to the sea-shore and were there purified. The tlurd was, it seems from the scanty notices which we have of it, a day of fasting. On the fourth a basket containing pomegranates and poppy seeds (tlie latter representing the stupefying power, Ndpxicos, under whose influence the maiden Persephone was stolen away, the former denoting the fecundating principle by which the earth is prepared for the outburst of vegetation after the sleep of winter), was carried on a waggon in a basket, whence the procession received the namie KaddOov xdOodos. The waggon was followed by women carrying small cases, Kiera: puotixal, in their hands. On the fifth day, the day of lamps, the torches borne in procession to the temple at Eleusis denoted the wanderings of the goddess in search of her child, through the season of darkness and gloom. The sixth, the most solemn day of all, was known by the name of Iacchus, "Iaxxos, who in the Eleusinian legend is described as a son of Demeter, but who, according to the Theban tale, is, under his name Dionysus, the child of Zeus and Semele. 'The statue of this god, bearing a torch, was carried in solemn procession to Eleusis from the Athenian suburb of Kerameikos (Ceramicus). During the night which followed this celebration those who sought initiation were admitted to the last rites, in the presence of those only who, having been already initiated, were called érémra. After taking

the usual oath of secrecy, they passed from the darkness of night into the lighted interior of the sbrine, and there saw the things which none but Epoptz could look upon, and which they were bound not to reveal. The imagination of later writers, not speaking from personal knowledge, ran riot in description of terrible ordeals and scaring sights undergone by the mystz before the final splendours burst upon their eyes; while the fancy of Christians invested the preparatory rites with

even greater horrors. Probably both the awfulness of the ordeal and the glories of the subsequent revelation were absurdly exaggerated. The whole of this part of the ritual is on its face symbolical of the passage through death to life, first in the case of the fruit-bearing earth, and then of the soul of man.

The real work of the festival was now over. The pilgrimage of the Mourning Mother had been traced from the moment when her child had been torn from her to the hour when by the Eleusinian fountain she was restored to her in all her loveliness. The seventh day was a day of jesting and raillery, denoting most probably the joy in- volved in the outburst of spring, although the institutional legend ascribed it to the efforts of Iambe or Baubo to dispel the grief of the goddess before the return of the maiden. The eighth day, called Epidauria, is said to have been added because on that day the god Asclepius (Aisculapius), arriving too late for the ceremonial of the sixth day, asked for initiation. This legend is a set-off to the one which was supposed to account for the institution of the lesser Eleusinia for the benefit of Hercules. The pouring of water or wine from two vessels, one held towards the east, the other towards the west, some mystic words being at the same time recited, gave to the ninth and last day its name TAnpoxdat.

The nature of the mysterious doctrines set forth before those who were initiated in the Eleusinian festival is a question which belongs rather to the subject of mysteries in general. Enough has been already said to show that one great feature in this feast was the dramatic symbolism which described the revivification of the earth after the death of winter. This symbolism assumed forms which would explain thcir meaning even to the uninitiated. But the revival of nature would be inseparably associated with the thought of the life into which the human soul passes through the gateway of death; and in a festival where everything was dramatic the one truth or fact would be expressed by signs not less than the other. The Eleusinian legend represents Dionysus or Iacchus as the son of Demeter ; and in the great Dionysiac festival at Athens the phallus was solemnly carried in procession, as in like state the veiled ship or boat of Athene was borne to the Acropolis. This ship or boat was represented by the mystic cists or chests carried by the pilgrims to

Eleusis, and answers to the yoni, as the phallus corresponds to the lingam of the Hindu. The methods of initiation based on these signs might be gross or spiritual, coarse or refined, according to the genius of the people by whom they were used ; nor would it be surprising if both these elements were more or less mingled in all mystical celebrations. There is no reason for supposing that the Eleusinian mysteries involved any more than this symbolical teaching which centres on the two ideas of death and reproduction ; there is no valid ground for supposing that it involved less. Hence when Dr Thirlwall expresses a doubt whether the Greek mysteries were ever used " for the exposition of theological doctrines differing from the popular creed," or when Mr Grote asserts it to be altogether improbable that "any recondite doctrine, religious or philosophical, was attached. to the mysteries or contained in the holy stories " of any priesthood of the ancient world, the remark is probably right, if by this recondite teaching be meant

doctrines relating to the nature of God and the divine government of the world; but we should be scarcely justified in pushing it further. . ;

How far in the Eleusinian mysteries the ritual was strictly Greek or even strictly Aryan is a question of greater difficulty, and perhaps of greater interest It may, be enough here to say that the Iacchus or Dionysus who in the Eleusinian legend is the son of Demeter is pre-eminently a Theban god, and that to Thebes especially is traced the introduction from Asia of that orgiastic worship in which the frenzy of the worshippers denoted the irresistible impulses by which the decay and reproduction of the natural world are governed.

See Ouwaroff, Essai sur les mystéres d'Eleusis, Paris, 1816; Sainte Croix, Recherches historiques sur les mystéres du Paganisme, Paris, 1817, 2 vols. ; Preller, Demeter und Persephone, Hamburg, 1837 ; Dollinger, Heidenthum und Judenthum, Ratisbon, 1857 ; A. Mommsen, Heortologie, Antiquarische Untersuchungen tiber die Stddtischen Feste der Athener, Leipsic, 1864; F. Lenormant, Recherches Archéologiques & Eleusis exécutées dans le cours de Pannée 1860, Recwetl des inscriptions, Paris, 1862; Monographie de la voie sacrée éleusinicnne,

de ses monuments, et de ses sowvenirs, tome i, 1864, and “ Mémoire sur les representations qui avaient lieu dans le mystéres d’Eleusis,” in Mémoires de 0 Acad. des Inscrip- tions, 1861; Grote, History of Greece, part i. chap. i. 1870; Cox, Mythology of the Aryan Nations, book ii. chap. ii. section 12, 1870 ; Bernhard Schmidt, “ Demeter in Eleusis und Herr F. Lenormant,” in Rheinisches Museum, 1876 ; Brown, Dionysiak Myth, chap. vi. sub-section 3, on the Eleusinian Ritual, 1877. (G. W. C.)

ELEUSIS, a small city of Attica about fourteen miles north-west of Athens, occupying the eastern part of a rocky ridge close to the shore opposite the island of Like most of the other cities of Greece, its origin

Salamis.

(From the Inedited Antiquities of Attica.)

1. Temple of Artemis Propylea. 4. Temple of Demeter. 2. Outer propylzon. 5. Outer inclosure of the sacred

3. Inner propyleon. buildings.

6. Inner inclosure.

these, to Ogyges, a fact which at least proves it to be of the highest antiquity. In the earlier period of its history it seems to have been an independent rival of Athens, and it was afterwards reckoned one of the twelve Old Attic cities. A considerable portion of its small territory was occupied by the plains of Thria, noticeable for their fertility, though the hopes of the husbandmen were not unfrequently disappointed by the blight of the south wind. To the west was the Campus Rharius, Iediov ‘Papwov, or Rharian Plain, where Demeter is said to have sown the first seeds of corn; in the midst of the Campus was the KadXixopov dpéap, a well round which the Eleusinian matrons are said at first to have danced in honour of the goddess ; and on its confines was the field called Orgas, planted with trees consecrated to Demeter and Proserpine. To the traveller approaching by the Sacred Way from the east the first building that presented itself was the temple of Triptolemus, the site of which is

measure the distances of more than 20 other towns.

now occupied by the little church of St Zacharias; and next came a temple dedicated to Artemis Propylea and Poseidon, constructed entirely of Pentelic marble. En- trance into the outer peribolos, or inclosure, of the great temple of the mysteries was obtained by means of a por- tico built in imitation of the propylea of the Athenian citadel ; into the inner perzbolos by another dedicated by the consul Appius Claudius Pulcher, in 54 B.c., and exe- cuted by his nephew Claudius Pulcher and Marcius Rex. The temple itself, sacred to Demeter and Kora (Ceres and Proserpine), was considered one of the most beautiful pro- ductions of the genius of Greece. The original foundation is said to have been due to Pandion II., and Clemens Alexandrinus places it even 120 years earlier, in the reign of Lynceus. Its position and riches naturally exposed the temple to the attacks of the enemies of Attica; and, though defended by a strong fortress, it was seldom able to make any lengthened resistance. Cleomenes, king of Sparta, dared to violate its sacred precincts; but, if we may believe the Athenians, he was soon after seized with a retri. butive fit of madness. The Persians burnt it to the ground after the battle of Platza; but scarcely had they retired from Greece, when the Athenians determined to rebuild it with more than its original magnificence. Ictinus, the architect of the Parthenon, was ordered to draw up the plan of the new edifice. He adopted the Doric order of architecture, without the erection of pillars in front of the building. We know not whether he lived long enough to carry his plan into execution; but it was during the splen- did administration of Pericles, and under the cultivated taste of Phidias, that the temple was completed in all its magnificence, The mystic cell (uvorixds onkds, évd«ropor, or reAeoryptov) was begun by Corcebus, but he lived only to finish the lower row of columns, with their architraves. Metagenes, of the district of Xypete, added the rest of the entablature, and the upper row of columns. Xenocles of Cholarge built the dome on the top. A portico was long afterwards added by Demetrius Phalereus, who employed for that purpose the architect Philo. This magnificent structure continued to exist till the hordes of Alaric com- pleted its

overthrow in 396 a.p. The city disappeared on the destruction of the temple ; and upon the site nothing is now found but a miserable village called Lefsina (Aevavva), or Lepsina, amidst the ruins of the sacred edifice. The coins of Eleusis are still common, representing Demeter drawn by dragons or serpents, and bearing the inscription EAEY3I or EAEY within a wreath of ears of corn. A colossal statue of the goddess, regarded by the inhabitants as their patroness and protectress, was removed to England in 1801, and is now preserved in Cambridge.

ELEUTHEROPOLIS, an ancient city of Palestine, about 25 miles from Jerusalem, on the road to Gaza, identified by Robinson with the ruins at the modern village of Beit Jibrin. It is mentioned by Ptolemy under the older name of Baitogabra, and did not acquire the title of Eleuther-opolis, or Free City, till the Syrian visit of the emperor Septimius Severus. In the time of Eusebius it was so well known that he uses it as a central point from which to The year 796 saw its complete destruction ; and it was still in ruins when the crusaders of the 12th century chose Bethgebrim, as they called it, as the site of one of their fortresses. After the battle of Hattin it was captured by the Saracens; and though King Richard of England again obtained possession, it finally fell into the hands of Bibars. The fortress and a fine old chapel still remain. According to a local tradition, it was at Eleutheropolis that the fountain rose from Samson's "jaw-bone of an ass." Epiphanius, a native of a neighbouring village, is frequently called an Eleutheropolitan.

ELGhN

ELGIN, or MoraysHiRE, a maritime county in the north of Scotland, bounded on the N. by the Moray Firth, along which it extends for thirty miles, on the E. and 8.E. by Banffshire, on the 8. and S.W. by Inverness-shire, and on the W. by Nairnshire. The distance from the sea to its furthest inland point is 33 miles. It contains, since the alterations made by tle Inverness and Elgin County Boundaries Act, 1870, about 487 square miles, or 312,375 acres, nearly one-third of which may be considered as under cultivation. As thus limited, the county comprises but the eastern portion of the ancient province of Moray, which

extended from the Spey on the east to the river Beauly on the west, and from the sea to the Grampians southwards.

Elginshire naturally divides itself into two portions, dis- tinguished not less by physical aspect and geological struc- ture than by the products of the soil—the seaboard and the upland. The surface of the former, as its local name, "laigh o' Moray," implies, is level, rising, however, be- tween the mouth of the Lossie and Burghead, and westward from Elgin, into ridges of some height. Throughout this district the prevailing rock is sandstone, overtopped to the south and east of Elgin, and in several other localities—as at Lossiemouth—by a species of limestone or " cherty rock." From the mouth of the Spey west and south till the gneissose rocks of the uplands are reached, the sandstone is of a dark red colour, and belongs undoubtedly to the Old Red or Devonian formation. Elsewhere in the district it is grey or yellow, apparently overlying beds of this Old Red, but almost destitute of fossils, except in the coast ridge and the parallel portion of the inland ridge already mentioned, where are the famous reptiliferous strata whose age has lately given rise to so much discussion. Oolitic patches, indicative of a formation of mesozoic age having once existed in the neighbourhood, are also found scattered between Elgin and the sea. Favoured by an ex- cellent climate and rich soil, the lowlands of Moray have been long noted for their fertility. Wheat, barley, and oats are all grown in great perfection, and exotic fruits of various kinds ripen freely in the open air. Since the beginning of the present century, agricultural pursuits have been carried on in a spirit that has greatly increased the natural resources of the district. Within the same period the breeding and rearing of cattle has become one of the most profitable occupations of the farmer; and some of the finest short- horned and polled cattle in Scotland are to be seen here, as well as crosses between these two breeds. On a number of the more extensive farms large flocks of sheep, chiefly Leicesters, are kept all the year round. The upland portion of the county is hilly, gradually rising higher and higher above the level of the sea,—the loftiest of its ridges being the Cromdale hills, one point of which has an elevation of 2328 feet. Here the rocks are metamorphic, with asso- ciated limestones and veins of granite, closely resembling the rocks elsewhere met with

around the Grampians, between the Old Red and the central masses of granite and other once molten matter. Their strike is N.E. and S.W., the same as prevails between Aberdeen and Argyll. The climate of this district is much colder and damper ; oats is the principal cereal, barley being confined to the glens and straths ; the cattle partake more of the character of the Highland breed ; and the blackfaced sheep takes the place of the Leicester,

The rivers of Elginshire are three in number—the Spey in the east, the Lossie in the centre, and the Findhorn in the west. The first of these rises in Badenoch, a district of Inverness-shire, and, after flowing north-east for a distance of about 120 miles (including windings), of which 50 are in Elginshire, falls into the Moray Firth at the village of Garmouth. It is said to be the most rapid river in Scotland, and to discharge a larger volume of water than

any other Scottish stream, the Tay alone excepted. The Spey receives a number of tributaries, the chief of which are the Truim, the Dulnain, the Avon, and the Fiddich. The Lossie, by far the smallest of the three, and the only one of them that rises within the boundaries of the couuty, issues from a small loch of the same name in the uplands, and, after a somewhat tortuous course of about 25 miles, empties itself into the sea at Lossiemouth. The Findhorn, like the Spey, has its source in Inverness-shire, in the western slope of the Monadleadh mountains, which for a number of miles form the watershed between it and the Spey. It then flows through parts of Nairn and Moray shires, and, after running in a north-easterly direction for about 70 miles, of which not more than 11 are within the boundaries of the latter, reaches the sea at the village of Find- horn, where it expands into an estuary of some extent. For seven or eight miles after it enters Morayshire, the scenery along its banks is among the grandest and finest of the kind in Britain. Of all the rivers affected by the memorable rainfall that occurred in the north of Scotland in August 1829, none rose higher or committed greater havoc than the Findhorn. Both the Spey and the Findhorn abound in salmon and grilse, the fisheries for which are very valu- able.

West of the estuary of the latter are the Culbin sandhills, some of which, though ever shifting, have an average height of 118 feet. They cover what was 200 years ago an extensive estate, then comprising thousands of acres of the finest land, but now presenting an impressive scene of desolation and solitude. The lochs are small and few in number. The sea coast is very exposed; rocky be- tween Lossiemouth and Burghead, elsewhere low and sandy. Of its few harbours, Burghead is the most sheltered by position ; but a good deal has been done by art for that of Lossiemouth, in which a number of vessels may sometimes be seen lying. For a number of years the herring fishery was successfully prosecuted at Lossiemouth, Burghead, Hopeman, and Findhorn, there being one season as many as 120 boats fishing from Lossiemouth alone; but latterly it has been more or less a failure, owing to the herring, for some cause or other, having become scarcer in their old feeding grounds. Large quantities of haddock, cod, and ling are caught in the firth and sent south during the winter and spring. Elginshire is not particularly rich in minerals. No true coal has yet been discovered within its limits; and though iron ore is said to exist in the higher parts, it cannot, owing to the absence of coal, be profitably worked. Lead occurs to the west of Lossiemouth. Attempts formerly made to extract it from the rock in sufficient quantities to prove remunerative failed; but operations lately undertaken give promise of success. The yellow sandstone of the lower district is a building-stone of supe- rior excellence, practically inexhaustible,—the distinct glacial stria, seen on most of its outcropping strata, prov- ing how capable it is of resisting all atmospheric in- fluence. The rough impracticable gneissose beds of the upper district offer no favourite building-stone, and true slates are unknown. The plantations consist of larch, fir, and to a less extent oak. The country is well wooded, but since the introduction of railways a considerable quantity of timber has been cut down. The forest of Darnaway, on the left bank of the Findhorn, is believed to be a remnant of the natural wood with which a great part of Scotland was once covered. The manufactures are by no means important. Shipbuilding is carried on at the mouth of the Spey, though not on a large scale. The Highland Railway, which traverses Morayshire from east to west, is joined at Alves and Kinloss by branches from Burghead and Findhorn respectively, the latter of these

being at present (1878) disused. At Forres the main line of the same railway strikes off for Perth by the VU. — 147

valleys, first of the River Findhorn and afterwards of the Spey, the Garry, and the Tay. The Great North of Scot- land Railway has also been extended from Keith to Elgin by a somewhat circuitous route, and is connected with the High- land Railway at Boat of Garten in Strathspey. 'The Moray- shire Railway, joining Elgin to Lossiemouth, the first line formed north of Aberdeen, is now worked as a branch of the Great North. In 1872 there were in Elginshire 251 owners of land of 1 acre and upwards in extent, the principal among them being the earl of Seafield (Castle Grant), 96,721; the earl of Fife (Innes House), 40,951 ; Sir William G. Gordon Cumming, Bart. (Altyre House), 36,387 ; the earl of Moray (Darnaway Castle), 21,669 ; and the duke of Richmond and Gordon (Gordon Castle), 12,271. In the same year the annual value of the land in the county was estimated to be upwards of £200,000. The number of inhabited houses was 8452. The aggregate population of the whole county was, in 1831, 34,498 ; in 1841, 35,012; in 1851, 38,959; in 1861, 44,218; in 1871, 43,612. It unites with Nairnshire in returning a member to parliament. In 1877-78 the combined con- stituency was 1837, of which 1555 voters were in Elgin- shire. 'The county contains 22 parishes. Lcclesiastically it is part of the synod of Moray, the limits of which are nearly co-extensive with those of the ancient province, except that Strathbogie has been added.

There are two royal burghs in Elginshire—Elgin, the county town (for which see below), and Forres. Forres (population in 1871, 3959) must have been a place of some importance at an early date, though it was subsequently overshadowed by the neighbouring burgh or city. Its castle was for 300 years the official residence of the hereditary sheriffs of Moray; and of the lands anciently bestowed upon it by royal favour it still possesses upwards of 1000 acres. The town is pleasantly situated at the foot of the Cluny Hills, several wooded eminences traversed in all directions by public walks that are sheltered alike from the heat of summer and from the cold of winter. On the southern slope of one of

them is a large hydropathic establishment. Forres being one of the centres of railway communication in the north, all parts of the country are easily accessible from it. Its most noteworthy memorial of antiquity is Sweno's Stone, one of tliose remarkable sculptured monuments peculiar to the north-east of Scot- land. Besides the villages on the coast mentioned above, Elginshire contains those of Fochabers, Rothes, and Grantown.

In all parts of the county the oldest names of places are Celtic, showing clearly what race had at one time been in possession of the soil. At the dawn of authentic history we find Macbeth, Ri or Mormaer of Moray, in rebellion against "the gracious Duncan." The sequel is well known. A century or so later there was a great influx of strangers into Moray—Normans, Saxons, and Flemings—who got large grants of land from David I. and his immediate successors. It was in those days that the family of De Moravia became the owners of the fairest part of the province. At the same period, and under the fostering influence of the same kings, the church acquired extensive lands in Moray. In addition to the cathedral at Elgin, there were the abbey of Kinloss, and the priories of Urquhart and Pluscarden, all well endowed. Chief among its ruined castles are Spynie Palace, the country residence of the bishops of Moray ; Duffus, once the home of the De Moravias, and "still the admiration of the antiquary;' Rothes, for centuries the seat of the Leslies; and, built on an island in the middle of a loch of the same name, Lochindorb, which was in the 13th century one of the mountain strongholds of the then powerful family of Comyn. Another interesting locality is the promontory of Burg-

head, or " the Broch," as it is still familiarly called, anciently the site of a Christian church, the date of the planting of which there is some evidence to show goes back as far as the days of Columba, and probably the site also of one of those brochs or fortresses so common in the more northern parts of the kingdom, the nationality of whose builders is stilla matter of dispute. The headland was afterwards turned, apparently by the destruction of these or other buildings, into a

kind of fortified camp, a plan of which has been preserved by General Roy, in his Military An- tiquities of North Britain, Except a remarkable well cut in the solid rock, and of older date at least than the mounds sketched by Roy, few vestiges of the former importance of Burghead now remain.

ELGIN, a royal and parliamentary burgh of Scotland, and the county town of the above county, which, from its having been once the see of a bishop, and occasionally the residence of the kings of Scotland, claims for itself the designation of a city. It occupies a sheltered situation on the banks of the small river Lossie, about five miles from where the latter enters the Moray Firth. From Edinburgh it is dis- tant by railway 200 miles, from Aberdeen 71, and from Inverness 363. Elgin has one main street about a mile in length, with several others running parallel or at right angles to it. Northwards across the Lossie is the suburb of Bishopmill, in a different parish, but within the parlia- mentary boundaries of the burgh. In the outskirts of Elgin proper, as well as in the neighbourhood of Bishopmill, are a large number of villas, most of them built within the last thirty years. Onan eminence at the west end of the High Street stands Gray's Hospital, opened for the recep- tion of patients in 1819, It was built and is maintained out of the proceeds of a legacy of £24,000, bequeathed for the purpose by Alexander Gray, surgeon, H.E.LC.S., a native of the town. 'The site of the old church of St Giles is occupied by the parish church, erected in 1828, at an expense of nearly £9000. At the eastern extremity of High Street is Anderson's Institution, " for the education of youth and the support of old age," opened in 1833. This building cost nearly £12,000. Its founder, the son of a poor woman who cradled him among the ruins of the cathedral, rose from the ranks to be a major-general in the service of the East India Company, and bequeathed for the erection and endowment of this institution £70,000. On the top of Ladyhill rises a column 80 feet high, surmounted by a statue of the last duke of Gordon in his robes as chancellor of Marischal College and University, Aberdeen. Along the High Street are many handsome modern struc- tures, erected mainly for business purposes, prominent among which are those belonging to various banking com- panies. Other public buildings and institutions are—the District Asylum, the Assembly Rooms, the Market Build- ings,

the Burgh Court-house and the County Buildings, the Club-house and Reading-room, the Museum, and the Morayshire Union Poorhouse. The places of worship, besides the parish church, are the High and South Free churches, the Moss Street and South Street U.P. churches, the Congregational church, and the Episcopal, the Roman Catholic, and the Baptist chapels, all of them of recent date. Elgin is well supplied with schools, the old grammar school of the burgh being represented by the Elgin Academy. The ruins of the cathedral are situated at the east end of the town. In 1390, after it had stood 166 years, the "' Wolfe of Badenoch," a natural son of King Robert IL, having quarrelled with Bishop Barr, set fire to the splendid pile. The destruction thus wrought was repaired but slowly, owing in part to the lawless condition of the country inthose days. After the Reformation, the lead was stripped from the roof in 1568 by order of the Privy Council, and shipped for Holland to be there sold. The building being

thus exposed gradually yielded to the influence of the weather, and in 1711 the great central tower fell to the ground. It remained in a neglected state till about 1820, when it was taken possession of in the name of the Crown by the Commissioners of Woods and Forests. The cathe- dral is now well inclosed, and every attention paid to

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Ground-plan of Elgin Cathedral.

its preservation from further decay. Adjoining are the ruins of the town house of the bishops of Moray, whose official residence was Spynie Palace, situated about three miles to the north. The Museum, already mentioned, contains, besides objects from various parts of the world, a very complete collection illustrating the natural history and antiquities of the county, chiefly formed through the zeal and activity of a band of local workers.

The trade of Elgin is largely connected with its weekly and other markets. It has, however, two woollen manu- factories, a tanwork, one or two small iron foundries, two breweries, and some other industrial establishments. Its port is Lossiemouth, with which it is connected by railway, but it has likewise railway communication with Burghead. The railway from Aberdeen to Inverness passes the town, and a branch line strikes off southwards here that traverses Strathspey. There are several newspapers, one of which is published twice a week ; and, besides a circulating library and book clubs, Elgin has a literary and scientific society in connection with the Museum. Attracted by early associations, by the salubrity of its climate, or by other advantages it enjoys, not a few gentlemen of independent means make it their home. 'The municipal corporation of the burgh and city of Elgin consists of a provost, 4 bailies, and 12 councillors ; and, along with Banff, Cullen, Inverurie, Kintore, and Peterhead, it returns one member to the imperial parliament. Population in 1871, 7340; parliamentary constituency in 1877-8, 918.

The first notice we have of Elgin carries us back beyond the middle of the 12th century. In a charter granted by David I. to a priory in its neighbourhood, it is referred to as "my burgh of Elgin." Certain privileges bestowed on its citizens by this king were afterwards

confirmed and extended by his grandson, William the Lion, who seems to have oftener than once held his court in its castle. William's son and successor, Alexander IJI., frequently resided there, and it was in his reign that it became an episcopal city. When Edward I. of England entered Scotland in the year 1296 at the head of his army, he marehed northwards as far as Elgin, where he remained some days. The town or city must then have been a place of considerable importance. Its castle, the ruins of whieh are still to be seen on a green mound near its western boundary, called Ladyhill, was one of the seats of Scottish royalty. Beneath this fortress, and commanded by it, ran the single street— now High Street—that formed the ancient town, with the East and West Ports at either end. 'T'wo short lanes branching off near its centre led to the North and Sonth Ports respectively. At one time these four Ports were no doubt connected by some defensive works. About half-way between the East and West Ports, stood a church dedicated to St Giles, the patron saint of Elgin, and sur- rounded by a graveyard. A little to the west of this church was the Tolbooth. There is evidence that the clergy and landed pro- prietors of the town and neighbourhood had even then residences within the limits of the town. But its glory was its noble cathe- dral, founded in 1224 by Bishop Andrew Moray, and declared by Billings to have been "the most stately and the most beauti-

fully decorated of all the ecclesiastical edifices of the country." Clustered round the cathedral were the deanery, and the manses and gardens of the canons, —the whole constituting the " College," and inclosed by a stone wall 20 fect high and 6 feet thick. Among its other ecclesiastieal buildings were two monasteries, one of black and the other of grey friars, and a chapel to the Virgin connected with the castle. The Reformation, by stripping Elgin of its ecclesiastical honours, greatly reduced its influence. It con- tinued, however, till towards the close of the last century to be the winter residence cf the chief landowners of the district, some of whom lived in houses surrounded by large gardens, others in mansions fronting the street and resting on squat pillars and arches. A characteristic specimen of the latter is shown by Billings in his Baronial and Ecclesiastical Antiquities of Scotland. The merchant gentlemen of the town, some of whom carricd on a very extensive import and export tiade in all sorts of commodities,

oecupied dwellings of the same class, while the humbier burgesses lived in sinaller houses, whose erow-stepped gables were turned to the main street. With the change that, owing to various influences came over the social habits of the upper classes in the course of the last century, the importanee of Elgin was a second time threatened, but when the agricultural resourees of the eountry began to be more fully developed, its position as the centre of one of the most fertile districts of Scotland gave a new impetus to its prosperity.

See Shaw's History of the Province of Moray, Kdinburgh, 1775 ; A Survey of the Province of Moray, Aberdeen, 1798 ; Rhind's Sketches of the Past and Present Stute of Moray, Edinburgh, 1839; Dr James Taylor's Hdward I. in the North of Scotland (privately printed), Elgin, 1858 ; Dunbar's Social Life in Former Days, chiefly in the Province of Moray, 2 vols., Edinburgh, 1865-66; Morayshire Described, Elgin, 1868. (J. M'D.)

ELGIN, Tuomas Bruce, SEVENTH EARLOoF (1766-1841), was born July 20, 1766, and succeeded his brother in the Scotch earldoms of Elgm and Kincardine when only seven years of age. He was educated at Harrow and West- minster, and, after studying for some time at the university of St Andrews, he proceeded to the Continent, where he prosecuted the study of international law at Paris, and of military science in Germany. When his education was completed he entered the army, in which he rose to the rank of general. His chief attention was, however, devoted to diplomacy. In 1792 he was appointed envoy at Brussels, and in 1795 envoy extraordinary at Berlin; and from 1799 to 1802 he was envoy extraordinary at the Porte. It was during his stay at Constantinople that he formed the purpose of removing from Athens the celebrated sculptures now known as the Elgin Marbles. His doing so was censured by some as vandalism, and doubts were also expressed as to the artistic value of many of the marbles ; but he completely vindicated himself in a pamphlet pub- lished in 1810, and entitled Memorandum on the Subject of the Earl of Elgin's Pursuits in Greece. In 1816 the collection was purchased by the nation for £36,000, and placed in the British Museum, the outlay incurred by Lord Elgin

having been more than £50,000. Lord Elgin was a Scotch representative peer for fifty years. He died at Paris, November 14, 1841,

ELGIN AND KINCARDINE, James Bruce, Earn or (1811-1863), was the eighth earl of Elgin and twelfth earl of Kincardine in the peerage of Scotland, and the first Baron Elgin in that of the United Kingdom. The eldest son of Thomas, the seventh earl, by his second marriage he was born in 1811, and succeeded to the peerage in 1841. He was educated at Eton and at Christ Church, Oxford, where he had as companions and rivals his younger predecessors in the office of governor-general of India, Dalhousie and Canning. Mr Gladstone also was one of his juniors at both school and college, and recalls the circumstance that it was from young Bruce he " first learned that Milton had written any prose." As a young man he came into contact with Dr Chalmers, who induced him to speak in public on church extension, and it was to Chalmers's sermon on the " Expul- sive Power of a New Affection" that he turned ou his death- bed, repeating many passages from it in the last hour. He sat in the House of Commons for Southampton long enough to attach him to the constitutional principles now described

as Liberal-Conservative, though he never identified himself with a party.

Lord Elgin began his official career in 1842, at the age of thirty, as governor of Jamaica. He succeeded the great Indian civilian, Lord Metcalfe, who had left the colony in such a state of quietude and prosperity as was possible soon after emancipation. During an administration of four years he succeeded in winning the respect of all classes. He improved the condition of the negroes and conciliated the planters by working through them. In 1846 Lord Grey appointed him governor-general of Canada. Son-in- law of the popular earl of Durham, he was well received by the colonists, and he set himself deliberately to carry out the policy which makes Lord Durham's name remembered there with gratitude to this day. Alike from his political experience in England and his life in Jamaica Lord Elgin had learned that safety lay in actiug as the moderator of all parties, while applying

fearlessly the constitutional principles of the mother country to each difficulty as it arose. In this his frank and genial manners also aided him powerfully. His assent to the local measure for indemnifying those who had suffered in the troubles of 1837 led the mob of Montreal to pelt his carriage for the rewarding of rebels for rebellion, as Mr Gladstone described it. But long before his eight years' term of service expired he was the most popular man in Canada. His relations with the United States, his hearty support of the self-government and defence of the colony, and his settlement of the free-trade and fishery questions, moreover, led to his being raised to the British peerage.

Soon after his return to England in 1854, Lord Palmer- ston offered him a seat in the Cabinet as chancellor of the duchy of Lancaster, which he declined. But when, in 1856 the seizure of the "' Arrow " by Commissioner Yeh plunged England into war with China, he at once accepted the appointment of special envoy with the expedition. On reaching Point de Galle he was met by a force summoned from Bombay to Calcutta by the news of the sepoy mutiny at Meerut on the 11th May. His first idea, that the some- what meagre intelligence would justify most energetic action in China, was at once changed when urgent letters from Lord Canning reached him at Singapore, the next port, on the 3dJune. H.MLS. "Shannon" was at once sent on to Calcutta with the troops destined for China, and Lord Elgin himself followed it, when gloomier letters from India reached him. The arrival of the '"' Shannon" gave new life to the handful of white men fighting for civilization against fearful odds, and before the reinforcements from England arrived the back of the mutiny had been broken. Nor was the position in China seriously affected by the want of the troops. Lord Elgin sent in his ultimatum to Commissioner Yeh at Canton on the same day, the 12th December, that he learned the relief of Lucknow, and he soon after sent Yeh a prisoner to Calcutta. By July 1858, after months of Chinese deception, he was able to leave the Gulf of Pecheli with the emperor's assent to the Treaty of Tiensin, whereby concessions were made sueh as all civilized peoples grant to each other, if only from self-interest. The treaty sanctions the residence of foreign ambassadors in Peking—long secured by the Russians, guarantees pro- tection to Christians, opens the country to travellers with passports, and the

Yang-tzse and five additional ports to trade, under a revised tariff. The sum of £650,000 was exacted for losses at Canton, and an equal sum for the expenses of the war. Following the Americans, the apparently successful plenipotentiary visited Japan, and obtained less considerable concessions from its Government in the Treaty of Yeddo. It is true that the negotiations were confined to the really subordinate Tycoon or Shogoon, holding an office since abolished, but that visit proved the

beginning of British influence in the most progressive country of Asia. Unfortunately, the Chinese difficulty was not yet atanend. After tedious disputes with the tariff commissioners as to the opium duty, and a visit to the upper waters of the Yang-tzse, Lord Elgin had reached England in May 1859. But when his brother and the allied forces attempted to proceed to Peking with the ratified treaty, they were fired on from the Taku forts at the mouth of the Peiho. The Chinese had resolved to try the fortune of war once more, and Lord Russell again sent out Lord Elgin as ambassador extraordinary to demand an apology for the attack, the execution of the treaty, and an indemnity for the military and naval expenditure. Sir Robert Napier (afterwards Lord Napier of Magdala), and Sir Hope Grant, with the French, so effectually routed the Tatar troops and sacked the Summer Palace that by the 24th October 1860 @ couvention was concluded, which was " entirely satis-factory to Her Majesty's Government." The treaty and convention have regulated the relations of China with the West to the present time (1878). In the interval between the two visits to China, Lord Elgin held the office of post- master-general in Lord Palmerston's administration, and was elected lord rector of the university of Glasgow. He had not been a month at home after the second visit when the same premier selected him to be Her Majesty's viceroy and governor-general of India.

Lord Elgin had now attained the object of his honourable ambition, after the office had been filled in most critical times by his juniors and old college companions, the marquis of Dalhousie and the Earl Canning. He succeeded a statesman who had done much to reorganize

the whole administration of India, shattered as it had been by the mutiny. Long, too long in grappling with it, as he himself afterwards confessed, Lord Canning had atoned for the sluggishness of his early action by the vigour of his two last years of office, and established his popularity on the firm basis of his land-tenure reforms and his foreign or feudatory policy. Lord Elgin could only develop both, and he recognized this as what he called his ‘ humble task.” But, as the first viceroy directly appointed by the Crown, and as subject to the secretary of state for India, Lord Elgin at once gave up all Lord Canning had fought for, in the co-ordinate independence, or rather the stimulating responsibility, of the governor-general, which had prevailed from the days of Clive and Warren Hastings. From his time to the present the old powers of the historic governor- general have been overshadowed by the party influences of the Indian secretary. This subservience was seen in a further blow at the legislature, by which a bill could be published without leave from the Calcutta council, and in the reversal of Lord Canning’s measure for the sale of a fee-simple tenure with all its political as well as economic advantages. But, on the other hand, Lord Elgin loyally carried out the wise and equitable policy of his predecessor towards our feudatories with a firmness and a dignity that in the case of Holkar and Oudeypore had a good effect. He did his best to check the aggression of the Dutch in Sumatra, which was contrary to treaty, and he supported Dost Mahomed in Cabul until that aged warrior entered the then neutral and disputed territory of Herat. Determined to maintain inviolate the integrity of our own north-west frontier, Lord Elgin assembled a camp of exercise at Lahore, and marched a force to the Peshawur border to punish those branches of the Yusufzai tribe who had violated the engagements of 1858.

It was in the midst of this “little war” that he died. Soon after his arrival at Calcutta, he had projected the usual tour to Simla, to be followed by an inspection of the Punjab and its warlike ring-fence of Pathans. He even contemplated the summoning of the central legislative

council at Lahore. After passing the summer of 1863 in the cool retreat of Peterhoff, Lord Elgin began a march across the hills from Simla to Sealkote by the upper valleys of the Beas, the Ravee, and the Chenab, chiefly to decide the two allied questions of tea cultiva- tion aud trade routes to Kashgaria and Tibet. The climbing up to the Rotung Pass (13,000 feet) which separates the Beas valley from that of the Chenab, and the crossing of the frail twig bridge across the Chundra torrent, prostrated him by the time he had descended into the smiling English-like Kangra valley. Thence he wrote his last letter to Sir Charles Wood, still full of hope and not free from anxiety as to the Sittana expedition. At the lovely hill station of Dhurmsala, " the place of piety," he lay on his deathbed, watching the glories of the Himalayan autumn, and even directing Lady Elgin where to select his grave in the little cemetery around the station church, which hangs high on the bluff above the house where he breathed his last. After telegraphing his resignation to the Queen, he lay for a fortnight amid sacred words and holy thoughts, tended by loving and skilful hands, and suddenly gave up the fight with agony on the 20th November 1863. He died of fatty degeneration of the muscular fibre of the heart. He is the second governor-general whose body has a resting- place in India, Lord Cornwallis having found a grave at Ghazeepore, during his second administration. It is vain to speculate what Lord Elgin might have been had he lived to apply the experience gathered during his eventful apprenticeship to Indian administration. Sir John (now Lord) Lawrence, the great Bengal civilian, took up his task. Lord Elgin will be best remembered as the quietly successful governor-general of Canada for eight years.

For his whole career see Letters and Journals of James, Eighth Earl of Eigin (John Murray), edited by Walrond, but corrected by his brother-in-law, Dean Stanley ; for the China missions see Narrative of the Earl of Elgin's Mission to China and Japan, by

Laurence Oliphant, his private secretary; for the brief Indian administration see the Friend of India for 1862-63. (G. SM.)

EL-GOLEA, a town on the southern frontiers of Algeria, in that part of the Sahara which bears the name of El-erg, about 160 miles 8.W. of

Wargla, in 30° 35’ N. lat. and 3° 10’ E. lon. It consists of three portions —the citadel on a limestone hill, the upper town, and the lower town, each separated from the others by irregular plantations of date trees. In itself it is of no particular interest, but its position makes it a very important station for the caravan trade between Algeria and the countries to the south. It was originally a settlement of the Zendta Berbers, by whom it was known as Taorert ; and there is still a considerable Berber element in its population, though the Arabic language is in general use. The full Arab name is Lil Golea’a el Menia’a, or the “little fortress well defended.” According to the statement of the natives, the well in the upper town is about 60 feet deep.

ELI (1 Sam. chaps. i—iv.) was priest of Jehovah at the temple of Shiloh, the sanctuary of the ark, and at the same time judge over Israel—an unusual combination of offices, which must have been won by signal services to the nation in his earlier years, though in the history preserved to us he appears in the weakness of extreme old age, unable to contro] the petulance and rapacity of his sons, Hophni and Phinehas, which disgraced the sanctuary and disgusted the people. While the ceutral authority was thus weakened, the Philistines advanced against Israel, and gained a complete victory in the great battle of Ebenezer, where the ark was taken, and Hophni and Phinehas slain. On hearing the news, Eli fell from his seat and died. According to the Massoretic text, he was ninety-eight years old, and had judged Israel for forty years (1 Sam. iv. 15, 18). The Septuagint translator gives but twenty

years in ver. 18, and seems not to have read ver. 15 [Wellhausen 2m doco]. After these events the sanctuary of Shiloh appears to have been destroyed by the Philistines [comp. Jer. vii.; Ewald, Geschichte, 11. 584; Wellhausen on 2 Sam. viii. 17], and the descendants of Eli with the whole of their clan or “father’s house” subsequently appear as settled at Nob (1 Sam. xxi. 1, xxii. 11 sqq., comp. xiv. 3). In the massacre of the clan by Saul, with the subsequent deposition of the survivor Abiathar from the priestly office (1 Kings ii. 27), the prophecies of judgment

uttered in the days of Eli against his corrupt house were strikingly fulfilled (1 Sam. ii. 27 sqq., iii. 11 sqq.).

An important point ef Hebrew archeology is involved in the genealogy of Eli and his house. It appears from 1 Kings ii. 27-35 that Zadok, from whom the later high priests claimed descent, and who appears in 1 Chron. v. 38 (E. V. vi. 12) as the lineal descendant of Aaron through Eleazar and Phinehas, was not of the house of Eli, and in 1 Chron. xxiv. Ahimelech, son of Abiathar, is reckoned to the sons of Ithamar, the younger branch of the house of Aaron. Hence the traditional view that in the person of Eli the high-priesthood was temporarily diverted from the line of Eleazer and Phinehas into that of Ithamar [comp. Joseph. And. c. 11, $5, v. viii. c. 1,§ 3, and for the fancies of the Rabbins on the cause of this diversion, Selden, De Succ. in Pontif., lib. i. cap. 2]. This view, however, seems to be absolutely inconsistent with 1 Sam. ii., which represents Eli's "father's house" or clan as the original priestly family, and predicts the destruction or degradation to an inferior position of the whole of this 'father's house," and not merely of the direct descendants of Eli. Moreover, Ahimelech, who is the only link to connect Eli with Ithamar, is an ambiguous personage, who, perhaps, owes his existence to a corruption in the text of 2 Sam. viii. 17 [comp. Wellhausen tn loco; Graf, Ge- schichtliche Bucher, p. 237], where most recent critics read, and the history seems to require, ' Abiathar son of Ahimelech" [comp. however, Bertheau on 1 Chron. xviii. 16, and Keil on 1 Chron. v.]. To build an elaborate theory on the genealogical statements in Chronicles is the less justifiable because that book wholly ignores the priesthood of Eli, while Hebrew genealogies must sometimes be understood in a figurative sense. Compare further on the whole sub- ject, Thenius and Wellhausen, on 1 Sam. ii.; Ewald's Geschichte, ii. p. 576 sqq.; Graf, " Zur Geschichte des Stammes Levi" in Merx's Archiv,i. pp. 79, 88, and among older writers especially Selden, in his book already cited, De Successione in Pontificatum. (Ww. RB. 8.)

ELIAS LEVITA (1472-1549), a Jewish rabbi, the most distinguished Hebrew scholar of his time, was born at Neustadt, on the Aisch, in Bavaria, in 1472. From the fact that he spent most of his life in Italy,

some have sup- posed him to have been an Italian by birth. There can be no doubt, however, that he was a German, as he asserts the fact in the preface to one of his works, and his pupil Miinster states expressly that he was born at Neustadt of Jewish parents. His father, Rabbi Ascher Levita, assumed the surname of Aschkenasi (the German), which was also used by the son. Banished as a Jew from his native country, Elias went to Italy in the beginning of the 16th century. He resided at first in Venice, where he earned a high reputation as a teacher of Hebrew. In 1504 he re- moved to Padua, where he continued his career as a teacher, and wrote a commentary on the Hebrew grammar of Rabbi Kimchi. When Padua was sacked in 1509 he lost all his property, aud removed to Venice. About 1512 he took up his residence in Rome, where he enjoyed for a number of

1 A curious Jewish tradition makes Phinehas the man of God who denounced judgment on Eli. Jerome, Quast. Lleb. in Lib. I. Regum.

years the friendship of Cardinal Egidio, and of several other dignitaries of the church. So intimate were his rela- tions with the Christians that he was accused of having apostatized from Judaism. His opinions were undoubtedly more liberal than those of the majority of the Jews of his time, but there is no reason to question his own assertion that he remained true to the faith in which he was born. When Rome was attacked by Charles V. in 1527, Elias Levita lost all his means for the second time, and again found an asylum in Venice. In 1540 he went to Isny in Swabia, having been invited by Paul Fagius to join him in the superintendence of a printing-press for Hebrew books. The last two years of his life were spent in Venice, where he died in 1549. The most valuable of the numerous works of Elias Levita were those bearing on Hebrew grammar and lexicography. His Afassoreth Hammassoreth (Venice, 1538) is a critical commentary on the text of the Hebrew Scriptures, and contains a very able discussion of the question of the origin of the vowel points, which he assigns to the Massoretic doctors of the school of Tiberias in the 5th century after Christ. He also wrote a treatise on Hebrew grammar, a dictionary, chiefly to the Targums and

the Talmud, and several smaller works in Hebrew philology. In the preface to his Massoreth, and other por- tions of his works, there are various autobiographical details, A German translation of the Massoreth Hammassoreth by Semler appeared in 1772, and an edition of the work with notes and an English translation was published in Loudon in 1867.

ELIE DE BEAUMONT, Jean Baptiste ARMAND Louts Ltonce (1798-1874), a celebrated French geologist, was born at Canon, in Calvados, on the 25th September 1798. He was educated at the Lycée Henri IV., where he took the first prize in mathematics and physics; at the Ecole Polytechnique, where he stood first at the exit examination in 1819; and at the Ecole des Mines, where he began to show a decided preference for the science with which his name is associated. In 1823 he was selected along with Dufrénoy by Brochant de Villiers, the professor of geology in the Ecole des Mines, to accompany him on a scientific tour to England and Scotland, with the double object of inspecting the mining and metallurgical establish- ments of the country, and of studying the principles on which the geological map of England had been prepared, with a view to tle construction of a similar map of France. An account of the tour was published by Elie de Beau- mont and Dufrénoy conjointly, under the title Voyage métallurgique en Angleterre (1827). In 1835 he was appointed professor of geology at the Ecole des Mines, in succession to Brochant de Villiers, whose assistant he had been in the duties of the chair since 1827. He held the office of engineer-in-chief of mines in France from 1833. Ifis growing scientific reputation secured his election to the membership of the Academy of Berlin, of the Academy of Sciences of France, and of the Royal Society of London. By a decree of the president he was made a senator of France in 1852, and on the death of Arago (1853) he was chosen perpetual secretary of the Academy of Sciences. Hlie de Beaumont's name is best known to geologists in connection with his theory of the origin of mountain ranges, first propounded in a paper read to the Academy of Sciences in 1829, and afterwards elaborated in several treatises and shorter papers, of which the Notice sur le systeme des montagnes (3 vols. 1852) may be named as the most important. According to his view, all mountain ranges parallel to the same great

circle of the earth are of strictly contemporaneous origin, and between the great circles a relation of symmetry exists in the form of a pentagonal réseau. For an elaborate statement and criticism of the theory, see the introductory address by

Hopkins in the Journal of the Geological Society of London for 1853. The theory has not found general acceptance, but it has proved of great value to geological science, owing to the extensive additions to the knowledge of the structure of mountain ranges which its author made in endeavouring to find facts to support it. Probably, however, the best service Elie de Beaumont rendered to science was in con- nection with the geological map of France, in' the prepara- tion of which, from 1825 till its completion eighteen years later, he had the leading share. After his compulsory superanuuation at the Ecole des Mines, he continued to superintend the issue of the detailed maps almost until his death, which occurred on the 21st September 1874. His academic lectures for 1843-44 were published in 1847 under the title Lecons de Géologie Pratique.

ELIJAH (Exisanu,literally God-Jehovah, in N.'T.,Et1as), the greatest and sternest of the Hebrew prophets, makes his appearance in the narrative of the Old Testament with an abruptness that is strikingly in keeping with his character and work. The words in which he is first intro- duced—" Elijah the Tishbite, of the inhabitants of Gilead " (1 Kings xvii. 1)—contain all that is told of his origin, and, few as the words are, their meaning is not without ambiguity. By varying the pointing of the Hebrew word translated "of the inhabitants" in the authorized version, the passage is understood by a number of critics to indicate a Tishbeh in Gilead, not named elsewhere, as the birth- place of the prophet; but it is not certain that anything more definite is meant than that the prophet came from Gilead, the mountainous region beyond Jordan. Whether the place of his birth is definitely indicated or not, there is nothing said of his genealogy ; and thus his unique position among the prophets of Israel, whose descent is almost invariably given, is signalized from the first. Some have supposed that he was by birth a heathen and not a Jew, but this is an nnfounded conjecture, so

inherently improbable that it does not deserve consideration. His appearance in the sacred narrative, like Melchisedek, “ without father, without mother,” gave rise to various rabbinical traditions, such as that he was Phinehas,! the grandson of Aaron, returned to earth, or that he was an angel in human form.

The first and most important part of Elijah’s career as a prophet lay in the reign of Ahab, which, according to the usual chronology, commenced about 918 Bc. He is introduced in the passage already quoted (1 Kings xvii. 1) as predicting the drought God was to send upon Israel as a punishment for the apostasy into which Ahab had been led by his heathen wife Jezebel. The duration of the drought is vaguely stated in Kings; from Luke iv. 25 aud James v. 17, we learn that it lasted three years and a half. During the first portion of this period Elijah, under the divine direction, found a refuge by the brook Cherith, “before the Jordan.” This description leaves it uncertain whether the brook was to the east of Jordan in Elijah’s native Gilead, or to the west in Samaria, as Robinson supposes. Here he drank of the brook and was fed by ravens, who night and morning brought him bread and flesh. The word translated “ ravens” has also been rendered ‘“ merchants,” “ Arabians,” or “ inhabitants of the rock Oreb.” There is a general concurrence of opinion, however, that the authorized version represents the true sense of the original, When the growing severity of the drought had dried up the brook, the prophet, under the same divine direction as before, betook himself to another refuge in Zarephath, a Phcenician town near Zidon. At the gate of the town he met the widow to whom he had been sent gathering sticks for the preparation of what she believed was to be her last meal. Though

1 Cf. Selden, De Success. in Pont. Heb., lib, ii. cap. 2.

probably a worshipper of Baal, she received the prophet with hospitality, shariug with him her all but exhausted store, in faith of his promise in the name of the God of Israel that the supply would not fail so long as the drought lasted. Her faith was rewarded by the fulfilment of the promise, the cruise of oil and the barrel of meal affording

sustenance for both herself and her guest until the close of the three and a half years'famine. During this period her son died, and was miraculously restored to life in answer to the prayers of the prophet.

Elijah emerged from his retirement in the third year, when, the famine having reached its worst, Ahab and his minister Obadiah had themselves to search the land for provender for the royal] stables. To the latter Elijah appeared with his characteristic suddenness, and anuounced his intention of showing himself to Ahab. The king, who in spite of the calamity that had befallen him was still hardened in his apostasy, met Elijah with the reproach that he was the troubler of Israel, which the prophet with the boldness that befitted his mission at once flung back upon him who had forsaken the commandments of the Lord and followed the Baalim. The retort was accompanied by a challenge—or rather a command—to the king to assemble on Mount Carmel "all Israel" and the four hundred and fifty prophets of Baal and the four hundred prophets of Asherah. The latter are described as "eating at Jezebel's table," by which it is indicated that they were under the special favour and protection of the queen, From the allusion to an "altar of Jehovah that was broken down " (1 Kings xviii. 30) it has been inferred that Carmel was an ancient sacred place, though this is the first mention of it in the Scripture narrative. (On Mount Carmel and Elijah's connection with it in history aud tradition see CARMEL, vol. v. p. 116.)

The scene on Carmel is perhaps the grandest in the life of Elijah, or indeed in the whole of the Old Testament. Asa typical embodiment for all time of the conflict between superstition and true religion, it is lifted out of the range of mere individual biography into that of spiritual symbolism, and it has accordingly furnished at once a fruitful theme for the religious teacher and a lofty inspira- tion for the artist. The incident is indeed a true type, showing the characteristic features of combatants that are always meeting, and of a conflict that is always being waged, The false prophets were allowed to invoke their god in whatever manner they pleased from the early morning until the time of evening sacrifice, The only interruption came at noon, in the mocking encouragement of Elijah (1 Kings xviii. 27), which is remarkable as an

almost solitary instance of grim sarcastic humour occurring in the Bible. Its effect upon the false prophets was to increase their frenzy ; they “cried aloud and cut themselves with knives and lancets,” as the authorized version has it. The translation should rather be “swords and lances.” The evening came, and the god had made no sign; “there was neither voice, nor any to answer, nor any that regarded.” Elijah now stepped forward with the quiet confidence and dignity that became the prophet and repre- sentative of the true God. Two things are noteworthy in his preparations: all Israel is represented symbolically in the twelve stones with which he built the altar; and the water poured upon the sacrifice and into the surrounding trench was evidently designed to prevent the suspicion of fraud, In striking contrast to the unreasoning frenzy and the “vain repetitions ” of the false prophets are the few and simple words with which Elijah makes his prayer to Jehovah. Once only, with the calm assurance of one who knew that his prayer would be answered, he invokes the God of his fathers to vindicate himself in the presence of an apostate people. The answer comes at ouce: “The

fire of the Lord fell and consumed the burnt sacrifice, and the wood, and the stones, and the dust, and licked up the water that was in the trench.” So convincing a sign was irresistible ; the people who had stood by in wondering silence now fell on their faces and acknowledged Jehovah as the true God. In harmony with the method in which Jehovah often vindicated himself in the Old Testament economy, the acknowledgment of the true prophet and his God was immediately followed by the destructiou of the false prophets. The first heat of conviction made the people quick to obey the command to seize the prophets of Baal, who were immediately afterwards slain by Elijah beside the brook Kishon. The deed, though not without parallel in the Old Testament history, stamps the pecu- liarly vindictive character of Elijah’s prophetic mission.

The people having returned to their rightful allegiance to the true God, the drought sent as a punishment for their defection at once ceased.

The narrative proceeds without a break. On the evening of the day that had witnessed the decisive contest, Elijah, aftcr having invited Ahab to eat and drink, and foretold abundance of rain, proceeded once more to the top of Carmel, and there, with "his face between his knees" (possibly en- gaged in the prayer referred to in James v. 17-18), waited for the long-looked-for blessing. His servant, sent repeatedly to search the sky for signs, returned the seventh time reporting a little cloud arising out of the sea "like a man's hand." The portent was scarcely seen ere it was fulfilled. The sky was full of clouds anda great rain was falling when Ahab, obeying the command of Elijah, set out in his chariot for Jezreel. Elijah, with what object does not appear, ran before the chariot to the entrance of Jezreel, a distance of at least sixteen miles, thus showing the power of endurance natural to a prophet of the wilderness. If he went with any hope that the events that had just occurred would change the heart of Jezebel, as they seem to have changed the heart of the king, he was at once undeceived. On being told what had taken place, Jezebel sent a messenger to Elijah with a vow in the most solemn terms that ere another day had passed his life would be even as the lives of the prophets of Baal, and the threat was enough to cause him to take to instant flight.

The first stage of his journey was to Beersheba, on the confines of the kingdom of Judah. Here he left his servant, who, according to an old Jewish tradition, was the widow's son of Zarephath, afterwards the prophet Jonah,} and proceeded a day's journey into the wilderness. Laying himself down under a solitary juniper (broom), he gave vent to his bitter disappointment at the apparent failure of his efforts for the reformation of Israel in a prayer for death. By another of those miraculous interpositions which occur at nearly every turn of his history he was twice supplied with food and drink, in the strength of which he journeyed forty days and forty nights until he came to Horeb, where he lodged ina cave. A hole . just large enough for a man's body" (Stanley), immediately below the summit of Jebel Misa, is still pointed out by tradition as the cave of Elijah.

If the scene on Carmel was the grandest, that on Horeb was spiritually the most profound in the life of Elijah. There for the first time he

learned that the normal channel of divine revelation is spiritual and not material, and that its object is mercy and not judgment. Not in the strong wind that brake the rocks in pieces, not in the earthquake, not in the fire, but in the still small voice that followed, the Lord made himself known. There, too, he learned, also for the first time, the true nature and limits of his own prophetic mission. He was the herald, not of a sudden

1 Jerome, Prowm. in Jonam.

vengeance ahd a sudden reformation of which his own eyes |

might hope to see the fulfilment, but of the slow steady progress of that kingdom of God that cometh not with observation. He was taught this practically in the threefold commission laid upon him, which implied in each part of it that the work of vengeance and of reformation alike were to be fulfilled by other hands and in a succeeding age. He was to return to Damascus and anoint Hazael king of Syria ; he was to anoint Jehu the son of Nimshi as king of Israel in place of Ahab; and as his own successor in the prophetic office he was to anoint Elisha the son of Shaphat. The revelation at Horeb closed with an announcement that must have been at once a comfort and a rebuke to the prophet. In his allegiance to Jehovah he was not alone, as in sadness of spirit he had supposed; there were no less than seven thousand in Israel who had not bowed to Baal.

Leaving Horeb and proceeding northwards, Elijah found the opportunity of fulfilling the last of the three commands that had been laid upon him. He met Elisha engaged at the plough probably near his native place, Abel-meholah, in the valley of the Jordan, and, by the symbolical act of cast- ing his mantle upon him, consecrated him to the prophetic office. As it happened, this was the only command of the three which he fulfilled in person; the course of events left the other two to be carried out by his successor. After the call of Elisha the narrative contains no notice of Elijah for several years. It was not until Ahab, at the prompting of Jezebel, had committed his crowning

iniquity in the matter of Naboth's vineyard that he again appeared, as usual with startling abruptness. Without any indication of whence or how he came, he is represented in the narrative as standing in the vineyard when Ahab entered to take possession of it, and as pronouncing upon the king and his house that awful doom (1 Kings xxi. 17-24) which, though deferred for a time, was ultimately fulfilled to the letter.

With one more denunciation of the house of Ahab, Elijah's function as a messenger of wrath was fully dis- charged. When Ahaziah, the son and successor of Ahab, having injured himself by falling through a lattice, sent to inquire at Baal-zebub, the god of Ekron, whether he should recover, the prophet was commanded by God to appear to the messengers and tell them that, for this resort to a false god, the king should die. The effect of his appearance was such that they turned back without attempting to fulfil their errand. Their description of the prophet left the king in no doubt as to his identity: " It is Elijah the Tishbite." With the true Jezebel spirit he resolved to destroy the enemy of his house, and despatched a captain with a band of fifty to arrest him. They came upon Elijah seated on "the mount,"—probably Carmel. The imperious terms in which he was summoned to come down—perhaps also a tone of mockery in the appellation "Thou man of God "—were pun- ished by fire from heaven, which descended at the bidding of Elijah and consumed the whole band. A second captain and fifty were despatched, behaved in a similar way, and met the same fate. The leader of a third troop took a humbler tone, sued for mercy, and obtained it. Elijah then went with them to the king, but only to repeat before his face the doom he had already made known to his Imessengers, which was almost immediately afterwards fulfilled.

The only mention of Elijah's name in the book of Chronicles (2 Chron. xxi. 12-15), where he is represented as sending a letter of rebuke and denunciation to Jehoram, king of Judah, furnishes a chronological difficulty, owing to the fact that Elijah's translation seems to have taken place before the death of Jehoshaphat, the father of Jehoram. There is reason, however, to suppose that Jehoram reigned for some years before the death of his father; and on the

other hand, though the account of Elijah's translation (2 Kings ii.) immediately follows that of his last public act in denouncing the doom of Ahaziah (2 Kings i.), a considerable interval may have elapsed between the two events. What- ever its duration, the time was spent in close and continu- ous fellowship with Elisha, his disciple and successor, who, though thrice entreated to leave him, showed the true disciple spirit in the solemn vow, "' As the Lord liveth, and as thy soul liveth, I will not leave thee." The approaching translation seems to have been known, not only to Elijah and Elisha, but also to the schools of the prophets at Bethel and Jericho, both of which they visited in their last east- ward journey. At the Jordan their progress was stopped only until Elijah, wrapping his prophet's mantle together, smote the water with it, and so by a last miracle passed over on dry ground. When they had crossed, the master desired the disciple to ask some parting blessing. The request for a double portion (.e., probably a first-born's portion) of the prophet's spirit Elijah characterized as a hard thing ; but he promised to grant it if Elisha should remain with him to the last, so as to see him when he was taken away. The end is told in words of simple sublimity: " And it came to pass, as they still went on and talked, that, behold, there appeared a chariot of fire, and horses of fire, and parted them both asunder ; and Elijah went up by a whirlwind into heaven" (2 Kings ii 11). There is in this, as Stanley has truly remarked, an "inextricable interweaving of fact and figure." It is scarcely necessary to point ont, however, that through the figure the narrative evidently means to convey as fact that Elijah passed from earth, not by the gates of death, but by miraculous translation. Such a supernatural close is in perfect harmony with a career into every stage of which the supernatural enters as an essential feature. For whatever explanation may be offered of the miraculous element in Elijah's life, it must obviously be one that accounts not for a few miraculous incidents only, which might be mere excrescences, but for a series of miraculous events so closely connected and so continuous as to form the main thread of the history,

Elijah occupied an altogether peculiar place in later Jewish history and tradition. Of the general belief among the Jewish people that he should return for the restoration of Israel the Scriptures contain several indications, such as the prophecy of Malachi (iv. 5-6). Evenif this be applied to John the Baptist, between whom and Elijah there are many striking points of resemblance, there are several allusions in the gospels which show the currency of a belief in the return of Elias, which was not satisfied by the mission of John (Matt. xi. 14, xvi. 14; Luke ix. 8; John i, 21).4

Elijah is canonized both in the Greek and in the Latin Churches, his festival being kept in both on the 20th July, —the date of his ascension in the nineteenth year of Jehoshaphat, according to Cornelius a Lapide. (w. B. s.)

ELIOT, Joun (1604-1690), "the Apostle of the Indians of North America," was born at Nasing, in Essex, in 1604, and was educated at Jesus College, Cambridge, where he took his bachelor's degree in 1623. He there displayed a partiality for philology which may have had some in- fluence in stimulating the zeal he afterwards displayed in acquiring the language of the native Indians. After leaving the university he was employed as an usher in a school near Chelmsford under the Rev. Thomas Hooker. While in the family of Mr Hooker, Eliot received serious impressions, and resolved to devote himself to the work of the Christian ministry. As there was then no field for non- conformist preachers in England, he resolved to emigrate

1 For curious facts indicating the survival of the same belief among the Jews at the present day, see Stanley's Jewish Church, lect. xxx.

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to America, where he arrived on the 3d of November 1631. After officiating for a year in the first church in Boston, he was in November 1632 appointed pastor of the church in Roxbury, where he continued till his death,

When Eliot began his mission work there were about twenty tribes of Indians within the bounds of the plantation of Massachusetts Bay, and for a long time he assiduously employed himself in iearning their language. He obtained the assistance of a young Indian taken prisoner in the Pequot war of 1637, and who had been put to service with a Dorchester planter. With his help Eliot translated the Commandments, the Lord's Prayer, and many Scripture texts, and at length was able to preach to the Indians in their own language. This he did without the aid of an interpreter in 1646, at a place a few miles from Cambridge, afterwards called Nenantum or Noonatomen, i.e, " Re- joicing," where a settlement of Christian Indians was sub- sequently established.

The labours of Eliot, being reported in England, ex- cited great attention, and a society, afterwards incorporated, was instituted for the propagation of the gospel in New England. Among its leading members was the Hon. Robert Boyle, well known by his scientific labours, who was one of Eliot's constant correspondents, From the funds of this corporation an allowance of £50 per annum was paid to Eliot in supplement of his moderate salary of £60 as minister of Roxbury.

In 1651 a town called Natick, or " Place of Hills," was founded by the Christian Indians, mainly through the instrumentality of Eliot, for which he drew up a set of civil and economical regulations. He also in 1653, at the charge of the corporation, published a catechism for their use. This was the first work published in the Indian language; no copy of it is known to exist. In the same year there was published by the corporation in London a work called Teares of Repentance, or a Surther Progress of the Gospel among the Indians of New England, in which there was given " A Brief Relation of the Proceedings of the Lord's Work among the Indians, in reference unto their Church-estate, by John Eliot."

% In 1655 there was published in London by the corpora

tion a tract entitled A Later and Further M antfestation of the Progress of the Gospel amongst the Indians in New England, declaring their Constant Love and Zeal to the Truth, &e., being a Narrative of the Examinatons of the Indians about their Knowledge in Religion by the

Elders of the Church, related by Mr John Eliot. This work contained the confessions of those Indians that were baptized by Eliot and admitted to church fellowship. In 1660 Eliot drew upon himself some animadversion by the publication at London of a work called The Christian Com- monwealth , or the Civil Policy of the rising Kingdom of Jesus Christ, which was found to contain seditious principles, especially directed against the Government of England. The statements, however, made in this book were afterwards retracted by its author.

About this time Eliot completed his task of translating the Bible into the Indian language. The corporation in Lon- don supplied the funds, and the New Testament in Indian was Issued in 1661, shortly after the restoration of Charles II. It happened that the printing of the work was completed when the corporation was expecting a royal charter. A dedi- cation to the king was accordingly inserted, written in a tone calculated to win hisfavour It stated that the Old Testament was in the press, and it craved the " royal assistance for the perfecting thereof." The Old Testament was at length published in 1663. Copies of the New Testament were bound with it, ana thus the whole Bible was completed in the Indian language. 'To it were added a catechism, and thePsalms of David in Indian verse. The title

of this Bible, which is now of great rarity, and fetches a very high price, is Mamussee Wunneetupanatamwe Up-Biblum God naneeswe Nukkone Testament kah wonk Wusku Testa- ment—WNe quoshkinnumuk nashpe Wuttinneumoh Christ noh asoowesit John Eliot; literally translated :—" The whole Holy his-Bible God, both Old Testament and also New Testament. This turned by the-servant-of-Christ, who is- called John Eliot." This Indian version of the Seriptures was printed at Cambridge (U.S.) by Samuel Green and Marmaduke Johnson, and was the first Bible printed in America,

In 1680 another edition of the New Testament was published ; and in 1685 the second edition of the Old Testament appeared. This last was bound up with the second impression of the New Testament, and the two parts form the second edition of the whole Bible. It was dedicated

“To the Hon. Robert Boyle, the Governour, and to the Company for the Propagation of the Gospel,” &c., and is, like the first edition, a work of great rarity. Eliot received valuable assistance in preparing this edition from the Rev. John Cotton of Plymouth (U.S.), who had also spent much labour in obtaining a thorough knowledge of the Indian language. A new edition of the Indian Bible was printed in 1822 at Boston by P. S. Du Ponceau and J. Pickering,

Besides his translation of the Bible, Eliot published at Cambridge (U.S.) in 1664 a translation of Baxter’s Call to the Unconverted, of which a second edition was issued in 1688. In 1665 he published an abridged translation of Bishop Bayly’s Practice of Piety, and a second edition in 1685. His well-known [Indian Grammar Begun was written in the winter of 1664, his sons assisting in the work, and was printed at Cambridge (U.S.) in 1666. At the end of this book are these memorable words,—“ Prayers and pains, through faith in Jesus Christ, will do anything.” The grammar was reprinted in 1822, with notes by Picker- ing and Du Ponceau, in the Collections of the Massachusetts Historical Society, vol. ix. The Indian Primer ; or the Way of Training up of our Indian Youth in the Good Knowledge of God; by J. E., was printed at Cambridge (U.S.) in 1669. It comprises an exposition of the Lord’s Prayer and a translation of the Larger Catechism in Indian. A reprint of this work, from the only complete copy known to exist, preserved in the library of the university of Edinburgh, was published, under the editorial superin- tendence of Mr John Small, in 1877.

In 1671 Eliot printed in English a little volume entitled Indian Dialogues, for their Instruction in that Great Service of Christ in Calling Home their Countrymen to the Know- ledge of God and of themselves. This was followed in 1672 by The Loguck Primer ; some Logical Notions to Initiate the Indians in the Knowledge of the Rule of Reason, &c. These two volumes, printed at Cambridge (U.S.), are extremely rare. Of the former, the only known copy exists in a private library in New York. A copy of the Logick Primer is preserved in the British Museum, and another in the Bodleian.

In 1611 a small tract of eleven pages was published at London, called A Brief Narrative of the Progress of the Gospel among the Indians in New England in the Year 1670. Given in by the Kev. Mr John Eliot, Minister of the Gospel there, in a Letter by him directed to the Right Worshipful the Commissioners under His Majesty's Great Seal for the Propagation of the Gospel amongst the Poor Blind Natives in those United Colonies. This was possibly one of the publications of the corporation after their charter was renewed by Charles II.; it is of extreme rarity.

Tn his old age the pen of Eliot was not idle. In 1678 he published Zhe Harmony of the Gospels in the Holy History of the Humiliation and Sufferings of Jesus Christ

from his Incarnation to his Death and Burial. This work, which was printed at Boston, is a life of our Saviour with many illustrative and practical remarks. The last of his publications was his translation into Indian cf Shepard's Sincere Convert, which he had nearly completed in 1664; this was revised by Grindal Rawson and printed in 1689.

Eliot died at Roxbury on the 20th of May 1690, at the age of eighty-six. He was acknowledged to have been a man whose simplicity of life and manners, and evangelical sweetness of temper, had won for him all hearts, whether in the villages of the emigrants or in the smoky huts of the natives of New England.

His translation of the Bible and other works composed for the use of the Indians are written in the Mohican dialect, which was spoken by the aborigines of New England. By Eliot and others it was called the Massachusetts language. Although it is no longer read, the works printed in it are valuable for the information they furnish as to the structure and character of the un- written dialects of barbarons nations. (3. 8M.)

ELIOT, Str Joun (1592-1632), one of the greatest among the English statesmen of the reign of Charles L, was born at his father's seat at Port Eliot, a small fishing-village on the River Tamar, in the mouth of April 1592. He was the son of a country gentleman of hospitable habits, and of considerable influence, if we may judge from Eliot's early entrance into public life. Against his youth no fault has been charged except such as was the natural fruit of a fiery but generous temper, and that it was not entirely spent in idle frolic is proved by the considerable scholarship which he attained. At fifteen he entered Exeter College, Oxford ; and, on leaving the university, he studied law at one of the inns of court. He also spent some months travelling in France, Spain, and Italy, in company, for part of the time, with young George Villiers, afterwards duke of Buckingham. At the age of twenty he married the daughter of one of his neighbours, a wealthy Cornish gentleman. He was only twenty-two

when, in the distinguished company of Pym and Went- |

worth, he commenced his parliamentary career, and only twenty-seven when he obtained the appointment of vice- admiral of Devon, with large powers for the defence and control of the commerce of the county. before the characteristic energy with which he performed the duties of his office involved him in difficulties. After many attempts, in 1623 he succeeded, by a clever but dangerous manceuvre, in entrapping the famous pirate Nutt, who had for years infested the southern coast, in-flicting immense damage upon English commerce, The issue is noteworthy, both as the event which first opened Eliot's eyes to the corruptness of the Government, and as an example of one of the causes which produced the Great Rebellion. The pirate, having gained powerful allies at court by means of bribery. was speedily permitted to re- commence his career of plunder; while the vice-admiral, upon charges which could not be substantiated, was flung into the Marshalsea, and detained there nearly four months.

A few days after his release Eliot was elected member of Parliament for Newport (February 1624). From the first he perceived that the success of the popuiar cause required the entire independence of parliament;

and his earliest recorded speech was to propose that, as ‘ misreports” were constantly being carried to the king, the deliberations of the House of Commons should be kept strictly secret. In the days of Eliot, such a measure would have carried with it advantages of the first importance ; and it was only natural that, in his anxiety to make parliament an efficient check upon the crown, he should forget how necessary was

It was not long |

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the check upon parliament which would thus have been lost.

In the first three parliaments of the reign of Charles I. Eliot was the foremost leader of the House of Commons. The House was at that time rich in great statesmen. Upon its benches sat Pym, Hampden, Selden, Coke, and many other sincere and steadfast patriots. But, though in pro- foundness of erudition one or two, but only one or two, may have surpassed him, neither in force of genius, in fire and power of oratory, in loftiness and ardour of sentiment, in inflexible firmness of resolution, nor in personal bravery and self-devotion, had he any superior, while in the union of these great qualities which made up his rare and noble character he had no equal. The circumstances of his past life also conduced to fit him for his position. His official intercourse with the duke of Buckingham, and a certain important interview between them, in which the duke had incautiously unveiled his design of governing without parliament, should parlia- ment refuse submission, had given him an early and valuable opportunity of gauging the character of the favourite ; anda bitter experience had acquainted him with the corruptness of the court. Undeterred by any vestige of personal fear, he dared, in plain and uncompromising language, to expose all the abuses which oppressed the country through inuumerable illegal exactions of many kinds and throngh the venality of the executive; and to point out how it was disgraced abroad by a foreign policy directed by the mere spleen of the favourite, and by the gross mismanagement of every campaign that had been undertaken. He dared to advise parliament to demand an account of the expenditure of the supplies which it had

voted, and to refuse further supplies till such an account had been rendered. Nay, he dared even to brave the king's deadliest hatred by naming repeatedly, with direct and sternest invective, the great duke of Buckingham, the all- powerful favourite, as chiefly responsible for the misgovern-

| ment of the country. He did not escape unpunished. In

1626, for drawing a bold parallel between Buckingham and Sejanus, he was sent to the Tower; but the House of Commons refused to proceed with any business till he should be released, and, on his release, passed a vote clearing him from fault. In the same year he was confined for a time in the Gatehouse, whence, careless of mere personal considerations, he ventured to petition the king against forced loans. He was also accused of having, in his capacity of vice-admiral, defrauded the duke of Buckingham, who, among his innumerable offices, held that of admiral of Devon, and was supplanted by a creature of the duke's. And, finally, a sentence of outlawry was passed upon him. But the very fact that he was thus specially singled out for vengeance by the king only imcreased the confidence reposed in him by the people. In 1628, despite the most strenuous opposition of the court, he was chosen member for his own county of Cornwall; and he resumed his work with undiminished zeal and courage. He at once advised the House to adopt, and firmly to maintain, the only policy which could be effective, namely, to vote no further supplies till they obtained redress of the grievances of which they complained. He joined with Coke, Selden, Littleton, Wentworth, and others in framing the Petition of Right, and, when the first evasive answer was given to that peti- tion, and men scarce knew what to do for wondering at the king's madness and audacity, he fearlessly reviewed the events of the whole reign, and proposed a remonstrance to the king, naming the duke of Buckingham as the cause of the kingdom's wretchedness. And, on the last day of that famous parliament, when Holles and Valentine held the Speaker in the chair by force, it was his voice which read a protest against levying tonnage and poundage and other

taxes without consent of Parliament, and against the king's encouragement of Arminians and Papists (for it is charac- teristic both of himself and of his epoch that, though no Puritan, he spoke as strongly against the king's illegal toleration of Papists as against any other of his illegal acts); and also a declaration that whatever minister should 'bring in innovation in religion, or seek to extend, or in- troduce Popery and Armenianism," or should advise illegal methods of raising money, should be considered "a capital enemy to the commonwealth," nay, that whoever even yielded compliance to such illegal demands, should be held accessory to the crime. This was the last speech of that session, and Eliot's last speech of all.

A few days after, parliament having been dissolved, he was summoned, with Selden, Holles, Valentinc, and three other members, before the council. When examined he refused to answer for his conduct in parliament anywhere except before parliament; and he was then, with his com- panions, committed to "close confinement " in the Tower, books and the use of writing materials being strictly denied. 'This rigorous treatment was maintained for nearly three months, till Charles found it necessary to give way somewhat to the popular feeling which was expressed by libels against the bishops and the lord-treasurer, and by stern warnings addressed to himself. In May the prisoners were taken before the Court of King's Bench, when Eliot simply repeated the protest he had made before the council. The case was put off time after time till the long vacation came without its having been heard. Eliot was now, however, allowed to communicate with his friends, among whom his most constant and valued correspondent was Hampden, to borrow books from Sir Robert Cotton's library, and to employ the tedious hours in writing. He drew upa defence of his conduct, under the title of An Apology for Socrates — "An recte fecerit Socrates quod accusatus non responderit," and wrote a little book of philosophical meditations, which he called The Monarchy of Afan, and an account of the first parliament of Charles I., which he describes on the title- page as "a thing that concerns posterity ""—Vegotiwm Pos- terorum,—and which is of no slight historical value. In February 1623 the sentence was at last pronounced, the prisoners being all condemned to a fine; to be imprisoned during the

king's pleasure; and not to be released till they had given security for their good behaviour, had sub- mitted to the king, and had acknowledged their offences. The largest fine was imposed upon Eliot —a fine of £2000, which, however, he never paid, as he had taken the pre- caution of securing his property against such an event. Twenty-seven years later this sentence was reversed by par- liament, and Eliot's brave assertion of the independence of parliament was confirmed, never to be again questioned.

The confinement of the other prisoners was gradually made less and less strict, till they were at length allowed full liberty ; but Eliot's spirit, which no weariness or suffer- ing could conquer, disdained to submit where he held no submission to be due, and for him there was no mercy. After more than a year had passed since he first entered the Tower, and the king's hate had only increased in malignity, on December 21, 1631, the council met to devise new means to subdue his constancy and force him to submission, All admittance to him was now denied except to his sons. Moved into a room which his letters describe as dark, cold, and wretchedly uncomfortable, at length his health gave way, and the doctors prescribed fresh air and exercise. He now addressed the king, having been referred to him by the Court of King's Bench, to which he had first applied, in a petition, written in simple, manly language, request- ing that, for his health's sake, he might be allowed a temporary release. The answer being that the pctition was not sufficiently humble, he expressed himself "heartily sorry

that he had displeased His Majesty," but merely repeated his request with no word of submission. To this no reply was given; and fifteen days after Sir John Eliot had died in the Tower (27th November 1632). His sons humbly begged leave to carry his body to Port Eliot, that he might rest with his fathers, but even this poor request Charles had not magnanimity enough to grant; and, by his express command, Sir John Eliot was " buried in, the church of the parish where he died:"

An excellent life of Sir John Eliot, founded upon elaborate study of his papers and of the history of the period, has been written by John

Forster. (T. M. W.)

ELIS, or Exeta, a country of the Peloponnesus, bounded on the N. by Achaia, E. by Arcadia, 8. by Messenia, and W. by the Ionian Sea. The local form of the name was Valis, or Valeia, and its meaning, in all probability, the lowland. In its physical constitution Elis is practically one with Achaia and Arcadia; its mountains are mere offshoots of the Arcadian highlands, and its principal rivers are fed by Arcadian springs, From Erymanthus in the north, Skollis (now known as Mavri and Santamcri in different parts of its length) stretches toward the west, and Pholoe along the eastern frontier ; in the south a prolongation of Mount Lyceon bore in ancient times the names of Minthe and Lapithus, which have given place respectively to Alvena and to Kaiapha and Smerna. These mountains are well clothed with vegetation, and present a soft and pleasing appearance in contrast to the picturesque wildness of the parent ranges. They gradually sink towards the east and die off into what was one of the richest alluvial tracts in the Peloponnesus. Except where it is broken by the rocky promontories of Chleonatas (now Chlemutzi) and Ichthys (now Katakolo), the coast lics low, with stretches of sand in the north and lagoons and marshes towards the south. During the summer months communication with the sea being established by means of canals, thesc lagunes yield a rich harvest of fish to the inhabitants, who at the same time, however, are almost driven from the coast by the swarms of gnats.

Elis was divided into three districts—Hollow or Lowland Elis (4 xoiAn "HXis), Pisatis, or the territory of Pisa, and Triphylia, or the country of the three tribes. Hollow Elis, the largest and most northern of the three, was watered by the Peneus and its tributary the Ladon, whose unitcd stream forms the modern Gastuni. It included not only the champaign country originally designated by its name, but also the mountainous region of Acrorea, occupied by the offshoots of Erymanthus. Besides the capital city of Elis, it contained Cyllene, an Arcadian settlement on the sea coast, whose inhabitants worshipped Hermes under the phallic symbol, Pylus at the junction of the Peneus and the Ladon, which, like so many other places of the same name, claimed to be the city of Nestor, and the fortified frontier town of Lasion, the ruins of which are still

visible at Kuti, near the village of Kumani. The district was famous in antiquity for its cattle and horses; and its byssus, supposed to have been introduced by the Pheenicians, was inferior only to that of Palestine. Pisatis extended south from Hollow Elis to the right bank of the Alpheus, and was divided into eight departments called after as many towns. Of these Salmone, Heraclea, Cicysion, Dyspontium, and Harpina are known,—the last being the reputed burial-place of Marmax, the deliverer of Hippodamia. From the time of the early investigators it has been disputed whether Pisa, which gave its name to the district, has ever been a city, or was only a fountain ora hill. By far the most important spot in Pisatis was the scene of the great Olympic games, on the northern bank of the Alpheus; but for details in regard to the locality, and the results of the explorations commenced

in 1875, the reader must be referred to the special article Onympra., 'Triphylia stretches south from the Alpheus to the Neda, which forms the boundary towards Messenia. Of the nine towns mentioned by Polybius, only two attained to any considerable influence— Lepreus and Macistus, which gave the names of Lepreatis and Macistia to the southern and northern halves of Triphylia. The former was the seat of a strongly in- dependent population, and continued to take every opportunity of resisting the supremacy of the Eleans. In the time of Pausanius it was in a very decadent condition, and possessed only a poor brick-built temple of Demeter ; but considerable remains of its outer walls are still in existence near the village of Strovitzi, on a part of the Minthe range.

The original inhabitants of Elis were called Caucones and Paroreate. From traces of the worship of Venus in the city of Elis, and from the presence of such names as Same and Jardanus, it is believed that the Phcenicians had settlements in the country at avery remote period. The inhabitants of Elis first appear in Grecian history under the title of Epeans, as setting out for the Trojan war, and they are described by Homer as living in a state of constant hostility with their neighbours the Pylians. At the close of the eleventh century B.c., the Dorians

invaded the Peloponnesus, and Elis fell to the share of Oxylus and the Atolians. These people, amalgamating with the Epeans, formed a powerful kingdom in the north of Elis. After this many changes took place in the political distribution of the country, till at length it came to acknowledge only three tribes, each independent of the others. 'hese tribes were the Epeans, Minyez, and Eleans. Before the end of the eighth century B.c., however, the Eleans had vanquished poth their rivals, and established thcir supremacy over the whole country. Among the other advantages ok they thus gained was the right of celebrating the Olympic games, which had formerly been the prerogative of the Pisans, The attempts which this people made to recover their lost privilege, during a period of nearly two hundred years, ended at length in the total destruction of their city by the Eleans. From the time of this event (572 B.c.) till the Peloponnesian war, the peace of Elis remained undisturbed. In that great contest Elis sided at first with Sparta; but that power, jealous of the increasing prosperity of its ally, availed itself of the first pretext to pick a quarrel. At the battle of Mantinea the Eleans fought against the Spartans, who, as soon as the war came to a close, took vengeance upon them by de- priving them of Triphylia and the towns of the Acrorea. The Eleans made no attempt to re-establish their authority over these places, till the star of Thebes rose in the ascendant after the battle of Leuctra. It is not unlikely that they would have effected their purpose had not the Arcadian confederacy come to the assistance of the Triphylians. In 366 3.c. hostilities broke out between them, and though the Eleans were at first successful, they were soon overpowered, and their capital very nearly fell into the hands of the enemy. Unable to make head against their opponents, they applied for assistance to the Spartans, who in- vaded Arcadia, and forced the Arcadians to recall their troops from Elis. The general result of this war was the restoration of their territory to the Eleans, who were also again invested with the right of holding the Olympic games. During the Macedonian supremacy in Greece they sided with the victors, but refused to fight against their countrymen. After the death of Alexander they renounced the Macedoniau alliance. At a sub- sequent period they joined the Atolian League, but persistently refused to identify themselves with the Acheans. When the whole of Greece fell under the Roman yoke, the sanctity of Olympia secured for the Eleans a certain

amount of indulgence. The games still continued to attract to the country large numbers of strangers, until they were finally put down by Theodosius in 394, two years previous to the utter destruction of the country by the Gothic invasion under Alaric. In later times Elis fell successively into the hands of the Franks and the Venetians, under whose rule it recovered to some extent its ancient prosperity. By the latter people the province of Belvedere on the Peneus was called, in consequence of its fertility, "the milch cow of the Morea."

E is, the chief city in the above country, was situated on the river Peneus, just where it passes from the mountainous district of Acrorea into the champaign below. According to native tradition, it was originally founded by Oxylus, the leader of the Atolians, whose statue stood in the market-place. In 471 B.c. it received a great extension by the incorporation, or ' synoikismos," of various small hamlets, whose inhabitants took up their abode in the city.

ELI—ELI

Up to this date it only occupied the ridge of the hill now called Kalascopi, to the south of the Peneus, but after- wards it spread out in several suburbs, and even to the other side of the stream. As all the athletes who intended to take part in the Olympic games were obliged to undergo a month's training in the city, its gymnasiums were among its principal institutions, They were three innumber—the " Xystos," with its pillared galleries, its avenues of plane- trees, its plethrion or wrestling-place, its altars to Hercules, to Eros and Anteros, to Demeter and Cora, and its cenotaph of Achilles ; the " Tetragonon," appropriated to the lighter exercises, and adorned with a statue of Zeus; and the " Maltho," in the interior of which was a hall or council chamber called Lalichmion after its founder. Among the other objects of interest were the temple of Artemis Philomirax ; the Hellanodiceum, or office of the Hellano- dicasts ; the Corcyrean Hall, a building in the Dorian style with two facades, built of spoils from Corcyra; a temple of Apollo Acesius; a temple of Silenus; an ancient struc- ture supported on oaken pillars and reputed to be the burial-place of Oxylus; the building where the sixteen women of Elis were wont to weave a robe for

the statue of Hera at Olympia; and the shrine of Dionysus, whose festival, the Thyia, was yearly celebrated in the neighbour- hood. The history of the town is closely identified with that of the country. In 399 B.c. it was occupied by Agis, king of Sparta. The acropolis was fortified in 312 by Telesphorus, the admiral of Antigonus, but it was shortly afterwards dismantled by Philemon, another of his generals. A view of the site is given by Stanhope.

See J. Spencer Stanhope, Olympia and Elis, 1824, folio ; Leake, Morea, 1880; Curtius, Peloponnesus, 1851-2 ; Schiller, Stdmme und Staaten Griechenlands; Bursian, Geographie von Griechenland,

1868-1872.

ELISHA (literally, God ts deliverance ; LXX., "EAtcar€ ; N.T., Eliseus), the disciple and successor of Elijah, was the son of Shaphat of Abel-meholah, which lay in the valley of the Jordan. He was called ta the prophetic office in the manner already related (see ELisaH), some time before the death of Ahab, and he survived until the reign of Joash. His official career thus appears to have extended over a period of nearly sixty years. The relation between Elijah and Elisha was of a par- ticularly close kind, and may be compared with that between Moses and Joshua or David and Solomon. The one is the complement of the other; the resemblances, and still more the marked contrast between the character and activity of each, qualified both together for the common discharge of one great work by " diversity of operation." The difference between them is much more striking than the resemblance. Elijah is the prophet of the wilderness, rugged and austere; Elisha is the prophet of civilized life, of the city and the court, with the dress, manners, and appearance of "other grave citizens." Llijah is the messenger of vengeance—sudden, fierce, and overwhelming ; Elisha is the messenger of mercy and restoration. Elijah's miracles, with few exceptions, are works of wrath and destruction; Elisha's miracles, with but one notable exception, are works of beneficence and healing. Elijah is the " prophet as fire" (Ecclesiasticus xl viii. 1), an abnormal agent working for exceptional ends; Elisha is the "holy man of God which passeth by us continually," mixing in the common life of the people,

and promoting the advance- ment of the kingdom of God in its ordinary channels of mercy, righteousness, and peace.

Though the duration of Elisha's career, with the approximate dates of its beginning and end, can be fixed, it is impossible to settle a detailed chronology of his life. In most of the events narrated no further indication of time is given than by the words "the king of Israel," the name

not being specified, so that it is impossible to tell which king is meant. There are two instances at least in which the order of time is obviously the reverse of the order of narrative (compare 2 Kings viii. 1-6 with 2 Kings v. 27, and 2 Kings xiii. 14-21 with 2 Kings xiii. 13). There are besides this other grounds, which it would be out of place to state here, for concluding that the narrative as we now have it has been disarranged and is incomplete. The fact, however, of dislocation and probable mutilation of the original documents requires to be borne in mind in dealing with the life of Elisha. It may serve not only to explain the insuperable difficulties of a detailed chronology, but also to throw some light on the altogether exceptional character of the miraculous element in Elisha's history. Not only are the miracles very numerous, even more so than in the case of Elijah, but, as has been frequently pointed out, they stand in a different relation to the man and his work from that in which the miracles of Elijah or any of the wonder-working prophets do. With all the other prophets the primary function is spiritual teaching,— tairacles, even though numerous and many of them symbolical like Elisha's, are only accessory. With Elisha, on the other hand, miracles seem the principal function, and the spiritual teaching is altogether subsidiary.

An obvious though only very partial explanation of the superabundance of miracles in Elisha's life is suggested by the fact that several of them were merely repetitions or doubles of those of his master and predecessor. Such were his first miracle, when returning across the Jordan he made a dry path for himself in the same manner as Elijah (2 Kings ii. 14); the increase of the widow's pot of oil (2 Kings

iv. 1-7) ; and the restoration of the son of the woman of Shunem to life (2 Kings iv. 18-37). It is to be observed, however, that with all the similarity there is a very considerable difference in the circumstances in the two cases, which makes it difficult to accept the theory that stories from the earlier life have been imported by mistake into the later. Besides, this theory, even if tenable, applies only to three of the miracles, and leaves unexplained a much larger number which are not only not repetitions of those of Elijah, but, as has already been pointed out, have an entirely opposite character. The healing of the water of Jericho by putting salt in it (2 Kings ii. 19-21), the provision of water for the army of Jehoshaphat in the arid desert (2 Kings ii. 6-20), the neutralizing by meal of the poison in the pottage of the famine-stricken sons of the prophets at Jericho (2 Kings iv. 38-41), the healing of Naaman the Syrian (2 Kings v. 1-19), and the causing the iron axehead that had sunk in the water to rise to the surface (2 Kings vi. 1-7), are all instances of the beneficence which was the general characteristic of Elisha's wonder-workiug activity in contrast to that of Elijah. Another miracle of the same class, the feeding of a hundred men with twenty loaves so that something was left over (2 Kings iv. 42-44), deserves mention by itself as the most striking though not the only instance of a resemblance between the work of Elisha and that of Jesus, to which commentators have frequently drawn attention. The one distinct exception to the general beneficence of Elisha's activity—the destruction of the forty-two children who mocked him as he was going up to Bethel (2 Kings ii, 23-25)—presents an ethical difficulty which is scarcely satisfactorily removed by the suggestion that the narrative has lost some particulars which would have shown the real enormity of the offence of the children. The leprosy brought upon Gehazi (2 Kings v. 20-27), though a miracle of judgment, scarcely belongs to the same class as the other. The wonder-working power of Elisha is represented as continuing even after his death. As the feeding of the hundred men and the cure of leprosy con- nect his work with that of Jesus, so the quickening of the

dead man who was cast into his sepulchre by the mere contact with his bones (2 Kings xiii. 21) is the most striking instance of an analogy between his miracles and those recorded of medizval saints. Stanley in reference to this has remarked that in the life of Elisha ‘ alone in the sacred history the gulf between biblical and ecclesiastical miracles almost disappears.”

The place which Elisha filled in the history of Israel during his long career as a prophet was, apart altogether from his wonder-working, one of great influence and importance. In the natural as in the supernatural sphere of his activity the most noteworthy thing is the contrast between him and his predecessor. Elijah interfered in the history of his country as the prophet of exclusiveness, Elisha as the prophet of comprehension. During the reign of Jehoram he acted at several important crises as the king’s divine counsellor and guide. At the first of these, when he delivered the army that had been brought out against Moab froma threatened dearth of water (2 Kings iii.), he plainly intimates that, but for his regard to Jehoshaphat, the king of Judah, who was in alliance with Israel, he would not have interfered. His next signal interference was during the incursions of the Syrians, when he disclosed the plans of the invaders to Jehoram with such effect that they were again and again (“not once nor twice ”) baffled (2 Kings vi. 8-23). When Benhadad, the king of Syria, is informed that “Elisha, the prophet that is in Israel, telleth the king of Israel the words that thou speakest in thy bed-chamber,” he at once sends an army to Dothan, where the prophet is residing, in order to take captive the destroyer of his plans. At the prayer of Elisha an army of horses and chariots of fire is revealed to his servant surrounding the prophet. Ata second prayer the invaders are struck blind, and in this state they are led by Elisha to Samaria, where their sight is restored. Their lives are spared at the command of the prophet, and they return home so impressed with the supernatural power that is opposed to them that their incursions thenceforward cease. The marauding incursions were given up, however, only to be followed by the invasion of a regular army under Benhadad, which laid siege to Samaria, and so caused a famine of the severest kind (2 Kings vi. 24-29). The calamity was imputed by Jehoram to the influence of Elisha, and he ordered the

prophet to be immediately put to death. Forewarned of the danger, Elisha ordered the messenger who had been sent to slay him to be detained at tle door, and, when immediately afterwards the king himself came (“ messenger” in 2 Kings vi. 33 should rather be king), predicted a great plenty within twenty-four hours. The apparently incredible prophecy was fulfilled by the flight of the Syrian army under the circumstances stated in 2 Kings vii. After the episode with regard to the woman of Shunem (2 Kings viii. 1-6), which, as has been already pointed out, is introduced out of its chrono- logical order, Elisha is represented as at Damascus (2 Kings viii. 7-15), The object for which le went to the Syrian capital is not expressly stated, but it evidently was to fulfil the second command laid upon Elijah, viz., to anoint Hazael as king of Syria. The reverence with which the heathen monarch Benhadad addressed Elisha deserves to be noted as showing the extent of the prophet’s influence. In sending to know the issue of his illness, the king causes himself to be styled ‘“““7’hy son Benhadad.” Equally remarkable is the very ambiguous nature of Elisha’s reply (2 Kings viii. 10), which may, however, be due to the doubtful state of the Hebrew text. The next and, as it proved, the last important interference of Elisha in the history of his country, constituted the fulfilment of the third of the commands laid upon Elijah. The work of anoiuting Jehu to be king over Israel was performed

by deputy, as related in 2 Kings ix. 1-3. During the reigns of Jehu and Jehoahaz the Scripture narrative con- tains no notice of Elisha, but from the circumstances of his death (2 Kings xiii. 14-21) it is clear that he had continued to hold the office and receive the honours of a prophet. Joash the king waited on him on his deathbed, and addressed him in the same words of profound reverence and regret which he himself had used to Elijah: “ Oh my father, my father, tlie chariot of Israel and the horsemen thereof.” By the result of a symbolic discharge of arrows he informed the king of his coming success against Syria, and immediately thereafter he died. It seems fitly to com- plete the contrast between him and his greater predecessor to be told expressly that “he

was buried.” The miracle wrought at his tomb has been already noticed.

Elisha is canonized in the Greek Church, his festival being on the 14th June, under which date his life is entered in the Acta Sanctorum.

ELIZABETH, queen of England, one of the most fortu- nate and illustrious of modern sovereigns, was born in tlie palace of Greenwich on the 7th of September 1533. She was the only surviving issue of the ill-starred union between Henry VIII. and Anne Boleyn, which extended over a space of less than three years. Anne was crowned at Westminster June 15, 1533, and was beheaded within the Tower of London May 19, 1536. The girlish beauty and vivacity of Anne Boleyn, with her brief career of royal splendour and her violent death, invest her story with a portion of romantic interest ; but she does not seem to have possessed any solid virtues or intellectual superiority. The name of Elizabeth cannot be added to the list of eminent persons who are said to have inherited their peculiar talents and dispositions from the side of the mother. On the coutrary, she closely resembled her father in many respects,— in his stout heart and haughty temper, his strong self-will and energy, and his love of courtly pomp and magnificeuce. Combined with these, however, there was in Elizabeth a degree of politic caution and wisdom, with no small dis- simulation and artifice, which certainly does not appear in the character of “bluff King Harry.” Early hardships and dangers had taught Elizabeth prudence and suspicion, as well as afforded opportunity in her forced retirement for the pursuit of learning and for private accomplishments. The period of her youth was an interesting and memorable one in English history. The doctrines of the Keformation had spread from Germany to this country ; and the passions

and interests of Henry led him to adopt in part the new

faith, or-at least to abjure the grand tenet of the Papal supremacy. Anne Boleyn, by her charms and influence, facilitated this great change ; and there is historical truth as well as poetical beauty in the couplet of Gray, “That Love could teach a monarch to be wise, And gospel light first dawn’d from Boleyn’s eyes.”

The Protestantism of England was henceforth linked to Elizabeth's title tothe crown. She was in her fourteenth year when her father King Henry died. Her education had been carefully attended to, latterly under the superintend- ence of good Catherine Parr, the last of Henry's queens. The young princess was instructed in Greek and Latin, first by William Grindal, and afterwards by Roger Ascham, wlio has described his pupil in glowing terms as " exempt from female weakness," and endued with a masculine power of application, quick apprehension, and retentive memory. She spoke French and Italian with fluency, was elegant in her penmanship, whether in the Greek or Roman character, and was skilful in music, though she did not delight in it. 'With respect to personal decoration," adds Ascham, "she greatly prefers a simple elegance toshow and spleudour." This last characteristic, if it ever existed, did not abide with Elizabeth. Her love of. rich dresses, jewels, and other

ornaments was excessive ; and at her death slie is said to have had abont 2000 costly suits of all countries in her wardrobe. Nor can it be said that even at the tender age of sixteen, when Roger Ascham drew her flattering portrait, Elizabeth was exempt from female weakness. After the death of Henry, the queen-dowager married the Lord Admiral Seymour, whose gallantries and ambition em- bittered her latter days. Seymour paid court to the Prin- cess Elizabeth, and with the connivance of her governess, Mrs Ashley, obtained frequent interviews, in which much boisterous and indelicate familiarity passed. The graver court ladies found fault with " my lady Elizabeth's going in a night in a barge upon Thames, and for other light parts;" and the scandal proceeded so far as to become matter of examination by the council. Mrs Ashley and Thomas Parry, cofferer of the princess's household (after- wards patronized by Elizabeth), were committed for a time to the Tower, and Elizabeth underwent an examination by Sir Thomas Tyrwhit, but would confess nothing. 'She hath a very good wit," said Tyrwhit, "and nothing is gotten of her but by great policy." The subsequent dis- grace and death of Seymour closed this first of Elizabeth's love passages; she applied herself diligently to her studies

under Ascham, and maintained that " policy" and caution which events rendered more than ever necessary.

The premature death of Edward VI. called forth a dis- play of Elizabeth's sagacity and courage. Edward had been prevailed upon by the duke of Northumberland to dispose of the crown by will to lis cousin Lady Jaue Grey. The two sisters, Mary and Elizabeth, on whom the succession had been settled by the testamentary provisions of Henry VIII, as well as by statute, were thus excluded. Mary's friends immediately took up arms ; Elizabeth was asked to resign her title in consideration of a sum of money, and certain lands which should be assigned to her; but she rejected the proposal, adding that her elder sister should be treated with first, as during Mary's lifetime she herself had no right to the throne. Elizabeth then rallied her friends and followers, and when Mary approached London, successful and triumphant, she was met by Elizabeth at the head of 1000 horse—knights, squires, and ladies, with their attendants. Such a congratulation merited a different acknowledgment from that which Elizabeth was fated to experieuce. But the temper of Mary, never frank or amiable, had been soured by neglect, persecution, and ill- health; and her fanatical devotion to the ancient religion had become the absorbing and ruling passion of her mind. She was not devoid of private virtues,—certainly excelling Elizabeth in sincerity and depth of feeling ; but her virtues "walked a narrow round;" and whenever the Romish Church was in question, all feelings of private tenderness, and all considerations of public expediency or justice, were with Mary as flax in the fire. The five years of her reign are perhaps the most uu-English epoch in our annals,?

1 Miss Lucy Aikin, in her AZemoirs of the Court of Elizabeth, praises the magnanimity of Elizabeth in allowing Shakespeare's drama of Henry VITI., in which the wrongs and sufferings of Catherine of Aragon are embalmed, to be publicly offered to the compassion of her people. We wish that this instance of magnanimity could be justly ascribed to the queen ; but it seems certain that Shakespeare's Henry VITT. was not produced till after Elizabeth's death. No poet would have dared to hint at the death of the queen while she lived ; and

Cranmer's prophecy in the fifth act speaks of the death of Eliza- beth and of her successor James. We have Ben Jonson's testimony as to Shakespeare's favour with Elizabeth,—

'¢Those flights wpon the banks of Thames,

That so did take Eliza and our James." And the tradition that the poet wrote his Merry Wives of Windsor by request of the queen, who wished to see Falstaff in love, is at least highly probable. One of the latest Shakespearean discoveries is that the poet, along with his " fellows" Kempe and Burbage, acted in two plays before the queen at Greenwich in December 1594, for which

ELIZABETH

To escape from indignities and persecution at court, Elizabeth was suffered to retire, though carefully watched, to her house of Ashridge, in Buckinghamshire. Wyat's insurrection, prompted by the rumoured marriage of Mary with Philip of Spain, made her still more an object of suspicion and distrust, as the hopes of the Protestant party were on all occasions turned to Elizabeth. The young princess was taken from Ashridge and privately cominitted to the Tower. Her death was demanded by some of the bigoted adherents of the court, but Mary dared not and probably did not desire to proceed to this extremity ; Philip, when allied to the English crown, interceded on behalf of the fair captive, and Elizabeth was removed to Woodstock, under care of a fierce Catholic, Sir Henry Bedingfield. Her extreme wariness and circumspection baffled every effort to entrap her. She conformed out- wardly to the Catholic Church, opening a chapel in her house at Woodstock, and keeping a large crucifix in her chamber. This conformity was not unnaturally ascribed to dissimulation, but part was probably real, To the end of her life, Elizabeth retained a portion of the old belief. She had always a crucifix with lighted tapers before it in her private chapel; she put up prayers to the Virgin (being, she said, a virgin herself, she saw no sin in this); she disliked all preaching and controversy on the subject of the real preseuce ; and she was zealous almost to slaying against the marriage of the clergy. She was anxious to retain as much as possible of the Catholic ceremonial and the splendid

celebrations of the church festivals, which the ardent reformers would gladly have swept away, as had been done in Scotland. The Anglican Church was a compromise.

The wretched and inglorious reign of Mary terminated on the 17th of November 1558. Elizabeth heard the news of her accession at Hatfield, and she fell down on her knees exclaiming : A Domino factum est istud, et est mirabile oculis nostris— It is the Lord's doing, it is marvellous in our eyes "——words which she afterwards caused to be stamped on a gold coin, impressing on her silver coin another pious motto, Posut Deum adjutorem meum—' I have chosen God for my helper." All her perils were now passed. The nation received her with unbounded enthusiasm. Church bells were rung, bonfires blazed, tables were spread on the streets, the Protestants exulted with a holy joy.

Elizabeth was in her twenty-fifth year when she ascended the throne. She had been better disciplined and trained for her high trust than most princes, yet the difficulties that surrounded the English crown at this time might well have appalled her. The nation was struggling in a war with France, trade was much decayed, Calais had been lost, and England was distracted by religious divisions and animosities. All Catholic Europe might be expected to be arrayed against the Protestant queen of England. Elizabeth, however, at once chose the better part for herself and the nation. Without waiting for the assembling of her first parliament, she ordered the church service to be read in English, and the elevation of the host to be discontinued. But before this could be known abroad, she had instructed the English ambassador at Rome to notify her accession: to the pope. PauljIV., then pontiff, arrogantly replied, that England was a fief of the Holy See, that Elizabeth was illegitimate, and could not inherit the crown, and that she should renounce all her pretensions and submit to his decision. If Elizabeth had ever wavered as to the course she should pursue, this papal fulmination must have fixed her determination. Twelve years afterwards, a subsequent pope, Pius V., issued a bull releasing English Catholics from their allegiance to the queen, and formally depriving

they received, upon the Council's warrant, £13, 6s. 8d. and, " by way of her Majesty's favour,' £6, 13s. 4d.—in all £20 (Halliwell's Id/us-

trations, 1874).

her of her title to the throne. But the thunders of the Vatican, like the threats of the Escorial, fell harmless on the English shores, The nation, under its Protestant monarch and her wise counsellors, the Lord-Keeper Bacon, Cecil (afterwards Lord Burghley), Walsingham, Throckmorton, Sir Ralph Sadler, and others, pursued its triumphant course, while its naval strength and glory were augmented beyond all former precedent. The exploits of the gallant sea-rovers Drake, Hawkins, and Frobisher, the heroic deaths of the brave admirals Gilbert and Grenville, and the transatlantic adventures of Raleigh—are still unsurpassed in romantic interest. The government of Elizabeth and the public events of her reign will fall to be recorded in another part of this work, under the head of Encnanp. Her first parliament passed the famous Acts of Supremacy and Uni- formity, which struck directly at the papal power. All clergymen and public functionaries were obliged to renounce the temporal and spiritual jurisdiction of every foreign prince and prelate ; and all ministers, whether beneficed or not, were prohibited from using any but the established liturgy. These statutes were carried out with considerable severity ; many Catholics suffered death; but all might have saved themselves, if they had explicitly denied the right of the pope to depose the queen. The Puritans and nonconformists, on the other hand, were content to bear some portion of the burden of intolerance and oppression, from the consideration that Elizabeth was the bulwark of Protestantism, If they lost her firm hand they lost all ; and the numerous plots and machinations of the Catholics against the queen's life showed how highly it was valued, and how precious it was to Protestant Europe. In the latter part of the queen's reign, her domestic and fiscal regulations were justly open to censure. The abuse of monopolies had grown to be a great evil; grants of exclu- sive right to deal in almost all commodities had been given to the royal favourites, who were exorbitant in their

demands, and oppressed the people at pleasure. Elizabeth wisely yielded to the growing strength of the Commons, and the monopolies complained of were cancelled. The monarcliy, though as yet arbitrary and in some respects un- defined, was still, in essential points, limited by law.

One great object of the Protestants was to secure a suc- cessor to the throne by the marriage of Elizabeth. The nearest heir was Mary Queen of Scots, a zealous Catholic, who was supported by all the Catholic states, and had os- tentatiously quartered the royal arms of England with her own, thus deeply offending the proud and jealons Elizabeth. The hand of the English queen was eagerly solicited by numerous suitors—by Philip of Spain, who was ambitious of continuing his connection with England, by the Arch- duke Charles of Austria, by Eric king of Sweden, the duke of Anjou, and others. With some of these Elizabeth negotiated and coquetted for years ; to Anjou she seems to have been attached ; but her affections were more deeply touched, as Mr Hallam has remarked, by her favourite Dudley, earl of Leicester. Her early resolution, and that which ultimately prevailed over her weakness or vanity, was, that she should remain single and hold undivided power. To a deputation from the Commons on this.deli- cate subject, she emphatically said she had resolved to live and die a virgin queen: 'and for me it shall be sufficient that a marble stone declare that a queen, having reigned such a time, lived and died a virgin." She appears often to have wavered in her resolution, and, in her partiality for handsome courtiers and admirers, to have forgotten her prudence and dignity. Her partiality for Essex was undis- guised—it was unhappy for both; and making Hatton chancellor because he could dance gracefully was a bold but not unsuccessful achievement. LElizabeth's fits of rage were as violent as her fits of love. Her maids of honour

sometimes felt the weight of the royal hand; and when Essex once turned his back on her, she appropriately dealt him a box on the ear. As

a pendant to these nugw, we may add, that Elizabeth swore strongly, decided and masculine oaths.

The feminine weakness and egregious vanity of Elizabeth, in the midst of so many masculine qualities of temperament and intellect, have afforded abundant matter for garrulous chroniclers. Five years after she ascended the throne, she issued a proclamation against portrait painters and engravers, who had erred in expressing "that natural representation of her majesty's person, favour, or grace," that was desired by her loving subjects, and who were ordered to desist uutil some "special cunning painter " might be permitted to lave access to the royal presence. The works of the un- skilful and common painters were, as Raleigh relates, by the queen's commandment, "knocked in pieces and cast into the fire." A long account is given by the Scottish ambassador Melville of certain interviews he had with Elizabeth when in her most gracious and pleasant mood. She showed him " my lord's picture,"—a portrait of the unworthy favourite Dudley ; she changed her dress every day, "one day the English weed, another the French, and another the Italian, and so forth," asking Melville which became her best; her hair, he says, was rather reddish than yellow, and curled naturally ; she inquired whether the queen of Scotland or herself was of highest stature, and Melville answering that Mary was tallest, "then," saith she, "she is too high, for I myself am neither too high nor too low." Melville praised Mary's accomplishments as a musician and dancer, and Elizabeth contrived, as if by accident, that he should hear her play upon the virginals : " she inquired whether my queen or she played best ; in that I found myself obliged to give her the praise." In the matter of the dancing, Melville was also able to answer, that Mary did not dance "so high and disposedly" as Elizabeth. Determined to show all her accomplishments, Elizabeth addressed the wary ambassador in Italian, which she spoke " reasonably well," and in German, which, he says, was "not so good." These glimpses of the woman Elizabeth contrast strangely with the sovereign, who, at Tilbury camp, rode from rank to rank of her army, bare- headed, with a general's truncheon in her hand, declaring to her soldiers that she was resolved to live and die amongst them in the midst and heat of the battle ; and that she thought it " foul scorn that Parma or Spain, or any

prince of Europe, should dare to invade the borders of her realms." Language and sentiments like these, reflecting the feeling of the nation, must have insured the destruction of the troops of Parma or Spain, even if the vaunted Armada had not been sunk by the English fire or scattered by tempests. At this great crisis, however, Elizabeth owed much of her popu- larity and secutity to the wisdom of her ministers and the spirit of her people, rather than to her own patriotism and seuse of duty. She had from unwise parsimony 1m- poverished the navy, as she had previously neglected the army, and left the country comparatively defenceless. It was only after repeated applications and entreaties that Burghley and Walsingham obtained the royal consent to carry out the necessaty preparations. Walsingham made large personal advances, which were never repaid. Trresolu- tion would seem a priori to be a weakness alien to the despotic character of Elizabeth, yet it is certain that she was often, on momentous occasions, hesitating, wavering, and undecided. The sagacity and devotedness of her chief counsellors, though not incited or fed by the royal bounty, were her safety and her strength.

The darkest stain on the memory of Elizabeth is her treatment of Mary Queen of Scots. To have cut off Mary from the crown, settling it on her son, would have secured

the Protestant succession, and Mary liberated would most probably have repaired to France, whence her revenue was derived, or to Spain. Thus the conspiracies for her release and her own machinations would have been averted. Her execution, though clamoured for by the English nation, was an act of cruelty peculiarly revolting on the part of a. female sovereign and kinswoman. And Elizabeth's affected reluctance to sign the death warrant, her prompting to secretary Davison that Sir Amias Paulet should be instigated to make away with the captive queen (which the "dainty precise fellow," as Elizabeth termed him, refused to do), and her feigned grief and indignation after the event had taken place—throwing the blame on her ministers and on the unfortunate secretary who placed the warrant before her for signature—all this

over-acted and disgusting hypocrisy is almost as injurious to the reputa- tion of Elizabeth as the deed itself.

Mr Froude has said that no trace can be found of personal animosity on the part of Elizabeth towards Mary. It is evident, however, that jealousy if not hatred animated the English queen towards her rival. The youth and beauty of Mary were a source of aversion ; Elizabeth never forgave her for quartering the royal arms of England ; and there was a certain malicious letter, written by Mary to Elizabeth when the captive queen was under the guardian- ship of the earl of Shrewsbury, that must have chafed the Tudor blood in no ordinary degree. In this epistle Mary reported some alleged speeches of the countess of Shrewsbury charging Elizabeth with licentious amours, physical defects, absurd vanity, folly, and avarice (Hume, chap. xlii.). The original letter in Mary's handwriting was seen :by Prince Labanoff (circa 1840) among the Cecil papers in Hatfield House, where, we believe, it still remains. It is such an epistle as no woman—royalty apart—would ever forget or forgive, but there is a pro- bability that Burghley or Walsingham may have intercepted the letter, and not ventured to deliver it to their royal mistress.

To the end of her life Elizabeth affected all the airs of a coy beauty and coquette. Even her statesmen addressed her in a strain of fulsome adulation and semi-gallantry. She was the Gloriana of Spenser, the "fair vestal throned in the west" of Shakespeare, and the idol of all the lesser poets, as well as courtiers and politicians. When Raleigh was confined in the Tower, he wrote to Cecil—trusting, no doubt, that his letter would be shown to Elizabeth—that he was in the utmost depth of misery because he could no longer see the queen. "I, that was wont to behold her riding like Alexander, hunting like Diana, walking like Venus, the gentle wind blowing her fair hair about her pure cheeks like a nymph [Elizabeth was then in her fifty- niuth year]; sometime singing like an angel, sometime playing like Orpheus," &c, Elizabeth continued her gorgeous finery and rigorous state ceremonial, and was waited upon by applauding crowds whenever she went abroad. We havea graphic picture of her in her sixty- fifth year by a German, Paul Hentzner, who saw the queen on a Sunday as she proceeded to chapel.

She appeared stately and majestic ; her face oblong, fair but wrinkled ; her eyes small, yet black and pleasant , her nose a little hooked, her lips narrow, her teeth black, her hands slender and her fingers long (there was a special beauty in her delicate white hands, and in her audiences she took care not to hide them). She had pearls with rich drops in her ears, wore false red hair, had a small crown on her head, her bosom uncovered, her dress white silk, bordered with pearls of the size of beans, a collar of gold and jewels ; and thus arrayed, Elizabeth passed along smiling graciously on the spectators, who fell down on their knees as she

approached ; while a marchioness bore up her train, a bevy

of ladies followed her dressed in white, and she was guarded on each side by fifty gentlemen pensioners, carrying gilt battle-axes.

A few years afterwards we see the eclipse of all this splendour and servility. Towards the end of March 1603, Elizabeth was seized with her mortal illness. She became restless and melancholy, refused medicine, and sat for days and nights on cushions, silent, her finger pressed on her mouth. When asked by Cecil who should succeed her on the. throne, she characteristically answered, ‘My seat has been the seat of kings; I will have no rascal to succeed me.” She afterwards, when speechless, joined her hands together above her head, “in manner of a crown,” to signify, in answer to another interrogatory from Cecil, that she wished the King of Scots to be her successor. She expired on the 24th of March 1603. And thus calmly passed away the last of the Tudors, the lion-hearted Elizabeth. She was in the seventieth year of her age and forty-fifth of her reign—a period of brilliant prosperity and advancement, during which England had put forth her brightest genius, valour, and enterprise, and attained to the highest distinction and glory among the states of Europe. The “ golden days of good queen Bess” were long remembered in contrast to those of her pusillanimous suc- cessor, and this traditional splendour, in spite of historical research and juster views of government, has scarcely yet “ faded into the common light of day.”

Horace Walpole has assigned to Elizabeth a place in his Catalogue of Royal and Noble Authors, and a list of thirteen productions, exclusive of letters and speeches, is attached to the queen's name. They consist chiefly of translations from the Greek, Latin, and French, with a sonnet printed during her own lifetime, and some prayers and meditations. The learning of Elizabeth is undoubted : it was consider- able even in that age of learned ladies; but her style is stiff, involved, quaint, and full of conceits—the whole evincing rather a predilection for literary and scholastic studies than literary taste or power. (R. CA.)

ELIZABETH, Sr (1207-1231), of Hungary, daughter of Andrew II, king of Hungary, was born in Presburg in 1207. At four years of age she was betrothed to Louis IV., landgrave of Thuringia, and conducted to the Thuringian court to be educated under the direction of his parents. From her earliest years she is said to have evinced an aversion to worldly pleasures, and, making the early Christians her chief model, to have devoted her whole time to religion and to works of charity. She was married at the age of fourteen, and acquired such influence over her hus- band that he adopted her doctrines and zealously assisted her in all her charitable endeavours. On the death of Louis in 1227, Elizabeth was deprived of the regency by his brother Henry Raspe, on the pretext that she was wast: ing the estates by her alms ; and with her three infant children she was driven from her home without being allowed to carry with her even the barest necessaries of life. She lived for some time in great hardship, but ultimately her uncle, the bishop of Bamberg, offered her an asylum in a house adjoining his palace. Through the intercession of some of the principal barons, the regency was again offered her, and her son Hermann was declared heir to the throne; but renouncing all power, and making use of her wealth only for charitable purposes, she preferred to live in seclusion at Marburg under the direction of her confessor Conrad. There she spent the remainder of her days in penances of unusual severity, and in ministrations to the sick, especially those afflicted with the most loathsome diseases. She died at Marburg, 19th November 1231, and four years after- wards was canonized by Gregory IX. on account of the fre- quent miracles reported to have been performed at her temb,

A life of Elizabeth was written by Theodore of Thuringia; and L' Histoire de Sainte Elisabeth de Hongrie, by Montalembert, was published at Paris in 1836. Her life has also supplied the materials for a dramatic poem by Charles Kingsley, entitled the Saint's Tragedy.

ELIZABETH PETROVNA (1709-1762), empress of Russia, daughter of Peter the Great and of Catherine L., was born on the 5th September 1709. In consequence of a law of her father, by which the sovereign had the

'power to choose his successor, she had no legal claim to the

throne, The empress Anna Ivanova died in 1740. She had appointed Ivan, son of her niece Anne duchess of Brunswick, a child only a few months old, to the throne, with Biron, her favourite, regent. Elizabeth was quite con- tented with this arrangement. She declared that love was the supreme good, and that she had no desire for the cares and honours of a crown. But the prestige of her father's name, and the favour in which she stood with the Russian people, rendered her an object of jealousy to the regent and to the mother of the presumptive heir ; and on her refusing a proposal of marriage with the duke of Brunswick, brother- in-law of Anne, it was hinted to her that she should take the veil. She might not even then have listened to the suggestions of those who counselled a conspiracy, had she not been persuaded by Lestocq, her physician and favourite, that the suspicions of the Government were so much aroused that to go back or to delay was no longer compatible with safety. Yielding to those representations, she resolved to make the venture, and on the 6th December 1741 entered the barracks of the Preobrajensky guards and endeavoured to induce them to swear allegiance to her. Notwithstanding her powerful appeal and the promise of high rewards, all hesitated with the exception of a single company—old soldiers of Peter the Great ; but placing her- self at the head of this small band, she entered the imperial palace and made prisoners of the regent and of Anne and her son. She possessed already the affections of the people, and at once her authority was firmly established. Her administration was successful both at home and

abroad. Although she was ruled by worthless favourites, who fol- lowed each other in rapid succession, her reign was very popular with the people, who surnamed her the Clement. She was indolent and sensual, but she possessed con- siderable abilities, and an energetic will when it was roused to exertion. She had some taste for literature and the fine arts, and founded the university of Mos- cow, and the Academy for the Fine Arts of St Peters- burg. In 1743 she brought the war with Sweden to a close by an advantageous treaty. She successfully assisted Maria Theresa against Frederick the Great, and in this way con- tributed to the peace of Aix-la-Chapelle in 1748. After this, irritated, it is said, by a reported witty remark of Frederick, she took part in the Seven Years' War, and by suc- cessive victories reduced that monarch to great straits, from which he was only delivered by her death (Jan. 5, 1762).

ELIZABETH, originally ExizaABETHTOWN, a city of the United States, capital of Union county, New Jersey, is situated eleven miles W.S.W. of New York, on the Elizabeth river, near its junction with Staten Sound. It is a well-built and flourishing place, and possesses twenty-four churches, a Roman Catholic nunnery, a court-house and county jail, a city hall, two high schools, a business college, a collegiate school, an almshouse, and an orphan asylum. Besides a great establishment for the manufacture of the "' Singer " sewing machine, there are breweries, foundrics, potteries, and factories for edge-tools, saws, stoves, carriages, oil-cloth, &c. The port, which is open to vessels of 300 tons, is one of the greatest coal-shipping depéts in the United States, forming, as it does, the outlet for the Pennsylvanian fields. The town dates from 1665; it, was the VIII. — 19

capital of New Jersey from February 1755 to September 1757, and obtained its city charter in 1865. Population in 1850, 5583; in 1870, 20,832.

ELIZABETHGRAD, or YELIZAVETGRAD, a fortified town and military depdt of South Russia, in the govern- ment of Kherson, is situated on the left bank of the Ingul, 153 miles N. by W. of Kherson, in 48° 31' N. lat. and 31° 17' E. loug. It is built with great regularity, and

its streets are spacious and in some cases lined with trees. It has a citadel with six bastions, a hospital, and several churches. Its trade is considerable, and its annual autumnal fair is the one most frequented in the government. It was founded in 1754,and was named after the empress Elizabeth. The citadel was garrisoned with Cossacks, and the outskirts were settled with schismatics, or raskolniks, who lad returned from Turkey. Including its four suburbs, the population of Elizabethgrad in 1873 was 31,962.

ELIZABETHPOL, YeEtizaverpot, or GANSHA, the chief town of a government in the province of Tiflis, in Russian Transcaucasia, is situated 1449 feet above the sea-level, on an affluent of the Kur, 90 miles south-east of Tiflis, in 40° 40’ 42” N. lat. and 46° 21’ 19” E. long. It was at one time a place of cousiderable importance, but on account of having been frequently stormed and pillaged is now in a somewhat dilapidated condition. The streets are narrow, and most of the houses low-roofed and without windows, but it has several elegant mosques and other public build- ings. It is divided into four quarters, two of which are inhabited by Armenians and two by Tatars. The inhabi- tants are engaged chiefly in horticulture, agriculture, and the rearing of silkworms and cattle. Gandzak, Kanga, or Kendzhe, as the town was formerly called, first appears in history in 1088, when it was under the rule of the Turkish emir Vuzan, and was included in the Armenian province of Artza’kh. Its extent at that time is attested by the twenty- two ancient cemeteries which still exist. The present town was founded by Shah Abbas, four miles from the site of the older city, which is now marked by the Green Mosque. It continued in Mahometan possession till 1804, when it was stormed by the Russians under Prince Tsitsianoff, and received its present name in honour of Elizabeth, daughter of Alexander I. In 1826 it was the scene of a great victory over the Persians. The popula- tion in 1873 was 15,439.

ELK. See Derr, vol. vii. p. 24.

ELLENBOROUGH, Epwarp Law, Baron (1750- 1818), chief-justice of the Court of King’s Bench, was born on the 16th November 1750, at Great Salkeld, in Cumberland, of which place his father, afterwards

bishop of Carlisle, was at the time rector. Educated at the Charterhouse school and at St Peter's College, Cambridge, he passed as third wrangler, and was soon afterwards elected toa fellowship at Trinity. In spite of his father's strong wish that he should take orders, he chose the legal profession, and on quitting the university was entered at Liucoln's Inn. After spending five years as a "special pleader under the

bar," he was called to the bar in 1780. He chose the |

Northern Circuit, and in a very short time obtained a lucrative practice and a high reputation. In 1787 he was appointed principal counsel for Warren Hastiugs in the celebrated impeachment trial before the House of Lords, and the ability with which he conducted the defence was universally recognized. He had commenced his political career as a Whig, but, like many others, he saw in the French Revolution a reason for changing sides, and be- came a supporter of Pitt. On the formation of the Addington ministry in 1801, he was appointed attorney- general, and in the following year he succeeded Lord Kenyon as chief-justice of the King's Bench. On being raised to the bencli he was created a peer, taking his title

from the village of Ellenborough in Cumberland, where his maternal ancestors had long held a small patrimony. In 1806, on the formation of Lord Grenville's ministry " of all the talents," Lord Ellenborough declined the offer of the Great Seal, but accepted a seat in the Cabinet. His doing so while he retained the chief-justiceship was much criticised at the time, and, though not without precedent, is open to obvious objections on constitutional grounds. As a judge he had grave faults, though his decisions displayed profound legal knowledge, and in mercantile law especially were reckoned of high authority. He was harsh and over- bearing to counsel, and in the political trials which were so frequent in his time showed an unmistakable bias against the accused. In the trial of Hone for blasphemy in 1817, Ellenborough directed the jury to find a verdict of guilty, and their acquittal of the prisoner is generally said to have hastened his death. He resigned his judicial office in Novem- ber 1818, and died on the 13th December following.

ELLENBOROUGH, Epwarp Law, Ear or (1790- 1871), the eldest son of Baron Ellenborough, noticed above, was born in 1790, was educated at Eton and St John's College, Cambridge, and represented the subsequently dis- franchised borough of St Michael's in the House of

Commons, until the death of his father in 1818 gave him a seat in the House of Lords. He was twice married; his only child died young; his second wife was divorced by Act of Parliament in 1830. By the friendship of the duke of Wellington, which he retained all through his Indian career, Lord Ellenborough was appointed lord privy seal, and then president of tle Board of Control, in the year 1828. In 1834 and in 1841 for a few weeks he again held the latter office, the duties of which at once made him familiar with the affairs of India, and gave hiin control over the court of diréctors. Sir Robert Peel appointed him governor-general with the Queen's approval. He discharged the duties of the high position from the 28th February 1842 to the 15th June 1844, when the directors exercised their power of recalling him. He finally left Calcutta on the Ist August 1844. His Indian administration of two and a half years, or half the usual term of service, was from first to last a sulyject of hostile criticism. His own letters sent monthly to the Queen, and his correspondence with the duke of Wellington, published in 1874 after his death, enable us to form an intelligent and impartial judgment of his meteor- like career. The events in dispute are his policy towards Afghanistan and the army and captives there, his conquest of Sind, and his campaign in Gwalior. He was fortunate in having as his private secretary Captain (afterwards Sir Henry) Duraud, the accomplished engineer officer and statesman, who died in 1871 when lieutenant-governor of the Punjab. Although he was absorbed in military and foreign politics, his administration was fertile in peaceful reforms, due to his colleague, Mr Wilberforce Bird, who purged the police, put down state lotteries, and prohibited slavery, with Ellenborough's hearty support.

The impartial study of Lord Ellenborough's correspond ence in the light of the records and criticisms of the times must confirm the contemporary verdict against him ou the questions of Afghanistan and Sind, and inay lead us to approve of his action in Gwalior. All through his brief Indian career, nioreover, his severest critics must admire thie splendour of his intellect (which put him in the first rank of orators in the House of Lords down almost to the year of his death), the purity of his public patronage, and the energy of his devotion to the service of his country. The same judgment which marked his later criticism of others

was wanting when he held the almost irresponsible power of governor-general, to make his rule as useful as it was remarkable. If men like Durand and Wilberforce Bird helped him by the possession of the official and ethical

virtues which he lacked, we must not forget that Sir Charles Napier led his Government and himself still farther to that extreme of rashness and impulse which was his bane. And against his only too apparent contempt or indifference for all things not military we must set the statesmanlike views expressed to the Queen and the duke of Wellington on the critical position of Great Britain in the East, and the necessity for strengthening it by military reforms. He repeated what the greater governor-general Wellesley had urged, but in vain, on the East India Com- pany at the beginning of the century, and Dalhousie again in 1854-56. The penalty came in the mutiny campaigns of 1857, as it had been foreshadowed in the Cabul disasters of 1838-42.

It was to retrieve these disasters that Lord Ellen- borough was sent out. If he had a difficult task, he found the tide of fortune just on the turn. In his pro- clamation of the 15th March 1842, as in his memorandum for the Queen dated the 18th, he stated with characteristic clearness and eloquence the duty of first inflicting some signal and decisive blow on the Afghans, and then leaving them to govern themselves under the sovereign of their own choice. Unhappily, when he left his council for Upper India, and learned the trifling failure of General England, he instructed Pollock and Nott, who were advancing triumphantly with their avenging columns to rescue the captives, to fall back. Nota word was said of the nine ladies, twenty officers, and fourteen children who were being pursued from prison to prison in the hills, in spite of the heroic efforts of one of their number, Major- General Colin Mackenzie, who still survives, to secure their honourable release. Even such an object as " that of avenging our losses and re-establishing our military character in all its original brilliancy" was declared not now to be justifiable. How this charge was received by the "illustrious" troops of Jellalabad and the advancing conquerors of Ghuznee and Akbar Khan,

the Life of Pollock and the journals of the day testify. The shout of indignation was too much even for Ellenborough, but he only added to it derision when heshirked responsibility by directing Pollock and Nott to retire by the roundabout way of Cabul if they could! The army proved true to the governor-general's earlier proclamation rather than to his later fears; the hostages were rescued, the scene of Sir Alexander Burnes's murder in the heart of Cabul was burned down. Dost Mahomed was quietly dismissed from a prison in Calcutta to the throne in the Bala Hissar, and Ellenborough presided over the painting of the elephants for an unprecedented military spectacle at Ferozepore, on the south bank of the Sutlej. But this was not the only piece of theatrical display which capped with ridicule the horrors and the follies of these four years in Afghanistan. When Sultan Mahmoud, in 1024, sacked the Hindu temple of Somnauth on the north-west coast of India, he carried off, with the treasures, the richly-studded sandal-wood gates of the fane, and set them up in his capital of Ghuznee. The Mahometan puppet of the English, Shah Shooja, had been asked, when ruler of Afghanistan, to restore them to India; and what he had failed to do the Christian ruler of opposing Mahometans and Hindus resolved to effect in the most solemn and public manner. In vain had Major (now Sir Henry) Rawlinson proved that they were only reproductions of the original gates, to which the Ghuznee Moulvies clung merely as a source of offer- ings from the faithful who visited the old conqueror's tomb. In vain did the Hindu sepoys show the most chilling indifference to the belauded restoration. FEllen- borough could not resist the temptation to copy Napoleon's magniloquent proclamation under the Pyramids. The

trophy of successful warfare" than the heroic hostages whose names Lady Sale's Journals, Mackenzie's martyr- like courage, and Vincent Hyre's book have made im- perishable—were conveyed on a triumphal car to the fort of Agra, and there they lie among the old muskets to this day. That Somnauth proclamation was the first step towards its author's recall, but it had the one good result of calling forth Lord

Macaulay's most brilliant philippic in the House of Commons on the 9th March 1843.

Hardly had Ellenborough issued his medal with the legend " Pax Asice Restituta" when he was at war with the Ameers of Sind. The tributary Ameers had on the whole been faithful, for Major (afterwards Sir James) Outram con- trolled them. But he had reported the opposition ofa few, aud Ellenborough ordered an inquiry. His instructions were admirable, in equity as well as energy, and if Outram had been left to carry them out all would have been well. But the duty was intrusted to Sir Charles Napier, with full political as well as military powers. And to add to the evil, Meer Ali Morad intrigued with both sides so effectually that he betrayed the Ameers on the one hand, while lie deluded Sir Charles Napier to their destruction on the other. Ellenborough was led on till events were beyond his control, and his own just and merciful instructions were forgotten. Sir Charles Napier made more than one confession like this: ""We have no right to seize Sind, yet we shall do so, and a very advantageous, useful, and humane piece of rascality it will be." The battles of Meanee and Dubba, or Hydrabad, followed; and the Indus became a British river from Kurrachee to Mooltan, soon to be " red" to its source in the glaciers that fringe Kashgaria. Yet, writing to the Queen on the 27th June 1843, he formally pronouuced his policy "at once just and expedient," after remarking that "it would not be ungrateful to him to be relieved from a government which he has conducted amidst uninterrupted misrepresentations and calumny."

Sind had hardly been disposed of when troubles arose on both sides of the governor-general, who was then at Agra. On the north the disordered kingdom of the Sikhs was threatening the frontier. In Gwalior to the south, the feudatory Mahratta state, there were a strong and large mutinous army, a Ranee only twelve years of age, an adopted chief of eight, and factions in the council of ministers. Instead of citing the authority of the forgotten treaty of Burhanpore, the governor-general might have pled the public security—he did talk of " humanity "—as a reason for demanding that the state should be intrusted to one regent. Our nominee proved incompetent, his rival showed himself a traitor; Tara Ranee swas herself little more than a child; and the

Pretorians controlled the whole. Ellenborough reviewed the danger in the un- answerable minute of Ist November 1845, and told Sir Hugh Gough to advance. Further treachery and military licence rendered the battles of Maharajpore and Punniar, fought on the same day, inevitable though they were, a surprise to the combatants. The governor-general, on his charger, exposed himself with characteristic rashness in the thick of the fight, and when it was over he regaled the wounded with oranges and gifts. The treaty that fol- lowed was as merciful as it was wise. The pacification of Gwalior also had its effect beyond the Sutlej, where anarchy was restrained for yet another year, and the work of civilization was left to Ellenborough's two suc- cessors. The idol of the army, he did not leave India without a military banquet, which the duke of Wellington, in an official letter to the earl of Ripon, full of curious re- miniscences, refused tocondemn. Sir Robert Peel's Govern- ment, which had sent him out, made him a viscount and earl, and put him at the head of the Admiralty. When

desecrated or fraudulent folding doors—more " glorious | again in his old office, as almost the last president of the

Board of Control under Lord Derby, in 1858, he fell into his old impetuosity, by censuring Canning for the con- fiseation of Oudh, which would have been communistic if it had not proved nominal, and, so far, justified by political reasons. To save the Cabinet he resigned. But for this act of rashness, he might have enjoyed the task of carrying into effect the home constitution for the Government of India which he sketched in his evidence before the Select Committee of the House of Commons on Indian Territories on the 8th June 1852. Paying off his old score against the East India Company, he then advocated the abolition of the Court of Directors as a governing body, the opening of the Civil Service to the army, the transference of the government to the Crown, and the appointment of a council to advise the minister who should take the place of the president of the Board of Control. These suggestions of 1852 were carried out by his successor Lord Stanley, now earl of Derby, in 1858, so closely even in details, that Lord

Ellenborough must be pronounced the author, for good or evil, of the present home constitution of the Government of India. After his farewell to official life, the dash and the brilliancy of the earl of Ellenborough found a legitimate ex- pression in his vigilant criticisms of Indian, and his broad and eloquent expositions of European, politics in the House of Lords. To the nation he bequeathed, as his only defence, the publication of his letters already referred to, "' without introduction or comment." He died at his seat, Southam House, near Cheltenham, on the 22d December 1871, at the age of eighty-one. The barony reverted to his nephew, the earldom becoming extinct. One of the most able, and certainly the most erratic, of all the governors-general, he survived six of his successors. In many features of his character he resembled his distinguished father.

For the vexed facts of Ellenboroughs career, and his always forcibly expressed opinions, see History of the Indian Administra- tion (Bentley, 1874), edited by Lord Colchester ; Minutes of Evidence twken before the Select Committee on Indian Territories, June 1852 ; volume i. of the Calcutta Review; the Friend of India, during the years 1842-45 ; and a curious little attack on his Gwalior policy by the Maharaja's superintending surgeon, John Hope, The House of Scindea: A Sketch (Longmans, 1863). General Colin Mackenzie's pamphlets and Sir John Kaye's writings throw further light on the treatment of the captives. The numerous books by

and against Sir Charles Napier, on the conquest of Sind, should be consulted. (G. SM.)

ELLESMERE, Francis Ecrrton, First Earn or (1800-1857), born in London on the 1st January 1800, was the second son of the first duke of Sutherland. He was known by his patronymic as Lord Francis Leveson Gower until 1833, when he assumed the surname of Egerton alone, having succeeded on the death of his father to the estates which the latter inherited from the duke of Bridgewater. Educated at Eton and at Christ Church, Oxford, he entered parliament soon after attaining his majority as member for the pocket borough of Bletchingly, in Surrey. He after- wards sat for Sutherlandshire and for South Lancashire,

which he represented when he was elevated to the peerage as Earl of Ellesmere and Viscount Brackley in 1846. In politics he was a moderate Conservative of independent views, as was shown by his supporting the proposal for establishing the university of London, by his making and carrying a motion for the endowment of the Roman Catholic clergy in Ireland, and by his advocating free trade long before Sir Robert Peel yielded on the question. Appointed a lord of the treasury in 1827, he held the post of chief . Secretary for Ireland from 1828 till July 1830, when he became secretary-at-war. Before the close of the year the administration was broken up, and Lord Francis Leveson Gower did not again hold office. Though he filled a place of some prominence in the political world, his claims to remembrance are founded chiefly on his services to litera- ture and the fine arts. Ere he was twenty he printed for

private circulation a volume of poems, which he followed up after a short interval by the publication of a very creditable translation of Goethe's Faust, one of the earliest that appeared in England. It was accompanied by some happy translations of German lyrics and a few original poems. In 1839 he visited the Mediterranean and the Holy Land. His impressions of travel were recorded in his very agreeably written Mediterranean Sketches (1843), and in the notes to a poem entitled The Pilgrimage. He published several other works in prose and verse, all dis- playing a fine literary taste. His contributions to the Quarterly Review were published in a collected form after his death. His literary reputation secured for him the position of rector of Aberdeen University in 1841. Lord Ellesmere was a munificent and yet discriminating patron of artists. To the splendid collection of pictures which he inherited from the duke of Bridgewater he made numerous additions which greatly enriched it, and he built for it a noble gallery to which the public were allowed free access. His benelovence, while unobtrusive, was unfailing, and his manner had the charm of dignified and yet unaffected courtesy. Lord Ellesmere served as president of the Royal Geographical Society and as president of the Royal Asiatie Society. In 1853 he visited the United States as British commissioner to

the Great Exhibition at New York. In 1855 he was made a K.G. He was one of the trustees of the National Gallery at the time of his death, which occurred on the 18th February 1857.

ELLICHPUR (with Melghat), a district of British India, in the commissionership of East Berar, within the Hyderabad Assigned Districts, lies between 20° 51’ and 21° 46’ N. lat. and 76° 40’ and 78° 30’ E. long. It is bounded on the N. by the Tapti river and the Betul and Chindwaréa districts of the Central Provinces, on the E. by the Wardha river, on the S. by the Amrdoti district, and on the W. by the Nimar and Akola districts. Together with Melghat, it now comprises an area of 2772 square miles, with a population of 344,358, of whom nine-tenths are Hindus. The entire northern half of the district consists of a succession of hills and valleys known as the Melghat or Gawilgarh hills, a section of the Sdtpur4 Mountains. The main ridge or watershed of the Satpurds runs through the district from east to west, attaining its greatest eleva- tion at Bairdt, 3987 feet above sea-level. The southern portion of the district is flat, and drained by numerous small streams flowing into the Wardha and Purnd rivers. The only metalled road is that from Amrdoti to Ellichpur ; but there are several other country roads, and fair weather tracks from village to village passable for eight months in the year. In the hill country, the chief passes are Mallard on the east and Dulghat and Bingard on the west, none of which, however, are practicable for wheeled vehicles. The principal agricultural products are rice and wheat (of excellent quality), gram, pulses, and oilseeds, and these, together with ghz and forest timber, comprise the chief exports of the district. The imports are mainly English and cuuntry cloth, iron and copper utensils, tobacco, salt, sugar, &c. Ellichpur, the principal town, contdins a population of 27,782. It was formerly the capital of the Mahometan governors of the Deccan, and a place of considerable importance.

ELLIOTSON, Dr Jonny, was born at Southwark, London, towards the end of the last century. He studied medicine first at Edinburgh and then at Cambridge, in both which places he took the degree of M.D., and sub- sequently at the Borough Hospitals in London. In 1817 he obtained the post of assistant physician, and six years later that of

physician at St Thomas's Hospital. He there introduced clinical lecturing, a practice which, except at the London Hospital, was at the time nowhere in vogue in

the metropolis. In 1831 he ceased lecturing at St 'Thomas's, and was elected professor of the principles and practice of physic in London University; in 1834 he resigned the physicianship of the former institution, and accepted a similar post at the North London Hospital. In 1837 he espoused the cause of mesmerism, and thus eventually brought himself into collision with the medical committee of the hospital, a circumstance which led him, on December 28, 1838, to resign the offices held by hin there and at the university. In spite of the discourage- ments he had received, he continued the practice of mesmerism, and became in 1849 physician of a mesmeric infirmary. He died July 29, 1868. Dr Elliotson was the discoverer of the communicability of glanders to the human subject, the treatment of neuralgia by acupuncture, and the fact that pain does not necessarily continue till death in cases of perforatiou or rupture of the stomach ; he was the first to prove the value of quinine as an antiperiodic, of strong solution of silver nitrate in erysipelas, of prussic acid in gastrodynia and vomiting (Lancet, 1827, xi. p. 671), and as a means of preparing the stomach for other medicines, of cupric sulphate in chronic diarrhea, aud of creasote, potassium iodide, and ferrous carbonate in other diseases ; and he was moreover one of the earliest among British physicians to advocate the employment of the stethescope.

He wrote a translation of Bluménbach's Jnstitutiones Physio- logice, 1817; Cases of the Hydrocyanic or Prussic Acid, 1820; Lectures.on Diseases of the Heart, 1830; Princtples and Practice of Medicine, 1839 (2nd ed. 1842), a work which has been translated into several languages; Human Physiology, 1840; and Sufgical Operations in the Mesmeric State without Pain, 1843. He was the author of numerous papers in the Transactions of the Medico- Chirurgical Society, of which he was at one time president ; and he also edited a mesmeric journal, The Zoist. He was a fellow both of the Royal College of Physicians and

Royal Society, and the founder and president of the Phrenological Society.

ELLIOTT, Esenezer (1781-1849), the corn-law rhymer, was born at Masborough, Yorkshire, on the 17th of March 1781. His father Ebenezer, a man of vigorous intellect but bigoted in his theological tendencies, exercised a power- ful sway over the mind of the future poet. At school Ebenezer was considered a dull pupil; and his childhood was solitary. A touching autobiographic fragment, which appeared after his death in the Athenceum for 1850, and is republished in Watkins's life of the poet, gives a deeply in- teresting account of his early years. His imagination had an unhealthy craving for the horrible, and gloated over the faces of those who had died a violent death, till he was cured by the sight of a body floating in a canal, in an ad- vanced state of decomposition. A more pleasing part of the autobiography tells of his passion for making models of ships, kites, &c. In a very important sense the child was father of the man in Flliott's case, for "even in those days," he says, " I was a free trader, though I knew it not." His father, exasperated at Ebenezer's persistent indolence at school, put him into the foundry with which he was him- self connected, where the manufacturing processes interested him. The sight of some fine botanical plates in Sowerby's Finglish Botany led him to love flowers, and to gather them as copies for drawing, although not to a taste for botany, "the classifications of which seemed to be like preparations for sending flowers to prison" (Autobiography). In his Sunday rambles he encountered a snake, which fascinated him so much that he visited it weekly, and called it " my first snake-love." This is probably the new form his love for what is generally considered loathsome assumed. These walks, by bringing him in contact with the beauty and freshness of nature, proved the foundation of his passion for poetry, which was first gratified by his brother Giles reading Thomson's Seasons aloud to him. Acting on his first impulse, he rushed out into the garden to verify the

description of the polyanthus and auricula; and his earliest poetic effusion was an imitation of Thomson. He now set about a systematic study of English grammar, but was greatly hindered by amemory singularly defective for rules and classifications, although so strong in other respects that he "almost knew the Bible by heart" when he was twelve years old, and could repeat three books of the Paradise Lost when he was sixteen. About the end of Ebenezer's fourteenth year, a poor curate called Firth bequeathed his library to Mr Elliott—a circumstance which had a great in- fluence on the development of the poet's genius. Barrow, Young, Shenstone, and Milton were special favourites ; and, after he had studied them thoroughly, Shakespeare, Ossian, Junius, Schiller's Aobbers, and Gibbon's Decline and Fall were eagerly read. Elliott's first published poem, Zhe Vernal Walk, was soon followed by Night, or the Legend of Wharneliffe, and the Zales of Night, embracing Bothweli and the Hzxile, dedicated respectively to Southey and Bulwer. Another volume contained Love, The Letter, They Met Again, and Withered Wild Flowers. Then came the epic fragment entitled Spirits and Men. The fruits of his thoughts on political subjects were seen in the anter and the Corn-Law Rhymes, of which a third edition appeared in 1831. His other important poems are Zhe Village Patriarch (1831), The Splendid Village, and the Corn Law Hymns. Many gems are to be found among his M©'scel- laneous Poems; but the dramas entitled Kerhonah and Taurassdes are the least happy of his productions. After his death appeared More Prose and Verse in two volumes, His chief works were published between 1830 and 1836. He carried on business as an iron-founder in Sheffield for 20 years (1821-41), in which he was so successful that he re- tired to an estate at Great Houghton, near Barnsley, in 1841, where he resided till his death, which took place on the lst of December 1849. A few weeks before he died, his daughter was married to John Watkins, his future bio- grapher. Elliott lives in history by his determined opposi- tion to the " bread-tax," as he called the corn laws, the sad results of which he expressed in such terribly vivid lines as the following :— '*T bought his coffin with my bed, My gown bought earth and prayer; I pawn'd my mother's ring for bread, I pawn'd my father's chair." Even when he reached comparative affluence himself, he re- mained the sturdy champion of the poor, whose representa- tive in the Jtéhymes says :—.

‘* And workhouse bread ne’er crossed my teeth, — I trust it never will.” Elliott’s poetry is stamped throughout by the grandeur of his personal character. Transparent sincerity and passion- ate earnestness meet us in every page. His poems are beautifully described by Carlyle as ‘hues of joy and harmony, painted out of troublous tears.” To be a reformer of the world was his ambition; and the purely literary spirit, which looks at life mainly as affording materials for artistic conceptions, was utterly foreign to his nature. Crabbe’s genius cast a spell over Elliott ; although it can scarcely be said that a man of such rugged originality was a slavish imitator of any one. His works reflect the joy with which a poet escapes from the smoke, glare, and noise of city life to drink in the sweet air of country lanes and fields. Yorkshire scenery especially is embalmed in his verse. Although Elliott had no great respect for theological dogma, there is a genuine religious vein in his poetry. His works have engaged the pens of men endowed with loftier literary genius than his own, including Professor Wilson, Southey, Bulwer, and Carlyle.

In addition to the life by Watkins, there is a biography by January Searle ; and an edition of his poems has been issued by his son, the Rev. Edwin Elliott of St John’s, Antigua.

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ELLIS, Gzorcx (1745-1815), a miscellaneous writer dis- tinguished for his services in promoting a knowledge of early English literature, was born in London in 1745. Educated at Westminster School and at Trinity College, Cambridge, he commenced his literary career as a contributor to the Rolliad and the Probationary Odes, political satires directed against Pitt’s administration. He was afterwards, however, on friendly terms with Pitt, and in 1797 he accompanied Lord Malmesbury to Lille as secretary to the embassy. He found continued scope for his powers as a political caricaturist in the columns of the Anéi-Jacobin, to which he was, next to Canning and Frere, perhaps the

most brilliant contributor. For some years before the Antz- Jacobin was started Ellis had been working in the congenial field of early English literature, in which he was one of the first to awaken a new interest. The first edition of his Specimens of the Karly English Poets appeared in 1790 ; an enlarged edition in three volumes was published in 1801. This was followed by Specimens of Harly English Romances in Metre (3 vols. 1805). Hallam speaks of his "' good taste in selection;" and his skill as editor and inter- preter were of much service to less learned readers than himself. Ellis was an intimate friend of Sir Walter Scott, who styled him "the first converser I ever saw," and dedicated to him the fifth canto of AZarmion. He died on the 15th April 1815. The monument erected to his memory in the parish church of Gunning Hill, Berks, bears a fine inscription from the pen of Canning.

ELLIS, Sir Henry (1777-1869), a distinguished antiquarian writer, for many years principal librarian to the British Museum, was born in London of a Yorkshire family in 1777. He was educated at the Merchant Taylors' School, and at St John's College, Oxford, where he took his degree and obtained afellowship. After having held for a few months a sub-librarianship in the Bodleian, he was appointed to a similar post in the British Museum in 1800. In 1827 he became chief librarian, and he dis- charged the duties of the office with great efficiency and urbanity until 1856, when he resigned on account of advancing age. During the reign of William IV. he was made a knight of Hanover. He died on the 15th January 1869. Sir Henry Ellis's life was one of very considerable literary activity. His first work of importance was the preparation of a new edition of Brand's Popular Antiquities, which appeared in 1813. In 1816 he was selected by the Commissioners of Public Records to write the introduc- tion to Domesday Book, a task which he discharged with much learning, though several of his views have not stood the test of later criticism. His Original Letters Illustrative of English History (first series, 1824; second series, 1827) are compiled chiefly from manuscripts in the British Museum and the State Paper Office, and have been of con- siderable service to historical writers. To the Library of Entertaining Knowledge he contributed four volumes on the Elgin and Townley Marbles. Sir Henry was for many years joint-secretary of the Society of Antiquaries.

ELLIS, Witiram (1794-1872), one of the most devoted and successful of modern missionaries, was born in London on the 29th August 1794. When he was about four years old his father, who was a working man, removed with his family to Wisbeach, where accordingly his boyhood was spent. His school education was even scantier than boys of his class at that time usually received, but being naturally bright and intelligent he did much to supply the deficiency by his own efforts. When about twelve years of age he was put to work with a market gardener. He showed an enthusiastic interest in gardening work, and continued to be engaged in it under various employers until 1814. In that year having come under serious

the London Missionary Society, and after due inquiry the offer was accepted. The year which was allowed him for training was devoted not merely to the study of theology at Homerton, but to the acquisition of various practical arts, such as printing and bookbinding, which proved of the utmost service to him in the mission field. Having been ordained he sailed for the South Sea Islands in January 1816, and reached his destination after a voyage of thirteen months' duratiou. He remained in Polynesia, occupying various stations in succession, until 1824, when he was compelled to return home on account of the state of his wife's health. Though the period of his residence in the island was thus comparatively short, his labours were very fruitful, contributing perhaps as much as those of any other missionary to bring about the extraordinary improve-

'ment in the religious, moral, and social condition of the

Southern Archipelago that has taken place during the present century. He was not only unwearied in his efforts to promote the immediate spiritual object of his mission, but he introduced many secondary aids to the improvement of the condition of the people. His gardening experience enabled him successfully to acclimatize many species of tropical fruits and plants, which now form an important source of wealth to the islanders ; and he had the distinc- tion of setting up and working the first printing-press in the South Seas. Ellis and his wife

availed themselves for their journey home of an American vessel, which landed them free of all charge at New Bedford, Massachusetts, in the spring of 1825. They remained for some months in the United States, where they were exceedingly well received, and Ellis excited much interest in the mission with which he was connected by attending numerous public meetings held in support of its claims. For several years after his return to England, he was employed as a travelling agent of the London Missionary Society, whose schemes he explained and advocated in nearly every important town of the United Kingdom. In the midst of this busy life he found time to publish his Zour through Hawaii (1826), which had been written in the course of his journey home, and his Polynesian Researches (2 vuls., 1829), a work which Southey in the Quarterly Review characterized as one of the most interesting he had ever read. In 1832 he was appointed foreign secretary to the London Missionary Society, the state of his wife's health rendering the long cherished prospect of a return to the South Seas hope- less) He discharged the duties of the office with great efficiency for seven years, when threatened cerebral disease compelled him to resign it. In the interval his first wife had died, and he had married in 1837 Miss Sarah Stickney, authoress of The Poetry of Life, The Women of England, and many other well-known works. Just before resigning the secretaryship he published his History of Madagascar, and thus first established between his name and that island a connection which was destined to be honourable and en- during in no common degree. After a season spentin Pau, of which Mrs Ellis has given a most interesting account in her Summer and Winter in the Pyrenees, Mr Ellis and his wife returned to England in 1841, and took up their resid- ence in a beautiful country house at Rose Hill, Hoddesdon, Hertfordshire. Here he continued to show unabated interest and almost unabated activity in the business of the Society with which he had been in one capacity or another so long connected. By desire of the directors he undertook a history of the society, the first volume of which appeared in 1844, though pressure of other work prevented its com- pletion. In 1847 he accepted the pastorate of the little congregational church at Hoddesdon, which had been re- vived and strengthened mainly through his exertions.

After a few years his quiet life was interrupted by a call

religious impressions, he offered himself as a missionary to! from the London Missionary Society to proceed to Mada-

gascar in order to inquire into the prospects for the resump- tion of the missionary enterprise there, which had been checked for several years owing to the bitter hostility of the reigning queen. Between 1853 and 1857 he paid three visits to that island, of which he has given a full account iu his Zhree Visits to Madagascar (1858), one of the most profoundly interesting and romantic narratives in the whole literature of missions. In reading it one scarcely knows whether to admire most the fearlessness, the undeviating regard for principle, or the discretion, with which he dis- charged a most delicate and difficult negotiation, and won in the end a signal triumph for free Christianity. Though its primary interest is religious, the work contains much valuable scientific information. At the invitation of the directors of the society, Ellis undertook another journey to Madagascar in 1863, when he was close upon seventy years of age. Of this he gave an account in his Madagascar Revisited (1867). He died on the 25th June 1872. In addition to the works already mentioned, Ellis was the author of A Vindication of the South Sea Missions from the Misrepresentations of Otto Von Kotzebue (1831), and Village Lectures on Popery (1851).

Mrs Ellis survived her husband only a few days. Fora . considerable number of years she conducted a ladies' school in Hertfordshire on principles which she had carefully thought out, and which are explained in her Rawdon House (1848). She wrote upwards of thirty works, most of which were very popular.

ELLOR, or Extur, a town of British India, in the Goddvari district, in the presidency of Madras, situated on the bank of the Tammaler river, in 16° 43' N. lat. and 81° 10' E. long. The town contains a population of 25,487 persons, made up as follows : Hindus, 20,253; Mahometans, 5046; Christians, 188. llor is a municipality, and the chief town of the ¢déluk or sub-district of the same name. The town, which is clean and

healthy, with well- shaded roads, is the headquarters of an executive engineer, with magisterial and civil courts, post-office, school, &c.; it is also a station of the Church Missionary Society and of the Lutheran Mission. The municipal income in 1875-76 amounted to £769, and the expenditure to £957. The chief industry of the place is the manufacture of woollen carpets. Ellor was formerly a military station.

ELLORA, a town of India, in the native state of Hyderabad, near the city of Dowletabad, situated in 20° 2’ N. lat. and 75° 13’ E. long. In a mountain near this town there are some remarkable excuvations, containing mythological symbols of the Hindu worship, and temples ornamented with statues of mauy of the deities. The principal figures are those of Indra, the god of the firma- ment, and his consort Indrdéni. Besides these, there are some figures of the deities and incarnations adored by the Jains, the followers of Buddha and Parisndth; but all of them have been forsaken by the priests. The Temple is said to have been executed by Rajah Edu of Ellichpur, who was cured of a cutaneous disorder by a spring near the place, and in gratitude gave orders for the construction of the shrine. It measures 138 feet in front, and in the interior extends 247 feet in length by 150 feet in breadth, and is in some places 100 feet high. A minute account of these curious antiquities is contained in the sixth volume of the Aseatic Researches and in Fergusson’s Listory of Indian and Eastern Architecture. See also article Arcui- TECTURE, vol. ii. pp. 394-395. Ellora was ceded in 1818 by Holkar to the British, who transferred it to the Nizim in 1822 by the treaty of Hyderabad.

ELLSWORTH, a city of the United States, capital of Hancock county, Maine, is situated 25 miles east of Bangor, on the Union river, about four miles from its mouth. As the port of entry for the district of Frenchinan’s Bay, and

the seat of an extensive trade in timber, it enjoys great commercial prosperity ; and, besides a considerable variety of wooden wares, it manufactures iron, brass, sailcloth, carriages, and sledges. Population in 1840, 2263; in

1870, 5257.

ELLWOOD, Tuomas (1639-1713), an English author, chiefly celebrated from his connection with Milton, was born at Crowell, in Oxfordshire, in 1639. ‘he principal facts of his life are related in a very interesting antobiography, which contains much information as to his intercourse with the poet. While he was still young his father removed to London, where Thomas became acquainted with a Quaker family named Pennington, and was led through their influence to connect himself with the Society of Friends. The change was very distasteful to his father, and the autvbiography gives a full account of the persecution to which he was subjected on account of it. It was through the Penningtons that he was introduced in 1661 to Milton in the capacity of Latin reader. He spent nearly every afternoon in the poet’s house in Jewin Street, until the intercourse was interrupted by an illness which compelled him to go to the country. Aftcr a period of imprisonment at Aylesbury for Quakerism, Ellwood resumed his visits to Milton, who was now residing at a house his Quaker friend had taken for him at Giles Chalfont. It was during this residence in the country that the poet gave hiin the manuscript of the Paradise Lost to read, and did him the honour of asking his opinion of it. In returning the manuscript Ellwood suggested “ Paradise ound ” as a sub- ject; and when Milton long afterwards in London showed him Paradise Regained, it was with the remark, “ This is owing to you, for you put it into my head at Chalfont.” Ellwood was the author of several polemical works, of which Forgery no Christianity (1674) and The Foundation of Tithes Shaken (1682) deserve mention. His Sacred Histories of the Old and New Testaments appeared in 1705 and 1709. He died in 1713. His autobiography was published in the following year. Another edition appeared iy FP) 1.

ELM, the popular name for the trees and shrubs con- stituting the genus Ulmus, of the natural order Ulmacece. The Common Elm, U. campestris, a doubtful native of England, is found throughout great part of Europe, in North Africa, and in Asia Minor, whence it ranges as far east as Japan. It grows on almost all soils, but thrives best on a rich loam, in open, low-lying, moderately moist situations, attaining a height

of 60-100, and in some few cases as much as 130 or 150 feet. The branches are numerous and spreading, and often pendulvus at the extremities; the bark is rugged; the leaves are alternate, ovate, rough, doubly serrate, and, as in other species of Ulmus, unequal at the base (see vol. iv. p. 109, fig. 100) ; the flowers are small, lermaphrodite, numerous, in purplish brown tufts, and each with a fringed basal bract, have a four-toothed campanulate calyx, four stamens, and two styles, and appear before the leaves in March and April; and the seed-vessels are green, membranous, one-seeded, and deeply-cleft. Unlike the wych elm, it rarely perfects its seed in England, where it is propagated by means of suckers from old trees, or preferably by layers from stools. In the first ten years of its growth it ordinarily reaches a height of 25-30 feet. The wood, at first brownish-white, becomes, with growth, of a brown colour having a greenish shade, It is close-grained, free from knots, without: ap- pareut medullary rays, and is hard and tough, but will not take a polish. All parts of the trunk, including the sapwood, are available in carpentry. By drying, the wood loses over 60 per cent. of its weight, and has then a specific gravity of 0°588, It has considerable transverse strength, does not crack when once scasoned, and is

remarkably durable under water, or if kept quite dry ; though it decays rapidly on exposure to the weather, which in ten to eighteen months causes the bark to fall off, and gives to the wood a yellowish colour—a sign of deteriora- tion in quality. To prevent shrinking and warping it may be preserved in water or mud, but it is best worked up soon after felling. Analyses of the ash of the wood have given a percentage of 47°8 per cent. of lime, 21°9 per cent. of potash, and 13°7 per cent. of soda. In summer, elm trees often exude an alkaline gummy substance, which by the action of the air becomes the brown insoluble body termed ulmin. Elm wood is used for keels and bilge-planks, the blocks and dead-eyes of rigging, and ships' pumps, for coffins, wheels, furniture, carved and turned articles, and for general carpenters' work ; and previous to the common employment of cast-iron was much in request for water- pipes. The inner bark of the elim is made into bast mats and ropes. It contains mucilage, with a little tannic acid, and was formerly much employed

for the preparation of an antiscorbutic decoction, the decoctum ulmi of pharmacy. The bark of Ulmus fulva, Michaux, the Slippery or Red Elm of the United States and Canada, serves the North American Indians for the same purpose, and also as a vulnerary. The leaves as well as the young shoots of elms have been found a suitable food for live stock. For orna- mental purposes elm trees are frequently planted, and in avenues, as at the park of Stratfieldsaye, in Hampshire, are highly effective. They were first used in France for the adornment of public walks in the reign of Francis 1. In Italy, as in ancient times, it is still customary to train the vine upon the elm—a practice to which frequent allusion has been made by the poets. Among the small-leaved varieties of U. campestris are the species U. Berardi and U. fastigiata ; besides these there are several slender kinds with variegated leaves.

The Wych Elm, or Wych Hazel, U. montana, is in- digenous to Britain, where it usually attains a height of about 50 feet, but among tall-growing trees may reach 120 feet. It has drooping branches, and a smoother and thinner bark, larger and more tapering leaves, and a far less deeply notched seed-vessel than U. campestris. The wood, though raore porous than in that species, is a tough and hard material when properly seasoned, and, being very flexible when steamed, is well adapted for boat-building. Branches of the wych elm were formerly manufactured into bows (see vol. ii. p. 372), and if forked were employed as divining- rods. The Weeping Elm, the most ornamental member of the genus, is regarded as a variety of this species. The Dutch or Sand Elm is a tree very similar to the wych elm, but produces inferior timber. The Cork-Barked Elm, U. suberosa, is distinguished chiefly by the thick deeply-fissured bark with which its branches are covered. The American or White Elm, U. americana, is a hardy and very handsome species, of which the old tree of Boston Common (U.S.) was a representative. 'This tree is supposed to have been in existence before the settlement of Boston, and at the time of its destruction by the storm of the 15th February 1876 measured 22 feet in circumference.

See ARBORICULTURE, Vol. ii. p. 317 ; Loudon, Arboretum Britan- nicum, vol. lit. 1838.

ELMACIN, Exmactrnus, or Enmakyn, Gzorer (1223- 1273), author of a history of the Saracens, and known in the East by the name of Ibn-Amid, was a Christian of Egypt, where he was born in the year 1223. He occupied the place of ketib or secretary at the court of the sultans of Egypt, an office which was usually filled by Christians. His history consists of annals which extend from the time of Mahomet till the year 1117. It is principally occupied with the affairs of the Saracen empire, but contains some passages relating to the Eastern Christians, In 1238 he |

succeeded his father, Yaser Al Amid, who had held the office of secretary to the council of war under the sultans of Egypt for forty-five years. Elmacin died at Damascus in 1273. His history was published, in Arabic and Latin, at Leyden in 1625.

ELMES, Harvey Lonspaze (1814-1847), the architect of St George's Hall, Liverpool, was the son of James Elmes (see next article), and was born at Chichester in 1814. After serving some time in his father's office, and under a surveyor at Bedford and an architect at Bath, he became partner with his father in 1835, and in the following year he was the successful competitor among 86 for a design for St George's Hall, Liverpool. The foun- dation stone of this building was laid on the 28th June 1838, but Elmes being successful in a competition for the Assize Courts in the same city, it was finally decided to include the Hall and Courts in a single building. In ac- cordance with this idea, Elmes prepared a fresh design, and the work of erection commenced in 1841. He superin- tended its progress till 1847, when from failing health he was compelled to delegate his duties to C. R. Cockerell, R.A., and leave for Jamaica, where he died of consump- tion on the 26th November 1847.

ELMES, Jamxs (1782-1862), father of the preceding, an architect, civil engineer, and writer on the arts, was born in London 15th October 1782. He was educated at Merchant Taylors' School, and, after studying building under his father, and architecture under Mr George Gibson, became a student at the Royal Academy, where he gained the

silver medal in 1804. He designed a large number of buildings in the metropolis, and was surveyor and civil engineer to the port of London, but is best known as a writer on the arts. In 1809 he became vice-president of the Royal Architectural Society, but this office, as well as that of surveyor of the port of London, he was compelled through partial loss of sight to resign in 1828. He died at Greenwich April 2, 1862.

Besides contributing largely to periodical literature, he is author of Sir Christopher Wren and his Times (1823), Lectures on Archi- tecture (1823), The Arts and Artists (1825), General and Bioyraphi-

cal Dictionary of the Fine Arts (1826), Treatise on Architectural Jurisprudence (1827), and Lhomas Clarkson ; a Monograph (1854).

ELMINA, a town and fort on the Gold Coast, Upper Guinea, West Africa, now a British possession, is situated on a peninsula bounded on the north by the River Benyan or Beyuh, about six miles west of Cape Coast Castle, in 5° 4′ 45” N. lat. and 1° 20’ 30” W. long. The streets of the native town are narrow and dirty, but there are a con- siderable number of neat and spacious cottages, occupied by the officials and merchants. The inhabitants are chiefly merchants and their servants, fishers, and mechanics. The river could at one time be entered by schooners, but on account of a bar having formed at its mouth it 1s now ac- cessible only to small boats. Elmina is the earliest European settlement ou this coast, and was established by the Por- tuguese as early as 1481, under the name of Sido-Jorge da Mina. Soon after landing they commenced to build the castle now known under the name of Fort St George, but it was not completed till eighty years afterwards. Another defensive work is Fort St Ingo, built in 1666, which is behind the town and at some distance from the coast, Elmina was captured by the Dutch in 1637, and ceded to tllem by treaty in 1640. Along with the Dutcli possessions on the Guinea Coast, it was, in return for certain commercial privileges, transferred to Great Britain, April 6, 1872. The king of Ashantee, claiming to be its superior, objected to its transfer, and the result was the Ashantee war. During

this war the king's quarter was bombarded and laid in ruins by the British, June 13, 1873. The population of Elmina is about 10,000.

ELMIRA, a city of the United States, capital of Chemung county New York, is situated in a fertile valley on the Chemung river, and on the Erie and Northern Central railroads, 274 miles W.N.W. of New York. By the Chemung Canal it is connected with Seneca Lake, 20 miles distant, and by the Junction Canal with the interior of Pennsylvania. Its principal buildings are the fine court- house, the female college, attended by about 120 students, the high and normal schools, and the free academy. It has iron and steel works, breweries, tanneries, and manu- factories of boots and shoes, edge tools, and pianos. Elmira was settled in 1788, was incorporated as a village under the name of New Town in 1815, received its present name in 1823, and obtained a city charter in 1864. The popula- tion in 1870 was 15,863.

EL-OBEID, Leserp, or OBerpu, the chief town of the country of Kordofan, in Africa, and the seat of an Egyptian governor, is situated at a height of 1700 feet above the sea, at the foot of Jebel Kordofan, about 150 miles west of the Bahr-el Abiad, or White Nile, in 13° 15' N. lat. and 30° 7' E. long. It is scattered over a large area, and in fact consists of several distinct townships, each inhabited by a different race. Most of the houses are mere mud huts, which require to be rebuilt or extensively repaired every year after the rainy season; but, besides the governor's residence, there are three barracks, a gun- powder magazine, a hospital, and six mosques. Strong fences of thorny brushwood have to be maintained by every household as a protective against the wild beasts that invade the town by night. Though the wells have been sunk to a depth of nearly 100 feet, water is fre- quently scarce. The inhabitants make plaited work of- palm-leaf fibres and beautiful silver filigree; and a con- siderable trade is carried on in gum, gold, and ivory with Darfur and other neighbouring countries. The population is estimated at from 12,000 to 20,000.

ELOI, Sr (588-659), originally a goldsmith, but after- wards bishop of Noyon, was born at Cadillac, near Limoges, in 588. Having manifested at an early age a decided talent for the art of design, he was placed by

his parents with the master of the mint at Limoges, where he made rapid progress in goldsmith's work. He became coiner to Clotaire II. of France, and treasurer to his successor Dugabert. Both kings intrusted him with important works, among which were the composition of the bas-reliefs which ornament the tomb of St Germain, bishop of Paris, and the execution (for Clotaire) of two chairs of gold, adorned with jewels, which at that time were reckoned chefs-d'ccuvre. Though he was amassing great wealth, Eloi acquired a distaste for a worldly life, and resolved to become a priest. At first he retired to a monastery, but' in 640 was raised to the bishopric of Noyon. He made frequent missionary excursions to the pagans of Brabant, and also founded a great many monas- teries and churches. He died Ist December 659.

His life has been written by his friend and contemporary St Ouen ; and a French translation of this life by the Abbé La Roque,

together with 16 homilies said to have been written by St Eloi, was published at Paris in 1693.

EL PASO, or Et Paso Det Nort, a town of Mexico, in the state of Chihuahua, situated on the Rio Grande, ina narrow valley near the frontier of New Mexico, 340 miles W.S.W. of Santa Fé, 31° 42' N. lat., 106° 40' W. long. The name is often applied to a whole group of small settle- ments on the Rio Grande, but belongs properly to the largest of their number, which owes its origin to the establishment of a military post. It is situated in the

chief thoroughfare between New Mexico and Chihuahua. The town is a mere collection of brick huts without windows, and with earthen floors. In the district the vine is largely cultivated, and wine and brandy are manufac- tured. On account of the fertility of the soil the inhabi- tants enjoy an abundance of material luxuries, but they are totally ignorant of most of the appliances of civilized life. The population is about 6000.
. ELPHINSTONE, Tur Honouraste Movuntstuart (1779-1859), an eminent Indian statesman, fourth son of the eleventh Baron Elphinstone in the peerage of Scotland, was born in 1779. Having

received an appointment in the civil service of the East India Company, of which one of his uncles was a director, he reached Calcutta in the beginning of 1796, After filling several subordinate posts, he was appointed in 1801 assistant to the British resident at Poonah, at the court of the Peishwa, the most powerful of the Mahratta princes. Here he obtained his first opportunity of distinction, being attached in the capacity of diplomatist to the mission of Sir Arthur Wellesley to the Mahrattas. When, on the failure of negotiations, war broke out, Elphinstone, though a civilian, acted as virtual atde-de-camp to General Wellesley. He was present at the battle of Assaye, and displayed such courage and knowledge of tactics throughout the whole campaign that Wellesley told him he had mistaken his profession, and that he ought to have been a soldier. In 1806, when the war closed, he was appointed British resident at Nagpore. Here, the times being uneventful and his duties light, he occupied much of his leisure in reading classical and general litera- ture, and acquired those studious habits which clung to him throughout life. In 1808 he was placed at the head of a most important political mission to Central Asia, being appointed the first British envoy to the court of Cabul, with the object of securing a friendly alliance with the Afghans in view of a possible French invasion. The negotiations, protracted and difficult, resulted in a treaty securing what the English wished ; but it proved of little value, partly because the danger of invasion had passed away, and partly because the Shah Shuja was driven from the throne by his brother before it could be ratified. The most valuable permanent result of the embassy was the literary fruit it bore several years afterwards in Elphinstone's great work on Cabul. After spending about a year in Calcutta arranging the report of his mission, Elphinstone was appointed in 1811 to the important and difficult post of resident at Poonah. ~The difficulty arose from the general complication of Mahratta politics, and especially from the weak and treacherous character of the Peishwa, which Elphinstone rightly read from the first. While the mask of friendship was kept up Elphinstone carried out the only suitable policy, that of vigilant quiescence, with admirable tact and patience; when in 1817 the mask was thrown aside and the Peishwa ventured to declare war, the English resident proved for the second time the truth of Wellesley's assertion that he was born a soldier.

Though his own account of his share in the campaign is characteristically modest, one can gather from it that the success of the English troops was chiefly owing to his assuming the command at an important crisis during the battle of Kirkee. When Poonak fell he humanely exerted himself with almost complete success to prevent a seemingly inevitable sack of the town by the incensed soldiers. The Peishwa being driven from his throne, his territories were annexed to the British dominions, and Elphinstone was nominated commissioner to administer them. He discharged the responsible task with rare judg- ment and ability. The characteristic feature of his policy was his scrupulous regard for the customs, interests, and wishes of the native population, in so far as these were VIII. — 20

compatible with the British supremacy. Recognizing the deep-seated conservatism of the Hindu character, he avoided needless change, and sought rather to develop what reforms seemed essential from within than to impose them from without. With this view he preserved as far as possible the native system of administration of justice, and maintained the landholders and chiefs in the possession of their rights and privileges. His conciliatory administration not only drew to him personally the attachment of all classes, but was of the utmost benefit in confirming the British authority in the newly annexed territory, which might easily have been brought by a different policy to throw off the yoke.

So high was Elphinstone's reputation for administrative ability, that, when the lieutenant-governorship of Bombay fell vacant in 1819, the Court of Directors appointed him to the position in preference to two candidates of distin- guished merit who were both his seniors. He entered upon his new duties in 1820, and discharged them until 1827, when he was succeeded by Sir John Malcolm. The period was tranquil, and the governor devoted himself to internal reforms with that happy combination of zeal and discretion which always distinguished him. His principal achieve- ment was the drawing up of the Elphinstone code, which for comprehensiveness, clearness, and equity takes' a high rank

among works of its class. He faithfully carried out the policy of retrenchment prescribed by the East India Company, and it may be noted as characteristic that he commenced his economic reforms by reducing the Govern- ment House establishment. His efforts to promote native education, however, had probably more beneficial and far-reaching results than any other department of his activity. He may fairly be regarded as the founder of the system of state education in India, and he probably did more than any other Indian administrator to further every likely scheme for the promotion of native education. Adhering to the policy he had adopted at Poonah of respecting the customs, Opinions, feelings, and even—wherever possible— the prejudices of the native population, he won their attachment in quite an exceptional degree. Bishop Heber, who specially admired his zeal in the cause of education, spoke of him as one of the most extraordinary men and cer- tainly the most popular governor that he had fallen in with. Of his popularity remarkable proof was afforded both by natives and Europeans when he resigned his post. The farewell addresses which poured in upon him were almost innumerable; and his connection with the presidency was most appropriately commemorated in the endowment by the native conlmunities of the Elphinstone College, and in the erection of a statue in marble by the European inhabi- tants of the presidencies.

Elphinstone spent nearly two years on the journey home, visiting Egypt and Palestine, and many of the scenes in Greece and Italy with which he was already familiar as an ardent student of classical literature. On his arrival in England the choice was open to him of a distinguished career in home politics or the highest place in the management of Indian affairs. But he was deficient in ambition, and his health had suffered so much from his residence in India that he deemed himself dis- qualified for public life. Accordingly, although the governor-generalship of India was twice offered to him in the most flattering terms within a few years of his return, he declined it on both occasions; and he resisted with equal firmness all attempts to induce him to enter the home parliament. It is understood that he declined the offer of a peerage. The retirement in which he spent the last thirty years of his life, however, was far from being either indolent or dishonourable. He

kept up the habit of study he had acquired in India, he made contributions of the highest

ELP ALN Sr ems

value to literature, and he preserved until his death the liveliest interest in the affairs of the great empire which had been the scene of his activity. His advice was always taken and generally followed in difficult questions of Indian policy, and he kept up constant communication by correspondence and otherwise with leading Indian administrators, so that his personal influence continued to be an important factor in the government of India almost to the day of his death. He had long before his return from India made his reputation as an author by the work on Cabul already mentioned, which was published in 1815 with the title An Account of the Kingdom of Cabul and tts Dependencies in Persia and India. Soon after his arrival in England he commenced the preparation of a work of wider scope, a history of India, which was published in 1841. It embraced the Hindu and Mahometan periods, and is generally regarded as a work of the highest authority. Its chief features are thoroughness of research, judicious use of materials, and condensation of style.

Mr Elphinstone died at his residence at Limpsfield, in Surrey, on the 20th November 1859. (w. B. 8.)

ELPHINSTONE, Wirriam (1431-1514), a Scottish prelate and statesman of considerable eminence, was born at Glasgow in 1431. He received his education at the grammar school and the university of that city, and took his degree as M.A. about his twentieth year. Having received ordination, he was appointed priest of the church of St Michael's, Glasgow, an office which he held for four years. Heafterwards studied civil and canon law in the university of Paris, where in due time he became professor, and for six years discharged the duties of his office with great reputation. On his return to Scotland on the invita- tion of Bishop Muirhead, after an absence of nine years, he was successively appointed official of Glasgow, St Andrews, and Lothian. In the year of his return he was made rector of the university of Glasgow. In 1478 he was admitted a member of the Privy Council;

and on the occasion of a misunderstanding between James III. of Scotland and Louis XI. of France, his powerful mediation at the latter court, in conjunction with the bishop of Dunkeld and tlie earl of Buchan, effected an amicable reconciliation. For the diplomatic ability which Elphinstone on this occasion displayed the king rewarded him with the see of Ross, from which he was translated to that of Aberdeen about 1484. He subsequently held the office of chancellor of the kingdom ; and besides carrying on negotiations with the English king, he acted as mediator between James and the discontended nobility. During his residence at Aberdeen, Elphinstone appears to have declined all inter- ference with public affairs of a political nature, and to have confined himself to the discharge of his episcopal duties. But when James IV. ascended the tlirone, he was chosen in 1488 ambassador to the emperor Maximilian, in order to negotiate a marriage between his royal master and the emperor's daughter. The bishop's mission failed in the object for which it was set on foot, but was the means of terminating an enmity which had long existed between the Dutch and Scots. The masterly manner in which he con- ducted this affair raised him in the estimation of James, – who generally consulted him and followed his advice in every affair of importance. From 1492 till the close of his life he held the office of lord privy seal. Elphinstone was also a zealous patron of learning. It is generally believed that the establishment of a university at Aberdeen was entirely owing to his influence with the pope, from whom he obtained a bull for that purpose; and it was almost entirely by his exertions that King's College was undertaken and completed. At his death, which took place on the 25th October 1514, at the advanced age of eighty-three, he bequeathed a sum of 10,000 pounds

Scots for its erection and endowment, as well as for the maintenance of a bridge over the Dee. Besides a history of Scotland, now preserved among the Fairfax MSS. in the Bodleian Library, Elphinstone wrote a book of canons and some lives of Scottish saints.

EL ROSARIO, a town of Mexico, in the state of Xinoloa, 55 miles east of Mazatlan. At one time its gold and silver mines attracted a large number of diggers, but they are no longer wrought, and it is now of importance chiefly as a depét for the trade with Mazatlan and the interior. Population about 5000.

ELSINORE, or Exstneur (Danish, Hetsrn@or), a sea- port town of Denmark, is situated in the district of Frederiksborg, on the east coast of the island of Seeland, 56° 2’ N. lat., 12° 38’ E. long. It stands at the narrowest part of the Sound, opposite the Swedish town of Helsingborg, which is only about three miles distant, and with which the means of intercourse are ample. The town is well built, but its streets are somewhat irregular. Until 1857, Sound dues were paid to it by all foreign vessels, except those of Sweden, going to or from the Baltic. Its harbour is small, but the roadstead affords excellent anchorage, which is largely taken advantage of by shipmasters detained by adverse winds. Its import and export trades are gradually increasing, coal comprising the chief portion of the former, and the latter being principally the supply of provisions to passing ships. Elsinore was raised to the rank of a town in 1425, In 1522 it was taken and burnt by Liibeck, but in 1535 was retaken by Christian II. It is celebrated as the scene of Shakespeare’s tragedy of Hamlet, and it was the birth-place of Saxo-Grammaticus, from whose history the story of Hamlet is derived. A pile of rocks surrounded by trees is yet shown to travellers as the grave of Hamlet, and Ophelia’s brook is also pointed out, but both are of course mere inventions. Ona tongue of land east of the town stands the castle of Kronberg or Kronenberg, a magnificent, solid, and venerable Gothic structure built by Frederick IL towards the end of the 16th century. It was taken by the Swedes in 1688, but its possession was again given up to the Danes in 1660. Its strength has been increased greatly by modern fortifications, and it has accommodation for 1000 men. From its turrets, one of which serves as a lighthouse, there are fine views of the straits and of the neighbouring countries. Within it the principal object of interest is the apartment in which Matilda, queen of Christian VIL and sister of George III. of England, was imprisoned before she was taken to Hanover. North-west of the town is Marienlyst, originally a royal chateau, but now a hotel

aud bathing establishment. The population of Elsinore in 1870 was 8891.

ELVAS (the ancient Helvas), a fortified frontier city of Portugal, in the Portalegre district of the province of Alemtejo, is situated near a: sub-tributary of the Guadiana, on a hill belonging to the mountain chain of Zoledo, 105 miles east of Lisbon and 10 miles west of the Spanish town of Badajoz, with which towns it is connected by rail- way. Its streets are winding, narrow, and dirty, and many of the Moorish buildings which gave the town a somewhat venerable aspect are fast crumbling to ruins. It is the seat of a bishopric, and has four parish churches, one of which is a cathedral, seven conventual buildings, a theatre, an arsenal, and a hospital. It is supplied with water by means of a large Moorish aqueduct. It carries on a large contra- band trade with Spain, especially in articles of English manufacture ; and has also manufactories for hardware and jewellery. The surrounding country is very fruitful, and affords large supplies of oil, wine, and vegetables. Elvas is the largest and strongest fortress of Portugal. It is de- fended by seven bastions which surround the town, and by two forts—Santa Luzia and Nostra Senhora da Graca—

which command the whole neighbourhood. Elvas was a place of great importance during the Peninsular war. It was taken by Marshal Junot in March 1808, and held by the French till August, when it was given up in terms of the convention at Cintra. The population in 1869 num- bered 11,088.

ELY, a city of Cambridgeshire, is situated on a con- siderable eminence in the Isle of Ely, near the Ouse, 16 niles N.N.E. of Cambridge. It consists chiefly of one long-street, and the houses are mostly old. The soil in the vicinity is very fertile, and is cultivated chiefly by market gardeners, who send large quantities of fruit and vegetables to the London market. The town has a considerable manufactory for earthenware and tobacco pipes, and there are several mills in the isle for the preparation of oil from flax, hemp, and cole-seed. The market-day is Thursday. Besides the churches and the cathedral, the chief

public buildings are the grammar-school founded by Henry VIII., the new corn exchange, the mechanics' institute, and the sessions house. Needham's charity school has recently been developed into a considerable school of the second grade. The national and infant schools are large and com- modious. A monastery was founded here about 670; but in 870 it was pillaged and destroyed by the Danes, and it re- mained in ruins till 970, when it was restored by Ethel- wold, bishop of Winchester. In 1107 PY.

Ely was erected into a bishopric by Henry I., and after the dissolution of the monasteries, Henry VIII. converted the conventual church into a cathedral. This edifice displays a singular mixture igo of various styles of architecture, and has |||} an unfinished appearance, but taken as a whole it is a noble structure. The nave, which is Late Norman, was pro- bably completed about the middle of the 12th century, and the western tower and the transepts were built by Bishop Ridal (1174-1189), The Galilee or western ; porch, which is Early English, was erected by Bishop Eustace (1198-1215). The choir was originally Early Norman, but its Norman apse was destroyed, and the church extended eastward by six more arches, by Bishop Northwold, about the middle of the 13th century. The addition is Early English, and its carving is very elaborate and beautiful. The beautiful lady-chapel was begun by Bishop Hotham,

Arms of Ely Bishopric.

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Ground-plan of Ely Cathedral.

and when the Norman tower erected by Abbot Simeon fell in 1321, the same bishop rebuilt it enlarged in the form of an octagon, and crowned it with a lofty lantern. This addition, as well as the lady-chapel, was designed by Alan of Walsingham. The total length of the cathedral from east. to west is 525 feet, and the western tower is 220 feet high. The interior is exceedingly beautiful, and contains many interesting monuments. The cathedral has lately undergone extensive restoration under the direction of Sir G. G. Scott, R.A., which is still in progress, and has

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already cost more than £60,000. The church of the Holy Trinity, which is attached to the cathedral, was commenced in the reign of Edward II, and is one of the most perfect buildings of that age. St Mary's church is also a hand- some structure, partly in the Norman and partly in the Early English style of architecture. The pcpulation of the two parishes of Ely, including an extensive rural district, in 1871 was 8166.

ELYSIUM, a name given by the Greeks to the abode of the righteous dead, who, in the words of Pindar, inherit, there a tearless eternity (Ol., ii. 120). In the Odyssey, iv. 563, this region, which answers to the Hindu

Sutala, is spoken of as a plain at the end of the earth, where the fair-haired Rhadamanthys lives, and where the people are vexed by neither snow nor storm, heat nor cold, the air being always tempered by the zephyr wafted to them from the ocean. In the Hesiodic Weeks and Days, 166, the same description is given of the islands of the blessed, which yield three harvests yearly. These are near the Deep-eddying Ocean, but the sovereign who rules them is not Rhadamanthys, but Cronus. In Pindar, Rhadamanthys (whose name has by some been identified with the Egyptian Rhotamenti, or king of the under-world) sits by the side of his fathe1 Cronus and administers sound judgment. In later accounts this idea is developed into the tribunal of Minos, Rhadamanthys, and AXacus, before which all must appear in order to receive for their righteous or their evil lives the sentence which secures to them an entrance into Paradise or condemns them to be thrust down into Tartarus. Elsewhere Atacus is the gate-keeper of the under-world, near whom the hell-hound Kerberos (Cerberus) keeps watch. The images under which these abodes of the blessed are described point clearly to the phenomena of sunset, and reappear in the pictures drawn of the palace of Alkinoés (Alcinoiis). They reflect the spotless purity of a heaven lit up by the sun, which tinges with gold the cloud islands as they float on the deep blue sky. Here are the asphodel meadows, which none but the pure in heart, the truthful, and the generous can be suffered to tread; and thus an idea which at the outset had been purely physical, suggested the thoughts of trial, atonement, and purification.

See Preller, Griechische Mythologie, i. 686, 645, ii. 129; Brown, Great Dionysiak Myth, 185; Muir, Sanskrit Texts, part iv. p. 7.

ELYOT, Sir THomas, one of the most learned English- men of the time of Henry VIII, was the son of a certain Sir Richard Elyot, usually said to be of Suffolk, but, according to a suggestion by C. H. Cooper in Motes and Queries, 1853, more probably of Wiltshire. | If an identification proposed by Wood be correct, Sir Thomas studied at St Mary's Hall, Oxford, and obtained the degree of bachelor of arts in 1518 and that of bachelor of civil law in 1524; but according to Parker and others he belonged to Jesus College, Cambridge, and his name begins to appear in the list of justices of assize for the Western Circuit about

1511. Be this as it may, he evidently received a university education, and, as he himself declares, soon became “desirous of reading many books, especially concerning humanity and moral philosophy.” He continued to hold the office of clerk to the Western Assize till Wolsey per- suaded him to exchange it for that of clerk of the king’s council, The patent confirming the appointment is undated, but belongs to the year 1519. It grants him 40 marks a year and the usual summer and winter livery as enjoyed by Rob. Rydon, John Baldiswell, &., and other profits as enjoyed by Ric. Eden or Rob. Ridon, on a con- ditional surrender of patent 21st Oct. 4 Henry VIIL, granting the office to the said Rich. Eden. (Brewer, Letters

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letter addressed to Wolsey’s great successor, he performed the duties of the clerkship for “six years and a half,” but never received any of the emoluments, and never obtained a full recognition of his status (Henry Ellis, Let- ters, ii.). On his father’s death he became involved in a lawsuit with his cousin Sir Wm. Tynderne about some property in Cambridgeshire ; and though he ultimately gained his case, it proved a severe drain on his small estate. In 1532 he was sent on embassies to the papal and imperial courts, and while in Germany unfortunately received instructions to procure the arrest of Tyndale the Reformer. In this part of his mission he totally failed; and his efforts have since procured him the abuse of many a Protestant writer. His intimacy with Sir Thomas More appears to have awakened the suspicions of the king or his minister, for we find him writing to Cromwell that his friendship for the ill-fated scholar went no further than usque ad aras. He begs for a share in the confiscated property of the monasteries, and offers to give Cromwell the first year’s revenue. Unless his letters are to be dis- trusted, he was for the greater part of his life in very poor circumstances, and, in spite of the rolling rhetoric with which in his prefaces he celebrates the magnanimity of his patrons, received little from them but promises and praise. He died in 1546, and was buried at Carleton, in Cambridgeshire. Among his contemporaries and _ his

immediate successors Elyot enjoyed a high reputation as a scholar; and his future fame was secured by his Latin dictionary and his book called the Governor. The latter treats of the way in which a child ought to be trained who is afterwards expected to become a governor of men, and in so doing discusses such subjects as friendship, punish- ment, dancing, &c. The former, remarkable as the first Eng- lish book of its kind, contains not only purely lexicographical matter, but little paragraphs on geographical, mythologi- cal, and historical proper names, and descriptions of natural objects, diseases, and the like. Asa writer Sir Thomas was eminently didactic ; his works have all a direct practical purpose, and he is not slow to assert the benefit that must accrue to the reader's character from their perusal.

The following is a list:—The Boke named the Gouernour, London, 1531, and frequently afterwards ; reprinted in 1834, New- castle, by A. T. Eliot ; The knowledge which maketh a wise man, 1533; Pasquine the playne, 1535 ; Isocrates's Doctrinal of Princes, 1534; Pico de Mirandula's Rules of a Christian Life, 1534; The Castell of Health, compiled out of the chief authours of Physick, 1584; Dictionarium, 1538 (a copy in the Brit. Museum belonged to Cromwell, and has an autograph Latin letter from Elyot on the blank leaf at the beginning); The Image of Governance, compiled of the actes and sentences notable of the most noble emperor Alexander Severus, 1540 (translated, according to the author's fictitious account, for which he is bitterly attacked by Bayle, from the Greek of Encolpius, which had been lent him by a gentle. man of Naples, called Pudericus, but called back before he had his translation quite complete); The Bankette of Sapience, 1542; Preservative agaynste Death, 1545 ; Defence for good Women, 1545. Roger Ascham mentions his De rebus memorabilibus Anglie; and Webbe quotes from his translation of Horace's Poetica.

See Strype's Heclesiastical Memorials, i., and appendix No. 1xii.; Archeologia, xxiii., and Wright's Suppression of Monasteries, Cam- den Soc. 1848, both containing the begging letter to Cromwell; Privy Purse Hxpenses of Princess Mary, 82, 230 ; Wood's Athene Oxonicnses ; Ames, sub nomine Berthelet; Demaus, Life of Tyn- dale, 1871.

ELZEVIR, the name of a celebrated family of Dutch printers belonging to the 17th century. The original name was Elsevier, or Elzevier, and their French editions mostly retain this name; but in their Latin editions, which are the more numerous, the name is spelt Elzeverius, which was gradually corrupted into Elzevir. The family origin- ally came from Louvaine, and there Louis, who first made the name Elzevir famous, was born in 1540. He learned

Foreign and Domestic of the Reign of Henry VIII, vol. | the business of a bookbinder, and having been compelled iv.) According to Elyot's own account in a mournful [in 1580, on account of his political opinions, to leave his

native country, he established himself as bookbinder and bookseller in Leyden. His Hutropius, which appeared in 1592, was long regarded as the earliest Elzevir, but the first is now known to be Drusiz Hbraicarum questionum ac responsionum libri duo, which was produced in 1583. In all he published about 150 works. His typographical mark was the arms of the United Provinces—an eagle on a cippus holding in its claws a sheaf of seven arrows, with the inscription Concordia res parve crescunt. He died February 4, 1617. Of his five sons, Matthieu, Louis, Gilles, Joost, and Bonaventure, who all adopted their father's profession, Bonaventure, who was born in 1583, is the most celebrated. He commenced business as a printer in 1608, and in 1626 took into partnership Abraham, a son of Matthieu, born at Leyden in 1592. Abraham died 14th August 1652, and Bonaventure about a month afterwards. The fame of the Elzevir editions rests chiefly on the works issued by this firm. Their Cireek and Hebrew impressions are considered inferior to those of the Aldos and the Estiennes, but their small edi- tions in 12mo, 16mo, and 24mo, for elegance of design, neatuess, clearness, and regularity of type, and beauty of paper, cannot be surpassed. Especially may be mentioned the Novum Testamentum Gracum, 1624, 1633; the Psalterium Davidis, 1635, 1653; Virgil Opera, 1636, Terentu Comedie, 1635; but the works which gave their press its chief celebrity are their collection of French authors on history and

politics in 24mo, known under the name of the Petites Republiques, and their series of Latin, French, and Italian classics in small 12mo. Jean, son of Abraham, born in 1622, had since 1647 been in partner- ship with his father and uncle, and when they died Daniel, son of Bonaventure, born in 1626, joined him. Their partnership did not last more than two years, and after its dissolution Jean carried on the business alone till his death in 1661. In 1654 Daniel joined his cousin Louis (the third of that name and son of the second Louis), who was born in 1604, and had established a printing press at Amsterdam in 1638. From 1655 to 1666 they published a series of Latin classics in 8vo, cum notis variorum ,; Cicero in 4to; the Etymologicon Lingue Latine ; and a inagnificent Corpus Juris in folio, 2 vols., 1663. Louis died in 1670, and Daniel in 1680. Besides Bonaventure, another son of Matthieu, Isaac, born in 1593, established a printing press at Leyden, where he carried on business from 1616 to 1625; but none of his editions attained much fame. The last representatives of the Elzevir printers were Peter, grandson of Joost, who from 1667 to 1672 was a bookseller at Utrecht, and printed seven or eight volumes of little consequence; and Abraham, son of the first Abraham, who from 1681 to 1712 was university printer at Leyden.

Many of the Elzevir editions bear no other typographical inark than simply the words Apud Hlzeverios, or Hx officina Llseveriana, under the rubrique of the town. Isaac took as typographical mark the branch of a tree surrounded by a vine branch bearing clusters of fruit, and below it.a mau standing, with the motto non solus. The third Louis adopted Minerva with an olive branch, and the motto Ve extra oleas. When the Elseviers did not wish to put their name to their works they generally marked them with a sphere, but of course the mere fact that a work printed in the 17th century bears this mark is no proof that it is theirs. The total number of works of all kinds which bear the name of the Elseviers is 1213, of which 968 are in Latin, 44 in Greek, 126 in French, 32 in Flemish, 22 in the Eastern languages, 11 in German, and 10 in Italian.

See “ Notice de la collection d’auteurs latins, francais, et italiens,

imprimée de format petit en 12, par les Elsévier," in Brunet's Manuel du Libraire (Paris, 1820); Bérard's Essai bibliographique sur_les

éditions des Elzévirs (Paris, 1822) ; De Reume, Recherches historiques, généalogiques, et bibliographiques sur les Elséver (Brussels, 1847) ; Paul Dupont, Histoire de ?i:nprimerie, in two vols. (Paris, 1854); Pieter, Annales de Vimprimerte Elsevirienne (2d ed., Ghent, 1858); Walther, Les Elseveriennes de la bibliothéque impériale de St Peters- bourg (St Petersburg, 1864).

EMANUEL (Portuguese, Manogt) I. (1469-1521), king of Portugal, surnamed the Happy, was the son of Duke Ferdinand of Viseu and cousin of John II. of Portugal, and was born May 3, 1469. The care of his early education was confided to a Sicilian named Cataldo, under whom he made rapid progress, especially in the classical languages. He succeeded to the throne on the death of John IL., 27th October 1495. In 1497 he married Donna Isabella, daughter of Ferdinand and Isabella of Castile. She died in 1498, and two years after her death he married her sister Donna Maria. As soon as he mounted the throne Emanuel devoted himself with great ardour to the maritime enterprises begun by his predecessor. He dispatched Vasco da Gama to sail round the Cape of Good Hope in order to discover a new passage to India, and on his return he sent Pedro Alvarez de Cabral to complete his discoveries. Cabral discovered Brazil and the Moluccas, and established commercial relations with the Indian and African coasts. Through these expeditions and others under Albuquerque, the influence of Portugal was rendered predominant on the coasts of South Africa and the Indian archipelago, and an inexhaustible field for commerce and colonization was opened up to the Portu- guese. Emanuel also entered into commercial relations with Persia, Ethiopia, and China. His whole foreign policy, with the exception of an attempt to conquer Morocco, was a brilliant success; and at the close of his reign Por- tugal had attained a degree of prosperity, both external and internal, until then unexampled in her history. He was also no less anxious for the individual welfare of his subjects than for the outward prosperity of his

kingdom. He made personal visits to all his provinces to inquire into the administration of justice, and he is the author of a code of laws which bears his name. At certain stated hours he was accessible to any of his subjects without distinction who desired redress of grievances, or had any request of importance to make, and so great was his courtesy and patience in listening to their statements that when necessary he sacrificed to them hours that he usually devoted to en- joyment or repose. His persecutions of the Jews, cruel as they were, can scarcely be blamed when we remember the bigotry of his time and country; aud it says much for his impartial administration of justice that he caused the ring- leaders of a popular insurrection against that people to be executed with the usual marks of opprobrium. He died at Lisbon, December 13, 1521.

EMANUEL-BEN-SALOMON, a Hebrew poet of whose life the few facts that are known are gathered from allu- sions in his works. He was born at Rome about the middle of the 13th century, and spent the greater part of his life in that city. He seems also to have resided for a considerable period at Fermo. The precise date of his death, like that of his birth, is unknown. His collected poems, entitled Jlechabberoth, were printed at Brescia in 1491 and at Constantinople in 1535. Both editions are exceedingly rare. 'The work contains about thirty different poems of various kinds, love songs, drinking songs, odes, madrigals, &c. The last is a descriptive poem, the subject being heaven and hell, and it was published separately at Prague in 1559 and at Frankfort in 1713. As a pwet Emanuel is distinguished by the liveliness of his fancy and the finish of his versification. His choice of subjects, and his free method of treating them, led to his being proscribed by the stricter rabbis as a blasphemer. He has been called the Voltaire of the Hebrews, but with even less appro-

priateness than such far-fetched comparisons generally possess. Besides his poetical works, Emanuel wrote com- mentaries on several of the books of the Old Testament Scriptures, some of which exist only in

manuscript. He was also the author of a work on Hebrew grammar and criticism.

EMBALMING (Greek, BéAcapov, balsam; German, einbalsamuren ; French, embaumement), the art of preparing dead bodies, chiefly by the use of medicaments, in order to preserve them from putrefactiou and the attacks of insects. The ancient Egyptians carried the art to great perfection, and embalmed not only human beings, but cats, crocodiles, ichneumons, and other sacred animals. It has been suggested that the origin of embalming in Egypt is to be traced to a want of fuel for the purpose of cremation, to the inadvisability or at some times impossibility of burial in a soil annually disturbed by the inundation of the Nile, aud to the necessity, for sanitary reasons, of preventing the decomposition of the bodies of the dead when placed in open sepulchres. As, however, the corpses of the embalmed must have constituted but a small proportion of the aggregate mass of animal matter daily to be disposed of, the above explanation is far from satisfactory ; and it may be questioned whether embalming, together with the greater number of the Egyptian doctrines concerning a futare life, may not have entirely originated in superstition or senti- ment concerning the dead. According to Prescott, it was a belief in a resurrection of the body that led the ancient Peruvians to preserve the air-dried corpses of their dead with so much solicitude (see Conquest of Peru, bk. i. chap. iii.). Prichard (Zgyptian Mythology, p. 200) holds it as probable that the views with which the Egyptians embalmed bodies were " akin to those which rendered the Greeks and Romans so anxious to perform the usual rites of sepulture to their departed warriors, namely, that these solemnities expedited the journey of the soul to the ap- pointed region, where it was to receive judgment for its former deeds, and to have its future doom fixed accordingly." It has been supposed by some that the discovery of the preservation of bodies interred in saline soils may have been the immediate origin of embalming in Egypt. In that country certain classes of the community were specially appointed for the practice of the art. Joseph, we are told in Gen. 1. 2, " commanded his servants the physicians to embalm his father." Herodotus (ii. 86) gives an account of three of the methods of embalming followed by the Egyptians. The most expensive of these,

which cost a talent of silver (£243, 15s), was as follows. The brains were in part removed through the nostrils by means of a bent iron implement, and in part by the injection of drugs. The intestines having been drawn out through an incision in the left side, the abdomen was cleansed with palm-wine, and filled with myrrh, cassia, and other materials, and the opening was sewed up. This done, the body was steeped seventy days in a solution of litron or natron.!_ Diodorus (i. 91) relates that the cutter (rapacyicrns) appointed to make the incision in the flank for the removal of the intestines, as soon as he had performed his office, was pursued with stones and curses by those about him, it being held by the Egyptians a detestable thing to commit any violence or inflict a wound on the body. After the steep- ing, the body was washed, and handed over to the swathers, a peculiar class of the lowest order of priests, called by Plutarch cholchyte, by whom it was bandaged in gummed cloth ; it was then ready for the coffin. Mummies thus prepared were considered to represent Osiris. In another method of embalming, costing twenty-two mine (about £90), the abdomen was injected with

Bee 1 Neutral carbonate of sodium, Na,CO,, found at the natron lakes in the Libyan desert, and at El Hegs, in Upper Egypt.

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“ cedar-tree pitch ”(kedpia), which, as it would seem from Pliny (Wat. HMist., xvi. 21), was the liquid distillate of the pitch-pine. This is stated by Herodotus to have had a corrosive and solvent action on the viscera. After injec- tion the body was steeped a certain number of days in natron ; the contents of the abdomen were allowed to escape; and the process was then complete. The preparation of the bodies of the poorest consisted simply in placing them in natron for seventy days, after a previous rinsing of the abdomen with “syrmza.” The material principally used in the costlier modes of embalming appears to have been asphalt; wax was more rarely employed. In some cases embalming seems to have been effected by immersing the body in a bath of molten bitumen. Tanuing also was resorted to. Occasionally the viscera, after treatment, were in part or wholly replaced in the body, together with

wax figures of the four genii of Amenti. More commonly they were embalmed in a mixture of sand

and asphalt, and buried in vases, or canopt, placed near the

mummy, the abdomen being filled with chips and sawdust of cedar and a small quantity of natron, in one jar were placed the stomach and large intestine; in another, the small intestines ; in a third, the lungs and heart ; in a fourth, the gall-bladder and liver. Porphyry (De Abdstinentia, iv. 10) mentions a custom of inclosing the intestines in a box, and consigning them to the Nile, after a-prayer uttered by one of the embalmers, but his statement is regarded by Sir J. G. Wilkinson as unworthy of belief. The body of Nero's wife Poppza, contrary to the usage of the Romans, was not burnt, but, as customary among other nations with the bodies of potentates, was honoured with embalmment (see Tacitus, Annal., xvi. 6). The body of Alexander the Great is said to have been embalmed with honey (Statius, Sylv., iii. 2, 117), and the same material was used to preserve the corpse of Agesipolis I. during its conveyance to Sparta for burial. Herodotus states (ili. 24) that the Ethiopians, in embalming, dried the body, rubbed it with gypsum (or chalk), and, having painted it, placed it in a block of some transparent substance. The Guanches, the aborigines of the Canaries, employeda mode of embalming similar to that of the Egyptians, filling the hollow caused by the removal of the viscera with salt and an absorbent vegetable powder (see Bory de Saint Vincent, Lssads sur les Iles Fortunées, 1803, p. 495). Embalming was still in vogue among the Egyptians in the time of St Augustine, who says that they termed mummies gabbare (Serm. 120, cap. 12). In modern times numerous methods of embalm- ing have been practised. By William Hunter essential oils, alcohol, cinnabar, camphor, saltpetre, and pitch or rosin were employed, and the final desiccation of the body was effected by means of roasted gypsum placed in its coffin. Boudet embalmed with tan, salt, asphalt, and Peruvian bark, camphor, cinnamon, and other aromatics, and corrosive sublimate. The last-mentioned drug, the chloride and sulphate of zinc, the acetate and sulphate of aluminium, and creasote and carbolic acid have all been recommended by various modern embalmers.

See Mummy ; Louis Penicher, Traité des Embawmements, Paris, 1669 ; S. Blancard, Anatomia Reformata, et de Balsamatione nova methodus, Lugd. Bat. 1695 ; Thomas Greenhill, Zhe Art of Em- balming, Lond. 1705; J. N. Marjolin, Manuel d' Anatomic, Paris, 1810; Pettigrew, History of Mummies, Lond. 1834; Gannal, Traité 7 Embaumements, Paris, 1838 ; 2nd ed. 1841; Magnus, Das Einbalsamiren der Leichen, Brunsw., 1839; Rawlinson's Hero- dotus, vol. ii. p. 141.

EMBANKMENT is an engineering term used to denote any large heap of materials collected together by artificial means. Embankments are constructed for carrying roads or railways across valleys. They are also employed for protecting land from the encroachments of river ficods, and on a larger scale, in low-lying countries, as a defence

against the inroads of the sea. Embankments are also the main features in almost all schemes of water-works, being used for impounding water for supply of towns or com- pensation to mills. See Irrigation and Warer-Works.

EMBER DAYS axnp EMBER WEEKS, the four seasons set apart by the Western Church for special prayer and fasting, and the ordination of clergy, known in the medieval church as guatuor tempora, or jejunia quatuor tempcrum. The Ember weeks are the complete weeks next following Holy Cross Day (September 14), St Lucy's Day (December 13), the first Sunday in Lent, and Whitsun Day. The Wednesdays, Fridays, and Saturdays of these weeks are the Ember days distinctively, the following Sundays being the days of ordination. These dates are given in the following memorial distich with a frank in- diffcrence to quantity and metre—

Vult Crux, Lucia, Cinis, Charismata dia Quod det vota pia quarta sequens feria.

The word Hmber is of uncertain derivation. We may at once dismiss, as founded only onan accidental similarity of sound, that from the "embers" or ashes erroneously assumed to have been used at these

seasons in token of humiliation. Other more probable derivations are from the Anglo-Saxon ymb-ren, a circuit or revolution (from ymb, around, and rennen, to run); or by process of agglu- tination and phonetic decay, from the Latin gquatuor tempora. 'Those who advocate this latter derivation appeal to the analogous forms by which these seasons are desig- nated in some of the Teutonic languages, ¢g.—German, quatember ; Dutch, quatertemper; Danish, kvatember ; Swedish, tamper-dagar. But the occurrence of the Anglo- Saxon compounds ymbren-tid, ymbren-wucan, ymbren-faes- tan, ymbren-dagas, for Ember tide, weeks, fasts, days, favours the former derivation, which is also confirmed by the use of the word imbren in the Acts of the council of Apham, 1009 a.p. ("jejunia quatuor tempora que embren vocant"). It corresponds also with Pope Leo the Great's definition, "jejunia ecclesiastica per totius anni circulum distributa."

The observance of the Ember days is confined to the Western Church, and had its origin as an ecclesiastical ordinance in Rome. They were probably at first merely the fasts preparatory to the three great festivals of Christmas, Easter, and Pentecost. A fourth was subse- quently added, for the sake of symmetry, to make them correspond with the four seasons, and they became known as the jgunium vernum, cestivum, autumnale, and hiemale, so that, to quote Pope Leo's words, "the law of abstinence might apply to every season of the year." An earlier men- tion of these fasts, as four in number—the first known—is in the writings of Philastrius, bishop of Brescia, in the middle of the 4th century. He also connects them with the great Christian festivals (De Heres. 119). In Leo's time, 440-461 a.p., Wednesday, Friday, and Saturday were already the days of special observance. From Rome the Ember days gradually spread through the whole of Western Christendom. Uniformity of practice, however, in this particular was of somewhat slow growth. Neither in Gaul nor Spain do they seem to have been generally recognized much before the 8th century. Their introduction into Britain appears to have been earlier, dating from Augustine, 597 a.D., acting under the authority of Gregory the Great. The general period of the four fasts being roughly fixed, the precise date appears to have varied considerably, and in some cases to have lost its connection with the festivals altogether. The Ordo Romanus fixes

the spring fast in the first week of March (then the first month); the summer fast in the second week of Junc; the autumnal fast in the third week of September ; and the winter fast in the com- plete week next before Christmas eve. Other regulations pre-

vailed in different countries, until the inconveniences arising from the want of uniformity led to the rule now observed being laid down under Pope Urban II. as the law of the church, in the councils of Placentia and Clermont, 1095 «.p. The present rule which fixes the ordination of clergy in the Ember weeks cannot be traced further back than the time of Pope Gelasius, 492-496 a.p. In the early ages of the church ordinations took place at any season of the year whenever necessity required. Gelasius is stated by ritual writers to have been the first who limited them to these particular times, the special solemnity of the season being in all probability the cause of the selection. The rule once introduced commended itself to the mind of the church, and its observance spread. We find it laid down: in the pontificate of Archbishop Egbert of York, 732-766 a.D., and referred to as a canonical rule ina capitulary of Charles the Great, and it was finally established as a law of the church in the pontificate of Gregory VII., c. 1085. Authorities : Muratori, Dissert. de Jejun. Quat. Temp., ¢. vii., anecdot. tom. ii. p. 262; Bingham, Antig. of the Christ. Church, bk. iv. chap. vi. § 6, bk. xxi. chap. ii. § 1-7; Binterim, Denkwir- digketten, vol. v. part 2, pp. 133 f.; Augusti, Handbuch der Christlich, Archéol., vol. i. p. 465, iii. 486. (E. V.)

EMBEZZLEMENT, in English law, is a peculiar form of theft which is distinguished from the ordinary crime in two points :—(1) It is committed by a person who is in the position of clerk or servant to the owner of the property stolen ; and (2) the property when stolen is in the posses- sion of such clerk or servant. The definition of embezzle- ment as a special form of theft arose out of the difficulties caused by the legal doctrine that to constitute larceny the property must be taken out of the possession of the owner. Servants and others were thus able to steal with impunity goods intrusted to them by their masters. The statute 21

Henry VIII. c. 7 was passed to meet this case; and it enacted that it should be felony in servants to convert to their own use caskets, jewels, money, goods, or chattels delivered to them by their masters. 'This Act," says Sir J. F. Stephen (General View of the Criminal Law of England), "assisted by certain subtleties according to which the possession of the servant was taken under particular circumstances to be the possession of the master, so that the servant by converting the goods to his own use took them out of his own possession gua servant (which was his master's posses- sion) and put them into his own possession qua thief (which was a felony), was considered sufficient for practical purposes for more than 200 years." In 1799, a clerk who had converted to his own use a cheque paid across the counter to him by a customer of his master was held to be not guilty of felony ; and in the same year the Act 39 Geo. ITI. c. 85 was passed, which, meeting the difficulty in such cases, enacted that if any clerk or servant, or any person employed as clerk or servant, should, by virtue of such em- ployment, receive or take into his possession any money, bonds, bills, &c., for or in the name or on account of his employers, and should fraudulently embezzle the same, every such offender should be deemed to have stolen the same. The same definition is substantially repeated in a Consolida- tion Act passed in 1827 (7 and 8 Geo. IV. c. 29). Numberless difficulties of interpretation arose under these Acts, ¢.g., a8 to the meaning of "clerk or servant," as to the difference between theft and embezzlement, &c. The law now in force, or the Larceny Act, 24 and 25 Vict. c. 96, defines the offence thus (section 68) :—' Whosoever, being a clerk or servant, or being employed for the purpose or in the capacity of a clerk or servant, shall fraudulently embezzle any chattel, money, or valuable security which shall be delivered to or received or taken into possession by him for or in the name or on the account of his master or employer, or any part thereof, shall be deemed to have

feloniously stolen the same from his master or employer, although such chattel, money, or security was not received into the possession of such iaaster or employer other- wise than by the actual possession of his clerk, servant, or other person so employed, and being convicted

thereof shall be liable, at the discretion of the court, to be kept in penal servitude for any time not exceeding fourteen years, and not less than three {now five) years." To constitute the offence thus described three things must concur :—(1) The offender 1ust be a clerk or servant ; (2) he must receive into his possession some chattel on behalf of his master; and (3) he inust fraudulently embezzle the same. A clerk or servant has been defined to be a person bound either by an express contract of service or by conduct implying such a contract to obey the orders and submit to the control of his master in the transaction of the business which it is his duty as such clerk or servant to transact. (Stephen's Digest of the Criminal Law, Art. 309.) The Larceny Act also describes similar offences on the part of persons, not being clerks or servants, to which the name embezzlement is not un- commonly applied, eg., the fraudulent conversion by bankers, merchauts, brokers, attorneys, or other agents, of money or securities or goods intrusted to them. 'This offence is a misdemeanour punishable by penal servitude for any term not exceeding seven nor less than five years. So also trustees fraudulently disposing of trust property, and directors of companies fraudulently appropriating the company's property or keeping fraudulent accounts, or wil- fully destroying books or publishing fraudulent statements, are misdemeanants punishable in the same way. EMBLEMENTS, in English law, means the growing crops which belong to the tenant of an estate of uncertain duration, which has unexpectedly determined without any fault of his own. "It is derived from: the French emblavence de bled (corn sprung or put up ebove ground), and strictly signifies the growing crops of sown land; but the doctrine of emblements extends uot only to corn sown, but to roots planted and other annual artificial profits" (Woodfall on Landlord and Tenant). If the estate, although of uncertain duration, is determined by the tenant's own acts, the right to emblements does not arise. By 14 and 15 Vict. c. 25, a tenant at rack-rent, whose lease has deter- mined by the death or cession of estate of a landlord entitled only for life, or for any other uncertain interest, shall, in- stead of emblemeuts, be entitled to hold the lands until the expiration of the current year of his tenancy. EMBOSSING is the art of producing raised portions or patterns on the surface of metal, leather, textile fabrics, cardboard, paper, and similar substances. Strictly the term is applicable only to raised impressions

produced by means of engraved dies or plates brought forcibly to bear on the material to be embossed, by various means, according to the nature of the substance acted on. Thus raised patterns produced by carving, chiselling, casting, and chasing or hammering are excluded from the range of embossed work. Embossing supplies a convenient and expeditious medium for producing elegant ornamental effects in many distinct industries ; and especially in its relations to paper and card- board its applications are varied and important. Crests, monograms, addresses, &c., are embossed on paper and envelopes from dies (see Drz-Sinkrn@) set in small hand- Screw presses, a force or counter-die being prepared in leather faced with a coating of gutta-percha. The dies to be used for plain embossing are generally cut deeper than those intended to be used with colours. Colour embossing is done in two ways—the first and ordinary kind that in which the ink is applied to the raised portion of the design. The colour in this case is spread on the die with a brush, and the whole surface is carefully cleaned, leaving only ink in the depressed parts of the engraving. In the second

variety— called cameo embossing—the colour is applied to the flat parts of the design by means of a small printing roller, and the letters or design in relief is left uncoloured. In embossing large ornamental designs, engraved plates or electrotypes therefrom are employed, the force or counter- part being composed of mill-board faced with gutta-percha, In working these, powerful screw-presses, in principle like coining or medal-striking presses, are employed. Embossing also is most extensively practised for ornamental purposes in the art of bookbinding. The blocked ornaments on cloth covers for books, and the blocking or imitation tooling on the cheaper kinds of leather work, are effected by means of powerful embossing or arming presses. (See LooKBInDING.) For impressing embossed patterns on wall papers, textiles of various kinds, and felt, cylinders of copper, engraved with the patterns to be raised, are employed, and these are mounted in

calender frames, in which they press against rollers having a yielding surface, or so coustructcd that depressions in the engraved cylinders fit into corresponding elevations in those against which they press. 'The opera- tions of embossing and colour printing are also sometimes effected together in a modification of the ordinary cylinder printing machine used in calico-printing, in whieh it is only necessary to introduce suitably engraved cylinders. For many purposes the embossing rollers must be maintained at a high temperature while in operation ; and they are heated either by steam, by gas jets, or by the introduction of red- hot irons within them. 'The stamped or struck ornaments in sheet metal, used especially in connection with the brass and Britannia metal trades, are obtained by a process of embossing—hard steel dies with forces or counter-parts of soft metal being used in their production (see Brass). A kind of embossed ornament is formed on the surface of soft wood by first compressing and consequently sinking the parts intended to be embossed, then planing the whole surface level, after which, when the wood is. placed in water, the previously depressed portion swells up and rises to its original level. Thus an embossed pattern is produced which may be subsequently sharpened and finished by the ordinary process of carving.

EMBROIDERY'? is the art of working with the needle flowers, fruits, human and animal forms upon wool, silk, linen, or other woven texture. Thatit is of the greatest antiquity we have the testimony of Moses and Homer, and it takes precedence of painting, as the earliest method of representing figures and ornaments was by needle-work traced upon canvas. From the earliest times it served to decorate the sacerdotal vestments and other objects applied to ecclesiastical use, and queens deemed it an honour to occupy their leisure hours in delineating with the needle the achievements of their heroes. The Jews are supposed to have derived their skill in needle-work from the Kgyptians, with whom the art of embroidery was general ; they produced figured cloths by the needle and the loom, and practised the art of introducing gold thread or wire into their work. Amasis, king of Egypt, sent to the Minerva of Lindus a linen corslet with figures interwoven and embroidered with gold and wool; and, to judge from a passage in Ezekiel, they even embroidered the sails of their galleys which they exported to

Tyre: “ Fine linen with broidered work from Egypt was that which thou spreadest forth to be thy sail.” Embroidery and tapestry are often con- founded; the distinction should be clearly understood. Embroidery is worked upon a woven texture having both warp and woof, whereas tapestry is wrought ina loom upon a warp stretched along its frame, but has no warp thrown across by the shuttle; the weft is done with short threads variously coloured and put in by a kind of needle.

1 French, bord, bordurz,; Angio-Saxon, bord—ithe edge or margin of anything, because embroidery was chiefly exercised npon the edge or border of vestments.

EMBROIDERY

The book of Exodus describes how the curtains of the tabernacle were embroidered by hand, and the garments of Aaron and his sons were wrought in needle-work. Aholiab, the chief embroiderer, is specially appointed to assist in the work of decoration. In celebrating the triumph of Sisera, his mother is made to say that he has a “ prey of divers colours of needle-work on both sides,” evidently meaning that the stuff was wrought on both sides alike, a style of embroidery exhibiting qa degree of patience and skill only practised by the nations of the East.

Homer makes constant allusion toembroidery. Penelope {to say nothing for her immortal web) throws over Ulysses on his departure for Troy an embroidered garment of gold on which she had depicted incidents of the chase. Helen is described as sitting apart, engaged in working a gorgeous suit upon which she had portrayed the wars of Troy; and Andromache was embroidering flowers of various hues upon a purple cloth when the cries of the people without informed her of the tragic end of Hector. In Greece the art was held in the greatest honour, and its invention ascribed to Minerva, and prompt was her punishment of the luckless Arachne for daring to doubt her supremacy in the art. The maidens whio took part in the procession of the Panathenia embroidered the veil or peplum, upon which the deeds of the goddess were worked in embroidery and gold.

Phrygia became celebrated for the beauty of its needle- work. The "toga picta" ornamented with Phrygian embroidery was worn by the Roman generals at their triumphs, and by their consuls when they celebrated the games—-hence embroidery itself in Latin is styled '* Phrygian," and the Romans knew it under no other name.

Babylon was no less renowned for its embroideries, and maintained its reputation up to the first century of the Christian era. Josephus tells us that the veils given by Herod for the temple were of Babylonian workmanship,— the women excelling, says Apollonius, in executing designs of varied colours. The Sidonian women brought by Paris to Troy embroidered veils of such rich embroidery that Hecuba deemed them worthy of being presented as an offering to Minerva; and Lucan speaks with enthusiasm of the magnificent Sidonian veil worn by Cleopatra at the feast she gave Cesar after the death of Pompey. The embroidered robe of Servius Tullius was ornamented all over with the image of the goddess Fortune, to whom he ascribed his success, and to wliom he built several temples. Tarquin the elder first appeared at Rome in a robe embroidered all over with gold, and Cicero describes Damocles as reclining on his bed with a coverlet of magnificent embroidery.

Passing to the first ages of the Christian era, we find the pontifical ornaments, the tissues that decorated the altars, and the curtains of the churches all worked with the holy images; and in the 5th century the art of weaving stuffs and enriching them with embroidery was carried to the highest degree of perfection. The whole history of the church was embroidered on the toga of a Christian senator; and Anastasius, who has left a description of ornaments of this kind given by popes and emperors to the churches from the 4th to the 9th century, has even recorded the subjects of these embroideries, which are executed in gold and silver thread upon silk stuffs of the most brilliant colours, producing a wonderful effect. " Opus plumarium " was then the general term for embroidery, and so given because stitches were laid down lengthwise and so put together that they seemed to overlap one another like the feathers in the plumage of a bird. Not inaptly, therefore, was this style called feather-stitch, in contradistinction to

cross-stitch. Pope Paschal (5th century), a great admirer of needle-work, made many splendid donations to the church. On one of his vestments were portrayed the Wise

Virgins, miraculously worked ; on another a peacock, in all the gorgeous and changing colours of its plumage, on an amber ground.

In medizval times, spinning and embroidery were the occupation of women of all ranks, from the palace to the cloister, and a sharp rivalry existed in the production of sacerdotal vestments and ornaments. So early as the 6th century, St Césaire, bishop of Arles, forbade the nuns under his rule from embroidering robes adorned with paintings, flowers, and precious stones. 'This prohibition, however, was not of w general character. Near Ely, an Anglo- Saxon lady brought together a number of girls who pro- duced admirable embroidery for the benefit of the monastery ; and in the 7th century, St Eustadiole, abbess of Bourges, made sacred vestments and decorated the altar with works by herself and her community. A century later, two sisters, abbesses of Valentina, in Belgium, became famous for their excellence in all feminine pursuits, and imposed embroidery work upon the inmates of their convent as a protection from idleness, the most dangerous of all evils.

At the beginning of the 9th century, ladies of rank are to be found engaged in embroidery. St Viborade, living at St Gall, adorned beautiful coverings for the sacred books of that monastery, it being then the custom to wrap in silk and carry on a linen cloth the Gospels used for the offices of the church; and the same abbey received from Hadwiga, daughter of Henry duke of Swabia, chasubles and ornaments embroidered by the hand of that princess. Judith of Bavaria, mother of Charles the Bald, was also a skilful embroideress. When Harold, king of Deumark, came to be baptized at Ingelheim with all his family, the empress Judith, who stood sponsor for the queen, presented her with a robe enriched by herself with gold and precious stones. In the 10th century, Queen Adhelais, wife of Hugh Capet, presented to the church

of St Martin at Tours, and another to the abbey of St Denis, two chasubles of different designs but of wonderful workmanship.

Long before the Conquest English ladies were much skilled with the needle. The beautiful "opus Anglicum" was pro- duced under the Anglo-Saxons, and so highly was it valued that we find (800) Deubart, bishop of Durham, granting the lease of a farm of 200 acres for life to the embroideress Eanswitha for the charge of scouring, repairing, and renewing the embroidered vestments of the priests. In the 7th century, St Ethelreda, queen and first abbess of Ely, presented to St Cuthbert a stole and maniple marvellously embroidered and embellished with gold and precious stones. The four daughters of Edward the Elder are all praised for their needles' skill; and in the 10th century, A'lfleda, a high-born Saxon lady, gave to the church at Ely a curtain on which she had wrought in needle-work the deeds of daring of her husband Brithnoth, who was slain by the Danes. Later on, Emma, wife of Canute, enriched the same minster with costly stuffs, of which one at least had been embroidered all over with orfrays by the queen herself, and embellished with gold and gems disposed with such art and profusion as could not be matched at that time in all England.

The excellence of the English work was maintained as time went on, a proof of which is found in an anecdote re- lated by Matthew of Paris: —""'About this time" (1246), he tells us, "the Lord Pope (Innocent IV.), having observed that the ecclesiastical ornaments of some Englishmen, such as choristers' copes and mitres, were embroidered in gold thread after a very desirable fashion, asked where these works were made, and received in answer, in England. ' Then,' said the Pope, 'England is surely a garden of delights for us. It is truly a never-failing spring, and there, where many things abound, much se be extorted.'

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Accordingly, the same Lord Pope sent sacred and sealed briefs to nearly all the abbots of the Cistercian order estab- lished in England, requesting them to have forthwith for- warded to him those

embroideries in gold, which he preferred to all others, and with which he wished to adorn his chasuble and choral cope, as if these objects cost them nothing." But, it may be asked, what is the " opus Anglicum?" Happily in the Syon Monastery Cope, pre- served in the South Kensington Museum, there is an in- valuable specimen of English needle-work of the 13th century. We find that the whole of the face is worked in chain-stitch (modern tambour or crochet) in circular lines, the relief being given by hollows sunk by means of hot irons. The general practice was to work the draperies in feather-stitch (opus plumarium).

The old English "opus consuetum" or cutwork, the "appliqué" or "en rapport" of the French, and " lavori di commesso" of the Italians, consists of pieces cut and shaped out of silk or other material and sewed upon the grounding.

In the 11th or probably early in the 12th century was executed the valuable specimen preserved to us, the so-called tapestry of Bayeux, ascribed by early tradition to no less a lady than Queen Matilda, and representing the various episodes of the conquest of England by William of Normandy. It is not tapestry, but an embroidery work in crewels in "long-stitch " of various colours, on a linea cloth 19 inches wide by 226 yards long. Probabilities forbid us from believing that Matilda and her waiting maids ever did a stitch on this canvas, which, crowded as it is with fighting men, some on foot some on horseback, must have taken much time and busied many fingers to execute; nor is it likely that Matilda would have chosen coarse linen and common worsted as the materials with which to celebrate her husband's achievements. More likely, this curious work was done in London at the cost of those natives of Normandy on whom William had bestowed lands in England, and was sent by them as an offering to the cathedral of their native place. Whether it be due to the queen or not, the monument is no less interesting to history, as furnishing a crowd of details in illustration of arms and customs not to be met with elsewhere.

The art of pictorial needle-work had become universally spread. The inventory of the Holy See (1295) mentions the embroideries of

Florence, Milan, Lucca, France, England, Germany, and Spain. The Paris embroiderers had formed themselves into a guild; and throughout the Middle Ages down to the 16th century embroidery was an art, a serious branch of painting. The needle, like the brush of the painter, moved over the tissue, leaving behind its coloured threads, and producing a painting soft in tone and ingenious in execution. At Verona, an artist took twenty-six years to execute in needle-work the life of St John, after the designs of Pollaniolo, as an offering to that church at Florence. Catherine de' Medici, herself a distinguished needle-woman, brought over in her train from Florence the designer for embroidery, Frederick Vinciolo ; and under her sons, so overloaded was dress with ornament as to be described by contemporaries as to be " stiff" with embroi- dery. These were indeed great days for needle-work in our own land. Women as well as men pursued the art as a trade, and the public records show to what an extent it was carried on; while great ladies wrought in their castles sur- rounded by their maidens. Embroidery was then their chief pleasure, and their most serious occupation, Shut out from the business of life, they had ample leisure to cultivate their taste, and ample means of gratifyingit. The church was very rich in precious stufis and embroideries, velvet, cutwork (appliqué), or cloth of gold; and for domestic decoration they were equally prized. Many of our great showhouses are perfect storehouses of embroidery.

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The countess of Shrewsbury, for instance, better known as Bess of Hardwick, the great needle-woman of the day, with all the business and cares of children, hospitals, and charities, yet found time to embroider furniture for her palaces, and her sampler patterns hang to this day on her walls; and there also are the bedhangings of Scotlands queen, who beguiled her weary hours by work at her needle. Hatfield, Penshurst, Knole, are all filled with similar reminiscences of royal and noble ladies. Charles I. used to send from his prison locks of his own hair to the gentry favourable to his cause, that the ladies of their household,

when embroidering the royal portraiture in coloured silks, might be able to work the head with the hair of the sovereign himself.

In France this time was a glorious period for needle- work, Not only was the fashion continued, as in England, of producing figures and portraits, but a fresh development was given to floral and arabesque ornament. Flowers in the grandiose style, wrought with arabesques of gold and silver, among which sported birds and insects, were the characteristic designs of the period; and Gaston duke of Orleans established hothouses and botanical gardens, which he filled with rare exotics, to supply the needle with new forms and richer tints. The crown manufacturers adorned the rich brocades of Tours, watered silks, and cloths of silver with patterns furnished by Charles Le Brun for the portiéres and curtains to the rooms he had designed. Hangings, furniture, costumes, equipages—embroidery invaded all. The throne of Louis XV., used for the recep- tion of the Knights of the Holy Ghost, alone cost 300,000 livres; nor was the embroidery of the state coaches of Marie Antoinette less costly.

The history of embroidery having been carried to the end of the 18th century, a few observations remain on its state in the present day, when every country furnishes its works of the needle, from the gorgeous productions in gold and silver of the East to the humble porcupine quill and mohair embroidery of the Canadian Indian.

In an industrial point of view, the art may be ranged into two classes., First, there is white embroidery, applied to dress and furniture, upon cloth, muslin, or tulle, in which France and Switzerland hold the first place, and then Scotland and Saxony. The second class comprises works in silk, gold, and silver, the two last more especially dedi- cated to church ornaments and military costume. From the East we derive the most elaborate specimens of em- broidery as applied to dress and furniture; for while iu the West these are chiefly used for the church and costume, in the East every article of domestic use is covered with embroideries in silver and gold. The Chinese embroider the imperial dragon upon their robes of crimson satin ; nor are the Japanese works less gorgeous or in less perfect taste. The Persians, in the 17th century,

sent to Kurope rich embroidered coverlets for the state beds of the period.

They work extensively in chain-stitch. A supplementary

division may be made of the so-called Berlin work, executed in wool and silk upon canvas, in cross-stitch, or point de marque, as it was formerly called, as being the stitch used for marking.

See Textile Fabrics, by Rev. D. Rock, D.D. ; Handbook of Arts of Middle Ages, by Jules Labarte; Histoire du Mobilier, by A. Jacquemart ; Manuel de la Broderve, by Mme. Celnart; Rapport du Jury International Exposition Universelle de 1867, Group, vi.; Re- cherches sur la Fabrication des Etoffes, by Francisque Michel ; Art Needlework, by E. Masé ; English Medieval Embroidery, by Rev. C. H. Hartshorne; Church Embroidery, by A. Dolby; Church Needlework, by Miss Lambert; Art of Needlework, by Lady Wilton. (enw 18h Ie.)

EMBRUN (the ancient Hbrodwnwm), a fortified town of France, capital of the arrondissement of the same name, In the department of Hautes-Alpes, is situated on a steep rock

near the right bank of the Durance, 25 miles east of Gap. It has woollen and linen manufactures. Its principa] build- ings are the cathedral, said to have been founded in the time of Charlemagne, a handsome Gothic structure, surmounted with a lofty tower ; the archiepiscopal palace ; the ancient college of the Jesuits, now converted into a prison ; and the ancient convent of the Capuchins. Embrun was an import- ant military station in the time of the Romans. It was the seat of a bishop in the time of Constantine, and from the 9th century till the Revolution it ranked as an arch- bishopric. It has been sacked successively by the Vandals, the Huns, the Lombards, the Saxons, and the Saracens; and in the reign of Louis XIV. it was bombarded and taken by the duke of Savoy. The population in 1872 was 3075.

EMBRYOLOGY is a branch of biological inquiry com- prising the history of the young of man and animals, and it may be also of plants. The term is derived from the Greek éu8pvov, signifying a growing part or thing, and has been somewhat vaguely applied to the product of genera- tion of any plant or animal which is in process of formation. Among the higher animals, and especially in the human species, the Latin word fetus has sometimes been employed in the same signification as embryo, but it is more generally held to denote a more advanced stage of formation, while the term embryo is applied to the earlier condition of the product of conception before it has assumed the character- istic form and structure of the parent.

In all animals, with the exception of the Protozoa, the new being, deriving its origin from a definite organized structure termed the ovum or egg, passes during the pro- gress of its formation and growth from a simpler to a more complex form and organic structure by a series of con- secutive changes which come under the general denomina- tion of development. The consideration of these changes, which is mainly an anatomical subject, being partly mor- phological as affecting the larger and more obvious organic form, aud partly histological as belonging to the minute or textural structure, constitutes by far the greater part of the science of embryology, but the latter word may also include the history of all other living phenomena mani- fested by the young animal in the progress of its growth to maturity.

The formative process through which the embryo passes is necessarily of very different degrees of complexity, ac- cording to the more simple or complex organization of the adult animal to which it belongs. But it presents throughout the whole range of animals certain general features of similarity dependent on the fundamental re- semblance of the organized elements from which all animals derive their origin.

A minute mass of protoplasm constitutes not only the simplest, but also the invariable, form presented by the germinal part of the ovum or egg, and in all animals, ex- cept the Protozoa, in which the nature of the germ is still doubtful, it takes at first the form of an organized cell, or it

is a definite spherical and nucleated mass of protoplasm. It is therefore a germ-cell.

In all ova the first stage of the formative process, follow- ing upon fecundation of the germ, consists in the multipli- cation of the egg or germ-cell by a process of the nature of fissiparous division, so that when this division has pro- ceeded some length, it results in the production of a mass or congeries of organized cells descended from that which formed the primitive germ, and containing in combination the molecular elements of the materials contributed by the male and female parents to the formation of the fertilized germ. This is the mulberry stage, or morula, of Haeckel. In a more advanced stage among the higher animals, the cells of this mass assume more or less of a laminar arrange- nent, constituting the blastoderm or germinal membrane of

Pander and succeeding authors ; and in the first and lowest forms of this structure two layers are distinguished, corre- sponding to the outer and inner cellular lamine of which the earliest form of the embryo consists in the higher, and the whole of the body in the lower, forms of animals. These layers are the ectoderm and endoderm of the embryo- logist and comparative anatomist (Huxley and Allman).

In the lowest animals little if any further differentiation of the germinal structures ensues; but in animals higher in the scale there arises a third or intermediate layer, the mesoderm, which takes an important part along with the other two layers in the formation of the animal organism. The cellular blastoderm, therefore, is already the embryo of the lowest animals; while in the higher that term could scarcely with propriety be applied to the product of development in the egg until some of the characteristic lineaments, however rudimentary, of the new animal are apparent.

But in the whole of this process of embryonic develop- ment, whether it be of the simplest or of the most complex kind, it is to be observed that it is solely by the multipli- cation and differentiation of cells which have

descended more or less directly from the original germ-cell that the organizing process is effected. It follows from this that the processes of organic growth or embryonic development pre- sent a textural or histological uniformity to a remarkable degree throughout the whole zoological series. There is also a very striking similarity in the morphological phenomena of development within large groups of animals. Our know- ledge, indeed, of the mode of formation of the young in all the varied forms of animal organization is still too limited to admit of our affirming that a uniform and progressive morphological type pervades the whole animal kingdom; but already many ascertained facts point strongly to such a conclusion, and the more our knowledge of the process of development in individaal animals (ontogeny) advances, the greater resemblance do we recognize in the formative processes; so that it becomes more and more probable that the morphological development of any of the higher animals includes, or as it were repeats within certain limits, the various steps of the process which belong to the inferior grades of the animal kingdom. Hence we are led to the further conclusion that there is an essential correspondence between the individual development or ontogeny of the higher animals and the progressive advance of the organi- zation in the whole animal series.

If, further, we adopt the Darwinian view of the evolution of animal life and organization by descent of one species of animals from others preceding it, we shall see that the embryological history of any animal is at the same time the history of its relation to other animals and of its phylogenetic development or gradual derivation as a species from more simple progenitors in the lapse of time. It is obvious, therefore, that we must look to the future pro- gress of embryology as well as of paleontology for a large portion of the facts upon which the confirmation of the modern theory of evolution will rest.

From what has been said it will be apparent that it would be impossible, within the limits of one article, to trace even in the briefest possible manner the phenomena of embryological development in all different animals. But special descriptions, so far as required, will find their ap- propriate places under the divisions of animals to which they

respectively belong ; and as there are some considera- tions relating to embryology which require to be stated besides the history of development, it has been deemed advisable to bring the more important facts of develop- ment of the embryo into connection with those relating to reproduction in general under the heading GENERA- TION, to which article, therefore the reader is referred.

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In the present article, accordingly, we shall do no more than trace shortly the steps by which the modern science of Embryology has originated and has assumed the important position which it now occupies among the biological sciences.

In its scientific and systematic form embryology may be considered as having only taken birth within the present century, although the germ from which it sprung was already formed nearly half a century earlier. The ancients, it is true, as we see by the writings of Aristotle and Galen, pursued the subject with interest, and the in- defatigable Grecian naturalist and philosopher had even made continued series of observations on the progressive stages of development in the incubated egg, and on the reproduction of various animals; but although, after the revival of learning, various anatomists and physiologists from time to time made contributions to the knowledge of the foetal structure in its larger organs, yet from the minuteness of the observations required for embryological research, it was not till the microscope came into use for the investigation of organic structure that any intimate know- ledge was attained of the nature of organogenesis. It is not to be wondered at, therefore, that during a long period, in this as in other branches of physical inquiry, vague speculations took the place of direct observation and more solid information. This is apparent in most of the works treating of generation during the 16th and part of the 17th centuries. +

Harvey was the first to give, in the middle of the latter century, a new life and direction to investigation of this sub- ject, by his discovery of the connection between the cicatri- cula of the yolk and the rudiments of the chick, and by his faithful description of the successive stages of

development as observed in tho incubated egg, as well as of the progress of gestation in some Mammalia. He had also the merit of fixing the attention of physiologists upon general laws of development as deduced from actual observation of the phenomena, by the enunciation of two important proposi- tions, viz.—(1) that all animals are produced out of ova, and (2) that the organs of the embryo arise by new forma- tion, or epigenesis, and not by mere enlargement out of a pre-existing invisible condition (Zxercitationes de Gene- ratione Anvmalium, Amstelodami, 1651, and in English by G. Ent, 1853, London). Harvey's observations, however, were aided only by the use of magnifying glasses (perspe- citle), probably of no great power, and he saw nothing of the earliest appearances of the embryo in the first thirty-six hours, and believed the blood and the heart to be the parts first formed.

The influence of the work of Harvey, and of the success- ful application of the microscope to embryological investi- gation, was soon afterwards apparent in the admirable researches of Malpighi of Bologna, as evinced by his com- munications to the Royal Society of London in 1672, " De ee

1 It may be proper to mention, as autliors of this period who made special researches on the development of the embryo—(1) Volcher Coiter of Groningen, who, along with Aldrovandus of Bologna, made a series of observations on the formation of the chick, day by day, in the incubated egg, which were described in a work published in 1573, and (2) Hieronymus Fabricius (ab Aquapendente), who, in his work De formato fetu, first published at Padua in 1600, gave an interesting account, illustrated by many fine engravings, of uterogestation and the foetus of a number of quadrupeds and other animals, and in a pos- thumous work entitled De formatione ovi et pulli, edited by J. Prevost, and published at Padua in 1621, described and illustrated by engrav- ings the daily changes of the egg in incubation. It is enough, how- ever, to say that Fabricius was entirely ignorant of the earlier phenomena of development which occur in the first two or three days, and even of the source of the embryonic rudiments, which he conceived to spring, not

from the yolk or true ovum, but from the chalaze or twisted deepest part of the white. The cicatricula he looked upon as

merely the vestige of the pedicle by which the yolk had previously been attached to the ovary.

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ovo incubato," and * De formatione pulli," and more especially in his delineations of some of the earlier phenomena of development, in which, as in many other parts of minute anatomy, he partially or wholly anticipated discoveries, the full development of which has only been accomplished in the present century. Malpighi traced the origin of the embryo almost to its very commencement in the formation of the cerebro-spinal groove within the cica- tricula, which he removed from the opaque mass of the yolk ; and he only erred in supposing the embryonal rudi- ments to have pre-existed as such in the egg, in conse- quence, apparently, of his having employed for observation, in very warm weather, eggs which, though he believed them to be unincubated, had in reality undergone some of the earlier developmental changes.

The works of Walter Needham (1667), Regner de Graaf (1673), Swammerdam (1685), Vallisneri (1689)—-following upon those of Harvey—all contain important contributions to the knowledge of our subject, as tending to show the similarity in the mode of production from ova in a variety of animals with that previously best known in birds. 'The observations more especially of De Graaf, Nicolas Steno, and J. van Horne gave much greater precision to the knowledge of the connection between the origin of the ovum of quadrupeds and the vesicles of the ovary now termed Graafian, which De Graaf showed always burst and discharged their contents on the occurrence of pregnancy.

These observations bring us to the period of Boerhaave and Albinus in the earlier part of the 18th century, and in the succeeding years to that of Haller, whose vast erudition and varied and accurate original observations threw light upon the entire process of reproduction in animals, and brought its history into a more syste- matic and

intelligible form. A considerable part of the seventh and the whole of the eighth volumes of Haller's great work, the Hlementa Physiologic, published at suc- cessive times from 1757 to 1766, are occupied with the general view of the function of generation, while his special contributions to embryology are contained in his Deux Mémoires sur la formation du Coeur dans le Poulet, and Deux Mémoires sur la formation des Os, both published at Lausanne in 1758, and republished in an extended and altered form, together with his " Observations on the early condition of the Embryo in Quadrupeds," made along with Kiihlemann, in the Opera Minora (1762-68). Though originally educated as a believer in the doctrine of " pre- formation" by his teacher Boerhaave, Haller was soon led to abandon that view in favour of "epigenesis" or new formation, as may be seen in various parts of his works published before the middle of the century; see especially a long note explanatory of the grounds of his change of Opinion in his edition of Boerhaave's Prelectiones Aca- demice, vol. v. part 2, p. 497 (1744), and his Prime Innee Physiologie (1747). But some years later, and after having been engaged in observing the phenomena of deve- lopment in the incubated egg, he again changed his views, and during the remainder of his life was a keen opponent of the system of epigenesis and a defender and exponent of the theory of "evolution," as it was then named—a theory very different from that now bearing the name, and which implied belief in the pre-existence of the organs of the embryo in the germ, according to the theory of encase- ment (emboitement) or inclusion supported by Leibnitz and Bonnet. (See the interesting work of Bonnet, Con- sidérations sur les Corps Organisés, Amsterdam, 1762, for an account of his own views and those of Haller.) The reader is also referred to the article Evoturion in the present volume, for a further history of the change which has taken place in the use of the term in more recent times,

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It was reserved for Caspar Frederick Wolff (1733-1794), a German by birth, but naturalized afterwards in Russia, to bring forward observations which, though almost entirely neglected for a long time after their publication, and in some measure discredited under the

influence of Haller's authority, were sixty years later acknowledged to have established the theory of epigenesis upon the secure basis of ascertained facts, and to have laid the first foundation of the morphological science of embryology. Wolff's work, entitled Zheoria Generations, first published as an inaugural Dissertation at Berlin in 1759, was republished with additions in German at Berlin in 1764, and again in Latin at Halle in 1774. Wolff also wrote a " Memoir on the Development of the Intestine" in Mov. Comment. Acad. Petropol., 1768 and 1769. But it was not till the latter work was translated into German by J. F. Meckel, and appeared in his Archiv for 1812, that Wolff's peculiar merits as the founder of modern embryology came to be known or fully appreciated.

The special novelty of Wolff's discoveries consisted mnainly in this, that he showed that the germinal part of the bird's egg forms a layer of united granules or organized particles (cells of the modern histologist), presenting at first no semblance of the form or structure of the future embryo, but gradually converted by various morphological changes in the formative material, which are all capable of being traced by observation, into the several rudimentary organs and systems of the embyro. The earlier form of the embryo he delineated with accuracy; the actual mode of formation he traced in more than one organ, as for example in the alimentary canal, and he was the discoverer of several new and important embryological facts, as in the instance of the primordial kidneys, which have thus been named the Wolffian bodies. Wolff further showed that the growing parts of plants owe their origin to organized particles or cells, so that he was led to the great generalization that the processes of embryonic formation and of adult growth and nutrition are all of a like nature in both plants and animals. No advance, however, was made upon the basis of Wolff's discoveries till the year 1817, when the researches of Pander on the development of the chick gave a fuller and more exact view of the phenomena less clearly indicated by Wolff, and laid down with greater precision a plan of the formation of parts in the embryo of birds, which may be regarded as the foundation of the views of all subsequent embryologists.

But although the minuter investigation of the nature and true theory of the process of embryonic development was thus held in abeyance for more than half a century, the interval was not unproductive of observations having an important bearing on the knowledge of the anatomy of the foetus and the function of reproduction. The great work of William Hunter on the human gravid uterus, containing unequalled pictorial illustrations of its subject from the penct! of Rymsdyk and other artists, was published in 1775; and during a large part of the same period numerous communications to the Memoirs of the Royal Society testified to the activity and genius of his brother, John Hunter, in the investigation of various parts of comparative embryology. But it is mainly in his rich museum, and in the manu- scripts and drawings which he left, and which have been in part described and published in the catalogue of his wonderful collection, that we obtain any adequate idea of the unexampled industry and wide scope of research of that great anatomist and physiologist.

As belonging to a somewhat later period, but still before the time when the more strict investigation of embryologi-

1 Along with the work of W. Hunter must be mentioned a large collection of unpublished observations by Dr James Donglas, which are preserved in the Hunterian Musenm of Glasgow University.

cal phenomena was resumed by Pander, there fall to be noticed, as indicative of the rapid progress that was making, the experiments of Spallanzani, 1789; the researches of Autenrieth, 1797, and of Soemmering, 1799, on the human foetus; the observations of Senff on the formation of the skeleton, 1801; those of Oken and Kieser on the intestine and other organs, 1806; Oken’s remarkable work on the bones of the head, 1807 (with the views promulgated in which Goethe’s name is also intimately connected); J. F. Meckel’s numerous aud valuable contributions to embryo- logy and comparative anatomy, extending over a long series of years; and Tiedemann’s classical work on the develop- ment of the brain, 1816.

Christian Pander's observations were made at the instance and under the immediate supervision of Prof. Dollinger at Wiirzburg, and we learn from Von Baer's autobiography that he, being an early friend of Pander's, and knowing his qualifications for the task, had pointed him out to Déllinger as well fitted to carry out the investigation of development which that professor was desirous of having accomplished. Pander's inaugural dissertation was entitled Historia meta- morphoseos quam ovum incubatum prioribus quinque diebus subtt, Virceburgi, 1817; and it was also published in Ger- man under the title of Beitrdge zur Entwickelungsgeschichte des ITiihuchens im Hie, Wiirzburg, 1817. The beautiful plates illustrating the latter work were executed by the elder D'Alton, well known for his skill in scientific ob- servation, delineation, and engraving.

Pander observed the blastoderm or germinal membrane of the fowl's egg to acquire three layers of organized sub- stance in the earlier period of incubation. These he named respectively the serous or outer, the vascular or middle, and the mucous or inner layers; and he traced with great skill and care the origin of the principal rudimentary organs and systems from different ones of these layers, pointing out shortly, but much more distinctly than Wolff had done, the actual nature of the changes occurring in the process of development.

Carl Ernest von Baer, the greatest of modern embryolo- gists, was, as already remarked, the early friend of Pander, and, at the time when the latter was engaged in his researches at Wiirzburg, was associated with Dollinger as prosector, and engaged with him in the study of comparative anatomy. He witnessed, therefore, though he did not actually take part in, Pander's researches; and the latter having after- wards abandoned the inquiry, Von Baer took it up for himself in the year 1819, when he had obtained an appoint- ment in the university of Kdnigsberg, where he was the colleague of Burdach and Rathke, both of whom were able coadjutors in the investigation of the subject of his choice. (See V. Baer's interesting autobiography, published on his retirement from St Petersburg to Dorpat in 1864.)?

Von Baer's observations were carried on at various times from 1819 to 1826 and 1827, when he published the first results in a description of the development of the chick in the first edition of Burdach's Physiology.

It was at this time that Von Baer made the important dis- covery of the ovarian ovum of mammals and of man, totally unknown before his time, and was thus able to prove as matter of exact observation what had only been surmised previously, viz., the entire similarity in the mode of origin of these animals with others lower in the scale. (/pistola de Ou Mammalium et Hominis Genesi, Lipsie, 1827. Sce

2 Von Baer was born in the Russian province of Esthonia in 1792, and was educated at Dorpat and in Germany. After having been fifteen years professor in the Prussian university of Kénigsberg, he was called toSt Petersburg, where he remained for nearly thirty years, and, as professor and member of the Imperial Academy, promoted in the most zealous and able manner, by his unexampled activity, compre- hensive and original views, sound judgment, and powerful co-operation, the whole range of scientific education and biological research.

also the interesting commentary on or supplement to the Epistola in Heusinger's Journal, and the translation in Breschet's Répertoire, Paris, 1829.) ;

In 1829 Von Baer published the first part of his great work, entitled Beobachtungen und Meflexionen uber die Entwickelungsgeschichte der Thiere, the second part of which, still leaving the work incomplete, did not appear till 1838. In this work, distinguished by the fulness, richness, and extreme accuracy of the observations and descriptions, as well as by the breadth and soundness of the general views on embryology and allied branches of biology which it presents, he gave a detailed account not only of the whole progress of development of the chick as observed day by day during the incubation of the egg, but he also described what was known, and what he himself had investigated by numerous and varied observations, of the whole course of formation of the young in

other vertebrate animals. His work is in fact a system of comparative embryology, replete with new discoveries in almost every part.

Von Baer's account of the layers of the blastoderm differs somewhat from that of Pander, and appears to be more consistent with the further researches which have lately been made than was at one time supposed, in this respect, that he distinguished from a very early period two primitive or fundamental layers, viz., the animal or upper, and the vegetative or lower, from each of which, in connec- tion with two intermediate layers derived from them, the fundameutal organs and systems of the embryo are derived: —the animal layer, with its derivative, supplying the der- mal, neural, osseous, and muscular; the vegetative layer, with its derivative, the vascular and mucous (intestinal) systems. He laid down the general morphological principle that the fundamental organs have essentially the shape of tubular cavities, as appears in the first form of the central organ of the nervous system, in the two mus- cular and osseous tubes which form the walls of the body, and in the intestinal canal; and he followed out with admirable clearness the steps by which from these funda- mental systems the other orgaus arise secondarily, such as the organs of sense, the glands, lungs, heart, vascular glands, Wolffian bodies, kidneys, and generative organs.

To complete Von Baer's system there was mainly wanting a more minute knowledge of the intimate structure of the elementary textures, but this had not yet been acquired by biologists, and it remained for Thomas Schwann of Liége in 1839, along with whom should be mentioned those who, like Robert Brown and Schleiden, prepared the way for his great discovery, to point out the uniformity in histological structure of the simpler forms of plants and animals, the nature of the organized animal and vegetable cell, the cellular constitution of the primitive ovum of animals, and the derivation of the various textures, complex as well as simple, from the transformation or, as it is now called, differentiation of simple cellular elements,—discoveries which have exercised a powerful and lasting influence on the whole progress of biological knowledge in our time, and have contributed in an eminent degree to promote the advance of embryology itsclf.

To Reichert of Berlin more particularly is due the first application of the newer histological views to the explanation of the phenomena of development, 1840. To him and to Kolliker and Virchow is due the ascertainment of the general principle that there is no free-cell formation in embryonic development and gcowth, but that all organs are derived from the multiplication, combination, and transformation of cells, and that all cells giving rise to organs are the descendants or progeny of previously existing cells, and that these may be traced back to the original cell or cell- substance of the ovum.

It may be that modern research has somewhat modified

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the views taken by biologists of the statements of Schwann as to the constitution of the oganized cell, espe- cially as regards its simplest or most elementary form, and has indicated more exactly the nature of the protoplasmic material which constitutes its living basis; but it has not caused any very wide departure from the general principles enunciated by that physiologist. Schwann's treatise, entitled Miscrocopical Researches into the Accordance in the Structure and Growth of Animals and Plants, was published in German at Berlin in 1839, and was translated into English by Henry Smith, and printed for the Sydenham Society in 1847, along with a translation of Schleiden's memoir, " Contributions to Phytogenesis," which originally appeared in 1838 in Miiller's Archiv for that year, and which had also been published in English in Taylor and Francis's Scientific Memoirs, vol. ii. part vi.

Among the newer observations of the same period which contributed to a more exact knowledge of the structure of the ovum itself may be mentioned—first, the discovery of the germinal vesicle, or nucleus, in the germ-disk of . birds by Purkinje (Symbole ad ov avium hastoriam ante incubationem, Vratislavie, 1825, and republished at Leipsic in 1830); second, Von Baer's discovery of the mammiferous ovum in 1827, already referred to; third, the discovery of the germinal vesicle of mammals by Coste in 1834, and its independent observation by Wharton Jones in 1835; and fourth, the observation in the same year

by Rudolph Waguer of the germinal macula or nucleus. Coste's discovery of the germinal vesicle of Mammalia was first communicated to the public in the Comptes Rendus of the French Academy for 1833, and was more fully described in the Recherches sur la génération des Mammiferes, by Delpech and Coste, Paris, 1834. Thomas Wharton Jones's observations, made in the autumn of 1834, without a knowledge of Coste's communication, were presented to the Royal Society in 1835. This discovery was also confirmed and extended by Valentin and Bernardt, as recorded by the latter in his work Symb. ad ow Mammal. hist. ante pregnationem. Rudolph Wagner's observations first appeared in his Zeaxtbook of Comparatiwe Anatomy, published at Leipsic in 1834-5, and in Miiller's Archiv for the latter year. His more extended researches are described in his work Prodromus hist. generationis hominis atque aninalium, Leipsic, 1836, and in a memoir inserted in the Trans. of the Roy. Bavarian Acad. of Sciences, Munich, 1837.

The two decades of years from 1820 to 1840 were peculiarly fertile in contributions to the anatomy of the foetus and the progress of embryological knowledge. The researches of Prevost and Dumas on the ova and primary stages of development of Butrachia, birds, and mammals, miade as early as 1824, deserve especial notice as important steps in advance, both in the discovery of the process of yolk segmentation in the batrachian ovum, and in their having shown almost with the force of demon- stration, previous to the discovery of the mammiferous ovarian ovum by Von Baer, that that body must exist as a minute spherule in the Graafian follicle of the ovary, although they did not actually succeed in bringing the ova clearly under observation.

The works of Pockels (1825), of Seiler (1831), of Breschet (1832), of Velpeau (1833), of Bischoff (1834)—all bearing upon human embryology; the researches of Coste in comparative embryology in 1834, already referred to, and those published by the same author in 1837; the publication of Joannes Miiller's great work on physiology, and Rudolph Wagner's smaller text-book, in both of which the subject of embryology received a very full treatment, together with the

excellent Manwal of the Development of the Foetus, by Valentin, in 1835, the first separate and systematic work on the whole subject, now

secured to embryology its permanent place among the biological sciences on the Continent ; while in this country attention was drawn to the subject by the memoirs of Allen Thomson (1831), Th. Wharton Jones (1835-38) and Martin Barry (1839-40).

Among the more remarkable special discoveries which belong to the period now referred to, a few may be mentioned, as, for example, that of the chorda dorsalis by Von Baer, a most important one, which may be regarded as the key to the whole of vertebral morphology; the phenomenon of yolk segmentation, now known to be uni- versal among animals, but which was only first carefully observed in Batrachia by Prévost aud Dumas (though previously casually noticed by Swammerdam), and was soon afterwards followed out by Rusconi and Von Baer in fishes ; the discovery of the branchial clefts, plates, and vascular arches in the embryoes of the higher abranchiate animals by Rathke in 1825-27; the able investigation of the transformations of these arches by Reichert in 1837; and the researches on the origin and development of the urinary and generative organs by Joannes Miller in

1829-30.

On entering the fifth decade of our century, the number of original contributions and systematic treatises becomes so great as to render the attempt to enumerate even a selection of the more important of them quite unsuitable to the limits of the present article. We must be satisfied, therefore, with a reference to one or two which seem to stand out with greater prominence than the rest as land- marks in the progress of embryological discovery. Among these may first be mentioned the researches of Theodor I. W. von Bischoff, formerly of Giessen and now of Munich, on the development of the ovum in Mammalia, in which a series of the most laborious, minute, and accurate observa- tions furnished a greatly novel and very full history of the formative process in several animals of that class. These

researches are contained in four memoirs, treating separately of the development of the rabbit, the dog, the guinea-pig, and the roe-deer, and appeared in succession in the years 1842, 1845, 1852, and 1854.

Next may be mentioned the great work of Coste, entitled Histoire gén. et particul. du Développement des Animaux, of which, however, only four fasciculi appeared between the years 1847 and 1859, leaving the work incomplete. In this work, in the large folio form, beau- tiful representations are given of the author's valuable observations on human embryology, and on that of various mammals, birds, and fishes, and of the author's discovery in 1847 of the process of partial yolk segmentation in the germinal disc of the fowl's egg during its descent through the oviduct, and his observations on the same phenomenon in fishes and mammals.

The development of reptiles received important elucida- tion from the researches of Rathke, in his history of the development of serpents, published at Koénigsberg in 1839, and in a similar work on the turtle in 1848, as well as in a later one on the crocodile in 1866,—along with which may be associated the observations of H. J. Clark on the "Embryology of the Turtle," published in Agassiz's Contributions to Natural History, &c., 1857.

The phenomena of yolk segmentation, to which reference has more than once been made, and to which later researches give more and more importance in connec- tion with the fundamental phenomena of development, received great elucidation during this period, first from the observations of C. T. E. von Siebold and those of Bagge on the complete yolk segmentation of the egg in nematoid worms in 1841, and more fully by the observa- tions of Kélliker in the same animals in 1843. The nature of partial segmentation of the yolk was first made known

by Kélliker in his work on the development of the Cepha- lopoda in 1844, and, as has already been mentioned, the phenomena were observed by Coste in the eggs of birds. The latter observations have

since been confirmed by those of Oellacher, Gitte, and Kolliker. Further researches in a vast number of animals give every reason to believe that the phenomenon of segmentation is in some shape or other the invariable precursor of embryonic formation.

A large body of facts having by this time been ascer- tained with respect to the more obvious processes of de- velopment, a further attempt to refer the phenomena of organogenesis to morphological and histological principles became desirable. More especially was the need felt to point out with greater minuteness and accuracy the relation in which the origin of the fundamental organs of the embryo stands to the layers of the blastoderm; and this we find accomplished with signal success in the researches of Remak on the development of the chick and frog, published between the years 1850 and 1855.

From Remak's observations it appeared that the middle layer of the blastoderm, whatever may be the precise source from which it originally springs,—a point left undetermincd by Von Baer, Remak, and even by more recent observers,— becomes divided in its lateral portions into two laminz, so as to leave between them the cavity which afterwards inter- venes between the external wall and the contained viscera of the body. This cavity corresponds to the pleuro-peri- toneal space of the higher animals, and may be designated in the lower by the general term of coelom (Haeckel).

While, therefore, Remak recognized an outer and an inner layer of the blastoderm, corresponding only in some measure with the serous and mucous layers of Pander, he showed that the greater part of the middle layer is divided into two, the outer of which is the main source of the osseous and muscular walls of the body, and the inner is the seat of development of the involuntary contractile walls of the alimentary canal, the heart, and the principal vessels.

Thus, according to the system of Remak, while the central portion of the middle layer remains undivided, and gives rise to the axial chorda dorsalis or notochord, with the surrounding vertebral aud cranial walls, the lateral parts of this layer are in the earlier stage of its develop- ment split into two by the formation of the pleuro- peritoneal

cavity, and there thus result the four layers whose relation may, according to the light received from more recent inquiry, be tabularly represented as follows:—

1. Sensorial or Epiblast….....

Eetoderm 2. Body ‘Wait | Secon-

Primi-

tive 2. 3. Mesoderm dary Blasto- or Mesoblast.. Blasto- derm | 8. Visceral Wall | derm.

Hndoderm 4, Intestinal or Hypoblast….....

From the first of these layers (1), the newro-corneous of Remak, now named epiblast, the cuticular system and central organs of the nervous system (cerebro-spinal axis) are primarily formed, and secondarily, certain parts of the principal organs of sense, viz., the eye, ear, and nose. ‘The motoro-germinative is the name applied to the middle layer by Remak, of which (2), the outer division, the volwnto- motory, corresponding to the body-wall or somatopleure of more recent authors, furnishes the material for the de- velopment of the true skin, the voluntary muscles, and the skeleton; and (3), the inner division, the ¢nvolunto-motory, corresponding to the visceral wall or splanchno-pleure of recent authors, is the source of formation of the contractile wall of the alimentary canal, the heart, and larger blood- vessels, the vascular glands, the primordial kidneys, and the generative organs. The fourth or lowest layer (4), the intestino-glandular of Remak and the hypoblast of recent writers, is the source of the epithelial lining of the alimen-

tary canal and air passages and of the cellular parts of the internal glands.

These researches of Remak appear in some measure to reconcile the views of Von Baer with those of other embryologists, as to the constitution of the blastoderm and the relation of its several layers to the fundamental systems and organs of the embryo. Recent observation, though modifying them in some respects, has not led to any im- portant invalidation of their general results; and we may therefore in the meantime regard them as forming the principal basis or starting-point of modern embryological inquiries, although much still remains to be ascertained as to the source of the mesoblast and its relation to the two primitive layers of the blastoderm. More especially important in a comparative embryological view is the for- mation of the calom or somato-visceral cavity, as connected with the gradual appearance in the animal series of the lymphatic and blood vascular cavities.

But while the researches of Remak and others had thus in the commencement of the sixth decade of our century brought the history of the general phenomena of develop- ment or embryogeny into a consistent and systematic form, especially as known in the higher vertebrates, much still remained to be done in the more minute investigation of the origin of the ovum and its germ, and the intimate nature of the process of fecundation, as well as in regard to the histological and morphological changes in which the organogenic processes consist. The progress of discovery in these departments has been greatly promoted by the very great improvements which have been introduced into the methods of investigation, the successful prosecution of which has had an equally favourable influence on the whole range of minute anatomy and histology, viz.—(1), the hardening, clearing, and tinting processes of preparation; (2), the method of fine section of the parts to be observed; and (3), the permanent preservation of specimens in the moist or dried state.

The first of these methods may be said to have had its origin in the introduction of the use of chromic acid as a hardening agent by Hannover of Copenhagen in 1840; and the works on practical histology since published bear ample testimony to the prodigious advance in refinement in the adaptation of this and other methods of hardening

and dis- tinctive coloration of the tissues, which have in recent times rendered the minuter investigation of the tissues compara- tively elegant and exact, and indeed now almost exhaustive.

The second method, or that of sections, as applied to embryological research, obviously suggested by the diagrams of Pander and Von Baer, seems first to have been practi- cally applied by Allen Thomson in 1831, though without the assistance of finer modern appliances, in the ascertain- ment of the earliest double condition of the aorta in the bird's embryo. It was soon carried to a much greater extent by Reichert, and later by Remak, and it is now universally pursued as a principal means of embryological investigation. 'To show the extent to which the successful combination of the above-mentioned methods is now carried by the use of the most approved chemical reagents and the best sectional instruments, it may be stated that as many as several hundreds of perfectly clear sections may be made through the body of an embryo of only half an inch in length, and that similarly thin sections may be made in any de- sired direction through the smallest as well as larger ova, and that, notwithstanding the extreme delicacy of some of the parts and the inequality of their density, every one of the sections may be made to present a distinct and true view both of the microscopic histological characters and of the larger morphological relations of the parts observed.

Accordingly, during the time which has elapsed since the publication of Remak's work, the number of contributions

to different parts of our subject, by the history of original observations made maiuly by the way of sections, has been immense, and it goes on increasing to the present time. Among the more important of these, as influencing the general progress of embryological science, the following may be mentioned.

First, in connection with the development of Fishes, the researches of Lereboullet "On the Pike and the Perch" (Anna. des Sciences Nat., 1862,); those of Joseph Oellacher " On the Trout" (Zeitsch. fiir

Wissensch. Zool., 1872); those of His also ‘On Osseous Fishes,” appearing in 1875, and the important and elaborate researches of F. M. Balfour “On the Elasmobranch Fishes,” in 1874 and following years (Journ. of Anat. and Physiol. and Quart. Journal of Microscopic Anatomy); the prize memoir of Max Schulze On the Development of the River Lamprey, Haarlem, 1856 ; and the researches of Kowalewsky “ On the Development of the Amphioxus” (in the Mem. of the St Petersburg Acad., tom Xi., 1867), are deserving of uotice.

Second, in regard to Amphibia, after the memoirs of Rusconi, Reichert, Remak, and C. Vogt of earlier date, the most important recent contributions are those of V. Bambecke “ On the develop- ment of Pelobates fuscus” (Mém. de l’ Acad. de. Belgique, vol. xxxiv., 1868), and the very beautiful work of C. Gotte On the De- velopment of the Toad, Bombinator igneus (Leipsic, 1874, folio).

Third, in regard to Reptilia, not much has been done since Rathke’s work On the Development of the Turtle was published in 1848. But there may be mentioned as valuable contributions to this department, the Account of the Development of the Crocodile, by Rathke himself in 1866, and the “ Embryology of the Turtle,” by H. J. Clark, in Agassiz’s Contributions to the Natural History of the United States (vol. ii. 1857).

Fourth, in the class of Birds, the most notable work which has appeared in recent times on the earlier phenomena of their develop- ment is that of His, entitled Researches on the First Foundation of the Body in Vertebrate Animals (Leipsic, 1868), in which a careful revision of the subject is undertaken from original observations, and a clearer distinction established between the axial or central and the lateral parts of the blastoderm. Under this head come also the researches of Dursy upon the primitive traceofthe chick (Lahr, 1866), F. M. Balfour’s paper on the same subject (1873), and the important observations of Peremeschko on the formation of the layers of the blastoderm, especially the middle one (Vienna Acad., 1868), Affanasieff on the first circulation in the fowl’s embryo (in 1866), E. Klein on the development of blood vessels and blood corpuscles from the middie layer (1868), along with which may also be quoted the observations of Waldeyer,

Oellacher, Stricker, Gotte, Balfour, and Kélliker, as tending to throw light on the origin of the blastedermic layers.

Fifth, in regard to Mammatia, the most recent observations after those of Bischoff on the process of development in this class, arc those of Hensen, in Zettsch. fiir Anat. und Entwickelungsgesch., vol. i., 1875-6 ; the observations of Kolliker in the new edition of his systematic work, 1876 ; those of Reichert, in his Account of the Development of the Guineapig, Berlin, 1862, and his Description of an Early Human Product, &c., Berlin, 1873 ; also in the papers of KE. A. Schafer, from Physiol. Laborat. Univ. Coll. London, and Proceedings Roy. Soc., 1876.

On the structure and morphology of the ovum may be quoted the article “ Ovum ” in the Cyclopedia of Anatomy and Physiology, by Allen Thomson (1852-56); the contributions of Gegenbaur, 1861 and 1864, and of Cramer, 1868; and the very able “ Mémoire Couronne” of Edward van Beneden, Recherches swr la composition et la signification de 1 Oeuf, Brussels, 1870.

With respect to the process of segmentation of the ovum and earliest steps in the formation of the germ, the most interesting re- searches have recently been communicated by Auerbach, Butschli, Strasburger, Edw. van Beneden, Oscar Hertwig, and others, which are still in progress, and will be referred to in the article GENE- RATION.

Several systematic works or text-books on embryology have ap- peared since it assumed the form and dimensions of a special branch of science. The first of these, by Valentin, referring to the development of man, mammals, and birds, was published in 1835. The next was that of Bischoff, published in 1842, as one of the volumes of the encyclopedic system of anatomy named after Soemmering. The third work of this kind was that of Kolliker, in the form of lectures, published in 1861, and giving a very full account of the development of the ovum and embryo in man and the higher animals. Of this work a second edition is now in pro- gress, the first part having appeared in 1876. To this excellent work, as fhe production of one who has contributed a very large amount of original observations on embryology and the whole range of minute anatomy, the reader may be referred for the fullest and most accurate systematic information on the subject. In comparative embryology we have the interesting short treatise of Rathke,

edited after his death by Kélliker in 1861, and the Lehrbuch der Vergleichende Embryologie by S. L. Schenk, Vienna, 1874. We may also refer here to the excellent plates illustrating embryology in the Zcones physiologice of A. Ecker, 1854.

In this country, since the appearance of the very careful trans- lation of Miiller's Physiology by Baly, which had the advantage of revision in many of its parts by Sharpey, and the translation of Wagner's Physiology in 1846, there has appeared only one syste- matic work on embryology, viz., the Elements of Embryology by M. Fosterand F. M. Balfour, of which the first part, which appeared in 1874, treating of the development of the embryo of birds, deserves the highest praise. A short view of human embryology is given by Allen Thomson in the 8th edition of Quain's Anatomy, 1876.

For an account of the relation of embryology to the classification of animals and to phylogeny or the theory of descent, the English reader is referred to various parts of the writings of Darwin and Huxley, and to the excellent translation of Haeckel's work on the History of Creation, 2 vols., Jondon, 1874; to F. M. Balfour's "* Comparison of the Early Stages in the Development of Verte- brates" in Journ. of Microscopical Science, vol. xv., 1875, and to the recently published Notes on Embryology and Classification, by Z. Ray Lankester, 1877.

In the preceding sketch of the history of the foundation and progress of the science of embryology, no attempt has been made to trace that part of it which includes the development of different invertebrate animals, as it was felt that from the extremely numerous, varied, scattered, and fragmentary nature of many of the contributions of authors in this part of our subject, any attempt at the citation even of the more important would be quite unsuitable to this work.

It will be enough for us here to state that the first con- siderable original work on the development of a division of the invertebrates was that of Maurice Herold of M arburg on spiders, " De generatione Aranearum ex ovo," published at Marburg in 1824, in which the whole phenomena of the formative process in that animal are described with remark- able clearness and completeness.

A few years later an important series of contributions to the history of the development of invertebrate animals appeared in the second volume of Burdacli's work on Physiology, of which the first edition was published in 1828, and in this the history of the development of the

Entozoa was the production of Ch. Theod. Von Siebold, and that of most of the other invertebrates, was com- piled by Rathke from the results of his own observations and those of others, These memoirs, together with others subsequently published by Rathke, entitle him to be re- garded as the founder of invertebrate embryology.

It would be quite unsuitable in this article to attempt to pursue further the history of research in the embryology of invertebrate animals, as may well be seen from the fol- lowing enumeration in an alphabetical order of the names of some of the more prominent original observers, to whom has been mainly due the great progress in this part of our science, viz., Agassiz, Allman, Balbiani, Edward van Bene- den, P. J. van Beneden, Victor Carus, Claparéde, Cohn, Dalyell, Darwin, Dujardin, Ecker, Eschricht, Gegenbaur, Haeckel, Huxley, Kolliker, Kowalewsky, Krohn, Lacaze Duthiers, Lereboullet, Leuckart, Leydig, Lovén, Lubbock, Metschnikoff, Milne-Edwards, H. Miiller, Johannes Miiller, Nordmann, Prévost, Quatrefages, Salensky, Sars, Max Schultze, Semper, Steenstrup, Stein, C. Vogt, R. Wagner, Strethill Wright. But this list includes only a small part of the observers whose contributions to the knowledge of this wide field of research would require to be noticed in any account of its literature.

The most general results which are deducible from the numerous observations which are now being accumulated in this department of embryology may be briefly stated as follows.

In the Protozoa there is no true sexual generation, although in some the phenomena of conjugation form an approach to that mode of reproduction. The yreater number

usually naultiply either by fission or by gemmation; but in some, and probably in all, reproduction also appears to take place from extremely minute particles separated from the parent animals, whicli can scarcely be called ova, but which, for want of a better term, we may designate germinal particles.

In all animals above the Protozoa, including the sponges, male and female reproductive elements are to be distin- guished, that of the female taking the form of an ovum, in which the germinal part has the protoplasmic structure of a true organized cell.

Fecundation of the ovum takes place, as in all verte- brates, by the direct access of the substance of the male element to the germinal part of the ovum.

The first steps in the development of a fecundated ovum are in all instances among the invertebrates, just as in the vertebrates, those of cellular multiplication by fission or cleavage of the protoplasmic germ of the ovum, which results in the formation of a more or less laminar blastoderm.

This blastoderm presents at first two layers of cells, ectoderm and endoderm, in all animals above the Protozoa, and in the lowest of the Coelenterata only two ; but in all the higher animals there appears an additional intermediate layer or layers, constituting the mesoderm.

From these layers the rudiments of the several systems and organs of tle body are developed by processes of cel- lular multiplication and differentiation according to certain histological and morphological laws essentially analogous to those which have been in part previously referred to in this article, and which will be more fully described in that on GENERATION.

Having now traced the principal steps by which, upon the basis of extended morphological and histological ob- servations during a century, extending from Wolff to Dar- win, the science of embryology has been securely founded, enough has been adduced to show the important place which this science must occupy in relation to other depart- ments of biology. It will be seen that histology owes to embryological observations the greatest amount of its recent extraordinary progress. It is also apparent that many of the most important facts in physiology, especially as related to growth and nutrition, can only be understood from a full and minute acquaintance with the various changes of differentiation observed in the development

of organie structure. It is equally obvious that the nature of certain kinds of congenital malformation receive their rational explanation in the knowledge of the natural organogenetic process of development, from which they are no more than deviations in different modes and degrees. Nor can it be doubted that the arrangement of animals under an ap- proved zoological system, in which the various affinities and gradations of their organization are fully recognized, can only be undertaken upon the basis of a complete knowledge of the metamorphoses of the young of animals and the relation of the embryonic to the adult forms of the species. Lastly, the general views which we may attempt to form of the process by which in the long lapse of time since the creation the various kinds of animals, including man, may be supposed to have originated must be founded on the correlation of the ascertained facts of embryology, as observed in every animal species, with the fuller knowledge of the different forms and gradations of all existing animals, and with the more complete observa- tion o1 the different forms of organization, the evidence of whose existence at successive periods of the earth's history is to be found in their fossil remains which are inclosed in the various strata composing its superficial crust. (A. T.)

EMDEN, formerly EmppeEn, a maritime town of Prussia, in the district of Aurich, province of Hanover, is situated near the mouth of the Ems, on the Westphalian railway,

45 miles W.N.W. of Oldenburg. The town is much intersected by canals, and more than thirty bridges are re- quired to connect its different parts. It has a considerable maritime trade, chiefly in corn, butter, cheese, and wood. Its industries are ship-building, tanning, and the manufac- ture of paper, cement, and tobacco. Amongst its public buildings may be named the town-house, the orphanage, the poorhouse, the museum, the great Reformed church, the gymnasium, and the deaf and dumb institute. Emden belonged originally to East Friesland. From 1595 it was a free town under the protection of

Holland until 1744, when, along with East Friesland, it was transferred to Prussia, after which it came into the possession of Holland in 1806, of France in 1809, of Prussia in 1814, and of Hanover in 1815; aud finally in 1866 it was, along with Hanover, incorporated with Prussia. The population of Emden in 1875 was 12,874.

EMERALD (Greek, capaydos), a precious stone classed mineralogically with the beryl (see vol. iii. p. 613), from which, however, it differs in having a fine green colour, attributed to the presence in it of chromium sesquioxide : it-also never presents the internal striz often seen in the beryl. The cheinical composition of the emerald may be represented by the formula 6SiO,,Al1,0,,3G10. It occurs in six-sided prismatic crystals of the hexagonal systein, the edges of which not unfrequently show various niodifications. The emerald is trausparent or translucent, and has a vitreous, rarely resinous lustre, an uneven and conchoidal fracture, a hardness of 75-8, and a specific gravity of 2°670 to 2°732. Tt is brittle and comparatively soft when fresh from the mine, but hardens on exposure to the air. The specific gravity of crystallized emeralds after fusion was found by Greville Williams to be 2°4, 9 per cent. of the original weight having been lost. The emerald is unaffected by acids, but with borax gives before the blowpipe a transparent greenish glass. On friction it becomes electric. Wohler, Rose, Hofmeister, and Greville Williams have shown that the emerald may be heated to a very high temperature without destruction of its colour, which cannot therefore, as supposed by Lewy, be due to the organic impurities discovered in the stone. Cleavage of the emerald at right angles to the axis of the crystals may be effected without much difficulty, and in the East, previous to about the middle of the 15th century, the stone was generally worn in slices so obtained. The finest emeralds are procured from Muzo, in Colombia (see vol. vi. p. 154). The fossiliferons character of the liniestone in which they occur at Muzo, and the presence in them of froni 1°65 to 2°15 per cent. of water, led Mr Lewy to the conclusion that they must have been crystallized out of aqueous solution. Other localities are Henbachthal in Salzburg, Odontchelong in Siberia, and Canjargum in India. The emeralds of Colombia, according to Boussingault, are divided into several classes, the principal of which are the canutillos or the crystallized and more

valuable stones, and the morallons or amorphous stones, poor in colour, and of little value. The Hebrew word nophech, rendered " emerald " in the English version of the Scriptures, appears to have been the carbuncle. The emerald was highly valued by the ancients (see Pliny, Nat. Hist., xxxvii. 5). Various virtues were formerly ascribed to the gem: it was said to be good for the eyes, to colour water green, to assist women in childbirth, and to drive away evil spirits ; and in the East it is still accredited with talismanic and medicinal properties. One of the most celebrated examples of the emerald is that in the possession of the duke of Devonshire, measuring upwards of 2 inches in length, and across its three diameters 24, 24, aud 1{ inches. Other fine stones are the Hope emerald, weighing 6 oz, and those of the Russian, Saxon, and Papal crowns. Emeralds are cut on a copper wheel with

emery, and polished on a tin wheel with rotten-stone,

- Tn a good gem," says Mr Emanuel, " the surface must be

perfectly straight and smooth, so as to cast no darkening shadow on any of its particles." The form usually given to emeralds is that of a square table with the edges re- placed, the lower surface being cut into facets parallel to their sides, When fine they are always set without a foil; and, as their brilliancy is somewhat impaired by candle- light, they are generally surrounded with small diamonds or pearls, which enhance their effect. The gem has been very successfully imitated by manufacturers of paste stones, the colouring matter used being oxide of chromium. As a gem the emerald is reckoned inferior only to the diamond and ruby, but, unlike them, it does not increase in value in proportion to the cube of its weight. What is termed the Oriental emerald is a green variety of corundum, an exceedingly scarce gem.

See H. Emanuel, Diamonds and Precious Stones, 1865; Greville

Williams, " Researches on Emeralds and Beryls," Proc. Roy. Soc. xxi. 1872-3, p. 409. EMERIC-DAVID, Toussatnt-BERNARD (1755-1839), a French archeologist and writer on art, was born at Aix, in Provence,

20th August 1755. He was destined for the legal profession, and having gone in 1775 to Paris to com- plete his legal education, he acquired there a taste for art which influenced his whole future career. After being made advocate, he went to Italy, where he continued his art studies. He soon returned, however, to his native village, and followed for some time the profession of au advocate ; but on the death of his uncle Antoine David in 1787 he succeeded to his printing business. He was elected mayor of Aix in 1791; and although he speedily resigned his office, he was in 1793 threatened with arrest, and had for some time to adopt a vagrant life. When danger was past he returned to Aix, sold his printing business, and engaged in general commercial pursuits; but he was not long in renouncing these also, in order to devote himself exclusively to literature and art. From 1809 to 1815 he represented his department in the legislative chamber, and in 1816 he was elected a member of the Institute. He died at Paris, 2d April 1839.

Emeric-David was placed in 1825 on the commission appointed to continue L' Histoire littéraire de la France. His principal works are Recherches sur l'art statuaire, considéré chez les anciens et les moderncs, Paris, 1805, a work which obtained the prize of the Insti- tute ; Suite d'études calquées et dessinées d'apres cing tableaux de Raphael, Paris, 1818-21, in 6 vols. fol.; Jupiter, ow recherches sur ce dicu, sur son cultc, &c., Paris, 1833, 2 vols. 8vo, illustrated; and Vulecain, Paris, 1837.

EMERSON, Wittram (1701-1782), an eminent but eccentric mathematician, was born May 14, 1701, at Hurworth, near Darlington, where his father Dudley Emerson, also a mathematician of high attainments, taught a school. From him young Emerson received a thorough mathematical education, and the bequest of a good mathe- matical library. For his classical training he was indebted to the curate of Hurworth, who lodged in his father's house, In the earlier part of his life he followed his father's profes- sion, but with little success ; and this, coupled with the fact of his having received as an only child a moderate compe- teuce from his parents, led him to devote hiniself entirely to studious retirement. Towards the close of 178! he re- linquished his studies and disposed of his library. His death took place

soon after, May 20, 1782, at his native village, in the eighty-first year of his age. Emerson iu dress, manners, and appearance was eccentric and indeed clownish, but he possessed remarkable independence of character, and intellectual energy of a very high order. The boldness with which he expressed his opinions on religious subjects led to his being charged with scepticism, but for this there was uo foundation. He invariably shut

himself up in London during the publication of his works, and carefully revised them sheet by sheet himself, so that they are singularly free from errata. In mechanics, he never advanced a proposition which he had not previously tested in practice, nor published an invention without first proving its effects by a model. Emerson was married, but had no family. His wife employed her leisure in spinning on a curious wheel, of which an accurate drawing is given in his Mechanics. His own favourite recreation was fishing. He was skilled in the science of music, the theory of sounds, and the ancient and modern scales; but he never attained any excellence as a performer.

The following is a list of Emerson's works :—The Doctrine of Fluxions, 1748, 8vo; The Projection of the Sphere, orthographic, stereographic, and gnomical, 1749, 8vo; The Elements of Trigono- metry, 1749, 8v0o; The Principles of Mechanics ,1754, 8vo; A Treatise of Navigation, 1755, 12mo; A Treatise of Algebra, in two books, 1785, 8vo; The Arithmetic of Infinites, and the Differential Method, illustrated by Examples, 1767, 8v0; Mechanics, or the Doctrine of Motion, 1769, 8vo; The Elements of Optics, in four books, 1768, 8vo; A System of Astronomy, 1769, 8vo; The Laws of Centripetal and Centrifugal Force, 1769, 8vo ; The Mathematical Principles of Geography, 1770, 8vo; Tracts, 1770, 8vo; Cyclomathesis, or an easy Introduction to the several branches of the Mathematics, 1770, in ten vols. 8vo; A short Comment on Sir Isaac Newtons Prin- cipia ; to which is added, A Defence of Sir Isaac against the objec- tions that have been made to several parts of his works, 1770, 8vo ; A Miscellaneous Treatise containing several Mathematical Subjects, 1776, 8vo. :

EMERY (Greek, cuvpis ; Spanish, esmerzl), an impure variety of the mineral corundum, bluish-grey to brownish in colour, dimly translucent, and granular and rough in fracture, and having a hardness of 9, and specific gravity varying between 3°7 and 4°3, Much of the emery of com- merce is artificially coloured of a rich reddish brown. Analyses of emery show a percentage composition of from about 60 to 80 per cent. of alumina, and 8 to 33 per cent. of ferric oxide, with small quantities of lime, silica, and water. It occurs in amorphous masses in schists, gneiss, granular limestone, and other crystalline rocks, and in rolled and detached pieces and in granules in soils. The principal European source of emery is the island of Naxos, which in 1872 exported to England 1270 tons, to Hamburg 250 tons, and to Rotterdam 300 tons of the mineral. It occurs also near Smyrna, and in Sweden, Saxony, Spain, Green- land, Massachusetts, and other localities. Emery is used as a polishing material for plate-glass, crystal, lapidaries' work, and metals, and in cutting granite and marble, It is pre- pared for use by breaking with hammers, crushing with steel stamps, and sifting. Combined with leather by the American " tanite " process, or treated after Ransome's method for the manufacture of artificial stone (see Con- CRETE, vol, vi, p. 243), emery powder is formed into grinding wheels, hones, and similar instruments, Emery, more especially that used for emery-paper and emery-cloth, is commonly adulterated with garnet, zircon, iron-slag, and other substances harder than quartz sand.

EMETICS, substances which are administered for the purpose of producing vomiting. They are usually regarded as of two varieties, viz., those which produce their effect in virtue of their absorption into the blood and consequent influence upon the nerve centres, and those which act topically on the mucous membrane of the stomach, giving rise to vomiting as the result of reflex action. The former class of emetics are slower in their operation and are attended with much greater depression of the system and antecedent nausea than the latter, the action of which is prompt. The use of emetics in medicine is comparatively rare, although at one time they were often resorted to in the early stages of acute diseases, such as fevers and inflammations, with the object of cutting them short. Their power, however, to

accomplish this is more than questionable. Among the purposes for which emetics are

employed are the following—to empty the stomach in certain cases of poisoning, such as by narcotics or where indigestible substances are giving rise to disturbance which calls for their removal, and to clear the air passages of obstructions, as in certain cases of bronchitis or croup, where the respiratory tubes become filled with morbid material which threatens death by asphyxia, and which cannot be dislodged by coughing, For both these pur- poses the stimulating emetics are to be preferred, such as the sulphates of zine and copper, or, where these are not available, mustard stirred into water. Again, emetics are eiployed in producing, short of their emetic action, a certain degree of nausea and consequent relaxation during the early stages of acute inflammation in strong persons, and for this purpose the more depressing emetics are resorted to, such as antimony, ipecacuanha, apomorphia, &c. The latter are likewise employed in obstetric prac- tice with the view of producing relaxation in cases of protracted labour from uterine and muscular rigidity. Emetics ought always to be administered with caution, since the act of vomiting may be attended with danger where there exists any tendency to brain disease or in cases of disease of internal organs; or further, from the vomiting continuing longer than was intended, injury may be done to the mucous membrane of the stomach as well as serious shock inflicted on the system.

EMEU, evidently from the Portuguese #ma,! a name which has in turn been applied to each of the earlier-known forms of Ratite Birds, but has in all likelihood finally settled upon that which inhabits Australia, though, until less than a century ago, it was given by most authors to the bird now commonly called Cassowary—this last word being a corrupted form of the Malayan Suwari (see Crawfurd, Gramm. and Dict. Malay Language, ii. pp. 178 and 25), apparently first printed as Casoaris by Bontius in 1658 (Hist. nat. et med. Ind. Orient. p. 71).

The Cassowaries (Casuartide) and Emeus (Dromeide) —as the latter name is now used—have much structural resemblance, and form the

Order JMMegistanes,2 which is peculiar to the Australian Region. Professor Huxley has shewn (Proc. Zool. Soc. 1867, pp. 422, 423) that they agree in differing from the other fatitw in many important characters, into the details of which it is now impossible to enter ; but one of the most obvious of them is that each contour-feather appears to be double, its hyporrhachis, or aftershaft, being as long as the main shaft—a feature noticed in the case of either form so soon as examples were brought to Europe, The external distinctions of the two families are, however, equally plain. 'The Cassowaries, when adult, bear a horny helmet on their head, they have some part ofthe neck bare, generally more or less ornamented with caruncles, and the claw of the inner toe is remarkably elongated. The Emeus have no helmet, their head is feathered, their neck has no caruncles, and their inner toes bear a claw of no singular character.

The type of the Casuarizdew is the species named by Linnzeus Struthio casuarius and by Latham Caswarius emeu. Vieillot subsequently called it C. galeatus, and his epithet

1 By Moraes (1796) and Sousa (1830) the word is said to be from the Arabic Na'dma or Na'éma, an Ostrich (Struthio camelus); but no additional evidence in support of the assertion is given by Dozy in 1869 (Glossaire des mots espagnols et portugais dérivés de Varabe. Ed. 2, p. 260). According to Gesner in 1555 (lib. iii. p. 709), it was the Portuguese name of the Crane (Grus communis), and had been transferred with the qualifying addition of "di Get" (i.e., Ground- Crane) to the Ostrich. This statement is confirmed by Aldrovandus (lib. ix. cap. 2). Subsequently, but in what order can scarcely now be determined, the name was naturally enough used for the Ostrich-like birds inhabiting the lands discovered by the Portuguese, both in the Old and in the New World. The last of these are now known as Rheas, and the preceding as Cassowaries.

2 Ann. and Mag. Nat. Hist. ser. 4, xx. p. 500.

has been very commonly adopted by writers, to the exclusion of the older specific appellation. It seems to be peculiar to the island of Ceram, and was made known to naturalists, as we learn from Olusius, in 1597, by the first Dutch ex- pedition to the East Indies, when an example was brought from Banda, whither it had doubtless been conveyed from its native island. It was said to have been called by the inhabitants " Emeu," or " Ema," but this name they must have had from the earlier Portuguese navigators. Since that time examples have been continually imported into Europe, so that it has become one of the best-known members of the subclass fatite, and a description of it seems hardly necessary. Fora long time its glossy, but coarse and hair-like, black plumage, its lofty helmet, the gaudily-coloured caruncles of its neck, and the four or five barbless quills which represent its wing-feathers, made it appear unique amoung birds. But in 1857 Dr George Bennett certified the existence of a second and perfectly distinct species of Cassowary, an inhabitant of New Britain, where it was known to the natives as the Mooruk, and in

Fic. 1.—Ceram Cassowary. ?

his honour it was named by Mr Gould C. bennetti. Several examples were soon after received in this country, and these confirmed the view of it already taken. Of late years a con- siderable number of other species of the genus have been described (see Birps, vol. iii. p. 740, note) from various localities in the same Subregion.2 Conspicuous among

1 It is known that the Portuguese preceded the Dutch in their voyages to the East, and it is almost certain that the latter were assisted by pilots of the former nation, whose names for places and various natural objects would be imparted to their employers (see Dopo, vol. vii. p. 322).

- **The figures are taken, by permission, from Messrs Mosenthal and Harting's Ostriches and Ostrich Farming, Tritbner & Co., 1877.**

° The enterprise of travelling naturalists in New Guinea and its adjacent islands has recently been so great that the list given in the passage above referred to is already out of date, and it seems at preseut

hardly possible to place the exact state of our knowledge of the species of Caswarius before the reader. Several of them have been described from immature examples living in menageries, which

them from its large size and lofty helmet is the C. australis, from the northern parts of Anstralia. Its existence indeed had been ascertained, by the late Mr T. 8. Wall, in 1854, but the specimen obtained by that unfortunate explorer was lost, and it was not until 1867 that an example was submitted to competent naturalists.

Not much seems to be known of the habits of any of the Cassowaries in a state of nature. Though the old species occurs rather plentifully over the whole of the interior of Ceram, Mr Wallace was unable to obtain or even to see an example. They all appear to bear captivity well, and the hens in confinement frequently lay their dark green and rough-shelled eggs, which, according to the custom of the Ratite, are incubated by the cocks. The nestling plumage is mottled (Proc. Zool. Soc. 1863, pl. xlii.), and when about half-grown they are clothed in disbevelled feathers of a deep tawny colour.

Of the Emeus (as the word is now restricted) the best- known is the Casuarius novee-hollandic of Latham, made by Vieillot the type of his genus Dromcus,* whence the

Fic. 2,—Emen.

name of the family (Dromcide) is taken. This bird immediately after the colonization of New South Wales (in 1788) was found to inhabit the south-eastern portion of Australia, where, according to Hunter (Hist. Journ., &e., pp. 409, 413), the natives call it Maracry, Marryang, or Maroang ; but it has now been so hunted down that not an

a a a ra a a have not always lived to assume the characteristics of the adult, and a comparison of such examples has uot in every case been practicable. Moreover, the precise localities whence some of them have been brought have perhaps been wrongly assigned. The promised work

of Prof. Salvadori on the ornithology of New Guinea will very likely clear up many points that are now open to doubt; and though it is probable that in some instances the same species has beeu designated by more than one name, it cannot be maintained that every existing species has been brought to our knowledge.

4 The obvious misprint of Dromeicus in this anthor's work (Analyse, &c., p. 54) has been foolishly followed by many naturalists, forgetful that he corrected it a few pages further on (p. 70) to Dromaius—the properly latinized form of which is Dromeus.

example remains at large in the districts that have been fully settled. It issaid to have existed also on the islands of Bass's Straits and in Tasmania, but it has been exter- minated in both, without, so far as is known, any ornithologist having had the opportunity of determining whether the race inhabiting those localities was specifically identical with that of the mainland or distinct. Next to the Ostrich the largest of existing birds, the common Emeu is an inhabitant of the more open country, feeding on fruits, roots, and herbage, and generally keeping in small companies, The nest is a shallow pit scraped in the ground, and from nine to thirteen eggs, in colour varying from a bluish-green to a dark bottle-green, are laid therein, These are hatched by the cock-bird, the period of incubation lasting from 70 to 80 days. The young at birth are striped longitudinally with dark markings on a light ground. A remarkable structure in Dromeus is a singular opening in the front of the windpipe, communicating with a tracheal pouch. This has attracted the attention of several anatomists, and has been well described by Dr Murie (Proc. Zool. Soc. 1867, pp. 405-415). Various conjec- tures have been made as to its function, the most probable of which seems to be that it is an organ of sound in the breeding-season, at which time the hen-bird has long been known to utter a remarkably loud booming note. Due convenience being afforded to it, the Emeu thrives well, and readily propagates its kind in Europe. Itis the only form of Ratite bird which naturally takes to the water, and examples have been seen voluntarily swimming a wide river.

The existence in Australia of a second species of Dromeus had long been suspected, and Broderip in 1842 stated (Penny Cyclop. xxiii. p. 145) that Mr Gould had even supplied a name (D. parvulus) for it; but there can be little doubt that this suggestion was founded on a mistake, However, in 1859 Mr Bartlett described, under the name of D. trroratus, what has since been generally admitted to be a good species, and it now seems certain that this fills in the western part of Australia the place occupied by the older-known form in the Eastern. It is a more slender bird, and when adult has the feathers barred with white and dark-grey ending in a black spot which has a rufous margin, while those of D. nove-hollandice are of a uniform blackish-grey from the base to near the tip, which is black with a broad subterminal rufous band. Both species have been figured by Mr Sclater from admirable drawings by Mr Wolf (7'rans. Zool. Soc. iv. pls. 75, 76), and interesting particulars as to their domestication in England are given by Mr Harting (Ostriches and Ostrich Farming, pp. 131-174). (a. N.)

EMIGRATION, now one of the most constant and orderly movements of human society, must have been one of the earliest, however irregular, of human impulses. It is the act of men, families, tribes, or parts of tribes, leaving the place of their birth with the view of settling in some other place. They are emigrants in the country they leave, and immigrants in the country they pass into. But this converse nomenclature describes an identical class of persons and the same kind of adventure, more necessary now than ever to be distinguished from migrations within a given terri- tory, or the frequent travellings between distant countries in which many engage, whether on purposes of business or pleasure. Emigration is a going out with a design of per- manently settling in new seats of residence, labour, trade, aud society. It is the practical response which mankind have given in all ages to the command to " multiply, and replenish the earth, and subdue it ;" or, in other words, it is a necessary result of the increase of population within a limited though cherished space, and of the appointed destiny of our race to people and develop the world,

The natural law of population, though probably the deep underlying force of all emigrations, is not the only force at work in the general movement by which people, and races of people, have migrated from one part of the world to another. Not only famines, which may be said to present the pressure of population in its intensest form, but wars of official conquest and ambition, religious persecu- tions and religious phantasies, civil broils and political re- volutions, the discovery of gold and silver mines, the envy of more genial climes and fertile lands than people have been born to, the individual love of change and adventure and pushing one's fortune, have considerable power in pro- moting emigrations, apart from the rude pressure of physi- cal wants. F amines in India, for example, do not result in much emigration; and yet the Irish famine in 1846-7

- led immediately to one of the most remarkable removals of

persons and families from one hemisphere to another in modern times. It would be difficult to account by the law of population for the successive immigrations of Saxons, Danes, and Normans into England, or to maintain that it was a force of hunger only which impelled the Northern barbarians to attack the Roman Empire. In the invasion of Turkey in 1877 the Russian soldiers are said to have been surprised at the plenty of the Bulgarian towns and villages, and to have had curious reflections why they should have been led so far afield to battle for the relief of a population so much more comfortably bestowed than themselves. Yet when the Russian soldiers return to their comparatively sterile homes, having seen the abundance of grain and fruits and flowers on the slopes of the Balkans, their accounts will probably only increase the Muscovite passion to penetrate by force of arms into more productive regions than those of Northern Europe and Asia. We must allow, in short, for many causes of emigration, as well as many wrong views of the means by which the advantages of emigration are to be realized.

The passage of Scripture which relates what took place between Abraham and Lot in the plains of Bethel, adduced by J. R. M'Culloch in the article "Emigration" in the last edition of this work, will always

remain a strikingly natural and suggestive picture of the outward movement of society in its primitive elements. There was no want apparently of material resources. 'Is not the whole land before thee," were the words of Abraham ; and Lot, lifting up his eyes, saw the plain of Jordan unoccupied and well-watered. But there was strife among the servants, quarrels as to pasturings and waterings, with Canaanites and Perizzites dwelling in the land as an additional element of disorder. The kinsmen could not agree, or adjust their rule ; and separation would be judicious, if not necessary. The narrative exhibits the influence of individualism on human affairs—on the affair of emigration as on others. In early times it was found difficult or impossible to make any important progress on the basis of social unity.

Nomads taking possession of vacant territory or invading the territory of others, victorious kings carrying whole tribes or nations into captivity, citizens driven out of civilized states by political rage, or attracted to adjacent lands by the promised wealth of agriculture or trade, and colonies more or less officially organized in the track of war and conquest, are the pictures we have of emigration in the ancient world.

'* Many of the emigrants from the Greek States, as Mr M'Culloch wrote in the article above referred to, " consisted of citizens forced by the violence of contending factions to seek new settlements in other countries. But Greece also sent forth emigrants, impelled by the difficulty of maintaining themselves at home, or allured by the glowing descriptions of the comparative abundance they would enjoy in distant lands. Both these classes of emigrants established themselves, for the most part, either in countries with a scanty

population, or whose inhabitants were in a decidedly lower state of civilization. And the greater refinement and ingenuity of the

Greeks, and their industrious habits, enabled them to make a rapid progress, so that several of these colonies became, 1n no very lengthened period, populous and powerful states. , ;

“Few voluntary enligrants ever left Rome. The colonies which she sent forth were intended to bridle subjugated provinces, and should be regarded rather as the outposts of an immense army, the headquarters of which were at Rome, than as establishments of individuals who had bid adieu to their mother country, and who intended to maintain themselves in their new residence by their own industry.

“But in their wish to amend their condition, emigrants have not always been contented to establish themselves in unoccupied or thinly-peopled countries. Sometimes, as in the case of the irrup- tion of the northern nations into the Roman empire, they have attacked countries that were densely peopled, and, having subdued the inhabitants, have seized upon the whole, or upon a greater or less proportion of their lands. ;

‘* Pastoral nations, inasmuch as they can carry with them the flocks and herds from which they derive their subsistence, may

emigrate in very large bodies, and previously to the invention of ’

gunpowder and other improvements in warfare were very danger- ous neighbours. The danger was further increased, or rather was perpetually kept up, by the fact that the emigration of one tribe or nation, by making more room for those that remained bchind, gave a corresponding stimulus to population, so that, the vacuum being soon filled up, the motive to fresh emigration became as great as ever. On this principle we are able to account satis- factorily for the successive swarms of barbarians that, issuing from the countries in the north of Europe, first attacked and ultimately overthrew the colossal fabric of Roman power. It admits of demonstration that these countries were then not nearly so populous as at present, that they had not more, perhaps, than a fifth ora sixth part of the inhabitants by which they are now occupied. But as they depended principally on pasturage, their numbers were often in excess compared with their means of support. And the pressure of want, that is, the necessity of finding additional room for their flocks and herds on the one hand, and, on the other, the prospect of vast wealth and riches of which they might hope to possess themselves, precipitated them into those expeditions in which, though often defeated, they were in the end successful.”

A movement which is to be recognized as one of the necessary conditions of human progress is thus seen ad- vancing in its early history from a collision of interests, and receiving both impulse and advantage from all the discords, wars, and difficulties of social and political life. It may be presumed, notwithstanding the imperfect civilization of many large regions of the world, that emigration has now attained so many ways and means, and so well-established an order, as to proceed more spontaneously and functionally, and be less indebted to violent forces for its impulsion, than in past times. 'The striking modern form of emigration is the removal of individuals and families from their native seats to distant countries, in large numbers, yet without concert and without apparent distress, silently and intelli- gently, the emigrants knowing what they are leaving and whither they are going. Emigration of this kind, like the commerce in commodities, does not advance rapidly for a long period. 'The first adventurers have often a rough experience, and do not invite others, but gradually the number who succeed increases, and in their letters home encourage relatives and friends to follow their example, and not unfrequently supply the means of acting upon their advice. This, in a constant and cumulative form, comes to have more real and wholesome influence than all the emigration aid societies ever established, however useful these may have been in their place. 'The traffic of the steam navigation companies during the last twenty- five years would show how largely the volume of free and well-considered emigration has thus been increased; and, indeed, it may be observed that emigration of this kind has received much the same impetus as material commerce from the ocean steamers, railways, telegraphs, and other greatly improved means of transmission. 'The movement is liable to its own fluctuations; it ebbs and flows from one year to another ; but of its permanence and extension there can be no reasonable doubt.

Trite as this may appear, it is worthy of being observed

EMIGRATIOR

how rapidly the change has been evolved. In the thirty years from 1815 to 1845 the annual emigration from the United Kingdom to all parts

had not increased to 100,000 souls. The total number of emigrants in 1815 was only 2081, in the following year 12,510, and 20,634 in 1817. This was the starting-point on the close of the great European wars; and at the end of thirty years of peace, what progress had been made? In 1843 the total number of emigrants from the United Kingdom was 57,212 ; it was 70,686 in 1844, and 93,501 in 1845. Only in three years of the long interval, viz., 1832, 1841, and 1842, had the annual emigration risen to or above 100,000. But 1847, in which year the emigration rose to 258,270, marks the beginning of unwonted increase, sustained over many years in succession, and, with some exceptional years, sustained, indeed, to the present time. The average annual emigration in the five years ending 1853 was 323,002, whereas from 1815 to the same year 1853 it had only been 97,269. The Irish famine, ensuing on an almost total failure of the potato crops, was the first in the order of events to which this remarkable increase of emigration is to be ascribed; but the Californian and Australian gold discoveries, the political reaction caused by the coup @etat in France, the failure of the European revolutions of 1848, and the rising spirit of enterprise and grow- ing prosperity following on the adoption of free trade in the United Kingdom, by which the industry and pro- duction of all the emigrant-receiving countries were largely promoted, prolonged the impulse which had first been given by a sharp distress affecting more parts of Europe than Ireland, and placed emigration on the more voluntary and substantial basis which has characterized it of late years. The way was made so plain by the ocean steamers and railways, which trade and capital were bringing into rapid action, that larger numbers of people saw the advantage of passing over great distances from one hemisphere to another. It was uot till 1855 that any relapse occurred in the large annual totals of emigration from the United Kingdom; and so late as the five years 1869-73 the average number per year of emigrants from British ports was 274,645.

This increase of emigration was not confined to the United Kingdom. It was European; and, indeed, our emigration statistics always include some proportion of emigrants from neighbouring countries, who ship from British ports. But from the north of Europe—from Scandinavia and Germany—there has been a largely in- creased emigration during

this period, proceeding under much the same incitements and facilities as from England, Scotland, and Ireland. From France the emigration has not been so marked as from many less populous countries. The German race have peopled the United States so largely as to have become a prominent element in the Transatlantic republic; but noone hears of the French as one of the constitutents of a commonwealth which they helped materially to found, and where they must always be held in esteem, The emigration of France follows her own colonies and traditions chiefly ; it is found in Louisiana and in Canada, and almost everywhere discursively and thinly ; and in much the same way the Spaniards and Italians still lean in their emigration to La Plata and South America, where there is a trace of ancestry, and their language is spoken. The industrial motive and faculty, however, now draw emigrants from all the European nations into the most various parts of the New World. In Australia and other southern climes, where the grape has found an extended cultivation, Rhineland and Cisalpine vine-dressers are et work. The Highland Scotch cling to Canada, and prefer New Zealand to the Australian mainland; but the engineers of the Lowland Clyde, ubiquitous as their ships, are found

wherever a steamer plies or a hammer sounds on the sea- washed surface of the globe. To complete this sketch it aust be added that the Chinese—the most numerous while the most isolated nationality in the world—have also become emigrants in large numbers, though it may be doubted whether the Chinese immigration to the Pacific coast of the United States has as its object a permanent change of country, or differs yet at least essentially from the coolie inigrations from India and China to the Eastern Archipelago, or of South Sea Islanders to Queensland and other parts of Australia, which are more of the nature of a trausfer of labour for a term of years than a definite emigration of both sexes and of families The number of Chinese in the United States, according to the census of 1870, was 63,199, and in the Australian colony of Victoria at the same peried 17,935—in both cases nearly all males. In an elaborate report on coolie emigration from India by Mr Geoghegan, presented to parliament in 1874, it appears—to take

Ceylon as an example—thiat in the ten years ending 1869 the average annual number of persons removing from Madras to that island was 65,000 (of whom 50,000 were adult males), and that the average annual number who re- turned from Ceylon to Madras was 48,000. A constant coming and going is the feature of all coolie emigration, whether from India or from China. The Chinese have a superstitious desire to die within the borders of their own sacred land. Nevertheless, their strong and persistent move- ment to the Western world is a significant pbenomenon. It has broken through all restraints at home, and it has held its ground, in the face of no little social hostility, from San Francisco to New York and other cities on the Atlantic seaboard.

Foreign and colonial emigration, in short, is now so widely practised, and has been rendered by improved means of transit so safe and expeditious, that its continued progress is not only sure, but one may foresee, from the various forces in play, that at no distant time it will have become, over the largest portion of the world, as familiar as migration from one province of the same country to another. The attitude and duties of states, and of the populations of states, towards a movement which comes into contact at many points with existing laws and interests—laws of naturalization, military conscription, and allegiance, with asserted rights of labour, and with social, religious, and international prejudices—have thus become questions of much importance.

Nothing is more certain than that nearly all the old countries suffered in past times from want of emigration, unless it be that all the new countries have greatly benefited by it. Leaving China out of view, where foreign immigrants have only been tolerated under treaties ex- torted by force of arms, there has been a general approval of emigration on the one hand, and of immigration on the other. In the United Kingdom the population are singu- larly free to choose either their own country or its colonies or other countries as the place of their abode. They are under no compulsory military service; and emigration has been actively encouraged by societies and protected by the Government for half a century. The greatest obstacle to free emigration from the Continent would appear to be the system of military

conscription. Every German of twenty or twenty-one years is liable to per- sonal service in the standing army for seven years—three of active service, four in the reserve—and to other five years in the landwehr, with the landsturm behind the laudwehr making further demands on the time and liberty of the subject. In France a similar system is now enforced, though under more liberal exemptions. It is but fair to state that Germany, exclusive of Prussia, has up to this time been sufficiently free in its emigration to

have sent to the United States from 1820 to 1870 not fewer than 2,267,500 persons, which is nearly as many as have gone from Ireland to the United States in the same half century, viz., 2,700,493. But from Prussia, where the conscription has been longest in rigorous operation, the number of emigrants to the United States in the same period has been only 100,983, and from France 245,812. Though the conscription may not be the sole cause of this, yet the demands made by the great military powers on the drilling and fighting services of the whole youth and man-

‘hood of their populations are obviously obstructive to the

pursuit of industry and fortune in foreign countries or in colonies. These demands may be relaxed from time to time, while the system itself is maintained ; but they are relaxed with a grudge, and the Governments acquire inordinate ideas of the irrevocable allegiance of their sub- jects. If the latter are permitted to emigrate, it is under condition of being liable to recall on brief notice to the standards of their country; and an armed truce, such as has prevailed in the most civilized nations of the Continent of Europe during five or six years of peace, might soon be as detrimental to free emigration as war itself, under which it usually ceases for the time. From Russia none can emigrate without permission of the czar; and a similar despotism over the subject is the rule of the Ottoman empire. A state may be within its reasonable and proper line of duty in promoting and aiding either emigration or immigration. But that the permission of the state should be necessary to the one process or the other is inconceivable, save in

some rare and dire emergencies of war or politics. The duty of states in regard to emigration, viewed in what must now be the generally accepted light of a necessary and wholesome function of the general economy, thus resolves itself into a duty of regulation and guardian-ship under the two categories, always presented, of the countries which the emigrants leave, and the countries to which they go. The one are bound to see that emigrant ships are well found and not overcrowded, and that adequate arrangements are made for the provisioning, health, and safety of the passengers in their transit ; while the other are bound to give them shelter and guidance on landing, to protect them from imposture, and to see that all pre-engagements made with them be fulfilled. The commission of emigration in the United Kingdom, early established as a brauch of the colonial office, has laboured diligently in introducing care and order into the sphere of foreign and colonial emigration, as well as into the coolie immigration of the Eastern seas. The regulations in the British home and colonial ports are embodied in two Acts of Parliament, called the Passengers Acts 1855 and 1863, which contain the administrative code on this subject in its statutory detail—only for "'Commissioners of Emigra- tion" must now be read " Board of Trade," the supervision of emigrant ships having devolved on that department in conuection with the general merchant shipping. Of the regulations for the reception of immigrants, on the other hand, the arrangements at New York afford probably one of the best examples. If uo country has had more to do with the shipping of emigrants than the United Kingdom, no place has had more to do with their reception than the great American seaport; and measures have been adopted there by which the abuses once prevailing have been over- come, and at the same time all the arrangements for the com- fort, security, and guidance of immigrants have been placed on a satisfactory basis. Emigrant ships are visited six miles from the port by health officers, and any who may be sick or diseased are removed to hospitals under the care of the commissioners of emigration or the quarantine commission. The others are required to land at Castle Garden, where there isa large rotunda capable of accommodating 4000

persons, and where every immediate want of the emigrants may be supplied without leaving the depot. Letters may be written for them, or telegrams despatched to friends, or friends may be introduced immediately on their credentials being presented. The utmost care is taken to guard the immigrants from falling into bad hands, and every information is afforded them as to how they shall best proceed in their respective objects. 'The supervision thus exercised in the port is extended over the railways to the various parts of the Union to which immigrants may be bound. Besides such arrangements, no less honourable to the authorities of a country than encouraging to the emigrant, direct inducements have frequently been held out to settlers, both in the United States and the British colonies, in the form of grants of land or land at a cheap price, and in assisted or free passages. Unless it be when emigrants move in a large group or body, with the view of settling together in one place, a free grant of land may prove illusory, from not being suited to the industrial aptitudes of the emigrant:or not situated in a locality where he would choose to reside. But when the Government of a state or colony offers assisted or free passages, it may be safely con- cluded that there is immediate demand for the services of the emigrants; and, as in such cases the classes of work- people required are usually specified, there is an additional security against misunderstanding or misadventure. It may be observed that Her Majesty's commissioners of emigration will not advise intending emigrants where they should go or where their particular qualifications or occupations are in most demand; but they will sometimes warn intending emigrants where they should not go, and much evil might occasionally be averted were an appeal made to this negative advice, more especially when tempting offers and attractions are presented from quarters of the world in which the failures of emigration have hitherto been much more frequent than the successes.! The discussions thirty or forty years ago on organized methods of colonization have mostly disappeared in these later times. We hear no more of Mr Wakefield's scheme, though it was useful in familiarizing the public mind with the conditions of settling population successfully on distant and unoccupied territories. Whena Highland community was evicted from its native glen in Scotland, or a High- land clan was paralysed by the bankruptcy and ruin of its chief, it contributed to their successful

establishment in Canada that they emigrated in a body, with such ties of kindred and loyalty as remained. Again, at the present day, the solitary Icelanders, moved by a spirit of emigra- tion from the volcanic rock and desert to which their ancestors were driven by despotism—and the Mennonites, invited into Russia by Paul to lay the foundation of the great wheat trade of Odessa, and now under expulsion by Alexander IJ. for refusing to bear arms, on the grounds of their original contract and conscientious scruples, are settling, in successive groups, with much promise of future happiness, in the Canadian province of Manitoba. From these and similar instances one can readily perceive the utility of organized emigration, and can scarcely doubt, so various and changeful is the condition of many isolated populations of the world, that it will long be a subject of practical study. But the reason, apparently, why modes and theories of colonization have almost passed out of the sphere of politics is that colonies are now so numerous and well established, and the means of entering into their oo ee lS 2 Those who may have occasion to pursue the details under this head are referred to an official publication of Her Majesty's emigra- tion commission, entitled " No, 34, Colonization Circular—1877," in which will be found the spirit of nearly all the statutes (550) of states

and colonies with which the emigration of the United Kingdom is related.

EMiGRADIVH

social and industrial life so easy, that the consideration of initial forms has in great measure been superseded. Enii- gration moves of itself over vast areas of population, sub- ject to commercial and social causes in various parts of the world ; and the duty of states is chiefly to give it outlet, and as much security as good administration can supply. The question whether countries receiving emigrants may not be called upon in some cases to check the flow of immigration within their borders is less free of difficulty than any similar question as regards the countries from which emigrants proceed, An example of what may happen has been seen in the Mormonism of the United States, where the settlers were not only at variance with the republic on so cardinal a point as the

civil law of mar- riage, but at open war with the federal jurisdiction and sovereignty of the soil. Similar perplexities might arise from a large Chinese or other heathen immigration, intro- ducing customs and observances which, though called religious and claiming toleration, could only be regarded as contrary to civil order, morality, and decency. Some dilemma of the same sort may even occur in the emi- grant-giving countries, as, for instance, when trades- unionists, while deriving all the benefit of a large outward flow of labour, fall upon foreign workmen who immigrate into the United Kingdom with a violence and disorder

| which the law has not yet learned or been able to prevent.

The statistics of emigration and immigration are copious enough, but being variously recorded by the numerous states and colonies, it is no easy task to bring them together in a general table, or to reduce them within moderate com pass. The countries receiving emigrants are usually more careful to distinguish the nationalities of the persons than the countries which they leave, or rather the conntries from which they take their passage across the seas. In 1853 ‘ foreigners ” first began to be distinguished from British subjects in the returns of our emigration commissioners, and it may give some idea of the proportion in which the foreign element enters into the emigration of the United Kingdom to take a recent year. In 1874, for example, the emigrants who sailed from Britain are classified as fol- lows :—116,490 English, 60,496 Irish, 20,286 Scotch, 38,465 foreigners, and 5277 “not distinguished.” Yet considerable as the foreign element is in the United King- dom statistics, its destination is small towards either our North American or Australasian colonies, and flows in the largest bulk to the United States, where the nationality of the immigrants is minutely discriminated in the returns of the emigration bureau. The table given below shows in decennial periods the main currents of European emigration and its principal destinations during the half century from 1820 to 1869 inclusive.

The “all other places,’ under which term statistics usually embrace the emigration not contained in the table, receive but a small though a

growing portion of the persons who leave Europe with a view to industrial settlement elsewhere. There is the emigration to the River Plate, remarkable less for its amount than for the hold it possesses over the Latin races; and there is the emigration to the South African colonies, more promising of results in the future than can be gathered from its actual progress, In the Cape Colony and its various aunexations there are 187,000 white or European settlers in a population of 776,000; and in the special colony of Natal only about one-seventh of the population are of European origin. The immigration to the River Plate in the six years 1868-73 was 250,698, of which in 1872 and 1873, when the immigration was largest, 56 per cent. were Italians, 19 Spaniards, 16 French, 3 British, 5 Germans, and 1 per cent. various, —the proportion of males being 73, and females 27.

EMM—EMM

| Countr" To British 0 T Years. eenieretta Noir Tees AvetMaatin Totals, from. America, a Colonies.

1820-29

England . 17,148 lige Bhd 126,616!| 51,617 Syl fot Scotland . 3, 151 Germany … 5,611 rissiay …. 142 Holland …. 1,105 France …... 7,688 Switzerland. 3,148 DAI, oo snces 381 Sweden and 91 Norway . : Total….| 126,616 90,077 5,175 221,868 1880-39 | England .) 8,026 Ireland … 820,766 | 159,672 538,274 Scotland . (2,575 Germany … 121,636 sie IORNSSIE, boone 5} SI Son Holland….. 1,377 Be France…. .. 39,330 | Switzerland. 4,430 Uitallivgeeenrnra: 2,191 Sweden and 1.149 Norway… ? H Total…) 320,766 | 343,517| 53,274 717,557 | 1840-49 | | England . 25,663 Treland .. 428,376 | 646,195 | > 126,837 | Scotland . 2,878 Germany : 372,971 o Prussia …... 12) 518 Holland….. 7,624 France …... 75,300 Switzerland. 4,819 Wtalyaiccc..35 1 PAu Sweden and Norway… tame? Total …| 428,376 }1,161,564 | 126,837 |1,716,777

1850-59

England . 240,921 Treland … 258, 460 |1,073,065 | > 498,587 Scotland . 37,578 Germany…. 935,171 Brussial…-.. 40,901 Holland 11,672 France

…... 82,278 Switzerland. 24,428 Mitel vetiew se 6,648 Sweden ani Norway… cs Total …} 258,460 2,474,859 | 498,537 |8,231,856

1860-69

England . 167,040 Treland … 169,741} 724,513 | > 287,435 Scotland . 26,526 Germany … 741,004 Prussia …... 43,685 Holland….. 8,914 France …... ee 38,134 Switzerland. oe 21,278 i ee . 10,626 Sweden and Norway… aowe4 Total …| 169,741 |1,875,452 | 287,435 2,882,628 Total of the five dec. > |1,308,959 |5,945,469 | 971,258 | 8,220,686 periods..

1 It seems better, for more than simplicity's sake, to give the emigration from the United Kingdom to British North America and Australia, as here, in the gross. It had always more or less of aforeign element not easily separable in the returns from the English, Irish, and Seotch; and there has been a constant inter- change of emigrants and immigrants between Canada and the United States,

The preference of emigration to British North America began to yield to the United States in the last five years of the decade 1830-39, when the politics of Canada were much disturbed ; and other causes in the next decennial period gave an impulse in the same direction. But the effect of the potato famine of 1847 in Ireland on the course of emigration that ensued has probably been rated much beyond its due. It will be observed that the emigration of the Irish to the United States greatly exceeded that of English and Scotch in 1820-29, and: was threefold greater in 1830-39 than it had been in 1820-29, while that of English and Scotch had much decreased. Taking into account these phenomena of the preceding twenty years, it is difficult to believe that more than 300,000 of the Irish emigration to the United States in 1840-49 can be accounted for by a failure of potato crops occurring in 1846-7. More than that number of Irish displaced by the famine were absorbed in the industry of England and Scotland, of which the census returns since give abundant proof. If in the following decade, 1850-59, the Irish emigration to the United States rose to the enormous total of 1,073,065, it was accompanied by the no less surprising and much more

sudden emigration of 935,171 Germans to the same quarter, pointing to more general causes than a local failure of crops, and showing how fruitfully the nations of the Old World may people the New with advantage to their social life, their trade, and their poli- tical stability, and to the general well-being. (R. SO.)

EMMAUS, a village to which, in the narrative of Luke, it is said two of the disciples of Jesus were journeying when he appeared to them on the day of his resurrection. The Authorized Version makes its distance from Jerusalem 60 furlongs, and although some manuscripts read 160, not only is the weight of authority in favour of the shorter distance, but it is impossible that the disciples, starting in the evening, could have walked the longer distance back to Jerusalem, and have still found the eleven gathered together. The only village of the name now remaining near Jerusalem is Emmaus Nicopolis, 20 miles distant, and from the 4th to the 14th century this village was believed to be the New Testament Emmaus. A tradition, which cannot be traced further back than the 14th century, fixes it at Kubeibeh; but except that the distance of Kubeibeh from Jerusalem corresponds with that of the village mentioned by Luke, no reason can now be dis- covered for the origin of the tradition, A place named Emmaus is mentioned by Josephus as distant from Jerusalem 60 furlongs; and he states also that the word Emmaus means " warm bath," The word is supposed to be the Greek form of the Hebrew word Hammath, which has the same meaning. Impressed with these considera- tions, Lieutenant Conder, R.N., in the Quarterly Statement of the Palestine Exploration Fund (October 1876), suggests a site for the ancient Emmaus, "the most satisfactory yet proposed." He points out that Khamasa, the name of a ruin about 8 miles from Jerusalem, is probably an Arabic corruption of Hammath or Ammaus; and this opinion is corroborated by the fact that near the ruin are a spring of clear water and a little pool, with the remains of a small church. (See Zschokke, Das neutestamentliche Emmaus, 1865, and criticism by Menke in Petermann's Afvtth., 1866.)

EMMERICH (the ancient Embrica), a town of Prussia, . in the government district of Diisseldorf, is situated on the right bank of the Rhine, and on the railway from Cologne

whieh complicates the matter still more. A surer test of the foree of the respce tive emigrations up to the latest period is the number of alien-born inhabitants at the last census. In the Dominion of Canada at the eensus of 1871 there were 219,451 native-born Irish, 144,999 English and Welsh, 121,074 Scotch, 64,447 United States Amerieans, and 24,162 Germans. In the prineipal Australian colony—Victoria—at the eensus of the same year there were 164,287 native- born English, 6614 Welsh, 56,210 Scoteh, 100,468 Irish, 8995 Germans, and nearly the same number of all other Evropeans as of Germans.

to Amsterdam, 5 miles N.E. of Cleves. It has a consider- able shipping trade, and manufactories of tobacco, chocolate, leather, liqueurs, ink, and perfumery. Its old minster church, built in the middle of the 11th century, contains some fine specimens of choir stalls. Emmerich was an important place at an early period, and seems in the middle of the 15th century to have contained 40,000 inhabitants. In 1794 it was bombarded by the French, and in 1806 it took the oath of allegiance to Murat. It passed into the possession of Prussia in 1815. The popu-lation in 1875 was 8117.

EMMET, Rozerr (1778-1803), brother of the subject of the next article, was born in Dublin in 1778. He was a school-fellow of the poet Thomas Moore, and his senior by a year at Trinity College, Dublin. Both were members of the Historical Society, and the great champions of the popular side. In 1798 Emmet was expelled from the uni- versity, on the ground of being connected with the association of United Irishmen. THe shortly afterwards went to the Continent, aud remained there till 1802, when he returned secretly to Dublin, and endeavoured to plan a general Irish revolution. On 23d July 1803, deeming that the time had come to execute his scheme, he made an attempt to seize the arsenal and castle of Dublin; but the mob which he headed scarcely achieved so much as a serious riot, for they dispersed at the first military volley. Emmet fled to the Wicklow mountains, and perceiving that success was now impossible, resolved to escape to the Continent; but, contrary to

the advice of his friends, he determined to have a last interview with the lady to whom he was attached, a daughter of Curran, the celebrated barrister. The delay proved fatal to him. He was apprehended, and committed for trial on the charge of high treason. He defended himself in a speech of remarkable eloquence, but was condemned to death, and on September 20, 1803, was executed in St Thomas Street, Dublin. Moore, in one of the most pathetic of his Irish melodies, "'O breathe not his name," commemorates Emmet's fate; and that of Miss Curran, who died in Sicily soon after him, is the subject of another, "She is far from the land where her young hero sleeps." Although it must be allowed that the con- duct of Emmet in his revolutionary attempt was rash and mistaken, the high purity and unselfishness of his inten- tions have never been questioned.

A life of Emmet was written by the Countess of Haussonville, and was translated into English by John' P. Leonard. See also Life of Curran, London, 1819; Curran and his Contemporaries, by ©. Phillips, 1818 ; Life of Robert Emmet, by R. Madden, 1847; and Robert Emmet, Cause of his Rebellion, London, 1871.

EMMET, Tuomas Appis (1764-1827), a lawyer and politician, was born in Cork the 24th April 1764. He was the second son of Dr Robert Emmet, who latterly was state- physician in Dublin. After attending the school of Mr Kerr in Cork, Thomas in 1778 entered Trinity College, Dublin. In 1783 he went to study medicine at the university of Edinburgh, where he continued four years. He then visited the chief medical schools of the Continent, and after travelling through Germany, france, and Italy, returned in 1788 to Ireland. Owing, he himself says, to the advice of Sir James Mackintosh, he now resolved to forsake medicine for law; and with the view of preparing himself for the Irish bar, he studied two years at the Temple, London. He was admitted a member of the Dublin bar in 1790. In the earlier years of his practice he was often engaged as counsel for those of the United Irishmen who were accused of political offences; but after he became more closely connected with the association, it was deemed prudent that, while privately acting as their legal adviser in all matters, he should no longer be engaged in the public defence of any of their

number. In 1797 he became one of the directory of the association, and on the

arrest of O'Connor about the middle of the same year, he succeeded him as chief leader. On the 12th March 1798 he and other leaders were arrested, and after being examined at the castle were committed to Newgate. He was examined before a secret committee of the House of Lords, and afterwards before a secret committee of the House of Commons; and on the 9th April 1799 he was conveyed as a prisoner to Fort-George, Scotland, where he remained till June 1802. He then received his liberty, but only on condition that he spent the remainder of his life on a foreign soil, his return to British territory being forbidden by severe penalties. After being conveyed to Cuxhaven, he proceeded to Hamburg, and finally to Brussels, where he passed the winter. In the beginning of 1803 he went to France, and had an interview with Napoleon; but having little faith in Napoleon's designs of invading England, he in the end of tle year embarked for America, Here he rose to considerable eminence at tlie New York bar, and in 1812 held for a short time the office of attorney-general of the State of New York. He died suddenly, 14th November 1827, while conducting a case in the United States circuit court.

See Biography, by C. S. Haynes, London, 1829; and memoir in Madden's Lives of United Irishmen, 2d vol. 2d ser., London, 1843,

EMMIUS, Usso (1547-1626), a celebrated Dutch historian and geographer, was born at Gretha in East Friesland. He was chosen rector of the college of Norden in 1579, but was ejected in 1587 for refusing to subscribe the confession of Augsburg, He was subsequently rector of the colleges of Leer aud Groningen, and when in 1614 the college in the latter city obtained a university charter, he was chosen as its principal and its professor of history and Greek, and by his wise guidance and his learning raised it speedily to a position of great eminence. He had correspondence with the principal learned men of his time, who all held him in high esteem. He died 9th December

1626.

His principal works are—Opus Chronologicum, Gronin., 1619, fol.; Vetus Greeia illustrata, Leyd., 1626, 8vo; Rerum Frisicarunr Historia, Leyd., 1616, fol.; Historia Temporis Nostri, Gronin., 1732, 4to.

EMPEDOCLES, one of the most imposing and enigmatic figures in early Greek philosophy, was a native of Agrigentum in Sicily, and lived in the 5th century, probably from 490 to 430 n.c, The details of his life are full of fable and contradictions. The most probable accounts represent him as belonging to an honourable family in the palmy days of his city, as a champion of free institutions, like his father Meton, detecting the aims of incipient tyrants, and crushing the opponents of popular rights, but as finally forced, through the change of parties that occurred during his visit to Olympia, to forego his native city, and to return to Peloponnesus to die. Of his poem on nature (vers) there are left about 400 lines in unequal fragments out of the original 5000; of the hymns of purification (caBappot) less than 100 verses remain ; of the other works, improbably assigned to him, nothing is known. His grand but obscure hexameters, after the example of Parmenides, delighted Lucretius. Aristotle, it is said, called him the father of rhetoric. But it was as at once statesman, prophet, physicist, physician, and reformer that he most impressed the popular imagination. To his contemporaries, as to himself, he seemed more than a mere man. The Sicilians honoured his august aspect as he moved amongst them with purple robes and golden girdle, with long hair bound by a Delphic garland, and brazen sandals on his feet, and with a retinue of slaves behind him. Stories were told of the ingenuity and generosity by which he had made the marshes round Selinus salubrious, of the grotesque device by which he laid the winds that ruined the harvests of

Agrigentum, and of the almost miraculous restoration to life of a woman who had long lain in a death-like trance. Legends stranger still told of his disappearance from among men. Empedocles, according to one story, was one mid-

hight, after a feast held in his honour, called away ina blaze

of glory to the gods; according to another, he had only thrown himself into the crater of Etna, in the hope that men, finding no traces of his end, would suppose him translated to heaven. But his hopes were cheated by the volcano, which cast forth his brazen sandals, and betrayed his secret.

As his history is uncertain, so his doctrines are hard to put together. He does not belong to any one definite school. While, on one hand, he combines much that had been suggested by Parmenides, Pythagoras, and the Ionic school, he has germs of truth that Plato and Aristotle afterwards developed. There are, according to Empedocles, four ultimate kinds of things, four primal divinities, of which are made all structures in the world—fire, air, water, earth. These four elements are eternally brought into union, and eternally parted from each other, by two divine beings or powers, love and hatred—an attractive and a repulsive force which the ordinary eye can see working amongst men, but which really pervade the whole world. According to the different proportions in which these four indestructible and unchangeable matters are combined with each other is the difference of the organic structure pro- duced; ¢.., flesh and blood are made of equal parts of all four elemeuts, whereas bones are one-half fire, one-fourth earth, and one-fourth water. It is in the aggregation and segregation of elements thus arising that Empedocles, like the atomists, finds the real process which corresponds to what is popularly termed growth, increase, or decrease, Nothing new comes or can come into being; the only change that can occur is a change in the juxtaposition of element with element.

Empedocles apparently regarded love and discord as alternately holding the empire over things,—neither, how- ever, being ever quite absent. As the best and original state, he seems to have conceived a period when love was predominant, and all the elements formed one great sphere or globe. Since that period discord had gained more sway; and the actual world was full of contrasts and oppositions, due to the combined action of both principles. His theory attempted to explain the separation of elements, the formation of earth and sea, of sun and

moon, of atmo- sphere. But the most interesting and most matured part of his views dealt with the first origin of plants and animals, and with the physiology of man. As the elements (his deities) entered into combinations, there appeared quaint results—heads without necks, arms without shoulders. Then as these fragmentary structures met, there were seen horned heads on human bodies, bodies of oxen with men's heads, and figures of double sex. But most of these products of natural forces disappeared as suddenly as they arose ; only in those rare cases where the several parts were found adapted to each other, and casual member fitted into casual member, did the complex struc- tures thus formed last. Thus from spontaneous aggrega- tions of casual aggregates, which suited each other as if this had been intended, did the organic universe originally spring. Soon various influences reduced the creatures of double sex to a male and a female, and the world was replenished with organic life.

As man, animal, and plant are composed of the same elements in different proportions, there is an identity of nature in them all. They all have sense and understand- ing; in man, however, and especially in the blood at his heart, mind has its peculiar seat. But mind is always dependent upon the body, and varies with its changing

constitution. Hence the precepts of morality are with Empedocles largely dietetic,

Knowledge is explained by the principle that the several elements in the things outside us are perceived by the corresponding elements in ourselves. We know only in so far as we have a cognate nature within us to the object of knowledge. Like is known by like. The whole body is full of pores, and hence respiration takes place over the whole frame, But in the organs of sense these pores are specially adapted to receive the effluxes which are con- tinually rising from bodies around us; and in this way perception is somewhat obscurely explained.

It is not easy to harmonize these quasi-scientific theories with the theory of transmigration of souls which Empedocles seems to expound. Probably the doctrine that the divinity (Sa/uwv) passes from element to element, nowhere finding a home, is a mystical way of teaching the

continued identity of the principles which are at the bottom of every phase of development from inorganic nature to man. At the top of the scale are the prophet and the physician, those who have best learned the secret of life; they are next to the divine. One law, an identity of elements, pervades all nature ; existence is one from end to end ; the plant and the animal are links in a chain where man is a link too; and even the distinction between male and female is transcended. The beasts are kindred with man; he who eats their flesh is not much better than a cannibal.

Looking at the opposition between these and the ordinary opinions, we are not surprised that Empedocles notes the limitation and narrowness of human perceptions. We see, he says, but a part, and fancy that we have grasped the whole. But the senses cannot lead to truth ; thought and reflection must look at the thing on every side. It is the business of a philosopher, while he lays bare the fundamental difference of elements, to display the identity that subsists between what seem unconnected parts of the universe.

See Mullach, Fragmenta Philosophorum Greecorum, vol. i.; Zeller, Phil. der Griechen, Bd. i. (W. W.)

EMPEROR (imperator, atroxpdétwp, Kaiser), a title formerly borne by the sovereigns of the Roman empire (see Empire), and since their time by a variety of other potentates. The term ¢mperator seems to have originally belonged to every Roman magistrate who received from the comitia curiata the imperium (i.e. the power of the sword and authority to command in war). It was, therefore, in strictness not a title but a descriptive epithet. Towards the end of the Roman republic, however, it had become rather a special title of honour bestowed by the acclamations of a victorious army on their general, or by a vote of the senate as a reward for distinguished services (see Tac., Ann., lii. 74; Cic., Phalipp., xiv. 4), and in this sense it continued to be used during the earlier period of the empire. Julius Cesar, however, assumed it (under a vote of the senate) in a different sense, viz., as a permanent title, or rather as a part of his name (prewnomen), denoting the absolute military power which had come into his hands; and it was given by the

senate, in like manner and with a like significance, to Augustus (see Dion Cassius, lii. 41, li. 17.) Tiberius and Claudius refused it ; but under their successors it soon became established as the regular official title of the monarch of the Roman world, ultimately superseding the name of princeps. When Greek became the sole language of the Eastern Roman empire, imperator was rendered sometimes by Bacudevs and sometimes by avroxpdrwp, the former word being the usual designation of a sovereign, the latter specially denoting that despotic power which the imperator held, and being in fact the official translation of imperator.

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Justinian uses atroxpétwp as his formal title, and Bacvrcds as the popular term. On the revival of the Roman empire in the West by Charles the Great in 800 a.D., the title (at first in the form imperator, or imperator Augustus, after- wards Romanorum imperator Auyustus) was taken by him and by his Frankish, Italian, and German successors, heads of the Holy Roman Empire, down till the abdication of the emperor Francis IJ. in 1806. The doctrine had, however, grown up in the earlier Middle Ages (about the time of the emperor Henry II., 1002-1024) that although the emperor was chosen in Germany (at first by the nation, afterwards by a small body of electors), and entitled from the moment of his election to be crowned in Rome by the pope, he could not use the title of emperor until that coronation had actually taken place. The Gernian sovereign, therefore, though he exercised, as soon as chosen, full imperial powers both in Germany and Italy, called himself merely " King of the Romans" (Romanorum rex semper Augustus) until he had received the sacred crown in the sacred city. In 1508 Maximilian I., being refused a passage to Rome by the Venetians, obtained from Pope Julius II. a bull permitting him to style him- self emperor elect (imperator electus, erwihlter Kaiser). This title was taken by Ferdinand J. (1558) and all suc- ceeding emperors, immediately upon their coronation in Germany ; and it was until 1806 their strict legal designa- tion, and was always employed by them in/proclamations and other official documents. The term "elect" was,

however, omitted even in formal documents when the sovereign was addressed, or was spoken of in the third person.

According to medizeval theory, there was and could be only one emperor in the world, the direct vicegerent of God, who represented the unity of mankind and of the Christian people on its temporal side as the pope did on its spiritual Hence during those ages the Western monarch and Western writers did not admit in principle, though they sometimes recognized in fact, the title of the emperor who reigned at Constantinople; and the Easterns in like manner denied the existence of an emperor in-the West, and maintained that the heads of the Holy Roman Empire were merely German intruders. In spite, however, of the universal acceptance of the theory above mentioned, the title of emperor was one which other princes seem to have hankered after. In 1053 Ferdinand the Great of Castile, in the pride of his victories over the Moors, assumed tlie style of Hispanie imperator, but was forced by the remonstrances of the emperor Henry III. to abandon it. In the 12th century it was again assumed by Alphonso VII. of Castile, but not by any of his successors. In England the Anglo-Saxon kings frequently used the term basileus, and sometimes also tmperator, partly from a desire to imitate the pomp of the "Byzantine court, partly in order to claim a sove- reiguty over the minor kingdoms and races of the British isles corresponding to that which the emperor was held to have over Europe generally (see Freeman, Norman Con- quest, vol. i., Appendix, who however attaches too much importance to this English use).

In comparatively modern times, the title of emperor has been taken by the monarchs of Russia (Vassili, about 1520, his predecessors at Moscow having been called Great Dukes of Muscovy, and the title of Czar or Tsar being apparently a Slavonic word for prince, not related to Ozsar), France (Napoleon Bonaparte in 1804, Louis Napoleon Bonaparte in 1853), Austria (1805), Brazil (1822), Germany (Decem- ber 41, 1870), Great Britain and Ireland in respect of the Indian dominions of the crown (1876). Usurpers who have reigned in Hayti, a certain Augustin Iturbide who (in 1822) became ruler of Mexico after the revolt against

Spain, and the archduke Maximilian of Austria during his short tenure of power in Mexico, also called themselves emperors ; and modern usage applies the term to various semi-civilized potentates, such as the sovereigns of China and Morocco. It can, therefore, hardly be said that the name has at present any definite descriptive force, such as it had in the Middle Ages, although its associations are chiefly with arbitrary military power, and it is vaguely supposed to imply a sort of precedence over kings. In the cases of Germany, Austria, and Britain in respect of India, it may perhaps be taken to denote that general over-lord- ship which their sovereigns exercise over minor princes and over their various territories, and which is distinct from their position as sovereigns of one or more particular king- dom or kingdoms, the German emperor being also king of Prussia, as the emperor of Austria is king of Hungary, and the empress of India queen of Great Britain and Ireland.

See Selden, Titles of Honour; Bryce, Holy Roman Empire ; Sir E. Colebrooke, ‘On Imperial and other Titles,” in the Journal of the Royal Asiatic Society, 1877. (J. BR.)

EMPHYSEMA (from éugvodw, to inflate), in medicine, means an abnormal presence of air in certain parts of the body. In its restricted sense, however, it is generally employed to designate a peculiar affection of the lungs, of which there are two forms. In one of these there is over- distension of the air-cells of these organs (see’ ANATOMY), and in parts destruction of their walls, giving rise to the formation of large sacs, from the rupture and running together of a number of contiguous air-vesicles. This is termed vesicular emphysema, In the other form the air is infiltrated into the connective tissue beneath the pleura and between the pulmonary air-cells, constituting what is known as interlobular emphysema.

The former variety is by far the more common, and appears to be capable of being produced by various causes, the chief of which are the following :—

1. Where a portion of the lung has become wasted, or its vesicular structure permanently obliterated by disease, without corresponding falling in of the chest wall, the neighbouring air vesicles or some of them undergo dilata- tion to fill the vacuum.

2. In some cases of bronchitis, where numbers of the smaller bronchial tubes become obstructed, the air in the pulmonary vesicles remains imprisoned, the force of expira- tion being insufficient to expel it ; while, on the other hand, the stronger force of inspiration being adequate to overcome the resistance, the air-cells tend to become more and more distended, and permanent alterations in their structure, in- cluding emphysema, are the result.

3. Emphysema also arises from exertion involving vio- lent expiratory efforts, during which the glottis is con- stricted, as in paroxysms of coughing, in straining, and in lifting heavy weights. Hooping cough is well known as the exciting cause of emphysema in many persons.

In whatever manner produced, this disease gives rise to important morbid changes in the affected portions of the lungs, especially the loss of the natural elasticity of the air- cells, and likewise the destruction of many of the pulmonary capillary blood-vessels, and the diminution of aerating surface for the blood. Asa consequence of these, other changes are apt to arise affecting related organs, more particularly the heart and the venous system generally, one of the most frequent results of which is the occurrence of dropsy. The chief symptom in this complaint is short- ness of breathing, more or less constant but greatly aggravated by exertion, and by attacks of bronchitis, to which persons suffering from emphysema appear to be specially liable. The respiration is of similar character to that already described in the case of asthma. In severe forms of the disease the patient comes to acquire a peculiar

puffy or bloated appearance, and the configuration of the chest is altered, assuming the character known as the barrel-shaped or emphysematous thorax.

The main element in the treatment of emphysema con-

sists in attention to the general condition of the health, and i the avoidance of all causes likely to aggravate the disease or induce its complications. The same general plan of treatment as that recommended in asthma and bronchitis is applicable in emphysema. During attacks of urgent breathlessness antispasmodic remedies should be had recourse to, while the employment of dry cupping over the lungs, and even of moderate wet cupping over the precordium, will often afford marked and speedy relief.

Interlobular emphysema, arising from the rupture of air- cells in the immediate neighbourhood of the pleura, may occur as a complication of the vesicular form, or separately as the result of some sudden expulsive effort, such as a fit of coughing, or, as has frequently happened, in parturition. Occasionally the air infiltrates the cellular tissue of the mediastinum, and thence comes to distend the integument of the whole surface of the body. When occurring sud- denly and extensively, this has beea known to produce death by asphyxia.

EMPIRE, a term used to denote either the territories governed by a person bearing the title of emperor (see EMPEROR), or, more generally, any extensive dominion. The historians of a former age were accustomed to enume- rate a succession of great empires, and especially the Babylonian and Assyrian, the Medo-Persian, and the Macedonian, which had embraced the greater part of the civilized world before the rise of Roman power, but that system has now been abandoned. In its strict sense, “the Empire ” meant during the Middle Ages, and indeed almost till the present century, the Romano-Germanic or so-called Holy Roman Empire, of which this is therefore the proper place to give a short account. The old Roman empire, founded by Julius Cesar and Augustus, was finally divided in 395 a.p. between Arcadius and Honorius, the two sons of Theodosius the Great,—that is to say, one part of it, the Western, was ruled from Rome or Ravenna by one sovereign, and the other or Eastern half from Constantinople by another,—although the whole was still held to constitute, in theory, a single Roman state which had been divided merely for administrative

purposes. In 476 the Western throne was overturned by Odoacer, the leader of an army of barbarian mercenaries in the imperial service ; and the provinces which had obeyed it, so far as they were not theu already occupied by invading German tribes, reverted to the emperor reigning at Con- stantinople, who thereby became again sole titular monarch of the Roman world. Justinian reconquered Italy in the following century, and his successors retained Rome, though Constantinople was their capital, for two cen- turies. This state of things lasted till 800, when Charles king of the Franks (Charlemagne) was crowned Roman emperor in Rome by Pope Leo III. All the Western provinces, except a part of Italy, had long since ceased to obey the emperor, and that part of Italy had rebelled about seventy years before. The object of the eleva- tion of the Frankish king was to make Rome again the capital of an undivided Roman empire, rather than to effect a severance by creating a separate Western empire ; but as the Eastern empire continued to subsist, the effect of the step really was to establish two mutually hostile lines of emperors, each claiming to be the one rightful successor of Augustus and Constantine, but neither able to dispossess its rival. The imperial title, which had fallen very low under the successors of Charles, was again revived in the West by Otto the Great, king of the East Franks, in 962; and from his time on there was an unbroken suc-

cession of German kings who took the name and enjoyed the titular rank and rights of Roman emperors, being acknowledged in the Western countries and by the Latin Church as the heads of the whole Christian community. Their power was, however, practically confined to Germany and Northern Italy, and after the death of Frederick II. (1250), it became comparatively weak even in those countries, In 1453 Constantinople was taken by the Turks, and the Eastern Roman empire came to an end. The Western, however, though now so feeble that it could only be kept on foot by choosing as emperor some prince powerful by his hereditary dominions, lasted on till the year 1806, when Francis II. of Hapsburg, archduke of Austria and king of Hungary and Bohemia, resigned his imperial title, and withdrew to the government

of his hereditary kingdoms and principalities under the name (assumed the year before) of emperor of Austria. With him the Holy Roman Empire ended.

The territorial extent of the Romano-Germanic empire varied greatly at different periods of its history. In the time of Charles the Great it included the northern half of Italy (except the district about Venice), Gaul, Western and Southern Germany, and Spain between the Pyrenees and the Ebro. Under Otto the Great and his first successors it extended over the whole of Germany (including Holland and Belgium), as it then stood (modern Germany stretches further towards the north-east), and the south-east part of modern France, being what was then called the kingdom of Burgundy, and had claims of superiority, more or less definite in different cases, over the adjacent kingdoms of Hungary, Poland, and Denmark. Its further pretensions over the greater kingdoms of France, England, Spain, and Naples can hardly be said to have been admitted, though in a speculative sense the Holy Empire was held to include these states and indeed the whole Christian world. At the era of the Reformation all claims over districts out- side Germany had become obsolete, nor were they ever revived. From the 15th century onwards it was practically conterminous with modern Germany, except that it did not include East Prussia.

The government of the Holy Roman Empire was never an absolute monarchy in the sense in which that of the old pagan empire had been, or that of the Eastern empire at Constantinople was while it lasted. Down till the end of the Hohenstaufen time (1254) it was a strong feudal monarchy, in which, as in the other feudal kingdoms of Europe, the sovereign enjoyed powers which were con- siderable but by no means unlimited, as he was obliged to respect the rights of his vassals, and could obtain supplies and pass laws only with the consent of the Diet, or supreme national assembly. From the time of Rudolf of Hapsburg (who came to the throne in 1272), its strength, which had been broken in a long struggle against the pope and the Italian republics, was much less; its revenues had shrunk, and the greater nobles had become practically independent princes, sovereign in their own territories, and sometinies stronger than the emperor. The

struggles which attended and followed the Reformation still further weakened the authority of the crown, to which, as Roman Catholic, the Protestant princes and cities became almost of necessity hostile ; and after the Thirty Years' War, when the Peace of Westphalia (1648) had finally settled the constitu- tion of the empire, it was really no longer an empire at all, but a federation of very numerous principalities, some large, many very small, united under the presidency of a head who bore the title of emperor, but en joyed scarcely any actual power, and represented in a Diet which was now not so much a national parliament as a standing con- gress of envoys and officials,

The imperial crown was always in theory elective, but

in the earlier Middle Ages it was elective in much the same sense as the crowns of other feudal kingdoms, that is to say, the consent of the nobles and people, latterly of the chief nobles' only, was required to the elevation of a sove- reign, while practically it was hereditary, that is to say, the son or other near relative of the last sovereign was usually chosen to succeed him. Partly, however, owing to the extinction of several families in succession which had held it, partly to the influence of the pope and the idea that the imperial office was of a more sacred nature than the regal, the elective gradually came to prevail over the hereditary principle ; and from the 13th century onwards, the Romano-Germanic throne was in the gift of a small electoral college consisting first of seven, then of eight, and ultimately of nine princes (see Pfeffinger, Vitriarius «lus- tratus ; Moser, Rémische Kayser; Bryce, Holy Roman Empire). Nevertheless, from the election of Frederick III. in 1440 down to 1806, all the emperors except two—Charles VII. (1742) and Francis I. (1745)—belonged to the house of Hapsburg.

The present German empire, which came into existence when the king of Prussia accepted the title of emperor (December 31, 1870), is not legally a continuation of the Romano-Germanic empire, though practically it occupies a somewhat similar European position. Technically speak- ing, it is a new creation, which has not succeeded to

the rights of Rome dny more than the Russian empire has to those of the Eastern or Byzantine enipire, which-the czars have sometimes claimed to represent. (5. BR.)

EMPOLL, a town of Italy, in the province of Florence and district of San Miniato, is situated in a fertile plain on the river Arno, 6 miles from Florence, with which it is connected by railway. Its principal industries are the manufacture of cotton cloth, tanning, straw-plaiting, and the manufacture of macaroni. It has a collegiate church, founded in 1093, and containing some fine statuary and paintings by Giotto and others. The population in 1871 was 5949.

EMPYEMA (from év, within, and zitov, pus), a term in medicine applied to an accumulation of purulent fluid within the cavity of the pleura (see PLEURIsyY).

EMS, a watering place of Prussia, in the district of Wiesbaden, province of Hesse-Nassau, is situated on the Lahn, 7 miles S.E. of Coblentz, in a beautiful valley surrounded by wooded mountains and vine-clad hills.

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Plan of Ems.

1. Evangelical Church. 7. Police Office

2. Synagogue, 8. New Baths.

3. Gas Works. 9. Catholic Church 4. oo 10. Catholic Cemetery 5. rhaus. 1 i 5 ace 1 English Church

Tt possesses alkaline hot springs, which are used both for drinking and for bathing, and are considered of great effi- cacy as a remedy for chronic nervous diseases and affections of the liver and respiratory organs. About 15,000 persons frequent them annually. In Ems, on July 13th, 1870, took place the famous interview between King William of

Prussia and the French ambassador Benedetti, which resulted in the French and German war of 1870-71. The population of Ems in 1875 was 6104.

ENAMEL. An enamel may be best defined as a vitreous glaze fused to a metallic surface. There is indeed no difference between an enamel and a glaze, save in the character of the surface to which it is applied. Both are vitrified substances, either with or without colour, and exhibiting every degree of translucency,—some varieties being perfectly transparent, while others are completely opaque. Chemically they consist of easily-fusible salts, such as the silicates and borates of sodium, potassium, and lead, to which various metallic oxides are added when it is desired to impart colour to the enamel. These varieties of glass are pulverized, and the powder is used either in a dry or, more commonly, in a moistened state. The powder or paste, having been spread over the surface to be in- crusted, is exposed to a moderate temperature in a muffle heated in the enamel-furnace, when the vitreous substance soon becomes sufficiently fluid to spread itself over the metallic surface, to which it closely adheres. If the glass is merely cemented to the metal, without any trace of fusion, the process is not true enamelling. Although it is extremely convenient to restrict the term "enamel," as in the definition at the head of this article, to those glassy materials which are applied to the surface of metals, it should be

remarked that some writers extend it to glazes which are employed on pottery and on other non-metallic materials ; while popularly the term has a yet wider use, being applied in fact to almost any brilliant surface, whether produced by varnishing, by lacquering, or by other processes not involving fusion ; hence we hear of enamelled leather, enamelled paper, enamelled slate, &c. Sometimes a coating of true enamel or of glaze is employed solely for utility, as in the case of vessels of enamelled iron or of glazed earthenware; but more commonly enamels are applied with a view to decorative effect, the decoration thus produced being extremely permanent, since the fused material is but little affected by atmospheric influences. When enamelling is thus artistically employed, it is usual to speak of the finished works of art themselves as "enamels ;" and, as such usage has no practical inconvenience, it will be followed in this article.

According to some authorities, the oldest reference to enamelling is to be found in the book of Ezekiel (i. 4, 27; viii. 2). The original word chashmal, Sovin, was translated by the LXX. 7Aexrpov, and appears in the authorized version as amber. Genesius, however, believes that the Hebrew word signified polished metal rather than amber. Pliny tells us that the word electrwm was applied to two distinct substances, namely, to amber and to an alloy of # gold and 3 silver. It has been held, however, by M. Labarte, a great authority 'on the history of enamelling, that there are passages in Homer and in Hesiod in which the word electron will not bear either of Pliny's meanings, but must be taken to signify enamelled gold. Labarte has found a formidable opponent to this interpretation in the Count Ferdinand De Lasteyrie (Z'Electrum des anciens étaut-ul de 'émail ? Paris, 1857).

To whatever period the origin of enamelling may be assigned, it is certain that glazes having the composition of good enamels were manufactured at a very early date. Excellent glazes are still preserved on some of the bricks which have been found among the ruins of Babylonia and Assyria, and have been referred to the 8th or 7th century B.c. Nor should we forget the glazed slipper-shaped coffins which occur in great numbers at Warka, probably the ancient Ur of the Chaldees, and are referred to the Sassanian period. The glazes on the

Babylonian bricks were examined by Dr Percy, who found that the base was

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a soda-glass, or silicate of sodium, rendered opaque in some specimens by the presence of stannic oxide, or coloured blue in others by means of silicate of copper associated with the sodic silicate, or exhibiting in other specimens a fine yellow colour, due to the presence of antimony and lead, probably in the form of " Naples yellow." Glazes, of a similar character to some of these, were also manu- factured by the Egyptians as early as the sixth dynasty. Sepulchral figures, and a variety of other objects familiar to students of Egyptian art, were produced in a substance which has been miscalled " porcelain," and which is, in fact, a frit coated with variously-coloured glazes, of which the most common is of a fine celestial blue colour. This colour is due to the presence of a double silicate of copper and sodium. Beautiful as these glazes unquestionably are, they are not true enamels, since they are not applied to tnetallic surfaces. It is true that the ancient Egyptians were able to produce an effect not unlike that of enamel- ling by inlaying bronze and gold with coloured pastes. But Dr Birch says of the Egyptians that "their real enamelling does not appear to be older than the time of the Ptolemaic and Roman dominion in Egypt."

There can be little doubt that the Greeks and Etruscans were acquainted with the art of enamelling. They seem, however, to have practised it to only a very limited extent, and it may be fairly doubted whether they had attained to such a mastery of its details as some writers have assumed. Thus M, Lenormant, writing in 1863, says—

"Les collections de 1'Europe possédent maintenant des piéces incontestables qui démontrent pour les Egyptiéns, les Phéniciens, les Grecs, et les Etrusques, la connaissance des secrets les plus difficiles de l'émaillerie, ainsi que la pratique de toutes les formes et de toutes les applications dont ce procéde peut étre susceptible."

Whatever knowledge of enamelling the Greeks may at onetime have possessed, they appear to have lost it beforethe 3d century of ourera.

This is inferred from a famous passage in Philostratus, which was probably written about 240 a.v. Philostratus was a Greek sophist who went from Athens to the court of Julia, the wife of Septimius Severus. The passage is found in the Jcones (lib. i. cap. 28), and since attention was first called to it by Buonarroti, it has been quoted by all writers on enamelling; it is, in fact, the earliest distinct reference to the art. ‘ It is said that the ‘barbarians who inhabit the ocean pour these colours,” alluding to the coloured decorations of some horse-trap- pings, “on to heated bronze, and that they adhere, become as hard as stone, and preserve the designs.”! On this passage the learned commentator Olearius remarks, “‘Celtas intelligit per barbaros in Oceano.” It is a vexed question, however, whether the reference applies to the Celts of Britain or to those of Gaul. French writers naturally apply the allusion to the maritime Gauls; but Mr Franks and some other writers have pointed out that the expression used by Philostratus, év’Qxeava, would refer more appropriately to an insular people, like the Britons. Large numbers of enamelled cbjects have indeed been found in various parts of England, Scotland, and Ireland. Among these ornamental objects are shields, fibula, rings, and even bits and other horse-furniture, such as are probably referred to in the passage from the Zcones. The ornamenta- tion is mostly in that style which has been designated by Mr Franks as late Celtic. Excellent examples are furnished by the enamels which were found in the Victoria Cave near Settle in Yorkshire, and have been described by Professor Boyd Dawkins ; these are referred to about the 5th century. (See article Cave, vol. v. p. 270.) It is not improbable that the art of enamelling, after it ceased to be cultivated in Britain, may have lingered in Ireland,

1 Tautd pact ra xpduara Tovs ev ’AxeavG BapBdpous eyxeiv rq XAAKEG Starboy, 72 5E cuvicracbat Kad AGodTOat, nat cwLEW & eypagn.

which is known to have been a great centre of arts aud sciences during the 6th and 7th centuries.

Although such specimens as those just referred to seem to show that enamelling was practised at a very early period in Western Europe, it is nevertheless in the Eastern empire that we find the earliest historic evidence of the art having flourished as an important industry. Byzantium was indeed for centuries the great seat of this industry, which probably dated from at least the time of Justinian. The word smaltum is found for the first time in a life of Leo. IV. written in the 9th century. Theophilus, the artist-monk, has left a minute description of the manner in which the Byzantine enamellers of the 10th century carried on their work. Most of the Byzantine enamels were executed on plates of gold, and large numbers have no doubt been destroyed on account of the intrinsic value of the metal. Such specimens as are extant furnish valuable examples of what is known as the clotsonné process.

In cloisonné work, the design is presented in coloured cnamels which are separated one from another by meaus of ribs of metal bent so as to follow the outline of the sub- ject. A plate of gold generally formed the basement of the work, and upon this plate the design was traced in slender fillets of gold. These threads were easily bent to the required form, and were fixed upright upon the plaque, so as to form a number of cells for reception of the enamel. The powdered glass, moistened into a paste was carefully introduced into these compartments, and the prepared plate was then fired. To retain the fused enamel, the edges of the plates were slightly turned up, thus forming a rim. After careful cooling, the irregular fused surface was ground down, and polished, when the design appeared in coloured enamels separated by gold partitions, or cloisons. In many cases the metal base forms part of the field, and the subject is then enamelled in a hollow which has been been beaten out, while the gold forms a brilliant background. Cloisonné enamelling has been employed by the Chinese and Japanese, who, instead of restricting it to flat surfaces of the precious metals, have applied it to copper vases and other large hollow vessels. They also ingeniously attach the metal fillets to the surface of pottery, and thus produce cups, vases, and other objects in porcelain ornamented with cloisonné work. Many Chinese and Japanese enamels are, however, executed by other processes, such as the champ-levé and _ surface methods, to be afterwards described.

The most famous example of Byzantine cloisonné work is the Pala d'Ora at St Mark's, Venice. This magnificent altar- piece contains a number of enamelled panels and medal- lions, execnted for the most part on gold, though some are on silver, It is believed that the Pala was brought from Constantinople to Venice about the year 1105, and that some of the enamels may be referred to this date; but probably they are not all of the same period. Among other interesting examples of ancient cloisonné enamel- ling, reference may be made to the well-known Alfred Jewel, which was found at Athelney in Somersetshire in 1693, and is preserved in the Ashmolean Museum at Oxford. The face of the jewel is of rock-crystal, beneath which is a figure-subject in semi-transparent enamels of blue, white, green, and brown. Around the edge is the legend, AELFRED MEC HEHT GEVVRCAN (Alfred ordered me to bemade). Possibly this jewel, or at least the enamelled part, was brought from the East, and is not an example of Saxon enamelling. Cloisonné work is also seen in the cross which was obtained from the tomb of Queen Dagmar who died in 1213, in a valuable pectoral cross belonging to Mr A. J. Beresford Hope, and in a small portrait of St Paul on gold, in the Museum of Practical Geology, London.

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A rare variety of cloisonné enamelling is known to 'French antiquaries as enamel "de plique & jour.' The peculiarity of this style consisted in setting transparent enamels without any background, so that light could be freely transmitted through the glass, the enamels being fixed by having their edges fused to the windows in which they were framed. Specimens of this work are extremely rare. A fine example, in the shape of a small covered cup, may be seen in the South Kensington Museum, having been purchased for the sum of £400,

Very similar in effect to the cloisonné enamels, but much less rare and valuable, are those inlaid works which were executed by the champ-levé process. Copper was usually employed in place of the precious metals; and the par- titions between one colour and another were formed by ridges of the base and not by separate fillets of metal. A plate of copper, about 4 inch thick, and having the surface polished,

formed the ground-work of the enamel. By means of a graver, the parts to be enamelled were chased out, so as to leave slender ribs standing up as boundary- walls to the cavities. Enamel in the state of either powder or paste was then introduced into these casements, and the work was fired. Finally, the surface was polished, and the metallic outlines generally gilt. In some examples, the figures are represented in enamel on a metal background; while in others the figures stand out in engraved metal upon an enamelled background; and in others again the entire field is enamelled.

Champ-levé enamelling was applied to a vast variety of purposes, and specimens of the work are to be found in almost every museum. The late Celtic or Romano-British enamels, referred to above, belong to this class. One of the most interesting champ-levé enamels of early date is the elegant bronze vase which was found in 1835 in a tumulus at Bartlow, in the parish of Ashdown, Essex. The sepulchral mound formed one of a group of four conical barrows, which have been referred by their contents to the late Roman period. The vase is a globular vessel with rectangular handle, ornamented with bands of running leaves and flowers executed in blue, green, and red enamels. Faraday showed that the blue colour was due to cobalt, and the red to copper, the green also being probably a copper-colour. This singularly interesting specimen suffered from a fire at Easton Hall in 1847, and its remains are now in the British Museum. (See coloured figure in Archeologia, vol. xxvi.) Another famous example of this kind of enamelling is seen in Westminster Abbey, in the tomb of William de Valence, earl of Pembroke, who died in 1296. It is highly probable that the enamels on this monument were executed at Limoges in France, a city which during the Middle Ages was the chief centre of the enamelling industry. So numerous were the enamels of the early Limoges school that it is impossible within the limits of this article to refer to special examples. They date back certainly as early as the latter part of the 12th century; for a letter which is referred to the year 1170 alludes to an enamelled book- cover de opere Lemovicino. The champ-levé process was extensively applied by the Limoges enamellers to the decoration of altar-furniture, especially reliquaries or shrines, pyxes for preserving the host, priket candle- sticks, ciboria, crosiers, and other

ecclesiastical appoint- ments. During the 14th century Limoges lost its reputa- tion; but it revived at a later period in an entirely new style of enamelling. The inlaid process, in fact, gave way to that of painted enamels, and the graver was displaced by the pencil. But before noticing the process of superficial enamelling, it is desirable to refer to another

style, which took its birth in Italy at the beginning of the 14th century.

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In the Italian process, the enamels were always more or less translucent, and completely covered the metal ground, the design being defined by sculpturing beneath the transparent medium. The enamels were of various colours, and differences of shade were obtained by the varying thickness of the glass in different parts of the design. Gold or silver was the metal generally employed. The subject was chased in very low relief, and covered with powdered enamels. Great care was required during firing, to prevent the several colours runuing together in a con- fused mass. As examples of translucent enamels, reference may be made to the silver horn, known as the " Bruce horn," the property of the marquis of Aylesbury, and to the crosier of William of Wykeham at New College, Oxford.

Soon after the introduction of transparent enamelling in Italy, the art became popular in France, and this probably led the way to the invention of enamel-painting. The artists of Limoges acquired great celebrity in this work. The early painted enamels from the Limousin workshops were executed in opaque white upon a brown ground, the white being overlaid where necessary by transparent coloured enamels. The lights were picked out in gold, while the brilliant effect of gems was obtained by the use of padllettes, or coloured foils. Nardon Pénicaud is the best known artist in this style, and an excellent. example of his work, dated 1503, is preserved in the Hétel de Cluny in Paris.

About the beginning of the 16th century a mnch more finished style of painting was introduced at Limoges ; and under the auspices of Francis I. the art attained to a con- siderable development. Léonard Limousin,

who is known to have painted from 1532 to 1574, became the great master of this style. While some of the works were executed in brilliant colours, most of them were in monochrome. The background was generally dark, either black or deep purple, and the design was painted en grisaille, relieved in the case of figure-subjects by delicate carnations. The effect was occasionally heightened by ap- propriate touches of gold, and in many of the coloured enamels brilliancy was obtained by the use of silver foil, or paillon, placed beneath a transparent enamel. Portraits were frequently painted on copper plaques; and tlie art was also applied to the decoration of ewers, vases, plateaux, candlesticks, salt-cellars, and a variety of elegant objects for domestic as well as ecclesiastical use. Among the artists of this school may be mentioned Pierre Raymond, Jean Pénicaud, Pierre and Jean Courtois, Martin Didier, Jean Court dit Vigier, P. Courteys, and the master known only by his initials C. N.

Towards the latter end of the 16th and in the beginning of the 17th century it was the fashion for the Limoges enamellers to paint in a minute style, which is seen in the works of the brothers Laudin and of the family of Nouailhers. The art at length degenerated into a system of tawdry colouring, and in the reign of Louis XIV. it fell into a state of decay, from which an attempt to revive it was made by Louis XVI., but without success.

Probably the decline of the Limoges school was connected with the rise of a new branch of enamelling, which has been distinguished as the miniature style. This is the style which has continued in vogue up to the present day. Its invention is ascribed to Jean Toutin, a goldsmith of Chateaudun, but it was greatly improved by Jean Petitot of Geneva, who carried it to a high state of perfection, and painted for Charles I. in England and for Louis XIV. in France. These enamels are executed generally on plates of copper or of gold, but silver is sometimes employed. In consequence of the risk involved in the successive firings, the plates were formerly confined to a small size, about 5 or 6 inches square. Horace Hone, an English enameller

of the last century, was the first who attempted large} largely employed for the decoration of pottery and

pieces, but he was excelled by Henry Bone, R.A. Bone had been a china painter in the Plymouth and Bristol works ; aud on his removal to London he applied his knowledge of vitrified pigments to enamel painting. Iixcelling all his predecessors in the magnitude of his plates, he ventured on subjects so large that in 1810 he painted a noble plaque measuring 18 inches by 16 inches. This master-piece was a copy of Titian's famous Bacchus and Ariadne, in the National Gallery, and was purchased by Mr Bowies of Wanstead for 2200 guineas. Bone's chief works were a series of portraits of celebrities of the Khzabethan period, which were sold by auction on the artist's death in 1834. (See Bonz, vol. iv. p. 32.) Enamelling was also prosecuted by his son, H. P. Bone, wlio executed a very large Madonna and Child, and by his grandsons, W. Bone and C. R. Bone, both of whom are recently deceased. The art of enamel painting was also carried on by A. Essex, but of late years it has not been extensively cultivated in this country. In con- nection with remarkable enamels it should be mentioned that a painting of the Holy Family, after Parmigiano, was executed by C. Muss on a plaque measuring as much as 20 inches by 15 inches. This noble work was purchased by George IV. for 1500 guineas.

In order to prepare a plate for the artist, a thin picce of gold or of copper is carefully annealed, and then coated with a dead white enamel. The cnamel is imported in cakes from Venice, and is nade from a mixture of silica, borax, and stannic oxide. After the plate has been fired, a second coating of enamel is applied, and the plate returned to the oven. It is afterwards coated for the third time, hut now with a more easily fusible glass, which is known in the workshop as " flux." This is also imported from Venice, in the form of tubes and beads, and is employed to produce a brilliant lustre on the surface. The ground having been thus prepared is carefully ground smooth, and is then ready for the artist. The colours which he employs consist of various metallic oxides mixed with the flux; but it is obvious that the

enameller's palette must be limited, since he is able to employ only such substances as are permanent at the temperature to which the plate will be subjected in the muffle. Blue colours are produced by means of oxide of cobalt ; violet by oxide of manganese ; green by cupric oxide or by chromic oxide ; red either by cuprous oxide, which is difficult to work in the oven, or by the preparation of gold known as purple of Cassius, which also produces a fine purple; yellow by oxide of silver, oxide of lead, or an alkaline antimoniate; brown by ferric oxide; and black by ferrous oxide, or by means of cobalt and manganese, which have intense tinctorial power, and produce dense colours. Special recipes will be found in technical treatises, and need not be inserted here.

The powdered colours of the enameller are mixed with oil of lavender or spike and spirit of turpentine, as a veliicle, and are applied to the enamel-ground by means of a camel's-hair pencil. Atter each layer has been spread over the surface, the plate must be fired, and highly-finished work may have to pass through the oven a score of times. Once vitrified, the colours are permanent ; hence the artist has no opportunity of correcting faults, except by the tedious process of grinding away a portion of the plate. Since the tints may be greatly modified by too high a temperature, the greatest care is needed in managing the furnace. In return for the great labour and risk involved in enainelling, the artist secures permanence for his work, the painting being always as fresh as when first executed ; it is indeed a painting in glass.

In the middle of the last century the art of enamelling was largely applied to the decoration of snuff-boxes, patch- boxes, tea-canisters, candlesticks, needle-cases, labels for wine-bottles, and a variety of other small articles. The manufacture was established by Mr 8. T. Janssen at York House, Battersea, near London, about the year 1750. The objects were usually made of copper; and having been coated with an opaque white enamel, were decorated with Watteau subjects and floral and other designs, painted in enamel colours. A peculiar rose-tint was a favourite colour at Battersea. Advantage was also taken of the process of transferring engravings from copper-plates to glazed surfaces——a

process which was introduced about the year 1750 by Sadler and Green of Liverpool, and was

| gum-water.

porcelain. It is known that a manufacture of small enamelled objects, similar to those made at Battersea, but usually decorated in coarser style, was carried on by George Brett at Bilston in South Staffordshire. Splendid snutf- boxes and other ornamental articles in enamelled work were also turned out by artists in France and Germany.

Of late years the art of enamelling has been extensively applied to the coating of iron vessels for domestic purposes, with the view of keeping a clean surface and preventing the rusting of the metal. As far back as 1799, a process for this kind of enamelling was introduced by Dr Hickling ; and within the last thirty years a large number of patents have been granted for similar purposes. One of the most extensively used processes is that of Charles Henry Paris, which was introduced into England in 1850, and is now largely worked at Birmingham. The metal articles are first cleaned with dilute sulphuric acid, and powdered glaze is then sifted upon the clean surface. Adhesion of the powder is secured by applying to the iron a coating of The object is then dried in an oven, whence it is transferred to the enamelling-furnace, where it is heated until the fused glaze flows evenly over the surface. After removal from the oven, the objects are allowed to cool with extreine slowness. It is often found necessary to apply a second coating of enamel. Paris's composition consists of 130 parts of cullet or broken glass, 20} parts of carbonate of sodium, and 12 parts of boracic acid. This forms the fundamental glaze, upon which variously coloured enamels may be employed. If enamelled vessels are to be used for culinary purposes, great care must be taken that the glass contains no lead, the presence of which would be highly dangerous. Acids often find their way through the pores of an enamel to the subjacent metal, and, spreadiug out between the iron and the glaze, cause the enamel to peel off. Exposure to sudden changes of temperature also tends to injure the enamel.

Enamelling of a similar character is now largely used for street plates, name-plates at railway stations, advertising tablets, and other objects where permanent lettering is required. The insides of baths, cisterns, and boilers are also protected by enamelling ; and it has been proposed to prevent the fouling of ships' bottoms by a coating of enamel. In 1871 a patent was granted to Mr Neilson of Glasgow for enamelling large metal objects, to which the process had not been previously applied, and also for improvements in the mechanical appliances needed for the transference of large objects in and out of tlie enamelling oven.

For the history of enamelling see M. Labarte's Lecherehes sur la Peinture en Email (Paris, 1856). This is incorporated in the author's Histoire des Arts tndustriels au Moyen Age (vol. iii. 2d. ed. Paris, 1875). Seealso, the Marquis de Laborde's Notice des Emaux exposés dans les galeries du Musée du Louvre (Paris, 1852). English readers will find an admirable sketch of the history in Mr Franks's Observations on Glass and Enamel, extracted from the Art Treasures of the U. K. For details of old processes the works of Neri and Benvenuto Cellini may beconsulted. Valuable papers will be found in the Archeolog. Journ. (vol. ii. p. 154), by Albert Way; Journ. Arch. Assoc. (vol. iii. p. 280), by W. H. Rogers ; and Avt Journal for 1851, by A. Essex. The following works are also desery- ing of notice—M. Reboulleau's Novear Manuel complet de la peinture en verre sur porcclaine et sur émail (new ed., by M. Magnier, Paris, 1866), and M. Claudius Popelin's Z'Email des Peintres (Paris, 1866). (F. W. R.*)

ENCAUSTIC PAINTING. The name encaustie is applied to paintings executed with vehicles in which wax is the chief ingredient. The term was appropriately applied to the ancient methods of painting in wax, because these required heat to effect them. Wax, however, may now be used as a vehicle for painting without heat being requisite ; nevertheless the ancient term encaustic has

been retained, and is indiscriminately applied to all methods of painting in wax. The durability of wax, and its power of resisting the effects of the atmosphere, were well known to the Greeks, who used it for the pro- tection of their sculptures. As a vehicle for painting it was commonly employed by them and by the Romans and Egyptians; but in recent times it has met with only a limited application. Of modern encaustic paintings those by Schnorr in the Residenz at Munich are the most impor- tant. At present thcre is no general agreement as to which is the best method of using wax for mural painting. Modern paintings in wax, in their chromatic range and in their general effect, occupy a middle place between those executed in oil and in fresco. Wax painting is not so easy as oil, but presents fewer technical difficulties than fresco.

Ancient authors often make mention of encaustic, which, if it had been described by the word cnurere, to burn in, one might have supposed to have been a species of enamel painting, But the expressions "'incausto pingere," "pictura encaustica," "ceris pingere," '"pictura inurere," used by Pliny and other ancient writers, make it clear that some other species of painting is meant. Pliny distinguishes three species of encaustic painting. In the first they used a stylus, and painted either on ivory or on polished wood, previously saturated with some certain colour; the point of the stylus or stigma served for this operation, and its broad or blade end cleared off the small filaments which arose from the outlines made by the stylus in the wax pre- paration. In the second method it appears that the wax colours, being prepared beforehand, and formed into small cylinders for use, were smoothly spread by the spatula after the outlines were determined, and thus the picture was pro- ceeded with and finished. By the side of the painter stood a brazier, which was used to heat the spatula and probably the prepared colours. This is the method which was pro- bably used by the painters who decorated the houses of Herculancum and of Pompeii, as artists practising this method of painting are depicted in the decorations. This method has recently been revived in Italy. The third method was by painting by a brush dipped into wax liquefied by heat; the colours so applied attained consi- derable hardness, and could not be damaged either by the heat of the sun or by the effects of sea-water. It was thus

that ships were decorated; and this kind of encaustic was therefore styled ‘ship painting.”

About the year 1749 Count Caylus, and M. Bachelier, a painter, made some experiments in encaustic painting, and the count undertook to explain an obscure passage in Pliny, supposed to be the following (xxxv. 39) :—“ Ceris pingere ac picturam inurere quis primus excogitaverit non constat. Quidam Aristidis inventum putant, postea consummatum a Praxitele ; sed aliquanto vetustiores encaustice picture extitere, ut Polygnoti et Nicanoris et Arcesilai Pariorum. Lysippus quoque Atginz picture sue inscripsit évéxavoer, quod profecto non fecisset nisi encaustica inventa.” There are other passages in Pliny bearing upon this subject, in one of which (xxi. 49) he gives an account of the prepara- tion of “ Punica cera.” The nature of this Punic wax, which was the essential ingredient of the ancient painting in encaustic, has not been definitely ascertained. The Chevalier Lorgna, who investigated the subject in a small but valuable tract, asserts that the nétron which Pliny mentions is not the nitre of the moderns, but the natron of the ancients, viz., the native salt which is found crystallized in Egypt and other hot countries in sands surrounding lakes of salt water. This substance the Carthaginians, according to Pliny, used in preparing their wax, and hence the name Punic seems to be derived. Lorgna made a number of experiments with this salt, using from three to twenty parts of white melted wax with one of natron. He held

the mixture in an iron vessel over a slow fire, stirring it gently with a wooden spatula, till the mass assumed the consistency of butter and the colour of milk. He then removed it from the fire, and put it in the shade in the open air to harden. The wax being cooled liquefied in water, and a milky emulsion resulted from it like that which could be made with the best Venetian soap.

Experiments, it is said, were made with this wax in paint- ing in encaustic in the apartments of the Count Giovanni Battista Gasola by the Italian painter Antonio Paccheri, who dissolved the Punic wax when it was not so much hardened as to require to be “‘igni resoluta,”

as expressed by Pliny, with pure water slightly infused with gum-arabic, instead of sarcocolla, mentioned by Pliny. He afterwards mixed the colours with this wax so liquefied as he would have done with oil, and proceeded to paint in the same manner; nor were the colours seen to run or alter in the least ; and the mixture was so flexible that the pencil ran smoother than it would have done with oil. The painting being dry, he treated it with caustic, and rubbed it with linen cloths, by which the colours acquired peculiar vivacity and brightness,

About the year 1755 further experiments were made by Count Caylus and several French artists. One method was to melt wax with oil of turpentine as a vehicle for the colours. It is well known that wax may be dissolved in spirit and used as a medium, but it dries too quickly to allow of perfect blending, and would by the evaporation of the spirit be prejudicial to the artist's health. Another method suggested about this time, and one which seems to tally very well with Pliny's description, is the. following. Melt the wax with strong solution of salt of tartar, and let the colours be ground up in it. Place the picture when finished before the fire till by degrees the wax melts, swells, and is bloated up upon the picture; the picture is then gradually removed from the fire, and the colours, without being injuriously affected by the operation of the fire, become unalterable, spirits of wine having been burnt upon them without doing the least harm. Count Caylus's metliod was different, and much simpler :—(1) the cloth or wood designed for the picture is waxed over, by rubbing it simply with a piece of beeswax ; (2) the colours are mixed up with pure water ; but as these colours will not adhere to the wax, the whole ground must be rubbed over with chalk or whiting before the colour is applied; and (3) when the pic- ture is dry it is put near the fire, whereby the wax is melted and absorbs the colours. It must be allowed that nothing could well be simpler than this process, and it was thought that this kind of painting would be capable of withstanding the weather and of lasting longer than oil painting. This kind of painting has not the gloss of oil painting, so that the picture may be seen in any light, a quality of the very first importance in all methods of mural painting. The colours too, when so secured, are firm, and will bear wash- ing, and have a property which is perhaps more important still, viz., that exposure to smoke and foul vapours merely

leaves a deposit on the surface without injuring the work. The " encausto pingendi" of the ancients could not have been enamelling, as the word "inurerc," taken in its rigorous sense, might at first lead one to suppose, nor could it have been painting produced in the same manner as encaustic tiles or encaustic tesser; but that it must have been something akin to the count's process would appear from the words of Pliny already quoted, "Ceris pingere ac picturam inurere."

Werner of Neustadt found the following process very effectual in making wax soluble in water. For each pound of white wax he took twenty-four ounces of potash, which he dissolved in two pints of water, warming it gently. In this ley he boiled the wax, cut into little bits, for half an

hour, after which he removed it from the fire and allowed it to cool. The wax floated on the surface of the liquor in the form of a white saponaceous matter; and this being triturated with water produced a sort of emulsion, which he called wax milk, or encaustic wax. This preparation may be mixed with all kinds of colours, and consequently can be applied in a single operation.

Mrs Hooker of Rottingdean made, at the end of the last century, many experiments to establish a method of painting in wax, and received a gold palette from the Society of Arts for her investigations in this branch of art. Her account is printed in the tenth volume of the Society's Transactions (1792), under the name of Miss Emma Jane Greenland. The following is an abstract of her processes :—

Put into a glazed earthen vessel four ounces and a half of gum arabic, and cight ounces or half a pint wine measure of cold spring water ; when the gum is dissolved, stir in, over alow fire, seven ounces of gum mastic, continually stirring and_beating hard with a spoon, in order to dissolve the gum mastic. When sufficiently boiled the mixture will no longer appear transparent, but will become opaque and stifflike a paste. As soon as thisis the case, and the gum water and mastic are quite boiling, without taking them off the fire, add five ounces of white

wax, broken into small pieces ; stir and beat till the wax is perfectly melted and boils ; then take the composition off the fire, as boiling it longer than necessary would harden the wax, and prevent it afterwards from mixing well with water. When the composition is taken off the fire, it shonld be beaten well whilst hot (but not boiling) in the glazed earthen vessel ; mix with it by degrees a pint or sixteen ounces more of cold spring water, then strain the composition, and bottle it. The composition if properly made should be like cream, and the colours when mixed with it as smooth as with oil. Mix with the composition on a china palette any powder colours which may be required to the consistency of oil colours; then paint with pure water. In painting with this composition the colours blend without difficulty when wet, and even when dry the tints may be easily united by means of a brush and a very small quantity of water. The painting being finished, heat some white wax in a glazed earthen vessel over a slow fire till melted, but not boiling; then with a hard brush cover the painting with the wax ; when cold take a moderately hot iron, such as is used for irouing linen, and which will not "hiss" when put to the usual test, and draw it lightly over the wax. The painting will appear as if under a cloud, till the wax and the substance the picture is painted Gea are perfectly cold ; but if then it should uot appear sufficiently clear, the wax may be melted by holding a hot iron at a proper distance from it, especially before such portions of the picture as do not appear sufficiently transparent or brilliant ; for the oftener heat is applied to the picture the greater will be the transparency and the brilliancy of the colouring; but the contrary effect would be the result were the heat applied too sud- denly, in too great a degree, or for too long a time. When the picture is cold, rub it with a finc linen cloth. Plaster surfaces re- quire no other preparation than a coating of the composition.

It would be equally practicable to paint with wax alone, dissolved in gum water. 'Take three quarters of a pint of cold spring water, and four ounces and a half of gum arabic, put them into a glazed earthen vessel, and when the gum is dissolved, add eight ounces of white wax. Put the earthen vessel, with the gum water and wax, upon a slow fire, and stir them till the wax is dissolved, and when the mixture has boiled a few minutes, take it off the fire, and throw it into a basin, as by remaining

in the hot earthen vessel the wax would become rather hard ; beat the gum water and wax till quite cold. It is necessary to use some pure water in mixing this compo- sition with the colours. If the ingredients should separate when bottled, they have only to be well shaken together. This composi- tion may be kept for a long time, and be rendered fit for use by putting a little cold water upon it for a short time.

The following is a recent receipt. Place in a large pipkin, half full of hot turpentine, as much gum dammar as will dissolve (4 Ib gum makes about 14 pints varnish) ; melt from two to two and a half of the wax tablets sold by chemists in a pint of this varnish ; when cold the composition should just be consistent enough to stand up on the palette. If too thin, heat it again, and add wax ; if too thick add turpentine. This vehicle may be used with ordi- nary oil colours. Before commencing your work heat the wall, and rub in as much vehicle as it will absorb; after the work is finished it should be re-heated, to secure its adhesion to the wall.

See Lorgna, Un discorso sulla cera punica ; Pittore Vicenzo Re- queno, Saggi sul Ristabilimento dell' antica Arte de' Grecit e Romant, Parma, 1787 ; Phil. Tran., vol. xlix., part 2; Muntz on Encaustic Painting ; Elmes's Dictionary of the Fine Arts ; W. Cave Thomas, Methods of Mural Decoration, London, 1769. (yar @. >)

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ENCAUSTIC TILES. The term ' encaustic" as applied to tiles is of modern though somewhat doubtful origin. The art bears no resemblance to the " encaustic painting " mentioned by Pliny and other ancient writers, although the expression (which signifies executed by fire) is perhaps as correctly applied to this manufacture as to the wax-incised pictures of the ancients. The term is, strictly speaking, applied to tiles which are decorated with patterns formed with different coloured clays, inlaid in the tile, and fired with it. This art appears to have had its origin in the latter part of the 12th century, but the culminating point of its excellence and popularity was attained during the 13th; and it was extensively used for the decoration of Gothic

buildings in connection with each succeeding chauge in that style of architecture.

In medizval times the manufacture appears to. have been principally carried on in England and Normandy, but examples of ancient tile-pavements of this description are also to be found in Holland and other Continental countries. The greater number of ancient examples are in squares, varying from 4 to 9 inches, but some striking exceptions occur, from which it has been attempted to trace a connec- tion between this art and that of Roman mosaics. Pave- ments presenting a kind of connecting link between the two have been discovered at Fountains Abbey, and in Prior Crauden's chapel, Ely, in which the tiles are of great variety of form and size ; and, instead of the patterns being wholly inlaid in the tiles themselves, the design is, to a large extent, produced by the outlines of the individual pieces, which, in the latter example, are cut to the forms required to be represented, including the subject of the temptation of Adam and Eve, trees, lions, &c., the tesserz being also enriched with what may be more strictly called encaustic decoration.

Encaustic tiles were almost exclusively used for pave- ments, but an interesting instance of their employment for wall decoration occurs in the abbey church of Great Malvern, where these tiles have probably been originally used to form a reredos, and bear designs representing Gothic architecture in perspective, having introduced into them the sacred monogram "I.H.S.," the crowned monogram of "Maria," the symbols of the Passion, the Royal Arms, and other devices. This example is also interesting as bearing the date of its manufacture on the margin, " Anno R. R. H. VI. XXXVJ.," that is, the thirty-sixth year of the reign of Henry VI. (1457-8).

Combinations of encaustic tiles forming a cross were frequently used as mortuary slabs ; and an example of this kind of monument is in Worcester cathedral an sztu, whilst the detached component tiles are to be found in other ancient churches.

Many interesting ancient inscriptions are found entering into the designs of encaustic tiles, amongst which is the following, from Great

Malvern, which has been deciphered with some difficulty, and rendered into modern English

thus— “ Think, man, thy life May not ever endure ; That thou do’st thy self Of that thou art sure ; But that thou keepest Unto thy executor’s care, If ever it avail thec, It is but chance.”

A tile from the same place also bears the following quotation from the book of Job, curiously arranged, and beautifully combined with Gothic ornament : “ Miseremini mei, miseremini mei saltem, vos amici mei, quia manus Domini tetigit me.” The border of this tile bears the names of the evangelists, with the date a.p. MCCCCLVI. The armorial bearings of noble benefactors, and the devices

of abbots and other church dignitaries, also enter largely into the decorations of ancient encaustic tiles. Amongst the most interesting examples of these pavements, found in situ, is that in the chapter house at Westminster, which about the year 1840 was laid open to view by the removal of a wooden floor previously covering it. It is probably of the tine of Heury III., in whose reign it is recorded that the king’s little chapel at Westminster was paved with ‘“painted tile,’—“mandatum est, &e., quod parvam capel- lam apud Westm. tegula picta decenter paveari faciatis.” —Rot. Claus. 22 Henry III. M. 19, 1237-38 av. The tiles of this pavement comprise subjects which may be taken to represent the king, queen, and the abbot, also the legend of King Edward the Confessor bestowing a ring, as alms, on St John the Baptist, who appeared to him in the guise of a pilgrim, besides other curious historical designs. The tiles from Chertsey Abbey, Surrey, now in the architectural museum, Westminster, are also amongst the oldest, and, at the same time, the finest and most artistic yet brought to light. They present a remarkable series of illustrations from the English romance of Sir Tristram, and of incidents in the history of Richard Cceur-de-Lion. These tiles were all found in fragments, but have been put together with great care.

Traces of the ancient manufacture of encaustic tiles have been found in several places in England, and the remains of kilns containing tiles in various stages of manufacture have been discovered at Bawsley, near Lynu, in the neighbourhood of Droitwich, as well as in other localities, by which an interesting light has been thrown upon the ancient process of production. In almost every instance these tiles were covered with a yellowish glaze, composed principally of lead, similar to that now used in the commoner English earthenware manufactures.

The modern revival of the art dates from the year 1830, when a patent was granted, with this object, to Samuel Wright, a potter of Shelton, in Staffordshire; but, he hav- ing failed to bring his experiments to a profitable result at the expiration of the term, a further extension for seven years was granted lim. In the year 1844 his patent right was purchased, in equal shares, by the celebrated china manufacturer Herbert Minton and Mr Fleming St John, the former carrying on the manufacture at Stoke-upon- Trent, and the latter at Worcester, in partnership with Mr George Barr, an eminent china manufacturer of that city. Four years later, the firm of which Mr Minton was the head re-purchased the residue of Mr St John's share of the patent right, who about the same time relinquished the manufacture. In the year 1850 Messrs Maw & Co. pur- chased the remaining stock of encaustic tiles at the Worcester china works, and, on the expiration of Mr Wright's patent, commenced the manufacture on those premises, from which they removed to the present site of their works, at Benthall, near Broseley, Shropshire, whence the marls, peculiarly suitable for the purpose, had pre- viously been obtained.

The modern manufacture may be described under two heads—viz., the "plastic " and the " semi-dry " or " dust " processes. The former, which was the only one employed up to the year 1863, is in every essential point the same as that used in medieval times, differing merely in the greater finish and perfection which modern appliances have effected, and probably alsu in the material of the moulds. Jt is not known of what those anciently used were made, but conjecture has suggested wood, fired clay, and stone.

The great difficulty of the manufacture consists in the necessity for introducing into a single tile the variety of different coloured clays or "bodies" which together com- pose the design, it being essential that they should not

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only be perfected by the same amount of heat in the process of firing, but that they should possess an equal contractile power during each stage of the manufacture.

The tile is first impressed from a plaster-of-Paris mould, bearing the pattern in relief, and set in a brass frame, upon which fits another frame, the dimensions and depth of which correspond with the size and thickness of the tile ; the pattern is thus sunk in the clay to a depth of abont one-sixteenth of an inch, in the following manner. The workman first introduces into the mould what may be described as a sheet of refined clay of the desired colour for the ground of the pattern; upon this facing, which forms a kind of veneer, is placed a thicker mass of a coarser kind of clay, and the whole is then subjected to screw pressure, which consolidates the two kinds of clays, and at the same time perfectly impresses the pattern of the mould; the superfluous clay is then removed with a scraper, and a second veneering of fine clay, similar to that used for the face, is placed on the back; the tile being removed from the mould, the depressed parts of the design are filled with clay, of one or more colours, by pouring it in in a "slip" or semi-liquid state. The tile is then set aside for twenty-four hours to stiffen, and when the "slip" inlay has become uearly of the same consistency as the tile itself, the face is brought roughly to an even surface, by "spreading" the soft clay with a pallet-knife. The tile is then further allowed to dry till it attains the stiffness of wax, when it is "finished" by scraping the face with a steel scraper, until the inlaid pattern and ground are developed free from superfluous clay, aud thie edges are cut true to a square, when it is ready for the drying stove. When the drying, which takes from six to ten days, is completed, the tiles are placed in fire-clay boxes, known as " saggers," containing from eight to ten each, which are then stacked, one upon another, in the kiln or oven.

The process of firing occupies four days and nights, and has to be conducted with the greatest care, as not only the exact size and hardness of the tiles are dependent upon it, but also the perfection of the colours, with which object it is necessary to raise the heat very gradually, and to secure a regular circulation of air in the oven, So as to produce the exact degree of oxidization needed to bring out the desired colours in the materials used for this purpose. The pyromcters used in this part of the process consist of long narrow tiles, and the degree of heat is judged both by their colour and the gradual reduction in length which they undergo, each piece, as it is withdrawn from the oven, being measured in a gauge, with this object,—the total shrinkage of the tile, in the drying and firing, amounting to about 14 inches in the foot. For purposes of paving, most of the modern encaustic tiles are used in the "bisque" or unglazed state, the glaze in the ancient tiles having apparently been employed with the object of covering the soft material of the tile itself, and of adding richness tothe colour. Where glazing is found necessary in the modern tiles it is effected by dipping them in a combination of lead, alkaline salts, felspar, and silica, finely levigated in water, which is fused by passing them through a kiln specially constructed for the purpose.

The semi-dry or "dust" process of mauufacturing encaustic tiles is an adaptation of an itvention patented in the year 1840 by Richard Prosser, by which articles of various kinds are moulded out of pulverized clay, in metal dies, by screw pressure. In the year 1863 Messrs Boulton and Worthington, engineers of Burslem, patented a process by which the use of powdered clay (hitherto only used for tiles of oue colour) was applied to the manufacture of encaustic tiles. The design is formed by perforated brass plates,—from one to six or seven being used, according to

the nature of the pattern. Where the whole design can be perforated in the plate without detaching such parts as would represent the ground, only one plate is needed ; but where there are several concentric rings or similar forms, additional plates are required. Into the perforations

of each plate metal rams, attached to a flat plate of iron, are accurately fitted. The metal die in which the tiles are pressed is composed of a thick block and a square frame or “box ;” the latter is connected with levers and a balance- weight, so that it can be raised or depressed, either forming a hollow mould, of which the face of the block above men- tioned forms tlie bottom, or depressed in such a way as to leave the face of the block standing above it, in which latter position it is ready for the commencement of the pro- cess. The perforated plates first mentioned are then, in succession, placed upon the face of the block, being kept in position by two pins fixed to the frame of the die, corre- sponding with holes made in their margin. The perfora- tions of the brass plate being filled with powdered clay of the desired colour, this is so far compressed, by means of the metal ram, as to allow both the ram and the plate to be removed together, leaving the compressed dust (repre- senting the pattern of the tile in relief) on the block or face plate. In cases where a number of plates are necessary, the pattern is thus bwzlt wp, each adding such a part as can be perforated in a single plate. The frame is then raised, so as to form a mould of the required depth, which being filled with powdered clay, intended to form both the ground of tle pattern and the substance of the tile, the whole mould or die is slid, in a groove provided for the purpose, under the screw press, to which is attached a plate covering the mould, and resting on the top of the movable frame ; tls, on pressure being applied, forces down the frame until the powdered clay is thoroughly con- solidated and incorporated with that part forming the design. On the pressure being relieved, the die is drawn from beneath the press, the frame is forced down by means of the levers to which it {s attached, and the tile is left resting, face downwards, on the block, when it is ready for the drying-stove, the subsequent treatment being the sare as in the plastic process. This process affords the advan- tage of much greater rapidity in execution than can be effected by the plastic method, and as the tile undergoes little or no shrinkage in the desiccation of the small amount of moisture which is needed to make the particles of the dust combine under pressure, the risk of distortiou in the process of drying is reduced to a minimum, but the heavy prime cost of the perforated brass plates necessarily con- fines this otherwise valuable invention to such designs as are most largely in demand.

The modern application of encaustic tiles is by no means confined to the ecclesiastical purposes for which they were mainly used in medieval times, although for this purpose many of the ancient designs have been reproduced, and the rough execution of the old examples has been imitated with striking fidelity. Some of the most eminent architects of recent years have exercised their skill in the production of designs more suitable for domestic purposes ; and pave- ments of these tiles, combined with other kindred manufac- tures (for which see Mosaics and TiLes), have become an almost universal part of the permanent decoration of the better class of public and private buildings, for which pur- pose they are also largely exported to the colonies and foreign countries, superseding the perishable forms of floor- ing, and at the same time rendering unnecessary any decora- tive coverings. (A. M.)

ENCHASING, or CuHasinc, is the art of producing figures and ornamental patterns, either raised or indented, on metallic surfaces by means of steel tools or punches. It is practised extensively for the ornamentation of gold and

silversinith work, electro-plate, and similar objects, being employed to produce bold flutings and bosses, and in another manner utilized for imitating engraved surfaces. The chaser first outlines the pattern on the surface he is to ornament, after which, if the work involves bold or high embossments, these are blocked ont by a process termed "snarling." The snarling iron is a long iron tool turned up at the end, and made so that when securely fastened in a vice the upturned end can reach and press against any portion of the interior of the vase or other object to be chased. The part to be raised being held firmly against the upturned point of the snarling iron, the workman gives the shoulder or opposite end of the iron a sharp blow, which causes the point applied to the work to give it a percussive stroke, and thus throw up the surface of the metal held against the tool. When the blocking out from the interior is finished, or when no such embossing is required, the object to be chased is filled with molten pitch, which is allowed to harden. It is then fastened to a sandbag, and with hammer and a multitude of small

punches of different outline the whole details of the pattern, ned, smooth, or " matt," are worked out. Em- bossing aud stamping from steel dies and rolled orna- ments are now taking the place of chased ornamentations in the cheaper kinds of plated work.

ENCINA or Enzina, JuAN DEL, the founder of the Spanish drama, was born in 1468 or 1469, either in the city of Salamanca or more probably in the neighbouring village of Encinas. After studying at the university of Salamanca under the patronage of the chancellor Don Gutierre de Toledo, brother of Don Garcia, count of Alva, he proceeded to Madrid, and became, when about twenty- five years of age, a member of the household of Don Fadrique de Toledo and Dona Isabel Pimental, the first duke and duchess of Alva. In or about the year 1492 — the year, that is, in which Columbus added the new world to the dominions of Spain—the poet began to entertain his patrons by the representation of comedies of his own composition, in which he sometimes played the part of the Gracioso, or buffoon. In 1496, under the title of Cancionero, he published a collection of nine dramatic and numerons lyrical poems, divided into four parts, dedicated respectively to their Catholic majesties, to the prince Don Juan, to the dukes of Alva, and to Don Garcia de Toledo. Some years afterwards he went to Rome, joined the clerical order, attracted the attention of Leo X. by his skill in music, and was appointed his maestro di capella. Great praise was bestowed by his contemporaries on a farce, Placida e Victoriano, published by him in 1514; but of tle justness of their criticism we have no means of judging, since, owing in all probability to its insertion in the Jndex Lxpurgatorius, all copies of it have perished. In 1519 the poet went to Jerusalem in company with the marquis of Tarifa, Don Fadrique Enriquez Afan de Riberon; but he was again in Rome about the middle of 1520, and in the following year published his Zrabagia o Via Sacra de HMierusalem, a versified account of his journey, which has since been several times reprinted along with the marquis's narrative (Rome, 1721; Madrid, 1786). Shortly after- wards he was appointed prior of Leon, and returned to Spain. His death took place at Salamanca in 1534, and he was buried in the cathedral of that city. His Cancionero, which was reprinted five times in the course of the 16th century (Seville, 1501 ; Burgos, 1503 ; Salamanca, 1509, in company

with the coplas of Zambardo; Saragossa, 1512 and 1516), is preceded by a prose treatise, among the first of its kind, on the condition of the poetic art in Spain. The dramatic poems, of interest mainly as marking the transition from the purely ecclesiastical to the secular stage, comprise "mysteries," as The Passion of Our Precious

Redeemer, The most Sacred Resurrection of Chrest, and pastoral plays (Zglogas), as The Knight turned Shepherd, The Shepherds become Courtiers, The Triumph of Love. Seven of the number are reprinted in Bohl de Faber, Teatro espatiol, Hamburg, 1832. After the author's death there appeared in 1556 without rubric, Documento e instruccion para las doncellas desposadas y recien casadas con una justa damores. See Barrera, Catalogo del Teatro antiguo espaiol.

ENCKE, Jowann Franz (1791-1865), a celebrated astronomer, was born at Hamburg on the 23d September 1791. He received his early education from his father, who was a clergyman, and he afterwards studied at the university of Gdéttingen, devoting himself specially to astronomy under the instruction of Professor Gauss. In 1813-14 he served inthe Hanseatic legionin the war with Napoleon, and in 1815 he became a lieutenant of artillery in the Prussian service. When peace was concluded he resumed his astronomical studies at Gottingen until 1817, when he was appointed by Lindenau the Saxon minister of state to a post in the Observatory of Seeberg, near Gotha. In 1822-3 he published at Gotha two volumes, entitled Die Hntfernung der Sonne, in which the various observations of the transits of Venus in 1761 and 1769 were carefully reconsidered, and the calculations verified and corrected. One of the earliest subjects to which his attention was directed was the determination of the orbit of the comet observed by Pons at Marseilles in November 1818. He calculated the period of its recurrence at about three and a quarter years, and conjectured it to be the

same comet that liad appeared in 1786, 1795, and 1805. Upon the data he possessed he was able to predict its re- appearance in 1822, and he stated also that it would probably be invisible in Europe. His prediction was almost exactly verified, the comet being observed in New South Wales on the 3d June 1822, and the time of its perihelion passage being within three hours of that which he had computed. From the elements supplied by this observation he was able to foretell more accurately its recurrences in 1825 and 1828, and after the latter of these he determined its exact orbit. After the observation of 1832 he determined the period of its revolntion as 3°29 years, with a gradual acceleration which he ascribed to the existence of a resisting medium. The comet is known as Encke's comet. In 1825 Encke was appointed to succeed Bode as director of the Royal Observatory at Berlin, a situation which he filled with great ability until within a year of his death. In 1830 he became editor of the Berlin Astronomisches Jahrbuch, to which he

contributed a large number of valuable papers. The observations taken under his direction at the Berlin Observatory were recorded and published in a series of volumes, of which the first appeared in 1840. Of his many other contributions to astronomical literature may be mentioned his new method for computing perturbations, his dissertation De Formulis Dioptricis (1845), and his work on the relation of astronomy to the other sciences, which was published in 1846. Encke was one of the foreign members of the Royal Society of London, and in 1840 he was created a knight by the king of Prussia. He died at Spandau on September 2, 1865.

ENCYCLOPADIA

HE Greeks seem to have understood by encyclo- peedia (éyxvxAoradefa, or éyxvKALos maudeia) instruc-

tion in the whole circle or complete system of learning —education in arts and sciences. Thus Pliny, in the preface to his Vatural History, says that his book treated of all the subjects of the encyclopzdia of the Greeks, "' Jam omnia attingenda que Graci Tis éyxuKAomaidefas vocant." Quintilian (Znst. Orat., i. 10) directs that before boys are placed under the rhetorician they should be instructed in the other arts, "ut efficiatur orbis ille doctrine quam Greeci éyxvkdomadeiav vocant." Galen (De victus ratione wm morbis acutis, ¢. 11) speaks of those who are not educated év 7H éyxukAoTwade'a. In these passages of Pliny and Quintilian, however, from one or both of which the modern use of the word seems to have been taken, éyxvKAuos madeia is now read, and this seems to have been the usual expression, Vitruvius (lib. vi. preef.) calls the encyclios or éyxtkduos Tadeda of the Greeks '" doctrinarum omnium disciplina," instruction in all branches of learning. Strabo (lib. iv. cap. 10) speaks of philosophy xat riv GAAnv radeiav éyxtkduov. Tzetzes (Chiliades, xi 527), quoting from Porphyry's Lives of the Philosophers, says that éyxvx\ua pabypara was the circle of grammar, rhetoric, philosophy, and the four arts under it, arithmetic, music, geometry, and astronomy. Zonaras explains it as grammar, poetry, rhetoric, philosophy, mathematics, and simply every art and science (d7A@s taca réxvy Kal émicryun), because sophists go

through them as through a circle. The idea seems to be a complete course of instruction in all parts of knowledge. An epic poem was called cyclic when it contained the whole mythology ; and among physicians kixdw Oeparrevew, cyclo curare (Vegetius, De Arte Veterinaria, li. 5, 6), meant a cure effected by a regular and prescribed course of diet and medicine (see Wower, De Polymathia, c. 24,§ 14). The word encyclopedia was probably first used in English by Sir Thomas Elyot.

heape of all maner of lernyng : whiche of some is called the worlde of science, of other the circle of doctrine, whiche is in one worde of greke Encyclopedia."—The Governour, bk. i. chap. xiii. In his Latin dictionary, 1538, he ex- plains " Encyclios et Encyclia, the cykle or course of all doctrines," and 'Encyclopedia, that lernynge whiche com- prehendeth all lyberall science and studies." The term does not seem to have been used as the title of a book by the ancients or in the Middle Ages. The edition of the works of Joachimus Fortius Ringelbergius, printed at Basel in 1541, is called on the title-page Lucubrationes vel potius absolutissima kvkdomadea. Paulus Scalichius de Lika, an Hungarian count, wrote Wncyclopediw seu Orbis Dis- cuplinarum Hpistemon, Basile, 1599, 4to. Alsted pub- lished in 1608 Hncyclopedia Cursus Philosophici, which he afterwards expanded into his great work, first published in 1620, called without any limitation Hacyclopedia, because it treats of everything that can be learned by man in this life. This is now the most usual sense in which the word encyclopedia is used—a book treating of all the various kinds of knowledge, and it has become in modern times the common title of such books. Cyclopzdia was formerly sometimes used, but is now retained only in English, and is not merely without any appearance of classical authority, but is etymologically less definite, complete, and correct. For as Cyropedia means " the instruction of Cyrus," so cyclopedia may mean " instruction of a circle." Vossius says, "' Cyclopedia is sometimes found, but the best writers say encyclopedia" (De Vitiis Sermonis, 1645, p. 402). Gesner says, " xvxdos est circulus, que figura est simplicissima et perfectissima simul: nam incipi potest ubicunque in illa et ubicunque coheret. Cyclopedia itaque significat omnem doctrinarum scientiam inter se coherere. Encyclopedia est

institutio in illo circulo.” (Zsagoge, 1774, i, 40.) In a more restricted sense, encyclopzedia

“In an oratour is required to be a | means a system or classification of the various branches of

ENCWCELOPADIA

knowledge, a subject on which many books have been pub- shed, especially in Germany, as Schmid’s Allgemeine Ency- klopidve und Methodologie der Wissenschaften, Jena, 1810, 4to, 241 pages. In this sense the Nowwm Organum of Bacon has often been called an encyclopedia. But it is “a grammar only of the sciences: a cyclopedia is not a grammar, but a dictionary ; and to confuse the meanings of grammar and dictionary is to lose the benefit of a dis- tinction which it is fertunate that terms have been coined to convey” (Quarterly Jeeview, cxiii. 354). Fortunius Licetus, an Italian physician, entitled several of his disser- tations on Roman altars and other antiquities encyclopzedias (as, for instance, Hncyclopedia ud Aram mysticam Nonarit, Patavie, 1631, 4to), because in composing them he borrowed the aid of all the sciences. The Hacyclopedia Moralis of Marcellinus de Pise, Paris, 1646, fol. 4 vols., is a series of sermons. Encyclopiedia is often used to mean a book which is, or professes to be, a complete or very full collection or treatise relating to some particular subject, as Blaine’s excellent work, The Encyclopedia of Rural Sports, London, 1852, 8vo; The Encyclopedia of Wit, London, 1803, 12mo; Zhe Vocal Encyclopedia, Loudon, 1807, 16mo, a collection of songs, catches, &c. The word is more frequently used for an alphabetical dictionary treating fully of some science or subject, as Murray, Hncyclopedia of Geography, London, 1834, 8vo; Lefebvre Laboulaye, Zn- cyclopédie Technologique- Dictionnaire des Arts et Manu- factures, Paris, 1845-47, 8vo. 2 vols. ; Holtzendorff, Encyclopidie der Rechtswissenschaft, Leipzig, 1870, &c., 8vo.

The most ancient encyclopedia extant is Pliny’s Vatwral History in 37 books (including the preface) and 2493 chapters, which may be thus described generally :—book 1, preface ; book 2, cosmography, astronomy, and meteorology ; books 3 to 6, geography ; books 7 to 11,

zoology, including man, and the invention of the arts; books 12 to 19, botany ; books 20 to 32, medicines, vegetable and animal remedies, medical authors, and magic; books 33 to 37, metals, fine arts, mineralogy, and mineral remedies. Pliny, who died 79 a.D., was not a naturalist, a physician, or an artist, and collected his work in his leisure intervals while engaged in public affairs. He says it contains 20,000 facts (too small a number by half, says Lemaire), collected from 2000 books by 100 authors. Hardouin has given a list of 464 authors quoted by him. His work was a very high authority in the Middle Ages, and 48 editions of it were printed before 1536.

Martianus Minzeus Felix Capella, an African, wrote about 470, in mingled verse and prose, a sort of encyclopsdia, which is important from having been regarded in the Middle Ages as a model storeliouse of learning, and used in the schools, where the scholars had to learn the verses by heart, as a text-book of high class education in the arts. It is sometimes entitled Satyra, or Satyricon, but is usually known as De Nuptiis Philologice et Mercurii, though this title is sometimes confined to the first two books, a rather confused allegory ending with the apotheosis of Philologia and the celebration of her marriage in the milky way, where Apollo presents to her the seven liberal arts, who, in the succeeding seven books, describe their respective branches of knowledge, namely, grammar, dialectics (divided into metaphysics and logic), rhetoric, geometry (geography, with some single geometrical propositions), arithmetic (chiefly the properties of numbers), astronomy, and music (includ- ing poetry). The style is that of an African of the 5th century, full of grandiloquence, metaphors, and strange words. He seldom mentions his authorities, and sometimes quotes authors whom he does not at all seem to have read. His work was frequently copied in the Middle Ages by ignorant transcribers, and was eight times printed from

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1499 to 1599. The best annotated edition is by Kopp, Frankfort, 1836, 4t0, and the most convenient and the best text is that of Eyssenstadt, Lipsiz, 1866, 8vo.

Isidore, bishop of Seville from 600 to 630, wrote Ltymolo- giarum libri XX. (often also entitled his Origines) at the request of his friend Braulio, bishop of Saragossa, who after Isidore's death divided the work into books, as it was left unfinished, and divided only into titles.

The tenth book is an alphabet of 625 Latin words, not belonging to his other subjects, with their explanations as known to him, aud often with their etymologies, frequently very absurd. The other books contain 448 chapters, and are:—1, grammar (Latin); 2, rhetoric and dialetics; 8, the four matkematical disciplines— arithmetic, geometry, music, and astronomy; 4, medicine; 5, laws and times (chronology), with a short chronicle ending in 627; 6, ecclesiastical books and offices; 7, God, angels, and the orders of the faithful; 8, the church and sects; 9, languages, society, and relationships; 11, man and portents; 12, animals, in eicht classes, namely, pecora ct jumenta, beasts, small animals (including spiders, crickets, and ants), serpents, worms, fishes, birds, and smal. winged creatures, chiefly insects; 18, the world and its parts; 14, the earth and its parts, containing chapters on Asia, Europe, and Libya, that is, Africa; 15, buildings, fields, and their measures; 16, stones (of which one is echo) aud metals; 17, de rebus rusticis; 18, war and games; 19, ships, buildings, and garmeuts; 20, provisions, domestic and rustic instruments.

Isidore appears to have known Hebrew and Greck, and to have been familiar with the Latin classical poets, but he is a mere collector, and his derivations given all through the work are not unfrequently absurd, and, unless when very obvious, will not bear criticism. He seldom mentions his authorities except when he quotes the poets or historians. Yet his work was a great one for the time, and for many centuries was a much valued authority and a rich source of material for other works, and he had a high reputation for learning both in his own time and in subsequent ages. His Ltymologies were often imitated, quoted, and copied. MSS. are very numerous: Antonio (whose editor, Bayer, saw nearly 40) says, "plures passimque reperinntur in bibliothecarum angulis." This work was printed mine times before 1529.

Hrabanus Maurus, whose family name was Magneutius, was educated in the abbey of Fulda, ordained deacon in 802 ("Annales Francoruin" in Bouquet, Historiens dela France, v. 66), sent to the school of St Martin of Tours then directed by Alcuin, where he seems to have learned Greek, and is said by Trithemius to have been taught Hebrew, Syriac, and Chaldee by Theophilus an Ephesian. In his Commentaries on Joshua (lib. ii. c. 5), he speaks of having resided at Sidon. He returned to I'ulda and taught the school there. He became abbot of Fulda in 822, resigned in April 842, was ordained archbishop of Mayence 26th July 847, and died 4th February 856. He compiled an encyclopedia De universo (also called in some MSS. De unwersalr natura, De natura rerum, and De origine rerum) in 22 books and 325 chapters. It is chiefly a re-arrange- ment of Isidore's Ltymologies, omitting the first four books, half of the fifth, and the tenth (the seven liberal arts, law, medicine, and the alphabet of words), and copying the rest, beginning with the seventh book, verbally, though with great omissions, and adding (according to Ritter, Geschichte der Philosophie, vii. 193, from Alcuin, Augustine, or some other accessible source) the meanings given in the Bible to the subject matter of the chapter; while things not mentioned in Scripture, especially such as belong to classi- cal antiquity, are omitted, so that his work seems to be formed of two alternating parts. His arrangement of beginning with God and the angels long prevailed in methodical encyclopedias. His last six books follow very closely the order of the last five of Isidore, from which they are taken. His omissions are characteristic of the dimi- nished literary activity and more contracted knowledge of his time. His work was presented to Louis the German,

king of Bavaria, at Hersfeld in October 847, and was printed in 1473, fol., probably at Venice, and again at Strasburg by Mentelin about 1472-75, fol., 334 pages.

Michael Constantine Psellus, the younger, wrote Aidackadta rayrodarn, dedicated to the emperor Michael Dueas, who reigned 1071-78. It was printed by Fabricius in his Bibliotheca Greca, 1712, vol. v., in

186 pages 4to and 193 chapters, each containing a question and answer. Beginning with divinity, it goes on through natural history and astronomy, and ends with chapters on excessive hunger, and why flesh hung from a fig-tree becomes tender. As cvllation with 2 Turin MS. showed that 35 chapters were wanting, Harles has omitted the text in his edition of Ae anl gives only the titles of the chapters (x.

84-88).

The author of the greatest encyclopedia of the Middle Ages, Vincentius Bellovacensis, or Belvacensis, most pro- bably a native of Beauvais or of the Beauvaisis, was a Dominican friar, called by Louis IX. of France, on his found- ing Royaumont, a Cistercian monastery, in 1228, to fill the office of lector. He seems also to have been royal librarian, aud Louis IX. paid for copying and buying many books for him. Fifteen different dates from 1240 to 1334 have been proposed for his death, but the most probable and the best supported by evidence seems to be 1264. His great work, eilled Bibliotheca mundi, or Speculum majus, quadruplex, or triplex, is only the third part of what he had prepared and abridged "ad fratrum preces et consilium prelati." The edition of 1624 contains 4327 folio pages of very small ty pe. That the work excited great attention, and was much used at all times, is proved by the great number of MSS. in all] libraries, of which nearly 80 have been described, though no general notice of them has been published. In his pro- logue or general preface, which is prefixed to each of the three genuine parts, he says it is called Speculum because it briefly contains almost everything he could collect from innumerable books which is worthy of speculation, that is, of admiration or imitation, done or said in the visible and invisible world from the beginning to the end, and even future things. He was so anxious that the names of the authors quoted should not be lost or transposed in copying that lhe wrote them, not on the margin, but in the text itself, "inter lineas ipsas sicut in decretis;" therefore Thomasius (De Plagio, 542~75) acquits him of plagiarism, because he represents his work as a collection, and acknow- ledges all quotations,

The Speculum Majus deseribes—first, natural things ; secondly, human doetrines, gramniatieal, literary, moral and politieal, inelud- ing jurisprudence, mathematies, and physies; thirdly, ancienthistory, sacred and profane, with modern history, eivil, literary, and, above all, eeelesiastieal. To these three genuine parts a fourth was added, called Speculum morale. The first part, Speculum naturale, finished in 1250, ealled in some MSS. Speewlum in Hexameron, beeause arranged aceording to the order of the ereation, eontains 82 books and 3718 ehapters. Book 1 treats of the ereator and the angels ; 2 the sensible world and the work of the first day, including light, eolours, and demons ; 8, second day, the firmament; 5 to 14, the third day,—book 5 waters, 6 the earth, 7 minerals and metals, 9-14 botany, containing eight alphabetieal lists, aromatie plants (Absin- thium to Erigeron) 198 names, cultivated plants (Abrotanum to Zinziber) 112 names, the others mueh shorter ; book 15, fourth day, astronomy and teehnieal ehronology ; book 16, fifth day, birds ; book 17 fishes (list of 98 names, ineluding sepia, spongia), and marine monsters (45 names) ; books 18 to 22, sixth day, animals; 2 to 28,man; 29, de universo, relating to the operations of the Creator since the ereation, miraeles, original sin, kc. The last three books form a sort of appendix :—book 30, nature of things ; 31, natural history of human life; 32, plaees and times. The second part, Speetlum doctrinale, eontains 17 books and 2374 ehapters ; book 1, the fall, studies, doctors, words, with an alphabetieal dietionary of about 2300 words, Abavus to Zodia; book 2, a very full gram- mar, with 45 ehapters on verbs; book 8, logie, rhetorie, and poetry (with 29 fables) ; 4, 5, monastie scienee ; 6, economie seienee ; 7, politics ; 8, legal actions ; 9, 10, crimes; 11, mechanical arts ; 12, practical medicine ; 18, 14, theoretie medieine ; 15, physics; 16,

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mathematies, including metaphysies; 17, theology. Vincent had an aceurate knowledge of Arabie figures and of the decimal nota- tion, and his book was probably the first written in France in whieh they were explained. He does not mention meehanies or opties by name. The third part, Speewlum morale, is undoubtedly not by Vineent de Beauvais. It was written, aeeording to Quetif, between 1310 and 1325, and is not

mentioned in the prologue in any MS. written before 1310, in whieh the division of the work is said to be threefold, and the Speculum historiale is ealled the third part, and not the fourth, a8 itis in the later MSS. No MS. of the Speculum morale contains the prologue. It is divided into 3 books and 347 distinctions, subdivided into artieles. Seholastic arguments are more frequent, authors rarely named, and eontradietory doetrines placed together. It is ehiefly taken from Peter de Tarentasia on the Sentences of Peter Lombard, Stephen de Borbone on the Seven Gifts of the Spirit, Richard de Middleton, the anonymous De consideratione novissimorwm, and, above all, from the Swnma Theologice of Thomas Aquinas. The fourth part, Speculum historiale, in 31 books and 3798 chapters, contains a history of the world from the creation to 1254, with 24 chapters on the death of men, the end of the world, whieh he places with St Hildegard in 2376 a.p., the reign of Antichrist, the last judgment, and the renewal of the universe. In more aneient times his elief guides are Peter Comes- tor (died 1178) and the Cistercian Helinand (died 1223). He men- tions Turpin as the principal historian of Charlemagne. No one, says Quetif, has writteu the history of his time with more aeeuracy and truth, and greater freedom from all flattery. Jaeob Van Maer- lant translated this Speculum into Flemish verse, and continued it to 1273. A Freneh translation was made by Jean de Vignay (a eanon hospitaller of St Jaeques du Hautpas, who died in 1841), at the request of Joanna of Burgundy, queen of Philip VI. of Franee, and printed by Verard, Paris, 1495-6, fol. 5 vols. :

Vincent de Beauvais has preserved several works of the Middle Ages, and gives extracts from mauy lost classics and valuable readings of others, and has done more than any other medizval writer to awaken a taste for classical literature. Fabricius (Bibl. Greca, 1728, xiv. pp. 107-25) has given a list of 328 authors, Hebrew, Arabic, Greek, and Latin, quoted in the Speculum naturale. To these should be added about 100 more for the doctrinale and historiale. As he did not know Greek or Arabic, he used Latin translations. The best edition of the Speculum majus is the first, printed at Strasburg, by Mentelin, 1469 ? to 1473, fol. 10 vols. The three Venice editions of 1484, 1493-4, and 1591, fol. 4 vols., are very imperfect and in- correct. The last edition, Duaci, 1624, fol. 4 vois., by the Benedictines of St Vaast of Arras, is equally incorrect, and

Vincent's readings of ancient texts are replaced by the current readings of the time.

Brunetto Latini of Florence (born 1230, died 1294), the master of Dante and Guido Cavalcanti, while an exile in France between 1260 and 1267, wrote in French Li Livres dou Tresor, in 3 books and 413 chapters. Book i. contains the origin of the world, the history of the Bible and of the foundation of governments, astronomy, geography, and lastly natural history, taken from Aristotle, Pliny, and the old French Bestiaries. The first part of Book iL, on morality, is from the Lthics of Aristotle, which Brunetto had translated into Italian. The second part is little raore than a copy of the well-known collection of extracts from ancient and modern moralists, called the Moralities of the Philosophers, of which there are many MSS. in prose and verse. Book iL, on politics, begins with a treatise on rhetoric, chiefly from Cicero De Inventione, with many ex- tracts from other writers and Brunetto's remarks. The last part, the most original and interesting of all, treats of the government of the Italian republics of the time. Like many of his contemporaries, Brunetto revised his work, so that there are two editions, the second made after his return from exile. MSS. are singularly numerous, and exist in all the dialects then used in France. Others were written in Italy. It was translated into Italian in the latter part of the 13th century by Bono Giamboni, and was printed at Trevigi, 1474, fol., Venice, 1528 and 1533. The Tesoro of Brunetto must not be confounded with his Z'esoretto, an Italian poem of 2937 short lines. Napeleon L had in-

tended to have the French text of the Zesoro printed with commentaries, and appointed a commission for the purpose. It was at last published in the Collection des Documents inédis, Paris, 1863, 4to, 772 pages, edited by Chabaille from 42 MSS.

Bartholomeus de Glanvilla, an English Franciscan friar, wrote about 1360 a most popular work, De proprietatibus rerum, in 19 books and

1230 chapters.

Book 1 relates to God; 2, angels; 3, the soul; 4, the substance of the body; 5, anatomy; 6, ages; 7, diseases; 8, the heavens (astro- nomy and astrology); 9, time; 10, matter and form; 11, air; 12, birds (including insects, 38 names, Aquila to Vespertilio); 13, water (with fishes); 14, the earth (42 mountains, Ararath to Ziph); 15, provinces (171 countries, Asia to Zeugia); 16, precious stones (including coral, pearl, salt, 104 names, Arena to Zinguttes); 17, trees and herbs (197, Arbor to Zucarum); 18, animals (114, Aries to Vipera); 19, colours, scents, flavours, and liquors, with a list of 36 eggs, Aspis to Vultur. Some editions add book 20, accidents of things, that is numbers, measures, weights, and sounds. The Paris edition of 1574 has a book on bees.

There were 15 editions before 1500. An English transla- tion was completed 11th February 1398 by John Trevisa, and printed by Wynkyn de Worde, Westminster, 1495 ? fol.; London, 1533, fol. ; and with considerable additions by Stephen Batman, a physician, London, 1582, fol. It was translated into French by Jehan Corbichon at the command of Charles V. of France, and printed 14 times from 1482 to 1556. A Dutch translation was printed in 1479, and again at Harlem, 1485, fol.; and a Spanish translation by Padre Vincinte de Burgos, Tholosa, 1494, fol.

Petrus Berchorius, a French Benedictine, prior of the abbey of St Eloy in Paris, where he died in 1362, wrote a kind of encyclopedia, chiefly relating to divinity, in three parts:—Leductorium morale super totam Bibliam, 428 mortaliates in 34 books on the Bible from Genesis to Apocalypse ; Reductorium morale de proprietatibus rerum, in 14 books and 958 chapters, a methodical encyclopzedia or system of nature on the plan of Bartholomew de Glanville, and chiefly taken from him (Berchorius places animals next after fishes in books 9 and 16, and adopts as natural classes volatilia, natatilia, and gressibilia); Dictionarius, an alphabetical dictionary of 3514 words used in the Bible With moral expositions, occupying in the last edition 1558 folio pages. The first part was printed 11 times from 1474 to 1515, and the third 4 times. The three parts were printed together as Petri Berchorii opera

omnia (an incorrect title, for he wrote much besides), Moguntiz, 1609, fol. 3 vols., 2719 pages; Colonia Agrippine, 1631, fol. 3 vols; 2b. 1730-31, fol. 6 vols., 2570 pages.

A very popular small encyclopedia, Margarita philo- sophica, in 12 books, divided into 26 tractates and 573 chapters, was written by George Reisch, a German, prior of the Carthusians of Freiburg, and confessor of the emperor Maximilian I. Books 1-7 treat of the seven liberal arts ; 8, 9, principles and origin of natural things; 10, 11, the soul, vegetative, sensitive, and intellectual; 12, moral philosophy. The first edition, Heidelberg, 1496, 4to, was followed by 8 others to 1535. An Italian translation by the astronomer Giovanno Paolo Gallucci was published at Venice in 1594, 1138 small quarto pages, of which 343 consist of additional tracts appended by the translator.

Raphael Maffei, called Volaterranus, being a native of Volterra, where he was born in 1451 and died 5th January 1522, wrote Commentaru Urbani, Rome, 1506, fol., in 38 books, so called because written at Rome. This encyclo- pedia, printed eight times up to 1603, is remarkable for the great importance given to geography, and also to biography, a subject not included in previous encyclopzdias. Indeed, the book is formed of three nearly equal parts,— geographia, 11 books; anthropologia (biography), 11 books ; and philclozia, 15 books. The books are not divided into

short chapters in the ancient manner, like those of its pre- decessors. The edition of 1603 contains 814 folio pages. The first book consists of the table of contents and a classed index; books 2-12, geograpby ; 13-23, lives of illustrious men, the popes occupying book 22, and the emperors book 23 ; 24-27, animals and plants ; 28, metals, gems, stones, houses, and other inanimate things ; 34, de scientiis cyclicis (grammar and rhetoric) ; 35, de scientiis mathematicis (arithmetic, geometry, optica, catoptrica, astronomy, and astrology); 36-38, Aristotelica (on the works of Aristotle),

George Valla, born about 1430 at Placentia, and there- fore called Placentinus, died at Venice in 1499 while lecturing on the immortality of the soul. Aldus published his work, edited by his son John Peter Valla, De eaxpetendis et fugiendis rebus, Venetiis, 1501, fol. 2 vols.

It contains 49 books and 2119 chapters. Book 1 is introductory, on knowledge, philosophy, and mathematics, considered generally (he divides everything to be sought or avoided into three kinds— those which are in the mind, in the body by nature or habit, and thirdly, external, coming from without); books 2-4, arithmetic; 5-9, music; 10-15, geometry, including Euclid and mechanics,— book 15 being in three long chapters—de spiritualibus, that is, pneumatics and hydraulics, de catoptricis, and de optice; 16-19, astrology (with the structure and use of the astrolobe); 20-23, physics (including metaphysics); 24-30, medicine; 31-34, grammar; 35-37, dialectics; 38, poetry; 39, 40, rhetoric; 41, moral philo- sophy; 42-44, economics; 45, politics; 46-48, de corporis com- modis et incommodis, on the good and evil of the body (and soul); 49, de rebus externis, as glory, grandeur, &c.

Antonio Zara, born 1574, made bishop of Petina in Istria 1600, finished 17th January 1614 a work published as Anatomia Ingeniorum et Scientarium, Venetiis, 1615, 4to, 664 pages, in four sections and 54 membra, The first section, on the dignity and excellence of man, in 16 membra, considers him in all his bodily and mental aspects. The first membrum describes his structure and his soul, and in the latter part contains the author's preface, the deeds of his ancestors, an account of himself, and the dedication of his book to Ferdinand archduke of Austria. Four membra treat of the discovery of character by chiromancy, physiog- nomy, dreams, and astrology. The second section treats of 16 sciences of the imagination,—writing, magic, poetry, oratory, courtiership (aulicitas), theoretical and mystic arithmetic, geometry, architecture, optics, cosmography, astrology, practical medicine, war, government, The third section treats of 8 sciences of intellect,—logic, physiés, metaphysics, theoretical medicine, ethics, practical juris- prudence, judicature, theoretical theology. The fourth section treats of 12 sciences of memory, —grammar, practical arithmetic, human history, sacred canons, practical theology, sacred

history, and lastly the creation and the final catas- trophe. The book, now very rare, is well arranged, with a copious index, and is full of curious learning,

Johann Heinrich Alsted, born 1588, died 1638, published Encyclopedia septem tomis distincta, Herborne Nassovi- orum 1630, fol. 7 vols., 2543 pages of very small type. It is in 35 books, divided into 7 classes, preceded by 48 synop- tical tables of the whole, and followed by an index of 119 pages.

I. Precognita disciplinarum, 4 books, hexologia, technologia, archelogia, didactica, that is, on intellectual habits and on the classification, origin, and study of the arts. II. Philology, 6 books, lexica, grammar, rhetoric, logic, oratory, and poetry: book 5, lexica, contains dictionaries explained in Latin of 1076 Hebrew, 842 Syriac, 1934 Arabic, 1923 Greek, and 2092 Latin words, and also nomen- clator technologie, &c., a classified vocabulary of terms used in the arts and sciences, in Latin, Greek, and Hebrew, filling 34 pages; book 6 contains Hebrew, Aramaic, Greek, Latin, and German grammars; book 10, poetica, contains a list of 61 Rotwelsch words, III. Theoretic philosophy, 10 books:—book 11, metaphysics; 12, pneumatica (on spirits); 13, physics; 14, arithmetic; 15, geometry; 16, cosmography; 17, uranometria (astronomy and astrology); 18, geography (with maps of the Old World, eastern Mediterranean, and Palestine under the Old and New Testaments, and a plate of Noah's

ark); 19, optics; 20, music. IV. Practical philosophy, 4 books:— 21, ethics; 22, economics (on relationships); 23, politics, with flori- legium politicum, 119 pages of extracts from historians, philo- sophers, and orators; 24, scholastics (on education, with a flori- legium of 25 pages). V. The three superior faculties:—25, theo- logy; 26, jurisprudence; 27, medicine (ending with the rules of the Salernian school). VI. Mechanical arts in general:—book 28, mathematical mechanical arts; book 29, agriculture, gardening, care of animals, baking, brewing,

preparing medicines, metallurgy (with mining); book 30, physical mechanical arts—printing, dial- ling, &c. Under pedutica (games) is Vida's Latin poem on chess, and one by Leuschner on the ludus Lorzius. VII. Farragines disciplinarum, 5 books:—31, mnemonics; 32, history; 38, chrono- logy; 84, architecture; 35, quodlibetica, miscellaneous arts, as magic, cabbala, alchemy, magnetism, &c., with others apparently distinguished and named by himself, as, paradoxologia, the art of explaining paradoxes; dipnosophistica, the art of philosophizing while feasting; cyclognomica, the art of conversing well de quovis scibili; tabacologia, the nature, usc, and abuse of tobacco, &c.,—in all 35 articles in this book. :

Alsted's encyclopedia was received with very great applause, and was highly valued. Lami (Zntretiens, 1684, p. 188) thought it almost the only encyclopzedia which did not deserve to be despised. Alsted's learning was very various, and his reading was very extensive and diversified. He gives few references, and Thomasius charges him with plagiarism, as he often copies literally withoutany acknow- ledgment. He wrote not long before the appearance of encyclopedias in modern languages superseded his own and other Latin books, and but a short time before the alphabetical arrangement began to prevail over the metho- dical. His book was reprinted, Lugduni, 1649, fol. 4 vols., 2608 pages.

Jean de Magnon, historiographer to the king of France, undertook to write an encyclopedia in French heroic verse, which was to fill ten volumes of 20,000 lines each, and to render libraries merely a useless ornament. But he did not live to finish it, as he was killed at night by robbers on the Pont Neuf in Paris, in April 1662. The part he left was printed as La Science wniverselle, Paris, 1663, fol., 348 pages,—10 books containing about 11,000 lines, They begin with the nature of God, and end with the history of the fall of man, His verses, say Chaudon and Delandine, are perhaps the most nerveless, incorrect, obscure, and flat in French poetry ; yet the author had been the friend of Moliére, and had acted with him in comedy.

Louis Moréri (born 25th March 1643 at Bargemont, in the diocese of Frejus, died 10th July 1680 at Paris) wrote a dictionary of history, genealogy, and biography, Le grand dictionnatre historique, ou le mélange curieux de Vhistoire sacrée et profane, Lyons, 1674, fol. He began a second edition on a larger scale, published at Lyons in 1681, in two volumes folio; the sixth edition was edited by Jean le Clerc, Amsterdam, 1691, fol. 4 vols, ; the twenticth and last edition, Paris, 1759, fol. 10 vols. Moréri's dictionary, still very useful, was of very great value and importance, though not the first of the kind. It superseded the very inferior compilation of Juigné- Broissinére, Dictionnaire Theologique, Lhstorique, Poetique, Cosmographique, et Chronologique, Paris, 1644, 4to; Rouen, 1668, &c.,—a translation, with additions, of the Dictionarium Llistoricum, Geographicum, et Poeticum of Charles Estienne, published in 15538, 4to, and often after- wards. As such a work was much wanted, J nigné's book went through twelve editions in less than thirty years, notwithstanding its want of criticism, errors, anachronisms, defects, and inferior style.

Johann Jacob Hofmann, born 11th September 1635, died 10th March 1706, son of a schoolmaster at Basel, which he is said never to have left, and where he was pro- fessor of Greek and History, wrote Lexicon Universale Iistorico- Geographico-Chronol ogico – Poetico-Philologicum,

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Basileze, 1677, fol. 2 vols, 1823 pages, a dictionary of history, biography, geography, genealogies of princely families, chronology, mythology, and philology. At the end is Nomenclator MvgééyAwrros, an index of names of places, people, &c., in many languages, carefully collected, and explained in Latin, filling 110 pages ; with an index of subjects not forming separate articles, occupying 34 pages. Tm 1683 he published a continuation in 2 vols. fol., 2293 pages, containing, besides additions to the subjects given in his lexicon, the history of animals, plants, stones, metals, elements, stars, and especially of man and his affairs, arts, honours, laws, magic, music, rites, and a vast number of other subjects. In 1698 he published a second edition, Lugduni

Batavorum, fol. 4 vols., 3742 pages, incorporating the continuation with additions. From the great extent of his plan, many articles, especially in history, are super- ficial and faulty.

Etienne Chauvin was born at Nismes 18th April 1640. He fled to Rotterdam on the revocation of the Edict of Nantes, and in 1688 supplied Bayle's place in his lectures on philosophy. In 1695 he was invited by the elector of Brandenburg to go as professor of philosophy to Berlin, where he became the represeutative of the Cartesian philosophy, and died 6th April 1725. He wrote Lexicon Rationale, sive Thesaurus Philosophicus Ordine Alphabetico digestus, Rotterdami, 1692, fol., 746 pages and 30 plates. An im- proved and enlarged edition was printed as Lexicon philo- sophicum secundis curis, Leovardie, 1713, large folio, 725 pages, and 30 plates. This great work may be considered as a dictionary of the Cartesian philosophy, and was very much used by Brucker and other earlier historians of philo- sophy. It is written ina very dry and scholastic style, and seldum names authorities.

The great dictionary of French, begun by the French Academy 7th February 1639, excluded all words especially belonging to science and the arts. But the success of the rival dictionary of Furetiére, which, as its title page, as well as that of the Zssats published in 1684, conspicucusly announced, professed to give " les termes de toutes les Sciences et des Arts," induced Thomas Corneille, a member of the Academy, to compile Le Dictionnaire des Arts et des Sciences, which the Academy published with the first edition of their dictionary, Paris, 1694, folio, as a supplement in two volumes containing 1236 pages. It was reprinted at Amsterdam, 1696, fol. 2 vols., and at Paris in 1720, and again in 1732, revised by Fontenelle. A long series of dictionaries of arts and sciences have followed Corneille in placing in their titles the arts before the sciences, which he probably did merely in order to differ from Furetiére. Corneille professed to quote no author whom he had not consulted ; to take plants from Dioscorides and M atthiolus, medicine from Ettmiiller, chemistry from a MS. of Perrault, and architecture, painting, and sculpture from Félibien 'i and to give an abridged history of animals, birds, and fishes, and an account of all

religious and military orders and their statutes, heresiarchs and heresies, and dignities and charges ancient and modern.

Pierre Bayle (born 18th November 1647, died 28th December 1706) wrote a very important and valuable work, Dictionnaire Historique et Critique, Rotterdam, 1697, fol. 2 vols. His design was to make a dictionary of the errors and omissions of Moréri and others, but he was much embarrassed by the numerous editions and supplements of Moréri. A second edition with an additional volume appeared at Amsterdam in 1702, fol. 3 vols. The fourth edition, Rotterdam, 1720, fol. 4 vols., was much enlarged from his manuscripts, and was edited by Prosper Marchand. It contains 3132 pages besides tables, &c. The ninth edition was published at Basel, 1741, fol. 10 vols. It was translated into English from the second edition, London,

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1709, fol. 4 vols., with some slight additions and correc- |

tions by the author; and again from the fifth edition of 1730 by Birch and Lockman, London, 1734-40, fol. 5 vols. J. G. de Chaufepié published Nouveau Dictionnaire historique, Amsterdam, 1750-56, fol., 4 vols., as a supple- ment to Bayle. It chiefly consists of the articles added by the English translators with many corrections and additions, and about 500 new articles added by himself, and contains in all about 1400 articles. Prosper Marchand, editor of the fourth edition, left at his death, 14th January 1756, materials for a supplementary Dictionnaire lustorique, La Haye, 1758, fol. 2 vols. 891 pages, 136 articles. It had occupied his leisure moments for forty years. Much of his work was written on small scraps of paper, sometimes 20 in half a page and no larger than a nail, in such small char- acters that not only the editor but the printer had to use powerful magnifiers. Bayle's dictionary was also translated into German, Leipzig, 1741-44, fol. 4 vols., with a preface by J. C. Gottsched. It is still a work of great importance and value.

Vincenzo Maria Coronelli, a Franciscan friar, who was born in Venice about 1650, made cosmographer to the re- public in 1685, became

general of his order in 1702, and was found dead at his study table 9th December 1718, began in 1701 to publish a general alphabetical encyclo- pedia, written in Italian, at which he had been working for thirty years, Biblioteca Universale Sacro-profana. It was to explain more than 300,000 words, to include history and biography as well as all other subjects, and to extend to 45 volumes folio. Volumes 1-39 were to contain the dictionary A toZ; 40, 41, the supplement; 42, retractations and corrections; 43, universal index; 44, index divided into matters ; 45, index in various languages. But seven volumes only were published, Venezia, 1701-6, fol. 5609 pages, A to Caque. The first six volumes have each an index of from 28 to 48 pages (in all 224 pages) of subjects, whether forming articles or incidental. The articles in each are uumbered, and amount to 30,269 in the six volumes, which complete the letter B. On an average 3 pages contain 22 articles. Each volume is dedicated to a different patron,—the pope, the doge, the king of Spain, &c. This work is remarkable for the extent and completeness of its plan, and for being the first great alphabetical encyclo- pedia, as well as for being written in a modern language, but it was hastily written and very incorrect. Never, per- haps, says Tiraboschi (Storia della Letteratura Italiana, vill. 546), was there so quick a writer ; he composed a folio volume as easily as others would a page, but he never perfected his works, and what we have of this book will not induce us to regret the want of the re- mainder.

The first alphabetical encyclopaedia written in English was the work of a London clergyman, John Harris (born about 1667, elected first secretary of the Royal Society 30th November 1709, died 7th September 17 19), Lexicon Lechiucum, or an universal English Dictionary of Arts and Scvences, London, 1704, fol. 1220 pages, 4 plates, with many diagrams and figures printed in the text. Like many subsequent English encyclopedias the pages are not numbered. It professes not merely to explain the terms used in the arts and sciences, but the arts and sciences themselves. The author complains that he found much less help from previous dictionaries than one would suppose, that Chauvin is full of obsolete school terms, and Corneille gives only bare explanations of terms, which often relate only to simple ideas and common things. He omits theology, antiquity, biography, and

poetry; gives only technical history, geography, and chronology ; and in logic, metaphysics, ethics, grammar, and rhetoric, merely explains the terms used. In mathematics and anatomy he professes

to be very full, but says that the catalogues and places of the stars are very imperfect, as Flamsteed refused to assist him. In botany he gave from Ray, Morrison, and Tourne- fort "a pretty exact botanick lexicon, which was what we really wanted before," with an account of all the " kinds and subalternate species of plants, and their specific differ- ences " on Ray's method. He gave a table of fossils from Dr Woodward, professor of medicine in Gresham College, and took great pains to describe the parts of a ship accurately and particularly, going often on board himself for the pur- pose. In law he abridged from the best writers what he thought necessary. He meant to have given at the end an alphabet for each art and science, and some more plates of anatomy and ships, "but the undertaker could not afford it at the price." A review of his work, extending to the un- usual length of four pages, appeared in the Philosophical Transactions, 1704 (p. 1699). This volume was reprinted in 1708. A second volume of 1419 pages and 4 plates appeared in 1710, with a list of about 1300 subscribers. Great part of it consisted of mathematical and astronomical tables, as he intended his work to serve as a small mathe- matical library. He was allowed by Sir Isaac Newton to print his treatise on acids. He gives a table of logarithms to seven figures of decimals (44 pages), and one of sines, tangents, and secants (120 pages), a list of books filling two pages, and an index of the articles in both volumes under 26 heads, filling 50 pages. The longest lists are law (1700 articles), chyurgery, anatomy, geometry, fortification, botany, and music. The mathematical and physical part is considered very able. He often mentions his authorities, and gives lists of books on particular subjects, as botany and chronology. His dictionary was long very popular. The fifth edition was published in 1736, fol. 2 vols. A supplement, including no new subjects, appeared in 1744, London, fol. 996 pages, 6 plates. It was intended to rival Chambers, but, being considered a booksellcr's speculation, was not well received.

Johann Hiibner, rector of the Johanneum in Hamburg, born 17th March 1668, wrote prefaces to two dictionaries written in German, which bore his name, and were long popular. The first was Reales Staats-Zeitungs und Conver- satrons-Lexicon, Leipzig, 1704, 8vo ; second edition, 1706, 947 pages; at the end a register of arms, and indexes of Latin and French words; fifth edition, 1711; fifteenth edition 1735, 1119 pages. The thirty-first edition was edited and enlarged by F. A. Riider, and published by Brockhaus, Leipzig, 1824-28, 8vo, 4 vols., 3088 pages. It was translated into Hungarian by Fejer, Pesten, 1816, 8vo, 5 vols., 2958 pages. The second published as a supple- ment, was Curicuses und reales Natur- Kunst- Berg- Gewerb- wud Handlungs-Lexicon, Leipzig, 1712, 8vo, 788 pages, frequently reprinted to 1792. The first relates to the political state of the world, as religion, orders, states, rivers, towns, castles, mountuins, genealogy, war, ships ; the second to nature, science, art, and comimerce. They were the work of many authors, of whom Paul Jacob Marpurger, a celebrated and voluminous writer on trade and commerce, born at Nuremberg 27th June 1656, was an extensive con- tributor, and is the only one named by Hiibner.

Johann Theodor Jablonski, who was born at Dantzie 15th December 1654, appointed secretary to the newly founded Prussian Academy in 1700, when he went to Berlin, where he died 28th April 1731, published Allgemeines Lexicon der Ktinste und Wissenschaften, Leipzig, 1721, 4to, a short but excellent encyclopedia still valued in Germany. It does not include theology, history, geography, biography, and genealogy. He not only names his authorities, but gives a list of their works. A new edition in 1748 was increased one-third to 1508 pages. An improved edition, Konigsberg and Leipzig, 1767, 4to, 2 vols, 1852 pages,

was edited by J. J. Schwabe, public teacher of philosophy at Leipsic.

Ephraim Chambers published his Cyclopedia; or an Universal Dictionary of Art and Sciences, containing an Explication of the Terms and an Account of the Things Signified thereby in the several Arts, Liberal and Mechani- cal, and the several Sciences, Human and Divine,

London, 1728, fol. 2 vols. The dedication to the king is dated October 15, 1727. Chambers endeavoured to connect the scattered articles relating to each subject by a system of references, and to consider " the several matters, not only in themselves, but relatively, or as they respect each other ; both to treat them as so many wholes and as so many parts of some greater whole." Under each article he refers to the subject to which it belongs, and also to its subordinate parts ; thus Copyhold has a reference to Tenure, of which it is a particular kind, and other references to Rolls, Custom, Manor, Fine, Charterland, and Freehold. In his preface he gives an " analysis of the divisions of know- ledge," 47 in number, with ,classed lists of the articles belonging to each, intended to serve as table of contents and also as a rubric or directory indicating the order in which the articles should be read. But it does so very im- perfectly, as the lists are curtailed by many et ceteras; thus 19 occur in a list of 119 articles under Anatomy, which has nearly 2200 articles in Rees's index. He omits etymologies unless "they appeared of some significance;" he gives only one grammatical form of each word, unless peculiar ideas are arbitrarily attached to different forms, as precipitate, precipitant, precipitation, when each has an article; and he omits complex ideas generally known, and thus " gets free of a vast load of plebeian words." His work, he says, is a collection, not the produce of one man's wit, for that would go but a little way, but of the whole commonwealth of learning. 'Nobody that fell in my way has been spared, antient or modern, foreign nor domestic, Christian or Jew nor heathen." To the subjects given by Harris he adds theology, metaphysics, ethics, politics, logic, grammar, rhetoric, and poetry, but excludes history, biography, genealogy, geography, and chronology, except their techni- cal parts. A second edition appeared in 1738, fol. 2 vols. 2466 pages, "retouched and amended in a thousand places." A few articles are added and some others enlarged, but he was prevented from doing more because "' the booksellers were alarmed with a bill in parliament containing a clause to oblige the publishers of all improved editions of books to print their improvements separately." The bill after passing the Commons was unexpectedly thrown out by the Lords ; but fearing that it might be revived, the booksellers thought it best to retreat though more than twenty sheets had been printed. Five other editions were published in London, 1739 to 1751-2, besides one in

Dublin, 1742, all in 2 vols. fol. An Italian translation, Venezia, 1748-49, 4to, 9 vols., was the first complete Italian encyclopedia. When Chambers was in France in 1739 he rejected very favourable proposals to publish an edition there dedicated to Louis XV. His work was judiciously, honestly, and carefully done, and long maintained its popularity. But it had many defects and omissions, as he was well aware ; and at his death, 15th May 1740, he had collected and arranged materials for seven new volumes. John Lewis Scott was employed by the booksellers to select such articles as were fit for the press and to supply others. He is said to have done this very efficiently until appointed sub-preceptor to the prince of Wales and Prince Edward. His task was en- trusted to Dr (afterwardscalled SirJ ohn) Hill, who performed it very hastily, and with characteristic carelessness and self-sufficiency, copying freely from his own writings. The Sup- plement was published in London, 1753, fol. 2 vols., 3307 pages and 12 plates. As Hill wasa botanist, the botanical

part, which had been very defective in the Cyclopedia was the best. Abraham Rees published a revised and enlarged edition, " with the supplement and modern improvements incorporated in one alphabet," London, 1778-88, fol. 2 vols, 5010 pages, 159 plates. It was published in 418 numbers, at 6d. each. Rees says that he has added more than 4400 new articles. At the end he gives an index of articles, classed under 100 heads, numbering about 57,000, and filling 80 pages. The heads, with 39 cross references, are arranged alphabetically. Rees's edition was reprinted, London, 1786-88, and 1789-91, fol. 5 vols., and Dublin, 1787, fol. 4 vols. According to the English custom, all the editions of the Cyclopedia have no pagination.

One of the largest and most comprehensive encyclo- peedias was undertaken and in a great measure completed by Johann Heinrich Zedler, a bookseller of Leipzig, who was born at Breslau 7th January 1706, made a Prussian commerzienrath in 1731, and died at Leipzig in 1760,— Grosses vollstdndiges Universal Lexicon Aller Wissenschaften und Kiinste welche bishero durch menschlichen Verstand und Witz

erfunden und verbessert worden, Halle and Leipzig, 1732-50, fol. 64 vols. 64,309 pages ; and Néthige Supple- mente, ib. 1751-54, vols. 1. to iv., A to Caq, 3016 pages. The columns, two in a page, are numbered, varying from 1356 in vol. li. to 2588 in vol. xlix. Each volume has a dedication, with a portrait. The first nine are the emperor, the kings of Prussia and Poland, the empress of Russia, and the kings of England, France, Poland, Denmark, and Sweden. 'The dedications, of which two are in verse, and all are signed by Zedler, amount to 459 pages. The supplement has no dedications or portraits. The preface to the first volume of the work is by Johann Peter von Ludewig, chancellor of the university of Halle (born 15th August 1690, died 6th September 1743). Nine editors were employed, whom Ludewig compares to the nine muses ; and the whole of each subject was entrusted to the same person, that all its parts might be uniformly treated. Carl Giinther Ludovici (born at Leipsic 7th August 1707, public teacher of philosophy there from 1734, died 3d July 1778) edited the work from vol. xix., beginning the letter M, and published in 1739, to the end, and also the supple- ment. The work was published by subscription. Johann Heinrich Wolff, an eminent merchant and shop-keeper in Leipsic, born there 29th April 1690, came to Zedler's assistance by advancing the very heavy expenses and becoming answerable for the subscriptions, and spared no cost that the work might be complete. Zedler very truly says, in his preface to vol. xviii., that his Universal Lexicon was a work such as no time and no nation could show, and both in its plan and execution it is much more compre- hensive and complete than any previous encyclopedia. Colleges, says Ludewig, where all sciences are taught and studied, are on that account called wnzversities, and their teaching is called studiwm universale; but the Universal Lexicon contains not only what they teach in theology, jurisprudence, medicine, philosophy, history, mathematics, &ec., but also many other things belonging to courts, chanceries, hunting, forests, war and peace, and to artists, artizans, housekeepers, and merchants, not thought of in colleges. Its plan embraces not only history, geography, and biography, but also genealogy, topography, and from vol. xviii, published in 1738, lives of illustrious living persons. Zedler inquires why death alone should make a deserving man capable of having his services and worthy deeds made known to the world in print. The lives of the dead,

he says, are to be found in books, but those of the living are not to be met with anywhere, and would often be more useful if known. In consequence of this preface, many lives and genealogies were sent to him for publication.

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Cross references generally give not only the article referred to, but also the volume and column, and, when necessary, such brief information as may distinguish the word referred to from others similar but of different meaning. Lists of authorities, often long, exact, and valuable, are frequently appended to the articles. This work, which is well and carefully compiled, and very trustworthy, is still a most valuable book of reference on many subjects, especially topography, genealogy, and biography. The genealogies and family histories are excellent, and many particulars are given of the lives and works of authors not easily found elsewhere.

A work on a new plan was published by Dennis de Coetlogon, a Frenchman naturalized in England, who styled himself " Knight of St Lazare, M.D., and member of the Royal Academy of Angers,"—An Universal History of Arts and Sciences, London, 1745, fol. 2 vols., 2529 pages, 33 plates, and 161 articles arranged alphabetically. He "endeavours to render each treatise as complete as possible, avoiding above all things needless repetitions, and never puzzling the reader with the least reference." Theology is divided into several treatises ; Philosophy into Ethicks, Logick, and Metaphysick, each under its letter; and Physick is subdivided into Anatomy, Botany, Geography, Geometry, &c. Military Art is divided into Arniy, Fortification, Gunnery. The royal licence is dated 13th March 1740-1, the dedication is to the duke of Gisors, the pages are numbered, there is an appendix of 35 pages of astronomical tables, and the two indexes, one to each volume, fill 69 pages, and contain about 9000 subjects. The type is large and the style diffuse, but the subject matter is sometimes curious. The author says that his work is the only one of the kind, and that he wrote out with his own hand every line, even the index. But not- withstanding

the novelty of his plan, his work does not seem ever to have been popular.

Gianfrancesco Pivati, born at Padua in 1689, died at Venice in 1764, secretary of the Academy of Sciences at Venice, who had published in 1744 a 4to volume contain- ing a Dizionario universale, wrote Nuovo diztonarto scventifico e cwrioso sacro-profano, Venezia, 1746-51, fol. 10 vols., 7791 pages, 597 plates. It is a general encyclopzedia, including geography, but not history or biography. He gives frequent references to his authorities and much curious information. His preliminary discourse (80 pages) contains a history of the several sciences from mathematics to geography. The book was published by subscription, and at the end of the last volume is a Catalogo dei Signort Associati, 252 in number, who took 266 copies. It is also re- markable for the number of its plates, which are engraved on copper. In each volume they are placed together at the end, and are preceded by an explanatory index of subjects refer- ring to the plates and to the articles they illustrate.

One of the greatest and most remarkable literary enter- prises of the 18th century, the famous French Encyclopédie, originated in a French translation of Chambers's Cyclopedia, begun in 1743, and finished in 1745 by John Mills, an Englishman resident in France, assisted by Gottfried Sellius, a very learned native of Dantzic, who, after being a pro- fessor at Halle and Gottingen, and residing in Holland, had settled in Paris. They applied to Lebreton, the king's printer, to publish the work, to fulfil the formalities required by French law, with which, as foreigners, they were not acquainted, and to solicit a royal privilege. This he obtained, but in his own name alone. Mills complained so loudly and bitterly of this deception that Lebreton had to acknowledge formally that the privilege belonged en toute propriété to John Mills. But, as he again took care not to acquaint Mills with the necessary legal forinalities, this title soon became invalid. Mills then agreed to grant

him part of his privilege, and in May 1745 the work was announced as Encyclopédié ou Dictionnaire Universel des Arts et des Sciences, folio,

four volumes of 250 to 260 sheets each, with a fifth of at least 120 plates, and a voca- bulary or list of articles in French, Latin, German, Italian, and Spanish, with other lists for each language explained in French, so that foreigners might easily find any article wanted. It was to be published by subscription at 135 livres, but for large paper copies 200 livres, the first volume to be delivered in June 1746, and the two last at the end of 1748. The subscription list, which was considerable, closed 3lst December 1745. Mills demanded an account, which Lebreton, who had again omitted certain formalities, insultingly refused. Mills brought an action against him, but before it was decided Lebreton procured the revocation of the privilege as informal, and obtained another for him- self dated 21st January 1746. Thus, for unwittingly con- travening regulations with which his unscrupulous publisher ought to have made him acquainted, Mills was despoiled of the work he had both planned and executed, and had to return to England. Jean Paul de Gua de Malves, professor of philosophy in the college of France (born at Carcassonne in 1713, died 15th June 1785), was then engaged as editor merely to correct errors and add new discoveries. But he proposed a thorough revision, and obtained the assistance of many learned men and artists, among whom Desessarts names Louis, Condillac, D'Alembert, and Diderot. But the publishers did not think his reputation high enough to ensure success, withheld their confidence, and often opposed his plans as too expensive. Tired at last of disputes, and too easily offended, De Gua resigned the editorship. The publishers, who had already made heavy advances, offered it to Diderot (born October 1713, died 30th J uly 1784), who was probably recommended to them by his very well received Dictionnaire Universel de Medicine, Paris, 1746- 48, fol. 6 vols., published by Briasson, David, and Durand, with notes and additions by Julien Busson, doctor regent of the faculty of medicine of Paris. It was a translation, made with the assistance of Eidous and Toussaint, of the cele- brated work of Dr Robert James, inventor of the fever powders, A Medicinal Dictionary, London, 1743-45, fol. 3 vols., 3275 pages and 98 plates, comprising a history of drugs, with chemistry, botany, and natural history so far as they relate to medicine, and with an historical preface of 99 pages (in the translation 136). The proposed work was to have been similar in character. De Gua's papers were handed over to

Diderot in great confusion. He soon per- suaded the publishers to undertake a far more original and comprehensive work. His friend D'Alembert undertook to edit the mathematics. Other subjects were allotted to 21 contributors, each of whom received the articles on this sub- ject in Mill's translation to serve as a basis for his work. But they were in most cases so badly*composed and trans- lated, so full of errors and omissions, that they were not used. The contributions were to be finished in three months, but none were ready in time, except Music by Rousseau, which he admits was hastily and badly done, Diderot was imprisoned at Vincennes, 29th July 1749, for his Lettre sur les Aveugles. He was closely confined for 28 days, and was then for three months and ten days a prisoner on parole in the castle. This did not stop the printing, though it caused delay. The prospectus by Diderot appeared in November 1750. The work was to form 8 vols. fol., with at least 600 plates. The first volume was published in July 1751, and delivered to the subscribers in August. The second appeared in J. anuary 1752. An arrét of the council, 9th February, suppressed both volumes as inju- rious to the king's authority and to religion. Malesherbes, director-general of the Librairie, stopped the issue of volume ii, 9th February, and on the 21st: went with a

lettre de cachet to Lebreton's to seize the plates and the MSS., but did not find, says Barbier, even those of volume iii, as they had been taken to his own house by Diderot aud one of the publishers. The Jesuits tried to continue the work, but in vain. It was less easy, says Grimm, than to ruin philosophers. The Dzctionnaire de Trévoux pro- nounced the completion of the Hneyclopédie impossible, and the project ridiculous (5th edition, 1752, iii. 750). The Governinent had to request the editors to resume the work as one honourable to the natiou. The Marquis d'Argenson writes, 7th May 1752, that Mme. de Pompadour had been urging them to proceed, and at the end of June he reports them as again at work. Volume iii, rather improved by the delay, appeared in October 1753 ; and volume vii., completing G, in November 1757. The clamours against the work soon recommenced. D'Alembert retired in January 1758, weary of sermons, satires, and intolerant and absurd

censors. The parliament of Paris, by an arrété, 23d January 1759, stopped the sale and distribution of the Zn- cyclopédie, Helvetius's De [Hsprit, and six other books; and by an arrét, 6th February, ordered them all to be burnt, but referred the Mncyclopédie for examination to a commission of nine. An arrét du conseil, 7th March, re- voked the privilege of 1746, and stopped the printing. Volume viii. was then in the press. Malesherbes warned Diderot that he would have his papers seized next day ; and when Diderot said he could not make a selection, or find a place of safety at such short notice, Malesherbes said, ** Send them to me, they will not look for them there." This, according to Mme. de Vandeul, Diderot's daughter, was done with perfect success. In the article Pardonner Diderot refers to these persecutions, and says, "In the space of some months we have seen our honour, fortune, liberty, and life imperilled." Malesherbes, Choiseul, and Mme. de Pompadour protected the work ; Diderot obtained private permission to go on printing, but with a strict charge not to publish any part until the whole was finished. The Jesuits were condemned by the parliament of Paris in 1762, and by the king in November 1764. Volume i. of plates appeared in 1762, and volumes viii. to xvii., ten volumes of text, 9408 pages, completing the work, with the 4th volume of plates in 1765, when there were 4250 sub- seribers. The work circulated freely in the provinces and in foreign countries, and was secretly distributed in Paris and Versailles. The general assembly of the clergy, on 20th June 1765, approved articles in which it was con- demned, and on 27th September adopted a mémoire to be presented to the king. They were forbidden to pub- lish their acts which favoured the Jesuits, but Lebreton was required to give a list of his subscribers, and was put into the Bastille for eight days in 1766. A royal order was sent to the subscribers to deliver their copies to the lieutenant of police. Voltaire in 1774 relates that, at a petit souper of the king at Trianon, there was a debate on the composition of gunpowder. Mme. de Pompadour said she did not know how her rouge or her silk stockings were made. The Duc de la Vallitre regretted that the king had confiscated their encyclopzdias, which could decide everything. The king said he had been told that the work was most dangerous, but as he wished to judge for himself, he sent for a copy. Three servants with diffi- culty brought in the 21 volumes. The company found everything they looked for, and the king allowed the

confiscated copies to be returned. Mme. de Pompadour died 15th April 1764. Lebreton had half of the property in the work, and Durand, David, and Briasson had the rest. Lebreton, who had the largest printing office in Paris, em- ployed 50 workmen in printing the last ten volumes. He had the articles set in type exactly as the authors sent them in, and when Diderot had corrected the last proof of each

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sheet, he and his foreman, hastily, secretly, and by night, unknown to his partners in the work, cut out whatever seemed to them daring, or likely to give offence, mutilated most of the best articles without any regard to the consecu- tiveness of what was left, and burnt the manuscript as they proceeded. 'The printing of the work was nearly finished when Diderot, having to consult one of his great philosophi- cal articles in the letter S, found it entirely mutilated. He was confounded, says Grimm, at discovering the atrocity of the printer; all the best articles were in the same cou- fusion. This discovery put him into a state of frenzy and despair from rage and grief. His daughter never heard him speak coolly on the subject, and after twenty years it stillmade him angry. He believed that every one knew as well as he did what was wanting in each article, but in fact the mutilation was not perceived even by the authors, and for many years was known to few persons. Diderot at' first re- fused to correct the remaining proofs, or to do more than write the explanations of the plates. He required, accord- ing to Mme. de Vandeul, that a copy, now at St Petersburg with his library, should be printed with columns in which all was restored. The mutilations began as far back as the article Intendant. But how far, says Rosenkrantz, this murderous, incredible, and infamous operation was carried caunot now be exactly ascertained. Diderot's articles, not including those on arts and trades, were reprinted in Naigeon's edition (Paris, 1821, 8vo, 22 vols.). They fill 4132 pages, and number 1139, of which 601 were written for the last ten volumes. They are on very many subjects, but principally on grammar, history, morality, philosophy, literature, and metaphysics. Asa contributor, his special department of the work was philosophy, and arts and trades. He passed whole days in workshops, and began by examin- ing a machine carefully, then he had

it taken to pieces and put together again, then he watched it at work, and lastly worked it himself. He thus learned to use such compli- cated machines as the stocking and cut velvet looms. He at first received 1200 livres a year as editor, but afterwards 2500 livres a volume, besides a final sum of 20,000 livres. Although after his engagement he did not suffer from poverty as he had done before, he was obliged to sell his library in order to provide for his daughter. De Jaucourt spared neither time, trouble, nor expense in perfecting the work, for which he received nothing, and he employed several secretaries at it for ten years. To pay them he had to sell his house in Paris, which Lebreton bought with the profits derived from De Jaucourt's work. All the pub- lishers made large fortunes; their expenses amounted to 1,158,000 livres, and their profits to 2,162,000. D'Alem- bert's " Discours Preliminaire," 45 pages, written in 1750, prefixed to the first volume, and delivered before the French Academy on his reception, 19th December 1754, consists of a systematic arrangement of the various branches of knowledge, and an account of their progress since their re- vival, His system, chiefly taken from Bacon, divides them into three classes,—under memory, reason, and imagination. Arts and trades are placed under natural history, supersti- tion and magic under science de Dieu, and orthography and heraldry under logic. 'The literary world is divided into three corresponding classes—érudits, philosophes, and beaux esprits. As in Chambers's Cyclopedia, history and biography were excluded, except incidentally; thus Aristotle's life is given in the article Aristotelisme. The science to which an article belongs is generally named at the beginning of it, references are given to other articles, and the author's names are marked by initials, of which lists are given in the earlier volumes, but sometimes their names are subscribed in full. Articles by Diderot have no mark, and those inserted by him as editor have an asterisk prefixed. Among the contributors were Voltaire, Euler,

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Marmontel, Montesquieu, D'Anville, D'Holbach, and Turgot, the leader of the new school of economists which made its first appearance in the pages of the Hncyclopédie. Louis wrote the surgery, Daubenton

natural history, Eidous heraldry and art, Toussaint jurisprudence, and Condamine articles on South America. No encyclopedia perhaps has been of such political importance, or has occupied so con- spicuous a place in the civil and literary history of its century. It souglit not only to give information, but to guide opinion. It was, as Rosenkranz says (Diderot, i. 157), theistic and heretical. It was opposed to the cliurch, then all powerful in France, and it treated dogma histori- cally. It was, as Desnoiresterres says (Voltaire, v. 164), a war machine; as it progressed, its attacks both on the church and the still more despotic government, as well as on Christianity itself, became bolder and more undisguised. and it was met by opposition and persecution unparalleled in the history of encyclopedias. Its execution is very un- equal, and its articles of very different value. It was not constructed on a regular plan, or subjected to sufficient supervision ; articles were sent in by the contributors, and not seen by the editors until they were in type. In each subject there are some excellent articles, but others are very inferior or altogether omitted, and references are often given to articles which do not exist. Thus marine is said to be more than three-fourths deficient 3 and in geo- graphy errors and omissions abound,—even capitals and sovereign states are overlooked, while villages are given as towns, and towns are described which never existed. The style is too generally loose, digressive, and inexact ; dates are seldom given; and discursiveness, verbosity, and dogmatism are frequent faults, Voltaire was constantly de- manding truth, brevity, and method, and said it was built half of marble and half of wood. D'Alembert compared it to a harlequin's coat, in which there is some good stuff but too many rags. Diderot was dissatisfied with it as a whole ; much of it was compiled in haste; and carelessly written articles and incompetent contributors were admitted for want of money to pay good writers. Zedler's Universal Lewicon is now on the whole much more useful for reference than its far more brilliant successor. The permanent value of encyclopzdias depends on the proportion of exact and precise facts they contain, and on their systematic regularity.

The first edition of the Encyclopédie, in 17 vols. folio, 16,288 pages, was imitated by a counterfeit edition printed at Geneva as the volumes appeared in Paris. Eleven folio volumes of plates were published at

Paris, 1762 to 1772, containing 2888 plates and 923 pages of explanation, &c. A supplement was printed at Amsterdam and Paris, 1776~- 77, fol. 5 vols., 3874 pages, with 224 plates. History was introduced at the wish of the public, but only "the general features which mark epochs in the annals of the world." The astronomy was by Delalande, mathematics by Condorcet, tables by Bernouilli, natural history by Adanson, anatomy and physiology by Haller. Daubenton, Condamine, Marmontel, and other old contributors wrote many articles, and several were taken from foreign editions. A very full and elaborate index of the articles and subjects of the 33 volumes was printed at Amsterdam in 1780, fol. 2 vols., 1852 pages. It was made by Pierre Mouchon, who was born at Geneva 30th July 1735, consecrated minister 18th August 1758, pastor of the French church at Basel 1766, elected a pastor in Geneva 6th March 1788, principal of the college there 22d April 1791, died 20 August 1797, This Table Analytique, which took him five years to make, was undertaken for the publishers Cramer and De Tournes, who gave him 800 louis for it. Though very exact and full, he designedly omits the attacks on Christianity. This index was rendered more useful and indispensable by the very diffuse and digressive style of the work, and by the

vast number of its articles. A complete copy of the first edition of the Lncyclopédie consists of 35 vols. fol., printed 1751-80, containing 23,135 pages and 3132 plates. It was written by about 160 contributors. About 1761, Panckoncke and other publishers in Paris proposed a new and revised edition, and bought the plates for 250,000 livres. But, as Diderot indignantly refused to edit what he considered a fraud on the subscribers to the as yet un- finished work, they began simply to reprint tle work, pro- mising supplementary volumes. When three volumes were printed the whole was seized in 1770 by the Goverument at the complaint of the clergy, and was lodged in the Bastille. The plan of a second French edition was laid aside then, to be revived twenty years later in a very different form. Foreign editions of the Encyclopédie are numerous, and it is difficult to enumerate them correctly. One, with notes by Ottavio Diodati, Dr Sebastiano Paoli, and

Carlo Giuliani appeared at Lucca, 1758-71, fol. 17 vols. of text and 10 of plates, Though it was very much expurgated, all engaged in it were exconimunicated by the pope in 1759. An attempt made at Siena to publish an Italian translation failed. An edition by the Abbé Serafini and Dr Gonnella, Livourne, 1770, &c., fol. 33 vols. , returned a profit of 60,000 piastres, and was protected by Leopold 1., who secured the pope's silence. Other editions are Genéve, Cramer, 1772-76, a facsimile reprint ; Genéve, Pellet, 1777-79, 4to, 36 vols. of text and 3 of plates, with 6 vols. of Mouchon's index, Lyon 1780, 4to ; Genéve et Neufchatel, Pellet, 1778-79, 4to, 36 vols, of text and 3 of plates ; Lausanne, 1778-81, 36 vols. 4to, or 72 octavo, of text and 3 of plates 1779-80 ; Lausanne et Berne, chez les Sociétés Typographiques, 1780-82, 36 vols. 8vo of text and 3 vols. 4to of plates, 1782. These four editions have the supplement incorporated. Fortuné Barthelemy de Felice, an Italian monk, born at Rome 24th August 1723, who had been professor at Rome and Naples, and had become a Protestant, printed a very incorrect though successful edition, Yverdun, 1770-80 4to, 42 vols. of text, 5 of supplement, and 10 of plates. It professed to be a new work, standing in the same relationship to the Lncyclopédie as that did to Chambers's, which is far from being the case. Sir Joseph Ayloffe issued proposals, 14th December Tifa, for an English translation of the Encyclopédie, to be finished by Christmas 1756, in 10 vols. 4to, with at least 600 plates, No. 1 appeared in January 1752, but met with little success, Several selections of articles and extracts have been published under the title of LLisprit de Ency- clopédie. The last was by Hennequin, Paris, 1822-23, 8vo, 15 vols, An English selection is Select Essays from the Lincyclopedy, London, 1773, 8vo, The articles of most of the principal contributors have been reprinted in the editions of their respective works. Voltaire wrote 8 vols. 8vo of a kind of fragmentary supplement, Questions sur l' Encyclopédie, frequently printed, and usually included in editions of his works, together with his contributions to the Lincyclopédie and his Dictionnaire Philosophique. Several special dictionaries have been formed from the Encyclopédie, as the Dictionnaire Portatif des Arts et Métiers, Paris, 1766, Svo, 2 vols., about 1300 pages, by Philippe Macquer, brother of the author of the Dict. de Chimie. An enlarged edition by the Abbé Jaubert, Paris, 1773, 5 vols. 8vo, 3017 pages, was much valued and often reprinted, The

books attacking and defending the Encyclopédie are very many. No original work of the 18th century, says Lan- frey, has been more depreciated, ridiculed, and calumuiated. It has been called chaos, nothingness, the Tower of Babel, a work of disorder and destruction, the gospel of Satan, and even the ruins of Palmyra,

The Encyclopedia Britannica, "by a society of gentle- men in Scotland, printed in Edinburgh for A. Bell and C.

Macfarquhar, and sold by Colin Macfarquhar at his print- ing office in Nicolson Street," was completed in 1771 in3 volumes 4to, containing 2670 pages, and 160 copperplates engraved by Andrew Bell. It was published in numbers, of which the two first were issued in December 1768, "price 6d. each, or 8d on a finer paper," and was to be completed in 100 weekly numbers. It was compiled, as the title-page says, on a new plan. The different sciences and arts were "digested into distinct treatises or systems," of which there are 45 with cross headings, that is, titles printed across the page, and about 30 other articles more than three pages long. The longest' are ' Anatomy," 166 pages, and "Surgery," 238 pages. '"' The various technical terms, &c., are explained as they occur in the order of the alphabet." "Instead of dismembering the sciences, by attempting to treat them intelligibly under a multitude of technical terms, they have digested the principles of every science in the form of systems or distinct treatises, and explained the terms as they occur in the order of the alphabet, with references to the sciences ta which they belong." This plan, as the compilers say, differs from that of all the previous dictionaries of arts and sciences, Its merit and novelty consists in the combination of De Coetlogon's plan with that in common use,—on the one hand keeping important subjects together, and on the other facilitating reference by numerous separate articles. It is doubtful to whom the credit of this plan is due. The editor, William Smellie, a printer (born in 1740, died 24th June 1795), afterwards secretary and superin- tendent of natural history to the Society of Scottish Antiquaries, is said by his biographer to have devised the plan and written or compiled all the chief articles;

and he prints, but without date, part of a letter written and signed by Andrew Bell by which he was engaged in the work :— " Sir, As we are engaged in publishing a dictionary of the arts and sciences, and as you have informed us that there are fifteen capital sciences which you will undertake for and write up the sub-divisions and detached parts of these conform to your plan, and likewise to prepare the whole work for the press, &., &e., we hereby agree to allow you £200 for your trouble, &c." Prof. Macvey Napier says that Smellie "was more likely to have suggested that great im- provement than any of his known coadjutors." Archibald Constable, who was interested in the work from 1788, and was afterwards intimately acquainted with Bell, says Colin Macfarquhar was the actual projector of the Lncyclo- poedia, and the editor of the two first editions, while Smellie was merely "a contributor for hire" (Jfemoirs, ii. 311). Dr Gleig, in his preface to the third edition, says : "The idea had been conceived by him (Colin Macfarquhar) and his friend Mr Andrew Bell, engraver. By whom these gentlemen were assisted in digesting the plan which attracted to that work so much public attention, or whether they had any assistance, are questions in which our readers caunot be interested." Macfarquhar, according to Con- stable, was a person of excellent taste and very general knowledge, though at starting he had little or no capital, and was obliged to associate Bell, then the principal en- graver in Edinburgh, as a partner in his undertaking.

_ Thesecond edition was begun in 1776, and was published in numbers, of which the first was issued 21st June 1777, and the last, No. 181, 18th September 1784, forming 10 vols. 4to, dated 1778 to 1783, and containing 8595 pages and 340 plates. The pagination is continuous, ending with page 9200, but 295 pages are inserted in various places, and page 7099 is followed by 8000. The number and length of the articles was much increased, 72 have cross headings, and more than 150 others may be classed as long articles. At the end is an appendix (" Abatement" to " Wood") of 200 pages, containing,

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under the heading Botanical Table, a list of the 931 genera included in the 58 natural orders of Linnzus, and followed by a list of 526 books, said to have been the prin- cipal authorities used. All the maps are placed together under the article “ Geography ” (195 pages). Most of the long articles have numbered marginal titles; ‘ Scotland,” 84 pages, has 837. ‘ Medicine,” 309 pages, and ‘“ Phar- macy ” have each an index. The plan of the work was en- larged by the addition of history and biography, which encyclopedias in general had long omitted. ‘From the time of the second edition of this work, every cyclopedia of note, in England and elsewhere, has been a cyclopeedia, not solely of arts and sciences, but of the whole wide circle of general learning and miscellaneous information ” (Quarterly Review, cxili, 362). Smellie was applied to by Bell to edit the second edition, and to take a share of one-third in the work ; but he refused, because the other persons. concerned in it, at the suggestion of “‘a very distinguished nobleman of very high rank” (said by Professor Napier to have been the duke of Buccleuch), insisted upon the introduction of a system of general biography which he con- sidered inconsistent with the character of a dictionary of arts and sciences. James Tytler, M.A.,seems to have been selected as the next most eligible compiler. His father, a man of extensive knowledge, was 53 years minister of Fearn in Forfarshire, and died in 1785, Tytler (outlawed by the High Court of Justiciary, 7th January 1793, buried at Salem in Massachusetts 11th January 1804, aged fifty-eight) “ wrote,” says Watt, “many of the scientific treatises and histories, and almost all the minor articles ” (Bibliotheca Brit.).

After about a year’s preparation, the third edition was announced in 1787; the first number was published early in 1788, aud the first volume in October 1788. There

-were to be 300 weekly numbers, price ls. each, forming

30 parts at 10s. 6d. each, and 15 volumes, with 360 plates. It was completed in 1797 in 18 vols. 4to, containing 14,579 pages and 542 plates. Among the multifarious articles re- presented in the frontispiece, which was required by the traditional fashion of the period, isa balloon. The maps are, as in subsequent editions, distributed

among the articles relating to the respective countries. It was edited by Colin Macfarquhar as far as the article “Mysteries” (by Dr Doig, vol. xil.), when he died, 2d April 1793, in his forty- eighth year, “ worn out,” says Constable, “by fatigue and anxiety of mind.” His children’s trustees and Andrew Bell requested George Gleig of Stirling (consecrated 30th October 1808 assistant and successor to the bishop of Brechin), who had written about twelve articles, to edit the rest of the work; ““‘and for the time, and the limited sum allowed him for the reward of contributors, his part in the work was considered very well done” (Constable, ii. 312). Professor Robison was induced by Gleig to become a contributor. He first revised the article “ Optics,” and then wrote a series of articles on natural philosophy, which attracted great attention and were long highly esteemed by scientific men. The sub-editors were James Walker (Primus Scotize Episcopus 27th May 1837, died 5th March 1841, aged seventy) until 1795, then James Thomson, suc- ceeded in November 1796 by his brother Thomas, after- wards professor of chemistry at Glasgow, who remained connected with the Hncyclopedia until 1800. According to Kerr (Smellie’s Life, i. 364-5), 10,000 copies were printed, and the profit to the proprietors was £42,000, be- sides the payments for their respective work in the con- duct of the publication as tradesmen,—Bell as engraver of all the plates, and Macfarquhar as sole printer. Ac- cording to Constable (Afemozrs, ii. 312), the impression was begun at 5000 copies, and concluded with a sale of 13,000. James Hunter, ‘an active bookseller of no character,” who

EPC YO had a shop in Middle Row, Holburn, sold the book to the trade, and on his failure Thomson Bonar, a wine merchant, who had married Bell’s daughter, became the seller of the book. He quarrelled with his father-in-law, who would not see him forten years before his death in 1809. When the edition was completed, the copyright and remaining books were sold in order to wind’ up the concern, and “ the whole was purchased by Bell, who gave £13 a copy, sold all the complete copies to the trade, printed up the odd volumes, and thus kept the work in the market for several years ” (Constable, il. 312).

The supplement of the third edition, printed for Thomson Bonar, and edited by Gleig, was published in 1801 in 2 vols. 4to, containing 1624 pages and 50 copperplates engraved by D. Lizars. In the dedication to the king, dated Stirling, 10th December 1800, Dr Gleig says: “ The French Lncyclopédie had been accused, and justly accused, of having disseminated far and wide the seeds of anarchy aud atheism. If the Hncyclopedia Britannica shall in any degree counteract the tendency of that pestiferous work, even these two volumes will not be wholly unworthy of your Majesty’s attention.” Professor Robison added 19 articles to the series he had begun when the third edition was so far advanced. Professor Playfair assisted in “Mathematics.” Dr Thomas Thomson wrote “ Chemistry,” **Mineiulogy,” and other articles, in which the use of symbols was for the first time introduced into chemistry ; and these articles formed the first outline of his System of Chenustry, published at Edinburgh in 1802, 8vo, 4 vols. ; the sixth edition, 1821.

The fourth edition, printed for Andrew Bell, was begun

in 1800 or 1801, and finished in 1810 in 20 vols. 4to, con- taining 16,033 pages, with 581 plates engraved by Beli. The dedication to the king, signed Andrew Bell, is dated Lauristoun, Edinburgh, 1809. The preface is that‘of the third edition with the necessary alterations and additions in the latter part. No articles were reprinted from the supplement, as Bell had not the copyright. Professor Wallace’s articles on mathematics were much valued, and raised the scientific character of the work. Dr Thomas Thomson declined the editorship, and recommended Dr James Millar, afterwards editor of the Lncyclopedia Fdinensis (died 13th July 1827). He was fond of natural history and a good chemist, but, according to Constable, slow and dilatory and not well qualified. Andrew Bell died 10th June 1809, aged eighty-three, “leaving,” says Constable, “‘ two sets of trustees, one literary to make the money, the other legal to lay it out after it was made.” The edition began with 1250 copies and concluded at 4000, of which two-thirds passed through the hands of Constable’s firm. Early in 1804 Andrew Bell had offered Constable and his partner Hunter the copyright of the work, printing materials, &c., aud all that was then printed of the fourth edition, for

£20,000. This offer was in agitation in March 1804, when the two partners were in London. On 5th May 1804, after Lord Jeffrey's arrival in Edinburgh, as he relates to Francis Horner, they intrusted him witha design, on which he found that most of his friends had embarked with great eagerness, "for publishing an entire new ency- clopxdia upon an improved plan. Stewart, I understand, is to lend his name, and to write the preliminary discourse, besides other articles, Playfair is to superintend the mathematical department, and Robison the natural philo- sophy. Thomas 'Thomson is extremely zealous in the cause. W. Scott has embraced it with great affection… The authors are to be paid at least as well as reviewers, and are to retain the copyright of théir articles for separate publi- cation if they think proper." (Cockburn, Life of Lord Jeffrey, 1852, ii. 90.) It was then, perhaps, that Constable gave £100 to Bonar for the copyright of the supplement.

public sale. volumes, which formed one lot, the copyright formed another lot, and soon. The whole was purchased by myself and in my name

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The fifth edition was begun immediately after the fourth as a mere reprint. " The management of the edition, or rather misman- agement, went on under the lawyer trustecs for several years, and at last the whole property was again brought to the markct by

There were about 1800 copies printed of the five first

for between £13,000 and £14,000, and it was said by the wise book- sellers of Edinburgh and others that I had completely ruined my- self and all connected with me by a purchase to such an enormous amount ; this was early in 1812" (Constable, ii. 314). Bonar, who lived next door to the printing office, thought he could con- duet the book, and had resolved on the purchase. Having a good deal of moncy, he seemed to Constable a formidable rival; whose alliance was to be secured. After " sundry interviews" it was agreed that Constable should buy the copyright in his own name, and that Bonar should have one-third, and also one-third of the copyright of the supplement, for which he gave

£200. Dr James Millar cor- rected and revised the last 15 volumes. The preface is dated 1st December 1814. The printing was superintended by Bonar, who died 26th' July 1814. His trustees were repaid his advances on the work, about £6000, and the copyright was valued at £11,000, of which they reccived one-third, Constable adding £500, as the book had been so extremely successful. It was published in 20 vols., 16,017 pages, 582 plates, price £36, and dated 1817.

Soon after the purchase of the copyright, Constable began to prepare for the publication of a supplement, to be of four or, at the very utmost, five volumes. "The first article arranged for was one on 'Chemistry' by Sir Humphrey Davy, but he went abroad [in October, 1813] and I released him from his engagement, and employed Mr Brande ; the second article was Mr Stcwart's Disserta- tion, for which I agreed to pay him £1000, leaving the cxtent of it to himself, but with this understanding, that it was not to be under ten sheets, and might extend to twenty " (Constable, ii. 318). Dugald Stewart, in a letter to Constable, 15th November 1812, though le declines to engage to execute any of his own sug- gestions, recommends that four discourses should " stand in front," forming 'fa general map of the various departments of human knowledge," similar to "the exceilent discourse prefixed by D'Alembert to the French Encyclopédie," together with historical sketches of the progress since Bacon's time of modern discoveries in metaphysical, moral, and political philosophy, in mathematics and physics, in chemistry, and in zoology, botany, and miner- alogy. He would only promise to undertake the general map and the first historical sketch, if his health and other engagements permitted, after the second volume of his Philosophy of the Human Mind (published in 1818) had gone to press. For the sccond he recommended Playfair, for chemistry Sir Humphrey Davy. He received £1000 for the first part of his dissertation (166 pages), and £700 for the second (257 pages), the right of publication being limited to the Supplement and Lncyclopedia. Constable next contracted with Professor Playfair for a dissertation "to be equal in length or not to Mr Stewart's, for £250 ; but a short time after- wards I felt that to pay one eminent individual £1000 because he would not take less would be quite unfair, and I wrote to the worthy Professor that I had fixed his payment at £500." Constable gave him

£500 for the first part (127 pages), and would have given as much for the second (90 pages) if it had been as long. His next object was to find out the greatest defects in the book, and he gave Professor Leslic £200 and Graham Dalyell £100 for looking over it. He then wrote out a prospectus and submitted it in print to Stewart, “but the cautious philosopher referred” him to Playfair, who “ returned it next day very greatly improved.” For this Constable scnt him six dozen of very fine old sherry, only fceling regret that he had nothing better to offer. He at first intended to have two editors, “ one for the strictly literary and the other for the scientific department.” Hc applied to Dr Thomas Brown, who ‘preferred writing trash of poetry to useful and lucrative employment.” At last he fixed on Mr Macvey Napier (born 1777), whom he had known from 1798, and who “had becn a hard student, and at college laid a good foundation for his future career, though more perhaps in general information than in what would be, strictly speakiug, called schclarship ; this, however, does not fit him the less for his present task.” Constable, in a letter dated 11th June 1813, offered him £300 before the first part went to press, £150 on the completion at press of each of the eight half volumes, £500 if the work was reprinted or extended beyond 7000 copies, and £200 for incidental expenses. “In this way the composition of the four volumes, including the introductory dis- sertations, will amount to considerably more than £9000.” In a postscript the certain payment is characteristically increased to £1575, the contingent to £735, and the allowance for incidental expenses to £300 (Constable, ii. 326). Napier went to London, and obtained the co-operation of many literary men. The sup: plement was published in half-volume parts from December 1816 to April 1824. It formed six volumes 4to, containing 4933 pages,

| 125 plates, 9 maps, three dissertations, and 669 artieles, of which a

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list is given at the end. The first dissertation, on the “ progress of metaphysical, ethical, and political philosophy,” was by Stewart, who completed his plan only in respect to metaphysics. He had thought it

would be casy to adapt the intellectual map or general survey of human knowledge, sketched by Bacon and improved by D'Alembert, to the advanced state of the sciences, while its unrivalled authority would have softened criticism. But on closer examination he found the logical views on which this systematic arrangement was based essentially erroneous ; and, doubt- ing whether the time had come for a successful repetition of this bold

experiment, he forbore to substitute a new scheme of his own. Sir

James Mackintosh characterized this discourse as "the most splendid

of Mr Stewart's works, a composition which no other living writer of

English prose has equalled" (dinburgh Review, xxvii. 191, Septem- ber 1816). The second dissertation, "On the progress of mathematics and physics," was by Playfair, who died 19th July 1819, when he had only finished the period of Newton and Leibnitz. The third,

by Professor Brande, "On the progress of chemistry from the

early middle ages to 1800," was the only one completed. These historical dissertations were admirable and delightful compositions, and important and interesting additions to the Encyclopedia; but it is difficult to see why they should form a separate department distinct from the general alphabet. The preface, dated March 1824, begins with an account of the more important previous encyclopedias, relates tlie history of this to the sixth edition, de-

scribes the preparation for the supplement and gives an "outline of the contents," and mentions under each great division of knowledge the principal articles and their authors' names, often with remarks

on the characters of both. Among the distinguished contributors were Leslie, Playfair, Ivory, Sir John Barrow, Tredgold, Jeffrey, John Bird Sumner, Blanco White, Hamilton Smith, and Hazlitt,

Sir Walter Scott, to gratify his generous friend Constable, laid aside Waverley, which he was completing for publication, and in

April and May 1814 wrote “ Chivalry.” He also wrote “ Drama” in

November 1818, and “Romance” in the summer of 1823. As it seemed to the editor that encyclopedias had previously attended

little to political philosophy, he wrote “Balance of Power,” and procured from James Mill “ Banks for Savings,” “ Education,” “‘Law of Nations,” “ Liberty of the Press,” and other articles, which, reprinted cheaply, had a wide circulation. M‘Culloch wrote “Corn Laws,” “Interest,” “Money,” “ Political Economy,” &c. Mr Ricardo wrote ‘*Cominerce” and “ Funding System,” and Professor Malthus, in his article “ Population,” gave a compre- hensive summary of the facts and reasonings on which his theory rested. In the article “Egypt” Dr Thomas Young “‘first gave to the public an éxtended view of the results of his successful interpretation of the hieroglyphic characters on the stone of Rosetta,” with a vocabulary of 221 words in English, Coptic, Hieroglyphic, and Enchorial, engraved on four plates. There were about 160 biographies, chiefly of persons who had died within the preceding 30 years. Constable “ wished short biographi- cal notices of the first founders of this great work, but they were, in the opinion of my editor, too insignificant to entitle them to the rank which such separate notice, it was supposed, would have given them as literary men, although his own consequence in the world had its origin in their exertions” (Memoirs, ii 326). It is to be regretted that this wish was not carried out, as was done in the latter volumes of Zedler. Arago wrote “Double Refraction” and “ Polari- zation of Light,” a note to which mentions his name as author. Playfair wrote “Aipinus,” and “ Physical Astronomy.” Biot wrote “Electricity” and “Pendulum.” He “gave his assistance with alacrity,” though his articles had to be translated. Signatures, on the plan of the Encyclopédie, were annexed to each article, the list forming a triple alphabet, A to XXX, with the full names of the 72 contributors arranged apparently in the order of their first occur- rence. At the end of vol. vi. are Addenda and Corrigenda,

including “‘ Interpolation,” by Leslie, and “ Polarization of Light,” by Arago.

The sixth edition, ‘revised, corrected, and improved,” appeared in half volume parts, price 16s. in boards, vol. xx. part ii. com- pleting the work in May 1823. Constable, thinking it not wise to reprint so large a book year after year without correction, in 1820 selected Mr Charles Maclaren (born 7th October 1782) as editor. ‘* His attention was chiefly directed to the historical and geographical articles, He was to keep the press going, and have the whole com- pleted in three years.” He wrote “ America,” “ Greecd,”” “roy,” &e, Many of the large articles, as “ Agriculture,” ‘* Chemistry,” “Conchology,” were new or nearly so; and references were given to the supplement. A new edition in 25 vols. was contem- plated, not to be announced till a certain time after the supplement was finished; but Constable’s house stopped payment 19th January 1826, and his copyrights were sold by auction. ‘Those of the Encyclopedia were bought by contract, 16th J uly 1828, for £6150, by Thomas Allan, proprietor of the Caledonian Mercury, Adam Black, Abram Thomson, bookbinder, and Alexander Wight, banker, who, with the trustee of Constable’s estate, had previously begun the seventh edition. Not many years later Mr Black purchased all the shares and became sole proprietor.

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ENCYCLOPADIA

The seventh edition, 21 vols. 4to (with an index of 187 pages, compiled by Robert Cox), containing 17,101 pages and 506 plates, edited by Macvey Napier, assisted by James Browne, LL.D., was begun in 1827, and published from March 1830 to January 1842. It was reset throughout and stereotyped. Mathematical diagrams were printed in the text from woodeuts. The first half of the preface was nearly that of the supplement. The list of signatures, contain- ing 167 names, consists of four alphabets with additions, and differs altogether from that in the supplement : many names are omitted, the order is changed, and 103 are added. A list follows of over 300 articles, without signatures, by 87 writers. The dissertations—lst, Stewart’s, 289 pages; 2d, “ Ethics” (136

pages), by Sir James Mackintosh, whose death prevented the addition of ‘ Political Philosophy ;” 3d, Playfair’s, 189 pages; 4th, its continuation by Sir John Leslie, 100 pages—and their index of 30 pages, fill vol. i. As they did not include Greek philosophy, ‘ Aristotle,” “ Plato,” and “ Socrates” were supplied by Dr Hampden, afterwards bishop of Hereford. Among the numerous contributors of cminence, mention may be made of Sir David Brewster, Prof. Phillips, Prof. Spalding, John Hill Burton, Thomas De Quincey, Patrick Fraser Tytler, Capt. Basil Hall, Sir Thomas Dick Lauder, Antonio Panizzi, John Scott Russell, and Robert Stephenson. Zoology was divided into 11 chief articles, “Mammalia,” “Ornithology,” “‘Rep- tilia,” “Ichthyology,” “ Mollusca,” “ Crustacea,” “ Arachnides,” “Entomology,” “Helminthology,’”’ “Zoophytcs,” and “Animal- cule,”—all by James Wilson. ‘I’he biographical articles, in this as in all the editions of the Hncyclopedia, do not embrace the names of persons living at the time of publication.

The eighth edition, 1853-60, 4to, 21 vols. (and index of 239 pages, 1861), containing 17,957 pages and 402 plates, with many woodcuts, was edited by Dr Thomas Stewart Traill, professor of medical jurisprudence in Edinburgh University. The dicaarttitiea were reprinted, with one on the ‘ Rise, Progress, and Corruptions of Christianity” (97 pages), by Archbishop Whatcly, and a con- tinuation of Leslie’s to 1850, by Professor James David Forbes, 198 pages, the work of nearly three years, called by himself his ““magnum opus” (Life, pp. 361, 366). Lord Macaulay, Charles Kingsley, Isaac Taylor, Hepworth Dixon, Robert Chambers, Rev. Charles Merivale, Rev. F. W. Farrar, Sir John Richardson, Dr Scoresby, Dr Hooker, Henry Austin Layard, Edw. B. Eastwick, John Crawfurd, Augustus Petermann, Baron Bunsen, Sir John Herschel, Dr Lankester, Professors Owen, Rankine, William Thomson, Aytoun, Blackie, Daniel Wilson, and J ukes, were some of the many eminent new contributors found among the 344 authors, of whom an alphabetical list is given, with a key to the signatures. In the preface a list of 279 articles by 189 writers, classed under 15 heads, is given, instead of the enumeration of the chief articles and their writers, with critical remarks and explana- tions, inserted in previous prefaces. It is very much clearer and more useful, though its

tabular form excluded all particulars except in notes. This edition was not wholly reset like the seventh, but many long articles were retained almost or entirely intact.

The publication of the ninth cdition (the present work) was commenced in January 1875.

A new and enlarged edition of the Encyclopédie arranged as a system of separate dictionaries, and entitled Encyclo- pédie Méthodique ou par ordre de matiéres, was undertaken by Charles Joseph Panckoucke, a publisher of Paris (born at Lille 26th November 1736, died 19th December 1798). His privilege was dated 20th June 1780. The articles be- longing to different subjects would readily form distinct dictionaries, although, having been constructed for an alphabetical plan, they seemed unsuited for any system wholly methodical. Two copies of the book and its sup- plement were cut up into articles, which were sorted into subjects. The division adopted was,—1, mathematics ; 2, physics ; 3, medicine; 4, anatomy and physiology ; 5, surgery ; 6, chemistry, metallurgy, and pharmacy ; 7, agri- culture; 8, natural history of animals, in six parts; 9, botany ; 10, minerals ; 11, physical geography ; 12, ancient and modern geography ; 13, antiquities; 14, history ; 15, theology ; 16, philosophy; 17, metaphysics, logic, and morality ; 18, grammar and literature; 19, law ; a, finance ; 21, political economy ; 22, commerce ; 23, marine; 24 art militaire ; 25, beaux arts; 26 arts et métiers,—all forming distinct dictionaries entrusted to different editors, The first object of each editor was to exclude all articles belonging to other subjects, and to take care that those of a doubtful nature should not be omitted by all. In some words (such as air, which belonged equally to chemistry,

physics, and medicine) the methodical arrangement has the unexpected effect of breaking up the single article into several widely separated. ach dictionary was to have an introduction and a classified table of the principal articles. History and its minor parts, as inscriptions, fables, medals, were to be included. Theology, which was neither complete, exact, nor orthodox, was to be by the Abbé Bergier, confessor to

Monsieur. The whole work was to be completed and connected together by a Vocabulaire Universel, 1 vol. 4to, with references to all the places where each word occurred, and a very exact history of the Hncyclopédie aud its edi- tions by Panckoucke. The prospectus, issued early in 1782, proposed three editions—84 vols. 8vo, 43 vols. 4to with 3 columns to a page, and 53 vols. 4to of about 100 sheets with 2 columns to a page, each edition having 7 vols. 4to of 250 to 300 plates each. The subscription was to be 672 livres from 15th March to July 1782, then 751, and 888 after April 1783. It was to be issued in livraisons of 2 vols, each, the first (jurisprudence, vol. i., literature, vol. i.) to appear in July 1782, and the whole to be finished in 1787, The number of subscribers, 4072, was so great that the subscription list of 672 livres was closed 30th April. Twenty-five printing offices were employed, and in November 1782 the 1st livraison (jurisprudence, vol. i., and half vol. each of arts et métiers and histoire naturelle) was issued. A Spanish prospectus was sent out, and obtained 330 Spanish subscribers, with the inquisitor-general at thcir head. The complaints of the subscribers and his own heavy advances, over 150,000 livres, induced Panckoucke, in November 1788, to appeal to the authors to finish the work. Those en retard made new contracts, giving their word of honour to put their parts to press in 1788, and to continue them without interruption, so that Panckoucke hoped to finish the whole, including the vocabulary (4 or 5 vols.), in 1792. Whole sciences, as architecture, engineering, hunting, police, games, &c., had been over- looked in the prospectus; a new division was made in 44 parts, to contain 51 dictionaries and about 124 vols. Permission was obtained, 27th February 1789, to receive subscriptions for the separate dictionaries. Two thousand subscribers were lost by the Revolution, The 50th livraison appeared ou July 23, 1792, when all the dictionaries eventu- ally published had been begun except seven—jeux familiers and mathematiques, physics, art oratoire, physical geography, chasses, and péches; and 18 were finished,—mathe- matics, games, surgery, ancient and modern geography, history, theology, logic, grammar, jurisprudence, finance, political economy, commerce, marine, arts militaires, arts académiques, arts et métiers, encyclopediana. Supplements were added to military art in 1797, and to history in 1807, but not to any of the other 16, though required for most long before 1832. The publication was continued by Henri Agasse,

Panckoucke's son-in-law, from 1794 to 1813, and then by Mme. Agasse, his widow, to 1832, when it was completed in 102 livraisons or 337 parts, forming 1664 vols. of text, and 51 parts containing 6439 plates. The letter-press issued with the plates amounts to 5458 pages, making with the text 124,210 pages. To save expense the plates belonging to architecture were not published. Pharmacy (separated from chemistry), minerals, education, pont et chaussécs had been announced but were not pub- lished, neither was the Vocabulaire Universel, the key and index to the whole work, so that it is difficult to carry out any research, or to find all the articles on any subject. The original parts have been so often subdivided, and have been so added to by other dictionaries, supplements, and appen- dices, that, without going into great detail, an exact account cannot be given of the work, which contains 88 alphabets, with 83 indexes, and 166 introductions, discourses, prefaces, &c. Many dictionaries have a classed index of articles ;

that of économie politique is very excellent, giving the con- tents of each article, so that any passage can be found easily, The largest dictionaries are medicine, 13 vols., 10,330 pages; zoology, 7 dictionaries, 13,645 pages, 1206 plates ; botany, 12,002 pages, 1000 plates (34 only of cryptogamic plants) ; geography, 3 dictionaries and 2 atlases, 9090 pages, 193 maps and plates ; jurisprudence (with police and municipalities), 10 vols., 7607 pages. Anatomy, 4 vols., 2866 pages, is not a dictionary but a series of systematic treatises. Assemblée Nationale was to be in three parts,— (1) the history of the Revolution, (2) debates, and (3) laws and decrees. Only vol. ii., debates, appeared, 1792, 804 pages, Absens to Aurillac. Ten volumes of a Spanish trans- lation with a vol. of plates were published at Madrid to 1806,—viz., historia natural, i., ii. ; grammatica, i. ; arte militar, i., ii; geografia, i- iii.; fabricas, i, ii, plates, vol. i. A French edition was printed at Padua, with the plates, says Peignot, very carefully engraved. Probably no more un- manageable body of dictionaries has ever been published except Migne's Hncyclopédie Theologique, Paris 1844-75, 4to, 168 vols., 101 dictionaries, 119,059 pages.

No encyclopzedia has been more useful and successful, or more frequently copied, imitated, and translated, than that known as the Conversations Lexicon of Brockhaus. It was begun as Conversations Lexikon mit voratiglicher Riicksicht auf die gegenwirtigen Zeiten, Leipzig, 1796 to 1808, 8vo, 6 vols., 2762 pages, by Dr Gotthelf Renatus Libel (born Ist April 1767 at Thalwitz near Wurzen in Saxony, died 14th February 1799), who intended to supersede Hiibner, and included geography, history, and in part biography, be- sides mythology, philosophy, natural history, &c. Vols. i~iv. (A to R) appeared 1796 to 1800, vol.v. in 1806. Fried- rich Arnold Brockhaus (born at Dortmund 4th May 1772, settled at Amsterdam in 1801-2, where he opened a German bookseller's shop, 15th October 1805, as Rehloff and Co., Dutch law not allowing him tc use his own name) bought the work with its copyright, 25th October 1808, for 1800 thalers from the printer, who seems to have got it in payment of his bill. The editor, Christian Wilhelm Franke, by contract dated 16th November, was to finish vol. vi. by December 5, and the already projected supple- ment, 2 vols., by Michaelmas 1809, for 8 thalers a printed sheet. No penalty was specified, but, says his grandson, Brockhaus was to learn that such contracts, whether under penalty or not, are not kept, for the supplement was finished only in 1811. Brockhaus issued a new impression as Conversations Lexikon oder kurzgefasstes Handworterbuch, &c., 1809-11, and on removing to Altenburg in 1811 began himself to edit the 2d edition (1812-19, 10 vols.), and, when vol. iv. was published, the 3d (1814-19). He carried on both editions together until 1817, when he re- moved to Leipsic, and began the 4th edition as Al/gemeine Deutsche Real.Encyclopddie fiir die gebildeten Stdnde. Con- versations Lexikon. This double title has ever since been re- tained. The 5th edition was at once begun, and was finished in eighteen months. Dr Ludwig Hain assisted in editing the 4th and 5th editions until he left Leipsic in April 1820, when Professor F. C. Hasse took his place. The 12,000 copies of the 5th edition being exhausted while vol. x. was at press, a 2d unaltered impression of 10,000 was required in 1820, and a 3d of 10,000 in 1822. The 6th edition, 10 vols, was begun in September 1822. Brockhaus died 20th August 1823. His two eldest sons, Friedrich and Heinrich, who carried on the business for the heirs and be- came sole possessors in 1829, finished the edition

with Hasse's assistance in September 1823. The 7th edition (1827-29, 12 vols, 10,489 pages, 13,000 copies, 2d im- pression 14,000) was edited by Hasse. The 8th edition (1833-36, 12 vols., 10,689 pages, 31,000 copies to 1842) begun in the autumn of 1832, ended May 1837, was edited

by Dr Karl August Espe (born February 1804, died in the Trrenanstalt at Stétteritz near Leipsic, 24th November 1850) with the aid of many learned and distinguished writers. A general index, Universal Register, 242 pages, was added in 1829. The 9th edition (1843-47, 15 vols., 11,470 pages, over 30,000 copies) was edited by Dr Espe. The 10th edition (1851-55, 12,564 pages) was also in 15 vols., for convenience in reference, and was edited by Dr August Kurtzel aided by Oskar Pilz. Friedrich Brockhaus had retired in 1849, and Dr Heinrich Edward, elder son of Heinrich, made partner in 1854, assisted in this edition from the beginning, and Heinrich Rudolf, the younger son, partner since 1863, in the 11th (1864-68, 15 vols. of 60 sheets, 13,366 pages). Kurtzel died 24th April 1871, and Pilz was sole editor until March 1872, when Dr Gustav Stockmann joined, who was alone from April until joined by Dr Karl Wippermann in October. Besides the Univer- sal Register of 136 pages and about 50,000 articles, each volume has an index. The supplement, 2 vols., 1764 pages, was begun in February 1871, and finished in April 1873. The 12th edition, begun in 1875, is to be in 15 vols. of 64 sheets, 15,300 pages, to be finished in 1880. The Conversations Lexicon is intended, not for scientific use, but to promote general mental improvement by giving the results of research and discovery in a simple aud popu- lar form without extended details. The articles, often too brief, are very excellent and trustworthy, especially on German subjects, give references to the best books, and in- clude biographies of living men.

The most copious German encyclopedia is Ersch and Gruber's Allgemeine Encyclopiédie der Wissenschaften und Kiinste, Leipzig, 1818-75, 151 vols., 69,893 pages, and about 360 plates, being perhaps three-fifths of the work. It was designed and begun in 1813 by Professor Johann Samuel Ersch (born at Gross Glogau, 23d June 17

66, chief librarian at Halle, died 16th January 1828) to satisfy the wants of Germans, only in part supplied by foreign works, It was stopped by the war until 1816, when Professor Hufelaud (born at Dantzic 19th October 1760) joined, but died, 25th November 1817, while the specimen part was at press. 'The work is in three sections :—(1), A to G, 95 vols, 1818-75, 44,379 pages (A to Guano), edited to vol. xvii, 1828 (Chioc-Boya to Olaytonia), by Ersch, who carried on nearly all the correspondence, and to vol. liv. (Gargano to Gauhe), by Professor J. G. Gruber, who joined on Hufeland's death, and was succeeded in 1851 by M. H. E. Meier, and since 1856 to vol. Ixii, (Gerson to Geschlecht) by Hermann Brockhaus (third son of Friedrich Arnold, born at Amsterdam 28th Jan. 1806, professor of Sanskrit at Leipsic); (2) H to N, 31 vols., 1827-55, 14,447 pages (H to Izzo), begun by W. Miiller, librarian at Dessau, who died in September 1827, and was succeeded by Professor A. G. Hoffmann of Jena ; (3) O to Z, 25 vols., 11,067 pages (O to Phyxios), edited by Meier. All articles bear the authors' names, those not ready in time were placed at the end of their letter. The longest is Griechen- land, vols. 80-87, 3668 pages, with a table of contents, It began to appear after vol. 73 (Gdtze to Gondouin), and hence does not come in its proper place, which is in vol. 91. Gross Britannieu contains 700 pages, and Indien by Benfey 356. As may be expected in a work designed by a biblio- grapher so renowned aud industrious as Ersch, the titles of books and lists of authorities and references are very full and accurate. Among the contributors are the most learned Germans of the last 60 years. It contains much original research and many of its articles rank among the best authorities on their respective subjects.

The Encyclopedia Metropolitana (London, 1845, 4to, 28 vols., issued in 59 parts in 1817-45, 22,426 pages, 565 plates) professed to give sciences and systematic arts entire

***Goldstiicker, &c.**

and in their natural sequence, as shown in the introductory treatise on method by. T. Coleridge. 'The plan was the proposal of the poet Coleridge, and it had at least enough of a poetical character to be

eminently unpractical ” (Quarterly Review, cxiii., 379). However defective the plan, the excellence of many of the treatises by Archbishop Whately, Sir John Herschel, Professors Barlow, Peacock, De Morgan, &c., is undoubted. It is in four divisions, the last only being alphabetical :—I. Pure Sciences, 2 vols., 1813 pages, 16 plates, 28 treatises, includes grammar, law, and theology ; II. Mixed and Applied Sciences, 8 vols., 5391 pages, 437 plates, 42 treatises, including fine arts, useful arts, natural history and its “application,” the medical sciences; III. History and Biography, 5 vols., 4458 pages, 7 maps, containing biography (135 essays) chrono- logically arranged (to Thomas Aquinas in vol. 3), and in- terspersed with (210) chapters on history (to 1815), as the most philosophical, interesting, and natural form (but modern lives were so many that the plan broke down, and a division of biography, to be in 2 vols., was announced but not published); IV. Miscellaneous, 12 vols., 10,338 pages, 105 plates, including geography, a dictionary of English (the first forin of Richardson’s), and descriptive natural history. It is not easy to see why geography and natural history, so essentially systematic, were thus treated, or why annuities, brewing, bridges, &c., are less systematic than sculpture, agriculture, and carpentry. The index, 364 pages, contains about 9000 articles. A re-issue in 38 vols. 4to, was announced in 1849. Ofa second edition, 42 vols. 8vo, 14,744 pages, belonging to divisions i. to iii, were published in 1849-58.

The very excellent and useful Znglish Cyclopedia (London, 1854-62, 4to, 23 vols., 12,117 pages ; supplements, 1869-73, 4 vols, 2858 pages), conducted by Charles Knight, based on the Penny Cycdopadia (London, 1833-46, 4to, 29 vols., 15,625 pages), of which he had the copy- right, is in four divisions all alphabetical, and evidently very unequal as classes:—1, geography; 2, natural history ; 3, biography (with 703 lives of living persons); 4, arts and sciences, History is given under geography, but very slightly; the nomenclature of natural history is partly popular and partly scientific; and the work contains much valuable matter, but also much that is undigested and imperfectly edited. The synoptical index, 168 pages, has four columns on a page, one for each division, so that the order is alphabetical and yet the words are classed.

Chambers's Encyclopedia (Edinburgh, W. and R. Chambers) 1860-68, 8vo, 10 vols, 8283 pages, edited in part by the publishers, but under the charge of Dr Andrew Findlater, as "acting editor" throughout, was founded ou the 10th edition of Brockhaus.

The New American Cyclopedia, New York (Appelton & Co.), 1858-63, 16 vols., 12,752 pages, is the work of the editors, George Ripley and Charles Anderson Dana, and 364 contributors, chiefly American. A supplementary work, The American Annual Cyclopedia, a yearly 8vo vol. of about 800 pages and 250 articles, has been published since 1861. In a new edition, The American Cyclopedia, 1873-76, 8vo, 16 vols., 13,484 pages, by the same editors, 4 associate editors, 31 revisers, and a librarian, each article passed through the hands of 6 or 8 revisers. It is, for its extent, one of the very best encyclopzedias, particu- larly on American subjects. a, ts)

END—ENE

ENDIVE, Cichorium Endivia, L., an annual esculent plant of the natural order Composite, commonly reputed to have been introduced into Europe from the East Indies, but, according to some authorities, more probably indigenous to Egypt. There are numerous varieties of the endive, forming two groups, namely, the curled or narrow-leaved (C. #. crispa), and the Batavian or broad- leaved (C'. H. latifolia), the leaves of which are not curled. The former varieties are those most used for salads, the latter being grown chiefly for culinary purposes. The plant requires a light, rich, and dry soil, in an unshaded situation. In the climate of England, sowing for the main crop should commence about the second or third week in June; but for plants required to be used young it may be as early as the latter half of April, and for winter crops up to the iniddle of August. The seed should be finely spread in drills 4 inches asunder, and then lightly covered. After reaching an inch in height, the young plants are thinned ; and when about a month old they may be placed out at distances of 12 or 15 inches, in drills 3 inches in depth, care being taken in removing them from the seed-bed to disturb their roots as little as possible. The Batavian require more room than the curled-leaved varieties, Transplantation, where early crops are

required, has been found inadvisable. Rapidity of growth is promoted by the application of liquid manures. The bleaching of endive, in order to prevent the development of the natural bitter taste of the leaves, and to improve their appearance, is begun about three months after the sowing, and is best effected either by tying the outer leaves around the inner, or, a3 in damp seasons, by the use of the bleaching-pot. The bleaching may be completed in ten days or so in summer, but in winter it takes three or four weeks. For late crops, protection from frost is requisite ; and to secure fine winter endive, it has been recommended to take up the full-grown plants in November, and to place them under shelter, in a soil of moderately dry sand or of half-decayed peat earth. Where forcing-houses are employed, endive may be sown in January, so as to procure by the end of the following month plants ready for use.

ENDOR, an ancient town of Palestine, originally belonging to the Philistines, and chiefly memorable as the abode of the sorceress whom Saul consulted on the eve of the battle of Gilboa, in which he perished. Although situated in the territory of the tribe of Issachar, it was assigned to Manasseh. In the time of Eusebius and Jerome it still existed as a large village 4 miles south of mount Tabor; and at the same distance, on the northern slope of the lower ridge of Hermon, there is still a village of this name.

ENDOWED SCHOOLS ACTS. Since the beginning of the present reign a number of statutes have been passed dealing with the endowed grammar schools of England.

The Act 3 and 4 Vict. c. 77, which notices in the preamble:

the great number of grammar schools in England, both of royal and private foundation, and remarks that the term “grammar” had been construed to mean Greek and Latin, and that the governers and trustees of such schools were unable to establish any other education than that expressly provided for by the toundation, empowered courts of equity to make decrees or orders extending the systems of instruction and the riglit of admission to any school, and to establish schemes for the application of its revenues, having due regard to the intentions of the founder. The Act 23 Vict. c. 11 enabled and required

the trustees and governors of endowed schools to make sucli order as, without interfering with the religious teaching of the other scholars or authorizing any new religious teaching, should admit children of other denominations than that to which the foundation belongs, except where the foundation

expressly requires the children to be instructed according to the formularies of such denomination. The most important public schools —Eton, Harrow, Westminster, &c.—were expressly exempted from the operation of both of these Acts. The Act 31 and 32 Vict. c. 23 annexed certain conditions to the appointment of officers in endowed schools. The most important Act of the series was the 32 and 38 Vict. c. 56 (The Endowed Schools Act 1869) which authorized the appointment of commissioners, with power "'in such manner as may rerder any educational endow- meut most conducive to the advancement of the education of boys and girls, and either of them, to alter and add to any existing, and to make new trusts, directions, and provisions in lieu of any existing trusts, directions, and provisions which affect such endowment and the education promoted thereby." The powers of the commissioners extend to all school endowments other than those specified in section 8 of the Act, which, zzter alia, excludes schools under the Public Schools Act 1868, voluntary schools, schools aided by parliamentary grant, endowments not necessarily educational, &c. The 36 and 37 Vict. c. 87 con- tinues and amends in various particulars the Act of 1869. The 37 and 38 Vict. c. 87 transfers the powers of the Endowed Schools Commissioners to the Charity Commis- sioners (see CHaritTies). The Public Schools Act 1868, above referred to, deals with the following schools only -—Eton, Winchester, Westininster, Charterhouse, Harrow, Rugby, and Shrewsbury.

ENDYMION. In the genealogy of the Iapetids Endymion is said to be the son of Aethlius, who is the son of Zeus by Protogeneia, the daughter of Deucalion and Pyrrha. The legend of Endymion was localized in Elis, the westernmost land in the Peloponnesus, where his tomb was shown in the days of Pausanias. The simplest form of the story is perhaps that

of Apollodorus (i. 7, 5), who merely says that Selene (the moon) loved him, and that Zeus left him free to choose anything that he might desire, his choice being an everlasting sleep, in which he might remain youthful for ever. This is simply a reversing of the myth of Eos (the morning), who forgot to ask eternal youth for her husband Tithonus, whose decrepit form she was glad to hide ina cave. In other versions Endymion is a beautiful youth, whom Selene visits while he lies asleep in the cave of Latmus. She thus becomes the mother of his fifty daughters, who have been supposed by Preller (Griechische Mythologie, i. 384) to denote the fifty moons of the Olympian festal cycle, but who in their number must be compared with the fifty sons or daughters of Aigyptus, Danaus, or Priam. As the parent of these children, Selene is called Asterodia, the being whose path is among the stars. These names of themselves show that this myth was so transparent that it could never be more than thinly disguised. Endymion is, in short, as his name denotes, simply the sun setting opposite to the rising moon, the word being formed in a manner analogous to Hyperion, a name signifying the ascending or high soaring Helios or sun. The Latmian cave is the cave of forgetfulness or sleep, into which the sun plunges beneath the sea. Hence he is naturally spoken of as the son of Aethlius (the child of Protogeneia, the early dawn), who struggles and toils through his long journey across the heaven. There is nothing in the myth which warrants the idea that Endymion is a personification of sleep. Hypnus, the true god of slumber, is a conqueror whom none can resist ; Endymion is simply one who cannot shake off his own sleep, a sleep so profonnd that they who are vexed in heart may well envy it (Theocr., Zdyll. iii. 49).

ENERGY may be defined as the power of doing work, or of overcoming resistance. A bent spring. possesses energy, for it is capable of doing work in returning to its

natural form ; a charge of gunpowder possesses energy, for it is capable of doing work in exploding; a Leyden jar charged with electricity possesses energy, for it is capable of doing work in being discharged. A

complete account of our knowledge of energy and its transformations would require an exhaustive treatise on every branch of physical science, for natural philosophy is simply the science of energy. There are, however, certain general principles to which energy conforms in all the varied transformations which it is capable of undergoing, and of these principles we propose to give a brief sketch.

Before we can treat energy as a physical quantity we must possess some means of measuring it. If we raise 1 ib of matter through a foot we do a certain amount of work against the earth's attraction. If we raise 2 ib through the same height we do twice this amount of work, and so on for any number of pounds, so that the work done is proportional to the mass raised, and therefore to the resist- ance overcome. Also, if we neglect the variation of the intensity of gravity, the work done in raising 1 through 2 feet will be double of that done in raising it 1 foot. Hence we conclude that the work done varies as the resist- ance overcome and the distance through which it is over- come conjointly.

Now, we may select any definite quantity of work we please as our unit, as, for example, the work done in lifting a pound a foot high from the sea-level in the latitude of London, which is the unit of work generally adopted by British engineers, and is called the "foot-pound." The most useful unit for scientific purposes is one which de- pends only on the fundamental units of length, mass, and time, and is hence called an absolute unit. Such a unit is independent of gravity or of any other quantity which varies with the locality. Taking the centimetre, gramme, and second as our fundamental units, the most convenient unit of force is that which, acting on a gramme for a second, produces in it a velocity of a centimetre per second; this is called a Dyne. The unit of work is that which is re- quired to overcome a resistance of a dyne over a centimetre, and is called an Erg. In the latitude of Paris the dyne is equal to the weight of about 73; of a gramme, and the erg is the amount of work required to raise 53, of a gramme vertically through one centimetre. A megalerg is one million ergs.

Energy is the capacity for doing work. The unit of energy should therefore be the same as that of work, and the centimetre-gramme-

second (or, as it is usually called, the C.G.8.) unit of energy is the erg.

The forms of energy which are most readily recognized are of course those in which the energy can be most readily employed in doing mechanical work, and it is manifest that masses of matter which are large enough to be seen and handled are more readily dealt with mechanically than are smaller masses. Hence when useful work can be obtained from a system by simply connecting visible portions of it by a train of mechanism, such energy is more readily recognized than is that which compels us to control the behaviour of molecules before we can transform it into useful work, The former is sometimes, though very improperly, called visible energy, because its transformation is always accompanied by a visible change in the system itself.

The conception of work and of energy was originally derived from observation of purely mechanical phenomena, that is to say, phenomena in which the relative positions and motions of visible portions of matter were all that were taken into consideration. Hence it is not surprising that, in those more subtle forms in which energy cannot be so readily converted into work, it should for a long while have escaped recognition after it had become familiar to the student of dynamics.

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If a pound weight be suspended bya string passing over a pulley, in descending through 10 feet it is capable of raising nearly a pound weight, attached to the other end of the string, through the same height, and thus can do nearly 10 foot-pounds of work. The smoother we make the pulley the more nearly does the amount of useful work which the weight is capable of doing approach 10 foot-pounds, and if we take into account the work done against the friction of the pulley, we may say that the work done by the descending weight is 10 foot-pounds, and hence when the weight is in its elevated position we have at disposal 10 foot-pounds more energy than when it is in the lower posi- tion. It should be noticed, however, that this energy is possessed by the system consisting of the earth and pound together, iu virtue of their separation, and that neither could do work without the other to attract it. The

system consisting of the earth and the pound therefore possesses an amount of energy which depends on the relative posi- tions of its two parts, and the stresses existing between them. In most mechanical systems the stresses acting between the parts can be determined when the relative positions of all the parts are known ; and the energy which a system possesses in virtue of the relative positions of its parts, or its configuration, is called its ‘ Potential Energy,” to distinguish it from another form of energy which we shall presently consider. The word potential does not imply that this energy is not real and exists only in potentiality ; it 7s energy, and has as much claim to the title as it has in any other form in which it may appear.

It is a well-known proposition in dynamics that, if a body be projected vertically upwards in vacuo, with a velocity of » centimetres per second, it will rise to a height

v ; ; of 5, centimetres, where g represents the numerical value

of the acceleration produced by gravity in centimetre-second units. Now, if m represent the mass of the body in grammes, its weight will be mg dynes, for it will require a force of mg dynes to produce in it the acceleration denoted by g. Hence the work done in raising the mass will be

represented by mgs, , that is, 4me?ergs, But it is merely

in virtue of the velocity of projection that the mass is capable of rising against the resistance of gravity, and hence we must conclude that at the instant of projec- tion it possessed }mv? units of energy. Now, whatever be the direction in which a body is moving, a friction- less constraint, like a string attached to the body, can cause its velocity to be changed into the vertical direc- tion without any change taking place in the magnitude of the velocity. Hence we may say that if a body of mass m be moving in any direction relative to the earth, we have at disposal, in virtue of this motion, 4mv? units of energy, aud this is converted into potential energy if the body come to rest at the highest point of its path,

Like potential energy, this energy is relative and is due to the motion of the body relative to the earth, for we know nothing about absolute motion in space; and, moreover, when we have brought the body to rest relative to the earth, we shall have deprived it of all the energy which we can derive from its motion. The energy is there- fore possessed in common by the system consisting of the earth and the body; and the energy which a system pos- sesses in virtue of the relative motions of its parts is called "Kinetic Energy."

A good example of the transformation of kinetic energy into potential energy, and vice versa, is seen in the pendu- lum. When at the limits of its swing, the pendulum is for an instant at rest, and all the energy of the oscillation is potential. When passing through its position of equilibrium, since gravity can do no more work upon it

without changing its fixed point of support, all the euergy of oscillation is kinetic. At intermediate positions the energy is partly kinetic and partly potential.

Kinetic energy is possessed by a system of two or more bodies in virtue of the relative motion of its parts. Since our conception of velocity is essentially relative, and we know nothing about absolute velocities in space, it is plain that any property possessed by a body in virtue of its motion can be possessed by it only in relation to those bodies with respect to which it is moving, and thus a single rigid body can never be said to possess kinetic energy in virtue of the motion of its centre of mass. If a body whose mass is m grammes be moving with a velocity of v centimetres per second relative to the earth, the kinetic energy possessed by the system is dmv? ergs if m be small relative to the earth. But if we consider two bodies each of mass m and one of them moving with velocity »v rela- tive to the other, we can only obtain dmv? units of work from this system alone, and we ought not to say that the system considered by itself possesses more than mv? units of energy. If we include the earth in our system the whole energy will depend on the velocities of the bodies relative to the earth, and not simply on their velocities relative to one another. Hence whenever we say that the

kinetic energy of a body is }mv*, we mean its kinetic energy relative to the earth, and the statement is only true when the mass of the body is very small compared with that of the earth. Any general expression for the energy of a system ought to be true whatever body in the system we consider fixed. It is manifest that the expression Jv? will not be a true re- presentation of the kinetic energy of the earth and a cannon

shot if we choose to consider the shot fixed and the earth |.

moving towards it. In fact any general expression for the energy of a system must involve the masses of ald the bodies concerned ; but if the mass of one body be infinite compared with that of any of the others we may adopt the expression 32(mv*) for the kinetic energy, the body of infinite mass being supposed at rest.

It is only when a body possesses no motion of rotation that we may speak of its velocity as a whole. If a body be rotating about an axis, it follows from D'Alembert's principle that the work it is capable of doing while being brought to restis the same as if each particle were perfectly free and moving with the velocity which it actually possesses. Hence if the moment of inertia of a body about its axis of rotation be represented by I, and its angular velocity by w, the work which can be done by it if we can succeed in bringing it to rest will be 4Iw2 We shall see hereafter how this energy may be transformed without the help of any external body if we suppose the rotating body indefinitely extensible in any direction at right angles to the axis of rotation, so that there is a sense in which we may speak of the kinetic energy of rotation as really belonging to the rotating body.

When the stresses acting between the parts of a system depend only on the relative positions of those parts, the sum of the kinetic energy and potential energy of the system is always the same, provided the system be not acted upon by anything without it. Such a system is called conserva- tive, and is well illustrated by the swinging pendulum above referred to. But there are some stresses the direction of whose action depends on that of the relative motion of the visible bodies between which they appear to act, while there are others whose magnitude also depends on the relative velocities of the bodies. When work is done

against these forces no equivalent of potential energy is produced, at least in the form in which we have been accustomed to recognize it, for if the motion of the system be reversed the forces will be also reversed and will still oppose the motion. It was long believed that work done against such forces

was lost, and it was not till the present century that the energy thus transformed was traced, and the principle of conservation of energy established on a sound physical basis.

The principle of the Conservation of Energy has been

stated by Professor Clerk Maxwell as follows :—

“The total energy of any body or system of bodies is a

quantity which can neither be increased nor diminished by any mutual action of those bodies, though it may be trans- Jormed into any one of the forms of which energy is sus- ceptible,

Hence it follows that, if a system be unaffected by any

agent external to itself, the whole amount of energy pos- sessed by it will be constant, and independent of the mutual action of its parts. If work be done upon a system or energy communicated to it from without, the energy of the system will be increased by the equivalent of the work so done or by the energy so communicated; while if the system be allowed to do work upon external bodies or in any way to communicate energy to them, the energy of the system will be diminished by the equivalent of the

work so done or energy so communicated. In order to establish this principle it might at first sight

appear necessary to make direct measurements of energy in

all the forms in which it can possibly present itself. But there is one form of energy which can be readily measured, and to which all other

forms can be easily reduced, viz., heat. If then we transform a quantity of energy from the form in which it is possessed by the earth and a raised weight, and which can be at once determined in foot- pounds or ergs, into heat, and measure the amount of heat so produced,—and if subsequently we allow an equal amount of energy to undergo various intermediate trans- formations, but to be finally reduced to heat,—and if we find that under all conditions the amount of heat is the same, and in different sets of experiments proportional only to the amount cf energy with which we started, we shall be justified in asserting that no energy has been lost or gained during the transformations. It is the experimental proof of this which Joule has given us during the last thirty years, but we shall refer more at length to his work shortly.

It has been recently pointed out by Thomson and Tait (Natural Philosophy, arts. 262 sqq.) that Newton was acquainted with the principle of the conservation of energy, so far as it belongs purely to mechanics. But what became of the work done against friction and such non-conserva- tive forces was entirely unknown to Newton, and for long after his time this work was supposed to be lost. There were, however, some, even before Newton's time, who had more than a suspicion that heat was a form of energy. Bacon expressed his conviction that heat consists of a kind of motion or "brisk agitation" of the particles of matter. In the Novum Organum, after giving a long list of the sources of heat, some of which may fairly be adduced in support of his opinion, he says, " From these examples, taken collectively as well as singly, the nature whose limit is heat appears to be motion." In the following quotation Bacon appears to rise to the most complete appreciation of the dynamical nature of heat, nor do the most recent advances in science enable us to go much further. "It must not be thought that heat generates motion or motion heat (though in some respects this is true), but the very essence of heat, or the substantial self of heat, is motion and nothing else." Although Bacon's essay contains much sound reasoning, and many observations and experiments are cited which afford very strong evidence in favour of the theory he maintains, yet these are interspersed with so many false analogies, and such confusion between heat and the acrid or irritaut properties of

bodies, that we must re- serve for those who came after him the credit of having

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After Newton's time the first important step in the history of energy was made by Benjamin Thompson, Count Rumford, and was published in the Phil. Trans. for 1798. Rumford was engaged in superintending the boring: of cannon in the military arsenal at Munich, and was struck by the amount of heat produced by the action of the boring bar upon the brass castings. In order to see whether the heat came out of the chips he compared the capacity for heat of the chips abraded by the boring bar with that of an equal quantity of the metal cut from the block by a fine saw, and obtained the same result in the two cases, from which he concluded that "the heat produced could not possibly have been furnished at the expense of the latent heat of tite metallic chips."

Rumford then turned up a hollow cylinder which was cast in one piece with a brass six-pounder, and having reduced the connection between the cylinder and cannon to a narrow ueck of metal, he caused a blunt borer to press against the hollow of the cylinder with a force equal to the weight of about 10,000 ib, while the casting was niade to rotate in a lathe. By this means the mean temperature of the brass was raised through about 70° Fahr., while the amount of metal abraded was only 837 grains. The cylinder, when it was subsequently removed from the rest of the casting, was found to weigh 113-13 bb.

In order to be sure that the heat was not due to the –

action of the air upon the newly exposed metallic surface, the cylinder and the end of the boring bar were immersed in 18°77 tb of water contained in an oak box. The temperature of the water at the commencement of the experiment was 60° Fahr., and after two horses had turned the lathe for 24 hours the water boiled. Taking into account the heat absorbed by the box and the metal, Rumford calculated that the heat developed was sufficient to raise 26°58 Ib of water from the freezing to the boiling point, and in this calculation the heat lost by

radiation and conduction was neglected. Since one horse was capable of doing the work required, Rumford remarked that one horse can generate heat as rapidly as nine wax candles burning in the ordinary manner.

Finally, Rumford reviewed all the sources from which the heat might have been supposed to be derived, and concluded that it was simply produced by the friction, and that the supply was inexhaustible. 'It is hardly

necessary to add," he remarks, '* that anything which any.

insulated body or system of bodies can continue to furnish without limitation cannot possibly be a material substance , and it appears to me to be extremely difficult, if not quite impossible, to form any distinct idea of anything capable of being excited and communicated in the manner that heat was excited and communicated in these experiments, except it be motion." ;

Abont the same time that Rumford's experiments were published, Sir Humphry Davy showed that two pieces of ice could be melted by rubbing them together in a vacuum although everything surrounding them was'at a temperature below the freezing point. He did not, however, see that since the heat could not have been supplied by the ice, for ice absorbs heat in melting, this experiment afforded con- clusive proof of the dynamical nature of heat.

Though we may allow that the results obtained by Rumford and Davy demonstrate satisfactorily that heat is in some way due to motion, yet they do not tell us to what particular dynamical quantity heat corresponds. For example, does the heat generated by friction vary as the friction and the time during which it acts, or is it propor- tional to the friction and the distance through which the rubbing bodies are displaced,—that is, to the work done

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against friction,—or dves it involve any other conditions ? If it van be shown that, however the duration and all other conditions of the experiment maybe varied, the same amount of beat can in the end be always produced when the same amount of energy is expended, then, and only then, can we infer that heat is a form of energy, and that the energy consumed has been really transformed into heat. This Joule has done, and his experiments conclusively prove that heat and energy are of the same nature, and that all other forms of energy with which we are acquainted can be transformed into an equivalent amount of heat; and this is the condition ultimately assumed by the energy employed in doing work against friction and similar forces, which energy was in Newton's time supposed to be lost.

Derinition.—The quantity of energy which, of entirely converted into heat, is capable of raising the temperature of the unit mass of water from 0° C. to 1° C. ts called the mechanical equivalent of heat.

One of the first who took in hand the determination of the mechanical equivalent of heat was Séguin, a nephew of Montgolfier. He argued that, if heat be energy, then, when it is employed in doing work, as in a steam-engine, some of the heat must itself be consumed in the operation. Hence he inferred that the amount of heat given up to the condenser of an engine when the engine is doing work must be less than when the same amount of steam is blown through the engine without doing any work. Séguin was unable to verify this experimentally, but in 1857 Hirn succeeded, not only in showing that such a difference exists, but in measuring it, and hence determining a tolerably approximate value of the mechanical equivalent of heat.

In 1839 Séguin endeavoured to determiue the mechanical equivalent of heat from the loss of heat suffered by steam in expanding, asswming that the whole of the heat so lost was consumed in doing external work against the pressure to which the steam was exposed. This assumption, how- ever, cannot be justified, because it neglected to take account of work which might possibly have to be done within the steam itself during the expansion.

In 1842, Mayer, a physician at Heilbronn, published an attempt to determine the mechanical equivalent of heat from the heat produced when air is compressed. Mayer made an assumption the converse of that of Séguin, asserting that the whole of the work done in compressing the air was converted into heat, and neglecting the possibility of heat being consumed in doing work within the air itself or being produced by the transformation of internal potential energy. Joule afterwards proved (see below) that Mayer's assumption was in accordance witli fact, so that his method was a sound one as far as experi- ment was concerned, and it was only on account of the values.of the specific heats of air at constant pressure and at constant volume employed by him being very inexact that the value of the mechanical equivalent of heat obtained by Mayer was very far from the truth.

Passing over Colding, who in 1843 presented to the Royal Society of Copenhagen a paper entitled ' Theses concerning Force," which clearly stated the " principle of the perpetuity of energy," and who also performed a series of experiments for the purpose of determining the heat developed by the compression of various bodies which entitle him to be mentioned among the founders of the modern theory of energy, we come to Dr Joule of Manchester, to whom we are indebted more than to any other for the establishment of the principle of the conservation of energy on the broad basis on which it now stands. The best known of Joule's experiments was that in which a brass paddle consisting of eight arms of complicated form arranged symmetrically round an axis was made to rotate in a cylindrical vessel of water containing four fixed vanes,

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which allowed the passage of the arms of the paddle but prevented the water from rotating as a whole. The paddle was driven by weights connected with it by strings which passed over friction rollers, and the temperature of the water was observed by thermometers which indicated sooth of a degree Fahrenheit. Special experiments were made to determine the work done against resistances outside the ves- sel of water, which amounted to about -006 of the whole, and corrections

were made for the loss of heat by radiation, the buoyancy of the air affecting the descending weights, and the energy dissipated when the weights struck the floor with a finite velocity. From these experiments Joule obtained 772-692 foot-pounds in the latitude of Manchester as equivalent to the amount of heat required to raise 1 ib of water through 1° Fahr. from the freezing-point. Adopt- ing the centigrade scale, this gives 1390-846 foot-pounds as the mechanical equivalent of heat.

With an apparatus similar to the above, but smaller, made of iron and filled with mercury, Joule obtained results vary- ing from 772-814 foot-pounds when driving weights of about 58 tb. were employed to 775°352 foot-pounds when the driving weights were only about 194 b. By causing two conical surfaces of cast-iron immersed in mercury and contained in an iron vessel to rub against one another when pressed together by a lever, Joule obtained 776-045 foot- pounds for the mechanical equivalent of heat when the heavy weights were used, and 774‘93 foot-pounds with the small driving weights. In this experiment a great noise was produced, corresponding to a loss of energy, and Joule endeavoured to determine the amount of energy necessary to produce an equal amount of sound from the string of a violoncello and to apply a corresponding correction.

The close agreement between the results of these experi- nents, differing widely as they do in their details, at least indicates that “ the amount of heat produced by friction is proportional to the work done and independent of the nature of the rubbing surfaces.” Joule inferred from them that the mechanical equivalent of heat is probably about 772 foot-pounds, or, employing the centigrade scale, about 1390 foot-pounds.

Previously to determining the mechanical equivalent of heat by the most accurate experimental method at his command, Joule established a series of cases in which the production of one kind of energy was accompanied by a disappearance of some other form. In 1840 he showed that when an electric current was produced by means of a dynamo-magneto-electric machine the heat generated in the conductor, when no external work was done by the current, was the same as if the

energy employed in producing the current had been converted into heat by friction, thus show- ing that electric currents conform to the principle of the conservation of energy, since energy can neither be created nor destroyed by them. He also determined a roughly ap- proximate value for the mechanical equivalent of heat from the results of these experiments. Extending his investiga- tions to the currents produced by batteries, he found that the total voltaic heat generated in any circuit was pro- portional to the number of electrochemical equivalents electrolysed in each cell multiplied by the electromotive force of the battery. Now, we know that the number of electrochemical equivalents electrolysed is proportional to the whole amount of electricity which passed through the circuit, and the product of this by the electromotive force of the battery is the work done by the latter, so that in this case also Joule showed that the heat generated was proportional to the work done.

During his experiments on the heat produced by electric currents, Joule showed that, when a platinum wire was heated by the current so as to emit light, the heat generated in the circuit for the same amount of work done by the

battery was less than when the wire was kept cold, proving that when light is produced an equivalent amount of some other form of energy must disappear.

In 1844 and 1845 Joule published a series of researches on the compression and expansion of air. A metal vessel was~- placed in a calorimeter and air forced into it, the amount of energy expended in compressing the air being measured. Assuming that the whole of the energy was converted into heat, when the air was subjected to a pressure of 21°5 atmospheres Joule obtained for the mechanical equivalent of heat about 824:8 foot-pounds, and when a pressure of only 10-5 atmospheres was employed the result was 796°9 foot-pounds.

In the next experiment the air was compressed as before,

and then allowed to escape through a long lead tube im-

mersed in the water of a calorimeter, and finally collected in a bell jar. The amount of heat absorbed by the air could thus be measured, while the work done by it in expanding could be readily calculated. In allowing the air to expand from a pressure of 21 atmospheres to that of 1 atmosphere the value of the mechanical equivalent of heat obtained was 821°89 foot-pounds. Between 10 atmospheres and 1 it was 815:875 foot-pounds, and between 23 and 14 atmospheres 761-74 foot-pounds.

But, unlike Mayer and Séguin, Joule was not content with assuming that when air is compressed or allowed to expand the heat generated or absorbed is the equivalent of the work done and of that only, no change being made in the internal energy of the air itself when the temperature is kept constant. To test this two vessels similar to that used in the last experiment were placed in the same calorimeter and connected by a tube with a stop-cock. One contained air at a pressure of 22 atmospheres, while the other was ex- hausted. On opening the stop-cock no work was done by the expanding air against external forces, since it expanded into a vacuum, and it was found that no heat was generated or absorbed. This showed that Mayer's assumption was true. On repeating the experiment when the two vessels were placed in different calorimeters, it was found that heat was absorbed by the vessel containing the compressed air, while an equal quantity of heat was produced in the calorimeter containing the exhausted vessel. The heat absorbed was consumed in giving motion to the issuing stream of air, and was reproduced by the impact of the particles on the sides of the exhausted vessel.

The more recent researches of Dr Joule and Sir William Thomson (Phil. Trans., 1853, p. 357, 1854, p. 321, and 1862, p. 579) have shown that the statement that no internal work is done when a gas expands or contracts is not quite true, but the amount is very small in the cases of those gases which, like oxygen, hydrogen, and nitrogen, can only be liquefied by intense cold and pressure. It is worthy of note that mixtures of nitrogen and oxygen behaved more like theoretically perfect gases than either of the gases alone.

For the other contributions of Joule to our knowledge of energy, and for those of Sadi Carnot, Rankine, Clausius, Helmholtz, Sir William Thomson, James Thomson, Favre, and others, we must refer the reader to the articles on the several branches of physics, especially to Hear.

Though we can convert the whole of the energy possessed by any mechanical system into heat, it is not in

1 Joule's papers will be found scattered through the Philosophicat Magazine from 1839 to 1864; also in the Memoirs of the Manchester Society (2) vii. viii. ix. and (3) i.; the Proceedings of the Manchester Society, 1859-60, 175; Phil. Trams., [1850] i. 61, [1853] 357, [1854] 321, [1859] 91, [1859] 183, [1863] 579 ; Proceedings of Roy. Soc., vi. 807, vi. 345, viii. 41, 178, viii. 355, viii. 556, viii, 564, ix. 3, ix. 254, ix. 496, x. 502; and the Reports of the British Asso- ciation [1859] ii. 12, and [1861] ii. 83.

our power to perform the inverse operation, and to utilize the whole of the heat in doing mechanical work. Thus we see that different forms of energy are not equally valuable for conversion into work. The energy of a system should be measured by the amount of work it can do under the most favourable conditions which can be imagined, though we are not necessarily capable of realizing them. The ratio of the portion of the energy of a system which can under given conditions be converted into work to the whole amount of energy present is called the availability of the energy. If a system be removed from all com- munication with anything outside of itself, the whole amount of energy possessed by it will remain the same, but will of its own accord tend to undergo such trans- formations as will diminish its availability; for since work is done only when energy undergoes transforma- tion, every change which it is allowed to undergo of its own accord deprives us of one opportunity of deriving useful work, that is, of converting a portion of the energy into the particular form we desire. This principle, known as the principle of the dissipation of energy, was first pointed out by Sir

William Thomson in the Philosophical Magazine for April 1852, and was applied by him to some of the prin. cipal problems of cosmical physics. Though controlling all phenomena of which we have any experience, the principle of the dissipation of energy rests on a very different founda- tion from that of the conservation of energy ; for while we can conceive of no means of circumventing the latter principle, it seems that the actions of intelligent beings are subject to the former only in consequence of the rudeness of the machinery which they have at their disposal for con- trolling the behaviour of those portions of matter in virtue of the relative motions or positions of which the energy with which they have to deal exists. If we have a weight capable of falling through a certain distance, we can employ the system consisting of the earth and weight to do an amount of useful work which is less than the potential energy possessed by the system only in consequence of the friction of the constraints, so that the limit of availability in this case is determined only by the friction which is unavoidable. Here we have to deal with a system with which we can grapple, and whose motions can be controlled at will, If, on the other hand, we have to deal with a system of molecules of whose motions we become conscious only by indirect means, while we know absolutely nothing either of the motions or positions of any individual molecules, it is obvious that we cannot grasp single molecules and control their movements so as to derive work from the system, All we can do, then, is to place the system under certain conditions, and be content with the amount of work which it is, as it were, willing to do under those conditions. It is well known that a greater pro- portion of the heat possessed by a body at a high tempera- ture can be converted into work than in the case of an equal quantity of heat possessed by a body at a low tempera- ture, so that the availability of heat increases with the temperature.

Clerk Maxwell supposed two compartments, A and B,

to be filled with gas at the same temperature, and to be separated by a partition containing a number of trap- doors, each of which could be opened or closed without any expenditure of energy. An intelligent creature, or “demon,” possessed of unlimited powers of vision, is placed

in charge of each door, with instructions to open the door whenever a particle in A comes towards it with more than a certain velocity V, and to keep it closed against all particles in A moving with less than this velocity, but, on the other hand, to open the door whenever a particle in B approaches it with less than a certain velocity v, which is not greater than V, and to keep it closed against all

particles in B moving with a greater velocity than this, By continuing this process every unit of mass which enters B will carry with it more energy than each unit which leaves B, and hence the temperature of the gas in B will be raised and that of the gas in A lowered, while no heat is lost and no energy expended, so that by the application of intelligence alone a portion of gas of uniform pres- sure and temperature may be divided into two parts, in which both the temperature and the pressure are different, and from which, therefore, work can be obtained at the expense of heat. If the gas do not liquefy, there seems no limit to the extent to which this operation may be carried, by increasing V and diminishing v, except that v cannot be made less than zero, which corresponds to the whole of the energy being abstracted from the gas in A and given to that in B. This shows that the principle of the dissipation of energy has control over the actions of those agents only whose faculties are too gross to enable them to grapple with those portions of matter in virtue of the relative motions or relative positions of which the energy exists with which they are concerned.

In April 1875 Lord Rayleigh published a paper in the Philosophical Magazine on "the work which may be gained during the mixing of gases." In the preface to the paper Lord Rayleigh says, "' Whenever, then, two gases are allowed to mix without the performance of work, there is dissipation of energy, and an opportunity of doing work at the expense of low temperature heat has been for ever lost." He then shows that the amount of work obtainable is equal to that which can be done by the first gas in expanding into the space occupied by the second (supposed vacuous) together with that done by the second in expanding into the space occupied by the first. In the experiment imagined by

Lord Rayleigh a porous diaphragm takes the place of the partition and trap-doors imagined by Clerk Maxwell, and the gases sort themselves on account of the difference in the velocities of mean square of molecules of the different gases. When the pressure on one side of the diaphragm is greater than that on the other, work may be done at the expense of heat in pushing the diaphragm, and the operation continued until the gases are uniformly diffused. There is this difference, however, between this experiment and Clerk Maxwell's, that when the gases have diffused the experiment cannot be repeated, and it is no more contrary to the dissipation of energy than is the fact that work may be derived at the expense of heat when a gas expands into a vacuum, for the working substance is not finally restored to its original condition; while Clerk Maxwell's experiment may be supposed to be continued and work obtained till the whole of the gas has been reduced to the absolute zero of temperature, and the ex- periment may be repeated by again heating the gas. Inde- pendently of Lord Rayleigh, Mr S. Tolver Preston, in November 1877, called attention to the work which may be done at the expense of heat during the diffusion of gases, and the bearing of this upon the dissipation of energy (see Nature, Nov, 8, 1877).

In these experiments the molecular energy of a gas is converted into work only in virtue of the molecules being separated into classes in which their velocities are different, and these classes then allowed to act upon one another through the intervention of a suitable heat engine. If we could carry out this subdivision into classes as far as we pleased we might transform the whole of the heat of a body into work. The availability of heat is limited only by our power of bringing those particles whose motions constitute heat in bodies to rest relatively to one another ; and we have precisely similar limits to the availability of the energy due to the motion of visible and tangible bodies, .

If a battery of electromotive force E maintain a current | ascent of energy from the less available form of heat to the

C in a conductor, and no other electromotive force exist in the circuit, the whole of the work done will be converted into heat, and the amount of work done per second will be EC. If R denote the resistance of the whole circuit, E = CR, and the heat generated per second is O?R. If the current drive an electromagnetic engine, the reaction of the engine will produce an electromotive force opposing the current. Suppose the current to be thus reduced to C'.. Then the work done by the battery per second will be EC' or CC'R, while the heat generated per second will be CR, so that we have the difference (C — C')C'R for the energy consumed in driving the engine. The ratio of this to the whole work

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done by the battery is os, so that the efficiency is

increased by diminishing C'. If we could drive the engine so fast as to reduce C' to zero, the whole of the energy of the battery would be available, no heat being produced in the wires, but the horse-power of the engine would be indefinitely small. The reason why the whole of the energy of the current is not available is that heat must always be generated in a wire in which a finite current is flowing, so that, in the case of a battery in which the whole of the energy of cheinical affinity is employed in producing a current, the availability of the energy is limited only on account of the resistance of the conductors, and may be increased by diminishing this resistance. The availability of the energy of electrical separation in a charged Leyden jar is also limited only by the resistance of conductors, in virtue of which an amount of heat is necessarily produced, which is greater the less the time occupied in discharging the jar. The availability of the energy of magnetization is limited by the coercive force of the magnetized material, in virtue of which any change in the intensity of magnetization is accompanied by the production of heat.

Since the motion of the centre of mass of a system is unaffected by any actions taking place between the parts of the system, it is plain that a system considered by itself cannot be said to possess energy in 'virtue of the motion of its centre of mass, and in estimating the energy of the system at any instant we may therefore treat this point as fixed, and

consider only motions relative to it. Thus any motion of rotation we may consider to take place about an axis through the centre of mass. Now, if a system be not acted upon by any forces from without which have a moment about this axis, the product of the angular velocity of the system and of its moment of inertia about the axis of rotation will remain unchanged. Hence if we increase the moment of inertia we shall diminish the angular velocity in the inverse ratio, and therefore diminish the energy of rotation in this ratio, since the latter is proportional to the moment of inertia and the square of the angular velocity. If, then, we have a material system moving in the most general manner possible, we shall reduce its kinetic energy to a minimum by causing such actions to take place between the parts of the system as will make its moment of inertia about the invariable line as great as possible, and then changing the relative motions of the parts in such a manner that they move as if they were rigidly connected with one another. .The motion of the system will then be a simple rotation with its kinetic energy as small as possible, and the greatest amount of energy will thus have been transformed.

In all the cases we have examined there is a general tendency for other forms of energy to be transformed into heat on account of the friction of rough surfaces, the resistance of conductors, or similar causes, and thus to lose availability. In some cases, as when heat is converted into the kinetic energy of moving machinery or the potential energy of raised weights, there seems to be an

more available form of mechanical energy, but when this takes place there is always, accompanying 'it, a quantity of heat which passes from a body at a high temperature to one at a lower temperature, thus losing availability, so that on the whole there is a degradation of energy. Thus Thomson's second law of thermodynamics, which states that "it is impossible by means of inanimate material agency to obtain work by cooling matter below the temperature of the coldest body in the neighbourhood," appears to be generally true, except when this work is obtained at the expense of some other condition of advantage, as, for example, that possessed by air at a higher pressure than the surrounding atmosphere, or by different kinds of matter which are

separate and tend to diffuse, and then the work having once been obtained, the system cannot be restored to its original condition without the degradation of energy from some other source, even though the heat converted into work be restored to the working bodies.

It is sometimes important to consider the rate at which energy may be transformed into useful work, or the horse- power of the agent. It generally happeus that to obtain the greatest possible amount of work from a given supply of energy, and to obtain it at the greatest rate, are conflict- ing interests. We have seen that the efficiency of an electromagnetic engine is greatest when the current is indefinitely small, and then the rate at which it works is also indefinitely small. Jacobi showed that for a given electromotive force in the battery the horse-power is greatest when the current is reduced to one-half of what it would be if the engine were at rest. A similar condition obtains in the steam-engine, in which a great rate of working necessitates the dissipation of a large amount of energy through the resistance of the steam-pipes, &c. The only way to secure a high degree of efficiency with a great horse-power in the case of the steam-engine is by increasing the section of the steam-pipes and the areas of the steam ports. The efficiency of an electromagnetic engine cannot be greater than one-half when it is working at its maximum horse-power, but we may obtain any fixed rate of working we please with a given degree of efficiency by diminishing the resistance of the battery and conductors until the maximum horse-power of the engine exceeds that at which it is to be worked by a sufficient amount. (w. G.)

ENFANTIN, Bartuttemy Prosper [Le Pire Enran- TIN], (1796-1864), one of the founders of Saint-Simonism, was born at Paris, February 8, 1796. He was the son of a banker of Dauphiny, and after receiving his early education at a lyceum, was sent in 1813 to the Ecole Polytechnique, In March 1814 he was one of the band of students who, on the heights of Montmartre and Saint- Chaumont, attempted resistance to the armies of the allies then engaged in the investment of Paris. In consequence of this outbreak of patriotic enthusiasm, the school was soon after closed by Louis XVIII., and the young student was compelled to seek some other career instead of that of the soldier.

He first engaged himself to a country wine- merchaut, for whom he travelled in Germany, Russia, and the Netherlands. In 1821 he entered a banking-house newly established at St Petersburg, but returned two years later to Paris, where he was appointed cashier to the Caisse Hypothécaire. At the same time he became a member of the secret society of the Carbonari. In 1825 a new turn was given to his thoughts and his life by the friendship which he formed with Olinde Rodriguez, the favoured disciple of Saint-Simon. Introduced by Rodriguez to the master, who was then near his end, he ardently embraced his doctrines and schemes of social, political, and religious reformation. With Rodriguez he received the last in- structions of Saint-Simon, and the two were entrusted

with the propagation and development of his system. Their first step was the establishment of a journal, entitled Le Producteur, and of a limited liability company for its support. This journal had for its motto " The Golden Age, hitherto placed by blind tradition in the past, is before us." Enfantin contributed largely to its pages; and setting forth in it not only the doctrines of his master, but also new views of his own, he gave offence to some of his supporters, and in the course of 1826 the journal was discontinued. He had now become known, and had found influential adherents in some members of the Liberal party, among them Blanqui, Bazard, Duveyrier, Pereire, Auguste Comte, Michel Chevalier, and Pierre Leroux. Before the close of 1828 they had their public meetings and lectures, not in Paris alone, but also in many provincial towns. The revolution of July (1830) brought a new freedom to the socialist reformers, and they did not fail to avail them- selves of the occasion. A proclamation was issued demand- ing the community of goods, the abolition of the right of inheritance, and the enfranchisement of women. Enfantin now resigned his office of cashier, and devoted himself wholly to his cause. He obtained the support of the Globe newspaper, made appeals to the people by systematic preaching, and organized centres of action in some of the principal cities of France, The headquarters in Paris were removed from the modest rooms in the Rue Taranne, and established in large halls near the

Boulevard Italien. Bazard and Enfantin were proclaimed ‘Péres Suprémes.”

This union of the supreme fathers, however, was only

nominal. A divergence was already manifest, which rapidly increased to serious difference and dissension. Bazard had devoted himself to political reform, Enfantin to social and moral change; Bazard was organizer and governor, Enfantin was teacher and consoler; the former attracted reverence, the latter love. A hopeless antagonism arose between them in reference to the proposal of Enfantin to supersede the formula of Saint-Simon, which was in sub- stance “the greatest good of the greatest number,” by another thus worded—‘*“ To each one according to his capacity, to each capacity according to its works.” The breach was widened by Enfantin’s announcement of his theory of the relation of man and woman, which would sub- stitute for the “ tyranny of marriage ” a system of “ free love.” Bazard now separated from his colleague, and in his withdrawal was followed by all those whose chief aim was philosophical and political. Enfantin thus became sole “‘ father,” and the few who were chiefly attracted by his religious pretensions and aims still adhered to him. New converts joined them, and Enfantin assumed that his followers in France numbered 40,000. He wore on his breast a badge with his title of “Pére,” was spoken of by his preachers as “ the living law,” declared, and probably believed, himself to be the chosen of God, and sent out emissaries in quest of a woman predestined to be the “female Messiah,” and the mother of a new Saviour. The quest was very costly and altogether fruitless. No such woman was discoverable. Meanwhile believers in Enfantin and his new religion were multiplying in all parts of Europe. His extravagances and success at length brought down upon hia the hand of the law. Public morality was in peril, and in May 1832 the halls of the new sect were closed by the Government, and the father, with some of his followers, appeared before the tribunals, He now retired to his estate at Menilmontant, near Paris, where with forty disciples he continued to carry out his views. In August of the same year he was again arrested, and on his appearance in court he desired his defence to be undertaken by two women who were with him, alleging that the matter was of

special concern to women. This was of course refused. The trial occupied two days and resulted in a verdict of

guilty, and a sentence of imprisonment for a year with a small fine. This prosecution was the death-blow to the new society, which soon became extinct. Enfantin was released in a few months, and then, accompanied by some of his followers, he went to Egypt. He stayed there two years, and might have entered the service of the viceroy if he would have professed himelf, as a few of his friends did, a Mahometan. On his return to France, a sadder and practically a wiser man, he settled down to very prosaic work. He became first a postmaster near Lyons, and in 1841 was appointed, through the influence of some of his friends who had risen to posts of power, member of a scientific commission on Algeria, which led him to engage in researches concerning North Africa and colonization in general. In 1845 he was appointed director of the Paris and Lyons railway. Three years later he established, in conjunction with Duveyrier, a daily journal, entitled Le Crédit, which was discontinued in 1850. He was after- wards attached to the administration of the railway from Lyons to the Mediterranean, Father Enfantin held fast by his ideal to the end, but he had renounced the hope of giving it a local habitation and a name in the degenerate obstinate world. His personal influence over those who associated with him was immense. “He was a man of a noble presence, with finely formed and expressive features. He was gentle and insinuating in manner, and possessed a calm, graceful, and winning delivery ” (Gené. Mag., Jan. 1865). His evident sincerity, his genuine enthusiasm, gave him his marvellous ascendency. Not a few of his disciples have since ranked amongst the most distinguished men of France. He died suddenly at Paris, September 1, 1864.

Amongst his works are—Doctrine de Saint-Simon (written in conjunction with several of his followers), published in 1830, and several times republished ; Economie politique et Politique (1831) ; Correspondance politique (1835-1840); Correspondance philosophique et religveuse (1843-1845); and La Vie éternelle passte, présente, future

(1861). A large number of articles by his hand appeared in Le Producteur, L' Organisateur, Le Globe, and other periodicals, He

also wrote in 1832 Le Livre Nouveau, intended as a substitute for the Christian Scriptures, but it was not published.

ENFIELD, a market town of Middlesex, is situated ten miles N.E. of London. A large number of its inhabitants are employed in the royal small arms factory at Enfield Lock, where the rifle now manufactured, however, is not the " Enfield," but the Martini-Henry. Enfield has the remains of an ancient royal palace, in which Edward VI. kept his court, and where Elizabeth rested on her way to London in order to assume the crown. Near to it is Enfield chase, disforested in 1799 and divided between various parishes and the Crown, and now occupied by several country seats of the more opulent traders of London, The population of Enfield in 1871 was 16,054.

ENFIELD, a town of the United States, in Hartford co., Connecticut, is situated on the Connecticut river, and on the railway from Hartford to Springfield, 14 miles N. of Hartford. It is connected by a bridge with Suffolk, and two miles further down the river there is a bridge by which the railroad crosses to Windsor-Locks. Enfield has a large carpet factory and extensive powder mills. It contains a community of Shakers, who are noted for their stock-raising and their culture of seeds. The population in 1870 was 6322.

ENFIELD, Wittt1am (1741-1797), a dissenting divine, noted for the number and variety of his literary works, was born at Sudbury in 1741. He received his education at the dissenting academy at Daventry, under the care of Dr Ashworth, where he passed through the usual curriculum of five years. Immediately afterwards he was chosen minister of the congregation of Benn's Garden, Liverpool, in 1763. During his residence in Liverpool he published

two volumes of sermons (1768-1770), as well as a collec- tion of hymns and family prayers, which met with a very favourable reception. In 1770 he was appointed tutor and lecturer on the belles-lettres at Warrington academy, an office which he held till the dissolution of the academy in 1783. On accepting it he obtained the degree of Doctor of Laws from the university of Edinburgh. Simultaneously with his tutorial appointment he held the pastoral charge of the dissenting congregation of Warrington. After an interval of two years spent in private tuition, he was chosen pastor of the dissenting (Unitarian) congregation of Octagon Street, Norwich, where he remained till his death, which took place November 3, 1797, in the 57th year of his age. Of the works of Dr Enfield a considerable number are mere compilations, in which no higher quality is displayed than the taste which dictated the selection. To this class belong the Preacher's Directory (1771), the English Preacher (1775-4), the Speaker (1775), and others. The last named work, an elocutionary manual, has passed through numerous editions, and Enfield's name is better known in connection with it than through any of his other works. Among his original works, however, and especially those published or written at the close of his life, there are some that display considerable powers of thought and great elegance of expression. His posthumous sermons on the principal characters of the Old and New Testaments not only evince the author's ability as a commentator, but show profound insight into the ethics of history. In theology he was a Socinian. At the recommendation of Dr Bagot, bishop of Norwich, he published an abridg- ment of Brucker's History of Philosophy, in 2 vols. 4to. He also wrote a work, entitled the Znstetutes of Natural

Philosophy, Theoretical and Experimental, 4to, 1783,

besides a variety of occasional pamphlets and sermons. His last literary employment was in writing for his friend Dr John Aikin's Biographical Dictionary. More than half the lives in the first volume of that work are from his pen.

ENGADINE (the ancient Vallis Hniatina or Gnigadena, German Hngadin, Italian Hngadina), the valley of the Inn from its source to the

Austrian frontier at Martinsbruck, a distance (by road) of about 65 miles. It is divided politically into two districts, the Upper and Lower Engadine, and four circles, which form part of the Gotteshausbund, one of the three leagues comprised in canton Graubiinden.

The Upper Engadine has only one circle, whose chief village is Samaden. It consists of the valley of the Inn with its tributaries. The river flows through a long and straight trough, about 30 miles in length, and varying from a mile to half a mile in breadth, lying between lofty mountains, at a mean height of 5500 feet above the sea, being, after the Avers and Spél valleys, the highest inha- bited region of central Europe. Unlike most Alpine valleys the Engadine is closed at its head only by a low bank. The Maloya Pass (5942 feet) is hardly 100 feet above the lake of Sils. The lakes of Silvaplana and St Moritz lie at nearly the same level. Samaden (ad sum- mum (&ni) stands at the junction of the Inn and its first considerable tributary the Flatzbach. This stream drains the principal glaciers of the Bernina chain, the largest glacier group in eastern Switzerland, remarkable for its closely-clustered summits, the highest of which, Piz Bernina, attains a height of 13,294 feet. Beside the Flatzbach runs the road to the Bernina Pass (7658 feet), leading into the Val Tellina. It passes Pontresina, a village of late years much frequented in summer by travellers of all nations. Its name has been assumed to be a trace of the presence of Saracens in this part of the Alps (Pons Saracenorum). Another and more plausible deriva- tion (Pons Rheetize) has been suggested.

The valley below Samaden is for some distance level and uniform, and studded with flourishing hamlets. The boundary between the two Engadines lies between Scanfs and Zernetz, in an uninhabited part of the valley.

Owing to its great elevation, the scenery of the Upper Engadine has a bleak northern aspect. Pines and larches alone flourish, garden vegetables are grown only in sunny spots, and there is no tillage. The Alpine flora, however, is very rich and varied, and the Upper Engadine has been called “a paradise for the botanist.” Snow always lies low on

the mountain sides, and often falls even in the valley in the month of August. Hence the climate is described in the proverb—“ Nine months winter and three months cold weather.” The mean annual temperature is 36°5° Fahr., that of the summer months 50°8° Fahr., of the winter 17°5° Fahr. The villages are built entirely of stone. The houses are large and roomy, a cattle stable being often included under the same roof. The small deeply-set windows bear witness to the severity of the climate. Those of the lower story are protected with iron gratings, a precaution the character of the people does not justify. An abundant use of paint and whitewash gives many of the dwellings an almost Dutch air of cleanliness, and the window-sills are usually decorated with carnations and other bright flowers.

The Lower Engadine is divided into three circles. Schuls is the chief village; next in importance is Zer- netz, which stands at the junction of the Inn and Spol. The latter stream issues from Val di Livigno, the only inhabited valley north of the Alps belonging to Italy. At this point the Inn flows for a few miles due N. through a wooded defile before resuming its N.E. course. From Suss to Finstermunz it runs in a deep channel, while the villages lie high on terraces on the mountain sides, cut off from one another by deep ravines, through which descend streams from the glaciers of the Silvretta (Silva Rhzotiz) range on the N. and from the wild dolomite ridges of the Scarlthal on the S. In the recesses of the latter bears are still found. The villages of the Lower Engadine are not So well built as those of the upper valley, and the inhabi- tants are said to be less energetic and more ignorant than their neighbours.

Below the village of Schuls, on the left bank of the Inn, lie the baths of Tarasp, much resorted to by North Germans. The springs to which they chiefly owe their repute are saline-alkaline in character.

One of the highroads into Italy has since early times passed through the Upper Engadine. The Romans used the Bernina Pass in conjunction with the Julier. In the Middle Ages this route was the most frequented between the Mont Cenis and the Brenner, and was chosen by travellers who wished to avoid the Milanese territory and the Spanish troops. In

recent years the old mule-track over the Bernina Pass has been converted into a military road, and the internal communications of the country have been opened up on all sides. Roads have been made over the Albula, Fluela, and Ofen Passes, and the villages of the Lower Engadine, previously almost inaccessible on wheels, have been united by a good road both to the upper valley and to Tyrol.

The population of the valley at the last census (1870) was 9756, of which 8402 are Protestants and 1335 Catho- lics. The Catholics are found chiefly at Tarasp and in the secluded glens of Samnaun and Sampnoir on the Tyrolese frontier. The people are industrious, frugal, and alive to their own interests, and at the same time more independent in manner, and less courteous to strangers than those of central Switzerland. With the exception of Tarasp, which is mostly German, the whole district is "' Romantsch." The language is a dialect known as " Ladin," nearly allied to

that spoken in the Tyrolese valleys of Groden, Abtei, and Enneberg. It has a scanty literature, consisting of a trans- lation of the Bible, some prayer and hymn books, and one newspaper, the Yéql d'Hngiadina, printed once a week at Samaden. German is now taught in all the schools of the valley. The wealth of the inhabitants consists in their hay meadows and pastures. The lower Alps feed large herds of cows, the upper are let to Bergamasque shepherds, who travel thither every summer with their flocks. A consider- able trade is also carried on in Italian products and Val Tellina wines, in which the Engadiners serve as carriers. Formerly many of them used to emigrate to different parts of the world, where they found employment, especially as pastry-cooks. Of late years the sudden influx of strangers has changed the picturesque villages into groups of hotels, and diverted the inhabitants from their former pursuits. The iron springs of St Moritz, the cause and centre of the immigration of summer visitors from all parts of Europe, have been known since the 16th century. They had been steadily resorted to by Germans and Italians since the days of Paracelsus, though it was not till the present century that any bath-house was erected for the convenience of the guests, who found sufficient accommodation in the village. The waters are highly charged with alkaline salts and carbonate of iron, with a small proportion of phosphoric acid, and traces of iodine, bromine, &c. Their influence, in combination with mountain air, is extremely beneficial in cases requiring strong tonic treatment.

See Coxe, Zravels in Switzerland ; Theobald, Naturdtlde aus den Thétischen Alpen; Ball, Central Alps; Mrs H. Freshfield, .4 Summer Tour in the Grisons ; Caviezel, Engadine ; Lechner, Piz Languard ; Dr Burney Yeo, A Season at St Moritz (for medical aud botanical information) ; Fortnightly Review, No. cxi., new series, (D. W. F.)

ENGEL, Jonanna Jaxozp (1741-1802), a German writer, chiefly distinguished as a dramatist, was born at Parchim, in Mecklenburg, on the 11th September 1741. His father was a clergyman, and he himself studied for the church, though he did not enter upon the clerical profession. He studied at Rostock and Biitzow, and afterwards at Leipsic, where he took his doctor's degree in 1769. In the same year he produced his first drama, Der dankbare Sohn, which was received with marked approval. In 1776 he was appointed professor of moral philosophy and belles- lettres in the Joachimsthal gymnasium at Berlin, and a few years later he became tutor to the Prussian crown-prince, afterwards Frederick William III. The lessons which he gave his royal pupil in ethics and politics were published in 1798, with the title Fuirstenspegel, and furnish a favourable specimen of his powers as a popular philosophical writer. In 1787 he was admitted a member of the Academy of Sciences of Berlin, and ia the same year he became director of the royal theatre. In the latter situation he was not successful, owing chiefly to an infirmity of temper, and he resigned it in 1794, For some time he resided at Schwerin, but on the accession of his former pupil Frederick William III. to the throne he was invited to return to Berlin, and received a pension. He died while on a visit to his native place on the 28th June, 1802.

Besides numerous dramas, some of which had a con- siderable success, Engel was the author of several valuable works on wsthetical subjects. His Anfangsgriinde einer Theorie der Dichtungsarten (Leipsic, 1783) was one of the earliest works on the theory of poetry produced in Germany, and showed fine taste and acute critical faculty, if it lacked the loftier qualities of imagination and true poetic insight. 'The same excellences and the same defects were apparent in his Ideen zu einer Mimik (2 vols. Leipsic, 1785) written in the form of letters. His

Philosoph fiir cre Welt (Leipsic, 1788) consists chiefly of dialogues on men and morals, written in an attractive style, and con-

taining much just reflection and criticism. His last work, a romance entitled Lorenz Stark (Ueipsic, 1795), though its plot was weak, achieved a great success, in virtue of the purity of its style, the marked individuality of its characters, and the interest of its dialogues. Engel's Stimmdtliche Schriften were published in 12 volumes at Berlin in 1801-6, and a new edition of them appeared at Frankfort in 1857.

ENGELBRECHTSDATTER, Dortun (1634-1716), a Norwegian poetess, who enjoyed a very wide reputation throughout Scandinavia and over Germany during the first half of the 18th century. She was born at Bergen in January 1634; her father, Engelbrecht Jorgensen, was originally rector of the high school in that city, and after- wards dean of the cathedral. In 1652 she married Ambrosius Hardenbech, a theological writer famous for his flowery funeral sermons, who succeeded her father at the cathedral, when the latter died in 1659. By the poetess Hardenbech had five sons and four daughters. In 1678 her first volume appeared, Sjeelens aandelige Sangoffer (The Soul's Spiritual Offering of Song), published at Copenhagen. This volume of hymns and devotional pieces, very modestly brought out, had an unparalleled success, and surpassed in popularity every similar collection of that age. The fortunate poetess was invited to Denmark, and on her arrival at Copenhagen was presented at court. She was also introduced to Thomas Kingo, the father of Danish poetry, and the eminent pair greeted one another with a brace of improvised couplets, which have been preserved, and of which the poetess's reply is incom-parably the neater. The next fifteen years of her life were extremely unhappy. In 1683 her husband died, and before 1698 she had buried all her nine children. In the midst of her troubles appeared her second work, the Taareofer (Sacrifice of Tears), which is a continuous religious poem in four books. This was combincd with the Sangoffer, and no less than three editions of the united works were published before her death, and many after it. In 1698 she brought out a third volume of

sacred verse, Kit kristeligt Valet fra Verden (A Christian Rejection of the World), a very tame production. In her old age she was honoured by a visit from the great poet of her time, Petter Dass, who made the laborious journey to Bergen merely to see her. She died, aged eighty-two, in 1716. The first verses of Dorthe Engelbrechtsdatter are the best; her Sangoffer was dedicated to Jesus, the Zaareoffer to Queen Charlotte Amalia; the change is significant of her different position in the eyes of the world. She is, all through, a dull and tiresome writer, but her immense fame among her contem- poraries, and her merit as one of the earliest writers of verse in modern Norway, give her a position in literature.

ENGHIEN, Lovts-Anrotnr-Henrt bE Bovurzon- Conve, Duc p' (1772-1804), was the son of Henri-Louis- Joseph, prince of Condé, and of Louise-Marie-Thérése- Bathilde d'Orleans, and was born at Chantilly on the 2nd August 1772. He was educated privately by the Abbé Millot, and was trained in the art of war by his grandfather the prince of Condé, with whom he was present at the battle of St Omer in 1788. In 1789 he, along with the other members of his family, went into exile. In 1792 he joined the royalist forces under his father in Flanders, and on the dissolution of this army he served under his grand- father, and specially distinguished himself at the battle of Berstheim in 1793. In 1794 he was made knight of the order of St Louis, and from 1796 to 1799 he commanded the vanguard of his grandfather's forces. When these were disbanded in 1801, he contracted a private marriage with the Princess Charlotte, niece of Cardinal de Rohan, and took up his residence near Ettenheim in Baden. Being suspected of concocting a plot against Napoleon Bonaparte,

spies were placed to watch his movements, who reported, it is said falsely, that he was in the habit of making frequent secret journeys along with General Dumouriez. Bonaparte therefore thought it necessary to seize his papers, and on the 14th March 1804 caused his chateau to be surrounded by 400 gendarmes, who took the duke prisoner, and conducted him to Strasburg. After being brought to Paris

on the 20th March, he was conducted to Vincennes, where he was tried by court martial, and with- out being found guilty of any definite charges, was on the morning of the 21st at four o'clock condemned to death as a traitor. Half-an-hour afterwards he was led out to execution, and as soon as he was dead he was thrown into a grave, which, in anticipation of his sentence, had been prepared beforehand. Upon Napoleon's conduct in these arbitrary proceedings various interpretations have been put, but there are scarcely materials for forming a decisive judgment, It was in reference to the execution of the

Due d'Enghien that Fouché made the remark which has passed into a proverb: " It was worse than a crime; it was a blunder." After the Restoration the remains of the duke were removed to the chapel of the castle at Vincennes,

ENGINEERING—the art of designing and construct- ing works—embraces a very wide range of subjects, and the different departments into which the profession is now divided do not admit of very strict definition ; but it may be mentioned that civil engineering includes the design and construction of canals, river navigations, harbours, docks, roads, bridges, railways, lighthouses, water supply, irrigation, sewerage, gas supply, telegraphs, &c.; mechanical engineering includes machinery, mill-work, steam-engines, iron shipbuilding, agricultural implements, &c. ; mining engineering includes the working and raising of coal, iron, lead, copper, &c., and other minerals; and military engin- eering includes fortifications, gunnery, artillery, telegraphy, &c., as applied in warfare.

ENGLAND

Plate I. PART IL—GEOGRAPHY AND STATISTICS. I. Situation.—Soil und Climate.—Political and all-importaut to England, known as the Coal Measures, a Civil Divisions. term originally used by the miners. The beds of coal, solid Situa- NGLAND, comprising, with Wales, the southern | basis of England's modern supremacy in arts, manufactures, tion. portion of the island of Great Britain, extends from

| and, to some extent, political power, lie upon a peculiar 49° 48° to 55° 45’ N. lat., and from 1° 45’ E. to 5° 44’ W. | stratum, which generally, but not always, is of the nature long., and covers an area of 58,320 square miles, It | of fire-clay. Coal itself is well known to consist of corresponds in latitude with Northern Germany and the | mineralized vegetable matter, the intermingled shales and Netherlands. In shape it is nearly triangular; and owing | sandstones still showing the impressions of trunks of trees, to its being surrounded by the sea on all sides, except for | ferns, and reed-like plants, and it is supposed that this a distance of about seventy miles on the Scottish border, | fire-clay was the original soil upon which grew the priceless it has a most extensive coast-line. The seas which encircle | treasure. it are the German Ocean or North Seaon the E., and the The Coal Measures are covered by the Permian rocks Geolo- Atlantic Ocean on the W. and S., the latter receiving in | of England, which complete the geological formation to sical some of its parts the names of the Irish or St George’s | which the name of Paleozoic or Primary strata has been “28 Channel, and of the English Channel. The coast is much | given. “During the time they were forming,” says indented, more particularly on the Atlantic side, the total | Professor Ramsay, “ this part of the world suffered many length, following the indentations, being estimated at over | ups and downs, accompanied by large denudations ; but 2000 miles. at the close of the Permian period, a disturbance of the Physical There are few countries more diversified in physical struc- | strata on the greatest scale put an end to this great struc- ture, or in soil, climate, and natural scenery, than England. | Paleozoic epoch over all our area, and much more besides, ture. As regards physical structure, it has been truly described | and from the Permian beds downwards to the Cambrian

to be in itself “an epitome of the geology of almost the whole of Europe.” Nearly all the formations of the earth’s crust, from the Silurian upwards to the most recent, are to be found, in layers more or less thick, in different parts of England. The lowest geological formations, known in genera] as Primary or Paleeozoic, are met with principally in the north and north-west of England, in the counties of Cumberland and Westmoreland, and in North Wales. The rocks of

Cumberland and North Wales, belonging to the Lower Silurian formation, consist mainly of slaty and gritty strata, interbedded with various kinds of felspathic lava and volcanic ashes, accompanied by numerous bosses and dykes of greenstone, quartz-porphyry, and other igneous rocks, These latter contribute greatly to give rise to that peculiar mountainous aspect which distinguishes these dis- tricts. The next geological formation, above that of the Silurian, is found in the Old Red Sandstone, and the so- called Devonian rocks, which occupy extensive tracts in Devonshire, Cornwall, South Wales, Herefordshire, and Worcestershire. Above these strata comes the Carboni- ferous Limestone, composed entirely of sea-shells, encrinites, and other organic remains, which formation, stretching from South Wales through the south-west of England into Derby- shire, attains in parts a thickness of 3000 feet and more. Next above the Carboniferous Limestone come the strata,

strata a large part of what is now England was heaved up and formed dry land, to be again wasted and worn away by sea-waves and rivers, and all the common atmospheric agencies. This old land in great part consisted of what we now know as Wales, and the adjacent counties of Hereford- shire, Monmouthshire, and Shropshire, of part of Devon and Cornwall, and probably the Pennine chain, and all the mountainous parts of Scotland. Around old Wales, on three sides of Cumberland, and probably all round and over great part of Devon and Cornwall, the New Red Sand- stone was deposited. Part at least of this oldest of the Secondary rocks was formed of the waste of the older Palzeozoic strata that had then risen above the surface of the water."

If, in the physical structure of England, the Primary Pre. — strata form a highly important element as containing the Hohe Coal Measures, the more immediate nature of the soil is 7822"

determined by the Secondary and Tertiary formations, Among the Secondary strata, none are more interesting than the so-called " Wealden series" of sonthern England. Geologists are agreed upon the fact that the Wealden and Purbeck beds represent the delta of an immense river, equal in size to the modern Ganges or the Mississippi,

the waters of which carried down to its mouth the bodies of huge reptiles and mammalia now extinct, or the semblance

Altera- tions of coast line.

Encroach- ments of the sea.

Moun- tains and lakes.

of which is to be found only in the tropical regions. But if this much is ascertained, by the evidence of organic remains found in abundance in Kent and Sussex, there is, and in all likelihood ever will be, complete ignorance as to the shape and extent of the continent which this great river drained, and of which England then formed a part. Professor Ramsay surmises that "in size it must have been far larger than Europe, and probably as large as Asia, or the great continents of North or South America."

The formations of the Tertiary or Eocene period lie all over England, the most recent being represented by the alluvial beds of Norfolk, Suffolk, and South Hampshire, and of the basin of the Thames. The whole of the east coast of England, and a great part of the south coast, not only bear the mark of the most recent geological changes that have taken place in this country, but are affected by a con- tinuation of them to this day. A long extent of coast-line constantly undergoes alterations, in some instances the land gaining upon the sea, and in others, rather less numerous, the sea upon the land. The whole of Romney Marsh, in Kent, embracing upwards of 24,000 acres, formerly con- stituted an arm of the sea, where vessels rode in deep water, carrying produce to ports which are no more in existence. Lydd, or, as it is called in old records, Hlyda, and Romney, though maritime still in name, retaining some of the ancient privileges of the Cinque Ports, have become, through changes in the coast-line, small inland towns ; and the same has been the fate of Rye, Winchelsea, and other places in that district. Again, the Isle of Thanet, in the north- eastern corner of Kent, has ceased to be an island at all but in name. The wide estuary of the sea,

separating it from the mainland, and through which ships in comparatively recent times sailed from the English Channel into the Thames, using it as the shortest road from the south to London, has entirely disappeared, leaving barely a rill of water to mark its former existence.

If the sea retreated on some parts of the coast, it encroached, and is encroaching, on the firm land over a considerable extent of other coastline on the German Ocean, at well as on the English Channel. Ravenspur, once an im- portant town of Yorkshire, where Bolingbroke, afterwards Henry IV., landed in 1399, is now submerged by the sea waves ; and Eccles-by-the-Sea, Cromer, and other ancient ports in Norfolk have met with the same fate. It is a com- mon occurrence for the pedestrian who rambles over the Kentish hills bounding the narrower parts of the English Channel, to find that the path he is following suddenly comes to an end at the edge of the cliff, interrupted by a vertical precipice towards the shore. The process of destruction, slow in some places, is so rapid in others that it can be traced from month to month, and even from week to week—the incessant roll of the tides washing away the soft Eocene strata forming the base of the cliffs, and leaving the summits to roll over into the sea. It is the same in Yorkshire as in Kent. Over a distance of thirty-six miles, between Bridlington and Kilnsea, says Professor Phillips, "the materials which fall from the wasting cliff are sorted by the tide; the whole shore is in motion; every cliff is hastening to its fall; the parishes are contracted, the churches wasted away." Many cliffs of the east coast, from the Humber to the mouth of the Thames, are suffering from this destructive action of the sea, in some places at an average rate of from 4 to 5 yards a year, or a quarter of a mile in a century.

_ In conformity with the geological structure of England, its mountains lie in the north and west, falling into undu- lating ground in the centre and towards the south, and leaving the eastern districts, bordered by the German Ocean, a uniform plain. The mountains of England may be looked upon as one principal chain, often interrupted,

however, and with endless ramifications, stretching from the Scottish border, in Northumberland, down to the western end of Cornwall, jutting out there into the Atlantic. The chain, traced in this direction, commences with the Cheviot Hills, the highest summit of which is Cheviot Peak, in Northumberland, 2676 feet above the level of the sea. Stretching south-westward, the chain next merges into the mountain ranges of Cumberland and Westmoreland, comprising Skiddaw, 3022 feet, Helvellyn, 3118 feet, and Scawfell, 3208 feet above the level of the sea. Within these ranges lie the only notable lakes of England, the largest of which, however, Windermere, does not cover more than three square miles. After sending out numerous branches eastwards into the county of York, the chain sinks to modest elevations in Lancashire and Cheshire, but rises again in Wales, where it attains its greatest height in the summit of Wyddva, the pinnacle of the Snowdon range, 3571 feet above the sea. Partly lost in the Bristol Channel, and partly ramifying through Gloucestershire, Wilts, and Somerset, the chain next rises into high table- land in Devonshire—Dartmoor Forest, averaging an eleva- tion of 1500 feet above the sea-level, forming its most ele- vated portion, The chain gradually declines from Dartmoor to the Land's End, and becomes also more con- tracted in that direction. From the Dunkerry Beacon, on Exmoor, 1668 feet above the sea, the mountain range goes sinking on to Carnwarth, in Cornwall, 849 feet; to Cara' Brea, 697 feet; and, finally, to the famous headland of Bolerium, the granite masses of which oppose the ever- surging waters of the Atlantic, but rise only about 60 feet above them.

Essentially dependent on the configuration of the chain Rivers,

of mountains traversing England is that of its rivers. As the mountainous regions are in the west, the principal rivers flow away from them, towards the east, with but few exceptions. Surrounded by the sea, and with a moist atmosphere, England has a comparatively large number of rivers, though none of them of great length, their course being in most instances the shortest allowed by the con- figuration of the island. At the head of English rivers, with acknowledged supremacy over the rest, stands the Thames. It drains an area of 6160 square miles, exclusive of its lower estuary, calculated to

embrace an additional drainage of about 4000 square miles. Next, in extent of area of drainage, come the Trent and Ouse, the joint waters of which form the Humber, carrying off the rain- fall from 9550 square miles of land, or about one-sixth of the whole of England. The Witham, the Welland, the Nen and their tributaries, flowing into the old estuary of the Wash, drain together an area of 5850 square miles. In comparison with the drainage area of these rivers, run- ning principally from east to west, that of currents fol- lowing an opposite direction is small; but several of them are nevertheless of great commercial and industrial im- portance. Foremost among these westerly-flowing rivers stands the Severn, the source of which is only a short distance from that of the Thames, the watershed being formed here by the narrow Oolitic escarpment of the Cotswold hills. The Severn drains an area of 8580 square miles, being more than that of all the other westward- running rivers together. Next to it stand the Mersey, which, with its sea-estuary, drains 1750 square miles, the Avon, which drains 1210 square miles, and the Eden, which drains 995 square miles of land. In Camden's Britannia, published in 1605, there is a list enumerating 553 rivers and streams, with separate names, in England and Wales; but it cannot be said that there are, at the utmost, more than fifty rivers that can properly be described as navigable. The former importance of the rivers of England, connected with each other by a vast network of canals, for inland

Climate.

Rainfall.

PHYSICAL FEATURES. |

navigation, has suffered much since the introduction of railways; still they continue of great benefit for cheap, if slow, communication. Of the highest commercial value still are the Thames, the Humber, the Mersey, and the Severn, but these four principal English rivers derive their importance mainly, if not entirely, from being arms of the sea.

Affected by its insular position, with no part of its land more than a hundred miles from the sea, and perhaps equally as much—though

modern scientific investigation has not quite set this matter at rest—by that most remark- able current of the ocean known as the Gulf Stream, the climate of England is much milder than that of any other country in the same latitude on the continent of Europe, or in America. The mean annual temperature of England in recent years has been 49°7°,—that of summer averaging 60°8°, and that of winter 39°5°. The principal cause of this very high as well as very equable temperature, contrasting toa marvellous extent with that of other countries in like latitude, such as, for example, Northern Canada, is generally ascribed, with but few dissenting opinions, to the constant flow of heated water bathing the western shore of the island. The vast current of the Gulf Stream, originating within the land-locked area of the Gulf of Mexico, where the tropical sun is heating the waters as in an immense cauldron, after running for some distance eastward into the open ocean, then turns direct to the north-east, so that the first land it meets with, and which feels its effect, is the shores of Ireland and England. The actual amount of heat so given to England must be enormous, since the temperature of the Gulf Stream is at least 8° above that of the surrounding waters of the North Atlantic. A recent scientific traveller, making expcriments in a voyage from England to the United States, found that, while in the Gulf Stream the water was at sunrise always not less than 4° above the temperature of the air, by a sudden change, on quitting the north-easterly current, the temperature of the waves was found to be, on the average, 4° below that of the air. England is thus in the position of a great hot-house, kept above the surrounding temperature by never ending cur- rents of warm air.

But it isnot warmth alone, but moisture, which the Gulf Stream gives to England. Here, as in the greater part of western Europe, the prevailing winds are from the south- west, bringing with them the warm, moist air of the great Atlantic current, and discharging it in rainfall all over the land. This is strikingly shown in the statistics of rainfall in England, which prove it far higher in the western than in the eastern counties, and greatest in those parts where the moist Atlantic air-currents are unimpeded by mountain ranges. In tbe extreme south-west, in Cornwall, from 22 to 47 inches of rain fall every year, and the average may be taken at 36 inches; while in the adjoining county, Devonshire, a

little further inland, the average is but 32 inches. However, the high range of the Dartmoor hills causes a much greater variation in the amount of rainfall in the latter county than in the former ; for while no less than 52°33 inches fall on the summit of Dartmoor, only 19°87 inches fall at Sidmouth, lying sheltered to the west. The same is the case further east, in Somersetshire, where 36°76 inches of rain fall annually at West Harptree, facing the Bristol Channel, while only 19 inches fall at Taunton, shut off from the moist gulf current by the Exmoor range. So it is everywhere, all over England, with the general result that in the west, and more especially the southern parts of it, there is morc rainfall than in the east, the variations also being much less in the latter districts. In Dorsetshire the annual rainfall varies from 18°45 inches at Abbotsbury to 29-05 inches at Blandford, and in Wiltshire from 18°14 inchesat Chippenham to 25:20 inches at Salisbury. Further

eastward, in Hampshire, the variation is from 16°51 inches at Aldershot to 26°90 inches in Woolmer Forest ; while in Sussex, nearer the sea, it is from 18°18 inches at Hastings to 32°79 inches at Chichester. In the metropolitan counties of Middlesex, Kent, and Surrey the variations are no greater than from 16°22 inches at Hampstead to 28-90 inches at Cranbrook. The highest rainfall anywhere yet ascertained in England and Wales was at Beddgelert, Carnarvonshire, where it reached the enormous amount off 101°58 inches in the year 1870. Lying on the western slope of the highest summit of the Snowdon range, close to the Atlantic, the little village received a surcharge of the moist air of the Gulf Stream.

Co-operating in their influence, climate and geological Soil and formation have given England a soil moderately fertile, yet fertility.

adapted on the whole more for pasturage than for agricul- ture. In Wales, and other parts of northern and western England through which stretch the principal mountain ranges, the Silurian rocks, covered on their upper surface chiefly with hard gritty and slaty

material, difficult to decom- pose by atmospheric action, form but little soil, so that the ground must to a large extent remain untilled, leaving it at the same time well adapted for pastoral purposes. Again, through the inland counties, from Northumberland to Derbyshire, there runs another long tract of hilly country, composed of carboniferous rocks, so constituted as to be unfit for ordinary agriculture, except where intersected by stream-fed valleys. Further east come the bleak moorlands of Yorkshire, which, barren in their nature, are being surrounded and intersected by some of the most fertile tracts in England, extremely well cultivated and thickly inhabited. On the whole, it may be said that while much of the high-lying ground is fit only for pastoral purposes, the low lands are more or less fertile, the extreme moisture of the air having caused the complete disintegration even of such old geological formations as those of the Red Sandstone. It is a somewhat singular fact that nearly all the districts of England, where fruit-trees are grown in large quantities, lie chiefly upon red rocks, sometimes of the Old and sometimes of the New Sandstone strata. There cannot be a doubt, however, that, on the whole, the soil of England would be very barren, repaying poorly the labours of the husbandman, but for the vast cover of warmth and moisture received from the waters of the Atlantic, which favours it as the sun of more southerly regions, and makes its fauna and flora equal to those of any country in the temperate zone.

The physical aspect of England has had little to do with Civil

its civil divisions, which are somewhat arbitrary, and remote in their origin. The division of the country into tythings, hundreds, and counties is generally attributed, on the authority of Ingulphus, to King Alfred, but it is more probable that he only systematized what already existed, in the general survey which was taken during his reign. English county names occur in history before the extinction of the Heptarchy,some of the smaller kingdoms of which, as Kent, Sussex, and Essex, became counties under the new political settlement. At the same time, the kingdom of Wessex was composed of counties with still existing names, Berkshire, Hampshire, Wiltshire, and Somersctshire. Under King Alfred's re-arrangement, virtually that of the present day,

as far as the larger divisions are concerned, physical boundaries were frequently disregarded, which had its cause probably in the existence of the older political borders, such as those existing during the heptarchy. On the east coast of England, the divisions generally conform with the physical features: the Tyne, Tees, Humber, Wash, Yare, Stour, and Thames separate the counties of Northumberland, Durham, Yorkshire, Lincolnshire, Norfolk, Suffolk, Essex, and Kent. The same, however,

is not the case on the south and south-west coast, the smaller rivers of which were disregarded in fixing the borders of Kent, Sussex, Hampshire, and Devon. Again, the east-running Thames divides counties from its mouth almost up to its source; while the westerly Severn forms not a single boundary, even for a short distance, from its spring down to its sea estuary. ‘Finally, the dividing line between England and Scotland is mainly artificial in the west, while in the east are the natural boundaries of the Tweed and the Cheviot Hills.

Modern legislation has made few changes in the ancient divisions of England into counties, or shires, and hundreds. Each of the forty counties of England and twelve counties of Wales is still primarily divided into hundreds, although the borders thus formed are little more than nominal, the hundreds having become practically extinct as an adminis- trative subdivision. Originally signifying a district con- taining a hundred families, the division lost its meaning entirely with the unequal increase of population, and at present, while some hundreds count their population by hundreds of thousands, others have not gone far beyond the number that gave rise to the name. At the census of 1871 the number of hundreds, or their equivalents, for which the population was separately shown was 818. In naming the subdivisions corresponding to hundreds, the ancient word “‘ wapentake ” is still adopted officially as re- gards the counties of York, Lincoln, and Nottingham,— Yorkshire, exclusive of the city of York, and Lincolnshire being each divided into three parts, consisting of a given number of wapentakes. In Cumberland and Westmoreland the

hundreds are called “ wards,” while in Kent they are grouped into “lathes,” and in Sussex into “rapes.”

Intimately connected with the division into hundreds in former times was that into boroughs. The old Saxon borough, in fact, was nothing more than a hundred, or a

roup ‘of hundreds, encircled by a moat, a stockade, or a wall. All the inhabitants of the borough, or burgesses,

LN Gap RS

[DIVISIONS.

Council, shall think fit to accede to the request. The number of towns which thus obtained charters has since 1835 been 45; but the provisions of the Act were not universally adopted, and to this day a number of towns, some of considerable importance, are still without municipal organization, At the census of 1871, the total number of municipal boroughs was 224, containing more than one- fourth of the population of England and Wales.

Claiming high rank among the municipal corporations of Cinque England, and forming one of the most ancient and celebrated Ports.

subdivisions, or jurisdictions, of the country, are the Cinque Ports. The Cinque Ports existed as self-governing boroughs from a very early time, though the exact date of their incorporation is not known. It is stated in Jeake’s Charters of the Cinque Ports that in the records of the town of Rye there is a memorandum that ‘the five Ports were enfranchised in the time of King Edward the Con- fessor.” The five ports originating the title were Hastings, Romney, Hythe, Dover, and Sandwich. To these were added the so-called “ ancient towns ” of Rye and Winchelsea, which were placed, as regards rights and privileges, ou the same footing as the original Cinque Ports. Each of the seven towns, with the exception of Winchelsea, had one or more “‘members,” or “ limbs,” placed under the mantle of its privileges, very important for many centuries, one of them being an almost entire exemption from

taxes levied by the king. In early times these “members ” were in a great measure dependent from their respective ports, but the old connection has long ceased. Most of the old ‘““members ” are at present corporate towns, and therefore completely independent, and only the few that are not remain under the municipal jurisdiction of their parent ports. The still existing privileges of the Cinque Ports, including jurisdiction of the south coast from Seaford in Sussex to the mouth of the Thames, are of no great im- portance, but they are favoured by a large share of parlia- mentary representation. (See also vol. v. p. 786.)

were freemen, bound to each other as neighbours, sharing common burthens, and responsible for each other to sur-

Unlike the civil divisions of the country, those formed Parlia- for parliamentary representation are mainly of recent date, mentary

rounding communities. As the boroughs grew in size and importance, the hundred lost its former significance; still for a long time the original principle was kept in view of having the same subdivision, organization, and government for town and couutry populations. Many of the ancient boroughs have now fallen into decay, while new boroughs sprang up in many parts of the country with the rapid pro- gress of population which commenced after the middle of the last century. In 1835 a great change was made in their constitution, and the limits of many were enlarged by the adoption of new boundaries. The change was the result of the labours of a parliamentary commission appointed ‘to inquire into municipal corporations.”

The parliamentary commissioners experienced, at the outset of their work, considerable difficulty in ascertaining

the exact number of corporate bodies in England and Wales.

Acting upon the best information they were able to collect, they visited and instituted inquiries in 285 places. It was found that 16 of them contained corporations of an exclu- sively manorial character; that 89 could claim to be properly boroughs ; and that the remainder, 178 in

number, required legislation to settle their rights and privileges. The latter, accordingly, were placed under the operation of the Municipal Corporation Act, 5 and 6 Will. IV. c. 76. Subsequently to the passing of this Act, two more old boroughs, Ashton-under-Lyne and Hartlepool, were brought under its provision by the grant of new charters.

It was provided for by section 141 of the Municipal Cor- poration Act that any towns, on the petition of the in- habitant householders, may have granted to them charters of incorporation if Her Majesty, by the advice of the Privy

Vast changes in the character of this representation—the "visions

origin of which is involved is much obscurity—were made by the Reform Bill of 1832; and others, scarcely less im- portant, by the statute of 30 and 31 Vict. c. 102, known as the Reform Act of 1867. By the latter Act, the existing franchise was not only much enlarged, but new divisions of counties were made for electoral purposes, while the limits of many boroughs were extended, new ones created, and old ones excluded from the list. The new parliamentary boroughs created by the Act of 1867 were Burnley, Chelsea, Darlington, Dewsbury, Gravesend, Hackney, Hartlepool, Middlesborough, Staleybridge, Stockton, and Wednesbury ; a representative was also given to the university of London, and additional ones to Birmingham, Leeds, Liverpool, Manchester, Merthyr Tydfil, and Salford. On the other hand, 4 boroughs were disfranchised immediately by the Act, and 7 more in 1868, the year after its passing, while 36 were reduced to one representative instead of two. In the new division of counties made by the Reform Act of 1867, Cheshire and Lincolnshire were separated into North, Mid, and South ; Devonshire and Derbyshire into North, South, and East; Essex into North-East, North-West, and South ; Norfolk into West, North-East, and South-East ; Somersetshire into East, Mid, and West; and the West Riding of Yorkshire into North, Mid, and South; with minor alterations. These re-arrangements of parliamentary representation were more than justified by the changes of population brought abont by time. Within the parlia- mentary boroughs the

population increased 16‘1 per cent. from 1851 to 1861, and 23°3 per cent. from 1861- 71; while outside them the increase was only 8°9 per

Judicial

DIVISIONS. |

cent. in the first, and 5°5 per cent. in the second decennial period. Much less systematic than the parliamentary are the

divisions. judicial divisions of the country. There is in all of them

Eccle- siastical divisions.

Miscel- laneous divisions.

a striking want of coherence, even as regards the adminis- tration of the law. The circuits of the judges do not con- sist of any definite number of the county-court circuits, nor are the county-court circuits aggregates of the petty sessional divisions. For the purposes of assizes and jail delivery, there are in England eight circuits of the judges, besides the jurisdiction of the central criminal court in London. The eight circuits of the judges have received the names of the Home, Midland, Norfolk, Oxford, Northern, Western, North Wales, and South Wales circuits, indicating the counties which they embrace. Based chiefly on the old boundaries of hundreds, all the counties of England and Wales have divisions for the purposes of special and petty sessions. By the authority of various Acts of Parliament, the justices at quarter sessions are allowed to alter and re- arrange these sessional divisions, making them conformable, if so inclined, to the boundaries of poor-law unions. The last census returns show that in 1871 there were 700 sessional divisions in England and Wales, besides 193 boroughs with petty sessions, 97 of the latter having also separate quarter sessions. For police purposes there were, at the same time, 622 divisions, including 167 boroughs possessing independent police control.

Quite as early as the division of the country into hundreds was that into ecclesiastical districts. But they varied much, both in number and

extent, up to the time of the Reformation, and there have been constant altera- tions up to the present time. The ancient division of the land for ecclesiastical purposes was exclusively into parishes, or districts containing a church ; but as the population went on increasing, and additional places of worship came to be erected, some portions of the old parishes were generally assigned to the newly formed districts. First known simply as chapelries, these districts gradually acquired boundaries as definite, and as fully recognized by law, as those of the parent parish. In recent years, the term parish has acquired a rather uncertain meaning, being used in a twofold sense,—the clergy adhering to the old signification of ecclesiastical district, while the poor-law authorities make it the designation of boundaries separately rated for the relief of the poor. In the census returns for 1871, the term " civil parish " was adopted for the poor-law parish, to distinguish it from the ecclesiastical parish. The exact number of ecclesiastical parishes was not ascertained at the census of 1871, which only refers to " ecclesiastical districts," 3000 in number ; and in the absence of other official information, it is difficult to calculate it, the more so aS new parishes are being constantly formed by the action of the Ecclesiastical Commission, established in 1836, by Act 6 and 7 Will. c.77. According to estimates based on the returns of the Clergy List, there are at present about 13,500 ecclesiastical parishes in England and Wales. They are grouped in 728 rural deaneries, with further division into 78 archdeaconries, 30 episcopal dioceses, and 2 archi- episcopal provinces.

Besides the divisions already enumerated, there are vari- ous others of minor importance, or not in frequent use. Of this character are the so-called lieutenancy subdivisions, established to carry out the laws affecting the militia. Within the boundaries thus formed, lists are kept contain- ing the names of all men liable to serve, under certain cir- cumstances, in the militia of England and Wales, so as to keep the force in permanency. A subdivision of another kind is that of the country into highway districts. These divisions were constituted under the Act 25 and 26 Vict. c. 61, which gave power to justices in general, or quarter

sessions, to form special boundaries, consisting of parishes and places not within the jurisdiction of other boards or legal authorities, for the better management of highways. The Act came into effect in 1863, but its provisions, being optional, were not widely adopted; it led to the formation of not quite 500 highway districts. Their extent and population was not given in the census returns of 1871.

In the introduction to the report on the census of Com-

England and Wales, the registrar-general furnished a list of the various divisions of the country, showing their complexity. including those made for the special purpose of taking the census, into five orders, as follows :—

Order. Subdivisions. oe: MMe BRT eAIUIT Ele os ioricssc scciest ose mciesessacerseiwecescesretes AV Geeta nas oacacccousscemereneeceeroree' MOgeCO CCNA SOHGOO 1 iy Bhesistration Divisionsys:.s.c< aeb or dn anedrapsesocand0d, 52 Parliamentary Counties and Divisions of Counties 95 III. Hundreds, Wapentakes, Wards, Liberties, Sokes, 1.042 ATM ODOUGIISN § oxocswactns rectetacics cee diads os oeclendisie es s Petty Sessional Divisions and Boroughs…..... 893 Mieutenancy SUPAUWASIONS .-...04..0:00eecnsceseecessoos. 621 Pa Ue RR os iievics sos. oon. oe aM oa 647 Rominationm Drei Gts cise sswswerevs.. + saveedearciauieinns 626 TV. Registration Sab-Giscrictss, ...c000c.cssccceseasaseneese 2,195 VY. Parishes, Townships, or Places with separate…... 15.416 MEGUMI sole MO folll dill OMiacecsers, «ss csrtsas ss) oniassiaadeee ; ipammmnerentilorm, IDWS ye iF peeeeseecsaseencecneseesooss econ 32,543 Vil. Parliamentary, BOrouolis'....2..20—..i20s-00—+ cesses 198 MiumicipslWBOnOughst 22.cic….2….cecescacesscecssasesne 224 Mocalls board GD istric tates. ee seeceee ees aaeers eae 721 Towns with Improvement Commissioners…..... 88 Others Warceplowinetes…....-.~~c:.n0cc0 acrcccccs cseccccens 96 EWA ISETICISIS. «2.5 sac c. cee. .ntsaedeteerseveccesns 443 colesiasticaleWicthiCtss./.. «<< ces... 8,000~~

Commenting upon the extraordinary amount of divisions and subdivisions of England and Wales, the registrar- general remarks that "it is a peculiarity of this country that nearly every public authority divides the country differently, and with little or no reference to other divisions ; each authority appears to be unacquainted with the existence, or at least the work, of the others." He gives at the same time his opinion that "one simple connected series of subdivisions of the country" would not only simplify the census takings, greatly disturbed at present by "the multiplicity, entanglement, and want of harmony in the groups," but would still more be an aid towards reducing " the difficulties of local administration."

Il. Area and Population.—Vital Statistics —EHmigration.

plexity of exist ers es ing di- He classed the whole of the existing divisions, yisions,

Until the beginning of the present century, there existed Former no other knowledge of the actual area and population of estimates the country but what was given in the vaguest estimates, Ct popie

But there can be little doubt that the population of Hng- land and Wales was almost stationary for centuries, owing chiefly to want of intereommunication, which led to famines, more or less severe—it being a common occurrence that, while one county, with a good harvest, was revelling in abundance, the people of the adjoining one were starving. It is calculated, on the basis of a number of parish registers, that in 1650 the population of England and Wales numbered 5,450,000, having probably risen less than half a million during the lapse of a century. In the course of another century, when there was a feeble commencement of road- making, the increase amounted, probably, to close upon a million, the calculated population of 1750 being 6,400,000. From that time began a marked increase, and at the taking of the first census, in 1801, it was ascertained that the

lation.

Enume- rations at eight census periods.

Popula- tion in registra- tion dis- tricts,

Numbers of the sexes,

population, living on an area of 58,320 square miles, or 37,324,883 acres, numbered 8,892,536, being—if the former estimates were approximately correct—an increase of very nearly 24 milliots in little over fifty years. This rate of increase was not only continued, but came to be greatly exceeded in the present century.

Since the first census of 1801, regular enumerations of the people of England and Wales have been taken every

ten years.

The results of these enumerations are shown in

the subjoined table, giving the total numbers of the popu- lation at each census, together with the absolute increase, and the growth per cent., during each decennial period :—

Dates of Enumeration.

1801, March 10th… 1811, May 27th

1821, May 28th 1831, May 29th 1841, June 7th 1851, March 31st… 1861, April 8th 1871, April 3rd

Population.

8,892,536 10,164,256 12,000,236 13,896,797 15,914,148 17,927,609 20,066,224 22,712,266

Increase at | each census,

Decennial rate of increase per cent.

1,271,720 1,835,980 1,896,561 2,017,351 2,013,461 2,138,615 2,646,042

The increase of population throughout the century was

larger in the towns than in the country districts.

This

was most markedly the case in the centennial period from 1861 to 1871, as will be seen from the following table, showing the increase per cent. of the population in each of the eleven “registration districts” mapped out by the

registrar-general.

It will be seen that the greatest increase

was in the division, rich in manufacturing and mining industries, embracing the northern counties and York- shire, and the least in the agricultural districts of the

south-western and eastern counties.

Divisions. P ee eee

1861-71.

i ee canuueeae ee ec aes: 3,254, 260 . South Hastern (Surrey, Kent, Sus- sex, Hants, Berks ae ‘ aeten 2,167,726 III. South Midland (Herts, Bucks, Oxford, Northampton, Hunts, 1,442,654 Beds, Cambridge)..... ..... IV. Eastern (Kssex, Suffolk, Norfolk)....| 1,218,728 Y. South Western (Wilts, Dorset, 1,880,777 Devon, Cornwall, Somerset) .... eet? VI. West Midland (Gloucester, Here- ford, Salop, Stafford, Worcester, 2,720, 669 A CISA oop gcceeeaeiodsetetee sp VII. North Midland (leicester, Rut- land, Lincoln, N otts, Derby) ... 1,406,935 VIII. ee —_— (Cheshire, Lanca- 3,389,044 EX aeMorkslarem esc. cee, carccutaee eee 2,395, 569 X. Northern (Durham, Northumber+ land, Cumberland,

Westmore- 1,414,234 land) XI. Monmouth and Wales…..... 1,421,670

22,712,266

As regards sexes, the total numbers were as follows at each of the eight enumerations from 1801 to 1871 :-—

Date of Enumeration.

Malcs.

4,254,735 4,873,605 5,850,319 6,771,196 7,777,586 8,781, 225 9,776,259

11,058,934

Females.

4,637,801 5,290,651 6,149,917 7,125,601 8,136,562 9,146,384

10,289,965

11,653,332

Population.

Excess per cent. of Females.

8,892,536 10,164,256 12,000,236 13,896,797 15,914,148 17,927,609 20,066,224 22,712,266

OT OUHY HR ON OT 00 60 RSS CoM OMLon Ey Soll Eon

[PoPULATION.

The following table exhibits the main results of the Censusof census of 1871 as regards extent and population, giving 1871; the area, in statute acres, of each of the forty counties 1% of England and twelve counties of Wales, and the number ang of inhabited houses—a house being

defined as a separate popula. building inclosed by external and party walls—in each tion. county, The population according to the census of 1861 is appended for the sake of comparison.

Areain | Inhabited Population, Counties or Shires. Statute Houses, Acres. 1871. 1861. 1871. ENGLAND. H DECHOTG: jesse. css 295,582 30,506 135,287 146,257 BOCK S& seepec a we: ee 451,210 39,638 176,256 196,475 Buckingham ……. 466,932 BY aM 167,993 175,879 Cambridge ……..... 525,182| 40,272] 176,016{ 186,906 Chester…....0..0000- 707,078 | 110,449| 505,428] 561,201 Cornwall…….....| 873,600] 73,950| 369,390| 362,343 Cumberland…….....| 1,001,273 | 44,061 205,276 220,258 Bee cosine cine 658,803} 78,309} 389,327| 379,394 DEVON scsisescs ss ces 1,657,180 | 105,200 584,373 601,374 ID OVS 3 pligadarpaceeasene 632,025 39,410 188,789 195,537 DG AMT. o..s0cee 622,476 | 114,705 508,666 685,089 INISSEX Be See. Wasies cece 1,060,549 92,356 404,851 466, 486 Gloucester ……..... 805,102 | 101,407 485,770 534,640 Eleretord.y ss. seaaecies 534,823 26,371 123,712 125,370 lalerqatoresl Booqaebeoose 391,141 39,056 173,280 192,226 Huntingdon ……..| 229,544 14,082 64,250 63, 708 Went iter senses «ss 1,039,419} 151,344 738,887 848,294 Lhaneaster ……..- 1,219,221 | 530,490] 2,429,440 | 2,819,495 Lhe1CO SHOT: ..6.. 556 oe 514,164 58, 606 237,412 269,311 Tn COMM ween. ~~teee~~| Ly Osan 94,212 412,246 436,599 | Middlesex …….....| 180,186 | 321,229] 2,206,485 | 2,539,765 Monmouth ……..... 368,399 | .36,169 174,633 195,448 Norfolk eea…s+— 1,354,301 99,428 484,798 438,656 Northampton……... 630,358 52,539 227,704 248,891 Northumberland ..| 1,249,299 62,436 343,025 386,646 Nottingham…….... 526,076 68,419 273,867 319,758 O)siorat concdecnonaone 472,717 37,849 170,944 177,975 utlandensssrcsss 95,805 4,766 21,861 22,073 ISAO Dione: sensesse cree 826,055 50,804 240,959 248,111 Somerset……..... 1,047,220 92,205} 444,873 463,483 Southampton……... 1,070,216 98,283 481,815 544,684 tallord cescsecse sad 728,468 | 167,614 746,948 858,326 SUMMON. sc cmseece race 947,681 76,501 387,070 348, 869 RUMEPOY cvesnacesvcsace 478,792} 168,448 831,098 | 1,090,635 | SUSSEX .....eceeeeeeee 936,911| 75,385| 368,735| 417,456 Wramwitcksecewe.:. cs: 563,946 | 131,442 561,853 634,189 Westmoreland ….j| 485,432 12,671 60,817 65,010 AWHILESY sc eseee ete ccacs 865,092 54,874 249,311 257,177 Worcester …....6…

472,165| 69,988] 307,397| 338,887 ionic. ...cotinia 3,830,567 | 500,397 | 2,033,610 | 2,395,569 Total of England 32,590,397 |4,009,783 118,954,444 |21, 495,131 WALES. AMO TESOVE. cc scse ss 193,453 12,170 54,609 51,040 ITEC OM mr ee etaceaes 460,158 12,647 61,627 59,901 Cardigan ncss.c..0» 443,387 16,420 72,245 73,441 Carmarthen …..... 606,331] 24,333} 111,796} 116,710 Carnaryon'..... 370,273 23, 298 95,694 106,121 Denbigh it…...:... 386, 052 22,500 100,778 105,102 ch) 184,905| 16,636 69,737 76,312 Glamorgan …..... 547,494} 72,905 317,752 | 397,859 Merioneth …..... 385,291| 10,006 38,963 46,598 Montgomery …... 483,323 13,911 36,919 67,623 Pembroke….....) 401,691 19,583 96,278 ; 91,998 YAGI OIyawea reer cee es sc 272,128 4,925 25,382 25,430

4,734,436 | 249,334 | 1,111,780

1,217,185

Total of Wales…

Total Wet 37,324,888 |4,259,117 |23, 066,224 [22,712,266

and Wales…..

At the census of 1861 the number of inhabited houses was 3,739,505, so that there was an increase of 519,612 in the ten years. It was found at the census of 1871 that whereas in the whole of the United Kingdom there were on the average 5‘6 persons to each inhabited house, 0:41 persons to an acre, and 2°46 acres to a person, the propor- tions were very different in England and Wales, Expressed in tabular form, as most concise, they were as follows :—

VITAL STATISTICS. |

Acres toa Person.

Persons to an Acre.

Persons to an Tnhablted

Divisions.

0°66 0°26

ales 3°88

HON 1 AON!

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at the censuses of 1861 and 1871, and the rate of increase per cent. during the decennial period.

Rate of increase per cent.

1861, 1871.

April 8 April 3.

Cities and Towns,

0°61 1°64 Lond on… «eee 2,803, 989 8, 254,260 ; PAVCCN OGL joscssonvusvseeere-. cee 443,938 493,405 ; Mancheatere,....0 ee: eee 338,722 351,189 3°7 England and Wales are at present more densely popu- | | Salford… cece 102,449 | 124,801 | 21°8 lated than any country of Europe, except Belgium. 'Taking | | Birmingham ….....0..0….. aes ae 1p h U ited Kin dom the aver e deusit of Leeds Statatsisinisipysieis n't ceie a/eleisreteiererntal sisreteta tive 2 7,165 259, the whole of the Un neem > uA choi. ———ns Sia 185,172 | 239,946 | 29°6 population in 1871 was 265 individuals per square mile ; | | Bristol…..... 154,093 | 182,552 | 18°5 but while the proportion in Scotland was only 109, and Bradford,.....0…..-:s:seeeeeeeees. 106,218 | 145,830 | 37°3 in Ireland 169 per square mile, in England and Wales | | Newcastle-on-Tyne …..... 109,108 | 128,443 a : : bavateuer fanare wile FU iste nds i'e oe sSBRNES cane anus 97,661 121,892 | 24 it was 389 inhabitants per square mile. Portsmouth…....cccccsssccsses 94,799 | 113,569 | 19°8 Growth The growth of population leading to the present high SUMCORIAN .:c.5:.00s0asesseseeceec ces 78,211 98,242 | 25°6 of popu-

density has been of comparatively recent date. A succinct MO. Feo oa savsvedensvnsssnen 68,056 95,220 40-0 lation survey of it is given in the subjoined table, showing the Seen se eteeeeenecesceeeeens 74,093 | 86,621 | 16-0 oo Cee) Oo 72,3383 | 82,629 | 142 country. °stimated population of England and Wales at the end of | | Nomwich 0 74,891] 80,386} 7°3 " June every fifth year from 1801 to 1876, and also for | | Wolverhampton 0 60,860 | 68,291 | 12°2 1877, according to the returns of the registrar-general. ——__—_|_—_. Co a 5,368,434 | 6,270,275 '8 Years. Males. Females, mm A penn. At the end of June 1877, the population of the 13 largest 4,404,490 4,656,503 9,060,998 towns in England and Wales, each with over 100,000 4,700,476 4,955,643 9,656,119 inhabitants, was as follows, according to the estimates of 5,025,212 5,297,380 10,322,592 the registrar-general, based upon the returns of births and een teeters ee deaths :— London, 3,533,484 inhabitants ; Liverpool, 6,417,196 6,657,090 13,074,286 527,083 ; MM inchester, with Salford, 500,397 ; Birmingham, 6,859,085 7,185,375 13,994,460 377,436 ; Leeds, 291,580; Sheffield, 274,914; Bristol, 7,310,074 7,618,403 14,928,477 199,539 ; Bradford, 173,723 ; Newcastle-on-Tyne, 139,929 ; 7,784,883 8,144,609 | 15,929,492 Hull, 136, 933 ; Portsmouth, 124,867 ; Leicester, 113,581 ; 8,298,360 8,645, 732 16,944,092 d Sunderland, 108.343 inhabit 8,808, 662 9,174,187 17,982,849 and Sunderland, 1U,040 Inhabitants. 9,311,182 9,731,230 19,042,412 While the eight decennial census enumerations, from Vital sta~ 9,801,152 10,318,162 20,119,314 1801 to 1871, bear witness to the rapid growth of popula- tistics. Fees aoe ees tion in England and Wales, the favourable vital statistics 11/301,633 12,442 377 24.244 010 of the country are no less distinctly shown by the annual returns of the registrar-general compiled from the registers 11,948,677 12,598,632 24,547,309 of births, deaths, and marriages. These registers, in use, : though not general, since the reign of Queen Elizabeth, It will be seen that the annual increase from the beginning | were formerly a part of the ecclesiastical organization, and of the century till the middle of 1877 was at the average | continued to be attached, more or less, to the church till rate of 1:35 per cent., being considerably above that of any | the year 1837, at the commencement of which an Act of other country in Europe. Parliament came into operation which provided a far more Popula- The general increase of population was, as before noticed, |

complete machinery than that before existing for the exact a i, far greater in the towns than in the rural districts. This | record of all births, deaths, and marriages. The new oroughs

ea specially the case in the twenty years from the census

system—established eighteen years earlier than a similar districts, Of 1851 to that of 1871, as shown in the subjoined table.

one for Scotland—which relieved the clergy from the functions previously thrown upon them, was still more improved by subsequent Acts, one of the most important of which, making all registration of births and deaths com- pulsory, came into operation on the 1st of January 1875. It is generally held that the present system is as perfect as that of any country in Europe.

The following table gives the annual numbers of births, Births, deaths, and marriages in England and Wales for every fifth deaths, year from 1841—when the improved system had been ®2d mar-

Districts outside Parliamentary © Boroughs.

Census

Parliamentary Year,

Boroughs.

1851 1861 1871

7,438,679 8,638, 569 10,652,423

10,488,930 11,427,655 12,059,843

17,927,609 20,066,224 22,712,266

Actual increase in the two Periods.

1851-61 1,199,890 938,725 2,138,615 brought into full organization—to the year 1876 :— teal 1861-71 2,013,854 632,188 2,646,042 em i Births. Deaths, Marriages. : Increase per cent, ees

512,158 343,847 122,496

1851-61 bye ots) 390,315 145,664

1861-71 615,865 395, 396 154,206 657,704 391,369 159,262

Popula- One-fourth of the total urban population of England yeslees spb ieee tion of and Wales live in London, and not far from one-third live 797,428 514,879 190,112 od in 18 large cities and towns, selected by the registrar- 887,464 510,308 201,835

general for the publication of weekly rates of mortality, The following is a list of these 18 towns, all of them

The rate of births, deaths, and marriages for each 1000 containing over 60,000 inhabitants, with their population

of the population of England and Wales, computed on the

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estimated number for the middle of each of tlie same years was as follows :—

@o 1000 Persons living.

Persons

Deaths. Married.

Births. 32°2 33°8 84°2 84°5 84°6

85‘2

85°0 36°6

21°6 23°0 22°0 20°5 21°6 23°4 22°6 21°9

1841 1846 1851 1856 1861 1866 1871 1876

34°0 22°3 Taking the average of the whole period of 37 years, from 1841 to 1876, there was one birth annually to every 29 persons, one death to every 45 persons, and one individual married to every 61 persons. The highest birth rate was in 1847, when there was one birth to 32 persons ; the lowest death rate in 1845 and 1850, when there was one death to 48 persons; and the highest marriage rate in 1853, when one individual was married to every 56 persons. Propor- The proportion of the sexes born—not quite regular tion of throughout the period, but with a marked tendency to male the sexes. decrease—was that of 104,811 boys to every 100,000 girls. The disproportion in the excess of male births has been ascertained to find its equilibrium, through a higher rate of infant mortality among the males, about the tenth year of life, and is finally changed, by perilous male occupations and other causes, to the extent that there are 100,000 women of all ages to 94,900 men in England.

The number of illegitimate births underwent a gradual decline in the period from 1840 to 1876, which was greatest in the last decade. The average annual number of illegitimate births to every 100 births was 5°7 in the ten years from 1865 to 1874, and fell to 5°0 in 1875, and to 4:8 in 1876. The rate of illegitimacy was highest in the agricultural counties, where it increased in recent years, while largely decreasing in the urban districts. The in- crease was highest in Essex, where it rose to 10°5 per cent. ; in Hertfordshire, where it rose to 17°3 per cent.; and in Rutlandshire, where it went as high as 23°D per cent., so that in the latter purely agricultural county nearly one- fourth of all the births were illegitimate. ; Barly It seems probable that the decrease of illegitimacy in the mar. urban districts is much influenced by a constantly increas- riages. ing number of early marriages. While in the quinquennial

period 1841-45 the proportion of males under age that married was 4°38 per cent., and of females 13°33 per cent., the marriage rate of minors, undergoing a steady and unin- terrupted rise, went up in the

period 1871-75 to 8°15 for males and to 22°22 forfemales. In the ten years from 1846 to 1855, the proportion of males under age who married was 10°64 per cent., and of females under age 33°47, while in the ten years from 1866 to 1875, the proportional percentage was 17°05 for men and 47 '09 for women. Vitalstae The rates of births, deaths, and marriages in England tistics of and Wales compare very favourably with those of most England Continental countries. While the average annual birth rate comPared in the twenty years from 1856 to 1875 was higher in some bon states, such as Prussia and Austria, the annual death rate countries, during the same period was much lower, resulting in a larger actual surplus of births over deaths. As regards the average marriage rate within the period, that of England and Wales was not as high as in some Continental countries; but this again was more than compensated for by a greater fecundity of marriages. Taking the total increase of popu- lation within the century, England stands at the head of the list —France beingat the bottom—of all the states of Europe.

Mean average…..

Tllegiti- macy.

ENGLAND

[EMIGRATION.

The increase of population would have been still greater, Emigra. but for the disturbing element of emigration. It was soon tion. after the cessation of the Napoleonic wars that the emigra- tion movement from the United Kingdom began, setting in at first very feebly, and being directed almost solely towards the United States of America. It gained intensity during the decade from 1841 to 1850; and, gradually rising, reached its highest point in 1851 and 1852, in which years respectively 335,966 and 368,764 persons left the kingdom. After this there was a gradual decline in the number of British emigrants till 1861, when it sank to 91,770, which decrease was followed, with changes, by a further rise, and then by a final decline, lasting to the present time.

The following table gives a survey of the emigration from Emi- the United Kingdom to foreign countries, in groups of grants years and single years, distinguishing two great periods of ie rise and fall, from 1815 to 1852 and from 1853 to 1876 :— i

b

Years. erase Years, hae

Tete 120”.....---- 123,528 || 1853-1860…..... | 1,582,475 Toot iaa0…..... 247,292 || 1861-1870… ...0.. 1,967,570 1831-1940…..... age 252,435 ry Ee: 5 1,684,892 || 1872 ooo. eeeeeeeee 295,213 Toole eke £06,006 |) 1878 …..... .... 310,612 cc os CH eC. ee 241,014 ier ean a 173,809

eee, 138,222

Total, 1815-1852 .| 3,468,592

Total, 1858-1876 .| 4,961,350

During the whole of the two periods, embracing sixty- two years, the total number of emigrants that left the United Kingdom was 8,424,042.

In the returns of emigration issued by the Government, Emi-

no distinction of nationalities was made previous to the grants year 1853 ; and it cannot be stated, therefore, how many Enol F of the emigrants who left the country from 1815 to 1853 4,9 were natives of England and Wales. In the eight years Wales, from 1853 to 1860 the number of English emigrants was 195,684, and in the ten years 1861 to 1870 it rose to 365,115. In 1871 the number was 71,926, and in 1872 it rose to 82,339. The number fell 78,968 in 1873, to 56,338 in 1874, to 43,867 in 1875, and to 34,612 in 1876. During the whole of the twenty-four years from 18538 to 1876 the number of emigrants from England and Wales was 928,898, out of the total emigration of 4,961,350. The proportion of English emigrants was thus less than one-fifth, and assuming the same to have been the case during the whole period, it may be calculated that about a million and a half of natives of England

and Wales quitted the country in the sixty-two years from 1815 to 1876, which formed the emigration period.

The period all but closed with 1876, in which year the Emi- surplus of British emigrants over returning immigrants was rants reduced to the small number of 17,822. Since the year #4 an 1870, but not previously, tolerably accurate accounts were "a kept of immigration as well as emigration, with the results shown in the following table, which gives for the seven years from 1870 to 1876 the number of emigrants of British origin, together with the number of immigrants, with the balance of net emigration.

Number of Immigrants.

49,157 58,827 70,181 86,416 118,129 94,228 91,647

Number of British

igration. Emigrants. —

202,511 192,751

153,354 138,924 140,313 141,929 79,143 46,447 17,822

210,494 228,345 197,272 140,675 109,469

Destina- The British emigration of 1876 was made up of 73,396 ons In tion ot persons of English, 10,097 of Scottish, and 25,976 of Irish | lists on which the returns were based. Still, with all these emi- origin. Of the English emigrants, 34,612 went to the imperfections, and the undoubted miscalculations in the grants. United States, 6227 to British North America, 20,582 to | rental values, generally admitted to be large under-state- Australia, and 11,975 to other colonies aud other foreign | ments, enough remains to give a fair idea of the division countries. More persons of British origin returned from | of landed property in England and Wales. ; the United States than went there in the year 1876, the One of the most notable features of the returns is the Great number of emigrants being 54,554, and of immigrants | fact that the

number of landowners possessed of less than a 54,697. On the whole, it seems probable that the | one acre is as high as 703,289, being 73:3 per cent. of the on emigration movement will not soon again rise to the vast | whole. The great decrease seen in the number of those owners. dimensions it once assumed, and that, at any rate, it will | who possess from one acre to ten, being considerably under cease to be an important factor in the growth of the | one-fifth of the first class, is remarkable; and no less so is English population. it that there are more landowners who possess from 100 to 500 acres than who possess from 50 to 100 acres. The III. Dwision of the Land.—Agriculture. total number of landowners in England and Wales is alto- Division Till within the last few years nothing whatever was | gether, according to these returns, very far above to what of landed ;nown regarding the ownership of -land in England, and | was formerly believed, for in the census returns of 1861 Property. widely differing estimates, none of them of any real value, | the number of "landed proprietors " was given at 30,766, in the absence of all authentic facts, were brought forward | and in those of 1871 at 22,964. But while it is seen that from time to time about the subject. Various attempts to | teal property is so widely distributed, there appears not get official returns failed, till at last the House of Lords | the less from the Bluebook of 1876 the all-important consented to an inquiry, which resulted in the publication, | fact that the proprietors of over 5000 acres, who deserve, in 1876, of a report in two volumes imperial quarto, }| More especially, the title of "great" landowners, 874 in entitled Landowners in England and Wales: Return of | number, hold 9,367,031 acres, or more than one-fourth of the Owners of Land of One Acre and upwards in England | the country. The owners of 1000 acres and upwards, and Wales, eaclusive of the Metropolis, with their Names, | 2uubering 5408, hold 18,695,528 acres, being more than Addresses, Extent of Lands, and Estimated Gross Rental. | one-half of the land; and those of 500 acres and upwards, Though the information put forth in this Bluebook, | 10,207 in number, hold 22,013,206 acres, or two-thirds referring to the year 1873, is not distinguished by great | of the whole of England and Wales. , accuracy, the returns regarding the extent and rental of | Together with the returns of landowners in England English, the land being based on the parish valuation lists, mostly there were issued similar ones for

Scotland and Treland. Scottish, very defective, while large extents of land are not accounted | It is not a little interesting to compare the relative facts aie for atall, still the publication proved of the highest interest, | given in these vartous returns, which illustrate to a striking owners, as containing the only actual facts known about the division | degree the diversity of the ownership of the soil and and ownership of the land. division of the land in the three portions of the United Number The summary of the return published by the Govern- Kingdom. While in Evgland the proportion of landowners of land- ment, referred to frequently as the New Domesday Book, | below an acre is 72°3 per cent., it is 85°5 per cent. in Scot- i 1873, showed that in the year 1873 there were in England and land, and 52°6 in Ireland. Again, of landowners possess-

DIVISION OF LAND. |

Wales 972,836 owners of land, holding together 23,013,515 acres, of a gross estimated rental of £99,382,301. The subjoined table exhibits the number of landowners, under thirteen classifications of ownership, the total extent of lands held by each class, and the gross estimated rental : —

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wanting, through great errors and omissions in the parish

ing more than one acre, the proportion who have less than 500 acres is 96°1 per cent. in England, 86°5 per cent. in Scotland, and 80:1 per cent. in Ireland. With regard to England, the twelve largest owners hold in the aggregate 1,058,883 acres, while the twelve largest owners in Scot- land possess 4,339,722 acres, and the twelve largest owners

Classification of Ownership. | Number. | Extentof | Gross Esti- in Ireland 1,297,888 acres. Thus the ownership of the . “sae cait’| | twelve principal landowners of England is not one-fourth Acres, £ that of the twelve chief landowners of Scotland. Less than one acre ……..... 703,

289 151,172 | 29,127,679 The total number of landowners in each of the divisions lacreandunder 10 / 121,983 478,680 | 6,438,325 : : : lows in th ial 10 seres and „ 50| 72,640 1,750,080 | 6,509,290 of the United Kingdom was given as follows in the officia BO 100) 25,889] 1,791,606 | 4,302,003 returns :— 100. „ 5s 500| 32,317] 6,827,347 | 13,680,760 500 4, =, ««1,000} +4,799| 3,317,678 | 6,427,552 Number | Number of 1,000 „ 4, 2,000} 2,719} 3,799,307 | 7,914,371 — Guraslor "cnamene | selbanae te 2,000 ” ” 5,000 1,815 5,529,190 9,579,312 , less than and Owners. 5,000 3 », 10,000 581 | 3,974,725 | 5,522,610 one acre. upwards, 10,000 „ ~—„ — 20,000 223 | 3,098,675 | 4,337,023 20,000 an 3, 80,000 66] 1,917,076 | 2,331,303 Emgeland ys. ncaceeseaetneeio 703,289 269,547 972,836 50,000 „ 4, 100,000 3| 194,939] 188,746 Su tt ie 113,005 19,126 132,131 100,000 and upwards…..... 1] 181,616 | 161,874 Treland ….....| 36,144 | 32,572 68,716 Areas not specified …..... 6,448 ae 2,831,453 Se Se, aa i Rentals i, ME pdicocoe 113 1,424 ae United Kingdom…....; 852,438 321,245 | 1,173,683 Total of England and : Wales (exclusive’of the $| 972,836 | 33,018,515 | 99,352,301 The gross estimated rental value of the landed property Esti- Metropolis) ..... enumerated in the returns was stated as follows :— mated esi Estimated rental Divisions. Of the total area of England and Wales comprising pee joer 2 Ue C010 GopmeREPARepeecacceccassuoreonadose codec £99, 352,301 land. 37,324,883 statute acres, no less than 4,311,368 are not Scotland: ...::s… cytes ea 18,698,774 accounted for in the foregoing returns. These must con- inland »..... 00s. hates 18,417,758 sist partly of waste spaces, moorlands, and other areas, ; . — including that of tie metropolis and crown property, United Kinedeiiv.y cca: ene £131, 468,833

intentionally set aside; and partly of lakes, rivers, and roads. This leaves perhaps a million or more of acres

In England, one person in 20 of the population is an owner of land, against one in 25 in Scotland, and one in 79

ENGLAN®S

Although the number of counties is nearly the same in each of these two groups, the total average is larger in the grazing than in the corn

division in the ratio of 53 to 47 per cent. of total acreage under crops and grass in England.

The following tables furnish a concise account of the Returns acreage under crops and otherwise, together with the f the – number of live stock, in the two divisions of grazing and eee corn-growing counties of England, according to the growing Agricultural Returns for the year 1877 :— counties,

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Land, inTreland. ‘The proportion of owners of land to inhabited popula- houses is 1 to 4 in England, 1 to 3 in Scotland, and 1 to tion, 2nd 14 in Ireland. In England, the average extent of land — held by each owner is 38 acres 3 roods 30 perches, while it is 143 acres 1 rood 6 perches in Scotland, and 293 acres 1 rood 32 perches in Ireland. The average estimated rental of each owner of land in England is £102, 3s., against £141, 8s. in Scotland, and £195, 3s. in Ireland. The According to the New Domesday Book, about two-thirds “upper of the landed property accounted for in the returns as ten thou- existing in England and Wales is held by 103207 owners,

[AGRICULTURE.

Grazing Countics, Corn Counties,

eg who, therefore, well deserve the old title of the “‘ upper ten pee Per- thousand.” The following proprietors outside the metro- Hereage: | CO |ieoeteee Teen polis are returned in 1873 as either holding upwards of | | ————_-___|_E | eal 2. 50,000 acres, or having estimated rentals exceeding | | Total acreage returned. |12,908,018 | 53°1 |11,404,015| 46:9 um :— £100,000 per ann fr 1,047,077} 35:1’| 1,940,052 64-9 ; HBATIG Vi. | ccened thes cauneen 724,679 | 86°2 | 1,275,852] 68°8 ree County, saa OMe eit haere T7i2lb | 52°2 712782.) 47Ke a Rye. 15,800 | 32°5 82,804 | 67°5 ‘ : : RGA rsesuitieg desnsee Sees 126,851 | 27:0 343,302 | 73:0 Duke of Northumberland] Northumberland …....s.0:s+ee+0« 181,616 , , Pee i: ee ‘“ Denby ar rk GFE ouaieantes 126.904 IRCHS EMEA ess yore ce catcoinnos 69,820 | 22°8 236,586 | 77:2 Sew aw

Wyatt, Bank, . 1) MSE as Montsomery, emert-|.| ceeaee Total corn crops…..} 2,761,442| 387°8 | 4,541,880] 62:2 Duke of Cleveland Hiei | ay EL ee 81,441 peta 179.018 | 689 nee marl orCatl umberland, Northumberland, 8,54 (9) ati Geiss scis.sasiaeieed Ges ; 5 i ae era Patra Geaaeliein (| aes Turnips and swedes ….. 679,284 | 45-4 | 816,651] 54°6 Ear! of Lonsdale. Westmoreland, (Gaainen ail Mangold nsGanadcn COOpeONdAd 101,529 29°2 246, 760 70°8 Earl of Powis …. ..| Montgomery, Salop GaEROES? Wertttisaceerescsced 3,054] 21:1 11,891} 78.9 Duke of Rutland ..| Leicester, a Cabbage, rape, &c. 69,120; 39°2 | 107,098 60‘8 Cg We Gate etches lucerne, &c….| 125,867] 29°38 | 295,006] 70-2 sex, York (E.R.), Cumberland. rass : – . Melita aneeeaes Boe Gi ee under { for hay wos 81 0,654 50°4 798,708 49°6 Ear] Cawdor Carmarthen, Pembroke rotation.) ‘notfor hay.) 678,958 | 59°7 454,072 | 40°3 Sir Lawrence Palk, Bart. .| D @ Sir J W. Ramsden, Bart. . a 2 otal green crops ; ‘ In some cases the estimated rental exceeds the income and grass …..... clini \vaiieal \inctinastiie ini ia Fae ee bo a ee ee Bare fallow …..esessess. 251,459| 486 | 324,776| 56-4 value or the whole of the land 1s given at £3, Os. 2d. per |.| Permanent { for hay…..| 2,033,187] 62°8 | 1,206,178] 37:2 acre, which is thrice that of Scotland, where the average is pasture (not forhay.| 5,208,654] 68°4 | 2,409,997] 31:6 19s, 9d. per acre, and four and a half times as much as in |.| Flax… 2,845 | 39° 4,365 | 60°5 Ireland, where it is 13s. 4d. per acre. The comparatively HPs vos seeseeeeesceeeereees 8,502 11°9 62,787 | 88° : Orchards, &¢. ..... 122,499 | 77-0 36,596 | 23-0 high rental of the land in England and Wales, combined ; § mae es, combine Woods, &. ve.ceccceccese 676,189 | 51:0 | 649,626] 49-0 with the limited ownership of the soil, two-thirds being in the hands of little over ten thousand persons, and the rest Lives Srocx. divided among nearly a million, must have naturally the ae pt a: a 365,664) 48°0 895,425 | 520 greatest influence on the state of agriculture of the country. pe raiding. pak 171,075 | 55°83 188,044 | 44:7 To what extent this is the case, will be seen from the “Agri- |.| Cattle…....cccceccccceccee 2,621,282 | 65°9 | 1,858,368] 34:1 cultural Returns” annually published by the Government. Sheep …..scceseeeeeees.| 9,697,359 | 52°9 | 8,633,018) 47-1 Division These returns, drawn up under a well-organized system, |.| PiSS-++-+----- eee 1,028,734 | 48°6 | 1,086,017 | 51-4 i ~? on the ee ae ed ea toe by the | “The following short statement gives a summary of the official a ee ‘ h ,

a – ol es ar a W, ia i eee preceding table, showing the percentage of the distri- agricul- “Gey ewe ge ee ce ee ee ee ” ha bution of the acreage for each division :— tural re- great districts, the first being called the Western or “the tarns. Grazing division,” and the second the Eastern or “the CBr.

Grazing

i . atc 8 a a F rowin Corn-growing division,” viz.: Counties. | Qcnnties.

Grazing Counties, Corn Countics.

Percentage | Percentage

Northumberland. York, East Riding. of Total of Total Cumberland. Lincolnshire. ae —— Durham. Nottingham. Tae aS ee York, North and West Rutland. < “i eee aii a

Ridings. Huntingdon. ; wo Westmoreland. Warwick. 2a) aed 2 3 Lancashire. Northampton. ee ae se 1 i Se i | Clover and other grass { fo. hay …... S ae : ii Suffolk ; under rotation …... not for hay . Letceantt: Bedford. Bare: fallowessa. cette. eens ee aes Shropshire. Bucks. be sei Oxford.

ereford. L : >. Moumanan, yo In the returns of the census of 1871, before given, the Distri- Gloucester. Hertford. total area of England was stated at 32,590,397 acres, and a of ¥ ae Essex. that of Wales at 4,734,436 acres. In the Agricultural es 5 tal | ni Returns for the year 1877 it was reported that the total England Devon. Kent. acreage under crops, bare fallow, and grass had come to be and Cornwall. | Sussex. 24,312,033 acres in England, and 2,731,159 acres in Wales.

Live stock in England and Wales.

Wales. Thus there were 8,278,364 acres, or about one- fourth of the total, not accounted for in the Agricultural Returns for England, and

1,643,327 acres, or about one- third of the total, in those for Wales. The subjoined tables exhibit the distribution of the acreage, and the numbers of live stock, both for England and for Wales in the year 1877.

England. Wales.

Corn crops :— Acres, Acres, Wi Redimererte nets: occvicstisijecsesvesae eve 2,987,129 100,226 IBAPICVROLMNCTOR crs vonscecnsicoeneeaeaees 2,000,531 147,212 (O20) coucooaspbcOoe BC eCee eee eC neem 1,489,999 239,298 TRG) epoaegoonoheous co BaBeden CCUSBEREROG OCoe 48,604 1,455 JBCEITES oddone coogpapesnpEneene ce COOnEREEOGo: 470,153 2,979 RG OSEUNIEE CN Sai rcaiss aire vsisumeeteam eens 306,356 8,508

TOCA OL COPRIGTOPS.....0000008 aoe 494,678

Green crops :—

xtrucutestemntcrnrreraa ccerscnios cneesaricecs 308,964 42,942 Turnips and swedes……..seceeeeeaes 1,495,885 70,813 ME TEU esa ccs eepaie tess vscuneversaa seme 348,289 7,713 (CENTRO) Ge heaa amano CUR ROEnE me soc tettice cas 14,445 376

176,218 1,305 420,373 6,386

Cabbage, kohl-rabi, and rape……. Vetches and other green crops, except clover or grass …….....

a

Total of green Crops ……..scceeeeee 2,759,174 129,535

Clover, sanfoin, and grasses under rotation :—For hay …..0…...csceceeee INOLHOD BAY. sscsen-0errs

1,609,357 | 207,012 1,128,030 | 144,785

2,737,387 351,797

Motaltofclover; 6Chcccseseeeeecnecne

Permanent pasture or grass not broken up in rotation (exclusive of heatli or mountain land) :—For hay…....

Not for hay…

3, 239, 365 399,194

7,618,651 | 1,333,089

10,858,016 | 1,732,283

7,210 28

71,239 ba

576,235 22,838

Total of permanent pasture, &c.

Pp Bare fallow or uncropped arable land .

24,312,033 | 2,731,159

Total acreage under crops, bare ONO ROI FEARS os secssececsnsseenss

Live Stock. England. Wales.

Number.

761,089 309,119

1,070,208

Horses, including ponies :— Used for purposes of agriculture … Unbroken horses and mares kept). solely for breeding ….....000¢.

Total of horses …....cs.sscesesceees 129,638

Cattle :— Cows and heifers in milk or in calf| 1,557,574 Other cattle : —

2 years of age and above …... Under 2 years of age ….....4.

254,392

1,072,407 1,349,669

120,355 241,462

MNO GAMO CATE acc cndessvestee.s «+8 3,979,650 616,209

Sheep :— s I year old and above….....s…0000 Mer PEAT Od. ..s0secaecssseavenees

1,974,313 887,700

2,862,013

11,481,945 6,848, 432

OER GE SHCA es. vss csesersasececas 18,330,377

5 ee entre 2,114,751

230,720

It appears from the last annual Agricultural Returns that the extent of arable land in England and Wales is on the decrease, as is also the produce of live stock, while, on the other hand, the area of pasture land is on the increase. The decline in the acreage of arable land, very marked in the five years from 1872 to 1877, was greater in Wales than in

England, and embraced all the principal crops. The land Decrease under wheat fell from 3,336,888 acres in 1872 to 2,987,129 of the ex- in 1877, in England; and from 126,367 acres in 1872 to pe 100,226 in 1877, in Wales. During the same period, the jana, acreage under potatoes fell in England from 339,056 to and in- 303,964, and in Wales from 48,417 to 42,942; and that crease of under clover in England from 2,822,392 to 2737,387, Pastures. and in Wales from 370,850 to 351,797. In the acreage

under barley and oats there was a slight increase in England,

but a decrease in Wales; while in the acreage under

turnips and swedes there was a trifling increase in England

and a decrease in Wales during the period. Taken alto- gether, the extent of arable land in England fell from 13,839,000 acres in 1872 to 13,454,000 acres in 1877,

being a decrease of 385,000 acres. In Wales, the extent

of arable land sank from 1,104,000 acres to 999,000 acres

in the same period, the decrease amounting to 105,000

acres. ‘The decrease of arable land during the five years

was very steady, and so likewise was the increase in the acreage of pasture land. There were in England under pasture—exclusive of heath and mountain land—9,991,000

acres in 1872, and 10,858,000 acres in 1877, the increase

in the five years amounting to 867,000 acres, being more than double the extent of decrease of arable land. In Wales there were under pasture 1,532,000 acres in 1872, and 1,732,000 acres in 1877, making the increase amount to 200,000 acres, this also being not far from double that of the decrease in arable land. The decrease in the extent of arable land, and simultaneous increase of pastures, may be explained by the fact of England being supplied, more and more, with corn from foreign countries, where it can be grown cheaper than at home. Naturally, the produce of pasture lands cannot be brought in the same way into the country. If the decrease of arable land and increase of pastures Diminu-

can be thus explained, it is not so easy tv account for the tion of decline of live stock which also took place during the same ae period, more especially from 1874. It might have been 77, expected that the widening of the pastural area would have led to an increase of live stock, but the contrary was the case, more especially as regards horned cattle and sheep. In England there were 4,305,440 head of cattle in June 1874, and 3,979,650 head in June 1877, so that there was a decrease of 325,790 head in three years. During the same period, the number of cattle in Wales fell from 665,105 to 616,209, being a decline of 48,896. The decrease in numbers was even greater in sheep. There were 19,859,758 sheep in England in June 1874, and 18,330,377 in June 1877, being a decrease of 1,529,381. In Wales, during the same period, the number of sheep fell from 3,064,696 to 2,862,013, being a decrease of 202,683. Thus the total decline in the number of sheep in England and Wales was no less than 1,732,064 in the short space of three years. The great

diminution of live stock during the triennial period from 1874 to 1877 was not confined to England and Wales, but occurred simultaneously in Scot- land, as well as in Ireland, being greatest in the latter country, where the decline in sheep alone amounted to 10} per cent.

In the census returns of 1871, the number of persons Number entered as "agriculturists" in England and Wales was 28 a 1,447,481, comprising 1,264,031 men and 183,450 women. ae At the preceding census (1861) the number of " agricul- ~ turists"" was given at 1,833,652, showing a diminution of 386,171 within the decennial period, due probably to the augmented use of machinery for the cultivation of the soil.

IV.—fines and Minerals.

Next to agriculture, first foundation of the wealth of all countries, the material resources of England lie in its VII. — 29

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Mineral minerals. The earliest traces of its mineral riches appear riches of jn the visits of men from the Mediterranean, who braved

ek the dangers of unknown seas to gather the tin of Cornwall, ae Cornish tin still holds the first place in the annual reports ~~" on the "Mineral Statistics of the United Kingdom" drawn up by the keeper of mining records; but, though by no means an unprolific source of riches, it has sunk far behind a number of other minerals, unknown, even in name, at the time the Pheenicians visited, in search of it, the island of Britain. In the last of those annual reports the mineral produce of Great Britain is summarized as follows, in regard to quantities and value, under nineteen headings,

or classes, representing the produce of the year 1876 :—

Minerals, Quantities. Value. Tons. Cwts. £&

(Goalies A OTN en corn 133,344,766 0 | 46,670,668

Tron OF€ sescscsseesevees een 16,841,583 14 6,825,705

ROCs oyica ye \cntvsadeeeciwaetged 79,252 0 317,186

HINOLOMP ss eseaccsessceniseanseriecas« 13,688 9 600, 923

CRARORCWES, «ocsicvsccs vos coeteeeeees 79,096 6 1,218,078

PAM EMOEG] Li seg ch sss s-cvebaswssnaeen 23,613 8 90,142

OMY TICES: seses sos cccsecesscteees 48,809 14 43,870

PAISCHIC’ ine Metis osasmearsencneecuerte 4,228 1 28,092

MGM SAMS, ...ici secs ssasevaseseesas 2,796 17 9,783

Ochre andambery,.....cscsuses+« 8,805 4 4,478

\yGillltesyna\ teepencocccpencaccoconennod: 23 10 ye

MOLES PAL rcsinccurescasnenenesette 337 10 230

(CE Ean pne aetna EReeann bod norranree 3,971,123 0 744,224

(Chili)V] CS AR neppneanangcenpotoncor 610,785 0 319,853

SR. cctictecrn REE. 55 2,273,256 0 1,136,628

IBALY PORE sis 5 oo aaictanaieeassawse serene 23,561 18 24,479

SRO UGW 5 «vss sonansev ere reeiasans 258,150 0 625,000

CPE. us)00e canteen ccedvercaee: 61,741 0 18,571

Sundry minerals, including

China stone….sssseeseeess ue 13,750

Total Under another calculation, the keeper of mining records

value of gives the following summary of the total value of minerals, minerals together with metals, obtained from the mines of the United ee Kingdom in 1876 :—

OL RRR ecHARBE ooo nooo obacbacoRene ee ccvenoarettt £46,670,668

Metals, obtained from ores ….....cse0008 18,668,818 Earthy and other minerals….....00008 2,887,367 Total. vale… icrcssss-s pdepocconoondonee £68, 226,853

Metals The metals obtained from ores are classified as follows, ee according to quantities and value, in 1876 :— n ’

Metals. Quantities, Tons. £

6,555,997 16,062,192 1,270,415 675,750 392,300

158,011

106,262 1,138 2,750

18,668,818

Chief articles of Bri- tish mineral produce,

It will be seen by a glance at the preceding tables that the mineral wealth of the United Kingdom lies, in sub- stance, in two articles, namely, coal and iron ore. From these springs, as immediate produce, a third, namely, pig iron, Coal and iron ore together form, as regards value, over nine-tenths of the mineral produce; while pig iron by itself holds nearly the same position in value among the metals produced in the United Kingdom.

Coal.—In the production of the by far most important article of Great Britain’s mineral wealth, to which all others are but appendages, England and Wales stand foremost to such an extent as to throw the other two divisions

ENGLAND

[MINERALS.

of the United Kingdom into comparative insignificance. Coal pro- To the total coal produce of the United Kingdom in the duce of year 1876, England and Wales contributed 114,554,278 England tons, being five-sixths of the whole. The remainder, ae 18,790,488 tons, was produced almost entirely in Scotland, : ——the mines of East Scotland furnishing 11,667,648 tons,

and those of West Scotland 6,997,904 tons. The produc-

tion of coal in Ireland in 1876 was not more than 124,936

tons.

England and Wales are officially divided into nineteen Colliery colliery districts, very unequal in size, but so arranged, districts geographically, as to be within the constant and regular ane inspection of the Government survey. The following Fon table gives a list of these districts, with the number of collieries in each, and the quantities of coal taken from them in the year 1876.2 Coal

produce in

1876.

Number Colliery Districts. of Collieries.

Tons,

12,580,500 19,411,123

1,401,603 584,380 8,265,000 9,125,000 15,055,275 7,025,350 3,415,100 884,750 1,005,000

10,081,067

4,077,548 1,054,049 1,257,547 650,415 4,499,985 2,207,250 11,973, 336

114,554,278

South Durham

Cumberland and Westmoreland…... Cheshire

Lancashire, North and East Lancashire, West

Yorkshire

Nottinghamshire

Warwickshire

IG GUCRLENGHAT OSs avaicnuster eve saiuaasnien cat

Staffordshire, South, and Worces- tershire

Staffordshire, North

Shropshire

Gloucestershire

Somersetshire

Wales, North Wales, South

Seeing the supreme importance of coal as the chief Eng- material agent of modern civilization, and one the value of 14's which, instead of lessening, is likely to become infinitely i, odd greater in future years, with the expansion of science and arts, the question has frequently been discussed whether the British coal-fields may not become exhausted at some time or other, The subject more especially engaged the attention of parliament and the Government in 1866, through the publication of a work by Professor W. Stanley Jevons, of Manchester, entitled Zhe Coal Question, which, while admitting the immensity of England's

wealth in coal, asserted that the present ever-increasing rate of supply could not continue in the same proportion for any great length of time. This theory found much opposition, others maintaining that the coal deposits of Great Britain were virtually inexhaustible, and that, properly managed, and with constantly improved scientific appliances, their riches would last as long, if not longer, than the probable life of the nation,

The discussion in and out of parliament on "the ex- haustion of our coal mines," important as it was, scarcely settled the main points of the question, namely, first, to what depth the coal mines of Great Britain can be practi- cally worked, and, secondly, to what extent the use of coal may be limited in the future, by the discovery of other motive powers, As to the first point, Mr Edward Hull,

a well-known authority on mining subjects, laid it down, after practical inquiries, that the limit of coal-mining was not reached till the depth of 4000 feet; but this again

1 See also Coat, vol. vi. p. 49. ® Compare with this the table at vol. vi. p. 79.

Increase in the produc- tion of coal, 1855 to

1876,

Distribu- tion of work in col- lieries ;

_acci-

dents.

was disputed by other investigators, who expressed confi- dence that the limit was 2500 feet, a depth already reached in some existing mines. Greater still must be the uncertainty regarding the possible or probable discovery of other sources of motive power as substitutes for coal. The

opponents of the widely expressed theory that such discoveries were not only possible, but of the very nature of scientific progress, which having, quite recently, taught mankind the high value of coal, was not likely to stop here, found powerful support in Professor Tyndall, who insisted that coal was the absolute monarch, present and future. "'T see no prospect," he wrote to Professor Jevons, "of any substitute being found for coal as a motive power. We have, it is true, our winds and streams and tides; and we have the beams of the sun. But these are common to all the world. We cannot make head against a nation which, in addition to these sources of power, possesses the power of coal." Professor Tyndall concludes with the somewhat startling dictum that " the destiny of this nation is not in the hands of its statesmen, but of its coal-owners," adding, emphatically, that, " while the orators of St Stephen's are unconscious of the fact, the life-blood of this country is flowing away."

Professor Tyndall wrote this letter in 1866 ; and if, as he and others thought, the "life-blood of this country" was then flowing at too high a rate, it has been flowing much faster ever since. In the ten years from 1856 to 1866, the production of the coal mines of the United Kingdom rose from 66,645,450 tons to 101,630,544, and after another lapse of ten years, in 1876 it had risen to 133,344,766 tons. The gradual rise in production is indi- cated in the subjoined table, which shows the quantities and the value of the coal brought from the mines of the United Kingdom every third year from 1855, when the first accurate returns were published, to 1876 :—

Years. Quantities.

Tons,

61,453,079 65,008,649 88,685,214

16,113,267 16,252,162 20,908,803 23,197,968 26,125,145 27,607,798 47,631,280 46,670,668

92,787,878 104,500,480 110,431,192 127,016,747 133,344,766

It is an admitted fact that the price of coal, which has been gradually risiug in recent years, must continue to rise, both on account of its increased consumption, and of the constantly growing expenses of raising it. Although the total area of the coal-fields of Great Britain extends, accord- ing to the most authentic estimates, over 5400 square miles, comparatively few new pits have been opened in recent years; and the ever-increasing demand has been supplied by the deepening, as well as widening, of the best collieries. This'could only be achieved at an increased outlay, inasmuch as the cost of raising coal to the surface and the attendant expenses of administration and super- vision are far greater than the cost of the actual displace- ment of the material from its beds.

From the returns of one of the oldest and best-managed collieries in England, the South Hetton, in Durham, it appears that out of 529 men employed, only 140 were hewers of coal. The account, interesting in various ways, stands as follows :—

Persons, (Te wwerckolcoall wees sesttenetens toccteomseeececcenete 140 Putters, sereeners; and louderst:.....02…05.—...0008 22, Adin istiatlvierstall .,..co<_cceveeees cers="" ceeosres="" _12333="" museellaneous_="" workerss___n-cs.c.scssceseneccrevssemeneree="" _9="" _="" p="">

Total number of persons employed in colliery …529

HNG LAY

227

The extraordinarily large number of persons required in a colliery, over and above the actual producers of coal, to attend to the working of the establishment, is explained by the mine and its machinery requiring the most strict and unceasing supervision to prevent dangerous accidents. Thus a large staff of workmen and artisans of all kinds, such as smiths, joiners, engine-wrights, masons, and others, has to be kept, to watch over the complicated apparatus by which the mine is ventilated and the precious mineral raised from the bowels of the earth.

It may be said:that, as a rule, the working of the collieries of England and Wales is most satisfactory, the superintendence, both on the part of the private owners and the Government, being the best that human ingenuity can devise. Nevertheless, the annual loss of life is terribly large. In the ten years from 1857 to 1866, the number of deaths from colliery accidents averaged 1000 per annum; and though in the next ten years the death rate decreased, it never fell under 800 a year.

The production of coal in the United Kingdom was more than doubled in the period from 1855 to 1876, but the exports to foreign countries during the same time increased nearly eight-fold. From 4,976,902 tons in 1855 the exports rose to 9,170,477 tons in 1865, and to 11,702,649 tons in 1870. They further rose to 13,198,494 tons in 1872, to 13,927,205 tons in 1874, to 14,544,916 tons in 1875, and to 16,299,077 tons in 1876. Of the total exports of the year 1876, France took 3,160,555 tons, Germany 2,243,722 tons, and Italy, Russia, and Sweden and Norway each a little over a million tons, the remainder being distributed over thirty other foreign countries and British colonies. Vast as has been the amount of the coal exports in recent years, they still represent less than one-eighth of the coal produce of the country. The mines of the district of South Durham alone produced in 1876 considerably more coal than was exported to all foreign countries.

Iron Ore.—Though vastly inferior, as a source of national wealth, to coal, and deriving nearly all its value from it, still the second most important produce of English mines, the iron ore, has the greatest effect upon the industrial char- acter of the country. England and Wales alone produce iron ore, the amount raised in Scotland and Ireland being quite insignificant. It amounted in Scotland to 5226 tons, valued at £3432, and in Ireland to 116,066 tons, valued at £60,748, in 1876. The whole of the rest of the pro- duce of the United Kingdom, 16,720,291 tons, valued at £6,761,525, was raised in England and Wales.

The following table exhibits the quantities and value of the iron ore raised in the chief producing counties and districts of England and Wales in the year 1876 :—

Counties, Quantities.

Tons. Cwts. . ob Wornmwallle, ...cs.tssstsesesneereee 18,390 0 10,566 18 0 IWGVOTSHITC,...:srensencas-corees 9,936 10 5,075 15 0 Somersetshire ……0000e 44,299 3 31,110 38 6 Gloncestershireteyes.sssecos ate 115,098 3 77,3894 3 0 Walltishire: 2… sstesee~~...teeroess 573,374 15 101,622 19 0 Staffordshire, North …….. 19,998 13 14,658 10 0 MATL CASMIT CY… sanstanesesiense sean 984,460 18 | 728,505 15 0 W@rmiberland'.), wens .tasencsesosers 1,353,910 9 996,046 2 6 Yorkshire, North Riding…... 6,562,000 0 | 1,162,020 0 0 Northumberland and eae 24,202 12 14,521 16 0 South Wales and on MOUWLNGHITE seeccseeueres ese 83,969 15 41,484 0~~

~~Coal Mines Regulation~~

~~5,659, 423~~

~~Act in other counties….~~

~~Oo~~

~~Iron Ore worked under the |~~

~~- Total, England and Wales | 16,720,291 0 | 6,761,525-~~

~~Exports of coals.~~

~~Tron ore,~~

~~Produce of iron ore in English~~

~~counties,~~

~~Manufac- ture of iron by charcoal.~~

~~Dis- covery of iron smelting by " pit coal,"~~

~~Produc- tion of pig iron, 1756 to~~

~~1854.~~

~~Produc- tion of pig iron, 1854 to~~

~~1876.~~

~~Tron ore lies widely distributed all over England and Wales, and though at present mainly raised in the northern and western counties, and all the districts which contain coal, the union with which alone gives it industrial value, the geological strata containing it are equally to be found in the south and elsewhere. 'The earliest use of the iron ore in England, before the important discovery of the manufacture of pig iron by coal was known, was almost ex- clusively in the southern counties, more particularly in Sussex. 'I have heard," says John Norden, the topo- grapher, in his Survey of Middlesex, published in the latter part of the 17th century, "that there are, or recently were, in Sussex neere 140 hammers and furnaces for iron." William Camden, writing about the same time, adds that Sussex "is full of iron mines in sundry places, where, for the making and founding thereof, there be furnaces on every side, and a huge deal of wood is yearly burnt." Other writers refer to the burning of ' cole," that is, charcoal, in the iron manufacture of the south of England.~~

~~The old iron manufacture came to an end towards the middle of the 18th century, with the destruction of the once plentiful woods and forests of England. However, the pro- duction of iron in the country was still estimated in 1740 at 17,350 tons, made in 59 " hammers and furnaces," being less than half the number mentioned by John Norden as existing in Sussex. Within the next few years the trade sank still lower, and was on the point of being extinguished, when at last the efforts of a number of enterprising men to make use of "pit coal" for making iron were crowned with success. Like most discoveries, this great one, destined to give a new course to the industrial and commercial history of England, was not the work of one man, but resulted from the labours of many; still an important share of it fell to the Darbys, father and son, the first of whom established, in 1709, with the help of skilled Dutch work- men, the celebrated Colebrookdale ironworks, in Shropshire. The father did not reap the benefits of his~~

great enterprise, but the son was fully rewarded. He sat " watching the filling of his furnace for six days and nights uninterruptedly, and was falling into a deep sleep, when he saw the molten iron running forth." In December 1756, the Colebrook- dale iron works were "at the top pinnacle of prosperity, making twenty or twenty-two tons per week, and sold off as fast as made, at profit enough."

At the date here given, the total production of pig iron in England was probably about 225,000 tons a year, but from that time it rose with extraordinary rapidity. It is estimated that 68,300 tons were produced in the United Kingdom in 1788, which amount had increased to 125,079 tons in 1796, and to 258,206 tons in 1806, a doubling in ten years. The production had again doubled in 1825, when it was 581,000 tons; and once more in 1839, in which year it had risen to 1,240,000 tons. In 1848, the total amount of pig iron produced was estimated to be over two millions of tons; and in 1854, the first year for which trustworthy statistics were gathered by the mining record office, the production surpassed three millions.

The following table exhibits the quantities and value of pig iron produced in the United Kingdom in every third year from 1855 to 1876 :—

Value.

Quantities.

owe.

8,218,154 3,456,064

£

8,045, 385 8,640,160 9,280,975 11,919,877 11,902,557 14,908,787 18,057,739 16,062,192

3,712,390 4,767,951 4,761,023 5,968,515 6,566,451 6,555,997

~~ENGERABW®~~

~~[TRON.~~

~~The pig iron produced in the United Kingdom in the year 1876 came from 17,813,818 tons of iron, of which amount 16,841,583 tons were raised at home, and the re- mainder, 972,235 tons, imported from foreign countries, principally from Italy, Spain, and Portugal.~~

~~The following statement shows the amount of pig iron produced, and the quantity of coal used in its manufacture, in each of the divisions of Great Britain in the year 1876 :—~~

~~Pig Iron. Coal.~~

~~Tons.~~

~~10,871,706 1,676,675 8,050,000~~

~~Tons.~~

~~4,664,158~~

~~788,844 1,108,000~~

~~Total Great Britain …~~

~~6,555,997 15,598,381~~

~~It will be seen that the quantity of coal used in the manufacture of pig iron represented nearly one-eighth of the total coal produce of the year 1876.~~

~~The following table exhibits the number of furnaces in blast, and the quantities of pig iron made, in the various~~

~~counties of England and Wales, in the year 1876 :— Countien Forges. | Tigacon | ENGLAND. Number. Tons. INIORbHMMDCRIENANS ..c0ssi.ceeccccestecseeccceisess 1 Durkan peed tsreacaccccc cscs seeassecess~~

~~504 823,172 VY ORksue, OMG ACINe o6.ccccccensccerasnone 75 1,261,018 Do. VOM PEMD asters. ce cars snasen 34 285,451 GT ENON a cirny cnsaescctins..-1bers sentences 35 300,719 ACH MIE OMe criss siccice's cae se aisletine satan snncee 30 552,984 Wumiberlandiecccstdhecncsteneccesccccesceancsraes 27 436,887 SIO MS UIC Mena cece sates sat caisinces ear ccestene 16 106,711 INOnEHES tAtOndSHIVG . 5. .cs;cccrsscaeccesessoaes 25 213,569 South LOM I nce s oa snaaenannetsts 65 465,946 INOTHHAMPLONSHITC 5. ..... ¢.COMSHP OG SE sa ssced sens vscivecaceastalses sei 16 125,198 Gloucestershire"; ...cses.ssctshiiiessececaes dence 5 28,108 AWallthetnimenecer icasi nists s ceinssosseaesemenenceete 2 Spr enc ev cy xcosdaseshanstereasnees ie 29,479 IS OMIGNSOUSHITE Pee tase ness ca senesacestsesiceutioices 1 Total for Bmeland …;.....:2..000060. 398% 4,664,158 NortH WALES. MGUDIGHBEMEC : iva succccscseccucessessevsarsusess 3 UM pints]: Goncoaceqnaqnsoe5qNggHnatenunconscHocec 1 Beanies~~

~~SoutH WALES. Anthracite furnaces Glamorganshire Monmouthshire~~

~~Total for Wales……..~~

~~20,421 321,754 413,946 788,844~~

~~5,452,997~~

~~England and Wales~~

~~The iron manufacture was not in a prosperous condition in the year 1876. The total number of existing furnaces in England and Wales was 771, so that more than 200 were standing idle. The total number of existing furnaces in England was 626, and in Wales 145, showing that the depression of trade was greatest in Wales, exactly one-half of the furnaces standing idle. The total number of active ironworks amounted to 159 in England, and 24 in Wales, at the end of 1876.~~

~~Lead.—In comparison with coal and iron, all the other mineral products of the country are of small importance. Of these minor products, the highest on the list, as to value, is lead ore, raised in the~~

~~United Kingdom to the value of £1,218,078 in 1876, and producing lead valued at £1,270,415. The quantities of lead ore raised in the year amounted to 79,096 tons, and the metallic produce to~~

~~Pig iron and coal consum))- tion,~~

~~Iron fur- naces in England and Wales,~~

~~State of~~

~~iron~~

~~manuface ure~~

~~Produc- tion of ead.~~

~~a~~

~~Decline of lead produce.~~

~~Produc- tion of tin.~~

~~Produce of~~

~~copper.~~

~~MINOR MINERALS. |~~

~~58,667 tons. Of this total, 73,361 tons of ore were raised in England and Wales, producing 54,363 tons of lead. More than one-half of the lead ore and lead produced in England came from the counties of Durham and North- umberland, while two-thirds of the produce of Wales came from Montgomeryshire and Cardiganshire. There werealto- gether 392 lead mines in the United Kingdom in 1876, and of this number 387 were in England and Wales. The mines were very unequal in extent and produce. Derbyshire contained 140 lead mines, producing 2441 tons of ore and 2149 tons of metal; while Durham and Northumberland produced 23,285 tons of ore and 16,730 tons of metal in 28 mines.~~

~~The produce of the lead mines, after remaining stationary for many years, declined considerably from 1870 to 1876. In the fifteen years from 1854 to 1868 the average annual produce in the United Kingdom amounted to about 68,000 tons, valued at £1,400,000. The culminating point of production was reached in the year 1870, with 73,420 tons, valued at £1,452,715, after which there was a steady falling off, down to the amount of 1876. The decrease in the home produce of lead was accompanied by an increase in the imports of the metal, which amounted to 61,987 tons, valued at £1,411,988, in 1874, and rose to 79,825 tons, valued at £1,801,962, in 1875, and to 80,649 tons, valued at £1,749,978, in 1876. It will be seen that the imports of lead are considerably larger than the home production.~~

~~Tin.—Next to lead in value, among the minor ores and metals, stands tin. In 1876 there were raised 13,688 tons of tin ore, producing 8500 tons of metallic tin, valued at £675,750. Tin ore is found nowhere but in Cornwall and Devonshire, the famous mines of Cornwall, which attracted foreigners thousands of years ago, producing the greater part. At the end of 1876 there were returned as existing in England 135 tin mines, of which number 104 were in Cornwall and 16 in Devonshire, the remainder consisting not of " mines," in the ordinary sense, but, more strictly, of "finding places," situated on rivers and near the shore. The number and produce of tin mines have suffered a great decrease in recent years. In 1872 there were raised 14,266 tons of ore, producing 9560 tons of metal, valued at £1,459,990; in 1873, only 1,056,835 tons were raised, producing 9972 tons of metal, valued at £1,329,766, and in 1874 but 788,310 tons of ore, producing 9,942 tous of metal, valued at £1,077,712. The year 1875 showed a further falling off to 735,606 tons of ore, with 9614 tons of metal, valued at £866,266, upon which followed the first- mentioned still lower production of the year 1876. Dur- ing the same period, the imports of tin, in blocks and ingots, from foreign countries gradually increased. They amounted to 166,840 cwts., valued at £1,154,578, in 1872, and rose to 304,551 cwts., valued at £1,148,542, in 1876. It will be seen that while the total quantity of tin imported within the quinquennial period underwent a considerable increase, the total value not only did not augment, but actually~~

~~decreased. The decline in price was probably one of the main causes of the decline in production of tin.~~

~~Copper.—Next to tin in value, among the minor ores and metals, stands copper. The total product of copper ore raised in the United Kingdom in 1876 was 79,252 tons, of which 71,756 tons were the produce of England and Wales, while 680 tons came from Scotland, and 6816 tons from Ireland. The totalamount of the metal produced from the ores was 4694 tons, valued at £392,300, of which 4222 tons were made in England and Wales, 33 in Scotland, and 449 in Ireland. There were at the end of 1876 copper mines to the number of 101 in the United Kingdom,—England and Wales possessing 93, Scotland 1, and Ireland 7. Only the copper niines of England, and more particularly those of Cornwall and Devonshire, are of any importance. At~~

~~the end of 1876 there was one copper mine in each of the counties of Cumberland, Cheshire, and Lancashire, 15 in Devonshire, and 65 in Cornwall, the latter producing 43,016 tons of ore and 3034 tons of metal. Even more than lead and tin, the production of copper has been greatly declining in recent years. In 1855 the total produce of copper was as high as 21,294 tons, valued at £3,042,877 ; which amount had fallen to 15,968 tons, valued at £1,706,261, in 1860. In 1865 the quantity had fallen to 11,888 tons, valued at £1,134,664; and in 1870 it had further declined to 7175 tons, valued at £551,309. Thus the decline continued, with slight fluctuations, till the pro- duction had reached the small amount of 1876. As with lead and tin, the copper imports grew largely while the production declined.~~

~~Zinc.—The remaining metallic ores—azinc, silver, and gold—are but of trifling value. counties of England and seven of Wales, which together possess 53 mines. There are 3 more mines in the Isle of Man, and 1 in Scotland. In 1876, the total of zinc ore raised was 23,613 tons, producing 6641 tons of zinc, valued £158,011. The production of zinc trebled in quantity and value in the sixteen years from 1852 to 1876. It~~

~~amounted only to 2151 tons, valued at £50,548, in 1862, and in 1872 had risen to 5191 tons, valued at £118,076. The increase in production did not prevent a simultaneous increase in im- ports, which more than doubled in the decennial period from 1866 to 1876, amounting in the latter year to 29,327 tons, valued at £662,190, being more than four times the amount of the home produce.~~

~~Silver and Gold.—Silver and gold, the so-called "" pre- cious" metals—though iron is infinitely more valuable under every point of view—form but imperceptible additions to the mineral wealth of the country. Of silver, always found in combination with lead ores, 483,422 ounces, valued at £106,222, were raised in the year 1876 in the United Kingdom, and of gold, 293 ounces, valued at £1138. There were, according to the returns of the mining record office, two " gold mines" in the United Kingdom, the one in Merionethshire, and the other in the county of Wicklow, Ireland. The former, situated at Clogan, produced 288 ounces, valued at £1119, in 1876. As for the Irish " gold mine," its yield was just 4 ounces, worth £18. The returns do not state the sum expended in raising the 4 ounces of Irish gold.~~

~~Salt and Clays.—The sum total of England's mineral~~

~~Produce~~

~~Zinc is found in five of zinc.~~

~~Produce of silver and gold,~~

~~Produce~~

~~riches is completed by a variety of miscellaneous substances.0f salt~~

~~raised from the earth, such as salt, clays—including porce- lain, potter's clay, and fire clay—coprolites, oil shales, barytes, and gypsum. None of these are of much import- ance except salt and clays. The centre of the salt produc- tion is in Cheshire, at Northwich, Middlewich, Winsford, and other places ; but there are also salt mines in Stafford- shire and Worcestershire. In 1876 the total quantity of salt~~

~~raised amounted to 2,273,256 tons, valued at £1,136,628, of.~~

~~which 854,538 tons, valued at £529,547, were exported to foreign countries, chiefly to the United States and British India. Of clays of all kinds, the total produce in 1876 was 3,971,123 tons, valued at £744,224. The finest of the clays, known as kaolin, or porcelain clay, is the produce of Cornwall and Devonshire, the former county raising 105,275 tons, and the latter 25,000 tons, in 1876. Of im- portance next to it, as potter's material, is the " Poole clay" of Dorsetshire, of which 72,105 tons were produced in 1876. Raised in much larger quantities than both the kaolin and the "Poole" are the fire-clays, the production of which in the year 1876 amounted to 1,514,902 tons. The fire-clays are found chiefly in the north and west of England and in South Wales. There were 171 fire-clay pits at the end of 1876, the largest number of them, 45, in Northumber-~~

~~and clays,~~

~~230~~

~~land and Durham, and the next largest, 33, in South Wales. Miners.— In the census returns of 1871 there were engaged 376,783 persons distinguished as " miners," the number inmining egmprising 371,105 males and 5678 females. At the tome Preceding census of 1861 there were 330,446 persons ions enumerated as " miners," of whom 330,352 were males and only 94 females. Thus there was a total increase of 46,337 persons so designated, comprising 40,753 males and 5584 females, in the ten years from 1861 to 1871. There were besides enumerated as " workers in stone and clay," 152,673 at the census of 1871, comprising 149,567 males and 3106 females. At the census of 1861 the total num- ber of persons so classified was 144,773, so that there was an increase of 7900 persons in the decennial period.~~

~~Number~~

~~V, Textile Manufactures.\— Fisheries.~~

~~There were two agencies, one moral and the other material, that gained for England its comparatively modern superior- ity in manufactures. Long after textile and other industries had been flourishing in the leading states of the Continent,— the Netherlands, Flanders, and France,—England remained a purely agricultural and pastoral country, content to export her riches in wool, and to import them again, greatly enhanced in value, as clothing. Thus it remained till religious persecution drove the flower of the industrial population of the West of Europe away from the homes of their birth; and, happy to find an asylum here, they liberally repaid English hospitality by establishing their own arts in the country, and teaching them to the inhabitants. Thus religious liberty formed the noble~~

~~Origin of the cotton manufac- ture,~~

~~foundation of England's industrial greatness. Then came~~

~~the material agent, machinery propelled by steam. The invention of the steam engine, following quickly upon that of the carding machine, the spinning jenny, and other ingenious machinery employed in_ textile manufactures, gave an extraordinary impulse to their development, and, with them, that of kindred branches of industry. At the basis of all of them was England's wealth in coal.~~

~~Cotton Manufacture—That England, not possessing the raw material, became the seat of the cotton manu- facture, was owing, in the first instance, to the ingenuity of lier inventors of machinery. Established as early as the beginning of the 17th century at Manchester, the cotton manufacture made no progress for a long time, and generation after generation clothed themselves in cotton "goods spun by Dutch and German weavers. It was not~~

~~till the latter part of the 18th century, when a series of inventions, unparalleled in the annals of industry, followed each other in quick succession, that the cotton manufacture took real root in the country, gradually eclipsing that of other European nations. But though the superior excellence of their machinery enabled Englishmen to start In the race of competition, it was the discovery of the new motive power,~~

drawn from coal, which made them win the race. In 1815 the total quantity of raw cotton imported into the United Kingdom was not more than 99 millions of pounds, which amount had increased to 152 millions of pounds in 1820, and rose further to 229 millions in 1825, so that there was considerably more than a doubling of the im- ports in ten years. In 1830 the imports of raw cotton had further rison to 264 millions of pounds, in 1835 to 364 millions, and in 1840 to 592 millions of pounds.

The following table shows the progress, with fluctuations,

of the cotton trade, in the annual imports, the exports, and the excess of imports of raw cotton during each, for every fifth year from 1841 to 1876 :—

ee

1 See also the separate articles on the different textile manufac-

tures.

Inven- tions for spinning cotton.

Imports of raw cotton, 1841 to

1876.

ENGLAND

Total imports of raw Cotton.

Tb

487,992,355 467,856,274

757,379,749 1,023, 886,304

| 1,256, 984,736

~~1,377,514,096 1,778, 139,776 1,487,858,848~~

~~[corroN MANUFACTURE.~~

~~Total exports of raw Cotton~~

~~——’~~

~~Tb~~

~~87,673,585 65,930,732~~

~~111,980,394 146,660,864 298,287,920 388,981,936 362,075,616 203,305,872~~

~~Excess of imports.~~

~~Tb ‘450,318,770~~

~~401,925,542 645,399, 355 877,225,440 958,696,816 988,532,160~~

~~1,416,064, 160~~

~~1,284,552, 976~~

~~7~~

~~There were 2655 cotton factories in the United Kingdom Number at the end of 1874. They had 41,881,789 spindles and of 463,118 power-looms, and gave employment to 479,515 A persons, of whom 187,620 were males and 291,895 Se females. The following statement gives the number of cotton factories in England—there are none in Wales—distinguishing those devoted to spinning and to weaving, and the total—including those both spinning and weaving, and all others—at various periods, from 1850 to 1874 :—~~

~~Number of Factories. Motalinamnber~~

~~Years. ; of Cotton Spinning. Weaving. Factories,~~

~~1850 762 229~~

~~1856 910 419 ,~~

~~1861 1,079 722~~

~~1868 1,041 632~~

~~1870 1,085 649~~

~~1874 1,172 600~~

~~The following table shows the number of spindles used Number in the cotton factories of England, distinguishing those for of | spinning and for doubling—the total including all others— sPindles. at various annual periods from 1850 to 1874 :—~~

~~Number of Spindics. Total Number~~

~~of Spindles, Doubling.~~

~~10,055,410 10,557,799 13,274,346 15,651,002 15,309,505 14,585, 130~~

~~Spinning.~~

~~8,685,392 15,260,777 15,077,299 14, 827,226 17,302,982 21,449,102~~

~~19,173,969 25,818,576 28,351,925 30,478,228 32,613,631 36,034,232~~

~~The subjoined table exhibits the number of power-looms Number used in the cotton factories of Englund, both weaving and of power- spinning and weaving, at various annual periods from 1850 Jooms. to 1874 :—~~

~~Spinning Weaving. and Weaving~~

~~Total Number of~~

~~Power Looms.~~

184,816 209,609 235,268 206, 827 235,904 260,724

36,544 65,880 131,554 137,892 175,482 170,665

223,626 275,590 368,125 344,719 411,336 431,389

The following table gives the number of persons, male wumber and female, employed in the cotton factories of England of at various periods from 1850 to 1874 :— Nei: in cotton

Females. factories.

160,052 192,816 238,894 204,396 243,177 259,729

Males.

291,662 341,170 407,598 357,052 414,970 440,336

131,610 148, 354

173,704 152,656 171,798 180,607

Of the males employed in 1874 there were 33,342 under thirteen years of age, and 37,016 from thirteen to eighteen

WOOLLEN MANUFACTURE. |

years of age,—the rest, 110,249, being above eighteen years.

Of the 259,729 females employed in cotton factories in | worsted factories in England and Wales :—

1874 there were 32,637 under thirteen years of age. The cotton factories were distributed as follows over England at the end of 1874 :—

Distribu- tion of

cotton factories over Number eer N eae ber ‘ Counties. f of 0 a oon Factories,| ower | Persons, Middlesex, Surrey, ao Ill 18 897 Gloucester,

~~Hereford, Salop, Staf- ford, Worcester, and Warwick. 3,000 5,278 Leicester, Rutland, Lincoln, and 41 4,632 29,948 | 36,485 RARE CASHIG OBR sesso. eccsccceseeeseeessese® 373,061 | 352,003 Derbyshire 7,608 | 10,091 Yorkshire ashes 15,147 | 28,669 Durham, Northumberland, Cum- berland, and Westmoreland … 2,382 2,478 Essex, Suffolk, and Norfolk 184 3038 Total 431,389 | 440,336 It will be seen that Lancashire absorbs more than three- fourths of the manufacture of cotton fabrics in England. Number Woollen and Worsted.—Second only to the cotton trade~~

~~of as a national industry is the manufacture of woollen and -,, worsted textile fabrics. There were in 1874 in the United Kingdom 1800 woollen and 692 worsted factories. In the woollen factories there were in use 3,323,881 spindles and 57,090 power-looms, and they employed 134,605 persons ; while in the worsted factories there were in use 2,382,450 spindles and 81,747 power-looms, and they employed 142,097 persons. Unlike cotton, the raw material for woollen fabrics is mainly produced at home; still for many years past the native supply has been insufficient, which necessitated imports from foreign countries and British colonies, ever increasing in amount. During 1840-1876 the imports of wool rose from 49 to 390 millions of pounds. The following table exhibits the imports of wool into the United Kingdom from foreign countries and British colonies, the amount of re-exports, and the net balance of imports, for every fifth year from 1841 to 1876 :—~~

~~Imports of wool.~~

~~Total Exports (Foreign and Colonial).~~

~~Total Imports~~

~~of Wool. Net Imports.~~

~~Tb~~

~~58,617,308 62,243, 482~~

~~Ib~~

~~2,553,671 8,011,980~~

~~tb~~

~~56,170,974 65, 255, 462~~

~~ENGLAND~~

~~231~~

~~The subjoined table gives similar details regarding the Worsted factories in Eng- land and Wales,~~

~~Number of Persons Employed.~~

~~78,915~~

~~86,690~~

~~82,972 128, 410~~

~~103,514 |~~

~~181,830~~

~~Number of | Worsted | Factories. |~~

~~Number of Power Looms.~~

~~umber of~~

~~Years. Ayitiice~~

~~1850 1856 1861 1868 1870 1874~~

~~498 508 512 687 599 648~~

~~864,874 1,298, 326 1,245,526 2,149,024 1,766,636 2,128,890~~

~~32,617 38,809 42,968 71,556 63, 443 75,591~~

~~The number of persons employed in the woollen factories~~

~~of England and Wales in 1874 comprised 54,119 males and 51,252 females. Of the males, 4391 were under thirteen years of age, 10,726 from thirteen to eighteen years of age, and 93,002 above eighteen. Of the females, 2841 were under thirteen, and 48,411 over thirteen years of age. In the worsted factories, the persons employed in 1874 com- prised 53,995 males and 77,835 females. Of the males, 14,074 were under thirteen, 10,694 were from thirteen to eighteen, and 29,227 above eighteen years of age. Of the females, 15,394 were under thirteen, and 62,441 over thirteen years of age. It will be seen that the number of children, of both sexes, is far greater comparatively in the worsted than in the woollen factories,~~

~~The following table exhibits the distribution of the Distri- woollen factories over England and Wales, giving the num- bution of ber in different counties, with power-looms and persons eno employed, at the end of 1874 :—~~

~~Number of Persons Employed.~~

~~Number of Power Looms,~~

~~Number Counties. of Factories.~~

~~Herts, Bucks, Oxford, North- ampton, Hants, Bedford, and Cambridge~~

~~Wilts, Dorset, Devon, Corn- wall, and Somerset~~

~~Gloucester, Hereford, Salop, Stafford, Worcester, and Warwick~~

~~Leicester, Rutland, Lincoln, and Notts~~

~~Cheshire~~

~~984 7,695 4,978~~

~~318~~

538 11,822

130 9,028 2 30,684

Northumberland, ‘ Cumberland, and Westmore-

Middlesex, Surrey, and Kent …. Wales and Monmouth

83,311,975 116,211,392 147,172,841

18,729,987 26,679,793 54,377,104

69,581,988 89,531,599 92,795,737

239,358, 689 323,036,299 390,055,759

66,573,488 134,866,304 178,020,372

172,785,201 188,169,995 217,035,387

Woollen Of the 1800 woollen factories in existence in the United factories

iff Wing Kingdom at the end of 1874, England and Wales had 480 ;

land and @Nd of the 692 worsted factories, England and Wales had

Wales, 239. The following table shows the number of woollen factories in England and Wales, the number of spindles and of power-looms in use, and the number of persons employed, at various annual periods from 1850 to 1874 :—

Number of Number of THOME Number of Ati spiiaies | over bate Enc, 1,306 1,356,691 o570 64,426

1,410 1,499,949 13,726 69,130 1,456 1,846,850 20,344 76,309 1,420 4,222,916 42,571 101,938 1,550 2,681,931 37,856 100,640 1,483 2,604,610 45,025 105,371

~~The worsted factories were thus distributed over Eng- Distri- land— there are none in Wales—at the end of 1874:— _ bution of~~

~~worsted Number | Number | Number of | factories. Counties. of of Power Persons Factories. | Looms, | Employed. Middlesex, Surrey, and Kent …. 6 31 129 Essex, Suffolk, and Norfolk……. 1 563 1,042 Wilts, Dorset, Devon, Corn- 4 564 wall, and Somerset …….. a Gloucester, Hereford, Salop, Stafford, Worcester, and 40 1,731 7,089 ck 6 eS Leicester, Rutland, Lincoln, Ena ISKOULS) Aarsrcenacdenaasococcor 13 ae 1,825 MAA TGS ITS: ssh s«:0<0ceeeeeeen nnn eee f 46 6,758 5,317 VEO ER UTo) aee on peteeeemere tteeee acsctre 520 | 65,789 | 114,388 Durham, Northumberland, Cumberland, and Westmore- 7 635 1,351 Nand)... Ms. ateevsecceies sesame tees Derbyshirel <2:.\-.....-~~

~~Number of silk factories.~~

~~Silk fac- tories in England,~~

~~232~~

~~The preceding tables show that the chief seat of the woollen and worsted manufacture is in Yorkshire, while Lancashire stands second, but a long way behind. In the western and some of the midland counties where the trade is carried on, it is on a very reduced scale, as the factories have no power-looms. The eastern counties likewise have at present buta very small share of the trade, which is now all but extinct in Norwich, the most ancient manufacturing town in the kingdom, where a colony of Flemings settled in the reign of Henry I., getting the long wool spun at the neighbouring market-town of Worstead, after which the new produce was named. The once famous market-town itself has sunk to an obscure village.~~

~~Silk,—Compared with the manufacture of goods made from cotton and wool, that of other textile fabrics is com- paratively unimportant, the main articles being silk, flax, and hemp. As far as the United Kingdom is concerned, the manufacture of flax stands first among these minor textile fabrics ; but taking England alone, the chief of them is silk. There were in 1874 in the United Kingdom 818 silk factories, with~~

~~1,336,411 spindles and 10,002 power- looms, employing 45,559 persons. Of this total, only 4 factories, with 226 power-looms, employing 740 persons, were in Scotland ; and but 2 factories, with 7 puwer-looms, employing 400 persons, were in Ireland.~~

~~The following table shows the number of silk factories in England, with the number of spindles and power-looms in use, and the number of persons employed, at various periods from 1850 to 1874 :—~~

~~Number of Silk Factories.~~

~~Number of Persons Employed.~~

~~Number of Power Looms.~~

~~Number of Spindles,~~

~~1,188,908 1,063,555 1,305,910 968, 182 929,157 1,103,898~~

~~6,092 9,260 10,635 14,511 12,135 9,759~~

~~272~~

~~454 761 587 692 812~~

~~The number of persons employed in the silk factories of England in 1874 comprised 12,772 males and 31,647 females. Of the males, 2324 were under thirteen, 2375 from thirteen to eighteen, and 8073 over eighteen years of age. Of the females, 4521 were under thirteen. 'he employment of children of both sexes in silk factories was on the decrease from 1850 to 1874, while during the same period it was largely on the increase in cotton factories, and also, but to a smaller degree, in the woollen and worsted manufacture.~~

~~ENGLAW®~~

~~[SILK AND LINEN.~~

~~It will be seen from the above table that the silk manu- facture is more dispersed over England than either that of cotton or woollen fabrics. The tendency to use machinery appears most pronounced in Lancashire and the three eastern counties, in both of which disticts the number of power-looms is nearly half as large as that of hands em- ployed ; while in other counties the number of power-looms is very smal! in proportion to that of workers.~~

~~Innen.—Next to silk in importance, as one of the minor Number At the end of of flax 1874, there were in the whole of the United Kingdom 449 '¢tories.~~

~~textile manufactures of England, stands flax.~~

~~factories for spinning flax, using 1,473,800 spindles and 41,980 power- looms, and employing 128,459 hands. In the returns for 1874, Scotland took the first rank as regards the number of flax factories, Ireland the second, and England the third rank. There were in Scotland at that date 159 factories, with 275,119 spindles and 18,529 power-looms, employing 45,816 persons; and in Ireland 149 factories, with 906,946 spindles and 17,827 power- looms, employing 60,316 hands.~~

~~The following table gives the number of factories for Flax fac- spinning flax in England, with the number of spindles and tories in of power- looms in use, and the number of persons em- Exegland.~~

~~ployed, at various annual periods from 1851 to 1874 :—~~

~~Number of Persons Employed.~~

~~| Number of Power Looms.~~

~~1,083 1,987 2,160 5,086 3,048 5,624~~

~~Number of Flax Factories.~~

~~Number of Spindles.~~

~~265,568 441,759 344,308 437,628 269,768 291,735~~

~~135~~

~~138 136 128 165 141~~

~~The number of persons employed in the flax-spinning factories of England in 1874 comprised 6856 males and 15,471 females. Of the males, 844 were boys under thirteen, 1380 lads from thirteen to eighteen, and 4632 men over eighteen years of age. Of the females, 1245 were children under thirteen, and 14,226 women over | thirteen years of age. There was a slight increase in the proportion of children of both sexes employed in the flax factories of England in the period from 1850 to 1874. In the Scottish flax factories, during the same time, the increase of children, notably females, was very great. There were only 218 girls under thirteen employed in all the flax-spinning factories of Scotland in 1850, and the number had risen to 1956 in 1874.~~

~~Distri- The following table shows the distribution of silk factories The following table shows the distribution of flax Distri- ae of over the various counties of England—there are none in | factories over the various counties of England—there are bution factories “’ales—with the number of power-looms in use and of | none in Wales—at the end of 1874 :— 24 ree over persons employed, at the end of the year 1874 :— —s England. Number | Number Number Number | Number Number Counties. of Flax | of Power | of Persons Counties. of Silk | of Power | of Persons Factories. | Looms. | Employed. Factories. | Looms. Employed. — ——_ | —_—__— ————_- Middlesex, Surrey, and Kent….. 8 164 Middlesex, Surrey, and Kent …. Sussex, Hants, and Berks …..... 36 153 Herts, Bucks, Oxford, North- Essex, Suffolk, and Norfolk…..... 149 256 ampton, Hunts, Beds, and Wilts, Dorset, Devon, Corn- 399 2.736 Cambridge wall, and Somerset ……. 4 Essex, Suffolk, and Norfolk Gloucester, Hereford, Salop, Wilts, Dorset, Devon, Corn- Stafford, Worcester, and wall, Sonierset, and Hants.. ‘Wiarwitk me aur-e mien ee. Gloucester, Hereford, Salop, Leicester, Stafford, Worcester, and Biel IN GHD oc ssc cascscaneoncstess Lancashime) .75.ca uaa teenenil« soos. Leicester, Rutland, Lincoln, Deérbyshiter…..ccsce escent and Notts VWorkshiné® «2a: cacceerertt csc nee Cheshire Durham, Northumberland, Lancashire Cumberland, and Westmore- Derbyshire~~

~~….. ET besser DOOR ONO ERR AE Yorkshire Chesitine®. ©. Btvesedtes..2 cetcccee~~

~~141 5,624~~

~~22,397~~

~~FISHERIES. | ENGLAND 233~~

~~The chief seat of the flax manufacture, it will be seen, | also upon the fisheries. It appears from official returns Fish- is in Yorkshire. It is a new branch of industry in | that there was a gradual decrease in the number of fishing ries :~~

~~| Leicestershire and the adjoining midland counties, where | boats, as will be seen from the subjoined table, which gives ne it did not exist previous to 1870. the number of boats of which the tonnage was known, for . Hlemp Hemp and Jute.—Among the minor textile manufactures, | each division of the United Kingdom in the years 1872, | and jute hemp and jute come next to flax. The hemp manufacture | 1873, and 1874 :— ‘ factories. is of comparatively recent date. There were but five hemp | ——————_ | factories in the United Kingdom in 1861, but they had : iter 1872. 1873. 1874, increased to 61 in 1874. Of these 45 were in England, ; waver, | aviieer. | nie 12 in Scotland, and 4 in Ireland. The English hémp | | ———— - — | factories, situated mainly in Lancashire and the northern | | England and Wales…….. 14,237 14,171 14,126~~

~~counties, had in use 6448 spindles and 22 power-looms in ae ee 14,451 13,954 13,471~~

~~1874, and gave employment to 3039 persons, of whom Isle of Man 375 37] 377 1574, or about one-half, were women. Of jute factories, there were in the United Kingdom 110 in 1874, England having 15, Scotland 84, and Ireland 11. The English ae a, ae” jute factories, distributed over the northern and midland counties, had in use 21,754 spindles and 927 power-looms~~

~~The following table shows the tonnage of the preceding Tonnage~~

~~in 1874, and employed 4933 persons, of whom 3423, or number of fishing boats, in each of the years named :— es nearly three-fourths, were women. In 1861 the whole of 1872, the jute factories of England employed only 107 persons. Hosiery, Hosiery, Lace, and Shoddy.— There are enumerated in | a lace, and parliamentary papers, and various official returns, {| | England and Wales…..... 140,535 | 145,134 ., number of other existing factories, among them of hosiery, ei ee a 92,294 'lace, "shoddy," hair, felt, and elastic fabrics. The Mostery | (PERN... ..... ss. cence: 25,629~~

~~factories of the United Kingdom employed 11,980, and the lace factories 10,373 persons in 1874; but all the others gave employment, in the aggregate, to less than 9000 workers. The hosiery factories were all in England, with the exception of 4 in Scotland, employing 1006 persons, In the English hosiery factories, 65 in number, nearly all in Leicestershire and adjoining midland counties, there were 10,914 persons employed in 1874, about one-half of them women. The hosiery factories of England more than doubled from 1861, when their number was 65, to 1874. The same was the case with the lace factories, which increased from 186 in 1868 to 311 in 1874. Another notable textile industry enumerated in the official returns is that of "shoddy factories." There were of these establishments, 125 in the United Kingdom in 1874, all of them in England, with the exception of some very small Scottish ones, returned as employing together 7 persons. The English shoddy factories, dispersed in 1874 over York- shire and Lancashire, with but a few in other counties, had in use in that year 101,134 spindles and 1437 power- looms, and employed 3424 persons, more than one-half of them women. 'There was an increase in the shoddy factories of Lancashire from 1868 to 1874, but a decrease during the same period in those of Yorkshire.~~

~~Factory Supervision.—To protect the health of the people employed in English manufacturing industries, and to pre- serve them from accidents of all kinds, parliament passed in recent years a numberof laws, knowngenerallyas the Factory Acts. In these Acts, the hours of labour are restricted, more especially for young persons and women, who cannot be set to work for more than 12 hours on any day, and not~~

~~for more than 60 hours per week. The due execution of the Factory Acts is superintended by inspectors of factories, appointed by the Government, who have to make to the home secretary half-yearly reports, which are printed and laid before parliament. In a recent report it is stated that the laws passed are constantly more appreciated both by employers of labour and by the workers, but that the latter are subjected to much suffering through stagnation of trade. The latter is ascribed mainly to foreign competition. While there is doubtless truth in this view, there can be equally little doubt that other causes have affected, and continue to affect, English manufacturing industry.~~

~~FisHerres.—The stagnation of trade which made itself felt, in recent years, in the chief manufactures, operated~~

~~UEVE OF TMB. ser. ce cnevagor sf 5,032 Channel Islands ……. 2,725~~

~~DOWEL, osc saaesss+asenseoocncd, SOR ONO 270,744 274,267~~

~~It will be seen that there was an increase, during the three years, in the total tonnage of the English, but a decrease in that of the Scottish and Irish fishing boats, as well as in that of the Channel Islands.~~

~~The fishing boats of the United Kingdom are divided by Classifi- the Board of Trade into three classes,—the first class com- cation of prising all boats over 15 tons ; the second all boats under {ishing 15 tons, propelled otherwise than by oars ; and the third >™**- class all boats navigated only by oars. The number of the first class in England and Wales at the end of 1874 was 2934, with a tonnage of 110,500, and in Scotland 2407, with a tonnage of 40,629. Of fishing boats of the second class there were at the same date 8313, with a tonnage of 35,670, in England, and 9815, with a tonnage of 48,124, in Scotland. Of boats of the third class, there were in England 2879, with a tonnage of 4098, and in Scotland 1249, with a tonnage of 2366. Thus,England had the superiority in vessels of the first and third, but not in those of the second class. The fisheries of England are devoted mainly to the netting of mackerel, pilchards, and similar fish, and those of Scotland to cod, ling, and herrings.~~

~~The imports of fish from foreign countries have in recent Imports years been on the increase, and the exports on the decrease. and ex- The total value of the imports of fish in 1872 was £859,042, ports of and in 1876 it amounted to £1,459,974. The total exports ac of fish were of the value of £1,183,801 in 1872, and of £624,726 in 1876. 'The exports are chiefly in herrings, of which 631,750 barrels were shipped to foreign countries in 1872, and 426,588 barrels in 1876. (See also FISHERIES.)~~

~~VI.— Commerce.—Shipping.~~

~~British commerce received an enormous development, un- Progress paralleled in the history of any nation, during the half a of Brit- century from 1826 to 1876. In the year 1826 the aggre- ish com- gate value of the imports into and exports from the United ™*® Kingdom amounted to no more than £88,758,678 ; while the total rose to £110,559,538 in 1836, and to £205,625,831 in 1846. In 1856 the aggregate of imports and exports had risen to £311,764,507, in 1866 to £534,195,956, and in 1876 to £631,931,305. Thus the commercial transac- tions of the United Kingdom—those of England, by itself,~~

~~cannot be given—with foreign states and British colonies The exports of British home produce from the United Foreign~~

~~increased more than seven-fold in the course of fifty years. | Kingdom im each of the years 1875 and 1876 were sent to export Imports The following two tables exhibit the values of the | the following colonial possessions and foreign countries :— ™4kets. and annual imports, of the total annual exports of British home apr, produce, and of the total imports and exports of the United~~

~~ne Kingdom—the latter including exports of foreign and~~

~~Exports of Home Produce, Year 1875. Year 1876.~~

~~colonial produce—as well as the proportions per head of To ee Possessions :— £ &~~

~~hird vear from 1864 to 1876 -_ “Ce eee 24,246,406 | 22,405,420~~

~~population, for every third yea USER POM ion ane cspvesysceeessoure 19,491,247 | 17,681,661~~

~~ee British North America ……. 9,036,583 7,358,151~~

~~EOE Total Imports CaperandeNaitall,….~~

~~SO re eee. |.) semewaene Hong Kong……ccccccee ceesees ree 8,599,811 | 3,080,376~~

~~ssl Wiest GMS cs ocageeeene+scoe0.-0s 2,186,527 | 2,927,996~~

~~£ £ £ Straits Settlements ……. 1,961,634 1,968,946~~

~~274,952,172 160, 449,053 487,571,786 Cilpralitargey vteeeere soc. coe oes 969,222 1,120,965~~

~~275,183,187 | 180,961,923 | 500,985,666 oy ilies tes lel ae, 1,076,752 | 1,073,505~~

~~308,257,493 199,586,322 547,338,070 All other possessions ……., 2,116,721 2,878, 63 371,287,372 | 255,164,603 | 682,292 137 _ a~~

~~375,154,703 200,639, 204 631,931,305 Total to British Possessions ….. 71,092,163 | 64,859,224~~

~~To Foreign Countries :—~~

~~Imports Exports of Total Imports OY cis ies es GEA os ve vev’es 23,287,883 | 20,082,262~~

~~Spa British Produce. and Exports. United States ……..c00cccee:2| 91,868,279 | 16,838,517~~

~~SY SSS SS AT Go uracmeccccccereesitsisses saseeerce: 15,357,127 | 16,085,615~~

~~Proportion per Proportion per Proportion per INGPWerIANMGB, Wen. cusskeeocselsceees 13,118,691 | 11,777,192~~

~~Head of popula- | Head of popula- | Head of Popula- UR eee ct creates ee 6,766,698 | 6,689,402~~

~~a : = RRGBIR t…..soscesscresecesersveeessseon! 9,090,504 | 182 886~~

~~——— / TUPKEY .6…6.c0.sccesssseessesesessseee| 6,889,905 | 5,922,895~~

~~5 Pyvraizall emer sone anc enone aeccts 6,869, 491 5,919,758~~

~~5 BOM WIRA csneesoeensenvateareoess | 5,781,988 | 5,875,407~~

~~6 eee ee ee 4,928,500 | 4,611,180~~

~~7 Sweden and Norway …... ..... 4,538,455 4,224,719~~

~~6 SOA. eae etteecicssisecationar ers sis slaaies 3, 430,340 3,992,365~~

~~ee ee ek 2,945,846 | 2,630,407~~

~~Foreign 'The following table exhibits the value of tho imports into || Denmark. TTTTT | aeepsyor | a2tostt06~~

~~paid the United Kingdom from the principal British possessions SS Ee Ae eee 2, 460,227 2,032,685~~

~~mare*S* and foreign countries in each of the years 1875 and 1876 :— Spanish West Indies…..... 2,630,634 | 2,015,118 (CLA I ein semneebncind anOnaeenGaacuanese 2,207,418 1,945,791 |~~

~~Imports. Year 1875. Year 1876. Java.. Hee een te esse eae enee neces eee eu ees 1,735,996 1,676,198~~

~~Argentine Confederation …..... 2,386,002 1,548,532~~

~~< : UU MA sce rccsoreeeeses say eeeetnees 718,830 1,006,307~~

~~From British Possessions :— £ £ ROWMIATA Pete eeics:cascore scores 1,054,744 707,568~~

~~ars sigalssioie eStseteeemter nee volte 30,137,295 | 30,025,024 Ail other countries……; 2,788,877 9,595,007~~

~~ysdsulaces sae eeeaiien te 20,559,154 | 21,961,929~~

~~Sore 10,212,624 | 11,023,782 Total to Foreign Countries ……} 152,378,800 | 185,779, 980 Wiest (indies cnsqeeeeseneaie os oc: 5,414,059 6,894,331 —_—_—_—_—_———— Cape of Good Hope and Natal| 4,478,960 4,192,416 Total exports of home produce..| 223,465,963 | 200,639,204 CeO sss. ee ee ea coie| Top Ankes || Miami ee ele. Straits Settlements ……. 3,149,310 2,641,946 It will be seen from the preceeding tables that the bulk Conceen- nea: amen pe aa es of the commercial transactions of the United Kingdom, tration of~~

~~both as regards imports and exports, is with but a few states British — mainly three British colonies and eight or nine foreign Jomo, countries. In the same manner, the great mass of imports, as well as of exports of British produce centres, in each~~

~~Total from British Possessions} 84,423,971 | 84,232,576~~

~~From Foreign Countries :—~~

~~Frame eZ] aetza0‘101 | Ge’s08e4 || 88, in about half a dozen principal articles. More than~~

~~Cori ah ae On Neate 21,836,401 | 21,115,189 || one-half of the total imports into the United Kingdom are~~

~~MUEIMM ois al ov slsieuenenesennee 20,708,901 | 17,574,488 made up of the six articles enumerated in the following~~

~~Netherlands. ……+1esese. 14,836,648 | 16,602,154 || table, one-half of which represent food for the nation, and~~

~~ee eee 13,607,582 | 14,988,641 ! ; –~~

~~BOM. . casateeeeesees eeeese ss 14892.940 | 18.848.298 the other half raw material for its manufactures. The Principal~~

~~Bh gana ne deren see nese wasnalyes 10,895,043 | 11,481,519 table shows the value of each of these six articles im-1™Ports.~~

~~Sweden and Norway…….. 8,918,638 | 10,654,311 ported into the United Kingdom during the years 1875 and~~

~~WPSUNS >. ee cosmic sumneeee es emee teem 8,660,953 8,763,146 1876 —~~

~~(NTO) Shc RnR aaaoensoanee nacht antic 6,555,714 7,444,323~~

~~Peru… Sao aaleleas sia. .c)heeeals. » See 4,884,181 5,630,670 Principal Articles Imported. 1875. 1876.~~

~~BTAZTIO ae aerate. oo cs ciciiaaeeee ester 7,418,605 5,178,386 _ ———— os~~

~~MP) STUNG vataig otecos steren caleoeenee 4,241,671, 4,217,934 £ £~~

~~1 Li ile. Gen BNOAR OM etnennarn nares: 4,632,619 4,152,201 Loe Comm andeflomueenssriece ses 53,086,691 51,812,488~~

~~Eee. eee. 4,196,096 | 3,584,598 2, COtbOR TAR. ee. seeessssessoevee 46,259,822 | 40,180,880~~

~~Postagalh See.~~

~~Spanish West Indies…….. 3,668,776 2,948,385 4, Sugar, raw and refined.,..... 21,548,303 20,456, 977~~

~~EOC, Mi iccn teens. ee ee 1,762,301 | 1,799,377 5. Woodiamt GURDEt. esai.c007 0s 15,424,498 19,140,526~~

~~Argentine Republic ……| 1,358,788 1,664,029 6;. “leaWremec. corte essences oss 13,766,961 12,697,204~~

~~Philippine Islands……. 1,559,500 1,442,556~~

~~Java and dependencies …… 1,442,607 , 1,440,860 The six principal articles of British produce exported to principal~~

~~Rowmanie…. saa… aie 594,158 1,238,091 : & : : derived f~~

~~Unitas 1 5088 841314 colonial possessions and foreign countries are derived from exports~~

~~Allether countries…2-1.| 10,806,440 | 9,701,799 | | the labours of either manufacturing or mining industry. of Beith It may be gathered from the preceding chapters on mines Procut’~~

~~Total from Foreign Countries) 289,515,606 | 290,822,127 | | and minerals, and on manufactures, to what an extent these six great export articles are the produce of each of the divi-~~

~~sious of the United Kingdom.~~

~~Dotaltimports:.....,.....08 378,989,577 | 375,154,703~~

~~« SHIPPING. | ENGLAND 250 Principal articles exported. 1875. 1876. Year 1875. | Year 1876, 1. Cotton manufactures : £ £ £ £ Piece goods, white or plain ….| 38,255,013 | 31,454,280 7, 15.763.666 | 15.802.004 », printed or dyed…| 19,900,918 | 18,494,492 i ac cis. lk ett oie of other kinds ….| 5,442,922 | 4,910,763 Testard 1.755.487 | 1.829.881 OOD YON. .....0ceseccanesscae 13,172,860 | 12,781,733 eee ee. cin ccae PEED oes ssesessssssevvese a 71,771,713 | 67,641,268 ETO) eeeee 2 208 Pai olivns Gd worsted ° More than one-half of the total customs receipts of the Customs Cloths, coatings, &c. .....{ 6,850,208 | 6,451,410 United Kingdom, and nearly two-thirds of those of receipts Flannels, blankets, and baizes) 1,289,637 | 1,014,886 England and Wales, are collected in London; while the a Worsted stuffs ……..:0ceeeees 11,159,914 9,141,605 amount collected at Liverpool is~~

~~not very far from the total pelish Carpets and druggets……. 1,159,979 911,873 : ; nglis All other sorts ..s.sc.cscsecescseee. 1,249,592 | 1,083,704 | | Tecelpts of Scotland and Ireland. Besides London and ports. Woollen and worsted yarn…... 5,099,307 4,417,241 Liverpool, there are but eight towns of England and ae Wales, out of eighty-seven which have custom-house Total s.scsseereeerseeees 26,758,632 | 23,020,719 establishments, where the collection amounts to £100,000 ay ak die sleet – and more per annum. The following is a list of these Iron, pig and puddled…….. | 8,449,916 2,842,434 eight ports, together with London and Liverpool, giving wy bar, angle, ak and rod a fee Rear the sums collected by the customs in each of them, in the railroad, of all sorts …... 4538 00,10 5 ea oii, res ee Weta | | Ie and Iss : » titted plates. .....0ees0-00s 3,686,607 2,891,693 vear Year 1876 hoops and plates …….. |) Seeacaee | oeeeeraen || | Br lal », wrought, of all sorts…... 4,342,492 4,041,418 £ £ », old, for re-manufacture… 102,837 95,977 9,940,139 9,981,021 Steel, wrought and unwrought| 1,901,491 1,635,569 2,919,419 2,979,241 ——— 691,730 673,395 MUO CagaRsenconteencencee 25,747,271 | 20,737,410 334,738 304,422~~

~~150,255 161,985~~

~~4. Coals, cinders, and fuel …….+. 9,658,088 8,904,463 161,461 159,009~~

~~128,334 128,809~~

~~De, EACHUNOTY es iaicvuesantaneurese nn sien 9,058,647 7,210,426 137,193 126,429 age as 103,018 105,918 6. Linen :— 107,500 101,609 White or plain …….. DOO GEBEDEAC 5,904,958 4,365,072 Lee pe eee, ee baooe The table indicates commerce in goods only that pay WANOM VANE, oe soiaceunéseovvcaees 1,855,684 1,449,513 duty ; otherwise Liverpool would show larger returns. —<———_—__——— It appears from the returns of the last thirty years that Great Rotalern ees seesresestees 9,128,604 7,070,149~~

~~the commerce of the country has a constantly growing centres tendency towards concentration, and that while the cus- °f co™- toms receipts of the smaller ports are gradually decreasing, “°* there is corresponding increase in those of the two chief~~

ports, London and Liverpool, which are gradually becom-

ing the all-absorbing centres of England's international

trade and navigation.

Shipping.—The shipping of the United Kingdom in- Progress creased sixfold in the period from 1840 to 1876. Inthcof | year 1840 the total tonnage of vessels, British and foreign, S#PPI"s- which centered at ports of the United Kingdom was

Tnecrease of im- ports,

The most important fact in connection with the foreign commerce of the United Kingdom in recent years, is that and de. 'Here has been a gradual and steady increase of imports, crease of together with a decrease of exports of home produce. The exports, movenient began in 1872. Up to that time, the exports of British home produce had kept on increasing with the imports, although at a lesser rate, and far inferior in aggregate value; but a change took place in the latter year. While the imports continued their upward

Customs receipts of the United King- dom.

course, gradually rising from £354,693,624 in 1872 to £375,154,703 in 1876, the exports of British produce fell from £256,257,347 in 1872 to £200,639,204 in 1876. The decline in exports, regular and steady throughout the period, and with a tendency to become more pronounced every year, affected all the principal articles of British home produce just enumerated. The value of the cotton manufactures exported sank from £80,164,155 in 1872 to £67,641,268 in 1876 ; woollen fabrics from £38,493,411 to £23,020,719; iron and steel from £35,996,167 to £20,737,410; coals from £10,442,321 to £8,904,468 ; machinery from £8,201,112 to £7,210,426; and linen manufactures from £10,956,761 to £7,070,149. The decline during the four years, it will be seen, was greatest of all in textile manufactures, and least in coals and machinery.

~~Customs Receipts. —While the distribution of the exports from each of the three great divisions of the United King- dom may be judged by their comparative manufacturing activity, that of the imports can be approximately ascertained—making due allowance for great centres of commerce—from the custom-house returns. The receipts of the customs were as follows in each of the years 1875 and 1876 :—~~

~~4,657,795 ; andin the year 1850 it had risen to 7,100,476 ; while in 1860 the total tonnage was 12,172,785. The rise continued uninterrupted, as will be seen from the following table, which gives the tonnage of British and of foreign vessels which entered and cleared at ports of the United Kingdom every third year from 1864 to 1876 :—~~

~~Entered.~~

~~British. Total.~~

~~Foreign.~~

~~Tons,~~

~~13,515,011 16,338,817 18,113,364 21,864,957 25,067,264~~

~~Tons,~~

~~4,486,911 5,140,952 5,782,974 7,323,929 8,555,318~~

~~Tons,~~

~~9,028,100 11,197,865 12,880,390 14,541,028 16,511,951~~

~~Cleared.~~

~~British.~~

~~Foreign.~~

~~Tons. Tons. Tons. 1864 9,173,575 | 4,515,928 | 13,689,498 1867 11,172,205 | 5,245,090 | 16,417,295 1870 12,691,790 | 5,835,028 |~~

~~18,526,818 1873 15,106,316 | 7,468,713 | 22,575,029 1876 | 16,930,028 | 8,787,610 | 25,717,628 |~~

~~236 ENGLAND [RAILWAYS,~~

~~The total tonnage here enumerated comprised both sail- { were made in 1660, and canal-building began in the middle ing vessels and steamers. The number and tonnage of the | of the following century; but though roads and canals aided former is decreasing, and that of the latter increasing, to | materially in raising the commercial and industrial activity such an extent that steam vessels appear likely to absorb | of the nation, their fostermg agency was very slight com- the whole international commerce of the country. pared with that of railways. In the half century during The following table of the principal ports of the country | which England has built railways, its material progress has summarizes the tonnage of vessels with cargoes which | been vastly greater than that of the whole five previous entered and cleared coastwise, and from and to foreign | centuries. countries and British possessions, in 1876 :— The first line of railway on which carriages were propelled Early by steam engines, that from Stockton to Darlington, four- Pxslish Entered. | Cleared. teen miles in length, was opened September 27, 1825, "Ways Toms. fond Although this little line, pioneer not only of England's, but : 4,503,673 | 18,578,192 the world's railways, proved a great success, it had no im- Tren oe 5,587,416 | 11,967,633 mediate successors of any note till five years after, when the 7 5,168,330 | 6,650,204 first really important railway, connecting two great centres 2,883,535 | 3,554,744 of commerce, was fmished. This was the line from Man- 1,334,285 | 3,025,613 chester to Liverpool, opened September 15, 1830, when 2,289,710 | 2,593,530 Mr Huskisson was accidentally killed. As yet no railway a | Ae Te a had come near the metropolis, but great efforts were made 992,092 1,559,833 by George Stephenson and his friends to get permission Newport? ; 959,792 | 1,468,266 for constructing a line from London to Birmingham. The Hartlepool * 956,248 | 1,408,407 bill brought into parliament for this purpose met with the 1 These are almost exclusively mineral ports. most violent opposition, chiefly on the part of the great~~

~~Tonnage The subjoined table shows the total tonnage of the sail-~~
~~landowners, who, so far from seing that the new mode o of vessels ing~~
~~vessels and steamers registered as belonging to the communication~~
~~would immensely enhance the value of their~~

~~onthe Tynited Kin gdom, at the end of each third year from 1864~~
~~properties, loudly proclaimed that the substitution of steam~~

~~ae ae for horse-power would be "the curse and the ruin of : England."~~
~~It took three years to get the bill for the Years. Sailing Vessels.~~
~~Steamers. | Total. London-Birmingham railway, which was passed at~~
~~last in a a ae eo =. the session of 1833, obtaining the royal assent on the~~
~~8th 1864 4,930,219 697,981 5,627,500 of May. The first sod of the great~~
~~line was cut at Chalk The first~~

~~1867 4,852,911 901,062 5,753,973 Farm, London, on the Ist of June~~
~~1834. Enornious en- great~~

~~a aes " ricer he gineering difficulties had to be overcome, originating~~
~~not so ae 1376 4,257,986 20057347 6'263°333 much from the nature of~~
~~the ground as from intense public~~

~~prejudice against the new mode oflocomotion. Instead of following the~~
~~course of the old highroad, running along valleys, the line had to be~~
~~pushed, by numerous viaducts and tunnels, over hollows and under~~
~~hills, so as to avoid~~

~~Increase During the period 1864-76 the number and tonnage of of~~
~~steam sailing vessels registered as belonging to the United King-~~

~~naviga- : Broan ar ae but ane A ing increased from 2490 | touching any~~
~~considerable towns. It took five years to tp '| seed a He e ' ows that~~
~~their tonnage nearly | construct the railway from London to~~
~~Birmingham, at a cs wg hail © Ad oie unuscalgs a doubling of the | gost~~
~~of 'over four millions. Even friends of the railway beh cure al a a lige ca~~
~~of commerce | presaged that such outlay could not by any possibility be~~
~~requiring them to be more and more large. Nearly three- |~~
~~remunerative ; but the contrary became evident from the fourths of the~~

total shipping of the United Kingdom be- | moment the line was opened, in 1838. The first great Tonge ¥ a and i United K: “trunk” line proved a striking success, and its opening e total tonnage of the United Kingdom, far larger | settled, without further controversy, the establishment of than that of any other country, represents by itself more | the new system of intercommunication in England. een Ale of the shipping of all the maritime states of All the great railway systems of England sprang into Origin 7 ‘ ee ie ; ; existence within less than ten years after the opening of of the re ip-building has long been an industry of great import- | the Tondon-Birmingham line. Out of the latter grew, in leading

building. ance in England, although of late yéars it has suffered considerable fluctuations. The principal centres of the

industry are the Thames, the Tees, the Tyne, and Sunder- | a¢ pecards milea «et : : ? : g ge, the Great Western, originated in a line land on the east coast, and Liverpool, Barrow, and White- from Paddington, ‘London, to Bristol, ‘for which an Act of haven on the west. A very large proportion of vessels | Parliament was obtained in 1835, and which was opened built in recent years are constructed of iron, with the con- | jn 1841. In 1836, a bill passed the legislature erecting sequence that the ship-building trade has mostly settled in | the “Great North of England” Railway Company, ertul ———— of the coast that are nearest to the iron and | which was developed the now third largest of English rail- i a: + ae way systems, the North-Eastern. A few years subsequently In 1874 the total amount of shipping built in England | various other Acts were passed, sanctioning the “ Midland reached 277,984 tons ; in 1875, 220,036 tons ; and in 1876, | Counties” and the “North Midland” lines, from which oe sie en there were built 166,214 tons, | sprang the present Midland system, fourth largest of Eng- ee ey “tt Se in 1876. The numbers do not | lish railway companies. The construction of railways, up pai ii cg Natio to this time, was confined almost exclusively to England ; VIL Railways.—Canals and Roads. cae begun much later in Scotland, and still later Influence Far greater even than the impulse given to the country’s The total length of railways in the United Kingdom at ig foreign commerce by steam navigation has

~~been the vast) the end of the year 1825, which saw the opening of the YS. progress of internal communication effected by railways. | first line, was 40 miles, constructed at a cost of £120,000. The first ordinary roads deserving the name of highways | Five years later, at the end of 1830, there were not mcre~~

~~the first instance, one of the largest of companies, the Lon- ee~~

~~don and North-Western, while the most extensive system, panies.~~

~~RAILWAYS. || ENGLAND Joe~~

~~Growth than 95 miles, built at a cost of £840,925, but at the ofrail- end of 1835 there were 293 miles, costing £5,648,531. Thus, in the first five years of railway construction, from 1825 to 1835 to 1830, the mileage doubled ; while in the second 1850. _ five years, from 1830 to 1835, it trebled. It quintupled in the next five-yearly period, till the end of 1840, when the total length of miles of railway in the kingdom had come to be 1435, built at a cost of £41,391,634, as repre- sented by the paid-up capital of the various companies. The next five years saw again nearly another doubling of length of lines, for at the end of 1845 there were 244] miles of railway, created by a paid-up capital of £88,481,376. Not far from a fresh trebling took place in the course of the next quinquennial period, and at the end of 1850 there were 6621 miles of railways, constructed at the cost of £240,270,745. Nearly all the railways opened up to this date were main or " trunk" lines, con- necting more or less busy centres of population, the traffic between which was so large as to require double lines. Unlike most European countries up to the present time, England began railway building on a scale commensurate with the importance of the new mode of intercommunica- tion, the leaders of the great enterprise foreseeing clearly the ultimate requirements of their work. It thus came to pass that double lines were made the rule, and single lines the exception. More recently, however, an increase has taken place in the construction of the latter, owing to the extension of short branches from the main lines. Caenth The length of railways open for traffic in the United of rail- Kingdom, either with double or single lines, and the a amount of~~

~~authorized capital, were as follows at the end of 1856 to each fifth year from 1856 to 1876 :—~~

~~1876.~~

~~Double or Single lines. more lines.~~

~~Miles. Miles.~~

~~6,266 2,444~~

~~6,893 3,972 7,711 6,143 8,338 7,038 9,169 7,708~~

~~Authorized Capital.~~

~~Shares and Loans and Stock. Debentures. oo~~

~~£ £ : £ 282,890,751 94,877,156 | 377,767,907 322,369,654 | 107,503,292 | 429,872,946 466,151,633 | 154,412,773 | 620,564,406 451,898,908 | 163,827,982 | 615,726,890 549,095,705 | 192,706,822 | 741,802,527~~

~~Distri- Nearly three-fourths of the railways of the United~~

~~bution of Kingdom, and far more than three-fourths of the capital~~

~~ree invested in them, fall to the share of England and Wales. er the : :~~

~~United 'The length of lines open for traffic in each of the three~~

~~King- divisions of the kingdom, and the amount of authorized~~

~~dom. capital, was as follows on the 31st December 1876 :—~~

~~Distri- bution of P Shares | BY Loans Total capital, : nee, | ana Stock, | 824 Deben| Authorized~~

~~tures, Capital.~~

~~£ £&~~

~~449,973,593 | 161,438,942~~

~~71,595,107 } 21,130,250 27,527,005 | 10,137,630~~

~~United~~

~~Kingdom 549,095,705 | 192,706,822~~

~~Among the most marvellous effects produced by railways was the incentive given by them to the population to move from one place to another. Before the making of ordi nary~~

~~roads, that is, previous to the middle of the 17th century, and the old era of packhorses and bridle paths, there was scarcely any movement worth the name ; and the immense majority of people had to live and die in the places where they were born, simply through not being able to transport themselves elsewhere, even for a short distance. A change took place when highways came to be made, with stage- coaches rolling along them, at a rate of from six to ten miles an hour. But the accommodation afforded by these new means of travelling was necessarily limited, besides being costly, in time as wellas money, and the mass of the people could not avail themselves of it. But what was impossible for "the coach" was the easiest achievement for "the train" of coaches. In "the train," placed upon two longitudinal lines of iron rails, and propelled by steam, the whole nation for the first time obtained freedom of movement, The ancient packhorses carried their hundreds, and the stage-coaches their thousands ; but the railways carried their millions—and more millions than ever stage- coaches carried thousands.~~

~~Impulse to tra- velling given by railways.~~

~~The railways carried their first million of passengers in Passen- 1833, the year in which Stephenson won his great parlia- gertrafiic~~

~~mentary battle in getting the bill for the London-Birming- ham line passed. The number of passengers carried per mile in 1832 was 4860, but before other ten years were gone, the number of passengers had not~~

~~only increased in pro- portion with the opening of new lines, but more than doubled per mile, and, instead of being under 5000, had in 1842 come to be near 12,000. The following table ex- hibits the growth of the passenger traffic on the railways of the United Kingdom, giving the length of lines open, the total number of passengers carried, and the number per mile, in every fifth year from 1846 to 1876 :—~~

~~Length of Number of Years, Dec. 31. Lines open Total Number Passengers for Traffic. of Passengers. Per Mile.~~

~~Miles.~~

~~1846 3,036 43,790,983 14,423 1851 6,890 85,391,095 12,309 1856 8,707 129,347,592 14,855 1861 10,869 173,773,218 15,988 1866 13,854 274,408,895 19,734 1871 15,376 375,409,146 24,415 1876 16,872 538,681,722 31,928~~

~~The table shows, more clearly than could be expressed by any description in words only, the striking changes effected by railways in the migratory habits of the people in the course of a generation. While the number of pas- sengers was little above 14,000 per mile in 1846, it was nearly 32,000 in 1876. The number of passengers carried on the railways of, the United Kingdom in the year 1876 was equal to four times the population of Europe, and more than half the estimated population of the globe.~~

~~of railways, 1832 to~~

~~1876.~~

~~Considerably more than four-fifths of the passenger traffic Passen. on the railways of the United Kingdom is in England and gertraftic Wales. The number of railway passengers in England and ™ 1876.~~

~~Wales, in Scotland, .and in Ireland, and the numbers travelling by each class of railway, were as follows in the year 1876 :—~~

~~Ist Class 2nd Class ard Class Passengers. | Passengers. | Passengers.~~

~~Divisions.~~

~~England and } Wales ….) Scotland …..... 4,693,843 | 3,319,741 | 31,978,057 | 39,991,641~~

~~ies 1,862,382 | 4,208,562 | 11,285,319 | 177356,263~~

~~United en |~~

~~Kingdom 44,859,066 |66,478,195 |426,950,034 588,287,295~~

~~ENGLAND~~

~~Tramways.—The obvious advantages, quite independent Tram- of steam power, offered by placing longitudinal rails on the ways.~~

~~[TRAMWAYS AND ROADS.~~

~~238~~

~~Not included in the above summary are season-ticket holders, to the number of 394,427—345,656 in England~~

~~and Wales, 26,481 in Scotland, and 22,290 in Ireland— the addition of which brings the total number of passen- gers to 538,681,722 in the year 1876.~~

~~ground for the traction of vehicles led to the introduction, in recent years, of a modified form of railways, known as tramroads. In reality, tramroads are the oldest railways. Wooden rails existed in the mining and quarrying districts~~

~~Receipts The total receipts, the total working expenditure, and the and ex- net receipts of the railways in each division of the United | of England as early as the commencement of the 18th pendi- Kingdom were as follows in the year 1876 :—~· century, and these being liable to rapid destruction by wear Miosteiyt d tear, it occurred to the manager of the far-famed Cole- railways, Nl i H g ° Total Proportion || brookdale works before referred to that iron would be an Divisions oe.~~

~~om dices. ‘ee oi Expendi- || excellent substitute for wood. Accordingly, in 1767 the Receipts. whole of the wooden rails used on the extensive grounds in i nd ee = aa the cae a bi Ate a = England and) |-. replace iron rails. Early as thus was the establishmen Wie… es A Pa Ne fg of ee sai oe over ahh vehicles were drawn by Scone seeeenees i Sei eas pee ee PA horses, into England, they were forgotten over steam- cate: dee a? ae worked railways, and nearly a century elapsed before they ited’ King- were introduced again. The first tramway was laid down ae ie 62,216,775 | 88,555,509) (28,680,266 sa at Birkenhead in’ 1860, after pound models; but a subsequent attempt to lay down a line in London, from the Passen- The receipts of the railways of England and Wales in Marble Arch to Bayswater, and another from Westminster gerand 1876 were derived to the extent of 55 per cent. from the Bridge southwards, proved a failure. Fresh attempts, made oe goods traffic; and of 45 per cent. from passenger traffic. In | 1868, were more successful ; and in 1870 an Act was ” 1854 the total receipts were exactly alike from the two passed by the legislature—33 and 34 Vict. c. 78—to facili- sources, but after that year the proportion contributed by | tate the construction of aaa throughout the country. goods gradually rose, reaching 51 per cent. in 1858, 52 per This led to the laying down of “street railways ” in nearly cent. in 1862, 53 per cent. in 1863, 54 per cent. in 1867, all the large towns. _ According to a return laid before the and 55 per cent. in 1873. In Scotland the receipts from House of Commons in the session of 1878, the total length goods traffic in recent years amounted to 85 per cent. of the | 0f tramways authorized by parliament up to the 30th of total; but in Ireland the passenger traffic furnished 53 per June 1877 was 363 miles, and the total length opened for cent. of the total receipts. traffic 213 miles, comprising 125 miles of double lines, and Number The construction of railways in England was undertaken 88 miles of single lines. The total authorized capital of all of rail- originally by a vast number of small companies, each the tramway companies on the 30th June 1877 was way com- obtaining separate Acts of Parliament deemed requisite £5,528,989, while the paid-up capital amounted to Panies- for their existence. But many years did not elapse before £3,269,744, and the capital actually expended to it was discovered that there could be neither harmonious £3,343,265._ A parliamentary commission on tramways, nor profitable working of a great many~~

~~systems, and this which made its report in the session of 1877, recommended led‘to a series of amalgamations, by which the majority | the introduction of steam as a motive power, and the pro- of.the lines were brought under the management of a few bable adoption of this improvement can scarcely fail to great corporations. In the official “ Railway Returns” | bring “street railways,” in course of time, to be a useful issued by the Board of Trade, there were still 92 independ- | 2Ppendage of the ordinary railway system, ‘ ent companies enumerated as existing in England and Canals.—Roads and canals, too, the oldest aids to inter- Canals. Wales at the end of 1876, but the mass of these consisted | Communication, are tending more and more, as far as of very small undertakings. Virtually, the railways of the lengthened distances are concerned, to be simple auxiliaries country were controlled by seven leading companies, as of railways. The total length of the canals traversing follows :— England extends over 2360 miles, and it is estimated that more than half of this length already either belongs to Raat oP Mande | Length ae sedlen railway companies or is under their control, while the eae eee eee ment. Dee. 81, 1876. remainder must follow the same tendency of absorption, as wait the traffic on them, even for the heavy goods, is unable to 2,058 withstand the competition of railways. Various attempts 1,632 to introduce steam on the canals have not met with success, Mee being opposed by the size and construction of most of them, : and the hindrance of numerous locks, dividing unequal London and South Western …. levels. Great Northern Roads.—Railways have rather aided than prevented the Turn extension and improvement of the old highways of England, Dae The The seven great railway companies here enumerated— | the turnpike roads, which are now acknowledged to be — seven which might be reduced to six, the North Eastern and Great | among the best in the world. But the “turnpikes” them ae Northern practically forming a united system—held between | selves have almost become things of the past. The system panies, them 8543 miles on the 31st December 1876, representing | of road-building by private enterprise, the undertakers being~~

~~nearly all the main lines of the country. It seems probable that, with the exception, perhaps, of two or three companies south of the Thames,~~

possessing, in the communication with the Continent, an independent traffic, all the others will gradually follow the process of absorption, more and more strongly developed in recent years. It may be that the process will ultimately reach its furthest solution by all the railways being placed by purchase, the same as the telegraphs, under the sole control of the Government.

rewarded by tolls levied from vehicles, persons, or animals using the roads, was established in England in 1663, an Act of Charles IT., 15. c. 1, authorizing the taking of such tolls at "turnpikes" in Herts and Cambridgeshire. A century after, in 1767, the authorization was extended over the whole kingdom, by Act 7 George III. c. 40. In its fullness, the system lasted just sixty years, for the first breach in it was made by an Act 7 and 8 George IV. c. 24, passed in 1827, by which the chief turnpikes in the metro-

polis were abolished. Further Acts in the same direction followed, leading to the gradual extinction, by due compen- sation of the persons interested, of the old system, the maintenance of the roads being vested in " turnpike trusts and highway boards," empowered to levy local rates. The revenue of these boards, outside the metropolis, amounted to £2,302,869 in 1870, and had risen to over three millions sterling in 1876.

VIII. Post and Telegraphs.

The post- It is one of the main arguments of the advocates of the office as @ purchase of all the railways by the state, that vast under- Govern- takings, in which the whole nation is deeply interested, ment de- ; : tT Ses : part. ought not to be left to private enterprise, aiming at gain ment. Chiefly ; and that such concerns not only can be, but mostly

are, better managed by the Government. The argument rests on the post-office. On all sides it is admitted that the creation and maintenance of the post-office as it now exists, burthened with an immense amount of work besides the mere carrying of correspondence,

~~is a striking instance of the successful interference of Government in commercial affairs ; while it is difficult to imagine how the same result could have been achieved by private persons. So general is this belief that all the states not only of Europe, but of the civilized world, have made the English post-office their model, closely imitating its whole organization,~~

~~In its present form, the post-office is an entirely modern creation, though the first regular arrangements for despatch- ing letters to all parts of the kingdom date back to the year 1635, when the "letter-office for England and Scotland " was established. But the system thus inaugurated, also based upon a Government monopoly, existing as such to the present time, remained long practically a private enter- prise, the right of conveying letters and packets being let by contract to privileged individuals, whose sole aim was to make the greatest profit out of the undertaking. The first radical reform of the system, which laid the foundation of the present organization, was made by the Act 1 Vict. c. 32, confirmed July 12, 1837, which repealed all the old enactments relating to the post-office in favour of an entirely new legislation. This important Act was followed by another, 2 and 3 Vict. c. 52, confirmed August 17, 1839, which established a uniform rate of postage of one penny on inland letters, repealing at the same time the old and much abused system of ""franking" letters, exercised by members of parliament and others since 1660. The Act came into operation on the 10th of January 1840.~~

~~The vast increase in correspondence following upon the new organization is shown in the subjoined table, which gives the estimated number of letters in 1839 and 1840, and the ascertained number in quinquennial periods from 1841 to 1870, and for each of the six years from 1871 to 1876 in England and in the United Kingdom, together with the average number of the letters to each person, according to the returns of the postmaster-general :—~~

~~Origin of the post Office,~~

~~Increase of corre- spond- ence from 1839 to~~

~~1876,~~

~~Total in United Kingdom.~~

~~Totalin | Average~~

~~England | Number and to each Wales. Person.~~

~~Average Number to each Person.~~

~~Years and Periods.~~

~~76,000,000 6,563,000 169,000,000 227,000,000 327,000,000 410,000,000 523,000,000 648,000,000 800,000,000 867,000,000 885,000,000 907,000,000 967,503,300 1,008,392,100 1,018,955,200~~

~~60,000,000~~

~~Estimated No. of letters, 1839… franks, 1839…) 5,172,000; 1 » letters, 1840…| 132,000,000 Average of 5 years, 1841-45~~

~~1846-50~~

~~” ”~~

~~534,000,000 664,000,000~~

~~804,053,100 846,852,400 856,042,400~~

~~ENGLAND~~

~~239~~

~~The following table gives the number of letters, the Letters, number of post-cards, and the number of book-packets and ie cards,~~

~~newspapers, distributed by the post-office in each of the (“5 three divisions of the United Kingdom in the year 1876 :— jews.~~

~~= cae papers. Number of pet Nuinber of Number of Book Packets Divisions. Letters. Post Cards. and~~

~~= Newspapers. Englandand Wales| 856,042,400 | 78,412,100 241,866,100 Jmellgun ds Satageke. «cee 71,792,100 4,883,500 24,146,600 SOOT AO aeCe 91,120,700 9,640,100 32,778,100 United Kingdom …| 1,018,955,200 | 92,935,700 298,790,800~~

~~The average number of letters for each individual of the Letters ° population in the year 1876 was 35 in England and Wales, and po- 26 in Scotland, aud 13 in Ireland. pulation.~~

~~The estimated number of newspapers delivered in 1876 was 125,065,800. Halfpenny postal cards came into use from the Ist of October 1870, and foreign post-cards were first issued in 1875, under the International Postal Treaty of Bern, to which the adhesion of the British Government was given on the 30th September 1874.~~

~~Money Orders.—With the increase of the work of the Money- post-office, and the success with which it was performed, orders more and more duties were laid upon it by the Government. an : The first of these was the money-order system, under which 1876-77. persons were enabled to hand the money in at one post- office for payment at another office. After the system had been tried from the year 1839 in the United Kingdom, it was extended to the colonies in 1856, and to foreign countries in 1869. The following table gives the total number and amount of money-orders, inland, colonial, and foreign, issued by the post-office in each of the years, ending December 31, from 1871 to 1875, and in the financial year ended March 31, 1877 :—~~

~~Total of Inland, Colonial,~~

~~and Foreign Orders. Inerease~~

~~per eens, in~~

~~Inerease per eent.~~

~~in Number.~~

~~Number. Amount.~~

~~£~~

~~22,578,547 25,019,683 26,802,264 27,507,672 27,688, 255~~

~~28,702,375~~

~~12,253,528~~

~~14,242,612~~

~~15,432,245~~

~~16,221,503~~

~~. : 16,819,874~~

~~ear ended 31st March 1877….. 18,179,922~~

~~The enormous increase in the money-order business of Money- the post-office since its establishment in 1839 is shown in orders the subjoined table, which gives the amount of money = a orders issued in England and in the United Kingdom, and P™*”™ the number issued to each 100 of the population :—~~

~~England and Wales.~~

~~United Kingdom.~~

~~Number Number polmrey of Money * rdcrs Orders Years and Periods. Amount. issued to Amount. issued to each 100 each 100 of popu- of popu- lation. lation. £ £ DO neccecdesisesaccestacsacacese 240,063 09 313,124 0°7 1840 Priicicceacseeccee 802,827 31 960,975 2:2 ck \ 1841-45… 4,211,885 12°3 4,987,256″ 8-9 Bs 1846-50….. 6,668,684 19°4 7,954,533 14:7 51-5 8,488,175 23°9 9,941,316 18°9 faa 10,898,412 29:2, 12,737,504 23°6 14,021,757 32°9 16,398,361 2771 16,484,950 37°2 19,319~~

707 312 hasesccneanvisisasassusecce 18,566,317 45°1 21,799,583 388°2 uaceesteretess stone orm 20,375,179 516 24,013,747 43°9 Res deta dee cneeraece cee 21,629,750 550 25,600,069 471 penosse cus cassansUascanecce 22,246,625 57°3 26,296,441 49:0 i) Gaensiecces

Foreign and

colonial money-

i orders in 1870 was 143,211, transmitting £600,981; and | existing system of private telegraph companies, severely in 1876 the number had risen to 145,838, but the amount | competing with each other for the most remunerative busi- fell to £572,752. On the other hand, the total number | ness, there were 700 towns in the kingdom having a surplus of foreign money orders rose from 47,431, transmitting | service, each being attended to by two, three, or more com- £172,983, in 1870 to 211,163, transmitting £612,925, in | panies, with offices close together, in the central parts ; 1876. In the case of both colonial and foreign money | while, on the other hand, there existed 486 towns with no orders, the number and amount arriving from abroad are | telegraphic facilities, except, perhaps, that offered by the far greater than those sent away. nearest railway station. It was this fact which weighed,

Post- Savings Banks.—The post-office, besides issuing and | more than any other, in giving the future control of the

office paying money orders, fulfils the duties of a national savings | telegraphs to the post-office, to be worked as a state

savings' bank, and also of an insurance institution, granting life | monopoly.

banks. insurance policies and annuities. The post-office savings There were, when the Act of 1868 was passed, 13 Transfer banks, established by Act of Parliament in 1861, held a | telegraph companies in existence within the United King- total amount of £26,996,550, standing in the names of | dom, including several which owned submarine cables for

~~1,702,374 depositors, at the end of 1876. The proportion | international service. There were, besides, 83 railway com- graphsto of depositors to population at that date was one to 15 in | panies possessing electric telegraphs, for the use of the the post- England and Wales, one to 71 in Scotland, and one to 87 | public as well as their own service. Altogether these 83 tice. in Ireland. In the whole of the United Kingdom it was | railway companies had constructed for themselves 5157 one to 19. The average daily number of deposits in the | miles of lines, comprising 16,191 miles of wire, with 1226 year 1876 was 10,347, and the average amount standing | stations for public use ; while the 13 telegraph companies to the credit of depositors, £15, 17s. ld. It is a notable | possessed 16,879 miles of land lines, made up of 79,646 fact that, although the majority of depositors undoubtedly | miles of wire, besides 4688 miles of submarine cable, con- belong to the labouring classes, including servants, the | taining 8122 miles of wire imbedded, with 2155 stations. transactions of the post-office savings bank are much larger | Under the Act of Parliament, only 3 telegraph companies, in winter than insummer. The greatest number of deposits | the Electric, the British and Irish Magnetic, and tle United in the year 1876 occurred on the 31st January, when it | Kingdom Telegraphic, had specified sums allowed to them reached 25,063, considerably more than double the average | for their property, and with all the rest the purchase money daily number. There were 5448 post-oflices open as savings | had to be settled by agreement, if requisite through an banks at the end of 1876. (See page 256 below.) arbitrator appointed by the Board of Trade. It necessarily~~

~~Post- Infe Assurance.—While the post-office savings banks | took some time to settle these matters, which involved pay-~~

~~240~~

~~The money-order business transacted with the British colonies and with foreign countries is about equal in im- portance, but the latter showed a far greater expansion in the years 1870 to 1876. The total number of colonial~~

~~office life proved a great success, ever growing, and evidently much~~

~~insur-~~

~~appreciated by the public, the same cannot be said about~~

~~ance and the life insurance and annuity department. It showed~~

~~annul-~~

~~some vitality in the first few years after its establishment,~~

~~ENGLARZD~~

~~[TELEGRAPH,~~

~~that end [it is recommended that] the postmaster-general be empowered to work telegraphs in connection with the administration of the post-office." It was stated in parlia- ment during the debates on the Act that, under the then~~

~~ment of over six millions sterling ; but the task was accom- plished, on the whole, with remarkable rapidity ; and on the 5th of February 1870, the post-office commenced the working of all the telegraph lines of the United Kingdom.~~

~~aa from 1865 to 1872, but after this date both the insurance The vast increase of telegraphic communication immedi- Postal aud annuity contracts greatly declined, In 1872 the | ately after the new state organization, and its subsequent tele- number of life policies granted was 757, insuring £55,982 ; | progress, is shown in the subjoined table, which gives the oa while in 1876 the number had fallen to 270, insuring | total number of messages forwarded from the year 1870— 1870 to £22,875. During the same period the number of annuity | commencing February 5—to the 31st of March 1877, the 1876-77. contracts fell from 1057 in 1872 to 758 in 1876, the total | last period comprising fifteen months, to bring, as pre- receipts in the latter year, both for immediate and deferred | viously explained, the postal accounts into uniformity with annuities, not amounting to more than £111,775. The | the general financial accounts of the kingdom :— almost insignificant amount of~~

~~the transactions seems to show that this department of the post-office has no vitality, a the field being already fully occupied by private enterprise. Yeanienved England and ay es~~

~~Postal Telegraphs.—Subsequent to the establishment of the || a ui~~

~~telegraph money order, the savings banks, and the insurance depart- || 31st December 1870 ……. 4,655,627 | 955,116 | 588,950~~

~~system. ments, a business of immense importance was added to the || 30th December 1871……. 6,300,867 | 1,305,596 | 800,328 functions of the post-office in the control and management || 28th December 1872……. 7,664,463 | 1,677,203 | 1,118,092 of all the telegraphs of the Kingdom. Tt was not without || o¢th December 1874……| 107084685 | 2‘141/080 | 17368105 mo pe at ce id Frome cen teen aie 25th December 1875……| 10,775,279 | 2,272,405 | 1,434,996 add to the Government mono months ended 31s ‘ of sending messages by alectiil wires ; but after long dis- March 1877 ……. TACoraeer lancer 2 | igceen~~

~~cussions in 1866 and 1867, the system was approved of by the legislature the year after. An Act, 31 and 32 Vict. c. 110, authorizing the purchase of all the telegraphs by the Government, for the purpose of being added to the machinery of the post-office, was passed in thesession of 1868, receiving the royal assent on the 31st of July. It was followed by another statute, 32 and 33 Vict. c. 73, estab- lishing the monopoly. ‘The chief reasons for passing the Act of 1868 were given in the preamble, which declared that “it would be attended with great advantage to the state, as well as to merchants and traders, and to the public generally, if a cheaper, more widely extended, and more expeditious system of telegraphy were established, and to~~

~~More than one-half of the whole number of messages of Postal England and Wales forwarded by post-office telegraphs are telegraph~~

~~metropolitan. The number of London messages was 2,462,039 in 1870, and rose to 4,398,262 in 1872, to 5,577,724 in 1874, and to 8,188,107 in the 15 months ended the 3lst March 1877. The number of post-offices open for the transaction of telegraph business in the United Kingdom~~

on the 31st of March 1877. was 3734, in addition to which messages were received at and delivered from 1636 railway stations. The staff exclusively engaged on telegraph duties numbered 11,654, comprising 21 superior officers, 6656 clerks, and 4977 messengers.

FINANCE. |

Working By the terms of the Act of 1868, establishing the system

of postal of postal telegraphs, all the railway companies retain the watts privilege of transmitting messages relating to their own

" service free of charge, on the wires running along their

lines. To the public a uniform rate of transmission is

charged, irrespective of distance. The charge was fixed, provisionally, at one shilling for every twenty words, and threepence for every additional word, the names and addresses of senders and receivers uot being included in

the number. The payments were originally made in

postage stamps; but on the lst of April 1876, distinctive

telegraph stamps for the prepayment of messages were in-

troduced. Forms of receipts for messages were brought

into use on the Ist of February of the same year, but it | was stated in the twenty-third report of the postmaster- general, dated August 4, 1877, that up to that time " very

little use had been made" of this innovation by the public.

| Receipts

The subjoined table gives the total receipts and the net | andex- revenue of the postal telegraphs, from their establishment, | pendi- on the 5th of

February 1870, to the end of the financial __ ture of year 1876-77 :—

telegraph KY Total Telegraph Net a. c€ a € ment, Years ended 31st March. Telegraph Working Revenue. Revenue. Expenses. £ £ £

100,760 62,273 38,487

696,934 394,477 | 303,457

751,611 591,776 159,835

989,921 874,946 | 114,975 1,083,466 967,790 | 115,676 1,187,079 | 1,077,347 | 59,739 1,276,662 | 1,031,524 | 245,116 1,813,107 | 1,193,957 | 189,850 Revenue — The total gross receipts of the post-office, from postage, an money orders, and other sources, exclusive of telegraphs, in tire of the financial year ending March 31, 187 7, amounted to

the post- £6,017,072, and the total expenditure to £4,070,006, office, ex- leaving a net revenue of £1,947,066. In the year 1840, the ee ~ date of the introduction of the " penny post" and the estab- oni lishment of the post-office on its present organization, the total gross receipts were £1,359,466, while the net revenue was £500,789. The gross receipts increased at a much ' larger rate within the period from 1840 to 1877 than the net receipts, which latter fell for some years, notably from 1867 to 1871, through great and costly improvements being made in the service. The chief branches of expenditure in the year ended March 31, 1877, were £2,046,065 for salaries, wages, and pensions ; £779,632 for conveyance of letters and packets by mail boats and private ships; £684,465 for conveyance of letters by railways; and £171,370 for the same service done by coaches, carts, and other vehicles. The total expenditure of the money-order department in the year ended March 31, 1877, resulted, according to the report of the postmaster-general before cited, in a loss of £10,000, which deficit was expected to be greater in future years, owing to " the large increase in the number of inland money orders for small amounts, on which the commission

is insufficient to cover the cost of the service." '~Staffef Stag—The total staff of officers and servants employed . be Post- by the post-office

at the end of 1876 was 45,024, in- ome clusive of 11,654 persons attendingly solely to telegraph duties. Of post-office clerks there were at the date 3380 ; of postmasters, 13,447; and of letter carriers, sorters, and post-office messengers, 16,327. In London alone, the staff of the post-office comprised 10,380 persons, of which number 5500 were attached to the chief offices in St Martin's-le-Grand. In 1840 the total number of post- offices in the United Kingdom was 4500; and at the end of 1876 they had increased to 13,447, besides which there were 10,724 road letter-boxes, It is now an established

fact that not any other Government department of modern times has succeeded like the post-office in the double task of augmenting the welfare of the nation and at the same time increasing the public revenue.

IX. National Revenue and Expenditure.—Tasxation.

The finances of no European state are in a more admir- Financial able condition than those of the United Kingdom. Not periods only is the national revenue, requisite to meet the expendi- ce ' ture, raised with the utmost facility, but for many years yg7), , the balance of them has been complete, an annual surplus being the rule, and a deficit the exception, in most financial periods. In the half century intervening between the years 1827-28 and 1876-77, both the expenditure and revenue rose to but a comparatively small degree, far below all proportion with the vastly increased wealth of the nation during the same period. In the financial year 1827-28 the total public revenue amounted to £54,932,518, and the expenditure to £53,800,291; while in the financial year 1840-41 the total revenue was £47,433,399, and the total expenditure £49,285,396. 'Thus, in the course of thirteen years, the fiscal burthens laid upon the population, augmented by nearly. two millions in the meantime, in- stead of being increased, had been greatly lessened. Sub- sequently, from 1841 to 1877, a gradually increasing ex- penditure took place, together with a rising public revenue : but the

upward movement was slight, and much below the growth of the population in numbers, and, still more, in wealth. At the end of the next decennial period, in the financial year 1850-51, the total revenue had risen to £53,057,053, and the expenditure to £49,882,322; and at the end of another decennial period, in the financial year 1860-61, the revenue stood at £70,283,674, and the expenditure at £72,792,059. At the end of the next decennial period, in the financial year 1870-7 1, the total revenue had fallen to £69,945,220, and the expendi- ture to £69,548,539. During the whole of the thirty years from 1840-41 to 1870-71, there were but few annual periods without a surplus of revenue over expenditure.

The subjoined table shows the total revenue and the tota] Annual expenditure of the government, together with the propor- al tion of receipts per head of population of the United King- fendi- dom, in every fifth financial year from 1841 to 1871, and turefrom each year thereafter to 1877. Up to 1854, the financial 1841 to years ended April 5; but, commencing from 1855, the 1876. financial years ended March 31. Till the year ending March 31, 1856, the meé revenue and expenditure were always given in the official returns ; but, commencing with the year ending March 31, 1871, the accounts furnished, more correctly, the gross expenditure and revenue, the latter including charges for its collection :—

popes aes of

Years ended Total 'Head of a case Total Revenue. Expenditure. ee of Kingdom,

£ AY £ 8. d.

1841 47,433,399 49,285,396 | 1 15 9 1846 52,009,324 49,628,724 ys 1851 53,057,053 49,882,322 | 1 18 6 1856 65,704,491 88,428,345 | 2 10 7 1861 70,283,674 72,792,059 | 2 8 10 1866 67,812,292 65,914,357 | 2 5 1 1871 69,945,220 | 69,548,539 | 2 4 5 1872 74,708,314 71,490,020 | 2 7 3 1873 76,608,770 70,714,448 | 2 8 9 1874 77,335,657 76,466,510 | 2 8 @ 1875 74,921,873 74,328,040 wy (eB 1876 77,131,693 76,621,773 25 f th

1877 78,565,036 78,125,227 2 7 6

The largest surplus in the course of the thirty-six years from 1840-41 to 1876-77 occurred in the financial year VIII. — 31

Surplus and de- ficit

periods.

Sources of reve- nue in

1876-77.

Branches of expen- diture in

1876-77.

242

1869-70, when the excess of revenue over expenditure amounted to £6,569,500, and the next largest in the financial year 1844-45, when the excess of income over expenditure was £6,342,436. On the other hand, the greatest deficit showed itself in the financial year 1855-56, when unforeseen war expenses brought the revenue below the expenditure to the extent of £22,723,854. The fifteen years from 1863 to 1877 showed all, with the exception of two, 1868 and 1869, a surplus of revenue over expenditure,

The following table gives the official account of the gross sources of revenue of the United Kingdom for the financial year ended March 31, 1877 :—

&

@uStOIHS "een see ree he oat ab an iaegauee tress sienaets 19,922,000 ER OIBGs. saciis eee bs acto Be teeta sear emote ea N NE 27,736,000 Shame. oc cisrijet ait duals wang Gneantngeuienekeasinds mui' 10,890,000 Land Tax and Bouse Debby. oss ossas;pageesrwis wsevension§ 2,532,000 Property and income Wax 5, cos.adevinacesniic

~~yecsoset wees 5,280,000 Peso Mcereen erat et enea ses ete iaamteseathncre acre 6,000,000 TP ole GRA SOPs Me crennecciieut cosy set guaviewwet osaums talons 1,305,000 Crowe dss NES) sreies avers qomes eahdaicarSoveas io cag ak Mee 410.000 Miscellaneous '< ' £ Military and Naval extra Receipts, aud Préccolls of Old Stores sold .... 906,760 Amount received from the Revenues of India on account of Charges for > 868,330 BYiGIah, WO GPS op to + pacnessoa4 dads ued Interest on Public pe Beate gy 654,572 Interest on the Purchase Money o the Suez Canal Shares ees 1m,ki0 Allowance out of Profits of Issue 138.578 received from Bank of England .... : Saving on vote of credit for Ashantee 12.197 WUE oslo leiiisistere'e wbinrelt oTae arele wares Walsterisiete AINe 2 Other Miscellaneous Receipts ..... 1,770,480 ——— 4,490,034 Dedted ROOM os «yr a5seicsisiiguas yates a 78,565,036~~

~~The following table gives the official account of the gross expenditure of the United Kingdom for the financial year ended March 31, 1877 :—~~

~~4 ¥ asian & £ Interest and Management of the Per- manent Debt si, vd seiagtteis icietree pitelo toad 21,588,982 Terminable Anntiities,,.....sceeeeeee 5,374,198 Interest of Exchequer Bills..... 103,912 Interest of Bank Advances for De- 8.127 CIQMOW? ar 7nd denies | eae ay cshaens Graest 4 New Sinking Fund.....s0ccccc 624,781~~

~~- 27,700,000~~

~~Interest on Local Loans..... stele panies tan athes Lana se 142,921 Interest, &c., on Exchequer Bonds (Suez)..... 149,912 Charges on Consolidated Fund. PT esis csr hinds pee sloann ed 406,710 Annuities and Pensions .....4. 316,669 Salaries and Allowances .....0.0.. 96,850 COUPES OED USEICE 5.55 .ccccneveraaccasennee 631,791 Miscellaneous Charges .....s0008s 143,018 ——— 1,595,039 Supply Services. POAT 5 tess £5 Mons A genie atlas Mees vital 15,251,355 Charges for troops in India ..... 170,000 Army Purchase Commission..... 498,362 IN AVA ch oa tas saduntnaniacaala tsa tte toe a 11,364,383 Ashantee Expedition. .....cc0ccccc 2,017 Miscellaneous Civil Services..... 13,333,851 Customs and Inland~~

~~Revenue……. 2,766,279 POR EAOMICE Frcs ctepeptarge tt acons Ces Sag 3,159,218 Telegraph Merwis….. ccrisss~~

~~48,537,355~~

~~Total Bxpema stare 5, g0c0is….sevecltaws 78,125,227~~

~~The surplus for the financial year 1876-77 amounted to £439,809, being less than in any of the preceding five years. In the budget estimates for 1877-78 the total revenue was calculated at £79,020,000, and the total ex- penditure at £78,794,044, leaving a surplus of £225,956.~~

~~About three-fourths of the total revenue of the United~~

~~ENGLAND~~

~~H~~

~~an~~

~~[REVENUE.~~

~~Kingdom are derived from three sources of income—excise, Principal~~

~~customs duties, and stamps. In the sixteen financial years sources~~

~~from 1861-62 the revenue from the excise increased greatly, °f eve (i~~

~~and that from customs declined, while that from stamps increased moderately. The following table shows the receipts from these main sources of revenue for every third year from 1861-62 to 1876-77 :—~~

~~Years ended~~

~~Customs. |~~

~~Bist March, | Excise Stamps. £ £ £ 1862 | 18,332,000 | 23,674,000 | 8,590,945 1865 | 19,558,000 | 22,572,000 | 9,530,000 1868 | 20,162,000 | 22,650,000 | 9,541,000 1871 | 22,788,000 | 20,191,000 | 9,007,000 1874 |~~

~~271722000 | 20,339,000 | 10,550,000 1877 | 27,736,000 | 19,922,000 | 10,890,000~~

~~Hacise.—The vast increase in the receipts from the excise during the sixteen years from 1862 to 1877 was due solely to the corresponding increase in the consumption of spiritu- ous liquors. The increase was greatest in the receipts from spirits, which rose from £9,618,291 im 1861-62 to £14,873,165 in 1876-77. The excise receipts from malt grew from £5,866,302 in 1861-62 to £8,040,378 ; and those from licences to make and sell spirits and malt liquors from £1,500,613 in 1861-62 to £3,548,557 in 1876-77. In the latter financial year the receipts from the excise had come to represent already considerably more than one-third of the total revenue, and should the growth, very steady and regular from year to year, continue at the rate shown in the preceding table, it will not be long before one-half of the national income will be raised by the voluntary taxa- tion of the consumers of alcoholic liquors.~~

~~Customs.—The decline in the receipts from customs during the period 1862 to 1877 was due entirely to a con- stant reduction of duties. Those on tea were reduced in 1862, causing a loss to the revenue of £1,641,541; and again in 1864, when the loss was £2,214,981. The duties on sugar were also greatly reduced in 1863, the loss to the customs being £1,741,272; and again in 1872, with a loss of £1,612,882; while the small remnant of the old duties on corn was repealed in 1868, at a loss of £855,581; and the example was followed in the case of the sugar duties, the last of which was abolished in 1875. Thus the sugar duties, producing £6,383,289 in 1861-62, brought nothing in 1876-77, while the tea duties fell from £5,516,584 to £3,723,147. Alone of all the customs duties, those on foreign spirits and wine increased during the period, not- withstanding the latter article also underwent a reduction of duties. Together, the foreign wine and spirits duties produced £3,753,785 in the financial year 1840-41, and £7,507,807 in 1876-77. Adding this sum to the excise receipts, the total revenue derived from spirituous liquors in the financial year 1876-77 was no less than £35,243,807, or nearly three-sevenths of the national revenue.~~

~~The ex-~~

~~cise as source of~~

~~revenue,~~

~~Receipts from cus- om.~~

~~The subjoined table exhibits the changes effected in the Changes national revenue by either the repeal or reduction of, taxes, im taxa-~~

~~and the imposition or re-imposition of old and new ones, during the period from 1861-62 to 1876-77 :—~~

~~Actual Imposed. | Diminution (—) , or Addition (+)~~

~~Repealed or Reduced.~~

~~£ — 14,252,248~~

~~+ 489,000~~

~~— 9,242,000 — 1,272,938 — 2,406,900~~

~~£~~

~~11,034 1,870,000~~

~~7,916,000~~

~~£~~

~~14,263,282 1,381,000~~

~~17,158,000 1,272,983 2,427,400~~

~~36,502,615~~

~~Stamps (including Succession Duty)...~~

~~20,500~~

~~9,817,534 | — 26,685,081~~

~~On.~~

~~. The in- | come- tax,~~

~~branches of expen- diture.~~

~~Principal~~

~~EXPENDITURE AND DEBT.|~~

~~Income Tax.—The basis and principle of the system of levying the national revenue is indirect taxation, or, as it may very properly be called, voluntary taxation, since at present no impost lies upon any article of prime necessity. To this system the only exception is the income tax, which, however, has mauy opponents, and is barely considered by the legislature a permanent tax, as it has to undergo constant changes, all tending to its repeal at a favourable opportunity. Originally granted by parliament, against great opposition, in 1798, as "an aid for the prosecution of the war " against France, the old income tax was repealed in 1816, But it was re-imposed, under modified forms, in 1842, nominally for only three years, the amount being fixed at 7d. in the pound. Subsequently parliament con- sented to new prolongations, alternately of three years, of one year, and of seven years; and in the course of the Crimean war, the impost was raised, first to 14d., and then to 16d., in the pound. In 1857 the income tax was again reduced to 7d., and in 1858 to 8d., in the pound, In the following year it was once more raised to 9d., and to 10d. in 1860; but was again reduced to 9d. in the pound in 1861, to 7d. in 1863, to 6d. in 1864, and to 4d. in 1865. In 1867 the tax was again raised to 5d., and in 1868 to 6d., but in the following year once more lowered to 5d., and in 1870 to 4d., in the pound. The tax was again brought up to 6d. in 1871, but lowered to 4d. in 1872, to 3d. in 1873, and to 2d. in 1874, Finally, in 1876 it was once more raised to 3d. in the pound, but at the same time restricted to incomes of over £150 per annum, with a de- duction of £120 for all incomes between £150 and £400, thus affecting mainly the so-called "upper" and " upper middle" classes of the population. The total~~

~~receipts of the income tax amounted to £10,365,000 in the financial year 1861-62, and had sunk to £5,280,000, or little more than one-half, in the year 1876-77.~~

~~An indication of the proportions of the revenue derived from taxation in England, Scotland, and Ireland respectively is given in the following table. The figures, which are for the year ending March 31, 1877, do not include the post- office returns, and in the case of the income tax are exclu- sive of the returns from the incomes of Government officials,~~

~~Revenue, 1876-77, England. Scotland. Treland.~~

~~£ £ £ BILGE. S.ssvettecvestdeeteee te 13,078,101 | 4,056,881 | 8,507,985 Bits)... ccccemeens…. eee 7,220,089 368,343 451,950 -| 1,894,856 124,309 211,078 PObcosoGnonowdod 8,034,395 308,599 205,563 OvinoG COUNORDUD Anon eb opoMoe 6,014,114 787,227 | 1,024,284 Billeretisierelsietetseistees 3,206,765 322,156 894,644~~

~~noopebagos 2,404,792 133,382 dbo eslerleisivieicloisinineicie seeing 4,342,410 518,149 269,889 sielesieisle/slelsieleipisicictoistcislo sieretes 8,581,581 | 1,110,807 589,173 opeeasdaace 1,324,787 77,910 10,208 MB ere sess: caaleetess. 51,101,890 | 7,757,218 6,664,724~~

~~£2 1 84/£2 8 63/ £1 4 113 apenditure.—As the main sources of national revenue are but few, so are the principal branches of expenditure. They may be reduced to three, namely,—first, the interest and management of the national debt; secondly, the charges for the army and navy ; and thirdly, the cost of the general government, entered in the financial accounts under the headings of "Civil List,' "Miscellaneous Civil Services," and other charges placed to the Consolidated Fund. The following table exhibits the annual disburse- ment under each of these three principal branches of~~

~~national expenditure, during every third financial year from 1861-62 to 1876-77 :—~~

~~ENGLAND~~

Civil List and Civil Charges of all kinds.

Interest and Management of Debt.

Financiall Years ended lst March.

Aimy and Navy.

£

10,821,956 10,205,412 11,193,758 13,176,659 17,067,609 15,779,779

£

29, 452,342 25,280,925 28,587,581 24,937,041 26,220,864 27,286,117

£

26,330,684

26,369,398 26,571,750 26,826,437 26,706,726 27,992, 834

National Debt.—It will be seen that, leaving alone the Growth cost of the army and navy—of which more in the next of the chapter—the charges for the interest and management of national the debt form by far the most important branch of national 4¢>*: expenditure. The foundation of this debt, larger than that of any other country in the world, and the burthen of which could be safely borne only by the wealthiest of nations, was laid at the time of the Revolution, in 1689, and its growth since that time, both as regards capital and interest, is shown in the following table :—

Historical Periods. Reed pi echaelen £ £ Debt at the Revolution, in 1689…. 664,263 39,855 Excess of debt contracted during the reign of William III. above 15,730, 489 1,271,087 CEWUSp aU Clk as, .scagearso5t ssesseaces Debt at the accession of Queen EOC ENO rare vxncsateane tons a Tatas Debt contracted during Queen 37,750,661

~~2,040,416 A TOTGHS IRENE, opeyeebanooosopnaencc Debt at the accession of George TSU ae». scascesiaton caxomiae a See Debt paid off during the reign of ; George I., above debt con- 2,058,125 1,133,807 EMMA =. Elda s s/sdtles «caivee sian cannes Debt at the accession of George 1 oh) gee gD dis ickcal) Bes uae Debt contracted from the accession of George II. till the peace of Paris in 1763, three years 86,773,192 2,634,500 after the accession of George MNEN Ty co coh on apne ee seca wi Tele tan aes PTT OO sivas. wails, onsick «4 138,865, 430 4,852,051~~

~~Paid during peace, from 1763 to~~

~~en 380,480~~

~~- 10,281,795~~

~~Debt at the commencement of the American war, in 1775…... Debt contracted during the Ameri- can war~~

~~128,583,685 | 4,471,571~~

~~121,267,993 | 4,980,201~~

~~Bee eee reese ees caeeee aeeseeee~~

~~Debt at the conclusion of the~~

~~when the English and Irish Exchequers were consolidated .~~

~~American war, in 1784…….. Aner OLsGe 9,451,772 Paid during peace from 1784 to 10.501.380 243.977~~

~~WAQS Mins vcacuaaxscdseeeteuscaeees totes es: ‘ Debt at the commencement of the 8~~

~~French war, in 1798……. BeurnOU ts Oya0S ap Debt contracted during the French 601,500,343 | 22,829,696~~

~~WiAMMes scesvevcacsese seuss ceeceet ees Total funded and unfunded debt~~

~~on the 1st of February 1817, 840,850,491 | 32,088,191~~

~~Debt cancelled from the Ist of February 1817 to 5th of 58,211,675 Deva ETA? TISIS. poaonpocdeccoadocodooe~~

~~2,894,674~~

~~Debt and charge thereon on 5th of Jaritary 1886). cesseee-ceneraes 787,688,816 | 29,148,517~~

~~Seeeieneneeemememenee eee~~

~~Debt and charge thereon on 31st~~

~~of March 1861 || 824,607,459 | 26,985,114~~

~~244~~

~~The following table exhibits the amounts of capital of the debt, distinguishing funded and unfunded, during each of the sixteen years from 1861-62 to 1876-77 :—~~

~~Capital of the national~~

~~debt from ae 'al Capital of 1862 to ae one Capital of Capital of Bes Debt, 1877. iat Aion Funded Debt. Unfunded Debt. inclusive of Termin . able Annuities. £ £ £ 788,229,618 16,517,900 | 824,136,394 787,422,928 16,495,400 | 824,635,055 781,712,401 13,136,000 | 821,290,829 780,202,104 10,742,500 | 816,352,974 773,941,190 8,187,700 | 807,563,924 770,188,625 7,956,800 | 805,666,938 741,844,981 7,911,100 | 806,572,884 741,112,640 8,896,100 | 805,480,164 741,514,681 6,761,500 | 801,406,561 732,043,270 6,091,000 | 796,104,155 731,756,962 5,155,100 | 792,661,132 727,374,082 4,829,100 | 785,761,762~~

~~728,514,005 4,479,600 779,288,245~~

714,797,715 5,239,000 | 775,348,386 713,657,517 11,401,800 | 776,970,544 712,621,355 13,943,800 | 775,873,718 Termin- The amount of terminable annuities, included in the total able an- canital of the debt, by computation in 3 per cent. stock, nuities

andsink- Varied considerably in different years, through additions ing fund. being made to them, as in 1864, when £5,000,000 of the funded debt were converted into terminable annuities, and again in 1875, when £4,000,000 of Suez Canal bonds were added. The total computed capital of them amounted to £49,308,558 on the 31st of March 1877. By the provi- sions of an Act of Parliament passed in the session of 1875, the national debt will be gradually reduced by the establish- ment of a new permanent sinking fund, maintained by annual grants. The grants, by the same Act, were fixed at £27,400,000 for the financial year 1875-76, at £27,700,000 for the year 1876-77, and at £28,000,000 for every subsequent year after 1877.

There is a somewhat remarkable harmony between the chief sources of revenue and the principal branches of ex-

Compati- son of

chhnin penditure. Thus in the financial year 1876-77 the first pendi- source of revenue, excise, productive of £27,736,000, almost

ture. exactly covered the first branch of expenditure, interest and management of debt, amounting to £27,992,834, Again, in the same financial year, the receipts from customs and stamps paid, with a surplus left, for the cost of the army and navy; while the produce of the taxes, including income tax, together with the post-office, discharged the expenses of the general government. Local Local Taxation.—Besides the national or so-called im- taxation. perial taxation, a sum considerably surpassing the total receipts from the excise is raised annually by local taxation. In the financial year ended March 31, 1874—the last for which returns were published at the end of 1877—the total amount raised by taxes, and from other sources of income, for the purposes of local government, in each of the three divisions of the United Kingdom, was as follows :—

~~Local Taxes,~~

~~Divisions.~~

~~Total of~~

~~Levied by From Tolls,~~

~~Rates. Dues, &c. Taxes. £ "£ £ England and Wales…..... 19,778,122 | 4,105,907 | 28,879,029 Scotland (partlyestimated)}| 1,908,210 | 464,347 | 2,372,557 lrelend …. 3s 2,640,737 355,272 | 2,996,009~~

~~Total for United Kingdom | 24,822,069 | 4,925,526 | 29,247,595 l _ In addition to the sums here specified, the local authori- ties raised in the financial year 1873-74 the amount of £1,552,555 from sales and rents of property, £2,404,675 from Government contributions, £8,480,486 by loans, and £3,848,504 from miscellaneous sources. The total local~~

~~ENGULAR®~~

~~[FINANCE.~~

~~receipts, including taxes, amounted in the year to £45,533,815,—of which £37,731,193 was contributed by England and Wales, £3,202,714 by Scotland, and £4,599,908 by Ireland.~~

~~From a parliamentary paper, comparing imperial and Taxation local taxation in the United Kingdom, issued in the session be head of 1876, it appears that the burthen of local taxation is eHeall much higher in England and Wales than either in Scotland ; or in Ireland. If spread evenly over the three divisions of the United Kingdom, it amounted in 1873-4 to £2, 18s. 11d. per head of the total population.~~

~~X. Army and Navy.~~

~~About one-fifth of the entire national expenditure is for Cost of the maintenance of the army, and an additional one-seventh the army for that of the navy. In the army estimates for the financial audi year ending the 31st March 1878, sanctioned by parliament, the total~~

~~amount to be expended on account of the army was fixed at £14,583,700, of which £12,643,900 was for "effective services," that is, the actual maintenance of the regular army, as well as auxiliary and reserve forces, and £1,894,800 for "auxiliary services," comprising rewards, pensions, and superannuation allowances.~~

~~The regular army was composed, according to the army Amy cs-estimates of 1877-78, of 7153 commissioned officers, for laa 16,968 non-commissioned officers, and 109,599 rank and 7, 1 file, being a total of 133,720 men of all ranks, as follows :—~~

~~Non-com- missioned~~

~~officers, trumpeters, and drummers.~~

~~Branches of the Military Service. Officers.~~

~~Officers on the General and Departmental Staff :— General stallt…. cima ss-sceecsasssonves Army accountants……..s..s0cs00 Chaplain's department …..... ..... Medical department, ... Commissariat department, &c…..~~

~~BOTAN SUMOR cist stenscsasresderenes~~

~~Regiments : Royal horse artillery, including riding establishment.. ..... Cavalry, including life and MOVSE UALS ION EYL GHYCATAGES. o canasqusasseodeno06c ATIMYSSERVICE CORDS: «5 .cscseccece eases Infantry, including foot guards… Army hospital corps ……4. West India regiments Colonial corps~~

~~Oo creonrerenre~~

~~COO e eee rereceteseesenes~~

~~Total REPOS ....6.s.cccccees~~

~~Staff of Militia :— PAN DIMOR Vertes isa ccecceniesacneneerecacss MAMET ose s cee sis csi sestnnesiennsesaas~~

~~Total Militia Staff……~~

~~Miscellaneous Establishments : Instruction in gunnery, &c. ……. Royal academy, Woolwich…… Royal military college, Sandhurst Stafivcollepemennsscntess csvset Regimental schools ……60005 Manufacturing establishments … VarTOWS C00 s0c0s.es sees sees vsnereesen~~

~~Total force, officers and men, the cost of which is defrayed from Ariny Grants ……..s000.~~

~~16,968 | 109 599~~

~~ARMY. | ENGLAN D 245 Numbers The numbers of the regular army, maintained for service ; number of volunteers who joined and passed through the ofthe in the United Kingdom, have varied much in the course of | force was as follows, according to a report laid before par- i, ** the present century. In the year 1800 the total was 70,745; | liament in the session of 1877 :— : from and it rose to 106,331 in 1805, and to 112,518 in 1810. Oe actil oe 1800 to Within the next three quinquennial periods, the number Licht Horse Are conto. BIB 1876. decreased, that is, to 80,731 in 1815, to 61,116 in 1820, Analleey decir aie and to 46,264 in 1825. In 1830 the number rose again Engineers to 48,094, but fell to 47,214 in 1835. There was another Mounted Rifles……..ssssssessseeseeeeeeens 262 rise to 50,476 in 1840, to 59,870 in 1845, and to 67,077 Tiiffe: V olvamteens's<. ….te.sessoesorestdeeserens 486,498 in 1850. In 1855 the number had fallen once more to Pease ee 682,911 49,342, but this was tke lowest point it reached. The – strength of the army rose again to 89,507 in 1860 ; it stood The fourth and last branch of the reserves or auxiliary Enrolled at 78,410 in 1865, and at 84,361 in 1870. There were | troops of the United Kingdom, the enrolled pensioners, pension- considerable fluctuations in the number of men maintained | were returned as numbering 36,000 in the army estimates for home service in each of the years from 1871 to 1876. | of 1877-78. The enrolled pensioners are divided into two The number was 82,472 at the end of 1871, 94,402 in | classes, 15,000 men forming the first, and 21,000 men the 1872, 101,145 in 1873, 98,719 in 1874, 92,386 in 1875, | second division. and 96,275 in~~

~~1876. Of the total force in the United Army Expenditure—The expenditure for the army, Army — Kingdom in 1876, there were 68,253 men in England and | after nearly doubling from 1840-41 to 1861-62, remained expendi- Wales, 3595 in Scotland, 22,414 in Ireland, and 1713 in | almost stationary in the sixteen financial years from ee the Channel Islands. 1861-62 to 1876-77. It amounted to £15,570,869 1a Troops The numbers of regular troops on colonial service were | 1861-62, and, gradually decreasing, fell to £13,804,450 in 1877-78. on, gradually diminished in recent years. They were éntirely | 1865-66, after which it rose again to £15,482,582. It colonial \ithdrawn from Australia and New Zealand, and partly | sank once more to £13,430,400 in 1870-71, but rose in saw from British North America, a small force only being left | the financial year 1872-73 to £14,824,500 ; and changed in Nova Scotia. The chief military stations left were | little till the year 1876-77, when the disbursements for Malta, Gibraltar, the Cape of Good Hope, Ceylon, Bermuda, | the army amounted to £15,749,717. The largest branch of and Hong Kong. 'The total number of the British forces | expenditure is that for the general staff and regimental in India was given at 62,652 men of all ranks in the army | pay, for which £4,565,800 was set down in the army esti- estimates of 1877-78. mates of 1877-78 ; and the next largest branch for provi- Recruits. The recruits for the regular army were raised as follows | sions, transport, and other services, fixed at £2,986,000 from each of the divisions of the United Kingdom in the | for the same year. The total cost of the auxiliary and years 1871 to 1873 :— reserve forces for the year 1877-78 was not more than £1,209,100, of which £534,000 was for the mae 's, | England cota rn United £74,400 for the yeomanry cavalry, £468,700 for the ee ee ee volunteer corps, aa £132,000 for the enrolled pensioners 1871 18,015 2,365 21,927 and army reserve force. 1872 14,525 1,886 17,507 Naval Expenditure.—Although considered 'the bulwark Naval 1873 | 18,431 1,057 2,114 16,602 of the nation," and more important for the defence of the expendi- kingdom than its land forces, the navy is maintained at oo Deser- _ Desertions from the army, mainly if. not entirely by | much less expense. However, the disbursements for the 1877, tions, recruits, were formerly extremely numerous. But they navy increased very largely since the year 1840, when the tended to diminish in recent years, partly on account of im- | old wooden "" three-deckers,"~~

~~formerly the pride of the seas, proved organization, under which better treatment is | had to disappear, to give way, first, to iron ships propelled secured to the rank and file of soldiers, and partly by the by steam, and, not long after, to armour-clad men-of-war, option given to recruits to enlist either for "long" service gradually assuming the shape of ,floating fortresses. In of twelve years, or for "short" service of six years. In| the financial year 1840-41 the total expenditure on the year 1862 there were 4624 recruits approved, ard | account of the navy, including transport service, was among them there were no fewer than 2895 desertions, £5,597,511; and in the next year, 1841-42, the cost rose being more than one-half of the tota]; but from among the | to £6,489,074. In 1845-46 the naval expenditure had 21,927 recruits of 1871 there were but 5861 desertions ; | risen to £6,809,872, in 1846-47 to £7,803,465, and in while from 20,640 recruits enlisted in the year 1874 there | 1847-48 to £8,013,873. After 1848 the expenditure for were only 5572 desertions. Of the recruits of 1874, there | the navy remained nearly stationary for six years, till enlisted 7784 on "long" service, and- 12,856 on "short" 1854, when it suddenly rose, with the setting in of the era ace. of armour-clad ships. In the financial year 1854-55 the Militia, The army estimates enumerate, as constituting the forces | naval expenditure went up, with a leap, to £14,490,105; yeoman- of the United Kingdom, besides the regular troops, four | and in the next year, 1855-56, it reached the large sum of Bi ee other bodies, classified as reserves, or auxiliary troops. | £19,654,585, an amount unparalleled before or since. The ee, These are—the militia, the yeomanry cavalry, the volunteer | next few years showed a great reduction in naval expendi-~~

~~corps, and the enrolled pensioners and army reserve force. The total number of the militia in 1877-78 was returned at 139,331, comprising a permanent staff of 4831, and 134,500 men in training service. For the same period the total number of yeomanry cavalry was 14,830, there being a permanent staff of 282, and 14,548 yeomen, The total number of volunteers provided for in the army esti- mates of 1877-78 was 174,241, comprising 32,393 artillery volunteers, aud 148,848 light horse, engineers, and rifle volunteers. Since its establishment, under a new organiza- tion, in the year 1859, down to the end of 187 6, the total~~

~~ture, which fell to £13,459,013 in 1856-57, to £10,590,000 in 1857-58, and to £9,215,487 in 1858-59, There was another rise to £11,823,859 in 1859-60, and to £13,331,668 in 1860-61; but this was followed by a decrease to £12,598,042 in 1861-62, and to £11,370,588 in 1862-63. At the latter amount the expenditure for the navy remained, with unimportant fluctuations, till 1877, never rising much above 12 millions, nor sinking much below 10 millions. The naval expenditure amounted to £11,364,383 in the financial year ended March 31, 1877.~~

~~Navy.—In the naval estimates for the financial year~~

~~1877-78, voted by parliament, the total expenditure was fixed at £10,979,829, and in them the strength of the navy of the United Kingdom, regarding ships in commission, was reported as follows for December 1, 1876 :—~~

~~Number of ships in com-~~

~~mmission.~~

~~Ships in Commission. Sea-going steamers :— Tron-clad line-of-battle ships ……sesseeeeeee 4 Jron-clad frigates and corvettes ……. 2… 18 Other sens pig oss a0 OMB canons a aera 30 Sloops:and Savallivessels:….+.,.ceusinsscess cece: 65 Total sea-going steaMe#S……cce cess ees —- 112~~

~~Reserve gteamers and sailing vessels :— Hirst TeserVeistCaMerse so… .cteneeuieesesses «cress 9 Receiving and depot steamers……. ...ceeeeeee eee 6~~

~~ms a >> sollime Vessels! ..c.ces……- 1S SuUPveY MS HEAMICEBY …..0..ccdsiceeneeesnesossnsieee 3 Trop) sMips WSteAMOTS| see. vncaret sees «SCOPES SH ISCCAMIOVS i ecceca- ces cess slese sen clcehacee te 3 Mend ersMsteamMersiree.. .ccsent csasesiesecvdesssdetecceees 38 Fein SOME VESAEISS.. coset estas .siece telserce sci 6 Coast-guard cruisers, StCAMETS ……esesseeeeeeee 4 ay~~

~~* sailing: Vesiels…….. 2.0.0.0. 20 Gunnery training vessels, and sloops, sailing. 9 Drill ships for the Naval Reserve….. ..... 8 Total reserve steamers and sailing vessels.~~

~~Total navy~~

~~Seem meter eee eee ee ree eee teases eters ere reetesees~~

~~The number of ships in commission here given form but a small portion of the naval forces of the United Kingdom, especially of its by far most important division, the armour-clad fleet. Together with the navy estimates for the financial year 1877-78, there was issued a parliamentary return, issued from the Admiralty, dated April 5, 1877, containing a list " of all iron-clads, and date of their first completion for sea." The return gives the names of 48 armour-clad vessels, 31 of them classified as " broadside ships," las a "'ram," 14as " turret slips," and 2 as " iron- clads building."~~

~~The whole of the armour-clad ships of the broadside class completed previous to 1870 have no thicker armour than from 44 to 5} inches ; while those completed from 1870 to 1873 received armour of from 6 to 8 inches thickness. This was increased in the broadside iron-clad of 1877, the " Alexandra," to from 8 to 12 inches thickness; and in three not quite completed, to armour of from 8 to 10 and 11 inches. In the turret ships, a greater thickness of armour was resorted to at an earlier date. The ' Glatton," completed in 1872, was the first ship to receive armour of from 12 to 14 inches in thickness, subsequently also given to the " Devastation " and the " Thunderer ; " while the "Dreadnought" had 14 inches throughout. Surpassing all other ships in armour-thickness is the " Inflexible," under construction at the end of 1877, the central part of which has from 16 to 24 inches, protecting 4 guns of 81 ton weight, the heaviest ever made for the British navy, and exceeded only by a few made in England for two Italian men-of-war.~~

~~Tle construction of unarmoured ships, while not yet quite abandoned, is confined entirely to screw streamers, built of iron or steel, designed for great speed, and with very powerful engines. There were 9 ships of this class at the end of 1877, 3 of them frigates and 6 corvettes. The two~~

largest frigates, the "'Inconstant" and the "Shah," of 5700 tons, with engines of 7500 horse-power, were reported at the date to be the swiftest ships of the British navy.

The number of men provided for the naval service of the ee kingdom was 54,400 in the navy estimates 1877-78. They officersin Were divided into 34,100 seamen and 6300 boys, 3000 of the naval the latter being under training, giving a total of 40,400 service. directly classified as "sailors." Besides them, for the ser- vice of the fleet, were 14,000 marines—7000 afloat and

Armour- clad ships,

Increase of ar- mour- thickness in iron- clads.

Unar- moured ships,

Number of nfen

ENGLAND

[NAVY,

7000 on shore. Included in the number of 34,100 seamen of the fleet, provided for in the estimates of 1877-78, were 160 flag officers, 30 officers superintending dockyards and naval establishments, and 2889 other commissioned officers on active service, being a total of 3079 officers for the British navy.

XI. Religion and Hducation.

There is a singular want of authentic religious statistics Want in England. While in nearly all other European countries of reli- the number of the population adhering to various creeds is ree ie

: 5 a0 ; istics in

carefully ascertained at the periodical census takings, or pneland, at other times, this has never been dose in England, except in a cursory

~~manner. At the census of March 31, 1851, an enumeration took place of the number of places of worship in England and Wales, and the attendance of persons therein on the preceding day, a Sunday; but the information thus obtained, though valuable in some re- spects, was not of the kind to allow accurate conclusions concerning the strength of the various religious bodies, it. being well known that the attendance ;in churches and chapels comprises many persons outside the creed to which they adhere. The returns of the census of March 1851 were as follows :—~~

~~=~~

~~Total Attendance in Places of Worship.~~

~~Percentage~~

~~Creeds. of Attendance.~~

~~2,971,258~~

~~Church of England ……..~~

~~47°4 Charch of Romer. Mies. .—0. +. 249,389 3°9 All other religious bodies ….) 3,185,575 48°7~~

~~6,356, 222~~

~~@eeeneeeereeeeerere~~

~~The total population of England and Wales at the census of March 31, 1851, was 17,927,609, so that the church attendance registered comprised little more than one-third of the population.~~

~~In the absence of other official reports, the best existing Marri-~~

~~means of ascertaining the numbers of the various creeds are ages as a in the returns of the registrar-general of births, deaths, and tst of marriages. Since the year 1836, when, during Lord a Melbourne's administration, an Act was passed granting all dissenters from the state~~

church the right to go through the ceremony of marriage in their own churches and chapels— a right of which they had been deprived from 1754, for a period of 82 years—strict accounts were kept of the creeds of all persons marrying, and from these tolerably accurate conclusions may be drawn regarding the respective numbers, if not of all the sects and denominations, at least of the two great divisions of the population, churchmen and noncon- formists. A careful analysis of the marriage returns for the forty years from 1837 to the end of 1876 makes it apparent that the number of nonconformists is steadily increasing, and that, although the great majority of the population still adhere to the Church of England, the pro- bability seems that it will be otherwise in the course of one or two generations.

Dissenters.—From an enumeration made in the year Dissent- 1699, and believed to be quite trustworthy, it appears that ers from at that time the total number of Protestant dissenters from the the Church of England was not more than 214,000, being pe 4:18 per cent. of the population. There are no returns for jand. about a century and a half after this date from which an estimate can be drawn respecting the number of dissenters, the first new basis for them not offering itself till the pass- ing of the Marriage Act of 1836. In 1845, when the Act had been well carried out, the number of Protestant dis- senters in England and Wales was calculated at 1,351,000, being 8-08 per cent. of the population. This was no great increase from 1699, when the percentage was 4°18, but the rise of dissent became more marked henceforth. In1851 the

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The total number of "licensed" churches and chapels belonging to Protestant and other dissenters from the estab- lished church was 20,480 on the 31st December 1875. The number had fallen to 19,486 on the 3lst October 1877.

The numerically most important body of Protestant Wesley- dissenters is that of Wesleyan Methodists, founded in 1739 7 ar by the Rev. John Wesley, clergyman of the Church of O°)"

~~and other~~

~~England. Subsequently to his death, in 1791, the com- pigsent-~~

~~RELIGION. |~~

~~number of Protestant dissenters was estimated at 1,958,000, or 10°89 per cent. of the population ; and ten years after, in 1861, the total number was calculated to have increased to 3,090,000, being 15°36 per cent. of the population. There was an estimated further increase to 3,686,000, or 17°38 per cent. of the population, in the number of dissenters at the end of 1866; while the last calculations, going down to the end of 1876, make it probable that at~~

~~this date the number had risen to 4,500,000, being not far from 20 per cent. of the population. According to the most reliable estimates, the dissenters did not constitute the majority of the population in the year 1876 in any part of England, but they possessed it in Wales. Next to Wales, the greatest number of dissenters were in Monmouthshire, Cumberland, Cornwall and Devon, Durham, and Yorkshire, in all which counties they constituted more than a third of the population. On the other hand, the disseuters were in a small minority in nearly all the southern counties of England, notably in Middlesex, Kent, and Sussex. In the metropolis itself, the Protestant dissenters were estimated to form about 10 per cent. of the population.~~

~~munity split into various subdivisions, of which 13 are ers.~~

~~enumerated in the preceding list. The largest of these, known simply as Methodists, or Wesleyan Methodists, had on its roll 402,437 members at the end of 1876; and the next largest, the Primitive Methodists, 181,081 members. Of more or less importance, among the other bodies of Protestant dissenters, are the Baptists, split into nearly as many divisions as the Wesleyan Methodists ; the Indepen- dents, also known as Congregationalists; the Unitarians ; and the Moravians. No authentic returns exist regarding the number of persons adhering to any of the minor Protestant creeds reported by the registrar-general as exist- ing in England and Wales.~~

~~More numerous than any single body of Protestant Number~~

~~Under the Act of 1836, the registrar-general has to keep dissenters is that of Roman Catholics in England. It is ofRoman~~

~~a list of all the churches and chapels of the various dissent-~~

~~Number of reli-~~

~~gions dle- nomina- tions.~~

~~ing religious denominations wishing to be "licensed" for~~

~~the celebration of marriages.~~

~~according to the " Thirty-Eighth Annual Report of the Registrar-General " issued in 1877, no less than 122. The~~

~~The number so entered was,~~

~~following was the reported list of denominations :—~~

~~Religious Denominations in Engiand and Wales.~~

~~Advents. Apostolics. Armenian New Society.~~

~~Independents. Independent Unionists. Inghaniites.~~

~~stated by Hallam that in the reign of Queen Elizabeth the Roman Catholics numbered one-third of the entire popula- tion; but the effect of the many repressive laws enacted against them was that at the end of the 17th century, when the already referred to religious census of 1699 was taken, the total number was only 27,696, being barely one-half per cent. of the population. It was estimated that the num- ber of Roman Catholics in England had increased to 68,000 in 1767, being about 1 per cent. of the population, and that~~

~~Baptists viz i it stood at 69,400 in 1780, being less than 1 per cent. On~~

~~Calne Banat Latter Day Saints the basis of the marriage returns of the registrar-general, SUS. – i i i~~

~~General Baptist New Connexion. Mormons. the estimated number of Roman Catholics in England and~~

~~Old Baptists. New Church. :~~

~~Particular Baptists. Presbyterian Baptists, Scotch Baptists. Seventh Day Baptlsts. Strict Baptists,~~

~~Union Baptists. Unitarian Baptists,~~

~~Baptized Believers. Believers in Christ.~~

~~Bible Christians.~~

~~Bible Defence Association.~~

~~New Jerusalem Church. Orthodox Eastern Church. Peculiar People.~~

~~Plymouth Brethren.~~

~~Polish Society.~~

~~Presbyterian Church in England. Primitive Christians.~~

~~| Progressionists.~~

~~Protestant Members of the Church of~~

~~Wales was 284,300 in 1845, or 1°70 per cent. of the popn- lation; but within the next six years, when there was a large immigration of Irish, the numbers rapidly rose, and at the end of 1851 the total number of Roman Catholics was calculated at 758,800, being 4:22 of the population. The numbers kept rising till 1854, when there were~~

~~Brethren. England. ‘ estimated to be 916,600 Roman Catholics in England and~~

~~Calvinists. Protestants “adhering to Articles of Wal he 4-94 2 oh lati ~e mn~~

~~Catholic and Apostolic Church, Church of England, 1 to 18 inclusive, ales, DelIng per cent. of the population; but there~~

~~Christadelphians, = a was a fall after this year, if not in numbers yet in percen- pt Ned ee Cee Providence tage. The calculated number was 927,500, or 4°61 per~~

~~Christian Believers. MELE i :~~

~~nee Bee Hage cent., in 1861, and 982,000, or 4°62 per cent., in 1866.~~

~~Christian Eliasites.~~

~~Christian Israelites,~~

~~Christian Mission,~~

~~Christian Teetotallers.~~

~~Christian Temperance Men. Christian Unionists.~~

~~Church ef Christ.~~

~~Church of Progress.~~

~~Church of Scotland,~~

~~Church of the Peopie.~~

~~Countess of Huntingdon’s Connexion. Disciples in Christ.~~

~~Disciples of Jesus Christ.~~

~~Eastern Orthodox Greek Church. Eclectics, ‘ a Episcopalian Dissenters. Evangelical Unionists,~~

~~Followers of the Lord Jesus Christ. Free Catholic Christian Church. Free Christian Association.~~

~~Free Christians.~~

~~Free Church,~~

~~Free Church (Episcopal).~~

~~Free Church of England.~~

~~Free Gospel and Christian Brethren. Free Gospel Church,~~

~~Free Grace Gospel Christians.~~

~~Py en Se ie Oe bers being 134 millions in the middle of 1877, leaving ie 'd i . . ur Gcvrdiin, Roraen, Carroner nee ence: about 11 millions to all other creeds—was governed, at of ee — Temperance Methodists. the end of 1877, by 2 archbishops and 28 bishops. th _ Glory Band. United Free Methodist Church, Ny. ps a ishops, the land,~~

~~Greek Catholic.~~

~~Halifax Psychological Society. Hallelujah Band.~~

~~Hope Mission.~~

~~Humanitarians.~~

~~Independent Religious Reformers.~~

~~Recreative Religionists.~~

~~Reformed Church of England.~~

~~Reformed Presbyterians orCovenanters.~~

~~Reformers, :~~

~~**Revival Band.**~~

~~**Revivalists.**~~

~~**Roman Catholics.**~~

~~**Salem Society.**~~

~~**Sandemanians.**~~

~~**Second Advent Brethren.**~~

~~**Separatists (Protestant).**~~

~~**Society of the New Church,**~~

~~**Spiritual Church.**~~

~~**Swedenborgians.**~~

~~**Temperance Church.**~~

~~**Testimony Congregational Church.**~~

~~**Trinitarians,**~~

~~**Unionists.**~~

~~**Unitarian Christians.**~~

~~**Unitarians.**~~

~~**United Brethren or Moravians**~~

~~**United Christian Churel**~~

~~**United Presbyterians.**~~

~~**Welsh Free Presbyterians.**~~

~~Wesleyan Methodists, viz., Methodists. New Connexion Wesleyans, Original Connexion of Wesleyans.~~

~~Welsh Calvinistic Methodists, Wesleyan Methodist Association. Wesleyan Reformers, $~~

~~Wesleyan Reform Glory Band, Wesleyans,~~

~~Working Man's Evangeiistic Mission Chapels,~~

~~It is estimated that in the middle of 1877 the number of Roman Catholics in England and Wales had barely reached one million, being a less percentage than in 1866, aud that about one-half the number comprised natives of Ireland, with their families. It would thus seem that Roman Catholicism has not been progressive in England for about a quarter of a century. However, the wealth of the body increased very greatly during this period, owing mainly to the secession of many rich persons, of both sexes, to the church, which led to a vast increase of Roman Catholic places of worship. They numbered 616 in 1858, and had risen to 1095 at the end of 1877, with a clergy of 1892. The government of the Roman Catholic Church in England and Wales is under 12 bishops ruling dioceses, and 1 archbishop, head of the "' province of Westminster."~~

~~Catho-, ies.~~

~~The Established Church of England, to which adhere the Govern- majority of the population—the estimated number of mem- ment~~

~~former at the head of two provinces, and the latter of as many episcopal sees. There were as many as 21 bishoprics at the beginning of the 8th century, which number was thought insuflicient at the time, for the Veucrable Bede,~~

:

~~ENGLAWN®SO~~

~~Ecclesiastical Commissioncrs, but the latter dependent Clergy chiefly on preferments, held independent of their dignity, of the The more immediate supervision of the parochial clergy, Church~~

~~estimated to number about 13,000, is in charge of 610 rural ae~~

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~~some years before his death, in 735, exhorted King Egbert to increase the sees by converting many monasteries into cathedrals. However, the advice was not followed; and at the period of the Conquest the number of sees was~~

~~[REnicion.~~

~~still 21. During the centuries that elapsed till the Refor- mation, while the population increased from 1} to 4 mil- lions of souls, only two new bishoprics were formed, namely, that of Ely in 1109, and that of Carlisle in 1133. In the reign of Henry VIII. it was proposed to establish 20 new dioceses, but only 6 came to be formed, one of which, that of Westminster, had no long existence. Three centuries again elapsed after the Reformation till any more sees were founded, the first new creation being that of Ripon, estab- lished in 1836. Eleven years afterwards, in 1847, the bishopric of Manchester was founded; while the lapse of another twenty years saw the establishment of two more bishoprics in those of St Albans and Truro,~~

~~into the Revenues and Patronage of the Established Church in England and Wales." In 1836 the members of the com- mission, after having made a close investigation into all the sources'of church revenue, were constituted, by Act 6 and 7 William IV. ¢. 77, a perpetual corporation, under the title of " Ecclesiastical Commissioners for England and~~

~~deans, who have no salaries as such, but are entirely depen- dent on that derived from their preferments, or "livings." The incomes of these vary extremely, being excessively low in many cases, while in others approaching the revenues of the dignitaries of the church. 'To raise the value of the smallest "livings " has been among the chief labours of the~~

~~Ecclesiastical Commissioners, and they have been aided in the task by the endeavours of various societies, both lay and clerical, among them that of the "Bishop of London Fund," established in 1864. Foremost among the older organizations stands the '" Queen Anne's Bounty," founded in 1703, to increase the incomes of the poorer clergy. The commissioners under the Act of Queen Anne which~~

~~Sees of The following is a list of the thirty archiepiscopal and } established the "' Bounty" found no less than 5597 livings England episcopal sees of England and Wales—the latter arranged | under £50 per annum in England and Wales; but since oo in alphabetical order,— with date of their establishment, and | that time the number greatly decreased, and although there "fixed incomes attached to them :— are no official returns on the subject, it may be estimated 7 that there were not 1000 preferments in the country in Fonsdeelon, 1877 endowed with such small incomes. Education.—The spirit of reform which made itself felt Progress one: enone at. in the church by the institution of the Church Inquiry and of educa. meet ee Ecclesiastical Commissions exhibited itself to a far more ton in Bath and Wells vigorous degree during the same period by promoting the 'heures Chichester cause of education. The work of educational reform began middle E with the upper and middle class schools, and gradually classes. went downwards, till it reached the lowest classes of the population. Parliament began occupying itself with the condition and management of the public schools of England in 1818, when acommission made a report upon them, ex- posing many evils. Though little action was taken at the time, the work of inquiry continued in various forms, lead- ing to the close inspection of more than 2000 endowed Ha ae a schools. Many of these were compelled to undergo exten- Gee sive reforms in their mode of teaching, so as no longer to ex- St Asaph clude science, art, and modern languages; while the revenues St David's of nearly all of them were regulated, and made to serve Salisbury larger objects than before. It was the leading aim of the air olidatien educational reformers in parliament both to deepen and Worcester widen education, giving the largest possible number the best possible instruction, and a variety of measures were passed York Peta os York. for this purpose. From 1834 direct annual grants were ee) voted, the first of £20,000, for the~~

~~promotion of education, Qagar and in 1839 the Committee of the Privy Council on Education was instituted for the distribution. of the money. An Act for the establishment of industrial schools was | passed in 1857 ; and in the same year the universities of Oxford and Cambridge consented to undertake " middle- Ecclesi- © The formerly variable incomes of the archbishops were | class examinations " in some of the chief towns of England. astical- fixed by a number of statutes, arising out of the establish- | These local university examinations began in the summer of ee? ment, in 1832, of a parliamentary "" Commission to inquire | 1858,and proved most successful in promoting higher educa-~~

~~tion. It was stimulated no less by an Act passed in 1869, 31 and 32 Vict. c. 118, reforming the government, teaching, and discipline of the seven great public schools of England, —Eton, Harrow, Rugby, Winchester, Shrewsbury, the Charterhouse, and Westminster. This statute greatly widened their field of instruction.~~

~~Wales," with power to administer the financial affairs of the church, to pay fixed salaries to the principal church dignitaries, to re-arrange, under approval of the Queen in council, the boundaries of dioceses and incumbencies, and to take other measures " conducive to the efficiency of the~~

~~While these efforts were made to improve the education Progress of the middle and upper classes, the lower classes of the of educa- population were not altogether forgotten. Still the achieve- #1" ments in this direction, naturally vastly more difficult, were the aa~~

~~for a time inconsiderable. The first impulse given towards classes.~~

~~established church, and the best mode of providing for the cure of souls,"~~

~~Tn the government of the Church of England, the arch-~~

~~bishops and bishops are assisted by 30 deans and 74 arch-~~

~~deacons, the former having fixed incomes, paid by the~~

more determined exertion was by a great educational con- ference, under the presidency of the Prince Consort, which took place in London in June 1857, and passed resolutions that were soon echoed all over the land. 'The first result of the conference was the appointment, in the session of

EDUCATION. |

1858, of a parliamentary commission to inquire into the state of popular education, the report of which was issued, rather tardily, in March 1861. Close upon the report followed a minute of the Committee of the Privy Council on Education, establishing a revised code of regulations for elementary schools. The code, which was to come into operation on the 1st April 1862, decreed regular examina- tions of the pupils, payment by results, evening schools for adults, and various other changes in elementary education, tending to make it more general. But so far from giving satisfaction, the new code raised a storm of Opposition, chiefly from the clergy, and had to be altered in some of

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£504,286, and over a million in 1875, when they stood at . £1,093,378. In 1876 the annual grants for examination and attendance increased to £1,272,495, and in 1877 to £1,415,333.

Denominational Schools,—It appears from parliamentary Denomi- returns issued in the session of 1874 that at that time, nations

when the school-board system had just began to take root the great mass of the pupils of elementary schools under inspection were in institutions belonging to and under the control of the Church of England. The following tabular statement gives the number of pupils present at examina- tion in the elementary schools of England and Wales con-

? schools.

~~Public its most important provisions. In the session of 1870 a | trolled respectively by the Church of England, the Roman Hlemen- statute of the highest importance was passed, which effected | Catholics, the school boards, and the British, Wesleyan, a little less than a revolution in the state of national educa- | and all other schools, in the years 1871 to 1873 :— Actof tion. By this statute, 33 and 34 Vict. c. 75, entitled " An 1870. Act to provide for Public Elementary Education in England Nuraber of | Total Number and Wales," it was ordered that "there shall be provided Denominations of Schools. ag present at for every school district a sufficient amount of accommoda- Inspection. | "sPection. tion in public elementary schools available for all the oan ee win children resident in such district, for whose elementary 7' 398 1'172/944 education efficient and suitable provision is not otherwise 8.051 1,254,907 made." It was further enacted that all children attending . | ca these "public elementary schools" whose parents were : , unable, from poverty, to pay anything towards their edu- || Roman Catholic……. Ea Wage cation, should be admitted free, the expenses so incurred, 'vais with all others necessary to carry out the provisions of the 82 11,388 Act, to be defrayed a of local eatin ' Finally, it was Sie Pare 520 91,262 ordered that the whole administration of the new system 1691 | 362,978 | of public education should be placed under "school British, Wesleyan, and 1,980 379,199 boards," elected by the suffrages of all tax-payers, includ- all'other'Scheols 1,999 389, 612 ing women, and invested with large powers, among them that of compelling all parents, under severe penalties, to ae oaece give their children between the ages of five and thirteen 11,094 1,847,216 the advantages of education. The statute of 1870, proving more beneficial even than expected at the outset, laid a Board Schools.—It will be seen that on the 31st of Tnerease firm basis for universal education. | August 1872, the total number of schools under school ofschools Progress The gradual progress of public elementary education | boards was not more than 82, with 11,388 pupils present at of ele- during the course of a quarter of a century isshown in the | inspection ; and that a year later the number of schools had ee following table, which gives the total number of schools | risen to 520, and that of pupils to 91,262. After this time, tion, Under Government inspection, the total number of children | with the machinery established by the Act of 1870 getting for whom~~

accommodation was provided, and the average | more and more into working order, and its chief feature, number of children attending the schools, in every fifth | that of compulsion, being gradually applied, the progress scholastic year, ended August 31, from 1850 to 1870, and | of elementary education became very rapid. At the end of for each year thereafter to 1876. August 1876, there were 1604 schools under school boards in England and Wales, affording accommodation to 556,150 Years endeq | Number of Number of _ | Average Number pupils. The total number of school boards at the end of ht | ee August 1876 was 1790, of which 123 were in boroughs and 1667 in rural or extra-municipal parishes. There 1,844 370,948 197,578 were at the same date 99 boroughs, out of 223, in England ake (at 2 NY and Wales as yet without school boards; still these exceptions 6,012 1,158,827 751,325 y ; le 6,865 1,470,473 901,750 included no place with over 50,000 inhabitants. On the 8,986 1,950,641 1,255,083 1st of April 1877 there were 11,221,363 of the total 9,521 2,092,984 1,345,802 population drawn within the clauses of the Act enforcing ae 2,397,745 1,445,326 the attendance of children at school, so that compulsory ,911 2,683,541 1,570,741 : half of oh 13,084 2,952,479 1,710,806 education had become the law for about one-half o e 14,067 3,229,112 1,863,176 population, and it might be calculated that only a few more 14,875 3,483, 789 2,007,732 years would be required to include the whole. The total amount received by the school boards of Cost of | Baris While the charge for elementary education, under the England and Wales in the year ended August 31, 1876, the mentary Act of 1870, chiefly falls upon local rates, there are at the | was £2,695,644, of which £1,178,946 came from local Ret ae same time large and continually increasing parliamentary rates, and £1,516,698 from loans, the latter raised for the system fake grants made, out of imperial funds, for promoting the edu- | erection of school buildings, and other works of a permanent and com-

cation of the masses. In 1863 the annual grants for ex-

lon ¢ The total amount thus borrowed amounted to pulsory amination and attendance of pupils in elementary schools,

~~educa- tion,~~

~~character. £5,466,106 at the end of August 1876, the sum being~~

~~under inspection in England and Wales, amounted to only £205; but they rose to £180,303 in 1864, to £376,367 in 1865, to £388,006 in 1866, to £429,885 in 1867, and to £431,594 in1868. Thus regularly advancing, the grants came to over half a million in 1869, amounting then to~~

~~raised at 34 per cent. annual interest by the Public Works~~

~~Loan Commissioners, to be repaid in the course of fifty~~

~~years from local rates, the pressure upon which is expected~~

~~to become gradually less as the great work of compulsory~~

~~education advances towards its completion. The average VITI. — 32~~

~~250~~

~~school board taxation in the whole of England and Wales was 1°87d. per pound sterling in the year 1874-75, and rose to 343d. per pound in the year 1875-76.~~

~~Adult Education.—Though as yet unaffected by the in- troduction of the system of compulsory education, there is, nevertheless, a vast progress of general instruction visible among the adult generation, as is proved by the constantly growing numbers of persons able to sign their names to the marriage registers. The annual numbers, carefully collected by the registrar of births, deaths, and marriages, as among the most noteworthy tokens of the educational condition of the people, show that while in the quinquennial period 1841-45 there were in England and Wales 32°6 per cent. of men and 489 per cent. of women who signed the marriage registers with ‘ marks,” being unable to write, the proportion very steadily decreased from period to period, and from year to year, till it had fallen in 1871-75 to 18°5 per cent. in the case of men, and to 25:2 per cent. in the case of women. ‘Thus there was in the~~

~~thirty-five years from 1841 to 1875 a decrease of 15:5 per cent. in illiterate men and of 25:6 per cent. in illiterate women. Propor- The proportion of males and females unable to write tion of varies greatly in the several counties of England and in persons Wales, as will be seen from the following table, which gives unable to 4 ; : sign the percentage of both sexes who signed the marriage re- their gisters with "marks" in the year 1875, according to the 38th~~

~~names to annual report of the registrar-general, issued in 1877 :— marriage registers,~~

~~State of educa- tion among adults.~~

~~Percentage of Persons signing with ** Marks." Counties,~~

~~Men. Women.~~

~~Hampshire Northumberland Kent~~

~~Northamptonshire Derbyshire Berkshire Cheshire . Yorkshire Herefordshire Leicestershire Lancashire~~

~~Oxfordshire~~

~~Somerset Nottinghamshire LW aE WACKSMIMGH .. cscsecceicaceneeeeeetscees~~

~~Cornwall Worcestershire South Wales Huntingdonshire Cambridgeshire~~

~~Buckinghamshire Shropshire North Wales~~

~~Bedfordshire Hertfordshire Monmouthshire Staffordshire~~

~~Large as seems the proportion of male and female adults still unable to write in England, the registrar-general, in~~

~~ENGLAND~~

~~es~~

~~[EDUCATION.~~

~~his 38th annual report, published in 1877, arrived at the Educa- hopeful calculation that " if instruction increases in future tional years at the same arithmetical rate as it has done in the years from 1841 to 1875, then all the men will be able to i. write in 38 years, and all the women in 31 years."~~

~~XII. Crime and Pauperism.~~

~~The wide-spread belief that increase of education will Number lead to a decrease both of crime and pauperism receives some ° crimi- confirmation from the criminaland other statistics of England evi and Wales for more than a generation, though not to the jgv¢. ; full extent that might be desired. As regards crime, the decrease of it, while of a fluctuating nature, was much less in proportion than the increase of education, as shown by the number of persons committed for trial before juries in England and Wales and either convicted or acquitted.~~

~~The following table shows these numbers for every fifth year from 1841 to 1876 :—~~

~~Number of Persons Committed for Trial.~~

~~Number of Persons Acquitted.~~

~~Number of Persons Convicted.~~

~~27,760 25,107~~

~~20,280 18,144 21,579 14,734 13,879 14,254 11,946 12,195~~

~~27,960 19,437 18,326 18,849 16,269 16,078~~

~~The small difference between the number of persons con- victed and acquitted and the total committed comprised those found to be and detained as insane.~~

~~It will be seen from the preceding table that, while the Decrease~~

~~total committals decreased from 27,760 in 1841 to 16,078 of crime. in 1876, and the convictions from 20,280 in 1841 to 12,195 in 1876, the downward progress was not regular, but inter- mittent, fall and rise following each other. Thus there were fewer convictions in the year 1871 than in 1876. The fluctuations in crime and the number of criminals must be referred to complicated causes, chief among them the state of trade and commerce, which, according as they are either flourishing or depressed, greatly influence the con- dition of welfare of the masses of the population.~~

~~The classes of offences for which persons were committed Ctassesof for trial in England and Wales, and either convicted or offences. acquitted by juries, in each of the three years from 1871 to 1873, were as follows : —~~

~~Number Committed or Bailed.~~

~~2,175 2,082 2,011 1,509 1,325 1,233 11,265 10,225~~

~~10,516 | 7,968~~

~~197 102 162 89 161 81 483 408 395 336 379 327 640 420 612 391 593 414~~

~~Number Acquitted or Discharged.~~

~~735~~

~~Number~~

~~Classes of Offences. Convicted.~~

~~1,418 1, 408 1,347 1,146 1,034~~

~~952 8,457 7,609~~

~~Against the Person…~~

~~Against Property com- mitted with Vio-~~

~~Property committed without Violence~~

~~Malicious Offences against Property …~~

~~Forgery, and Offences against the Cur- TOME sles Yaw ssceneetce~~

~~Other Offences not included in the above Classes~~

~~11,946 10,862 11,089~~

~~16,269 14,801 14,893~~

~~Numbers and.~~

~~classes of~~

~~prison- ers.~~

~~Ages ot prison- ers,~~

~~Educa- tion of prison- ers,~~

~~Repeated convic- tions,~~

~~CRIME. |~~

~~The total number of prisoners confined in the jails of the~~

~~United Kingdom, under sentence either of juries or of~~

~~stipendiary and other magistrates, was 220,817 at the end of 1871, and rose to 220,887 in 1872, and 232,362 at the end of 1873. Of the latter total, 165,142 were imprisoned in England and Wales, 33,419 in Scotland, and 33,801 in Treland. The classes of convicts confined in the prisons of England and Wales—including those imprisoned for debt, and military deserters, under the Mutiny Acts—were as follows at the end of the year 1873 :—~~

~~**Total.**~~

~~**Classes of Prisoners. Females.**~~

~~CRIMINAL PRISONERS :— Convicted (not previously in~~

~~1,105 278 1,383~~

~~AChnSte00105) RRB ppe odes soootsepcariodca: E Committed for Trial……006. 10,194} 3,106 | 13,300 Summarily Convicted ……. 86,250 | 40,187 | 126,437 Weeamt GE SUTEHHESH.....0..ccccscs snes. 2,190 854 3,044 Remanded and Discharged …….. 8,206 | 3,043 | 11,249 MOU reece. caetiaas. «cota 107,945 | 47,468 | 155,413 Debtors and under Civil Process…..| 6,404 283 6,687~~

~~eeeeavene~~

~~Offenders under Mutiny Act 3,042 3,042~~

~~117,391 | 47,751 | 165,142~~

~~Cece eersessccesesens~~

~~The ages of the 155,413 prisoners—excluding debtors and deserters—in the prisons of England and Wales, at the end of 1873, were as follows :—~~

~~Males. Females. Total.~~

~~Ages of Prisoners.~~

~~Under 12 Years 12 and under 21~~

~~o9~~

~~60 Years and upwards Ages not ascertained~~

~~47,468~~

~~The degree of education of the same 155,413 prisoners was as follows :—~~

~~Education of Prisoners. Males. Females.~~

~~33,750 | 18,148 31°3~~

~~69,553~~

~~-Not able to read or write Proportion per cent. to total… Able to read, or to read and write imperfectly Proportion per cent. to total… Able to read and write well Proportion per cent. to total… Superior Instruction Proportion per cent. to total… Instruction not ascertained~~

~~Of the 155,413 prisoners in the prisons of England and Wales at the end of 1873, no less than 61,274, or two- fifths, were old offenders. The number of their previous convictions was as follows :—~~

~~Females. Total.~~

~~6,182 3,402 2,227~~

~~A:~~

~~1,351 1,820 2,098 4,648~~

~~87,778 | 28,501 | 61,274~~

~~Number of previous Convictions. Males.~~

~~Eight to ten times Above ten times~~

~~The preceding tables show succinctly to what an extent the prisons of England and Wales are filled by what may~~

~~ENGLAND~~

~~251~~

~~be called acriminal population, that is, one living regularly Criminal by crime. It is a population not very young, nearly one- popula- half of the~~

~~whole being between the ages of thirty and #™- sixty, and not possessed of any education worth the name,—~~

~~33°4 per cent., or just one-third of the whole, being unable~~

~~either to read or write, and 63 per cent. of the whole only~~

~~able to read, or to read and write imperfectly. Thus more~~

~~than 96 per cent. of the entire army of prisoners, male and female, belonged, so far as education went, to the dregs of~~

~~the population ; while only a quite inappreciable fraction, expressed by 0°1 per cent., was that of a class described as possessed of " superior instruction."~~

~~Police.—Besides the direct cost of prisoners, there are a Expendi- variety of other expenses connected with their apprehension ture for and conviction, but it would be impossible to give an police. account of them. Foremost among these expenses stands that for the police, the total charge for which in the year 1873 amounted to £2,567,491. The expenditure was divided as follows among the various classes of the police :—~~

~~Classes, Number, Expenditure,~~

~~£860, 266~~

~~620,111 1,009,106 78,008~~

~~County constabulary……ccscccccccc Borough police~~

~~Metropolitan police, 'including that is of dockyards~~

~~OO mcce saroncevasesssertane~~

~~Geer ccccsoerssccerees~~

~~£2,567,491~~

~~**Pauperism.—There is, as might be expected, an intimate Crime connection between crime and pauperism. At the side of and pau- a fixed prison population, steeped in crime, stands a regular Perism. workhouse population, sunk in helpless, irretrievable poverty. If far more harmless than the criminal popula- tion, the pauper population, on the other hand, is far more numerous, varying between three quarters of a million and a million. The number of paupers, like that of criminals, kept rising and falling, in alternate waves, during the course of the last generation, under the probable influence of good or bad harvests mainly, and the state of trade, with a general tendency to increase within the first half of the period, and to decrease within the second half. The total number of paupers in the United Kingdom, embracing both those kept in workhouses and those receiving public charity out of doors, was 1,022,540 in 1846, of whom 910,561 were in England and Wales, 69,432 in Scotland, and 42,547 in Ireland. At the end of thirty years, in 1876, the total number of paupers in the United Kingdom had fallen to 906,983, of whom 728,350 were in England and Wales, 100,105 in Scotland, and 78,528 in Ireland. Thus the aggregate decrease within the period was solely due to a decline of pauperism in England, there being an increase of 30,673 paupers in Scotland, and of 35,981 in Ireland.**~~

~~**The following table gives the number of paupers, distin- fie: guishing "in-door," within workhouses, and " out-door," of receiving public relief, in England and Wales, for every fifth paupers, year from 1851 to 1871, and each year thereafter to 1877, ee to on the first day of January in every year :— .**~~

~~**Out-door Paupers.**~~

~~**In-door Paupers.**~~

~~**750,328 752,170 759,462 782,358 916,637 823,431 736,201 679,723 661,876 600,662 571,159**~~

~~**110,565 125,597 130,961 137,986**~~

~~860,893 877,767 890, 423 920,344 1,081,926 977,664 890,372 829,281 815,587 749,593 728,350~~

~~165,289 154,233 154,171 149,558 153,711 148,931 157,191~~

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~~Number There were 590 workhouses and “ unions” for the relief of work- of paupers in England and Wales on the Ist of January houses. 1849 and the number gradually rose till it reached 655 in 1864, from which time it remained stationary till 1869, when there wag an amalgamation of several poor-law unions. There were 650 workhouses and unions on the 1st of January 1877. Able- The paupers of 1877 comprised 92,806 returned as bodied “able-bodied,” of which number 18,993 received in-door, andadult snd 73,813 out-door relief. Of the remaining paupers, Paupers: 635.544 in number, 138,198 received in-door, and 497,346 out-door relief. Two-thirds of all the paupers were sane adults, the other third comprising children under sixteen years of age, lunatics, and idiots. Among the adult in-door paupers of 1877, the men formed the majority, but the women were nearly three times a8 numerous as the men among out-door paupers. Aged persons, or widows, deserted wives, and “unmarried mothers” with their children, comprised the great mass of these out-door paupers. Expendi- Pauperism is far more costly than crime. The total ture for expenditure for criminals in the year 1873 was £585,021,~~

~~crimi- while that for the maintenance of paupers amounted to nals. 7,692,169. The branches of expenditure for criminals in the year 1873, and the average cost of each prisoner, were as follows :— Branches of Expendit Tore itapeudi re, : xXpendaiture ranches 0 xpenditure, Expenditure. non Eniace ORDINARY CHARGES. £ Sea a Repairs, furniture, fuel, and light, 119.414 67 1 POTD MOCO teesicaels We soilece uasucesceeeeeticte ? Officers’ salaries, allowances, and 236.751 |13 7 9 [OGG ONE an gnpapensonnsacdepebaobemonoaKn 2 Prisoners’ diet, clothing, &¢. ..... 153,339 8 13 5 Uotaile. We covaeneseneienaanc ce 502,504 | 28 8 38 EXTRAORDINARY CHARGES. Repayment of money borrowed, | interest, &c., new buildings, addi- 82,517 418 4 tions, and alterations ..... Total~~

ordinary and extraordinary.| 585,021 Expendi- The total amount raised by “‘ poor rates” so-called in a for England and Wales in the year 1873 was £12,657,943, ee rciet and the amount expended £12,426,566. But of this poor, expenditure, not more than the sum of £7,692,169, before mentioned, was employed directly for the relief of the poor, the remainder, £4,734,397, going for other payments under the poor-laws, such as police rates, vaccination fees, and disbursements of highway boards. The actual direct ex- penses for the relief of the poor in the year 1873 were under the following branches :— £ Cost of in-door maintenance……. Brsnc teen acct 1,549,403 Costkonout-door rele iire cas .cs. sects caacess. eee 8,279,122 Workhouse loans repaid and interest thereon. 272,698 Salaries and rations of officers ….. ....00 893,218 pi eee connected with the relief of) 914,957 a cay of lunatics in asylums or licensed 780,927 OUISES sic ccccccnsnnes seeestcessccnssesave seeeeeseeeeee OME 5. te 7,690,325 Taxation Lhe average rate imposed by local taxation for the

for pau- actual relief of the poor in 1873 was 5s. 11d. in the pound perism. per head of population for the whole of the United King- dom, while for England and Wales alone it was 6s. 7d. per head of population, for Scotland 5s. 2d., and for Ireland 3s. 4d. Taking the percentage ratio to the whole popula- tion, tax-paying and not, the amount was 3s. 3d. per indi- vidual for the United Kingdom, while the share for Eng-

ENGLAND

“—

[PAUPERISM.

land and Wales was 3s. 8d. per head, for Scotland 3s. 5d., and for Ireland 1s, 4d. per head of population.

The enormous cost of pauperism, and consequent heavy Poor-law burthen entailed upon taxpayers—deemed the harder as commis- being very unequally distributed, the poorest parishes being §!0ne”s the highest assessed—led to many recent legislative noord attempts to

~~effect a remedy. Under the Poor-Law Amend- boara, ment Act of 4 and 5 Will. IV. c. 76, passed in 18384, a somewhat complicated administrative machinery was formed for the purpose, receiving the title of "Poor Law Commis- sion ;" but it was superseded in 1847, by the statute 10 and 11 Vict. c. 109, which instituted the ""' Commissioners for administering the Laws for the Relief of the Poor in England and Wales." An Act passed two years after, 12 and 13 Vict. c. 103, abolished alike commissions and com- missioners, establishing in their stead, a "a poor-law board," invested with extensive powers, its president having a seat in the Cabinet. Although by the Act itself, and the institution of a new member of the Government, it was sufficiently acknowledged that the question of pauperism had become one of the most momentous of the day, and although its working, under the direction of a very able chief, gave general satisfaction, it was soon found that it was faulty in nlany respects. It was particularly so in not recognizing that the system of maintaining the poor, having been and remaining entirely local, could not be dissevered from local government in general, and that the necessary reform must be in this direction.~~

~~The admission of this fact led to the passing of another Institu- statute, 34 and 35 Vict. c. 70, which obtained the royal tion of assent, August 14, 1871, known as the Local Government hel Board Act. The Act ordered the establishment of a Local ment Government Board, as a ministerial department, to under- Board. take all the functions of the Poor-Law Board, abolished henceforth, and, moreover, to superintend the execution of all the laws relating to the public health, and to matters connected with local government. The new Local Govern- ment Board began its functions in March 1871, its presi- dent holding a seat in the Cabinet.~~

~~Since its institution, the Local Government Board has Annual published annual reports, addressed to parliament, the reports sixth of which was issued at the end of the session of a 1877. Judging by this report, the action of the new system for superintending the relief of the poor has been very successful, there being a considerable decrease of the expenditure for the actual maintenance of paupers. But this was effected entirely by savings in out-door relief.~~

~~The respective charges for the maintenance of paupers in workhouses and for out-door relief in 1871 and in 1876 were stated as follows in the report :—~~

~~In-door Maintenance.~~

~~Out-door Relief.~~

~~£ | 5,188,665~~

~~4,295,028~~

~~£~~

~~3,663,970 2,760,804~~

~~£~~

~~1,524,695 1,534,224~~

~~1871 1876~~

~~Increase Decrease~~

~~9,529~~

~~903,166~~

~~893, 637~~

~~Poor-Law Administration.—According to the sixth Cost of annual report of the Local Government Board, the expendi- Poo™ law 5 : adminis- ture for the in-door and out-door maintenance of paupers jation, formed little more than half the total cost set down as being " for the relief of the poor." Among the other branches of expenditure were "salaries and rations of poor-law officers," £943,000; "charges for pauper lunatics in asylums," £883,000; and a number of similar disbursements, the total amounting to £3,042,830. It is admitted in the~~

~~report that, notwithstanding the strictest supervision, the | local expenses of administration continue increasing, while~~

~~CILTARITABLE INSTITUTIONS. |~~

~~the direct cost of maintenance of the poor is decreasing. Thus in 1871, when the actual maintenance of in-door and out-door paupers cost £893,600 more than in 1876, the extra branches of expenditure were £357,000 less.~~

~~1601, usually known as the Statute of Charitable Uses, a rather wide definition was given of what was considered to be within the realm of charity. It might be used, declared the Act, " for relief of aged, impotent, and poor people ; for maintenance of sick and maimed soldiers and mariners ; for schools of learning, free schools, and scholars in universities ; for repair of bridges, ports, havens, cause-ways, churches, sea-banks, and highways ; for education and preferment of orphans ; for relief, stock, or maintenance of houses of correction ; for marriages of poor maids ; for sup- portation, aid, and help of young tradesmen, handicraftsmen, and persons decayed ; for relief or redemption of prisoners or captives; and for aid or ease of any poor inhabitants concerning payments of fifteens, setting out of soldiers, and~~

~~ENGLAND~~

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~~commissioners should be appointed by the lord chancellor, tour for each diocese, to act under the bishop, and " inquire by a jury concerning charities." It does not appear that much action was ever taken under the statute, cuinbrous in all its prescriptions, and it had fallen into disuse before the~~

~~Pauper- § There cannot be any reasonable doubt that the princi- _ ism and pal remedy of pauperism must be sought in the general | middle of the last century, when it was gradually replaced eduea- education of the poor. That this is already taking effect, | by other legislative~~

~~enactments. ce Hon under the salutary working of the Compulsory Education | " No general record of charitable institutions is known to Records Act of 1870, there are many symptoms. It is stated, in a | have existed until the close of the 18th century, when the ~ — report of the inspectors of the London board schools, pub- | subject came to occupy the serious attention of parliament. be lished at the end of 1877, that the order and regularity | It manifested itself chiefly in the passing of a statute, 26 strictly enforced in their schools not only affect the charac- | Geo. III. c. 58, generally called the Gilbert Act, which ter of the children, but that of the parents in the most | gave orders " for procuring, upon oath, returns of all charit- destitute social condition, including paupers receiving out- | able donations for the benefit of poor persons in the several door relief. ' There are indications," says the report, | parishes in England." The returns obtained under this Act "" that the parents are beginning to feel the wholesome in- | were examined and reported on by a committee of the fluence of the schools. We are assured by teachers in the | House of Commons, which sat in 1786 and 1788, when it very lowest neighbourhood that there is now much less | appeared that out of 13,000 parishes and townships in active opposition to their efforts to improve the children | England and Wales, only 14 had omitted reporting their than formerly, and a marked diminution in the violent | charities. The aggregate annual income of those reported language and rough conduct which were at one time the | upon amounted to £528,710, but it was generally held that invariable accompaniments to a parent's visit to the school." | this sum was a gross understatement. Consequently, there The education of their children, the report goes on to say, | was more legislation, though at considerable intervals, on is strikingly reflected in a " growing self-respect of the | the subject of charities, Under an Act of 52 George III. parents," while all things "point unmistakably to a great | c. 102, passed in 1812, stringent regulations were laid down change for the better, which is being slowly yet surely | for ascertaining the nature and inéome of all the charitable effected in the homes of the children through the influence | institutions in England; but the Act was never properly of board schools." enforced, and remained to all intents and purposes a dead . . ; Ym letter. More effective, although limited in scope, was an XIVI. Hospitals and Charitable Institutions. Act of 58~~

~~George III. c. 91, a in 1818, oe ordered Charity | No country in the world is so rich in charitable institu- | an inquiry into the educational charities of England. It and pau- tions of every description as England. The relations | was this statute which first instituted the " Charity Com- _ perism. between the vast pauperism and the equally vast flow of | missioners for England and Wales." charity designed to remedy it have been keenly discussed; } The actual functions of this board, in superintending all The and while many insist that the latter is simply an offspring | charities, and making annual reports upon them to parlia- board of of the former, there are others no less confident in main- | ment, were defined by the Charitable Trusts Act of 1853, os taining that the abundance of charity has given rise to the | to which amendments were passed in 1855, in 1860, and in gioners, very evil it was expected to cure. Probably the truth lies | 1869. By these statutes, the " Charity Commissioners for midway between the conflicting arguments. If indigence England and Wales" are invested with great powers, some gave rise to charity, the excess of the latter could scarcely | of them distinctly judicial in their nature, and the rest of an fail in its turn to beget improvidence, and, with it, poverty. | administrative character. They may compel the trustees There can be little doubt that, in modern times at any rate, | and administrators of all endowed charitable institutions to the immense multiplication of charitable institutions has keep full accounts of their receipts and disbursements, and served to foster idleness among the lower classes in large | to forward them every year; and they may likewise order towns, and thus has swelled the ranks of hereditary pauper- | special inquiries into the circumstance of individual charities, ism. Legislation has not remained ignorant of this fact, | and enforce the production of all required information. and hence a large number of laws for regulating the uses | Possessed of such powers, the commissioners have been and abuses of charity. enabled to publish a number of valuable annual reports, Oldest The oldest of these regulations were made in the same beginning with the year 1852, on the number and character statute Yeign which laid the foundation of the poor-law, that of | of the net-work of charitable institutions spread all over oe a Elizabeth. By the Act of 43 Elizabeth c. 4, passed in England, tending to alleviate misery and to promote greater Cnarities,~~

~~welfare, or at least designed to do so. Still these reports are far from giving a complete picture of the vast extent of organized charity, since the action of the Charity Com- missioners does not embrace any but endowed charities, and not all even of this class. Specially exempted from the operations of the Charitable Trusts Act of 1853, and its subsequent amendments, are the charities of tlie universities and their colleges, those of Eton and Winchester, of the various cathedral foundations, of all friendly and benefit societies, and of all institutions wholly maintained by voluntary contributions. Among these and other exemp- tions fall a number of charitable institutions as important of their kind as ancient in origin—the Hospitals.~~

~~There can be little doubt that hospitals were,~~

~~, : f : if not the Origin, of other taxes." It is clear from the wording of this statute~~

~~that, at the time it was made, organized charitable institutions were already numerous in England. In order that they might be well managed, and their funds employed for none but legitimate purposes, the Act ordered that~~

~~very oldest, at least among the most ancient, of English hospi- charitable institutions. The earliest of these establishments tals. probably grew up in the time of the crusades, or soon after, necessitated by the spread of new diseases, introduced by~~

~~the knights and their followers returning from the East,~~

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~~How terrible were the ravages made by some of these diseases, such as leprosy, is shown by the fact that there were counted in France, in the year 1225, upwards of 2000 hospitals, going by the distinctive name of " leprosoria." England must have suffered, as well as France, from the influx of the infectious maladies from the same source, although the English crusaders were much less numerous, and many of them belonged to a better class. Neither in~~

~~ENGLAND~~

~~[HOSPITALS.~~

~~Newgate Street, London, founded in 1553, is solely devoted to the education of upwards of a thousand boys, out of revenues of about £58,000 per annum; while the second, Bridewell Hospital, has become an industrial school, its annual income of nearly £15,000 being employed in the training of 150 boys and as many girls, under a scheme settled in 1860 by the 'Charity Commissioners of England and Wales."~~

~~There are no official statistics regarding either the total Reve- number of hospitals in England, or their revenues, the great ae majority of these institutions being maintained by volun- ,)P"~~

~~France nor in England any trace is left of the " leprosoria" of the 13th century, all the existing hospitals being of~~

~~more modern foundation. ton~~

~~tary contributions, and therefore, as previously mentioned,~~

~~The The most ancient in the list of English hospitals is that oldest of St Bartholomew, London, which had its origin in a | by law exempt from the supervision of the Charity Com- English priory of the same name, founded by Rahere, a minstrel | missioners. In a few provincial towns, such as Salisbury, hospital. Of King Henry IL, about the year 1100. A quarter of a | Cambridge, Bristol, Winchester, and York, there are century later, Rahere obtained from the king the grant of a | hospitals dating back to the first part of the 18th century, piece of waste ground, adjoining the monastery, where he | and with more or less considerable revenues ; but otherwise built and endowed a hospital "for a master, brethren, and | the metropolis is the chief home of all these charitable in- sisters, and for the entertainment of poor, diseased people | stitutions, both on account of its wealth, and in connexion till they get well." At the dissolution of the monasteries, | with the study of medicine necessarily demanding central- in the reign of Henry VIII, St Bartholomew contained 100 | ization. Besides the "royal hospitals"~~

~~there are others, beds, with one physician and three surgeons. The hospital | endowed and unendowed, possessed of large revenues. was refounded, on a new basis, in 1544, and incorporated | Foremost among them stand Guy's Hospital, Southwark, by charter in 1546. St Bartholomew, on account of its | founded in 1721, which has an annual income from invest- age no less than of the excellency of its medical staff, con- | ments of over £40,000, and relieves 5000 in-patients and tinues to stand in the foremost rank of English hospitals, | 85,000 out-patients in the course of the year; and the as of the endowed charities of the country in general. Its | London Hospital, established in 1740, and supported mainly average annual income, in recent years, amounted to about | by voluntary contributions, which maintains 6300 in- £40,000, derived mainly from rents and funded property. | patients and 46,000 out-patients, at a cost of £44,700 per In 1876 St Bartholomew's Hospital had 5672 in-patients | annum. Among the other principal metropolitan hospitals and 19,576 out-patients, together with 153,905 other | are that of Westminster, founded in 1719, with an annual patients attending for temporary medical and surgical atten- | income of £13,000 per annum, relieving 2000 in-patients dance, thus affording relief to 179,153 persons in the | and 20,000 out-patients ; St George's, at Hyde Park Corner, course of the year. opened 1733, disbursing £28,000 a year for 4000 in- The five The management of the oldest of English hospitals was | patients and 17,000 out-patients; and the Royal Free royalhos- united, in 1782, with that of four other charitable institu- | Hospital, Gray's Inn Road, which spends £22,000 in pitals. tions of the same kind in London, namely, Bethlehem, St | relieving annually 2000 in-patients and 26,000 out-patients.~~

~~Thomas's, Christ's Hospital, and Bridewell. The union was affected under the Act 22 George III. c. 77, and from it the joined institutions were called 'the five royal hospitals," their superintendence being placed under "the pious care of the lord mayor of London." Only three out of the " five royal hospitals," St Bartholomew, Bethlehem, and St Thomas, now remain institutions in the same sense, the other two, Christ's Hospital and Bridewell, having been diverted entirely from their orginal design. Bethlehem Hospital, like St Bartholomew's originally a_ priory, founded in 1247, under the name of St Mary of~~

~~Bethlehem, by Simon Fitz Mary, sheriff of London, was given, with all its revenues, by Henry VIII in 1547, to the city of London, as a hospital for lunatics. With the exception of an institution of the kind previously founded in Granada, Spain, it was the first lunatic hospital in Europe, and as such acquired large fame, though for a long time not well deserved, the unhappy inmates being treated more like caged animals than human sufferers. Bethlehem Hospital had its first site in Bishopsgate Street, from which it was transferred to Moorfields, in the city of London, in 1675, and finally to its present place, St George's Fields, Lambeth, in 1814. The income of Bethlehem Hospital in the year 1876 amounted to £25,184. More wealthy than Bethlehem, and with revenues equal to those of St Bartholomew, is the third of the "royal hospitals," St Thomas, likewise originally a priory, and converted into a hospital in 1553. The old building, in Southwark, near London Bridge, was levelled to the ground in 1862, to make room for the South-Eastern Railway, when a new and larger edifice was erected in Stangate, Lambeth, facing the Houses of Parliament, and. opened in 1871. Of the two converted "royal hospitals," the first, Christ's Hospital,~~

~~There were altogether 115 hospitals in the metropolis at the end of 1877, of which number 16 ranked as " general " hospitals, for the treatment of all diseases, while the rest were devoted to special maladies or infirmities. To aid in the maintenance of all these institutions, involving an aggregate expenditure of @er a million sterling per annum, there has been made, since 1873, in the middle of June an annual collection in most of the churches and chapels of London, known as that of the " hospital Sunday." The collection produced over £25,000 in June 1877, and not muck less in the preceding years. The receipts of 1877 were distributed among seveuty-six general and special hospitals, including four medical institutions and forty- three dispensaries, the former receiving £22,747, and the latter £2223. In addition to the " hospital Sunday" there was started in the metropolis, in 1875, a "hospital Saturday " collection, made later in the year, the object being to let the so-called working classes contribute to institutions maintained almost exclusively for their own benefit ; but~~

~~the receipts in 1876 and 1877 were compara- tively small, with large expenses of collection.~~

~~Endowed Charitves.—While no authentic information Endowed exists regarding the number and income of the charitable charities~~

~~institutions maintained by voluntary contributions, the %~~

~~Charity Commissioners for England and Wales have issued from time to time, in their reports to parliament, accounts of the financial state of the endowed charities placed under their control. Appended to one of these reports, issued in June 1877, was a series of tabular summaries, giving an account of the income, both from landed property and invested funds, of all the endowed charities under the super- intendence of the commissioners in England and Wales. Of these the following is an abstract :—~~

~~England.~~

~~is Gh A YD 255~~

~~further sum of £115,073, bringing the total income from~~

~~ENDOWED CHARITIES. |~~

~~] Endowed~~

~~sabe Income of l a f charities Gaunites ov Ciies. Charities f Total Income of real estate up to £1,558,250. The annual income from jin each ieiditieaias: Real Estate, | Endowed Charities personalty in 1877 amounted to £640,213, produced from eg 7 – £17,418,250 of invested stock and £2,197,478 of other » counties, ENGLAND. Bf Gk £. sd. senile ? : WedtOrd once. amberland ..cs..0cs0ssses.s 2,808 4 4 5,600 16 5 1853, the personalty of the endowed charities has to be of chari- ht Petes eee teeeeeee eee ens Aaae 2 4 peat u} gradually transferred to the "" Official Trustees of Charitable en EMOMIss:.s saemeenesne ammeter: ; ; BAG : ° Tiss sia mee Ge 11,051 1 7| 13,586 14 10] | Eunds," consisting of two persons appointed by the lord ibe cs ccoce 13,521 2 6]~~

~~18,206 11 9] | Chancellor, who are invested with large powers both of Se SaaS = eee 22,151 15 9 28,949 4 0] | transferment and re-transferment. Under very slow but [ee ree ie 2 ae 3 9 30,271 7 10| | steady progress, the work has been going on since the year Hereford sa noel} ©8680 1 0| 18777 6 10| | 1854 and according to the twenty-fourth annual report of UBPEPOE! 6 occeeeeeeeeoseeeeeeess 13,741 2 0 19,127 5 1 the Charity Commissioners, issued in 1877, the total sum EUEGINCOOR ....00000.000%8 00+ 8,816 17 11 4,649 17 9 of stocks and investments held by the " Official Trustees " BBOMEM Ne co ox ons sagen deneetes +s 44,014 6 8 64,783 4 51 | at the end of 1876 amounted to £7,177,942, after deduct- IFAT CASLET sc serorreeeserereec ss 42,672 7 3 DIRSTET i 3 ing a sum of £837,430 as re-transferments beicetternas.cnssuvsevseveeee 24,655 7 7| 28,597 9 1 8 ; ae ~ . Bh COln, «<0. asc -cesmeeciescem 43.661 10 4 48,994 17 2 The vastness of the work of the Charity Conimissioners Division London (City of) : and " Official Trustees" is shown by the fact that the seven of chari- Chariored Hs stgss ue i Q Rai & ; millions sterling standing in the names of the latter at the aes to arochla ATIUIES ..... € 174 + 0 Pee ruinvter (Giga) 4m 18564 7 0 28°356 9 7 end of the year 1876 were divided in no less than 8244 Middlesex .....cscseeeeeseeeee. 28,898 19 2| 50,508 12 0 | | Separate accounts. a MLOUMOUEN .<cnasononar couse 5,725 2 1 6,827 2 5 The annual income of upwards of two millions sterling ae Summit a us j oe a = divided among the endowed charitable institutions of OLUMAMPTOM a vercccsnes scene ' ivin :— NonhuabGlend 29° 552 16 8 27 id 1) 8 England and Wales may be thus analysed as to origin : NottingWam .....0000.- 20,9385 17 2 24,704 2 6 Income of charities in London and Westminster, in- £ Cs ih a te 13,945 9 1 20,530 15 2 cluding city COMPANIES .....,....seesersrerenseers 228,764 Rutland .....0.ccessseoseeeeeescs 6,165 8 10 6,686 8 6 '3 3, other local charities Fen vare encore save eentassesesesete 1,314,914 Cee ee 19,583 13 8 27,698 4 4 fe 6s ppmmbemncwal Chaeniaesiee.. ii. .: 1.00000. 08Waenalieueeces 654,783 SONMETSOU oe.ssccccessseeie nee WAAL we 26,280 13 0 5 ae ae an See. 13,820 3 1 23,969 10 0 Total .....ssssseeeeeeerseverereeeee ces reeeeee2,198,461 tafford ...sssesseeseeeeseaee 21,386 10 0! 29,332 1 9 The principal objects to which this annual income is Gjassif- SUOMI osssessessesessessesene BLO 9 2 42,209 8 8 devot ah a "y follows in the twenty-fourth annu i~~

aacten a (OT es a rer ee 58,640 3 8! 70,92410 1 ee Ce, ee icee Oe oun awe canon SUSSEX eeeeeeeeeeeeeeeeeeeeeeeee. 6,488 6 8 12,478 210] | report of the Charity Commissioners, issued in 1877 :— ae Warwick vteseetese ase ens 55,812 8 10 63,376 16 2 Objects of Endowed Charities. Annual Income. aera Coventry (City of) ..... 11,673 19 11 15,553 1 2 Education, including apprenticing, &c..... £754,728 Westmoreland ..... 4,590 5 8 7,469 8 8 Clergy and lecturers of Church of England 90,843 Wiltshire .....6....sssecccce 14,391 3 9 21,341 10 0 Other Church purposes .....s0:sssseeeees 112,895 Worcester ser eeseeeeeeneerasees 25,459 5 9 37,627 2 0 Nonconformists—chapels and ministers... 38,832 York : — Parochial and other public uses ..... 66,875 City of, and East Riding 28,105 12 3 35,029 0 2 Asylums and almshouses.....ss.s00+ 552,119 North Riding ..... 9,626 16 0 12,457 7 4 Hospitals and dispensaries..... scene 199,140 West Riding ..... 58,472 0 3 88,181 13 0 Distribution amongst the poor.....00. 383,029 Norru WaAtEs. ORM, OR... 2 £2,198, 461 AMMEN SiR sd ROSH xc ovis 1,806 17 2 23052, 0) 0 . as : AEDONION 455 5. covnnesscess o2he ifei, MS 2,090 19 4 Educational Charities.—It will be seen from the preced- ganca- eee ve eetaeeeeeeeeseeeeneeey 5,110 5 2 6,226 7 6| | ing statement that about one-third of the total annual tional | ugh ons ke ge - 7 es a i income of endowed charities of England and Wales is for charities.) Montgomery v.....-00ee,., 1,088 14 2 1,640 10 5| | Purposes of education. The sum probably represents buta fraction of the actual amount devoted to education, since z Sour Watus. the majority of the institutions promoting it depend either Cardigan seeenuiil} er 13 0} "58 "8 9 | | Wholly or in part upon voluntary contributions, and very Carmarthen .....se0e0es0s: 529 7 6 2,012 16 10 | | few of them are largely endowed. Among the more im- | CAMO CAD es. sssecccccevensesss 1420 1g 1,921 19 4] | portant charities for educational purposes are the Society BPSTMDTOKS yi seeeevessessvess ees W531 128 °9 2,487 10 6 for Promoting Christian Knowledge, founded in 1698, the Radnor ..eseeseessseesesees oe | 834 1111 | income of which in 1876 was £52,851, including legacies EXcLUsIvE or CounrtrEs. of £16,000; the National Society, established in 1811, Diocesan Charities..... 1315. 1-9 10,801 7 8] | under which are 13,000 schools, which had an income of wee ne 17,185 |?) 27,425 ral) £26,931 in 1876; and Dulwich College, founded by Edward » ae A

cated 8. wee Frere Alleyn in 1619, and reorganized by Act of Parliament in a é d 1858, which has an annual income of over £16,000. As LObale erteusse: 1,558,250 19 1 | 2,198,461 3 8 before mentioned, the English universities and colleges, as well as the schools of Eton and Winchester, together with Property It will be seen from the preceding table that the endow- | all cathedral foundations, are specially exempt from the ye ment of the mass of the charities is mainly in land. The | control of the Charity Commissioners, and no account is

total area of land belonging to the endowed charities at the

therefore given in the annual reports of their revenues.

) 'date of the report, June 1877, amounted to 524,311 acres, which brought an annual rental of £1,443,177. Rent

charges and fixed annual payments for land produced a

Asylums and Almshouses.—While one-third of the annual Asylums income of the endowed charities is for educational purposes, andalms- one-fourth is for the maintenance of asylums and alms-)ouses.

houses. These charitable institutions are numerous all over England, and many of them of ancient date, but the incomes of the majority of them are very small. In the metropolis alone there are over 100 asylums and almshouses, and the total number of them in England and Wales is considerably more than 1000. Among the most notable of these institutions are the Charter House of London, established in 1611, which has an annual income of £25,000; the almshouses of the Mercer's Company, dating back to 1393, endowed to the same amount ; and Morden College, Blackheath, near Greenwich, founded 1695, with revenues of over £10,000. Distribu- Distribution of Charitres.—There is a curious agglomera- ier is ,, tion of endowed charitable institutions in many parts and ee ie districts of England. Thus the small town of Baldock, in abun- Hertfordshire, has 17 charities; the village of Banstead, dance." Surrey, 21; and the city of Norwich, 28 different

~~charities, mostly of ancient date. Probably a sort of competition for becoming founders of charitable institutions, with the names of the originators going down to posterity, existed in these and many more small places for some period, which led to their becoming rich in bequests, not always to the advan. tage of future generations, while other towns, some thickly inhabited, remained without these foundations. It is stated by the Charity Commissioners for England and Wales in their fourth annual report, published in 1877, that great reforms in the still existing irregular distribution of charities, arising from endowments, are urgently required. '" The case of a parish," says the report, " has been brought to our notice, which is in possession of parochial charities to the value of upwards of £800 a year, the population of which is at present 46, of which number it is believed that only four or five sleep within the parish, and not one of whom could properly come under the designation of poor." It is estimated that the total amount raised annually for charit- able purposes in England amounts to, if it does not exceed, ten millions sterling—a sum strikingly indicative, in its abundance, as of national kindness, so of national wealth.~~

~~XIV. Savings and Wealth of the Population.~~

~~Origin of Giving Alms no Charity was the title given by Defoe to io a pamphlet, published in 1704, in which he recommended ans the establishment of savings banks as a remedy for pauperism, the cancer of which, he declared, was only increased by charitable institutions. The imaginative author of Robinson Crusoe thought it quite possible that parliament might order the nation to be thrifty, passing~~

~~Acts "which shall make drunkards take care of wife and children, spendthrifts lay up for a wet day; make lazy fellows diligent, and thoughtless, sottish men careful and provident." A long time elapsed before Defoe's wish for savings banks was acted upon. In 1771 Francis Maseres, a thoughtful philanthropist, carried a bill through the House~~

~~of Commons enabling rate-payers of parishes to establish savings banks; but the bill was thrown out by the Lords,~~

~~as revolutionary in its nature. Subsequently there were several private efforts to effect the same end, which met, however, with only trifling success. A savings bank for~~

~~the poor, under the ill-chosen name of '" Benevolent Institu-~~

~~tion," was established by the Rev. Joseph Smith at Wend-~~

~~over, Buckinghamshire, in 1799, on the model of a Swiss "caisse de domestiques," and a similar one by Mrs Priscilla Wakefield at Tottenham, near London, in 1804,~~

~~the title of the latter being that of "Charitable Trust."~~

~~But these institutions met with no support from the people;~~

~~and it was not before the year 1817, when parliament took~~

~~the subject in hand, and legislated upon it, that savings banks took root in the country. The statute which effected~~

~~it was Act 57 George III. c. 105 and 130, which placed all~~

~~the savings banks of England and Wales under the control~~

~~of the Government. In 1828 the Act was extended to Treland, and in 1835 to Scotland; but in neither of these divisions of the United Kingdom had it to any degree the same effect as in England. For various reasons, chief among them ordinary banking facilities, savings banks never flourished greatly in Scotland, while the poverty of the country prevented them flourishing in Ireland.~~

~~4~~

~~The extension of savings banks in England, rather slow Develop. at first, became very marked during the decenuial period ment of from 1830 to 1840, and at the end of the latter year 552 the sys.~~

~~of them had been established in the country, the total deposits amounting to £21,036,190. Thenceforth the deposits rose steadily one million every year until 1846, when there came a period of decrease till 1849, followed by a further increase which lasted uninterruptedly till 1861. At the end of the latter year, the total deposits in the say- ings banks of England and Wales had risen to £36,855,508. The deposits in Scotland at the same date amounted to £2,537,963, and in Ireland to £2,153,004.~~

~~em,~~

~~The following table shows the amount of deposits Progress received and paid back by trustees of the old savings of~~

~~banks, in England and in Wales, during every third year from 1864 to 1876, together with the sum of the total capital at the end of each year, the whole exclusive of the deposits in post-office savings banks :—~~

~~Old Savings Banks.~~

~~England. Wales.~~

~~£ £~~

~~Received 6,580,322 177,369 Paid 8,837,626 233,228 Capital 38,743,143 984,910 Received…..| 5,582,409 159,069 Paid 6,607,107 186,472 Capital 30,974,031 ‘ 976,621 Received…..| 5,537,136 162,404 Raidies. ce} Gsonos9s0 175,584 Capital 31,038,029 1,029,468 Received 6,344,182 242,479 Paid …….] 6,600,535 195,292~~

~~32,501,883 1,213,587~~

~~6,588,701 198,956~~

~~7,034, 866 257,208~~

~~Capital …....| 34,206,562 1,201,093~~

~~savings banks, 1864 to~~

~~1876.~~

~~The facilities of the people to place their savings securely Post- and profitably were greatly increased by the establishment office~~

~~of post-office savings banks, by which the number of offices taking deposits was spread, as it had never before been, all over the country. By Act 24 Vict. c. 14, passed in 1861, the postmaster-general 'was empowered to direct all postmasters to receive deposits of money, of not less than one shilling, for remittance to the central office at St Martin's-le-Grand, London, to be repaid on demand, with 24per cent. interest per annum. The first of the new post-office savings banks were opened throughout Great Britain on the 16*h Septem- ber 1861, and their progress since that time is shown in the subjoined table, which gives the number of offices open, the number of deposits, and the amount of deposits, in years and periods of years, from 1861 till 1876 :—~~

~~x, – ' Number Number of Amount of Years and periods of Years. of Banks. Deposits. Deposits.~~

~~from 16th Sept. 1861, to~~

~~4607 | 2,745,245 4858 | 2,917,698 | 7,955,740 5068 | 3,044,692 | 8,841,256 5260 | 3,132,483 | 8,783,852 3,166,186 | 8,982,350~~

~~7,699,916~~

~~B18t Déc. 1862 …….. 2585 639,216 | £2,114,669 Th: epee are 2991 842,848 | 92651,209 moe. 8 a 3081 | 1,110,762 ' 3,350,000 POC oscces ces, sac, eee, 3321 | 1,302,309 | 3,719,017 Average of 5 yrs. 1866-70.| 3815 | 1,802,031 | 5,232,108 1871 4335 | 2,362,621 | 6,664,629~~

~~savings banks.~~

~~INCOME ASSESSMENTS. |~~

~~_ Aggre- The total number of both old and post-office savings pm banks open at the end of the year 1876 was 5912, and the fore total~~

~~number of depositors 3,195,761. At the 20th banks, November 1876 there were 1,493,401 accounts open with~~

~~the old savings banks in the United Kingdom, and the amount owing to depositors was £43,283,700, being an average of nearly £29 for each depositor. The amount deposited in post-office savings banks at the end of 1876, in the name of 1,702,374 depositors, was £26,996,550, an average of £15, 17s. (see page 240).~~

~~‘ Distribu- It appears from the detailed annual returns of the old a. savings banks, which, notwithstanding the wide-spread com-~~

~~over” Detition of the post-office, still hold over 34 millions of England Savings of the lower classes, that these savings are made in and very unequal proportions throughout England and Wales. Wales. They are largest, as may be expected, in Middlesex, where the deposits amounted at the end of 1876 to £5,347,217 ; but Lancashire came very near it, with deposits of £5,302,982. The county of York stood next, the deposits at the date amounting to £3,960,754; while three more counties showed deposits of over a million, namely, Devon- shire, £1,950,303; Cheshire, £1,235,084 ; and Northum- berland, £1,166,086. Asa rule, the manufacturing coun- ties of England show a far larger amount of savings, per head of population, than the purely agricultural counties, which may be sufficiently explained by the lowness of wages in the latter. In two counties of England, Hunt- ingdonshire and Rutland, there were no savings banks of the old establishment in 1876; and the same was the case in two counties of Wales, Anglesey and Merionethshire. In Wales in general the savings are far below those in England. There were in the old savings banks of Carnar- vonshire only 702 depositors at the end of 1876, being one in 152 of the population. The proportion at the same date for the whole of England and Wales was one de- positor in every 21 of the population, and for Wales alone one in every 37, Assess» Assessments to Income Tax.—While the statistics of the mentsto savings banks serve as valuable indications of the growth i of habits of thrift among the lower classes, they furnish 1843 to little or no information of the progress of national wealth. 1875. It is naturally impossible to measure this pregress with any approach to~~

~~accuracy, but fair estimates towards it may be drawn from the income tax returns. Originally instituted in 1799, to defray the expenses of the war against France, the income tax was levied from that date till 1816, when it ceased, the motion for its renewal having been defeated in tle House of Commons by a large majority. The tax was re-imposed in 1842, by Act 5 and 6 Vict. c. 35, and renewed at intervals, but with constant changes in the amount taxed per pound of income. In the first financial year of its being levied, ended April 5, 1843, the total annual value of property and profits assessed in England and Wales was returned at £227,710,444 ; but the amount sank to £221,101,717 in 1844, and £220,464,968 in 1845, while it reached again £227,863,132 in 1846. There was a rapid increase, scarcely checked for a few years, at intervals from this date for the next twenty years. In the financial year ending 1848, the total annual value of property and profits assessed to the income tax in England and Wales had risen to £229,868,226, in 1851 to £230,419,304, in 1854 to £256,333,899, in 1857 to £261,069,680, and in 1860 to £282,312,309. The in- crease from this time up to the financial period ended April 5, 1875—the last year for which returns have been pub- lished in January 1878—is shown in the subjoined table, which gives the total annual value of property and profits assessed to income tax in England and Wales, as well as in the United Kingdom, during each of the fifteen years from 1861 to 1875 :—~~

~~ENGLAND~~

~~Years ended England and United Kingdom. April 5th, Wales. 1861 £282, 248,060 £335,654,211~~

~~1862 295,894,976 351,745,241 1863 302,828,234 359,142,897 1864 313,639,959 371,102,842 1865 335,175,427 395,828,680 1866 350,277,476 413,105,180 1867 358,437,953 423,773,568 1868 365,366,419 430,368,971 1869 370,070,360 434,803,957 1870 379,310,635 444,914,228 1871 398,506,773 465,594, 366 1872 413,223,690 482,338,317 1873 439,803,156 513,807,284 1874 463,470,571 543,025,761 1875 481,774,580 571,056,167~~

~~Under the Act of 1842 which instituted the income tax, Division~~

~~all incomes were ordered to be taxed under five classes, or of in- schedules, marked by the first five letters of the alphabet. co Schedule A was to comprise all incomes from ownership of (asses, lands, tenements, and tithes ; schedule B, all incomes from occupation of lands and tenements ; schedule C, all in- comes from public dividends and annuities ; schedule D, all incomes from trades and professions; and finally, schedule E, all incomes from Government offices and pensions. The annual value of each of these classes increased in the fifteen years from 1861 to 1875, but in very unequal proportions. The least increase was in the incomes under schedule B, arising from the occupation of lands and tenements, not amounting to more than 25 per cent. during the period, while there was but a slightly larger increase in the incomes under schedule C and E, the former comprising dividends and annuities, and the latter public salaries and pensions. On the other hand, the incomes under schedule A, from ownership of lands, more than doubled in England and Wales in the course of the fifteen years from 1861 to 1875 ; and the incomes under schedule D, from trades and pro- fessions, were not far from trebling during the same period.~~

~~The following table exhibits the gradual rise in annual Incomes value of these two classes of incomes in England and Wales a during the fifteen years 1861 to 1875 :—~~

~~and from trades Incomes under Incomes under and pro- Years ended Schedule A. Schedule D. fessions.~~

~~Trades and~~

~~April 5th. Professions.~~

~~Ownership of Lands and Houses,~~

~~114,058,538 120,124,206 121,328,434 122,993,875 131,341,499 135,144,462 110,696,900 116,341,387 117,907,336 119,429, 807 124,814,412 125,896,143 127,271,928 131,084,816 132,720,684~~

~~£81,531,326~~

~~85,208,610~~

~~88,809,996~~

~~96,982,709 106,898,319 115,601,940 147,678,722 147,576,240 149, 451,289 154,174,613 164,058,371 176,447,374 198,172,490 214,808,581 229,396, 892~~

~~The annual value of the incomes assessed under schedule A in the year 1875 was £16,716,474 in Scotland, and £12,994,735 in Ireland, the aggregate for the United Kingdom being £162,431,893, so that England represented more than three-fourths of the total. Under schedule D, the annual value of the incomes in 1875 was £27,412,223 in Scotland, and £10,133,323 in Ireland, making an aggregate of £266,942,347 for the United Kingdom, and leaving not far from six-sevenths to the share of England and Wales.~~

~~VIIL — 33~~

~~Growth of the national income.~~

~~Amount of accu- mulated wealth.~~

~~Growth~~

~~258~~

~~Growth of National I. ncome.—The income tax returns given in the preceding tables furnish important materials for ascertaining, if only approximately, the national income of England. They show, first of all, that it is not only grow- ing, but growing at an enormous rate. This is conclusively proved by the returns of the aggregate annual value of the 'ncomes assessed under schedule D, comprising the gains derived from trades and professions, including in the same the profits from such undertakings as mines, railways, canals, and gas and water works. It is said, with truth, that these incomes under schedule D are " the true gauge of the prosperity of the nation ;" and if this be admitted, the people of England are growing vastly in prosperity. In the fifteen years~~

~~from 1861 to 1875, the increase in the annual value of the incomes of England and Wales taxed under schedule D was no less than £147,865,566, being at the rate of £9,857,704 per annum. In Scotland, during the same period, the increase of incomes under schedule D was at the rate of £1,269,298 per annum, and in Ireland at the rate of £353,135; while in the whole of the United Kingdom it was at the rate of £11,480,138 per annum.~~

~~Accumulated Wealth—There have been many attempts made to estimate the amount of capital, or of accumulated wealth, of the country in recent times, and the rate at which it is increasing. One of the most recent, as well as most valuable of these estimates, was contained in an elaborate paper by Mr Robert Giffen, head of the statistical department of the Board of Trade, read before the Statistical Society of London on the 15th of January 1878. Tak- ing the income tax returns, down to the year ended March 31, 1875, the latest for which particulars were published, for the basis of his calculations, Mr Giffen arrived at the conclusion that " the total capital of the people of the United Kingdom may be reckoned at a minimum of 8500 millions sterling," this being " the capitalized value of the income derived from capital," or, in other words, the accumulated wealth of the nation.~~

~~""Jt is a bewildering figure," says Mr Giffen, "about eleven times the amount of our national debt, which may thus be reck- oned with all soberness as a fleabite. Nearly 7500 millions out of this amount besides must be reckoned as income-yielding, only the remaining 1000 millions being set down as the value of mov- able property or the direct property of imperial or local authoritics, which does not yield any individual revenue. The suggestion may perhaps be made that to some extent these are only figures in an account—that the capital outlay on the soil, plant, machinery, factories, and houses of England, or on the circulating capital of English industry, would not come to so much. But in reply I would say that, while there is no evidence one way or the other as to what the outlay has been, while we shall neyer know what it has cost from generation to generation, to give us all this inheritance, there is some justification for thinking that the values are stable and uot transitory. They represent an estate on which thirty-four millions of~~

~~people have facilities for production and distribution, which must be equal all in all to the facilities existing anywhere else, because they are constantly tried in the furnace of free trade, and are not sustained by any adventitious means. If certain pro- perties have acquired what is called a monopoly value, it is because actual workers are able to pay the corresponding rent out of their first carnings, and have ample wages and profit besides. In such matters the property of a great country, like a factory or business, must be valued as that of a going concern, and the monopoly value~~

~~which certain things acquire only enters into the question of the distribution of the estate and its income."~~

~~As regards the growth of capital in the course of the first~~

~~ofcapital three quarters of the present century, Mr Giffen's calcula-~~

~~in the present century.~~

~~tions showed that it had been going on at an ever-increasing rate, the greatest increase taking place in the decennial period from 1865 to 1875. The following table was pub- lished by him as an approximate account of the capital and property existing in the United Kingdom, distinguished as assessed and not assessed to income tax, in each of the years 1865 and 1875, given in millions of pounds,~~

~~with the amount and percentage of increase in the ten years :—~~

~~ENGLAND~~

~~[NATIONAL WEALTH.~~

~~Increase in 1875.~~

~~1875.~~

~~Capital and Property.~~

~~1865. mer Amount. Gok!~~

~~ASSESSED TO INCOME-TAX. Millions. | Millions. | Millions. ES « cteeadl os assniass oncgereeacencnes 1864 | 2007 143 8 FHGUSOS . 05 cc. sssssecesecertWercese ees 1031 | 1420 389 38 Farmers' profits …….ccseeesree ees 620 668 48 8 Public funds, less home funds….. 211 519 308 | 146 Ibi NOR Senenoeceroccon orden: 19 56 37 | 195 Iingar\y Zhe 3) poqnaesesece aconduacandoodtc: 7 29 22 | 314 Railways …….0..cccccccesseoeeseccccccs 414 655 241 58 Jail a iesr. «cccc. sce wevecs seutamecciaiseler j 18 20 2 11 GeBRIOTES,….. cca. crisiiscns seininaice+ «48a 37 53 16 43 BTTIOS a. ngps von one cons nslengacsceiwisas 2 4 2 | 160 Other profits ……..ee.ccreesesenee ess 55 84 29 53 Other income-tax, principally~~

~~trades, professions, and com- 659 | 1128 469 71 PADICS oeeeseccccccccccccccccteeeees ner: 4938 | 6643 | 1706 | 35. Nor ASSESSED TO INCOME-TAX. Trades and professions omitted … 75 105 30 40 Income from capital of non- 200 300 100 50 income-tax-paying classes …. Foreign investments not in , Schedules C and D …….+.. 100 409 300 | 2005 Movable property not yielding 500 700 200 | 40 eee ee ee Government and local property .,} 300 400 100 | 33 Grand Total… ..... 6118 | 8548 | 24386 | 40~~

~~In the concluding part of his paper, Mr Giffen entered upon the Distribu- difficult task of estimating the distribution of the increase o wealth tion of both in the three divisions of the United Kingdom and among the in- classes, premising that "it would be difficult to find sufficient crease of details, owing to the large amounts of income which are earned in wealth,~~

~~one part of the country and pay income tax in another.~~

~~'The great increase," he goes on to say, " both in amount and per head of population is undoubtedly in England, although the income tax returns show clearly enough that both Ireland and Scotland now progress very rapidly. In another aspect, viz., as to whether capital is being more diffused, or is accumulating in fewer hands, I am afraid the data are not sufficiently good for any sure conclusions. 'here are certain means for comparing the number of assessments under Schedule D, at different amounts of income, which would appear to show that the~~

~~number of large incomes is increasing more quickly than the increase of population or the in- crease of wealth. But the fact of the rich class becoming a little more numerous, would not prove that, as a whole, the number of people possessed of moderate capital, and the average amount they possessed, are increasing or diminishing, while the increasing number of company assessments under Schedule D makes the number of assessments altogether useless for comparison, as we have no infor- mation whatever respecting the number of individual shareholders in the different companies, the average amount of each individual interest, and the interests of the halders in Schedules A, B, and C."~~

~~As regards the important question whether the accumulation of Influence recent years, subsequently to 1875, marked by great of de- Mr Gilften's pression conclusions were that the process of growth continued nnid- of trade terruptedly. He expressed his conviction "that in no year is the upon accumulation absolutely at an end, and that in many direc- capital.~~

~~capital in depression of almost all branches of trade and industry,~~

~~tions it is even more active in dull years than it is at other times. We know, for instance, that the capital outlay on railways is incessant ; that during the last two or three years of depression, and eyen now, the nation is saving in railways very nearly as much as the annual income of the capital invested in them. In agriculture again, there is a constant annual reclamation of land in progress, besides an incessant outlay on the older cultivated area. The truth is that, owing to the division of labour, there must be a vast disorganization of industry, not a mere tem- porary falling oft from a former inflation, before accumulation can be wholly checked. A certain portion of the community is told off, as it were, to create the accumulations, and if the accumulations were not made, we should sce in the building trades, in railway construction, in shipbuilding, and numerous other directions, a wide-spread stoppage of works, and masses of unemployed labourers, far exceeding anything witnessed even in those terrible times of depression which were frequent before the free trade period, when industry was partially~~

~~disorganized, and pauperism assumed most threatening dimensions. In the absence of the effects which would follow, we must assume that the cause is not present, that~~

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~~as Lord Macaulay says, “the great English revolution of Power the 17th century,” the supreme authority of parliament. is andjuris- of ancient date, forming a part of the common law of the diction~~

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~~there is no stoppage of accumulation; but that accumulation, on the contrary, goes on at prescnt in most directions at an average annual rate, or at a rate greater than the average.~~

~~Eng- Another eminent political economist and statistician, the late a cet £ i; ee Olgpan- land’s Mr Dudley Baxter, who read a paper on the “ National Wealth of | realm. The power and jurisdiction of parliament,” Sir jjament. position the United Kingdom” before the Statistical Society of London | Edward Coke laid down the rule, “‘is so transcendent and in a on the 21st of January 1868, just ten years before Mr ne took | absolute that it cannot be confined, either for causes or world. a far less hopeful view than the latter about the constancy of increase sya: » W . :~~

~~of the national wealth. He expressed his belief that, while “the | PCTSONS, within any bounds. With equal emphasis, Sir~~

~~income of England is the largest of any nation, and shows wonder- | William Blackstone added that to parliament “ that absolute~~

~~ful good fortune and prosperity, we must not forget that it rests on | despotic power, which must in all governments reside~~

~~an unstable foundation. The turn of trade, or obstinacy and co somewhere, is entrusted by the constitution of these king-~~

~~sightedness in our working-classes, or a great naval war, may drive ” rages . : .~~

~~us from the markets of the world, and bring down our auxiliary as doms. e Tn constitutional fiction, parliament consists of~~

~~well as our productive industries.” Mr Dudley Baxter wound up three estates of the realm,” namely, first, the Lords~~

~~his conclusions with an eloquent warning. _“ England’s position,” | Spiritual, secondly, the Lords Temporal, and thirdly, the~~

~~he exclaimed, “is not that of a great landed propeigety, with an Commons; but the more modern form of division is that~~

~~assured revenue, and only subject to occasional loss o crops, or | – a –~~

~~hostile depredations. It is that of a great merchant who, by im- ae two Houses, described as the Upper and Lower, =~~

~~mense skill and capital, has gained the front rank, and developed | that of the Lords and the Commons. (See P ARLIAMENT.)~~

~~an enormous commerce, but has to support an ever increasing host | Strictly speaking, a member of the Upper House is a~~

~~of dependants. He has to encounter the risks of trade, and to face parliamentary representative equally with one of the Lower~~

~~jealous rivals, and can only depend on continued good judgment | Fouse but in ordinary language, representing, as often it~~

~~and fortune, with the help of God, to maintain himself and his d g £ ie “Fille of © b f ij b? i~~

~~successors in the foremost place among the nations of the world.” i great j acts, ea eee *, CG parliament ” 1s~~

only given to members o e ouse O ommons. XV. Government and Laws. The Upper House, or House of Lords, consists of a vary- The ? p

Nature As England stands alone in the greatness of her wealth, ing number of members as regards the representation of House cf ofthe the extent of her commerce, and the vastness of her manu- England, but fixed with respect to Scotland and Ireland. Ts. English factures, so also does she hold a unique place among nations | In the official " Roll of the Lords Spiritual and Temporal," constitu- ! capes ao ; P f poral, tion, ®8 regards her government. Under the nominal form of | issued at the commencement of the parliamentary session

an hereditary monarchy, with restricted powers, the nation is actually governed by two Houses of Parliament, whose laws, when assented to by the sovereign, form the statutes of the realm. It has been already remarked in the article ConstituTION AND ConstiTuTIONAL Law that, in respect of her government, " England differs conspicuously from most other countries. Her constitution is to a large extent un-written, using the word in much the same sense as when we speak of unwritten law. Its rules can be found in no written document, but depend, as so much of English law does, on precedent modified by a constant process of inter- pretation." One of the most thoughtful of modern political writers, the late Mr Walter Bagehot, sketched, in perhaps fewer words than any other, the nature of this unwritten and constantly modified constitution in its most receut aspect. "The efficient secret of the English constitution," lie says, "may be described as the close union, the nearly complete fusion, of the executive and legislative powers. According to the traditional theory, as it exists in all the books, the goodness of our constitution consists in the entire separation of the legislative and executive authorities ; but in truth its merit consists in their singular approxima- tion. The connecting link is the Cabinet. By that new word we mean a committee of the legislative body selected to be the executive body. The legislature has many com- inittees, but this is its greatest. It uses for this, its main committee, the men in whom it has most confidence. It does not, it is true, choose them directly ; but it is nearly omnipotent in choosing them indirectly." It is a striking illustration of the fact of the constitution of England being "unwritten "

~~that the Cabinet, though universally and un- disputedly admitted to represent the Government of the country, remains utterly unknown as such both to the written law and the legislature. The names of the persons who compose the Cabinet for the time being are never officially announced, nor are there even any official records of its meetings, or of the resolutions which may have been come to at them by the members. Strangest of all, the Cabinet, virtually nominated by the legislative body, and depending for its existence on a majority of supporters in it, has never yet been formally recognized by any Act of Parliament.~~

~~Although the assumption of the executive by a committee of the legislature is of comparatively modern date, forming,~~

~~of 1878, the number of members of the Upper House was returned at exactly 500, the list comprising 5 members of the royal family, 2 archbishops, 21 dukes, 19 marquesses, 113 earls, 24 viscounts, 24 bishops, 248 barons, 16 Scottish representative peers, and 28 representative peers of Ireland. All the peers of England, as well as those whose patent of peerage is for the United Kingdom, have seats and votes in the House of Lords, but the peers of Scotland and Ireland are represented only by delegates, those for Scot- land being elected for every new parliament and those for Ireland for life.~~

~~The Government, through the sovereign, has an unre- Peerages stricted power for creating new peerages, which at times created~~

~~has been largely used for political purposes. During the reign of Queen Victoria, up to the end of 1877, there were created 151 new peerages under various administrations, The 151 peers so created form at present more than one- third of the House of Lords, deducting from its roll the spiritual and representative members. Nearly three-fourths of the existing peerages have been created since the acces- sion of the House of Hanover.~~

~~The actual functions of the House of Lords, as a branch Fune- of the legislature, are not very clearly defined; but it is tions~~

~~generally assumed that it has a revising faculty over all bills passed by the Commons, except those relating to the public revenue and expenditure. As a rule, a very small number of peers take part in the work of a session, and the ex- tremely limited attendance is signified by the rule that three membersare sufficient to form a quorum in the Upper House, while there must be 40 in the Lower House. One of the reasons of non-attemdance of the members of the House of Lords is found in their special privilege of voting by proxy, instead of in person, which is largely exercised. Most of the sittings of the Upper House are not only very short, but irregular, the custom being to adjourn "during pleasure," which means that the lord chancellor, or the deputy speaker, may, in the exercise of his discretion, two other peers being present, take his seat on the woolsack, and order business to proceed at any hour during the day. Besides its legislative functions, the House is invested with high judicial powers, forming the supreme court of appeal in the realm.~~

~~If nominally inferior to the Upper House, the Lower House of legislature, or House of Commons, stands above~~

~~The House of Com- n1olis.~~

~~Length of ses- sions of the House of Com- ulons.~~

~~Consti- tution of the House of Com- nions.~~

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~~it in actual power and authority. It is a power constantly on the increase, and tending to absorb all others, having proved the most auspicious for Government.~~

~~" Whatever may have been the circumstances," says Dr Hearn, of Melbourne, in his elaborate work on the government of England, <¢ which led to the gradual formation of parliamentary government, the cause of its continuance is clear. In practical politics, as in every other art, the great test of excellence is success. But in at least British communities, the success of parliamentary government does not admit~~

~~of doubt. As Edward I. found the supplies voted by the representatives of his burgesses more profitable than the tollages at which he assessed their constituents, so experience has shown to later sovereigns the great advantage to their govern- ment of our modern system. Where in former times the only remedy for misgovernment, real or supposed, was a change of dynasty, the evil is now corrected at no greater cost than that of a ministerial crisis. Where informer times serious evils were endured because the remedy was worse than the disease, even trivial incon- veniences now excite universal complaints, and meet with speedy remedy."~~

~~Although politically omnipotent, the House of Commons cannot prolong its own existence beyond seven years. The average duration of parliaments in the present century has been three years and eight monthis, a term almost exactly coinciding with the average duration of Cabinets within the period. 'The following table gives the dates at which the parliaments of the United Kingdom—dating from the union of Great Britain with Ireland, which took effect on the lst of January 1800—met and were dissolved :—~~

~~Parliament. Met. Was dissolved.~~

~~George III. ..... Ist 27 Sept. 1796 ah, fee 2nd 31 Aug. 1802 ay |W ASasecees 3rd 15 Dec. 1806 $00 aaa 4th 22 June 1807 Pie Winontsonss 5th 24 Nov. 1812 Sree Cmerane zee 6th 4 Aug. 1818 George TV. <....2.00 7th 23 Apr. 1820 Roe We Paesices 8th 14 Nov. 1826 William IV. ..... 9th 26 Oct. 1830 ae mo raters 10th 14 June 1831 i secsecees{ 11th | 29 Jan. 1833 il pe anteettnk 12th 19 Feb. 1835 | 18 July 1837 WICTORI ses cee tecsees 13th 14 Nov. 1837 | 23 June 1841 -eg Dt Case cane 14th 11 Aug. 1841 | 23 July 1847 dyed) Sembee 15th 21 Sept. 1847 | 1July 1852 a ee 16th 4 Nov. 1852 | 20 Mar. 1857 "A CPR TE 17th 30 Apr. 1857 | 23 Apr. 1859 ree ise 18th 31 May 1859 | 6July 1865 Pe eaten Aes 19th 6 Feb. 1866 | 31 July 1868 pte ahd webicind 20th 10 Dec. 1868 | 24 Jan. 1874 21st 5 Mar. 1874 =~~

~~The shortest-lived House of Commons was the third of~~

~~the United Kingdom, which existed only for four months and fifteen days, while the longest was the seventh, which sat six years one month and nine days, thus reaching uearly the extreme limit of age set to parliament by the consti- tution of the realm.~~

~~The constitution of the House of Commons, in its present state, as framed by the Reform Bills of 1832 and 1867-68, is that of a body elected by nearly universal suffrage, but in very unequal electoral divisions. Under the English Reform Act of 1867, extended, with slight changes, to Scotland and Ireland in 1868, the franchise was given to all householders in boroughs, and occupiers of lands or houses rated at no less than £12 in counties, thus admit- ting to the right of electing members of parliament the majority of the adult male population, with the sole excep- tion of the class of agricultural labourers. The elections, under an Act passed in 1872, take place by secret vote and ballot. It appears from an annual return made by order of the House of Commons that, at the end of June 1877, the total number of its constituents in England and Wales amounted to 2,377,761, while in Scotland at the same date the number was 302,313, and in Ireland 231,265. The number of members returned, respectively, for the counties,~~

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~~[GOVERNMENT.~~

~~boroughs, and universities of each of the three divisions of the United Kingdom, with the number of electors on the register, was as follows at the end of June 1877 :—~~

~~Members of Electors on~~

~~Divisions.~~

~~Parliament. register. ENGLAND AND WALES. BO! COMME oasis oat oacrale emt ese 187 850,587 200 cities and boroughis……. 293 1,514,716 SD) UL VOMSLUVER, ctr. ancss ts neniooinele sao aise 5 12,458 Total, England and Wales…. 485 2,377,761 SCOTLAND. 83~~

~~counties …. ..... RCo cee 32 88,594 22 cities and burgh districts ……. 26 202, 852 BF MUS TVOTST GEOR ts vis hives aniciennmnte oicfSesnraoe tae 2 10,867 Wotall Scotlands cszavessnesvseso8 60 302,318 IRELAND. BoE UNE Ta ete weet area Maisto ce Soins SRE Rove 64 178,919 38 cities and Boroughs……. 39 53,958 A FOUUBL CELL: 7 steejeis striate sie stsis ve 6 darvains 2 3,393 Mota, WCU. oii cenciises canes 105 231,265~~

~~United Kingdom 2,911,339 ©~~

~~cee r et eerereeee~~

~~It is stated in a recent parliamentary return that, if the allotment of members of parliament to each of the three divisions of the United Kingdom were regulated solely by population, on the basis of the last census, England and Wales should have 493, Scotland 60, and Ireland 97 repre- sentatives ; while if the allotment were made according to contributions to the public revenue, England and Wales should have 514, Scotland 79, and Ireland 57 members.~~

~~It has become the most important function of the House The of Commons in modern times to appoint the Government Cabinet.~~

~~for the time being, and, more immediately, those leading members of the Government, headed by the prime minister, known as the Cabinet. Far reaching as is the legislative authority of the elected representatives of the nation, it naturally must stand in the background of. this higher power of choosing the rulers of the country, since the latter, besides guiding the executive, likewise are the more im- mediate framers of all the laws that are passed. 'The legislature," says Mr Bagehot, in his already quoted work, "chosen, in name, to make laws, in fact finds its principal business in making and in keeping an executive." It has come to be tacitly understood that the leading statesman of the political party possessing a majority in the House of Conimons must fill the place of prime minister, officially styled first lord of the treasury, while the other chief men of the party have a claim to become members of the Cabinet.~~

~~“‘The leading minister selected,” says Mr Bagehot, “has to choose his associates, but he only chooses among a charmed circle. The position of most men in parliament forbids their being invited to the Cabinet ; the position of a few men ensures their being in- vited. Between the compulsory list whom he nust take, and the impossible list whom he cannot take, a prime minister’s independent choice in the formation of a cabinet is not very large; it extends rather to the division of cabinet offices than to the choice of cabinet ministers. Parliament and the nation have pretty well settled who shall have the first places; but they have not discriminated with the same accuracy which men shall have which place. The highest patronage of a prime minister is, of course, a considerable power, though it is exercised under close and imperative restrictions, and it is far less than it seems to be when stated in theory, or looked at from a distance. The Cabinet, in a word, is a board of control chosen by the legislature, out of persons whom it trusts and knows, to rule the nation.”~~

~~There is no fixed number of members for the Cabinet, any more than of regular meetings of the members admitted to it. In recent years the number of members varied from eleven to sixteen, the former, the lowest ever attained,~~

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~~being in 1876, under the premiership of Mr Disraeli, just | a fusion of the judicature for the better distribution of~~

~~previous to his elevation to the peerage under the title of earl of Beaconsfield. All Cabinets yet formed included the following nine members of the administration :—the prime minister, the lord chancellor, the lord president of the council, the chancellor of the exchequer, and the secretaries of state presiding over the departments of foreign affairs, war, India, the colonies, and home affairs. To these nine members there are usually added various others, most frequently~~

~~the first lord of the Admiralty, the postmaster- general, the chief secretary for Ireland, and the president~~

~~of the Board of Trade. (See also the article CaBrnet.) Members The Cabinet does not constitute more than about one- ofthe fourth part of the executive, or what is generally called the Govern- Government. With every change of administration, ment. 'necessitated by the expressed will of the House of Com- mons, from forty to fifty political heads of department have to quit their places, to make room for men belonging to the party which can claim a parliamentary majority. Besides the departments already mentioned, whose heads are generally, or sometimes, included in the Cabinet, there are others of great importance, such as the Committee of Council on Education, the Local Government Board, the Office of Works and Public Buildings, and the various departments for the collection of the national revenue, con- sidered to form part of the Government, or, more correctly, the administration. The chief officers of all these branches of the administration change with the Cabinet, with the exception of the heads of the departments of the customs, excise, stamps, and taxes, who hold permanent appoint- ments. Subject to political changes likewise are the great law officers of the crown, the lord chancellor, attorney-general, solicitor-general, and judge-advocate-general of England, the lord-advocate and solicitor-general of Scotland, and the lord chancellor, attorney-general, and _solicitor- general for Ireland. These, as all the other members of the political administration, hold office "durante bene placito," instead of, as the administrators of the law, or~~

~~judges, " quamdiu bene se gesserint."~~

~~Thelaw _In closest contact with the constitution and government courts of of England, and similar to them in nearly every respect, England. ore its laws and their administration. Unlike most other . countries, England has no code of laws; nor would codifica- tion be easily possible, seeing that the principles which~~

~~govern the national jurisprudence are, like those which lie at the basis of the constitution, as much "unwritten," as "written." Broadly, the whole body of laws may be divided into two classes, namely, first, those~~

~~springing from , immemorial usage, sanctified by judicial decisions, and, secondly, those springing from parliamentary enactments. The former, in their nature, take far deeper root in the na- tional life than in the latter. This is expressed by the fact that-there were law-exponents, or judges, long before there were law-makers, or legislators. The most ancient of Eng- lish courts, that of King's or Queen's Bench—in its correct legal title, "the Court of the King before the King him- self," coram ipso rege—was far older than parliament itself, for it can be traced buck clearly, both in character and the essence of its jurisdiction, to the reign of King Alfred. Not much less ancient than "the Court of the King before the King" was the Court of Chancery, which acted for ages as the fountain of justice, the officina justitie, forming / the origin of the courts of common law. The independence of the Courts of King's Bench and of Chancery was destroyed by the Judicature Act of 1871, exactly 1000 years after the accession of Alfred.~~

~~The Judi- The Judicature Act of 1871, amended and enlarged in ric 1873, and in operation froin the lst of November 1875,~~

~~made very important alterations in the administration of Justice in England. By its provisions, aiming centrally at~~

~~judicial force, there was formed a single court, called the "High Court," divided into five departnients, called respec- tively the Queen's Bench, the Chancery, the Common Pleas, the Exchequer, and the Probate, Divorce, and Admiralty divisions, It is in these divisions that is vested the admin- istration of the law, while the " High Court," or, more fully, the "' High Court of Justice," as such, can scarcely be said to have any existence. It is, as one of the judges described it soon after the passing of the Judicature Act, an ens ratvonis,—that is, it exists only in theory, or in contempla- tion of law.~~

~~At the head of the judicial administration of the kingdom, General as at present constituted, stands the Lord High Chancellor of courts of Great Britain, a political oflicer changing with the Cabinet, Po oad presiding over the supreme Court of Judicature, and form-?"°5* ing part also of the judicial committee of the Privy Council, sitting as a court of appeal. There are annually about 100 cases heard and determined before the~~

~~judicial committee of the Privy Council, and seldom less than 300 cases "re- maining for hearing" or in arrears, the number tending to increase. All the judges of the divisions of the High Court form part of the judicial conimittee of the Privy Council, which has besides four special paid judges. President of the first of the five divisions of the High Court of Justice, the Queen's Bench, is the lord chief justice of England, under whom are four " puisne justices," while the second division, the Chancery, is presided over by the Master of the Rolls, who has at his side three vice-chancellors administering law in the vice-chancellor's courts. Within the Chancery division are the great seal patent office, and office of the commissioners of patents for inventions, the designs registry, and the trade marks registry. In the third of the divisions of the High Court, the Common Pleas, the president has the title of lord chief justice, and in the fourth, the Exchequer, that of lord chief baron, the former having under him four " puisne justices," and the latter four " puisne barons." Finally, in the fifth division, that of Probate, Divorce, and Admiralty cases, there is one president and one judge, with an admiralty advocate, queen's proctor, and an admiralty proctor. (See also Court, vol. vi., p. 516.)~~

~~Besides the great courts of law, which, like the fore- Circuits going, have jurisdiction all over the kingdom, there are a of courts number of courts exercising local jurisdiction within coun- size. ties, boroughs, and other defined districts. Foremost among the courts of local jurisdiction are those of assize. The great inconvenience of resort by suitors from distant parts to the seat of the central courts of law led, from a very early period, to the appointment of justices 'in eyre," or itinerant judges, authorized to hear civil and criminal causes within a prescribed circuit.~~

~~These circuits of assize, altered at various times, are at present seven in number, denominated respectively the South-Eastern or Home, the Midland, the Northern, the Oxford, the Western, the North Wales and Chester, and the South Wales circuits. The South-Eastern or Home circuit embraces the counties of Herts, Essex, Hunts, Cam- bridge, Suffolk, Norfolk, Kent, Sussex, and Surrey, the assizes being held at Hertford, Chelmsford, Huntingdon, Cambridge, Ipswich, Bury St~~

~~Edmunds, Norwich, Maid- stone, Lewes, and Kingston; the Midland, the counties of Bedford, Bucks, Derby, Leicester, Lincoln, Notts, North- ampton, Rutland, and Warwick, with assizes at Bedford, Aylesbury, Derby, Leicester, Lincoln, Nottingham, North- ampton, Oakham, and Warwick; the Northern, the coun- ties of Cumberland, Westmoreland, Lancashire, Durliam, Northumberland, and York, the assizes being held at Car- lisle, Appleby, Lancaster, Manchester, Liverpool, Durham, Newcastle, York, and Leeds; the Oxford circuit, the coun-~~

~~ties of Berks, Oxford, Worcester, Stafford, Shropshire, Hereford, Monmouth, and Gloucester, the assizes being held at Reading, Oxford, Worcester, Stafford, Shrewsbury, Hereford, Monmouth, and Gloucester; and the Western circuit, the counties of Hants, Wilts, Dorset, Devon, Com- wall, and Somerset, with assizes at Winchester, Devizes, Dorchester, Exeter, Bodmin, and Taunton. The North Wales and Chester circuit extends over Montgomery, Merioneth, Carnarvon, Anglesey, Denbigh, Flint, and Cheshire, assizes being held at Welshpool, Dolgelly, Car- narvon, Beaumaris, Ruthin, Mold, and Chester; the South Wales Circuit embraces Pembroke, Cardigan, Carmarthen, Glamorgan, Brecon, aud Radnor, with assizes at Haverford- west, Cardigan, Carmarthen, Swansea, Brecon, and Pres- teign. In every circuit there are at least two assizes held every year, mostly in spring and summer; but in the more populous circuits there are also winter assizes. The appoint- ments of the judges for the various assizes are made out in the Chancery division of the High Court of Justice, the custom being to let the selection take place by mutual agreement among the members of the judicial bench. Among the other local courts of jurisdiction deserving notice are the Central Criminal Court of London, the Middlesex Sessions, and the Surrey Sessions. The Central Criminal Court, sitting at the Old Bailey, tries, as indi- cated by its name, only criminal cases, the sessions, presided over by a judge, taking place once every month throughout the year. Different in organization from the Central Criminal Court are the two~~

~~metropolitan law courts, going by the names of the Middlesex Sessions and the Surrey Sessions. These courts, instituted, not only for the trial of prisoners, but for various administrative purposes, such as the licensing of public-houses, and the inspection of weights and measures, are composed of county justices, or, as they are commonly called, magistrates, presided over by a chair- man and assistant judge. Similar in constitution to the Middlesex and Surrey Sessions are the general and quarter sessions of other counties. They are held in the first week after March 31, June 24, October 11, and December 28, it~~

~~being left to the decision of the county justices composing them to fix the exact date when they are to commence,~~

~~-with liberty to make such changes as shall not interfere~~

~~with the holding of the assizes. The county justices, assembled in general and quarter sessions, have jurisdiction in civil and criminal actions, except, as regards the latter, cases of treason, perjury, and other heavy crimes.~~

~~By the Municipal Corporation Act of 5 and 6 William tyipy. IV. cap. 76, cities and boroughs in England and Wales nals in may have a system of magisterial judicature similar to that cities of counties. The ordinary duties of county justices, out of a be sessions, are performed for most cities and boroughs by ~~ their mayors or other magistrates. By the same Act, courts of quarter sessions may also be granted to cities and boroughs. The sole judges of such courts are recorders, empowered to take cognizance of offences in the same man- mer as courts of quarter sessions in counties, but with a jurisdiction to levy county rates and to grant licences, or to exercise any of the other powers vested in town councils.~~

~~The recorder, who must be a barrister of not less than five years' standing, has to hold his court quarterly, or, if ne- cessary, more~~

~~frequently ; and should there be an unusually large number of cases to be tried, he may, with the sanc-~~

~~tion of the town council, form a second court, under the~~

~~presidency of an "assistant barrister," approved of by the~~

~~Secretary of State for the Home Department.~~

~~It was long the opinion of writers on jurisprudence, substitu. foreign and English, as well as of the public in general, tion of that one of the most manifest advantages of English law _—s was in its general adoption of trial by jury. In recent 2″ times, however, a growing tendency has been manifested to trust, at least in civil cases, more to the administration of the law by judges than by juries. This tendency is strik- ingly shown in the most important juridical statntes passed lately, the Judicature Acts already referred to. There can be no doubt that on this subject the legislature expresses but public opinion, and that what is ordered by parliament in respect to changes in the administration of the English law is done by the will of the nation. (F. MA.)~~

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~~PART IL.—IHISTORY.~~

~~Meaning ENGLAND, the land of the Angles or English, is, Britain in the fifth century, the time of the settlement Britain hn according to its etymology, the distinctive name of that | which gave to so large a part of the island the name of in the Eng- part of Britain in which, by reason of the Teutonic conquests | England, was in a state unlike any other part of the world. – aa land, inthe fifth and sixth centuries, the Teutonic race and speech | The greater part of the island, all that is now called te~~

~~became dominant. The name is in itself equally applicable to the older home of the Angles in Germany; but, though cognate forms, as Azgeln, are to be found there, the exact forms Anglia or England do not seem to have been in use. As applied to later settlements of Englishmen, settlements made by men starting from Britain, it is used with direct and conscious reference to the elder England. New England implies Old England. The name is thus etymolo- gically applicable to English settlements anywhere ; histori- cally it belongs to the great English settlement in Britain. And, in its use for many ages past, it has not~~

~~taken in the whole of that part of Britain which is historically English. Part of northern England was at an early time detached from the English kingdom to form part of Scotland. And again, from the part of England so detached, the English tongue, and much of English blood, has further spread over part of the proper Scotland. In modern usage then England means somewhat less than the land which is marked out by its strict etymology. It does not mean the whole of the Teutonic part of Britain, but only that part of it which has formed the kingdom of England since the present line between England and Scotland was drawn. But in any case it should be remembered that the name is a purely political name. Britain is a certain part of the earth's surface, with unchangeable physical boundaries. England, Scotland, Wales, are political names of parts of Britain, which have had different meanings at different times, accord- ing as the part of Britain to which they have been applied has been larger or smaller. It is also to be remembered that these political names are comparatively modern. England, for instance, is not heard of by that name till late in the tenth century. In fact it hardly could have been a forraal title, used in the country itself, till the many English settlements in Britain had become one kingdom. It is not, as we shall see, the oldest name for the Teutonic part of Britain. But as the various English kingdoms were fused into one, Engiand became and remained the name of that one. England then is that part of Britain which came and remained under the direct rule of the king of the English. Tt thus excludes Scotland, meaning by Scotland, as by England, a greater and a smaller space at different times. Tt also in strictness excludes Wales. Legal phraseology is not quite consistent on this head; but the more accurate description of South Britain is "England and Wales," rather than " England " only. Wales, first under its own princes, then under the English kings, was long a depend- ency of England rather than a part of England; and its complete political incorporation with England has not alto- gether destroyed its separate character.~~

~~England then is the name which certain historical events caused to be applied to a part of the isle of Britain. The history of England therefore strictly begins with the begin- ning of those events which caused part of Britain to become England. 'he history of England has no concern with~~

~~the earlier history of Britain, except so far as is needed to make the working of those causes intelligible. Nor need it dwell on the earlier history of the English before they came into Britain further than is needed for the same end. The history of England begins when the English first settled in Britain. But, in order to understand this settlement, some account must be given of the earlier condition both of the settlers themselves and of the land in which they settled.~~

~~England and Wales, with a considerable part of what is now called Scotland, had formed a Roman province, but had been cut off from the empire by the act of the imperial power itself. As the Roman legions had been a hundred and thirty years earlier withdrawn from Dacia by Aurelian, so they were in the early years of the fifth century with-drawn from Britain by Honorius. The Teutonic invaders therefore found in Britain, what they did not find in Gaul or Spain, an independent people, who doubtless kept many memories and fruits of their long subjection to Rome, but who had ceased to be actual Roman subjects. The people whom the English found in tlie possession of this restored~~

~~and somewhat precarious independence were tlie Celtic The It is not here needful to determine Britons.~~

~~people of the Britons. certain curious points of controversy, how far the purely Celtic character of the inhabitants of Britain had been modified by intermixture, either with races earlier than their own settlemeut or with Teutonic or other settlers during the time of Roman dominion. All the probabilities of the case would certainly go against the belief that the Celts found the isle of Britain wholly uninhabited. That~~

~~they were the first Aryan settlers there can be no reasonable Question doubt ; but, even in the absence of any kind of evidence, of earlie~~

~~we should expect that the first Aryan settlers would, in Britain as elsewhere, find earlier non-Aryan settlers in possession of the land. One set of inquirers have made it highly probable that the cromlechs and other primeval remains, which used to be vaguely called Druidical, are really the works of a race of inhabitants earlier than the Celts. Another~~

~~set of inquirers have, from the phrysio- logical point of view, brought plausible arguments to show, not only that such an earlier non-Aryan population existed, but that it actually forms a perceptible element in the present population of South Britain. It has been argued that a large part of the population of the border shires of England and Wales is in truth neither English nor British, but comes of a non-Aryan stock akin to the Basques of Gaul and Spain. So, on the other hand, it has been argued that a part of the eastern coast of Britain had received Teutonic inhabitants earlier than the conquest of Britain by the Romans. It has been argued too, and in this case argued with undoubted certainty, that, under the Roman occupation, soldiers and other subjects and allies of the empire of various races, the Teutonic race among others, settled in the Roman province of Britain, and helped to form a part of its inhabitants. But, if all these doctrines are admitted in their fullest extent, they in no way affect the political history of England. They simply prove that the British people whom the English found in possession of the isle of Britain had, like all other nations in all other times and places, had the purity of their blood more or less affected by foreign intermixture. They in nowise affect the fact that the English invaders found in this island a people who, for all practical and historical purposes, must be looked upon as Celtic, a people in whom the dominant blood, and the dominant national being, was undoubtedly Celtic. In the eye of general history they must be looked on, as they were in the eyes of their English conquerors themselves, as Britons. They were Britons, inodified no doubt in every respect by their long subjection to Rome, but still essentially a British, that is, a Celtic people. And it is further clear~~

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~~Survival that they were a people who had been less modified by~~

~~of the Roman influences than the inhabitants of the other | produced so many of those imilitary chiefs who, by the tyrants. hi a7 provinces of the empire. This is shown by the fact that | favour of their armies, sometimes it would seem with the — the ancient British language survived the Roman Conquest, | good will of the inhabitants. of the~~

~~provinces, set them- "and still remains the language of a not inconsiderable part | selves up as opposition emperors, in revolt against the of the isle of Britain. The mere fact of the existence of | acknowledged prince who reigned in the Old or the New the Welsh language shows that Roman influences could | Rome, at Milan or at Ravenna. The position of these not have been so strong in Britain as they were in Gaul | tyrants must not be misunderstood, as if they at all con- and Spain. The military conquest and the political | sciously aimed at the foundation of national kingdoms. occupation were no doubt as complete in Britain as in any | Their object was not to lop off a province from the empire, other province of the Roman empire; but the moral and | and to form it into an independent state. Their object social influence of Rome must have been less than it was | was the empire itself, the whole if they could get it ; if not, elsewhere. In Gauland Spain the inhabitants adopted the | as large a share of it as their forces would allow them to name, the feelings, and the speech of Rome, and handed | hold. An emperor who ruled in Britain was anxious, if he on their Roman speech to their Teutonic conquerors. The | could, to rule also in Gaul, to rule also in Italy. But the difference between tlie phenomena of Britain and the geographical necessities of the case stepped in, and often con- phenomena of the continental provinces is plain at a | fined the emperors who arose in Britain to a purely insular glance. The speech of Gaul and Spain at this day is | dominion. That dominion was more easily won, and more Latin ; the exceptions are only where the earlier languages easily kept as a practically distinct power, than the dominion survive in obscure corners. In the lands which formed | of any of the continental provinces. It was again doubtless Britain the Roman province of Britain a Latin speech is now | due to the geographical position of Britain that it was the one given up . . : ¥ A . : z by the nowhere spoken, nor is there any sign that a Latin speech province of the West from which the legions were deliberately Pomel has ever been spoken as the popular language at any time | withdrawn. They were withdrawn from one world to since the withdrawal of the Roman legions. The dominant | another. The Roman world, it seemed, might exist without tongue is that of the Teutonic conquerors ; but part of the'| the dominion of the British world. The deliberate surrender island, a part somewhat more than a mere corner, keeps its | of Gaul or~~

~~Spain or Africa would have been quite another ancient British speech. The Roman tongue, dominant and | matter. Those lands had become in every sense members more than dominant in Gaul and Spain, has in Britain no | of the Roman world, and the voluntary lopping off of any place at all. one of those members would have been an act of suicide Insular _ Britain then, even if the Roman legions had not been | which no one would have dreamed of. With the great position deliberately withdrawn from it, was, at the beginning of | island it was otherwise. While the other provinces were pe the fifth century, in quite another case from the other | cut off from the empire by open or disguised foreign inva-~~

~~provinces of the empire. Mere conquest had been as thorough as in any other frontier province; for it must not be forgotten that Britain was pre-eminently a frontier province. As the whole of Britain was never subdued, the part which was subdued always remained, like the lands on the Rhine and the Danube, exposed to the attacks of the still independent inhabitants of the island. But the usual results of Roman conquest, social and national assimilation, had been much less thorough than elsewhere even in the frontier provinces. One main cause of this difference doubtless was the geographical position of the country.~~

~~ENGLAWN®~~

~~fertile in tyrants. That is to say, no part of the empire The~~

~~sion, Britain was voluntarily given up. It was doubtless given up through fear of foreign invasion, through a feeling of inability to withstand foreign invasion; but uot as the direct result of foreign invasion itself. We may believe that suc- cessive Teutonic inroads had so weakened the Roman power in Britain that it was felt hopeless to attempt to keep the province any longer, But the actual Teutonic con- querors of the island found the Roman legions already gone. Britain was won by the English, not from Roman legions or from Roman provincials, but from men who had been Roman provincials, but who,~~

~~on the withdrawal of the Roman legions, had changed into an independent British people. It is however to be borne in mind that the independence in possession of which the Britons were found by their English conquerors was an independence which had been thrust upon them. No province of the empire separated itself from the empire of its own free will. Britain would have had, on every geographical and national ground, more temptation so to do than any other province of the West. But Britain did not, any more than any other province of the West, seek for independence of Rome. The forsaken people, left to themselves, cried to their masters to come back to be their helpers; but the groans of the Britons fell in vain on the ears of Aétius. He could deliver Gaul from the Hun; he felt no call to deliver Britain from the Pict or the Saxon, The inhabi-~~

~~speech, whatever their political condition at home or their political relation to other countries, have been before all things pre-eminently islanders. This must be borne in~~

~~tants of the Roman province of Britain were left to defend Britain themselves how they could, against the incursions alike of ae their neighbours in those parts of their island which Rome P&¢*~~

~~mind through the whole of British history. We are not dealing with Celts, Romans, Teutons, simply as such, but with Celts, Romans, Teutons, modified by the fact that they dwelled in a great island, which was cut off in many ways from the rest of the world, and which acted in many things a3 a Separate world of itself,~~

~~— Zhe result of this insular position of Britain was shown in many things during the time of the Roman dominion. It was remarked that no province of the empire wag so~~

~~had never subdued, and of the more dangerous Teutonic invaders from beyond the sea. Thus forsaken by Rome, they seem to have tried to keep up some shadow of a Roman domiuion among themselves. Their chiefs bore Roman titles; a tradition of imperial succession was kept up among the reputed descendants of the tyrant Maximus. So the first British prince whom history or legend brings into personal contact~~

~~with the Teutonic invaders appears in the earliest versions of the tale, not asa British king,~~

~~Coutrast~~

~~with other pro- vinces of the empire.~~

~~North- ern Bri- tain ne- ver con- quered by Rome,~~

~~THE BRITONS. |~~

~~but as a Roman duke.~~

~~conquest which we have from the hand of British Gildas.~~

~~But, however they might cling to Roman shadows, the people whom the English found in this island were undoubtedly in every practical sense a British nation, a And the fact that the invaders~~

~~revived British nation. had to deal with a nation, and not with mere provincials,~~

~~had, beyond all doubt, a most important effect on the~~

~~progress and the nature of their conquest.~~

~~The land then in which the English conquerors settled, aud the people whom they found in possession of that land, were thus in a wholly different condition from the lands in which the other Teutonic conquerors settled, and from the people whom they found in those lands. Here was one cause which gave the English conquest of Britain a wholly different character from the Teutonic conquest of any other of the western provinces of the empire. The difference may in truth be summed up in a word; it was not a conquest of one of the provinces of the empire, but a conquest of a Jand which had once been a province of the empire. And if the condition of the land and people that were to be conquered was thus unlike that of any land and people elsewhere, the condition of those who were to be its con- querors was at least as widely different from the condition of those who were the conquerors of any of~~

~~the continental provinces. A large part of the difference lies in the difference between a continental and an insular land. When an island is conquered by new settlers, it can only be by settlers from beyond sea, and a settlement from beyond sea is likely to be in many things different from a settlement which is made by land. This is part of the difference, but it is far from all. Had the invaders of Britain been exactly the same kind of people as the invaders of Gaul or Spain, had the people of Britain been in exactly the same position as the people of Gaul or Spain, the mere fact that it was made by sea would doubtless have given the conquest of Britain a special character of its own, But the main difference lies deeper. As the people of Britain were in a widely different position from the people of Gaul and Spain, so the Teutonic con- querors of Britain were in a position at least as different from the Teutonic conquerors of Gaul or Spain.~~

~~The enemies by whom the inhabitants of the forsaken province were first attacked were indeed neither men of another race nor invaders from beyond sea. The immediate danger was from the Celtic inhabitants of those parts of the island which the Romans had never subdued. The boundary of the Roman province had often fluctuated, and the defence of the frontier had needed all the efforts of the legions and the further protection of artificial bulwarks. A line of forts, a massive dyke, a wall of stone strengthened by towers, had been raised at different times at two different points. The line of Hadrian marked the southern limit from Solway to the mouth of the Tyne. The line of Antoninus took in a larger territory as far as the firths of Clyde and Forth. Severus fell back to the line of Hadrian. Under Valentinian the victories of the elder Theodosius carried the recovered Roman land of Valentia beyond the line of Antoninus. In the last moments of Roman dominion the boundary again fell back; the defences of Hadrian and Severus were again strengthened, and took the form of that mighty wall on the ruins of which we still gaze with wonder. But amid all these chauges there remained to the north of the Roman province an inde- pendent territory, of greater or less extent, which the Roman confessed by his very defences that he was unable to subdue. That its inhabitants, like the inhabitants of tle conquered part of the island, belonged to the Celtic Tace there cau be no reasonable doubt ; but as to the~~

~~ENGLAND~~

~~Such is the title which Vortigern bears in that one meagre yet authentic narrative of English~~

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~~exact degree of their kindred with the people of southern Britain many questions have been raised. On the whole it seems most likely that they belonged to the same branch of the Celtic race as the southern Britons, aud that they differed from them chiefly as the wnsubdued part of any race naturally differs from the part which is brought into subjection. In the later days of the Roman power in Britain, these northern tribes, under the name of ThePicts Picts, appear as dangerous invaders of the Roman pro- and Scots. vince, invaders whose inroads were sometimes pushed even into its southern regions, Along with them we hear of the Scots, a name which as yet means only the people of Ireland. But about this time the Scottish name was carried into Britain bya settlement of Irish Scots on the north-western coast of the island, in the land known as Argyle. The Picts of Britain, the Scots of Treland, appear as the first enemies whose attacks had to be endured by the forsaken inhabitants of the former Roman province. But it was not the Picts or the Scots by whom the conquest of southern Britain was to be made. A conquest at their hands could have had no other effect than bringing the island back more or less thoroughly into that of the state in which it had been before the Roman Conquest. Another fate was in store for the greatest of European islands. The conquest of southern Britain was to be made, but it was not to be made by any of the in- habitants of Britain. That great event, one of the greatest in the history of Europe and of the world, was to be the work of Teutonic settlers from beyond the sea.~~

~~The Teutonic settlement in Britain must, in the general General history of Europe, be looked on as part of the great move- character ment which drove so many of the Teutonic nations westward " the).~~

~~c eutonic and southward. It was part, in short, of the general ndtilo: wandering of the nations. But it had in many respects a ments in character of its own, which distinguishes it in a marked the em- way~~

~~from the other western and southern settlements of the Pit. Teutonic conquerors. We have already seen that the con- dition of Britain and its inhabitants in the fifth century was widely different from the condition of Gaul or Spain. The land had never been so thoroughly Romanized, and the Roman legions had been withdrawn by a voluntary act of the Roman government. Here we have one point of difference ; we have also seen that there is another point of difference in the mere fact that the invaders came by sea.~~

~~But the difference in the position and character of the invaders themselves was more important still. The great mass of the Teutonic settlers who entered the empire by land had already acquired some tinge of Roman cultivation. They already knew something of the arts, the laws, and the religion of Rome; they served in the Roman armies ; they received grants of land within the Roman dominions as the reward of their services. Their princes were proud to bear Roman titles of honour, military or civil. The conquest was in many cases veiled under some form of decent submission to the Roman power. The Teutonic chief, in truth a foreign invader, did not scorn to give his occupation a show of legality by accepting some kind of commission from the emperor. I short, in most of their continental conquests, the Teutons were to the Romans, if conquerors, yet also disciples. In most cases they had embraced Christianity before their final settlement ou ; Roman ground. Where this was not the case, their conver- sion speedily followed on their settlement.1 Where they came as Christians, but as Arian Christians, they gradually conformed to the Roman standard of orthodoxy. Sooner or~~

~~—SS~~

~~1 The Vandals and the East-Goths came to an end at a comparatively early stage of their settlement, before they had assimilated with the Romans. The more permanent settlers, the West-Goths in Spain and the Lombards in Italy, gradually became Catholic.~~

~~nn, 24~~

~~Different charac- was altogether different. ter of the~~

~~Teutonic conquest where the arts,~~

~~of Britain.~~

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~~later they exchanged their own speech for the speech of Rome, and were gradually lost among the niass of the Roman inhabitants. These processes were quicker or slower according to circumstances. They were quicker where the Goths in Spain or the Burgundians in Gaul were altogether isolated and cut off from their old homes. They were slower where, as in the case of the Franks, the settlements of the conquerors on Roman ground were continuous with their former possessions in the unconquered Teutonic land. But sooner or later, more or less completely, the same causes led to the same results. Wherever the Teutons settled within the empire, they neither exterminated nor assimilated the Roman inhabitants. They were in the end assimilated by them, though, of course, in the process of such assimilation, the Roman inhabitants themselves under- went a certain degree of modification, greater or less, accord- ing to circumstances. Thus both France and Italy are Roman lands, with a certain infused Teutonic element. But for the same reasons which made assimilation in Gaul slower than in Italy, the infused Teutonic element is much greater in France than it is in Italy.~~

~~The case of the Teutonic tribes which settled in Britain They came from lands which had been altogether untouched by the Roman power, and the language, and the religion of Rome were altogether unknown. They had never been Roman subjects, Roman soldiers, or even Roman allies. They had received no grants from Roman princes, nor had their chiefs been honoured with Roman titles. They were, in short, altogether free from Roman influences. They had no share in that reverence for Rome and all that belonged to her that had so deep an effect on all who came within the range of her magic power. They came not, like the conquerors of the continental provinces, as disciples of a civilization which they revered, but simply as destroyers of a civilization of which they knew nothing. The conquerors of the con- tinental provinces, themselves already half Romanized, settled in lands which were still~~

~~thoroughly Roman. The conquerors of Britain, themselves untouched by the slightest Roman influence, settled in a land where Roman influences had already begun to die out. From this wide difference in the circumstances both of conquerors and the conquered, as compared with the circumstances of conqueror and con- quered in other countries, it followed that the English con- quest of Britain had a character altogether different from the Teutonic conquest of any other Roman province. A people wholly ignorant of Roman culture, coming by sea, and therefore utterly cut of from their own homes, were of themselves disposed to act as destroyers in a way in which the Teutonic invaders elsewhere were not. They were also, as it were, compelled to act as destroyers by the circumstances of the land into which they entered. They met with an amount of resistance, of steady national resistance, such as Goths, Franks, and Burgundians nowhere~~

~~met with. They had to win the land bit by bit by hard |~~

~~fighting ; their advance was often checked by victories on the part of the Britons, or delayed by periods of mere ex- haustion and inaction. Their conquest thus took a character of extermination, of complete displacement of one people by another, which was not taken by the Teutonic conquests elsewhere. The English could not, like their fellows on the continent, sit quietly down as the ruling order among a people who for the most part easily submitted, and who therefore kept their lives, their laws, their religion, and a share of their property. The determined resistance of the Britons made it a struggle for life and death on both sides. On the one hand, it made death or personal slavery the only alternatives fcr the conquered within the conquered territory. On the other hand, the gradual nature of the conquest gave the conquered in one district every opportunity of~~

~~escaping into the districts which were still unconquered. Exter- There can be no reasonable doubt that the English conquest, ™inating~~

~~in those parts of Britain which were conquered while the~~

~~English still remained heathens, came as near to a conquest conquest,~~

~~of extermination, to a general killing or driving out of the earlier inhabitants, as was possible in the nature of the case. A complete physical extermination, the killing or driving out of every individual of a whole people, is a thing which cannot take place, except in the case of some utterly helpless tribe attacked by a people immeasurably superior to them in physical resources. Even in such cases it commonly happens that the savage is not, strictly speaking, exterminated by the civilized man; he rather dies out before him. Still less could complete physical extinction take place with a people in the condition of the Britons at the English landing. In the course of the English con- quest we may be sure that the alternative of death or flight was the ordinary rule; but we may be equally sure that the rule had its exceptions. The women could be largely spared ; even men would sometimes be allowed to escape death at the price of slavery. It might even happen that here and there someof the conquered might make terms with the conquerors, and might be admitted to their fellowship. In all these ways it follows that, physically and genea- logically, there is a British element in the English nation, even in the most strictly Teutonic parts of England. No nation is of perfectly pure blood, and the English nation is no exception to the rule. The point is that the British infusion was not large enough to have any perceptible effect on the national being of England. The smaller Celtic infusion was assimilated into the greater Teutonic mass. In the sense of the physiologist or the genealogist, the English nation is not purely Teutonic; but then in their sense no nation is purely anything. The point is that the English people are as strictly Teutonic as the High-Germans are Teutonic, or as the Britons themselves were Celtic. or that Englishman may conceivably have had British fore- fathers, as this or that High-German may conceivably have had Slavonic forefathers, as this or that Briton may con- ceivably have had Basque forefathers ; but to speak of the Britons as the forefathers of the English nation as a nation is as misleading as it would be to speak of the Slaves as the forefathers of the German nation, or of the Basques as the forefathers of the British nation. One nation displaced another ; the English**

~~displaced the Britons, One system of law, language, and religion gave way to another system of law, language, and religion. The English swept away all that was Roman or British from the soil of the land which they made English, as thoroughly as the Saracens swept away all that was Roman from the soil of Africa. Yet we may be quite certain that in both cases some slaves and renegades here and there conformed to the new state of things. The only point is that they were not in such numbers as to be of the slightest historical importance, not in such numbers as to work any practical modification of the general mass in which they lost themselves.~~

~~A new people thus settled in the land, a people who displaced, as far as their complete conquest reached, its earlier inhabitants. From each successive district that was subdued all traces of the old state of things passed away, except a few of the gigantic works of Roman engineering skill, The old language passed away; English displaced Welsh as the language of every district which the English occupied. And the language of the con- querors, in thus displacing the language of the conquered, was hardly at all modified by it; a few Welsh and a very few Latin words were all that crept into English at this stage. The old local nomenclature passed away, except in the case of a few great cities and a few great natural objects. London on the Thames and Gloucester~~

~~This The Eng-~~

~~conquests. But it passed on its name toa new race of | quest of the greater part of Britain, the conquest which~~

~~TheEng- Kentishmen, Caxtwaru, alien in blood, speech, law, and | changed so great a part of Britain into England. It was a~~

~~lish con- faith to the British Cantii whom they displaced. That | destroying conquest which swept away the former inhabi-~~

~~_.. the new comers were alien in faith is perhaps after all the | tants and their whole political system. It was specially a~~

~~cone greatest and most important point of difference between the | heathen conquest, which utterly rooted up Christianity from~~

~~quest. English conquest and the other Teutonic conquests. Of all | a land where it must have already taken deep root. It the Teutonic conquerors of lands which were or had been | was a gradual conquest, spread over several centuries, a Roman, the English alone entered the land as heathens and | conquest in which the conquerors had to win each step by abode in it as heathens. The religious history of Roman | hard fighting against the earlier inhabitants. Lastly, it Britain is a most mysterious subject; but there can be no | was a conquest which never was completed, which never doubt that there was an organized Christian church in the | spread over the whole island. Leaving for the present purely island at the time of the English invasion. And, as far as | political questions about homage and supremacy, it is plain we can see, it would seem that, at least within the former | that there is a large part of Britain which remained un- Roman province, the profession of Christianity was univer- | touched by the English occupation, and where the ancient sal; there is no sign that aught of old British or "Roman | inhabitants, their language, laws, and manners still lived on. idolatry still lived on. On this Christian land and this | And it may be added that, in some districts to which English Christian people came the destroyingscourge of a heathen con- | occupation did extend, in those conquests namely which quest. Our one record of the time, the lament of Gildas, | were the latest in date, the character of the conquest greatly brings out this feature in the strongest light. As afterwards, | changed from what it had been in its earlier stages. when the Christian English came under the scourge of the heathen Dane, so now, when the Christian Briton came It seemed well fully to set forth the nature of the con- The Low- under the scourge of the heathen English, the churches and | quest before giving any detailed account of the former con- puich clergy were the foremost objects of the destroying fury of the | dition of the conquerors, or any direct narrative of their Sf ads invaders. During the first hundred and fifty years of Eng- | conquest. Having cleared the ground from misconceptions, language, lish settlement in Britain, English conquest meant heathen | it will be easier to tell the tale simply and clearly. The conquest ; English rule meant heathen rule.~~

~~Christianity, | Teutonic conquerors of Britain then were the Low-Dutch! its ministers, its professors, its temples, were thoroughly | tribes from the border-lands of Germany and Scandinavia, swept away before the inroad of Teutonic heathendom. the lands from the mouths of the Elbe and the Weser.~~

~~Com- In all these ways then the English conquest of Britain | Their dialects form a branch of the Teutonic speech distinct~~

~~parison stands apart by itself, as something differing in all its main | from the High-Dutch dialects spoken to the south of them.~~

~~oo. a features from the common race of the Teutonic conquests | Their own speech must not be looked on as in any sense a~~

~~a Fee: elsewhere. There are only two parts of Western Europe | corruption of the High-Dutch, but as a perfectly independ~~

~~ubian Which present phenomena which are atall like those of our | ent and coequal branch of the great Teutonic family, as old~~

~~lands, own island. These are those parts of Germany which lie~~

~~THE ENGLISH CONQUEST. |~~

~~on the Severn keep their British names; but the names of the vast mass of the towns and villages of England are purely English. The only exceptions are in the districts which were won from the Briton at a later stage of conquest, and in those districts which, through the working of later events, came largely to exchange their English nomenclature for a Danish one. But the English and the Danish nomenclature mark two successive waves of Teutonic conquest; they make one whole as opposed to anything Roman or British. The change of nomenclature shows how complete the change of occupants was ; the land was settled and divided afresh, and each place received a new name in the language of the new settlers. The settlers brought with them their own territorial and tribal divisions, their own laws or customs, their own religion. No feature of primitive English law or~~

custom can be shown with the slightest probability to be derived from a Roman or British source. And nowhere, at this stage, within the conquered districts did conquerors and conquered live on side by side, each making use of its own law, as so largely happened in the Teutonic conquests on the continent. That English terri- torial divisions often represent the earlier divisions of the conquered people is far more likely. The territory won by a particular battle would naturally answer to the territory of the tribe which was overthrown in that battle. And where earlier divisions were made convenient by any- thing in the physical conformation of the country, the same reason which had already fixed the boundary would lead the new settlers to fix it again at the same points as before. But everything else passed away. Kent alone, of the great divisions of south-eastern Britain, kept its name through all

on the left bank of the Rhine and on theright bank of the Danube. There, as in Britain, a land that was Roman ceased to be Roman. The speech, the laws, and the manners of Germany displaced those of Rome. Thus far the case of these lands resembles the case of Britain, and

is unlike the case of Italy, Spain, and the rest of Gaul. But their case differed in this, that the Rhenish and Danubian lands lay adjoining to the unconquered Teu- tonic lands; they were the lands which were specially exposed to Teutonic inroads. The earliest inroads of the invaders would naturally be of a more devastating kind than those which followed. It would largely be in the course of their earliest inroads that they picked up that amount of Roman culture which made the second stage of their inroads less devastating. And after all, the amount of havoc could not have been equal to the amount of havoc which was done in Britain, as most of the Roman cities lived through the storm and kept their Roman names. And in the lands west of the Rhine, in those German lands which formed part of the Roman province of Gaul, the Teutonic invaders were but winning back an old Teutonic land. It is possible that some traces of Teutonic speech and

~~feeling may have still lingered on to make the progress of the invaders more easy. And in these lands, above all, the Roman inha- bitants had the fullest means of withdrawing into the unsub- dued part of the province. As long as the Teuton was a mere destroyer, they would naturally seek shelter in the lands which were still untouched. As soon as he became only a conqueror, and not a mere destroyer, they would find it more to their interest to submit. In Britain it was not till a much later stage, not till the greater part of his con- quests were made, that the Teutonic conqueror began to carry on his conquests in such a fashion as to make it the interest of the conquered to submit rather than to flee.~~

~~Such then was the general nature of the Teutonic con-~~

~~1 Dutch is the English form of Theotiscus, the truer Latin name of the German nation, of which Deutsch in its various spellings is the native form. This wider use of the word has hardly ceased in America, and in England the name, with its two divisions of High Dutch and Low-Duich, was in familiar use down to the beginning of the last century.~~

~~as the High-Dutch, perhaps older. These dialects, which~~

~~in their system of letter-changes agree with the ancient~~

~~Gothic and the Scandinavian rather than with the High-~~

~~Dutch, form the natural speech of the whole coast region stretching from Picardy to Denmark, and they have been~~

~~carried by conquest far to the east, along the Slavonic, Prussian, and Finnish coasts of the Baltic. But their area~~

~~has been encroached on in different parts by French, by Danish, and by High-Dutch, so that that form of the Low-~~

~~Dutch which is spoken in the kingdom of the Netherlands,~~

~~and which we now know specially as Dutch, is the only con- tinental dialect of the whole group which is commonly acknowledged as a national and literary language. Among~~

~~Angles, the tribes of this region, three stand out conspicuously in Saxons, the history of that conquest, the Angles, the Saxons, om and the Jutes.1 Each had its special and marked share 'in the work. The Jutes, in all likelihood, formed the first permanent Teutonic settlement in Britain. The Saxons~~

~~and the Angles settled later; but each of them occupied~~

~~a far larger part of the island than the Jutes. And each~~

~~Native of these last gave a name to the Teutonic settlements ad as a whole. As soon as the Teutonic settlers were so ons" far united as to bear a common name, the received name names of ; é : 3 5 : le on their own lips was Hnglish, on the lips of their Celtic united ueighbours and enemies the received name was Saxon. nation.~~

~~The reason for this difference in nomenclature is plain. The Angles occupied a greater share of the land than the Saxons ; they therefore gave the national name to the united people.? But the Saxons were the first among the invaders with whom the Celtic or Roman inhabitants of Britain had to deal; they therefore gave the Saxon name to the in- vaders in general. This last fact at once brings us to the actual history of the English conquest. If we cannot say that the English conquest itself began, we may at least say that the first steps towards it were taken, as soon as any Low- Dutch invaders from beyond sea first attempted a settlement by arms in Roman, or once Roman, Britain. This process, it must be marked, stands wholly apart from questions either as to the possible Teutonic origin of any of the tribes whom the Romans found in Britain, or as to possible Teutonic settlements in the province made with the sanction of the Roman authorities. This last process undoubtedly happened in the case of soldiers of Teutonic race~~

~~serving in the Roman armies. But Teutonic settlements, either before the Roman occupation or under the Roman occupa- tion, are something wholly distinct from the Teutonic con- quest either of a Roman province or of a land forsaken by Rome. Such settlements might make the Teutonic con- quest more easy when it did come, but that is all that they could do. Settlers of either of those classes became Roman subjects, Roman provincials. The events which led to the Conquest began when men of Teutonic race first settled or First at- tried to settle in the island, not as Roman soldiers or Roman~~

~~SS subjects, but as foreign invaders of the Roman land. alle This work, which was not the English conquest, but which~~

~~was the first step towards it, the conquest which was merely attempted and not carried out, seems to have begun in the second half of the fourth century. Claudian bears witness to the naval victories of the elder Theodosius, the father of the renowned emperor of that name, who (367 a.p.) beat~~

~~1 The Angles and the Saxons are plain enough; there is a certain degree of mystery about the Jutes, their name, and their origin. But it is enough for our purpose that they were a third Teutonic people, distinguishable from the Angles and Saxons.~~

~~? Engle, Angelcyn, Angli, are the usual names of the united nation. Angli-Saxones, Angul-Seaxe, are sometimes found, especially in the royal style of the tenth century. Those forms are equivalent to Angli et Saxones, the nation formed by the union of the Angles and Saxons. Itis therefore the more correct description of the two; but its employ- ment in England is always formal ; it clearly never passed into general use. In foreign writers it is somewhat more common.~~

~~back a Saxon invasion by sea. That is to say, an attempt at Teutonic settlement was then made; but there was still strength in the Roman~~

power to hinder it. Had it been otherwise, the history of English conquest in Britain would have begun in the fourth centuly instead of in the fifth. Incursions undoubtedly went on; the south-eastern coast of Britain, the part specially exposed to Saxon invasion, got

the name of the Saxon Shore,? and a Roman officer with the The

title of Count had that shore under his special keeping. 88

But things took quite a new turn after the withdrawal of the Roman legions from Britain. The land now lay open to settlement in a way in which it had not done before. It is now therefore that actual conquests, as distinguished from mere incursions and attempted settlements, begin. Our materials for the history of this great event, an event which is nothing short of the beginning of our national history, at first sight seem scanty. Our only absolutely contemporary notice is to be found in two meagre entries in the chronicle of Prosper of Aquitaine, which however assert the main fact that Britain was brought under the power of the Saxons about the middle of the fifth century. The native writer who is most nearly contemporary, the Briton Gildas, belongs to the next century, and was a witness of some stages, though not of the earliest, of the work of con- quest. He is the earliest writer who gives us anything that can be called a narrative, a narrative meagre enough, but which helps us to some particular events and personal names. About the same time Procopius, without any direct notice of the conquest, speaks of Britain as a land inhabited by Angles and Frisians as well as Britons. The series of English writers begins with Beda, and goes on with the English Chronicles, to which we may fairly add the fragments of ancient English songs which lnrk in the Latin of Henry of Huntingdon. Of these Beda himself did not write till more than two hundred years after the beginning of the Conquest, and the materials for his short narrative of the Conquest itself seems to come at least as much from British as from English sources. Our only details are those which are preserved inthe Chronicles and in Henry of Huntingdon. The Chronicles in their present form do not date from an earlier time than the reign of Aulfred in the ninth century ; but any one who studies them carefully will see that this part of the record contains far older

~~materials. The narrative is remarkably free from anything which has a legendary sound. That its chronology may be largely arbitrary is possible ; but that it is so is of itself an arbitrary conjecture. The English at the time of their landing were not wholly illiterate. They had their runic alphabet, and it is perfectly possible that the entries in the Chronicles may come from an absolutely contemporary record. Such a record, even if it marked the sequence of years according to some reckoning of its own, must of course have been adapted to the Christian reckoning by the com- pilers of the Chronicles, and in such a process some errors of detail may well have crept in. But there seems no reason to suspect invention, falsification, or even accidental error, on any great scale. The narrative will bear testing ; the entries fit in with all that can be made out from an examination of the country. They fit in with the notices of the Welsh writers, and with all such~~

~~3 The Limes Saxonicus or Littus Saxonicum was first truly explained by Dr Guest. It means, not a shore occupied by Saxons, but a boun- dary against Saxons. It answers to the Danish, Slavonic, and Spanish marches of the later empire, except that in the one case the enemy was to be dreaded by land, and in the other case by sea.~~

~~" Prosper has two entries. The former says that " Hac tempestate (the time of Constantine the Tyrant, 407-411) pre valitudine Rom- anorum, vires funditus attenuate Britannie." The other says that, some time before the death of Aétius in 454, " Britannie, usque ad hoc tempus variis cladibus eventibusque lacerate, in ditionem Saxonum rediguntur."~~

~~ore,~~

~~Notices of the conquest,~~

~~names of real men as much as Wulf, Beorn, and Leo. And the years of Hengest's reign are, after all, one short of the mystical forty.~~

~~In the British narrative, in the single Roman entry, of Use of these events, the Teutonic invaders are called Saxons. In the the Chronicles they appear as Angelcyn, Angle, Engle, ae~~

~~. . C73 i~~

~~Angles or English. They are so called, not merely in the j;., historical summary of the ninth century editor, but in the names.~~

~~ENGLISH AND WELSH. |~~

~~incidental sources of knowledge as we have. In this way a narrative in considerable detail has been recovered by the care and skill of Dr Guest. As for the notices in Henry of Huntingdon, which evidently contain fragments of lost poems, we must remember that a contemporary poem may be just as good an authority as a prose writing. Several poems are inserted in the Chronicles themselves in undoubtedly historical times, in the tenth and eleventh centuries. Other poems of those ages, sometimes, like the~~

~~song of Maldon, preserved in the original, sometimes, like the song of Stamfordbridge and the song of Waltheof at York, preserved only in Latin fragments, are among our best materials for military events. They go far more into detail than the prose writers do. There seems then no good ground for doubting the general trustworthiness of the narrative which is preserved to us in the Chronicles, and which we are occasionally able to enlarge from other sources. It is, of course, only the earlier stages of the Conquest that can be made the subject of any controversy at all. From the beginning of the conversion of the English to Christianity, we begin to have contemporary materials of one kind or another, till, in the time of Atlfred, the Chronicle itself becomes contemporary. It is only for about a hundred and fifty years that we are left almost wholly to judge of our materials by their internal evidence. And surely a narrative like that of the Chronicles, no tissue of wild and impossible legends, but a steady business- like series of entries, may very well have been handed down for that length of time by means of runes, helped here and there by a contemporary song.~~

~~entry (473) which has the earliest ring of all about it. But when Beda, and after him the Chronicler, gives a short ethnological account of the invaders, they describe the Teutonic conquerors of Kent neither as Saxons nor as Angles, but as Jutes. As the Jutes then, in the very re- cord of their conquest, are spoken of, on the one hand as Saxons, on the other hand as English, it seems to follow that, from the very beginning, the Celtic inhabitants of Britain called all Teutonic invaders Saxons, while the in- vaders themselves from the very beginning used Angle or English as their common name. The general use of the Saxon name by the Celts is only what we should have looked for; the wide use of the English name among the Teutons themselves is a fact to be noticed. It is at least certain that, while the English name is often applied to Saxons and Jutes, it would be hard to find any case where an Angle calls himself, or is called in his own tongue, a Saxon. We need not infer that the English name had become the common name of all the three tribes before they left Germany ; it certainly became so within no long time after they settled in Britain.~~

~~We also see that, from the beginning, the Teutonic con- The~~

~~Settle- Our narrative then, put together from these various | querors spoke of their British enemies as Welsh or Welsh ment of sources, represents the Britons, after the departure of the | strangers. The name is familiar in that sense both in 2@me. mae Roman legions, as left without defence against the attacks | Britain and on the mainland, but it seems never to~~

~~of their northern neighbours the Picts and Scots. They apply for help to Aétius; but the Roman general, busy in the struggle with Attila, has no leisure to do anything for them. Their prince, who bears a name of which the most familiar form is Vortigern, invites the help of the Saxons, an unwise step enough, but one which has plenty of parallels in history, The British prince, in the most authentic record, is not a king but a duke. The Teutonic leaders whom he invites are also ealdormen or heretogan, not kings. They are the two brothers Hengest and Horsa. Their landing is fixed by the Chronicle to the year 449 ; and, without insisting on this exact date, it is plain that the Conquest must have~~

~~begun about the middle of the fifth century. A warfare of nearly forty years, in which many battles are entered, established the first Teutonic kingdom in Britain, that of Kent, the one land which never lost its British name. Of the two brother leaders, Horsa is killed in a battle with Vortigern in 455, after which Hengest and his son Aisc assume the kingly title. In all this there is nothing like romance ; it is a matter-of-fact kind of history, which might be preserved by a runic chronicle, which might almost be preserved by tradition. Once only we have a touch which seems to come from a song, as when in a battle in the year 473 the Welsh are said to have "fled from the English like fire." The geography of the story has been minutely examined, and it shows that the tale is a sound and credible military narrative. Later writers, English and British, have tricked out the story with endless mythical details, and have carried the arms of Hengest far beyond the narrow limits of Kent, to which the Chronicle confines them. Modern critics have found materials for cavil in the names of the two brothers, and in the number of the thirty-nine years of the reign of Hengest. Both points might easily be given up. The main fact is the gradual conquest of a small corner of Britain after much hard fighting with its British possessors. But there really seems no reason why Hengest and Horsa might not be~~

~~be applied to any strangers but those who were either of Roman or of Celtic speech. And it would seem to be applied only to those Celts who had come under the Roman dominion. Our forefathers spoke of the Bretwealas in Britain, of the Galwealas in Gaul, of the Rumwealas in Italy ; but the name seems never to be applied to the Scots either in Ireland or in Britain. Like the word Slave, it sank, in the language of the conquerors, to express bondage. The masculine wealh sometimes, the feminine wylne much more commonly, mean a slave in the secondary meaning of that word. This difference of usage is again remarkable. It falls in with the belief, natural in itself, that in the process of conquest the few Britons who were spared were mainly women. Again, Beda and the Chronicler, as we have seen, speak of the Teutonic conquerors of Britain as sprung from three tribes only, the Saxous, Angles, and Jutes. It was plainly only those three tribes, that is,~~

~~chiefs of those tribes, who founded kingdoms in Britain. But in all great migra-~~

~~tions various kindred tribes are sure to take a part, and it Question would be rash to rule that no Low-Dutch people but those of other~~

~~Procopius, for instance, Tentonic speaks, not of Angles and Saxons, but of Angles and ——~~

~~three took a part in the enterprise.~~

~~Frisians. We may well believe that Frisians, and other tribes too, helped in the work. Possibly no one settlement consisted wholly of men of any one tribe. It is enough~~

~~'that all the royal races of the several kingdoms belonged to~~

~~tle three stocks, Saxon, Anglian, and Jutish. It was then by Saxon, Anglian, and Jutish settlers, or at all events by settlers under Saxon, Anglian, and Jutish leaders, that thie greater part of Britain was changed into England. But the work was a slow one, and the way in which it was carried out seems not to have been exactly the same in all parts. founded. 'The old dream of a regular J/epturchy has long been exploded ; but it is certain that, among a crowd of~~

~~smallcr states, seven or cight stand out as conspicuous king- amoung the rest, and as having something like a continuous doms.~~

~~In the end seven or eight chief kingdoms were Growth~~

~~The~~

~~Jutish settle- ments.~~

~~The~~

~~Saxon settle- ments.~~

~~Svuth- Saxons.~~

~~West- Saxons.~~

~~East- Saxons.~~

~~The Anglian settle. ments.~~

~~270~~

~~history. The Jutes, the first to settle, occupied the smallest part of the country. Their dominions took in only Kent with perhaps for a while Surrey, and Wight with a small part of the neighbouring mainland of Hampshire. They were hemmed in on all sides by the Saxon settlements, all of which bore the Saxon name. Swthsexe, Westsexe, Eastsexe, have been softened in modern speech into Sussex, Wessex, and HWssex; but the names are strictly not terri- torial, but tribal. Westsexe and the rest are all of them names, not of a land, but of a people. The whole of the Saxon settlements were made on the southern and south- eastern coasts; and it was the West-Saxons only who at any time carried their conquests to any distance inland. The South-Saxon settlement came next after the Jutish settlement in Kent. The date given to it is 477. The most remarkable event in the process of conquest was the storming of Anderida, now Pevensey, in491. The forsaken walls of the Roman city still bear witness to the day when Elle and Cissa slew all that were within, and when not a Bret was left behind. But the South-Saxons found a natural frontier to the north in the great wood of An- derida. Their kingdom always remained little more than a long strip of coast, cut off to a great extent from the other kingdoms of Britain, and playing but a small part in their general history. It still keeps its name and boundary as the modern county of Sussex. The kingdom of the Gewissas or West-Saxons, founded to the west of the South-Saxons, was destined to hold quite another place in English and British history. Two Saxon ealdormen, Cerdic and Cynric, founded in 495 a settlement on the coast of what is now Hampshire. That settlement grew into the kingdom of England. Twenty-four years after their first landing, the two Saxon ealdormen deemed their position strong enough, and their conquests wide enough, for them to assume the kingly title. Thus began the royal line of the West-Saxons, which became the royal line of England. The third Saxon settlement, that of~~

~~the East- Saxons, has no such definite date given to its foundation ; but it certainly began not later than the first half of the sixth century. Like Sussex, it never extended itself far in- land; but it derived some importance from its containing two of the great cities of Roman Britain. One was Camu- lodunum or Colchester; the other was London. But London, with its district of the Middle-Saxons, grew, by virtue of its admirable position, to a greatness which gave it a separate being. 'The city of ships, on its broad river, remained as a great prize to be striven for by every con- queror, rather than as a lasting and integral possession of any one of the English kingdoms.~~

~~The settlements of the Angles, who in course of time occupied a much larger part of the land to which they gave their name than was occupied by the Saxons, have quite another history from the kingdoms of which we have just spoken. In Kent, in Sussex, in Wessex, the chief who leads the settlement is himself the founder of the kingdom. In the case of Kent and Sussex, the kingdom never permanently outgrew the bounds of the earliest conquests. The boundaries of Wessex advanced and fell back and advanced again ; but they advanced by the process of bringing fresh con- quests, newly won from the Briton, under the rule of the already existing kingly house of Wessex. The Anglian kingdoms grew in another way. We know, in some cases at least, the names of their first kings ; but those first kings do not appear as the first leaders of settlers from beyond sea. It would rather seem as if a crowd of small settle- ments, of the date and circumstances of whose foundation we can say nothing, each doubtless ruled by its own caldorman or petty king, were gradually grouped together into several considerable kingdoms. It is perfectly possible, though there is no evidence for the belief, that some of~~

~~these original settlements may have actually been of earlier date than the landing of Cerdic, of Aille, or of Hengest. What is certain is that these Anglian states do not appear as organized kingdoms till a later~~

~~time than Kent, Sussex, and Wessex. The chief Anglian powers were four. The~~

~~:~~

~~East-Angles occupied the land to the north of the East- Zast- Saxons, a land which the vast fen region to the west of it Angles.~~

~~made in those times, if not insular, at least peninsular.~~

~~North of the Humber arose two kingdoms, Bernicia and Zernicia,~~

~~Deira, whose union at a later time formed the mighty realm of Nortlumberland, stretching from the Humber to the Forth. Ida, who in 547 gathered together a number of scattered Anglian settlements into the kingdom of Bernicia, is the one Anglian prince during the first stage of conquest who stands out with a personal being like that of the Saxon and Jutish founders, From his fortress on the basaltic rock of Bamburgh, overhanging the German Ocean, he ruled the eastern seaboard from Tees to Forth. Of the founder of the kingdom of Deira to the south of Bernicia we have no such clear mention, nor do we know when or by what means that kingdom won the possession which gave it its chief importance. This was the former capital of Roman Britain, Hboracum, Koforwic, or York. Of the process of conquest in centra] England we know even less. We know absolutely nothing of the circumstances under which the land was won from the Briton. A crowd of Anglian tribes, which kept more or less of separate existence till a very late time, were gradually brought under the dominion of a single Anglian power. This power, as growing up on the British frontier, took the name of Merce, the men of the mark or border, and the name of Mercia gradually spread over all central England. The date of the beginning of the Mercian kingdom is fixed as late as 584. But this of course docs not mean a fresh settlement from beyond sea, but simply the gathering together of several small settle- ments so as to form one considerable power. The bound- aries of the true Mercian kingdom may be traced by the boundaries of the old diocese of Lichfield; but it could not have reached to anything like this extent so early as 584. Here then we have, among a crowd of smaller states, a few kingdoms, seven**

~~or eight in number, which stand out prominently, and fill a place in the history of Britain. Among these again, a smaller number stand out at different times as aspiring, with more or less of success, to the general supremacy of the country. In all cases where a number of kindred but independent states lie near together, a supremacy of one kind or another is sure to come, either by force or by consent, to some one among the number, in which the rest are, more or less quickly, more or less thoroughly, merged. Thus, in modern Europe, France grew into Gaul, and Castile grew into Spain; thus in our own day Piedmont has grown into Italy, and Prussia has gone far towards growing into Germany. So in the end Wessex grew into England; but it was not till after many struggles, many ups and downs, many changes of frontier, that the house of Cerdic became the royal house over the whole land, Three, or at most four, of the greater Teutonic kingdoms in Britain became serious competitors for the general supremacy over all the settlements of the race. Kent, small in geographical extent, had the start in order of time, and was in many ways favoured by position. But any effective supremacy on the part of Kent belongs only to an early stage of English occupation ; the powers among which the supremacy was really disputed were the great Saxon kingdom of Wessex, the great Anglian king- dom of Northumberland, formed by the union of Bernicia and Deira, and the Anglian kingdom of Mercia, which formed itself in the space between them. It would seem that, sometimes at least, a supremacy of some kind on the part of one kingdom over the whole or part of the rest was~~

~~Deira.~~

~~Growth of Mercia.~~

~~Final~~

~~predomi- nance of Wessex.~~

~~The Bret- waldas.~~

~~Process of con- quest.~~

~~Plate II, (Britain in 597).~~

~~TIME OF HEATHEN CONQUEST. |~~

~~formally acknowledged; and the chief so recognized by common consent was known as a Bretwalda or ruler of Britain. Our knowledge on. this subject hardly goes beyond establishing the fact that such a supremacy was sometimes acknowledged, without telling us anything in detail as to its nature, or as to the way in which it was obtained. It was not continuous; there were times when there was no Bretwalda. It fluctuated from kingdom to kingdom, according to the accidents of war, policy, or per- sonal ability. The fact that such a supremacy existed from early times is chiefly important on account of what it after- wards grew into, The tradition of a supremacy vested in some one power clearly helped the West-Saxon kings in gathering all the Teutonic kingdoms of Britain into the one realm of England. It further combined with other influences in suggesting the doctrine of an imperial supremacy over the whole isle of Britain.~~

~~The establishment of these kingdoms at the expense of the Britons forms the period of heathen conquest, which we may reckon at about a hundred and sixty years. In the course of that time, the English, at first established only on the eastern and part of the southern coast, made their way step by step to the western sea. At the end of this period the whole of Britain was very far from being conquered ; indeed English conquest was very far from having reached its fullest extent; but the English had become the dominant race in South Britain. The Britons still kept a large part of the land; but they held it only in de- tached pieces. The English were the advancing people. The Britons could not at the utmost hope to do more than defend what they still kept. The work of conquest during this period was mainly the work of Wessex at one end and of the Northumbrian kingdoms at the other. Sussex, Kent, East-Anglia, each gave the English race a Bretwalda ; but these powers, as well as Essex, were geographically cut off froma any share in the conquest after the first stage of settle- ment. Wessex, on the other hand, whose later growth took another direction, pressed boldly into the heart of Britain. West-Saxon progress was indeed checked for a while~~

~~by British resistance under the famous Arthur. The legendary renown which has gathered round Arthur's name ought not to wipe out the fact that he met Saxon Cerdi+ face to face, and by the rings of Badbury dealt him a blow which for a while made the English invader halt.2 But from the middle of the sixth century West-Saxon advance is swift. In 552 the second stage begins with the taking of Old Sarum. Sixteen years later comes, doubtless not the first, but the first recorded, fight of Englishman against English- man. 'The fight of Wibbandin (Wimbledon) made Surrey West-Saxon, and cut off Kent from all hope of further ad- vance. In 571 the West-Saxon border, under the Bretwalda Ceawlin, stretched far beyond the Thames, as far north as the present Buckingham. Still no English conqueror had reached the sea between Britain and Ireland. From Dun- barton to the south coast of Devonshire, the British occupa- tion of the western side of the island was still unbroken. Aque Solis, Corinium, Glevum, Uriconium, and, greater than all, Deva on her promontory, were still British strongholds. They had not yet changed into Bath, Cirencester, Gloucester, Wroxeter, and Chester. The next object of the advancing English was to break this line, to reach the sea, and, if not wholly to subdue the British in- habitants of the west coast, at least to break their continu- ous power into fragments which might be more easily~~

~~1 It may be, as Mr Kemble suggests, that the truer form is Bryten-wealda, and the truer meaning " wide ruler." But if so, it is true only etymologically. In the two or three places where the name is used, it is used, rightly or wrongly, to mean "ruler of Britain."~~

~~? Dr Guest has shown that " Mons Badonicus " is not Bath, or any-Where else but Badbury in Dorset.~~

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~~In 577 Ceawlin took Bath, Gloucester, and Con- Cirencester, and carried the West-Saxon border to the Westsef~~

~~overcome.~~

estuary of the Severn, the future Bristol Channel. The British dominion was thus split asunder. Wales and Strathclyde, to use the geographical names of a time a little later, still formed a continuous whole. But they were now cut off from all connexion with the Britons in the great south-western peninsula, the peninsula of West-Wales, from the northern Axe to the Land's End. To break through the line at another point, to seize Deva and to carry the West- Saxon arms to the north-western sea, was the next object. In this Ceawlin failed; but his expedition of 583 estab- lished a long strip of English territory alung the Severn valley. Wessex thus seemed to be growing into the great power of central, as well as of southern, Britain. But the second great blow which was to cleave the British dominion into three, as it had been already cloven into two, was not

to be dealt by Saxon hands. A great power had now grown Growth

up in the north. At various periods before and after the of English conquest, things looked as if the supreme power was to be fixed in the northern lands, in the city by the Ouse and not in the city by the Thames. Eboracum had been in Roman days the capital of Britain. The once im- perial city was now the head of a great realm, formed by the union of Bernicia and Deira under their conquering king Aithelfrith, In 603 a victory over the Scottish king Aigdan at Degsanstan secured his power to the north. Some years later he broke through the line of unconquered British territory ; he smote the Britons under the walls of

Deva, and left those walls, like the walls of Anderida, de- Taking

solate without an inhabitant. The English conquest of Britain, if not yet completed, was now assured, The British power, which five and twenty years before had stretched uninterruptedly along the whole west coast, was now broken into three parts, Through western and central Britain the boundaries were still very fluctuating, While A®thelfrith smote Deva, lands near to his own capital, the land of Elmet and Loidis, the modern Leeds, was still unconquered British ground. The dominion of Wessex north of the Thames and Avon had rather the character of an outlying territory stretching into a hostile land, than of the compact dominion which the West-Saxon kings held over Hamp- shire,

~~Wiltshire, and Berkshire. Moreover the two great powers of the north and the south were now brought into rivalry and collision. Athelfrith had done what Ccawlin had failed to do; and between Northumberland and Wessex a third great power had arisen, which in a few years was to show itself the equal of either. The West-Saxon had reached the western sea at one point; the Northumbrian had reached it at another point. But the greater part of the western conquests of both were to go to swell the Mercian power which had just come into being. And besides all this, a revolution had begun which was to work the greatest of allchanges. The victory of Aithelfrith was the last great blow dealt by the heathen English to the Christian Britons. When it was dealt, Northumberland, Wessex, Mercia, Sussex, and East-Anglia were still heathen. But Kent and Essex had already embraced the gospel. York and Winchester still knew no worship but that of Woden ; but the altars of Christ had already risen once more in Canterbury and London.~~

~~The time of heathen conquest thus ends with the first years of the seventh century. 'The introduction of Christianity among the English was so great a change, it gave so different a character to all the events that followed, that this would seem to be the most fitting point in our story to stop and attempt a picture of the general state of things in Teutonic Britain during the first century and a half after. Tcutonic conquest began. The introdnction of a new religion did~~

~~Effects of not stop warfare, whether between Englishman and Briton~~

~~Chris- tianity.~~

~~Old-Eng- lish lan- guage.~~

~~or between Englishman and Englishman. It did not stop aggressive conquest at the cost of either kinsmen or strangers. But it so far humanized its new converts that warfare ceased to be exterminating. Conquest now meant political subjugation and, for a while, social degradation. Tt no longer meant the more frightful alternatives of~~

~~death, flight, or personal slavery. The lands won by the English up to this date must be looked on as having become purely Teutonic. The Britons were swept away as nearly asa people can be sweptaway. The lands conquered after this time must be looked on as lands in which the dominant Teuton has largely assimilated his Celtic subjects, The process has gone on from that day to this, and it goes on still, Kent, the south-eastern peninsula, has been purely English for fourteen hundred years. Cornwall, the south- western peninsula, has become fully English, even in speech, only within the memory of a generation which has hardly passed away. 'Thus, in the hundred and fifty-eight years which passed between the landing of Hengest and the victory of Athelfrith, a large part of Britain had received another language, another religion, another system of law. Old things had passed away; all things had become new. In the whole eastern part of the island, from the Forth to the English Channel, and through a great, though still somewhat undefined, central region, reaching at two points to the western seas, the Roman and the Briton had gone, and the Teuton had taken their place. The three Low-Dutch tribes brought with them their form of the common Teutonic language. Into that language a few Roman and a few British words crept from the begin- ning. British slaves, British women, brought in a few humble words of domestic life. A few of the great works of Roman civilization, such as the conquerors had never seen in their own land, struck them with awe and wonder. For these they had no names in their own tougue; they therefore kept their Latin names in the English tongue. The words street, port, chester, thus came into our language. Many of the great natural objects, most of the rivers, a few of the hills, kept their earlier names; so did a few great cities. With these few exceptions, the vocabulary of the tongue which our fathers brought with them remained un- touched, It was enriched by a few new words to ex- press new ideas, and that was all. Nothing happened till far later times to make any change in its character, its grammatical construction, its general stock of words. We brought with us our language, and with our language we brought with us the earliest monuments of its literature. We brought with us our English Iliad in the primeval Song of Beowulf; we brought with us our Homeric catalogue in the Song of the Traveller. Whether they were written or unwritten, whether they lived only in the memory or were~~

~~graven with the primeval runes, those songs were the work of Englishmen in days before a rood of British soil had become England. Nor need we doubt that the deeds of Hengest and Cerdic had already been graven on tlie primeval beech,! while yet Englishmen knew no speech but English, and worshipped no god but Woden and his fellows. Before the Roman made his second appearance in this island, the national literature of Englishmen, the local litera- ture of England, had begun.~~

~~We thus brought with us into Britain that form of the common Aryan speech which had grown up among the tribes of northern Germany. Wherever, during the first hundred and fifty years of the English settlement, the English arms reached, there the tongue of Rome and the tongue of Britain passed away. Their place was taken by~~

~~1 Beech and book are the same word, just like the two senses of the~~

~~Latin liber. Write is cognate with the High-Dutch reissen, just like scribere with scrobs,~~

~~the speech which, with the changes that fourteen hundred years have wrought in it, still abides the speech of England. Tt has changed, as all other languages have changed. It has, like all other languages, so changed that its older forms cannot now be understood without special study ; but it has never lost its unbroken personal being. The English tongue has never been displaced by any other tongue, as the tongue of the Briton was displaced by the tongue of the English. It has lived on, spoken in different local forms in different parts of the land, changing from age to age, losing old inflexions, taking in new words; but it las changed simply as the nation itself has changed, witliout ceasing to be one and the same English nation; it has changed, as each man in the nation himself changes in his passage from childhood to old age, without ceasing to be the same personal being in old agewhich he was in childhood.~~

~~And, with our form of the common Aryan language, The we brought with us our form of another common Aryan Teutonic possession, which still abides, also unchanged in its personal Polity.~~

~~identity, never displaced to make way for any other system, but whicli has gone through even greater and more constant changes than our spoken language. We brouglit with us our own political and social system ; that is, the form which the political and social system common to tlie whole Aryan family had taken among the tribes of northern Germany. A germ of political and social life was brought into Britain in the keels of Hengest, which, changing from genera- tion to generation but never itself exchanged for any other system, borrowing from foreign sources but assimilating what it borrowed with its own essence, changing its out- ward shape but abiding untouched in its true substance, has lived and grown through fourteen hundred years into the law, the constitution, the social being, of England.~~

~~The earliest Jaw or custom of England was the law or Effects of custom of the old homes of the English settlers, with such conquest modifications as the settlement in a land beyond the sea °Y 8~~

~~could not fail to bring with it. These modifications, as a moment's thought will show, must have been considerable. A conquest by land need not involve any sudden change ; it does not necessarily place the conqueror in any wholly new set of circumstances. It may well be a mere territorial advance, a mere addition of field to field, in which the last won territory does not call for any different treatment from the older territory immediately behind it. But a conquest by sea implies a breach of continuity ; the old land is necessarily forsaken, and a fresh start lias to be made in anew one. The political society of the old home may be reproduced in the new; but it is reproduced rather than continued, and it can hardly be reproduced without some measure of change. And a settlement made bit by bit, each step being won by hard fighting, such as was the English set- tlement in Britain, will be affected by all such influences as are likely to be strengthened by constant fighting for the possession of a new country. And in such a case, when the nation is an army in active service, when the chiefs of the nation are~~

~~the leaders of that army, the influences which are most likely to be strengthened are those which tend in the direction of national unity. Or, what is almost the same thing, they are the influences which tend to strengthen the authority of the chiefs by whom the national unity is represented.~~

~~The political and social state of the Low-Dutcl: tribes at the time of their settlement in Britain was still essentially the primitive Teutonic democracy, the state of things described by Tacitus, and which still exists, modified of course in the lapse of ages, but untouched by any violent change, in some of the smaller and more primitive cantons of Switzerland. The family is at the root of everything.~~

~~The Azde of land, the portion supposed to be enough for the The hide.~~

~~maintenance of a single family, is the lowest territorial unit,~~

~~_ The mark or town-~~

~~ship.~~

~~The hundred.~~

~~The 94 or shire.~~

~~TEUTONIC POLITY. |~~

~~The enlarged family, in Greek and Latin phrase the gens, tracing by natural descent or by artificial adoption to a common forefather, real or imaginary, divine or human, is the lowest political unit. As in ancient Greece and Italy, it constantly bears the name of such supposed forefather. The Aiscingas, the Scyldingas, a crowd of other such names, marked in Teutonic, just as in Greek, by the patronymic ending, are sometimes recorded in history or legend, some- times simply left to be inferred from the local nomenclature of England and other Teutonic lands. The territory, originally the common territory, of such an enlarged or artificial family, formed the lowest territorial division, the mark or township. The cultivated land of each gens was fenced in by a~~

~~boundary line of untilled land, forming the mark in the strictest sense. The township then and its inha- bitants formed the lowest political unit, an unit having its own assembly and its own political organization. Such a political unit still forms the gemeinde, the commune, of other lands. This unit has been exposed in England to influences which have altered its character more tho- roughly than it has been altered anywhere else. An ecclesiastical influence has changed the original mark into the half civil, half ecclesiastical parish. An influence of another kind changed the primitive community, holding its common land by its own right, into a body of tenants holding their land of a lord. The township which had passed through such a change became a manor.~~

~~Tt must always be remembered that, in the primitive polity, each larger group is formed by bringing together several of the smaller. Several gentes brought together formed in the Roman system the curia, answering to the Attic dparpia and the Spartan 687. The Teutonic counter- part of this group is the hundred. The name must in its beginning have meant a real hundred of some kind; but such names soon lose their proper force, and are used in a purely conventional sense. The hundreds of Englands are familiar as geographical divisions; but their traditional organization, administrative, judicial, and military, is fast passing out of memory. When the English first landed in Britain, and for ages after, that organization was fresh and vigorous. But it is quite possible that, even before the voyage of Hengest, the mere name of hundred had become purely conventional, and had ceased to imply an actual hundred of any kind.~~

~~As a group of gentes formed a curia, so a group of curie form a tribe. In the Teutonic aomenclature, the territory of the tribe is the yd, gau, peod, or scir, in modern English shire, the pagus or scira of Latin writers, G@é or gau, a name familiar in Germany, but whose existence can only just be proved in England, is doubtless the elder name. Shire, from shear, does not mean a group of lesser units, but in strictness a division, something shorn off from a greater whole. Both names are historically true. Of the existing shires of England some are really primitive gas, settlements of tribes, while others are in strictness shires,~~

~~artificial divisions formed at a later time in imitation of the primitive gd. The West-Saxon shires are primitive gas, and two at least, those of the Sumorsstas and the Dorszetas, still keep the ancient tribal names. But the old tribal divisions of Mercia were wiped out in the Danish conquest of the ninth century. In the process of English re- conquest the land was mapped out afresh into shires, strictly so called, shires grouped conveniently round a central town, and bearing the name of that town instead of the name of the ancient tribe. The shire, it is needless to say, is still a living thing throughout England, and from England it has spread itself, commonly under the French name county, through all lands ruled, settled, or influenced by England.~~

~~The gé was the lowest group which could exist asa really distinct political power. The mark and the hundred, like~~

~~the gens and the curia, do not, at least in the finished system, whether Teutonic or Greek and Italian, aspire to the character of an independent state. The gd, like the tribe, might do so. The gé might be wholly independent ; it might be dependent on some stronger neighbour ; it might be incorporated into a kingdom, and sink into one of its geographical divisions. But in any case it kept its full and separate organization, its assembly with judicial, adminis- trative, and legislative power, its chief bearing the title of Laldorman or Alderman in peace, of Heretoga, Herzog—the otpatyyds of the Athenian tribe—in time of war. The alderman stood, like the territory of which he was the chief, in various relations. He might be an independent or a vassal prince ; he might, by the incorporation of his ga@ with a kingdom, have sunk into a mere magistrate, appointed by the king and assembly of the whole kingdom. But the organization of the gd or shire remained in either case. So the Ramnes and Titienses were independent tribes, occupy- ing their several hills. They joined together, to become the tribes whose union formed the earliest Rome.~~

A system of gds or shires is thus the oldest fully The developed form of the Teutonic polity. The process of "ingdom

grouping independent gdés into a yet greater division was gradual, and went on much faster in some parts than others. The union of gdés formed a rice or kingdom ; the chief of the group thus formed was a cyning or king. What, it may be asked, was the difference between king and caldorman ? The question is a hard one; but one point of difference seems plain. The caldorman was a ruler in peace and a captain in war. The king was more. Among the English at least, the kingly houses all claimed descent from the blood of the gods. very king was a son of Woden. A vague religious reverence thus gathered round the king, in which the caldorman had no share. He was also the head of the highest political aggregate which the ideas of those days had reached. He was, as his name implies, the head of the kin, the nation. The rule of the caldorman was tribal, and merely earthly ; the rule of the king was national, and in some sort divine.

Kingship then, the leadership of a nation, was, in the Nature ideas of those days, an office and not a property. As an r, ing- office, it demanded qualifications. It demanded in truth the *"'?»

highest qualifications, the qualifications needed in one who was to be the leader of his people in peace and in war. Such an office could not be trusted to the chances of any law of strict hereditary descent. Or rather, the notion of any law of strict hereditary descent was a thing which had not yet presented itself to men's minds. Kingship then was elective ; the leader of the people became such only by the choice of the people; but the right of choice was not wholly unlimited ; the king, so custom and tradition taughé, must come of the stock of Woden. But within that stock one member of it was as sacred, as kingly, as another. The son of a deceased king would doubtless be his most obvious successor, if there was nothing specially to suggest another choice; but he had no further claim beyond any other man of his house. Traditional rule dictated that the choice should be made from the royal house; reason dictated that it should fall on the worthiest of the royal house. The union of these two feelings led to that mixture of election and hereditary succession which

we find among the ancient English, as among most other nations at the same stage. The king is chosen; but he is chosen, under all ordinary circumstances, from the one kingly line. He is not chosen as the heir or the representative or the next of kin of the former king. He is chosen as that one of tha kingly house whom the people think fit to choose. He is chosen from the house ; therefore kindred in the female line goes for nothing. The son of a king's daughter does not belong to the kingly house ; he is therefore not eligible for VIII — 35

Gradual growth of king- ship.

Earls and: churls.

the kingly office. But the most distant kinsman in the male line is as much one of the kingly stock as the king himself, and the choice of the nation may fall upon him. There is no point in our early constitution which is more 1m- portant to insist on than this. Nothing has led to more and greater misconceptions than carrying back the legal theories of later days into earlier times, than fancying that every prince was an usurper whose succession to the crown did not take place according to rules which he and those who chose him had never heard of, and would not have under- stood.

The institution of kingship came in gradually among the Teutonic nations, and its growth was much slower in some parts than in others. In the time of Tacitus, kingship was clearly far from universal. By the time of the Wandering of the Nations, when scattered tribes had begun to gather to- gether in greater masses, it was clearly the rule. Among the Saxons its growth was specially slow. Among the Old- Saxons who stayed behind in Germany it never came in at all. So both the Saxon and the Jutish leaders came to Britain, not as kings, but as ealdormen or Heretogan. They were of the stock of Woden, and were therefore qualified for kingship ; but they did not take the kingly title till they had made a firm settlement in the country. The institution of kingship seems to have grown up in different ways in different parts of England. From all that we can see of the Anglian kingdoms, they were formed by

~~the union of several states into one greater kingdom. In such a case the caldormen or kings of the incorporated states might go on under the superiority of the common king; but the king sank into the wnder-king, kingly in descent, kingly in office among his own people, but owning the external authority of the common king. In Wessex the course of things was otherwise. There too we find several kings at once; but all are, not only of the stock of Woden, but of the house of Cerdic. There was moreover always one head king over the whole West-Saxon nation. Something of the same kind seems to have been the rule in Kent. We see, though dimly, signs of a separate, and doubtless subordinate, king-dom of the West-Kentishmen.~~

~~Among the English conquerors of Britain we see from the beginning the same elements of political life which we see amoung the other Teutonic nations, and which were doubt- less parts of the original Aryan inheritance. The inhabit- ants of the land fall into two great classes, the free and the unfree, classes each of which is again capable of subdivision. Every freeman is a citizen and a soldier; he is, or may be, a landowner; he has his place in the army, his voice in the assembly. But all freemen are not equal in rank and honour. There is a broad distinction, a distinction so old that its beginning cannot be traced, between the man who is simply free and the man who is not only free but noble. This distinction is expressed in different Teutonic dialects by the rhyming names eorl and ceorl, jarl and karl, in modern English form, earl and churl. These two last words have in modern use changed their meaning, In their oldest sense they answer to the modern phrase genile and simple. It is impossible to say in what the privileges of the eorl consisted, nor is there anything to show that they were oppressive. But the distinction was broadly drawn, and the birth of the eorl clearly entitled him to special respect and honour, if to nothing more. And such special respect and honour would, in the common course of things, give the eorlas a preference for all offices and dis- tinctions, whether honorary or substantial, which either king or people had to bestow. The unfree class again were clearly not on a level in all times and places. The actual slave, the thrall, the peow, is found everywhere. The class is formed and recruited in two ways. The cap- tive taken in war accepts slavery as a lighter doom than~~

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~~death ; the freeman whio is guilty of certain crimes is de- Theslave,~~

~~graded to the state of slavery by sentence of law. In either case the servile condition of the parent is inherited by his children, and the slave class goes on increasing. The existence of other classes between the absolute slave, the mere chattel of his master, and the full freeman, with his place in the army and his voice in the assembly, is possible and frequent, but not universal. It was a natural position either for the enfranchised slave, for the foreign settler, or for the conquered enemy who was admitted to more favourable terms than usual. Out of such cases there might easily arise a class, personally free, but not possessed of the full political rights of freedom. There might indeed be many stages of imperfect freedom or mitigated bondage between the personal slave and the free churl. To some of these intermediate ranks the slave might rise or the freeman might sink. But such a class, though often found, is not a necessary element in Teutonic society. But the cor, the churl, and the thrall, are found everywhere. They are taken for granted ; and legend represented the three classes as called into being by separate acts of the creative power of the gods. All these, as essential elements of Teutonic society, are found among our forefathers from the beginning.~~

~~But in all Teutonic societies another principle was at work, which began very early to change the nature of primitive Teutonic society. That society was a community, a community which, like all other communities, admitted distinctions of rank, wealth, and office, but where each man, earl or churl, held his place strictly as a member of the community, bound by its laws, and owing to it his duties in war and in peace. The Teutonic community differs from the Greek or Italian city in so far as it is not fenced in with walls, but has its inhabited places spread over the whole of its territory. But its leading political conception is essentially the same. The king or ealdorman is clothed with the authority of a leader. The earls have their privileges, in whatever those privileges may consist. In the assembly the king and the~~

~~earls may consult and propose, while the simple freemen merely say yea or nay. But each discharges his duty in his higher or lower place strictly as a member of the community. His duty, his allegiance, is due to the whole society, not to any particular member of it. This primitive system was from a very early time broken in upon by the practice of personal commendation to a lord. Such commendation was in its beginning strictly military. In the primitive commuuity the army is simply the nation under arms. Each man discharges his duties in war, like his duties in peace, in obedience to the law of the society of which he is part. But at a very early time—for the picture stands out distinctly in Tacitus—successful and popular leaders began to gather round them a band of special followers, devoted by a personal tie to themselves. Where the chief led they followed. The tie was mutual. For the chief to forsake his followers, for the followers to forsake their chief, was alike shameful. A personal tie thus arose between man and man, alongside of the political tie which bound each member of the community to the com- munity itself. The king, caldorman, or other chief, became something more than the magistrate and captain of the com- munity. He became the peryonal lord of some particular men among its members. They became his men, bound to do him personal service. He became their Alaford, lord,—in the primitive meaning of the word, loaf-gwer,—who was to reward the service which they rendered to him. The new principle spread, and gradually made its way into every relation of Teutonic society. The personal following of the king, his gestias cr companions, his pegnas or servants, grew into a nobility of office. Thus arose the nobility of the thegns, which gindually supplanted the older nobility of birth, the nobility of the earls. The growth of the~~

~~Commen-~~

~~dation.~~

~~Growth of the thegns.~~

~~Tenure of land.~~

~~Folk-~~

royal power, and the growth of the importance of the thegnhood, naturally went hand in hand. A power like that of kingship, when once established, is sure to grow. It is specially sure to grow in a period of conquest. The king and his personal followers are likely to be foremost in warfare ; and each increase of territory increases the power and dignity of the king, and therewith raises the condition of his followers. We see the institution of thegnhood in full force at an early stage of the Teutonic settlement in Britain. We may feel sure that the Teutonic settlement in Britain greatly served to strengthen it. And we cannot doubt that the change from the nobility of office to the nobility of birth greatly affected the position of the churl or simple freeman. By breaking down a barrier which was purely a barrier of birth, it made it easier for individual churls to rise toa higher rank. But by gradually coufining office and power and influence to the king's personal following, it tended to degrade the position of the churls as a class.

This relation of a man to his lord might be on any scale.

It might be contracted between men of any rank, between.

a weaker and a more powerful king, between a poorer and a richer churl, or between men of any of the intermediate ranks. In its higher degrees the relation was political ; in its lower degrees it was purely social. It spread alike up- wards and downwards, till it became the rule and not the exception. It came to be looked on as the business of every man to seek a lord, and at last the lordless man had legal disadvantages. Still the relation between a man and his lord, the voluntary commendation of a man to his lord, was in itself a relation purely personal, and had nothing to do with the holding of land. But the two things might easily be brought into connexion with one another. And as the practice of commendation grew, analogous changes gradually affected the tenure of land. In both cases the personal relation grew at the expense of the public relation. The community lost, and the individual gained.

~~The land of a Teutonic community is primarily the property of the community itself. It is folkland, ager publicus, the land of the people. But here, as everywhere else, private property in land gradually arose; that is, the community granted out parts of the common possession to its individual members. The pictures of Ceesar and Tacitus show that, in the time between them, the institution of private property in land had already made some advances. When it has once begun, it is sure to advance. It would specially advance with every conquest ; each man would claim to have his personal share of the soil which he had helped to win. Thus, alongside of the folkland, the land~~

~~land and of the community, grew up the private estate, the del,~~

~~books land.~~

~~odal, or allod. This is land which is a man's very own, the gift of the community, held according to the laws of the community. It is not the gift of this or that man, owing any service to this or that man. As the king's power grew, as he came to be looked on more and more as the representative of the community, the land of the com- munity came step by step to be looked on as his land. In the six hundred years between the English conquest of Britain and the Norman conquest of England, the folkland, the ager publicus, passed into terra regis, the land of the king. As the community could at all times grant away its own land, the doctrine gradually grew that the king, the head of the community, could grant it away also. In the first stage he granted it only with the assent of the com- munity ; ina later stage he came to dispense with that assent. Land thus booked, granted by a written document, to whomever the king would, but of course mainly to his personal followers, became bookland. The lord was the giver of bread to his man, and the land of the community was the noblest form of bread that he could give him. And, as~~

~~| things went on, he might sometimes grant him more than the land itself. The primitive community, great or small, from the township to the nation, had the rights of a commun- ity; it had judicial and administrative powers. From those powers it might be deemed a privilege for the royal grantee~~

~~to be exempted. He might be clothed with exceptional~~

~~judicial powers within his own lands; the next stage would be for those powers to spread themselves over the lands of his neighbours. The privileged landowner within a com- munity might grow to be the lord of tie community. The township might grow into the lordship ; its free assembly might grow into the court of the lord; the land itself, so much of it as escaped the lord's clutches, might be declared to be held under the lord. In the fictions of lawyers things are commonly turned about. 'The exception is declared to be the rule, and the rule to be the exception. If the com- munity contrives to save any fragments of its ancient rights from the grasp of the lord, those fragments are at last judi- cially declared to be held only by the lord's grant. If no grant can be found in real history, legal ingenuity will be ready to assume one.~~

~~All land was by immemorial custom burthened with three duties. To the repair of bridges and the repair of fortresses all land was bound to contribute. And the duty of every member of the community to serve in arms when called on for the defence of the community was so far a charge upon the land that a certain amount of land had to supply a certain number of men. But this is not military service in the later sense; the land is not held of a lord by a military tenure; the personal duty of serving in the Jyrd, the militia of the community, is not a duty paid by the man to his lord, but by the member of the community to the community itself. The primitive militia of the com- munity and the personal following of the lords form two distinct elements, which often appear.as distinct in the records of early warfare. The strictly military tenure, the holding of land from a lord on condition of doing him military service, does not concern us as yet.~~

~~The English settlers in Britain thus brought with them all the elements of Teutonic society as they stood in their day. The distinction of earl,~~

~~churl, and theow went on in Teutonic Britain as they had gone on in Germany from time immemorial. Marks, hundreds, gds, arose on the conquered soil of Britain, as they had already arisen on the ancestral soil of Germany. But the circumstances of the conquest could not fail to hasten the process by which the smaller communities were gradually gathered into the larger. That the gentes settled by marks is plain from nomenclature ; and, much as in Greece the same Doric tribes helped over and over again to found distinct Doric settlements, so settle- ments of the same gens formed in distant parts of England bore the same name. The gens of the Wellingas, for instance, appears at Wellington in Somerset, at Wellington in Shropshire, and at Wellingborough in Northamptonshire. But the mark never could have had the same importance in England which it had in Germany. Such a settlement could never maintain itself alone in a country which was being conquered bit by bit. Every settlement must from the beginning have relied on the help of its neighbours, alike for further conquests and for the defence of what it had already won. Everything must have tended to closer union among the communities which grouped together to form the hundred, the gd, and the kingdom. The gé must, from the first, have been the lowest group capable of real separate being. And in Wessex at least, each gd, as it was formed, was placed under the rule of an under-king of the royal house. Incentral England the gés, each doubtless under its separate king or ealdorman, often remained really distinct, till they were swallowed up by the growing power of Mercia.~~

~~All these groups, greater and smaller, mark or town-~~

~~Origin of manors,~~

~~'The trinoda necesst- tas.~~

~~Influence of the insular conquest.~~

~~Greater and. less- erassem-~~

~~Llies~~

~~The IVit- end- geméot.~~

~~English towns.~~

~~No in- heritance from Rome.~~

~~ship, hundred, gé or shire, and kingdom, kept the constitution of the primitive community, modified by such changes as change of circumstances could not fail to bring with them. So far as we can get any glimpses of any of them, we see in all alike the same elements. There is in all the presiding chief, the leading men propos- ing and debating, the whole body of freemen saying yea or nay to their proposals. The chief change was one of the highest practical moment, but which was not the result of any sudden revolution, or even of any enacted law. Democracy may change into oligarchy by the niere working of the laws cf time and space. The simple freeman may have the same right to appear in the assembly of the king- dom which he has to appear in the assembly of his own town- ship. But he is far from being so likely to be found there. Mere distance settles the question. Only tlie more wealthy and the more zealous will go long journeys to take a part in public affairs. Thus the assembly, popular and unlimited in its theoretical constitution, silently narrows till it becomes an assembly of the chief men, with such only of the common freemen as live near the place of assembly or are drawn to it in greater numbers than usual on some occasion of special excitement. The assembly of the king- dom, the Wetenagemét or Meeting of the Wise, gradually took this character. There was no need to shut the mass of the people out; they shut themselves out. In the Scirgemét, the assembly of the shire, we see the working of the same law. Attendance has to be enforced by law; at least a minimum number for each district is fixed. This practically comes to confining the assembly to those who are specially summoned ; for a special summons to certain members is always found to lead in the end to the ex- clusion of those who are not summoned. In this way, without any formal change, by the mere working of natural causes, the popular character of the primitive assemblies died out. It died out of course more thoroughly in the higher assemblies than in the lower. The great assembly of the kingdom, in theory the gathering of all~~

~~the freemen of the kingdom, shrank up into an assembly of the king's thegns, subject to the appearance of more numerous bodies of men on specially stirring occasions, and to the presence of the citizens of the town where the assembly was held, when it was held in a town. This will always happen whenever the assembly of a large country is primary and not representative. The more purely democratic its constitution, the more sure is it to shrink up into oligarchy. But it is well to remember that, as long as our national assem- blies kept any traces of their primitive shape, those great meetings which chose and deposed kings, which made and repealed laws, which made war and peace, were, in theory at least, meetings not of this or that class, but of the nation.~~

~~In the last paragraph we have been carried on somewhat beyond the date which we had reached in our narrative, somewhat beyond the period of heathen England. In so doing we have incidentally made mention of towns. The origin of the English towns certainly comes within the period with which we are immediately dealing. Than that origin no part of our subject is more obscure. But one negative point we may assert with full confidence ; there is no trace of any possession, of any law or custom or office, which the cities and boroughs of England have inherited from the older municipalities of Rome. Whatever likeness may be seen between the two is due, beyond all doubt, not to direct derivation, but to the eternal law according to which like causes produce like results. In the primitive Teutonic system, in the system reaching from the mark up to the kingdom, there was no place for walled towns. The early Teuton looked on the walled town as a prison. When in after times strictly English towns arose, their position was wholly different from that of the Roman towns. The~~

~~Roman town was the centre and mistress of everything within its own range. The city was a commonwealth ; the surrounding country was little more than a subject district, Without a city there could, in Greek and Roman ideas, be no organized political or social life. In the~~

~~Teutonic system, on the other hand, towns were wholly unknown, and they have never in any Teutonic country come to fill the place which they have always filled in southern Euiope. The difference between English social life and that of the southern part of the European continent, the shrinking of the English upper classes from town life in any shape but that of the capital of the kingdom, dates from the very be- ginning of our history. In southern Europe the city is an essential of life; in England it is a kind of accident. When English towns did arise, they were simply districts where houses stood thicker together than elsewhere. The town was a mark, a hundred, perhaps a shire, in which more men lived within a smaller space than they lived in other marks, hundreds, or shires, But the question here arises, When did the English conquerors of Britain begin to occupy walled towns at all? It is certain that in many cases the Roman town was simply forsaken by its English conquerors. At Pevensey and Silchester the inhabitants wereslaughtered, and the walls left standing empty forever. Itis equally cer- tain that in other cases, as at Bath and Chester, the Roman walls, after standing empty for a while,—in the case of Ches- ter for the ascertained period of three hundred years,—were again inhabited by settlements of Englishmen. The ques- tion is whether this last was the case with all the Roman sites which were won during the time of heathen conquest and which became English towns in later times, or whether any of them were continuously inhabited, and simply passed from British to English occupiers. It is quite certain that in some cases the period of desolation, if there was any, must have been short. If London, Canterbury, York, Lincoln, Colchester, ever stood void and forsaken, they must have been settled afresh very soon. Some at least of them were again inhabited cities at the end of the sixth century. London and York, above all, would doubtless hold out long after all the surrounding country had been subdued, They may have held out till the conquerors had laid aside some- what of their first rudeness, and had learned to see that a city and its walls were a valuable possession. In some then of the greatest cities we may believe that their con- quest was comparatively late, and that, when they were conquered, they immediately became dwelling-places of the conquerors. It may then well be that there never was a moment when the walls of Eboracum, the walls of Augusta— the old city once called London and afterwards~~

~~to be called London again—ceased to gird in the dwelling-places of man. The point is that the connexion between Eboracum and Hoforwic, between Augusta and Lundenbyrig, is a con- nexion purely geographical. The Briton went out, and the Englishman came in. The rulers and the people of the Teutonic commonwealth had no political succession from the rulers and people of the Roman commonwealth which had once occupied the same soil,~~

~~Of English law during this time we have no contemporary 0ld-Eng- But law in its first form is the same as lish law.~~

~~monuments. custom; the earliest written codes are simply the customs of the time set down in writing. We have no written English laws till after the introduction of Christianity ; the oldest written code bears the name of the first Christian king. But the dooms of A®thelberht, and the dooms of much later kings, are, in all those points which are not clearly modified by Christianity, good evidence for the laws or customs of heathen times. Our oldest laws set before us a society in which the position of the king is well marked, and where he summons his people to him, doubtless to the general assembly of his realm. 'The classes of eorl, ceorl,~~

~~The wer- later time and under other circumstances. The first | of our land. Of that land the Teutonic gods took full _ gild. English laws are drawn up for a purely Teutonic people, | possession along with their worshippers. The creed of the keeping their old Teutonic customs. Two of the most | Roman and the Briton passed away with those who pro- characteristic features of ancient English law are there in | fessed it. The still unconquered Welsh never thought of their fulness. Every man has his value; but his value | undertaking the work of missionaries among the conquerors differs according to his rank. Every freeman's oath is | and destroyers of their brethren. And they would have worth something ; but the oath of the earl is worth more | had small chance of being hearkened to by those conquerors than the oath of the churl. Death or injury done to any | and destroyers, if they had undertaken such a task. It was man has its penalty ; but the penalty is higher or lower | otherwise when a new light came from iands beyond the~~

~~according to the rank of the person injured. In short, in | sea, between whose people and ours there reigned no such all the early codes, in England and elsewhere, the state has | mutual scorn and hatred. And above all things, it was already stepped in to regulate and modify the natural | otherwise when the call to a new faith came directly from desire for vengeance on the part of the injured person or | the capital of the western world. The English folk were his kinsfolk. The natural avenger of the slain man seeks | first called on to cast aside the faith of Woden and to for the blood of the slayer ; the state steps in and persuades | embrace the faith of Christ by men who came on that him, in Tentonic England no less than in Homeric Greece, | errand from Rome herself, at the bidding of the acknow- to accept of a money payment instead of the gratification | ledged father of Western Christendom. of his vengeance. The right of a man in a state of uature The conversion of the English to Christianity was not Conver- The to do himself justice with the strong arm, the fahde or feud | only one of the great turning-points in the history of sion of fehde. the source of the private war and the duel of later times | England; it was one of the great turning-poiuts in the nS e —is not wholly set aside ; but it is regulated and modified, | history of Christianity itself. It was, as far at least as the Chris. and confined to certain extreme cases. The state in all such | West is concerned, a conversion of a kind that was tianity, cases steps in as a mediator between the wrong-doer and | altogether new. Christianity is historically the religion of the man who seeks to avenge himself upon the wrong-doer. | the Roman empire ; wherever the influence of Rome, East It takes the right of punishment out of his hands into its | or West, has spread, there Christianity has been dominant ; own. The later legal doctrine that a wrong done to any | beyond that range it has taken little root. The Teutonic member of the community is a wrong done to the com- | conquerors of the continental provinces accepted the religion munity itself, and to the king as its head, has not yet been | of the empire as they accepted its laws and language. At reached. A crime done against the king is more heavily | the end of the sixth century, all the subjects, all the western punished than a crime done against another man ; but that | conquerors of Rome, were Christian. Heathendom took in is simply because the king fills the highest place in the long | only the lands, like Scandinavia and~~

~~Germany beyond the gradation of ranks. The first notion of a crime against the | Rhine, which had never formed part of the empire, together state as such seems to come out in that venerable enact- | with the one Western land which had wholly fallen away ment which looks like the origin of one branch of our | from the empire. The conversion of England was the first modern privilege of parliament—' If the king his people to | strictly foreign mission of the Western Church. It was the him call, and to them then man evil do, twofold bot and | first spiritual conquest of a people wholly strange, a people to the king fifty shillings." who stood in no kind of relation to Rome and her civiliza- tion. It was the first act of a long sciies of spiritual con- The _'The language, the laws, and the constitution which the | quests which gradually brought all Europe within the pale 7 English settlers in Britain brought with them from their | of the Church. And it was more than the first act of~~

~~and peow are plainly marked. Of the thegn, in the earliest code of all, there is no mention. We have mention also of the classes intermediate between the freeman and the slave, the dat namely and the esne. But we see no signs of a society containing men of distinct nationalities; there is uothing answering to the mention of the Romans in the codes of the continental Teutons, or to the mention of the Welsh in other English codes which were drawn up at a~~

~~older homes were in the course of ages to undergo many changes ; the newer forms were to part away widely from the older; but all was to be gradual growth, gradual change ; there was to be no sudden revolution, no supplanting of one tongue by another tongue, of one law by another law. But the English had brought with them from their older Lomes another possession which was to pass utterly away, a system which was to be thoroughly supplanted by a rival system of foreign birth. With their language and their laws they had brought with them their religion ; and while their language and their laws were to abide, their religion was to pass away. The old religion of the English was, like their language and their laws, that form of the common Aryan heritage which had grown up among the people of northern Germany. The old~~

~~Teutonic faith is best known to us in the poetry and legends of that branch of the race which clave to it longer than the rest, in the Eddas and Sagas of the Northmen of Scandinavia. Our system was doubtless essentially the same as theirs, though, as it was laid aside by both High and Low Germans earlier than it Was in Scandinavia, it may never have reached among them the same full pcetic development which it reached in more~~

~~northern lands. The names of the chief gods, Wvden, Thunder,! Frigga, and the rest, are the same with only dialectic differences. The name of one of our old gods is of special interest ; the great Aryan power of the sky, Zeus himself, appears among us, though with lessened honours, under the English form of Ziw. He, with his fellows, gives his name to a day of the week; and his name, like that of his fellows, may be traced in the local nomenclature~~

~~the series ; it enlisted in the missionary work the people who were to send forth the most successful apostles to other lands. The conversion of England directly led to the conversion of heathen Germany and Scandinavia. Gregory, who was so anxious for the soul of Trajan, was himself a spiritual Trajan, enlarging his spiritual empire by conquests more lasting than the earthly conquests of Trajan himself. The conversion of the English to Christianity carried with it the readmission of Britain into the general world of Europe. Throughout the fifth and sixth centuries the notices of the affairs of Britain in continental writers are rare and meagre beyond expression. They show that Britain had fallen back into the isolation of the days before Cesar; it had again become an unknown world, a world about which any kind of fable might be safely uttered. Such rare intercourse as that world had with the Roman world was through the Teutonic masters of Gaul, the Franks. And it may be taken as a sign that, in the latter~~

~~\ Puner, Punor, in modern form Thunder, is the true English~~

~~name. The more familiar form Thor is, like most Scandinavian forms, a contraction. Thursday is for Pundresdeg,~~

~~years of the sixth century, Kent at least must have been striving to bring itself within the European circle, when we find its king Athelberht married to a Christian wife, the daughter of a Frankish king. It is to be noticed how- ever that neither the queen herself nor the Frankish bishop whom she brought with her seem to have directly done anything for the conversion of the king or his people. That work could be done by nothing short of the majesty of Rome.~~

~~One point which cannot be too strongly insisted on at this stage is that the Church of England which was founded ccccetin. 0% Augustine has nothing whatever to do with the early the con. British Church. In after times certain British dioceses yersion. submitted to English ecclesiastical rule, and that is all.~~

~~The Christianity of England did not come wholly from any~~

~~single source ; and one of the sources from which it came~~

~~was found within the British islands. But that source was~~

~~not a British source. The Roman planted; the Scot No watered ; but the Briton did nothing. He not only did British nothing; he refused to do anything; he would have share. yothing to say to Augustine's invitation to join in preaching the gospel to the heathen English. Theologians may dis- pute over the inferences which may be drawn from the fact ; but the historical fact cannot be altered to please any man. The Church of England is the daughter of the Church of Rome. She is so perhaps more directly than any other Church in Europe. England was the special con- quest of the Roman Church, the first land which looked up with reverence to the Roman pontiff, while it owed not even a nominal allegiance to the Roman Cesar.~~

~~The conversion of the English was gradual, and, on the whole, peaceful. Christianity was nowhere forced on an unwilling people by fire and sword, as was done in some later conversions. We find wars between Christian and heathen kingdoms in which religion is clearly one great animating cause on both sides ; but we do not hear of persecutions or wars of religion within the bosom of any kingdom. Asarule, the king is converted first. The great men follow, perhaps in duty bound as his thegns. The mass of the people follow their leaders. But all is done without compulsion ; if conversion was not always the result of argument, it was at least the result of example. This may perhaps show that the old religion sat somewhat lightly on its votaries, and in some cases the new religion seems to have sat somewhat lightly on its converse. The Christian king sometimes had heathen sons, and their accession was followed by a relapse. But, in the space of about a huudred years, allthe English kingdoms had be- come Christian. The men of Wight in their island, and the men of Sussex isolated between the sea and the great wood, were the last to cleave to the idols of their fathers. The seventh century was the great time of struggle between the two religions. It was also the time when Mercia first stood forth as an equal rival with Northumber- land, Wessex, and Kent. Kent soon sinks into a secondary rank, and leaves the first place to be disputed between the three other great powers. At the beginning of the Conver- period when the first Roman missionaries came, in 597, sion of the Bretwaldadom, which had been held by Aélle of Sussex hee and Ceawlin of Wessex, was held by ANthelberht of Kent. andEast- He is expressly said to have been supreme over all the Anglia; kingdoms south of the Humber. That this supremacy was~~

~~not a mere name is shewn by the fact that his safe-con- duct held good when Augustine crossed the still heathen land of Wessex to confer with the British bishops on the banks of the Severn. Under /ithelberht, the Kentish Church was planted by Augustine, and from Kent the new~~

~~Roman and Scottish~~

~~The con- version gradual,~~

~~4 i teaching spread over Essex and East-Anglia. From Kent Seal too came the first conversion of Northumberland, and with~~

~~it of Lindesey, by the preaching of Paulinus under the~~

~~ENGihAY,D.~~

~~[uisTory.~~

~~powerful BretwaldaEadwine of Deira. That king had, before The his conversion, conquered the Welsh kingdom of Loidis and ni Elmet, and had made Northumberland the first power in pret. Britain. His first rivalry was with Wessex, which he waldas, brought to acknowledge his supremacy. After his conver-~~

~~sion he had to endure the more dangerous enmity of two powers which united against him on different. grounds.~~

~~The Teutonic conqueror was hateful to the Briton Ceedwalla,~~

~~whose kingdom of Strathclyde, cut off from his southern countrymen by the victory of Adthelfrith, was still a power-~~

~~ful state. The Christian convert was hateful to the heathen Penda, under whom Mercia first became great, Penda of Before the two Eadwine fell at Heathfield in 633, and with Mercia. him fell for a moment the Christianity and the power of Northumberland. The new power of Mercia grew equally~~

~~to the south at the expense of Wessex. But this first~~

~~burst of Mercian power was not to be lasting. Before~~

~~long Northumberland was again united, powerful, and Christian, under the Bernician Bretwaldas, and her power~~

~~and religion were first restored for a while by Oswald the~~

~~saint. He overthrew his British and Christian enemy at Heavenfield in 635. 'This is a date of importance. In~~

~~some sort it marks the completion of the English conquest.~~

~~Much British land was still to be won by hard fighting ;~~

~~but Ceedwalla was the last British prince who could wage aggressive and dangerous warfare against an English~~

~~rival. Against his heathen and English enemy Oswald~~

~~was less successful. He too, like Eadwine, fell before Penda at Maserfield in 642. A time of confusion and division followed, but under Oswiu, the next Bretwalda, Northumberland rose again. In 654 Penda fell before him~~

~~at Winwedfield, and the armed strife between Christianity~~

~~and heathendom was at an end. The second conversion of Northumberland, and the conversion of Mercia which Conver- followed the fall of Penda, were chiefly the work of the ce Scots. That name, it must be remembered, though it does j not shut out the Scottish colony in Britain, primarily means~~

~~the original Scots of Ireland. Columba and his successors~~

~~in their holy island linked the two together, and both~~

~~were zealous in the missionary work, both in Britain and~~

~~on the continent. But, though a large part of England~~

~~thus owed its Christianity to the Scots, yet the special Scottish usages did not abide in the churches of Northum- berland and Mercia. After much debating, the Bret-~~

~~walda Oswiu adopted, on behalf of his people, the usages~~

~~of Rome and Kent. Meanwhile Wessex had been converted Conver by an independent mission from the Franks of Gaul under a its apostle Birinus. The heathendom of Sussex gave way 10 guesex," 681 to the preaching of the Northumbrian Wilfrith, and a and few years later the men of Wight, the last abiding-place Wight. of the old gods, were partly converted by Wilfrith, partly slaughtered by the West-Saxon Ceadwalla. All England~~

~~was now Christian; and the English Church was finally organized between 668 and 690 by Theodore of Tarsus.~~

~~The Roman, the Scot, and the man of the Hast, thus all – worked together to bring the English conquerors of Britain within the pale of the Christian Church, and thereby within~~

~~the general world of Europe.~~

~~There is something wonderful in the way in which Hffect of Christianity fitted itself in, so to speak, to the old Teutonic aa 'oul institutions of England. The change in men's thoughts, a the change in their ways of looking at most things, must have been great; but there is no sudden break. The old political and social state goes on ; the old laws and institu- tions are not abolished; they are hardly modified; all that happeus is that many new laws are inserted among the old. But the Jaws bear the old character. The old scale of ranks is enlarged to take in some new members, in the form of the various degrees of the Christian priesthood.~~

~~Some new crimes are forbidden ; some new observances are~~

~~Addition to the elder le- gislation.~~

~~Ecclesi- astical divisions.~~

~~National character of the English Church,~~

~~EFFECTS OF THE CONVERSION. |~~

enjoined ; but the spirit of the law, the nature of the penalties, the manner of their execution, remains the same. The various ranks of the clergy have their value, in Teutonic fashion, along with the various ranks of the laity. Churches arose, and the fabrics, with their ministers and their property, were placed under the protection of the law. Provisions against idolatrous practices are found; but the old faith passed away so easily that but little legislation of this kind was needed. The land received a new geo- graphical division in the form of ecclesiastical provinces and dioceses; but these commouly followed the existing civil geography. The extent of the bishop's diocese coin- cided with that of some kingdom or principality, and, as the ecclesiastical divisions underwent, till quite late times, much less change than the civil ones, the boundaries of the dioceses are our best guides to the boundaries of the old kingdoms and caldormanships. Nowhere was the Church more thoroughly national than in England. The old assembly of the shire received the bishop as a new chief, along with the ancient caldorman, and the two sat together jointly to hear matters which the more minute jurisprudence of a later time divided into causes eccle- siastical and causes temporal. Bishops, abbots, and other churchmen, became prominent in the counsels of kings and in the assemblies of the nation. A century or two later, we even find them leading the national armies to battle. Through the whole native history of England, we find no traces of any of the controversies between Church and State which show themselves in later times. In truth, Church and State did not exist as two distinct bodies ; they hardly existed as two distinct ideas. As the army was the nation in its military aspect, so the Church was the nation in its religious aspect. The leaders of the body might be different according to the matter in hand ; but the body itself was one.

This strongly national character of the ancient English Church naturally followed on the time and manner of the conversion of the English nation. The English were not like the Teutonic conquerors on the continent, in whose eyes the Church was a Roman institution, alongside of other Roman institutions. In Gaul and Spain, for some generatious after the Teutonic conquest, ecclesiastical power and office remained in the hands of the conquered. In some later conversions the Church was a foreign insti- tution through an opposite cause. It was an

~~institution forced on the people by their conquerors. In England neither of these causes of separation had any being. The English of their own free will accepted the creed of foreign teachers ; but the Church was not to them a foreign insti- tution. The first two or three bishops of each see were necessarily strangers ; but as soon as Englishmen were found fitted for such offices, they held them to the exclusion of strangers. It is hard to find a foreign prelate in England between Theodore of Tarsus and Robert of Jumiéges. Again, when England was converted, the privileges of the clergy as an order, the powers of the bishop of Rome as their head, were things which were still in their infancy. The claims made by the clergy and the popes in the eleventh, twelfth, and thirteenth centuries would have been unintelligible either to Athelberht or to Augustine. There was nothing in England to part off the clergy, as a body having feelings and interests distinct from the rest of the nation. There was nothing to tempt the Roman bishops, subjects as they still were of the Roman emperors, to put forth the claims of an Hildebrand or an Innocent. There was nothing to make them claim from the newly founded English Church anything beyond the reverence due to a parent from a child who has already reached full age.~~

~~In short, if we look through our early law, and seek~~

~~for changes in the law itself—as distinguished from legisla- tion on new subjects—which can be said to be directly owing to the change of religion, we shall find few indeed.~~

~~It is indeed very likely that the power of bequeathing Power of property by will was introduced by the Roman clergy. bequest.~~

~~There is a remarkable reference to the practice which implies as much ;! and we know that the wills of dead men were a matter which the clergy took largely into their own hands, and which became in the end a subject for the specially ecclesiastical jurisdiction. Yet the power of~~

~~willing may have grown up in England, just as it did at Rome. In the beginning a will is an exceptional act. The testator prays the community to allow his goods to be disposed of in a particular way. The confirmation gradually becomes matter of form ; at last it is altogether dispensed with, and the power of bequest, once a privilege granted in a particular case, becomes the common right of every man. Still there is a strong likelihood the other way, and it may well be that the power of bequest has really been transferred from the Roman law to that of England, Only, if so it be, it must be remembered that it is no heritage from the inhabitants of the Roman province of Britain. It is something which was brought in afresh, as part of the ecclesiastical system of Gregory and Augustine.~~

~~Another novelty in our law, which was directly owing Corporate to the conversion, was the institution of ecclesiastical property.~~

~~property. This is plain on theface of it. Nothing could be given for the support of the new religion till the new religion had been accepted. But the institution of ecclesi- astical property involved something more than this. If it did not from the beginning imply the legal doctrine of corporate property, it at least soon grew into it. This doctrine is something wholly distinct from the primitive communal property. It presupposes the intermediate stage of private ownership. The land is first cut off from the common possession to form the particular possession of this or that person. Then, by a legal fiction, several persons are clothed with the attributes of a single person, and the artificial being called a corporation appears. Such corpora- tions were quite familiar to Roman law ; but it is incon- ceivable that any such subtlety should have been thought of in primitive Teutonic times. The king or caldorman, who gave lands to this or that church,—commonly under the formula of giving to God, or to such and such a saint,— if he did not at once create, at least paved the way for, all the fictions and subtleties of law with regard to corporatious of all kinds, lay and spiritual, aggregate and sole.~~

~~It was also doubtless owing to direct Christian influence Ordeal that the early jurisprudence of England came to differ in and one singular~~

~~point from that of other Teutonic nations, W@se" of~~

~~The wager of battle, an original Teutonic institution, one which was brought again into England in later times, seems to have been altogether disused between the conversion and the Norman conquest. It has an English name, the ornest ; but it is quite unknown to English law or English usage. Its place is taken by the direct appeal to the judg- ment of God in the formof the ordeal. The divine power, it was held, would directly interfere to save the innocent and to punish the guilty. We need not suppose that the ordeal itself was an invention of Christian teachers, The same idea may be found in many customs in other parts of the world. But it must be owing to direct Christian teaching that the judgment by hot iron or hot water altogether drove out the more warlike appeal to the judg- — A * The Norman writer William of Poitiers (p. 128 Giles) makes Harold thus answer William's claim by Eadward's bequest :—Ab co tempore quo beatus Augustinus in hanc venit regionem, communem gentis hujus fuisse consuetudinem donationem, quam in ultimo fine suo quis fecerit, eam ratam habere." It is an odd quarter to go to for a statement of English law, but its soundnesy can hardly be doubted.~~

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~~ment of battle, so that this last came in again in after~~

~~times in the guise of a foreign innovation. New But, small as were the direct legal or political changes Latin in- which it wrought, the conversion of the English, even ae setting aside its purely theological and spiritual side, English, Was the greatest event in the history of our nation, The effects which it wrought were greatand manifold. The Roman missionaries brought with them a new learn- ing, a new culture. The little influence which Rome had on our language and laws, before the great continental infusion of later times, was due far more to the days of the conversion than to the days of the first conquest. Our forefathers translated a great number of ecclesiastical terms, some of which we have come again to use in a Latin shape. Still, as new things must have new names, the Roman missionaries brought into our language a good many Latin words to express ecclesiastical ideas, and~~

~~seemingly a few other words, expressing other objects of Roman culture. Here was a second Roman infusion into our Teutonic speech. It was an infusion far greater than the handful of Latin words which we picked up in the course of the first conquest ; but it was still an infusion which in no way affected the purity of our native vocabu- lary. Some foreign things kept their foreign names ; but no native thing changed its native name for a foreign one. The effect on language was in short much the same as the effect on law. There was no break, no change ; only certain new elements were adopted and assimilated by the old.~~

~~But if the conversion wrought but little change in the English tongue, it breathed a new literary life into the English people. The missionaries brought with them tue whole learning of their time, and, above all, the use of the Latin language. Latin, it must be remembered, was still, not merely the literary tongue, but the common every-day speech of Western Europe. 'The dialects which grew into the Romance languages had doubtless already begun to form themselves ; but no one looked on them as anything but vulgar dialects of Latin ; no one thought of committing them to writing, or of using them for any serious purpose. A people who knew no Latin were cut off from all inter- course with the civilized world of the West; a people among whom Latin was cultivated at once formed part of that world. From the coming of Augustine, "book Latin " again took its place among the languages of Britain.! But happily it always remained "book Latin." It never displaced the native Teutonic speech on the lips of men ; it never even shut out the native speech from the rank of a cultivated language possessing a written literature. Or rather, the general intellectual impulse which followed on the conversion, while it first gave us Latin literature, also first made our English written literature. We learned to use a more convenient alphabet than the runes, a more con- venient writing material than the beech. English was, what the Romance languages were not as yt, so far apart from Use of atin that the two languages, the two literatures, could ee live side by side. One point only is to be regretted. It service, 18 at once the strength and the weakness of the Latin~~

~~Church, and one of her points of contrast with the Churches of the East, that, wherever her system is accepted in its fulness, she imposes~~

~~the tongue of Rome as the one tongue of religious worship. Like crowds of other laws and usages, good and bad, this usage came about of itself, without any set purpose ; it was only when it was objected to in after times that arguments were sought for to defend~~

~~Effect on litera- ture.~~

~~1 The Chronicles at the very beginning say, "Her synd on pam iglande fif gepeddu—Anglise, Brytwylse, Scottyse, Pihttise, and Bocladen." This translates Beda's list " Anglorum videlicet, Brit-~~

~~tonum, Scottorum, Pictorum, et Latinorum, que meditatione scriptu- rarum ceteris omnibus est facta communis."~~

~~ENGLAND~~

~~[nIstory.~~

~~it. It was in England that the practice began of having divine service in a tongue not understanded of the people. That is to say, England was the first country of wholly foreign speech which the Roman Church had to deal with. It had not come into any man's head to translate the mass or the lectionary into the dialects of Gaul or Spain. Indeed we may be sure that the time for such a step was uot yet come ; the ecclesiastical Latin was doubtless at least as intelligible then as the English of the sixteenth century is now. Thus men who were accustomed only to Latin in public worship went on using it, even in a country where the same reasons which pleaded for the use of Latin at Rome pleaded no less strongly for the use of English. But this was the only error; the native tongue was in no way discouraged as the tongue either of devotional writ or of translations or paraphrasesof Scripture. A noble Christian literature soon grew up in the English tongue. The only thing to be lamented is that its growth must have put the older heathen literature under a cloud. The songs which record the English conquest live only in Latin fragments, and Beowulf himself has been taught to utter Christian phrases, if only with stammering lips.~~

~~The two ends of England contributed to the growth of the Cedmon new English literature. Our Christian English poetry is of ™4 Deira ; our English prose is of Wessex; our Latin litera- “”°* ture, our earliest history in literary shape, is of Bernicia. Czedmon of Streoneshalh led the way, the first of onr Eng- lish sacred poets, he who, a thousand years before Milton, dealt with Milton’s theme in Milton’s spirit—he who sang the warfare of Hebrew patriarchs with the true ring of a Teutonic battle-song. Next came Beeda of Jarrow, the first who recorded English history in Latin prose, and who, amid a crowd of Latin writings, did not forget the ren- dering of the gospel into the tongue of his own people. For Cedmon there might have been a place in the older state of things; for Bada there could have been none. Czdmon, born while parts of England were still heathen, might have been a heathen born ; he might, in the self- same spirit, with little more than the change of names, have sung of Woden and Loki instead of Christ and Satan ; he might have told the tale of Ida warring with the Briton instead of the tale of Abraham warring with the kings of Caanan. But Beda is the direct offspring of the great religious change. The monk, the student, who never struck a blow in battle or raised his voice in the assembly of shire or kingdom, was a new character among Englishmen. Yet Beeda is English too ; he is no stranger to us ; he is the man of our own race, as the man of our race might now become under a state of things so far removed from the thoughts of the olden time. Of English prose, though in a sense it begins with Beda, the true and full growth is later. Its founder is the king who was at once the judge, the captain, and the teacher of his people, West-Saxon Ailfred himself.~~

~~We may also safely say that it was with the conversion Effects to Christianity that the first rudiments of art were brought @ back into Britain. As heathen Rome taught her culture to the Briton, so Christian Rome taught her culture to the Englishman. How far the monuments of Roman skill were designedly swept away it might be hard to say. Most likely there was no design in the matter. Much would perish in the ordinary course of barbarian havoc, and there was no English Theodoric to guard what escaped. It isa speaking fact that a Roman column standing in its place is a thing unknown in Britain. We may be sure that the art of stone building was unknown to the heathen English~~

~~in their old homes; nor was there anything in the circum- stances of their settlement in their new homes to lead their thoughts in that direction. Architecture, and with it the other arts, painting, music, and the rest, came in again in~~

~~, the wake of the Church. Churches were built in the style~~

~~Intro- duction of mon- asticism.~~

~~Effects on the doctrine of king- ship.~~

~~which was then usual in Italy, churches of brick or stone with round arches. Sometimes a Roman ruin was still able to be repaired ; more commonly it supplied materials for a new building. When the tall bell-towers came into fashion in Italy, they were imitated in England also. Thus arose, in England as elsewhere, that early round- arched style, based directly on Italian models, which formed the usual style of all western Europe till the eleventh cen- tury. The art of those days was mainly ecclesiastical. Houses were commonly, most likely always, of wood till the coming of the Normans. The Roman military works seem hardly to have been imitated till the great cera of forti- fication in the tenth century.~~

~~With the new religion the land received a wholly new class of mankind, utterly unknown to the heathen Teutons, the class of men and women devoted to the religious life. Monasticism forms a marked feature in some pagan systems ; but it had no place in the old Teutouic religion. We had not so much as anything that answered to the virgins of Vesta. But Teutonic monasticism took a charac- ter of its own. Monasteries became private inheritances ; the distinction was not always very accurately drawn between the ordained monk and the secular priest, between the unordained monk and the layman. Celibacy was doubtless essential to the very laxest form of the monastic life ; but we shall look in vain in the early monasteries of England for any very strict observance of the rule of Saint Benedict. There was room however in them alike for the ascetic scholarship of Beda and for the ruder zeal~~

~~which led a crowd of men and women of all ranks, among them kings' daughters and even reigning kings, to forsake the world to embrace the religious life. A large proportion of the native saints of the English calendar were supplied by those kingly houses whose pride had once been to be sprung of the blood of the gods of heathendom.~~

~~This last idea had of course wholly to change its shape under the influence of the new faith. The pedigree was not forgotten ; Woden was still the forefather of all the kingly houses. But Woden was now found out to have been a mere mortal hero, the descendant of Noah in such and such a generation. We may suspect that one effect of Christianity was to lessen the reverence for the kingly stock as such, to strengthen the elective element, and to make it easier to choose kings who were not of kingly descent. The analogy alike of the Roman emperors and of ecclesiasti- cal officers of all kinds would work the same way. But kingship, as an office, was in Christian hands clothed with a higher majesty, and became an object of deeper reverence. If one form of sanctity was taken away from the son of Woden, he gradually obtained another in his new character of the Lord's Anointed. At least from the eighth century, perhaps from an earlier time, English kings began, as the emperors had long been, to be admitted to their office with ecclesiastical ceremonies, among which the rite of unction held the chief place. The king thus became in some measure a sharer in the sanctity of the priesthood. He was clothed in sacred vestments, and enjoyed sacred privileges beyond the laymen of ordinary degree. But this only brought out more strongly his position as holding au office according to law. The priest, the abbot, the bishop, was chosen and admitted to his office according to a known law. According to the same law, he might, in case of demerit, be deposed from his office. So it was with the kingly office. The greater the mysterious sanctity that was shed over the kingly office, the more was his person shorn of all mysterious sanctity. He held a sacred office; but that sacred office might, like any other office, be taken away from an unworthy holder. On the other hand, the growing practice of personal commendation stepped in to restore the balance, and to strengthen the king's personal authority.~~

He became the personal lord of all the chief men in his kingdom. They were bound to him by a voluntary tic of personal faith and honour. But these two growing notions, which made the king, on the one band a personal lord, on the other hand an ecclesiastical officer, worked together somewhat to wipe out the older idea of the king as the head of the people, the chief, the judge and captain of the community, commanding obedience directly as the head of the state, without any need either of religious consecra- tion or of personal allegiance.

But if the new religion thus modified the older ideas of The na- kingship, and tended on the whole to strengthen the kingly pas a power, it affected the national being of the English people oy ie in a yet more direct way. In fact, it created that national Church. being. Hitherto there had been no tie to bind together the various Teutonic kingdoms in Britain, except the preca- rious and fluctuating tie of the Bretwaldadom. Had the Bretwaldadom been permanent, it might have gradually fused all the Teutonic settlements into one nation. In thie form which it actually took, it was a mere momentary superiority of one kingdom over others, which was naturally irksome, and was thrown off as soon as might be. The Church sowed the seeds of a truer national unity by accus- toming Englishmen from different kingdoms to act together, and to acknowledge a common head. England had national synods long before she had national parliaments.

Her kingdoms acknowledged a common primate long before

they acknowledged a common king. The original scheme The two of Gregory would have divided Britain into two ecclesiasti- eel cal provinces of much the same extent. York was to have (1 P”™ taken in all Scotland ; but the claim of York to ecclesiasti-

cal jurisdiction over Scotland was always precarious, com-

monly nominal, and it was in the end formally abolished.

The regular succession of archbishops of York began later

than that of Canterbury, and the northern primate, some-

~~times with one or two suffragans, sometimes with none at~~

~~all, never practically held the same metropolitan position as~~

~~the archbishop of Canterbury. This last became, long~~

~~before any king could so call himself, the "head of Angle-~~

~~kin,"! the chief of the English nation, irrespective of political divisions. And such an influence was purely national, It gave no political importance to the secondary,~~

~~soon to become the dependent, kingdom of Kent. It worked however when Kent had been merged in Wessex,~~

~~to help the advance of Wessex, and to settle the general headship of England in the south. And, in the same~~

~~way, the position of the see of York, which in practice~~

~~was not so much an archbishopric as a great and powerful independent bishopric, doubtless did much to strengthen~~

~~the general tendency of Northumberland to keep up a~~

~~being distinct from that of southern England.~~

~~Thus, before the end of the seventh century, Teutonic and Wars no heathen England had embraced a new creed, and with that !onger f creed it had received those changes in thought, law, and is rd custom which could not fail to follow on such a conversion. pation. One change above all affects the general history. Warfare still goes on, warfare alike with the Britons and with Englishmen of other kingdoms ; but warfare no longer im- plies extermination, Where the heathen conqueror carried mere slaughter and havoc, the Christian conqueror was satisfied with political subjection. The overthrow of Deva by ithelfrith may well have been the last case of mere destruction. The greatness and fall of Penda form part of the history of the conversion; his reign was the armed~~

~~1 In the poem on the martyrdom of Allfheah in the Chronicles, 1011, the archbishop is called— 'Se pe er was heafod Angeleynnes And cristendomes.'"~~

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~~resistance of heathendom to the new faith. His alliance with Czedwalla gave the Briton his last chance of greatness at the cost of the Teutonic intruder. When Cedwalla and Penda had both fallen before the sword of the Northum- brian Bretwaldas, two questions were solved. The Teuton and not the Celt was to be dominant in southern Britain ; but the rule of the Teuton was to be a Christian and not a heathen rule. But a third question, which of the Teutonic powers in Britain should become the head of Britain, was still undecided. This question took more than a hundred~~

~~ERGLAWD~~

~~[HIsToRY.~~

~~the dominion of Northumberland died with him. The northern land still remained for a while the chief seat of learning and culture, the land of Cedmon and Beda. But its political power fell with Ecgfrith, The stoutest Northumbrian kings of the eighth century could at most keep their own borders against the Mercian, or again win victories against the North Briton. Of the Bretwaldadom of the seventh century they had no hope. Towards the end of the eighth century Northumberland fell into a state of confusion and division, which made it an easy prey~~

~~fe years to settle, and it was at last settled in a way which | for any enemy. English was hardly to be looked for. During the greater part of During the greater part of the eighth century everything Greatness A the seventh and eighth centuries the struggle seemed to lie | looked as if the chief place in the island was destined for of om: wholly between Northumberland and Mercia. Wessex seems | Mercia. ASthelbald (716-757), Offa (757-796), and Mercia. to have given up all herschemesof~~

~~aggrandizement in central | Cenwulf (797-819), through three long reigns, taking in . Western Britain. She gradually loses her dominion north of the | more than a century, kept up the might and glory of their advance Thames ; it is sometimes more than she can do to maintain | kingdom. Meanwhile, in Wessex a series of valiant kings reels her own independence against Mercian supremacy. But | pressed westward against the Briton, and bore up against " all the while she is gradually extending her dominion at | the Mercian. But to bear up was as much as they could the expense of the Britons to the west. She is also, in | do. The fight of Burford in 752, under the West-Saxon the latter part of the period, establishing a supremacy | king Cuthred, secured the independence of Wessex; but it over the smaller English kingdoms to the east. The | secured only her independence ; her northern frontier was Wessex of 800 A.D. was a state of a wholly different | finally cut short by Offa. This last is the greatest name in Shape on the map from the Wessex of 600 a.p. The | Mercian history. Though none of these Mercian kings are West-Saxon kings, from the seventh century onwards, | enrolled on the list of Bretwaldas, yet the position of Offa Offa and ruled over a realm of quite a different character from any | was as great as that of any English king before the final Charles, of the earlier English kingdoms. Their western conquests, | union of the kingdoms. In one way it was higher than from the northern Axe to the Tamar, made them, now that | that of any of them. Offa held, not only a British, but an the days of mere slaughter and havoc were passed, masters | European position. Britain was now again threatened with of a realm which contained British as well as English sub- | annexation by a continental power. Charles the Great, not jects. In the laws of Ine (675-693) we find the picture | yet crowned Cesar and Augustus, but already virtual lord of a land in which the Britons are under the full protec- | of Romie, exercised an influence in British affairs such as tion of the law, but in which they form a distinct class, | no prince of the mainland had ever exercised since Honorius marked as inferior to the dominant English. The | withdrew his legions. That Englishmen, the famous Welshman's oath and the Welshman's life both have their | Alcuin (Ealhwine) at their head, held high places at his value ; but they are rated at a less value than the oath and | court and in his favour was simply part of the wise the life ofan Englishman of the same rank.~~

~~When we turn | encouragement which he held out to learning and merit to the laws of Ailfred (878-901), no trace of any such dis- | everywhere. But the great Frankish king exercised direct tinction is left. He legislates for a purely English realm. | influence, if not supremacy, in several parts of our island, That is to say, the Welsh within the West-Saxon kingdom | The Scots are, at least by his own annalist, counted had, in the course of those two hundred years, become natur- | among his homagers. Northumberland took back a king at alized Englishmen. The impassable barrier of creed which | his bidding. A banished West-Saxon prince learned in his divided the Christian Briton from the heathen Teuton hadnow | school the art of founding empires. But with the great passed away. 'There was nothing to hinder the conquered, | king of the Mercians Charles correspouded as an equal. War when once admitted to legal protection, from gradually | was once threatened, but only threatened, between the great adopting the tongue and manners of their conquerors. potentates of the island and of the mainland, In the next Advance The same work must have been going on along the | reign Cenwulf found it needful to put it clearly on record of Mercian frontier also ; but here we have not the means of | that neither the bishop of Rome nor the emperor of Rome Mercia, studying it in the same detail. During these hundred and | had any jurisdiction in his realm of Mercia. These dealings fifty years the Mercian kings spread their dominion a long | with the continental empire should be marked, both on way westward of the boundary stream of the Severn. But | their own account and because of the light which they we hear far more of them as warring, often as conquerors, | throw on some later passages in British history. against the English powers to the north and south of them. Charles, lord of the western world of Rome, was not Supre- Great- But at the beginning of this period Northumberland still | fated to become lord of the island world of Britain. But macy of ness of remains the greatest power of Britain. For a while after | a nearer approach to that character than had yet fallen to va :~~

~~Northum- the death of Penda her supremacy was undoubted. Mercia~~

~~any English prince was in store for the friend and pupil of Ecgberbt, borland. "hed again became independent, and under Wulfhere (657—~~

the great emperor. West-Saxon Ecgberht went back from

675) and his successor Aithelred (675-703), who died a monk, pressed far towards the dominion of southern as well as of central England. Meanwhile, Ecgfrith. of Northum- berland (670-685) was pressing on to the further north, as the West-Saxon kings were to the extreme west. Northumberland, it must be remembered, reached to the Forth; but to the west it was hemmed in by the British land which stretched to the Clyde. This last Ecgfrith incorporated with his dominions. Carlisle and its district, a land which was in after days to become English again, now became English for a moment, as well as the land to the west which was not to become English again. But Kegfrith fell ina war with the Picts beyond the Forth, and

the Frankish court to do in Britain as nearly as he could what Charles had done in Germany and Gaul. He went back to become the eighth Bretwalda, and more than a Bretwalda. The day of Northumberland and the day of Mercia had passed; the day of Wessex had come. The single reign of Eegberlit (802-837) placed her for ever at the head of the powers of Britain. Immediate king only south of the Thames, Ecgberht stretched his overlordship to the Forth, and, what no Bretwalda had done before him, he handed on his dominion to his successors. But the dominion of Ecgberht must not be mistaken for a kingdom of all England. He was king of the West-Saxons; once only does he call himself King of the English. But the

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kingdoms of Kent, Sussex, and Essex were now, as the West-Saxon shires had once been, ruled by under-kings of the West-Saxon house. In Mercia, Northumberland, and East-Anglia native kings still reigned, but they held their crowns as the men of the West-Saxon overlord. And in neither was the West-Saxon supremacy a mere precarious dominion, like that of the earlier Bretwaldas. Both rela- ; tions were steps towards more perfect incorporation ;_ they were stages in the process by which Wessex grew into | England, England The name of Zngland is not yet found in any con- oF temporary writer. It came into use in the course of the Sawony- next century. In truth, the oldest name for the Teutonic

~~part . of Britain is not Hngland, but Saxony. This is only what was to be looked for. The lands won by the Teutons would . first receive a common name from the Celts of the island, and that name, according to their usage, would naturally be | Saxony. The Teutonic settlers themselves would not give their country a common name till they had reached some degree of political unity; but when they gave it a name, that name was naturally Hngland. England, in short, as a political unity, began to be formed in the ninth century; it received its name in the tenth. Now that the various English kingdoms are brought so closely together, we begin to feel the need of a geographical name which may take them all in. Some name is needed, some name was doubtless soon felt to be needed, to distinguish the English kingdoms now united under West-Saxon supremacy from the other parts of the island. The position of Ecgberht could not be so well described as by calling him king of the West-Saxons and lord of all England. Lord of all Britain he was not, though he came nearer to being so than any prince before him. West-Wales, if not actually { incorporated, was brought into thorough dependence, and the princes of North-Wales—that is, Wales in the modern sense—were brought to acknowledge the West-Saxon supremacy. The Welsh of Strathclyde, the Picts, and the Scots, remained independent and untouched. Thus, though a kingdom of England was not yet formed, | the greatest of all steps had been taken towards forming . it. But the work of Ecgberht had stood but for a little while when it seemed to be swept away for ever. Yet while it seemed to be swept away, it was in truth both quickened) and strengthened by an event which forms one of the great landmarks in our story, an event which has no parallel since the first settlement of the English in Britain. The English conquest was in some sort wrought over again, Christian Britain was again attacked by heathen invaders, and a large part of it was again brought under heathen rule. The West-Saxon supremacy seemed to vanish away ; the West-Saxon kingdom itself was for a moment over- come. But the blows which overcame kingdom and supremacy did in truth only enable Ecgberht's successors again to do Ecgberht's work more thoroughly.~~

~~The dominion of Ecgberht passed to his son Aithelwulf (837-858), and from him to four of his sons in succession, Adthelbald, Athelberht,~~

Aithelred (858—871), and the more famous Ailfred (871-900). This succession involves a constitutional point ; for we hear of a will of Aithelwulf, confirmed by the Witan, by which the order in which his sons were to succeed to the crown was arranged beforehand. There is in this no formal surrender of the right of the nation to choose its king; for the confirmation by the Witan j was equivalent to a conditional election in advance. But that the crown could be made the subject of bequest in any shape shows the growth of a whole crowd of ideas which | had no place in the elder Teutonic system. Weare, to say the least, on the way towards the doctrine that the leader- | ship of men is not an office but a property. This is the first case of any attempt to settle the succession beforehand,

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and, as in most other cases afterwards, the attempt failed. The sons of Aithelwulf succeeded; but they did not succeed in the order marked out by their father's will. Another point which marks the increasing intercourse between England and the mainland is the fact that A!thelwulf made the pilgrimage to Rome. More than one king had given up his crown, and had ended his days at Rome ; but this is the first case of a reigning king thus absenting him- self from his kingdom. On his return also he married a foreign wife, Judith the daughter of Charles the Bald. This is the first recorded case of the kind since the marriage of Aithelberht of Kent; and we shall find only one more in the whole line before the Norman Conquest. As long as England remained purely England, the mothers of English kings were Englishwomen.

Another point with regard to the succession should be Acces. noticed. On the death of Athelred, Alfred succeeded, sion of though /Ethelred had children living. This is of course "!!te4. simply an instance of the general law of choosing from the royal house, but of choosing only oue who was personally qualified to reign. Minors were therefore passed by, as a matter of course, in favour of a full grown uncle or other kinsman. The children thus shut out might or might not be chosen at some future vacancy. The right of Alfred to his crown was not disputed

~~in his own day, nor has he commonly been branded by later historians with the name of usurper. But it is well to bear in mind that his succession was of exactly the same kind as that of some later kings to whom the name of usurper has been freely applied. In all such cases the mistake comes from for- getting that the strict laws of succession to which we have been used for the last two or three centuries were altogether unknown in the earlier stages of our constitution,~~

~~But the main history of England during these reigns, The Dan- and indeed for a long time after, gathers round the succes- ish inva- sive Danish invasions. Christian England was now *!02S- attacked by the heathen Danes, as Christian Britain had been attacked by the heathen English. But the results in the two cases were widely different. The Danes were not a people altogether foreign to the English; they were of kindred race, and spoke a kindred tongue. Had their in- roads begun when the settlements of the Angles, Saxons, and Jutes were still new, they might have passed for a fourth branch of the same stock, come to share the spoil with their kinsfolk. As it was, their nearness in blood and speech made them disposed to accept a new religion at the hands of the English, and in the end to merge their own national being in that of the English, in a way in which the English themselves had been in no way disposed to do towards the wholly foreign races among whom they settled.~~

~~The Danish invasions of England were part of a general movement which about this time began to carry the adven-~~

~~turous people of Scandinavia into all parts of Europe. Of Move. the three great kingdoms into which they settled down ments of about this time, Sweden had little to do with Western theScar- Europe; the advance of that power was to the east. But in, the people of Norway and Denmark ravaged everywhere, : and settled in many places, along the coasts of Germany,~~

~~Gaul, and the British islands. The Northmen founded powerful states, which have an occasional connexion with English history, in Ireland, Orkney, and the Western Islands ; but the Scandinavian settlements in England itself~~

~~were almost wholly Danish in the stricter sense! Their~~

~~1 That there were in northern England Northmen, as distinguished from Danes, appears from the record of the commendation of 924 in the Winchester Chronicle. The name Northmen, at an earlier time, meant the Scandinavian nations generally ; it is now specially used to mean the men of Norway. The Danes settled on the eastern coast of Northumberland and Hast-Anglia; the Northmen would seem to have made their way into western Yorkshire by way of Cumberland.~~

~~Three invasions fall naturally into three periods. There is first a | Authelfled. The Lord and Lady of the Mercians held a stages of time of mere plunder ; secondly, a time of local settlement, | place intermediate between that of an under-king and an Danish hen Danish dynasties are set up in certain parts of | ordinary caldorman. At the other end of Wessex, Kent — England; lastly, when England, Denmark, and other | and Sussex were completely incorporated, and ceased to be European powers had grown into something more of definite | even distinct apanages. 'The West-Saxon supremacy was shape and order, we find an attempt, and for a while a suc- | more fully established in Wales, and at last, in 893, even cessful attempt, to place a king of all Denmark on the | the Danes of the north acknowledged it. Aflfred had thus, throne of a kingdom of all England. Of these periods it | in name at least, won back the overlordship of Ecgberht, is the first two only with which we are concerned at this | combined with an enlarged immediate kingdom. As that stage, and these two have their exact parallels in the two | immediate kingdom took in by far the greater part of stages of English invasion in Britain. The first recorded | Saxon England, and little or nothing that was not Saxon, inroad of the Danes in any part of England is placed in | he sometimes bears, neither the narrower style of King Northumberland in 789 ; but it was not till the latter years | of the West-Saxons nor the wider style of King of the of the reign of Ecgberht that their incursions became | English, but the title, almost peculiar and specially formidable, at least in southern England. They plundered | appropriate to himself, of King of the Saxons. His both in Kent and in Wessex, and they leagued themselves | overlordship over the heathen Danes was doubtless far with the West-Welsh to meet a common defeat~~

~~at the hands | less firmly established than Ecgberht's overlordship had of the Bretwalda. been over their Christian predecessors. But now, in the Settle. The actual settlements did not begin till the reign of | eyes of the Christian inhabitants of Northumberland ment /Mithelred. In 870 the Danes, after ravaging various parts | and Mercia, the West-Saxon king was no longer a stranger eg of Northumberland and Mercia, and setting up a puppet | and a conqueror. He had become the champion of their ta king in Bernicia, occupied East-Anglia, whose king, the | race and faith against their heathen masters, In that Guth. famous local saint Eadmund, died a martyr. Then came | character Alfred himself hardly appeared. The last rum. _ their first great invasion of Wessex, and the battles of the | years of his reign were chiefly taken up in defending last days of Aithelred and the first days of Alfred. Then | Wessex and English Mercia against new Danish inva- (874-888) Northumberland and Mercia came altogether into | sions from without. But this Christian and English Second the power of the Danes. For a moment they overran | championship is the distinct characteristic of the kings #dvance Wessex itself, and the realm of Alfred was confined to the | who follow him, of his son Eadward the Unconquered reall isle of Athelney. But the spirit of the great king never | (901-925), of his grandsons Athelstan (925-940), Eadmund failed, and that of his people rose again. The Danes were | (940-946), and Hadred (946-955). Under them Wessex driven from Wessex, and the peace of Wedmore settled the | grew into England, and the overlordship grew into the relations between the West-Saxon king and the Danes of | empire of Britain. Eadward waged the war in partnership East-Anglia. A line drawn from north-west to south-east | with his sister the Lady of the Mercians, who ruled alone Plate II. divided Mercia into two parts. The south-western fell to | after the death of her husband, and whose territory was on the West-Saxon, the north-eastern to the Dave. The | her death fully incorporated with Wessex. The son and Danish king Guthrum embraced Christianity, and became a | the daughter of A'lfred gradually advanced their frontier, precarious and dangerous vassal of the West-Saxon overlord. | winning battles, fortifying towns, till Eadward, King of the His actual kingdom lay in East-Anglia; the chief power | English, held all England south of the Humber as his in Danish Mercia lay in the confederacy of the five | immediate realm. His~~

~~overlordship was more fully The boroughs, Lincoln, Leicester, Nottingham, Derby, and | admitted by the Welsh and the Northumbrians, and it was kingdom Stamford. In all these the Danish settlers seem to have | acknowledged for the first time by the Scots and the of formed a patrician order, holding the English inhabitants | Strathclyde Welsh, who in 924 chose the English king as — in bondage. Deira, with York for its capital, formed a | father and lord. Under Athelstan Northumberland was Danish kingdom, In Bernicia English princes still reigned | incorporated, and the immediate realm of the one king of under Danish overlordship. In a large part both of | the English reached to the Forth. Still both he and his Northumberland and Mercia the land was divided among | two successors had to fight against endless revolts and Danish owners, and not a few places received new Danish | rival kings in Northumberland. The Danish land was names. It might have seemed that the Danish conquest of | won and lost and won back over and over again, till at more than half England was only less thorough than the | last under Eadred Northumberland was finally incorpo- English conquest of Britain itself. rated, and ruled, sometimes by a single earl, sometimes by Effects But in truth the Danish occupation of northern and | two, of the king's appointment. The kingdom of England ofthe eastern England did but make ready the way for the more | was now formed. thorough incorporation of those lands with the West-Saxon The first half of the tenth century thus gave the West- The _ ment, Kingdom. Ecgberht had established his supremacy over | Saxon kings a position in Britain such as no English kings imperial the English powers in those lands. But it was the | of any kingdom had held before them. Dominant in ca supremacy of an external master. The Danish settlements | their own island, claiming and, whenever they could, gave the West-Saxon kings a wholly new character. | exercising a supremacy over the other princes of the Changed Unless we reckon the tributary kingship of Bernicia, all | island, their position in the island world of Britain was oo the ancient English kingdoms, with their royal houses, | analogous to the position of the Western emperors in con- Wessex, Were swept away wherever the Danes established their | tinental Europe. It was in fact an imperial position. As~~

~~power. The West-Saxon kings remained the only champions of Christian faith and English nationality. They were now Kings of the English, and they alone. Mark also that, by the treaty between Alfred and Guthrum, while the West-Saxon king lost as an overlord, he gained as an immediate sovereign. The actual West-Saxon dominion, as distinguished from mere West-Saxon supremacy, again reached far beyond the Thames. English Mercia was ruled under Alfred by an ealdorman of the old royal stock, the husband of his daughter the renowned~~

~~ENGUAN DPD~~

~~[HISTORY.~~

~~such it was marked by the assumption of the imperial titles, monarcha, imperator, basileus, Augustus, and even Cesar. These titles were meant at once to assert the imperial supremacy of the English kings within their own world, and to deny any supremacy over Britain on the part of either of the lords of the continental world. When we remember that some both of the Teutonic and Celtic princes of Britain had been the men of Charles the Great, the denial of all supremacy in the Cesars of the mainland was not needless. Indeed that denial was formally made over~~

~~: Rela-~~

~~tions to~~

~~Cumber- land and Scot-~~

~~land,~~

~~Legisla- tion.~~

~~Growth of the kingly power,~~

~~THE KINGDOM OF ENGLAND. |~~

~~**and over again at various times down to the reign of Henry VIII.**~~

~~**On the other hand, we see during these reigns the beginning of the process which fixed the modern frontier of England to the north. The Picts and the Scots of Britain now formed what, as regarded their southern neighbours, was a single great kingdom north of Forth and Clyde. In the great fight of Brunanburh in 936 the Scots joined the Danes against Aithelstan, and shared in their defeat. After that time the relations of the Scottish kings to the English overlord seem for a long while to have been friendly. During this period the Scottish power began to make its way south of the two great firths. In 945 Eadmund conquered Cumberland. It might not be easy to say exactly what territory is meant by that name; but it was clearly the whole or a part of the ancient Strathclyde. It most likely took in Carlisle and its district, which had not been under direct English rule since the days of Ecgfrith. This territory Eadmund bestowed on Malcolm king of Scots, distinctly as a territorial fief. This is perhaps the earliest case of a grant of that kind in our history. It is something different from the commendation of either Scots or Britons to Eadward in 924, The northern kingdom of the Britons now became the ordinary apanage of the heirs of the Scottish crown. The Scottish royal house, if not the actual Scottish kingdom, thus obtained a great establishment south of the firth of Clyde, and soon afterwards the Scottish kings themselves made their way south of the Forth. In the reign of Eadred, Edinburgh, the border fortress of Nortlumberland to the north, became a Scottish possession. It is not clear on what terms this acquisition was made, or whether it was made in war or in peace. It is at least as likely, under the circumstances of the time, that it was a peaceful grant. But in any case it was the beginning of the process which brought the lands between Forth and Tweed into the possession of the Scottish kings, and which thereby turned them into English kings of a northern England, which was for a while more English than the sonthern England itself.**~~

~~**This period of war and conquest was also a period of legislation and intellectual advancement. In Atlfred we have the noblest name in all English history, the name of him who united more and more varied virtues than any other recorded ruler. 'The captain of his people, he**~~

was also their Jawgiver and their teacher. His laws, the first that can be called a code, laws drawn up by himself and then submitted by him tothe approval of his Witan, mark, as we have seen, when they are compared with those of Ine, a time when the distinction of Englishman and Briton had passed away from the West-Saxon kingdom. They are remarkable also for the great mass of scriptural and other religious matter which is brought in whole into their text. The laws of Eadward, of Acthelstan, and of Eadmund follow, and among them we have the text of the treaty between Atlfred and Guthrum, the earliest diplomatic in- strument in our language. In all these laws we may trace the growth of the various new ideas which have been already spoken of as having gradually made their way into the older Teutonic system. The king grows greater and greater. Already a sacred, and fast becoming an imperial personage, he is something widely different from the old kings who ruled only over Wight or half of Kent. The increase of his dignity, the increase of the extent of his dominion, raise him at every step above the mass of his people. And as tlie kingdom grows, the right of the ordinary freeman to a place in the general assembly of the nation becomes more and more shadowy. That assembly shrinks more and more into an assembly of bishops, ealdormen, and king's thegns, made ever and anon more

splendid by the appearance of vassal princes and kings. As the king grows in greatness, his immediate followers grow also. planted by the new nobility of the thegns. this change is the general depression of the churls as a class, while it becomes easier for this or that churl to raise himself to thegn's rank. On the other hand, the lowest class of all begins to have its lot lightened. The spirit of Christianity, if it does not yet venture to preach the emancipation of the slave, brings in provisions which lessen the rigour of the ancient law. And we now find the first of a series of well meant, though for the most part vain, attempts at least to hinder the slave from being sold out of his native land. Commerce and discovery are fostered. Thegn's rank is held out as

~~a reward to the successful trader by sea. Intercourse with foreign countries becomes closer and closer. No foreign wife shares the throne of the basileus of Britain; but the sisters of glorious Athelstan are given in marriage to the greatest princes of Western Europe. men and great events.~~

~~The old nobility of the earls is finally sup- Social The result of changes.~~

~~It was a great age for England, an age of great The West. The line of our hero kings, of Saxon~~

~~Eadward the Unconquered, of Atthelstan the Glorious, and kings.~~

~~of Eadmund the Doer-of-great-deeds, is only less famous than it should be, because even their names must yield to the unequalled glory of their grandfather and father. Towards the end of the period we see, for the first time in English history, the person of a great minister, the wise counsellor of wise kings. Our first recorded statesman who was not a king is, as might be looked for in that age, a churchman, the great Dunstan, the guide of England through many stirring years of war and peace. The Church had made the English a nation ; a great churchman was now foremost in making England a kingdom. A kingdom she now became, not yet indivisible, but still one. But one and strong and glorious as England stood in the central years of the tenth century, her unity and strength and glory were bought in no small degree by the loss of the ancient freedom of her people.~~

~~In literature this was a time which saw nothing short of Begin-~~

~~the beginning of English prose. have seen, the special home of learning and culture in England was in the north. Wessex had her scholars too, King Ine's kinsman Ealdhelm at their head; but the Jand of Beeda took the lead. In the confusions of the latter years of the eighth century the light of Northumbrian learning~~

~~For a long time, as we ning of English prose,~~

~~seems to have died out ; yet even at the time of Atlfred's Writings accession the great king places the greatest lack of learning of~~

~~south of the Thames. In the interval of peace between the wars at the beginning and the wars at the end of his reign, Alfred largely devoted himself to wipe out this stain. He was himself the first English prose writer on a great scale ; but his writings, in accordance with the modest and practical bent of his mind, were no displays of original genius, but translations, or rather paraphrases, of sucli Latin works, both on divine and on secular subjects, as he thouglit were fitted for the improvement of his people. But above anything that Atlfred wrote himself stands the really greatest literary work of his reign, the beginning of the English Chronicle as it now stands.~~

~~Beeda and the records of other lands were pressed into the service ; the work became contemporary in the minute and brilliant narrative of Ailfred's own reign. From his day it goes on, sometimes full, sometimes meagre, sometimes a dry record of names and dates, sometimes rising to the highest flight of the prose picture or of the heroic lay, but in one shape or another never failing us, till the pen dropped from the hand of the monk of Peterborough who recorded the coming of Henry of Anjou. We, and we alone among the nations of Western Europe, can read our own~~

~~Allfred.~~

~~The fragmentary The Eng- chronicles of earlier times were put together ; the history of lish~~

~~hronicle.~~

~~Dunstan.~~

~~286~~

~~story from the beginning in our own tongue in which we were born. But it must be borne in mind that, as we go on, we shall find that the English Chronicle is not one chronicle but many. The record which~~

~~began at the begin- ning of Ailfred was in the eleventh century continued in various monasteries, and the later parts of the several copies must be looked on, not as copies of a single work with some places where they differ, but as separate works which have some matter incommon. 'The tale is told in different ways, with much difference of local feeling and even of political creed. The different chronicles stop at different periods. That of Peterborough, as we lave hinted, stops suddenly in 1154.~~

~~England under A'lfred was a land where foreign merit was welcome, as under Charles the Great English merit had been welcome in other lands. The Briton Asser, the Old- Saxon John, the Frankish Grimbald, received at the West- Saxon court the same reception which Ealhwine had met with at the hands of the mighty Frank. Learning now prospered ; the monasteries were schools; but the native tongue flourished also. Of the wars of Eadward and Aithelfleed the Chronicle gives us a full military narrative ; in the following reigns the prose entries are meagre, but we get in their stead the glorious lay of Brunanburh and the shorter song of the deliverance of the Five Boroughs. Towards the end of our present period, Dunstan, the great statesman, began to appear as an ecclesiastical reformer. His name is connected with the movement of the last half of the tenth century for enforcing a stricter discipline on the monasteries and for substituting monks for secular priests in many cathedral and other churches. The English clergy, even those who formed collegiate bodies, were fond of the separate, and not uncommonly married, life of the secular priest. This supposed laxity now gave way in several episcopal churches to the strict Benedictine rule. Hence came the usage, almost but not quite peculiar to England, by which the bishop had, as his diocesan council and the ministers of his own special church, a body of men who had professedly renounced all the affairs of this world, That Dunstan shared in this movement there is no doubt. But it would be hard to show from real history that he was foremost in the movement; and it is far more certain that no merely ecclesiastical reform was the fore- most object in Dunstan's policy. The unity and the greatness of England were the first objects of the statesman whom Glastonbury gave to England.~~

~~Under Eadred the unity of England was formed. On his death the newly-built fabric seemed to break in pieces. The days of the grandsons of AZlfred, like the days of his brothers, were days when brothers succeeded one another after short reigns, and died for the most part childless. When Eadred died, there was no other son of Eadward the Unconquered to succeed him; nor does there seem to have~~

~~HNGLAND~~

~~–~~

~~[HHSTORY.~~

~~Mercia as under-king. The division was followed by a period, short, confused, and obscure, but of the highest im- portance both on its constitutional and on its ecclesiastical side. The facts which stand out without doubt are that Eadwig was the enemy of Dunstan and that Eadgar was his friend; that in 957 the kingdom of England was altogether divided by the Mercians and Northumbrians declaring their~~

~~under-king Eadgar full king in his own right ; that in 959 Reign of the kingdom was again united by the death of Eadwig and Eadgar.~~

~~the succession of Eadgar to the whole realm. But the causes which immediately led to these events are told with every kind of contradiction ; the characters of the actors are painted in the most vpposite colours. It is clear however that with the accession of Eadgar the party of the monks triumphed. It is clear also that under Eadgar's rule the land enjoyed sixteen years of unparalleled peace and of unparalleled prosperity. During his reign no word of foreign invasion was breathed, and the two or three disturbances within the island were of slight consequence. The well-known picture of the basileus of Britain rowed by eight vassal kings on the Dee, even if some of its details may be legendary, at least sets before us the popular conception of the dominion of Eadgar the Peaceful. On the other hand, when we turn to the personal character of the two brothers, it is dangerous to accept, without the closest examination, either the crimes which the monks lay to the charge of Eadwig or the crimes which the gleemen lay to the~~

~~charge of Eadgar. At no time in our early history did England hold a higher position in the world in general. And when Old- Saxon Otto wore the crown of Rome, and West-Saxon Eadgar, in some sort his nephew, reigned over the island empire of Britain, the Saxon name had reached the highest point of its glory.~~

~~The reign of Eadgar, there can be no doubt, did much for the unity of England. By birth a king of the south, he owed his crown to the men of the north. He strictly preserved the distinct laws and customs to which the great divisions of the kingdom, now beginning to be distinguished as West-Saxon, Mercian, and Danish, were severally attached. Commerce and intercourse with foreign countries is encouraged. 'The ecclesiastical reform led to increased splendour in ecclesiastical buildings, and the land was covered with minsters built on a scale before unknown. The kingdom thus built up and strengthened had presently to undergo the shock of a disputed election for the crown. Again the immediate royal family contained none but~~

~~minors, the two sons of Eadgar, Eadward and Atthelred. Reign of As far as we can see, Aithelred was supported by the party Had-~~

~~of the monks and Eadward by their enemies. Dunstan therefore distinctly sacrificed his party to his country when he brought about the election of Eadward, the elder of the boys, whose minority would therefore be the shorter. His short reign (975-979) was ended by his murder, done, there can be little doubt, at the bidding of his step-mother~~

~~fflithryth, the Elfrida of romance. Her young son AZthel- Reign of red then entered on the saddest and most shameful reign a in our annals. His time of thirty-seven years (979-1016)~~

~~been in the more distant branches of the royal family any one likely to command the unanimous voice of the nation. For a man who, though of kingly descent, was not the son~~

~~of a king to come forward as a candidate for the crown would hardly have been endured, except in the case of one who held a commanding~~

~~personal position, such as was held by no man in the realm save the mighty churchman. England had therefore more than once during this age to risk the woes which are denounced against the land whose king is a child. And the realm so newly united risked the dangers not only of minority but of division. The young sons of Eadmund, passed by according to ordinary rule on the death of their father, succeeded, for want of better candidates, on the death of their uncle Eadred. The elder, Eadwig, received Wessex as his immediate kingdom ; tke younger, Eadgar, reigned over Northumberland and~~

~~| something which words cannot set forth.~~

~~forms the most marked contrast to the short and vigorous reigns of the heroes who opened the century. For the first nine years of this unhappy time, Dunstan still lived; he was taken away before the fulness ofevil came. The main feature of this time is the renewal of the Danish invasions, which, after some years of mere plundering incursions, take their third form, that of a distinct political conquest, the establishment of a Danish king on the throne of all England. The constitutional lesson of this time is that, limited as the powers of an English king were by law, incapable as he was of doing any important act without the consent of his Witan, the difference between a good and a bad king was It was for the~~

~~THE DANISH WARs. |~~

~~Witan to pass decrees; but it was for the king to put them in force; and under Atthelred nothing good ever was put in force. The unready king —that is the king without rede or counsel—seems to have been incapable of any settled or vigorous plan of action. He showed energy now and then in needless and fruitless enterprises; but under him the kingdom never showed an united front towards the common enemy. His only policy, the only policy of his cowardly or traitorous advisers, was the self-destroying policy of buying off the invaders with money. The invaders are met at London, at Maldon, at Exeter, with the highest valour and conduct on the part of the leaders and people of particular cities and districts ; but it is always isolated cities and districts which resist. Such local efforts were naturally fruitless ; the local force is~~

~~either defeated by superior numbers, or, if victorious, it has, through want of concert with other parts of the kingdom, no means of following up its victory. Through a warfare like this, carried on year after year, the nation at last lost heart as well as its king. Local jealousies, hushed under the vigorous rule of earlier kings, now rose again. It is emphatically said that one shire would not help other. Under such a reign the efforts of the best men in the land were thwarted, and the places of highest power fell to the worst men. The successive advisers of Atthelred appear as a succession of traitors, who sold him and his kingdom to the enemy. The last of them, Eadric, whom Aithelred made earl of the Mercians and married to one of his many daughters, plays the chief part in the revolution which in the end placed the Dane on the English throne.~~

~~Begin- The staple then of the history of this time is foreign~~

~~ning of warfare, and that mostly warfare which takes the shape of~~

~~inter- invasion of England. But this time is marked also by with 'reign intercourse of another kind, intercourse which may Nor- at the time have seemed of no great importance, but which~~

~~mandy. helped, together with the Danish invasions, to lead the way to events greater even than the Danish conquest itself, English political intercourse with other lands had hitherto~~

~~been mainly with the Franks in Germany and Gaul, and~~

~~with their successors in Germany, the Saxon emperors.~~

~~In the course of the tenth century, the new powers of France~~

~~and Normandy had sprung up in what had been the western or Gaulish part of the Frankish dominion. The~~

~~king of the French at Paris was cut off from the sea by his~~

~~vassal the duke of the Normans at Rouen. While Nor- mandy was a practically independent state, there could be~~

~~hardly any dealings, in war or in peace, between England and France. But it was through its connexion with Normandy~~

~~that England became entangled in the affairs of France,~~

~~and the connexion between England and Normandy begins~~

~~under Aithelred. England and France might doubtless in~~

~~the end have become rival powers in some other way ; but~~

~~the way in which they actually did become rival powers was through a chain of events of which we have now reached~~

~~the beginning. Two quarrels between Aithelred and the Norman duke Richard were ended by a peace and a Marriage Marriage (1002) between Authelred and Richard's daughter of Mithel- Emma. Here was the beginning of the causes which led re pes to the Norman Conquest. Emma brought with her * Norman followers, some of whom were trusted with com- mands in England. The kindred between the ruling families of the two lands which came of the marriage of~~

~~Emma led to increased intercourse between Normandy~~

~~and England, to Norman interference with English affairs,~~

~~to the settlement of Normans in England, to the claims~~

~~of Duke William and to the Norman Conquest. When Normandy and England were under a common sovereign,~~

~~France became in some sort a neighbour and an enemy of England. The rivalry between Normandy and France~~

~~led to a rivalry between England and: France, and that~~

rivalry went on after France had swallowed up Normandy. Thus not only the Norman Conquest, and the internal changes which followed it, but the French wars of the four- teenth and fifteenth centuries, and the long abiding enmity between Englishmen and Frenchmen, have their direct source in the events of the reign of A‘thelred.

This last series of Danish invasions began, in the form Deuth of of mere plundering incursions, in 980. In 991 a formid- Briht- able invasion, Norwegian rather than Danish, and in which ”° ie the famous Norwegian king Olaf Tryggvesson seems to have had a share, was marked by two opposite events, each alike characteristic of the time. Brihtnoth, the caldorman of the East-Saxons, died with his thegns around him in the fight of Maldon, and his fall is recorded in one of the noblest of Teutonic battle-songs. Aithelred’s earl, as he calls himself in the song, met the invaders with steel ; but fEthelred himself had no arms but gold. The year of Brihtnoth’s death was the very one in which the invaders were for the first time bought off with money. In 994 came a great joint invasion under the two kings of the north, Olaf of Norway and Swegen of Denmark. They were beaten off by the Londoners. Aithelred again bought peace ; Olaf, converted to Christianity, kept the peace and vanishes from the story; but the war went on, if not with Swegen himself, at least with his Danes. After eight years of invasions, payments, brave local resistance, and inaction and treason at head quarters, came the general massacre Massacre of the Danes in England on the day of Saint Brice in . alls 1002. This of course does not mean the slaughter of all the men of Danish descent in England, but simply the slaughter of those men of the invading host who had stayed in England, under cover of a treaty. Then came in 1003 a more terrible invasion by Swegen in person, when Exeter was betrayed to him by a Norman follower of the queen’s.

A valiant resistance in East-Anglia checked the invasion at

the time, and Swegen himself did not appear again for some

~~years. In the next stage, in 1006, the Danes first ravaged the~~

~~inland part of Wessex. In 1010 comes the invasion of Thurkill ; and the battle of Ringmere near Ipswich marks~~

~~the last armed resistance. In 1013 Swegen came again.~~

~~All strength and all hope was now gone; Aithelred was Swegen deposed, and took refuge in Normandy, and the Danish acknow- king was acknowledged as king—though native writers a choose rather to call him tyrant—over all England. =a~~

~~This Danish conquest of England, taking the form of a forced election of the conqueror, is something widely different alike from mere plundering incursions and from mere local settlements. It shows that we have got into the age of great powers. The king of an established king- dom adds another crown to the one which he has already, and strives to give his conquest an outward show of legality. Swegen's conquest is in this way almost a literal foreshadowing of the more famous conquest of William.~~

~~But Swegen's conquest was only for a moinent; he died~~

~~the next year; his Danish host chose his younger son~~

~~Cnut as his successor ; the English Witan voted the restor- First ation of Aithelred. In Denmark, it must carefully be election marked, Swegen was succeeded by his elder son Harold, @™™* Cnut was chosen king over England only. A Danish dynasty was to reign in England; it was not yet ruled~~

~~that Denmark and England were to have a single king.~~

~~The war was now renewed between Cnut and Eadimund, surnamed Ironside, one of the younger sons of Avthelred. Englishmen had again a hero at their head, and, under his guidance, the whole state of affairs was changed. In the~~

~~midst of this second war, in 1016, Aithelred died. A double election took place; Cnut and Eadmund were chosen to succeed by two distinct bodies of the English Witan. Eadmund, it would seem, was chosen, at such a~~

~~this time there is no doubt. But in 1031 Malcolm of Scotland, and two under-kings, the famous Macbeth and one described as Jehmarc, did full homage to the King of all England. The northern king thus held his dominions in three distinct forms. In Scotland proper he was simply under the terms of the old commendation. Cumberland, whatever extent of territory comes under that name, was strictly a territorial fief. Lothian was an earldom held within the kingdom of England.~~

~~The position of Cnut, both as a man and as a king, Cnnt's derives a special interest from his being a convert to relation Christianity. His father Swegen was an apostate. Ho i had been baptized in his childhood or youth; but be cast hun~~

~~moment, over the head and with the consent of his elder brother AEthelstan. A series of battles followed, in which Eadmund had decidedly the upper hand, til] the last fight at Assandin, that is, Ashington in Essex, was lost_ by the treason of Eadric. The kingdom was divided ; Kad- mund took the south with a formal supremacy; Cnut took the north. The division was hardly made when Eadmund died mysteriously, by the practice of Eadric, as men deemed. And now another and final election gaye Cnut the crown of the whole realm.~~

~~Reign The personal character of Cnut, his gradual change from~~

~~and cha- g barbarian conqueror into a king who stood beside~~

~~racter of Aifred in the memory of his people, makes him one of the~~

~~His do- minions.~~

~~most interesting studies in our whole history. But we have here to deal mainly with the political results of his accession. England was now brought more closely than ever into relations with other parts of the world. But those relations took a shape which was altogether new and unexpected. Cnut was a conqueror, and his establishment in England was a conquest, so far as that a foreign king made his way to the English crown at the sword's point. And, when he had worn the crown, he did not scruple to secure it by the death or banishment of such Englishmen as he thought dangerous to him, either on account of their connexion with the former royal house or on any other ground. But, when he had once made himself safe on the throne, there was uothing more of the conqueror about him. England was neither oppressed nor degraded under his rule. His government, his laws, were framed after the pattern of those of the ancient kings. He sent home his Danish army, keeping only a body of chosen guards, the famous housecarls. These were the first standing army known in England, a body of picked men, Danes, English- men, or brave men from any quarter. Cnut gradually displaced the Danes whom he had at first placed in high offices, and gave them English successors. He raised an Englishman, the renowned Godwine, to a place second only to kingship, with the new title of Earl of the West-Saxons. In her foreign relations, England, under her Danish king, was in no sense a dependency of Denmark. England was the centre, Winchester was the imperial city, of a northern empire, which rivalled those of the East and the West. Cnut, it must be remembered, was chosen to the crown of England first of all, while still very young. To that crown he added the crown of Denmark, on the death or deposition of his brother Harold. He won Norway, which had revolted against bis father, from its king Olaf; and he seems to have established his power over part of Sweden and other parts of the Baltic lands. But all these were acquisitions made by one who was already " King of all England ;" * they were largely won by English valour, and: the complaint in Denmark and elsewhere was that Cnut made his northern kingdoms subordinate to England, and preferred Englishmen rather than natives to high offices in them. At home, after the first years of his reign, his rule was one of perfect peace. In 1018 a~~

~~Scottish victory at Carham secured all Lothian to the Scottish king. This~~

~~already begun.~~

~~aside his new faith, and carried war into England as a heathen conqueror. His son Cnut was baptized in the course of his English wars, and he appears in English history as a Christian king, a devout king, a special favourite of the Church and her ministers. His laws are strong on all ecclesiastical points, and they contain—what was need- ful in his day, but which had not been needful, in Wessex at least, for some ages—a crowd of provisions for the suppression of heathen worship. In Denmark he appears as completing the conversion of that kingdom which had His newly born religious zeal led him, like 4Ethelwulf, to make the pilgrimage to Rome. His recep- tion there by the pope, the emperor, and the Burgundian king, helped to raise the position of England and her sovereign in foreign eyes; but it had no other political result.~~

~~One change, the fruit of which was chiefly seen a little cnut's later, was made by Cnut in the administration of the earls.~~

~~kingdom. As far as we can see, the rule had hitherto been for each shire to have its own caldorman. One caldorman sometimes held several shires, and the arrange- ment, at any rate under Aithelred, was confused and fluctuating ; under Cnut it was organized in a new shape. Four great chiefs were set over the four great divisions of the kingdom, Wessex, East-Anglia, Mercia, and Northum- berland. The Danish title Jarl or Earl, hitherto used only in Northumberland, was now substituted for caldor- man. We find also smaller earls of one or more shires ; but it is plain that these were subordinate to these great governors. Wessex, above all, received now for the first time, in the person of Godwine, a governor distinct from her king.~~

~~The relations between England and Normandy now get Relations fEthelred had found shelter with Nor in the Norman court with his brother-in-law Duke Richard. ™224Y-~~

~~closer and more important.~~

~~The young Aithelings, Alfred and Eadward, the sons of AXthelred and Emma, were brought up at the court of their uncle. But, strange to say, their mother Emma entered into a secoud marriage with Cnut himself, who must have been many years younger than she was. With Richard of Normandy Cnut kept unbroken peace ; but Richard's more adventurous son Robert asserted the rights of his cousin and threatened— perhaps attempted—an invasion of England on their behalf. Robert presently died on his famous~~

~~Rela- | was the carrying out of the work which had been begun | pilgrimage. In the same year (1035), Cnut himself died, tions —_ by the Scottish annexation of Edinburgh. Whether there | still in the prime of life, after a reign of only eighteen eG had been an earlier grant, or an earlier conquest, of.| years from his final election.~~

~~Lothian is uncertain. Of its Scottish occupation from~~

~~1 This is merely a probability, not an ascertained fact ; but several circumstances point to such a supposition, there is nothing to con- tradict it, and it would explain several difficulties. See History of the Norman Conquest, i. 691, ed. 3.~~

- ~~Up to this time the title is always " King of the English," never 'King of England." Cnut uses the special style of " King of all Englaud," 'Rex totius Anglie." This is not strictly a territorial style ; still less is it the style of aconqueror. The object is to distin- guish his kingship over all England from his earlier divided kingship when the land was parted between him and Eadmund.~~

~~Such a dominion as the northern empire of Cnut was Division Such a power can hardly of Caut's The dominions of &™P7®~~

~~in its own nature ephemeral. endure beyond the life of its founder. Charles the Great, geographically continuous and bound together both by Roman and by Frankish traditions, could not be kept under one ruler. Much less could the scattered empire of great islands and~~

~~peninsulas which Cnut had brought under his power. Not only did his empire break in pieces, but his kingdom of England was again, for the last time, divided. Of his empire he himself had decreed~~

~~OO~~

~~THE DANISH KINGS. |~~

~~the partition. He had in some sort begun it in his life- time. His sons had been sent to reign as under-kings in Denmark and Norway. As his successor in England he named Harthacnut, his son by Emma, who at his death was under-king in Denmark. But the succession to the English crown was disputed. Godwine and the West- Saxons asserted the claims of Harthacnut, according to his father's will. Mercia and Northumberland declared for Cnut's doubtful or illegitimate son Harold. A civil war might have been looked for; but a decree of the Witan divided the kingdom between the two candidates. Hartha- cnut, now king of the West-Saxons, tarried in Denmark, and left his English kingdom to the care of Emma and Godwine. Now, and not under Cnut, the West-Saxon realm seemed to be dealt with as a province of Denmark. The offended subjects of Harthacnut voted the deposition of their non-resident king, and the crown of the whole realm passed to Harold. Since that day England has been an united kingdom. Its crown has often been disputed and struggled for in arms; but every claimant has been a claimant of the whole kingdom. The division of England between two kings has never been seriously proposed since the deposition of Harthacnut.~~

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~~The election of Eadward was in some sort the beginning of the Norman Conquest. The English nation had chosen Eadward, who seemed an Englishman, rather than Swegen, who seemed a foreigner. But Eadward was in truth far more of a foreigner than Swegen. Born in England, but taken to Normandy in his childhood, he was in speech and feeling far more Norman than English. His monastic virtues won~~

~~him the reputation of a saint and the title of Confessor, but no man could have been less fitted to wear the crown of England in such an age. His reign falls into two parts. Elected mainly by the influence of Godwine, Eadward married his benefactor's daughter, and raised his sons to earldoms. But the greatness of the West-Saxon earls was looked on with more or less j ealousy by central and northern England, or at least by the earls who ruled over them. According to the division of Cnut, Northumberland was ruled by the Danish Siward, Mercia by Leofric, seemingly a descendant of the ancient kings of Mercia. Leofric himself was, as a party leader, eminently moderate and conciliatory ; but the rivalry between his house and the house of Godwine formed a marked feature in the reign.~~

~~Eadward~~

~~the Con- fessor.~~

~~The very thought Meanwhile the king himself filled every place that he Banish- could with Norman favourites, who plotted against English- ment of men of every district and party. Above all, the king was G° ¢wine.~~

~~under the influence of the Norman Robert, a monk of~~

~~of such a thing had altogether passed out of men's minds before the end of the century with which we are now dealing.~~

~~Reignsof The divided reign of Harold and Harthacnut was~~

~~Cnut's sons,~~

~~matked by an event which is told in as many and as con- tradictory shapes as any event in our early history. But it is certain that Alfred, the elder of the two Aathelings who were living in banishment in Normandy, came over to England to make an attempt on the crown. The case is an exact parallel to the coming of the two Stewart pre- tenders seven hundred years later. As Allfred landed on the south coast, his immediate design must have been on the kingdom of Harthacnut ;~~

~~but he came, in some way or other, into the power of Harold. His Norman companions were put to cruel deaths ; the Aitheling himself was blinded, and died soon after. Such dealings are quite contrary to either the English or the Norman practice of the age. It shows that the son of Cnut, unlike his father, retained the full spirit of a Scandinavian pirate. That Earl Godwine had a share in the crime was rumoured in his own day ; but, as the tale is commonly told, it is absolutely impossible. If his guilt was asserted by some, it was carefully denied by others ; he was tried on the charge, and was solemnly acquitted; and, in the state of our evidence on the subject, he is entitled to the benefit of that acquittal. The reign of Harold was short. On his death in 1040, Harthacnut was chosen to the whole kingdom. A son of Emma, therefore a half brother of the surviving Aatheling Ead- ward, he sent for that prince to his court. But Hartha- cnut proved as worthless and brutal as Harold, and his Teign, like Harold's, was short. On his death in 1042, the English nation were thoroughly tired of Danish rule. The memory of Cnut could not outweigh the infamy of his two sons, There was still a Danish party, whose candi- date was Swegen, the nephew of Cnut through his sister Estrith, a prince who afterwards ruled Denmark with consummate prudence, But the English people had made up their minds to go back to the old kingly stock of the West-Saxons. In two distinct elections the nation chose the Atheling Eadward, an unwilling candidate, recom- mended by his birth. But at such a moment English and kingly birth outweighed every other consideration. It should be also remarked that Eadward, like so many other kings, was chosen over the head of a nephew, who, according to modern ideas, was the direct heir. This was another Eadward, the son of his elder brother Eadmund Ironside. But he was far away in Hungary and none thought of him.~~

~~Jumiéges, whom he raised successively to the bishopric of London and the archbishopric of Canterbury. The influence of strangers was now at its height ; so was their insolence. Against the king's foreign favourites no justice could be had. Godwine and his sons took up arms in the cause of the nation (1051). He was induced to abide by the decision of a national assembly, by which he and his sons were banished. The power of the strangers now seemed secure. William, duke of the Normans, a~~

~~kinsman of Eadward through his mother, visited Eadward ; and it was most likely now that Eadward made to him that promise of the succession to the crown on which William afterwards founded his claim to succeed him. It seemed as if the Norman conquest of England had been already brought about without slash or blow. The king was Norman in feeling ; he was surrounded by Norman courtiers ; Normans and other men of French speech held high offices and great estates. The peaceful succession of the Norman duke to the English crown seemed far from unlikely. But all this was only on the surface. It is needless to show that a king of the English had no right to bequeath his crown. The utmost that he could do was to recommend a candidate to the Witan, and their choice was, under all ordinary cir- cumstances, confined to the royal house. William. himself might doubtless see through all this; but his kindred to Eadward,'the bequest of Eadward in his favour, worthless as either was in point of English law, were advantages which he well knew how to turn to his own purposes.~~

~~A peaceful conquest of this kind, had such a thing been possible, would have been an unmixed evil. When the actual Norman Conquest came, its final results were on the whole for good. But that was because the violent overthrow of our national freedom did in effect breathe a new life into the nation. It called forth the spirit of Englishmen, and step by step we won back more than we had lost. But had the Normanizing schemes of the Confessor been carried out, the ancient freedom would have been under- mined rather than overthrown ; there would have been less to call forth the full strength of antagonistic feelings, anda England might, without knowing it, have sunk to the level of continental states. It is therefore not only in the patriotic view of the moment, but in the longest-sighted view of general history, that we set down the return of Godwine and his sons in the year after their banish-~~

~~Schemes of Wil- liam of or- mandy.~~

~~Return of God- wine,~~

~~Adminis- tration of Harold.~~

~~ment as one of the great events of our history. 'They came in arms; but the nation received them with- all gladness, and the army which the king had brought together refused to fight against the deliverers. The restoration of Godwine and his sons, and the banishment of the archbishop and of a crowd of other Normans, was decreed in a national assembly which was one of the most memorable in English history. The old Teutonic constitu- tion revived. At such a moment the Witenagemédt ceased to be a mere gathering of the chief men of the realm. The nation itself came together. Such a name may fairly be given to an assembly made up of the citizens of London and of the two armies which had refused to fight against one another. This is the most conspicuous among several instances which show that, narrow as the constitution of the national assembly had become in ordinary practice, the rights of the common freemen were only dormant, and could still be made good whenever circumstances were favourable for making them good. It should be noticed also that this armed assembly of the nation took upon itself to depose an archbishop, and seemingly to nominate his successor. So to do was, there can be no doubt, fully within the powers of an English national assembly. But the breach of all ecclesiastical rule, as ecclesiastical rule was understood on the continent, was turned by Norman cunning into another count against England and her deliverers.~~

~~Godwine died the year after his return, and his place in the kingdom was taken by his son Harold. His policy was one of conciliation, The king was allowed to keep his personal favourites about him ; but the Norman influence in public affairs was stopped. On the other hand, Harold cultivated the friendship of Germany, and many Lotharingian churchmen were promoted in England. The Welsh were now again formidable, having been united under a vigorous prince named Gruffydd ap Llywelyn. After some victories over other Euglish commanders, the Britons were at last brought to more complete dependence by Harold himself, in a war in which Gruffydd was killed~~

~~by his own people. Earlier than this, the Northumbrian earl Siward had overcome Macbeth, and had restored the Scottish crown to Malcolm, the heir of the former kings.~~

~~England thus, under the administration of Harold, held a high place at home and abroad. Still there were several sources of weakness, all of which the Nornian knew how to make use of. When the Norman archbishop Robert was deposed and banished, his English successor Stigand was looked on at Rome as an usurper of the see. In the early years of Eadward, Roman influence had greatly grown in England, and the canonical scruple about Stigand's appoint- ment was shared by many at home. And when at last Harold procured the acknowledgment of Stigand from Pope Benedict X., matters were only made worse; for Benedict himself was presently declared to be an usurper. It was of more importance still that Harold himself was alleged to have entered into some personal engagements with Duke William. The tale, which comes to us only from the Norman writers, is told with so much contradiction that it is im- possible to get at the exact truth. The Normans gave out that Harold was sent by Eadward to announce his bequest of the crown to William, that he did homage to William, engaged to marry his daughter, and promised to promote his succession at Eadward's death and to give him immediate possession of the castle of Dover. This tale is altogether impossible ; but it is very likely that Harold was ship- wrecked on the shore of Ponthieu and imprisoned by its count Guy; that he was released by the interference of Dnke William; that, in return for this favour, he helped him in his war with the Bretons ; that he promised—though an Older man than Duke William—to marry his daughter ;~~

~~and that he did an act of formal homage to his intended father-in-law and temporary military commander. Here is most likely the germ of the story, a story about which the contemporary English writers are significantly sileut, while the Normans improve it into such forms as suited their own purposes. It is plain that the canonical question about~~

~~Stigand, and the story of Harold's oath, gave every oppor- tunity, when the time came, to represent the English as a sacrilegious and schismatic people, and their ruler as a man faithless to his oath.~~

~~While these sources of danger were growing up abroad, a third source was growing up in England itself. The rivalry between the West-Saxon and the Mercian, between the house of Godwine aud the house of Leofric, went on. The character of Leofric himself is without stain ; but his son filfgar did not scruple to ally himself with the Welsh~~

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~~against England, Outlawed and restored, he held his Banish. father's earldom of Mercia till his death, when it passed to ment of~~

~~his son Eadwine. But, in the latter days of Eadward, all the rest of England was under the government of the sons of Godwine. Of these Tostig had succeeded Siward in Northuniberland. He was a personal favourite of the king, and his appointment may well have been King Eadward's own act. In the last year of Eadward's reign the Northumbrians deposed Tostig, and chose as their earl Morkere, the brother of Eadwine. Rather than plunge the country into a civil war, Harold confirmed the choice of the Northumbrians. Tostig went into foreign lands to complaiu of his brother, and to plot against his country. Harold thus drew on himself the enmity of his brother, without winning the gratitude of the sons of Ailfgar.~~

~~Such were the threefold dangers which threatened England when Eadward died, January 5, 1066, while the Witan were assembled at Westminster for the Christmas feast. Eadward was childless, and the question of the suc- cession must have been in men's minds during the whole of his reign. That he promised the crown to William at the time of the duke's visit is, as we have seen, very likely. But such thoughts passed away under the administration of Harold. Eadward sent for his nephew Eadward from Hungary, clearly designing him as his successor. The younger Eadward came to England and died. He left two daughters, and a son Eadgar, young and of little promise, who was at Eadward's death the only male left in the royal family. In such a strait,~~

~~it was needful to look for a king beyond the royal family. Eadward on lis death had recom- mended Harold to the choice of the electors, a recommenda- tion which was willingly accepted. Harold was chosen and crowned, taking care to avoid any question as to the validity of the crowning rite, by having it performed, not by Stigand, but by Ealdred archbishop of York. The Northumbrians for a moment refused to acknowledge the election of the new king ; but he won them over by his presence and the eloquence of his friend Wulfstan bishop of Worcester. It was most likely at the same time that he tried to win the northern earls to his side by a marriage with their sister Ealdgyth. This was a direct breach of his promise to William; and, as Ealdgyth was the widow of Gruffydd of Wales, this last fact was made a further charge against him by the Normans.~~

~~Tostig,~~

~~Election of Harold.~~

~~Of the lawfulness of Harold's succession, according to the Its law-~~

~~English law of the time, there can 'be no doubt. nominated by the late king, regularly chosen, regularly con- secrated. The Witan had always exercised a free choice within the royal house, and the same principle would~~

~~He was fulness.~~

~~justify achoice beyond the royal house, when the royal'~~

~~house contained no qualified candidate. Minorities had been endured after the death of Eadred and after the death of Eadgar. But then the only man in the land who held at all the same position as Harold now did was the~~

~~churchman Dunstan. In fact the claims of Eadgar do not seem to have been put forward at the time. They begin to be heard of at a later time,~~

~~when the notion of strict hereditary right was growing. When Harold is blamed at the time, it is not for disregarding the hereditary right of Eadgar, but for breaking his own personal engagement to William. Whatever was the nature of that engagement, its breach was at most a ground of complaint against Harold personally; it could give William no claim as against the people of England. According to English law, William had no shadow of claim. The crown was not hereditary but elective; and he was not elected to it. Nor had he even any hereditary claim; for he was not of the kingly stock of Cerdic. The alleged bequest of Eadward was cancelled by the later bequest in favour of Harold. The whole question was a personal question be- tween William and Harold. A single act of homage done by Harold to William when in William's military service could not bind Harold to refuse the crown which the nation offered him. The engagement to marry William's daughter was undoubtedly broken. To this charge we have Harold's own answer: A King of the English could not marry a foreign wife without the consent of his Witan. Claimsof William then had no claim to the crown on any showing,~~

~~land was without a leader, and therefore without union. Local resistance was often valiant; but it was only local resistance, and the land was conquered bit by bit.~~

~~On the death of Harold, the Witan in London chose His elec- Eadgar to the vacant throne. But the Mercian earls failed 0″ s~~

~~him, as they had failed Harold ; and their treason hindered any general national resistance. Before the end of the year, the newly chosen king and a large body of the chief men of the realm found it expedient to submit to the invader. He had then subdued the shires south of London, whose forces had been utterly cut off at Senlac; he had crossed the Thames and threatened the city from the north. He was now chosen king and crowned at Westminster on Christmas day. He was thus king by the submission of the chief men, by the rite of coronation, and by the absence of any other claimant. But he was very far from having full possession of the whole kingdom. His actual authority did not go beyond the south-eastern part of the country. His dominions certainly~~

reached from Hampshire to Norfolk. They probably took in Wiltshire, Oxfordshire, and Northamptonshire, with an outlying post in Herefordshire ; but the north, the south-west, and the greater part of central England were still unsubdued.

William. either of natural right or of English law. But, by artfully The conquest of these still independent districts was the Progress working together a number of points which had no real | result of a series of local campaigns spread over about two % the: bearing on the matter, he was able to make out a plausible | years, from the beginning of 1068 to the beginning of 1070. "a case in lands where English law was unknown. His | In 1067 William visited Normandy, and the oppression of Plate HT,

kindred to Eadward, the alleged bequest of Eadward, the alleged perjury of Harold, the alleged wrong done to Archbishop Robert and the other Normans, were able to be worked into a picture which gradually won supporters to William, first in his own duchy, and then beyond its bounds. His own subjects, who at first listened but coldly, were before long stirred to zeal in his cause. Foreign princes encouraged him; to the Roman see above all it was the best of opportunities for winning increased power in England. Pope Alexander H., under the influence of his archdeacon Hildebrand, afterwards the renowned Pope tregory VH., approved of William's claims. He was thus able to cloke his schemes under the guise of a crusade, and to attack England alike with temporal and _ spiritual weapons.

Wil- Thus doubly armed, the Norman duke set forth on his liam's in- enterprise against England. He had not a single partisan Ma in the country; but Tostig, the banished Englishman, was " "indirectly doing his work. For Tostig William was too slow; he betook himself to Harold Hardrada, the famous king of Norway, and either stirred him up to an attempt on England or joined him in an attempt which he had already planned. Harold of England was thus attacked at once by two enemies, either of whom alone it might be hard to overcome. The Norwegian came first; he landed in Yorkshire, defeated Eadwine and Morkere at Fulford, and on September 24 received the submission of York. Harold

~~of England on the morrow overthrew the Norwegian invader at Stamfordbridge. Three days later the Normans landed at Pevensey ; the English king marched southward; the northern earls kept back their forces, seemingly in the hope of a division of the kingdom. On October 14, Harold, at the head of the men of Wessex, East-Anglia, and part of Mercia, met William and his host on the hill of Senlac. After a hard-fought struggle, the Normans by a stratagem made their way on to the hill; the king was wounded by an arrow and cut down by four Norman knights, and his personal following was slaughtered around him. The first step in the conquest of England was thus taken; but the work was far from being done. After the fall of Harold, William had never again to fight a pitched battle; the~~

~~his lieutenants, his half-brother Odo, bishop of Bayeux and earl of Kent, and William Fitz-Osbern, earl of Hereford, stirred up revolts in Kent and in Herefordshire. The Kentish revolt took the strange form of an alliance with a foreign prince, Eustace count of Boulogne, who had been himself in William's service in his invasion. In Hereford- shire the movement was more strictly national, though its chief, Hadric, surnamed the Wild, who had never submitted to William, did not disdain an alliance with his Welsh neighbours. Eadric in fact held out till a much later time ; but the Kentishmen with their foreign allies were subdued before William's return. At the end of the year the king came back, and with the beginning of the next year he betook himself to the conquest of what was still unconquered. His first march was towards the west, where Exeter and the whole of western England were still independent. 'They were first subdued in the spring of 1068. After a revolt in the next year, after two attempts in successive years on the part of Harold's sons, western England was finally subdued in the course of 1069. Northern England, as far as the northern boundary of Yorkshire, was first conquered in the autumn of 1068. An attempt on Durham in January 1069 was defeated. York and the North generally revolted more than once. In September 1069 Swegen of Denmark sent a great fleet to the help of the English, who were under the leadership of Eadgar, Waltheof the son of Siward, earl of Northampton and Huntingdon, and the other northern leaders. But, in the course of the winter of 1069-1070, the whole of northern and central England was~~

finally conquered, Chester being the last point to hold out. After this time there were local revolts, but no very general resistance of any large part of the country. Early in 1070 William reviewed and dismissed his army at Salisbury. At the Easter feast of the same year, being now full king over all England, he was again solemnly crowned by legates from Rome.

A distinction must be carefully drawn between the resistance to William's arms in those districts which had never submitted to his authority and the revolts which happened after his power was fully established. The two are however divided by a very short interval of time. In the course of the summer of 1070 the fen-land was in

of Here- never have fully submitted ; still the warfare there was a

war. new and distinct outbreak, and not a continuation of the earlier warfare at Exeter, York, and Chester. The abbey of Ely was the centre of resistance, and, in a country which so often formed the last shelter of defeated parties, it was defended for about a year. Harl Eadwine was slain on his way to join the insurgents; Morkere was in the island at the time of its surrender, and was condemned to a life-long imprisonment. Hereward alone, with a few valiant followers, escaped by sea. He appears to have been afterwards reconciled to William, and even to have served him in his foreign wars. The manner of his death is uncertain.

Wil- The war at Ely was the last patriotic warfare on the an part of the English against William. He was now undis- ee puted master of England; the nation had learned that the time for national resistance was past, and that local revolts could avail nothing. On the Welsh border he established the great earldoms of Chester, Shrewsbury, and Hereford, whose holders largely extended the power of the English kingdom at the expense of the Britons. Northumberland was entrusted to the care of a succession of earls, first English, then Norman. But on

~~this side the frontiers of the kingdom were not at this time enlarged. Relations But from the very beginning of William's conquest the with northern frontier was a source of the deepest anxiety. The~~

~~Scotland. panished English, and specially the royal family, found shelter at the court of Malcolm of Scotland, who married Margaret, the sister of Eadgar. Under cover of asserting their rights, Malcolm cruelly ravaged northern England. But in 1072 William himself entered Scotland and received the homage of Malcolm at Abernethy. He had thus succeeded to the empire, as well as to the immediate kingdom, of his West-Saxon predecessors. In the next year he employed English troops on the continent in winning back the revolted county of Maine. In 1074 he could afford to admit Eadgar, the rival king of 2 moment, to his favour.~~

~~A revolt which took place in 1075 only showed how firmly William's power was established, and how little disposition there was on the part of the English to rise against him. Two of his own earls rose against him. One, Ralph earl of Norfolk, was an Englishman by birth; but as he came over with William and served with him at Senlac, he must have been banished under Eadward or Harold. His fellow rebel, Roger earl of Hereford, was the son of William's special friend William Fitz-Osbern. These two revolted; but they had to trust mainly to the help of Breton mercenaries or adventurers: Normans and English were leagued against them. The revolt was crushed; Ralph escaped; Roger, like Morkere, spent the rest of his days in prison. But their fall brought down with them the last Englishman who held a secular post of the first rank under William. This was Waltheof, formerly the leader of the English at York, but who had submitted again and had been received to the king's highest favour. Besides his former earldoms of Northampton and Huntingdon, he had received the earldom of Northumber- land. That name now means so much of Bernicia as had not passed to the Scottish kings; that is, the present county so-called. Waltheof seems to have listened to the plans of his brother earls; but he took no part in their revolt, and he even revealed the conspiracy to William. Yet he was the only one of the three whose life was taken. After a long imprisonment, he was on May 31, 1076, beheaded at Winchester. At no~~

~~other time in William's long reign did he send a political enemy to the scaffold ; and Waltheof could hardly be called a political enemy. The Norman courtiers and his own Norman wife, the king's niece~~

~~Revolt of the earls,~~

~~Eixecu- tion of Wal- theof,~~

~~ENGLAND~~

~~revolt under Hereward. That inaccessible district can |~~

~~[HISTORY.~~

~~Judith, seem to have called for his blood. By the English he was looked on as a saint and martyr.~~

~~The last eleven years of William's reign are far richer in continental than in English events. He was engaged in wars with his French and Breton neighbours, and with his rebellious eldest son Robert. In England a Danish invasion in 1075, in concert with the revolt of the earls, led toa sack of York, and to nothing further. In 1080 Walcher, Murderof bishop of Durham and earl of Northumberland, was killed aa in a popular tumult. A revolt it could hardly be called ; "cher. but it was crnelly punished by the king's brother Bishop Odo. After this we do not hear of so much as a tumult.~~

~~In 1086 an invasion from Denmark was again threatened~~

~~by the Danish king Cnut. His enterprise was stopped by~~

~~his death by the hands of his own subjects, which won him, somewhat strangely, the honours of martyrdom and the title~~

~~of a saint. The next year, 1087, William himself died of Death of an accidental hurt received while burning the town of William, Mantes in warfare with his neighbour and lord, Philip king~~

~~of the French.~~

~~The Conqueror was now gone, but the tale of the Con- Accession quest is not quite over. One act more of the drama a Wil- is still to be told before we stop to consider the nature, Buta the cause, and the results, of this wonderful revolution. Revoltof By the dying will of William, Normandy passed to his the Nor. eldest son Robert; England he wished to be the portion ™@2ssup- of his second son William. William, surnamed the Red, Pe was acknowledged and crowned without opposition. In English, the next year (1088) almost the whole of the Norman nobles rebelled on behalf of Robert. The king appealed to his English subjects. By their valour, seconded by the loyalty of the bishops, the Norman revolt was put down, and the crown of the Red King was made safe. This was the last time that Normans and English, as such, met in arms on English soil. The work of the Conquest had been so thoroughly done that it could bear in a certain sense to be undone. The conquest made by the Norman had been so thorough that it was not disturbed even by English victories over Normans. Within twenty-two years after William's landing, his son, the second Norman king, owed his crown to the support of the native English against his own country- men. Signs of distinction and jealousy between the two races may be discerned for some time longer ; but the last open warfare between them was when the English defended the throne of William Rufus against his Norman rebels.~~

~~Such is a short sketch of the leading events of the period Character which we may call the period of the Norman Conquest. a the Looking at it simply as an event, it is most important to "24 bear in mind its gradual nature. Nothing can be further from the truth than the notion that England passed at once into the hands of the Normans after a single battle. Still there is a sense in which it is not untrue to say that England was conquered in a single battle. After the fall of Harold, at all events after the northern earls withdrew their forces from the service of Eadgar, the conquest of England was only a question of time. Just as in the days of Authelred, there was no acknowledged leader; and throughout that age, under a worthy leader, the English people could do everything; without such an one, they could do nothing. There was no man who could gather the whole force of the nation around him. There was no man who could stand up as William's rival either in~~

military or in political skill. Hence, after the one great battle, there was no common effort. The West resisted valiantly ; the North resisted valiantly ; but the resistance of each was isolated without any intelligent concert. Help came from Denmark ; but it was no avail when there was no generalship, no common plan, and when the Danish leaders were actually bribed by William. In all these ways the strength of the

country was frittered away. Ailfred and Eadmund Ironside, whether defeated or victorious, fought battle after battle. They were real leaders. After Harold fell in the first battle, there was no real leader left, and the first pitched battle was the last. Next to the fall of Harold and his brothers in the first battle, William's greatest advantage was the submission of London and of the chief men assembled in London. This enabled him to be crowned king at an early stage of the war, when not more than a third of the country was in his actual possession. From that time his government had a show of legality. The resistance of the west and north was, in fact, as truly resist- ance to an invading enemy as the fight on Senlac itself. But, when William was once crowned, when there was no other king in the land, resistance to him took the outward form of rebellion. The gradual nature of the conquest, together with William's position as crowned king at the head of an established government, even enabled him to turn the force of the conquered districts against those which were still unconquered, and to subdue England in some measure by the arms of Englishmen. Thus, within five years from his landing, anything like real resistance had come toanend, William was full king throughout the land. The revolt of the earls met with no national sup- port, and the tumult in which Bishop Walcher was killed was a mere tumult, caused by local and personal wrongs,

~~He deceived others ; most likely he deceived himself. He was in no sort a vulgar oppressor, in no sort a contemptuous despiser of law and right. He never lost sight of a formal justice and of a more than formal piety. He was cruel, in the sense of not scrupling at any severity which would serve his purpose; he was not cruel, in the sense of taking any pleasure in oppression for its own sake. He was guided strictly by the letter of the law, according to his reading of the law. In his own idea, he was not only guided by justice, but he tempered justice with mercy. It is certain that he often forgave those who revolted against him; it is also certain that he carefully abstained from blood except in open battle. When he punished, it was always, with the single exception of Waltheof, by some penalty short of death. That the worse part of his character grew at the expense of the better is not wonder- ful in such a career. Early in his reign he laid waste Northumberland out of a cruel policy; later in his reign he laid waste a large tract of Hampshire to form a forest for his own pleasure. In his earlier days Exeter withstood him, Le Mans revolted against him. Both those cities he entered as a peaceful conqueror. In his last days he gave Mantes to the flames, and enjoyed the sight, when he had no wrong to avenge on the part of the people of Mantes, but when he was simply stirred up to wrath by a silly jest of their king.~~

~~The effect of the peculiar position and character of His con- William was that his settlement was in truth a territorial fiscations conquest veiled under legal forms. In William's reading 74, of the law, if he was not himself actually king from the of Jana~~

~~such asmight have happened in any age. The one general national impulse of a later date than the fall of Chester was, as we have just seen, that which led the English people~~

~~to support that son of the Conqueror who appealed to them against that son of the Conqueror who was supported by the Norman nobles.~~

~~moment of Eadward's death, yet at least he was the one lawful successor to the kingdom. It was therefore treason to fight against him, or to put any hindrance in the way of~~

~~Title of But the Norman conquest of England was something Con-~~
~~much more than the mere establishment of a Norman king | his taking~~
~~possession of the crown. The lands and goods quror. ora Norman~~
~~dynasty upon the throne of England. William, | of traitors were~~
~~confiscated to the crown ; therefore the lands we must always~~
~~remember, did not give himself out asa con- | and goods of all who had~~
~~opposed William, living or dead, queror. The name Conqueror,~~
~~Conquestor, though applied | were confiscated to him. The crown lands~~
~~—and in with perfect truth in the common sense, must strictly be |~~
~~William's reading of the law, the folkland was crown land— taken in~~
~~the legal meaning of purchaser or acquirer. | of course passed to the~~
~~new king. The whole folkland William claimed the crown as the lawful~~
~~successor of | then, together with the lands of all who had fallen on~~
~~Eadward. No doubt he would have been well pleased if | Senlac,~~
~~including the vast estates of Harold and his his title had been peaceably~~
~~acknowledged. As his claim | brothers, all passed to William, and was~~
~~at his disposal. was not acknowledged or taken notice of in any way, he~~
~~| But, as no Englishman had supported his claims, as many had, from~~
~~his own point of view, no course left except to | Englishmen had~~
~~opposed him in arms, the whole nation make good his rights by force ;~~
~~and, in a land where he had | was involved either in actual or in~~
~~constructive treason. no native partisans, the making good of his rights~~
~~by force | The whole soil of England then, except the property of meant~~
~~the conquest of the land by a foreign army. The | ecclesiastical~~
~~corporations, was forfeited to the new king. peculiar character of the~~
~~Norman Conquest comes from } But William was not inclined to press~~
~~his claims to the this, that a legal claim to the crown was made good~~
~~through | uttermost; at his first entry he allowed the mass of the~~
~~conquest by a foreign army. William's accession was some- | English~~
~~landowners to redeem the whole or a part of thing quite different from~~
~~the mere peaceful succession of | their possessions. Gradually, after~~
~~each conquest of a a foreign king. It was also something quite different~~
~~from | district, after each suppression of a revolt, more land came a~~
~~mere foreign invasion without any legal pretext at all. into the king's~~
~~power. That land was dealt with according to his pleasure. It was~~
~~restored, wholly or in part, to its We must here, in considering the~~
~~effects of the Norman | former owners ; it was granted away, wholly or~~

~~in part, to Conquest, distinguish between those immediate effects | new owners, as William thought good in each particular which are rather the form which the Conquest itself | case. But in every case, whether a man kept his own land took and those lasting effects which the peculiar nature | or received land which had belonged to some one else, all of the Conquest caused it to have upon the whole future | land was held as a grant from the kg. The only proof history of England. The peculiar nature of William's claim, | of lawful ownership was either the king's written grant, or and the personal character of William himself, had the | else evidence that the owner had been put in possession by deepest influence both on the character of the Conquest itself | the king's order. Of this process of confiscation and as an event, aud on the character of its permanent results, | regrant, carried out bit by bit during the whole reign of Charac- We may say generally of William that he was 4 man William, Domesday is the record. We see that, in the Wien who united the highest military skill of his age with a | course of William's twenty-one years, by far the greater part~~

~~political skill which would have made him great in any age. He knew how to knit together a number of points, none of which really proved anything, but all of which in one way or another told in his favour, so as to give a plausible look to a claim which had no legal or moral ground whatever.~~

~~of the land of England had changed hands. We see further, as we might take for granted in such a case, that by far the greater part of the land which was granted to new owners was granted to William's foreign followers. By the end of William's reign all the greatest estates in England had~~

~~?~~

~~passed into the hands of Normans and other strangers. But we see also that it is an utter mistake to believe that~~

~~[HISTORY.~~

~~also, though in this case a greater degree of caution was ofbishop. needed. The king might by himself, or at all events with Tics and~~

~~Legal~~

~~Englishmen were indiscriminately turned out of hearth and home. A few Englishmen who had, in whatever way, won William's special favour kept great estates. A crowd of Englishmen kept small estates or fragments of great ones. In a vast number of cases the English owner kept his lands as tenant under a Norman grantee. Altogether the actual occupants of the soil must have been much less disturbed than might have seemed possible in so great a transfer of lands from one set of owners to another.~~

~~The special feature of this great transfer of land from~~

~~character men of one nation to men of another is that it was done~~

~~of Wil-~~

~~le scramble for what every man could get ; nor was it like those | 1070 by the papal legates, the new organization of the cases in the early Teutonic invasions when the lands of the | English Church began. The two metropolitan sees were conquered, or a part of them, were systematically divided | filled ky foreigners. York was vacant in ordinary course among the conquering army. Every step in William's | by the death of Ealdred ; it was bestowed on the Norman great confiscation was done regularly and according to his | Thomas of Bayeux. Canterbury was vacated by the notion of law. There was no formal or general distinction | deposition of Stigand, and was bestowed on a far more between Normans and Englishmen. Every man, Norman | famous man, Lanfranc of Pavia, William's right hand man or English, was dealt with according to his personal merits. | in the settlement of Church and State. Other sees were Every man, Norman or English, held his land only by a | filled in the same year, and gradually, as bishops died or grant from King William. No general change was made in | were deposed, Normans took their places. At William's the tenure of land. The new owner got his land on the | death, Wulfstan of~~

~~Worcester was the only bishop of same terms on which the old owner had held it. The new } English birth. owner was clothed with the same rights, and was burthened Of these changes in the possession of landed property Domes- with the same liabilities, as the old one. William took ; Domesday Book is the great record. This unique and 4ay. lands here, and granted them there, according to the circum- | invaluable document was drawn up in pursuance of a stances of each case. Most commonly he took from | decree passed in the Christmas assembly of 1085-1086, Englishmen and gave to Normans. But he took from | and the necessary survey was made in the course of the Englishmen and gave to Normans, not by virtue of any | first seven months of 1086. The immediate object of the legal distinction between Englishmen and Normans, but | survey was a fiscal one, to insure that the tax on the land because it was, as a rule, Englishmen who incurred | known as Danegeld! might be more regularly paid and forfeiture by resisting him, Normans who deserved reward | more fairly assessed. But William further took care to by serving lim. have a complete picture of his kingdom drawn up. We His dis- | As William dealt with lands, so he dealt with offices. | are told in all cases by whom the land was held at the time posal of The two processes were to some extent the same ; for most | of the survey, and by whom it had been held in the time ollices + ecclesiastical and many temporal offices carried with them | of King Eadward. We are told what was the value of the land or rights over land. Gradually, and under cover of | land at those two dates. This is the essence of the law, the highest offices in Church and State were taken from | inquiry ; but wealso get a mass of statistics and a mass of Englishmen and bestowed on Normans. At the end of | personal and local detail of every kind. As a mere list of William's reign there was no English earl, but one English | landowners under Eadward and under William, it enables bishop, and only a few English abbots. But this change | us to trace the exact degree to which land had passed from was not made allatonce. In the appointment of earls | Englishmen to Normans. And the incidental notices of William brought in a new policy which reversed that of | tenures, customs, personal anecdotes, the local institutions Cnut. 'The great earldoms were broken up. There were | of districts and towns, are at least as valuable as the no more earls of the West-Saxons or of the Mercians, and | essential parts of the~~

~~survey. With their help we can see the earldom of Northumberland now meant only the | England as it was in 1086 more clearly than we can see it of earl. modern county. Indeed William did not appoint earls at | at any earlier time, more clearly than we can see it at any doms; all, except in districts which were open to attack by land | later time for a long while after. And not the least~~

~~gradually and under legal form. It was not a mere~~

~~or sea—districts, in short, where the earls would have to play the part of marguesses. Kent, Norfolk, Northumber- land, Chester, Shrewsbury, Hereford, were William's only earldoms. Lach of these had a special duty of guardian- ship against the Briton, the Scot, the Dane, and any possible enemies from Gaul or Germany. At his coming he estab- lished Norman earls in such parts of the earldoms of Harold and his brothers as he thought needed defence. Elsewhere he kept the English earls, and even appointed new ones, as the circumstances of the time dictated. At last, ten years after William's coming, the last English earl was removed by the beheading of Waltheof. Other officers, sheriffs, stallers, and the like, were in the same way gradually changed. But smaller posts largely remained in the hands of Englishmen. It has been noticed, as marking some traits in William's personal habits, that Eadward's English huntsmen kept their places, but that all the new king's cooks were strangers.~~

~~ry' . ° . . I'he same system was carried on with ecclesiastical offices~~

~~the consent of his Witan, remove a sheriff, an earl, or any temporal officer : to remove a bishop or abbot needed, in William's view, full ecclesiastical sanction. Throughout William's reign, when a bishop died, a foreign successor was found for him, and those English bishops against whom any canonical charge could be devised were removed without waiting for their deaths. The same general rule was applied to the abbots, though here the exclusion of English- men was not quite so strict. Though the greater number of the newly appointed abbots were strangers, a few Englishmen were appointed to abbeys even down to the end of William's reign. In a series of synods held in~~

~~instructive thing about the survey is the light which it throws on the general character of William's government, the system of legal fictions, the strict regard to a formal justice. William is assumed throughout as the lawful and immediate successor of Eadward. The reign of Harold is ignored. The grant of William is assumed as the one lawful source of property; but there is throughout a clear desire to do justice according to that doctrine, to secure every man in his right, as William understood right, without any regard to race or rank. Powerful Normans, William's own brothers among them, are entered as withholding lands wrongfully, sometimes from other Normans, sometimes from Englishmen. Domesday, in short, may be set along-side of the English Chronicle as one of the two great and~~

~~1 The more correct name is Heregeld, that is, a tax for the support of a paid military force. Danegeld is, in strictness, money paid to the Danes as black mail by Aithelred and others. But, as both payments were unpopular, the two names got confounded, and Danegeld became~~

~~. the received name of the chief direct tax paid in those times.~~

~~abbeys,~~

~~Assem~ blies under William.~~

~~Changes . in the law.~~

~~EFFECTS OF THE CONQUEST. |~~

~~unique sources of English history. They are possessions which have no parallel elsewhere.~~

~~In the constitution of England William made no formal change, and the particular laws of his enacting were few. The direct changes of his reign had some analogy to the direct changes which followed on the introduction of Christianity. No old institutions were abolished ; but some new institutions were set up by the side of the old oues. The old national assemblies went on, without any change in their formal constitution. The real change in their character was not a formal, but a~~

~~practical one. The assembly which, at the beginning of William's reign, was an assembly of Englishmen with here and there a Norman had, before the end of his reign, changed into an assembly of Normans with here and there an Englishman. The assemblies, as before, were in ordinary times mere gather- ings of the great men of the realm; but, as before, on special occasions, a vast multitude was brought together. Thus, when Domesday was finished in 1086, William gathered all the landowners of his kingdom, great and small, whether his tenants-in-chief or the tenants of an intermediate lord, and made them all become his men, No one act in English history is more important than this. By it William secured his realm against the growth of feudal doctrines and their abuses. It established the principle that, whatever duty a man might owe to any inferior lord, his duty to his sovereign lord the king came first. When this rule was once established, the mightiest earl in England could never be to William what William himself was to his own lord the King of the French. This one act of the wisdom of the Conqueror secured the unity of England for ever.~~

~~Of the few actual changes in the law which William made, the most part were mere ordinances enacted to meet the immediate needs of the time. Thus, for instance, in the appeal to the judgment of God, the English ordeal and the Norman wager of battle were alike legalized and regulated. Provisions were made for the safety of William's foreign followers, especially by the singular law of Murder and Englishry, according to which, if an unknown man was found dead, he was held to be a Norman, unless he could be proved to be English. In legislating against the slave-trade, William only fol- lowed in the steps of former kings; but in wholly for- bidding the punishment of death, he acted on a personal theory of his own. But it must be remembered that, in William's jurisprudence, the substitutes for death were mutilations which in modern ideas would be deemed worse than death. Most of these provisions were in their own nature temporary. The chief permanent charge in our law which was due to an actual ordinance of William was a part of his ecclesiastical reformation, the separation of the temporal and spiritual jurisdictions. Hitherto the bishop and the earl had sat together in the Scirgemét, and had heard both ecclesiastical and temporal causes. This was now forbidden, and~~

separate ecclesiastical courts began. The strict forest law of William's reign must also have been an innovation; but it does not exist in the shape of a code; we know it only by the complaints of the con-temporary chronicles, and by the practice of later times. Tn all legal matters the ancient assemblies and the ancient forms went on; nor was there any direct change in the language of the law. English remained, as before, an alter- native language with Latin. But from this time the use of Latin gradually encroaches on the use of English. French is not used till a much later time.

But the immediate and formal changes which followed on William's coming were of small account when compared with the indirect, and far more important, changes which came as it were of themselves as the natural result of his

coming. A revolution was gradually wrought in everything that touched the relations of the kingdom within and with- out. But it was a revolution of a strange kind. It was a revolution which seemed, if not to root up our ancient institutions, at least practically so to transform them that they might be deemed to have in truth passed away. It was a revolution which seemed to have broken down the spirit of Englishmen for ever under the yoke of strangers. But what that revolution really did was to call forth the spirit of Englishmen in a stronger and more abiding shape, and to enable us to win back under new forms the substance of the institutions which seemed for a moment to have passed away. This will then be the best place to go through the chief lasting results of the Conquest, and to show how deeply, and in what ways, that event has influenced our institutions and the general course of our history down to our own day.

First of all, the Norman Conquest altogether changed the European position of England. As soon as England was ruled by a continental prince who kept his dominions on the continent, Britain ceased to be that separate world which it had hitherto been. And, though after

~~events brought us back in no small degree to our older insular character, yet Britain has never again become so completely another world as it wasin the older day. We have already seen that it was through her connexion with Normandy that England was first led into that rivalry with France which has had so great an influence on our later history. England took up the quarrel of Normandy, and she carried it on on her own account after Normandy had gone over to the other side. And, besides this special side of our history which is formed by the relations between England and France, the Norman Conquest brought England in every way into closer connexion with continental nations generally. In ecclesiastical matters this took the form of a far closer connexion with the see of Rome than had been known before. The insular position of Britain had hitherto made the English Church far more independent of the see of Rome than the western churches generally. If the king of the English was looked on as the emperor of another world, the primate of all England was also looked on, and was sometimes directly spoken of, as the pope of another world. And it may be that the very fact that the English Church was more directly the child of the Roman Church than any other of the western churches may really have helped to strengthen the independence of the island church. It was pre-eminently a child. It was not a subject ora servant, nor could it pass for a part of the Roman Church itself. It was a child, but a child of full age, who owed reverence indeed, but who no longer owed servile obedi- ence. One great effect of the Conquest was to weaken this insular independence, and to bring the insular Church more nearly into the same position as the churches of the mainland. In this, as in many other things, the Con- quest did but confirm and hasten tendencies which were already at work. The reforms of Dunstan's day marked one step Romewards. Another, we may say, was marked by the pilgrimage of Cnut. The zeal of a new convert naturally filled the Danish king with a special reverence for the chief seat of the religion which he had embraced. The reign of Eadward, a special devotee of the Roman Church, wrought still more strongly in the same direction. In his day the interference of the Roman see in the affairs of England becomes more marked and constant than ever. But the great step of all was taken by William himself. When he sought for a papal confirmation of his claim to the crown of England, he went very far~~

~~towards clothing the pope with a power to dispose of that crown. In William's own hands the rights of his crown were safe, When Hildebrand himself called on him to do homage for his~~

~~Effect of the Con- quest~~

~~on foreign relations,~~

~~on eccle- siastical relations.~~

~~English share~~

~~in the crusades,~~

~~William hinders feudal- ism.~~

~~296~~

~~crown, he refused to do what no king of the English had done before him. So, while the great struggle of investi- tures was raging in Germany and Italy, William went on in England and in Normandy investing bishops and abbots with the staff, as the kings and dukes before him had done. Nor did Hildebrand ever blame William for doing what he branded as such deadly sin in his own sovereign the emperor. Under William the old ecclesiastical supremacy of the crown remained untouched; but it is none the less true that two acts of his had a direct tendency to under- mine it. The separation of the ecclesiastical and temporal jurisdictions led the way to those claims on the part of churchmen to be exempted from all temporal jurisdiction which were unheeded in his day, but which became matter of such important controversy under his successors. And, though he himself firmly refused all homage for his crown, yet, when he made the pope a judge between himself and Harold, he led the way for the day when his descendant took his crown back again as a fief of the Roman see.~~

~~In other points also we see the way in which the Norman Conquest opened a path for increased intercourse between England and the continent. It was doubtless mainly owing to the Norman settlers that England took the share which she did in the crusades. The crusades were primarily a Gaulish movement. Germany was less stirred than Gaul, and Scandinavia was less stirred than Germany. England, in her old insular state, could hardly have played a greater part than Scandinavia. Again, with the accession of a foreign line of kings, foreign marriages become more common. The settlement of foreiguers in England which began with the conquest and confiscations of William~~

~~was fol- lowed by the coming of settlers of a more peaceful kind, of foreign merchants and of foreign scholars. And, if strangers came to make their fortunes in England, the general break- ing down of barriers between nation and nation equally opened the way for the advancement of Englishmen in other lands. These were gradual and indirect results of the great Norman revolution. But the Conquest itself, its confisca- tions and its outlawries, led directly to an emigration of Englishmen of quite another kind. Englishmen, chafing under the yoke of the stranger, found their way to the ex- tremest bounds of Europe. They took service under the Eastern emperor, and remained the surest bulwarks of his throne against the assaults of Turk and Frank alike.~~

~~With regard to the effects of the Conquest on English in- stitutions, the Norman king stepped into the position of his English predecessors. As king he claimed their rights, and nomore. But the circumstances of the Conquest worked in every way to increase his power, and to provide him with new means of influence and new sources of revenue. The notion that William introduced a "feudal system" into England is a delusion which shows utter ignorance both of the position of William and of the general history of Europe. If by a " feudal system " is meant the state of things in Germany and Gaul, a state of things in which every great vassal became a rival to the king, William took direct care that no such " feudal system " should ever be introduced into his kingdom. But if by a " feudal system" is meant merely the holding of land by military tenure, subject to the burthens of reliefs, wardship, marriage, and the like, though William certainly did not introduce such a "system" ready made, yet the circumstances of his reign did much to promote the growth of that kind of tenure, and of the whole class of ideas connected with it. Such tendencies were already growing in England, and his coming strengthened them. Under him the doctrine that all land is a grant from the crown became a fact. And, though he did not directly innovate on the Old-English tenures, yet we can see that the doctrine of military tenure began in his reign, and that if was put into a systematic shape, and carried out to its~~

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logical consequences, in the reign of his son. The Norman kings ruled in a twofold character ; they were all that their English predecessors had been, and something more. The Norman king was the chief of the state ; he was also the personal lord of every man in his kingdom. In the one character, he could call out the military force of the state; in the other, he could call on his tenants for the military service due from their lands. As chief of the state, he levied the ancient taxes due to the state ; as lord he levied the new-fangled profits which, according to thenew-fangled ideas, were due to the lord from his tenants. In short, William brought in that side of feudal doctrine which helped to strengthen the crown, and kept out that side which helped to weaken it. The doctrine that a man was bound to follow his immediate lord had destroyed the royal power in other lands. William, by making himself the immediate lord of all his subjects, turned that doctrine into the strongest support of his crown.

This union of two sources of power in the Norman kings power of

made their rule practically despotic. But their very

despotism preserved English freedom. They had no tempta- Norman

tion to uproot institutions which they found means to turn into instruments of their power. They had no temptation to abolish the national assemblies, in which they found little check on their will, and in which they both displayed their power and practically exercised it. The coming of William practically changed the character of those assemblies ; it gradually gave them a new constitution and a new name.

But there was no sweeping away, no sudden revolution ; all No break

was done gradually and by force of circumstances at parti- cular times. on; there is no break between the earliest national assem- blies and the latest. At some points of our history, the freedom of England seems sometimes to slumber; but it never died. The seeming slumber under Norman despotism led to the awakening of the thirteenth century. The

~~seeming slumber under Tudor despotism led to the awaken- ing of the seventeenth.~~

~~The king was thus in possession of two sources of power, of two sources of revenue.~~

~~cumstances of William's conquest. He was both king and lord of all men within his realm. To the English he was in the first place king; to the Normans he was in the first place lord. Each race had need of him, and the Norman kings knew how to play off each race against the other. In the first days of the Conquest, the king, if he was not the friend of his English subjects, was at least not their worst enemy. His power was some protection against local oppressors. Both William Rufus and Henry I. were raised to the throne by the English in the teeth of Norman opposition. Gradually, as the two races drew together, as in a word the Normans became Englishmen, neither race needed the support of the king against the other, while both alike felt the heavy yoke of his dominion. Instead of the English people siding with the king against the Norman barons, the Norman barons, changed into Englishmen, now became the leaders of the English people against the king.~~

~~The greatest effect of the Norman Conquest is really to be Changes~~

~~looked for, not in any sudden changes, least of all in any great and immediate legislative changes, but ina complete, though gradual, change of the administrative system, and in such changes of the law as followed upon those changes in the administration. And even the administrative changes seldom took the form of the utter abolition of anything old. They too rather took the form, sometimes of setting up something new by the side of the old, some- times only of increasing the importance of one old institu- tion at the expense of another. Thus the national assemblies themselves changed their character, and a variety~~

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~~Thus the forms of a free constitution went constitu~~

~~Their~~

~~One source came by inheritance twofold from his English predecessors ; another came from the cir- Position.~~

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~~trative system.~~

~~Effects of | the prac- tice of~~

~~gum. SUmmons. Wherever it becomes usual specially tosummon | hold. The notion that offices in the royal household were mons, particular members of an assembly, the first step is taken | honourable is part of the general doctrine of the comitatus towards the exclusion of all who are not so specially | and its personal service, the doctrine out of which grew the summoned. In the great assembly at Salisbury, where all nobility of the thegns. Some of these offices were simply the landowners of England becanie the "men " of the king, | old offices with new names. 'The staller became the con- we see the first germs of Lords and Commons. The Witan | stable, the bower-thegn became the chamberlain, the steward are distinguished from the "land-sitting men." By the kept his English name. Some of these posts became Witan, so called long after the Conquest, we are doubtless hereditary and almost honorary. In some cases, as in that to understand those great men of the realm who were usually | of the chamberlain and the steward, a secondary office of summoned to every assembly. The vast multitude who} the same namo grew up. Of greater importance and came to do their homage to the king were summoned only | interest are those officers into whose hands came the chief for that particular~~

~~occasion. The personal right of summons powers of government under the king. N othing is so is the essence of the peerage. It is the distinctive mark | important under the Norman reigns as the exchequer. But The ex- round which all the other honours and privileges of the | the exchequer is simply an old institution with a new chequer, | peer have grown. 'The earls and the bishops of England, name, and the treasurer is simply an old officer with a new by never losing their right to the personal summons, have | name. The king's hoard or treasury must always have | kept that right to personal attendance in the national | had a keeper ; but the hoarder, under the Latin name of assembly which was once common to all freemen, but which | treaswrer, grew into increased importance in times when Lords other freemen have lost. The House of Lords represents | the main object of government seemed to be to fill the andCom-by unbroken succession the Witan of the assembly of king's hoard. The hoard or treasury got the playful name m» Salisbury ; that is, it represents by unbroken succession the | of exchequer,! and it grew into two departments of state, old assemblies of the Teutonic democracy. Never did any | administrative and judicial. The treasurer himself grew institution so utterly change its character. But the change | into an officer of such power and dignity that, for a long has been the gradual result of circumstances, without any | time past, his office has been put into commission among violent break. 'The " land-sitting men," on the other hand, | several holders. And of these the chief has drawn in late not summoned personally or regularly, but summoned in a | years to himself more than the power, though without the mass when their attendance was specially needed, gradually | dignity, of the old single-headed treasurer. The chancellor lost the right of personal attendance, till in the end they | again is found by that title under Eadward the Confessor, gained instead the more practical right of appearing by their | and his office must have existed under some title as early as | representatives. 'Thus grew the Commons, 'The steps by | there was any settled government at all, But it is under | which our national assemblies took their final shape do not | the Norman kings that he gradually grew to great 4 begin till a later time. But it is important to notice that | importance and dignity, an importance and dignity which the first glimpse of something like Lords and Commons —a | have been more lasting in his case than in the case of any)~~

~~distinction which doubtless already existed in practice, but | other of the great officials of those days. But the greatest which is nowhere before put into a formal shape—dates dignitary of the Norman reigns, the justiciar, really seems from the last years of the Conqueror. to have been wholly new. The name is first given to the The | The practice of summons thus gave birth to our final | regents who represented William in his absence from ca parliamentary constitution. It gave birth also to a vast | England; and the office may well have grown up through~~

;

~~THE NORMAN KINGS. |~~

~~of institutions were developed out of the national assemblies, by no cause so much as by the growth of the practice of~~

~~number of administrative and judicial institutions, of which we see traces before the Conquest, but which put on their definite shape under the Norman kings. The practice of summons produced the House of Lords. It produced also the curia regis, the King's Court, out of which so many institutions grew. The King's Court is properly the national assembly itself; but the name gradually came to be con- fined to a kind of judicial and administrative committee of~~

~~ENGLAND~~

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~~importance which they had never held before,~~

~~the need which was felt for some such representative when the king visited his dominions beyond sea. The justiciar appears as the first in rank among the great officers of state; but while the chancellorship, remaining a single office, grew, the office of the justiciar was gradually divided among many holders. Among them all those, great and small, who administer justice in the king's name may claim to have a share.~~

~~They may Thegreat be divided into officers of state and officers of the house- Officers.~~

~~the assembly. Even before the Norman Conquest, we get a faint glimpse of a body of the king's immediate counsellors, bearing the name of the Theningmannagemét.~~

~~The modern judicial system of England begins, in some- The judi- thing like its present shape, in the reignof Henry II. But cial sys- its growth is one of the direct results of the Norman Con- t™.~~

~~Out of this body, to which was gradually attached the name of curia regis, grew, on the one side the Privy Council, and out of that the modern Cabinet, and on the other side the courts of law. The Cabinet, our most modern political institution, an institution so modern as to be unknown to the written law, is the last growth of the principle of~~

~~quest. The older judicial system is essentially local and popular. The men of the township, of the hundred, of the shire, come together under their local chiefs. The highest judicial body of all, as well as the highest legislative body of all, the assembly of the nation, comes together under the chief of the nation, the king. At least as early as the reign~~

~~of Aithelred we find examples of royal commissioners, like~~

~~the mzsscof the Frankish emperors and kings, who are sent on~~

~~the king's errand to the local courts. After the Conquest The this system grows, till in the end the local chiefs, the earl and king's the bishop, are wholly displaced by the king's judges. Thus a. grew up the lawyers' doctrine that the king is the fountain ite ocak~~

~~of justice. But the popular element survived in the various judges.~~

~~summons. The Cabinet, the body to which in common use we have latterly come to give the name of Government, is simply a body of those privy councillors who are specially summoned. Those who are not summoned stay away. All the king's courts, administrative and judicial,~~

~~grew in the same way. They were committees of the national assembly, which gradually grew into separate being and separate~~

~~powers, as the legislative, executive, and judicial branches of government parted off more distinctly from one another. Along with the practice of summons grew the importance of those who were most specially and habitually summoned, the great officers of the king's court and household. Soon after the Conquest these officers began to rise into an~~

~~forms of the jury. It is idle to debate about the invention or introduction of trial by jury. The truth is that it never~~

~~'The older names are fiscus and thesaurus. Scaccarium or ex- chequer was the established name by the time of Henry II. It comes from the parti-coloured cloth with which the table was covered, which suggested the notion of a chess-board.~~

~~tendency of the ideas which the Norman Conquest strongly New idea confirmed was to put the notion of property before the °f king- notion of office Kingship, the highest office in the common. (NPs a wealth, came to be looked on mainly as a possession. The Tt king of the people has now put on the character of the lord than~~

~~of the land ; his title gradually changes into a form which Ollice.~~

~~Origin of was invented or introduced, that, even more than other the jury. institutions, it emphatically grew. Its germ may be seen in all those cases, compurgation or any other, where a matter is decided by~~

~~the oaths of men taken from the community at large. The Conquest caused a step in advance by the more constant employment of recognitions~~

~~Recogni- tions.~~

~~Central-~~

~~ization of than anywhere else.~~

~~justice. tried either in the king's own courts or by judges immedi- | the doctrine of strict hereditary right. The general results ately commissioned by him. The local chiefs gave way to | of the Conquest were all in favour of that doctrine; but the the king's representatives. One local officer indeed grew | circumstances of the reigns which immediately followed the into increased activity. This was the officer who in each | Conquest all told the other way, and helped to keep up the shire had always been specially the king's officer, the | elective character of the crown for some time longer. The shire-reeve or sheriff', who looked after the interests of the | ancient doctrine died out very slowly, but it did die out in king, while the caldorman or earl represented the separate | the end. And then lawyers found out that the crown had being of the shire. Under William, earls ceased to be | been hereditary from the beginning, and ruled that the appointed, save where they had distinct military duties. | king never died, and that the throne never could be vacant. Under his successors earldoms gradually sank into merely | On the other hand, as office was turned into property, so Primo- honorary dignities. But the sheriff was in the Norman | property in land was turned into office, and carried with it geniture. reigns the busiest of all officers ; for he had to collect and | much of the likeness of a miniature sovereignty. The bring in all that was due to the royal exchequer from the | doctrine of primogeniture also now naturally supplanted the endless sources of income by which it was fed. old principle of division of lands. No doctrine could be Folkland The main political result of the Norman Conquest | more opposite to the old doctrine of nobility than the becomes thus was to strengthen every tendency that was already | doctrine which gave everything toa single son in the family. i in being—and such tendencies~~

~~have been powerfully at | In this way primogeniture has its good side. It gave usa ‘ work ever since the beginning of the growth of the | peerage ; but, in giving us a peerage, it saved us from a thegnhood—by which the king, his authority, his officers, | noblesse. took the place of the nation and its authority. But The immediate ecclesiastical effects of the Norman Con- Ecclesi- the older system was undermined rather than overthrown, | quest, those which in truth formed part of the process of ®tical and the course of our history has, to a great extent, given | conquest, have been already spoken of. But the introduc- us back the old institutions under other shapes. Thus, for | tion of foreign prelates, and the closer relations with Rome, quest. instance, there was a strong tendency at work to turn the | worked inmany ways. The foreign bishop naturally stood folkland, the land of the nation, into the land of the king. | at a greater distance from the native clergy than his English To this process the Conquest gave the finishing touch. The | predecessor had done. Moreover, the new theories as stroke by which the whole lay soil of England was held to | to the tenure of land turned the bishop into a baron, be forfeited to the Conqueror turned all folkland into terra | holding as a tenant-in-chief of the crown. The bishop Changeip regis. From Domesday onward the folkland vanishes ; but | became in his own diocese more of a lord and less of a the posi- now that the crown lands are placed under the control of | father, while he was often kept away from his diocese by parliament, as part of the national revenue, the terra regis | holding high temporal office. It gives a false view of the has practically become folkland again. And while the | case tosay that the prelates grasped at high temporal office : king, the highest lord, was thus encroaching on the nation, | the case rather is that, ina time when education was chiefly that is, on the community which took in all others, smaller | confined to the clergy, public business was mainly in the lords were doing the like to the lesser communities which | hands of the king’s clerks, and that they received bishoprics made up the nation. Under the older system all grants of | as the reward of their temporal services. Under such bishops sac and soc, that is, all grants to a particular person of any | the Church was secularized and feudalized. Ecclesiastical special jurisdiction exempt from the ordinary local courts, | livings were looked on less as offices with an endowment were in their own nature exceptional. As the new ideas | for the maintenance~~

~~of the holder than as benefices charged Growth grew, the manor, as it was called by the Normans, finally | with certain duties which might be discharged by deputy. of supplanted the township. Lawyers gradually found out | The relation of the parish priest to his bishop put on the manors,~~

~~taken on oath. Under Henry II. the practice was still further strengthened ; but it was not till long after his day that the modern idea of the jury was established, as no longer witnesses but judges of facts. Wheu their judicial character was fully established, that is, when in the reign of Charles II. they ceased to be called to account for their verdicts, the old popular character of the courts in a great measure came back to them.~~

~~In this way justice kecame more centralized in England All the weightier causes came to be~~

~~that the exceptional novelty was the original state of things.~~

~~Just as they ruled the king to be the fountain of justice,~~

~~better expresses this new position. The King of the English gradually changes into the King of England, William him- self is still almost always Rex Anglorum. But the new territorial title now begins to creep into use, and from the be- ginning of the thirteenth century it altogether displaces the older style. But the new ideas did much more than merely change the royal style. As soon as office had changed into property, as soon as the chief of the people had changed into the lord of the land, the old rule that the king should be chosen out of the one kingly house began to stiffen into~~

~~likeness of the relation between a man and his lord. At the same time, the rage for founding monasteries, which~~

~~because he had gradually taken the administration of justice into his own hands, so they ruled that, wherever any rights of the community had escaped the grasp of the lord, their existence must necessarily be owing to an unrecorded grant of the lord. The ancient court of the~~

~~people, the court baron, was held to be the court of the lord. Here again the evil has cured itself. The lord and his court have become harmless ; but they remain as curious examples of the way in which lawyers have read the history of England backwards.~~

~~Both as regarded the greater lord and the lesser, the~~

~~was at its height in Normandy at the time of the Conquest, Exemp- came into England with the Normans, and in the next ae century drew a fresh impulse from the foundation of the rerio Cistercian order. The love of exemptions of all kinds led chapters. to a constant striving on the part of ecclesiastical bodies to~~

~~be exempted from the ordinary ecclesiastical jurisdiction.~~

~~This is shown, not only by separate monasteries, but even~~

~~by the cathedral chapters, especially where the place of the chapter was filled by a monastic body. And one immediate~~

~~result of the Conquest was the transfer of the seats of several bishoprics from smaller towns to greater. This was~~

~~SOCIAL AND ECCLESIASTICAL CHANGES. |~~

~~i in accordance with the continental notion of a bishop, by which he was looked on as primarily bishop of a city, while in English ideas he was rather the bishop, first of a tribe, and then of a district. But this very change, one made by the Norman bishops themselves, may well have helped 7 to bring about that separation between the bishop and his church which dates from this time. The bishop who | had become a feudal lord, even when he was not alto- | gether away from his diocese on the king's service, com- | monly fixed his dwelling-place in his rural castle rather | than in his palace in the city.~~

~~) TheNor- The social results of the Conquest were such as natu- mans rally followed on the general transfer of the greatest i, estates and highest offices of the country. The Conquest~~

~~Bees' itself, the military occupation of William, was followed by a peaceful immigration of Normans and other strangers into England, especially into the merchant towns. London, above all, received a crowd of citizens of Norman birth. That these men, and the Norman settlers generally, turned into Englishmen in a wonderfully short time is one of the great features of our history. The causes are easy to see : with most men, if there be no special reason to the contrary, place of birth goes for more than descent by blood, and the stranger is gradually assimilated by the people among whom he dwells. And in the case of Normans and English, we can hardly doubt that original kindred went for something. The Norman was simply a Dane who had adopted the French tongue and some French fashions; he was easily won back into the Teutonic fold. But the circumstances of William's conquest, his pretended legal claim to the crown and the whole system of legal fictions which grew round that claim, helped largely to bring all classes of his subjects together. The Norman settled in England was driven to become in some sort an Englishman. He held his estates of the King of the English, according to English law. The fusion of the two races was so speedy that a writer little more than a hundred years after the Conquest, the author of the famous Dialogus de Scaccario, could say that, among the free population, it was impossible to tell who was of Norman and who was of English birth. That is to say, the great nobles must still have been all but purely Norman ; the lowest classes must have been all but purely English. In the intermediate classes, among the townsmen and the smaller landowners, the two races were so intermixed, and they had so modified one another, that the distinction between them had been forgotten. We might~~

~~Changes say that the effect of the Norman Conquest was to thrust in social every class, save one, of the older English society a step~~

~~, an downwards. The churl, the simple freeman, had been~~

~~gradually sinking for a long time before the Conquest. In the course of the century after the Conquest, he finally sank into the villain. On the other hand, if the churl gradually sank to the state of villainage, the slave gradually rose to it. The Norman Conquest, while thrusting down~~

every other class, undoubtedly helped to raise the most wretched and helpless class of all.

Chivalry. But while the Normans who settled in England changed

‘ into Englishmen with remarkable speed, they of course, by

the very fact of their fusion, did much to modify the

character of Englishmen. A way was now opened for all that class of ideas which, for want of better names, may be called feudal and chivalrous. Chivalry is rather French than Norman; and its development comes rather under the Angevin than under the Norman kings. Still, so far as Normandy was influenced by France, so far as the Norman Conquest opened a way for French influence, and, we may add, French kings, in England, so far this whole class of ideas and feelings may be set down as results of the Norman Conquest. But in England chivalry never was really dominant. Teutonic notions of right and

eer

ENGL ew YD

common sense were never wholly driven out. For the man unassisted by birth to rise was harder in some ages than in others. There was no age in England when it was wholly impossible.

The greatest of the outward changes which were caused Effectson by the Norman Conquest was its effect on the language and language. literature of England. In the matter of language, as in other matters, the Conquest itself wrought no formal change. Whatever change happened was the gradual result of the state of things which the Conquest brought about. French Late use was never substituted for English by any formal act. Docu- of French. ments were written in English long after the Conquest ; and, though the use of English

~~gradually dies out in the twelfth century, it dies out, not in favour of French, but in favour of Latin. French documents are not found till the thirteenth century ; they are not common till the latter part of that century. As it was with institutions, so it was with language. The old language was neither proscribed nor forgotten, but a new language came in by the side of it. William himself tried to learn English; his son Henry, if no other in his family, understood English, and seems even to have written it. Henry II. understood it, but seemingly did~~

~~all classes. It was the language of common speech an of purely popular writings; French was the more polite and fashionable language, the language of elegant literature ; Latin was the language of learning. Every educated man in the latter part of the twelfth century must have been familiar with all three.~~

~~A foreign language was thus brought into England along- Changes side of the native language, and it displaced the native in the language for certain purposes. Such astate of things could ae aa not fail to have a great effect on the English language ““6”8 itself. That effect largely took the usual form of strengthening tendencies which were already at work. The two changes which took place were the loss of the old Lossofin- inflexions and the infusion of foreign words into the flexions. vocabulary. Neither of these processes began with the Conquest ; the Conquest simply strengthened and quickened them. The other Low-Dutch and Scandinavian tongues, which were brought under no such influences as English was by the Conquest, have lost their inflexions quite as thoroughly as English has. Even the High-Dutch, which keeps a comparatively large stock of inflexions, has lost a large part of the forms which were once common to High and Low. We may be sure then that we should have lost our inflexions, or most of them, even if the Normans had not come. Indeed, in one form of English, the dialect of the North, the inflexions had largely given way already, chiefly, it would seem, through the influence of the Danes.~~

~~But when English lost its place as a polite and literary speech, when, though spoken by all classes, it was written~~

~~only for the lower classes, there was no longer any fixed literary standard ; the grammatical forms therefore became confused and inaccurate. We see the change at once in~~

~~those parts of the Chronicles which were written in the twelfth century. On the other hand, the English tongue~~

~~had taken in a few foreign words from the first coming of Infusion the English into Britain. The Roman missionaries brought offoreign in another stock. 'The Normans brought in a third. But Words. the third stock, like the second, consisted for a while mainly~~

~~of words which were more or less technical ; they were new~~

~~names for new things. Through the twelfth century the~~

~~two languages stood side by side, without either borrowing~~

~~much from the other. It was not till the thirteenth century~~

~~that French words came in to any great extent to express~~

~~things for which the English tongue had names already.~~

~~Thus the English tongue gradually put on its later cha-~~

~~racter. It remained Teutonic in its essence, Teutonic in its grammatical forms. But it lost its inflexions, more thoroughly than some kindred tongues, not more thoroughly than some others. It also received a vast infusion of Ro- mance words into its vocabulary, an infusion far greater in degree, but exactly the same in kind, as the Teutonic infusion into the vocabulary of the Romance languages,~~

~~clature also. On the whole, the Norman Conquest made but little change in this way. Few places, if any, lost their names. But some towns, castles, and monasteries of Norman foundation received French names ; and a crowd of English towns and villages did, as it were, take Norman sur- names, by taking the name of a Norman lord to distinguish them from other places of the same name.~~

~~especially into French.~~

~~In those days art is almost synonymous with architec- Changes In literature, as distinguished from language, and also in~~

~~Effects ture, and the changes in that art which were wrought by in archi- on lite art, the Norman Conquest is one of the most strongly | the Norman Conquest were great indeed. There was then tecture. rature. marked epochs in our history. The breaking down of the | but little room for great displays of artistic architecture barrier between the insular and the continental world did | anywhere but in churches. But in this, as in all periods of much for both. Learning had gone down again in England | genuine art, the style used for buildings of all classes was through the Danish invasions ; and Hadward the Confessor, | the same. Up to the eleventh century all Western Europe with all his fondness for foreigners, did little for foreign | had built in one style, in that older form of the Roman- scholars. Under William and his son Henry things | esque or round-arched architecture which came direct from altogether changed. 'The first two occupants of the see of | Italy and was known as the mos Romanus. Its most Canterbury after the Conquest were the two greatest | striking feature is the tall, slender bell-towers which in Eng- scholars of their day. Both of them were strangers in | land are a sign of work not later than the eleventh century, Normandy no less than in England: Lanfranc came from | while in Germany they go on through the twelfth, and in Lombard Pavia, Anselm from Burgundian Aosta. After | Italy they never went out of use at all. In the course of the them England herself produced a goodly crop of scholars | eleventh centuryseveral parts of Europe struck out newstyles among her children of both races. While the Chronicle | of their own, which still keep the round arch, and which are~~

~~was still writing in our own tongue, a crowd of learned | therefore properly classed as later varieties of the Roman- pens recorded English history in Latin. Florence of | esque type. One of these arose in N ormandy, and was, Worcester told the unvarnished tale of the early Norman | among other Norman fashions, brought into England by reigns in a chronicle which is English in all but language. | Eadward in the building of his new church at Westminster. Henry of Huntingdon preserved to us large fragments of our | After the Conquest the Norman style naturally became The Nor. ancient songs in a Latin dress. William of Malmesbury | the prevailing fashion. One part of that fashion was the man aspired to the character of a critical historian, a character building of churches on a gigantic scale, such as liad never tyls. still more nearly reached somewhat later by William of | before been seen in England. This fashion led the Norman Newburgh. The statesmen-historians of Henry II.'s day | bishops and abbots to pull down and rebuild most of the follow, and lead us on to the monastic historians of the thir- | minsters of England. The earliest Norman style was an teenth century. Yet, after all, one would gladly exchange | advance on the Primitive Romanesque in proportion and in much of the light which they give us for a continuation of | vigour of style, casting off the mere imitation of Roman the English Chronicle in the English tongue. models which had lingered for somany ages. But in mere Change One form of influence on language was the almost com- | amount of ornament it was certainly no advance. 'The en-~~

~~in proper plete exchange of the Old-English proper names for a new~~

~~names.~~

~~set of names which came over with the Conqueror. The strictly Norman proper names, those which the Normans either brought with them from the North or had bor- rowed from the Franks, are as truly Teutonic as the Eng- lish names; a few names only were common to both countries. But, just at the time of the Conquest, the Normans were beginning to adopt scriptural and saintly names, which were all but unknown in England. With the Conquest a new fashion set in, and the names, whether Teutonic or saintly, which were in Norman use gradually~~

~~displaced the ancient English names. A few specially royal and saintly names, like Eadward and Eadmund, alone survived. Throughout the twelfth century we constantly find the father bearing an English name, while the son has one of the new fashion. This point is of importance. It at once marks and hides the fusion of races. Jt helps us to see that many a man who was to all outward appearance a Stranger was in truth of genuine English descent.~~

~~riched Norman style comes in later. However, from the reign of William, one might perhaps say from the reign of Eadward, the older style gave way to the new. The Primi- tive models were now followed only in smaller and less important churches, where the use of the slender bell- towers lasted longer than any other feature. Yet the Norman style, in supplanting the earlier English fashion, was in some measure influenced by it. The Norman churches of England have some distinctly English features of which there is no sign in those of Normandy.~~

~~We are told that great improvements in domestic archi- tecture were brought in by the Normans; but, when we see the few Norman houses that are left to us, we may be inclined to think that the chief change was the freer appli- cation of stone to domestic work. It was ouly in houses of the very highest class, as in kings' palaces, that there was room for any great display of art. Such buildings allowed of the great hall, with rows of columns and arches, like those of a church. For municipal architecture there~~

~~Use of Along with the change in personal names came in | was as yet no room in our island. But military architecture heredi- the use of hereditary surnames. Surnames, in the sense | took one of its greatest steps in this age. Fortification had gaa of mere personal descriptions or nicknames, were already | advanced in England from the hedge or palisade which Ida~~

~~common both in England and in Normandy. But the hereditary surname, the name of the family handed on from father to son, was at the time of the Conquest unknown in England, and it was only just coming into use in Normandy. The Normans brought the fashion into~~

~~England, and the circumstances of the Conquest gave it a fresh impulse. While many of the Norman settlers brought with them the surnames which they had already taken from their estates or birth-places in Normandy, a crowd of men of both races now took surnames from their estates and birth-places in England. The fashion to some extent affected local nomen-~~

~~built at Bamburgh to the wall of squared stones with which~~

~~AXthelstan had surrounded Exeter. But the Norman castle, Norman name and thing, was brought in as something new in the castles.~~

~~days of Eadward, and the land was covered with them in the days of William. The massive square tower, of which the Conqueror's Tower of London is the greatest example, is one type. The shell-keep, the polygonal wall raised most commonly 'on a mound of English work, is another type. In the days of our forefathers the castle was the very embodiment of wrong and oppression. The Chronicle never speaks of castle-building without some epithet of horror.~~

~~EFFECTS ON LANGUAGE AND ART. |~~

~~One result of these changes in the art of fortification was largely to change the character of the warfare as well as the tactics of the age immediately following the Conquest. The older warfare of England is a warfare of pitched battles. Such is the warfare of A#lfred; such is the warfare of Brihtnoth and Ulfcytel and Eadmund Ironside. But the warfare of the twelfth century is mainly a warfare of sieges. The taking of towns and castles is endless; but between Senlac and the wars of the thirteenth century we hardly meet with more than two great battles in the open field, those of Tinchebrai and the Standard.~~

~~The changes in the character of warfare were accompanied by a more general change in the art of war. An ancient English army fought on foot ; the horse was used only to carry the warrior to the field. When the time for action came, the king or ealdorman and all his following dis- mounted. The old national weapon was the sword, which under Cnut was exchanged for the heavy Danish axe. The English armies of~~

~~the eleventh century consisted of two classes, both footmen. The housecarls, the paid force, and the thegns and other personal followers of the king, wore coats of mail and carried shields, which could be made into a kind of fortification called the shield-wall, They hurled jave- lins at the beginning of the fight, and came to close conflict with the axe. The irregular levies of the shires came armed with axes, javelins, clubs, or any other weapons that they could bring. But there was no cavalry, and there were but few archers. In the Norman system of warfare, cavalry and archers are the chief arms. 'The mailed knights charge on horseback with long lances raised high in the air; they use the sword, and sometimes the iron mace, for close combat. The infantry are mainly archers; the mounted archer is rare. With the Conquest the Norman tactics naturally dis- placed the English. The Englishman grasped the weapon of his conqueror, and the fame of the English archers began. Yet the Norman manner of fighting was itself to some ex- tent influenced by English practice. The English archer, though he had changed his weapon, was really the true heir of the English axeman. In the fourteenth century, as in the eleventh, the main strength of an English army lay in its infantry. And, earlier than this, the old traditions of English warfare were sometimes followed by the Normans themselves. More than once in wars of the twelfth cen- tury we find kings and nobles getting down from their horses and fighting on foot, axe in hand, like Cnut or Harold.~~

~~We can now sum up the main results of the Norman Con- quest. We can be hardly wrong in calling it the most im- portant event in English history since the first coming of the English and their conversion to Christianity. It was a great and a violent change, a change which, either in its immediate or in its more distant results, touched everything in the land. Yet there was no break, no gap, parting the times before it from the times after it. The changes which it wrought were to a great extent only the strengthening of tendencies which were already at work. The direct changes which we may look upon as forming the Conquest itself, as distinguished from its more distant results, were done at once gradually and under cover of legal form. No old institutions were uprooted, though some of them were undermined by new institutions set up alongside of them. The revolution which seemed to be the over-~~

throw of English freedom led in the end to its new birth. Under an unbroken succession of native kings, freedom might have died out step by step, as it did in, some other lands. As it was, the main effect of the Conquest was to call out the ancient English spirit in a more definite and antagonistic shape, to give the English nation new leaders in the conquerors who were gradually changed into country-

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men, and, by the union of the men of both races, to win back the substance of the old institutions under new forms.

Under the sons of the Conqueror England appears for Reign of

the first time in her new European character. Looking pel at her simply as a power, without regard to the nationality of her inhabitants, she now appears as an insular power making conquests on continental ground. William Rufus, placed on the throne by the English people in opposition to a Norman revolt, broke all his promises of good govern- ment, and ruled as one of the worst tyrants in our history. But it would be hard to show that he was an oppressor of Englishmen as Englishmen. His rule was rather a tyranny which pressed on all classes and all races, though the native English would doubtless be the class which felt it most bit- terly. Godless and vicious beyond all parallel before or after, he was still a captain and a statesman, and no king better knew how to make use of every art to advance the power of his kingdom. He won a large part of Normandy by force of arms; and, when his brother Robert set forth on the crusade, he obtained the whole duchy under cover of a mortgage. Maine revolted and was won back; a purchase of Aquitaine was negotiated ; Rufus was believed to have designs on the crown of France itself. A short

war was waged between Rufus and Philip of France, a war Warwith which now begins to put on the character of a war between France.

~~England and France, rather than that of a mere war between the duke of the Normans and his overlord at Paris. The wealth and strength of England now for the first time directly told in continental affairs. But the schemes of the Red King were cut short by the stroke of an arrow in the New Forest (2d August 1100). By an agreement between William and Robert, if either died childless, his brother was to succeed to his dominions. But at the death of Rufus, Robert was far away on the crusade, and the English nation had never paid much heed to any attempts to settle the succession of the crown before a vacancy. Henry, the~~

~~youngest son of the Conqueror, the only one of his sons Election~~

~~who was the son of a crowned king and born on English of ground, was unanimously chosen and speedily crowne An Englishman by birth, if not by descent, he further married a wife who had some English blood in her veins, and who, in the eyes of his subjects, passed for an English-woman. This was Edith, the daughter of Malcolm of Scotland, who at her marriage took the Norman name of Matilda. The English king and the English queen were mocked at by the Norman courtiers, who again conspired to bring in the Norman duke. Again a son of the Con- queror owed his crown to English loyalty. A second Norman invasion of England followed. Robert landed at Portsmouth, as his father had landed at Pevensey, but the policy of Henry found means to send him and his host away without fighting (1101). One of the usual agree-ments was made, an agreement which had little chance of being kept, by which again each brother was to succeed to the dominions of the other in case of the failure of direct heirs. But Robert was incapable of ruling his own dominions; a party in Normandy invited the King of the~~

~~English to save the duchy from anarchy. Two campaigns, His con-ending in the great fight of Tinchebrai (1106), brought quest of~~

~~Normandy into the hands of Henry. Men at the time N~~

~~looked on the day of Tinchebrai as the reversal of the day ™™4~~

~~of Senlac. Normandy was conquered by England, as England had before been conquered by Normandy, Such a view put forth only one side of the case; but from one side it was true.~~

~~During the rest of Henry's reign there was perfect peace in England; but nearly the whole time was filled with continental wars. The warfare between France and~~

~~g, Henry I.~~

~~Wars with France.~~

~~Intended should be done to his daughter as his successor.~~

~~succes- sion of Matilda.~~

~~Election of Stephen.~~

~~The anarchy.~~

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~~England, of which there had been only a glimpse in the days of Rufus, now began in earnest. It is true that the wars of Henry were waged wholly for Norman and not at all for English interests, and Englishmen at home bitterly complained of the taxes which were wrung from them for wars beyond sea. But it is none the less true that, in their European aspect, they were English wars, and that they tended to give the England of Heury a wholly different position from the England of the days before the Conquest. The later years of Henry were chiefly occupied in schemes of dynastic policy on thecontinent. His only legitimate son, the Attheling William, to whom homage as his successor had been done both in Normandy and in England, was drowned in 1120. The king's daughter Matilda had been married to the emperor Henry V. Strict alliance with Germany formed part of Henry's policy, as it had formed part of the policy of Godwine and Harold ; and the two Henries, emperor and king, joined in warfare against Lewis of France. On the death of the emperor, Matilda returned to England,~~

~~and, by an act without precedent either in his kingdom or in his duchy, Henry procured that homage No more striking comment can be needed as to the growth of the new ideas of kingship. The crown was beginning to be so thoroughly looked on as a possession that it was deemed that it might pass to a woman. On the other hand, no settlement could be more opposed to modern notions of hereditary right. When homage was first done to Matilda, Robert's son William, who, according to modern notions, was the direct heir of the Conqueror, was still living. In Normandy indeed he was his uncle's enemy, and in England his claims seem never to have been heard of. But, in the lack of legitimate male heirs, the choice either of the king's natural son Robert or of his sister's son Stephen would have been much less opposed to earlier ideas, both English and Norman, than the succession of Matilda. The imperial widow was presently married to Geoffrey of Anjou, a marriage clearly designed with a view to the enlargement of the continental dominions of her father's house.~~

~~King Henry died in 1135, leaving, as he deemed, the succession to his daughter and her young son Henry. As usual, an arrangement made before the vacancy was set aside, and the choice of England fellon Stephen. 'The case of the new king's election was not unlike the older and more famous case of the election of Harold. In itself it was perfectly good. Against it stood the fact that Stephen had, with the rest of the chief men, sworn to the succession of Matilda. Stephen then was a perjurer as regarded his own soul; he was no usurper as regarded the nation. He was accepted without opposition, and King Henry's son Robert did homage to him with the rest. But Stephen, a man of many winning personal qualities, was utterly unable to reign in those times. Rebellions broke out; Earl Robert asserted the rights of his sister in England, and Normandy was conquered by her husband Geoffrey. The empress landed in England (1139) ; she was chosen Lady (1141)—the name Queen was not used; but she was never crowned. A civil war, a time of utter anarchy and havoc~~

~~raged, till (1153) another agreement of the usual kind was~~

~~Succes- sion of Henryl,~~

~~made between Stephen and Matilda's son Henry, now duke of the Normans. He had been brought over to England as a child; he had taken his share in the wars ; and it was now agreed that Stephen should keep the crown for life, and that Henry should succeed him. This time the agree- ment took effect, When Stephen died in the next year, Henry succeeded without opposition. Again a duke of the Normans succeeded to the crown of England; but Henry of Anjou, by birth-place Henry of Le Mans, was far more than duke of the Normans and king of the English. To the~~

~~lands of his mother's father he added the lands of his father, Plate IV,~~

~~Anjou, Maine, and Touraine ; and a politic marriage gave him a greater dominion still. The designs of William Rufus upon the duchy of Aquitaine came to pass in another way. The great dominion of Southern Gaul, Poitou, Aquitaine, and Gascony, had passed to Eleanor the daughter of their last duke. She married Lewis, the heir of the crown of France, who almost immediately succeeded to the kingdom (1137). For a moment France and Aquitaine, Northern and Southern Gaul, the land of o7/ and the land of oc, were joined together. It might seem that a kingdom of France, in the modern sense, was about to begin. But the northern king and the southern duchess did not agree. A canonical objection to the marriage was conveniently found, and it was accordingly annulled. The divorced queen at once married the young duke of the Normans (1152). Her dominions came with her, and the prince who now succeeded to the crown of England already held the greatest power in Gaul, a power far greater than that of his nominal lord at Paris. With that dominion he won the undying hatred of the lord whose wife with her splendid heritage had passed to him. The king of Paris was not yet to be master of Southern Gaul. He was to be again shut up in his inland dominion, while his mighty vassal held the mouths of the great rivers and the fairest cities of the land. As England under~~

~~Cnut might seem to have become part of a Scandinavian empire, so under Henry she might seem to have become part of a Gaulish empire. The strictly Norman period of the English history comes to an~~

~~end, Normandy and England have alike become parts of European the dominions of a king who by female descent might be pee called either Norman or English, but who, both by birth %#°™~~

~~and by general character, was neither Norman nor English. In ruling over a vast number of distinct states, widely differing in blood, language, and everything else, ruling over all without exclusively belonging to any, Henry II., king, duke, and count of all the lands from the Pyrenees to the Scottish border, was the forerunner of the emperor Charles V.~~

~~Jt was during the reigns of the two sons and the grand- Fusionof son of the Conqueror that the chief steps were taken Normans~~

~~towards the fusion of English and Normans into one people, or rather towards the change of Normans into Englishmen. At the accession of Rufus the distinction was in full force ; at the accession of Henry I. it is clearly visible. In the~~

~~-course of Henry's reign it so far died out that, though it~~

~~was doubtless not forgotten, it was no longer marked by outward distinction. The name of Englishman now takes in all natives of England, of whatever descent. A tale of a general conspiracy to kill all the Normans soon after the accession of Stephen proves, when it is examined, to mean, just as in the case of the massacre of St Brice, not a design toslay everyman of Norman descent in England, but merely a design to slay a particular body of Norman mercenary soldiers.1_ Everything during these reigns tended to draw the two races more nearly together; nothing tended to keep them apart. The brutal tyranny of Rufus wronged both races alike ; yet men of native English descent could rise even under him.? The cold despotism of Henry at once benefited and offended both races alike. At one time of his reign~~

~~we meet with a complaint that he would admit no Englishman to high office. When the complaint is tested,~~

~~1 See History of the Norman Conquest, vol. v. p. 281.~~

~~2 The career of the crusader Robert the son of Godwine, whose history will be found in William of Malmesbury and in the Scottish writer John Fordun, who represents Turgot, is a case in point. So at the accession of Henry I. there were several Englishmen holding abbeys, one of whom, Godric of Peterborough, had been chosen by the monks, who paid William Rufus a large sum for leave to elect freely.~~

~~d English.~~

~~Feudal innova- tions of Flam- bard.~~

~~The laws~~

~~of Henry I~~

~~THE NORMAN REIGNS. |~~

~~it is found that the exclusion extended to natives of England of both races, that the preference was a preference for absolute foreigners as such. The horrors of the anarchy in Stephen's day fell on both races alike ; the foreign mer- cenaries who laid waste the land were hateful to both alike. We may safely say that, at the time of the accession of Henry of Anjou, the man of Norman descent born in England had, altogether in feeling and largely in speech, become an Englishman.~~

~~None of these three reigns was a time of great legislative changes, but the reigns of Rufus and Henry were the time in which the new system of administration grew up. Un- der Rufus the doctrine of military tenures, and of the incidents consequent on such tenures, was put into systematic shape by his rapacious minister Randolf Flambard, whom he raised to the bishopric of Durham. This man is distinctly charged with having first subjected ecclesiastical property to these burthens, and there can be little doubt that it was he who laid them on lay~~

~~property also, The evidence is this. Under the Conqueror we see the germs and beginnings of certain usages, but nothing more. At the accession of Henry they appear in a system- atic shape as established usages, usages which Henry does not promise to abolish, though he does promise to reform the abuses of them. The feudal burthens were a logical deduction from the doctrine of military tenure. The land is held of the lord on condition of certain services being rendered. It passes from father to son; but in order that each successive tenant may strictly hold it as a grant from the lord, the heir must receive itagain. For the new grant he must pay a relvef, the price of the relevatio, the taking up again, of the estate which has lapsed to the lord. But it may be that the heir is from age or sex incompetent to discharge the services due to the lord. In the case of the minor heir, the lord takes the fief into his own hands till the heir is of age to discharge them. 'The heiress can never discharge them in person; she must discharge them through a husband. But the interests of the lord require that she shall marry only with his approval, lest she should carry the fief into the hands of an enemy. All these occa- sions were turned by the perverse ingenuity of Randolf Flambard into means for increasing the royal revenue. The wardship, —that is, the temporary possession of the minor's estate,—might be granted or sold. So might the marriage of the heiress. The lord might either sell her and her estate for money, or else he might take money from the heiress herself for leave to marry according to her own inclinations. So with bishoprics and abbeys; Flambard found out that they too were held of the king by military service. During the vacancy of the benefice, there was no one to discharge the service; the king therefore took temporary possession of the ecclesiastical estate. And, as the new prelate could not be chosen without the royal consent, the king might prolong that temporary possession as long as he chose. All these inferences were logically drawn out and sternly carried into practice by the minister of Rufus. The utmost that Henry pledged himself to do was to reform the grosser oppressions of his brother's reign, and to limit his exactions within some reasonable bounds. The claims themselves went on, to the oppression and sorrow of successive genera- tions of heirs and heiresses, till, as regards lay tenures, the whole system was swept away by the famous Act of Charles IT.~~

~~There is nothing to make us think that the innovations of Flambard were ever put forth in a legislative shape. At -all events, no laws of William Rufus are extant. A book~~

~~is extant which calls itself the Laws of Henry; but, like the codes called the law of Eadward and William, it is rather a private compilation or law-book. It has a certain value, as a witness to the state of the law in~~

~~Henry L.'s time; but it must not be mistaken for a collection of real statutes put forth by that king. It is remarkable for the strongly English character of the jurisprudence described. There can be little doubt that the compiler purposely gave his work as English a charac- ter as he could; but there is as little doubt that Henry strove to give to his government, as far as he could, at least the appearance of an English character. In his charter he grants to his people the law of King Eadward —that is, the system of government which prevailed in Eadward's reign—with his father's amendments. And, both in the charter and in other documents of his reign, the time of King Eadward is constantly taken as the standard. Henry however kept the forests in his own hands, and preserved the stern forest law of his father. The reign of~~

~~Henry is also memorable as the time of the earliest extant to towns.~~

~~charters, both of the king and of other lords, granting new privileges to boroughs, often calling them into legal existence for the first time. Thus the citizens of London are exempted from various burthens of different kinds, and from the jurisdiction of any but their own courts. They have further the farm of all Middlesex—their subject dis- trict—and the appointment of their own sheriff. In the next reign or rather anarchy, the citizens of London appear dis- tinctly as a communio or commune.~~

~~But if this period was not marked by many formal changes in the law, the new administrative system grew stronger and stronger. If the reign of Rufus systematized the military tenures, the reign of Henry systematized the exchequer and the great offices of state. A family of able ministers begins with Roger, chancellor, justiciar, and bishop of Salisbury, a family of the secularized churchmen of that day, most of whom rose from the king's service to high ecclesiastical office. Henry, a strict administrator of justice, looked no less narrowly after his own interests. Under him we get the earliest pipe-roll of the exchequer, and a wonderful document it is, showing how many and how strange were the sources of income which flowed into the hoard of a Norman king.~~

~~These reigns are also of the highest moment in ecclesiasti- cal history. We now see what the ecclesiastical effects of the Conquest really were. As we have seen, the tendency of the time was to make bishoprics the reward of temporal services, a practice which under Rufus easily sank into direct simony. Yet Rufus himself, in a fit of sickness and repentance, put a saint at the head of the English Church. After a vacancy of four years (1089-1093) Anselm succeeded Lanfranc in the see of Canterbury. Anselm was forced into the office ; but at this stage he showed no objection whatever to the ancient English mode of investiture, by which the prelate received his staff from the king, and became his man. But, in such a reign as that of Rufus, the tendencies of such a man as Anselm could not fail to be Romewards, Rome might well seem to be the seat of law, as opposed to the wnlaw of the reigning king. The quarrel began about the acknowledgment of a pope of dis- puted title; it went on about various matters, till Anselm crossed the sea to confer with Pope Urban. He remained in banishment till the death of Rufus, and learned at Bari and at Rome that the laws of England were evil, that no churchman ought to receive investiture from a lay lord or do homage to a lay lord for the lands of his church. He was recalled by Henry, and served him loyally during Robert's invasion. But he refused to do homage or to consecrate the bishops whom the king had invested. A second absence from England (1103-1106) followed, till a compromise was made between the king and Pope Paschal. The king gave up the claim to invest with the staff; but the prelate was to do homage to the king for his lands. Anselm then came back,~~

~~Adminis- tration of~~

~~Henry.~~

~~Contro- versies of ufus~~

~~Henry with Anselm.~~

~~Growth of eccle- siastical claims.~~

~~The Cis- tercian order,~~

~~The uni- versities,~~

~~Rela- tions with Scotland.~~

~~The controversy is a memorable one, not the least so because Henry and Anselm are an almost solitary example of a king anda bishop who could each maintain claims which he held to be right without loss of temper or breach of personal friendship. Anselm was a true saint. He was no mere stickler for ecclesiastical privileges, but a denouncer of moral evil. One of his canons again denounces the slave-trade, and indeed denounces slavery itself, Yet it is plain that through Anselm the power of the Roman see in England greatly advanced, and he laboured hard to forbid the English use which allowed marriage to the clergy. Under his successors the claims of Rome grew yet faster, and a succession of canons were passed against the married clergy. Under the anarchy it is not wonderful if the ecclesiastical power grew: it was the only thing in the realm which kept any likeness of law. Ecclesiastical synods took upon themselves to judge the king; and the right of succession to the English crown was argued in a solemn pleading before the court of Rome. The doctrine of clerical exemptions grew; it was held that no clerk might be tried in a temporal court for any crime whatsoever. Nothing did greater damage to Stephen than his imprisoning two bishops, the famous Roger of Salisbury and his nephew Alexander of Lincoln. On the other hand, the ecclesiastical~~

courts continued to draw to themselves a large class of causes which concerned laymen. Nor was this in those days altogether without a good side. The bishops' courts had a bad name for corruption, that is, for letting off offenders for money. But at least they were not bloody. As they could not inflict death, so neither could they inflict the horrible mutilations which were common, even in the case of very trifling offences, in the courts of the king.

This period was also marked by the introduction of the Cistercian order into England. Houses of this order, a reform of the older Benedictine rule, never reached the wealth and importance of the Benedictine houses; but they have added a special feature to English scenery, The monks of this order habitually sought wild and lonely spots; the ruined abbey is most commonly Cistercian. At the same time, we see the first beginnings of the university system in England. Oxford, a flourishing borough, a strong military post, a favourite seat of national assemblies, and an occasional royal residence, now became for the first time a seat of learning. The teaching of divinity began under Robert Pullein in the days of Henry; that of law began under Vacarius in the days of Stephen. This is really all that we know of the beginnings of that great university ; but its growth must have been steady during the whole of this century ; for at the beginning of the next the scholars of Oxford were a numerous and important body.

The relations of England to the rest of Britain are of considerable importance during this time. The marriage of Malcolm and Margaret had most important results on both countries. The Scottish kings became in truth English kings, more truly English than the Normans and Angevins who reigned in England. Theirculture was English ; they dwelled mainly in the English or Anglicized parts of their dominions; strangers from England of both races were wel- come at their court. This English influence began under Malcolm; after a period of struggle, it became fully established under David. Malcolm invaded England more than once, both in the days of the Conqueror and in those of Rufus, and his last invasion saw also his death at Alnwick (November 14, 1093). This invasion was perhaps caused by an act of the king of the English which may well have been dangerous to

~~Scotland. Rufus was the one king of his race who enlarged the actual kingdom of England. He made Cumberland, meaning by that name the old diocese of Carlisle, an integral part of England ; he peopled it with colonists from southern~~

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~~England, and he rebuilt or repaired the local capital, which became a strong fortress against Scotland. After Malcolm came a time of struggles between the Scottish and the new English party in Scotland, which was ended by Eadgar, the son of Malcolm and Margaret, being placed on the throne by English help. Under his reign and those of Alexander and David (1097-1153) the relations between England and Scotland were close, and, as long as Henry of England lived, perfectly peaceful. In Stephen's day David asserted the rights of his niece the empress ; he twice invaded England; he suffered a great defeat in the battle of the Standard ; but he obtained the cession of the newly won land of Cumberland, and also of the earldom of Northumberland. Like Lothian at a former time, these lands were to be held as English earldoms. Their possession by the Scottish kings was short ; but it doubtless tended, along with other things, to make Lothian become more directly a part of the Scottish realm.~~

~~Along the Welsh frontier the power of England greatly advanced under the two Williams and under Henry. We may say, roughly speaking, that South Wales was conquered at this time. But the conquest amounted to little more than the settlement of Norman lords with a following of all nations, who kept up from their castles an endless warfare against the Welsh in their mountains. But one part of the land was settled in another way. The southern peninsula of Pembrokeshire, and seemingly the peninsula of Gower in Glamorgan, were under Henry (1111) planted with a Flemish colony, which may be fairly called-the last of the Teutonic settlements in Britain. In the Flemish district of Pembrokeshire the Britons and their tongue vanished as utterly as they had done from Kent. Two of the chief towns, Pembroke and Tenby,~~

keep Welsh names in a corrupt form; the rest of the local nomenclature preserves the names of the Flemish leaders.

With the accession of Henry of Anjou a new period begins. The purely English period has ended. The Norman period has ended also; England and Normandy are alike under the rule of the cosmopolitan prince from Le Mans. Englishmen tried to see a native king in the man who sprang through three generations of females from the son of Eadmund Ironside.1 And Henry was too wise to refuse to listen. Whatever he was, he was not Norman, and under him the last traces of distinction between men of English and of Norman birth in England altogether died out, Ofall the kings between the Conqueror and Edward the First, he has the best right to the name of lawgiver. He is not the author of any formal code; but he is the author of a greater number of actual enactments than any king before him. His reign falls naturally into three parts. The first is taken up with the restoration of order after the anarchy. 'To this work the young prince of twenty-one, who had already won a name beyond the sea, gave himself with a good will. He was helped in the work by one of the clerical statesmen of the age, Thomas the son of Gilbert Becket of London, archdeacon of Canterbury and the king's chancellor. Thomas is one of the great examples of the fusion of Normans and English. Born in London of Norman parents, he appears throughout his career as a passionate lover of his native land and his native city. He was a favourite with the English people, nor is there a word to show that he deemed himself, or was deemed by them, to be other than their countryman in the fullest sense. King Henry and Chancellor Thomas worked hard for eight years to restore the rule of law. One great difficulty in

1 See especially the dedication of the Genealogia Regum by Aithelred of Rievaux to Henry II]. The king's pedigree is there traced up to Adam, without any reference to his Angevin father or to his Norman grandfather.

Affairs of Wales.

Reign of Henry II.

~~Thomas of Lon-~~

~~Primacy of Thomas.~~

~~His dis-~~

~~putes~~

~~with the king.~~

~~THE ANGEVIN REIGNS. |~~

~~their path was the new doctrine of the immunity of the clergy from secular jurisdiction. These years were a time of comparative peace, broken chiefly by a war (1159) with Lewis of France for the succession of Toulouse. This war was, as we shall presently see, of great importance in a constitutional point of view; and in it the chancellor's functions, ecclesiastical and civil, did not hinder him from showing himself in the third character of a stout man-at- arms. At last, on the death of Archbishop Theobald (1162), Henry committed the fatal mistake of raising his great minister to the see of Canterbury, and the further mistake of expecting the new archbishop to remain his minister. The step was in every way new ; other bishoprics had been used as rewards for temporal services '. the primacy had been reserved, if not always for saints, at least for men whose character was not prominently worldly. Most archbishops had been monks. And though, both before and after the Conquest, archbishops of Canterbury had been rulers of the realm in more characters than one, no archbishop had ever held a post in the king's service like that of chancellor. The see was forced upon Thomas ; but, once archbishop, he put on the character of his new office in all its fulness. As a mere deacon holding secular office, he had been the king's most trusty servant ; now become priest, bishop, archbishop, he threw up his secular post, and became the champion of the ecclesiastical claims in their most extravagant shape. Quarrels soon arose between him and the king, quarrels which neither king nor primate carried on in the spirit of Anselm and Henry I. Thomas showed himself violent and provoking ; Henry showed himself mean and spiteful. The first great quarrel arose out of the ecclesiastical~~

claims ; for Thomas, in his new position, tried to shelter even the most guilty churchman from any punishment at the hands of the temporal courts. The king caused a body of ordinances, known as the Constitutions of Clarendon, to be drawn up, which professed to state the law as it stood under Henry I. before the anarchy. They were certainly not, as the ecclesiastical party called them, innovations of his own; but it was only natural that they should seem innovations to the ecclesiastical party. There was to be no appeal to any power out of the realm without the king's special leave. As a natural consequence, the clergy were not to leave the realm without the king's licence. The ecclesiastical courts were no longer to shelter offenders against the laws of the land. Advowsons were declared to be lay fees. The baronial character of the estates of bishops and abbots was distinctly asserted, and on this followed, as a logical consequence, the rule that those estates should pass into the king's hands during a vacancy. Elections of prelates were to be made in the king's chapel, with his consent. Another provision was added, not wholly new, and which hardly touched the general question, but which still marks the growth of the new ideas. The villain was not to be admitted to holy orders without the con- sent of his lord. The ecclesiastical legislation of Henry II. was, in fact, only a little more than a codification of the practice of Henry I.; it was only a little less than a fore- stalling of the legislation of Henry VIII. It contained in- novations on the practice of England before the Norman Con- quest; but. they were the innovations of Flambard, not of Henry himself. But the attempt was premature. Thomas, il & moment of weakness, assented to the Constitutions, and then withdrew his consent, Henry, thus far in the right, put himself in the wrong by raking up all kinds of forgotten and frivolous demands against the archbishop. Thomas fled from England and found shelter in France. | It was the Interest of Lewis to support any enemy of Henry. A weary time of dispute and intrigue followed, in which Thomas was but feebly supported by the pope Alexander

~~ITI. Henry sometimes threatened to acknowledge the imperial antipope; sometimes he forsook his own posi- tion; once, men said at the time, he went so far as himself to accept a legation from the pope. At last the first quarrel was patched up (1170). Thomas came back to England only to find a new and distinct ground of quarrel. The king had caused his eldest son Henry to be crowned by Roger archbishop of York, to the prejudice of the rights of the see of Canterbury. New excommunications, new disputes, followed. At last four knights in the king's service, mistaking a few hasty words of their master, crossed from N, ormandy to England, and slew the archbishop in his own church,~~

~~Thomas really died for the rights of the church of Can- terbury, not for any more general principle. But the second quarrel, as could not fail to happen, got mixed up in men's minds with the first; and the murdered archbishop was looked on as a saint and as a martyr to the general privileges of the church. The dead martyr was a more dangerous enemy to the king than the living primate had been. We now enter on the third period of Henry's reign, a time of nineteen years, in which Henry had to struggle against foes on every side, but chiefly against foes that were of his own household. His overlord of France, his vassal of Scotland, his own nobles, his wife and his own children, were all arrayed against him. As far as England was concerned, Henry was successful against all. The rebellion of the earls and the Scottish invasion (1174) both failed. On the conti- nent his fate was harder. The death of his eldest son, the rebellion of the youngest, the loss of the city of his birth, utterly broke down his spirit. At the age of fifty-six he died (1189) at Chinon, far away alike from England and from Normandy, a worn-out and broken-hearted man.~~

~~The great lawgiver was gone, and his dominions passed to his rebellious son Richard. This king has in popular belief become one of the heroes of England. That he should ever have been looked upon as such, that he should by strangers have been so looked upon even in his own time, shows how England had come to be looked on as the head and centre of the vast dominion of her kings. Personally Richard, though born on English ground, was the least English of all our kings. Invested from his~~

~~earliest years with his mother's Southern dominions, Richard of Poitou had little in him either of England or of Normandy: he was essentially the man of Southern Gaul. Twice in his reign he visited England; to be crowned on his first acces- sion, to be crowned again after his German captivity. The rest of his time was spent in his crusade, and in various continental disputes which concerned England not at all, except so far as she had to pay for them. The mirror of chivalry was the meanest and most insatiable of all the spoilers of her wealth. For England, as a kingdom, all that he did was to betray her independence by a homage to the emperor, which formed a precedent for a more famous homage in the next reign. His reign is an important one in constitutional progress, but as such it was the reign of his ministers and not of himself. One event towards the~~

~~His death.~~

~~Later years cf Henry.~~

~~Reign of Richard J.: itsun- English character.~~

~~end of his reign has been often misunderstood. A com- ee motion was raised in London (1196) by William the son of & Wi-~~

~~Osbert, known as William with the Long Beard, a fellow-~~

~~liam Fitz-~~

~~crusader and seemingly a personal friend of the king's. Osbert,~~

~~William professed to be the champion of the poor against the rich. Out of this a romantic story grew that he was the champion of the English against the Normans, The writers of his own time show that he was deemed a martyr by his followers and a traitor by his enemies; but they give no hint that he was the champion of one race against another. Nor do they give us any clue as to his own descent, English or Norman. There is not a word in any writer of the reign of Henry or Richard to make us think VIII. — 39~~

Reign of John.

Loss of Nor- mandy.

Union of Normans and

English. ae

together, in opposition to

306

that the distinction between the two races was at all re- membered in any hostile sense. Everything shows that all the inhabitants of the kingdom were fast drawing men born out of the realm, whether in Normandy or anywhere else.

Richard died, as he had lived, faraway from England and Normandy, in a petty quarrel witha Southern vassal (1199). Constitutional progress had gone on silently in his absence. In the next reign freedom had to be won openly from a tyrant by force of arms. No period of our history, save those of the Conversion and the Conquest, is of greater importance than the seventeen years of John. A popular confusion has to be got rid of with regard to his accession at the death of Richard. John, the youngest son of Henry, was the only survivor of his brothers; but Gcoffrey, the third son of Henry, had lefta son Arthur. Richard seems at one time to have designed Arthur for his successor. But his last bequest was in favour of his brother; and, even without that bequest, all English precedent was in favour of the brother rather than of the nephew. Arthur does not seem to have had a single partisan either in Normandy or in England. John was received as duke, chosen and crowned as king, without opposition. But on the continent generally the new doctrine of hereditary right had made much greater advances than it had in England. Anjou acknowledged Arthur; and Philip of France was led by an obvious policy to receive his homage for all the continental dominions of his uncle. But Arthur and his followers were soon crushed by the king-duke (1202), and the disappear- ance of Arthur left little room for doubt that he had been put out of the way by

his uncle. The king of the French called into being a new jurisprudence out of the romances of Charlemagne, and called on the twelve peers of France to sit in judgment on their felon brother. Sentence of forfeiture of all lands held of the French crown was pro- nounced against John. The sentence was carried out by an easy conquest of continental Normandy. ‘The islands clave to their duke, and they have ever since remained possessions of the English crown, keeping their local inde- pendence and their ancient laws. On behalf of the duchy John did not strike a blow ; but he led more than one expe- dition to secure or to win back his southern dominions, and the final result was that, of all the continental ‘possessions of Henry and Richard, Aquitaine alone remained to their successors, The relations of England to the continent were thus completely changed. Under Henry and Richard England had been only one, though the greatest, among the endless possessious of her king. Now that Normandy, Maine, and Anjou became provinces of France, Aquitaine became distinctly a distant dependency of England. “o the crown of France the gain was beyond words; the king was now a greater potentate than any of his vassals. He had won back those old possessions of the French duchy which had so long cut off its dukes and kings from the sea. To England the loss was the greatest of gains. It broke the last tie which bound any part of the inhabitants of Eng- land to any land beyond the four seas of England. If any- thing was still wanting to wipe out every trace of distinction between the descendants of those who a hundred and forty years earlier had been the conquerors and the conquered, the Freuch conquest of Normandy did the work. Every man in England was now an Englishman, and nothing but an Englishman. One question only has to be asked: Why id Normandy, the old foe of France, submit so tamely to a French conquest? The reason seems plain. Normandy was a conquered land. With Henry I. the line of her national dukes had ended. If the French king was a stranger, he was not more a stranger than the king of England and count of Anjou. The duchy really lost nothing by passing from a state which might seem that of

~~a dependency, to become an integral portion, often a royal apanage, of a kingdom of its own speech. Aquitaine, on the~~

~~other hand, foreign alike to England, Normandy, and France,~~

~~found its account in cleaving to the more distant sovereign. The nobles were drawn to France by community of feeling in many ways; but the cities clave to the distant king, who was their ally and protector rather than their master.~~

~~The English nation was now united : the smaller mass of the conquerors had been received and assimilated by the greater mass of the conquered. Events now thickly press one upon another, and all of them tended to draw all the sons of the soil closer and closer together. John, like Richard, was born in England; but, like Richard, he was in feeling neither English nor Norman. He surrounded himself with foreign counsellors and with foreign soldiers. He presently plunged into an ecclesiastical quarrel which showed the weak side of the ecclesiastical policy of the Conqueror. It needed William himself to carry out William's system. A disputed election to the see of Canterbury gave Innocent III. an opportunity for putting in a nominee of his own, and his choice—it must have been unwittingly—fell on one of the foremost of English patriots, on the first of the noble band who defied pope and king alike on behalf of the freedom of England. The candidate of the king and the candidate of the monks both gave way to Stephen Langton. John had so utterly turned away from him all the hearts of his people that none stood by him, even when the pope took upon him to declare the king of the English deposed from his crown, and to offer that crown to the king of the French. In his despair John became the man of the Roman pontiff, as his brother had become the man of the Roman Cesar. Archbishop Stephen now came back to England. The laws of king Eadward were renewed. When John flew to arms, the barons and people of England, with the primate at their head, swore to bring back the ancient laws, the laws of Eadward, the laws of Henry. Those names are now heard for the last time. John was constrained (1215) to sign the Great Charter ; and from that day Englishmen called for the observance of the Great Charter, as they had~~

~~hitherto called for the laws of Eadward. By that charter resistance to the royal power was legalized; in the struggle that followed it was the king who was the rebel. John had hardly sealed the charter, when he sent to his overlord at Rome, and the pontiff took upon him to annul the recovered liberties and to denounce suspensions and excommunications against those who had won them, At the head of his foreign mercenaries, the king laid waste his own dominions. The barons in despair chose a new king, and offered the crown to Lewis of France. Such a choice seems to us yet more strange than the speedy submission of Normandy to Lewis's father. That the step was most unwise was presently proved; but at the time it was intelligible alike to Normans and to English- men. If Lewis was a stranger, so was John. Personally Lewis promised far better than John, nor was it easy to find any other available candidate. If not Lewis himself, yet his wife, came by female descent of the royal stock ; and the only likely competitor, the emperor Otto, was at once closely allied with his uncle John and had shown that he could not keep the kingdoms which he had already. But, even before John died, men began to feel that, in inviting a French king, they had invited a French con- quest. In a few months (1216) the death of John cut the knot ; all English feeling turned to the side of his young and innocent son. He was indeed a minor, but a minor was better than a stranger. Henry III. succeeded as a national king, and a burst of national feeling drove the French out of the land. A long and weary time followed, in which the freedom of .England was slowly growing up;~~

~~John's quarrel with the pope.~~

~~The Great Charter.~~

~~Election of Lewis.~~

~~Succes- sion of Henry~~

~~III.~~

~~Legis- lation of Henry~~

~~10%~~

~~SS a a Rai~~

~~aa~~

~~of jus-~~

~~Admini- stration | tice,~~

~~——Ee~~

~~LEGISLATION OF HENRY 1. |~~

~~till, fifty years later, the time came when it had to be again asserted on the field of battle.~~

~~No time is richer than this in legal history. The whole reign of Henry II. was a reign of legislation, and the work was not interrupted even during the time of the great struggle with the archbishop. In the year before the promotion of Thomas to the primacy, king and chancellor had dealt one direct blow at all feudal ideas. In the war of Toulouse the scutage was first devised ; a money payment was accepted instead of personal military service. The money was of course spent in hiring mercenaries; and it was largely by the help of mercenaries that Henry subdued his rebels in England. But later in his reign, by the Assize of Arms (1181), he regulated the old constitutional force of the country, and enjoined that every free Englishman should be ready to serve with the weapons belonging to his rank. Other incidental notices show us that much legislation was done while Henry still had Thomas to his minister. But the ordinances of which the text is preserved belong to a later time. 'The reign of Henry is rich in charters to boroughs, several of which are early enough in his reign to bear the signature of chancellor Thomas. And a reference in the Constitutions of Clarendon shows that, thus early in his reign, Henry had begun that great step towards the development of jury trial which is one of the special marks of his reign. By the work of Henry and his chancellor the system of recognition was organized, by which sworn men gave a verdict, but as~~

~~yet a verdict given from their own know- ledge. The great legal writer of Henry's reign, the justiciar Randolf of Glanville, speaks of the recognition as a special gift of Henry to his people, and enlarges on its superiority to the wager of battle. All this comes within the chancellorship of Thomas; and we shall do the chancellor great injustice, if we think wholly of his later ecclesiastical character, and forget his services in the days when he was the chief minister of one of our greatest kings. Of the extant ordinances of Henry's reign, the oldest after the charter issued at his coronation are the Constitutions of Clarendon themselves (1164). The Assize of Clarendon— a wholly distinct document (1166)—and the Inquest of Sheriffs (1170) came during the time of the quarrel with Thomas, On these, after the death of Thomas, follows in 1176 the Assize of Northampton, in 1181 the Assize of Arms, and in 1184 the Assize of the Forest. All these bear witness to Henry's care, even when he was most occupied with other matters, to preserve the peace of the land, and to enable all his subjects to have justice done to them in the king's name. And in all, the mode of inquisi- tion by the oath of twelve lawful men grows at each step. The Assizes of Clarendon and Northampton have a special reference to one of Henry's great measures, that by which the visitation of the country by itinerant judges going regu- lar circuits was finally established. It was not an invention of his own; the visits of the king's judges had begun to take a regular shape under Henry I. But it was Henry II. who organized the whole system afresh after the anarchy. It was he who finally established the specially English principle that justice should be administered in different parts of the kingdom by judges not belonging to the particular district, but immediately commissioned by the king. When the king's judges came and received the inquisitions of the local jurors, though the complete modern ideal of a judge and jury had not been reached, yet some- thing had been reached which could grow into that ideal without any one moment of change so great as the changes wrought by Henry himself. By him the jury was applied to all manner of purposes. The Assize of Arms was distinctly a return to the old military system. It gave a new life to the fyrd, the ancient militia, which had never gone out of~~

~~ENGLAND~~

~~use, but which had been overshadowed by feudal levies on the one hand and by the use of mercenaries on the other. Each man was to have the arms which befitted the amount of his property. It was by a jury that the liability of each man to be ranked in such or such a class was to be fixed. Even in the Assize of the Forest, an ordinance framed to protect the most exceptional and most oppressive of all the royal rights, the popular element comes in. are appointed in each shire to protect those rights. Lastly, when in 1188 the tithe was levied for the defence of Eastern Christendom against Saladin, the liability of each man to the impost was assessed by a local jury. In all these ways the appeal to the oath of lawful men, as opposed to any other form of finding out truth, was strengthened by every step in the legislation of Henry.~~

~~Sworn knights~~

~~Meanwhile the administrative system which had been Henry's~~

~~growing up ever since the Conquest took firm root under Henry. We have a contemporary picture of it, drawn by one of Henry's own officials, in the Dialogus de Scaccario. This was the word of Richard, treasurer of the exchequer and bishop of London, one of the family of officials founded by Roger of Salisbury. Alongside of this, we have our first strictly legal treatise, as distinguished from private compilations and codes, in the work of the great justiciar Randolf of Glanville. In short, we may say that under Henry the legal system of England took a shape which it has practically kept ever since. The endless changes of the last seven hundred years are rather special amendments of Henry's work than anything which can be said to start altogether afresh from a new point. Strictly constitutional advance rather belongs to the reigns of Heury's sons than to that of Henry himself. Nor is this wonderful. Consti- tutional advance commonly means the lessening of the royal power, and acts which lessen the royal power do not often issue from the free will of kings. In Henry's time, above all, a time when law and order had to be restored after the reign of anarchy, the momentary need was rather to strengthen the royal power than to lessen it. Legal reforms are often, as in this case, the free gift of wise kings;~~

~~constitutional reforms have commonly to be wrested from weak or wicked kings. But the legal reforms of Henry supplied an element which largely entered into the constitutional reforms of the next stage. Out of Henry's favourite institution of recognitions on oath grew, not only trial by jury, but also the House of Commons. By the time of Henry II. the force of circumstances,~~

~~admini-~~

~~strative system.~~

~~Begin-~~

~~especially the working of the practice of summons, had nings of~~

~~gradually changed the ancient assembly of the whole nation into a mere gathering of the great men of the realm. The~~

~~represen- tation in~~

~~arlia-~~

~~work which had now to be done, and which, in the space of ment.~~

~~about a hundred years, was gradually done by a number of instruments, conscious and unconscious, was to call into being a second and more popular assembly alongside of the assembly which had lost its popular character. To use language which belongs to a somewhat later time than that with which we are now dealing, the House of Lords already existed ; the House of Commons had to be called into being alongside of it. The details of this great process of con- stitutional growth must be drawn out by the strictly con- stitutional historian. All that can be done here is to call attention to the main lines of the process and to its more remarkable landmarks. And it may be well from the very beginning to give the warning that the two Houses of the English Parliament did not arise out of any theoretical preference for two houses over one or three. The number was fixed, like everything else in English history, by what we are apt to call circumstances or accidents.~~

~~Our whole parliamentary system was eminently one which was not made, but grew. Thus, for instance, it was only gradually established that the barons should be personally summoned~~

~~to the same house as the bishops and earls, while the knights should appear only by their representatives along with the smaller freeholders and the burgesses of the towns. It is in the reign of Richard I. that we begin to see the first faint glimmerings of parliamentary representation. The one object of the absentee king was to screw all the money that he could out of the kingdom for which he cared not. The object of his wise ministers, of Archbishop Hubert among the first, was to gain the greatest amount of money for their master with the least amount of oppres- sion towards the nation. Under Hubert's administration, chosen bodies of knights or other lawful men, acting in characters which become more and more distinctly repre- sentative, were summoned for every kind of purpose, How far they were nominated, how far freely elected, is not always clear. It seems most likely that in one stage they were nominated by the sheriff in the county court, while at a later stage they were chosen by the county court itself. In other words, the principle of representation was first established, and then the next stage naturally was that the representatives should be freely chosen. Summoned bodies of knights appear in characters which are the forerunners of grand jurors and of justices of the peace. They appear also in a character which makes them distinctly forerunners of the knights of the shire which were soou to come. A chosen body of knights have to assess the imposts on each shire. From assessing the taxes the next stage was to vote or to refuse them. In 1213 the sheriffs are called on to summon four discreet men from each shire, to come and speak with the king about the affairs of the realm. When we have reached this stage, we have come very near to a parliament, name and thing.~~

~~The reign of John, in short, is marked by common con- sent as the time from which Englishmen date the birth of their national freedom in its~~

later form. From his day men no longer asked for the observance of the laws of Eadward. They asked for the observance of John's own charter, which was deemed to be nothing else than the laws of Eadward in a new shape. By that charter all the great principles of constitutional government were affirmed. They were so fully affirmed as to be in advance of the age; only a few years later men shrank from affirming them again with so clear a voice. Stephen Langton doubt- less saw further than other men of his day; but, if in one or two points he claimed more than his generation was ready for, the great mass of his legislation took root at once, and so prepared men for the final acceptance of all a generation or two later. The Charter is the first* solemn act of the united English nation after Norman conquerors and Nor- man settlers had become naturalized Englishmen. Of dis- tinction of race or law there is not a word. The one dis- tinction drawn is that between freeman and villain, and even the villain has rights which the Charter protects. It ordains nothing new, except the temporary provisions for its own enforcement, provisions which give a legal sanction to the natural right of resisting a king who rebels against the law. Novel abuses are to be redressed ; new means of redressing them are supplied ; but the old law of England, the law of Eadward, the law of Henry, stands firm. But it is with the strictly constitutional provisions of theCharter that we are here most concerned. Representation was already fast growing up ; but it had hardly yet reached such a stage that it could be ordained in legal form. But rules are laid down out of which, even if it had not begun already, representation in the strictest sense could not fail shortly to arise. The distinction which had been growing up ever since the Conquest, and indeed before, between the Witan and the Landsitting men now receives a legal sanction. The practice of summons makes the distinction. Certain great men, prelates, earls, and greater barons, are to receive

~~the personal summons, The rest of the king's tenants-in- chief are to be summoned only in a body. Here we have almost come to a separation of Lordsand Commons. But in modern ideas those names imply two distinct houses; and it was not yet settled, it had not yet come into men's minds to consider, whether the national council should consist of one house or a dozen. But it is decreed in so many words that the acts of those who came would bind those who stayed away. On such a provision representation, and not only representation but election of the representatives, follows almost as a matter of course. The mass stay away; a few appear, specially commissioned to act in the name of the rest. The Charter mentions only the king's tenants-in- chief ; so far had things been marred and feudalized by the influence of the Conquest. But as the election could only be made in the ancient county court, every freeholder at least, if not every freeman, won back his ancient right. If he could not come himself to cry Yea or Nay, he at least had a voice in choosing those who could do so with greater effect.~~

~~The point in which the legislation of the Charter seems The to have been in advance of the age was with regard to the power of~~

~~power of the purse. The old threefold burthen, the trinoda the puss~~

~~necessitas, seems, in the new feudalized state of things, to have~~

~~given way to the three cases in which the lord might law- |~~

~~fully call on his man for an aid. These were his own ransom from captivity, the knighting of his eldest son, and the marriage of his eldest daughter. This right is allowed to the king; but he could call for money in no other case, unless it was voted to him by the national council. This was the old law, and in quite recent times both Thomas of London and St Hugh, the Burgundian bishop of Lincoln, had, in full assembly, withstood exactions on the part of Henry and Richard. But, though both ancient law and modern precedent were for the clause, men were not ready for the direct assertion of its principle. Tue clause was left out at the later confirmations of the Charter, and the right was not again fully established till the end of the century. The provisions which were~~

~~temporary were not the least important. Twenty-five barons were appointed to carry them out, and, to show the advance of municipal~~

~~rights, among them was the mayor of London. If the king Resist-~~

~~C.~~

~~broke his oath, they were to call the whole commons of the ance leg- kingdom to their help, and to constrain the rebel king by #ized.~~

~~force. When John again rebelled, his barons and people drew the sword against him, and they were but carrying out the letter of the law.~~

~~The main principles of constitutional government had European thus been established ; the old freedom had been won back position~~

~~in a new shape. England was England again. European position of England had altogether changed. The final outcome of Norman and Angevin rule in England had been to make England an European and a continental power, holding two Gaulish dependencies, the duchy of Aquitaine and the insular Normandy. But the vast exten- sion of the Angevin dominions before they were thus cut short had brought England into connexion with most parts of Europe. The daughters of Henry IL., like the daughters of Eadward the Unconquered, were married to princes in distant lands, in Castile, Sicily, and Saxony. This last marriage, that of Matilda with Henry the Lion, gave the~~

~~of Eng- But the 'ona~~

~~old connexion between England and Germany a special Connex- direction. During the dispute with the archbishop, Henry ion with~~

~~was more than once tempted to forsake the obedience of ee~~

~~Alexander ITI., and to accept the pontiffs who were succes- sively set up by the emperor Frederick. But the Saxon marriage caused kings whose internal policy was distinctly Ghibeline to appear in foreign~~

~~lands as the allies of the Guelf. Otto IV., the son of Henry the Lion and Matilda, was constantly at the court of his uncles, and he received~~

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~~by William the Lion in the revolt of the English barons gpecial was avenged in 1174 by his defeat and captivity, and by submis- his acknowledgment of a supremacy of an altogether new sion of~~

~~THE GREAT CHARTER. |~~

~~from them earldoms and promises of kingdoms. It was in alliance with him that Englishman, German, and Fleming~~

~~tood side by side wh Hl th stood side by s when a ree were overcome by “William~~

~~The cru: emperors. But Henry himself took the vow of a crusader, eades. and Richard carried that vow into effect. In foreign lands | the English crown fell back to their former state, to form the Poitevin count appeared as an English king, and his | materials for a great controversy a hundred years later. followers, of whatever race or speech, were looked on as Englishmen. The fame of England was thus spread With regard to language, this period is one in which the Use of through all lands ; yet it was in the reigns of Richard and | use of Latin becomes universal in all public documents. French John that the crown of England was humbled as it never | There are still a few English writs of the early days of 9°. was before or since. Richard became the man of the | Henry II., and the first known French document comes !***!? emperor for his kingdoms; John became the man of the | from the hand of Stephen Langton in the year of the Great pope. That he also offered to become the man of the | Charter. The truth is that the men of this~~

~~time were so Almohade Commander of the Faithful reads almost like a | familiar with the use of all three languages, English, piece of satire; but the evidence on which the story rests | French, and Latin, that it is rarely indeed that any writer cannot be lightly cast aside. thinks it needful to mention which of the three a man Conquest Within the island world of Britain the power of England | spoke at any particular moment. But it is clear that, by cf Ire- rose for a moment under Henry II. to a greater height | the end of the 12th century, English was understood and jand. than it had ever risen at any earlier time. Or we might | spoken by all classes. It is equally clear that a fashion say that another island world, less only than Britain itself, | now set in in favour of French merely as a fashion. was brought into relation with the world of Britain, as the | Richard was altogether non-resident, and could have had world of Britain was brought into relation with the world | little influence on such matters. But John, and after him of Europe. The first Angevin king of England became | Henry III., kept a foreign court in England. Though the first English lord of Ireland. The connexion between | born in the land, they were far more strangers than Henry the two islands had been growing close fora long time. | II. had been. Thus, at the very moment when French Shadowy tales are told of a dominion exercised by Eadgar | had lost its position as the natural speech of one class of and by Cnut on the eastern shore of Ireland. It is more | the inhabitants of England, it came to the front again as a certain that, under the two Williams and under Henry I., | mere courtly speech, foreign to all. In short, in regard to first the Danish settlers, and then the Irish themselves, | language, as in regard to matters of fashion generally, the entered into spiritual relations with the see of Canterbury | Norman period was succeeded by a French period. But which could hardly fail to grow into temporal relations with | neither French nor English was at this time the tongue of the crown of England. One Irish king was, if not the | solid literature, as distinguished from writings which are Litera- vassal, at least the attached friend, of Henry I. One of | merely popular or merely courtly. Such writings were ture. the first acts of Henry II. was to obtain a bull from the | severally English and French. But all the learned writings one English pope, Hadrian IV., granting him the dominion | of a learned age were in Latin. Neither in English nor in of the island of~~

~~Ireland. But the conquest of the new | French is there any original English history of this time, realm was begun only by private adventurers in 1169. For | unless we except the rhyming chronicles of Wace and Benoit one moment, in 1171, the conquest seemed to be a reality. | de Sainte More, which are writings essentially Norman, The Irish princes became the men of Henry, who pre- | though incidentally bearing on English matters. Our sently granted the kingdom of Ireland to his son John. | Latin materials for the history of this time are abundant. But in truth all that was done was to begin that long and | We have the so-called Benedict of Peterborough; we have Histo- dreary tale of half-conquest and local warfare which gave | Roger of Howden and Gervase of Canterbury; we have rians of Ireland five centuries of greater wretchedness than England | Ralph de Diceto and the critical William of Newburgh. el had endured in the first five years of Norman dominion. | The quarrel between Henry and Thomas gave rise to an end- °° As if from a feeling how unreal the claim was, the kingly | less crop of letters, lives, and documents of all kinds. The style granted to John was dropped by John himself; and, | expedition of Richard I. finds its place among the histories till the reign of Henry VIII, the king of England took | of the crusades. And, while history was thus abundant, from his precarious Irish dominion no higher title than | legend was not wanting. The actual life of Geoffrey of Mon- Lord. mouth belongs to the days of Henry I. and Stephen; but it Relations On tlic Welsh frontier the endless warfare went on; but | was in the second half of the century that his writings began ae _ this cannot be called a period of conquest. The armies of | to have a lasting influence. His wild fables of Arthur and Legends "83 Henry II. suffered at least one defeat at the hands of the | earlier British kings seem at the outside to have preserved of Ar- Britons ; and the contemporary writer John of Salisbury | a few distorted scraps of genuine West-Welsh history. But thur, ventures to regret that England had not in his day a leader | they gave birth to a vast legendary literature, Latin, French, like Harold to guard her frontier. Under John we find | and English, which has done more perhaps than any the first connexion by marriage between the ruling houses | other one cause to make Englishmen forget that they were of England and Wales. A natural daughter of John was | Englishmen. And, beside history and legend, there was married to the~~

~~Welsh prince Llywelyn. From this time | also at this time no lack of Latin literature of a more the position of the Welsh princes changes, and they begin | general kind, such as the writings of John of Salisbury, to play a certain part in the internal affairs of England. | Peter of Blois, and the often misunderstood Walter Map or with On the Scottish frontier Henry II. took back the earldoms | Mapes. Among many others these may pass as some of Scotland. of Northumberland and Cumberland, which had been | the chief; but the literature of this age, of all classes, is~~

~~the French king at Bouvines. In other parts of the empire, we find Henry seeking a wife for his son John in Savoy, and bringing a saint from Grenoble to rule at Witham and at Lincoln. But more than all, England, as a power, began at this period to take a direct share in the crusades. In- dividual Englishmen of both races had fought in earlier crusades, and had entered the service of the eastern~~

~~yielded to David and his son. Presently the share taken~~

~~kind on the part of the English overlord. For the firs time, Scottish lords, as well as Scottish kings, did homage to Henry ; and, for the first time also, Scottish castles were placed in his hands. But when the chivalrous Richard was selling everything, he sold back these newly acquired rights. The relations in which the kingdom of Scotland, the earldom of Lothian, and the territorial fief of what we may now best distinguish as Scottish Cumberland, stood to~~

~~overflowing. Many of these writers were real scholars,~~

~~the Lion.~~

~~Transi- tion in architec- ture,~~

~~Period 1217—~~

~~1340.~~

~~310~~

~~well versed in both sacred and profane learning. In Giraldus we see something higher still. He was vain, spiteful, and careless of truth. But, as we see in William of Malmesbury and William of Newburgh the beginnings of historical criticism, so in Giraldus we see the first approaches to something like scientific observation alike in language and in natural history.~~

~~In the history of art this age is one of the greatest turn- ing-points. It is the time of transition between the round and the pointed arch, between the Romanesque and the so- called Gothic style. The richer and lighter Norman style of Roger of Salisbury was through the reign of Henry II. gradually getting still richer and still lighter. The pointed arch, first introduced in the vaults, then in the main arcades, gradually spread itself into every part of the building. The change in the form of the arch was at first unaccompanied by any change in detail ; the Romanesque ornaments con- tinued in use. Gradually they were changed for a system of ornament which better suited the new constructive forms. By the first years of the thirteenth century, the change was complete; a style all but peculiar to England, quite peculiar to England and Normandy, a style marked by the use of untraceried lancets as windows, combined with the use of purely Gothic detail, was fully developed. The stages of the change may perhaps be best studied in the churches of Canterbury and Lincoln. Along with the development of architecture, there was an even more remarkable develop- ment of sculpture. The carvers of the eleventh century and of the first half of the twelfth could hardly represent the human figure; and when they attempted foliage, as in capitals, it was rude and inartistic. The later years of the twelfth century produced capitals almost rivalling the old Corinthian types. The next generation struck out more original, but equally perfect, forms of beauty. The sculp- ture, strictly so called, of the thirteenth century, if it never shook itself free from a certain amount of conventional stiff- ness, if its artists had neither the modern artist's anatomical science nor the old Greek's familiarity with the human figure, was at least a vast advance on works of the times immediately before them. English sculpture indeed leaped in the thirteenth century to a point of excellence which it found hard to keep.~~

~~The next period in English history may be nieasured in different ways, according to the point of view from which that history is looked at, The English nation has now taken its later form. It has assimilated its Romance con- querors, and in so doing it has received a certain Romance infusion in language, laws, and mauners. The connexion with Normandy has made England an European power. The separation from Normandy has made England again an English power, The nation has now to struggle against a new form of foreign invasion. Englishmen, of whichever race, have to hold their own against the Poitevin and the Savoyard. They have to wage the long struggle of the thirteenth century at once against the king at home and against the pope beyond sea. This time is marked by the reign of Henry III. But the time of struggle is alsoa time of constitutional progress, and under Edward I. the law and constitution of England put on the essence of their later form. Here then, in a purely constitutional view, is one of the landmarks of our history, a landmark to be placed alongside of the Conquest and the Great Charter. But our former landmarks, the Conquest, the accession of Henry IL., the reign of John, were not merely constitutional landmarks, but landmarks in the history of England as an European power. This last the legislation of Edward I. can hardly be said to be. The next great European land- mark is the beginning of the long wars between England and France. From the reign of John to the reign of~~

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~~'legates.~~

~~[HISTORY.~~

~~Edward III., the foreign relations of England hold a secondary place as compared with her constitutional pro- gress. There are frequent wars with France; but they are rather the wars of the duke of Aquitaine than of the king of England. Under Edward III. a wholly new state of foreign relations begins. The rivalry between England and France, which had grown out of the older rivalry between Normandy and France and which had survived the separa- tion of Normandy from England and its union with France, now becomes, for a hundred years and more, the~~

~~leading feature in English history, one of the leading features in European history. In this European aspect, the period which follows the claim of a French prince to the crown of England comes to its natural end when a king of England claims the crown of France. We take then our preseut start from the day when Lewis was driven out of England, and we next draw our breath when Edward III. invades France.~~

~~The reign of Henry HT. was, down almost to our own Reign of~~

~~day, the longest in our annals. are, on the whole, the dreariest time in our history. No time of so great a length has so few events which stand out as prominent landmarks. First comes the minority of Henry, the time when, notwithstanding the vigour of the great Earl Marshal, England was largely ruled by papal The homage of John had, according to feudal principles, made the pope the guardian of his minor heir ; and it was not the policy of Rome to let that guardianship be a mere name. 'The Charter is confirmed over and over again; but, as we have seen, with the loss of some of its most important clauses. In 1227 the king declares himself of age; presently he gets rid of his great minister Hubert of Burgh; he fills the land with Poitevins and other kindred of his mother ; he drives his nobles, his brother Earl Richard at their head, into discontent, and some of them into rebellion. The new struggle of Englishmen against strangers has begun. A new phase opens when help comes from the quarter from which it could least have been looked for, when Englishmen find a leader against strangers in one who was himself by birth a stranger. Montfort first appears; he receives the king's sister in marriage, with the earldom of Leicester to which he had an hereditary claim. Suspected at first as a foreigner, the earl grows into the truest of Englishmen. A reformer from the beginning, he gradually widens his basis, till he becomes, above all men, the leader of the people. Mean- while the king's marriage with Eleanor of Provence brings a second shoal of strangers to feed on the good things of England. A border war is waged against France with small good luck. In 1259 that war is ended by a treaty, by which Normandy is given up for ever, and the English king keeps nothing on the continent except part of the Aquitanian heritage of the elder Eleanor. Meanwhile, during part of this time, Aquitaine is placed under the rule of Earl~~

~~Simon, a ruler beloved of the cities and hated of the nobles. Meanwhile pope and king are draining the wealth of the nation; but their very extortions help the growth of freedom. Parliament after parliament meets to make grants indeed, but in making grants to protect and to assert its powers. In 1256, in 1257, new entanglements, new forms of extortion arose, while Earl Richard, the one Englishman who was ever called to the throne of the Cvesars, passed into Germany to receive his almost nominal kingship. The crown of Sicily was offered by Alexander IV. to the king's younger son Edmund. More money is demanded, more money is granted; but each grant leads to a fresh demand, and at last the spirit of nobles and people is thoroughly roused. Forty-two years after the accession of Henry, we reach the first great landmark of his reign, the famous Provisions of Oxford.~~

~~The first forty years of it Henry~~

~~In 1238 Simon of Simon of Montfort.~~

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~~REIGN OF HENRY 111.|~~

~~Provi- By these provisions the royal power was practically put~~

~~id. in commission, very much as it had been by the Great~~

- ~~Charter in the latter days of John. It is specially to be~~

~~noticed that at this stage the king's eldest son Edward,~~

~~afterwards King Edward I., appears on more than one~~

~~occasion on the popular side. He and Simon were for~~

~~a while fellow-workers. But Henry, like John, rebelled~~
~~against the provisions which cramped his power, and about~~
~~the same time Edward was reconciled to his father. The~~
~~matters at issue between the king and his people were~~
~~now submitted to the judgment of the king of the~~
~~French, St Lewis himself. But Lewis, if a saint, was~~
~~also a king. By the mise of Amiens (1274) he annulled~~
~~the Provisions of Oxford, as overthrowing the royal~~
~~authority ; but at the same time he decreed that the nation~~
~~should keep its ancient liberties. To men who held that~~
~~the Provisions of Oxford were, like the Great Charter, simply~~
~~a re-enactment of ancient liberties, such an award seemed~~
~~inconsistent on the face of it. There was now no hope but in~~
~~The arms. The civil war now begins; Earl Simon, a stranger by~~
~~barons' hirth, is the leader of the barons and people of England.~~
~~wat. King Richard of Germany, who once seemed destined to hold~~
~~the place which Simon had come to hold, was now fighting~~
~~on the side of his brotherand fellow-king. So were the two~~
~~kings' sons, Edward of England and Henry of Germany.~~
~~Kings and kings' sons were overthrown at Lewes (May 13,~~

~~1264), and the royal authority passed into the hands of the earl, By him, early in the next year, was held the great Parliament, the first to which representatives of the boroughs were summoned along with prelates, earls, barons, and knights of the shire. But quarrels presently arose between Earl Simon and his fellow barons. Edward, kept for a while in ward with his father, escaped and gathered an army. In the fight of Evesham (4th August 1265) Simon was overthrown and killed, and was canonized, not by the Rome which he had always withstood, but by the popular voice of England. The war lingered at Simoun's castle of Kenilworth, and, as in the days of Hereward, in the marshes of Ely. Peace was at last made (1267); and the terms on which it was made, and the generally con-ciliatory character of Edward's policy towards the vanquished, already showed how much he had learned from the uncle who had fallen before him, but whose work he was destined to bring to perfection. The peace of the last few years of Henry's reign seems wonderful after the storms which had filled up the greater part of it. Edward could~~

~~leave the land in safety to go on the crusade; and, when~~

~~his father died (1272) in his absence, his succession to the~~

~~crown was at once recognized and his peace proclaimed.~~

~~To say that he was the first king who reigned without~~

~~election is almost. question of words. At no time in our~~

~~history would there have been, in such a case as this,~~

~~any chance of opposition to the eldest son of the Jast king.~~

~~What really shows how fast the new ideas of kingship had~~

~~advanced is the fact that Edward reigned for nearly two~~

~~years without coronation. Henry died November 16, 1272.~~

~~The reign of Edward was held to begin with his proclama-~~

~~tion four days later ; the doctrine that the king never dies~~

~~Accession is a later device still. Edward was then in Sicily, nor~~

~~, was his return a hasty one. He passed leisurely through~~

- **~~several parts of Europe; he suppressed disturbances in his~~**

~~duchy of Aquitaine, and was crowned seventeen days~~

~~after his arrival in England (August 19,1274). Nothing~~

~~could show more clearly than this how fast the office con-~~

~~ferred by election and coronation was passing into the possession~~
~~handed on by simple hereditary succession.~~

~~The reign of Edward which thus began is one of the~~

~~most memorable in the whole course of English history.~~

~~It is more than an accident that he was the first king since~~

~~the Conquest who bore one of the ancient kingly names.~~

~~ERG Eb A RD~~

~~311~~

~~Under him we feel at once that the work is done, that all Reign of traces of conquest, all traces of distinction of races, have Edward. passed away. We have again an united English nation, under a king English in name and in heart. For the first time since the Norman came, England has a king whose whole policy is thoroughly English, whose work seems in so many ways a falling back on the work of the old native kings, specially of the king whose name he bore. For the first time since the Conquest, we have a king who is neither surrounded by foreign favourites nor has his policy directed to foreign objects. As duke of Aquitaine, Edward could not avoid wars and controversies with France; but wars and controversies with France were in his days something altogether secondary. His objects were those of the old West-Saxon kings, to be the lawgiver of England, and, as far as might be, to make England co- extensive with Britain. Still, like some other kings, Edward has been misunderstood through not attending to the chronology of his reign. His Scottish warfare, which is perhaps the first thing which is suggested by his name, takes up only the last nine years of a reign of thirty-five. He had been king nineteen years before the controversy as to the Scottish crown arose. So in the earlier part of his reign the Welsh warfare, which in the popular con- ception stands alongside of the Scottish warfare, has very much the air of an episode in a time mainly given to internal legislation. The reign naturally falls into two divisions. In the first, from 1272 to 1291, internal affairs are most prominent, though it also takes in the conquest of Wales and some important dealings with France. In the latter part, from 1291 to 1307, Scottish affairs are, or seem to be, predominant. And yet it is during this time that the greatest constitutional step of allis taken, and that parliament distinctly assumes its later form.~~

~~The immediate occasions of the Welsh war arose out of Conquest the disputes of the last reign. The Welsh prince Llywelyn, of Wales. who still held the north-western part of Wales by the title of Prince of Aberffraw and Lord of Snowdon, had been allied with Simon; his subjects had shared in the earl's warfare, and he was himself betrothed to the earl's daughter. Disputes arose out of Llywelyn's refusal to meet the English king and do his homage. In 1276 he was declared to have forfeited his fiefs, and in the next year he was constrained to surrender the eastern part of his territory and to do homage for the rest. In 1282 a revolt began, in which David, the brother of Llywelyn, who had been hitherto in Edward's favour and was enriched with English honours, seized the castle of Hawarden and massacred all who were init. The revolt was put down ; the land was speedily conquered ; Llywelyn died in war; his brother was put to death as a traitor. The part of Wales which had thus far kept its separate being as a vassal state was now forfeited to the overlord. Through- out a great part of the land English law was introduced. Shires, with their system of administration, were formed; boroughs were founded; castles were built to keep down the malcontents. The principality was designed to form a separate apanage for a younger son of the English king ; but, as Edward, the first English prince, succeeded to the crown by the death of his elder brother, the title of Prince of Wales has since commonly been borne by the eldest son of the English king. The Welsh revolted again, even iu Edward's own time ; but their revolt was only for a moment. Later revolts were of importance only wheu the malcontents contrived to connect themselves with English rebels or with foreign enemies of England. The general tendency of things was to closer union between the kingdom and the principality, down to the complete incorporation of Wales with England in the sixteenth century.~~

~~Fourteen years passed between the conquest of Wales and~~

~~Edward's first warfare with Scotland. In this interval much of the legislation of Edward's reign went on. He visited Gascony, and confirmed his power there; and in 1290 he freed England from the~~

presence of the Jews. The next year began those negotiations with Scotland which led to war between the two kingdoms of Britain, to the momentary conquest of Scotland, and to its final independ- ence,

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the Scottish queen Margaret. end to by the young queen's death.

called on to decide. Such an opportunity was not to be lost ; Edward demanded to be first of all formally recognized as superior lord of the crown which he was called on to dis- pose of. He was so recognized ; the claims of the competitors were fairly heard before a mixed commission; and the judg- ment given was strictly according to the laws of hereditary

Position Rightly to understand this great controversy, we must | succession, as they were now beginning to be understood. of the look back to the older relations in which the various posses- | The question between John Balliol and Robert Bruce was several sions of the Scottish crown stood to the crown of England. | a question between primogeniture and nearness of kin. Ye * 'These were threefold. Between Scotland proper and | That question was in truth settled by the decision in favour of the England the relation was that degree of dependence, what- | of Balliol. The crown of Scotland was assigned to the Scottish ever it might be deemed to be, which arose out of the old | candidate to whom it would have passed by the later law kings. commendation to Edward the Elder. The special burthens | either of England or of Scotland. The decision in truth

imposed by Henry II. had been withdrawn by Richard. Over Scotland proper the utmost claim that could be made was that of a mere external supremacy, a supremacy older than the feudal law and undoubtedly carrying with it none of the recently devised feudal incidents. Scottish Cumber- land, on the other hand, was a territorial fief in the strictest sense, though again a fief older than the later feudal juris- prudence. Lothian or northern Northumberland was in strictness an earldom

~~within the English kingdom, just as Northumberland in the latest sense was when that earldom too came for a while into the hands of the Scottish kings. Here then, in strictness, were three distinct relations for three different parts of the Scottish dominions. But it~~

~~created that later law. The new king John at once entered into a relation of homage which involved a more complete dependence on England than any Scottish king had ever before acknowledged. But, though it was to Edward's manifest interest to have three weaker vassals rather than a single powerful one, he at once rejected the demand of Bruce and Hastings that the kingdom should be divided. It must be remembered that all three competitors, Bruce no less than Balliol and Hastings, though they held Scottish estates and came by female descent of the Scottish royal family, were essentially English barons, who felt no kind of degradation in a renewed homage to their own~~

~~This scheme was put an The dis. Then came the dis- puted puted succession, a dispute which Edward was in 129] S%°*e-~~

~~king. But it is plain that they did not carry with them Division the general feeling of what we must now begin to call the of ——— Scottish people. The older names of things are now 2 °~~

~~had never been the interest of either side to define the claims very strictly. As long as the two kingdoms~~

~~land. were at peace, as they had been through a large part "=~~

~~of the twelfth and thirteenth centuries, the English king had been satisfied to receive the homage of the Scottish kings, without defining very strictly for what territories or on what terms it was rendered. In any case, English interference in the internal affairs of any part of those dominions was unknown. The distinction between the different tenures of Scotland, Strathclyde or Cumberland, and Lothian, passed out of sight. It was remembered on the English side that some kind of homage was due from all, It was remembered on the Scottish side that the~~

~~strangely reversed. The English of northern Northuniber- land, so long under Scottish rule, had adopted the Scottish name, and had learned to feel a national patriotism, distinct from, and even hostile to, southern England. They were the Scots from whom the English kings had to endure so stubborn a national resistance. The true Celtic Scots, the men of the highlands and islands, had in truth but little to do with the matter. Whenever they had any share in the disputes of the time, dislike to the king of Scots, the nearer enemy, commonly drove them to the English side.~~

~~In 1292 John of Balliol received the Scottish crown as Reign of a vassal of England. A claim which we may be sure was John without precedent, but which was strictly according to the PBaliiol.~~

~~kingdom of Scotland at least was no territorial fief of the crown of England. But while the relations of the two~~

~~kingdoms were in this uncertain state, the whole feudal jurisprudence had grown up, and neither side could any longer louk on the matter in its strict historical bearing. The different tenures of different parts of the Scottish dominions were forgotten on both sides, and the question finally took the shape, Are the Scottish dominions, as a whole, a fief of the English crown or not? It was hardly possible that the question should take any other form; yet such a form altogether confused ancient rights and distinctions. In claiming the ordinary superiority of a feudal lord over the whole Scottish dominions, Edward claimed more than his historic right over the kingdom of Scotland. He claimed less than his historic right over the earldom of Lothian. But the confusion was natural and unavoidable. It was only according to the ordinary work- ings of human nature, that the full feudal claims should be asserted on the one side, and that, on the other side, the only question should seem to be between accepting or denying them in 'their fulness. But it is eininently characteristic of Edward's mind that, while his evident~~

~~rules of the feudal jurisprudence which had grown up, was tefore long brought to bear upon him. From the courts of the vassal there was, according to that jurisprudence, an appeal to the courts of the lord.~~

~~Scottish subjects, dis- satisfied with the justice which they got in the courts of King John, appealed to the courts of King Edward. Just as in the case of the arbitration, an opportunity was thrown in Edward's way, of which it was not in human nature to refuse to take advantage. John, having acknowledged himself a vassal, refused to do what was now held to be a vassal's duty. He was presently found to be negotiating against his lord with that lord's foreign enemies. That war followed was not wonderful ; that, when John renounced his allegiance, he was held to have forfeited his fief was according to received feudal notions. The fief was forfeited; the kingdom was conquered ; the separate king- dom of Scotland was abolished; it was incorporated with England, and was meant to have some share of representa- tion in that parliament of England to which Edward had just given its perfect form.~~

~~In 1304 the whole island of Eaward's~~

~~policy was to seize every opportunity for bringing the whole of Britain into a more perfect union, he should take care to be guided throughout by the rules of at least a~~

~~formal justice.~~

~~His first attempt to unite the kingdoms was by the vbvious means of a marriage between his son Edward and~~

~~Britain, so far as its most northern parts could be said to conquest be under the obedience of any oue, was under the obe- i a ; : : and. dience of the English king, In all this Edward simply acted as any man would act in Estimate his view of the case. He carried out the law as he under- of his stood it. There is thus far nothing to wonder at, nothing conduct.~~

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~~on both sides, till, after Edward had been deposed in 1327, a peace between Scotland and England was concluded in the next year, by which the independence of Scotland was fully acknowledged. The old claims, of whatever kind or over whatever territory, must be looked on as being from this time definitely given up. Scotland, in the sense which~~

~~the word then bore, a sense which, with the exception of the fluctuating possession of Berwick, is the same which it bears still,! must be looked on from henceforth as a Indepen- kingdom absolutely independent of England. To carry dence of on the analogy already drawn between the relations of 8°tand.~~

~~THE SCOTTISH CONTROVERSY.|~~

~~to blame. On the other hand, that the mass of the Scottish people—defined as above—should resist his claims was as little to be wondered at, as little to be blamed. Each side acted according to the ordinary workings of human nature in their several positions. The real greatness of William Wallace is shown in the fact that he was essentially a popular leader, one who kept up the heart of a nation whose natural chiefs had forsaken it. On the other hand, even Setting aside the charges of special cruelties, William Wallace could not fail to seem, in the eyes of Edward and of every Englishman, a rebel who had despised the offers of~~

~~William Wallace.~~

~~mercy which were accepted by every one else. That an English court condemned him as a traitor was in no way wonderful, in no way blameworthy ; that Scottish patriotism revered him as a martyr was as little wonderful, as little blameworthy.~~

~~This first war of Edward with Scotland thus began with the taking of Berwick in 1296, and ended with the taking of Stirling in 1304. Meanwhile Edward was engaged in disputes and warfare with France, which began at nearly the same time as the Scottish war. The points in controversy between France and England supply a striking and instructive parallel to the points in controversy between England and Scotland.~~

~~Scotland to England and those of Aquitaine to France, the treaty of Northampton in 1328 answers to the treaty of Bretigny thirty-two years later.~~

~~The change in the fortune and character of the war with Reign of Scotland which followed when Edward II. succeeded Edward Edward I. was only part of the general change which ~ naturally followed on such a change of sovereign. The ruler, lawgiver, and conqueror had passed away, to make room for a son who inherited none of these characters. Legis- lation and conquest come to an end ; constitutional progress becomes indirect. Edward II. was ruled by favourites ; that his earliest favourite, Piers Gaveston, was a foreigner from Gascony doubtless tended to increase the usual dislike~~

~~Analo- As the king of Scots was the man of the king of England, | to favourites ; but the fact was no longer of the same poli- gies be- so was the duke of Aquitaine the man of the king of the | tical importance as the predominance of foreign favourites fone a French. In both cases the vassalage was older than the | had been in earlier times. There was no longer any fear of tish and 2¢W feudal jurisprudence. But the doctrines of that juris- England again becoming the prey of the stranger. Still French prudence now began to be pressed against Edward himself. | the reign of Edward II. is, in some respects, a repetition of disputes. A quarrel arose between Gascons, subjects of Edward, and | the reign of Henry ITI. The national dislike to the favou- Normans, now subjects of Philip of France. The quarrel | rite led to an opposition to the king, which in 1310-1311~~

~~. grew into a war which was waged by the subjects of the two brought about the practical transfer of the royal power—in kings without any commission from their respective sove- imitation, it would seem, of the Provisions of Oxford—to reigns. Edward, summoned to appear in the court of his | a body of prelates and barons, called the Ordainers. The~~

~~lord to answer for the doings of his subjects, did not deny | almost immediate recall of Gaveston, in defiance of the~~

~~his obligation, though he appeared only by deputy. Pre- | new ordinances, led to a new Barons' War, in which the~~

~~sently his duchy was declared forfeited, by a process which king's cousin, Earl Thomas of Lancaster, appears rather as~~

~~in England at least was deemed unjust; and it was in the | a parody than as a follower of the great Simon. We now~~

~~end recovered only by a negotiation and arbitration and a | reach the beginning of a series of political executions~~

~~double marriage. In this war, as in earlier French wars, | which have no parallel in earlier days, but which from this~~

~~England had the alliance of Germany and of Flanders. | time disfigure our history for many centuries. The first~~

~~And, as the same years saw the beginnings of the long | blood shed was that of Gaveston himself, in 1312. It was } alliance between Scotland and France, we may say that avenged ten years after by the execution of Thomas of we have come to the beginning of European arrangements | Lancaster. Meanwhile the strife between the king and his~~

~~which lasted till very modern times. barons had gone on. A second time, in 1318, the royal~~

~~War of | The second Scottish war, the war of Bruce, was quite | power was transferred to a council. Then came the choice of Robert distinct from the first, the war of Wallace. The interval | new favourites, the Despensers, fatherand son. They were Bruce. which divides them is short ; but the change of circum- | at least Englishmen, bearing a name which had been glo- stances was enough altogether to change the conduct of | rious in former civil strife. But they were no less hated than~~

~~Edward. As long as the war took the form of resistance | the stranger Gaveston. In a moment of recovered power~~

~~to the establishment of his authority, his general clemency | on the king's part follows the execution of Earl Thomas, a was remarkable. Severity began only when the war took martyr in the belief of his party no less than Simon himself. the form of revolt against established~~

~~authority. The con- Presently Edward has to meet with foes, not only in his~~

~~| quest of Scotland had been completed in 1304. Robert | own house but in his own household. Dark and mysterious . Bruce, the grandson of the original competitor, having.lost | causes drew on him the deadly hatred of his own wife, and | all hope of Edward's favour by the murder of his rival John gave him a rival in his own son. In the revolution of Comyn, revolted and assumed the Scottish crown in 1306. 1326, the queen is the leader ; the favourites die in their es : In the next year, 1307, the cause of Bruce seemed again | turn the death of traitors. The year 1327 opens with the~~

~~war~~

~~altogether hopeless, when things were changed by the death of Edward on his march to Scotland. With the single ex- ception of the execution of Wallace, the whole of Edward's acts of severity in Scotland come within a single twelve- month, from July 1306 to July 1307. After the death of the great king and the accession of Edward II., the war naturally lingered ; it was interrupted by truces ; and a series of successes on the part of Robert Bruce were crowned in 1314 by the overwhelming defeat of the English at Bannockburn. Then comes, from 1315 to 1318, the attempt to establish Edward Bruce asking of Ireland. For ten years follows a time of truces and of occasional invasions~~

~~practical assertion of the highest right which the national council in its new form had inherited from the earliest~~

~~times. By a solemn vote of the parliament of England, Deposi- the king was deposed, and his own son Edward was placed nae , on the throne. In earlier times the deposition of a king "°W?"? in no way implied his murder, any more than the fall from~~

~~power of a great earl or prelate implied either his murder~~

~~or his legal execution. But the days of blood had now set his mur- in; before the end of the year the deposed king died by @*~~

~~1 That is, as regards the English frontier. The relations between Scotland and the Scandinavian islands do not concern English history,~~

~~a foul assassination. 'The new king was still a minor, and the first years of his reign were the reign of his mother Isabel and her favourite Roger Mortimer. Another revolu- tion was needed to break their power. In 1330, with the execution of Mortimer aud the imprisonment of Isabel, the real reign of Edward III. begins. And within a short space the struggle with Scotland has again begun, to be merged in a few years in the long abiding struggle between England and France.~~

~~Tn a constitutional point of view, as well as in many others, the period which we have just gone through may be deemed the most important of all periods in English history. It is the time during which our nation, our laws, our language, finally assimilated whatever was to be assimilated of the foreign elemeuts brought in by the Norman Conquest, and finally threw off whatever was to be thrown off. At the beginning of the period we saw the English nation debating between an Angevin and a French king. At the end of it England, as England, is a great European power, waging war on the continent for the conquest of France. So it is with everything else. It is during this time that most of the things which go to make up the national life puton their later form. Above all things, this was the case with the great council of the English nation. It is for constitutional historians to trace the minuter details; the main outline may be traced in the assemblies of the reigns of Henry III. and Edward I. The name of the assembly had hitherto been fluc- tuating. During this period the name of Parliament became finally established. The name is a translation of an Old- English phrase. The Conqueror is said in the English Chronicle to have had '" very deep speech with his Witan." This deep speech, in Latin colloquium, in~~

~~**French parlement, was the distinguishing feature of a meeting between king and people; in the end it gave its name to the assembly itself. The constitution of the assembly, as defined in the Great Charter, did not absolutely imply representation ; but it showed that the full establishment of representation could not be long delayed. 'The work of this period was to call up, alongside of the gathering of prelates, earls, and other great men specially summoned, into which the**~~

~~**Origin of ancient Witenagemét had shrunk up, another assembly**~~

~~**the Com- ons,**~~

~~**Doctrine of estates.**~~

~~**directly representing all other classes of the nation which enjoyed political rights. This assembly, chosen by various local bodies, communitates or universitates, having a quasi corporate being, came gradually to bear the name of the commons. The knights of the shire, the barons, citizens, and burgesses of the towns, were severally chosen by the com- muna or communitas of that part of the people which they represented. We thus get the two houses of Lords and Commons, of which we have seen foreshadowings getting more and more clear from the days of the Conqueror on- wards. But it was only gradually fixed that the mem- bers of the national council should sit in two bodies, and not in one or in more than two. The notion of local representation, by which shires and boroughs chose representatives of their own communities, had to some ex- tent to strive with another doctrine, that of the representa- tion of estates or classes of men. 'The thirteenth century was the age when the national assemblies, not only of Eng- and but of most other European countries, were putting on their definite shape. And, in most of them, the system of estates prevailed. These in most countries were three— clergy, nobles, and commons. By these last were commonly meant only the communities of the chartered towns, while the noblesse of foreign countries answered to the lesser barons and knights who in England were reckoned among the commons. The English system thus went far to take in the whole free population, while the estates of other**~~

~~BNGEARY.~~

~~[n1sToRY.~~

~~countries, the commons no less than the clergy and nobles, must be looked on as privileged bodies. In England we had in truth no estates ; we had no nobility in the foreign sense.~~

~~Such a nobility was inconsistent with the institu- Nature of~~

~~tion of peerage, which gradually grew out of the practice of the peer-~~

~~personal summons. Two official classes, bishops and earls, have always kept their right of personal summons. With regard to others, both lay barons and churchmen under the rank of the bishops and chief abbots, it is plain that in the early parliaments the king summoned very much whom he would. It was only gradually that the right of sum- mons was held, first to be vested for life in every man who had once been summoned, and afterwards to be hereditary in his descendants. Thus was formed the House of Lords, consisting of certain lay members succeed- ing by hereditary right, and of certain heads of ecclesiasti- cal foundations. The office of the peer, the office of legislator and judge, passes by hereditary succession in the one case, by ecclesiastical succession in the other. The holder of the hereditary office was gradually clothed with various personal privileges, but his children remained unprivileged members of the general body of the commons. So far as nobility exists at all in England, it is confined to the person of the peer for the time being. But in truth~~

~~The English peerage is strictly official. 8~~

~~there is in England no nobility, no estate of nobles, in the –~~

~~continental seuse of those words.~~

~~Yet the continental theory of estates so far worked in the development of our parliamentary system that the " Three Estates of England" became a familiar phrase. It was meant to denote the lords, the~~

~~commons, and the clergy in their parliamentary character. For it is plain that it was the intention of Edward I. to organize the clergy as a parliamentary estate, alongside of the lords and commons, This scheme failed, mainly through the unwillingness of the clergy themselves to attend in a secular assembly. This left, so far as there were any estates at all, two estates only, lords and commons. This led to the common mis- take—a mistake of respectable antiquity—of fancying the three estates to be king, lords, and commons. The eccle- siastical members of the House of Lords kept their seats there ; but the parliamentary representation of the clergy as an estate came to nothing. So far as the clergy kept any parliamentary powers, they exercised them in the two provincial convocations. These anomalous assemblies, fluc- tuating between the character of an ecclesiastical synod and of a parliamentary estate, kept, from Edward I. to Charles II., the parliamentary power of self-taxation, For a long time lords and commons taxed themselves separately. So did the clergy ; so sometimes did other bodies. It was only very gradually that the final constitution of parliament was settled. That the barons should sit with the bishops and earls, that the citizens and burgesses should sit with the knights, were puints which gradually settled themselves. And more than once things looked as if, besides separate assemblies of the clergy, we might have had also separate assemblies of merchants and of lawyers. The great fact is that, while at the beginning of the thirteenth century the name and the constitution of the national assembly were still unsettled, at the beginuing of the fourteenth century we had a regular parliament of Lords and Commons. 'The chief point which still remained unsettled was the position of the estate of the clergy.~~

~~Phrase of Three Estates.~~

~~This seems to be the general result of the constitutional Assem- growth of the thirteenth century, as traced out by our great blies under~~

~~constitutional historian. may here mark some of the chief steps in the progress. During the reign of Henry III. assemblies were constantly held, and their constitution is often vaguely described. But in a great many cases phrases are used which, however~~

~~Leaving the minuter details, we me~~

~~GROWTH OF PARLIAMENT. |~~

~~Popu- vague, imply a popular element. We read of knights, of a cle- tenants-in-chief, of freemen, sometimes even of freemen and ent,~~

~~villains, sometimes, more vaguely still, of "universi," "universitas Angliz," and the like. In some cases we are able better to interpret these vague phrases. For instance, in 1224 each shire sends four knights chosen by the "milites et probi homines." Whether these knights were or were not to vote along with the magnates, they were at all events to transact business with them. We must always remember that in these times formal voting in the modern sense is hardly to be looked for. In 1254 we have a dis- tinct case of two knights summoned from each shire by royal writ. Inthe Oxford parliament of 1258 four knights are ordered to be chosen in each shire, who are to report to another parliament within the same year. At that parlia- ment they seem to appear by the title of ""'Communitas Bachelarize Anglie." It may be doubted whether this is strictly a case of the knights acting as part of the parlia- ment, Still every instance of the kind must have helped to strengthen the growing doctrine of representation. From this time the attendance of elected knights seems to be fully established, and along with the knights we find in many Parlia- cases distinct representatives of the clergy. It isin Earl ment of Simon's parliament of 1265 that we first find distinct Repre- Tepresentatives of the boroughs. Each county sends two senta- knights, each city or borough two citizens or burgesses, and tives of the cinque ports four each. But this same parliament shows the how fluctuating the practice of summons still was. The boroughs. earl, st the clergy, str ong th le at earl, strong among the gy, strong among the people a large, was much less strong among the great men of the realm. Besides summoning the citizens for the first time, he summoned a crowd of churchmen, regular and secular, greater than appeared in any other parliament. But he summoned only five earls, including himself, those namely whom he could trust. We should call such a body a packed parliament ; but for a long time every parliament was a packed parliament. That is to say,~~

some barons, some abbots, were always personally summoned, some towns were always called on to send representatives; but the barons, the abbots, and the represented towns were by no means the same in every parliament. 'This kind of irregularity is always found till institutions have finally stiffened into some particular shape. Our whole law and constitution rests far more on precedent than on formal enactments, and in unsettled times precedents are slow in establishing themselves,

The parliament of 1265 was the model parliament, the assembly whose pattern, in its essential features, set the standard which was in the end followed, and which has lasted till our own time.1 But the pattern which it set did not become the invariable rule till the great parliament of 1295. In the earlier parliaments of Edward I. the knights aud citizens are often mentioned; but, on the other hand, we meet also with the same vague descriptions as in earlier times. But in 1295 Edward definitely adopted the model which Simon has set him, and the summoning of knights, citizens, and burgesses, though with great irregularity as to ee SS eae eee

Parlia- ments of Edward i

1 In the great political poem which forms the manifesto of the patriotic party are two lines which have been often quoted :— "'Tgitur communitas regni consulatur, Et quid universitas sentiat, sciatur." But what follows shows that the duties of a popular assembly were held to be, not to enact new laws, but to declare the old ones, and to procure their better observance :— "Cui leges proprie maxime sunt note, Nec cuncti provincie sic sunt idiote, Quin sciant plus ceteris regni sui mores, Quos relinquunt posteris hii qui sunt priores. Qui reguntur legibus magis ipsas sciunt ; Quorum sunt in usibus plus perite fiunt, Et quia res agitur sua, plus curabunt, Et quo pax adquiritur sibi procurabunt."

~~the places from which representatives were summoned, has ever since been the rule. It was thus under Edward I. that parliament finally put on the essentials of its present form. But we must still allow for irregularities in practice. It does not follow that every enactment was always passed with the consent of all the classes of which the parliament was made up. A doctrine had come in that the king was the legislator, that the votes of the parliament, or of any part of it, were petitions which he could accept or reject, or again that he might legislate on a petition from one house or branch of the assembly apart from the others. The national council had now won back its ancient constitution as an assembly of the freemen of the realm, either personally or by representation. But it was only step by step that it won back the full powers of the ancient Witenage- mét. There are some indeed which it still shrinks from exercising directly, some which it shrinks from exercising at all.~~

~~The reign of Henry III. was a reign of constant parlia- Legisla- mentary action, but it was not a time rich in legislation in tion the strictest sense. 'The most direct case of change in the Se law during Henry's reign was the abolition of the ordeal at Tit. u its beginning. This led incidentally to further changes in judicial procedure, and it is one of the chief landmarks in the development of the jury system. But it isin itself not so much independent legislation as the application to Eng- land of a decree of a General Council of the church. In short the parliaments of Henry III. are less famous for changing the law than for refusing to change it. The famous saying " Nolumus leges Angliz mutari" dates from the council of Merton in 1236, when the barons refused to agree to the proposal of the prelates for assimilating the law of England to the civil and canon law in the matter of children born before wedlock. By the former systems of jurisprudence, the subsequent marriage of their parents admitted them to the rights of legitimate birth. But the barons chose to maintain the harsher rule of the common law of England.~~

~~But, if the reign of Henry III. was not a time rich in payyia- legislation, it forms an important stage in the growth of our mentary parliamentary life. The chief work of that reign was that growth the first steps were taken towards the practical establishment a of the~~

~~doctrine set forth in the omitted clauses of the Great lL; Charter, the doctrine, in modern phrase, that the power of power of the purse belongs to parliament. In Henry's day England the purse, and her parliament had to wage a never-ending strife against her two enemies, king and pope. The main duty of the nation was to withstand the extortions of both alike.~~

~~The king was always asking for money ; the conditions of a grant commonly were that the charters should be again confirmed and be better observed. And gradually another demand arises, that the great officers of state shall be appointed, if not by parliament, at least with the assent of parliament. But demands like these, demands for the removal of aliens and the like, are all demands for the reform of abuses and the execution of the old laws ; new laws are never asked for. The Oxford Provisions of 1258 show the ideas of reform which were then entertained ; it is not legislation, it is reform of bad administration, even at the cost of transferring the king's authority to other hands, which is asked for. Simon himself, the greatest of constitutional reformers, was not a legislator. His Parliament is famous, not for anything that it did, but for what it was. Nor after Simon's fall do we meet with much legislation strictly so called. The ordinances of Kenilworth and Marlborough are ordinances for the settle- ment of the kingdom, ordinances for the better observance of the Charter and of the statutes of 1259. They are not legislation in the strictest sense, the enactment of absolutely 5 new laws. .~~

~~Legisla- tion of Edward IG~~

~~Parlia-~~

~~mentary power of taxation.~~

~~Use of French~~

~~316~~

~~On the other hand, the reign of Edward L., like the reign of Henry IL. is emphatically a time of legislation strictly so called, as well as of~~

~~constitutional progress. At no time were so many memorable statutes passed. Edward s first great act, the first Statute of Westminster, in 1275, has been described as "almost a code by itself." But it was followed almost yearly by enactment upon enactment. The statute de religtosis in 1279 forbade the alienation of lands in mortmain without the consent of the superiorlord. Ten years later, after a mass of legislation in intermediate years, came the statute guia emptores, which forbade subinfeuda- tion. The holder of land could no longer grant it to be held of himself ; he could alienate it only so as to be held of the higher lord by the tenure by which he held it him- self. Other statutes regulated the local administration, the range of the ecclesiastical courts, almost every detail of English law. At last, in 1297, the famous Confirmatio Cartarum was wrung from the king ; the power of arbitrary taxation was surrendered; no tax is any longer to be levied by the king without parliamentary sanction. That is to say, those clauses of the Great Charter which were left out in the confirmations under Henry III. were now restored and put in force. As in all other things in these ages, we must allow for what seems to us amazing irregularity of practice. It does not follow that, because a certain course was ordained by law, therefore the law was always carried out. But the principle was established, and it could always be appealed to in case of any breach of the law. By the end of Edward's reign, a national assembly, composed of much the same elements of which it is composed still, was acknowledged to possess what is practically the greatest of parliainentary powers.~~

~~The extreme legislative activity of this reign is one of many signs that the immediate effects of the Norman Con- quest had now quite passed away. A thoroughly united nation, which had forgotten the foreign origin of certain classes of the nation, could bear to have new laws enacted, to have old institutions put into new forms. But the particular form which the great constitutional triumph of this reign took looks both forward and backward. It looks forward, as showing that we have reached what is really modern history. The parliamentary power of the purse is the ruling principle of all later constitutional struggles. But it also looks backward. An ancient Witenagemdt possessed the power of the purse, like all other powers. But in those days the power of the~~

~~purse was a power of secondary importance. In early times taxation never holds the same prominent place in politics which it does after- wards. But the rule of a series of kings in whose eyes kingship was rather a possession than an office, in whose eyes the kingdom was an estate out of which they had to squeeze the greatest possible income, had made it the most needful thing of all to check the king's power of taking his subjects' money. From this time each parliamentary struggle takes the form of a bargain. The king will re- dress such and such a grievance, if he receives such and such a grant. By constantly pressing this new power, par- liament, and above all that house of parliament in which the power of the purse came to be specially lodged, has gradually won back the powers of the older assemblies. It no longer in form makes war and peace, or elects and de- poses kings. It does not even in form elect or depose their ministers. But the body which can grant or refuse the means of carrying on the machinery of government has gradually come to have, in an indirect way, the powers of government once more in its own hands.~~

~~Another sign that the remembrance of old wrongs and old distinctions of race had passed away is supplied by a~~

~~in public feature of these times which at first sight might seem to~~

~~acts.~~

~~prove the contrary. The reigns of the first two Edwards~~

~~ENGERAN®~~

~~[HISTORY.~~

~~are exactly the time when the French language was most universally in use as the language of public acts. From this time the laws of England begin to be written in French. The truth is that the predominance of French at this period is no direct tradition of the days of the Norman Con- quest. Itissimply a sign of the fashion which made French to be looked on as the most polite, as it certainly was the most widely spoken, of Western languages. It was merely a fashion; Edward and his nobles~~

~~knew and spoke English thoroughly well. But the fact that such a fashion could take root showed that the use of the French language had ceased to call up any memories of the conquest of England by men whose tongue was French. If the use of French called forth any hostile feelings on the part of Englishmen, it was now, notas the speech of a forgotten conquest in their own land, but as the speech of a rival nation beyond the sea. And when French had come to be used simply as a matter of fashion, its supremacy was doomed ; in the course of the fourteenth century, English, modified as it was by the indirect effects of the Conquest, gradually won back its old place as the dominant speech of England.~~

~~This age, so great in our political history, is of equal Patriotic importance in the intellectual and religious development of church-England. It was an age when difference as to theological a~~

~~dogmas was still unknown in England, but when a strong national opposition was growing to the exactions and oppressions of thesee of Rome. In the thirteenth century there is no sign of any revolt against the national Church; the nation and the national Church are one in opposition to the foreign enemy. The most remarkable feature of the reign of Henry III. is the union of all classes, barons, clergy, and commons, in the common struggle against pope and king. 'The series of patriot prelates which begins with Stephen Langton is carried on in Archbishop Edmund the saint—in Robert Grosseteste, saint, scholar, and philoso- pher—in Walter of Cantelupe, a statesman of a Norman baronial house. The first signs of any jealousy felt towards the national clergy do not begin till the great national strife is over, and till some at least of the English prelates had given in to the new-fangled teaching at Rome. When, at the papal bidding, the English clergy refused for a moment to contribute to the needs of the English state, the great Edward found the means to put them beyond the pale of English law.~~

~~The intellectual activity of the thirteenth century, the great creative and destructive century throughout all Europe and civilized Asia, was not small in England. It was the age of the friars. Cisterciaus had appeared as a reform on the Benedictines, so now the Franciscans, the~~

~~Dominicans, and the other mendicant orders, began a far more thorough reform of the monastic system. 'The Cistercians in their wildernesses might practise an ascetic discipline for the good of their own souls; but they did little for other men. The rest of the nation knew them chiefly as diligent growers of wool. But the friars, carrying the vow of poverty to the extremest point, rejecting corporate as well as personal property, fixed themselves by choice in the most squalid quarters of the towns. They were confessors and preachers; presently~~

~~1 When Walter of Hemingburgh (i. 337) records that Edward I. spoke to the Turkish ambassadors in English, it must not be taken, as it has sometimes been misunderstood, as if it meant that Edward's speaking of English was something exceptional. It would have had this meaning, if Edward had been speaking to an English- man of low degree who was not likely to understand French. But when Edward speaks English to Turks, and has his words interpreted to them by some one who could translate from English into Turkish or Arabic, it shows how familiarly English was spoken by Edward himself and by those about him. So again, in the famous dialogue between Edward and Roger earl of Norfolk, the play on the earl's name Bigod, which is found both there and elsewhere, has no force in~~

~~-any language but English.~~

~~As in the twelfth century the The~~

~~Colleges in the univer- sities,~~

~~Suppres- sion of the Tem- plars.~~

~~Histo- riaus of St Al-~~

~~bans.~~

~~Political poems,~~

~~INTELLECTUAL MOVEMENT. |~~

they became scholars also, and they had a large share in the increased intellectual activity of the universities. Oxford and Cainbridge were now established seats of learn- ing, thronged by crowds of masters and scholars. Up to this time masters and scholars had lived where they could and how they could. In the course of the thirteenth century colleges began to be founded. That is, by the bounty of some founder, societies of masters and scholars were brought together as corporate bodies, holding a house for their dwelling-place, and lands or other revenues for their maintenance. The first beginnings of this system were seen in Merton College in Oxford and Peterhouse in Cambridge. The growth of these colleges, which in the end came in a manner to swallow up the universities, is the most distinguishing feature of the English universities, as distinguished from those of other lands. But, though the foundation of the colleges and the influence of the friars in the universities were both fruits of the same movement, it must be remembered that they were wholly distinct fruits. The colleges of Oxford and Cambridge were not monastic foundations, except in a few cases where a great monastery established a college in one of the universities for the education of its own younger members. Otherwise the colleges were strictly secular, and religious vows carried with them a forfeiture of membership. The colleges lived on ; the intellectual as well as the religious life of the friars was short. They presently fell away from their first love, and became yet more corrupt than the older orders which held a higher temporal position. But, while the first life of the friars lasted, it was brilliant indeed. They were en- couraged by Robert Grosseteste ; the friar Adam Marsh was the chosen adviser of Earl Simon. The friar Roger Bacon was the wonder of his own day, a master of knowledge beyond his day, and one who paid the penalty of thus outstripping his fellows.

The thirteenth century saw the growth of a new kind of monastic order in the form of the friars, The early part of the fourteenth century saw the fall of one of the great military orders which had arisen in the enthusiasm of the crusades. The Templars, the victims of Philip the Fair and his puppet Pope Clement V., were suppressed in England as elsewhere ; but it is something that, even in so bad a time as the reign of Edward II., England had no share in the torturings and murderings

~~which marked the suppres- sion of the order in France. The property of the Templars was for the most part granted to the rival military order of St John, which kept it till the general dissolution of monasteries.~~

~~The literature of the thirteenth century was abundant in all the three languages which were then in use in England. The statesmen aud historians of Henry II.'s day now give way to the monastic annalists. Pre-eminent over other houses is the school of annalists of St Albans, and pre- eminent among them is the patriotic historian Matthew Paris. He writes of earlier times with little criticism; he cannot be classed on this score either with William of Malmesbury or with William of Newburgh. But he stands at the head of all our annalists as a vigorous, outspoken, narrator of contemporary history, not only in England but in the world in general. He is a bold champion of the popular side, a representative of the English Church and nation against pope and king alike. But it should be noted that all the monastic annalists take the popular side, with the single exception of Thomas Wykes of Oseney, the one royal- ist chronicler cf his day. The civil wars called forth a mass of literature in all three languages. The praises of Earl Simon are sung in French and in Latin ; and the English tongue now comes forth with a new mission, as the vehicle, sometimes of satire, sometimes of panegyric upon the great ones of the earth. The Englishman's right of grumbling~~

~~is immemorial, and from the thirteenth century onwards his grumbling has very commonly taken the shape of out- spoken rhymes in his own tongue. But, in an historical and political point of view, the most important work of the time of the civil war is the great political poem in Latin rhyme which sets forth the platform of Earl Simon and the patriots. A clearer and more vigorous assertion of popular principles has never been put forth in any age. English had hardly yet reached the dignity of being employed in such a document as this ; but the native literature was ad- vancing during the whole of the thirteenth century. Besides devotional works in prose and verse, it was used English in long continued poems on various subjects early in the ¥T42es. century. The~~

~~Ormulum of Ormin is religious; the Brut of La3amon is legendary. It shows how the tales of Arthur had, even in the minds of Englishmen writing in the English tongue, supplanted the history of their own people. Towards the end of the century our language was put to a better use, in the form of rhyming chronicles, such as those of Robert of Gloucester and the English version of Peter of Langtoft. For a successor to the Peterborough Chronicler, for an English history in English prose, we have still a long time to wait.~~

~~In the department of art, the pointed arch, with the Architee- details appropriate to that form, was now thoroughly ture of established. In the time of Edward I. the long narrow a thir:~~

~~2 : eenth window of the earlier part of the century began to be ex- 314 four- changed for the large window with tracery, different forms teenth of which lasted as long as medieval architecture lasted at centuries. all. But alongside of development in this way, the sculp- ture of the early part of the century gradually gave way, even early in the fourteenth century, to flatter and less bold forms. In ecclesiastical architecture a new type of church, long, narrow, and simple, quite unlike the picturesque outlines of the older minsters, came in with the friars. Houses began to be larger and more elaborate in plan ; but the great change was in military architecture.~~

~~The massive donjons and shell-keeps of the Norman type~~

~~grew under the Edwards into castles of vast size and com- Castles. plicated arrangement, planned with great skill according to~~

~~the military needs of the time. The castle of Caernarvon, begun by the first and continued by the second Edward, shows what is called the Edwardian type of castle in its highest perfection.~~

~~By this time the art of warfare in England had seem- Warfare. ingly changed altogether from what it had been before the Normans came. And yet the change was after all more seeming than real. In the Scottish wars the English array of cavalry and archers, matched against the Scottish spear- men, seemed to show that the English had~~

~~altogether adopted the tactics of their Norman conquerors. And so, as regards the weapons in use, they had. But an English army still kept its ancient character of having a national infantry as its main strength. It was the preservation of England as a military power that this was the case. We are now coming to the days of chivalry, the days of brutal contempt Chivalry. for all classes of mankind outside the favoured pale, the days which, in warfare, went far to-put mad personal enterprise instead of rational military calculation. England was not wholly untouched by these follies; but she was far less deeply touched by them than their native land of France. The difference showed itself when the two nations were matched English together in a long and deadly struggle. The French were and in the end successful in war, because England had under- French taken a task beyond her powers or the powers of any other = nation, the task of subduing and holding a country greater than herself. But the English were invariably successful, even with much smaller numbers, in all the great battles.~~

~~The cause lay in the different constitution of their armies ; and the difference in the constitution of their armies lay~~

~~deep in the difference of the political condition of the two countries. In France political privilege was the exclusive possession of the noblesse and the chartered towns. In England freedom was the birthright of all above the villain, and even the villain had many ways of reaching freedom open to him. France therefore had a gallant cavalry in her noblesse ; for infantry she had either foreign mercenaries or an unwarlike rabble. In an English army the infantry, furnished by the niass of the freemen, formed its main strength, and, more than any other arm, won the great battles. In the course of the fourteenth century, the chivalrous type of warfare received a series of deadly blows dealt by a trained infantry of burghers or yeomen. 'The Flemings at Courtrai, the men of the Three Lands at Morgarten, the men of the more extended League at Sempach, the Scots at Bannockburn, the English at Crecy, are all instances of the same law.~~

~~Edward III., pre- eminently the chivalrous king, helped to give chivalry its death-stroke. |~~

~~Of his reign the most prominent feature was the war with France in which that death-stroke was dealt. It is a war which may be looked at from two sides. On the part of the king himself, it was less the warfare of an English king than the warfare of a French prince seeking the French crown. On the part of the English nation it was distinctly a national war. The French influence on England, as distinguished from the earlier Norman element in England, the influence which had been going on ever since the beginning of the thirteenth century, reached its height in Edward the son of the Frenchwoman Isabel. The follies of chivalry, follies so conspicuously French as distinguished from either English or Norman, were now in all their glory. We have reached the days of Froissart, chronicler of knights and ladies. We instinctively feel that Edward III. is less of an Englishman than Edward I. But the nation is purely English. If anything was needed to wipe out the last feeble memory of old distinctions, it was the warfare which Englishmen waged in what was now the French province of Normandy. But, in common justice both to Edward and to his people, it must not be forgotten that, though the French war was in form a war waged to win the crown of France for an English king, it was a war which neither king nor people could well have Causesof avoided. Edward was goaded into the war by the cease- the war. less attempts which the French king made on his duchy of~~

~~Aquitaine, and by the help which the French king gave to the Scottish enemies of England. In 1328 the French throne became vacant by the death of Charles IV., the youngest son and last male descendant Edward's Of Philip the Fair. Edward claimed the crown in right of~~

~~The French wars,~~

~~Charac- ter of Edward Ill.~~

~~claim his mother, the sister of the deceased king. The claim~~

~~s the found no support in France, and the crown passed to Philip rench P —:~~

~~crown, 01 Valois, the first cousin of Charles, and the next in succes-~~

~~sion to the male line. By this decision, just as by the decision of the dispute for the crown of Scotland, a principle was settled, a principle which ever after made the French law of succession different from that of England, Scotland, and Spain. During the 341 years which had passed since the election of Hugh Capet, every king of the French had been succeeded by his own son, and in several cases the succession had been made yet more certain by the coronation of the son in the lifetime of his father. It thus came about that both the notion of hereditary succession as opposed to election, and the notion of direct male succession as opposed to any other rule of succession, had, by Heredi- this time, taken firmer root in France than in any other od a kingdom in Europe. The result of a genealogical accident France was therefore supposed to spring from an ancient law of the kingdom. As anew jurisprudence had been called up out~~

~~EWNe ba ND~~

~~[HISTORY.~~

~~of the romances of Charlemagne to insure the forfeiture of The cup. John, so a new rule of succession was called up out of the posed ancient Frankish codes to bar the claim of Edward. We Saliclaw. now hear for the first time of the imaginary Salic law, which~~

~~was held to shut out females from the succession to the French crown. According to modern English law, neither Edward nor Philip was the heir ; there were females nearer~~

~~to the crown than either of them. But Edward's doctrine~~

~~was that, though a female could not herself inherit, yet her~~

~~son could inherit through her. He claimed as the male~~

~~person nearest of kin to the late king. Philip claimed in~~

~~the simpler character of the next in the male line, passing~~

~~by females altogether. The question was new ; but, as the French crown had never passed either to or through a female,~~

~~the claim of Philip naturally seemed more in accordance Succes- with earlier precedent. But, had the argument lain the sien of other way, had female succession been asserted by the Philp. Frenchman and male succession by the foreign prince, we~~

~~nay believe that the native candidate would have found~~

~~his way to the French crown all the same. How little~~

~~these genealogical subtleties really went for was shown a~~

~~little later, when, in the dispute for the duchy of Britanny, Edward appeared as the champion of male, and Philip of~~

~~female succession.~~

~~When Edward's claim to the French crown was rejected, Scottish he did homage (1329) to his rival for his Gascon duchy, ba of though with some reservations which might keep controversy aii alive. Matters were hastened by a newScottish war. The English lords who had held and lost estates in Scotland were, by the treaty of Northampton, to receive them again.~~

~~This article had not been carried out, and in 1332 the dis-~~

~~inherited lords made an attempt on Scotland under Edward~~

~~Balliol, son of the former king John. Once by their own~~

~~forces, and a second time by English help, they succeeded~~

~~in placing their candidate on the Scottish throne. He re-~~

~~warded his allies by ceding southern Scotland to England,~~

~~and renewing the old dependent relation for the rest of the~~

~~kingdom. The state of war between England and Scotland~~

~~thus began again, and with far less show of reason on the~~

~~English side than there had been in the days of Edward I.~~

~~But the Scottish war led to consequences still more import-~~

~~ant than itself. Philip, ever on the watch for opportunities Philip~~

~~against Aquitaine, gave help to the Scots (1337), as his helps the~~

~~predecessor had done in the earlier war. It appears that 5°~~

~~Edward now for the first time called himself King of France, Edward~~

~~though the regular use of the title did not begin till three takes the : :~~
~~itle of~~

~~years later. As in former wars with France, Edward formed King of~~

~~alliances with the Flemish cities and with the emperor Lewis; France.~~

~~and it was to satisfy the scruples of the Flemings, whose~~

~~land was a French fief, that he finally took the title of King~~

~~of France! Then followed the first part of the War of a The Hun-~~

~~Hundred Years, a struggle of twenty years, broken once or dred |~~

~~twice by truces. This stage is famous for the naval victory wy. ye.~~

~~of Sluys in 1340, for the more famous land fights of Crecy gins,~~

~~in 1346 and Poitiers in 1356, and for the capture of Calais~~

~~in 1347. The captivity of King John of France at Poitiers~~

~~led to negotiations, and this first stage of the war ended~~

~~with the peace of Bretigny in 1360. By its terms Edward Peace of~~

~~renounced all claim to the French crown and gave up his Bretigny.~~

~~French title. On the other hand, all his possessions on the~~

~~continent, both his hereditary dominions and his recent Plate V.~~

~~conquests, Aquitaine, Ponthieu, and Calais, were released~~

~~from all homage to the French crown. Calais may be said to~~

~~have been incorporated with England, and it was afterwards~~

~~1 The usual Latin title of the French kings had always been national and not territorial: "Rex Francorum," not "Rex Francie." But, as the territorial style was now fully established in England, Edward called himself " Rex Francie et Angliz." The territorial style was finally adopted by the French kings when the French crown passed to a king of Navarre. The style then became " Rex Francie et Navarre," till the ancient title was revived in 1791.~~

~~represented in the English parliament. Aquitaine, now become independent of France, as Scotland had become in- dependent of England, was granted by Edward to his famous son Edward the Black Prince, who kept his court at Bour- deaux, now the capital of a sovereign state.~~

~~The long alliance between France and Scotland against England had now fairly set in, and the Scottish war went on alongside of the French war. In 1346 the king of Scots, David Bruce, invaded England and was taken prisoner, as John of France was ten years later. In the same year as this last event Edward Balliol surrendered his claim to Edward of England, who presently invaded ; Scotland in the new character of its immediate sovereign.~~

~~In 1357 David was released, and was described in the treaty as King of Scotland. In later documents however the title was not given either to him or to his successor Robert, the first of the Stewart kings. A desultory and occasional warfare long went on, and the claims of the English kings, either to the old superiority or, by the cession of Edward Balliol, to the Scottish crown itself, are ever and anon pnt forward. England had now, in the form of Scotland and France, a standing enemy on each side.~~

~~Second The peace of Bretigny was not long kept. The English~~

~~French rule in Aquitaine was, speaking generally, acceptable to the~~

~~a: cities; but the French connexion was more to the taste of the nobles. The prince of Aquitaine presently embroiled himself in the affairs of Spain, supporting Pedro the Cruel of Castile against his brother Henry. In 1367 he won the splendid but useless victory of Navarete or Najara; but the cost of the expedition led to injudicious taxation in Aquitaine. Though the principality no longer owed homage to the French crown, those who deemed themselves aggrieved appealed to the French king as superior lord. Charles V., who had succeeded John in 1364, accepted the appeal, and sumnioned the prince of Aquitaine to his court. A new war began, which, often carried on with much languor, often interrupted by truces, but not ended by any formal peace, lasted till the treaty of Troyes in 1420. The peace was clearly broken by the French, and Edward again took up the title of King of France. But fortune now dis- tinctly turned to the French side. The most striking event of the war was tle recovery and massacre of Limoges by the prince of Aquitaine in 1370. The prince now came to England to end his days more worthily as a patriotic states- man. The war went on, till in 1374~~

~~all was lost save Calais, the great southern cities of Bourdeaux and Bayonne, and a few other points in the south. The last few years of Edward's reign were a time of truce.~~

~~war ; captivity of David~~

~~Scottish Bruce.~~

~~Reign of~~

~~The change from the reign of Edward III. to that of i~~

~~Richard II. is in some points like the change from the reign of Edward I. to that of Edward II. The leading events again touch the internal rather than the external history. The internal history of the reign of Edward III. is of the highest importance. But it is of an importance wholly constitutional and social. It is not marked on the surface by any striking internal events. In the reign of Richard we have over again the same kind of internal events which mark the reign of Edward II., but with the addition of a great social struggle to which we have seen no parallel in earlier times. But, if there is much in com- mon in the two reigns, there is a marked difference between the twomen. Richard, if foolish and extravagant, was not weak; he had distinct political aims; he seems to have seriously designed the establishment of a despotic power in the crown. His accession marks another stage in the growth of the doctrine of hereditary succession. Richard, the minor son of the Black Prince, succeeded his grand- father without opposition, without any public mention of any claims on the part of his uncles, the surviving sons of~~

~~Succes- sion of grand-~~

~~sons.~~

~~the late king. In fact the dissatisfaction which was shown at a vague rumour that the young king's eldest uncle John of Gaunt, duke of Lancaster, had designs on the crown, shows how men's ideas on such matters had changed, not only since the days of A'lfred, but even since the days of John, In the reign which thus began foreign affairs become quite secondary. The wars both with France and Scotland go on, but they go on for the most part languidly ; occasional raids alternate with truces. But the very beginning of Richard's reign saw an actual French invasion of England, in which the Isle of Wight was ravaged and Hastings burned. The French war was ended, as far as this reign is concerned, by Richard's second marriage with Isabel of France in 1396, which was accom- panied by a truce for twenty-five years.~~

~~The first marked internal event of Richard's reign was The pea- the result of political, social, and religious causes which had sant re- been busily at work during the reign of Edward. The Y!* immediate occasion of the famous outbreak of Richard's time was a poll-tax which was laid on by parliament in 1380. The peasant revolt of the next year followed. The spirit shown by the young king in the famous story of the death of Wat Tyler has often been dwelled on, as if it were something exceptional. But Richard did not lack spirit at any time; and at this time his spirit was chiefly shown in making promises whivh were not, and could not be, carried out. The revolt was pnt down, and the rest of the Revolu- internal history of the reign consists of disputes, not so ie es much between the king and the people or the barons in a general as among his uncles, his favourites, and his ministers. One of Richard's favourites, Michael de la Pole, earl of Suffolk, deserves notice, less on his own account than as one who, sprung from a merchant family at Kingston- ou-Hull, rose to the height of power. Though he himself fell from power and died in obscurity, yet he was in the end the founder of a ducal house. We thus see that the con- tempt for trade which had lately come in among the other follies of chivalry was, after all, not very deep set. Richard's other chief favourite was Robert Vere, of the house of the earls of Oxford, whom he raised to the rank of marquess of Dublin, and at last to that of duke of Ireland. The year 1386 saw the fall of the favourites ; and the impeachment of the earl of Suffolk by the Commons Impeach- marks a constitutional stage. This time the~~

accused my by escaped with a slight punishment ; but, as in the times of (*°©°™ Henry III. and Edward IL, the royal authority was trans- : ferred to a council under the duke of Gloucester. 'The next year the king attempted a revolution; but a new impeachment followed, on which both the favourites were condemned to death as traitors in a parliament known as the Wonderful and the Merciless ; but they escaped beyond sea. In 1389 the king, by a sudden stroke, won back his power. For a while his rule was constitutional and seemingly not unpopular; but he gradually aimed at despotism. In 1397 he procured the overthrow of his uncle the duke of Gloucester and the chief of the nobles of his party, contriving that all that was done openly should be under legal forms. Duke Thomas died in a mysterious way.

His chief adherent, the earl of Arundel, was beheaded. In

the next year, on occasion of a judicial combat between Thomas Mowbray, duke of Norfolk, and the king's cousin Henry, duke of Hereford, the son of John of Gaunt, the

king arbitrarily banished both disputants, but promised

them the possession of their estates. But in breach of this promise, when John of Gaunt died in 1399, Richard seized

on the inheritance of his son. He then chose this very inopportune moment to go personally to settle the disturb-

ances of Ireland, During his absence Henry came back; Richard's Richard, on his return, found himself generally forsaken, 4¢Posi- and he was presently deposed by parliament. The election "°™

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of Henry in his place was perfectly regular according to aucient precedent. But two things again mark the growth of the new ideas. Not only, as in the case of Edward IL,

Claim of was the deposed king made to resign, but Henry himself, in

~~Henry IV.~~

~~Growth of the heredi- tary doc- trine,~~

~~Reign of Henry TV:~~

~~claiming the crown, did not rely solely on his perfectly good parliamentary title, but mixed up with it a vague claim by hereditary right. He was "descended by right line of blood coming from the good lord King Henry III." This phrase makes it needful to explain a little more fully the state of the royal succession, which becomes of such importance in the next period.~~

~~Richard himself had, as we have seen, succeeded without opposition, according to the doctrine of representation, though in earlier times the choice of parliament would have rather fallen on one of hisuncles. The new ideas were car- ried yet further when, under Richard, Roger Mortimer, ear] of March, was declared presumptive heir to the throne. The doctrines both of representation and of female succession were here implied, as Roger was through his mother grand- son of Lionel, duke of Clarence, second son! of Edward IIT. In earlier times, whatever might have been thought of Richard's own claim, such a claim as this of Roger would have seemed ridiculous while three sons of Edward, the dukes John of Lancaster, Edmund of York, and Thomas of Gloucester, were all living. And in fact the claim of Roger was not put forward at the deposition of Richard and election of Henry; but it was not forgotten, and later events again gave it importance. Henry's own challenge by descent from Henry III. was shrouded in purposed vague- ness. He is commonly thought to have referred to a claim of his own yet more strange than the claim of Earl Roger. He was, through his mother, the direct representative of Edmund, earl of Lancaster, the second son of Henry IIL, who, according to an absurd rumour, was really his eldest son. Such a claim could hardly be put forward publicly ; and Henry's vague words might be taken as meaning only that he was the next to the crown in malesuccession. But that any claim of the kind should have been thought of, when Henry had a perfectly good right by parliamentary election, shows how the ancient right of the nation freely~~

~~to choose its sovereign, at all events from among the members of the royal house, was gradually dying out of men's minds.~~

~~The short and troubled reign of Henry IV. has commonly led to forgetfulness of his earlier fame as a gallant and popular prince, a pilgrim to Jerusalem, a crusader in Africa and Prussia. The fourteen years of his reign are almost wholly filled with plots, civil wars, and the endless warfare in Scotland and France: Now again Wales becomes of im- portance, through the union of a Welsh pretender with the discontented partyin England. In the early insurrections, as in that of 1400, the name of the late king Richard was used, The fate of the deposed king was never certainly known ; but there seems no just ground for doubting that he either died or was murdered soon after this first revolt. That a pretended Richard appeared, that he was made use of by Henry's French and Scottish enemies, was simply what commonly happens in such cases. 'The revolt of 1400 was hardly suppressed when it was followed by the more dangerous revolt of Owen Glyndwr, who restored for a while the old independence of North Wales, and acted in concert with the French, the Scots, and the English rebels. In fact, down to his death in 1415, he was never fully subdued. His English allies, the Percies and Mortimers, were defeated at Shrewsbury in 1403 ; and other plots and revolts, in all of which the house of Percy had a hand, were crushed in 1405 and 1408. At the time of Henry's death,~~

~~? Lionel was strictly the third son of Edward HT. ; but he was the second of those who left descendants. As all the three elder sons of Edward died before their father, John of Gaunt was the eldest sur- viving son of Edward at his father's death.~~

~~ENGLEANS~~

~~[utstory.~~

~~in 1413, there was a truce with Scotland; but the war in France, which had gone on during the whole of his reign, was being waged with a greater vigour than usual.~~

~~In 1406 the crown was settled by parliament on Henry State of and his sons ; and on his death his eldest son Henry suc- France,~~

~~ceeded without opposition. A new era in the French war at once began. France, under its weak or rather mad king Charles VI., was torn in pieces by the factions of Orleans and Burgundy. Henry IV. had, in the latter years of his reign, employed the policy of playing off one party against the other, and had given help to each in turn. The war, which had gone on, though mostly in a desultory way, ever since the return of the Black Prince to Eng- land in 1370, now began again in earnest under a king who was one of the greatest of warriors and statesmen. The character of Henry's enterprise is often misunderstood. It is said that, whatever claim Edward III. might have had to the crown of France, Henry V. could have none. It is said that, according to Edward III.'s doctrine, by which the right to the crown might pass through females to their male representatives, the rights of Edward III. had passed to Roger of March. So, as a matter of genealogy, they certainly had ; and, as a matter of genealogy, there was doubtless an inconsistency in the use of the Freuch title by Henry IV. and Henry V. But the true way of looking at the matter is that both the peace of Bretigny and the truce made in the latter years of Richard II. had been broken by the French, that the war was going on at Henry's accession,~~

~~that it was just then being more vigorously pressed than it The war had been for some time, and that all that Henry V. did was pressed to throw the whole national power, guided by his own by Hemy~~

~~genius, into its vigorous prosecution. At his accession, his only continental possessions were Calais and its small terri- tory, and a small part of Aquitaine, including Bourdeaux and Bayonne.~~

~~claim to the French crown ; but his real object seems to have been the conquest of as large a continental territory as possible, but in any case the conquest of Normandy. At this distance of time, we see that such a scheme was neither just nor politic. His own age did not condemn it on either ground. He was checked for a moment, first by a Lollard revolt, then by a conspiracy on behalf either of Richard or of the earl of March. But in 1415 he was able to begin his great enterprise. A~~

~~negotiation, in which Henry claimed, first the crown of France, then the whole continental possessions of the Angevin kings, and lastly the territory ceded at Bretigny, naturally failed. He then crossed the~~

~~sea in 1415, took Harfleur, and won the battle of Agincourt. His con-~~
~~The three next years saw his alliance with Duke John of quests.~~

~~Burgundy, and completed the conquest of Normandy. In 1419 the murder of Duke John by the partisans of the dauphin Charles drove Philip, the new duke of Burgundy, and the whole Burgundian party, altogether to the English side. Paris itself received Henry. Next year~~

~~(1420), by the treaty of Troyes, Heury gave up his title of Treaty of Charles VI. was to keep the French Troyes.~~

~~King of France. crown for life; Henry was to marry his daughter Katharine, to be declared his heir, and to be meanwhile regent of the kingdom. But the party of the disinherited dauphin still held out, and the war went on in the centre of France, while the rule of Henry was established in the north and south. On August 31, 1422, Henry V. died, revealing the true object of his policy by his last injunction that in no case should peace be made, unless Norm:ndy was ceded to England in full sovereignty. Katharine, Henry VI., succeeded to the kingdom of England and the heirship of France. Two months later, by the~~

~~death of his grandfather the French king, he succeeded, goms,~~

~~In Henry's policy, Southern Gaul, which Character had been so nearly lost, becomes secondary. He puts for- of his ward the treaty of Bretigny, as he also puts forward his ?°”°%~~

~~The infant son of Henry and HenryVI.~~

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~~THE FRENCH WARS.]~~

~~according to the provisions of the treaty, to the crown of France. His two kingdoms were intrusted to the regency of his two paternal uncles, England to Humfrey duke of Gloucester, and France to John, the great duke of Bed- ford. The babe was king at Rouen and Paris, and either king or sovereign lord at Bourdeaux;} but in the inter- mediate land he had a rival in a third uncle, his mother's brother, Charles VII. Reignof A time of thirty years follows, in which the English were Henry gradually driven out of France and Aquitaine, till nothing : was left of the old heritage except the Norman islands, and nothing was left of the new conquests except Calais and its small territory. Even after Henry was dead, the great regent was far stronger than the French claimant ; but several causes, one after the other, joined to break the English power on the continent. The mainstay of Eng land was the Burgundian alliance. This was first put in jeopardy by the marriage of Duke Humfrey, the regent of England, with Jacqueline, countess of Holland and Hainault, and his attempt to get possession of her dominions. f Then, in 1429, came the wonderful career of the Maid, Joan of Arc. She raised the siege of Orleans; she led Charles to be crowned at Rheims, a ceremony which gave him a certain advantage over his uncrowned rival. Her intervention turned the tide for a while on the French side; but Charles seemed quite unable to press his advantage, and he did absolutely nothing for the deliverance of the Maid when in 1430 she was taken prisoner, and was the next year burned as a heretic and sorceress. Meanwhile Henry was crowned in England in 1429 and in Paris in 1431. In the next year the death of the duchess of Bedford, sister of the duke of Burgundy, broke the tie between her husband and her brother. At last, in 1435, at the peace of Arras, Philip altogether forsook the English alliance. Almost at the same moment the duke of Bedford died, and Losses in from this time the English power in France gradually fell France. back. Paris was lost in 1436. Presently comes a time of truces and negotiations; and in 1445, on the king's marriage with Margaret of Anjou, Maine and Anjou were surrendered. In 1449 Rouen was lost, and the second French conquest of Normandy was completed in the next year. In 1451 the French conquered all that was left to England in the south, Bourdeanx being the last town to hold out. But here the tide once more changed for a moment. The Aquitanian cities found that they had gained nothing by their transfer to the nearer~~

~~instead of the more distant master. In 1453 John Talbot, the great earl of Shrews- bury, came with an English force, and was welcomed as a deliverer. He was slain at Castillon in July;~~

~~Final Bourdeaux was again taken by the French in October, 4 and the tie of three hundred years which united Eng- aie, land and Aquitaine was broken for ever. Less striking~~

~~in the history of the world, the French conquest of Aquitaine is, in the history of Western Europe, almost as marked an epoch as the Turkish conquest of Constanti- nople which happened nearly at the same moment. Two great questions were decided by it. The Norman Conquest first made England a continental power ; the succession of the Angevins greatly increased her continental position. That position now wholly passed away. England is now again shut up within her own four seas. From this time New re. she constantly takes a part in continental affairs ; but she lations holds no continental possessions save such outlying posts~~

~~po as Calais, Boulogne, Dunkirk, or Gibraltar. Calais she and kept for another century, partly no doubt because the France,~~

~~1 After the peace of Bretigny, Edward HJ. changed his styls of Duke of Aquitaine to Lord. He was " Dominus Hibernie et Aqui- tanie." When he again took up the title of King of France, it might have been doubted whether Aquitaine remained a distinct sovereign lordship or was merged in the kingdom.~~

~~iWon AND~~

~~element in parliament.~~

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~~cessions made by France to Burgundy at Arras cut of~~

~~Calais from the French territory, and made Burgundy the~~

~~one continental neighbour of England. Again, the French French conquest of Aquitaine is no less an epoch in the history of conquest France itself. It completed the formation of France in the neal modern sense. Ever since the twelfth century, the French ; kings had been striving after dominion south of the Loire,~~

~~that is, after the union of Southern with Northern Gaul.~~

~~They gained their point for a moment by the marriage of~~

~~Lewis and Eleanor. They gained it again for a moment~~

~~by the surrender of Aquitaine to Philip the Fair. They~~

~~now gained it for ever. The whole relations between England and France were now changed. There were to be~~

~~many later wars between the two kingdoms, and for a~~

~~while the old claims of England were always remembered~~

~~and were now and then asserted. But any serious hope of~~

~~an English conquest of France, or even of an English con-~~

~~quest of Normandy or Aquitaine, passed away when Bour-~~

~~deaux opened its gates to the French in 1453. From that~~

~~day the modern relatious between England and France begin,~~

~~The period of the Hundred Years' War was the time in Internal~~

~~which what we may call the growth of England came to growth anend. The nation in its later shape was fully formed at of Eng- the end of the thirteenth century. The great lines of its a later law and constitution have been already drawn. Dur- ing the following period law and constitution have to take their perfect shape at home, and the nation, now fully formed, has to take its final position among the powers of~~

~~Europe. During this time England and the English people became essentially all that they have been ever since. The changes in later times have been great and important; but they have been changes of detail. In the thirteenth century it was still by no means clear what was to be thefinal shape of English institutions, what was to be the final position of the English people at home and abroad. In the fifteenth century all this had been fixed. The con- stitution, the laws, the language, the national character, of Englishmen had all taken a shape from which in their main points they were never again to change. The island realm, with the character of islanders impressed upon its people, with its political constitution and its social state differing from that of any other European nation, was by the end of this period fully formed. When we have reached the end of this period, we know what England is. The personal character of the nation is now fixed. Up to this time the history of the nation has been the record of its growth ; our study has had somewhat of a physical character. From this time our study is rather bio- graphical ; our history ceases to be the record of the growth of a nation; it becomes the record of the acts of a nation after it has taken its final shape.~~

~~In a specially constitutional aspect, the reign of Edward Consti- III, the central time of the period with which we are tutional~~

~~dealing, is hardly less important than the reign of Edward aon a I. But its importance is of a different kind. The qy7),~~

~~earlier reign fixed the constitution of parliament; it reign, decreed that in an English parliament certain elements should always be present. It laid down asa matter of broad principle what the essential powers of parliament were. In the later reign, the essential elements of parlia- ment finally arrange themselves in their several places and relations to one another. The powers, rights, and privileges of each element in the state, and the exact manner of exercising them, were now fixed and defined. The Commons are now fully established as an essential It is further established that prelates, earls, and barons are to form one body, that knights, citizens, and burgesses are to form another. That is to say, as the attempt to make the clergy act as a VIII. — 41~~

~~Relations of Lords and Com- mons.~~

~~Petition- ing power of the Com- mons.~~

~~Judicial powers of parlia- ment.~~

~~Position of the Lords.~~

~~O22~~

~~parliamentary estate came to nothing, parliament now definitely took its modern form of an assembly of two houses, Lords and Commons. A statute of Edward II. in 1322 distinctly asserted the right of the Commons to a share in all acts which touched the general welfare of the kingdom. But a distinction was for a long time drawn between the older and the newer element in the assembly. For a long time the doctrine was that the Commons petitioned, and that their petitions were granted by the king with the assent of the Lords. This position of the Commons as a petitioning body is of the deepest importance, and looks both forwards and backwards. Looking backwards, it was an almost necessary result of the way in which parliament had grown up. The Lords were, and the Com- mons were not, representatives by direct succession of the ancient sovereign assemblies of the land. It was for them by immemorial right to advise the king and to consent to his acts. The Commons had been called into being along- side of them; they had no such traditional powers; they could win them only step by step. Looking forwards, the position of the Commons as a petitioning body was a source of immediate weakness and of final strength. For a while they simply petitioned ; not only might their petitions be refused, but, if they were granted, they had no control over the shape in which they were granted. If the king granted a petition which involved any change in the law, it was by royal officers that the petition was put into the form of a statute after the representatives of the Commons had gone back to their homes. Such a practice gave oppor- tunity for many tricks. It was a frequent subject of com- plaint that the petitions which were said to be granted, and the statutes which were enacted in answer to them, were something quite different from what the Commons had really asked for. This evil was first seriously checked in the reign of~~

~~Henry VI, when the practice was established which still prevails, that of bringing in, instead of a mere petition, a bill drawn in the form which the proposed statute was intended to take. Again, as long as the Commons were mere petitioners at whose request a law was enacted, it might be held that the king was equally able to enact at the request of some other petitioning body. Thus we still find statutes sometimes enacted, without the petition of the Commons, sometimes, for instance, at the petition of the clergy. So again, this same position of the Commons as a petitioning body led to one distinction between them and the Lords which has gone on to our own times. In one chief function of the ancient assemblies the Commons never obtained a direct share. Parliament, like those ancient assemblies, has always been the highest court of justice. But its strictly judicial powers have always been exercised by the Lords only. The Commons, by virtue of their petitioning power, have become denouncers and accusers ; but they have never become judges. By virtue of their petitioning power, they began, as early as the reign of Edward ITI., to denounce the ministers of the king, and to demand their dismissal. In the Good Parliament of 1376, and again in the parliament of Richard ten years later, this power grows into a regular impeachment of the offenders, which is brought by the Commons as accusers before the Lords as judges. Whenever the Commons have taken part in action which was practically judicial, it has always been under some other form. They have exercised a somewhat arbitrary and anomalous authority in defence of their own privileges. They have passed bills of attainder and bills of pains and penalties; but these take the form of legislative acts. Strictly judicial functions like those of the Lords they have never claimed.~~

~~One effect of the growth of the Commons was to give a more definite position to the Lords. As long as there was ouly one body, and that a fluctuating body, membership~~

~~ENGLAN®~~

~~of the assembly could not be looked on as conferring any definite status. None but the bishops and earls had any undoubted personal claim. Some abbots, some barons, were always summoned; but for a~~

~~long time they were not always the same abbots or the same barons, and the memory of the old right of attendance on the part of the whole free population had not altogether died away. So long as this state of things lasted, no definite line could be drawn between those who were members of the assembly and those who were not. It was only when a new body arose by the side of the old one, a body which confessedly repre- sented all persons who had no place in the elder body, that meinbership of the elder body became a definite personal privilege.~~

~~The vague and fluctuating gathering of the great Nature or~~

~~men of the realm now grew into a peerage of known the peer.~~

~~members, and possessing defined rights. which made the Lords, as we may now call them, sharers in their powers in every way raised the position of the Lords as aclass. The peerage, with its several ranks and its de- fined privileges, grew up in the reigns from Edward III. to Henry VI. It was gradually established that the king's writ of summons, by which he called this or that man to give his attendance in parliament, conveyed a perpetual right, not only to himself but to his heirs. And now that the peerage has taken this more definite character, we hear of new and more solemn ways of admission to its ranks, such as creations in parliament and by letters patent.~~

~~The very change 8~~

~~New New ranks~~

~~titles of peerage of foreign origin were devised. Edward of reer~~

~~III. first created dukes, beginning with his own sons. duchy of Cornwall has ever since belonged of right to the eldest son of the sovereign. Under Richard dukes became more common; under him too the title of marchio or marquess, properly the lord or guardian of a march or frontier, came to denote another honorary rank of peerage. Under Henry VI. another new rank of peerage first appears, that of vicecomes or viscount, a word which had hitherto meant the sheriff of a county. All these new titles were, as titles, purely honorary ; they expressed~~

~~mere rank, with no rights or duties but such as were conimon to the whole peerage. The creation of these new titles completed the change in the position of the earls, about whom some trace of their original official character long hung. The earldom now became a mere rank in the peerage, like any other. The new dukes and marquesses were set above the earls, while the viscounts were thrust in between the earls and the barons. But both the old titles and the new kept the same position as ranks in an official peerage, in a body of legislators and judges, the temporal portion of which held their seats by genealogical succession.1_ But no nobility in~~

~~The age.~~

~~the foreign sense was, or could be, created. Because the Children peer was raised above other men as hereditary legislator of peers~~

~~and hereditary judge, therefore his children remained, like other men, members of the general body of the Commons.~~

~~commol-~~

~~As the growth of the Commons at once raised and defined The the position of the Lords, so the general growth of the power king's — of parliament at once defined, and by defining strengthened, Prer8~~

~~the king's prerogative.~~

~~: de- It now became a question what fined ma~~

~~acts were lawful to the king without the consent of parlia- strength-~~

~~ment, and what acts needed that consent.~~

~~1" Genealogical succession," because the phrase " hereditary succession " is, in the older use of the word, applicable alike to the spiritual and the temporal peers, at least as both classes stood till the union with Scotland. In older language "jus hereditarium" means a right handed on from one holder to another, whether the successor be~~

~~the son of the last holder, or a person chosen or appointed to succeed him after his death. In this sense, the seats attached to the sees of Canterbury, York, London, Durham, and Winchester, are still as strictly hereditary as any earldom or barony. But that name cannot apply to various modern forms of peerage, such as the elective peers of Scotland and Ireland, to the rotatory bishops of Ireland now abolished, to those bishops of England who succeed only by seniority, or to the last newly created judicial peerages.~~

~~It is clear that, ened.~~

~~GROWTH OF PARLIAMENT. |~~

~~whenever prerogative was defined, it was at once limited and strengthened. But the very strengthening was of the nature of a limitation. A power which was directly or indirectly bestowed by parliament ceased to be a power inherent in the crown. The struggle was therefore a hard one. The kings strove to hold their ground at every point, and to escape from the fetters which the nation strove to lay upon them. When the Commons tried to make the king dismiss evil counsellors or moderate the expenses of his household, when they tried to regulate the oppressive right of purveyance, the king was apt to find a loop-hole in some Uncon- protest or reservation or saving clause. So the kings stitu- strove to keep the power of arbitrary taxation in their own tional hands by drawing distinctions between customs and other sources of revenue. So they strove to keep the power of legislation without the consent of parliament, by drawing a distinction between statutes and ordinances, and by pretending to a right to suspend the operation of statutes. The claim to legislate by ordinance is closely connected with the way in which all our legislative and judicial bodies arose. The parliament, the privy council, the courts of justice, have all grown out of the ancient assembly. For some while after the Conquest it is not always easy to see whether the words curia regis mean the great council of the nation or the smaller council of the king's immediate advisers. The greater and the smaller council were alike fragments of the national assembly, and both alike derived their special shape from the practice of personal summons. If one body so formed had the right~~

~~of legislation, it might be argued that the other body so formed had it also. So again, as the Commons grew, the form of their petitions, praying that such and such an enactment might be made by the king with the consent of the Lords, seemed to recognize the king as the only real lawgiver. It might suggest the thought that he could, if he would, exercise his legislative powers, even though the Commons did not petition, and though the Lords did not assent. A crowd of loop-holes were thus opened for irregular doings of all kinds—for attempts on the part of the kings to evade every constitutional fetter—for attempts to reign without parlia- ments, to impose taxes by their own authority, or to legislate with the consent only of their own council or of some other body other than a regular parliament. Every point had to be struggled for over and overagain, But by the end of the fourteenth century we may say that the constitution and the powers of parliament were, as far as the letter of the law went, much the same as they are now. But it took three hundred years more to secure the observance of the letter of the law, while the two hundred years that have followed have, by the side of the written law, developed the unwritten constitution. Actions For the peculiar character of that unwritten constitution, — for the system by which a crowd of powers which the te ice Commons shrink from directly exercising are now exercised aud war. by them indirectly, we have to wait for some ages. In those days a power was either exercised directly or it was not exercised at all. Thus one most important power which was freely exercised by our most ancient assemblies, but which modern parliaments shrink from directly exercising, the power of making peace and war, was in the fourteenth century in a very irregular state. Sometimes parliament claims a voice in such matters ; sometimes the king seems to thrust a control over them on an unwilling parliament. That is to say, the kings wished to make parliament share the responsibility of their acts. A parliament could hardly refuse to support the king in a war which it had itself ap- proved. 'The wars of Edward III., and his constant calls for money, made frequent parliaments needful. Perhaps no other series of events in our history did so much tostrengthen and define every parliamentary power. But it was mainly~~

~~kings.~~

~~by the petitioning position of the Commons that all power has Growth thus been drawn into the hands of parliament. Any matter of the , might become the subject of a petition of the Commons. It cet followed that, as their petitions gradually grew into demands jong, which could not be resisted, every matter might become the~~

~~subject of legislation by the Commons. In their position~~

~~as petitioners lay their strength, 'They only petitioned,~~

~~while the king enacted and the Lords assented. But the humbler position gave them the first word, The enacting~~

~~power of the king gradually came to be a mere power of refusing to enact, a power which has long ceased to be exercised. The humble petitioners came to be the proposers~~

~~of everything, and so to be the masters of everything. They~~

~~had the privilege of the prerogativa tribus.~~

~~The power of parliament to settle the succession to the Power ot crown, that is, the ancient right of election in another shape, Parlia- comes more largely into play at a later period. We have mere a however one of the greatest instances of its exercise in the succes. deposition of Richard and the settlement of the crown on sion. Henry IV. and his heirs. And twelve years before the ancient doctrine was carried out in practice, it was solemnly declared by Bishop Arundel and Thomas duke of Gloucester, speaking in the name of parliament, that, by an ancient statute, parliament, with the common consent of the nation, had a night to depose a king who failed to govern according to the laws and by the advice of his peers, and to call to the throne some other member of the royal family in his stead. Most certainly there never was such a statute in the form of a statute ; but the doctrine simply expressed the~~

~~immemorial principle on which the nation had always acted whenever it was needful. And the state- ment that there was a statute to that effect was perhaps simply an instance of the growth of the doctrines of the professional lawyers. Men were beginning to forget that the earliest written law was nothing more than immemorial custom committed to writing. They were beginning to think that, wherever there was law or even custom, it must have had its beginning in some written, even if forgotten, enactment.~~

~~After all, nothing better shows the power of parlia- Attempts~~

~~ment than the attempts which were often made by those in to infiu- power to procure a packed House of Commons. Complaints ag were made that the sheriffs returned knights of the shire ; who were not really the choice of the electors, and that they summoned, or failed to summon, boroughs to send burgesses, according to their arbitrary will. Lastly, in the early days of Henry VL, we find the rights of the electors restricted by parliament itself. The constitution of the House of Commons was clearly growing too popular for the ruling powers, and it was thought needful to legislate in the inte- rests of oligarchy. By the statute of 1429 the electors of Narrow- "' small substance and of no value" were disfranchised, and ide ex the right of voting was confined to those who had a freehold ¢y:.6. of forty shillings yearly, a not inconsiderable amount at that time. By another statute of the same reign (1444— 45) it is enacted that the knights chosen shall be " notable knights or notable esquires, gentlemen by birth." This enactment is instructive in many ways. It shows, what we find to have been the case almost from the beginning, that the knights of the shire were not always knights in the strict sense. The electors were clearly trying to break down all distinctions of rank and birth, and an attempt is made to enforce these distinctions by law. Happily no de- finition of " gentlemen by birth" was or could be attempted. This backsliding statute has therefore become a dead letter, as its fellow has no less through the change in the value of money.~~

~~The powers of parliament in this age, and the external influences under which parliaments acted, cannot be better illustated than" by a~~

~~comparison of the last two parliaments~~

~~TheGood of Edward III.~~

~~Parlia- ment.~~

~~John Wick- liffe.~~

~~Founda- tion of colleges.~~

~~Resist- ance to the~~

~~popes,~~

~~a24~~

~~The parliament of 1376, which lived in men's memories by the name of the Good Parliament, had the full support of the prince of Wales. It was able to overthrow the king's ministers, to remove his favourite Alice Perrers from court, and to encumber him with a council. A crowd of petitions of various kinds were presented, some of them insisting on freedom of elec- tion. The houses separated; the prince died; all the acts of the parliament were set at nought; most of them were re- versed by a packed parliament the next year. Yet even this packed parliament established some wholesome doctrines, and amongst others enacted that no statute should be made at the petition of the clergy without the consent of the Commons. The same alternation of reforming and re- actionary parliaments is found under Richard JJ. There ig no surer witness to the importance of any assembly or other institution than the fact that the ruling powers find it convenient to corrupt or pervert it.~~

~~When we turn to the religious, the social, and the literary aspect of this period, we may be amazed at the way in which the three are all intertwined together, and in which they all gather round a single man. We cannot write the history of the fourteenth century in any of these aspects, we cannot write the history of the fifteenth as affected by causes which had their beginning in the fourteenth, with- out bringing in the name of Johu Wickliffe. As a man who was employed in~~

important negotiations with foreign powers, he has earned his place in any minute record even of the outward political history of his time. But it is in these other three branches that he stands out as the fore- most figure of his time. But, while he is prominent in all three alike, it is his religious position which is primary. His influence on our social and literary history is secondary, and acts wholly through his religious position. Wickliffe, a renowned schoolman and doctor of Oxford, a well beneficed secular priest, and not unknown in the political world, made himself the centre and the mouth-piece of the great need of his time. The fourteenth century saw the beginning of a cry for a religious reformation in a wider sense than a mere reform of the abuses of the moment. Reforms of that kind have been demanded, promised, and indeed partly attempted, in almost every age. The day of the monks was past when the day of the friars be- gan; and now the day of the friars was past also. They too had fallen from their first love, and the abuses of the mendicant orders formed one of the chief subjects of decla- mation for the reformers of the time. The bounty of founders now took another form. The foundation of colleges in the universities went on briskly all through the fourteenth and fifteenth centuries. Schools and hospitals, chantries and colleges of priests attached to parish churches, were largely founded ; but the foundation of monasteries was now rare. The great foundations of William of Wykeham at Winchester and Oxford, followed by those of Henry VI. at Eton and Cambridge, form an era in the history of education in England.

It is singular that this new class of foundations was largely helped by an act of legislation which might well pass for spoliation of the Church. The fourteenth century and the beginning of the fifteenth was a busy time of legislation on ecclesiastical matters. The political strife with the Roman see went on in full vigour, with all the more vigour because the Roman see had in some sort ceased to be a Roman see. In the fourteenth century the popes were no longer the common fathers of Christendom, ruling from the centre of Christendom. They had forsaken Rome for Avignon, a city close to the French border, and where they were the tools of the king of the neighbouring realm. The popes of Rome had been oppressors and

~~ENGLANE~~

~~[WISTORY.~~

~~spoilers of England; the popes of Avignon were her political enemies, the allies of her rivals in Britain and on the coutinent. When, later in the century, Rome and Avignon became the seats of rival popes, Ingland was naturally found on the side of the pope of Rome, France and Scotland on the side of the pope of Avignon. But, whether at Rome or at Avignon, the foreign ecclesiastical power had to be kept in check. A series of statutes designed to check papal encroachments marks the reign of Edward IIL, and still more conspicuously marks the reign of Richard IJ. The statute of provisors checked the interference of the popes with the disposal of English benefices. The statute of premunire denounced the heaviest penalties against the unauthorized introduction of papal bulls into the kingdom. Legislation of this kind was indeed only repressing innovations; it was bringing the law back to what it had been in the days of King Eadward and King William. Under the house of Lancaster, the spirit of opposition to the papal claims grew fainter, at all events on the part of the kings. In the appointment of bishoprics especially, pope and king found it easy to play into one another's hands, at the expense of the ecclesiastical electors. Meanwhile, from the reign of Edward III. onwards, opposition to the aggressions of the head of the Church abroad grew into a dangerous hankering after the possessions of the Church at home. In the later days of Edward a strong party of the baronage, headed by John of Gaunt, were zealous for ecclesiastical reform, in the sense of confiscation of ecclesiastical property and of the exclusion of churchmen from political office. In the reign of Henry IV. a scheme was proposed in the Commons for the general confiscation of ecclesiastical revenues. This storm~~

~~Designs against church property.~~

~~Suppres-~~

~~was turned aside, but the hand of disendowment fell heavily sion of~~

~~in the next reign on one class of ecclesiastical foundations, though, as it turned out, greatly to the profit of another class. The new colleges and other foundations were largely endowed out of the revenues of the alien priories. These were monasteries in England which were dependent on greater monasteries in Normandy or elsewhere beyond the sea. During the wars with France these alien houses were looked on as outposts of the enemy, and in the reign of Henry V, they were finally suppressed. By far the greater part of their revenues went to the educational and secular foundations which were growing up at Oxford, Cambridge, and elsewhere. A king and a primate, both of them of a piety unusual in that age, Henry V. and Archbishop Chicheley, were the chief actors in this aliena- tion of ecclesiastical revenues by the secular power.~~

~~But changes of this kind were not religious reformation ; they were hardly ecclesiastical reform. It is plain that the corruptions of the Church were growing; everything shows the prevalence of a hard, secular, grasping spirit in ecclesiastical relations. The primates of the fourteenth and fifteenth centuries are, if we except the momentary primacy of Thomas Bradwardine, an inferior race to those of the thirteenth. Men cried, as they had ever cried, for the reform of practical evils, and they now began to go much further. system, and even the received doctrines of the Church. was held that heresy was a crime at common law; but, as a matter of fact, religious dissent of any kind was rarely heard of in England from the earliest times till the fourteenth century. The most remarkable case in earlier times was in the reign of Henry Il., when a company of~~

~~foreigners, belonging to some of the sects of Southern~~

~~Europe, succeeded in making a single English proselyte.~~

~~alien~~

~~priories.~~

~~They began to attack the whole ecclesiastical Begip- Tt ning of religious dissent.~~

~~But the teaching of Wickliffe in the fourteenth century Teaching was the beginning of the religious changes of the sixteenth of Wick- century. Wickliffe, the founder of a sect which suffered liffe.~~

~~much persecution, can hardly be said to have been~~

~~The Black Death ;~~

~~its social of villains.~~

~~effects.~~

~~The re- volt of the vil- lains.~~

~~Gradual dying out of villain- age.~~

~~Lollardy~~

~~discre.~~

~~dited by~~

~~the re-~~

~~ECCLESIASTICAL AND SOCIAL QUESTIONS. |~~

~~persecuted himself. His doctrines led directly to the unlawfuluess of the whole ecclesiastical system, and specially to the unlawfuluess of ecclesiastical property. Those doctrines he sent forth his poor priests to teach ; but he himself lived and died in quiet possession of the rectory of Lutterworth. A reformer, theological, moral, and political, he allied himself with John of Gaunt, as the Puritans did in after times with Robert Dudley, though the duke's schemes of reform were certainly of a more earthly kind than those of the doctor. But this union came to an end when another side of Wickliffe's teaching, one which was doubtless not designed by Wickliffe himself, came into notice. This age was beyond all others the age of social change, or at least of events which led to the greatest social change. Causes which had doubtless been~~

~~**working long before came to a head under the joint influence of a fearful physical stroke and of the new religions teaching.**~~

~~**We may safely set down the great plague of 1349, known as the Black Death, as the greatest of all social landmarks in English history. While the chivalrous king was keeping the feast of the foundation of the Order of the Garter, half the inhabitants of his kingdom were swept away by the pestilence. The natural results followed. We have seen that one of the gradual results of the Norman Conquest was to fuse together the churls, the lowest class of freemen, along with the slaves in the intermediate class By this time personal slavery had pretty well died out; but villainage was still in full force. But various causes—among them the frequent emancipation of the villains—had called into being a class of free labourers alongside of the villains. When the plague cut off so large a proportion of the whole people, labour became scarcer, and higher wages were naturally demanded. Parliament after parliament, beginning in the very year of the Black Death, tried, in the interests of the employers of labour, to keep wages at their old rate. 'The Good Parliament itself did not shrink from this selfish and impossible attempt. The discontent caused by these statutes, the general stirring of men's minds of which Wickliffe and the Vision of the Ploughman are alike witnesses, led, under the preaching of some of Wickliffe's wilder and fiercer disciples, to the great peasant outbreak of 1381, the insurrection which has chiefly become famous through the story of Wat Tyler. The young king, undoubtedly outstripping his legal powers, promised freedom to all the villains. This promise the next parliament not unnaturally refused to confirm. Two results followed. Though the villains were not at once emancipated, yet from this time villainage gradually died out, as slavery had already died out. Neither institution was ever abolished by law ; but all the slaves gradually became villains, all the villains gradually became freemen. By the end of the fifteenth century, villainage was hardly known, except here and there on ecclesiastical estates. The clergy had always preached the emancipation of the villains asa good work. Yet they were the slowest of all landowners to emancipate their own villains. In this there is no real inconsistency. The layman might do what he would with his own; he might dispense with services owing to himself. Those who were at any**~~

~~moment the members of an ecclesiastical corporation might be held not to have the same right to emancipate their villains, that is, to make away with the rights of the corporation itself.~~

~~The other great result of the peasant uprising was to associate in men's minds the two ideas of religious reforma- tion and political, or rather social, revolution. Wickliffe was himself as guiltless of the revolt of the villains as Luther was of the Peasants' War or of the reign of the Anabaptists. But in both cases the teaching of the more moderate reformer had a real connexion with the doings of~~

~~the reformers who outstripped him. From this time Lollardy, as the teaching of Wickliffe was called, was under a cloud. It was held to be all one, not only with heresy, but with revolution. Wickliffe himself died in peace; but for the few years that he outlived the revolt, he lost all political influence and political support. The reign of Richard was hostile to the ecclesiastical order at home and abroad. Yet it produced in 1382 the first statute against heresy, the penalties of which did not go beyond imprison- ment. It was regularly passed; yet the Commons in the next parliament expressly demanded that it should be declared null. The first statute for the burning of heretics dates from the reign of Henry IV., from which time the stake was their legal doom. But the number of heretics to burn was not great. The most famous victim was Sir John Oldcastle, Lord Cobham, who was hanged and burned under Henry V. on a combined charge of treason and heresy. Thus far the political character of Lollardy shows itself, But through the rest of the fifteenth century, though we ever and anon hear of a martyrdom, religious dissent was so thoroughly discredited as to be of no poli- tical importance.~~

~~Wickliffe was thus the direct author of a religious change. He was indirectly, if not the author, at least the uninten- tional abettor, of a social and political change. His place in the history of English literature is at least equal to his place in religious and political history. He was the~~

~~father of later English prose writing. Since the sudden close of the Peterborough Chronicle, English prose writing had never quite died out, but it had remained something quite secondary by the side of English verse. But in the fourteenth century the English language again won back its own place. Now that the English nation had been formed again in its new shape, it was needful to pro- claim the fact to the world by some unmistakable outward sign. That sign was found in the restoration of the national language to its rights as the acknowledged speech of the land, and that restoration was brought about by the same cause which first showed the regenerate English nation in the character of a great European power. It was the French war which completed the triumph of the English tongue. The men who had overcome the French enemy on his own soil could not endure that the French tongue should remain in use on the soil of England even as the speech of fashion. In the course of Edward III.'s reign English displaced French as the speech of education and as the speech of the courts of law. Statutes are still drawn up in French, but speeches in parliament are now in English. The ministers of the crown address the houses, and Henry of Lancaster claims the crown, in the native speech of the land. At last, under Henry Y., negotiations were carried on with France by ambassadors who knew not the French tongue. From this time the use of French in public documents, an use which still lingered till the end of the fifteenth century, was as mere a survival as the two or three formule which are couched in French still.~~

~~Thus after the ups and downs of three hundred years,~~

~~land, the one common speech of Englishmen of all ranks. =~~

~~But the ancient tongue, in winning back its ancient place, had greatly changed its ancient character. The two great changes in language which the effects of the Norman Con- quest had rather strengthened than begun, the loss of inflexions and the constant introduction of foreign words, had had more and more effect as the speakers of the two tongues grew closer together, as the use of one or the other marked no longer a national but merely a social distinction. The English tongue which thus, in the course of tho fourteenth century, won back its place~~

~~from French, was a form of English which had lost or corrupted most of the~~

~~Statutes against~~

~~heresy.~~

~~Language and liter- ature; triumph of English over French,~~

~~Changes~~

~~Sum- mary.~~

~~old grammatical forms, which had adopted a crowd of foreign words, and which had even displaced many English words to make way for them. Still the unbroken continuity, the personal being as it were, of the native tongue remained untouched. We may say that in one age French displaced English, that in another age English displaced French. But the English tongue always remained the English tongue. The tongue of Chaucer did not displace the tongue of Beowulf; the elder form of the language changed into the younger by gradual and imperceptible shades. The fourteenth century was one of the great periods of English literature. The devotional vein which had never ceased, the satirical vein which had begun—most likely begun again— in the thirteenth century, flowed together in the fourteenth to form the great work, religious, moral, and social, of Williain Langland, the Vision of Piers the Ploughman. And after the English poet of the people soon came the English poet of more courtly life and more courtly speech in the person of Geoffrey Chaucer. And alongside of these more famous names we have a considerable mass of verse, political and satirical, on the events of the times. But while a hundred years earlier compositions of this kind were written indif- ferently in three languages, we have them now in two only; they are written in Latin and in English, but never in French. We have indeed one French chronicle of this time, that which records the deposition and death of Richard; but it is the work of a Frenchman. But it is now that English prose comes to the front in the~~

~~hands of Wickliffe, in the form of his translation of the Bible and of his countless popular tracts. From his time a series of prose writers has never failed us. The English version of the travels of Sir John Mandeville in the fourteenth century, the theological writings of Bishop Reginald Peacock in the fifteenth, carry on the series from the days of the great master, Prose history in English does not appear in the fourteenth century, and it is of small importance in the fifteenth. But that is the case with our history generally. The old series of the Latin historians of England is but feebly represented in the fourteenth century, and it can hardly be said to be represented at all in the fifteenth, The great school of St Albans comes down to Thomas of Wals- ingham and Abhot Whethamstead. But we now look in vain at St Albans for successors of Matthew Paris, as we look in vain elsewhere for successors of William of Malmes- bury or William of Newburgh.~~

~~It is therefore not too much to say that, in the course of this period, the period of the Hundred Years' War, England finally took its modern shape. The essence of the constitution, the main points of the law, the dominant language, all took a shape which has since been changed only in detail. In all these things the formation of the England that was to be was brought to perfection in this age. And if the remaining distinctive characteristic of England was not brought to perfection in this age, the first steps to it were already taken. The papal claims were narrowly limited by law; ecclesiastical revenues were alienated by authority of parliament; if strictly religions reformation obtained no legal sanction, yet its seeds were now for the first time sown in the heart of the people. And if this was the age when the main features of English political life put on their present form, it was no less so with the main features of English social life. The dis- tinguishing elements of English society, the peer as distin- guished from the continental noble, the country gentleman, the farmer, the free labourer—all of them elements so specially English—all take nearly their present shape dur- ing this time. Villainage, if not actually abolished, received its death-blow. The mingling of classes is shown even by the oligarchic statutes which tried in some measure to~~

~~[wisToRy.~~

~~hinder it. Esquires had long represented shires as well as actual knights. The rich citizen could buy a landed estate, and in a generation or two his children counted as esquires. The towns were growing in wealth and political importance, but their internal constitutions were getting narrower. The law was administered by nearly the same courts as it is now, and the abundance of lawsuits kept all courts, great and small, fully supplied with business. This growth of the law, the specially English law, statute and common, led to the rapid growth and increasing importance of the class of professional lawyers, men who practised the statute and common law of England, as distinguished from the professors of the law of Rome, civil and canon. Their importance is shown in the fourteenth century, by a peti- tion of the Commons that the practitioners of the law might not be returned as knights of the shire ; it was more terribly shown towards the end of that century in the bitter hatred towards the whole lawyer class which was shown in the peasant revolt. But notwithstanding both laws and lawyers, we find that powerful men, to say nothing of the king himself, were often able to interfere with the due administration of the law. But this fault is common to all lands. What is specially English is that, though the law was often broken, yet the law remained to rebuke those who broke it, and to triumph over them in the end.~~

~~Thus, on the whole, practical peace and order, as well as constitutional freedom, steadily advanced during this age. Not the smallest sign of its advance is the marked im- provement in domestic architecture. came in with the latter half of the fourteenth century and went on in use during the fifteenth, is commonly looked on as a decline from the style of the thirteenth and early fourteenth century. Yet, even as applied to churches, this style is not without its own merits, and it is the charac- teristic domestic style of England. Up to the end of the thirteenth century, we have but small remains of houses, houses as distinguished from castles and not built within the walls of a town. But in the fourteenth and fifteenth centuries England was covered with houses of all classes, manor-houses, parsonages, houses of substantial yeomen, of wood or stone according to their district, often excellent examples of~~

~~the architecture of the time, and witnessing to the general state of security in the greater part of the country. We at once contrast them with the houses of the same aud of a much later date on the Scottish border and in Ireland, where the esquire and the priest still had to live for safety's sake in the pele-tower. This last is in truth nothing but a continuation of the square Norman keep in a smaller and ruder form. In short, in England security, liberty, and political rights were spread over the whole country. They were not, as in most other lands, confined to the inhabitants either of fortified towns or of private strongholds.~~

~~Three hundred and fifty years of struggle had thus made England once more fully herself after the great overthrow of the Norman Conquest. Ina formal narrative of English history, our tale would now, as it draws nearer and nearer to our own time, be fittingly told in greater detail at each stage. In a sketch like the present the opposite process would seem to be no less fitting. We now know what England is. She has made herself; she has won her rights; she has now to defend, to secure, when needful to reform; she has no longer any need to create. The only exception is with regard to her religious history. In other respects all that has henceforth to be done is to keep what has already been gained. In the religious department alone, there is still something to be gained, something, if not to be created, at least to be put intoa wholly new shape.~~

~~The style which Advance~~

~~WARS OF THE ROSES. |~~

~~This great period of three hundred and fifty years, broken, as we have dealt with it, into several smaller periods, this period of creative struggle, is followed by another great period of about two hundred and fifty years. This is stilla time of struggle, but in political matters of mainly defensive struggle, while in religious matters the struggle is still, in a lower sense, creative. This long period again falls into three smaller periods. The first is the time of the civil wars of York and Lancaster, a time during which the fabric of freedom which had been built up with so much toil begins to yield, in outward appearance at least, to the growth of an almost despotic power in the crown. Then comes the time~~

~~of Tudor dominion, the time which, while it saw the greatest development of royal power, saw also the great religious change which was needed to complete the later character of England. Lastly, there is the time of renewed struggle, political and religious alike, against the feebler despotism of the Stewarts. Of these three periods, the first, answering nearly to the second half of the fifteenth century, has little religious interest. In the second, answering nearly to the sixteenth century, though the political interest is great, the religious interest surpasses it. In the third period, answering nearly to the seventeenth century, the religious and the political interest go side by side. But through the whole both of the sixteenth and seventeenth centuries, it is the importance of the religious interest which gives the period its special character. While, in political matters, men are simply striving to preserve or to win back an old freedom, in religious matters they are striving- to establish a wholly new freedom.~~

~~HN G LAW DD~~

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~~now manifest. His foreign queen and his ministers, the dukes of Suffolk and Somerset, were unpopular on various grounds, specially on account of the losses in France. Duke Richard, on the other hand, was an able and popular nobleman, who had won reputation both in France and in Ireland. As long as Henry was childless, he might be looked on as heir-presumptive to the crown. The only possible competitor was the duke of Somerset himself,~~

~~Somerset represented a branch of the royal family which TheBeau-~~

~~was of doubtful legitimacy, that of the natural children of forts.~~

~~John of Gaunt, who had been legitimated by Parliament, but whose position as regarded the royal succession was not clear! In 1450 a popular insurrection under Jack Cade, who called himself Mortimer, might pass for a sign that the claims of that family were not forgotten. The duke of Suffolk, impeached by the Commons, but not sentenced by the Lords, had been irregularly put to death. Somerset now remained~~

~~as the unpopular minister, while Richard of York was the leader of a popular opposition. The birth of the king's only son in 1453 took away the duke's hope of a peaceful succession, and in 1455 the civil war began.~~

~~The war of York and Lancaster, like the great war with Duration~~

~~France, with its occasional lulls and truces, must be looked on as really lasting, notwithstanding reconciliations, restora- tions, and momentary reigns, from the time when the sword was first drawn against Henry VI. to the time when it was last drawn against Henry VII. One thing is to be noted throughout, that, after every revolution, a parliament was always found ready to condemn the defeated side, and to acknowledge the rights of the conqueror. Thus, in the early stage of the war, the duke of York was attainted in~~

~~of the~~

~~civil war.~~

~~1459. In 1460 the victory of Northampton put him in a Duke~~

~~TheWars Beginning then, as before, with the most prominent out- | position to make good his claim to the crown. A com- Richard ofthe ward characteristics of the several periods, the feature which | promise was brought about by the Lords, which sounds as if oe ae Roses. first: strikes us is that the hundred years of foreign war are | it had been suggested by the treaty of Troyes. By their VL are followed by a period of about half the length, the chief fea- | award it was agreed that Henry should keep the crown for ture of which is the great civil strife of the fifteenth century, | life, but that the duke should displace the king's son in the the strife between the houses of York and Lancaster, com- | rank of heir apparent. Such an award implied the admis- monly known as the Wars of the Roses. It would seem as | sion of the new doctrine of absolute hereditary right in its if the failure of schemes of continental dominion on the part | extremest form. At the same time, it saved the personal of England had driven Englishmen to spend their energies | rights of the crowned king to whom the claimant had sworn in biting~~

~~and devouring one another at home. The fifty | allegiance. But this settlement on paper had no practical years after the final loss of Aquitaine form a time which, | effect. The queen and the lords of her party disregarded especially towards its end, is of much importance in other | it. In 1460 Duke Richard fell at Wakefield, and his claims ways. But this feature of constant civil war, war waged to | passed to his son Edward. The compromise was now set settle the disputed succession to the crown, is that which | aside on both sides. Henry had joined, or had been made gives to the time its most distinguishing character. Wars | to join, the queen's forces after the victory of Wakefield. with Scotland and with France go on very much as before. | The Yorkist doctrine was that, by so doing, he had broken One-year there isa raid ; the next yearthereisatruce. But | the award, and had thereby forfeited the crown, which there- warfare of this kind is of little importance in a general viewof | fore passed to Edward. The claims of Edward were con- the period. All hope of the conquest or serious dismember- | firmed by a kind of popular election in London. After Edward ment of either of the hostile countries has passed away. | his crowning victory at Towton followed his coronation, 1V- The origin of this great civil strife was to appearance purely | and a fresh parliamentary settlement, which declared the Claims genealogical. The claim of Roger earl of March to succeed | victor of Agincourt an usurper. The reign of Edward IV. – the Richard IL, by virtue of descent in the female line from an | is now held to begin; but the war was not yet over. York, of elder son of Edward IIL, showed the new doctrines in Margaret sought help in Scotland and France, and Scottish~~

~~their extremest form. But all claims on this score had been set aside by the repeated acts of parliament which gave the crown to Henry IV. and his heirs. No title could be better than that of the Lancastrian kings; and, amid the glories of the reign of Henry V., the genealogical fancy which was all that could be pleaded for the other family seems gradually to have been forgotten. But, just about the time of the loss of Aquitaine, a number of circumstances joined together to give a renewed importance to their claims, Those claims had now passed to Richard duke of York, who in the male line represented a son of Edward III. younger than John of Gaunt, but who in the female line~~

~~**represented the elder brother Lionel. The weakness of Henry VI., sometimes growing into absolute imbecility, was**~~

~~**help was bought by the surrender of Berwick. The war began again in 1463, and this stage of it may be looked on as ended by the Yorkist victory at Hexham in 1464. The next year Henry was captured. But by this time Edward had taken a step which led to the estrangement of his most powerful supporters. His marriage with one of his sub- jects, Elizabeth Grey, and the growing influence of her family, the Woodvilles, began to offend the house of Neville,**~~

~~**1 The case of the Beaufort family, earls and dukes of Somerset, is clearly stated by Lingard, iii. 8357. The original patent of 1397 did not in so many words except the succession to the crown, but it did so by implication, by making the persons legitimated capable of all dignities short of the crown, but, making no mention of the crown itself. In the later copies the crown was expressly excepted.**~~

~~**Restora- tion of Henry.**~~

~~**Henry earl of Rich- mond**~~

~~**Second reign of Edward IV,**~~

~~**Protec- torate and reign of Rich- ard III.**~~

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~~**and its head Richard earl of Warwick. After a series of almost unintelligible intrigues and insurrections, Edward was in 1470 driven out of the kingdom by an union between Warwick and the king's own brother, George duke of Clarence. Henry VI. was now taken from prison and again declared king. The crown was settled by parliament on him and his son, with remainder to Clarence. But in the next year Edward came back ; Clarence again changed sides, and the crown was secured to Edward by the fights of Barnet and Tewkesbury. At Tewkesbury Edward the son of Henry was killed; the death—we may feel sure that it was the murder—of Henry himself followed. The**~~

~~legitimate male line of Lancaster was now extinct; no descendant of any one of the sons of Henry IV. survived. There were foreign princes descended from John of Gaunt in the female line, and among them the famous‘ Charles duke of Burgundy, who seems, among the other objects of his ambition, to have sometimes dreamed of the English crown for himself. Such claims were not likely to meet with any support in England ; and Edward, by a stroke of real policy, won Charles to his side by the hand of his sister Margaret, and found shelter at his brother-in-law’s court during his exile. In England the hopes of the Lancastrian party now turned in a new direction, to legitimated descend- ants of John of Gaunt of the house of Somerset. That house also was extinct in the male line; its representative was Margaret, countess of Richmond. Her young son, Henry Tudor, earl of Richmond, was now, in the lack of any better claimant, looked on as the heir of Lancaster. It is needless to say that no genealogical subtlety could .be held to give him any share in the royalty which the choice of the nation had conferred on the line of Henry IV. But something of the sentiment of royal descent might be held to have come to Henry in a strange way through his father’s mother. She was no other than Katharine of France, the widow of Henry V., who married a Welshman named Owen Tudor, in whose descendants the crown of England passed, by a strange genealogical accident, to the ancient stock of Britain.~~

~~For the remaining twelve years of his life Edward IV. reigned without any important disturbance at home. But the members of the house of York had already begun to turn one against another. The validity of Edward’s marriage, and therefore the legitimacy of his children, was doubtful. Clarence was in any case the next in succession after them, while, by the statute passed during Henry’s second reign, he had a claim before Edward himself. In 1478 this dangerous brother was condemned in parliament ona vague charge of treason ; and he presently died, though not by any public execution. The latter years of Edward IV. were taken up chiefly with foreign policy and foreign war, both of which were on rather a small scale. A Scot- tish war from 1480 to 1482 is remarkable for the recovery of Berwick. In continental politics Edward was specially busy. His policy took largely the form of~~

~~planning foreign marriages for his children, none of which were carried into effect. Even before he was driven out in 1470, he was trying to form alliances against France, especially with Charles of Burgundy. But, though Charles sheltered EKd- ward in his exile, he gave him no real support when in 1475 he actually began an invasion of France. Edward, as well as Charles, was outwitted by Lewis XI. The king and his counsellors went home, without glory or conquest, but with large bribes of French money.~~

~~The death of Edward in 1483 again, nominally at least, gave the crown to a minor, Edward, the eldest son of the late king. The suspicions which had been vaguely raised against John of Gaunt during the minority of Richard II. became realities in the case of the ambitious uncle of Edward V. This was Richard duke of Gloucester, the~~

~~ENGLAWT®~~

~~youngest son of Richard duke of York, who was declared protector of the young king. His protectorate was marked~~

~~by the illegal slaughter of several of the lords of the party .~~

~~of the queen mother. Presently Richard's own adherents claimed the crown for him. The claim was based on the alleged invalidity of Edward IV.'s marriage. Some ventured on the more improbable scandal that neither Edward nor Clarence was really a son of Duke Richard, and that Richard of Gloucester was his only real representative. A more~~

~~decent argument was found in the attainder of George of"~~

~~Clarence, which, it was held, shut out his children from the succession, An irregular kind of election, which however professed to be made by the estates of the realm, called on Richard to assume the crown. He was crowned instead of his nephew ; and there can be little doubt that both Edward and his brother Richard duke of York were made away with,~~

~~like Arthur in earlier days, at the bidding of their uncle. The ancient custom of England would have spared ail these crimes. Richard, who had in other respects many of the qualities of a good ruler, would doubtless have been chosen on the death of his brother. As it was, lis crown was at once threatened by Henry of Richmond, who now passed for the representative of the house of Lancas- ter. The aim of his party was to marry him to Elizabeth, daughter of Edward IV., who now represented the more regular succession of the house of York. Richmond was in banishment in Britanny. The first attempts of himself and his partisans were crushed. At this stage of our history everything turns on marriages and genealogies. The deaths of Richard's queen Anne Neville and his son Edward open a new stage in the tale. John earl of Lincoln, the son of the king's sister Elizabeth duchess of Suffolk, was now declared the presumptive heir. But Richard now designed a marriage with his own niece Elizabeth, to which she and her mother seem to have consented. This plan~~

~~Be~~

~~hastened the schemes of Richmond. He landed, raised an Accession army, and, helped by the treachery of the Stanleys and aT~~

~~Percies, he overthrew Richard at Bosworth, August 22, 1485. Henry was crowned, and a parliament settled the crown on him and the heirs of his body, and none other. The new king clearly wished that his claims should be in no way dependent on his intended marriage with Elizabethi. Parliament, on the other hand, was clearly unwilling to give its formal sanction either to a right of conquest or to Henry's strange hereditary claim. Henry, in short, reigned by a parliamentary title, by an election which followed his coronation. In the next year however he carried out his promise of marrying Elizabeth; and, before the end of the year 1486, the birth of his eldest son, who, as the son of the first British king of England, received the name of Arthur, seemed tv put the succession ona sure ground.~~

~~We are apt to look on Henry VII. as the founder of a Position dynasty, and on his reign as marking the beginning of a of Henry.~~

~~new era. Both views are true; but they must not be allowed to put out of siglit the fact that, till quite the end of his reign, his throne was as insecure as that of any of his predecessors. The civil wars were not yet ended; in foreign lands Henry was looked on as a mere adventurer, who had won the crown by the chances of one battle, and who was likely to lose what he had won by the chances of another. Hence he was, like Edward IV. in the same case, specially anxious to establish his position among foreign princes. To obtain, as he did at last, an infanta for his son, even to give his daughter to the king of Scots, were in his view important objects of policy. But those objects were not attained till after he had strengthened his position at home by successfully withstanding more than one enemy.~~

~~The revolts against Henry began early. Before the birth Revolts of his son, he had to crush the first insurrection of Lord against~~

~~Lovell. The next year enemies arose against him in~~

~~enry.~~

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~~fifteenth century affected the general state of mankind, gun- Causes of powder, printing, and the compass, began in the course of spanee au the second half of that century to do their work on England „0°P°3 also. The Wars of the Roses differ widely, in their military eect on~~

~~The personal England.~~

~~BEGINNING OF THE TUDORS. | E N G L A N D~~

~~Ireland. There the rule of the elder duke of York had been popular, and the Yorkist party had always been the stronger. A claimant appeared, one Lambert Simnel, who professed to be Edward earl of Warwick, son of George~~

~~Estab- of Warwick. From this time, for the last ten years of his away as the continental nations. The power of the crown Growth lishment~~

~~reign, Henry reigned in safety. grew to a pitch which was altogether unknown at any earlier of the a The wars with France still lingered on, and in 1492 | time except under the Conqueror and his immediate succes- a ’ Henry had actually undertaken the siege of Boulogne. The | sors. Parliaments become more servile; sometimes they are POY enterprise was however ended by a treaty of peace. After dispensed with altogether. Arbitrary acts on the part of the Henry’s throne was secured by the deaths of Perkin and of | crown are perhaps not more common than in earlier times ; Edward of Warwick, his European position speedily rose. | but they take a new character. When law is generally In 1501 Katharine of Aragon was married to Arthur, and, | weak and is easily broken, the king’s breaches of the law on his death in the next year, she was contracted to his | do not seem very different from breaches of the law on the younger brother Henry. Earlier in this year, 1502, a| part of other men. When the king has become powerful + Peace treaty of peace was concluded with Scotland, which was enough to enforce the law on other men, but fails to Pan g, {ollowed in 1503 by the marriage of James king of Scots | observe the law in his own acts, the fault is of another kind. ‘and Henry’s elder daughter Margaret. This marks an era | It is no longer general lawlessness, but deliberate arbitrary in the relations between England and Scotland. Up to | rule. this time, ever since the enterprise of Edward Balliol, there It was to this state of things that England was tending Character had been constant warfare, interrupted only by truces. Now, during the whole of this time, The stir of civil war of the for the first time, a peace, strictly so called, was concluded, | alternated with the repose of despotism. It might almost yi ae Allclaims either to the crown of Scotland or to a superiority | be said that the two went on side by side; for the Wars : over it on the part of England must be looked on as being | of the Roses were not a period of anarchy like the wars of finally given up. There was still more than one war Stephen and Matilda. The crown was fought for by con- between England and Scotland before the union of the tending princes at the head of great armies ; but there was crowns ; but the state of constant warfare broken only by | little or nothing of the wasting local and personal warfare truces now comes to an end. of the earlier time. Except where the actual strife was Begin In 1509 Henry VII. died. His eldest surviving son, waging, things went on much~~

~~as usual. The king in Fe of Henry VIII, who now united the claims of York and possession was obeyed wherever his enemies were not in Tudor Lancaster, succeeded without a breath of opposition. He | military occupation. After each revolution a parliament period, Was the first king since Richard IT. who reigned by an | was ready to approve the change, to acknowledge the con-~~

~~duke of Clarence, the male representative of the house of York. Edward was indeed alive in the Tower, and was shown in public to prove the imposture. Yet Simnel was crowned in Ireland, and was presently supported by John earl of Lincoln, who had been himself declared heir presump- tive under Richard. The impostor and his partisans landed in England, and were overthrown at Stoke-upon-Trent. In 1492 another and more dangerous claimant, who professed to be Richard duke of York, the son of Edward IV., and whose real name was understood to be Perkin Warbeck, appeared also in Ireland. His cause was taken up by more that one foreign potentate, by James IV., king of Scots, and by Margaret, the duchess dowager of Burgundy, who, if he was what he pretended to be, was his own aunt. He made more than one attempt at invasion, some of them in company with the king of Scots. Meanwhile, early in 1497, the men of Cornwall rose and marched as far as Blackheath, close to London. There they were defeated but when, a few months later, Perkin landed in Cornwall, he found enough support there to besiege Exeter. But he shrank from a battle with the royal army ; he submitted to the king, and was put to death in the next year, 1499. Immediately afterwards followed the beheading of Edward~~

~~undisputed title; and he was, strangely enough, the last king who was formally elected in ancient fashion in the ceremony of his coronation. With him, rather than with his father, a new period opens; or, more accurately still, the new period opens with the second period of Henry VIL's reign, after all opposition to his title had passed away. When the first Tudor king felt himself safe, the~~

~~Tudor despotism began. Under the second Tudor king:~~

~~that despotism allied itself with ecclesiastical change, and the sixteenth century put on its most characteristic aspect.~~

~~It was during this period that England came within the Tange of those general causes of change which were now beginning to affect all Europe. The revival of learning, as it is called, was now spreading from Italy into other lands. The three great inventions which in the course of the~~

~~character, from the civil wars of earlier times. displays of chivalry in the field, as well as the older style of fortification, both became useless before the new engines of destruction. But, above all things, it was during this time that, in most parts of Europe, the chief steps were taken towards that general overthrow of ancient liberties which reached its highest growth in the sixteenth century. Europe was massing itself into a system of powers, greater in extent and smaller in number, than heretofore. The masters of these powers were learning a more subtle policy in foreign affairs than those who went before them, and they were beginning to rest their trust at home on standing armies. We have reached the time of Lewis XI. and of Ferdinand of Aragon. While France had grown by the annexation of nearly all its vassal states, and of some states which were not its vassals, the new power of Spain was growing up, to develop in the next period into the gigantic dominion of the house of Austria. Italy, with the mass of its small common- wealths grouped together among a few larger states, some princely, some republican, becomes during this age the battlefield of the rival powers. This new state of things was not without its influence on England, though our insular position saved us from being so completely carried~~

~~queror, to regulate the succession according to his pleasure, and commonly to attaint the defeated prince and _ his supporters. It marks that the age of revolution was drawing to an end when the famous statute of Henry VII. declared that no man would be called in question for adhering to a king in possession, be his title good or bad. The care taken by every claimant of the crown to obtain a parliamentary acknowledgment of his right was at once a homage paid to the formal authority of parliaments and a heavy blow struck at their moral weight.~~

~~The parlia- Parlia-~~

~~ments of this time were fast losing the spirit of the elder ments of parliaments. The number of the temporal lords was '¢ time.~~

~~lessened by battles, executions, and banishments. The~~

~~spiritual lords had become more thoroughly servants of the~~

~~crown than at any time since the twelfth century. The~~

~~lower house had also undergone a change. In one sense VII. — 42~~

~~Attempts kept virtue enough for kings to dread them.~~

~~of the kings to reign without parlia- nicnt.~~

~~Compari- son of England with con- tinental~~

~~countries,~~

~~Illegal doings of the kings.~~

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~~its position had risen. The place of representative of a city or borough was now sought for by men who were not actual citizens or burgesses. tive statute of Henry VI. and to the change in the con- stitutions of the boroughs, both knights and burgesses were now chosen by less popular constituencies than those who chose them in earlier times. Yet, low as parlia- ments had fallen from their ancient standard, they still Every king of this age who deemed himself safe on his throne tried toreign without a parliament. During the first reign of Edward IV., parliament met, formally at least, with one exception, every year. In the latter part of his reign five years passed without a parliament. So it was with Henry VII. Parliaments were frequent while insurrections were frequent. The last eleven years of Henry's reign saw only a single parliament. On the other hand, Richard TH., whose throne was not safe during a moment of his short reign, was the least unconstitutional~~

king of this period. He had time only for a single parliament, but that was a parliament rich in legislation, and which passed one great law restraining a special abuse of royal power. Edward IV., in the times when he dispensed with parlia- ments, brought in a practice of gathering what were called benevolences, gifts to the crown which were nominally free- will offerings, but which it was dangerous for the subject to refuse. These benevolences were expressly declared illegal by the statute of Richard. But Richard himself broke his own law; and later kings found it convenient to follow his practice rather than his legislation, And when the statute of Richard was quoted against them, they were not ashamed to plead that the act of the usurper was of itself uull.

‘ This then was the time cof trial for England and her

liberties. She and they were now full grown, and their strength had to be proved. Her prokation went on for more than two hundred years; but now it began. In the end the nation and its liberties proved too strong for the kings. Parliaments were bullied, packed, and corrupted; their sittings were stopped for years together; but they were never abolished. The great laws which secured freedom were often broken, but they were never repealed or set aside. At the beginning of this period the distinction between an absolute and a limited monarchy was as clearly drawn out by a minister of Henry VI. as it could be by any modern political writer. And, if the practice did not always conform to the model traced by Sir John Fortescue, the law always did. The old principles of freedom were never so utterly forgotten, never so utterly trodden under foot, that they could not be called to life again when the favourable moment came, In this, it is plain, the history of England differs from the history of France, of Spain, of most continental countries. And certainly one reason for the difference was that they were continental countries, while England is insular. Constant rivalries, constant warfare with immediate neighbours, gave better pretexts for the maintenance of standing armies than could be found in England. The only immediate neighbour of England was Scotland. And the wars with Scotland, though work- ing constant damage to the border shires, were not so dan- gerous to the kingdom in general that either prince or

~~people would have dreamed of keeping up a standing army on their account, And, after Henry VII.'s treaty, war with Scot- land ceased to be the regular state of things. Our kings therefore, without a standing army, could not utterly root out freedom as their continental brethren did. In the worst times they were driven to summon parliaments from time to time, and those parliaments now and then showed traces of the old spirit. Still from this time onward the adminis- tration becomes highly arbitrary. The king and his council~~

~~ENGLAND~~

~~And, owing to the restric-'~~

~~[WISTORY.~~

~~were guilty of constant illegal interference with the liberty of the subject. The court of Star-Chamber, an offshoot from the Privy Council and so from the old curia regis, though sometimes useful in punishing offenders who were too strong for the ordinary course of law, became a terrible engine ot oppression. It is characteristic of the time that judicial torture, unknown at all times to English law, and unknown to English practice at all times before the fifteenth century and after the seventeenth, now began to be freely used. But it was used in every case by a special and illegal exercise of prerogative. No man was ever tortured to extort confes- sion in any of the regular courts of English law.~~

~~The age which brought in the rack could hardly fail to be a merciless age. In fact the civil struggles of each age had, from the twelfth century onwards, been getting more and more bloodthirsty. During the Wars of the Roses each revolution, each battle, was followed by something that might be called a massacre, by a general slaughter of the leading men on both sides. On the other hand, the slaughter was mainly confined to the leading meu. But the murders or executions wrought at every stage of these wars undoubtedly had a political effect in lessening the numbers of the old nobility to a degree which mere slaughter in battle could never havedone. In this age too began the general practice of attainder by Act of Parliament. That is, a man is placed by a legislative~~

~~act in the same position as if he had been convicted after a regular trial. This process was now freely used, not only against the living, but sometimes against the dead. The main object in the latter case was of course the confiscation of the estate of the attainted person. It at first sight seems singular that the man who stands out as the foremost actor in the cruelties of this time was the man who was also fore- most as a scholar and patron of learning. This was John Tiptoft, earl of Worcester, who in the one character was bewailed by Caxton, while in the other he gained the popu- lar surname of the Butcher. But Tiptoft brought his learn- ing from Italy; he was in fact the first-fruits of the Italian Renaissance in England. And the Italian Renaissance, if it was a school of taste and learning, was hardly a school of either justice or mercy. Arbitrary power cruelly exercised can easily exist alongside of learning and refinement. This truth England began to learn in the present period. It learned it yet more thoroughly in the next.~~

~~The Italian studies of the earl of Worcester were certainly not shared by many of the contemporary nobles. Yet before this time, Humfrey duke of Gloucester had appeared asa patron of learning, and the foundation of colleges in both universities went on through the whole of the fifteenth century. But the new learning, as it was called, that wider field of study of which Greek learning was the most easily recognized outward badge, hardly took root in England till quite the end of this period, under Henry VII. Caxton had already begun to print under Edward IV., at a time when the native literature of England had sunk lower than it ever sank before or after. Yet signs were not wanting that the practice of writing, and writing in English, was now widely spread. The Paston Letters, which let us into the inmost life of a knightly family of Norfolk, are worth any amount of courtly Latin. But they are hardly litera- ture. Medizeval art too now entered on its latest phase imme- diately before its final overthrow. The architectural style of this time loses the aspiring lines of earlier times, and gives us instead a lavishness and intricacy of ornament, such as we see at St George's at Windsor and in Henry VII.'s chapel~~

~~1 Torture strictly so called, torture to bring the prisoner to confess, was never known to English law. It must not be confounded either with the~~

~~painful form of death which formed the penalty of treason, or with the pesne—more accurately prisone—forte et dure, the pressing to death, which was the fate of those who refused to plead.~~

~~Torture.~~

~~Frequent execi- tions,~~

~~Acts of attainder,~~

~~The new learning.~~

~~The Tudor architec-~~

~~Domes- tic archi- tecture.~~

~~Com- merce and dis- covery.~~

~~is- covery of America.~~

~~Henry VII. His posi- tion at the time.~~

~~HENRY VII. |~~

~~at Westminster. But the architectural details are still for the most part pure. It is in tombs and woodwork that the Renaissance details first creep in, and that 'hardly till the reign of Henry VIII. But, just at the end of this period and the beginning of the next, English domestic architecture reached its highest perfection. Houses had now quite out-stripped the alternatives of the period immediately before, when the choice lay between the fortress and the simple manor-house. In the latter part of the fifteenth century and the beginning of the sixteenth, we come to palaces, as distinguished from castles. Vast houses arose, where fortifi- cation was quite secondary or in truth had come to be a mere survival, and where we see the true English style just before it became corrupted. From Haddon Hall the series goes on, till in days which chronologically belong to our next period, we get such piles as Cowdray, Hampton Court, and the unfinished castle of Thornbury. These are build- ings of the reign of Henry VIII.; but the architectural~~

~~periods cannot be made exactly to fit in with the more obvious divisions of our history. The buildings of Henry VIII.'s reign must be classed with those of the fifteenth century, rather than with those of the latter half of the six- teenth. The Renaissance did not affect architecture, as dis- tinguished from furniture and decorations, till the time of Edward VI.~~

~~While two of the three great discoveries were causing a revolution in the worlds of warfare and literature, the third, the compass, was no less doing its work in its own region. Under Edward and Richard the commerce of England advanced swiftly. From the north-western seas it was now spread over the whole Mediterranean. At no time did it make greater advances than under Edward IV., who was a considerable merchant in his own person. In Henry VII.'s days the New World was thrown open to the adventurers of the Old. As far as mere discovery went, England had, before the end of the fifteenth century, her full share in the work through the American discoveries of Sebastian Cabot. But, as far as England was concerned, it was as yet mere discovery. The time for English settlements beyond the Occail, or even for English enterprise in those distant waters, had not yet come. The path towards them was shown, and that was all.~~

~~We have seen that the civil wars really end, and that the time of unrestrained Tudor domination begins, in the middle of the reign of Henry VII. His later rule was the rule of a despot, who strove as far as might be to reign without a parliament. His desire to be independent of his people led to that rule of grasping avarice which has caused his rule to be chiefly remembered for the endless shifts by which his greed of money was satisfied. His reign is important chiefly as leading the way to the more brilliant time which followed, a time whlch can be understood only if we throw ourselves into the point of view from which men looked upon it at the time. The next king, Henry VITI., began his reign in two characters which at once marked it off from any reign since that of Henry V., we might almost say from any reign since that of Edward III. After a long time during which the strength of England had been wasted in deciding in arms between rival pretenders to the crown, England had again a king whose title was undis- puted,~~

~~and who led Englishmen to conquest beyond the sed. That was the first aspect in which Henry VIII. appeared to England and to Europe. The real historical charac- teristics of his reign are different. The special features of his reign are the working of a despotism of a very peculiar kind, and the application of that despotism to work a great ecclesiastical revolution. But, though this last is the special characteristic of the age and the reign of Henry, yet it did not become a characteristic of his reign till he had~~

~~dol~~

~~already been many years on the throne. The acts which his name first suggests to the popular mind, the suppression of monasteries and the beheading of wives, do indeed effec- tually distinguish his reign from any other ; but they are features which belong to the latter years of his reign only. They no more make up the whole of Henry's reign than the Scottish wars make up the whole of the reign of Edward I. During the greater part of Henry's reign the characteristic feature of the time seemed to be the unusually high place which England held in the general affairs of Europe.~~

~~Chrono- logy of his reign.~~

~~There was much in the general character of the age which European helped to give England this special European importance, position~~

~~It was a transitional age; new ideas had come in, but the ol ideas had not been wholly forgotten. The powers of Europe were now beginning to put on some approach to the shape and the relations to one another which they kept down to very modern times. We have come to the beginning of the long rivalry between France and the house of Austria. France had, on different grounds, hereditary enmities both with the empire and with the houses of Burgundy and Aragon. The pretensions of the French kings to the kingdom of Naples and the duchy of Milan were the chief cause of the long struggles in Italy in which all the neigh- bouring powers had their share. Henry stood apart, and was eagerly~~

sought by all as ally or as arbiter. Here isa wholly new state of things, the beginning of that wider system of European policy which deems that no European state is wholly without interest in the affairs of any other. We are on the road to the days of the doctrine of the balance of power. On the other hand, the old enmity between England and France had not died out, nor had the old grounds for that enmity been forgotten. The memories of the days of Edward III. and Henry V. are at this time strangely mingled up with political ideas which might be a century or two later. Henry is called in as the arbiter of Italy and of Europe. He is the defender of the pope and the enemy of the Turk. He dreams of the empire for himself, and of the papacy for his great minister. Negotiations and changes of side are endless. Of the two successive kings of France, Lewis XII. and Francis I, he is alternately the friend and the enemy. He has wars with both; yet he becomes the brother-in law of Lewis and the sworn brother of Francis. When the empire and the powers of Castile, Burgundy, and Aragon were all united in the person of Charles V., the old alliance between England and Burgundy, and the far older alliance between England and the empire, united Charles and Henry for several .years against Francis. Henry's very failure to obtain the imperial crown seems not so much to have embittered him against the successful candidate as to have turned his thoughts towards the crown which he professed to claim by hereditary right. From 1519 to 1525, Henry and his imperial nephew seemed steady friends. From about this time till quite the end of Henry's reign, foreign affairs are almost sunk in the sur- passing interest of events at home. But, as those events depended on the divorce of the emperor's aunt, the friendship of England at this stage leaned to Francis against Charles. But, amidst all these shiftings of friendship and enmity, the only real warfare in which England either did or suffered anything was waged with the two old enemies, France and her firm ally Scotland. The two periods of really active warfare under Henry come at the two ends of his reign. From 1512 to 1514 was a time of war, a time of victory on the part of England. The one year 1513 saw the defeat of the invading Scots at Flodden, and the conquest of T'erouanne and Tournay by the king of England in person, with the emperor-elect as his ally, almost ag his mercenary. All this within the

~~space of a few weeks seemed to bring back the most triumphant days of Edward~~

~~of Eng- d land,~~

~~Wars and alliances of Henry.~~

~~Charac- ter of Henry's despot- ism.~~

~~B02~~

~~[IL Again in 1522 and 1523 Scotland and France were both successfully invaded. Eighteen years later, in 1541, the Scottish wars began again; two years later England and the empire were again allied against France and Séotland. In 1544 England was again successful over both enemies: while the king in person took Boulogne, his brother-in-law burned Edinburgh and laid waste Scotland, as far as came under his power, with a barbarity which can certainly not be laid to the charge of Edward I. It is certain that England in the end gained nothing by either the negotiations or the warfare of the reign of Henry. But they are enough to account for the fact, which to us seems so strange, that Henry was, on the whole, popular during his life, and that his memory was cherished after his death. He was the last native king who in his own person waged war, and that successful war, on the mainland. His victories were useless ; but they were victories ; and, as such, they fed the national imagination. After the dreary time of the civil wars, England again stood forth as a great power, a conquering power, a power in some sort greater than it had ever been before. 'To the conqueror much was forgiven in the way of wrong doing at home. More still was forgiven to the king who at last accomplished the work which Henry II. had begun but was not able to finish.~~

~~The traditions of arbitrary power and unscrupulous shedding of blood had been handed on to Henry by his predecessors, as far back as his Yorkist grandfather. It was the peculiar direction which was given to despotism and slaughter in the latter part of his reign which was wholly hisown, The darkest side of Henry's character came more and more :ato prominence in his later years; but his rule was arbitrary, and on~~

~~occasion bloody, from the beginning. He could from the beginning put men to death, either to gratify a popular cry or to shield himself from purely imaginary dangers. Empson and Dudley, the ministers of his father, had fully deserved the hatred of the people; but their execution, almost the first act of Henry's reign, could be justified on no possible ground of law. In the midst of Henry's French wars, in 1521, Edward Stafford, duke of Buckingham, was put to death, rather be- cause his royal descent was deemed to make him dangerous than on account of any proved crime. But, in these and in all Henry's acts, we see that attention to formal legality which is the special characteristic of his reign. At no time, unless during the first years of the Conquest, was so much wrong done under legal form, and the Conqueror at least did not send those whom he despoiled to the scaffold. It would be going a great deal too far to say that all Henry's acts could be justified by the letter of the law of England ; but it may be fairly said that he could always plead either law or precedent. For his worst acts he was always able to show at least some pretence of legal sanction ; his tyranny never became a reign of mere violence. In his days law emphatically became unlaw. Parliaments legis- lated as he thought good; judges and juries gave such judg- ments and verdicts as he thought good; and, when their action was too slow, parliament was ready to attaint, even without a hearing, any one whom the king wished to de- stroy. When Henry's mind turned to ecclesiastical change, parliaments and convocations alike were ready to shape the creed of the nation according to the caprice of its ruler. That such a tyranny could in this way be carried out, never by mere force, often under strictly legal forms, makes the character both of the man and of the time a study of special interest. It is a time which specially deserves and needs an historian.1 Here nothing more can be done than to trace its most general features.~~

~~. The historian has been found—though the history is not generally accessible, and is not complete—in Mr Brewer, who has traced the story of a large part of Henry's reign in the Prefaces to the Calendars~~

~~The ecclesiastical work of Henry's reign was not religious Henry reformation in the sense in which those words would have not a re-~~

~~been understood by Wickliffe or Luther.~~

~~Henry now and ligious~~

~~then, in the endless shiftings of his course, looked in the men~~

~~direction of the German Reformers, but it was rather for political than for religious ends. One or two of his theolo- gical productions at one stage do indeed show a slight Pro- testant tendency on one or two points.?. But this was only for a moment ; Henry's later legislation went towards the establishment of the most rigid orthodoxy, according to the Roman type, in all matters of dogma. To the end of his days Henry and his prelates, Cranmer conspicuously among them, took care to send to the flames any who swerved in the least degree from the received doctrine of transubstantia- tion. Henry's scheme was to carry out in its fulness that~~

~~He car-~~

~~after which earlier kings had so often striven, the complete ries out~~

~~emancipation of England from the power of the Roman see, and the transfer of the highest ecclesiastical jurisdiction to the crown In this he did little more than put into a more distinct shape the authority which the Conqueror had ex- ercised, and which Henry II. had striven to win back. The ancient kings had allowed the authority of the pope to be exercised only so far as they thought good; Henry threw it off altogether. The acts of 1534, which swept away the Roman supremacy, were the climax of the legislation which had been begun in the Constitutions of Clarendon, and which had been carried on in the statutes of Provisors and of pre- munire. A few special points of Henry's legislation which were likely to give special offence lasted only during his own reign and that of his son. Such were the title of, Head of the Church, and that personal iurisdiction in ecclesiastical matters which Henry claimed to exercise either by himself or though his vicar-~~

~~general. Such again were the com- missions from the crown which were taken out by bishops under Henry and Edward. 'These things formed no essen- tial part of the royal supremacy. They were abolished under Mary, and they were not re-established under Elizabeth. The essence of the change which Henry wrought was the~~

~~the scheme of Henry IL.~~

~~abolition of all foreign jurisdiction within the island realm. Apolition~~

~~And it must not be forgotten that, though the Roman bishop~~

~~and de-~~

~~was chiefly aimed at, the Roman emperor was aimed at also, Bialofall~~

~~It was not without reason that the ancient imperial style of England now reappears. Since the Conquest the use of that style had been rare, and the instances of its use always mark some special need of the time. Its increased fre- quency under Henry marks a special need of his time. When the imperial power was in the hands of Charles V., and when Charles V. was an enemy, it was not without reason that it was declared that the kingdom of England was an empire, and that its crown was an imperial crown. Separation from the see of Rome was not meant to carry with it any change of doctrine, or to imply any breach of communion with theChurches which remained in the Roman obedience. It was strictly a scheme of ecclesiastical inde- pendence, and no more. But the acts of Henry put ona peculiar character from the circumstances which led to his ecclesiastical changes, and from the way in which many of them were carried out. And, when ecclesiastical change had once begun, it could not fail to ally itself with other influences, however little such alliance formed any part of the scheme of Henry himself.~~

~~In strictness of speech, the English Reformation, if by~~

~~foreign jurisdic-~~

~~tion.~~

~~The Re-~~

~~those words we understand changes in doctrine and ritual, toma] tion: 1~~

~~is quite distinct from Henry's assertion of the ecclesiastica Bs~~

~~of State Papers. The general character of Henry is well sketched by Hallam, who prophesies beforehand against some modern delusions.~~

~~2 As for instance, in the " Book of Articles," and the "Godly and Pious Institution of a Christian Man," put forth in 1536. Here is a certain amount of wavering as to the number of sacraments. That is about the whole advance in a Protestant direction; the six articles of 1541 enforce the Roman theology on pain of death.~~

~~UT.~~

~~ee~~

~~Its cha- racter in England.~~

~~The Eng- lish Re- forma- tion be- gins from above.~~

~~independence of England. In idea the two things stand quite separate. Practically the two form two stages in a great series of cause and effect. The system of Henry has beeu epigrammatically described as Popery without the Pope. And the experience of a few years showed that Popery with- out the Pope was a visionary scheme. But the various stages which are often confounded under the one name of "the Reformation" must be carefully distinguished. There was not in England, as there was in some foreign countries, a particular act of a particular year which might fairly be called "the Reformation." In England, if the formula "The Refor- mation" has any meaning at all, it means tle whole period of ecclesiastical change which was sprcad over a~~

~~time of about forty years. It wasa time of constant change, of change backwards and forwards; its result was that, by the middle of the reign of Elizabeth, there was an established state of things wholly different from the established state of things which there had been in the middle of the reign of Henry VIII. But in the develop- ment of the ecclesiastical constitution of England, just as in the development of her political constitution, there was no moment when an old state of things was altogether swept away, and when a wholly new state of things set up in its place. The ecclesiastical development was far swifter, far more violent, than the political development, but the two were essentially of the same kind. Both were brought about by the gradual working of causes and their effects. As the political development of England was something wholly unlike the violent change of the French Revolution, so the ecclesiastical development of England was wholly unlike the violent change of the Reformation in the Swiss Protestant cantons.~~

~~The English Reformation then, including in that name the merely ecclesiastical changes of Henry as well as the more strictly religious changes of the next reign, was not in its beginning either a popular or a theological movement. In this it differs from the Reformation in many continental countries, and especially from the Reformation in the northern part of Britain. The Scottish Reformation began much later; but, when it began, its course was far swifter and fiercer. That is to say, it was essentially popular and essentially theological. 'The result was that, of all the nations which threw off the dominion of the Roman see, England, on the whole, made the least change, whilst Scotland undoubtedly made the most.!_ In England change began from above. But there is no reason to doubt that the acts with which the period of change began received the general approbation of the nation. It is plain that there was no general desire among Englishmen for strictly theological change. The old Lollard teaching, which had never quite died out, began to be of increased importance in the early days of Henry. There can be little doubt that~~

~~Effects of this revival of strictly theological dissent was part of the~~

~~the-new learning.~~

~~same general movement which gave life to the new learning. But the men of the new learning, the English friends of Erasmus, Colet and More, with their patron Archbishop Warham, were not, strictly speaking, theological reformers. They aimed at general enlightenment and at the reform of practical abuses and superstitions; but they designed no change in dogma or ritual. Their more strictly intellectual inovement merged in the wider theological movement ; but in the beginning they were so far distinct that the author of Utopia showed himself in the strangely incongruous cha- racter of a persecutor. The small party of theological reform~~

~~undoubtedly welcomed the changes of Henry, as being likely CS a ae~~

- ~~On the whole, because, in some points of sacramental doctrine and Titual, the Lutheran Churches, especially in Sweden, have made less change than the Church of England has. But nowhere did the general ecclesiastical system go on with so little change as it did in England.~~

~~in the end to advance their own cause; but the mass of the The nation was undoubtedly favourable to Henry's system of nation for Popery without the Pope. For three hundred years the [ae pope had been the standing grievance of Englishmen, and ,, pare they were now rejoiced to get rid of himaltogether. They were glad too to get rid of gross practical abuses, to reform~~

~~the corruptions and oppressions of the ecclesiastical juris- diction, to bring the clergy thoroughly under the power of~~

~~the law. But they were attached to their old religious customs and ceremonies, and they had no love for new dogmas. In all this Henry and the mass of his people~~

~~went heartily together. There were of course dissentients~~

~~on beth sides, men who wished for no change at all and~~

~~men who wished for far greater changes. But there can~~

~~be no doubt that the mass of the nation was satisfied with~~

~~what their king gave them, ccclesiastical independence without theological change. On these points, the great~~

~~body of Henry's statesmen and prelates were of one mind. Cranmer and Gardiner accepted and carried out the same position system. We can discern then, as at all other times, two of Cran- parties with opposite tendencies; but they are merely mer and opposite tendencies; there is no open breach. We are &diner tempted to think that there was from the beginning an organized Catholic and an organized Protestant party.?~~

~~But this is the idea of a later time. The mass of the nation~~

~~and the great body of the leading men were substantially~~

~~of one mind. There was a party favourable to more change~~

~~and a party favourable to less, but both accepted the degree~~

~~of change that was given them. A few zealots were embowelled for denying the supremacy; a few zealots were burned for denying transubstantiation. The great body of~~

~~the nation, the great body of its representatives and its leaders, accepted transubstantiation and the supremacy together. Nor is there any need to charge either Cranmer~~

~~or Gardiner with hypocrisy. No broad line was yet drawn,~~

~~such as was drawn afterwards. Men obeyed and ad- ministered the ecclesiastical law, though they might wish~~

~~it to bein some things different, just as men in all ages have obeyed and administered the temporal law, though they~~

~~may have in some things wished it to be different. In truth Cranmer and Gardiner alike were trying to work a system~~

~~which could not be permanently worked. They were trying~~

~~to reconcile two things which could not be permanently reconciled. At last it became clear that Popery without~~

~~the Pope would not work, and that men must take one side~~

~~or the other. When it came to this, men in the position~~

~~of Cranmer and Gardiner had to choose a side, and they~~

~~chose opposite sides. Still, among all changes, under Henry,~~

~~under Edward, under Mary, under Elizabeth, the mass of~~

~~the nation conformed to every change. Again there is no~~

~~need to charge them with hypocrisy. They obeyed the law, whether wholly approving it or not. A few on each side~~

~~had consciences so susceptible that they deemed it their~~

~~duty to defy the law. Among the mass of the nation some~~

~~might be inclined one way and some another ; but they felt~~

~~no call to court martyrdom on either side.~~

~~For it must be borne in mind throughout that as yet the Religions idea of religious toleration, though it had presented itself toleration to the mind of More as a matter of philosophical specula- un- tion, was unknown in Europe in any practical shape. ms Everywhere the dominant party, whichever it might be, forbade, and that in most cases under pain of death, the practice of any religion except that of the dominant party. Those who clave to the old religion forbade the practice of the new; and the professors of the new doctrines, the moment they had the power, forbade the practice of the old.~~

~~So in England, through the whole period of Reformation,~~

~~whe~~

- ~~These names are used, without any attempt at theological accuracy, as those which will most generally be understood, to point out the two opposite tendencies which at this stage were no more than tendencies,~~

~~the existing system, whatever it was, was the only system that was allowed. Every other form of worship was for- bidden under penalties, heavier or lighter. And there was always some form or degree of theological error which sent its professors to the flames. And, besides burnings for heresy, as heresy was understood at each successive stage, this period of English history is especially distinguished for the cloaking of what was really religious persecution under the guise of punishment for political offences. During the reign of Henry, every man who would now be deemed a conscientious Catholic was liable to die the death of a traitor. Every man who would now be deemed a con- scientious Protestant was liable to die the death of a heretic. Under Edward and Elizabeth the standard of belief was changed, so changed that only a few extreme sec- taries were now in danger of the flames. But the differ- ence simply was that the line was drawn at a different point. Those who went beyond that point were burned by those who a few years before might have been burned themselves. Adminis- For twenty years after his accession, Henry was famous, trationof not only for strict orthodoxy of dogma, but for special Wolsey. devotion to the Roman see. He had received a learned education, and he believed himself to be a special master of theology. His writings in that character, as a defender of Roman doctrine against Luther, won him in 1521 the title of Defender of the Faith, which by a singular irony was conferred by Leo X. Through all this first period of his reign, the series of ecclesiastical statesmen still goes on. For fourteen years, from 1515 to 1529, ecclesiastical statesmanship was in truth at its highest pitch in the person of Thomas Wolsey, archbishop, cardinal, and chancellor. During the administration of this famous man, we are instinctively reminded of the joint rule of an earlier Henry and an earlier Thomas ;~~

~~but the fate of the two great chancellors was widely different. No English minister before Wolsey, and few after him, ever attained so great an European position. He dreamed of the popedom, while his master dreamed of the empire. In his home adminis- tration Wolsey carried out the policy which had become usual since Edward IV., and summoned parliament as seldom as possible. On the other hand, his administration of justice won the highest general confidence, and his hand was far from heavy on the maintainers of the new religious doctrines. On the whole his position is rather European than English. He is tlie minister of Henry in his earlier character aS warrior, conqueror, and arbiter of Europe. He is more like the great cardinals who ruled in other lands than anything to which we are used in England. The purely English work of Henry's reign was done by the hands of men of another kind. The zra of the lay states- man now begins in the mightiest and most terrible of their~~

~~Thomas number, Thomas Cromwell. From this time the highest~~

~~Crom- offices are still occasionally held by churchmen, even as late~~

~~well. as the middle of the seventeenth century. But the holding of office by churchmen now becomes exceptional; lay ad- ininistration is the rule.~~

~~Henty's There is no need to go through the endless tale of~~

~~mar- Henry's marriages, divorces, and beheadings of wives,~~

~~Tiages.~~

~~except so far as they have a political or ecclesiastical bearing. The mere number of Henry's wives is unparalleled in our history, and has not many parallels in any history ; and the king was, to say the least, unlucky, who, out of six wives, found himself obliged to divorce two and behead two others. But, even in these matters, the peculiar character of Henry's tyranny stands forth. Everything is done with some show of legal form. When he wishes to get rid of a wife, or to exchange one wife for another, the first is divorced or beheaded by some process which~~

~~has at least the show of legal authority. ** Non nisi legitime vult nubere.”~~

~~ENGLAND~~

~~[HISTORY.~~

~~Of all Henry’s doings in this way, the long story of the paects o¢ divorce of Katharine of Aragon is the first, and the most Katha. remarkable in its historical bearings. We may pass by Tine’s details and points of controversy ; but it is plain that the “vere validity of the marriage of Henry aud Katharine was on~~

~~any showing doubtful, and that doubts had been from~~

~~time to time raised on the point before the great con- troversy arose. It is further plain that it was most desir-~~

~~able for the kingdom to have an heir whose legitimacy could~~

~~not be called in question. It is also plain that it is quite~~

~~in the character of Henry, if he wished to get rid of Katharine and to marry Anne, to seize upon every shadow~~

~~either of political expediency or of canonical subtlety which might help him to put a fair show on the course to which~~

~~his own fancy led him. What he did he would do with~~

~~some shadow of legal right, even though such shadow of~~

~~legal right was to be had only by devising a new juris- prudence, by upsetting the relations of Church and State as~~

~~they were then understood, by jeoparding the relations of his kingdoms with foreign powers, and by shedding any amount~~

~~of innocent blood, provided always that it could be shed~~

~~in legal form. It is enough for our purpose that Henry's~~

~~wish to put Anne in the place of Katharine led to the endless disputes as to the validity of Katharine's marriage,~~

~~and, as its first great result in England, to the fall of the~~

~~great cardinal in 1529, followed by his death in the next~~

~~year. Events now follow fast on one another. In 1531,~~

~~by one of the meanest tricks that ever king played, the whole estate of the clergy was held to have fallen into a premunire by admitting the legatine authority of Wolsey, which he had exercised with the king's full sanction, Their pardon was bought only by an enormous subsidy, and by acknowledging the king as Supreme Head on earth of the ithe of Church of England, a form of words now heard for the Supreme first time. In 1532, when all hope of a favourable sen- Head. tence from Rome had passed by, Henry is believed to~~

~~have privately married Anne. In 1533 the death of Arch- bishop Warham made room for the promotion of Thomas Cranmer to the see of Canterbury, a promotion which was~~

~~still made by papal authority. The first act of the new primate was to hold a court which declared the marriage~~

~~of Katharine null and the marriage of Anne lawful.~~

~~Then came the great legislation of the year 1534, by which the papal authority was wholly abolished, while the Abolition Act of Submission on the part of the clergy subordinated of papal all ecclesiastical legislation within the kingdom to the royal #uthority will. The succession to the crown was settled in favour~~

~~of the issue of Anne, to the exclusion of the issue of Katharine, and the punishment of treason was denounced against all who refused to swear~~

~~to the succession so or- dained. ‘The title of Supreme Head of the Church, already~~

~~voted by the clergy, was now bestowed by parliament,~~

~~and full ecclesiastical powers were annexed to it. These powers were allowed to be exercised by deputy, and in 1535 Cromwell was made vicegerent for the king in ecclesiastical matters, with precedence in the ecclesiastical convocation~~

~~over the metropolitan himself. On the other hand, a~~

~~strict statute was passed for the suppression of heresy.~~

~~The scheme of Henry was now fully established; the religion of England was Popery without the Pope.~~

~~It was only in an indirect way that such a change as this Indirect could give any encouragement to the professors of the re- results formed doctrines. It was only in a still more indirect way 2 pe that it could tend to the establishment of religious toleration © _ or the acknowledgment of liberty of conscience. Still, however indirectly, the first steps were now taken towards change in the received doctrines of the Church, and towards the toleration of dissent from those doctrines. So great a change could not fail to lead to further changes, and the next six years of Henry’s reign were a time in which all~~

~~RULE OF CROMWELL. |~~

~~the influences at work were in the direction of further change. It was the time of the administration of Crom- well, and of the highest influence of Cranmer. The~~

~~Deathsof new state of things was ushered in by the beheading of Sir Moreand Thomas More and of John Fisher, bishop of Rochester.~~

~~Fisher.~~

~~More’s doctrine of the royal~~

~~| Bucces- sion,~~

~~Crom- ——-well's Reign of Terror.~~

~~Burning of Lam- bert.~~

~~- blood of kings in their veins.~~

~~No greater mockery of all the forms of justice was ever done in any age or in any land. But the execution of these'two worthies calls for a special notice on account of the great constitutional point which it involves. They were called on to swear both to the succession to the crown, as settled on the issue of Anne, and also to the preamble of the act which declared the marriage of Katharine invalid. This latter oath involved a theological pro- position of which their consciences disapproved; to the succession they were perfectly ready to swear. That is to say, More, the great thinker of his generation, utterly cast aside the whole figment of hereditary right. In his view the children of Henry and Anne would be illegitimate ; but, in his view, it was within the power of parliament to settle the crown on the king's illegitimate children or on any persons whatsoever. 'To the succession therefore, which was all that was of any practical moment, he would swear; to a proposition which he held to be doctrinally false he would not swear. On these grounds Henry sent his wisest and greatest subject to the scaffold.~~

~~Cromwell's reign of terror, as it has been well called, now sets in. It is specially remarkable for the constant use of acts of attainder, acts sometimes passed without giving the accused person the opportunity of making any defence. Not that in Henry's reign a defence went for anything, even when the regular forms of trial by a man's peers were observed. It was deemed for the king's honour that those whom the king accused should be convicted, and the Lords or the jury convicted accordingly. In more than one case, entries were found in Cromwell's papers, directing that such and such a person should be "tried and executed." Mean- while new treasons and other crimes were invented. Martyrs were made on both sides ; the supposed traitor and the supposed heretic were sometimes drawn to death on the same hurdle.~~

~~‘Two of the martyrdoms of this period de- serve special notice. In one case at least, but seemingly in one only, the penalties of heresy were held to attach to the denial of the king’s supremacy. For this crime a friar, Forrest by name, was burned with special circumstances of brutal mockery. On the other side, the case of Lambert in 1538 well illustrates both the new jurisprudence and the peculiar position of some of the actors at the time. The men who were afterwards burned themselves were the fore- most in burning others. Lambert was denounced by Taylor and Barnes, and condemned by Cranmer, for the denial of transubstantiation. He appealed to the king in his charac- ter of Head of the Church. Henry heard the cause in person, and, when his own arguments and those of Cranmer failed to convince the heretic, he was sentenced to the stake by the voice of Cromwell.!_ About the same time a general persecution took place of all who were guilty of having the Margaret countess of Salis- bury was the daughter of George duke of Clarence, the mother of Reginald Pole. Pole was in theology the very opposite to Henry. As the system of Henry was Popery without the Pope, so Pole might be said to be inclined to the Pope without Popery. With a distinct leaning to thé Reformers on some strictly theological points, he was a zealot for the papal supremacy. On this point, and on all the eee~~

~~? A modern writer thus comments on the death of Lambert :— In a country which wags governed by law, not by the special will of a despot, the supreme magistrate was neither able, nor desired, so long as a law remained unrepealed by parliament, to suspend the action of it.” This singular argument forgets, among several other things, the royal prerogative of mercy.~~

~~practical points which flowed from it, Pole was a vigorous disputant against his royal kinsman. But he was beyond the sea, safe from the grasp of Henry, Cromwell, or Cranmer. The head of his aged mother, sentenced to die by act of attainder, paid the penalty of his crime.~~

~~This last deed of blood was specially Henry's own. The attainder of the countess was indeed passed while Cromwell was still in power, but she was not put to death till after his fall. But the deaths of particular persons seem but a small matter beside the great revolution which Cromwell wrought over the whole face of the country by his great work of the suppression of the monasteries. This work in- Suppres- deed incidentally supplied him with not a few personal sion of victims. That the power of the state was supreme, as over 'oie everything else, so over ecclesiastical foundations, no man in ; England could doubt. Monasteries had been suppressed on occasion from the earliest times. Special attention has been already called to the suppression under Henry V. ; and during Henry's own reign Wolsey had suppressed 2 parler considerable number of small monasteries to supply endow- suppres- ments for his colleges at Ipswich and Oxford. A general sions. suppression of all the monasteries in the kingdom was clearly within the power of parliament, and strong reasons might have been brought for such a course. We must however remember that at this stage Protestant objec- tions to the monastic life do not apply. Henry, while destroying the monasteries, enforced the obligation of the chief monastic vow. But it might well be argued that the number and wealth of these institutions was excessive, that they had ceased to fulfil their original purposes, that on any showing they needed a sweeping reform, and that possibly reform could not be carried out without suppres- sion, For the measure itself then much might be said. The way in which it was carried out was characteristic of Distinct Henry VIII. Mere violence was inconsistent with his ie character ; something of the form of law must be had. In jira 1536 the smaller monasteries were regularly suppressed by andlesser act of parliament, a course against which nothing can be monas- said. But the greater monasteries were surrendered one teries. by one into the king's hands by their actual occupants, an act of most doubtful legality. Where a surrender was refused, as at Reading, Colchester, and Glastonbury, the abbots were ordered, according to Cromwell's formula, to be " tried and executed " on such charges as were thonght Execu- good. In these cases, by a strange construction of law, the a os monastery was held to fall by the attainder of its abbot. °°° The suppression was justified by the reports of visitors, which in most cases charged the monks with crimes of~~

~~various kinds. No one will believe that such a report was either wholly true or wholly false; but it is to be noted that monasteries which were reported to be wholly blameless, and for whose preservation the visitors themselves pleaded, State of were suppressed with the rest. It is to be further noted the mon- that, where abbots and priors surrendered easily, of what- **tT!e% ever crimes they had been accused, their compliance was rewarded either with considerable pensions or with church preferment.2. Of no monastery in England was a worse character given than of the priory of Christ Church at Canterbury, that which was attached to the metropolitan church. Yet, when that cliurch was refounded as a secular chapter, Henry and Cranmer chose most of the canons and other officers of the church out of the body of men who had just before been branded with the blackest crimes. In the suppression under Henry V., nearly the whole of the confiscated revenues was applied to works of general~~

- ~~Thus the last abbot of Peterborough became the first bishop, and the prior of St Andrews at Northampton, who, in the act of surrender, had drawn a dark picture of the doings of himself and his monks, became the first dean.~~

~~Squan- VIII., by far the greater part of the vast revenues of the = Sue é~~

~~dering of monastic houses was squandered or gambled away among~~
~~But after all, in Henry's reign it is the marriages, the~~

~~Lac Henry's courtiers. Churches and churchyards were granted | divorces, and the beheadings of his several queens which~~

~~ee i destroyed or desecrated at their | form, if not the causes, at least the occasions, of the greatest~~

~~perty, 0 private men, to be destroyed or des ' nga] ¢ » OL the g pleasure. The tithe which the monasteries had taken to | changes. Henry's dissatisfaction with one marriage had led themselves, to the great wrong of the parish priests and their | to the fall of Wolsey and the rise of Cromwell ; his dissatis- flocks, was now seized with their other property, and was | faction with another marriage led to the fall~~

~~of Cromwell granted away to lay rectors. Cranmer, who gave up | himself. England and Europe had been turned upside several estates of his see to the king, did not scruple to | down in order that Henry might marry Anne Boleyn. Three receive grants of lands and tithe for the enrichment of his | years after her marriage, she was got rid of by the twofold own family. Only a small portion of the monastic revenues | process of a divorce pronounced by Cranmer which declared was saved for public purposes of any kind. A little was spent | the nullity of her marriage, and of a conviction for adultery on the defence of the coasts, Of a magnificent scheme | by the House of Lords which implied its validity. Anne Behead. for the foundation of new bishoprics, a small part only | was beheaded, and the next morning Henry, acting, as we ing of was carried out in the foundation of six slenderly endowed | have been tuld, from the severest principles of public duty,~~

~~Henry's sees. Those cathedral churches which had been served by | married her maid Jane Seymour. It was now made treason-~~

~~— monks, and which therefore came into the king's hands | able to assert the validity of Anne's marriage, as before it had~~

~~8+ with the other monasteries, were, with the exceptions of | been treasonable to deny it. Anne's daughter Elizabeth was~~

~~Bath and Coventry, refounded as churches of secular | declared illegitimate, as Katharine's daughter Mary had been canons. Henry also gained the reputation of a benefactor | declared illegitimate, and the crown was settled on the issue in both universities. At Oxford his claim rests on several | of Jane only. The new queen, by unusual good luck, died, Jane Sey. suppressions and refoundations of the college which had | neither divorced nor beheaded, at the birth of her only child, mour. been begun by Wolsey, and on his charging the chapters of | Henry's only legitimate son, the future Edward VI. Ex- Oxford and Westminster with the maintenance of certain | cept as regards the succession of the crown, all this is little professors. At Cambridge the like reputation was gained | more than an episode. MHenry's fourth marriage was of by rolling several small colleges into one large one. The | greater political importance. Katharine, Anne, and Jane statutes~~

~~of Henry's various foundations, drawn up in some | had been at least his own choice. Anne of Cleves was cases by his own hand, breathe a spirit of piety and zeal | chosen for him by his vicegerent. Her marriage was part Marriage worthy of Alfred or St Lewis. Here again there is no | of a political scheme for an union between Henry and the of Anne need to suspect conscious hypocrisy. It only makes the | Protestant princes of Germany against the emperor. Coe character of Henry a more wonderful moral study. Besides | Cromwell, it is plain, went further than the king approved calla the suppression of monasteries, a great deal of wealth, to | in advances towards these heretical allies, and the queen sults, be squandered in the like sort, was brought in by the | whom he found for Henry among them found no favour in destruction of shrines and by the seizure of the movable | Henry's eyes. Cromwell had in fact chosen his time badly ornaments of many churches which were not suppressed. | for any advances in a Protestant direction. While his Ou the other hand, most of the inmates of the suppressed | negotiations with the German princes were going on, the monasteries! received pensions, small in many cases, but | statute of six articles was passed by the parliament of 1539,~~

~~336~~

~~usefulness, chiefly to the great educational foundations which were then rising. In the suppression under Henry~~

~~enough for their maintenance ; and these pensions seem to have been: honestly paid. With the usual long life of annuitants, some of them still received their pensions in~~

~~PNG EAN &~~

~~[uIgToRY,~~

~~of the North were now appointed to keep that dangerous region in order. '~~

~~which enforced the old belief under the deadliest penalties. The marriage took place at the very beginning of 1540. In the course of the~~

~~year Cromwell was created Earl of Essex,~~

~~the reign of James I. arrested, attainted without a hearing, and beheaded. In Fall and~~

~~The foundations and refoundations just spoken of went | the interval between his attainder and his executiun, the execution on to the very end of Henry's reign. An Act of 1545 | marriage which he had brought about was annulled by of Ca placed the secular foundations, the colleges and hospitals, | convocation, and on the day of his beheading Henry at his mercy; and he destroyed, refounded, or left un- | married his fifth wife, Katharine Howard. touched, according to his pleasure. But the two great The administration of Cromwell, remarkable as it is in suppressions, the suppression of the greater and of the | other ways, derives its greatest constitutional importance lesser monasteries, were all done under the rule of Crom- | from the new relations between crown and parliament well, and in his time came their immediate political results. | which now begin. Wolsey, after the example of Edward~~

~~It is not easy to say what was the general feeling of the | 1V. and Henry VII, had shrunk from meeting the nation towards the suppressed monasteries. It doubtless | assembly of the nation. Under his rule parliaments were differed widely in different places, according to the character | summoned as seldom as might be. Cromwell, on the other Crom- of particular houses. It is certain that in 1536 the whole | hand, never feared to face parliament. From the time of Wells north of England rose in revolt on occasion of the sup- | bis accession to power till the end of Henry's reign, parlia- pression of the lesser monasteries. This revolt, called the | ments-were constantly held. And from this time, a prac- liaments.~~

~~Pilgrim- Pilgrimage of Grace, was distinctly a religious movement ; | tice which had been already followed sometimes rose into ce but it was a political movement as well. We seem to have | special importance. The king's powers of prorogation and~~

~~gone back to the days of Edward the Confessor, when we find the northern insurgents demanding that no man north of Trent should be compelled to appear in the ordinary course of justice anywhere but at York. They demanded also the holding of a parliament at York, which Henry pro- mised, but neglected to summon. The revolt began again, and it was suppressed with a large amount of hanging,~~

~~dissolution of parliament now come into notice. The early parliaments met; they did the business for which they were summoned, and then they went home again. The prolongation of the life of the assembly beyond the time of its session was not thought of. Each meeting implied a new election of the House of Commons. But it was gradually found that a parliament which suited the~~

~~beheading, and burning of the abbots, lay lords, ladies, and others who were concerned. A Lord President and Council~~

~~2 Aull perhaps, except the nuns of the lesser monasteries, who were sent away with only a gown apiece.~~

~~king's purposes might be kept in being by prorogations Practice from one session to another. This practice began to be of proro- used under Henry VI. and Edward IV., in which last 84"~~

~~reign the practice became usual; under Henry VILL~~

~~THE SUCCESSION.|~~

~~it became systematic. Some of his parliaments lived in this way for four successive. years. Cromwell was thoroughly master of the art of packing and managing parliaments, an art to which the succeeding reigns added the practice of summoning members from a crowd of petty places, with the express object of securing subservient re- turns. The parliaments of Henry's time passed, though not always without opposition, whatever the king wanted, even to the act which gave the king's proclamation, with certain exceptions, the force of a statute. But in the fact that parliaments for a while became so slavish lay the hope of~~

~~Effects of the final revival of freedom. It wags under the despotism~~

~~Henry's despot- ism.~~

~~Dealings with Scotland.~~

~~Scheme of union.~~

~~I ater years of Henry.~~

~~Katha- rine Howard.~~

~~of Henry exactly as it had been under the despotism of the Conqueror. 'There was no need to abolish institutions which could so easily be turned to work the despot's will. There was no ueed seriously to encroach upon their formal powers. 'The institutions and their powers thus remained, to be again quickened into full life in the seventeenth century, as they had before been quickened in the thirteenth century. Had Henry met with a stronger parliamentary opposition, our liberties might have passed away, like the liberties of the lands which went to make up the monarchies of France and Spain. Parliaments went on, because parliaments voted whatever the king wished. Juries went on, because they convicted whomever the king wished. But, because they were allowed to go on, a time came when parliaments learned to pass measures which kings did not wish to have passed, and when juries learned to acquit men whom kings wished to destroy. In this way, as William the Conqueror in one age, so Thomas Cromwell in another, may be looked on as the indirect preserver of English freedom.~~

~~After the fall of Cromwell the reign of Henry loses much of its interest; or at least the interest is, as at the beginning of his reign, again transferred to the wars with France and Scotland. But these wars, with their momentary successes, are of little importance, except that in the course of the Scottish war we see the beginning of the train of events which sixty years later united the English and Scottish crowns. James V. of Scotland, it must be remembered, was Henry's mephew, the son of his sister Margaret. Accordiug to genealogical notions, he was next in succession to the crown after Henry's own children. The prospect of~~

~~this contingent succession was dangled by Henry before the eyes of James. And when James died, leaving an infant daughter, the famous Queen Mary, Henry's schemes now took the form of a marriage between her and his son Edward. This was exactly the same scheme which had been proposed by Edward I. when Scotland had an earlier child queen. In neither case did the scheme bear immediate fruit. The marriage of Edward and Mary formed one of the terms of a momentary peace between England and Scotland in 1543. But the war began again, and was carried on, in connexion with the reforming party in Scotland, both during this reign and during the early years of the next, with the avowed~~

~~object of bringing about the marriage. Itis needless to say~~

~~that the marriage was never carried out. But Mary came to be, on other grounds, a claimant of the crown of England, and her son came to possess it.~~

~~During these later years of Henry, no commanding figure stands out like those of Wolsey and Cromwell. Henry. himself, towards the end of his reign, lost much of his energy. Martyrdoms on both sides still went on, though, as compared with the slaughter of later times, they were rare on both sides. There is yet no open change ; but the gap between the two parties gets wider and wider. Katharine Howard, married in 1540, was beheaded early in 1542. In the next year Henry married his last wife, a third Katharine, commonly called Katharine Parr, but who was~~

~~then the widow of Neville Lord Latimer. Her leaning was Katha- to the new doctrines, and at one time she was in danger on Tine Parr. their account. On the whole, the tendency was now in favour of change. Things seemed to sway backwards and forwards between Bishop Gardiner and the duke of Nor-~~

~~**folk on one side and Cranmer and Edward earl of Hertford,**~~

~~**a brother of Queen Jane Seymour, on the other side. At**~~

~~**the moment of Henry's death the reforming party had the greater influence. The last who were sentenced to die in**~~

~~**his time were Norfolk himself and his son the famous**~~

~~**earl of Surrey. The son perished; the father was saved by**~~

~~**the king's death. But though the reforming party had politically the upper hand, no step was taken as long as Henry lived in the direction of strictly religious reformation.**~~

~~**The most important question during these later years The suc- was the settlement of the succession. By a statute passed cession. in 1544, the crown was to pass to Henry's three children in order, Edward, Mary, and Elizabeth. Both the king's daughters had been declared illegitimate ; but now, without any reversal of their illegitimacy, they were placed' in the succession to the crown. On no theory could Mary and crown Elizabeth both be legitimate; the law had declared that entailed neither of them was. The point is of importance, because Hent g in truth neither Mary nor Elizabeth reigned by any right of ame birth, but by a purely parliamentary title. But the statute went on further to bestow on Henry a power which never was bestowed on any other king before or after. In default of the issue of his own children, the crown was to pass to such persons as he might himself appoint by his last will, signed with his own hand. By his last will he exercised this power by leaving the crown in remainder to the issue of his younger sister, Mary the French queen, who, after the death of Lewis XII., had married Charles Brandon, duke of Suffolk. He thus passed by the queen of Scots and the other issue of his elder sister Margaret. The Henry's provisions of this will become of great importance at a later Will. time; and it shows on what small accidents great questions may depend, that it is matter of controversy whether the will was signed by the king's own hand, according to the statute, or whether it was merely signed with a stamp.**~~

~~In this memorable reign then, though no strictly religious reformation was wrought, yet a step was taken which made religious reformation inevitable. One marked feature of the fully developed English character was now added. England was from this time, with a momentary interruption, the enemy of the Roman see. But the reign of Henry helped in another way towards the welding together of the whole isle of Britain. Wales was now fully incorporated with the Incorpor- kingdom of England. It was brought wholly under English ac of law and was fully represented in the English parliament, '* Ireland too was brought into more complete submission than it had ever been before, and in 1542 Henry exchanged his title of Lord of Ireland for that of King, or, as an Irish Iveland a Act words it, "King and Emperor of the realm of England 'stom: and of the land of Ireland." Ireland was a dependent kingdom ; still from this time it was a kingdom attached to the crown of England, and by making it such a distinct step was taken towards the union of the British islands.~~

~~On the reign of Henry followed the reigns of his three Reigns of children in succession, according to the order laid down in Henry's the statute of 1544. The marked historical feature of these children. reigns is that they are the time of strictly religious reformation. It was found that the middle system of Henry could not last, that the English Church and nation must throw in its lot with one side or the other in the great Begin- controversy of the age. Under Edward the religious ning of reformation was wrought. Under Mary, first the work of ete Edward, and then the work of Henry, was undone, and the cies. authority of the Roman see was again : liagy Under~~

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~~Reign of Elizabeth the work both of Henry and of Edward was done~~

~~Eliza- again. Ter reign, four times the length of the two reigns beth : : c Spal~~

- ~~of her brother and sister, is the time when the religious~~

~~position of England took its final form. The national Church was organized in its essential features as it still remains, And, before the end of her reign, the two parties, those who thought change had gone too far and those who thought that it had not gone far enough, had ceased to be mere parties within the same body. They had become distinct bodies of separatists on either side of the national Church. The reign of Elizabeth saw the beginnings of the Roman Catholic body on the one side and of the Protestant dissenters on the other. As yet both dissentient bodies existed only as objects of persecution. A main feature of the later religious history of England has been the steps by~~

~~which, first the Protestant dissenters, and then the Roman~~

~~Catholics, have been admitted to full equality with the~~

~~members of the national Church.~~

~~The political history of these reigns, domestic and~~

~~foreign, is of high importance, but it depends in a large~~

~~Relations Measure on the religious history. It was mainly owing to~~

~~with religious causes that the enmity towards France, so strong France in earlier times, so strong again in later times, was during and : : = a cian~~

~~Spain. this period exchanged for a temporary enmity towards Spain. Begin. And during the reign of Elizabeth we see the beginnings~~

~~ning of of that alliance between certain religious parties and certain religious political parties which forms the leading feature of the ae history of the seventeenth century. In truth, it was during parties, this time that organized parties, either religious or political, had their beginning. In a certain sense there have been Whigs and Tories from the beginning. We can see the existence of different political opinions, of different theories as to the relation of the crown and people, in days before the Norman Conquest ; and in every civil war, in the wars of the thirteenth century above all, distinct political parties stand forth and meet one another in arms. But it can hardly be said that such parties lasted beyond the immediate occasion, or that the party of one age was connected by direct succession with the party of an earlier age. But from the days of Elizabeth the political and religious parties of later times can be distinctly traced. From her time they have an unbroken succession; from her time they have the~~

~~special characteristic of being parliamentary parties. Reign of 'The six years' reign of the young son of Henry VIII. Edward might almost be~~

called a revolutionary period throughout. — Its beginning marks a stage in the history of kingship in England. Edward VI., succeeding by the express terms of an act of parliament, was the first king at whose accession the last traces of the ancient popular election were dis- pensed with. He was a minor, and his authority was struggled for by a knot of ambitious men, all of whom had risen into importance during the late reigu. The king's uncle, Edward earl of Hertford, named by Henry as one meniber of a council of regency, contrived to make himself duke of Somerset and sole protector. Finding a rival in his younger brother Thomas, he, Cromwell-fashion, procured his attainder without a hearing. In 1549 he himself fell before the arts of John Dudley, earl of Warwick and duke Northum- of Northumberland, the son of the notorious agent of berland. Henry VII., the father of the notorious favourite of Elizabeth. Somerset was partly restored to favour in 1550 ; but in 1551 came his trial and execution, strange to say on a charge of felony, though a political felony, and not of treason. 'The remaining two years of the reign of Edward , are the reign of Northumberland. His last act was to per- ce s suade the young king to do without parliamentary authority ane what his father had done by parliamentary authority, and to settle the succession to the crown by will. By this illegal instrument he disinherited both his sisters, and named Jane Grey as his successor. As a granddaughter of the French

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queen Mary, Jane was in the line named by Henry in case Momen. of the failure of his own children; but her immediate promo- try reign tion was due to her being the wife of a son of Northum- a berland. Jane, proclaimed by the council, was rejected by

the nation, and Mary, whose parliamentary title was undoubted, was raised to the throne by a popular movement. Accession Northumberland of course paid his forfeit with his head ; of Mary. but the execution of Jane herself, not at the time, but

~~after a later revolt in which she had no share, was an act~~

~~of needless harshness.~~

~~England under Edward altogether fell from the great European position which she had held under Henry. The chief foreign events of the time are the war with Scotland, the Relations useless and barbarous havoc done by the protector, and the With peace both with Scotland and with France by which Boulogne a was restored. But-the real character of the reign is marked janq, by its ecclesiastical changes, changes which are largely mixed up with a social revolution which was now going on.~~

~~The strictly religious changes began with the promulgation Religions of a Book of Homilies in the first year of Edward. It changes. marks the state of things at the time that one of these hontilies, which are still to this day set forth by authority~~

~~to be read in churches, was the work of Edmund Bonner.~~

~~The homilies were followed in 1548 by a form for the ad- ministration of the communion in English, and in 1549 by~~

~~the publication of the complete English Prayer-Book and~~

~~an act allowing the marriage of the clergy. This first The Prayer-Book of Edward marks the first stage of the religious English Reformation. It is a purely Euglish stage ; the influence a of Rome has been cast aside; the influence of continental ae Protestantism has not yet come iu. But some of the foreign Reformers were before long invited to England, and their presence soon made itself felt. In 1552 the Prayer-Book~~

~~was revised in a more distinctly Protestant direction. Before this, in 1551, a Book of Articles of Religion, forty-~~

~~two in number, were put forth, The Prayer-Book and the~~

~~Book of Articles represent two sides of the Reformed English Church. 'The Prayer-Book, chiefly formed out of ancient service-books, remained, even after the changes of~~

~~1552, a link with the older state of things. The Articles, The even after some changes in the time of Elizabeth, form a Articles. manifesto on behalf of the new state of things and a link~~

~~with the Reformed Churches in other lands. The Prayer-Book and the Articles have ever since been severally~~

~~the watchwords of two parties within the Church. It is~~

~~not too much to say that there has ever since been a~~

~~party which has loved the Prayer-Book and endured~~

~~the Articles, and a party which has loved the Articles and endured the Prayer-Book. By the end of Edward's reign,~~

~~the English Church stood by itself, retaining the old fabric~~

~~of ecclesiastical government, with a service-book chiefly drawn from ancient sources, but with a system of doctrine breathing the spirit of the more thorough-going Reformers of~~

~~the continent. Had Edward lived, further changes would probably have followed. As it was, the reaction under Mary opened the way for the final settlement under Elizabeth.~~

~~The position of the prelates who clave to the old system during Edward's reign should be carefully noticed. They neither resigned their sees nor refused obedience to the new law. It does not appear that any bishop declined the use of the first Prayer-Book. Gardiner and Bonner were The imprisoned and deprived of their sees on various pretences, bishops as were several bishops later in the reign for refusal to Be comply with various orders, somic of which certainly had no parliamentary authority. A large body of the prelates and others were~~

~~dissatisfied with the changes that were made; but there was not only no separation, there was no disobedience to the law. More than one bishop who appears as a persecutor in Mary's reign had gone considerable lengths under Edward. And, as there was little non-con-~~

~~REIGNS OF EDWARD AND MARY.]~~

~~formity, there was little persecution in this reign. The Lady Mary, protected by the emperor, continued the private use of the old service. The heresy statutes were abo- lished ; yet Cranmer found means, under cover of the common law, to send to the flames one Englishwoman and one stranger who ventured to go further in the way of novelty than himself.~~

~~But, besides ecclesiastical reform, this reign was beyond all other times the time of ecclesiastical spoliation. It was even more distinctly so than the reign of Henry. The sup- pression of the monasteries, the destruction of the shrines, were at least acts of policy. But in Edward's reign the Suppres- possessions of the Church were simply thrown to be sion of scrambled for by the courtiers. One of the first acts of the colleges. peion, the suppression of those colleges, chantries, and the~~

~~like, which Henry had spared, was at least done in legal~~

~~form. But, during the rest of Edward's time, Somerset, Church Northumberland, and the rest simply seized on whatever plunder they thought good. The nearest approach to legal form in ofthe such cases was the show of an exchange by which a valuable courtiers. ostate was exchanged for a paltry rectory. And, as far as~~

~~the courtiers were concerned, everything went to enrich~~

~~private men. The one act in which the public good was at The all thought of came from the king himself. Edward, of his grammar-own act, applied a part of the revenues of the suppressed ae colleges and chantries to the foundation of that great Hon of system of grammar schools which still bear his name. Edward. The legislation of this reign presents some good points.~~

~~Many of the newly created treasons of the late reign were abolished, and two witnesses were made necessary on trials for that crime. The act which gave the king's proclama- tion the force of a statute was repealed. On the other hand, there was the severe Statute of Vagabonds, which went beyond even the old Statute of Labourers. This reign too was marked, like those of Richard II. and Henry VL, by popular revolts. One grievance was the throwing land out of tillage and taking it into pasture. This was laid specially to the charge of the grantees of the monastic lands, who were found to be in most respects harder landlords than the monks had been. Risings of the lower people took place, both in the eastern counties where the Reformed doctrines were popular, and in the West where the religious changes were disliked. The western insurrection broke out on the first use of the new Prayer-Book. The insurgents demanded the continuance of the old service and a partial restoration of the monasteries. This last demand perhaps points to the state of feeling into which the various currents for aud against the monastic orders had at last settled down. The popular belief clearly was that, in the former state of things, there had been more monasteries than enough, but that the country had not gained by sweeping them away altogether. It was eminently characteristic of the time that this revolt of Englishmen was put down by the help of German and Italian mercenaries.~~

~~Burn- ings.~~

~~The western rising.~~

~~Reign of~~

~~Miley The reign of Edward was followed by another reign, yet~~

~~shorter than his own, but not less memorable. The nine days wonder of Jane's reign was followed by the five years of Mary. It is singular that, though the crown of Eng- land had so often passed to claimants whose descent was wholly in the female line, yet England had never before seen acrowned queen. The empress Matilda was never crowned, and she bore no higher title than Lady. The novelty gave rise to some cavil, and it was found needful at a later stage of Thefirst Mary's reign for~~

~~Parliament to declare that a queen of tent England possessed all the rights and powers of a king.~~

~~’ This first female reign was the time which finally settled the religious position of England. There can be little doubt that throughout Edward’s reign the mass of the People were still attached to the system of Henry, that they~~

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~~did not wish for the religious changes of Edward’s reign, Effect of but that they had not the slightest wish to bring back the Mary’s spiritual dominion of Rome. They were for the mass, but 8 not for the pope. The reign of Mary taught them that the middle system would not work, that one side or the other~~

~~must be taken, that the mass could not be had without the~~

~~pope. Furthermore, men learned to connect both mass and~~

~~pope with a political alliance which they hated, and with~~

~~a persecution different both in kind and in degree from anything which England had before seen. As for Mary The herself, it is as impossible to deny her many personal middle virtues as it is to deny her share in a persecution which, poe whoever may have been its advisers, she at least did nothing aebes to stop. But her personal position had much to do with~~

~~the course of events, religious and political, She was the Personal only person in the realm who was bound, not only to the position ancient faith and ritual, but also to the supremacy of of Mary. Rome. The supremacy of Rome was inseparably con- nected with the validity of her mother’s marriage and~~

~~the legitimacy of her own birth. As it was, she was simply queen by act of parliament. She naturally wished~~

~~to be queen as the legitimate daughter of her father. And,~~

~~if she was bound to Rome, she was no less bound to~~

~~Spain. The emperor had been her firm and her only friend,~~

~~whose influence had secured her life and her freedom of worship, Another sovereign might have restored the ancient worship with the assent of the greater part of the nation ; but, with Mary as queen, the restoration of the ancient worship meant spiritual subinission to Rome and political subserviency to Spain ; and in this the nation was~~

~~not prepared to follow her,~~

~~The ecclesiastical changes of Mary's reign began at the beginning. She caused the old services to be used on several occasions before their restoration by law, and, by virtue of the ecclesiastical supremacy which she inherited from Henry and Edward, she caused the bishops who had been deprived during the late reign to be restored to their sees. Foremost among these was Stephen Gardiner, bishop Stephen of Winchester, who became the queen's chancellor and chief Gardiner, adviser. There seems reason to think that his share in the persecution has been greatly exaggerated. It is certain that his conduct in secular matters was that of a patriotic, and even a constitutional, statesman, A parliament shortly met, which declared the validity of the marriage of Henry and Katharine and the legitimacy of their daughter's birth.~~

~~The ancient worship was restored, and some special enact- The old ments of the two late reigns were repealed ; but the worshiz ecclesiastical power of the crown was in no way touched, "estored. and nothing was said of the restoration of the papal authority.~~

~~The middle system of Henry was thus restored, but only~~

~~fora moment. The next great question was that of the queen's marriage. Gardiner and her English advisers favoured her marriage with Edward Courtenay, earl of The Devonshire, whose parents had been among the victims of queen's Henry, and who was descended from one of the daughters ™@'™48¢ of Edward IV. But Mary's fixed purpose from the begin-~~

~~ning was to marry her Spanish kinsman Philip. Sir Thomas~~

~~Wyatt and the duke of Suffolk, father of the imprisoned~~

~~Jane, took arms to hinder the marriage ; but their enterprise~~

~~led only to their deaths and to those of Jane and her husband.~~

~~More interesting in the history of our institutions is the~~

~~fact, almost unparalleled in these times, that one of the~~

~~accused persons, Sir Nicholas Throckmorton, was acquitted~~

~~by the jury that tried him. Wis life was saved ; but he remained for a while in prison, and the jurors, according to a custom which was not left off till more than a cen- tury later, were fined. In the next year, 1554, the queen's marriage with Philip, already king of Naples, took place. This first husband of a reigning queen was made king of England and of Mary's other kingdoms for her life. In the~~

~~Reconci- liation with Rome.~~

~~The per- secution.~~

~~Burning of Cran- mer,~~

~~340~~

~~next year, by the abdication of Charles V., Philip succeeded to the Spanish, Italian, and Burgundian possessions of his father. The difference between the position of Philip and that of Charles is to be~~

~~noticed. Charles V. was emperor ; alliance with an emperor was simply the continuation of a policy older than the Norman Conquest. — But Philip was not emperor; his policy was not imperial but Spanish. The marriage made England for a moment, in an European point of view, a mere tool of Spain. At home it uo doubt strengthened the movement for complete reconciliation with Rome, and for the persecution of those who, after being dominant in the last reign, were deemed heretics in this. In the year of Mary's marriage Reginald Pole, now cardinal, came back to England as legate, and the Lords and Commons of England knelt to receive his absolution for the national schism. He confirmed by papal authority various acts done during the time of the separation, and it does not appear that the ordinations uf bishops and priests which had been made during Edward's reign were ever called in question. And, to quiet a doubt which made many minds uneasy, the actual owners of church lands were confirmed in their possession, An act of parliament followed, by which the papal authority was restored as it had stood before the changes of Henry. Gardiner aud Bonner, the strenuous opponents of the pope in Henry's days, and Thirlby, who had gone a long way with the changes under Edward, were now bishops of a Church in full communion with Rome. That is doubtless, they had seen that, at all events with a Spanish king con- sort, the middle system could not be kept, and that those who clave to the mass must accept the pope with it. From this time we have two distinct religious parties, the party of the pope and the party of the Reformation. These last were now deemed heretics, and the old heresy laws were revived for their destruction. In 1555 the persecution began, and it lasted till the end of Mary's reign. It differed from the two-edged persecution of Henry's reign in two points. Henry's victims of either faith were com- paratively few, and they were mostly persons of sonie importance. In the three years of the persecution of Mary, more victims were burned than in all the reigns before and after put together. And it was a persecution which, as far as the laity were concerned, fell mainly on victims whom Henry would have scorned to destroy, on the poor, the halt, andthe blind. No layman of any distinction suffered ; but on the Reformed clergy the hand of the destroyer fell heavily. Five bishops perished. Of these were Ridley and Latimer—true martyrs on one side, as More and Fisher on the other—Hooper, the professor of a straiter sect of~~

~~Protestantism, and the less famous Farrar of St David's. The primate followed the next year. He had been lawfully condemned to death for his treason in the usurpation of Jane; and his execution under that sentence, though it would have been a harsh measure, would have been a small matter compared with many an execution of the days of Henry. He was spared, probably in mercy; but he was spared only to bring on Mary and her government the deeper infamy of burning one who had recanted his heresies. The persecution was throughout more the work of the council— by whom Bonner was blamed for slackness—than of the bishops. No one was more zealous for slaughter than William Paulet, marquess of Winchester, one of the new men who conformed to every change, and who died in honour under Elizabeth. After the burning of Cranmer, and not till then, though the see had been for some while vacant by his deprivation, Pole succeeded to the see of Canterbury, the last archbishop in communion with Rome. The last days of Mary showed the impolicy of the Spanish match. _ Strange to say, one of the first acts of Philip, so pre-eminently the Catholic king, was a war with~~

~~ENGLAND~~

~~[uistTory.~~

~~the pope, Paul IV., in his temporal character. Henry of War with France broke his truce with Spain, and encouraged English France, traitors to attempt the betrayal of Calais, and to make an actual landing in England. Mary declared war in 1557,~~

~~and English troops shared in the victory of St Quintin.~~

~~But at the beginning of the next year, the last of Mary's reign, the French took Calais, and England ceased to be a continental power. She has won back that character in~~

~~later times by the momentary possession of Dunkirk and~~

~~the more lasting possession of Gibraltar; but the last relic Loss of of the conquests of Edward III. now passed away, as the Calais. last relics of~~

~~the inheritance of Eleanor had passed away~~

~~105 years before. For a few months Mary bore up against sickness and neglect, against sorrow and national discontent.~~

~~On November 17, 1558, she died, and the cardinal followed~~

~~her, having been for a few hours the subject of Elizabeth.~~

~~This last fact brings us to the great reign which ends the Reign of period with which we are now dealing. Under Elizabeth Eliza- that which was wanting to complete the character of England — and of Englishmen was added. The religious character of the nation was now fixed; and its religious character had no small share in fixing its political position at home and abroad. The national Church retained so much of the Position middle system of Heury as to hold in some sort a middle of the place between Rome and the Protestant Churches of the Ca continent. But this middle position at no time extended ‘ to more than strictly religious points of doctrine, discipline, and ceremony. As a nation, as a power, Englaud has been essentially Protestant from the time of Elizabeth. But the fact of the middle position of the English Church led to the formation of religious bodies at home which parted off from it in opposite directions. And from Elizabeth’s day onwards the party of further religious reform has also been the party of political freedom. The Puritan party, it must be Begin- remembered, had no more notion of toleration than any nings of other party of those days. Its object, like that of every the Putt other party, was not the mere toleration, but the exclusive establishmeut, of its own system. But, on the one hand, every change, every debate, helped to bring about religious toleration in the end. And, as the Puritan movement was largely a movement against arbitrary authority, it was necessarily a movement in favour of freedom. But in England a movement in favour of freedom did not mean the establishment of anything new, but the restoration of what was old. It meant the carrying out of existing laws which Tudor despotism had trampled under foot. In any new legislation that might be needed, it meant the falling back on the old constitutional principles which had beeu always acknowledged, if not always carried out in practice, from Edward I. to Henry VI. Politically~~

~~the struggle of the seventeenth century, which had its root in the controver- sies of the sixteenth, was the repetition of the struggle of the thirteenth, Even in the religious element in both cases there is a likeness. Earl Simon and his friends did not swerve from the received orthodoxy of their day; for the time for strictly religious controversy had not yet come. But they were none the less the Puritans of their own day. A revived spirit of independence marks the parliaments of Elizabeth, and marks them in proportion as the Puritan element grows stronger. Elizabeth loved arbitrary power as well as any sovereign that ever reigned; but she knew that one condition of holding any power was to know how to yield, and, when she yielded, she yielded gracefully.~~

~~Whatever may have been Elizabeth's personal religious Ecclesi- convictions, there can be little doubt that the middle system astical of Henry was that to which she was herself inclined, But change? she found that its complete restoration was impossible, If it had ever been possible, it was impossible now, after the reconciliation with Rome and the persecution. Her reform~~

~~tan party.~~

~~The prayer- book,~~

~~Opposi- tion of the~~

~~bishops,~~

~~REIGN OF ELIZABETH. |~~

~~was therefore obliged to be, not a return to the system of her father, but a return, with some modifications, to the system of her' brother. The second service-book of his reign was taken as the standard; but some changes were made, the first of several successive changes, all of which have been in the direction of a return to the first book. It was Hlizabeth's policy to make her new system as little offensive as might be to those who still preferred the old state of things. She refused the title of Head of the Church which was offered to her by parliament, and which had been borne by Henry, by Edward, and by Mary up to~~

~~the reconciliation with Rome. She caused some passages in the prayer-book, which were specially offensive to the papal party, to be left out. The forty-two articles of Edward were not enforced in the earlier years of her reign, and when they were enforced, they were cut down to thirty-nine. One favourite doctrine of the Reformers, the lawfulness of marriage in the clergy, Elizabeth could never be brought to sanction by any legal enactment. The practice was simply winked at during the whole of her reign, and was not legalized till the reign of her successor. On the other hand, the anti-papal legislation of Henry was restored in its substance; but the refusal of the oaths, which under Henry had carried with it the pains of treason, in Elizabeth's first legislation carried with it only loss of office. But we are met at the very beginning with the fact that the changes under Elizabeth, less violent in every way than the changes of Henry and Edward, met with a much more decided opposition from the bishops than the changes of Edward and Henry had met with. Prelates who had gone all lengths with Henry, who had gone a considerable way with Edward, refused the oath of supremacy under Elizabeth. One only of the existing bishops conformed, Kitchen of Llandaff, who had kept his see through all changes. The reason doubtless was that the rest had seen the hopeless- ness of the middle system, that they had chosen their side with the papacy, and that they could not either in con- science or in decency change again. The mass of the clergy conformed; so did the great body of the laity, including some of the lords who had voted in parliament against all Elizabeth's changes. In the early years of Elizabeth, though there were two discontented parties in opposite directions, and though some still practised the old rites in secret, there was no open separation either way. Elizabeth always professed that she did not force the con- science of any one, but that the English service was established by law, and that the law must be obeyed. And there doubtless were still many who were ready to conform without approving, just as they were ready to obey the law on any other subject, even though they might wish the law to be altered. It has even been said that, when Pope Pius TV. made overtures to the queen, he offered to admit the use of the English service-book on condition of his supremacy being acknowledged.! Such a compromise would have put the English Church in the same position as the bodies known in the East as United Greeks and United Armenians, who admit~~

~~the papal authority, but keep their own national usages. But the pontiffs before and after Pius, Paul IV. and Pius V., dealt with Elizabeth in another fashion. In their eyes, and in the eyes of all the extreme supporters of papal claims, she was not only schismatic and heretic, but an usurper of the English crown. . On this last point much of the history of this reign turns, both domestic and foreign. According to English~~

~~1 The evidence on which this statement is made will be found at length in Hook's Lives of the Archbishops, viii. 321. It is certainly not such evidence as would be needed to assert the fact with any positiveness ; but the tale is not very unlikely in 1560, though it would be quite out of place in 1570. The deliberate invention of the story, unless perhaps at a much later time, would really be more unlikely than the story itself.~~

~~law, nothing could be better than Elizabeth's parliamentary The suc- title, a title quite independent of the canonical legitimacy cession } of her birth. But, according to the papal theory, she was ae illegitimate, and, according to the hereditary theory, her peth and illegitimacy excluded her from the crown. On this show- Mary. ing, the lawful queen was Mary of Scotland, who, at the beginning of Elizabeth's reign, was the wife of the dauphin, soon afterwards Francis II., king of France. Francis and Mary took the titles of king and queen of England and Ireland ; and Mary, whether at the court of France, on the throne of Scotland, or in her prison in England, was the centre of all the bopes and all the conspiracies of the Roman party. This is not the place to go through her story, closely connected as it is throughout with English history. As regards the succession, it is clear that, by the will of Henry VIII., the claim of the house of Suffolk was Claims undoubted. But it was a kind of claim which needed a of the claimant of position and ability, like Richard of York in howe of former times, to assert it. The house of Suffolk, on the other hand, was under a cloud, through a series of low or doubtful marriages. Their claim therefore passed out of notice. The queen obstinately refused to name any successor, or to allow~~

~~any successor to be named; and all claims might be looked on as set aside by an act which made it treasonable to maintain any one to be the lawful successor except the queeu's own issue. In this state of things, men's minds naturally turned to the Scottish line, which had at least hereditary descent in its favour. After the death of Mary the religious objection no longer applied, ; and James, her Protestant son, succeeded on Elizabeth's Accession death, without the slightest opposition from any party. of James The house of Stewart however came in without any shadow a of parliamentary title, and directly in the teeth of the parliamentary title of the house of Suffolk, if the will of Henry VIII. is to be looked on as valid and unrepealed.~~

~~The quiet of the first eleven years of Elizabeth's reign was broken in 1569 by a rising in the North in favour of Rising the old religion. This was not a mere popular movement, in the like the western and eastern revolts of Edward's reign, North. Its leaders were the greatest nobles of northern England, the earls of Northumberland and Westmoreland. It was, in short, the Pilgrimage of Grace over again. The insur- rection was put down with a good deal of bloodshed, but not till mass had been again sung in Durham abbey. In the next year, 1570, the bull of excommunication and deposition pronounced by Pius V. changed all Elizabeth's relations at home and abroad. From this time the English The Roman Catholics, from a party dissatisfied with change, Roman become a distinct and a persecuted religious body. In the ae next year the Puritan movement for further change in the tans sepa- church took a more definite shape in the motions of Strick- rate, land in the House of Commons. About the same time the first separate Puritan congregations began to be formed. From this time the queen and her ecclesiastical system had to struggle with enemies on both sides, and to deal out persecution in different measures against both. A terrible engine for this purpose was the special creation of the reign of Elizabeth, the Court of High Commission. The queen, as The High Supreme Governor of the Church, appointed commissioners, Commis- clerical and lay, to exercise the somewhat undefined powers *"°™ of her office. Alongside of the Star-Chamber a kindred power arose, to bring men's souls and bodies into sub- mission. And meanwhile a few men who ventured on specially daring speculations, and whose tenets~~

~~were con- demned alike by Roman, Anglican, and Puritan orthodoxy, Persecu- were still sent to the flames. The Roman martyrs were tions. many; but in their case religious and political disputes were hopelessly mixed up. Conspirators agaiust the queen's life or crown could not be allowed to escape on any pretence of religious dyty. On the other hand, acts of simple religious~~

~~Execu- tion of Mary Stewart.~~

~~Change in rela- tions with France and Spain.~~

~~England the chief Protest- ant power,~~

~~Discov-~~

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~~worship were made criminal, though liable to the fate of treason and not of heresy. Plots of all kinds went on till the execution of Mary Stewart in 1587. After that time there was less material for plots; but the persecution went on on both sides. But by this time the foreign relations of the kingdom had become even more important than the condition of things at home.~~

~~At the death of Mary Tudor, England was at war with France and in closealliance with Spain. This state of things lasted during the early part of Elizabeth's reign. She helped the French Protestants ; but she concluded peace in 1564. During the rest of her reign the old enmity towards France died out. Elizabeth was at one time almost ready to accept a Catholic husband; at another time she again encouraged the French Protestants. But the accession of Henry of Navarre made France and England friends, Henry and Elizabeth had acommonenemy. As enmity against France died out, so friendship for Spain died out also, Philip, Elizabeth's first suitor, gradually changed into her most dangerous enemy, the assertor of the claims of Mary, and, after her death, her would- be avenger, and moreover the assertor of the claims of his own daughter as a remote descendant of John of Gaunt. The Armada, the dealings of England with the insurgents in the~~

~~Netherlands, the expedition to Cadiz, are all events which stand out on the surface of English history. England now stood out as the great Protestant. power of Europe, the maintainer of the Protestant cause everywhere. In short, the reign of Elizabeth finally gave to England and English- men their special religious character, as earlier times had given them their special political character. That special political character, overshadowed for a while by Tudor despotism, showed itself again towards the end of her reign. The England of the seventeenth century, free and Protest- ant, was now fully formed. The course of the century of which Elizabeth only saw the opening was to win back the freedom of England, to confirm the national Protes- tantism, and to take the first steps towards that religious toleration on both sides of which the age of Elizabeth had not dreamed.~~

~~But another feature in the character of England was~~

~~eries and added in the reign of Elizabeth. If England now took up~~

~~distant com- merce,~~

~~a new and definite position as an European power, the first steps were also taken towards making her more than an European power. In the days of Edward and Mary English commerce and maritime enterprise had a new range opened to them by the beginning of intercourse with Russia. That nation, great in earlier days on the Euxine, was now shut out from all southern and western outlets, and access to her one haven of Archangel could be had only by the Frozen Ocean and the White Sea. Under Elizabeth maritime enterprise, commercial and warlike, took a far wider range. American colonization did not as yet begin ; Indian do- minion was yet more distant ; but it was in these times that the first steps were taken towards both. The seamen of England now broke into the preserved maritime empire of Spain, and gave the land which was to give birth to Wash- ington a name in honour of their own virgin queen. The merchants of England, chartered as usual as a company, now first made their way to the great Indian continent, to behold, under the rule of Akbar, that religious toleration which Elizabeth denied to Catholic and Puritan. It is hard for us to conceive the effect which was made on men's minds by a change which was~~

~~practically an enlargement of the bounds of the physical world. If it is absurd to set up the great seamen of Elizabeth's day, Drake and Gilbert and Cavendish and Raleigh, as though they were faultless heroes, it 1s equally unfair to decry them as mere pirates. They were the natural creation of a new state of things. It was not theoretically justifiable, but it was in no way wonderful, if men of all nations deemed that, in new and barbarous~~

~~lands and seas, they were set free from the obligations of public law which bound them in their European homes. But one stain, deeper and more lasting, dates from Elizabeth's days. At home personal slavery had long been forgotten, and the last traces of villainage can now be dis- cerned only by the most prying eyes. The distant enterprises of England now brought back in a new shape the shame of our earliest days. The kidnapping and selling of negroes now became a chief branch of English commerce. And it must not be forgotten that, till the humane decisions of the last century, the negro, like the British captive or the English criminal of ancient times, was as much a slave on the soil of England as he was on the soil of America,~~

~~The completed national character of England dates from the days of the Tudors, and mainly from the reign of Elizabeth. From this time, in dealing with the actors in English history, we seem, more thoroughly than in any earlier time, to be dealing with men who are in all things our own fellows. One main cause of this is that the language of the sixteenth century is the earliest form of English which an ordinary modern reader can understand without an effort. The handwriting of the sixteeenth ceutury is harder to read than the handwriting of any age before or since. The spelling of the sixteenth century is more chaotic and unreasonable than the spelling of any age before or since. But the language itself, when taken out of its uncouth clothing, is in the main intelligible, even to those who have not made language a special study. The philologer sees that the language of the nineteenth century is the same, by unbroken personal unity, as the language of the fifth~~

~~**century. He sees that the changes which dis- tinguish the language of the nineteenth century from the language of the fifth century were fully accomplished by the fourteenth. But all this is for the philologer. The ordi- nary reader, who reads merely for the matter or the style of his book, cannot understand the language of the fifth**~~

~~**century at all; he can understand the language of the four-**~~

~~**teenth century only with an effort. But the language of the sixteenth century is clear to every one who reads with decent attention. It is near enough to the speech of our own times to be understood ; it is far enough removed from the speech of our own times to have an archaic flavour, venerable or quaint, according to the matter in hand and its treatment. The literature of the sixteenth century gives us the earliest English writings in prose and verse which we read simply as literature. Spenser and Shakespere, Hooker and Raleigh, stand to usin a different relation from Cadmon, or even from Chaucer. And, greater than all, the sixteenth century has given us, in our national prayer- book, in our national translation of the Bible,! models of the English tongue which, as long as they survive, will survive to rebuke its corrupters. For them we have to thank the reigns of Henry and of Edward. Henry first gave his people the Scriptures in their own tongue, and then restricted their use. But his gift went for more than his restriction.**~~

~~**The slave trade,**~~

~~**Lan- guage of the six-**~~

~~**Eliza- bethan litera- ture.**~~

~~**From that day to this, the English Bible The**~~

~~**has been the only literary, as well as the only religious, English**~~

~~**food of millions of Englishmen. English Bible, as the medieval scholar had lived in the Latin Bible. That two great works of sixteenth century English have been familiar to us ever since, while no earlier writing has been commonly known in the like sort, is**~~

~~1 The authorized version, as it stands, is, as every one knows, a work of the seventeenth century, not of the sixteenth. But it was the work of men whose minds had been formed in the sixteenth century, and the translation of the sixteenth century was taken as its groundwork, Whenever it departs from that model, however much it may gain as a more accurate representation of the original, it loses as a piece of English and English rhythm. Compare the Psalms in the translation of Henry's day and in that of the days of James.~~

~~The Puritan lived in the Bile~~

~~which had been suppressed under Edward; the foundation Founda- of colleges in the universities went on under both sisters ; a of and this was a special time for the erection of schools and Ua; 0s. hospitals. Even Leicester has left a memorial of this kind pitals,~~

~~doubtless one great reason why the English of the sixteenth century is the earliest English which is commonly intel- ligible. But this is not the only reason. The reign of Elizabeth is in itself the most marked epoch in English~~

~~Hterature. The stirring of men's minds which led to the great political and religious events of the age led also to the sudden burst of a whole literature in verse and prose. In the sixteenth century the English drama began, modern English theology began, the writing of history in the modern sense aud in the English tongue began. And with the beginning of a school of new writers came a time of more diligent care towards our ancient writers. The fanatic religionists and greedy spoilers of Henry and Edward's days liad destroyed ancient records and chronicles by wholesale. The hand of Elizabeth's first primate, the re- nowned Matthew Parker, was stretched out to save instead of to destroy, to publish instead of to tear in pieces. To his pious care more than to that of any other man, we owe it that the ancient history of England can be read and written.~~

~~And, as it was with language, so it was with everything else which goes to make up thie national life. Its modern form is now completed. We feel that the men of Hlizabeth's day, her statesmen, her warriors, her poets, and her divines, are men who come near to ourselves in a way which the men of earlier times cannot do. A gap of more than a generation, of more than two generations, seems to part Wolsey from Burghley. The main features of English social life had really been fixed in the fifteenth century ; they do not thoroughly come home to us till the sixteenth.~~

~~courtiers, made theniselves great fortunes at the expense of the Church. But all was not spoliation in this age. Mary and Elizabeth restored some of the collegiate churches~~

~~behind him. And it may pass for a kind of charitable foundation on the part of the nation itself, when by a statute of Elizabeth a public provision was first made for the relief of the poor.~~

~~England and the English people are thus thoroughly formed in the shape which they have kept to thisday. Their political constitution has lived through its time of trial, ready to come forth again in its full strength. The religious character of England is fixed ; her European posi- tion is fixed also. She has become wholly insular, ready to play in European politics the special part of an insular power. At home Wales is incorporated ; Ireland, now a kingdom, is brought more nearly than ever under the rule of its queen. The time has now come for a nearer and a friendly union with the other kingdom which hitherto has divided the isle of Britain with England. The lack of direct descendants of Henry, the ill luck of the descendants of his sister Mary, carried the English crown to the de- scendants of Margaret, and called the king of Scots to the English throne. The union of the crowns led, as a necessary though not an immediate effect, to the union of kingdoms, to the time when England and Scotland, political names, so long rival and hostile names, were merged in the common geographical name of Great Britain. (E. A. F.)~~

~~England." And the same style was freely used by his successors. But the kingdom of Great Britain did not really begin till Anne's Act of Union.~~

~~The more accurate, though rarer, style of the Stewarts is “ King of England, Scotland, France, and Ireland.”~~

~~Sum- mary.~~

~~Eliza- We see this in its outward form in the houses of The defeat of the Spanish Armada in 1588 had been Acces- bethan Elizabeth’s reign. They are the earliest houses, great or | the final victory gained on behalf of the independence of sion of house. small, in which a modern Englishman of any class can live | the English church and state. The fifteen years which J#mes I. with any degree of modern comfort. In point of style, they | followed had been years of successful war; but they had have fallen away from the models of the early part of the | been also years during which the nation had been pre- century, The architecture of this age is primarily domestic. | paring itself to conform its institutions to the new circum- For ecclesiastical art there was little room in a time | stances in which it found itself in consequence of the great when more churches were pulled down than were built. | victory. WheuJames arrived from Scotland to occupy the Repairs were commonly done in a rough and clumsy fashion. | throne of Elizabeth he found a general desire for change. Still there are a few ecclesiastical buildings, ranging from.| Especially there was a feeling that there might be some Edward VI. to James I., such as the tower of Probus in Corn- | relaxation in the ecclesiastical arrangements. Roman wall and the choir of Wadham College chapel, in which the | Catholics and Puritans alike wished for a modification of older style is still faithfully carried on. The revived Italian | the laws which bore hardly on them. James at first James I. style was brought in by Protector Somerset; but, as | relaxed the peualties under which the Roman Catholics 274 the applied to whole buildings, the fashion did not take; the | suffered, then he grew frightened by the increase of their “*tholics. ‘details became a strange mixture of corrupt English and | numbers and reimposed the penalties. The Gunpowder corrupt Italian ; but the outlines are purely English. The | Plot (1605) was the result, followed by a sharper persecu- Elizabethan houses, with their endless shifting of gables, | tion than ever. are often actually more picturesque in outline than the The Puritans were invited to a conference with the king James I. houses of~~

~~the beginning of the century. They are more | at Hampton Court (1604). They no longer asked, as many and the distinctly houses ; the features handed down by tradition | of them had asked in the beginning of Elizabeth's reign, to Putitans. from the castle no longer linger, even as survivals. And | substitute the Presbyterian discipline for the Episcopal they are of all sizes, palaces, manor-houses, burgher dwell- | government. All they demanded was to be allowed permis- ings in towns, solitary farm-houses, cottages in the village | sion whilst remaining as ministers in the church to omit the street. And they are of all materials, stone, brick, or | usage of certain ceremonies to which they objected. It timber, according to the district. They are the houses of | was the opinion of Bacon that it would be wise to grant an age when law was fully established, and when the | their request. Jamcs thought otherwise, and attempted to different ranks of society, though the distinctions between | carry out the Elizabethan conformity more strictly than it them were far more sharply drawn, were essentially the | had been carried out in his predecessor's reign. same as they are now. In 1604 the Commons agreed with Bacon. They James I. The objects of the bounty of founders were now | dcclared that they were no Puritans themselves, but that, and the necessarily changed; but their bounty was by no means | in such a dearth of able ministers, it was not well to lose we worn out. Mary restored several monasteries, which were | the services of any one who was capable of preaching the again suppressed by Elizabeth. Mary also restored a great | gospel. By his refusal to entertain their views James Phnder part of the alienated bishops' lands. The plunder of the ofbishop- bishops also went on all through Elizabeth's reign, and 1 James I. was very fond of calling himself " King of Great Britain," rics, Burghley, Hatton, and Raleigh, and other statesmen and | @ geographical description which reminds one of Cnut's " King of all~~

~~placed himself in opposition to the Commons in a matter which touched their deeper feelings. As a necessary con- sequence every dispute on questions of smaller weight assumed an exaggerated importance. The king had re- ceived a scanty revenue with his crown,~~

and he spent freely what little he had. As the Commons offered grudging sup- plies, the necessity under which he was of filling up the annual deficit led him to an action by which a grave con- stitutional question was raised. Question From the time of Richard II. to the reign of Mary no of theim- attempt had been made to raise duties on exports and im- Pos" __ ports without consent of parliament. But Mary had, under a specious pretext, recommenced to a slight extent the evil practice, and Elizabeth had gone a little further in the same direction. In 1606 a merchant named Bate resisted the payment of an imposition —as duties levied by the sole authority of the crown were then called. The case was argued in the Court of Exchequer, and was there decided in favour of the crown. Shortly afterwards new impositions were set to the amount of £70,000 a year. When parlia- ment met in 1610 the whole subject was discussed, and it was conclusively shown that, if the barons of the exchequer had been right in any sense, it was only in that narrow technical seuse which is of no value at all. A compromise attempted broke down, and the difficulty was left to plague the next generation. The king was always able to assert that the judges were on his side, and it was as yet an acknowledged principle of the constitution that parliament could not change the law without the express consent of the crown, even if, which was not the case in this matter, the Lords had sided with the Commons. Janies's attempt to obtain further supplies from the Commons by opening a bargain for the surrender of some of his old feudal preroga- tives, such as wardship and marriage, which had no longer any real meaning except as a means of obtaining money in Breach MN oppressive way, broke down, and early in 1611 James between dissolved his first parliament in anger. A second parlia- being ment, summoned in 1614, met with the same fate after a i ® session of a few weeks. The dissolution of this second parliament was followed by a short imprisonment of some of the more active mem- bers, and by a demand made through England for a benevolence to make up the deficiency which parliament had neglected to meet. The court represented that, as no compulsion was used, there was nothing illegal in this pro- ceeding. But as the names of those who refused to pay were taken down, it cannot be said that there was no indirect pressure. The most important result of the breach with the parlia- ment of 1614, however, was the resolution taken by James to seek refuge from his

financial aud other troubles in a close alliance with the king of Spain. His own accession had done much to improve the position of England in its relation with the Continental powers. Scotland was no louger available as a possible enemy to England, and though Attempt- an attempt to bind the union between the two nations by ed union freedom of commercial intercourse had been wrecked upon

isa the jealousy of the English Commons (1607), a legal decision had granted the status of national subjects to all persons born in Scotland after the king's accession in England. Ireland, too, had been thoroughly overpowered at the end of Elizabeth's reign, and the flight of the earls of ——— Tyrone and Tyrconnnel in 1607 had teen followed by the tion of Settlement of English and Scottish colonists in Ulster, a Ulster, measure which, in the way in which it was undertaken,

sowed the seeds of future evils, but undoubtedly conduced to increase the immediate strength of the English Govern- ment in Ireland.

Without fear of danger at home, therefore, James, who as king of Scotland had taken no part in Elizabeth's quarrel

ENGLAND

[HISTORY.

with Philip I1., not only suspended hostilities immediately The on his accession, and signed a peace in the following year, Peace but looked favourably on the project of a Spanish alliance, bi in order that the chief Protestant and the chief Catholic "P*™ powers might join together to impose peace on Europe, in

the place of those hideous religious wars by which the last century had been disfigured. In 1611 circumstances had disgusted him with his new ally, but in 1614 he courted

him again, not only on grounds of general policy, but because he hoped that the large portion which would accom-

~~pany the hand of an infanta would go far to fill the empty treasury.~~

~~In this way the Spanish alliance, unpopular in itself, was The formed to liberate the king from the shackles imposed on Spanish him by the English constitution. Its unpopularity, great len from the beginning, became greater when Raleigh's execu- tion (1618) caused the Government to appear before the world as truckling to Spain. The obloquy under which James laboured increased when the Thirty Years' War broke The out (1618), and when his daughter Elizabeth, whose Tuirty husband, the Elector Palatine, was the unhappy claimant to we the Bohemian crown (1619), stood forth as tle lovely symbol of tlie deserted Protestantism of Europe. Yet it was not entirely in pity for German Protestants that the heart of Englishmen beat. Men felt that their own security was at stake. The prospect of a Spanish infanta as the bride of the future king of England filled them with suspicious terrors. In Elizabeth's time the danger, if not entirely external, did not come from the Government itself. Now the favour shown to the Roman Catholics by the king opened up a source of mischief which was to some extent real, if it was toa still greater extent imaginary. Whether the danger were real or imaginary, the consequence of the distrust resulting from the suspicion was the reawakening of the slumbering demand for fresh persecution of the Roman Catholics, a demand which made a complete recon- ciliation between the crown and the Lower House a matter of the greatest difficulty.~~

~~In 1621 the third parliament of James was summoned The third to provide money for the war in defence of his son-in-law's ier inheritance in the Palatinate, which he now proposed Tames to undertake. But it soon appeared that he was not prepared immediately to come to blows, and the Commons, voting a small sum as a token of their loyalty, passed to other matters.~~

~~Indolent in his temper, James had been in the habit of leaving his patronage in the hands of a confidential favourite, and that position was now filled by George Villiers, marquis and afterwards duke of Buckingham.~~

~~The natural consequence was that men who paid court to~~

~~him were promoted, and those who kept at a distance from~~

~~him had no notice taken of their merits. Further, a Monopo- system of granting mouopolies and other privileges had lies at- again sprung up. Many of these grants embodied some tacleay scheme which was intended to serve the interests of the public, and many actions which appear startling to us were covered by the extreme protectionist theories then in vogue.~~

~~But abuses of every kind had clustered round them, and~~

~~in many cases the profits had gone into the pockets of hangers-on of the court, whilst officials had given their assistance to the grantors even beyond their legal powers. James was driven by the outcry raised to abandon these monopolies, and an Act of Parliament in 1624 placed the future grant of protections to new inventions under the safeguard of the judges.~~

~~The attack on the monopolies was followed by charges Fall of brought by tlle Commons before the Lords against persons Bacon. implicated in carrying them into execution, and sub- sequently against Lord Chancellor Bacon as guilty of corruption. The sentence passed by the Lords vindicated~~

~~Dissolu- tion of parlia- ment,~~

~~The jour- _ ney to Madrid.~~

~~The French alliance.~~

~~The first years of CharlesI,~~

~~THE FIRST TWO STUARTS. |~~

~~the right of parliament to punish officials who had enjoyed the favour of the crown, which had fallen into disuse since the accession of the House of York. There was no open contest between parliament and king in this matter. But the initiative of demanding justice had passed~~

~~from the crown to the Commons. It is impossible to overestimate the effect of these proceedings on the position of parlia- ment. The crown could never again be regarded as the sun of the governmental system.~~

~~When the Commons met after the summer adjournment a new constitutional question was raised. The king was at last determined to find troops for the defence of the Palatinate, and asked the Commons for money to pay them. They in turn petitioned the crown to akandon the Spanish alliance, which they regarded as the source of all the mischief. James told them that they had no right to discuss business on which he had not asked their opinion. They declared that they were privileged to discuss any matter relating to the commonwealth which they chose to take in hand, and embodied their opinion in a protest, which they entered on their journals. The king tore the protest out of the book, and dissolved parliament.~~

~~Then followed a fresh call for a benevolence, this time more sparingly answered than before. A year of fruitless diplomacy failed to save the Palatinate from total loss. The ill-considered journey to Madrid, in which Prince Charles, accompanied by Buckingham, hoped to wring from the Spanish statesmen a promise to restore the Palatinate in compliment for his marriage with the infanta, ended also in total failure. In the autumn of 1623 Charles re- turned to England without a wife, and without hope of regaining the Palatinate with Spanish aid.~~

~~He came back resolved to take vengeance upon Spain. The parliament elected in 1624 was ready to second him, It voted some supplies on the understanding that, when the king had matured his plans for carrying on the war, it should come together in the autumn to vote the necessary subsidies. It never met again. Charles had promised that, if he married a Roman Catholic lady, he would grant no toleration to the English Catholics in consideration of the marriage. In the autumn he had engaged himself to marry Henrietta Maria, the sister of the king of France, and had bound himself to grant the very conditions which he had declared to the Commons that he never would concede. Hence it was that he did not venture to recommend his father to summon parliament till the marriage was over. But though there was but little~~

~~money to dispose of, he and Buckingham, who, now that James was sick and infirm, were the real leaders of the Government, could not endure to abstain from the prosecution of the, war. Early in 1625 an expedition, under Count Mansfeld, was sent to Holland, that it might ultimately cut its way to the Palatinate. Left without pay and without supplies, the men perished by thousands, and when James died in March, the new king had to meet his first parliament burthened by a broken promise and a disastrous failure.~~

~~When parliament met (1625) the Commons at first con- tented themselves with voting a sum of money far too small to carry on the extensive military and naval operation in which Charles had embarked. When the king explained his necessities, they intimated that they had no confidence in Buckingham, and asked that, before they granted further supply, the king would name counsellors whom they could trust, to advise him on its employment. Charles at once dissolved parliament. He knew that the demand for ministerial responsibility would in the end involve his own responsibility, and, believing as he did that Buckingham's arrangements had been merely unlucky, he declined to sacrifice the minister whom he trusted.~~

~~Charles and Buckingham did their best to win back~~

~~popularity by strenuous exertion. They attempted to found a great Protestant alliance on the Continent, and they sent a great expedition to Cadiz. The Protestant alliance and the expedition to Cadiz ended in equal failure. The second parliament of the reign (1626) impeached Buckingham for crimes against the state. As Charles would not dismiss him simply because the Commons were dissatisfied with him as a minister, they fell back on charging him with criminal designs. Once more Charles dissolved parliament to save Buckingham. Then came fresh enterprises and fresh failures. A fleet under Lord Willoughby was almost ruined by a storm. The king of Denmark, trusting to supplies from England which never came, was defeated at Lutter. A new war, in~~

~~addition to the Spanish war, broke out with France. A great expedition to Rhé, under Buckingham's command (1627), intended to succour the Huguenots of Rochelle against their sovereign, ended in disaster. In order to enable himself to meet expenditure on so vast a svale, Charles had levied a forced loan from his subjects. Men of high rank in society who refused to pay were imprisoned. Soldiers were billeted by force in pri- vate houses, and military officers executed martial law on civilians. When the imprisoned gentlemen appealed to the King's Bench for a writ of habeas corpus, it appeared that no cause of committal had been assigned, and the judges therefore refused to liberate them. Still Charles believed it possible to carry on the war, and especially to send relief to Rochelle, now strictly blockaded by the French Govern- ment. In order to find the means for this object he summoned his third parliament (1628).~~

~~complained. Charles was willing to surrender his claim to billet soldiers by force, to order the execution of martial law in time of peace, and to exact forced loans, bene- volences, or any kind of taxation, without consent of parliament; but he protested against the demand that he should surrender the right to imprison without showing cause. It was argued on his behalf that in case of a great conspiracy, it would be necessary to trust the crown with unusual powers to enable it to preserve the peace. The Commous, who knew that the crown had used the powers which it claimed, not against conspirators, but against the commonwealth itself, refused to listen to the argument, and insisted on the acceptance of the whole Petition of Right, in which they demanded redress for all their grievances. The king at last gave his consent to it, as he could obtain money in no other way. In after times, when any real danger occurred which needed a suspension of the ordinary safeguards of liberty, a remedy was found in the suspension of the law by Act of Parliament ; such a remedy, however, only became possible when king and parliament were on good terms of agreement with one another.~~

~~That time was as yet far distant.~~

~~murder soon after the prorogation removed one subject of dispute. But when they met again (1629) they had two quarrels left over from the~~

~~preceding session. About a third part of the king's revenue was derived from customs duties, which had for many generations been granted by parliament to each sovereign for life. Charles held that this grant was little more than a matter of form, whilst the Commons held that it was a matter of right. But for the other dispute the difficulty would probably have been got over. The strong Protestantism of Elizabeth's reign had assumed a distinctly Calvinistic form, and the country gentlemen who formed the majority of the House of Commons were resolutely determined that no other theology than the Calvinistic should be taught in England. In the last few years a reaction against it had arisen, especially in~~

~~VIII. — 44~~

~~The Commons at The Peti- once proceeded to draw a line which should cut off the tion of possibility of a repetition of the injuries of which they Right.~~

~~The House of Com- Disputes mons brought fresh charges against Buckingham, whose ° Teli-~~

~~Eleven years without a parlia- ment.~~

~~Ship- money.~~

~~the universities, and those who adopted an unpopular creed, and who at the same time showed tendencies to a more ceremonial form of worship, naturally fell back on the sup- port of the crown. Charles, who might reasonably have exerted himself to secure a fair liberty for all opinions, promoted these unpopular divines to bishoprics and livings, and the divines in turn exalted the royal prerogative above parliamentary rights. He now proposed that both sides should keep silence on the points in dispute. The Commons rejected his scheme, and prepared to call in question the most obnoxious of the clergy. In this irritated temper they took up the question of tonnage and poundage, and instead of confining themselves to the great public ques- tion, they~~

~~called to the bar some custom-house officers who happened to have seized the goods of one of their members. Charles declared that the seizure had taken place by his orders. When they refused to accept the excuse, he dis- solved parliament, but not before a tumult took place in the House, and the speaker was forcibly held down in his chuir whilst resolutions hostile to the Government were put to the vote.~~

~~For eleven years no parliament metagain. The extreme action of the Lower House was not supported by the people, and the king had the opportunity, if he chose to use it, of putting himself right with the nation after no long delay. But he never understood that power only attends sympathetic leadership. He contented himself with putting himself technically in the right, and with resting his case on the favourable decisions of the judges. Under any circumstances, neither the training nor the position of judges is such as to make them fit to be the final arbiters of political disputes. They are accustomed to declare what the law is, not what it ought to be. These judges, more- over, were not in the position to be impartial. They had been selected by the king, and were liable to be deprived of their office when he saw fit. In the course of Charles's reign two chief justices and one chief baron were dismissed or suspended. Besides the ordinary judges there were the extraordinary tribunals, the court of High Commission nominated by the crown to punish ecclesiastical offenders, and the court of Star Chamber, composed of the privy councillors and the chief justices, and therefore also nominated by the crown, to inflict fine, imprisonment, and even corporal mutilation on lay offenders. Those who rose up in any way against the established order were sharply punished.~~

~~The harsh treatment of individuals only calls forth re- sistance when constitutional morality has sunk deeply into the popular mind. The ignoring of the feelings and pre- judices of large classes has a deeper effect. Charles's foreign policy, and his pretentious claim to the sovereignty of the British seas, demanded the support of a fleet, which might indeed be turned to good purpose in offering a counterpoise to'the growing navies of France and Holland. 'The in- creasing estrangement between him and the nation made~~

~~_ him averse to the natural remedy of a parliament, and he~~

~~reverted to the absolute practices of the Middle Ages, in order that he might strain them far beyond the warrant of precedent to levy a tax under the name of ship-money, first on the port towns and then on the whole of England. Payment was resisted by John Hampden, a Buckingham- shire squire ; but the judges declared that the king was in the right (1638). Yet the arguments used by Hampden's lawyers sunk deeply into the popular mind, and almost every man in England who was called on to pay the tax _ upon the king as a wrong-doer under the forms of aw.~~

~~Any Government which, from want of sympathy with the feelings of the masses, offends the sense of right by the levy of taxes for which it does not venture to ask their~~

~~consent, is also likely to treat with unfeeling harshness the Land's religion of thinking men. So it was in the reign of Charles, 8°Y@n- He gave authority to William Laud, since 1633 archbishop ca os of Canterbury, to carry out his design of reducing the Church, English Church to complete uniformity of ceremonial. The practice in most churches differed from the laws under which public worship was intended to be guided. Land. did his best to carry out the letter of the law, under the belief that uniformity of worship would produce unity of spirit, and in some cases he explained away the law in the direction in which he wished it to be bent. The com- munion table was removed from the centre of the church to the east end, was spoken of as an altar, and was fenced in with rails, at which communicants were expected to kneel. At the same time offence was given to the Puritans by an order that every clergyman should read the Declaration of Sports, in which the king directed that no hindrance should be thrown in the way of those who wished to dance or shoot at the butts on Sunday afternoon. Many of the clergy were suspended or deprived, many emigrated to Holland or New England, and of those who remained a large part bore the yoke with feelings of ill- coucealed dissatisfaction. Suspicion was easily aroused that a deep plot existed, of which Laud was believed to be the centre, for carrying the nation over to the Church of Rome, a~~

~~suspicion which seemed to be converted into a certainty when it was known that Panzani and Con, two agents of the pope, had access to Charles, and that in 1637 there was a sudden accession to the number of converts to the Papal Church amongst the lords and ladies of the court. The rising feeling may be traced in the poems of Milton. LI' Allegro and Il Penseroso—probably written in 1632— are full of thoughts which denote him to have been at that time of no special school. The Comus, written in 1634, is stamped with the impress of the Puritan ideal without the Puritan asperity ; whilst the Zycidas, in 1637, contains lines directed aggressively against the system of Laud as serving merely as a stepping-stone to Rome.~~

~~In the summer of 1638 Charles had long ceased to reigu in the affections of his subjects. But their traditionary loyalty had not yet failed, and if he had not called on them for fresh exertions, it is possible that the coming revolution would have been long delayed. Men were ready to shout applause in honour of Puritan martyrs like Prynne, Burton, and Bastwick, whose ears were cut off in 1637, or in honour of the lawyers who argued such a case as that of Hampden. But no signs of active resistance had yet appeared. Unluckily for Charles, he was likely to stand in need of the active co-operation of Englishmen. He had attempted to force a new Prayer-Book upon the Scottish nation. A riot at Edinburgh in 1637 quickly led to national resistance, and when in November 1638 the General Assembly at Glasgow set Charles's orders at defiance, he was compelled to choose between tame submission and immediate war. In 1639 he gathered an English force, and marched towards the border. But English laymen, though asked to supply the money which he needed for the support of his army, deliberately kept it in their pockets, and the contributions of the clergy and of official persons were not sufficient to enable him to keep his troops long in the field. The king therefore thought it best to agree to terms of pacification. _Mis- The Scot understandings broke out as to the interpretation of the a ae treaty, and Charles having discovered that the Scotch were — intriguing with France, fancied that England, in hatred of its ancient foe, would now be ready to rally to his standard. After an interval of eleven years, in April 1640 he once more called a parliament.~~

~~The Short Parliament, as it was called, demanded an redress of grievances, the abandonment of the claim to levy payia. ship-money, and a complete change in the ecclesiastical ment.~~

~~THE PURITAN REVOLUTION. |~~

~~system. Charles thought that it would not be worth while even to conquer Scotland on such terms, and dissolved parliament. A fresh war with Scotland followed. Went- worth, now earl of Strafford, became the leading adviser of the king. With all the energy of his disposition he threw himself into Charles's plans, and left no stone unturned to furnish the new expedition with supplies and money. But no skilfulness of a commander can avail when soldiers are TheScot- determined not to fight. The Scotch crossed the Tweed, and~~

~~tish in- Charles's army was well pleased to fly before them. Ina vasion. short time the whole of Northumberland and Durham were in the hands of the invaders. Charles was obliged to leave these two counties in their hands as a pledge for the payment of their expenses; and he was also obliged to summon parliament to grant him the supplies which he needed for that object. Meeting | When the Long Parliament met in November 1640, they of Long were in a position in which no parliament had been before. a Though nominally the Houses did not command a single ' soldier, they had in reality the whole Scottish army at their back. By refusing supplies they would put it out of the king's power to fulfil his engagements to that army, and it would immediately pursue its onward march to claim its rights. : Attain- Hence there was scarcely anything which the king could der of venture to deny the Commons. Under Pym's leadership, bo they began by asking the head of Strafford. Nominally he~~

~~was accused of a number of acts of oppression in the north of England and in Ireland. His real offence lay in his attempt to make the king absolute, and in the design with which he was credited of intending to bring over an Irish army to crush the liberties of England. If he had been a man of moderate abilities he might have escaped. But the Commons feared his commanding genius too much to let him go free. They began with an impeachment. Difficulties arose, and the~~

~~impeachment was turned into a bill of attainder. The king abandoned his minister, and the execution of Strafford left Charles without a single man of supreme ability on his side. Then came rapidly a suc- cession of blows at the supports by which the Tudor~~

~~Over- monarchy had been upheld. The courts of Star Chamber~~

~~throw of and High Commission and the Council of the North were~~

~~pe abolished. The raising of tonnage and poundage without~~

~~ment. @ parliamentary grant was declared illegal. The judges who had given obnoxious decisions were called to answer for their fault, and were taught that they were responsible to the House of Commons as well as the king. Finally, a bill was passed providing that the existing House should~~

~~,, not be dissolved without its own consent.~~

~~Division Tt was clearly a revolutionary position which the House~~

~~a had d. But it d b it~~

~~House 24 assumed. But it was assumed because it was~~

~~into impossible to expect that a king who had ruled as Charles~~

~~parties. had ruled could take up a new position as the exponent of the~~

~~feelings which were represented in the Commons. As long as Charles lived he could not be otherwise than an object of suspicion ; and yet if he were dethroned there was no one available to fill his place. There arose therefore two parties in the House, one ready to trust the king, the other disinclined to put any confidence in him at all. The division was the sharper because it cvincided with a difference in matters of religion. Scarcely any one wished to see the Laudian ceremonies upheld. But the members who favoured the king, and who formed a considerable minority, wished to see a certain liberty of religious thought, together with a return undera modified Episcopacy to the~~

~~forms of worship which prevailed before Laud had taken the church in hand. The other side, which had the majority by a few votes, wished to see the Puritan creed prevail in all its strictness, and were favourable to the establishment of the Presbyterian discipline. The king,~~

~~by his unwise action, tarew power into the hands of his opponents. He listened with tolerable calmness to their Grand Remonstrance, but his attempt to seize the five members whom he accused of high treason made a good understanding impossible. The Scottish army had been paid off some months before, and civil war was the only means of deciding the quarrel.~~

~~At first the fortune of war wavered. Edgehill was a The civil drawn battle (1642), and the campaign of 1643, though it war. was on the whole favourable to the king, gave no decisive results, Before the year was at an end parliament invited anew Scottish army to intervene in England. As an in- ducement, the Solemn League and Covenant was signed by all Parliamentarian Englishmen, the terms of which were interpreted by the Scotch to bind England to submit to Presbyterianism, though the most important clauses had been purposely left vague, so as to afford a loophole of escape.~~

~~The battle of Marston Moor, with the defeat of the Presby- Royalist forces in the north, was the result. But the battle terians did not improve the position of the Scots. They had been salt repulsed, and the victory was justly ascribed to the Baglish OO contingent. The composition of that contingent was such as to have a special political significance. It leader was Oliver Cromwell. It was formed by men who were fierce Puritan enthusiasts, and who for the very reason that the intensity of their religion separated them from the mass of their countrymen, had learnt to uphold with all the energy of zeal the doctrine that neither church nor state had a right to interfere with the forms of worship which each congregation might select for itself. They were commonly~~

~~known as Independents, from the communities which had~~

~~sprung up under the name of Separatists in the reign of Elizabeth, and which maintained the principle of congrega- tional independence; though many other sects found a place in their ranks.~~

~~The principle advocated by the army, and opposed by Compre-~~

~~the Scotch and the majority of the House of Commons, hension was liberty of sectarian association. Some years earlier, "ete under the dominion of Laud, another principle had been ; proclaimed by Chillingworth and Hales, that of liberty of thought to be maintained within the unity of the church. Both these movements conduced to the ultimate establish- ment of toleration,—the one by permitting those to worship as they saw fit whose faith was too definite to enable them to be content with outward forms by which their particular belief was not clearly expressed, the other by allowing those whose charity was greater than their polemical zeal to find a common ground to worship side by side with others whose beliefs did not entirely coincide with their own.~~

~~For the present the Independents were to have their way. Over- The Presbyterian leaders, Essex and Manchester, were throw of not successful leaders. The army was remodelled after '2° *ins- Cromwell's pattern, and the king was finally crushed at Naseby (1645). The next year (1646) he surrendered to the Scots. Then followed two years of fruitless negotiation, in which after the Scotch abandoned the king to the English parliament, the army took him out of the hands of the parliament, whilst each in turn tried to find some basis of arrangement on which he might appear to sit on the throne without again misdirecting the government. Such a basis The could not be found, and when Charles stirred up a fresh second civil war and a Scottish invasion (1648), the leaders of the civil war. army vowed that, if victory was theirs, they would bring him to justice. To do this it was necessary to drive out a large number of the members of the House of Commons, by what was known as Pride's Purge, and to obtain from the mutilated Commons the dismissal of the House of Lords, and the establishment of~~

~~a high court of justice, before which the king was brought to trial, and sentenced~~

~~Execu- tion of the king. The Com- mon- wealth.~~

~~The Pro- tectorate,~~

~~to death. He was beheaded ona scaffold outside the windows of Whitehall (1649).~~

~~The government set up was a government by the com- mittees of a council of state nominally supporting themselves on the House of Commons, though the members who still retained their places were so few that the council of state was sufficiently numerous to form a majority in the House. During eleven years the nation passed through many vicissitudes in its forms of government. These forms take. no place in the gradual development of English institutions, and have never been referred to as affording precedents to be followed. To the student of political science, however, they have a special interest of their own, as they show that when men had shaken themselves loose from the chain of habit and prejudice, and had set them- selves to baild up a political shelter under which to dwell, they were irresistibly attracted by that which was permanent in the old constitutional forins of which the special develop- ment had of late years been so disastrous. After Cromwell had suppressed resistance in Ireland (1649), had conquered Scotland (1650), and had overthrown the son of the late king, the future Charles II., at Worcester (1651), the value of government by an assembly was tested and found wanting. After Cromwell had expelled the remains of the Long Parliament (1653), and had set up another assembly of nominated members, that second experiment was found equally wanting. It was necessary to have recourse to one head of the executive government, controlling and directing its actions. Cromwell occupied this position as Lord Pro- tector. He did all that it was in his power to do to prevent his authority from degenerating intotyranny. He summoned two parliaments, of only one House, and with the consent of the second parliament he erected a second House, so that he might have~~

~~some means of checking the Lower House without constantly coming into personal collision with its authority. As far as form went, the constitution in 1658, so far as it differed from the Stuart constitution, differed for the better. But it suffered from one fatal defect. It was based on the rule of the sword. The only substitute for traditional authority is the clearly expressed expression of the national will, and it is impossible to doubt that if the national will had been expressed it would have swept away Cromwell and all his system. The majority of the upper and middle classes, which had united together against Laud, was now re-united against Cromwell. The Puritans themselves were but a minority, and of that minority con- siderable numbers disliked the free liberty accorded to the sects. Whilst the worship of the Church of England was proscribed, every illiterate or frenzied enthusiast was allowed to harangue at his pleasure. Those who cared little for religion felt insulted when they saw a Goverument with which they had no sympathy ruling by means of an army which they dreaded and detested, Cromwell did his best to avert a social revolution, and to direct the energies of his supporters into the channels of merely political change. But he could not prevent, and it cannot be said that he wished to prevent, the rise of men of ability from positions of social inferiority. The nation had striven against the arbitrary government of the king; but it was not prepared to shake off the predominance of that widely spreading aristocracy which, under the name of country gentlemen, had rooted itself too deeply to be easily passed by. Crora- well's rule was covered with military glory, and there can be no doubt that he honestly applied himself to solve domestic difficulties as well. But he reaped the reward of those who strive for something better than the genera- tion in which they live is able to appreciate. His own faults and errors were remembered against him. He tried in vain to establish constitutional government and religious toleration. When he died (1658) there remained branded~~

~~ENGLAND~~

~~[utsTory,~~

~~on the national mind two strong impressions which it took more than a century to obliterate—the dread of the domination of a standing army, and abhorrence of the very name of religious zeal.~~

~~The eighteen months which followed deepened the im- pression thus formed. The army had appeared a hard master when it lent its strength toa wise and sagacious rule. It was worse when it undertook to rule in its own name, to set up and pull down parliaments and Govern- ments. The only choice left to the nation seemed to be one between military tyranny and military anarchy. Therefore it was that when Monk advanced from Scotland and declared for a free parliament, there was little doubt~~

~~' that the new parliament would recall the exiled king, and~~

~~seek to build again on the old foundations.~~

~~The Restoration was effected by a coalition between the Cavaliers, or followers of Charles I., and the Presbyterians who had originally opposed hira. It was only after the nature of a great reaction that the latter should for a time be swamped by the former. When the Long Parlia- ment of the Restoration met in 1661, the Act of Uniformity entirely excluded all idea of reform in the Puritan direc- tion, and ordered the expulsion from their benefices of all clergymen who refused to express approval of the whole of the Book of Common Prayer (1662). A previous statute, the Corporation Act (1661), ordered that all members of corporations should renounce the Covenant and the doctrine that subjects might in any case rightfully use force against the king, and should receive the sacrament after the forms of the Church of England. The object for which Laud had striven, the compulsory imposition of uniformity, thus became part of the law of the land.~~

~~Herein lay the novelty of the system of the Restoration. The system of Laud and the system of Cromwell had both been imposed by a minority which had possessed itself of the powers of government. 'The new uniformity was imposed by parliament, and parliament had the nation behind it. For the first time, therefore, all those who objected to~~

~~the established religion sought, not to alter its forms to suit themselves, but to gain permission to worship in separate congregations. Ultimately, the Dissenters, as they began to be called, would obtain their object. As soon as it became clear to the mass of the nation that the dissenters were in a decided minority, there would be no reason to fear the utmost they could do even if the present liberty of worship and teaching were conceded to them. For the present, however, they were feared out of all proportion to their numbers. They counted amongst them the old soldiers of the Protectorate, and though that army had been dissolved, it always seemed possible that it might spring to arms once more. A bitter experience had taught men that a hundred of Oliver's Ironsides might easily chase a thousand Cavaliers ; and as long as this danger was believed to exist, every effort would be made to keep dissent from spreading. Hence the Conventicle Act (1664) imposed penalties on those taking part in religious meetings in private houses, and the Five Mile Act (1665) forbade the expelled clergyman to come within five miles of a corporate borough, the very place where he was most likely to secure adherence, unless he would swear his adhesion to the doctrine of non-resistance.~~

~~The doctrine of non-resistance was evidently that by which, at this time, the loyal subject was distinguished from those whom he stigmatized as disloyal. Yet even the most loyal found that, if it was wrong to take up arms against the king, it might be right to oppose him in other ways. Even the Cavaliers did not wish to see Charles II. an absolute sovereign. 'They wished to re- construct the system which had been violently interrupted by the events of the autumn of 1641, and to found govern-~~

~~The~~

~~anarchy,~~

~~The Re. storation,~~

~~Prospects of tolera-~~

~~tion,~~

~~Doctrine of non- resist-~~

~~ance.~~

~~REIGN OF CHARLES 1.]~~

~~ment on the co-operation between king and parliament, withcut defining to themselves what was to be done if the king's conduct became insufferable. Openly, indeed, Charles II. did not force them to reconsider their position. He did not thrust members of the Commons into prison, or issue writs for ship-money. He laid no claim to taxa- tion which had not been granted by parliament. But he was extravagant and self-indulgent, and he wanted more money than they were willing to supply. A war with the~~

~~of the arrogant potentate who, at the head of the mightiest army in Europe, treated with contempt all rights which came into collision with his own wishes. Nor was Lewis XIV. merely to be feared as a military or political opponent. Even when he was on bad ternis with the pope he was a warm upholder of the Papal Church, and Protestants began to ask whether their religion would long be safe if other states succumbed to his arms. Soon, too, suspicions arose that there were those in England who~~

~~The first Dutch broke out, and there were strong suspicions that | might be glad to use his assistance for the overthrow of~~

~~Dutch Charles applied money voted for the fleet to the main- | Protestantism at home.~~

~~war tenance of a vicious and luxurious court. Against the In fact, the danger was to the full as great as it was vice and luxury, indeed, little objection was likely to be | imagined tobe, The king was as much a Roman Catholic as brought. The over-haste of the Puritans to drill~~

~~England | he was anything at all, and in his annoyance at the inter- into ways of morality and virtue had thrown at least the | ference of the Commons with his expenditure he thought upper-classes into a slough of revelry and baseness. But | it a fine thing to lead an easy uncontrolled existence as if the vice did not appear objectionable the expense did, | the pensioner of the great king. In 1670 the secret and a new chapter in the financial history of the Government | treaty of Dover was signed. Charles was to receive from was opened when the Commons, having previously gained | Louis £200,000 a year, and the aid of 6000 French troops, control over taxation, proceeded to vindicate their right | to enable him to declare himself a convert, and to obtain to control expenditure. special advantages for his religion, whilst he was also to~~

~~TheCom- As far, indeed, as taxation was concerned, the Long | place the forces of England at Lewis's disposal for his~~

~~monsaim Parliament had not left its successor much to do. The~~

~~a purposes of aggression on the Continent. atcontro" abolition of feudal tenures and purveyance had long been~~

~~Charles had no difficulty in stirring up the commercial Second~~

~~ay demanded, and the conclusion of an arrangement which | jealousy of England so as to bring about a second Dutch ag .~~

~~ture. had been mooted in the reign of James I. is only notable | war (1672). The next year, unwilling to face the dangers ey as affording one instance out of many of the tendency of | of his larger plan, he issued a Declaration of Indulgence tion of In- a single class to shift burdens off its own shoulders. The | (1673). By a single act of the prerogative the king dulgence. predominant landowners preferred the grant of an excise | suspended all penal laws against Roman Catholics and which would be taken out of all pockets to a land-tax which | dissenters alike. would exclusively be felt by those who were relieved by The cavalier parliament had been gradually drifting The De- the abolition of the tenures. The question of expenditure | into opposition to the crown. But~~

~~to the end it was true “laration was constantly telling on the relations between the king | to its resolution to retain the political predominance of — and the House of Commons. After the Puritan army had | the English Church. It dreaded the Roman Catholics. with. been disbanded, the king resolved to keep on foot a petty | It hated and despised the dissenters. Under any circum- drawn. force of 5000 men, and he had much difficulty in provid | stances an indulgence would have been most distasteful ing for it out of a revenue which had not been intended | toit. But the growing belief that the whole scheme was by those who voted it to be used for such a purpose. | merely intended to serve the purposes of the Roman Then came the Dutch war, bringing with it a suspicion that | Catholics converted its dislike into deadly opposition. some at least of the money given for paying sailors and | Yet it resolved to base its opposition upon constitu- fitting out ships was employed by Charles on very different | tional grounds. The right claimed by the king to suspend objects. The Commons accordingly, in 1665, succeeded in | the laws was questioned, and his claim to special authority enforcing, on precedents derived from the reigns of Richard | in ecclesiastical matters was treated with contempt. The II. and Henry IV., the right of appropriating the supplies | king gave way, and withdrew his declaration. But no granted to special objects ; and with more difficulty they | solemn Act of Parliament declared it to be illegal, and in obtained, in 1666, the appointment of a commission em- | due course of time it would be heard of again. powered to investigate irregularities in the issue of moneys. The Commons followed up their blow by passing the The Test Such measures were the complement of the control over | Test Act, making the reception of the sacrament accord- Act taxation which they had previously gained, and as far as | ing to the forms of the Church of England, and the theirpower of supervision went, it constitated them and | renunciation of the doctrine of transubstantiation, a neces- not the king the directors of the course of government. If | sary qualification for office. At once it appeared what a this result was not immediately felt, it was because the | hold the members of the obnoxious church had had upon king had a large certain revenue voted to him for life, so | the administration of the state. The lord high admiral, that, for the present at least, it was only his extraordinary | the lord treasurer, and a secretary of state refused to~~

~~expenses which could be brought under parliamentary | take the test. The lord high admiral was the heir to control. Nor did even the renewal of parliamentary | the throne, the king's brother, the duke of York. impeachment, which ended in the banishment of Lord Charles, as usual, bent before the storm. In Danby he Danby's Chancellor Clarendon (1667), bring on any direct collision | found a minister whose views answered precisely to the ministry. with the king. If the Commons wished to be rid of him | views of the existing House of Commons. Like the Com- because he upheld the prerogative, the king was equally | mons, Danby wished to silence both Roman Catholics and desirous to be rid of him because he looked coldly on the | dissenters. Like the Commons, too, he wished to embark looseness of the royal morals. — |on a foreign policy hostile to France. But he served a~~

~~Danger The great motive power of the later politics of the reign | master who regarded Lewis less as a possible adversary~~

~~. was to be found beyond the channel. To the men of the | than as a possible paymaster. Sometimes Danby was~~

~~days of Charles II. Lewis XIV. of France was what Philip IT. of Spain had been to the men of the days of Elizabeth. Gradually, in foreign policy, the commercial emulation with the Dutch, which found vent in one war in the time of the Commonwealth, and in two wars in the time of Charles II., gave way to a dread, rising into hatred,~~

~~allowed to do as he liked, and the marriage of the duke of York's eldest daughter Mary to her cousin the prince of Orange was the most lasting result of his admin- istration. More often he was obliged to follow where Charles led, and Charles was constantly ready to sell the neutrality of England for large sums of French gold. At~~

~~last one of these negotiations was detected, and Danby, who was supposed to be the author instead of the unwilling~~

~~instrument of the intrigue, was impeached. In order to save his minister, Charles dissolved parliament (1678).~~

~~ENGLAND~~

~~[HISTORY.~~

~~third of the short parliaments held at Oxford the Whigs rode armed into the city, the nation decided that the future danger of a Roman Catholic succession was incomparably less than the immediate danger of another civil war.~~

~~The pop- (Charles could not have chosen a more unlucky time for |} Loyal addresses poured in to the king. For the four ish plot. his own quiet. 'The strong feeling against the Roman remaining years of his reign he ruled without summoning Catholics had been quickened into a flame by a great im- | any parliament. Whigs were brought before prejudiced posture. The inventors of the so-called Popish plot charged | juries and partial judges. Their blood flowed on the the leading English Roman Catholics with a design to scaffold. The charter of the city of London was confis- murder the king. Judges and juries alike were maddened | cated. The reign of the Tories was unquestioned. Yet with excitement, and listened greedily to the lies which | it was not quite what the reign of the Cavaliers had been poured forth from the lips of profligate informers. Inno- | in 1660. The violence of the Restoration had been cent blood was shed in abundance. directed primarily against Puritanism, and only against Three The excitement had its root in the uneasy feeling caused | certain forms of government so far as they allowed Puritans aie. by the knowledge that the heir to the throne was a Roman | to gain the upper hand. The violence of the Tories was ments, Catholic. Three parliaments were summoned and dissolved. | directed against rebellion and disorder, and only against In each parliament the main question at issue between | dissenters so far as they were believed to be fomenters of The Ex- the Commons and the crown was the Exclusion Bill, by | disorder. Religious hatred had less part in the action of oe which the Commons sought to deprive the duke of York | the ruling party, and even from its worst actions a wise~~

~~of his inheritance ; and it was notorious that the leaders of the movement wished the crown to descend to the king's~~

~~man might have predicted that the day of toleration was not so far off as it seemed.~~

~~illegitimate son, the duke of Monmouth. The accession of James II. (1689) put the views of the pig~~

~~Whigs The principles by which the Commons were guided in | opponents of the Exclusion Bill to the test. A new years anc these parliaments were very different. from those which | parliament was elected, almost entirely composed of decided of the ones: had prevailed in the first parliament of the Restoration. | Tories. A rebellion in Scotland, headed by the earl of i of Those principles to which that party adhered which about | Argyll, and a rebellion in England, headed by the duke of anc this time became known as the Tory party had been | Monmouth, were easily suppressed. But the inherent formed under the influence of the terror caused by militant | difficulties of the king's position were not thereby over- Puritanism. In the state the Tory inherited the ideas of | come. It would have been hard, in days in which Clarendon, and, without being at all ready to abandon the | religious questions occupied so large a space in the field of claims of parliaments, nevertheless somewhat inconsis- | politics, for a Roman Catholic sovereign to rule successfully tently spoke of the king as ruling by a divine and inde- | over a Protestant nation. James set himself to make it, feasible title, and wielding a power which it was both | in his case, impossible, It may be that he did not con- impious and unconstitutional to resist by force. In the | sciously present to himself any object other than fair treat- church he inherited the ideas of Laud, and saw in the | ment for his co-religionists. On the one hand, however, maintenance of the Act of Uniformity the safeguard of | he alienated even reasonable opponents by offering no religion. But the hold of these opinions on the nation had | guarantees that equality so gained would not be converted been weakened with the cessation of the causes which had | into superiority by the aid of his own military force and produced them. In 1680 twenty years had passed since | of the assistance of the French~~

~~king; whilst on the other the Puritan army had been disbanded. Many of Crom- | hand he relied, even more strongly than his father had well's soldiers had died, and most of them were growing | done, on the technical legality which exalted the preroga- old. The dissenters had shown no signs of engaging in | tive in defiance of the spirit of the law. He began by plots or conspiracies. They were known to be only a | making use of the necessity of resisting Monmouth to comparatively small minority of the population, and though | increase his army, under the pretext of the danger of a they had been cruelly persecuted, they had suffered with- | repetition of the late rebellion ; and in the regiments thus out a thought of resistance. Dread of the dissenters, | levied he appointed many Roman Catholic officers who had therefore, had become a mere chimera, which only those | refused to comply with the Test Act. Rather than submit could entertain whose minds were influenced by prejudice. | to the gentlest remonstrance, he prorogued parliament, and On the other hand, dread of the Roman Catholics was a | proceeded to obtain from the Court of King's Bench a living force. Unless the law were altered a Roman | judgment in favour of his right to dispense with all Catholic would be on the throne, wielding all the resources | penalties due by law, in the same way that his grandfather of the prerogative, and probably supported by all the | had appealed to the judges in the matter of the post-nati. resources of the king of France. Hence the leading prin- | But not only was the question put by James II. of far ciple of the Whigs, as the predominant party was now | wider import than the question put by James I., but he called, was in the state to seek for the highest national | deprived the court to which he applied of all moral authority in parliament rather than in the king, and in the | authority by previously turning out of office the judges church to adopt the rational theology of Chillingworth | who were likely to disagree with him, and by appointing and Hales, whilst looking to the dissenters as allies against | new ones who were likely to agree with him. A Court of the Roman Catholics, who were the enemies of both. High Commission of doubtful legality was subsequently Tory Events were to show that it was a wise provision which | erected (1686) to deprive or suspend clergymen who made**

~~reaction.~~

~~**led the Whigs to seek to exclude the duke of York from the throne. But their plan suffered under two faults, the conjunction of which was ruinous to them for the time. In the first place, their choice of Monmouth as the heir was Antelicitous, Not only was he under the stain of illegitimacy, but his succession excluded the future succes- sion of Mary, whose husband, the prince of Orange, was the hope of Protestant Europe. In the second place, drastic remedies are never generally acceptable when the evil to be remedied is still in the future. When in the**~~

~~**themselves obnoxious to the court, whilst James appointed Roman Catholics to the headship of certain colleges at Oxford. The legal support given him by judges of his own selection was fortified by the military support of an army collected at Hounslow Heath; and a Roman Catholic, the ear] of Tyrconnel, was sent as lord-deputy to Ireland (1687) to organize a Roman Catholic army on which the king might fall back if his English forces proved insufficient for his purpose.**~~

~~**Thus fortified, James issued a declaration of indulgence**~~

~~**THE POLITICAL REVOLUTION. |**~~

~~**(1687) granting full religious liberty to all his subjects. The belief that the grant of liberty to all religions was only intended to serve as a cloak for the ascendency of one was so strong that the measure roused the opposition of all those who objected to see the king's will substituted for the law, even if they wished to see the Protestant dissenters tolerated. In spite of this opposition, the king thought it possible to obtain a parliamentary sanction for his declara- Attempt tion. The parliament to which he intended to appeal was, to sum- however, to be as different a body from the parliament**~~

~~**James's declara- tion of indul- gence.**~~

~~**mon " which met in the first year of his reign as the bench of 7 judges which had approved of the dispensing power had bal been different from the bench which existed at his acces-**~~

~~sion. A large number of the borough members were in~~

~~those days returned by the corporations, and the corpora-.~~

~~tions were accordingly changed. But so thoroughly was the spirit of the country roused, that many even of the new corporations were set against James's declaration, and he had therefore to abandon for a time the hope of seeing it accepted even by a packed House of Commons. All, how- ever, that he could do to give it force he did. He ordered~~

~~Trial of the clergy to read it in all pulpits (1688). Seven bishops~~

~~the seven who presented a petition asking him to relieve the clergy~~

~~bishops. from the burthen of proclaiming what they believed to be illegal were brought to trial for publishing a seditious libel. Their acquittal by a jury was the first serious blow to the system adopted by the king,~~

~~Birthof Another event which seemed likely to consolidate his an heir power was in reality the signal of his ruin. The queen i, bore him ason. There was thus no longer a strong pro- ' bability that the king would be succeeded at no great dis- tance of time by a Protestant heir. Popular incredulity expressed itself in the assertion that, as James had attempted~~

~~to gain his ends by means of a packed bench of judges and~~

~~a packed House of Commons, he had now capped the~~

~~series of falsifications by the production of a supposititious~~

~~Invita- heir. The leaders of both parties combined to invite the tion of prince of Orange to come to the rescue of the religion and a a of AWS of England. He landed on November 5 at Brixham.~~

~~Orange, Before he could reach London every class of English society~~

had declared in his favour. James was deserted even by Acces- his army, He fled to France, and aconvention parliament, sion of summoned without the royal writ, declared that his flight William was equivalent to abdication, and offered the crown in joint sovereignty to William and Mary (1689).

The Revolution, as it was called, was more than a mere change of sovereigns. It finally transferred the ultimate decision in the state from the king to parliament. What parliament had been in the 15th century with the House of Lords predominating, that parliament was to be again in the end of the 17th century with the House of Commons Predomi- predominating. That House of Commons was far from nance of resting on a wide basis of popular suffrage. The county a voters were the freeholders; but in the towns, with some

"Important exceptions, the electors were the richer inhabit- ants who formed the corporations of the boroughs, or a body of select householders more or less under the control of some neighbouring landowner. A House so chosen was an aristocratic body, but it was aristocratic in a far wider sense than the House of Lords was aristocratic. The trad- ing and legal classes found their representation there by the side of the great owners of land. The House drew its Strength from its position as a true representative of the effective strength of the nation in its social and economical organization.

Such was the body which firmly grasped the control over every branch of the administration. Limiting in the Bill of Rights-the powers assumed by the crown, the Commons declared that the king could not keep a standing army in time of poace without consent of parliament; and they

Results of the Revolu- tion,

~~made that consent effectual, as far as legislation could go, by passing a Mutiny Act year by year for twelve months only, so as to prevent the crown from exercising military discipline without their authority. Behind these legal con- trivances stood the fact that the army was organized in the same way as the nation was organized, being officered by gentlemen who had no desire to overthrow a constitution through which the class from which they sprung con- trolled the government. Strengthened by the cessation of any fear of military violence, the Commons placed the crown in financial dependence on themselves by granting a large part of the revenue only for a limited term of years, and by putting strictly in force their right of appropriating that revenue to special branches of expenditure.~~

~~Such a revolution might have ended in the substitution Causes in of the despotism of a class for the despotism of a man. favour of Many causes combined to prevent this result. The land- liberty. owners, who formed the majority of the House, were not elected directly, as was the case with nobility of the French States General, by their own class, but by electors who, though generally loyal to them, would have broken off from them if they had attempted to make themselves masters of their fellow-citizens. No less important was the almost absolute independence of the judges, begun at the begin- Independ- ning of the reign, by the grant of oflice to them during good ence of behaviour instead of during the king's pleasure, and finally the secured by the clause in the Act of Settlement in 1701, i°48°*- which protected them against dismissal except on the joint address of both Houses of Parliament. Such an improve- ment, however, finds its full counterpart in another great step already taken. The more representative a Govern- ment becomes, the more necessary it is for the well-being Liberty of of the nation that the expression of individual thought writing should be free in every direction. If it is not so the Ss id~~

~~go ac : 5 peaking, Government is inclined to proscribe unpopular opinion, and to forget that new opinions by which the greatest benefits are likely to be conferred are certain at first to be entertained by a very few, and are quite certain to be unpopular as soon as they come into collision with the opinions of the majority. In the Middle Ages the~~

~~benefits of the liberation of thought from state control had been secured by the antagonism between church and state. The Tudor sovereigns had rightfully asserted the principle that in a well-ordered nation only one supreme power can be allowed to exist ; but in so doing they had enslaved religion. It was fortunate that, just at the moment when parliamentary control was established over the state, circumstances should have arisen which niade the majority ready to restore to the individual conscience that supremacy over religion which the medival ecclesiastics had claimed for the corporation of the universal church. Dissenters had, in the main, stood shoulder to shoulder with churchmen in rejecting the suspicious benefits of James, and both gratitude and policy forbade the thought of replacing them under the heavy yoke which had been imposed on them at tle Restoration. The exact mode in which relief should be afforded was still an open question. The idea prevalent with the more liberal minds amongst the clergy was that of comprehension,—that is to say, of so modifying the prayers and ceremonies of the churcli as to enable the dissenters cheerfully to enterin. The scheme was one which had approved itself to minds of the highest order,—to More, to Bacon, to Hales, and to Jeremy Taylor. It is one which, as long as beliefs are not very divergent, keeps up a sense of brotherhood over-ruling the diversity of opinion. It broke down, as it always will break down in practice, whenever the difference of belief is so strongly felt as to seek earnestly to embody itself in diversity of outward practice. The greater part of the clergy of the church felt that to surrender their accustomed formularies~~

~~ae teed the right of separate assemblies for worship outside | government with the requisite steadiness of action and Act. the pale of the church, though it embodied the principles | clearness of insight. Such work can only fitly be intrusted of Cromwell and Milton, and not those of Chillingworth | to a few, and whenever difficult circumstances arise, it is and Hales, was carried without difficulty, whilst the pro- | necessary that the action of those few be kept in harmony posed scheme of comprehension never had a chance of | by the predominance of one. The scheme on which success (1689). William hit, by the advice of the earl of Sunderland, was The choice was one which posterity can~~

~~heartily approve. | that which has since been known as Cabinet government, However wide the limits of toleration be drawn, there will | He selected as his ministers the leading members of the always be those who will be left outside. By religious | two Houses who had the confidence of the majority of the liberty those inside gain as much as those who are without. | House of Commons. In this way, the majority felt an From the moment of the passing of the Toleration Act, no | interest in supporting the men who embodied their own Protestant in England performed any act of worship except | opinions, and fell in turn under the influence of those who by his own free and deliberate choice. The literary spokes- | held them with greater prudence or ability than fell to the man of the new system was Locke. His Letters concerning | lot of the average members of the House. All that Toleration laid down the principle which had been main- | William doubtless intended was to acquire a ready instru- tained by Cromwell, with a wider application than was | ment to enable him to carry on the war with success, In possible in days when the state was in the hands of a | reality he had re-founded, on a new basis, the government mere minority only able to maintain itself in power by con- | of England. His own personal qualities were such that stant and suspicious vigilance. he was able to dominate over any set of ministers; but The Tess One measure remained to place the dissenters in the | the time would come when there would be a sovereign of Act re- position of full membership of the state. The Test Act | inferior powers. Then the body of ministers would step tained. excluded them from office. But the memory of the high- | into his place. he old rude arrangements of the Middle handed proceedings of Puritan rulers was still too recent to | Ages had provided by frequent depositions that an allow Englishmen to run the risk of a reimposition of their | inefficient sovereign should cease to rule, and those yoke, and this feeling, fanciful as it was, was sufficient to | arrangements had been imitated in the case of Charles I. keep the Test Act in force for years to come. and James II. Still the claim to rule had, at least from Liberty | The complement of the Toleration Act was the abolition | the time of Henry IIL, been derived from hereditary de- of the of the censorship of the press (1695), The ideas of the | scent, and the interruption, however frequently it might presss author of the Areopagitica had at last prevailed. 'The | occur, had been regarded as~~

something abnormal, only to attempt to fix certain opinions on the nation which were | be applied where there was an absolute necessity to prevent pleasing to those in power was abandoned by king and | the wielder of executive authority from setting at defiance parliament alike. The nation, or at least so much of it as | the determined purpose of the nation. After the Revolu- cared to read books or pamphlets on political subjects, was | tion, not only had the king's title been so changed as to acknowledged to be the supreme judge, which must there- | make him more directly than ever dependent on the fore be allowed to listen to what councillors it pleased. nation, but he now called into existence a body which This new position of the nation made itself felt in | derived its own strength from its conformity with the various ways. It was William's merit that, fond as he was | wishes of the representatives of the nation. of power, he recognized the fact that he could not rule For the moment it seemed to be but a temporary Unruli- except so far as he carried the good-will of the nation with | expedient. When the war came to anend the Whig party ness of him. No doubt he was helped to an intelligent perception | which had sustained William in his struggle with France tea of the new situation by the fact that, as a foreigner, he | split up. The dominant feeling of the House of Commons" cared far more for carrying on war successfully against | was no longer the desire to support the crown against a France than for influencing the domestic legislation of a | foreign enemy, but to make government as cheap as country which was not his own, and by the knowledge | possible, leaving future dangers to the chances of the that the conduct of the struggle which lasted till he was | future. William had not so understood the new invention able to treat with France on equal terms at Ryswick | of a united ministry as binding him to take into his service (1697) was fairly trusted to his hands. Nevertheless these | a united ministry of men whom he regarded as fools and years of war called for the united action of a uational | knaves, He allowed the Commons to reduce the army to government, and in seeking to gain this support for him- | a skeleton, to question his actions, and to treat him as if he self, he hit upon an expedient which opened a new era in} were a cipher. But it was only by slow degrees that he constitutional politics. was brought to acknowledge the necessity of choosing his Begin- The supremacy of the House of Commons would have | members from amongst the men

who had done these ningof been an evil of no common magnitude, if it had made | things. ee government impossible. Yet this was precisely what it The time came when he needed again the support of the The tiers threatened to do. Sometimes the dominant party in the | nation. The death of Charles IL., the heirless king of the Spanish

was to surrender somewhat of the belief which those for- mularies signified, while the dissenting clergy were equally reluctant to adopt the common prayer book even in a modified form. Hence the Toleration Act, which guaran-

House pressed with unscrupulous rancour upon its opponents. Sometimes the majority shifted from side to side as the House was influenced by passing gusts of passion or sympathy, so that, as it was said at the time, no man could foretell one day what the House would be pleased to do on the next. Against the first of these dangers William was to a great extent able to guard, by the exercise of his right of dissolution, so as to appeal to the constituencies, which did not always share in the pas- sions of their representatives. But the second danger could not be met in this way. The only cure for waywardness

| is responsibility, and not only was this precisely what the Commons had not learned to feel, but it was that which it was impossible to make them feel directly. A body composed of several hundred members cannot carry on

huge Spanish monarchy, had long been expected. Since the peace of Ryswick, William and Lewis XIV. had come to terms by two successive partition treaties for a division of those vast territories in such a way that the whole of them should not fall into the hands of a near relation either of the king of France or of the emperor, the head of the house of Austria. When the death actually took place in 1700, William seemed to

~~have no authority in England whatever; and Lewis was therefore encouraged to break his engagements, and to accept the whole of the Spanish inheritance for his grandson, who became Philip~~

~~succes- ion.~~

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~~WAR OF THE SPANISH SUCCESSION. |~~

~~Y. of Spain. William saw clearly that such predominance of France in Europe would lead to the development of pretensions unbearable to other states. But the House of Commons did not see it, even when the Dutch garrisons were driven by French troops out of the posts in the Spanish Netherlands which they had occupied for many years (1701). The Act William had prudently done all that he could to con- of Settle- ciliate the Tory majority. In the preceding year (1700) ments 'he had given office to a Tory ministry, and he now (1701) gave his assent to the Act of Settlement, which secured the succession of the crown to the house of Hanover to the exclusion of all Roman Catholic claimants, though it imposed several fresh restrictions on the prerogative. William was indeed wise in keeping his feelings under control. The country sympathized with him more than the Commons did, and when the House imprisoned the gentlemen deputed by the freeholders of Kent to present a petition asking that its loyal addresses might be turned into bills of supply, it simply advertised its weakness to the whole country. Forma- = The reception of this Kentish petition was but a fore- tion of taste of the discrepancy between the Commons and the the nation, which was to prove the marked feature of the – middle of the century now opening. For the present the 'House was ready to give way. It requested the king to enter into alliance with the Dutch. William went yet further in the direction in which he was urged. He formed an alliance with the emperor as well as with the States General to prevent the union of the crowns of France and Spain, and to compel France to evacuate the Netherlands. An unexpected event came to give him all the strength he needed. James II. died, and Lewis acknowledged his son as~~
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~~the rightful king of England. Englishmen of both parties were stung to indignation by the insult. William dissolved parliament, and the new House of Commons, Tory as it was by a small majority, was eager to support the king. It voted men and money according to his wishes. England was to be the soul of the Grand Alliance against France. But before a blow was struck William was thrown from his horse. He died on March 8, 1702. "The man," as Burke said of him, "was dead, but the Grand Alliance survived in which King William lived and reigned,"~~

~~Upon the accession of Anne, war was at once commenced. The Grand Alliance became, as William would have wished, a league to wrest the whole of the Spanish dominions from Philip, in favour of the Austrian archduke Charles. It found a chief of supreme military and diplomatic genius in the duke of Marlborough. His Marlbo- victory at Blenheim (1704) drove the French out of rough's Germany. His victory of Ramillies (1706) drove them Metories. out of the Netherlands. In Spain, Gibraltar was captured by Rooke (1704) and Barcelona by Peterborough (1705). Prince Eugene relieved Turin from a French siege, and followed up the blow by driving the besiegers out of Italy.~~

~~At home Marlborough, caring nothing for politics, at first gave his support to the Tories, whose church policy formity "OS Tegarded with favour by the queen. Their efforts *rmity. were directed towards the restriction of the Toleration Act~~

~~within narrow limits, Many dissenters had evaded the Test Act by partaking of the communion in a church; though they subsequently attended their own chapels. An Occasional Conformity Bill, imposing penalties on those who adopted this practice, twice passed the Commons (1702, 1703), but was rejected by the House of Lords, in which the Whig element predominated. The church was served in a nobler manner in 1704 by the abandonment of first-fruits and tenths by the queen for the purpose of raising the pittances of the poorer clergy. In 1707 a piece~~

~~Acces- sion of Anne.~~

~~Occa- sional con-~~

of legislation of the highest value was carried to a success-

ful end. The Act of Union, passed in the parliaments union of England and Scotland, joined the legislature of the two with kingdoms and the nations themselves in an indissoluble Scotland. bond. ;

The ministry in office at the time of the passing of the United Act of Union had suffered important changes since the Whig commencement of the reign. 'The Tories had never been ™™S!"Y- as earnest in the prosecution of the war as the Whigs ; and Marlborough, who cared above ail things for the prosecution of the war, gradually replaced Tories by Whigs in the ministry. His intention was doubtless to conciliate both parties by admitting them both to a share of power ; but the Whigs were determined to have all or none, and in 1708 a purely Whig ministry was formed to support the war as the first purely Whig ministry had supported it in the reign of William. The years of its power were the years of the victories of Oudenarde (1708) and of Malplaquet (1709), bringing with them the entire ruin of the military power of Lewis.

Such successes, if they were not embraced in the Spirit Growing of moderation, boded no good to the Whigs. It was unpopu- known that even before the last battle Lewis had been tty of ready to give up his grandson, and that his offers had been Whigs. rejected because he would not consent to join the allies in turning him out of Spain. A belief spread in England that Marlborough wished the endless prolongation of the war for his own selfish ends. Spain was far away, and, if the Netherlands were safe, enough had been done for the interests of England. The Whigs were charged with refusing to make peace when an honourable and _satis- factory peace was not beyond their reach. '

As soon as the demand for a vigorous prosecution of the war relaxed, the Whigs could but rely on their domestic policy, in which they were strongest in the eyes of posterity but weakest in the eyes of

~~contemporaries. It was known that they looked for the principle on which the queen's throne rested to the national act of the Revolution rather than to the birth of the sovereign as the daughter of James IL. whilst popular feeling preferred, however inconsistently, to attach itself to some fragment of hereditary right. What was of greater consequence was that it was known that they were the friends of the dis- senters, and that their leaders, if they could have had their way, would not only have maintained the Toleration Act, but would also have repealed the Test Act. In 1709 a sermon preached by Dr Sacheverel denounced toleration and the right of resistance in tones worthy of the first days of the Restoration. Foolish as the sermon was, it was but the reflection of folly which was widely spread amongst the rude and less educated classes. The Whig leaders unwisely took up the challenge and impeached Sacheverel. The Lords condemned the man, but they condemned him to an easy sentence. His trial was the signal for riot. Dissent- ing chapels were sacked to the cry of High Church and Sacheverel. The queen, who had personal reasons for dis- liking the Whigs, dismissed them from office (1710), and a Tory House of Commons was elected amidst the excite- Tory ment to support the Tory ministry of Harley and St John, ministry.~~

~~After some hesitation the new ministry made peace peace of with France, and the treaty of Utrecht, stipulating for Utrecht. the permanent separation of the crowns of France and Spain, and, assigning Milan, Naples, and the Spanish Netherlands to the Austrian claimant, accomplished all that could reasonably be desired, though the abandon- ment to the vengeance of the Spanish Government of our Catalan allies, and the base desertion of our Continental confederates on the very field of action, brought dishonour on the good name of England. The Commons gladly welcomed the cessation of the war. The approval of thé VIII. — 45~~

~~dod~~

~~Lords had been secured by the creation of twelve Tory peers. In home politics the new ministry was in danger of being carried away by its more violent supporters. St John, now Viscount Bolingbroke, with~~

~~unscrupulous auda- city placed himself at their head. The Occasional Con- formity Bill was at last carried (1711). To it was added~~

~~Occasion- al Con-~~

~~formity the Schism Act (1714), forbidding dissenters to keep~~

~~Act and schools or engage in tuition. Bolingbroke went still~~

~~oc H di intrigue for bringing over the~~

~~Schism further. e engaged in an intrigue for bringing over tl~~

~~Act. Pretender to succeed the queen upon her death. This wild conduct alienated the moderate Tories, who, much as they wished to see the throne occupied by the heir of the ancient line, could not bring themselves to consent to its occupation by a Catholic prince, even if his birth marked him out for sovereignty. Such men, therefore, when Anne died (1714) joined the Whigs in proclaiming the elector of Hanover king as George I.~~

~~Acces- The accession of George I. brought with it the predomin-~~

~~sion of ance of the Whigs. They had on their side the royal~~

~~= .power, the greater part of the aristocracy, the dissenters,~~

~~ouse of . ° ° Hanover, 20d the higher trading and commercial classes. The~~

~~Tories appealed to the dislike of dissenters prevalent amongst the country gentlemen and the country clergy, and to the jealousy felt by the agricultural classes to- wards those who enriched themselves by trade. Suchia feeling, if it was aroused by irritating legislation, might very probably turn to the advantage of the exiled house, especially as the majority of Englishmen were to be found on the Tory side. It was therefore advisable that Government should content itself with as little action as possible, in order to give time for old habits to wear themselves out. The landing of the Pretender in Scotland (1715), and~~

~~the defeat of a portion of his army which had advanced to Preston,—a defeat which was the consequence of the apathy of his English supporters, and which was followed by the complete suppression of the rebellion,— gave increased strength to the Whig Government. But they were reluctant to face an immediate dissolution, and the Septennial Act was passed (1716) to extend to seven years the duration of parliaments, which had been fixed at three years by the Triennial Act of William and Mary. Under General Stanhope an effort was made to draw legislation in a more liberal direction. The Repealof Occasional Conformity Act and the Schism Act were Occasion- repealed (1719); but the majorities on the side of the a Sig Goverumeut were unusually small, and Stanhops, who (r+ a q would willingly have repealed the Test Act so far as it~~

~~Act and : Schism related to dissenters, was compelled to abandon the pro-~~

~~Act. ject as entirely impracticable. The Peerage Bill, intro- Peerage Guced at the same time to limit the royal power of creating Bil, —_ peers, was happily thrown out in the Commons. It was~~

~~proposed partly from a desire to guard the Lords against such a sudden increase of their numbers as had been forced on them when the treaty of Utrecht was under discussion, and partly to secure the Whigs in office against any change in the royal councils in a succeeding reign. It was in fact conceived by men who valued the immediate victory of their principles more than they trusted to the general good sense of the nation. The Lords were at this time, as a matter of fact, not merely wealthier but wiser than the Commons; and it is no wonder that,in days when the Commons, by passing the Septennial Act, had shown their distrust of their own constituents, the peers should show, by the Peerage Bill, their distrust of that House which was elected by those constituencies. Nevertheless the remedy was worse than the disease. A close oligarchy would not only have held a dominant position for some twenty or thirty years, during which it would really be fit to exercise authority, but would have been impenetrable to the force of public opinion when the time came that a public opinion~~

~~ENGLAND~~

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~~worthy of the name was formed. It is essential to the permanence of an Upper House that it should be unable to set at defiance the will of the nation expressed by its representatives; and without the power of creation the House of Lords might easily have attempted to do this till there was no alternative to a violent alteration of the constitution.~~

~~The excitement following on the bursting of the South way.~~

~~Sea Bubble, and the death or ruin of the leading ministers, p brought Walpole to the front (1721). business when men of business were few in the House of Commons, he was eminently fit to manage the affairs of the country. But he owed his long continuance in office especially to his sagacity. He clearly saw, what Stanhope had failed to see that the mass of the nation was not fitted as yet to interest itself wisely in affairs of government, and that therefore the rule must be kept in the hands of the upper classes. But he was too sensible to adopt the coarse expedient which had commended itself to Stanhope, and he preferred humouring the masses to contradicting them.~~

~~ole's~~

~~As a man of Winistry,~~

~~The struggle of the preceding century had left its mark Freedom~~

~~in every direction on the national development.~~

~~Out of of~~

~~the reaction against Puritanism had come a widely-spread 'ought.~~

~~relaxation of morals, and also, as far as the educated class was concerned, an eagerness for the discussion of all social aud religious problems. The fierce excitement of political life had stirred up the fountains of thought, and the most anciently received doctrines were~~

~~held of little worth until they were brought to the test of reason. It was a time when the pen was more powerful than the sword, when a secretary of state would treat with condescension a witty pamphleteer, and when such a pamphleteer might hope, not in vain, to become a secretary of state.~~

~~It was in this world of reason and literature that the partia- Whigs of the Peerage Bill moved. Walpole perceived mentary~~

~~that there was another world which understood none of ¢ these things. With cynical insight be discovered that a great Government cannot rest on a clique, however distin- guished, If the mass of the nation was sot conscious of political wants, it was conscious of material wants. The merchant needed protection for his trade; the voters gladly welcomed election day as bringing guineas to their pockets. Members of Parliament were ready to sell their votes for places, for pensions, for actual money. The system was not new, as Danby is credited with the discovery that a vote in the House of Commons might be purchased. But with Walpole it reached its height.~~

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~~orrup- ion,~~

~~Such a system was possible because the House of General Commons was not really accountable to its constituents. political The votes of its members were not published, and still less apathy.~~

~~were their speeches made known. Such a silence could only be maintained around the House when there was little interest in its proceedings. The great questions of religion and taxation which had agitated the country under the Stuarts were now fairly settled. To reawaken those ques- tions in any shape would be dangerous. Walpole took good care never to repeat the mistake of the Sacheverel trial. Wheu on one occasion he was led into the proposal of an unpopular excise he at once drew back. England in his days was growing rich. Englishmen were bluff and independent, in their ways often coarse and unmannerly. Their life was the life depicted on the canvas of Hogarth~~

~~and the pages of Fielding. All high imagination, all devotion to the public weal, seemed laid asleep. But the political instinct was not dead, and it would one day express itself for better ends than an agitation against an excise bill or an outcry for a popular war. A Government could no longer employ its powers for direct oppression. In his own house and in his own conscience, every Englishman, as far as the Govern- ment was concerned, was the master of his destiny. By~~

~~Walpole the first prime~~

~~minister,~~

~~The Op- position,~~

~~War with Spain.~~

~~Pe ham,~~

~~Ministry of Henry Pelham,~~

~~WALPOLE AND THE PELHAMS. |~~

~~and by the idea would dawn on the nation that anarchy is as productive of evil as tyranny, and that a Government which omits to regulate or control allows the strong to oppress the weak, and the rich to oppress the poor.~~

~~Walpole's administration lasted long enough to give room for some feeble expression of this feeling. When George I. was succeeded by George II. (1727), Walpole remained in power. His eagerness for the possession of that power which he desired to use for his country's good, together with the incapacity of two kings born and bred in a foreign country to take a leading part in English affairs, com- pleted the change which had been effected when William for the first time entrusted the conduct of government to a united Cabinet. There was now for the first time a prime minister in England, a person who was himself a subject imposing harmonious action on the Cabinet. The change was so gradually and silently effected that it is difficult to~~

~~**realize its full importance. So far, indeed, as it only came about through the incapacity of the first two kings of the house of Hanover, it might be obliterated, and was in fact toa great extent obliterated by a more active successor. But so far as it was the result of general tendencies, it could never be obliterated. In the ministries in which Somers and Montagu on the one hand and Harley and St John on the other had taken part,-there was no prime minister except so far as one member of the administration dominated over his colleagues by the force of character and intelligence. In the reign of George III. even North and Addington were universally acknowledged by that title, though they had little claim to the independence of action of a Walpole or a Pitt.**~~

~~**The change was, in fact, one of the most important of those by which the English constitution has been altered from an hereditary monarchy with a parliamentary regulative agency toa parliamentary government with an hereditary regulative agency. In Walpole's time the forms of the constitution had become, in all essential particulars, what they are now. What was wanting was a national force behind them to give them their proper work.**~~

~~**The growing opposition which finally drove Walpole from power was not entirely without a nobler element than could be furnished by personal rivalry or ignorant distrust of commercial and financial success. It was well that complaints that a great country ought not to be governed by patronage and bribery should be raised, although, as subsequent experience showed, the causes which rendered corruption inevitable were not to be removed by the expulsion of Walpole from office. But for one error, indeed, it is probable that Walpole's rule would have been further prolonged than it was. In 1739 a popular excite- ment arose for a declaration of war against Spain. Walpole believed that war to be certainly unjust, and likely to be disastrous, He had, however, been so accustomed to give way to popular pressure that he did not perceive the difference between a wise and timely determination to leave a right action undone in the face of insuperable difficulties, and an unwise and cowardly determination to do that which he believed to be wrong and imprudent. If he had now resigned rather than demean himself by acting against his conscience, it is by no**~~

means unlikely that he would have been recalled to power before many years were over. As it was, the failures of the war recoiled on his own head, and in 1742 his long ministry came to an end.

After a short interval a successor was found in Henry All the ordinary arts of corruption which Walpole had practised were continued, and to them were added arts of corruption which Walpole had disdained to practise. He at least understood that there were certain principles in accordance with which he wished to conduct

public affairs, and he had driven colleague after colleague out of office rather than allow them to distract his method of government. Pelham and his brother, the cowardly intriguing duke of Newcastle, had no principles of govern- ment whatever. They offered place to every man of parliamentary skill or influence. There was no opposition, because the ministers never attempted to do anything which would arouse opposition, and because they were ready to do anything called for by any one who had power enough to make himself dangerous; and in 1743 they embarked ona useless war with France in order to please the king, who saw in every commotion on the Continent some danger to his beloved Hanoverian possessions.

At most times in the history of England such a ministry would have been driven from office by the roused outery of an offended people. In the days of the Pelhams, government was regarded as lying too far outside the all- important private interests of the community to make it worth while to make any effort to rescue it from the degradation into which it had fallen ; yet the Pelhams had not been long in power before this serene belief that the country could get on very well without a government in any real sense of the word was put to the test. In 1745 Charles Edward, the son of the Pretender, landed in Scotland. He was followed by many of the Highland clans, always ready to draw the

~~sword against the con- stituted authorities of the Lowlands; and even in the Lowlands, and especially in Edinburgh, he found adherents, who still felt the sting inflicted by the sup- pression of the national independence of Scotland. The English army was in as chaotic a condition as its Govern- ment, and Charles Edward inflicted a complete defeat on a force which met him at Prestonpans. Before the end of the year the victor, at the head of 5000 men, had advanced to Derby. But he found no support in England, and the mere numbers brought against him compelled him to retreat, to find defeat at Culloden in the following year (1746). The war on the Continent had been waged with indifferent success. The victory of Dettingen (1743) and the glorious defeat of Fontenoy (1745) had achieved no objects worthy of English intervention, and the Peace of Aix-la-Chapelle put an end in 1748 to hostilities which should never have been commenced. The Government pur- sued its inglorious career as long as Henry Pelham lived. He had at least some share in the financial ability of Wal- pole, and it was not till he died in 1754 that the real diffi- culties of a system which was based on the avoidance of difficulties had fairly to be faced.~~

~~The change which was needed was not such as was to be expected from any mere re-adjustment of the political machine. Those who cared for religion or morality had forgotten that man was an imaginative and emotional being. Defenders of Christianity and of deism alike appealed to the reason alone. Enthusiasm was treated as a folly or a crime, and earnestness of every kind was branded with the name of enthusiasm. The higher order of minds dwelt with preference upon the beneficent wis- dom of the Creator. The lower order of minds treated religion as a kind of life-assurance against the inconve- nience of eternal death.~~

~~Upon such a system as this human nature was certain to revenge itself. The preaching of Wesley and Whitfield appealed direct to the emotions. They preached the old Puritan doctrine of conversion, and called upon each in- dividual not to understand, or to admire, or to act, but vividly to realize the love and mercy of God. In all this there was nothing new. What was new was that Wesley added an organization, in which each of~~

~~his followers un- folded to one another the secrets of their heart, and became accountable to his fellows. Large as the numbers of the~~

~~The young Pretender.~~

~~Death of Pelham.~~

~~Moral and reli- gious at- mosphere.~~

~~Wesley and Whitfield.~~

~~Ministry of New- castle.~~

~~Ministry of Pitt und New- vastla~~

~~The Seven Years'~~

~~War;~~

~~306~~

~~Wesleyans ultimately became, their influence is not to be measured by their numbers. The double want of the age, the want of spiritual earnestness and the want of organized coherence, would find satisfaction in many ways which would have seemed strange to Wesley, but which were, nevertheless, a continuance of the work which he began.~~

~~As far as Government was concerned, when Henry Pelham died (1754) the lowest depth of baseness seemed to have been reached. The duke of Newcastle, who suc- ceeded his brother, looked on the work of corruption with absolute pleasure, and regarded genius and ability as an awkward interruption of that happy arrangement which made men subservient to flattery and money. Whilst he was in the very act of trying to drive from office all men who were possessed of any sort of ideas, he was surprised by agreat war. In America, the French settlers in Canada and the English settlers on the Atlantic coast were falling to blows for the possession of the vast territories drained by the Ohio and its tributaries. In India, Frenchmen and Englishmen had striven during~~

~~the last war for authority over the native states round Pondicherry and Madras, and the conflict threatened to break out anew. When war commenced in earnest, and the reality of danger came home to Englishmen by the capture of Minorca (1756), there arose a demand for a more capable Government than any which Newcastle could offer. Terrified by the storm of obloquy which he aroused, he fled from office. A Government was formed, of which the soul was William Pitt. Pitt was, in some sort, to the political life of Eng- lishmen what Wesley was to their religious life. He brought no new political ideas into their minds, but he ruled them by the force of his character and the example of his purity. His weapons were trust and confidence. He appealed to the patriotism of his fellow-countrymen, to their imaginative love for the national greatness, and he did not appeal in vain. He perceived instinctively that a large number, even of those who took greedily the bribes of Walpole and the Pelhams, took them, not because they loved money better than their country, but because they had no conception that their country had any need of them at all. It was a truth, but it was not the whole truth. The great Whig families rallied under Newcastle and drove Pitt from office (1757). But if Pitt could not govern without Newcastle's corruption, neither could Newcastle govern without Pitt's energy. At last a com- promise was effected, and Newcastle undertook the work of bribing, whilst Pitt undertook the work of govern- ing.~~

~~The war which had already broken out, the Seven Years' War (1756-1763), was not confined to Englandalone. By the side of the duel between France and England, a war was going on upon the Continent, in which Austria—with its allies, France, Russia, and the German princes—had fallen upon the new kingdom of Prussia and its sovereign Frederick II. England and Prussia, therefore, necessarily formed an alliance. Different as the two Governments were, they were both alike in recognizing, in part at least, the conditions of progress. The generations which have succeeded the generation of Pitt and Frederick have learned gradually the necessity of seeking strength from the embodiment of popular feeling in a representative assembly, and of seeking order from the organization of scientific knowledge. Even in Pitt's day England, how- ever imperfectly, rested its strength on the popular will. Even in Frederick's day Prussia was ruled by adminis-~~

~~trators selected for their special knowledge. Neither France nor Austria had any conception of the necessity of fulfilling these requirements. Hence the strength of England and of Prussia. The war seems to be a mere struggle for territory. There is no feeling in either Pitt~~

~~or Frederick, such as there was in the men who contended half a century later against Napoleon, that they were fighting the battles of the civilized world. There is some- thing repulsive as well in the enthusiastic nationality of Pitt as in the cynical nationality of Frederick. Pitt's sole object was to exalt England to a position in which she might fear no rival, and might scarcely look upon a second. But in so doing he exalted that which, in spite of all that had happened, best deserved to be exalted. The habits of individual energy fused together by the inspiration of patriotism conquered Canada. The unintelligent over-regulation of the French Government could not maintain the colonies which had been founded in happier times. In 1758 Louisburg was taken, and the mouth of the St Lawrence guarded against France. In 1759 Quebec fell before Wolfe, who died at the moment of victory. In the same year the naval victories of Lagos and Quiberon Bay established the supremacy of the British at sea. The battle of Plassey (1757) had laid Bengal at the feet of Clive ; and Coote's victory at Wandewash (1760) led to the final ruin of the relics of French authority in southern India. When George II. died (1760), England was the first maritime and colonial power in the world.~~

~~In George III. the king once more became an important factor in English politics. From his childhood he had been trained by his mother and his instructors to regard the break- ing down of the power of the great families as the task of his life. In this he was walking in the same direction as Pitt was walking. If the two men could have worked together in the same direction, England might have been spared many misfortunes. Unhappily, the king could not under- stand Pitt's higher qualities, his bold confidence in the popular feeling, and his contempt for corruption and intrigue. And yet the king's authority was~~

~~indispensable to Pitt, if he was to carry on his conflict against the great families with success. When the war came to an end, as it must come to an end sooner or later, Pitt's special pre- dominance, derived as it was from his power of breathing a martial spirit into the fleets and armies of England, would come to an end too. Only the king, with his hold upon the traditional instincts of loyalty and the force of his still unimpaired prerogative, could, in ordinary times, hold head against the wealthy and influential aristocracy. Unfortunately, George III. was not wise enough to deal with the difficulty in a high-minded fashion. With a well- intentioned but narrow mind, he had nothing in him to strike the imagination of his subjects. He met influence with influence, corruption with corruption, intrigue with intrigue. Unhappily, too, his earliest relations with Pitt in- volved a dispute on a point on which he was right and Pitt was wrong. In 1761 Pitt resigned oflice, because neither the king nor the cabinet were willing to declare war against Spain in the midst of the war with France. As the war with Spain was inevitable, and as, when it broke out in the following year (1762), it was followed by triumphs for which Pitt had prepared the way, the prescience of the great war-minister appeared to be fully established. But it was his love of war, not his skill in carrying it on, which was really in question. He would be satisfied with nothing short of the absolute ruin of France. He would have given England that dangerous position of supremacy which was gained for France by Lewis XIV. in the 17th century, and by Napoleon in the 19th century. He would have made his country still more haughty and arrogant than it was, till other nations rose against it, as they have three times risen against France, rather than submit to the intolerahe yoke. It was a happy thing for England that peace was Ygned (1763).~~

~~Even as it was, a spirit of contemptuous disregard of the rights of others had been roused, which would not be~~

~~George lil.~~

~~Pitt's re- signation,~~

~~Bute and Grenville~~

~~Suppres- sion of contra- band trade in America.~~

~~The Stamp Act.~~

~~THE QUARREL WITH AMERICA. |~~

~~easily allayed. The king's premature attempt to secure a prime minister of his own choosing in Lord Bute (1761 came to an end through the minister's incapacity (1763). George Grenville, who followed him, kept the king in leading-strings in reliance upon his parliamentary majority. Something, no doubt, had been accomplished by the in- corruptibility of Pitt. The practice of bribing members of parliament by actual presents in money came to an end, though the practice of bribing them by place and pension long continued. The arrogance which Pitt displayed towards foreign nations was displayed by Grenville towards classes of the population of the British dominions. It was enough for him to establish a right. He never put him- self in the position of those who were to suffer by its being put in force.~~

~~The first to suffer from Grenville's conception of his duty were the American colonies. The mercantile system which had sprung up in Spain in the 16th century held that colonies were to be entirely prohibited from trading, except with the mother country. Every European country had adopted this view, and the acquisition of fresh colonial dominions by England, at the peace of 1763, had been made not so much through lust of empire as through love of trade. Of all English colonies, the American were the most populous and important. Their proximity to the Spanish colonies in the West Indies had naturally led to a contrabrand trade. To this trade Grenville put a stop, as far as lay in his power.~~

~~_ Obnoxious as this measure was in America, the colonists had acknowledged the principle on which it was founded too long to make it easy to resist it. Another step of Gren- ville's met with more open opposition. Even with all the~~

~~experience of the century which followed, the relations~~

~~Resist- ance in America,~~

~~The Rocking- ham ministry.~~

~~The De- claratory Act and Tepeal of Stamp Act,~~

~~between a mother country and her colonies are not easy to arrange. If the burthen of defence is to be borne in common, if can hardly be left to the mother country to declare war, and to exact the necessary taxation, without the consent of the colonies. If, on the other hand, it is to be borne by the mother country alone, she may well complain that she is left to bear more than her due share of the weight. The latter alternative forced itself upou the attention of Grenville. The British parliament, he held, was the supreme legislature, and, as such, was entitled to raise taxes in America to support the military forces needed for the defence of America. The Act (1765) im- posing a stamp tax on the American colonies was the result, .~~

~~_ As might have been expected, the Americans resisted. For them, the question was precisely that which Hampden had fought out in the case of ship-money. As far as they were concerned, the British parliament had stepped into the position of Charles I. If Grenville had remained in office he would probably have persisted in his resolution. He was driven from his post by the king's resolution no longer to submit to his insolence.~~

~~A new ministry was formed under the marquis of Rockingham, composed of some of those leaders of the Whig aristocracy who had not followed the Grenville ministry. They were well-intentioned, but weak, and without political ability; and the king regarded them with distrust, only qualified by his abhorrence of the ministry which they superseded.~~

~~As soon as the bad news came from America, thie ministry was placed between two recommendations. Gren- ville, on the one hand, advised that the tax should be enforced. Pitt, on the other, declared that the British parliament had absolutely no right to tax America, though he held that it had the right to regulate, or in other words to tax, the~~

~~commerce of America for the benefit of the British merchant and manufacturer. Between the two~~

~~ENGLAND~~

~~Bot~~

~~the Government took a middle course. parliament a total repeal of the Stamp Act, but it also passed a Declaratory Act, claiming for the British parlia- ment the supreme power over the colonies in matters of taxation, as well as in matters of legislation.~~

~~It is possible that the course thus adopted was chosen simply because it was a middle course. But it was pro- bably suggested by Edmund Burke, who was then Lord~~

~~It obtained from~~

~~Burke's~~

~~Rockingham's private secretary, but who for some time to Political come was to furnish thinking to the party to which he tery:~~

~~attached himself. Burke carried into the world of theory those politics of expediency of which Walpole had been the practical originator. He held that questions of abstract right had no place in politics. It was therefore as absurd to argue with Pitt that England had a right to regulate commerce, as it was to argue with Grenville that England had a right to levy taxes. All that could be said was that it was expedient in a wide-spread empire that the power of final decision should be lodged somewhere, and that it was also expedient not to use that power in such a way as to irritate those whom it was the truest wisdom to conciliate.~~

~~The weak side of this view was the weak side of all.Argu-~~

~~Burke's political philosophy. Like all great innovators, he was intensely conservative where he was not an advocate of change. With new views on every subject relating to the exercise of power, he shrunk even from~~

~~entertaining the slightest question relating to the distribu- tion of power. He recommended to the British parliament the most self-denying wisdom, but he could not see that in its relation to the colonies the British parliament was so constituted as to make it entirely unprepared to be either wise or self-denying. It is true that if he had thought out the matter in this direction he would have been led further than he or any other man in England or America was at that time prepared to go. If the British parliament was unfit to legislate for America, and if, as was undoubtedly the case, it was impossible to create a representative body which was fit to legislate, it would follow that the American colonies could only be fairly governed as practically independent states, though they might possibly remain, like the great colonies of our own day, in a position of alliance rather than of dependence. It was because the issues opened led to changes so far greater than the wisest statesman then perceived, that Pitt's solution, logi- cally untenable as it was, was preferable to Burke's. Pitt would have given bad reasons for going a step in the right direction. Burke gave excellent reasons why those who were certain to go wrong should have the power to go right.~~

~~ca were the measures relating to America passed when the king turned out the ministry. The new minis- try was, formed by Pitt, who was created Lord Chatham (1766), on thé principle of bringing together men who had shaken themselves loose from any of the different Whig cliques. Whatever chance the plan had of succeed- ing was at an end when Chatlhiam's mind temporarily gave way under stress of disease (1767). Charles Townshend, a brilliant headstrong man, led parliament in the way which had been prepared by the Declaratory Act, and laid duties on tea and other articles of commerce entering the ports of America,~~

~~It was impossible that the position thus claimed by the British parliament towards America should affect America alone.~~

~~ments of Pitt and Burke.~~

~~Ministry of Lord Chatham.~~

~~The tea duties,~~

~~The habit of obtaining money otherwise than by Home:~~

~~the consent of those who are required to pay it would be pulitics,~~

~~certain to make parliament careless of the feelings and interests of that great majority of the population at home which was unrepresented in parliament. The resistance of America to the taxation imposed was therefore not with-~~

~~Wilkes and The North Briton.~~

~~Middle- sex elec- tion.~~

~~Lord North and the new Tories.~~

~~Divisions in the Opposi- tion,~~

~~Coercion in America,~~

~~The Ameri- can Wal.~~

~~out benefit to the natives of the mother-country. Already there were signs of a readiness in parliament to treat even the constituencies with contempt. In 1763, in the days of the Grenville ministry, Join Wilkes, a profligate and scurrilous writer, had been arrested on a general warrant, —that is to say, a warrant in which the name of no individual was mentioned,—as the author of an alleged libel on the king, contained in No. 45 of Zhe North Briton. He was a member of parliament, and as such was declared by Chief Justice Pratt to be privileged against arrest. In 1768 he was elected member for Middlesex. The House of Commons expelled him. He was again elected, and again expelled. The third time the Commons gave the seat to which Wilkes was a third time chosen to Colonel Lutrell, who was far down in the poll. Wilkes thus became the representative of a great constitutional~~

~~prin- ciple, the principle that the electors have a right to choose their representatives without restriction saving by the regulations of the law.~~

~~For the present the contention of the American colonists and of the defenders of Wilkes at home was confined within the compass of the law. Yet in both cases it might easily pass beyond that compass, and might rest itself upon an appeal to the duty of Governments to modify the law and to enlarge the basis of their authority, when law and authority have become too narrow.~~

~~As regards America, though Townshend died, the Government persisted in his policy. As resistance grew stronger in America, the king urged the use of compulsion. If he had not the wisdom of the country on his side, he had its prejudices. The arrogant spirit of Englishmen mide them contemptuous towards the colonists, and the desire to thrust taxation upon others than themselves made the new colonial legislation popular. In 1770 the king made Lord North prime minister. He had won the object on which he had set his heart. A new Tory party had spring up, not distinguished, like the Tories of Queen Anne's reign, by a special ecclesiastical policy, but by their acceptance of the king's claim to nominate ministers, and so to predominate in the ministry himself.~~

~~Unhappily the Opposition, united in the desire to con- ciliate America, was divided on questions of home policy. Chatham would have met the new danger by parliamentary reform, giving increased voting power to the freeholders of the counties. Burke from principle, and his noble patrons mainly from lower motives, were opposed to any such change, As Burke had wished the British parliament to be supreme over the colonies, in confidence that this supremacy would not be abused, so he wished the great land-owning connec- tion resting on the rotten boroughs to rule over the unre- presented people, in confidence that this power would not be abused. Amidst these distractions the king had an easy game to play. He had all the patronage of the Government in his hands, and beyond the circle which was influenced by gifts of patronage he could appeal to the ignorance and self-seeking of the nation, with which, though he knew it not, he was himself in the closest sympathy.~~

~~**No wonder resistance grew more vigorous in America. In 1773 the inhabitants of Boston threw ship-loads of tea into the harbour rather than pay the obnoxious duty. In 1774 the Boston Port Bill deprived Boston of its com- mercial rights, whilst the Massachusetts Government Bill took away from that colony the ordinary political liberties of Englishmen. 'The first skirmish of the inevitable war was fought at Lexington in 1775. In 1776 the thirteen colonies united in the Congress issued their Declaration of Independence. England put forth all its strength to beat down resistance. She increased her armies by hirelings bought from the German princes. But not only did no military genius appear on the English side, but the**~~

~~**distance across the Atlantic was so great, and the immense spaces of even the settled part of the American continent**~~

~~**were so large, that it was impossible to effect that conquest**~~

~~**which seemed so easy at a distance. The difficulties of**~~

~~**the Americans, too, were enormous, but they had the advan-**~~

~~**tage of being at home; and in Washington they found a**~~

~~**leader worthy of the great cause for which he fought. In**~~

~~**1777 a British army under Burgoyne capitulated at Saratoga ; and in the same year France, eager to revenge France the disasters of the Seven Years' War,, formed an alliance supports with the revolted colonies as free and independent states, "@e™%% and was soon joined by Spain.**~~

~~**Chatham, who was ready to make any concession to America short of independence, and especially of independ ence at the dictation of France, died in 1778. The war Endof was continued for some years with varying results ; but in the war. 1781 the capitulation of a second British army under Cornwallis at York Town was a decisive blow, which brought home to the minds of the dullest the assurance that the conquest of America was an impossibility.**~~

~~Before this event happened there had been a great~~

~~change in public feeling in England. The increasing weight of taxation gave rise in 1780 to a great meeting of the freeholders of Yorkshire, which in turn gave the signal for a general agitation for the reduction of unnecessary ex- pense in the government. To this desire Burke gave expression in his bill for economical reform, though he was unable to carry it in the teeth of interested opposition. The movement in favour of economy was necessarily also a movement in favour of peace ; and when the surrender of York Town was known (1782), Lord North at once resigned office.~~

~~The new ministry formed under Lord Rockingham The comprised not only his own immediate followers, of whom second the most prominent was Charles Fox, but the followers of oka Chatham, of whom Lord Shelburne was the acknowledged ministry. leader. A treaty of peace acknowledging the independence of the United States of America was at once set on foot ; and the negotiation with France was rendered easy by the defeat of a French fleet by Rodney, and by the failure of the combined forces of France and Spain to take Gibraltar.~~

~~Already the ministry ou which such great hopes had Strugzle been placed had broken up. Rockingham died in July between 1782. The two sections of which the Government was oe composed had different aims. The Rockingham section, ang Fox. which now looked up to Fox, rested on aristocratic con- nection and influence ; the Shelburne section was anxious to gain popular support by active reforms, and to gain over the king to their side. Judging by past experience, the combination might well seem hopeless, and honourable men like Fox might easily regard it with suspicion. But Fox's allies took good care that their name should not be associated with the idea of improvement. They pruned Burke's Economical Reform Bill till it left as many abuses as it suppressed; and though the bill prohibited the grant of pensions above £300, they hastily gave away pensions of much larger value to their own friends before the bill had received the royal assent. They also opposed a bill for parliameatary reform brought in by young William Pitt. When the king chose Shelburne as prime minister, they refused to follow him, and~~

~~put forward the incompetent duke of Portland as their candidate for the office. The struggle was thus renewed on the old ground of the king's right to select his ministers. But while the king now put forward a minister notoriously able and competent to the task, his opponents put forward a man whose only claim to office was the possession of large estates. They forced their way back to power by means as unscrupulous as their claim to it was unjustifiable.~~

~~They formed a coalition with Lord North whose politics~~

~~The cca- lition~~

~~PITT AND TIE COALITION. | ENGLAND 309~~

~~and character they had denounced for years. The coali- tion, as soon as the peace with America and France bad been signed (1783), drove Shelburne from office. The duke of Portland became the nominal head of the Govern- ment, Fox and North its real leaders.~~

~~Such a ministry could not afford to make a single blun- der. The king detested it, and the assumption by the Whig houses of a right to nominate the head of the Government without reference to the national interests could never be popular. The blunder was soon committed. Burke, hating wrong and injustice with a bitter hatred, had descried in~~

~~TheIndia the government of British India by the East India Company~~

~~Bill,~~

~~Pitt's ministry,~~

~~a disgrace to the English name. For many of the actions of that government no honourable man can think of uttering a word of defence. The helpless natives were oppressed and robbed by the Company and its servants in every possible way. Burke drew up a bill, which was adopted by the coalition Government, for taking all authority in India out of the hands of the Company, and even placing the Company's management of its own commercial affairs under~~

~~control. The governing and controlling body was naturally to be acouncil appointed at home. The question of the nomination of this council at once drew the whole question within the domain of party politics. The whole patronage of India would be in its hands, and, as _parlia- ment was then constituted, the balance of parties might be more seriously affected by the distribution of that pa- tronage than it would be now. When, therefore, it was understood that the Government bill meant the council to be named in the bill for four years, or, in other words, to be named by the coalition ministry, it was generally regarded as an unblushing attempt to turn a measure for the good government of India into a measure for securing the ministry in office. The bill of course passed theCommons. When it came before the Lords, it was thrown out in consequence of a message from the king that he would regard any one who voted for it as his enemy.~~

~~The contest had thus become one between the inflnence of the crown and the influence of the great houses. Con- stitutional historians, who treat the question as one of merely theoretical politics, leave out of consideration this essential element of the situation, and forget that, if it was wrong for the king to influence the Lords by his mes- sage, it was equally wrong for the ministry to acquire for themselves fresh patronage with which to influence the Com- mons. But there was now, what there had not been in the time of Walpole and the Pelhams, a public opinion ready to throw its weight on one side or the other. The county members still formed the most independent portion of the representation, and there were many possessors of rotten boroughs who were ready to agree with the county mem- bers rather than with the great landowners, In choosing Pitt, the young son of Chatham, for his prime minister, as soon as he had dismissed the coalition, George III. gave assurance that he wished his counsels to be directed by integrity and ability. After a strnggle of many weeks, parliament was dissolved (1784), and the new House of Commons was prepared to support the king's minister by a large majority.~~

~~As far as names go, the change effected placed in office the new Tory party for an almost uninterrupted period of forty-six years. It so happened, however, that after the first eight years of that period had~~

~~passed by, circum- stances occurred which effected so great a change in the composition and character of that party as to render any statement to this effect entirely illusive. During eight years, however, Pitt's ministry was not merely a Tory ministry resting on the choice of the king, but a Liberal ministry resting on national support and upon advanced political knowledge.~~

~~The nation which Pitt had behind him was very differeut Material from the populace which had assailed Walpole's Excise Progress. Bill, or had shouted for Wilkes and liberty. At the beginning of the century the intellect of thoughtful Englishmen had applied itself to speculative problems of religion and philosophy. In the middle of the century it applied itself to practical problems affecting the employ- ment of industry. In 1776 Adam Smith published the Wealth of Nations. Already in 1762 the work of Brindley, the Bridgewater canal, the first joint of a net- work of inland water communication, was opened. In.. 1767 Hargreaves produced the spinning-jenny; Arkwright's spinning machine was exhibited in 1768 ; Crompton's mule was finished in 1779; Cartwright hit upon the idea of the power-loom in 1784, though it was not brought into profitable use till 1801. The Staffordshire potteries had . been flourishing under Wedgwood since 1763, and the improved steam-engine was brought into shape by Watt in 1768. During these years the duke of Bedford, Coke of Holkham, and Robert Bakewell were busy in the improve- ment of stock and agriculture.~~

~~The increase of wealth and prosperity caused by these changes went far to produce a large class of the population entirely outside the associations of the landowning class, but with sufficient intelligence to appreciate the advantages of a government carried on without regard to the personal interests and rivalries of the aristocracy. The mode in which that increase of wealth was effected was even more decisive on the ultimate destinies of the country.~~

~~The substitution of the organization of hereditary monarchy for the organization of wealth and station would ultimately have led to evils as great as those which it superseded. It was only tolerable as a stepping-stone to the organization of intelligence. The larger the numbers~~

~~admitted to in- fluence the affairs of state, the more necessary is it that they respect the powers of intellect. It would be foolish to institute a comparison between an Arkwright or a – Crompton and a Locke or a Newton. But it is certain that for one man who could appreciate the importance of the treatise On the Human Understanding or the theory of gravitation, there were thousands who could understand the value of the water-frame or the power-loom, The habit of locking with reverence upon mental power was fostered in no slight measure by the industrial development of the second half of the 18th century.~~

~~The supremacy of intelligence in the political world was, Pitt's _ for the tirae, represented in Pitt. In 1784 he passed an India Bill. India Bill, which left the commerce and all except the highest patronage of India in the hands of the Mast India Company, but which erected a department of the home Government named the Board of Control to compel the Com- pany to carry out such political measures as the Government saw fit. A bill for parliamentary reform was, however, His thrown out by the opposition of his own supporters in parlia- en of ment, whilst outside parliament there was no general desire cet for a change in a system which for the present produced reform. such excellent fruits. Still more excellent was his plan of His deal- legislation for Ireland. Irishmen had taken advantage of ings with the weakness of England during the American war to Treland. enforce upon the ministry of the day, n 1780 and 1782, an abandonment of all claim on the part of the English Government and the English judges to interfere in any way with Irish affairs. From 1782, therefore, there were two independent legislatures within the British Isles,—the one sitting at Westminster and the other sitting in Dublin.~~

~~With these political changes Fox professed himself to be content. Pitt, whose mind was open to wider considera- tions, proposed to throw open commerce to both nations by removing all the restrictions placed on the trade of Ireland with England and with the rest of the world. The opposi-~~

~~Commer- °~~

~~cial treaty with France.~~

~~The Re-~~

~~gency Bill.~~

~~360~~

~~tion of the English parliament was only removed by conces- sions continuing some important restrictions upon Irish ex- ports, and by giving the English parliament the right of ini- tiation in all measures relating to the regulation of the trade which was to be common to both nations. The Irish parlia- ment took umbrage at the superiority claimed by England, and threw out the measure as an insult, which, even as it stood, was undeniably in favour of Ireland. The lesson of the incompatibility of two co-ordinate legislatures was not thrown away upon Pitt.~~

~~In 1786 the commercial treaty with France opened that country to English trade, and was the first result of the theories laid down by Adam Smith ten years previously. The first attack upon the horrors of the slave-trade was made in 1788 ; and in the same year, in the debates on the Regency Bill caused by the king's insanity, Pitt defended against Fox the right of parliament to make provision for the exercise of the powers of the crown when the wearer was permanently or temporarily disabled from exercising his authority.~~

~~The king | When the king recovered, he went to St Paul's to return~~

~~at St Paul's.~~

~~The French Revolu- tion,~~

~~thanks, on the 23d of April 1789. The enthusiasm with which he was greeted showed how completely he had the nation on his side. All the hopes of liberal reformers were now othis side. All the hopes of moral and religious men were on his side as well. The seed sown by Wesley had grown to bea great tree. A spirit of thoughtfulness in religious matters and of moral energy was growing in the nation, and the king was endeared to his subjects as much by his domestic virtues as by his~~

~~support of the great minister who acted in his name. The happy prospect was soon to be overclouded. On the 4th of May, eleven days after the appearance of George IIT. at St Paul's, the French States General met at Versailles.~~

~~By the great mass of intelligent Englishmen the change was greeted with enthusiasm. It is seldom that one nation understands the tendencies and difficulties of another ; and the mere fact that power was being transferred from an absolute monarch to a representative assembly led super- ficial observers to imagine that they were witnessing a mere repetition of the victory of the English parliament over the Stuart kings. In fact, that which was passing in France was of a totally different nature from the English struggle of the 17th century. In England, the conflict had been carried on for the purpose of limiting the power of the king. In France, it was begun in order to sweep away au aristocracy in church and state which had become bar barously oppressive. It was not therefore a conflict touch- ing simply on the political organization of the state. The whole social organization of the country was at stake, and the struggle would be carried on at every point of the territory, and would involve every class of society. In such a conflict, therefore, there was nothing necessarily antagonistic to the maintenance of the most absolute royal power. If there had been a king on the throne who had understood the needs of the times, and who could have placed himself without afterthought at the head of the national movement, he would have been stronger for all good purposes than Lewis XIV. liad ever been. Un- happily, it was not in Lewis XVI. to do anything of the kind. Well intentioned and desirous to effect the good of his people, he was not clear-headed enough to understand how it was to be done, or strong-willed enough to carry out any good resolutions to which he might be brought. The one thing impossible for a king was to be neutral in the great division which was opening in French society ; and Lewis was too much a creature of habit to throw off the social ties which united him to the aristocracy. It was the knowledge that the king was in heart on the wrong side that made his continuance to rule impossible. Un-**

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doubtedly the best thing that tle French could have done, after the king's leanings were known, would have been to dethrone him. But this was not a step which any nation was likely to take in a hurry; and the constitution drawn up by the States General after it passed into the form of the National Assembly was necessarily grounded on suspicion. The one indispensable requisite for the working of a constitution is that it shall be possible to maintain a certain degree of harmony between the various func- tionaries who are intrusted with the work. Such a harmony was impossible between Lewis and the French nation. Amongst the higher order of minds there might be a desire for liberty, and the word liberty was on the lips of every one. But the thought of liberty was rarely to be found. It was by the passion of equality that the nation was possessed. For the new spirit it was necessary to find new institutions. The old ones had broken down from absolute rottenness, and if they had been other than they were, they were certain to be used on the anti- national side. The force must be given to the nation, not to the aristocracy—not to the king, the ally of the aristocracy. Yet all this had to be done when the mass of the nation was rude and uneducated, ignorant and unversed in political life to the last degree, and when, too, it had been taught by the long course of monarchial government to see force placed above right, and was there- fore all the more inclined to solve its difficulties by force. What wonder, therefore, if violence took the place of argument, if mob-rule stepped in to enforce the popular over the unpopular reasoning, and the king soon found that he was practically.a prisoner in the hands of his subjects.

In proportion as the French Revolution turned away English from the path which English ignorance had marked out for feeling.

it, Englishmen turned away from it in disgust. As they did not understand the aims of the French Revolutionists, they were unable to make that excuse for even so much of their conduct as admits of excuse. Three men, Fox, Burke, and Pitt, however, represented three varieties of opinion into which the nation was very unequally divided.

Fox, generous and trustful towards the movements of View of

~~large masses of men, had very little intellectual grasp of the questions at issue in France. He treated the strnggle as one simply for the establishment of free institutions ; and when at last the crimes of the leaders became patent to the world, he contented himself with lamenting the unfortunate fact, and fell back on the argument. that though England could not sympathize with the French tyrants, there was no reason why she should go to war with them.~~

~~Burke, on the other hand, while he failed to understand the full tendency of the Revolution for good as well as for evil, understood it far better than any Englishman of that day understood it. He saw that its main aim was equality, not liberty, and that not only would the French nation be ready, in pursuit of equality, to welcome any tyranny which would serve its purpose, but would be the more prone to acts of tyranny over individuals from the complete remodelling of institutions, with the object of giving immediate effect to the will of the ignorant masses, which was especially liable to be counterfeited by designing and unscrupulous agitators. There is no doubt that in all this Burke was in the right, as he was in his denunciation of the mischief certain to follow when a nation tries to start afresh, and to blot out all past progress in the light of simple reason, which is often most fallible when it believes itself to be most.infallible. Where he went wrong was in his ignorance of the special circumstances of the French nation, and his consequent blindness to the fact that the historical method of gradual progress was impossible where institutions had become so utterly bad as they were in~~

~~Fox,~~

~~of Burke,~~

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~~tion. But the great landowners, who contributed su strong Division an element in it, composed the very class which had most of the~~

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~~France, and that consequently the system of starting afresh, to which he reasonably objected, was to the French a~~

~~THE FRENCH REVOLUTION. |~~

~~The old Whig~~

~~and of Pitt occupied ground apart from either Fox or Burke. against France; but he sought to a set a limit to her con- Pitt. He had neither Fox's sympathy for popular movements quests in the winter, though he had not sought to set a nor Burke's intellectual appreciation of the immediate | limit to the conquests of the coalesced sovereigns in the tendencies of the Revolution. Hence, whilst he pronounced preceding summer. He treated with supercilious contempt against any active interference with France, he was an | the National Convention, which had dethroned the king advocate of peace, not because he saw more than Fox or | and proclaimed a republic. Above all, he took up a declar- Burke, but because he saw less. He fancied that France | ation by the Convention, that they would give help to all would be so totally occupied with its own troubles that peoples struggling for liberty against their respective it would cease for a long time to be dangerous to other | Governments, as a challenge to England. The horrors nations. A resolution formed on grounds so hopelessly | caused in England by the trial and execution of Lewis XVI. futile was not likely to stand the test of time. completed the estrangement between the two countries, and CoMlition © Even if France had been spared the trial of external though the declaration of war came from France (1793), it agains; pressure, it is almost certain that she would have roused | had been in great part brought about by the bearing of France, resistance by some attempt to maintain her new principles | England and its Government. | abroad. When the king of Prussia coalesced with the In appearance the great Whig landowners gave their sup- Pitt emperor in 1792 to force her to re-establish the royal | port to Pitt, and in 1794 some of their leaders, the duke 24 the authority, she broke out into a passion of self- asserting | of Portland, Lord Fitzwilliam, and Mr Wyndham, entered Victories defiance. The king was dethroned, and preparations were | the cabinet to serve under him. In reality it was Pitt who " a made to~~

~~try him for his life as an accomplice of the | had surrendered. The ministry and the party by which P 'invaders. A republic was proclaimed, and in its name | it was supported might call themselves Tory still. But innocent persons, whose only crime was to belong to the | the great reforming policy of 1784 was entirely at an end, noble class by birth and feeling, were massacred by hun- | Strong as it was, the Government did not know its own Violence dreds. The grim suspicion which clothed itself with strength. It saw sedition and revolution everywhere. It of the cruelty in the capital became patriotic resistance on the | twisted loosetalk into criminal intent, It covered the country frontier. Before the end of the year the invasion was re- | with its spies, The slightest attempt to concert measures pulsed, Savoy occupied, the Austrian Netherlands overrun, | for obtaining reform were branded as revolutionary and the Dutch republic threatened. violence. Men who would otherwise have been content with oo Very few Governments in Europe were so rooted in the declaiming in favour of reform were goaded into actual sedi- tia -- affections of their people as to be able to look without | tion. The Government sought and obtained additional Englana, '@tror on the challenge thus thrown out to them. The powers from parliament. Fine, imprisonment, and trans-~~

~~matter not of choice but of necessity. Nor did he see that the passion for equality, like every great passion, justified itself, and that the problem was, not how to obtain liberty in defiance of it, but how so to guide it as to obtain liberty by it and through it.~~

~~Burke did not content himself with pointing out speculatively the evils which he foreboded for the French, He perceived clearly that the effect of the new French principles could no more be confined to French territory than the principles of Protestantism in the 16th century could be confined to Saxony. He knew well that the appeal to abstract reason and the hatred of aristocracy would spread over Europe like a flood, and, as he was in the habit of considering whatever was most opposed to the object of his dislike to be wholly excellent, he called for a crusade of all established Governments against the anarchi- cal principles of dissolution which had broken loose in France.~~

~~English Government was one of those very few. No mere despotism was here exercised by the king. No broad im- passable line here divided the aristocracy from the people. The work of former generations of Englishmen had been too well done to call for that breach of historical continuity which was a dire necessity in France. There was much need of reform. There was no need of a revolution. The whole of the upper and middle classes, with few exceptions, clung together in a fierce spirit of resistance ; and the mass of the lower. classes, especially in the country, were too well off to wish for change. The spirit of resistance to revolution quickly developed into a spirit of resistance to reform, and those who continued to advocate changes more or less after the French model were treated as the enemies of mankind. A fierce hatred of France and of all that attached itself to France became the predominating spirit of the nation.~~

~~Such a change in the national mind could not but affect the constitution of the Whig party. The reasoning of Burke would, in itself, have done little to effect its disrup-~~

~~to fear from the principles of the Revolution.~~

~~questions which had divided them from the king and Pitt?"~~

~~in 1783 had dwindled into nothing before the appalling question of the immediate present. They made themselves the leaders of the war party, and they knew that that party comprised almost the whole of the parliamentary classes. What could Pitt do but surrender? The whole of the intellectual basis of his foreign policy was swept away when it became evident that the Continental war would bring with it an accession of French territory. He did not abandon his opinions. His opinions rather abandoned him. A wider intelligence might have held that, let France gain what territorial aggrandizement it might upon the Con- tinent, it was impossible to resist such changes until the opponents of France had so purified themselves as to obtain a hold upon the moral feelings of mankind. Pitt could uot take this view; perhaps no man in his day could be fairly expected to take it. He did not indeed declare war~~

~~portation were dealt out by the law courts in lavish mea- sure. The Reign of Terror in France was answered by a reign of violence in England, modified by the political habits of a nation trained to freedom, but resting on the same spirit of fear and intolerance. In November 1794 an attempt 'was made actually to shed blood. Hardy, Horne Tooke, and Thelwall were brought to trial, on a charge of high treason, for issuing invitations to a national convention intended to promote changes of the greatest magnitude in the government. Happily the jury refused to see in this certainly dangerous proceeding a crime worthy of death, and its verdict of Not guilty saved the nation from the disgrace of meting out the extreme penalty of high treason to an attempt to hold a public meeting for the redress of grievances.~~

~~The public feeling, in fact, regained its composure sooner than the ministry. The upper and middle classes became conscious of their own strength; and though~~

~~'reform and reformers were as unpopular as ever, the instru-~~

~~ments by which reform might be gained hereafter were left VIII, — 46~~

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~~plaints of the sailors; whilst an unreasonable mutiny at the Mutiny Nore was suppressed by firmness in resistance. A renewed in the~~

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~~untouched for the use of a future generation. The Sedition and Treason Bills, passed in 1795, were limited in their~~

~~Litt as In the meanwhile, Pitt's management of the war was | because, though the English were this time ready to awar leading, as far as the Continent was concerned, to failure | abandon the Netherlands to France, they were not ready to minister. ror failure. Nothing else was possible. He had none of | give back the Cape of Good Hope to the~~

~~Dutch and the abilities of a war minister, and his system of sending | Trinidad to Spain. Before the end of the year England detached expeditions to various points was not calculated | had no ally in Europe excepting Portugal. Bonaparte had to attain success. Nor is it likely that, even if he had | dictated to Austria the treaty of Campo Formio. been more competent in this respect, he would have accom- Isolated as Great Britain was, there was less inclination England plished anything worthy of the efforts which he put forth. | to make peace in England in 1798 than there had been in Without Tt has been said that if he had roused the passions of men, | 1795. In proportion as France fell into the hands of the a and had proclaimed a holy war upon the Continent, he | less violent but more corrupt of the Revolutionists, the would have had a better chance of gaining his ends, But | enthusiasm which her proclamation of principles had once passions cannot be artificially excited, and a holy war pre- | created amongst the class excluded from political power supposes a cause which, if it is not holy in itself, will at | died away; whilst the antagonism aroused by mere mili- least be supposed by men to be so. Except under special | tary conquest under the conduct of the rapacious Bonaparte circumstances, however, it was impossible to rouse enthu- | was on the increase. The attempt at invasion had roused siasm against the French republic. Toulon might be | the national spirit to stubborn resistance; whilst. the succoured and abandoned in 1793; La Vendée might have | Government itself, warned by the failure of the proceed- fallacious hopes held out to it in 1794. Frenchmen who | ings against Hardy and his associates, and freed from the were shocked at the habitual employment of the guillotine | blind terror which had made it violent during the first were yet not inclined to rise at the bidding of a foreign | years of the war, was able to devote its energies unre- invader against a Government which at all events stood | servedly to carrying on hostilities. manfully up for the integrity of French territory, whilst If, however, a French invasion had ever been anything State of the long habit of submission to absolute rule had made | more than a dream, it was because there was one quarter Ireland. the nation slow to take the conduct of affairs into its own | in which misgovernment had created a state of circum- hands. The middle classes on the Continent too were on | stances by which it was absolutely invited. At the end the side of the peasants, and looked to~~

~~French principles | of 1794 Lord Fitzwilliam had been sent to Ireland as lord- if not to French armies as offering an amelioration of their | lieutenant, and had set his face against the vile jobbery French lot. The Austrian Netherlands, regained from France in | through which the leaders of the Protestant minority~~

~~duration, and were never actually put in force.~~

~~successes 1793, were reconquered by France in 1794; and a British~~

~~on Jand.~~

~~English~~

~~successes dg enough to insure her own safety.~~

~~force under the duke of York did nothing to avert the misfortune. The land was annexed to the territory of the French republic. Early in 1795 the Dutch Netherlands were revolutionized and constituted into a republic in alliance with France, In the same year Prussia made peace with France. Austria continued the contest alone, receiving large sums of money from England, and doing very little in return. .~~

~~If England could do little for the Continent, she could Howe's victory of~~

~~attempt to negotiate peace at Lille had ended in failure, fleet.~~

~~governed Ireland, and had thrown himself warmly into the encouragement of Grattan's scheme for the admission of the Catholics to political power. The aggrieved jobbers gained the ear of the king, and in 1795 Fitzwilliam was recalled. Then ensued a scene which has no parallel even in the organized massacres of the French Republic. The Catholics, joined in a society called the United Irishmen, to enforce their claims, if need be by an alliance with France, and the establishment of an independent republic. Deeds of violence preluded any actual attempt at insurrection. The Protestants, under the name of Orangemen, gathered~~

~~at sea. the 1st of June (1794) inflicted the first of a long series of | to the support of the Government as yeomanry or militia- defeats on the French navy. An attempt in 1795 to sup- | men. Before long these guardians of the peace had spread port the French royalists by a landing in Quiberon Bay | terror over all Catholic Ireland. By the lash, by tor- ended in failure, but Ceylon and the Cape of Good Hope | ture, by the defilement of chaste and innocent women, were taken from the Dutch. The war, however, had become | they made their predominance felt. It was in 1796, SO expensive, and its results were evidently so small, | in the very midst of these abominable horrors, that that there was a growing feeling in England in favour of | French ships had appeared but had been unable to land peace, especially as the Reign of Terror had come to an | troops in Bantry Bay. Nevertheless, though no assistance The Irish end in 1794, and a regular Government, the Directory, had | was to be had, the United Irishmen rose in rebellion in rebellion. been appointed in 1795. Accordingly, in 1796 Lord | 1798. The rebellion was suppressed, and again the Malmesbury was sent to France to treat for peace; but the } militiamen and volunteers were let loose to establish order negotiation was at once broken off by his demand that | by massacre and violence. Fortunately, the English France should abandon the Netherlands. Government intervened, and a new lord-lieutenant, the Hoche's The French Government, buoyed up by the successes | marquis of Cornwallis, was sent over to Dublin. The eel of General Bonaparte, who was driving the Austrians out | raging Protestant aristocracy was held back from further ton in ° 1 Baitry of Italy, resolved to attempt an invasion of Ireland. In | deeds of cruelty and vengeance, and law and order were Bay. December a French fleet, with Hoche on board, sailed for | established so far as it was possible to establish them in a Bantry Bay. Only part of it arrived there, and retreated | land so torn by hostile factions. : without effecting anything. A smaller force, landing in Pitt rose to the occasion. He planned a great scheme The ____ Pembrokeshire, was reduced to surrender. of union between the two nations (1799). There was to Union. iy pee The French attempted to renew the enterprise in the | be one parliament for Great Britain and Ireland, as there Vincent following year. Spain was now in alliance with France, | was one parliament for England and Scotland. The and Cam- 24d it was proposed that a Spanish fleet should join the |~~

~~jobbers who filled the seats in the Irish House of perdown. French fleet and the Dutch fleet for a joint invasion. | Commons, and who voted in the name of a people whom~~

~~Jervis defeated the Spanish fleet at St Vincent, and Duncan defeated the Dutch fleet at Camperdown (1797). During the same year a mutiny in the fleet at Spithead and St Helens was quieted by concessions to the reasonable com-~~

~~they in no sense represented, joined the few members who from a sense of patriotism refused to vote away so easy a source of wealth and influence. Pitt bought the votes which he could not command, and the Irish parlia-~~

~~Pitt's fesigna- tion.~~

~~Battle of the Nile. The second coalition.~~

~~Claim to the right of search.~~

~~Adding. ton's ministry,~~

~~The 'peace of Amiens.~~

~~Renewal °~~

~~of the war,~~

~~ment, on these ignoble terms, consented to extinguish itself (1800). It depended on the English Government whether this change, by which Ireland lost the semblance of national independence, should be followed by a step in advauce for that country in a serious attempt to diminish the evils of Protestant supremacy. That step Pitt had pledged himself to take, and in 1801 he had prepared a measure for admitting the Catholics to political power. The king stood in the way, and Pitt resigned office rather than forfeit his word,~~

~~The year which witnessed Pitt's failure in domestic legisla- tion also witnessed his failure in military effort. In 1798 Bonaparte sailed for Egypt with the intention of setting up a French dominion in the East. The fleet which conveyed him was annihilated after his landing by Nelson at the battle of the Nile. Pitt seized the opportunity of the great general's absence from Europe to organize a second coalition against France. In the campaign of 1799 Italy was regained from France, and in the East Bonaparte was driven back from Acre by the Turks headed by Sir Sidney Smith. The news of French disasters brought him hurriedly back to Europe, but before he could take part in the war Massena had defeated the coalition at Zurich. A coup @état, however, placed Bonaparte, under the name of first consul, in practical possession of absolute power; and in the following year his great victory at Marengo (1801), followed up by Moreau's victory of Hohenlinden, enabled him to dictate as a conqueror the treaty of Lunéville, by which France entered once more into possession of the frontier of the Rhine. By this treaty not only was England again isolated, but she found herself exposed to new enemies. Her enforcement of the right of search to enable her ships to take enemies' goods out of neutral vessels exasperated even friendly powers, and Russia was joined by Sweden and Denmark to enforce resistance to the claim. It was under these circumstances that Pitt's resig- hation was announced.~~

~~The successor of the great minister was Addington, whose mind was imbued with all the Protestant prejudices of the king, which were, it~~

must be owned, the Protestant prejudices of the nation. He had neither force of char- acter nor strength of intellect. Nelson's victory at Copen- lagen, which crushed the naval power of Denmark and broke up the Northern Alliance, and the landing of Aber- cromby in Aboukir 'Bay, followed by the victory of Alex- andria and the consequent evacuation of Egypt by the French, were events prepared by the former adminis- tration. Addington's real work was the peace of Amiens (1802), an experimental peace, as the king called it, to see if the first consul could be contented to restrain himself within the very wide limits by which his authority in Europe was still circumscribed.

Tn a few months England was made aware that the ex- periment would not succeed. Interference and annexation became the standing policy of the new French Government. England, discovering how little intention Bonaparte had of carrying out the spirit of the treaty, refused to abandon Malta, as she had engaged to do by the terms of peace. The war began again, no longer a war against certain principles, and the extension of dominion resulting from the victory of those principles, but against aggressive des- potism, wielding military force, conducted by consummate military genius, and setting at naught the rights of popu- lations as well as the claims of rulers. This time the English nation was all but unanimous in resistance. This time its resistance would be sooner or later supported by ali that was healthy in Europe.

The spirit of England was fully roused by the news that Bonaparte was preparing invasion. Volunteers were enrolled in defence of the country. There was a general

| belief that the prime minister was not equal to the crisis.

Addington retired, and Pitt again became prime minister pitt's

(1804).

~~He would gladly have joined Fox in forming an second~~

~~administration on a broader basis than his former one, ™inistry.~~

~~But the king objected to Fox, and some of Pitt's old friends refused to desert the proscribed statesman. Pitt became the head of a ministry of which he was the only efficient member.~~

~~England was strong enough to hold her own against Trafal- Bonaparte, who was now Napoleon, emperor of the French gar and~~

~~(1805). Nelson crushed the combined French and Spanish fleets at Trafalgar, paying with his own life for a victory which put an end to the French naval power for the remainder of the war. The iron of Napoleon's tyranny had not yet entered into the Continental nations sufficiently to rouse them to atruly popular resistance. A third coalition ended in as complete a disaster as that in which the first and second had ended. Austria lost a large part of her force in the capitulation of Ulm, and the Austrian and Russian armies were overpowered at Austerlitz. To effect these victories the force which threatened the invasion of England would necessarily have been withdrawn, even if the result of the battle of Trafalgar had not made the enterprise hopeless. Pitt died shortly after receiving the news of the disasters of his allies (1806).~~

~~Auster- itz~~

~~Pitt's death forced the king to accept a ministry of Ministry~~

~~which Fox was a member.~~

~~This ministry of All the of All~~

~~Talents, as it was called, was not successful in the thé~~

~~conduct of the war. Its year of office was the year in which Prussia was crushed at Jena, and it dissipated the strength of the English army in unimportant distant expeditions, instead of throwing it upon one spot~~

~~to aid Prussia or Russia. Its great title to fame is the aboli- tion of the slave trade. J ox's death deprived the ministry of its strongest member, and in the following year an attempt on its part to admit Roman Catholics to the naval and military service of the crown drew from the king a demand for an engagement never to propose any concession to the Catholics. They refused to make any such promise, and were summarily ejected from office. The king's firm stand was popular in England. The reaction against the French Revolution no longer demanded the infliction of penalties upon those who promulgated its~~

~~doctrines; but a spirit had been produced which was:~~

~~inexorable against all attempts to effect any change for the better. A spirit of blind, unreasoning constivatism had taken the place of the enlightened Toryism of Pitt's earlier days.~~

~~. Talents.~~

~~The new ministry (1807), under the nominal leadership Ministry~~

~~of the duke of Portland, had to face Napoleon alone. battle of Friedland and the peace of Tilsit left him master of the greater part of the Continent. Prussia and Austria were already stripped of territory; and as protector of the Confederation of the Rhine, Napoleon ruled in Germany. Italy was directly subjected to his power. Unable to make war upon England by his fleets and armies, he attempted to subdue her by ruining her commerce. By the Berlin decree (1807), he declared the whole of the British islands to be in a state of blockade, though he had not a single ship at sea to enforce his declaration. He~~

~~The of the Duke of~~

~~Portland.~~

~~declared all British manufactured goods prohibited wherever Commer-~~

~~his power reached, and excluded d neutral ships which had touched at a British port,~~

~~from his dominions even oa struggle The vith~~

~~British Government, instead of leaving Napoleon to bear prance,~~

~~the odium of this attack on neutral commerce, retaliated by Orders in Council conceived in the spirit of his own measure. They declared that all vessels trading with France were liable to seizure, and that all such vessels clearing from a hostile port must touch at a British port to pay customs duties. Napoleon answered by the Milan~~

~~The Pen-~~

~~insular war,~~

~~decree, forbidding neutrals to trade in any article imported from any part of the British dominions. The Orders in Council cost England a war with America. The Berlin and Milan decrees contributed largely to the overthrow of Napoleon's power. Every poor man who was debarred from the means of providing sugar or cloth for his family felt the grievance. The French Republic had declared war against the nobles and the higher classes ; Napoleon de- creed an oppression which was bitterly felt in every cottage.~~

~~In pursuit of his design of forcing the Continental system, as he termed it, on Portugal, Napoleon sent Junot to occupy Lisbon, and dethroned the king in 1807. In 1808 he seized on the royal family of Spain, and offered the crown to his brother Joseph. When the Spaniards resisted, the English Government sent troops to the Peninsula. Defeated at Vimeira, Junot was allowed to evacuate Portugal. Napoleon came to the rescue of his lieutenants in Spain, and though he retired without effect- ing the expulsion of the English, Sir John Moore was slain at Corunna (1809) after inflicting a repulse on the French, and his army was shipped for England. In the summer Wellesley landed in Portugal. Thanks to a fresh aggressive war of Napoleon against Austria, he was able to make his footing sure, though the English nuinistry sent large forces to perish in the marshes of Walcheren, which might have been~~

~~better employed in supporting Wellesley at the time when he was driven to retreat before superior nuinbers after the fruitless victory of Talavera.~~

~~In 1810 Wellesley, now known under the name of Wellington, beat back the masses of the French forces under Massena from behind the lines of Torres Vedras. Wellington's resistance was great as a military exploit. But it was far more than a military exploit. It would have been of little avail to linger, however safely, in a corner of Portugal unless he were sure of better allies than the wretched Spanish soldiers who had looked on whilst he fought for them at Talavera. Wellington saw clearly that there is no ally so strong as the arrogance and injustice of anenemy. His firm hope was that Napoleon would ruin himself, and his hope did not deceive him. In 1812 Napoleon wrecked his finest army on the snows of Russia. Wellington had breathing space to issue forth from Portugal, to seize the frontier fortresses of Ciudad Rodrigo and Badajos, and to win the battle of Salamanca. In 1813 Germany rose against its oppressor. The victory of Leipsic drove the despot over the Rhine, and the victory of Vittoria drove his lieutenants over the Pyrenees. The peoples of Europe were against him. In 1814 he was driven into exile at Elba. Wellington's last victory in this war was won at Toulouse after the abdication of the emperor. In 1815 the emperor returned and seized the throne once more. England and Prussia were the first in~~

~~Battle of the field, and the crushing blow at Waterloo consigned him~~

~~Water- loo.~~

~~Ameri- can war.~~

~~First years of peace,~~

~~to a life-long exile at St Helena.~~

~~The war with America, begun in 1812, had been caused by the pressure of the English naval force on neutral com- merce under the Orders in Council, which the British Government refused to withdraw till it was too late, and by its claim to impress British seamen when serving on~~

~~board American ships. The war was brought to an end by the treaty of Ghent (1814).~~

~~After a long war the difficulties of the victors are often greater than those of the conquered. The conquered have their attention directed to the reparation of losses, and are inspired by a patriotic desire to submit to sacrifices for the sake of their country. The victors are in the frame of mind which expects everything to be easy, and they have been accustomed to direct their energies to the business of overpowering foreign enemies, and to hide their eyes from~~

~~the constant watchfulness required by the needs of the population at home. The war out of which England had come was more than ever calculated to foster this tendency to domestic inaction. To the governing classes despotism, revolution, and reform were almost synonymous. Ministries had succeeded one another: Perceval followed Portland in 1809, and Liverpool followed Perceval in 1812. They were all alike in abhorrence of the very idea of change, in the entire abandonment of those principles of active and intelligent government by which Pitt, whose followers they professed to be, had been always inspired. The supremacy of the proprietors of land, and absolute resistance to reform, were accepted as the rule of government. It made no difference that the king had become permanently insane in 1810, and that the base and sensual prince of Wales became regent in 1811, till he ascended the throne in 1820 as George IV.~~

~~The wrongs of the propertied classes could make tlem- selves heard. In 1815 a corn law had been passed pro- hibiting the import of corn till the price was above 80s. a quarter. In 1816 the ministry were compelled to submit to the repeal of the property tax, and abandoned the malt tax without pressure. In the meanwhile the agricultural and industrial poor were on the verge of starvation. It would be absurd to draw too close a comparison between the position of the English upper classes at this time and of the French upper classes before the Revolution. But there~~

~~was the same tendency to use political power as a support for their own material interests, the same neglect of the wants and feelings of those who had none to help them. Those in authority were naturally startled when, at a time when mobs driven to desperation were breaking machines and burning ricks, Cobbett in his Weekly Polite- cal Register was advocating universal sufirage and annual parliaments. The revolution struck down in France appeared to be at the doors in England.~~

~~In great part, no doubt, the misery was brought about by causes over which no Government could have had any control,—by the breaking up of the irregular channels through which commerce had flowed during the war. But it was in great part, too, owing to the incidence of the pro- tective system to which the Government, widely departing from the track marked out by the early steps of Pitt, was giving effect with the full support of the manufacturing as well as the landowning class.~~

~~A riot in London (1816), and a missile thrown at the carriage of the prince regent, roused in parliament some- thing like the repressive violence of 1794. Even the brilliant Canning, the ablest of the disciples of Pitt,~~

~~Strife of classes.~~

~~Demand for par- liament- ary res form.~~

~~Repres- sive meas sures,~~

~~declaimed against the parliamentary reform which was now –~~

~~asked for in so many quarters. Acts, of which the suspen- sion of the Habeas Corpus Act was the most severe, were passed to strengthen the hands of the ministry. Seditious meetings, mingled with real or imaginary projects of insur- rection, kept the alarm of the upper classes on the stretch. But, as in 1794, juries were suspicious of evidence fur- nished by spies, and refused to convict on insufficient proof.~~

~~The strife between classes culminated in 1819. Large meetings in the open air were held in the great towns, and inflammatory speeches were freely addressed to them. Some of the speakers were arrested. At Stockport the constable in charge of one of the prisoners was attacked andshot. Birmingham, a great unrepresented town, elected a " legislatorial attorney." A large meeting was summoned~~

~~at Manchester, another great unrepresented town, to follow The the example. The meeting was declared by the magistrates Manches-~~

~~to be illegal, and another meeting was accordingly sum- moned for the undoubtedly legal purpose of petitioning for parliamentary reform. On the appointed day thousands~~

~~ér mas-~~

~~sacre.~~

~~KNGLAND 365~~

~~admit Catholics to a seat in parliament, thus carrying out Domes-~~

~~Pitt's great plan, though sadly late. From 1823 to 1828 ticpolicy Huskisson, as president of the Board of Trade, had been oe at work loosening the bonds of commercial restriction, and \iscon.~~

~~thus carrying out Pitt's policy in another direction.~~

~~PARLIAMENTARY REFORM. |~~

~~poured in from the surrounding districts. These men had been previously drilled, for the purpose, as their own leaders asserted, of enabling them to preserve order,—for the pur- pose, as the magistrates suspected, of preparing them to take part in an armed insurrection. A fruitless attempt by the~~

~~magistrates to arrest a popular agitator named Hunt as he was preparing to address the crowd was followed up bya charge of cavalry. Six persons were killed, and a far larger number were wounded in the~~

~~onslaught. The Manchester massacre divided the kingdom into opposite camps. The use of military violence roused a feeling which struck a chord of old English feeling inherited from the days when~~

~~Such changes, however, were only an instalment of those which were demanded by the now ripened public opinion of the country; and as the ministers had not been the initiators of the late concessions to Catholics and dissenters, they failed to obtain any enthusiastic support from reform- ers; whilst the fact that the concessions had been made alienated the opponents of reform. On the death of George~~

~~Oliver's dragoons had made themselves hated. Large meetings were held to protest, and were addressed by men who had but little sympathy with the previous agitation. Parliameut replied by enacting new laws, known as the Six Acts, in restraint of sedition, by sharpening the powers~~

~~IV. and the accession of William IV. (1830), a new minis- Lord try, a combination of Whigs and Canningites, came into Gtey's office under Lord Grey. LY After a struggle lasting over more than a year, parlia- The Re- mentary reform was carried in the teeth of the opposition form Act.~~

~~The Six Acts.~~

~~by his sympathy with despotic rule upon the Continent. ledge. Mechanical invention, which had accomplished George Soon after George IV. became king, on the death of his | such wonders in the middle of the 18th century, entered TV.and father in 1820, the alienation of the people from the upon a fresh period of development when the first passenger .., Government was marked by the indignation aroused by | railway train was dragged by a locomotive in 1830. : 'the attempts of ministers to pass a Bill of Pains and | Mental power applied to the perfecting of manufacture is Penaltics depriving the new queen of her rights as the wife | not in itself higher than mental power applied in other of the sovereign on the ground of the alleged immorality | directions, but it is more easily understood and more readily of her conduct. Even those who suspected or believed | respected. Experience~~

~~taught large masses of men to sub that her conduct had not been blameless, were shocked at | mit to the guidance of those who knew what they did not an attempt made by a king whose own life was one of | know. Amongst statesmen, too, the shock to the old notorious profligacy, and whose conduct towards his wife | order produced an open mind for the reception of new had been cruel and unfeeling, to gain his own ends at the | ideas, and the necessity of basing authority on a wider expense of oue whom he had expelled from his home and | foundation produced a desire for the spread of education, had exposed to every form of temptation. The failure of | and gave rise to a popular literature which aimed at inter- the ministers to carry the Bill of Pains and Penalties was | preting to the multitude the thoughts by which their con- a tnrning-point in the history of the country. The exist- | duct might be influenced. ing system lost its hold on the moral feelings as well as on The first great act of the reformed parliament bore the Legisla- the intelligence of the nation. For some time to come, | impress of the higher mind of the nation. The abolition ms by sympathy with parliamentary reform would be confined to | of slavery (1833) in all British colonies did credit to its the ranks of the Opposition. But in 1822 the dcath of | heart; the new poor-law (1834) did credit to its under- parlia- Lord Castlereagh, who had recently become Lord London- | standing. An attempt to strip the Irish established church ment. ; derry, and the retirement of Lord Sidmouth, placed Can- | of some of its revenues broke up the ministry. There were ning in the secretaryship for foreign affairs and Peel at the | differences amongst the members of tle Government, and home office, those differences were echoed in the country. The king Can- Canning carried the foreign policy of the country in a | was frightened at the number of changes demanded, dis- ee new direction. The desire for peace had led the ministry | missed his ministers, and intrusted the formation of a new nelle. to support the Holy Alliance, a league formed between the | Government to Sir Robert Peel. The new Government Peel's~~

~~of the administrators of justice. The Government took up the same antagonistic position against the right of English- men to meet for political purposes which had been taken up in the days of the Reign of Terror. But the very fact that there was no reign of terror on the other~~

side of the Channel weakened its hands. The intelligence of the country was no longer on their side. Lord Sidmouth, the Addington who had made so inefficient a prime minister, was not the man to gain support as home secretary for a policy of severity which was only the disguise of weakness a and Lord Castlereagh, to whom was intrusted the management of foreign affairs, had disgusted all generous minds

absolute sovereigns of the Continent for the suppression in common of all popular movements. Canning broke loose from these old traditions. He made himself loved or hated by offering, without purpose of aggression or aggrandizement, aid or countenance to nations threatened by the great des- potic monarchies; and he thus to some extent placed limits ou the power of the military despotisms of Europe. Far more cautious and conservative than Canning, Peel took up the work which had been begun by Romilly, and put anend to the barbarous infliction of the penalty of death for slight offences. After Canning's short ministry, followed by his death (1827), Peel, after consenting to the abolition of the Test and Corporation Acts, passed a bill, in conjunction with the new prime minister the duke of Wellington, to

of the House of Lords, The franchise was so arranged as to give a very large share of influence to the middle classes of the towns. But though the landowning aristocracy was no longer supreme, it was by no means thrown on the ground. Lords and gentlemen of large estate and ancient lineage had taken the lead in the reforming cabinet, and the class which had the advantages of leisure and position on its side would have no difficulty in leading, as soon as it abandoned the attempt to stand alone. Fortunately, too, at the time when the institutions of our country were refounded on a broader basis, science had long taken a form which impressed the minds of the people with a reverence for know-

abandoned the title of Tory for the title of Conservative.

It was the last time that the sovereign actively interfered ministry.

in the change of a ministry. The habits of parliament had been much changed since the days of the Regency Bill of 1788, when it was

acknowledged by all that a change of ministry would follow tle announcement of the accession of the Prince of Wales to power, without any correspond- ing change in the political temper of parliament. Sinecure appointments had recently been lopped away with an unspar- . ing hand, and the power of corrupting members of parlia- ment had been taken away. 'The character of the members themselves had risen. They were more deeply interested in political causes themselves, and were too clearly brought under the full light of publicity to make it possible for them

The Mel- bourne ministry.

to become amenable to those evil influences to which their fathers had succumbed. :

The new minister dissolved parliament. The increase to the numbers of his followers showed that the country had to some extent taken alarm. But he could not com- mand a majority, and he resigned office in favour of Lord Melbourne (1835). The Melbourne ministry signalized its accession to office by the reform of the municipal corpora- tions. Then canie the lowering of the stamp duty on news- papers and the Tithe Commutation Act (1836), benefiting the landholders and the clergy alike. The foundation was laid of many a beneficial change.

classes in 1832. The idea which was steadily making its way was the idea of testing all questions by the interest of the nation as a whole, and of disregarding in comparison the special interests of particular classes. It was this idea which lay at the root of the scientific doctrine on which the free traders founded their practice, and which com mended that

~~practice to imaginations as well as to the desires of the mass of the population.~~

~~This combination of thought with popular movement towards equality was but one of the manifestations of that greater movement which had been 'passing over Europe ever since the beginning of the French Revolution. It was~~

~~Chart- The accession of Queen Victoria (1837) did not cut short | assisted by the character of the material progress of the ism. the tenure of power of the ministry. But the condition of | time. When the soil of the country was covered with a the manufacturing poor was deplorable, and it gave rise to | network of railways, when the electric telegraph began to the Chartist agitation for admission to equal political | come into use, and all parts of the country were brought rights with the middle classes. A large body of Chartists | into closer connection with one another, when the circula- threatened an appeal to physical force, and the terror pro- | tion of books and newspapers became more easy and more duced by these threats swelled the tide of Conservative re- | rapid, the sense of unity grew stronger with the growth of action. The ministry suffered, too, from a lack of financial | the means of communication. Nor was it only the sense ability. They were bold enough where they saw their way. | of the unity of the various parts of the country which was Fall of 'The introduction of the penny postage (1840) was a daring | growing. Class drew nearer to class, and the wants, the~~

~~the Whig step in the face of embarrassed finances, though it might be~~

~~Govern- supported by the success of the lowering of the news- than they had formerly been. Slowly but surely the pee: paper stamp duty in 1836. In 1841 ministers produced influence of education spread. The duty of legislating free-trade measures as the best remedy for existing evils. | for the benefit of the weak and the poor was better under- But they were already discredited by past ill success in the | stood, tempered by an increasing understanding of the evils management of the exchequer, and the hostile majority in | of interference with liberty of action. In the midst of the the new parliament which carried Peel to~~

~~power was the | tendency to equality, the old English belief in the virtue of expression as much of want of confidence in their ability | liberty was strengthened by the knowledge imparted by a as of dislike of their measures. more scientific conception of human nature. Peel's The Conservative ministry followed in the steps of its It was impossible that this change should pass. over the Purther second predecessors. An income-tax was once more laid on (1842) | national mind without giving rise to a desire to include reform mmstty- +> enable the prime minister to reduce the duties on im- | the working class in that body of electors in whose hands Proposed, ports. With respect to corn, he imposed a sliding scale | political power was ultimately placed. Before the end of of duties, which shut out foreign corn in seasons of low | Lord John Russell's ministry, a new Reform Bill had been prices, and allowed it to come in in seasons of high prices. | introduced by the Government (1852), but it did not pass Outside parliament a great association, the Anti-Corn-Law | into law. Soon after Lord Aberdeen's accession to office League, with Richard Cobden as its principal spokesman, | the mind of the nation was too completely taken up with poured forth unanswerable arguments on behalf of the | foreign affairs to attend to organic changes at home. The entire freedom from duty of imported food. It was | attack upon Turkey by the emperor of Russia was resisted a fortunate circumstance that the free-trade doctrines won | by the allied forces of England and France. England was their way by degrees. Victories are not won by reason | jealous of Russian advancement in the East; and in the alone, and it is no wonder that after a parliament in which | hands of the emperor Nicholas the government of Russia the landowners were more than usually strong had deprived | was a military despotism so brutal, and was so heavily laid the manufacturers of protection, the manufacturers dis- | in the scale in opposition to all liberal progress on the covered that the arguments which had been found good in | Continent, that England and France might well have been their case would also hold good in the case of the land-| regarded as fighting the battle of Europe as well as owners, especially after they had learnt from their own ex- | contending in their own cause. The invasion of the perience that prosperity was likely to result from the | Crimea and the victory of the Alma were followed by the The change. At last Sir Robert Peel, shaken by argument and | siege of Sebastopol~~

~~and the successful defence of the heights Crimean Free moved by the difficulty of providing for an Irish famine, | above Inkerman (1854). Inexperience in war left the trade. proposed and carried the repeal of the corn duties (1846). | English army especially exposed to hardships in the winter ; Peel's resolution broke up his party, and made his retire- | and when operations were resumed in the summer, it was ment from office inevitable. Lord John Russell, who suc- | far outnumbered by its French allies, who consequently ceeded him, completed the system which Peel had estab- | gained the greater part of the credit of the capture of lished. The markets were thrown opeu to foreign as well | Sebastopol (1855). In the following winter mistakes had as to colonial sugar (1846), and the repeal of the naviga- | been corrected, and the condition of the English army was tion laws (1847) enabled the merchant to employ foreign | worthy of the nation which sent it forth. The peace which ships aud seamen in the conveyance of his goods; and after | was signed at Paris (1856) deprived it of the opportunity the short ministry of Lord Derby (1852), another sweeping | of showing its powers. The terms, so far as they imposed abolition of duties was carried by Mr Gladstone as | restrictions upon Russia, have not proved of any permanent chancellor of the exchequer in the ministry of Lord | value; and the idea which then prevailed that the Turks Aberdeen (1853). were likely to advance in the course of political and social Tenden- The changes in the direction of free trade were accom- | improvement was without any corresponding basis in the ee = pauied by a large number of other changes which have left | region of facts, It was quite right that the settlement of~~

~~their mark on the statute-book and on the habits of the people. There is no mistaking the tendency of this great era of legislation under the influence of the reform by which the balance of power had swayed over to the middle~~

~~desires, and the prejudices of each were better understood~~

~~the unhappy regious commonly known as Turkey in Europe should be taken up as European rather than a Russian duty, but it is a duty the~~

~~distractions or jealousies of Euro- pean powers left unfulfilled, till Russia at last stepped~~

~~The Indian mutiny.~~

~~_ Progress _ of the~~

~~reform question.~~

~~HSTORY. |~~

~~forward to repair their omissions. The indirect results of the Crimean war are to be found in the removal of the pressure with which Russia had weighed on the nations of the Continent; and it may perhaps be fairly argued that the subsequent happy formation of a united Italy and a united Germany were in part rendered possible by the suc- cess of England and France under the walls of Sebastopol.~~

~~For some time after the Crimean war the business of legislation proceeded without any very great shocks. The suppression of a vast military rebellion in India (1857) was followed by the assumption of the direct authority over India by the crown. Though one or two attempts were made to effect an electoral reform, they were wrecked on the apathy or hostility of the nation, and there was general acquiescence in the course pursued by Lord Palmerston's ministry (1859), which, after one half-hearted attempt, refused to proceed further with the measure which it had proposed ; whilst a succession of financial improve- ments were carried out by Mr Gladstone, his chancellor of the exchequer. On Lord Palmerston's death (1865), the new Government, with Earl Russell at its head and Mr Gladstone as the leader of the House of Commons, proposed a measure of reform, and resigned on failing to carry it (1866). Lord Derby succeeded, and Mr Disraeli intro-~~

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~~duced an elaborate and complicated measure in the House The~~

~~of Commons. By this time the feeling of the working class had risen, and the necessary impulse was thus given 7, to the HOuse. The measure was modified and amplified, and became the law of the land (1867). The working class took its place by the side of the middle and upper class. As in 1832, a new spirit was breathed into legislation.~~

~~The first parliament elected under the new system (1868) Gladstone: gave a majority against the opinions of the Conservative ™nistry.~~

~~ministry. Mr Gladstone became prime minister. The Irish Episcopal Church was disestablished, and the Irish land laws reformed. The ballot was applied to parlia- mentary elections, a new and improved system of elementary education was set on foot, and the practice of purchasing promotions in the army abolished. But no amount of zeal for improvement will make Englishmen hasty to forget the noed of caution and moderation. The time came when the nation was no longer in a reforming mood. Interests of classes and trades were able to make themselves heard. Personal ill-feeling was roused by some members of the ministry, and a new parliament showed a large majority in support of a Conservative ministry (1874). It would not be in place here to discuss the difficulties of the present or the prospects of the future, (Ss. R. G.)~~

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~~EWGLAND~~

~~TABLE or SoverEIGNS OF ENGLAND FROM THE NorMAN CONQUEST, AND PRINCIPAL OFFICERS or STATE FROM THE ACCESSION OF THE Houses oF STUART.~~

~~SovEREIGNS. 1850. Lord Langdale and others, ; aoe i pail o illi i) se 06 Gule blenny Velleeee.. coer 1485 ee Ee SrORe te. – Lord Cranworth, C. Willian tL Cheba 4087 Hoe 12 Eran ce 1509 | 1850. Lord Truro, C. 1866, Lord Chelmsford, C. re 1100 |\Bdward VI……-cce 1547 | 1852. Lord St Leonards, C. 1868. Lord Cairns, C. Se) L190: | BOVE. oeteeeeessecen, em 1553 ey ae el le ra rea Lom deere ee IZA IIE… ene Seeaes fee 1558 » Lor €imstorda, U. – Lord Selborne, C. ie nee | a ee 1603 | 1859. Lord Campbell, C, —_— | 1874: Lord Cais, @ OUR Fe scgase eres ciecan ceetoer AUilG}S) || {Clog ese RSM eeee econ ssseee 1625 ‘ 18h saga7 JD UE Gees noatepec o8he TAI Wen penre enter. core. snc 1649 Lorp TREASURERS OR First Lorps oF THE TREASURY, iB cliw ad [eee ece ssc D272: |(ChanlesMlliaes,...5.-.dehiveivonees 1760 1603. Lord Buckhurst, cr. Earl | 1711. Zarl of Oxford. PARLOR 6 sieseince > snauncion’ MAGI | Georeen TVs pe. ecclesia: nel 820 of Dorset 1604. 1714. Duke of Shrewsbury. OE Wivascscsusasiccuannet? 1483 | William IV…….. ... ..1880 1608. Earl of Salisbury. 1714. Earl of~~

~~Halifax. omar, ON… cede. weer hes a SOMMVICLON a. cee coco Oe 1612. Earl of Northampton and +e me ea others, coinmissioners. 1715. Sir R. Walpole. Lorp Cnancrxtors (C,) orn Lorp Krupmrs (L.K,). 1614. Earl of Suffolk. 1717. Lord Sidlihowe. 1603. Sir T. Egerton, L.K., cr. | 1714. Lord Cowper, C. 1618, Archbishop Abbot and | 1718. Earl of Sunderland. Lord Ellesmere 1603, and | 1718. Sir R. Tracy and others, others, commissioners, 1721. Sir R. Walpole. Viscount Brackley 1616. commissioners, 1620. Sir H. Montagu, cr. Vis | 1742. Earl of Wilmington. 1617. Sir F. Bacon, L.K., cr. | 1718. Lord Parker, C., cr. Earl of count Mandeville 1621. 1743. H. Pelham. ‘ Lord Verulam 1618, and Macclesfield, 1721. 1621. Lord Cranfield, cr. Earl of | 1754. Duke of Newcastle.~~

~~1621.~~

~~St Albans 1621. J. Williams, Bishop of~~

~~Lincoln, L.K.~~

~~1725. 17/26,~~

~~Sir J. Jekyll and others, commissioners, Lord King, C.~~

~~1624.~~

~~Middlesex 1622. Sir J. Ley, cr. Lord Ley 1625, and Tarl of Marl-~~

~~1756. 1757. 1762.~~

~~Duke of Devonshire. Duke of Newcastle. Earl of Bute.~~

~~1625. Sir T. Coventry, L.K., cr. | 1733. Lord Talbot, C. borough 1626. 1763. G, Grenville.~~

~~Lord Coventry 1628. 1737. Lord Hardwicke, C., cr. | 1628. Lord Weston, cr. Earl of | 1765, Marquis of Rockingham, 1640. Sir J. Finch, L.K., cr. Earl of Hardwicke 1754. Portland 1633. 1766. Duke of Grafton.~~

~~Lord Finch 1640. 1756. Sir J. Willes and others, | 1635. Archbishop Laud and | 1770. Lord North.~~

~~1641.~~

~~cr. Lord Lyttelton 1641. | 1757. Sir R. Henley, L.K., cr. | 1636. W. Juxon, Bp. of London. | 1782. Earl of Shelburne. 1645. Sir R. Lane, L.K. Lord Henley and C, 1760, | 1641. Sir E. Lyttelton andothers, | 1783. Duke of Portland. 1649. Interregnum. Earl of Northington, 1764. commissioners, 1788. W. "Pitt. 1660. Sir E. Hyde, C., cr. Lord | 1766. Lord Camden, C. 1643. Lord Cottington. 1801. H. Addington. Hyde 1660, and Earl of | 1770. C. Yorke, ©. 1649. Interregnum. 1804, W. Pitt. Clarendon 1661]. 1770. Sir 8S. S. Smythe and | 1660. Sir E. Hyde and others, | 1806. Lord Grenville. 1667. Sir O. Bridgeman, L.K. others, cominissioners. commissioners. 1807. Duke of Portland. 1672. Earl of Shaftesbury, C. 1771. Lord Apsley, C., succeeded | 1660. Earl of Southampton. 1807. S. Perceval. 1673. SirH. Finch, L.K.,cr. Lord as Earl Bathurst 1775. 1667. Duke of Albemarle and | 1812. Earl of Liverpool. Finch 1674, C. 1675, cr. | 1778. Lord Thurlow, OC. others, commissioners. 1827. G. Canning. Earl of Nottingham 1681. | 1783. Lord Loughborough and | 1672. Lord Clifford. 1827. Viscount Goderich. 1682. Sir F. North, L.K., cr. others, commissioners. 1673. Viscount Dunblane, cr. | 1828. Duke of Wellington. Lord Guilford 1683. 1783. Lord Thurlow, C. Earl of Danby 1674. 1830. Earl Grey. 1685. Lord Jeffreys, C. 1792. Sir J. Eyre and others, | 1679. Earl of Essex. 1834, Viscount Melbourne. 1690. Sir J. Maynard and others, comunissioners. 1679. Lord Hyde, cr. Viscount | 1834. Sir R. Pcel. commissioners. 1793. Lord Loughborough, C., Hyde 1681, Earl of Ro- | 1835. Viscount Melbourne. 1690. Sir J. Trevor and others, cr. Earl of Rosslyn 1801. chester 1682. 1841. Sir R. Peel. commissioners. 1801. Lord Eldon, C. 1684. Lord Godolphin. 1846. Lord J. Russell. 1693. Sir J. Somers, L.K., C., | 1806. Lord Erskine, C. 1687, Lord Bellasyse. 1852. Earl of Derby. . cr. Lord Somers 1697. 1807. Lord Eldon, C. 1689. Earl of Monmouth. 1852. Earl of Aberdeen. é 1700. Sir N. Wright, L.K. 1827. Lord Lyndhurst, C. 1690. Sir J. Lowther. 1858. Earl of Derby. 1705. W. Cowper, L.K., cr. Lord | 1830, Lord Brougham, ©. 1690. Lord Godolphin. 1859. Viscount Palmerston. Cowper 1706, C. 1707. 1834.~~

~~Lord Lyndhurst, C. 1697. C. Montagu. 1865. Lord J. Russell. 1710. Sir T. Trevor and others, | 1835. Sir C. C. Pepys and others, | 1699. Earl of Tankerville. 1866. Earl of Derby. commissioners. commissioners, 1700. Lord Godolphin. 1868. B. Disraeli. 1710. Sir S. Harcourt, L.K., cr. | 1886. Lord Cottenham, C. 1701. Earl of Carlisle. 1868. W. E. Gladstone. Lord Harcourt 1711, C. | 1841. Lord Lyndhurst, ©. 1702. Lord Godolphin. 1874. B. Disraeli, cr. Earl of 1713. 1846. Lord Cottenham, C. 1710. Earl Paulett. Beaconsfield 1876.~~

~~[The substitution of two secretaries for one was the consequence of the increase of business. each secretary taking whatever work the king saw fit to entrust him with. During the reigns of tendency to entrust one secretary with the correspondence with Protestant states and their allies, a Probably in the reign of Charles II., and certain] were instituted. The secretary for the former took the Low Count the latter took France, Switzerland, Italy, Spain, to the former secretary. Even when the departments were changed to Home and Foreign, was a mere matter of convenience. Every secretary can still carry on business in the depa:~~

~~Catholic states.~~

~~Sir E. Lyttelton, L.K.,~~

~~commissioners.~~

~~others, commissioners.~~

~~SECRETARIES OF STATE.~~

~~1782,~~

~~Marquis of Rockinghain.~~

~~There was no distinction of departments, the first two Stuarts, however, there was a nd the other with the correspondence with y as early as 1691, two departments, the Northern and the Southern, ries, Germany,~~

~~Denmark, Sweden, Poland, and Russia. Portugal, and Turkey. Home affairs were common to both.~~

~~The secretary for Ireland and the Colonies fell~~

~~and subsequently still further divided, the division rtment of another without a fresh appointment.]~~

~~1603. Sir R. Cecil (cr. Lord Cecil 1603, Viscount Cranborne 1604, Earl of Salisbury 1609). 1612. Vacant.~~

~~1614. Sir R. Winwood. 1640. P : : ; . Sir H. Vane.~~

~~1615. : . : Sir T, Lake, 1641. Sir FE. Nicholas.~~

~~1618. Sir R. Naunton. 1642, ; – , , . Viscount Falkland. 1619. Sir G. Calvert, 1643. Lord Digby.~~

~~1623. Sir E. Conway, cr. Lord Conway 1625. 1625, : : °~~

~~1625, : : : j 1628. Viscount Dorchester. 1622. Sir F. Windebank,~~

~~Interregnum. 1660. Sir E. Nicholas. Sir W. Morrice. 1662. Sir H. Bennet, cr. Earl of~~

~~Arlington, 1665,~~

~~Sir A. Morton.~~

~~Sir J. Coke.~~

~~1668. 1672.~~

~~Sir J. Trevor. H. Coventry.~~

~~1674. Sir J. Williamson. 1678. Earl of esi~~

~~1680. 1681. 1683. 1684, 1684. 1688. 1689.~~

~~Lord Conw ay. Earl of Sunderland.~~

~~Earl of Shrewsbur ye~~

~~ENGLAND~~

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~~SECRETARIES oF STATE—continucd.~~

~~Sir L. Jenkins,~~

~~S. Godolphin.~~

~~Earl of Middleton. Viscount Preston. Larl of Nottingham.~~

~~1690. Viscount Sidney.~~

~~1692. Sir J. Trenchard.~~

~~1694, Earl of Shrewsbury.~~

~~1695. Sir W. Trumbull.~~

~~1697. J. Vernon.~~

~~1700. Sir C. Hedges, Karl of Jersey.~~

~~WW AGule ‘ ; ; ; Earl of Manchester,~~

~~1702. ; : Earl of Nottingham,~~

~~1704. , ‘ ; – R. Harley,~~

~~1706. Earl of Sunderland.~~

~~1708. H. Boyle.~~

~~1710, Lord Dartmouth, cr. Eorl He St en, cr. Viscount Boling- of Dartmouth 1711, broke 1712.~~

~~1713. W. Bromley.~~

~~1714. J. Stanhope. Viscount Townshend,~~

~~1717. Earl of Sunderland. J. Addison.~~

~~1718. Karl Stanhope. J. Craggs.~~

~~1748. Duke of Bedford. 1751. Earl of Sie~~

~~1754. 5 ; – Sir T, Robinson. 1755. i ‘ : : ~ Ti Box~~

~~1756. ; « Wee Ritts~~

~~1761. Earl of eri~~

~~1761. Karl of Egremont,~~

~~1762. G. Grenv ite.~~

~~1763. Earl of Halifax,~~

~~1765, Duke of Grafton,~~

~~1766. Duke of Richmond.~~

~~1766. Earl of Shelburne,~~

~~1768. .~~

~~1768. Earlof Hillsborough, ‘Colonies, 1768. Earl of Rochford.~~

~~Karl of Sandwiel. H. 8. Conway.~~

~~Viscount Weymouth,~~

~~WFAA), 4 : Z . Earl of Sandwich. uA ZAl A , . ; . Earl of Halifax. We 7i7ale Earl of Suffolk,~~

~~1772. EarlofDar tmouth, Colonies.~~

~~1775. Viscount Weymouth.~~

~~1776. Lord G. S. Germaine, Colonies,~~

~~1779, : é n~~

~~1779. Earl of Hillsborough.~~

~~1782. W. Ellis, Colonies.~~

~~Viscount Stormont,~~

~~1721. 1724. 1730.~~

~~Viscount Townshend.~~

~~Lord Harrin gton.~~

~~Lord Care: Duke of Newcastle,~~

~~Home Department,~~

~~1782, Earl of Shelburne. 1782. Lord Grantham.~~

~~Foreign Department. C. J. Fox. T. Townshend.~~

~~Lord Carteret. Karl of Harrington. Earl Granville. 1746. Karl of Harrington, 1746. Karl of Chesterfield.~~

~~1742. 1744, 1746.~~

~~C. J. Fox. Karl Temple. Lord Sydney,~~

~~1783. Lord North.~~

~~1783. Marquis of Carmarthen. 1788. , b F i 5 1789. W, W. Grenville,~~

~~1791. H, Dundas. Lord Grenville.~~

~~Home Department.~~

~~Foreign iessiiamai~~

~~War and Colonial Department.~~

~~1794. | Duke of Portland. . ; A ; Lord Grenville. Hi. Dundas. 1801. | Lord Pelham. . c c . 0 f Lord Hawkesbury. é c Lord Hobart. 1803. | C. P. Yorke. . C c : ‘ F 1804, | Lord Hawkesbury. , : ; : Lord Harrowby. . : ‘ : : Earl Camden, 1805, ; ; : ; ; Lord Mulgrave. , ‘ : : : Viseonnt Castlereagh. 1806. | Earl Speneer, : : : C. J. Fox. A : 2 ; : W. Windham. 1807. | Lord Hawkesbury. : G. Canning. . ‘ : : : Viscount Castlereagh, 1809. | R. Ryder. ; ; ‘ – Earl of Bathurst. . 1809, ; , ‘ ; ; Marquis Wellesley. 1812, Viscount Sidmouth, 3 ‘ ; ; ‘ Viscount Castlereagh. Earl Bathurst. S22) / KR. Peel. . . ; 5 ; ; G. Canning, . é F i : : 1827. | W. S. Bourne. : Earl Dudley : a F p : : Viscount Goderich, 1827. | Marquis of Lansdowne. . ‘ : ‘ : : W. Huskisson. 1828. | R. Peel. ‘ 7 ; ; Farl of Aberileen. : : Sir G. Murray. 1830. | Viscount Melbourne, ‘ ‘ ’ : Viscount Palmerston. Viscount Goderich, 1833. ; : : ; d ; ; : E. G. 8. Stanley. | 1834 | Viscount Duncannon, 0 : : 4 T. Spring Rice. 1834. | H. Goulburn. : . Duke of Wellington. ; : Earl of Aberdeen. 1835. | Lord J. Russell. I, Viscount Palinerston. Lord Glenelg. 1839. ‘ Marquis of Normanby. 1839, Marquis of N ormanby. : ; : : . Lord J. Russell. 1841. | Sir J. Graham. . * ; Earl of Aberdeen. . ; Lord Stanley, 1845, ‘ P : ; F , . . F W. E. Gladstone. 1846. | Sir G. Grey. ‘ – é Viscount Palmerston. . : ; Karl Grey, 1852. | S. H. Rialpole ‘ ; ; Earl of Malmesbury. Sir J, S, Pakington, 1852. | Viseonnt Palmerston. é Lord J. Russell. Duke of N eweastle. Home Sahai Foreign Department. Colonial Department. War Department, 1855, Sir G. ies 4 Earl of Clarendon. . ‘ S. Herbert. . ‘ : Lord Panmure. 1855. ; : d – prewe’ 2 A Lord J. Russell, , : 1855. ’ : i ; i . H. Labouelcere. t 1858. | S. H. Walpole. Earl of Malmesbury. Lord Stanley. : J. Peel, 7 Home Department. Foreign Department. Colonial Department. War Department. India es~~

~~1858. | S. H. Walpole. Earl of Malmesbury. Sir E. G. E. L. Bulwer | J. Peel. : ’ . | Lord Stanley. 1859. | J. T. Set lagian: Lytton.~~

~~Estcourt. i d. 1859. | Sir G. Cornewall | Lord J. Russell, cr. Harl | Duke of Neweastle. S, Herbert, er. Lord | Sir C, Wood.~~

~~Lewis. Russell 1861. Herbert 1861. 1861. | Sir G. Grey. . . A Sir G, C. Lewis. 1863. : ; : A , ; Tar] de Grey and Ripon. 1864, : , . : Earl] Cardwell. 1865. : Earl of Clarendon. ‘~~

~~y I S Earl of Carnarvon. 6 Iida cal, F Viscount Cranborne.~~

~~1867, * ‘- ——— . oc : Duke of Buckingham. . | Sir J. S. Pakington, . | Sir S. H. Northcote. 1868. | H. A. Bruce. Earl of Clarendon. . | Earl Granville. Earl Cardwell, , : | Duke of Argyll. 1870. ‘ ; e Earl Granville. . | Earl of Kimberley. 1874. | R. A. Cross. . Earl of Derby. . Earl of Carnarvon. G. Hardy. Marquis of Salisbury. 1878. : : Marquis of Salisbury. Sir M. Hicks Beach. F, A. Stanley. G. Hardy, cr. Vise.~~

~~I =n~~

~~Cranbrook, 1878. VILL — 47~~

~~ENGLAND, Tse Cuvurcu or, is that portion of the | universal church of Christ located in England, having for its ministers bishops, priests, and deacons (see Preface to Ordinal), and being legally and historically continuous with the church of the most ancient times. The Church of England claims to be a “true and apostolical church, teach- ing and maintaining the doctrine of the apostles” (canon iii). It acknowledges the supremacy of tle crown, as that to which “the chief government of all estates of the realm, whether ecclesiastical or civil, in all causes doth appertain” (art. 37). It is established, or recognized by the law as the national church, and endowed—that is, the gifts of land or tithes made to it in ancient times are secured to it by the law. The Church of England has always had a national character. In medizval Acts of Parliament it was called by the same name as at present, and was never identical with the Church of Rome, which was usually described as the court (curia) of Rome. In the 16th century, by a series of measures passed by the three estates of the realm, its vassalage to Rome was broken off, since which time the Roman court has maintained a hostile attitude towards it. The Church of England does not assume the right of con- demning any national church (art. 34). It grounds itself on Holy~~

~~Scripture and the three creeds (articles 6 and 8). It is Protestant, as sympathizing with the protest made in Germany against the errors of Rome, and Catholic, as claim- ing to be a portion of the universal church of Christ (25 Henry VIIL., ch. 21, § 13; 1 Eliz., cb. 1).~~

~~I. Historical Sketch.— British Period.—Christianity was planted in Britain at an early period after its first promul- gation. If we reject the traditions which assigned the first preaching of it there to the apostle Paul, or to Joseph of Arimathea, there is nevertheless a high probability that its origin in Britain was due to the intercourse of that country with the East, established in the first place by the~~

~~ENGLUARW®~~

~~Pheenicians, and continued by the colony planted by them at Marseilles. Glastonbury, according to William of Malmesbury, was the oldest church in Britain, and the tra- ditions of Glastonbury are all of an Oriental character. Moreover, the eastern method of computing Easter, long retained by the British church, while it was strongly re- pudiated by Rome, points conclusively to the Oriental origin of the former. The history of the conversion of King Lucius, adopted by Ussher, is now universally rejected as unauthentic; but that the church in Britain had, by the endof the 3d century, made a considerable number of converts, the records of the persecution under Diocletian afford evidence. Constantine, then governor of Britain, received the edict of persecution, and proceeded, though unwillingly, to exe- cute it, and to " pull down the churches" of the Christians (Lactantius). It was in this persecution (203) that Alban, a Roman soldier, suffered death at Verulam for sheltering a Christian priest, and Aaron and Julius at Caerleon-on-Usk. A still stronger evidence of the existence and vitality of the British church is supplied by the fact that three British bishops (Eborius of York, Restitutus of London, and Adelfius) were present at the council vf Arles (314), and subscribed the canons. It is also highly probable that British bishops were present at the general council of Nica. They appear to have been summoned to the synods of Sardica (347) and Rimini (360). Towards the end of the 4th century, Pelagius, who is known to have been a native of Britain, and Celestius, a monk of~~

~~the Scotic or Irish race, brought the British church into notoriety by their heretical teaching, and their controversies with Augustine and Jerome. Both Pelagius and Celestius passed into the East, but their doctrines appear to have spread in Britain, and accordingly two French bishops (Germanus and Lupus) were sent by the synod of Troyes to counteract these errors.~~

~~Sasynod held at Verulam (429) the erroneous doctrines of~~

~~[cHurcH.~~

~~Pelagius were repudiated. Gennadius (Catal. Script. Eccles.) mentions Fastidius, a British bishop, as having about this time composed several useful works ; and Ninian, a native of North Wales, is said to have gone on a mission to the heathen Picts in the south of Scotland, and to have founded several churches among them. Patrick, the apostle of Ireland, was also a native of Britain, but the whole of his career is so obscured by contradictory legends that it is hard to ascertain anything reliable about him. One effect of the influence of the French bishops Germanus and Lupus on the British church was the introduction into it of the Gallican liturgy, which differed in many points from the Roman. Some of these differences were afterwards adopted by the Roman Augustine in settling the use for England, so that the worship of the English Church has never been identical with that of Rome. As the Roman power was withdrawn from Britain, and the people, untaught to defend themselves, fell victims to the inroads of various heathen invaders, the remains of the Christian church in the land were driven either into the far west, or into the mountains of Wales, and during the 5th and 6th centuries Britain became again substantially, but not entirely, a heathen country.~~

~~Saxon Period,—The story which relates how Gregory the Roman bishop was moved to send the Benedictine monk Augustine and his 40 companions on a mission to the Anglo-Saxons is one of the most familiar in church history (597). Bertha, the French-born queen of Kent, being a Christian, was the great support of the monks, but the relics of the old Christianity of the land were also an important help to them. Two Christian churches (at least) were in existence close to the~~

~~walls of Canterbury. A large number probably of the Christianized Roman- Britons existed as a subject population. The traditions of Christianity survived. Hence the rapid success of Augus- tine and his companions, in spite of the distant and some- what hostile attitude assumed by the leaders of the British church towards them. Thus the southern and central parts of Britain were rapidly reconverted to the faith. There were bishops at Canterbury, London, and Rochester. The conversions of Northumbria and Mevycia, the north and east, followed, chiefly through the labours of Paulinus, who had accompanied as chaplain the Kentish princess Ethel- burga to the kingdom of her husband Edwin of North- umbria. Meanwhile, concurrently with the work of these Roman missionaries, the monks of fona—the monastery established in one of the western isles of Scotland by Columba, a disciple of St Patrick—had done much in the conversion of the south of Scotland and north of England. Among tliese Aidan was conspicuous for his zeal and devotion. The teaching of the Scotch missionaries was in accordance with the old British type of Christianity, from which their religion was derived, while the Roman clergy held different customs as to the time for celebrating Easter, the tonsure, the manner of baptism, and other matters. To effect if possible an agreement, a conference was held at Whitby (664), in which Colman on the one side and Wilfrid on the other took a principal part. The Roman party gained the advantage, and the British peculiarities were gradually merged in the greater power and vigour of the Roman system. In 668 Theodore, a Greek, was conse- crated archbishop of Canterbury by Pope Vitalian. Nearly the whole of the island was now Christian, and all parts of it recognized and submitted to Archbishop Theodore. His administration of the church was marked by great vigour and wisdom. He was especially solicitous to promote learning. Ata synod held at Hertford (673) the Haster dispute was settled, and various canons for the regulation of the church agreed upon. A large number of new sees were also founded by Theodore, and a very useful work~~

~~was done by him in the foundation and settlement of parish churches, and the arrangement that a portion of the tithes, previously paid by the~~

~~Saxon thanes to the bishop and the cathedral, should be paid by them to the priest of their own church, Thus Archbishop Theodore may be said to have been the founder of the national church of England. The his- tory of this period and part of the following century is related in great detail by Bada or Bede, a monk of Jarrow, who took much pains to collect his materials, and is a thoroughly trustworthy writer. Though himself a monk, Bede speaks very strongly against the multiplication of monasteries, and of the dissolute lives often led in them (Letter to Egbert). In the year 736 Egbert, bishop of York, obtained the pall from Rome, and was thus constituted a metropolitan with the three Northumbrian bishops as his suffragans. In 747 a synod of the bishops of the southern province was held at Cloveshoe, and a body of canons was agreed upon, regulating many points of doctrine and practice. Among other things, it was ordered that the clergy should teach the people the creed and the Lord's Prayer in the vulgar tongue (into which they had been translated by Bede), and explain to them the nature of the sacraments. The second canon of this synod indicates a complete independ- ence in the English Church, and implies a censure on any who ventured to appeal to Rome, as had been lately done by Wilfrid. The Saxon church at this period was one of the most flourishing in Europe, It sent out missionaries to Germany ; it produced poets of considerable power, as Aldhelm ; it furnished to Charlemagne the most learned and efficient of his instruments for the revival of learning in Alcuin of York. Synods were continually held to regulate matters of discipline, and though the acquirements of the clergy were but slender, yet they were probably equal, if not superior, to those of the clergy of other churches of the day. But this happy state of things was rudely inter- fered with by the irruptions of the pagan Danes. These barbarous enemies seem to have directed their attacks specially and designedly against the monasteries and churches, either out of peculiar hatred to the Christian faith, or because they expected to find these religious houses the special receptacles of treasure. Thus the great Benedictine abbeys of Winchester, Peterborough, Bardney, Croyland, and all the grand foundations of Northumbria, were utterly ruined by them, the monks massacred, the buildings burned to the ground ; and so complete was the overthrow of monastic establishments by these savages, that not until the time of Dunstan,~~

~~towards the end of the 10th century, could monasticism be restored in England. The reign of Alfred was a real boon to the church, not only as breaking the power of the Danes, but as introducing a strong stimulus to the cultivation of learning. Whether Alfred is to be regarded as the founder of the University of Oxford or not, he certainly established schools, and induced learned men to visit the country. Among these was John Scotus, surnamed Erigena. Erigena is perhaps the most re- markable figure in the whole of the dark ages. He was nearly, if not altogether, a pantheist in religion. He wrote both against predestination and the gross material view of the eucharist then beginning to be set forth by Radbert. His book on this subject still survives under the name of Ratramn. He passed from the court of Charles the Bald to that of Alfred, where he was in high in favour. It may be gathered from this that his opinions were not unaccept- able to the king, and this is one of the many indications that the early English Church did not accord with the Roman in the materialistic doctrine of the eucharist. Alfred's own literary labours were considerable. His trans- lations of Gregory's Pastoral Care, Boetius's Consola- tion, and Bede's J/istory were all calculated to help his clergy in advancing in learning, and in a more especial~~

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~~O71 manner was this the case with his translations of various parts of the Latin version of the Scriptures into the verna cular tongue. After their decisive defeat by Athelstan (938), the Danes in England generally began to embrace Christianity, which prepared the way for its reception by the second great series of invading bodies towards the end of the century. The regulations made by Athelstan greatly stimulated the increase of parish churches. Priests were to be legally entitled to the rank of thanes, and a churl or franklin might reach the Witenagemot if, among other conditions, he had a church with a bell-tower on his estate. Accordingly, there is evidence that about this time the number of parish churches was very considerable, there being in Lincolnshire alone upwards of twohuudred. The monastic system was in complete abeyance, and all those who desired to become clerks were attracted in this direc- tion. It was the great work of Dunstan, a Glastonbury monk,~~

~~who rose to be archbishop of Canterbury (959), to undo as far as possible this wholesome state of things. He commenced a crusade against the married clergy, and in favour of celibacy and the ccenobitic life. He built and endowed about forty monasteries, and at most of the bishops' sees compelled the secular clergy, who had formed the chapter, to retire in favour of the regulars, who were then constituted the chapter of the cathedral church. This connexion of the cathedrals with monasteries was a special peculiarity of the English Church. The doctrine of the Church of England at this period may be fairly gathered from the writings of the Abbot A'lfric, which were approved by Sigeric, archbishop of Canterbury. Ailfric was the author of an English grammar and dictionary, and he wrote two volumes of sermons or homilies, which are in great part translations from the fathers of the church. In these the eucharist is explained, notas involving any material change in the elements, but as conferring the spiritual presence. At this time the clergy were obliged to possess a considerable number of books, and to expound the gospel every Sunday to the people in English, and the creed and the Lord's Prayer as often as possible. During the sad times which followed, church services were everywhere interrupted and the clergy dispersed. Archbishop Elphege fella victim to the heathen Danes, but when at length King Canute declared himself a Christian, things rapidly assumed a more promising aspect for the church. Thelaws of King Canute are even of a remarkably pronounced Christian tone. When in 1042 the English family was restored to the throne, the church was at its highest point of power and influence. But Edward's long residence in Normandy led him to introduce many foreign prelates, aud found alien priories, a policy which not only prepared the way for the great change which was now to come upon the church, but was the cause afterwards of many scandals and abuses. Medieval Period.—At the time of the Norman Conqnest there were about 4500 parish churches in England, besides numerous monasteries and the cathedral churches of tke sees. The number of clergy is doubtful, but it is conjec- tured that the small number given in the survey (1600) may be accounted for by the fact that when a church is mentioned the priest belonging to it is implied (Sir H. Ellis). By various laws and directions of the English kings, the clergy had acquired a right to the tithe of all movable goods; and the~~

~~gifts of the faithful had enriched the church with lands to the amount of about three-tenths of the whole property of the country. The priest took rank with the thane; the bishop ranked with the caldorman, and presided jointly with him over the shire-gemot. The cor- rectional police of the whole population was in the hands of the church. Civil and ecclesiastical causes were heard in the same courts, and synods adjudicated in cases of property when the rights of the church were concerned.~~

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~~This powerful corporation paid only a doubtful and undet fined allegiance to Rome, and was not at allin the condition of vassalage in which most of the Continental churches were. It was in order to gain this vassalage from the English Church that the pope was induced to grant to Duke William the licence which sanctioned his attack upon England. The Conquest thus assuined almost as much of an ecclesiastical as a secular character. Hence the hard measure meted out to Saxon bishops and abbots. Hence the completion of Dunstan's work in enforced clerical celibacy and the exaltation of monasticism. Hence the complete separation of the civil and ecclesiastical jurisdic- tions, and the exceptional immunities given to churchmen. The conquerot was crowned, not only by the archbishop of York, but also by two Roman cardinals as legates of the pope. These emissaries joined in a council with the Norman-English bishops (1070), authorizing, on the part of the pope, the deposition of the English primate and other bishops, and the spoliation of the monasteries, and effecting the complete subjection of the English Church to Rome. The establishing of the papal sovereignty over the English Church, and the settling of the Romish system in England, was entrusted to Lanfranc, a Lombard by birth, and lately abbot of Caen in Normandy. This very able man, becoming archbishop of Canterbury, contrived to overpower the rival claims of Thomas, archbishop of York, and, aided by the pope's authority, to rule with absolute sway overt the English clergy. A vast increase of vigour was everywhere soon discernible in the Church of England. The Norman prelates, skilled in architecture, erected those grand cathedrals which still in many places remain to do honour to~~

their taste and munificence. The sees were generally transferred from the small places, in which they had been located by the English, to towns which had grown into greater importance and population. Thus Dorchester gave place to Lincoln, and Thetford to Norwich. All places of trust and dignity in the church were soon in the hands of foreigners. Yet Lanfrane could not effect the complete supremacy of the monastic system. In the new foundation of Lincoln, secular canons were established as the chapter rather than monks, and about half the cathedrals of England retained this constitution. King William also soon showed signs of resistance to the claims of that imperium in imperio which his policy had created. He refused fealty to the pope on the ground that none of his predecessors had paid it. He claimed for himself the right of deciding between the rival claims of popes, and that no canons should be promulgated by the clergy with- out his consent—the very claim which, after nearly five centuries of contention, the clergy themselves admitted in the time of Henry VIII. The sagacity of the Conqueror must soon have discovered that he had introduced into the land an influence of necessity antagonistic and danger- ous to the kingly authority. The name of Anselm, the successor of Lanfranc as primate, is famous in English church history as having boldly maintained a contest, during two reigns, for the privileges of the church, not only against the king, but also against the bishops and clergy, who were all ready to yield to the royal claims. The issue of this contest (1107) was that the crown was obliged to abandon its ancient right of investing the bishop in the jurisdiction of his see by the gift of the ring and crozier, accepting in lieu of that merely his homage for his temporalties, that henceforth the church was to be free to hold synods and enforce discipline, and that appeals were to lie to Rome. 'To Anselm thus must be allowed the credit (if it be a credit) of having emanci- pated the church from feudalism to the state and trans- ferred its feudalism to Rome. It is hardly to be wondered at that his successor William of Corboil, in order to make

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~~this supreme authority of Rome more available for the purposes of his administration, consented to accept the appointment of legate of the pope (1125). There remained for the completion of the system two other points to be fought out under succeeding primates, viz., the exemption of clerks from the civil jurisdiction, and the right of the pope to nominate bishops in spite of the crown. During this century the Roman Church was at the height of its power and influence, the celibacy of the clergy, strenuously pressed by Rome, was becoming the rule rather than the exception, and a great revival of monasticism had given birth to divers orders in which the lax discipline of the old Benedictines was replaced by an ascetic strictness. Of these the most famous was that of the Cistercians or white monks, which was introduced into England in 1128, and which soon numbered 30 houses in England, some of which were conspicuous for their magnificence and beauty. The settlement of the Cistercians in England not cnly gave an immense impetus to monasticism, but it introduced into the church of the land a principle most disastrous in its after effects to the discipline and well-being of the church. The Cistercians were, by the charters granted to them by the pope, to be exempt from all episcopal visitation and control. They were only amenable to the rule of abbots of their own order. This exemption was naturally destructive : of all discipline, and it was a privilege so greatly coveted by houses of other orders that they stopped at no deceit or forgery of documents in order to obtain it. St Albans was the first great Benedictine abbey that obtained this privilege. Many otliers were occupied in a continued struggle for it. The military orders and their affiliated houses enjoyed it. The exemption of the abbey from episcopal control carried with it the exemption of the churches, often numerous, which were connected with the religious house by its hay- ing become possessor of their tithes. Hence sprang the greatest disorders and difficulties, resulting, in fact, in the abeyance of all order, and the grievous licentiousness of many religious houses. That which ecclesiastics were striving after in the matter of church laws, the laity were encouraged to endeavour to obtain in the matter of civil laws. The privilege of being tried only in church courts, and beiug amenable only to church censures, was claimed for all connected with the church. 'To obtain this right, laymen took some degree of minor orders, or entered into the service of some ecclesiastic. As all such could plead "benefit of~~

clergy," and, in fact, obtain a practical immunity from law, the greatest abuses prevailed. William of New- berry tells us that hundreds of murders were committed by "clerks," for which no punishment was exacted. To abate this scandal was the great work of King Henry II., the most able of the early sovereigns of England, and the founder of that judicial system which has borne such good fruit. To uphold it was the work of Thomas Becket, arch- bishop of Canterbury. By the Constitutions sworn to at Clarendon (1164) a sort of compromise was made. Clerks accused of crimes were obliged to plead in the courts of common law, but, on proving their clerkship, were to be proceeded against in courts Christian, under the surveillance of the lay authority. Should they plead guilty, they were t> be dealt with by the lay courts. The same Constitutions enacted that there should be an appeal from the archbishop to the king, which should be final, thus cutting off the ap- peal to Rome. Bishops were to be elected by the clergy, but subject to the approval of the king. The power of ex- communication and interdict was also limited, and the king had the revenues of all vacant bishoprics given to him. These Constitutions, which appear so favourable to the cause of the crown, did not, in fact, settle the dispute. The arch- bishop at once repudiated them. The pope declared them void, and the issue of the struggle was, in the event, in

favour of the claims of the clergy. In the miserable reign of John, a vigorous pope claimed and obtained the right of nominating to the primacy and sees of England, without any regard to the king orthe national church. The country was subdued by the savage expedient of an interdict, which the superstition of the age did not allow it to disregard; and the king, at length completely prostrate at the feet of the pope, made a shameful cession of his kingdom, and re- ceived it back as a fief of the church. The pope, having achieved the right to dispose of English bishoprics, now claimed the right of disposing of English benefices, which were granted in great numbers to Italians and other foreiguers, who never troubled themselves to visit the church assigned to them, but merely received the revenue through an agent. The degradation and disgrace of thie Church of England rcached its

~~extreme point during the loug and inglorious reign of Henry HJ., when the first symptoms of reaction began to manifest thernselves. The most famous scholar of his day, Robert Grosseteste, bishop of Lincoln, after being long a strong supporter of the papal claims, became their outspoken opponent. The extreme vigour and fearlessness of lis character, and the high re- putation he enjoyed, enabled Grosseteste first to break down the claims for exemption from episcopal control set up by the monastic bodies, then to bring under his control the chapter of his cathedral church, and finally to refuse to admit a nominee of the pope to a stall in Lincoln. For this last act of independence he was excommunicated, but he utterly disregarded the sentence, declared that in acting as he had done the pope was no better than antichrist, and encouraged the English to assert the nationality of their church and to disregard the claims of Rome. At the same time, violent popular tumults were excited against the foreign incumbents, and remonstrances were poured into Rome from the barons and chief men against the injustice inflicted on the English Church. At the synod of Merton, held in 1255, the claims of the church to a special and dominant jurisdiction were pressed to their highest point. The vigorous administration of Edward I. introduced various checks to the growing power of the clergy. Parlia- ment had now become a reality, and was able to contend with and check the church synods, which about the same time were reinforced in strength by the admission of repre- seutative proctors from the clergy. The Statute of Mort- main (7 Edward I. c. 2) restrained the acquisition of lands by the church. That of circumspecte agatis limited the claims made at Merton. The inability of the clergy to refuse taxes to the crown, even when they were supported by a papal bull, was clearly demonstrated (1297), and a bishop of Worcester, who had ventured to accept a grant of the temporalties of his see from the pope, was obliged to renounce the bull and submit to a fine of 1000 marks. At the parliament of Carlisle (1305) stringent regulations were made with the view of checking papal exactions, and the provisor statutes of Edward III. effectually limited the papal power of disposing of English benefices. The premunire statute (16 Richard II. c. 5) opposed a firm barrier to papal claims; and had not the necessities of the house of Lancaster obliged its princes to court the church, and the confusions of the Wars of the Roses~~

~~supervened, it is probable that the teaching of Wickliffe would have inaugurated in England as complete a revolt from Rome as that witnessed in the 16th century. The immense power and wealth enjoyed by the Church of England during the Middle Ages, and its complete freedom for self-regulation, did not preserve it from great shortcomiugs and corruptions. A continuous catena of satirists and censors, from William of Malmesbury to Dean Colet, have brought the most grievous charges against the medizval clergy, on the grounds of simony, negligence of duty, and licentiousness.~~

~~In 1250 Bishop Grosseteste, before the council of Lyons, spoke of the clergy of that day in terms which arc absolutely appalling. In the 15th centnry the letter of Pope Innocent to Cardinal Morton describes the regulars in England in language almost as strong as that employed afterwards by Bale and Foxe. It may, however, not unfairly be alleged that these general charges are of far too sweeping a character. To the student who looks a little deeper, there are many evidences of simple and earnest devotion dis- cernible in the medizval church. The establishment of the mendicant orders in the 13th century produced at first a great revival of rcligion in the church. Many of the chief towns had been utterly neglected by the clergy; and the country villages were mostly dependent on the chance ministrations of a monk of some neighbouring monastery, which had absorbed the tithes of the parish under pretence of supplying its spiritual needs. The Franciscans, obliged by their rule to tend the sick and suffering, ministered among a population scourged by leprosy and decimated by epidemics ; the Dominicans, or preachers, brought into use a more attractive and homely style of sermon, and conveyed instruction to many utterly dark places. Yet the corrup- tion of the friars by worldly influences was very speedy, and when in the 14th century Robert Langland and John Wickliffe wrote, it was specially against the friars that their attacks were directed. The great work of Wickliffe was to raise a protest against Rome, to oppose the prevailing superstitions on the eucharist, and to give to his country- men a vernacular version of the Scriptures. His writings were not altogether free from a communistic tinge, but~~

they were of immense value in recalling the minds of the men of his age to scripture truth, and the vast effect they produced was not only perceptible in his own time, when it was said by the chronicler Knighton that every other man was a Wickliffist, but was also perceptible 150 years later, at the beginning of the English Reformation. 'There must have been, therefore, preachers or teachers of his views during all this time, though obscured and concealed on account of the persecutions which fell upon the Lollards. Indeed, did space allow it, an uuder-current of simple scriptural faith might be traced all through the medizeval period, while the rulers of the church, in a spirit of thorough worldliness, were sanctioning every gainful form of superstition, and were in too many instances given to luxury and licence. In the 16th century all the old devices for upholding the faith seemed to be drooping and ready to dic. The monastic system had fallen into utter disrepute, and for 150 years but six monasteries had been founded in England. The friars, changed from being preachers into pedlars and sturdy beggars, had a bad reputation everywhere. Pilgrimages had become mere promenades for amusement and licence. Relics vying with each other in grotesque pretensions were a mere subject of ridicule to all but the most ignorant. Meanwhile the traffic in indulgences had shocked the moral sense even of that corrupt age; and a series of popes, either soldiers, sceptics, or men of pleasure, had not availed to recommend the system of which they were the heads. In England the bishops were almost universally either states- men, lawyers, or diplomatists. The clergy had absolutely abdicated the preaching function and the pastoral care, and contented themselves with a meagre circle of routine duties, When, in cathedrals or on high occasions, sermons were preached, the audience was destined to hear nothing but the ingenious subtleties of Aquinas or Scotus, portions of whose writings were often taken for a text. The church seemed to be threatened with an absolute collapse, unless some renovating power could be brought to bear upon it. Reformed Period.—In this state of weakness and corrup- tion, the accession to the throne of England of a young and vigorous sovereign (1509) gave an impulse towards im-

~~provement in both church and state. The tastes of Henry VIILL were decidedly ecclesiastical. He had been well edu- cated, and was very fairly learned. He had chosen for lis chief minister a churchman who had raised himself by ability from a low origin, and who entertained the highest views of the prerogatives of learning, and the value of edu- cation, while he was hampered by no superstitious reverence for effete institutions, nor prepared to condemn and punish as heresy every departure from commonly received opinions. The conjuncture seemed favourable for such a reformation as was desired by Erasmus, Thomas More, and John Colet, who were then living much together, and endeavouring by lectures and writings to bring about some resurrection of learning and intellectual life from the death-like trance in which they were lying. How far the plans of the educa- tional reformers might have proved successful cannot be judged, for the opportunity for calm measures rapidly passed away. The Saxon monk Luther threw down the gauntlet before the pope, and proclaimed internecine war. This scattered the ranks of the educational reformers, turn- ing some of them into fierce persecutors, and placing even the relentless satirist Erasmus, the determined foe of the monkish superstitions, on the side of those whom he had so violently assailed. lLuther's Treatise De DBabylonica captivitate Ecclesice was published in 1520, and by the next year there is abundant evidence, not only that it was well known in England, but that it had produced much effect. In that year both Archbishop Warham and Bishop Longland write to Cardinal Wolsey, urgently calling upon him to take some steps for the suppressing of the growing Lutheranism of Oxford. Wolsey, thus constrained to act, went through the pageant of a public burning, at St Paul's, of all the Lutheran books which could be collected, some time in August 1521. In the same month (August 25) came forth King Henry's treatise against Martin Luther (Assertio Septem Sacramentorum adversus Martinum Lutherum, edita ab invictissimo Anglice et Francie rege et domino Hibernie, Henrico, ejus nomints octavo). This atiack, which was very violent, and which elicited equal violence in reply, produced a complete schism between the literary reformers of England and the religious reformers of Germany and Switzerland. 'Two of the former, Bishop Fisher and Sir T. More, joined in the conflict, the latter with somewhat disgraceful violenve, while the king, flattered by the~~

~~title of Defender of the Faith conferred on him by Pope Clement, was enlisted as a thorough-going partisan against the Lutherans. There is reason to believe, how- ever, that this was not the case to anything like the same extent with Cardinal Wolsey. In 1523 he distinctly refused to send a commission to Cambridge to drive out Lutheranism. In his splendid structure and grand concep- tion of Cardinal College, which was fast growing towards completion in Oxford, he nominated as fellows a band of Cambridge men who were known to be pronounced Lutherans. This great man seems to have believed in thie power of truth to defend itself, and to have been thoroughly averse to coercive punishments for heresy. But in this he stood nearly alone, and the march of events soon transferred to a party of Englishmen that bitter hatred which had been conceived by the king, Sir T. More, and the bishops against the followers of Luther. In 1526 William Tyndale, by birth a Gloucestershire man, by education connected with both Oxford and Cambridge, published his first two editions of the New Testament in English at Worms. The English bishops, who knew that Tyndale had been in communication with Luther, immediately took steps for hindering tlie circulation of these books in England. Many were burned at Cheapside (1527) ; but the supply was by no means stopped, and in addition a large number of English works, printed abroad, and all~~

~~breathing the extreme violeuce and thoroughness of Luther's spirit, made their way into England. Sir Thomas More was selected by the bishops as the champion of orthodoxy, and urgently pressed to undertake the refutation of these books. Hence commenced the controversy between him, Tyndale, Fryth, and Barnes, which continued for some years. Sir Thomas More was specially angered by a clever but somewhat scurrilous brochure, entitled Zhe Supplication of Beggars, written by Simon Fish, a quondam lawyer of Gray's Inn, in which the doctrine of purgatory is mercilessly satirized. To this he replied in the Supplica- tion of Souls, an imaginary appeal of the souls in purgatory against the new doctrines, which were likely to leave them bereft of the~~

aid of prayers and masses. Meanwhile the unfortunate divorce case had proved the ruin of Cardinal Wolsey; and Sir T. More, succeeding him as chancellor, had used his power, with the full concurrence of the king and the bishops, to bring many of those who held with Luther or Tyndale to the stake, But while the authorities were thus embittered against reformation which, under other circumstances, they might have treated more favourably, there had been steadily growiug since the commencement of the reign a feeling of bitter dislike and exasperation of the laynien against the clergy, which was destined to pro- duce very remarkable results. This had been fostered by several causes, among which the determined attempt made by the clergy to resist an enactment of parliament designed to restrict the privilege of benefit of clergy (4 Henry VIII. c. 2) was one. Another was the case of Richard Hunne, a merchant tailor of London, committed to prison by the bishop, and found hanging dead in hiscell. His murder was freely attributed to the bishop's commissary, and the fact of his dead body having been burned on the plea of heresy increased the odium excited by this suspicion, That the king shared in the prevailing feeling is evident by his severe treatment of convocation for their trial of Dr Standish, who had justified the Act of Parliament directed against the privileges of the clergy. On this occasion (1516), Henry is said to have clearly claimed and explained that supre- macy over the church which was afterwards conceded to. him (Keilway's Reports). But that which most tended to exasperate the laity against the clergy at this period was, without question, the state of the church courts, and the vexatious disciplinary proceedings to which, on the informa- tion of any disreputable 'person, the laity were constantly subjected. The evil was admitted by some of the bishops, but it seemed as if they were powerless to remedy it. Arch- bishop Warham had called upon his convocation to help him in the matter, but Wolsey unwisely interfered, desiring to show his supreme power as legate. He afterwards sum- moned the convocations of the two provinces to meet as a legatine synod (June 1523) to treat of the reformation both of the laity and the clergy. Nothing, however, was done to remedy the crying grievance, and the laity deter- mined to take their cause into their own hands. There were thus two elements at work in the country at this period likely to produce important changes in the ecclesiastical system, viz., the rapid

development in England of the re- ligious opinions of the foreign reformers, and the growing feel- ing of bitterness entertained by the laity against the clergy. To these was added, before the meeting of the famous parlin

ment of November 1529, another very important factor, in the disappointed and angry temper of the king. Henry,

who had imagined that his will must needs be law, had found himself thwarted in the matter of his divorce by the pope and the Roman curia; and the abortive termination of the trial at the legatine court of Blackfriars had roused him to fury. His anger was directed first of all against Wolsey, but he was inclined to be harshly disposed also against the whole of the clerical body, while he already

contemplated taking vengeance on the pope by the extremest legal enactments, Thus a state of feeling had been gener- ated in England altogether different from that which had existed before Luther began to write, and when merely educational and literary refornis were contemplated. More violent and trenchant reforms seemed to be required, and these were now to find expression in the work of the parliament and convocation of 1529. In the first session of this parliament three measures affecting the revenues and fees of the clergy were passed, and Bishop Fisher, who assumed a very high tone in defending his order, was complained of by the Commons and censured by the king. The clergy saw themselves seriously threatened, and when, after Wolsey's fall, the whole of the clerical body was declared by the judges to have incurred the penalties of the premunire statute, the convocations, acting for their brethren, were ready to purchase immunity by the sacrifice of very large sums, But the king, not satisfied with this, demanded more from the clergy than a mere money pay- ment. He demanded of them their acceptance of his claim to supremacy over the church, which was in fact a distinct renunciation of their allegiance to Rome. After much disputing as to the terms, this was at last agreed to by the two convocations (February and May 1531), but with the saving clause—As far as is permitted by the law of

~~Christ. When the Act of Parliament which embodied this~~

~~acknowledgment of the clergy came afterwards to be drawn, this saving clause was omitted. From the moment when the clergy agreed to accept the royal supremacy, the rupture with Rome went on apace, and was embodied and carried out in one statute after another. The clergy who had yielded to the menaces of the premunire law were soon compelled, by anattack brought upon them by the extreme unpopularity of the church courts, to concede another very important point. On March 18, 1532, the Commons pre- sented to the king an address specially directed against the ordinaries, or those of the clergy who possessed jurisdiction, but bringing also many heavy charges against the whole of the clergy. The answers drawn up by convocation satisfied neither the king nor the Commons, and the convocation was called upon to promise that from henceforth no new canons should be made or promulgated without the king's consent, that a review of all the old canons should take place by a body of commissioners, and that only those ratified by the king should hold good. This complete surrender of the whole code of church law into the king's hands was toa certain extent evaded by the clergy, but substantially they agreed to the king's requirements (May 16, 1532). Hence- forth no convocations could be summoned but by the king's writ, no church law could be made but such as the king approved, and the old canons were to be subjected to review. This important transaction, known as the Submission of the Clergy, may be considered as the supplement to their ac- knowledgment of the royal supremacy, and as completing their rupture with Rome. The acts of the convocation which followed—the petition against the payments exacted from them by the pope, the formal renunciation of the Supremacy claimed by him—were natural sequents of the other. Meantime the parliament went rapidly forward in the work of breaking off the fetters of Rome, and securing the independence of the national church. In the session of 1533 was passed the famous statute for restraint of ap- peals, which, grounding itself upon historical precedent, makes all ecclesiastical appeals from henceforth terminable within the kingdom (24 Henry VIII. c. 12). Other acts embodied the concessions made by the clergy (25 Henry VIII. c. 19), made illegal papal appointments to bishoprics (25 Henry~~

~~VIII. c. 20) and papal dispensations (c. 21), and enacted the royal supremacy in the strongest terms (26 Henry VIIL c.1 andec. 13). The last work of this re-~~

~~markable parliament was to give to the king all monasteries of less value than £200 a year, and all others which within a year after the passing of this Act (February 1536) should be surrendered to him. The way towards this measure— which was revolutionary, not only in its religious, but also in its social aspect—had been paved by the proceedings of Cardinal Wolsey in providing a foundation for his contem- plated colleges. A papal bull had authorized the suppres- sion of forty of the smaller religious houses for this purpose. Wolsey had only imitated the example of Chicheley, Waynflete, and Wickham, and it was suggested to the king, by Thomas Cromwell, that he could not be wrong in follow- ing these eminent churchmen. Cromwell had been secretary to the cardinal, and had distinguished himself by advocating his cause after his fall, For some time past he had been the principal adviser of Henry in all the measures taken to free the land from Rome, and the most remarkable use which the king had made of the ecclesiasti- cal supremacy conferred upon him by the clergy and the parliament was to appoint Cromwell his vicar-general, with full powers to exercise the undefined authority belonging to the royal supremacy over all churchmen and churches. By virtue of this power Cromwell had made a visitation of the monasteries by means of certain commissioners; and a report strongly censuring their state, both moral, disciplinary, and financial, had been presented to parliament. On the strength of this report, the Act suppressing all the smaller religious houses of friars, canons, monks, and nuns was passed, The larger houses were destined soon to follow, for a rebellion having been excited in the north by the suppression of the smaller houses, the opportunity of its Suppression was made use of to induce the greater abbeys to surrender, in the hope of thus escaping inquiry into their complicity in the rising. An Actconfirming these surrenders was passed (1539), and the king tlius became possessed of the whole monastic wealth of England both in movables and lands. A court called the Court of~~

~~Augmentations was established to regnlate the transfer. Small pensions were assigned to the monks and nuns thus forcibly driven into secular life, and the remainder of the sum, amounting in modern value to not less than £38,000,000, was expended in various ways. Six new sees were founded, some grammar schools were established, some forts built, but the greater part of the money was given with reckless pro- digality to the courtiers. While the suppression of the monasteries was in progress, many acts were done tending to establish the uew state of things, and to complete the revolt of the Church of England from the dominion of Rome. The king had pressed the acknowledgment of his supremacy, and had sacrificed, in doing this, many victims, and among them, two of the most eminent men in England, Bishop Fisher and Sir Thomas More (1535). In 1536 the first authoritative statement of reformed doctrine was made. Ten articles were drawn up by the king and accepted by the convocation of the clergy, which speak only of three sacraments, declare that the whole Christian faith is to be found in the Bible, and disparage the worship of images, the invocation of saints, and the belief in purgatory. In the following year (1537), a larger body of reformed teach- ing was put forth in a book sanctioned by authority, called The Institution of a Christian Man. But that which tended most of all to the rapid spread of reformed doctrine was the publication of the Bible in English. In 1530 the king had promised that this should be conceded. In 1534 the convocation, at the instance of Archbishop Cranmer, had reminded him of his promise, and petitioned for its fulfil- ment. But there was no immediate prospect of this coming about, Consequently Cromwell, whose political life was staked on the progress of the Reformation, employed Miles Coverdale, in concert with Tyndale in Germany, to make~~

~~and print a translation of the Scriptures from the Latin and German versions of them. This was publislied in England (October 1535), and though not formally approved, was tolerated by the king. Another version, which embodied all Tyndale's translations, appeared in 1537 (Matthew's Bible), and in 1538 Cromwell ventured to in- sert in a body of injunctions, issued by him for the direc- tion of the clergy, an order~~

~~that each parish should procure a copy of what was called the Great Bible. This referred to an edition not yet published, which came forth in the following year (1539); and in the next (1540) was re- published with a preface written by Archbishop Cranmer. The English Bible being thus fairly launched in the country, the attempts made by the reactionary party to check the advance of reformed opinions all proved abortive. The king vacillated strangely between one influence and the other. In 1539 he was himself the author of a law intended to uphold the old faith with extreme severity. Under this the punishment of death was decreed against all who re- fused to acknowledge the doctrine of transubstantiation, and very rigorous penalties against five other proscribed opinions. The fall of Cromwell soon followed, and the reactionary party seemed for a moment to have triumphed. But the influence of Archbishop Cranmer with the king could not be overthrown, and further progress in reforma- tion was soon to be discerned. The law of Six Articles was modified and allowed to lie dormant; the service-books were reviewed and amended by convocation; the litany was published in English; the king himself put out an English primer, in which the strongest statements are made as to the desirability of having prayers and services in English. In fact, an English prayer-book and an English service for the mass were both in course of construction by convocation when King Henry died (1547). By his will he nominated sixteen councillors to administer affairs during the minority of his son Edward VL, and in this council the reforming or Protestant clenient soon had complete sway. A book of homilies containing reformed doctrine was ordered to be read in all churches. In 1548 4 service in English was published to be appended to the Latin service of the mass, and provision was made in this for the recep- tion in both kinds by the laity, In 1549 an English prayer-book, carefully drawn up from thie cld service-books of a body of divines, accepted by convocation and parlia- ment, was given to the church, and the use of it was made compulsory by an Act of Uniformity. Images were soon removed from churches, altars taken away to be replaced by tables, and Archbishop Cranmer, zealously bent on the work of reformation, earnestly invited all the most distin- guished foreign Reformers to visit England, that, if possible, the lovers of reformation might agree to a confession of faith, to be opposed to the confession of~~

the Romish Church then being formulated and settled at the Council of Trent. Many of the foreigners thus invited did in fact visit England, and their influence was very considerable, With their help a body of 42 articles was drawn up by the English divines, which, having been approved by convoca- tion and sanctioned by the king, the clergy were called

upon to subscribe. In 1552 was published a second prayer-

book, which, with some additions, and a considerable retrenchment of the first book in the matter of ceremonial, had altogether a much more Protestant character than its predecessor. The ordinal was also a second time reformed. The extreme rapaciousness of the chief men of the state at this period led to a seizure of church property, which greatly impoverished and kept back the growth of the church in after years. The impropriate tithes, which in very many cases had been acquired by monasteries, went, at their suppression, into lay hands, and no suitable provi- sion was made for the remuneration of the clergyman of

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the benefice. Hence the clergy for a long period were of a low social grade, and very few of them competent through learning to become preachers. When, on the death of Edward (1553), Queen Mary succeeded him, the majority of the clergy accepted without hesitation the re-establish- ment of the old superstitions. There was, however, a certain number, estimated variously from 1500 to 3000, who were incapacitated from doing this. These were the clergy who had taken advantage of the enabling law, passed in the last reign, to contract matrimony. These clergy were now everywhere expelled from their benefices, and some of them were harshly treated. About 800 of the laity and clergy who favoured reforming views, foreseeing the danger to be apprehended from the queen, escaped at her accession to various towns on the continent ; the remainder of like views in England soon found their way into prison, until it should be determined what policy

~~to adopt towards them. There is reason to believe that Bishop Gardiner, who was Mary's chief adviser at the beginning of her reign, was in favour of a lenient policy, and that Cardinal Pole, who arrived in England as papal legate (November 1554), was also opposed at first to harsh measures. But the temper of the prince whom Mary had married, as well as her own, were both favourable to persecution, and it was determined in the council to proceed to the extremest measures sanctioned by the law against the so-called here- tics. A commission of bishops was opened (January 1555) for the trial of heretics. On February 4 was burned for alleged heresy at Smithfield Mr Rogers, prebendary of St Panls ; on February 8, at Coventry, Mr Saunders, rector of All Hallows Bread St.; on February 9, Hooper, bishop of Gloucester, at Gloucester, and on the same day Dr Taylor, rector of Hadleigh, at that place; on March 30, Farrar, bishop of St David's, at Carmarthen. On October 16 Bishops Ridley and Latimer were burned at Oxford, and finally at the same place, on March 22, 1556, was burned Archbishop Cranmer, for 23 years the primate of England. These executions of leading divines were accompanied by those of others, many of whom were illiterate persons, many also women. In the year 1555 were burned 75 ; in 1556, 83; in 1557, 77; in 1558, 51,— making a total of 286 in four years. So far, however, was this savage persecution from exterminating the reforming spirit from the church that, when, on the welcome death of Queen Mary (1558), a new queen who favoured the reformation succeeded, the whole of the clergy of England, with the exception of 189, accepted the change, 'The chief danger to the Church of England now arose, not from the cruelty of the Romanists, who were henceforth kept down with a strong hand, but from the contemptuous and insubordinate spirit developed among some who held reforming views. During their so- journ abroad the English exiles had become familiar with a type of reformed religion different from that which had been adopted by their own church, and they endeavoured to press this upon the acceptance of the Church of England. It was seen that no change of importance, and certainly none in the Protestant direction, was to be expected in the formularies of that church. The queen was a lover of ceremonial. The primate (Parker) was a moderate man, but with no tendency to favour the foreign reformers, and inclined to exact obedience to law. The prayer-~~

book was reviewed, but the only alterations made in it tended rather in the direction of increased ceremonial. The disciples of the foreign reformers, who soon obtained the name of Puritans, could not for a time believe that the ceremonial would be really enforced against them with vigour. But the queen was determined to compel the bishops to exercise discipline. When the Puritans discovered this, some of them formally separated from the church (1566); many more deliberately set themselves to devise plans for evad-

ing the laws and still keeping their benefices. The ministers who acted thus were strongly supported by a numerous party in the House of Commons, and only the untiring vigour and courage and the unfailing popularity of the queen saved the church from disruption. On the one hand Elizabeth constrained. the bishops, often with the roughest menaces, to act. On the other she exercised a most dictatorial authority over parliament, and prevented its in- terference. Yet all this time the chief supporters of the Puritans were among her own favourites and ministers, Lord Leicester and secretary Walsingham being the most conspicuous. So imperiously did the queen treat the chief ministers of the church, that at her demand the Star Chamber suspended the primate Grindal from the exercise of his office, and kept him in this enforced inaction till near his death. His offence was that he refused to obey the queen's orders to put down certain meetings and exer- cises of clergy and laity which were called prophesyings, and which were judged by the queen to have a tendency to encourage Puritanism. In the next primate, Archbishop Whitgift (1583), the queen fowid a man after her own mind—an unsparing disciplinarian, without the least tendency to undervalue the requirements of his position. Under Whitgift the subscription test was applied much more thoroughly than before, and in consequence the number of dissenters increased, while a complete conformity was pro- duced in the church. The Puritans, despairing of obtain- ing legislative relief, and soured and embittered by the harsh treatment which they often experienced from the courts of ecclesiastical commission, allowed themselves to fall into the unjustifiable practice of writing railing libels against the bishops and

~~clergy. These, which were known by the name of the Mar-Prelate libels, from a nom de plume assumed by one of the writers, became most bitter and fierce about the time of the great danger of the country from the Spanish Armada (1588). They were at length put down, and the writers of tiem punished with much severity ;and by a law passed in 1593, which, making Puritanism an offence against the statute law, put the punishment of dissenters into the hands of the common law judges, the resistance to the church was well-nigh over- come. The chief of the Puritans now quitted England. The last ten years of Elizabeth's reign were comparatively free from religious contentions, and the church grew and flourished. In 1563 a review of the 42 articles agreed upon under Edward VI. had issued in the number being reduced to 39, the introduction of some new matter, and the exclusion of some previously adopted. The amended articles were accepted by the convocation of Canterbury and representatives of that of York, and, being ratified by the queen, were ordered to be subscribed by the whole of the clergy. An Act of Parliament making this compulsory was passed 1571. A second book of homilies was also now sent out by the convocation for the use of the clergy, and continual efforts were made to improve the learning of the parochial clergy, and to provide a larger supply of Ministers competent to preach. During the reign of Elizabeth the theology of the church of England in its re- formed state acquired form and substance. Jewel's great work (The Apology) stated its case as against the Romanists. Whitgift, Bancroft, Hooker, and Bilson defended its teach- ing and discipline against the Puritans. The grouud taken by this latter class of writers became gradually higher, until at length a divine right and claim were demanded for episcopacy. These higher views were readily accepted by the new sovereign James [, who, himself a theological writer, and thoroughly alienated from the Presbyterians by the rough treatment he had received at their hands, was ready to accord high authority to the church as he demanded it for the throne. His absolutist views of government soon~~

~~embroiled him with the parliament, and the church shared in the unpopularity of the monarch. At the commencement of the reign of James, the Puritans entertained great expec- tatious of obtaining changes favourable to their views. A petition, signed by nearly a thousand ministers who held with them, had been presented to the king, and a conference was arranged to be held at Hampton Court (January 1604) to consider the points in dispute. Very small changes were the issue of this conference. It afforded an opportunity for the king to exhibit his theological skill, and to threaten the Puritans that they must expect rough treatment if they did not conform. Severe measures followed. Bancroft, the new primate (December 1604), demanded not only the act of subscription to the formularies, but a declaration from the clergy that they made it ex animo. Through this many were deprived. Under Abbot, who succeeded him (1610), Calvinistic opinions were much favoured in the church, and the king, who at that time appeared to hold these views, sent four English divines to represent him at the synod of Dort (1618). But towards the latter part of the reign a change both in politics and in the theology which found favour is very apparent. Arminian opinions began now to be freely advocated by divines, and the parliament, which was strongly opposed to these opinions and to the milder treatment of Romanists with which they were accompanied, began to make fierce personal assaults on the chief main- tainers of them. Thus Bishops Neile and Harsnet, and Mr Montagu, one of the king's chaplains, were attacked by the House of Commons. The accession of Charles, who was more strongly imbued with the opinions so distasteful to parliament than even his father, while it encouraged the court divines to bolder flights, made the temper of parlia- ment more hostile both to them and the king. The angry dissolution of the parliament in 1629 was followed by an organized attempt on the part of the church rulers to preach up absolutist doctrines and the divine right of kings. The king's trusted adviser, Laud, was at the same time the auto- cratic ruler of the church, having, through the courts of High Commission and Star Chamber, an absolute power over both clergy and laity. Laud aspired not only to exact conformity, but to regulate the opinions and teaching of the whole body of clergy after the court pattern. He at the same time sought to improve the solemnity and decency of public worship, and to introduce~~

many much-needed reforms into the church. But his measures were often taken with- out regard either to policy or justice, and, in consequence, a vast store of unpopularity was accumulated against him, which found vent when, early in 1640, during the sit- ting of the Short Parliament, a convocation met, and pro- ceeded under royal licence to make canons. An unfortun- ate mistake in the hasty wording of a canon, which, leaving an " é&c." in the list of church officers to whom obedience was to be sworn, seemed to suggest the possibility of a trap laid for the unwary, caused a general ferment throughout the country. The unwise policy of continuing the convocation after the dissolution of parliament, in order that it might grant the king a benevolence, added fuel to the fire, and when, in Noventber 1640, the Long Parliament met, a most violent attack was at once made on Archbishop Laud and the clergy generally. Laud and two other bishops were committed to the Tower, awaiting articles of impeachment; the bishops were expelled from the House of Lords, the court of High Commission was taken away, and coramittees were appointed both in parliament and in the country to deal with tle numerous petitions presented against the clergy, Soon the king and parliament were at open war, and tli severest measures were directed against the clergy, whé were inostly loyal to the king. In 1643 met an assembly of divines at Westminster, to which was committed the task of recasting the whole of the formularies and constitution of VIII. — 48

the church. They issued a directory for public worship, the use of which was enforced by law, while that of the Common Prayer was forbidden under severe penalties. The taking of the Scotch Solemn League and Covenant was en- forced on all persons, and those clergy who refused it were at once deprived; others were ejected from their benefices by the committees established in various parts of the country, whose jurisdiction was summary and irresponsible. By these means a large proportion of the Episcopal clergy of England were ejected during the times of Presbyterian ascendency. Their archbishop had been beheaded as a traitor (1645), and many of their leading divines were in prison. Under Cromwell and the Independents the condi- tion of the clergy did

not improve. A body called the triers was appointed to test the qualifications of all ministers, and to exclude those judged unfit. In 1655 a very severe law forbade the clergy to use the Common Prayer in private houses, or to act as tutors or schoolmasters, They were thus reduced to the greatest distress and misery. The long-continued oppression to which the clergy had to submit during the Rebellion and Commonwealth naturally disposed them to harshness against the nonconformists at the restoration of the monarchy (1660). They resisted the demands upon them for concessions on the Puritanical side made at the Savoy Conference, and in the review of the prayer-book by convocation which followed, the changes made were by no means such as were likely to render it more acceptable to the objectors. Yet to this prayer-book a severe Act of Parliament required an immediate and uncon- ditional assent and consent, as the condition of ministering in the church, requiring at the same time that all those who had not received episcopal orders should seek them, and that a declaration against the Covenant and a promise of non-re- sistance should be made. The effect of these requirements was to eject from ministering in the church about 2000 ministers (1662). The ejected were followed up and per- secuted by various harsh measures, nfaking it illegal for them to hold conventicles,—the parliament acting, as it seemed, from vindictive feeling, the king desiring to drive the non- conformists to despair, that they might seek from him the exercise of a dispensing power which he assumed to possess. His real object was to legalize Romanism, and in fact to carry out precisely the same policy which his brother after- wards adopted. The Protestant nonconformists for the most part refused to assist this policy, even to relieve themselves from persecution; and when James at length published the declaration for liberty of conscience (1687), they were found rather on the side of the church which had dealt harshly with them than un that of the king who offered them gifts. The trial of the seven bishops for withstanding the royal will, and upholding the supremacy of law, made the church immensely popular in the country. At the Revolution, by far the greater number of clergy elected to transfer their allegiance to William, but nine bishops and over 400 clergy refused the oaths. Among the bishops was the primate (Sancroft) and Bishop Ken, the most saintly prelate of his day. These seceders formed a separate church ; they were, however,

~~weakened by intestine quarrels, and, never obtain- ing any general support, they disappeared towards the end of the century. Among them were some of the most learned divines of the English Church, and their secession was a great blow to the church, which soon showed signs of running into an extreme latitudinarianism. 'The bitter feuds which prevailed between the two houses of the southern convocation all the time of William and Anne were due chiefly to political causes, the lower house being for the most part Jacobites, while the bishops were Whigs. It was mainly on this ground that in 1717 the Government suspended the action of convocation, which did not meet again for business until recent times.~~

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~~During the 18th centuzy a general remissness and negli- gence prevailed throughout the Church of Eugland. Many of the clergy were Arians in their views; the sacredness of their office was but little recognized ; the services in many churches were negligent and infrequent. 'The first reaction came from a band of earnest young clergymen and students at Oxford, of whom the two Wesleys and Whit- field are the best known. . These men became travelling preachers, endeavouring to carry to every part of the land a stirring religious appeal. 'Their success was marvellous. Gradually their converts were organized, and arrangements made for their continued instruction. 'The church did not readily lend itself to the movement, and the new societies stepped aside from it into ground of their own. Whitfield became the leader of the Calvinistic Methodists, and the two Wesleys of the larger body, which favoured Arminian views. The Methodist movement had operated very strongly on the English clergy, and towards the end of the century a considerable section of them, distinguished for their zeal and earnestness, were known as the Evan- gelical School. By their exertions the Church Missionary Society, designed to spread Chiistianity in Africa and the East, was founded; Bible and tract societies, Sunday schools, and other agencies were established. In the 19th century the growth of the Church of England~~

~~has been remarkable. ‘The school of Oxford Tract writers, which began to attract notice about 1838, gave prominence to the sacramental system and corporate powers of the church, and enlisted a new class of energies in its service. The zeal for building and restoring church fabrics has been so strong that within a period of thirty years a sum of £30,000,000 is known to have been contributed for this purpose. Atthe same time the church has aided materially in furnishing schoolhouses for all the villages in England, and in numberless other works of utility and charity. Its colonial and missionary episcopate now amounts to 60; while the daughter-church in America has nearly the same number of prelates. The extension of the home episcopate is also proceeding, but at aslower rate. ‘The two new sees of St Albans and Truro were established in 1877. The church of England can now number, as affiliated to her and accepting her use, a body of nearly two hundred prelates. In England her clergy amount to about 20,000; while, notwithstanding the complete toleration accorded to all dissenters since the Revolution, it is probable that con- siderably more than half the population of the country still acknowledges allegiance to the ancient church.!~~

~~II. Formularies and Doctrines.—The formularies of the English Church are translations in part from Latin and Greek rituals, which have been used fourteen or fifteen hundred years in the Christian church, and in part from the service book called the Consultation of Hermann, archbishop of Cologne, published in 1543. This was the work of Bucer and Melanchthon, but was grounded on a book previously published by Luther. Some portion of the formularies is the original composition of English divines. Morning and Evening Services.—These were chiefly com- piled from the ancient services used at the Seven Hours of Prayer (nocturn-lauds or matins, prime, tierce, sext, nones, vespers, and compline). ‘he services prescribed for these hours, after being shortened, had been brought together in a book called the Breviary (1073-1086). From the Breviary the English form was translated, the morning service being an abridgment of those prescribed for nocturn-lauds and matins, the evening of those prescribed for vespers and compline. ‘The sentences, exhortation, confession, and absolution,~~

~~which did not appear in the first reformed prayer-book, but were added in the second,~~

~~1 Trustworthy recent statistics are not forthcoming.~~

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~~were probably suggested by the forms adopted by some of the Reformers. But the language of these also is care- fully adopted from old liturgies. In place of the numerous short lections of the old services, which were sometimes taken from Scripture and sometimes from the legends of saints, two chapters of Scripture were appointed to be read at each service, by which both the Old Testament and the New were read through in. regular course. Several occasional prayers and thanksgivings have been added for use in the morning and evening services at the different reviews of the prayer-book. The litany provided to be used, in addition to the morning and evening service, on Sundays, Wednesdays, and Fridays, was a translation of a very ancient form of service, which had been said processionally in the church ever since the time of St Chrysostom. 'The English litany was translated by Cran- mer, at the desire of Henry VIII., in 1544. Cranmer cut out such of the old invocations as did not accord with his reforming views, and inserted several portions from the litany issued in 1543 by Hermann, archbishop of Cologne. The form now used in the English Church has been slightly altered from that put forth in 1544. Communion Service. —The service to which by far the greatest importance was attached in the ancient church was that for holy com- munion, or the mass, as it came to be called from the last word of the Latin form. This is properly designated the liturgy or the service par excellence. The ancient Galli- can liturgy had been adopted by the early British church, and was found in use in Britain when Augustine came from Rome. Augustine, by permission of Pope Gregory, grafted some particulars of it on the Roman use which he introduced, and thus created an English liturgy, which, however, was not uniform throughout the land, but varied in different districts. This English liturgy was revised and reformed by Osmund, bishop of Salisbury, in 1087. The Sarwm Use, thus created, was the ordinary eucharistic office for the English Church up to the**

~~time of the Refor- mation, but there existed also other uses, as those of York, Hereford, Exeter, Lincoln, Bangor, Aberdeen. One of the earliest measures taken in the reign of Edward VI. was to issue a communion office, which, leaving un- touched the ancient Latin service, added to it an English service, by which communion was to be minis- tered to the people in both kinds (1548). This service was quickly superseded by the one contained in the prayer-book of 1549, which was put forth, not as an addition to, but as a substitute for, the ancient Latin service. It was principally a translation of the Latin service, but contained also some additions taken from Hermann's Consultation. In 1552 the English communion service was rearranged and considerably altered, the recital of the ten commandments with the kyrie eleison being introduced, the words of administration altered, and other changes made to give it a more Protestant character. At the review of the prayer-book after the accession of Elizabeth, some changes were again made, and also at the last review in 1661. The English communion office asit stands at present is taken principally from the ancient liturgies, but also to a very considerable extent from reformed sources. The baptismal offices were compiled partly from the ancient forms, but chiefly from the offices in Archbishop Hermann's Consultation. The office for adult baptism was added in 1661. Zhe Catechism.—This is altogether an office of the Reformation, no such form being found in the ancient service-books. The earlier part of the Catechism was originally inserted in the office for confirmation. The latter part, explaining the sacraments, was added after the Hampton Court conference, in compliance with the desire of the Puritans, and is the composition of Dr Overall, then dean of St Paul's. Service for Confirmation.—This service~~

~~was brought into its present form at 1661, being then separated from the Catechism, with the previous explanatory rubric turned into a preface. It is due, as most of the English prayer-book, partly to the ancient Sarum office and partly to the Consultation of Archbishop~~

~~Hermann. Order of Matrimony.—This service is taken almost entirely from the ancient office in the Sarum manual, as also is the office for the Visitation of the Sick. In 1552, when the practice of reserving the elements was forbidden, the service for the Communion of the Sick was added. The order for Burial of the Dead is a substitution for the medieval offices of com- mendation, burial, mass for the dead, and office for the dead. It has been much changed at the several revisions of the prayer book. The service for the Churching of Women is mainly derived from the medizval office. The Commination Service is made up of the address composed by the Refor- mers, and the prayers and suffrages anciently used in the church on the first day of Lent. The Forms of Prayer to be used at Sea were composed by Bishop Sanderson in 1601. The Ordinal did not form a part of the prayer-book of 1549, but was composed under the authority of a special Act of Parliament, which empowered six bishops and six other divines to draw up a fitting ordinal. This was pre- sented to the council, February 28, 1550, and authorized. It was reviewed on the formation of the second prayer book (1552), and considerably altered, and it was then appointed to form part of the prayer-book. The prayers are almost entirely new compositions, but the general arrangement of the services and the form and manner of conferring holy orders is the same that has been used for many centuries.~~

~~The Doctrines of the English Church may be gathered to a great extent from the prayer-book, inasmuch as it was the custom of the Reformers, who compiled that book, to introduce into all the services some words of exhortation and teaching as to the nature of the service; but it is more fully set forth and explained in the Articles and Homilies. The authority of these two books may be regarded as the same, inasmuch as the articles formally recognize and sanction the two books of homilies (art. 35). The first book of Homilies was set forth im- mediately after the accession of Edward VI., and authorized by his injunctions to be read in all churches at the mass. It was distributed to the different parishes by the royal visitors, together with an English version of the paraphrase of Erasmus. These homilies were probably mainly the work of Cranmer. The second book of homilies was set out with the sanction of convocation in 1562, but was not sanctioned by the queen for nearly~~

~~a year afterwards. It was due, in part at least, to Bishop Cox, who wrote the pre- face to the volume, and was designed not to supersede but to supplement the earlier volume, The Arécicles, now in number 39, were originally 42. They were drawn up in the years 1551 and 1552 under the superintendence of Archbishop Cranmer and Bishop Ridley. These prelates made drafts of the articles proposed, and sent them to vari- ous divines of eminence, both English and foreign, inviting their suggestions thereon. The foundation cf these drafts was a paper of articles agreed upon between Archbishop Cranmer and certain Lutheran divines who were in England in 1538, with a view of inducing Henry VIII. to adopt the Augsburg Confession. These were drawn as nearly as possible in the terms of the Augsburg Confession, and hence the resemblance between the articles of the Church of England and those of Augsburg. The 42 articles are sup- posed to have been approved by convocation in 1553, and ordered to be offered to the clergy for subscription. They were originally published together with a Catechism drawn up by Bishop Poynet. On the accession of Elizabeth the bishops were anxious to republish the articles as a counter~~

statement to the dogmatic decrees of the Council of Trent. They were reviewed by the two houses of the convocation of Canterbury and some members of the northern convoca- tion in 1563, and having been reduced to 39, and some additions and alterations made in them, were ratified by the queen, and subscribed first by the convocations, and then by all the clergy. In 1571 an Act of Parliament was passed making subscription to the articles necessary for all clergy as the condition of holding benefices; and the articles were again revised by convocation, and republished both in Latin and English. Together with the homilies and prayer-book, they form a complete exposition of the tenets of the English Church on all the main points both of doctrine and of discipline.

III. Constitutional Status.—The Church of England, or the Spiritualty, is one of the estates of the realm, and has an integral part in all legislation. It was on the ground of this constitutional position of the spiritualty that the famous protest was made, in 1641, as to the proceedings in the House of Lords in the absence of the bishops. This is pronounced by Mr Hallam to be in accordance with the plainest principles of law (Const. Hist., i. 553). The church is accepted by the state as the religious body in England, which is the legitimate possessor of all property set apart and devoted to religious uses, except the rights of some other religious body be specially expressed. It is the possessor of the ancient religious fabrics of the land and of the cemeteries attached to them. Its rights are carefully guarded by law, the incumbent of each parish being a corporation sole with certain duties and privileges, This position of the church towards the state is called its Establishment. It has arisen not from any definite Act of Parliament or the state, but from the gradual interpenetra- tion of the state by the church, and from their having mutually grown up together.

The organization of the church in England was anterior to that of the state. When the country was still divided into separate kingdonis, the church had become one throughout the land, and looked generally to a common centre. This had been the work of Archbishop Theodore (668),

~~who, by subdividing dioceses and establishing parish churches, had given form to the Christianity of the country. The church thus settled adapted itself to the civil organiza- tions. The mark, vicus, or township became the sphere of duty of a single priest, the kingdom the diocese of a bishop, the whole land the province of the metropolitan ; the rival archbishops head rival nationalities ; the greater dioceses are divided on the lines of the earlier under-kingdoms ; the shires become the archdeaconries, and the hundreds the deaneries of a later age. The archdeacon or bishop presided with the ealdorman and sheriff in the shire-mot ; the parish priest led his people to the hundred-mot; the Witenagemot had its most distinct and permanent constituent in the clergy, bishops, and abbots. The church in England had thus from the very first a territorial organization, the land was divided and parcelled out to it, or rather by it. As the nation grew towards unity the territorial claims of the church became only the more firmly fixed ; its tight to endowments, which had in the first place been voluntarily given, was ratified and confirmed. The church was not endowed any more than established by any definite act of the state, but growing up together with the state it obtained sources of revenue from the piety of the faithful, — its position and its revenues being, not created, but defended and secured by law. The Church of England has always had the constitutional power, recognized by the law, of meeting in synod to discuss and settle matters touching the spiritualty,—the metropolitan of each province having his separate synod. After the Conquest, when secular and spiritual things were carefully divided one from the other,~~

~~the metropolitan summoned the synod by his own authority, and it consisted merely of his suffragan bishops, with the prelates—that is to say, deans, abbots, archdeacons—with- out any representatives of the parochial clergy. These first appeared in a legatine synod at Westminster in 1255, but it was not till the time of Edward I. that the synods of the Church of England acquired that special organization which they have preserved ever since. The necessity that the clergy~~

~~were then placed under of yielding to the king's heavy demands for taxes was the cause of the introduction of the representative system into the church. In the presence of more rigid demands for money payments, it was felt that those upon whom the taxes fell must have a Voice in voting them. Accordingly the clergy of each diocese were now called upon to elect two proctors to sit in convocation. The first summons of elected representatives of the clergy to convocation bears date 1279. In 1295 the king, thinking that these representatives of the clergy sit- ting actually in parliament would be more amenable to pressure that when they sat in a house of their own, ordered two clergy from each diocese to be summoned to parilia- ment. But the clergy shrank from this, and it soon fell into disuse. The convocations thus constituted under Edward I. consisted in each of the two provinces of Can- terbury and York, first of the metropolitan, who was president ; next of all diocesan bishops; then of all prelates, —that is to say, dignified clergy, deans, archdeacons, abbots; lastly, of representatives chosen by the chapters of the cathedrals and the clergy of the diocese. The numbers of these have varied at different times, and may be changed at the will of the president. These convocations voted all the money payments of the clergy to the crown, and also, before the time of Henry VIII, legislated for the clergy by canons without any check from the state. But in 1532 these bodies were constrained, by the great danger in which they then stood, to accept what was called the Submission of the Clergy tothe crown. By this the archbishops abandoned their right of summoning their convocations independently, and undertook only to summon them on receiving the writ of the crown. They undertook also not to promulgate any canons save those which were ratified by the crown. This act of the clergy was embodied in an Act of Parliament and made law (1534), and it is under this law that the con- vocations of the two provinces have since met and acted. Their constitutional position at present is to be the advisers of the crown and parliament in all things spiritual and ecclesiastical, but they have no legislative power save in so far as what they have agreed upon may be made the sub- stance of an Act of Parliament. The convocations have thus in many instances procured their determinations to become the law of the land, as, notably in the Act. of Uni- formity of 1662, and recently in the Shortened Service Act. But convocation may not only~~

~~thus indirectly make statute law; it may also make, with the consent of the crown, canons which bind the clergy where they are not contrariant to statute law. The canon does not in any way come before parliament, but merely requires the royal licence and approval to become valid. It was thus that the body of canons by which the clergy are at present governed were made in 1604. The meetings of convocation have always coincided with those of parliament, and only in two instances, in 1584 and 1640, has either convocation sat after the rising of parliament. In several instances the northern convocation, being the smaller, has consented to send representatives to the southern, and thus to constitute one synod. 'The convocations do not in reality consist of two houses, though they are thus divided for the purposes of discussion and voting, but only of one house each, the lower clergy being in fact the assessors of the bishops. In 1664 the clergy abandoned their right of taxing themselves~~

~~in their convocations, and became subject to the general law of the land in this matter. In view of this concession they obtained the right of voting for members of parliament. In 1717 the lower house of the Canterbury convocation show- ing, as was thought, a turbulent spirit and a tendency to oppose the house of Hanover, the action of convocation was suspended, and it remained silent for one hundred and thirty-five years. The unconstitutional and oppressive character of this enforced silence of the spiritualty produced much discontent, and led in modern days to an organized attempt to overcome it. As convocation still continued to meet as a formality, and then to be immediately prorogued, opportunity was taken of its meeting, in February 1852, to present to the lower house a large number of petitions pray- ing for the revival of its action. They voted an address to the upper house enforcing the prayer of these petitions, and were allowed to present it. The action of this long inanimate body thus recommenced, and, the Government not seeing fit to oppose it, has gone on with increasing vigour ever since. The constitutional status of the Church of England has been considerably affected by various measures passed since the Restoration. The chief of these are the Toleration Act of William and~~

~~Mary, the Act of Union with Scotland of Queen Anne, the Roman Catholic Fmancipation Act, and the Jewish Disabilities Removal Act. Through the operation of these Acts the two houses of the legislature no longer consist entirely of members of the Church of England, although their right to legislate for that church remains the same. The effect of this is very perceptible in the course of modern legislation. The Church of England can no longer levy a compulsory rate on all occupiers for the maintenance of the church fabrics, as formerly. The exclusive right of performing the marriage service has also been taken from her, the completest equality between the religious bodies existing within the state being aimed at. This, so far as is consistent with the preserva- tion of a certain prerogative to the church, as the church of the sovereign and one of the estates of the realm, and of the ancient church endowments, may be said to be the accepted principle of modern legislation.~~

~~IV. Law.—The Church of England is governed by a system of jurisprudence made up of three elements,—the Common Law, the Canon Law, the Statute Law. The first consists of customs, precedents, and judicial records ; the second of all canons passed or accepted by English synods, which are not " contrariant to the laws, statutes, and customs of the realm," and which, if passed after the Act of Submission of the Clergy, 1534, have received the sanction of the crown; the third of Acts of Parliament relating to the church, Of these there is now a very large number. The laws relating to the church being of a mixed character, the judicial administration of those laws is assigned to various tribunals, some of a purely ecclesiastical kind, some of a purely secular kind, and some in which the ecclesiastical and secular elements are combined, All questions of civil rights are within the jurisdiction of the secular courts. Questions touching the orthodoxy of the clergy, their conduct in their ministrations, and their morals are subject to the jurisdiction of the bishops, with the right of appeal from a lower to a higher court, and ultimately to the sovereign in council. The ordinary" ecclesiastical tribunal of first instance is the consistory court of each diocese. Of this the bishop is judex ordinarius, but he does not preside in it in person, but by his chancellor. In the case of criminal offences charged against any of the clergy, the bishop's mode of proceeding is~~

~~regulated by recent legislation, which has substituted another tribunal for the ancient diocesan court. 'This is contained in the Act 3 and 4 Vict., c. 86, entitled "An Act for better en- forcing Church Discipline." Under this Act the bishop~~

~~may either proceed against the accused clerk himself, by~~

~~issuing a commission to five persons to inquire whether~~

~~there is a case, and then if this is found, proceeding to try~~

~~it with three assessors; or he may send the case at once to~~

~~the provincial court, where it will be tried before the Dean~~

~~of the Arches. A further regulation of procedure in the~~

~~case of clerks charged with offences against the rubrics of~~

~~the prayer book has been made by the Public Worship. Regulation Act of 1876.~~

~~See Bede, Opera, ed. J. A. Giles, Oxon, 1843-5; Ussher, Eccles. Britann. Antiquitatcs (ed. Elrington), Dublin, 1841-62 ; Stilling- fleet, Origines Britannice (ed. Pantin), 2 vols., Oxon, 1842; Churton, Early English Church (Eng. Lib.), 1841; Soames, Latin Church during Anglo-Saxon Times, 1848; J eremy Collier, Zcclesias- tical History of Great Britain (ed. Barham), 9 vols., 1840; Thomas Fuller, Church History of Britain to 1648, 3 vols., 1837; Inett, History of English Church, 2 vols.; D. Wilkins, Concilia Magne Britannie, 4 vols., 1737; Foxe, Acts and Monuments of Christian Martyrs (ed. Cattley), 8 vols., 1841; Nic. Sander, De Origine et Progressu Schismatis Anglicani (ed. Richton), Col. Agr., 1585; Burnet, History of the Reformation (ed. Pocock), Oxford, 7 vols., 1865; Strype, Historical and Biographical Works, 27 vols., Oxford, 1822-28; Heylin, Ecclesia Restaurata, 1674; Dodd, Church History of England, with notes by Tierney, 5 vols., 1840 ; S. R.~~

~~Maitland, Essays on Reformation, 1849; Hook, Lives of Archbishops of Canterbury, 9 vols., 1860-76; Massingherd, History of the Reformation (Eng. Lib.), 1842; J. H. Blunt, History of the Reformation, 1860, and Annotated Prayer Book, 1867; Soames, History of the Reformation, 4 vols., 1826; Perry, History of Church of England, 3 vols., 1862-4, and Student's Manual of English Church History, 1878; James Anderson, History of the Church of England in the Colonies, 3 vols., 1856; Proctor, History of the Prayer Book; Cardwell, Documentary Annals of Church of England—History of Conferences—Synodalia, 5 vols., 1839-42; Blunt and Phillimore, Law of the Church of England, 2 vols.; Clausnitzen, Gottesdienst, Kirchenverfassung, und Geistlichkeit der bischéflichen englischen Kirche, Berlin, 1817 ; G. Weber, Geschichte der akatholischen Kirchen u. Sckten in Grossbritannien, 1845-53 ; and J. L. Funk, Organisation der englischen Staatskirche, Altcn- burg, 1829. (G. G. P.)~~

~~ENGLISH BIBLE. The history of the vernacular Bible of the English race resolves itself into two distinctly marked periods,—the one being that of Manuscript Bibles, which were direct translations from the Latin Vulgate, the other that of Printed Bibles, which were, more or less com- pletely, translations from the original Hebrew and Greek of the Old and New Testaments.~~

~~The Manuscript Bible.~~

~~As far back as the English language can be followed, there are traces of the work of English translators of the Scriptures.! St Aidan, bishop of Lindisfarne in the first half of the 7th century (died 651 a.p.), is said by Bede to have employed those who were about him, laymen as well as clergy, in reading and learning the Scriptures, espe- cially the Psalms; and the laymen of Northumbria were not likely to understand any but their native tongue. A little later Ceedmon, a lay monk of Whitby (died 680), whose gifts as a poet had been discovered while he was a cow-herd on the neighbouring downs, composed a metrical version of several parts of the Old and New Testaments from English translations which had been made for him by monks who understood the Latin Vulgate. Rather later still, Eadfrith, bishop of Lindisfarne (died 721), is~~

~~said, on some authority known to Archbishop Ussher (Works, xii. 282), to have translated most of the books of the Bible ; and similar traditions are handed down respect- ing the Venerable Bede (died 735), Alcuin (died 804), and King Alfred (died 901). 'he earliest relic of such work that actually remains extant is an English Psalter,~~

~~1 There seem indeed to have been copies of a vernacular version in the earlier language of the country, for Gildas writes in the begin- ning of his history that, when English martyrs gave up their lives for Christianity during the Diocletian persecution in the beginning of the 4th century, "all the copies of the Holy Scriptures which could be found were burned in the streets."~~

~~Ald- the first fifty Psalms of which are in prose and the rest in~~

~~helm's verse, which was translated by St Aldhelm, long abbot of~~

~~Psalter. Malmesbury, and at his death (709) bishop of Sherborne, and of which a copy is preserved in the N ational Library at Paris. This Psalter was printed at Oxford, under the editorship of Thorpe, in 1835, and is one of the earliest monuments of the English language.~~

~~The Line Next in date comes a volume known as the Lindisfarne~~

~~disfarne or St Cuthbert's Evangelistarium. This beautiful volume,~~

~~Gospels. which formerly belonged to the dean and chapter of Durham, but is now preserved in the British Museum (Nero D. iv.), was written in Latin by Eadfrith about 680, and illuminated by Ethelwold, afterwards (724-740) bishop of Lindisfarne. At a later date an interlinear English trans- lation was added by Ealdred, probably the monk who afterwards became (957-968) bishop of Chester-le-Street. The Lindisfarne Gospels were edited, with a learned intro- duction, by Bouterwek in 1857, and also by Stevenson and Waring for the Surtees Society in 1854-65.~~

~~The Of a little later date is a similar volume, known as the Rush-Rushworth Gospels, which is preserved in the Bodleian worth Library (Auct. D. 2, 19). This manuscript was originally Gospels. written in Latin by MacRegol, an Irish scribe, about 820, and the interlinear English version was added about 80 or 100 years afterwards by a scribe named Owen and a priest of Harewood named Ferman. The three later gospels are so nearly identical with those of the Lindisfarne book as to show that the translation contained in the latter represents a publicly circulated version. The Rushworth Gospels have also been printed by the Surtees Society. Elfri's There was in circulation, too, in the 10th century, a Hepes translation of the first seven books of the Old Testament, euch,~~

~~which had been made by AIIlfric, who was during the later part of his life (994-1005), archbishop of Canterbury. These seven books were probably, however, part only of a much larger work, for translations of the books of Kings, Esther, Job, Judith, the Maccabees, and of the four gospels, also exist, which are of the same date, and are supposed to be from the same pen. Copies of the Heptateuch exist in the British Museum (Claud. B. iv.), and in the Bodleian Library (Laud 509), a copy of the gospels being preserved in the Library of Corpus Christi College, Cambridge. The Heptateuch was printed by Edward Thwaites in 1698.~~

~~In addition to the above, there are also many copies of the " Anglo-Saxon " Psalter and of the Gospels in the British Museum, in the libraries of Oxford aud Cambridge, and elsewhere, some of which are written in between the lines of the Latin, and others of which are, like lfric's Heptateuch, d&c., independent works. Such manuscripts are found of as late a date as the end of the 12th century, showing that the more ancient form of the English language was in use long after the Norman Conquest, and even when the transition was far advanced from " Anglo-Saxon" to the medieval English of Chaucer. The general character of the older English may be seen by the following specimen, taken from /tlfric's Heptateuch, the comparison with modern English being made easy by a parallel version :—~~

~~GEN. xxxvir. 5-11.~~

~~TentTH CENTURY.~~

~~. .. hine hatedon the swithor. & he cweth to him, Gehirath min swefen the me mette. Me thuhte tht we bundon sceafas on xcere, & tht min sceaf arist, & stode uprihte omiddan eowrum sceafum, & eowre gilmas stodon ymbutan & abugon to minum sceafe.~~

~~Tha cwedon his gebrothru, Cwist thu ? bist thu ure~~

~~cyning, oththe beoth we thine hyr men? Witodlice thurh this swefn & thurh thas spreca hig hinc hatedon, & hefdon andan to him. Other swefen hine mette, & he rehte tht his brothrum, & cwth, Ic geseah on swefne swiice~~

~~MopeERN.~~

~~. .- him hated the more. And he quoth to them, Hear my dream that me met. Me thought that we bounden sheaves in the acre, and that mine sheaf arised, and stood upright amid your sheaves, and your yelms [bundles] stood about and bowed to mine sheaf. Then said his brethren, Sayest thou? beest thou our king, either be we thine hire-men? Wherefore through his dream and through his speeches they him hated and had anger to him. Other dream him met, and he told that his brethren, and quoth, I saw in a dream as it were~~

~~ENGLAS& "SBABLTE~~

~~sunne & mona & endleofun steorran, & calle abugon me. Tha he tht his feeder & his brothrum rehte, tha threatode se feder hine, & cweth, Hwat sceal this swefen beon the thu gesawe? Sceolon we abugan the, ic & thin modur & thine gebrothru? Witodlice his gebrothru yrsodon swithe. . ..~~

~~sun and moon and eleven~~

~~stars, and all bowed to me. When he that his father and his brethren told, then threatened his father him, and quoth, What shall this dream~~

~~**be that thou sawest? Shall**~~

~~**we bow to thee, I and thine mother and thine brethren? Wherefore**~~

~~**his brethren were angry with…..**~~

~~**The English which was spoken before the Conquest un- derwent much change, however, during the reigns of the Norman and Angevin kings; and although the reproduc- tion of the older translations shows that there were some Englishmen who still used their language in its ancient form, yet there can be no doubt that many of the old words had become obsolete by the time of the Plantagenets, and that the vernacular tongue of the country had been so altered by its contact with the French spoken by the upper classes as to make new translations of the Scriptures necessary. Of such new translations Archbishop Cranmer writes in his preface to the authorized version of 1540. The Holy Bible was, he says, "translated and read in the Saxons' tongue, which at that time was our mother tongue," many hundred years before the date at which he was writ- ing, '" whereof there remaineth yet divers copies, found in old abbeys, of such antique manner of writing and speaking that few men now been able to read and understand them. And when this language waxed old and out of common usage, because folk should not lack the fruit of reading it was again translated into the newer language, whereof yet also many copies remain, and be daily found." Sir Thomas More also wrote that "the whole Bible was, long before Wickliffe'sdays, by virtuous and well-learned men, translated into the English tongue, and by good and godly people with devotion and soberness well and reverently read" (More's Dial., iii. 14). Similar evidence is given by Foxe the martyrologist, who says in his dedication to an edition of the Anglo-Saxon gospels, "If histories be well examined, we shall find both before the Conquest and after, as well before John Wickliffe was born as since, the whole body of the Scriptures by sundry men translated into our country tongue." But as of the earlier period so of this, there are none but fragmentary remains, the 'many copies" which remained when Cranmer wrote in 1540 having doubtless disappeared in the vast and ruthless destruction of libraries which took place within a few years after that date.} There**~~

~~are, however, two English versions of the Psalter still remaining which were made early in the 14th century, together with many abstracts and metrical paraphrases of particular books of the Bible, translations of the epistles and gospels used in divine service, paraphrases of gospel lessons, narratives of the Passion and Resurrection of our Lord, and other means for familiarizing the people with~~

~~'Holy Scripture. It was also the custom of medieval~~

~~preachers and writers to give their own English version of any text which they quoted, not resorting as in later times to a commonly received translation ; and a very curious illustration of this fact is found in the prologue to the Wickliffite Bible, where, of the many quotations made from the Scriptures, none are taken from the English version to which it forms the preface, but all are translated directly from the Vulgate The same fact is observable in the works of Chaucer and of Wickliffe himself, neither of them using the Wickliffite version, though their works con- tain numerous quotations from Scripture translated into English.~~

~~1 Bale writes in 1549, "I judge this to be true, and utter it with~~

~~heaviness, that neither the Britons under the Romans and Saxons, nor~~

~~yet the English people under the Danes and Normans, had ever such damage of their learned monuments as we have seen in our time" (Bale's Declaration upon Leland's Journal). About that time, among hundreds of other libraries, those of the city of London and of the uni- versity of Oxford entirely disappeared, the very book shelves of the latter being sold for firewood. .~~

~~Schors ham's Psalter.~~

~~Rolle of Ham- pole's Psalter.~~

~~The~~

~~Hereford yf Rolle '~~

~~and.~~

~~Wickliffe~~

~~Bible,~~

~~1384,~~

~~_ off, a note is inserted stating the fact in Latin, “Explicit~~

~~iN GeISa BISE~~

~~tls later version and that of Hereford and Wickliffe to Purvey’s suggest that it is a revision of the latter rather than a new Version,~~

~~Of the two Psalters mentioned above, the earlier one was translated by William de Schorham, who was vicar of Chart Sutton in Kent in the year 1320. One copy is preserved in the British Museum (Add. MS. 17,376), and two others are in the library of Trinity College, Dublin. The other version was made by Richard Rolle, a chantry priest and hermit of Hampole, near Doncaster (died 1349). Among many works that he wrote was a Latin commentary on the Psalms, and on his being persuaded to re-write this in English, an English version of the Psalms was incorpor- ated with it in the same way as the Latin had been in the original work. “In this werke,” wrote the author—~~

~~““T seke no straunge Ynglys, but lightest and commmmnnest, & swilk is moste lyk unto the Latyne, so that thai yt knawes noght ye Latyne be the Ynglys may com to many Latyne wordis. In ye translacion I feloghe the letter als-mekille as I may, and ther I fynd no propre Ynglys, I feloghe ye wit of ye wordis, so that thai that schulen rede it them thar not drede erryng.”~~

~~The commentary of Hampole, as the author is frequently called, was very extensively circulated, and many copies of it exist. It was also printed at Cologne in the year 1536.~~

~~Treading worthily in the footsteps of these and many other worthy predecessors, come the translators of the two noble 14th century versions, which were long regarded as the exclusive work of John Wickliffe, and were thus always associated with his name (see WicKLIFFE). 'The first of these two versions was completed about 1384, the year of Wickliffe's death, and may be distinguished by the names of the principal translators, as Hereford and Wickliffe's version. The second was completed about 1388, and for the same reason may be called Purvey's version.~~

~~Wickliffe's earliest work was of the same nature as that being a commentary on the book of Revelation, which he is supposed to have written in 1352. This was followed in 1360 by a commentary on the gospels, consist- ing chiefly of passages from the fathers translated into English and placed beside an English version of the gospels. It is this translation of the gospels alone which can be cer- tainly identified as the work of Wickliffe in the Bible which goes by his name ; but Sir Frederick Madden says, in his preface to the Wickliffite versions, that the Epistles, Acts, and Apocalypse " might probably be the work of Wickliffe himself ; at least the similarity of style between the gospels and the other parts favours the supposition." The Old Testament and Apocryphal books were translated principally by Nicolas de Hereford, of Queen's College, Oxford, at one time vice-chancellor of the university, and afterwards a canon of Hereford. It is to be observed, however, that tlie translation of the Psalms in Hereford's Old Testament is undoubtedly based upon that of the Hampole Psalter. The original manuscript of Hereford's translation, with his alterations and corrections, is preserved in the Bodleian Library (Bodl. 959). It extends only as far as Baruch iii. 19, and it is supposed that his work was interrupted in the middle of the year 1382 by a summons to appear before convocation in London, and bya subsequent appeal which he made to Rome, and which ended in an imprisonment there. A contemporary copy of his manuscript also exists in the Bodleian (Douce 369), which shows the further growth of this version. At the place where Hereford left~~

~~translationem Nicholay de Herford," and the remaining books of the Old Testament, Ezekiel, Daniel, the twelve minor prophets, and the two books of Maccabees, are added by another and unknown hand. The Bible was then com- pleted by extracting the text of the gospels from Wickliffe's commentary, and adding to it a new translation of the rest of the New Testament. Copies of this Bible are rare, far the greater number of the copies of the " Wickliffite Bible " being of the later version, now to be described.~~

~~Although there is enough verbal resemblance between |~~

~~translation, the account given of his work by Purvey him- self says nothing about such a revision, and represents it as an independent version.~~

~~"For these reasons and other," he wrote in his prologue or preface, " with common charity to save all men in our realm which God will have saved, a simple creature hath translated the Bible out of Latin into English. First, this simple creature had much travail, with divers fellows and helpers, to gather many old Bibles, and other doctors, and common glosses, and to make one Latin Bible some deal true : and then to study it of the new, the text with the gloss and other doctors as he might get, and specially Lyra on the Old Testament that helped him full much in this work : the third time to counsel with old grammarians and old divines of hard words and hard senses how they might best be understood and translated : the fourth time, to translate as clearly as he could to the sense, and to have many good fellows and cunning at the cor- recting of the translation."~~

~~These words imply a labour of some years, and as Purvey makes no allusion whatever to any other translation – of his own time, it is reasonable to suppose that he went to his task without any knowledge that a similar work was being done by contemporaries. But although he says much in his prologue respecting the manuer in which his work of translation had been done, Purvey gives no information respecting the date at which he was writing. He lived on as late as the year 1427,~~

~~leading an unsettled life, and suffering imprisonment for his opinions, which he recanted at St Paul's Cross in 1400; but it is supposed that his translation was completed by about the year 1388. About 150 copies of Purvey's version are known to be still in existence, some of them beautifully illuminated and beauti- fully bound, but they all appear to have been written before~~

~~1430.4~~

~~The following specimen of the later version (John xi. 1-13) will show that its language is not very far removed from that of the present day : —~~

~~*' And ther was a sijk man, Lazarus of Bethanye, of the castel of Marie and Martha hise sistris. And it was Marye, which anoyntide the Lord with oynement, and wipte hise feet with hir heeris, whos brother Lazarus was sijk. Therefor hise sistris senten to hym, and seide, Lord, lo! he whom thou lonest is sijk. And Jhesus herde, and seide to hem, This syknesse is not to the deth, but for the glorie of God, that mannus sone be glorified bi him. And Jhesus louyde Martha and hir sistir Marie, and Lazarus. Therfor whanne Jhesus herde that he was sijk, thanne he dwellide in the same place twei daies. And after these thingis he seide to hise disciplis, Go we eft in to Judee. The disciplis seien to hym, Maister, now the Jewis soughten for to stoone thee, and eft goist thou thidir? Jhesus answerde, whether ther ben not twelue ouris of the dai? If ony man wandre in the dai he hirtith not, for he seeth the light of this world. But if he wandre in the night, he stomblith, for light is not in him. He seith these thingis, and aftir these thingis he seith to hem Lazarus oure freend, slepith, but Y go to reise hym fro sleep. Therfor hise disciplis seiden : Lord, if he slepith, he schal be saaf. But Jhesus hadde seid of his deth ; but thei gessiden that he seide of slepyng of sleep. Thaune therfor Jhesus seide to hem opynli, Lazarus is dead ; and Y hane ioye for you, that ye bileue, for Y was not there ; but go we to hym."~~

~~This was the latest English dress in which the Holy Bible appeared during those seven centuries or more in which it was a reproduction of~~

~~the Latin Vulgate, and before the invention of printing was brought to bear on the circulation of the Scriptures.~~

~~1 The earlier and the later of these two " Wickliffite" versions of the Bible were printed in parallel columes in four quarto volumes in 1850, under the editorship of the Rev. Josiah Forshall and Sir Frederic Madden. Previously to that time the New Testament of Purvey had been printed by the Rev. John Lewis, in folio, in 1781, and again by the Rev. H. H. Baber, in quarto, in 1810; it was also printed in Bagster's English Hexapla, in 1841. Of the earlier version the Song of Solomon was printed, and many detached portions of other books, in Dr Adam Clarke's Commentary in 1810, and the New Testament by MrLea Wilson in 1848.~~

~~Williant Tyndale.~~

~~Tyn- dale's New Tes- tament,~~

~~1526.~~

~~ot~~

~~The Printed Buble.~~

~~It is singular that while France, Spain, and Italy each possessed vernacular Bibles before Henry VIII. began his reign, and Germany had seventeen editions of the Scriptures printed and widely circulated in the German language before Luther was known, yet no English printer attempted to put the familiar English Bible into type. No part of the Bible was printed in English before 1526, no complete Bible before 1535, and none in England before 1538.1~~

~~The first-fruits of the printing press as regards the English Bible were the New Testament and the Pentateuch of William Tyndale (1484-1536), which were translated and printed abroad between the years 1524 and 1530. Demaus, in his life of Tyndale, gives reasons for coming to the conclusion that he first formed the intention of trans- lating the Bible "' about the end of 1522 or beginning of 1523" (Demaus's Life of Tyndale,~~

~~p. 63, n.), at which time he was engaged, as a clergyman of the mature age of thirty-eight, in teaching the children of Sir John Walsh of Little Sodbury, in Gloucestershire, the eldest of whom was only six or seven years of age (¢bid. p. 37). Early in 1523 he left Sodbury and went up to London, where he was engaged for six months as chantry priest to the family of Humphrey Monmouth, a city merchant, whose residence was near the Tower. About the end of 1523 Tyndale endeavoured to obtain a home in the household of the learned Tunstall, then bishop of London, it being the custom for bishops of those days to surround themselves with a small court of scholars, chaplains, and assistants, who were maintained out of the revenues of their sees. The bishop was already overburdened, however, with dependents, and though Tyndale carried a translation of an oration of Isocrates in his hand as evidence of his Greek scholarship, he said nothing about his contemplated translation of the New Testament; and being, as he says, " evil-favuured in this world, and without grace in the sight of men, speechless and rude, dull and slow-witted," it is no wonder that the bishop recommended him kindly "to seek in London, where he said I could not lack a service," such as that in which he had already been engaged. Thus it happened that Tyndale left England and went to Germany early in the year 1524, an unknown, an unsuccessful, and a dis- appointed man, and yet one whose work during the next two years was to be honoured by every succeeding genera- tion of his countrymen, and to give his name a conspicuous place among those of the Reformers (see TyNDALE).~~

~~The six months which Tyndale had spent in Monmouth's house were probably occupied in preparing himself for his greater undertaking by the translation of the Hnchiridion of Erasmus, and " another little treatise," which he left in charge of the merchant. On landing at Hamburg he " got him straight to Luther " at Wittenberg, according to the unanimous testimony of his contemporaries, and there the work of translation must have been commenced im- mediately; for notwithstanding a long journey by land to Cologne, a sufficiently long residence there for the printing of St Matthew and St Mark in one edition, a removal to Worms and the time occupied there in printing another edition of the whole New Testament, the translation was widely circulated in England within less than two years of Tyndale's arrival in~~

~~Germany. Whether he was in any way assisted by Luther is still a disputed point, as, although Tyndale translated and adapted Luther's prefaces to the several books, and also many of his marginal annotations or " glosses," this does not necessarily indicate any personal influence of the great Reformer, and there is no historical evidence to show that there was any intercourse between~~

~~u It should be mentioned, however, that the popular Golden Legend contained nearly the whole of the Pentateuch and the Gospel narrative in English, and that this was printed by Caxton in 1493.~~

~~them. What is more certain is that Tyndale was assisted by a Franciscan friar named William Roye, and by "a faithful companion " whose name he does not give, " till that was ended which I could not do alone without one both to write and to help me to compare the texts together." When the work of translation was sufficiently advanced, or when it was completed, Tyndale and Roye removed to Cologne, where it was put to press by Peter Quentel, that printer being chosen perhaps of all in Germany because his partners the Byrckmans were booksellers in London, and would thus be able to set the book in circula- tion. The printers began an impression of 3000 in a small quarto size, but the printing had only proceeded as far as the tenth sheet, when any further progress was prohibited by the authorities of the city, Tyndale and Roye being considered as " two English apostates who had been some time at Wittenberg, " and whose work could not but there- fore be an evil one. The two Englishmen managed, how- ever, to escape higher up the Rhine to Worms, where Luther's influence was much stronger than at Cologne, and they succeeded in carrying with them some, or all, of the 20,000 or 30,000 sheets which had been printed. Instead of completing Quentel's work, PeterScheeffer the Worms printer was employed to print another impression of 3000 in a small octavo size, without prefaces to the books or annotations inthe margin, and only having an address ""To the Reder " at the end in addition to the New Testament text itself. Both impressions arrived in England early in the~~

~~summer of 1526, less than two years after Tyndale had quitted its shores, and were put into circulation with more or less secrecy as opportunity offered. The imperfect or quarto impression printed at Cologne is sometimes spoken of by contemporaries as " Matthew and Mark in English" or "the chapters of Matthew;" and Dr Robert Ridley, uncle to Bishop Ridley, writes of 'the common and vulgar translation of the New Testament into English, done by Mr William Hichyns otherwise called Mr W. Tyndale, and friar William Roye," distinguishing the two impressions by men- tioning " their commentaries and annotations in Matthew and Mark in the first print, as well as their preface," or address to the reader, "in the second print" (Demaus's Life of Tyndale, p. 105). But both these impressions are now so rare that of the first only sixty-two pages of one copy are known (Brit. Mus., Grenv. 12,179), and of the second only one imperfect copy, which is in the library of St Paul's Cathedral, and one perfect copy which is in that of the Baptist college at Bristol. Tyndale's work was, however, reprinted surreptitiously at Antwerp three times before 1528, and again under the editorship of George Joye,? one of his former friends, in August 1534.. In November 1534 Tyndale himself brought out a revised edition, with translations added of all the Sarum Epistles and Gospels which were taken from the Old Testament and the Apocryphal books, this edition being also printed at Antwerp by Martin Emperour. In the following year Tyndale once more set forth a revised edition, "fynesshed in the yere of oure Lorde God A.M.p. and xxxv.;" and this is supposed to have been revised by him while in prison in the castle of Vilvorde, being the last of his labours in con- nection with the English Bible. His execution took place on October 6, 1536, and about the same time a small folio reprint of his revised edition of 1534 was brought out in~~

~~oo ce ene eee~~

~~2 Joye was a rival translator, and although he and Tyndale had once been friends, they afterwards wrote against each other in exceedingly bitter language. Joye published an English Psalter at Strasburg ir 1530, a translation of Isaiah in 1531, and one of Jeremiah in 1534. Tyndale says that he had printed two leaves of a translation of Genesis and sent~~

~~copies of it to the king and queen, with a request that he might receive licence to go through the whole Bible. But although he survived until 1553, Joye's name does not appear again in association with the work of translation.~~

~~Tyn-~~

~~dale's~~

~~Penta- teuch,~~

~~1530.~~

~~The~~

~~Cover-~~

~~dale Bible~~

~~15385.~~

~~?~~

~~oNGint SH BUR~~

~~England by Berthelet, the king's printer.! In later years twenty-nine editions of Tyndale's New Testament were~~

~~published, without reckoning modern reprints.~~

~~Three years and a half after the publication of his English New Testament, on J anuary 17, 1530, Tyndale published his English Pentateuch. That he did not know anything of Hebrew when he left England in 1524 seems certain (Hadie's Lng. Bible, i. 208), while translation of the New Testament and seeing it through the press in less than two years could scarcely have left him time for acquiring a~~

~~knowledge of it before 1526. In May 1528 he published~~

~~two works, Zhe Parable of the Wicked Mammon and The Obedience of a Christian Man, and was at the same time engaged in writing Zhe Practice of Prelates, a work of considerable size. Between the middle of 1526 and the~~

~~middle of 1529 it was impossible for any man so fully employed to learn Hebrew so thoroughly as to be able to produce at the end of that time an original translation of the Pentateuch, and the opinion that Tyndale did so cannot be maintained in the face of such historical facts. Frith, who joined him at Marburg in 1528, may have been a Hebrew scholar, and from him Tyndale may have received assistance in the work. But Foxe states that when Tyndale had completed his translation, he was shipwrecked on the coast of Holland, losing it and all his books, that he sailed by another ship to Hamburg, and that there Coverdale "helped him in the translating of the whole five books of Moses, from Easter till December, in the house of a worship- ful widow, Mistress Margarct Van Emmerson, 1529 a.p., a great sweating sickness being at the same time in the town. So having despatched his business at Hamburg he returned afterwards to Antwerp again." (Foxe's Acts and Afon., v. 120, ed. 1846.) But there is so much in com- mon between the language of Tyndale's Pentateuch and that of his predecessor Purvey, that it is evident the old English Bible, already so familiar to Englishmen, was made the foundation of the new work. Tyndale himself may have had sufficient knowledge of Hebrew to have corrected some of the more glaring errors of the Wickliffite version, especially by the help of Luther's German Bible; or he may, as Foxe alleges, have been assisted by Coverdale, who had a competent acquaintance with the language. How- ever this may have been, the English Pentateuch was so rapidly placed in the printer's hands, notwithstanding Tyndale's other literary occupations, that it came from the press with the colophon " Emprented at Marlborow, in the land of Hesse, by me, Hans Luft, the yere of oure Lorde Mccccccxxx., the xvii. daye of January," and was shortly afterwards put in circulation in England. Of this work several copies arc still in existence, but the only perfect one known is in the British Museum. In the following year Tyndale published a translation of Jonah, the only copy known of which is in the library of the marquis of Bristol at Ixworth ; and in 1534 he brought out a revised edition of~~

~~the book of Genesis, which was the last of his labours in connection with the Old Testament.~~

~~Meanwhile a complete English Bible was being pre- pared by Miles Coverdale (1485-1565), an Augustinian friar who was afterwards for a few years (1551-1555) bishop of Exeter, As the printing of the whole Bible must have occupied the printers for many months, and probably did occupy them for several years, and as that printing was finished on October 4, 1535, it is evident that Coverdale must have been engaged on the preparation of the work for the press at almost as early a date as Tyndale. There is,~~

~~"The type and the woodcut border of the title-page were immedi- ately afterwards used by Berthelet in printing the Institution of a Christian Man, a work of considerable size, which was published in July 1537. The only copy known of this edition of Tyndale's transla- tion is in the Bodleian Library. }~~

~~indeed, a correspondence extant between Cromwell when he was secretary to Wolsey and Coverdale when he was resident at the Augustinian priory at Cambridge, which shows that the work was in hand in the year 1527. But the book was printed abroad, and Foxe's statement shows that Coverdale was at Antwerp in 1529, so that probably the greater part of the translation was made, like that of Tyndale, out of England. Mr Henry Stevens has pointed out that, in a biographical notice of Emanuel Van Meteren appended to his history of Belgium by Simon Ruytinck, the latter states that Jacob Van Meteren, the father of Emanuel, had manifested great zeal in producing at Antwerp a transhation of the Bible into English "for the advancement of the kingdom of Christ in England, and for this purpose he employed a certain learned scholar named Miles Coverdale." As Van Meteren had been taught the art of printing in his youth, it seems very probable that he exercised his zeal in the matter by undertaking the cost of printing the work as well as that of remunerating the trans- lator. The woodcuts in Coverdale's Bible, but not the type, have been traced up to James Nicolson, printer in St Thomas' Hospital in 1535, and Mr~~

~~Stevens connects him with the book and with Van Meteren in the following manner : “The London bookbinders and stationers, finding the market filled with foreign books, especially Testaments, made complaint in 1533-34, and petitioned for relief; in consequence of which a statute was passed compelling foreigners to sell their editions entire to some London stationer, in sheets, so that the binders might not suffer. This new law was to come into operation about the begin- ning of 1535. In consequence of this law, Jacob Van Meteren, as his Bible approached completion, was obliged to come to London to sell the edition. We have reason to believe that he sold it to James Nicolson of Southwark, who not only bought the entire edition, but the woodeuts, and probably the punches and type; but if the latter, they were doubtless lost in transmission, as they have never turned up inany shape since. All the copies of the Cover- dale Bible in the original condition, as far as we know, have appeared in English binding, thus confirming this law of 1534.” (Caxton Celebr. Catal., pp. 88, 89.) It is now evident that Coverdale refers partly, at least, to Jacob Van Meteren when he says in his dedication : “ Trusting in His infinite goodness that He would bring my simple and rude labour herein to good effect, therefore, as the Holy Ghost moved other men to do the cost hereof, so was I boldened in God to labour in the same.” But although the discovery of Ruytinck’s statement seems to show conclusively that Coverdale completed his translation, after Wolsey’s fall, at the cost of Van Meteren, and at Antwerp instead of Cam- bridge, he so far picked up the semi-official clue which he had dropped for a time that he published it with a dedica- tion to King Henry VIIL, which occupies five pages, and is subscribed “youre Grace’s humble subiecte and daylye oratour, Myles Coverdale,” ; ; This first of all printed English Bibles is a small folio volume measuring 11? by 8 inches, and bears the title— “Biblia. The Bible, that is, the Holy Scripture of the Olde and New Testament, faithfully and truly translated out of Douche and Latyn in to Englyshe, M.D.xxxv.,” with the texts 2 Thes. iii, 1, Col. iii. 16, Josh. 1. 8 under- neath. The colophon is “Prynted in the yeare of our Lord M.D. Xxxv., and fynished the fourth daye of October.” The title page was, however, for some reason cancelled imme- diately, and only one perfect copy of itisknowp. The new title page with the same date, 1535, merely says, ‘ fayth- fully translated in to Englyshe,” omitting the words “ and truly”~~

~~and "out of Douche and Latyn." A second edition in folio, "newly oversene and corrected," was printed by Nicolson, with English type, in 1537; and also, in the VUT. — 49~~

~~Mat- The large sale of the New Testaments of Tyndale, and~~

~~thew's the success of Coverdale's Bible, showed the London book- | been one which was published in 1539 by "John Byddell for~~

~~Bible, sellers that a new and profitable branch of business was | Thomas Barthlet," with Richard Taverner, "a learned man, ayern-~~

~~1637. opened out to them, and they soon began to avail them- | as editor." This was, in fact, what would now be called a er's selves of its advantages. Richard Grafton and Edward | "piracy," being Grafton's "' Matthew Bible" revised by bee~~

~~386~~

~~same year, a third edition in quarto. On the title-page of the latter were added the words, "set forth witb the Kynge's moost gracious licence."~~

~~The words at first printed on the title-page, and sub- sequently cancelled, had been doubtless placed there by mistake. In his dedication to the king, Coverdale says, "T have with a clear conscience purely and faithfully trans- lated this out of five sundry interpreters, having only the manifest truth of the Scriptures before mine eyes." These 't five interpreters " would naturally be Bibles in Hebrew, Greek, Latin, German, and English,—the English being that with which Coverdale must long have been familiar, the Wickliffite version, together with the recent translations of Tyndale.!~~

~~It should be added that Coverdale's Bible was the first in which the non-canonical books were collected out of the body of the Old Testament and placed by themselves at the end of it under a separate title. Coverdale entitled them "The Voluine of the Book called Hagiographa," but this was changed to " Apocrypha" in the Great Bible of~~

~~1549,~~

~~Whitchurch, afterwards the king's printers, were the first in the field, bringing out a fine and full-sized folio in 15387, the same year in which Coverdale's second edition appeared, "truely and purely translated into English by Thomas Matthew." This volume was prepared for the press at Antwerp by "John Rogers alias Matthew," who was for some time (1534-1548) chaplain to the Merchant Ad- venttrers there, whose wife, Adriana Pratt, was a rela- tive of Jacob Van Meteren, and who returning to England in 1548 became canon of St Paul's, and was the first of the suerers at Smithfield in the reign of Queen Mary. It was not, however, 'translated. .... by Thomas Matthew," but was a compilation from the translations of Tyndale and Coverdale, made under the editorship of Rogers, who revised them to some extent before sending them to press. The Pentateuch was printed from Tyndale's translation of 1531; and the books from Joshua to the end of Chronicles are said to have been translated by Tyndale also—a tradition corroborated by internal evidence (Westcott's Lng. Bible, p- 224)—and to have been left by him in the hands of Rogers. From Ezra to Malachi the translation is taken from Coverdale, as is also that of the Apocryphal books. The New Testament is a revised copy of Tyndale's edition of 1535. Thus, as the book consists of 1100 pages, more than half, or 600 pages, must be assigned to Tyndale, and the reinaining 500 pages to Coverdale.~~

~~It is probable that the Matthew Bible was printed by Antwerp booksellers as a speculation, in the same manner as the New Testament had been brought out under the editorship of Joye by the "widowe of Christoffel of End- hoven," in 1534, But while it was at the press, Grafton~~

~~ENGLASH BABE~~

~~is confirmed by the fact that in the following year, 1538, there was "Imprynted at Antwerpe by Matthew Crom" a New Testament in which the text of Coverdale was used, with the prologues of Tyndale,—a concordance, some anno- tations, and nearly 200 woodcuts being added by the enter- prising printer. In whatever way the Matthew Bible originated, the edition of 1500 copies was purchased by Grafton for the~~

~~sum of £500, equal to about £6000 of modern money; and, having obtained leave to place on the title page "Set forth with the Kings most gracyous licence," he and his partner published it in the summer of~~

~~1537.~~

~~Grafton was afraid that rivals would step in and deprive him of the profits which he expected. He therefore entreated Secretary Cromwell that the sale of his Bible might be expedited by compelling every abbey to take six copies. He also complained that there were " Dutchmen dwelling within the realm, who can neither speak good English, nor write none, who yet will both print and correct such an edition, and who are so covetous that they will not bestow twenty or forty pounds on a learned man as editor." Perhaps the rival edition which he really feared may have~~

~~Taverner, a learned member of the Inner Temple, who had been one of Wolsey's students at Christ Church, and although a layman, had occasionally preached from the university pulpit. Taverner made many alterations in the Matthew Bible, and the rapidity with which he edited the work indicates that he must have used a Bible already annotated by himself as the basis of bis labours.? Taverner's Bible was printed in folio with "Cum privilegio ad imprimendum solum " on the title-page, and it was at the same time printed in quarto. In the same year folio and quarto editions of the New Testament alone were published, and in the following year, 1540, the New Testament in duodecimo. The Old Testament was reprinted as part of a Bible of 1551. but no other editions are known than those named.~~

~~It will have been observed that the translations of Holy Scripture which had been printed during these fourteen years (1526-1539) were all made by private men and printed without any public authority. Some of them had indeed been set forth by the king's licence, but the object of this is shown by a letter of Archbishop Cranmer to Secretary Cromwell, requesting that it might be given to Matthew's Bible. It is "that the same may be sold and read of every person, without danger of any act, proclamation, or ordinance heretofore granted to the contrary, until such time that we, the bishops, shall set forth a better translation,~~

~~which I think will not be till a day afterdoomsday." This letter was written on August 4, 1537, and the impatient words at the end refer to an authorized version which had been projected several years before, and which was, in fact, at that very time in preparation, though not proceeding quickly enough to satisfy Cranmer.~~

~~and Whitchurch appear to have stepped in with an offer to issued a commission of Prepara- purchase the work, their initials being found on a title-page~~

~~which is placed before the prophecy of Isaiah. This view~~

~~In the year 1530 Henry VIII : inquiry respecting the expedieucy and necessity of having tion of "in the English tongue both the New Testament and the fowl Old," the commission consisting of Sir Thomas More, the version.~~

~~1 The above conclusion is not at all contradicted by Coverdale's statement in his address to the reader, that "' To help me therein I have had sundry translations, not only in Latin, but also of the Dutch"—or German—"interpreters, whom, because of their singular gifts and special diligence in the Bible, I have been the more glad to follow for the most part, according as I was required." He thinks it quite un-necessary to say that he translated directly from the Hebrew and Greek, but adds, that he was far from rejecting all help and guidance as to the meaning of Hebrew and Greek words, gladly and humbly~~

~~looking to see how others had interpreted the words into Latin and Germsn.~~

~~two archbishops, and the bishop of London, together with seventeen other "discreet and well-learned personages" taken from the two universities and "other parts of his realm," whose names are recorded, together "' with many more learned men of the said universities in great number assembled then and there together" (Wilkins's Conc., ili.~~

~~2 Such Bibles of early date are not uncommon ; one is now before the writer which is full of Hebrew, Greek, and Latin notes.~~

~~The au- thorized version~~

~~of 1539,~~

~~EWGia Se" BIBLES~~

~~737). This commission, which included Hugh and William Latimer among its members, reported against the expedi- ency of setting forth a vernacular translatiou until there was amore settled state of religious opinion, but states that the king "intended to provide that the Holy Scripture shall be, by great, learned, and Catholic persons, translated into the English tongue if it shall then seem to His Grace con- venient to be" (¢bid. 740). The convocation of Canterbury refreshed the royal memory on the subject by petitioning the king on December 19, 1534, "that His Majesty would vouchsafe to decree, that the Scriptures should be translated into the vulgar tongue by some honest and learned men, to be nominated by the king, and to be delivered to the people according to their learning" (¢b¢d. 770). It was doubtless in response to this petition that the measures were taken of which a very slight historical record remains in some notes of Ralph Morrice, Cranmer's secretary. " First," he says, the archbishop "began with the translation of the New Testament, taking an old English translation thereof," —the Wickliffite probably, for Tyndale's was only eight years old,—" which he divided into nine or ten parts, caus- ing each part to be written at large in a paper book, and then to be sent to the best learned bishops and others, to the intent that they should make a perfect correction thereof. And when they had done, he required them to send back their parts so corrected unto him at Lambeth, by a day limited for that purpose; and the same course, no question, he took with the Old Testament." (Camd. Soc. Narr. of Ref., p. 277.) A letter from Bishop Gardiner to Cromwell is preserved among the state papers, dated June 10, 1535, in which the former writes that he had translated St Luke and St John for his portion of the work, and that he had expended great labour upon them; and of the rest, with the exception of Stokesley, bishop of London,' when the day came," says Morrice, "every man sent to Lambeth their parts corrected." Some further steps of revision and preparation for the press would no doubt be taken, and the subject was~~

~~again before convocation in 1536 (Burnet's Ref, i. 314; Pococke's ed. 1865) ; but, as in the case of later re- visions of the Bible, the detailed history is lost to us,—all that is known further relating to the printing.~~

~~For reasons not now known, it was determined that this authorized version should be printed by Francis Regnault, the Paris printer, who provided most of the service-books that were used in England. At the request of Henry VIIL., "noster carissimus frater," a licence was granted to Regnault for this purpose by Francis the French king, while Coverdale and Grafton were sent over in 1537, the one as a learned editor the other as a practical printer, to superintend the work as it passed through the press. Por- tions of the printed sheets were sent home by Bonner, who was then ambassador at the court of Paris, as ambassador's baggage, and were thus conveyed out of France free from any difficulties with the French authorities ; but when the printing was far advanced, on December 17, 1538, its further progress was interdicted by the inquisitor-general, and orders were given to seize the whole of the impression. Coverdale and Grafton left Paris quickly, leaving a great number of finished sheets, which were condemned to be burned in the Place Maubert ; but, through the connivance of the officer appointed to see this done, the whole of them were sold to haberdasher as waste paper, and " four great dry vats" full of them sent over to England. As the licence to print them had been given at the special request of Henry VIIL, it is probable that the escape of the men and the books was facilitated by the civil authorities to prevent any unpleasantness with the English king. A short time afterwards the types, printing press, and workmen followed the printed sheets, and the volume which had been begun in Paris in 1537 was completed in London, the**

~~colophon stating that it was " Fynisshed in Apryll, Anno M.CCccc.XxxIx. It is a splendid folio " Bible of the largest volume," and was distinguished from its predecessors by the name of "The Great Bible." The title-page describes it as "The Byble in Englyshe, that is to saye, the content of all the Holy Scripture, bothe of the Olde and Newe~~

~~Testament, truly translated after the veryte of the Hebreue and Greke texts by ye dylygent studye of dyverse excellent learned men, expert in the forsayde tongues. Prynted by Rychard Grafton and Edward Whitchurch. Cum privilegio ad imprimendum solum, 1539." This was the first of seven editions of this noble Bible which issued from the press during the years 1539-41,—the second of them, that of 1540, having the important addition "This is the Byble apoynted to the vse of the churches" on the title-page. Seventy years afterwards it assumed the form ever since known as the " Authorized Version," but its Psalter is still embedded, without any alteration, in the Book of Common Prayer.~~

~~The " Great Bible" was, however, a dignitary among books, its size and its price (about £6 of modern money) making it comparatively inaccessible as a home volume for private use. The demand for the vernacular Scriptures which the supply of them had caused was at the same time so enormous that before the end of Edward VI.'s reign 26 editions of folio and quarto Bibles, and about double that number of editions of New Testaments, had been printed. This demand for household Bibles was effectually and unex- pectedly met by one on the production of which the English~~

~~refugees were engaged at Geneva during the last year of The~~

~~Queen Mary's reign and the beginning of the reign of Queen Elizabeth, and which became the household Bible of the English middle classes for at least two generations, The Geneva Bible was not an original translation, but a revision of the Great Bible by Hebrew and Greek scholars, who were quite competent to compare the English translation with the original. It was begun in 1558 when Coverdale was at Geneva, and his ample experience was no doubt enlisted in the work ; but after his return to England in the middle of 1559, the responsible editors were William Whittingham, afterwards lay dean of Durham, Anthony Gilby, after- wards for a short time dean of Christ Church and then pre- bendary of St Paul's, and Thomas Sampson, afterwards dean of Christ Church. The revision was carried on with such industry that the printing of the Bible was finished in April 1560. It became popular~~

immediately on account of its handy size, usually that of a small quarto, and of its being printed in a readable Roman type instead of black letter. It also contained a marginal commentary, which proved a great attraction to the Puritans ; and, above all, an improve- ment which Whittingham had already introduced into an independent English New Testament which he had pub- lished in 1557 was also introduced into the Bible of 1560, that of dividing the chapters into verses. Like all Bibles hitherto printed, and nearly all that were printed until the latter part of the 17th century, the Geneva Bible contained the Apocrypha, but copies are occasionally found from which it was omitted by the binder! The popularity of

1The Geneva Bible has often been called the " Breeches " Bible from the trauslation of Gen ii. 7, " They sewed fig leaves together and made themselves breeches." But this had been familiar long before, in Caxton's Golden Legend and in the Wickliffite Bible. An edition of Matthew's Bible, printed in 1551, is similarly called the " Bug" Bible, from the reading in Ps. xci. 5, "So that thou shalt not nede to be afrayed for any bugges by night ;"" but Coverdale's and Taverner's Bibles use the same word, equivalent to the modern "" bogie." A Bible of 1631 has been called the " Wicked Bible," because the important little word "not" is left out of the Seventh Commandment, an accident which also happened in a German Bible of the last century; and another almost as wicked a volume is a small pearl Bible of 1653, in which St Paul is made to ask "Know ye not that the unrighteous shall inherit the Kingdom of God ?"

this Bible was so great that about 200 editions of it in |

various sizes from folio downward were published, often with the Prayer Book and metrical Psalms appended ; and it gave way very slowly even before the present Authorized Version, which is much superior to it. The first Bible printed in Scotland was a folio reprint of the Geneva version, " Printed in Edinburgh By Alexander Arbuthnot, Printer to the Kinge's Maiestie, dwelling at ye Kirk of feild, 1579."

~~ENGLIsSM BISLEs~~

~~Sir Henry Savile, the most learned layman of his time ; and, to say nothing of others well known to later generations, nine who were then or afterwards professors of Hebrew or of Greek at Oxford or Cambridge. It is observable also that they were chosen without reference to party, at least as many of the Puritan clergy as of the opposite party being placed on the committees, and among them Reynolds and Chaderton, two of the four who had represented those clergy in the Hampton Court conference. The following list, taken from the General Introduction to Blunt's~~

~~The Soon after the accession of Queen Elizabeth, when the Bishops' demand for Bibles was again pressing upon the printers, | Annotated Bible, is drawn upin such a way as to show the oe Archbishop Parker organized a revision of the Great Bible | academical or other position which each of them occupied, ' of 1539 by "able bishops and other learned men." The | and the particular part of the work on which they were work was undertaken by the archbishop himself, eleven | engaged ; but other scholars also were invited to take the other bishops, and four deans and prebendaries, in 1563, the | subject up in their private studies, and to communicate with plan of distributing it being precisely the same as that | Andrewes at Westminster, or with the professors of Hebrew adopted by Archbishop Cranmer. The rules upon which | at Oxford and Cambridge. they proceeded were these :— Books.) Writers. Best known as. | '1. To follow the common English translation used in the —_—|— : – churches, and not to recede from it, but where it varieth manifestly ers P Buee 4 Bence steestecesceenees President. from the Hebrew or Greek original. 2. To use sections and divi- DW coectn nee Prabostiery of Vee… es sions in the text as Pagnine in his translation useth, and for the i 1] Clerke …….] One of the Six Preachers……ssssssssesesssnces Bs verity of the Hebrew to follow the said Pagnine and Munster 7 ee Rector of St Clement Danes ……..00.see0.000 222 ah ci . eigli…ccn8 Archdeacon Of Middlesex …….sscscessecccsossecnes eas specially, and generally others learned in the tongues. 3. To make =) coricigis,| Mellow tt ChemaColees. FES no bitter notes upon any text, or yet to set down any determination 2 King~~

~~ws… Ti Ei HOHNMN 5 2 eons hic scsovaccesecace 3 am in places of controversy. 4. To note such chapters and places as & || Thomson….| Clare Hall, Cambridge……scsssssssserrseessseees = contain matters of genealogies, or other such places not edifying, MP cere ee ee aa ae — with some strike or note, that the reader may eschew them in his || 8 (| Richardson | Master of Trinity… ti i public reading. 5. That all such words as sound in the old trans- 3 || Chaderton ..| Master of Emmanuel jf e238 lation to any offence of lightness or obscenity be expressed with | J | Dillingham | Rector of Dean Beds… |\ B25 more convenient terms and phrases." g),| Hattiscon…..| Vice Master of Trinity . '|{ S84 J C S }) Andrewes… — of Jesus Coll… {| gee ; en pal Spalding ….. cllow of St John's…... ocho Xd Tuch labour was expended 1 ate this TEVECLON, but the & BYDG ....00006 Archdeacon Of NOTWich……:sccesseess toes be printing was completed, and the volume, a large folio, was Harding ….| Reg. Prof. of Heb. and Pres, of Maga, ... President. . ° o.e at eynolds ….) #Tresident 0 orpus TUS lo cccccccccccesccccccooeece . ready for publication on October 5, 1568. Several editions 13) | wonana..2.: Réetor Bxeter Coll, and Reg. Prof. Divinity | gy i j i ips | WGilley,.....2..- Reetoniof Gincoln Cols .c….:c2scsase:-c.SSL | SiOibleecssceese Bp. of Glouc. (author of Prefacc). .....s0se000 ne ES whether it was ever cordially received. The Great Bible | |=4 |} Brett 00 Fellow of Chelsea College wsrevsesssrertseos ° 5 os C 2 Fareclowe…| Provost of Chelsea College ……..scssessssessseeses of 1539 was used in many churches, and the Geneva Bible _ (| Duport…….| Master of Jesus Coll. and Preb. of Ely ……|) President, was in almost every house; and although the 80th Canon || ¢ || Braithwaite.| Master of Gonville and Caius. i} og -603 sos ish , : = Radcliffe…..) Fellow of Trinity…..... fe of 1603 enjoins that the Bishops' Bible shall be the only P< | Ward ……..| Master of Sidney Sussex ee one used in churches, it was never reprinted after 1606. || 2 || Downes……| Reglus Proteases of Greek 58 e,e . . eee) RAOUL Y AML SUL yY coccscossecces is} A quarto edition was brought out in 1569, and the New | | ~ \) warac Prebendary of Chichester wal) OO Testament was several times printed separately. | | gS (| Abbot2-0) arenpishop of Canterbutyecnnencecc|) The pre- The Euglish Bible which 18s now recognized as the a3 Montague… Bishop of Winchester . Oeecenceecenccccessseeesceecencce| 5 mae Pais tk oa 7 ' 5 Fei~~

~~JA\homipsontes PO CANIOL WANGSON <<. ..0ccuscccsescanss--- scttnss es scree Bex ano Authorized Version," wherever the English language is SO)| Savile… (Sir Henry) Warden of Merton… ctssesenecc S23 5 ce ' De 5 Fa 9) Perin…..... BAR TOTMGECK: .. feetesei soseaceszas ssteatesenecens ae version, spoken, 18 a revision of the Bishops Bible, begun in 1604 st HALTS cece Reg. Prof. of Greek, and Warden of Winch… es = 1611, . and published in 1611. It arose out of the conference ee ae. between the High Church and Low Church parties which ad Helsiineeall Pie. Si Uotin's, Oxted', ee "4 ——— was held by James I. at Hampton Court in 1604, being || 3 J | Spencer…...| Fellow of Corp. Christi, Cambr \ BS. os P 2B Fenton…..... Prebendary of St Paul's……000000. apa ict originally proposed by Dr Reynolds, president of Corpus iS || Rabbett…... Rector of St Vedast's, London…..... gE z Bank Sanderson…) Archdeacon Of Rochester…....ccsssssccsescorsees 3 Christi College, Oxford, the leader and spokesman of the Dakin…...<.. Gresham Professor of Divinity,.....0…..00….0. : Sas)~~

~~Low Church party, and subsequently on the committee which revised the translation of the Prophets. No real opposition was offered to the proposal, and the king cleverly sketched out on the moment a plan to be adopted. He " wished that some special pains should be taken in that behalf for one uniform translation, and this to be done by the best learned in both universities; after them to be revised by the bishops and the chief learned of the church ; from them to be presented to the Privy Council; and lastly, to be~~

~~When this large body of scholars were set down to their work, a set of rules was drawn up for their guidance, which has happily come down to modern times among the very few records that remain of this great undertaking By whom they were framed is not known, but it is probable that they were well sifted, and passed through several hands before they reached the exact shape in which they were eventually acted upon.~~

~~ratified by his royal authority. And so this whole church to be bound upon it, and none other." He also particularly desired that no notes~~

should be added by way of comment

‘1. The ordinary Bible read in the church, commonly called the Rules for Bishops’ Bible, to be followed, and as little altered as the truth of the re- the original will permit. 2. The names of the prophets and the holy visers or writers, with the other names of the text, to be retained, as nigh as translat-

in the margin. The appointment of the revisers was a work of much responsibility and labour, and five months elapsed before they were selected and their respective por- tions assigned to them ; but the list of those who began the work, and who, with some few changes in consequence of deaths, brought it to a happy conclusion, shows how large an amount of scholarship was enlisted, It includes Bishop Andrewes, who was familiar with Hebrew, Chaldee, Syriac, Greek, Latin, and ten other languages; Bishop Overall; Dr Saravia: Bedwell, the greatest Arabic scholar of Europe ;

may be, accordingly as they were vulgarly used. 3. The old ecclesi- ors.

astical words to be kept, videlzeet, the word church not to be trans- lated congregation, &c. 4. When a word hath divers significations, that to be kept which hath been most commonly used by the most of the ancient fathers, being agreeable to the propriety of the place and the analogy of the faith. 5. The division of the chapters to be altered either not at all, or as little as may be, if necessity so re- quire. 6. No marginal notes at all to be affixed, but only for the explanation of the Hebrew or Greek words which cannot, without some circumlocution, so briefly and fitly be expressed in the text. 7. Such quotations of places to be marginally set down, as sha’l serve for the fit references of one scripture to another. 8, Every

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particular man of each company to take the same chapter or chap- ters ; aud having translated or amended them severally by himself, where he thinketh good, all to meet together, confer what they have done, and agree for their parts what shall stand. 9. As any one company hath

~~dispatched any one book in this manner, they shall send it to the rest, to be considered of seriously and j udiciously ; for his majesty is very careful in this point. 10. If any company, upon the review of the book so sent, doubt or differ upon any place, to send them word thereof, note the place, and withal send the reasons ; to which if they consent not, the difference to be com- pounded at the general meeting, which is to be of the chief persons of each company, at the end of the work. 11. When any place of special obscurity is doubted of, letters to be directed by authority, to send to any learned man in the land for his judgment of such a place. 12. Letters to be sent from every bishop to the rest of his clergy, admonishing thein of this translation in hand, and to move and charge as many as, being skilful in the tongues, and having taken pains in that kind, to send his particular observations to the company, either at Westminster, Cambridge, or Oxford, according as it was directed before in the king's letter to the archbishop. 13. The directors in each company to be the deans of Westminster and Chester for that place, and the king's professors in Hebrew and Greek in either university. 14. These translations to be used, when they agree better with the text than the Bishop's Bible, viz., Tyndal's, Mathew's, Coverdale's, Whitchurch's, Geneva. 15. Besides the said directors before mentioned, three or four of the most ancient and grave divines in either of our universities, not employed in translating, to be assigned by the vice-chancellor, upon conference with the rest of the heads, to be overseers of the translations, as well Hebrew as Greek, for the better observation of the fourth rule above specified."~~

~~That the work was carried on in the spirit of these rules is shown by the quaint but instructive document which was appended to the Bible as a preface on its completiou. It 'hath cost the workmen, as light as it seemeth, twice seven times seventy-two days and more: matters of such weight and consequence are to be speeded with maturity : for in a business of moment a man feareth not the blame of convenient slackness. Neither did we think much to consult the translators or commentators, Chaldee, Hebrew, Syrian, Greek, or Latin, no nor the Spanish, French, Italian, or Dutch. Neither did we disdain to revise that which we had done, and to bring back to the anvil that which we had hammered; but having and using such great helps as were needful, and~~

~~fearing no reproacli for slowness, nor coveting praise for expedition, we have at length, through the good hand of the Lord upon us, brought the work to that pass you see." That work occupied the six committees for four or five years, some parts being brought back to the anvil to be hammered as much as fourteen and some as much as seventeen times. But at length it passed into the hands of the printers, and came from the press of Robert Barker, the king's patentee, in two contemporary issues of folio volumes, separately composed and printed for the sake of speedy production, in the year 1611. Since that time many millions of this translation or revised translation have been printed, and the general acceptance of it by all English-speaking people of whatever denomination is a testimony to its excellency.~~

~~One principal reason why the English Bible in this last form gives such general satisfaction to the English ear is thatit speaks inalanguage of its own which is conventionally received as a Biblical tongue—a language which is thoroughly English, and which is yet separated by its archaic form from the colloquial English of every-day use on the one hand, and from the literary English of most other books on the other. This archaic language is not, however, that of Elizabethan and Jacobean times, as is sometimes alleged. Its genealogy is to be traced up ina direct line through every state of Biblical revision to the Latin Vulgate, and the common English ancestor of every such revision is the Wickliffite Bible of the 14th century. This may be seen clearly by placing a passage from the Wickliffite New Testament, in modern spelling but in no other way modernized, beside the same passage taken from the Bible in common use.~~

~~LUKE XVI. 19-11. Fourteenth Century Version in Modern Spelling. There was a rich man, and was clothed in purple and white silk,~~

~~Authorized Version now in use, There was a certain rich man, which was clothed in purple and fine linen,~~

~~and ate every day shiningly: and there was a beggar, Lazarus by name, that lay at his gate, full of boils, and coveted to be fulfilled of~~

~~the crumbs that fallen down from the rich man's board: and no man gave to him; but hounds came and licked his boils. And it was~~

~~done that the beggar died, and was borne of angels Into Abraham's bosom: And the ric man was dead also and was buried in hell, And~~

~~he raised his eyes when he was in torments, and saw Abraham afar, and Lazarus in his bosom. And he cried and said, Father Abraham, haye merey on me, and send Lazarus, that he dip the~~

~~end of his finger in water, to eool my tongue; for I~~

~~am tormented in this flame, And Abraham said to him, Son, have mind, for thou hast receiived good thing~~

~~in thy life, and Lazarus also evil things: but he is now eomforted, and thou art tor- mented. And in all~~

~~these things, a great dark place is established~~

~~betwixt us and you; that they~~

~~that would from hence pass to you may not; neither from thenee pass over hither. And he said, Then I pray thee, Father, that thou~~

~~send him into the house~~

~~of my father: for I have five brethren; that he witness to them, lest also they come into this place of torments, And Abraham said to him,~~

~~They have Moses and the prophets; hear they them. And he said,~~

~~Nay, Father Abraham, but if any of dead men go to them, they si1al] do penance. And he said to him, If they~~

~~hear not Moses and the prophets,~~

~~neither if any of dead men~~

~~rise again, they should believe~~

~~to him.~~

~~and fared sumptuously every day and there was a certain heggar named Lazarus, which was laid at his gate, full of sores, and desiring to be fed with~~

~~the crumbs which fell~~

~~froin the rich man's table:~~

~~moreover the dogs came and licked his sores. And it came to~~

~~pass that the beggar died,~~

~~and was carried by the angels into Abraham's bosom: the~~

~~rich man also died and~~

~~was buried; and in hell~~

~~he lift up his eyes, being~~

~~in torments, and seeth~~

~~Abraham afar off, and Lazarus~~

~~in his bosom. And he cried~~

~~and said, Father Abraham,~~

~~have mercy on me, and send Lazarus, that he may dip the~~

~~tip of his finger in water,~~

~~and cool my tongue; for I~~

~~am tormented in this flame.~~

~~But Abraham said,~~

~~Son, remember that thou~~

~~in thy lifetime receivedst thy good things, and likewise Lacarus evil things: but now he is comforted, and thon art tor- mented. And beside all~~

~~this, between us and you~~

~~there is a great gulf fixed:~~

~~so that they which would pass from henee to you eannot; neither ean they pass to us~~

~~which would come from thenee. Then he said, I pray thee therefore, Father, that thou wouldest send him to my~~

~~father's house: for I have five brethren; that he may testify unto them, lest they also come~~

~~into this place of torment. Abraham saith unto him,~~

~~They have Moses and the prophets ; let them hear thein. And he said, Nay, Father Abraham, but~~

~~if one went unto them from the dead, they will repent.~~

~~And he said unto him, If they hear not Moses and the prophets neither will they be persuaded, though one 10se from the~~

~~dead.~~

~~That this remarkable continuity of expression has great practical value is shown by the fact that the only other English Bible which has ever lived beyond one edition, that of the Roman Catholics, has been imperceptibly approxi- mating to the Authorized Version at every revision that it has undergone, since the original publication of the New Testament at Rheims in 1582, and the Old Testament at Douay in 1610.~~

~~Nor, it is satisfactory to add, has the tender hand with which the Old English of the Bible has been touched in the course of revision led to any sacrifice of sound translation. Modern scholarship may be able to introduce some improvements making the version of still greater value, but upon the whole it already stands pre- eminent for its accurate representation of the original Hebrew and Greek, and may challenge favourable compari- son in this respect with the Septuagint, with the Latin Vulgate, or with any other version.~~

~~The question of revision of the Authorized Version has Recent been frequently discussed, but it is only in very recent revision.~~

~~times that anything has been done which appears to call for particular mention here. In February 1870 the con- vocation of Canterbury, at the instigation of the bishop of Winchester, Dr Samuel Wilberforce, appointed a committee to consider the subject, which three months afterwards re-~~

~~ported in the following terms :—~~

~~'1, That it is desirable that a revision of the Authorized Version of the Holy Scriptures be undertaken. 2. That the revision be so conducted as to comprise both marginal renderings, and such emen- dations as it may be found necessary to insert in the text of the Authorized Version. 3. That in the above resolutions we do not contemplate any new translation of the Bible, or any alteration of the language, except where, in the judgment of the most competent scholars such change is necessary. 4. That in such necessary~~

~~Biblio- graphy.~~

~~changes the style of the language employed in the existing version be closely followed. 5. That it is desirable that Convocation should nominate a body of its own members to undertake the work of revision, who shall be at liberty to invite the co-operation of any eminent for scholarship, to whatever nation or religious body they may belong." ;~~

~~The report was adopted, and two companies were formed for the revision of the Authorized Version of the Old and New Testaments respectively, consisting of members of convocation and other distinguished Biblical scholars. During the eight years that have elapsed since their appointment the two companies have devoted themselves assiduously to the discharge of the task assigned them, and it is understood that their work is now (1878) approaching completion, but no part of the new revision has yet been published.~~

~~There is still much to be learned respecting the bibliographical history of the English Bible, but several useful works have appeared among the many that have been been written on the subject. The earliest attempt was An Historical Accownt of the several English Translations of the Bible, &c., by Anthony Johnson, 1730. 'This was followed in 1731 by Lewis's Complete History of the several Translations of the Holy Bible and New Testament into English, which was, until recently, the standard work on the subject. Archbishop Newcome wrote 4n Historical View of the English Bibli- cal Translations, &c., with a list of the various editions from 1526 to 1776, which was published at Dublin in 1792. In 1821 Arch- deacon Cotton brought out 4 List of Editions of the Bible and parts thercof in English, from the year 1505 to 1820, which has been republished in a corrected and enlarged form, and is a work of much value. The Annals of the English Bible, by Christopher Anderson, printed in two volumes in 1845, was a well-meant attempt to give a complete view of the subject, but is exceedingly diffuse, and is deficient in critical value. Far the most valuable account extant of the Manuscript English Bible is that which forms the preface to Forshall and Madden's edition of the Wickliffite Bible, published at the Clarendon Press in 1850. Taking Ngee authoritative posi- tions as regards the printed English Bible are Westcott's General View of the History of the English Bible, 1868, and the exhaustive account given of the Authorized Version of 1611 in the introduction to Scrivener's Cambridge Paragraph Bible, 1873. More recently has appeared, in two volumes, Kadie's The English Bible: an Exter- nal and Critical History of the various English Translations of Scripture, 1876, which is the fullest popular account extant of the whole subject. The most complete list of printed English Bibles is, however, that contained in The Bibles~~

~~in the Caxton Exhibition, by Henry Stevens, 1878, where much valuable bibliographical in- formation on the subject is to be found. @: HB.)~~

~~ENGLISH LANGUAGE. In its widest sense, the name is now conveniently used to comprehend the language of tle English people from their settlement in Britain to the present day, the various stages through which it has passed being distinguished as Old, Middle, and New or Modern English. In works yet recent, and even in some still current, the name Hnglish is confined to the third, or at most extended to the second and third of these stages, since the language assumed in the maiu the vocabulary and grammatical forins which it now presents, the oldest or inflected stage being treated as a separate language, under the title of Anglo-Saxon, while the transition period which connects the two has been called Semi-Saxon. This view had the justification that, looked upon by themselves, either as vehicles of thought or as objects of study and analysis, Old English, or Anglo-Saxon, and Modern English are, for all practical ends, distinct languages,—as much so, for ex- ample, as Latin and Spanish. No amouut of familiarity with Modern English, including its local dialects, would enable the student to read Anglo-Saxon, three-fourths of the vocabulary of which have perished and been recon- structed within 800 years ;! nor would a knowledge even of these lost words give him the power, since the grammatical system, alike in accidence and syntax, would be entirely strange to him. Indeed, it is probable that a~~

~~es careful examination of several letters of Bosworth's Anglo-Saxon Dictionary gives in 2000 words (including derivatives and compounds,~~

~~bat excluding orthographic variants) 535 which still exist as modern English words.~~

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~~| modern Englishman would acquire the power of reading and writing French in less time than it would cost him to attain to the same~~

~~proficiency in Old English; so that if the test of distinct languages be their degree of practical difference from each other, it cannot be denied that " Anglo- Saxon " is a distinct language from Modern English. But when we view the subject historically, recognizing the fact that living speech is subject to continuous change in certain definite directions, determined by the constitution and cir- cumstances of mankind, as an evolution or development of which we can trace the steps, and that, owing to the abundance of written materials, this evolution appears so gradual in English that we can nowhere draw distinct lines separating its successive stages, we recognize these stages as merely temporary phases of an individual whole, and speak of the English language as used alike by Cynewulf and by Tennyson, just as we include alike King Alfred and Mr Bright as members of the English race.2 It must not be forgotten, however, that in this wide sense the English language includes, not only the literary or courtly forms of speech used at successive periods, but also the popular and, it may be, altogether unwritten dialects that exist by their side. Only on this basis, indeed, can we speak of Old, Middle, and Modern English as the same language, since in actual fact the precise déalect which is now the cultivated language, or " English " par excellence, is not the descend- ant of that dialect which was the cultivated language or English of Alfred, but of a sister dialect then sunk in obscurity,—even as the direct descendant of Alfred's ""Englisc" is now to be found in the neglected and non- literary rustic speech of Wiltshire and Somersetshire. Causes which, linguistically considered, are external and accidental, have shifted the political and intellectual centre of England, and along with it transferred literary and courtly patronage from one form of English to another; if tle centre of influence had happened to be fixed at York or on the banks of the Forth, both would probably have been neglected for a third.~~

~~The English language, thus defined, is not "native" to Britain, that is, it was not found here at the dawn of history, but was introduced by foreign immigrants at a date many centuries later, At the Roman Conquest of the island, the languages spoken by the natives belonged all (so far as is known) to the Celtic branch of the Aryan family, modern forms of which still survive in Wales, freland, the Scottish~~

~~Highlands, Isle of Man, and Brittany, while one has quite recently become extinct in Cornwall. Dialects allied to Welsh and Cornish were apparently spoken over the greater part of Britain, as far north as the Firths of Forth and Clyde ; beyond these estuaries and in the isles to the west, including Ireland and Man, dialects akin to Irish and Scottish Gaelic prevailed. The dialect of the Picts in the east of Scotland, according to recent in- quiries, presented characteristics uniting the British or Cymric with the Gaelic division.? The long occupation of South Britain by the Romans (43-409 a.p.)— a period, it must not be forgotten, equal to that from the close of the Middle Ages to the present day, or to the whole duration of Modern English—familiarized the provincial inhabitants with Latin, which was probably the ordinary speech of the~~

~~2 The practical convenience of having one name for what was the same thing in various stages of development is not affected by the proba- bility that (Mr Freeman notwithstanding) Hngle and Hnglise were, at an early period, not applied to the whole of our Tentonic ancestors in Britain, but only to a part of them. The dialects of Hngle and Seaxan~~

~~were alike old forms of what was afterwards English speech, and so, viewed in relation to it, Old English, whatever their contemporary names might be.~~

~~3 As to the place of the Pictish, see Dr W. F. Skene's Four Ancient Books of Wales, I. vii., viii. Prof. Rhys says " the Picts, Mr Skene notwithstanding, were probably Kymric rather than Goidelic."— Welsh Philology, p. 19.~~

~~towns. Gildas, writing nearly a century and a half after the renunciation of Honorius, addressed the British princes in that language ;* and the linguistic history of Britain might have been not different from that of Gual, Spain, and the other provinces of the Western Empire, where a rustic Latin giving birth to a neo-Latinic language finally super- seded the native one except in remote and mountainous districts," when the course of events was entirely changed~~

~~by the Teutonic conquests of the 5th and 6th centuries, The Angles, Saxons, and their allies belonged to the Teu- tonic or Gothic branch of the Aryan family, represented in modern times not only by the English and their colonies, but by the populations of Germany, Holland, Denmark, and the Scandinavian peninsula, and found at the dawn of history located between and about the estuaries and lower courses of the Rhine and the Weser, and the adjacent coasts and isles. For more than 1000 years the Teutonic or Gothic stock has been divided into the three branches of the Low German, High German, and Scandinavian, of which the former represents the original stock, the two others being offshoots to the south and north respectively. To it also belonged the Mceso-Gothic, the tongue of certain Germans who, passing down the Danube, invaded the borders of the empire, and obtained settlements in the province of Meesia, where their language was committed to writing in the 4th century ; its literary remains are of peculiar value as the oldest specimens, by several centuries, of Teutonic speech. To the Low German division also belonged the dialects of the invaders of Britain. As we have no specimens of the language of these tribes for nearly three centuries after their settlement in this island, we cannot tell to what extent they agreed with, and differed from, each other; nor can we be sure whether the dif- ferences actually found at a later period, when we have opportunity of comparison, between northern and southern English, were due to original diversity, or to subsequent differentiation. However, as the dialectal differences afterwards discernible corresponded in the main to the areas historically assigned to Angles and Saxons respectively, it may be assumed that there was some difference of dialect to begin with, that of the Saxons being more closely allied to the Old Saxon of the Contineut, of which Dutch is probably the nearest living representative, and the Angle dialect having more affinity with the Frisian, and through that with the Scandinavian. At the present day the most English or Angli-form dialects of the Continent are those of the North Frisian islands of Amrum and Sylt, on the west coast of Schleswig, Itis well known that the greater part of the ancient Friesland has been swept away by the encroachments of the North Sea, and the disjecta membra of the Frisian race, pressed by the sea in front and encroaching nationalitics behind, are found only in isolated fragments from the Zuyder Zee to the coasts of Denmark. Of~~

~~the Gedtas, Edtas, or “ Jutes,” who, according to Beda, formed the third tribe along with the Angles and Saxons, it is difficult to speak linguistically. In the opinion of the present writer, the speech of Kent has ever been a typically southern or “Saxon” one, and at the present day its popular dialect is identical with that of Sussex, one of the old Saxon kingdoms; that of the Isle of Wight differs in no respect from that of Hampshire, nor does it show any special connection with that of Kent. Mr Henry Sweet has, however, shown? that Kentish as early as the 8th cen-~~

- ~~The works of Gildas in the original Latin were edited by Mr Stevenson for the English Historical Society. Thercis an English trans- lation in Six Old English Chronicles in Bohn’s Antiquarian Library.~~

~~2 As to the continued existence of Latin in Britain, see further in Rhys’s Lectures on Welsh Philology, p. 226-7.~~

~~8 ** Dialects and Prehistoric Forms of English,” Transactions of the Philological Society for 1875-6, p. 548.~~

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~~j tury differed from West-Saxon in one or two points of~~

~~vowel pronunciation, and that the distinction was maintained as late as the 14th; though it cannot be said to have therein approached more closely to the northern dialect, which ought to have been the case had Bzda’s “Gedtas” been Jutlanders.~~

~~As it was amongst the Angel-cynn or Engle of Northum- bria that literary culture first flourished, and an Angle or Linglise dialect was the first to be used for vernacular literature,* Hnglisc came eventually to be a general name for all forms of the vernacular as opposed to Latin, &c.; and even when the West-Saxon of Alfred became in its turn the literary or classical form of speech, it was still called Englise or Hnglish. The origin of the name Anglo-Saxon 1s disputed, some maintaining very positively that it means a union of Angles and Saxons,~~

~~others (with better founda- tion) that it meant Hnglish Saxons, or Saxons of England, as distinguished from Saxons of the Continent. Its modern use is mainly due to the little band of scholars who in the 16th and 17th centuries turned their attention to the long forgotten language of Alfred and Ailfric, which, as it differed so utterly from the English of their own day, they found it convenient to distinguish by a name which was applied to themselves by those who spoke it. To them "Anglo-Saxon" and "English" were separated by a gulf which it was reserved for later scholars to bridge across, and show the historical continuity of the English of all ages.~~

~~As already hinted, the English language, in the wide sense, presents three main stages of development—Old, Middle, and Modern—distinguished by their inflexional character- istics. The latter cau be best summarized in the words of Mr Henry Sweet, in his History of English Sounds:6 "Old English is the period of full inflexions (name, gifan, caru), Middle English of devedled inflexions (naame, given, caare), and Modern English of lost inflexions (name, give, care= nam, giv, car). We have besidcs two periods of transition, one in which nama and name exist side by side, and an- other in which final ¢ [with other endings] is beginning to drop." By dost inflexions it is meant that only very few reiain, and these mostly uon-syllabic, as the-s in stones, the -ed in loved, the -r in their, as contrasted with the Old English stan-as, luf-od-e and luf-od-on, para. Each of these periods may also be divided into two—an early and a late; but from the want of materials this division may be waived in regard to the first. We have thus the follow- ing divisions, with the approximate dates, which, however, varied considerably for different dialects and parts of the country :—~~

~~Old English or Anglo-Saxon…….0605 to 1100 Transition Old English, or " Semi-Saxou"....1100 to 1200 Early Middle English, or " Early English" ...1200 to 1300~~

~~TmatemMiddlo: Haelish…….+5.0scseestevceeas 1300 to 1400 Pransition Middle English…….. +s» ++ sass 1400 to 1485 Early Moderu English, 'Tudor English "....1485 to 1611 BAC EM MEG ess… .. «ities s oso. siceases.> «scan 1611 onward.~~

Many writers carry the Transition Old English down to 1250, Early Middle English thence to 1350, and Late Middle English 1350 to 1485, absorbing the Second

4 See also Earle's Philology of the English Tongue, p. 25.

> Aithelstan in 934 calls himself in a charter " Ongol-Saxna cyning and Brytenwalda calles thyses iglandes ;" Eadred in 955 is "* Angul- seaxna cyning and casere totius Britannie," and the name is of frequent occurrence in Latin documents. These facts ought to be remembered in the interest of the scholars of the 17th century, who have been blamed for the use of the term Anglo-Saxon, as if they had invented it. By "Anglo-Saxon" language they meant the language of the people who sometimes at least called themselves " Anglo-Saxons." Even now the name is practically useful, when we are dealing with the subject per se, as is Old English, on the other hand, when we are treating it historically or in connexion with English as a whole.

5 Transactions of the Philological Society, 1873-4, p. 620.

Transition period. But the division given above, which was, I believe, first proposed by Mr Sweet, represents better the development of the language.

The Otp Enaxtsn, or Anglo-Saxou tongue, as introduced into Britain, was highly inflexional, though its inflexions were not so full as those of the older Moeso-Gothic, and considerably less so than those of Greek and Latin during their classical periods. They corresponded on the whole to those of modern literary German, though both in nouns and verbs the forms were more distinct ; for example, the German guten answers to three Old English forms,— godne, godum, godan,; guter to two—gédre, gédra , liebten to two,—lufodon and lufeden. Nouns had four cases, Vomina- tive, Accusative (not always distinct), Genitive, Dative, the latter used also with prepositions to express locative, instru- mental, and most ablative relations; of a distinct instru- mental case only vestiges occur. There were several declensions of nonns, the main

~~division being that known in Teutonic languages generally as strong and weak,—a distinction also extending to adjectives in such wise that every adjective assumed either inflexion as determined by associated grammatical forms. The first and second personal pronouns possessed a dual ; the third person had a complete declension of the stem he, instead of being made up as now of the three seen in he, she, they. The verb dis- tinguished the subjunctive from the indicative mood, but had only two inflected tenses, present and past,—the former also used for the future, the latter for all the shades of past time. The order of the sentence corresponded generally to that of German. Thus from King Alfred's additions to his translation of Orosius :—Donne py ylean dege hi hine to peem ade beran wyllad, ponne todzlaé hi his feob. paet per to lafe bid efter pam gedrynce and pem plegan. on fif od%e syx. hwilum on ma. swa swa paes feos andefn bid. " Then the same day [that] they him to the pile bear will, then divide they his property that there to remainder is, after the drinking and the sports, into five or six, at times into more, according as of the property the value is."~~

~~The poetry was distinguished by allitcration, and the abundant use of figurative and metaphorical expressions, of bold compounds and archaic words never found in prose. Thus in the following lines from Beowulf :—~~

~~Strat wees stan-fah, stig wisode~~

~~Gumum etgeedere. gud-byrne scdn~~

~~Heard hond-locen. hring-iren scir~~

~~Song in searwum, pa hie to sele fursum Jn hyra gry're geatwum, gangan cwomon.!~~

~~The street was stone-variegated, (it) pointed the path To (the) men together ; the war-mailcoat shone, " Hard hand-locked. The ring-iron sheer (bright ring- mail) Sang in their cunning-trappings, as they to hall forth In their horror-accoutrements to go came."~~

~~The Old English was a homogeneous language, having very few foreign elements in it, and forming its compounds and derivatives entirely from its own resources. A few Latin appellatives learned from the Romans in the German wars had been adopted into the common Teutonic tongue, and are found in English as in the allied dialects, Such were strete, street (via strata), camp, battle, cdésere, Ceesar, mil, mile, pin, punishment; perhaps cyrice, church, biscop, bishop, leden, Latin language, cése, cheese, butor, butter, pipor, pepper, olfend, camel (elephantus), pund, pound, ynce, inch (wncia), and a few others. The relations of the first invaders to the Britons were to a great extent those of destroyers; and with the exception of the proper names of places and prominent natural features, which as is usual were retained by the new population, few British~~

~~} Thorpe's Beowulf, l. 645.~~

~~words found their way into the Old English. Among these are named broc, a badger, bréc, breeches, clit, clout, pil, pool, and a few words relating to the employment of field or household menials. Still fewer words seem to have been adopted from the provincial Latin, almost the only certain one being castra, applied to the Roman towns, which appeared in English as cestre, ceaster, now found in com- position as -caster, -chester, cester. The introduction and gradual adoption of Christianity, brought a new series of Latin words connected with the offices of the church, the accompaniments of higher civilization, the foreign produc tions either actually made known, or mentioned in the Scriptures and devotional books. Such were mynster (monasterium), elmesse (eleemosyna), candel (candela), turtle (turtur), fic (ficms), cedar (cedrus), These words, whose number increased from the 7th to the 10th century, are commonly called Latin of the second period, the Latin of the first period including the Latin words brought by the English from Germany, as well as those picked up in Britain either from the provincials or the Welsh, which have not hitherto been separated from them. The Danish invasions of the 8th and 10th centuries resulted in the establishment of extensive Danish aud~~

~~Norwegian popula- tions, about the basin of the Humber and its tributaries, and above Morecambe Bay. Although these Scandinavian settlers must have greatly affected the language of their own localities, few traces of their influence are to be found in the literature of the Old English period. As with the greater part of the words adopted from the Celtic, it was not until after the dominion of the Norman had overlaid all preceding conquests, and the new English began to emerge from the ruins of the old, that Danish words in any number made their appearance in books, as equally native with the Anglo-Saxon.~~

~~The earliest specimens we have of English date to the © end of the 7th century, and belong to the Anglian or northern dialect, which, under the political eminence of the early Northumbrian kings from Edwin to Eegfrié, aided perhaps by the learning of the scholars of Iona, first attained to literary distinction. Of this literature in its original form mere fragments exist, one of the most in- teresting of which consists of the verses uttered by Beeda on his deathbed, and preserved in a nearly contemporary MS. :—~~

~~Fore there neid-faerae . naenig uuiurthit thonc-snotturra . than him tharf sie,~~

~~to ymb-hycgganne . aer his hin-iongae, huaet his gastae . godaes aeththa yflaes, aefter deoth-daege . doemid uueorthae.~~

~~Before the inevitable journey no one becomes~~

~~More thought-prudent than he has need,~~

~~To ponder, ere his hence-going,~~

~~What, to his ghost, of good or of ill,~~

~~After death-day, deemed shall be. But our chief acquaintance with Old English is in its West-Saxon form, the earliest literary remains of which date to the 9th century, when under the political supremacy of Wessex and the scholarship of King Alfred it became the literary language of the English nation, the classical "Anglo-Saxon." If our materials were~~

more extensive, it would probably be necessary to divide the Old English into several periods ; as itis, Mr Sweet, who has laboured chiefly in this field, has pointed out considerable differences between the "early West-Saxon" of King Alfred and the later language of the 11th century,? the earlier language having numerous inflexional and phonetic distinctions which are "levelled" in the later, showing that the tendency to pass from the synthetical to the analytical stage existed quite

2 See Mr Sweet's preface to his edition of King Alfred's West-Saxon Version of Gregory's Pastoral Care, Early English Text Society,

1871-2.

independently of the Norman Conquest. The northern dialect, whose literary career had been cut short in the 8th century by the Danish invasions, reappears in the 10th in the form of glosses to the Latin gospels and the Ritual of Durham, where we find that in the process of inflexion- levelling it has, owing to the confusion which had so long reigned in the north, advanced far beyond the sister dialect of the south, so as to be already almost Transition English, or ' Semi-Saxon."

Among the literary remains of the Old English may be mentioned the epic poem of Beowulf, the original nucleus of which has been supposed to date to heathen and even Continental times, though we now possess it only in a later form ; several works of Alfred, two of which, his translation of Orosius, and of Zhe Pastoral Care of St Gregory, are contemporary specimens of his language; the theological works of Adlfric (including translations of the Pentateuch and the gospels) and of Wulfstan; the poetical works of Cynewulf ; those ascribed to Cedmon; the Anglo-Saxon Chronicle ; and many works both in prose and verse of which the authors are unknown.

The earliest specimens, the inscriptions on the Ruthwell and Beweastle crosses, are in a Runic character ; but the letters used in the manuscripts generally are a British variety of the Roman alphabet

which the Anglo-Saxons found in the island, and which was also used by the Welsh and Irish.1 Several of the letters had in Britain developed forms, and retained or acquired values, unlike those used on the Continent, in particular db; zpyc(dfgrst). The letters k q z were not used, q being represented by cw ; u or v was only a vowel, the consonantal power of v being repre- sented as in Welsh by f. The Runes called thorn and wén, for which the Roman alphabet had no character, were at first expressed by th, 8 (a contraction for 65 or 6h), and v or u; but ata later period the characters p and p were revived from the old Runic alphabet. Contrary to Continental usage, the letters cand z (g) had only their hard or guttural powers, as in the neighbouring Celtic languages; so that words which, when the Continental Roman alphabet came to be used for Germanic languages, had to be written with k, were in Old English written with c, as cirice =kirke. The key to the values of the letters, and thus to the pro- nunciation of Old English, is also to be found in the Celtic tongues whence the letters were taken.

The Old English period is usually considered as terminat- ing about the year 1100,—that is, with the death of the generation who saw the Norman Conquest. The Conquest established in England a foreign court, a foreign aristocracy, and a foreign hierarchy.2 The French language, in its Norman dialect, became the only polite medium of intercourse. The native tongue, despised not only as unknown but as the language of a subject race, was left to the use of boors and serfs, and except in a few stray cases ceased to be written at all? The natural results followed. When the educated generation that saw the arrival of the Norman died out, the language, ceasing to be read and written, lost all its literary words. The words of ordinary life whose preservation is independent of books lived on as vigorously as ever, but the literary terms, those that related to science, art, and higher culture, the bold artistic compounds, the figurative terms of poetry, were speedily forgotten. The practical vocabulary

1 See on this Rhys, Lectures on Welsh Philology, v.

- For a discriminating view of the effects of the Norman Conquest on the English Language, see Freeman, Norman Conquest, ch. xxv.

~~3 There is not the least reason to suppose that any attempt was made to proscribe or suppress the native tongue, which was indeed used in some official documents addressed to Englishmen by the Con- queror himself. Its social degradation seemed even on the point of coming to an end, when it was confirmed and prolonged for two cen- turies more by the accession of the Angevin dynasty, under whom everything French received a fresh impetus,~~

~~shrank to a fraction of its former extent. And when, genera- tions later, English began to be used for general literature, the only terms at hand to express ideas above those of every day life were to be found in the French of the privileged classes, of whom alone art, science, law, and theology had been for generations the inheritance. Hence each successive literary effort of the reviving English tongue shows a larger adoption of French words to supply the place of the forgotten native ones, till by the days of Chaucer they constituted a formidable part of the vocabulary. Nor was it for the time being only that the French words affected the English vocabulary. The Norman French words introduced by the Conquest, as well as the Parisian French words which followed under the early Plantagenets, were, the bulk of them, Latin words which had lived on among the people of Gaul, and, modified in the mouths of succeeding genera- tions, had reached forms more or less remote from their originals. In being now adopted as English, they supplied precedents in accordance with which other Latin words without limit might be converted into English ones, when- ever required ; and long before the Renaissance of classical learning, though in much greater numbers after that epoch, these precedents were eagerly followed.~~

~~While the eventual though distant result of the Norman Conquest was thus a large reconstruction of the English vocabulary, the grammar of the language was not directly affected by it. There was no reason why it should,—we might almost add, no way by which it could. While the English used their own words, they could not forget their own way of using them, the inflexions and constructions by which alone the words~~

~~expressed ideas,—in other words, their grammar ; when one by one French words were intro- duced into the sentence they became English by the very act of admission, and were at once subjected to all the duties and liabilities of English words in the same position. This is of course precisely what we do at the present day : telegraph and telegram make participle telegraphing and plural telegrams, and "scrumptious," adverb " scrwmp- tiously," precisely as if they had been in the language for ages.~~

~~But indirectly the grammar was affected very quickly. In languages in the inflected or synthetic stage the termina- tions must be pronounced with marked distinctness, as these contain the correlation of ideas ; it is all-important to hear whether a word is bonws or bonis or bonas or bonos, This implies a measured and careful pronunciation, against which the effort for ease and rapidity of utterance is con- tinually struggling, while indolence and carelessness con- tinually compromise it. There has been an increasing tendency in English, as in other languages, to give each word one main accent, at or near the beginning, and to suffer the concluding syllables to fall into obscurity. We are familiar with the cockney winder, sofer, holler, Sarer, Sunder, for window, sofa, holla, Sarah, Sunday, the various final vowels sinking into an obscure neutral one convention- ally spelt er, Already before the Conquest, forms originally hatu, sello, tunga, appeared as hate, selle, tunge, with the terminations levelled to obscure e, but during the illiterate period of the language after the Conquest, this careless obscuring of terminal vowels became universal, all unaccented vowels in the final syllable (except 7) sinking into e. During the 12th century, while this change was going on, we find a great confusion of grammatical forms, the full inflexions of Old English standing side by side in the same sentence with the levelled ones of Middle English, It is to this state of the language that the names 7'ransition and Period of Confusion (Dr Abbott's appellation) point ; its appearance, as that of Anglo-Saxon broken down in its endings, had previously given to it the suggestive if not strictly logical title of Semi-Saxon, By most writers the~~

~~oot~~

~~close of the period has been brought down to 1250; but very shortly after 1200 in the south, and considerably before it in the north, the levelling of inflexions was com- plete, and the language possessed of a tolerably settled system of new grammatical forms, the use of which marks Middle English.~~

~~Although the written remains of the TRANSITION OLD ENGLISH are few, sufficient exist to enable us to trace the course of linguistic change. Within two generations after the Conquest, faithful pens were at work transliterating the old homilies of A#lfric, and other lights of the Anglo-Saxon Church, into the neglected idiom of their posterity. Twice during the period, in the reigns of Stephen and Henry II., Zllfric's gospels were similarly modernized so as to be "un- derstanded of the people". And shortly after 1100 appeared the great work of the age, the versified Chronicle of Layamon, or Lawéman, a priest of Ernely, on the Severn, who, using as his basis the French Brut of Wace, expanded it by additions of his own to more than twice the extent; his work of 32,250 lines is a mine of illustration for the Janguage of the period. While these southern re- mains carry on in unbroken sequence the history of the Old English of Alfred': and Aélfric, the history of the northern English is an entire blank from the 11th to the 13th century. The stubborn resistance of the north, and the terrible retaliation inflicted by William, apparently effaced northern English culture for centuries. If anything was written in the vernacular in the kingdom of Scotland during the same period, it probably perished during the calamities to which that country was subjected during the half century of struggle for independence. In reality, however, the northern English had entered its Transition or " Semi-Saxon" stage two centuries earlier ; the glosses of the 10th century show that the Danish inroads had there anticipated the results hastened by the Norman Conquest in the south. Meanwhile a dialect was making its appear- ance in another quarter of England, destined to overshadow the old literary dialects of north and south alike, and become the English of the future. The Mercian kingdom, which, as its name imports, lay along the marches of the earlier states, and was really a congeries of the outlying members of**

many tribes, must have presented from the beginning a linguistic mixture and transition; and it is probable that more than one intermediate form of speech arose within its confines, between Lancashire and the Thames. But the only specimen of such we can with some degree of certainty produce comes towards the close of the Old English period, in the gloss to the Rushworth Gospels, which, so far as concerns St Matthew, and a few verses of St John xviii, is probably in a Mercian dialect. At least it presents a phase of the language which in inflexional decay stands about midway between the West-Saxon and the Northumbrian glosses, to which it is yet posterior in time. But soon after the Conquest we find an undoubted midland dialect in the Transition stage from Old to Middle English, in the south-eastern part of ancient Mercia, in a district bounded on the south and south-east by the Saxon Middlesex and Essex, and on the east and north by the East Anglian Norfolk and Suffolk and the Danish settlements on the Trent and Humber. In this district, and in the monastery of Peterborough, one of the copies of the Old English Chronicle, transcribed about 1120, was written up by two succeeding hands to the death of Stephen in 1154. The section from 1122 to 1131, written in the latter year, shows the same confusion as in Layamon between Old English forms and those of a still simpler Middle English, impatient to rid itself of the inflexional trammels which were still, though in weakened forms, so tightly hugged south of the Thames. And: in the concluding section. written in 1154 we find Middle

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English fairly started on its career. A specimen of this new tongue will best show the cliange that had taken lace.

‘ 1140 a.v.—And te eorl of Angseu werd ded, and his sune Henri toe to pe rice. And te cuen of France to-delde fra pe king, and scse com to pe iunge eorl Henri. and he toc hire to wiue, and al Peitou mid hire. pa ferde he mid micel feerd into Engleland and wan castles—-and te king ferde agenes him mid micel mare ferd. popweethere fuhtten hi noht. oc ferden pe zercebiscop and te wise men betwux heom, and makede that

~~sahte that te king sculde ben lauerd and king wile he liuede. and eefter his dei ware Henri king. and he helde him for fader, and he him for sune. and sib and sexhte sculde ben betwyx heom, and on al Engleland.!~~

~~With this may be contrasted a specimen of southern English, at least 25 years later (Hatton Gospels, Luke i. 46).?~~

~~Da cwed Maria: Min sanle mersed drihten, and min gast ge-blissode on gode minen helende. For pam pe he ge- seah his pinene eadmodnysse. Sovlice henen-fors ime eadige segged alle cneornesse; for pam pe me mychele ping dyde se pe mihtyg ys; and his name is halig. And his mildheortnysse of cneornisse on cneornesse hine on- draedende. He worhte niaegne on hys earme ; he to-daelde pa ofermode, on moda heora heortan. He warp pa rice of setlle, and pa eadmode he up-an-hof. Hyngriende he mid gode ge-felde, and pa ofermode ydele for-let. He afeng israel his cniht, and gemynde his mildleortnysse ; Swa he sprec to ure feederen Abrahame, and his sade on a weorlde,~~

~~The Mippre ENciisH stage was pre-eminently the Dialectal period of the language. It was not till after the middle of the 14th century that English obtained official recognition as a language. For three centuries, therefore, there was no standard form of speech which claimed any pre-eminence over the others. The writers of each district wrote in the dialect familiar to them; and between extreme forms the difference was so great as to amount to unintelligibility ; works written for southern Englishmen had to be translated for the benefit of the men of the north :—~~

~~"Tn sotherin Inglis was it drawin, And turnid ic haue it till ur awin Langage of pe northin lede That can na nothir Inglis rede." Cursor Mundi, 20,064.~~

~~Three main dialects were distinguished by contemporary writers, as in the often-quoted passage from Trevisa's trans- lation of Higden's Polychronicon completed in 1387 :— " Also Englysche men hadde fram pe bygynnynge pre maner speche, Souperon, Norperon, and Myddel speche (in pe myddel of pe lond) as hy come of pre maner people of Germania. .... Also of pe forseyde Saxon tonge, pat ys deled a pre, and~~

~~ys abyde scarslyche wip feaw uplondysche men and ys gret wondur, for men of pe est wip men of pe west, as hyt were under pe same part of heyvene, acordep more in sounynge of speche pan men of pe norp wip men of pe soup; perfore hyt ys pat Mercii, pat bup men of myddel Engelond, as hyt were parteners of pe endes, undurstondep betre pe syde longages Norperon and Souperon, pan Norpern and Soupern undurstondep oyper oper." —~~

~~The modern study of these Middle English dialects, initiated by Mr Garnett, and elaborated by Dr Richard Morris,? has shown that they were readily distinguished by~~

~~1 Karle, Two of the Saxon Chronicles parallel, 1865, p. 265.~~

~~2 Skeat, Anglo-Saxon and Northumbrian Gospels, 1874.~~

~~3 See his Harly English Alliterative Poems, for the Early English Text Society, 1864 ; Historical Outlines of English Accidence, 1870 ; and Elementary Lessons in Historical English Grammar, 1874.~~

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~~the conjugation of the present tense of the verb, which in typical specimens was as follows :—~~

~~Southern.~~

~~Ich singe. We singep.~~

~~Pou singest, 3¢ singep.~~

~~He singep. Hy singep. Midland.~~

~~Ich, I, singe, We singen.~~

~~Pou singest. 3e singen.~~

~~He singep. Hy, thei, singen. Northern.~~

~~Ic, I, syng(e). Pu synges. He synges.~~

~~We syng(e), We pat synges. 3e syng(e), 3¢ foules synges. Thay syng(e), Men synges.~~

~~Of these the southern is simply the old West-Saxon, witht the vowels levelled toe. The northern second person in -es is older than the southern and West-Saxon -est » but the -es of the third person and plural is derived from an older~~

~~_ eth, the change of -th into -s being found in progress in the Durham glosses of the 10th century. In the plural, when accompanied by the pronoun subject, the verb had already dropped the inflexions entirely as in Modern English. The origin of the ez plural in the midland dialect, unknown to Old English, has been a matter of conjecture; most pro -bably it is an instance of Jorm-levelling, the inflexion of the present indicative being assimilated to that of the past, and the present and past subjunctive, in all of which en was the plural termination. In the declension of nouns, adjec tives, and pronouns, the northern dialect had attained before the end of the 13th century to the simplicity of Modern English, while the southern dialect still retained a large number of inflexions, and the midland a considerable number. The dialects differed also in phonology, for while the northern generally retained the hard or guttural values of k, g, sc, these were in the two other dialects palatalized before front vowels into ch, j, and sh. Kyrk, chirche or church; bryg, bridge, scryke, shriek, are examples. The original @ in stdn, mar, preserved in the northern stane, mare, became o elsewhere, as in stone, more. So that the north presented the general aspect of conservation of old sounds with the most thorough-going dissolution of old in- flexions ; the south, a tenacious retention of the inflexions, with an extensive revolution in the sounds. Inone import- ant respect, however, phonetic decay was far ahead in the north: the final ¢ to which all the old vowels had been levelled during the Transition period, and which is a distinguishing feature of Middle English in the midland and southern. dialects, became mute, ?.¢., disappeared, in the northern dialect before the latter emerged from its three centuries of obscuration, shortly before 1300. So thoroughly~~

~~modern did its form consequently become that we might almost call it Modern English, and say that the Middle English stage of the northern dialect is lost. For comparison with the other dialects, however, the same nomenclature may be used, and we may class as Middle English the extensive literature which northern England produced during the 14th century. The earliest specimen is probably the Metrical Psalter in the Cotton Library,} copied during the reign of Edward II. from an original of the previous century. This is followed by the gigantic versified paraphrase of Scripture history called the Cursor Mundi,? also composed before 1300. The dates of the numerous alliterative romances in this dialect cannot be determined with exactness, as all survive in later copies, but it is probable that many of them are not later than 1300. In the 14th century appeared the theological and devotional works of Richard Rolle the anchorite of crr ce cce~~

~~1 Edited for the Surtees Society, by Rev. J. Stevenson. * Edited for the Early English Text Society, by Rev. Dr Morris.~~

~~Hampole, Dan Jon Gaytrigg, William of Nassington, and other writers whose names are unknown; and towards the close of the century, specimens of the language also appear from Scotland both in public documents and the poetical works of John Barbour, whose language, barring minute points of orthography, is identical with that of the contem- porary northern English writers.~~

~~In the southern dialect, the work of Layamon was suc- ceeded at an interval estimated at from 15 to 25 years by the Ancren Riwle or "Rule of N uns," written for a small sisterhood at Tarrant-Kaines, in Dorsetshire, in which we find the Middle English stage fully developed, and also re- cognize a dialectal characteristic which had probably long~~

~~prevailed in the south, though concealed by the spelling, in~~

~~the use of » for f, as valle, fall, vordonne, fordo, vorto, for to, veder, father, vrom, frox~~

~~- Not till later do we find a recognition of the parallel use of z for s. Among the writings which succeed, Zhe Owl and the Nightingale of Nicholas de Guildford, of Portesham in Dorsetshire,about 1250, the Chronicle of Robert of Gloucester, 1298, and Trevisa's translation of Higden, 1387, are of chief import ance in illustrating the history of southern English. The earliest form of Langland's Piers Ploughman, 1362, as pre- served in the Vernon MS., appears to be in an intermediate dialect between southern and midland.? The Kentish form of southern English seems to have retained specially archaic features ; five short sermons in it of the middle of the 13th century have been published by Rev. Dr Morris ; but the great work illustrating it is the Ayenbdite of J. nwyt (Remorse of Conscience), 1340, of which we are told by its author Dan Michel of Northgate, Kent—~~

~~"* pet pis boc is y-write mid engliss of Kent ; Pis boc is y-mad uor lewede men, Vor uader, and uor moder, and uor oper ken, Ham uor to ber3e uram alle manyere zen, Pet ine hare inwytte ne bleue no uoul wen."~~

~~In its use of v («) and z for f and s, and its grammatical inflexions, it presents an extreme type of southern speech, with vowel peculiarities specially Kentish; and in com- parison with contemporary midland English works, it looks like a fossil of two centuries earlier,~~

~~Turning from the dialectal extremes of the Middle English to the midland speech, which we left at the closing leaves of the Peterborough Chronicle of 1154, we find a rapid development of this dialect, which was before long to become the national literary language. As was natural in a tract of country which stretched from Lancaster to Essex, a very considerable variety is found in the documents which agree in presenting the leading midland features, those of Lancashire and Lincolnshire approaching the northern dialect both in vocabulary, phonetic character, and greater neglect of inflexions. But this diversity diminishes as we advance. The first great work is the Ormulum, or metrical Scripture paraphase of Orm or Ormin, written about 1200, it~~

~~is generally assumed, in Lincolnshire or Notts, though there is much to be said for the neighbourhood of Ormskirk in Lancashire. Anyhow the dialect has a decided smack of the north, and shows for the first time in English litera- ture a large percentage of Scandinavian words, derived from the Danish settlers, who, in adopting English, had preserved a vast number of their ancestral forms of speech, which were in time to pass into the common language, of which they now constitute some of the inost familiar words. Blunt, bull, dre, dwell, ill, kid, raise, same, thrive, wand, wing,®~~

~~3 The Vision of William concerning Piers the Ploughman exists in three different recensions by the author, all of which have been edited for the Early English Text Society by Rev. W. W. Skeat.~~

- ~~Edited by Rev. Dr Morris for Early English Text Society, in 1866,~~

~~® See a list in Mr Kington Oliphant's Sowrces of Standard English,~~

~~9/, a work in which the history of Middle English is admirably developed.~~

~~are words from this source, which appear first in the work of Orm, of which the following lines may be quoted :— " De Judewisshe folkess boc hemm se33de,patt hemm birrde Twa bukkes samenn to pe preost att kirrke-dure brinngenn ; And tex pa didenn blipeli3, swa summ pe boc hemm talihte, And brohhtenn twezenn bukkess peer Dribhtin peerwipp to lakenn. And att te kirrke-dure toc pe preost ta twe33enn bukkess, And o patt an he fags peer all pez3re sake and sinne, And lét itt cornenn forpwipp all ut inntill wilde wesste ; And toc and snap patt operr buce Drihhtin peerwipp to lakenn. All piss wass don forr here ned, And ec forr ure nede ; For hemm itt hallp biforenn Godd to clennssenn hemm of sinne ; And all swa maz; itt hellpenn pe 3iff patt tu willt [itt] follzhenn. 3iff patt tu willt full innwarrdliz wipp fulle trowwpe lefenn All patt tatt wass bitacnedd tzer, to lefenn and to trowwenn." White's Ormulum, 1. 1324.~~

~~The author of the Ormulum was a phonetist, and employed a special spelling of his own to represent not only the quality but the quantities of vowels and conson- ants,—a circumstance which gives his work a peculiar value to the investigator.~~

~~Thirty years after the Ormulum, the east midiand rhymed Story of Genesis and Exodus! shows us the dialect in a more southern form, with the vowels of modern English. In 1258 was issued the celebrated English proclamation of Henry III., or rather of Simon de Montfort in his name, which, as the only public recognition of the native tongue between William the Conqueror and Edward JIL, has been spoken of as the first specimen of English. It runs—~~

~~"'Henrz pur3 godes fultume king on Engleneloande. Lhoauerd on Yrloande, Duk on Normandie on Aquitaine and eorl on Aniow Send igretinge to alle hise holde ilerde and ileawede on Huntendoneschire. pat witen 3e wel alle pest we willen and vnnen peet pat vre reedesmen alle oper pe moare dzl of heom pset beop ichosen pur3 us and pur3 peet loandes folk on vre kuneriche. habbep idon and schullen don in pe worpnesse of gode and on vre treowpe. for pe freme of pe loande. pur3 pe besizte of pan to-foren-iseide redesmen. beo stedefzest and ilestinde in alle pinge a buten ende, And we hoaten alle vre treowe in pe treowpe pet heo vs o3en. pet heo stedefeestliche healden and swerien to healden and to werien po isetnesses pet beon imakede and beon to makien pur3 pan to-foren iseide radesmen. oper pur3 pe moare dzl of heom alswo alse hit is biforen iseid. And pet she oper helpe pet for to done bi pan ilche ope azenes alle men. Ri3zt for to done and to foangen. And noan ne nime of loande ne of e3te. wherpur3 pis besizte muze beon ilet oper iwersed on onie wise. And 3if oni oper onie cumen her ongenes ; we willen and hoaten peet alle vre treowe heom healden deadliche ifoan. And for pet we willen pat pis beo stedefeest and lestinde ; we senden 3ew pis writ open iseined wip vre seel. to halden a- manges 3ew ine hord. Witnesse vs seluen et Lundene. pane E3tetenpe day. on pe Monpe of Octobre In pe Two-and-~~

~~1 Edited for the Early English Text-Society by Dr Morris, 1865.~~

~~ENGLISH LANGUAGE~~

~~fowertizpe zeare of vre cruninge. And pis wes idon cetforen vre isworene redesmen. ....—~~

~~“ And al on po ilche worden is isend in to eurihce opre shcire ouer al pzre kuneriche on Englencloande. and ek in tel Irelonde.”~~

~~As to the dialect of this document, it is more southern than anything else, with a slight midland admixture, and represents no doubt the London speech of the day. London being in a Saxon county, and contiguous to the Saxon Kent and Surrey, had certainly at first a southern dialect ; but its position as the capital, as well as its proximity to the midland district, made its dialect more and more midland. Even in Chaucer, however, it has still southern features, for Chaucer’s language is well known to be more southern than standard English eventually became. Inflexionally, the proclamation is much more archaic than the Genesis and Exodus or Ormulum; but it closely resembles the old Kentish Sermons and Proverbs of Alfred in the southern dialect of 1250.~~

~~In the writings of the second half of this century, the language becomes rapidly more modern in aspect, till we arrive about 1300 at the name of Robert of Brunne in south Lincolnshire, with whom we pass from the Early to the Later Middle English. Different tests and different dates have indeed been proposed for subdividing the Middle English, but the most important is that of Mr Henry Nicol, based on the discovery that in the 13th century, as in Ormin, the Old English short vowels in an open syllable still retained their short quantity, as ndma, dver, méte ; but by the beginning of the 14th century they were lengthened to na-me, over, mé-te, a change which has also taken place at a particular period in all the Teutonic, and even the Romance languages, as in bud-no for b6-nwm, ca-ne for cd-nem, &c. The lengthening of the penult left the final syllable by contrast shortened or weakened, and paved the way for the disappearance of final e in the century following, through the stages na-me, nd-mé, naé-m’, na&m, the one long syllable in nam(e) being the quantitative equivalent of the two short syllables in nd-mé; and thus came the idea that mute e makes a preceding vowel long, the truth being that the lengthening of the vowel made the e mute. The late~~

~~Middle English produced the prose of Mandeville and Wycliffe, and the poetry of Chaucer, with whom it may be said to have culminated, and in whose writings its main characteristics as distinct from Old and Modern English may be studied. Thus, we find final e in full use representing numerous original vowels and terminations as~~

~~Him thought that his herté woldé breké, in Old English—~~

~~Him puhte pet his heorte wolde brecan, which may be compared with the modern German—~~

~~Thm diuchte dasz sein Herze wollte brechen. In nouns the -es of the plural and genitive case is still syllabic—~~

~~Reede as the berstl-es of a sow-es eer-es. Several old genitives and plural forms continued to exist, and the dative or prepositional case often has a final e. Adjectives retain so much of the old declension as to have -e in the definite form and in the plural—~~

~~The tend-re cropp-es and the yong-e sonne.~~

~~And smal-e fowl-es maken melodie.~~

~~Numerous old forms of comparison were in use, which have not come down to Modern English, as herre, ferre, lenger, heat = higher, farther, longer, highest. In the pronouns, ich lingered alongside of J; ye was only nominative, and you objective ; the northern thei had dispossessed tbe southern hy, but her and hem (the modern 'em) stood their ground against their and them. The verb is I lov-e, thou lov-est,~~

~~he lov-eth ; but in the plural Jov-en is interchanged with lov-e, as rhyme or euphony requires. So in the plural of the past we love-den or love-de. The infinitive also ends in en, often e, always syllabic. The present participle, in Old English -ende, passing through inde, has been con founded with the verbal noun in -ynge, yng, as in Modern English. The past participle largely retains the prefix y or 7-, representing the~~

~~Old English ge-, as in i-ronne, y-don, run, done Many old verb forms still continued in existence. The adoption of French words, not only those of Norman introduction, but those subsequently introduced under the Angevin kings, to supply obsolete and obsolescent English ones, which had kept pace with the growth of literature since the beginning of the Middle English period, had now reached its climax; later times added many more, but they also dropped many that were in regular use with Chaucer and his contemporaries.~~

~~Chaucer's great contemporary, William Langland, in his Vision of William concerning Piers the Ploughman, and his imitator the author of Pierce the Ploughman's Crede (about 1400) used the Old English alliterative versification for the last time in the south. Rhyme had made its appear- ance in the language shortly after the Conquest—if not already known before; and in the south and midlands it became decidedly more popular than alliteration; the latter retained its hold much longer in the north, where it was written even after 1500: many of the northern romances are either simply alliterative, or have both alliteration and rhyme. To these characteristics of northern and southern verse respectively Chaucer alludes in the prologue of the " Persone," who, when called upon for his tale, said—~~

~~" But trusteth wel; I am a sotherne man, I cannot geste rom, ram, ruf, by my letter, And, God wote, rime hold I but litel better : And therfore, if you list, I wol not glose, I wol you tell a litel tale in prose."~~

~~The changes from Old to Middle English may be summed up thus :— Loss of a large part of the native vocabulary, and adoption of French words to supply the blank; not infre- quent adoption of French words as synonyms of existing native ones ; modernization of the English words preserved, by vowel change in a definite direction from back to front, and from open to close, a becoming 0, 0 tending to 00, w to ou, ea to é, é to ee, ee to 7, and by advance of consonants from guttural to palatal; obscuration of vowels after the accent, and especially of final a, 0, « to é; consequent con- fusion and loss of old inflexions, and their replacement by prepositions, auxiliary verbs, and rules of position; aban- donment of alliteration for rhyme; and great development of~~

~~dialects, in consequence of there being no standard or recognized type of English.~~

~~But the recognition came at length. By the reign of Edward III., French was so little known in England, even in the families of the great, that about 1350 "John Cornwal, a maystere of gramere, chaungede pe lore in gramere scole and construccion of [7.e., from] Freynsch into Englysch;"? and in 1362-3 English by statute took the place of French in the pleadings in courts of law. Every reason conspired that this "' English " should be the mid- land dialect. It was the intermediate dialect, intelligible, as Trevisa has told us, to both extremes, even when these failed to be intelligible to each other ; in its south-eastern form, it was the language of London, where the supreme law courts were, the centre of political and commercial life ; it was the language in which the Wycliffite versions had given the Holy Scriptures to the people ; the language in which Chaucer had raised English poetry to a height of~~

~~1 Trevisa, Translation of Higden's Polychrontcon,~~

~~excellence admired and imitated by contemporaries and followers. And accordingly after the end of the 14th century, all Englishmen who thought they had anything to say worth listening to said it in the midland speech. Trevisa's own work was almost the last literary effort of the southern dialect ; henceforth it was but a rustic patois, which the dramatist might use to give local colouring to his creations, as Shakespeare uses it to complete Edgar's peasant disguise in Lear, or which 19th century research might disinter to illustrate obscure chapters in the history of language. And though the northern English proved a little more stubborn, it disappeared also from literature in England ; but in Scotland, which had now become politically and socially estranged from England, it continued its course as the national language of the country, attaining in the 15th and 16th centuries a distinct development and high literary culture, for the details of which readers are referred to the article on Scottish Lancuaasz.~~

~~The 15th century of English history, with its bloody French war abroad, and Wars of the Roses at home, was a barren period in literature, and a transition one in language, witnessing the decay and~~

~~disappearance of the final e, and most of the syllabic inflexions of Middle English. Already by 1420, in Chaucer's disciple Hoccleve, final e was quite uncertain ; in Lydgate it was practically gone. In 1450 the writings of Pecocke against the Wycliffites show the verbal inflexions in -en in a state of obsolescence ; he has still the southern pronouns her and hem for the northern their, them:—~~

~~"And here-a3ens holi scripture wole pat men schulden lacke pe coueryng which wommen schulden haue, & thei schulden so lacke bi pat pe heeris of her heedis schulden be schorne, & schulde not growe in lengpe doun as wommanys heer schulde growe. . . ..~~

~~"Also here-wipal into pe open si3t of ymagis in open chirchis, alle peple, men & wommen & children mowe come whanne euere pei wolen in ech tyme of pe day, but so mowe pei not come in-to pe vce of bokis to be delyuered to hem neiper to be red bifore hem; & perfore, as for to soone & ofte come into remembraunce of a long mater bi ech oon persoon, and also as forto make pat pe mo persoones come into remembraunce of a mater, ymagis & picturis serven in a specialer maner pan bokis doon, pou3 in an oper maner ful substanciali bokis seruen better into remembrauncing of po same materis pan ymagis & picturis doon ; & perfore, pou3 writingis seruen weel into remembrauncing upon pe bifore seid pingis, 3it not at pe ful: Forwhi pe bokis han not pe avail of remembrauncing now seid whiche ymagis han." 2~~

~~The change of the language during the second period of Transition, as well as the extent of dialectal differences, is quaintly expressed a generation later by Caxton, who in the prologue to one of the last of his works, his translation of Virgil's Zneydos (1490), speaks of the difficulty he had in pleasing all readers :—~~

~~"T doubted that it sholde not please some gentylmen, whiche late blamed me, sayeng, y' in my translacyons I had ouer curyous termes, whiche coud not be vnderstande of comyn peple, and desired me to vse olde and homely termes in my translacyons. And fayn wolde I satysfy euery man; and so to doo, toke an olde boke and redde therin ; and certaynly the englysshe was so rude and brood that I coude not wele vnderstande it. And also my lorde abbot of Westmynster ded do shewe~~

~~to me late certayn euydences wryton in olde englysshe for to reduce it in to our englysshe now vsid. And certaynly it was wreton in suche wyse that it was more lyke to dutche than englysshe ; I coude not reduce ne brynge it to be vnderstonden. And~~

~~2 Skeat, Specimens of English Literature, p. 49, 54.~~

~~certaynly, our langage now vsed varyeth ferre from that whiche was vsed and spoken whan I was borne. For we englysshemen ben borne vnder the domynacyon of the mone, whiche is neuer stedfaste, but euer wauerynge, wex- ynge one season, and waneth and dycreaseth another season, And that comyn englysshe that is spoken in one shyre varyeth from a nother. In so much that in my days hap- pened that certayn marchauntes were in a shipe in tamyse, for to haue sayled ouer the sea into zelande, and for lacke of wynde thei taryed atte forlond, and wente to lande for to refreshe them. And one of theym named sheffelde, a mercer, cam in to an hows and axed for mete, and specy- ally he axyd after eggys, And the goode wyf answerde, that she coude speke no frenshe. And the marchaunt was angry, for he also coude speke no frenshe, but wolde haue hadde egges; and she vnderstode hym not. And thenne at laste a nother sayd that he wolde haue eyren ; then the good wyf sayd that she vnderstod hym wel. Loo! what sholde a man in thyse dayes now wryte, egges or eyren ? certaynly, it is harde to playse euery man, by -cause of dyuersite & chaunge of langage. For in these dayes, euery man that is in ony reputacyon in his countre wyll vtter his comynycacyon and maters in suche maners & termes that fewe men shall vnderstonde theym. And som honest and grete clerkes haue ben wyth me, and desired me to wryte the moste curyous termes that I coude fynde. And thus bytwene playu, rude, and curyous, I stande abasshed ; but in my Judgemente, the comyn termes that be dayli vsed ben lyghter to be vnderstonde than the olde and auncyent englysshe." .~~

~~In the productions of Caxton's press, we see the passage from Middle to Modern English completed. The earlier of these have still an occasional verbal plural in n, especially in the word they ben; the southern her and hem of Middle English vary with the northern and Modern~~

~~English ¢hevr, them. Inthe late works, the older forms have been practi cally ousted, and the year 1485, which witnessed the establishment of the Tudor dynasty, may be conveniently put as that which closed the Middle English transition, and introduced Modern English." Both in the completion of this result, and in its comparative permanence, the printing press had an important share. By its exclusive patronage of the midland speech, it raised it still higher above the sister dialects, aud secured its abiding victory. As books were multiplied and found their way into every corner of the land, and the art of reading became a more common acquirement, the man of Northumberland or of Somerset- shire had forced upon his attention the book-English in which alone these were printed. This became in turn the model for his own writings, and by and by, if he made any pretensions to education, of his own speech. The written form of the language also tended to uniformity. In previ- ous periods the scribe made his own spelling with a primary aim at expressing his own speech, according to the particu- lar values attached by himself or his contemporaries to the letters and combinations of the alphabet, though liable to disturbance in the most common words and combinations by his ocular recollections of the spelling of others. But after the introduction of printing, this ocular recognition of words became ever more and more an aim; the book addressed the mind directly through the eye, instead of circuitously through eye and ear; and thus there was a continuous tendency for written words and parts of words to be reduced to a single form, and that the most usual, or through some accident the best known, but not necessarily that which would have been chosen had the ear been called in as umpire. Modern English spelling, with its rigid uniformity as to individual results and whimsical caprice as to principles, is the creation of the printing-office, the victory which, after a ceutury and a half of struggle,~~

~~mechanical convenience won over natural habits. Besides eventually creating a uniformity in writing, the introduction of printing made or at least ratified some important changes. The British and Old English form of the Roman alphabet has already been referred to. This at the~~

~~Norman Conquest was superseded by an alphabet with the French forms and values of the letters. Thus & took the place of the older c before c¢ and 7; qureplaced cw; the Norman w took the place of the wén (p), &. But there were certain sounds in English for which Norman writing had no provision; and for these, in writing English, the native characters were retained. Thus the Old English g (x), beside the sound in go, had a guttural sound as in German tag, Irish magh, and in certain positions a palatalized form of this approaching y as in you (if pronounced with aspiration hyou or ghyou). These sounds continued to be written with the native form of the letter as 6u73, 30ur, while the French form was used for the sounds in go, age,—one original letter being thus split into two. So for the sounds of ¢h, especially the sound in that, the Old English thorn (p) continued to be used. But as these characters were not used for French and Latin, their use even in English became disturbed towards the 15th century, and when printing was intro- duced, the founts, cast for Continental languages, had no characters for them, so that they disappeared entirely, being replaced, 3 by gh, yh, y, and p by th. This was.a real loss to the English alphabet. In the north it is curious that the printers tried to express the forms rather than the powers of these letters, and consequently 3 was represented by z, the black letter form of which was confounded with it, while the p was expressed by y, which its MS. form had come to approach or in some cases simulate. So in early Scotch books we find zellow, ze, yat, yem, = yellow, ye, that, them.~~

~~Moprrn Encursu thus dates from Caxton. The language had at length reached the all but inflexionless state which it now presents. A single older verbal form, the southern -eth of the third person singular, continued to he the literary prose form throughout the 16th century, but the northern form in s was intermixed with it in poetry (where it saved a syllable), and must ere long, as we see from Shakespeare, have taken its place in familiar speech. The fuller an, none, mine, thine, in the early part of the 16th cen tury at least, were-used in positions where their contracted forms a, no, my, thy are now found. But with such minute exceptions, the accidence of the 16th century was the accidence of the 19th. While, however, the older inflexions had disappeared, there was as yet no general agreement as to the mode of their replacement.~~

~~Hence the 16th century shows a syntactic licence and freedom which distinguishes it strikingly from that of later times. The language seems to be in a plastic, unformed state, and its writers, as it were, experiment with it, bending it to constructions which now seem indefensible. Old distinctions of case and mood have disappeared from noun and verb, without fashion having yet decided what pre- positions or auxiliary verbs shall most fittingly convey their meaning. 'The laxity of word-order which was per- mitted in older states of the language by the formal expression of relations was often continued though the inflexions which expressed the relations had disappeared. Partial analogy was followed in allowing forms to be identified in one case, because, in another, such identifica- tion was accidentally produced, as for instance the past participles of write and take were made wrote and took, because the contracted participles of bind and break were bound and broke. Finally, because, in dropping inflexions, the former distinctions even between parts of speech had disappeared, so that zon, e.g., was at once noun, adjective,~~

~~and verb, clean, adjective, verb, and adverb, it appeared as if any word whatever might be used in any grammatical relation, where it conveyed the idea of the speaker. Thus, as has been pointed out by Dr Abbott, " you can happy your friend, malice or foot your enemy, or fall an axe on his neck. You can speak and act eusy, free, excellent, you can talk of fair instead of beauty (fairness), and a pale in- stead of a paleness. A he is used for a man, and a lady is described by a gentleman as 'the fairest she he has yet beheld.' An adverb can be used as a verb, as ' they askance their eyes ;' as a noun, ' the backward and abyss of time ;' or as an adjective, a ' seldom pleasure.' For, as he also says, " clearness was preferred to grammatical correctness, and brevity both to correctness and clearness. Hence it was common to place words in the order in which they came uppermost in the mind without much regard to syntax, and the result was a forcible and perfectly unambiguous but ungrammatical sentence, such as The prince that feeds great natures they will slay him.~~

~~Ben Jonson,~~

~~or, as instances of brevity, Be guilty of my death since of my crime. Shakespeare. It cost more to get than to lose in a day. Ben Jonson." These characteristics, together with the presence of words now obsolete or archaic, and the use of existing words in senses different from our own, as general for specific, literal for metaphorical, and vice versa, which are so apparent to every reader of the 16th century literature, make it useful to separate Larly Modern or Tudor English from the subsequent and still existing stage, since the consensus of usage has declared in favour of individual senses and con- structions which are alone admissible in ordinary language. The commencement of the Tudor period was contempo-~~

~~raneous with the Renaissance in art and literature, and the dawn of modern discoveries in geography and science. The revival of the study of the classical writers of Greece and Rome, and the translation of their works into the vernacu- lar, led to the introduction of an immense number of new words derived from these languages, either to express new ideas and objects, or to indicate new distinctions in or groupings of old ideas, Often also it seemed as if scholars were so pervaded with the form as well as the spirit of the old, that it came more natural to them to express them- selves in words borrowed from the old than in their native tongue, and thus words of Latin origin were introduced even when English already possessed perfectly good equi- valents. As has already been stated, the French words of Norman and Angevin introduction, being principally Latin words in an altered form, when used as English supplied models whereby other Latin words could be converted into English ones, and it is after these models that the Latin words introduced during and since the 16th century have been fashioned. There is nothing in the form of the words procession and progression to show that the one was used in England in the 11th, the other not till the 16th century. Moreover, as the formation of new words from Latin has gone on in French as well as in English since the Renaissance, we cannot tell whether such words, e.g, as persuade and persuasion, were borrowed from their French equivalents or formed in England independently. With some words indeeil it is impossible to say~~

~~whether they wére formed in England directly from Latin, borrowed from contemporary late French, or had been in England since the Norman period ; even photograph, geology, and telephone have the form that they would have had if they had been _¥A Shakspearian Grammar, by B. A. Abbott, M.A, To this book~~

~~we are largely indebted for its admirable summary of the characters of 'udor English, :~~

~~living words in the mouthis of Greeks, Latins, French, and English from the beginning, instead of formations of the 19th century.2 While every writer was thus introducing new words according to his idea of their being needed, it naturally happened that a large number were not accepted by contemporaries or posterity ; a portentous list might be formed of these mintages of the 16th and 17th centuries, which either never became current coin, or circulated only as it were for a moment.~~

~~The voyages of English navigators in the latter part of the 16th century also introduced a considerable number of Spanish words, and American words in Spanish forms, of which potato, tobacco, cargo, armadillo, alligator, galleon may serve as examples,~~

~~The date of 1611, which coincides with the end of Shakespeare's literary work and the appearance of the Authorized Version of the Bible (a compilation from the various 16th century versions), may be taken as marking the close of Tudor English, The language was thenceforth Modern in structure, style, and expression, although the spelling did not settle down to present usage till about the Restoration. The distinctive features of Modern English have already been anticipated by way of contrast with preceding stages of the language. It is only necessary to refer to the fact that the vocabulary is now much more composite than at any previous period. The immense development of the physical sciences has called for a corresponding extension of terminology which has been supplied from Latin and especially Greek; and although these terms are in the first instance ¢cchnical, yet with the spread of education and general diffusion of the~~

~~rudiments and appliances of science, the boundary line between technical and general, indefinite at the best, tends more and more to melt away, in addition to the fact that words still technical become general in figurative or metonymic senses. Ache, diamond, stomach, comet, organ, tone, ball, carte, are none the less familiar because once technical words. Commercial, social, artistic, or literary contact has also led to the adoption of numerous words from modern European languages, especially French, Italian, Portuguese, Dutch (these two at a less recent period): thus from French soirée, séance, dépét, débris, programme, prestige ; from Italian bust, cartoon, concert, regatta, rufian; from Portuguese caste, palaver; from Dutch yacht, skipper, schooner, sloop. Commercial inter- course and colonization have extended far beyond Europe, and given us words more or fewer from Hindu, Persian, Arabic, Turkish, Malay, Chinese, and from American, Australian, Polynesian, and African languages. More important even than these perhaps are the dialectal words that from time to time obtain literary recognition, restoring to us obsolete Old English forms, and not seldom words of Celtic or Danish origin, which have been preserved in local dialects, and thus at length find their way into the standard language. As to the actual proportion of the various ele- ments, it is probable that original English words do not now form more than a third or perhaps a fourth of the total entries in a full English dictionary ; and it might seem strange, therefore, that we still identify the language with that of the 9th century, and class it as a member of the Low German division. But this explains itself, when we consider that of the total words in a dictionary only a small portion are used by any one individual in speaking or even in writing; that this portion includes all or nearly all the Anglo-Saxon words, aud but a small fraction of~~

~~2 Kvangelist, astronomy, dialogue, are words that have so lived, of which their form is the result. Photograph, &c., take this form as if they had the same history.~~

~~3 See extended lists of the foreign words in English in Dr Morris's Historical Outlines of English Accidence, p. 33,~~

the others. The latter are in fact almost all sames,—the vast majority names of things (nouns), a smaller number names of attributes and actions (adjectives and verbs), and, from their very nature, names of the things, attributes, and actions which come less usually or very rarely under our notice. Thus in an ordinary book, a novel or story, the foreign elements will amount to from 10 to 15 per cent. of the whole ; as the subject becomes more recondite or technical their number will increase ; till in a work on chemistry or abstruse mathematics the proportion may be 40 per cent. But after all, it is not the question whence words may have been taken, but how they are used in a language that settles its character. If new words when adopted conform themselves to the manner and usage of the adopting language, it makes absolutely no difference whether they are transferred from some other language, or invented off at the ground. In either case they are new words to begin with; in either case also, if they are needed, they will become as thoroughly native, z.¢., familiar from childhood to those who use them, as those that possess the longest native pedigree. In this respect English is still strictly the same language it was in the days of Alfred ; and comparing its history with that of other Low German dialects, there is no reason to believe that its grammar or structure would have been different, however different its vocabulary might have been, if the Norman Conquest had never taken place.

The preceding sketch has had reference mainly to the inflexional changes which the language has undergone ; distinct from, though intimately connected with these (as where the confusion or loss of inflexions was a consequence of the weakening of final sounds) are the great phonetic changes which have taken place between the 8th and 19th centuries, and which result in making modern English words very different from their Anglo-Saxon originals, even where no element has been lost, as in words like stone, mine, doom, day, child, bridge, shoot, A.S. stdn, min, dom, deg, cild, brycg, sceót. The history of English sounds has been treated at length by Mr A. J. Ellis and Mr Henry

~~Sweet! (with whose results those of Dr Weymouth? should be compared); and it is only necessary here to indicate the broad facts, which are the following. (1) In an accented closed syllable, original short vowels have remained nearly unchanged; thus the words at, men, bill, God, dust, are pro nounced now nearly as in O. E., though the last two were more like the Scotch o and North English w respectively, and in most words the short a had a broader sound like the provincial ain man. (2) Long accented vowels and diphthongs have undergone a regular Jaut-verschvebung or shift towards higher and more advanced positions, so that the words bdn, her, soece or séce, st6l (2.e., bahn or bawn, hér, sok and sark, stdle) are now béne, hazr, seek, stool; while the two high vowels %@ (=00) and ¢ (ee) have become diph- thongs, as his, scir, now house, shire, though the old sound of w remains in the north (hoose), and the original 2 in the pronunciation sheer, approved by Walker, 'as in machine, and shire, and magazine." (3) Short vowels in an open syllable have usually been lengthened, as in nd-ma, cdfa, now name, cove; but to this there are many exceptions. (4) Vowels in terminal unaccented syllables have all sunk into short obscure é, and then, if final, disappeared; so oxa, séo, wudu, became ox-e, se-e, wood-e, and then oz, see, wood; oxan, lufod, now oxen, loved, lov'd; writan, writon, later writ-en, writ-e, now write, z.e, writ. (5) The back con-~~

~~1 See list of works at the end of this article. An important work by Mr Henry Nicol, on the history of " French Sounds in English," is in course of publication for the Philological Society.~~

~~2 On Early English Pronunciation, &c., by R. F. Weymouth, D.Lit., M.A., London, 1874, and paper On " Here" and " There" tn Chaucer, Phil. Soc., 1877.~~

~~sonants, ¢, g, sc, in connection with front vowels, have often become palatalized to ch, j, sh, as circe, ryeg, fisc, now church, ridge, fish. A final g has passed through a guttural or palatal continuant to w or y, forming a diphthong or new vowel, as in boga, laga, deg, heg, drig, now bow, law, day, hay, dry. W and h have disappeared before r and J, as in write, wlisp; h final (=gh) has become f, &, w, or nothing, as ruh, hoh,~~

~~boh, deah, heah, now rough, hough, bough, dough, high =ruf, hok, bow, dé, hi. KR after a vowel has practically disappeared in standard English, or at most become vocalized, or combined with the vowel, as in hear, bar, more, her. These and other changes have taken place gradually, and in accordance with well-known phonetic laws; the details as to time and mode may be studied in the special works already named. It may be mentioned that the total loss of grammatical gender in English, and the almost compiete disappearance of cases, are purely phonetic phenomena, Gender was practically (whatever its remote origin) the use of adjectives and pronouns with certain distinctive terminations, in accordance with the kind of nouns to which they were attached; when these distinc- tive terminations were uniformly levelled to final é, or other weak sounds, and thus ceased to distinguish nouns into kinds, the distinction into kinds having no other existence disappeared. Thus when pet gode hors, pone godan hund, pa godan béc, became, by phonetic weakening, pe goode hors, pe goode hownd, pe goode boke, the words horse, hound, book were no longer different kinds of nouns ; grammatical gender had ceased to exist. The concord of the pronouns is now regulated by rationulity and sex, instead of gender, which has no existence in English, The man who lost his life ; the bird which built 2s nest.~~

~~Our remarks from the end of the 14th century have been confined to the standard or literary form of English, for of the other dialects from that date (with the exception of the northern English in Scotland, where it became ina social and literary sense a distinct language), we have no history. We know, however, that they continued to exist as local and popular forms of speech, as well from the fact that they exist still as from the statements of writers during the interval. Thus Puttenham in his Arte of English Poesie, 1589, says—~~

~~'¢Our maker [i.e., poet] therfore at these dayes shall not follow Piers Plowman, nor Gower, nor Lydgate, nor yet Chaucer, for their language is now not of use with us: neither shall he take the termes of Northern-m.en, such as they use in dayly talke, whether they be noble men or gentle men or of their best clarkes, all is a [= onc] matter ; nor in effect any speach used beyond the river of Trent, though no man can deny~~

~~but that theirs is the purer English Saxon at this day, yet it is not so Courtly nor so currant as our Southerne English is, no more is the far Westerne mans speach : ye shall therefore take the usual speach of the Court, and that of London and the shires lying about London within 1x myles, and not much above. I say not this but that in every shyre of England there be gentlemen and others that speake but specially write as good Southerne as we of Middlesex or Surrey do, but not the common people of every shire, to whom the gentlemen, and also their learned clarkes do for the most part condescend, but herein we are already ruled by th' English Dictionaries and other bookes written by learned men."—Arber's Reprint, p. 157.~~

~~In comparatively modern times, there has been a revival of interest in these long-neglected forms of English, several of which, following in the wake of the revival of Lowland Scotch last century, have produced a considerable literature in the form of local poems, tales, and "folk-lore." In these respects Lancashire, Cumberland, Yorkshire, Devonshire, and Dorsetshire, the "far north" and "far west" of Puttenham, where the dialect was felt to be so inde- pendent of literary English as not to be branded as a vulgar corruption of it, stand prominent. More recently the dialects have been investigated philologically, a department in which, as in English philology generally, the name of Richard Garnett takes the lead. The work has been~~

~~carried out zealously by Prince Louis Lucien Bonaparte, Mr A. J. Ellis, and the Rev. W. W. Skeat, to whom is due the foundation of a Dialect Society for the investiga- tion of this branch of philology. The researches of Prince L. L. Bonaparte and Mr Ellis have resulted in the classi- fication and mapping of the existing dialects! They recog- nize a Worthern dialect lying north of a line drawn from Morecambe Bay to the Humber, which, with the kindred Scottish dialects (already investigated and classed),? is the direct descendant of early northern English, and a South-western dialect occupying Somerset, Wilts, Dorset, Gloucester, and western Hampshire, which, with the Devonian dialect beyond it, are the descendants of early southern English and the~~

still older West-Saxon of Alfred. This dialect must in the 14th century have been spoken everywhere south of Thames ; but the influence of London caused its extinction in Surrey, Sussex, aud Kent, so that already in Puttentam it had become "far western." An East Midland dialect, extending from south Lincolnshire to London, occupies the cradle-land of the standard English speech, and still shows least variation from it. Between and around these typical dialects are ten others, representing the old Midland proper, or dialects between it and the others already mentioned. Thus "north of Trent" the North-western dialect of south Lancashire, Cheshire, Derby, and Stafford, with that of Shropshire, represents the early West Midland English, of which several specimens re- main; while the North-eastern of Nottingham and north Lincolnshire represents the dialect of the Lay of Have- lok. With the North Midland dialect of south-west Yorkshire, these represent forms of speech which to the modern Londoner, as to Puttenham, are still decidedly northern, though properly intermediate between northern and midland, and preserving interesting traces of the midland pronouns and verbal inflexions. There is an Eastern dialect in the East Anglian counties ; a Midland in Leicester and Warwick shires; a Western in Hereford, Worcester, and north Gloucestershire, intermediate between south-western and north-western, and representing the dialect of Piers Plowman. Finally, between the east midland and south-western, in the counties of Buckingham, Oxford, Berks, Hants, Surrey, and Sussex, there is a dialect which must have once been south-western, but of which the most salient characters have been rubbed off by proximity to London and the East Midland speech. In east Sussex and Kent this South-eastern dialect attains to a more distinctive character. The Kentish form of early Southern English evidently maintained its existence more toughly than that of the counties immediately south of London. If we can trust the fidelity of the dialect attributed to Edgar in Zear, it was still strongly marked in the days of Shakespeare. In the south-eastern corner of Ireland, in the baronies of Forth and Bargy, in county Wexford, a very archaic form of English, of which speci- mens have been preserved,? was still spoken in the pre- sent century. In all probability it dated from the first English invasion. In many parts of Ulster forms of Lowland Scotch dating to the settlement under James IL are still spoken; but the English of

~~Ireland generally seems to represent 16th and 17th century English, as in the pronunciation of tea, wheat (tay, whait), largely affected of course by the native Celtic. Beyond the limits of the~~

~~1 ee description and map in Trans. of Philol. Soc., 1875-6, p. 570.~~

~~2 The Dialect of the Southern Counties of Scotland, its Pronunci- ation, Grammar, and Historical Relations, with an Appendix on the present limits of the Gaelic and Lowland Scotch, and the Dialectal Divisions of the Lowland Tongue ; and a Linguistical Map of Scot- land, by James A. H. Murray, London, 1873. ,~~

~~3.4 Glossary (with some pieces of Verse) of the Old Dialect of the English Colony of Forth and Bargy, collected by Jacob Poole, edited by W. Barnes, B.D., London, 1867.~~

~~British Isles, English is the language of extensive regions, now or formerly colonies. In all these countries the presence of numerous new objects and new conditions of life has led to the supplementing of the vocabulary by the adoption of words from native languages, and special adaptation of English words. The use of a common literature, however, prevents the overgrowth of these local peculiarities, and also makes them familiar to Englishmen. It is only in the older states of the American Union that anything like a local dialect has been produced ; and even there the so-called Yankee dialect, and Americanisms, are much more archaic English forms which have been lust or have become dialectal in England than a develop- ment of the American soil.~~

~~The steps by which English, from being the language of a few thousaud invaders along the eastern and southern seaboard of Britain, has been diffused by conquest and colonization over its present area form a subject too large for the limits of this article. It need only be remarked that within the confines of Britain itself the process is not yet complete. Representatives of earlier languages survive in Wales and the Scottish Highlands, though in neither case can the substitution of English be remote. In Ireland, where English was introduced by conquest much~~

~~later, Irish is still spoken in patches all over the country ; though English is understood, and probably spoken after a fashion, everywhere. At opposite extremities of Britain the Cornish of Cornwall and the Norse dialects of Orkney and Shet- land died out very gradually in the course of last century. The Manx, or Celtic of Man, is even now in the last stage of dissolution; and in the Channel Isles the Norman patois of Jersey and Guernsey have largely yielded to English within the last thirty years.~~

~~The accompanying table (page 402) will graphically repre- sent the chronological and dialectal development of English.' Various names have been proposed for the different stages ; it seems only necessary to add to those in the table the de- scriptive names of Dr Abbott, who has proposed (How to Parse, p. 298) to call the Old English, or Anglo-Saxon, the " Synthetical or Inflexional Period ;" the Old English Tran- sition (Late Anglo-Saxon of Mr Skeat), the "Period of Con- fusion ;" the Early Middle English, " Analytical Period" (1250-1350); the Late Middle English, " National Period" (1350-1500) ; the Tudor English, " Period of Licence ;" and the Modern English, " Period of Settlement."~~

~~As the study of English has made immense advances within the last twelve years, it is only in works recently published that the student will find the subject satisfactorily handled. Among those treating of the whole subject or parts of it may be mentioned—4 History of English Rhythms, by Edwin Guest, London, 1838; the Philological Essays of Richard Garnett [1835-1848], edited by his son, London, 1859; The English Language, by R. G. Latham, 5th ed., London, 1862; Origin and History of the English Lan- guage, by G. P. Marsh, London, 1862; Lectures on the Hinglish Language, by the same, New York and London, 1863; Historische Grammatik der englischen Sprache, by C. F. Koch, Weimar, 1863, &c.; Englische Grammatik, by Eduard Matzner, Berlin, 1860-65 (an English translation by C. J. Grece, LL.B., London, 1874); Zhe Philology of the English Tongue, by John Earle, M.A., Oxford, 1866; Comparative Grammar of the Anglo-Saxon Language, by F. A. March, New York, 1870; Historical Outlines of English Accidence, by the Rev. R. Morris, LL.D., London, 1878; Elementary Lessons in Histo- vical English Grammar, by the same, London, 1874;~~

~~The Sources of Standard English, by T. L. Kington Oliphant, M.A., London, 1873; Modern English, by F. Hall, London, 1873; A Shaxespearian Grammar, by E. A. Abbott, D.D., London, 1872; How to Parse, by the same, London, 1875; Early English Pronunciation, &c., by A. J. Ellis, London, 1869-75, and stillin progress; The History of English Sounds, by Henry Sweet, London, 1874; King Alfred's Translation of Gregory's Pastoral Care, by the same, Early lng. Text Soc., 1871-72; On Dialects and Prehistoric Forms of English, by the same, Philolog. Soc., 1877; as well as many separate papers by various authors in the Transactions of the Philological Society, and the publications of the Early English Text Society.~~

~~4 Brought before the Philological Society in January 1876. VIII. — 51~~

~~402 ENGLISH LANGUAGE Chronological Chart of the English Language.~~

~~CuronoLogicaL NOMENCLATURE. LitERARY DEVELOPMENT OF THE LEADING DIALECTS, |~~

~~I~~

~~Pivictows. Subdivisions. Dates. Northern English. Midland English. Southern English. 500 , , a, a! ae ' ea) z | a4 = B E B 600 * | S Dh asia of Ethelbert, 600.) 1 a ' , i] 1 ia \ iz~~

~~Ceedmon, 669,~~

~~700 Cynewulf?~~

~~7 | (Laws cf Inc, 700.) o MB Beda, 734. _ Epinal Glossary ? =a z a 4 ae~~

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~~a A~~

~~Ai s=| OLD ENGLISH or ANGLO-SAXON. : 4 @ Alfred, 885.~~

~~area 900, = g~~

~~: ° A Z } a, 5 oe s i 5 Rhymes in Saxon Chron., Durham Glosses, 950-975. @ [| Rushworth Gloss, be 937-979, ‘ene = Ml ? 975-1000. 8,~~

~~‘.~~

~~bo I Zlfric, 1000. : i E Wulfstan, 1016, i F , Worcester Chronicle, ’ 1043-79, 1100 ; ! ——~~

~~i] icle, 1123-31. ; Chronicle, Cotton Homilies, 1150.~~

~~OLD ENGLISH TRANSITION :~~

~~icle, 1154. (SEMI-SAXON,) bs pp porns i ff Zatton Gospels, 1170. 1200 2, & ff ormulum, 1200. a eee Layamon, 1208. te SE Ancren Riwle, 1220? mM ZA rd = . 20. : & | Earty Mippiz Eneutsn, zg A lniecaicicaiiaaeacinas | eet mars HL, tag f ; 5 , enry ITI, A oH (EARLY ENGLISH.) g 5 Wl warrowing of Hell, 1280. “ / zi 1300 Cursor Mundi. B [| Robt. Gloucester, 1300. = Le) = my fy Robt. of Brunne, 138038. Ee = 5 5 EB [i Ayenbdite, 1340. Se = ®: [Mandeville, 1356. Qe | Lares Mippie Encuisn. 5 [| Hampole, 1350. = = 4 Barbour, 1375. Wycliffe, Chaucer. Trevisa, 1387. alia 1400 w ‘ ; — | ee & Wyntoun, 1420. Lydgate, 1425. : MippLE ENGLISH TRANSITION. g ” 8 ton, 1477-90.~~

~~1485 ;~~

~~1500 “ Dunbar, 1500. a Tyndal, 1525 4 © ’ é = =] EARLY Monern ENGLISH, 2 Lyndesay. E a3] Tupor ENGLIsH. wa = (eae ro) =] ‘ ion S 3 He = [i James VI, 1590. = fl Shakespeare, 1590-1613. ‘ (Edgar in Lear.) i; 3 1611 oo a : 2) oO by * S Milton, 1626-71. Le 1 Pe 2 1700 Eg Dryden, 1663-1700. at S’ Allan Ramsay, 1717 Addison, 1717. ‘ = 3 rd~~

aya Exmoor Scolding, 1746. MopERrN ENGLISH. © Denctates cons ent oO le 1800 8 ; Coleridge, 1805.

Scott. Barnes, 1844,

Macaulay. Tennyson.

The three vertical lines represent the three leading forms of English, Northern, Midland, and Southern, and the names occurring down the course of each are those of writers and works in that form of English at the given date. The thickness of the line shows the com- parative literary position of this form of speech at the time, thick indicating a literary language, medium a literary dialect, thin a popular dialect or patois ; a dotted line shows that this period is unrepresented by specimens. The horizontal lines divide the periods; these (after the first two) refer mainly to the Midland English; in inflexional decay the Northern English was at least a century in advance of the Midland, and the Southern nearly as much behind it. (J. A. H. M.)

I, Arglo-Saxon Period, 596-1066.—The early history

of literature in England might lend some counten- ance to the theory that the development of a nation's literature is, at bottom, but a chapter of its religious his- tory. While the religion of our fathers was in the main a rude awe-struck worship of the forces of nature, litera- ture either had no existence for them, or was in a state not less elementary, consisting of a few songs and oracles, and nothing more. With the advent of the religion of Christ—the only faith which at once recog- nizes the original dignity of human nature and repairs its fall—came an intellectual as well as a spiritual awaken- ing to the Teutonic nations—for into such the original tribes or clans of the invaders had now grown—that were planted in the old provinces of Roman Britain. Fortified by gospel precept for the present life, and thrilled with the hope of the life to come, the Saxon mind, released from disquietude, felt free to range

~~discursively through such regions of human knowledge as its teachers opened before it, and the Saxon heart was fain to pour out many a rude but vigorous song. Pope Gregory himself, who, according to the old phraseology, sent baptism to the English, is said indeed to have spoken disparagingly of human learning. But the missionaries could not fail to bring with them from Rome the intellectual culture of the countries bordering on the Mediterranean, so far as it had survived the fall of the Western empire and the irruption of the barbarians. The Roman alphabet, paper or parchment, and pen and ink, drove out the Northern runes, the beechen tablet, and the scratching implement. The necessity of the preservation, aud at least partial translation, of the Scriptures, the varied exigences of the Catholic ritual, the demand for so much knowledge of astronomy as would enable the clergy to fix beforehand the date of Easter, all favoured, or rather com- pelled, the promotion of learning and education up to a certain point, and led to continual discussion and inter- change of ideas. Gratefully and eagerly our forefathers drew in the warm and genial breath which came to them from the intenser life and higher enlightenment of the south. Beda dates his history by the indictions of the Eastern emperors; and while in practice he obeyed his native king descended from Woden, in tbeory he recognized the larger and more rational sway of the Cesar enthroned at Constantinople.~~

~~On a closer examination, we find that there were two principal centres, during the first two centuries after the conversion, where learning was honoured and literature flourished. These centres were Wessex and Northumbria. For although Christianity was first preached in Kent, and the great monastery at Canterbury was long a valuable school of theology and history (witness the liberal praise awarded by Beda to Abbot Albinus in the preface to his Ecclesiastical History), yet the limited size of the kingdom, and the ill fortune which befell it in its wars with Mercia and Wessex, seem to have checked its intellectual growth. When we have named the oldest form of the Saxon Chronicle, —that represented by the Parker MS. A,—and the not very interesting works of Abbot A'lfric, there is little left in the shape of extant writings, dating before the Conquest, for which we have to thank the men of Kent. But in Wessex and Northumbria alike, the size of the territory,~~

~~the presence of numerous monasteries, perhaps also the proximity of Celtic peoples or societies endowed with many literary gifts,—the Britons in the case of Wessex, the Culdees of Iona in the case of Northumbria,— co-operated to produce a long period of literary activity, the~~

~~monumenis of which it must now be our endeavour briefly to review and characterize.~~

~~But before we consider the Anglo-Saxon literature which was founded on Christianity, the question whether any Anglo-Saxon literature exists of date prior to the conver- sion demands an answer. It was formerly thought that the important poem of Beowulf was in the main a pagan work, and must have been produced before the Angles and Saxons quitted their German homes ; but closer investiga- tion has shown that it is permeated almost everywhere by Christian ideas, and that it cannot be dated earlier than the first quarter of the 8th century. But two poems remain, presenting problems of great difficulty, many of which have not yet been satisfactorily solved, which so far as appears must have been composed in Germany while our forefathers were still in their German seats. These are The Traveller's Song and Deor's Complaint. In the first, Widsith, a poet of Myrging race (the Myrgings were a tribe dwelling near the Eider), recounts the nations that he had visited as a travelling gleeman, names the kings who ruled over them, and singles out two or three whose open-handed generosity he had experienced, and to whom he accordingly awards the tribute of a poet's praise. This poem may per- haps be dated from the second half of the 6th century. Though written in or near Anglen, after the migration of most of the Angles to Britain, the language of the poem seems to have been accommodated to the ordinary West-~~

~~| Saxon dialect, for in this respect it differs in no degree from~~

~~the other poems which stand before and after it in the Exeter Codex. Deor's Complaint mentions Weland, the Teutonic demi-god corresponding to Vulcan, Theodric,~~

~~| Eormanric, &c. ; it is the lament of a bard supplanted by~~

~~a rival in his lord's favour. In date it is probably not far distant from the Z'raveller's Song.~~

~~We may now return to the literary development in Wessex. Christianity was introduced into Wessex by Bishop Birinus in 634, and spread over the whole kingdom with marvellous celerity. The bishop's see was fixed at first at Dorchester, near Oxford; thence it was moved to Winchester ; before the end of the century it was necessary to carve out another bishopric farther to the west, and the see was fixed at Sherborne. Winchester, Malmesbury, and Glastonbury were great and famous monasteries early in the 8th century. The heroic Winfrid (better known as St Boniface), trained in a monastery at Exeter, could not rest contented that Wessex should have received the faith, but carried Christianity to the Germans. Great spiritual fervour, ardent zeal, great intellectual activity, seems to have prevailed in every part of the little kingdom. The interesting letters of St Boniface give us tantalizing glimpses of a busy life, social and_monastic, In the west of England, no detailed picture of which it Is now possible to reconstruct. The most distinguished known writer was St Aldhelm, a monk of Malmesbury, and, for a few years before his death in 709, bishop of Sherborne. His extant works in Latin are chiefly in praise of virginity, that form of self-mastery which, difficult as it was for a people teeming with undeveloped power and unexhausted passion, included, he might think, and made possible every other kind of self-mastery. The Saxon writings of St Aldhelm are lost, unless we accept a conjecture of Grimm that he was the author of Andreas, one of the poems in the Vercelli Codex. Cynewulf, the author of Crist, Hlene, and Juliana, though to us unhappily no more than a name, was a poet of no mean powers. Mr Kemble was disposed to identify him with an abbot of Peterborough who lived~~

~~The Tra-~~

~~veller's Song.~~

~~Deor's Com-~~

~~plaint.~~

~~Aldhelm.~~

~~Cyne-~~

~~wulf,~~

~~Allitera- tion.~~

~~Beowulf,~~

~~4()4~~

~~in the 11th century; but it is far more probable,—whatever weight we may attach to Grimm's hypothesis that he was a pupil of St Aldhelm,—that Cynewulf was a West-Saxon writer, and lived in the first balf of the 8th century. Crist is a poem of nearly 1700 lines, incomplete at the beginning. When first edited by Mr Thorpe along with the other contents of the Exeter Codex, it was believed to be a string of disconnected poems. Dietrich was the first who pointed out the internal connection of these, and showed that they constituted one organic whole. Cynewulf seems to revel in the task of expressing in his mother tongue the new religious ideas which had come to his race. Beginning from the Annunciation, he expatiates on the various and inestimable benefits which Christ by his incarnation bestowed on men, concluding with a vivid picture of the last great day of account. The key-note of the poem seems to be found in the 15th canto, where the six "leaps," or movements, of Christ are enumerated :—the first, when He became incarnate; the second, when He was born ; the third, when He mounted on the cross, and so on. The name " Cynewulf" is given in runes in the 16th canto; it occurs in the same way in the other poems attributed to this writer. lene is the legend of the dis- covery of the true cross at Jerusalem by the empress Helena, the mother of Constantine; Juliana is the story of the martyrdom of the saint so named, under Maximian. Guthlac, a free version of the Latin life of St Guthlac (who died in 714) by Felix, a monk of Croyland, is probably the work of a Mercian writer, whose language was altered by a West-Saxon transcriber into conformity with that of the poems already mentioned. Andreas, a poem of more than 1700 lines, ascribed by Grimm, as we have seen, to St~~

~~Aldhelm, but at any rate a West-Saxon poem of the 8th century, is founded on an apocryphal Greek narrative of the " Acts of Andrew and Matthew." The first-named apostle, after rescuing the second from confinement in a barbarous land named Mermedonia, and working numerous miracles of an amazing character, converts the entire nation, and departs after committing them to the charge of a pious bishop narned Plato,~~

~~All the poems hitherto named, and indeed the great mass of Anglo-Saxon poetry, are written in that alliterative metre which was the favourite rhythm of the whole Teutonic north, and of which one variety may be seen in the famous poems of the Edda. Each line is in two sections, balanced the one against the other, and containing usually from four to eight syllables and two accents. The general rule of the metre is that the two accented words in the first section, and one of those in the second section, begin upon the same letter, if a consonant, but, if the accented words begin with vowels, then upon different letters.~~

~~The preponderance of opinion is now in favour of ascribing to Beowulf, the most important surviving monu- ment of Anglo-Saxon poetry, a West-Saxon origin, and a date not later than the middle, nor earlier than the first decade, of the 8th century. Yet the difficulty of the problem may be estimated from the facts, that Thorkelin, the first editor, described Beowulf as a "Danish poem," that Mr Kemble, wrongly identifying the Geatas with the Angles, believed it to have been composed in Anglen before the migration, and brought over to Wessex before the end of the 5th century, and that Mr Thorpe considered it to be merely a translation of a Swedish poem of the 11th century. Notwithstanding this discrepancy, the general view taken above is that of Grein, Miillenhoff, and other eminent scholars, and we are convinced that the further investigation is carried the more firmly will its soundness be established. Founded on a single MS., which, as originally written, was full of errors. and now is much~~

~~ENGLISH UMMPERATUGe~~

~~[saxon.~~

~~defaced, the text of Beowulf can never, unless another MS, should be discovered, be placed on a thoroughly satisfactory footing ; much, however, has been done for its improve- ment by the labours of German and Danish critics. The general drift of the poem is to celebrate the heroic deeds of Beowulf, who, originally of Swedish race, was adopted by the king of Gautland, or Gotland (as the southern portion of Sweden is still called), and brought up with his own sons. Hearing that the Danish king Hrothgar is harassed by the attacks of a man-eating monster called Grendel, he sails to Zealand to his aid, and after various adventures kills both Grendel and his mother. After this Beowulf is chosen king of Gotland, and reigns many years in great prosperity, till in his old age, undertaking to fight with a fiery dragon that lias been making great ravages among his subjects, he succeeds in killing it, but receives a mortal injury in the struggle. The burning of his body, and the erection of a huge mound or cairn over his ashes, asa beacon "easy to be seen far off by seafaring men," conclude the. poem, and form a passage of remarkable beauty.~~

~~Towards the end of the 8th century the descents of the The~~

~~piratical heathens known by the general name of Danes, but probably born for the most part in Scandinavian countries lying to the north of Denmark, began to plague the English coasts. These destroying savages resembled the modern Turks in possessing fine military qualities, and above all indomitable courage; they were also like the Turks in this respect that, wherever they set their foot, progress of every lind was arrested, culture was blasted, and the hopes of civilization died away. Fortunately they were not, like the Turks, absolutely deaf to the voice of the Christian missionary, though their natural brutishness made them difficult to convert and prone to relapse. With incredible pains, and a charity that nothing could disgust or deter, the church gradually wou over these Scandinavian Calibans to the Christian creed; and when once converted their immense natural energy and tenacity were turned into right and beneficial channels, at least in great measure. But for 230 years,—from the sack of Lindisfarne to the accession of Canute, —the so-called Danes were the curse of England, destroying monasteries and the schools maintained by them, burning churches~~

~~and private houses, making life and property everywhere insecure, and depriving the land of that tranquillity without which literature and art are im- possible. After a long prevalence of this state of things, society in Wessex having been, one would think, almost~~

~~reduced to its first elements, Alfred arose, and after Alfred.~~

~~obtaining some successes in battle over the Danes, lead- ing to a treaty and the conversion of part of them to Christianity, obtained a period of peace for his harassed and dejected countrymen. History tells us how well he wrought to build up in every way the fallen edifice of West-Saxon society. Among his labours not the least meritorious was his translation of Beda's Historia Licclesiastica, Pope Gregory's work De Cura Pastorali, the famous treatise of Boethius De Consolatione, and the Unwersal History of Orosius. He also founded several schools, and made a beginning in the work of restoring monasteries. Yet in spite of his generous efforts, the evils caused by the Danes could not be repaired. A sort of blight seemed to have passed over the Anglo-Saxon genius; the claims of material existence suddenly seemed to engross their thoughts, perhaps because their sufferings had taught them that, however it may be with individuals, for nations all higher developments must have a basis of material prosperity to rest upon. Now and then a great man ap- peared, endowed with a reparative force, and with a courage which aimed at raising the fallen spirit of the people, and turning them back again into the old paths of nobleness~~

~~St Dun- stan.~~

~~Adam. nan,~~

~~Cedmon.~~

~~596-1066.]~~

~~Such a man was St Dunstan, who fought with a giant's strength against corruption, sloth, and ignorance, and was ever faithful to the interests of learning. There isin the Bodleian Library a little volume, probably written in his own hand; it is a sort of common-place book; the~~

~~frontispiece is a drawing of the saint prostrated at the feet of the throned Christ, executed by Dunstan himself : among the contents of the volume are—a grammatical treatise by Eutychius, with extremely curious Welsh glosses, part of Ovid De Arte Amandi with similar glosses, and lessons, in Latin and Greek, taken from the Pentateuch and the prophets. But his work was undone during the disastrous reign of Ethelred II., at the end of which the Danish power established itself in England. Under Edward the Confessor, French influences began to be greatly felt. The two races of the Teutonic north had torn each other to pieces, and the culture which Saxon had been able to impart to Northman was not sufficient to discipline him into a truly civilized man. England, though at a terrible cost, had to be knit on to the state-system of Southern Europe; her anarchy must give place to centralization ; her schools, and her art, and her architecture be remodelled by Italians and Frenchmen ; her poets turn their eyes, not towards Iceland, but towards Normandy or Provence. Turning now to the other literary centre, the Northum- brian kingdom, we find that impulse and initiation were due to more than one source. In the main, the conversion vf the Angles north of the Tees, and the implantation among them of the germs of culture, are traceable to Tona, and, indirectly, to the Irish Church and St Patrick. From Ireland, in the persons of St Colamba and his followers, was wafted tothe long low island surrounded by the mountains of the Hebrides, a ministry of light and civiliza- tion, which from the 6th to te 11th century diffused its blessings over northern Europe. Oswald, son of the Bernician king Ethelfrid, was driven out of Northumbria after his father's death by Edwin of Deira, and took refuge among the northern Picts. He embraced Christianity through the teaching of the monks of Iona or some monastery dependent on it; and when he became king of Bernicia in 634, one of his first thoughts was to send to his old teachers, and ask that missionaries might be sent to instruct his people. Aidan accordingly came from Iona and founded a bishop's see at Lindisfarne, or Holy Isle. Hence issued the founders of the monasteries of Hexham, Coldingham, Whitby, and many other places. The actual representatives of the monks of Iona returned after some years to their own country, because they would not give way in the dispute concerning Easter; but the civilizing effects of their mission did not~~

pass away. The school of piety and learning which produced an Aidan, an Adamnan, and a Cuthbert deserved well not of England only but of humanity. Adamnan, abbot of Iona about the year 690, has a peculiar interest for us, because a long extract from his work on the holy places is incorporated by Beda in his Zeclesiastical History. He also wrote a life of his founder, St Columba, printed by Canisius and in the Florilegium Insule Sanctorum. To the encouragement of Bishop Aidan we owe it that Hilda, a lady of the royal house of Deira, established monasteries at Hartlepool and Streoneshalch (afterwards Whitby); and it was by the monks of Streoneshalch that the seed was sown, which, falling upon a good heart and a capacious brain, bore fruit in the poetry of Cadmon, the earliest English poet. We need not repeat the well-known story of the vision, in which the destined bard, then a humble menial employed about the stables and boat-service of the monastery, believed that an injunction of more than mortal authority was laid upon him, to "sing of the beginning of creation." The impulse having been once communicated, Ceedmon, as Beda

informs us, continued for a long time to clothe in his native measures the principal religious facts recorded in the Pentateuch and in the New Testament. Is the work commouly known as Czedmon's Paraphrase identical with the work described by Beda? Have we in this paraphrase a genuine utterance of the 7th century? The answers to these questions are still involved in doubt, and to enter upon the discussion which they presuppose would be foreign to our present purpose. We will merely say that the unique MS. of the Paraphrase, which is of the 10th century, contains no indication whatever of authorship, and that it opens in a manner different from the prologue made by the real Cuedmon, of which we have a Latin version in Beda and an Anglo-Saxon version in Alfred's translation of Beda. On the other hand, the portion of the MS. which is written in the first hand agrees tolerably well in its contents with the real work of Cedmon, as Beda describes it. The portion of the MS. which is written in the second hand is probably of much later date

~~; some critics have not hesitated to designate its author as the "'pseudo-Cedmon." The opening cantos of the Para- phrase, which treat of the rebellion of the angels and the fall of man, are allowed by general consent to be thoso most vividly expressed, and most characterized by poetical power. It is here that bright strong phrases occur, which, as is believed, Milton himself did not disdain to utilize, and his known acquaintance with Francis Junius, the then possessor of the Cedmon MS., seems to lend some countenance to the belief.~~

~~Hitherto the influences in Northumbria tending to culture have been found to be only indirectly Roman; the immediate source of them was Iona. But when we come~~

~~to the Venerable Beda, the great light of the Northumbrian Beda.~~

~~church, the glory of letters in a rude and turbulent age, nay, even the teacher and the beacon light of all Europe for the period from the 7th to the 10th century, we find that the fountain whence he drew the streams of thought and knowledge came from no derivative source, but was supplied directly from the well-head of Christian culture. Benedict Biscop, a young Northumbrian thane, much employed and favoured in the court of Oswy, abandoned the world for the church, and travelling to Rome resided there several years, diligently studying the details of ecclesiastical life and training, and the institutes of litur- gical order. Returning to England in 668, with Theodore, the new primate, and the abbot Hadrian, he brought into Northumbria a large number of books, relics, and other ecclesiastical objects, and, being warmly welcomed by King Egfrid, founded a monastery in honour of St Peter on land granted by the king at the mouth of the Wear. That the other great apostolic name venerated at Rome might not go without due honour, he built a second monastery soon afterwards in honour of St Paul at Jarrow on the Tyne, seven miles from Wearmouth. After the fouuder's time the two monasteries were usually governed by one abbot. When only seven years old, Beda, like Orderic in a later age, was brought by his father to Jarrow, and given up to the abbot to be trained to monastic life. The rest of his life, down to the year 731, was passed in the monastery, as we know from his own statement ; in 735 he died. His~~

~~works, which have several times been edited in a complete form abroad, but never yet in his own country, may be grouped under five heads—1, Educational ; 2, Theological ; 3, Historical ; 4, Poetical ; 5, Letters. To the first class belong the treatises De Orthographia and De Arte Metrica, the first being a short dictionary, giving the correct spelling and the idiomatic use of a considerable number of Latin words, with (in many cases) their Greek equivalents,—the second a prosody, describing the principal classical metres, with examples. De Natura Rerum is a~~

~~cosmogony and cosmography, with numerous diagrams and maps. A number of treatises, of which the most important are De Ratione Temporum and De Ratione Computi, fall under the same head; their general object being to eluci- date all questions connected with the ecclesiastical calendar and the right calculation of Easter. Under the second head, that of theological works, fall lis Hxpositiones on St Mark's and St Luke's Gospels, on the Acts, and other books of the New Testament, his homilies, forty-nine in number, and a book of Prayers, chiefly made up of verses taken from the Psalms. Under the head of " Historical lives of five abbots of Wearmouth and Jarrow, a life of St Cuthbert, another of St Felix, bishop of Nola, and a Martyrology, which has several times been printed. The Ecclesiastical History opens with a preface, in which, in that tone of calmness and mild dignity which go far to make a perfect prose style, Beda explains in detail the nature and the sources of the evidence on which he has relied in compiling the work. A short introduction then sketches the general history of Britain from the landing of Julius Cesar to the coming of Augustine, giving special details respecting the martyrdom of St Alban under Diocletian, and the missionary preaching of St Germanus of Auxerre in the 5th century. From the landing of Augustine in 596 to the year 731, the progress of Christianity, the successes and the reverses of the church in the arduous work of bringing within her pale the fiercely warring nations of the Heptarchy, are narrated, fully but unsystematically, for each kingdom of the Heptarchy in turn, A short sketch of " Universal History," forming the latter portion of the De~~

~~Ratvone Temporum, has been treated by the editors of the Monu-menta Hist. Brit. as if it werea separate work, and printed, with the title De Sex Mtatibus Mundi, in that useful but unwieldy volume. Among the poetical works are a life of St Cuthbert in Latin hexameters, a number of hymns, most of which are written in the lively iambic metre of which a familiar instance is the hymn beginning " Vexilla regis prodeunt," a poem on Justin Martyr in a tro- chaic metre, and another in hexameters on the Day of Judgment, This last seems to have been much admired ; Simeon of Durham copied it entire into his history. The versification of this remarkable poem has considerable merits ; in that respect it is not more than three hundred years behind Claudian. But when we come to the spirit of the poem, aud think of the moral atmosphere which it implies, and aims at extending, we see that ten thousand years would not adequately measure the chasm which divides the monastic poets from the last " vates " of heathen Rome. For the key-note of Beda's poem is the sense of sin; whatever is expressed by the words compunction, penance, expiation, heart-crushing sorrow for having offended God, trust in the one Redeemer, pervades all his lines ; and we need not say how alien is all this to the spirit of the poets, who, with little thought of individual and personal reformation, staked their all in the future upon the greatness and stability of Rome. "Tu regere imperio populos, Romane, memento." The letters, most of which are merely the dedications and addresses prefixed to some of his works, refer little to contemporary events ; two or three, however, are of great interest.~~

~~At the time when Beda died (735), the Angles of North- umbria were beginning to lay aside the use of arms, and zealously to frequent the monastery schools ; among their princes, as among those of Wessex, some were found to exchange a crow for a cowl and athrone fora cell. But a reaction set in; perhaps some had tried asceticism who had no vocation for it; and after the middle of the century Northumbrian history is darkened by the frequent record of dissension among the members of the royal house,~~

~~[SAXON,~~

~~civil war, and assassination. On this state of things came the ravages of the Northmen, and made it incurable. Lindisfarne, with all its treasures and collections, was destroyed by them in 793. This is but a sample of the havoc wrought by those barbarians; yet for a long time many monasteries escaped ; and, in particular, that of York was a centre of learning far on into the 9th century, probably till the disastrous battle occurred before York, described in the Saxon Chronicle under 867. At this monastery Alcuin was educated, and when grown up he Alcuin, had charge of its school and library. In 780 he was sent on a mission to Rome; on his return, at Parma, he fell in with the emperor Charlemagne, who invited him to settle at Aix-la-Chapelle, at that time the chief imperial residence, to teach his children, and aid in the organization of educa- tion throughout his dominions. Having obtained the permission of his superiors at York, Alcuin complied with the request ; and from that time to his death, in 804, resided, with little intermission, either at the imperial court or at Tours. Alcuin's letters, though the good man was of a somewhat dry and pedantic turn, coutain much matter of interest. His extant works are of considerable bulk ; they are chiefly educational and theological treatises,~~

~~| which for lack of vigour or originality of treatment have fallen into complete oblivion.~~

~~What is still of value in the works of Alcuin is, besides the letters, the lives of St Willibrord, the English apostle of Friesland, St Vedast, and St Richer.~~

~~After the death of Alcuin, the confusion in Northumbria became ever worse and worse, for the Danes forced their way into the land, and many years passed before the two nations could agree to live on friendly terms together side by side. But for the Durham Gospels, a version in the Angle dialect of the four gospels, and a few similar remains, the north of England presents a dead blank to the historian of literature from Alcuin to Simeon of Durham, a period of more than three hundred years. In the south, as we have seen, the resistance to the intrusion of the barbarian element was more successful, and the~~

~~intellectual atmosphere far less dark. The works of ZElfric, who died archbishop of Canterbury in 1006, are ailfric. the last subject of consideration in the present section. They are chiefly interesting because they show the growing importance of the native language. Allfric's Homulies are in Anglo-Saxon ; his Colloquy isa conversation on common things, in Latin and Anglo-Saxon, between a master and his scholar; his Grammar, adapted from Priscian and Donatus, has for its object to teach Latin to Anglo-Saxons ; its editorial and didactic part is therefore in Anglo-Saxon. The annals of public events, to which, as collected and arranged by Archbishop Plegmund at the end of the 9th century, we give the name of the Saxon Chronicle, con- Saxon tinued to be recorded at Canterbury in the native language Chro- till about the date of the Conquest; after that time the ies: task passed into the hands of the monks of Peterborough, and was carried on by them for nearly a hundred years. A work of collecting and transcribing the remains of the national poetry began, of which the priceless volume known as the Lxeter Codex, given by bishop Leofric to the library Exeter of Exeter cathedral in the reign of Edward the Confessor, Codex. is the monument and the fruit. The collection contained in the manuscript discovered about fifty years ago at Vercelli was probably made about the same time. In Vercelli~~

~~these two collections are contained the works of Cynewulf, Codex.~~

~~the Traveller's Song, Guthlac, Andreas, the poem on the Phenix, &c. Being thus made more widely known, the ancient poems would soon have found imitators, and a fresh development of Anglo-Saxon poetry would have been the result. Had there been no violent change, England would by slow degrees have got through with the task ot~~

~~Turold,~~

~~Gui- chard,~~

~~NORMAN,|~~

~~assimilating and taming the Northmen; and, in spite of physical isolation, would have participated, though probably lagging far behind~~

~~the rest, in the general intellectual advance of the nations of Europe. The tissue of her civilization would have been, in preponderating measure, Teutonic, like that of Germany ; but it would have lacked the golden thread of the "Holy Roman Empire," which brought an element of idealism and beauty into the plain texture of German life. For good or for evil, the process of national and also of intellectual development was to be altered and quickened by the arrival of a knightly race of conquerors from across the channel.~~

~~II. Anglo-Norman Period, 1066-1215.—The 11th cen- tury is remarkably barren in great names and memories which captivate the imagination; it was, however, an advance upon the 10th, which Baronius has described as the central and worst period of intellectual darkness. In England, for about 150 years after the Conquest, there was no unity of intellectual life; in political life, however, the iron hand of the Conqueror compelled an external uniformity, by the universal exaction of homage to him- self. The strength of the Norman monarchy, the absence of religious differences, and, after a time, the loss of Nor- mandy, were causes working powerfully in aid of the con- ciliation and interfusion of the different elements of the population. But at first it was as if three separate nations were encamped confusedly on British soil,—the Normans, the English, and the Welsh. The clergy, as a fourth power, of all nationalities or of none, became,—by its use of Latin asa common tongue, by preaching a common faith and teaching a common philosophy, and as representing the equality and charity which are among the essential features of Christianity,—an ever present mediating influence tend- ing to break down the partitions between the camps. The intellectual state and progress of each nation, down to and a little beyond the end of the 12th century, must now be briefly discussed.~~

~~1. Normans.—In less than two centuries after the Northmen under Rollo had settled in Normandy, they had not only exchanged their Teutonic speech for the language of France, but made,—with French as the medium of expression,—remarkable literary progress, In this progress the Normans settled in England participated to the full. It is probable that the Turoldus, who, availing himself of earlier Frankish~~

~~lays and chronicles, composed towards the end of the 11th century the noble heroic poem called the Chanson de Roland, was an abbot of Peterborough, son of the clerk of the same name who was the Conqueror's preceptor. From the reign of Henry I., though the names of several writers are known, little of importance has come down to us. The treatise on politeness called Urbanus, attributed to Henry himself, is in all probability the com- position of a later age. The works of the hapless satirist, Luc de la Barre, are not extant, and Evrard's translation (1130) of Cato's Disticha into French verse is not a note-worthy performance. The reign of Stephen, though con- fusion and civil war prevailed over a great part of England, witnessed an extraordinary outburst of literary activity. Of the historians who shed a lustre on this reign we shall speak in a different connexion ; but it was also memorable for its French poets. Guichard of Beaulieu, a cell of St Alban's (1150), produced a poem in Alexandrines of some merit, on the vices of the age; Geffroy Gaimar (1140) wrote his lively Hstorie des Engles (a chronicle of the Anglo-Saxon kings); and Benoit de Ste More, either in this reign or early in that of Henry IL, produced a vast poem on the History of the War of Troy, which seems to have been the original exemplar on which the numerous "Troy-books" of later generations were modelled. The~~

~~family of Benoit was of Norman extraction, but settled in England. Under Henry II., whose ceaseless and enlightened energy stimulated production wherever it was exerted, French poetry took an ever bolder sweep. Robert~~

~~Wace, a native of Jersey and a clerk of Caen, composed Wace. about 1155 his famous Brut d' Angleterre, a history of the~~

~~kings of Britain from Brutus to Cadwallader, founded on the Historia Britonum of Geoffrey of Monmouth. Again, when Henry had commissioned Benoit to write a metrical history of the dukes of Normandy, the quick-witted Wace anticipated his slower rival, and~~

~~**produced in 1160 the first part of the Roman de Rou, treating of the same subject.**~~

~~**Thus far we have considered the Anglo-Norman poets chiefly as chroniclers; we have now to regard them as romance writers. It is true that in their hands history slides into romance, and vice versa; thus the Brut d'Angleterre may be regarded as historical in so far as it treats of the series of British kings, mythical as that series itself may be, but as a romance in most of that portion of it which is devoted to the adventures of Arthur. We here enter upon a wide field; the stores of Arthurian, Carlovingian, and general chivalrous romance suggest themselves to the mind; a thousand interesting inquiries present themselves ; but the limits traced for us prescribe a treatment little more than alluswe,; that is, French romance can only be described in virtue of the stimulating and suggestive effect which it had on English writers. This effect was produced in a measure by great poems like the Alexandreis (1200), by the original French romances on Charlemagne and his peers, and by that on the third**~~

~~**crusade and the prowess of King Richard. But the Arthur romances relating to Arthur, doubtless on account of the romance.**~~

~~**extent to which they really sprang from British soil, were those which most profoundly stirred the English mind. It is not difficult to trace the steps by which the legend grew. Gildas, writing in the 6th century, knows of Arthur's victory at Mount Badon, but does not name him. Nennius, whose date is uncertain, but who should probably be assigned to the 9th century, mentions the same victory as one of several which were gained by " the magnanimous Arthur " over the Saxon invader. Three centuries pass, and the story comes to us again, greatly amplified, in the British History of Geoffrey of Monmouth (1126). This history, Geoffrey assures us, was founded upon a book in the Breton language, brought over from Britanny by an archdeacon of Oxford. Ritson scouted the assertion as fictitious, yet it was probably true; and the supposition of a Breton origin for his history is exactly what would best account for the great development which we find the Arthur legend to have now attained, in comparison with the age of Nennius.**~~

~~For Britanny was the fruitful parent of numberless forms of imaginative fiction,—a trait noticed by Chaucer : “‘ These olde gentil Bretons in their daies, Of divers aventures maden laies :”~~

~~and what character would the Breton bards be more likely to embellish than that of the hero king, who, during and before the migration of their forefatliers, had made such a gallant stand against the Saxon? Yet, though Geoffrey has so much to tell us of Arthur, he is silent about the Round Table. That splendid feature of the legend first appears in the Brut of Wace, and was probably derived from Breton poems or traditions to which Geoffrey had not access. Layamon reproduces it, with additional details, in his version of Wace. Other branches of Arthurian romance, especially those relating to Tristan and Perceval, became about this time widely popular; it is to this period also that the Chevalier du Lion of Chrétien de Troyes belongs. Suddenly there is a great change. A~~

~~Saint Graal.~~

~~Welsh poetry.~~

~~cycle of romance, which till now had breathed only of revenge, slaughter, race-hatreds, unlawful love, magic, and witchcraft, becomes transformed in a few y2ars into a serles of mystical legends, symbolizing and teaching one of the profoundest dogmas of the Catholic creed. This strange effect was produced by the infusion into the Arthur legend of the conception of the Saint G’raal, the holy vessel used by Christ at the Last Supper, and containing drops of his plood, which Joseph of Arimathea was said to have brought into Britain. This transformation seems to have been executed by Walter Map, the remarkable Welshman whose genius decisively colours the intellectual history of the last forty years of the 12th century. Map is said to have written a Latin history of the Graal, which is not now extant; yet from it all the authors of the French prose romances on Arthur and the Saint Graal which appeared between 1170 and 1230—Robert de Borron, his kinsman Hélie, Luc de Gast, and Map himself—profess to have~~

~~translated their compositions, The chief of these works are the Saint Graal, Merlin, the Quest of the Saint Graal, Lancelot, Tristan, and Mort Artur. In all, to " achieve the Saint Graal," that is, to find or see the holy vessel which, on account of the sins of men, had long since vanished from Britain, is represented as the height of chivalrous ambition ; but among all Arthur's knights, only Sir Galahad, the son of Lancelot, is sufficiently pure in heart to be favoured with the sublime vision. English versions, more or less literal, of these romances, among which may be named the works of Lonelich and Sir~~

~~Thomas Malory, and the alliterative poem of Joseph of~~

~~Arimathie, attest the great and enduring popularity of the Graal form of Arthurian legend.~~

~~Q. After a long period of silence, the bardic poetry of Wales broke out, just when the independence of the nation was about to be extinguished, into passionate and varied utterance. The princes who struggled successfully against the attacks of Henry II. found gifted bards—Gwalchmai, Elidir, Gwion, &c.—to celebrate in fiercely patriotic strains their imperfect triumphs. A translation of one of Gwalchmai's odes may be found, under the title of the Triumph of Owen, among Gray's poems. Supposed " Prophecies of Merlin," a sample of which may be seen in the strange work of Geoffrey of Monmouth, fed the popular belief that Arthur yet lived, and would return one day to Wales as a deliverer. Both the 7'riads and the Mabinogion refer in part to Arthur, but from different stand-points. In the Zriads such mention as there is of him represents him as a British king, doing battle with the foes of his race, and full of a sententious wit and wisdom. In the Mabinogion the indigenous Welsh view is over- powered by that of the Norman trouvéres; we have the Arthur, not of history or tradition, but of chivalry; the mysterious Saint Graal proves as attractive to the Celtic as to the Teutonic imagination. Three of the romances by Chrétien de Troyes appear in a Welsh dress among the tales of the Mabinogion. After the loss of independence under Edward I., the importance and originality of Welsh literature appear to have progressively declined.~~

3. The English-speaking portion—that is, the great mass—of the population, down to the reign of John, has left few literary traces of its existence. Whoever wished to move amongst the educated and cultured classes, and to associate with persons of rank, authority, or influence, found it necessary, though he might be descended from Alfred himself, to speak French in good society, and to write in French whatever he wished good society to read. From the Conquest to 1200, the industry of the most lynx-eyed antiquary has discovered—with the exception of the continuation of the Saxon Chronicle—no literary record in English beyond a few short fragments, such as the lines

ENGUISH' LITeRWATUERS

governors standard English should remain, as to its grammatical

[NORMAN.

preserved as a part of Canute's song by Thomas of Ely, the prophecy of Here, and the hymn of St Godric. The con- tinuation beyond the Conquest of the Saxon Chronicle was made by the monks of Peterborough. It is not complete for the reign of Stephen, passing over several years sub silentio ; but it records the accession of Henry IZ. in 1104, and then ends abruptly. The writer or writers were perhaps unable to stand up any longer against the then universal fashion of employing Latin for any serious prose work. Moreover, as the Anglo-Saxon was no longer taught in schools nor spoken in the higher circles of society, it had lost much of its original harmony and precision of structure; and "when the annalist found himself using one inflexion for another, or dropping inflexions altogether, he may well have thought it high time to exchange a tongue which seemed to be crumbling and breaking up, for one whose forms were fixed and its grammar rational. Little did the down-hearted monk anticipate the future glories which, after a crisis of transformation and fusion, would surround his rude ancestral tongue."?

A few years after the beginning of the 13th cen- Laya- tury we have to note the appearance of an important ™2.

~~and interesting work in English,—Layamon's Brut. But it can scarcely be said to belong to English literature, unless Beowulf and Judith be similarly classified, for the langnage is almost as purely Teutonic as in these. In the older version of the Brut not more than fifty words of Latin or French origin have been found ; and of these several were in common use in England before the Con- quest. The Brut is strictly a monument of the age of transition. We need not, with some writers, call the language "semi-Saxon ;" it is certainly English, and, from a particular point of view, purer English than we speak now; but it is not that form of English which, from first to last, has been the instrument employed to build up English literature. That form, as we shall see in the next~~

~~section, was determined and conditioned by the necessity~~

~~of effecting a compromise between the speech of the and that of the governed, so that the new~~

~~framework, comparatively intact, while admitting to its franchise, and enrolling among its vocables, an indefinite number of foreign recruits.~~

~~The work of Layamon isa translation, but with very con- siderable additions, of Wace's Brut d'Angleterre. The most interesting of these additions (the sources of which have not been as yet pointed out) constitute an expansion of the legendary history of Arthur. Layamon was the parish priest of Ernley-on-Severn (now Areley Regis), a re- mote Worcestershire village, far from the capital or any large city. At such a place Norman influence would be at a minimum ; the people would go on from one generation to another, living and speaking much as their fathers did before them; and we may suppose that, finding some in- dications of literary taste and poetic feeling among mem- bers of his flock, the good Layamon took this way of gratifying them. But it must be carefully observed that in the Brut, although the language is English, the poetical atmosphere, the intellectual horizon, and even the cast of diction, are Norman-French. The rich poetic vocabulary of the Anglo-Saxon poets, traceable as late as the reign of Edgar, has vanished beyond recovery. Not one of the in- numerable poetic compounds relating to battle and victory which are found in Beowulf, Andreas,~~

~~&c., occurs in the duller pages of the Brut. Words expressive of jurisdiction and government, of which the Anglo-Saxon, while- the native race was dominant, had a great variety, are in the Brut, if used at all, borrowed to a large extent from French. ee ee ee~~

~~1 Amold's Manual of English Literature.~~

~~History and Phi- losophy.~~

~~French and English,~~

~~TRANSITION. |~~

~~The labours of the clergy and monks during all this period were applied with unwearying diligence and signal success to the building up of a Latin literature. In the list of chroniclers occur the well-known names of Florence of Worcester, William of Malmesbury, and Henry of Huntingdon. Many histories of particular monasteries were written, and have recently to a large extent been made accessible, through the labours of editors employed under the superintendence of the Master of the Rolls. St Anselm, archbishop of Canterbury in the reigns of William II. and Henry I., employed his great metaphysical and dialectical powers in the endeavour to establish a harmony between reason and faith. The scholastic philosophy, technically speaking, began with Peter Lombard and his Book of Sentences (1151) ; from the university of Paris it spread all over Europe; and in the next period it will be seen that several of the most eminent schoolmen were natives of the British Isles. The works of our countrynian, John of Salisbury, who studied and resided much at Paris about the middle of the century, throw a curious light on the tenets and mutual relations of the scholastic sects,~~

~~III. Amalgamation of Races. —Commencements of English Lnterature, 1215-1350.—The course of events in this period, as bearing upon literature, may be thus described. The fortunate loss of Normandy in 1204 brought the ruling classes and the commonalty of England closer together, put an end to the transmarine nationality and domicile of the former, and gave a common political interest, in relation to the outside~~

~~world, to all the dwellers on English soil. Thus two out of the four nations, which we spoke of in the last section as encamped side by side on British territory, were soon in a fair way of being fused into one. The third— the Welsh—losing in 1292 its political independence, lost also with it the pretension, and almost the desire, to main- tain a separate literature. Still, however, in spite of com- mon interests, and the ever-growing multiplicity of the ties of blood between the two, Norman and Englishman continued each to speak his own language. Layamon, about 1205, and Ormin, fifteen or twenty years later, write for the English-speaking majority which understands little or no French ; from French their language is just as alien as the Flemish of the present day. The first great step towards that blending of tongues which was to crown the blending of families already commenced was taken when the English writers and translators of the 13th century (the terms are almost synonymous), began to admit freely into their writings an unlimited number of those generally intelligible French words of which the stock was, through closer intercourse between the governors and the governed, perpetually on the increase. Of this practice Robert of Gloucester and Robert Manning are conspicuous examples. In spite of this approxiination, we shall find that strenuous efforts were made, by or on behalf of the upper classes, to retain French as the common literary language, and keep English in the position of a popular dialect, useful for the common purposes of life, but not vivified by genius or polished by contact with refined lips. Of this effort Robert de Grosseteste, bishop of Lincoln, may be considered the centre. It broke down, however, against the force of circumstances. First, as fast as good French books were produced, Englishmen translated them, and the translations probably found ten readers for one Who could enjoy the originals ; secondly, the wars between England and France which broke out in 1338, and in which the English-speaking archers—the back-bone of the stout yeomanry, now, alas! no more, which then covered the land—won the chief share of glory, must have greatly tended to discredit among Englishmen of all classes the tongue of their enemies.~~

~~2G he of Lepr. Po Rs~~

rage for speaking French which had existed before the "grete deth" (the plague of 1348), was since then ""somdele chaunged." Though he naturally refers to a date still fresh in every one's memory, the change could have had nothing to do with the plague ; it was probably, as conjectured above, the effect of the French war. By the middle of the 14th century the industry of the translators had produced a great body of English composi- tions, coloured everywhere by French thought, and studded with French words; the preaching of the friars had for a hundred years been working in the same direction, 1.6. to break down the partition not only between the races but between the tongues; the war suddenly gave to English an enormous advantage over its rival in respect of popularity ; it need not therefore surprise us to find, as we shall find in the next period, a great native writer choosing English for the instrument of his thought, and founding English literature upon an imperishable basis.

In the last section we saw that Latin, the language of the clerical community, was holding its ground vigorously and successfully against the different forms of vernacular speech current in England. While these last remained in a rude and unsettled condition, it was inevitable that Latin should enjoy this superiority. But the French language was ever growing in importance ; its grammatical forms were by this time tolerably settled, and its modes of derivation fixed; it was a spoken tongue, and the Latin was not. Hence, about the date of Magna Charta (1215), French begins to appear in our public instruments, Latin having been the documentary language since the Conquest ; about 1270 it begins to supersede Latin as the language of private correspondence. Latin thenceforward was less and less used as the language of poetry, the vehicle of satire, or the voice of piety; French took its place. The theologian, the philosopher, and the annalist alone remained faithful to Latin, the third more out of habit perhaps, and because he had inherited the great works of the past, the histories of Beda, Florence, &., than because his work could not have been competently performed in French. To this period belong the important chronicle of

~~Matthew Paris, who died in 1259, that of N icholas Trivet, eS and the Polychronicon (or at any rate the earlier portion '@"*~~

~~of it) of Ranulf Higden. Great developments of the scholastic theology were made in this period, chiefly by the new orders of friars founded about its commencement, the children of St Francis and St Dominic. Two of the most celebrated of the Franciscan writers, Duns Scotus and William of Occam, were natives of the British isles; they were respectively the chiefs of the realists and nominalists, the parties representing among the school- men Platonic and Aristotelian theories. Robert Holcot, a distinguished Dominican writer and a nominalist, was carried off by the plague of 1348.~~

~~Philosophy now for the first time, in the person of Roger Roger Bacon, devotes herself systematically to the study Bacon,~~

~~of nature and its laws. This great man, the chief part of whose long life was spent in the Franciscan friary at Oxford, died in 1292. The main plan of his principal work, the Opus Majus, was—in the words of Dr Whewell—* to urge the necessity of a reform in the mode of philosophizing, to set forth the reasons why knowledge had not made a greater progress, to draw back attention to sources of knowledge which had been unwisely neglected, to discover other sources which were yet wholly unknown, and to animate men to the undertaking by a prospect of the vast advantages which it offered." But the subsidiary aids which physical science requires were wanting to him, and in that rude age could only be obtained with extreme difficulty. Mathematical instruments were terribly expen-~~

~~Trevisa says that the popular | sive; tables were scarcely to be had; books were both~~

~~VII. — se~~

~~Grosse- _ 'make French the exclusive literary language of the English~~

~~teste.~~

~~Orniin,~~

~~Robert of Glou- cester.~~

~~410~~

~~rare and costly. That he discovered so much as he did— chiefly in chemistry and optics—is a thing to wonder at. Vague reports of these discoveries circulating among the ignorant populace caused Roger Bacon to be deemed a conjuror or necromancer ; the chap-books and low comedies of the reign of Elizabeth represent him exclusively in this light.~~

~~"in the reign of Henry III. a strong effort was made to~~

~~people. It was a struggle between the tongue of the upper class and the tongue of the middle class. Robert Grosseteste, the admired and venerated bishop of a great gee, was surrounded by ecclesiastics of rank, and in constant intercourse with earls and barons. All such persons would speak French; those that were laymen would stand in great need of spiritual and moral instruction, and this could not well be conveyed to them in any language but their own; it was quite natural, therefore, that the bishop should encourage the writing of French treatises; and it is probable that he sincerely thought the English tongue not to be worth cultivating for the purposes of literature. He may be excused for holding this opinion, if the only specimens of it which he had seen on paper were such as the Ormulum, or even as Layamon's Brut, A French work, the Manuel de Péché, treating of the decalogue and the seven deadly sins, which are illustrated with many legendary stories, was formerly ascribed to Grosseteste— it is now known to have been the work of William of Waddington; yet if the statement be true, that it is a version of a little known Latin treatise, there remains a probability that the bishop, in pursuance of a general plan of action, encouraged Waddington to make his version. To the Chastel d' Amour, a work of devotion dwelling on the mode of the miraculous incarnation of the Redeemer, Grosseteste's claim seems to be better founded; if he did not write it, he certainly caused it to be~~

~~written. The same despair of making anything of English, or the same connexion with a circle of readers in the upper: ranks of society, led Peter Langtoft, a canon of Bridlington, in spite of his unmistakably English name, to write in French a rhyming chronicle of English history, which he brings down to 1307, Other cases might be mentioned; in fact, as Warton says, 'fanonymous French pieces both in prose and verse, and written about this time, are innumerable in our manuscript repositories." There were French originals of Guy of Warwick, Hevis of Hamtoun, and many other romances, although few of them are now extant.~~

~~But if the attack was vigorous, the defence was sturdy and persistent, with a tenacity which spoke of final victory. Ormin's rhythmic gospels (supposed to have been written about 1225), though the orthography proceeds upon a theory, and is so far interesting, presents, it must be admitted—owing to the strangeness of the spelling, the want of rhyme, and the paucity of words of Latin origin— a barbarous, almost repulsive, aspect to the reader. The war of the barons in Henry III.'s reign, in which the cause of Leicester and other French-speaking aristocrats was taken up by the mass of the people with unmeasured enthusiasm, certainly had the effect of introducing a number of French words into the popular speech. This may be gathered froin the remarkable English ballad on the battle of Lewes (1264), written by a partisan of Leicester, the phraseology of which is marked by almost the same proportion of words of French origin as prevails in modern English. Moreover, the movement of the verse is vigorous and free, and such as befits a language that is fast rising into importance, and has a great destiny before it In the reign of Edward I. appeared the English rhyming chronicle of Robert of Gloucester. The early portion of it is founded on Wace's Brut, but the author continues the history down to 1272,~~

~~the date of Edward's accession. Robert is a plodding dull writer, but his work proves that he knew of a considerable class of persons wlio knew~~

~~no French, yet were capable of deriving pleasure from literature; it is for this class that his somewhat ponderous poem was intended. The pretty poem describing a contest between an owl and a nightingale (date about 1270) is in the dialect of the south of England. It is no translation, but seems to have been suggested by passages in the Roman de la ose. Many English romances, ¢.g., Havelok, King Horn, King Alexander, Richard I., Guy of Warwick, &c., date from the reign of Edward I, or, say, from the last twenty years of the 13th century. Most of these are translations from~~

~~the French; in the case of Havelok, however, this remains Havelok,~~

~~to be proved, no French version (other than the sketch, much earlier in date, given in Gairnar's Hstorie) being now extant. There isa French version of King Lorn, but it differs greatly from the English romance, and there is good reason for believing that the English poem is thie earlier of the two. Both Havelok and King Horn are founded on Anglo-Danish traditions current in the east of England ; on this account, and in consideration of the long intellectual blight which the Danish inroads produced in those parts of the country, they are extremely interesting and valuable. They abound in French words, and on reading them we feel that a language which has become so fluent, flexible, and accommodating cannot but make its way and attain to pre- dominance,~~

~~Perhaps the works of no single writer contributed so~~

~~much to this result as those of Robert Manning, or, as he Manning.~~

~~is also called, Robert of Brunne. Robert was a monk of the order founded by St Gilbert of Sempringham ; his monastery was in South Lincolnshire, He belongs to the reigns of Edward II, and Edward ITI, ; the date of his death is unknown; but it was probably about 1340. He executed a new version of Wace's Brut in octosyllabic rhyming verse, and added to it a translation of the French rhyming chronicle of Peter Langtoft, mentioned in a previous paragraph. He also translated Waddington's Manuel des Péchés, adding many characteristic and lively passages which make his version much more entertaining than the original work, Ta all these labours the good monk was impelled, not~~

~~by the love of fame, which would have been more easily gratified if he had written in French, but by the benevolent desire to give his lay friends and acquaintances something pleasant to read and talk about, — ** For to haf solace and gamen, Jn felauschip when tha sit samen [together],"~~

~~We have found that by degrees men of better, or at least equal, mark have taken to writing in English, as compared with those who preferred French ; for instance, Robert Manning is at least equal as a versifier to Peter Langtoft. In the next section will be described the rise of Chaucer, Langland, and Gower, and the final victory of the native speech.~~

~~IV. Early English Interature, 1350-1477.—The period at which we have arrived comprises about 120 years, end- ing at the date of the introduction of printing into England. During all this time the scholastic philosophy reigned undisturbed at the universities. methods of argument and reliance on logic were concerned, was as much a schoolman as the friars who contended with him. The time was not yet come when a churchman would be found, like Colet, to decry the scholastic methods, and rely on literature rather than on logic. Wickliffe's first attacks upon the established order were directed, not against doctrine, but against the encroachments of the church upon the state, against the holding of temporal "lordship" or authority by ecclesiastical persons, and~~

~~Wickliffe, so far as his Wick-~~

~~1350-1477.]~~

~~against the claim asserted by the Pope to receive " Peter's pence," or an equivalent, from the English nation. These views he was said to have borrowed from Marsilius of Padua and John of Gaudun; but in truth such Ghibeline sentiments were so common in France and Germany, as well as Italy, that it is needless, in Wickliffe's case, to attempt to trace them to particular authors. Afterwards he broached some singular opinions on several abstruse points of metaphysics, which led to " determinations " or treatises being published against him by John Kyningham, a Carmelite, and John Tyssington, a Franciscan. Lastly, he~~

~~aroused a theological storm, about 1380, by reviving some- thing like the condemned heresy of Berengarius on the mode of the presence of Christ in the sacrament. Replies were written by Wynterton, Wells, Berton, and others; A synod met in London and condemned Wickliffe's doctrine ; he died at Lutterworth soon afterwards. The whole com- plex controversy which he had stirred up was taken in hand, some years later, by a man of vast ability and~~

~~and successful writings of Manning, asserts itself in this period as a growth of time, destined to have thenceforward an independent being and a powerful influence. It is interesting to note that two distinct and rival ten- dencies now make their appearance, which may be de- scribed as the Teutonic affinity and the Franco-Latin affinity. The sturdiness and self-reliance of the old Saxon blood led many Englishmen to undervalue the culture of the day, which came from the South, and to look lovingly towards the old Teutonic rock from which they were hewn, in the faith that true light and deliverance were to be found there. Of this tendency Langland is the chief representative in the 14th century. He employs the old rhythm of the Teutonic nations,— alliteration ; he rejects French models, and studies not French poets; the homely kindly life of the English lower and lower-middle classes is what he loves to depict ; the covetousness and ambition of the foreign ecclesiastics who absorb English prelacies he is never tired of denouncing. The whole~~

~~learning, Thomas Walden the Carmelite, one of the English theologians who took part in the council of Constance.~~

~~body of alliterating poets,—and recent investigation has Allitera-~~

~~shown that their number was considerable even down to a poets.~~

~~Pecock.~~

~~Walden's Doctrinale Fidei has been more than once printed on the Continent.~~

~~All the writings hitherto described were in Latin, But Wickliffe, on the principle '" Flectere si nequeo superos, Acheronta movebo," resolved to carry the conflict into a more spacious arena, and to appeal to popular sympathy by writing in the language of the people. He preached and circulated many English sermons ; he organized his "pore priestes" as a body of itinerant preachers; assisted by his followers he put into circulation an incredible number of English tracts, directed against abuses in discipline, and what he deemed errors in doctrine. Lastly, he caused to be made a complete English translation of the Vulgate Bible, and himself, in all probability, took a con- siderable share in the work. His efforts, seconded by those of his principal adherents, such as Herford, Repington, Purvey, &c., gave rise to the sect of the Lollards, which must have rapidly grown into importance, since it received marked notice in the poetry (written probably between 1380 and 1390), of both Chaucer and Gower. The famous Act " De heretico comburendo" of 1401, and the rigid inquisitorial measures instituted by Archbishop Arundel, and carried on by Chichely, drove Lollardism beneath the surface of society and from the pages of avowed literature. Yet, though repressed, the spirit of discontent survived. Many Lollards were burnt so late as in the first year of Henry VIII. ; and the rain of pamphlets and ballads against the church and the clergy, which burst forth as soon as the king was ascertained to be hostile to them, was a sufficient indication of the pent-up hatred which filled the breasts of thousands.~~

~~The career of Pecock, bishop of Chichester, may be regarded as an incident of Lollardism. Feeling sore and uneasy under the attacks which men, many of whom were undeniably earnest and moral, were making on the clergy and their doings, Pecock wrote in English The Repres- sor of over-much wytinge [blaming] of the Clergie. He thought that the time for appealing to authority was gone by, and that the Lollards could only be reconciled to the church by proving that her~~

~~precepts and her ritual were in themselves reasonable. In short, he made the reason of the individual the judge of the goodness, or otherwise, of what the church did and commanded. On this ground his brother bishops could not follow him; his books were condemned at a synod held in 1457, and he was deposed from his bishopric.~~

~~English literature in the full and proper sense, of which we saw the beginnings in the cumbrous alex- andrines of Robert of Gloucester, and the more pleasing~~

~~the 16th century, the last known alliterative piece i by Dunbar,— represent, with Langland, this Teutonic affinity. Chaucer, Gower, Lydgate, and the writers who formed themselves upon them, represent the Franco-Latin affinity. Endowed with a more receptive temper and finer perceptions than the men of the opposite schcol, Chaucer opened his large heart and capacious intelligence to all forms of excellence within his reach ; anda man so minded could not fail to see that what had been written in French and Italian far outweighed what had hitherto been written in English or German. Neither could his more cultivated ear fail to prefer the rhyme of the South to the alliteration of the North. 'I am a Southron man," he says under the mask of the Persone— '**T cannot geste, rom, ram, ruf, by my letter ;"~~

~~that is, I cannot write alliterative poems like Langland. Wherever good words were to be had, Chaucer appropriated them, whether their origin were Saxon or Romance; wher- ever he found a good poem, he imitated it, often bettering the instruction. This veracity of the intellect, this large- mindedness, were the cause that our early literature was laid on broad foundations, and contributed not a little to the many-sided and sympathetic character of our language.~~

~~The labours of Tyrwhitt and Warton, and in our own day of Sandras and Ten-Brink, have laid bare the sources~~

~~whence the genius of Chaucer drew its materials and Chaucer,~~

~~derived its kindling suggestions. The old notion that his earliest writings show the influence of the Provengal poetry has been~~

~~abandoned on more accurate inquiry. The Complaynt of the Dethe of Pite, which is among the earliest, if not the earliest, of the extant compositions, is saturated with the French spirit. The great work of his early youth was the translation of the Homan de la Rose of Lorris and Meung,—a poem, be it remembered, not the growth of Normandy, but of France proper, not the work of trouvéres, but of French poets. This transformation and sublimation of the romance of the earlier into the dream and allegory of the later Middle Ages, originated by the genius of Lorris, was eagerly adopted by Chaucer, most of whose pieces, prior to the great work of his life, the Canterbury Tales, were cast in the allegorical mould. This is the case with the Assembly of Foules, where the gentle "formel eagle" is believed to represent Isabel, daughter of Edward III., betrothed in 1364 to Engelram de Couci, as the formel is in the poem to the "royal tercel." Again the Boke of the Duchesse, on the death of Blanche, duchess of Lancaster, in 1369, is, in form, a vision seen in a dream ; it is also full of actual borrowings from the French poets Lorris, Meung,and Machault. The~~

~~mannerism of the French poets is also present in the Court of Love and the Mouse of Fame, compositions which probably belong to Chaucer's middle life. Even in the Leyende of Goode Women, a work of his later years, many passages, particularly the beautiful lines rehearsing his annual worship of the daisy, are significant of the degree in which his mind was still imbued with the grace- ful and fanciful conceptions of the French poets.~~

~~But the sunny south produced in that age other poets beside the French, poets the force and melody of whose writings caused the glory of Lorris and Machault to wax pale incomparison. Chaucer must have become acquainted with Boccaccio at an early age, for in the Assembly of Foules, written when he was only twenty-four or twenty-five, several stanzas are translated from the description, in the T'heseide of the~~

~~Italian poet, of the garden of Queen Nature. With Petrarch he is believed on reasonable grounds to have become acquainted during his visit to Italy in 1373; the charming allusion to the "laureat poete," in the prologue to the " Clerke's Tale," is familiar to every reader. Dante, whom he calls "the grete poete of Itaille," supplied him with a vision in the "House of Fame," and with the materials of one of the tragedies in the " Monke's Tale," the story of Count Ugolino. But it was to Boccaccio that his obligations were the largest; from his /%lostrato he translated, though with many additions and alterations, his Troylus and Cryseyde, the ' Knighte's Tale" isin the main a translation of the Z"heseide, and two or three other Canter- bury Tales are more or less close renderings of stories in the Decameron. Italian was then ina far more advanced stage, one better suited for literary purposes, than English ; and it must be set down as undoubtedly due to his Italian studies that in Chaucer's hands our language,—which seventy years before had appeared as a barbarous dialect in the mouth of Robert of Gloucester, and, even as used by Langland, Chaucer's contemporary, is harsh and crabbed,— was proved to be rich in sweetness and harmony, no less than in force.~~

~~After all, had Chaucer done no more than has been already indicated, though he would have deserved credit for polishing and regularizing the language, and would have left models of style for later ages to imitate, he would not have earned the praise of a great and immortal poet. In this category, however, he is definitively placed, in virtue of the original portions of the Canterbury Tales. Not only is the Prologue the work of a great literary artist, drawing from nature with an incomparable force, sureness, and freedom of hand, but the whole series of linking passages, besides many of the tales, which, though the materials are old, are trausfigured by the treatment they receive, attest the presence of a masterly intellect and an unfailing imagination. He "saw life thoroughly and saw it whole ;" his somewhat keen and caustic temper opened his eyes to the tricks of hypocrites and pretenders, which his manly straightforwardness made him expose without ceremony; on the other hand, the noble and really superior cast of his character placed him in full sympathy with those who in heroic self-denial were following under his eyes the counsels of perfection. Over~~

~~against the portraits of Monk, Friar, and Pardoner in the Prologue, may be set the legend of Sainte Cecile, the "Man of Lawe's Tale," and the exquisite opening stanzas of the " Prioress's Tale." In that peculiar combination of great force of handling with grace and versatility, on which the availability and effect of poetic genius so largely depend, Chaucer may be placed in a trio with Shakespeare and Pope, and no fourth name in English literature can, from this point of view, he raised to their level.~~

~~Coming to speak of Gower after Chaucer, we descend, as we now clearly see, through an enormous interval ; but~~

~~this distance was not so apparent to their contemporaries and immediate successors. 'Ancient Gower" was a favourite with Richard IJ., and was also prudent enough to pay his court betimes to the young Duke of Lancaster, soon to be Henry IV. His Confessio Amantis is coloured by all the profanity and much of the cynicism which belong to Jean de Meung's portion of the J'oman de la Rose. It may be observed, in passing, that the Homan was the product of a kind of minor renaissance, or revival of ancient learning. The Somnium Scipionrs of Macrobius gave the dream-form, and Ovid's Ars Amandi supplied an abundant store of amatory details. From this last, and from others of his poems, the counsels and warnings to lovers, with which the Roman, the Confessio Amantis, and many another popular poem of that day was stocked, were, partly by suggestion, partly by direct translation, derived. That the Avs Amandi should come to spread so wide an influence was a fact of no good omen to the morals of Europe. Refinement, even when little more than external, seems to exercise an invincible attraction on the human mind. The wit and suppleness of the Greek iutellect, the polished luxury of the Roman empire, dazzled more and more the semi-cultivated society of Europe, and created a paganizing fashion, of which the moral results were often deplorable. Numbers even of ecclesiastics were carried away ; bishops prided themselves on their elegant symposia; abbots, "purple as their wines,"~~

~~thumbed Anacreon instead of their breviaries; and in spite of Savonarola and other reformers from within, no effectual check appeared for these evils till it was supplied by the rude blasts of the Reformation.~~

~~Dan Lydgate, the monk of Bury, was a loyal admirer and Lydgate.~~

~~follower of Chaucer ; and if the practice of poetry could make a perfect poet, he should stand, in virtue of his innumerable compositions, among those of the highest rank. But the language,—already rich and various, but unsettled in form and deficient in precedents,—escaped out of his control ; to bend and tame it effectually while in such a condition required the strength of an intellectual giant, such as Chaucer was, but Lydgate certainly was not. We know that Chaucer took the greatest pains with his metre— "" So praye I to God, that none miswrite thee, Ne thee mysmetre for defaut of tonge :"~~

~~but Lydgate, though, to recommend his mediocre thoughts, he should have taken much greater pains, took in fact much less. Perhaps some crude theory of poetic inspira- tion misled him, as it misleads poets of our own day, whose roughness and obscurity yield as unsatisfactory results as Lydgate's roughness and mediocrity. The materials for his more important productions were chiefly French and Latin works of his own day, or not much earlier in date. Thus his Falls of Princes is from a French metrical version of Boccaccio's Latin prose work, De Casibus Illustrium Virorum, and his Troy-book is founded on the Historia Trojana of Guido di Colonna, a Sicilian jurist of the 13th century. Lydgate's admiration for Chaucer was undoubtedly sincere, and he probably attempted to imitate the best points of Chaucer's style. If yet to a great extent he failed, this was perhaps due, not merely to the carelessness to which we have before adverted, but also to the influence of the barbarous writers of alliterative verse, whose activity at this period we described in the early part of this section. Alliterative rhythm is accentual, heroic rhythm is syllabic. An alliterative verse may have a varying number of syllables, but must have four accents ; an heroic verse may have a varying number of accents, but must contain ten, or at most eleven, syllables. Of course the variation in~~

either case is confined within certain limits, and the rules themselves are not without exceptions ;

Inven- tion of printing.

Caxton,

1350—1477.]

but into these details we have not space to enter. Suffice it to say, that the reason why there is so much halting metre in Lydgate, Hawes, Barclay, Harding, Juliana Berners, and ether versifiers of the 15th and 16th centuries, would seem to be that, unlike Chaucer, they indulged in much of the syllabic licence of the alliterators, while yet they were not goths enough to adopt their rhythm alto- gether. Between the Teutonic and Franco-Latin stools, so to speak, they fell to the ground.

A recent writer, to whose labours the history of English literature is much indebted,! desiring to mark pictur- esquely the appearance of an art which he thought was destined to give the death-blow to medizeval superstition, has said that "in the year of the condemnation of Reginald Pecock for declaring that all truth would bear the test of reason and inquiry, John Fust or Faust and Peter Schoeffer printed a magnificent edition of the Psalter." This shows how easily au attractive antithesis may become a trap for the unwary. The statement inade in the protasis of the above sentence is untrue, and that in the apodosis irrelevant. Pecock was not coudemned for " declaring that all truth would bear the test of reason and inquiry " (which of course his opponents believed as well as he), but for maintaining, along with other novel opinions, that reason was a better guide than authority as to the matter of revealed religion. Doubtless many would agree with him, but this is a very different proposition from the other. Nor again was the appearance of Fust's Psalter au epoch in the history of printing, as the coincidence of dates, to be worth noticing, would require, for it was both pre- ceded and followed by the production of more important works.

~~Yet it would not be easy to overrate the effect produced by the invention of printing on the development of litera- ture, and the diffusion of those complex influences and arrangements which we call civilization. Language and its devices, as Horne Tooke showed in his Diversions of Purley, exist but to promote the rapid interchange of ideas between man and man ; and the device of printing is a further long step in the same march, and a part of the same endeavour. By means of it, books reached in five years countries which before they had not reached in twenty, and readers were multiplied a hundred fold. Through it the speculations of scholars and the theories of philosophers could be quickly brought before the whole body of learned men and philosophers in Europe ; hence arose counter-speculations and adverse theories, which again obtained publicity with the same rapidity as the first, and to this process there was no limit. Poetry, as being one of the more spontaneous growths of the hnman mind,— the child of passion and imagination, not of controversy,— owed comparatively little to the new invention. The literary annals of Spain furnish us with the names of more than a hundred poets who adorned the long reign of John II. of Castile, ere printing came into being; while for a century after the discovery, the poetic art was in a feeble and inert condition, both in Spain and England. On the other hand, historical studies of all kinds, since they flourish in proportion to the facilities given of collect- ing facts and materials,—and printing greatly enhanced these facilities,— received a sudden and highly beneficial impulse.~~

~~The first book certainly known to have been printed in England is the Dictes and Sayings of the Philosophers, a translation from the French; this was printed by Caxton in 1477, within the precints of the abbey of Westminster. The monks of St Alban's soon set up a printing-press in their great monastery ; and Oxford and Cambridge quickly~~

~~1 Prof. H. Morley.~~

followed suit. For fifteen years more Caxton laboured diligently in his vocation, and at his death in 1492 left the art of printing firmly established in England. An examin- ation of the list of works which he printed shows what branches of literature were most in esteem in the English society of his day. Professor Craik enumerates forty-five works, which comprise all Caxton's more important typo- graphical performances. Of these, thirteen are religious and devotional, twelve are works of romance and chivalry or other prose fiction, seven are historical or legal works, five are English versions of classical authors, five hand- books or didactic works, and three editions of English poets. To the first class belong the Golden Legend (a translation of the collection of lives of saints under that name compiled by Jacobus de Voragine), a Liber Festivalis, or guide to church festivals, a Life of Saint Wynefrid, and several pious books translated from the French. Under the second head fall Malory's English version of the great French prose romances of Arthur, the Ryal Book, a " Troy- book" translated from the French of Raoul Le Fevre, the Book of Feats of Arms, and the Historye of Reynard the Foxe, translated from the Flemish. To the historical section belong Trevisa's version of Higden's Polychronicon, the Chronicles of England by Fabyan, and the statutes passed in the first year of Richard III. Among the classics offered to the English public were versions of the A'neid and of Cicero De Senectute and De Amicitia, translated from French versions, and Chaucer's rendering of Boethius's De Consolatione Philosophie, The handbooks contain the Moral Proverbs of Christine de Pisan, a Boke of Good Manners, a Boke for Travellers, &c. The English poets, editions of parts of whose works were printed by Caxton, were, as was to be expected, Chaucer, Gower, and Lydgate.

_In the period ending with 1350, we saw that the plant of English literature, though putting out some vigorous offshoots, in the poems of Nicolas of Guildford and Robert Manning, was still struggling with great linguistic diffi- culties, so that it remained uncertain whether, like Flemish literature in Belgium, it would not have to content itself with appealing to the humbler classes of the people, and leave to France the office of ministering to the intellectual and imaginative wants of all cultivated persons. In 1470 this doubt remained no more; the question

had been finally settled in favour of native genius. England had now a literature in her own speech of which she might be proud,—authors whose manner and phraseology supplied models to allied but less advanced nationalities, of Scotland, who was killed in 1436, speaks in the King's Quhair of the trio of English poets in terms of reverence comparable to those which Chaucer himself, in Z'roylus and Cryseyde, had used of the great poets of antiquity. But this success had only been gained by the wise exercise of that talent for compromise which we English, even to this day, are said to possess almost toa fault. English literature was to employ a language which in its structure and grammar indeed was Teutonic, but was to admit without scruple into its vocabulary thousands of French words which the upper classes, the descendants of the Norman invaders, were in the habit of using. It seemed as if both language and people were destined to hold a position midway between the European nations of Teutonic and those of Latin origin, to be interpreters between the one and the other, and thus to facilitate, for the numerous communities which in due time the English race was to plant over the world, the comprehension of the thoughts and the appreciation of the ideals of both.

V. Period of the Renaissance and the Reformation, 1477-1579.—The decline of the scholastic philosophy in England in the 15th century, as indeed in every other

James I, James I.

Revival of Greek study.

country of Europe, was noticed in the last section. A new interest seized upon all the more lively intelligences, —that of recovering what, having passed into oblivion, might still be recoverable of the works of the ancients, as well as of appropriating thoroughly what was already known. In Latin literature the chief works had long been known; Virgil, Ovid, and even many of the works of Cicero, had for ages been the delight of scholars and the food of poets. But even in respect of these, the greater publicity which the multiplication of copies by the

priuting- press gave to them led to innumerable questions being stirred, which till then had lain comparatively dormant. The problems of textual, philological, and literary criticism, which the careful study of an author suggested to an acute mind, were taken up with eagerness by a large and ever-increasing circle of students. But it was Greek learn- ing, because of the comparative newness of the field, and the inconceivable value of the treasures which it hid, that awakened the most intense and passionate interest. The story of the revival of Greek studies in Italy, towards the end of the 14th century, is as exciting to a sensitive intellect asanyromance. Graduallythecontagionof the learned frenzy which created a hundred academies and literary societies in the Italian cities spread itself across the Alps. England was but a very little, if at all, behind France. The steps by which a change of so much importance to literature was effected seem to be worth tracing with some minute- ness. Without lingering over the names of Gray, Phrea, and Vitelli, by each of whom something was done towards promoting Greek study at Oxford, we will begin with Linacre's master, William Selling. An Oxonian, and a monk of Christ Church, Canterbury, Selling conceived a fervent desire to partake of the intellectual banquet pro- vided in the schools of Florence, where the great Lorenzo was then ruling the republic ; and about the year in which Sir Thomas More was born (1480) he travelled into Italy,

and attended for some time the lectures of that prodigy of .

learning and talent, Angelo Politiano. While in Italy he learnt to read and speak Greek, and collected a number of Greek MSS.; but unluckily, soon after his return with these to England, they were destroyed by an accidental fire. Thomas Linacre, a Derbyshire boy, had Selling for his master at the Canterbury school; his capacity and zeal for study were great, and when Selling was sent on a mission into Italy by Henry VII. in 1486 or 1487, he took Linacre with him, and left him studying Greek under Politiano at Bologna. In these studies William Grocyn, an older man than Linacre, is mentioned by contem- poraries as his "sodalis." Having been for many years a fellow of New College, he visited Italy between 1480 and 1490, and studied chiefly at Florence, under Demetrius Chalcondyles and Politiano. " Grocyn," says George

~~Lilye, “‘was the first who publicly lectured on Greek literature at the university of Oxford, to crowded audiences of young men.” Grocyn was a somewhat hard, dry man; an Aristo- telian, not a Platonist. Plato he regarded as a man who multiplied words, but in Aristotle he saw the founder of real science. His lectures seem to have been delivered between 1491 and 1500. Grocyn left no works behind him ; but Linacre, who probably began to lecture in Greek when Grocyn ceased to do so, was a voluminous author and editor. To him we owe editions of the principal works of some of the Greek medical writers, and a Latin grammar, which was superseded in a few years by the more symmetrical Breviarium of William Lilye, commonly called Lilly’s Grammar. An anecdote related of Linacre illustrates the enthusiasm for letters, mingled with a dash of pedantic absurdity, which characterized the age. When about to leave Italy and return to his native country, he erected at Padua an altar, which he dedicated to the genius~~

~~of Italy ; le crowned it with flowers, and burned incense upon it. at Oxford, in about the years 1496 and 1497. His Pro- gymnasmata and Epigrams (the latter written conjointly with William Lilye) are the work of a man deeply imbued and inflamed with the classical spirit. The celebrated~~

~~Dean Colet, whose eminent services to literature and Coles,~~

~~education have been of late years examined and recorded by Seebohm, Lupton, and others, studied Greek in Italy a few years later than Grocyn and Linacre. He lectured at Oxford after 1497 on the epistles of St Paul (in Greek), and at St Paul’s, London, of which he was dean, on the Hierarchies of Dionysius. The letters of Erasmus present in the clearest light the “ perfervidum ingenium ” of this remarkable man, who, as tle founder of St Paul’s school, may be said still to live and work among us. This school he opened in 1510, appointing William Lilye its first head- master. lLilye himself was no common man. In~~

~~**youth he had travelled to the Holy Land, and on his return took up his abode at Rhodes, and made himself master of the Greek language. Polydore Vergil even says that Lilye was the first Englishman who ever taught publicly " per- fectas literas," by which he appears to mean the Greek authors, but this is certainly a mistake. For the scholars of St Paul's school, Richard Pace, another Oxford man, wrote, at Colet's request, a pleasant discursive treatise called De Lructu qui ex Doctrina pereipitur (1518), in which are introduced some interesting details respecting the learned men of that day. William Latimer, a priest and an Oxford man, is continually mentioned in the letters of Erasmus and his contemporaries as a scholar of vast erudition and especially conversant with Greek. But he was diffident, and perhaps indolent, and declined the task of teaching Fisher Greek, which Erasmus urged him to undertake.**~~

~~**It is a lamentable fact that after this brilliant opening of the study of the humanities at Oxford, the dawn was overcast, and a dismal reaction set in. Erasmus tells us that, about 1518, a body of brutal obscurantists appeared in the university, who, calling themselves Trojans, attempted by ridicule and petty persecution to discourage the study of Greek. It was on this occasion that More wrote his Epistle to the University (1519), complaining that the party of the barbarians was not put down. The king was induced to interfere, and the nuisance was after a while suppressed. At Cambridge, though the study of Greek appears to have been introduced later than at Oxford, it was carried on without check or discouragement, and was supported by endowments at an earlier period than at the sister univer- sity. The excellent Fisher, bishop of Rochester, who was chancellor of the university of Cambridge from 1501 to 1517, and in that time founded, or helped to found, the colleges of Christ's and St John's, promoted Greek learning with all his energy. He invited Erasmus down to Cambridge in 1511, and procured for him, first, the Lady Margaret professorship of divinity, and afterwards the chair of Greek. He was succeeded by a scholar of some celebrity, Richard Croke, who, after being educated for twelve years at foreign universities, at the expense of Archbishop Warham, returned a most accomplished Grecian, and settled at Cambridge. The archbishop just named, the last before the change of religion, was a prelate of great**~~

~~enlightenment and unfailing generosity. Erasmus, who received from him an annual pension and frequent gifts, is never weary of extolling to his correspondents the "sanctissimi mores," the love of letters, integrity, and piety of the English primate. Towards the middle of the century Sir John Cheke, as Milton says, "taught Cam- bridge and King Edward Greek ;" his friend Sir Thomas Smith was also a great promoter of Jearning.~~

~~From the suppression of the monasteriss in 1536 to~~

~~More, born in 1480, learnt Greek under Linacre Mure.~~

~~1477-1579. |~~

~~the end of his reign, the violence and brutality of Henry VIIL. exercised a baneful effect on the progress of learning. Instead of conferring together about the Greek particles, Oxford men were obliged to consider what they should think and say about the king's divorce. The fate of More, the finest scholar at Oxford, and a writer of European reputation, of whom Charles V. said to the English ambas- sador, 'We would rather have lost the best city of our dominions than such a worthy councillor," dispirited and alarmed all English men of letters. In such dangerous times wariness, quietness, unobtrusiveness, must have seemed to be the one way of safety. When the tyrant~~

~~died, men breathed indeed more freely; but the rapacity |~~

~~and indifference to letters of Protector Somerset's govern- ment must have filled all university men with the feeling that the tenure of their endowments was anything but secure, and such a state of mind is not good for the pur-~~

~~Reign of suits of learning. Under Mary there was some revival~~

~~Mary.~~

~~of literary activity ; a collection was made und published of the English works of Sir Thomas More; and new editions of Gower and Lydgate~~

~~were printed. Warton truly observes, that "'when we turn our eyes from [this reign's| political evils to the objects which its literary history presents, a fair and flourishing scene appears." On the other hand, the compulsory revival of the scholastic philosophy at the universities, which involyed, as we are told, the depreciation of the new learning, was an un- pleasant feature of the times, There is a well-known passage in Ascham's Schoolmaster, where, speaking of Cambridge in Mary's time, he says, that " the love of good learning began suddenly to wax cold, the knowledge of the tongues was manifestly contemned; the truth being," he goes on to say, "that plans were laid by the university authorities to bring back the works of Duns Scotus, and all the rabble of barbarous questionists," into the academi- cal course, in the place of Aristotle, Plato, Cicero, and Demosthenes. To throw contempt on the schoolmen,— though it was not confined to the Protestants, for More, Jrasmus, Colet, Pace, and many other Catholics had expressed more or less of a similar aversion,—yet was characteristic of them, for their theologians without excep- tion rejected the Schola. Therefore Gardiner and Bonner appear to have resolved to force scholasticism on the young men of their day, simply because they did not like it.~~

~~Yet at Oxford things cannot have been so bad, for it was in this reign that Trinity College was founded by Sir Thomas Pope, a zealous Catholic, "in the constitution of which the founder principally inculcates the use and necessity of classical literature, and recommends it as the most important and leading object in that system of academical study, which he prescribes to the youth of the new society. For, besides a lecturer in philosophy ap- pointed for the ordinary purpose of teaching the scholastic sciences, he establishes in this seminary a teacher cf humanity."1 The accession of Elizabeth brought another change. The schoolmen were again ejected, and with contumely, from English seats of learning. By a singular irony of fate, the name of the owner of one of the brightest and most penetrating intellects ever given to man, Duns Scotus, came to be used, in England, as a synonym for a blockhead. Polite literature was now so exclusively culti- vated that it destroyed philosophy. The old systems were discredited, but no new system was adopted in their place. Nor has philosophical speculation ever recovered in England that high place in~~

~~the hierarchy of the sciences which is itsdue. In the first twenty years of the reign of Elizabeth, though exact scholarship did not flourish much, there was @ great and very beneficial activity in the work of making~~

~~1 Warton.~~

~~translations from the classics.~~

~~authors of the chief of these. Fairfax and Harrington translated the master-pieces of Tasso and Ariosto. But for the ample store of fresh materials thus supplied, the genius of Shakespeare, who had not a university education, must have displayed itself under comparatively restricted forms.~~

~~Little need be said of those inferior descriptions of Hawes.~~

~~poetry which this period produced. Stephen Hawes, in his Pastime of Pleasure, endeavoured, but with very imperfect success, to effect that blending of allegory with romance which was to be the brilliant achievement of Spenser. The mind of Alexander Barclay seems to have been swayed by that Teutonic affinity of which we spoke in a former section ; he turned to Sebastian Brandt rather than to Petrarch, and preferred the grotesque humour of the Narrenschife to the sonnets on Laura. In Skelton, almost the only poet of the first twenty years of Henry VIIL's reign, the coarser fibres of the English nature are offensively prominent. His fondness for alliteration, and indifference to the syllabic regularity of his verse, show that he too belonged to the Teutonizing party among the English writers, and that he may be affiliated to Lang- land and the other alliterators of an earlierage. He occa- sionally wrote some pretty little lyrics,—witness the musical lines Z'o Afaistress Margary Wentworth,—but buf- foonery and a coarse kind of satire were what his nature prompted him to, and in these he excelled. His attacks on Wolsey's pride, luxury, and sensuality are well known, nor can it be said that they were not deserved; still, as~~

~~proceeding from an incontinent priest, they remind us unpleasantly of "Satan reproving sin." The macaronic verse in which this poet delighted, a farrago of Latin words, classical and barbarous, French words, cant expres- sions, and English terms clipped or lengthened at pleasure, was called by our ancestors, for many years after his death, ""Skeltonical;" but Walton has shown that he did not invent it, but that it was in common use in his time both in Italy and in France. The end of the reign of Henry~~

~~VIIL was illustrated by the poetry of Surrey and Wyatt. Surrey~~

~~These two writers, having resided long in Italy, and learnt, like Chaucer, justly to appreciate the greatness of Italian literature, which none of their countrymen since Chaucer seemed able to do, " greatly polished," as Puttenham says, "our rude and homely manner of vulgar poesie from that it had been before, and for that cause may justly be sayd the first reformers of our English metre and style." To Chaucer's heroic verse Surrey restored the syllabic regu- larity which it had Jost in inferior hands, and stripping it of rhyme, he for the first time produced English blank verse. Into this rhythm he translated part of the nevd. He shares with Wyatt the credit of having naturalized the sonnet in English literature.~~

~~In Scotland there arose in this period several poets of considerable mark, all of whom, in respect of their turn of thought and the best features of their style, may be pro- perly affiliated to Chaucer. Henryson wrote in "rhyme royal "~—Chaucer's favourite metre—the Testament of Faire Creseyde, a sort of supplement to Chaucer's Z'roylus and Cryseyde. In the poetical remains of Gawain Douglas, bishop of Dunkeld, there is much melody and sweetness.~~

~~In the poems of Dunbar the influence of Chaucer is Dunbar,~~

~~especially noticeable. Zhe T'histle and the Kose and the Golden Terge are poems of the same class as the Assembly of Foules and the Court of Love; the allegoric form, and the machinery of dream and vision, are employed in both.~~

~~Sir David Lyndsay began by being a great admirer and Lyndsay.~~

~~imitator of Chaucer, but the Teutonic affinities of his mind waxed ever stronger, and he ended by gaining great~~

~~The names of Golding, Trans. North, Phaier, Marlowe, and Stanihurst indicate the !ators,~~

~~Miracle plays.~~

~~Moral plays.~~

~~416~~

~~temporary fame as the author of coarse and ribald satires, directed against the abuses of his day, especially those which deformed the church.- His latest work, a Dvalog concerning the Monarché, appeared in 1553.~~

~~In the article Drama it was described how tlie modern drama grew up under the shadow of the church, and an attempt was made to convey a clear notion of the mode in which the ancient miracle plays were performed. As the people grew richer and more numerous, and the arts of life were improved, and experience suggested ways of correcting blemishes and adding fresh splendour to the spectacle, these plays were exhibited with ever increasing pomp. Yet, at the same time, the lay spirit getting hold of them more and more, and the religious laxity of the Renaissance attacking the clergy, we find those which date from the 15th century not only grotesque, but gross to the last degree. Their composition in many parts betrays a scandalous accommodation or condescension to the brutality or pruriency of the hearers. Take for instance, the scene called "The Bridal of Mary and Joseph" in the Coventry Mysteries. To interest masses of ignor- ant people it may have been necessary to be simple, broad, and outspoken; but it could not have been neces- sary to introduce a heap of filthy jokes, not found in their original, gathering round tle mystery of the Lacar- nation, for the sake of raising a horse-laugh, and cover- ing the cheeks of the country girls with blushes. It must be remembered that the entire system of~~

~~language and allusions in these plays is contemporary. Mary's kinsman, "Abizachar, is a medieval bishop, with his court, his sumpnours, and his apparitors; the whole thing is racy of the soil, and redolent of the national humour; you are no more transported into Palestine than a travestie of 'Medea " transports you into Greece. The moral effects upon juvenile spectators of so much loose talk, conveyed to them as it was with a sanction (for a religious aim was always professed, and indeed as a rule sincerely enter- tained in these exhibitions), cannot have been of an improv- ing nature.~~

~~Besides the great serial plays, such as The Chester—The Coventry—and the Townley Mysteries, in the successive scenes of which all the principal truths and doctrines of religion, beginning with the creation, and ending with "'' Doomsday," were represented, a demand arose for special plays, treating of the life, or the miracles, or the martyrdom of some favourite saint. Such were Zhe Conversion of St Paul, St Mary Magdalen, and St Anne, which may be seen in a MS. in the Bodleian library. These were some- times performed in the churches, on the festival of the saint celebrated in them, sometimes in the halls of royal palaces or colleges, sometimes again within the precincts of monasteries. Gradually something more refined, more in the fashion, than any miracle play, was called for at courts and colleges. Then arose the moral plays, in which the allegorical treatment and metaphysical refine- ments which were of the taste of the age were applied to dramatic entertainments. Saints and angels were dis- carded ; and virtues, vices, and abstract notions of various kinds took their place as the dramatis persone. The devil of the miracle plays, who had more and more become a grotesque and comic character, at least in many of them, appeared as the "vice" or "iniquity" of the moral plays, and introduced into them also a corresponding comic element; this "vice," as is well known, was gradually transformed into the clown of the modern stage. Skelton wrote two moral plays, one called The Nigramansir, which was performed before Henry VII. and his court at Wood- stock, the other Magnyfycence. A more ambitious effort was the Satyre of Thrie Estaits, by Lindsay; this enormous moral play was acted before the Scottish court in 1535,~~

~~ENGLISH tA Ute ee~~

~~[RENAISSANCE.~~

~~and occupied: nine hours in the representation. The dulness and tediousness of plays of this kind, owing to the want of human interest, prevented them from holding their ground against the more natural form of the drama which the imitation of the ancients soon introduced; yet Mr Collier, in his History of Dramatic Poetry, has shown that moral plays continued to be written down to the very end of the reign of Elizabeth. Translations and imita- tions of the plays of Plautus and Terence paved the way for the reign of a purer taste. Sixteen years after it had witnessed Zhe Nigramansir, the English court was refreshed by "a goodie comedie of Plautus," probably through the instrumentality of Sir Thomas More, who was then in high favour with Henry. The interludes of John Heywood, court-jester to the same king, were another step in advance. The personified qualities are here dropped, and persons take their place ; these persons, however, are not yet individuals, but representatives of classes, "a pedlar," "a palmer," &c, The earliest proper comedy that las yet been discovered is the Ralph Roister Doister of Nicholas Udall, the head master of Eton College. this play, written to be performed by his scholars, Udall imitates so far as he can the style and manner of Terence. It is divided into acts and scenes, and is written in hob- bling alexandrine rhyming lines, which, as containing twelve syllables, 7.¢., six feet, he obviously thought were the nearest Euglish reproduction of the iambic trimeter. He did not see that the movement of our heroic blank verse, in spite of its being shorter by two syllables, represents more faithfully than any other English metre the movement of the iambic trimeter; while such rough alexandrines as his only recall the Saturnian verse of Nevius. The recognition of the fact that for the English drama the proper metre is the blank verse of ten syllables~~

~~was due to the finer perceptions of Sackville, who, with gack- Norton, produced the tragedy of Ferrex and Porrex, or ville.~~

~~Gorbodue, in 1561; this, the earliest regular tragedy that has been discovered, was played before Queen Elizabeth in the hall of the Inner~~

~~Temple. For some years tlie drama continued to be beholden to the hospitality of the court, or some legal society, or educational institution (Gray's Inn, Lincoln's Inn, St Paul's school, &c.), for the local habitation where it might display its illusions. But as the popular delight in such exhibitions increased at this time faster than the Puritanic aversion to them (although this also was gaining ground, as we shall see), it was in- evitable that the stage should cease to be movable and migratory, and establish itself in a permanent home, The first public theatre was opened at Blackfriars in 1575; the histrionic art became a recognized profession ; many other theatres sprang up before the end of the century ; Italian plays were adapted, Latin plays translated, episodes of English history dramatized; and, on the whole, a kind of dramatic atmosphere was generated in the English metro- polis, highly favourable to the career of a great artist, should such a one appear.~~

~~More's philosophical fiction of Utopia, imitated from More.~~

~~Plato's Aflantis, appeared in Latin in 1516; it is the picture of an ideal commonwealth. The Governour, by Sir Thomas Elyot, was also intended to be a political treatise ; but under the despotism of Henry the subject was too dangerous, and the author confines himself almost entirely to questions connected with education. The earliest good English prose, in Mr Hallam's opinion, is found in Sir Thomas More's History of Henry V., which appeared in 1513. But the curious treatise by Sir~~

~~John Fortescue, written more than thirty years before, Fortes- the Difference between an Absolute and a Limited Monarchy, cue.~~

~~is really very good English, and contains few words that are not now in use; if it were divested of its barbarous~~

~~In Udall,~~

~~Contro- versial writers,~~

~~1477-1579.]~~

~~orthography, this would be at once manifest. Our prose style was much improved by the various works of Roger Ascham, who taught Latin to Elizabeth, and held learned conversations with Lady Jane Grey.~~

~~The religious convulsions by which the country was shaken to its centre during this period are of little direct interest to the historian of literature; for the lines of literary development which the activity of preceding ages had marked out were not seriously deflected, nor did the theological controversy produce on either side works which, like Hooker's Lcclestastical Polity or Bossnet's Variations, may claim, on account of perfection of style or power of treatment, a permanent place in literature. The Reformers of Henry the VIII.'s reign were the heirs and continuators of " Lollardy," but joined to it, from thre armoury of Luther and Calvin, new views on predestination, the futility of works, justification by faith alone, and the final assurance of the elect, which had indeed a practical bearing of the most important kind, but were not set forth by our native writers in particularly forcible terms or attractive forms. William Tyndale, who carried on a long and acrimonious controversy with Sir Thomas More, is perhaps the most important writer on that side. Cranmer's writings show much learning, considerable grasp of in- tellect, and a certain beadth of style; they are deficient, however, in sincerity and manliness, The homely wit and rough satirical power of Latimer are well illustrated in many of his sermons, He, and most of the English Reformers, exemplify in a marked way the Teutonic affinity of which we have more than once spoken; the desire to be sturdily independent, coupled with a sense of teeming latent energy,—of a potentiality of great achieve- ment on this side and on that,—indicate in them at once the strength and the blemish of the Teutonic genius. After the accession of Elizabeth, the leading men among the clergy, refusing to take the oath of supremacy, were for the most part driven into exile, and for many years waged war, in heavy treatise or light pamphlet, against the uew settlement of religion. The names of Sander, Harpsfield, Harding, Stapleton, and many others occur in this connexion. But as they wrote for the most part in Latin, for the sake of Continental readers, their efforts produced little effect, and are now scarcely remembered. Jewel, the Protestant bishop of Salisbury, who had been in exile at Strasburg~~

under Mary, and contracted a close friendship with Peter Martyr, wrote an Apology (1562) in reply to these disputants, from whom the work drew forth loud charges of inaccuracy and unfairness of quotation. The Apology was ia Latin, but the Defence of the Apology, written in answer to Harding, was in English. The laborious exercise of thought on these topics, and the warfare with pen and tongue which was the result, could not fail to increase the elasticity and enlarge the adaptivity of the language, and so far tended to improve it as an organ of literature.

VI. The Old Cwilization in conflict with Puritanism, 1579-1660.—Regarding the position of the Roman see in the Christian church as a "separable accident," the accept- ance or rejection of which made no essential difference, the literary men of the latter part of the reign of Elizabeth, while rejecting, chiefly on political grounds, the authority of that see, had no quarrel in other respects with the religion which had come down to them from their fore- fathers, nor with the forms of civilization and efforts towards a higher culture which that religion had encouraged. Both in Spenser and Shakespeare we notice a decided re-pugnance towards Rome, and a disposition to deny her claim to obedience (compare the description of Duessa in the Faerie Queene, and the denunciation of papal power put

by Shakespeare in the mouth of King John) ; but with this exception they belong to the old school; they might have been Englishmen of fifty years before, instead of twenty or thirty years after, the Reformation. This has been pointed out in detail by Mr Thornbury and others in the case of Shakespeare ; they have shown how alien the notions of Puritanism were to his heart and mind, except in the one point of opposition to Rome, Spenser's description of the house of Cecelia, and his invective against the Blatant Beast, not to refer to many other passages, show that the sanie thing held good of him. But it is not our object to dwell on this ; the point to which we would call attention is, that the poets and dramatists of this period, as well as a large body of

~~the clergy, clave heartily to the civilization and culture which they had inherited from the past. To this form of civilization the Puritan or ultra-reforming party, which began to show its strength under the lax rule of Archbishop Grindal, was radically opposed. The culture which bad gathered treasures from every side, and welcomed all that was good and beautiful in paganism, was tainted and abominable in their eyes. To them it seemed that a Christian society should be exclusively formed and built up on models furnished by the Old and New Testaments. To come to the particular tendencies of Puritanism with which we have now to do,— it looked with sour displeasure on the English poetry and drama of the day, and, according as it possessed power, suppressed them. What meant these loose and profane sonneteers by writing about their mistresses in language that was little short of idolatrous, and celebrating Bacchus, Venus, and Apollo in terms which could hardly be acquitted of blasphemy? Why, if they must rhyme, could they not compose comfortable hymus of Zion, and if they must have music, sing the Psalms of David? Expression was given to these sentiments in a pamphlet breathing a spirit of comparative moderation,— the School of Abuse of Stephen Gosson (1579). Sir Philip~~

~~Sidney in his able reply, the Defence of Poesy, vindicated sidney.~~

~~the legitimacy of the taste for literature and art which Englishmen had inherited from their forefathers. Again, innumerable allusions in the works of the dramatists of this and the next reign, including Shakespeare, prove the animosity which subsisted between them and the Puritans, whom they rightly regarded as the implacable enemies of their art. On the outbreak of civil war the Puritans, gain- ing the upper hand in London, immediately shut up the theatres. It is not, therefore, without reason that we have characterized the epoch which we are considering as that of the "conflict between Puritanism and the old civilization."~~

~~Poetry, which does not, like the drama in its more developed stages, require any local establishment in order to produce its effects, pursued its flight in defiance of Puritan censure. It was not, however, unaffected by it. The disapproval of him and his works, entertained by a large~~

~~section among the most virtuous of his countrymen, irritated the poet by its exaggeration, and often made him out of recklessness import an additional degree of licence into hislanguage. Yet morality was in the end the gainer. For in spite of narrowness, and exaggeration, and occasional hypocrisy, there was real earnestness and virtuous intention in the great body of the Puritans ; and to these qualities society eventually did homage by refusing to tolerate, in poetry at least, what was openly and scandalously immoral. In spite of one or two who leap over the line, poetry in the 18th century, and still more in the 19th, has not permitted her votaries to write as they please, but has prescribed to them measure and seemliness. This may indeed be attributed to the increasing refinement of European life , but that refinement itself, so far as it is moral, is toa large extent the work of the Puritan spirit.~~

~~VIII. — 53~~

~~Eliza- bethan litera- ture.~~

~~Spenser.~~

~~Shake- Speare,~~

~~418~~

~~Without further preface let us turn to the consideration~~

~~of that amazing phenomenon, the literature of the~~

~~Elizabethan age. Many circumstances, many slowly~~

~~elaborated changes, had prepared the way. The cautious~~

~~peace-policy of Elizabeth, her wise love of economy, and~~

~~her care to surround herself with able counsellors, produced~~

~~their natural fruits in a state of general prosperity never~~

~~experienced before. Every adventurous and inquiring~~

~~mind was stimulated by the reports continually arriving of the discovery of "islands far away," of riches and beauty which the earth had hitherto veiled from her children revealed to wondering eyes in America and the East, of inventions which enlarged the power, and discoveries which widened the knowledge, of man. Again, the greatly augmented use of the language as a literary instrument, consequent upon the religious dissensions now temporarily silenced, had, as already explained, made it a much fitter organ for thought than it had been in the reign of Henry VIII. Lastly, the powerful influences now pressing in from abroad must be duly weighed. The genius of Ariosto had clothed medizeval romance in a splendid garb, which, for the first time since the 13th century, made the subject attractive to cultivated minds, Tasso's epic, with its sustained grace and sweetness, had shown how the shades and half-shades of sentiment in which refined spirits delight can be expressed by corresponding nuances of language. Certain eminent writers in France, especially Du Bellay and Ronsard, had consecrated considerable powers and incessant activity to the work of reforming the language and literature of their own country through the concentrated study and fearless imitation of ancient models. Consider- ing all these various elements, we shall be better able to understand how, given a gorgeous imagination like that of Spenser, and a mind of universal range like that of Shake- speare, these writers were able to place that enormous difference between themselves and their predecessors which separates the Faerie Queene from the Pastime of Pleasure, oe the comedies of Shakespeare from those of Still and~~

~~all.~~

~~Without stopping to criticise, and reserving the drama for separate consideration, we must endeavour by a brief description to convey some notion of the poetical exuber- ance of the Elizabethan era. Spenser's Faerie Queene, a colossal fragment of a still more colossal design, relates ostensibly the romantic adventures of brave knights and fair ladies ; but every incident has an allegorical meaning, and the propagation of the several moral virtues is the professed object of the entire work. The well-known stanza which he invented, consisting of nine lines, the last an alexandrine, with three rhymes, is so skilfully~~

~~con- structed and so well adapted to our language, that it has been frequently employed since, with marked suc- cess, by eminent poets. Burns used it for the Cotter's Saturday Night, and Byron for Childe Harold. The rhymes in it are better arranged than in the standard metre of Italy, the ottava rima, because the distribution is such as to bind the whole structure better together, and to avoid that palpable break between the first six lines and the concluding couplet which is noticeable in the stanza of Tasso and Ariosto, Again, the extra syllables in the ninth line seem exactly to counterbalance the risk of monotony which the additional line would otherwise entail. The sonnets of Shakespeare, if we accept the acute interpreta- tion of Mr Simpson, indicate the influence of some aristo- cratic friend of the poet, who, having travelled much in Italy and formed the acquaintance of members of the learned "academes" for which Italian cities were then famous, had learned from them those Platonizing specula- a pout love and its kinds—the vulgar, the civil, the~~

~~8, and the ideal love—which are partially repro-~~

~~duced in the sonnets. Among Shakespeare's other poems the chief were Venus and Adonis and the Rape of Lucreece, pieces remarkable for their luscious melody and ornate elegance. The classical and mythological themes attest at once the receptivity of the intellect of Shakespeare, a country-bred youth who had studied at neither university, and the strength of the Renaissance movement, from which no mind, even the most powerful, could then hold itself aloof. Of the same class is Marlowe's beautiful poem of Hero and Leander, translated from the Greek of the pseudo- Muszus, George Chapman produced, about 1601, a com- plete translation of the Z/ad in long fourteen syllable lines, It was the first time that this feat had been accomplished in any modern language ; and the fact well typifies the in- tensity of force with which the Euglish intellect was now working in every direction.~~

~~a few religious poems of great beauty. He is by some con- sidered the first of the metaphysical school of poets; but the credit (or discredit) of that leadership rather belongs to Donne. Marston, Hall, and Gascoigne (the author of the Steel Glass) may be regarded as the founders of English satire. Sir Philip Sidney, the ornament of Elizabethi's court, wrote sonnets and songs, which, though imitated from Italian and Spanish models, were freighted by his powerful mind with a burden of thought and passion not to be found in the originals. The attempts of Daniel and Drayton in the epic style (Wars of the Roses, Barons' Wars), were failures ; but wherever we meet with many ventures, it cannot be but that some will fail. Of such poems as Warner's Albion's England, or Drayton's Poly-Olbion, or Tusser's Five Hundred Points of Husbandry, it is unnecessary to speak,~~

~~The class of poets to whom Johnson attached the name Poetry of "metaphysical," while Milton calls them '" fantastics," in- conceit.~~

~~cludes Donne their founder, Cowley, Crashaw, Cleveland, and several others. In date they belong rather to the reigns of James I. and Charles I. than to that of Elizabeth. They are distinguished by their fondness for '" conceits," or intellectual tours de force, the general aim of which was to gain credit for ingenuity, and a deep insight into the nature of things, by tracing resemblances or analogies between objects apparently remote and diverse. This poetry of conceit, which nearly corresponded to the estzlo culto of Spain, is usually said to have been invented by the Neapolitan poet Marini, author of the Sospetio di Hrode, and by him propagated in France, whence it came to Eng- land. It was merely another development of that tendency to the mystical in thought and the far-fetched in language, characteristic of the Gothic ages, which we have seen more fully exemplified in the countless allegories and moral plays of previous periods. In Donne the style is insufferable ; "conceits " are strewn about his pages like puns about the conversation of a punster, and they are not half so amusing,~~

~~Cowley, on the other hand, was a true poet; the daring Cowley.~~

~~flights of his fancy, the tenderness of his feelings, and the grace and profouudness of his musings, still rescue much that he wrote from~~

~~oblivion. Composing, in imitation of Pindar (though he did not really understand the Pindaric metres), irregular passages of song which he called "' Pindariques," he gave the first example of a class of poems which comprises performances so memorable as the Aleaander's Feast of Dryden and the Bard of Gray. Crashaw, the translator of the Sospetto di Hrode, is in the highest degree a worshipper of the far-fetched. He is the author of the celebrated line, describing the miracle of Cana in Galilee,—~~

~~Lympha pudica Deum vidit, et erubuit.~~

~~The conscious water saw her God, and blushed. Edmund Waller, though his earliest writings betray an~~

~~Robert Southwell, the Jesuit, South. put to death by the Government in 1696, left behind him well.~~

~~_ Waller.~~

~~Eliza- bethan Drama.~~

~~Players.~~

~~1579-1660.]~~

~~affinity to the fantastic school, mixed too much in the world, and had too much good taste and good sense, to go very far with them. He is the English song-writer par excellence , his is the only name which we can think of, when Burns is cited for Scotland and Béranger for France. His manner was so good and his style so clear that Dryden calls him the "father of English numbers," and declares that but for him "' none of us could write." Pope allows to Waller smoothness, but ascribes much more to the in- fluence of Dryden himself : " Waller was smooth, but Dryden taught to join~~

~~The varying verse, the full resounding line,~~

~~The long majestic march, and energy divine."~~

In the last section we noticed the rise of true comedy and tragedy, and gave the date-of the building of the first regular theatre at the Blackfriars, Returning to the subject, we propose to examine the commencements of the Elizabethan drama in somewhat more detail, treating (1) of the actors, (2) of the plays which they performed, (3) of the stages which they had at their disposal, including under this head their resources of scenery and stage effect.

1. From an early period of the reign we find frequent mention of companies of players travelling from town to town, and performing in the town-halls, under the sanction of, and with remuneration from, the respective corporations, such of the plays which they had brought as might seem suitable to the audience expected. It is noteworthy that every such company announced itself as "the servants" of my Jord this, or the earl of that, and indeed were really such; had they given themselves out for an independent body of players, the stern laws against vagabondage then prevailing would have made them at once amenable to the sharp jurisdiction of the local magistrates. Thus we read of the servants of the Lord Strange, those of the earls of Leicester, Warwick, Derby, &c. These noblemen en- rolled the bands of players among their retainers, and pro- bably maintained and gave them wages for a part of the year, but allowed them at other times, under the patronage of their high names and with licences under their hands, to make a living by entertaining the public. It was the servants of the earl of Leicester who in 1574 obtained from the queen a writ under the privy seal, authorizing them to perform "comedies, tragedies, interludes, stage-plays, and such other like as they have already used and studied, or hereafter shall use and study, as well in the city of London as throughout the realm of England." But when the players prepared to avail themselves of their privilege, a conflict of authorities became apparent. The mayor and corporation of London asserted their right of control over

all dramatic performances within the limits of the city, and

issued orders providing, amongst other things, that the players whom they might license should contribute half their receipts to charitable

purposes. Probably a portion of the corporation was, even at this early period, actuated by Puritan sentiments. The poor players, who under such regulations would have soon found their occupation gone, or at any rate unremunerative, turned their eye to the vacant space between St Paul's and the river, where stood the ruins of the great convent and church of the Black Friars (Dominicans). On this site, which was outside the jurisdiction of the city, they established the first theatre by converting to their purpose some of the dilapidated buildings. Years passed ; the number of the players increased ; and in 1589, as we learn from a curious memorial which they addressed in that year to the privy council, they were sixteen in number, " all of them sharers in the Blackfriars play-house." The twelfth name subscribed to this list was that of William Shakespeare; tle nintb that of the dramatist George Peele. These facts show that that

"separation of powers," which, in the drama as in politics, |

is the fruit of an advanced experience, did not then exist. The offices of lessee, stage-manager, actor, and play-writer were all combined in these early players. They owned the theatre in which they acted, furnished their own stage, chose their own plays, and, to a greater or less extent, wrote them. After having received the royal licence in 1574, this company ceased to bear the name of the earl of Leicester, but described themselves as " Her Majesty's poor players." The trace of this early connection with the court still remains in the appellation " Theatre Royal," assumed by several of the older London theatres.

2. With regard to the nature of the dramatic performances, these included, besides those specified in the licence to the Blackfriars Company, moral plays and histories. Under the general description of moral play we may include those that were written with a controversial purpose, either for or against the Reformation, such as the plays by Bishop Bale, Lusty Juventus, Every Man, Sc. Quite a num- ber of such pieces were put on the stage by the Catholics after the accession of

~~Elizabeth, with the view of turning the new state services into ridicule; these drew down a special prohibition from the Government. Many dramas, called sometimes tragedies, sometimes histories, were on classical subjects, such as Catiline's Conspiracies (by Stephen Gosson, who afterwards wrote vchemently against the stage), Cupid and Psyche, Ptolemy, and plays on the lives of Pompey and Cesar. The audience being limited, tle companies of players numerous, and the expense of scenery and dresses trifling, novelty in the pieces represented became the predominant source ofattraction; hence the extraordinary variety of plays produced at this early period. Scriptural subjects were popular; thus among the earliest printed plays are Nash's Christ's Tears over Jerusalem, and Peele's David and Bethsabe. "Histories" dealt often with personages and events of the ancient world. But they also presented in dramatic forms passages from the story of England, many of which, by tradition and continual dis- cussion, still lived in the memory, and vividly stirred the feelings of the people; and it was natural that dramas of this class, as they came to be planned with more art and composed with greater power, should transcend in interest the dramas with classical plots, and appropriate the name of "histories" to themselves. One of the earliest of these, The Famous Victories of Henry V., was acted about 1580; Shakespeare founded on it one of his historical plays. The history of Hdward IJ. by Marlowe, Greene's James TV., and Peele's HLdward J. all date somewhere about 1590; the older play of King John appeared in 1591; and the original plays which, refashioned or retouched by the hand of Shakespeare, come before us as the three parts of Henry VI., seem to have been produced between 1590 and 1595.~~

~~Before the time when Shakespeare began to write for the stage, it may be said that several respectable or even re- markable tragedies had appeared, that some good and flowing historical dramas had been written, and that a great variety of interludes, approaching in character to our farces, and not deficient in wit and drollery, had been pro- duced. To prove the above assertion as to tragedy, it would be enough to adduce Marlowe's powerful plays, Dr Faustus and Tamburlaine the Great,—the first strong to move the tragic passions, the second dazzling and astonish- ing us by its soaring rants and~~

~~gorgeous rhetoric. The clever interludes of John Heywood would alone sustain what we have stated as to pieces of that description. In comedy, on the other hand, very little had been achieved. Of those that were in prose, like Gascoigne's Supposes and Nash's Pierce Penniless, the rough uncouth language was unrelieved by any wit that could pass muster ina later age. No comedics in verse superior to those of Greene can per-~~

~~Plays.~~

~~The early stage.~~

~~Shake- speare.~~

~~420~~

~~haps be named; and these are disfigured by every kind of literary fault. ; a!~~

~~3. With regard to the stage itself, the building of the first theatre in London has been already described. But for many years previously temporary theatres had been made out of the court-yards, with their surrounding galleries, of London inns, ¢.g., the Belle Savage in Ludgate Hill, the Red Bull in Bishopsgate Street, and the Cross Keys in Gracechurch Street. It is to the second of these that Gosson alludes in his School of Abuse (1579), when he speaks of "the Jew shown at the Bull," and goes on to describe it so as to make it clear that this was an old play with a plot resembling that of the Merchant of Venice. If any one desires it, he may still help his imagination to picture the scene, by going into the court-yard of one of the few old city inns still left, the " Four Swans" in Bishopsgate Street for instance, and imagining a stage erected at one end, the galleries crowded with aristocratic spectators, seated or standing, and the open space below filled with play-goers of the common sort, admitted at the charge of one penny, and with the canopy of heaven above their heads. Five of these theatrical inns were turned into play-houses between 1570 and 1630. The company that owned the Blackfriars Theatre erected a new one called the Globe in~~

1594 on the Bank-side, a position corresponding to one on the present Thames embankment ; this, being for summer use, was not roofed in.

Amidst such rude surroundings, and with such imperfect appliances, the mighty genius of Shakespeare was fain to live and act. It has been observed that English comedy was less advanced at the time of his coming up to London (about 1586) than the other dramatic forms; and it is in comedy accordingly that his early triumphs were won, and his extraordinary superiority to all his predecessors most signally demonstrated. Love's Labour's Lost and The Comedy of Errors were probably his first essays ; they were followed by ILidsummer Night's Dream, Two Gentle- men of Verona, &c. The versification of dramatic dialogue had been thoroughly reformed by Marlowe, whose sense of rhythm was exquisite; English blank verse had been wrought into a fine and fitting material, ready to receive whatever impression a gifted dramatist might stamp upon it. But Marlowe was no meditative observer of human life, no accurate discerner of human motives. The language, therefore, that he puts in the mouth of his different person-ages does not greatly vary; they are all apt to take to ea

1 Sidney's Defence of Poesie ted b ight in hi Shakspere, a Dicitig" ice

ENGLYES He DITERSATUES

[ELIZABETHAN.

ranting on the least provocation. Shakespeare added to Marlowe's skill of composition a power of characterization which no dramatist, ancient or modern, ever surpassed. To this power, as its fitting accompaniment, was joined a gift of modulation, by which the language assigned to each char- acter was made suitable to it and to no other, and this with a truth and naturalness which the readers and spectators of every following age have recognized. Again, turning, like Chaucer, with eager longing to the refining influences which came from the south, he adjusted and polished his dialogue with the utmost care, till to the swiftness and evenness of movement which he might have learnt from Marlowe he united much of the easy grace of Ariosto and of the sweetness of Tasso. He probably read an immense number of Italian

~~novels, either in the original or in translations; many of his comedies are founded upon such tales. Thus prepared, he could with safety, as in Merry Wives of Windsor, deal with home scenes, and a plot of his own invention, without running any risk of falling. into the coarseness and vulgarity of Gammer Gurton,: George-a-Greene, and hundreds of other pieces, written by men in whom the Teutonic affinity of the race predominated unchecked. To these qualifications Shakespeare added a sound dramatic judgment, which, as was natural, improved with years and experience, teaching him what to seek and what to shun, so as to secure that popularity which is the test of dramatic excellence, Asan acting play, Zhe Tempest, written near the end of his career, is far superior to Love's. Labour's Lost. But to the last he did not attain to supreme excellence in this direction ; the unity of action, necessarily sacrificed in the histories, is not always preserved in dramas where its retention would have been easy ; nor is that sub- ordination of inferior parts to the central action, which dramatists of less power have often successfully managed, always duly attended to by Shakespeare.~~

~~Of neither the comedies nor the tragedies of Shakespeare can it be said that they are in a special sense " dramas of character." The boasting soldier, the lying traveller, the religious hypocrite, the scheming matron, the ambitious tyrant, and many other clearly marked types, are not pourtrayed for us in the plays of Shakespeare with that sharpness of outline which they present in the works of Plautus, Moliére, and Alfieri. The cause may perhaps be sought in the absence from Shakespeare's mind of all ex- aggeration, and in the fact that without some slight exaggeration these striking dramatic types which take hold onthe memory and the imagination cannot be produced, Shakespeare saw men as they are, and so described them ; and the consequence is that, although neither Macbeth nor Richard III. exhibits the stock character of the " ambitious tyrant," each displays a special form of ambition, modified, as always happens in real life, by many concomitant qualities and aims, to trace the lineaments of which will reward in a high degree the pains of the literary analyst. It is this quality of essential truth of presentation which has gathered round our Shakespeare's dramas the instruc- tive and beautiful criticism of a~~

~~Gervinus, the interpreta- tions of a Goethe, and the historic faculty of a Guizot or a Villemain.~~

~~In the exhibition of tragic passions, and in the range of the appeal which they make to the moral sentiments of an audience, Shakespeare's tragedies havenever been surpassed. Considered as acting plays they are of varying excellence. In Othello and Romeo and Juliet, both founded on Italian novels, the incidents move on in a'swift and well-combined sequeuce, which, from this point of view, leaves nothing to be desired. Hamlet, though from tradition and habit it always attracts large audiences, is better suited for the closet than the stage ; the drag of the third and fonrth acts is undeniable. In none of the tragedies is there any~~

~~attempt to preserve the unity of time except in Romeo and Juliet ; here the action is powerfully and successfully con- centrated. The Roman plays, based on Plutarch's Lives, though they abound in passages of great power and beauty, are not so constructed as to produce the highest dramatic effect.~~

~~When we turn to the other dramatists, Shakespeare's con- temporaries and successors, the one point about them all that most strikes us is, their amazing exuberance. The English genius, as M. Tainein substance remarks, is naturally abundant and full of force ; if left to itself, it attends more to quantity than to quality; it is daring and enterprising, and knows not when it is over-matched, as English soldiers are said not to know when they are beaten. Of this national vigour a large proportion was in the Elizabethan times directed to literature, and particularly to the stage. The development of the drama had now gone on withont any notable check for many generations. All the artistic faculty of the country which betore the Reformation had applied itself to other arts, such as decorative architecture, painting, and sculpture,~~

now, when the scope for the exercise of these was suddenly reduced to the narrowest limits, tended to seek and find a refuge in the Thespian art. Space does not permit of our noticing these dramatists in any but the briefest manner. Ben Jonson, proud of his learning and his university education, invented most of his own plots, and plumed himself on his strict observance of the unities. In the plays of Beaumont and Fletcher the influ- ence of the Spanish drama, the glory of which had been carried to a great height by Calderon and Lope de Vega, is noticeable. The intensity of Massirger and the pathos of Ford, amid much that is grotesque or repulsive, preserve their dramas from entire oblivion. Other names are those of Webster, Chapman, Heywood, Dekker, Marston, Middleton, and Rowley. The plays of Shirley were at the height of their popularity when, after the breaking out of the civil war, the theatres were closed by order of the parliament. This order is the overt act of Puritanism, by which, after having first complained of, then protested against, then furiously denounced, the abuses of the stage, it proceeds, now that it has got the handling of the civil sword, to remove both use and abuse by force. The violent language of Prynne in the book (1633) to which he gave the title of Hzstriomastiz (a barbarous compound signifying "“‘ the player's scourge"), though at the time cruelly punished by the Star Chamber, told of a great and increasing force of public opinion behind him, of which he was but the mouth-piece. Puritanism, by the order of suppression, at once avenged the insults and ridicule with which the dramatists had assailed it, and cut down a vigorous scion which had grown up out of the root of the ancient civilization. The drama was restored before twenty years were over ; but it was a new creation, and never won the people's love as the old Elizabethan drama had done. It was an affair of courts and coteries, and was almost shaken down by the blunt reproaches of one honest, plain-spoken man, Jeremy Collier. Puritanism possessing itself more and more of the popular conscience, the revival of a national drama became impossible. Our theatres are supported by the miscellaneous urban population which is always to be found in great cities ; but as a nation we have had no drama since the civil war.

In the department of Fiction we have to note a new transformation of the romance, by which it assumes the form of pastoral novel. The tale

of chivalry, modified so as to recommend a religious ideal by Walter Map and his fellow-workers, then passing into the love-story with allegorical embellishments in the hands of Lorris, was further changed by Sannazzaro, Montemayor, and other Spanish and Italian writers, into the love-story with pastoral

and mythological embellishments. Here of course we trace the influence of the classical revival ; allegory is dropped as too cumbrous ; and a florid phraseology, culled from the idylls of Theocritus, the miscellaneous works of Lucian, and other classical or quasi-classical sources, takes its place.

The Arcadia of Sir Philip Sidney was suggested by sidney.

Sannazzaro's pastoral romance of the same name, but cau be read with more interest, because we see that it has been made the vehicle by means of which a powerful mind makes known its thoughts on many intricate and important ques- tions, in metaphysics, political science, art, and social ethics. But the prolixity of the work, together with its confused arrangement, would always prevent it from attaining to anything like the popularity which it enjoyed when, and

for some time after, it appeared. The Huphues of Lyly, a Lyly.

kind of philosophical novel, written in an affected and pedantic style, has, since the ascription to its influence by Sir Walter Scott of the magniloquent bombast which he puts in the mouth of Sir Piercie Shafton in the Monastery, and considers to be characteristic of the conversation of courtiers at that period, given rise to tle term "euphuism." Yet it must be allowed that Sir Piercie Shafton's talk is quite a caricature of the Janguage in Euphues ; of the two, it more resembles the high-flown language that we meet with in Sidney's Arcadia. The Mundus Alter et Idem of Hall (atterwards bishop of Norwich) is a satirical romance, written from the clerico- despotic point

~~of view, in the aim of exhibiting the debase- ment which the principle of democracy, if carried out con- sistently and over a long period, would, according to thie author's theory, bring upon both social and individual man. One of the last and most pernicious delusions of the infatuated community described in the book consists in establishing "a perpetual parliament." Such were thie advisers, obeying whose fatal suggestions Charles I. reigned eleven years without a parliament, and brought things to a pass whence civil war was the only issue.~~

~~In the Ecclesiastical Polity of Richard Hooker, published Hooker.~~

~~near the close of the 16th century, a solid intellectual basis, illustrated by great learning and the attractions of a grave and majestic style, was for the first time given to the con- ception of the wa media, in which Anglican churchmen believed they saw a secure slielter for moderate minds, midway between Rome and the extreme forms of Protestantism. The work is naturally directed rather against tle Puritans, who were numerous both in church and state, and might eventually, as in fact they did, gain the upper hand, than against the Catholics, whom the laws already silenced and disarmed. The restiveness of the Puritans under the existing laws and church ordinances, which, as they thought, left religion insufficiently reformed, suggested to Hooker an inquiry into the nature of laws, and the grounds of their binding force; this is the subject of the celebrated disquisition in the first book. The Puritans were not convinced, and the struggle between them and the Anglicans went on increasing in violence, until, after the outbreak of war, the ascendency of the Puritan element in the Lower House, and the secession of most of the peers to Oxford, enabled its enemies temporarily to suppress the established church. During the suppression, a work of great ability, entitled A Discourse on the Inberty of Pro-~~

~~phesying (1647), appeared from the pen of Jeremy Taylor. Taylor.~~

~~Fifty years have made a great difference ; tlie champion of Anglicanism no longer insists on obedience, but pleads for toleration ; if only the Church of England could be estab- lished again in certain districts, he would be willing to see the worship of many different sects, provided~~

~~that they all agreed to accept the Apostles' Creed as a common standard, carried on in other parts of the country. The lapse of a few years restored to the church its former status without~~

~~Bacon.~~

~~Hobbes.~~

~~422.~~

~~ENGLISH LYTERATURE~~

~~[ELIZABETHAN.~~

~~any damaging concessions, and the question of toleration | origin, nature, and value of their conceptions respecting~~

~~was laid by till the Revolution.~~

~~The scholastic philosophy fell, as we have seen, at the change of religion; and for some time nothing took its place. When philosophical studies were revived, they took a new direction, and were pursued in a new spirit. The old philosophy, summing up the wisdom of Greece and that of the Christian schools, said to the student, " Know God, know thyself; from this twofold knowledge learn what is duty; that done, investigate at discretion either nature or the world of ideas." In practice, however, a dry logic and metaphysic, encumbered with technicalities, formed the sole intellectual pabulum provided for most students of philo- sophy. The new doctrine, introduced by Bacon, said, " Know Nature, and for that purpose study thy own mind, and discover the criteria by which nature's ways may be tested ; the knowledge so gained will be power, which, well used, will enrich and adorn human life." Mr Hallam, re- presenting the general English opinion, calls Bacon "the father of modern science;" but his claim to the title is disputed both by the French and by the Italians. However this may be, it is certain that he very early conceived the idea of working out a new and complete system of philo- sophy ; and to a juvenile work unfolding his project in~~

~~outline, which seems to have been written about 1584, he_~~

~~gave the title Zemporis Partus Maximus, the greatest birth of Time. The phrase sounds arrogant, but was not really so; all that Bacon meant to say was, that the new doctrine was the inevitable outcome of a time now ripe for its recep- tion,—the growth of the Zeit-geist, to use a modern phrase, —and that it was impossible to overstate its importance and potency. But his life was too much taken up with active labours at the bar, on the bench, and in the council- chamber, to permit of his carrying his vast plans into execu- tion. All that we possess of his philosophy is contained in the Advancement of Learning (1605), the Jnstawratio Magna (1620), and the De Augmentis Scientiarum (1623).~~

~~'The Instauratio is a colossal programme of his philosophy~~

~~in six divisions, of which only the second, the " Novum Organum," is worked out, and that not completely. The " Novum Organum " was designed to be the new logic of induction, which Bacon regarded as tle mind's proper in- strument in utilizing the fruits of experience. ' Experience aud observation are the guides through the Baconian philo- sophy, which is the hand-maid and interpreter of nature." Nevertheless the particular instrument which he invented, the method of instances, is too cumbrous for practical use, and in fact never has been employed in physical inquiries. "If we have not tried it," says Mr Ellis, in one of his ex- ceedingly able introductions to the works of Bacon, " it is because we feel confident that it would not answer. We regard it as a curious piece of machinery, very subtle, elaborate, and ingenious, but not worth constructing, because all the work it could do may be done more easily another way." It is not in virtue of his method, which will not work, nor on account of special contributions to any branch of physical science, for none such exist, that so high a place among philosophers is assigned to Bacon by his countrymen. It is rather on account of the lofty enthusiasm which animates his writings, and makes him appear in them as the hierophant of Nature, eloquently pleading against the neglect of her worship.~~

~~The edifice of Christian philosophy lay in ruins, as we have seen, from the time of the Renaissance ; Bacou offered a partial substitute,~~

~~designed to endow man with power over nature ; it was left for Hobbes, his assistant and disciple, to make an attempt to occupy the whole of the ancient field of thought. He desired to instruct mankind as to the meee~~

~~1 Hallam.~~

~~God and themselves, to investigate the moral nature of man, and to define the forms of guidance and of conduct best suited for a being so constituted in mind and heart. His principal work was published in 1651 under the title of Leviathan. The fundamental principle from which he starts is, that every thought which can arise in the mind of man isa 'representation or appearance of some quality of a body without us, which is commonly called an object." "There is no conception," he proceeds, "in a man's mind which hath not at first, totally, or by parts, been begotten upon the organs of sense. The rest are derived from that original." The doctrine of innate ideas, and every sugges- tion that it is possible for man to obtain real knowledge otherwise than through the reports of the senses, are by this preliminary tenet rejected. He proceeds, with the utmost acuteness, and a power of close and sustained observation which is truly admirable, to analyse the more important conceptions concerning God, time, infinity, sub- stance, &c., which find a harbour within the mind. His explanations and definitions on all these heads bear, as might be expected from his primary tenet, a strong materialistic impress. He is also a nominalist ; all objects, according to him, exist singly and separately ; the only universal is the zame given to a number of objects which agree in certain given respects ; the belief in the existence of universals as zdeas he rejects, not as erroneous but as absurd ; nothing exists for him between, or besides, the object, and the human faculties perceiving and naming it. Of the belief in a God he says that "' by the visible things of this world and their admirable order a man may conceive there is a cause of them, which men call God, and yet not have an idea or image of Him in his mind." '" As God is incomprehensible, it follows that we can have no conception or image of the Deity ; and consequently all His attributes signify our inability or defect of power to conceive anything concerning his nature, and not any conception of**

the same, excepting only this, that there is a God." In spite of statements of this kind, which are obviously capable of being taken in a good sense, it has been customary to regard Hobbes as an atheist. The cause is found in the complete inadequacy of his system of morals to make good what might be wanting in his speculative tenets. It is not the omissions and one-sidedness of his metaphysics alone, but it is these, coupled with the perversious in his moral philosophy, which have affixed to his name a reputation for atheisn. The doctrine of the existence of God, even attenuated to the form which we have seen above, might have been sufficiently integrated by a sound doctrine re-specting the human conscience, the best witness for God, according to the general belief, that it is in man's power to appeal to. But when we examine Hobbes's teaching on moral matters, we find it full of paradox and absurdity. Every passion and feeling which can move the human heart is, according to him, the more or less disguised offspring of self-love. He scoffs at the very notion of free-will. The warnings of conscience are merely the fear of something disagreeable happening to ourselves, if we proceed in a particular line of conduct towards our neighbours. Justice and virtue are chimeras ; that is just which is commanded by the laws, or which a man has covenanted to do ; that is virtuous which tends to the general well-being of the com- munity in which we move.

Hobbes's views on civil society and government were first given to the world in his De Cive (1647); but this was afterwards incorporated in the Leviathan, The state of nature, he holds, is a state of war; each man has, until he is restrained, a uatural right to take everything around him for his own use; every other man has an equal right ; war is therefore inevitable. But men find that in the long-run

1579-1660.]

peace conduces to their enjoyment more than war ; they are willing, therefore, that the natural right which each possesses should be abridged, and with this end in view they enter into a covenant under which a government is set up over them, charged with maintaining peace, and attend- ing to their welfare in other ways. After this has

~~been done, the subjects cannot change their government without itsconsent. There are three possible forms of government, —monarchy, aristocracy, democracy,—in each of which the sovereign power cannot be limited or divided. He appears to have thought the limited monarchy of England a vicious form, which events had shown to be practically untenable, the division of power between sovereign and democratic assembly having led to civil war. Of the three forms he much prefers monarchy, that is, absolute monarchy. He thinks it even more important that the sovereign should not be hampered by any opposition on the part of the priesthood, than that he should not be disturbed by the democracy. Accordingly he insists that the state and the church should be the same body under different aspects, the sovereign of the one being also the supreme head and ruler of the other. The sovereign, if he be a Christian, is to determine what religious dogmas shall be taught by the clergy, and to be the judge in the last resort on questions affecting those dogmas. "This," as Mr Hallam observes, 'ig not very far removed from the doctrine of Hooker, and still less from the practice of Henry VIII."~~

~~There is ample evidence that the philosophy of Hobbes exercised a baneful influence on the morality of a large number of educated men in the last half of the 17th century. But for his love of paradox, this influence would doubtless have been still greater. In an eloquent peroration, Mr Hallam thus sums up his examination of the political and ethical writings of the philosopher of Malmesbury :—" The political system of Hobbes, like his moral system, of which, in fact, it is only a portion, sears up the heart. It takes away the sense of wrong, that has consoled the wise and good in their dangers, the proud appeal of innocence under oppression, like that of Prometheus to the elements, uttered to the witnessing world, to the coming ages, to the just ear ofheaven. It confounds the principles of moral approbation, the notions of good and ill desert, in a servile idvlatry of the monstrous leviathan it creates, and after sacrificing all right at the altar of power, denies to the Omnipotent the prerogative of dictating the laws of His own worship."?~~

~~VII. Reaction and Counter-Action, 1660-1700.—At the Restoration, the king and his personal friends, who had lived abroad during the~~

~~Commonwealth and Protectorate, brought to England a sense of fitness in things literary, and an aversion to what was grotesque and exaggerated in style, which they had picked up in the polished society of the French salons. In poetry, perhaps, no reform was needed. The prevalence of good taste and good sense, assisted by the example of Milton, who in his juvenile poems scorned to use the " new-fangled toys" of the fantastic poets, had already condemned the school which delighted in " con- ceits." There is a purity of form in the odes of Waller, in the works of Denham, and even in much that in his later years came from the pen of Cowley, which prevented ex- ception being taken to them on the score of refinement. With regard to prose style and the drama the case was different. When men looked back for twenty years and more to the theatre as it was before the troubles, and re- membered the plays of Jonson and Shirley, they felt that there was much need of a change. The gay young roué of Jonson's plays is a coarse, brutal, and insupportable personage; his "clenches" and sallies are not wit, but the~~

~~1 Literature of Europe vol. iii.~~

~~noisy outcome of a superficial cleverness, aided by a flow of animal spirits. The easy badinage and well-managed double entendre of the French comic stage were new phenomena, of which that of England had never had the least conception. Nor, in tragedy, was there any inclina- tion to return to the piled up agony—" horror on horror's head '—of the plots of Ford and Fletcher. Corneille had shown that the sentiments of honour and love in their chivalrous intensity, when exhibited as in conflict with the harsh demands of circumstance and the world, are capable of producing the finest tragic situations. Dryden's heroic plays (The Indian Emperor, The Conquest of Granada, &c.) were up to a certain point imitations of Corneille; the extent to which they are sensational and crowded with incident was a feature taken from the theatre of Spain. The verse is rhymed in imitation of his French models; and in more than one of his prefaces or essays Dryden~~

~~ably urged the claims of "his long-loved mistress, Rhyme," as an indispen- sable decoration without which the requisite weight and dignity of the tragic style could not be attained. In the article on the Drama (vol. vii. p. 434), notice has been taken of the chief works, both in tragedy and comedy, pro- duced by our dramatists between the Restoration and the end of the century. Dryden, whose power and insight grew with advancing age, recognized, after devoting himself to the heroic style for years, the superiority of Shakespeare, abandoned rhyme, and produced in 1690 his finest play Don Sebastian. But it was then too late to arrest the decay of the drama. The Dutch king who then sat on the Stuart throne, the Dntch army which had placed him there, the exultation of the Whigs and the dissenters, were all so raany indications that the Teutonic element in the English mind was again in the ascendant. And the ascendency of the Teutonic element, then still more than in previous ages, on account of the gulf which had been established between the Teutonic and Latin races by the Reformation, implied the predominance of an energy which preferred strength to grace, the useful to the beautiful, industry to art. All these impulses were of course only confirmed by the religious and moral views which are grouped under the~~

~~general name of Puritanism. The drama, therefore, being Decline~~

~~in opposition to the prevailing spirit, fell ever lower and lower ; and though momentarily uplifted, in later times, by the genius of a Goldsmith or a Sheridan, it has never regained its hold upon the nation. A modern critic las compared our drama, commencing with the Elizabethan age and ending with the present day, to a huge pyramid which stands on a broad and magnificent base, dwindles continually, and ends in nothing. Even at this day, there is still too much of the Puritan temper in general society to admit of the success of any proposal in parliament tending to the encouragement and support of the drama by the state, as a department of national culture.~~

~~The prose style of the French writers was, at the time Prose We had no Style.~~

~~of the Restoration, much superior to ours. one to oppose to Segrais, Fontenelle, Balzac, Voiture, Menage, and Bouhours, to select only the principal names among the French critics and beawx esprits. Nor was this superiority of our neighbours sensibly diminished till the next century, when Addison, Steele, and Swift redressed the balance. Yet it must be conceded to Dryden that the prose of his numerous essays, prefaces, and dedications, prefixed or subjoined to his published plays (especially the Essay on Dramatic Poesy), is incomparably more polished and more effective than any of the rude attempts at criticism which our writers had hitherto attempted. There is, how- ever, a certain wildness clinging to Dryden's style, in spite of his efforts to improve it, and in spite of his wit and. the promptitude of his vivacious intellect: one never feels quite secure against the occurrence of a solecism. Hobbes's.~~

~~Bunyan.~~

~~Hudi- bras.~~

~~Dryden.~~

~~ENGLISH~~

~~style is more unexceptionable ; he had resided much in France, and consorted with French /:terati?, and thus learned the charm of a perfectly clear and simple way of writing. Among the divines of this age there was much eloquence, much richness and force, but little good style. Nothing can be more copious than Taylor, but it is a cloying manner ; his facility of speech and coining iniagina- tion are masters of him, not he of them. Isaac Barrow, who died in his forty-seventh year in 1677, seems to be the best of them; he has more self-command than Taylor, more earnestness than South, and more dignity than Baxter. Against Tillotson's style no particular objection can be urged, except that it does not prevent his Sermons from being dull and dry.~~

~~In the Pilgrim's Progress of John Bunyan (1684) the style, without being elevated or distinguished, is plain and manly. It is of course free from pedantry, which cannot be where there is no learning; but it is~~

also free from afectations, and—almost always—from vulgarity. It is interesting to observe in this,—the most popular English work of the century,—the revival of the old allegorical way of writing which was so much relished in the age of Chaucer. Mr Hallam remarks that there is some inconsistency or defectiveness of plan; the persecution of the pilgrims in the city of Vanity, aud the adventure of the cave and the two giants, might with equal propriety, so far as the allegorical meaning is concerned, have been placed at any other stage of the pilgrimage. This is true ; but it is only saying that in these passages the tale overpowers the allegory ; considered as incidents in the tale, they could not have been better placed than where they are.

In the heyday of reaction against the hypocrisy and violence of the Puritans, it may be imagined that neither they nor their principles found any quarter. A long satire in doggerel verse, the Hudibras of Samuel Butler, one of the best second-rate poets of the day, was especially devoted to their discomfiture. The general texture of this poem is loose and careless; the versification, as a rule, too un- polished to invite to a second reading ; still there are epigrammatic couplets and sarcastic descriptions in it which will be remembered while English literature endures. Denham, best known as the author of the pretty descriptive poem of Cooper's Hill, wrote many pieces in the spirit of the reaction, which in him, as in Davenant and others, went to the length of identifying Puritanism with Christianity, and rejecting both together. Such at least seems the natural conclusion to be drawn from a perusal of Denham's strange poem entitled Zhe Progress of Learning. In Dryden's poetry the temper and policy of reaction are exhibited with great distinctness. At first, and for many years after the Restoration, his attacks are chiefly upon the political side of Puritanism; he rings the changes on "rebellion," "faction," "disobedience," and " anarchy." In Absalom and Achitophel (1681) he argues, with that skill of ratiocination in metre which never forsakes him, against the tenets of democracy and the absolute right of a majority :—

"' Nor is the people's judgment always true ; The most may err as grossly as the few." In Threnodia Augustalis he talks of "senates insolently loud;" and in the Hind and Panther (1687) cleverly presses

~~home against the clergy, who were grumbling at the arbitrary acts of James IJ., their own declared principles of “passive obedience” and “submission for conscience’ sake.” In middle life Dryden began to take a lively interest in the controversy on the grounds of religious belief ; we see him in the Religio Laici (1681) perplexing himself with the endeavour to ascertain the limits of the province of authority and that of private judgment. Waiving the question as to the entire sincerity, or rather disinterested-~~

~~ness, of his conversion, we find him, after that event, ex. emplifying the reaction against Puritanism in an extreme degree ; as he had magnified the authority of the prince in the political sphere, so now he magnifies the authority of the church in the religious sphere. The Hind and Panther, as all the world knows, is a theologico-political dialogue, disguised under a thin, avery thin veil of allegory, on some of the questions debated between the churches of Rome and England, and also on some of the political theories then in vogue.~~

~~As for the drama, the mere fact of its revival was a part of the reaction against Puritanism. In the coarse play of The Roundheads, or the Good Old Cause, by Mrs Aphra Behn, which came out shortly after the Restoration, some of the great Commonwealthsmen are exhibited on the stage, of course in an odious light. Dryden kept clear, in his dramas, of scurrilities of this kind, probably because he himself had been brought up among Puritans. In the famous play of Str Courtly Nice (1685) by Crowne, the character of tle Whig-Puritan, Mr Testimony, is a com- pound of hypocrisy, knavery, and cowardice. Yet at the time when this play was represented, the party of the counter-action, represented now by the names of Whig and dissenter, was already so strong that Crowne could say of them in his dedication to the duke of Ormond,—“ There were no living, if some great men, elevated not only in quality but understanding above the rest of the world, did not~~

~~protect us [the dramatists] from those barbarians, because they know us." After the Revolution there was a truce; the comedies of Congreve and Wycherley have Con- no political bearing. The comic stage was hardly, if at greve. all, employed for party purpuses till the reign of Queen Anne, when the strong high-church temper which prevailed in the country caused the revival of Sir Courtly Nice (1711). A few years later Cibber, in his play of the Nonjuror, imitated from Moliére's Tartufe, attacked the nonjurors and the Catholics in the interest of the Hanoverian succession. As altered by Bickersteth, the same play appeared soon afterwards with the title of 7'he Hypocrite ; here dissent is attacked in the persons of Dr Cantwell and Mawworm. .~~

~~In political philosophy the reactionary spirit was repre- sented by Sir Robert Filmer, who, in his Patriarcha (1680), argued that legitimate kings inherited the absolute power over their subjects, which he assumed Adam and the patri- archs to have possessed and exercised over their families. This doctrine was opposed by the republican Algernon Sidney, and also by Locke, whose admirable 7'reatises on Locke on Government appeared in 1688. Though not indisposed to SOV@ir admit that the monarchical constitution of existing kingdoms "°"" was originally imitated from the patriarchal rule, which in the infancy of society is known to have existed, nay, which still exists in families and clans, Locke denied that this imitation implied any devolution of right or power ; the origin of civil right he sought, like Hooker, in a contract, expressed or implied, between the governors and the governed, which bound the one to govern on certain prescribed terms, that is, according to law, and the other to obey the lawful commands of the government. It is well known that this doctrine of an original contract found its way into that celebrated state-paper, the Declaration of Rights, in which it is asserted that James Il. had " endeavoured to subvert the constitution of this kingdom, by breaking the original contract between king and people."~~

~~In other departments of literature, as well as political philosophy, the counter-action strongly asserted — itself. Milton, "on evil tongues though fallen, and evil times," Milton. knew that he should " fit audience find, though few," when at the close of life he gave his long-~~

~~promised service to the epic muse, and sang " an elaborate song to generations."~~

~~Locke's Essay,~~

~~1660-1700.]~~

~~The Paradise Lost is indisputably the work of a great and lofty mind, —-of 2 mind armed by uature with an astonish- ing moral energy, and equipped with powers of imagination and conception suitable to the charge of a vast enterprise. This is the more apparent, because the diction of the poem certainly falls below the standard of purity and evenness which the best writers of the day had reached, while the peculiar nature of his subject involved Milton in the greatest difficulties. A number of awkward and ill-sound- ing words, the use of which would fix the note of pedantry on any one else than Milton, were formed by him from the Latin, and freely employed in the Paradise Lost ; how injudiciously, the mere fact that not one of them has held its ground and come into common use is sufticient to prove. The subject,— belonging neither to history nor legend, so that details could not be supplied by: tradition, and could only be invented at the imminent risk of profaneness,—wus bafiling by its very grandeur and simplicity. It did not in itself present a sufficiency of changes and incidents to furnish out the material of a long epic composition ; hence Milton was obliged to have recourse to episodes, with which nearly half the poem is taken up. It is noteworthy how weighty and dignified a rhythm blank verse becomes iu his hands. Never, as used by him, does it even tend to be the dull, insignificant, tiresome metre which it was in the hands of later writers, ¢.g., Thomson, Young, and even Words- worth, in their negligent hours. Milton, in whose eyes the Cavaliers of the Restoration were— '* The sons Of Belial, flown with insolence and wine,"~~

~~ueither wished nor expected to be read at court. Forty years later, when counter-action had accomplished the Re- volution, and Whiggism had secured much of the ground from which its parent Puritanism had been contemptuously thrust back, Whig critics like Addison found no difficulty in gaining a hearing, when they pressed upon general society~~

~~the consideration of the surpassing claims of the Paradise Lost to the admiration of Englishmen.~~

~~In the department of history, the reaction produced, in Clarendon's [History of the Rebellion, a masterly and endur- ing work, The writers of the counter-action were also busy in this field; and Burnet's /istory of the Reformation (1679) was thought to lend so much support to Protestant and liberal principles that he received the thanks of the House of Commous for writing it.~~

~~The materialistic empiricism of Hobbes gave place in this period to what has been called the sensistic empiricism, or sensationalism, of Locke. Inasmuch as this philosopher struck two important blows at principles which the Whig- Puritans detested,—at the principle of authority, by deriving all human knowledge from experience, and at the doctrine which ascribes reality both to the accidents, or sensible qualities, of objects, and to the substances in which they are supposed to inhere, by (with Descartes) awarding mere subjectivity to accidents, and relegating substance to the region of the unknowable,—he may properly be regarded as the philosopher of the counter-action.~~

~~The first book of the Lssay on the Human Understanding (1689) is devoted to the endeavour to disprove the doctrine of innate ideas. Yet, when we proceed to examine Locke's own view of the origin of our knowledge, it would appear at first sight that he admits one source which is independent of the reports of sense. Our knowledge, he says, is made up partly of ideas of sensation, partly of ideas of reflection. These last are supplied to the mind by its own operations ; we know that we think, believe, doubt, will, love, &c. Now, if these operations were assumed to have any other basis than sensible experience, ideas of reflection might be a source of knowledge independent of the senses. But as his argument proceeds, it is evident that Locke had no such~~

~~meaning. All such mental operations, in his view, are de- pendent on the mind's having previously been supplied with ideas by the senses. " In time the mind comes to reflect on its own operations about the ideas got by sensation, and thereby stores itself with a new set of ideas, which I call ideas of reflection." This and many similar passages are decisive as to Locke's belief, that there is but one original gate of ideas, viz., the senses. The mind at birth is a tabula rasa, or, to use his own illustration, a " sheet of white paper ;" whatever knowledge it afterwards acquires is written on it by the finger of experience. This denial of a priori knowledge was not effectually confuted till the rise of Kant, near the close of the 18th century. It followed from Locke's principles that belief in revealed religion (which in his case was perfectly sincere) was simply and entirely a question of external evidence. If the evidence for the truth of the alleged fact or doctrine appeared sufficient, the mind would accept it; if not, reject it; but no principle inherent in its own constitution could be appealed to in either case to aid its judgment; for on Locke's system no such principles existed.~~

~~VIII. The Age of Queen Anne, 1700-1729.—Weary of life, Dryden had descended into the tomb; and his mantlé had fallen on no poet. Grateful for support manfully rendered when all the world was against him, he had, in some moving and musical lines, designated in Congreve the successor to his faine—~~

- ~~Let not the insulting foe my fame pursue, But shade those laurels which descend to you :" but that cold man of fashion never rose above the point which he had reached in the Mourning Bride.~~

~~was Addison, whose Campaign (1704), an heroic poem on Addison.~~

~~the battle of Blenheim, is much in the style of that portion of Dryden's Annus Jfirabilis which describes the duke of York's victory over the Dutch fleet, but is written with more care and more concentration. To the production of Cato, a tragedy which observes the rules, and aims at exhibiting the lofty grandeur and the devotion to principle cf the Roman character, Addison seems to have been in- duced partly by his protracted stay in Italy (where lus attention was engrossed)y classical monuments, and turned with indifference from medieval), partly by the~~

~~desire to win laurels in the field where Corneille and Racine had shone with such distinction, and to show that an English dramatist could be as correct as they. No other poem of note, with the single exception to which we shall presently refer, was written in the reign of Anne. The innumerable verses composed by Swift were written rather to give vent to his spleen, and exercise his misanthropic humour, than under the presence of any motive which ordinarily influ- ences poets. Parnell wrote one or two didactic pieces, and Rowe some pastoral ballads, which are not without merit.~~

~~Defoe's satirical poems, The True-Born Englishman and Defoe.~~

~~the Ode to the Pillory, possess the interest which the in- domitable character and caustic humour of the man impart to them. As a dissenter, he felt properly grateful to the Dutch prince, one of the first acts of whose reign was to establish a legal toleration, and was equally indignant with the clergymen and gentlemen of England, who, though glad to be rid of James IL., felt sore at the thought that the Re- volution was effected by foreign regiments. This feeling led to a temporary insistance in society on the fact that a man was az Englishman born ; and it is this insistance which Defoe assails with homely but effective ridicule in the True-Born Englishman. The Ode to the Pillcry was VII. —54~~

~~Pope.~~

~~Political compro- inise.~~

~~426~~

~~written while its author lay in prison, awaiting his public exposure in that "state machine en 4 Shortest Way with the Dissenters. This was an ironical pamphlet, occasioned by the disgust with which Defoe was inspired by the conduct of the wealthy dissenters in London, who occasionally conformed to the worship of the establishment in order to qualify themselves under the Test. Act for holding office. Defoe recommends the passing of an Act by which a dissenter attending a conventicle shall be made punishable by death or imprisonment for life.~~

~~Many of the clergy took the pamphlet seriously, and approved of it; when it was discovered that the advice was ironical, the exasperation against Defoe was so great that it resulted in his being condemned to pay a heavy fine and to stand in the pillory. The Ode has a nervous strength, almost dignity, of style, which can seldom be asserted of the writings of Defoe. Referring to this incident, Pope, whose Catholic rearing made him detest the abettor of the Revolution and the champion of William of' Orange, wrote in tho Dunciad—~~

~~" Karless on high stands unabash'd Defoe"—~~

~~though he knew that the sentence to the pillory had long ceased to entail the loss of ears.~~

~~The exceptionally remarkable poem to which reference was made in the last paragraph was Pope's Hssay on Criticism, which appeared in 1711. Of all such poems~~

~~the Ars Poetica of Horace is the original model—a model, | it may be added, which has never been surpassed. The |~~

~~classical taste, and the desire to conform to the ancient rules, which had obtained a complete ascendency in the literary circles of France during the reign of Louis XIV., were now almost equally prevalent in England. Boileau's Epttre sur ? Art Poetique, and the critical writings of Bossu, Bouhours, Dacier, and Sarasin, led to the appearance in England of such works as Roscommon's Lssay on Translated Verse, Sheffield's two Zssays, on satire and on poetry, and the critical attempts, in prose, of Rymer and Dennis. The receptivity and power of Pope's intellect were naturally employed at an early period of his career on a line of thought, in literature and art, which interested so many able minds, and was, so to speak, in the air. He lays down in the Hssay rules for the guidance of critics in judging, which, he contends, they are as much bound to observe as poets are to follow the rules of art in writing. The acuteness of observation, the terseness of definition, the brilliance of wit, and the keenness of polished invective~~

~~which distinguish the Hssay, render it, though containing .~~

~~little that is absolutely new, a composition of which English literature may well be proud.~~

~~But the chief literary achievements of this period were expressed in prose. Prose is the medium which befits the seculum rationalisticum which is now opening, an age in which men do not trouble themselves about new ideas, but reason and debate upon those which have been already manifested. Ideas possess themselves of the whole man, and impel him to remodel his life in accordance with them. The idea of the theocratic republic, growing into distinct shape in the minds of Milton, Cromwell, and other Puritans, drove them to march throngh war, regicide, and revolution towards its accomplishment. The idea of hereditary monarchy, ruling by virtue of a right of which the origin is lost in the mists of a venerable antiquity, and is therefore assumed to be divine, animated the Jacobites of 1700, as it animates the French legitimists of our own day. But neither of these two ideas had, after turning England upside down, succeeded in establishing itself ; the country had acquiesced perforce in a compromise. The partisans of the theocratic republic were forced to put up with king, constitution, law, and an Erastian church; never-~~

~~" for having written Zhe |~~

~~theless they were tolerated, and even allowed to write and preach what they pleased, so long as they did not openly advocate sedition. The partisans of hereditary monarchy were forced to accept a king, and then a queen, and then a whole dynasty, whose rights had no older or more sacred origin than the Acts of Settlement of 1689 and 1701 ; still some deference was paid to their cherished sentiments, inasmuch as the new stock of royalty was not sought from an alien tree, but was a scion, though not the legitimate scion, growing from the old Stuart trunk. With this make- shift English loyalty was fain to be content. Thus on both sides the consistent theorists, the men of an idea, were discountenanced ; and the v/a media in politics and religion, since it~~

~~seemed to be the only practicable path, was more and more frequented by men of sense. Then a host of reasoners and debaters arose, bent upon showing, not that the compromises were logically sound, which they could not do, but that the extremists were dangerous foois. Moreover, since the compromise might be held and viewed from opposite sides, endless debate was possible, and actually arose, as to the right way of viewing it, whether mainly as a concession to liberty and democracy, or mainly as the guarantee of order and conservatism. In contests of this kind the pens of many able writers were engaged in the reign of Anne; we may mention in particular Swift, Steele, Addison, and Arbuthnot. We will briefly examine their chief performances, first in general literature and then in theology and philosophy.~~

~~Swift, appointed to the deanery of St Patrick's in 1713, swift,~~

~~was generally believed to have no faith in revealed religion, but to adhere to what we have called "the compromise " for the sake of what he could get by it. On the night before his installation, a copy of verses was affixed to the door of St Patrick's cathedral, containing these amongst~~

~~other lines :— "This place he got by wit and rhyme, And other ways most odd; And might a bishop be,—in time, Did he believe in God."~~

~~"¢ Look down, St Patrick, look, we pray,~~

~~On this thy church and steeple ; Convert thy dean on this great day, Orelse, God help the people." This reputation for unbelief was acquired through the publication of Zhe Tale of a Tub (1704), in which Switt employed the unequalled resources of his scornful wit in satirizing the extreme parties, the consistent doctrines, which the Revolution had discomfited. In the celebrated apologue of Peter, Martin, and Jack (by whom we may either understand Catholicism, Lutheranism, and Calvinism, or the Church of Rome, that of England, and the Puritans), it is hard to say whether the assault on Peter's kuavery and mendacity, or on Jack's fanatical folly, be thermore un- sparing, Of Martin, who represents rational religion, moderation, common-sense,—in a word, the compromise, — Swift has only expressions of approval, But we~~

~~know that what men feel to be acompromise, they cannot heartily love ; and it is therefore only in conformity with what we should expect, to find that for every page given to the commendation of Martin, at least twenty are employed in reviling Peter or ridiculing Jack. Hence the general effect of the work as a whole is that of an attack on Christianity ; and on this account its perusal was much recommended by Voltaire.~~

~~But there were other upholders of "the compromise " who had nothing of Swift's cynical temper, nay, who were conspicuously warm-hearted, eager, and generous. Such a man was the Irishman Richard Steele. been descended from one of those Cromwellian adventurers who were rewarded for their services to the Puritan~~

~~He seems to have Steele.~~

~~The Spec- tator.~~

~~1700-1729.]~~

~~commonwealth by grants of land at the expense of the Irish. It was natural, therefore, that his political sympathies should be of an Orange hue, and that he should regard William ITI. as the greatest of dcliverers, the most benefi- cent of conquerors. For, but for the battle of the Boyne, it cannot be doubted that the confiscations of previous reigns would have been in great measure reversed, and the native Irish resettled on their own soil; in which case families of English origin and of recent importation, like that of Steele, would have fared but badly. Hence in his Christian Hero (1701), written while he was in the army, and again in the Tatler, Steele launches forth into glowing panegyrics on his Dutch hero, which would have satisfied Lord Macaulay himself. The foundations being secure, Steele, whose cducation was English (he was at the Charterhouse and at Oxford along with Addison), employed his voluble argumentative tongue and his racy Hibernian humour to improve the superstructure. Mild reasoning, gentle ridicule, harmless banter, might, he thought, be used with effect to assuage the rancour of old animosities, soften the asperity of party spirit, expose the weak side of vanity, and introduce a temper of ' sweet reasonableness " into all social relations. Availing himself of the advantages which his position as~~

~~conductor of the Government Gazette gave him for obtaining early news, Steele started the Zatler in 1709, with the view of enter- taining with instructive and amusing gossip the readers whom the promise of news from the seat of war had already attracted. 'The imaginary editor, Isaac Bickerstaff (the name was borrowed from Swift, who had employed it in his ironical controversy with Partridge the almanac-maker), dates his communications from various coffee-houses according to their subject matter. Addison, who was at the time in Ireland, soon discovered the authorship of the Tatler, and was enlisted with joy by Steele as a contributor.~~

~~It was succeeded by the Spectator (1711-1713), planned |~~

~~by the two friends in concert, with the same general objects as the Tatler, but with better machinery. Almost at the opening, in No. 3, Addison wrote a clever vindication of the revolution-compromise, which the Jacobite leanings of some among the ministry appeared at the time to place in jeopardy. With this exception, political questions are scarcely mentioned by the Spectator, who in his character of a mild censor of manners, " pietate gravis ac meritis," affects to stand aloof from the strife of party, and by ex- postulation and advice, undertakes to reform society. "The Tatler and Spectator were published," says Dr Johnson, 'at a time when two parties, loud, restless, and violent, each with plausible declarations, and each perhaps without any distinct termination of its views, were agitat- ing the nation; to minds heated with political contest they supplied cooler and more inoffensive reflexions: and it is said by Addison that they had a perceptible influence upon the conversation of that time, and taught the frolic and the gay to unite merriment with decency." By turning to fresh intellectual fields the minds of the upper classes—the people in good society—to whom the theatre was now a forbidden or despised excitement, Addison and Steele did without doubt allay much restless- ness, still or amuse many: feverish longings. Its ideals discredited or found impracticable, the English mind, dis- enchanted and in heavy cheer, took up with languid in- terest these pleasant chatty discoursings about things in general, and allowed itself to be amused, and half forgot its spiritual perplexities. Nothing was settled by these papers, nothing~~

~~really probed to the bottom ; but they taught, with much light grace and humour, lessons of good sense and mutual tolerance ; and their popularity proved that the lesson was relished. 'The characterization which we meet with in the Spectator has been justly admired. Sir Roger~~

~~6 0 eee~~

~~clearest and most systematic manner.~~

~~de Coverley is an excellent type of the English country gentleman of that day—unintelligent and full of prejudices, but manly, open-hearted, and conscientious. The mercan- tile classes are represented, less adequately, yet in a digni- fied and attractive manner, by Sir Andrew [Freeport. Captain Sentry, as the representative of the army, is not so satisfactory ; compare him with Uncle Toby and Corporal Trim in Sterne's 7ristram Shandy and the contrast between a dull, wooden figure, and personages who bring the life of~~

~~| the British army in Flanders exactly and vividly before our~~

~~eyes, is immediately apparent.~~

~~The theological controversies of the period were carried on chiefly between deists and churchmen on the one hand, and non-jurors and oath-takers on the other. There will always be able men to whom revealed religion will not com- mend itself, because demonstration of its truth is in the nature of things impossible, and the portal through which conviction must be reached is too lowly for many to enter. In this age of reasoning, the English writers who followed Hobbes in eliminating the supernatural from Christianity considered it to be their duty to exhibit their proofs in the Thus arose the English school of English deists. Toland, the author of a good life Deists. of Milton, led the way with Christianity not Mysterious (1702). Tindal followed with Christianity as Old as the~~

~~| Creation, in which an attempt is made to identify Christ~~

~~with Crishna, and to evaporate the Christian religion into a solar myth. Collins, in his Discourse on Iree-Thinking, took the line of impugning the trustworthiness of the text of Scripture. He was answered by Dr Richard Bentley in~~

~~a tract called Phileleutherus Lipsiensis, in which it is main- | tained that the text of the Greek Testanient is on the whole~~

~~in a sounder state than that of any of.the Greek classical authors. Berkeley combated free-thinking in the philo- sophical dialogue of Alciphron, Bishop Butler, and after- wards Warburton, contributed important works to the same controversy.~~

~~In philosophy the trains of thought which Hobbes and Leibnitz had pursued were either further developed, or led to opposing reactions. Hobbes's selfish theory of morals, and his disposition to leave out the idea of God from his system of the universe, found-resolute opponents, not only in Clarke and Berkeley, but also in Shaftesbury, the noble author of the Characteristics. The treatises composing this work were published at various times between 1708 and 1713. Shaftesbury maintains the disinterested theory of Shaftes- morals, but rather in a rhetorical way than with much bwy. solidity of argument; he derives virtue, beneficence, and compassion, not, as Hobbes had in each case done, from a source tainted by self-interest, but from the delight which the mind naturally takes in actions and feelings conform- able to its own unperverted nature. In his general reason- ings on the constitution of nature and of man, Shaftesbury is an optimist; but his optimism acquires its serenity at the cost of surrendering the distinction between good and evil, virtue and vice. Like Pope (who, indeed, in the Hssay on Man, versified and condensed freely the glowing rhetoric of the Characteristics), Shaftesbury~~

~~'¢ Accounts for moral as for natural things :"~~

~~the Deity whom he celebrates in eloquent periods is not a being who hates moral evil while permitting it, but one from whose elevated point~~

of view that which seems to us worthy of reprobation must appear as necessary to the working out of a vast scheme of paternal government. These views bear a considerable resemblance to the hypothesis more cautiously put forward by the late Professor Mansell, and at once combated by Mr Mill and Professor Goldwin Smith, which suggested that man's ideas of justice and injustice, right and wrong, were per-

Berke- ley.

Defoe.

haps entirely different in kind from. those which existed in the mind of God. It is obvions that the Supreme Being of the Characteristics, in whose eyes the excesses of the Reign of Terror would be merely a hurricane purifying the moral atmosphere, and who would see " with equal eye

'* A hero perish or a sparrow fall '—

has little in common with the God of the New Testament, whose absolute rejection of iniquity is the very basis on which revealed religion is built, and in whose eyes the least of his reasonable creatures is "of more value than many sparrows." This dissonance between Christianity and his own system was evident to Shaftesbury himself, and led him to speak disrespectfully of the former in various places of his writings. He is accordingly classed by Leland among deistical writers. Pope, less clear- sighted, would not admit that the philosophy of the Lssay on Man (which is precisely the same as that of Shaftesbury) was in any way repugnant to Christianity ; and Warburton argued laboriously on the same side. Nevertheless, in his Universal Prayer, Pope implicitly retracted the main tenet of the longer poem ; and posterity has held that Crousaz, the assailant of the Zssay, understood its real bearing better than Warburton its defender.

Disturbed at the thought of the predominance which the spread of Locke's sensationalist philosophy might be expected to give to the

~~material interests of man, yet not choosing to revert to any of the old systems which let in the principle of authority, Berkeley conceived the strange idea of denying the validity of the inferences made by every perceiving mind concerning the objects perceived. He denied the existence of matter, or material substance, which is merely the name given by philosophers to the "something" which underlies and supports the sensible qualities of an object. The objects themselves, he admitted, are real; the ideas which the mind forms concerning them are also real; moreover, these ideas constitute for man the sole road to the knowledge of the objects. Instead of holding with Locke that the objects, by the impressions which they make on the senses, engender ideas, he held that the ideas implanted by the Creator in the human mind teach it all that it can possibly know about the objects. This ideal philosophy, having a merely subjective base—growing neither out of tradition nor experience—might obviously be twisted to the vindication of any system of opinions what- ever. Hume, therefore, as we shall see in the next section, had not much difficulty in reducing it ad absurdum, by de- veloping further the sceptical theory from which it started.~~

~~In France and Spain, Lesage and Lazarillo de Tormes had already won laurels by writing humorous tales of fiction in prose. Defoe, with us, was the first of a series in which he has had so many brilliant successors, by com- posing Lobinson Crusoe (1719). Many other fictitious tales, in all which he aimed at the appearance of being a truthful narrator of facts, followed from the same facile pen. But in the texture of these, as in the mind that produced them, there was something coarse and homely ; they could not supplant for refined readers the high-flown romances of France. That was reserved for the sentimental novels of Richardson ; stmelia similibus curantur.~~

~~IX. The Triumph of Compromise, 1729-1789.—In the early part of this period, Pope, who died in 1744, was still the great literary force; for most of the remainder of it, that honour belonged to Samuel Johnson. Nothing can more strongly demonstrate the vitality of the political prin- ciples which triumphed at the Revolution than the fact that both these great men, though in secret they abhorred the compromise, had~~

~~no choice but to acquiesce init. Pope, whose grounds of dislike were both religious and political,~~

~~ENGLISH LITERATURES~~

~~[GEORGIAN.~~

~~indemnified himself for his acquiescence by many a scornful gibe and bitter sarcasm levelled at the German family which had seated itself on the Stuart throne. Witness the mock- ing adulation of the opening lines of the epistle to Augustus (George II.), or the scathing satire with which he pursued the memory of Queen Caroline both in the Dunciad and the Epilogue to the Satvres, though he knew, and even admitted in a note, that that princess in her last moments 'manifested the utmost courage and resolution." Johnson, whose objection to the compromise was almost wholly political, was an arrant Jacobite in feeling to the end of his days. One of his earliest productions, the Marmor Norfolciense, is a clever and cutting Jacobite squib. Allu- sions in his satire of London (1738) show the same political colour, and probably had much to do with the sympathizing approval which Pope expressed for the unknown poet, who, he said, would soon be detervé. And although, after he had accepted a pension from George III., he conld not decently, as he smilingly admitted to Boswell, ' drink King James's health in the wine that King George gave him the money to pay for," yet the old feeling lurked in his mind, and found violent expression in a recorded conversa- tion as late as 1777. " He had this evening. ....a violent argument with Dr Taylor as to the inclinations of the people of England at this time towards the royal family of Stuart. He grew so outrageous as to say that, 'if England were fairly polled, the present king would be sent away to-night, and his adherents hanged to-morrow.' "~~

~~But, in general, the compromise met with inward no less than outward assent on the part of all the leading minds of the nation, literary men and divines equally with statesmen, For the first part of the period, the resolute common sense of Walpole, and the moderate churchmanship of Warburton, accurately represented the English mind. 'The detect of a compromise is, aS was said in the last section, that it does not kindle enthusiasm ; under it politics and politicians are apt to grow dull and~~

~~vapid. Such a state of things pre- vailed at the time of the rising of 1745, when the young Pretender was not very far from succeeding, from sheer inertness on the part of those concerned in upholding the Revolution settlement. Soon afterwards there was a change. Young men grew up, before whose eyes floated visions of an expanding empire ; the rapid advance of the American colonies, the success of Englishmen in India, on both which fields France was then our rival, stimulated the genius of the elder Pitt, and furnished themes for the eloquence of Burke. Then the value of those principles of political liberty which had been consolidated at the Revolution came to be understood. Through these Pitt achieved in the Seven Years' War his memorable triumph over the abso- lute monarchies of France and Spain; and at the Peace of Paris (1763) England stood at the greatest height of national glory which is recorded in her history. Yet the brilliant scene was soon overcast. A Toryism without ideas, which was but in fact the portion of Revolution- Whiggism which refused to move with the times, aided by the personal influence of a narrow-minded, illiberal king, got possession of the administration, and immediately everything went wrong. The American war succeeded, and neither the authority of Chatham nor the enlightenment of Burke and Wyndham could prevent its ending in disaster. Soon after the Peace of Versailles the younger Pitt, then a sincere Whig, came into power. He applied himself with great skill and industry to the work of binding firmly together that inheritance of empire, —still sufficiently ample, —which the peace had left us, when in the middle of his task he was suddenly confronted by the portentous outbreak of the French revolution.~~

~~This period witnessed the foundation of the science of political economy by: Adam Smith, whose memorable~~

~~Adam S.nith,~~

~~Cowper.~~

~~Burns,~~

~~1729 -1789,]~~

~~Inquiry into the Nature and Causes of the Wealth of~~

~~Nations appeared in 1776. It also produced several~~

~~eminent historians and philosophers, of whose works some~~

~~notice will be taken presently. In other departments of literature, after the death of Pope, it was but poorly distin- guished. Gray will be long remembered for the beauty and melody of some of his pieces,—the Hlegy in a Country Churchyard, the Bard, and the Progress of Poesy. Inthe elegant poems of Goldsmith occur passages of sentiment, e.g., the famous lines " Il] fares the land," &c., which read like anticipations of Rousseau. The satires of Churchill, though vigorous and pointed, are founded upon no intelli- gible principle; they have no universal character, like those of Pope, nor do they represent any definite political or religious view; rather they are dictated by mere national prejudice (e.g., the Prophecy of Famine, a tirade against the Scotch), or by vulgar partisanship,—the eternal animosity of the outs against the ins. The Rosciad was a satire upon a stage sunk so low as not to be worth satirizing. There is much sweetness and grace in the verses of Shenstone; they formed part of the intellectual food which nourished the strong soul of Burns. Collins's Ode to the Passions, so much praised by our grandfathers, is gradually passing out of ken. The Wight Thoughts of Young demand our notice, as the work of a man of large intellectual capacity, though of ignoble character. His meditations, though they never pass into the mystical or transcendental stage, are just and edifying; in applying them he displays a rich sermoniziug vein; but a flavour of cant hangs about his most ambitious efforts. Beattie's Minstrel, a poem in the Spenserian stanza, deserves a passing word of commendation ; it unites manly dignity to refinement and delicacy of feeling. Cowper, ever on the brink of insanity, resorted to literature in order to prevent his mind from preying on itself. An amiable piety makes his Zask, a long moralizing poem in blank verse, attractive to many minds; from the mere literary point of view, it must be allowed to be a feeble production. As he gained more confidence in himself, he developed a curious sort of mild feline humour, which appears in tle delightful ballad of John Gilpin, and in several shorter pieces. The~~

strength which had been wanting all his life came to him near its close, and inspired him to write those stanzas of wondrous majesty and beauty which have the title of Zhe Castaway ; —unhappily it was the strength of spiritual despair.

| Beyond the Tweed, as Johnson was sinking towards the grave, and when the voice of English poetry had almost ceased to sound, a man of genius was coming to maturity, whose direct and impassioned utterances, straight from tlie heart of nature, were to reduce the frigid imitators of Pope to their proper insignificance, to startle the dull worshippers of the conventional, and to prepare the English-speaking world for that general break-up of formulas which the tempest of the French Revolution was about to initiate. Robert Burns was a native force; no foreign literature moulded him, no influence of Continental thought either made or marred him. He had the education of a Scottish peasant, and his self-culture does not appear to have con- sisted in much more than reading Pope and Shenstone, the Spectator, Sterne's novels, and a few other popular books. His natural powers were of the finest and highest order. Truly writes his countryman, the late Professor Craik : "Burns's head was as strong as lis heart; his natural sagacity, logical faculty, and judgment were of the first order; no man, of poetical or prosaic temperament, ever had a more substantial intellectual character." The man being such, and such the equipment with which education and circumstance had furnished him, we observe with in- terest that he came into serious collision, on becoming com- plete master of his powers, with the religious system,—that

of the Presbyterian Kirk of Scotland,—in which he had been brought up. It neither awed, nor attracted, nor con- vinced him. He never wrote more powerfully, or with a more searching humour, than when employed in exposing the hypocrisy and fanaticism of certain of its ministers.) If he had friends among them, it was among the "' Moderates," a party corresponding to the Broad Church clergy of the present day, whom their colleagues in the Presbyterian ministry

~~regarded with undisguised abhorrence. Religion, therefore, established no control over him 3 and unhappily this splendid nature found no resource in philo- sophy, nor moral strength within, which could avail to save him from the tyranny of his passions, " Vina, Venus,"— two out of the three banes spoken of by the Roman epigrammatist,— undermined too soon that stalwart frame, and silvered that glorious head. He died in his thirty- seventh year in 1796, leaving behind him, besides a few longer pieces, more than 200 songs, among which may be found gems of pathos, melody, and beauty, which any nation might be proud to wear in its intellectual coronet.~~

~~In the history of the drama during this period, the most he noteworthy feature is the return of Shakespeare to the stage, drama, brought about, soon after the middle of the century, by the reverent zeal of Garrick. When Drury Lane theatre was opened in 1747, chiefly for the performance of Shakespeare's plays, Johnson wrote the celebrated Prologue which was delivered on the occasion, describing the great dramatist as "exhausting worlds and then imagining new," as spurning the " bounded reign" of real existence, and forcing time to "pant after him in vain." Comedy, no longer gross, had become commonplace. From this reproach the two admir- able plays of Goldsmith, She Stoops to Conquer aud The Good-Natured Man, temporarily freed it; nor could it be justly imputed during the period of Sheridan's connection Sheri- with the stage, from 1775 to 1780. But the wit that dan. blazes,— the fun that sparkles,in the scenes of the fivals and the Critic, are of no purely English growth. Sheridan's Irish birth and Celtic temperament must be largely credited with the brightness and permanent attrac tiveness of his plays.~~

~~Prose fiction, which more and more came to supply that kind of intellectual distraction which had before been sought in the drama, and, aided by the printing press, to diffuse its blessings (if they are blessings) to strata of the population which the drama had never reached, was employed in this period by several writers of rare ability. Fielding's Z'om Jones and Amelia, Richardson's Clarissa Marlowe and Sir Charles Grandison, made the same kind of stir in general society that had been caused by Dryden's heroic plays some eighty years~~

~~before. An ingenious French critic (Philaréte Chasles) has attempted to trece in the works of these writers the conflict, though much trans- formed, of the Puritans and Cavaliers of an earlier age. Lovelace, he thinks, represents the insolent temper and disregard for morality of the aristocratic Cavaliers ; Clarissa, his victim, the daughter of a virtuous middle class family, exhibits the substantial rectitude of that " good old cause," which licentious courts could persecute but could not sub- due. Fielding, the aristocrat, recalls and continues the jovial recklessness of the men of the Restoration ; Richardson, the plebeian, is in the line of Milton, Penn, Fox, Bunyan, and other witnesses. Yet these resemblances are after all superficial. It is true that Fielding cannot help writing like a gentleman, and a meniber of an ancient house ; while Richardson, though he is fond of giving titles to his characters, betrays perhaps by his sercousness his breeding among the upper and most respectable classes of the proletariate. But when we look more closely, we find~~

~~1 "Holy Willie's Prayer," 'The Holy Fair," &c.~~

~~that both Fielding and Richardson adhere firmly to the Re- volution- compromise, both in religion and politics, —and the one quite as much as the other. Fielding is as zealous a Protestant as Bunyan or Baxter; and the doctrine of non- resistance was rejected by him as warmly as by the Whig prosecutors of Sacheverell. Richardson, again, is neither a republican nor a nonconformist. He finds no objection, on the score of tolerance and latitude, to the church of Burmet, Tillotson, and Hoadly; and the hereditary presidency which the Act of Settlement had vested in the Hanoverian family was too feeble and inoffensive to excite in the breast of the most zealous of Whigs fears of the pre- ponderance of the regal power in the constitution. Both Richardson and Fielding are entirely satisfied with the political and religious constitution of the land they live in. Dismissing such fancies, let us consider what were the actual occasions which led to the production of Pamela and the novels which followed it, and in what relation they stand to preceding literary~~

~~work. 'They were in the main at once the symptoms and the developing causes of a reac- tion against the sentimental romances with which ladies and gentlemen had stuffed their heads and beguiled their time in the 17th and in the early part of the 18th century. A list of the chief works of this kind of literature is to be found in Addison's amusing paper on Leonora's library (Spectator, No. 37); it includes Sidney's Arcadia, the Grand Cyrus, Cassandra, Pharamond, Cleopatra, &c., the works named being all translations from the French romances of Scudery and Calprenéde. The excessive popularity of this kind of reading is intimated by Addison when he says (No. 92), adverting to letters which he has received in relation to his project of forming a perfect '"lady's library," that he has been "advised to place Pharamond at the head of his catalogue, and, if he thinks proper, to give the second place to Cassandra." In the character of Leonora herself, Addison mildly ridicules the sentimentality, affecta- tion, and unreality which such reading, carried to excess, engenders. Richardson, whose father was a Derbyshire joiner, and who was brought up to the trade of a printer, in which he persevered all his life and prospered, had reached his fiftieth year when he was requested by two London booksellers to write for publication a series of familiar Letters, for the instruction of persons who did not know how to express themselves properly in writing about the ordinary affairs of life. He consented, but pro- posed to give a moral and improving turn to the instruction to be communicated ; to this the booksellers at once agreed. While he was writing model letters giving advice to young women going out to service, tle incidents of a story which had come within his own experience occurred to his mind. It seemed to him that this story, if told by way of letters, "in an easy and natural manner, suitable to the simplicity of it, might possibly introduce a new species of writing that might turn young people into a course of reading different from the pomp and parade of romance writing, and, dismissing the improbable and marvellous, with which novels generally abound, might tend to promote the cause of religion and virtue." The heroine of his tale was a simple country girl, without book-learning, but strong in virtue and honesty of heart, to whom he gave the name Pamela (one of the two princesses in Siduey's Arcadia), as if to show that, to quote from Emerson, " the life of man is the true romance, which, if it be valiantly~~

~~conducted, will yield the imagination a higher charm than any fiction." Pamela's virtue is assailed by the young libertine in whose house she is living as a servant; she resists him, and her~~

~~virtue" is "rewarded" (this is the second title of the book) by the honour and glory of marriage with this repro- bate, who, being a fine gentleman, and stooping to a union with a "lass of low degree," atones for all past shortcomings~~

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~~[GEORGIAN.~~

~~by this amazing condescension. The book was well reccived ; Pope, thin declining towards the tomb, praised it as "likely to do more good than twenty volumes of sermons." There was, however, astrain of vulgarity in the manner in which the catastrophe of tlis romance of real life was narrated ; and this defect was noted by the eagle eye of Fielding. (1742) the Adventures of Joseph Andrews. Joseph is a virtuous footman who resists tlic improper advances of the titled lady in whose service he is ; this of course was mere jest and caricature; in the end Joseph, instead of, like Pamela, marrying out of his condition, is wedded, as common sense would dictate, to a pretty modest girl of his own rank. The bent of his own powers, and tlie suitable- ness of this new field for their employment, must have been revealed to Fielding while writing Joseph Andrews, Till now it had been his ambition to shine as a dramatist, and he had produced some plays of no inconsiderable merit ; but soon after the appearance of his first novel he quitted the stage and gave up the remainder of his life, so far as it was not engrossed by the duties of a zealous police magistrate, partly to the production of essays on social topics, partly to novel-writing. Zom Jones (1749) is allowed to be his master-piece ; it is one of the finest pieces of character-painting to be found in the whole range of literature. Yet it must be understood that Fielding's char- acters belong to a social medium from which the ideal and the heroic are shut out by the conditions of its existence ; the "compromise" which England had accepted repressed enthusiasm and a high strain of virtue in every direction ; no creations, therefore, possessing the imniortal interest of some of those in Don Quixote could~~

~~be expected from him who has been sometimes called the "English Cervantes." But taking them as they are, the characters of Tom Jones and Blifil, of Thwackum and Square, present us with inimitable types. Tom Jones, as the generous, manly youth, whom passion hurries into vice, but good feeling and innate rectitude never fail to rescue, is contrasted with the artful hypocrite Blifil, whose outward demeanour pays a homage to virtue which his secret practices and desires undo. Thwackum, the pedagogue, shows what comes of a pedantic learning which has nothing of the largeness of true culture; Square, the thinker, exhibits the moral decadence that results from a grovelling philosophy. In 1748 Richardson published Clarissa Harlowe, aud in 1753 Sir Charles Grandison ; both these novels are in the epistolary form. Clarissa soon obtained a European repu- tation, the sentimental metaphysics which constitute so large a portion of it being exactly to the taste of a large number of readers in France and Switzerland. Rousseau adopted the style, while corrupting the principles, of the English author, when he wrote his Vouvelle Helovse. The casuistry of love and seduction is interminable ; so also is the novel of Clarissa; yet perhaps no reader who had launched fairly into it ever put the book down unfinished. It excites a deep tragic interest which no formal tragedy produced in England had awakened for several generations ; the noble Clarissa, dying because she cannot brook a stain which yet touched not her will, nor came near her con- science, is a spectacle pathetic and touching in the extreme. The chivalrous, but provokingly perfect, Sir Charles Grandison was tlie character created by Richardson as a kind of contrast to, and compensation for, the aristocratic villain, Lovelace. His embarrassing situation between two lovely women who both adore him, and both of whom he loves, the English Harriet and the Italian Clementina,— though in the brief telling it seems absurd,—is managed in the novel with so much art and vraisemblance as to inspire the reader during seven volumes with a genuine perplexity and solicitude. His abrupt half-declaration to Harriet—~~

~~As a burlesque upon Pamela, he wrote Fielding,~~

~~Smollett.~~

~~Sterne.~~

~~History.~~

~~Hume,~~

~~1729-1789.]~~

~~“ Honour forbids me; yet honour bids me ;—yet I cannot be unjust, ungenerous, selfish |!”—is a delicious morceau which can never fail to captivate, and fill with attendrisse- ment, souls of sensibility. After Richardson and Fielding came Smollett, with his Roderick Random and Humphrey Clinker, novels of coarser mould, and Sterne with Zristram Shandy and the Sentimental Journey. As works of humour, which contain also several admirable and minutely drawn pictures of character, the two last-named works, or at any rate Zrustram Shandy, stand alone in our literature ; but they are not in the proper sense of the term novels. It is interesting to note that Sheridan borrowed some of his most popular characters from the novelists; Charles and Josepli Surface are evident copies of Tom Jones and Blifil; while Tabitha Bramble and Sir Ulic Mackilligut are no less manifestly the originals of Mrs Malaprop and Sir Lucius O’Trigger. These are not the only resemblances; in fact Humphrey Clinker is the mine out of which Sheridan dug The Rivals. Nothing was more common, in the drama of the Elizabethan age, than for the play-wrights to take their plots from novels. But in the present case we note a difference in the mode of procedure, which is a marked tes- timony to the increased relative importance of the novel. The Elizabethan dramatists borrowed only names and incidents ; they created their characters. The Georgian dramatists often borrowed their characters ready made from the pages of the novels, now glowing with a warmer life and richer colouring than their own. To the novels already mentioned Goldsmith’s Vicar of Wakefield (1766) must be added,—the book which first drew CGoethe’s attention to English literature, and disclosed the hitherto unsuspected ulyllic side of the existence of the good Protestant village pastor. To pass over inferior writers (Frances Burney, Henry Mackenzie, &c.), enough has been said to show that England, after the middle of the 18th century, obtained a school of novel-writers of her~~

~~own, and shook herself free from the trammels alike of French classicism and French romanticism ; nor have the able writers who then came into prominence ever wanted worthy successors down to the present day.~~

~~The luminous intellect of Voltaire had, in the Assai sur les Moewrs, cast a fresh light on history, which was soon reflected in the writings of English students in this field. In the preface to the Hssai, Voltaire said that the question was no longer to inform the world 'in what year a prince who did not deserve to be remembered succeeded another barbarian like himself, in the midst of a rude and coarse nation." Henceforth it would be the business of a historian to seek out, amidst the throng of recorded events, "that which deserves to be known by us, —the spirit, the manners, the usages of the principal nations." Not believ- ing in Christianity, and looking to intellectual and literary culture as the great means of human progress, Voltaire naturally regarded the history of the first ten centuries of our era as "no more deserving of being known than the history of the wolves and the bears;" feudalism and the Middle Ages filled him with disgust ; it was only when he came to the Renaissance, with its revival of learning, its tolerance of theological differences, and its love of polish, that he seemed to find anything worth writing a history about. Hume, composing a //istory of England (1754) under the influence of ideas not very dissimilar to those of Voltaire, and commencing with the Stuart period, was not likely to write favourably of the Puritans, who were neither tolerant nor polished. His work accordingly gave much offence to the Whig party, which had inherited the political tradi- tions of Puritanism. Robertson's historical pictures,—of Scotland, of Charles V., and of the settlement of America, —did not, except incidentally, go back beyond the period**

~~of the Renaissance ; the actions of men who lived before |~~

~~that age seemed to him scarcely ona par with the " dignity of history." the Roman Empire, is designed to trace the gradual political debilitation of the empire, and the extinction of letters and arts through the ravages of the barbarians ; thence passing with a firm and vigorous step through the long night of bar- barism he dilates with eloquence and delight on the story of the rekindling of tle flame of learning, and the renewed ap- preciation of beauty and refinement, which characterized the Italian Renaissance of the 14th and 15thcenturies. We see that the historians of the 18th century, our own among the number, regarded the early and middle ages of our era as the province of the antiquary and the annalist rather than the historian proper,— who, if he dealt with them at all, should despatch them in brief summaries, in which, assum- ing an air of great superiority, he should try the men of the Yth or any other early century by the prevalent ideas of the eighteenth. Obviously, in the age in which we live, we have "changed all that ;" the age of the Renaissance no longer presents itself to our eyes with such an over- powering lustre ; and research into the motives and cast of thought of a Charlemagne or a Henry II. seems to us no longer beneath the "dignity of history."~~

~~In theology, one very remarkable work belongs to this Butler.~~

~~period,—Butler's Analogy of Leligion to the Constitution and Course of Nature (1736). This is an apologetic work, and may perhaps be regarded as the last word in the deistical controversy. Butler, whose caution and fairness of mind are truly admirable, and who does not pretend that the inquiry which he institutes leads to more than probable conclusions, argues in this work that it is just as difficult to believe nature to have proceeded from and to be ruled by God, as to admit that Christianity has a divine origin. This line of reasoning, though cogent as against the deists, most of whom admitted a divine author of nature, is obviously insufficient to meet the scepticism of the present day, which, embracing the theory of evolution, either rejects the belief in a First Cause altogether, or declines to examine it, as lying beyond the scope of thie human faculties. The Sermons of Bishop Butler, in which he established against Hobbes the fact of the existence in the human mind of disinterested affections and dispositions pointing~~

~~to the good of others, belongs rather to the depart- ment of philosophy than that of theology.~~

~~The philosophical speculations of this period may be Philo- described as a series of oscillations round Locke's "ssay of S°PhY-~~

~~the Human Understanding,—Hume taking Locke's prin- ciples, and turning them into a theory of scepticism; Hutche- son starting the theory of a new "sense" never dreamed of before, the moral sense ; Hartley and Priestley developing Locke's sensationalism into materialism ; while the Scotch school (Reid, Beattie, Dugald Stewart), recoiling from the consequences of Locke's system, attempted to smuggle "innate ideas" back into philosophy under the names of ""comnion sense," 'instinctive judgments," 'irresistible beliefs," and so forth. Such brief examination of these writers as our limits allow will make our meaning clearer, Locke's system, says Dugald Stewart,! in making sensa- tion and reflection the sources of all our simple ideas, led him " to some dangerous opinions concerning the nature of moral distinctions, which he seems to have considered as the offspring of education and fashion." How Berkeley combated the tendencies of Locke's principles we have already seen.~~

~~1729, unwilling to admit that our moral ideas had no other ultimate source than sensation, yet wishing to conform as much as possible to Locke's terminology, referred the~~

~~1 Quilines of Morul Philosophy, ed. by M'Cosh, p. 49.~~

~~Gibbon's great work, the Decline and Fall of Gibbon.~~

~~Hutcheson, an Irishman of great acuteness, Hutche- who was appointed to a philosophical chair at Glasgow in son.~~

~~Hume.~~

~~Reid.~~

~~"origin of our moral ideas to a particular power of percep- tion, to which he gave the name of the moral sense. 1 But this was to use the word "sense" in a different meaning from what it had ever borne before; inasmuch as the objects of this so-called sense, being the qualities of moral actions, must be of necessity incorporeal, intangible, and imperceptible, and, as such, totally unlike the objects of the faculties commonly called senses, viz., sights, sounds, smells, tastes, &c. Nor was anything gained for the independence and immutability of morality; for it was argued by com- mentators on Hutcheson that, if the moral faculty were a "sense," then the qualities perceived by it, like the secondary qualities of material objects perceived by sensa- tion and reflection, must be understood as subjective not vbjective, as existing in and for the perceiving mind alone, aud not inherent in the actions themselves, which would thus become colourless and neutral, z.e., destitute of moral character.~~

~~A return upon scepticism was a frequent incident in the history of the Creek schools of thought, especially when the principles of opposing systems had been put forth with un- usual warmth, and their supporters had found reconcilia- tion and the explanation of differences out of the question. An example of this, in the history of English thought, is furnished by the case of Hume. Provoked by the extravagant paradoxes of Berkeley, who had ecclesiastical and professional reasons for trying to convince men that niaterial objects had no reality,—miud was everything,— since the mystical and unnatural state of mind so engendered would favour the reception of any theology the philosopher might afterwards desire to implant,— Hume undertook to prove that mind had no real existence any more than matter, or that, if it had, such existence could not be proved. Wheu I talk of "'my mind," he said, how do I know that there is anything really existent which corresponds to the words? By the impressions and sensa- tions of which I am conscious? Bunt these only prove themselves; no one of conrse denies them; I only deny, at least I say you cannot prove, the existence of au entity in which these impressions inhere, and to which you give the name of "mind." If there was no flaw in such reason- ing, philosophy was brought to a stand, and no certainty of any kind was attainable by the human faculties.~~

~~Before the Scotch school and the great Immanuel Kant appeared to challenge these conclusions, David Hartley, in his Observations on Man (1749), espoused the tenets of Locke, and applied all his ingenuity to explaining the origin of as much of our knowledge as he could with any plausibility so treat, by referring it to the physical principle of the 'association of ideas."~~

~~In the treatise already referred to, Hume declares that he does not wish to undermine or even to combat any man's belief; his aim was only to deniolish bad logic, to expose the emptiness of alleged proofs of the divine govern- ment which were no proofs at all, and to make men see that " belief is more properly an act of the sensitive than of the cogitative part of our nature." The line of thought suggested by this and similar expressions appears to have been taken up and eagerly pursued by Reid, who, in his Inquiry into the Human Mind upon the Principles of Common Sense (1764), maintains that a large, and not the least important part of our knowledge is acquired, not, as Locke asserted, through sensation and reflection, but by means of immediate and instinctive judgments, in forming which the common sense of all mankind is at one. The moral faculty, according to Reid, judges of right and wrong in this instinctive way; it isa branch of common sense. Beattie, who was a better poet than he was a philosopher, ee~~

~~1 Dugald Stewart.~~

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~~pushed Reid's theory to an extreme which bordered on the ridiculovs, including among the "irresistible" and "necessary" beliefs of the human mind a number of notions which are really of a historic and derivative charac- ter. Dr Priestley, the discoverer of oxygen, adopting the system of Locke as a basis, wrote on A/atter and Spirit, criticised the philosophy of Reid, and discussed the tenet of philosophical necessity ; a strong materialistic bias per- vades his writings. A greater thinker than any that Europe had witnessed since Descartes, now arose in~~

~~Germany. This was Kant, whose ambition it was to put a Kant,~~

~~period to the desolating prevalence of scepticism, and deliver philosophy from the instability and uncertainty by which it had been long beset. His Critique of the Pure Reason appeared about 1781. Against Locke, he showed that the mind can form neither conceptions nor judgments without the pre-existeuce in the thought of the absolute and universal ideas of time, space, unity, cause, being, &c.,— which ideas proceed from the intelligence itself, without any action being exerted on the organs of sensation. They are a priori, that is, prior to sensible experience; they belong to the pure reason, and may be regarded as the forms of our knowledge,—forms which the understanding applies to the material furnished by perceptions. He does not, however, allow that these ideas, though a priort, have any objective character ; and for this metaphysical subjectivism he has been strenuously assailed by the Platonizing and ortliodox schools of the present day. Against the material- ists he maintains, in the Critique of the Practical Reason, that the "moral niotive," or principle, which tle intelligence (called in this aspect the practical reason) furnishes us with for the direction of our will, is immutable,—absolute,— necessary,— given a priori by the reason, and presenting to us the supreine and universal good as the final end of our existence, our desires, and our efforts. This motive is duty, or the moral obligation imposed on the human will by a power above it, which, consequently, is not man himself. To the knowledge, therefore, derived from the practical reason, Kant ascribes an oljective character, which, as we saw, he denied to the forms of the pure reason. This law of duty supposes liberty in man as the very condition of the cbligation which it imposes on him. Here of course Kant is at variance with the necessitarians and materialists. There being a necessary connection between virtue, z.¢,, the obedience to duty, and the supreme good which it seeks, yet this connection being only partially realizable in this life, Kant infers the reality of a future life and the immortality of the soul. And, in view of our powerlessness to bring about this harmony between happiness and virtue, he infers the existence of a First Cause, infinitely powerful, just, and wise, which will establish it hereafter. 'The colossal system~~

~~of Kant was known to Dugald Stewart (whose first work, Dugald Outlines of Moral Philosophy, appeared in 1793), but only Stewart.~~

~~through the medium of an imperfect Latin translation ; from this canse, probably, he is thought to have failed to do full justice to it. Dugald Stewart, who was appointed to the chair of moral philosophy at Edinburgh in 1785, was the master of a clear and charming style, which made his lectures the delight of a large circle of pupils. Among these were nunibered not a few, in the spheres both of thought and action, who have left their mark on the age and the society to which they belonged,—Brougham, Lord Palmerston, Lord Russell, Francis Horner, Lord Lansdowne, Jeffrey, Sir Walter Scott, Sydney Smith, James Mill, Alison the historian, and Dr Chalmers,—a varied and brilliant auditory for one professor to have lectured to and influenced in his day. One of the most interesting of Stewart's numerous works is his Dissertation concerning the Progress of Metaphysical, Ethical, and Political Philosophy since the Revival of Letters in Europe. In his Outlines~~

~~Scott,~~

~~1729-1789.]~~

~~(the work above mentioned), he argued, keeping generally to the lines of Butler and Hutcheson, that there is a moral faculty in man, that it is guided by duty not by interest, and that these two are not in the present state of the world identical, nor are the feelings that are inspired by actions prompted by the one the same as thos2 which are suggested by actions prompted by the other. Right and wrong, he thinks, must be held to be intrinsic qualities of actions, and not merely modes of the mind observing those actions. Everywhere he is firm and explicit on the immutability of moral distinctions. In fact, in its general outcome his ethical philosophy resembles pretty closely that of Kant; but it is not thought out with the same rigour of logic, nor founded on as searching a psychological analysis, nor expressed in as exact a terminology, as belong to the writings of the philosopher of Kouigsberg.~~

X. The French Revolution, 1789-1832.—Probably there was nota single gifted mind in any country of Europe upon which the tempest of the French Revolution did not come with a stimulating or disturbing influence. Young men— hasty counsellors ever, from the days of Rehoboam,—thrilled with hope and flushed with excitement, announced and believed that a golden age had opened for mankind. Wordsworth hastened from Cambridge in 1792 to France, where he lived more than a year, and formed some Girondist acquaintances ; Coleridge invented a scheme for an ideal community which was to form a model settlement, to be conducted on principles of pantisocracy, on the banks of the Susquehanna; Southey nearly got himself into trouble by publishing Wat Tyler, a dramatic sketch of an inflam- matory and seditious character. On the other hand, the young Walter Scott looked with shrewd, clear eyes on the tumultuous scene, and was not tempted to throw himself into the vortex ; for him the treasures of Europe's mighty past were real and precious, and not to be bartered for any quantity of visionary hopes and fairy gold. Soon the pro- ceedings of the Revolutionists made it clear enough that human nature and human motives were not changed ; and the ranks of reaction were rapidly filled. In England an immense effect was produced by the appearance of Burke's Reflections on the French Revolution in 1791. The sympa- thizers with the French republicans dwindled in number so fast, that at the end of the century, as it was sportively said, the whole of the opposition to Pitt's Government in the House of Lords went home from the debate in a single hack cab. Wordsworth, Southey, and Coleridge changed round to the Conservative side. The appearance in France of the Génie du Christianisme (1802) by Chateaubriand marked the commencement of the great continental reaction. The public policy of England became essentially conservative ; she endeavoured to prop up all the old monarchies on the Continent, whether they deserved to live or not; she harboured thousands of French priests ; she supported the temporal power of the pope. A remarkable dissonance hence arose between the policy of the country and some of the finest notes in its literature. While the English aristo- cracy was putting forth its full strength to combat Jacobinism by land and sea, the spirit of revolution breathed from the pages of Shelley and Byron. The war with Napoleon was waged with the approval of the great majority of the nation; but

~~the able critics and publicists who conducted the Edinburgh Review (started in 1802) were vehemently opposed to it, and would, if their influence had prevailed, have withdrawn the sword of England from the contest at least ten years before Waterloo.~~

~~The romantic poems of Scott (Lay of the Last Minstrel, Marmion, Lady of the Lake, é&c.) were popular because they were in sympathy with the return (now strongly pro- nounced) of the European mind towards chivalry, feudalism,~~

~~Jinesse and self-consciousness of modern times.~~

~~and the medizval spirit. The works of the Renaissance were no longer praised ; its art was held to be imitative or debased, its refinement to be superficial, its enthusiasm factitious. Taking its cue from Rousseau, all the world was thirsting, or pretending to thirst, after nature and simplicity ; the maiveté and spontaneity, real or imagined, of the "ages of faith " seemed incalculably better than the Working this vein somewhat too long, Scott was at last outshone in~~

~~it by Byron, whose romantic tales (Bride of Abydos, The Byron.~~

~~Corsair, The Giaour, &c.) were still more remote from the dulness and conventionality of ordinary life than those of Scott. In Childe Harold, a poem finely but unequally versified in the Spenserian stanza, the noble poet described himself,—for no one ever doubted that he was himself " the great sublime he drew,"—travelling through Spain, Italy, and Greece, a prey to melancholy discontent, brooding over the perishing relics of departed greatness, but unable to utter any formula potent for its re-creation other than vague cries for the bursting of all fetters which repress the spirit or the limbs of men. The increasing moral disorder of Byron's mind is marked by the appearance of Don Juan, a long rambling poem, written after his wife had left him, and he had gone to the Continent in 1816, never to return. In 1823 he joined the~~

~~Greek insurgents who had taken arms to throw off the Turkish yoke. He landed at Misso- longhi, spent large sums of money, but effected nothing of importance ; and in April 1824 he was cut off by a fever.~~

~~Shelley is a striking illustration of the influence which Shelley.~~

~~the revolutionary literature of that age possessed in mould- ing or modifying human character. His own earliest recollections dated to a time when all ranks of English society were animated by feelings of horror and detesta- tion at the French " Terror," and in no mood to embrace any revolutionary sentiment, or even give a hearing to any novel opinion. Yet the mind of Shelley—nursed upon the sceptical suggestions of Hume, the utopian speculations of Godwin, and the antinomian dreams of Rousseau, and pushing to extremes, from the fervour of a nature in which prudence and diffidence found no place, all that he read— was in a state of high revolt, even in his college days, against all that was held sacred by other men. Sent away from Oxford, he fell in with the bright high-spirited Harriet Westbrook, and induced her to marry him. But all bonds, including those of matrimony, which fettered the free inclinations of the mind, Shelley had taught himself to regard as a tyranny to be withstood. He grew tired of Harriet, formed a connexion of free love with Mary God- win, and deserted his hapless wife, who, two years after- wards, committed suicide. Whether Shelley would ever have brought his wild actions and wilder thoughts under any discipline it is impossible to tell, for he was cut off by a sudden and early death. Tis poems display the most perfect and wonderful mastery of the resources of the English language for the purposes of imaginative expres- sion that has ever been attained to among our poets. As Pope and Dryden gave us logic in metre, so Byron and ~ Shelley gave us rhetoric in metre. Splendid pieces of declamation may be found in the Childe Harold and "Isles of Greece" of the one poet, and in the Hellas and Levolt of Islam of the other. The "Sky-lark," and some other poems, considered as creations of tle pure imagination, have surely never been surpassed.~~

~~An accidental circumstance,—the finding of an old unfinished MS. in a forgotten nook of a cabinet,—turned Sir Walter Scott into the path of~~

prose fiction, in which his strong memory and inexhaustible imagination, joined with a gift for picturesque description, and the faculty, within certain limits, of creating and presenting living types of character, eminently qualified oe _ excel. Then

was given to the world the long and splendid series of novels, commencing with Waverley and ending (when his mind had partially given way) with Casécle Dangerous. We do not forget that a living French critic, whose admirable style makes even his paradoxes attractive, treats the Waverley Novels with little ceremony; they were taken, he says, for faithful copies of the antique world in Europe at a time when people knew no better ; now we go to the original sources of information, and find that he distorts everything. But, in the first place, so far as the Waverley Novels consist of the skilful evolution of plots invented by the author, and of the contrasted play of characters created by him,—and not of historical pictures,—this criticism does not touch them at all. In Peveril of the Peak, for in- stance, where a peculiar zest attaches itself to tho love of Julian Peveril for Alice Bridgenorth on account of the political and religious differences which divide their fathers, though Scott might be proved to have omitted some im- portant features in his historic sketch of the Restoration, still the deep attraction of the story would not lose its charm. So again, in Jvanhoe, although the repulsion between Saxon and Norman—the concrete picture of which, presented in this novel, so deeply impressed the historian Thierry—be to some extent an exaggeration of the feelings which actually prevailed between the two races under Richard I., yet neither does this inaccuracy affect the sub- stantial truthfulness and instructiveness of the historic tableau, nor, if it did, would the tragic passages which describe the siege of the castle of Front-de-Boouf exercise an inferior fascination. But, secondly, the real meaning of M. Taine's charge is, not that Scott has mis-read history, but that he has not read it from the special philosophical stand- point of M. Taine. He

did not read it in the conviction of the relativity of all events, nor regard it simply as the evolution of the Welt-Geist, nor believe that human society, through the stages of theology and metaphysics, advances inevitably to the bourn of positive science. But it remains to be proved whether these views of history will not prove more ephemeral than the simpler conceptions which pos- sessed the mind of Sir Walter Scott.

Reference was made above to tle commencement of the Edinburgh Review in 1802, The tendencies of thought which distinguished its founders were of so remarkable a character,—exercised so marked an effect on the philosophy, the legislation, and even the literature of their times,—and are still so influential, that some attempt to analyse and describe them must be made. There were varieties of opinion among the writers for this celebrated review from the first; amongst them were mere Whigs and mere literary critics, but that which gave it a backbone was its being partially the organ of a party, known some years later by the name of "Philosophical Radicals." This school took its philosophy from Locke, Bentham, and Adam Smith. It held that the old systems which admitted the principle of authority were for ever ruined and discredited, that, as government was an affair of contract, so religion was an affair of evidence, and that, since the same evidence was estimated differently by different minds, the right course was, to confine religion within the domain of the individual conscience, tolerating all forms of it not anti- social, but giving political prominence to none. Coleridge, In an eloquent work published in 1829,! supported the theory of a national church, not as the channel for teaching religious truth, but as providing a machinery for diffusing culture and enlightenment, as well as teaching morality by example, through the length and breadth of the land. This view was too Platonic for the school we are now cou- sidering—which, however, did not attack the already

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1 Constitution of Church and Staée.

ENGLISH. LITERATURE

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~~existing established church, but contented itself with insist- ing that its clergy should be vigilantly controlled by the state, lest they should teach principles or practices incon- sistent with the general good. Churches they regarded as decrepit and perishing institutions ; it was the state which, in their eyes, flourished in immortal youth; and their hopes of future good were involved in the development of civilization under its auspices. They believed in the gradual advance and perfectibility of the race through the operation of wise institutions, furthering the free play of all the human faculties, while guaranteeing the order and stability of society. The happiness that would thence arise, consist- ing in tho realization of "the greatest good of the greatest number," they regarded as the satisfaction of enthusiasm and the goal of effort. To political economy, that eminently lay study, and to the development of physical science, they looked for the measures and the means requisite for the attainment of this happiness. Moreover, siuce, from their point of view, there was nothing absolute in moral sanctions, it was ridiculous fora nation to hamper itself by adherence to engagements contracted by a former generation, on the plea of national honour, if such adherence was prejudicial to the interests of the living. Views of this kind, begin- ning even then to be propounded, drew from Burke the ex- clamation that the "age of chivalry was: past," and that "that of sophists, economists, and calculators had suc- ceeded." Thestudy of social grievances, and of the means of removing them, assumed a prominent place among their objects, and gave rise to much laudable and beneficial activity. On humanitarian grounds they supported the agitation against slavery which Christian philanthropists like Clarkson and Wilberforce had commenced from a religious motive. Senior occupied himself with the evils of the old poor-law; Francis Horner became a great authority on finance; Sir Samuel Romilly took up the reform of our criminal jurisprudence; Ricardo, J. 8. Mill, and M'Culloch studied the laws of the creation and dis- tribution of wealth, and demonstrated the impolicy of re- strictions on trade. The benefits of national education began to be seen and enforced; and Lancaster~~

~~and Bell entered upon useful labours connected with the organiza- tion of schools and the supply of teachers. Harriet Martineau wrote popular tales, and Elliott ‘ Corn-law Rhymes,” in order to indoctrinate the multitude with sound views on economical questions. In short, all the good was done or attempted which men starting from the basis of empirical philosophy could do or attempt; whatever was outside the range of that philosophy was neglected.~~

~~There is something rather saddening in the contemplation of the careers of most of the eminent literary men of this epoch. Byron and Shelley were cut off in the flower of their days; Southey’s overtasked brain gave way some years before his death, and the same fate befell Ireland’s gifted singer, Thomas Moore. Scott, rninced through too much haste to be rich, literally worked himself to death to clear off the mountain of liability which his implication in Ballantyne’s failure had thrown upon him. Coleridge, though he lived to old age, had weakened a will originally irresolute, and shattered nerves originally over-sensitive by the fatal practice of opium-eating ; in the time of grey hairs he subsided into a dreamy talker about ‘“sum-in- ject” and “ om-in-ject.”? Wordsworth alone preserved to~~

~~the last an unimpaired sanity of mind and body, for which Words-~~

~~he might thank the simplicity and serenity of his life in Westmoreland, where he settled on his return from France. Rapt in profound meditation, he communed among the mountains with the spirit of the universe ; and the beauty of the crag, the tarn, the flower, transmitted itself, through~~

~~2 Carlyle’s Life of Sterling.~~

~~Etymo- logy.~~

~~EN G—~~

~~ENG 435~~

~~the lips of nature's poet-priest, into verse of wondrous | in all English-speaking countries, declining, while that of~~

~~melody. When the period of inspiration was past, he quietly conformed to the religion and politics of his neigh- bours, and wrote much in support of them ; but these later works are pitched in a lower key.~~

~~Since the death of Scott, the power of literature, com- bined with journalism, has been continually on the rise. The novelists, while describing, have modified our social customs ; the essayists have been instrumental in bringing about political reforms ; the poets have stirred,—generally to thoughts and desires of change,—the impressible hearts of the young. The power of art over the human mind, and its influence in determining the aspects of life, have been,~~

~~literature has been advancing. Whether this particular distribution of the master-infinences that affect mankind will continue to prevail, or whether art is destined to regain among us a portion of its early power, and the sway of literature to be correspondingly restricted, is a question which the future must decide.~~

~~See Hallam's Introduction to the Literature of Europe; Warton's History of English Poetry; Morley's English Writers; Grein's Bibliothek der Angel-stéchsisehen Poesie; the Benedictine Histoire Littéraive de la France, with its continuations; Prof. Ward's His- tory of Dramatic Literature; Collier's History of English Dramatic Poetry; Knight's Shakspere: a Biography; Spence's Anecdotes ; Coleridge's Literary Remains. (T. A.)~~

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~~engraver with his tools.~~

~~ENGRAVING. The verb engrave is an old French word adopted by the English language, in which it bears at the present day but one signification, that of marking by incision. In old English the word was used in other senses, with which we need not now trouble the reader, and the verb engraver in modern French, used for a boat when she runs her keel into the beach or fora cart when its wheels stick in the mud of a road or the sand of a river, is a different word, being derived from gréve, the sands of sea or river, which comes from the Provengal grava, the bed of a torrent, and is nearly related to the English gravel. Our English verb to engrave belongs to a large family of words in many Western languages, the Anglo-Saxon form grafan being remarkable for its similarity to the Greek ypddev. Littré affirms that the Latin words scribere and scrobs are also etymologically related to the verb graver, and it is evident that there is a close connection between scrobs, a furrow, and the hollow cuttings produced by an The grave in which the dead are buried is also connected with these words both by its meaning and its etymology. The idea of a furrow or cutting is essential to engraving, much more essential than any artistic idea. The rudest mark which is cut into the substance of anything is really an engraving, whilst the most admirable drawing which does not cut into the surface is not engraving at all, When Old Mortality deepened~~

~~the inscriptions on the tombstones of the Cuvenanters he was strictly doing engraver's work, though of a coarse kind. In like manner the peoples of remote antiquity who chiselled their writing and drawing on slabs of stone, were in the strictest sense engravers, though the connection between their rude performance and the refined workmanship which is bestowed on a modern vignette may not at first sight be very obvious. On the other hand, a lithograph is not an engraving, neither is a photograph, nor a photographic autotype; but the applications of photography which are known as héliogravure and photogravure are really engraving, because in these processes the surface of the metal plate is eaten into or lowered. For the same reason etching may be correctly included under the generic term engraving, and an etcher is called in French a graveur & leauforte, an engraver by means of acid.~~

~~Engraving may then be defined as writing or drawing in Defini- which the marks are produced by removing a portion of tion.~~

~~the substance on which the writing or drawing is made, instead of by simply staining or discolouring it as ink and lead pencil do, or covering it with an opaque or transparent pigment as in oil-painting.~~

~~The idea of multiplication by printing, or by casting (as in seal engraving), is a mere accidental suggestion and not an essential part of the art. Engraving preceded printing,~~

~~436~~

~~and is still much used without any connection with printing, as in the chased ornamentation of silver plate, fire-arms, jewellery, and other objects of luxury.~~

~~It is our intention, in the present article, to confine ourselves strictly to engraving as one of the fine arts. Its present position is almost universally secondary to paint- ing. The engraver, in the fine arts, is almost invariably occupied in translating the works of painters, as by his intervention they can afterwards, at least in translation, be widely disseminated by the press.~~

~~ENGRAVING~~

~~woodcuts are printed is the most obvious of all the kinds of printing. If a block of wood is inked witha greasy ink and then pressed on a piece of paper, the ink from the block will be transferred at once to the paper, on which we shall have a black patch exactly the size and shape of the inked surface. Now, suppose that the simple Chinese who first discovered this was ingenious enough to goa . step further, it would evidently occur to him that if one of the elaborate signs, each of which in his own language stood for a word, were drawn upon the block of wood, in reverse,~~

~~Principal There are several different varieties of engraving, the | and then the whole of the white wood sufficiently cut away varieties chief of~~

which are—(1) Line engraving on metal plates, | to leave the sign in relief, an image of it might be taken on Origin of ofen- ysually of copper or steel, in which the line is always the paper much more quickly than the sign could be copied wood en. aie incised ; (2) Etching, usually on metal, in which the lines | with a camel-hair brush and Indian ink. No sooner had 8'Ving. are corroded by means of acid; (3) Mezzotint, in which | this experiment been tried and found to answer than block- there are no lines whatever, but only shades produced by | printing was discovered, and from the printing of signs to roughening the surface of the metal; and (4) Woodcut, in the printing of rude images of things, exactly in the same which the lines which print black have to be left in relief, | manner, the step was so easy that it must have been made whilst the surface round them is cut away. insensibly. Wood engraving, then, is really nothing but These primary technical conditions have an irresistible | that primitive block-cutting which prepared for the printer influence even upon the mental qualities exhibited in the | the letters in relief now replaced by movable types, and the different kinds of engraving. Each kind is favourable to | only difference between a delicate modern woodcut and the certain mental states, and unfavourable to others, eacli rude letters in the first printed books is a difference of being in itself an artistic as well as a technical discipline. | artistic skill and knowledge. In Chinese and Japanese A line engraver will not see or think like an etcher, nor woodcuts we can still recognize traditions of treatment an etcher like an engraver in mezzotint; and the con- | which come from the designing of their written characters. sequence of this difference is that the manner in which a The main elements of a Chinese or a Japanese woodcut, line has to be cut has a great influence in determining the | uninfluenced by European example, are dashing or delicate direction of artistic taste and feeling. Nor is this influence | outlines and markings of various thickness, exactly such as confined to the engravers themselves, The enormous | a clever writer with the brush would make with his Indian multiplication of their works by printing makes engravers | ink or vermilion. Often we get a perfectly black blot, ex- only second to writers in their power over public taste, | quisitely shaped and full of careful purpose, and these which they can refine or vitiate by spreading refined or | broad vigorous blacks are quite in harmony with the kind

~~vulgar interpretations of pictures. of printing for which wood engraving is intended. Engrav- There is no inherent reason why engraving should be| It has not hitherto been satisfactorily ascertained whether The car- ing inde- ysed only to translate painting. The early engravers were | wood engraving came to Europe from the East or was re- liest Eu- ee often original artists who worked out designs of their own, | discovered by some European artificer. The precise date veo a ~ but in course of time a commercial reason prevailed over | of the first European woodcut is also a matter of doubt, erovigal~~

~~originality. It was found that a well-known picture assured the sale of an engraving from it beforehand, whereas an engraving which stood entirely on its own merits came into the world without advantages, and had its own way to make. Besides this, the engraver who copied a picture saved himself all the trouble of thinking out and composing the design, which he found ready to his hand. The same reasons have prevailed against original etching in our own day. There has been a great revival of etching during the last fifteen or twenty years, especially on the Continent, and many artists have acquired very great skill in this mode of engraving. It was hoped, at first, that they would employ their skill upon original works, but the convenience, both of publishers and etchers, soon led them to employ etching, as engraving had been employed before, almost exclusively in translating pictures, We cannot but deplore this subordination of engraving to painting; and when we recur to the great engravers of past times who composed and invented their own works, it is with a feel- ing of regret that they have left so very few successors.~~

~~Although we mentioned the four chief kinds of engrav- |~~

~~ing in the order of what is usually considered to be their relative importance, putting line engraving in the first place and woodcut in the last, this is not the chronological order of their discovery. Woodcut is the oldest kind of engrav- ing from which impressions were printed, and must there- fore be taken first in a paper of this kind, which proposes to deal only with engraving for the press.~~

~~Wood Engraving.~~

~~It is natural that wood engraving should have occurred first to the primitive mind, because the manner in which~~

~~but here we have certain data which at least set limits to the possibility of error. European wood engraving dates certainly from the first quarter of the 15th century. It used to be believed that a cut of St Christopher, very rudely executed, and dated 1423, was the Adam of all our woodcuts, but subsequent investigations have shaken this theory. 'There is a cut in the Brussels library, of the Virgin and Child surrounded by four saints, which is dated 1418, but the composition is so very elegant and the drawing so refined and beautiful, that one has a difficulty in believing the date, though it is received as authentic. The Virgin and Child of the Paris library is without date, but is sup- posed, apparently with reason, to be earlier than either of the two we have mentioned ; and M. Delaborde has proved that two cuts were printed in 1406, The Virgin and Child at Paris may be taken as a good representative specimen of very early European wood engraving. It is simple art, but not bad art. The forms are drawn in bold thick lines and the black blot is used with niuch effect in the hollows and recesses of the design. Beyond this there is no shading. Rude as the work is, the artist has expressed exquisite maternal tenderness in the pressure of the Virgin's cheek to that of the Child, whilst the attitude of the Child itself, with its foot in its hand and its arm round the mother's neck, is most true to nature, as is the pose of the other foot against the mother's arm, and also the baby-like bend- ing and twisting of the legs. The Virgin is crowned, and stands against a niche-like decoration with pinnacles as often seen in illuminated manuscripts. In the woodcut this architectural decoration is boldly but effectively drawn. Here, then, we have real art already, art in which appeared both vigour of style and tenderness of feeling.~~

~~The criblé.~~

~~Techni- cal cha- racteris- tics of early~~

~~wood en-~~

~~graving.~~

~~ENGRAWVENG~~

~~The very earliest wood engraving consisted of outlines and white spaces with smaller black spaces, but shading is rare or absent. Before passing to shaded woodcuts we may mention a kind of wood engraving practised in the middle of the 15th century by a French engraver, often called Bernard Milnet, though his name is a matter of doubt, and by other engravers nearer the beginning of that century. This method is called the criblé, a word for which there is no convenient translation in English. It means, riddled with small holes, as a target may be riddled with small shot. The effect of light and dark is produced in this kind of engraving by sinking a great number of round holes of different diameters in the substance of the wood, which, of course, all come white in the printing; it is, in short, a sort of stippling in white. When a more advanced kind of wood engraving had become prevalent the criblé was no longer used for general purposes, but it was retained for the grounds of decorative wood engraving, being used occasionally in borders for pages, in printers' inarks, and other designs, which were survivals in black and white of the ancient art of illuminating. Curiously enough, this kind of wood engraving, though long disused for purposes of art, has of late years been revived with ex- cellent effect for scientific purposes. It is now the accepted method of illustration for astronomical books. The black given by the untouched wooden block represents the night sky, and the holes, smaller or larger, represent in white the stars and planets of lesser or greater magnitude. The pro- cess is so perfectly adapted to this purpose, being so cheap, rapid, and simple, that it will probably never be superseded. The objections to it for artistic purposes are, however, so obvious that they were soon perceived even by the untrained critical faculty of the earlier workmen, who turned their attention to woodcut in simple black lines, in- cluding outline and shading. In early work the outline is firm and very distinct, being thicker in line than the shading, and in the shading the lines are simple, without cross-hatchings, as the workmen found it easier and more natural to take out a white line-like space between two parallel or nearly parallel black lines than to cut out the twenty or thirty small white lozenges into which the same space would have been divided by cross-hatchings. The early work would also sometimes retain the simple~~

~~black patch which we find in Japanese woodcuts, for example, in the Christmas Dancers of Wohlgemuth all the shoes are black patches, though there is no discrimination of local colour in anything else. A precise parallel to this treat- ment is to be found in a Japanese woodcut of the Wild Boar and Hare given by Aimé Humbert in his book on Japan, in which the boar has a cap which is a perfectly black patch though all other local colour is omitted. The similarity of method between Wohlgemuth and the Japanese artist is so close that they both take pleasure in drawing thin black lines at a little distance from the patch and following its shape like a border. In course of time, as wood engravers became more expert, they were not so careful to spare themselves trouble and pains, and then cross-hatchings were introduced, but at first more as a variety to relieve the eye than as a common method of shading. In the 16th century a simple kind of wood engraving reached such a high degree of perfection that the best work of that time has never been surpassed in its own way. We intend very shortly to render full justice to the highly developed skill of modern wood engravers ; but it is undeniable that in the 16th century the art stood more on its own merits than it does now, respected itself more, and affirmed itself without imitating other arts.~~

~~Wood engraving in the 16th century was much more con- ventional than it is in the present day, and this very con- ventionalism, enabled it to express what it had to express~~

~~with greater decision and power.~~

~~The wood engraver in Wool –~~

~~those days was free from many difficult conditions which engrav-~~

~~hamper his modern successor. He did not care in the least about aerial perspective, and nobody expected him to care about it; he did not trouble his mind about local colour, but generally omitted it, sometimes, however, giving it here and there, but only when it suited his fancy. As for light- and-shade, he shaded only when he wanted to~~

~~give relief, but never worked out anything like a studied and balanced effect of light-and-shade, nor did he feel any responsibility about the matter. What he really cared for, and generally attained, was a firm, clear, simple kind of drawing, con- ventional in its indifference to the mystery of nature and to the poetic sentiment which comes to us from that mystery, but by no means indifferent to fact, of a decided and tangible kind. The wood engraving of the 16th century was a singularly positive art, as positive as carving ; indeed, most of the famous woodcuts of that time miglit be translated into carved panels without much loss of char- acter. Their complete independence of pictorial conditions might he illustrated by many examples. In Diirer's Salu- tation the dark blue of the sky above the Alpine mountains is translated by dark shading, but so far is this piece of local colour from being carried out in the rest of the com- position that the important foreground figures, with their draperies, are shaded as if they were statues in plaster of Paris. Again, the sky itself is false in its shading, for it is without gradation, but the shading upon it has a purpose, which is to prevent the upper part of the composition from looking too empty, and the conventionalism of wood engraving was so accepted in those days that the artist could have recourse to this expedient in defiance alike of pictorial harmony and of natural truth. In Holbein's~~

~~ing in the 16th century.~~

~~Diirer's Saluta- tion.~~

~~Hol-~~

~~admirable series of small well-filled compositions, the bein's~~

~~Dance of Death, the firm and matter-of-fact drawing is accompanied by a sort of light-and-shade adopted simply for convenience, with as little reference to natural truth as might be expected in a stained-glass window. There is a most interesting series of little woodcuts drawn and engraved in the 16th century by J. Amman as illustrations of the different handicrafts and trades, and entitled The Baker, The Miller, The Butcher, and so on. Nothing is more striking in this valuable series than the remarkable closeness with which the artist observed~~

~~everything in the nature of a hard fact, such as the shape of a hatchet or a spade ; but he sees no mystery anywhere—he can draw leaves but not foliage, feathers but not plumage, locks but not hair, a hill but not a landscape. In the Witches'~~

~~Dance of Death.~~

~~Amman's handi- crafts.~~

~~Kitchen, a woodcut by Baldung Griin cf Strasburg, dated Baldung 1510, the steam rising from the pot is so hard that it has Grin.~~

~~the appearance of two trunks of trees denuded of their bark, and makes a pendant in the composition to a real tree on the opposite side which does not look more substantial. The clouds of steam round about the jet are like puddings. Nor was this a personal deficiency in Baldung Griin. It was Diirer's own way of engraving clouds and vapour, and all the engravers of that time followed it. Their conceptions were much more those of a carver than those of a painter. Diirer actually did carve in high relief, and Griin's Witches' Kitchen might be carved in the same manner without loss; indeed it has the appear- ance of an alto-rilievo with the ground tinted darker than the carvings. When the engravers were rather draughts- men than carvers, their drawing was of a decorative character. For example, in the magnificent portrait of~~

~~Christian III. of Denmark by Jacob Binck, one of the Jacob very finest examples of old wood engraving, the face and Binck.~~

~~beard are drawn with few lines and very powerfully, but the costume is treated strictly as decoration, the lines of the patterns being all given, with as little shading as~~

~~ENGRAVING~~

~~paratively rapid art; but since the black line has been preferred the art has become a handicraft, because original artists have not time to cut out thousands of little white spaces. The reader may at once realize for himself the tediousness of the process by comparing the ease with~~

which one writes a page of manuscript with the labour which would be involved in cutting away, with perfect accuracy, every space, however minute, which the pen had not blackened with ink.

The two centuries in which wood engraving has developed Modern itself most remarkably are the 16th and the 19th. We wooden have described the character of 16th century work, which 6”

possible, and what shadiug there is is simple, without cross-hatching.

The perfection of simple wood engraving having been attained so early as the 16th century, the art became extremely productive, and has been so ever since. During the 17th and 18th centuries it still remained a compara- tively severe and conventional form of art, because the workmen shaded as much as possible either with straight lines or simple curves, so that there was never much appearance of freedom, Modern wood engraving is quite a distinct art, being based on different principles, but between the two stands the work of an original genius,

Bewick.

Bewick, who cannot be overlooked. He was born in 1753, and died in 1828. Although apprenticed to an engraver in 1767, he was never taught to draw, and got into ways and habits of his own which add to the originality of his work, though his defective training is always evident. His work is the more genuine from his habit of engraving his own designs, which left him perfect freedom of interpreta- tion, but the genuineness of it is not only of the kind which comes from independence of spirit, it is due also to his fidelity to the technical nature of the process, a fidelity very rare in the art. The reader will remember that in wood engraving every cutting prints white, and every space left untouched prints black. Simple black lines are obtained by cutting out white lines or spaces between them, and crossed black lines have to be obtained by laboriously cutting out all the white lozenges between them. In Bewick’s cuts white lines are abundant and are often crossed, but black lines are never crossed ; he is also quite willing to

~~utilize the black space, as the Japanese wood engravers, and Diirer's master Wohlgemuth used to do. The side of the frying-pan in the vignette of the Cat and the Mouse is treated precisely on their principles, so precisely indeed that we have the line at the edge fora border. the twentieth chapter of the Memozr, the space of dark shade under the bushes is left quite black, whilst the leaves and twigs, and the rod and line too, are all drawn in pure white lincs. Bewick, indeed, was more careful in his adherence to the technical conditions of the art than any of the primitive woodcutters except those who worked in crzblé and who used white lines as weil as their dots. Such a thing as a fishing-net is an excellent test of this disposition. In the interesting series by J. Amman illustrating the crafts and trades of the 16th century, there is a cut of a man fishing in a river, from a small punt, with~~

~~In the vignette of the Fisherman, at the end of |~~

~~was easy, as the work of that time had a limited purpose and a settled character. It may not appear so easy to. describe the various and unsettled work of our own time, but it is animated by a leading idea, which is universality. Wood engraving in the 19th century has no special character of its own, nothing like Bewick's work, which had a character derived from the nature of the process ; but~~

~~on the other hand, the modern art is set to imitate every Its great kind of engraving and every kind of drawing. Thus we variety.~~

~~have woodcuts that imitate line engraving, others that copy etching and even mezzotint, whilst others try to imitate the crumbling touch of charcoal or of chalk, or the wash of water-colour, or even the wash and the pen-line together. The art is put to all sorts of purposes; and though it is not and cannot be free, it is made to pretend to a freedom which the old masters would have rejected as an affectation. Rapid sketches are made on the block with the pen, and the modern wood engraver sets himself patiently to cut out all the spaces of white, in'which case the engraver is in reality less free than his predecessor in the 16th century, though the result has a false appearance of liberty. The woodcut is like a polyglot who has learned to speak many other languages at the risk of forgetting his own. And, wonderful as may be~~

its powers of imitation, it can only approximate to the arts which it imitates; it can never rival each of them on its own ground. It can convey the idea of etching or water-colour, but not their quality ; it can imitate the manner of a line engraver on steel, but it cannot give the delicacy of his lines. What- ever be the art which the wood engraver imitates, a practised eye sees at the first glance that the result is nothing but a woodcut. Therefore, although we may admire the supple- ness of an art which can assume so many transformations, it is certain that these transformations give little satisfaction to severe judges. We are bound, however, to acknowledge

a net. The net comes dark against the light surface of | that in manual skill and in variety of resource modern Amman the river, and Amman took the trouble to cut a white | wood engravers far excel their predecessors. A Belgian aud lozenge for every mesh. Bewick, in one of his vignettes, | wood engraver, Stéphane Pannemaker, exhibited at the Panne- Bewick. represents a fisherman mending his nets by the side of a | Salon of 1876 a woodcut entitled La Baigneuse, which maker, stream. A long net is hung to dry on four upright sticks, | astonished the art-world by the amazing perfection of its but to avoid the trouble of cutting out the lozenges, | method, all the delicate modelling of a nude figure being Bewick artfully contrives his arrangement of light and | rendered by simple modulations of unbroken line. Both shade so that the net shall be in light against a space of | English and French publications abound in striking proofs White black shade under some bushes. This permits him to cut | of skill. The modern art, as exhibited in these publica- lines. tions, may be broadly divided into two sections, oue

every string of the net in white, according to his practice of using the white line whenever he could. THe used it with great ability in the scales of his fish, but this was simply from a regard to technical convenience, for when he engraved ou raetal he marked the scales of his fish by black lines. These may seem very trifling considerations to persons unacquainted with the fine arts, who may think that it can matter little whether a fishing-net is drawn in black lines or in white, but the fact is that the entire destiny of wood engraving has depended

~~on preserving or rejecting the white line. as if was by Bewick, original artists might have followed his example in engraving their own inventions, because then wood engraving would have been a natural and com-~~

~~Had it been generally accepted~~

~~depending upon line, in which case the black line of a pen sketch is carefully preserved, and the other depending upon tone, when the tones of a sketch with the brush are trans- lated by the wood engraver into shades obtained in his own way by the burin. 'The first of these methods requires extreme care, skill, and patience, but makes little demand upon the intelligence of the artist ; the second leaves him more free to interpret, but he cannot do this rightly with- out understanding both tone and texture. The wood-cuts in Doré's Don Quiwote are done by each method alternately, many of the designs having been sketched with a pen upon the block, whilst others are shaded with a brush in Indian ink and white, the latter being engraved by interpreting~~

~~HRGE A WYN SG~~

~~tle shades of the brush.~~

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~~In the pen drawings the lines | ing their works by means of engraving, after which they are Dore's, in the brush drawings tle lines are the | filled up the hollows produced by the burin with a black Pisan, cugraver's. In the night scenes M. Pisan has usually | enamel made of silver, lead, and sulphur, the result being _ adopted Bewick's system of white lines, the block being | that the design was rendered much more visible by the left untouched in its blackness wherever the effect permitted. opposition of the enamel and the metal. An engraved Ius- Modern English wood engraving shows to great advantage design filled up in this manner was called a niello, and our Nichi. trated jn such newspapers as the J/dustrated London News and the | modern door- plates are really nied/i also, for in them too news: Graphic, the best of their kind in the world, and also in | the engraved lines are filled with black. The word comes ee. vignettes for book illustration, which English artists usually | from migellum, and simply refers to the colour of the execute with delicacy and taste. A certain standard of | enamel. Whilst a niello was in progress the artist could Vig- vignette engraving was reached by Mr Edmund Evans in | not see it so well as if the enamel were already in the nettes. Mr Birket Foster's edition of Cowper's Z'ask, which is not | lines, and on the other hand, he did not like to put in the likely to be surpassed in its own way, either for delicacy | hard enamel prematurely, as when once it was set it could of tone or for careful preservation of the drawing. An | not easily be got out again. He therefore took a sulphur important extension of wood engraving in modern times | cast of his niello in progress, on a matrix of fine clay, and Com- has been due to the invention of compound blocks. | filled up the lines in the sulphur with lampblack, thus pound Formerly a woodcut was limited in size to the dimensions | enabling himself to judge of the state of his engraving. blocks. of a block of boxwood cut across the grain, except in the | At a later period it was discovered that a proof could be primitive condition of the art, when commoner woods were | taken on damped paper by filling the engraved lines with used in the direction of the grain; but in the present day | a certain ink and wiping it off the surface of the plate, many small blocks are fitted~~

~~**together so as to form a single | sufficient pressure being applied to make the paper go into large one. They can be separated or joined together again | the hollowed lines and fetch the ink out of them. This at will, and it is this facility which has rendered possible | was the beginning of plate printing, but nobody at first the rapid production of large cuts for the newspapers, as | suspected the artistic and commercial importance of the many cutters work on the same subject at once, each taking | discovery. The niello engravers thought it a convenient his own section. way of proving their work, as it saved the trouble of the rocess The process of modern wood engraving may be briefly | sulphur cast, but they saw no further into the future. of described as follows. The surface of the block is lightly | They went on engraving nielli just the same to ornament eT whitened with Chinese white so as to produce a light | plate and furniture ; nor was it until the next century that ring. yellowish grey tint, and on this the artist draws either with | the new method of printing was carried out to its great and ~ a pen if the work is intended to be in line, or with a hard | wonderful results. Even in our own day the full import- pointed pencil and a brush if it is intended to be in shade. | ance of it is only understood by persons who have made If it is to be a line woodcut the cutter simply digs out the | the fine arts a subject of special study. There are, whites with a sharp burin or scalpel (he bas these tools of | however, certain differences between plate printing and Artistic various shapes and sizes), and that is all he has to do; but | block printing which affect the essentials of art. When import- if the drawing on the wood is shaded with a brush, then | paper is driven cnto a line so as to fetch the ink out of it, ae of the cutter has to work upon the tones in such a manner | the line may be of unimaginable fineness, it will print all ae that they will come relatively true in the printing. This | the same; but when the paper is only pressed upon a raised is by no means easy, and the result is often a disappoint- | line, the line must have some appreciable thickness, so that ment, besides which the artist's drawing is destroyed in | the wood engraving can never be so delicate as plate the' process, so that it is now customary to have the block | engraving. Again, not only does plate printing excel block photographed before the engraver touches it, when the | printing in delicacy ; it excels it also in force and depth. drawing is specially worth preserving. This was doue for | There never was, and**~~

~~there will never be, a woodcut line Mr Leighton's illustrations to Romola. having the power of a deep line in a plate, for in block . printing the line is only a blackened surface of paper, Copper and Steel Plate Engraving. whereas in plate printing it is a cast with an additional thick- Engraving on plates of copper and steel is the converse | ness of printing ink. of wood engraving in method. In line engraving it is the Having limited ourselves in this article to engraving for line itself which is hollowed, whereas in the woodcut, as | tlie press, we do not stay to enumerate the niello engravers, we have seen, when the line is to print black it is left in | but pass at once to the art of line engraving for prints ; relief, and only white spaces and white lines are hollowed. | and first let us describe the process, which is as 'simple in There was no difficulty about discovering the art of line | theory as it is difficult in practice, The most important engraving, which has been practised from the earliest ages. | of the tools used is the burin, which is a bar of steel with The Prehis: The prehistoric Aztec hatchet given to Humboldt in Mexico | one end fixed in a handle rather like a mushroom with one burin. toric en- was just as really and truly engraved as a modern copper- | side cut away, the burin itself being shaped so that the gmying- plate with outlines after Flaxmau or Thorwaldsen; the | cutting end of it when sharpened takes the form of a Aztec engraving is of course ruder than the European, but lozenge. Burins are made in many varieties to suit in- it is the same art. The important discovery which made | dividual tastes and the different uses to which they are line engraving one of the multiplying arts was the discovery | applied, but most burins resemble each other in presenting how to print an incised line, which would not occur to | the shape of a more or less elongated lozenge at the end every one, and which in fact was hit upon at last by | where they are sharpened. 'The burin acts exactly like a accident, and known for some tine before its real utility | plough; it makes a furrow and turns out a shaving of was suspected. Line engraving in Europe does not owe | metal as the plough turns the soil of a field. The burin, its origin to the woodcut, but to the chasing on gold- | however, is pushed while the plough is pulled, and this smiths' work. If the reader will look at any article of | peculiar character of the burin as a pushed instrument at jewellery in which the metal is ornamented with incised | once establishes a wide separation between it~~

~~and all the designs, he will there see the true origin of our precious | other instruments employed in the arts of design, such as Plate- Diirers and Marcautonios. The history of the first plate- | pencils, brushes, pens, and etching needles. The manual Printing. printing is as follows. 'The goldsmiths of Florence in the | difficulty which has to be overcome by the engraver is in~~

~~middle of the 15th century were in the habit of ornament- | making himself master of the burin, and in order to~~

~~AAO ENGRAVING~~

~~accomplish this he is obliged to go through a great deal of The student may soon understand the spirit and technical Early simply manual practice in cutting lines. The beginner quality of the earliest Italian engraving by giving his Italian learns to cut straight lines and curves of various degrees of | attention to a few of the series which used erroneously to line en-~~

~~depth, and to cross them so that the interstices may form squares, lozenges, triangles, &c. These exercises, after long practice, give a degree of manual skill which has been often misemployed in ingenious trifling, to the detriment of true artistic quality, so that laborious men have wasted their time in cutting patterns like woven wire, and carefully inserting a dot in the middle of every lozenge or square. Whilst avoiding this error, which has been the bane of engraving, the student should train his hand and eye by copying portions of good prints directly on the metal, as a modern engraver cannot work in ignorance of the language of his art, though he may employ it in his own way afterwards, It is, however, unfortunately true that set methods, which may be called the business of engraving, have a tendency to become much more predominant than in the sister art of painting, so that real originality expresses itself much less frequently with the burin than with the brush. Elements The elements of engraving with the burin upon metal of burin will be best understood by an example of a very simple custav- kind, as in the engraving of letters, The capital letter B ing on ere 2 ; F metal, Contains in itself the rudiments of an engraver's education, As at first drawn, before the~~

~~blacks are inserted, this letter consists of two perpendicular straight lines and four curves, all the curves differing from each other. Suppose, then, that the engraver has to make a B, he will scratch these lines very lightly with a sharp point or style. The next thing is to cut out the blacks (not the whites, as in wood engraving), and this would be done with two different burins. The engraver would get his vertical black line by a powerful ploughing with the burin between his two preparatory first lines, and then take out some copper in the thickest parts of the two curves. This done he would then take a finer burin and work out the gradation from the thick line in the midst of the curve to the thin extremities which touch the perpendicular. When there is much gradation in a line the darker parts of it are often gradually ploughed out by returning to it over and over again, The hollows so produced are afterwards filled with printing ink, just as the hollows in a niello were filled with black enamel ; the printing ink is wiped from the smooth surface of the copper, damped paper is laid upon it, and driven into the hollowed letter by the pressure of a rolling cylinder ; it fetches the ink out, and you have your letter B in intense black upon a white ground.~~

~~When the surface of a metal plate is sufficiently polished to be used for engraving, the slightest scratch upon it will print as a black line, the degree of blackness being propor- tioned to the depth of the scratch. Most readers of these pages will possess an engraved plate from which visiting cards are printed. Such a plate is a good example of some elementary principles of engraving. It contains thin lines and thick ones, and a considerable variety of curves. An elaborate line engraving, if it is a pure line engraving and nothing else, will contain only these simple elements in different combinations, The real line engraver is always engraving a line more or less broad and deep in one direc- tion or another ; he has no other business than this.~~

~~'We may now pass to the early Italian and early German prints, in which the line is used with such perfect simplicity of purpose that the methods of the artists are as~~

~~legible as if we saw them actually at work.! a errithe Wie Ot a~~

~~1 It may be well to say something here about the accessibility of examples, Any one living in London can study engraving at its sources to the fullest extent in fine impressions belonging to that little-appre-~~

~~ciated treasure-house, the print-room of the British Museum, but the |;~~

~~difficulty is for students who live in the provinces or in distant colonies.~~

~~be called the Playing Cards of Mantegna. " The series," gravings~~

~~says Professor Colvin, '" consists of fifty pieces, divided into sets of ten each. Of these five sets, each is marked with an initial letter, A, B, C, D, E, and every print of the series carries besides an Arabic numeral, 1, 2, 3, up to 50. Only the numerical order, which shows how the series is meant to be arranged and studied, reverses the alphabetical order which corresponds with the respective dignity of the subject ; thus Nos. 1-10 are lettered as class E, Nos, 11-20 as class D, and so on. This number, fifty, and this plan of subdivision by tens, are quite inconsistent with the supposed destination of the series as playing-cards; and so also are the subjects of the series. They represent a kind of encyclopedia of knowledge, proceeding upwards from earthly to transcendental things,—first, the various orders and conditions of men ; second, the nine muses and Apollo ; third, the seven liberal arts, with poetry, theology, and philosophy added to complete the group of ten ; fourth, the four cardinal and three theological virtues, with three singular personifications or geniuses added to complete ten —a genius of time, a genius of the sun, and a genius of cosmos, the world ; fifth, the planets, in their mythological, astrological, and astronomical signification, with the three outer spheres added to make up the ten—viz., the eighth, or sphere of the fixed stars, the Primum Mobile, or inclosing sphere, which by its rotation imparts rotation to the rest within, and the Prima Causa, or empyrean sphere, the unrevolving abiding place of Deity. The series is, therefore,~~

~~This difficulty has been overcome of late years by the perfection to which M. Amand Durand has brought the art of photographic engraving originally invented by Niepce, and now called héliogravure. By means of this a new plate can be produced from an impression of an~~

~~old engraving without touching the print, and so perfect that the impres- sions yielded by the new plate can only be distinguished from old prints by an expert, and not always with certainty by him, so that they have to be marked on the back to prevent fraud. M. Amand Durand has made it his principal business to reproduce engravings by the old masters ; so that the provincial or colonial student may now possess in his own cabinet a selection of the best examples. One thing only it is necessary for him to bear in mind. There are two sorts of héliogravure,—that which prints like a copper-plate and that which prints like a woodcut. Both are used for book illustration, and indiscriminately, so that the student will often meet with a plate-engraving which has been reproduced to print like a woodcut, and whenever he does so he ought not to pay the slightest attention to it, for no plate-engraving can ever be reproduced as a woodcut without the loss of its finest technical qualities. A plate so reproduced will no doubt retain its composition and cxpression, though even the ex- pression may often lose a little from the greater coarseness of the lines ; but all its quality as workmanship, all the delicacy of the manual art, is sacrificed, merely that it may be printed more cheaply. The student should therefore resolutely turn away from all typographic héliogravures after engraved plates, and confine his attention to those which are printed as the original plates were printed, a matter which he can easily ascertain for himself by seeing that there is a plate mark, the colourless mark produced by the edges of the plate npon the paper. M. Amand Durand has published many copies from engravings by dif- ferent old masters, including complete sets from the original works of Vandyke, Paul Potter, Claude, and Albcrt Diirer. Such reproductions as these are really available for purposes of study, but the quantity of different photographic processes invented of late years has inundated the market with the most various kinds of more or less defective re- productions, which the student ought carefully to avoid. And how- ever perfect the process may be, all reproductions on a reduced scale should be rejected at once by students, for the manner of working adopted by a true master depends always upon the scale of his en- graving. Diirer will put more into a large plate than into a little one ; and when a large plate by Diirer is reduced by a photographic process, the reduction, by its microscopic abundance of detail, conveys a false idea of Diirer's~~

~~practice as an artist. The reductions of old engravings which are now so frequently used for book-illustrations are more injurious than helpful to any right appreciation of engraving. Reduction is good only when the artist worked with a view to it, as is now often done in drawings intended to be reproduced photographically with a foreseen diminution of scale, ;~~

~~Techni- cal prin- ciples.~~

~~Man- tegna,~~

~~Early German engray- ing on Inetal. Schon- gauer,~~

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~~as the most recent critics have called it, a moral and educational series, or instructive picture-book."~~

~~We have not space to enter into the controversy about the origin of these engravings. They are supposed to be Florentine ; they are certainly Italian; and their technical manner is called that of Baccio Baldini, of whose biography nothing is known. But if the history of these engravings is obscure, their style is as clear as a style can be. There is not room for a moment's doubt about the artist's con- ception of his art. In all these figures the outline is the main thing, and next to that the lines which mark the leading folds of the drapery, lines quite classical in purity of form and severity of selection, and especially character- istic in this, that they are always really engraver's lines, such as may naturally be done with the burin, and they never imitate the freer line of the pencil or etching needle. As for shading, it is used in the greatest moderation with thin straight strokes of the burin, that never overpower the stronger organic lines of the design. Of chiaroscuro, in any complete sense, there is none. The sky behind the figures is represented by white paper, and the foreground is sometimes occupied by flat decorative engraving, much nearer in feeling to calligraphy than to modern painting. Sometimes there is a cast shadow, but it is not studied, and is only used to give relief. We may observe that in this early metal engraving the lines are often crossed in the shading,~~

~~whereas in the earliest woodcuts they are not; the reason being that when lines are incised they can as easily be crossed as not, whereas, when they are reserved, the crossing involves much labour of a non-artistic kind. Here, then, we have pure line-engraving with the burin, that is, the engraving of the pure line patiently studied for its own beauty, and exhibited in an abstract manner, with care for natural form combined with inattention to the effects of nature. Even the forms, too, are idealized, especially in the cast of draperies, for the express purpose of exhibiting the line to better advantage. Such are the characteristics of those very early Italian engravings which were attributed erroneouslyto Mantegna. When we come to Mantegna himself we find a style equally decided. Draw- ing and shading were for him two entirely distinct things. He did not draw and shade at the same time, as a modern chiaroscurist would, but he first got his outlines and the patterns on his dresses all very accurate and right, and then threw a veil of shading over them, and a very peculiar kind of shading it was, all the lines being straight and all the shading diagonal. This is the primitive method, its pecu- liarities being due, not to a learned self-restraint, but to a combination of natural genius with technical inexperience, which made the early Italians at once desire and discover the siinplest.and easiest methods. But whilst the Italians were shading with straight lines the Germans had begun to use curves, and as soon as the Italians saw good German work they abandoned their old stiff practice and tried to give to their burins something of the German suppleness.~~

~~The characteristics of early metal engraving in Germany are seen to perfection in Martin Schongauer and Albert Diirer, who, though with striking differences, had many points in common. Schongauer was the earlier artist of the two, as he died in 1488; whilst the date of Diirer's death is 1528, just forty years later. Schongauer was therefore a whole generation before Diirer, yet scarcely inferior to him in the use of the burin, though Diirer has a much greater reputation, due in great measure to his singular imaginative powers. Schongauer is the first great German engraver who is known to us by name, but he was preceded by an unknown German master, whom we now call the master of 1466, who had Gothic notions of art (in strong contrast to the~~

~~classicism of Baccio Baldini), but used the burin skilfully in his own way, conceiving of line~~

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~~and shade as separate elements, yet shading with an evident desire to follow the form of the thing shaded, and with lines in various directions. Schongauer's art is a great stride in advance, and we find in him an evident pleasure in the bold use of the burin. Outline and shade, in Schongauer, are not nearly so much separated as in Baccio Baldini, and the shading, generally in curved lines, is far more masterly than the straight shading of Mantegna.~~

~~Diirer continued Schongauer's curved shading, with in- Diirer.~~

~~creasing manual delicacy and skill; and as he found him- self able to perform feats with the burin which amused both himself and his buyers, he over-loaded his plates with quantities of living and inanimate objects, each of which he finished with as much care as if it were the most important thing in the composition. The engravers of those days had no conception of any necessity for subordi- nating one part of their work to another; they drew, like children, first one object and then another object, and so on until the plate was furnished from top to bottom and from the left side to the right. Here, of course, is an element of facility in primitive art which is denied to the modern artist. In Diirer all objects are on the same plane. In his St Hubert, the stag is quietly standing on the horse's back, with one hoof on the saddle, and the kneeling knight looks as if he were tapping the horse on the nose. Diirer seems to have perceived the mistake about the stag, for he put a tree between us and the animal to correct it, but the stag is on the horse's back nevertheless. This ignorance of the laws of effect is least visible and obtrusive in plates which have no landscape distances, such as The Coat of Arms with the Death's Head and The Coat of Arms with the Cock. Diirer's great manual skill and close observation made him a wonderful engraver of objects~~

~~taken separately. He saw and rendered all objects; nothing His mi- escaped him; he applied the same intensity of study to nuteness.~~

~~everything. Though a thorough student of the nude (witness his Adam and Eve, and other plates), he would pay just as much attention to the creases of a gaiter as to the development of a muscle; and though man was his main subject, he would study dogs with equal care (see the five dogs in the St Hubert), or even pigs (see the Prodigal Son); and at a time when landscape painting was unknown he studied every clump of trees, every visible trunk and branch, nay, every foreground plant, and each leaf of it separately. In his buildings he saw every brick like a bricklayer, and every joint in the woodwork like a car- penter. 'The immense variety of the objects which he engraved was a training in suppleness of hand. His lines go in every direction, and are made to render both the undulations of surfaces (see the plane in the Melancholia) and their texture (see the granular texture of the stones in the same print).~~

~~From Diirer we come to Italy again, through Marc- Marc- antonio, who copied Diirer, translating more than sixty of antonio,~~

~~his woodcuts upon metal. It is one of the most remark- able things in the history of art, that a man who had trained himself by copying northern work, little removed from pure Gothicism, should have become soon after- wards the great engraver of Raphael, who was much pleased with his work and aided him by personal advice. Yet, although Raphael was a painter, and Marcantonio his interpreter, the reader is not to infer that engraving had as yet subordinated itself to painting.~~

~~always (much more judiciously) gave him drawings, which~~

~~the engraver migbt interpret without going outside of his~~

~~own art; consequently Marcantonio's works are always~~

~~genuine engravings, and are never pictorial. Marcantonio~~

~~was an engraver of remarkable power. In him the real VIII. — 56~~

~~Raphael him- Ra- self evidently considered engraving a distinct art, for he Lice never once set Marcantonio to work from a picture, but ™”°? %~~

~~The in- the group known as the engravers of Rubens.~~

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~~pure art of line-engraving reached its maturity. He retained much of the early Italian manuer 1 his backgrounds, where its simplicity gives a desirable sobriety ; but his figures are boldly modelled in curved lines, crossing each other in the darker shades, but left single in the passages from dark to light, and breaking away in fine dots as they approach the light itself, which is of pure white paper. A school of engraving was thus fonnded by Raphael, through Marcantonio, which cast aside the minute details of the early schools for a broad, harmonious treatment.~~

~~We cannot here give a detailed account of the northern and southern schools of line-engraviug, which, after Diirer and Marcantonio, developed themselves with great rapidity and were ennobled by many famous names, but although we cannot give lists of these, we may direct the student to a school of engraving which marked a new development, That great~~

~~fluenceof painter understood the importance of engraving as a means~~

~~Rubens.~~

~~Vorster-~~

~~of increasing his fame and wealth, and directed Vorster- man and others, as Raphael had directed Marcantonio. The theory of engraving at that time was that it ought not to render accurately the local colour of painting, which would appear wanting in harmony when dissociated from the hues of the picture ; and it was one of the anxieties of Rubens so to direct his engravers that the result might be a fine plate independently of what he had painted, To this end he helped his engravers by drawings, in which he sometimes went so far as to~~

~~indicate what he thought the best direction for the lines. Rubens liked Vorster-~~

~~ENGESAW IDS~~

~~Faithorne studied in France under the direction of Philippe de Champagne the painter, and Robert Nanteuil the engraver. Philippe Lebas, and then five years in Italy, where he saturated his mind with Italian art. French engravers came to stay and work in England as they went to study in Italy, so that the art of engraving became in the 18th century a cosmopolitan language. In figure-engraving the outline was less and Jess insisted upon. Strange nade it his study to soften and lose the outline. Mean- while, the great classical Renaissance school, with Gérard~~

~~Audran at its head, had carried forward the art of model- Audran,~~

~~ling with the burin, and had arrived at great perfection of a sober and dignified kind. Audran was very productive in the latter half of the 17th century, and died in 1703, after a life of severe self-direction in labour, the best external influence he underwent being that of the painter Nicolas Poussin. He made his work more rapid by the use of etching, but kept it entirely subordinate to the work of the burin. One of the finest of his large plates is St John Baptizing, from Poussin, with groups of dignified figures in the foreground and a background of grand classical landscape, all executed with the most thorough knowledge according to the ideas of that time.~~

~~The influence of Claude Lorrain on the engraving of land- Influence~~

~~scape was exercised less through his etchings than his of pictures, which compelled the engravers to study delicate distinctions in the values of light and dark. In this way,~~

~~through Woollet and Vivarés, Claude exercised an influence~~

~~man and yan's work, and scarcely corrected it, a plate he especially | on landscape engraving almost equal to that of Raphael and ere approved~~

~~being Susannali and the Elders, which is a learned | Rubens on the engraving of the figure, though he did not, Rubens, piece of work well modelled, and shaded everywhere on.| like those painters, direct his engravers personally.~~

~~Sir Robert Strange studied in France under Strange,~~

~~Claude.~~

~~the figures and costumes with fine curved lines, the straight line being reserved for the masonry. Vorsterman quitted Rubens after executing fourteen important plates, and was succeeded by Paul Pontius, then a youth of twenty, who~~

~~In the 19th century line-engraving has received both Line en- an impulse and a check, which by many is thought to graving be its death-blow. The impulse came from the growth ™ the~~

~~- ° : ‘ : I of public wealth, the increasing interest in art and the ani~~

~~went on engraving from Rubens with increasing skill until the painter’s death. Boetius a Bolswert engraved from Rubens towards the close of his life, and his brother Schelte a Bolswert engraved more than sixty composi- tions from Rubens, of the most varied character, including~~

~~increase in the commerce of art, which now, by mcans of of engraving, penetrated into the homes of the middle classes, as well as from the growing demand for illustrated books, which have given employment to engravers of first- rate ability. The check to line-engraving has come from~~

~~hunting scenes and landscapes. This brings us to the~~

~~engraving of landscape as a separate study. Rubens~~

~~treated landscape in a very broad comprehensive manner,~~

~~and Schelte’s way of engraving it was also broad and com-~~

~~prehensive, The lines are long and often undulating, the~~

~~cross-hatchings bold and rather obtrusive, for they often~~

~~substitute unpleasant reticulations for the refinement and~~

~~mystery of nature, but it was a beginning, and a vigorous~~

~~beginning. The technical developments of engraving under~~

~~the influence of Rubens may be summed up briefly as~~

~~follows :—1. The Italian outlinc had been discarded as~~

~~the chief subject of attention, and modelling had been~~

~~Results snbstituted for it; 2. Broad masses had been substituted~~

~~- his ins for the minntely finished detail of the northern schools ;~~

~~vences 3. A system of light and dark had been adopted which was~~

~~not pictorial, but belonged especially to engraving, which it rendcred (in the opinion of Rubens) more harmonious.~~

~~The history of line-engraving, from the time of Rubens~~

~~to the beginning of the 19th century, is rather that~~

~~of the vigorous and energetic application of principles~~

~~already accepted than any new development. From the~~

~~two sources we have already indicated, the school of~~

~~Raphael and the school of Rubens, a double tradition~~

~~English flowed to England and France, where it mingled and~~

~~—_ directed English and French practice. The first influence~~

me = on English line-engraving was Flemish, and came from

graving. Rubens through Vandyke, Vorsterman, and others ; but the

English engravers soon underwent French and Italian

inflnences, for although Payne learned from a Fleming,

the desire for cheaper and more rapid methods, a desire satisfied in various ways, but especially by etching and by

the various kinds of photography. Nevertheless, the

19th century has produced most highly accomplished

work in line-engraving, both in the figure and in land- scape. Its characteristics, in comparison with the work Charac- of other centuries, are chiefly a more thorough and delicate teristics rendering of local colour, light and shade, and texture. ° 4 The elder engravers could draw as correctly as the ete moderns, but: they either neglected these elements or admitted them sparingly, as opposed to the spirit of their

art. If you look at a modern engraving from Landseer,

you will see the blackness of a gentleman's boots (local colour), the soft roughness of his coat (texture), and the

exact value in light and dark of his face and costume against the cloudy sky. Nay more, you will find every sparkle on bit, boot, and stirrup. Modern painting pays moreattention to texture and chiaroscuro than classical paint-

ing did, so engraving has followed in the same directions.

But there is a certain sameness in pure line-engraving

which is more favonrable to some forms and textures than

~~to others. This sameness of line-engraving, and its costli- Mixed ness, have led to the adoption of mixed methods, which methods. are extremely prevalent in modern commercial prints from popular artists. In the well-known prints from Rosa Bonheur, for example, by T. Landseer, H. T. Ryall, and~~

~~C. G. Lewis, the tone of the skies is got by machine-ruling,~~

~~and so ig much undertone in the landscape ; the fur of the animals is all etched, and so are the foreground plants,~~

~~ENGERAY 1 ©~~

~~the real burin work being used sparingly where niost~~

~~favourable to texture. Even in the exquisite engraviugs~~

~~after Turner, by Cooke, Goodall, Wallis, Miller, Willmore,~~

~~and others, who reached a degree of delicacy in light and~~

~~shade far surpassing the work of the old masters, the~~

~~engravers have recourse to etching, finishing with the Turner's burin and dry point. Turner's name may be added to influence those of Raphael, Rubens, and Claude in the list of uponen- painters who have had a special influence upon engraving. graving: 'The speciality of Turner's influence was in the direction of delicacy of tone. In this respect the Turner vignettes to Roger's poems were a high-water mark of human attain- ment, not likely ever to be surpassed.~~

~~Pure line-engraving is still practised by a few artists in England and France. In England, Mr Jeens is a direct de- scendant of the great line engravers, and will take high rank in the future by the perfection of his drawing and the good taste with which he has used the burin in shading. In France, the lovers of line-engraving have endeavoured to keep it alive by organizing themselves into a society for its~~

~~encouragement. The most recent direction of the art, in Gaillard, the works of Ferdinand Gaillard, is a return to studied~~

~~outline, but in combination with the most elaborate modelling. In his St Sebastian the outline is studied and marked with careful firmness throughout, and the modelling is thoroughly worked out in minute touches and fine lines, giving powerful relief without any but the most delicate chiaroscuro.~~

~~Jeens.~~

~~Etching.~~

~~We mentioned etching amongst the causes which have operated destructively on line-engraving. The chief difference between the two arts is that in line-engraving the furrow is produced by the ploughing of the burin,~~

~~Etymo- Whereas in etching the copper is eaten away by acid. The logy. English word is merely an Anglicized form of the Dutch etsen, which has the same origin as our verb to eat, con- sequently, unless there is corrosion, or eating away of substance, there is no etching. The word is vulgarly and most erroneously used for pen drawing. Preparae 'To prepare a plate for etching it is first covered with tion of etching-ground, a composition which resists acid. The 4 qualities of a ground are to be so adhesive that it will not pe quit the copper when a small quantity is left isolated Etching between lines, yet not so adhesive that the etching point ground. cannot easily and entirely remove it; at the same time a good ground will be hard enough to bear the hand upon it, or a sheet of paper, yet not so hard as to be brittle. The Bosse's best is that of Abraham Bosse, which is composed as ground. follows :—Melt two ounces of white wax; then add to it one ounce of gum-mastic in powder, a little at a time, stirring till the wax and the mastic are well mingled ; then add, in the same manner, an ounce of bitumen in powder. There are three different ways of applying an etching- ground toa plate. The old-fashioned way was to wrap a ball of the ground in silk, heat the plate, and then rub the Covering ball upon the surface, enough of the ground to cover the the plate melting through the silk. To~~

~~equalize the ground a Plate, Gabber was used, which was made of cotton-wool under horsehair, the whole inclosed in silk. This method is still used by many artists, from tradition and habit, but it is far inferior in perfection and convenience to that which we will now describe. When the etching-ground is melted, add to it half its volume of essential oil of lavender, mix well, and allow the mixture to cool. You have now a paste which can be spread upon a cold plate with a roller; these rollers are covered with leather and made (very care- fully) forthe purpose. You first spread a little paste on a sheet of glass (if too thick, add more oil of lavender and mix with a palette knife), and roll it till the roller is quite equally charged all over, when the paste is easily trans-~~

~~ferred to the copper, which is afterwards gently heated to expel the oil of lavender. In both these methods of grounding a plate the work is not completed until the ground has been smoked, which is effected as follows,~~

~~The plate is held by a hand-vice if a sinall one, or, if large,~~

~~is fixed at some height, with the covered side downwards.~~

~~A smoking torch, composed of many thin bees-wax dips Smoking twisted together, is then lighted and passed repeatedly the under the plate in every direction, till the ground has Plate. incorporated enough lampblack to blacken it. The third~~

~~way of covering a plate for etching is to apply the ground in solution as collodion is applied by photo- graphers. The ground may be dissolved in chloroform, Liquid or in oil of lavender, The plate being grounded, its grounds. back and edges are protected from the acid by Japan varnish, which soon dries, and then the drawing is traced~~

~~upon it. The best way of tracing a drawing is to use sheet gelatine, which is employed as follows. The gelatine is~~

~~laid upon the drawing, which its transparence allows you to~~

~~see perfectly, and you trace the lines by scratching the Tracing, smooth surface with a sharp point. You then fill these scratches with fine black-lead, in powder, rubbing it in witli~~

~~the finger, turn the tracing with its face to the plate, and~~

~~rub the back of it with a burnisher. The black-lead from~~

~~the scratches adheres to the etching ground and shows upon~~

~~it as pale grey, much more visible than anything else you~~

~~can use for tracing. 'Then comes the work of the etching- needle, which is merely a piece of steel sharpened more or~~

~~less, Turner used a prong of an old steel fork which did The as well as anything, but neater etching-needles are sold by needle. artists' colourmakers. The needle removes the acid and~~

~~lays the copper bare. Some artists sharpen their needles~~

~~so as to present a cutting edge which, when used sideways, scrapes away a broad line; and many etchers use needles~~

~~of various degrees of sharpness to get thicker or thinner lines. It may be well to observe, in connection with this~~

~~part of the subject, that whilst thick lines agree perfectly Thick well with the nature of woodcut, they are very apt to give and thin an unpleasant heaviness to plate engraving of all kinds, lines whilst thin lines have generally a clear and agreeable ap- pearance in plate engraving. Nevertheless, lines of moderate thickness are used effectively in etching when covered with finer shading, and very thick lines indeed were employed with good results by Turner when he intended to cover them with mezzotint, and to print in brown ink, because their thickness was essential to prevent them from being overwhelmed by the mezzotint, and the brown ink made them print less heavily than black. Etchers differ in opinion as to whether the~~

~~needle ought to scratch the copper or simply to glide upon its surface. A gliding needle~~

~~is much more free, and therefore communicates a greater appearance of freedom to the etching, but it has the incon- venience that the etching-ground may not always be entirely removed, and then the lines may be defective from insufficient biting. A scratching needle, on the other hand,~~

~~is free from this serious inconvenience, but it must not scratch irregularly so as to engrave lines of various depth.~~

~~The biting in former times was generally done with a mix- Biting. ture of uitrous acid and water, in equal proportions ; but in~~

~~the present day a Dutch mordant is a good deal used, which~~

~~is composed as follows :—Hydrochloric acid, 100 grammes ; chlorate of potash, 20 grammes; water, 880 grammes. To~~

~~make it, heat the water, add the chlorate of potash, wait~~

~~till it is entirely dissolved, and then add the acid. The nitrous mordant acts rapidly, and causes ebullition; the Dutch mordant acts slowly, and causes no ebullition. The nitrous mordant widens the lines; the Dutch mordant bites~~

~~in depth, and does not widen the lines to any perceptible – degree. The time required for both depends upon temperature. A mordant bites slowly when cold, and more~~

~~Reduc- ing. Rebiting,~~

~~Influence of Rem- brandt and. Claude.~~

~~The re- vival of etching.~~

~~and more rapidly when heated. To obviate irregularity caused by difference of temperature, the writer of this paper has found it a good plan to heat the Dutch mordant artificially to 95° Fahr. by lamps under the bath (for which a photographer's porcelain tray is most convenient), and keep it steadily to that temperature ; the results may then be counted upon ; but whatever the temperature fixed upon, the results will be regular if it is regular. To get different degrees of biting on the same plate the lines which are to be pale are " stopped out" by being painted over with Japan varnish or with etching-ground dissolved in oil of lavender, the darkest lines being reserved to the last, as they have to bite longest. When the acid has done its work properly the lines are bitten in such various degrees of depth that they will print with the degree of blackness required ; but if some parts of the subject require to be made paler, they can be lowered by rubbing them with charcoal and olive oil, and if they have to be made deeper they can be rebitten, or covered with added shading. Rebiting is done with the roller above meutioued, which is now charged very lightly with paste and rolled over the copper with no pressure but its own weight, so as to cover the smooth surface, but not fill up any of the lines. The oil of lavender is then expelled as before by gently heating the plate, but it is not smoked. The lines which require rebiting may now be rebitten, and the others preserved against the action of the acid by stopping out. These are a few of the most essential technical points in etching, but there are many matters of detail for which the reader is referred to the special works on the subject. The two countries in which etching has been most prac- tised are Holland and France. It has also been successfully practised in Italy, Germany, and England, but not to so great anextent, It has resembled line engraving in receiv- ing a powerful impulse from celebrated painters, but whereas with the exception of Albert Diirer the painters have seldom been practical line engravers, they have advanced etching not only by advice given to others but by the work of their own hands. Rembrandt did as much for etching as either Raphael or Rubens for line engraving ; and in landscape the etchings of Claude had an influence which still continues, both Rembrandt and Claude being practical workmen in etching, and very skilful workmen. And not only these, but many other eminent painters have practised etching successfully, each in his own way.~~

~~Ostade, Ruysdael, Berghem, Paul Potter, Karl Dujardin, etched as they painted, and so did a greater than any of them, Vandyke. In the earlier part of the present century etching was almost a defunct art, except as it was employed by engravers as a help to get faster through their work, of which " engraving" got all the credit, the public being unable to distinguish between etched lines aud lines cut with the burin. During the last fifteen or twenty years, however, there has been a great revival of etching as an in- dependent art, a revival which has extended all over Europe, though France has had by far the largest and most import- ant share in it. It was hoped, at the beginning of this~~

~~revival, that it would lead to the production of many fine~~

~~original works; but the commercial laws of demand and supply have unfortunately made modern etching almost entirely the slave of painting. Nearly all the clever etchers of the present day are occupied in translating pictures, which many of them, especially Unger, Jacquemart, Flameng, and Rajon, do with remarkable ability, even to the very touch and texture of the painter. The comparative rapidity of the process, and the ease with which it imitates the manner of painters, have caused etching to be now very generally preferred to line engraving by publishers for the~~

~~- translation of all pictures except those belonging toa severe~~

~~and classical style of art, for which the burin is, and will always remain, better adapted than the etching-needle.~~

~~ENGRAYViIWSG~~

~~Yet, notwitlistanding the present commercial predomi- nance of etching from pictures, there are still some artists and eminent amateurs who have cultivated original etching with success. Mr Seymour Haden, Mr Whistler, Mr Samuel Palmer, and others in England, MM. Bracquemond, Dau- bigny, Charles Jacque, Appian, Lalanne, and others on the Coutinent, besides that singular and remarkable genius Charles Méryon, have produced original works of very various interest and power. Etching clubs, or associations of artists for the publication~~

~~of original etchings, have been founded in England, France, Germany, and Belgium. The real difficulty of the art, and its apparent facility, have led to much worthless production, but this ought not to make us overlook what is really valuable.~~

~~The following is a brief analysis of different styles of etch- Styles of 1. Pure Line—.As there is line engraving, so there is ¢tching.~~

~~ing. line etching; but as the etching-needle is a freer instrumeut than the burin, the line has qualities which differ widely from those of the burin line. Each of the two has its own charm and beauty; the liberty of the one is charming, and the re- straint of the other is admirable also in its right place. In line etching, as in line engraving, the great masters purposely exhibit the line and do not hide it under too much shading. 2. Line and Shade.—This answers exactly in etching to Mantegna's work in engraving. The most important lines are drawn first throughout, and the shade thrown over them like a wash with the brush over a pen sketch in indelible ink. 3. Shade and Texture.—This is used chiefly to imitate oil-painting. Here the line (properly so called) is entirely abandoned, and the attention of the etcher is given to tex- ture and chiaroscuro. He uses lines, of course, to express these, but does not exhibit them for their own beauty ; on tlie contrary, he conceals them.~~

~~Of these three styles of etching the first is technically the easiest, and being also the most rapid, is adopted for sketching on the copper from nature ; the second is the next in difficulty ; and the third the most difficult, on account of the biting, which is never easy to manage when it becomes elaborate. The etcher has, however, many re- sources ; he can make passages paler by burnishing them, or by using charcoal, or he can efface them entirely with the scraper and charcoal ; he can darken them by rebiting or by regrounding the plate and adding fresh work ; and he need not run the risk of biting the very palest passages of all, because these can be easily done with the dry point, which is simply a well-sharpened stylus used directly on the copper without the help of acid. It is often asserted that any one can etch who can draw, but this is a mistaken assertion likely to mislead. Without requiriug so long an apprenticeship as the burin, etching is a very difficult art indeed, the~~

~~two main causes of its difficulty being that the artist does not see his work properly as he proceeds, and that mistakes or misfortunes in the biting, which are of frequent occurrence to the inexperienced, may destroy all the relations of tone.~~

~~Aquatint.—This is a kind of etching which successfully Aquatint~~

~~imitates washes with a brush. There are many ways of preparing a plate for aquatint, but the following is the best. Have three different solutions of rosin in rectified alcohol, making them of various degrees of strength, but always thin enough to be quite fluid, the weakest solution being almost colourless. First pour the strongest solution on the plate. When it dries it will produce a granulation ; and you may now bite as in ordinary etching for your darker tones, stopping out what the acid is not to operate upon, or you may use a brush charged with acid, per- chloride of iron being a very good mordant for the pur- pose. After cleaning the plate, you proceed with the weaker solutions in the same way, the weakest giving the finest granulation for skies, distances, &c. The process~~

~~Tendency~~

~~ENG Pa Yrm G~~

~~requires a good deal of stopping-out, and some burnishing, scraping, &c., at last. It has been employed very success- fully by M. Brunet Debaines in his plates from Turner, especially in Agrippina landing with the Ashes of Ger- manicus. Aquatint may be effectively used in combina- tion with line etching, and still more harmoniously with soft ground etching in which the line imitates that of the lead pencil.~~

~~The natural tendency of the three kinds of engraving we~~

~~ofengrav- have studied is from line to shade and from shade to~~

~~ing to tone and texture.~~

~~Tnven- tion of mezzo- tint en- graving.~~

~~Prepara- tion of~~

~~the plate.~~

~~The pro-~~

~~cess,~~

~~The en- fravers of ftey- nolds,~~

~~Lupton,~~

~~texture. The perfection of line is seldom maintained when the atteution of artists has been directed to the other elements, for line is a separate study. Shade is its enemy, but line may still survive under a veil of half shade. When chiaroscuro becomes complete the delicacy cf line, which is an abstraction, is nearly lost; and when texture becomes an object also, the line is lost altogether. This appears to be the natural law of development in the graphic arts, and it is an approach to nature, which is all shade and texture without line ; yet the pure line isa loss in art, from its ready expression of the feeling of the artist, and a loss for which more natural truth is not always a compensation.~~

~~Mezzotint.~~

~~Of all the kinds of engraving, mezzotint comes nearest to nature, though it is far from being the best as a means of artistic expression. It is said to have been invented by Prince Rupert, or by Lewis Siegen, a lieutenant in his service, in or about the year 1611, and to have been suggested by the rust on a weapon which a soldier was cleaning. The plate is prepared (before any design is made upon it) by means of an instrument like a chisel, with the edge ground into the segment of a circle like the rocker of a cradle, and so engraved as to present when sharp about 100 or 120 small teeth. This cradle is rocked from side to side with the hand, and every tooth makes a small dent in the copper, and raises a corresponding bur. The whole surface of the plate is gone over with this instrument about eighty times, in different directions, before it is in a fit con- dition to be worked upon. When sufficiently~~

~~prepared it presents a fine soft-looking and perfectly even grain, and if in this state a proof is taken from it by the usual process of copper-plate printing, the result is nothing but the richest possible black. The engraver works from dark to light -by removing the grain with a scraper, and exactly in proportion as lhe removes it the tint becomes paler and paler. Pure whites are got by scraping the grain away entirely, and burnishing the place. As the process is from dark to light, the engraver has to be very cautious not to remove too much of his grain at once. He proceeds gradually from dark to half-dark, from half-dark to middle- tint, from middle-tint to half-light, and from half-light to light. He has nothing to do with line, but thinks entirely of masses relieved from each other by chiaroscuro. When the work is good the result is soft and harmonious, well adapted to the interpretation of some painters, but not of all. As the art has been most practised in England, some of its most successful work has been employed in the tran- slation of English artists, More than a hundred engravers in mezzotint employed themselves on the portraits of Sir Joshua Reynolds, and the best of their works are now valued as the classics of the art, which is connected with the name of Reynolds just as line engraving is connected with that of Raphael. Turner and Constable's landscapes were also admirably engraved in mezzotint by Lupton and others, Turner himself being a good mezzotint engraver, though he practised the art little. Mezzotint engraving is~~

~~Cousena. still practised in England with great skill by Cousens and~~

~~others, and would no doubt be more resorted to than it is~~

~~if the plates yielded larger editions, but unfortunately they soon show signs of wear. Dry point is really nothing but mezzotint in line.~~

~~raises a bur, which retains the ink in the printing just as the bur from the cradle does in mezzotint. The bur of dry point also wears away fast, and yields but few impressions.~~

~~Copper, steel, and zinc are the metals chiefly used for engraving. Steel is less employed than formerly, because copper is now covered with a coat of steel by the electro- type process, which enables it to resist printing indefinitely, as the steel can be renewed at will. Zinc is similarly coated with copper, and sometimes used for small editions.~~

~~Autuoritirs.—A real knowledge of engraving can only be at- tained by a careful study and comparison of the prints themselves, or of accurate facsimiles, so that books are of little use except as guides to prints when the reader happens to be unaware of their existence, or else for their explanation of technical processes, 'I'he department of art-literature which classifics prints is called Zcono- graphy, and the classifications adopted by iconographers are of the most various kinds. For example, if a complete book were written on Shakespearian iconography it would contain full information about all prints illustrating the life and works of Shakespeare, and in the same way there may be the iconography of a locality or of asingle event. The history of engraving is a part of iconography, and there are already various histories of the art in different lan- guages. In England Mr W. Y. Ottley wrote an Early History of Engraving, published in two volumes 4to, 1816, and began what was intended to be a series of notices on engravers and their works. Mr H. Ottley has also written upon the same subject. The facili- ties for the reproduction of engravings by the photographic pro- cesses have of late years given an impetus to iconography. One of the most reliable modern writers on the subject is M. Georges Duplessis, the keeper of prints in the national library of France. He hag written the History of Engraving in France, and has pub- lished many notices of engravers to accompany the reproductions by M. Amand Durand. He is also the author of a useful little manual entitled Les Merveilles dela Gravure. Count de Laborde collected materials for a history of wood-engraving, and began to publish them, but the work advanced no farther than a first num- ber. Jansen's work on the origin of wood and plate engraving, and on the knowledge of prints of the 15th and 16th centuries, was published at Paris in two volumes 8vo in 1808. Didot's Essai typographique et bibliographique sur Vhistoire de la gravure sur bois was published in Paris (8vo) in 1863.~~

ard against certain assertions of the author, especially these two, —(1) that all good engraving rejects chiaroscuro, and (2) that etch- ing is an indolent and blundering process at the best. The illustra- tions to this volume are of unequal merit : the facsimilesfrom Holbein are good; the reductions of early Italian engravings are not good. The reader will find information about engraving, and many fac- similes of old woodcuts, in the different volumes by Paul Lacroix on the Middle Ages and the Renaissance, published by Firmin Didot ; the information may be relied upon, but the facsimiles, though effective, are not always perfect. Roret's Collection de Manuels for- mant une Encyclopédie des Sciences et des Arts contains a pocket volume on engraving which is full of useful practical information, and another similar volume on plate-printing, also very useful to engravers on metal, who ought always to understand printing ; these volumes may be had separately. Etching has been the subject of several different treatises. The oldest is that of Abraham Bosse, published at Paris in 1645, 8vo, and in 1701, 12mo. The revival of etching in our own day has been accompanied by the publication of various treatises. The first was a short account of the old process by Mr Alfred Ashley ; then came the French brochure of M. Maxime Lalanne; then Etching and Etchers (450 pages, in the stereo- typed edition) by the writer of this article, and a smaller treatise, The Etcher's Handbook, by the same. These were followed by another short French handbook, that of M. Martial. For information about the states of plates, their prices, their anthenticity and history, the student ought to consult the best catalogue-makers, such as Bartsch, Claussin, Charles Blanc, &c. The literature of engraving

As Dry the point of the stylus makes its scratch on the copper, it pots

is now rapidly increasing in consequence of the new processes of reproduction, and the great engravers of past times are becoming much better known. Works on the subject frequently appear, not only in England and France, but also in Germany, whilst Holland and Italy bring their contributions to general iconography. In consequence of this rapid extension of studies on the subject, any attempt at a universal

~~bibliography of works about engraving would soon become obsolete or incomplete. (BAGyE:)~~

~~ENGUERA, a town in the province of Valencia, in Spain, is situated in a mountainous district 32 miles S.S.W. of Valencia and 12 miles W.N.W. of San Felipe. Olives and mulberries abound in the surrounding country. In the town there are a convent and a hospital. It possesses woollen mills, and has also a considerable general trade. Population, 5700.~~

~~ENKHUIZEN, a seaport town of the Netherlands, in the province of North Holland, situated on the Zuyder Zee, 28 miles N.N.E. of Amsterdam. Its principal buildings are the town-house, the Wester-Kerk, the orphanage, the church of the Old Catholics. The town-house, erected in 1588, is adorned with allegorical paintings by Gerard de Lairesse, Houbraken, and Van Neck; one of its chambers is hung with fine tapestry of Louis XIV.'s time, and the burgomaster's room contains a chef deuvre by Ferdinand Bol. The industrial establishments comprise a foundry, several sugar refineries, and one of the largest factories in Europe for the manufacture of buoys; and there is a trade in wood, butter, and cheese. At the beginning of the 17th century the town numbered 40,000 inhabitants, and sent 400 vessels to the herring fishery ; but the harbour is now rendered nearly useless by accumu-lations of sand, the fishing smacks do not number more than a dozen; and the population in 1869 was only 4925.~~

~~The nucleus of Enkhuizen was formed by a few houses (Enkele huizen) built about 1000 a.p., and it was still an open village in 1279. In spite of numerous military vicissitudes, and a great flood which happened in 1514, it rapidly advanced, and under Spanish rule became a strongly fortified and beautifully built town. It was, however, the first of the cities of Holland to open its gates to William the Silent, in 1572. During the 17th century it began to decay, and in the 18th it sank to its present position.~~

~~ENLISTMENT, as defined in the annual Mutiny Act (39 Vict. c. 8), consists in the recruit answering the ques- tions put by the person authorized to recruit or to enrol under the Reserve Force Act or to~~

~~enlist under the Militia Reserve Acts, and in his accepting the enlisting money with the accompanying notice. The recruit is then entitled to be billeted, and must, in not less than twenty-four and not more than ninety-six hours, appear before a magistrate (who is not a military officer) to be attested as a soldier or to object to his enlistment. If the recruit objects and satisfies the magistrate that the enlistment was irregular, he is discharged, and the matter reported to the military authorities; if the recruit objects, but the enlistment was regular, he must repay the enlisting money and any pay or allowances he may have received, and 20s. of smart money, and is then discharged. If the recruit does not object, or cannot pay the money, the questions in the form of attestation are again put by the magistrate, who also administers the oath of allegiance. If the recruit does not appear, he may be punished as a rogue or vagabond. Before this attestation the recruit is not subject to court- martial, but fraudulent conduct followed by attestation is punished either by the justices of the peace or by the district or garrison court-martial. Every attempt by an undischarged soldier or volunteer to re-enlist is punishable as desertion; but in the case of militiamen the penalty is generally a stoppage of 1d. or 2d. of weekly pay for a certain period. It is from the date of attestation that the period of service for pension or discharge runs. The above provisions apply to enlistment in the United King- domi of natural born subjects, The Mutiny Act makes~~

~~special provision for enlistment abroad and for the enlist- ment of negroes or coloured persons who are not sub- jects of Her Majesty by birth, or who have been con- demned as prize under the Slave Trade Acts. A master wishing to recover an apprentice or indentured labourer wlio has enlisted must claim him within a month after enlist- ment. The apprentice is not only punished for wrongful enlisting, but remains liable to serve in the army at the end of his apprenticeship, and indeed may be punished as a deserter if he does not deliver himself up as a recruit. Much the same rules will be found in the Marine Mutiny Act. The enlistment oath for the militia is contained in the Militia Service Act, 36 and 37 Vict.c.68, The period of service implied in~~

~~enlistment is now regulated by the Army Enlistment Act, 1870, 33 and 34 Vict. c 67, repealed as regards compulsory general enlistment by the Mutiny Act, 1876. Long service is always for twelve years. Shortservice in the cavalry, artillery, and engineers is eight years army and four years reserve ; in the infantry and army service corps, six years army and six years reserve. For the army hospital corps and the colonial corps there.is no short service. In 1870 it was said that this scheme would require 322,449 recruits annually, and that in eight years a reserve of 81,811 would be created. The average enlistment is only about 20,000, but this is largely accounted for by the inducements given to enter the militia. In early times attendance at the posse comitatus was enforced by the penalty of culvertage, or turntail, viz., forfeiture of property and perpetual servitude. The organization of this levy will be found in the Assize of Arms (27 Hen. II.) and the Statute of Winchester (13 Edw. I.), which apply to all men between the ages of fifteen and sixty. By a later Act (4 and 5 Philip and Mary), commissioners of musters were appointed. When the feudal system of escuage was on the wane, Edward III. introduced a custom of "indenting" with private persons to furnish soldiers at certain rates of wage. Many of such indentures of Henry V.'s time, printed in Hunter's Critical and Historical Tracts, vol. i., appear to be agree- meuts for one year in consideration of gages et regards, or pay and bounty, at certain rates, 6d. a day for an archer and ls. for a man at arms. The parties agree about sharing tlie gaignes de guerre, prisoners and booty. A quarter's wages, called prest money, is paid in advance. Not till the time of Henry VII. was "coat and conduct money" added tothis mere bounty on joining. From time to time general pardons were given to all felons who would serve in the army, and even so late as 1703 a statute freed all insolvent debtors who would serve. The Welsh, Cornish, and Irish made up a large proportion of the recruits of the early English armies. (See also ARMy, vol. ii. p. 574).~~

~~ENNIS, a municipal and parliamentary borough and market-town of Ireland, the capital of the county of Clare, province of Munster, is situated on the Fergus, about 25 miles W.N.W. from Limerick, with which town and Athenry it is connected by railway. Ennis has breweries, distilleries, and extensive flour mills; and in the neigh-~~

~~bourhood there is a valuable limestone quarry. The prin- cipal buildings are the Roman Catholic chapel, which is the cathedral of the diocese of Killaloe; the parish church, formed out of the ruins of the Franciscan abbey, founded in 1240 by Donogh Carbrac O'Brien ; the court-house, a nunnery, and a school on the foundation of Erasmus Smith. On the site of the old court-house a colossal statue in white limestone of Daniel O'Connell was erected in 1865. The interesting ruins of Clare Abbey, founded in 1194 by Donell O'Brien, king of Munster, are half-way between Ennis and the village of Clare Castle. Ennis returns a member to parliament. Population in 1871, 6503.~~

~~ENN—ENN~~

~~ENNISCORTHY, a market-town of Wexford county, Treland, 13 miles N.N.W. of Wexford, on the side of asteep hill above the Slaney, which here becomes navigable for barges of alarge size. It is on the line of railway between Dublin and Wexford. It possesses tanneries, breweries, flour mills, a woollen factory, and a distillery. Ennis- corthy was taken by Cromwell in 1649, and in 1798 was stormed and burned by the rebels, whose main forces encamped on an eminence called " Vinegar Hill," which overlooks tle town from the east. The old castle of Enniscorthy, a massive square pile with a round tower at each corner, is one of the earliest military structures of the Anglo-Norman invaders. Population in 1871, 5594.~~

~~ENNISKILLEN, a municipal and _ parliamentary borough and market town of Ireland, capital of the county of Fermanagh, province of Ulster, is situated on an island in the strait or river which connects the upper and lower lakes of Lough Erne, 102 miles N.W. from Dublin and 22 miles from Clones by railway. The town occupies the whole island, and is connected with two suburbs on the mainland on each side by two bridges. It has a brewery, two tanneries, and a small manufactory of cutlery, and considerable trade in corn, pork, and flax. The chief public buildings are the parish church, the Roman Catholic chapel, the Presbyterian and Methodist meeting houses, the county court-house, the town-hall, the royal school founded by Charles I., and the infirmary. In 1689 Enniskillen defeated a superior force sent~~

~~against it by James IL; and part of the defenders of the town were subsequently formed into a regiment of cavalry, which still retains the name of the Enniskillen Dragoons. .The town returns 9 member to parliament. Population in 1871, 5836.~~

~~ENNIUS, Q. Although Enniusis known to us only from fragments of lis writings and from ancient testimony, yet there is sufficient evidence from both sources to justify us in assigning to him a position of great eminence and influence in Roman literature. Although not the creator of tliat literature, for he is later in date, not only than Livius Andronicus and Neevius, but than Plautus, yet he did more than any of the early writers to impart to it a character of serious elevation, and thereby to make it truly representative of Rome. The influence of Nevius was little felt by subsequent writers; and, although the works of Plautus have enjoyed a happier fortune than those of Ennius, yet Latin comedy was essentially an exotic product, and stood in no direct relation to Roman life, nor to the deepest and most permanent moods of the national mind. On the other hand, both Lucretius and Virgil may be regarded as inheriting the spirit of. Ennius; and in many fragments of his various works we recognize his affinity with the genius of Roman history, oratory, and satire.~~

~~The circumstances of his life naturally fitted him to become the chief medium of contact between the art and intelligence of Greece and the practical energy and com- manding character of Rome. He was born among the Calabrian mountains (' Calabris in montibus ortus") in the small town of Rudiz, in the year 239 B.c., one year after the date of the first dramatic representation of Livius Andronicus, and two years after the end of the first Punic war, Oscan was the language of the district in which Rudiz was situated ; but, as it is called by Strabo "EAAnus woAus, and as Ennius is spoken of as " semi-Greecus," Greek was probably the language in common use among the cultivated classes. Since the subjugation of Italy, and the settlement of Roman and Latin colonies in the conquered districts, the knowledge of Latin must have been spread among the allies who sent their contingents to the Roman armies. Ennius testified to his appreciation of the intellec- tual gain~~

~~derived from the possession of various languages by using, in reference to his knowledge of Oscan, Greek,~~

~~and Latin, tlie expression that "he had three hearts" (Gell. xvii. 17), the word "cor" being used by him, as by many other Latin authors, as the seat of intelligence. Through the access which these languages gave to the ideas and sentiments of which they were the organs, Ennius was able to combine the culture of Greece, the fresh feeling and inspiration of Italy, the elevated mood and "imperial patriotism of Rome," in laying the strong foundation of the national literature.~~

~~He is said (Serv. on dn. vii, 691) to have claimed descent from one of the legendary kings of his native district, the "' Messapus equum domitor" who is introduced by Virgil (in recognition of the poetical fame of his reputed descendant) as coming to the gathering of the Italian clans accompanied by his follawers, chanting their native songs,—~~

~~"'Thant equati numero regemque canebant."~~

~~This consciousness of ancient lineage is in accordance with the high self-confident tone of his mind, with his sympathy with the dominant genius of the Roman republic, and with his personal relations to the members of her great, families. The exemption from war which his native district enjoyed during the first twenty years of his life afforded him leisure to acquire the culture which he turned to use in later life; and the vicinity of Tarentum afforded him favourable opportunities for familiarizing himself with the dramatic art of Greece. But of his early years nothing is directly known, and we first hear of him in middle life as serving, with the rank of centurion, in Sardinia, in the year 204 3B.c, where he attracted the attention of the Quecstor Cato, and was taken by him to Rome in that year. This personal service in the second Punic war, the most momentous struggle in which Rome was ever engaged, must have deepened his interest in the national fortunes, and contributed to that knowledge of men, and especially of the soldierly character, which was afterwards largely displayed in his epic and dramatic poetry. As Cato made it a reproach to M. Fulvius Nobilior~~

~~that he had taken Ennius, after he became known as a poet, along with him in his A®tolian campaign (Cicero, Z'usc. Disp., i. 2), we may perhaps infer that it was the personal qualities of the man rather than the genius or culture of the poet which recommended the Messapian soldier to his regard.~~

~~From the time of his arrival in Rome till his death in 169 3B.c., he devoted himself actively to various kinds of literary production, and probably to giving instruction in Greek, for which a great demand existed among the families of more liberal ideas among the Ronian aristocracy. He lived on the Aventine, "in a plain and simple way, attended only by a single maid-servant " (to quote the words of Jerome in his continuation of the Eusebian Chrouicle), and enjoying the friendship of the foremost men in the state, such as the great Scipio and M. Fulvius Nobilior, the conqueror of Aitolia. So strong was the bond of friend- ship which united him to the former of these men, that a bust of the poet was placed after death in the tomb of the Scipios, between those of the conqueror of Hannibal and the conqueror of Antiochus. He accompanied M. Fulvius Nobilior in his Atolian campaign, in the year 189 B.c., and was present at the capture of Ambracia, which formed the subject of one of his dramas. The representa- tion of this drama probably took place at the celebration of the general's triumph two years later. Through the influence of his son, the poet obtained the privilege of Roman citizenship, a fact commemorated by him in a line of the Annals—~~

~~"Nos sumw Romani qui fuvimus ante Rudini."~~

~~He died at the age of 70, immediately after producing the tragedy of Z'hyestes. In the last book of his epic~~

~~poem, in which he seems to have given various details of his personal history, he mentions that he was in his 67th year at the date of its composition. He compared himself, in contemplation of the close of the great work of his life, to a gallant horse which, after having often won the prize at the Olympic games, obtained his rest when weary with age.~~

~~A similar feeling of pride at the completion of a great career is expressed in the memorial lines which he composed to be placed under his bust after death,—‘ Let no one weep for me, or celebrate my funeral with mourning; for I still live, as I pass to and fro through the mouths of men.”~~

~~From the impression stamped on his remains, and from the testimony of his countrymen, we think of him as a man of a robust, sagacious, and cheerful nature (Hor. Zp. ii. 1,50; Cic. De Sen. 5); of great. industry and versatility ; combining imaginative enthusiasm and a vein of religious mysticism with a sceptical indifference to popular beliefs and a scorn of religious imposture; and tempering the grave scriousness of a Roman with a genial capacity for enjoyment (Hor. Jp, i. xix. 7), We may realize the nature of his relation to such men as Fulvius Nobilior, and his personal bearing towards them, by a passage quoted from his Annals (Gell. xii. 4), in which he is said, on the authority of the grammarian Ajlius Stilo (a contemporary of Lucilius, and one of Cicero’s teachers), to have drawn his own portrait under the figure of a confidential friend of the Roman general Servilius. This friend is introducced as_ being sent for by Servilius during a battle, and is described as one “whom he (Servilivs) gladly made the sharer of his table, his talk, and his cares, when tired out with speaking on great affairs of state in the broad forum and august senate,—one with whom he could frankly speak about serious matters or jest about trifles,—to whom he could safely confide all that he cared to utter, with whom he had much hearty entertainment alone and in society,—one whose nature could never be prompted to any baseness through levity or malice,—a learned, loyal, pleasant man, contented and cheerful, of much tact and courtesy, choice in his language, and of few words, with much old buried lore, with much knowledge of men, and much skill in divine and human law, —who knew weil when to speak and when to be silent.~~

~~His career as a writer began at a great epoch of the national life, the end of the second Punic war. ‘The self- confident and triumphant spirit produced by the successful result of that struggle may be discerned in the exuberant vitality and animal spirits of the comedies of Plautus, whose period of most vigorous production falls in the years between the~~

~~end of the war and his death in 184 B.c, Morenearly contemporary with Ennius was Oecilius Statius, the Insubrian Gaul, whom Roman critics ranked as a greater comic dramatist than Plautus or Terence. If weight may be attached to the phrase in which Horace repeats the criticism of the Augustan age,—~~

~~**Vincere Cecilius gravitate,"~~

~~he must have resembled him in temper also more than the~~

~~older dramatists. Till the appearance of Ennius, Roman literature, although it had produced the epic poem of Nevius and some adaptations of Greek tragedy, had been most successful in comedy. Nevius and Plautus were men of thoroughy popular fibre. Neevins suffered for his attacks on members of the aristocracy, and, although Plautus carefully avoids any direct notice of public matters, yet the bias of his sympathies is indicated in several pass- ages of his extant plays. Ennius, on the other hand, was by temperament in thorough sympathy with the domi- nant aristocratic element in Roman life and institutions.~~

~~Under his influence literature became less suited to the |~~

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~~popular taste, more specially addressed to a limited and cultivated class, but at the same time more truly expressive of what was greatest and most worthy to endure in the national sentiment and traditions. With the many-sided activity which characterized him, he attempted comedy, but with so little success that, in the canon of Voleatius Sedi- gitus he is mentioned, solely as a mark of respect " for his antiquity," tenth and last in the list of comic poets, The names of only one or two of his comedies are known, He may be regarded also as the inventor of Roman satire, in its original sense of a "medley" or "miscellany," although it was by Lucilius that the character of aggressive and cen- sorious criticism of men and manuers was first imparted to that form of literature. The word "satura" was originally applied to a rude scenic and musical performance, exhibited at Rome before the introduction of the regular drama. The saturee of Ennius were collections of writings~~

~~on vari- ous subjects, and written in various metres, and contained in four or, perhaps, six books, Among these were included metrical versions of the physical speculations of Epichar- mus, of the gastronomic researches of Archestratus of Gela (“ Heduphagetica”), and, probably, of the rationalistic doctrines of Euhemerus. It may be noticed that all these writers whose works were thus introduced to the Romans were Sicilian Greeks. Original compositions were also con- tained in these sature, and among them the panegyric on Scipio, to which Horace refers in the phrase “ Calabree Pierides” (Od, iv. 8, 22). The satire of Ennius seems to have resembled the more artistic satire of Horace in its record of personal experiences, in the occasional introduc- tion of dialogue, in the use made of fables with a moral application, and in the didactic office which it assumed. But the chief distinction of Ennius was gained in tragic and narrative poetry. He was the first to impart to the Roman adaptations of Greek tragedy the masculine dignity, pathos, and oratorical fervour which continued to animate them in the hands of Pacuvius and Accius, and which, when set off by the acting of sopus, called forth vehement applause in the age of Cicero. The titles of about twenty-five of his tragedies are known to us, and a considerable number of fragments, varying in length from a few words to about fifteen lines, have been preserved. These tragedies were for the most part adaptations and, in some cases, translations from Euripides. One or two were original dramas, of the class called “preetextate,” ¢.¢., dramas founded on Roman history or legend. The heroes and heroines of the Trojan cycle, such as Achilles, Ajax, Telamon, Cassandra, Andromache, were prominent figures in some of those adapted from the Greek. Several of the more important fragments are found in Cicero, who expresses a great admiration of the manly fortitude or dignified pathos (“O poéma tenerum et moratum atque molle”) of the passages which he quotes. Although it is more difficult to judge, from unconnected fragments, of the genius of a dramatic than of any other kind of poet, yet in these remains of the tragedies of Ennius we can trace indica- tionsof strong sympathy with the noblerand bolderelements of character, of vivid realization of impassioned situations, and of sagacious observation of life. The frank bearing, fortitude, and self-sacrificing heroism of the best type of the soldierly character find expression in the persons of Achilles, Telamon, and~~

~~Eurypylus; and a dignified and pas- sionate tenderness of feeling makes itself heard in the lyrical utterances of Cassandra and Andromache. The language is generally nervous and vigorous, occasionally vivified with imaginative energy. But it flows less smoothly and easily than that of the dialogue of Latin comedy. It shows the same tendency to aim at effect by alliterations, asson- ances, and plays on words. The rudencss of early art is most apparent in the inequality of the metres in~~

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~~which both the dialogue and the " recitative" are com- posed.~~

~~But the work which gained him his reputation as the Homer of Rome, and which called forth the tribute of affectionate admiration from Cicero and Lucretius, and that of frequent imitation from Virgil, was the Annates, a long narrative poem in eighteen books, containing the record of the national story from mythical times to the years during which the poem was written. Although the whole conception of the work implies that confusion of the provinces of poetry and history which was perpetuated by later writers, and especially by Lucan and Silius, yet it was a true instinct of genius to discern in the idea of the national destiny the only possible motive of a Romen epic. The execution of the poem (to judge of it by the fragments, amounting to about six hundred lines, which have been preserved) although rough, unequal, and often prosaic, seems to have combined the realistic fidelity and freshness of feeling of a contemporary chronicle with the vivifying and idealizing power of genius. He prided himself especially on being the first to form the strong speech of Latium into the mould of the Homeric hexameter. And although it took several generations of poets to beat their music out to the perfection of the Virgilian cadences, yet in the rude adaptation of Ennius the secret of what ultimately became one of the grandest organs of literary expression was first discovered and revealed. 'The inspiring idea of the poem was accepted, purified of all alien material, and realized in artistic shape by Virgil in his national epic. He deliberately imparted to that poem the charm of antique associations by incorporating with it much of the phraseology and sentiment of Ennius. The occasional references to Roman history in~~

~~Lucretius are evidently reminiscences of the Annals. He as well as Cicero speaks of him with pride and affection as ““Ennins noster.” Of the great Roman writers Horace had least sympathy with him ; yet he testifies to the high esteem in which he was held during the Augustan age. Ovid expresses the grounds of that esteem when he characterizes him as~~

~~‘* Ingenio maximus, arte rudis.”~~

~~A sentence of Quintilian expresses the feeling of rever- ence for his genius and character, mixed with distaste for his rude workmanship, with which the Romaus of the early empire regarded him :—“ Let us revere Ennins as we revere the sacred groves, hallowed by antiquity, whose massive and venerable oak trees are not so remarkable for beanty as for the religious awe which they inspire” (Inst. Or. x. i. 88). From his own application of the epithet “sanctus” to poets, which may be compared to the application by Lucretius of the same word to the great discoverers in philosophy, and to the “ piivates ” of Virgil, we may learn something of the earnest spirit in which he wrote for his countrymen the great story of their fathers’ deeds. ** Aspicite, O cives, senis Enni imagini’ formam ; Hic vestrum panxit maxima facta patrum.”~~

~~The best edition of his fragments is that of Vahlen, published in 1854. The remains of his tragedies are edited also in Ribbeck’s TLragicorum Latinorum Reliquic, published in 1852. These remains are critically discussed in the Rémische Tragédie of the same author, published in 1875. (QVERYEES:;)~~

~~ENOCH. Four persons of this name are mentioned in the Old Testament Scriptures. The first was the eldest son of Cain, who called a city which he built by the same name as his first-born (Gen. iv. 17). In the English Authorized Version Enoch appears, in the form Hanoch, as the name of the eldest son of Reuben (Gen. xlvi. 9) and of a son of Midian (Gen. xxv. 4). The name is most familiar, however, as that of the son of Jared and the father of Methusaleh, whose life is told in’ Gen. v. 18-24, and~~

further illustrated in Heb. xi. 5. The evident meaning of the two passages taken together is that Enoch, after a life of close intercourse with the spiritual world, which lasted for 365 years, was translated to heaven without dying. The symbolic meaning of the numbers connected with his life has not escaped notice. He was "the seventh from Adam " (Jude 14), aud this has been held to typify his perfection. On the fact that his years are the same in number as the days of an ordinary solar year a mythical interpretation of the story of his life has been offered which seems more ingenious than sound. According to this, Enoch is the god of the new year. The year " is not " at the end of 365 days, but is immediately renewed. Enoch's chief importance in Old Testament history consists in the fact that along with Elijah he is a palpable witness to the doctrine of immortality. Later traditions, founded probably on the apocryphal book which bears his name, re- present him as the inventor of arithmetic and astronomy. On the book of Enoch, see APocatyptic LirERatuRg, vol. ii. pp. 175.

ENOS (the ancient Minos), a seaport town in the metropolitan province of European Turkey, vilayet of Adrianople and sandjak of Gallipoli, is sitnated on the south side of the Gulf of Enos, 38 miles N.W. of Gallipoli and 80 miles §.W. of Adrianople. It is connected with Adrianople by the river Maritza, and for a long time has been its principal seaport ; but on account of its harbour having become partially choked by a sandbank, and the fact that Adrianople is now connected by rail with the neighbouring port Dédé-Agatch, its trade is gradually declining. The deposits which have accumulated in the harbour are the cause of fevers which at certain periods almost decimate the population. Population about 7000.

ENRIQUEZ GOMEZ, Antonio, the name finaly adopted by a Spanish dramatist and poet, who was the son of Don Diego Enriquez Villanueva, a converted Portuguese Jew, and during the first part of his public life was known as Enrique Enriquez de Paz. He was born in Seville, pro- bably between 1600 and 1602, and obtained a classical education. His twentieth year was hardly out when he entered the

army, and his military services procured him, not only the rank of captain, but also admission into the Portuguese order of San Miguel de Avis, About 1629 a number of comedies from his pen were represented in the theatre of Madrid, the Cardenal de Albornoz and Kernan Mendez Pinto being especially applauded; and he was probably still in the capital in 1635, when there appeared his Kama péstuma & la vida y muerte de Lope de Vega. Fear of persecution on account of his suspected Jewish proclivities seems to have Jed him to leave Spaiu in 1636 ; and in 1638 we find him in France, where he remained for eleven years, became councillor and majordomo to Louis XIITI., and continued assiduously to write and publish. Shortly after 1656 he settled in Amsterdam, and in the religious tolerance of that city made open avowal of his Judaism, and thus had the honour of appearing in effigy in the great auto-da-fe celebrated in Seville on April 14, 1660. The date of his death is not known, but it was probably not many years later. He had at least one son, Diego Enriquez Basurto, who in 1649 published at Rouen £/ triwmpho de la virtud y paciencia de Job. As a writer Enriquez is characterized by ready invention and a " fatal facility " of execution; and especially in his later works his style is full of extravagances. His Academizas morales de las Musas, Bordeaux, 1642, contains, besides three other comedies, A lo que obliga el honor, which was the foundation of Calderon's Medico de su honor. Ll siglo pitagorico y vida de don Gregorio Guadafia, Rouen, 1644, 1647, and 1687 (reprinted at Brussels by F. Foppens in 1727, and by Rivadeneyra in tom, xxxui. of his Bzblioteca de Autores

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espaftoles), is a series of satirical sketches in prose and verse, which partake of the character of the picaresque romance. La culpa del primer peregrino (Rouen, 1644 ; Madrid, 1735), a mystical poem ; Luis dado de Duos d Anna (Paris, ae presenting the author's views on political matters ; Politica, Angelica (Rouen, 1647) ; La torre de Babulonia (Rouen, 1647 ; Madrid, 1670), containing the two parts of Fernan Mendez Pinto ; Samson Nazareno, a heroic poem ; and several

~~comedies not mentioned above, complete the list of Enriquez's acknowledged writings. Adolfo de Castro, however, in his notes to Ga Blas, advanced the opinion that the comedies usually attributed to Fernando de Zarate were really the production of Enriquez Gomez, who had merely adopted the shelter of a pseudonym to facilitate the introduction of his works into Spain. His principal authority was the following entry in the Jndex Expurgatorius : "Don Fernando de Zarate (is Antonio Enriquez Gomez)—His comedy, El capellan de la Virgen, San Ildefonso, is prohibited ;" and the fact that almost nothing was known about Zarate lent a strong show of probability to his theory. The matter has since been eagerly debated. Mesonero Romanos, editor of vol. i. of the Dramaticos posteriores é Lope de Vega (i.e., vol. xlvii. of Rivadeneyra's Bzblioteca), though at first he adopted Castro's opinion, has since become its vigorous opponent; and Barrera makes out a very strong case in favour of the historical individuality of Zarate, alleging, among other arguments, that the subjects of the plays ascribed to him, Ell gran sepulcro de Cristo, Santa Maria Magdalena, &c., are not such as were likely to be treated in his later years by the Jewish poet, that autograph manuscripts of Zarate exist in various collections, and that the style and methods of the two writers are perceptibly distinct.~~

~~See José Amador de los Rios, studios historicos, &c., sobre los Judios de Espafia, Madrid 1848; Schack, Geschichte der dram. Lit.und Kunst in Spanien, 1849 ; Kayserling, Sephardim, Leipsic, 1859; Barrera, Catalogo del Teatro Antiguo Espafiol, Madrid, 1860.~~

~~ENSCHEDE, a town in the Overyssel province of Holland, is situated near the Prussian boundary, about 45 miles S.E. of Zwolle, at the junction of three railways, Its principal industry is the spinning and weaving of cotton, in which six spinning mills and thirteen steam-power looms are employed. 'Two-thirds of the town was destroyed by fire on the 7th May 1862, but was very soon rebuilt. Population in 1875, 5291.~~

~~ENTAIL (from tazller, to cut) really means a limited succession—one cut out by the will of the maker of the entail from the ordinary legal course of succession. The derivation of the word from talis (tales heeredes qui in tenore investiture contineantur) is now abandoned. But,~~

~~as an existing social institution, entail has also generally involved more or less restriction on the proprietary powers of the heirs succeeding to the subject of entail. The policy of entails has therefore been keenly discussed! The attempt to settle the matter on legal principles entirely failed. On the one hand, in the language of the civil law, wnusquisque est ver suce moderator et arbiter. This was said to imply an unlimited right to dictate the conditions on which an estate was to be enjoyed after the death of its owner. On the other hand, it was argued that on death the ownership must change, and that the restrictions imposed on heirs of entail were inconsistent with the nature of property. These legal conceptions are themselves merely the products of different states of society. A powerful and learned writer? has recently shown that the notion of absolute and exclusive private property is of quite modern date; and it may be~~

~~*See J. R. M'Culloch's note xix. to his edition of Wealth of~~

~~Nations, 1828, afterwards republished as Treatise on the Succession to Property vacant by Death, London, 1848.~~

~~A i i A ° e,e Paris, vw in his De la Propriété et de ses formes primitives,~~

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~~added that the power of testamentary disposition was un- known in primitive times, and has only been very gradually admitted. In most civilized countries, so far as concerns the creation of perpetuities, it is now being curtailed in obedience to those considerations of social expediency which alone can decide the question of entails. Conservative philosophers have maintained that the hope of founding a family and an estate which will together be immortal is so great an incentive to the higher forms of industry that the state cannot afford to do without it. But the irresistible answer is that if you give this powerful motive to the founder of a perpetuity, you take it away from every suc- ceeding generation of his descendants. They are born to wealth which their idleness will not dissipate, and possibly to social distinction which has~~

not been earned by their exertions. Besides, it is not disputed that perpetuities are opposed to the interest of the state in the annual produce of the soil, which they place extra commerciuwm. These evil consequences of entails have been vividly. described by Blackstone? in a passage borrowed without acknowledg- ment from Bacon :#—“ Children grew disobedient when they knew they could not be set aside ; farmers were ousted of their leases made by tenants in tail ; for, if such leases had been valid, then under colour of long leases the issue might have been virtually disinherited ; creditors were defrauded of their debts ; for if tenant in tail could have charged lis estate with their payment, he might have also defeated his issue by mortgaging it for as much as it was worth ; innumerable latent entails were produced to deprive purchasers of the land they had fairly bought—of suits in consequence of wliich our ancient books are full; and treasons were encouraged—as estates-tail were not liable to forfeiture longer than for the tenant’s life.” It is, indeed, obvious that, even if we assume heirs of entail as a class to have been keenly alive to the duties or the true interests of ownership, they had no power to improve their estates or to assist their tenants in doing so. But even if entailed estates were managed so as to yield the greatest possible amount of produce, it would still be a misfortune, and a complete answer to the argument we have been considering, that the land, so far as entailed, would be beyond tlie most ambitious hopes of the mercantile and manufacturing community. Perpetuities have, however, been defended on the perfectly distinct principle, not economical (in the narrower sense), but broadly political, that they are essential to the permanent well-being of an aristocracy. It is impossible here to discuss the advantages resulting from the existence of an aristocratic caste, whether invested with the hereditary privilege of legislation or regarded merely as contributing to political life an element of safety and independence and culture and historical continuity. These advantages, if they be facts, do not seem to be necessarily connected with any particular system of land-laws, and in certain circumstances a system of perpetuities might possibly impoverish and degrade a real aristocracy. But it is certainly true that in the past the two institutions are found in very close connection. Perhaps, in this view, the earliest type of an entail occurs when, out of the common property of a tribe or other primitive organization, some

~~lands are given to a family who hold a public office or exercise definite hereditary functions. In later times the connection is sufficiently illustrated by the Carlovingian institution of majoratus, which spread through France and Italy and Spain, and which, like so many other Carlovingian ideas, was reproduced by Napoleon in the tawdry magnifi- cence of the imperial decrees of 1808.5 Thestrong feeling~~

~~3 Commentaries on the Laws of England, ii. 7, p. 116, Sweet's edition, 1844,~~

~~4 "On the Use of the Law," Works (Spedding's ed.), vii. 490. 5 Merlin, Répertoire de jurisprudence, tome vii, p. 702.~~

~~ENTAIL~~

~~'which associates the land wita its hereditary owners nas found expression in the well-known lines— '* Shades that to Bacon could retreat afford Become the portion of a booby lord, And Hemsley, once proud Buckingham's delight, Slides to a scriv'ner and a city knight."~~

~~Hence, also, the various suggestions which have been made of a downward and an upward limit to the property which should be required for a lawful entail of certain dignities. In his essay on Popular Discontents Sir William Temple proposed, and Dr Johnson applauded the proposal, that every baron should have at least £4000, every earl £6000, and every duke £8000 worth of land. This idea has frequently been realized in practice. In Prussia an entail was incompetent except of subjects above £400 in net annual value; in Denmark the estate must be at least 200 tonder of hard corn, or 2000 acres in extent ; and under the Napoleonic system the dotation of the proposed entail, whether proceeding from the Government or from the applicant himself, was always carefully fixed by the Conseil du sceau des titres, with reference to the title or dignity which it was intended to preserve. A prince of the imperial blood or a grand dignitary was entitled to call his house a palazs, princes of the empire and dukes had to content themselves with Adtel, and so on. The same principle appears in the canon of construction laid down by the old Italian law, that a majoratus of such subjects as palatium, turris. sastrum, and even edificium was easily~~

~~presumed.t Indeed, kingdoms have been the subject of entail, and thus the law of entail has supplied the key to more than one political situation. Such was the great controversy "de vanitate heredum – regre- dientium," whether according to the doctrine of reversion or regredient-erben, on the failure of heirs male, and in the absence of any pactum confraternitatis taking the estate to another family, a fee-simple estate remained in the last substitute, or whether the estate returned to the heirs of the entail. This question arose in 1790 between Maria Theresa and the elector of Bavaria; the former was victorious by force of arms against the general opinion of lawyers. It was also discussed all over Europe in the Hochsteden case. The crown of Spain was the type of the regular mayorazgo in that country—the inalienable estates descending to the eldest and nearest heir by blood (natu major), with right of representation and without preference of males, Again, the relation between the crown and the entailed estates of subjects has produced a number of elaborate rules with respect to the juste cause of interference by the state, and has thus profoundly influenced the history of Europe. An Italian majoratus, for instance, might include such subjects as jus honorificum, patronatus, commenda militaris, feudum habens administrationem: from all these monks were by the common law excluded ; and all of them were forfeited to the fisc, either absolutely or for a time, by the blasphemy, heresy, or treason of the heir in possession. 'The entail, therefore, has always beeu much more than a family settlement or a system of land tenure. In modern Europe there have not been many forms of hereditary aristocracy without some form of entail. But it by no means follows that the influence of perpetuities upon the aristocracy has been beneficial. The introduction of post obit bonds, and the law of England relating to the protection of infants against unconscionable bargains, sug- gest some reflections of a different kind. It will appear in this article that public opinion has generally condemned. entails, and that they are being rapidly abolished through- out Europe. A~~

~~The speeches of Iseus and Demosthenes show that in~~

~~EE ee ee ee areas Te 1 Joannis Torre, De successione in Majoratibus et Primogenituris, Paris, 1692.~~

~~Greece many difficult questions had risen with regard tu the power of a testator to substitute one heir after another ; but the earliest definite legal forms of entail were those which appeared under the later Roman law relating to jider commissa, or trusts. The fidei commissum was originally a trust conveyance introduced for the purpose of evading such disabilities as the lex Voconia imposed on women to take directly under a will. The trustee, or fiductarius, was after the time of Augustus liable in a personal action at the instance of the beneficiary, or heres fiduciarius. This form, however, was soon converted into a long nomination or substitution of heirs, to which clauses prohibiting alienation were added. The most common clauses were such as " ne eum fundum vendatis," " ne ex nomine familiz alienaretur." One well-known form also prohibited mortgages, and emphatically declared that the settled estates should remain " firmas meis filiis et nepotibus per wacversum tempus," and that all contrary deeds should be void and null. On this deed Sczevola expressed the opinion that a security over the rents was not a contravention.2 For some centuries the law recognized such entails as valid in perpetuity; but by Novel 159,° " Ut restitutiones in uno gradu subsistant," their validity was confined to the first four generations.~~

~~The jus emphyteuticum limited to heredes swi, which was granted to colonz, formed the type of the tenure by hereditary lease, bail héréditaire, which is still common in Europe. Among others may be mentioned the aforamento of Portugal, in which the superior is named directo senhor, and the vassal or tenant foreiro ; the contratto di livello and bent libellart of parts of Italy ; the emphiteusis transitoria ad quoscunque ex pacto et providentia concedentis, the tenure of monastery lands, in the old Roman states; the erbleihe and landsiedelgiiter of Bavaria (" allodified" in 1848) ; the beklem-regt of Groningen, subject to the propinen, or fine, on renewal; the erb-pacht of several German districts; the quevaises and domaine congéable of the west of France; most of which, indeed, have become fee-simple estates, but were at one time inalienable. The differences between emphyteusis and feu are well brought out in an essay De prohibita~~

~~rerum alienatione by the Dutch jurist Sande, Leovardiz, 1657. This and the tenure on which the limitanet milites held their agri limitrophi as a sub- sidium adversus rebelles naturally introduce us to the feuda gentilitia of the feudal law in which the benefice was granted out to a vassal and his heirs, who could not alienate without the superior's consent, because on the failure of these heirs the feu returned to the superior. Indeed, the vassal could not alter the succession ; and hence, as Sir Thomas Craig observes, " sine superioris consensu vix tallize locus esse potest."* The principle of limitation is here of course entirely opposed to that of the Roman law, which affirmed the right of a testator to name his heirs in per- petuity. It was a feudal maxim, "Solus Deus potest facere heredem ;"° and the limitations on the vassal's right arose, not from his own act, but from the reserved estate of superiority and the tenor of his charter in the lands. The feudal law also favoured male heirs, and required that one heir only should succeed.~~

~~It appears from the laws of Alfred (c. 37), that entails were known before the Norman feudal law had been domesticated in England. " Si quis terram hereditariam habeat, eam von vendat a cognatis heredibus suis, si illi viro prohibitum sit, qui eam ab initio acquisivit, ut ita facere nequeat." These grants which could not be alienated from the lineage of the first purchaser were also known as ii iE. e~~

~~2D, xxxi. De legatis et fidei commissis, tt. 69-88. C. vi. De fidei commissis, t. 4.~~

~~3 See a note on this Novel, Gibbon, viii. 80.~~

~~4 ii. 16, De successione talliata, § 12.~~

~~5 See Mr Charles Butler's note 191a to Coke on Littleton.~~

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~~feuda conditionata, because if the donee had no heirs of his body the estate reverted to the donor. This right of reversion being constantly~~

~~evaded by a sale and repurchase on the birth of issue, the famous Statute of Westminster the Second, de donts conditionalibus, 13 Edw. I. ec. 1, was 'passed, which provided that the will of the donor should be observed, and that no alienation by the donee should pre- vent the operation of the condition. Thus was created the fee-tail, or feudum talliatum, of English law—a strict and practically perpetual entail. The power of alienation was reintroduced by the judges in Taltarum's case (Year Book, 12 Edw. IV. 19) by means of a fictitious suit or recovery which had originally been devised by the regular clergy for evading the statutes of mortmain. A full account of the mysteries of praecipe and vouching, and of another ficti- tious process of fine (finalis concordia) and proclamation, will be found in Blackstone, ii. 7, and Mr Knowler's argu- ment in Taylor and Horde, 1 Burr. 60. These forms were abolished by an Act passed in 1833 ; and now every tenant in tail, at least while there is a possibility of issue, may bar even his issue by executing a deed and enrolling it in the Court of Chancery, but not by will. This right is available to creditors. The erroneous notion of heir land, however,—of something which must perpetually descend from father to son,—still lingers in some country districts of England. By the common form of marriage settlement, the eldest son and the other sons of the marriage are made tenants in tail, Where the parent or some other person enjoys a life interest under the settlement, he is called the protector of the settlement, and his consent is required to the barring of the entail by the first tenant in tail. Thus, except in the case of estates tail granted by the crown as a reward for public services (see 34 and 35 Hen. VIII. c. 20), land in England cannot now be tied up for a longer period than the lives of persons in existence and twenty- one years thereafter. The rigid law of forfeiture which -was applied in the time of Henry VIII. to estates tail was repealed by the Act 33 and 34 Vict. c. 23, which provides that no conviction of treason or felony or verdict of felo de se shall cause any attainder or corruption of blood or any forfeiture or escheat.~~

~~In Scotland, where for several centuries feus remained inalienable beyond one-half of their extent, where the feudal aristocracy often violently resisted the approach of creditors or apprisers, and where the dawning of commerce was very late, statutory authority was not given~~

~~to entails antil the year 1685.1 As Sir George Mackenzie said in one of his pleadings, "' the honour of the country standeth more by ancient families than by merchants." The word entail, indeed, is often used before the 15th century, but generally in the sense of a simple destination alterable by every heir in possession. Thus Sir James Balfour informs us that "infefment of tailzie" is considered lawful and not prejudicial to the king's soul and conscience, and explains that the entail might at any time be broken by resignation in favour of heirs whomsoever. 'The earliest prohibition de non alienando occurs in 1489. After this it was attempted to protect the rights of substitute heirs by the diligences of inhibition and interdiction; and at last, in the early part of the 17th century, Sir Thomas Hope, who revised the Calderwood entail, introduced the well- known irritant and resolutive clauses, declaring void deeds in contravention of the entail and the right of the con- travening 'heir. Cromwell, with his usual sagacity, appointed a committee to consider the legal destruction of entails ; but in the celebrated Stormonth case in 1662, one of the clauses just mentioned was held to be valid at com-~~

~~a 1 ' ' 175 pe rymple's Hssay towards a General History of Feudal Property,~~

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~~mon law against creditors, who, however, had got notice of it from the titledeeds. Much doubt was felt about the soundness of this decision. The first Roxburgh entail had been addressed to the sovereign, as if to invoke special protection. The aristocracy were alarmed by the forfeitures for treason which took place under Lauderdale's adminis- tration; and accordingly the statute of 1685 was passed, which until 1848 remained the foundation of the Scoteli law of entail. It adopts the style suggested by Hope (a prohibition of sales, mortgages, and alterations of succession, with irritant arid resolutive clauses), and provides that if the deed of entail be recorded in the register of tailzies, and if notice of the conditions be also given in the titles of the estate, the entail is to have perpetual validity. The heir in possession remained nominally proprietor, but his powers of management were in reality not~~

~~much more extensive than those of a liferenter. The statute applied to almost everything in the nature of aheritable subject. Jedburgh cross, for instance, was entailed; so was the office of heritable usher; even the smallest properties (¢.g., a lodging in Edinburgh, pars tenementt in Forfar, a single field in the Haughs of Clyde) were sometimes tied up. But it did not apply to the entails of money and household furniture, which had not been uncommon in earlier times. It has been well described as a " padlock on the plough;" and the security from forfeiture (except of the life-interest of the traitor) which the Scotch Estates fancied they had secured by the Act 1690 c. 33 was taken away by the Act 1708, c. 21, which attempted to assimilate the laws relating to treason in the two countries. The feudal maxim "tantum facit quis delinguendo quantum alienando" may have made rebellion more stubborn ; but it is impossible not to agree with the Scotch statute, that "it is just that every man suffer for his own fault, and not the innocent with or for the guilty." The English law of forfeiture, on the other hand, proceeds on the Ciceronian principle " ut caritas liberorum amiciores parentes reipublice redderet" (Ad Brutum, 12).2_ The only interests saved from forfeiture under an English entail were those of remainder-men ; but as a Scotch entail has no remainder-men, the forfeiture of Scotch estates was for a time complete. The judges and the commissioners of forfeited estates took very different and very warm views of the matter. After the first Jacobite rebellion, however, a compromise was effected in the case of Gordon of Park, according to which only the right of the traitor's issue was taken away. Meanwhile the entail system was found to weigh heavily on agricul- ture; the amount of litigation to assert or to control the rights of the proprietors was excessive; the judges, chiefly members of the aristocratic class, at first benignant towards perpetuities, had begun to apply those strict tests of language as distinguished from intention which have since furnished some of the most ludicrous and not the most creditable efforts of judicial interpretation ; and at last, through the efforts of the Faculty of Advocates led by Mr Lockhart, the Montgomery Act (10 Geo. III. c. 51) was passed, which gave some relief to heirs in possession in such matters as building and improving leases, expenditure on permanent improvements, and exchanges. It was followed after a long interval by the Aberdeen Act (5 Geo. IV. c. 87), which conferred powers~~

of charging provisions to a limited amount for husbands, wives, and children; and after a select committee of the Commons had reported on the subject of Scotch entail (Par. Pap. vii. 1828), by the Rosebery Act (6 and 7 Will. IV. c. 42, amended by | and 2 Vict. c. 70, and 4 and 5 Vict. c. 24), which enlarged

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2 See Considerations on the Law

of Forfeiture for High Treason, by Mr Charles Yorke, London, 1748. :

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the powers of excambion, or exchange. The suggestion made in 1827 to throw entailed estates into judicial management by an action of cognition and sale was fortunately abandoned. In 1840 an Act (3 and 4 Vict. c. 48) permitted the granting of sites for churclies, schools, manses, and teachers' houses. At last, an accomplished lawyer, Lord Rutherfurd, framed and passed the compre- 'hensive Act, 11 and 12 Vict. c. 36, which still bears his name, and which has abolished perpetuities in Scotland and introduced a system of greater freedom than that of strict settlement in England. This Act not only increases the power of charging entailed estates with improvement debts and provisions, of feuing, and of sale to pay off debt, but it introduces a right to disentail to be exercised for some time after the passing of the Act with certain consents, but which practically gives an estate in fee-simple to every entailed proprietor born after 1848. This Act, which also applies for the first time the principle of the Thellusson Act to land in Scotland, has been usefully enlarged by the following Acts—16 and 17 Vict. c. 94, 31 and 32 Vict. c. 84, and 38 and 39 Vict. c. 61,—the last of which con- tains a liberal definition of permanent improvements. In 1847 it was estimated that one-half of the land in Scotland was under entail; in 1827 the proportion was stated at one-third, the number of separate entails being about 1600. Since 1848, 616 deeds of entail, including re- entails, 435 instruments of disentail, and 105 deeds of excambion have been recorded (Treatise on the History and Law of Entails in Scotland, by E. D. Sandford, 2d ed. 1842; see also the text-

~~books on conveyancing, minor works by Fergusson, Irvine, and Duff, and two essays by Lord Kames).1~~

~~From a very early time the Roman law of entail, or "substitution graduelle," was received in France. The very phrase of the digest, " ne de nomine exiret," was in common use. Jnstnwation, or recording in the books of a Prévoté Royale, or Bailliage Royal, was necessary to bind creditors. The institute, grevé (gravatus), could by a hypothéque subsidiatre charge the estate with a provision for his wife. In 1747 the Chancellor D'Aguesseau, after collecting the opinions of all the local parliaments on the subject, passed the Ordonnances of Orléans and Moulin, which prohibited perpetual substitutions, but permitted them for two degrees (see Questions concernant les Sub- stitutions, 1770; also Pothier's Géwvres Posthumes, tom. yv., and art. "Subs. Fidei-commissaire" in Merlin, xiii. 67). Substitutions of every kind were abolished by section 896 of the Code Napoléon, but at the same time, as was explained above, the emperor attempted to revive the system of majorats, or entails of subsidized dignities. He says his object is "'' non seulement d'entourer notre tréne de la splendeur qui convient & sa dignité, mais encore, de nourrir au coeur de nos sujets une louable émulation, en perpétuant d'illustres souvenirs, et en conservant aux Ages futurs l'image toujours présente des récompenses qui sous un gouvernement juste suivent les grands services rendus 4 etat" (Imperial Decree of 1st March 1808). All the dukes, barons, counts, and chevaliers, and the others who obtained majorats, had to make the following oath :—" Je jure d'étre fidéle 4 'empereur et & sa dynastie, d'obéir aux constitutions, lois, et réglemens de l'empire, de servir sa majesté en bon, loyal, et fiddle sujet, et d'élever mes enfans dans les memes sentimens de fidélité et d'obéissance, et de marcher & la défense de la patrie toutes les fois que le territoire sera menacé, ou que sa majesté irait & l'armée." here a alll a EE~~

~~1 Acturial formule for the values of interests under entails will be found in Considerations on Pecuniary Interests, &c., by Spencer Thomson, Edin., 1870. For the legal principles of valuation under the Act of 1875, see case of Wilson v. De Virte, Dec. 19, 1877, in the Court of Session.~~

~~**The estates of these majorats were subject to inspection by agents conservateurs. The mansion-house was to be at least 2 per cent. of the value of the estate, The later French laws relating to substitutions are those of 12th May 1835, prohibiting all future substitutions, and 7th May 1849.**~~

~~It has already been pointed out that the Spanish crown was a majorat, subject to the quaint condition, seyendo home para ello, that the heir should be a fit and proper person. The inalienability of the domain of the sovereign (except to provide an.apanage for the younger members of the reigning family) and of the greater peers was almost part of the common law of Europe (Sande, De proh. rer. alien.) But in Spain there was an unusual complexity of entails,—regular and irregular, substantial and habitual, &c., varying with the elements of linea, gradus, sexus, and cetas. The linea de agnacion limitada was equivalent to the English tail male special. The propriedad was not forfeited for treason, except in cases of special enormity, as when the Communeros rose against Charles I. A unique species of entail is the linea de qualidad, confined to such as obtain a certain qualification, e.g., doctor, &c. There was also the singular elective entail, in which a right to choose the heir was given to some oue outside the family.? This resembles the patron of an Italian majorat. Sir Geo. Mackenzie mentions that in the original Dundas entail a discretionary power was given to friends (Z'reatise on Taillies). Wherever a title was connected with lands, the consent of the crown was required to the creation of a majorat. The principle of succession was that at every devolution the nearest heir to the original testator should be selected (proximitas gravantis non gravati).3 In Italy a very similar state of matters existed ; the Roman phrase " quia volo ut bona mea remaneant in familia mea" seem to have become words of style.~~

~~In Portugal the prasos de vita, or inalienable right of primogeniture for three generations, was abolished by the Act of 19th May 1863.~~

~~Denmark still retains much more perfect entails. There the sedegaard, or family seat, including the hovedgaard, or manorial demesne, and the bénder gods, or portion occupied by small farmers, is frequently entailed either as (1) the stamhuse, a perpetual entail of both heritable and movable estate, which the crown sometimes graciously allows to be converted into money trusts, or (2) the 32 baronial fiefs all created sinc2 the establishment of absolute government in 1660, and which on failure of heirs revert to the crown.* Ever since the teaching of the~~

~~economist Pontoppidan, followed up by the practical efforts of Bernstorff and Struensee, and in the present century by the agitation of the Bondevenner, or Radical Left of the Rigsdag, there has been a tendency to bring land more completely into commerce. The constitution of 1849, indeed, prohibits the creation of new entails. By Bishop Mourad's bill of 1861, drawn by the jurist Larsen, the powers of selling the entailed bonder gaarde were extended much beyond the principles of festetvang, or obligation to lease for two lives. Count Frijs and the landowners' party then began the voluntary conversion of the tene- mented farms into freeholds ; and in 1869 Hansen carried his expropriation bill, which prohibits new estates for life, and provides a machinery for compensation at the expiry of existing interests. In Sweden, although primogeniture and even favour to male issue is unknown, there are still entails, although no new ones can be created.~~

~~2 Molina, De Hispanorum Primogenitorum Origine et Natura, 1672.~~

~~3 The French constitution of Bayonne (1808) abolished majorats producing less than 5000 or more than 20,000 piastres.~~

~~4 There is also the Arve foeste, or entailed lease to the tenant and his heirs for ever, escheating to the owner on failure of heirs, and without powers of sale or mortgage.~~

~~The old hereditary male fiefs, sanjak or beglik, ziaenet and timars, originally granted by the Ottoman rulers, have now entirely disappeared. These grants were indivisible and inviolable, and formed a species of Government entail. The possessor of the beglik was in the Turkish-speaking provinces called dere-beg, lord of the valley; in the Arab districts (eg., Syria and Irak) he was called ameer, or governor. The erazye mirige, or imlak (crown) lands, held from the crown, still require public authority for most acts of full ownership. (See the law of 7th Ramazan 1274, or 19th April 1857, which, slightly modified, forms at present the code of land-title in Turkey in Europe.) It is a fundamental principle of Mahometan law that all land belongs to the sultan as the gift of God, and is therefore to be used justly.~~

~~The land-legislation of Prussia during the present century is so often quoted that this sketch would not be complete without some reference to its provisions on the subject of entails. By the 5th clause of the edict of October 9, 1807, the practice of settling estates by hereditary leases (afterwards abolished) was continued , while the 9th clause provided that feudal entails and fides commissa might be unsettled by family agreement. The Prussian fide' commissum may be constituted in every object of property yielding annual returns without waste of substance ; and so an entail of certain movables is com- petent. The Prussian tenant for life can let on lease, and charge the land with annuities for his daughters, and can gratuitously dispose of his life-interest. The Hessian law compels him to charge the fee with provisions to his younger sons, The sale of useless land has always been permitted, but otherwise a public Act of expropriation must be got, or a decision of the whole family council.~~

~~Two next heirs in remainder may, however, by their con- |~~

~~sent give effect toan exchange. The charges to which a fidet commissum is subject are the debts of the founder, expenditure by the tenant for the abolition of real charges, for embankment dues, flood-rates, rebuilding, and for bringing worn-out land again into cultivation. The succession is usually limited to male persons; and monks and dishonoured persons are specially excluded. In the Rhine Provinces and many parts of North Germany, fice? commissa were abolished on tlie introduction of French law without compensation to the heirs in remainder. They were subsequently re-established, but the 38th section of the Land Rights of the German people (1848) provides— "« Widei commissa are to be abolished. The form and con- ditions of such abolition are to be determined by the legislation of each state." Distinct from jidex commissa there are in Germany many ancient customary entails, not usually restricted to male heirs, and terminable by agree- ment of the occupant with the next heir. There was also power to sell in circumstances of necessity subject to pre- emption by the next heir. Many of these estates rest on family " bye-laws."~~

~~On the whole subject see Reports by H.M. Consuls on Systems of Land Tenure, 1870. (W. C. S.)~~

~~ENTOMOLOGY. See Insects.~~

~~ENTOZOA, from évrds, within, and Gov, an animal, a name applied to internal parasites. See PARASITES.~~

~~ENTRECASTEAUX, JoszpnH-ANToINE BrRuNI D' (1739-1793), a celebrated French navigator, was born at Aix in 1739. He entered the navy at the age of fifteen. At the commencement of the war in 1778 he commanded a frigate of 32 guns, and by his clever seamanship was successful in convoying a fleet of merchant vessels from Marseilles to the Levant, although they were attacked by two pirate vessels, each of which was larger than his own ship. In 1785 he was appointed to the command of the French fleet in the East Indies ; and in 1787 he was~~

~~named governor of the Mauritius and the Isie of Bourbon. While in command of the East India fleet, he made a voyage to China, an achievement which led the French Government to select him to command an expedition in search of La Pérouse, of whom nothing had been heard since February 1788. Entrecasteaux failed to obtain any tidings of him, but in the course of his search he made important geographical discoveries. He traced the outlines of the eastern coast of New Caledonia, discovered many fine harbours and roadsteads on the south of Tasmania, and touched at more than 300 places on the south-west coast of New Holland. While near the island of Java he was attacked by scurvy, and died 20th July 1793. There are three narratives of his voyages :—the first by De La Billardiére, Paris, 1800, the second by De Rossel, Paris, 1808, and the third by De Fréminville, Brest, 1838.~~

~~ENZIO, king of Sardinia (1225-1272), who played a great part in the conflict between the empire and the papacy in the first half of the 13th century, was one of the natural sons of the emperor Frederick II. by his mistress the beautiful Bianca Lancia. He was born at Palermo at the close of the year 1225, the same year in which his father married as his second wife Jolante of Jerusalem. His name is conjectured to be a corruption of the German "Hans." In his thirteenth year he fought by~~

his father's side against the Lombards at the battle of Cortenuova ; and in the following year (1238) the emperor, in pursuance of his determination to recover for the empire various territories claimed as fiefs of the Holy See, married Euzio to Adelasia, the widowed heiress of Sardinia and Corsica, and at the same time conferred on him the title of king of Sardinia, He also received the honour of knighthood from his father. In May 1239 he was declared vicar imperial in the north of Italy, and took command of the German and Saracen troops in the imperial army. From this time Enzio was his father's right hand in war. He at once entered the March of Ancona; and so formidable to the papacy were his achievements that the most distinguished soldier-cardinal, John of Colonna, was sent against him. Before the end of the year the pope, Gregory 1X., excoin- municated Frederick and his son ; aud a crusade against them was soon after preached. 'This beating of the "drum ecclesiastic," however, did not scare them from their purpose. In 1241 Enzio was entrusted with the com- mand of the fleet, and in this post he added to his already high reputation by a victory over the Genoese. The pope having convoked a council at Nome, the prelates were flocking to it in large numbers in defiance of the emperor's remonstrances and commands. They were conveyed on board a number of Genoese galleys; and this fleet Enzio, in conjunction with the Pisaus, encountered and defeated near Meloria (May 3). Three vessels were sunk and nineteen captured. Amongst the captives were three cardinal-legates, and many bishops and archbishops. The booty taken was immense, and included the vast sums of money which the notorious Cardinal Otho had just collected in England. The prelates were all taken to Naples, and were kept in close confinement, bound with silver chains in mockery. After the death of the pope (August) Enuzio was sent with a large army to aid his brother Conrad, king of the Romans, against the invading Tatar hosts. By the victory won by the two brothers of the honse of Hohenstauffen, near the Delphos, an affluent of the Danube, Europe and Christendom were finally delivered from the presence of these desolating hordes, Enzio was afterwards sent into Lombardy, which was for several years the scene of his chief exploits. In 1245 he was excommunicated with the emperor by Pope Innocent IV. Two years later he besieged Parma, but was compelled to retire. He soon

~~after besieged Colonna. In 1249 he took the castle of Arola, and on this occasion he sullied his fair fame by putting to death more than a hundred Guelfs of Reggio who were taken prisoners there. At the head of the Modenese, Enzio encountered the troops of Bologna, May 26, 1249, at Fossalta, and was wounded and taken prisoner. He was consigned to perpetual imprisonment, and nothing could move his captors to abate a jot of their rigour. On one occasion he nearly succeeded in making his escape concealed in a cask, but was recognized by his golden hair. 'A captive at the age of twenty-four," says Dean Milman, "this youth, of beauty equal to his bravery,—the poet, the musician, as well as the most valiant soldier and consum- mate captain, —pined out twenty-three years of life, if not in a squalid dungeon, in miserable inactivity." Enzio was passionately loved by Lucia Biadagioli, a high-born maiden of Bologna, who was given to him as a companion ; and she made several unsuccessful attempts to restore him to freedom. He was the best-beloved son of the emperor, who would have given any sum for his ransom, and to whom the loss of him was a life-long affliction. Nor was he less idolized by his followers for his brave, honourable, and generous character as a leader in war. Enzio died in con- finement at Bologna, March 14,1272. The Bolognese gave him a magnificent funeral. His body was embalmed, robed in scarlet, and lay in state for some days wearing a golden crown and sceptre. It was then buried in the church of St Dominic, and a marble tomb was erected in memory of the hero. History, says Mr Kington (Hist. of Frederick the Second, vol. ii. p. 289), does not record a more sorrowful tale.~~

~~EON DE BEAUMONT, Cuartes GENEVIEVE LOUISE Avcusts Anpré TrmoTsis D' (1728-1810), commonly known as the Chevalier d'Eon, a political adventurer, was born at Tonnerre, in Burgundy, on the 5th October 1728. He was the son of an advocate of good position, and after a distinguished course of study at the Collége Mazarin, he became a doctor of law by special dispensation before the usual age, aud adopted his father's profession. He com- menced literary work as a contributor to Fréron's Année Littéraire, and attracted notice as a political writer by two works on financial and administrative questions,~~

which he published in his twenty-fifth year. His reputation in- creased so rapidly that in 1755 he was, on the recommenda- tion of the prince of Conti, entrusted by Louis XV. with a secret mission to the court of Russia. It was on this occa- sion that he for the first time assumed the dress of a woman, with the connivance, it is supposed, of the French court. In this disguise he obtained the appointment of reader to the empress Elizabeth, and won her over entirely to the views of his royal master, with whom he maintained a secret correspondence during the whole of his diplomatic career. After a year's absence he returned to Paris to be immediately charged with a second mission to St Peters- burg, in which he figured in his true sex, and as brother of the reader who had been at the Russian court the year before. He played an important part in the negotiations between the courts of Russia, Austria, and France during the Seven Years' War. For these diplomatic services he was rewarded with the decoration of the grand cross of St Louis. In 1759 he served with the French army on the Rhine as aide-de-camp to the Marshal de Broglie, and was wounded during the campaign. He had held for some years previously a commission in a regiment of dragoons, and was distinguished for his skill in military exercises, particularly in fencing. In 1762, on the return of the Duc de Nivernais, Eon, who had been secretary to his embassy, was appointed his successor, first as resident agent and then as minister plenipotentiary at the court of Great Britain, He had not been long in this position when he

lost the favour of his sovereign, chiefly, according to his own account, through the adverse influence of Madame de Pompadour, who was jealous of him as a secret corre- spondent of the king. Superseded by Count Guerchy, Eon showed his irritation by denying the genuineness of the letter of appointment, and by raising an action against Guerchy for an attempt to poison him. Guerchy, on the other hand, had previously commenced an action against Eon for libel, founded on the publication by the latter of certain state documents of which he had posses- sion in his official capacity. Both parties succeeded in so far as a true bill was found against Guerchy for the attempt to murder, though

~~by pleading his privilege as ambassador he escaped a trial, aud Eon was found guilty of the libel. Failing to come up for judgment when called on, he was outlawed. For some years afterwards he lived in obscurity, appearing in public chiefly at fencing matches. During this period rumours as to the sex of Eon, originating probably in the story of his first residence at St Petersburg as a female, began to excite public interest. Bets were frequently laid on the subject, and an action raised before Lord Mansfield in 1777 for the recovery of one of these bets brought the question toa judicial decision, by which Eon was declared a female. A month after the trial he returned to France, having received permission to do soas the result of negotiations in which Beaumarchais was employed as agent. The condi- tions were that he was to deliver up certain state docu- ments in his possession, and to wear the dress of a female. The reason for the latter of these stipulations has never been clearly explained, but he complied with it to the close of his life. In 1784 he received permission to visit London for the purpose of bringing back his library and other property. He did not, however, return to France, though after the Revolution he sent a letter, using the name of Madame d'Eon, in which he offered to serve in the republican army. He died in London on the 22d May 1810. During the closing years of his life he is said to have enjoyed a sinall pension from George III. A_post- mortem examination of the body conclusively established the fact that Eon was a man.~~

~~EOTVOS, Jézser, Baron (1813-1871), a distinguished~~

~~Hungarian statesman, author, poet, and orator, was born~~

~~at Buda on the 3d September 1813. He was educated partly at his father's estate at Ercsi, in the megye or county of Székesfehérvar (Stuhlweissenburg), and partly in Buda, where also he studied law and philosophy from 1826-31. As early as 1830, Eodtvés commenced his literary career by a translation of Goethe's Goetz von Berlichingen, followed shortly afterwards by two original comedies and a tragedy Boszt (Revenge), which showed a singular beauty of style. In 1833, after having passed the requisite examinations at Pozsony (Pressburg), he began at the early age of twenty his official career as a vice-notary,~~

which position he held for two years. He then went to Vienna, where he was employed at the Hungarian chancellory; here, however, he only remained for ashorttime. In 1836 he commenced a long journey with the object of visiting the chief towns of Germany, Holland, France, and England, and did not return to Hungary before 1837. Shortly after this he was appointed to a seat in the district court of justice at Eperies, which office he soon resigned, withdrawing to his grandfather's estate at Salyi, where for some time he devoted himself to literary studies. His dramatic works had mean- while attracted the attention of the Kisfaludy society, of which learned body he was elected a member in the year 1835. But hereached the zenith of his fame as an author in the year 1838, when his novel Karthaust (Lhe Carthusian) appeared in the celebrated Arvizkényv (Inunda- tion-Book), of which he was himself the editor, and which

was published between 1838 und 1841 at Pesth, for the benefit of the sufferers from the floods which devastated that city in 1838. The articles comprised in this work, which extended to five volumes, were contributed by vari- ous distinguished literary men, amongst whom Kotvos, as having written the longest and most important article, occu- pies a conspicuons place. In reengnition of his literary merit he was in 1839 elected a member of the Hungarian Academy of Sciences. In the year 1840 Eotvis, having removed from Salyi to Buda, took his seat in the Upper House of the Hungarian Diet, and identified himself with the advanced political movement of that period, aiding his eloquence by his writings. Among the many important works which emanated from his pen at this time, one entitled A Malu Jegyzije (The Village Notary), which appeared in 1845, demands especial attention. In this work the author vividly depicts the abuses of the old system of public administration in Hungary by county elections; and the vigour of the narrative, combined with the humorous and political character of the incidents related, have caused it to be considered as one of the best national tales in the whole circle of European literature. An English transla- tion of this romance by Otto Wenckstern, with an introduc- tion by F. Pulszky, to whom the original was dedicated, appeared in

~~1850; and there is also an excellent German translation by Count J. Mailath. The Votary was followed in 1847 by an_ historical romance of the 16th century, Magyarorsedg 1514 ben, translated afterwards into German under the hame of Bawernkrieg ; this work struck the key-note of that emancipation of the peasantry which was virtually effected in 1848. In fact, the reforms which from time to time were introduced into the Hungarian constitu- tion must be in a great measure ascribed to the political and literary labours of Eotvds. His work Reform was a collection of articles which he had previously contributed to one of the leading Hungarian newspapers, the Pesti Hirlap.~~

~~Upon the formation of the first responsible Hungarian ministry on the 15th March 1848, Rarou Eétvis received the portfolio of minister of public instruction; but on the 28th September he was obliged to relinquish that post, in consequence of the assassination of Lamberg, the Austrian governor of Hungary. He then proceeded to Vienna, and subsequently to Munich, returning to Pesth in 1851. Soon after his return he published an important political treatise, both in Hungarian and German, entitled A XY LX. század uralkodé eseméinek befolydsa az dlladalomra (The Influence of the Ruling Ideas of the 19th Century on the State). By this work, and others of a similar tendency, he was instru- mental in preparing the popular mind for those constitu- tional changes which were afterwards so beneficially intro- duced; and when, in 1867, the second Hungarian ministry was called into existence, Edtvés was again entrusted with the portfolio of minister of public instruction. Already in the year 1855 he had been elected vice-president of the Hungarian Academy of Sciences, and in 1866 he attained the high honour of president. He died on the 2d February ze I, after a few weeks' illness, in the fifty-eighth year of lis age. .~~

~~EPAMINONDAS, the most celebrated general of Thebes, born towards the close of the 5th century B.C., was the son of Polymnis, and belonged to a noble family. Brought up in poverty, he was diligent in acquiring the culture of the age, and became skilful in gymnastic exercises and in playing the flute. For his intellectual education he was chiefly indebted to Iiysis of Tarentum, a Pythagorean exile. According to the account given by Plutarch, he served on the Spartan side at the battle of~~

~~Mantinea in 385 B.c. along with Pelopidas, who having fallen apparently mortally wounded during the engagement, was protected~~

~~by Epaminondas at the risk of his life. Some have sup- posed this incident to have been the origin of a friendship which is one of the most honourable and enduring in ancient Greek history. Epaminondas was almost past his prime before he took any prominent part in public affairs, He refused at first to co-operate in the revolution of 379 B.C., of which his friend Pelopidas was one of the leaders, owing to Pythagorean scruples as to the possible shedding of innocent blood. But his desire to be freed from the Spartan yoke was as keen as that of any of his fellow citizens, and after the blow was struck he did his utmost to stir up the Theban youth to maintain their independence. In 371 B.c. Epaminondas was one of the chief representa- tives of Thebes at the conference at Sparta where the Athenians sought to arrange a peace. He claimed the right to sign the treaty for Beotia, thus asserting the supremacy of Thebes over the Boeotian cities. The claim was not recognized by the representatives of the other states, and as Epaminondas insisted on it, Thebes was excluded from the treaty altogether. A Spartan invasion of Beeotia under Cleombrotus immediately followed the rupture of negotiations. With an army not one-half the strength of that opposed to it, Epaminondas inflicted a crushing de- feat upon the invaders in the celebrated battle of Leuctra (371). He immediately set himself to consolidate the position of Thebes by forming alliances and by weakening Sparta. With the latter object in view, he supported the founding of Megalopolis and the organization of Arcadia as an independent government. In 369 he entered the Peloponnesus, and took another important step towards the weakening of Sparta by establishing the Messenians in their own country, and founding the city of Messene on Mount Ithome. On their return home Epaminondas and Pelopidas were accused of having retained their command beyond the legal period. Though there was no doubt that they had broken the letter of the law, Epaminondas made a spirited defence, which secured the acquittal of both. In the spring of 368 Epaminondas was again in the Peloponnesus, and detached Sicyon and~~

~~Pellene from the Lacedzemonian alliance. On his return, however, he was repulsed by Chabrias in an attack which he made upon Coriuth. Later in the same year he took part in the un- successful expedition sent to Thessaly to deliver Pelopidas from Alexander of Phere, though he did not hold a command, having been degraded owing to an impression that he had not been sufficiently active against Sparta in the previous campaign. In the next year (367) he was seut at the head of an army into Thessaly, and succeeded in freeing Pelopidas without requiring to give battle. Mean- while the relation of the Arcadians with Thebes had been growing unfriendly, and all the efforts of Epaminondas could not prevent them from forming an alliance with Athens. Matters were brought toa crisis in 363, when the Theban governor of Tegea arrested the represeutatives of Arcadia, who had met there to conclude a peace with Elis. Though the prisoners were released in « short time, and an apology made for their arrest, the Arcadians demanded the punishment of the governor. Epaminondas replied that the mistake lay not in the arrest but in the release, and that he would come shortly and reduce the Arcadians to reason. Accordingly in 362 he invaded the Peloponnesus for the fourth time. A pitched battle was fought at Mantinea, in which the Thebans were victorious, but Epaminondas was mortally wounded. He was carried out of the throng, and being told that he would die as soon: as the javelin was withdrawn from his wound, he did not allow this to be done until he had heard that his army was Victorious and that his shield was safe. A column was erected over his grave, which was made on the spot where he fell.~~

~~KPE—EPH~~

~~EPEE, Cuaries-Micuen, Appi pr L' (1712-1789), celebrated for his labours in behalf of the deaf and dumb, was born at Paris 25th November 1712, being the son of the king's architect. He studied for the church, but having declined to sign a religious formula opposed to the doctrines of the Jansenists, he was denied ordination by the bishop of his diocese, He then devoted himself to the study of law; but about the time of his admission to the bar of Paris, the bishop of Troyes granted him ordination, and offered him a canonry in his cathedral. This bishop died soon after, and the abbé, coming to Paris, was, on account~~

~~of his relations with Soanen, the famous Jansenist, deprived of his ecclesiastical functions by the archbishop of Beaumont. About the same time it happened that he heard of two deaf mutes whom a priest lately dead had been endeavouring to instruct, and he offered to take his place. The Spaniard Pereira was then in Paris, exhibiting the results he had obtained in the education of deaf mutes ; and it has been affirmed that it was from him that Epée obtained his manual alphabet. The abbé, how- ever, affirmed that he knew nothing of Pereira's method; and whether he did or not, there can be no doubt that he attained far greater success than Pereira or any of his predecessors, and that the whole system now followed in the instruction of deaf mutes virtually owes its origin to his intelligence and devotion. In 1755 he founded, for this beneficent purpose, a school which he supported at his own expense until his death, and which afterwards was succeeded by the " Institution Nationale des Sourds Muets & Paris," founded by the National Assembly in 1791. He died 23d December 1789. In 1838 a bronze monument was erected over his grave in the church of Saint Rech. He published various books on his method of instruction, but that published in 1784 virtually supersedes all others. It is'entitled La véritable maniére d'instruire les sourds et muets, confirmée par une longue expérience. He also began a Dictionnaire général des Signes, which was completed by his successor, the Abbé Sicard.~~

~~EPERIES, or Presova, in Hungarian ErERJEs, a royal free town of Hungary, capital of the varmegye or county of Sdros, and situated on the left bank of the River Tarcza, an affluent of the Theiss (48° 55' N. lat., 21° 15' E. long.), 143 miles north-east of Pesth. Next to Kaschau, Eperies is the finest town in Upper Hungary, and has considerable manufactures of cloth, wool, table-linen, and earthenware. The principal trade is in wine, linen, cattle, and grain. In the neighbourhood are the royal salt-works and mines of Sdévar and the chalybeate springs of Szemete. The town itself is deficient in its supply of pure spring water. Since the year 1807 Eperies has been the seat of a Greek Catholic bishopric ; and it possesses an episcopal library, a Catholic gymnasium, a normal high school, and an evangelical district college. Among the principal buildings are one Lutheran and four Roman Catholic churches, a Jews' synagogue, a town-hall, and a county court-~~

~~house. The population in the year 1857 was 8916, but in 1870 it had increased to the number of 10,772.~~

~~Eperies was founded about the middle of the 12th century by a German colony, and was elevated to the rank of a royal free town in 1247 by Louis J. (the Great). It was afterwards fortified, and received special privileges. On August 11, 1685, it was taken from the Turks by the Austrians under General Schulz. In 1687 General Caraffa erected a scaffold in the public square, upon which he de- capitated, in a single day, thirty notables of the town. Eperies became in 1768 the head-quarters of the confederation of Bar.~~

~~EPERNAY (the ancient Aqua Perennes), the chief town of a French arrondissement in the departinent of the Marne, is situated on the left bank of the Marne, at the extremity of a beautiful and fertile valley on the line of railway between Paris and Strasburg, 20 miles W.N.W. of Chalons, and 75 miles east of Paris. The town is neatly~~

~~built, and in its suburbsare many handsome villas, inhabited chiefly by rich wine merchants. It is best known as the principal entrepét of the Champagne wines, which are kept here bottled in extensive vaults in the chalk rock on which the town is built. Among its other industries may be named the spinning and weaving of wool, printing, stock- ing-making, tanning, brandy-making, and the manufacture of chemicals. The principal buildings are the town-house, in which is a public library with 15,000 volumes, the palace of justice, the theatre, and the parish church, built in the Italian style, and containing some fine stained glass windows. The population in 1872 was 12,877.~~

~~Epernay was burned by Francis J. in 1545, to prevent Charles V. obtaining possession of its wine stores. It resisted Henry of Na- varre in 1592, and Marshal Biron fell in the attack which preceded~~

~~its capture. In 1642 it was, along with Chateau-Thierry, erected into a duchy, and assigned to the duke of Bouillon.~~

EPHEMERIDA, a remarkable family of Pseudo- Neuropterous Insects, deriving the name from éfzjpepos, in allusion to the very short lives of the winged insects. In some species it is possible that they have scarcely more than one day's existence, but others are far longer lived, though the extreme limit is probably rarely more than a week. The family has very sharply defined characters, which separate its members at once from all other neurop- terous (or pseudo-neuropterous) groups.

These insects are universaily aquatic in their preparatory states. The eggs are dropped into the water by the female in large masses, resembling, in some species, bunches of grapesin miniature. Probably several months elapse before the young larvee are excluded. The sub-aquatic condition lasts a considerable time: in Cloéon, a genus of small and delicate species, Lubbock proved it to extend over more than six months; but in larger and more robust genera (e.g., Palingenia) there appears reason to believe that the greater part of three years is occupied in prepara- tory conditions. The larva is elongate. The head is rather large, and is furnished at first with five simple eyes of nearly equal size; but as it increases in size the homologues of the facetted eyes of the imago become larger, whereas those equivalent to the ocelli remain small. The antenne are long and thread-like, composed at first of few joints, but the number of these latter apparently increase at each moult. The mouth parts are well-developed, consisting of an upper lip, powerful mandibles, ordinarily three-jointed maxillary palpi, a deeply quadrifid labium or lower lip, and three-jointed labial palpi. There are three distinct and large thoracic segments, whereof the prothorax is narrower than the others; the legs are much shorter and stouter than in the winged insect, with monomerous tarsi terminated by a single claw. The abdomen consists of ten segments, the tenth furnished with long and slender multi-articulate tails, which appear to be only two in number at first, but an inter- mediate one gradually develops itself (though this latter is often lost in the winged insect). Respiration is effected by means of external gills placed along both sides of the dorsum of the abdomen and hinder segments of the thorax, These vary in form: in some species they are entire plates, in others they are cut up into numerous divisions, in all cases traversed by numerous tracheal ramifications. According to the researches of Lubbock and of the

Messrs Joly, the very young larve have no breathing organs, and respiration is effected through the skin. Lubbock traced at least twenty moults in Cloéon,; at about the tenth rudi- ments of the wing-cases began toappear. These gradually become larger, and when go the creature may be said to have entered its "' nymph " stage ; but there is no condition analogous to the pupa-stage of insects with complete meta-morphoses. There may be said to be three or four different modes of life in these larvee: some are fossorial, and form

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tubes in the mud or clay in which they live ; others are found on or beneath stones ; while others again swim and crawl freely among water plants. It is probable that some are carnivorous, either attacking other larvze or subsisting on more minute forms of animal life; but others perhaps feed more exclusively on vegetable matters of a low type, 'such as diatoms. ; When the aquatic insect has reached its full growth, it emerges from the water or seeks its surface ; the thorax splits down the back, and the winged form appears. But this is not yet perfect, although it has all the form of a perfect insect and is capable of flight ; it is what is variously termed a "pseud-imago," '" sub-imago," or " pro-imago." Contrary to the habits of all other insects, there yet remains a pellicle that has to be shed, covering every part of the body. This final moult is effected soon after the insect's appearance in the winged form; the creature seeks a temporary resting-place, the pellicle splits down the back, and the now perfect insect comes forth, often differing very greatly in colours and markings from the condition in which it was only a few moments before. If the observer take up a suitable position near water, his coat is often seen to be covered with the cast sub-imaginal skins of these insects, which had chosen him as a convenient object upon which to undergo their final change. In some few

genera of very low type it appears probable that, at any

rate in the female, this final change is never effected, and that the creature dies a sub-imago.

~~The winged insect differs considerably in form from its sub-aquatic condition. The head is smaller, often occupied almost entirely above in the male by the very large eyes, which in some species are curiously double in that sex, one portion being pillared, and forming what is termed a 'turban ;" the mouth parts are aborted, for the creature is now incapable of taking nutriment either solid or fluid ; the antenne are mere short bristles, consisting of two rather large basal joints and a multi-articulate thread. The pro- thorax is much narrowed, whereas the other segments (especially the mesothorax) are greatly enlarged; the legs long and slender, the anterior pair often very much longer in the male than in the female ; the tarsi four- or five- jointed ; but in some genera (eg., Oligonewria and allies) the legs are aborted, and the creatures are driven help- lessly about by the wind. The wings are carried erect : the anterior pair large, with numerous longitudinal ner- vures, and usually abundant transverse reticulation; the posterior pair very much smaller, often lanceolate, and frequently wanting absolutely. The abdomen consists of ten segments; at the end are either two or three long multi articulate tails; in the male the ninth joint bears forcipated appendages ; in the female the oviducts terminate at the junction of the seventh and eighth ventral segments. The sexual act takes place in the air, and is of very short duration, but is apparently repeated several times, at any rate in some cases.~~

~~Ephemeride are found all over the world, even up to high northern latitudes. Pictet, Eaton, and others have given us valuable works or monographs on the family, but the subject still remains little understood, partly owing to the great ditficulty of preserving such delicate insects ; and it appears probable they can only be satisfactorily investigated as moist preparations. The number of described species is less than 200, spread over many genera.~~

~~From the earliest times attention has been drawn to the enormous abundance of species of the family in certain localities. Scopoli, writing more than a century ago, speaks of them as so abundant in one place in Carniola that in June twenty cart-loads were carried away for manure ! Polymitarcys virgo, which, though not found in England, occurs in many parts of Europe (and is common~~

at Paris), emerges from the water soon after sunset, and continues for several hours in such myriads as to resemble snow showers, putting out lights, and causing incon- venience to man, and annoyance to horses by entering their nostrils. In other parts of the world they have been recorded in multitudes that obscured passers-by on the other side of the street. And similar records might be multiplied almost to any exent. In Britain, although they are often very abundant, we have scarcely anything analogous. .

Fish, as is well known, devour them greedily, and enjoy a veritable feast during the short period in which any particular species appears. By anglers our common species of Lphemera (vulgata and dania, but more espe- cially the latter, which is more abundant) are known as the " May-fly," but the terms "Green Drake" and " Bastard Drake" are applied to conditions of the same species. Useful information on this point will be found in Ronalds's Fly-Fisher's Entomology, edited by Westwood.

A singular creature, with a carapace almost like that of a miniature tortoise, originally described by Latreille as a doubtful genus of Branchiopod Crustacea under the name of Prosopistoma, of which two species are known (one occur- ring in France, the other in Madagascar), is now almost proved by Messrs E. & N. Joly to be the aquatic condition of some insect of this family.

Ephemeride belong to a very ancient type of insects, and their fossil imprints are common, occurring even in the Carboniferous formation. (R. M'L.)

EPHESIANS, Tue EptstLe To THE. Destination of the Epistle—The first and most important inquiry con- nected with the epistle to the Ephesians has reference to the persons to whom it was originally addressed; and this inquiry again depends so much upon the reading of the first verse of the epistle that, before proceeding further, it ig necessary to determine as far as possible what that reading is. In the Authorized Version the epistle opens External with the words, " Paul,

~~an apostle of Jesus Christ by the evidence will of God, to the saints which are at Ephesus, and to the oe faithful in Christ Jesus." " At Ephesus" is the expres- tion, | sion in dispute. The two words are omitted by the first hand of the Vatican and Sinaitic MSS., and by the second hand of 67, a cursive MS. of the 12th century, whose corrected text Griesbach considered much more valuable than the text as it originally stood; but they are found in all other MSS. and versions.~~

~~Strong as is the evidence arising from the combination of the Vatican and the Sinaitic MSS., it would be difficult to resist the singular amount of authority opposed to them, were it not for passages from writers and fathers earlier than the earliest of our existing MSS., which show that the absence of the words was not only known to them, but was so far accepted, as at least probably correct, that they made it a ground of curious speculation with regard to the particular method of designating Christians then employed by the apostle. The earliest witness is Marcion, about Marcion, the middle of the 2d century, although he deals only with the fact. We gather Marcion's view from the language of Tertullian. In his treatise Contra Marcionem (v. 11, 17), the African father charges Marcion with having, contrary to the veritas ecclesie, given a false title to the eyistle, designating it as the epistle to the Laodiceans, guasi et am isto diligentissimus explorator.1 Had Marcion read " at Ephesus" in the first verse of the epistle, it would have been impossible for him to falsify the title, changing it into " the epistle to the Laodiceans." The change would~~

~~1 The passages from Tertullian, as well as from the other fathers to be subsequently quoted, will be found at length in most of the intro- ductions to the New Testament in common use. We take them from the Conspectus of authorities in Tischendorf's New Test., ed. viii.~~

~~Ee fiers Vs~~

~~have been at once refuted by the opening words. It will 'be observed that Tertullian does not accuse him of alter- ing the text. Marcion therefore must have read without "at Ephesus," and must have urged that he was led to this conclusion by his diligent inquiries. Jt is difficult to see why, in assigning such a reason for his view, he is~~

~~and that, during the 4th century, MSS. then considered " ancient," which also omitted them, were at least regarded as highly authoritative by distinguished men. The internal evidence is even more decisive than the Internal external, Without the words the reading in question is evidence~~

~~one of the most difficult of the New Testament. It is – ig estina=~~

~~Ter- clusion from Tertullian's words as to the reading adopted | ing could hardly have suggested itself, and the name of a tullian, by himself. There is no doubt force in the argument of | place was rather inserted to get rid rc Finally, except Harless and others that, when determining any disputed | on the supposition that the epistle was addressed directly point with regard to the New Testament, his principles led | to Ephesus, a supposition that few will accept, the history of him to appeal to the authority of tradition and not to | the insertion connects itself with that particular form of critical considerations. But this was in cases where there | the "circular letter" theory which is of all others the was a doubt. Here, with "at Ephesus" in the text, there | most improbable, and most out of keeping with the character could be none ; and it is hardly possible to imagine that, | of the apostolic age. On the other hand, the insertion of if he had these words before him, he should not, even while | the words was extremely natural. They took the place of resting upon the veritas ecclesie as sufficient for his pur- | nothing where something seemed obviously required. There pose, have taken occasion from them to pour out upon the | was no other city whose name would so readily suggest heretic all the vials of his indignant scorn. Instead of | itself for insertion as that of Ephesus. It was the metro- that he only speaks, however scornfully, of Marcion's great | polis of the province. St Paul had spent there a longer diligence in inquiry, and refers to nothing but the " title." | time than in any other city visited by him on his missionary The inferences are (1) that in all probability Tertullian did | tours. It was to be expected that he should write to it. not read "at Ephesus," and (2) that he knew of but one | The letter was no doubt read in Ephesus ; and, leaving that~~

~~tradition in the church reaching back to the earliest times, | city without any designation of its readers, it would, as it and unhesitatingly accepted by him, that the epistle had | spread thence to all parts of the Christian world, be supposed ; been addressed to the Ephesians. to have been addressed to the church which was the great Origen. The evidence of Origen is important. In a catena con- | centre of its circulation. These considerations, too, would taining part of his lost commentary upon the epistle, that | no doubt derive additional weight from the notice in 2 eminent father is quoted as saying that "in the Ephesians | Tim. iv. 12, " Tychicus have I sent to Ephesus," compared alone" has he found the words "to the saints that are ;" | with Eph. vi. 21, Everything, in short, was in favour of as inquiring into the meaning of the strange expression ; as | the insertion,—everything against the omission.t On all explaining it by the supposition that of those who are | sides the strength of the argument is irresistible ; and we made partakers of the "I am" it may fitly be said " They | conclude that the words "at Ephesus" form no part of the are ;" and as confirming his interpretation by the words of | genuine text of our epistle. the same Paul, who speaks in a similar manner elsewhere, With the removal of the words " at Ephesus" from the Theories when he writes that " God has chosen the things that are opening of the epistle, the way is cleared for the considera- of desti- not to bring to nought the things that are." The inferences | tion of the question of its destination, Three main theories os are (1) that Origen did not read "at Ephesus," or he | require to be shortly noticed. (1.) The first is that the would uot have commented as he does, and (2) that he | recognized designation is correct. The absence of the kuew the epistle as one to the Ephesians, words we have found it necessary to eliminate does not of Basil. Once more, Basil, about the end of the 4th century, | itself prove that the epistle was not sent to Ephesus. It**

not to be believed. He could have no dogmatic interest in adopting the one reading rather than the other. The inferences are (1) that Marcion did not read "at Ephesus ;" (2) that even in his time the epistle was generally regarded as addressed to the Ephesians; (3) that he, as the result of careful investigation, believed it to have been addressed to the Laodiceans. It is more difficult to draw any con-

~~reasons in an exactly similar way, quoting without the ex- pression in dispute, and adding that he had obtained the reading "from those who had gone before him, and from his own study of ancient MSS." The inferences in his case are the same as in the case of the others already mentioned, with this difference, that the reading "at Ephesus" was now generally accepted in the church.~~

~~It is unnecessary to refer to Jerome, while the evidence of the Ignatian epistle, if it may be relied on, simply shows that very early in the 2d century a whole epistle, which can hardly be any otlier than our present one (the longer recension leaves no doubt upon the point), was believed to have been written by St Paul to the Ephesian church. Some slight force may be added to the testimony of Marcion and Basil by the consideration that both belonged to Asia Minor, and that their sphere cf labour was con- tiguous to the district to one part or another of which the epistle was sent by the apostle.~~

~~In the light of these considerations, the MS. authority in favour of the omission of 'at Ephesus " assumes a very different importance from what it might otherwise possess. It is clear that in the first half of the 2d century there were MSS, in circulation which did not read the words;~~

~~almost impossible to give a satisfactory explanation of it. 4.5,~~

~~It is at variance with the style of language always used by the apostle on similar occasions. It cannot be explained by the supposition that the dogmatic rendering of which we have spoken was first given to the "are," and that then, for the sake of this, "at Ephesus" was dropped. With "at Ephesus" in the text, such a dogmatic render-~~

~~forms a presumption against such a supposition, for St Paul's practice is to name the churches to which he writes. But it does not do more. As we have already seen, even those fathers who did not read '"' Ephesus" in i. 1 accepted the title "to the Ephesians." Such had been the tradition of the church, and Marcion alone had questioned its correct- ness, Great difficulties, however, oppose the reception of this theory. Little stress can indeed be laid on the want at the end of the epistle of the greetings so commonly sent en nee~~

~~1 It is probable that the form of the evidence now given is resisted mainly because of the impression that the insertion of "at Ephesus" makes easy a reading otherwise almost inexplicable. But this is not the fact. The rendering is as dificult with the words "qt Hphesus" in the text as without them. The combination of the verb with the place named is then, indeed, easy enough, and it finds a parallel in Rom. i. 7. But the difficulty lies elsewhere. It lies in the combina- tion of the simple xa) moots immediately following with this parti- cipial clause; and that difficulty is in no degree touched by taking "at Ephesus" into the text. In fact, the difficulty is thus rather increased, the only translation that can then be given, ""To the saints which are in Ephesus, and the faithful in Christ Jesus,' being ap- parently inadmissible. Could one only persuade himself to render xat by "also" when "at Ephesus" is dropped, all would be simple, "To the saints who are also faithful in Christ Jesus ;"' but surely St Paul could not have spoken thus,~~

~~by St Paul to different mezabers of the churches known to him. Such greetings are wanting also in the epistles to Thessalonica, although the apostle wrote to that city under circumstances peculiariy calling forth his affectionate re- membrance of his converts there. It is otherwise with the indications contained in the epistle itself that its writer was personally unknown to those to whom he writes, and that they, on their part, knew of him and of his work rather by the information of others than by actual experience :—" If so be that ye heard of the dispensation of the grace of God which was given me to yonward " (ill. 2), where the particles ei ye cannot be understood as stat- ing only the ground, without the introduction of doubt, upon which the argument was proceeding (Alford), a use of ei ye not allowed by grammarians (Moulton's Winer, p. 561), and where the certainty wanting in the particle is not given by the context (as Meyer); "For this cause I also, having heard of the faith in the Lord Jesus which is in yourselves, . . . cease not to give thanks for you" (i. 15, 16), where the parallel passage in Colossians (i. 9 compared with i. 6), contrasting the day when the apostle first "heard" of their knowledge of the grace of God in truth~~

~~with that when they first "heard" of that grace, points out to us in a way not to be mistaken the sense in which the verb is to be understood (Lightfoot, On the Col., p. 28). But St Paul could not have used such language in reference to the Ephesians. He had laboured too long among them, had been too successful in his ministry, and had acquired too intimate a personal knowledge of their condition, to have permitted him to speak thus either of himself or them. Add to this the fact that in Eph. i. 1 the apostle does not associate Timothy with himself, although that disciple was well known to the church at Ephesus, while he does mention him in the salutations of the epistles to the Colossians and to Philemon written at the same time, and the evidence is very strong that the epistle before us was not, in the first instance at least, addressed to the Ephesian church.1 (2.) Another theory, generally associated with the name of Archbishop Ussher, although hardly less connected with that of Beza, has in later years found such general acceptance that it may probably be regarded as at this moment the prevailing view,—that the epistle is a circular letter, designed, not for Ephesus alone, but for many churches of Asia or the Peloponnesus or still wider districts. The modifications of this theory have been extremely numerous, varying with the adoption or rejection of the reading 'at Ephesus" in i. 1, as well as with the difficulties felt by those adopting it as to the manner in which the epistle was to be cir- culated. It is unnecessary to examine these theories separately, They are, as a group, exposed to objections which appear to be insuperable. 1. There is not the slightest trace of the existence of such a theory in Christian antiquity. 2. Had the apostle intended the epistle to be a circular one, nothing would have been easier for him than to say so. He does employ such a general designa-~~

~~churches of Asia" was familiar to him (1 Cor. xvi: 19, comp. Rev. i. 4). 3. No other name than Ephesus, except ~ Laodicea, appears to have been at any time connected with the epistle. Even this name, too, seeias not to have. been placed in the text. The statement of Marcion, our only authority for thus associating Lacdicea and the epistle with one another refers not to the text, but to the title. 4, The epistle has distinct reference to particular persons (i. 15, 16, vi. 22). 5. The idea of a~~

~~number of copies furnished to Tychicns with a space in blank for the name to be filled in is entirely at variance with the simplicity of the apostle and the character of the apostolic age. The circular hypothesis, in any of the forms thus proposed, may be abandoned with little hesitation. (3.) There remains a third theory which cannot be omitted, It adopts the circular idea, but at the same time identifies the epistle to the Ephesians with the epistle spoken of at Coi. iv. 16 as "that from Laodicea." This theory has beeen adopted by Canon Liglitfoot in the following words :—~~

~~"The apostle wrote at this time a circular letter to the Asiatic~~

~~churches, which got its ultimate designation from the metropolitan city, and is consequently known to us as the epistle to the Ephesians. It was the immediate object of Tychicus's journey to deliver copies of this letter at all the principal centres of Christianity in the dis- trict, and at the same time to communicate by word of mouth the apostle's special messages to each (Eph. vi. 21, 22). Among these centres was Laodicea. Thus his mission brought him into the im- mediate neighbourhood of Colosse. But he was not charged to deliver another copy of the circular letter at. Colosse itself, for this church would be regarded only as a dependency of Laodicea ; and, besides, he was the bearer of a special letter from the apostle to them. It wassufficient, therefore, to provide that the Laodicean copy should be circulated and read at Colosse." Dr Lightfoot further expresses his belief that '" educated opinion is tending, though slowly, in this direction," and that "ultimately this view will be generally received" (Colossians, p. 347). In the absence of Dr Lightfoot's as yet unpublished arguments in favour of the view thus taken by him, it is impossible to say whether he may be success- ful in establishing it or not. But, in the meantime, it seems liable, with the exception of that part which identifies the epistle to the Ephesians with the epistle 'from Laodicea" of Col. iv. 16, to all the objections which we have urged against the circular hypothesis, together with the additional difficulty of supposing that Tychicus, starting with a number of copies of the letter in his hands, should either leave his last copy at Laodicea, or that, if any remained, the Colossian church, instead of getting one of them, should be instructed to procure its copy from Laodicea. If, on the~~

~~other hand, it be said that the words " the epistle from Laodicea " are not a mere note of the place whence the epistle might be procured, but that, in one way or another, they point to a special connexion between the epistle and the city, it will follow that the former had a particular designation and was not circular.~~

~~The theories examined by us areall unsatisfactory. We have to ask whether there is any other way of meeting the difficulties of the case,~~

~~1. The first thing here arresting attention is, that wholly The Gentile readers are presupposed in the epistle (ii. 11, 12 ; epistle rl ill. 1; iv. 17). Nor this alone. When St Paul speaks of pete his apostleship, he speaks of himself with much greater Gentile emphasis than usnal as the apostle of the Gentiles (iii. Chris- 1-8). And, still further, in two highly important passages, tans. the force of which is lost in the Authorized Version, he shows that he has the Gentiles in view, not in what they become when they are brought to form part of the one holy temple, of the one redeemed family, of God, but in what they are when regarded as distinct and separate from the Jews :—"In whom every building fitly framed together groweth into a temple holy in the Lord" (ii. 21) ;! " For~~

~~tion in Gal. i. 2 and 2 Cor. i. 1. The expression " the~~

~~1 Another consideration worthy of notice is suggested to the writer by a friend. In Eph. v. 1 the apostle calls upon his readers to be imitators of God. It is the only occasion on which he does so. Writ- ing to those to whom he was personally known, he always calls upon them to imitate himself, 1 Vor. iv. 16, xi. 1; 1 Thes. i. 6; 2 Thes. iii. 7-9. The same friend (Mr A. Forbes, Aberdeen) suggests also, the importance of comparing the tone of the Ephesian epistle with that of St Paul's address to the Ephesian elders in Acts xx. From that aldress we learn how he would have spoken, as he did speak, to members of the Ephesian church—not 'if ye bave heard," or " when ye read ye may understand," or 'if so be that ye were taught in : " 2 but "ye know;" '*T have not shunned to declare unto you~~

~~€ whole counsel of God ;" 'I kept back nothing, but have showed~~

~~Ue . 66 ye ae . remember that I ceased not to warn every one of you." e difference in tone is very marked.~~

~~i i~~

~~1 The word " building" here is certainly not to be understoud,~~

~~The~~

~~same as I that from Laodicea" of Col. iv. 16 is that before us.~~

~~EPRESIAN~~

~~this-cause I bow my knees unto the Father from whom every family in heaven and on earth is named " (iii. 14, #5). Tt has been customary to say that in the church addressed the Gentile element prevailed, and that hence the wants of the Gentiles are mainly before the writer. But, in fact, there is no trace of Jewisli readers in the epistle, " not even in ii. 15," and Dr Davidson, observing this, not unnaturally grounds upon it the argument that, addressed to the church at Ephesus, it must be later than St Paul's time, because the apostle could not have left the Jewish Christians unnoticed (Zntr., i p. 379).~~

~~May not the true conclusion be one of an altogether different character ?—that our epistle to tlle Ephesians was not addressed to a church at all. There was probably no church at that time in Asia composed of Gentile converts alone. All of them were mixed communities. The tone of the epistle to the Colossians shows us that the errors prevailing in Colossx were of a Judxo-Gnostic character, and that the most powerful element in that church was Jewish. It is not an unfair inference that this must also have been the case in the neighbouring churches of Laodicea, Hierapolis, and Ephesus. How then could St Paul, writ- ing to any one of these churches, speak to it as if it were wholly Gentile, as if the Jewish element had no existence in it? The true explanation seems to be, that we have in the Ephesian epistle not an epistle to a church; that we have an appeal to Gentile Christians as such; that the apostle is thinking of his readers in that capacity, and not as a merely constituent part of any local church whatever.~~

~~2. A second point claiming consideration is, that we have no small reason to suppose that "the epistle from The authority~~

~~Lsodicea. of distinguished critics can be quoted for this view (Grotius,~~

~~Wetstein, Hammoud, Mill, Canon Lightfoot, &c.); and it is not to be regarded as mere conjecture. We have seen that Marcion, as the result of diligent inquiry, liad come to the conclusion that the epistle to the Ephesians ought to have borne the name of the epistle to the Laodiceans. We know also that a passage quoted by him from the latter is found in the former (see in Tischendorf's New Test. Eph. i. 1), thus identifying the two epistles by their contents as well as by their titles. We must give some weight to the improbability that an epistle to which St Paul attached such importance that he directed it to be passed on from one church to another would be lost; and, when we put all these circumstances together, there seems every reason to think that "the epistle from Laodicea"' is no other than our epistle to the Ephesians.~~

~~On these grounds, then, rests the suggestion which we offer! Adopting the idea that the epistle to the Ephesians is "the epistle from Laodicea" of Col. iv. 16, it seems to~~

~~with Meyer, Schenkel (in loc.), and probably Ewald (Geschicht, vii. p. 248, &c), to apply to individual Christian churches as dis- tinguished from the Catholic or universal church, embracing them all in one great whole. The " buildings " thought of are not simply numerically different from one another; they are different in kind. They may be heavenly or earthly, Jewish or Gentile, &c. _As such they are brought into Christ, and then they become parts of one holy temple in Him. The same remark applies to the 'every family " of Tia, Way~~

~~1 Since this article was written, the writer's attention has been called to the fact that Ewald, in his Sieben Sendschreiben d. Nees, 1870, has adopted the same view of the destination of the epistle. He had not done so in his Geschichte d. V. I., and the writer was not aware of the fact. Ewald, at the same time, attributes the epistle to a disciple and friend of the apostle, writing 70-80 A.D. He urges that St Paul himself never wrote except to distinct churches (p. 157). But that very circumstance~~

~~would surely have led any one writing in his name to adhere to the apostle's practice, and to avoid exposing his epistle to the suspicion which a departure from it could not fail to awaken, Why, too, if the writer adopted from Col. iv. 7 the idea of sending the epistle by T'ychicus, does he not adopt from Col. i, 1 the idea of uniting Timothy with himself in the salutation ?~~

~~us that it was not intended to be an epistle to the church of the last-named city. It was an epistle to the Gentile converts, as such, in the first place of Laodicea, in the second place of Colossa.~~

~~The view now taken derives much confirmation from the Confir- light thrown by it upon some of the difficulties connected mation~~

~~with the epistle which no theory yet proposed has succeeded a aken.~~

~~in removing. (1.) It at once explains the want of those local references which we should naturally expect in a letter written to an organized community; while, at the same time, the persons for whom the letter is intended are a sufficiently limited class to justify the expressions of i. 15 and vi. 22. (2.) It explains the absence of any special designation ini. 1, and relieves us from the necessity of supposing that there was a blank space left in that verse. St Paul could hardly have inserted the name of a town without leading to the false impression that he was writing to its church. (3.) It explains the fact that the name of a place should have been permitted to find its way into i. 1, where no name originally stood. Had the epistle been in- tended for any church or churches, they, even though not inserting their own names, would not readily have per- mitted the insertiou of another. They would have claimed their own epistle. General Gentile readers, as not organized, could not so easily do so. (4.) It explains the remarkable expression of Col. iv. 16, "the epistle from Laodicea." We might have expected "the epistle to the Laodiceans." But what had been written was not an epistle to the Laodiceans, and therefore it is not styled one. It was an epistle to a particular section of Christians both in Laodicea and Colossz, and only sent to Laodicea first. Hence the designation, " the epistle from~~

~~Laodicea." (5.) It explains what has been found so inexplicable (David-son, Jntr., i. p. 381; Harless, Hphes. Brief, p. 40), that, writing both to the Colossians and the Laodiceans by the same messenger, the apostle should include the brethren in Laodicea in a salutation of the epistle to Colossz, and should enjoin an epistle meant for the Colossians to be read to Laodiceans who had one of their own by the same hand. He was not writing to the cliurch at Laodicea; therefore let the church there have both its letter and its salutations through the neighbouring church to which he was writing at the moment. (6.) It explains the absence from the epistle of all allusion to doctrinal error on the part of its recipients. We see from the Colossian epistle how deep was the hold of such errors at Colosse. In any circumstances it would hardly be possible to imagine that similar errors did not exist both at Laodicea and Ephesus; and this conclusion as to the first of these two cities is in the present instance confirmed by the fact that the epistle to the Colossians, filled with controversy as to doctrinal errors, was directed to be read there. Again, therefore, their being left un- noticed in our so-called epistle to the Ephesians seems to be a proof that St Paul is not writing to the church of the city addressed by him. Had he been doing so he would naturally have taken its whole condition into account ; but he is dealing with one portion of its community alone, and with that portion mainly, if not only, upon one point of interest. (7.) It explains even to some extent the difficult words of i. 1, rots dylous Tots otow Kal motois &v XpioT@ *Iyood. There appears to be but one meaning of which these words are susceptible, "To the saints existing and faithful in Christ Jesus." All other renderings proposed either do injustice to the Greek, or make the apostle say what it is not possible he should have said in conformity with his general teaching. This, the rendering of Origen, is natural and idiomatic. Its peculiarity is of course that it makes the substantive verb of the original more than a simple copula. It makes it a distinct predicate, pointing out a characteristic of the condition of those addressed.~~

~~Object of~~

~~epistle.~~

~~462.~~

~~They have a being, a place, a name ; they “are,” they are “ existing,” in Christ Jesus. The expression 1s undoubtedly most peculiar, having probably no perfect parallel in the New Testament. Yet it is there, and no reading that we can adopt removes it. The view that we have taken of the destination of the epistle seems to some extent to offer an explanation. There was a special propriety in reminding the Gentile Christians that they existed, that they had a place, that they “were” in Christ Jesus. We see from the whole tone of the epistle that this was the very point on which they were perplexed. There was no doubt about the Jewish Christians. It is taken for granted by the apostle, and lie repeats it more than once, that they were “near” (ii. 13, 17). What he had especially to enforce is that the Gentiles were “near” also. He did not require to say of the former what it was so needful to say of the latter. What he does say, indeed, might lave been said equally of both. Both, when believing, ‘were in Christ Jesus.” But the words have a peculiar force when applied to Gentile Christians who had been “ strangers to the covenant of the promise,” and who had to be encouraged to feel with greater depth and power than they yet experienced that they were partakers of the full privileges of those who were fellow- citizens with the saints and of the household of God. There is thus an emphasis on the rots otow. The Gentile Christians are not merely in Christ, but in Him they “are.” In Him they too have a real and genuine exist- ence, such as those only have who are in covenant with God.1~~

~~II. Object of the Hpistle.—This is much more definite than it is often thought to be. The apostle has something more precise in view than to set forth the glory of the re- deemed and Christian standing of his readers (Meyer), or to describe the life by which the Christian community is marked (Schenkel), or to explain the ground, the course, and the end of the Christian church (Alford). It is not luis purpose only to pour himself forth in adoring contem- plation of the blessings received by us in Christ (Harless) ; and it is far too little to say that he desires to strengthen the faith and to encourage the hopes of those to whom he writes (Gloag). Even Canon Lightfoot seems hardly to give a~~

~~special enough object to the epistle when he finds its principal theme in " the life and energy of the church as dependent on Christ" (Ox the Coloss., p. 329). These views may be all partially correct ; but they are not enongh. In this very setting forth of the greatness of the church, in this description of her life, in this presenting of her to us in all the ideal glory of her state as united to her Lord, the apostle has a further and immediately practical aim—to show us that this ideal glory contemplated from the first~~

~~1 We are not without distinct examples of a use of the substantive verb approaching extremely near to this in the epistle to the Colossians, written at the same time as the epistle to the Ephesians. In ii. 3, ii. 10, and iii. 1 of that epistle the "are" and "is" are not to be con- nected with "hidden," "fulfilled" (Authorized Version, "complete"'), or '* sitting." These are all secondary predicates. The first predicate is the substantive verb, to which the others are added. The treasures of wisdom spoken of "are" in Christ, and are "hidden;" the Colossian Christians " are" in Him, and are " fulfilled; " Christ himself " is "' when the things above are, and He is there " sitting" at the right hand of God (comp. Lightfoot, 7 loc.). Even in the Ephesian epistle itself, we have something of a similar kind. The Authorized Version of ii, 5 conveys a very imperfect idea of the Greek. 'The words there used do not mean " by grace ye are saved," but " by grace ye are, saved men." With such examples before us we need have less difficulty in putting Origen's metaphysical meaning into the "are" of i. 1; nor does there seem to be so much over-refinement in this notion as is often thought. If the Almighty chose for Himself the name I am, why may not His people be said to "be" in Him? All, however, that we urge is, that such a use of the verb has more than ordinary force when applied to Gentile believers. I am is a covenant title. No one doubted that the Jews were within the covenant ; what needed enforcement was that the Gentiles were not less so.~~

~~KE EEE ST 2 Nes~~

~~the union of both Jews and Gentiles in equal enjoyment of the privileges of God's covenant, that to the complete- ness of the body of~~

~~Christ the latter are as necessary as thie former, and that it is only when both are together in Christ that His fulness is realized and manifested. It is God's eternal plan that all things shall thus be restored and united in the Beloved; and, unless they are so, frankly, freely, and fully, that plan will be defeated. Hence it is~~

~~that the apostle begins by describing in the loftiest language Analysis~~

~~that realizing of the Almighty's purpose formed before the~~

~~foundation of the world which was to be effected in "a" °P itis~~

~~(not "the," for it is the thought of God with which we are dealing) " dispensation of the fulness of the seasons " (not times"), when He would "sum up," or gather together under one head, "all things in the Christ, the things in heaven and the things upon the earth " (i. 3-10). Hence it is that Israel "also" (1. 11), which had before hoped in the Christ, had been made an inheritance in Him; but not Israel alone, for the Gentiles "also" (kai tueis) had been made a similar inheritance, " sealed with the Spirit of the promise," and to the same end, "the praise of the glory of God's grace" (i. 10-14; comp. especially verses 12 and 14, and note the article before dcéys in verse 14). There- fore he prays that the God of our Lord Jesus Christ, 'the Father of the glory," will reveal this knowledge fully (émvyvcéoer) in them, that so they may understand the ex- ceeding greatness of His power which He wrought in Christ, when He raised Him from the dead and made Him to sit at His right hand in the heavenly places, constituting hin Head over all things to the one church which is his body, the pleroma of Him whose pleroma is only reached when all things in all are "fulfilled" in Him (i. 15-23), This participation in the pleroma had been bestowed on them, Gentiles though they were (judas emphatic at ii. 1.), when they, in the same manner as the Jews (xai yets, il. 3), had been qvickened together with the Christ, been raised from the dead, and been made to sit together in the heavenly places in Christ Jesus, this new and higher life being nothing more than the execution of God's great design (ii. 1-10). The apostle next makes a practical appeal to his readers, as Gentiles, calling on them to remember their present as contrasted with their former state, especially in this respect, that the same Lord who was the peace~~

~~of the Jews was also their peace," that they who had been afar off were now, as well as those who had been nigh, united in one new man, having access in one spirit to the one Father, and that now even they were fellow-citizens with the saints, members of the family of God, resting on the one foundation on which every building (not " the whole building" of Authorized Version), Gentile as well as Jew, grows up a part, fitly framed to the other parts, of one holy temple in the Lord (ii. 11-22). At this point the apostle seems to have been about to address to them the practical exhortation which meets us cnly at iv. 1, but he is again carried away by the thought of the great mystery which fills his mind. He turns to it therefore anew, only looking at it first as committed to him rather than in its effects on them. Yet it is the same mystery as that of which he had already spoken, that the Gentiles were made fellow-heirs and fellow-members of the body and fellow-partakers (mark the repeated ovv used with sucl striking frequency in this epistle) of the promise in Christ Jesus through the Gospel, and bursting forth into a prayer to the Father, of whom every family (not 'the whole family " of Authorized Version) in heaven and on earth is named, that Christ may dwell.through faith in their hearts in love, so that they may be fulfilled unto all the fulness~~

~~2 eipfvny ought to be read a second time after the second kai of rh, IP~~

~~RiP Sl Ns~~

~~of God (iii. 1-19). A doxology follows, where the singular prominence of the thought of the church in St Paul's mind at this moment, shown by the mention of it before the mention of Christ, "in the church and in Christ Jesus " (v. 21), ought not to escape the notice of the reader (iii. 20, 21).1 Even at the beginning of chap. iv., where the prac- tical exhortation, suspended for a time, is taken up, the apostle has this unity that is in Christ still pressing upon his thoughts; for he no sooner mentions the unity (verse 3) than in the fulness of his heart he hastens to enlarge on it; and, recalling all the gifts which Christ had bestowed upon His church, he speaks of them as given to secure that we may "all," that is again, Jewish and Gentile Christians, attain unto the unity of the faith and of the~~

~~important features of her condition, her foundation, spirituality, unity, organization, aim. The consequence is that the nature of the spiritual life is brought out in this epistle to a wonderful degree. Nowhere in the writings of St Paul is such frequent allusion made to the work of the Spirit in the soul and in the church. It would seem as if the apostle, feeling that in previous epistles he had said all that he had to say of the source and medium of redemption, desired to dwell, before he closed his labours, upon its application, to contemplate fully not merely the love of God and the grace of Christ, but the power of a Spirit, as He enlightens, renews, seals, and fills the cart.~~

~~III. Relation to the Epistle to the Colossians.—We are Relation thus prepared to examine the relation of our epistle to the to Colos- epistle to the Colossians. The complaint of De Wette 55~~

~~knowledge of the Son of God, unto a full-grown man, unto the measure of the stature of the pleroma of Christ, from~~

~~wliom the whole body, by means of its several joints of supply, of which the Gentiles are one as well as the Jews (mark the rdons apis of verse 16), maketh the in- crease of the body unto a building up of itself in love (iv.~~

~~1-16).~~

~~It is not necessary to analyse further the teaching of this epistle, the remainder consisting of practical exhortations, What lias been said is sufficient to show that one great thought runs through it all, not so much the glory of Christ in Himself, as that glory realized in the church which is His body, in which the scattered "buildings" are united into one holy temple, the scattered 'families " into one great family, the scattered " joints of supply " into one strong and vigorous body; and all this in Jesus Christ, whose glory is only accomplished, only reaches its pleroma, when this is done.~~

~~More, however, has to be said, for it is obvious that the description thus given of the glory of the church is not given for its own sake only. It is neither a pious medita- tion nor the splendid vision of an ecstatic hour. It has all a practical bearing upou Gentile Christians. It is to show them that their calling into the church is no accidental, doubtful thing. It is a part of God's eternal plan, the execution of which is essential to the accomplish- ing of the glory of the Christ and of Himself in Him. Whatever, therefore, was their past state of alienation, it could only be temporary. They must have their full share in the privileges of those who are one with God, must be an integral portion of the one body of His Son. None can be more near than they, for none in whom Christ is revealed can be more near than others in whom the same revelation has been made. Let them dispel their doubts, rest in the assurance that He who is the peace of Israel is also their peace, and walk worthy of Him whose pleroma they help to "fulfil". The whole is the practical unfold- ing and application of the thoughts which filled the~~

~~upon this point has been echoed by many later writers. The resemblances between the two epistles are said to be so great that the former must be regarded as a mere verbose expansion of the latter. Even those by whom tle authenticity of the Ephesian epistle is defended admit the striking similarity ; but they find the explanation of it in the fact that the two epistles were written at the same time, when the same ideas were in the author's mind, and when he was writing to two churches in a similar condition, A long succession of writers from Paley onwards have adopted this line of defence, many of whom have at the saine time rather inconsistently admitted that the epistle to the Ephesians shows no trace of the doctrinal errors combated in that to the Colossians, and that what may be called the doctrinal portion of the two epistles exhibits differences at least as striking as the similarities. The real explanation seems to lie in a wholly different direction, and is to be found neither in attempting to weaken the force of the similarities, nor in urging, while admitting them, that the wants of the readers were the same. The trnth is that there is no reason to doubt that the two churches of Laodicea and Colosse, as might indeed from their proximity to each other have been expected, were in a very similar condition, both doctrinally and practically, and that the same~~

~~great doctrines were in the apostle's mind when he wrote to both. This consideration explains the similarities-which strike the reader ; while the differences spring not from difference of doctrine, but from the wholly-different and independent point of view from which the same doctrines are looked at in each epistle. Thus Col. i. 14 is much the same as Eph. i. 7; Col. i. 20 as Eph. i. 10; Col. i. 16 as Eph. i, 21; Col. i. 18, 19 as Eph. i. 22, 23; Col. ii. 13 as Eph. ii, 5; Col ii, 11 as Eph. ii. 11; Col. i. 20 as Eph. ii. 16; Col. i. 25, 26 as Eph. iii. 2, 3; but a comparison of these passages will show that, what- ever the resemblance be, they have in each epistle a dis-~~

~~apostle's mind in his epistle to the Colossians. The great | tinct purpose of their own: in that to the Colossians to Place of importance to be attached to the Ephesian epistle in the | set forth the glory of Him in whom the whole church epistle construction of the Pauline system of doctrine will thus be | lives; in that to the Ephesians to show that this glory~~

~~in Pauline teaching.~~

~~apparent. It presents to us the realizing of that dispensa- tion of God which belongs to the fulness of all preceding '"seasons" (i. 10), which is to exhibit the exceeding riches of His grace to all ages that are to follow, one succeeding another, without end (ii. 7; mark the compound, not the simple verb, émepxoévors). It takes up everything that went before; and nothing can be added to what it con- tains. It sets before us the completion of an edifice whose foundations had been laid in a past eternity, and which was to stand for ever. It is especially the storehouse of truth connected with the church, using that word in its most comprehensive sense, for it treats of all the most tt eee ee – 1 The reading of the T. R. has here again to be amended hy the insertion of a kai after éxxAnota.~~

~~cannot be fulfilled except by the bringing of a// into unity in His one church, so that there cannot be two separate communities, but only one body in Christ. In short, the epistle to the Colossians is occupied with Christ himself. In opposition to the Judzo-Gnostic errors prevailing in Colossee, and doubtless in Laodicea also, the apostle sets forth in it~~

~~Christ in His person, life, death, resurrection, and exaltation in heaven. He is the true solution of their religious perplexities. He is the one and only Mediator between God and humanity, the one and only principle of the divine life to which humanity is to be brought. The epistle to the Ephesians is occupied with the church. In opposition to the arrogance of Jewish and the fears of Gentile Christians prevailing in Laodicea, and doubtless in Colossz also, the apostle sets forth in it the~~

~~Ephe-~~

~~gians and We speak~~

~~Colos- another; and we thus better understand how it was that Christian of Asia belonging to the Pauline school, who was ramig: OL directed that the two should be read together | desirous at once to regain for the apostle the alienated as: (Col. iv. 16). Without the other each was incomplete. affections of the Asiatic Christians, and to compose the But together they make up the complex thought, "I am | differences between the Jewish and Gentile sections of the the vine, ye are the branches;" ' Abide in me, and [I in | church. you." Nor is it without interest to notice that this is not Such being the state of the argument against the Objec. a solitary instance of such a relation between two different | authenticity of the epistle, it will be seen that tle more tions an- books of the New Testament written by the same pen. A | important objections have been already, by anticipation, swered, similar relation exists between the gospel of St Luke and | met in the previous positive statements of the article. the Acts of the Apostles, and between the gospel of St (1.) In particular, it ought to be necessary to say little more Want of John andthe Apocalypse. In the first of each of the three | upon what has been generally felt to be the most powerful of these, specific pairs we have Christ the head, in the second His body | the want of specific aim pete by the epistle, and its dependence purpose, few : : upon the epistle to the Colossians. A specific aim, however which is the church. It will thus be seen, too, that, in the erroneously conceived, is distinctly attributed to it by its later absence of direct historical evidence we may be spared the | opponents ; and we have only to compare it a little more closely inquiry as to which of the two~~

~~epistles was written first. | with the epistle to the Colossians in order to see that, so far from All inquirers allow that the interval between them was merely contin ae pacing of that epistle in an extended form, : ‘ : * ; . | it exhibits thorough independence. Its very resemblance to the extremely short. The chief point of soa that in this Colossian epistle makes this the more striking, because it shows us short interval the epistle to the Colossians 18 first in order | not something entirely new, but that new use of old truths which of thought, though not necessarily in order of time. ‘The | is often more difficult to produce than what is wholly new. It is inference of Harless from iv. 16 (Zph. Brief, Einl., p. 51) not thus that the imitator or forger discovers himself. To be able that. supposing the Ephesian epistle to be “that from | wield a great doctrine in this way, to present it to one’s self and Li ai PE S t 8 ila P b Su otane’a sia others in different lights, to apply it to varying circumstances, in aodicea, if must have been written betore the epistie tO | gicates a fulland original possession of it. An imitator would of the Colossians, an order of writing which he rejects, may | necessity have repeated what had been said before. He would have be weakly founded, but it may also be correct. There is | shown no originality or power in his treatment of the doctrine, and nothing to binder the supposition that with two aspects of we should have received at his hands nothing but broken and h an a ce PP FP othiel. aan iceicall es imperfect fragments of what he had not himself assimilated. No the truth in his min » one Of which 18 logically prior tO | traces of such weakness meet us here. We are in the presence of a the other, the apostle might first transfer to paper the last | master who has felt the fulness of the truth proclaimed by him, of the two. ‘The circumstances calling for it might at the | and who can see with his own eyes the different applications of moment seem to be tle most urgent. The priority of the which it is susceptible. Careful attention, again, to the passages Colossian epistle in every respect worth speaking of will (guid ma cupyory ot ile eenne hae te oe nee : oo y tee) P go” merely a reproduction of the Colossian epistle, but one indicating still remain, although we allow the correctness of ‘the | comparative poverty both in ideas and words (such as Eph. iii. 15 inference drawn by Harless from the verse referred to, and | compared with Col. ii. 19; Eph. i. 17, 18 compared with Col. i. 9) the argument for the identity of the epistle to the | will show that the~~

~~richness of thought and language is often on the Buhos ‘th that “f Taotivta” will bh Prcted side of the former of the two. But the true answer to the objection Be cee ee = rom Laodicea “ will be unattected | i; to be found not in any attempt to exalt either epistle at the by the admission. , f expense of the other so much as in marking the independent Authen- IV. Authenticity of the Hpistle.—It is only in compara- | handling by both of the closely related truths with which they ticity. tively recent times that doubts have been entertained upon | deal. Both will then appear in the light in which even Baur~~

~~church in its unity.! It is the one body of Christ, and the Gentiles must be a constituent part of the body if the body is to be complete,—a part of the fulness, of the pleroma, of Christ, if that pleroma is to be reached. They are not therefore to suppose that, because they were once far-off, they are not now nigh, as nigh as those who claimed, and might appear, to have been always nigh in a sense peculiar to themselves.~~

~~It will thus be observed that the two epistles of which are in the strictest sense complementary to one~~

~~this point. Usteri, in his Pawl. Lehrb., 1824, appears to have been the first to express them, although he did not~~

~~but takes the date of its composition further back, ascribing it to “‘an unnamed disciple and friend of the apostle” desirous to speak in his spirit and name truths which St Paul himself had been too much occupied with other things to utter (Geschichte d. V. I., 1859, vii. p. 246-7). Lastly, Hilgenfeld may be mentioned, who in his Hixleitung, p. 669, &c., 1875, gathering together the objections of his predecessors, and adding one or two minor ones of his own, assigns the epistle to the Gnostic times of the 2d century, and supposes it to have been written by a~~

~~was disposed to regard them, “ twin brothers coming together into the world” (Paulus, p. 455) ; aud the question will no longer be one of copying, but of authorship later than the apostolic age.~~

~~hesitate to use the epistle for the purpose of his book. The same doubts were afterwards more fully expressed by Schleiermacher, in his Hinlectung ins N.7’., from whose~~

~~(2.) This, accordingly, is the objection that next meets us. It Relation is urged that the epistle to the Ephesians bears evident marks of to having sprung up in the midst of the Gnostic heresies of the Gnostic- second century. The peculiar phraseology of many parts of the ism.~~

~~oral lectures, according to Bleek (Introd. Clark’s Trausla- tion, ii. p. 39), Usteri had received his views. De Wette followed in successive editions of his Hinleitung, from 1843 onwards, not, however, deciding against the epistle, but only questioning its authenticity on the ground of its want of specific purpose, its dependence on the epistle to the Colossians, its poverty of thought, and its divergence both in teaching and style from the genuine epistles of St Paul. He was followed by Baur in his Paulus, 1845, and by Schwegler in his Vachap. Zettalt., 1845, these two critics connecting the language of the epistle with the Gnostic and Montanist heresies of the 2d century, and for the first time unhesitatingly rejecting it. Ewald agrees with Baur and Schwegler in denying the Pauline authorship of the epistle,~~

~~1 A distinct intimation of the arrogance with which the Jewish looked down upon the Gentile Christians and of the contemptuous language which they used concerning them, is afforded by Eph. ii. 11 (comp. Meyer in loc.).~~

~~epistle is supposed to confirm this. Thus we are prepared by the words of iv. 14 to suppose that the writer has false teachings in his eye ; and when we find him speaking as he does of “ the mystery ” of God’s will (i. 9, comp. iii. 4, 9, v. 32, vi. 19), of the “pleroma,” that favourite term of the Gnostic systems (i. 23, iil. 19, iv. 13; comp. iv. 10, v. 18), of the “zon” of this world (ii. 2), the “pons” (ii. 7, iii. 9, 11), the “son of the wous” (iii. 21), of “the prince of the power of the air” (ii. 2), of “ the~~

~~principalities and the authorities in the heavenly places" (iii. 10, comp. i. 21, vi. 12), of the " knowledge " (iii. 19) and the 'full knowledge" (i. 17, iv. 13) to which Christians are to come, and of the " manifold wisdom of God " (iii. 21), the conclusion is considered irresistible, that we have in all this an opposition to Gnosticism, and a date later than the first century. We shall not attempt to deny the probability that there is a reference to Gnostic errors in expressions such as these. To say that they were originally employed by the apostle in order to unfold after his own manner the truth that he had to proclaim, and that they were then, in speculative abuse, made the foundation of, or essential elements in, Gnostic systems is unnatural. They are too peculiar, too different from the language of St Paul in his earlier epistles, to permit such an explanation. \ Reference to what is known to us as Gnostic error there must be in~~

~~Harmon- izing ten- dency,~~

~~Peculiar words and thoughts.~~

~~EPHESIANS~~

~~them; and could it be shown that such terms came first into existence with the Gnostics of the second century we should at once give up the argument. The whole question is thus one of date. Had such ideas or words existence in the apostolic age or had they not? Answer must be made in the affirmative. Some of the expressions referred to, " mystery," "on," " knowledge," " full knowledge," " wisdom," occur with remarkable frequency in St Paul's undisputed epistles to the Romans, Corinthians, and Galatians. 'The priuce of the power of the air" combined with " the world- rulers of this darkness" (Eph. vi. 12) presents only an unmistak- able parallel to "the prince of this world" in the gospel of St Johu (xii. 31, xiv. 30, xvi. 11), a gospel which, in the present state of criticism upon the point, it would be absurd to bring down to the middle of the second century.. Speculations, again, regarding the different orders of the celestial hierarchy, in regard to its thrones and dominions and principalities and powers, in regard also to the worshipping of angels, can be traced to the very confines of the apostolic age ; and from the masterly dissertation on the word pleroma~~

~~attached by Canon Lightfoot to his epistle to the Colossians, it will be seen what a high probability there is that that word belonged to the apostolic age itself (comp. Burton's Lectures on the Gnostic Heresies, Lect. v.).~~

~~It thus appears that these Gnostic ideas were in circulation before the apostolic age was out. That it was later before they were combined and elaborated into the systems now known as the Gnostic systems, and that the elaboration of these systems may itself have been promoted by the use in the sacred writings of the terms men- tioned, is no doubt true; but that is no proof that tlie ideas them- selves did not possess at the earlier date a powerful hold over the minds of men. If so, then the province of Asia was one of the great centres of their influence. Its cities were the meeting place of all eastern as well as western thought; and in them, far more than in Rome or Corinth or Thessalonica or Galatia, Gnosticism found at once a home and a starting-point for further progress. What, then, was an apostle to do when he went to places where such thoughts prevailed, and where they were injuriously atfectiug the life of the church? Exactly what St Paul did in the epistles to Laodicea and Colossz. The new terms used by him came from the new teaching made necessary by the places and the time. As he thought of the wants of those to whom he wrote, he saw that the truth committed to him could meet their more speculative errors, could satisfy their more speculative wants, as fully as it had met and satisfied necessities of a still earlier and simpler kind. We learned to see more clearly, to estimate more highly, the grandeur of his trust. He hastened, therefore, with it to the rescue ; and, like any one on whom a new vision of divine truth has dawned, he did it with an exuberauce of language, with a power of expression, witha swing of exultation, such as he had only on rare occasions exhibited before. Nor only so. The very form of his teaching was modified, and took traces of the speculations it was designed to counteract. The spectacle is a most interesting one, and ought to be most encouraging and quickening to Christian faith. The truth does not differ in the epistles to which we allude from what it was in earlier epistles by the same author. But there is growth, development. There is a theology in the proper sense of the term even in the New Testament itself—a spur to theologians of every age to adapt in like~~

~~manner the eternal truth to the wants of their own times, and to construct a theology which shall be living, because, while founded on the great facts of the gospel, it is cast in the mould which their times demand.~~

~~(8.) Hilgenfeld's view as to the harmonizing tendency of the epistle, as to its effect in uniting opposing parties into one catholic church, has also been substantially met. The epistleis throughout addressed to one class of persons, not to two classes ; and there is no allusion whatever to any factious spirit exhibited by the former. That the church of Christ is one was surely a truth which sprang, not out of the controversies of hostile parties, but out of the teach- ing of Christ Himself in the gospels (comp. esp. John x.), and which is nowhere more strenuously insisted on than in the acknowledged epistles of St Paul (Rom. xii., 1 Cor. x. xi. xii.). The peculiarity here is not in the thought itself, but in the modein which the thought is presented ; ahd the explanation of this is to be found in the considerations already adduced.~~

~~(4.) Other objections to the authenticity of our epistles, such as its dmat Aeydueva and its un-Pauline statements, may be passed over in afew words. The former are certainly not more numerous than may be expected when we remember the peculiar state of circumstances to which the apostle addresses himself. The most important examples of the latter are—ii. 20, "apostles and prophets" as the foundation, the citation in vy. 14, which it is said caunot be identified, and the mode in which justification is alluded to in ii. 8, while Hilgenfeld, not satisfied with these examples from Baur, finds a proof that we have a Pauline disciple rather than St Paul himself before us in iii. 8, " the least of all saints," instead of " the least of the apostles" as inl Cor. xv. 9. Itis hardly possible to follow such minute objec- tions here. For the first compare 1 Cor. xii. 28; for the second we may compare Isa. lx. 1, 2, and may remember the freedom with~~

~~which the Old Testament is often quoted in the New ; for the third it may be noticed that in a statement which Baur finds unfavourable to Pauline authorship, Hilgenfeld finds a clear proof of Pauline dis-~~

~~cipleship (p. 677) ; and for the fourth that, in the verse in Corinthians immediately preceding that referred to, the apostle designates him- self '*an abortion," a much more humbling expression than ' the least of all saints." Those who allow force to what has been said on the first three objections will not be stumbled by such minor difficulties. Those who refuse it will feel that what they consider their unanswered. objections are sufficient to justify their position. We may omit further notice of them, and may simply urge upon the point before us that, the field being thus cleared of the objec- tions, we are thrown back upon what is really the main ground upon which the New Testament books are to be accepted, the tradition of the church. It is quite a possible thing that in a particular case, whether relating to the Old or New Testament, that tradition may be incorrect. All fair criticism, therefore, is to be welcomed ; but, when no good objection to an accepted opinion of the church has been established, there is everything to lead us to acquiesce in it with confidence. The early church was not so thoughtless upon these points as she is often said to have been. She guarded her treasures with great care, and was very watchful lest anything should be placed amongst them in whose genuineness she had not every confidence. What the tradition of the church is in the present instance is not doubted ; and it is unnecessary to enter here into detail. The ordinary introductions to the New Testament and the prologomena of the different commentators on the epistle contain all the facts.~~

~~V. Occasion, Place, and Date of the Epistle.—It will Occasion, The place,~~

~~not be necessary to say much upon these points. occasion was evidently afforded by the despatch of Tychicus and Onesimus to Colossz (Col. iv. 7-9; comp. Eph. vi. 21). By them St Paul would send letters to the Colossian church and to Philemon, one of its members. He embraced the opportunity of writing also to the Gentile converts of Loadicea, and of the neighbouring church at Colossz ; and that epistle, not being written to a church, but being primarily intended for a section of the Christian communities of the two cities, had no name of a place inserted in it as the object of its destination. In this respect it resembles, and may be regarded as a counter- part of, the epistle to the Hebrews.~~

~~As to the place where it was penned, the question lies between Rome and Czsarea, for St Paul was a prisoner at the time (iii. 1, iv. 20), and his imprisonment in one or other of these two cities must be referred to. The ques- tion has been decided by some in favour of Czesarea on such grounds as the following :—that Csesarea was nearer Asia than Rome was, and that thus the spiritual condition of the Asiatic churches would be more easily known to the apostle at the former than the latter city; that for the same reason Onesimus, who we know from the epistle to Phile- mon was met by the apostle in the place of his imprison- ment, would be more likely to flee' from his master to Ceesarea than to Rome; that the words of the epistle to Philemon "departed for a season" (v. 15) imply a shorter absence than is involved in the thought of Rome, and there- fore point to Cxsarea, because it is not likely that St Paul would have so mauy of his friends beside him at Rome as he had when he wrote the three letters of which the epistle to the Ephesians is one—Tychicus, Aristarchus, Mark, Jesus Justus, Epaphras, Luke (see the epistles); because if the apostle wrote from Rome, Tychicus and Onesimus would pass through Ephesus or Laodicea on their way to Colosse, and we ought therefore to find Onesi- mus commended to the church there, whereas, if the apostle wrote from Czsarea, his two friends would be at Colossze first, and Tychicus, leaving Onesimus behind, would pro- ceed thence alone; because the words "that ye also may know" (vi. 21) lead to the inference that others had been told of the apostle's state, who can only be the Colossians, visited on the way between Czesarea and Ephesus; because it would seem that the apostle intended at the close of his imprisonment to visit Phrygia (Philemon i. 22), whereas we learn from Phil. ii. 24 that at the close of the Roman~~

~~imprisonment he intended to visit Macedonia. In so far as these considerations relate to the thought of a place where information as to the state of distaut churches could most easily be had, where friends~~

~~would be most likely to congregate, or in which fugitives would most readily seek refuge, it is obvious that they are better fulfilled by Rome than by Ceesarea. The idea again of visiting Macedonia might be fulfilled by its being taken on the way to Asia. No stress can be laid on the omission of the name of Onesi- mus, and the meaning of vi. 21 does not seem to be that ye "also," in addition to the Colossians, of whom nothing had been said, "may know," but that ye, of whose state I have spoken freely as one thoroughly acquainted with it, may "also" know my state. The decisive argument, how- ever, for Rome rather than Cvsarea, as the place whence the epistle was written, arises from the fact that all the epistles known as those of the imprisonment must have been written from the same place, and that this epistolary activity is more naturally connected with Rome than with Ceesarea. In the former city the apostle had much greater freedom than in the latter, both to receive intelligence and to write to friends (Acts xxviii. 30, 31). Upon the whole, the commonly entertained belief that our epistle was written at Rome may be received without hesitation. If so, it was written towards the close of the apostle's captivity in that city, 63 A.D.~~

~~Literature.—In dealing with an epistle such as this it is un- necessary to devote much space to the literature of the subject. Any one desirous to study the epistle will gradually become acquainted with it as he pursues his task. But references may be made to the various Introductions to the New Testament by such writers as De Wette, Bleek, Davidson, Hilgenfeld, Gloag, and to the leading commentaries, those of Riickert, Harless, De Wette, Stier, Meyer, Eadie, Ellicott, Schenkel in Lange's B. Werk, Ewald in an appendix to his Sieben Sendschreiben d. N. T., Bleek. The student will not fail to consuit Baur in his Paulus, and the Nachapost. Zeitalter of Schwegler. Nowhere will a larger amount of valuable matter bearing on the epistle be found than in Canon Lightfoot's Commentary on the Colossians, with its introduction and. appendices. (W. MI.)~~

~~EPHESUS, a very ancient city on the west coast of Asia Minor. It was situate on some hills which rose out of a fertile plain near the mouth of the river Cayster, while the temple and precincts of Artemis or Diana, to the fame of which the town owed much of its celebrity, were in the~~

~~plain itself, at the distance of about a mile. The situation of the city was such as at all times to command a great commerce. Of the three great river basins of western Asia Minor, those of the Hermus, Cayster, and Meeander, it commanded the second, and had ready access by easy passes to the other two, besides being the natural port and landing-place for Sardes, the capital of the Lydian kings.~~

~~The earliest inhabitants assigned to Ephesus are the mythical Amazons, who are said to have founded the city, and to have been the first priestesses of the Asiatic Artemis. With the Amazons we hear of Leleges and Pelasgi as in possession. In the 11th century 3.c., accord-ing to tradition, Androclus, son of the Athenian king Codrus, landed on the spot with his Ionians, and from this conquest dates the history of the Greek Ephesus, But here the Ionians by no means succeeded in absorbing the races in possession or superseding the established worship. Their city was firmly established on Coressus and Prion, between which hills lies the city harbour; but the old inhabitants still clustered in the plain around the sanctuary of Artemis. When, however, we call the deity of Ephesus Artemis, we must guard against misconception. Really she was a primitive Asiatic goddess of nature of the same class as Mylitta and Cybele, the mother of vegetation and the nurse of wild beasts, an embodiment of the fertility and productive power of the earth. She was represente 1~~

~~in art as a stiff erect mummy, her bosom covered with many breasts, in which latter circumstance Guhl sees allusion to the abundance of springs which arise in the Ephesian plain. The organization of her worship, too, of which more below, was totally unlike anything Hellenic. It was only by reason of their preconceived ideas that the Tonians found in this outlandish and primitive being a form of Artemis their conductor. The entire history of Ephesus consists of a long series of. struggles between Greek and Asiatic manners and religions, between the ideas of the agora and the harbour and those of the precincts of the goddess. This struggle can be traced throughout in the devices of the Ephesian coin, the type of the goddess which appears in it~~

~~**becoming at times Asiatic, at times Hellenic, according to the predominant influence of the period.**~~

~~**For centuries after the foundation of Androclus, the Asiatic influences waxed and the Greek waned. Twice in the period 700-500 B.c. the city owed its preservation to the interference of the goddess,—once when the swarms of the Cimmerians overran Asia Minor, and once when Croesus besieged the town, and only retired after it had solemnly dedicated itself to Artemis, the sign of such dedication being the stretching of a rope from city to sanctuary. Croesus was eager in every way to propitiate the goddess, and as at this time her first great temple was building on the plans of the architect Chersiphron, he presented most of the columns required for the building as well as some cows of gold. It is probable that policy mingled with his piety, his object being to make Ephesus Asiatic in character, a harmonious part of the empire he was forming in hither Asia, and then to use the city as a port and by such means counterbalance the growing power of Miletus and other cities of the coast. The mother-city of Ephesus, Athens, seems to have 'counter- worked his projects by despatching one of her noblest citizens, Aristarchus, to restore law on the basis of the Solonian constitution. The labours of Aristarchus seem to have borne fruit. It was an Ephesian follower of his, Hermodorus, who aided the Decemviri at Rome in their compilation of a system of law. And in the same genera- tion Heraclitus, probably a descendant of Codrus, quitted his hereditary magistracy in order to devote himself to philosophy, in which his name became almost as great as that of any Greek. Poetry had long flourished at Ephesus. From very early times the Homeric poems had found a home and many admirers there; and to Ephesus belong the earliest elegiac poems of Greece, the war songs of Callinus, who flourished in the 7th century B.c., and was the model of Tyrteus. And yet that on the whole Croesus was successful in his schemes seems certain. When the Ionian revolt against Persia broke out in the year 500 B.c., under the lead of Miletus, Ephesus remained submissive to Persian rule ; and when Xerxes returned from the march against Greece, he honoured the temple of Artemis, and even left his children behind at Ephesus for safety's sake. After the great Persian defeat, Ephesus for a time paid tribute to Athens, with the other cities of the**~~

~~coast, and Lysander first and afterwards Agesilaus made it their head-quarters.~~

~~In the year 356 B.c., on the same night on which Alexander the Great was born, an incendiary named Herostratus, wishing only to make his name famous, if even by a monstrous crime, set fire to that temple of Artemis which Chersiphron had planned, and which had been later enlarged or even rebuilt by Psonius in the 5th century. With the greatest eagerness the Ephesians set about its re- construction on a still more splendid scale. The ladies of the city sold their jewellery, and neighbouring cities sent contributions, many of the massive columns being the gift~~

~~of kings. Though Alexander the Great, after his victories, offered to pay the whole cost of reconstruction, on condition that he might inscribe his name as dedicator on the pedi- ment, his offer was refused. The temple was rapidly com- pleted, and was considered in after times the most perfect model of Ionic architecture, and one of the seven wonders of the world. The recent excavations of Mr Wood have enabled us to form a fairly exact notion of its details, as will be seen below. The architect employed was Dinocrates, and Scopas was one of the sculptors employed in the decoration.~~

~~Alexander established a democratic government at Ephesus. Soon after his death the city fell into the hands of Lysimachus, who determined to impress upon the city a more Hellenic character, and to destroy the ancient bar- barizing influences. To this end he compelled, it is said by means of an artificial inundation, the people who dwelt in the plain by the temple to migrate to the Greek quarter on the hill now identified as Coressus, which he surrounded~~

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~~by a solid wall. He recruited the numbers of the inhabi- tants by transferring thither the people of Lebedus and Colophon, and finally, in order to make the breach with the past complete, renamed the city after his wife Arsinoé. But the former influences soon reasserted themselves, and with the old name returned Asiatic superstition and Asiatic luxury. The people were again notorious for wealth, for their effeminate manner of life, and for their devotion to sorcery and witchcraft. After the defeat of Antiochus the Great, king of Syria, by the Romans, Ephesus was handed over by the conquerors to Eumenes, king of Pergamus, whose successor, Attalus Philadelphus, worked the city irremediable harm. Thinking that the shallowness of the harbour was due to the width of its mouth, he built a mole part-way across the latter; the result, however, was con- trary to his wishes, the silting up of the harbour with sand proceeding now at a greater pace than before. The third Attalus of Pergamus bequeathed Ephesus with the rest of his possessions to the Roman people, when it became the~~

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~~Plan of Ephesus (copied by~~

~~capital of the province of Asia, and the residence of the proconsul. Henceforth Ephesus remained subject to the Romans until the barbarian invasions, save for a short period, when, at the instigation of Mithradates, the cities of Asia Minor revolted and massacred their Roman residents, The Ephesians even dragged out and slew those Romans who had fled to the precincts of Artemis for pro- tection, notwithstanding which they soon returned from their new to their former masters, and even had the effront- ery to state, in an inscription preserved to this day, that their defection to Mithradates was a mere yielding to superior force. Sulla, after his victory over Mithradates, brushed away their pretexts, and after inflicting on thema very heavy fine, told them that the punishment fell far short of their deserts. In the civil wars of the lst century B.C. the Ephesians were so unfortunate as twice to support the unsuccessful party, giving shelter to, or being made use~~

~~permission from Wood’s Discoveries at Ephesus, Longmans, 1876).~~

~~of by, first Brutus and Cassius and afterwards Antony, for which partisanship or weakness they paid very heavily in fines.~~

~~All this time the city was gradually growing in wealth and in devotion to the service of Artemis, a devotion which had become quite fanatical at the time of St Paul's visit. The story of his doings there need not be repeated; the supplement of them is, however, very suggestive,—the burning, namely, of books of sorcery to a great value. Addiction to the practise of occult arts was always general in the city. The Christian church which St Paul planted was nurtured by St Jobn, and is great in Christian tradition as the nurse of saints and martyrs. It was, however, long before the spread of Christianity threatened the cultus of Artemis. The city was proud to be termed neocorus, or servant of the goddess. Roman emperors vied with wealthy natives in lavish gifts to her, one Vibius Salutaris among~~

~~the latter presenting a quantity of gold and silver images to be carried annually in procession. . Ephesus contested stoutly with Smyrna and Pergamus the honour of being called the first city of Asia; each city appealed to Rome, and we still possess rescripts in which the emperors endeavour to mitigate the bitterness of the rivalry. The Goths destroyed both city and temple in the year 262 a.D.; and although the city revived, it never recovered its former splendour. A general council of the church was held there in 341; but by the 15th century it had sunk into awretched village, the name of which, Ayasaluk, is now known to be a corruption of the title of St John, Hagios Theologos. The ruins of the temple, after serving asa quarry to the peautifiers of Constantinople, the Turkish conquerors, and the medieval Italians, were finally covered deep with mud by the river Cayster, and its true site was unsuspected until the laborious excavations of Mr Wood were rewarded with success in the year 1869,~~

~~The organization of the temple hierarchy, and its customs and privileges, retained throughout an Oriental and some- what ascetic tinge. The priestesses of the goddess, termed Melissee or bees, were virgins, and her priests were com- pelled to celibacy. The chief among~~

~~the latter, who bore the Persian name of Megabyzus and the Greek title Neocorus, was doubtless a power in the state as well as a dignitary of religion. Besides these, there was a vast throng of dependants who lived by the temple and its services,— theologi, who may have expounded sacred legends, hymnodz, who composed hymns in honour of the deity, and others, together with a great crowd of hierodule who performed more menial offices. The making of shrines and images of the goddess occupied many hands. To support this greedy mob offerings were flowing in in a constant stream from votaries and from visitors, who contributed sometimes money and sometimes statues and works of art. These latter so accumulated that the temple became a rich museum, among the chief treasures of which were the figures of Amazons sculptured in competition by Phidias, Polycletus, Cresilas, and Phradmon, and the painting by Apelles of Alexander holding a thunderbolt. The temple was also richly endowed in lands, and possessed the fishery of the Selinusian lakes, with other large revenues. But perhaps the most important of all the privileges possessed by the goddess and her priests was that of asylum. Fugitives from justice or vengeance who reached her precincts were perfectly safe from all pursuit and arrest. The boundaries of the space possessing such virtue were from time to time enlarged. Mithradates extended them to a bow-shot from the temple in all directions, and Mark Antony imprudently allowed them to take in part of the city, which part thus became free of all law, and a haunt of thieves and villains. Augustus, while leaving the right of asylum untouched, diminished the space to which the privilege belonged, and built round it a wall, which still surrounds the ruins of the temple at the distance of about a quarter of a mile, bearing an inscription in Greek and Latin, which states that it was erected in the proconsulship of Asinius Gallus, out of the revenues of the temple. Besides being a place of worship, a museum, and a sanctuary, the Ephesian temple was a great bank. Nowhere in Asia could money be more safely bestowed than here ; therefore both kings and private persons placed their treasures under the guardianship of the goddess.~~

~~The government of the city is a matter of some obscurity. We know that for some time after its founda- tion it was ruled by kings of the race of Codrus, and after- wards by archons who belonged to the same stock.~~

~~In the time of Lysander it was under an oligarchy; Alexander re-established the democracy. We have the titles of~~

~~a~~

~~EPHESUS~~

~~knowing their functions. The tumult raised by Demetrius against Paul was quelled by the town-clerk or recorder (ypaypareds). Inscriptions mention archons, strategi, gymnasiarchs, peedonomi, and Asiarchs, besides the religious functionaries ; but no doubt the chief power rested with the senate and the demos.~~

~~The topography of Ephesus was but very imperfectly known until the excavations conducted by Mr J. 'IT. Wood on behalf of the trustees of the British Museum during the years 1863-74. He first explored the Odeum and the Great Theatre situate in the city itself, and in the latter place had the good fortune to find an inscription which indicated to him in what direction to search for the temple, for it stated that processions came to the city from the temple by the Magnesian gate, and returned by the Coressian. These two gates were next identified, and following up that road which issued from the Magnesian gate, Mr Wood lighted first on the tomb of Androclus, and afterwards ou~~

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~~Scheme of Temple of Artemis or Diana at Ephesus.~~

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~~an angle of the peribolus wall of the time of Augustus. He next found and excavated the site of the temple of~~

~~Artemis. He found remains of more than one temple;~~

~~three separate floors being clearly distinguishable one above the other. Of these the lowest consisted of a layer of charcoal between two of putty. It is probable that this was the floor of the temple of Crœsus's time, which Chersiphron was said to have made with charcoal and fleeces. Above this lowest floor were two others of marble, which would seem to have belonged, one to the temple burned by Herostratus, the other to that erected on its ruins immediately afterwards. Of this latter building the remains were sufficient to enable Mr Wood to restore it with considerable accuracy. The dimensions of it, taken at the lowest step of the flight which led up to the peristyle on all sides, were 418 feet 1 inch by 239 feet 44 inches. The number of the external columns was 100, their height about 56 feet. It is observable that the dimensions given by Pliny seem to be in every case incorrect. The most re markable fact about the columns is that many of them were~~

~~several magistrates in imperial times, but without exactly | sculptured with figures in high relief to a man's height~~

~~above the ground ; one was, we are told, chiselled by the sculptor Scopas, and certainly the existing fragments of seulptured columns now recovered and preserved in the~~

~~qualification of age or property, and without scrutiny. The restriction of their number to five had reference to the polis or city of Sparta, and the four hamlets which with~~

~~British Museum are not the work of common hands. The | it formed the stronghold of the Spartan oligarchy.~~

~~fragments of sculptured fricze found in the excavations would seem to prove that the frieze was adorned with re- presentations of Hercules, Theseus, and the Amazons. The cymatium was decorated with the conventional honey-suckle ornament, intercepted by fine lions' heads. The roof was covered with flat marble tiles. The whole edifice was ovtastyle, having eight columns at the ends, and dipteral, with two rows of columns all round. Fragments were also found which appear to belong to the 6th century B.c., and as some of these are parts of sculptured columus, it would seem that the temple of Chersiphron had set to the later building the example of cutting reliefs on the main pillars.~~

~~The best works on Ephesus are those of Guhl, Falkener, Ernst Curtius, and J. T. Wood. The first of these writers has collected most of the ancient authorities; the last has been successful in topo- graphical researches. The accompanying plans are from his book, and are inserted by his kind permission, and that of Messrs Long- mans and Co., publishers. The first gives the general plan of the city, and the road to the temple. The second gives the scheme of the temple, the fragments of walls and columns found by Mr Wood in position being represented black. (eo Ga)~~

~~EPHORI. This name, which exactly corresponds with the Greek episkopos, meaning bishop or overseer, was given to certain magistrates in many Dorian cities of ancient Greeee. But the most prominent are the ephors of Sparta, who, whatever may have been their origin, appear during the times for which we have historical knowledge as the supreme power in the state, controlling alike its civil and military administration. When in the 3d century B.c. the complete humiliation of Sparta led the kings Agis III. and Cleomenes III. to resolve on restoring what they supposed to be the ancient constitution,~~

~~their first blow was directed at the ephors, whom they charged with deliberate usurpa- tion. According to their version (Plut., Cleom. 10) the ephors owed their existence to the Messenian wars, which rendered necessary the prolonged absence of the kings, who accordingly delegated to them their judicial functions ; and the subordinate powers thus given were gradually extended until they became virtually absolute. Another tradition ascribed the institution of the ephors to Lycurgus him- self. But if of Lycurgus we cannot be said to know anything, the lays of Tyrtzeus, which alone give us any trustworthy information about the Messenian wars, say nothing as to the origin of the ephoralty. We can, therefore, do no more than trace the development of their powers during the ages for which we have genuine his- torical narratives.~~

~~Holding the country strictly as an army of occupation, the whole body of Spartans was formed internally into a close oligarchy, all the members of which had the same privileges and were subjected to the same discipline, with the exception of the kings and the ephors. But the two Heraclid kings, as representing the two rival sons of Aristodemus, generally held each the other in check, and thus added to the influence of the ephors. That the latter were originally subordinate is made plain by the statement of Xenophon (De Rep. Lac., 15), that there was still in his time a monthly interchange of oaths, by which the kings pledged themselves to govern according to the laws, while the ephors on this condition undertook to maintain their authority. The ceremony had in Xenophon's days lost its meaning ; but it pointed clearly to a time when the kings had been predominant. It further shows that from the first the ephors represented the whole body of the citizens ; and the mode of electing them, which Aristotle ridicules as childish, attests their popular character. The general assembly might choose any one for the office, without any~~

~~In their relations with the kings we find the ephors gradually acquiring greater weight, and exercising their power more decisively. Herodotus (vi. 56) speaks of the kings as still possessing the power of declaring war at their own will. But in the wars of which we have histori- cal knowledge, not only is the decision given by the ephors, who may or~~

may not have taken counsel with the senate and the assembly, but two of their number accompany the kings, who thus become simply leaders of the army, acting under the control of civil magistrates, until, after the unsuc- cessful expedition of King Agis against Argos in 417 B.c., a law was passed appointing ten commissioners to attend the kings in all their campaigns. The ephors were still further distinguished from all other citizens by the privilege of exemption from the public discipline. They also kept their seats on tlie approach of the kings, while custom re- quired the latter to rise if the ephors passed by. In the relations of Sparta with foreign states generally we find the public business carried on not by the kings but by the ephors, who treat with ambassadors, determine the number of troops to be levied, decide on their destination, and con- clude treatics.

Of the five ephors, the first in rank, probably as being the first elected, gave his name to the year, like the Archon Eponymus at Athens. The whole college met in the Archeion, which answered to the Athenian Prytaneion. They exercised jurisdiction in all important civil suits, criminal cases and capital offences being carried before the senate. With this jurisdiction they combined a large censorial power, which extended even to minute details in the life of the citizens. Their right of scrutiny into the conduct of magistrates they could exercise even during their term of office. Not only could they depose such as they found unworthy, but they might summon the kings before their tribunal, or bring a capital charge against them before the Spartan assembly. With the gradual slackening of the system of public discipline, and with the increasing licence which their position enabled them to assume, their power became an intolerable burden, at least to the kings ; and Cleomenes cut the knot by massacring the whole college, and abolishing the office.

EPHORUS, a Greek historian of Cume, in olis, flourished about 408 B.c. His father's name was Demo- philus or Antiochus ; and he studied along with Eudoxus and Theopompus under the philosopher Isocrates.

The chief work of Ephorus was a history of the wars be- tween the Greeks and Persians, in which, like Herodotus, he introduced the

~~description of foreign and barbarous nations in the form of episodes. Only a few diseonuected frag- ments of it have come downto us. According to the scheme of Marx, the first book contained an account of the return of the Heraclidz into the Peloponnesus, and the change of affairs consequent upon that event ; the second was occupied with.the state of the rest of Greece; and the third narrated the departure of the Greek colonies to Asia. In these three books he thus brought the history of Greece and Asia down to that period when they began to assume a peaceful aspect, probably a few years before the commence- ment of the Median war. After this introduction be pro- ceeded to describe separately each country which sub- sequently became the scene of important transactions,—in the fourth book Europe, in the fifth Asia and Africa; and in the sixth he probably gave an account of the nation of the Pelasgi. The seventh book contained the most ancient traditionary notices of Sicily, and probably all he could collect respecting the original inhabitants of Italy and the~~

~~adjacent islands. The eighth book narrated the various changes of fortune to which those nations had been subject who in succession held the supreme command in Asia, namely, the Assyrians, Lydians, and Persians. The frag- ments which remain refer principally to the history of Croesus. In the ninth book he described the origin, changes, and migrations of the Amazons, Scythians, and other nations who inhabited the coasts of the Pontus and those northern countries, whence, through Thrace and Thessaly, lie returned to Greece and its 'affairs. Then it was that Ephorus reached the period when, like every Greek historian, he imagined that the transactions of the whole world became centred in the causes and events of the Persian war; and then also he began to treat his subject with more copiousness, for we find that, while in his tenth book he had already brought down his history to the times of Miltiades, about 490 3.c., in his eighteenth book he had reached Dercyllidas, 399, and in his twenty- fifth he had arrived at the battle of Mantinea, 362. The part of the thirtieth book which gave an account of the sacred war was composed, not by Ephorus himself, but by his son Demophilus. At the conclusion of the war Ephorus took up the thread~~

~~of the history, and continued it to the siege of Perinthus, 340 B.c. According to Diodorus Siculus, the whole period treated of was 750 years.~~

~~For a more full description of the life of Ephorus, and a collection of the fragments of his history which have been preserved, the~~

~~reader may consult Ephori.Fragmenta, by Meier Marx, 1815;~~

~~Creuzer, Symbolik und Mythologie der alten Volker, besonders der Griechen, 1819; Vossius, De Historicis Grecis, 1651; and Ulrici, Charakteristik der antiken Historiographie, 1833.~~

~~EPHRAEM SYRUS, or Ephraim the Syrian, flourished in the 4th century of the Christian era, acquired great renown among his contemporaries, and has since been esteemed one of the most celebrated fathers of the church. So highly was he honoured that, according to the testimony of Jerome (Script. Eccl., c. 115), his homilies were read in many of the churches of Greece immediately after the reading of scripture. His name is almost never mentioned without the prefix Mor or Mari (master). Of the events of his life but little is known, and what has been handed down to us is much lessened in value by an admixture of apocryphal stories. The following is a translation of a short memoir of Ephraem from a Syriac source. The original is found in a 14th century MS., which is printed by Assemani in the Roman edition of Ephraem's works.~~

~~"The blessed Mor Ephraem was a Syrian by birth; his father was of Nisibis, his mother of the city Amida. His father was an idolatrous priest, and they lived in the time of Constantine Victor [i.e. the Great]. His father expelled him from home because he was not obedient to his wicked will; he therefore went and lived with the holy Mor Jacob, the bishop of Nisibis, and led an entire life of godliness until the time of Jovian [when Nisibis was, in 363, surrendered to the Persians]. He then left that place and came to the city Edessa, where he received the gift of the Holy Ghost, and abundantly supplied the church with the gifts and doctrine of the Spirit. After a time he went to the desert of Egypt, and from thence to Cesarea of Cappadocia to Basil, and received from him~~

~~the imposition of hands for the diaconate. He im- mediately returned to Edessa, and ended his life there in the year 684 (of the Greeks), on the ninth day of Haziron (June), that is, in the year 373 of the advent of our Lord."~~

~~A much longer life, also extant in Syriac, gives no more historical data which can be relied on; and the so-called testament or will, which professes to contain curious auto- biographical matter referring to his religious history and feelings, is of doubtful authenticity. A careful recension of the piece is given by Overbeck in his Opera Selecta, The statement of the manuscript just quoted, that Ephraem was born at Nisibis, has the authority of Sozomenus in its favour ; and Ephraem himself, in his commentary on Genesis, refers to Mesopotamia as his native country. The Syrian sources are unanimous about the date of his death, and,~~

~~according to Dr Bickell, the dubiety of Rédiger has arisen from a misinterpretation. At Edessa Ephraem adopted a monastic life, and is said to have dwelt in a cave near the town. Thestory of his visit to Egypt is probably mythical. Though the external facts of Ephraem's life are thus few and doubtful, there is no question of the manner in which he impressed. his genius and spirit upon his own age, or of the great value of his literary remains. His popularity and influence among the luxurious and refined people of Edessa were very great. He wrote against Julian, and combated the heresies of Bardesanes the Gnostic philosopher, of the Arians and Sabellians, of the Manichzeans and Novatians. Whether he was acquainted with Greek or not is a matter of dispute which can hardly be decided by his writings; but Geiger has rendered it probable that he had come con- siderably under Jewish influence, not a few words being employed by him in an acceptation foreign to Syriac, but well-known in the Hebrew of his time and country. His works consist of commentaries, sermons, tractates, and hymns. Of many the original Syriac appears to have perished; and they are only preserved in Greek, Latin, Armenian, or Slavonic. The greater proportion of the ser- mons and tractates are composed in a metrical~~

~~form, the verses being of various measures—tetrasyllabic, heptasyllabic, or octosyllabic,—and arranged in strophes varying from four to twelve lines. Rhyme and assonance are both employed at irregular intervals, and, as Geiger has pointed out in the Ztschr. d. D. Morg. Ges., 1867, a considerable number of the pieces are alphabetical or nominal acrostics, though the fact is sometimes disguised in the MSS. by the misarrangement of the lines. That he has applied his verse to such prosaic purposes as the refutation of heresy and the inculcation of orthodoxy would seem of itself to make heavily against Ephraem's reputation as a poet ; but it is impossible to read some even of his most unpromising pieces without admitting that he has a genuine poetic gift. Some of his hymns on the death of children may rank for pathos: and happy simplicity with the finest lyrics of their class ; and there can be no doubt of the imaginative force of such lines as the following :—' For before that time Death by this was made arrogant, and boasted himself of it, ' Behold priests and kings lie bound by me in the midst of my prisons.' A mighty war came without warning against the tyrant Death ; and as a robber, the shouts of the foe sur- prised him and humbled his glory. The dead perceived a sweet savour of life in the midst of Hades ; and they began to spread the glad tidings among one another that their hope was accomplished." Several of the Nisibean poems are impassioned odes on events in contemporary history, and are thus of value to the historical student. The Repentance of Nineveh partakes of the character of the epic.~~

~~The principal edition of Ephraem's works was prepared and pub- lished at Rome under the patronage of the popes Clement XI., Clement XII., and Benedict XIV. _ It consists of three volumes of Greek texts and three volumes of Syriac texts, with a Latin trans- lation. The first vol., published in 1732, was edited by Joseph Simon Assemani, the 4th and 5th (1737 and 1740) by Petrus Benedictus, the 6th (1743) by Benedictus (who died before it was completed) and Stephanus Evodius Assemani, and the 2d and 3d (1743 and 1746) by Joseph Simon Assemani. An earlier edition of 171 piecesin 3 folio volumes, edited by Gerhard Vossius, had appeared at Rome in 1589, 1593, and 1598; and Edward Thwaites had pub- lished a folic of Greek texts from Oxford MSS. in 1709. The following are the principal modern contributions to~~

~~our knowledge of Ephraem and his works :—Spohn, Collatio versions syriace, quam Peschito vocant, cum fragmentis in comm. Ephraemi obvits, 1785, 1794; Hahn, Bardesanes Gnosticus, 1819 ; Hahn, "* Ueber den Gesang in der Syr. Kirche," in Staiidlin and Vater's Kirchen-historisches Archiv, 1823; Hahn and Sieffert, Chrestomathia Syriaca sive S. Ephraemi carmina selecta, 1825; Tschirner, "De claris veteris ecclesix oratoribus," in his Opuscwla academica, 1829; Pius Zingerle, Ausgewihlte Schriften des heil. Kirchenvaters Ephraem, Innsbruck, 1830-1838; Lengerke, De Ephraemi Syri arte hermeneutica, Kon-igsberg, 1831; J. B. Morris, Select W orks of St Ephraem the Syrian,~~

~~translated out of the original Syriac, 1847; Angelo Paggi and Fausto Lasinio, Innt funebri di S. Efrem Siro, Florence, 1851; Burgess, Select Metrical Hymns and Homilies of Ephraem Syrus, 1858, and The Repentance of Nineveh, 1853; Alsleben, Das Leben des H. Ephrém, Berlin, 1853; Rodiger, " Ephram Syrus," in Herzog's Real- Encyclop. fiir Protest. Theol., 1855; R. P. Smith, Catalogue of the Syrian Manuscripts in the Bodleian, 1864; Overbeck, Ephraemi Syri aliorumque opera selecta (Syrian text), Oxford, 1865; Bickell, S. Ephraemi Syri Carmina Nisibena (Latin transl.), Leipsic, 1866; Wright, Catalogue of the Syriac Manuscripts in the British Museum, part ii. p. 406-416; Benin, Tradition of the Syriac Church, 1871.~~

~~EPHRAIM, the younger son of Joseph, who received the precedence over the elder (Manasseh) by the blessing of Jacob, on the occasion when he adopted both into the number of his sons in place of Joseph their father. Both, accordingly, were the founders of tribes which bore their names, the intention of Jacob being that Joseph should by this means have double the honour accorded to his brethren. Attheexodus from Egypt, the tribe of Ephraim, of which he was the founder, numbered 40,500, while that of Manasseh numbered only 32,200 (Numb. i. 32-35), but in their wanderings the number of the former was diminished by 8000. 'Their possessions in the very centre of Palestine included most of what was afterwards called Samaria. The proud and ambitious character of the tribe is indicated in their demands as~~

~~narrated in Josh. xvii. 14, Judges viii. 1-3, xii. 1, and they were long jealous of the regal honours of Judah ; but after the dismemberment of the tribes, their rivalry was merged in that subsisting between the two kingdoms.~~

~~EPICHARMUS (540-450 B.c.), a celebrated poet of the old comedy, was born in the island of Cos, where his father Elothales was a physician, of the race of the Ascle- piads. According to Diogenes Laertius, he was brought to Megara, in Sicily, when only three months old; but it is more probable that he migrated thither, as Suidas asserts, of his own accord at a later period. After the destruction of Megara he removed to Syracuse, where at the court of Hiero he spent the remainder of his days, dying, it is said, at ninety years of age. From his protracted residence in the island he is geuerally known in antiquity as a Sicilian (Hor. £p. ii. 1. 58). Epicharmus studied philosophy, it is said, under Pythagoras, for it is now generally admitted that Epicharmus the Pythagorean, and Epicharmus the father of the old coniedy are identical. It was only after his residence in Megara, a colony from the Isthmian Megara, which disputed with Athens the invention of comedy, that he turned his attention to that branch of dramatic literature. His principal merit in this department seems to have consisted in the exclusion of that vulgar buffoonery which disgraced all previous comedies, and in the introduc- tion of a regular plot in which the comus, or band of revellers, sustained the dialogue, with which maxims drawn from the Pythagorean ethics were liberally inter- spersed.~~

~~'* The subjects of the plays of Epicharmus," says Miiller (Dorians, iv. 7, 2) 'were mostly mythological, ¢.¢., parodies or travesties of mythology, nearly in the style of the satyrical drama of Athens. Thus in the comedy of Busiris Hercules was represented in the most ludicrous light as a voracious glutton; and he was again exhibited in the same character (with a mixture perhaps of satifical remarks on the luxury of the times) in The Marriage of Hebe, in which an astonishing number of dishes was mentioned. He also, like Aristophanes, handled political subjects, and invented comic characters like the later Athenian poets. 'he piece called The Plunderings, which described the devastation of Sicily in his time, had a political meaning; and this was perhaps also~~

~~the case with The Islands ; at least it was mentioned in this play that Hieron had prevented Anaxilas from destroying Locri."~~

~~Of his comedies, which are generally written in trochaic tetrameters, thirty-five titles and a few fragments are still extant. The excellence of his dramatic style is proved by the high estimation in which he is held by Plato (Thect. p. 152, e).~~

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~~EPICTETUS (the word means "acquired," but no otlier name has been handed down for him) was, according to the received account, born at Hierapolis, a town in the south- west quarter of Phrygia. His life extends between a date slightly anterior and a date slightly posterior to the second half of the lst century a.p. While young, he was one of the slaves of Epaphroditus, a freedman and courtier of the emperor Nero; and while in that position, he managed to attend the lectures of Musonius Rufus, an important and esteemed teacher of the Stoical system during the reigns of Nero and Vespasian. Epictetus was lame— whether from birth or in consequence of an accident or of his owner's cruelty is unknown ; he was also of weakly health. That he was a free man in the later part of his life is evident, but the means by which his liberty was obtained are unrecorded. In the days of Domitian he was one of the recognised votaries and perhaps professors of philo- sophy ; and in the year 90, when that emperor, irritated by the support and encouragement which the opposition to his tyranny found amongst the adherents of Stoicism, issued an edict to all philosophers to quit Rome, Epictetus was amongst those who withdrew into the provinces. For the rest of his life he settled at Nicopolis, a town of southern Epirus, not far from the scene of the battle of Actium. There for several years he lived, and taught by close earnest personal address and conversation. Accord- ing to some authorities he lived into the time of Hadrian ; he himself mentions the coinage of the emperor Trajan. His contemporaries and the next generation held his charac- ter and teaching in high honour. According to Lucian, the earthenware lamp which had belonged to the sage was bought by an enthusiastic relic-hunter for 3000 drachmas. He was never married. He wrote nothing;~~

but much of his teaching was taken down with affectionate care by his pupil Flavius Arrianus, the historian of Alexander the Great, and is preserved in two treatises, of the larger of which, called the Discourses of Epictetus (Emuxryrov Avatpi- Bai), four books are still extant. The other treatise is a shorter and has been a more popular work, the Afanual or "Eyxeipidiov. It contains in an aphoristic form the main doctrines of the longer work. There exists a tolerably extensive commentary on the Manual by Simplicius.

The philosophy of Epictetus is stamped with an intensely practical character, aud exhibits a high idealistic type of morality. He is an earnest, sometimes stern and some- tines pathetic preacher of righteousness, who despises the mere graces of a literary and rhetorical lecturer and the subtleties of an abstruse logic. He has no patience with mere antiquarian study of the Stoical writers. The problem of how life is to be carried out well is the one question which throws all other inquiries into the shade. " When you enter the school of the philosopher, ye enter the room of a surgeon; and as ye are not whole when ye come in, ye cannot leave it with a smile, but with pain." True education lies in learning to wish things to be as they actually are: it lies in learning to distinguish what is our own from what does not belong to us. But there is only one thing which is fully our own,—that is, our will or purpose. God, acting as a good king and a true father, has given us a will which cannot be restrained, compelled, or thwarted; he has 'put it wholly in our own power, so that even he himself has no power to check or control it. Nothing external, neither death nor exile nor pain nor any such thing,.is ever the cause of our acting or not acting ; the sole true cause lies in our opinions and judgments. Nothing can ever force us to act against our will; if we are conquered, it is because we have willed to be conquered. And thus, although we are not responsible for the ideas that present themselves to our consciousness, we are abso- lutely and without any modification responsible for the

way in which we use them. Nothing is ours besides our will. And the divine law which bids us keep fast what is our own forbids us to make

~~any claim to what is not ours; and while enjoining us to make use of whatever is given to us, it bids us not long after what has not been given. "Two maxims," he says, "we must ever bear in mind,—that apart from the will there is nothing either good or bad, and that we must not try to anticipate or direct events, but merely accept them with intelligence." We must, in short, resign ourselves to whatever fate and fortune bring to us, believing, as the first article of our creed, that there is a god, whose thought directs the universe, and that not merely in our acts, but even in our thoughts and plans, we cannot escape his eye. In the world, according to Epictetus, the true position of man is that of member of a great system, which comprehends God and men. Each human being is thus a citizen of two cities, He is in the first instance a citizen of his own nation or common- wealth in a corner of the world; but he is also a member of the great city of gods and men, whereof the city poli- tical is only a copy in miniature. All men are the sons of God, and kindred in nature with the divinity. For man though a member in the system of the world is more than a merely subservient or instrumental part ; he has also within him a principle which can guide and understand the movement of all the members; he can enter into the method of divine administration, and thus can learn—and it is the acme of his learning—the will of God, which is the will of nature. Man, said the Stoic, is a rational animal; and in virtue of that rationality he is neither less nor worse than the gods, for the magnitude of reason is estimated not by length nor by height, but by its judg- ments. Each man has within him a guardian spirit, a god within him, who never sleeps ; so that even in darkness and solitude we are never alone, because God is within, and our guardian spirit. The body which accompanies us is not strictly speaking ours ; it is a poor dead thing, which belongs to the things outside us. But by reason we are the masters of those ideas and appearances which present themselves from without; we can combine them, and sys- tematize, and can set up in ourselves an order of ideas corresponding with the order of nature.~~

~~The natural instinct of animated life, to which man also is originally subject, is self-preservation and self-interest. But men are so ordered and constituted that the individual cannot secure his own interests unless he contribute to the common welfare. We are bound up by the~~

~~law of nature with the whole fabric of the world. The aim of the philo-sopher therefore is to reach the position of a mind which embraces the whole world in its view,—to grow into the mind of God and to make the will of nature our own. Such a sage agrees in his thought with God; he no longer blames either God or man; he fails of nothing which he purposes and falls in with no misfortune unprepared; he indulges neither in anger nor envy nor jealousy; he is leaving manhood for godhead, and in his dead body his thoughts are concerned about his fellowship with God.~~

~~The historical models to which Epictetus reverts are Diogenes and Socrates. But he frequently describes an ideal character of a missionary sage, the perfect Stoic—or, as he calls him, the Cynic. 'The Cynic, " he says, "is a messenger sent from God to men to show them the error of their ways about good and evil, and how they seek good and evil where they cannot be found." 'This missionary has neither country nor home nor land nor slave; his bed is the ground; he is without wife or child ; his only man- sion is the earth and sky and a shabby cloak. It must be that he suffer stripes ; and being beaten, he must love those who beat him as if he were a father or a brother. He must be perfectly unembarrassed in the service of God,~~

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~~not bound by the common ties of life, nor entangled by relationships, which if he transgresses he will lose the character of a man of honour, while if he upholds them he will cease to be the messenger, watchman, and herald of the gods. The perfect man thus described will not be angry with the wrong-doer ; he will ouly pity his erring brother ; for anger in such a case would only betray that he too thought the wrong-doer gained a substantial bless- ing by his wrongful act, instead of being, as he is, utterly ruined,~~

~~The best edition of the works of Epictetus is that by Schweig- hauser in 6 vols. 8vo, 1799-1800. There are at least two English~~

~~translations, —an old one by Elizabeth Carter, and a recent version by George Long. (W. W.)~~

EPICURUS, the founder of the Epicurean school of philosophy, was born in the end of 342 or the beginning of 341 B.c., seven years after the death of Plato, His father Neocles belonged to Gargettos, one of the small villages of Attica, but had settled in Samos, not later than 352, as one of the colonists sent out by the Athenian state after the conquest of the island by Timotheus in 366. In Samos, and also at Teos, Epicurus passed the early years of his life, probably assisting his father, who was a common schoolmaster, possibly, too, assisting his mother Archestrata in the practice of her witchcraft—if we may believe doubtful tales. At the age of 18 he went to Athens, where the Platonic school was flourishing under the lead of Xenocrates, and which Aristotle had recently quitted for Chalcis to avoid an indictment for impiety. 'This visit to Athens, however, was a short one, for in the next year (322) Antipater the Macedonian punished the Athenians for their incipient revolt by banishing about 12,000 of the poorer citizens to distant shores. It was in connection with this event that Epicurus joined his father, who was now located at Colophon. It seems possible that before this time he had listened to some lectures from Nausiphanes, a Democritean philosopher—perhaps also from others—but there is little reason to suppose that he was much better than a petty teacher like his father. The first awakening of the philo- sophic spirit was seen, it is said, when he asked his teacher, as they read together in Hesiod how chaos was the first of all things, "" What then preceded chaos?" Stimulated further by the perusal of some writings of Democritus, Epicurus began to formulate a doctrine of his own; and at Mitylene and Lampsacus, where he spent several years, he gradually gathered round him several disciples who adopted his views with enthusiasm. In 307, the year in which Demetrius Poliorcetes entered Athens and restored to it an at Jeast nominal freedom, Epicurus returned to that city, which had now for a century and a half been the recognized head-quarters of Greek philosophy. Half his life was past; for the remaining thirty-six years he continued at Athens, with the exception of one or two visits to his friends in Ionia. The scene of his philosophic life and teaching was a garden which he bought at the cost of about £300 (80 minx). There he passed his days as the loved and venerated head of a remarkable society, such as the ancient world had never seen. Amongst the number were Metrodorus, a bosom-friend of more energetic

~~temper- ament than Epicurus ; during their acquaintance, which lasted till the death of Metrodorus seven years before his friend, they only parted company for the space of six months. Timocrates, a brother of Metrodorus, was another member ; so were Polyzenus, a fair-minded and studious man, Hermar- chus, a son of poor parents, who succeeded Epicurus as chief of the school, Leonteus, and others. Nor were women absent from the philosophic coterie. Themista, the wife of Leonteus, was a friend and correspondent of Epicurus; Idomeneus, another member, had married a~~

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~~sister of Metrodorus ; and Metrodorus himself had as his consort Leontion, once a hetera in Athens, but now the mother of a boy and girl, for whose welfare Epicurus made special provision in his will. That these were not the only ladies in the society is possible enough, and it is possible that the relations between the sexes—in this pro- totype of Rabelais's Abbey of Theléme—were not entirely what is termed Platonic. But there is on the other hand scarcely a doubt that the tales of licentiousness which ill- tempered opponents circulated regarding the society of the garden are groundless. The stories of the Stoics, who sought occasionally to refute the views of Epicurus by an appeal to his alleged antecedents and habits, were no doubt in the main, as Diogenes Laertius says, the stories of maniacs. The general charges against him which they endeavoured to substantiate by forged letters need not count for much. Even when they tried to show that he was not a citizen with full rights, that he was a plagiarist of other men's wisdom, a correspondent of ladies whom the aristocracy of the period held of dubious rank, an ignoramus, and a scandalous and abusive critic of his opponents, they only exaggerated what, if true, was not so heinous as they wished it to appear. Against them trust- worthy authorities testified to his general and remarkable considerateness ; they pointed to the statues which the city had raised in his honour, and above all to the numbers of his friends, who were many enough to fill whole cities.~~

~~The mode of life in his community was plain. The general drink was water, and the food barley bread ; half a pint of wine was held an ample allowance. 'Send me," says Epicurus toa correspondent, "send me some Cythnian cheese, so that, should I choose, I may fare sumptuously." But though they lived together, Epicurus would not let his friends throw all their property into the common stock ; that, he remarked, would imply distrust of their own and others' good resolutions. The company was held in unity by the siren-like charms of his personality, and by the free sociality which he inculcated and exemplified. Though he seems to have had a warm affection for his countrymen, it was as human beings brought into contact with him, and not as members of a political body, that he preferred to regard them. He never entered public life. His kindli- ness extended even to his slaves, one of whom, named Mouse, was a brother in philosophy.~~

~~Epicurus died of stone in 270 3B.c. In a letter toa friend, he speaks of the pleasure afforded to him in his sufferings by the remembrance of happy hours spent in reasoning on the questions of philosophy. He passed away bidding his friends keep in mind the doctrines he had taught them. By his will he left his property, con- sisting of the garden, a house in Melite (the south-west quarter of Athens), and apparently some funds besides, to two trustees for behoof of his society, and for the special interest of some youthful members, The garden was set apart for the use of the school; the house became the house of Hermarchus and his fellow-philosophers during his life-time. The surplus proceeds of the property were further to be applied to maintain a yearly offering in com- memoration of his departed father, mother, and brothers, to pay the expenses incurred in celebrating his own birth- day every year on the 7th Gamelion, and for a social gathering of the sect on the 20th of every month in honour of himself and Metrodorus. Besides similar tributes in honour of his brothers and Polyznus, he directed the trustees to be guardians'of the son of Polyzenus and the son of Metrodorus; whilst the daughter of the last-mentioned was to be married by the guardian to some 'member of the society who should be approved of by Hermarchus. His four slaves, three men and one woman, were left their freedom. His books passed on to Hermarchus.~~

~~Epicurus was a voluminous writer,—the author, it is said, of about 300 works. He had a style and vocabulary of his own. His chief aim in writing was plainness and intelligibility, but his want of order and of logical preci- sion considerably thwarted the realization of his purpose. He pretended to have read little, and to be the original architect of his own system, and the claim was no doubt on the whole true. But he had read Democritus, and it is said Anaxagoras and Archelaus were also amongst his more favourite philosophical authors. His works, it is said, were full of repetition,—which was natural enough ; and critics profess to have found in them some vulgarities of language and faults of style. But at any rate they were read and remembered, his pupils got them by heart, and to the Jast era of Epicureanism they continued in full authority. His chief work was a treatise on nature, in thirty-seven books, of which fragments from about nine books have been found in the rolls discovered at Hercu- lancum, along with considerable treatises by several of his followers, and most notably Philodemus, An epitome of his doctrine is contained in three letters preserved by Diogenes.~~

~~The Epicurean philosophy is traditionally divided into the three branches of logic, physics, and ethics. But it is only as a basis of facts and principles for his theory of life that logical and physical inquiries find a place at all. Epicurus himself had not apparently shared in any large or liberal culture, and his influence was certainly thrown on the side of those who depreciated purely scientific pursuits as one-sided and misleading. 'Steer clear of all culture" was his advice to a young disciple. In this aver- sion to a purely or mainly intellectual training may be traced a recoil from the systematic metaphysics of Plato and Aristotle. With these writers the tendency was to sacrifice the moral to the intellectual—to subordinate the practical man to the philosopher. Ethics had been based upon logic and metaphysics; more had been done to explain the formation of a right judgment in matters of morality than to explain or promote right action. But every-day experience showed that no amount of merely intellectual study is preventive of immorality, and that the systematic knowledge of truth is one thing and right action is another. It seemed to many as well as to~~

~~Epicurus that the philosophy of Plato and Aristotle led to an aristocracy of intellect, but not to a commonwealth of happiness and goodness. In this way a reaction set in against reasoning and speculation ; people wanted to get back to common sense and the feelings of ordinary men. In the second place, Plato and Aristotle had constructed their moral theories on the assumption that a state or a city existed which both showed in the shape of its several institutions how the individual man was expected to behave, and threatened him with various penalties in case he attempted to find out a way of action for himself. They could accordingly give themselves the comparatively easy task of showing how the individual could learn to apprehend and embody in his own conduct the moral law which was exhibited in the institutions of society. But experience had in the time of Epicurus shown the temporary and artificial~~

~~character of the civic form of social life. It was necessary therefore for Epicurus to go back to nature to find a morc enduring and a wider foundation for ethical doctrine, and to decline the help that might be derived from a consider- ation of the existing form of political union. It was no less necessary to go back from words to realities, to give up reasonings and get at feelings, to test conceptions and arguments by a final reference to the only touchstone of truth—to sensation. There, and there only, one seems to find a common and a satisfactory ground, supposing always that all men's feelings give the same answer. Logic must VIII. — 60~~

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~~go, but so also must the state, as a specially-privileged and eternal order of things, as anything more than a contriv- ance serving certain purposes of general utility. ;~~

~~To the Epicureans the elaborate logic of the Stoics was a superfluity. In place of logic we find canonic, the theory of the tests of truth and reality. The only ultimate canon of reality is sensation and feeling ; whatever we fee], whatever we perceive by any sense, that we know on the most certain evidence we can have to be real, and in proportion as our feeling is clear, distinct, and vivid, in that proportion are we sure of~~

~~the reality of its object. The truth of anything is measured by its vivid and effective presence in consciousness. But in what that vividness (évdpyea) consists is a question which Epicurus does not raise, and which he would no doubt have deemed super- fluous quibbling over a matter sufficiently settled by com- mon sense. Besides our sensations, we learn truth and reality by our preconceptions or ideas (xpoAyjwets). These are the fainter images produced by repeated sensations, the "ideas" resulting from previous ' impressions "— sensations at second-hand as it were, which are stored up in memory, and which a general name serves to recall. These bear witness to reality, not because we feel anything now, but because we felt it once; they are sensations registered in language, and again, if need be, trans- latable into immediate sensations or groups of sensation. Lastly, reality is vouched for by the imaginative appre- hensions of the mind (davracrixal éryBodat), immediate feelings of which the mind is conscious as produced by some action of its own. 'This last canon, however, was of dubious validity. Epicureanism generally stopped by affirm- ing that whatever we effectively feel in consciousness is real; in which sense they allow reality to the fancies of the insane, the dreams of a sleeper, and those feelings by which we imagine the existence of beings of perfect blessedness and endless life. And similarly, just because fear, hope, and remembrance add to the intensity of con- sciousness, can the Epicurean hold that bodily pain and pleasure isa less durable and important thing than pain and pleasure of mind, Whatever we feel to affect us does affect us, and is therefore real. Error can only arise be- cause we mix up our opinions and suppositions with what we actually feel. The Epicurean canonic is a rejection of logic; it sticks fast to the one poiut that 'sensation is sensation," and there is no miore to be made of it. Sensa- tion, it says, is unreasoning (dAoyos); it must be accepted, and not criticised. Reasoning can only come in to put sensations together, and to point out how they severally contribute to human welfare; it does not make them, and cannot alter them.~~

~~In the Epicurean physics we have two parts,—a general metaphysic and psychology, and a special explanation of particular phenomena of nature. It is in this department that we find exemplified the method of the founder. That method consists in argument by analogy: we apply~~

~~the process which we have learned in some familiar instance to explain and rationalize for our own satisfaction some obscure and distant process which we do not understand. It is an attempt to make the phenomena of nature intelli- gible to us by regarding them as instances on a grand scale of what we are already familiar with ona small. This is what Epicurus calls explaining what we do not see by what we do see. It supposes us to know and compre- hend what we are familiar with, and assumes that to explain is to substitute a process with which we are at home for one which we cannot penetrate, but which, with- out contradicting any of the phenomena, may be conceived to take place in a similar way. ages? phates Epicurus founded upon Democritus, and his~~

~~ier object was to abolish the dualism between mind and~~

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~~matter which is so essential a point in the systems of Plato and Aristotle. All that exists, says Epicurus, is corporeal (76 wav éort cdua); the intangible is non-existent, or empty space. If a thing exists it must be felt, and to be felt it must exert resistance. But all things are not intangible which our senses are not subtle enough to detect. We must indeed accept our feelings; but we must also believe much which is not directly testified by sensa- tion, if only it does not contravene our sensations and serves to explain phenomena. The fundamental postulates of Epicureanism are atoms and the void. We must believe, according to him, that space is infinite, and that there is an illimitable multitude of indestructible, indivisible, and absolutely compact atoms in perpetual motion in this il- limitable space. These atoms, differing only in size, figure, and weight, are perpetually moving with equal velocities, but at a rate far surpassing our conceptions ; as they move, they are for ever giving rise to new worlds; and these worlds are perpetually tending towards dissolution, and towards a fresh series of creations. 'This universe of ours is only one section out of the innumerable worlds in in- finite space; other worlds may present systems very different from the arrangement of sun, moon, and stars, which we see in this. The soul of man is only a finer species of body,~~

~~spread throughout the whole aggregation which we term his bodily frame. Like a warm breath, it pervades the human structure and works with it; nor could it act as it does in perception unless it were corporeal. The various processes of sense, notably vision, are explained on the principles of materialism. From the surfaces of all objects there are continually flowing thin filmy images exactly copying the solid body whence they originate; aud these images by direct impact on the organism produce (we need not care to ask how) the phenomena of vision. Epicurus in this way explains vision by substituting for the apparent action of a body at a distance a direct contact of image and organ. But without following the explana- tion into the details in which it revels, it may be enough to say that the whole hypothesis is but an attempt to exclude the occult conception of action at a distance, and substitute a familiar phenomenon.~~

~~This tendential character of the Epicurean physics becomes more palpable when we look at his mode of rendering particular phenomena intelligible. His purpose is to eliminate all ideas by which the grander phenomena of nature are popularly attributed to Divine interference. That there are gods Epicurus never dreams of denying ; the feelings of human nature are too vivid which present to our mind's eye beings of perfect blessedness and unbroken tranquillity. But these gods have not on their shoulders the burden of upholding and governing the world. They are themselves the products of the order of nature,—a higher species than humanity, but not the rulers of man, neither the makers nor the upholders of the world. Man should worship them, but his worship is the reverence due to the ideals of perfect blessedness ; it ought not to be inspired either by hope or by fear. 'T'o prevent all reference of the more potent phenomena of nature to divine action Epicurus rationalizes the processes of the cosmos. He imagines all possible plans or hypotheses, not actually contradicted by our experience of familiar events, which will represent in an intelligible way the processes of astronomy and meteorology. When two or mere modes of accounting for a phenomena are equally admissible as not directly contradicted by known pheno- mena, it seems to Epicurus almost a return to the old mythological habit of mind when a savant asserts that the real cause is one and only one. 'Thus, after several hypothetical~~

~~accounts of how thunder may be bronght about, he adds, "Thunder may be explained in many~~

~~EPEPeuUnRUVUs~~

~~other ways; only let us have no myths of divine action. To assign only a single cause for these phenomena, when the facts familiar to us suggest several, is insane, and is just the absurd conduct to be expected from people who dabble in the vanities of astronomy." We need not be too curious to inquire how these celestial phenomena actually do come about ; we can learn how they might have been produced, and to go further is to trench on ground beyond the limits of human knowledge.~~

~~Thus, if Epicurus objects to the doctrine of mythology, he objects no less to the doctrine of an inevitable fate, a necessary order of things unchangeable and supreme over the human will. " Better were it," he says, " to accept all the legends of the gods than to make ourselves slaves to the fate of the natural philosophers." Fatalism, which was the doctrine of the Stoics, seemed to Epicurus no less deadly a foe of man's true welfare than popular supersti- tion. Even in the movement of the atoms he introduces a sudden change of direction, which is supposed to render their aggregation easier, and to break the even law of destiny. So, in the sphere of human action, Epicurus would allow of no absolutely controlling necessity. There is much in our circumstances that springs from mere chance, but it does not overmaster man. With a latent optimism, Epicurus asserts that, though there are evils in the world, still their domination is brief at the height, and there are many consoling circumstances ; while, on the other hand, it is easy to attain the maximum of pleasure. The sphere of man's action is marked by self-determina- tion; he need own no master. " Better," he says, "is the misfortune of the man who has planned his way wisely, than the prosperity of him who lias devised foolishly." In fact, it is only when we assume for man this indepen- dence of the gods and of fatality that the Epicurean theory of life becomes possible. It assumes that man can, like the gods, withdraw himself out of reach of all external influences, and thus, as a sage, "live like a god among men, seeing that the man is in no wise like a mortal creature who lives in undying blessedness." And this~~

pre- sent life is the only one. With one consent Epicurcanism preaches that the death of the body is the end of every- thing for man, and hence the other world has lost all its terrors as well as all its hopes.

The attitude of Epicurus in this whole matter is antago- nistic to science. The idea of a systematic enchainment of phenomena, in which each is conditioned by every other, and none can be taken in isolation and explained apart from the rest, was foreign to his mind. When that idea is embraced, then obviously the whole group of phenomena must be taken into account in determining whether any hypothesis will serve to explain a detached section. But so little was the scientific conception of the solar system familiar to Epicurus that he could reproach the astronomers, because their account of an eclipse represented things other- wise than as they appear to the senses, and could declare that the sun and stars were just as large as they seemed to us.

The moral philosophy of Epicurus is the heir of the Cyrenaic doctrine that pleasure is the good thing in life. Neither sect, it may be added, advocated sensuality pure and unfeigned,—the Epicurean least of all. By pleasure Epicurus meant both more and less than the Cyrenaics. To the Cyrenaics pleasure was of moments; to Epicurus it extended as a habit of mind through life. 'To the Cyrenaics pleasure was something active and positive; to Epicurus it was rather negative,—tranquillity more than vigorous enjoyment. The test of true pleasure, according to Epicurus, is the removal and absorption of all that gives pain; it implies freedom from pain of body and from trouble of mind. 'The happiness of the Epicurean

was, it might almost seem, a grave and solemn pleasure— a quiet unobtrusive case of heart, but not exuberance and excitement. The Cyrenaic was a buoyant and self- reliant nature, who lived in the light of a grander day in Greece ; and he plucked pleasures carelessly and lightly from the trees in the garden of life as he passed through on his journey, without anxiety for the future, or regret for the past. The sage of Epicureanism is a rational and reflective seeker fur happiness, who balances the claims of each pleasure against the evils that may possibly

ensue, and treads the path of enjoyment cautiously, as befits "a sober reason which inquires diligently into the grounds of acting or refraining from action, and which banishes those prejudices from which spring the chief perturbation of the soul." Prudential wisdom is therefore the only means by which a truly happy life may be attained ; it is thus the chief excellence, and the foundation of all the virtues. It is, in fact, says Epicurus,—in language which contrasts strongly with that of Aristotle on the same topic—a more precious power than philosophy." Pleasure still remains the end; but the natural instinct which prompts to take any opportunity of enjoyment is held in check by the reflection on consequences. The reason or intellect is introduced to measure pleasures—to balance possible pleasures and pains—to construct a scheme in which pleasures are the materials of a happy life. Feeling, which Epicurus declared to be the means of determining what is good, is subordinated toa reason which adjudicates between competing pleasures with the view of securing tranquil- lity of mind and body. But to do so is no easy task; it makes the search for pleasure almost an impossibility. Epicurus is more clearly in the right when he expatiates on the necessary interdependence of virtue and happiness : "We cannot live pleasantly without living wisely and nobly and righteously." Virtue is at least a means of happiness, though apart from that it is no good in itself, any more than mere sensual enjoyments, which are good only because they may sometimes serve to secure health of body and tranquillity of mind.

The theory of Epicurus has no direct utilitarian tone. Its aim is the happiness of the individual. But its selfish- ness is tempered by friendship. The only duties which Epicurus recognizes are those which have been freely accepted on rational grounds, not from the compulsion of appetite or of circumstances. Thus the ideal of Epicurean society was the friendly circle. The family and the state imposed, as he thought, obligations which lessened the independence of man, and subjected him to externals. "The sage," he says, " will not marry and beget children, nor will he take part in state affairs. Though holding but little by many conventionalities, he will not assume a cynical or stoical indifference to others ; he will not form hard and fast judgments ; he will not believe all sinners to be equally depraved, nor all sages equally wise." Friend-

~~ship—like the state in its first origin—is based upon utility; but in it our relations are less forced; and though its motive be utility, still one must begin the good work of well-doing, even as the husbandman first bestows his labour and wealth upon the soil from which he hopes one day to receive fruit in return.~~

~~Even in the lifetime of Epicurus we hear of the vast numbers of his friends, not merely in Greece, but in Asia and Egypt. The crowds of Epicureans were a standing enigma to the adherents of less popular sects. Cicero pondered over the fact; Arcesilaus explained the secession to the Epicurean camp, compared with the fact that no Epi- curean was ever known to have abandoned his school, by saying that, though it was possible for a man to be turned into a eunuch, no eunuch could ever become a man. But the phenomenon was not obscure. The doctrine has many~~

~~truths, and attracts most natures in some of its parts, espe- cially in an age of religious scepticism. Besides, Epicure- anism resembled a church more than a philosophical school. It was not very systematic, but very dogmatic. To develop it would have been to destroy it, for its great point was to hold fast to certain principles of common sense. The dogmas of Epicnrus became to his followers a creed em- bodying the truths on which salvation depended ; and they passed on from one geueration to another with scarcely a change or addition.~~

~~The immediate disciples of Epicurus have been already mentioned, with the exception of Colotes. In the 2nd century B.C. Apollodorus and Zeno of Sidon taught at Athens. About 150 B.c. Epicureanism established itself at Rome. Beginning with C. Amafinius, we find the names of Phedrus and Philodemus as distinguished Epi- cureans in the time of Cicero. But the greatest of its Roman names was Lucretius, whose De Rerum Natura embodies the main teaching of Epicurus with great exact- ness, and with a beauty which the subject seemed scarcely to allow. Lucretius is a proof, if any were needed, that Epicureanism is~~

~~compatible with nobility of soul. In the lst century of the Christian era, the nature of the time, with its active political struggles, naturally called Stoicism more into the foreground ; yet Seneca, though nominally a Stoic, draws nearly all his suavity and much of his paternal wisdom from the writings of Epicurus. The position of Epicnreanism as a recognized schoo] in the 2nd century is best seen in the fact that it was one of the four schools (the others were the Stoic, Platonist, and Peri- patetic) which were placed on a footing of equal endow- ment when Marcus Aurelius founded chairs of philosophy at Athens. The evidence of Diogenes proves that it still subsisted as a school a century later, but its spirit lasted longer than its formal organisation as a school. A great deal of the best of the Renaissance was founded on Epi- cureanism.~~

~~The chief ancient account of Epicurus is to be found in the 10th hook of Diogenes Laertius, in Lucretius, and in several treatises of Cicero and Plutarch. Gassendi, in his De Vita, Mforibus, et Doctrina Epicuri (luyons, 1647), and his Syntagma Philosophie Epicuri, has systematized the doctrine. The Volwmina Herculancnsia, the first series of which in 11 vols. fol. was published between 1793 and 1855 at Naples, and the second series of which, begun in 1861, is still going on, contain numerous fragments of treatises by Epi- curus, and several members of his school. The fragments of the second and eleventh books have been edited after Rosini, by Orelli. T. Gompertz, in his Herkulanische Studien, and in recent contributions to the Vienna Academy (Jfonatsberichtc), has tried to evolve from the fragments more approximation to modern empiricism than they seem to contain. Cf. also G. Trezza, Epiewro e I' Epicureismo, Florence, 1877, and Zeller's Philosophy of the Stoics, Epicurcans, and Sceptics, translated by Reichel. (W. W.)~~

~~EPIDAMNODS, an ancient city of Illyricum, was founded by a joint colony of Corcyreans and Corinthians towards the close of the 7th century B.c.,and from its admirable position aud the fertility of the surrounding country soon rose into very considerable importance. The dissolution of its original oligarchical government by the increasing power of the democrats was one of the causes that contributed to bring~~

~~about the Peloponnesian war, in the course of which it soon sank into a secondary position, and ultimately disappeared altogether from the contest. In 312 B.c. it was seized by Glaucias, king of the Ilyrians ; and about the close of the war it was attacked by pirates, who were twice driven back —on the second occasion by the timely arrival of assistance from Rome. As the name Epidamnus sounded to Roman cars like an evil omen, the alternative name of Dyrrachium, which it probably received from the rugged nature of the adjoining sea-coast, came into general use. In the later history of the Roman republic Dyrrachium became famous as the place where Pompey made the last successful resist- ance to the rising fortunes of Cesar, who was at length~~

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~~compelled to transfer the theatre of war to another quarter, At the end of the struggle between Antony and Augustus it fell into the hands of the latter, and was by him made over to a colony of his veteran troops. Under the Lower Empire it became the capital of Epirus Nova, and attained remarkable prosperity. In 481 it was besieged by Theodoric, the king of the East Goths; and in the 10th and 11th centuries it frequently had to defend itself against the Bulgarians. The emperor Ducas bestowed it as a duchy on Bryennius. In 1082 it was stormed by the Norman Guiscard, who in the previous year had defeated the Greeks under their emperor Alexius; and in 1185 it fell into the hands of King William of Sicily. Surrendered to Venice on the division of the Byzantine kingdom, it afterwards broke loose from the republic. In 1273 it was laid in ruins by an earthquake ; but it soon recovered from the disaster, and in the beginning of the next century it appears as an independent duchy under Philip of Otranto. The Turks obtained possession in 1503. See Durazzo, vol. vii. p. 553.~~

~~EPIDAURUS, a maritime city of ancient Greece, on the eastern coast of Argolis, sometimes distinguished as 7 iepa *Ezidavpos, or Epidaurus the Holy. It stood on a small rocky peninsula with a natural harbour on the northern side and an open but serviceable bay on the southern ; and from this position acquired the epithet of dicropos, or the two-mouthed. Its narrow but fertile territory consisted of a plain shut in on~~

all sides except towards the sea by con- siderable elevations, among which the most remarkable were Mount Arachneon (the modern Arna) and Titthion. The conterminous states were Corinth, Argos, Troezen, and Hermione. Its proximity to Athens and the islands of the Saronic gulf, the commercial advantages of its position, and the fame of its temple of isculapius combined to make Epidaurus a place of no small importance. Its origin was ascribed to a Carian colony, whose memory was possibly preserved in Epicarus, the earlier name of the city ; it was_afterwards occupied by Ionians, and appears to have incorporated a body of Phlegyans from Thessaly. The Jonians in turn succumbed to the Dorians of Argos, who, according to the legend, were led by Deiphontes ; and from that time the city continued to preserve its Dorian charac- ter. It not only colonized the neighbouring islands, and founded the city of Augina, by which it was ultimately out- stripped in wealth and power, but also took part with the people of Argos and Troezen in their settlements in the south of Asia Minor, The monarchical government intro- duced by Deiphontes gave way to an oligarchy, and the oligarchy degenerated into a despotism. When Procles the tyrant was carried captive by Periander of Corinth, the oligarchy was restored ; and the people of Epidaurus con- tinued ever afterwards close allies of the Spartan power. The governing body consisted of 180 members, chosen from certain influential families, and the executive was entrusted to a select committee of artyne. The rural population, who had no share in the affairs of the city, were called kovizrodes, or dusty-feet. Among the objects of interest described by Pausanias as extant in Epidaurus are the image of Athena Cisssa in the Acropolis, the temple. of Dionysus and Artemis, a shrine of Aphrodite, statues of Aisculapius and his wife Epione, and a temple of Hera. The site of the last is identified with the chapel of St Nicolas ; a few portions of the outer walls of the city can be traced; and the name Epidaurus is still preserved by the little village of Nea-Epidavros, or Pidhavro. About five miles from the city stood a famous temple of Aasculapius, in a beautiful valley in the heart of the mountains ; and in its neighbourhood were buildings for the accommodation and recreation of the patients who flocked thither in quest of health; so that the spot was

practically a prototype of our modern watering-places. The dAgos, or inclosure, was kept sacred from birth and death; but rooms were provided in connexion with the temple for the "incubation" of ordinary sick folk. A festival in honour of Aisculapius was celebrated every fourth year, nine days after the Isthmian games at Corinth. The institution acquired great wealth from the offerings of those who received or expected benefit from the god or his priests; and though it was plundered both by Sulla and the Cilician pirates, it is evident from the character of the ruins that it recovered its prosperity in the later Roman period. Antoninus Pius is especially commemorated on account of the many buildings he restored or erected for the service of the sanctuary. The site of the temple can still be recognized ; the great theatre of Polyclitus is the laost perfect ruin of its kind in southern Greece ; and the ground plan of the same architect's ""'Tholos" of white marble is still to be seen.

See Expédition dela Moreée, ii.; Curtius, Peloponnesus, ii.; Transactions of Roy. Soc. of Lit., 2nd series, vol. ii.; Weclawski, De rebus Epidawriorwm, Posen, 1854.

EPIDAURUS, a city of the Peloponnesus on the east coast of Laconia, distinguished by the epithet of Limera, which is explained as either the Well-havened or the Hungry. It was founded by the people of Epidaurus the Holy, and its principal temples were those of A!sculapius aud Aphrodite. It was abandoned during the Middle Ages ; and its inhabitants took possession of the promontory of Minoa, turned it into an island, and built and fortified thereon the city of Monembasia (¢.e., of the one entrance), which became the most flourishing of all the towns in tlie Morea, and gave its name, as corrupted by the people of Western Europe, to the well-known Malmsey or Malvasia wine. The ruins of Hpidaurus are to be seen at the place uow called Old Monemvasia.

A third Epidaurus was situated in Illyricum, on the site of the present Vecchia Ragusa; but it is not mentioned till the time of the civil wars of Pompey and Cesar, and lis no special interest.

~~EPIGONI, a Greek word denoting simply saxs or descendants, but applied more particularly to certain raythical chiefs who fought against Thebes. After the terrible catastrophe which brought about the death of Tokaste (Jocasta) and the blinding of CEdipus, Eteocles and Polynices, the sons of this ill-fated pair, incurred the wrath of their father, whom they cast out from his home to fight with poverty as well as blindness. The curse of the aged king worked in the dissensions of the two brothers ; and Polynices, driven into exile, made his way to Argos, where Adrastus took up his cause. The result was the enterprise which Attic tradition spoke of as the expedition of the Seven Argive Chiefs against Thebes, but which, according to the poets of the Thebais, involved as large a gathering as that of the chieftains who assembled to hunt the Calydonian boar or to recover the Golden Fleece. This strife was fatal, as the prophecies of Mclam- pous had declared it must be, to all the chiefs engaged in it with the exception of Adrastus, the seer Amphiaraus being saved from death only by the opening of the earth, which received him alive with his chariot into her bosom. Thus ended the first assault of the Argives against Thebes, an assault which answers closely to the first ineffectual attempts of the Heraclids to recover their paternal in- heritance in the Peloponnesus. As in the other tradition, with which the Theban story was parallel, it was followed by a second attack in the struggle known as the war of the Epigoni, or the children of the discomfited chiefs of the former expedition. The doom of Thebes was now come, and the Epigoni appeared, like the Heraclids, when their period of enforced idleness is at an end. The Thebans are~~

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~~utterly routed by the Argives under Alemzon, the son of Amphiaraus ; and the prophet Tiresias declares that there is no longer any hope, as the gods have abandoned them.~~

~~| The city is therefore surrendered, and Thersandrus, the~~

~~son of Polynices, is seated on the throne of Cadmus. How far the poets of the Thebais, which treated of these wars, may have imparted to their subject the charm of our Iliad or Odyssey, the scanty fragments of the poem, which alone we possess, make it impossible to say; but there can~~

~~be no doubt that there were incidents in the struggle which might be so treated as to win for it a title to the high praise bestowed upon it by Pausanias (ix, "The.~~

~~EPIGRAMS. Nothing perhaps could be more hopeless than an attempt to discover or devise a definition wide enough to include the vast multitude of little poems which at one time or other have been honoured with the title of epigram, and precise enough to exclude all others. Without taking account of its evident misapplications, we find that the name has been given—first, in strict accordance with its Greek etymology from érvypdpery, to inscribe, to any actual inscription on monument, statue, or building ; secondly, to verses never intended for such a purpose, but assuming for artistic reasous the epigraphical form ; thirdly, to verses expressing with something of the terseness of an inscription a striking or beautiful thought; and fourthly, by un-warrantable restriction, to alittle poem ending in a " point," especially of the satirical kind. The last of these has obtained considerable popularity from the well-known lines—~~

~~'* The qualities rare in a bee that we meet In an epigram never should fail; The body should always be little and sweet, And a sting should be left in its tail "—~~

~~which represent the older Latin of some unknown writer—~~

~~"'Omne epigramma sit instar apis: sit aculeus illi; Sint sua mella; sit et corporis exigui."~~

~~Attempts not a few of a more elaborate kind have been made to state the essential element of the epigram, and to classify existing specimens ; but, as every lover of epigrams must feel, most of them have been attended with very partial success. Scaliger, in the third book of his Poetics, gives a fivefold division, which displays a certain ingenuity in the nomenclature but is very superficial; the first class takes its name from mel, or honey, and consists of adulatory specimens; the second from fed, or gall; the third from acetum, or vinegar ; and the fourth from sad, or salt ; while the fifth is styled the condensed, or multiplex. This classification is adopted by Nicolaus Mercerius in his De~~

~~conscribendo epigrammate, Paris, 1653; but he supple- mented it by another of much more scientific value, based on the figures of the ancient rhetoricians. Lessing, in the preface to his own epigrams, gives an interesting treatment of the theory, his principal doctrine being practically the same as that of several of his less eminent predecessors, that there ought to be two parts more or less clearly distinguished,— the first awakening the reader's attention in the same way as an actual monument might do, and the other satisfying his curiosity in some unexpected manner. An attempt was made by Herder to increase the comprehensiveness and pre- cision of the theory ; but as he himself confesses, his classifi- cation is rather vague—the expository, the paradigmatic, the pictorial, the impassioned, the artfully turned, the illusory, andthe swift. After all, if the arrangement accord- ing to authorship be rejected, the simplest and most satis- factory is according to subjects. The epigram is one of the most catholic of literary forms, and lends itself to the expres- sion of almost any feeling orthought. It may be an elegy, a satire, or a love-poem in miniature, an embodiment of the wisdom of the ages, a bon-mot set off with a couple of rhymes.~~

~~'¢T cannot tell thee who lies buried here ; No man that knew him followed by his bier ; The winds and waves conveyed him to this shore, Then ask the winds and waves to tell thee more." ANONYMOUS.~~

~~"< Wherefore should I vainly try To teach thee what my love will be In after years, when thou and I Have both grown old in company, If words are vain to tell thee how, Mary, I do love thee now ?" ANONYMOUS.~~

~~*¢O Bruscus, cease our aching ears to vex, With thy loud railing at the softer sex ; No accusation worse than this could be, That once a woman did give birth to thee." ACILIUS.~~

~~'«Treason doth never prosper. What's the reason ? For if it prospers none dare call it treason." HARRINGTON. "Ward has no heart they say, but I deny it; He has a heart,and gets his speeches by it." RoGERs.~~

~~From its very brevity there is no small danger of the epigram passing into childish triviality: the paltriest pun, a senseless anagrani, is considered stuff enough and to spare. For proof of this there is unfortunately no need to look far; but perhaps the reader could not find a better collection ready to his hand than the second twenty-five of the Lpigrammatum Centurie of Samuel Erichius ; by tlie time he reaches No. 11 of the 47th century, he will be quite ready to grant the appropriateness of the identity maintained between the German Seele, or soul, and the German Ese, or ass.~~

~~Of the epigram as cultivated by the Greeks a detailed account has been given in the article on the ANTHOLOGIES, those wonderful collections which bid fair to remain the richest of their kind. 'The delicacy and simplicity of so much of what has been preserved is perhaps tlieir most striking feature ; and one cannot but be surprised at the number of poets proved capable of such work. In Latin literature, on the other hand, the epigrammatists are com- paratively few, and though several of them, as Catullus and Martial, are men of high literary genius, too much of what they have left behind 1s vitiated by brutality and obscenity. On the subsequent history of the epigram, indeed, Martial has exercised an influence as baneful as it is extensive, and he may fairly be counted the far-off pro- genitor of a host of scurrilous verses which lhe himself would almost have blushed to write. Nearly all the learned Latinists of the 16th and 17th centuries may claim admittance into the list of epigrammatists,—Bembo and Sealiger, Buchanan and More, Stroza and Sannazarius. Melanchthon, who succeeded in combining so much of Pagan culture with his Reformation Christianity, has left us some graceful specimens, but his editor, Joannes Major Jaochimus, has so little idea of what an epigram is, that he includes in his collection some translations from the Psalms. John Owen, or, as he Latinized lis name, Johannes Audoenus, a Cambro-Briton, attained quite an unusual celebrity in this department, and is regularly dis- tinguished as Owen the Epigrammatist. The tradition of the Latin epigram has been kept alive in Eugland by such men as Porson, Vincent Bourne, and Walter Savage Landor; and at one at least of our universities there is an annual prize for the best original specimen. Happily there is now little danger of any too personal~~

~~epigrammatist suffering the fate of Niccolo Franco, who paid the forfeit of his life for having launched his venomous Latin against Pius V., though he may still incur the milder penalty of having ae nos inserted in the Index Hxpurgatorius, and find, like~~

~~wen, that he consequently has lost an inheritance.~~

~~EPIGRANMS~~

~~In English literature proper there is no writer like Martial in Latin or Logau in German, whose fame is entirely due to his epigrams; but several even of those whose names can perish never have not disdained this diminutive form. The designation epigram, however, is used by our earlier writers with excessive laxity, and given or withheld without apparent reason. The collection which bears the title of One and thyrtye Epigrammes, wherein are bryefly touched so many abuses that may and ought to be put away: Compiled and Imprinted by Robert Crowley, 1550, is of almost no literary value, consisting of rugged and in many cases vulgar and pointless attempts at satire. Those of Henry Parrot, published in 1613 as Laguet ridiculosi, or Springes to catch Woodcocks, are only not quite as worthless, though, as faras the mere form goes, they better deserve the name they assume ; for, according to the author's poetical simile—~~

~~'¢ We make our epigrammes as men taste cheesc, Which hath his relish in the last farewell." John Weever's collection (1599) is of interest mainly be- cause of its allusion to Shakespeare. Ben Jonson furnishes a number of noble examples in his Underwoods ; and one or two of Spenser's little poems and a great many of Herrick's are properly classed as epigrams. Turberville is just as graceful in this department as he is in everything else; but he has left one at least which is not without value— '* A miser's mind thou hast, Thou hast a prince's pelf,~~

~~Which makes thee wealthy to thine heir, A beggar to thyself."~~

~~A few quaint specimens may be culled from the pages of Thomas Fuller ; but most of the fifty-uine epigrams recently published by Mr Grosart are poor affairs at the best. Cowley, Waller, Dryden, Prior, Parnell,~~

~~Swift, Addison, Johnson, Goldsmith, and Young have all been at times successful in their epigrammatical attempts ; but perhaps uone of them has proved himself so much “ to the manner born” as Pope, whose name indeed is almost identified with the epigrammatical spirit in our literature. Few of our modern poets have followed in his footsteps, and though nearly all might plead guilty to an epigram or two, there is no one who has a distinct reputation as an epigrammatist. Such a reputation might certainly have been Landor’s, had he not chosen to write the best of his minor poems in Latin, and thus made his readers nearly as select as his language.~~

~~The French are undoubtedly the most successful cul- tivators of the “ salt ” and the “vinegar” epigram; and from the time of Marot downwards many of their principal authors have earned no small celebrity in this department. It is enough to mention the names of J. B. Rousseau, Lebrun, Voltaire, Marmontel, Piron, and Chénier. In spite of Rapin’s dictum that a man ought to be content if he succeeded in writing one really good epigram, those of Lebrun alone number upwards of 600, and a very fair pro- portion of them would doubtless pass muster even with Rapin himself. If Piron was never anything better, “ pas méme un académicien,” he appears at least in Grimm’s phrase to have been “ une machine & saillies, 4 epigraramES, et & bon-mots.” Perhaps more than anywhere else the epigram has been recognized in France as a regular weapon in literary and political contests, and it night not be alto- gether a hopeless task to compile an epigrammatical history from the Revolution to the present time.~~

~~While any fair collection of German epigrams will furnish examples that for keenness of wit would be quite in place in a French anthology, the Teutonic tendency to the moral and didactic has given rise to a class but sparingly represented in French. The very name of~~

~~Stnngedichie bears witness to this peculiarity, which is ex- | quite erroneously, as they can in no strictly scientific sense~~

~~emplified equally by the rude priameln, or preameln, of the 13th and 14th centuries and the polished lines of Goethe and Schiller. Logau published his Deutsche Sinngetichte Drey Tausend in 1654, and Wernicke no fewer than six volumes of Ueberschriften oder Epigrammata in 1697 ; Kastner's Sinngedichte appeared in 1782, and Haug and Weissen's Lpigrammatische Anthologie in 1804. Kleist, Opitz, Gleim, Hagedorn, Klopstock, and A. W. Schlegel all possess some reputation as epigrammatists ; Lessing is facile princeps in the satirical style ; and Herder has the honour of having enriched his language with much of what is best from Oriental and classical sources.~~

~~It is often by no means easy to trace the history of even a single epigram, and the investigator soon learns to be cautious of congratulating himself on the attainment of a genuine original. The same point, refurbished and fitted anew to its tiny shaft, has been shot again and again by laughing cupids or fierce-eyed furies in many a frolic and many a fray. During the period when the epigram was the favourite form in Germany, Gervinus tells us how the works, not only of the Greek aud Roman writers, but of Neo-Latinists, Spaniards, Dutchmen, Frenchmen, Englishmen, and Poles were rausacked and plundered ; and the same process of pillage has gone on in a more or less modified degree in other times and countries. Very noticeable often are the modifications of tone and expres- sion occasioned by national and individual characteristics: the simplicity of the prototype may become common-place in the imitation, the sublime be distorted into the gro- tesque, the pathetic degenerate into the absurdly senti- mental ; or on the other hand, an unpromising motif may be happily developed into unexpected beauty. A good illustration of the variety with which the same epigram may be translated and travestied is afforded by a little volume published in Edinburgh in 1808, under the title of Lucubrations on the Epigram—~~

~~"Et wey hy padelv & de? radeiv,~~

~~Kal uh wadeiv, xadrdy hy 7d wabeiy "Et 56 de? wabeiv & 8 Hv paderr,~~

~~Tl Se? wade; xph yap mabeiv.~~

~~The two collections of epigrams most accessible to the English reader are Booth's Epigrams, Ancient and Modern, 1863, and Dodd's The Epigrammatists, 1870. In the appendix to the latter is a pretty full bibliography, to which the following list may serve as a supplement :— Thomas Correus, De toto eo poematis genere quod epigramma dicitur, Venice, 1569, Bologna, 1590 ; Cottunius, De Conjiciendo epigrammate, Bologna, 1632; Vincentius Gallus, Opusculum de epigrammate, Milan, 1641; Vavassor, De epigram- mate liber, Paris, 1669 ; Gedanke von deutschen Epigrammatibus, Leipsic, 1698; Doctissimorwm nostra cetate italorum epigrammata: Flaminiit Molec, Naugerit, Cotte, Lampridii, Sadoleti, et aliorum, cura Jo. Gagnet, Paris, c. 1550; Brugiére de Barante, Recueil des plus belles épigrammes des poétes francais, 2 vols., Paris, 1698 ; Chr. Aug. Heumann, Anthologia Latina : hoc est, epigrammata partim a priscis partim junioribus a poetis, Hanover, 1721 ; Fayolle, Acon- tologie ow dictionnaire d'épigrammes, Paris, 1817; Geijsbeck, Epi- grammatische Anthologie; Sauvage, Les guépes gauloises: petit eney- clopédie des meilleurs épigrammes, &c., depuis Clement Marot jusqw' aux poetes de nos jours, 1859; La réeréation et passe-temps des tristes: reeweil d'épigrammes et de petits contes en vers réimprimé sur Védition de Rowen 1595, &c., Paris, 1863. A large number of epi- grams and much miscellaneous information in regard to their origin, application, and translation is scatiered through Notes and Queries. A pleasant anonymous article on the subject is printed in The Quarterly Review, No. 233.~~

~~EPILEPSY (from éat, upon, and AapBave, to seize), syno- nym, Falling Sickness. The term as generally understood is applied to a nervous disorder characterized by a fit of sudden loss of consciousness, attended with convulsions. There may, however, exist manifestations of epilepsy much less marked than this, yet equally characteristic of the disease; while, on the other hand, it is to be borne in mind that many other attacks of a convulsive nature have the term "epileptic" or "epileptiform" applied to them~~

~~be held to be epilepsy.~~

~~Epilepsy was well known in ancient times, and was re- garded as a special infliction of the gods, hence the names morbus sacer, morbus divus. It was also termed morbus Herculeus, from Hercules having been supposed to have been epileptic, and morbus comitialis, from the circum- stance that when any member of the forum was seized with an epileptic fit thé assembly was broken up. Morbus ca- ducus, morbus lunaticus astralis, morbus demoniacus, morbus major, were all terms employed to designate epilepsy.~~

~~The forms which this disease manifests have been dif- ferently described by different writers, but there are two well-marked varieties of the epileptic seizure, either of which may exist alone, or both may be found to occur together in the same individual. To these the terms epilepsia gravior and epilepsia mitior, le grand mal and le petit mal, are usually applied. The former of these, if not the more common, is at least that which attracts most attention, being what is generally known as an epileptic fit.~~

~~Although in most instances such an attack comes on suddenly, it is in many cases preceded by certain premoni- tory indications or warnings, which may be present for a greater or less time previously. These are of very varied character, and may be in the form of some temporary change in the disposition, such as unusual depression or elevation of spirits, or of some alteration in the look. Besides these general symptoms, thereare frequently peculiar sensations which immediately precede the onset of the fit, and to such the name of "aura epileptica" is applied. In its strict sense this term refers to a feeling of a breath of air blowing upon some part of the body, and passing upwards towards the head. This sensation, however, is not a common one, and the term has now come to be applied to any peculiar feeling which the patient experiences as a precursor of the attack. The so-called " aura" may be of mental character, in the form of an agonizing feeling of momentary duration; of sensorial character, in the form of pain in a limb or in some internal organ, such as the stomach, or morbid feeling connected with the special senses; or, further, of motorial character, in the form of contractions or trembling in some of the muscles. When such sensations affect a limb, the employment of firm com- pression by the hand or by~~

a ligature occasionally succeeds in warding off an attack. The aura may be so distinct and of sucli duration as to enable the patient to lie down, or seek a place of safety before the fit comes on.

The seizure is usually preceded by a loud scream or cry, which is not to be ascribed, as was at one time supposed, to terror or pain, but is due to the convulsive action of the muscles of the larynx, and the expulsion of a column of air through the narrowed glottis. If the patient is standing he immediately falls, and often sustains serious injury. Unconsciousness is complete, and the muscles generally are in a state of stiffness or tonic contraction, which will usually be found to affect those of one side of the body in particular. The head is turned by a series of jerks towards one or other shoulder, the breathing is for the moment arrested, the countenance first pale then livid, the pupils dilated, and the pulse rapid. This, the first stage of the fit, generally lasts for about half a minute, and is followed by the state of clonic (z.e., tumultuous) spasm of the rnuscles, in which the whole body is thrown into violent agitation, occasionally so great that bones may be fractured or dislocated. The eyes roll wildly, the teeth are gnashed together, and the tongue and cheeks are often severely bitten. The breathing is noisy and laborious, and foam (often tinged with blood) issues from the mouth, while the contents of the bowels and bladder are ejected. The aspect of the patient in this condition is shocking

to witness, and the sight has been known to induce a similar attack in an onlooker. This stage lasts for a period varying from a few seconds to several minutes, when the convulsive movements gradually subside, and relaxation of the muscles takes place, together with partial return of consciousness, the patient looking confusedly about him and attempting to speak. This, however, is soon followed by drowsiness and stupor, which may con- tinue for several hours, when he awakes either apparently quite recovered, or fatigued and depressed, and occasionally in a state of excitement which sometimes assumes the form of mania.

~~Epileptic fits of this sort succeed each other with varying degrees of frequency, and occasionally, though not frequently, with regular periodicity. In some persons they only occur once in a lifetime, or once in the course of many years, while in others they return every week or two, or even are of daily occurrence, and occasionally there are numerous attacks each day. According to Dr Reynolds, there are four times as many epileptics who have their attacks more frequently than once a month as there are of those whose attacks recur at longer intervals. When the fit returns it is not uncommon for oue seizure to be followed by another within a few hours or days. Occasionally there occurs a constant succession of attacks extending over many hours, and with such rapidity that the patient appears as if he had never come out of the one fit. The term status epilepticus is applied to this condition, which is sometimes followed with fatal results, Iu many epileptics the fits occur during the night as well as during the day, but in some instances they are entirely nocturnal, and it is well known that in such cases the disease may long exist and yet remain un- recognized either by the patient or the physician.~~

~~The other manifestation of epilepsy, to which the names epilepsia mitior or le petit mal are given, differs from that above described in the absence of the convulsive spasms. Tt is also termed by some authors epileptic vertigo (giddi- ness), and consists essentially in the sudden arrest of volition and consciousness, which is of but short duration, and may be accompanied with staggering or some alteration in position or motion, or may simply exhibit itself in a look of absence or confusiou, and, should the patient happen to be engaged in conversation, by an abrupt termin- ation of the act. In general it lasts but a few seconds, and the individual resumes his occupation without perhaps being aware of anything having been the matter. In some instances there is a degree of spasmodic action in certain muscles which may cause the patient to make some unexpected movement, such as turning half round, or walking abruptly aside, or may show itself by some unusual expression of countenance, such as squinting or grinning. There may be some amount of "aura" pre- ceding such attacks, and also of faintness following them. The petit mal most commonly co-exists with the grand mal, but has no necessary connection with it, as each may exist alone.~~

~~According to Trousseau, the petit mal in general precedes the manifestation of the grand mal, but some- times the reverse is the case.~~

~~Although the above account represents the phenomena usually observed in the two varieties of epilepsy, it is to be noted that many cases occur exhibiting other symptoms which cannot be included in such a general description.~~

~~Epilepsy appears to exert no necessarily injurious effect upon the general health, and even where it exists in an ageravated form is quite consistent with a high degree of bodily vigour. It is very different, however, with regard to its influence upon the mind ; and the question of the re- lation of epilepsy to insanity is one of great and increasing importance. Allusion has already been made to the occa- sional occurrence of maniacal excitement as one of the re-~~

~~sults of the epileptic seizure. Such attacks, to which the name of furor epilepticus is applied, are generally accom- panied with violent acts on the part of the patient, render- ing him dangerous, and demanding prompt measures of restraint. These attacks are by no means limited to the more severe form of epilepsy, but appear to 'be even more frequently associated with the milder form—the epileptic vertigo—where they either replace altogether or immedi- ately follow the short period of absence characteristic of this form of the disease. Numerous cases are on record of persons known to be epileptic being suddenly seized, either after or without apparent spasmodic attack, with some sudden impulse, in which they have used dangerous violence tu those beside them, irrespective altogether of malevolent intention, as appears from their retaining no recollection whatever, after the short period of excitement, of anything that had occurred; and there is reason to believe that crimes of heinous character, for which the perpetrators have suffered punishment, have been committed in a state of mind such as that now described. The subject is obviously one of the greatest medico-legal interest and importance in regard to the question of criminal responsi- bility, and it is now justly receiving much greater attention than formerly.~~

~~Apart, however, from such marked and comparatively rare instances of what is termed epileptic insanity, the general mental condition of the epileptic is in a large pro- portion of cases unfavourably affected by the disease. There are doubtless examples (aud their number according to statistics is estimated at less than one-third) where, even among those suffering from frequent and severe attacks, no departure from the normal condition of mental integrity cau be recognized. But in general there exists some peculiarity, exhibiting itself either in the form of defective memory, or diminishing intelligence, or, what is perhaps as frequent, in irregularities of temper, the patient being irritable or per- verse and eccentric. In not a few cases there is a steady mental decline, which ends in dementia or idiocy. It is stated by some high authorities that epileptic women suffer in regard to their mental condition more than men. It also appears to be the case that the later in life the disease shows itself the more likely is the mind to suffer. Neither the frequency nor the severity of the seizures seer to have any necessary influence in the matter; and the general opinion appears to be that the milder form of the disease is that with which mental failure is more apt to be associated.~~

~~Epilepsy has ever been regarded as one of the most formidable diseases that can afflict mankind, and much labour has been bestowed upon the investigation of its pathology. It must, however, be confessed that morbid anatomy has hitherto failed to throw any satisfactory light upon the real nature of this disease. In the very rare in- stances of persons dying in the epileptic fit, the post mortem appearances presented by the brain are in general either entirely negative, or of such indefinite character as cerebral congestion, while, on the other hand, in chronic cases of epilepsy, such lesions as atrophy and degeneration of braiu substance or vascular disease are frequently met with, but are, as is well known, common to many other forms of ner- vous disease, and are much more probably the consequences rather than the causes of the epileptic attacks. The dis- ease is commonly regarded as one of functional character.~~

~~It is impossible in this notice to refer in detail to the vari- ous doctrines which have been held by physicians and patho- logists upon the subject~~

of the site of the lesion in epilepsy. Tt is now generally admitted, as the result both of obser- vation and experiment, that the upper part of the spinal cord, including the medulla oblongata, pons varolii, and other ganglia at the base of the brain, are the parts affected

in epilepsy ; and it is supposed that a condition of irritability or over-action of the ganglionic nerve cells in these parts, which are concerned in controlling the vaso- motor nerves, the muscles of respiration, and the mus- cular system generally, is the immediate cause of a fit. The fact, however, of the loss of consciousness and other sensorial phenomena being the earliest occurrences in the attack, preceding the convulsions, and in not a few in- stances, as has already been observed, being the only indi- cations present, is regarded by some as pointing to other parts of the cerebral centres as being implicated in the origination of the fit. The whole subject, however, is still involved in obscurity. There are, nevertheless, certain facts which have been brought to light in the investigation of this disease which are of interest and importance as re- gards its causation.

The influence of hereditary predisposition in epilepsy is very marked. It is necessary, however, to bear in mind the point so forcibly insisted on by Trousseau in relation to epilepsy, that hereditary transmission may be either direct or indirect, that is to say, that what is epilepsy in one generatiou may be some other form of neurosis in the next, and conversely, nervous diseases being remarkable for their tendency to transformation in their descent in families. Where epilepsy is hereditary, it generally manifests itself at an unusually early period of life. A singular fact, which also bears to some extent upon the pathology of this disease, was brought to light by Dr Brown Séquard in hia experi- ments, namely, that the young of animals which had been artificially rendered epileptic were liable to similar seizures. In connexion with the hereditary transmission of epilepsy it must be observed that all authorities concur in the opinion that this disease is one among the baneful effects that often follow marriages of consanguinity. Further, there is reason to believe that intemperance,

apart altogether from its direct effect in favouring the occurrence of epilepsy, has an evil influence in the hereditary transmission of this as of other nervous diseases. A want of symmetry in the formation of the skull and defective cerebral development are not unfrequently observed where epilepsy is hereditarily transmitted.

Age is of importance in reference to the production of epilepsy. The disease may come on at any period of life, but it appears from the statistics of Dr Reynolds and others, that it most frequently first manifests itself between the ages of ten and twenty years, the period of second dentition and puberty, aud again at or about the age of forty.

Among other causes which are influential in the development of epilepsy may be mentioned sudden fright, prolonged mental anxiety, over-work, and debauchery. Epileptic fits also occur in connexion with injuries of the head and organic disease of the brain, as well as with a depraved state of the general health, and with irritations in distant organs, as seen in the fits occurring in dentition, in kidney disease, and as the result of worms in the intestines. The epileptic symptoms traceable to these causes are some- times termed sympathetic or eccentric epilepsy ; while, on the other hand, many authorities refuse to designate attacks thus brought about by the name epilepsy, unless the symptoms exhibit a liability to return even after their cause has been removed, which would seem to be sometimes the case.

Epilepsy is occasionally feigned for the purpose of extortion, but an experienced medical practitioner will rarely be deceived ; and when it is stated that although many of the phenomena of an attack, particularly the con- vulsive movements, can be readily simulated, yet that the condition of the pupils, which are dilated during the fit, cannot be feigned, and that the impostor seldom bites his

tongue or injures himself, deception is not likely to succeed even with non-medical persons of intelligence.

~~The treatment of epilepsy can only be briefly alluded to here. During the fit little can be done beyond preventing as far as possible the patient from injuring himself while unconsciousness continues. Tight clothing should be loosened, and a cork or pad inserted between the teeth. When the fit is of long continuance, the dashing of cold water on the face and chest, or the inhalation of chloro- form, or, as has been recently proposed, of nitrite of amyl, may be useful ; and in some cases, where there is great congestion of the face and threatening asphyxia, blood- letting may be called for; in general, however, the fit ter- minates independently of any such measures. When the fit is over the patient should be allowed to sleep, and have the head and shoulders well raised.~~

~~In the intervals of the attacks the general health of the patient is one of the most important points to be attended to. The strictest hygienic rules should be observed, and all such causes as have been referred to as favouring the development of the disease should as far as possible be avoided. Of medicinal remedies for epilepsy there are innumerable varieties, but only a few deserve mention as possessing any efficacy in controlling or curing the disease. For no disease has a greater number of specifics been vaunted and found to be useless. The metallic salts, especially those of zinc, silver, and arsenic, are much employed, and apparently with benefit in some cases, but they seldom can be continued for any great length of time, owing to their liability to produce evil effects upon the health. The two remedies which have been found most serviceable are belladonna and bromide of potassium. The former of these has the strong recommendation of Trousseau, who advises its administration either as a pill composed of the extract and powdered leaves, or in the form of atropia in gradually increased doses, and continued for a length of time. This drug certainly succeeds in many cases in diminishing the number of the attacks, but it has not yielded such encouraging results as have been attained by the other substance above mentioned, the bromide of potassium, which is the remedy now generally employed in the treatment of epilepsy. This salt, given in from 10 to 30 grain doses three times a day, is generally followed with some amelioration of the symptoms either in regard to the severity or frequency of the attacks, and in a few instances with~~

apparent cure. Its employment, more- over, can be persevered with for a long time with little inconvenience. Some physicians combine with it an equal proportion of the analogous salt, the bromide of ammonium, while others employ belladonna along with the bromides, and apparently with good effect. As adjuvants to these measures, counter-irritation to the nape of the neck by blisters or setons is sometimes attended with benefit. (J. 0. a.)

EPIMENIDES, a poet and prophet of Crete, was born at Phestus, or according to others at Gnossus, in the 7th century before the Christian era. In the account of his life as given by Diogenes Laertius (i. 12), it is impossible to distinguish between what may be true and what is obviously fabulous. When keeping his father's sheep one day, he is said to have retired into a cave, where he fell into a profound sleep which lasted fifty-seven years, Returning home to the altered abodes of his family, he was hailed as the especial favourite of the gods, and venerated as the possessor of superhuman wisdom. He was invited by Solon to Athens (about 596 B.c.), in order to give the sanction of his sacred presence to the purification of the city previous to the promulgation of the political code of the great lawgiver. Having accomplished the desired lustration by the performance of certain religious rites, Epimenides was loaded by the Athenians with wealth and

honours. He refused, however, to accept their gifts, con- tenting himself with a branch of the sacred olive, and the exaction of a promise of perpetual friendship _between Athens and Gnossus. 'The death of Epimenides is said to have taken place in Crete, although Sparta boasted of possessing his tomb, and doubtless he may have travelled into many different countries, if (as one tradition runs) he attained the age of nearly three hundred years. He was said to have written a poew on the Argonautic expedition, and several other poetical works, and there are grounds for supposing that he may have done so ; but these, with a variety of undoubtedly spurious prose treatises attributed to him

~~in ancient times, are now entirely lost. Epimenides is supposed to be the Cretan prophet to whom St Paul alludes in his epistle to Titus (i, 12).~~

~~EPINAL, a town of France, capital of the department of Vosges, is situated on both sides of the Moselle, at the foot of the Vosges chain of mountains, and on the railway from Nancy to Belfort, 35 miles $.S.E. of Nancy and 200 E.S.E. of Paris. The town is tolerably well built, and in its vicinity are some beautiful promenades. It was~~

~~formerly fortified, and has still the remains of an ancient~~

~~castle. Its principal buildings are the Gothic parish church, the hotel of the prefecture, the communal college, the barracks, and the departmental prison. It has also a large public library, a museum of paintings and antiquities, a chamber of commerce, and schools of design and music. Its principal manufactures are woollen and linen fabrics, earthenware, cutlery, paper, leather, and chemical products ; and it has a considerable trade in horses, cattle, corn, wine,~~

~~and wood. Epinal originated towards the end of the 10th~~

~~century with the founding of a monastery by the bishop of Metz, who ruled the town till 1444, when its inhabitants placed themselves under the protection of Charles VII. In 1466 it was transferred to the duchy of Lotharingia, and in 1766 it was, along with that duchy, incorporated with France. It was occupied by the Germans on the 12th October 1870 after a short fight, and until the 15th was the-head-quarters of General von Werder. The population in 1872 was 10,938.~~

~~EPINAY, Louise Fiorence Pétronitve DE LA Live D' (1725-1783), a French authoress, well known on account of her Uiaisons with Rousseau and Baron von Grimm, and her acquaintanceship with Diderot, D'Alembert, D'Hol- bach, and other French Jittératewrs, was born at Paris in 1725. Her father, Tardieu d'Esclavelles, a brigadier of infantry, was killed in battle when she was nineteen years of age; and in recognition of his services, the Government arranged that she should marry her cousin De la Live d'Epinay, on whom they bestowed the office of farmer-general, The marriage was an unhappy one; and~~

~~according to her own version of the matter, she believed that the prodigality, dissipation, and infideiities of her husband justified her in regarding herself as freed from all~~

~~the obligations implied in the conjugal bond. Conceiving ’ a strong attachment for J. J. Rousseau, she in 1756 built for him, in the valley of Montmorency, a cottage which she named the “Hermitage ;” and there, notwithstanding the pleasantries and gay remonstrances of his friends at his forsaking the brilliant society of Paris, he sought for a time to enjoy the quiet and natural rural pleasures for which he always expressed a strong preference. Rousseau, in his Confessions, affirmed that the attachment was ali on her side; but as, after her liaison with Grimm, he became her bitter enemy and detractor, not much weight can be given to his statements on this point. In Grimm’s absence from France (1775-76), Madame d’Epinay continued, under the superintendence of Diderot, the correspondence he had begun with various European sovereigns, She spent the whole~~

~~of a small circle of Jittératewrs, and occupying her spare time chiefly in various kinds of literary composition. She died 17th April 1783. Her Conversations d’ milie, com- posed for the education of her grand-daughter, the Comtesse @pinay, was crowned by the French Academy in 1783. The Afémoires et Correspondance de. Mme. d Epinay, renfermant un grand nombre de lettres inédites de Grimm, de Diderot, et de J. J. Rouseau, ainsi que des détails, &c., was published at Paris 1818. The Afémoures ace written by herself in the form of a sort of autobiographic romance, and although they contain much that is mere imagination, and also a great deal of misrepresentation, they are of great value as a picture of the manners and habits of the most eminent Frenchmen of the time. All the letters and documents published along with the Afémoires are genuine. Many of Madame d’Epinay’s letters are contained in the Correspondance de Vabbé Galiani (Paris, 1818). Two anonymous works, Lettres & mon Jils (Geneva, 1758) and Mes Moments Leureux (Geneva, 1758), are attributed to Madame d’Epinay.~~

EPIPHANIUS, Sz, a celebrated father of the church, was born in the beginning of the 4th century at Bezanduca, a village of Palestine, near Eleutheropolis. He is said to have been of Jewish extraction. In his youth he resided in Egypt, where, under the Gnostics, he began an ascetic course of life ; and on his return to Palestine he became a zealous disciple of the patriarch Hilarion, and eventually the president of a monastery which he founded near his native place. In 367 he was nominated bishop of Constantia, previously known as Salamis, the metropolis of Cyprus—an office which he held till his death in 402. Zealous for the truth, but passionate, bigoted, and ignorant, he devoted himself to furthering the spread or the recently established monasticism, and to the confutation of heresy, of which he regarded Origen and his followers as the chief representatives. The first of the Origenists that he attacked was John, bishop of Jerusalem, whom he denounced from his, own pulpit at Jerusalem in terms so violent that the bishop sent his archdeacon to request lim to desist; and afterwards, instigated by Theoplilus, bishop of Alexandria, he proceeded so far as to summon a council of Cyprian bishops to condemn the errors of Origen. His next blow was aimed at Chrysostom, the patriarch of Constantinople, and a pretext was found in the shelter which he had given to four Nitrian monks whom Theophilus had expelled on the charge cf Origenism. Finding himself baffled by the authority of Chrysostom, Epiphanius proceeded in extreme old age to Constantinople, and endeavoured to subvert his influence at the court ; but having presumptuously announced to. the empress Eudoxia that her son, who was then ill, would die unless she ceased to favour the friends of Origen, he was immediately dis- missed, and died on the passage home to Cyprus. At his parting interview with Chrysostom, he is said to have expressed the hope that that patriarch "would not die a bishop ;" and Chrysostom, in retaliation, uttered a wish that "he would never get back in safety to his own country." As both these malevolent wishes were liter- ally accomplished, there is reason to suppose that the story may have been fabricated after the event. The principal works of Epiphanius are his 'anarion, or treatise on heresies, of which he also wrote an abridgment ; his Ancoratus, or discourse on the faith ; and his treatise on the weights and measures of the Jews. These, with two epistles to John of Jerusalem and Jerome, are his only genuine remains.

~~He wrote a large number of works which are lost. The best edition of his works is that of the Jesuit Petavius, 2 vols. fol., Paris, 1622. In allusion to his knowledge of Hebrew, Syriac, Egyptian, Greek, and~~

~~of her after life at the " Hermitage," enjoying the society | Latin, Jerome styles Epiphanius Penfaglottos or Five:~~

~~EPI—EPT~~

~~tongued ; but if his knowledge of languages was really so extensive, it is certain that le was utterly destitute of critical and logical power. His early asceticism seems to have imbued him with a love of the marvellous; and his religious zeal served only to increase his credulity, so that many of the most absurd legends in the early church have received the sanction of his authority. His works are, in fact, chiefly valuable from the quotations which they embody.~~

~~EPIPHANY, Fesrrvat oF, one of the chief festivals of the Christian church, kept on the 6th of January, as the closing day of the Christmas commemoration, the English "Twelfth Day." The name "Epiphany" (7 'Emiddévea, or ta "Emiavia, also Geoddvia, and Xpirroddvia) marks it out as a commemoration of the manifestation of Jesus Christ to the world as the Son of God. This manifestation has been variously interpreted in different sections of the church. In the East, where, as its Greek name indicates, the festival had its origin, it was associated with our Lord's baptism as the " manifestation " of Christ as Son of God by the voice from heaven and the descent of the Holy Spirit. From this connection the Epiphany became one of the chief days for the baptizing of catechumens. The water in the font was consecrated on this day, and bottles of the sacred fluid were carried home by the faithful and preserved till the day came round again. Baptism being regarded as the illumination of the soul (dwropds), this day gained the title of "the lights," or the 'day of lights" (ri dara, hepa tov porwv). The Epiphany was never a day of baptism in the Western Church. This com-memoration of Christ's baptism arose in the East before that of His Nativity. From a forced interpretation of Luke iii, 23, our Lord was supposed to have been baptized on the thirtieth anniversary of His birth, and the two events were commemorated on the same day,~~

~~January 6. Other manifestations were also associated with these two, especially the displays of our Lord's miraculous power at the marriage feast at Cana of Galilee, and the feeding of the five thousand. It was not till the latter half of the 4th century that the Nativity had a distinct celebration in the East on the 25th of December. In the Western Church the two commemorations have always been separated; and the Epiphany has been associated with the visit of the Magi, or Wise Men of the East, to the infaut Saviour, almost to the exclusion of any other reference. These mysterious strangers, who in process of time developed into three kings, named Caspar, Melchior, and Balthasar, descended respectively from Ham, Shem, and Japheth, being regarded as the first-fruits of the heathen world to Christ, the festival obtained the designation it bears in the English Common Prayer Book, " the Epiphany, or manifestation of Christ to the Gentiles." In the Latin Church it is known as "festum trium regum." The popular name in Rome is la Beffana, a corruption of the medieval "" Bethphania," derived from the manifesta. tion in the house (Hebrew, beth) at Cana of Galilee. The earliest mention of the festival in the West is in the account given by Ammianus Marcellinus of a visit paid by Julian to a church at Vienne on this day (lib. xxi. c. 2). It eventually took rank as a leading church festival. Abstinence from servile work, which had been enjoined by the Apostolical Constitutions (lib. v. ¢. 13, lib. viii. c. 33), was enacted by the emperors Theodosius il. and Justinian, together with the suspension of public games and legal business. Another custom of the early church was for the metropolitans at the Epiphany to announce to their suffragan bishops the date of Easter and the other movable feasts (Indictio Paschalis) by letters known as " Festal Epistles." To describe the curious and picturesque customs connected with this festival would carry us far~~

~~beyond our limits. They may be found in Hone's Zvery- Day Book and Year Book, Chambers's Book of Days, and Brand's Popular Antiquities. One custom deserves to be particularized. The sovereigns of England on this day make an oblation of gold, frankincense, and myrrh at the altar of the Chapel Royal. This is now performed by~~

~~deputy, but till comparatively recent times the offering was made in person.~~

~~Bingham, Origines, bk. xx. ch. iv. pp. 6-9; Augusti, Handbuch der Christl. Archéol. vol. i. pp. 542 ff., and vol. ii. p. 3876; Binterim, Denkwiirdigkeiten, vol. v. part 1, pp. 310 #7. (BE. V.)~~

~~EPIPHYTES. See Borany, vol. iv. p. 94.~~

~~EPIRUS, or Epirus, was that part of Northern Greece which stretched along the Ionian Sea from the Acrocer- aunian promontory on the N. to the Ambracian gulf on the §., and was conterminous on the landward side with Illyria, Macedonia, and Thessaly—thus corresponding to the southern portion of Albania. The name Epirus ("Hrretpos, or in the local dialects "Acupos) signified main- land, and was originally applied to the whole coast south- ward to the Corinthian gulf, in contradistinction to the neighbouring islands, Corcyra, Leucas, &c. The country~~

~~| is all more or less mountainous, especially towards the east,~~

~~where the Pindus chain, in its main massif of Lacmon, feeds the fountains of nearly all the great rivers of North- ern Greece,—the Peneus, the Achelous, the Arachthus, and the Aous. In ancient times it did not produce corn suffi- cieut for the wants of its inhabitants ; but it was celebrated, as it has been almost to the present day, for its cattle and its horses. According to Theopompus, a writer of the fourth century B.c., the Epirots were divided into fourteen independent tribes, of which the principal were the Chaones, the Thesproti, aud the Molossi. The Chaones, identified by one theory with the Chones who dwelt on the Tarentine gulf in Italy, inhabited the northern portion of the country along the Acroceraunian shore, the Molossians the inland district of which the lake of Pambotis or Yannina may be regarded as the centre, and the Thesprotians the region to the north of the Ambravian gulf. Aristotle places in Epirus the original home of the Hellenes, though the com- mon opinion among his countrymen traced them rather to Thessaly. In any case Epirus, in spite of its distance from the chief centres of Greek thought and action, and the fact that its~~

~~inhabitants were hardly regarded as other than barbarians, exerted even at an early period no small influence on Greece, by means more especially of the oracle of Dodona. One of the earliest and most flourishing settle- ments of the Greeks proper in Epirus was the Corinthian colony of Ambracia, which give its name to the neighbour- ing gulf. The happy results of the experiment appear to have tempted other Greek states to imitate the example, and Elatria, Bucheta, and Pandosia bore witness to the enterprise of the people of Elis. Among the other towns in the country the following were of some importance :— in Chaonia—Palaste and Chimera, fortified posts to which. the dwellers in the open country could retire in time of war; Onchesmus or Anchiasmus, now represeuted by Santi Quarante, or 4 oxdAa Tov 'Ayiov Sdpavra, the Harbour of the Forty Saints ; Pheenice, still so called, the wealthiest of all the native cities of Epirus, and after the fall of the Molossian kingdom the centre of an Epirotic League ; Buthroton, the modern Butrinto; Phanote, well known from its connection with the wars of the Romans; and Hadrianopolis, founded by the emperor whose name it bore ; in Thesprotia—the Elean settlements already mentioned ; Cassope, the chef lieu of the Cassopzans, the most power- ful of the Thesprotian clans; Ephyra, afterwards Cichy- rus, a very ancient site, identified by Leake with the mon- astery of St John three or four miles from Phanari, but by Bursian with the ruins on the hill of Kastri at the northern~~

~~end of the Acherusian Lake ; and in Molossia—Passaron, where the kings were wont to take the oath of the constitu- tion and receive their people's allegiance; and Tecmon, Phylace, and Horreum, all of doubtful identification. The Byzantine town of Rogus is probably the same as the modern Luro, formerly known as Oropus.~~

~~History. —The kings or rather chieftains of the Molossians, who ultimately extended their power over all Epirus, claimed to be de- secnded from Pyrrhus, son of Achilles, who, according to the legend, settled in the country after the sack of Troy, and transmitted his kingdom to Molossus, his son by Andromache. The early history of the~~

~~dynasty is very obscure ; but Admetus, who lived in the 5th century B.0., has become famous for his hospitable reception of the banished Themistocles, in spite of the grudge that he must have har- boured against the great Athenian, who had persuaded his country- men to refuse the alliance tardily offered by the Molossian chief when their victory against the Persians was already secured. He was suc- ceeded about 429 B.c. by his son or grandson, Tharymbas or Arymbas I. who being placed by a decree of the people under the guardianship of Sabylinthus, chief of the Atintanes, was educated at Athens, and thus became at a later date the introducer of a higher kind of civilization among his subjects. Alcetas, the next king mentioned in history, was contemporary with Dionysius of Syracuse (about 385 8.c.) and was indebted to his assistance for the recovery of his throne. His son Arymbas II. (who succeeded by the death of his brother Neoptolemus) ruled with prudence and equity, and gave encouragement to literature and the arts. To him Xenocrates of Chalcedon dedicated his four books on the art of governing ; and it is specially mentioned that he bestowed great care on the education of his brother's children. Troas, one of his nieces, became his own wife ; and Olympias, the other, was mar- ried to Philip of Macedon, and had the honour of giving birth to Alexander the Great. On the death of Arymbas, his nephew Alex- ander, the brother of Olympias, was put in possession of the throne by the assistance of Philip, who was afterwards assassinated on occasion of the marriage of the youthful king with his daughter Cleopatra. Alexander was the first who bore the title of King of Epirus, and he raised the reputation of his country amongst foreign nations. His assistance having been songht by the Tarentines against the Samuites and Lucanians, he made a descent, 332 B.o., at Pestum, near the mouth of the river Silarus, and reduced several cities of the Lucani and Bruttii ; but in a second attack upon Italy he was surrounded by the enemy, defeated, and slain, near the city Pandosia, in the Bruttian territory.~~

~~acides, the son of Arymbas II., succeeded Alexander, and es- poused the cause of Olympias against Cassander; but he was de- throned by his own soldiers, and had hardly regained his position when he fell, 313 B.c., in battle against Philip, brother of Cas- sander. He had, by his wife Phthia, the celebrated Pyrrhus, and two daughters, Deidamia and~~

~~Troas, of whom the former married Demetrius Poliorcetes. His brother Alcetas, who succeeded him, continued the war with Cassander till he was defeated; and he was ultimately put to death by his rebellious subjects, 295 B.o. The name of Pyrrhus, who next ascended the throne, gives to the history of his country an importance which it would never have other- wise possessed; but for an account of his life we must refer to the article PyrRHUS.~~

~~Alexander, his son, who succceeded in 272 B.c., attempted to seize on Macedonia, and defeated Antigonus Gonatas, but was himself shortly afterwards driven from his kingdom by Demetrius. He recovered it, however, and spent the rest of his days in peace. Two other insignificant reigns brought the family of Pyrrhus to its close, and Epirus was thenceforward governed by a pretor, elected annually in a general assembly of the nation held at Passaron. It imprvu- dently espoused the cause of Perseus in his ill-fated war against the Romans, 168 B.c. ; and it was consequently exposed to the fury of the conquerors, who destroyed, it is said, 70 towns, aud carried into slavery 150,000 of the inhabitants. It never recovered from this blow. At the dissolution of the Achzan league, 146 B.c., it be- came part of the province of Macedonia, receiving the name Epirus Vetus, to distinguish it from Epirus Nova, which lay to the east.~~

~~On the division of the empire it became the inheritance of the emperors of the East, and remained under them until the taking of Constantinople by the Latins, in 1204, when Michel Angelus Com- nenus seized on Atolia and Epirus. On the death of Michel in 1216, these countries fell into the hands of his brother Theodore. Thomas, the last of the direct line, was murdered in 1318 by his nephew Thomas, lord of Zante and Cephalonia, and his dominions were dismembered. Not long after, Epirus was overrun by the Samians and Albanians, and the confusion which had been growing since the division of the empire was worse confounded still. Charles II. Tocco, lord of Cephalonia and Zante, obtained the recognition of his title of despot of Epirus from the emperor Manuel Comnenus, im. the beginning of the 15th century; but his family was deprived of their possession in 1431 by Amurath IT. In 1443, Scanderbeg,~~

~~king of Albania, made himself master of a considerable part of Epirus; but on his death it fell into the power of the Venetians, from whoin it passed again to the Turks, under whose domination it still remains.~~

~~Nauze, "Rech. hist. sur les p2uples qui s'établirent en Epire," in Ifém. de ? Acad. des IJnscr., 1729; Wolfe, *' Observations on the Gulf of Arta,' in Jour, Roy. Geog. Soc., 1834; Merleker, Darstellung des Landes und der Bewohner von Epeiros, Kénigs., 1841; J. H. Skene, " Remarkable Localities on the Coast of Epirus," in Jour. R. G. S.,1848 ; Bowen, Athos, Thessaly, and Epirus, 1852; Hahn, Albanesische Studien, 1854: Bursian, Geogr. von Griecheniand, vol. i., 1862; Major R. Stuart, " On Phys. Geogr. and Nat. Resources of Epirus," in J. R. G. S., 1869; Guido Cora, in Cosmos; Dumont, "Souvenirs de l'Adriatique, de I'Epire,"" &c., in Rev. des Deux Mondes. 1872.~~

~~EPISCOPACY. By Episcopacy we understand that form of church organization in which the chief ecclesiastical authority withiu a defined district or diocese is vested in bishops (episcopz), having in subordination to them priests, or presbyters, and deacons, and with the power of ordina- tion. Of this form of government there are traces in apostolic times ; evidences of its existence become increas- ingly frequent in the sub-apostolic period ; until when the church emerges from the impenetrable cloud which covers the close of the 1st and the beginning of the 2d century, we find every Christian community governed by a chief functionary, uniformly styled its " bishop," with two inferior orders of ministers under them, known as " presbyters" and "deacons." It may he regarded as an established fact that before the middle of the 2d century diocesan Episcopacy had become the rule in every part of the then Christian world, and we have now to inquire when and under what circumstances this form of government arose, and with what amount of authority it is invested. On these points the most opposite opinions have been maintained. In the words of Dr Lightfoot (to whose admirable dissertation "On the Christian Ministry," appended to his Commentary on the Epistle to the Philip- pians, we, though differing from him in some points, would once for all~~

~~acknowledge our obligation), “Some have recognized in Episcopacy an institution of divine origin, absolute and indispensable ; others bave represented it as‘ destitute of all apostolic sanction and authority.” Some, that is, regard it as of the de esse of a church, so that no Christian community can have any right to claim to be considered, in the true sense, a branch of the church catholic if it have not episcopal organization. Others, on the other hand, consider it as of the de bene esse of a church, desirable to its good government, and to the maintenance of evangelical truth and apostolical order, but not essential to its existence. It will be our object in this article to review the evidence as to the origin of Episcopacy afforded by history, and to present the facts and the plain inferences from them in a candid and dispassionate spirit.~~

~~I. In examining the question of the divine authority of Episcopacy, we have to consider carefully what we mean by the phrase. Do we intend that Episcopacy stands on the same level as Baptism and the Lord’s Supper as a direct ordinance of Christ “ generally necessary for salva- tion ;” or do we mean that it was called into being by the apostles and first teachers of the Christian church under that most real, though perhaps to them insensible, direc- tion of the Holy Spirit, to which their decisions and actions are continually ascribed in the sacred record (Acts viii. 29, 195 sei citiw?; cy. 28, avi. 6, 7, aikz. 21, Re. 23)) Of the former opinion, though asserted as an unquestion- able fact by many learned defenders of Episcopacy, we may safely assert that there is not a trace in the New Testament. That the episcopal organization of His church was among the “things pertaining to the kingdom of God” which formed the subject of the intercourse of Christ and the twelve in the interval between His re- surrection and His ascension is a mere hypothesis desti- tute of the semblance of proof. Neither the Acts nor the Epistles contain the slightest hint of any such autho- ritative communication being made before our Lord’s~~

~~EPESOCOr? OF~~

~~ascension, or of any direct revelation to that effect sub- sequent to that event, binding on the church for all time. The conclusion that would be~~

~~naturally drawn from the brief and scanty references to the organization of the Christian ministry in Holy Scripture is that the apostles were left free to act, under the direction of the Holy Spirit, as they might from time to time judge to be most for the good of the church. There can be no question that this was so in the appointment of the seven whose office is commonly identified with the Diaconate (Acts vi.) ; and, though the evidence is less distinct, it appears to have been thle case with the Presbyterate (Acts xiv. 23), while the authority of Timothy and Titus, in whom we see the first adumbration of diocesan Episcopacy, is plainly represented as delegated by the Apostle Paul with the view of carry- ing out the arrangements which special circumstances ren- dered desirable for the particular time and place. There is certainly nothing in the apostle's language to either of them to support the idea that by such delegation he was carrying into effect a divine ordinance of perpetual obliga- tion.~~

~~If, however, we interpret the expression "divine authority" in the larger sense, as including all that the apostles did, as the holders of Christ's express commission—" as my Father hath sent me even so send I you" (John xx. 21)—through the inspiration of the Holy Ghost, for the edification of the church of which they were the divinely appointed governors and propagators, there need be as little scruple in allowing the divine authority of Episcopacy as there is in thie case of other ordinances of the Christian church, such as the observation of the Lord's day, the baptism of infants, and confirmation. An institution of which traces are seen in apostolic times, and which is found prevailing throughout the church in the age succeeding the apostles, and con- tinuing everywhere without a break of continuity to the 16th century, and in most parts of Christendoin to the present day, cannot be looked upon as anything less than the deliberate expression of the mind of the church. In this qualified sense we may safely adopt the verdict of Hooker, "that if anything in the churcli's government, surely the first institution of bishops was from heaven,—was even of God,—the Holy Ghost was the author of it,.... and is to be acknowledged the ordinance of God no less than that ancient Jewish regiment, whereof though Jetliro was the deviser, yet after that God had allowed it all men were~~

~~subject unto it, as to the polity of God not of Jethro" (Eccl. Polit., bk. vii. c. v.§ 2, 10).~~

~~II. The twelve apostles were the depositaries of Christ's commission as the founders and governors of His churcli (Matt. xvi. 19, xviii. 18, xxviii. 19, 20; Mark xvi. 15; Luke xxiv. 47, 48; John xx. 21-23). In the Acts we fiud them its sole directors and administrators. The whole ministry of the church was, in the germ, included in the apostolate, from which it was gradually developed as occasion required by the successive delegation of the powers lodged with the apostles to other members of the church, first as their substitutes and afterwards as their successors. Thus the Christian ministry, as Canon Robertson has remarked (History of the Christian Church, vol. i. p. 8), "was developed not from below but from above," not by elevation, but by devolution. The first delegation was to the seven, for the discharge of the secular functions and lower spiritual offices for which the rapid growth of the church rendered the apostles personally un- eyual, This was succeeded by the delegation of the duties of teaching, government, and discipline to presbyters or elders, especially in congregations (such as those planted by Paul and Barnabas in Asia Minor) over which the apostles were unable to exercise any continuous personal superin- tendence (Acts xiv. 23). In Hooker's words, " the form~~

~~or regiment by them established at first was that the laity, or people, should be subject unto a college of ecclesiastical persons which were in every such city appointed for that purpose" (Hcecl. Polit., bk. vii. ch. v. §1). It may be desirable here to remove the confusion which may be pro- duced by the ambiguous use of the word " bishop," értoxoros, in the New Testament. It happens in all languages that in process of time the meaning of a word changes. That which in onc generation is a general term, in the next contracts into a teclinical term, ora word which designated one office becomes the title of another. It is so with the word "bishop." In its fundamental sense of an " overseer," "inspector," it was not originally a term of office at all. When it appears as snch in the New Testa- ment, it is simply synonymous with "~~

~~presbyter," the same officer of the church being called indifferently by the one or the other name. The " presbyters" or "elders" of the Ephesian church summoned by St Paul to meet him at Milctus (Acts xx. 17) are in verse 28 designated by him "bishops," or ' overseers," of the flock. In the pastoral epistles tlle words are used indifferently. Corresponding directions are given to Titus concerning tle ordaining of "elders" (Tit. i. 5-7), and to Timothy for the ordination of "bishops" (1 Tim. iii. 1-7), while the identity of the two is further evidenced by the use of the term "bishop" in Tit. i. 7, and "elders," 1 Tim. v. 17-19. St Peter also, when exhorting the presbyters, as their "brother presbyter " (ovprpeoBvrepos), to the zealous fulfil- ment of their charge, speaks of it as " the work of an over- seer,"or "bishop " (éricxorotvres) (1 Pet. v. 1, 2.) The titles continue synonymous in the epistle of Clement of Rome (Epist., i. § 42,44). That the offices were identical in the apostolic age is also more than once asserted by St Jerome, writing towards the close of the 4th century (e.7., "the apostle shows us plainly that presbyters and bishops are the same… . it is proved most clearly that a bishoo is the same as a presbyter."—WZpist. exlvi.; see also Epist. xix; and Ad Tit. i. 8), as well as by Chrysostom, Theodoret, and others, and may be regarded as indisput- able.~~

~~Any conclusion, therefore, drawn from the use of the term "bishop " in the New Testament, as to the existence of the episcopal office, would be fallacious. "Things," however, as Hooker has said, " are always ancienter than their names," and letting go the name and coming to the thing, indicatious.may be discovered in the Acts and pastoral epistles of something closely answering to a localized episcopate in apostolic times. James, the Lord's brother, occupies a position in the church at Jerusalem, associated with and yet distinct from and supcrior to his presbytery, and in some respects, at least in Jerusalem, higher than the apostles themselves, which presents many features of the diocesan episcopate of later times (Acts xii. 17, xv. 13, 19, xxi. 18; Gal. i. 19, ii, 9, 12), and tends to confirm the unanimous statement of early writers that he was the first bishop of Jerusalem. (Hieron., De Script. Eccles., ii; Euseb., Hist. Eccl., ii, 1.) But in him we have the only example of such an organization presented in the Acts. As Professor Shirley has remarked (Apostolic Age, p. 133), his position was in important~~

~~respects ex- ceptional. Whether one of the twelve or not, he was ranked with the apostles (Gal. i. 19), and his authority was therefore inherent, not derived from them. And therefore for years he remained the only Christian bishop. We have to pass on to the pastoral epistles of St Paul (the latest that proceeded from his pen) before we again meet with any clear traces of the existence of Episcopacy. The evidence of these epistles, however, is unquestion- able, whatever the exact nature of the office to which Timothy and Titus were designated by St Paul, Whether~~

~~permanent or temporary, whether their authority was that of diocesan bishops, or, as was more probably the case, of vicars-apostolic, it is certain that their power was a delegated one,—that they were acting as the substitutes of the apostle, aud that their duties were in essence identical with those of the episcopate. In Dr Lightfoot's words, 'they were in fact the link between the apostle, whose superintendence was occasional and general, and the bishop who exercised a permanent supervision over an individual congregation."~~

~~If the "angels" of the seven churches addressed in the early chapters of the Apocalypse could be certainly identi- fied with bishops, we should have a further evidence of localized Episcopacy in apostolic times of the highest value. But this interpretation, though very generally accepted, is not sufficiently free from question to bear the strain of argument.~~

~~HT. An almost impenetrable cloud hangs over the closing years of the 1st and the opening of the 2d century. When it begins to disperse we see an episcopal organization every- where established, and working with a quiet regularity, which gives no indications of its keing a novel experiiment, still less of its having been imposed by superior authority on a reluctant community. How is this momentous change, without a counterpart in history, to be accounted for? How, 'to adopt Professor Shirley's image, can we bridge over "the immense chasm which divides the rudi- mentary order of the churches planted by St Paul from the rigorously defined and universal Episcopacy which we find described by Ignatius? The more we look into the circum- stances the more the marvel grows."~~

~~‘The solution of this problem which appears to satisfy the various conditions most adequately is—that episcopal organi- zation was developed gradually according to the require-~~

~~ments of different churches ; that, as Jerome more than once~~

~~distinctly asserts, it was called into being by the experi- ence of the need of some coercive power to check dissen- sions, repress rising heresies; and supplement the authority of the rapidly diminishing body of the apostles ; and that, taking Tertullian as a trustworthy exponent of the tradi- tions of the 3d century, its first appearance was con- nected with the latest survivor of the Twelve, the Apostle John. An examination of the early history of the various churches founded in different parts of the world during the Ist century indicates that the establish- ment of Episcopacy was not a single definite and formal act proceeding from a central authority, such as the apostolic council after the fall of Jerusalem, imagined with- out sufficient evidence by Rothe, but a gradual and pro- gressive development, advancing faster in some places than in othérs, as the growth of the Christian community and the increasing inability of the apostles personally to regu- late the churches they had founded required. St Paul’s case presents a picture of what must have been occurring in every part of the Christian world. The apostle had at first to bear in his own person “the care of all the churches” (2 Cor. xi. 28), ¢.¢., of all those which looked up to him as their founder. His insufficiency to bear such a burden alone ‘forced itself upon him as these churches became more numerous. Presbyters and deacons, as Epiphanius has remarked (Her., lxxv. 5), could conduct the administration of a church for a while. But occasions arose, as at Ephesus and Crete, when the continuous presence of an authorized ruler became essential to check serious mischief. Letters, how- ever “ weighty,” could not compensate for the want of personal influence. It was impossible for the apostle, even when there was no restraint upon his liberty, to meet all the claims upon him in his own person. He therefore dele- gated his authority (whether temporarily or permanently does not materially affect the question) to others who acted by his commission, and who were charged among other~~

~~duties with the perpetuation of the Christian ministry (1 Tim. iii. v. 22; 2 Tim. ii. 2; Tit.1.5). We know from his pastoral epistles that St Paul did this to meet the special needs of the churches of Ephesus and Crete; and we may not unreasonably believe that the same measure was resorted to by him as well as by the other apostles in other churches where a similar emergency called forit. The language of St Jerome, which has been so often unfairly employed to weaken the cause of Episcopacy, when properly interpreted points to this origin. He asserts that the episcopal office was established as a remedy against schism, and to puta curb upon the factious spirit which, by the instigation of the devil, had sprung up in various churches, notably in that of Corinth As long as the apostolic founder of a church was living, and was able personally to interpose, this need for a bishop's authority would not be felt. As this resort closed, as it did very gradually, the development of Episcopacy advanced, with a steady though uneven pro- gress, until it became universal. Jerome's oft-quoted state-~~

~~'ment that the superiority of bishops to presbyters was~~

~~rather due to the custom of the church than to any actual ordinance of the Lord, "ex ecclesiee consuetudine magis quam dispositionis Domiuice veritate" (Hieron. in 7%. i. 5), does not in any way contradict its apostolical origin, which is indeed implied in the context of the passage, but merely 'signifies that the institution does not rest upon written words of Christ.~~

~~If we further ask by what authority it was decided that, in Jerome's words (u.s.), "to root out the thickets of heresies all the responsibility should be deferred to a single person," the testimony of antiquity, scanty, it is true, but adequate, affirms that this authority was apostolic, and points to St John as its chief though not exclusive source. Tertullian expressly asserts that "the order of bishops, if traced back to its origin, will rest upon Jobn as its author" (Adv. Marcion., iv. 5). This statement is confirmed by Clement of Alexandria, who relates that St John, after his return to Ephesus from Patmos, on the death of Domitian, was in the habit of ravking progresses through the~~

~~neighbouring districts, “in one place to establish bishops, in another to organize whole churches, in another to ordain individuals indicated by the Holy Spirit” (Apud Euseb., //ist. Hccl., iii. 23). | Irenzeus, the disciple of Polycarp, whose authority on srch a fact is indis- putable, says that his revered master had been “ established by apostles in Asia as bishop in the church of Smyrna” (Iren., iil. 38, § 4), a statement which is confirmed by Tertullian (De Prescript., 32). Polycarp is also distinctly mentioned as bishop of Smyrna, together with Onesimus, bishop of Ephesus, in the genuine letters of Ignatius. The names of Papias of Hierapolis, Sagaris of Laodicea, and Melito of Sardis, all contemporary bishops with Polycarp, supply “irrefragable evidence of the early and wide extension of Episcopacy throughout proconsular Asia, the scene of St Jolin’s latest labours” (Lightfoot, w.s., p. 212), and, “ unless all historical testimony is to be thrown aside as worthless, demonstrate that the institution of a localized episcopate — what Hovker calls “bishops with restraint,” in contrast with the “ episcopate at large” exercised by the apostles— “cannot be placed later than the closing years of the Ist century, and cannot be dissevered from the name of St~~

~~1 We may compare the language of St Paul, 1 Cor.: vii. 10, 12, “to the married I command, yet not I, but the Lord . . . to the rest speak I, not the Lord,” where the contrast is not, as is sometimes supposed, between the apostle speaking by inspiration and without inspiration, but between the apostle’s words and an actual “dictum” of our Lord (Mark x. 11). Dean Stanley remarks, “ the natural distinction between the sayings of Christ and the sayings of the apostles is here exempli- fied, Christ laying down the general rule, the apostles applying it to the particular emergencies which arose out of the relations of the particular churches with which they had to deal ” (Corinthians, p. 110°.~~

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~~| but they may be accepted as satisfactory evidence of the~~

~~John” (Lbid. p. 231). There is no reason for supposing that this was the result of the deliberations of an apos- tolic council, or that it was enforced by an authoritative decree. The doubtful and somewhat~~

~~legendary tale of Hegesippus, preserved in Eusebius, of the calling of such a council at Jerusalem after the fall of the city and the death of St James,—even if it be conceded that at that~~

~~late period any considerable number of the apostolic body |}~~

~~were alive, and were within reach of such a summons,— expressly limits its purpose to the appointment of Symeon, the son of Clopas, as a successor to St James. That this gathering lad in view so momentous a step as the estab- lishment of Episcopacy as the form of government for the church for all time is a mere hypothesis, unsupported by any ancient testimony or tradition. Neither have we evidence for any definite decree proceeding either from an apostolic council, or, if that be rejected as baseless, from St Jolin's individual authority. In the words of Dr Lightfoot, w.s., p. 205,—~~

~~"The evident utility and even pressing ueed of such an office, sanetioned by the most venerated name in Christendom, would be sufficient to seeure a wide though gradual reception. Such a reception, it is true, supposes a substantial harmony and freedom of intercourse among the churches which remained undisturbed by the troubles of the times; but the silence of history is not at all un- favourable to this supposition. In this way, during the historical blank which extends over half a century after the fall of Jerusalem, Episcopacy was matured, and the Catholic church consolidated."~~

~~The opening epoch is the only portion of the history of Episcopacy over which any uncertainty hangs. After the commencement of the 2d century, wherever we hear of the existence of a local church we find it, without any excep- tion, and with hardly any variety, under the government of a bishop, and that without any indication of there ever having been a time when it was otherwise. The existing bishop is usually spoken of as the successor of other bishops reaching in unbroken line to apostolic times. Episcopacy is everywhere uniformly established, and its claim to an unbroken descent from the apostles is every- where asserted, and nowhere called in question.~~

~~In the words of Dr Arnold, no prejudiced champion of Episcopacy,~~

~~“The beginning of the 2d century found the church under the government of bishops, many of whom derived their appointment from the apostles themselves at only one or two removes,—that is to say, they had been chosen by men who had themselves been chosen by an apostle, or by persons such as Timotheus, in whom an apostle lad entertained full confidenee” (Fragment on the Church, p. 124).~~

~~Trenzeus, writing at the close of the 2d century, argues for the apostolical purity of the faith of the Church of Rome from the unbroken chain by which it was connected with the apostles. ‘Linus was appointed by the apostles themselves ; Anacletus succeeded Linus; Clemens, Ana- cletus ; after whom followed in regular succession Euaristus, Alexander, Sixtus, Telesphorus, Hyginus, Pius, Anicetus, Soter, down to Elcutherius (the bishop of his own day), who holds the episcopal position twelfth in order from the apostles” (lib. il. ¢. 3, § 3).~~

~~The challenge given by Tertullian, a little later, to the heretics of his day, to “ produce the roll of their bishops running down in due succession from the beginning in such a manner that that first bishop of theirs shall be able to show for his ordainer or predecessor some one of the apostles, or of apostolic men” (De Prescript., ¢. 31), is equally convincing. In the following paragraph, where, after referring to the appointment of Polycarp at Smyrna by St John, and Clement at Rome by St Peter, he pro- ceeds—“ This is the manner in which the apostolic church hand down their registers, and exhibit those whom, having been appointed to their episcopal seats by apostolic law.”~~

~~Catalogues of the bishops of almost all the earlier churches arc in existence. These may contain some doubtful names ;~~

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~~belief, in the age nearest to that which they refer, that, in the words of Hooker, “under them [the apostles], and by their appointment, this order began, which maketli many presbyters subject unto the regiment of some one bishop” (Eccl. Polit., vii. 10). a~~

~~Once established, the value, nay, the necessity, of the episcopal form of government secured its permanence. It was not only, as in its first beginnings may have been its chief object, a remedy against schisms, and a safeguard against heresies, but it was the outward symbol of the unity of the church, and one of the most effectual methods by which that unity was maintained. The individual bishop was the visible representative of the corporate life of the individuals making up a congregation. The maxim of St Cyprian, " Ecclesia est in Episcopo" (Cyp., iv. Ep. 9), was universally recognized. 'They were the representatives of the church, and without them the church had no existence ; those were not tlie prayers of the church, that was nut ber communion which the bishop did not either preside at or sanction" (Arnold, u.s., p. 124). The bishop was regarded as the channel of divine grace, the bond of Christian brotherhood. Episcopacy, moreover, was not only the bond tying all the members of a church into one body, but also that which united the scattered churches into one organic whole. The collective episcopate formed the system of "joints and bands" by which the body of the catholic church was knit together. This idea has been well expressed by the present bishop of Edin- burgh, Dr Cotterill—~~

~~'*The episcopal office was the means of the confederation of the church, whether in the several provinces or throughout the world. The office was not something isolated—the mere promotion of an individual to eertain functions ; it was and is the result and the means of church federation, connecting first of all each generation with that which preceded, and then each bishop with the episcopal body, and through it with the whole church, the functions of the: office being exercised in union with other members of the federation, from whom mission is received, and in obedience to its laws, and not according to the mere will of the individual. Froin these considerations it is obvious that Episcopacy and organic unity are entirely of the same essenee (Charge to the Synod of the Diocese of Edinburgh, 1877).~~

~~The idea of Episcopacy thus set forth, as the unifying instrumentality in the church of Christ, is that which holds the prominent place in the estimate of the first Christian writer in whom we have any detailed reference to episcopal organization, St Ignatius of Autioch, In his eyes~~

the bishop represents the church, and is the centre of unity to the body, a safeguard against disunion, and a security for the maintenance of discipline and the harmonious co-operation of its various constituents. With Trenzeus tlie idea of the bishop as the centre of unity undergoes some modification. Heresy was the church's danger in his day, as intestine strife had been its danger in Ignatius's time. The unity of which Irenzeus, like his: later contemporary Tertullian, regards Episcopacy as the safeguard and guarantee is the unity of the faith. The one undying episcopate, with its direct descent from the apostles, was the assurance of the permanence of apostolic truth. The bishop, as the successor of the apostles, was the depositary of primitive truth, the inheritor of apostolic tradition. 'If you wish to ascertain the doctrine of the apostles, you must apply to the church of the apostles." The views of the necessity of Episcopacy expressed by- these early writers may seem to us sometimes overstrained, and their language exaggerated. But to them tliese exalted; terms were most real. They were no more than the natural expression of their experience of the strength and safety derived from the organization which they most ceertainly believed to be the gift to the church of: her Great Head. Whatever divergencies of view there may be as.

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to the origin and authority of Episcopacy, and of its general necessity, an unprejudiced survey of the early history of the church will show how important a part it played in the maintenance of its life and health, both in the promotion of organic unity and the preservation of purity of doctrine. 'The constitution of the church is ordained of God; but it is ordained because it is adapted for man." Once established in the chief centres of national life, the growth of Episcopacy was steady, and gradually covered the whole surface of Christendom with its ramifications. By degrees a systematic organization sprang up, by which neighbouring churches were grouped together for the purposes of consultation and self-government. The chief city of each district had the civil rank of the " metro- polis," or mother city. There the local synods naturally met, and the bishop—styled "metropolitan," from his position— took the lead in the deliberations, as " primus inter pares,"

~~and acted as the representative of his brother bishops in their intercourse with other churches. Thus, though all bishops were nominally equal, a superior dignity and authority came by general consent to be vested in thic metropolitans, which, when the churches becameestablished, received the stamp of ecclesiastical authority. A still higher dignity was assigned to the bishops of the chief seats of government, such as Rome, Antioch, Alexandria, and subsequently Constantinople ; and among these the bishop of Rome naturally had the precedence. In primitive times each city bad its own bishop, with a number of " chorepi- scopi," or country bishops subordinate to him, to take the oversight of the smaller towns or villages of the district, as their deputies. Whether these " chorepiscopi" were uni- versally of episcopal rank is an unsettled question. It is probable that no strict rule was observed on this point, and that, in accordance with the duties they were called to discharge, while some were bishops in the strict sense of the word, others had only received the orders of a presbyter. Convenience dictated that the ecclesiastical divisions should geuerally follow the civil divisions of the empire. When Christianity became established under Constantine, and the church and state represented different functions of the body corporate, this rule was strictly followed out, in accordance with the new divisions of prefectures and dioceses introduced by him. The term "diocese" was used in a much more extensive sense than that to which it was after- wards restricted. The empire was divided into four pre- fectures :—1, the East; 2, Illyria; 3, Italy; 4, Gaul,—each comprising a varying number of dioceses, each diocese containing within itself several provinces. Thus Asia, one of the five dioceses of the prefecture of the East, in- cluded ten provinces, and Pontus seven. The provinces were in their turn subdivided into districts bearing the designation of parcchie (mapotxia), which answered to dioceses in the modern sense of the term. Each of these " parcechize " had its own bishop, who was subordinate to the metropolitan, who had his see in the capital of the province. These metropolitans were subject to the authority of the bishop of the chief city of the political diocese, who in the East was styled "exarch," in the West "primate." A higher dignity still was assigned to the chief bishops of the great cities of the empire, such as Rome, Constantinople, Antioch, and Alexandria. To these, with the addition of Jerusalem, the title of " patriarch," which~~

had originally been common to all bishops, was more immediately but not exclusively restricted after the Council of Chalcedon, 451 a.p. In the West the title " patriarch " was employed with greater latitude for metropolitan bishops generally. Even so late as the 11th century we find the metropolitans of Aquileia and Grado so termed. (Mansi, xvi, 341; xviii. 465, 499.) The occupants of these primatial sees were also designated "archbishops." The

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term " cecumenical bishop" is sometimes found applied to the bishops of Rome, while that of " cecumenical patriarch " was assumed by the bishops of Constantinople, though more as a title of dignity than as implying any claims to univer- sal authority. Theoretically all these primatial sees were co-ordinate in authority, and were mutually independent of one another. By degrees the bishops of the more im- portant cities overshadowed their brethren, and exercised a supremacy which, though rather due to custom than to re- cognized claims, was increasingly acquiesced in from the manifest advantage of having a strong central power which could interfere in theological controversies or ecclesiastical disputes, with an authority to which all would bow. The gradual growth of the supremacy of the bishop of Rome as the chief pastor in the Western Church, and the ecclo- siastical head of the imperial city, will be the subject of a separate article.

The primitive rule was that, except in the case of coadjutor bishops, each diocese, in the modern sense, should have but one bishop, and that no bishop should have more than one diocese. Both rules were, however, in subsequeut times violated. When the Arian controversy was dividing the Christian world, it was no uncommon occurrence for one see to have two or three rival bishops, all denouncing and excommunicating one another. At Antioch in the latter half of the 4th century there were two orthodox bishops, Paulinus and Meletius, recognized respectively by the Western and the Eastern church, an Arian bishop Euzoius, and a fourth of the Apollinarian sect. After the rise of the Novatian schism many cities had both an ortho- dox and a Novatian bishop. The vicious practice for one bishop to hold a second

~~see "in commendam" was of gradual growth. Its origin was innocent. When a see was vacant and there was a difficulty about appointing a successor, its oversight was commended temporarily to a neighbouring bishop. The same was the case when a bishop was suspended for crime, or when a diocese had been so devastated by the inroads of heathen that its Christian population was too small to demand the services of a separate overseer. But that which began in necessity was continued by covetousness, until it culminated in the flagrant abuse which reached its height just before the Reformation, when the revenues of several sees were accumulated on a single individual, who probably was equally careless of the spiritual interests of all. Thus Cardinal Wolsey was at the same time archbishop of York and bishop of Durham and Winchester, and enjoyed the wealthy see of Tournay in France.~~

~~The translation of a bishop from one see to another was forbidden by the canons of the primitive church. The only exception was where it was evident that the motive could not be increase of wealth or temporal aggrandizement, as when a bishop removed from a richer to a poorer see, or from an easier to a more laborious one; or when there was the prospect of spiritual advantage to the church. Though many instances of translation are found in early times, they are usually exceptional cases, and it may be safely asserted that until the growth of secularity and covetousness in the hierarchy had made rich sees an object of eager competition among prelates, the practice was uni- versally condemned as an act parallel to divorce, only to be justified by the plea of necessity or benefit to the church.~~

~~It is unnecessary to trace the episcopate in the various churches in communion with the see of Rome. With hardly any, if any exceptions, the succession of bishops reaches in an unbroken line to the earliest ages of Christi- anity. This is also true of the churches of the orthodox communion in the East. Their episcopal pedigree exhibits few if any gaps, and the integrity of the record is usually beyond question.~~

~~hPa et COR BC cy~~

~~It will be a more important task to examine the history of the episcopate in those countries of Europe which re- tained that form of~~

~~church government after renouncing the papal authority, as well as in America and the de- pendeucies of Great Britain, with the view of testing its claims in each instance to what is known as * apostolical succession," 2.¢, an uninterrupted line of episcopally con- secrated prelates reaching up to the first ages of the church.~~

~~In England the primitive church, by whomsoever founded (the Eastern theory is certainly baseless), was undoubtedly Episcopal. The names of three British bishops, those of York, London, and Caerleon,! are found among those who attended the Council of Arles in 314, With the ancient British church, however, the later Epis- copacy of England has no connection. The existing Church of England is the lineal descendant of that planted in Kent by St Augustine at the end of the 6th century. The descent of her bishops is traced continuously by one of the most honest and accurate of her living historians, Professor Stubbs, in his Episcopal Succession in England. The separation from the see of Rome caused no breach in the continuity. Archbishop Parker, from whom the pre- sent Episcopacy descends, was consecrated December Li, 1559, by Bishop Barlow of Chichester (himself consecrated by Archbishop Cranmer June 11, 1536), Scory of Hereford, Coverdale of Exeter, and Hodgkins of Bedford. The ridiculous " Nag's Head Fable," by which some unscrupu- lous partisans have endeavoured to discredit the Anglican succession, was long since repudiated by the Roman Catholic historian Dr Lingard, and is now universally regarded with the contempt it deserves.2 See ENGLAND CuurcH oF, p. 370 of the present volume,~~

~~The episcopate of the Church of Scotland was at its commencement rather missionary than diocesan. The first bishops, St Ninian (died 432), St Palladius (died ¢. 435), and St Serf and St Ternan, the disciples of the latter, were missionaries among a heathen population, with no defined dioceses. ach had his centre of operations in a monastic establishment of which he had been founder,—St Ninian at Candida Casa, ze, Whithora in Galloway, St Palladius at Fordun in the Mearns, St Serf at Culross, St Ternan probably at Upper Banchory—but it would be an anti- cipation of a later organization to speak of these places as in any sense their episcopal sees. The first diocese of which we~~

~~have any knowledge was that founded by St Kentigern (died 612), which embraced the field of labour of St Ninian, and revived his decayed but scarcely extinct church. At one time St Kentigern fixed his see at Hoddam in Dumfriesshire, but it eventually became established at Glasgow. The missionary character of his episcopate is evident from the enormous size of his diocese. This, coextensive with the kingdom of Rydderch, king of Strathclyde, stretched from the Clyde to the Mersey, and in breadth probably reached from sea to sea. In 729 Galloway was severed from it and became a separate diocese, with its see at Candida Casa, Pecthelm, a deacon of Aldhelm of Sherborne, and a friend of Bede, being the first bishop. The Anglian succession of bishops at Candida Casa lasted till the beginning of the 9th century, when the ravages of the Northmen and the generally disturbed state of the country put an end toit. In Celtic Scotland, to the north of the Clyde, Episcopacy had still less of a diocesan character. In the Celtic church, among the~~

~~*The latest and most trustworthy authority, the lamented Mr A. W. Haddan, decides against the claim of Lincoln as the see of the third bishop. F~~

- ~~The fullest account of Archbishop Parker's own consecration and that of his consecrators will be found in the Ordinum Sacrorum in Ecclesia Anglicana Defensio, by the Rev. T. J. Bailey, which contains Photozincographic copies of the actual documents relating to the transaction,~~

~~"Scoti" both of Ireland aud Scotland, the organization was distinctly monastic, uot episcopal. The chief govern- ment of the church was vested in the abbots of the principal monasteries, to whom the bishops, necessary for the perpetuation of the ministry, were subordinate. In fact, in Celtic Scotland diocesan Episcopacy was non-existent, and the church was under the government of the primatial presbyter-abbot of Iona. The bishops residing in that and other monasteries, though superior to their abbots in ecclesiastical order, were-their inferiors in official rank, and were subject to their primatial authority. N or had~~

these bishops any territorial jurisdiction. “An episcopal succes- sion,” writes Mr Grub, “ was kept up, but it was not in connection with any fixed seat or territory; it was a succession of order alone, not of jurisdiction. Thera was no diocesan Episcopacy, properly speakinug,— no episcopal rule at all. Each abbot was the head of his own monastery, and over all was the successor of St Columba, the primate of the Picts and Scots” (Hecles. Hist. of Scot- land, vol. i. p. 139). On the union of the Picts and Scots under one sovereign, the centre of ecclesiastical authority was transferred, together with the relics of St Columba, from Iona to Dunkeld by Kenneth MacAlpine in 849, and again to St Andrews about 906. The bishop of St Andrews continued the only diocesan prelate, as bishop of the Scots, till the reign of Alexander I., when, before 1115, the sees of Moray aud Dunkeld were founded. About the same time, the Cumbrian see of Glasgow, which had become extinct during a long period of semi-barbarism, the result of perpetual invasions, was revived by David earl of Cumbria, in the person of John, consecrated at Rome by Pope Paschal IL, probably in 1117. It was also under David, after his accession to the Scottish crown, 1129, that the episcqpate received its most marked extension in the foundation of the sees of Aberdeen, Ross, Caithness, Brechin, and Dunblane, and the restoration of that of Candida Casa, in Galloway. The date of the foundation of the see of Argyll is doubtful. It has been placed not improbably c. 1200. The claims of the archbishops of York to the primacy of Scotland, at no time very well grounded nor willingly allowed, were the source of continual dissensions; and in 1188, Wiliam king of the Scots obtained a bull from Pope Clement Ill. declaring the independence of the Scotch Church and its bishops of any see but that of Rome. Three cerrturies, however, elapsed before Scotland secured a metropolitan of her own, after several ineffectual attempts to obtain the pall. In 1472 St Andrews was erected into an archiepiscopal and metropolitan see ; and a few years later, 1489, Glasgow also attained the same rank, The episcopate having been thus completely organized, the succession continued unbroken till the Reformation of the 16th century, when the canonical prelates were generally superseded. Protestant bishops were, however, continued after a fashion, 1571-1574, although the canonical validity of their consecration was in most cases exceedingly ques- tionable, it being very doubtful whether the

consecrators themselves had been consecrated, and even whether some of the new bishops had been episcopally ordained. 'The thirteen dioceses of the ancient church continued in 1578 to exist in name, and most of them were filled by Protestant ministers bearing the style of bishops, although hardly one of them ventured to exercise episcopal jurisdiction " (Grub, Zecl. List. of Scotland, ii. p. 203). This shadow of the episcopate speedily received a fatal blow. Titular Hpiscopacy was declared abolished in 1581 by royal proclamation; and though the base covetousness of some of the leading nobles prolonged its nominal existence for a while in the scandalous system of " tulchan bishops," by which men were appointed to sees on the express under- VIIL — 62

standing that their emoluments, with the exception of a small pension, should be transferred to the lay patron, it became virtually extinct. On the accession of James VI. to the English throne, Episcopacy was again for a short time revived in Scotland. The succession was obtained from England, and the archbishop of Glasgow, and the bishops of Brechin and Galloway, were con secrated in the chapel of London House, October 21, 1610. The renewed overthrow of Episcopacy, and the establishment of Presbyterianism during the Great Re- bellion of the 17th century, belong to general history, and need not be entered on here. On the restoration of Charles II. an unsuccessful attempt was made to re- establish the episcopal form of government. By this time all the bishops who derived their succession from those consecrated in 1610 had passed away, with two exceptions ; and it was resolved to obtain, a second time, the canonical 'succession from the English Church. On the 15th of December 1661, Sharp, Fairfoul, Hamilton, and Leighton were consecrated in Westminster Abbey to the archiepisco- pal sees of St Andrews and Glasgow, and the bishoprics of Galloway and Dunblane, respectively. On the return of these prelates to Scotland, they lost no time in consecrating bishops for the other vacant sees. Thus the Scottish episcopate was restored to its full complement of two arch- bishoprics, and twelve bishoprics—Aberdeen, Argyll, Brechin, Caithness, Dunblane, Dunkeld, Edinburgh, Gallo- way, the Isles, Moray, Orkney, and Ross. It would be beside the purpose of this article

~~to enter into the causes of the failure of this fresh attempt to establish prelacy in Scotland, or to narrate the political events which led to the renewed abolition of this form of church government and the establishment of Presbyterianism as the national religion of Scotland, or to speak of the civil disabilities under which the Episcopal Church laboured till the passing of the Act of Toleration in 1711, and, after the fresh calamities resulting from the part taken by the bishops and episcopal clergy in the rebellion of 1745, by the Relief Bill of 1792. The condition of the Episcopal Church was for a long time so depressed that no attempt was made to keep up a regular system of diocesan government. 'Two bishops without diocesan jurisdiction, Sage and Fullarton, were privately consecrated in 1705 at Edinburgh; and two more, Falconer and Christie, in 1709 at Dundee. Other similar consecrations followed, but after a period of considerable controversy between the advocates of diocesan Episcopacy and the government of the church by a college of bishops "' at large," the former system was accepted by the members of their communion, and is that under which the Episcopal Church in Scotland is now administered. The existing territorial divisions, each with its bishop, are (1) Aberdeen, (2) Argyll and the Isles, (3) Brechin, (4) Edinburgh, (5) Glasgow and Galloway, (6) Moray, Ross, and Caithness, (7) St Andrews, Dunkeld, and Dunblane. The bishops are appointed by the votes of their presbyters, and are all equal in jurisdiction, one of their body being chosen by themselves as "primus," for the purpose of convoking and presiding over the meetings of the episcopal college. This system is about to give place to that prevailing in the Episcopal Church from primitive times, by the appointment of a metropolitan. The most remarkable event in the history of the Scotch Episcopal Church in modern times has been the gift of the episcopal succession to the Church of America, by the consecration of Dr Samuel Seabury as bishop of eae by the Scotch bishops at Aberdeen, August 31,~~

~~In Ireland, Episcopacy appears to have been coeval with the introduction of the Christian faith. Before the apostolic labours of St Patrick, 430-491 a.p., and the brief mission of St Palladius by Pope Celestinus, c. 431,~~

there were bishops in Ireland whose names are recorded by Ussher. The church planted by St Patrick, though episco- pal, had no diocesan organization, As in the daughter Church of Scotland, the ecclesiastical system was monastic and collegiate, not diocesan or parochial. The bishops had neither local jurisdiction nor regulative authority, and seem to have existed simply for the purpose of ordination, which was held to be their exclusive right. As at Jona, the Irish bishops were subordinate to the heads of the monastic establishments to which they belonged, and that even when that position was held by a female. At Kildare the bishop was the nominee and functionary of the abbess St Bridget and her successors. There being no limitation to the num- ber of bishops, the order becaine multiplied far beyond the utmost needs of the Irish Church, until there were almost as many bishops as congregations. Having no sufficient employment at home, they wandered into other countries, where by their irregular performance of their episcopal functions gieat disorders were introduced, against which several of the canons of the church councils of the 9th century were directed. 'Their ordinations' were declared null and void at' the Council of Chalons in 813, and a still more stringent rule was passed at that of Calcuith, 816, forbidding any of the race of the "Scoti" to celebrate the sacraments or minister in any of the offices of the church: The Church of Ireland retained its complete independence asa national church, free from the jurisdiction or authority of Rome, till the early part of the 12th century. The archbishop of Armagh was the sole primate, and by him all the bishops were consecrated. 'The first introduction of Roman influence was due to the predatory Danes, or " Ostmen," who had established themselves on various spots of tle seaboard. On their conversion to Christianity they were naturally led to, seek their chief pastors, not from the native church of the country they had invaded, but from their own Norman kindred in England. "It was to the archbishops of Canterbury, Lanfranc and Anselm, that the bishops of the Danish cities—Limerick, Waterford, and Dublin—repaired for consecration, and made profession of canonical obedience ; and these bishops, though sometimes of Irish birth, were generally persons who had been trained in English monas- teries" (Robertson,

~~Hist of Christian Church, v. 264). This connexion with the Roman see through the English Church, though at first limited to the Danish settlers, was gradually extended and strengthened, until in 1118 we find Gilbert bishop of Limerick presiding over a synod as papal legate, and using his influence to bring the Iris Church into conformity with Roman customs. One beneficial result of this intercourse with Rome was that Ireland was partitioned out into territorial dioceses, with bishops possessing local jurisdiction. A second primatial see was also established at Cashel, to which those of Dublin and Tuam were afterwards added. The loss of the ancient independence of the Irish Church was sealed when the grant of the palls for which St Malachy, the strenuous advocate for complete conformity to the Latin Church, had so earnestly pleaded in his visits to Rome, 1137-1140, was unanimously solicited of the pope by the national synod held at Holmepatrick in 1148, and accepted at the hands of the cardinal legate by the Irish metropolitan at the synod of Kells in 1152. The conquest of Ireland by Henry II. of England, to whom it had been granted by Pope Hadrian IV., as "the head owner of all Christian islands," completed the subjection. A council convened by him at Cashel in 1172 decreed that the Church of Ireland should be reduced to the form of that of England; and Ireland was, chiefly through the influence of English ecclesiastics who were put into the highest dignities of the church, gradually brought into the same conformity to~~

~~DY Pieces UY~~

~~the Church of Rome as the other countries of the West. With the view, however, of counteracting the growing encroachments of the papacy, it became customary for the Irish bishops, after election by their own chapters, to receive consecration in England, in order that they might renounce in person all claims prejudicial to the English crown made by the Church of Rome. 'The state of the Church of Ireland during the Middle Ages was one of fierce intestine discord. Its episcopal succession, however, con- tinued unbroken. Nor did the Reformation cause any breach in its continuity. The Irish parliament in 1536 cast off the papal supremacy and accepted that of the crown. The bishops acquiesced in the change, and at the acces- sion of Elizabeth in 1560 all~~

~~save two, appointed by Queen Mary, took the oath of supremacy to the queen and conformed to the reformed liturgy. The line was pre- served during the storm of the Great Rebellion; at the Restoration eight of the Irish bishops were still surviving. Of these Bramhall was. selected for the primacy, and by him and his suffragans two archbishops and ten bishops were consecrated to the vacant sees in St Patrick's, Dublin, in 1661. The churches of England and Ireland were united by Act of Parliament in 1800. In 1833-34 the episcopate was much curtailed. Two of the archbishoprics were reduced to bishoprics, and ten of the bishoprics were merged in other sees. Finally, in 1869, the Irish Church was disestablished, and became, like the Episcopal Church of Scotland, an episcopal church existing in the country, not the established church of the country. Through all these changes the episcopal succession has remained unim- paired, and the Protestant episcopate caa claim to be regarded as the lineal representative of the ancient episco- pate of Ireland. The Roman Catholic bishops in Ireland derive their consecration from foreign churches,—those of Spain, Portugal, and Italy,—and therefore have no direct connexion with the national Irish Church.~~

~~The churches of Scandinavia, including those of Sweden, Norway, Denmark, and Iceland, were the only Christian bodies which embraced the Lutheran doctrines that preserved an episcopate through the stormy period of the Reformation. Of these, the Church of Sweden alone can put forth a claim to an unbroken succession, nor is this claim quite beyond question. The Scandinavian churches, with their bishops, were originally subject to the see of Hamburg or Bremen, of which their founder, the apostolic Anschar of Corbey (who died 865) was the first occupant. In 1104 Lund in Schonen was chosen as the seat of a new archiepiscopal see, to which all the Scandinavian kingdoms and dependencies should owe allegiance. The other kingdoms being displeased at their subjection to a Danish prelate, a synod was held at Skenning in 1248, under the presidency of the English cardinal, Nicholas Breakspear, afterwards Hadrian IV., which gave a primate to Norway, the islands, and Greenland, placed at Nidards (Drontheim), and provided for the erection of a primacy of Sweden, afterwards fixed in 1164 at Upsala. The epis- copal system being thus established, the~~

~~succession was continued in the Scandinavian churches till the Reforma- tion, when it was completely interrupted everywhere save in Sweden. During that period of disturbance all the Swedish sees became vacant but two, and the bishops of these two soon left the kingdom. The episcopate, however, was preserved by Peter Magnusson, who, when residing as warden of the Swedish hospital of St Bridget in Rome, had been duly elected bishop of the see of Westeraes, and consecrated c. 1524. No official record of his consecration can be discovered, but there is no snfficient reason to doubt the fact; and it is certain that during his lifetime he was acknowledged as a canonical bishop both by Roman Catho- lics and by Protestants. In 1528 Magnusson consecrated~~

~~bishops to fill the vacant sees, and, assisted by one of these, Magnus Sommar, bishop of Strengness, he afterwards con- secrated the Reformer, Lawrence Peterson, as archbishop of Upsala, Sept. 22, 1531. Some doubt has been raised as to the validity of the consecration of Peterson's successor, also named Lawrence Peterson, in 1575, from the insufficiency. of the documentary evidence of the consecration of his consecrator, Paul Justin, bishop of Abo. The integrity of. the succession has, however, been accepted after searching investigation by men of such learning as Grabe and Routh, and has been formally recognized by the convention of the American Episcopal Church. The number of dioceses in Sweden is now twelve, including the archiepiscopal see of. Upsala, by the holder of which the bishops are, as a rule, consecrated. On a vacancy three candidates are nominated. by the votes of the. clergy of the diocese, of whom one is selected by the king. The succession to the daughter church of Finland, now independent, stands or falls with that of Sweden.!~~

~~The other Scandinavian churches—those of Denmark, Norway, and Iceland,—though equally episcopal in form, cannot produce eny legitimate claim to the episcopal suc- cession. The Reformation was at first opposed by the whole episcopate. For this and other political charges, the king, Christian IIL, in 1536-37 suddenly placed most of the bishops under arrest, and compelled them to resign their sees into his~~

~~hands, to dispose of as he thought good. On their engaging not to oppose the Reformation they were indisposed to lead, these prelates were presented by him to stalls in cathedral or collegiate churches, and, quietly acquiescing in the new régime, created no schism from the national establishment. 'They did not, however, take any part in the consecration of their successors, which was per- formed by Bugenhagen, Luther's friend and fellow-labourer, at Copenhagen, September 2, 1537. The seven ministers on whom Bugenhagen laid hands were called evangelical superintendents, or bishops, and from these the existing succession is derived. Bugenhagen drew up, by the king's command, a scheme of church government for Denmark and Norway. In the latter kingdom the pre-Reformation bishops generally deserted their posts; two, Hans Reff of Opsloe and Geble Pedersen of Bergen, adopted the change and retained their sees, In Iceland the last of the Roman Catholic bishops authorised the first Protestant bishop, ordained at Roeskild, to hold his office in succession to him- self. It will be seen that the validity of the episcopal suc- cession in these churches is very questionable. But it has never been formally denied by the Church of England, and it has been accepted by Dodwell, Leslie, and Thorndike, and its orders have been recognized by the Indian bishops in the case of missionaries ordained by the Danish Church,~~

~~Another Protestant episcopal church is that of the Moravians, or, as they prefer to style themselves, the Unitas Fratrum. The Bohemian anti-Reformation swept the church of the Brethren from their original seat to find a refuge in Poland and Prussia. Here their ancient Epis- copacy, derived in 1467 from the Austrian Waldenses, was perpetuated in regular succession, until in 1735 one of the two last surviving bishops, Jablonski, with the concurrence of the other, Sitkovius, consecrated David Nitschmann to be the first bishop of the renewed church of the Brethren, established at Herrnhut in Saxony. Two years later, May 20, 1737, Jablonski and Nitschmann consecrated Count~~

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~~1 The whole subject of the Swedish episcopate and the validity of its succession will be found discussed in a series of papers—from which~~

our information is chiefly drawn—characterized by fairness and thoroughness of investigation, by the Rev. F. 8. May, in the Colonial Church Chronicle for 1861. We are also indebted to Mr May for a clear statement of the history of the episcopate in the other Scandi- navian churches, in papers read before the Church Congresses at Nore wich and Southampton.

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Zinzendorf as the second bishop of the Moravian church. From these two the existing Moravian episcopate is derived.

A remarkable instance of a Roman Catholic episcopal church not in communion with the papal see is to be found in the so-called Jansenist Church of Holland. Pre- served with difficulty through the tempestuous period of the Dutch Reformation, when after fierce struggle the Protestant faith obtained the ascendency it has ever since maintained in Holland, the episcopate was in danger of dying out at the beginning of the 18th century, through the refusal of the papal authorities to allow consecrations to the vacant sees, in revenge for the resolute adherence of the church to Jansenist doctrines, The episcopate was indeed only saved from extinction by the singularly opportune presence of a duly consecrated bishop of Babylon (Dominique Marie Varlet, previously vicar-general of Louisiana), who, having been suspended unheard by a notoriously uncanonical sentence, in consequence of his having manifested sympathy with the oppressed Church of Holland, by administering the rite of confirmation during his sojourn at Amsterdain on his outward journey, had made that city his home, on his return to Europe in 1721, while waiting the result of his appeal. Convinced that they had no hope of obtaining a prelate from the papal court, the chapter of Utrecht met and elected Cornelius Steenoven archbishop, April 27, 1723. More than a year having been spent in vain applications to neighbouring diocesan bishops to perform the ceremony, the newly-elected prelate was consecrated by the bishop of Babylon at Amsterdam, October 15, 1724. The act was declared unlawful and execrable by Pope Benedict XIII., and all who had taken

~~**part init were excommunicated. The national church maintained a firm attitude, and on the death of ths new archbishop, within half a year of his consecration, the chapter proceeded tothe immediateelection of a successor, Barchman Waytiers, who was also consecrated by the bishop of Babylon, September 30,1725. On the death of Waytiers, May 13, 1733, before he could succeed in securing the consecration of any suffragan, Theodore vau Croon was elected by the chapter, and received consecration from the same hands, October 28 of that year. Once again, and for the last time, on the death of this archbishop, Juue 9, 1739, the bishop of Babylon was called npon to save the Dutch episcopate from extinction by the consecration of Peter John Meindaerts, October 18, 1739. The chapter of Haarlem, whose unwillingness to offend the papal authori- ties by electing a bishop had hitherto prevented the increase of the episcopate, still refusing to act, the new archbishop took the matter into his own hands, nominated and con- secrated a bishop to that see in 1742, and added a third member to the episcopal college in the person of the bishop of Deventer, consecrated in 1758. The succession has con- tinued unbroken from that time to the present day, though in more than one instance its existence has hung precari- ously on asingle life. Each consecration has been followed by a formal excommunication by the pope, and, all the attempts to obtain reconciliation being repelled with insult, the church has at length settled down into the true Galli- can position of protest against ultramontanism whether of doctrine or of discipline. (A. W. Haddan's Remains, p. 413; Neale's Jansentst Church of Holland.)**~~

~~**The national Church of Holland has been the instrument of conferring the episcopate on the community known as "Old Catholics," whose separation from the Church of Rome, under the leadership of Dr Dillinger, was occasioned by the publication of the Vatican decrees relating to papal spremacy and infallibility, passed at the so-called cecumeni- cal council of 1870. Dr J. H. Reinkens, the individual chosen to be the first bishop of the new church at the synod, consisting of priests and lay delegates, held at Cologne, June 4, 1873, was consecrated on August 11 by**~~

~~**EPS ye Pracyr**~~

~~Mer. Heykamp, the bishop of Deventer,—Archbishop Loos' of Utrecht, who had promised to administer the rite, having died on the very day of the new bishop's election. A second bishop, Edward Herzog, was consecrated for the members of the Old Catholic body in Switzerland by Bishop Reinkens at Rheinfelden in Aargau, September 18, 1876, having been previously elected by a synod assembled at Olten.~~

~~The episcopate in the colonies and dependencies of the~~

~~English crown commenced with the consecration of Dr Charles Inglis to the diocese of Nova Scotia, which took place at Lambeth, August 12, 1787, the same year which had witnessed the foundation of the episcopate of the American Church. Quebec was formed into a separate diocese in 1793, and Nova Scotia was again subdivided by~~

~~the foundation of the sees of Newfoundland in 1839,~~

~~and Fredericton (New Brunswick) in 1845. The original diocese of Quebec has also been broken up by the establish- ment of the sees of Torouto (1839), Montreal (1850), Huron (1857), Ontario (1861), and Niagara (1875). These are all suffragans to Montreal, the metropolitical see of the Dominiou of Canada. In 1849 the diocese of Rupert's Land was formed out of the vast territories of the Hudson's Bay Company. 'This has subsequently been constituted metropolitical, having as its suffragans the bishops of Moosonee (1872), Athabasca (1874), Saskatchewan (1874), and the missionary bishop of Algoma (1873).~~

~~The next part of the British dependencies to receive the episcopate was the East Indies. formed, to which Dr Middleton was consecrated at Lambeth in 1814. The unwieldy diocese intrusted to his supervision, including eventually all British subjects in India, Ceylon, Mauritius, Australia, New Zealand, and Tasmania, has been gradually broken up into more than twenty separate dio- ceses, and the process of subdivision is continnally going on.~~

~~India alone now remains under the metropolitan of Calcutta, who has as his suffragans the bishops of Madras (1835), Bombay (1837), Colombo (Ceylon) (1846), Labuan (1855), Lahore. (1878), and Rangoon~~

~~(1878). The diocese of Victoria (Hong Kong) was established in 1849, that of the Mauritius in 1854, and of North China in~~

~~1872.~~

~~The West India islands came first under episcopal super- vision in 1824, when the dioceses of Barbados and Jamaica (now Kingston) were founded. In 1842 the diocese of Barbados was divided into three by the formation of the separate sees of Antigua and Guiana, and in 1861 the Bahamas were severed from Jamaica and became the see of Nassau. The bishopric of 'Trinidad was founded in 1872.~~

~~In 1836 Australia and the adjacent English dependencies were withdrawn from the nominal supervision of the bishops of Calcutta by the consecration of Dr W. G. Broughton as first bishop of Australia (now Sydney). New Zealand was erected into a separate see (now Auck- land) in 1841, and Tasmaniain 1842. 'The see of Sydney has since become metropolitical, containing the dioceses of Adelaide, Melbourne, Newcastle (all three founded in 1847), Perth (1857), Brisbane (1859), Goulburn (1863), Grafton and Armidale (1867), Bathurst (1869), and Ballarat (1875). The original diocese of New Zealaud is now divided into six under its own metropolitan, the primacy being elective and not attached to any specified see. These dioceses are Auckland (1869), Christchurch (1856), Wellington, Nelson, and Waiapu (all three founded in 1858), and Dunedin (1866). To these should be added the missionary bishopric of Melanesia (1861). The Poly- nesitn island of Hawaii became the seat of the bishop of Honolulu in 1861, the Falkland Islands were constituted a see in 1870, and after many difficulties Madagascar received the episcopate in 1874,~~

~~The see of Calcutta was.~~

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~~After the colony of the Cape of Good Hope had been in British possession for more than forty years, the episcopate was granted to it. Bishop Gray was consecrated first bishop of Cape Town on St Peter's Day 1847. This energetic prelate lost no time in subdividing his~~

~~enormous diocese. 'The first new sees were those of Graham's Town and Natal, founded in 1853. St Helena became a bishopric in 1859, the Orange River Territory (now Bloemfontein) in 1863, Maritzburg in 1869, Zululand in 1870, and Pretoria (the Transvaal) in 1878. The diocese otf Independent Kaffraria (St John's) was founded by the Scotch Episcopal Church in 1873. We must not omit to mention the missionary bishopric of Central Africa, or the Zambesi, founded by the Universities Mission in 1861, of which the lamented Charles Mackenzie was the first bishop.~~

~~On the western coast of Africa, Sierra Leone was con- stituted a diocese in 1850. In 1864 the Niger territory, including Lagos and Abbeokuta, was taken from it as a missionary diocese. On the seaboard between the two, the republic of Liberia is ecclesiastically subject to a bishop of the American church stationed at Cape Palmas.~~

~~In 1842 Gibraltar was made the seat of a bishop, whose jurisdiction extends over the clergy and members of the Church of England on the seaboard and islands of the Mediterranean, Archipelago, and Black Sea. In 1846 a bishop was consecrated, under the title of bishop of Jerusalem, to take oversight of the Protestant settlements in Asia Minor, Egypt, Palestine, and Syria.~~

~~The episcopate of the Protestant Episcopal Church of the United States of North America was originally derived partly from the Episcopal Church of Scotland, partly from that of England. As, however, the Scottish bishops trace their succession to those consecrated by English bishops in 1661, the American Church may be regarded as a legiti- mate daughter of the Anglican Church, with which she is united in doctrine and discipline, and in legally authorized communion. The first bishop of the American Church was Dr Samuel Seabury, elected by the clergy of Connec- ticut. The oath of allegiance, with which the archbishop had no power to dispense without a special Act of Parlia- ment, forming an inseparable obstacle to his consecration in England, Dr Seabury had recourse to the Scotch Episcopal Church, and was admitted to the episcopate at Aberdeen, November 14, 1784, by the hands of the bishops of Aberdeen, Ross, and Moray. Three years later,~~

the formal difficulty having been in the meantime removed, Dr White and Dr Provoost, the elected respectively of the conventions of Pennsylvania and New York, were conse- crated at. Lambeth on February 4, 1787, by Archbishops Moore and Markham and Bishops Moss of Bath and Wells and Hinchcliffe of Peterborough. There being now three bishops in the American Church, the number held canoni- cally necessary under ordinary circumstances to a rightful consecration, though not absolutely essential to its validity, they proceeded to consecrate others, the first being Dr Madison for Virginia. By the beginning of the new century the number of diocesan bishops had risen to seven, and now (1878) it amounts to fifty-seven, to whom must be added several missionary bishops consecrated for work among the heathen. The right of electing a bishop is vested, by the constitution of the American Church, in the convention of the diocese, lay as well as clerical. Their choice is submitted to the general convention, if sitting, if not,to the standing committees of the dioceses, aud must receive the sanction of the majority before the bishops can consecrate. (E. v.)

EPISCOPIUS, Stmon (1583-1643),a distinguished theo- logian (whose name in Dutch was Bisschop), was born at Amsterdam onthe Ist January 1583. In 1600 he entered the university of Leyden, where he took his master of arts

degree in 1606. He afterwards studied theology under. Arminius, and Arminius's opponent Gomar ; but soon be- coniing a strong sympathizer with the Arminian doctrines, he, on the death of Arminius in 1609, left Leyden for the university of Francker. In 1610, the year in which the Arminians preseuted the famous Remonstrance to the States of Holland, he was ordained minister at Bleyswich, a small village in the neighbourhood of Rotterdam ; and in the following year he advocated the cause of the Remon-: strants at the Hague conference. In 1612 he succeeded Gomar as professor of theology at Leyden, an appointment. which awakened the bitter enmity of the Calvinists, and, on account of the influence lent by it to the spread. of Arminian opinions, was doubtless an ultimate cause of the meeting of the Synod

~~of Dort in 1618. Episcopius was chosen as the spokesman of the thirteen representatives of the Remonstrants before the synod; but he was refused a heariug, aud the Remonstrant doctrines were condemned without any explanation or defence of them being per-‘ mitted. At the end of the synod’s sittings in 1619, Epis- copius and the other representatives were deprived of their’ offices and expelled from the country. Episcopius retired to Brabant, but ultimately went to France, and took up his’ residence at Rouen. He devoted the most of his time to the promotion by writings of the Arminian cause; but the attempt of Wadding to win him over to the Romish faith involved him also in a controversy with that famous Jesuit. After the death of the stadtholder Maurice, the violence of the Arminian controversy began to abate, and Episcopius was permitted in 1626 to resume his duties in the Remonstrant church of Rotterdam. He was after- wards appointed rector of the Remonstrant college at Amster- dam, where he died in 1643. Episcopius may be regarded as in great part the theological founder of Arminianism.’ Its principles were enunciated by Arminius, but in a frag- mentary and somewhat tentative shape, and it is to Epis- copius that the merit is due of having developed them into a complete and distinctive form of belief, and of having given them a widely extended and permanent influence. Besides opposing at all points the peculiar doctrines of Cal- vinism, Episcopius protested against the tendency of Calvin- ists to lay so much stress on abstract dogma, and argued that. Christianity was practical rather than theoretical,—not so much a system of intellectual belief as a moral power,— and that an orthodox faith did not necessarily imply the knowledge of and assent to a system of doctrine whiclt included the whole range of Christian truth, but only the knowledge and acceptance of so much of Christianity as was necessary to effect a real change on the heart and life. The principal works of Episcopius are his Confessio s. declaratio sententice pastorum qui in faderato Belgio Remonstrantes vocantur super preccipuis articulis religionis Christiane (1621), his Apologia pro Confessione (1629), and his uncompleted work Institutiones Theo- logice. A life of Episcopius was written by Limborch, and .one was also prefixed by his successor Curcellseus to an edition of his collected works published in 2 vols. (1650-1665). : EPITAPH (ézirdduos, sc. Adyos, from éri, upon, and ra@os, a tomb) means strictly an~~

~~inscription upon a tomb, though by a natural extension of usage the name is applied to any- thing written ostensibly for that purpose whether actually inscribed upon a tomb or not. Many of the best known epitaphs, both ancient and modern, are merely literary memorials, and find no place on sepulchral monuments. Sometimes the intention of the writer to have his produc- tion placed upon the grave of the person he has commemor- ated may have been frustrated, sometimes it may never have existed ; what be has written is still entitled to be called an epitaph if it be suitable for the purpose, whether the purpose has been carried out or not. The most obvious external condition that suitability for mural inscription imposes is one of rigid limitation as to length. An epitaph~~

~~cannot in the nature of things extend to the proportions that may be required in an elegy. ;~~

~~The desire to perpetuate the memory of the dead being natural to man, the practice of placing epitapls upon their graves has been common among all nations and in all ages. And the similarity, amounting sometimes almost to identity, of thought and expression that often exists between epitaphs written more than two thousand years ago and epitaphs written only yesterday is as striking an evidence as literature affords of the close kinship of human nature under tlie most varying conditions where the same primary elemental feelings are stirred. The grief and hope of the Roman mother as expressed in the touching lines —~~

~~Lagge fili bene quiescas Mater tua rogat te, Ut me ad te recipias : Vale! find their echo in similar inscriptions in many a modern cemetery.~~

~~Probably the earliest epitaphial inscriptions that have come down to us are those of the ancient Egyptians, written, as their mode of sepulture necessitated, upon the sarcophagi and coffins. Those that have been deciphered are all very much in the same form, commencing with a prayer to a deity, generally Osiris or Anubis, on behalf of the deceased, whose name, descent, and office are usually specified. There is,~~

~~**however, no attempt to delineate individual character, and the feelings of the survivors are not expressed other- wise than in the fact of a prayer being offered. Ancient Greek epitaphs, unlike the Egyptian, are of great literary interest, deep and often tender in feeling, rich and varied in expression, and generally epigrammatic in form. They are written usually in elegiac verse, though many of the later epitaphs are in prose. Among the gems of the Greek anthology familiar to English readers through translations are the epitaphs upon those who had fallen in battle. There are several ascribed to Simonides on the heroes of Thermopyle, of which the most celebrated is the epigram —**~~

~~**'*Go tell the Spartans, thou that passest by,**~~

~~**That here, obedient to their laws, we lie. " A hymn of Simonides on the same subject contains some lines of great beauty, which may be regarded as a literary epitaph :—.**~~

~~****In dark Thermopyle they lie;**~~

~~**Oh death of glory, there to die!**~~

~~**Their tomb an altar is, their name**~~

~~**A mighty heritage of fame ;**~~

~~**Their dirge is triumph.—Cankering rust,**~~

~~**And time that turneth all to dust**~~

~~**That tomb shall never waste nor hide,—**~~

~~**The tomb of warriors true and tried.**~~

~~**The full-voic'd praise of Greece around**~~

~~**Lies buried in that sacred mound ;**~~

~~**Where Sparta's king, Leonidas,**~~

~~In death eternal glory has."~~

~~In Lacedzemonia epitaphs were inscribed only upon the graves of those who had been especially distinguished in war; in Athens they were applied more indiscriminately. They generally contained the name, the descent, the demise, and some account of the life of the person commemorated. It must be remembered, however, that many of the so-called Greek epitaphs are merely literary memorials not intended for monumental inscription, and that in these freer scope is naturally given to general reflections, while less attention is paid to biographical details). Many of them, even some of the monumental, do not contain any personal name, as in the one ascribed to Plato :—~~

~~"a bs a earned sailor's tomb; a peasant's there doth~~

~~ands Thus the same world of Hades lies beneath both sea and land."~~

~~Others again are so entirely of the nature of general re-~~

~~Aflections upon death that they contain no indication of the~~

~~| repertory for the earlier Roman epitaphs in Britain.~~

~~particular case that called them forth. It may be ques tioned, indeed, whether several of this character quoted in ordinary collections are epitaphs at all, in the sense of being intended for a particular occasion.~~

~~Roman epitaphs, in contrast to those of the Greeks, con- tained, as a rule, nothing beyond a record of facts. The inscriptions on the urns, of which numerous specimens are to be found in the British Museum, present but little variation. The letters D.M. or D.M.S. (Deis Manibus or Diis Manibus Sacrum) are followed by the name of the person whose ashes are inclosed, his age at death, and sometimes one or two other particulars. The inscription closes with the name of the person who caused the urn to be made, and his relationship to the deceased. It is a curious illustration of the survival of traces of an old faith after it has been formally discarded to find that the letters D.M. are not uncommon on the Christian inscriptions in the catacombs. It has been~~

~~suggested that in this case. they mean Deo Maximo and not Dus Manibus, but the. explanation world be quite untenable, even if there were, not many other undeniable instances of the survival of: pigan superstitions in the thought and life of the early Christians. In these very catacomb inscriptions there are many illustrations to be found, apart from the use of the letters D. M., of the union of heathen with Christian senti- ment (see Maitland's Church in the Catacombs), The private burial places for the ashes of the dead were usually. by the side of the various roads leading into Rome, the: Via Appia, the Via Flaminia, &c. The traveller to or from the city thus passed for miles an almost uninterrupted succession of tombstones, whose inscriptions usually began with the appropriate words Szste Viator or Aspice Viator, the origin doubtless of the 'Stop Passenger, " which still. meets the eye in many parish churchyards of Britain. Another phrase of very common occurrence on ancient. Roman tombstones, S7t tthe terra levis,—Light lie the earth upon thee,—has continued in frequent use, as conveying an appropriate sentiment, down to modern times. A remark- able feature of many of the Roman epitaphs was the terrible. denunciation they often pronounced upon those who violated, the sepulchre. 'Two impressive examples may be quoted:—.~~

~~'* Male pereat, Insepultus jaceat, Non resurgat, Cun Juda partem habeat, Si quis sepulerum hune violaverit. "~~

~~The second is more refined but not less terrible in its male- diction :— ** Quisquis Hoe Sustulerit aut leserit Ultimus Suorum moriatur."~~

~~Such denunciations were not uncommon in later times. A well known instance is furnished in the lines on Shake- speare's tomb at Stratford-on-Avon, said to have been written by the poet himself :— " Guod frend for Jesus sake forbeare, To digg the dust enclosed heare ;~~

~~Bleste be y® man yt spares thes stones 'And curst be he y' moves my bones."~~

~~The earliest existing British epitaphs belonged to the Roman period, and are written in Latin after the Roman form. Specimens are to be seen in various antiquarian museums throughout the country ; some of~~

~~the inscriptions are given in Bruce's Roman Wall; and the seventh volume of the Corpus Inscriptionum Latinarum edited by Hiibner, containing the British inscriptions, is the most Ma~~

~~1e earliest, of course, are commemorative of soldiers belong-~~

~~| ing to the legions of occupation, but the Roman form was~~

~~afterwards adopted for native Britons. Long after the Roman form was discarded, the Latin language continued to be used, especially for inscriptions of a more public~~

~~oe ae Pel~~

~~character, as being from its supposed permanence the most |~~

~~suitable medium of communication to distant ages. It is only, in fact, within recent years that Latin has become unusual, and the more natural practice has been adopted of writing the epitaphs of distinguished men in the lan- guage of the country in which they lived. While Latin was the chief if not the sole literary language, it was, as a matter of course, almost exclusively used for epitaphial in- scriptions. 'The comparatively few English epitaphs that remain of the 11th and 12th centuries are all in Latin. They are generally confined to a mere statement of the name and rank of the deceased following the words " Hic jacet." Two noteworthy exceptions to this general brevity are, however, to be found in most of the collectiovs. One is the epitaph to Gundrada, danghter of the Conqueror (d. 1085), which still exists at Lewes, though in an im- perfect state, two of the lines having been lost ; another is that to William de Warren, earl of Surrey (d. 1089), believed to have been inscribed in the Abbey of St Pancras, near Lewes, founded by him. Both are encomiastic, and describe the character and work of the deceased with con- siderable fullness and beauty of expression. They are written in leonine verse. Inthe 13th century French began to be used in writing epitaphs,and inost of the inscriptions to celebrated historical personages between 1200 and 1400 are in that language. Mention may be made of tliose to Robert, the third earl of Oxford (d. 1221), as given in Weever, to Henry IIT (d. 1272) at Westminster~~

~~Abbey, and to Edward the Black Prince (d. 1376) at Canterbury. In most of the inscriptions of this period the deceased addresses the reader in the first person, describes his rank and posi- tion while alive, and, as in the case of the Black Princes, contrasts it with his wasted and loathsome state in the grave, and warns the reader to prepare for the same in- evitable change. The epitaph almost invariably closes with a, request, sometimes very urgently worded, for the prayers of the reader that the soul of the deceased may pass to glory, and an invocation of blessing, general or specific, upon all who comply. Epitaphs preserved much of the same character after English began to be used towards the close of the 14th century. The following to a member of the Savile family at Thornhill is probably even earlier, though its precise date cannot be fixed :— : '* Bonys emongg stonys lys ful~~

~~steyl gwylste the sawle wan- y deris were that God wylethe—' that is, Bones among stones lie full still, whilst the soul wanders whither God willeth It may be noted here that the majority of the inscriptions, Latin and Eng- lish, from 1300 to the period of the Reformation, that have been preserved, are upon brasses, (See Brassxs, MoNUMENTAL.)~~

~~It was in the reign of Elizabeth that epitaphs in English began to assume a distinct literary character and value, entitling them to rank with those that had hitherto been composed in Latin. There is one on the dowager countess of Pembroke (d. 1621), remarkable for its successful use of a somewhat daring liyperbole. It is usually attributed to Ben Jonson, but there seems reason to believe that it was written by William Browne, author of Britannia's Pustorals :—~~

~~'* Underncath this marble hearse Lies the subject of all verse ; Sydney's sister, Pembroke's mother ; Death, ere thou hast slain another Fair and learn'd and good as she, Time will throw his dart at thee. Marble piles let no man raise To her name for after days ;~~

~~Some kind woman, born as she, Reading this, like Niobe,~~

~~Shall turn marble, and become Both her mourner and her tomb."~~

~~If there be something of the exaggeration of a conccit in the second stanza, it needs scarcely to be pointed out that epitaphs, like every other form of composition, necessarily reflect the literary characteristics of the age in which they were written. The deprecation of marble as unnecessary suggests one of the finest literary epitaphs in the English language, that by Milton upon Shakespeare :— ;~~

~~**Whiat needs my Shakespeare, for his honoured bones, The labour of an age in piled stones ? Or that his hallowed reliques should be hid Under a star-ypointing pyramid ? Dear Son of Memory, great heir of fame, What need'st thou such weak witness of thy namie? – Thou in our wonder and astonishment Hast built thyself a live-long monument. For whilst, to the shame of slow-endeavouring art, Thy easy numbers flow; and that each heart Hath, from the leaves of thy unvalued book, Those Delphic lines with deep impression took ; Then thou our fancy of itself bereaving, Dost make us marble with too much conceiving ; Aud so sepulchred, in such pomp dost lie, That kings for such a tomb would wish to die.".~~

~~The epitaphs of Pope are generally considered to possess very great literary merit, though they were rated higher by Johnson and critics of his period than they are now. Two are quoted in most collections as, each in its own way, a typical specimen. . The first is on Mrs Corbet :—~~

~~'Here rests a woman, good without pretence, Blest with plain reason and with sober sense; No conquests she, but o'er herself, desired, No arts essayed, but not to be admired. Passion and pride were to her soul unknown, Convinced that virtuc only is our own.~~

~~So unaffected, so composed a mind;~~

~~So firm, yet soft; so strong, yet so refined; Heaven, as its purest gold, by tortures tried; The saint sustained it, but the woinan died."~~

~~The other, to Sir Isaac Newton, is not inscribed upon any monyment:—~~

~~‘* Nature and Nature’s laws lay hid in night ; God said, Let Newton be ! and all was light.”~~

~~Objection has been taken to it as “savouring of pro- fanity,”—a criticism which will be differently estimated by different minds.~~

~~Dr Johnson, who thought so much of Pope’s epitaphs, was himself a great authority in both the theory and _prac- tice of this species of composition. HIs essay on epitaphs is one of the few existing monographs on the subject, and his opinion as to the use of Latin had great influence. he manner in which he met the delicately insinuated re- quest of a number of eminent incn that English should be employed in the case of Oliver Goldsmith was characteristic, and showed the strength of his conviction on the subject (see Boswell’s Life, vol. vi. c. 7). The arguments in favour of Latin were chiefly drawn from its inherent fitness for epitaphial inscriptions and its classical stability. The first of thesc has a very considerable force, it being ad- ‘mitted on all hands that few languages are in themselves so suitable for the purpose; the second is outweighed by con- siderations that had considerable force in Dr Johnson’s time, and have acquired more since. Even to the learned Latin is no longer the language of daily thought and life as it was at the period of the Reformation, and the great body of those who may fairly claim to be called the well- educated classes can only read it with difficulty, if at all. It seems, therefore, little less than absurd, for the sake of a stability which is itself in great part delusive, to write epitaphs in a language unintelligible to the vast majority of those for whuse information presumably they are intended. Though a stickler for Latin, Dr Johnson wrote some ! very beantiful English epitaphs, as, for example, the follow- | ing on Philips, a musician :—~~

~~SO~~

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~~‘Philips, whose touch harmonious could remove The pangs of guilty power or hapless love ; Rest here, distressed by poverty no more, Tere~~

~~find that calm thou gav'st so oft before ; Sleep undisturbed within this peaceful shrine Till angels wake thee with a note like thine!"~~

~~In classifying epitaphs various principles of division may be adopted. Arranged according to nationality they indicate distinctions of race less clearly perhaps than any other form of literature does,—and this obviously because when under the influence of the deepest feeling men think and speak very much in the same way whatever be their country. At the same time the influence of nationality may to some extent be traced in epitaphs. The characteristics of the French style, its grace, clearness, wit, and epigram- matic «point, are all recognizable in French epitaphs. Instances such as "' La premiére au rendezvous," inscribed on the grave of a mother, Piron's epitaph written for himself after his rejection by the French Academy—~~

~~'*Ci-git Piron, qui ne fut jamais rien,~~

~~Pas méme Académicien—" and one by a relieved husband, to be seen at Pére la Chaise— '*Ci-git ma femme. Ah! qu'elle est bien~~

~~Pour son repos et pour lec mien—" might be multiplied indefinitely. One can hardly look through a collection of English epitaphs without being struck with the fact that these represent a greater variety of intellectual and emotional states than those of any other nation, ranging through every style of thought from the sublime to the commonplace, every mood of feeling from the most delicate and touching to the coarse and even brutal. Few subordinate illustrations of the wonderfully complex nature of the English nationality are more striking than this.~~

~~Epitaphs are sometimes classified according to their authorship and sometimes according to their subject, but neither division is so interesting as that which arranges them according to their characteristic features. What has just been said of English epitaphs is, of course, more true of epitaphs generally. They exemplify every variety of sentiment and taste, from lofty pathos and dignified eulogy to coarse buffoonery and the vilest scurrility. The extent to which the humorous and even the low comic element prevails among them is a~~

~~noteworthy circumstance. It is curious that the most solemn of all subjects should have been frequently treated, intentionally or unintentionally, in a style so ludicrous that a collection of epitaphs is generally one of the most amusing books that can be picked up. In this as in other cases too it is to be observed that the unintended humour is generally of a much more entertain- ing kind than that which has been deliberately perpetrated. It would be out of place to give here any specimens of a class of epitaphs which—just because they are the most amusing—are the most abundantly represented in all the ordinary collections.~~

~~See Weever, Ancient Funerall Monuments, 1631, 1661 (Tooke's edit., 1767); Philip Labbe, Thesaurus epitaphiorum, Paris, 1666; Theatrum Funebre extructum a Dodone Richea seu Ottone Aicher, 1675; Hackett, Select and Remarkable Epitaphs, 1757; De la Place, Recueil d'épitaphes, 3 vols., Paris, 1782; Pullcyn, Church- yard Gleanings, c. 1880; L. Lewysohn, Sechzig Epitaphien von Grabsteinen d. israelit. Friedhofes zu Worms, 1855; Pettigrew, Chronicles of the Tombs, 1857; S. Tissington, Epitaphs, 1857 ; Robinson, Epitaphs from Cemeteries in London, Edinburgh, &c., 1859; Le Blant, Inscriptions Chrétiennes de la Gaule antérieures au VIII siécle, 1856, 1865 ; Blommaert, Gaillard, &¢., Inscrip- tions funeraires et monumentales de la prov. de Flandre Orient, Ghent, 1857, 1860; Inscriptions fun. et mon. de la prov. d Anvers, Antwerp, 1857-1860; Chwolson, Achizehn Hebraische Grabschriften aus der Krim, 1859; J. Brown, Epitaphs, de., in Greyfriars Churchyard, Edinburgh, 1867; H. J. Loaring, Quaint, Curious, and Elegant Epitaphs, 1872 ; Cansick, Epitaphs in Cemeteries and Churches of St Pancras, 1872 ; Northend, Book of Epitaphs, New York, 1873 ; J. R. Kippax, Churchyard Literature: Choice coll. of American Epitaphs, 1876. a (W. B.S.)~~

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~~EPITHALAMIUM (from éri, and @dAapos, a nuptial chamber), originally among the Greeks a song which was sung by a number of boys and girls at the door of the nuptial chamber. According to the scholiast on Theocritus, one form the xataxoizyntixov, was employed at~~

~~night, and another, the dieyeptixov, to amuse the bride and bride-groom on the following: morning. In either case, as was natural, the main burden of the song consisted of invoca- tions of blessing and predictions of happiness, interrupted from time to time by the ancient chorus of Hymen hymenee. Among the Romans, a similar custom was in vogue, but the song was sung by girls only, after the marriage guests had gone, and it contained much more of what modern morality would condemn as obscene. In the hands of the poets the epithalamium was developed into a special literary form, and received considerable cultivation. Sappho, Anacreon, Stesichorus, and Pindar are all regarded as masters of the species, but the finest example preserved in Greek literature is the 18th Idyll of Theocritus, which celebrates the marriage of Menelaus and Helena. Catullus, Statius, Ausonius, Sidonius Apollinaris, and Claudian are the authors of the best known epithalaimia in clas- sical Latin; and they have been imitated by Buchanan, Scaliger, Sannazarius, and a whole host of modern Latin poets, with whom, indeed, the form was at one time in great favour. The names of Ronsard, Malherbe, and Scarron are especially associated with the species in French literature, and Marini and Metastasio in Italian. Perhaps no poem of the class has been more universally admired than the epithalamium of Spenser, though he has found no unworthy rivals in Ben Jonson and one or two of his successors.~~

~~EPSOM, a market town in the county of Surrey, is situated about 14 miles 8.W. of London, on a branch of the London and Brighton railway. The town is irregularly built, but contains some handsome new houses. The principal building is the parish church, a Gothic edifice, rebuilt in 1825, the interior of which contains some fine sculptures by Flaxman and Chantrey. Epsom has attained a wide celebrity on account of its mineral springs and its races. The former were discovered about 1618, and for some time after their discovery, the town enjoyed a wonder- ful degree of prosperity. After the Restoration, it was often visited by Charles II., and when Queen Anne came to the throne, her husband, Prince George of Denmark, made it his frequent resort. Epsom gradually lost its celebrity as a spa, but the annual races held on its downs have arrested the decay of the town. Races appear to have been established here as early as James I.'s residence at Nonsuch, but they~~

did not assume a permanent character until 1739. The principal races —the Derby and Oaks— are named after one of the earls of Derby, and his seat, the Oaks, which is in theneighbourhood. The latter race was established in 1779, and the former in the following year. The spring races are held on a Thursday and Friday to- wards the close of April; and the great Epsom meeting takes place on the Tuesday and three following days immediately

| before Whitsuntide,—the Derby on the Wednesday and the

Oaks on the Friday. The grand stand, erected in 1829, is 156 feet wide and 70 feet in depth, consists of three stories, accommodating nearly 5000 spectators, and in- cludes a saloon 108 feet by 34. The population of the civil parish, in 1871 was 6276.

EPSOM SALTS, the magnesite sulphas of pharmacy, and the epsomite or hair-salt of mineralogical treatises, is an hydrated magnesium sulphate, of the chemical constitu- tion MgSO,.7H,O, and isomorphous with zinc sulphate (see vol. vi. p. 527), which it resembles in appearance. The salt crystallizes in four-sided, right-rhombic, lustrous, colourless prisms, which in the commercial article are

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usually acicular in shape. It can be obtained also in crystals of the monoclinic system, It is very soluble, one part dissolving in 0°79 parts of water at 18°75°C., and has a bitter, saline, and cooling taste. The salt is pre- pared on the large scale by several methods, e.g., by the treatment of the bittern of salt works with sulphuric acid or ferrous sulphate, by which tlie magnesium chloride of the liquid is converted intv sulphate; by acting on mag- nesite, the native magnesium carbonate, or on magnesian limestone, with sulphuric acid, preferably, in the case of the latter substance, after the removal of the calcium car- bonate by means of hydrochloric acid; and, as in the neighbourhood of Genoa, by the roasting of pyritous ser- pentine, subsequent exposure to the air and lixiviation, peroxidization of ferrous salts by chlorine, precipitation of ferric oxide by burnt lime or dolomite, and evaporation of of the resultant solution of magnesium sulphate. The mineral waters

~~of Seidlitz, Saidschiitz, Piillna, and of other places besides Epsom owe their potency to magnesium sulphate. The salt occurs in fibrous crusts or botryoidal masses in some limestone caves; in gypsum quarries, as a result of the action of the gypsum on magnesian lime- stone; and in the old workings of mines, where it is pro- duced by the oxidation of pyrites in the presence of mag- nesium compounds. As a hydragogue purgative, it is in common use; it is more especially valuable in febrile diseases, in congestion of the portal system, and in the obstinate constipation of painter's colic. To produce diuresis, the drug is far less frequently resorted to. It possesses the advantage of exercising but little irritant effect upon the bowels. In some cases, where full doses have failed, the repeated administration of small quantities has been found effectual. The chief application of Epsom salts or '"Epsoms" is for weighting cotton-cloth. As a manure, magnesium sulphate has been chiefly employed as a top-dressing for clover-hay. The chlorides of mag- nesium and sodium and salts of iron and of calcium may occur as impurities in Epsom salts.~~

~~EQUATION. The present article includes DETeRMt- NANT and THEoRY oF Equations; and it may be proper to explain the relation to each other of the two subjects. Theory of Equations is used in its ordinary conventional sense to denote the theory of a single equation of any order in one unknown quantity; that is, it does not in- clude the theory of a system or systems of equations of any order between any number of unknown quantities. Such systems occur very frequently in analytical geometry and other parts of mathematics, but they are hardly as yet the subject-matter of a distinct theory ; and even Elimination, the transition-process for passing fiom a system of any number of equations involving the same number of unknown quantities to a single equation in one unknown quantity, hardly belongs to the Theory of Equations in the above restricted sense. But there is one case of a system of equations which precedes the Theory of Equations, and indeed presents itself at the outset of algebra, that of a system of simple (or linear) equations. Such a system gives rise to the function called a Determinant, and it is by means of these functions that the solution of the equa- tions is effected. We have thus the subject Determinant as nearly equivalent to (but somewhat more extensive than) that of a~~

~~system of linear equations ; and we have the other subject, Theory of Equations, used in the restricted sense above referred to, and as not including Elimination.~~

~~DETERMINANT.~~

~~1. A sketch of the history of determinants is given under ALGEBRA; it thereby appears that the algebraical function called a determinant presents itself in the solu-~~

~~tion of a system of simple equations, and we have herein a natural source of the theory. Thus, considering the equations~~

~~ae+by+cz2z=d,~~

~~ve+by+dz=d,~~

~~ave + by + 2 = ad', and proceeding to solve them by the so-called method of cross multiplication, we multiply the equations by factors selected in such a manner that upon adding the results the whole coefficient of y becomes = 0, and the whole coefficient of z becomes =0; the factors in question are b'c" —b"c', b le be", bc' — b'c (values which, as at once seen, have the desired property); we thus obtain an equation which con- tains on the left-hand side only a multiple of x, and on the right-hand side a constant term; the coefficient of a has the value~~

~~a(d'c" — b"c!) + a'(b"c — be") +a (be — B'c) ,~~

~~and this function, represented in the form~~

~~|a,b,¢ l; op Oe~~

~~la', zr" cl is said to be a determinant ; or, the number of elements being 37, it is called a determinant of the third order, It is to be noticed that the resulting equation is~~

~~fe b,c iw=!d,b,c / Ul 7 la , / ap ep e | a ve os Oy Nhc UWS G~~

~~where the expression ou the right-hand side is the like function with d, d’, d’ in place of a, a’, a” respectively, and is of course also a determinant. Moreover, the func- tions 6’c” —b”c’, bc —bc”, be’ —b’c used in the process are themselves the determinants of the second order~~

~~HY ¢e , ee (oh ; b, c~~

~~DOaCs 5? ¢ | ee We have herein the suggestion of the rule for the deriva- tion of the determinants of the orders 1, 2, 3, 4, &c., each from the preceding one, viz., we have~~

~~la =a, ! = , n” a, 5 = ale! ~a’itl , U’ hae | lio, € =ab’, ee +a’b”, e” tees ia’ v fs c Be, Cs ‘b ; Ce ‘Ot c a bv”, e a mW) ye ja i—a\b’! of “ay — ab” A he +alb”, A 6. F ae Alt BC ie Be ok say Dies Canc. \b ae a i iD 6 d i ‘ ; u id A a” ote se” a” Die Cie al ib ae 3@ | iD’ aCe ache j |b ue th as lige c 7 d~~

~~and so on, the terms being all + for a determinant of an odd order, but alternately + and — for a determinant of an even order.~~

~~9. It is easy, by induction, to arrive at the general results :—~~

~~A determinant of the order z is the sum of the 1.2.3… products which can be formed with » elements out of n? elements arranged in the form of a square, no two of the n elements being in the same line or in the same column, and each such product having the coefficient + unity.~~

~~The products in question may be obtained by permuting in every possible manner the columns (or the lines) of the determinant, and then taking for the factors the » elements in the dexter diagonal. And we thence derive the rule for the signs, viz., considering the primitive arrangement of the columns as positive, then an arrangement obtained therefrom by a single interchange (inversion, or derange- ment) of two columns is regarded as negative; and so in general an arrangement is positive or negative according as it is derived from the primitive arrangement by an even or an odd number of interchanges. [This implies the~~

theorem that a given arrangement can be derived from the primitive arrangement only by an odd number, or else only by an even number of interchanges,—a theorem the verifica- tion of which may be easily obtained from the theorem (in fact a particular case of the general one), an arrangement can be derived from itself only by an even number of interchanges.]] And this being so, each product has the sign belonging to the corresponding arrangement of the columns; in particular, a determinant contains with the sign + the product of the elements in its dexter diagonal. It is to be observed that the rule gives as many positive as negative arrangements, the number of each being

=41.2…7.

The rule of signs may be expressed in a different form. Giving to the columns in the primitive arrangement the numbers 1, 2, 3…, to obtain the sign belonging to any other arrangement we take, as often as a lower nuniber succeeds a higher one, the sign ~—, and, compounding together all these minus signs, obtain the proper sign, + or — as the case may be.

Thus, for three columns, it appears by either rule that 123, 231, 312 are positive; 213, 321, 213 are negative ; and the developed expression of the foregoing determinant of the third order is

=ab’c” —ab’¢ +a’b”c—albe’+a”bd —a’b’c.

3. It further appears that a determinant is a linear function! of the elements of each column thereof, and also a linear function of the elements of each line thereof; moreover, that the determinant retains the same value, only its sign being altered, when any two columns are inter- changed, or when any two lines are interchanged; more generally, when the columns are permuted in any manner, or when the lines are permuted in any manner, the deter- minant retains its original value, with the sign + or – according as the new arrangement (considered as derived from the primitive arrangement) is positive or negative according to the foregoing rule of signs. It at once fol- lows

~~that, if two columus are identical, or if two lines are identical, the value of the determinant is =0. It may be added, that if the lines are converted into columns, and the columns into lines, in such a way as to leave the dexter diagonal unaltered, the value of the determinant is unaltered; the determinant is in this case said to be transposed.~~

~~4, By what precedes it appears that there exists a function of the n? elements, linear as regards the terms of each colunin (or say, for shoréness, linear as to each column), and such that only the sign is altered when any two columns are interchanged; these properties completely determine the function, except as to acommon factor which may multiply all the terms. If, to get rid of this arbitrary common factor, we assume that the product of the elements in the dexter diagonal has the coefficient +1, we have a complete definition of the determinant, and it is interesting to show how from these properties, assumed for the definition of the determinant, it at once appears that the determinant is a function serving for the solution of a system of linear equations. Observe that the properties show at once that if any column is =0 (that is, if the elements in the column are each =Q), then the determinant is =0; and further, that if any two columus are identical, then the determinant is. =O;~~

~~5. Reverting to the system of linear equations written~~

~~down at the beginning of this article, consider the deter- minant eee eee eee 1 The expression, a linear function, is here used in its narrowest sense, a linear function without constant term; what is meant is, that the determinant is in regard to the elements CCLACL te column or line thereof, a function of the form Aa+A'a'+A"a"+... without any term independent of a, a', a"... ;~~

~~. of any~~

~~HOU ATI eR~~

~~axtbytc2z-d,b,c¢~~

~~wuet+byt+e2—d', a, c a"a+ bl" yt+e'z -~a', Mc cl it appears that this is~~

~~·,~~

~~=zla,b,c|+y|b,6,¢|+2\c,6,¢|-|d,6,¢], a’, Uc! Demme. i er Cee ne b”” Ci | a”. De fe Ge be. ce” lwetleg ba cl” viz., the second and third terms each vanishing, it is em ec i oe a Teed GR OU ae Ge. ae c” age Oe cl~~

~~But if the linear equations hold good, then the first column of the original determinant is =0, and therefore the deter- minant itself is =0; that is, the linear equations give~~

~~I.~~

~~wja,b,c|-|d,b,¢ =(0; By of ho Do a be cl Cie ev”, a~~

~~which is the result obtained above.~~

~~We might in a similar way find the values of y and z, but there is a more symmetrical process. Join to the original equations the new equation~~

~~ac-+ By + y2=8 ; a like process shows that, the equations being satisfied, we have~~

~~fa, B,7,8|=0; a Cane. hs hy G Opal! ql’ bus ae a’~~

~~Cnet —-3\a,6,c¢ \=0; Oh toe Cuena, a’, v, a’ b’ c d! ig aw~~

~~which, considering 6 as standing herein for its value ax+By+yz, is a consequence of the original equations only: we have thus an expression for ax+Py+ yz, an arbitrary linear function of the unknown quautities 2, y, z ; and by comparing the coefficients of a, 8, y on the two sides respectively, we have the values of wx, 7,2; in fact, these quantities, each multiplied by~~

~~ha bn Gls a’ b’ ¢ ql” b” Ch are in the first instance obtained in the forms 1 1 | 1 ; OE 6 SE NE, b, CR We tS, one Oh Do wich” We? | aan Cy Ca Gh bie ox dq’ a Dae ce dq’ Cs Bie Cw ql” but these are ee | eres See | Mn he Oh CRG ao, ad’ aes i b”,” er ql’ Ge Cie a Ge “ae n”| or,~~

what is the same thing, call 5 (ann OIG BAe Bk lly |G D pe (fn G5 Gh Cae, TO a (is of a” | Ce Os dQ!’ ait bE, q”’ respectively.

6. Multiplication of two determinants of the same order. —The theorem is obtained very easily from the last preced- ing definition of a determinant. It is most simply ex- pressed thus—

a, a’, a’) ’ (B ? B, B”) ’ (y ? y; 7”)

(a,b,c) ” ” ” cl . a,8,7 2 (as a ony “2 74 4 a / i, q Bie a (aig, 24) ” ” 9 a, 0″ ,€ a,B,Y

where the expression on the left side stands for a determi- nant, the terms of the first line being (a, 6, c)(o, a’,a”), that is, aa +ba” +ca”, (a, b, c)(B, 8’, 8”), that is, a8 + 68’ ¢B”, (a, b, cy, y’, y”), that is ay by’ +cy”; and similarly the

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terms in the second and third lines are the like functions with (a’, 0’, c’) and (a”, b”, c’”) respectively.

There is an apparently arbitrary transposition of lines and columns ; the result would hold good if on the left- hand side we had written (a, 8, y), (a’, B’y”), (a”, B”, y”), or what is the same thing, if on the right-hand side we had transposed the second determinant; and either of these changes would, it might be thought, increase the elegance of the form, but, for a reason which need not be explained,! the form actually adopted is the preferable one.

To indicate the method of proof, observe that the deter- minant on the left-hand side, gua linear function of its columns, may be broken up into a sum of (33=) 27 deter- minants, each of which is either of some such form as

t apr

OF Ge

~~aa)~~

~~where the term afy' is not a term of the aPy-determi- nant, and its coefficient (as a determinant with two iden- tical columns) vanishes ; or else it is of a form such as tap'y"|a,b,¢ a! af b! b c me (ye ce" that is, every term which does not vanish contains as a factor the abc-determinant last written down; the sum of all other factors a f'y" is the aBy-determinant of the formula; and the final result then is, that the determinant on the left-hand side is equal to the product on the right-hand side of the formula. 7. Decomposition of a determinant into complementary determinants.—Consider, for simplicity, a determinant of the fifth order, 5= 2 3, and let the top two lines be~~

~~?~~

~~then, if we consider how these elements enter into the determinant, it is at once seen that they enter only through a, b » : a,b | , &c., which can be formed by selecting any two columns at pleasure. Moreover, representing the remaining three lines by~~

~~" a sll n~~

~~the determinants of the second order~~

~~i b be 2 b e" a 7 ; wt ; ne, wn ; UL Cee ee ome, nas a it is further seen that the factor which multiplies the determinant formed with any two columns of the first set is the determinant of the third order formed with the com- plementary three columns of the second set; and it thus appears that the determinant of the fifth order is a sum of all the products of the form~~

~~+a, θ~~

~~a, b'~~

~~i " us~~

~~, a", at ve ay Cn Ga me Jit nett ain c ? d ?~~

~~b~~

~~é~~

~~the sign +: being in each case such that the sign of the term + ab'. cde" obtained from the diagonal elements of the component:determinants may be the actual sign of this term in the determinant of the fifth order; for the product written down the sign is obviously + .~~

~~Observe that for a determinant of the m-th order, taking the decomposition to be 1+(n—1), we fall back upon the equations given at the commencement, in order to show the genesis of a determinant.~~

~~a,b a', 0 ; the original determinant, by selecting the lines and columns at pleasure, is termed a minor of the original~~

~~determinant ; and when the number of lines and columns, MabnnNEEE Cesc 2~~

~~1 The reason is the connexion with the corresponding theorem for the multiplication of two matrices.~~

~~8. Any determinant formed out of the elements of~~

~~499~~

~~or order of the determinant, is n — 1, then such determinant is called a first minor ; the number of the first minors is~~

~~_=n?, the first minors, in fact, corresponding to the several~~

~~elements of the determinant—that is, the coefficient therein of any term whatever is the corresponding first minor. The first minors, each divided by the determinant itself, form a system of elements inverse to the elements of the determinant.~~

~~A determinant is symmetrical when every two elements symmetrically situated in regard to the dexter diagonal are equal to each other; if they are equal and opposite (that is, if the sum of the two elements be = 0),~~

~~this relation not extending to the diagonal elements themselves, which re- main arbitrary, then the determinant is skew ; but if the relation does extend to the diagonal terms (that is, if these are each =0), then the determinant is skew symmetrical ; thus the determinants~~

~~a@,h,g|;| @, vy—p 5 0, vi—-p h,b,f| |-v, 6b, a sivas Ola eA 9,F5¢ By—Ay ¢ B,-A, 0~~

~~are respectively symmetrical, skew, and skew symmetrical.~~

~~The theory admits of very extensive algebraic develop- ments, and applications in algebraical geometry and other parts of mathematics; but the fundamental properties of the functions may fairly be considered as included in what precedes.~~

~~THEORY OF EQUATIONS.~~

~~9. In the subject "Theory of Equations" the term equation is used to denote an equation of the form xe" —p,e"1,.,. +p,=0, where p,, Po… DP, are regarded as known, and x as a quantity to be determined ; for short- ness the equation is written f(z) =0.~~

~~The equation may be numerical; that is, the coeffi- cients 7, 93)... Pn are then numbers,—understanding by number a quantity of the form a+ fz (a and # having any positive or negative real values whatever, or say each of these is regarded as susceptible of continuous variation from an indefinitely large negative to an indefinitely large positive value), and 2 denoting ./—-1.,~~

~~Or the equation may be algebraical ; that is, the coeffi- cients are not then restricted to denote, or are not explicitly considered as denoting, numbers.~~

~~I. We consider first numerical equations. 10 to 14; Imaginary theory, 15 to 18.)~~

~~10. Postponing all consideration of imaginaries, we take in the first instance the coefficients to be real, and attend only to the real roots (if~~

~~any); that is, py, Po---Pn are real positive or negative quantities, and a root a, if it exists, is a positive or negative quantity such that a” — pa”... =p,=0, or say, f(a)=0. The fundamental theorems are given under ALGEBRA, sections X., X11L., XIV.; but there are various points in the theory which require further development.~~

~~It is very useful to consider the curve y=f (x),—or, what would come to the same, the curve Ay =/(«),—but it is better to retain the first-mentioned form of equation, drawing, if need be, the ordinate y ona reduced scale. For instance, if the given equation be x — 62? + 1lxz — 6:06 =0,? then the curve y=? — 6x?+ 11” —- 6-06 is as shown in the figure at page 501, without any reduction of scale for the ordinate.~~

~~It is clear that in general y is a continuous one-valued function of «, finite for every finite value of x, but becom- ing infinite when ~z is infinite; z.¢., assuming throughout that the coefficient of 2” is +1, then when v=, y= +o; but when c=—o, then y= +0 or —-,~~

~~(Real theory,~~

~~i ei aii 2 The coefficients were selected so that the roots might be nearly Yo 253~~

~~500~~

~~according as m is even Or odd ; the curve cuts any line whatever, and in particular it cuts the axis (of i); in at most 7 puints; and the value of x, ab any point of inter- section with the axis, is a root of the cquation hs (x) =0.~~

~~If B, a are any two values of x (a>, that is, a nearer 4+), then if f(8), f(a) have opposite signs, the curve cuts the axis an odd number of times, and therefore at least once, between the points =f, x=a; but if f(B), f(a) have the same sign, then between these poiuts the curve cuts the axis an even number of times, or it may be not at all. That is, f(8), f(a) having opposite signs, there are between the limits 8, a an odd number of real roots, and therefore at Jeast one real root; but F(B), F(4) having the same sign, there are between these limits an even number of real roots,~~

~~or it may be there is no real root. In particular, by giving to B, a the values —~', +00 (or, what is the same thing, any two values suffi- ciently near to these values respectively) it appears that an equation of an odd order has always an odd number of real roots, and therefore at least one real root ; but that an equation of an even order has an even number of real roots, or it may be no real root.~~

~~If a be such that for z= or >a. (that is, x nearer to +00) f(x) is always +, and B be such that for v= or < B (that is x nearer to — ©) f(x) is always —, then the real roots (if any) lie between these limits x= B, x=0; and it is easy to find by trial such two limits including between them all the real roots (if any).~~

~~11. Suppose that the positive value 6 is an inferior limit to the difference between two real roots of the equa- tion; or rather (since the foregoing expression would imply the existence of real roots) suppose that there are not two real roots such that their difference taken posi- tively is = or <8; then, y being any value whatever, there is clearly at most one real root between the limits y and y+; and by what precedes there is such real root or there is not such real root, according as f(y), f(y +9) have opposite signs or have the same sign. And by divid- ing in this manner the interval to a into intervals each of which is = or <8, we should not only ascertain the number of the real roots (if any), but we should also separate the real roots, that is, find for each of them limits y, y+8 between which there lies this one, and only this one, real root.~~

~~In particular cases it is frequently possible to ascertain the number of the real roots, and to effect their separation by trial or otherwise, without much difficulty; but the foregoing was the general process as employed by Lagrange even in the second edition (1808) of the Zvraité de la résolution des Equations Numériques ;+ the determina- tion of the limit § had to be effected by means of the " equation of differences" or equation of the order 4n(x— 1), the roots of which are the squares of the differences of the roots of the given equation, and the process is a cumbrous and unsatisfactory one.~~

~~12. The great step was effected by Sturm's theorem (1835)—viz., here starting from the function f(x), and its first derived function /'(x), we~~

~~have (by a process which is a slight modification of that for obtaining the greatest common measure of these two functions) to form a series~~

~~of functions Sa), fF' (), fa{)+ + + Fn (@)~~

~~of the degrees n,n —1,n—-2….. 0 respectively,—the last term 7,(%) being thus an absolute constant. These lead to the immediate determination of the number of real roots (if any) between any two given limits B, a; viz, supposing «> (that is, a nearer to +00), then substituting suc-~~

~~1 The third edition (1826) is a reproduction of that of 1808; the~~

~~first edition has the date 1798, but a 1 a < ar; t : taken from memoirs of 1767-68 a nd 1770-71. iii~~

~~gv ATT oOe~~

~~cessively these two values in the series of functions, and attending only to the signs of the resulting values, the number of the changes of sign lost in passing from P to a is the required number of real roots between the two limits. tively, the signs of the several functions depend merely on~~

~~In particular, taking B, a= —0, + respec-~~

~~the signs of the terms which contain the highest powers of~~

~~z, and are seen by inspection, and the theorem thus gives~~

~~at once the whole number of real roots.~~

~~And although theoretically, in order to complete by a finite number of operations the separation of the real roots, we still need to know the value of the before-mentioned limit 8; yet in any given case the separation may be effected by a limited number of repetitions of the process. The practical difficulty is when two or more roots are very near to each other. Suppose, for instance, that the theorem shows that there are two roots between 0 and 10; by giving to x the values 1, 2, 3,...~~

~~successively, it might appear that the two roots were between 5 and 6; then again that they were between 5°3 and 5°4, then between 5°34 and 5°35, and so on until we arrive at a separation ; say it appears that between 5°346 and 5-347 there is one root, and between 5°348 and 5-349 the other root. But in the case in question 8 would have a very small value, such as '002, and even supposing this value known, the direct application of the first-mentioned process would be still more laborious.~~

~~13. Supposing the separation once effected, the deter- mination of the single real root which lies between the two given limits may be effected to any required degree of approximation either by the processes of Horner and Lagrange (which are in priuciple a carrying out of the method of Sturm's theorem), or by the process of Newton, as perfected by Fourier (which requires to be separately considered).~~

~~First as to Horner and Lagrange. We know that between the limits B, a there lies one, and only one, real root of the equation ; f(8) and f(a) have therefore opposite signs. Suppose any intermediate value is @; in order to determine by Sturm's theorem whether the root lies between B, 6, or between 6, a, it would be quite unnecessary to calculate the signs of 7(6), /'(6, f.(0)...; only the sign of~~

~~7(6) is required; for, if this has the same sign as (8), then~~

~~the root is between f, 0; if the same sign as f(a), then the root is between 6, a. We want to make 6 increase from the inferior limit B, at which /(~~ ~~has the sign of /(8), so long as f(~~ ~~) retains this sign, and then toa value for which it assumes the opposite sign; we have thus two nearer limits of the required root, and the process may be repeated indefinitely.~~

~~Horner's method (1819) gives the root as a decimal, figure by figure; thus if the equation be known to have one real root between 0 and 10, it is in effect shown say that 5 is too small (that is, the root is between 5 and 6);~~

~~| next that 5-4 is too small (that is, the root is between 5:4~~

~~and 5:5); and soon to any number of decimals. Each figure is obtained, not by the successive trial of all the figures which precede it, but (as in the ordinary process of the extraction of a square root, which is in fact Horner's process applied to this particular case) it is given presumptively as the first figure of a quotient ; such value may be too large, and then the next inferior integer must be tried instead of it, or it may require to be further diminished. And it is to be remarked that the process not only gives the approximate value a of the root, but (as in the extrac- tion of a square root) it includes the calculation of the function f(a) which should be, and approximately is, =0. The arrangement of the calculations is very elegant, and forms an integral part of the actual method. It is to be observed that after a certain number of decimal places have~~

~~EQUATION 501~~

~~been obtained, a good many more can be found by a mere division. It is in the progress tacitly assumed that the roots have been first separated.~~

~~Lagrange's method (1767) gives the root as a continued fraction a+ apy integer (which may be =0), but 4, ¢,... are positive integers. Suppose the roots have been separated; then (by trial if need be of consecutive integer values) the limits may be made to be consecutive integer numbers: say~~

~~.., Where a@ is a positive or negative~~

~~they are a, a+1; the value of x is therefore =a+ = where~~

~~y is positive and greater than 1; from the given equation ae c 1 Z~~

~~for #, writing therein ie 29 , we form an equation of~~

~~the same order for y, and this equation will have one, and only one, positive root greater than 1; hence finding for it the limits 6, 6+1 (where 6is = or >1), we have~~

~~y=b +e, where z is positive and greater than 1; and so~~

~~cn—that is, we thus obtain the successive denominators b, c, d.. of the continued fraction. The method is theo- retically very elegant, but the disadvantage is that it gives the result in the form of a continued fraction, which for the most part rust ultimately be converted into a decimal. There is one advantage in the method, that a commensur- able root (that is, a root equal to a rational fraction) is found accurately, since, when such root exists, the continued frac- tion terminates.~~

~~14. Newton's method (1711), as perfected by Fourier (1831), may be roughly stated as follows. If «=y be an approximate value of any root, and y+ the correct value, then f(y+/)=0, that is,~~

~~f+ ter Ert…-0;~~

~~and then, if 2 be so small that the terms after the second~~

~~may be neglected, f(y) +h/(y)=0, that is, h= – ey or Y the new approximate value is =y— f(y) ; and so on, as~~

~~often as we please. It will be observed that so far nothing has been assumed as to the separation of the roots, or even as to the existence of a real root ; y has been taken as the approximate value of a root, but no precise meaning has been attached to this expression. The question arises, what are the conditions to be satisfied by y in order that the process may by successive repetitions actually lead to a certain real root of the equation; or say that, y being an approximate value of a certain real root, the new value~~

~~y- F(y) may be a more approximate value.~~

~~AC?)~~

~~Y~~

~~Referring to the figure, it is easy to see that that if OC represent the assumed value y, then, drawing the ordinate CP to meet the curve in P, and the tangent PC' to meet~~

~~the axis in OC', we shall have OC' as the new approximate value of the root. But observe that there is here a real root OX, and that the curve beyond X is convex to the axis; under these conditions the point C' is nearer to X than was C ; and, starting with C' instead of C, and pro- ceeding in like manner to draw a new ordinate and tangent, and so on as often as we please, we approximate continually, and that with great rapidity, to the true value OX, But if C had been taken on the other side of X, where the curve is concave to the axis, the new point ©' might or might not be nearer to X than was the point C; and in this case the method, if it succeeds at all, does so by acci- dent only, ¢.e., it may happen that C' or some subsequent point comes to be a point C, such that OC is a proper approximate value of the root, and then the subsequent approximations proceed in the same manner as if this value had been assumed in the first instance, all the pre- ceding work being wasted. It thus appears that for the proper application of the method we require more than the mere separation of the roots. In order to be able to approximate to a certain root a, = OX, we require to know that, between OX and some value ON, the curve is always convex to the axis (analytically, between the two values, J(x) and f"(#) must have always the same sign). When this is so, the point C may be taken anywhere on the proper side of X, and within the portion XN of the axis; and the process is then the one already explained. The approxima- tion is in general a very rapid one. If we know for the required root OX the two limits OM, ON such that from M to X the curve is always concave to the axis, while from X to N it is always convex to the axis,—then, taking D anywhere in the portion MX and (as before) C in the portion XN, drawing the ordinates DQ, CP, and join- ing the points P, Q by a line which meets the axis in D', also constructing the point C' by means of the tangent at P as before, we have for the required root the new limits OD', OC'; and proceeding in like manner with the points D', C', and so on as often as we please, we obtain at each step two limits approximating more and more nearly to the required root OX. The process as to the point D', trans- lated into analysis, is the ordinate process of interpola- tion. Suppose OD=f, OC=a,-we have approximately~~

~~J B+h) =f (B)+ Sa re whence if the root is B+~~

~~(a- A) FG) .~~

~~whe OP ,~~

~~Returning for a moment to Horner's method, it may be remarked that the correction 2, to an approximate value a, is therein found as a quotient the same or such as the quotient f(a)+/(a) which presents itself in Newton's method. 'The difference is that with Horner the integer part of this quotient is taken as the presumptive value of h, and the figure is verified at each step. With Newton the quotient itself, developed to the proper number of decimal places, is taken as the value of h; if too many decimals are taken, there would be a waste of work; but the error would correct itself at the next step. Of course the calculation should be conducted without any such waste of work.~~

~~Next as to the theory of imaginaries.~~

~~15. It will be recollected that the expression number and the correlative epithet numerical were at the outset used in a wide sense, as extending to imaginaries. This extension arises out of the theory of equations by a process analogous to that by which number, in its original most restricted sense of positive integer number, was extended to have the meaning of a real positive or negative magni- tude susceptible of continuous variation.~~

~~If for a moment number is understood in its most restricted sense as meaning positive integer number, the~~

~~502~~

~~solution of a simple equation leads to an extension ; ax—b=0, givesx= —,a positive fraction, and we can in a~~

~~this manner represent, not accurately, but as nearly as we please, any positive magnitude whatever; so an equation~~

~~ax+b=0 gives v= — 2. , which (approximately as before)~~

~~represents any negative magnitude. We thus arrive at the extended signification of number as a continuously varying positive or negative magnitude. Such numbers may be added or subtracted, multiplied or divided one by another, and the result is always a number. Now from a quadric equation we derive, in like manner, the notion of a complex or imaginary number such as is spoken of above. The equation x?1=0 is not (in the foregoing sense, number =real number) satisfied by any numerical value whatever of «; but we assume that there is a number which we call 7, satisfying the equation 27 1=0 ; and then taking a and 6 any real numbers, we form an expression such as a+0z, and use the expression number in this extended sense: any two such numbers may be added or subtracted, multiplied or divided one by the other, and the result is always a number. And if we consider first a quadric equation «?+px+q=0 where p and q are real numbers, and next the like equation, where p and q are any numbers whatever, it can be shown that there exists for x a numerical value which satisfies the equation; or, in other words, it can be shown that the equation has a numerical root. The like theorem, in fact, holds good for an equation of any order whatever; but suppose for a moment that this was not the case; say that there was a cubic equation 2°+pa?+qgx+r=0, with numerical coeffi- cients, not satisfied by any numerical value of x, we should have to establish a new imaginary j satisfying some sucli equation, and should then have to consider numbers of the form a+j, or perhaps a+/+¢j? (a, b, ¢ numbers a+ fz of the kind heretofore considered),—first we should be thrown back on the quadric equation x? + px+q=0, p and g being now numbers of the last-mentioned extended form —non constat that every such equation has a numerical root—and if not, we might be led to other imaginaries k, l, &c., and so on ad infinitum in inextricable confusion.~~

~~But in fact a numerical equation of any order whatever has always a numerical root, and thus numbers (in the fore- going sense, number= quantity of the form a+?) form (what real numbers do not) a universe complete in itself, such that starting in it we are never led out of it. There may very well be, and perhaps are, numbers in a more general sense of the term (quaternions are not a case in point, as the ordinary laws of combination are not adhered to), but in order to have to do with such numbers (if any) we must start with them.~~

~~16. The capital theorem as regards numerical equations thus is, every numerical equation has a numerical root ; or for shortness (the meaning being as before), every equation has a root. Of course the theorem is the reverse of self- evident, and it requires proof; but provisionally assuming it as true, we derive from it the general theory of numerical equations, As the term root was introduced in the course of an explanation, it will be convenient to give here the formal definition.~~

~~A number a@ such that substituted for x it makes the function x,"— p,x""...+, to be =0, or say such that it satisfies the equation f(x)=0, is said to be a root of the equation; that is, a being a root, we have~~

~~ar —pa"—1, , An =0, or say f(a)=0; and it is then easily shown that x—a is a factor of the function f(x), viz., that we have f(x) =(x—a) f,(x), where Fi(@) isa function 2" — qyx"*. . . + Q,_y of the order » — 1, with numerical coefficients ¢,, 99+» Gn—t-~~

~~EQUATION~~

~~In general a is not a root of the equation f(x) =0, but it may be so—.e., f, (z) may contain the factor x-a; when this is so, f(x) will contain the factor (x — a)?; writing then f(x) =(a —a)? f,(x), and assuming that a is not a root of the equation f,(x) =0, «=a is then said to be a double root of the equation f(x) =0; and similarly /(~) may con- tain the factor (#—a)° and no higher power, and x=a is then a triple root ; and so on.~~

~~Supposing in general that f(x) =(x—a)* F(x) (a being a positive integer which may be =1, (w—a)* the highest power of z—a which divides /(x), and F(x) being of course of the order n—a), then the equation F(x)=0 will have a root 6 which will be different from a; —b will be a factor, in general a simple one, but it may be a multiple one, of F(x), and f(x) will in this case be = (a — a)%(a —b)8 ®(xz) (8 a positive integer which may be =1, (x—b)* the highest power of x-6 in F(a) or f(a), and (x) being of course of the order n-a-{f). The original equation /(~)=0 is in this case said to have a roots each =a, 8 roots each =6; and so on for any other factors (# —c)7, &c.~~

~~We have thus the theorem—A numerical equation of the order 7 has in every case 2 roots, viz., there exist » num- bers a, b,.. (in general all distinct, but which may ar- range themselves in any sets of equal values), such that f(x) = (a —a)(v —b)(x—c)... identically.~~

~~It the equation has equal roots, these can in general be determined, and the case is at any rate a special one which may be in the first instance excluded from considera- tion. It is, therefore, in general assumed that the equa- tion f(z) =0 has all its roots unequal.~~

~~If the coefficients p,, p,... are all or any one or more of them imaginary, then the equation (x) =0, sepa- rating the real and imaginary parts thereof, may be written F(z) +76(x)=0, where F(x), ®(x) are each of them a function with real coefficients ; and it thus appears that the equation f(x) =0, with imaginary coefficients, has not in general any real root; supposing it to have a real root a, this must be at once a root of each of the equa tions F(a) =0 and ®(x)=0.~~

~~But an equation with real coefficients may have as well imaginary as real roots, and we have further the theorem that for any such equation the imaginary roots enter in pairs, viz., a+r being a root, then a— fi will be also a root. It follows that if the order be odd, there is always an odd number of real roots, and therefore at least one real root.~~

~~17. In the case of an equation with real coefficients, the question of the existence of real roots, and of their separa- tion, has been already considered. In the general case of an equation with imaginary (it may be real) coefficients, the like question arises as to the situation of the (real or imaginary) roots; thus, if for facility of conception we re- gard the constituents a, B of a root a+ i as the coordi- nates of a point im plano, and accordingly represent the root by such point, then drawing in the plane any closed curve or "contour," the question is how many roots lie within such contour.~~

~~This is solved theoretically by means of a theorem of Cauchy's (1837), viz., writing in the original equation x+y in place of z, the function /(x + iy) becomes = P 2Q, where P and Q are each of them a rational and integral function (with real coefficients) of (x, y). Imagining the point~~

~~(a, y) to travel along the contour, and considering the number of changes of sign from—to and from + to – of the fraction corresponding to passages of the fraction through zero (that is, to values for which P becomes=0, disregarding those for which Q becomes = 0), the difference of these numbers gives the number of rovts within the contour.~~

~~BQUATION 503~~

~~It is important to remark that the demonstration does not presuppose the existence of any root; the contour may be the infinity of the plane (such infinity regarded as a contour, or closed curve), and in this case it can be shown (and that very easily) that the difference of the numbers of changes of sign is=x; that is, there are within the infinite contour, or (what is the same thing) there are in all n roots; thus Cauchy's theorem contains really the proof of the fundamental theorem that a numerical equation of the nth order (not only has a numerical root, but) has precisely ~ roots. It would appear that this proof of the fundamental theorem in its most complete form is in prin- ciple identical with Gauss's last proof (1849) of the theorem, in the form—A numerical equation of the mth order has always a root.!~~

~~But in the case of a finite contour, the actual determina- tion of the difference which gives the number of real roots can be effected only in the case of a rectangular contour, by applying to each of its sides separately a method such as that of Sturm's theorem; and thus the actual deter- mination ultimately depends on a method such as that of Sturm's theorem.~~

~~Very little has been done in regard to the calculation of the imaginary roots of an equation by approximation; and the question is not here considered.~~

~~18. A class of numerical equations which needs to be considered is that of the binomial equations #*—a=0 (a=a+ Bi, a complex number). The foregoing conclu- sions apply, viz., there are always 2 roots, which, it may be shown, are all unequal. And these can be found numeri: cally by the extraction of the square root, and of an nth root, of real~~

numbers, and by the aid of a table of natural sines and cosines.? For writing

- |. p38 (ee | : a+ Bi Ja +B) Jats Jette

there is always a real angle X (positive and less than 27),

such that its cosine and sine are=

ee ; | Jette Jap respectively; that is, writing for shortness ,/a?@°=p, we have a 62=p (cos A+7 sin A), or the equation is z=

p(cosA +7 sin X); heuce observing that (cos * +7 sin >)

A n) -

The formula really gives all the roots, for instead of A we may write 4+ 2s7, s a positive or negative integer, and then we have . er) n ?

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a“ : — Deisaie =cosA+7sind, a value of wis = 9/p(cos ate sim

+7si

which has the » values obtained by giving to s the values 0,1,2…2 — 1 in succession; the roots are, it is clear, represented by points lying at equal intervals on a circle. But it is more convenient to proceed somewhat differently; taking one of the roots to be 0, so that 6” =a, then assuming x= Oy, the equation becomes 7” — 1 =0, which equation, like the original equation, has precisely n roots (one of them being of course =1). And the original equation x” — a=0 is thus reduced to the more simple equation x” — 1=0; and although the theory of this equation is included in the preceding one, yet it is proper to state it separately.

The equation «” — 1=0 has its several roots expressed

- 1 The earlier demonstrations by Euler, Lagrange, &c., relate to the case of a numerical equation with real coefficients ; and they consist in

~~showing that such equation has always a real quadratic divisor, fur- nishing two roots, which are either real or else conjugate imaginaries a+ Bi (see Lagrange's Equations Numériques). ;~~

~~2 The square root of a+ fi can be determined by the extraction of square roots of positive real numbers, without the trigonometrical tables,~~

~~in the form 1, w, w,... w* 1, where w may be taken=~~

~~LM a, QE : : : cos —-+7 sin —-; in fact, w having this value, any integer~~

~~: Qnk . , Dek power w* is =cos — +? sin —-, and we thence have (w*)" =~~

~~cos 27k+7 sin 2rk, =1, that is, w* is a root of the equation. The theory will be resumed further on. By what precedes, we are led to the notion (a numerical)~~

~~1~~

~~of the radical a*regarded as an n-valued function; any one of these being denoted by X/a, then the series of values s Va, oYa,...0″ aq; or we may, if we please, use~~

~~af /a instead of a* as a symbol to denote the n-valued function,~~

~~As the coefficients of an algebraical equation may be numerical, all which follows in regard to algebraical equa- tions is (with, it may be, some few modifications) appli- cable to numerical equations; and hence, concluding for the present this subject, it will be convenient to pass on to algebraical equations.~~

~~II. We consider secondly algebraical equations (19 to 34),~~

~~19. The equation is~~

~~x” — 9,2”-14+.,.. +7n=0, and we here asswme the existence of roots, viz,, we assume that there are 7 quantities a, b, c.. (in general all of them different, but which in particular cases may become equal in sets in any manner), such that~~

~~x” — MP1 4+, + Mn =0 5; or looking at the question in a different point of view, and starting with the roots a, b,c..as given, we express the product of the 2 factors x—a, x—b,..in the foregoing form, and thus arrive at an equation of the order having the 2 roots a, b,c.. In either case we have~~

~~Py = 3a, pz=Bab,.. pn=abe…;~~

~~t.¢., regarding the coefficients p,, Po. + Pn a8 given, then we assume the existence of roots a, 0, c,.. such tbat p,= Sa, &c.; or, regarding the roots as given, then we write Py» Py» &c., to denote the functions 2a, Zab, ke.~~

~~As already explained, the epithet algebraical is not used in opposition to numerical; an algebraical equation is merely an equation wherein the coefficients are not rc- stricted to denote, or are not explicitly considered as denot- ing, numbers. That the abstraction is legitimate, appears by the simplest example; in saying that the equation 2— pa+q=0 has a root «=4(p+ ,/p?—4q), we mean that writing this value for x the equation becomes an~~

~~identity, {4(p + /p? — 49)}? – {ht (p+ Jp? – 4g} +9 =(; and the verification of this identity in nowise de- pends upon p and g meaning numbers. But if it be asked what there is beyond numerical equations included in the term algebraical equation, or, again, what is the full extent of the meaning attributed to the term—the latter question at any rate it would be very difficult to answer ; as to the former one, it may be said that the coefficients may, for instance, be symbols of operation. As regards such equations, there is certainly no proof that every equation has a root, or that an equation of the nth order has x roots; nor is it in any wise clear what the precise signification of the statement is. But it is found that the assumption of the existence of the roots can be made without contradictory results ; conclusions derived from it, if~~

they involve the roots, rest on the same ground as the original assumption; but the conclusion may be indepen- dent of the roots altogether, and in this case it is un- doubtedly valid; the reasoning, although actually con- ducted by aid of the assumption (and, it may be, most easily and elegantly in this manner), is really independent

of the assumption. In illustration, we observe that it is allowable to express a function of p and q as follows,—that is, by means of a rational symmetrical function of a and b; this can, as a fact, be expressed as a rational function of a+b and ab; and if we prescribe that a+ and ab shall then be changed into p and q respectively, we have the required function of p,g. That is, we have F (a, 8) as a representation of f (p, g), obtained as if we had p=a+t 8, g=ab, but without in any wise assuming the existence of the a, b of these equations. 20. Starting from the equation ce —pan-l+... =x—-a.a—b. &c.

or the equivalent equations p, = Sa, &c., we find

a—par-1+, , =0,

5” — p,b”-1+. . =0;

(it is as satisfying these equations that a, b.. are said to be the roots of 2*—p,c”’..=0); and con- versely from the last-mentioned equations, assuming that a,b.. are all different, we deduce Di ==, po=Zab, &c. and x” —pi-1,..=x-a.%—-b. &c. Observe that if, for instance, a=, then the equations a®”— pa” ,.=0, i” —p,b” “... =0 would reduce them- selves to asingle relation, which would not of itself express that a was a double root,—that is, that (7 — a)? was a factor of *—p,2″ 1+ &c.; but by considering 0 as the limit of a+h, h indefinitely small, we obtain a second equation na®-1—(n—1)pyar-2+...=0, which, with the first, expresses that a is a double root ; and then the whole system of equations leads as before to the equations p,= Xa, &c. But the existence of a double root implies a certain relation between the co- efficients; the general case is when the roots are all un- equal,

~~We have then the theorem that every rational symmetri- cal function of the roots is a rational function of the co- efficients. This is an easy consequence from the less gene- ral theorem, every rational and integral symmetrical func- tion of the roots is a rational and integral function of the coefficients.~~

~~In particular, the suins of the powers 3a", Sa, &ec., are rational and integral functions of the coefficients.~~

~~The process originally employed for the expression of other functions Sa°0P, &c., in terms of the coefficients is to make them depend upon the sums of powers : for instance, Sa%bP = Sa*Sa? — att; but this is very objectionable ; the true theory consists in showing that we have systems of equations~~

~~py =2a, Pe = sab ie = Sa?+ 25ab 9~~

~~P3 Zabc 5~~

~~PrP. Sab +3sabe,~~

~~py? =Sa*+33a°b+6zabc,~~

~~where in each system there are precisely as many equa- tions as there are root-functions on the right-hand side— e.g., 8 equatious and 3 functions abc, Sab, Sa*. Hence in each system the root-functions can be dcterminced linearly in terms of the powers and products of the co- efficients :~~

~~{ 2ab = P2s~~

~~Za? =p,?— 2p, sabc = Per ei me ae 2a° =p," — 39,0. + 373,~~

~~and so on. The older process, if applied consistently, would derive the originally assumed value Sab, =p,, from the two equations Sa=p, Sa2? =p,2- 2p. 5 %é, we have 23ab = Sa. 3a — 3a', =p? — (p1? — 2p2), = 2p,~~

~~H@UATIORN~~

~~21. It is convenient to mention here the theorem that, x being determined as above by an equation of the order n, any rational and integral function whatever of 2, or more generally any rational function which does not be- come infinite in virtue of the equation itself, can be expressed as a rational and integral function of x, of the order x — 1, the coefficients being rational functions of the coefficients of the equation. Thus the equation gives 2" a function of the form in question; multiplying each side by z, and on the right-hand side writing for x" its fore- going value, we have a2"t', a function of the form in question; and the like for any higher power of 2, and therefore also for any rational and integral function of 2. The proof in the case of a rational non-integral function is somewhat more complicated. The final result is of the form $3 =I), or say $(x%) —y(a)I(x) =0, where 4, y, I~~

~~are rational and integral functions; in other words, this equa- tion, being true if only,/(~) =0, can only be so by reason that the left-hand side contains f(x) as a factor, or we must have identically $(«)— y(x)I(xz)=M(x)/(z). And it is, moreover, clear that the equation aa = I(x), being satisfied if only f(x) =0, must be satisfied by each root of the equa- tion.~~

~~From the theorem that a rational symmetrical function of the roots is expressible in terms of the coefticients, it at once follows that it is possible to determine an equation (of an assignable order) having for its roots the several values of any given (unsymmetrical) function of the roots of the given equation. For example, in the case of a quaitic equation, roots (a, b,c, d), it is possible to find an~~

~~equation having the roots ad, ac, ad, be, bd, cd (being there-~~

~~fore a sextic equation) : viz., in the product (y — ab)(y — ac)(y — ad)(y — be)(y – bd)(y – cd) the coefficients of the several powers of y will be sym- metrical functions of a, b, c, d and therefore rational and integral functions of the coefficients of the quartic equation; hence, supposing the product so expressed, and equating it to zero, we have the required sextic equation. In the same manner can be found the sextic equation having the roots (a—b)?, (a—c)*, (a—d)?, (b —c)?, (b—d)*, (c—d)*, which is the equation of differ- ences previously referred to ; and~~

similarly we obtain the equa- tion of differences for a given equation ofanyorder. Again, the equation sought for may be that having for its 7 roots the given rational functions ¢(«) , p(b), ... of the several roots of the given equation. Any such rational function can (as was shown) be expressed as a rational and integral function of the order »—1; and, retaining x in place of any one of the roots, the problem is to find y from the equa- tions 2″ – pa”... =0, and y= Moz”? + Mya”? +.., or, what is the same thing, from these two equations to elimi- nate zx. This is in fact Tschirnhausen's transformation

1683).

22. In connexion with what precedes, the question arises as to the number of values (obtained by permutations of the roots) of given unsymmetrical functions of the roots, or say of a given set of letters: for instance, with roots or letters (a, b, c, d) as before, how many values are there of the function ab+cd, or better, how many functions are there of this form? The answer is 3, viz., ab+cd, ac+bd, ad+be; or again we may ask whether, in the case of a given number of Ietters, there exist functions with a given number of values, 3-valued, 4-valued functions, &c.

It is at once seen that for any given number of letters there exist 2-valued functions; the product of the differ- ences of the letters is such a function ; however the letters are interchanged, it alters only its sign ; or say the two values are A,—A. And if P, Q are symmctrical functions

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of the letters, then the general forin of such a fuuction is P+QA ; this has ouly the two values P+ QA, P-QA.

In the case of 4 letters there exist (as appears above) 3-valued functions : but in the case of 5 letters there does not exist any 3-valued or 4-valued function; and the only 5-valued functions are those which are symmetrical in regard to four of the letters, and can thus be expressed in terms of one letter and of symmetrical functions of all the letters.

~~These last theorems present themselves in the demonstration of the non-existence of a solution of a quintic equation by radicals.~~

~~The theory is an extensive and important one, depend- ing on the notions of sudstetutcons and of groups.!~~

~~. 23. Returning to equations, we have the very import- ant theorem that, giveu the value of any unsymnietrical function of the roots, e.g.,in the case of a quartic equation, the function ab+ cd, it is in general possible to determine rationally the value of any similar function, such as (a+b+(c+d). .~~

~~The a priori ground of this theorem may be illustrated by means of a numerical equation. Suppose that the roots of a quartic equation are 1, 2, 3, 4, then if it is given that ab+cd=14, this in effect determines a,b to be 1, 2 and c,d to be 3,4 (viz. a=1,0=2 ora=2,b=1, andc=3,d=4 orce=3, d=4) or else a,b to be 3, 4 and c,d to be 1,2; and it therefore in effect determines (a+6)?+(c+d)' to be = 370, and not any other value; that is, (a+b)? + (e+), as having a single value, must be determinable rationally. And we can in the same way account for cases of failure as regards particular equations ; thus, the roots being 1, 2, 3, 4 as before, a2b= 2 determines a to be =1 and d to be =2; but if the roots had been 1, 2, 4,16 then a2d = 16 does not uniquely determine a,b but only makes them to be 1,16 or 2,4 respectively.~~

~~As to the a posteriori proof, assume, for instance,~~

~~t=ab+cd, y,=(a+b)?+(c+d), t,=ac+bd, yg=(at+c)+(b+d)%, tz=ad+be, ys= (at+d)>+(b+c)*:~~

~~then Y+%o+Yy AM +twetteYs Am +tYotts Ys will be respectively symmetrical functions of the roots of the quartic, and therefore rational and integral functions of the coefficients ; that is, they will be known.~~

~~Suppose for a moment that ¢,, ¢,, ¢, are a/J known; then~~

~~1A substitution is the operation by which we pass from the primi- tive arrangement of n letters to any other arrangement of the same~~

~~letters : for instance, the substitution os means that a is to be~~

~~Substitutions may, of I j Gon is the substitution which leaves the letters unaltered. Two or mote substi- tutions may be compounded together and give rise to a substitution; 4.€., performing upon the printitive arrangement first the substitution 8 and then upon the result the substitution a, we have the substitution a8. Substitutions are not commutative; thus, a8 is not in general = Ba; but they are assoviative, aB.y=a.By, so that aBy has a determinate meaning. A substitution may be compounded any number of times with itself, and we thus have the powers a", a®..&c. Since the num- ber of substitutions is limited, some power a' must be =1, or as this miay be expressed every substitution isa root of unity. A group of substitutions is a set such that each two of them compounded together in either order gives a substitution belonging to the set; every group includes the substitution unity, so that we may in general speak of a group 1,a,6,.. (the number of terms is the order of the group). The whole system of the 1.2.3…2 substitutions which can be performed upon the » letters is obviously a group: the order of every other group which can be formed out of these substitutions is a submultiple of this number ; but it is not conversely true that a group exists the order of which is any given submultiple of this number. In the case of a determinant the substitutions which give rise to the positive terms form a group the order of which is =41.2.3…x. For any function of the n-letters, the whole series of substitutions which leave the value of the functions unaltered form a group; and thence also the number of values of the function is —1.2.3…% divided by the order of the~~

~~group.~~

~~changed into 0, b into q cintod, d into a.~~

~~course, be represented by single letters a,B,..~~

~~000~~

~~the equations being linear in ,, ¥.,y, these can be expressed rationally in terms of the coefticients and of t,, to¢,; that is, Yy Ye Y3 Will be known. But observe further that y, is obtained as a function of ¢,,¢,,¢, symmetrical as regards ¢y,t,; it can therefore be expressed as a rational function of ¢, and of ¢,+¢,, ¢jf,, and thence as a rational function of Z, and of t) +t, +ts, tyty +tyte + totes tt.f,; but these last are symmetrical functions of the roots, and as such they are expressible rationally in terms of the coefficients ; that 1s, Y, will be expressed as a rational function of ¢, and of the coefficients ; or ¢, (alone, not #, or é,) being known, ¥, will be rationally determined.~~

~~24. We now consider the question of the algebraical solution of equations, or, more accurately, that of the solution of equations by radicals,~~

~~In the case of a quadric equation a? — px+q=0, we can by the assistance of the sign ,/(_) or ( )? find an ex- pression for # as a two-valued function of the coefficients , ¢ such that substituting this value in the equation, the equation is thereby identically satisfied ; it has been found that this expression is~~

~~z=h{p + /p — 4},~~

~~and the equation is on this account said to be algebraically solvable, or more accurately solvable by radicals. Or we may by writing «= -1p+z, reduce the equation to #=1(p* — 4q) viz., to an equation of the form 2=a; and in virtue of its being thus reducible we say that the original equation is solvable by radicals. And the question for an equation of any higher order, say of the order 2, is, can we by means of radicals (that is by aid of the sign */( )~~

~~1~~

~~or ( )™, using as many as we please of such signs and with any values of m) find an n-valued function (or any function) of the coefficients which substituted for # in the equation shall satisfy it identically.~~

~~It will be observed that the coefficients p,q..are not explicitly considered as numbers, but even if they do denote numbers, the question whether a numerical equa- tion admits of solution by radicals is wholly unconnected with the before-mentioned theorem of the existence of the n roots of such an equation. I[t does not even follow that in the case of a numerical equation solvable by radicals the algebraical solution gives the numerical solution, but this requires explanation, Consider first a numerical quadric equation with imaginary coefficients. In the formula 2=1(p+ J/p?—4q), substituting for p,q their given numerical values, we obtain for x an expression of the form t=a+ Bis Vy + 67, where a, B, y, dare real numbers. Thig expression substituted for # in the quadric equation would satisfy it identically, and it is thus an algebraical solution ; but there is no obvious priori reason why ,/y +02 should have a value=c-+di, where c and d are real numbers calcul- able by the extraction of a root or roots of real numbers ; however the case is (what there was no prior? right to expect) that ,/y +67 has such a value calculable by means of the radical expressions ,/{ ,/y?+6?+y}: and hence the algebraical solution of a numerical quadric equation does in every case give the numerical solution. The case of a numerical cubic equation will be considered presently,~~

~~25. A cubic equation can be solved by radicals, Taking for greater simplicity the cubic in the reduced form a+qe—r=0, and assuming <=a+), this will be a solu- tion if only 3ab=q and a?+l?=r, equations which give (a? — 6°)? =r? — 34,¢°, a quadric equation solvable by radi- cals, and giving a? — b?= ,/r?— 4,93, a two-valued function of the coefficients : combining this with a? + 03=r, we have a= 3(r+ ,/r?- 479%), a two-valued function; we then have a by means of a cube root, viz.,~~

~~am {art x ag”)}, VIII, — 64~~

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~~a six-valued function of the coefficients ; but then, writing 5 we have, as may be shown, a+6 a three-valued 3a~~

~~function of the coefficients ; and x=a+6 is the required solution by radicals. It would have been wrong to com- plete the solution by writing b= Y thr Vr?) }~~

~~for then a+ would have been given as a 9-valued function having only 3 of its values roots, and the other 6 values being irrelevant. Observe that in this last process we make no use of the equation 3a =4, in its original form, but use only the derived equation 27ab? =q3, implied in, but not implying, the origina]. form,~~

~~An interesting variation of the solution is to write a=ab(a+b), giving ab%(a? + 0°) =r and 3a%b?=q, or say~~

~~a? + 68 = – ab = 14; and consequently ———_——— 3 —cEEEEEE a Lrs JAII), Baie Jase),~~

~~i.e, here a3, 63 are each of them a two-valued function, but~~

~~as the only effect of altering the sign of the quadric |~~

~~radical is to interchange a, 0%, they may be regarded as~~

~~each of them one-valued; a and 6b are each of them | 3-valued (for observe that here only a*b%, not a8, is given) ; |~~

~~and ab (a+) thus is in appearance a 9-valued function ; but it can easily be shown that it is (as it ought to be) only 3-valued.~~

~~In the case of a numerical cubic, even when the co- efficients are real, substituting their values in the expres- sion~~

~~wm {srt Jae)} tee Yet Jt)},~~

~~this may depend on an expression of the form A/y+6éi where y and 6 are real numbers (it will do so if 7?- ore? is a negative number), and then we cannot by the extrac- tion of any root or roots of real positive numbers reduce 2/y+ 8i to the form c+ di, ¢ and d real numbers ; hence here the algebraical solution does not give the numerical solution, and we have here the so-called "irreducible case" of a cubic equation. By~~

~~what precedes there is nothing in this that might not have been expected; the algebraical solution makes the solution depend on the extraction of the cube root of — a number, and there was no reason for expecting this to be a real number. It is well known that the case in question is that wherein the three roots of the numerical cubic equation are all real; if the roots are two imaginary, one real, then contrariwise the quantity under the cube root is real; and the algebraical solution gives the numerical one.~~

~~The irreducible case is solvable by a trigonometrical formula, but this is not a solution by radicals: it consists in effect in reducing the given numerical cubic (not to a cubic of the form z°=a, solvable by the extraction of a cube root, but) to a cubic of the form 42° 3×2=a, cor responding to the equation 4cos*#- 3cos@=cos3@ which serves to determine cos@ when cos36 is known. The theory is applicable to an algebraical cubic equation; say that such an equation, if it can be reduced to the form 423 — 34 =a, is solvable by " trisection"—then the general cubic equation is solvable by trisection.~~

~~26. A quartic equation is solvable by radicals: and it is to be remarked that the existence of such a solution depends on the existence of 3-valued functions such as ab+cd of the four roots (a, b, c,d): by what precedes ab+cd is the root of a cubic equation, which equation is solvable by radicals: hence ab+cd can be found by radicals ; and since abcd is a given function, ab and cd can then be found by radicals. But by what precedes, if ab be known then any similar function, say a+ 6, is obtain-~~

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~~able rationally; and then from the values of a+ and ab we may by radicals obtain the value of a or 6, that is, an expression for the root of the given quartic equation: the expression ultimately obtained is 4-valued, corresponding to the different values of the several radicals which enter therein, and we have thus the expression by radicals of each of the four roots of the quartic equation. But when the quartic is numerical the same thing happens as in the cubic, and the algebraical solution does not in every case give the numerical one. —~~

~~It will be understood from the foregoing explanation as to the quartic how in the next following case, that of the quintic, the question of the sulvability by radicals depends on the existence or non-existence of &- valued functions of the five roots (a, b, c,d,e) ; the fundamental theorem is the one already stated, a rational function of five letters, if it~~

~~| has less than 5, cannot have more than 2 values, that is,~~

~~there are no 3-valued or 4-valued functions of 5 letters: and by reasoning depending in part upon this theorem, Abel (1824) showed that a general quintic equation is not solvable by radicals; and a fortiori the general equation of any order higher than 5 is not solvable by radicals.~~

~~27. The general theory of the solvability of an equa- tion by radicals depends fundamentally on Vandermonde's remark (1770) that, supposing an equation is solvable by radicals, and that we have therefore an algebraical expres- sion of x in terms of the coefficients, then substituting for the coefficients their values in terms of the roots, the re- sulting expression must reduce itself to any one at pleasure of the roots a,b,c.. 3 thus in the case of the quadric equa-~~

~~tion, in the expression « =}(p+ Jp? — 4q), substituting for p and q their values, and observing that (a+ b)? — 4ab= (a—b)?, this becomes x=} {a+0+ J (a—b)*}, the value being a or b according as the radical is taken to be + (a— b) or —(a—)).~~

~~So a un cubic equation #—px®+qu—r=0, if the roots are a,0,¢, and if w is used to denote an imaginary cube root of unity, o?+o+1=0, then writing for shortness p=atbt+e, L=a+ob+o%, M=a+o%+e, it is at once seen that LM, L3+ M3, and therefore also (L?— M®*)?~~

~~are symmetrical functions of the roots, and consequently~~

~~rational functions of the coeflicients : hence 4{L8+M34 /U8— M3}~~

~~is a rational function of the coefficients, which when these are replaced by their values as functions of the roots becomes, according to the sign~~

~~given to the quadric radical, = L3 or M3: taking it =L3, the cube root of the expres- sion has the three values L,wL,w*L ; and LM divided by the same cube root has therefore the values M,w?M,oM ; whence finally the expression~~

~~fot V{ac+ e+ JM) } LM 9/{4L8+M3+ /(- MP?) }] has the three values 4(p+L+M), {pt+olL+o°M), §(p+o7L+oM) ;~~

~~that is, these are =a, b,c respectively. If the value M? had been taken instead of L, then the expression would have had the same three values a, b,c. Comparing the solution given for the cubic a°+gz—r=0, it will readily be seen that the two solutions are identical, and that the function r2 — 43 under the radical sign must (by aid of the rela- tion p=0 which subsists in this case) reduce itself to (L3— M3)?; it is only by each radical being equal to a rational function of the roots that the final expression can become equal to the roots a, 5, ¢ respectively.~~

~~28. The formule for the cubic were obtained by La- grange (1770-71) from a different point of view. Upon examining and comparing the principal known methods for~~

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~~the solution of algebraical equations, he found that they all ultimately depended upon finding a “ resolvent ” equa- tion of which the root is a+ b+-0c+o3d+..., being an imaginary root of unity, of the same order as the equation ; ¢.g., for the cubic the root is a+ob+w%, an imaginary cube root of unity. Evidently the method gives for L3 a quadric equation, which is the “ resolvent ” equa- tion in this particular case.~~

~~For a quartic the formule present themselves in a some- what different form, by reason that 4 is not a prime number. Attempting to apply it to a quintic, we seek for the equation of which the root is (a+ wb + wc + wd + we), » an imaginary fifth root of unity, or rather the fifth power thereof (a4 +o) + wc + wd + w4e)®; this is a 24-valued function, but if we consider the four values corresponding to the roots of unity , w*, w*, wo, viz, the values~~

~~(at+w b+w%e+w3d + we)®, (a+wb+wte+ad+w'e)*, (+ wb + w c+ wid + we), (a + w4d + w8e+ wd +w e)®,~~

~~any symmetrical function of these, for instance their sum, is a six-valued function of the roots, and may therefore be determined by means of a sextic equation, the coefficients wherecf are rational functions of the coefficients of the original quintic equation; the conclusion being that the solution of an equation of the fifth order is made to de- pend upon that an equation of the sixth order. This is, of course, useless for the solution of the quintic equation, which, as already mentioned, does not admit of solution by radicals ; but the equation of the sixth order, Lagrange's resolvent sextic, is very important, and is intimately con- rected with all the later investigations in the theory.~~

~~29. It is to be remarked, in regard to the question of solvability by radicals, that not only the coefficients are taken to be arbitrary, but it is assumed that they are represented each by a single letter, or say rather that they are not so expressed in terms of other arbitrary quantities as to make a solution possible. If the coefficients are not all arbitrary, for instance, if some of them are zero, a sextic equation might be of the form 2° + bat+ca?+d=0, and so be solvable as a cubic; or if the coefficients of the sextic are given functions of the six arbitrary quantities a, b, c, d, e, f, such that the sextic is really of the form (a? + ac + b) (at + cx? + dx? +ex+f)=0, then it breaks up into the equations a + ax+b=0, «4+ cx3 + dz? +ex+f=0, and is consequently solvable by radicals; so also if the form is (w—a)(a- 6)(c—c)(w-d)(x—e)(a-f)=0, then the equation is solvable by radicals,—in this extreme case rationally. Such cases of solvability are self-evident ; but they are enough to show that the general theorem of the non-solvability by radicals of an equation of the fifth or any higher order does not in any wise exclude for such orders the existence of particular equations solvable by radicals, and there are, in fact, extensive classes of equa- tions which are thus solvable; the binomial equations x" —1=0 present an instance.~~

~~30. It has already been shown how the several roots of the equation x* —~1=0 can be expressed in the form~~

~~2 ee oe cos “<= +74 sin — , but the question is now that of the~~

~~algebraical solution (or solution by radicals) of this equa- tion. There is always a root=1; if w be any other root, then obviously w, w?,....” are all of them roots; a” —1 contains the factor «—1, and it thus appears that .o” are the n— 1 roots of the equation~~

~~grl4gn—24…+24+1=0;~~

~~2~~

~~, W*,..~~

~~we have, of course, o” ?+0”*...+o+1=0. It is proper to distinguish the cases » prime and com- posite; and in the latter case there is a distinction accord-~~

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~~ing as the prime factors of m are simple or multiple. By way of illustration, suppose successively x= 15 and n=9 ; in the former case, if a be an imaginary root of #?—]=0 (or root of 2?+a2+1=0), and B an imaginary root of 2° —1=0 (or root of 2t+23+22+2+1=0), then w may be taken =a8; the successive powers thereof, af, a2, 63, a4, a7, B, a8, «263, Bt, a, a2G, 62, a8, «284, are the roots of zl4+e….4+24+1=0; the solution thus depends on the solution of the equations 3—1=0 and #5-1=0. In the latter case, if a be an imaginary root of #3—1=0 (or root of #+2%+1=0), then the equation #®*-1=0 gives =1, 0, or a?; 28=1 gives me a, or a; and the solu- tion thus depends on the solution of the equations 23 — 1 =0, #8-a@=0, 22-a?=0. The first equation has the. roots 1, a, a”; if B be a rdot of either of the others, say if 8 =a, then assuming w=, the successive powers are f, B?, «, aB, oB?, a”, a28, «282, which are the roots of the equation #+a7…+¢+1=0.~~

~~Ti thus appears that the only case which need be con- sidered is that of m a prime number, and writing (as is more usual) 7 in place of w, we have 7, 7”, 73,... 7-1 as the (x — 1) roots of the reduced equation~~

~~1+ gn-2.,.t+c+1=0;~~

~~then not only 7*—1=0, but also r”1+7″ ...4r+1=0.~~

~~31. The process of solution due to Gauss (1801) depends essentially on the arrangement of the roots in a certain order, viz., not as above, with the indices of 7 in arith- metical progression, but with their indices in geometrical progression; the prime number ~ has a certain number of prime roots g, which are such that g”~’ is the lowest power of g, which is=1 to the modulus 7; or, what is the same thing, that the series of powers 1, g, g?...g”, each divided by x, leave (in a different order) the remainders 1, 2, 3… —1; hence giving to r in succession the indices 1, g, g?...g”, we have, in a different order, the whole series of roots 7, 72, 73… 7777.~~

~~In the most simple case, x = 5, the equation to be solved is c¢ +a3+22+2+1=0; here 2 is a prime root of 5, and the order of the roots is 7, 7%, 74, 73. The Gaussian pro- cess consists in forming an’ equation for determining the periods P,, P,, = r+7r* and r?+7r° respectively,— these being such that the symmetrical functions P,+P,, P,P, are rationally determinable: in fact P}+P,=-1, P,P,=(r+r\(r2 +73), =P +rt+rot77, =P trtree, P,, P, are thus the roots of w?+u—1=0; and taking them to be known, they are themselves broken up into subperiods, in the present case single terms, 7 and 7* for P,, 7? and 7° for P,; the symmetrical functions of these are then rationally determined in terms of P, and P,; thus r+7t=P,,r.rt=1, or 7, 7 are the roots of u2—P,u+1=0. The mode of division is more clearly seen for a larger value of 7; thus, for ~=7 a prime root is = 3, and the arrangement of the roots is, 7°, 92, 72, ae: We may form either 3 periods each of 2 terms, P,, P., Ps =r+75, 4r4, 124 7° respectively ; or else 2 periods each of 3 terms, P,, Pp=rtr?+ rt, +75 + 7° respectively ; in each case the symmetrical functions of the periods are rationally determinable: thus in the case of the two periods P,+P,=—-1, P\P,=3+rt+PrAtrtrts, =2; and the periods being known the symmetrical functions of the several terms of each period are rationally~~

~~determined in terms of the periods, thus r+7?+74=P,, reer +r gt=P,, r.rt=l.~~

~~The theory was further developed by Lagrange (1808), who, applying his general process to the equation in ques- tion, 2*14+2”*..+2%+1=0 (the roots a, b,c. . being the several powers of 7, the indices in geometrical progression as above), showed that the function (a+ wb+w%c+..)”+ was ia this case a given function of w with integer co-~~

~~efficients. Reverting to the before-mentioned particular equation a4 +a3+a%+2+1=0, it is very interesting to compare the process of solution with that for the solu- tion of the general quartic the roots whereof are a, 6, ¢, d. Take w, a root of the equation wf —1= 0 (whence w is = 1, ~1, 4, or—#, at pleasure), and consider the expression (a+ wb+ wet wd)’,~~

~~the developed value of this is~~

~~= a4+b4+c+d4+6(a%c? + bd?) +12(a%bd + b*ca + c7db + d?ac)~~

~~0 [40 0c+E+da)+12(ared + Pda+ cab + dbc) }~~

~~+ wf 6(a?b? + bc? + cd? + da”) + 4(aFc+ Bd + Ba + db) + 24abed }~~

~~+ wf 4(a3d + a+ 05 + dc) + 12(a?bc+ bred + da +d?ab)}~~

~~that is, this is a 6-valued function of a, 0, c, d, the root of a sextic (which is, in fact, solvable by radicals; but this is not here material).~~

~~If, however, a, 0, c, d denote the roots 7, 7°, 74, 7° of the special equation, then the expression becomes~~

~~r+ r 724 6(1 +1) 4+12(72 +744+73 +7)~~

~~+o {4141 +141)4+1204+ +r +7°)}~~

~~e f{O(rtr2trttr) 4P+rtt+r)t~~

~~+a {4(rtr2trt+r3) +147 +72+74)} viz., this is~~

~~=-1+40+140? – 160,~~

~~a completely determined value. That is, we have~~

~~(7 + wr? + wrt + w379)4 = —1+ 40 +140? – 160%, which result contains the solution of the equation. w=1, we have (r+7r?+74+7°)t=1, which is right; if w= —1, then (r+74-7?—73)4=25; if w=7, then we have {r—ré+ ¢ (r?-7°)}4= —15420¢; and if w= —2, then {r—rt—i (r?—7°)}4= ~15—207; the solution may be completed without difficulty.~~

~~The result is perfectly general, thus :—n being a prime number, 7 a root of the equation 21+ 2”-*....+%2+1=0, wo a root of ow” ‘—1=0, and g a prime root of g™?=1 (mod. 7), then~~

~~(r+or ve. $y 2y “n=~~

~~is a given function M,+M,o…+M,_.w”* with integer coefficients, and by the extraction of (7 —1)th roots of this and similar expressions we ultimately obtain 7 in terms of w, which is taken to be known; the equation «”—1=0, n a prime number, is thus solvable by radicals, In particular, if »—1 be a power of 2, the solution (by either process) requires the extraction of square roots only; and it was thus that Gauss discovered that it was possible to con- struct geometrically the regular polygons of 17 sides and 257 sides respectively. Some interesting developments in regard to the theory were obtained by Jacobi (1837); see the memoir ‘ Ueber die Kreistheilung, u.s.w.,” Crelle, t. xxx. (1846).~~

~~The equation x””’..%+1=0 has been considered for its own sake, but it also serves as a specimen of a class of equations solvable by radicals, considered by Abel (1828), and since called Abelian equations, viz., for the Abelian equation of the order 2, if a be any root, the roots are 2, Ox, 6°a,...0”—‘x (Ou being a rational function of a, and @“x =x); the theory is, in fact, very analogous to that of the above particular case. A more general theorem obtained by Abel is as follows :—If the roots of an equa- tion of any order are connected together in such wise that all the roots can be expressed rationally in terms of any one of them, say x;~~

~~if, moreover, 2, 6,7 being any two of the roots, we have 60,v=6,0z, the equation will be solvable algebraically. It is proper to refer also to Abel's definition of an ¢rreducible equation:—an equation px=0, the coefficients of which are rational functions of a certain number of known quantities a, b, c.., is called irreducible when it is impossible to express its roots by an~~

~~If | ,/5, are rational, and the equation is no longer irreducible.~~

~~'In the case of a given equation, assumed to be irreducible,~~

~~TION~~

~~equation of an inferior degree, the coefficients of which are also rational functions of a, b,c… (or, what is the same thing, when ¢x does not break up into factors which are rational fanctions of a, b,c..). Abel applied his theory to the equations which present themselves in the division of the elliptic functions, but not to the modular equations.~~

~~32. But the theory of the algebraical solution of equations in its most complete form was established by Galois (born October 1811, killed in a duel May 1832; see his collected works, Leowville, t. xl., 1846). The definition of an irre- ducible equation resembles Abel's,—an equation is re- ducible when it admits of a rational divisor, irreducible in the contrary case ; only the word ratzonal is used in this extended sense that, in connexion with the coefficients of the given equation, or with the irrational quantities (if any) whereof these are composed, he considers any number of other irrational quantities called " adjoint radicals," and he terms rational any rational function of the coefficients (or the irrationals whereof they are composed) and of these adjoint radicals; the epithet irreducible is thus taken either absolutely or in a relative sense, according to the~~

~~system of adjoint radicals which are taken into account.~~

~~For instance, the equation a*+23+2?+a%+1=0; the left hand side has here no rational divisor, and the equation is irreducible; but this~~

~~function is=(#?+}a+1)?— $2%, and it has thus the irrational divisors #? 3(1 /5)x+1, a2+3(1—,/5)e+1; and these, if we adjoin the radical~~

~~the problem to solve the equation is, in fact, that of find- ing radicals by the adjunction of which the equation be- comes reducible ; for instance, the general quadric equation x +-pxe+q=0 is irreducible, but it becomes reducible, breaking up into rational linear factors, when we adjoin the radical ,/ tp? — gq.~~

~~The fundamental theorem is the Proposition I. of the "Mémoire sur les conditions de résolubilite des équations par radicaux ;" viz., given an equation of which a, b, c.. are the m roots, there is always a group of permutations of the letters a, b, c.. possessed of the following properties :—~~

~~1. Every function of the roots invariable by the substi- tutions of the group is rationally known.~~

~~2. Reciprocally every rationally determinable function of the roots is invariable by the substitutions of the group.~~

~~Here by an invariable function is meant not only a function of which the form is invariable by the substitu-. tions of the group, but further, one of which the value is invariable by these substitutions ; for instance, if the equa- tion be x= 0, then wz isa function of the roots invariable by any substitution whatever. And in saying that a func- tion is rationally known, it is meant that its value is ex- pressible rationally in terms of the coefficients and of the adjoint quantities,~~

~~For instance, in the case of a general equation, the group is simply the system of the 1.2.3… permutations of all the roots, since, in this case, the only rationally determinable functions are the symmetric functions of the roots.~~

~~In the case of the equation 2"!...4+2+1=0, n a prime number, a, 0,¢c… k=7, 19, 7"... 79", where g is a prime root of m, then the group is the cyclical group abe…k, bc…ka,...kab…j, that is, in this particular case~~

~~the number of the permutations of the group is equal to the order of the equation.~~

~~This notion of the group of the original equation, or of the group of the equation as varied by the adjunction of a series of radicals, seems to be the fundamental one in Galois's theory. But the problem of solution by radicals, instead of being the sole object of the theory, appears as the~~

~~ie~~

~~first link of a long chain of questions relating to the trans- formation and classification of irrationals. Returning to the question of solution by radicals, it will be readily understood that by the adjunction of a radical the group may be diminished ; for instance, in the case of the general cubic, where the group is that of the six permutations, by the adjunction of the square root whicli enters into the solution, the group is reduced to abe, bea, cab ; that is, it becomes: possible to express rationally, in terms of the coefficients and of the adjoint square root, any function such as ab + 6% +a which is not altered by the cyclical substitution a into }, b into c,cinto a. And hence, to determine whether an equation of a given form is solvable by radicals, the course of investigation is to inquire whether, by the successive adjunction of radicals, it is possible to reduce the original group of the equation so as to make it ultimately cousist of a single permutation. The condition in order that an equation of a given prime order m may be solvable by radicals was in this way obtained —in the first instance in the form (scarcely intelligible with- out further explanation) that every function of the roots 2, %Q…%y, invariable by the substitutions aris for x, 1aust be rationally known; and then in the equivalent~~

~~form that the resolvent equation of the order 1.2. .,—2.~~

~~must have a rational root. In particular, the condition in order that a quintic equation may be solvable is that Lagrange's resolvent of the order 6 may have a rational factor, a result obtained from a direct investigation in a valuable memoir by E. Luther, Crelle, t. xxxiv. (1847).~~

~~Among other results demonstrated or announced by Galois may be mentioned those relating to the modular equations in the theory of elliptic functions ; for the trans- formations of the orders 5, 7, 11, the modular equations of the orders 6, 8, 12 are depressible to the orders 5, re Tel respectively ; but for the transformation, 7 a prime number greater than 11, the depression is impossible.~~

~~The general theory of Galois in regard to the solution of equations was completed, and some of the demonstra- tions supplied by Betti (1852). See also Serret's Cours VAlgebre supériewre, 2d ed., 1854; 4th ed. 1877-78, in course of publication.~~

~~33. Returning to quintic equations, Jerrard (1835) estab- lished the theorem that the general quintic equation is by the extraction of only square and cubic roots reducible to the form #°+ax+6=0, or what is the same thing, to #+2+b=0. The actual reduction by means of Tschirn- hausen's theorem was effected by Hermite in connexion with his elliptic-function solution of the quintic equation (1858) in a very elegant manner. It was shown by Cockle and Harley (1858-59) in connexion with the Jerrardian form, and by Cayley (1861), that Lagrange's resolvent equation of the sixth order can be replaced by a more simple sextic equation occupying a like place in the theory.~~

~~The theory of the modular equations, more particularly for the case n=5, has been studied by Hermite, Kro- necker, and Brioschi. In the case »=5, the modular equation of the order 6 depends, as already mentioned, on an equation of the order 5; and conversely the general quintic equation may be made to depend upon this modular equation of the order 6; that is, assuming the solution of this modular equation, we can solve (not by radicals) the general quintic equation; this is Hermite's solution of the general quintic equation by elliptic func- tions (1858); it is analogous to the before-mentioned trigonometrical solution of the cubic equation. The theory is reproduced and developed in Brioschi's memoir, "Ueber die Auflésung der Gleichungen vom fiinften Grade," Lath. Annalen, t. xiii. (1877-78).~~

~~34. The great modern work, reproducing the theories of~~

~~| dents.~~

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~~Galois, and exhibiting the theory of algebraic equations as a whole, is Jordan's V'raité des Substitutions et des Kqua- tions Algébriques, Paris, 1870. The work is divided into four books—book i, preliminary, relating to the theory of congruences; book ii. is in two chapters, the first relating to substitutions in general, the second to substitu- tions defined analytically, and chiefly to linear substitu- tions ; book iii. has four chapters, the first discussing the principles of the general theory, the other three contain- ing applications to algebra, geometry, and the theory of transcendents; lastly, book iv., divided into seven chapters, contains a determination of the general types of equations solvable by radicals, and a complete system of classification of these types. A glance through the index will show the vast extent which the theory has assumed, and the form of general conclusions arrived at; thus, in book iii., the algebraical applications comprise Abelian equations, equa- tions of Galois; the geometrical ones comprise Hesse's equa- tion, Clebsch's equations, lines on a quartic surface having a nodal line, singular points of Kummer's surface, lines on a cubic surface, problems of contact ; the applications to the theory of transcendents comprise circular functions, elliptic functions (including division and the modular equation), hyperelliptic functions, solution of equations by transcen- And on this last subject, solution of equations by transcendents, we may quote the result,—" the solution of the general equation of an order superior to five cannot be made to depend upon that of the equations for the division of the circular or elliptic functions;" and again (but with a reference to a possible case of exception), " the general equation cannot be solved by aid of the equations which~~

~~| give the division of the hyperelliptic functions into an odd~~

~~number of parts." (A. Ga.) EQUITES, an order of men in the commonwealth of Rome to which there is no exact parallel in modern times. Their origin goes back to the earliest period of Roman history. During the reign of the kings they appear to have been of noble birth,~~

the younger branches of patrician families, This we may infer from the statement of Polybius (vi. 20), that the knights now are chosen according to fortune,—evidently intimating that their selection had previously depended on a different principle. Romulus is said to have divided them into three centuries or " hundreds," each century being chosen from one of the three old Roman tribes, the Ramnes, Tities, and Luceres. Both Tullus Hostilius and Tarquinius added to their number; but, according to Livy, it was Servius Tullius (576 3.c.) who first organized them into a distinct body, and compelled the state to contribute annually to their maintenance. It is difficult to perceive in what way we are to explain the statement of Livy (i. 43), that ten thousand pounds of brass were given to each for the purchase of a horse,—an enormous sum when compared with that at which oxen and sheep were rated in the table of penalties. Every eques, of course, was bound to be provided with a good horse, and he may have been obliged to replace it if lost through any casualty in war. Its accoutrements, too, and a slave to take charge of it, were possibly all included in the sum. But whether, wlien the censor ordered the knight to sell his horse, it was the intention that the outfit money should be refunded to the state, we have no means of determining. Livy tells us also that the ws hordearvum or barley-money sup- plied to each knight for the maintenance of his. horse was obtained by a tax on widows and orphans. This certainly sounds strange, for it seems inconceivable that there should have been such a large number of rich widows; and even though the word vzduwa is explained to mean every single woman, maiden as well as widow, the difficulty stillremains. Beyond the hordeariwm the knights received

no pay, .- :

In 400 z.c., during the siege of Veii, on account of the want of sufficient cavalry, those who possessed the requisite fortune offered to provide horses at their own expense. These new equites, distinguished as equites equo prwato, in opposition to the equites equo publrco, received regular pay, but, as by the very circumstances of their origin they had

~~neither horse-money (aes equestre) nor barley-money (es hordearium), they formed a distinct body from the old equites, and had no share in any of their peculiar privileges. In 303 Bc. the censors Q. Fabius and P. Decius established a law by which it was ordained that every fifth year a pro- cession of the equites should take place, and that those who had misconducted themselves should be degraded from their rank. 'he procession (equitwm transvectio) took place every year on the 15th of July (idibus Quintilibus), the anniversary of the battle of Lake Regillus. The knights in full equipment rode from the Temple of Honour in the south of the city through the Porta Capena and onwards past the temple of Castor and Pollux through thie Forum to the Capitol. Their ranks were purged by the censors, before whom they filed past on foot. If the censor had no fault to find, he said to the eques, traduc equum, lead on your horse ; but if he was dissatisfied he said, vende equum, sell your horse, and the eques ceased to belong to the order. This review bore the name of equitum recognitio, or, as the Greek writers translate it, trréwv érioxeyis. The equites evidently soon became a very power-ful body in the state; yet in 186 B.c. we find it allowed as a reward to P. Aubutius that the censor should not assign him a public horse, aud thereby compel him to serve as an eques against his will, proving that the duties must have been burdensome and regarded by many with distaste. In the later period of the republic the equites increased in power and consequence, and at the same time gradually ceased altogether to be what their name implied, the military service which they had formerly rendered being now obtained from allies and auxiliaries. To be an eques came to mean simply that a man was pos-sessed of a certain amount of wealth without belonging to the senatorial order. The judicial functions were transferred from the senate to the body of equites by the Sempronian law, passed by C. Gracchus about 123 B.c.; and a short time afterwards they became the farmers of the public revenues, by which they were enabled to amass immense riches. 'They were deprived of their judicial powers by Sulla; but they now possessed too much influence in the state to be excluded from the higher and more dignified offices. After his death they were admitted to their former power, which, however, they shared with the senate. Towards the end of the republic, and under the emperors, the fortune requisite for an eques seems to have been four hundred sestertia, equal~~

~~to about £3230 of our money; and even at this time knights' horses were furnished by the state, as we find by ancient inscriptions of that period.~~

~~The equites, who still in the reign of Augustus adhered for the most part to the use of the simple iron ring, had before the time of Pliny obtained the right of wearing the golden ring formerly distinctive of the senatorial order. "Their dress was a tunic with a narrow purple stripe (twa angusticlavia), in contrast to the senatorial tunic with a broad stripe (tunica laticlana). In 67 Bo. a peculiar privilege was granted them by the Roscian law (lea Roscia theatralis), which reserved fourteen rows in the theatre behind the senatorial benches for their exclusive use.~~

~~Under the empire appears a class of equites distinguished as singulares Augusti imperatoris, which has been the subject of much debate. The epithet singularis is by some supposed to refer to their possession of a single horse, and by others it is regarded as indicative of their singular rank; but Henzen explains it' as equivalent to~~

~~particularis, because they were attached to the service of~~

~~an individual. They formed a sort of body-guard to the emperor, were stationed in Rome, and only under peculiar circumstances were called to serve outside of the city. They appear to have consisted largely of foreigners, more especially from the north of Europe: the names of Ger- mans, Batavians, Frisians, Friseevonians, Britons, Helvetians, Dalmatians, Bessians, Thracians, Rhzetians, Pannonians, frequently occur. A considerable number are evidently freedmen who have adopted the name of the reigning emperor on their entrance into his service; but the advan- tages of the position also attracted not a few of the Roman citizens. At what time the corps was established is un- known: Henzen thinks it was by one of the Flavian emperors, as there is no mention of them under the Julian and Claudian families, but they were certainly in existence under Trajan. They disappear in the reign of Constantine. Their relation to the auxiliaries was similar to that of~~

the pretorians to the Roman army proper. They were under the command of the prefects of the prectorium, and occu- pied two camps in the city,—one of which was at Torre Pignattara, where their monuments are frequently found.

See Madvig, ‘ De loco Ciceronis in Libro IV. de Republica,” in Opuscula Academica, vol. i., 1830; Muhlert, De cquitibus Romanis, Hild. 1830; Marquardt, Historia equitum Romanorum, Berlin, 1840; Zumpt, Ueber den rimischen Ritterstand, Berlin, 1840; Heunzen, “ Sugli equiti singolari degl’ imperatori Romani,” in Annali dell Instit. di Corr. Arch. di Roma, 1850; Gomont, Les chevaliers romains depuis Romulus jusqu’a Galba, 1854; Belot, Hist. des chevaliers romains depuis le temps des rois jusqu au temps des Gracques, 1867, and Hist. des chev. rom. depuis le temps des Gracques jusqu’d la division de Vempire romain, 1873; Ramsay, Manual of Roman Antiquities, 10th edition, 1876.

EQUITY in its most general sense means justice ; in its most technical sense it means a system of law, or a body of connected legal principles, which have superseded or supplemented the common law on the ground of their intrinsic superiority. Aristotle (Zthics, bk. v. c. 10) defines equity as a better sort of justice, which corrects legal justice where the latter errs through being expressed in a universal form and not taking account of particular cases. When the law speaks universally, and something happens which is not according to the common course of events, it is right that the law should be modified in its applicatio: to that particular case, as the lawgiver himself would have done, if the case had been present to his mind. Accord- ingly the equitable man (érteexys) is he who does not pusli the law to its extreme, but, having legal justice on his side, is disposed to make allowances. Equity as thus described would correspond rather to the judicial discretion which modifies the administration of the law than to the antagonistic system which claims to supersede the law.

The part played by equity in the development of law is admirably illustrated in the well-known work of Sir Henry Maine on Ancient Law. Positive law, at least in progressive societies, is constantly tending to fall

~~behind public opinion, and the expedients adopted for bringing it into harmony therewith are three, viz., legal fictions, equity, and statutory legislation. Equity here is defined to mean "any body of rules existing by the side of the original civil law, founded on distinct principles, and claiming incidentally to supersede the civil law in virtue of a superior sanctity inherent in those principles." It is thus different from legal fiction, by which a new rule is introduced surreptitiously, and under the pretence that no change has been made in the law, and from statutory legislation, in which the obligatory force of the rule is not supposed to depend upon its intrinsic fitness. The source of Roman equity was the fertile theory of natural law, or the law common to allnations. Even in the Institutes of Justinian the distinction is carefully drawn in the laws of a country. between those which are peculiar to itself and those which~~

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~~natural reason appoints for all mankind. The connexion in Roman law between the ideas of equity, nature, natural law, and the law common to all nations, 'and the influence of the Stoical philosophy on their development, are fully discussed in the third chapter of the work we have referred to. The agency by which these principles were introduced was the edicts of the praetor, an annual procla- mation setting forth the manner in which the magistrate intended to administer the law during his year of office. Fach successive praetor adopted the edict of his prede- cessor, and added new equitable rules of his own, until the further growth of the irregular code was stopped by the Preetor Salvius Julianus in the reign of Hadrian.~~

~~The place of the praetor was occupied in English juris- prudence by the lord high chancellor. The real beginning of English equity is to be found in the custom of handing over to that officer, for adjudication, the complaints which were addressed to the king, praying for remedies beyond the reach of the common law. Over and above the authority delegated to the ordinary councils or courts, a reserve of judicial power was believed to reside in the king, which was invoked as of grace by the suitors who could not obtain relief from any inferior tribunal. To the~~

~~chancellor, as already the head of the judicial system, these petitions were referred, although he was not at first the only officer through whom the prerogative of grace was administered. In the reign of Edward ITI. the equitable jurisdiction of the court appears to have been established. For some account of this tribunal see CHANCERY and CHANCELLOR. Its constitutional origin was analogous to that of the Star Chamber and the Court of Reqnests. The latter, in fact, was a minor court of equity attached to the lord privy seal as the Court of Chancery was to the chancellor. The successful assumption of extraordinary or equitable jurisdiction by the chancellor caused similar pre- tensions to be made by other officers and courts. ' Not only the Court of Exchequer, whose functions were in ® peculiar manner connected with royal authority, but the counties palatine of Chester, Lancaster, and Durham, the Court of Great Session in Wales, the universities, the city of London, the Cinque Ports, and other places silently assumed extraordinary jurisdiction similar to that exercised in the Court of Chancery." Even private persons, lords and ladies, affected to establish in their honours courts of equity.~~

~~English equity has one marked historical peculiarity, viz., that it established itself in a set of independent tribunals which remained in standing contrast to the ordinary courts for many hundred years. In Roman law the judge gave the preference to the equitable rule; in English law the equitable rule was enforced by a distinct set of judges. One cause of this separation was the rigid adherence to precedent on the part of the common law courts. Another was the jealousy prevailing in England against the principles of the Roman law on which English equity to a large extent was founded.~~

~~When a case of prerogative was referred to the chancellor in the reign of Edward III., he was required to grant such remedy as should be consonant to honesty (honestas). And honesty, conscience, and equity were said to be the funda- mental principles of the court. The early chancellors were ecclesiastics, and under their influence not only moral prin- ciples, where these were not regarded by the common law, but also the equitable principles of the Roman law were in- troduced into English jurisprudence. Between this point and the time when equity~~

~~became settled as a portion of the legal system, having fixed principles of its own, various views of its nature seem to have prevailed. Fora long time it was thought that precedents could have no place in equity, inasmuch as it professed in each case to do that~~

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~~which was just; and we find this view maintained by com- mon lawyers after it had been abandoned by the professors of equity themselves. Mr Spence, in his book on the Equitable Jurisdiction of the Court of Chancery, quotes a case in the reign of Charles IL, in which Chief-Justice Vaughan said :—~~

~~_. 'I wonder to hear of citing of precedents in matter of equity, for if there be equity in a case, that equity is an universal truth, and there can be no precedent in it ; so that in any precedent that can be produced, if it be the same with this case, the reason and equity~~

~~is the same in itself ; and if the precedent be not the same case with this, it is not to be cited."~~

~~But the Lord Keeper Bridgman answered :—~~

~~" Certainly precedents are very necessary and useful to us, for in them we may find the reasons of the equity to guide us, and besides the authority of those who made them is much to be regarded. We shall suppose they did it upon great consideration and weighing of the matter, and it would be very strange and very ill if we should disturb and set aside what has been the course for a long series of times and ages,"~~

~~Selden's description is well-known :—* Equity is a roguish thing. 'Tis all one as if they should make the standard for measure the chancellor's foot." Lord Nottingham in 1676 reconciled the ancient theory and the established practice by saying that the conscience which guided the court was not the natural conscience of the man, but the civil and political conscience of the judge. 'he same tendency of equity to settle into a system of law is seen in the recogni- tion of its limits—in~~

~~the fact that it did not attempt in all cases to give a remedy when the rule of the common law was cantrary to justice. Cases of hardship, which the early chancellors would certainly have relieved, were passed over by later judges, simply because no precedent could be found for their interference. The point at which the introduction of new principles of equity finally stopped is fixed by Sir Henry Maine in the chancellorship of Lord Eldon, who held that the doctrines of the court ought to be as well settled and made as uniform almost as those of the common law. From that time certainly equity, like common law, has pro- fessed to take its principles wholly from recorded decisions and statute law. The view (traceable no doubt to the Aristotelian definition) that equity mitigates the hardships of the law where the law errs through being framed in universals, is to be found in some of the earlier writings. Thus in the Doctor and Student it is said—~~

~~"Law makers take heed to such things as may often come, and not to every particular case, for they could not though they would ; therefore, in some cases it is necessary to leave the words of the law and follow that reason and justice requireth, and to that intent equity is ordained, that is to say, to temper and mitigate the rigour of the law.~~

~~And Lord Ellesmere said—~~

~~"The cause why there is a Chancery is for that men's actions are so divers and infinite that it is impossible to make any general law which shall aptly meet with every particular act and not fail in some circumstances, "~~

~~Modern equity, it need hardly be said, does not profess to soften the rigour of the law, or to correct the errors into which: it falls by reason of its generality. '~~

~~To give any account, even in outline, of the subject matter of equity within the necessary limits of this paper would be impossible. It will be sufficient to say here that the classification generally adopted by text-writers is based upon the relation of equity to the common law, of which some explanation in given above. Thus equitable jurisdic- tion is said to be exclusive, concurrent, or auxiliary. Equity has exclusive~~

jurisdiction where it recognizes rights which are unknown to the common law. The most important example is trusts. Equity has concurrent jurisdiction in cases where the law recognized the right but did not give adequate relief or did not give relief without circuity of action or some similar inconvenience. And equity has

auciliary jurisdiction when the machinery of the courts of law was unable to procure the necessary evidence.

"The evils of this double system of judicature," says the reportof the late Judicature Commission, "and the confusion and conflict of jurisdiction to which it has led, have been long known and acknowledged." A partial attempt to meet the difficulty was made by several Acts of Parliament (passed after the reports of commissions appointed in 1850 and 1851), which enabled courts of law and equity both to exercise certain powers formerly peculiar to one or other of them. A more complete remedy was introduced by the Judicature Act, 1873, which consolidated the courts of law and equity, and ordered that law and equity should be ad- ministered concurrently according to tle rules contained in the 26th section of the Act. The 25th section lays down certain legal principles in accordance with the general inten- tion, and also declares that 'generally in all matters not hereinbefore particularly mentioned, on which there is any conflict or variance between the rules of equity and the rules of the common law with reference to the same matter, the rules of equity shall prevail." (E. RB.)

ERARD, S&pastien (1752-1831), a manufacturer of musical instruments, distinguished especially for the im- provements he made upon the harp and the pianoforte, was born at Strasburg on the 4th April 1752. While a boy he showed great aptitude for practical geometry and architectural drawing, and in the workshop of his father, who was an upholsterer, he found opportunity for the early exercise of his mechanical ingenuity. When he was six- teen his father died, and he removed ta Paris where he obtained employment with a harpsichord maker, Here his remarkable constructive skill, while it speedily excited the jealousy of his master and procured his disinissal, almost equally

~~soon attracted the notice of musicians and musical instrument makers of eminence. Before he was twenty- five he set up in business for himself, his first workshop being a room in the hotel of the Duchesse de Villeroi, who gave him warm encouragement. Under her roof he con- structed in 1780 his first pianoforte, which was also one of the first manufactured in France, the instruments used previous to that period in the houses of the Paris nobility having been imported from Germany and England. When heard in the salon of his patroness, it quickly secured for its maker such a reputation that he was soon overwhelmed with commissions. Finding assistance necessary, he sent for his brother, Jean Baptiste, in conjunction with whom he established in the Rue de Bourbon in the Faubourg St Germain a piano manufactory, which in a few years became one of the most celebrated in Europe. On the outbreak of the Revolution he proceeded to London, where he established a factory similar to that in Paris. Return- ing to the French capital in 1796, he introduced soon afterwards grand pianofortes, made in the English fashion, with several improvements of his own. In 1808 he again visited London, where, two years later, he produced his first double-movement harp. He had previously made various improvements in the manufacture of harps, but the new instrument was an immense advance upon anything he had before produced, and obtained such a reputation that for some time he devoted himself exclusively to its manufac- ture. It has been said that in the year following his invention he made harps to the value of £25,000. In 1812 he returned to Paris, and continued to devote him- self with unwearied industry and unfailing ingenuity to the further perfecting of the two instruments with which his name is associated. It is needless to enumerate all his improvements, especially as the more important of them must be described in any account of the harp and plano respectively. In 1823 he crowned his work by producing his model grand pianoforte with the double~~

~~escapement. The action of these instruments is admirably adapted to convey every gradation of the player's touch to the strings, and on this~~

~~account they have been much used by pianists of eminence. LErard died at Passy, on the 5th August, 1831.~~

~~ERASMUS, DestpEerius, was born at Rotterdam on the night of 27-8 October, and probably in the year 1466. The iuscription on his statue, erected in his native place in 1622, names the year 1467 ; but the epitaph on his tombstone at Basel makes him 69 at the time of his death in July 1536, areckoning which might be compatible with either year, 1466 or 1467. 'The latter year is ex- cluded by Erasmus's own statements, which, though incon- sistent, agree on the whole best with the year 1466 (see Hp. 51, append.) His father's Christian name was Gerhard, of which Erasmus is meant for a Greek, and Desiderius for a Latin, rendering. He had no proper surname, not having been born in wedlock. His father provided for his education as long as he lived, placing him first as chorister in the cathedral school of Utrecht, and afterwards removing him to Deventer, of which school the celebrated teacher Alexander Hegius was at that time master. But Erasmus was too young—he Jeft Deventer zt. 13—to have come much under the instruction of the head-master.~~

~~Both his father and his mother dying young, Erasmus was left to the care of three guardians, who endeavoured to force him into aconvent. They sent him for three years to a couventual preparatory school at Bois-le- duc (Hertogenbosch), and afterwards so far overcame his resistance that he entered upon the novitiate in a house of the regular canons of St Augustine, at Stein, near Gouda. He made lus profession here in 1486, ct. 19; and was afterwards ordained priest by the bishop of Utrecht. Erasmus had no vocation for the devotional] exercises of convent life, and was disgusted with the society of the monks,—coarse, ignorant, and illiterate. His aspiration was to escape to some university where he might study. From the very first, the love of letters was the one ruling motive of his life. An unexpected chance brought him deliverance, Henri de Bergues, bishop of Cambray, took him to be his secretary. With the permission of the prior of Stein, and the consent of the general of the order and of the ordinary, the bishop of Utrecht, Erasmus left the convent. After a short stay with his new patron the bishop of Cambray, and with funds sparingly supplied by him,~~

~~Erasmus entered the college of Montaigu in the university of Paris. Of the revolting economy of this college in respect of food and lodging he has left a graphic account in the Colloqguies (Icthyophagia): 'I carried nothing away from it," he says, 'but a body infected with disease, and a plentiful supply of vermin." Rabelais, it will be remembered, has recorded a similar experience.~~

~~To cke out his scanty means he took pupils. With one of these, Lord Mountjoy, he came to England in 1497. According to Anthony Wood, he spent three years, 1497 to 1499, in Oxford. Many of the biographers make him return. to Paris in 1498; but the chronology of this part of Erasmus's life is confused, It is certain that he resided some time in Oxford, having a room in a small Augustinian house called St Mary's College, in New-inn-hall Lane, and either there or in London made the acquaintance of the few Englishmen who were distinguished for learning, Colet, Grocyn, Linacer, Latimer, Sixtinus. In 1499 he was again in Paris, then at Orleans, then at St Omer's in the Netherlands, and for the next five years he seems to have been continually on the move between France and Hol- land, his longest sojourn being at Lonvain. In these years he had a hard struggle with poverty, supporting himselt partly by pupils, partly by dedications, He wrote and~~

~~delivered a Latin oration on the occasion of the reception of the archduke Philip at Brussels in 1504, for which he got a haudsome fee. In April 1506 we find him again in England, first in London, and becoming acquainted with More and Warham, then at Cambridge, performing the exercises for the divinity degree, and commencing B.D. "The Athen Cantabrigienses" of Cooper make him take the degree of D.D. at the university, but this is an error. His stay in England was not long, as he found opportunity to carry out along cherished project of a journey to Italy. Want of funds had hitherto been the obstacle ; "I have a longing to visit Italy," he wrote in 1498, "but it is not easy to fly without wings." He was engaged to escort the two sons of Baptista Boyer, physician to Henry VIL, as far as Bologna. In September 1506~~

~~he was at Turin, and took the degree of D.D. in that university. He passed the winter of 1506-7 at Bologna, where he was witness of the triumphal entry of Julius IL, and where he made acquaintance with Paulus Bombasius and Scipio Carteromachus (Forteguerra). Here he obtained a papal dispensation permitting him to lay aside the dress of his order, though the story of his being mistaken for a plague-doctor in consequence of wearing it is justly dismissed by Drummond as a pleasant fiction. He visited Venice, where he stayed some time, for the purpose of passing through the press of Aldus a second and greatly enlarged edition of his Adagia. Here he was domesti- cated in the house of Asulanus, and made the acquaintance of the circle of learned men who were clustered round the Aldine press,—Marcus Musurus, Aleander, Baptista Egnatius, &c.~~

~~In 1508 he removed to Padua, where he spent the winter as tutor to Alexander Stewart, natural son of James IV., king of Scotland. Father and son fell together, not long after, at Flodden. In the early spring of 1509 the tutor and pupil removed to Siena, and from Siena Erasmus wentonto Rome. As his reputation had gone before him, he was received wherever he came with marks of distinc- tion. But he learnt nothing from intercourse with the Italian literati ; the Renaissance had already spent itself, and Erasmus complains 'In Italia frigent studia, fervent bella." He had various offers of preferment, but a letter from Lord Mountjoy announcing the death of the king of England, April 1509, and magnifying the favourable disposition of the young sovereign Henry VIII. towards Erasmus, and towards learning in general, determined his return to this country. From London, where he was the guest of Thomas More, and where he wrote his Encomium Morie, he moved to Cambridge, whither he was invited by John Fisher, bishop of Rochester, and lodged in Queen's College, of which Fisher was president. By Fisher's interest, he was appointed Lady Margaret's professor of divinity, and afterwards regius reader of Greek. From his mention of the grammars of Chrysoloras and of Gaza as the text books on which he lectured, it may be inferred that the study of Greek was still in its infancy in that university. Gibbon's sarcasm that ' Eras mus learned Greek at Oxford and taught it at Cambridge" (Zist., ch. 66) has just this foundation.~~

~~The stipends of these chairs were small, and Erasmus refused to take fees from students mostly very poor. He lived upon presents from wealthy ecclesiastics. Archbishop Warham was his principal patron. Erasmus says, " He has given me a living worth a hundred nobles, and changed it at my request for a pension of one hundred crowns. Within these few years he has given me more than four hundred nobles without my asking; one day he gave me one hundred and fifty. From other bishops I have received more than one hundred. Lord Mountjoy has appointed me a pension of one hundred crowns." He got fifteen~~

~~o13 angels from Colet for a dedication. He says, in tho Compendium Vite, that if the promises made to him had been performed he would have passed the rest of his days in England. But in this he perhaps deceived himself. At this period of his life, and till he was turned fifty, the agitation of locomotion, new places, and fresh faces were a necessity to him. An over-excited nervous sensibility was at the bottom of this feverish restlessness. In the autumn of 1513 he bade farewell to England, visited Lord Mountjoy at the Castle of Ham in Picardy, of which he was governor, and passed by the Rhine to Strasburg. Here he made the aquaintance of Wimpheling, Sebastian Brant, and the young Johann Sturm. He employed his time on board the tow-boat by which he leisurely ascended the river in correcting his "Commentarii de duplici copia," &ec., for a new edition. To Basel, which was to be the home of his old age, he was attracted by the reputation of its press.) But he met with such a hearty welcome from Froben and Amerbach, and found so agreeable a circle of men of learning, that he passed the whole winter 1514-15 here. The bishop of Basel, Christoph von Uten- heim, was so much pleased with him that he sought to domesticate him in his house; he made the acquaintance of Zwingli and of Hans Holbein, and drew round him a circle of young students full of ardour for learning, and consequently of admiration for Erasmus,—Glareanus, CEcolampadius, Beer, Myconius, Sapidus, and, above all, Beatus Rhenanus, who became his attached disciple and biographer.~~

~~Though from this time forward Basel became the centre of occupation and interest for Erasmus, yet for the next seven years he was in constant movement, from Basel to Flanders, thence to England in 1517,~~

~~and back again to Basel. Offers of church preferment in various countries continued to be made to him. But his circumstances had improved so much, by pensions, the presents which were showered upon him, and the sale of his books, that he was now in a position to refuse all proposals which would have interfered with his cherished independence. Aware how necessary it was, if he would maintain his literary supremacy, to keep on good terms with the powerful in church and state, and therefore. cautious not to give offence in word or act, he was yet most anxious to avoid dependence on any individual. It suited him to be always competed for, and never to sell himself. The general ardour for the restoration of the arts and of learning created an aristocratic public, of which Erasmus was supreme pontiff. Luther spoke to the people and the ignorant ; Erasmus had the ear of the educated class. His friends and admirers were distributed over all the coun- tries of Europe, and presents were continually arriving from small as well as great, from a donation of 200 florins, made by Pope Clement VIL, down to sweetmeats and comfits contributed by the nuns of Cologne (Zp. 666). From England, in particular, he continued to receive sup- plies of money. In the last year of his life, Cromwell sent him 20 angels, and Archbishop Crammer 18. Though Erasmus led a very hard-working and far from luxurious life, and had no extragavant habits, yet he could not live upon little. The excessive delicacy of his constitution exacted some unusual indulgences. He could not bear the iron stoves of Germany, and required an open fire- place, or a porcelain stove, in the room in which he worked. He was afflicted with the stone, and obliged to be particular as to the wine he drank. 'The white wines of Baden or the Rhine did not suit him; he could only drink those of Burgundy or Franche-Comté. No more acceptable pre- sent could be offered him than a cask of the light-red wine of the Jura. He could neither eat nor bear the smell of fish. " His heart," he said, " was Catholic, but his stomach VITL — 65~~

~~was Lutheran." For his constant journeys he required two horses, one for himself and one for his attendant. And though he was alinost always found in horse-fiesh by his friends, the keep had to be paid for. For his~~

~~literary labours and his extensive correspondence he required one or more amanuenses. He often had occasion, on his own business, or on that of Froben's press, to send special couriers to a distance, employing them by the way in col- lecting the free gifts of his tributaries.~~

~~Precarious as these means of subsistence seem, he pre- ferred the independence thus obtained to an assured position which would have involved obligations to a patron or professional duties which his weak health would have made onerous. He accepted the diploma of D.D. from the theological faculty at Louvain, but declined an offered professorship, saying "he did not like teaching." The duke of Bavaria offered to meet this objection by dispens- ing with teaching, if he would only reside, and would have named him on these terms to a chair in his new university of Ingolstadt, with a salary of 200 ducats, and the rever- sion of one or more prebendal stalls. The archduke Ferdi- nand offered a pension of 400 florins, if he would only come to reside at Vienna. Adrian VI. offered him a deanery (Zp. 859), but the offer seems to have been of a possible and not an actual deanery. Offers, flattering but equally vague, were made from France, on the part of the bishop of Bayeux, and even of Francis I. "Invitor amplissimis conditionibus; offeruntur dignitates et episcopa- tus; rex essein si juvenis essem"(£p.735). Erasmusdeclined ail, and about the end of the year 1520 settled permanently at Basel, in the capacity of general editor and literary adviser of Froben's press. He had a house of his own in Louvain, and as a subject of the emperor, and attached to his court by a pension, it would have been convenient to him to have fixed his residence there. But the bigotry of the Flemish clergy, and the monkish atmosphere of the university of Louvain, overrun with Dominicans and Fran- ciscans, united for once in their enmity to the new classical learning, inclined Erasmus to seek a more congenial home in Basel. Here a freer spirit reigned, and here he had already formed several fast friendships. But that which had most influence upon his choice was the fact that Basel had been made, by two enterprising publishers, Froben and Johann Amerbach, the centre of the German book- trade. 'The arrival of Erasmus was an event in Basel. He had a public reception, and received addresses on the part of the bishop and clergy, the municipality, and the university. But to Froben his arrival was the~~

~~advent of the very man whom he had long wanted. Froben's enterprise, united with Erasmus's editorial skill, raised the press of Basel, for a time, to be the most important in Europe. The death of Froben in 1527, the final separation of Basel from the empire, the wreck of learning in the religious disputes, and the cheap paper and scamped work of the Frankfort presses, gradually withdrew the trade from Basel But during the eight years of Erasnius's co-opera- tion the Froben press took the lead of all the presses in Europe, both in the standard value of the works published and in style of typographical execution. Like some other publishers who preferred reputation to returns in money, Froben died poor, and his impressions never reached the splendour afterwards attained by those of the Estiennes, or of Plantin. The series of the Fathers alone contains Jerome (1516-18), Cyprian (1520), Pseudo-Arnobius (1522), Athan- asius (Latin, 1522), Hilarius (1523), Ireneus (Latin, 1526), Ambrose (1527), Augustine (1528), Epiphanius (1529), Chrysostom on St Matthew (Latin, 1530), Basil (Greek, 1532, the first Greek author printed in Germany), and Origen (Latin, 1536). In these editions, partly texts, partly translations, it is impossible to determine the respec-~~

~~tive shares of Erasmus and his many lielpers. The prefaces and dedications are all written by him, and some of them, as that to the Hilarius, are of importance for the history as well of the times as of Erasmus himself. Of his most important edition, that of the Greek text of the New Testament, something will be said further on.~~

~~In this "mill," as he calls it, Erasmus continued to grind for eight years, from his 53rd to his 61st year, getting through in that time an amount of literary labour to which most men in robust health would scarcely have proved equal. Besides his work as editor, he was always writing himself some book or pamphlet called for by the event of the day, some general fray in which he was com- pelled to mingle, or some personal assault which it was necessary to repel. He was himself painfully conscious how much his reputation as a writer was damaged by this extempore production. 'An author," he says, "should handle with~~

~~deliberate care the subject which he has selected, should keep his work long by him and retouch it many times before it sees the light. These things it has never been my good fortune to be able todo, Accident has determined my subject for me. I have written on without stopping, and published with such precipitation that changed circumstances have often compelled entire re-writing in the second edition" (Zp. ad Botzhem.). He was the object of those solicitations which always beset the author whose name upon the title page assures the sale of a book. He was besieged for dedications, and as every dedication meant a present proportioned to the cir- cumstances of the dedicatee, there was a natural tempta- tion to be lavish of them. Add to this a correspondence so extensive as to require him at times to wnite forty letters in one day. "I receive daily," he writes, "letters from remote parts, from kings, princes, prelates, and men of learning, and even from persons of whose existence I was ignorant." His day was thus one of incessant mental activity, and he had acquired the power of working with such rapidity that J. C. Scaliger, one of his detractors, says (Orat. 2 pro Cicerone) that he had been told by Aldus that Erasmus did more work in one day than others did in two. Under the heading " Herculei Labores," in Zhe Adagia, he hints at the immense labour which this com- pilation had cost him. But hard work was so far from breeding a distaste for his occupation, that reading and writing grew ever more delightful to him (literarum assi- duitas non modo-'mihi fastidium non parit, sed voluptatem ; crescit scribendo scribendi studium).~~

~~In 1527 Johann Froben died, and the disturbances at Basel, occasioned by the zealots for the religious revolution which was in progress throughout Switzerland, began to make Erasmus desirous of changing his residence. He selected Freiburg in the Breisgau, as a city which was still in the dominion of the emperor, and was free from religious dissension. Thither he removed in April 1529. He was received with public marks of respect by the authorities, who granted him the use of an unfinished residence which had been begun to be built for the late emperor Maximilian. Erasmus proposed only to remain at Freiburg for a few months, but found the place so suited to his habits that he bought a house of his own, and remained there six years. A desire for change of air—he fancied Freiburg was damp,—rumours of a new war with~~

~~France, and the necessity of seeing his Ecclesiastes through the press, took him back to Basel in 1535. He lived now a very retired life, and saw only a small circle of intimate friends. It was now that a last attempt was made by the papal court to enlist him in some public way against the Reformation. On the election of Paul HT. in 1534, he had, as usval, sent the new pope a congratulatory letter. After his arrival in Basel, he received a complimentary~~

~~answer, together with the nomination to the deanery of Deventer, the income of which was reckoned at 1500 ducats. This nomination was accompanied with an intima- tion that more was in store for him, and that steps would be taken to provide for him the income, viz., 3000 ducats, which was necessary to qualify for the cardinal's hat. But Erasmus was even less disposed now than he had been before to barter his reputation for honours. His health had been for some years gradually declining, and disease in the shape of gout gaining upon him. In the winter of 1535-6, he was confined entirely to his chamber, many days to his bed. Though thus afflicted he never ceased liis literary activity, dictating his tract On the Purity of the Church, and revising the sheets of a translation of Origen which was passing through Froben's press. His last letter is dated 28th June 1536, and subscribed " Eras. Rot. egra manu." 'I have never been so ill in my life before as I am now,—for many days unable even to read." Dysentery setting in carried him off 12th July 1536, in his 69th year.~~

~~By his will, now preserved in the library at Basel, he left what he had to leave, with the exception of some legacies, to Boniface Amerbach, Johann Froben's son-in- law, partly for himself, partly in trust for the benefit of the aged and infirm, or to be spent in portioning young girls, and in educating young men of promise. He left none of the usual legacies for masses or other clerical pur- poses, and was not attended by any priest or confessor in his last moments.~~

~~Erasmus's features are familiar to all, from Holbein's many portraits or their copies. Beatus Rhenanus, " Summus Erasmi observator," as he is called by De Thou, describes his person thus :—"' In stature not tall,~~

~~but not noticeably short; in figure well built and graceful; of an extremely delicate constitution, sensitive to the slightest changes of climate, food, or drink. After middle life he suffered from the stone, not to mention the common plague of studious men, an irritable mucous membrane. His complexion was fair; light blue eyes, and yellowish hair. Though his voice was weak, his enunciation was distinct; the expres- sion of his face cheerful; his manner and conversation polished, affable, even charming." It was this delicacy of stomach, and not pampered appetite, that made him loathe fish, and be fastidious as to his wine. His highly nervous organization made his feelings acute, and his brain inces- santly active. Through his ready sympathy with all forms of life and character, his attention was always alive. The active movement of his spirit spent itself, not in following out its own trains of thought, but in outward observation. No inan was ever less introspective, and though he talks much of himself, his egotism is the genial egotism which takes the world into its confidence, not the selfish egotism which feels no interest but in its own woes. He says of himself, and justly, "that he was incapable of dissimula- tion" (Hp. 1152), There is nothing behind, no pose, no scenic effect. It may be said of his letters that in them "tota patet vita senis." His nature was flexible without being faultily weak. He has many moods and each mood imprints itself in turn on his words. Hence, ona superficial view, Erasmus is set down as the most inconsistent of men. Further acquaintance makes us feel a unity of character underlying this susceptibility to the impressions of the moment. His seeming inconsistencies are reconciled to apprehension, not by a formula of the intellect, but by the many-sidedness of a highly impressible nature. In the words of Nisard, Erasmus was one of those " dont la gloire a été de beaucoup comprendre, et daftirmer peu. ;~~

~~This equal openness to every vibration of the environ- ment is the key to all Erasmus's acts and words, and among them to the middle attitude which he took up towards the~~

~~d15:~~

~~great religious conflict of his time. The reproaches of party assailed him in his life-time, and have continued to be heaped upon his memory. He~~

was loudly accused by the Catholics of collusion with the enemies of the faith. His powerful friends, the pope, Wolsey, Henry VIIL, the emperor, called upon him to declare against Luthier. Theological historians from that time forward have per- petuated the indictment that Erasmus sided with neither party in the struggle for religious truth. The most moderate form of the censure presents him in the odious light of a trimmer; the vulgar and venomous assailant is sure that Erasmus was a Protestant at heart, but withheld the avowal that he might not forfeit the worldly advan- tages he enjoyed as a Catholic. When by study of: his writings we come to know Erasmus intimately, there is revealed to us one of those natures to which partisanship is an impossibility. It was not timidity or weakness which kept Erasmus neutral, but the reasonableness of his nature. It was not only that his intellect revolted against the narrowness of party, his whole being repudiated its clamorous and vulgar excesses. As he loathed fish, so he loathed clerical fanaticism. Himself a Catholic priest— 'the glory of the priesthood and the shame"—the tone of the orthodox clergy was distasteful to him ; the ignorant hostility to classical learning which reigned in their colleges and convents disgusted him. In common with all the learned men of his age, he wished to see the power of the clergy broken, as that of an obscurantist army arrayed against light. He had employed all his resources of wit and satire against the priests and monks, and the super- stitions in which they traded, long before Luther's name was heard of. The motto which was already current in his life-time, "'that Erasmus laid the egg and Luther hatched it," is so far true, and no more. Erasmus would have suppressed the monasteries, put an end to the domina- tion of the clergy, and swept away scandalous and profit- able abuses, but to attack the church or re-mould received theology was far from his thoughts. And when out of Luther's revolt there arose a new fanaticism—that of evan- gelism, Erasmus recoiled from the violence of the new preachers, "Is it for this," he writes to Mclanchthon (Zp. 703), 'that we have shaken off bishops and partics, that we may come under the yoke of sucli madmen as Otto and Farel?" Passages have been collected, and it is an easy task, from the writings of Erasmus to prove that he shared the doctrines of the Reformers. Passages equally strong might be culled to show that he repudiated them. The truth is that theological questions in themselves had no

~~attraction for him. And when a theological position was emphasized by party passion it became odious to him. In 1521 he writes (Zp. 572) that he had not yet had time to read Luther's pamphlets, so offensive to his refined taste was their coarse vulgarity and exaggerated tone, as he had found on looking into them. In the words of Drum- mond, "Erasmus was in his own age the apostle of common sense and of rational religion. He did not care for dogma, and accordingly the dogmas of Rome, which had the consent of the Christian world, were in his eyes preferable to the dogmas of Protestantism… . . From the beginning to the end of his career he remained true to the purpose of his life, which was to fight the battle of sound learning and plain common sense against the powers of ignorance aud superstition, and amid all the convulsions of that period he never once lost his mental balance." Erasmus is accused of indifference. But he was far from indifferent to the progress of the revolution. He was keenly alive to its pernicious influence on the cherished interest of his life, the cause of learning. 'I abhor the evangelics, because it is through them that literature is everywhere declining, aid upon the point of perishing."~~

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~~He had been born with the hopes of the Renaissance, with its anticipation of a new Augustan age, and had seen this fair promise blighted by the irruption of a new horde of theological polemics, worse than the old scholastics, inas- much as they were revolutionary instead of conservative. Erasmus never flouted at religion nor even at theology as such, but only at blind and intemperate theologians.~~

~~But though Erasmus while lashing theologians respected theology, he did not cultivate it. He barely acquiesced in church dogma without being compelled to investi- gate it. His mind had no metaphysical inclination ; he was a man of letters, with a general tendency to rational views on every subject which came under his pen. His was not the mind to originate, like Calvin, a new scheme of Christian thought. He is at his weakest in defending free will against Luther, and indeed he can hardly be said to enter on tlie metaphysical qnestion. He treats the dispute entirely from the outside. It is im- possible in reading Erasmus~~

~~not to be reminded of the rationalist of the 18th century. Erasmus has been called the ‘ Voltaire of the Renaissance.” But there is a vast difference in the relations in which they respectively stood to the church and to Christianity. Voltaire, though he did not originate, yet adopted a moral and religious scheme which he sought to substitute for the church tradition. lie waged war, not only against the clergy, but against the church and its sovereigns. Erasmus drew the line at the first of these. He was not an anticipation of the 18th century ; he was the man of his age, as Voltaire of his; though Erasmus did not intend it, he undoubtedly shook the ecclesiastical edifice in all its parts; and, as Melchior Adamus says of him, “ pontifici Romano plus nocuit jocando, quam Lutherus stomachando,”~~

~~But if Erasmus was unlike the 18th century rationalist in that he did not declare war against the church, but remained a Catholic and mourned the disruption, he was yet a true rationalist in principle. The principle that reason is the one only guide of life, the supreme arbiter of all questions, politics and religion included, has its earliest and most complete exemplar in Erasmus. He does not dogmatically denounce the rights of reason, but he practically exercises them, Along with the charm of style, the great attraction of the writings of Erasmus is this unconscious freedom by which they are pervaded.~~

~~It must excite our surprise that one who used his pen so freely should have escaped the pains and penalties which invariably overtook minor offenders in the same kind. For it was not only against the clergy and the monks that he kept up a ceaseless stream of satiric raillery, he treated nobles, princes, and kings, with equal freedom. No 18th century republican has used stronger language than has this pensioner of Charles V. ‘The people build cities, princes pull them down; the industry of the citizens creates wealth for rapacious lords to plunder; plebeian magistrates pass good laws for kings to violate; the people love peace, and their rulers stir up war.” Such outbursts are frequent in one of his most popular books, The Adagia. popularity. He was here in sympathy with the secret sore of his age, and gave utterance to what all felt but none dared to whisper but he. It marks the difference between 1513 and 1669 that, in a reprint of the Julius Faclusus published in~~

~~1669 at Oxford, it was thonght necessary to leave out a sentence in which the writer of that dialogue, supposed by the editor to be Erasmus, asserts the right of states to deprive and punish bad kings. It is difficult to say to what we are to ascribe his immunity from painful consequences. We have to remember that he was removed from the Scene early (1536) in the reaction, before force was fully organized for the suppression of the revolution. And~~

~~These freedoms are part cause of Erasmus's –~~

~~ERASMUS~~

~~his popular works, The Adagia (1500), The Colloquies (1521), had established themselves as standard books in the more easy going age, when power, secure in its un- challenged strength, could afford to laugh with the laughers at itself. At the date of his death (1536), the Catholic revival, with its fell antipathy to art and letters, was only in its infancy ; and when times became dangerous, Erasmus cautiously declined to venture out of the protection of the empire, refusing repeated invitations to Italy and to France. 'I had thought of going to Bescangon," he said, "'ne non essem in ditione Cesaris" (Zp. 1299). In Italy a Bembo and a Sadoleto wrote a purer Latin than Erasmus, but contented themselves with pretty phrases, and were careful to touch no living chord of feeling. In France it was necessary for a Rabelais to hide his free-thinking under a disguise of revolting and unintelligible jargon. It was only in the empire that such liberty of speech as Erasmus used was practicable, and in the empire Erasmus passed for a moderate man. Upon the strength of an established character for moderation he enjoyed an excep- tional licence for the utterance of unwelcome truths ; and in spite of his flings at the rich and powerful, he remained through life a privileged person with them. No noble except Eppendorf, young and crack-brained, ever attempted to call him seriously to account for his gibes.~~

~~But though the men of the keys and the sword let him go his way unmolested, it was otherwise with his brethren of the pen. A man who is always launching opinions must expect to be retorted on. And when these judgments were winged by epigram, aud weighted by the name of~~

~~Erasmus, who stood at the head of letters, a wide-spread exasperation was the consequence. Mr Disraeli has not noticed Erasmus in his Quarrels of Authors, perhaps because Erasmus's quarrels would require a volume to themselves. 'So thin- skinned that a fly would draw blood," as the prince of Carpi expressed it, he could not himself restrain his pen from sarcasm. He forgot that though it is safe to lash the dunces, he could not with equal impunity sneer at those who, though they might not have the ear of the public as he had, could yet contradict and call names. And when literary jealousy was complicated with theological differences, as in the case of the free-thinkers, or with French vanity, as in that of Budzeus, the cause of the enemy was espoused by a party anda nation. The quarrel with Budzeus was strictly a national one. Cosmopolitan as Erasmus was, to the French literati he was still the Teuton. Dolet calls him "enemy of Cicero, and jealous detractor of the French name." The only contemporary name which could approach to a rivalry with his was that of Budeus (Budé), who was exactly contemporary, having been born in the same year as Erasmus. Rivals in fame, they were unlike in accomplishment, each having the quality which the other wauted. Budsus, though a Frenchman, knew Greek well ; Erasmus, though a Dutchman, very imperfectly. But the Frenchman Budeeus wrote an execrable Latin style, unreadable then as now, while the Teuton Erasmus charmed the reading world with a style which, though far from good Latin, is the most delightful which the Renaissance has left us. The style of Erasmus is, considered as Latin, incorrect, sometimes even barbarous, and far removed from any classical model. But it has qualities far above purity. The best Italian Latin is but an echo and an imita- tion; like the painted glass which we put in our churches, it is an anachronism. Bembo, Sadoleto, and the rest write purely in a dead language. Erasmus's Latin was a living and spoken tongue. Though Erasmus had passed nearly all his life in England, France, and Germany, he spoke not one of those three langnages. His conversa- tion was Latin ; and the language in which he talked about~~

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~~common things he wrote. Hence the spontaneity and naturalness of his page, its flavour of life and not of books. He writes from himself, and not out of Cicero. Hence, too, he spoiled nothing by anxious revision in terror lest some phrase not of the golden age should escape from his pen. He confesses apologetically to Longolius (Zp. 402) that it was his habit to extemporize all he wrote, and that this habit was incorrigible ; "effundo verius quam scribo omnia." But he was quite alive to the beauty of the Ciceronian periods of Bembo, Sadoleto, and Julius von Pflug, whom he calls "the three happiest stylists of our day" (Zp. 1370), and "would learn to imitate them, but he is too old." He complains that much reading of the works of St Jerome had spoiled his Latin ; but, as Scaliger says (Scalig* 2°), "Erasmus's language is better than St Jerome's." The same critic, however, thought Erasmus would have done better "if he had kept more closely to the classical models."~~

~~In the annals of classical learning Erasmus may be regarded as constituting an intermediate stage between the humanists of the Latin Renaissance and the learned men of the age of Greek scholarship, between Politiano and Joseph Scaliger. Erasmus, though justly styled by Muretus (Varr. Lectt. 7, 15), " eruditus sane vir, ac multz lectionis," was not a "learned " man in the special sense of the word,— not an " érudit." He was more than this ; he was the "man of letters,"—he first who had appeared in Europe since the fall of the Roman empire. His acquirements were vast, aud they were all brought to bear upon the life of his day. He did not make a study apart of antiquity for its own sake, but used it as an instrument of cul- ture. He did not worship, imitate, and reproduce the classics, like the Latin humanists who preceded him ; he did not master them and reduce them to a special science, as did the French Hellenists who succeeded him. He edited many authors, it is true, but he had neither the means of forming a text, nor did he attempt to doso. In editing a father, or a classic, he had in view the practical utility of the general reader, not the accuracy required by the guild of scholars. 'His Jerome," says J. Scaliger, "ig full of sad blunders" (Scalig* 2°), Even Julien Garnier could discover that Erasmus " falls in his haste into grievous error in his Latin version of St Basil, though his Latinity is superior to that of the other translators" (Pref. in Opp. St Bas.,1721). It must be remembered that the~~

~~commercial interests of Froben's press led to the introduc- tion of Erasmus's name on many a title page when he had little to do with the book, eg., the Latin Josephus of 1534, to which Erasmus only contributed one translation of 14 pages; or the Aristotle of 1531, of which Simon Grynzus seems to have been the real editor. Where Erasmus excelled was in prefaces,—not philological intro- ductions to each author, but spirited appeals to the interest of the general reader, showing how an ancient book might be made to minister to modern spiritual demands.~~

~~Tt has been the fate of Erasmus, as of so many great writers, to be best known to posterity by one of his slightest works. Those who have read nothing else of Erasmus have read his Colloquies. And a wider circle still, who would not care to read the text of the Prazse of Folly, know of the book, because of the Holbein illustra- tions, which have preserved in general remembrance a Latin jeu-d'-esprit which would otherwise have only been consulted by the curious. But Erasmus himself complained of "the caprice of fortune," which had made his Colloquies his most popular work, a " book full of foolish things, bad Latin, and solecisms" (Hp. ad Botz.). The Zucomium More (Praise of Folly) was composed during his journey from Italy, and written cut from his notes In seven days during his stay in Thomas More's house in London.~~

~~destined for publication, but a copy found its way into the hands of the printers Badius at Paris, and came out in 1512, Within a few months seven editions were called for, and Froben's reprint of 1515, consisting of 1800 copies, was sold in a few weeks. Milton, in 1628, speaks of it as being "in every one's hands" at Cambridge.~~

~~Of Erasmus's works, mostly hasty pamphlets, squibs, or personal explanations, two are chiefly memorable,—7Zhe Adagia and The Greek Testament. The first edition of the Adagia (Paris, 1500) was only the germ of the book after- wards known under that title. his first edition contained 800 proverbs. The last edition in Erasmus's life-time, 1536, has more than 4000. Duplessis (Bibliogr. parem.) enumer- ates 49 editions of the original work, adding that his list is not complete ; and~~

~~he does not mention the numerous abridgments. It is a mere commonplace-book, or compila- tion out of the Greek and Latin classics. The Italian fine writers (Muretus) sneered at it as "rudis indigestaque moles." But it was just what the public wanted, a manual of the wit and wisdom of the ancient world for the use of the modern. The collection was enlivened by commentary in Erasmus's finest vein. Yet so established was the book in the hands of the public that the Council of Trent, unable to suppress it, and not daring to overlook it, ordered the preparatiou of a castrated edition.~~

~~Of Erasmus's Greek Testament the same must be said, viz., that it has no title to be considered as a work.of learning or scholarship, yet that its influence upon opinion was profound and durable. It contributed more to the liberation of the human mind from the thraldom of the clergy than all the uproar and rage of Luther's many pamphlets. An an edition of the Greek Testament it has no critical value. But it was the first (Hdztio Princeps, Basile ap. Jo. Frobenium, 1516, folio), and it revealed the fact that the Vulgate, the Bible of the church, was not only a second-hand document, but in places an erroneous document. A shock was thus given to the credit of the clergy in the province of literature, equal to that which was given in the province of science by the astronomical discoveries of the 17th century. Even if Erasmus had had at his disposal the MSS. subsidia for forming a text, he had not the critical skill required to use them. He had at hand two late Basel MSS., which he sent straight to press, correcting them in places by two others. In four subsequent reprints, 1519, 1522, 1527, 1535, Erasmus gradually weeded out the many typographical errors of his first edition, but the text remained essentially such as he had first printed it. The Greek text indeed was but a subordinate part of his scheme. The principal object of the volume was the new Latin version, the original being placed alongside as a guarantee of the translator's good faith. This translation, with the justificatory notes which accompanied it, though not itself a work of critical scholar- ship, became the starting-point of modern exegetical science. Erasmus did nothing to solve the problem, but to him belongs the honour of having first propounded it.~~

~~For an account of the attacks which this publication brought on its author, as well as for a notice of his many literary and other controversies, the reader must be referred to some of the special lives of Erasmus. And no man of letters has had more numerous biographers. Beatus Rhenanus prefixed a brief, but pregnant, memoir to his edition of the Opera, Basile, 1540. The common founda- tion of all the modern compilations on the life of Erasmus is the sketch which Le Clerc, while he was superintending the Leyden edition of the works, drew up, and published in the Bibliotheque Choisie, tome 5. Dr Jortin adapted and enlarged Le Clerc inhis Life of Hrasmus, 2 vols. 4to., Lond. 1748. "Jortin has made," says Sir W. Hamilton~~

~~It was not | (Discussions, p. 218), "as, with his talents, he could hardly~~

~~fail to make, an amusing farrago out of the life and writ- ings of Erasmus, though not even superficially versed in the literary history of the 16th century. He rarely ventures beyond the text of Erasmus and Le Clerc without stumbling." Other lives are by Samucl Knight, 8vo, Cambr. 1726; Marsollier, 12mo, Paris, 1713; Burigny, 2 vols, 12mo, Paris, 1752; Ad. Miiller, 8vo, Hamburg, 1828; Escher, in the Historisches Taschenbuch, 1848 ; Erhard, in Ersch and Gruber's Lncyclopddie, 1841; D. Nisard, in Etudes sur la Renaissance, 8vo, Paris, 1855; Seebohm, in Oxford Reformers, 2d ed. 1869 ; H. H. Milman, 8vo, Lond. 1870; Stichart, 8vo, Leipsic, 1870; Durand de Laur, 2 vols., 8vo, Par. 1872; R. B. Drummond, 2 vols. 8vo, Lond. 1873 ; Gaston Feugére, 8vo, Par. 1874; A. R. Pennington, 8vo, Lond. 1875; Kimmel in Deutsche Bio- graphie, 1877; besides those which are contained in the various biographical dictionaries from Bayle downwards.~~

~~With this abundance of choice, in which the same story is told by a score of writers in English, French, and German, and in every variety of style, we can hardly say, as Sidney Smith did in 1812, that 'a life of Erasmus is a desideratum" (Life of S. Smith, p. 207). The brochures on separate works of Erasmus, or single stages of his life, are too many to be here enumerated.~~

~~**His works were published after his death in a collected edition, 9 vols. fol., Basil. 1540. The only other edition is the magnificent one edited by Le Clerc, 10 vols. fol. Lugd. Bat. 1703-6, which includes the Greek Testament, the Paraphrasis, and the Adagia, as well as the Lpistole, and smaller writings. It is provided with a good general index in the last volume, and with an excellent special index to the volume containing the epistles. (M. P.)**~~

~~**ERASTUS, Tuomas (1524-1583), was born at Baden in Switzerland on the 7th of September 1524. His family name was Liebler or Lieber, Hrastus being the Greek equi- valent. In 1540 he went to Basel, and in 1542 he entered the university there as student of philosophy and theology. An outbreak of the plague in 1544 drove him to Bologna, where he studied philosophy and medicine, taking his doctor's degree in the latter faculty. His residence in Italy lasted nine years, part of the time being spent at the uni- versity of Padua. Returning northwards in 1553, he for some time held the post of physician to the counts of Henneberg. In 1558 he was appointed physician to the Elector Palatine Otto Heinrich, and at the same time he obtained the chair of medicine in the university of Heidel- berg. By Frederick ITI., who succeeded Otto Heinrich in 1559, he was made privy-councillor and member of the church-consistory. Eminent both as a scientific and as a practical physician, he at the same time took a profound interest in the theological controversies of his day, and soon became deeply involved in them. While a student of theology at Basel he had heartily adopted the doctrines of Zwingli, and ever afterwards was prompt to avail himself of all the opportunities which his position afforded for ad- vaucing the views of the Zurich divines. At the instance of the elector he took an active part in the sacramentarian conferences held at Heidelberg in 1560 and at Maulbronn in 1564. In connexion with these conferences he published a statement and vindication of the Zwinglian doctrine of the Lord's Supper, which, on its being criticised on the Lutheran side by Dr John Marbach of Strasburg, he followed up with a second defence (1565). Shortly after the settlement of Erastus in Heidelberg, an effort was made to introduce into the church of the Palatinate a strict presbyterian constitu- tion after the Genevan model. Erastus became the leader of an influential opposition to this attempt.**~~

He made it his business to counteract what he called the " excommuni- catory fever" of the advocates of rigid discipline. In 1568

he wrote and circulated in manuscript 100 theses on the.

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| subject of church censures, maintaining that' exclusion from participation in the sacranients is not a legitimate punish- ment for any offence whatsoever (Hxplicatio, ix., xxxi.). A copy of the theses was sent to Zurich, and received with some favour there, but from Geneva they elicited a vigorous rejoinder by Beza, which led to the preparation of a Con- jfirmatio Thesium. The efforts of Erastus and his friends at Heidelberg in this matter met with little success, the presbyterian discipline being finally set up in 1570, with hardly any modification of the Genevan strictness. Mean- while Erastus had lost the favour of the elector, and by a correspondence with some of the Socinians of Transylvania had brought himself under suspicion of being favourable to their views. One of the first acts of the newly con- stituted church court seenis to have been a high-handed excommunication of Erastus, on the ground of his sup- posed Unitarianism. The sentence was reconsidered and removed in 1575, Erastus formally declaring that no one could hold the doctrine of the Trinity more firmly than he. The court physician, however, found his position at Heidelberg to be one of increasing discomfort. He accord- ingly returned in 1580 to Basel, where he received an appointment to the chair of ethics in 1583. He died on 31st December of the same year.

Erastus seems to have been much esteemed by his friends for his amiability, candour, and probity. As an investi- gator of nature, he was honourably distinguished by his adherence to a sound inductive method. Most of the works that appeared during his life time were directed against the fantastic notions of Paracelsus and his school (Dusserta- tionum de Medicina nova Phil. Paracelsi partes quatuor, Basel, 1572 ; De occultis pharmacorum potestatibus, Basel, 1574; De auro potabili, Basel, 1578, and other works). That he was not in

~~advance of his age in regard to witch- craft is shown by his treatise De lamits et strigibus (Basel, 1578), in which he urges upon magistrates the duty of putting witches to death.~~

~~The work by which he is best known, though original'y written in 1568, and afterwards revised by himself, was first published six years after his death (1589), by Castelvetro, who had married his widow. Its full title is Lxplicatio questionis gravissime utrum excommunicatio, quatenus religionem intelligentes et amplexantes a sacramentorum usu propter admissum facinus arcet, mandato nitatur divino an excogitata sit ab hominibus. In 75 theses he secks to show that excommunication is not a divine ordinance but a device of men, and that the sins of professing Christians are to be punished by the civil magistrate with civil penalties, not by pastors and elders denying access to the sacraments. The sacraments, being means of grace, ought not to be withheld from any one wishing to receive them. The punishment of all offences belongs to the civil magistrate exclusively. The church has no power to make laws or decrees, still less to inflict pains and penalties of any kind, Its function is simply to teach, exhort, convince, persuade. In Deut. iv. 8 it is implied that the laws and statutes of the Jewish people were the most perfect possible. That church there- fore is most worthily and wisely ordered which comes nearest tu the constitution of the Jewish church. But in the Jewish church we find no traces of two diverse judica- tories concerning manners, the one civil, the other ecclesiastical. No reason can be alleged why the Christian magistrate at the present day should not possess the same power which God commanded the magistrate to exercise in the Jewish commonwealth.**

These views of Erastus were speedily adopted by various eminent divines in England. Inthe Westminster Assembly there was a distinct Erastian party, of which the most pro- minent members were Selden, Lightfoot, Coleman, and Whitelocke. After a controversy of many months, in

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which Selden,-Coleman, Gillespie, and Rutherford were the miost prominent disputants, the proposition that "the Lord Jesus, as King

~~and Head of His church, hath therein appointed a government, in the hand of church-officers, distinct from the civil magistrate" was finally carried, the sole dissentient voice being that of Lightfoot. This pro-position, with the whole chapter "' Of Church Censures" in which it occurs, was intended and understood to contain a complete rejection of Erastian principles, and in this light it was regarded by the Erastians themselves. That chapter, however (the 30th of the Confession), was never formally ratified by the parliament.~~

~~The Anglican doctrine of '" the royal supremacy in causes ecclesiastical," it needs hardly be said, is not in any sense derived from Erastus (see the 37th Article; also Hooker's Keel, Pol., b. vill. and Preface). In Scotland Erastianism is disowned by all Presbyterians. They hold, as against Erastus, that there is "a government in the hand of church officers distinct from the civil magistrate." It is well known that serious differences have arisen as to some of the practical effects of this anti-Erastian doctrine. The history of these differences will be related elsewhere. (See ScoTLAND, CyurcH oF, and FREE CHURCH.)~~

~~An English translation of the SJzxplicatio appeared anonymously in 1659. A new translation, enriched with an. interesting preface, was published by the late Dr Robert Lee (Edin., 1844).~~

~~ERATO, the muse who presided over amatory poetry. See Muszs.~~

~~ERATOSTHENES, a celebrated astronomer and geo- metrician of Alexandria, was born at Cyrene, 276 B.c. His fame as an astronomer has cast into the shade his other accomplishnients, but in his own day he had some reputation both as a poet and as a grammarian, and he was appointed superintendent of the great Alexandrian library by Ptolemy Euergetes. He died of voluntary starvation, from grief on account of his blindness, 196 B.c. His works, with the exception of. the Catasterismt, or catalogue of the constellations, exist only in fragments. These have been published by Bernhardy under the title Hratosthenica (Berlin, 1822), and the remains of his poetical works have been published separately by Hiller (Leipsic, 1872). For an account of his astronomical and geometrical discoveries see ASTRONOMY, vol. ii. p. 748. .~~

~~ERBACH, the chief town of a circle in Hesse-Darm- stadt, province of Starkenburg, is situated on the Miimling, 22 miles S.E. of Darmstadt. It has cotton and woollen mills, lime and tile works, a tannery, and a manufactory for arms. Wool and cattle fairs are held twice a year. The castle contains interesting collections of Greek, Roman, and German antiquities, and the armour and weapons of many celebrated warriors. In the chapel are the stone coffins of Eginhard son-in-law of Charlemagne and his wife Emma. Erbach has been for a long time the resi- dence of the counts of Erbach, who trace their descent to Eginhard, but the first authentic information regarding them dates from the middle of the 12th century. Since 1532 they have held their title immediately from the empire, and since 1541 have been hereditary cup-bearers. They are now divided into three lines named according to their places of residence, the Erbach-Fiirstenau, Erbach- Erbach, and Erbach-Schénberg, who rank, not according to the age of their descent, but according to the age for the time being of the chief of their line. The countship lost its independence in 1806, and is now incorporated with Hesse. The population of Erbach in 1875 was 2663.~~

~~ERCILLA Y ZUNIGA, Atonso DE (1533-1595), a Spanish soldier and poet, was born in Madrid, August 7, 1533. On the death of his father, Fortunio Garcia de Arcilla y Arteaga, a learned and travelled jurisconsult of~~

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~~Biscayan origin, who held high office under the emperor Charles V., his mother obtained a place in the household of the empress Isabella, and the boy was brouglit up as a page to Philip, the heir-apparent. In this capacity Ercilla visited the Netherlands, Germany, and Italy, and was pre- sent in 1554 at the betrothal of his master to Mary of England, Hearing while he was in London that an ex- pedition was about to start for South America in order to chastise the revolted Araucanians of Chili, he asked and obtained permission to join the adventurers. In the war which ensued he fought bravely and well; but having through an accidental quarrel with a comrade fallen under suspicion of mutiny, he was condemned to death by his general, Garcia de Mendoza, and only~~

~~escaped, on the dis- covery of his comparative innocence, with a term of im- prisonment. He returned to Spain in 1562, and in the course of the next eight years visited Italy, France, Ger- many, Bohemia, &c. At Madrid in 1570 he married Maria de Bazan, connected with the Santa Cruz family ; in 1570 he was made knight of the order of Santiago ; in 1576 he was appointed chamberlain to the emperor Rudolph II. ; and in 1578 he was employed by Philip II. on a mission to Saragossa. After several years of poverty and neglect, he died at Madrid about 1595. His principal and, indeed, his almost solitary work is Za Araucafia, a poem based on the events of the wars in which he had been engaged. It consists of three parts, of which the first, composed between 1555 and 1563, and published in 1569, is a versified narrative adhering strictly to fact and date ; the second, published in 1578, is relieved or encumbered by visions and other romantic machinery ; and the third, which appeared in 1590, contains, in addi- tion to the subject proper, a variety of episodes relevant and irrelevant. Of symmetry or proportion this so-called epic is almost destitute; but it is written in excellent Spanish, and is full of passages of vigorous and natural description. Cervantes placed it on a level with some of the best Italian poems of its class; Voltaire spoke in warm terms of certain portions; and it is now acknowledged to occupy an honourable position in Spanish literature. It has been frequently reprinted,—at Madrid in 1776 and 1828, and again in 185], as part of Rivadeneyra's Biblio- teca. An analysis of the poem was given by Hayley in his Mssay on Epic Poetry, 1782; and another appeared in Charaktere der Vornehmsten Dichter aller Nationen, Leipsic, 1793. A French abridgment was published by Gilbert de Marlhiac in 1824; a German translation by Winterling at Nuremberg, 1831; and a complete French translation at Paris by Al. Nicolas, 1870.~~

~~See Baena, Diccionario de hijos ilustres de Madrid; Ticknor's Spanish Lit., vol. ii.; Viardot, Ktudes sur le thédtre et les beaux arts en Espagne.~~

~~ERDELYI, JAvos an (1814-1868), Hungarian poet and author, was born in 1814 at Kapos, in the county of Ungvar, and educated at the Protestant college of Sdrospatak. In 1833 he removed to Pesth, where, having attracted notice by his poetical talents, he was, in 1839, elected member of the Hungarian Academy of Sciences. His literary fame was~~

~~much enhanced by his collection of Hungarian national poems and folk-tales, Magyar Néphiltési Gytijtemény, Népdalok és Mondak (Pesth, 1846-47). This work, publish- ed by the Kisfaludy Society, was supplemented by a dis- sertation upon Hungarian national poetry, afterwards partially translated into German by Stier (Berlin, 1851). Erdélyi also compiled for the Kisfaludy Society an extensive collection of Hungarian proverbs—Magyar Kézmonddsok kényve (Pesth, 1851), —and was for some time editor of the Szépirodalmi Szemle (Review of Polite Literature). In 1848 he was appointed director of the national theatre at Pesth ; but after 1849 he resided at his native town. He died~~

~~on the 23rd January 1868. The most important recent work bearing his name is a collection of folk-lore, publish- ed the year after his death, entitled A Nép Költészete- népdalok, népmesék és kézmonddsok (Pesth, 1869). This work contains 300 national songs, 19 folk-tales, and 7362 Hungarian proverbs.~~

~~ERDMANN, Ovro Linnié (1804-1869) a German chemist, was the son of Karl Gottfried Erdmann, the physi- cian who introduced vaccination into Saxony. He was born at Dresden April 11, 1804. In 1820 and the following year he attended the lectures of the medico-chirurgical academy at Dresden, and in 1822 he entered the university of Leipsic, where he remained three years, devoting himself princi- pally to the study of chemistry. In 1824 he received the degree of doctor of philosophy, and in 1825 that of licentiate of chemistry. In 1827 he became extraordinary professor, and in 1830 ordinary professor, of chemistry at Leipsic, the duties of which office he continued to discharge till his death at Leipsic, 9th October 1869. At Leipsic Erdmann established a chemical laboratory, which became the model of many similar institutions in Europe. He is best known for his discoveries regarding the qualities of nickel, and' of indigo and other dye stuffs. In 1828, in conjunction with Werther, he founded the Jowrnal fiir | technische und dkonomische Chemie, and later the Journal fiir | prachtische Chemie. He is also the author of Ueber das |~~

~~Nickel (1827); Lehrbuch der Chemie (1828); Grundriss der Waarenkunde (1833); and Ueber das studium der Chemie (1861).~~

~~EREBUS. This word, which denotes darkness, comes ; probably from the same source as the Greek épeda, to cover, and épo¢, a roof, and has by some been connected also with | the Hebrew Ereb, night, which reappears in Algarve. In the Hesiodic 7heogony, 123, Erebus is, with Nyx, the night, the offspring of Chaos; and Erebus and Nyx become | the parents of Aither and Hemera, the pure air and the day. In the Odyssey Erebus becomes the abode of all the dead, without reference to the character of their past lives ; and from the Ziad it would follow that this abode was within the earth. It is a dreary and cheerless land, the inhabitants of which have no strength either of mind or of body ; and thus the idea of Erebus is distinguished from the notion which assigned the righteous dead to Elysium and the wicked to Tartarus. Achilles, who in Elysium inherits a tearless life, declares in Erebus that he would rather toil as a peasant on the earth than be a king in that gloomy abode of departed shades (Odys. xi. 489).~~

~~ERECHTHEUS, in Greek legend, apparently the same as Erichthonius, was a local hero of Attica, with whom was associated the belief of the Athenians in their ancestors having sprung from the soil (see AurocHTHoNES). But the story of his birth is told generally under the name of Erichthonius, who, in the form of a serpent, was the offspring of Athena and Hephaestus, and was by the former handed over in a closed basket to the three daughters of Cecrops, Aglaurus, Herse, and Pandrosus, with a command not to open it. When two of them, Aglaurus and Herse, opened it, they became frantic and threw themselves from the Acropolis of Athens. The scene of the opening of the basket is re- presented on a Greek vase in the British Museum, from which it is seen that the figure withiu it is not altogether of the form of a serpent (= Erichthonius), but has the head and body of a boy, such as were ascribed to Erechtheus. Radically the names of both are connected with the earth (xOsv). But while Erechtheus came to be looked upon as a first ancestor, and associated with the introduction of agriculture and other public benefits, his double, so to speak,~~

~~Erichthonius retained as a rule the character of a demon or semi-divine being.~~

~~ERETRIA. See Eupaa.~~

~~ER D—~~

~~ERF~~

~~ERFURT, a city of Prussian Saxony, and the capital of an administrative district, is situated on the Gera, and on the line of the Thuringian railway, about midway between Gotha and Weimar, which are 14 miles distant. It is irregularly built, having no street or square worthy of mention, with the exception of the Friedrich-Wilhelmsplatz, which con-~~

~~1. Lazaretto. . Government House. 2. Augustine Church 13 Obelisk,~~

~~8. Orphanage. 14, Church of St Severus. 4. Great Hospital. 15, Cathedral.~~

~~5. Hospital. 16. Mainzerhof.~~

~~6. Winter Theatre. 17. Factory of Arms.~~

~~7, Kaufmann's Church, 18. Seminary.~~

~~8. Townhall. 19. Tivoli (Summer Theatre) 9, Post Office. 20. Regler Church.~~

~~10. Barfiisser Church. 21. Military School.~~

~~11, Martinsstift. 22. Prediger Church,~~

~~tains a monument to the elector Frederick Charles Joseph of Mayence. Here are also situated the cathedral and the church of St Severus. The cathedral, built between 1319 and 1351, is one of the finest ecclesiastical buildings in Germany. It contains some very rich portal sculptures and bronze castings, among others the coronation of Maria by Peter~~

~~Vischer. In one of its towers is the famous bell called St Maria Gloriosa, which bears the date 1447, and weighs 270 cwt. 'The name by which this bell is usually known is Grosse Susanna, but this name properly belongs to its predecessor, which was melted by a fire which had attacked the tower. Among the other churches besides that of St Severus may be mentioned the Prediger, the Regler, and the Barfiisser. The only monastery now used is the Ursuline, which for sometime has contained an educa- tional establishment. The Augustine monastery, in which Luther lived as a monk, is now used as an orphange, under the name of the Martinsstift. The cell of Luther was destroyed by fire in 1872 At one time Erfurt had a university, whose charter dated from 1392; but it was suppressed in 1816, and its funds devoted to other pur- poses, among these being the endowment of an institution founded in 1758, and now called the Royal Academy of Practical Sciences, and the support of the library, which now contains 60,000 vols. and over 1000 manuscripts. Erfurt possesses a great number of educational establish-~~

~~ments,—a gymnasium, anormal seminary, a military school, a school of art and architecture, a midwifery school, and a commercial school. It also possesses, besides the Martius- stift, two orphanages, a hospital, two infirmaries, and an eye hospital. The most notable industry of Erfurt is the culture of flowers and of vegetables, which isvery extensively carried on. This industry had its origin in the large gardens attached to the monasteries. It has also woollen, cotton, linen, and thread mills ; stocking, lace, tobacco, leather, and chemical manufactories ; breweries and distilleries. Erfurt was formerly the capital of Thuringia, and until 1873 was a fortified town. It is said to have been founded about the 5th century. It was made the seat of a bishop in 740, but soon afterwards lost the dignity. In 805 Charles the Great created it a market town, after which it rose rapidly in importance. Although never strictly a free town, it for a long time retained almost complete political independence. In 1483 it renewed a protection league with Saxony, pledg- ing itself at the same time to a yearly contribution of 1500 guilders. Jtattained the height of its prosperity about the end of the 15th century, and is said to have then~~

~~numbered about 60,000 inhabitants. About the middle of the 17th century it was annexed by force to the electorate of Mayence, under which government it remained till 1802, when it came into the possession of Prussia. In 1808 it was the scene of the memorable interview between Napoleon and the emperor Alexander of Russia. Here also in the spring of 185”) the Diet known as the Union’s Parliament held its sittings. The population of Erfurt in 1875 was 48,025.~~

~~See Humbert, Les villes de Thuringe, 1870, and A. W. Fils, Hohenmessungen von dem Kreise Erfurt, &c. (Itmenau, 1865), an extract from which is givenin Petermann’s Mittheilungen, 1865.~~

~~ERGOT, or Spurrep Ryx, the drug ergota or Secale cornutum (Germ. Mutterkorn ; Fr. Seigle ergoté), consists of tke sclerotium of a fungus, Claviceps purpurea, Tulasne, of the order Pyrenomycetes, parasitic on the pistils of many species of the Graminacee, but obtained almost exclusively from rye, Secale cereale, L. In the ear of rye that is in- fected with ergot a species of fermentation takes place, and there exudes from it a sweet yellowish mucus, which after a time disappears. The ear loses its starch, and ceases to grow, and its ovaries become penetrated with the white spongy tissue of the mycelium of the fungus, termed originally by Léveillé Sphacelia segetum. From the my- celium, at the expense of the substance of the ear, is de- veloped the sclerotium or ergot, the Sclerotiwm clavus of De Candolle, and Spermedia clavus of Fries. This, when placed on damp earth, produces the third form of the fungus, its outer cell layers becoming soft, and filiform spore-bearing stalks about an inch in length being thrown ont. From the spores, as also from the conidia of the mycelium stage, the mycelium may be again produced.~~

~~The drug consists of grains, usually curved (hence the name, from the Old French argot, a cock’s spur), which are violet-black or dark purple externally, and whitish with a tinge of pink within, are between 4 and 14 in. long, and from 1 to 4 lines broad, and have two lateral furrows, a close fracture, a disagreeable rancid taste, and a faint, fishy odour, which last becomes more perceptible when the powder of the drug is~~

mixed with potash solution. Ergot should be kept in stoppered bottles in order to preserve it from the attacks of a species of mite, and to prevent the oxidation of its fatty oil.

The oil of crgot, which constitutes 30 per ccnt. of its weight, appears to consist mainly of palmitic acid, with some oleic acid. Among other constituents the drug, according to Wenzell, con- tains two bitter alkaloids, ergotin and ccbolin, and to the latter the special medicinal virtues of the drug are due. From the investiga- tions, however, of Prof. Dragendorif and Herr Padwissotzky, itappears that Wenzell's ergotin and ccbolin are not improbably identical

with each other. By those chemists the presence in ergot of the following compounds has been determined :—seleromucin, a slimy,

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colloidal body, soluble in water, insoluble in alcohol; 2 to 3 per cent. of a tasteless and indorous principle, sederotic acid, also colloidal, soluble in water and in 45 per cent. alcohol, and having, exclusive of a small quantity of ash, the percentage com- position—carbon 40, hydrogen, 5°2, nitrogen 4°2, oxygen 50°6 ; minute quantities of slightly active colouring matters, selererythrin and selerotodin, with selerokrystallin, seleroxanthin, and other sub- stances. The subcutaneous injection of from 0°02 to 0°04 gram. of sclerotic acid causes in the frog a state of palsy, accompanied by a peculiar swelling, which lasts six or seven days. (Sce Pharm. Journ. and Trans., June 17, 1876, p. 1001.) Trimcthylamine, C;H,N, is said to be obtained from ergot by distillation with potash, but neither that body nor ammonia pre-exists as such in the drug. : The extract, tincture, infusion, and powder of ergot are all employed In medicine. What is commonly termed ergotin" is an extract first prepared by Bonjean, of Cham- béry, whose name it often bears. By age the active medicinal properties of ergot are gradually impaired, and lost. The addition of 1 per cent. of acetic acid is said to render the liquid preparations permanent. The poisonous action of ergot on various animals has been shown by Bonjean, Diez, Gross, Parola, Wright, and others. Thus Tessier found that in pigs it caused first redness of the eyes and ears, then coldness of the limbs and

~~swelling of the joints, and finally gangrene of the extremities and intestines, and death during convulsions. Among the symptoms of poisoning by ergot in man are nausea, salivation, dilatation of the pupils, and subsequent injection of the conjunctiva, some colic, occasionally diarrhoea, coldness of the skin, vertigo, and convulsions. The name ergotism has been ap- plied to the disease produced by the eating of food prepared from ergotized rye. It appears to have been the cause of many of the epidemics which in former times occurred in Europe, the last of these being thonglit to have been that which, at the close of the rainy season of 1816, visited Lorraine and Burgundy. The disease is usually fatal, and inanifests itself in two phases, the spasmodic or convulsive and the gangrenous. In the former the first experiences are irritation of the skin, coldness of the body, cramps and numbness of the limbs, and pains in the head and back, followed in from one to three weeks by gastralgia, giddi- ness, fainting, convulsive movements of tle muscles, and other symptoms ; frequently the skin becomes spotted with a vesicular eruption. Great exhaustion and craving for food ensue. Examination of the body after death reveals considerable inflammation of the abdominal viscera. Gan- grenous ergotism begins with weariness and pain of the limbs ; the skin grows dull in hue, and at length dry gangrene attacks the extremities, and when death does not supervene the parts affected are generally lost. Dr E. R. Squibb (Year Book of Pharmacy, 1874, p. 43) considers it probable that the poisoning described as the result of eating ergotized food could occur only among underfed semi-scorbutic people, or under conditions not present in cases ordinarily requiring treatment with ergot. For the detection of the presence of ergot in rye flour a small quantity of the sample is mixed with ether, and a few crystals of oxalic acid are added ; if the liquid after being boiled and allowed to grow clear exhibits a red tinge, ergot is present in the sample (Bottger, Chem. Centralblatt, 3d ser., ii. 624). Arnal, Beatty, Gibbon, and other experi- menters have demonstrated that ergot diminishes the frequency of the pulse. Its power of causing the contrac- tion of the unstriped muscular tissue of the body appears to be due principally to its action on thie sympathetic system of nerves. It has been maintained by Brown Séquard that it occasions first vaso-motor spasm, and secondly vaso-motor paralysis. The powerful and persistent contraction of the uterus~~

~~to which it gives rise renders it valuable as a prophylactic against hemorrhage, and also, according to some authorities, as a means of lessening the after-pains. Before the completion of labour its use VITT. —66~~

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~~is contraindicated when there are obstacles to quick deli- very; moreover, the drug may cause the rupture of the uterus, or paralysis of the foetal heart by pressure, so that it should be excluded from the available means of inducing labour, and ought not to be administered even so late as two hours before the birth. From some cases that have been recorded, it would appear that, even in large doses, the drug may have no effect as an ecbolic if given in the early stages of gestation. Its influence on animals during parturition is the same as that observed in the human female. Ergot has been used generally as a styptic, and has been recommended in amenorrhœa de- pending on torpidity of the uterus, in chronic dysentery, paraplegia, paralysis of the bladder, paralysis produced by chronic myelitis, epilepsy, whooping-cough, headache, and in obstinate intermittent fevers which are no longer bene- fited by quinine and arsenic. The hypodermic injection of extract of ergot was first employed for aneurisms by Prof. Langenbeck of Berlin in 1859; and in 1872 Hildebrandt showed its applicability in cases of fibroid tumours of the uterus; it has further been found a rapid and effectual remedy in hemoptysis, enteric hemorrhage in typhoid, and in varix and bronchocele. Unless injected in small quan- tity it is apt to produce much irritation of the subcutaneous tissue.~~

~~The earliest mention of ergot is said to occur in the writings of Sigebert de Gremblour. The oxytoxic virtues of the drug, which are noticed by Lonicer, a writer of the 16th century, seem to have been known in France and Germany from a very remote period. It was not, however, until the year 1807 that, through Dr Stearns, of Saratoga County, the importance of its properties was brought prominently before the medical profession. The general recognition in Britain of its valueas a therapeutic agent dates from about the year 1828.~~

~~Bonjean, TJraité del'Ergot de Seigle, Paris, 1845; Tulasne," Mémoire sur l'Ergot des Glumacées,"' Ann. Sci. Nat. Botan., 3d ser., t. Xx., 1853; Stillé, Therapeutics and Materia Medica, vol. ii., Philad. 1868; Fiiickiger and Hanbury, Pharmaco- graphia, 1874; Wood, A Treatise on Therapeutics, Philad. 1874; Ringer, Handbook of Therapeutics, 4th ed., 1874: S$. Wilson, "Ohservations and Experiments on Ergot," Pharm. Journ, and Trans. 1876, p. 525 et seg. On-the tierapeutics of ergot important matter wili also be found in the various medical jourtuals.~~

~~(E. 11. B.)~~

~~ERIE, a city and port.of entry, the capital of Erie co., Pennsylvania, is situated on Lake Erie opposite Presque Island, about 120 miles N. of Pittsburg, 42° 8' N. lat. and 80° 10' W. long. Its streets are spacious and are laid out with great regularity. The principal buildings are the court house, the post office, the custom house, the opera house, the union dept, the academy, the marine hospital, the city hospital, and the orphan asylum. Erie has rail- way communication with Buffalo, Philadelphia, and Pitts- burg. Its inhabitants are engaged chiefly in various kinds of iron manufacture, and it possesses large rolling mills. It has also leather manufactories, a brass foundry, petroleum refineries, and several large breweries. For many of its manufactories a large supply of water is required, and this is supplied from Lake Erie by powerful engines which force it to the top of a tower 200 feet high, whence it is distributed through the mains. 'The harbour, which is formed out of the natural bay protected by a break- water, is 34 miles long, more than a mile wide, and from 9 to 25 feet deep. The principal shipments are coal, iron, aud petroleum ; and the total value of imports from Canada for the year ending 31st March 1877 was $297,392, and of exports $64,921. For the same period, the number of vessels in the coastwise trade was—entered, 279 steamers with 255,106 tonnage, and 348 sailing vessels with 152,830 tonnage; cleared, 268 steamers with 250,054 tonnage, and 365 sailing vessels with 152,916 tonnage. It was at Erie that Commander Perry equipped the vessels which in 1813 defeated the British fleet on Lake Erie. Erie was laid out in 1795, was incorporated as a borough in 1805, and~~

~~received a city charter in 1851. The population in 1870 was 19,646.~~

~~ERI—ERI~~

~~ERIE, Laxe. See St Lawrence.~~

~~ERIGENA, Jonannes Scotus, one of the most im- portant thinkers of the Middle Ages, flourished during the 9th century. The date and place of his birth are still un- determined. He was undoubtedly a native of the British isles, but of which is quite uncertain. He has been claimed for England by Gale, who thinks that the name Erigena is derived from Ergene in Herefordshire ; for Scotland by Mackenzie, who supposes him to have been born at Aire; for Ireland by Moore and the majority of writers. The name Erigena, often written Jerugena, seems to point to Jreland, Zerne, as the place of his birth or train- ing; Scotus may be thought to indicate that he was of Scottish extraction. As to the date of his birth, the best authorities fix it about 800-810, but on grounds entirely conjectural. Of his early education little or nothing is known. He appears to have studied in the best schools of Ireland, and to have been destined for the church. It~~

~~'is highly improbable, however, that he took orders as a~~

~~priest. Had he done so, some reference would be made to the fact by those who attacked his writings as unorthodox. From his knowledge of Greek, and from a passage in a certain MS. ascribed to him, it has been supposed that he had travelled and studied in Greece. But the passage is of doubtful authority, and the knowledge of Greek displayed in his works is not such as to compel us to conclude that he had actually visited Greece. That he had a competent acquaintance with the Greek language is manifest from his translations of Dionysius the Areopagite and of Maxiinus, from the manner in which he refers to Aristotle, and from his evident familiarity with neo-Platonist writers and the fathers of the early church. Roger Bacon, in his severe criticism on the ignorance of Greek displayed by the most eminent scholastic writers, expressly exempts Erigena, and ascribes to him a knowledge of Aristotle in the original.~~

~~The only portion of Erigena's life as to which we possess accurate information was that spent at the court of Charles the Bald. Charles invited the philosopher to France soon after his accession to the throne, probably in the year 843, and placed him at the head of the court school—scholu palatina. The reputation of this school or college seems to have increased greatly under Erigena's leadership, and the philosopher himself was treated with the greatest familiarity and indulgence by the king. William of Malmesbury's amusing story illustrates both the character of Scotus and the position he occupied at the French court.~~

~~The first of the works known to have been written by Scotus during this period was a treatise on the eucharist, which has not come down to us. In it he seems to have advanced the doctrine that the eucharist was merely sym- bolical or commemorative, an opinion for which Berengarius was at a later date censured and condemned. As a part of his penance Berengarius is said to have been compelled to burn publicly Erigena's treatise. So far as we can learn, however, Erigena's orthodoxy was not at the time suspected, and a few years later he was selected by the famous Hincmar to defend the doctrine of liberty of will against the extreme predestinarianism of the monk Gottshalk (Godeschalchus). The treatise De Divina Predestinatione, composed on this occasion, has been preserved, and from its general tenor and method one cannot be surprised that the author's orthodoxy was at once and vehemently suspected. Scotus argues the question entirely on speculative grounds, and starts with the bold affirmation that philosophy and religion are funda- mentally one and the same—' Conficitur inde veram esse philosophiam veram religionem, conversimque veram religionem esse veram philosophiam " (De Div. Pred., i. 1). Even more significant is his handling of authority and reason, to which we shall presently refer. The work was warmly assailed by Florus and Prudentius, and was con-.~~

~~demned by two councils—that of Valence in 855, and that of Langres in 859.~~

~~Erigena's next work was a translation of Dicnysius the Areopagite (see Dionysius) undertaken at the request of the king. This also has been preserved, and fragments of a commentary by Scotus on Dionysius have been discovered in MS. A translation of the Areopagite's pantheistical writings was not likely to alter the opinion alread y formed as to Erigena's orthodoxy. Pope Nicholas I. was offended that the work had not been submitted for approval before being given to the world, and ordered Charles to send Scotus to Rome, or at least to dismiss him from his court. There is no evidence, however, that this order was attended to. Erigena appears still to have remained in favour.~~

~~The latter part of his life is involved in total obscurity. The story that in 882 he was invited to Oxford by Alfred the Great, that he laboured there for many years, became abbot at Malmesbury, and was murdered by his scholars, is apparently without any satisfactory foundation, and doubtless refers to some other Johannes. Erigena in all probability never ieft France, and Hauréau has advanced some reasons for fixing the date of his death about 877.~~

~~The works of Erigena that have come down to us are the following :— (1) the treatise on predestination, first published in 1650; (2) a commentary on Marcianus Capella, published by Hauréau in 1861; (3) translation of Dionysius the Areopagite, published in Floss's edition of Erigena, vol. exxil. of Migne's Patrologie Cursus Completus, (4) miscel-laneous treatises, some still in MS., ¢.g., the work De Visione Dei, and the commentary ou Dionysius, which has been published in Appendix ad Opera edita ab Ang. Maio, Rom., 1871; (5) translation of St Maximus's scholia on Gregory of Nazianzen, published in Gale's edition of (6) the great work, De Divisione Nature, rept dvoéwy pepiopov. Of this last work three editions have appeared—that of Gale, Oxford, 1681, that by Schliiter, 1838, and that by Floss, 1853. '~~

~~Erigena is without doubt the most interesting figure among the Middle Age writers. The freedom of his speculation, and the boldness with which he works out his logical or dialectical system of the universe, altogether prevent us from classing him along with the scholastics~~

~~properly so called. He marks, indeed, a stage of transition from the older Platonizing philosophy to the Jater and more rigid scholasticism. In no sense whatever can it be affirmed that with Erigena philosophy is in the service of theology. The above-quoted assertion as to the substantial identity between philosophy and religion is indeed repeated almost totedem verlis by many of the later scholastic writers, but its significance altogether depends upon the selection of one or other term of the identity as fundamental or primary. Now there is uo possibility of mistaking Erigena's position: to him philosophy or reason is first, is primitive ; authority or religion is secondary, derived. ' Auctoritas siquidem ex vera ratione processit, ratio vero nequaquam ex auctoritate. Omnis enim auc- toritas, que vera ratione non approbatur, infirma videtur esse. Vera autem ratio, quum virtutibus suis rata atque immutabilis munitur, nullius auctoritatis adstipulatione roborari indiget" (De Div. Nat.,i.71). F. D. Maurice, the only historian of note who declines to ascribe a rationalizing tendency to Erigena, obscures the question by the manner in which he states it. He asks his readers, after weighing the evidence advanced, to determine " whether he (Erigena) used his philosophy to explain away his theology, or to bring out what he conceived to be the fullest meaning of it." These alternatives seem to be wrongly put. "Explaining away theology " is something wholly foreign to the philosophy of that age ; and even if we accept the alternative, that Erigena endeavours specula-~~

~~tively to bring out the full meaning of theology, we are by no means driven to the conclusion that he was primarily or principally a theologian. He does not start with the datum of theology as the completed body of truth, requiring only elucidation and interpretation; his fundamental thought is that of the universe, nature, ré wav, or God, as the ultimate unity which works itself out into the rational system of the world. Man and all that concerns man are but parts of this system, and are to be explained by refer- ence to it; for explanation or understanding of a thing is determination of its place in the universal orall. Religion or revelation is one element or factor in the divine process, a stage or phase of the ultimate rational life. The highest~~

~~faculty of man, reason, ¢ntellectus, intellectualis visio, is that which is not content with the individual or partial, but grasps the whole and thereby comprehends the parts. In this highest effort of reason, which is indeed God thinking in man, thought and being are at one, the opposition of being and thought is overcome. When Erigena starts with such propositions, it is clearly impossible to under- stand his position and work if we insist on regarding him as a scholastic, accepting the dogmas of the church as ulti- mate data, and endeavouring only to present them in due order and defend them by argument.~~

~~Erigena's great work, De Divisione Natura,is arranged in five books. The form of exposition is that of dialogue; the method of reasoning is the syllogistic. The leading thoughts are the follow- ing. Natura, pivots, is the name for the universal, the totality of all things, containing in itself being and non-being. It is the unity of which all special phenomena are manifestations. But of this nature there are four distinct classes :—(1) that which creates and is not created ; (2) that which is created and creates ; (3) that which is created and does not create; (4) that which neither is created nor creates, The first is God as the ground or origin of all things, the last is God as the final end or goal of all things, that into which the world of created things ultimately returns. The second and third together compose the created universe, which is the manifestation of God, God in processu, Theophania. Thus we distinguish in the divine system beginning, middle, and end; but these three are in essence one—the difference is only the conse- quence of one finite comprehension. We are compelled to envisage this eternal process under the form of time, to apply temporal dis- tinctions to that which is extra- or supra-temporal. The universe of created things, as we have seen, is twofold :—first, that which is created and ecreates,—the primordial ideas, archetypes, immutable relations, divine acts of will, according to which individual things are formed; second, that which is created and does not create,— the world of individuals, the effects of the primordial causes, with- out which the causes have no true being. Created things have no individual or self-independent existence ; they are only in God; and each thing is a manifestation of the divine, theophania, divina apparitio. . d~~

~~God alone, the uncreated creator of all, has true being. He is the true universal, all-containing and incomprehensible. The lower cannot comprehend the higher, and therefore we must say that the existence of God is above being, above essence; God is above goodness, above wisdom, above truth. No finite predi- cates can be applied to him; his mode of being cannot be deter- mined by any category. True theology is negative. Nevertheless the world, as the theophania, the revelation of God, enables us so far to understand the divine essence. We recognize his being in the being of all things, his wisdom in their orderly arrangement, his life in their constant motion. Thus God is for us a Trinity — the Father as substance or being (obcta), the Son as wisdom (dvva- pus), the Spirit as life (évépyeim). These three are realized in the universe—the Father as the system of things, the Son as the word, i.e., the realm of ideas, the Spirit as the life or moving force which introduces individuality and which ultimately draws back all things into the divine unity. In man, as the noblest of created things, the Trinity is seen most perfectly reflected : inéedlectus (voids), ratio (Adyos), and sensus (Sidvoim) make up the threefold thread of his being. Not in man alone, however, but in all things, God is to be regarded as realizing hiniself, as becoming incarnate.~~

~~The infinite essence of God, which may indeed be described as nithilum, nothing, is that from which all is created, from which all proceeds or emanates. The first procession or emanation, as above indicated, is the realm of ideas in the Platonic seuse, the word or wisdom of God. These ideas compose a whole or insepa- rable unity, but we are able in a dim way to think of them as a system logically arranged. Thus the highest idea is that of good- ness; things are, only if they are good; being without wellbeing~~

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~~is nought. Essence participates in yoodness—that which is good has being, and is therefore to be regarded as a species of good. Life, again, is a species of essence, wisdom a species of life, and so on, always descending from genus to species in a rigorous logical a 10n.~~

~~ac ideas are the eternal causes, which, under the moving influ- ence of the spirit, manifest themselves in their effects, the indi- vidual created things. Manifestation, however, is part of the being or essence of the causes, that is to say, if we interpret the expres- sion, God of necessity manifests himself in the world and is not without the world. Further, as the causes are eternal, timeless, so creation is eternal, timeless. The Mosaic account, then, is to be looked. upon merely as a mode in which is faintly shadowed forth what is above finite comprehension. It is altogether allegorical, and requires to be interpreted. Paradise and the Fall have no local or temporal being. Man was originally sinless and without distinction of sex. Only after the introduction of sin did man lose his spiritual body and acquire the animal nature with its distinction of sex. Woman is the impersonation of man's sensuous and fallen nature; on the final return to the divine unity, distinction of sex will vanish, and the spiritual body will be regained.~~

~~The most remarkable and at the same time the most obscure por- tion of the work is that in which the final return to God is handled. Naturally sin is a necessary preliminary to this redemption, and Scotus has the greatest difficulty in accounting for the fact of sin. If God is true being, then sin can have no substantive existence; it cannot be said~~

~~that God knows of sin, for to God knowing and being areone. In the universe of things, asa universe, there can be no sin; there must be perfect harmony. Sin, in fact, results from the will of the individual who falsely represents something as good which is not so. This misdirected will is punished by finding that the objects after which it thirsts are in truth vanity and emptiness. Hell is not to be regarded as having local existence ; it is the inner state of the sinful will. As the object of punish- ment is not the will or the individual himself but the misdirection of the will, so the result of punishment is the final purification and redemption of all; even the devils shall be saved. All, how- ever, are not saved at once ; the stages of the return to the final unity, corresponding to the stages in the creative process, are numer- ous and are passed through slowly. The ultimate goal is detjicatio, theosis, or resumption into the divine being, when the individual soul is raised to a full knowledge of God,'and where knowing and being are one. Afterall have been restored to the divine unity, there is no further creation, The ultimate unity is that which neither is created nor creates.~~

~~Editions of the De Divisione Nature have been enumerated above. The work has been very ably translated into German by Noack, J. S. #. tiber die Hintheilung der Natur, ubcrseat und mit eincr Schlussabhandlung, 3 vols., 1874-76. Monographs on his life and works are numerous ; the best are St René Taillandier, Scot. Hrigéne et la Phil. Scot., 1848; Christlieb, Leben u. Lehre d. J. S. E., 1860 ; Huber, J. S. #., 1861; Kaulich, Spekulative System des J. S. E., 1860; Stéckl, De Joh. Scoto Erigcena, 1867. See also the general works on scholastic philosophy, especially Hauréau, Stéckl, and Kaulich. For English readers a most admirable resumé is given by Maurice, Medieval Phil., pp. 45-79. (R. AD.)~~

~~ERIGONE. In the Attic myth of Dionysus, Erigone is the daughter of Icarius, who, having received from Dionysus the gift of wine, shares it with some shepherds, who, drinking it undiluted, fancy themselves poisoned, and having murdered Icarius, throw his body into a well. Guided by her dog Maira (the glistening one), Erigone whose name, like that of Protogeneia (see ENpyMion), denotes one born in early morning—discovers the crime, and hangs herself. After her death she~~

~~is said to have been translated to the constellation which the Latins called Virgo.~~

~~ERINNA, a Greek poetess, the contemporary and friend of Sappho, was prebably a native of Rhodes or the adjacent island of Telos, and was born about 6308. Although she died at the early age of nineteen, her poems were amongst the most famous of her time. Of her best known poera, called "HAaxdry (the Distaf'), which contained 300 lines, only 4 lines are now extant. It was written in a nixed dialect of Dorian and Eolian. Three epigrams in the Palatine anthology are also ascribed to her; but two of these are possibly spurious. Another poetess of this name is said to have flourished in the age of Demosthenes, but her existence is matter of considerable uncertainty. The~~

~~Erinua fragments were collected in Bergk' eae Greci (Leipsic, 1867). n Bergk's Poete Lyrict~~

~~ERI—ERI~~

~~ERINYES, the Greek name for the beings whom the Latins called Furie, Furies. They were especially the avengers of iniquity, and, as such, acquired a character so fearful that those who had need to speak of them called them the Eumenides, or merciful beings, to win from them the pity which they were but little supposed to feel. The name Erinyes cannot be explained from the Greek language ; but in the Hymns of the Rig-Veda constant mention is made of Saranyu, who there is the Dawn whose light steals across the heaven, revealing the things of darkness Of this being the Vedic hymn-makers speak as finding out the evil deeds dune during the night, and punishing the wrong-doer. But although for the Greeks, who had forgotten the meaning of the name, they had put on terrible attributes, the Erinyes still retained in their Western home some of their ancient characteristics. Thus for the toil-worn and suffering CEdipus, who unwittingly finds himself in their sacred grove near Athens, they have only a genial welcome. In the Vedic hymns, again, Saranyu draws the long threads of light across the sky. These threads become in the hands of the Erinyes who bear her name, and in those of the kindred Mcere, or Fates, the threads of human destiny. The idea thus suggested was~~

~~drawn out more fully in the myths of the Teutonic Norns, or Weird Sisters, who are three in number, as representing the past, the present, and the future. In the later versions of the Greek myth, the Erinyes were also said to be three, their names, Alecto, Megera, and Tisiphone, denoting relentless hatred, jealousy, and revenge.~~

~~ERIPHYLE, in Greek mythology, the wife of the seer Amphiaraus, whom the Argive chief Adrastus took with him to Thebes, because a prophecy had said that that city could not otherwise be taken. Not wishing to meddle in a quarrel which was not his own, Amphiaraus was com- pelled, by a promise which he had previously given to Adrastus, to abide by the decision of Eriphyle; and Eriphyle had been bribed by Polynices, the son of (Edipus, with the gift of the necklace of Harmonia, to pronounce in favour of the expedition. Thus constrained to go, the seer charged his sons to slay their mother if they should hear of his death, and to march against Thebes. The enterprise of Adrastus, known as the first Theban war, failed, and the earth opening swallowed Amphiaraus in his chariot. His son Alemzeon upon this slew his mother, whose Erinys gave him no rest until he surrendered to Pheebns the necklace of Harmonia and found out a spot to dwell in on which the sun had never shone at the time of Eriphyle's death. Such a place of banishment he found on the islands called Ciniade, which had grown up at the mouth of the river Achelous from the deposits brought down by its stream. Here he married Callirhoe, the daughter of the river god, who causes his death at the hands of the sons of Phegeus by insisting on his fetching her the necklace of Eriphyle.~~

~~ERIS, in Greek mythology, a sister of the war-god Ares, and in the Hesiodic theogony a daughter of Nyx, the night, who is also the mother of righteous recompense, Nemesis. In the Jliad Eris, or Strife, is described as insignificant at first, but as swelling until her head touches the heavens. In the legend of the Trojan war, Eris is the goddess who at the marriage festival of Peleus and Thetis flings on the table a golden apple, which is inscribed as a gift for the fairest of the fair. The rivalry of the three deities—Hera, Aphrodite, and Athena—for the gift is decided by the Judgment of Paris, who, being appointed umpire by~~

~~Zeus, bestows it on Aphrodite. In the @neid she appears under the name of Discordia.~~

~~ERIVAN, or Irwan, in Persian Rewan, a town of Russian Armenia, at the head of a province of the same name, is situated 3430 feet above the level of the Black~~

~~ERL—ERL~~

~~Sea, on the Zengui, Zanga, or Hrastan, an affluent of the |~~

~~Araxes, about 171 miles 8.8.W. of Tiflis by road. The old Persian portion of the town consists mainly of narrow crooked lanes inclosed by mud walls, which effectually con- ceal the houses, and the modern Russian portion is laid out in long ill-paved streets. On a steep rock, rising about 600 feet above the river, stands the old Turkish fortress, surrounded by ditches and earthen ramparts, and containing within its area part of the palace of the ancient Persian governors, a handsome but greatly dilapidated mosque, a Greek church of modern erection, a cannon foundry, and barracks. One chamber, called the Hall of the Sardar, bears witness to the former splendour of the palace by its pictorial decorations, which include legendary and historical scenes from the lives of Zal and Rustam, of Abbas- Mirza and Nadir Shah. The finest building in the city is undoubtedly the mosque of Hussein Ali Khan, familiarly known as the Blue Mosque from the colour of the euamelled tiles with which it is richly encased. At the mosque of Zal Khan a yearly passion play is performed illustrative of the assassination of Hussein the son of Ali. Besides the episcopal church of St Sergius (Sourp Sarghis), the Armenians possess five churches, a monastery, and a seminary. Several hundred travellers can be accommodated in the new caravanserai ; and there is a club which in some degree makes up for the absence of hotels. The bazaar, though extensive, is poorly supplied with goods; and the ouly manufactures of the town are a little cotton cloth, leather, earthenware, and blacksmiths' work. The fruits of the district are exceedingly cheap, and noted for their ex- cellence—especially the grapes, apples, apricots, and melons. The surrounding country is richly watered by a system of canals connected with the Gokcha or Sevanga Lake and the river~~

~~Zengui. Armenians, Persians, and Tatars are the main elements in the population, to which is added a certain number of Russians and Greeks —making a total in~~

~~1874 of 30,000.~~

~~The origin of Erivan is altogether unknown. One pious Armenian tradition recognizes in the name the joyful exclamation of Noah at the reappearance of the dry ground—£revan, it has shown itself; another explains it as equivalent to Hrovantavan, the place of defeat of Erovant H. of Armenia; and a third identifies it with the name of Rewan Kul, who built a castle about 1412 on the spot at the command of Shah Ismail. The present fortress at any rate was erected by the Turks in the 16th century, and since that time the place has been of considerable celebrity. It was taken by the Persians under Shah Abbas in 1604, besieged by the Turks for four months in 1615, and reconquered by the Persians under Nadir Shah in the 18th century. In 1780 it was successfully defended against Heraclius of Georgia ; and in 1804 it resisted the Russians under Prince Tsitsianoff. At length in 1827 Paskievitch took the fortress by storm, and in the following year the town and province were ceded to Russia by the peace of Turkmanchai. The successful general was rewarded by the title of Count of Erivan (Erivanski). A Tatar poem in celebration of the event has been preserved by Bodenstedt in his " Thousand and One Days in the East."~~

~~See Fr. Dubois de Montpéreux, Voyage autour du Caucase, vol. iil., 1839; Baron Thielman, Travels tn the Caucasus, &c., 1875; J. B. Telfer, Crimea and Transcau- casita, 1876; J. Bryce, Transcaucasia and Ararat, 1877.~~

~~ERLANGEN, a town of Bavaria, in the district of Middle Franconia, is situated at the confluence of the Schwabach with the Regnitz, eleven miles N.N.W. of Nuremberg, and on the railway between that town and Bamberg. It is sur- rounded by walls, and divided into an old and new town, the latter consisting of wide, straight, and well-built streets. It possesses a large brewery, the beer of which is in high repute in Germany; and among its other industries are stocking and glove making, glass and tobacco manufacture, and cotton-spinning. It is,~~

~~however, best known as the seat of a university founded by Frederick, margrave of Bayreuth, who in 1742 established a university at Bayreuth, but in 1743 changed its situation to Erlangen, A statue of this margrave, erected in 1843 by King Louis of Bavaria, stands in the market-place, facing the university buildings.~~

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~~The university occupies the ancient palace of the margraves of Bayreuth, and has faculties of arts, medicine, and theology. At the beginning its endowments were small, but they have latterly become considerable, especially through the benefactions of the margrave Alexander. The number of students in attendauce in 1876 was 429. Con- nected with the university are a library containing 110,000 volumes and 1000 manuscripts, an infirmary, an eye hospital, a maternity hospital, an anatomical museum, and a botanic garden. Erlangen also possesses a gymnasium and a commercial school. The town owes the foundation of its prosperity chiefly to the French Protestant refugees who settled here on the revocation of the Edict of Nantes and introduced various manufactures. In 1017 Erlangen was transferred from the bishopric of Wiirzburg to that of Bamberg; in 1361 it was transferred to that of Bohemia; it came into the possession of the counts of Nuremberg in 1400, of the margraves of Bayreuth in 1541, of Prussia in 1791, and of Bavaria in 1809. The population in 1875 was 13,597.~~

~~ERLAU (the Hungarian Hyer, Slavonic Jager, and Latin Agria), a fortified town of Hungary, capital of the varmegye or county of Heves, on the Erlau, or Eger, an affluent of the Theiss (47° 54' N. lat, 20° 22' E. long.), 67 miles E.N.E. of Pesth. Previous to 1803, Erlau was the see of a bishopric founded by St Stephen, king of Hungary, in the 11th century ; in 1804 it was elevated to an arch- bishopric. The town is situated in a valley surrounded by hills covered with vineyards, the cultivation of which forms the chief employment of the inhabitants ; the red wines from this district are considered the best in Hungary, and are largely exported to foreign countries. The other manufac- tures consist of woollen and linen fabrics, hat and shoe making, and leather~~

~~dressing. The town is inclosed by old walls and entered by six gates; the streets are narrow, but embellished with several fine buildings, the principal of which are the cathedral, the archbishop's palace, a diocesan lyceum with a library and observatory 172 feet high, the county hall, and two monasteries. Besides the cathedral, there are several other Roman Catholic churches, also a Greek and a Protestant church, and several schools. Erlau was founded by King Stephen of Hungary, who resided there in 1010. On an eminence above the tower stands an ancient Turkish fortress, which was often besieged during the constant wars between the Moslems and Christians. In 1552 the town resisted the repeated assaults of a large Turkish force; in 1596, however, it was given up to the Turks by the Austrian party in the garrison. During the revolution of 1848-49, Erlau_ was remarkable for the patriotic spirit displayed by its inhabi- tants; and it was here that the principal campaigns against the Austrians were organized. The population at the census of 1870 numbered 19,150, chiefly Roman Catholics.~~

~~ERLKONIG, or Ert-Kine, a mythical character in modern German literature, represented as a gigantic, bearded man with a golden crown and trailing garments, who carries children away to that undiscovered country where he him- self abides. There is no such personage in ancient German mythology, and the name is linguistically nothing more than the perpetuation of ablunder. It first appeared in Herder's Stimmen der Volker, 1778, where it is used in the transla- tion of the Danish song of the Hif-King's Daughter as equi- valent to the Danish ellerkonge, or ellekonge, that is, elver- konge, the king of the elves; and the true German word would have been Elbkénig, or Elbenkénig, afterwards used under the modified form of Llfenkénig by Wieland in his Oberon, 1780. Herder was probably misled by the fact that the Danish word elle signifies not only elf, but also alder-tree (Germ. Zrle). His mistake at any rate has been~~

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~~perpetuated by both English and French translators, who speak of a "king of the alders," "wn roo des aunes," and find an explanation of the~~

~~myth in the tree-worship of early times, or in the vapoury emanations that hang like weird phantoms round the alder-trees at night. The legend was adopted by Goethe as the subject of one of his finest ballads, rendered familiar to English readers by the translations of Lewis and Sir Walter Scott; and since then it has been treated as a musical theme by Reichardt and Schubert. See Notes and Queries, 4th series, vol. ix.~~

~~(1872).~~

~~ERMAN, Paut (1764-1851), a German physicist, was born in Berlin February 29, 1764. He originally intended to study for the church, but his inclination towards physical science induced him to change his purpose, and he became teacher of science at the French gymnasium in Berlin, and afterwards at the military academy. On the foundation of the university of Berlin in 1810 he became professor of physics, an office which he held until his death, 11th October 1851. In 1806 he became a member of the Academy of Physical Science. Erman made various dis- coveries of some importance in the departments of electri- city, magnetism, optics, and physiology. His son, George Adolph, still living (1878), is a well-known physicist and geographer.~~

~~ERMINE (Mustela erminea), a carnivorous mammal belonging to the family Afustelide, or Weasels, and resembling the other members of the family in the great length and slenderness of its oe : body and the short- ness of its liinbs, to which it owes the peculiar snake-like / character of its mo- 4% tions. It usually measures 10: inches in length exclusive of the tail, which is about 4 inches long, and which becomes bushy towards the point. Its fur in summer is of a reddish-brown colour above and white beneath, changing in the winter of northern latitudes to snowy whiteness, except at the tip of the tail, which at all seasons is of a jet black colour. In Scottish specimens this change in winter is complete, but in those found in the southern districts of England it is usually only partial, the ermine presenting during winter a piebald appearance. The white colour is evidently protective, enabling the animals to elude the observation of their enemies, and to steal unob- served on their prey. – It also retains heat better than a dark covering, and may thus serve to maintain an equable tem- perature at all seasons~~

~~within the body. According to Bell (British Quadrupeds, 2d ed.), the change of colour is effécted "not by the loss of the summer coat and the substitution of a new one for the winter, but by the actual change of colour in the existing fur." The ermine is a native of the northern parts of both hemispheres, inhabiting thickets and stony places, and frequently making use of the deserted burrows of moles and other underground mammals. It is exceed- ingly sanguinary in disposition, and agile in its movements ; it feeds principally on the rat, the water vole, and the rabbit, which it pursues with unusual pertinacity and bold- ness, hence the name stoat, signifying bold, by which it is commonly known. It takes readily to the water, and will even climb trees in pursuit of its prey. It is particularly destructive to poultry and game, and has often been known to attack the hare, fixing itself to the throat of its victim, and defying all the efforts of the latter to disengage it.~~

~~The Ermine,~~

~~ERM—ERN~~

~~Althongh among the fiercest, it is also one of the most playful of creatures, gamboling on the turf, turning somer- saults, and performing the most grotesque antics, apparentiy without other purpose than its own amusement. In approaching its prey even it indulges in the same playful propensity, but it may then be done with the view of allaying suspicion in its intended victim. The female brings forth five young ones about the beginning of summer. The winter coat of the ermine forms one of the most valuable of commer- cial furs, and is imported in enormous quantities from Nor- way, Sweden, Russia, and Siberia. It is largely used for muffs and tippets, and as a trimming for state robes, the jet black points of the tails being inserted at regular intervals as an ornament. In the reign of Edward III. the wearing of ermine was restricted to members of the royal family. It now enters more or less plentifully into almost all state robes, the rank and position of the wearer being in many cases indicated by the presence or absence, and the disposi- tion, of the black spots. In capturing the animal a trap is used, consisting of a heavy stone slab, supported by a~~

slender stick, baited with flesh; no sooner does the ermine begin to nibble at the bait than the delicate support gives way, and it is crushed beneath the stone.

ERNESTI, Jonann Avaust (1707-1781), one of the most illustrious philologists and theologians of the last century. He was born August 4, 1707, at Tennstadt in Thuringia, of which pluce his father, Johann Christoph Ernesti, likewise a distinguished theologian, was pastor, besides being superintendent of the electoral dioceses of Thuringia, Salz,and Sangerhausen. After having received his first instruction in classics from his father, and in the gymnasium of his native town, he was sent at the age of sixteen to the celebrated Saxon cloister school of Pforta. At twenty he entered the university of Wittenberg, and studied afterwards at the university of Leipsic. In 1730 he was made master in the faculty of philosophy. In the following year he accepted the office of conrector in the Thomas school of Leipsic, of which J. M. Gesner was then rector; and on Gesner's being called in 1734 as professor of rhetoric to Gottingen, he succeeded him as rector. He was, in 1742, named extraordinary professor of ancient literature in the university of Leipsic, and in 1756 promoted to the ordinary professorship of rhetoric. Here his reputation as a scholar, and his rational treatment of biblical exegesis, paved the way for his entrance into the theological faculty, in which he received his doctor's degree in 1758. Through the elegance of his learning, and his manner of discussion, he co-operated with Baumgarten of Halle in disengaging dogmatic theology from the scholastic and mystical excrescences with which it was then deformed, and thus paved the way for a revolution in theology. He died, after a short illness, in his seventy-sixth year, September

11, 1781.

It is perhaps as much from the impulse which Ernesti gave to sacred and profane criticism in Germany, as from the intrinsic excellence of his own works in either depart- ment, that he must derive his reputation as a philologist or theologian. In conjunction with Gesner, he instituted a new school in ancient literature, while with Semler he partially co-operated in the revolution of Lutheran theology.

~~From the Reformation down to the latter half of the 18th century, Germany was far excelled by Holland in the number and excellence of her philologists; and it was not until the appearance of Gesner and Ernesti, with their somewhat earlier contemporaries, Cortius, Daniel Longolius, and Michael Heusinger, that she could oppose above one or two rivals to the great critics of the Dutch schools. Gesner and Ernesti, however, through the influence of their lectures at the greater universities of Gittingen and Leipsic, through the wider extent of their labours in philology, and still~~

~~KRN—ERP~~

~~more through the greater excellence of their methods, are entitled to be held the founders of the new German school of ancient literature. Both, but especially Ernesti, detected grammatical niceties in the Latin tongue, in regard to the consecution of tenses, for instance, which had escaped preceding critics. His canons are, however, not without exceptions. As an editor of the C'reek classics, Ernesti deserves hardly to be named beside his Dutch contem- poraries, Hemsterhuis, Valckenaer, Ruhnken, or his col- league Reiske. The higher criticism was net even at- tempted by Ernesti. But to him and to Gesner the praise is due of having formed, partly by their discipline and partly by their example, philologists greater than them- selves, and of having kindled the national enthusiasm for ancient learning.~~

~~As a theologian, Ernesti is far less conspicuous than as a scholar, and his influence is not so marked either on his contemporaries or on his successors. It is, indeed, chiefly in hermeneutics that Ernesti has any claim to the char- acter of a great theologian. But here his merits are distinguished, and, at the period when his Jnstitautio Interpretis N. T'. was published, almost peculiar to himself. In it we find the principles of a general interpretation, formed without the assistance of any particular philosophy, but consisting of observations and rules which, though already enunciated, and applied in the criticism of the profane writers, had never rigorously been employed in biblical exegesis. He admits in the sacred writings as in the classics only one acceptation, and that the grammatical, convertible into and the same with the~~

~~logical and historical. He therefore justly censures the opinion of those who in the illustration of the Scriptures refer everything to the illumination of the Holy Spirit, as well as that of others who, disregarding all knowledge of the languages, would explain words by things, and thus introduce into the holy writings their peculiar glosses and opinions. The "analogy of faith," as a rule of interpretation, he greatly limits, and teaches that it can never alone afford the explanation of words, but only determine the choice among their possible significations, and must always stand in need of philology as an assistant. Every principle of his interpretation, however, rests on the assumption of the inspiration of the Scriptures, and he seems unconscious of any inconsistency between that doctrine as usually received and his principles of hermeneutics. It must be admitted that those of his followers who have seen the inconsistency, and endeavoured by one means or other to obviate it, have been more logical than their master. In the higher criticism of the sacred books LErnesti did nothing. In dogmatic he always expressed great contempt of strict systematic theology ; and though he lectured for many years on the Aphorisms of Neumann, it was rather in refutation than in support of his text-book.~~

~~Among his works the following are the more important :—I. In classical literature : Initia Doctrine Solidioris, 1736, 8vo, many subsequent editions; Initia Rhctorica, 1730; editions, mostly annotated, cf Xenophon's Memorabilia (1737), Cicero (1737-39), Suetonius (1748), Tacitus (1752), the Clouds of Aristophanes (1754), Romer (1759-64), Callimachus (1761), Polybius (1764), as well as of the Quesiura of Corradus, the Greek lexicon of Hedericus, and the Biblisthecs, Latina of Fabricius (unfinished); Archcologia Liitcraria, 1768, a new and improved edition by Martini; Hloratius Tursellinus de Particulis, 1769. 11. In sacred litcra- ture: Antimuratorius, sive Confutatio Disputationis Muratoriane de rebus liturgicis, 1755-58; Neuc Theologische Bibliothck, vols. i. to x. 1760-69, 8vo; Institutio Interpretis Nov. Test., 3d cd., 1775, 8vo; Neweste Theologische Bibliothck, vols. i. to x. 1771-75, 8vo. Besides these, he published above a hundred smaller works in the form of prefaces, academical dissertations, programmata, memoriz, elogia, epistles, orations, translations, &c., many of which have been~~

~~collected in the three following publications :—Opuscnla Oratoria, 1762, 2d edit. 1767, 8vo; Opuscula Philologica et Critica, 1764, 2d edit. 1776, 8vo; Opusenla Theologica, 1778, 8vo.~~

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~~ERNESTI, Joann Caristtan Gorriies (1756-1802), nephew of the preceding, a distinguished classical scholar and critic, was born at Arnstadt, Thuringia, in 1756. After attending the gymnasium of his native town, he entered the university of Leyden, where he had the advantage of his uncle's superintendence in his studies. He obtained his master's degree in 1777, but continued his studies till 1782. On the 5th June of that year he was made supplementary professor of philosophy at his native university ; and on the death of his cousin Angust Wilhelm, he was in 1802 elected professor of rhetoric. He died on the 5th June of the same year, having discharged his new professional duties for only five months.~~

~~His principal works are an edition of sop fabule Gr. (1781), Hesychii glossve sacre emendationibus notisque illustrate. (1785), Suide et Phavorint glosse sacre (1786), Si/ti Italict Punicoram Libri Septemdccim, etc., 2 vols. (1791 and 1792), Lexicon Techno- logice Greecorum rhetorice (1795), Lexicon Technologic. Roman- orum rhetorice (1797), and Ciccro's Geist und Kunst (1799-1802). He also edited some of his uncle's works.~~

~~ERNST, Hernrich Witnerm (1814-1865), an emi- neut violinist and composer, was born at Brinn, in Moravia, in 1814. He received his musical education at the Conservatorium of Vienna, studying the violin under Joseph Boehm and Mayseder, and composition under Seyfried. At the age of sixteen he made a concert tour through various towns of south Germany, which was the means of establishing his reputation as a violinist of the highest promise. In 1832 he visited Paris, where he found a warm reception, and continued to reside for several years. During this period he formed that intimacy with Stephen Heller of which a permanent memorial has been left in their charming joint-compositions—the Pensées Fugitives for piano and violin. In 1843 he paid his first visit to London at the close of the musical season. The~~

impression which he then made on a limited circle was more than confirmed during a longer residence in the following year, when his rare powers as a violinist were recognized by the general body of the musical public. Thenceforward he visited England nearly every year, until his health entirely broke down under the pressure of long continued neuralgic disease of a most severe kind, which frequently incapacitated him from the exercise of his art. The last seven years of his life were spent in retirement, chiefly at Nice, where he died on the 8th October 1865. As a violinist Ernst was distinguished for his almost unrivalled executive power, for his loftiness of conception, and for his intensely passionate expression. As a com- poser he wrote chiefly for his own instrument, and his Elegie and Otello Fantasia rank among the most treasured works for the violin. Ernst was a man of a singularly generous nature, as was shown by the unfailing readiness with which he gave his services for the benefit of his brother artists.

EROS, in Greek mythology, Love or Desire. By later' poets he is represented as a son of Zeus and Gaia (the Earth), or Aphrodite, or Artemis; but in the Hesiodic theogony he makes up, with Chaes, Gaia, and Tartarus, the number of self-existent deities, and as the most beautiful of all the gods, he conquers the mind and will of both gods and men. The name Eros answers to the Vedic Arnsha, a name applied to the sun, but only at his rising. Arusha, like the Greek Eros and the Latin Cupido, is spoken of as a child with beautiful wings.

ERPENTIUS (original name, Von Erpx), Tomas (1584-1624), a distinguished Orientalist, was born at Gor- cum, in Holland, September 11, 1584. After completing his early education at Leyden, he entered the university of that city, and in 1608 took the degree of master of arts. By the advice of Scaliger he studied the Oriental languages whilst taking his course of theology; and he even then

gave promise of great distinction in that department of learning. He afterwards travelled in England, France, Italy, and Germany, forming connexions with learned men, and availing himself of the information which they communicated. During his stay at Paris he contracted a

~~friendship with Casaubon, which lasted during his life, and also took lessons in Arabic from an Egyptian, Joseph Barbatus, otherwise called Abu-dakni. At Venice he perfected himself in the Turkish, Persic, and Ethiopic languages. After a long absence, Erpenius returned to his own country in 1612, and on the 10th February 1613 he was appointed professor of Arabic and other Oriental languages, Hebrew excepted, in the university of Leyden. Soon after his settlement at Leyden, animated by the example of Savary de Bréves, who had established an Arabic press at Paris at his own charge, lic caused new Arabic characters to be cut at a great expense, and erected a press in his own house. In 1619 the cnrators of the university of Leyden instituted a second chair of Hebrew in his favour. In 1620 he was sent by the States of Holland toinduce Pierre Dumoulin or André Rivet to settle in that country ; and after a second journey he was success- ful in inducing Rivet to comply with their request. Some time after the return of Erpeenins, the States appointed him their interpreter ; and in this capacity he had the duty im- posed upon him of translating and replying to the different letters of the Moslem princes of Asia and Africa. His reputation had now spread throughout all Europ2, and several princes, the kings of England and Spain, and the archbishop of Seville made him the most flattering offers; but he constantly refused to leave his native country. In addition to the numerous works he had already published, he was preparing an edition of the Koran with a Latin translation and notes, and was projecting an Oriental library, when at the early age of forty a contagious disease cut short his life, November 13, 1624.~~

~~Among his works may be mentioned his Grammatica Arabica, published originally in 1613, often reprinted, and still in use; Rudimentee lingue Arabice (1620) ; Grammatica Hbreea generalis,~~

~~1621; Grammatica Chaldaica et Syra, 1628; and an edition of Elmacinus's History of the Saracens.~~

~~ERSCH, Jonann Samvet (1766-1828), the founder of German bibliography, was born at Gross Glogan, in Prussian Silesia, June 23, 1766. In 1785 he entered the university of Halle with the view of studying theology, but very soon his whole attention became engrossed~~

~~with history, biblio- graphy, and geography. At Halle he made the acquain- tance of Fabri, professor of geography ; and when the latter was made professor of history and statistics at Jena, Ersch accompanied him thither, and aided him in the preparation of several works. He also devoted a large portion of his time to the acquisition of modern languages, and became a thorough proficient in French, Italian English, Swedish, and Danish, and in their respective literatures. In 1788 he published the Verzeichniss aller anonymischen Schriften, asa supplement to the 4th edition of Meusel's G'elchrtes Deutschland. The researches required for this work sug- gested to him the preparation of a Lepertorinm dtiber die Allgemeinen Deutschen Journale und andere pertodische Sammlangen fiir Hrdbeschreibung, Geschichte, und die damit verwandten Wissenschaften (licmgo, 1790-92). The fame which this publication acquired him led to his being engaged by Schiitz and Hufeland to prepare, iu connexion with their Jnstitut der allgemeinen Litteraturzeitung, an Allgemeines Repertorium der Litteratur, published in 8 vols. (Jena aud Weimar, 1793-1809), which condensed the literary productions of 15 years (1785-1800), and included an account not merely of the books published during that period, but also of articles in periodicals and magazines, and even of the criticisms to which each book had been~~

~~subjected. While engaged in this great work he also pro- jected La France littéraire, which was published at Hamburg in 5 vols., from 1797 to 1806. Jn 1795 he went to Hamburg to edit the Neue Hamburger Zeitung, founded by Victor Klopstock, brother of the poet, but returned in 1800 to Jena to take part in the preparation of the All- gemeinen Literaturzeitung. He also obtained in the same year the office of librarian in the university, and in 1802 was made professor of philosophy. In 1803 he accepted the chair of geography and statistics at Halle, and in 1808 was made principal librarian. He here projected a Hand- buch der Deutschen Literatur seit der Mitte des 18 Jahrh. bis auf die neueste Zeit (Leip., 1812-14) and along with Gruber the Allgemeine Encyklopddie der Wissenschaften und Kiinste, which he~~

~~continued as far as its 18th volume. He died at Halle 16th January 1828.~~

~~ERSKINE, Exsenezer (1680-1754), the chief founder of the Secession Church (formed of dissenters from the Church of Scotland), was the son of the Rev. Henry Erskine, who at one time was minister at Cornhill, North Durham, but was ejected in 1662 by the Act of Uniformity, and, after suffering some years' imprisonment, was after the' Revolution appointed to the parish of Chirnside, Berwick- shire. Ebenezer was born on the 22d June 1680, most probably at Dryburgh, Berwickshire, as his parents were residing there for the greater part of that year. He entered the university of Edinburgh in 1693, and took his M.A. degree in 1697. He was licensed to preach in 1702, and in the following year was settled in the parish of Portmoak, Kinross-shire. here he remained for twenty-eight years, after which, in the autumn of 1731, he was translated to the West Church, Stirling. Some time before this, he along with some other ministers was " rebuked and admonished " by the General Assembly for defending the doctrines con- tained in a book called the Marrow of Modern Divinity. A. sermon which he preaclied on lay-patronage before the synod of Perth in 1733 furnished new grounds of accnsa- tion, and he was compelled to shield himself from rebuke by appealing to the General Assembly. Here, however, the sentence of the synod was confirmed, and after many fruit- less attempts to obtain a hearing, he and other three ministers, Wilson, Moncrieff, and Fisher, were suspended from the office of the ministry by the commission in Nov- ember of that year. Against this sentence they protested, and constituted themselves into a separate church court, under the name of the Associate Presbytery. It was not, however, till 1739 that they were again summoned before the Assembly, when appearing in their corporate capacity they declined the authority of the church, and were deposed in the following year. They received numerous accessions to their communion, and remained in harmony with each other till 1747, when a division took place in regard to the nature of the oath administered to burgesses. Erskine joined with the " Burgher" section, to whom he became professor of theology. He continued also to preach to a numerous congregation in Stirling till lis death, which took place on the 2d June 1754. Erskine was a very~~

~~popular preacher, and a man of considerable force of char- acter ; and whatever opinion may be held as to his disputes with the Church of Scotland, it must be admitted that he acted throughout with an honesty and courage which are worthy of all respect. The Burgher and Anti-Burgler sec- tions of the Secession Church were reunited in 1820, and in 1847 they united with the Relief Synod in forming the United Presbyterian Church. Erskine's published works consist chiefly of sermons. His Life and Diary, edited by the Rev. Donald Fraser, was published in +840.]22),~~

~~ERSKINE, Joun, of Carnock (1695-1768), an eminent writer on the law of Scotland and professor in the university of Edinburgh, was born in 1695. His father, Lieutenant-~~

~~HRSKINE~~

~~Colonel John Erskine, son of Henry, second Lord Cardross,~~

~~was a noted Whig and zealous Presbyterian, who made~~

~~himself conspicuous at the Revolution by refusing to take~~

~~the oath of abjuration notwithstanding his Strong attach-~~

~~ment to King William. John Erskine the younger was admitted a member of the faculty of advocates in 79: Although he never enjoyed much practice at the bar, he acquired a high reputation as a sound and learned lawyer. In 1737 he was appointed professor of Scots law in the university of Edinburgh—a position which he proved to be peculiarly well fitted to adorn. In 1754 he published his Principles of the Law of Scotland. He retired from his chair in 1765 ; and during the remainder of his uneventful life he occupied himself with the preparation of his great work, the Institute of the Law of Scotland, which he did not live to publish. He died at Qardross on the Ist March~~

~~1768.~~

~~Erskine's Institute, although it docs not exhibit the grasp of principle which distinguished his great predecessor Lord Stair, is so conspicuous for learning, accuracy, and sound good sense, that it has always been esteemed of the highest authority on the law of Scotland. On one important branch indeed—commercial law—it is very defective, even when compared with Lord Stair's much earlier work ; but at the time when Erskine wrote com- merece had declined in Scotland, while the forfeitures con- sequent on the rebellions of 1715 and 1745 had given a great impetus to feudal conveyaneing; and the Institute naturally reflects this state of society. Nor does it pro- fess to give a very extended exposition of criminal law ; but on all the other branches of Scottish jurisprudence it is, even at the present day, the most trustworthy guide which the student can find. The Principles, although published first, is substantially an abridgment of the larger work, and is in some respects superior to it. More concise and direct, it gives an admirable exposition of the main principles of the law in a perspicuous and interesting manner. It was designed to supersede Sir George Mackenzie's Znstitutians as the class text-book ; and it is a conclusive proof of its excellence that it still retains this place in the university.~~

~~The Institute first appeared in 1773, and has repeatedly been republished. The best edition is the last (1871), by Mr Badenach Nicolson, who has preserved the valuable.and authoritative notes~~

~~of Lord Ivory's edition (1824-28). The last (15th) edition of the Principics is admirably edited by Mr Guthrie (1874).~~

~~ERSKINE, Joun, D.D. (1721-1803), son of the above, a minister of the Church of Scotland, was born on the 2d June 1721. It was his early desire to enter the church ; and although, in deference to his father's wish, he studied law for a time after completing his course in arts at the university of Edinburgh, he was eventually permitted to follow his own inclination. He was licensed to preach hy the presbytery of Dunblane in 1743 ; and in May of the following year he was ordained minister of the important parish of Kirkintilloch, near Glasgow. In 1753 he was translated to Culross, in Fifeshire, from which he was re- moved in 1758 to the New Greyfriars Church in Edin- burgh. In 1767 this was~~

exchanged for the collegiate charge of the Old Greyfriars Church, where he became the colleague of Principal Robertson, the historian. Here he remained until his death, which took place on January 19, 1803. His writings cousist chiefly of numerous coutrover- sial pamphlets on theological subjects, and their contents make it a matter of regret that he did not publish something which was the result of more extended labour. He carried on an extensive correspoudence with many distinguished men in England, on the Continent, and in America. His Sermous are clear, vigorous expositious of a moderate Calvin- ism, in which metaphysical argument and practical morality are happily blended. In church politics he was the leader

of the evangelical party ; but his high character and the benignity of his disposition secured for him the esteem of his opponents and the friendship of their leader, his colleague Dr Robertson. There is an excellent Life of Erskine by Sir H. Moncrieff Welwood (Edin. 1818), the appendix to which contains a complete list of his numerous writings.

ERSKINE, Ratpa (1685-1752), brother of Ebenezer Erskine, was born 18th March 1685. After studying at the university of Edinburgh, he was licensed as a preacher in 1709, and in 1711 was ordained as assistant minister at Dunfermline. He homologated the protests which his brother laid on the table of the Assembly after being re- buked for his synod sermon, but he did not formally with- draw from the Establishment till 1737. He was also present, though not as a member, at the first meeting of the Associate Presbytery. When the severance took place on account of the oath administered to burgesses, he adhered, along with his brother, to the Burgher section. He died after a short illness on November 6, 1752. His works consist of sermons, poetical paraphrases, and gospel sonnets. The Gospel Sonnets have frequently appeared separately. His Life and Diary, edited by the Rev. D. F raser, was published in 1842.

ERSKINE, Tromas, Baron (1750-1823), probably the greatest forensic orator that Britain has produced, was the third and youngest son of Henry David, tenth earl of Buchan, and was born in Edinburgh on the

~~10th of J anuary 1750. From an early age he showed a strong desire to enter one of the learned professions ; but his fathcr, whose means had barely permitted him to afford the cxpense of a liberal education for his two elder sons—one of whom, afterwards the well-known Harry Erskine, was studying for the Scotch bar—was unable to do more than give him a good school education at the High School of Edinburgh and the grammar school of St Andrews. He attended the university of St Andrews for one session, after which it was decided that he should join the navy; and in the spring of 1764 he loft Scotland to serve as a midshipman on board the "Tartar." His buoyancy of spirit and the opportunity for study which he had on board a man-of-war reconciled him to his new mode of. life; but on finding, when he returned to this country after four years' absence in North America and the West Indies, that there was little immediate chance of his rank of acting lioutenant being confirmed, he resolved to quit the service. He entered the army, purchasing a commission in the Ist Boyals with the meagre patrimony which had been left to him. But proimo- tion here was as slow as in the navy ; while in 1770 he had added greatly to his difficulties by marrying the daughter of Mr Daniel Moore, M.P. for Marlow, an excellent wife, butas poor as himself. In thesedepressing circumstances he happened to be quartered where the assizes were being held, and lounging into court one day was invited to the bench by his father's old friend Lord Mansfield, He was told that the barristers who were pleading were at the top of their profession, yet he felt that he could do as well, if not better, himself. He confided his plan to Lord Mansfield, who did not discourage him, and to his mother, a woman of re- markable determination of character, who strongly advised him to quit the army forthe law, Accordingly on the 26th April 1775 he was admitted a student of Lincoln's Inn. – He also on the 13th of January following entered himself as a gentleman commoner on the books of Trinity College, Cambridge, but merely that by graduating he might be called two years earlier. He placed himself as a pupil under Mr Buller, and when that eminent lawyer was ele- vated to the bench, under Mr (afterwards Baron) Wood, and was called to the bar on the 3d July 1778. His suc- cess was immediate and brilliant. An accident was the~~

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means of giving him his first case, Rex v. Baillie, in which le appeared for Captain Baillie, the lieutenant-governor of Greenwich Hospital, who had published a pamphlet ani- madverting in severe terms upon the abuses which Lord Sandwich, the first lord of the Admiralty, had introduced into the management of the hospital, and against whom a rule had been obtained from the Court of King's Bench to show cause why a criminal information for libel should not be filed. Erskine was the junior of five counsel; and it was his good fortune that the prolixity of his leaders con- sumed tlie whole of the first day, thereby giving the advan- tage of starting afresh next morning. He made use of this opportunity to deliver a speech of wonderful eloquence, skill, and courage, which captivated both the audience and the court. The rule was discharged, and Erskine's fortune was made. He received, it is said, thirty retainers before he left the court. In 1781 he delivered another remarkable spseech, in defence of Lord George Gordon—a speech which gave the death-blow to the doctrine of constructive treason. In 1783, when the Coalition Ministry came into power, he was returned to parliament as member for Portsmouth. His first speech in the House of Commons was a failure ; aud he never in parliamentary debate possessed anything like the influence he had at the bar. He lost his seat at the dissolution in the following year, and remained out of parliament until 1790, when he was ayain returned for Portsmouth. But his success at the bar continued unimpaired. In 1783 he received a patent of precedence.. His first special retainer was in defence of Dr Shipley, dean of St Asaph, who was tried in 1784 before Mr Justice Buller at Shrewsbury for seditious libel—a case memorable for Erskine's bold yet dignified vindication of the indepen- dence of the bar, and for the speech which he subse- quently made before the court at Westminster against a motion for a new trial. In 1789 he was counsel for Stock- dale, a bookseller, who was charged with seditious libel in publishing a pamphlet in favour of Warren Hastings, whose trial was then praceeding ; and his speech on this occasion, probably his greatest effort, is a consummate specimen of the art of addressing a jury. Three years afterwards he brought down the opposition alike of friends and foes by defending Thomas Paine, author of The Lights of Man—

~~holding that an advocate has no right, by refusing a brief, to convert himself inta a judge. As a consequence he lost the office of attorney-general to the Princes of Wales, to which he had been appointed in 1786 ; the prince, however, subsequently made amends by making him his chancellor. Among Erskine's later speeches may be mentioned those for Horne Tooke and the other advocates of parliamentary reform, and that for Hadfield, who was accused of shooting at the king. On the accession of the Grenville ministry in 1806, he was made lord chancellor, an office for which his training had in no way prepared him, but which he fortunately held only during the short period his party was in power. Of the remainder of his life it would be well if nothing could be said. Occasionally speaking in parliament, and hoping that he might return to office should the prince become regent, he gradually degenerated into a state of useless idleness. Never conspicuous for prudence, he aggravated his increasing poverty by an unfortunate second marriage. Once only—in his conductin the case of Queen Caroline—does he recall his former self. He died at Almondel, Linlithgowshire, 17th November 1823, of inflam- mation in the chest, caught on the voyage to Scotland. Erskine no doubt owed much to the period in which he lived. In another age his highest distinction would pro- bably have been the barren and evanescent reputation of a successful verdict-getter. The political trials in which he was engaged not only handed lim down to posterity as the vindicator of his country's liberties, but by inspiring him~~

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~~with the consciousness that he was defending his country and its constitution as much as if he were speaking in parliament or fighting in the field, developed, in a way that no ordinary trial could have done, that impassioned eloquence and undaunted courage which so often carried audience and jury and even court along with him. Asa judge he did not succeed; and it has been questioned whether under any circumstances he could have succeeded. For the office of chancellor he was plainly unfit ; but it is difficult to believe that one who for so long was the ornament of the bar of the King's Bench could have pre- sided over that court without adding fresh lustre to his name. Asa lawyer he~~

was well read, but by no means profound. His strength lay in the keenness of his reason- ing faculty, in his dexterity and the ability with which he disentangled complicated masses of evidence, and above all in his unrivalled power of fixing and commanding the attention of juries. To no department of knowledge but law had he applied himself systematically, with the single exception of English literature, of which he acquired a thorough mastery in early life, at intervals of leisure in college, on board ship, or in the army. Vanity is said to have been his ruling personal characteristic ; but those wlio knew him, while they admit the fault, say that in him it never took an offensive form, even in old age, while the singular grace and attractiveness of his manner endeared him to all with whom he came in contact.

In 1772 Erskine published Observations on the Prevailing Abuses in the British Army, a pamphlet which had a large circulation, and in later life, Armata, an imitation of Gulliver's Travels. His most noted speeches have repeatedly appearcd in a collected form. There is a good account of his life in Lord Campbell's Chancellors, and an interesting estimate of his character in Lord Abinger's recently published Memoir. (H. J. E, F.)

ERSKINE, Tuomas, of Linlathen (1788-1870), a writer on theology and religion, son of David Erskine, writer to the signet in Edinburgh, and of Anne Graham, of the Grahams of Airth, was born 13th October 1788. He wasa descendant of the earl of Mar, regent of Scotland in the reign of James VI., a grandson of John Erskine of Carnock, and a nephew of the Rev. Dr John Erskine, both noticed above. After beingeducated at the High School of Edinburgh and at Durham, he attended the literary and law classes at the university of Edinburgh; and becoming in 1810 a member of the Edinburgh faculty of advocates, he for some time enjoyed the intimate acquaintance of Cockburn, Jeffrey, Scott, and the other distinguished men whose talents then lent an unusual lustre to the Scotch bar. On the death of his elder brother in 1816 he succeeded to the family estate of Linlathen, near Dundee, and retired from the bar—occupying the chief portion of his subsequent life in the management of his estate, in the intercourse of a few select friends, and in the discussion—eitlier by conversation, by letters, or by literary

~~publications—of those religious topics which he considered to have a vital relation to man's highest welfare. The writings of Erskine are perhaps deficient in robustness of thought, but they are clothed in a graceful style, and possess a certain originality and interest, due chiefly to his strong earnestness, unaffected sincerity, and fine moral insight. His theological views have a consider- able similarity to those of Frederick Denison Maurice, who acknowledges having been indebted to him for his first true conception of the meaning of Christ's sacrifice. Erskine had little interest in the "ltistorical criticism" of Chris- tianity, and regarded as the only proper criterion of its truth its conformity or nonconformity with man's spiritual nature, aud its adaptability or non-adaptability to man's universal and deepest spiritual needs. He considered the incarnation of Christ as the necessary manifestation to man of an eternal sonship in the divine nature, apart from which those filial qualities which God demands from man could~~

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~~have no sanction; and by faith as used in Scripture he | small vesications.~~

~~understood to be meant a certain moral or spiritual con- dition which virtually implied salvation, because it implied the existence of a principle of spiritual life possessed of an immortal power. This faith, he believed, could be properly awakened only by the manifestation, through Christ, of love as the law of life, and as identical with an eternal righteous- ness which it was God's purpose to bestow on every individual soul. During the last 33 years of his life Mr Erskine did not engage in any literary efforts. He spent the summer generally at Linlathen, and the winter either at Edinburgh, Paris, Geneva, or Lausanne. On the Continent he enjoyed the society of, among others, Mdme. Vernet, the duchess de Broglie, the younger Mdme. de Staél, and M. Vinet of Lausanne, and among his most intimate friends in this country were Edward Irving, Frederick Maurice, Dean Stanley, Bishop Ewing, Dr John Brown, and Thomas Carlyle. He exercised con- siderable influence over the whole circle of his acquaintance by his unassuming earnestness in advocating his religious views, and by the~~

~~rare qualities of his personal character. He died at Edinburgh 20th March 1870.~~

~~His principal works are Remarks on the Internal Evidence for the Truth of Revealed Religion (1820), an Essay on Faith (1822), and the Unconditional Freeness of the Gospel (1828). These have all passed through several editions, and have also been translated into French. He is also the author of the Brazen Serpent (1831), the Doctrine of Election (1839), several " Introductory Essays" to edi- tions of Christian Authors, and a posthumous work entitled Spir7- tual Order and Other Papers (1871). Two vols. of his letters, edited by William Hanna, D.D., with reminiscences by Dean Stanley and Principal Shairp, appeared in 1877.~~

~~ERYSIPELAS (a Greek word, épvoizeAas, probably derived from épvOpes, and wéAAa, skin)—synonyms, the Rose, St Anthony's Fire—a disease characterized by diffuse inflammation of the skin, attended with fever. Two kinds of this disorder are recognized, namely,—trawmatic ery- sipelas, which occurs in connexion with some wound or external injury, and may thus affect any part of the body where such lesion may exist; and zdzopathic erysipelas, in which no connexion of this kind can be traced, but which appears to arise spontaneously, and most commonly affects the face and head. They are, however, essentially the same disease, and, as regards the latter variety, it is believed by some authorities that an abrasion of the skin, generally too trifling to attract attention, exists in almost every case as the starting-point of the inflammatory action.~~

~~The question as to whether erysipelas is to be regarded as an eruptive fever allied to scarlet fever, measles, &c., or a local inflammatory disease of the skin, the fever being secondary, has engaged much attention; and while the weight of opinion appears to be in favour of the latter view, the facts of the contagiousness of erysipelas, its occasional appearance in an epidemic form, and the discovery in the inflamed tissues of microscopic organisms (Bacteria) point to the existence of a specific poison as giving peculiar char- acters to this form of cutaneous inflammation. The con- tagiousness of erysipelas in its~~

~~traumatic form is often illus- trated in the surgical wards of hospitals, where, having once broken out, it is apt to spread with great rapidity, and to produce disastrous results, as well as in lying-in hospitals, where its occurrence gives rise to the spread of a form of puerperal fever of virulent character. It is not so certain that the disease in its idiopathic variety is contagious to persons who have no wound or abrasion, and this form of the complaint is in general excited by exposure to cold, a predisposing cause being some deranged or low condition of the general health.~~

~~When the erysipelas is of moderate character there 'is~~

~~simply a redness of the integument, which feels somewhat hard and thickened, and upon which there often appear~~

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~~This redness, though at first circum- scribed, tends to spread and affect the neighbouring sound skin, until an entire limb or a large area of the body may become involved in the inflammatory process. There is usually considerable pain, with heat and tingling in the affected part. As the disease advances the portions of skin first attacked become less inflamed, and exhibit a yellowish appearance, which is followed by slight desquamation of the cuticle. The inflammation in general gradually dis- appears. Sometimes, however, it breaks out again, and passes over the area originally affected a second time. But besides the skin, the subjacent tissues may become involved in the inflammation, and give rise to the formation of pus. This is termed phlegmonous erysipelas, and is much more apt to occur in connexion with the traumatic variety of the disease. Occasionally the affected parts become gangrenous. Certain complications are apt to arise in erysipelas affecting the surface of the body, particularly inflammation of serous membranes, such as the pericardium, pleura, and peritoneum.~~

~~Erysipelas of the face, the most common form of the idiopathic variety, usually begins with symptoms of general illness, the patient feeling languid, drowsy, and sick, while frequently there is a distinct rigor followed with fever. According to some observers, the fever is~~

~~syniptomatic of inflammation already begun in the neighbouring lymphatic vessels and glands before the appearance of the disease on the skin. Sore throat is sometimes felt, but in general the first indication of the local affection is a red and painful spot at the side of the nose or on one of the cheeks or ears. Occasionally it would appear that the inflammation begins in the throat, and reaches the face through the nasal fossz. The redness gradually spreads over the whole surface of the face, and is accompanied with swelling, which in the lax tissues of the cheeks and eyelids is so great thot the features soon become obliterated and the countenance wears a hideous expression. Advancing over the scalp, the disease may invade the neck and pass on to the trunk, but in general the inflammation remains confined to the face and head. While the disease progresses, besides the pain, ten- derness, and heat of the affected parts, the constitutional symptoms are very severe. The temperature rises often to 105° or higher, and there is great gastric disturbance. Delirium is a frequent accompaniment. The attack in general lasts for a week or ten days, during which the in- flammation subsides in the parts of the skin first attacked, while it spreads onwards in other directions, and after it has passed away there is, as already observed, some slight disquamation of the cuticle.~~

~~Although in general the termination is favourable, serious and occasionally fatal results follow from inflammation of the membranes of the brain, and in some rare instances sudden death has occurred from suffocation arising from cedema glottidis, the inflammatory action having spread into and extensively involved the throat. One attack of this disease, so far from protecting from, appears rather to predispose to others ; and this fact is appealed to by those physicians who deny that erysipelas is merely one of the eruptive fevers—such disorders, as is well known, rarely occurring a second time in the same individual.~~

~~Erysipelas occasionally assumes from the first a violent form, under which the patient sinks rapidly, and instances are on record where such attacks have proved disastrous to several persons who had been exposed to their contagion. It is sometimes a complication in certain forms of exhaust- ing disease, such as consumption or typhoid fever,~~

~~and is then to be regarded as of serious import. A very fatal form occasionally attacks new-born infants, particularly in the first four weeks of their lives. In epidemics of puerperal fever this form of erysipelas has been specially found to prevail,~~

~~The treatment of erysipelas is best conducted on the ex- pectant system. 'The disease in most instances tends to a favourable termination; and beyond attention to the condi- tion of the stomach and bowels, which may require the use of some gentle laxative, little is necessary in the way of medicine. The employment of preparations of iron in large doses is strongly recommended by many physicians. But the chief point is the administration of abundant nourish- ment ina light and digestible form. Of the many local applications which may be employed, hot opiate fomenta- tions, such as a decoction of poppy heads, will be found among the most soothing. Dusting the affected part with flour or powdered starch, and wrapping it in cotton wadding, is also of use; or collodion may be painted over the in- flamed surface to act as a protective.~~

~~With the object of preventing the spread of the inflamma- tion, lines drawn with sonic caustic material (such as com- mon lunar caustic) beyond the circumference of the inflamed part have been supposed to be of use, but this plan often fails. In the case of phlegmonous erysipelas complicating wounds, free incisions into the part are necessary. (J.0. A.)~~

~~ERYTHR4~·A, one of the Jonian cities of Asia Minor, was situated on a small peninsula stretching into the Bay of Erythre, at an equal distance from the mountains Mimas and Corycus, and directly opposite the island of Chios. In the peninsula excellent wine was produced. From the fact that, in the naval battle fought by the Ionian confederates before Miletus in 494 3.c., the Erythreans had only eight ships engaged, it is conjectured that Erythree could not have been a city of much importance. The Erythrans appear to have owned for a considerable time the supremacy of Athens, but towards the close of the Peloponnesian war they threw off their allegiance to that city. Erythrze~~

~~was the birth-place of two prophetesses—one of whom, Sibylla, is mentioned by Strabo as living in the early period of the city; the other, Athenais, lived in the time of Alexander. The site of the city has been accurately ascertained, and considerable remains of its most important buildings—in- cluding the acropolis, the theatre, and what is thought to be the ancient temple of Hercules—have been discovered at the modern Ritri.~~

~~ERYX, an ancient city and mountain in the west of Sicily, six miles from Drepana, and a short distance from the sea shore. On the summit of the mountain stood a celebrated temple of Venus, called from that circumstance Erycina, under which name the goddess is frequently mentioned by the Latin poets. See Monts 8. Grurano.~~

~~ERZEROUM, Erzrum, or sometimes ARZEROUM, an important town of Turkish Armenia, at the head of an ex- tensive vilayet of the same name, the residence of a pasha, and the seat of an Armenian patriarch and a Greek bishop, as well as the centre of the fourth army corps, and one of the main strategical points on the Turko-Russian frontier. It is situated 6200 feet above the level of the sea on the southern edge of a wide valley, surrounded by mountains of considerable elevation, about 4 miles from the Kara-Su or western branch of the Euphrates, 140 miles 8.S.E. of Trebizond. To the east lies the Devi-Boyun, upwards of 8000 feet in height, and to the south-east the Polan-Duken, the latter being the birthplace of a number of small streamlets, which, after meeting in the town, flow N. to the Kara-Su. The streets of the town are for the most part irregular, unpaved, badly drained, filthy, and infested with dogs ; and as the building material is mainly a dark- grey volcanic stone cemented with mud, the general appearance is dull and sombre. The roofs, with scarcely an exception, are flat or dome-shaped, and covered with a layer of earth and sward, on which it is no uncommon thing to see a donkey grazing. A considerable proportion, indeed, of the ordinary dwelling-houses are formed by~~

~~making an extensive quadrangular excavation in the earth, and covering in the whole ora part of the area, so that the roof is almost ona level with the natural surface of the ground. The town is said to contain about thirty khans or caravansaries, about as many mosques, a number of Christian churches, and nineteen public baths; but none of those buildings are of much architectural pre- tension, except the Armenian cathedral and the Shiftch— two graceful minarets near the citadel, belonging to an ancient and striking edifice, of which a detailed account may be found in Hamilton's Researches im Asia, 1842. A large number of circular towers with conical] tops give a certain picturesqueness to the general view; they are popularly reputed to be the tombs of holy men who died inthe 14th century. The defences consist of an old brick- built citadel near the centre of the town, an enceinte on Vauban's principles with dry ditch and dilapidated walls, several detached forts constructed since 1864, and a number of outlying earthworks of no great strength. The outer wall of the citadel having fallen into disrepair has been de- molished. An excellent supply of water from Polan-Duken is distributed by wooden pipes to numerous fountains, Situated as it is on the main route between the Black Sea and Persia, Erzeroum has long maintained an extensive trade ; and though on account of the unsettled state of the country its commercial prosperity has declined since 1830, Persia, England, Russia, and Germany think it worth while to maintain consular agents in the town. The exports are wheat, goat and sheep skins, mohair, and a lessening quantity of galls; and tobacco from Persia, known as timbakt, furs from Russia, and Manchester goods are among the main items of the transit trade. Since 1860 the road from Trebizond has been greatly improved, and four-wheeled fourgons accomplish the distance in eight or nine days. The principal trades are tanning, morocco-dyeing, sheep skin dressing, and the making of horse-shoes, nails, and iron, brass,and copperutensils. In 1873a building was erected by two Armenian Catholics, Shabanian by name, to be used as a distillery, soap-works, and a macaroni manufactory. A considerable number of the townspeople are owners of sheep-farms or flocks in the mountain pastures; and a still greater proportion keep sheep and cattle in the town, send- ing them out daily under the charge of a common herdsman. To a stranger it is a remarkable siglit to watch the regularity~~

with which, as the herdsman passes in the morning, the separate flocks and herds join the main body, and the equal regularity with which in the evening they turn aside to their respective quarters. The climate is exceedingly severe, and snow lies on the ground for about six months in the year. As wood is scarce the usual fuel is tezek or dry cow- dung, the preparation of which is one of the most impor- tant tasks of the farmer-citizen. In 1854 the population of Erzeroum was estimated at 50,000, of whom 30,000 were Turks, 5000 Orthodox Armenians, 2300 Catholic Armenians, 1200 Persians, 300 Greeks, 1200 Armenians, Georgians, and Jews claiming to be Russian subjects, and 10,000 soldiers. More recent estimates give 100,000, 60,000, and 50,000.

Erzeroum is a town of great antiquity, and has been identified with the Armenian Garin Khalakh, the Arabic Kalikalah, and the Byzantine Theodosiopolis of the 5th century. Its present name, by some regarded as a corruption of Arx Romanorum, the "' citadel

| of the Romans," is more probably derived from Arsen-er-Rum, see-

ing that Arsen is known to have been the name of a town in the immediate vicinity. At the time of its capture by the Seljuks in 1201 Erzeroum must have been a mighty city, if the statement that it lost 140,000 of its inhabitants forms even an approximation to the truth. It came into Turkish possession in 1517. On July 9, 1829, it was captured by the Russian general Paskevitch, and the Russian occupation continued till the peace of Adrianople, 14th September. In 1859 a severe earthquake occurred, by which about 4500 houses were destroyed, 9 minarets levelled with the ground, and about 500 people killed. After suffering greatly from disease and death, the town capitulated to the Russians in February 1878.

ERZ—ESA

See Curzon, Hrzeroum and Armenia; Flandin and Coste, Voyage en Perse, Paris, 1851; Monteith, Erzeroum and Kars, 1856 ; Williams, War Diary, 1877; ©. B. Norman, Armenia and the Campaign of 1877.

ERZGEBIRGE, a mountain chain of Germany, forming the boundary between Saxony and Bohemia, and extending in a W.S.W. direction from the Elbe to the Fichtelgebirge, where the White Elster has its source. Its length from E.N.E. to W.S. W. is over 100 miles, and its average breadth about 25 miles. The southern declivity is generally steep and rugged, forming in some places an almost perpendicular wall of the height of from 2000 to 2500 feet; while the northern, divided at intervals into valleys, sometimes of great fertility and sometimes wildly romantic, slopes gradu- ally towards the great plain of Northern Germany. The central part of the chain forms a plateau of an average height of more than 3000 feet. At the extremities of this plateau are situated the highest summits of the range :—in the south-east, Keilberg (4000 feet); in the north-east, Fichtelberg (3980 feet) ; and in the south-west, Spitzberg (3650 feet). Near Spitzberg, at the height of about 3300 feet, is situated Gottesgabe, the highest town in Germany. Geologically, the Erzgebirge range consists mainly of gneiss, mica, and phyllite. As its name indicates, it is famous for its mineral ores. These are chiefly silver and lead, the layers of both of which are very extensive, tin, nickel, copper, and iron. Gold is found in several places, and some arsenic, antimony, bismuth, manganese, mercury, and sulphur.

ESARHADDON (Assur-akhi-iddina, "Assur gave brothers") succeeded his father Sennacherib as king of Assyria, January 680 B.c. He had had to fight a battle a few weeks previously against his elder brothers, Adrammelech and Nergal-sharezer, who had murdered their father, and after their defeat fled to Armenia. The murder had probably been occasioned by the partiality shown by Sennacherib for Esarhaddon, a curious record of which has been preserved to us ina kind of will in which he bequeaths to Esarhaddon various private property. Esarhaddon seems to have been the ablest of the Assyrian monarchs; he was distinguished equally as a general and an organizer, and under him the Assyrian empire attained almost its furthest limits. His character, too, seems to have been milder than that of most other Assyrian kings, and his policy was one of conciliation. Babylon, which had been destroyed by Sennacherib in 691 B.c., was rebuilt, and made the southern capital. It was to Babylon, therefore, that Manasseh was brought (2 Chr. xxxiii. 11), Esarhaddon's first object was to strengthen

~~lis empire by overthrowing the rival monarchy of Egypt, and diverting the trade of Phoenicia to Nineveh. Zidon was accordingly razed to the ground, and the Assyrian arms carried as far as Cyprus; Tyre and Carchemish, how- ever, rather than Nineveh, profited by the event. Egypt, then under the Ethiopian Tirhakah, was invaded, the Assyrians being supplied with water during their march across the desert by the king of the Arabians. Memphis and its treasures were captured, and Egypt as far as Thebes was made an Assyrian province, and divided into twenty satrapies. These twenty satrapies Herodotus has turned into a dodecarchy, and connected with the twelve courts of the Labyrinth built centuries before. The conquest of Egypt had been preceded by two important campaigns. One was against the Minni and the Medes, which secured the north-eastern frontier of the empire; the other was an expedition which penetrated into the heart of Arabia, and reflected the highest credit on the enterprise and military genius of the Assyrian monarch. His armies marched a distance of about 900 miles into the desert, traversing Uz and Buz (Khazu and Bazu), and reducing a large number of Arab tribes to subjection. The object of both these~~

~~campaigns was clearly the same,—to spread terror among the barbarous tribes on the froutiers, aud to prevent them from harassing the Assyrian provinces. arly in his reign Esarhaddon had checked the southward march of the Gimir- rai, or Cimmerians, who had been driven from their old seats on the Volga by the Scyths. He defeated them under a chief named Teuspa (? Teispes) in Khupuscia (near Colchis), and drove them westward across the Halys towards Sinope. About the same time Cilicia and the Dah were subdued, as well as Eden, or Tel-Assur, south-east of Assyria. Egypt had been aided in its struggle against Esarhaddon by Tyre, which had revolted from Assyria in spite of the favour shown to it. The town was at once blockaded ; and the siege was still continuing when Esarhaddon died, in 668 B.C., after a reign of thirteen years, leaving behind him four sons and one daughter. Two years previously, just after his return from the Egyptian campaign, he had associated his son Assur-bani-pal, or Sardanapalus,~~

~~in the government. The fact was announced to an assembly of the people on the 12th day of Iyyar, or April.~~

~~ESAU, or Epom, the father of the Edomites, was the son of Isaac and Rebecca, and the elder twin brother of Jacob. According to the narrative contained in Genesis, the name Esau (hairy) was given to him on account of his hairy appearance at his birth, and the name Edom (red) when he sold his birthright to Jacob for a meal of red lentile pottage. Esau, who was a hunter, having returned famished from the chase, found Jacob enjoying a savoury dish, and besought him to be allowed to share it. Jacob refused this, unless Esau made over to him the privileges of the elder son; and, prompted by the pangs of hunger, the latter immediately consented. Notwithstanding this, andalthough by marriage with two Canaanitish women Esau had sepa- rated himself from the pure blood of Abraham, he would have received the covenant blessing from his father, had not Jacob secured it through the deceit of personating Esan, which, as his father was blind, he was able to accomplish by imitating the hairy appearance of his brother by means of goat skins. Esau, on hearing what Jacob had done, vowed to kill him, and the latter found it necessary to flee to Mesopotamia. Soon afterwards Esau, to propitiate his parents, married the daughter of Ishmael, but as they con- tinued to be offended by the idolatrous practices of his Canaanitish wives, he retired from his father's house and took up his residence in Mount Seir. Here he learned that Jacob was returning from Padanaram with his wives, children, and flocks; but, whether propitiated by the humble bearing of the latter or not, he not only refrained from exe- cuting the vengeance he had sworn against him, but even offered to escort him on his way. The two brothers after- wards united in burying their father; but after that Esau " took all his substance which he had got in the land of Canaan, and went into the country from the face of his brother Jacob." Some modern critics regard the history of Jacob and Esau as in a great degree, if not altogether, mythical, and the recorded life of Esau as suggested very much by the nature of the country inhabited by his descendants, its history, and the relation of its inhabitants to those of Canaan. The words "Esau" and "Seir" ety- mologically suggest a shaggy mountain- land. According to Ewald (Gesch. d. V. Isr. i. 336, 430, 494), the three~~

~~names Seir, Edom, Esau, indicate that an aboriginal race calling itself Seir was first subjugated by Canaanites bearing the name of Edom, and then both Seir and Edom by Hebrews bearing the name of Esau. Esau in its turn was compelled to yield to a younger branch of the same race, inferior in physical strength but superior in cer- tain moral qualities, The Phoenicians have a parallel legend about their progenitor Hypsuranius and the abori- ginal Usous (Esau).~~

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~~ESCHATOLOGY, or the " doctrine of last things," is a theological term for the facts revealed in Scripture about a future state, and the result of Christian speculation on these facts.~~

~~The origin of the term is to be found in the phrases " the last day," " the last times," and similar expressions adopted by New Testament writers from ancient prophecy.' It was the universal feeling among primitive Christians that they were living in the last period of the world's history. Their conflict with surrounding paganism constituted the final struggle between good and evil,? and would be ended by the appearance of Christ in visible triumph. The feeling was natural, and notnew. The Jews always believed that the Messianic kingdom would be preceded by an unusual manifestation of the hostile powers of heathenism.? In times of great national distress the excess of misery was regarded as a sign of approaching deliverance; and the hopes of the nation were revived and its courage sustained by apocalyptic visions, in which the future was depicted as a time of undisputed triumph and unending prosperity. A distinct class of literature—of which the prophecies of Ezekiel and Zechariah afford partial examples—grew out of this feeling, and from it has been mainly derived the form, not only of Jewish, but also of Christian eschatology.~~

~~The central point of expectation having necessarily shifted, for those who received Jesus as the Messiah, from the first to the second advent, this event forms the focus of the Christian doctrine of last things. The expressions common among the Hebrews to denote respectively the exist- ing and the coming dispensations—aiay otros, " this age,"4 aiwy péeAAwv, "the coming age"—were adopted, with a new reference.~~

~~They became “this life” and ‘the life tocome,”and in later language “‘time” and “eternity;” and the aidy, or age, became confused with the xécpos,° or visible order of things. With the momentous epoch that formed the dividing-point between these two periods remained associated all that ancient prophecy connected with the restoration of the Hebrew monarchy. The apocalyptic literature which began with the book of Daniel, and which belongs to the post-exile period, had, it is true, already changed the form of the primitive national hopes. The restoration had become the resurrection; the idea of judginent had been~~

~~enlaiged to include the dead; and the final consummation:~~

~~was depicted, not as a mere distinction of the heathen or their subjugation to Judaism, but as a universal catastrophe in which all who had ever lived would have their part. But the mode of presentation had not changed, and the old prophetic language was literally adopted, although the sphere of its application had so infinitely extended.~~

~~Christian eschatology, then, is especially occupied with the destinies of the church in the concluding act of the world’s drama. In formal treatises which trace the histori- cal development of the opinion on the last things, they are usually arranged under the heads—Second Advent, Millennium, Resurrection, Judgment, Conflagration of the World, and the State of the Blessed and the Damned.~~

~~But experience taught the first generation of Christians to postpone the moment of the realization of their hopes. The second advent—which, however, as the fourth gospel teaches, had already been spiritually realized—was delayed. Already~~

~~1 év rh éoxdrn huépa, John vi, 39; ér éoxdtwy tov xpdvwr, 1 Pet. i. 20, &c.; eff ra Eoxara, Mat. xii. 45; see Is. ii. 2 Mic. iv. 1; and cf. Acts ii. 17.~~

~~? See Neander, Hist. Ch. Dogmas, vol. i. p. 247 (Bohn’s series.)~~

- ~~Ps. ii; cf Rev. it. 27; 2 Hed. xiii. 21.~~

~~“ Alford’s note on Matt. xii.32. For similar expressions see Titus ii. 12, Mark x. 30, Gal. i. 4, Luke xx. 35. The Hebrew equivalents were MYT Dow and NAN Ddiy,~~

~~® See parable of tares, Matt. xiii., where the A. V. misses the point of the parable by translating both aidéy and Kéapos ‘*the world.” It is the harvest, the aidy or age, which comes to an end, not the world.~~

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~~ESCHATOLOGY~~

~~when St Paul wrote to the Thessalonians, some had died before the fulfilment of their desire, and the church was troubled with fears lest they should awake from the death- sleep too late for the divine appearing. A new epoch was therefore introduced. The destinies of the individual from the moment of departure from this life enter into the inquiry, and the already boundless field of speculation is increased by the addition of controversies about an inter- mediate state, purgatory, and the limboes® into which the schoolmen partitioned hell. Nor is the area of theory sub- stantiaily narrowed for Protestant theology, although it~~

~~limits the last things to four—death, resurrection, judg-~~

~~ment, end of the world, or more commonly, in practical dis- courses, to death, judgment, heaven, and hell.~~

~~The history of eschatology isin great measure the history of “lawless and uncertain thoughts” on these matters. The best notion of the extravagances allowed to speculation is obtained by a glance at the concluding part of the Summa Theologue, where Aquinas discusses these subjects. Thirty questions (besides an appendix devoted to purgatory) are proposed, each question being divided into several articles, and each article supported and opposed by many arguments, Then follows a conclusion, with the doctor’s remarks on his conclusion. We take a few of the proposi- tions at random :—“Whether souls are conducted to heaven or to hell immediately after death ;” “‘ Whether~~

~~the limbus of hell is the same as Abraham's bosom ;" " Whether the limbus puerorum is the same as the limbus patrum ;" or, pass- ing over afew pages, ' Whether the sun and moon will be really obscured at the day of judgment ;" " Whether the fire which is to purge the world will be like in kind to elemental fire ;" or again, '" Whether all the members of the human body will rise with it ;" " Whether the hair and nails will reappear;" and so on to questions of age, size, and sex.7~~

~~Of these and a thousand like inquiries modern thought of course takes uo notice. But there are more tremendous issues, which will never cease to engage the conscience and reason of man. 'The ultimate fate of the lost has created what has been called " a whirlpool of interminable contro- versy, roaring in endless circles over a dark and bottomless abyss."® "Only fragments of the dogma" are, as Neander remarks, to be found in Scripture.® And of these by far the greater number are poetical, and admit all the variety of interpretation possible to figurative language. The very books which are most occupied with last things found their way into the canon under protest.1° And it has been remarked that, "in nearly every passage on which it is attempted to found the eternal misery of the lost, there is a less or greater difficulty in settling the text, or in reach- ing the conviction that we read as the author wrote."!!_ The same uncertainty prevails all along the line of eschatological thought. In every age the popular opinion has been both more extravagant and more dogmatic than the expressed formulas of the church.!2 It is, indeed, difficult to determine~~

~~6 Limbus from an Italian word meaning lap.~~

~~7 Augustine devotes much space to inquiries of this kind, Civ. Det, xxii. 14, &. The reproduction of the hair, nails, &c., is affirmed by Jerome from Matt. x. 30. See Hagenbach, Hist. Doct., i. 402.~~

~~8Sir J. Stephen, Hssays in Eccl. Biography, vol. i. 346.~~

~~9 Hist. Christ. Dogm., i. 247 (Bohn's series).~~

~~10 The Apocalypse, Judé, and 2 Peter are classed by Eusebius with the doubtful or contested books (Euseb., Hist. Eccl., b. iii. c. 25.)~~

~~11 White, Life in Christ, p. 437. For English readers the confusion is increased by the arbitrary mode in which the A. V. has dealt with many of the most important terms, such as aiéy, xpfots, &c. See some powerful remarks on this in a volume of sermons just published by Canon Farrar, called Eternal Hope, p. 78, Preface, p. xxviii. sq., and Excursus ii.~~

~~12 Notice the reserve of the three great creeds—the deliberate exclusion of all pronounced opinion from the formularies of the English Church, and the comparative freedom claimed even by Roman Catholics (Newman, Grammar of Assent, p. 417).~~

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~~what, at any one time, the mind of the church has been. Reserve was wise, but reserve has its dangers. Licence was given to the unguided and uncontrolled popular imagination to create and people its own heaven and hell, while poetry and art were permitted to seize on the unseen future as their own domain, and, alas, to stamp their figured expressions indelibly as literal truths on the minds of men.~~

~~There are two distinct modes of treatment for these difficult subjects. In the philosophy of them we meet with the ever-recurrent antagonism between the Platonic and Aris- totelian systems.?_ Thus the speculative argument on which the schoolmen and Calvinists chiefly rely in support of a theory of unending penalty for sin—that the violated majesty of an Infinite Being demands infinite pain—is founded on a sentence in Aristotle's Lihics ;3 while a gentler creed appears with every revival of the Platonic philosophy, which, as Neander observes, extended its spiritualizing influence to eschatology as to other doctrines of the faith.4~~

~~But without entering on the region of pure speculation, the New Testament itself discloses two entirely different eschatological methods, The one is moral, spiritual, idealist, employing outward forms only as symbols, viewing the future rather in regard to development of character than as a mode of existence. This is the Christian as contrasted with the Jewish method. The other follows the natural ten-~~

~~dency of Hebrew thought. It is literal, material, sen- suous. It delights in chronological arrangements of the unknown future, and topographical arrangements of the unseen world. Missing the repeated warnings of Christ, delivered both in parables and in express admonitions— warnings to prepare for a slow and gradual development of His kingdom, and to leave "the times" in His Father's keeping—this method aims inall itsrepresentations at abrupt catastrophe and at a consummation depending on startling and supernatural surprises.5~~

~~These distinctive tendencies appear within the New Testament most prominently—the one in the fourth gospel the other in the Apocalypse. The Pauline theology exhibits them side by side, showing their discordance in the absence of all attempt on the part of the apostle to reconcile them. Thus in his treatment of the resurrec- tion, in the one view it is the sudden appearing of Christ which will begin the heavenly life for all, in the other this life in Christ—begun already on earth—will attain its perfection at the death of the individual. As the moment of the second advent receded, the church's expectation necessarily transferred the object of Christian hope—the communion with Christ in the kingdom of glory—to the earlier event, death ; but St Paul retains the old termino- logy without endeavouring to adapt it to this change (Phil. i, 22, 23, iii, 10, 11, with 1 Cor, xv. 52-/,; 1 Thess, iv. 15, &c.). The same discordance is observable in his treatment of the judgment and of the end of the world. In his use of terms and reference to times the apostle follows his Jewish training. "The day of the Lord," with all its prophetic associations as "day of judg. ment," is preserved; the sudden and final award of wrath or favour appears in its forensic form; and all is ended by a Separation between the heirs of eternal life and the lost.~~

~~1 The part played by poetry on these subjects from the Apocalypse downward has often distressed thoughtful people. But modern poetry and the highest literature of every department are on the side of liberal and tolerant views. 2 See Aug., Civ. Dei, xxi. 13. 3 Aquinas, Sum. Theol., quest xcix., art. 1; Calvin, Zmstit., iii. 25. 4 The first clear note of immortality in Hebrew literature is struck in the Book of Wisdom, the work of an Alexandrian Jew. The Origen- ists, perhaps Scotus~~

~~Erigena, and, in later times, some at least of the Cambridge Platonists, are examples of the statement above. _5 "Abrupt Supernaturalism." Neander, Hist. Christ. Dogm., i. 249.~~

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~~But the spirit of the apostolic teaching is independent of this form. The idea that regards the. development of the higher life as a constant process varying in each indi- vidual, but having its roots in the common life of the church,—that looks on to the ultimate perfection as a unity of all with the Redeemer in God, the whole universe having been gradually subdued by Christ to himself,—this, which we may call the essentially Christian idea, is what we receive as the innermost feeling of the man who, from a Pharisee and a zealous upholder of the law, was called to be a chosen instrument of the gospel of the favour of God in Christ.~~

~~In the patristic period the conflict between the two rival systems is apparent in every detail. Here, as everywhere else, the opposition is marked in regard to the duration of punishment. But it rages most fiercely, perhaps, round the doctrine of the millennium. The earthly reign of Messiah was transferred from Jewish to Christian expectation. But the Christian hope could not without inconsistency take a Jewish form. Christ's kingdom of heaven refused to realize itself as a period of sensual enjoyment, and the poetic chronology of the apocalypse was soon found to have raised difficulties of an insurmountable kind which were not diminished when a locality was sought for the promised earthly reign. If it was found at Jerusalem before the final judgment, how could the expectations connected with the second advent be fulfilled? In the Apocalypse the completion of the kingdom of God takes place in the New~~

~~| Jerusalem—the millennium appearing only as an interval of~~

~~rest after the crisis of the conflict with Antichrist. 'Thus a new decisive epoch is introduced, the consummation of things having thus gradually receded from the incarnation, which was the focus of Jewish eschatology, to the second advent, and still further to the close of the~~

~~millennial reign. The later interpretations, fixing the beginning of the thousand years kingdom at the incarnation, though decidedly opposed to the Apocalypse, is a recurrence to the primitive Jewish view. In accordance with this opinion, the end of the world was very generally expected about the year 1000. Another view dated the millennium from the formal adoption of Christianity by the empire under Con- stantine, and caused the expectation of the end of things~~

~~'which was so prevalent in the 14th century.®~~

~~The most important of all the questions that arise in connection with eschatology relates, of course, to the teach- ing of our Lord. A true view of the future must be a Theodicea. It must correspond to the highest human con- ception of the nature and character of God. The revelation in and through Christ affords this highest conception. And yet it is in the discourses of Christ himself that men find the passages which seem to prove the doctrine most irrecon- cilable with the insight He has elsewhere given into the Divine heart,~~

~~Now, Christ was not the first to "stamp ideas of immor- tality on the minds of.men under the forms of heaven and hell."? His gospel brought life and immortality to light, but it was by illuminating obscure and completing partial truths. It is therefore most important to ascertain what forms of belief on these subjects He found existing.~~

~~6 Millenarians or Chiliasts were opposed by Origen and Jerome. Augustine hesitated and changed his views about them. All were not equally gross in their conceptions. The prophetic pictures of festivity were the origin of the sensual notions. The apocalyptic literature, Sibylline oracles, &c., encouraged them. Papias (Iren., Adv. Her. v. 33) puts a fantastic prediction into the mouth of Christ, on which later writers enlarged. See Aug., Civ. Det, xx. 7. The specific time 1000 years did not originate with the Apocalypse. See Bleek's Introduc- tion, and Neander, Ch. Hist., ii. 496 (Bohn). Corrodi, Kritische Ge- schichte des Chiliasmus, is quoted as the classical German book on the subject. The English reader will get a full and most interesting view in Irving's Ben Ezra.~~

~~” Reconciliation of Religion and Science, by Rev T. W. Fowle, p. 93.~~

~~Eternity of punishment is often assumed to be a truth of natural religion,—an intuitive human belief. It would be truer to say that in all races the first vague guesses at 1mn- mortality include no thought of retribution at all. The continued existence was “ something between being and not being.” } Man survived only as a shadow of himself. Intel- lectually and morally he ended at death. Homer speaks of life and form in Hades, but says there is no mind there at all. The movement, freedom, joy of existence, ended for the Greek at death. The best that could then happen to him was to know that his body had been buried. All else was featureless, lifeless, inane,—an existence without even the excitement of the possibility of dying again. The bourne once reached, not only was there no return, but no further bourne remained to be aimed at. Thus the intense consciousness of the apparent finality of death determined the form of the earliest hopes of immortality when they began to dawu. Progress did not enter into them; there would be no discipline because nothing to exercise it on, no change of condition, for this implies power of adapta- tion if not of choice.~~

~~The primitive Hebrew conception was even less tolerable than the Greek. Sheol,—translated by the LXX. Hades, and by the Authorized Version, with curious impartiality, thirty-one times “ grave” and thirty-one times “‘hell,”*—-was, as originally conceived, a vast subterranean tomb, with the barred and bolted gates common to Hebrew tombs, in which the ghosts (Rephaim) did not even flit about, but lay like corpses in a sepulchre. No thought of retribution was counected with this deep and gloomy under-world. It was the common receptacle of all. The distinctions there were social or national, not moral. The only approach to a retri- butive idea is found in the exile time, in an expression of Ezekiel’s, who locates the uncircumcised heathen in the ‘* sides of the pit,” possibly the deepest and darkest part of Sheol. (See Ps. lxili. 9, lxxxix. 19, exliii. 3, evii. 18; Job x, 20-22, sieSpil. dG eux 25; Is. vi. 2, evn 18; 1 Kings xi. 2 ; Ezek. xxxii. 23.)~~

~~This primitive idea had, by the time of Christ, developed under influences of a very different kind. In the first place, the horror with which an ancient Hebrew had contemplated death, because in Sheol he would be cut off from all com- munion with the covenant God, was dissipated under the truer religious feeling struggling into life in the later Psalms and the book of Job.? At first it had been believed that Jehovah's control did not reach to the under-world. The King of Terrors was its only king. They who had been God's sheep when alive, in Sheol had a new shepherd, Death (Ps. xlix. 14, Perowne's translation). But truer views of God's nature dissipated this horror, and pious souls who despaired of redress in this life, began to look even in Sheol for a manifestation of divine justice and a proof of divine love. At length was grasped the hope of a deliverance from the prison house of the dead, and the doctrine of the resurrection crowned this hope, and gave a definite shape to the eschatology of the Jews.4~~

~~The release from the under-world which the Jew contem- plated in a bodily resurrection was found by Aryan thought in a metempsychosis. According to Josephus (Bell. Jud., ii. 8, 14), this was also a doctrine of the Pharisees and the~~

~~1 Locke, The Reasonableness of Christianity.~~

~~2 Neither translation is altogether happy. It was more than "'grave," and though etymologically equivalent to "hell" (the hollow), it did not gather any of the associations of hell till after the close of the canon.~~

~~3 Is. xxxviii. 18; Ps. cxv. 17, vi. 56, xxx.9, See on the develop- ment of ideas of immortality in the Old Testament a treatise, Ueber die Alttestamentlichen Vorstellungen vom Zustande nach dem Tode, by Bernhard Stade, Leipsic, 1877.~~

~~4 Ps, xvi. 10, lxxiii. 23-26, cxxxix. 7-10; Job xix. 25. The sym- bolic use by Ezekiel of a resuscitation to express a national deliverance shows the line along which this doctrine was reached.~~

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~~Essenes, and the notion of pre-existence has even been traced in the New Testament.® 'The idea of retribution has now entered into eschatology, and there is a curious analogy between the Hebrew conception and Plato's. The Greek philosopher leaves incurables to suffer in the lower regions (Rep., x. 615, of. Phaedo, 114), when other men have choice of new lives. So the Hebrews believed that the heathen and unjust would remain in the death-sleep of Sheol, while faithful Israel received back the soul in the resurrection (2 Macc. vii. 14, of. Jos., Ant., xliv. 1, 3). In different forms this thought reappears in Christian eschatology. Some find it in St Paul. It was the origin of the belief in a two-fold resurrection: the unjust, not being worthy to participate when the saints awake at their Lord's second coming, remain below till the final judgment.~~

~~But in the post-exile days—that veritable middle age of Tsrael—other influences appeared. Intolerable wrongs drove men to seek solace for themselves in visions of paradise, vengeance on their foes in visions of hell. Now appear the divisions of Sheol into receptacles for the good and bad. 'Their origin is seen in the apocalyptic book of Enoch. In chap. xxii. of that remarkable bovk, which, in the permanence of its influence as well as its form, re- sembles the Jnferno of Dante,' the seer is shown the "delightful places" where the souls of the good will be collected till judgment, and the "separations" existing between the just and unjust, 'made by chasm, by water, by light above it."8 And here first is express mention of "the castigation and the torment of those who eternally execrate and whose souls are punished and bound there for ever."9~~

~~Analogies have been found between the Greek Tartarns!© and the Hebrew hell, and the influence of the Western mythology traced in the latter; but in order to supply symbolism of torment of surpassing horror, no foreign influence was necessary. Gehenna (ze, the valley of Hinnom or the sons of Hinnom) and its ghastly associations were ready to supply images terrible beyond any that the mind of heathen poet or philosopher had conceived. Already known as the perpetual abode of~~

~~corruption and fire, " the place where lie the corpses of those who have transgressed against Jehovah—and their worm shall not die, neither shall their fire be quenched," it had become the apt symbol of utter moral depravity and ruin. But it was the unknown author of the book of Enoch who first saw it as "the accursed of the accursed for ever," who first placed in the dark ravine one of the mouths of hell, and thus from an cmblem of the moral ruin attending sin, made it the actual place of punishment for sinners."!~~

~~Henceforth Gehenna—hell—becomes known as a part of Hades, or Sheol. 'There is yet another place of torment reserved for the final reception of fallen angels and wicked men. It is the lake of fire and brimstone of the Apocalypse. Its origin also appears in Enoch, though the descriptions are too confused to allow of certain identifica-~~

~~5 See Glanville's Lux Orientalis, and Dr H. More's Divine Dialogues on John ix. 2.~~

~~6 Egypt appears to have been the common source of these ideas. See Herod. ii, 128. Their influence on the views of Origen is well known.~~

~~? Of. Stanley, Jewish Church, iii. 372. 8 Cf. Luke xvi.~~

~~® Lawrence's Translation. The expression in Daniel xii. 2, " Some to shame and everlasting contempt," is much less explicit.~~

~~10 The participle raprapdéoas = having hurled into Tartarus, occurs in 2 Pet. ii. 4. This is the only instance of the use of the word either in the LXX. or N. T. It should be remembered that the Greek Tar- tarus was properly the prison-house of defeated gods or demi-gods, and that its employment in the place cited as the dungeon for fallen angels is in strict analogy.~~

~~11 The precise topographical description of Gehenna in Enoch, which the Palestine Exploration Survey has confirmed in detail, is another likeness to Dante's mapped and measured hell. See Stanley, Jewish Ch., iii. 878, note, and Jerusalem Recovered, p. 307.~~

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~~tion of the locality. It is situated to the west near the "mountain of metals," and has by some been referred to the solfatara in South Italy.1 But more probably the region is that of the Dead Sea, to which Jude refers by name in his account of the fate awaiting the fallen angels. ? When in the Apocalypse the New Jerusalem is about to descend from heaven, Hell? itself with Death is cast into this sulphureous lake—not only symbolizing the final dis- appearance of all evil, but also the removal as far as possible from the heavenly city of all the dread associations of the dark valley of Hinnom.~~

~~On the other side of Hades was placed Paradise—a term whose origin is self-evident. Apocalyptic literature loved to imagine a restored Eden, and fill it with all the delights of sense—streams of milk and honey, twelve trees laden with divers fruits, mighty mountains whereon grow lilies and roses (2 Esdras ii, 19). Prophetical language supplied other symbols of joy—especially the happy banquet with the forefathers of the race (Luke xiii. 29, xvi. 22, of. Isa. xxv. 6, &.). In later times long controversies have turned on those localities ; the " minds at once logical and sensuous ask questions, and the answers are wildly conjectural ;" and no one can yet decide whether paradise, Abraham's bosom, and the third heaven are identical or different places.4~~

~~Further extravagancies may be found in the Rabbinical writings and in the many apocalypses which tho early church produced. The limboes of patristic speculation have their antitypes in the chambers (promptuari) out of which come ta Esdras the querulous voices of the dead.5 In the Talmudic representations of hell there is a fore shadowing of the Roman purgatory.6 But we cannot pursue Jewish eschatology into all its fanciful recesses, Enough has been said to show that when our Lord came he found the doctrines of last things presented in forms already fixed, and the terms Gehenna, Paradise, &c., in familiar and even proverbial use (Matt. xxiii. 15, cf. James iii. 6).~~

~~te popular views of a future state regard the use Jesus made of current terms as a sanction of their literal mean- ing. But from the very earliest Christian times another interpretation has been given. It has been understood that Christ treated popular religious terms as only the symbols of a false creed can be effectually treated. Ho rescued them for the service of the new and true. "He took from their future and remote, in order to give them a present and immediate, force and aspect." He employed the familiar images of heaven and hell to impress on men's consciences the supreme bliss of righteousness and the awful misery of sin.' If His words have been misap- prehended and misrepresented in this particular, so were they, even by the first disciples, in others (John xi. 13; Mark viii. 16, &c.). He taught on the principle of His~~

~~1 In Enoch, however, this " flaming womb of hell" is apparently the temporary place, Gehenna being the final abode of woe (Stanley, p. 374).~~

~~2 Jude 6, 7. See Renan, L' Antichrist, p. 338, note.~~

~~3 The word yéevva however does not appear in the Apozalypse ; Hades has quite taken its place (cf, Luke xvi. 23).~~

- ~~See art. "' Paradise,' in Smith's Bid. Dict.~~

~~5 2 Esd. iv. 35; see Renan, Les Evangiles, p. 357, note.~~

~~If we may determine the Jewish view of Gehenna in the time of our Lord from the opinion of modern rabbis and their exegesis of the Talmud, endless torment by no means formed part of the doctrine; "it meant not a material and everlasting fire, but an intermediate, a re- medial, a metaphorical, a terminable retribution." —Farrar, Hternal Hope, p. 81, and Excursus vy. »~~

~~' This view is very generally adopted with regard to the " worm of Gehenna, which is interpreted to mean the gnawing of an evil con- selence, Unfortunately the fashion set by Augustine of choosing what terms shall be literal and what metaphorical has prevailed. See Aung., Civ. Dei, xxi. 9, '* Let each one make his own choice, either assigning~~

~~the fire to the body and the worm to the soul,—the one figuratively, the other really, or assigning both really to the body.~~

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~~well-known saying, "He that hath ears to hear, let him hear,?"4~~

~~Special instances would take us to too great a length. Christ's treatment of the resurrection, both with sceptics and believers (Matt. xxii, 30-32 ; John xi. 25), was such as to dislodge His hearers' thoughts from the accidents (so to speak) of the great change, and fix them on its moral and spiritual aspects. The same intention appears also in His allusion to the judgment (John v. 25); while in the one unmistakable reference to the future heaven, He fastens the hope of His followers entirely on the thought of abiding communion with Himself (John xiv. 1-3).~~

~~There are still certain features of eschatological doctrine which require notice. The notion of an Intermediate State was generally prevalent during the first three centuries. It was exactly analogous to the Jewish notion of a divided under-world. The souls of the pious, says Justin (D. ¢. Tryph., 5), take up their abode in a better, those of the wicked in a worse place. Tertullian, however, believed that the martyrs went direct to the bliss of heaven—a view probably founded on Rev. vii. 14, 15. The doctrine changed its shape many times. It produced an Arabian heresy combated by Origen, that both soul and body fall into a death-sleep, from which they will not awake to tho last day. Revived at a later time, under the name Psychopannychy, it was made the subject of a treatise by Calvin. But the existence of an intermediate state re- mains a dogma of the Eastern Church to this day. Inthe Western the doctrine of Purgatory gradually absorbed it.~~

~~The idea of a purifying fire seems to have grown originally out of the belief in the general conflagration of the world. This belief, which so much occupies the Sibylline books, came perhaps from the Stoic philosophy.® It was supported by Deut. xxxii. 22, and though it finds no place in the Apocalypse, had penetrated religious thought before the composition of the second epistle of Peter (2 Pet. iii. 7-12). The early fathers agree in ascribing to this fire a purgative virtue, but with every~~

~~variety cf opinion as to the mode of its operation. Augustine first transferred it to Hades and the intermediate state, thus laying the foundation for the view of purgatory which Gregory the Great formulated into a dogma. Distinction must always be made between the early puri- fying flames, through which good and bad alike were destined to pass, and the Roman purgatory, in which only those destined at last for heaven worked out the residue of the temporal penalty for sin.}¢~~

~~Reformed eschatology differs from that of the primitive church in the absence of the intermediate state, from that of Rome in the rejection of purgatory. Both these forms of belief are felt to have mitigated in some degree the doctrine of an endless hell, which in Protestantism is brought more prominently into the foreground, the final doom being fixed not now at the general judgment, but at death, at which, without any authority from Scripture, the popular creed supposes the sinner's fate to be unalterably determined.~~

~~Many attempts in different quarters have been made to revive the milder creeds of the early church! A touching~~

~~8 Still a careful regard to audience is traceable in his use of apo- calyptic language about His second coming; it is to Jews only,—the twelve, or the High Priest, or the Sanhedrim, or Nathanael—the "Tsraelite indeed," —that he speaks of cleft heavens, cloud chariots, and attendant troops of angels. With the Roman governor he avoids Jewish metaphors.~~

~~° Justin, Apol. i. 44, &e. Seé Renan, Les Lvangiles, p. 170, note, where the Stoic authorities are given.~~

~~10 Authorities for the history of Purgatory will be found in Hag- enbach and Neander,~~

~~1 Modern divines (at least in the English Church) have tried to re- vise the ancient doctrines.~~

~~account of them may be read in Mr Maurice's famous essay. His own struggle to regain for the adjective aiwvos its ethical sense is well known. Perhaps he took too little account of the element of duration undoubtedly existing in it. The two senses pass imperceptibly into one another, but the scriptural use, when not distinctly ethical, gives it the sense of indefinite not of endless duration! But Mr Maurice vindicated, at least for English clergymen, a perfect freedom on this subject ; and though in his own case the claim was not allowed, his opinion was confirmed by the formal decision in the " Essays and Reviews" case.~~

~~The result of this is apparent. now throughout the think- ing part of Christendom ; the subject of eschatology, in con- nexion with the wider subject of immortality, is exercising profound attention. Philosophy and science are equally concerned in it with religion.2 Theologians recognizing this are in many different ways trying to reconcile the voice of Scripture with the voices of science and philosophy.~~

~~Two prominent attempts perhaps claim notice. The ad- vocates of Conditional Immortality or Annihilation maintain, from the letter of Scripture, destruction and not endless suffering to be the destiny of the lost. They take advan- tage of the doubt existing as to St Paul's doctrine of the termination of the world in unity—whether by unbelievers being completely annihilated, or by their being all finally converted. The view that immortality is not inherent in fallen human nature, but is the gift of God in Christ, has had many supporters, and in this part of their system, the ad- vocates of annihilation justly claim the authority of many great names. But the details of their eschatology are some- what confused and conflicting. They claim, however, with some doubt, Justin, Irenzeus, Arnobius, and others among the fathers, and Dodwell, Locke, Watts, Whately, &c., among later writers.® The best account of the doctrine is contained in a remarkable volume by the Rey. E. White called Life in Christ.~~

~~The Universalists or Origenists maintain, in the language of Acts iii. 21, a hope of the " restitution of all things." The hope is grounded not on the literal assertion of any one text,—though as many are quoted in its~~

~~favour as in that of any other theory of the future,—but on the divine character and purpose as revealed in Christ, and the implied failure of the redemptive work of the Saviour unless all for whom He died ultimately partake of salvation, Between this and the Augustinian system, which the great doctor candidly confesses dooms the vast majority of men to endless perdi- tion, there are of course many gradations of opinion. Possibly Universalists are apt to quote in their favour all who in any degree show themselves, to use Augustine's word, more merciful. Certainly a Jong list of illustrious names claim rank among them. Origen, of course, heads it, though earlier fathers—Athenagoras, for instance—are sometimes called in as witnesses of the milder creed. The~~

~~1 Mr White says that of the 90 subjects to which it or its cognates are applied 70 are of a temporary nature. See on this subject Farrar, Hiernal Hope, p. 79, and Excursus iii. He shows beyond dispute, what scores of writers (see e.g., Burnett, De statu mortuorwm) had shown before, that, though applied to some things which are endless, aidévios does not in itself mean endless.~~

~~2 See Unseen Universe, pp. 268 sq.~~

~~3 See Pfleiderer, Pauline Theol., c. vii., and ¢f. Baur, Life and Works of Paul, iii. 6, " Whatever he thought on the question, it must be perfectly clear that if death is to be robbed of his last sting there can be no eternal punishment."~~

~~4 For instance, as to the nature and duration of the retributive punishment which the wicked will undergo before destruction, the time of the resurrection, and the principle on which those to be anni- hilated will. be doomed, &c.~~

~~__, The language of the fathers, who adopted Scripture as they found . is frequently self-contradictory. "In the earliest of them, Justin ; artyr and Irenzus, are some well-known passages which seem clearly~~

~~0 imply either the ultimate redemption or the total destruction of~~

~~stnners, —Farrar, Eternal Hope, p. 155.~~

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~~fate of those who had died before Christ, and of the heathen, began at an early time to exercise the conscience of Christians. The descent of Christ into hell was by many believed to have had for its object the deliverance of souls from thence.6 The Pastor of Hermas is understood to join the elect with Christ in his benign ministry. Clement of Alexandria, Theophilus of Antioch, Gregory of Nazianzen, and Gregory of Nyssa, Diodorus of Tarsus, Didymus of Alexandria, Theodore of Mopsuetia, even Jerome, Ambrose, Scotus Erigena; and in later times on the Continent, Bengel, Neander, Oberlin, Hahn, Tholuck, and Martensen ; in England, among the Puritans, Jeremiah White and Peter Story ; in the English Church, Jeremy Taylor, Dr H. More, Thomas Burnet,' Richard Clark, Bishop Edmund Law, Bishop Rust, William Law, and George Stonehouse; and many in more recent times still,8—are all to be ranked among believers in a general restoration, A work by Mr Andrew Jukes, The Restitution of all Things, states the doctrine, though with some peculiarity of scriptural inter- pretation, very forcibly. Perhaps the reader of that work may think that it shifts the burden of proof from those who resist to those who maintain the doctrine of an endless hell.9 (A. 8. A.) ESCHEAT (esceeta), in English law, is the reversion of lands to the next lord on the failure of heirs of the tenant. ""' When the tenant of an estate in fee simple dies without having alienated his estate in his lifetime or by his will, and without leaving any heirs either lineal or collateral, the lands in which he held his estate escheat, as it is called, to the lord of whom he held them" (Williams on the Law of Real Property). This rule is explained by the conception of a freehold estate as an interest in lands held by the free-holder from some lord, the king being lord paramount. (See Esrare.) The granter retains an interest in the land similar to that of the donor of an estate for life, to whom the land reverts after the life estate is ended. As there are now few freehold estates traceable to any mesne or in- termediate lord, escheats, when they do occur, fall to the king as~~

~~lord paramount. Besides escheat for defect of heirs, there was formerly also escheat propter delictum tenentis, or by the corruption of the blood of the tenant through attainder consequent on conviction and sentence for treason or felony. The blood of the tenant becoming corrupt by attainder was decreed no longer inheritable, and the effect was the same as if the tenant had died without heirs, The land, therefore, escheated to the next heir, subject to the superior right of the crown to the forfeiture of the lands,— in the case of treason for ever, in the case of felony for a year and a day. All this has been abolished by the 33 and 34 Vict. c. 23 (the Felony Act, 1870), which provides for the appointment of an administrator to the property cf the convict. Escheat is also an incident of copyhold tenure. 'Trustestates, by a recent Act, are protected from escheat, ESCHENBACH, Wo.trram Von. See WoLFram. ESCHENBURG, Jonann Joacuim (17438-1820) a German littérateur, was born at Hamburg, 7th December 1743. After receiving his early education in his native town, he studied at Leipsic and Gottingen. In 1767 he was brought by the court-preacher Jerusalem to Bruns- wick, and through his influence he became a professor in the Collegium Carolinum. He was also made an aulic councillor, and senior of the Syriac college, and ultimately~~

~~® This was founded on 1 Pet. iii. 19. See Pearson On the Creed, and Burnet on Art. 3. Justin and Irenzus especially had this view, but it was also general among the fathers.~~

~~7 See his book De Statu Mortuorum.~~

~~8 ¢.9., Maurice, Milman, Sir J. Stephen, Lord Lyttelton, Kingsley, Thomas Erskine of Linlathen, and Bishop Ewing.~~

~~9 See for full account of opinions Farrar, Eternal Hope, pp. 155 sq.~~

~~received the office of privy councillor of justice. He is best known by his German translations of English works. He published a series of German translations of the prin- cipal English writers on esthetics, such as Brown, Burney, Priestley, and Hurd; and Germany owes also to~~

him the first complete translation of Shakespeare's plays, which, though it is deficient in poetical merits, and some- what too free, is still valuable on account of its general correctness. He died on the 27th April 1820.

Besides editing, with memoirs, an edition of the later German poets, he is the author of Handbuch der Classichen Literatur (1788) ; Entwurf einer Theorie und Literatur der schinen Wissenschaften (1783) ; Beispielsammlung zur Theorie und Literatur der schinen Wissenschaften (8 vols., 1788-95); Lehrbuch der Wissenschafts- kunde (1792); and Denkmédiler altdeutscher Dichtkunst (1799). Most of these works have passed through several editions.

ESCHENMAYER, Karn Aporr Avcust von (1770- 1852) a German philosopher and physicist, was born at Nuremberg 4th January 1770. After receiving his early education at the Caroline academy of Stuttgart, he entered the university of Tiibingen, where he received the degree of doctor of medicine. He practised for some time as a physi- cian at Sulz, and then at Kirchheim, and in 1811 he was chosen extraordinary professor of philosophy and medicine at Tiibingen. In 1818 he became ordinary professor of practical philosophy, but in 1836 he resigned his professor- ship, and took up his residence at Kirchheim, where, till the close of his life, he devoted his whole attention to philo- sophical studies. He died on the 13th November 1852. The philosophy of Eschenmayer is grounded primarily on the Kantian metaphysics, and in many particulars his views are identical with those of Schelling, but he differed from him in regard to the knowledge of the absolute. He believed that in order to complete the arc of truth philosophy must be supplemented by what he called " non-philosophy," a kind of mystical illumination by which was obtained a belief in God that could not be reached by mere intellec- tual effort. Thus beyond that system of truth which, according to the three ideas of the true, the beautiful, and the good, he divided into physics, esthetics, and ethics, he recognized a transcendental revelation given in the idea of the holy. He carried this strong tendency to mysticism into his physical researches, and was led by it to take a deep interest in the phenomena of animal magnetism. He ultimately became a devout believer in demoniacal and spiritual

~~possession ; and his later writings are all strongly impregnated with this lower supernaturalism.~~

~~His principal works are—Die Philosophie in ihrem Uebergange zur Nichtphilosophie, 1803 ; Versuch die scheinbare Magie des thier- ischen Magnetismus aus physiol.und psychischen Gesetzen zu erkliren, 1816; System der Moralphilosophie, 1818; Psychologie in drei Theilen, als empirische, reine, angewandte, 1822; Religionsphil- osophic, 3 vols., 1818-24; Die Hegel'sche Religionsphilosophie verglichen nuit dem Christl. Princip., 1834; Der Ischariotismus un- serer Tage, 1835 (directed against Strauss's Life of Jesus); Conflict zwischen Himmel und Holle, an dem Déimon eines besessenen Mid- chens beobachtet, 1837; Grundriss der Naturphilosophic, 1832; Grundztige der Christl. Philosophie, 1840 ; and Betrachtungen tiber der physischen Weltbau, 1852.~~

~~ESCHSCHOLTZ, Jonann Friepricu, a German tra- veller and naturalist, born November 12, 1793, at Dorpat, where he died May 12, 1831. He was naturalist and physician to Kotzebue's exploring expedition during 1815-18. On his return, he was appointed professor of medicine, and manager of the zoological museum of the university at Dorpat, and in 1823-26 he accompanied Kotzebue on his second voyage of discovery. Among Eschscholtz's publications are the System der Akalephen, Berlin, 1829, and the Zoologischer Atlas. The genus of plants Lschscholtzia was named by Chamisso in honour of the naturalist. For a figure of the first species described, E. californica, see E, plate ii. in vol. iv. of this work.~~

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~~ESCHWEGE, the head town of a circle in the district of Cassel, province of Hesse-Nassau, Prussia, is situated on the Werra, and on the Bebra-Friedland railway, about 28 miles south-east of Cassel. It consists of the old town on the left bank of the Werra, the new town on the right bank, and Briickenhausen on a small island connected with the old and new town by bridges. It is a thriving manu- facturing town, its chief industries being leather-making, yarn-spinning, cotton and linen weaving, the manufacture of liquors and oil, and glue and soap~~

~~boiling. It has two ancient buildings, the Nicholas tower, built in 1455, and ie old castle. The population of Eschwege in 1875 was~~

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~~ESCHWEILER, a town of Rhenish Prussia, in the government district of Aix-la-chapelle, is situated on the Inde, and on the Berg-Mark railway, about 8 miles E.N.E. from Aix-la-chapelle. It possesses three large iron-rolling mills, and among its other industries are the manufacture of iron and tin wares, muslins, needles, and wire. In the neighbourhood are some very valuable coal mines. The population in 1875 was 15,540.~~

~~ESCOBAR Y MENDOZA, Awronto (1589-1669) a Spanish casuist, was a descendant of the illustrious house of Mendoza, and was born at Valladolid in 1589. He was educated by the Jesuits, and at the age of fifteen took the habit of that order. He soon became a famous preacher, and his facility was so great that for 50 years he preached daily, and sometimes twice a day. Notwith- standing his constant oratorical efforts, he was a voluminous writer, and published altogether forty vols. in folio. His first literary efforts were Latin verses in praise of St Igna- tius Loyola and the Virgin Mary; but he is best known as a writer on casuistry. His principal works are—Sum- mula Casuum Conscientiae, several scripture commentaries, Liber Theologice moralis, and Universe Theologive moralis Problemata. The first mentioned of these was severely criticised by Pascal in the fifth and sixth of his Provincial Letters, as tending to inculcate a loose system of morality. It contains the famous maxim that purity of intention may be a justification of actions which are contrary to the moral code and to human laws ; and its general tendency is to find excuses for the majority-of human frailties. His doctrines were disapproved of by many Catholics, and were mildly condemned by Rome. They were also ridiculed in~~

~~Witty verses by Moliére, Boileau, and La Fontaine, and~~

~~gradually the name Escobar came to be used in France as a synonym for a person who is adroit in making the rules of morality harmonize~~

with his own interests. Not- withstanding the apparent looseness of his moral teaching, Escobar is said to have been simple in his habits, a strict observer of the rules of his order, and unweariedly zealous in his efforts to reform the lives of those with whom he had to deal. He died 4th July 1669.

ESCORIAL, or, as the name is not unfrequently given, EscuRIAt, one of the most remarkable buildings in Europe, comprising at once a convent, a church, a palace, and a mausoleum. It is situated on the south-eastern versant of the Sierra de Guadarrama, on the borders of New Castile, about 27 miles N.W. of Madrid, and immediately to the north of the railway between Madrid and Avil. Its lati- tude is 40° 35' N., its longitude 4° 1' W., and its height above the sea 3500 feet. The surrounding country is a sterile and gloomy wilderness exposed to the cold and blighting blasts of the Sierra. According to the usual tra- dition, which there seems no sufficient reason to reject, the Escorial owes its existence to a vow made by Philip II. of Spain shortly after the battle of St Quentin, in which his forces succeeded in routing the army of France. The day of the victory, August 10, 1557, was sacred to St Laurence, and accordingly the building was dedicated to that saint

and received the title of Hl real Monasterio de San Lorenzo del Escorial." The last distinctive epithet was derived from the little hamlet in the vicinity which furnished shelter, not only to the workmen, but to the monks of St Jerome who were afterwards to be in posses- sion of the monastery ; and the hamlet itself is generally but perhaps erroneously supposed to be indebted for its

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~~name to the scorze or dross of certain old iron mines. The preparation of the plans and the superintendence of the work were entrusted by the king to Juan Bautista de Toledo, a Spanish architect who had received most of his professional education in Italy. The first stone was laid in April 1563 ; and under the king's personal inspection the work rapidly advanced. Abundant supplies of~~

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~~Views and Plan of the Escorial.)~~

~~10. Chapel of St Maurice.~~

~~. Cuvren. 11. Chapel of the Rosary. 1. Principal entrance and portico. 12. Tomb of Louisa Carlota. 2, Court of the kings (Patio de los | 13. Chapel of the Patrocinio.~~

~~reyes). 14. Chapel of the Cristo de la buena 3. Vestibule of the church. muerte. 4. Choir of the seminarists. P 15. Chapel of the Eleven Thousand 5. Centre of the church and projec- Virgins,~~

~~tion of the dome. 16. Former Chapel of the Patrocinio. 6. Greater chapel. 17, Sacristy. 7. High altar. 8. Chapel of St John. PALACE, 9. Chapel of St Michael, 18, Principal court of the palace.~~

~~berroquefia, a granite-like stone, were obtained in the neighbourhood, and for rarer materials the resources of both the Old and the New World were put under con- tribution. The death of Toledo in 1567 threatened a fatal blow at the satisfactory completion of the enterprise, but a worthy successor was found in Juan Herrera, Toledo's favourite pupil, who adhered in the main to his master's Se eee lee PPO ae~~

~~. 2 Reduced from a large plan of the Escorial in the British Museum, Monasterio del Escorial," published at Madrid in 1876,~~

~~19. Ladies' tower. 30. Entrance to the college. 20. Court of the masks.~~

~~31. College yard. 21, Apartments of the royal children, 22. Royal oratory. CONVENT 23, Oratory where Philip II. dicd. 32. Clock tower.~~

~~33. Principal cloister,~~

~~SEMINARY, 34, Court of the evangelists, 7 24, Entrance to seminary. 35. Prior's cell. 25. Classrooms. 36, Archives. 26. Old philosophical hall. 37. Old church. 27. Old theological hall. 38. Visitors' hall. 28. Chamber of secrets. 39. Manuscript library. 29. Old refectory. 40. Convent refectory.~~

~~designs. On September 13, 1584, the last stone of the masonry was laid, and the works were brought to a ter- mination in 1593. Each successive occupant of the Spanish throne has done something, however slight, to the restora- tion or adornment of Philip's convent-palace, and Ferdinand did so much in this way that he has been called a second founder. In all its principal features, however, the Escorial remains what it was made by the genius of Toledo and Herrera working out the grand, if abnormal, desires of their dark-souled master. :~~

~~KES D—ESD~~

~~The ground plan of the building is said to occupy an area of 396,782 square feet, and the total area of all the stories would form a causeway one metre in breadth and 95 miles~~

~~in length. There are seven towers, fifteen gateways, and, according to Los Santos, no fewer than 12,000 windows and~~

~~doors. The general arrangement is shown by the accom- _ Entering by the main entrance the visitor finds himself in an atrium, called the Court of the Kings~~

~~panying plan.~~

~~(Patio de los Reyes) from the statues of the kings of Judah,~~

~~by Juan Bautista Monegro, which adorn the fagade of the~~

~~church. The sides of the atrium are unfortunately occupied by plain ungainly buildings five stories in height, awkwardly accommodating themselves to the upward slope of the ground. Of the grandeur of the church itself, however, there can be no question: it is the finest portion of the whole Escorial, and, according to Fergusson, deserves to rank as one of the great Renaissance churches of Europe. It is about 340 feet from east to west by, 200 from north to south, and thus occupies an area of about 70,000 square feet. The dome is 60 feet in diameter, and its height at the centre is about 320 feet. In glaring contrast to the bold and simple forms of the architecture, which belongs to the Doric style, were the bronze and marbles and pictures of the high altar, the masterpiece of the Milanese Giacomo Trezzo, almost ruined by the French. Directly under the altar is situated the pantheon or royal mausoleum, a richly decorated octagonal chamber with upwards of twenty niches, occupied by black marble urnas or sarcophagi, kept sacred for the dust of kings or mothers of kings. There are the remains of Charles V., of Philip IL., and of all their successors on the Spanish throne down to Ferdinard VIL, with the exception of Philip V. and Ferdinand VI. Several of the sarcophagi are still empty. For the other members of the royal family there is a separate vault, known as the Panteon de los Infantes, or more familiarly by the dreadfully suggestive name of Z/ Pudridero, The most interesting room in the palace is Philip IL's cell, from which through an opening in the wall he could see the celebration of mass while too ill to leave his bed. The library, situated above the principal portico, was at one time one of the richest in Europe, com prising the king's own collection, the extensive bequest of Diego de Mendoza, Philip's ambassador to Rome, the spoils of the emperor of Morocco, Muley Zidan, and various con- tributions from convents, churches, and cities. It suffered greatly in the fire of 1671, and has since been impoverished by plunder and neglect. Among its curiosities still extant are an ancient Koran, a Virgil of the 10th~~

~~century, an Apocalypse of the 14th, ZZ libro de los Juegos de Ajedrez, or “ Book of the Games of Chess, ” by Alphonso the Wise, and the original Alcal4 ordinance. Of the Arabic manuscripts which it contained in the 17th century a catalogue was given in Hottinger’s Promptuarium sive Bibliotheca Orien- talis, and another in the 18th, in Casiri’s Bibliotheca Arabico-Hispanica, 2 vols., Madrid, 1760-70. Of the artistic treasures with which the Escorial was gradually en- riched, it is sufficient to mention the frescoes of Peregrin Tibaldi, Carbajal, Bartolome Carducho, and Lucas Jordan, and the pictures of Claudio Coello, Titian, Tintoretto, Van der Weide, and Velasquez. Many of those that are mov- able have been transferred to Madrid, and many others have perished by fire or sack. The conflagration of 1671, already mentioned, raged for fifteen days, and only the church, a part of the palace, and two towers escaped uninjured. In 1808 the whole building was exposed to the ravages of the French soldiers under Houssaye. On the night of the Ist of October 1872, the college and seminary, a part of the palace, and the upper library were devastated by fire; but the damage occasioned by this has in great measure been repaired.~~

~~o4]~~

~~The reader will find a remarkable description of the emotional influence of the Escorial in Quinet’s Vacances cn Espagne ; and for his- torical and architectural details hc may consult the following works: — Fray Juan de San Geronimo, Memorias sobre la Fundacion del Escorial y su Fabrica, in the Coleccion de Documentos ineditos para la Historia de Espafia, vol. vii.; Herrera, Sumario y Breve De- claracton de los Discios y Estampas de la Fab. de 8. Lorenzo del Escorial, Madrid, 1589; José de Siguenza, Historia dela Orden de San Geronymo, Madrid, 1590, &.; Cabrera, Felipe Segundo, 1619 ; James Wadsworth, Further Observations of the English Spanish Pilgrime, London, 1629, 1630; Iario Mazzorali de Cremona, Le reuli grandeaze del Escuriale, Bologna, 1648 ; De los Santos, Deseripeton del real monasterio, &c., Madrid, 1657; Andres Ximenes, De- seripcion, &., Madrid, 1764 ; Quevedo, Historia del Real Mona- sterio, &c., Madrid, 1849; Rotondo, Hist. artistica, &c., del monasterio de San Lorenzo, Madrid, 1856-1861; Prescott, Life of Philip II.; Mrs Pitt Byrne, Cosas~~

~~de Espafta, 1866; Fergusson, Hist, of the Modern Styles of Architecture, 1873.~~

~~ESDRAS, Booxs or, The books called Esdras third and fourth in the sixth Article of the Church of England (1563) have been more commonly known to English readers since the publication of the Geneva Bible (1560) as Esdras first and second. In the earliest Protestant edition of the German Bible (where for the first time the apocry- phal hooks were sharply separated from the canonical) these two books of Esdras or Ezra stood first in the former class (1530). Though neither of them was included by Luther in his version of the Apocrypha published in 1534, they both reappeared in Coverdale's English Bible (1535) at the head of the list, and this position they have maintained in all subsequent English translations. On the other hand, they do not occur in the Complutensian polyglot (1514-17); they were wholly excluded from the canon by the Council of Trent (1546) ; nor did they appear in the Sixtine edition of the Vulgate (1590). They were printed, however, in the Clementine edition of 1592, along with the Prayer of Manasseh, though merely as au appendix, and with a pre-face to explain that they were permitted thus to appear only because they had been occasionally referred to by the fathers, and had found their way into some Latin Bibles both written and printed. Though associated thus closely in the vicissitudes of their later history, they have no such intimate relationship to one another as is suggested by their names. They differ widely in age, origin, theological interest, literary and historical importance, and must accord- ingly be treated as entirely separate works.~~

~~1 Espras, the Liber tertius Hsdre of the Vulgate and the thirty-nine Articles, is entitled in the Codex Vaticanus and in modern editions of the LXX. *EoSpas a', but in the Codex Alexandrinus simply 6 tepevs. With the exception of chaps. ili., iv., and v. 1-6, it is a mere compilation from the canonical work Chronicles-Ezra-Nehemiah. Chap. i., which gives an account of the celebration of the passover under Josiah, and then continues the history to the destruc- tion of Jerusalem in 588 B.c., follows verse by verse the narrative of 2 Ch. xxxv. l1-xxxvi. 21. There are, indeed, numerous verbal discrepancies, which show that the writer~~

~~had before him a Hebrew text somewhat differ- ent from that which we now possess, or else that he made use of a Greek version other than the Alexan- drian. Sometimes, too, he may seem to have delibe- rately abridged or expanded the text that lay before him; but the fact that on the whole he depended on the Chronicler must be abundantly manifest to any reader, and needs not be demonstrated here. The whole of the canonical book of Ezra is next incorporated, but with an interpolation and a dislocation. Chap. ii, 1-14, telling of the edict of Cyrus and the return of the Jews under " Samanassar" or " Sanabassar," closely follows Ezrai. In like manner, chap. i 15-25, telling how the works at Jerusalem were interrupted by the interdict of Artaxerxes, though introduced at an earlier stage in the narrative, is entirely derived from Ezra iv. 7-24. Chap. iii, l-v. 6,~~

~~relating how the young Zerubbabel gained the ear of Darius, and successfully reminded him of a forgotten vow to rebuild Jerusalem and the temple, and to restore the holy vessels and permit the return of the citizens to their places, is, as has already been indicated, either an original contribu- tion or one derived from some source which is no longer accessible to us. Chap. v. 7-70, containing the list of those who returned with Zerubbabel uuder " Darius," with an account of the progress of the temple under " Cyrus," and of the subsequent interruption "' for the space of two years," until the reign of " Darius," is derived from Ezra ii. l-iv. 5. Chaps. vi. and vii., corresponding to Ezra v. and vi., relate how the work was resumed under Darius, and completed in the sixth year of his reign. Chap. vill. 1—ix. 36 repeats the narrative of Ezra vii.—x., and chap. ix. 37-55 that of Neh. vii. 73—viii. 13.~~

~~The abruptness which characterizes the book as we now have it, both in its beginning and at its close, suggests the idea that possibly it may be merely a fragment of some larger compilation to which reference is perhaps made in 2 Mace. ii. 13. In its present form it has little to distinguish it as a composition from the work of the Chronicler, of which it is virtually an incomplete abridgment. The special object which the compiler may have had in view is indeed not easily conjectured. Some writers think they can discover a twofold purpose,—to give prominence to the new story about Zerubbabel, and to remove chronological difficulties which are raised by the canonical book of Ezra. If the latter was indeed part of his aim, he has been singularly unsuccessful. Far from obviating any of the diffi- culty caused by the Chronicler's having apparently intro- duced Artaxerxes Longimanus and Xerxes between Cyrus and Darius Hystaspis, he bas landed himself in new and glaring inconsistencies (comp., ¢g., ii. 10, 14,, with iv. 44). A more likely hypothesis is that his design was to give to the public sométhing more readable than the bald and literal Alexandrian translation. Critics are not unanimous upon the question whether he took his work directly from the Hebrew or from the present LXX. version. The majority are in favour of the former view; but Keil has the influential support of Schiirer (in Herzog's Hncyclopddie, i. 497, 1877) in the latter opinion. It is uncertain where he wrote. Egypt and Palestine lave both been suggested, but without adequate data for a definite conclusion. Who- ever he was he had a good command of Greek, nor was he ignorant of Hebrew. As for the date of the work, all we know is that it was already in existence and in repute in the time of Josephus. That historian has uufortunately followed its order of events in preference to that of the canonical Chronicler, andso has brought his narrative into in-~~

~~xtricable confusion in all that relates to the Persian period.~~

~~Unmistakable references to the work as authoritative are to be met with in Clement of Alexandria, in Cyprian, in Athanasius, and in Augustine (De Civ. Det, xviii. 36). Jerome, on the other hand, in his preface to Ezra and Nehemiah (which is to be found in all modern edi-~~

~~tions of the Vulgate), has condemned both books of Esdras as "somnia" and "procul abjicienda." It does not occur in any list either of canonical or of " ecclesi- astical" writings! Nor does its place in the Alexandrian canon seem to have been altogether undisputed. For it does not occur in al Latin Bibles presumably derived from the LXX.; and towards the beginning of the 16th century it was believed not to exist at all in Greek, so rare had it become.~~

~~1 Unless by 6 roruhy or Pastor of Athanasius (Epistola festalis), Hugo aS. Caro, and others this book be meant. But it is more pro- bable that the "'Shepherd" of Hermas is intended. See De Wette- Schrader, Hinl. sec. 31, note 6. By Augustine's "Esdre libri duo" (De Doctr. Chr. ii. 8) we are probably to understand our Ezra and Nehemiah ; but compare De Civ. Dense:~~

~~ESD kh AS~~

~~2 Espras, the liber quartus E'sdre of the Vulgate? (Ezra, Nehemiah, and 1 Esdras being the other three), was originally written in Greek,? and probably entitled droxdAuis "Eodpa (so Fritzsche ; but Hilgenfeld argues for "Efpas 6 mpopyrys). With the exception of incon- siderable fragments, the original (Greek) text has been lost ; but numerous ancient translations still testify to the wide-spread popularity which the work enjoyed during the carlier centuries of the Christian era, Five distinct ver- sions are now known to scholars,—the Latin, Syriac, Ethiopic, Arabic, and Armenian. Of these the Latin is the oldest and the best. In most of its MSS., and in all the eastern versions, the first two and the last two chapters of the received Vulgate text are omitted; and eighty-three verses are inserted between vii. 35 and vii. 36. The genuineness of tliese verses cannot be doubted: they were kuown to Ambrose, Vigilautius, and Jerome, and in 1875 were rediscovered by Bensly in a MS. of the 9th cen- tury. The four chapters just mentioned Fritzsche proposes to call the fifth book of Ezra, They are certainly dis- tinct from the original 2 Esdras, and are by general consent assigned to a Christian authorship of or near the 3d century.~~

~~The apocalyptic character of 2 Esdras has already been indicated (vol. ii. p. 175-6). Its seven visions all have refer- ence to the future of~~

~~Jerusalem, the central question being whether and when the city is to be restored and its enemies punished. The fifth vision (xi. 1-xii. 51) is of chief im- portance to the critic; his conclusions upon the date and origin of the book must depend almost entirely upon his in- terpretation of the symbolical eagle, the wings, the feathers, and the heads there described. According to Laurence, C. J. van der Vlis, and Liicke (2d edition), the vision is to be explained as having reference to the whole course of Roman history from Romulus to Julius Cesar. The three heads are Sulla, Pompey, and Cesar; and the work was composed about the time of the assassination of the last-named. Hilgenfeld, in his earlier interpretation of the vision (1857), referred it to the Ptolemies ; but in 1867 he substituted the Selcucide, while adhering to his original opinion that the three heads are Cesar, Antony, and Octavian, and that the work was written immediately after the death of Antony. The majority of modern critics be- lieve that Rome under the empire is intended ; but there are numerous differences as to the details of this interpre- tation. Gutschmid and some others identify the three heads with Septimius Severus, Caracalla, and Geta, thus placing the date of the composition of this part of the work as late as the year 218 a.p.4 But the more general opinion since Corrodi (1781) has been that the three Flavian em- perors, Vespasian, Titus, and Domitian, are intended by that symbol. Corrodi himself and Ewald assign the book to the reign of Titus; Volkmar, Langen, and Reuan to that of Nerva ; and Gfrérer, Dillmann, Wieseler, and Schiirer to that of Domitian. On the whole, it may be said that there is a growing consensus of opinion in favour of a date some- where between 81 and 97 a.p.~~

~~As upon the question of date, so upon the question of authorship, critics are now more nearly agreed than formerly in the belief that the book belongs to the Jewish cycle of apocalyptic literature, and that its author was pro- bably a Pharisee, and pessibly one who may have fought on the walls of Jerusalem in the final struggle. It is, indeed, (nee i ee ee~~

~~2 Though it begins there with the words "Liber Esdre prophets secundus." In the Syriac, Arabic, and Ethiopic versions it is styled the first of Ezra. In the Armenian it is the third.~~

~~3"Ewald is almost alone in claiming for it a Hebrew original (Gesch. vii. 69). See also Derenbourg, Revue critique for 1876, p. 132.~~

~~4 Gutschmid agrees with Hilgenfeld as to the date of the rest of the work. :~~

~~strongly, even fiercely, Jewish in its sympathies; and it is not a little remarkable that it should have made so little impression upon the Jewish mind, while by the Christians, on the other hand, it was received with great respect, and was indebted to them for its preservation. It has uot passed through their hands without alteration. The insertion of the word "Jesus" in chap. vii. 28 may he mentioned as an instance of the changes it has undergone.~~

~~By the author of the epistle of Barnabas (chap. xii.), by Clement of Alexandria (Strom. iii. 16), by Tertullian (De hab. mul., 3), and by Ambrose (De Bono Mortis, chap. x.—xii.), 2 Esdras is referred to as prophetic scripture. The unfavourable judgment of Jerome upon both books of Esdras is on the other hand repeated with special emphasis with regard to this in his treatise against Vigilantius. The work was never included in any list of canonical or " eccle- siastical" writings, nor did it generally appear in MS. Latin bibles. It was printed, however, in Pfister's Bamberg Latin Bible (1460), and frequently thereafter. To this circum- stance, doubtless, it owes its somewhat too high position, both in the Protestant and in the Romish Apocrypha. It may be interesting to notice that Columbus drew from chap. vi. 42 one of the arguments by which he supported his cause in the conference of Salamanca in 1487 (Navarrete, Coleccion, ii. 261).~~

~~It cannot be doubted that 2 Esdras has exercised con- siderable influence on the course of Christian thought, especially on eschatological subjects; but in cases of real coincidence between its teaching and that of Paul, the honour of priority is now very generally conceded to the canonical writer. The work is of great authority in some Oriental churches; and it has been a special favourite with many~~

~~Western mystics, such as Schwenkfeld and the once famous Antoinette Bourignon.~~

~~Tischendorf, in his Apocalypses Apocrypha, prints a Greek Apocalypse of Esdras, which is to be distinguished from 2 Esdras. It seems to date from the 3d century of the Christian era, and to belong originally to the Christian cycle (see vol. ii. p. 179).~~

~~The best commentary on 1 Esdras is that of O. F. Fritzsche in the Exegetisches Handbuch (Leipsic, 1851). See also his critical edition of the text (Libri apocryphi Veteris Testamenti grace ewm commentario critico (Leipsic,1871); De Wette-Schrader, Linicitung, sects. 363-4 (1869); Schiirer in Herzog's Encyclopédie, i. 496 (1877). —There have been several critical editions of the Latin text of 2 Esdras, the earliest having been those of Fabricius (1741) and Saba- tier (1751). Laurence was the first editor of the Ethiopic version (Oxford, 1820), Ewald of the Arabic (Gottingen, 1863), and Ceriani of the Syriac (Milan, 1868). The Vatican codex of the Arabic has now for the first time been edited by Gildemeister (Bonn, 1877). The Armenian is to be found in the Armenian Bible (Venice, 1805). The latest editions of the Latin are those of Hilgenfeld (1869) and of O. F. Fritzsche (Libri Apocryphi, as above). A good account of the work, with an almost exhaustive catalogue of the modern literature of the subject, is given by Schiirer in his Veutestamentliche Zeitgeschichte (Ieipsic, 1874). In 1875 Bensly published the results of an examination of the Amiens MS., which dates from the 9th century. The missing fragment has also been found in a Spanish MS. (sce Cambridge Journal of Philology, 1877). See also Renan, Les kvungiles (Paris, 1877),and Drummond, The Jewish Messiah, (London, 1878). (J. 8. BL.)~~

~~ESHER, a village and parish in the county of Suriey, Englaud, is situated about 15 miles S.W. of London. Near it is Claremont Palace (built by the great Lord Clive), formerly the residence of the Princess Charlotte, and more recently of Louis Philippe and his family. Of the mansion~~

~~house of Esher, in which Cardinal Wolsey resided for three |~~

~~or four weeks after his sudden fall from power in 1529, only the gatehouse now remains. A new mansion was erected in 1803. Esher church contains some fine memorials, and one of its three bells is said to have been brought from San Domingo by Sir Francis Drake. The population of the parish in 1871 was 1815.~~

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~~ESHREF, or Asurer, a town of Persia in the province of Mazanderan, about 50 miles west of Astrabad, and 5 miles inland from the Caspian Sea. It lies in a hollow of the mountains richly embowered with cypress, orange, and melon trees. The inhabitants, who number about 5000 or 6000, comprise, according to Napier, the descendants of a Georgian colony introduced by Shah Abbas Sefawi, some fainilies of Talish and Tats (the former a Turkish, the second a Persian tribe), and a number of Godars, a peculiar pariah race, possibly of Indian origin. Foreign trade, especially with Constantinople and Astrakhan, is carried on by means of the port of Mashhad-i-Sar, about 50 miles to the N.W., the exports being cotton, sugar, and cutlery, and the im- ports iron vessels and crockery. The principal buildings are the two dilapidated royal palaces. They were built in a style of great magnificence by Shah Abbas, and after a conflagration were restored by Shah Nadir, the conqueror of Delhi. The third palace of Sefiabad, situated on an eminence above the town, has been replaced by a modern building in the European style.~~

~~For details see Erinnerungen aus dem Leben des K. Russischen Gen.-Lieut. Johann von Blaramberg, 1874, quoted in Petermann's Mittheil., 1875 ; and. Napier's " Diary of a Tour in Khorassan," in Journ. of Roy. Geog. Soc., 1876.~~

~~ESKI-DJUMA, or Esx1-Dsumua, a town of Bulgaria, in the sanjak of Rustchuk, about 22 miles west of Shumla, on the northern slopes of the Binar-dagh, It has several mosques and baths, and derives great local importance from its fairs, of which the greatest, in May, is attended by a vast concourse of merchants from north and south, and displays a variety of German, French, Swiss, and Russian goods.~~

~~See Hilberg, Nach Eski Djumaia, mit Bericht iber die Messe von Eski Djwmaia im Mai 1876 von s. Exe. Gr, Edmund Zechy, Vienna, 1876.~~

~~ESKILSTUNA, a town of Sweden in the government of Sodermanland, anddistrict of Nykoping, onthe Hjelmar-Aa, which unites Lake Hjelmar with Lake Malar. It is the principal centre of Swedish manufacturing industry, pos- sessing a royal musket-factory, engineering works, cutlery-establishments, needle factories, dye-works, and tanneries. The place is mentioned in the 13th century, and is said to derive its name from an English missionary called Eskil who suffered martyrdom and was buried on the spot. It rose into importance in the reign of Charles X., who bestowed on it considerable privileges, and gave the first impulse to its manufacturing activity. Population 6130.~~

~~ESKIMO, Eskimos, or Esquimavx, the name applied by European ethnologists to a large number of cognate but widely separated tribes, which are scattered along the coasts of the arctic regions of America and Asia. The Danish form of the word has recently supplanted the older French form. The name is a corruption of the Abenaki Indian Zskimat- sic or the Ojiba Askimeg, both terms meaning "those who eat raw flesh." The native name is Znnuit—a word signifying, as names of savage tribes frequently do, "Zhe people." The Eskimo constitute a very homogeneous race, and are the widest spread aboriginal people in the world. They are entirely unknown in Europe, being confined to the arctic coast of America, and a small portion of the Asiatic shore of Behring Strait. On the American shores they are found, in broken tribes, from East Greenland to the western shores of Alaska,—never far off the coast, or south of the region where the winter ice allows seals to congregate in large numbers, They thus stretch for 3200 miles from S.E. to S.W.; and though in all likelihood they have little intercourse with each other, yet, judging from the traditions, the separate tribes must have maintained their present characteristic language and mode of life for at least 1000 years. Most probably, like the rest of the aborigines of the New World, they came from Asia at some very~~

~~o44 remote period. The N.W. American Coast Indians, whose modes of life are much the same as the Eskimo, bear ii striking resemblance to~~

them in appearance. The Eskimo may thus have been fishing Indians, who formerly lived on the banks of the great rivers which flow into the Polar Ocean, and were gradually driven seaward by the more southern Indians, against whom they to this day maintain a violent enmity. In the course of their migrations they arrived in Grinnell Land, crossed Smith Sound, not further north than Cape Union, according to Nares, then advanced gradually southward along the west coast of Greenland, doubled Cape Farewell, and spread up the east coast as far nortli as man has yet reached. They may have rounded, with the musk ox and the lemming, the north end of Greenland, but the probabilities are in the direction indi- cated. Even on hunting expeditions they rarely with- draw more than 20 miles from the coast, and only in very exceptional cases 30 miles. Save a slight admixture of European settlers, they are the only inhabitants of both sides of Davis Strait and Baffin's Bay. They extend as far south as about 50° N. lat. on the eastern side of America and in the west to 60° on the eastern shore of Behring Strait, while 55° to 60° are their southern limits on the shore of Hudson's Bay. Throughout all this range no other tribes intervene, except in two small spots on the coast of Western America, where the Kennayan and Ugalenze Indians come down to the shore for the purpose of fishing. The Aleutians are closely allied to the Eskimo in habits and language, though their culture is somewhat more highly developed. Rink divides them into the following groups, the most eastern of which would have to travel nearly 5000 miles to reach the most western. 1. The East Greenland Eskimo, few in number, every year advancing further south, and having intercourse with the next section. 2. The West Greenlanders, civilized, living under the Danish crown, and extending from Cape Farewell to 74° N. lat. 3. The Northernmost Greenlanders —the Arctic Highlanders of Ross—confined to Smith, Whale, Murchison, and Wolstenholme Sounds, north of the Melville Bay glaciers, not extending to the western shores of the former strait, nor within the memory of man having any intercourse with those south of them, They are very isolated, have greatly decreased of late years, did not until recently possess the kayak or skin-covered canoe, the umiak or open skin boat, or the bow and arrow, are bold hunters, pagans, and are perhaps the most typical of the Es- kimo in Greenland ; they have not of recent years greatly decreased, though at present they do not

~~number more than 200.1 4. The Labrador Eskimo, mostly civilized. 5. The Eskimo of the middle regions, occupying the coasts from Hudson's Bay to Barter Island, beyond Mackenzie River—perhaps comparativelya rathér heterogeneous group, inhabiting a stretch of country 2000 miles in length and 800 in breadth. 6. The Western Eskimo, from Barter Island to the western limits in America. They differ somewhat from the other groups in various habits, such as the use of the baidar or double-manned skin-covered canoe, in the clothing of the men, in their labrets, and in the head-dress of the women. 'They are allied to the Aleutians and the Indians of Alaska. 7. The Asiatic Eskimo or Tuski, who are again nearly allied to the Namollo and Itelmes. None of the Arctic tribes of Europe or Asia have the slightest con- nexion with them. Of all the Eskimo those of Greenland aud Labrador are the best known; the others are known but partially.~~

~~1 A party cf Eskimo from the western side of Smith Sound, about Cape Isabella, crossed aver in an umiak and five kayaks, about five years before the survivors of the crew of the " Polaris' wintered there in 1872-3. They introduced the use of the bow and arrow, Litherto unknown among the " Arctic Highlanders."~~

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~~Appearance and Dress.—The Eskimo are not so small as they are usually represented, their height—5d feet 4 inches to 5 feet 10 inches, and in rare cases even 6 feet—being quite up to the average of the coast Indians. Their dress, however, gives them a dwarfish appearance. Both men and women are muscular and active, the former often in- clining to embonpoint, and both having a pleasing, good- humoured, and not unfrequently, even handsome cast of countenance, apt to break into a "grin" on very small provocation. The face is broadly oval, flat, with fat cheeks ; forehead not high, and rather retreating ; teeth good, though, owing to the character of the food, worn down to the gums in old age; nose very flat ; eyes rather obliquely set, small, black, and bright; head largish, and covered with coarse black hair, which the women fasten up into a top knot on their crown, and the men clip in front and allow to hang loose and unkempt behind. Their skulls are of the meso- cephalic~~

~~type, the height being greater than the breadth ; according to Davis, 75 is the index of the latter and 77 of the former. Some of the tribes slightly compress the skulls of their new-born children laterally (Hall), but this practice is a very local one. The men have usually a slight moustache, but no whiskers, and rarely any beard. The skin has generally a "bacony" feel, and when cleaned of the smoke, grease, and other dirt—the accumulation of which varies according to the age of the individual—is only so slightly brown that red shows in the cheeks of the children and young women. The people soon age, how- ever. Their hands and feet are small and well formed, and, as a rule, they have a more pleasing appearance than all except the best-looking Indian tribes. The women and children dress entirely in skins of the seal, reindeer, bear, dog, or even fox, the first two being, however, the most common. The men and women's dress is much the samme. The jacket of the men has a hood, which in cold weather is usod to caver the head, leaving only the face exposed; it must be drawn over the head, as it has no opening in front or behind. The women's jacket has a fur-lined "amowt" or large hood for carrying a child, and an absurd looking tail behind, which is, however, usually tucked up. The trousers are either tight or loose, and are fastened into boots made of prepared seal skin, very ingeniously and neatly made. The women's trousers are usually ornamented with eider duck necks, or embroidery of native dyed leather; their boots, which are of white leather, or (in Greenland) dyed of various colours, reach over the knees, and in some tribes are very wide at the top, thus giving them an awkward appearance and a clumsy waddling walk. In winter there are two suits of clothes of this description, one with the hair inside, the other with it outside. They also sometimes wear shirts of bird-skins, and stockings of dog or young reindeer skins. The boots require to be changed when wet, otherwise they would freeze hard in cold weather. Their clothes are, like al] the Eskimo articles of dress or tools, very neatly made, fit beautifully, and are sewn with "sinew-thread," with a bone needle if a steel one cannot be had. In person the Eskimo are usually filthy, water not often coming in contact with them unless acci- dentally. The children when very young are, however, sometimes cleaned by being licked with their mother's tongue before being put into the bag of feathers which serves as their bed, cradle, and blankets.~~

~~Dwellings, Occupations, Characteristic Lmplements, and Food.—In summer the Eskimo live in conical skin tents, and in winter usually in half-underground huts (igloos) built of stone, turf, earth, and boncs, entered by a long tunnel-like passage, which can only be traversed on all fours. Sometimes, if residing temporarily at a place, they will erect neat round huts of blocks of snow with a sheet~~

~~| of ice for a window. 'These, however, though comfortable~~

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~~in the winter, become damp and dripping in the spring, and are then deserted. In the roof are deposited their spare harpoons, &c.; and from it is suspended the steatite basin-like lamp, the flames of which, the wick being of moss, serves as fire and light. On one side of the hut is the bench which is used as sofa, seats, and common sleeping place. The floor is usually very filthy, a pool of blood or a dead seal being often to be seen there. Ventila- tion is almost non-existent ; and after the lamp has blazed for some time, the family having assembled, the heat is all but unbearable: the upper garment must be taken off, and the unaccustomed visitor gasps half asphyxiated in the mephitic atmosphere. In the summer the wolfish-looking dogs lie outside on the roof of the huts, in the winter in the tunnel-like passage just outside the family apartment. The Western Eskimo build their houses chiefly of planks, merely cuvered on the outside with green turf. The same Eskimo have, in the more populous places, a public room for meetings. 'Council chambers" are also said to exist in Labrador, but are only known in Greenland by tradi- tion. Sometimes in South Greenland and in the Western Eskimo country the houses are made to accommodate several families, but as a rule each family has a house to itself. The Eskimo are solely hunters and fishers, and derive most of their subsistence from the sea. Their country will allow of no cultivation worth attending to; aud beyond a few berries, roots, &c., they use no vegetable food. They are essentially sarcophagous. The scal, the reindeer when obtainable, and various cetaceous animals supply the bulk of their food, as well as their clothing, light, fuel, and frequently also, when driftwood is scarce or unavailable, the material for various~~

~~articles of domestic economy. 'The shuttle-shaped canoe or kayak, covered with hairless seal-skin stretched on a wooden or whalebone frame, with only a hole in the centre for the paddler, is one of the most characteristic Eskimo imple- ments. The paddler propels it with a bone-tipped double- bladed paddle, like that used in the "canoes" familiar as aquatic playthings in England. He is covered with a waterproof skin or entrail dress, tightly fastened round the mouth of the hole in which he sits, so that, should the canoe overturn, not a drop of water may enter. A skilful kayaker can turn a complete somersault, boat and all, through the water. The wmiak or flat-bottomed skin luggage-boat, rowed by the women, is another, though less interesting, Eskimo vessel. The sledge, made of two runners of wvod or bone,—even, in one case on record, of frozen salmon (Maclure),—united by cross bars tied to the runners by hide thongs, and drawn by from 4 to 8 dogs harnessed abreast, is another article of Eskimo domestic economy which no European ingenuity has ever been able to improve. Some of their weapons afford remarkable evidence of inventive skill,—in particular, the harpoon, with the point detachable after it has struck the seal, narwhal, or white whale; the line to which the harpoon is fastened, with the inflated sealskin at the end, which tires out the prey, besides marking its course, and buoys it up when dead; the bird-spears, with bladder attached, and the adventitious side-points which strike the animal should the main one miss it; the rib bow of the wild Eskimo, &c. Although they lave to maintain a severe struggle for existence against the elements, the Eskimo have been able, in the manufacture of their tools, to develop artistic and mechanical skill far surpassing that of savages more favour- ably situated, but less endowed with brain power. They sometimes cook their food by boiling, but, when it is frozen, never hesitate to devour it raw. Blood, and the half-digested contents of the reindeer's paunch, are also eagerly consumed by them; but it is a mistake to suppose that they habitually eat blubber. Fat they are no doubt fond of, but blubber~~

~~is too precious: it must be kept for winter fuel and light. They are enormous eaters; two Eskimo will easily dispose of a seal at a sitting;~~

~~and in Greenland, for instance, each individual has for his daily consumption, on an average, 24 ib of flesh with blubber, and 1 ib of fish, besides mussels, berries, sea-weed, &c., to which in the Danish settlements may be added 2 oz. of imported food. Ten pounds of flesh, in addition to other food, is not uncommonly consumed in a day in time of plenty. A man will lie on his back and allow his wife to feed him with tit-bits of blubber and ficsh until he is unable to move.~~

~~The Eskimo cannot be strictly called a wandering race. They are nomadic only in so far that they have to move about from place to place during the fishing and shooting season, following the game in its migrations. They have, however, no regular property. They possess only the most necessary utensils and furniture, with a stock of provisions for less than one year; and these possessions never exceed certain limits fixed upon by tradition or custom (Rink). Long habit and the necessities of their life have also compelled those having food to share with those having none,—a custom which, with others, has conduced to the stagnant condition of Eskimo society and to their utter improvidence.~~

~~Moral and Mental Character.—So far as a nation can be characterized in a few words, it may be said that the Eskimo are, if not in the first rank of barbarous races, not in the last, and that, though they want some of the mental endowments of races like the Polynesians, they are equally free from many of their vicious traits. Their intelligence is considerable, as their implements and folk-tales abun- dantly prove. They display a taste for music, chartography, and drawing, display no small amount of humour, are quick at picking up peculiar traits in strangers, and are pain- fully acute in detecting the weak points or ludicrous sides of their character. They are excellent mimics, and easily learn the dances and songs of the Europeans, as well as their games, such as chess and draughts. They gamble a little,—but in moderation, for the Eskimo, though keeu traders, have a deep-rooted antipathy to speculation. When they offer anything for sale—say at a Danish settlement in Greenland—they always leave it to the buyer to settle the price. They have also a dislike to bind themselves by contract. Hence it was long before the Eskimo in Green- land could be induced to enter~~

~~into European service, though when they do so now-a-days they pass to almost the opposite extreme—they have no will of their own. It is affirmed by those who ought to know that any sort of licentiousness or indecency which might give rise to public offence is rare among them, In their private life their morality is, however, not high. The women are especially erring; and in Greenland, at places where strangers visit, their extreme laxity of morals, and their utter want of shame, are not more remarkable than the entire absence of jealousy or self-respect on the part of their countrymen and relatives. Theft in Greenland is almost unknown; but the wild Eskimo make very free with strangers' goods —though it must be allowed that the value they attach to the articles stolen is some excuse for the thieves. Among themselves, on the other hand, they are very honest,—a result of their being so much under the control of public opinion. Lying is said to be as common a trait of the Eskimo as of other savages in their dealings with Europeans. They have naturally not made any figure in literature. Their folk-lore is, however, extensive, and that collected by Dr Rink shows considerable imagination and no mean talent on the part of the story-tellers. In Greeu- land and Labrador most of the natives have been taught by the missionaries to read and write in their own language. Altogether, the literature published in the Eskimo tongue is considerable. Most of it has been printed in Denmark,~~

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~~but some has been "set up" in a small printing office in Greenland, from which about 280 sheets have issued, beside many lithographic prints. A journal (Atuagagl- dliutit nalinginarmik tusurumindsassumik univkat, %.e., "something for reading, accounts of all entertaining subjects") has been published since 1861. Up to 1874 it extended to 194 sheets in 4to, and about 200 leaves with illustrations. Two Eskimo have appeared as authors on a small scale, the last being Hans Hendrik, who has published an autobiography, narrating his life among the Smith Sound Eskimo, and as the hunter of the expeditions of Kane, Hayes, Hall, and Nares. Some of them pick up handicrafts very readily, and~~

those who have wrought in the Copenhagen workshops are said by their employers to learn various kinds of labour more rapidly than average Danish youths of the same age.

Religion. —The Eskimo nearly everywhere hold the same religious ideas, though in Greenland and Labrador they are, with few exceptions, nominally at least, Chris- tians, The whole world is, according to the pagan Eskimo's belief, governed by cnuas, supernatural powers or "owners," each of whom holds his sway within nitural limits. Any object or individual may have its, his, or her czwa, though generally speaking the idea of an emua is limited to certain localities or passions—such as a mountain or lake, or strength or eating. The soul, for instance, is the cxwa of the body. The earth and the sea rest on pillars, and cover an under-world accessible by various mountain clefts, or by various entrances from the sea. The sky is the floor of an upper-world to which some go after death, while others—good or bad—have their future home in the under-world. Here are the dwellings of the arsisswt—the people who live in abundance. The upper one, on tle contrary, is cold and hungry ; here live the arssartut or ball-players, so called from their playing at ball with a walrus head, which gives rise to the aurora borealis. The mediums between the znua and mankind are the angakoks (Esk. plur., angakut) or wizards, who possess the peculiar gift of angakoonek—or the state of "being angakok"—which they have acquired by the aid of guardian spirits called tornat (plural of térnak), who again are ruled by ¢ornarsuk, the supreme deity or devil of all. Such is their religion in the barest possible outline. They also invoke a supernatural influence which is called kusiunek or tliseenek, which may be translated as witch- craft: this is believed to be the mystic agency which causes sudden sickness or death. In the folk-lore of the Greenlanders as of other nations, divine justice manifests itself chiefly in the present life, though they have a faint belief in reward or punishment in the future world, according as the individual has behaved in this,

Language. —The idiom spoken from Greenland to North-eastern Siberia is, with a few exceptions, the same ; any difference is only that of dialect. It differs from the whole group of European languages, not

~~merely in the sound of the words, but more especially, according to Rink, in the construction. Its most remarkable feature is that a sentence of a European language is expressed in Eskimo by a single word constructed out of certain elements, each of which corresponds in some degree to one of our words. One specimen commonly given to visitors to Greenland may suflice :~~
~~Savigeksiniariartokasuaromaryotittogog, which is equivalent to "He says that you also will go away quickly in like manner and buy a pretty knife." Here is one word serving in the place of 17. It is made up as follows :— Savig a knife, ck pretty, sind buy, artartok G0 away, asuar hasten, omar wilt, y in like manner, oti thou, tog also, og he says.~~

~~Social Economy.—The Eskimo differ from most other tribes of savages, and notably from those of the rest of~~

~~America, by having no chiefs or political and military rulers. Fabricius concisely described them in his day — "Sine Deo, domino, reguntur consuetudine." The govern ment is mainly a family one, though if a man is distin- guished for skill in the chase, strength, shrewdness, or other qualities useful to a wild community, he will no doubt obtain a corresponding influence in the village or settlement. There is also a good deal of dependence of one upon another, as must happen in a people situated as the Eskimo. The family, the inhabitants of a house, and the inhabitants of a wintering place or hamlet are the three subdivisions recognized by the Eskimo; but any connexion between the different wintering places is hardly known and is not re- cognized. They never go to war with each other; and though revengeful, and apt to injure an enemy secretly, they rarely come to blows, and are morbidly anxious not to give offence. Indeed, in their intercourse with each other they indulge in much hyperbolical compliment, and language courteous from the teeth outwards. But they are not with- out courage. On the Coppermine and Mackenzie Rivers, where they sometimes come into collision with the Indians, they fight fiercely, and are a name of terror. Polygamy is rare, but the rights of divorce and re- marriage are exercised among the wild Eskimo without any definite restriction. The courtship or marriage customs and the laws of inheritance will be found fully described in the works mentioned in the~~

~~bibliography. The chief laws are such as the following. Every seal caught at a wintering place should be equally divided as far as it will go. Any one picking up driftwood has only to put some stones on it, as it lies on the shore, to establish his ownership in it. If a seal is harpooned and gets off with the harpoon sticking in it, the first owner loses his right in it if the bladder float gets de- tached. Any other kind of goods found are the property of the owner. If two hunters at the same time hit a bird, the bird is equally divided between them. All kind of game which is very large or rare is common property. In South Greenland whoever is the first to see a bear has ownership in it, no matter who kills it. The bor- rower is not bound to give compensation for any injury to the tools of another which he may have borrowed. If a man repent of a bargain he has a right to retract; nothing is sold on credit, or at least without being repaid in a short time. The Greenlanders were always fond of festivals, as are the Eskimo to thisday all over theircountry. When they met each other they used to rub noses together, but this, though a common custom still among the wild Eskimo, is entirely abandoned in Greenland except for the petting of children. There is, in Greenland at least, no national mode of salutation, either on meeting or parting. When a guest arrives or enters a house, commonly not the least sign is made either by him or his host. On leaving a place they now sometimes say " infivdluaritse," z.¢., live well, and to a European " aporniakinatit," 7.¢., do not hurt thy head, viz., against the upper part of the doorway. Population.—No precise statement can be made re- garding the numbers of the Eskimo race. For Greenland, however, we have exact data so far as the Danish possessions are concerned. In 1870, the date of the last census, there were, from Cape Farewell to the limit of the West Greenland region, 9588 people. Add to this about 200 for Smith's Sound, and say 400 for East Greenland, and the whole population of that island continent—inhabited and habit- able on the coast only—will not be many more than 10,000. On an average, the proportion of females to males in Green- laud has been 1118 to 1000, while in Iceland it is 1102, and in Denmark and the Faroe Isles there are 1018 to 1000 males. The natives of Greenland have decreased since the Danes came into the country, and at present the population is at a stand-still. On a rough estimate, the~~

whole Eskimo race does not, it is believed, exceed 40,000. But we have really no data, except at spots where they have come in contact with Europeans.

_ Bibliography. Sih ith notices of the Eskimo may be found in numerous works. e need only take cognizance here of modern writers who have actually lived among the Eskimo. These are :— Rink, Lskimoiské Eventyr og Sagn (1866) ; Supplement to the same work (1871); Tales and Traditions of the Eskimo (1875) ; Danish Greenland ; tts People and its Products (1877) ; Grénland, geogra- phisk og Statistisk beskrevet, 2 vols. (1857); Om Eskimocrnes Herkomst (Aarbog for Nord. Oldk. og Hist. 1871, pp. 269-302); Richardson, Polar Regions (1861), pp. 298-231; Markham, Arctic Papers of the R. G. S. (1875), pp. 163-232 ; Simpson, Jbid, pp. 233-275 ; Hans Hendriks the Eskimo's Memoirs ("Gcographical Magazine," Feb. 1878, et seg.); Brown, Races of Mankind, vol. i. (1872), pp. 5-20 ; Countries of the World, vol. i. (1877), pp. 123-144. See also the works and papers referred to in the foregoing works; the diction- aries and grammars of Fabricius, Washington, Kleinschmidt, and Janssen, and a sketch of the Eskimo language by Dr Rink in course of publication by the Smithsonian Institution ; and finally the various narratives and other official reports and papers of the Arctic voyagers, particularly those of Parry, Lyons, Franklin, Collinson, M'Clure, Graah, Kane, Rae, Hayes, Hall, Bessels, Koldeway,and Nares. (R. B.)

ESKI-SAGRA, or Esxi-Zacra, a town of European Turkey, province of Adrianople, is pleasantly situated on the southern slope of the Balkans, 70 miles N.W. of Adrianople. The vicinity is highly cultivated, and there are some well frequented hot mineral baths. Eski-Sagra has 13 mosques, several Christian churches, and a bazaar. Its principal manufactures are carpets, coarse cloth, and leather. In the Russo-Turkish war of 1877, while occupied by the Russians, it was threatened by the Turks under Suleiman Pasha, and General Gourko advancing to its relief suffered a disastrous defeat (July 31). The Russians were compelled to evacuate the town, and retire through the Lower Balkans,

~~after which it was set on fire by the Turks, and great barbarities were perpetrated on the Christian inhabitants. The population of the town num- bered about 20,000.~~

~~ESKI-SHEHR, a town of Asiatic Turkey, in Asia Minor, in the sanjak of Sultan Oegni, about 80 miles S.E. of Broussa, and 130 miles W.N.W. of Angora, to the south of the Purssak-Chai, a tributary of the Sangarius, in 30° 32' E. long. and 39° 43'N. lat. It consists of two portions, the town proper and the market-town, united by a causeway about a mile and a half in length. There are at least eight or ten mosques ; andthe market town contains three or four natural warm baths, which are mentioned as early as the 3d century by Athenzus. About 18 miles to the east are extensive deposits of meerschaum, which yield a yearly revenue to the Government of about 60,000 piastres. The clay is partly manufactured into pipes in the town; but the greater proportion finds its way to Europe and especially to Germany. The annual export is estimated at 2200 or 2500 chests, of a total value of 35 millions piastres. Eski-Shehr, 7.c., the old town, is identi- fied with the ancient Doryleum of Phrygia, and it still preserves some sculptures of the Roman period. Its name appears about 302 B.c., in connection with the wars of Lysimachus and Antigonus; and it is frequently men- tioned by the Byzantine historians as an imperial residence and military rendezvous. In 1097 it was the scene of the defeat of the Turks under Kilidj-Arslan by the crusaders under Geoffrey of Bouillon.~~

~~ESNEH, or Isnt, the Latopolis of the Greeks, a town of Upper Egypt, on the left bank of the Nile, 28 miles S.S.W. of Thebes, in 25° 17' 38" N. lat. and 33° E. long. Its position at the upper end of the Nile valley, which here widens out to a breadth of 44 miles, is greatly in its favour, and it forms an important depét in the caravan trade from Sennaar. 'The local manufactures are shawls, cottons, and pottery. It has frequently served as a place of refuge for the political exiles of southern Egypt, and at the time of the French expedition it was occupied by the~~

~~Mamelukes of Hassan, Osman, and Saleh Bey. More recently it has been the custom to transport thither female offenders from Cairo. To~~

~~the south of the town lies a Coptic monastery, which attracts a large number of pilgrims from far and near to visit the relics of the martyrs who were put to death at Esneh during the Diocletian persecution, 303 a.p. The population of the town is estimated at 30,000. For an account of the ancient temple of Kneph, see Eeyrt, vol. vii., p. 782.~~

~~ESPARTO, or Spanish Grass, Iacrochloa (Stipa, L.) tenacissima, Kunth, is a plant of the tribe Stipew, resem- bling the ornamental feather-grass of gardens. It is indi- genous to the south of Spain and the north of Africa, and is especially abundant in the sterile and rugged parts of Murcia and Valencia, and in Algeria, flourishing best in sandy, ferruginous soils, in dry, sunny situations on the sea coast. Pliny (V. H. xix. 2) described what appears to have been the same plant under the name of spartwm, wheuce the designation campus spartarius for the region surrounding New Carthage. (See CaRTAGENA, vol. v. p. 140.) It attains a height of three or four feet. The stems are cylindrical, and clothed with short hair, and grow in clusters of from two to ten feet in circumference; when young they serve as food for cattle, but after a few years' growth acquire great toughness of texture. The leaves vary from six inches to three feet in length, and are grey- green in colour ; on account of their tenacity of fibre and flexibility they have for centuries been employed for the making of ropes, sandals, baskets, mats, and other articles. Ships' cables of esparto, being light, have the quality of floating on water, and have long been in use in the Spanish navy. Esparto leaves contain 56 per cent. by weight of fibre, or about 10 per cent. more than straw, and lence have come largely into requisition as a substitute for linen rags in the manufacture of paper. For this purpose they were first utilized by the French, and in 1857 were intro- duced into Great Britain. In 1877 the total imports of esparto into the United Kingdom were 174,720 tons, being 43,809 tons in excess of the quantity imported in the previous year. When required for paper-making the leaves should be gathered before they are quite matured ; if, however, they are obtained too young, they furnish a paper having an objectionable semi-transparent appearance. The leaves are gathered by hand, and from two to three hundredweight may be collected in a day by a single labourer. They are generally obtained during the dry summer months, as at other times their adherence to the stems is so~~

~~firm as often to cause the uprooting of the plants in the attempt to remove them. LEsparto may be raised from seed, but cannot be harvested for twelve or fifteen years after sowing. The increased demands of the paper trade have led to forced cropping in some districts, where in consequence there has been a falling olf of from 2 to 10 per cent. in production. For the processes of the paper manufacturer esparto is used in the dry state, and without cutting; roots and flowers and stray weeds are first removed, and the material is then boiled with caustic soda, washed, and bleached with chlorine solution. Sundry experiments have been made to adapt esparto for use in the coarser textile fabrics. Messrs A. Edger and B. Proctor (see Chem. News, vol. xxxv. p. 141, 1877) have directed attention to the composition of the slag resulting from the burning of esparto, which they find to be strikingly similar to that of average medical bottle glass, the latter yielding on analysis 66°3 per cent. of silica and 25:1 per cent. of alkalies and alkaline earths, and the slag 64°6 and 27-45 per cent. of the same respectively. For further details concerning the manufacture of paper from esparto, see the article PAPER.~~

~~ESPINASSE, See L'EsSPrInasse.~~

~~ESPINEL, Vicents (15511-16341), a Spanish poet and ecclesiastic, born probably in 1551, at Ronda, in the province of Granada. He was educated at Salamanca, was an early patron and friend of Lope de Vega, and served as a soldier in Flanders. His ecclesiastical position seems to have been that of a chaplain at Ronda, but he resided chiefly at Madrid. He is now chiefly noted as having produced one of the best of those romances delineating Spanish manners that have found imitators in other countries. This book, which is entitled Relaciones de la Vida y Hechos del Escuders Marcos de Olregon, appeared in 1618 at Barcelona, at a period when Spanish literature was at a low ebb. Marcos is not a chivalresque "esquire", but a simple individual who seeks his fortune by attaching himself to great men; and the object of the author is to warm young men against so degrading a course of life. The squire tells his own story. The incidents, which are not generally~~

~~exciting, though amusing, and nationally characteristic, are supposed to be drawn in great part from the author's own life; the style is correct, though somewhat diffuse. Its chief interest, like that of the clever Vida y Hechos del Picaro Gusman de Alfarache of Aleman, is that Le Sage has not scrupled to borrow from both writers many of the incidents and characters in his novel of Gil Blas—a circumstance which induced an in- dignant Spaniard to give to his translation into Spanish of Le Sage's work the title, Gil Blas restored to his Country and his Native Tongue, while in the preface he denounces the barefaced plagiarism. The charge of plagiarism against Le Sage was first made by Voltaire, who grossly exaggerates in saying that Gil Blas is taken entirely from the work of Espinel. Espinel was noted for his musical taste, and added a fifth string to the national guitar. He was also a poet of some reputation, especially for his Canciones and L[edondillas. His pastorals and elegies contain many spirited natural descriptions, though they do not abound in original conceptions; and his versi- fication is always harmonious. He was the inventor or reviver of the measure known as the decimas, and some- times called after him Hspinelas, which consists of a stanza of ten verses of eight syllables each. He also translated into verse some of the odes and the Avs Poetica of Horace. Hspinel seems to have been neglected in his old age, for he died in great poverty at Madrid in 1634,~~

~~The Marcos de Olregon was translated into German by Tieck, with a preface and valuable notes. There is a good English translation by Algernon Langton (2 vols., London, 1816).~~

~~ESPREMESNIL, or Errimini, Jean Jacques Duvat pD' (1746-1794), was born in 1746 at Pondicherry, of which colony his father was at that time a member of the general council. He returned to France with his father in 1750, and after completing his studies for the legal profession became king's advocate at Chatelet, and shortly afterwards councillor of the parlement of Paris. He was an enthusiastic defender of the rights of the parlements against the edicts of Louis XVI.; and having procured from the printers a copy of the edicts of May 1788, establishing bailiwicks, and re-establishing the cour pléniére for the trial of those officers of the parlements who refused to register the~~

~~edicts, he revealed this coup d'état to an extraordinary assembly of all the chambers, and by a speech of great eloquence induced the magistrates to pro- test against what they considered the threatened violation of their rights. For this he was arrested, after an exciting scene, while occupying his place in the assembly. The president refused to point him out to the officer charged with his arrest, and each of the other members declared himself to be M. d'Esprémesnil; but at last Esprémesnil, while protesting against the violation of justice implied in his arrest, voluntarily delivered himself up. He was~~

~~banished to the island of St Margaret, but when a change took place in the ministry a few months afterwards, he was recalled to Paris. Shortly after his return he was elected a deputy to the States-general, where he soon became as strenuous in his support of the privileges of the king as he had previously been of the privileges of the parlements, and after combating, often with a passionateness amount- ing to violence, the various decrees restraining the royal authority, he at the close of the assembly in 1791 formally protested against the new constitution. In 1792 he was recognized by the revolutionary mob at the Tuileries, and would have suffered summary execution had he not been rescued half dead from the hands of his tormentors by a patrol of the national guard. He obtained temporary refuge in the monastery of St Germains, aud soon afterwards went to Havre, where he lived apparently forgotten till toward the end of 1793, when he was arrested and brought to Paris. He was tried before the revolutionary tribunal, and, being condemned to death, was executed 23d April 1794. (See the histories of the time.)~~

~~ESPRONCEDA, Jos pz (1810-1842), a Spanish poet and political agitator, whose life is remarkable for the variety of its incidents. His father was colonel of the Bourbon regiment, and it was while the army was on the march that the boy was born, on the highway near Almen- dralejo in Estremadura. On the close of the war, his parents settled at Madrid, and he thus had the opportunity of becoming a pupil of Alberto Lista, the professor of litera- ture in St Matthew's college. Before he was out of his fourteenth year, he had not only attracted his master's attention by his political poems, but had joined a conspiracy~~

~~against the minister Calomardi. During the imprisonment and seclusion at Guadalajara which this offence brought upon him, he soothed his solitude by singing the fate of Pelayo, the patron of Spanish liberty. On his release he withdrew to Lisbon, only to find himself again imprisoned in the castle of St George, and to be transported with some of his fellow refugees to England. Here, by one of those turns of fortune which make truth stranger than fiction, he met with a young lady with whom he had fallen in love while in Lisbon; and here too he became, what was per- haps of as much importance for his poetic development, a student of Shakespeare, Milton, and Byron. In 1830 he took part in the July revolution at Paris, and soon after joined the ill-fated expedition of Pablo de Chapalangarra in Spain. On the death of Ferdinand, he was not only allowed to return to his native country, but obtained an appointment in the queen's guards. This, however, he soon forfeited by a political song, and he was banished to Cuellar, where he had leisure to compose a novel in six volumes, called Don Sancho Saldafia 6 el Castellano de Cuellar. The publication of the estatuto real brought him back to Madrid to write and act with as little caution as ever. He joined the revolutionary movements of 1835 and 1836, and in 1840 entered the national guard as lieutenant. The republican party having come into power in 1840, he was appointed ambassador to the Hague, but was obliged to give up his post through an illness which terminated fatally at Madrid on the 23d of May 1842. His poetical works were collected by Villalta in 1840, and have been re- printed more than once under the editorship of Hartzen- busch. The "Student of Salamanca," 7 estudiante de Salamanca, is a continuation of the legend of Don Juan, and El Diablo Mundo is based on the story of Faust. Of the lyric poems, which are frequently distinguished by great force of expression and skill in versification, the most remarkable are i Mendigo or the Beggar, El Verdugo or the Headsman, the Hymn to the Sun, and the Ode to Night. (See Ch. de Mazada, Etudes sur I'Hspagne, and Quinet, Vacances en Espagne.)~~

~~ESQ—ESS~~

~~ESQUIMAUX. See Eskimo.~~

ESQUIRE (Lat. Armger, Old Fr. H'scuyer), originally a military office ranking immediately below a knight, whose attendant he was, and the bearer of his helmet, shield, and lance, in the tournament or in the battlefield. In early times the title was derived from office, not from birth, and was not hereditary ; latterly, however, it has come into such geueral use—or rather abuse—that all distinction it once had, or all rule regulating its use, is quite lost. Esquires may be divided into five classes, thus :—(1) younger sons of peers and their eldest sons ; (2) eldest sons of knights and their eldest sons; (3) chiefs of ancient families by prescription ; (4) esquires by creation or office, as heralds and sergeants of arms (constituted by receiving the collar of SS), judges, officers of state, naval and military officers, justices of peace, barristers-at-law; (5) esquires who

attend the Knight of the Bath on his installation—usnally |

two specially appointed. All these can legally use thie title. ESQUIROL, Jean Ettenne Dominique (1772-1840), a French physician celebrated for his treatment of the insane, was born at Toulouse in 1772. He began his studies with a view to the church at the seminary of St Sulpice, Paris, but being compelled by the Revolution to suspend them, he entered the medical service of the army. In 1794 he became a pupil of the military hospital of Narbonne, but as soon as he was able to leave this service be returned to Paris to complete his medical studies. Havy-ing attended the lectures of Pinel he was chosen by that celebrated physician to be his assistant in the Salpétriére, and also helped him in editing the Afédecine Clinique. Ile obtained his doctor's diploma in 1805, and in 1811 became physician of the Salpetricre. Having from the time that he completed his preparatory studies devoted his chief attention to the treatment of the insane, he com- menced in 1817 a course of lectures on that subject, and the revelations he then made of the abuses observed by him in the lunatic asylums of France induced the Government to appoint a commission to inquire into the subject. Esquirol, by his eloquence, his untiring energy and devotion, and the results of his skilful treatment, contributed greatly to the introduction of the humane method of dealing with mental maladies. He also busied himself in designing plans for the various apartments of lunatic

asylums; and the asylums of Rouen, Nantes, and Montpellier were built in accordance with his instructions. In 1823 he became inspector-general of the university of Paris for the faculties of medicine, and in 1826 chief physician of the asylum for insane at Charenton. He died at Paris, 13th December 1840. Besides contributing to the Dictionnaire des Sciences Médicales and the Encyclopédie des Gens du Monde, Esquirol is the author of an important work entitled Des Maladies Mentales, considérées

sous les rapports médical, hygiénique, et médico-légal, 2 vols., Paris,

1838.

ESQUIROS, Henri Aupronse (1814-1876), a French poet, novelist, and politician, was born at Paris in 1814. His first work, a volume of poetry entitled Les Hirondelles, was published in 1834, bunt though it gained the commenda- tion of Victor Hugo, it attracted little other attention, and obtained only a small sale. In 1837 he published a novel entitled Le Magicien, aud in 1840 a historical romance, Charlotte Corday. In the same year appeared J' Evangile du Peuple, an exposition of the life and character of Jesus, which represents the founder of Christianity as a democratic reformer. For this publication Esquiros was condemned £c eight months' imprisonment, and he beguiled his term of captivity by writing a volume of poetry, entitled Les Chants @P un Prisonnier, consisting chiefly of descriptions of cir- cumstances connected with his infancy and youth. Shortly after regaining his freedom he published three socialist tracts, entitled Les Vierges mariyres, Les Vierges folles,

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and les Vierges sages. In 1847 appeared Paris oul es sciences, les institutions, et les meeurs aw XIX siécle, 2 vols, In the same year he published Histoire des Montagnards, and in 1851 Jfstoire des Martyrs de la Inberté, two works which obtained a large circulation among the lower classes, and gained for their author such popularity that in 1849 he was elected a representative of the legislative assembly. In 1851, on account of his extremely radical opinions, and his strong opposition to the empire, he was expelled from France. He proceeded first to

~~Holland, and thence, in 1855, to England, where he was for some time professor of French literature at Woolwich. Here he wrote for the Revue des Denx Mondes a number of essays on English life and character, which were afterwards translated and published in London, under the title of the English at Home (1st series, 1862, 2d, 1863). He aiso published in 1859 La Néerlande et la vie hollanduise. His works both on England and on Holland are remarkable for fulness of infermation and sympathetic appreciation of foreign charac- teristics. In 1869 he was chosen a member of the legisla- tive assembly for the fourth circonscription of the depart- ment of the Bouches du Rhéne, and took his seat among the democratic opposition. In September 1870 he was made superior adininistrator of the department, but on account of his imprudent political prosecutions he was compelled to resign his office in the November following, after which he became editor of the Lyalité of Marseilles. In 1871 he was chosen a member of the legislative assembly, and sat again on the extreme left. He died at Versailles, May 13, 1576. Esquiros was too much of a partisan to be properly ranked as a statesman, and though he was a brilliant and facile writer, most of his political works are somewhat superficial and declamatory.~~

~~ESS, Jonann HEtnricu van (1772-1847), a Catholic theologian, was born at Warburg, Westphalia, 15th February 1772. He was educated at the Dominican gymnasium of his native town, and in 1790 entered, as a novice, the Bene- dictine abbey of Marienminster, in the bishopric of Pader- born. His Benedictine name was Leander. He was priest at Schwalenberg from 1799 to 1812, after which he became extraordinary professor of theology and joint-director of the teachers' seminary at Marburg. In 1818 he received the doctorate of theology and of canonical law. In 1807, in conjunction with his consin, he published a German translation of the New Testament, and as its circulation was forbidden by the pope, he published in 1808 a defence ef his views, entitled Ausziige aus den Ieiligen Vatern und anderen Lehrern der Watholischen Kirche tber das nothwendige und niteliche Bibellesen. An improved edi- tion of this tractate was published in 1816, under the title Gedanken tiber Bibel und Bibellehre, and in the same year appeared Was war die Bibel den ersten Christen 2 In 1818 he published Die Bibel nicht ein Buch fiir Priester, and this was followed in 1819 by a German~~

~~translation of the Old Testament. In 1822 he resigned his offices at Marburg 'n order to devote his whole time to the defence of his views regarding Bible reading by the peuple, and to endea- vour to promote the circulation of his Bible translations ; aud in 1840, conjointly with his pupil Wetzer, he completed a German translation of the Scriptures of the Old and New Testaments. He died at Affolderbach in the Odenwald, 13th October 1847,~~

~~ESSEK, Essrec, or Eszex, a fortress and imperial free town of Austria-Hungary, in the province of Slavonia, and the capital of the county of Vericze, is situated on the Drave about 135 miles S. by W. of Pesth. It has a Franciscan and a Capuchin monastery, a gymnasium, a military school, a hospital, and an arsenal. It carries on a considerable trade in corn, cattle, and wood, and has also silk manufac- tories and tanneries, Essek owes its origin to its fortress,~~

~~which existed as early as the time of the Romans under the name of Mursia. At the beginning of the Hungarian re- volution of 1848 the town was held by the Hungarians, but on the 4th February 1849, it was taken by the Austrians under General Baron 'T'rebersberg. The population in 1869 was 17,247.~~

~~ESSEN, a town of Prussia, in the government district of Diisseldorf, province of the Rhine, is situated 19 miles N.E. of Diisseldorf. It is the seat of a court of justice and a board of trade. Among its principal buildings are the town-house, the post-office, the imperial bank, the real school, the two infirmaries, and the hospital. It has also an old Benedictine nunnery founded in 873, and a Catholic church whose choir dates from the 9th century. In the immediate neighbourhood of the town there is a beautiful public park. The town owes its prosperity originally to the large coal mines in its vicinity, which employ more than 20,000 workmen, and afford special facilities for its various industries. It has manufactories of woollen and linen goods, vitriol, leather, and machines, but is best known by the cast-steel works of Frederick Krupp, at which are manu- factured the famous Krupp cannon. In 1876, 10,500 meu were employed in the factory, besides 5000~~

~~others in the mines and at the blast furnaces. There were in opera- tion 250 smelting furnaces, 390 annealing and other kinds of furnaces, 77 steam hammers, and 294 steam engines, with a total of 10,000 horse power. In 1875, 612,000 tons of coal and coke were used in the furnaces. The population of Essen has for some time been rapidly increasing ; while in 1849 it numbered only 8813, it amounted in 1875 to 54,790.~~

~~Essen was formed into a town about the middle of the 10th century by the abbess Hagona, sister of the emperor Henry I. The abbess of the nunnery, holding from 1275 the rank of a prin- cess, governed the town until 1802, when it was incorporated with~~

~~Prussia. In 1806 it came into the possession of the duchy of Berg, but it was again transferred to Prussia in 1813.~~

~~ESSENES, Tue, were one of the three principal sects of the Jews, appearing for the first time in Josephus, about the middle of the 2d century before Christ. The historian introduces thera along with the Pharisees and Sadducees in his account of the period of Jonathan the Asmonean. As to the circumstances under which they arose, the precise causes in Jewish life to which they owed their origin, and the various stages by which they attained to the elaborate organization of later times, we have no positive information whatever. The accounts we have of them refer particularly to the half century preceding the fall of Jerusalem, when the growth and organization of the sect was complete. Be- sides the detailed account of Josephus (Bell. Jud., ii. 8; briefly in Antig., xviii. 1, 5), we have a sketch of them in Philo (in his treatise Quod omnis probus liber, and in the fragment of his Apology for the Jews preserved in Eusebius, Pr. Hvang., viii. 11), anda brief notice from Pliny (Hist. Nat., v.17). Josephus himself made trial of the sect of Essenes in his youth; but from his own statement it appears that he must have been a very short time with them, and therefore could not have been initiated into the inner mysteries of the society (De vita sua, 2).~~

~~There is no little difficulty about tleir name. Josephus generally writes "Eoonvol, but has Eocato: sometimes; Philo has '"Eooator, and Pliny Esseni. Its derivation is quite uncertain, all the more so as the origin of~~

~~the sect is totally unknown. The most extraordinary conjecture is that of Philo, who connects it with dcvos, holy ; Salmasius proposed the Syrian city Essa; Ewald refers it to the "Rabbinical 19 (properly, preserver, guardian), and sup- poses that the Essenes called themselves so as watchers, servants (of God), since they didnot in fact purpose to be any- thing more than Oeparevral Ged, as Philo says." The most~~

~~probable root is SOX, to heal, suggested by several authori- ties, which also is analogous to G@epazrevrai, the name of the kindred sect in Egypt. (For a full discussion of the name of the sect, see Canon Lightfoot on the Colos- sians.)~~

~~The Essenes were an exclusive society, distinguished from the rest of the Jewish nation in Palestine by an organization peculiar to themselves, and by a theory of life in which a severe asceticism and a rare benevolence to one another and to mankind in general were the most striking characteristics. They had fixed rules for initiation, a succession of strictly separate grades within the limits of the society, and regulations for the conduct of their daily life even in its minutest details. Their membership could be recruited only from the outside world, as marriage and all intercourse with women were absolutely renounced. They were the first society in the world to condemn slavery both in theory and practice; they enforced and practised the most complete community of goods. They chose their own priests and public office-bearers, and even their own judges. Though their prevailing tendency was practical, and the tenets of the society were kept a profouud secret, it is perfectly clear from the concurrent testimony of Philo and Josephus that they cultivated a kind of speculation, which not only accounts for their spiritual asceticism, but indicates a great deviation from the normal development of Judaism, anda profound sympathy with Greek philosophy, and probably also witli Oricutal ideas. At the same time we do our Jewish authorities no injustice in imputing to them the patriotic tendency to idealize the society, and thus offer to their readers something in Jewish life that would bear comparison at least with similar manifestations of Gentile life.~~

~~There is some little difficulty in determining how far the Essenes separated themselves locally from their fellow countrymen. Josephus informs us that they had no single city of their own, but that many of them dwelt in every city. While in his treatise Quod omnis, &c., Philo speaks of tlieir avoiding towns and preferring to live in villages, in his Apology for the Jews we find them living in many cities, villages, and in great and prosperous towns. In Pliny they are a perennial colony settled on the western shore of the Dead Sea. On the whole, as Philo and Josephus agree in estimating their number at four thousand, we are justified in suspecting some exaggeration as to the many cities, towns, and villages where they were said to be found. As agriculture was their favourite occupation, and as their tendency was to withdraw from the haunts and ordinary interests of mankind, we may assume that with the growing confusion and corruption of Jewish society, they felt themselves attracted from the mass of the popula- tion to the sparsely peopled districts, till they found a con- genial settlement and free scope for their peculiar view of life by the shore of the Dead Sea. While their principles were consistent with the neighbourhood of men, they were better adapted to a state of seclusion.~~

~~The Essenes did not renounce marriage because they denied the validity of the institution or the necessity of it as providing for the continuance of the human race, but because they were convinced of the artfulness and fickle- ness of the sex. They adopted children when very young, and brought them up on their own principles. Pleasure generally they rejected as evil. They despised riches not less than pleasure ; neither poverty nor wealth was observ- able among them ; at initiation every one gave his property into the common stock ; every member in receipt of wages handed them over to the funds of the society. In matters of dress the asceticism of the society was very pronounced. They regarded oil as a defilement, even washing it off if anointed with it against their will. They did not change~~

~~their clothes or their shoes till they were torn in pieces or worn completely away. In general they thought it good to dress coarsely, and~~

~~preferred to be cladin white. Their daily routine was prescribed for them in the strictest manner. Before the rising of the sun they were to speak of nothing profane, but offered to it certain traditional forms of prayer as if beseeching it to rise. Thereafter they went about their daily tasks, working continuously at whatever trade they knew t.ll the fifth hour, when they assembled, and, girding on a garment of linen, bathed in cold water. They next seated themselves quietly in the dining hall, where the baker set bread in order, and the cook brought each a single dish of one kind of food. Before meat and after it grace was said by a priest. After dinner they resumed work till sunset. In the evening they had supper, in which strangers belonging to the society joined them, if there happened to be any such present. Withal there was no noise or confusion to mar the tranquillity of their inter- course ; no one usurped more than his share of the conver- sation ; the stillness of the place oppressed a stranger with a feeling of mysterious awe. This composure of spirit was owing to their perfect temperance in eating and drinking. Not only in the daily routine of the society, but generally, the activity of the members was controlled by their presi- dents. In only two things could they take the initiative, helpfulness and mercy; the deserving poor and the flestitute were to receive instant relief; but no member could give anything to his relatives without consulting the heads of the society. Their office-bearers were elected. They had also their special courts of justice, which were composed of not less than a hundred members, and their decisions, which were arrived at with extreme care, were irreversible. Oaths were strictly forbidden ; their word was stronger than an oath. They were just and temperate in anger, the guardians of good faith, and the ministers of peace, obedient to their elders and to the majority. But the moral characteristics which they most earnestly cultivated and enjoined will best appear in their rules of initiation, There was a novitiate of three years, during which the intending member was tested as tv his fitness for entering the society. If the result was satisfactory, he was admitted, but before partaking of the common meal, he was required to swear awful oaths, that he would reverence the deity, do justice to men, hurt no man voluntarily or at the command of another, hate the unjust and assist the just, and that he would render fidelity to all men, but especially to the rulers, seeing that no one rules but of God. He also vowed, if he should bear rule himself,~~

~~to make no violent use of his power, nor outshine those set under him by superior display, to make it his aii to cherish the truth and unmask liars, to be pure from theft and unjust gain, to conceal nothing from his fellow-members, nor to divulge any of their affairs to other men, even at the risk of death, to transmit their doctrines unchanged, and to keep secret the books of the society and the names of the angels. Within the limits of the society there were four grades so distinct that if any one touched a member of an inferior grade he required to cleanse himself by bathing in water ; members that had been found guilty of serious crimes were expelled from the society, and could not be received again till reduced to the very last extremity of want or sickness. As the result of the ascetic training of the Essenes, and of their temperate diet, we find that they lived to a great age, and were superior to pain and fear. During the Roman war they cheerfully underwent the most grievous tortures rather than break any of the principles of their faith. In fact, they had in many respects reached the very highest moral elevation attained by the ancient world ; they were just, humane, benevolent, and spiritually-minded ; the sick and aged were the objects~~

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~~of a special affectionate regard; and they condemned slavery, not only as an injustice, but as an impious violation of the natural brotherhood of men. 'There were some of the Essenes who permitted marriage, but strictly with a view to the preservation of the race; in other respects, they agreed with the main body of the society.~~

~~It will be apparent that the predominant tendency of the society was practical. Philo tells us expressly that they rejected logic as unnecessary to the acquisition of virtue, and speculation on nature as too lofty for the human intel- lect. Yet they had views of their own as to God, Providence, the soul, and a future state, which, while they had a practical use, were yet essentially speculative. On the one hand, indeed, they held tenaciously by the traditional Judaisms: blasphemy against their lawgiver was punished with death, the sacred books were preserved and read witht great reverence, though not without an allegorical interpre- tation, and the Sabbath was most scrupulously observed. But~~

~~in many important points their deviation from the strait path of Judaic development was complete. They rejected animal sacrifice as well as marriage; the oil with which priests and kings were anointed they accounted un- clean ; and the condemnation of oaths and the commuuity of goods were unmistakable innovations for which they found no hint or warrant in the old Hebrew writings. Their most singular feature, perhaps, was their reverence for the sun. As we have seen, uo profane word was to be uttered before his rising, and certain forms of prayer were offered to him; they were not to insult his rays by any act of un- cleanness, however natural. In their speculative hints respecting the soul and a future state, we find another im- portant deviation from Judaism, and the explanation of their asceticism. They held that the body is mortal, and its substance transitory ; that the soul is immortal, but, coining from the subtlest ether, is lured as by a sorcery of nature into the prison-house of the body. At death it is released from its bonds, as from long slavery, and joyously soars aloft. To the souls of the good there is reserved a life beyond the ocean, and a country oppressed neither by rain, nor snow, nor heat, but refreshed by a gentle west wind blowing continually from the sea, but to the wicked a region of wintry darkness and of unceasing torment. (In these points the resemblance of Essenism to certain phases of Greek philosophy and to some of the earlier Greek myths is unmistakable.) To all intensely earnest minds, in which the force of one great idea is not corrected by other tendencies, a spiritual asceticism is the natural complement of a theory according to which a vile body is the prison- house of an immortal soul. Josephus tells us, too, that the Essenes believed in fate; but in what sense, and what re- lation it bore to Divine Providence, does not appear.~~

~~In view of such divergencies from the normal develop- ment of Judaism, and of doctrines on the soul and a future state, which so closely resemble Pythagorean, Platonic, and even Zoroastrian speculations, the question naturally arises how far Essenism was a native product of the Jewish mind, and how far it had experienced the influence of Greek and Oriental thought. On the one hand it is clear, from the facts we have noted, that it must have completely passed the barriers of traditional Judaism, and equally clear, on the other, that~~

they could not have reached their peculiar point of view in perfect isolation from antecedent and con- temporary speculation. For more than a century before the Essenes appear as a factor in Jewish history, the Jews had come into closest contact with Greek life; doubtless they were rather repelled than attracted, but in either case could not help being affected, by it. With the theosophic speculations of Persia they had also been acquainted for many centuries, first during the Babylonian captivity, and afterwards through the general diffusion of that way of

Plate VI.

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thought in the adjoining countries. All this influence had greatly modified the opinious of the Jews. Nations cannot altogether select the medium in which they live, nor resist its influence, however vigorously they cling to an hereditary faith. Whatever they may have acquired in their inter- course with Persia must have already passed into Jewish thought generally, and probably had no special connexion with the origin of the Essenes ; but may we not assume with Zeller some direct and express influence of the Neo-Pytha- goreans as that which gave Essenism its distinctive cha- racter? As Josephus himself says, the Essenes live the same kind of life as the Pythagoreans. The Essenes cer- tainly did realize the Pythagorean ideal. In beliefs, insti- tutions, and tendencies we are struck by their close resem- blance. It is not impossible they were directly connected. Still the second century before Christ is too early a date to look for such a strong manifestation of Neo-Pytha- goreanism on Jewish soil. Besides we have all the data for explaining the origin of the Essenes without supposing any direct influence of the Neo-Pythagorean school. Greek culture was widely diffused among the Jews; the Greek philosophy was accessible to their scholars; Jewish thought could not but obey the impulse of the dominant civiliza- tion, and could not avoid more or less completely moving in parallel directions. So much must be conceded as to the medium in which the thoughtful Jewish intellect lived. On the other hand, like causes produce like results in all countries. Certain

~~conditions of civilization have favoured the formation of secret societies, with analogous institutions, in all ages. Accordingly, while we cannot fail to perceive a general affinity to Greek and Oriental thought in the tenets and institutions of the Essenes, we see still more clearly the proverbial intensity of the Jews, seeking in an organized seclusion from the world that satisfaction which they could not find in a disturbed and decaying national life. The Jewish people were unhappily hastening to the final catastrophe ; misrule, corruption, and fanaticism were everywhere gathering head; good men despaired of con- trolling such a headlong and turbulent movement; what could they do but withdraw from it, and cultivate a purer life under such conditions as secured or admitted it, in the exclusive society of men like-minded with themselves?~~

~~The original sources of our knowledge of the Essenes have been mentioned at the beginning of this paper; the best modern dis- cussions of them are to be found in such works as Zeller's Philo- sophie der Griechen, vol. iii.; Ewald, Geschichte d. V. Israél, iii. 419-428; Reuss, La theologie chrétienne aw siécle apostolique, i. 122-131; Keim, Life of Jesus of Nazara, vol. i.; Canon Lightfoot on the Colossians. : F (LEK)~~

~~ESSEX, the tenth in size of the English counties, is situated on the S.E, coast, and is consequently bounded on the E. and S.E, by the North Sea. On thie 8S. it is separated from Kent by the river Thames, on the W. from Middlesex and Hertfordshire by the Lea and the Stort, and on the N.E. from Suffolk by the Stour, while on the N. it is conterminous with Cambridgeshire.~~

~~Essex contains 1,055,133 acres, or 1648 square miles. The population in 1851 was 369,318; in 1861, 404,834 ; and in 1871, 466,436 (233,903 males and 232,533 females). The increase is found to be almost entirely in the south-western corner of the county contiguous to the metropolis, —the parish of West Ham, which by the last census contained 62,919 inhabitants, being now estimated to have about 110,000. The coast has an exceedingly irregular outline, and, short as it is, it is deeply indented by estuaries of no less than three rivers—the Stour at Harwich, the Blackwater and Colne at Maldon, and thie Thames ; and as may be~~

~~suggested by this fact, the seaboard entirely lacks the bold and rugged beauty of the shores ef the west of England. The rivers, with the exception of the Thames, are insignificant; and so far as they are~~

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~~ESS~~

~~navigable they are useful chiefly for the transport of agri- cultural produce. Harwich is the only considerable har- bour, but Wiveuhoe, on the Colne, is celebrated for its yacht-building, The sea has within historic times en- croached upon the land; and near Walton, on the Naze, ruins of buildings have been discerned at low water on a shoal known as the West Rocks, five miles out. On the cliffs of Walton are to be found interesting geological remains, In the parish of Dagenham there is a large tract at a lower level than the river, protected by an extensive dyke, which was restored in 1723 at an expense of nearly £42,500.~~

~~The Crouch, the Blackwater, and the Colne all supply favourite beds for oyster layers; and lawsuits to determine the right of dredging in these rivers have been pending for years. Barking sends out a large fleet of fishing smacks in the pursuit of turbot, soles, cod, &c.~~

~~Geologically the county rests almost entirely upon the London clay, which has been frequently pierced and found to be of great thickness. At Lamarsh, during the con- struction of the Stour Valley Railway, parts of a fossil elephant were discovered in a gravel stratum 14 feet below the surface. The soil of the southern and eastern portions is mostly of a rich alluvial character, with occasional traces of gravel; the Roothings in the centre are clay; but the northern district is sound loam, becoming lighter as it approaches Cambridgeshire. 'The landscape varies in like degree, the flat, uninteresting, but fertile grazing grounds~~

~~'near the coast and rivers providing a strong contrast to the~~

~~undulating and frequently hilly neighbourhoods of Dan- bury, Baddow, Wickham, Weald, Laindon Hills, Havering, Warley, and Hedingham.~~

~~The roads of this county could hardly be surpassed ; with a clay soil foundation, they have fur generations been re-~~

~~paired with flints picked by women and children from the~~

~~surface of the fields,—an industry which will die out under the new Education Acts. Gravel is difficult of access, and some of the inland towns are purchasing granite for their streets ; near Good Easter and Chignal, not ten miles from Chelmsford, the road surveyors are driven to the expedient of collecting pebbles from the brooks. With the exception of chalk for lime (mainly obtained at Ballingdon in the north and Grays in the south), septaria for making cement, and clay for bricks, the underground riches of the county are meagre, and it is to agriculture that we must look for the internal resources of Essex.~~

~~For the large quantity and the fine quality of both its wheat and its barley Essex has long been famous. Hssex wheat is one of the standard quotations of the London markets, and thousands of quarters are exported to the north of England, as well as to France, for seed purposes ; the Essex Rough Chaff, the Nursery, the Golden Drop, and the Taunton Dean, all flourish in perfection. What tlie barley lacks in delicacy of appearance and in fineness of skin, it makes up for in weight and size of berry, and in its kindly nature in malting. Beans are a prolific crop in most parts of the country, and pease, both for harvesting and for picking green for the London market, produce abundantly. The enormous importations from Russia and Sweden have caused farmers to neglect the cultivation of oats, and to turn their attention to the growth of the more lucrative barley; and the acreage of mangel-wurtzel and of kohl- rabi is gradually increasing, to the diminution of the more precarious turnip crop. The system of agriculture has undergone changes so great that the men of two generations ago could scarcely now recognize the face of the country, nor comprehend the routine of the farm. The extrava- gantly high and wide fences and the cramped little fields have given way to a more~~

~~intelligent scheme ; the anti- quated four-course shift is seldom heard of except in cove-~~

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~~nants controlling the last period of leases; long fallows are abandoned; steam cultivation has become general; the sickle is replaced by the reaping-machine, and other machines are employed to mow the grass, and shake it out, gather it, and even to "cock" it and elevate it to the stacks; in like manner the cereal crops are sown, hoed, reaped, stacked, aud thrashed by a force superior to, and cheaper than, manual power; and the employment of women and gangs of children in the fields, once so general, is now the excep- tion. The generous treatment of the land by the farmers of the county has been followed by corresponding concessions on the part of the landowners; and although the recent Agricultural Holdings Act has become nearly a dead letter owing to landlords 'contracting themselves out of the Act," yet there is for the most part a mutual good feeling between owner and occupier, and in cases where leases are granted the covenants are practical and liberal. It is probable, however, that in no county. in England is the phrase "farming by the custom of the country" so vague and elastic as in Essex; the system which is successful "on the flat" in the district north of Finchinefield and Rad- winter would be ruinous or impossible in Dengie Hundred, with its deep furrows drawn by powerful and costly teams between the narrow reaches of Purleigh, Mundon, and Latchingdon ; notwithstanding, both districts produce excellent crops. Not the least interesting feature in the agriculture of the county is the rapid disillusion which has taken place with regard to the growth of certain varieties of farm produce, which it was supposed could only be raised on certain soils and in certain districts,—notably the culti- vation of root crops and of barley, which now take their place in the ordinary rotation nearly throughout Essex. There are, it is true, localities particularly favourable to certain crops, and at Castle Hedingham, at Sible Heding- ham, and Coggeshall, and at Feering we find seed-growing practised both for the farm and the garden; at Wethers- field, Shalford, Hedingham, and Bocking are hop-grounds, which are, however, gradually dying out; Tiptree Heath supplies large~~

~~quantities of fruit, used principally by the London traders for preserving ; the teasel and the aromatic seeds, coriander and caraway, have well-nigh disappeared; onions, French beans, cabbages, potatoes, indeed all kinds of vegetables, are produced at Barking, Rainham, Aveley, and the neighbourhood, whence they are transferred by road to Covent Garden Market. Agricultural horses are imported from Suffolk, Norfalk, Lincolnshire, and Belgium, comparatively few being bred at home. Several herds of shorthorns have been established, but thousands of stare bullocks are introduced from Norfolk, Lincolnshire, Ireland, and Wales; of sheep there are but few distinct flocks; the pig tribe is represented by a high-class Berkshire type,—the "improved Essex," a breed introduced by the late Fisher Hobbs, having become absorbed by frequent crossing. From the comparative dryness of the climate Essex does not excel in pasturage, and in consequence the majority of farmers devote their attention to winter grazing, aud fatten their stock upon roots, ent hay, bean-meal, pease-meal, and vast quantities of oileake, usually of American manufacture. The county possesses one of the largest and most in- fluential agricultural associations in the kingdom, number- ing between 800 and 900 members, and giving away from £1500 to £1900 annually in prizes, many of which are open for competition to all England; the chamber of agriculture has 600 subscribers. Attempts at sewage farming have been made in several localities, but in most cases the sewage farm is looked upon as a necessary evil. Many of the minor towns have their sewage farm attached, but the disposal of the drainage usually exhausts any possible remuneration for the excessive outlay.~~

~~Essex, which was at one time famous for the extent of |~~

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~~| its forests, has for many years been decreasing its acreage of woodland. Epping Forest, which is of the estimated extent of 60,000 acres, has been in jeopardy of encroach- nent, but by the "Epping Forest Act, 1871," a board of commissioners was appointed for the better management of the lands; the corporation of the city of London has acquired by purchase the freehold interest of waste land belonging~~

~~to the lords of the manor, thus, at an outlay of £59,000, securing 800 acres for the benefit of the public for ever; the Ancient Court of Verderers has also beeu revived, and consists of an hereditary lord warden together with four verderers elected by freeholders of the county. The celebrated Fairlop oak, which measured 45-feet in girth, was blown down in 1820; the largest now standing is only 18 feet in girth, Hainault Forest was disafforested in 1851.~~

~~The landowners of Essex number 22,305, of whom 14,833, or 663 per cent., hold less than one acre each, the proportion for all England being 71 per cent. The gross estimated rental is put at £2,166,077, or £2, 5s. Ofd. per acre, as compared with £3, Os. 21d. for all England. From the return of 1873 we find that of owners possessing more than 5000 acres each, Lord Petre, Thorndon Hall, owns 19,085 acres; Lord Braybrooke, Audley End, 9684; Executors of Lord Maynard, Easton Lodge, 8617; Lord Rayleigh, Terling Place, 8536; the Governors of Guy's Hospital, 8400; Sir T. C. C. Western Felix Hall, 7875; R. B. Wingfield Baker, Orsett Hall, 7579; J. Archer Homblon, Great Hallingbury, 7127; J. Jolliffe Tufnel, Langleys, 6582; Mrs Honywood, Markshall, 6436; Colonel Bramston, Skreens, 6318; Executors of T. G. G. White, Berechurch Hall, 5600; Crown property, 5526; the Governors of the Charter House, 5481; Sir C. Du Cane, Braxted Park, 5409; the Countess Waldegrave, Dudbrook, 5108,~~

~~The manufacturing establishments in the county com- prise the various iron works at Chelmsford, Colchester, Maldon, Colne, Halstead, and Rayne (which supply agri- cultural implements for local use), important crape factories at Bocking and Halstead, a large manufactory of rich damasks and satins for furniture at Bocking, and a con- siderable jute factory at Barking. There are also Govern- ment gunpowder mills at Waltham Abbey.~~

~~The county forms nineteen " hundreds," each comprising several parishes, and one "liberty," that of Havering-atte- Bower, which includes Hornchurch and Romford. The "liberty " has a special jurisdiction of its own, indepen- dent of the county, having its own high~~

~~steward, magis- trates, clerk of the peace, coroner, and quarter sessions for the trial of offences committed within the borders of three parishes.~~

~~The principal towns are Colchester (population, 26,343), Chelmsford (9318), Maldon (population of parliamentary borough, 7151), Romford (6335), Harwich (6079), Halstead (5783), Barking (5766), Saffron Walden (5718), Braintree (4790), Witham (3347), Dunmow (3342). For parlia- mentary purposes the county is divided into three constitu- encies, east, south, and west, each returning two members; the borough of Colchester also sends two representatives to the House of Commons, while Maldon and Harwich elect one each, making a total of ten members. There are 250 justices of the peace for the county, which is divided into 18 petty sessional divisions. There are 17 poor law unions, 10 local boards of health, and 62 school boards. A large camp at Colchester, usually containing 3000 infantry and 1000 artillery and cavalry, is the headquarters of the eastern district of England, Great Warley being the military centre for Essex. Two regiments of militia are established, the Essex rifles and the West Essex regiment, having their head-quarters at Colchester and at Chelmsford respectively.~~

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~~According to the recent alterations in the arrangement of the circuits, Essex, Herts, Suffolk, Norfolk, Cambridge- shire,and Huntingdonshire are included in the south-eastern circuit, formed by the amalgamation of the home circuit with a portion of the Norfolk circuit. Ecclesiastically Essex be- longs to the new diocese of St Albans, instead of Rochester, as formerly. The new see, which also embraces Herts, has a population of 659,152, and an area of 2268 square miles. The county lunatic asylum is situated between Brentwood and Warley barracks; there is an infant orphan asylum at Wanstead, and a seaman's orphan asylum at Snaresbrooke.~~
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~~Essex is comparatively poor in prehistoric remains, but for this it is richly compensated by the variety and value of its Roman and medizval antiquities. The so-called Dane-pits not improbably belong to the pre-Roman period : they are almost certainly shafts sunk for chalk, and we know that at a very early date this material was ex- ported from Britain to the Continent. By some antiquaries Lexden is regarded as the site of the British town of Camulodunum, and certain mounds are identified with its defences, We know from history that within the present boundaries of Essex the Romans had not only their great central post of Camulodunum, but also stations called Durolitum, Cesaromagus, Canonum, Iceanum, and Othona. The site of several of these, however, is still matter of debate. Durolitum was possibly at or near Romford, no Roman remains having been found at Layton, which was once selected from a very superficial similarity of name ; Cesaromagus is usually identified with Chelmsford, and Iceanum with Chesterford ; and there is little or no doubt that Othona, the Ithanceaster of Bede, was situated near Bradwell. Roman military works have been recognized at Danbury, Tilbury, Harwich, Pleshy, &c., Roman dwelling- houses discovered at Chelmsford, at Sunken Church Field, near Hadstock, at Ridgewell, &c., and Roman cemeteries or tombs at Chelmsford, Chesterford, Hadstock, Bartlow, Coggeshall, and Wormingfield. At Wormingfield alone hundreds of urns have beenexhumed. Large quantities of Roman ware have turned up at Stifford and Canvey Island ; and Hallingbury church is far from the only building that has been indebted to the Roman brickmakers. Of Roman works of art discovered in the county perhaps the most reniarkable are the Colchester Sphinx and an effigy of a centurion unearthed in the same city. A Roman road connected London with Camulodunum, and another ran from Camulodunum to Cambridge, and sent off a branch to St Albans. It is supposed by many antiquaries that Saxon masonry can be detected in the foundations of several of the Essex churches, but, with the exception of Ashing- don church tower, believed to have been erected by Canute after his victory over Edmund Ironside, there is certainly no very recognizable building belonging to that period, This is probably to be in part ascribed to the fact that the comparative scarcity of stone and the unusual abund- ance of timber led to the extensive employment of the latter material. Many of the~~

~~Essex churches, as Black- more, Mountnessing, Margaretting, and South Bemfleet, have still massive porches and towers of timber; and St Andrew's church, Greenstead, with its walls of solid oak, continues an almost unique example of its kind. Of the four "round churches" in England one is in Essex at Little Maplestead ; but it is both the smallest and the most modern. The churches of South Weald, Hadleigh, Blackmore, Heybridge, and Hadstock may be mentioned as containing Norman masonry ; Southchurch, Danbury, and Boreham as being partly Early English ; Ingatestone, Stebbing, and Tilty for specimens of decorated architec- ture ; and Messing, Thaxted, and Saffron Walden as speci- mens of the Perpendicular. Stained glass windows have |~~

~~left their traces in several of the churches, the finest remains being those of Margaretting, which represent a tree of Jesse and the daisy or herb Margaret. Paintings have evidently been largely used for internal decoration : a remarkable series, probably of the 12th century, but much restored in the 14th, exists in the chancel of Cop- ford church ; and in the church at Ingatestone there was discovered in 1868 an almost unique fresco representa- tion of the seven deadly sins. The oldest brasses preserved in the county are those of Sir William Fitz-Ralph at Pebmarsh, about 1323 ; Richard of Beltown, at Corringham, 1340; Sir John Gifford, at Bowers Gifford, 1348; Ralph de Kneyton, at Aveley, 1370; Robert de Swynbourne, at Little Horkesley, 1391; and Sir Ingelram de Bruyn, at South Ockendon, 1400. The brass of Thomas Heron, aged 14, at Little Ilford, though dating only from 1517, is of interest as a picture of a schoolboy of the period. Ancient wooden effigies are preserved at Danbury, Little Leighs, and Little Horkesley,~~

~~Essex was rich in monastic foundations, though the greater number have left but meagre ruins behind. The Benedictines had an abbey at Saffron Walden, nunneries at Barking and Wickes, and priories at Monk's Colne and Hedingham ; the Augustinian canons had an abbey at Waltham (see WatTHamM ABBEY), priories at Thoby, Blackmore, Bicknacre, Little Leighs, Little Dunmow, and St Osyth; there were Cistercian abbeys at Coggeshall, Stratford, and Tilty ; the Cluniac~~

~~monks were settled at Prittlewell, the Premonstratensians at Beleigh Abbey, and the Knights Hospitallers at Little Maplestead. Barking Abbey is said to date its first origin from the 7th century, the most of the others arose in the 12th and 138th centuries. Besides the keep at Colchester there is a fine Norman castle at Hedingham, and two dilapidated round towers still stand at Hadleigh. Ongar, the house of the De Lacys, and Pleshy, the seat of the earls of Essex, have left only mounds behind them. Havering, the palace that was occupied by so many of our queens, is replaced by a modern house ; Wickham, the mansion of the bishops of London, is no more; and Theobald's Park, the splendid creation of Lord Burleigh, has shared the same fate. New Hall, which was successively occupied by Henry VIIL., Elizabeth, the earl of Essex, George Villiers duke of Buckingham, and Cromwell, is now a nunnery of the order of the Holy Sepulchre. Audley End, the mansion of Lord Braybrook, whose name is so well known in connexion with Essex antiquities, is a noble example of the domestic architecture of the Jacobean period; Layer Marney is an interesting proof of the Italian influences that were at work in the time of Wolsey. Horcham Hall was built by Sir John Cutt in the reign of Henry VII., and Gosfield Hall is of about the same date.~~

~~Its position in the south-eastern corner of England, and its con- tiguity to the metropolis, have given Essex no small prominence in the general history of England. The Romans of the first invasion (55 B.c.) received the nominal submission of its British inhabitants, the Trinobantes, who also occupied portions of what arc now Middlesex, Suffolk, Hertfordshire, and Cambridge. We have nu- mismatic evidence of no inconsiderable civilisation among this tribe in the following generation: Cunobelin or Cymbeline is well known from his coins, and his son Caractacus is the great hero of the national defence against the second Roman invasion. The defence, as is well-known, was futile: Camulodunum, the Trinobantian capital, was captured ; and Aulus Plautius made it the seat of a magnificent temple to the honour of Claudius the emperor. Dur- ing the great Boadicean rebellion, the Romans were driven from their post with terrible slaughter, but they soon recovered their ground and rapidly colonized the country. How thoroughly they took root can be read to this day in the relics they have~~

~~left. When the Saxons from over the sea began to make raids on the decadent colony, Essex formed part of the domain of the count of the Saxon Shore; and not long after the withdrawal of the Roman forces it was occupied by the men whose name it still bears, the East Seaxa or East Saxons. Their separate dynasty continued till~~

~~about 823, when they were incorporated with the rising power of Wessex, which was destined to widen into England. By the peace of Wedmore, Essex was recognized by Alfred as part of the Danish territory of Guthrum, but the Danes were expelled by Alfred's son, Edward the Elder. They have probably left a few traces of their presence in such names as Danbury and Dane-holes; but there is aardly a by to be met with among the numerous Saxon /ords, wealds, hams, thorps, burys, and ings. The futile attempt of Mellitus left the Christianization of the East Saxons to Cedd, who is said to have formed churches at Tilbury and Ithanceastre in the latter part of the 7th century. In 991 a great battle was fought at Maldon against the Danes, made memorable for ever to English- men by a Saxon song which celebrates the valour of Brihtnoth and his peers ; and it was probably at Ashington on the Crouch that in 1016 Cnut and Edmund Ironside met in what the early chroni- clers call the battle of Assandun. In 1045 Essex was part of the earldom of Harold. The family of Swene of Essex, who was in possession of a large part of the county at the time of the Con- quest, kept its ground for nearly a century. A new earldom created by Stephen was held by the Mandevilles till 1227, passed by mar- riage to the Bohuns, and went with the daughter of Humphrey de Bohun to Thomas of Woodstock, son of Edward III. Through his daughter it passed to William Bourchier, but the male line failed in 1540. The earldom was next assigned to Thomas Cromwell and William Parr, and from 1571 to 1646 it was held by the family of Devereux. Two years after the death of the last earl, who had joined the Parliamentary party, the city of Colchester was besieged and captured by the Parliamentary forces ; and throughout the struggle the people of Essex were mainly on the popular side. After the Res- toration, Arthur Capel was created Earl of Essex, and that family is still in possession of~~

~~the title. Of the celebrities of Essex it is sufficient to mention Samuel Purchas, Joseph Mead, John Ray, Joseph Strutt, Philemon Holland, Dr William Gilbert, Thomas Tusser, Francis Quarles, Thomas Gainsborough, and Dick Turpin.~~

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~~connected with the county is given by H. W. King in vol. ti. of the 7ransactions, 1863. (C. P. W.)~~

~~ESSEX, Watter DrveREux, First Earu or (1540- 1576), in the Devereux line, the eldest son of Sir Richard Devereux, was born in 1540. He succeeded his grand- father as Viscount Hereford in 1558, and in 1561 or 1562 he married Lettice, daughter of Sir Francis Knollys. In 1569 he served as high marshall of the field under the earl of Warwick and Lord Clinton, and materially assisted them in suppressing the northern insurrection. For his zeal in the service of the queen on this and other occasions, he in 1572 received the garter and was created Earl of Essex, a title which formerly belonged to his family through marriage with the Mandevilles. His honours had been merited more by good intentions than by actual achievements; and eager to give proof of " his good devotion to employ himself in the service of her Majesty," he offered on certain condi- tions to subdue and colonize, at his own expense, a portion of the Irish province of Ulster, at that time completely under the dominion of rebel chiefs. His offer, with certain modi- fications, was accepted, and he set sail for Ireland in August 1573, accompanied by a number of earls, knights, and gentlemen, and with a force of about 1200 men. The heginning of his enterprise was inauspicious, for on account of a storm which dispersed his fleet and drove some of his vessels as far as Cork and the Isle of Man, his forces~~

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~~did not all reach the place of rendezvous till late in the autumn, and he was compelled to entrench himself at Belfast for the winter. Here, by sickness, famine, and desertions, his troops were diminished to little more than 200 men, and he almost determined to abandon his undertaking; but receiving in the spring a reinforcement, he compelled the submission of Sir Brian MacPhelim, massacred bystratagem 200 of the O'Neils, taking Sir Brian O'Neal prisoner, and induced the earl of Desmond to surrender himself to the deputy Fitzwilliam. Elizabeth, however, instigated most probably by Leicester, after encouraging Essex to prepare to invade Trilogh Lenogh, suddenly commanded him to "break off his enterprise ;" but as she left him a certain~~

~~discretionary power, he took advantage of it to defeat Trilogh Lenogh, chastise Antrim, and massacre several hundreds of persons, chiefly women and children, discovered hiding in the caves of Rathlin. He returned to England in the end of 1575, resolved " to live henceforth an untroubled life ;" but he was ultimately persuaded to accept the offer of the queen to make him earl marshal of Ireland. He arrived in Dublin in September 1576, and three weeks afterwards died of dysentery. There were suspicions that he had been poisoned by Leicester, who shortly after his death married his widow, but these were not confirmed by the post mortem examination. The endeavours of Essex to better the condition of Ireland were, it must be admitted, a dismal failure; and the massacres of the O'Neals and of the Scots of Rathlin leave a somewhat dark stain on his reputation. But in judging of his achievements, it must be. remembered that the problem which he had under- taken to solve was exceptionally difficult, that his own energetic efforts were constantly thwarted by the jealousy of Fitzwilliam and the vacillatious of Elizabeth, and that he died before his abilities could be sufficiently tested ; and in estimating his character we must set over against his acts of cruelty, which the opinion of the time approved, his honesty and uprightness, and the noble generosity with which he devoted his life and fortune to the performance of a thankless task.~~

~~See Lives of the Devereux Earls of Essex, by the Honourable Walter Bouchier Devereux (1853), and Froude's History of Eng- land, vol. x.~~

~~ESSEX, Rosert Devereux, Second Eart or (1567— 1601), son of the preceding, was born at Netherwood, Herefordshire, November 10, 1567. He entered the university of Cambridge in 1577, and graduated in 1581. He appeared at court in 1584. In 1585 he accompanied the earl of Leicester on an expedition to Holland, and greatly distinguished himself at the battle of Zutphen. In 1587 he was appointed master of the horse, and in the following year was made general of the horse, and installed knight of the garter. On the death of Leicester he suc- ceeded him as chief favourite of the queen, a position which injuriously affected his whole subsequent life, and ultimately resulted in his ruin. While Elizabeth was approaching the mature age of sixty, Essex was scarcely twenty-one. Though well aware of the advantages of his~~

~~position, and somewhat vain of the queen's favour, his constant attendance on her at court was irksome to him beyond all endurance ; and when he could not make his escape to the scenes of foreign adventure after which he longed, he varied the monotony of his life at court by intrigues with the maids of honour. In 1589, without the queen's consent, he joined the expedition of Drake and Norreys against Portugal, but on the 4th June was com- pelled to obey a letter enjoining him at his " uttermost peril" to return immediately. Soon after his return occurred his famous duel with Sir Charles Blount, a rival favourite of the queen, in which the earl was disarmed and~~

~~slightly wounded in the thigh. In 1590 Essex married the widow of Sir Philip Sidney, but in dread of the queen's anger he kept the marriage secret as long as possible. When it was necessary to avow it, her rage at first knew no bounds, but as the earl did " use it with good temper," and "for her majesty's better satisfaction was pleased that my lady should live retired in her mother's house," he soon came to be "in very good favour." In 1591 he was appointed to the command of a force auxiliary to one formerly sent to assist Henry IV. of France against the Spaniards; but after a fruitless campaign he was finally recalled from the command in January 1592. For some years after this, most of his time was spent at court, where he held a position of unexampled influence, both on account of the favour of the queen, and from his own personal popularity. In 1596 he was, after a great many "' changes of humour" on the queen's part, appointed along with Lord Charles Howard to the command of an expedition, which was successful in defeating the Spanish fleet, capturing and pillaging Cadiz, and destroying 53 merchant vessels, It would seem to have been shortly after this exploit that the beginnings of a change in the feelings of the queen towards him came into existence. On his return she chided him that he had not followed up his successes, and though she professed great pleasure at again seeing lim in safety, and was ultimately satisfied that the abrupt termination of the expedition was contrary to his advice and remonstrances, she forbade him to publish anything in justification of his conduct. She doubtless was offended at his growing tendency to~~

~~assert his inde- pendence, and jealous of his increasing popularity with the people; but it is also probable that her strange infatuation regarding her own charms, great as it was, scarcely prevented her from suspecting either that his pro- fessed attachment had all along been somewhat alloyed with considerations of personal interest, or that at least it was now beginning to cool, Francis Bacon, at that time his most intimate friend, endeavoured to prevent the threatened rupture by writing him a long letter of advice ; and although perseverance in a long course of feigned action was for Essex impossible, he for some time attended pretty closely to the hints of his mentor, so that the queen "used him most graciously." In 1597 he was appointed master of the ordnance, and in the following year he obtained command of an expedition against Spain. He gained some trifling successes, but as the Plate fleet escaped him he failed of his main purpose ; and when on luis return the queen met him with the usual reproaches, he retired to his home at Wanstead. This was not what Elizabeth desired, and although she about this tire con- ferred on Lord Howard the earldom of Nottingham for services at Cadiz, the main merit of which was justly claimed by Essex, she ultimately held out to the latter the olive branch of peace, and condescended to soothe his wounded honour by creating him earl marshal of England. That nevertheless the irritated feelings neither of Essex nor of the queen were completely healed was manifested shortly afterwards in a manner which set propriety com- pletely at defiance. In a discussion on the appointment of a lord deputy to Ireland, Essex, on account of some taunting words of Elizabeth, turned his back upon her with a gesture indicative not only of anger but of contempt, and when she, unable to control her indignation, slapped him on the face, he left her presence swearing that such an insult he would not have endured even from Henry VIII. In 1599, while Ulster was in rebellion, the office of lord deputy was conferred on Essex, but whether at his own express wish, or only after he was persuaded against his will to accept it, has been disputed. This point has an Important bearing on the further question of the origin~~

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of Essex's treacherous designs. His campaign was an unsuccessful one, and by acting in various ways in opposi- tion to the commands of the queen and the council, and suddenly leaving the post of duty with the object of privately vindicating himself before the queen, he laid himself open to charges more serious than that of mere incompetency. for these misdemeanours he was deprived of all his high offices, and ordered to live a prisoner in his own house during the queen's pleasure. Chiefly through the intercession of Bacon his liberty was shortly afterwards restcred to him, but he was ordered not to return to court. For some time he hoped for an improvement in his pros- pects, but when he was refused the renewal of his patent for sweet wines, hope was succeeded by despair, and half maddened by wounded vanity, he made an attempt to incite a revolution in his behalf, by parading the streets of London with 300 retainers, and shouting, "For the queen! a plot is laid for my life!" These proceedings awakened, however, scarcely any other feelings than mild perplexity and wonder; and finding that hope of assist- ance from the citizens was vain, he returned to Essex House, where after defending himself for a short time he surrendered. After a trial—in which Bacon, who prose- cuted, delivered a speech against his guondam friend and benefactor, the bitterness of which was quite unnecessary to secure a conviction entailing at least very severe punish- ment—he was condemned to death, and notwithstanding many alterations in Elizabeth's mood, the sentence was carried out 21st February 1601.

Essex was in person tall and well proportioned, with a countenance which, though not strictly handsome, possessed, on account of its bold, cheerful, and amiable expression, a wonderful power of fascination. His carriage was not very graceful, but his manners are said to have been " courtly, grave, and exceedingly comely." He was brave, chival- rous, impulsive, imperious sometimes with his equals, but generous to all his dependants and incapable of secret malice; and these virtues, which were innate and which remained with him to the last, must be regarded as some- what counterbalancing, in our estimation of him, the follies and vices created by temptations which were exceptionally strong, and which obtained additional power from the time and manner of their occurrence. He was one of the most learned noblemen of his time, and his abilities were con- siderable.and mauy-sided, but a fatal want of

~~prudence and self-government made him almost the necessary victim of the difficult position in which from his early manhood he had been placed, partly by circumstances, and partly by his own pardonable vanity.~~

~~Camden's Life of Elizabeth ; Secret History of Queen Llizabeth and the Earl of Essex, by a " Person of Quality," pub. at Cologne 1690, and afterwards at London; Devereux, Lives of the Earls of~~

~~Essex; and Bacon and Essex, by Edwin HE. Abbott, D.D., 1877. See also the article BAcon. (He)~~

~~ESSEX, Rosert Devereux, Tuirp Ear or (1591- 1646), the son of the preceding, was born in 1591. He was educated at Eton and at Merton College, Oxford. Shortly after the arrival of James I. in London, Essex was placed about the prince of Wales, as a sharer both in his studies and amusements. At the early age of fifteen he was married to Frances Howard, daughter of the earl of Suffolk, but on account of the latter's connexion with Rochester (afterwards earl of Somerset), the marriage was annulled in 1613. A second marriage which he contracted in 1629 or 1630 with Elizabeth, daughter of Sir William Paulet, also ended unhappily. From 1620 to 1623 he served in the wars of the Palatinate, and in1625 he was vice- admiral of a fleet which made an unsuccessful attempt to capture Cadiz. In 1639 he was lientenant-general of an army sent by Charles against the Scotch Covenanters ; but~~

~~on account of the irresolution of the king no battle occurred, and the army was disbanded at the end of the year. Essex was discharged " without ordinary cereniony," aud refused an office which at that time fell vacant, " all which," says Clarendon, "wrought very much upon his rough, proud nature, and made him susceptible of some impressions afterwards which otherwise would not have found such easy admission." Having taken the side of the Parliament against Charles, he was, on the outbreak of the civil war in 1642, appointed to the command of the Parliamentary army. At the battle of Edgehill he remained master of the field, and in 1643 he captured Reading, and~~

~~relieved Gloucester ; but in the campaign of the following year, on account of his hesitation to fight against the king in person, nearly kis whole army fell into the hands of Charles, In 1645, on the passing of the self-denying ordinance, providing that no member of parliament should hold a public office, he resigned his commission ; but on account of his past services his annuity of £10,000 was continued to him for life. He died 4th September 1646, of a fever brought on by over-exertion in a stag-hunt in Windsor Forest.~~

~~Life of Robert Karl of Essex, by Robert Codrington, M.A., printed in Hart. AMisc.; Clarendon's History of the Rebellion; and Devereux, Lives of the Earls of Essex.~~

~~ESSLINGEN, a town of Wiirtemberg, circle of the Neckar, is situated on the river of the same name, and on the railway from Stuttgart to Ulm, 9 miles N.E. of Stuttgart. It is surrounded by walls, and has five suburbs, one of which is on an island in the river. On a commanding height above the town stands an old castle. The church of our lady is a fine Gothic edifice, built in the middle of the 15th century, and has a beautifully sculptured doorway and a tower 230 feet high. The church of St Dionysius dates from the 11th century, and possesses a fine screen and ciborium of 1486. The town hall is a handsome building. Esslingen has a richly endowed hospital, an orphan asylum, and a normal and other schools; and near the town there is a hydropathic establishment for the relief of the insane. The manufactures include woollen and cotton stuffs, hard- ware, and machinery. Esslingen was founded about the Sth century, became a free imperial city in 1209, and in 1801 was annexed to Wiirtemberg. The population in 1875 was 19,602. i~~

~~ESTAING, Cuartes Hector, Comte p' (1729-1794), a French admiral, was born at the chateau of Ruvel, Auvergne, in 1729. He entered the army as a colonel of infantry, and in 1757 he accompanied Count de Lally to the East Indies, with the rank of brigadier-general, In 1759 he was made prisoner at the siege of Madras, but was released on parole. Before the ratification of his exchange he obtained command of some vessels, and conducted Various naval attacks against the English ; and having, on his return to France in 1760, fallen accidentally into their~~

~~hands, he was, on the ground of having broken his parole, thrown into prison at Portsmouth, but as the charge could not be properly substantiated he was soon afterwards released. In 1763 he was named lieutenant-general in the navy, and in 1777 vice-admiral; and in 1778 he obtained the command of a fleet intended to assist the United States against Great Britain. In concert with the American generals, he planued an attack on Newport, preparatory to which he compelled the British to destroy Some war vessels that were in the harbour ; but before the concerted attack could take place, he put to sea against the English fleet, under Lord Howe, when owing to a violent storm, whicli arose suddenly and compelled the two fleets to separate before engaging in battle, many of his vessels were so shattered that he found it necessary to put into Boston for repairs. He then sailed to the West Indies~~

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~~where he captured St Vincent and Grenada, and compelled the English fleet to take refuge in the harbour of St Christopher. Despairing of the English leaving their place of refuge he set sail to attack Savannah, but all lis attempts, as well as those of the Americans, against the town were repulsed with heavy loss, and he was finally compelled to retire. Hereturned to France in 1780. He was in command of the combined fleet before Cadiz when the peace was signed in 1783; but from that time his chief attention was devoted to politics. In 1787 he was elected to the assembly of the notables; in 1789 he was appointed commandant of the national guard; and in 1792 he was chosen admiral by the national assenibly. Though in favour of national reform he continued to cherish a strong feeling of loyalty to the royal family, and on the trial of Marie Antoinette in 1793 bore testi- mony in her favour. On this account, and because of cer- tain friendly letters which had passed between him and the queen, he was himself brought to trial, and was executed April 28, 1794.~~

~~ESTATE, in English law, has many meanings, the common element of which is property. A man's cutire belongings constitute his estate: so much of it as consists of land and certain other interests associated~~

~~therewith is his Reat Estate; the rest is his Personan Estate. The legal incidents which distinguish the one from the other may be ascertained by reference to these headings. The word is more particularly applied to interests in land, and in popu- lar and general use an estate means the land itself. The strict technical meaning of an estate is an interest in lands, and this conception lies at the root of the English theory of property inland, " The first thing that the student has to do," says Mr Joshua Williams (Law of Real Property, p. 17), "is to get rid of the idea of absolute ownership. Such an idea is quite unknown to the English law. No man is in law the absolute owner of lands. He can only hold an estate in them." Thus he may hold an estate in fee simple, which is the largest estate a man can hold in English law, and comes close to the idea of absolute ownership, re- pudiated by Mr Williams ; or he may hold an estate tail, in which: the land is limited to himself and the heirs of his body ; or he may hold an estate for life, which lasts just so long as the life in question lasts. In all these cases the notion of tenure, of holding by a tenant from a lord, pre- vails. The last lord of all from whom all land is ultimately held is the king. Persons holding directly from the king and granting to others are the king's tenants 7 cupite, and are the mesne lords of their tenants. Even in the case of a fee simple estate, which a man can alienate as he pleases during his life or by his will, and which goes to his heirs if he does not alienate it, the reversionary right of the lord still remains, and may actually come iuto operation in the case of an EscueatT (q.v.). For the special characteristics of different estates or land, see Reat Estate.~~

~~ESTATES OF THE REALM. The proper meaning of this phrase, as applied to the English constitution, has been the subject of some dispute. Of its original meaning there can be no doubt. It indicated a division of society into classes or orders, and in England these orders were the nobles, tlie clergy, and the commons. The same kind of division is found in Continental states. In England there are, aS Professor Stubbs has pointed out (Coxstitutional History of England, vol. ii, p. 189), indications of a tendency on the part of other orders of men to assume the character of estates. For example, the king used to treat with the merchants for grants of money to be raised by taxation from the general body of merchants throughout the country. In this~~

~~sense the lawyers may be said to have been af one time an incipient estate of the realm. The organiza- tion of parliament checked all such tendencies, and the~~

~~technical "three estates " were those we have mentioned. In the lapse of time the original meaning of the phrase has been gradually lost sight of. The clergy have ceased to be a separate order so far as the political organization of the country is concerned. The " three estates " came to be identified with the three great divisions of the legislative authority,—kings, lords, and commons, The phrase seems to have been used in this sense in the reign of Henry IV., and Hallam says it was a current doctrine among the popu- lar lawyers of the 17th century. According to another view, the three estates of the realm were "the lords spiritual, the lords temporal, and the commons." (See p. 314 of the present volume.)~~

~~ESTE, the ancient Ateste, a town of Lombardy, in the delegation of Padua, and 18 miles $.8.W. of the town of that name, is beautifully situated at the southern extremity of the Kuganean hills, on the canal of Monselice. It hasa very antique and picturesque appearance; its houses are mostly of medizeval date; and it possesses some ancient buildings of considerable interest. Chief of these is the Rocca or castle, a donjon tower with embrasures and battlements occupying the site of the original fortress of Este. The church of San Martino is of great antiquity, and has a leaning Romanesque campanile. The interior of the church has been modernized. Este also possesses a belfrey tower containing a clock made by the celebrated Dondi. The chief manufactures of the town are silk-twist, hats, earthenware, majolica, and saltpetre. Este, under the name of Ateste, existed as early as 136 B.c. In 452 it was destroyed by Attila; and afterwards it was rebuilt by the Lombards within a narrower area. The population in 1871 was 5743.~~

~~. ESTE, one of the oldest princely houses of Italy. Their genealogy, according to Muratori, can be traced back to the small princes who governed Tuscany under the Carlo- vingians, and who some time~~

~~afterwards received certain districts or counties from them in fief. They are in all probability of Longobard origin, but there is no authentic record of their succession reaching farther back than to the marquis Adalbert who died about 917. They were called Este after the town of that name, and the title marquis of Este was first borne by Atpert Azzo II, who married Kunitza or Kunigouda, sister of Welph or Guelph IIL, duke of Carinthia. Welph died without issue, and the eldest son of Kunitza, Welph IV., succeeded to his inheri- tauce, and marrying a daughter of Otho II., duke of Bavaria, was created duke of Bavaria, on Otho's death without male succession, in 1071. Through him the house of Este thus became connected with the princely houses of Brunswick and Hanover, from which are descended the sovereigns of England. The Italian title and estates were inherited by Futco I. (1060-1135), son of Albert Azzo II. by his second marriage to Garisenda, countess of Maine, in France. Hugo, the second son by this marriage, in- herited his mother's property in France, but as he died without issue, it ultimately came into the possession of Fulco and his successors. During the 12th, 13th, and 14th centuries, the history of the Estensi is interwoven with that of the other princely houses of northern Italy, of the struggles for supremacy between pope and emperor, of the contests between rival cities, and even of the factions into which individual cities were sometimes divided. From the rivalry between the German Welphs and Weiblungen the names Guelfs and Ghibelines came to be used to designate the two great rival Italian parties; and, as the head of the Guelf party, the Estensi received at different periods the sovereignties of Ferrara, Modena, and Reggio. They distinguished themselves also as the patrons of litera-~~

~~ture and the fine arts, and had intimate relations with Ariosto and Tasso,~~

~~Oxsizzo I., son of Fulco L, entered into a league against Frederick Barbarossa, and was comprehended in the Venetian treaty of 1177 by which municipal podestas were instituted. He was elected podesta of Padua in 1182; and in 1184 Frederick named him marquis of Milan and~~

~~Genoa, a dignity somewhat similar to that of imperial vicar. By carrying off Marchesella, heiress of the Adelardi family of Ferrara, and marrying her to his son Azzo V., he ob- tained for his family a predominant influence in that city also, but kindled a strife with the family of Torello which continued to rage for two centuries. Obizzo I. died about 1190; and Azzo V. died about eleven years later and was succeeded by Azzo VI. (1170-1212), who became the head of the Guelf party. During the whole lifetime of Azzo VI. a civil war raged almost uninterruptedly in the streets of Ferrara, each party, it is said, being ten times driven from the city. Azzo died in November 1212, and was succeeded by ALDOVRANDINO, who in 1213 concluded a treaty with Salinguerra Torello, by which the government of Ferrara was divided between them. He died in 1215, and was succeeded by his brother Azzo VIT. (1205-1264), surnamed JVovello or the Young. Between him and Eccelino III. de Romano, who leagued himself with the Torelli, a war broke out in 1229, and although a temporary recouciliation was effected in 1233, and Azzo was aftianced to Adelaide, niece of Eccelino, it was renewed after his marriage in 1235. At first Eccelino, who supported the cause of Frederick IJ., was completely victorious in Lom- bardy, but the influence of Pope Alexander VI. gradually helped to combine the towns of Lombardy against him, and Azzo also received the assistance of many fugitives whom the tyranny of Ecceline had driven from Padua and Verona. Finally, after two years indecisive skirmishing, Eccelino accepted battle at Cassano, 16th September 1259, and was completely defeated and taken prisoner, surviving his overthrow only a few days. Azzo died 17th February 1264, and was succeeded by Oxizzo IT. (1240-1293), who in 1288 received the lordship of Modena, and in 1290 that of Reggio. Obizzo was succeeded by his son Azzo VIIL., who was elected perpetual sovereign of Modena and Reggio. The two brothers of Azzo, however, laid claim the one to Modena and the other to Reggio, and succeeded in capturing from him both towns. He was also driven from Este, but an attempt to deprive him of Ferrara was unsuccessful. Azzo died 31st January 1308. He had no legitimate children, and, on account of the hos- tility towards him of his two brothers, he named as his successor his grandson Fulco IIL, by his illegitimate son Francis, but despairing of holding possession of Ferrara against the brothers of Azzo, Francis, acting for his infant son,~~

ceded it to the Venetians in lieu of an annual pay- ment, and retired with Fulco to Venice, where they died in obscurity.

After this the possession of Ferrara, Modena, Reggio, and their dependencies was disputed for some years with varying results by the Venetians, the pope, and rival members of the legitimate line of Estensi, but from the time of Azzo VIIL the Estensi annals are intricate, confused, and of little interest until Nicuonas III. (1384- 1441), who exercised sovereignty over Ferrara, Modena, Parma, and Reggio, was declared by Boniface IX. captain general of the army of the church, and enjoyed in his later years the intimate friendship of the duke of Milan. He died suddenly from poison, most probably admin- istered by his enemies at the court of Milan to prevent his being named the duke's successor. To him succeeded LIoNnEL, who died in 1450, and was succeeded by Borso, who was created duke of Modena and Reggio by Frederick III., and, by the pope, duke of Ferrara. Borso was a great patron of literature, and established a printing press at

Ferrara, He died in 1471, and was succeeded by his brother Hercutss I. (1443-1505), who, with the help of the Venetians, seized the sovercignty of Ferrara from Nicholas, the son of Lionel, and afterwards, with the help of Ferdinand king of Naples, retained it against the Venetians aud Pope Sixtus IV. The last twenty-five years of his reign were peaceful and prosperous, and his capital became noted both for its luxury and as the resort of nen eminent in literature and art. Count Boiardo the poet was his

minister, and Ariosto also obtained his patronage and ,

friendship. To Hercules succeeded Atpnonso I. (1486- 1534), who was married to Lucretia Borgia, daughter of

Pope Alexander VI. During nearly the whole of his reign

Alphonso was engaged in the Italian wars, and in his com- plicated and difficult position manifested so much energy and adroitness, and such

~~skill as a general, that for a long time he was almost uniformly successful in his enterprises. On the formation in 1508 of the league of Cambray against the republic of Venice he was appointed by Pope Julius I. to the supreme command of the papal troops ; but after the Venetians had sustained a considerable number of reverses they made peace with the pope, and agreed to join him against the French. Alphonso was invited to co-operate with the new alliance, and on his refusal war was declared against him; but although he at first lost Modena and Reggio, he subsequently inflicted a suc- cession of defeats on the papal troops. He was, however, desirous of peace, and had gone to Rome with the purpose of making submission to the pope, when the news that orders had been given for his arrest reached him in time ouly to enable him to make his escape. On the defeat~~

~~of the French by the combined arms of Charles V. and~~

~~Pope Leo X., the possessions of Alphonso were confiscated, but after the death of Leo he was reinstated in them by Charles V. He died on the 31st October 1534, and was succeeded by his son Hercuress II. (1508-1559), who married Renée daughter of Louis XII. of France, and, joining the league of Henry II. of France and Pope Paul UV. against Spain, was named lieutenant-general of the French army in Italy, and general of the army of thic church. The war was, however, prosecuted with little vigour, and peace was made with Spain in 1558. Hercules and his brother Cardinal Hippolytus the younger, were patrons of literature and art, and the latter built the splendid castle of Este. Hercules II. was succeeded by Atpuonso IL., well known on account of his imprisonment of the poet Tasso. Alphonso died in 1597 without issue, and bequeathed his estate to his cousin Casar (1562-1628), but Pope Clement VIII. laid claim to Ferrara, and by a treaty with Lucretia, sister of Alphonso, it was given up to the see of Rome. Cesar held Modena and Reggio, but with him the splendour of the house of Este began to fade, and from that time it plays only a very subordinate part in Italian history,~~

~~The subsequent heads of the Este family were At- Puronso III., who retired in 1629 to a monastery in the Tyrol, where he ended his days in~~

1644; Francis I. (1610-1658), who was general of the French army in Italy; AueHonso IV. (1634-1662), the father of Mary, the queen of James IJ. of England, who held a position in the French army during the Spanish war, and by whom was founded the gallery of pictures at Modena; Francis IT. (1660-1694), who originated the library of Este and founded the University of Modena; RrnaLpo (1665-1737), through whose marriage with Charlotte Felicitas of Bruns- wick, the long separated branches of the house of Este Were again united; Francis III. (1698-1780), who married the daughter of Philippe of Orleans, was named by the king of Spain generalissimo of the Spanish troops in Italy, had his duchy devastated by the imperial troops, but

was re-established in its possession by the treaty of Aix-la- Chapelle, and, having reconciled himself with Maria Theresa, received from her the title of governor-general of Lom- bardy; and, finally, HercuLes Rrnatpo (1727-1803), who at the peace of Campo Fermo lost the duchies of Modena and Reggio, and with whom the male branch of the house of Este died out. His only daughter was married to Ferdinand, third son of the emperor Francis I. Ferdinand was created duke of Breisgau, and dying in 1806 was succeeded by Francis IV., who in 1816 was restored to the duchy of Modena and Reggio, and on the death of his mother inherited also the duchy of Massa and Carrara. He died January 26, 1846, and was succeeded in 1846 by his son Francis V., who lost his possessions by the events of 1859. On his death in 1875 the male line of the Austrian branch of the Estensi became extinct, and the title passed to Archduke Francis eldest son of the Arch- duke Charles Louis. The children of Lady Murray daughter of the earl of Kintore, by her marriage with August Frederick duke of Snssex, sixth son of George III. of England, assumed the old name Este, and claimed recog- nition as members of the royal family; but as the marriage was in violation of an Act regarding royal marriages passed in 1772, it was declared invalid, and their claims were set aside,

See Muratori, Delle antichita Estense ed Staliane, Annali @ Italia, and Scriptores Rerum Italicarwm ; History of the House of Esté, London,

~~1681; Leo and Botta, History 'of Italy ; and Sismondi, Histoire des Républiques Italiennes.~~

~~ESTELLA, a town of Spain, in the province of N: avarre, is beautifully situated on the Ega, 25 miles S.W. of Pamplona. Its streets are wide and well paved, and it possesses several squares. It has six churches, three monasteries, an old castle, and a college which was formerly a university. Its principal industries are the manufacture of woollen and linen fabrics, and brandy making ; and it has also a considerable trade in fruits, winc, and cattle. The surrounding country is very fertile, producing oranges, lemons, and other fruits, which are largely exported to England. Estella commands several defiles on the roads from the Castiles and Aragon, and on that account occupies a position of considerable stratagetic importance. It was long the head quarters of Don Carlos, who was proclaimed king there in 1833. In 1873 it was the chief stronghold of the Carlists, and in 1874, when driven from other places, they succeeded in retiring to Estella. On the 19th Feburary 1875 the Carlists in the town surrendered unconditionally, and with its loss the power of that faction almost immediately collapsed. The population of Estella is about 6000.~~

~~ESTEPA, the ancient Astepa, a town of Spain, in the pro- vince of Seville, is situated on the north side of Mount San Francisco, 60 miles E.S.E. of Seville. Its smaller streets are narrow and steep, but the principal ones are wide, level, and regular. It possesses an old castle and an old Gothic church, the latter said to be of Moorish origin. Its chief industries are the manufacture of oil, and of various kinds of coarse woollen cloth; and it has also a trade in grain, fruits, and cattle. The population is about~~

~~7500.~~

~~ESTEPONA, a maritime town of Spain, in the province of Malaga, is situated on the Mediterannean, 25 miles E.N.E, of Gibraltar. It contains an ancient castle and a fine parish church. It carries on an active fishing and coasting trade. The manufactures are chiefly linen, leather, earthenware, and bricks. The vicinity is very fertile, pro- ducing~~

~~oranges, lemons, and other fruits, which are largely exported to England. The population of the town is about 9000,~~

~~ESTERHAZY. See EszreruAzy.~~

~~560~~

**~~ESTHER. The Book of Esther relates how a Jewish maiden, Esther, a foster-daughter of Mordecai, was raised to the position of queen by the Persian king Ahasuerus (Xerxes) after he had divorced Vashti; next, how she and her uncle Mordecai frustrated Haman's resolution to extir- pate the Jews out of the Persian empire ; how Haman fell, and Mordecai was advanced to his place; how Esther obtained the king's permission for the Jews to destroy all who might attack them onthe day which Haman had appointed by lot for their extirpation ; and lastly, how a festival was instituted to commemorate their deliverance. Its main object is to account for the origin of the feast of Purim, which from its cradle in the Persian capital had gradually made its way into other countries (sth. ix. 19-32). The colouring of the narrative is entirely foreign. Frequent and minute references are made to the usages of the Persian court, while on the other hand the peculiar in- stitutions of the Jews, and even Jerusalem and the temple, and the very name of Israel, are studiously, as it would seem, ignored. The name of God is not mentioned once, a phenomenon entirely unique in the Old Testament writ- ings. From a theological point of view, the book is there- fore not of much interest. It attracts the historical critic, however, by the strangeness and difficulty of its statements, while the ordinary reader cannot fail to be struck by the force and dramatic vividness of its literary form. Its early popularity is shown by the interpolated passages (as different as possible from the original) in the Septuagint and old Latin versions.~~

~~It was not until the 18th century that a critical examina- tion of the book was made, with a view to determine its~~

~~precise historical value, not, however, at first with sufficient |~~

~~impartiality or historical information, Eichhorn, the most moderate of the earlier critics, belongs to the 19th century. He has drawn up a long list of improbabilities of detail, some of which he thinks he can explain away, while others remain in full force. Subsequent critics have believed themselves to have discovered fresh difficulties, insomuch that Dr Kuenen does not hesitate to say that "impossibilities and improbabilities pervade the whole narrative " (Religion of Israel, iii. 148). It is impossible to mention more than a few of these as a specimen. The very first verses of the book are great stumbling blocks to a Western reader. We are there told that Ahasuerus, " who reigned from India even unto Ethiopia, over an hundred and seven and twenty pro- vinces," gave a banquet which lasted 180 days, and at which (if we take the expressions of tho narrative literally) the whole official world of the Persian empire was simultaneously present (Esth. i, 3, 4). Further on, we are told that Esther, on her elevation to be queen, kept her Jewish origin secret (ii. 10), although she had been taken from the house of Mordecai, who was known to be a Jew (iii. 4), and had remained in constant intercourse with him (iv. 4-17). We also learn indirectly that Mordecai, previously to his mourning, was able to pass at pleasure into the harem of the jealous and amatory Xerxes (iv. 2). Further, that Mordecai offered a gross affront to Harman without any evil consequences (iii. 2-6). Lastly, Hamar, the cruel grand- vizier, takes the trouble to give eleven months notice of his intention to exterminate the Jews (iii. 12-14), which re- spite is spent by the Jews in fasting (the narrative does not add praying) and lamentation (iv. 3), and when the danger has been averted through the patriotism of Esther, the Jews are allowed to put to death 75,000 of their fellow sub- jects (ize).~~

~~Nevertheless, it must at any rate be admitted that these objections are not all of equal value, and that a comparison of the narrative of Esther with the later additions to the book, and with the stories of Judith and Tobit, is distinctly favourable to its historical verisimilitude. Some amount~~

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~~of exaggeration must be allowed for, as the infirmity of an Oriental race ; no exegesis is possible without such a postu- late. As for the Persian customs described, they are no doubt singular, but, in the absence of documentary evidence, it is unsafe to give them a positive contradiction. At least one confirmation of some importance has been supplied by Herodotus (iii. 69, ¢f. Esth. ii. 12), and many critics hold that the assembly assigned to the third year of Ahasuerus (Esth, i, 3) is that mentioned by Herodotus (vii. 8) as having been held previously to the expedition against Greece. This, however, is quite uncertain. The reference to the 127 provinces is in itself not improbable, but is only confirmed by the author of the book of Daniel (vi. 1, ¢. 1 Esd. iii, 3, LXX.), who has been thought by some to~~

~~have made a confusion between satrapies and sub-satrapies.~~

~~It is at any rate in perfect harmony with history that the~~

~~book of Esther includes India among the subject provinces ;~~

~~this is confirmed not only by Herodotus (iii. 94), but by the inscriptions of Darius at Persepolis and Naksh-i-Rustam. The conduct of Mordecai certainly remains mysterious. In our awn day, the harem is impenetrable, while 'any one declining to stand as the grand-vizier passes is almost beaten to death" (Morier, the English minister to the court of Persia, quoted by Dean Stanley). And if it is perhaps only too probable that a vizier would use his posi- tion for the gratification of spite, and if even the blood- thirstiness of Hamau is not inconceivable, still the circum- stances connected with the decree for the destruction of the Jews are almost more than even "the peculiarly extrava- gant and capricious character" of Xerxes (Canon Rawlin- son) can render easily acceptable.~~

~~The proper names of Esther, at any rate in their present form, do not all of them stand philological tests. Some of them are genuinely Persian, but others wear a somewhat questionable appearance. These may either be corrupt, or, as Néldeke suggests, framed by the author himself on Persian models. Among the most accurate is Ahasuerus or rather Akhashverosh (= Persian Chshayarsha, 7.¢., Xerxes). The character of~~

~~this king, too, agrees admirably with that given of Xerxes by Herodotus (¢f. Herod. i. 69, ix. 108). But then, it has been replied, it only agrees so well because Xerxes was a typical Oriental despot, magnificent, swayed by favourites, proud, amatory, capricious. Here we must leave this part of our subject—nothing short of a detailed commentary on the book would give the reader a satisfac- torily complete view of the facts. It must, however, be observed that the serious chronological difficulty in Esther ii. 5,6 (where Mordecai is apparently said to have been carried captive with Jeconiah) can hardly be removed by maintaining with Canon Rawlinson (contrary to Hebrew usage) that Kish, and not Mordecai, is the person referred to, It must, it would seem, be concluded that the theory that the book of Esther is a strictly historical narrative is not proof at all points against objection. The question then arises, is it a work of pure imagination? This was the view of the 18th century rationalistic critics. Semler, for instance, says, "Illud videtur esse certum, confictam esse universam parabolam, fasts et arrogantiz Judsorum locupletissimum testimonium" (Semler, Apparatus ad liberal. Vet. Test. interpr., p. 152 sq., quoted by Keil). By this theory, we might at once put a happy end to the guerilla warfare of rationalistic objectors. It is very~~

~~'necessary, however, to see how much is involved iu~~

~~accepting it. For the book of Esther expressly appeals to the authority of the royal Persian chronicles (ii, 23, x. 2) and of a contemporary memoir (ix. 32). If untrue, re- marks Canon Rawlinson, the book might easily have been proved to be so at the time when it was published, by re- ference to those chronicles (Speaker's Commentary, iil. 47 2). The only way to turn the point of this objection would be~~

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~~to show that the narrative was written subsequently to the fall of the Persian empire, and not earlier than the end of the fourth century, about 150 years after Xerxes. This has been maintained by several eminent critics (e.g. Zunz, Herzfeld, Ewald, Bertheau, Kuenen) on the~~

~~following grounds. (1) The absence of any reference to the story in the books (or rather book) of Chronicles, Ezra, and Nehemiah, in Daniel, in Ecclesiasticus (see chaps. xliv.—L), orin Philo. (2) The way in which the Persian monarchy is described. A book so far from complimentary in some of its details to a great Persian king cannot, it is urged, have been written during the continuance of his dynasty, any more than the so-called song of Solomon can have been written under the rule of the Solomonic family. 'True, the opening of Esther pourtrays in brilliant hues the outward splendour of Ahasuerus's empire, but the very brilliance, and still more the particularity, of the description, indicates that that cmpire was a wonder of the past, already begin- ning to be invested with the glamour of fairy-land. The necessity for au explanation of Persian customs (i. 13, viii. 8) is thought to point in the same direction. (3) " The absence of the religious spirit in the writer, or rather the absence of its manifestation. Had the writer lived soon after the events narrated, it is improbable that he would have omitted all [direct] mention of divine providence and the name of God, because the religious feeling had not so far degenerated among the Jewish captives who did not return to their own land with Zerubbabel, Ezra, and Nehemiah " (Dr Davidson, The Text of the Old Testament considered, 1856, p. 609). In the Greek period, on the other hand, we know for certain from Ecclesiastes that the religious spirit was declining, at any rate in some circles, even in Judea. (4) The lateness of the style. This has been carefully investigated by Zunz, who remarks that there are more than fifty expressions which point to a late date, and which include, besides Persisins, three also found (and found only) in Ezra, Nehemiah, Ecclesiastes, one in Nehemiah, Ecclesiastes, and Ps. cxix., one in Chronicles, five in Ecclesiastes, one in Daniel, one in Chronicles and Daniel, one in Nehemiah and Daniel, also six belonging to later Hebrew, two to Aramaic, and four resembling the usage of the Mishna. The value of this argument, how- ever, depends partly on the date which we assign to Chronicles, Ecclesiastes, and Daniel, also on the relation of Ezra and Nehemiah to Chronicles. The weighty reference to the Mishnaic usage remains, however, in full force, how- ever conservative be our decision on the date of Chronicles, &c. We have said nothing at present of the festival of Purim, which, according to Keil, is "the priucipal evidence of the historical truth of the whole~~

~~narrative," and which, even according to the more critical Friedrich Bleek, " un- doubtedly presupposes the occurrence of what is narrated in our book." To many scholars, however, the connexion of the book of Esther with the festival of Purim is rather a difficulty than otherwise. It is hardly necessary to refer to Mr Tylor for evidence of the tendency to invent stories to account for popular festivals. Dr Kuenen, who speaks as the representative of a growing school, maintains that the book of Esther is through and through unhistorical, that "the explanation it offers of the Purim feast is not taken from the reality, but invented to make that feast popular. A Persian word pur meaning lot is quite unknown" (Religion of Israel, iii, 148). He then fortifies his position by a reference to the numerous im- probabilities which we have already mentioned. According to him, Purim was originally a Persian feast, and was by degrees adopted by the Jews, first in Persia, and then in other countries, and the object of the author of Esther was to make the observance of the feast still more general. He is not, however, prepared with a satisfactory explanation of~~

~~the word Purim. Von Hammer's derivation from furdigdn, the name of a Persian festival, falls through, as Dr Kuenen~~

~~points out, owing to the fact that furdigdn was not a spring feast, and, as Purim was kept on the 14th and 15th of the~~

~~| month Adar, a spring feast is obviously required. A~~

~~more plausible form of the hypothesis adopted by Dr Kuenen is perhaps that of Zunz. The Jews during and after the exile were much influenced religiously by the nations among whom they lived (so at least many critics believe, quoting as instances the belief in the seven archangels and in Azazel). It was the policy of the doctors of the law to adopt as many of the new popular usages as they could, without detriment to the purity of their religion. Purim, a joyous, secular festival, enjoyed (as it still does enjoy) a great popularity among the Jews. The religious authorities, desiring to check the exuberance of its celebra- tion, determined to give it a quasi-consecration by connecting~~

~~it with an event (real or imaginary) in the history of the nation, They omitted the name of God, not from indiffer- ence to religion, but to prevent it from being profaned at the secular celebration to which Purim was liable (cf. Esther ix. 19-22). It must be observed, in conclusion, that while the doctors of the law attached great importance to Purim and to Esther—witness the statement that the men of the Great Assembly " wrote " (? edited) the book of Esther, also the various interpolated passages, and the devotion of an entire Talmudic treatise to the feast of Purim—the sacerdotal authorities (of a more conservative turn) did their utmost to disparage the intrusive festival. No psalms were sung in the temple at the feast of Purim—-not even those which were usual at half festivals (see Bloch, Mellenistische Bestandtheile im biblischen Schriftthum, pp. 39-41). The first mention of Purim occurs in 2 Macc., xv. 36, where the thirteenth day of Adar is said to have been observed as a festival in memory of the death of Nicanor, "the day before Mardocheus's day." Unfortunately the second book of Maccabees was written little, if at all, before the Christian era, while the first book (of much greater authority) simply says (vii. 49) : —" They ordained to keep yearly this day, being the thirteenth of Adar." Would the Jews, asks Dr Zunz, have made a new festival on the 13th, if the 14th were recognized as the feast of Purim? This, however, may well be called hypercriticism. And we may sum up by the remark that if direct historical evidence is deficient for the traditional view of the book of Esther, it is equally deficient for the rival critical theory. Probability is our only guide. Yet even if the book contain a larger or smaller romantic element, it is of real historical value as a record of the Jewish spirit in a little known age, and is edifying even to Christians from its powerful though indirect inculcation of the lesson of divine providence.~~

~~See, besides the Introductions to the Old Testament of Keil, Bleek, and Davidson, Baumgarten, De fide libri Estherce commen- tatio historico-critica, Hale, 1839; Bertheau, Die Diicher Esra, Nechemja, und Esther, Leipzig, 1862; Zunz, Zeitschrift der deutsch. morgenlind. Gesellschaft, 1873, p. 684, &c.; Oppert, Commentaire historique et philologique du livre d'Esther, Paris, 1864; Herzfeld, Geschichte des Volkes Jisraél, Leipzig, 1863, Bd. ii. pp. 1-9, 357-366; Ewald, History of Israel, Lond.~~

~~1874, vol. v., pp. 280-234 ; Gritz, “Die Kanonicitat des Buches Esther,” Monatsschrift, 1871, pp. 502- 511; Bloch, Hellenistische Bestandtheile im biblischen Schrifithum, 1877. (T. K. C.)~~

~~ESTHONIA (in German Zsthland, or more correctly Ehstland, in the native language Wroma, “the froutier country,” or Rahwama, “the country of the Rahwas or Esthonians,” in Lettish Zggawn Senna, probably “ the land of the banished”), one of three Baltic or so-called German provinces of Russia, is bounded on the N. by the Gulf of Finland, on the E. by the government of St Petersburg, from which it is separated by the river Narowa, on the 8. by Livonia, and on the W. by the Baltic. Inclusive of the islands of Dagp, Mohn, and Oesel, it has an area of 7817~~

~~square miles, It consists essentially of a nearly level plateau of Silurian limestone which presents to the Gulf of Finland a precipitous coast from 49 to 120 feet in height, has a gradual slope inland to the south, and is broken by three or four slightly marked terraces running E. and W. Traces of glacial action are exceedingly abundant in the shape of drift and boulders, both on the mainland and in the islands. A considerable portion of the surface is occupied by stretches of sand, marsh, or pine forests; but other parts afford a good arable soil. There are a great number of small lakes throughout the country, and on the eastern frontier lies the Ozero Tchudskoye or Peipus Lake, about 55 miles long and 30 broad. None of the rivers are large enough to be of real commercial importance, The climate is severe with long winters and frequent storms. Most of the population is engaged in agricultural pursuits— cattle, barley, rye, hemp, flax, and tobacco receiving their chief attention. With the exception of the distilling of brandy and the weaving of a little linen and cloth there is no manufacturing industry, and foreign commerce is almost entirely confined to Reval, Baltischport, and Hapsal. The province is administratively divided into the six districts of Reval, Wesenberg, Weissenstein, Hapsal, Leal, and Kunda, and the city of Reval is the seat of the principal Government~~

~~officials. The national church is Lutheran ; but it is gradually losing ground before the encroachments of Greco-Russian proselytism strongly supported by the politica] authorities. It divides the country into eight dioceses, and places the centre of its administration in a consistorium at Reval. In 1875 there were 578 schools, attended by 18,952 boys and 16,227 girls, or in other words, by 92 pupils out of every 1000 inhabitants. The higher education under the influence of the nobility and clergy keeps for the most part true to German traditions. Out of a population numbering 323,961 in 1870 about one-thirteenth is of German race; and the province may be briefly characterized as a country fundamentally Esthonian, with a Teutonic aristocracy and a Russian government. The Esthonians proper belong to the Finnish family, and still maintain their native language. Howorth, however, has recently endeavoured to show that their settlement in the Baltic district is after all not of such high antiquity. Perhaps none of the nationalities of Europe have main- tained greater purity of descent, and the general opinion is that they are the aboriginal occupants of the soil. They are not confined to the country with which they are nominally identified, but form more than a third of the population of Livonia or Liefland, and are found in iso- lated districts in the governments of Vitepsk, Pskoff, and St Petersburg. Altogether they are estimated at about 650,000. In physical development they do not rank high and appear to bear the marks of long-continued hardship and servitude. They are generally short in stature, especially in the neighbourhood of Dorpat. The skull is angular and brachycephalous, the forehead low, the space between the nostrils and mouth short, the hair usually yellowish or brown, and the beard scanty. Their language is rich in roots, and has no small flexibility of composition and structure. There are two main dialects —the Dorpat er Werro Esthonian and the Reval Esthonian — which are nearly as distinct from each other as Polish and Bohemian, and can hardly te successfully treated in a common grammar. The latter, which preserves more carefully the full inflexional forms, and pays greater attention to the laws of euphony, is consequently recognized as the literary speech, and has the wider domain. It breaks up again into two varieties, the one of which, like the Livonian and Tchudish, uses strong forms of words, while the other, like the literary~~

~~Finnish, indulges in weak forms. Minor varieties are exceedingly numer-~~

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~~ous—almost every parish, according to Wiedemann, having recognizable peculiarities. Thefirst publication inEsthonian was a Lutheran catechism, prepared at the suggestion of Heinrich von Galen, master of the Livonian order in the 16th century. In 1637 appeared an Esthonian grammar by Stahl, and in 1648 a similar work by Hutslev. A translation of the New Testament by a learned society was printed at Reval in 1715, and in 1780 Hupel published his Esthonian-German lexicon, with a grammar of the two principal dialects. Between 1813 and 1832 there appeared at Pernau twenty volumes of Beitrdge zur genauern Kennt- niss der Esthnischen Sprache, by Roseplanter, and from 1840 downwards A. von Jannau, Fr. Fihlmann, Aug. Heinrich Hansen, Knupffer, Haller, and others contributed valuable papers on Esthonian subjects to the Verhandlungen der Gelehrten Esthnischen Gresellschaft. In 1844 appeared Ahrens's Grammatik der Esthnischen Sprache Revalischen Dialects, which however, recognizes only the weaker form of the dialect. More recently F. J. Wiedemann under the auspices of the Imperial Academy of St Petersburg has devoted himself to the detailed investigation of Esthonian, visiting the different parts of the country, and registering all peculiarities on the spot. Reports of his labours are given in the Bulletin of the society, and his lexicon was published in 1869. The popular songs and traditions of the Esthonian are numerous and interesting; they have a close resemblance to the similar productions of Finland, and many of them em- body portions of an old heathen mythology and cosmogony. The last professional rhapsodist is said to have died in 1813. Rouss published a collection of Hsthnische Volkslieder in 1850-51, several of which may be found translated in Latham's Nattonalities of Europe, vol. i.; Dr Fr. Kreutz-wald, with questionable judgment, united a number of the separate songs into a connected poem (Helsingfors 1866); and his work has been translated by Carl von Reinthal as Die LEhstnische Sage von Kalewipoeg, 1857, 1859. Still more recently Jacob Hurt has commenced~~

~~at Dorpat what is intended to be a complete collection of Old Esthonian popular poetry, under the title of Vana Kanal, or " The Old Harp."~~

~~The Esthonians are mentioned in the 11th century by Adam of Bremen, and in the 12th and 13th the name becomes quite familiar. They appear to have given no small trouble to their Scandinavian neighbours by their piratical excursions, and several of the Danish kings attempted to bring them into subjection. Canute IV., or Knud Valdemarson, invaded their country with a fleet of 760 ships, forced many of their number to submit to the rite of baptism, and erected several Christian churches ; but hardly had his ships disappeared when the churches were in ruins, and the conversions proved to be a pretence. In 1219 Valdemar Seier, or the Victorious, received the papal blessing, and undertook another and more formidable crusade. The Danish soldiers vowed a vow that, if victory was granted to their arms, every Dane of twelve years and upwards would from henceforth hold a fast on St Laurence's Eve. At first they were apparently successful ; but after they deemed their conquest secure, the Esthonians fell upon them unawares, and pressed them so hard that, as the tale is told, their defeat would have been inevitable, had not the archbishop, Anders Suneson, like another Moses, ascended a hill and held up his hands in benediction and prayer. The victory thus obtained was commemorated by the creation of thirty-five knights on the field of battle, who, it may he noted, were the first members of their order in Denmark. Though their country was incorporated with the Danish kingdom, the Esthonians proved by no means submissive subjects, and we find several of Valdemar's suc- cessors obliged to suppress their insurrections by force. At length Valdemar Atterdag, after the great rebellion~~

~~of 1343, sold his troublesome possession in 1347 to the Knights of the Sword for 19,000 marks ; and the history of Esthonia is in consequence practically the history of that order till the 16th century. The nobles and cities offered voluntary homage to Sweden in 1521, but the Swedish kings found it no easy task to maintain their claim against the Russian encroachments, which had begun as early as 1483. The foolish~~

~~ambition of Charles XII. decided the matter against them ; and in 1721, by the peace of Nystadt, Esthonia was formally ceded to Peter the Great, who did what he could to conciliate the inhabitants, both Esthonians and Germans. Serfdom was abolished in 1817 by Alexander I., but the condition of the peasants continued so unsatisfactory that they rose in rebellion in 1859. The struggle between German and Russian influences is still going on, but it. can hardly end in anything else than Russian domination.~~

~~See, besides the works already mentioned, Hupel, Topogra- phische Nachrichten, Riga, 1774-82; Petri, Esthland und die Esthen, 1802; Willigerod, Geschichte Esthlands, 1817; Merkel, Die freien Leiten und Esthen, 1820; Ewer, Des Herzogthums Esthlands Ritter- und Landrechte, Dorpat, 1821; T. L. von Parrot, Liwen, Liéitten, Easten, 1839; Joh. Friedrich von Reck and Karl Eduard Napinsky, Allgemeines Schriftsteller- und Gelehrten-Lexicon der Provinzen Liv- land, Estland, &c.; Kohl, Die Deutseh-Russischen Ostseeprovinzen, 1840; Rigby, " L'Esthonie," in Revue Britannique, 1841; Letters Srom the Baltic, London, 1844; Possart, Statistik und Geographie des Gouvernements Esthlands, 1846; Kruse, Urgeschichte des Esth- nischen Volksstumms, 1846 ; Milner, The Baltie, 1854; Mag. Fr. Schmidt, " Untersuchungen iiber die Erscheinungen der Glacial- formation in Estland und auf Oesel," in Bull. de Acad. Imp. de St Petersbourg, 1865 ; Von Richter, Geschichte der deutschen Ostsee- provinzen, 1857-1858; Etzel, Ostsee und Kiistenlinder, 1859; Créger, Geschichte Liv- Est- und Kurlands, 1867; Eckardt, Die Baltischen Provinzen Russlands, Leipsic, 1869—English translation (" Modern Russia'), 1870; F. Miller, Beitrdge zwr Orographie und Hydrographie von Estland, 1870; Hunfalvy, Reisen in der Ostsee- provinzen Russlands, 1873; Weske, Reise durch das Estenland im Sommer 1875, St Petersburg, 1876; Fried. G. von Bunge, Das Herzogthum Estland wnterder Herrschaft der Kénige von Déinemark, Gotha, 1877.~~

~~ESTIENNE, SrepHanus, or STEPHIENS, a celebrated French family of printers. See STEPHIENS.~~

ESTOPPEL, in law, is where a party in litigation is not permitted to assert or deny something, when such assertion or denial would be inconsistent with his own previous state- ments or conduct. LEstoppel is said to arise in three ways —(1) by record or judgment, (2) by deed, and (3) by matter im pais or conduct. (1.) Where a cause of action has been tried and final judgment has been pronounced, the judgment is conclusive—either party attempting to renew the litiga- tion by a new action would be estopped by the judgment. "Every judgment is conclusive proof as against parties and privies, of facts directly in issue in the case, actually decided by the court, and appearing from the judgment itself to be the ground on which it was based."—Stephen's Digests of the Law of Evidence, Art. 41. (2.) It is one of the privi- leges of deeds as distinguished from simple contracts that they operate by way of estoppel. ' A man shall always be estopped by his own deed, or not permitted to aver or prove anything in contradiction to what he has once so solemnly and deliberately avowed " (Blackstone, 2 Com., 295); e.g., where a bond recited that the defendants were authorized by Acts of Parliament to borrow money, and that under such authority they had borrowed money from a certain person, they were estopped from setting up as a defence that they did not in fact so borrow money,as stated by their deed. (3.) Estoppel in pais is the most important head. The rule practically comes to this that, when a person in his dealings with others has acted so as to induce them to believe a thing to be true and to act on such belief, he may not in any proceeding between himself and them deny the thing to be true; ¢g., a partner retiring from a firm without giving notice to the customers, cannot,

- the lines of Torres Vedras towards Lisbon.

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as against a customer having no knowledge of his retire- ment, deny that he is a partner. As between landlord and tenant the principle operates to prevent the denial by the tenant of the Jandlord's title. So if a person comes upon land by the licence of the person in possession, he cannot deny that the licenser had a title to the possession at the time the licence was given. Again, if a man accepts a bill of exchange he may not

~~deny the signature or the capacity of the drawer. So a person receiving goods as baillee from another, cannot deny the title of that other to the goods at the time they were entrusted to him.~~

~~ESTREMADURA (commonly derived from extrema ora, compare Land's End, Finisttre, &c.), a province of Portugal, bounded on the N. and N.E. by Beira, on the S. and S.E. by Alemtejo, and on the W. by the Atlantic Ocean. It lies between 38° 6' and. 40° 15' N. lat., and between 7° 43' and 9° 32' W. long., being about 140 miles in length from N. to S. by about 80 miles in breadth. The river Tagus divides it into two nearly equal parts, the northern being the more mountainous, but at the same time the more fertile, of the two. A chain of mountains extending from Beira traverses the northern portion from N.N.E. to 8.8.W., and terminates on the coast between the estuary of the Tagus and the sea. This range sends off spurs in various directions. Between Torres Vedras and Lisbon is an extensive chain of points, some formed by nature and others by art, and stretching in a general direction from E. to W. Along these Lord Wellington constructed a series of defensive works called the " Lines of Torres Vedras," by means of which he was able successfully to resist the advance of the French in- vaders. This mountain chain attains a height of 2300 feet, and separates the streams which fall into the Tagus from those that flow directly into the sea, The part lying N.W. and between it and the sea is mostly flat and sandy towards the coast, and either barren or covered with forests of pines, For about 50 miles N. of the mouth of the Tagus, however, or as far as Peniche, the coast consists of rocky cliffs, some of which attain a great elevation. South-east of the ridge, and sloping towards the Tagus, the country is finer and better cultivated. The plains about Tomar and Santarem are very fertile, and abound with olive and other fruit trees. But the finest part of the province is that which lies S. of Here the valleys are covered with villages, country seats, gardens, orchards, and vineyards. In Estremadura the general sys- tem of land tenure was formerly that known as " Ingadas," by which the farmer paid a rent in corn or produce for each yoke of oxen lent out to him by the landlord. A modifica- tion of this tenure yet exists, and its results are seen in the bad and backward farming which prevails. South of the Tagus the country is mostly low and flat, and in several places unhealthy. The~~

~~land rises towards Alemtejo, and several ranges of hills proceeding from that province enter Estremadura. The principal river is the Tagus, which falls into the sea below Lisbon. The Zezere is a large and rapid stream which rises in Beira, and flowing southward falls into the Tagus below Punhete. The Zatas and Almansor both rise in Alemtejo, and flow at a short distance from each other into the eastern of the two branches into which the Tagus is divided above Lisbon. The principal rivers flowing directly to the sea are—in the northern portion, the Lis, Alcoa, Arnoya, and Zizambre, and in the southern the Maroteca and the Sado, the last being the largest. Estremadura is divided into the three districts of Lisbon, Santarem, and Leiria. The population of the pro- vince in 1871 was 839,691.~~

~~ESTREMADURA, an old province of Spain, divided in 1833 into the provinces of Badajoz and Caceres, lies between 37° 58’ and 40° 32’ N, lat, and between~~

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~~4° 32′ and 7° 26’ W. long., being about 180 miles in length from N. to 8S. by 130 in extreme breadth, and having an area about 14,280 square miles. It is bounded ou the N. by Salamanca and Avila, E. by Toledo and La Mancha, S. by Cordova and Sevilla, and W. by Portugal. The Tagus and the Guadiana cross the province from E. to W., and their respective basins form two natural and nearly equal divisions, — that of the Tagus, being the northern, called Alta or Upper Estremadura, and that of the Guadiana, Baja or Lower Estremadura. These two basins are separated from each other by a range of mountains, of which the eastern and higher portion attains an elevation of from 5000 to 6000 feet above the level of the sea. This natural division corresponds to the division into the provinces of Badajoz and Caceres, the former being Baja Estremadura, and the latter Alta Estremadura. The basin of the Guadiana is bounded on the S. by a continuation of the Sierra Morena, which fills up the southern part of the province with hilly ground, aud divides the waters of the Guadiana from those of the Guadalquivir. A branch of this chain proceeds northward from the confines of Cordova to the Guadiana. The basin of the Tagus is bounded on the N. by a~~

~~range of mountains which proceed westward from Avila along the boundaries between Estremadura and Salamanca, and afterwards enter Portugal. From this northeru range a branch proceeds in a §.W. direction between the rivers Alagon and Tietar ; from the eastern part of the central range a branch proceeds in a N.W. direction to the Tagus. The climate in summer is hot, but not unwholesome, except in some swampy places along the Guadiana. 'There is then but little rain; dew, however, is abundant, and sufficient to moisten the ground ; and the nights are cool. Although the high mountains are-covered with snow in the end of November, the winters are uot severe. The soil is very fertile, and might be rendered highly productive by a proper use of the waters of the many rivers by which it isintersected. Agriculture, however, is wholly neglected, and the noble plains that might yield abundance of all sorts of products are devoted only to pasturage. Vast numbers of merino sheep come annually from other parts to winter in these plains. Immense herds of swine are reared in the province, and constitute a great source of support to the inhabitants, not only supplying them with food, but also forming a great article of export to other provinces, —the pork, bacon, and hams being in high esteem. The extensive forests of oak, beech, and chestnuts afford an abundance of food for hogs. Olive, fruit, and cork trees are numerous. Game is abundant, and fish swarm in the rivers and streams. Estremadura has mines of lead, copper, silver, and iron, but these are almost totally neglected; and the manufac- tures are few. The chief products are corn, wine, oil, hemp, and flax. The population of Estremadura in 1870 was 734,377.~~

~~ESTREMOZ, a town of Portugal, in the province of Alemtejo, 22 miles W. of Elvas on the road to Lisbon. It was once a strongly fortified place with accommodation for a garrison of 20,000 men, but its citadel and forts are now falling intodecay. There are marble quarries in the neigh- bourhood, and the Estremoz bucaros, a kind of jar with a pleasant odour, are well known throughout Portugal. The queen of Portugal, St Elizabeth, died in the town in 1336. Population about 6600.~~

~~ESZEK, Germ. Esseck or Hssegq, Slav. Oszek, a fortified royal free town of Hungary, province of Croatia-Slavonia, situated on the right bank of the Drave, 13 miles from its confluence with the Danube, in 45°~~

~~33’ N. lat., 18°43’E. long. The town is divided by a wide esplanade into four parts, viz.,the fortress or town proper, the upper, the lower, and the new town. The most important buildings are the barracks,~~

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~~capable of accommodating 30,000 men, the town hall, and the old county hall. It has also Roman Catholic, Greek, and other churches, four silk-weaving factories,a gymnasium, and a normal high school. A wooden bridge crosses the Drave and the swampy ground adjoining. ‘There is steam communication with several places on the Upper Danube, and the trade iu raw hides, cattle, and corn is very exten- sive. Eszék stands on the site of the ancient Roman town Mursia A®lia, founded by the emperor Hadrian, 125 a.p., aud afterwards became the capital of Lower Panuonia. The town was made the seat of a bishopric by Constantine in 335, which, however, ceased to exist after the de- struction of the colony by Attila in 447. The Sla- vonians settled there inthe 6th century. In 1526 Eszék was occupied by the Turks, who having defeated thie Germans there in 1537, remained for about a century and a half in possession of the town, which ultimately came under Austrian rule in 1687. Eszék surrendered to the Hungarians in October 1848, but was retaken by the Austrians on the 14th February 1849. It has been a royal free town since 1809. Population in 1870, 17,247.~~

~~ESZTERHAZY, the name of an ancient, influential, and wealthy Hungarian family, which some genealogists derive from a descendant of Attila, a certain Paul Estoraz, who embraced Christianity in 969 a.p. Authentic accounts, however, do not extend beyond 1238, when the family was divided into the two branches of Zerh4zy and Illeshazy, the latter of which became extinct in 1838. Francis Zerhazy changed the name, in 1584, to Eszterhazy, and his descend- ants separated into the three existing branches :—Csesznek, Zolyom or Altsohl, and Frakné or Forchtenstein.~~

~~Paut IV., Prince Eszterhdzy de Galanta, the head of the third branch, was born at Eiseustadt, September 7, 1635. At an early age he became field-marshal, and distinguished himself in the wars against the Turks. In 1681 he was made Palatine of Hungary. In 1683 he assisted in the deliverance of Vienna, and in 1686 of Ofen from the hands of the Turks, and thus contributed to establish the power of the house of Austria in Hungary, for which services he was in 1687 created a prince of the Holy Roman Empire. He died 26th March 1713.~~

~~NicHouas Josep, Prince Eszterhazy de Galanta, Count of Forchtenstein, born 18th December 1714, was the grand- son of Paul IV. He distinguished himself in Silesia in 1745 at the head of the Hungarian troops, but is chiefly known as a patron of the arts and sciences. He was, moreover, a diplomatist, and served as ambassador at vari- ous courts. He died 28th September 1790.~~

~~Nicuouas IV., Prince Eszterhazy de Galanta, grandson of the last-named, was born 12th September 1765. In his youth he visited the chief countries of Europe, aud served for some time in the Austrian army, where he became field- marshal, but he afterwards entered the diplomatic corps. He was a great patron of the arts aud sciences, and founded an important picture gallery in his castle at Vienna. He also transformed his country seat at Eisenstadt into a temple of music and botany, and erected a fine mausoleum there to Haydn. In 1809, when Napoleon wished to weaken the Austrian power by the separation of Hungary, he is said to have offered the Magyar crown to Eszterhazy, who, however, firmly refused it. He died at Como in Italy, 25th November 1833.~~

~~Pau, Antuony, Prince Eszterhazy de Galanta, son of Nicholas IV., was born 11th March 1786, and devoted himself to diplomacy. In 1810 he was ambassador at Dresden, in 1814at Rome, and from 1815 to 1818, and again from 1830 to 1838, at the court of England, where he gained the reputation of being an able diplomatist. He subse- quently directed his energies to the support of the rising Hungarian national movement, and, in 1848, accepted the~~

~~post of minister of foreign affairs in the Batthydni a.dminis- tration, where he endeavoured to bring about a reconcilia- tion between the Austrian and the Hungarian ministry. After the suppression of the revolution, le retired into private life. In 1856, he represented Austria at the coronation of Alexander II., emperor of Russia. He died at Ratisbon 21st May 1866.~~

~~ETAH, a district and town of British India, in the lieutenant-governorship of the north-western provinces, and included in the division of Agra. Etah District stretches along the eastern edge of the Dudb or alluvial plain enclosed by the Ganges and the Jumna, and lies between 27° 20' 30" and 28° 1' N. lat., and between 78° 29' and 79° 19' 30" E. long. It is bounded on the N. by the Ganges, on the W. by the districts of Agra and Aligarh, on the 8. by the district of Mainpuri, and on the E. by that of Farrakh4bad. The total area of the district is 1512 square miles, of which 970 are cultivated. The total popu- lation, according to the census of 1872, amounts to 703,527 souls, comprising 636,149 Hindus, and 67,278 Mahometans. The males number 382,746, the females 320,739, the Lroportion of males to the total population being 54:5 per cent, The principal tribes and castes in point of number are:—(1) Brahmans, 60,691 ; (2) Rajputs, 57,025 ; (3) Baniyas or traders, 13,056; (4) Chamars or manual labourers, 86,635; (5) Ahirs, 76,754; besides numerous minor clans. The density of population is 465 persons to the square mile. The district consists for the most part of an elevated alluvial plateau, dipping down on its eastern slope into the valley of the Ganges. The uplands, how- ever, are not so fertile as in most of the neighbonring dis- tricts, owing to the insufficiency of the water supply ; while patches of a barren saline efflorescence occasionally interrupt the cultivated expanse. Between the modern bed of the Ganges and its ancient channel lies a belt of fertile land, covered with a rich deposit of silt, and abundantly supplied with natural moisture. A long line of swamps and hollows still marks the former course of the river; and above it rises abruptly the original cliff which now forms the terrace of the upland plain. The Kali Nadi, a small stream flowing in a deep and narrow gorge, passes through the centre of the district, and affords an outlet for the sur- face drainage. The tract of country to the west of this river is irrigated by the Cawnpur~~

~~and Etdwah branches of the Ganges canal; and another work, now in progress, will supply abundant water in future to the dry plateau on the east.~~

~~No railway passes through the district, but good metalled roads connect the chief towns, and the Ganges affords a means of transport for heavy goods. The principal agri- cultural products comprise wheat, barley, pulses, millets, cotton, sugar-cane, indigo, and opium. 'Two harvests a year can be taken off the land, in the spring and the autumn, tah exports large quantities of food-grains and other produce to neighbouring districts. Indigo is manu- factured in 200 factories, some of which are conducted by English capital. Eight towns in 1872 contained a population exceeding 5000 :—Etah, 8044; Marahra, 9214; Soron, 11,182; Sahdwar, 5156; Sakit, 5415; Dundwiraganj, 5414; Aliganj, 7912; Kasganj, 15,764. In 1870 the total revenue of Etah district from all sources amounted to £119,399, of which £78,852 was due to the land-tax. The five municipalities of Kasganj, Etah, Soron, Marahra, and Aliganj possess a joint income of £4878. The climate is dry and healthy, but sand and dust storms frequently occur. .~~

~~Etah was at an early date the seat of a primitive Aryan civilization, and the surrounding country is mentioned by Hioueu Thsang, the Chinese Buddhist pilgrim of the 7th century A.D., as rich in temples and monasteries. But~~

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~~after the bloody repression of Buddhism before the 8th century, the district seems to have fallen once more into the hands of aboriginal tribes, from whom it -was wrested a second time by the Rajputs during the course of their great migration eastward. With the rest of Upper India, it passed under the sway of Mahmud of Ghazni in 1017, and thenceforth followed the fortunes of the Mahometan~~

~~| empire. At the end of the last century it formed part of the territory over which the vazir of Oudh had made~~

~~_ himself ruler, and it came into the possession of the British~~

~~Government in 1801, under the treaty of Lucknow. During the mutiny of 1857 it was the scene of serious disturbances, coupled with the usual anarchic quarrels among the native princes.~~

~~Eran Town, the capital of the district, stands on the Grand Trunk Road, in 27° 33' 50" N. lat., and 78° 42' 25" E. long. The population in 1872 numbered 8044 souls, comprising 5884 Hindus, 2150 Mahometans, and 10 Christians. Before the period of British rule the town had little importance, and at present it is chiefly noticeable as the administrative headquarters for the district. It con- tains a handsome temple and large tank, with the usual public offices of a district capital. The muncipality had an income in 1874-75 of £1183, of which £845 was raised by an octroi duty. The incidence of taxation was at the rate of 2s. per head of the population.~~

~~ETAMPES, or Estampgs, a town of France, capital of an arrondissement of the same name in the department of Seine-et-Oise, is situated on the Paris and Orleans railway, 30 miles S. by W. of Paris, in a fertile valley, on the banks of two small streams, which fall into the Seine immediately below the town. It is the seat of a tribunal of primary instance, a communal college, and an agricul- tural society. Its most remarkable building is an old tower called Guinette, which is all that now remains of an ancient royal castle built in the 11th century by King Robert, in which Philip Augustus kept his wife a prisoner from 1199 to 1201. Etampes has three ancient churches—Notre-Dame built in the 13th century (with a lofty tower and spire), the church of St Martin, and the church of St Basil. In the square there is a statue of~~

~~tienne Geoffroy Sainte-Hilaire, who was born in K.tampes. The principal manufactures of the town are woollen goods, soap, and leather ; and it sends large supplies of corn, meal, vegetables, aud honey to Paris. Etampes is very old. In 826 it was plundered by the Normans, and it was con- quered by the prince of Condé in 1652. The population in 1872 was 7511.~~

~~ETAWAH, a district and city of British India, in the lieutenant-governorship of the North-Western Provinces, and included in the division of Agra. Etdwah District forms a purely artificial~~

~~administrative division, stretching across the level plain of the Duab, and beyond the valley of the Jumna, to the gorges of the Chambal and the last rocky outliers of the Vindhyan range. It lies between 26° 20' 30" and 27° N. lat., and between 78° 45' 45" and 79° 47' E. long., and is bounded on the N. by Mainpuri and Farrakhabdd districts ; on the W. by the Jumna, the Agra district, the Chambal, the Kudri Nadi, and the native state of Gwalior; on the 8S. by the Jumna; and on the E. by Cawnpur district. The total area of the district is 1691 square miles, of which 880 are cultivated. The total population, according to the census of 1872, amounts to 668,641 souls, comprising 631,923 Hindus, 36,571 Mahom- etans, and 147 Christians. The males number 369,928, the females 298,653, the proportion of males to the total population being 55:3 per cent. The principal tribes or castes areas follows :—(1) Brahmans, 93,082 ; (2) Rajputs, 58,358 ; (3) Baniyas or traders, 32,693; 4 Chamars, 96,923; (5) Ahirs, 75,035; (8) Kachhis, 48,160; (7)~~

~~Lodhas, 34,795; (8) Gadariyas, 21,926 ; and (9) Kolis, 20,391. The density of population is 395 persons to the square mile. The district exhibits a striking variety of surface and scenery. 'The greater portion lies within the Dudb or level alluvial plain between the Ganges and the Jumna. This part falls naturally into two sections, divided by the deep and fissured valley of the river Sengar. The tract to the north-east of that stream is rich and fertile, being watered by the Cawnpur and Etawah branches of the Ganges canal, which will soon be supplemented by other important works now in progress. The south- western region has the same natural advantages, but possesses no great irrigation system, and is consequently less fruitful than the opposite slopes. Near the banks of the Jumna, the plain descends into the river valley by a series of wild ravines and terraces, inhabited only by a scattered race of hereditary herdsmen. Beyond the Jumna again a strip of British territory extends along the tangled gorges of the Chambal and the Kudri Nadi, far into the borders of "the Gwalior state. This outlying tract embraces a series of rocky glens and mountain torrents,~~

~~crowned by the ruins of native strongholds, and inter-.~~

~~spersed with narrow ledges of cultivable alluvium.~~

~~The East Indian Railway runs through the centre of the district. The Jumna forms a great water-way for the heavy traffic; while good roads connect: most of the local centres with one another, and with the neighbouring cities. The principal crops are wheat, barley, pulses, millets, sugar-cane, cotton, andindigo. The district is essen- tially agricultural, and its exports consist entirely of the rural produce. Four towns in 1872 possessed a population exceeding 5000 :—Et4wah, 30,549; Phaphund, 6536 ; Aurdiya, 6459; and Jaswantnagar, 5310. In 1873 the total revenue of Et4wah district amounted to £191,097, of which sum £128,540 was contributed by the land-tax. The town of Etawah has the only municipality in the dis- trict. The climate, once hot and sultry, has now become comparatively moist and equable under the influence of irrigation and the planting of trees.~~

~~Etawah was marked out by its physical features as a secure retreat for the turbulent tribes of the Upper Duab, and it was not till the 12th century that any of the existing castes settled on the soil. After the Mussulman conquests of Delhi and the surrounding country, the Hindus of Et4wah appear to have held their own for many generations against the Mahometan power; Babar con- quered the district with the rest of the Dudb, and it remiined in the hands of the Mongols until the decay of their empire in the last century. After passing through the usual vicissitudes of Marhatté and Jat conquests during the long anarchy which preceded the British rule, Etawah was annexed by the vazir of Oudh in 1773, The vazir ceded it to the English in 1801, but it still remained so largely in the hands of lawless native chiefs that some difficulty was experienced in reducing it to orderly govern- ment. During the mutiny of 1857, serious disturbances occurred in Et4wah, and the district was occupied by the rebels from June to December ; order was not completely restored till the end of 1858.~~

~~Erdwau Town, the capital of the district, is picturesquely situated amongst the ravines on the bank of the Jumna, 70 miles §.E. of Agra. According to the census of 1872, its population amounts to 30,549 souls, comprising 21,241 Hindus, 9256 Mohametans, and 52 Christians. Deep~~

~~fissures intersect the various quarters of the town, over which broad roads connect the higher portions by bridges and embankments. A fine modern square, known as Humeganj, from the name of its founder, stands in the centre of the city, and contains the chief public buildings. A handsome mosque, the Jama Masjid, forms the chief~~

~~architectural ornament of Etdéwah. It was originally a Hindu or Buddhist temple, and has been adapted to its present use by the Mahometan conquerors. Several Hindu temples also stand about the ruins of the ancient fort. The chief trade is in ghz, grain, cotton, and oil-seeds, The Etawah municipality had an income of £3064 in 1875-76, of which £2435 was raised by taxes; the incidence of municipal taxation was ls. 74d. per head of the population.~~

~~ETCHMIADZIN, Epcumianzin, or ITSMIADSIN, a town and monastery in the Russian government of Erivan, famous as the seat of the Catholicus or primate of the Armenian church, It is situated in the plain of the Aras or Araxes, about 2985 feet above the sea, 12 miles W. of Erivan and 30 N. of Mount Ararat. The monastery comprises a pretty extensive complex of buildings, and is surrounded by brick walls 30 feet high, which, with their loopholes and towers, present the appearance of a fortress. Its architectural char- acter has been considerably impaired by additions and alterations in the modern Russian style. On the western side of the quadrangle isthe residence of the primate, on the south the refectory, built by the Catholicus Abraham (1730- 1735), on the east the lodgings for the monks, and on the north the cells. The cathedral is a small but fine cruciform building with a Byzantine cupola at the intersection, a large tower at the western end, and a smaller tower above each wing of the transepts. Of special interest is the porch, built of red porphyry, and profusely adorned with sculptured designs somewhat similar to those of Gothic architecture. The interior of the church is decorated with Persian frescoes of flowers, birds, and scroll-work. It is here that the Catholicus confers episcopal consecration by the sacred hand of St Gregory ; and here every seven years he prepares with great solemnity the holy oil which is to be used~~

~~throughout the churches of the Armenian communion. Of the numer-ous relics the chief are the head of the spear which pierced the Saviour's side, a piece of Noah's ark, presented by an angel to St James of Nisibis, and a piece of the true cross. Outside of the main entrance are the alabaster tombs of the primates Alexander I. (1714), Alexander II. (1755), Daniel (1806), and Narses (1857), and in hospitable con-tiguity a white marble monument erected by the East India Company to mark the resting-place of Sir John Macdonald, who died at Tabriz in 1830, while on an embassy to the Persian court. The library of the monastery is said at one time to have contained 15,000 volumes, and in spite of de- predation and neglect, it still remains a rich storehouse of Armenian literature. Brosset's Catalogue de la Bibliotheque d' Etchmiadzin, St Petersburg, 1840, contained only 635 numbers, but the new list drawn up by the monks (a copy of which was presented by Major Cunnyngham to the Oriental Library at Cambridge) mentions 2500 volumes, many of great size. Among the more remarkable manu-scripts are a copy of the gospels in a massive binding of carved ivory dating from the 10th or 11th century, and three bibles of the 13th century, one of which had belonged to Aytoun I., king of Armenia. A type-foundry, a printing- press, and a bookbinding establishment are maintained by the monks, who publish a weekly Armenian newspaper called Zhe Ararat, and supply religious and educational works for their co-religionists. The number of inmates in the monastery varies considerably. In 1834, according to Dubois, there were 50 monks and 13 bishops and arch- bishops ; and in 1872, according to Telfer, there were 5 bishops and archbishops, 20 monks, and 25 novices. The revenue, estimated at £10,000, is derived from the con- ventual domains, which, though much less extensive than they once were, still comprise, not ouly a number of estates, but five villages presented or rather restored by" the Russian emperor. The Catholicus has an annual income of 10,000 rubles. To the east of the monastery is a college~~

~~and seminary of modern erection. At the distance of about half a mile stand the churches of St Rhipsime and St Gaiana, two of the early martyrs of Armenian Chris- tianity ; the latter is of special interest as~~

~~the burial- place of all those primates who are not deemed worthy by the synod ofinterment besidethecathedral. From adistance the three churches form a fairly striking group, and accord- ingly the Turkish name for Etchmiadzin is simply Utch- Kilissi, or the Three Churches, A fourth of less importance isignored. The townof Etchmiadzin, oras itshould becalled Vagharshapat, contains about 8000 inhabitants, but has Jong ceased to be of any individual importance. According to Armenian historians it dates from the 6th century B.c., and takes its name from King Vagarsh, who in the 2d century A.D. chose it as his residence and surrounded it with walls, The great apostle of Armenia, St Gregory the Illuminator, having seen the Saviour descend in a flood of light in the neighbourhood of the palace, was ordered by an angel to erect achurch on the spot. He obeyed the divine command in 309, and gave the building the commemorative name of Edch-Miadzin, or Descended the Only Begotten. In 344 Vagharshapat ceased to be the Armenian capital, and in the 5th century the patriarchal seat was removed to Tovin, The monastery was founded by Narses II., who ruled from 524-33; and a restoration was effected by Gomidas in 618. At length in 1441 the primate George or Kevork brought back the see to the original site, and from that day to the present time Etchmiadzin has been the centre of the Armenian church. In the Russo-Persian war of 1827, though the monastery was declared neutral territory by both belligerents, it was occupied by Russian troops.~~

~~See Dubois du Montpéreux, Voyage autour du Caucase, vol. iii., 1839 ; Viscount Pollington, Half Round the Old World, 1867; S. C. Malan, S¢ Gregory the Illuminator; Thielman, Journey in the Caucasus, &c., 1875 ; Telfer, The Crimea and Transcaucasia, 1876,~~

~~ETEOCLES, a mythical king of Thebes, son of CEdipus and Jocasta. He and his brother Polynices were cursed by their father for shutting him up in a prison ; and inorder to prevent the fulfilment of his prayer that they might engage in fratricidal combat for his throne, they resolved to reign alternately, each for a year. Eteocles as the elder ascended the throne first, but at the expiry of the year he refused to surrender the throne to Polynices. The latter therefore, with the aid of Adrastus, king of Argos, whose daughter he had married, headed the~~

~~famous expedition of the Seven against Thebes. After a series of unavailing skirmishes between the rival forces, the two brothers met in single combat, and both were slain. The Theban rulers decreed that only Eteocles should receive the honour of burial, and that the body of Polynices should be cast out to the dogs and birds, but notwithstanding the decree, the burial rite was performed to Polynices by his sister Antigone. The fate of Eteocles and Polynices forms the subject of Aischy- lus's tragedy, The Seven against Thebes, and of Euripides's Pheenisse.~~

~~ETHELBERT, or ArHELBERHT, king of Kent, ascended the throne in 560. In 568 he was defeated by the West Saxons, and his authority limited to Kent, but ultimately he conquered the Saxons of Middlesex and Essex, and about 590 he was acknowledged as over-lord as far north as the Humber. About 375 he married Bertha or Bercta, daughter of the Frankish king Charibert. The Franks had already been converted to Christianity, and when Pope Gregory the Great heard that a Frankish princess was married to the king of Kent, he seized the opportunity to send Augustine to attempt the conversion of the Anglo-Saxons, In 597 Augustine and his companions landed in the Isle of Thanet, and on learning of their arrival Ethel- bert, prompted doubtless py Bertha, at once invited them~~

~~to an interview. Not being certain whether they might not use enchantments against him, he received them, for greater security, in the open air; and after listening to a long sermon from Augustine, he was so far impressed, that although not prepared at once to forsake his old religion, he granted liberty to the monks to preach to his people. According to the accounts that have been handed down their success was almost unprecedented, and as many as 10,000 baptisms are said to have taken place ina single day. Very shortly afterwards Ethelbert gave in his adhesion to Christianity, and immediately all the inhabitants of Kent followed his example. He gave up his palace for the monks to live in, and adjoining it he built a church, on the site of which was afterwards erected the cathedral of Can- terbury. He died in 616, and~~

was canonized, his day being the 24th February. The earliest code of Anglo-Saxon laws now extant was issued by Ethelbert in 600. With the exception of a provision for the protection of the pro- perty of God and the church, it consists chiefly of enact- ments against crimes—the various kinds of which, with the penalties attaching to commission of them, are stated in minute detail.

ETHELRED (or ruetrep) II., surnamed the Unready (968-1016), an Anglo-Saxon king, the son of Edgar and Elfrida, was born in 968. On the murder of Edward the Martyr in 979, Ethelred succeeded him on the Anglo- Saxon throne. He is said to have owed his surname "Unready " (i.e, without rede or counsel) to Dunstan, who even when he placed the crown on Ethelred's head prophesied that during his reign, on account of the sins of Elfrida, evils should fall upon the English such as they had never yet suffered. Such evils did fall upon them, and were doubtless chiefly due to the king. He possessed consider- able energy when roused to exert himself, but it was only exercised fitfully, and generally misdirected, being always awanting at critical periods, and never used but to the dis- advantage of his kingdom. Careless of everything but his immediate comfort or the gratification of an immediate whim, and listless and fond of ease, he allowed his king- dom and himself to be managed by worthless favourites, whose acts of, as it seems to us, open treachery were not only allowed to pass unpunished, in a manner which appears to us unaccountable, but seemed almost to form steps in their ladder of advancement to special influence and favour with the king. The successes attending the Danish invasions in the reign of Ethelred were due almost wholly to three causes,—the unpreparedness of the Anglo-Saxons, the treachery of the earls, and the failure of the king to follow up victories which were often won with no special prepara- tion, and without adequate leaders. About two years after Kthelred mounted the throne the Danish invasions recom- menced, but it was not till a later period that their inroads assnmed the serious aspect of an attempt to conquer the Anglo-Saxon kingdom. In 988 they were defeated at Watchet in Somersetshire, and in 991 at Maldon, immediately after which latter victory, Ethelred purchased peace from his defeated enemies by money raised through means of the oppressive tax known

as the “Danegeld.” The Danes were allowed to stay in England, and they on their part agreed to help Ethelred against any other foreign fleet that might attack him; but for some reason now unknown, a dispute arose in 992, and in a battle between the rival fleets, the Anglo-Saxons, notwithstanding the treachery of Elfric, were again victorious. After this the Danes sailed to the north of England and ravaged both sides of the Humber. In 994 Swend, king of the Danes, and Olaf, king of the Norwegians, combined their forces and attacked London, but their attempt was completely frustrated by the valour of the citizens ; and they sailed away to accom- plish the easier tusk of ravaging the southern coasts, when

Ethelred as usual did nothing to oppose them, but bought them off with a large sum of money. His efforts at con- ciliation were completely successful with Olaf, who, after being converted to Christianity, and adopted by Ethelred as his son, remained faithful ever afterwards to his promise of friendship. In the years 997, 998, and 999 the Danes ravaged the coasts of Wessex, Sussex, and Kent. In 1000 Ethelred, energetic at the wrong time and for wrong objects, invaded Normandy, but suffered a disastrous defeat. He concluded a treaty with that country soon afterwards, and in 1002 married Emma, daughter of Richard duke of Normandy. In the spring a treaty had been concluded with the Danes, but in the winter of the same year, Ethelred suspecting that they were plotting treachery, ordered a general massacre of all the Danes in England. Among others murdered was Gunold, sister of Swend ; and the Danish king, to revenge her death and that of his countrymen, invaded the coast of Devonshire with a large force. He met with scarcely any opposition, and com- mitted the usual ravages ti!l 1007, when peace was con- cluded by Ethelred’s consenting, as at other times, to the payment of a large sum of money. In 1009 Ethelred collected the “ largest fleet that had been seen in the reign of any king,” but it was soon afterwards nearly wholly destroyed by a violent storm, just before the Danes renewed their invasion. Ethelred, though he had gathered an army, was dissuaded from attacking them by Edric, and afterwards the English, through the treachery of their leaders, suffered a series of

~~defeats ; but in 1012 peace was again bought, and Thurkill, one of the Danish leaders, entered the English service, In 1013 Swend, with a more formidable fleet than any he had yet collected, sailed up the Humber, and then marched southward to London; but meeting there with a strenuous resistance, he was compelled to give up the attack and marched to Bath. Here he was proclaimed king, apparently by the Witan, and with the general consent of the English people, who were doubtless wearied of Ethelred's incompetency, of the treachery of the nobles, and of the oppressive taxes which had been paid for no purpose. London itself soon acknow- ledged the Danish king, and Ethelred, after for a time taking refuge in Thurkill's fleet, escaped to Normandy. Swend died on February 1014, and on his death Ethelred was recalled by the Witan, on the promise of ruling better in future. In the same year he defeated Cnut, son of Swend, but in 1015 Cnut renewed his attack with a large fleet, and being joined by the traitor Edric, ravaged Wessex and Mercia, and was preparing to attack London, when Ethelred died April 23, 1016. (See Palgrave's History of the Anglo-Saxons ; Freeman's Norman Conquest, vol. i. ; and Green's History of the English People.) ETHELWULF, or ArHetwutr, an Anglo-Saxon king, succeeded his father Egbert about 836. His reign, like that of his father, was almost wholly occupied with wars against the Danish invaders. For a long time he held them in check, and when in 851 they took Canterbury and London, and defeated Beohrtwulf, king of the Mercians, he met them at Ockley in Surrey, and there " made the greatest slaughter among the heathen army that we have heard tell of unto the present day, and there got the victory." But the Northmen were persevering in their efforts; and it is stated that in 855 they, for the first time, remained over winter in Sheppey. In the same year Ethelwulf made a journey to Rome, accompanied by his youngest and favourite son Alfred, to get the latter consecrated as his successor ; and as his first wife Osburga had been for some time dead, he delayed a few months in France to marry Judith, daughter of the king ofthe Franks. Ethelbald, his eldest surviving son, indignant at his youngest brother being preferred to him as Successor to his father's throne, took advantage of his~~

~~father's absence to stir up a revolution against him, and obtained the support of so powerful a party that an unnatural civil war was only prevented by Ethelwulf agree- ing to grant to his son the government of Wessex, he him- self being recognized as over-lord, and retaining the rest of – the kingdom. He died in 858,~~

~~ETHER, (C,H,),0, the ther or Atther Sulphuricus of pharmacy, is a colourless, volatile, highly inflammable liquid, of specific gravity 0°723, boiling-point when pure 35°6° C, and fusing-point — 31°C. It has a strong and characteristic odour, and a hot sweetish taste, is soluble in ten parts of water, and in all proportions in alcohol, and dissolves bromine, iodine, and, in small quantities, sulphur and phosphorus, also the volatile oils, most fatty and resinous substances, gun-cotton (see CoLLopion, vol. vi. p. 149), caoutchouc, and certain of the vegetable alkaloids. The vapour mixed with oxygen or air is violently explosive. The making of ether by the action of sulphuric acid on alcohol was known to Raymond Lully, who wrote in the 13th century ; and later Basil Valentin and Valerius Cordus described its preparation and properties. The name ether appears to have been applied to the drug only since the times of Froben, who in 1730 termed it sguritus cethereus. Ether is manufactured by the distillation of 5 parts of 90 per cent. alcohol with 9 parts of concentrated sulphuric acid, at a temperature of 140°-145° C., a constant stream of alcohol being caused to flow into the mixture during the operation. (See CHemisrry, vol. v. p. 566). Itis purified by treatment with lime and calcium chloride, and subsequent redistillation. According to P. Stefanelli (Ber. deutsch. Chem. Ges, 1875, p. 439), the presence of as small a quantity as 1 per cent. of alcohol may be detected in ether by the colour imparted to it by aniline violet ; if water or acetic acid be present, the ether must be shaken with an- hydrous potassium carbonate before the application of the test. Ether when drunk has a rapid though evanescent in- toxicating effect, estimated to be more than three times that of the same bulk of whisky, instead of which it is largely consumed in some parts of Ireland. (See H. N. Draper, Med. Press and Circular, iv. 117). Mixed with twice its volume of rectified spirit, it is administered internally as a remedy for nervons headache, flatulence, hiccough, hysteria, and spasmodic vomiting and asthma, occasionally also in angina pectoris,~~

~~intermittent fevers and typhus, and as an antidote for narcotic poisons, and for relieving the pain caused by biliary calculi, It has been shown by Longet that ether when swallowed even in fatal doses does not at any time produce anesthesia. Much heat being rendered latent by its evaporation, ether 1s sometimes employed as a refrigerant in the reduction of hernia. By the use of Dr Richardson's ether spray apparatus for effecting local anesthesia, a temperature of — 6° F. can be obtained, When not allowed to evaporate, ether acts as a rubefacient. Its vapour when inhaled causes at first considerable irritation of the air-passages, and increased rapidity of the pulse, accompanied by much excitement. With the establishment of complete anesthesia the pulse sinks to 60° or 70°, the face becomes pallid, and the muscles are relaxed. Ether occasions more excitement, and requires a somewhat longer period for its exhibition than chloroform, but does not exercise upon the heart the sedative influence of that drug. A history of the employment of ether as an anesthetic will be found under ANa&sTHESIA, vol. i. p. 786. See also CutorororM, vol. v. p. 680.~~

~~ETHER, or A2TuER (aifp, probably from aidw, I burn, though Plato in his Cratylus (410, b) derives the name from its perpetual motion—ére det Het rept Tov dépo peor, debenp Sixatws dv xaXotro), a material substance of a more subtle kind than visible bodies, supposed to exist in those parts of space which are apparently empty.~~

~~ETHER~~

~~The hypothesis of an ether has been maintained by dif- ferent speculators for very different reasons. To those who maintained the existence of a plenum as a philosophical principle, nature's abhorrence of a vacuum was a sufticient reason for imagining an all-surrounding ether, cven though every other argument should be against it. To Descartes, who made extension the sole essential property of matter, and matter a necessary condition of extension, the bare existence of bodies apparently at a distance was a proof of the existence of a continuous medium between then).~~

~~But besides these high metaphysical necessities for a medium, there were more mundaue uses to be fulfilled by ethers. Authers were invented for the planets to swim in, to constitute electric atmospheres and magnetic effluvia, to convey sensations from one part of our bodies to another, and so on, till all space had been filled three or four times over with ethers. It is only when we remember the extensive and mischievous influence on science which hypotheses about ethers used formerly to exercise, that we can appreciate the horror of ethers which sober-minded men had during the 18th century, and which, probably asa sort of hereditary prejudice, descended even to the late Mr John Stuart Mill.~~

~~The disciples of Newton maintained that in the fact of the mutual gravitation of the heavenly bodies, according to Newton's law, they had a complete quantitative account of their motions ; and they endeavoured to follow out the path which Newton had opened up by investigating and measuring the attractions and repuisions of electrified and magnetic bodies, and the cohesive forces in the interior of bodies, without attempting to account for these forces.~~

~~Newton himself, however, endeavoured to account for gravitation by differences of pressure in an ether (see art. Arrraction, vol, iii. p. 64); but he did not publish his theory, "because he was not able from experiment and observation to give a satisfactory account of this medium, and the manner of its operation in producing the chief plienomena of nature."~~

~~On the other hand, those who imagined zethers in order to explain phenomena could not specify the nature of the motion of these media, and could not prove that the media, as imagined by them, would produce the effects they were meant to explain. The only ether which has survived is that which was invented by Huygens to explain the pro- pagation of light. The evidence for the existence of the luminiferous zther has accumulated as additional pheno- mena of light and other radiations have been discovered ; and the properties of this medium, as deduced from the phenomena of light, have been found to be precisely those required to explain electromagnetic phenomena.~~

~~Function of the ether in the propagation of radiation.— The evidence for the undulatory theory of light will be given in full, under the article on Licur, but we may here give a brief summary of it so faras it bears on the existence of the ether.~~

~~That light is not itself a substance may be proved from the phenomenon of interference. A beam of light from a single source is divided by certain optical methods into two parts, and these, after travelling by different paths, are inade to reunite and fall upona screen. If either half of the beam is stopped, the other falls on the screen and illuminates it, but if both are allowed to pass, the screen in certain places becomes dark, and thus shows that the two portions of light have destroyed each other.~~

~~Now, we cannot suppose that two bodies when put to- gether can annihilate each other ; therefore light cannot be a substance. What we have proved is that one por- tion of light can be the exact opposite of another portion, just as +a is the exact opposite of —a, whatever a may~~

~~be. Among physical quantities we find some which are capable of having their signs reversed, and others which are not. Thus a displacement in one direction is the exact opposite of an equal displacement in the opposite direction. Such quantities are the measures, not of substances, but always of processes taking place in a substance. We therefore conclude that light is not a substance but a pro- cess going on ina substance, the process going on in the first portion of light being always the exact opposite of the process going on in the other at tle same instant, so that when the two portions are combined no process goes on at all. To determine the nature of the process in which the radiation of light consists, we alter the length of the path of one or both of the two portions of the beam, and we find that the light is extinguished when the difference of the length of the paths is an odd multiple of a certain small distance called a half wave-length. In all other cases there is more or less light; and whien the paths are equal, or when their difference is a multiple of a whole wave-length, the screen appears four times as bright as when one portion of the beam falls on it. In the ordinary form of the experiment these different cases are exhibited simultanequsly at different points of the screen, so that we see on the screen a set of fringes consisting of dark lines at equal intervals, with bright bands of graduated intensity between them.~~

~~If we consider what is going on at different points in the axis of a beam of light at the same instant, we shall find that if the distance between the points is a multiple of a wave-length the same process is going on at the two points at the same instant, but if the distance is an odd multiple of half a wave-length the process going on at one point is the exact opposite of the process going on at the other.~~

~~Now, light is known to be propagated with a certain velocity (3004 × 10″ centimetres per second in vacuum, according to Cornu). If, therefore, we suppose a movable point to travel along the ray with this velocity, we shall find the same process going on at every point of the ray as the moving point reaches it. If, lastly, we consider a fixed point in the axis of the beam, we shall observe a rapid alternation of these opposite processes, the interval of time between similar processes being the time light takes to travel a wave-length.~~

~~These phenomena may be summed up in the mathe- matical expression~~

~~u=A cos (nt — pxt+a)~~

~~which gives w, the phase of the process, at a point whose distance measured froma fixed point in the beam is z, and at a time ¢.~~

~~We have determined nothing as to the nature of the process. It may be a displacement, or a rotation, or an electrical disturbance, or indeed any physical quantity which is capable of assuming negative as well as positive values. Whatever be the nature of the process, if it is capable of being expressed by an equation of this form, the process going on at a fixed point is called a vibration; the con-~~

~~, : 2 F stant A is called the amplitude; the time = is called~~

~~the period; and nt — px +a is the phase. The configuration at a given instant is called a wave, and~~

~~the distance is called the wave-length. The velocity~~

~~of propagation is ™ When we contemplate the different~~

~~parts of the medium as going throngh the same process in succession, we use the word undulatory to denote this character of the process without in any way restricting its~~

~~physical nature. VII. — 72~~

~~570~~

~~A further insight into the physical nature of the process is obtained from the fact that if the two rays are polarized, and if the plane of polarization of one of them be made to turn round the axis of the ray, then when the two planes of polarization are parallel the phenomena of interference appear as above described. As the plane turns round, the dark and light bands become less distinct, and when the planes of polarization are at right angles, the illumination of the screen becomes uniform, and no trace of interference can be discovered.~~

~~Hence the physical process involved in the propagation of light must not only be a directed quantity or vector capable of having its direction reversed, but this vector must be at right angles to the ray, and either in the plane of polarization or perpendicular to it. Fresnel supposed it to be a displacement of the medium perpendicular to the plane of polarization. Maccullagh and Neumann supposed it to be a displacement in the plane of polarization. The comparison of these two theories must be deferred till we come to the phenomena of.dense media.~~

~~The process may, however, be an electromagnetic one, and as in this case the electric displacement and the mag- netic disturbance are perpendicular to each other, either of these may be supposed to be in the plane of polarization.~~

~~All that has been said with respect to the radiations which affect our eyes, and which we call light, applies also to those radiations which do not produce a luminous im- pression on our eyes, for the phenomena of interference have been observed, and the wave-lengths measured, in the case of radiations which can be detected only by their heat- ing or by their chemical effects.~~

~~Elasticity, tenacity, and density of the wether.— Having so far determined the geometrical character of the process, we must now turn our attention to the medium in which it takes place. We may use the term ether to denote this medium, whatever it may be.~~

~~In the first place, it is capable of transmitting energy. The radiations which it transmits are able not only to act on our senses, which of itself is evidence of work done, but to heat bodies which absorb them; and by measuring the heat communicated to such bodies, the energy of the radia- tion may be calculated.~~

~~In the next place this energy is not transmitted instan- taneously from the radiating body to the absorbing body, but exists for a certain time in the medium.~~

~~If we adopt either Fresnel's or Maccullagh's form of the undulatory theory, half of this energy is in the form of potential energy, due to the distortion of elementary por- tions of the medium, and half in the form of kinetic energy, due to the motion of the medium. We must therefore re- gard the ether as possessing elasticity similar to that of a solid body, and also as having a finite density. If we take Pouillet's estimate of 1°7633 as the number of gramme- centigrade units of heat produced by direct sunlight falling on a square centimetre in a minute, this is equivalent to 1°234 × 10% ergs persecond. Dividing this by 3-004 × 109, the velocity of light in centimetres per second, we get for the energy in acubic centimetre 4:1 × 10-5 ergs. Near the sun the energyina cubic centimetre would be about 46,000 times this, or 1:886 ergs. If we further assume, with Sir W. Thomson, that the amplitude is not more than one~~

~~hundredth of the wave-length, we have Ap = = » or about~~

~~100~~

~~zs } 80 that we have— Energy per cubic centimetre = 4pV2A2p? =~~

~~1°886 ergs. Greatest tangential stress per~~

~~Square centimetre = pV?Ap = 30°176 dynes. Coefficient of rigidity of ether, , ; – = pV? = 842°8 Density of ther, . » = p = 9°36× 10719~~

~~ETHER~~

~~The coefficient of rigidity of steel is about 8× 10", and that of glass 2°4 × 1011.~~

~~If the temperature of the atmosphere were everywhere 0° C, and if it were in equilibrium about the earth supposed at rest, its density at an infinite distance from the earth would be 3 × 10-46 which is about 3 × 10°27 times less than the estimated density of the xther. In the regions of in- terplanetary space the density of the ether is therefore very great compared with that of the attenuated atmosphere of interplanetary space, but the whole mass of ether within a sphere whose radius is that~~

~~of the most distant planet is very small compared with that of the planets them- selves?~~

~~The ether distinct from gross matter.—W hen light travels through the atmosphere it is manifest that the medium through which the light is propagated is not the air itself, for in the first place the air cannot transmit transverse vibrations, and the normal vibrations which the air does transmit travel about a million times slower than light. Solid transparent bodies, such as glass and crystals, are no doubt capable of transmitting transverse vibrations, but the velocity of transmission is still hundreds of thousand times less than that with which light is transmitted through these bodies. We are therefore obliged to suppose that the medium through which light is propagated is some- thing distinct from the transparent medium known to us, though it interpenetrates all transparent bedies and pro- bably opaque bodies too.~~

~~The velocity of light, however, is different in different transparent media, and we must therefore suppose that these mediatakesome part in the process, and that their particles are vibrating as well as those of the ether, but the energy of the vibrations of the gross particlesmust be very much smaller than that of the zther, for otherwise a much larger pro- portion of the incident light would be reflected when a ray passes from vacuum to glass or from glass to vacuum tlian we find to be the case.~~

~~Relative motion of the ether.—We must therefore con- sider the xther within dense bodies as somewhat loosely connected with the dense bodies, and we have next to inquire whether, when these dense bodies are in motion through the great ocean of ether, they carry along with them tlie ether they contain, or whether the ether passes through them as the water of the sea passes through the meshes of a net when it is towed along by a boat. If it were possible to determine the velocity of light by observing the time it takes to travel between one station and another on the earth's surface, we might, by comparing the observed velocities in opposite directions, determine the velocity of the «ther with respect to these terrestrial stations. All methods, however, by which it is~~

~~practicable to determine the velocity of light from terrestrial experiments depend on the measurement of the time required for the double journey from one station to the other and back again, and the increase of this time on account of a relative velocity of the ether equal to that of the earth in its orbit. would be only about one hundred millionth part of the whole time of transmission, and would therefore be quite in- sensible.~~

~~The theory of the motion of the ether is hardly sufficiently developed to enable us to form a strict mathe- matical theory of the aberration of light, taking into account the motion of the ether. Professor Stokes, however, has shown that, on a very probable hypothesis with respect to the motion of the ether, the amount of aberration would not be sensibly affected by that motion.~~

~~The only practicable method of determining directly the relative velocity of the «ther with respect to the solar system is to compare the values of the velocity of light~~

~~1 See Sir W. Thomson, Trans. R. S, Edin., vol. xxi. p. 60.~~

~~EBTHE ®~~

~~deduced from the observation of the eclipses of Jupiter's satellites when Jupiter is seen from the earth at nearly opposite points of the ecliptic.~~

~~Arago proposed to compare the deviation produced in the light of a star after passing through an achromatic prism when the direction of the ray within the prism formed different angles with the direction of motion of the earth in its orbit. If the ether were moving swiftly through the prism, the deviation might be expected to be different when the direction of the light was the same as that of the ether, and when these directions were opposite.~~

~~The present writer! arranged the experiment in a more practicable manner by using an ordinary spectroscope, in which a plane mirror was substituted for the slit of the col- limator. The cross wires of the observing telescope were illu- minated. The lightfrom any point of the~~

~~wire passed through the object-glass and then through the prisms as a parallel pencil till it fell on the object-glass of the collimator, and came to a focus at the mirror, where it was reflected, and after passing again through the object-glass it formed a pencil passing through each of the prisms parallel to its original direction, so that the object-glass of the observing telescope brought it to a focus. coinciding with the point of the cross wires from which it originally proceeded. Since the image coincided with the object, it could not be observed directly, but by diverting the pencil by partial re- flection at a plane surface of glass, it was found that the image of the finest spider line could be distinctly seen, though the~~

~~light which formed the image had passed twice through'~~

~~three prisms of 60°. The apparatus was first turned so that the direction of the light in first passing through the second prism was that of the earth's motion in its orbit. The apparatus was afterwards placed so that the direction of the light was opposite to that of .the earth's motion. Tf the deviation of the ray by the prisms was increased or diminished for this reason in the first journey, it would be diminished or increased in the return journey, and the image would appear on one side of the object. When the apparatus was turned round it would appear on the other side. The experiment was tried at different times of the year, bnt only negative results were obtained. We cannot, however, conclude absolutely from this experiment that the ether near the surface of the earth is carried along with the earth in its orbit, for it has been shown by Professor Stokes? that according to Fresnel's hypothesis the relative velocity of the ether within the prism would be to that of the zther outside inversely as the square of the index of refraction, and that in this case the deviation would not be sensibly altered on account of the motion of the prism through the cether.~~

~~Fizeau,? however, by observing the change of the planc of polarization of light transmitted obliquely through a series of glass plates, obtained what he supposed to be evidence of a difference in the result when the direction of the ray in space was different, and Angstrém obtained~~

~~analogous results by diffraction. The writer is not aware that either of these very difficult experiments has been verified by repetition.~~

~~In another experiment of M. Fizeau, which seems entitled to greater confidence, he has observed that the propagation of light in a stream of water takes place with greater velocity in the direction in which the water moves thar in the opposite direction, but that the change of velocity is less than that which would be due to the actual velocity of the water, and that the phenomenon does not occur when air is substituted for water. This experiment seems rather to verify Fresnel's theory of the zther; but the~~

~~1 Phil. Trans., clviii. (1868), p. 532. 2 Phil. Mag., 1846, p. 53. 3 Ann. de Chimie et de Physique, Feb. 1860.~~

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~~whole question of the state of the luminiferous medium near the earth, and of its connexion with gross maeter, is very far as yet from being settled by experiment.~~

~~Function of the ether in electromagnetic phenomena. —Faraday conjectured that the same medium which is concemed in the propagation of light might also be the agent in electromagnetic phenomena. 'For my own part," he says, " considering the relation of 9 vacuum to the magnetic force, and the general character of magnetic phenomena external to the magnet, I am much more inclined to the notion that in the transmission of the force there is such an action, external to the magnet, than that the effects are merely attraction and repulsion at a dis- tance, Such an action may be a function of the ether; for it is not unlikely that, if there be an ether, it should have other uses than simply the conveyance of radia- tion."* This conjecture has only been strengthened by subsequent investigations.~~

~~Electrical energy is of two kinds, electrostatic and electrokinetic. We have reason to believe that the former depends on a property of the~~

~~medium in virtue of which an electric displacement elicits an electromotive force in the opposite direction, the electromotive force for unit displacement being inversely as the specific inductive capa- city of the medium.~~

~~The electrokinetic energy, on the other hand, is simply the energy of the motion set up in the medium by electric currents and magnets, this motion not being con- fined to the wires which carry the currents, or to the mag- net, but existing in every place where magnetic force can be found.~~

~~Electromagnetic Theory of Light.—The properties of the electromagnetic medium are therefore as far as we have gone similar to those of the luminiferous medium, but the best way to compare them is to determine the velocity with which an electromagnetic disturbance would be propagated through thé medium. If this should be equal to the velocity of light, we would have strong reason to believe that the two media, occupying as they do the same space, are really identical. 'The data. for making the calculation are furnished by the experiments made in order to compare the electromagnetic with the electrostatic system of units. The velocity of propagation of an electromagnetic disturbance in air, as calculated from different sets of data, does not differ more from the velocity of light in air, as determined by different observers, than the several calculated values of these quantities differ among each other.~~

~~If the velocity of propagation of an electromagnetic disturbance is equal to that of light in other transparent media, then in non-magnetic media the specific inductive capacity should be equal to the square of the index of refraction.~~

~~Boltzmann? has found that this is very accurately true for the gases which he has examined. Liquids and solids exhibit a greater divergence from this relation, but we can hardly expect even an approximate verification when we have to compare the results of our sluggish electrical experiments with the alternations of light, which take place billions of times in a second.~~

~~The undulatory theory, in the form which treats the phenomena of light as the motion of an elastic solid, is still encumbered with several difficulties.®~~

~~The first and most important of these is that the theory indicates the possibility of undulations consisting of vibra- tions normal to the surface of the wave. The only way of i~~

~~4 Haperimental Researches, 3075.~~

~~5 Wiener Sitzb., 23 April 1874.~~

~~6 See Prof. Stokes, " Report on Double Refraction," British Ass. Report, 1862, p. 253.~~

~~accounting for the fact that the optical phenomena which would arise from these waves do not take place 1s to assume that the eether is incompressible.~~

~~The next is that, whereas the phenomena of reflection are best explained on the hypothesis that the vibrations are perpendicular to the plane of polarization, those of double refraction require us to assume that the vibrations are in that plane.~~

~~The third is that, in order to account for the fact that in a doubly refracting crystal the velocity of rays in any principal plane and polarized in that plane is the same, we must assume certain highly artificial relations among the coefficients of elasticity.~~

~~The electromagnetic theory of light satisfies all these requirements by the single hypothesis! that the electric displacement is perpendicular to the plane of polarization. No normal displacement can exist, and in doubly refracting crystals the specific dielectric capacity for each principal axis is assumed to be equal to the square of the index of refraction of a ray perpendicular to that axis, and polarized in a plane perpendicular to that axis. Boltzmann? has found that these relations~~

~~are approximately true in the case of crystallized sulphur, a body having three unequal axes. The specific dielectric capacity for these axes are respectively~~

~~4-773 3°970 3811 and the squares of the indices of refraction 4576 3‘886 3°591~~

~~Physical constitution of the ether.—What is the ultimate constitution of the ether? is it molecular or continuous ?~~

~~We know that the sether transmits transverse vibrations to very, great distances withuut sensible loss of energy by dissipation. A molecular medium, moving under such conditions that a group of molecules once near together remain near each other during the whole motion, may be capable of transmitting vibrations without much dissipation of energy, but if the motion is such that the groups of molecules are not merely slightly altered in configuration but entirely broken up, so that their component molecules pass into new types of grouping, then in the passage from one type of grouping to another the energy of regular vibrations will be frittered away into that of the irregular agitation which we call heat.~~

~~We cannot therefore suppose the constitution of the ether to be like that of a gas, in which the molecules are always in a state of irregular agitation, for in such a medium a trans- verse undulation is reduced to less than one five-hundredth of its amplitude in a single’ wave-length. If the ecther is molecular, the grouping of the molecules must remain of the same type, the configuration of the groups being only slightly altered during the motion.~~

~~Mr §8. Tolver Preston? has supposed that the ether is like a gas whose molecules very rarely interfere with each other, so that their mean path is far greater than any planetary distances. He has not investigated the pro- perties of such a medium with any degree of completeness, but it is easy to see that we might form a theory in which the molecules never interfere with each other’s motion of translation, but travel in all directions with the velocity of light ; and if we further suppose that vibrating bodies have the power of impressing on these molecules some~~

~~vector property (such as rotation about an axis) which does not interfere with their motion of translation, —___= Fe eee ee~~

- ~~Over de theorie der terugkaatsin I j (é é g en breking van het licht, —Aca- Sa Proefschrift door H. A. Lorentz. Arnhem, K. van der Zande, * " Ueber die Verschiedenheit der Dielektricitatsconstante des krys-~~

~~tallisirten Schwefels nach verschied Z 7 8 Boltzmann, Wiener Sttzb., 8th Oct. 1874. mean Cea~~

~~* Phil. Mag., Sept. and Nov. 1877.~~

~~ET H—ETH~~

~~and which is then carried along by the molecules, and if the alternation of the average value of this vector for all the molecules within an element of volume be the process which we call light, then the equations which express this average will be of the same form as that which expresses the displacement in the ordinary theory.~~

~~It is often asserted that the roere fact that a medium is elastic or compressible is a proof that the medium is not continuous, but is composed of separate parts having void spaces between them. But there is nothing inconsistent with experience in supposing elasticity or compressibility to be properties of every portion, however small, into which the medium can be conceived to be divided, in which case the medium would be strictly continuous. A medium, how- ever, though homogeneous and continuous as regards its density, may be rendered heterogeneous by its motion, as in Sir W. Thomson's hypothesis of vortex-molecules in a perfect liquid (see art. Arom).~~

~~The ether, if it is the medium of electromagnetic phe- nomena, is probably molecular, at least in this sense.~~

~~Sir W. Thomson has shown that the magnetic influence on light discovered by Faraday depends on the direction of motion of moving particles, and that it indicates a rotational motion in the medium when~~

~~magnetized. See also Maxwell's Electricity and Magnetism, art. 806, &c.~~

~~Now, it is manifest that this rotation cannot be that of the medium as a whole about an axis, for the magnetic field may be of any breadth, and there is no evidence of any motion the velocity of which increases with the dis- tance from a single fixed line in the field. If there is any motion of rotation, it must be a rotation of very small portions of the medium each about its own axis, so that the medium must be broken up into a number of mole- cular vortices.~~

~~We have as yet no data from which to determine the size or the number of these molecular vortices. We know, however, that the magnetic force in the region in the neighbourhood of a magnet is maintained as long as the steel retains its magnetization, and as we have no reason to believe that a steel magnet would lose all its mag- netization by the mere lapse of time, we conclude that the molecular vortices do not require a continual expendi- ture of work in order to maintain their motion, and that therefore this motion does not necessarily involve dissipa- tion of energy.~~

~~No theory of the constitution of the ether has yet been invented which will account for such a system of molecular vortices being maintained for an indefinite time withont their energy being gradually dissipated into that irregular agitation of the medium which, in ordinary media, is called heat.~~

~~Whatever difficulties we may have in forming a consistent idea of the constitution of the sether, there can be no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge.~~

~~Whether this vast homogeneous expanse of isotropic matter is fitted not only to be a medium of physical inter- action between distant bodies, and to fulfil other physical functions of which, perhaps, we have as yet no conception, but also, as the authors of the Unseen Universe seem to suggest, to constitute the material organism of bcings exercising~~

~~functions of life and mind as high or higher than ours are at present, is a question far transcending the limits of physical speculation. Sie Beatie)~~

~~ETHEREDGE, Sir Gores (c. 1636-1689), an English dramatist, was born in or near London about the year~~

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~~4 Proceedings of the Royal Society, June 1856,~~

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~~1636. He was a scion of an ancient and distinguished family of Oxfordshire. He was educated at Cambridge, but left the university early to travel in France and Flanders. it is probable that le witnessed in Paris the performances of some of Moliére's earliest comedies; and he seems, from an allusion in one of his plays, to have been personally acquainted with Bussy Rabutin. On his return to London he studied the law at one of the Inns of Court. His tastes were those of a fine gentleman, and he indulged freely in pleasure. Sometime soon after the Restoration he composed his comedy of The Comical Revenge, or Love mm a Lub, which introduced him to Lord Buckhurst, after- wards the earl of Dorset. This was brought out at the Duke's Theatre in 1664, and a few copies were printed in the same year. 'The main edition of this play, however, was not issued until 1669. It is partly iu rhymed heroic verse, like the stilted tragedies of the Howards and Killi- grews, but it contains comic scenes that are exceedingly bright and fresh. The sparring between Sir Frederick and the Widow introduced a style of wit hitherto unknown upon the English stage. The success of this play was very great, but Etheredge waited four years before he repeated his experiment. Meanwhile he gainced the highest reputa- tion as a poetical beau, and moved in the circle of Sir Charles Sedley, Lord Rochester, and the other noble wits of theday. In 1668 he brought out She would if she could, a comedy in many respects admirable, full of action, wit, and spirit, but to the last degree frivolous and immoral. But in this play Etheredge first shows himself a new power in literature ; he has nothing of the rudeness of his prede- cessors or the grossness of his~~

~~contemporaries. We move in an airy and fantastic world, where flirtation is the only serious business of life. At this time Etheredge was living a life no less frivolous and unprincipled than those of his Courtals and Freemans. He formed an alliance with the famous actress Mrs Barry; she bore him a daughter, on whom he settled £6000, but who unhappily died in her youth. His wealth and wit, the distinction and charm of his manners, won him the general worship of society, and his temperament is best shown by the names his contemporaries gave him, of "gentle George" and "easy Etheredge." The age upbraided him for inat- tention to literature; and at last, after a silence of eight years, he came forward with one more play, unfortunately his last. Zhe Man of Mode, or Sir Fopling Flutter, indisputably the best comedy of intrigue written in England before tlle days of Congreve, was acted and printed in 1676, and had an unbounded success. Besides the merit of its plot and wit, it had the personal charm of being supposed to satirize, or at least to paint, persons well known in London. Sir Fopling Flutter was a portrait of Beau Hewit, the reigning exquisite of the hour; in Dorimant the poet drew the elegant Sir Charles Sedley, andin Medley a portrait of himself; while even the drunken shoemaker was a real character, who made his fortune from being thus brought into public notice. After this brilliant success Etheredge retired from literature ; his gallantries and his gambling in a few years deprived him of his fortune, and he looked about for a rich match. In 1683 he met with a wealthy elderly widow, who con- sented to 1narry him if he madea lady of her. He accord- ingly got himself knighted, and gained her hand and her money, {t is said that before this, about 1680, he had been sent on an embassy to Turkey ; it is certain that in 1686 he was appointed resident minister in the Imperial German Court at Ratisbon, He was very uncomfortable in Germany, and solaced himself by writing amusing epistles in prose and verse to his friends in England. In 1688 he published a prose Account of the rejoicing at the Diet of Ratisbon. In 1689 he is believed to have died in~~

~~Ratisbon in a tragical manner, for whilst conducting a party of friends to the stairs after a banquet at lis house, he fell over into the court~~

~~below and broke his neck. But his death occurred at the moment when England was convulsed with revolution, and no one has preserved the exact date of it.~~

~~Etheredge deserves to hold a more distinguished place in our literature than has generally been allotted to him. In a dull and heavy age, he inaugurated a period of genuine wit and sprightliness. He invented the comedy of intrigue, and led the way for the masterpieces of Congreve and Sheridan. Before his time the manner of Ben Jonson had prevailed in comedy, and traditional " humours" and typical eccentricities, instead of real characters, had crowded the comic stage. Etheredge paints with a light faint hand, but it is from nature, and his portraits of fops and beaux are simply unexcelled. No one knows better than he how to present a gay young gentleman, a Dorimant, "an unconfinable rover after amorous adventures." His genius is as light as thistledown; he is frivolous, without force of conviction, without principle; but his wit is very sparkling, and his style pure and singularly picturesque. No one approaches Etheredge in delicate touches of dress, furniture, and scene; he makes the fine airs of London gentlemen and ladies live before our eyes even more vividly than Congreve does; but he has less insight and less energy than Congreve. Had he been poor or ambitious he might have been to England almost what Moliére was to France, but he was a rich man living at his ease, and he disdained to excel in literature. Etheredge was "a fair, slender, genteel man, but spoiled his countenance with drinking." His contemporaries all agree in acknow-ledging that he was the soul of affability and sprightly good-nature.~~

~~There is no recent edition of the works of Sir George Etheredge. A critical collection of them would fill a very important gap in our literature.~~

~~ETHERIDGE, Joun Westey (1804-1866), a Wes- leyan minister, and a writer on church history and biblical literature, was born near Newport, Isle of Wight, 24th February 1804. He received most of his early education from his father, who was master of an academy at Portsea, which was afterwards removed to Newport. Though he never attended any university he acquired ultimately a thorough knowledge~~

~~of Greek, Latin, Hebrew, Syriac, French, and German. In 1824 he was placed on the plan asa local preacher. In 1826 his offer to enter the ministry was accepted, and after probationary trial at Hull, Bingley, Lambeth, and Brighton, he was received into full connexion at the conference of 1831. For two years after this he renjained at Brighton, and in 1833 he removed to Corn- wall, being stationed successively at the Truro and Falmouth circuits. From Falmouth he removed to Darlaston, where in 1838 his health gave way. For a good many years he was a supernumerary, and in 1843 he took up his resi- dence at Paris, where in the public libraries he found great facilities for prosecuting his favourite studies. His health having considerably improved, he, in 1843, became pastor of the Methodist church at Boulogne. He returned to England in 1847, and was appointed successively to the circuits of Islington, Bristol, Leeds, Penzance, Penryn, Truro, and St Anstell in east Cornwall. Shortly after his return to England he received the degrees of M.A. and Ph.D. from the university of Heidelberg. He died at Camborne, May 24, 1866.~~

~~His principal works are Hore Aramatewe (1848) ; History of the Syrian Churches (1847) ; The Apostolic Acts and Epistles, from the Peshito or Ancient Syriae (1849); Jerusalem and Tiberias, a Survey of the Lclhigious and Scholastic learning of the Jews (1856) ; The~~

~~Targums of Onkelos and Jonathan ben Uzziel (1st vol. in 1862, 2d in 1865), See Memoir, by Rev. Thornley Smith (1871).~~

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~~ETHICS~~

~~f. EFINITION AND GENERAL ACCOUNT OF THE SUB-~~

~~D yect.—It is not easy to define in a single phrase the subject commonly called Ethics in such a manner as to meet with general acceptance; as its boundaries and relations to cognate subjects are variously conceived by writers of different schools, and rather indefinitely by mankind in general. Nor does the derivation of the term help usmuch. Ethics (7@:xd) originally meant that which relates to 700s ("character"); the~~

~~treatise of Aristotle's, however, to which the term was first applied, is not con- cerned with character considered simply as character, but with its good and bad qualities. Indeed, the antithesis of " good" and " bad," in some form, is involved in all ethical affirmation; and its presence constitutes a fundamental distinction between the science or study of ethics and any department of physical inquiry. Physics is concerned with what is, has been, or will be; ethics with what is '* good," or what " ought to be," and its opposite. We must add, however, that the good that ethics investigates is "good for man," to distinguish it from universal or abso- lute good, which is the subject-matter of theology or ontology ; and again, if we are to separate ethics from politics, we must introduce a further qualification, and de- fine the former as the study of the Good or Wellbeing of men considered as individuals, Neither of these distinctions, however, should be taken to imply a complete division of subjects ; and neitler, it may be added, was reached at once and without effort in the development of ethical reflection. In Platonism we find Ethics and Ontology indissolubly blended ; and, indeed, in almost every philosophical system in which the universe is contemplated as having an ultimate end or Good, the good of human beings is conceived as somehow closely related to this Universal Good. So again the connexion between Ethics and Politics is naturally very intimate. We only know the individual man as a member of some society; what we call his virtues are chiefly ex- hibited in his dealings with his fellows, and his most prominent pleasures are derived from intercourse with them; thus it is a paradox to maintain that man's highest good is independent of his social relations, or of the consti- tution and condition of the community of which he forms a part. So, again, it would be generally admitted that a statesman ought to aim at promoting the wellbeing of his follow citizens considered as individuals; and if so, the in- vestigation of the particulars of such wellbeing must be an integral part of politics. Still it is manifest that the good of an individual man can be separated as an object of study from the good of his community ; so that the ethical point of view has to be distinguished from the political, however large a field the two studies may have in common,~~

When, however, we thus isolate in thought the individual man from his polity, the close connexion of Ethics with Psychology becomes manifest. It is plain that the chief good of man cannot consist in anything external and material, such as wealth ; nor even in mere bodily health and wellbeing, which experience shows to be compatible with extreme badness and wretchedness. And though it is perhaps true that goodness is commonly attributed to men from a consideration of the external effects of their conduct ; stillit is generally held that a certain state of tlie agent's mind, a certain quality of disposition, motive, inten- tion, or purpose, is essential to the perfect moral goodness of an action, Thus all (or aimost all) ethical schools would agree that the main object of their investigation must belong to the psychical side of human life; whether they hold that

as merely sentient and emotional, identifying it with some species of desirable feeling or pleasure, or the genus or sum of such feelings, or whether they rather maintain that wellbeing of the mind must lie solely or chiefly in the quality of its activity. And when we attempt to work out either view into a clear and complete system, we are led inevitably to further psychological study, in order to examine different kinds und degrees of pleasure and pain, determine the nature and mutual relations of the different virtues or good qualities of character, and their opposites. So again, in discussing the fundamental question as to what is ultimately good or desirable, moralists are led to observe carefully what men actually do desire and aim at, and thus to analyse fully the process of voluntary action, as well as the emotional states that precede and prompt toit. In fact it will appear that all important ethical notions are also psychological; except the fundamental antithesis of " good" and " bad," or "right" and " wrong," with which psychology is not primarily concerned, any more than physics.

The two autitheses just mentioned are frequently regarded as identical, And in fact it does not matter for ordinary purposes whether we speak of " right" or " good " con- duct, " wrong" or "bad" motives. The common notion of what is Good for a human being—even if we restrict it to what is " ultimately" good, or " good in itself" and not merely as a means to some further end—includes more than the common notion of

what is Right for him, or his Duty. No doubt it is commonly believed that it will be ultimately best for a man to his duty, and that this will promote his real Interest or Happiness; but it does not follow that the notions of duty and interest are to be identified, or even that the connexion between the two may be scientifically demonstrated. The connexion is often regarded rather as a matter of faith; indeed many would hold that it is not undesirable that it should be somewhat obscure, in order that duty may be done as duty, and not from a mere calculation of self-love. Thus we arrive at another conception of ethics, in which it: is viewed as concerned primarily with the principles of duty or the moral code, and only secondarily—or perhaps not at all—with the relation of duty to the agent's private happi- ness. On this view the study connects itself with theology, if the rules of duty are regarded as a code of divine legis- lation; and apart from this reference it has a close affinity to rational or abstract jurisprudence. We might distinguish this as the modern view of ethics in contrast with the former, which was that of ancient Greek philosophy generally1,—the transition between the two being due chiefly to the influence of Christianity, but partly also to that of Roman jurisprudence. It is true that the thought of " the gods' unwritten and unfaltering law" was not by any means absent from the moral reflection of Greece ; still, the idea of Law was not taken as the ultimate and fundamental notion in any of the ancient ethical systems. These all proceed on the assumption that man, as a reasonable being, must seek his own highest good in this earthly life, and therefore that any laws he has to obey must be demonstrated to be means to the attainment of this good, or particulars in which it is realized. On this point the change produced by Christianity is even more striking, if we consider its more general effects rather than its influence on the minds that were most completely penetrated by its religious spirit.

1'T'o this statement a partial exception must be made as regards Stoicism, through which, in fact, as will presently appear. the transl-

ultimate good is to be found in psychical existence regarded | tion was partly made from the ancient to the modern manner of thought,

~~The true Christian saint lived even on earth, no less than the pagan philosopher, a life which he regarded as intrinsi- cally preferable to all other modes of earthly existence ; and, like the Platonic philosopher, a life of which practical virtuc was not so much the essence as the outward expression. Still even for the saint this earthly life afforded but an imperfect foretaste of the bliss for which he hoped; and in the view of more ordinary Christians, the ultimate good of man vanished from the scrutiny of mere ethical speculation into the indefinite brightness of a future life of happiness, supernaturally bestowed by God as a reward for obedience to his laws. Or rather, perhaps, by the mass of Christians, the raoral code was more commonly regarded, in still closer analogy to hnman legislation, as supported by penal sanc- tions ; since in all ages of Christianity the fear of the pains of hell has probably been a more powerful motive to draw men from vice than the hope of the pleasures of heaven. On either view the ultimate weal or ill of human beings became something that might be imagined and rhetorically described, but not definitely known or scientifically inves- tigated ; and thus the subject-matter of ethics defined itself afresh as Moral Law, a body of rules absolutely prescribed, and supplying a complete guidance for human conduct, though not claiming to contain an exhaustive statement of human good.~~

~~Within the Christian church, through the early and middle ages of its history, it naturally fell to theologians to expound, and to priests to administer this code of divine legislation. But when a more philosophical treatment of ethics was introduced by the schoolmen, the combinatiou in the code of two elements, one distinctively Christian, and the other cognizable by natural reason and binding on all men apart from revelation, began to be clearly seen; and an adequate theory of this second element seemed to be supplied by the development of theoretical jurisprudence that followed on the revival, in the 12th century, of the study of Roman law. In the later treatment of legal principles in Rome, the notion of a law of nature had become prominent; and this notion was naturally and easily adapted to represent the element in morality that was independent of revelation. It~~

~~is true that the natural law of the philosophical jurists did not concern itself primarily with duties, but rather with rights, and so with the relative and negative duties that are involved in the notion of rights; hence it could not properly be iden- tified with more than a portion of the moral code. This portion, however, is of such fundamental importance that the difference we have noticed has been frequently over- looked, and Morality not distinguished from Natural Law, except by the further control that the former claims over the inner springs of voluntary action.~~

~~It is chiefly in connexion with this jural view of morality that the inquiry into the origin of the moral faculty has occupied a prominent place in the modern treatment of Ethics. So long as the " moral faculty" is regarded merely as the faculty of knowing our true good, together with its main causes or conditions, it hardly seems im- portant to inquire how this faculty originated, any more than it is fora geometer to investigate the origin of the spatial faculty. But when conscience is conceived as a legislator and governor within the breast, claiming abso- lute authority over all other inipulses, it is natural that the legitimacy of its claim should be investigated; and it is not hard to understand how this legitimacy is thought to depend on the " originality " of the faculty —that is, on its being a part of the plan or type according to which human nature was originally constructed. Hence investigations into the moral coudition of children and savages and even animals, and more or less conjectural theories of the soul's growth and development, have been commonly~~

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~~regarded as necessary appendages or introductions to modern ethical discussion,~~

~~So again, it is through the jural conception of ethics that the coutroversy on free will chiefly becomes important. A man does not naturally inquire whether he is " free " or not to seek his own good, provided only he knows what it is, and that it is attainable by voluntary action. But when his conduct is compared with a code to the violation of which punishments are attached, the question whether he really~~

could obey the rule by which he is judged is obvious and inevitable, since if he could uot, it seems contrary to our sense of justice to punish him.

To sum up, the subject of Ethics, most comprehensively understood, includes (1) an investigation of the consti- tuents and conditions of the Good or Wellbeing of men considered individually, which chiefly takes the form of an examination into the general nature and particular species of (a) Virtue or (b) Pleasure, and the chief means of realizing these ends ; (2) an investigation of the principles and most important details of Duty or the Moral Law (so far as this is distinguished from Virtue); (3) some inquiry into the nature and origin of the Faculty by which duty is recognized; (4) some examination of the question of human Free Will. It is connected with Ontology or Theology, in so far asa Universal Good is recognized, inclu- sive of Human Good, or analogous to it; with Theology again, so far as morality is regarded as a Code of Divine appointinent. It is connected with Politics, so far as the wellbeing of any individual man is bound up with the wellbeing of his society; and again with Jurisprudence (or Politics), so far as morality is identified with Natural Law. Finally, almost every branch of Ethical discussion belongs at least in part to Psychology; and the inquiries into the origin of the moral faculty and the freedom of the Will are purely psychological.

We will now proceed to trace briefly the course of ethical speculation from its origin in Europe to the present day; confining our attention, during the latter part of this period, to such modes of thought as have been developed in England, or have exercised an important influence there.

II. Greek and Greco-Roman Ertuics.—The ethical speculation of Greece, and therefore of Europe, has not, any more than other elements of European civilization, an abrupt and absolute commencement. The naive and frag- mentary utterances of sage precepts for conduct, in which nascent moral reflection everywhere first manifests itself, supply a noteworthy element of Greek literature in the ""onomic" poetry of the 7th and 6th centuries before Christ; their importance in the

~~development of Greek civilization is strikingly characterized by the traditional enumeration of the “ seven sages” of the 6th century; and their influence on cihical thought is sufficiently shown in the references that Plato and even Aristotle make to the definitions and maxims of poets and sages. But from such utterances as these to moral philosophy there was still a long step; for though Thales (circ. 640-560 B.c.), one of the seven, was also the first physical philosopher of Greece, We have no ground for supposing that his practical wisdom had anything of a philosophical character. There seems to have been more connexion between moral teaching and metaphysical speculation in the case of Pythagoras (circ. 580-500 B.c.), who is conspicuous among pre-Socratic philosophers as the founder not merely of a school, but rather of a sect or order, bound by a common rule of life. Certainly the doctrine of the Pythagoreans, that the essence of justice (conceived as equal retribution) was a square number, indicates a serious attempt to extend to the region of conduct that mathematical view of the universe which was the funda- mental characteristic of Pythagoreanism; and the same may be said of their classification of good with unity, limit,~~

~~straightness, light, &c., and of evil with the opposite qualities. Still, on the whole, the moral precepts of Pythagoras appear to have been announced much more in a dogmatic, or even prophetic, than in a philosophic manner ; and, whether sound or arbitrary, to have been accepted by his disciples with a decidedly unphilosophic reverence for the “ipse dixit”! of the master. Hence, whatever influence the Pythagorean blending of ethical and mathe- matical notions may have had on Plato, and, through him, on later thought, we cannot regard the school as having really forestalled the Socratic inquiry after a completely reasoned theory of conduct. The ethical element in the “ dark ” philosophizing of Heraclitus (circ. 530-470 B.c.) shows more profundity of view but still less approximation to a system; in spite of the partial anticipation of Stoicism which we find in his conceptions of a law of the universe, to which the wise man will carefully conform, and~~

a divine harmony, in the recognition of which he will find his truest satisfaction. It is only when we come to Democritus, a contemporary of Socrates, the last of the series of original thinkers whom we distinguish as pre-Socratic, that we find anything which we can call an ethical system. The frag- ments that remain of the moral treatises of Democritus are sufficient, perhaps, to convince us that the turn of Greek philosophy in the direction of conduct, which was actually due to Socrates, would have taken place without him, though in a less decided manner; but when we compare the Democritean ethics with the post-Socratic system to which it has most affinity, Epicureanism, we find that it exhibits a very rudimentary apprehension of the formal conditions which moral teaching must fulfil before it can lay claim to be treated as scientific.

The fact is that a moral system could uot satisfactorily be constructed until attention had been strongly directed to the vagueness and inconsistency of the common moral opinions of mankind ; until this was done, the moral counsels of the philosopher, however supreine his contempt for the common herd, inevitably shared these defects. For this purpose was needed the concentration of a philosophic intellect of the first order on the problems of practice. In Socrates, for the first time, we find the required combination of a genuine ardour for knowledge, and a paramount intc- rest in conduct. The pre-Socratic thinkers, from Thales downwards, were all primarily devoted to ontological re- search ; but by the middle of the 5th century nc. the clash and conflict of their dogmatic systems had led some of the keenest minds to doubt the possibility of penetrating tlie secret of the universe. This doubt found expression in the reasoned scepticism of Gorgias, and produced the famous doctrine of Protagoras, that the human apprehension is the only standard of what is and what is not. A similar view of the natural limits of the human intellect repelled the philosophic ardour of Socrates from physico-metapbysi- cal inquiries. In his case, morcover, such a view found support in a naive piety that indisposed him to search into things of which the gods seemed to have reserved the know- ledge to themselves. The regulation of human action, on the other hand (except on occasions of special difficulty, for

~~which omens and oracles might be vouchsafed), they lad left to human reason ; on this accordingly Socrates concen- trated his efforts.~~

~~The demand for an art of conduct was not, however, original in Socrates, though his conception of the requisite knowledge was so in the highest degree. The thought of the most independent thinker is conditioned by that of his ege ; and we cannot disconnect the work of Socrates from the professional instruction in conduct which is so striking~~

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~~*This well-known phrase was originally attributed to the Pytha- goreans,~~

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~~a phenomenon of this period of Greek civilization. The origination of this kind of teaching seems to have been due to the genius of Protagoras ; whom we may suppose to have been turned, like Socrates, to the study of human affairs in consequence of his negative attitude towards current onto- logical speculation. 'This instruction, conveyed in well-thronged lectures, does not seem to have been based on any philosophical system, and was in fact of too popular a quality to be of much philosophicalimportance. It seems to have combined somewhat loosely the art of getting on in the world with the art of managing public affairs, and to have mingled encomiastic expositions of different virtues with prudential justifications of virtue, as a means of obtaining pleasure and avoiding pain. But however commonplace the teaching of the "sophistu" may have been, the general fact of the appearance of this new profession to meet a new social need is sufficiently remarkable. How came it that after so many centuries, in which Greeks lad used their moral notions with the confidence of perfect knowledge, and attributed to any cause rather than ignorance the extensive failure of men to realize virtue, they shouid suddenly be- come persnaded that good conduct was something that could be learnt from lectures? It must be borne in mind that in the Greek conception of virtue the moral view of life was not separated from the prudential; the dperj which the~~

~~sophists professed to communicate was not strictly virtue, as distinguished from other skills and gifts that sustain and enrich life. Thus while in this age, as in more wiodern times, most men would suppose that they had sufficient knowledge of justice and temperance, they would not be equally confident that they possessed the art of making the best of life generally. We must remember, too, the importance of the civic or public side of life, to a free-born leisured Greek in the small town communities of this age. The art of conduct as professed and taught to him would mean to a great extent the art of public life; indeed, Plato's Protagoras defines his function to be that of teaching "civic excellence" in distinction from other skills (as that of flute-playing), which might also be included under the notion of épery. It is more natural that a plain man should think scientific training necessary in dealing with affairs of state than in his own private concerns.~~

~~Still this emergence of an art of conduct with profcs- sional teachers cannot thoroughly be understood, unless it is viewed as a crowning result of a general tendency at this stage of Greek civilization to substitute technical skill for traditional procednre and empirically developed faculty. In the age of the sophists we find, wherever we turn, the same eager pursuit of knowledge, and the same eager effort to apply it directly to practice. The method of earth- measurement was rapidly becoming a sciencce; the astro- nomy of Meton was introducing precision into the compu- tation of time; Hippodamus was revolutionizing architcc- ture by building towns with straight broad streets; old- fashioned soldiers were grumbling at the new pedantries of "tactics " and " hoplitics ;" the art of music had recently received a great technical development ; and a still greater change had been effected in that training of the body which constituted the other half of ordinary Greek education. If bodily vigour was no longer to be left to nature and spon- taneous excrcise, but was to be attained by the systematic observance of rules laid down by professional trainers, it was natural to think that the same might be the case with mental excellences. The art of rhctoric, again, which was developed in Sicily in the second half of the fifth century, is a specially striking example of the general tendency we are here considermg ; and it is important to~~

~~observe that the profession of rhetorician was commonly blended with that of sophist. Indeed throughout the age of Socrates~~

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~~sophists and philosophers were commonly regarded, by those who refuscd to recognize their higher claims, as teaching an "art of words." It is easy to see how this came about ; when the demand of an art of conduct made itself felt, it was natural that the rhetoricians, skilled as they were in handling the accepted notions and principles of practice, should come forward to furnish the supply. Nor is there any reason to regard them as conscious charla- tans for so doing, any more than the professional journalist of our own day, whose position as a political instructor of mankind is commonly earned rather by a knack of merely writing than by any special depth of political wisdom. As Plato's Protagoras says, the sophists in professing to teach virtue only claimed to do somewhat better than others what all men are continually doing; and similarly we may say that, when tried by the touchstone of Socrates, they only exhibited somewhat more conspicuously than others the deficiencies which the great questioner found everywhere.~~

~~The charge that Socrates brought against the sophists and his fellow-men generally may be viewed in two aspects. On one side it looks quite artless and simple; on the other it is seen to herald a revolution in scientific method, and to contain the germ of a metaphysical system. Simply stated, the charge was that they talked about justice, temperance, law, &c., and yet could not tell what these things were; the accounts of them which they gave when pressed were, as Socrates forced them to admit, inconsistent with their own judgments on particular instances of justice, legality, &c. This "ignorance" of the real mean- ing of their terms was not, indeed, the only lack of know- ledge that Socrates discovered in his contemporaries, but it was the chief, and it was in the exposure of this that the philosophic importance of his work lay. For the famous "dialectic," by which he brought this ignorance home to his interlocutors, at once exhibited the scientific need of exact definitions of general notions, and suggested that these~~

~~definitions were to be attained by a careful comparison of particulars. Thus, we can understand how, in Aristotle's view, the main service of Socrates to philosophy consisted in "introducing induction and definitions." This descrip- tion, however, is both too technical and too positive to represent the naive and negative character of the Socratic dialectic. For that the results of these resistless arguments were mainly negative is plain from those (earlier) Platonic dialogues in which the impression of the real Socrates is to be found least modified. The pre-eminent " wisdom" which the Delphic oracle attributed to him was held by himself to consist in a unique consciousness of ignorance. And yet it is equally plain, even from Plato, that there was a most important positive element in the teaching of Socrates; had it been otherwise, the attempt of Xenophon to represent his discourses as directly edifying, and the veneration felt for him by the most dogmatic among subsequent schools of philosophy, would be quite inexplicable,~~

~~The union of these two elements in the work of Socrates has caused historians no little perplexity ; and certainly we cannot quite save the philosopher's consistency, unless we regard some of the doctrines attributed to him by Xenophon as merely tentative and provisional. Still the positions of Socrates that are most important in the history of ethical thought are not only easy to harmonize with his conviction of ignorance, but even render it easier to under- stand his unwearied cross-examination of common opinion. For the radical and most impressive article of his creed was constituted by his exalted estimate of this knowledge that was so hard to find, his conviction that ignorance of the good and evil in human life was the source of all practical error. If his habitual inquiries were met by the reply,~~

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~~" We do know what justice and holiness are though we can- not say," he would rejoin, " Whence, then, these perpetual disputes about what is just and holy?" True knowledge, he urged, would settle these quarrels, and produce uni- formity in men's moral judgments and conduct. To us, no doubt, it seems an extravagant paradox to treat men's ignorance of justice as the sole cause of unjust acts; and to the Greek mind also~~

~~the view was paradoxical ; but if we would understand the position, not of Socrates only, but of ancient ethical philosophy generally, we must try to realize that this paradox was also a nearly unanswerable deduction from a pair of truisms. That 'every one wishes for his own good, and would get it if he could," an arguer would hardly venture to question; and he would equally shrink from denying that justice and virtue generally were goods, and of all goods the finest. How then could he re- fuse to admit that 'those who knew how to do just and righteous acts would prefer nothing else, while those who did not know could not do them if they would,"! which would land him at once in the conclusion of Socrates that 'all virtues were summed up in wisdom or knowledge of Good." Observe that we are not to understand this " knowledge of good" as if it were knowledge of duty as distinct from interest. The force of the above argument depends upon a blending of duty and interest in the single notion of good. This blending Socrates did not, of course, invent—he found it in the common thought of his age ; but it was the primary moral function of his dialectic to educe and exhibit it, to drive it home and trace its practical consequences. A resolute assertion of the coincidence of different elements of good, as commonly recognized, forms the kernel of the positive moral teaching that Xenophon attributes to him. He could give no account that satisfied him of good in the abstract ; when pressed for one he evaded the questioners by saying that "he knew no good that was not good for something in particular ;" but that good is con- sistent with itself, that the beautiful is also profitable, the virtuous also pleasant, he was always ready to prove in concrete cases. If he prized the wisdom that is virtue, the "good of the soul," above all other goods, if in his unre- served devotion to the task of producing it in himself and others he endured the hardest penury, he steadily main- tained that such life was richer in enjoyment than a life of luxury; if he faced death rather than violate the laws of his country, he was prepared with a complete proof that it was probably his interest to die.~~

~~This many-sidedness in his view of good is strikingly illustrated by the curious blending of elevated and vulgar sentiment which his utterances about friendship show. If goodness of soul is the " finest of goods," a good friend must be the most valuable of external possessions ; no~~

effort is too great to keep or win such. Still, the good of friend- ship must be shown in its utility; a friend who can be of no service is valueless; and this "service" Socrates on occasion interpreted in the most homely and practical sense. Still, the highest of services that friend can render to friend is moral improvement,

To sum up, then, we may describe the relation of Socrates to the common sense of his age as that of per- petual particular scepticism, combined with permanent general faith. He isalways attacking common opinion, and showing it, from its inconsistencies, not to be knowledge ; but the premises of his arguments are always taken from common opinion, and the knowledge which he seeks is something that will harmonize, not overthrow it. This knowledge is not merely knowledge of Good, though that is the chief and crown of it; he is continually inquiring for

1 Cf. Xenophon, Memorabilia, ix. 4, where Xenophon fully confirms what Plato's dialogues abundantly illustrate.

definitions of all the notions that enter into practical reason- ings, whether for the regulation of public or private con- duct, and is unwearied in studying the rationale of even the inost subordinate acts of life. In fact, he required of all men, whatever their special business might be, that they should know what they were doing and why,— should act on some clear and consistent theory; the requirement was startling to many, but to all philosophic souls it was not the less irresistible, because it was usually indirect. The necessity, indeed, for firmness of purpose' as well as clear- ness of insight he did not expressly recognize, but this quality was all the more conspicuously manifested in his life. Indeed, it was the very perfection in which he possessed this virtue that led him to the paradox of ignor- ing it. Of himself at least it was true, that whatever he believed to be "fair and

~~**good" he must necessarily do; when another acted apparently against knowledge, the easiest explanation seemed to him to be that true knowledge was not really there.**~~

~~**These, then, seem the historically important character- istics of the great founder of moral philosophy, if we take (as we must) his teaching and character together :—(1) an ardent inquiry for knowledge nowhere to be found, but which, if found, would perfect human conduct; (2) a demand meanwhile that men should act as far as possible on some consistent theory; (3) a provisional adhesion to the com- monly received view of good, in all its incoherent com- plexity, and a perpetual readiness to maintain the unity of its different elements, and demonstrate the superiority of virtue by applying the commonest standard of self interest ; (4) personal firmness, as apparently easy as it was actually invincible, in carrying out such practical convictions as he had attained, It is only when we keep all these points in view that we can understand how from the spring of Socratic conversation flowed the branching rivers of Greek ethical thought.**~~

~~**Four distinct philosophical schools trace their immediate origin to the circle that gathered round Socrates—the Megarian, the Platonic, the Cynic, and the Cyrenaic. The impress of the master is manifest on all, in spite of the wide differences that divided them; and they all agree in holding the most important possession of man to be wisdom or knowledge, and the most important knowledge to be knowledge of Good. Here, however, the agreement ends. The more philosophic part of the circle, forming a group in which Enclides of Megara seems at first to have taken the lead, regarded this Good as the object of a still unfulfilled quest ; and setting out afresh in search of it, with a pro- found sense of its mystery, were led to identify it with the hidden secret of the universe, and thus to pass from ethics to metaphysics. Others again, whose demand for know- ledge was more easily satisfied, and who were more impressed with the positive and practical side of the master's teaching, made the quest a much simpler affair ; in fact, they took the Good as already known, and held philosophy to consist in the steady application of this knowledge to conduct. Among these were**~~

~~Antisthenes the Cynic and Aristippus of Cyrene. It is by their unre-served recognition of the duty of living consistently by theory, their sense of the new value given to life through this rationalization, and their effort to maintain the easy, calm, unwavering firmness of the Socratic temper, that we recognize both Antisthenes and Aristippus as " Socratic~~

~~1 Xenophon, it is true, describes him as exalting " self-control," éyxpdreia ; and Mr Grote (ist. of Greece, vol. viii. c. 68) finds this in-consistent with his fundamental principle. But there appears no reason for supposing that Socrates (or Xenophon) formally distinguished éyxpd- Teta from swppoodtyy as Aristotle does ; and it is quite easy to interpret the ordinary notion of ' self-control" Socratically, as essentially con-~~

~~sisting in knowledge of the comparatively small value of gratification of vicious appetite.~~

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~~men," in spite of the completeness with which they divided their master's positive doctrine into systems diametrically opposed. Of their contrasted principles we may perhaps say that, while Aristippus took the most obvious logical step for reducing the teaching of Socrates to clear dogmatic unity, Antisthenes certainly drew the most natural infer- ence from the Socratic life.~~

~~Aristippus argued that, if all that is beautiful or admir- Aristip: able in conduct has this quality as being useful, 7.e., pro- PUs~~

~~ductive of some further good ; if virtuous action is essentially action doue with insight, or rational apprehension of the act as a means to this good ; then surely this good can be but pleasure, which all living things with unperverted impulses seek, while they shun its opposite, pain. He further found a metaphysical basis for this conclusion in the doctrine to which the relativism of Protagoras led him, that we can know nothing of things without us except their impressions on ourselves. An immediate inference from this is the "smooth motion" of sense which~~

we call pleasure, from whatever source it came, as the only cognizable good; no kind of pleasure being in itself better than any otlier, though sorae kinds were to be rejected for their painful con- sequences. Bodily pleasures and pains Aristippus held to be the keenest ; though he does not seem to have maintained this on any materialistic theory, as he admitted the existence of purely meutal pleasures, such as joy in the prosperity of our fatherland. He fully recognized that his good was transient, and only capable of being realized in successive parts; giving even exaggerated empliasis to the rule of seeking the pleasure of the moment, and not troubling one- self about a dubious future. It was in the calm, resolute, skilful culling of such pleasures as circumstances afforded from moment to moment, undisturbed by passion, pre-judices, or superstition, that he conceived the quality of wisdom to be exhibited; and tradition represents him as realizing this ideal to an impressive degree. Among tlhe prejudices from which the wise mau was free he included all regard to customary morality beyond what was due to the actual penalties attached to its violation ; though he held, with Socrates, that these penalties actually render conformity reasonable.

Far otherwise was the Socratic spirit understood by The Antisthenes and the Cynics. They equally held that no Cynics

speculative research was needed for the discovery and definition of Good and Virtue; but they maintained that the Socratic wisdom, on the exercise of which man's wellbeing depended, was exhibited, not in the skilful pursuit, but in the rational disregard of pleasure,—in the clear apprehen- sion of the intrinsic worthlessness of this and most other objects of men's common aims. Antisthenes, indeed, did not overlook the need of supplementing merely intellectual insight by "Socratic force of soul ;" but it seemed to him that, by insight and invincible self-mastery combined, an absolute spiritual independence might be attained which left nothing wanting for perfect wellbeing. What, indeed, could be wanting to the free rational soul, when imaginary needs, illusory desires, and idle prejudices were all discarded. For as for poverty, painful toil, disrepute, and such evils as men dread most, these, he argued, were positively useful as means of progress in

~~spiritual freedom and virtue. The eccentricities with which his disciple Diogenes flaunted and revelled in this freedom have made him one of the most familiar figures of ancient social history, and one which in its very extravagance gives a vivid impression of tliat cle- ment in the Socratic pattern which it involuntarily carica- tures. Vainly, however, do we seek a definite positive import for the Cynic notion of wisdom or moral insight, besides the mere negation of irrational desires and prejudices. We saw that Socrates, while not claiming to have found the abstract theory of Good or Wise conduct, practically~~

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~~understood it to consist in the faithful performance of customary duties, maintaining always that his own happi- ness was therewith bound up. 'lhe Cynics more boldly discarded both pleasure and mere custom as alike irrational ; but in so doing they left the freed reason with no definite aim but its own freedom. It is absurd, as Plato urged, to say that knowledge is the good, and then when asked "'knowledge of what?" to have nothing positive to reply but "of the good ;" but the Cynics do not seem to have made any serious effort to escape from this absurdity.~~

~~The ultimate views of these two one-sided Socraticisms we shall have to notice presently when we come to the post Aristotelian schools. We must now proceed to the more complicated task of tracing the fuller development of the Socratic germ to its Platonic blossom and Aristotelian fruit. 'We can see that the influence of more than one of the earlier metaphysical schools combined with that of Socrates tv produce the famous idealism which subsequent genera- tions have learnt from Plato's dialogues ; but the precise extent and manner in which each element co-operated is difficult even to conjecture.1 Here, huwever, we may con- sider Plato's views merely in their relation to the teaching of Socrates, since to the latter is certainly due the ethical aspect of idealism with which we are at present concerned.~~

~~The ethics of Plato cannot properly be treated asa finished result, but rather as a continual movement from the position of Socrates towards the more complete and articulate system of Aristotle ; except that there isa mystical element at the core of Plato's teaching which finds no counterpait in Aristotle, and in fact disappears from Greek philosophy soon after Plato's death until it finds a partial revival and fantastic development in Neo-Pythagoreanism and Neo- Platonism. The first stage at which we can distinguish Plato's ethical view from that of Socrates is presented in the Protagoras, where he makes a serious, though clearly tenta- tive, effort to define the object of that knowledge which he regards, with his master, as the essence of allvirtue. This science, he here maintains, is really mensuration of pleasures and pains, by which the wise man avoids those mistaken under-estimates of the value of future feelings in comparison with present which we commonly call " yielding to fear or desire." This thorough-going hedonism has somewhat per- plexed Plato's readers ; but (as was said in speaking of the similar view of the Cyrenaics), when a disciple sought to make clear and definite the essentially Socratic doctrine that the different common notions of good,—the beauti- ful, the pleasant, and the useful,—were to be somehow identified and interpreted by each other, hedonism pre- sented itself as the most obvious conclusion. By Plato, however, this conclusion could only have been held before he had accomplished the movement of thought by which he carried the Socratic method beyond the range of human conduct, and developed it into a metaphysical system.~~

~~This movement may be briefly expressed thus. '" If we know," said Socrates, " what justice is, we can give an account or definition of it ;' true knowledge—to put it more technically—must be knowledge of the general fact, common to all the individual cases to which we apply our general notion. But why should we restrict this notion within the range of human conduct? The same relation of general notions to particular examples extends through the whole physical universe ; we can only think and talk of it by means of such notions. It must be equally true every-~~

~~1 The difficulty arises thus :—(1) Aristotle represents Platonism as having sprung from Socratic teaching combined with Heraclitus's doctrine of the flux of sensible things, and the Pythagorean theory that numbers were the real; but (2) in the Megarian doctrine the non-Socratic element is clearly the one changeless being of Parmenides ; while (8) the original connexion of Plato and Euclides is equally evident,~~

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~~where that true or scientific knowledge is general know- ledge, relating, not to individuals primarily, but to the general facts or qualities which individuals exemplify; in fact, our notion of an individual, when examined, is found to be an aggregate of such general qualities. But, again, the object of true knowledge must be what really exists ; hence the most real reality, the essence of the universe, must lie in these general facts, and not in the individuals that ex- emplify them.~~

~~So far the steps are plain enough ; but we do not yet see how this logical Realism (as it was afterwards called) comes to have the essentially ethical character that especially interests us in Platonism. For though Plato's philosophy is now concerned with the whole universe of being, the ultimate object of his philosophic contemplation is still "the good," now conceived as the ultimate ground of all being and knowledge. That is, the essence of the universe is identified with its end,—the " formal " with the "final " cause of things, to use the later Aristotelian phraseology. How comes this about ?~~

~~Perhaps we may best explain this by recurring to the original application of the Socratic method to human affairs. Since all rational activity is for some end, the different arts or functions into which human industry is divided are naturally defined by a statement of their ends or uses , and similarly, in giving an account of the different artists and functionaries, we necessarily state their end, "what they are good for." It is only so far as they realize this end that they are what we call them. A painter who cannot paint is, as we say, "no painter;" or, to take a favourite Socratic illustration, a ruler is essentially one who realizes the wellbeing of the ruled ; if he fails to do this, he is not, properly~~

~~speaking, a ruler at all. And in a society well- ordered on Socratic principles, every human being would be put to some use ; the essence of his life would consist in doing what he was good for. But again, it is easy to ex- tend this view throughout the whole region of. organized life ; an eye that does not attain its end by seeing is with- out the essence of an eye. In short, we may say of all organs and instruments that they are what we think them in proportion as they fulfil their function and attain their end: if, then, we conceive the whole universe organically, as a complex arrangement of means to ends, we shall under- stand how Plato might hold that all things really were, or (as we say) "realized their idea," in proportion as they accomplished the special end or good for which they were adapted. Even Socrates, in spite of his aversion to physics, was led by pious reflection to expound a teleological view of; the physical world, as subservieut in all its parts to divine ends; and in the metaphysical turn which Plato gave to this view, he was probably anticipated by Euclides of Megara, who held that the one real being is " that which we call by many names, Good, Wisdom, Reason, or God ;" to which Plato, raising to a loftier significance the Socratic identification of the beautiful with the useful, added the further name of absolute Beauty.~~

~~Let us conceive, then, that Plato has taken this vast stride of thought, and identified the ultimate notions of ethtics and ontology. We have now to see what attitude this will lead him to adopt towards the practical inquiries from which he started. _What will now be his view of wisdom, virtue, pleasure, and their relation to human wellbeing?~~

~~The answer-to this question is inevitably somewhat com- plicated. In the first place we have to observe that philosophy has now passed definitely from the market- place into the study or lecture-room. The quest of Socrates was for the true art of conduct for an ordinary member of the human society, a man living a practical life among his fellows. But if the objects of abstract thought con- stitute the real world, of which this world of individual~~

~~things is but a shadow, it is plain that the highest, most real life must lie in the former region and not in the latter. We thus reach the paradox that Plato enforced in more than one of his most impressive dialogues, that the true art of living is really an "'art of dying" as far as possible to mere sense, iu order more fully to exist in intimate union with absolute goodness and beauty. On the other hand, in so far as this philosophic abstraction from ordinary human interests can never be complete, since the philo- sopher must still live and act in the concrete sensible world, the Socratic identification of wisdom and virtue is fully maintained by Plato. Only he who apprehends good in the abstract can imitate it in such transient and imperfect good as admits of being realized in human life, and it is impossible, having this knowledge, that he should not act on it, whether in private or public affairs. Thus, in the true philosopher, we shall necessarily find the practically good man, he who being "likest of men to the gods is best loved by them;" and also the perfect statesman, if only the conditions of his society allow him a sphere for exercising his statesmanship.~~

~~When we come to examine the characteristics of this practical goodness, we find that they correspond to the fundamental conceptions in Plato's view of the universe. We have seen that he conceives the world of being as—(1) essentially ideal and knowable ; (2) organized and fitted for realization of good. Accordingly the soul of man, in its good or normal condition, must be (1) wise or knowing, (2) ordered, regulated, 'and harmonized. The question then arises, "' Wherein does this order or harmony precisely consist?" In explaining how Plato was led to answer this question, it will be well to notice that, while faithfully maintaining the Socratic doctrine that the highest virtue was inseparable from knowledge of the good, he had come, as his conception of this knowledge deepened and expanded, to recognize an inferior kind of virtue, possessed by men who were not philosophers. It is plain that if the good that is to be known is the ultimate ground of the whole of things, so that the knowledge of it includes all other know- ledge, it is only attainable by a select and carefully trained few, and we can hardly restrict all virtue to these alone. What account, then, was to be given of ordinary " civic" bravery, temperance, and justice? It seemed clear that men who did their duty, resisting the seductions of~~

~~fear and desire, must have right opinions, if not knowledge, as to the good aud evil in human life ; but whence comes this right "opinion?" Partly, Plato said, it comes by nature and "divine allotment," but for its adequate development "custom and practice" are required. Hence the para- mount importance of education and discipline for civic virtue ; and even for future philosophers such moral culture, in which physical and esthetic training must co-operate, is an indispensable prerequisite ; no merely intellectual preparation will suffice. What, then, is the precise effect of this culture if it does not merely develop the intellect ? A distinct step in psychological analysis was taken when Plato recognized that itseffect was to produce the "harmony" above mentioned among different parts of the soul, by subordinating the impulsive elements to reason. These impulsive elements he further distinguished as appetitive and combative, founding on this triple. division of the soul a systematic view of the four kinds of goodness chiefly recognized by the common moral consciousness of Greece, and in later times known as the cardinal! virtues. Of these the two most fundamental were (as has been already indicated) wisdom—in its highest form philosophy—and that harmonious regulation of psychical impulses and~~

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~~1 or . . . . . : : 2 the term "cardinalis " is Christian; it is first found in Ambrose In Inve. § 62).~~

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~~activities which Plato gives as the essence of dtxcarocvvy. This term in ordinary use had a wider meaning than our " justice,' and might without much straining denote uprightness in social relations generally. Still its import is essentially social; and we can only explain Plato's use of it by reference to the analogy which his analysis of the soul led him to draw between the individual man and the community. or in this latter also he regarded the regula- tive and combative elements as naturally distinct from the common herd, who are concerned with merely material interests ; so that social and individual wellbeing would depend on the same harmonious action of diverse elements,~~

which in its social application is more naturally termed dixatocivy. We see that these two fundamental virtues are mutually involved. Wisdom will necessarily maintain orderly activity, and this latter consists in regula- tion by wisdom, while tle two more special virtues of courage and temperance (cwdpoovry) are only different sides or aspects of this wisely regulated action of the complex soul, We may observe that this fourfold division of virtue was generally accepted in ethical discussion after Plato; though the notions were somewhat differently defined by different thinkers, and the peculiar Platonic interpretation of justice for the most part abandoned.

Such, then, are the forms in which essential good seemed to manifest itself in l:uman life ; it remains to ask whether the statement of these gives a complete account of human wellbeing, or whether pleasure is also to be included. On this point Platu's view seems to have gone through several oscillations. After apparently maintaining (Jrotagoras) that pleasure is the good, he passes first to the opposite extreme, and denies it (Phedo, Gorgias) to be a good at all. Not only is it, as concrete and transient, obviously not the real essential good that the philosopher seeks ; it is found further that the feelings most prominently recognized as pleasures are bound up with pain, as good can never be with evil; since they are the mere satisfaction of painful wants and cease with the removal of these; in so far, then, as com- mon sense riglitly recognizes some pleasures as good, it can only be from their tendency to produce some further good. This view, however, was too violent a divergence from Socratism for Plato to remain in it. That pleasure is not the real absolute good, was no ground for not including it in the good of concrete human life; and after all it was only coarse and vulgar pleasures that were indissolubly linked to the pains of want. Accordingly, in the Republic he has no objection to try the question of the intrinsic superiority of philosophic or virtuous? life by the standard of pleasure ; arguing that the philosophic (or good) man alone enjoys real pleasure, while the sensualist spends his life in oscillat- ing between painful want and the merely neutral state of painlessness, which he mistakes for positive pleasure. In, the Philebus, however, tllough a more careful psychological analysis leads him tv soften down the exaggerations of this attack on sensual pleasure, the antithesis of

~~knowledge and pleasure is again sharpened, and a desire to depreciate even good pleasures is more strongly shown ; still even here plea- sure is recognized as a constituent of that philosophic life which is the highest human good, while in the Laws, where the subject is more popularly treated, it is admitted that we cannot convince man that the just life is the best unless we can also prove it to be the pleasantest.~~

~~When a student passes from Plato to Aristotle, he is so Platoand * forcibly impressed by the contrast between the habits of Aristotle.~~

~~mind of the two authors and their manners of literary ex-~~

~~2 It is highly characteristic of Platonism that the issue in this dia- logue, as originally stated, is between virtue and vice, whereas, without any avowed change of ground, the issue ultimately discussed is between the philosophic life and the life of vulgar ambition or sensual enjoy- ment. :~~

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~~pression, that it is easy to understand how their systems have come to be popularly conceived as diametrically opposed to each other; and the uncompromising polemic which Aristotle, both in his ethical and his metaphysical treatises, directs against Plato and the Platonists, has tended strongly to confirm this view. Yeta closer inspection shows us that when a later president of the Academy (Antiochus of Ascalon) repudiated the scepticism which for two hundred years had been accepted as the traditional Platonic doctrine, he had good grounds for claiming Plato and Aristotle as coincident authorities for the ethical position which he took up. The truth is that, though Aristotle's divergence from Plato is very conspicuous when we con- sider either his general conceptiou of the subject of ethics, or the scientific working out of his system of virtues, still his agreement with his master is almost complete as regards the main outline of his theory of human good; the difference between the two practically vanishes when we view them in relation to the later controversy between Stoics and Epicureans. Even on the cardinal point on which Aristotle entered into direct controversy with Plato, the definite disagreement between the two is less than at first appears ; the objections of the disciple hit that part of the master's~~

system that was rather imagined than thought ; tlie positive result of Platonic speculation only gains in dis- tinctness by the application of Aristotelian analysis.

Plato, we saw, held that there is one supreme science or wisdom, of which the nltimate object is absolute good; in the knowledge of this, the knowledge of all particular goods,— that is, of all that we rationally desire to know,—is im- plicitly contained ; and also all practical virtue, as no one who truly knows what is good can fail to realize it. But in spite of the intense conviction with which he thus identi- fied metaphysical speculation and practical wisdom, we find in his writings no serious attempt to deduce the particulars of human wellbeing from his knowledge of absolute good, still less to unfold from it the particular cognitions of the special arts and sciences. Indeed, we may say that the dis- tinction which Aristotle explicitly draws between specula- tive science or wisdom, which is concerned with the eternal and immutable truths of being, and practical wisdom (on its political side statesmanship), which has for its object "human " or " practicable" good, is really indicated in Plato's actual treatment of the subjects, although the ex- press recognition of it is contrary to his principles. The discussion of good (eg.) in his Philebus relates entirely to human good, and the respective claims "of Thought and

excellence to the Deity seems to contradict Plato's doctrine that the just man as such is "likest the gods;" but here again the discrepancy is reduced when we remember that the essence of Plato's justice (d:cacoovvy) is harmonious activity. Nor, again, is Aristotle's divergence from the Socratic principle that all "virtue is knowledge" substan- tially greater than Plato's. Both accept the paradox in the qualified sense that no one can deliberately act contrary to what appears to him good, aud that perfect virtue is inseparably bound up with perfect wisdom or moral insight. Both, however, see that this moral insight is not to be im- parted by mere teaching, but depends rather on careful training in good habits applied to minds of good natural dispositions; though the doctrine has no doubt a more definite

~~and prominent place in Aristotle's system. In the same way the latter draws more clearly, and develops more fully, the distinction between impulsive offences and: the deliberate choice of evil for good which belongs to confirmed vice ; which is, however, implied in Plato's later recognition (in the Sophista) of ' disorder " of the soul as a kind of badness essentially different from ignorance. The disciple, no doubt, takes a step in advance by stating definitely, as an esseutial characteristic of virtuous action, that it is chosen for its own sake, for the beauty of virtue alone ; but herein he merely formulates the conviction that his master more persuasively inspires. Nor, finally, does Aristotle's account of the relation of pleasure to human wellbeing differ materially from the outcome of Plato's thought on this point, as the later dialogues present it to us; although he has to combat the extreme anti-hedonismn to which the Platonic school under Speusippus had been led. Pleasure, in Aristotle's view, is not the essence of wellbeing, but rather an inseparable accident of it ; human wellbeing is essentially well doing, excellent activity of some kind, whether its aim aud end be abstract truth or noble con- duct; but all activities are attended and in a manner perfected by pleasure, which is better and more desirable in proportion to the excellence of the activity. He no doubt criticises Plato's account of the nature of pleasure, arguing that we canuot properly conceive pleasure either as a "process" or as " replenishment "—the last term, he truly says, denotes a material rather than a psychical fact ; but this does not interfere with the general ethical agreement between the two ; and the doctrine that vicious pleasures are not true or real pleasures is so characteristically Platonic that we are almost surprised to find it in Aristotle.~~

~~In so far as there is any important difference between Aris-~~

~~Pleasure to constitute this; he only refers in passing to the the Platonic and the Aristotelian views of human good, totle's~~

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as something clearly beyond the limits of the present discussion, So again, in his last great ethico-political treatise (the Laws) there is hardly a trace of his peculiar metaphysics; it is from the union of practical wisdom (76 gpovetvy)—not philosophy—with power that the realiza- tion of the ideal state is now expected. On the other hand, the relation between human and divine good, as presented by Aristotle, is so close that we can hardly conceive Plato as having definitely thought it closer. The substantial good of the universe, in Aristotle's view, is the pure activity of universal abstract thought, at once subject and object, which, itself changeless and eternal, is the final cause and first source of the whole process of change in the con- crete world. And he holds, with Plato, that a similar activity of pure speculative intellect is the highest and best mode of human existence, and that in which the philosopher will seek to exist as far as possible ; though he must, being a man, concern himself with the affairs of ordinary human life, in which region his highest good will be attained by realizing perfect moral excellence. No doubt Aristotle's demonstration of the inappropriateness of attributing moral

we may observe that the latter is substantially the more faithful development of the ethical teaching of Socrates, although it is presented in a far more technical and scho- lastic form, and involves a more distinct rejection of the fundamental Socratic paradox. The same result appears wlien we compare the methods of the three philosophers. Although the Socratic induction forms a striking feature of Plato's dialogues, his ideal method of ethics is purely deductive ; he only admits common sense as supplying provisional steps and starting points from which the mind is to ascend to knowledge of absolute good; by deduction from which, as he conceives, the lower notions of particular goods are to be truly apprehended. Aristotle, discarding the transcendentalism of Plato, naturally receded towards the original Socratic method of induction from and verification by common opinion. Indeed, the turns and windings of his exposition are best understood if we consider his literary manner as a kind of Socratic dialogue formalized and reduced to a monologue—transferred, we may say, from the market- place to the lecture-room. LHe first leads us by an induc-

tion to the fundamental notion of ultimate end or good for man. All men, in acting, aim at some result, either for its own sake or as a means to some further end; but obviously everything cannot be sought merely as.a means ; there must therefore ke some ultimate end. In fact men commonly recognize such an end, and agree to call it well- being! («i8aovia) ; but they take very different views of its nature. How, then, shall we find the true view? Another genuinely Socratic induction leads us to this. We observe that men are classified and named according to their functions; all kinds of man, and indeed all organs of man, have their special functions, and are judged as functionaries and organs to be in good or bad condition according as they perform their functions well or ill, May we not then infer that man, as man, has his proper function, and that the wellbeing or " doing well" that all seek really lies in fulfilling well the proper function of man,—that is, in living well that life of the rational soul which we recog- nize as man's distinctive attribute?

Again, this Socratic deference to common opinion is not merely shown in the way by which Aristotle reaches his fundamental conception; it equally appears in his treatment of the conception itself. In the first place, though in Aristotle's view the most perfect wellbeing consists in the exercise of inan's " divinest part," pure speculative reason, he keeps far trom the paradox of putting forward this and nothing else as human good; so far, indeed, that the greater part of his treatise is occupied with an exposition of the inferior good which is realized in practical life when the appetitive or impulsive (senti-rational) element of the soul operates under the dne regulation of reason. Even when the notion of 'good performance of function" was thus widened, and when it had further taken in the pleasure that is inseparably connected with such function- ing, it did not yet correspond to the whole of what a Greek commonly understood as "human wellbeing ;" though, in order to make it fit better, Aristotle emphasizes more than we should have expected the necessity of worldly goods for the realization of such virtues as liberality, justice, &c, There still remain other goods, such as beauty, good birth, welfare of posterity, &c., the presence or absence of

which influenced the common view of a man's wellbeing, though tney could not be shown to be even indirectly important to his " well-acting." These Aristotle neither attempts to exclude from the philosophic conception of wellbeing nor to include in his forinal definition of it. The deliberate looseness which is thus given to his fundamental doctrine characterizes more or less his whole discussion of ethics. He plainly says that the subject does not admit of com- pletely scientific treatment ; his aim is to give not a per- fectly definite theory of human good, but a practically adequate acconnt of its most important constituents.

The most important characteristics, then, of wellbeing or good life for ordinary men are represented by the notions of the different moral excellences. In expounding these, Aristotle gives throughout the pure result of analytical observation of the common moral consciousness of his age. Ethical truth, in his view, is to be attained by induction from particular moral opinions, just as physical truth is to be obtained by induction from particular physical observa- tions, On account of the conflict of opinion in ethics we cannot hope to obtain perfect clearness and certainty upon all questions; still reflection will lead us to discard some of the conflicting views and find a reconcilation for others,

1 This cardinal term is commonly translated "happiness ;" and it must be allowed that it is the most natural term for what we (in Eng- lish) agree to call " our being's end and aim." But happiness so defin- itely signifies a state of feeling that it will not admit the interpretation that Aristotle (as well as Plato and the Stoics) expressly gives to evdaimuovla ; hence the rendering edSamovta by happiness has caused serious confusion to the students of Greek philosophy.

Tals

and will furnish, on the whole, a practically sufficient residuum of moral truth, In many respects this adhesion to common sense involves a sacrifice of both depth and completeness in Aristotle's system. His virtues are not arranged on any clear philosophic plan; the list shows no serious attempt to consider human life exhaustively, and exhibit the standard of excellence appropriate to its different departments or

~~aspects. He seems to have taken as a starting-point Plato's four cardinal virtues. The two comprehensive notions of Wisdom and Justice (Sucaroovvy) he treats separately. As regards both his analysis leads him to diverge considerably from Plato. As we saw, his distinction between practical and speculative Wisdom belongs to the deepest of his disagreements with his master ; and in the case of dixaocdvy again he distinguishes the wider use of the term to express Law-observance, which (he says) coincides witli the social side of virtue generally, and its narrower use for the virtue that " aims ata kind of equality," whether (1) in the distribution of wealth, honour, &c., or (2) in commercial exchange, or (3) in the reparation of wrongdone. Then, in arranging the other special virtues, he begins with courage and temperance, which (after Plato) he considers as the excellences of the "' irrational element" of the soul. Next follow two pairs of excellences, concerned respectively with wealth and honour :—(1) liberality and magnificence, of which the latter is exhibited in greater matters of expenditure, and (2) laudable ambition and high-mindedness similarly related to honour, Then comes gentleness—the virtue regulative of anger; and the list is concluded by the excellences of social intercourse, friend- liness (as a mean between obsequiousness and surliness), truthfulness, and decorous wit.~~

~~The abundant store of just aud close analytical obser- vation contained in Aristotle's account of these notions give it a permanent interest, even beyond its historical value as a delineation of the Greek ideal of "fair and good" life? But its looseness of arrangement and almost grotesque co-ordination of qualities widely differing in importance are obvious; and Aristotle's restriction of the sphere of courage to dangers in war, and of that of temperance to certain bodily pleasures, as well as his non-distinction of selfish and benevolent expenditure in describing liberality, illustrate the fragmentariness and superficiality of treatment to which mere analysis of the common usage of ethical terms is always liable to lead. Nor is his famous general formula for virtue, that it is a mean or middle state, always to be found somewhere between the vices which staud to it in the relation of excess aud defect, of much avail in rendering his treatment more systematic. It was important, no doubt, to express the need of limitation and regulation, of observing due measure and proportion, in order to attain good results in human life~~

~~no less than in artistic products; but the observation of this need was no new thing in Greek literature ; indeed, it had already led the Pythagoreans and Plato to find the ultimate essence of the ordered universe in number, But Aristotle's purely quantitative statement of the relation of virtue and vice is misleading, even where it is not obviously inappropriate ; and sometimes leads him to such eccentri- cities as that of making simple veracity a mean between boastfulness and mock-modesty.~~

~~2 Aristotle follows Plato and Socrates in identifying the notions of Kards ("fair," '*beantiful'"') and &yaGds (" good") in their application to conduct. We may observe, however, that while the latter term is used to denote the virtuous man, and (in the neuter) equivalent to end generally, the former is rather chosen to express the quality of virtuous acts which in any particular case is the end of the virtuous agent. Aristotle no doubt faithfully represents the common sense of Greece in considering that, in so far as virtue is in itself good to the virtuous agent, it belongs to that species of good which we distinguish as beautiful. In later Greek philosophy the term caddy (""honestum") became still more tech- nical in the signification of " morally good."~~

~~Transi- tion to Stoicism.~~

~~ET aHics~~

~~It ought to be said that Aristotle does not present the formula just discussed as supplying a criterion of good con- duct in any particular case; he expressly leaves this to be determined by "correct reasoning, and the judgment of the practically wise man." We cannot, however, find that he has furnished any substantial principles for its de-termination; indeed, he hardly seems to have formed a distinct general idea of the practical syllogism by which he conceives it to be effected.1 And, indeed, it would not have been easy for him to make this point plain, without bring- ing into prominence a profound discrepancy between his own view of rational action and the common opinion and practice of mankind. The kind of reasoning which his view of virtuous conduct requires is one in which the ulti- mate major premise states a distinctive characteristic of some virtue, and one or more minor~~

~~premises show that such characteristic belongs to a certiin mode of conduct under given circumstances; since it is essential to good conduct that it should contain its end in itself, and be chosen for its own sake. But he has not failed to observe that practical reasonings are not commonly of this kind, but are rather concerned with actions as means to ulterior ends; indeed, he lays stress on this as a characteristic of the " political" life, when he wishes to prove its inferiority to the life of pure speculation. Though common sense will adinit that virtues are the best of goods, it still undoubtedly conceives practical wisdom as chiefly exercised in provid- ing those inferior goods which Aristotle, after recoguizing the need or use of them for the realization of human well-being, has dropped out of sight ; aud the result is that, in trying to make clear his conception of practical wisdom, we find ourselves fluctuating continually between the common notion, which he does not distinctly reject, and the notion required as the keystone of his ethical system.~~

~~On the whole, there is probably no treatise so masterly as Aristotle's Hthics, and containing so much close and valid thought, that yet leaves on the reader's mind so strong an impression of dispersive and incomplete work. It is only by dwelling on these defects that we cau understand the small amount of influence that his system exercised during the five ceuturies after his death, in which the schools sprung from Socrates were still predominant in Greeco-Roman culture; as compared with the effect which it has had, directly or in- directly, in shaping the thought of modern Europe. Partly, no doubt, the limited influence of the " Peripatetics"? (as Aristotle's disciples were called) is to be attributed to that exaltation of the purely speculative life which distinguished the Aristotelian ethics from other later systems, and which was too alien from the common moral consciousness to find much acceptance in an age in which the ethical aims of philosophy had again become paramount. Partly, again, the analytical distinctness of Aristotle's manner brings into special prominence the difficulties that attend the Socratic effort to reconcile the ideal aspirations of men, and the principles on which they agree to distribute mutual praise and blame, with the principles on which their practical reasonings are commonly conducted. The conflict between these two elements of~~

~~Common Sense was too profound to be compromised; and the moral consciousness of mankind demanded a more trenchant partisanship than Aristotle's.~~

~~1 There is a certain difficulty in discussing Aristotle's views on the subject of practical wisdom, and the relation of the intellect to moral action, since it is most probable that the only accounts that we have of these views are not part of the genuine writings of Aristotle. Still books vi. and vii. of the Nicomachean Mthics contain no doubt as pure Aristotelian doctrine as a disciple could give, and appear to supply a sufficient foundation for the general criticism expressed in the text.~~

~~2 The term ig derived from mepiwareiy, "to walk about," and was applied to the disciples of Aristotle in consequence of the master's custom of giving instruction while walking to and fro in the shady avenues of the gymnasium where he lectured.~~

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~~Its demands were met by a school which separated the moral from the worldly view of life, with an absoluteness and de- finiteness that caught the imagination ; which regarded prac- tical goodness as the highest result and manifestation of its ideal of wisdom ; and which bound the common notions of duty into an apparently complete and coherent system, by a formula that comprehended the whole of human life, and exhibited its relation to the ordered process of the universe. This school was always known as the "Stoic," from the portico (orod) in which its founder Zeno used to teach. The intellectual descent of its ethical doctrines is principally to be traced to Socrates through the Cynics, though an im- portant element in them seems attributable to the school that inherited the " Academy" of Plato. Both Stoic and Cynic maintained, in its sharpest form, the fundamental tenet that the practical knowledge which is virtue, with the condition of soul that is inseparable from it, is alone to be accounted good. He who exercises this wisdom or knowledge has complete wellbeing; all else is indifferent to him. It is true that the Cynics were more concerned to emphasize the negative side of the sage's wellbeing, its independence of bodily health and strength, beauty, pleasure, wealth, good birth, good fame; while the~~

~~Stoics brought into more prominence its positive side, the mag- nanimous confidence, the tranquillity undisturbed by grief, the joy and good cheer of thie spirit, which inseparably attended the possession of wisdom. This difference, how- ever, did not amonnt to disagreement. The Stoics, in fact, seem generally to have regarded the eccentricities of Cynicism as an emphatic manner of expressing tlie essential antithesis between philosophy and the world; a manner which, though not necessary or even normal, night yet be advantageously adopted by the sage under certain circumstanves.?~~

~~Wherein, then, does this knowledge or wisdom that Stoicism.~~

~~makes free and perfect consist? Both Cynics and Stoics agreed that the most important part of it, that which con- stituted the fundamental distinction between the wise and the unwise, was the knowledge that the sole good of man lay in this knowledge or wisdom itself. It must be under- stood that by wisdom they meant wisdom realized in act ; indeed, they did not conceive the existence of wisdom as separable from such realization. We may observe, too, that the Stoics rejected the divergence which we have seen gradually taking place in Platonic-Aristotelian thought from the position of Socrates, "'that no one aims at what he knows to be bad." The stress that their psychology laid on the essential unity of the rational self that is the source of voluntary action, prevented them from accepting Plato's analysis of the soul into a regulative element aud elements needing regulation. They held that what we call passion, so far as it governs the voluntary action of a reasoning being, must always be erroneous judgment as to what is to be sought or shunned. From such passions or errors the truly wise man will be free. He will of course be con- scious of the solicitations of physical appetite ; but he will not be misled into supposing that its object is really a good ; he cannot, therefore, hope for the attainment of this object or fear.to miss it, as these states involve tle conception of it as a good. Similarly, though he will be subject like other men to bodily pain, this will not cause him mental grief or disquiet, as his worst agonies will not disturb his clear conviction that it is really indifferent to his true reasonable self. And so of all other objects that commonly~~

~~excite men's hope, fear, joy, or grief; they cannot produce these states in the sage, because he cannot judge them to be~~

~~3 It has been suggestively said that Cynicism was to Stoicism what monasticism was to early Christianity. The analogy, however, must not be pressed too far, since orthodox Stoics do not ever seem to have regarded Cynicism as the more perfect way.~~

~~good or bad. That this impassive sage was a being not to be found among living men the later Stoics at least were fully aware. They faintly suggested that one or two moral heroes of old time might have realized the ideal, but they admitted that all other philosophers (even) were merely ina state of pro- gress towards it. This admission did not in the least dimi- nish the rigour of their demand for absolute loyalty to the exclusive claims of wisdom. The assurance of its own unique value that such wisdom involved they held to be an abid- ing possession for those who had attained it ;' and without this assurance no act could be truly wise or virtuous. Whatever was not of knowledge was of sin ; and the dis- tinction between right and wrong being absolute and not adinitting of degrees, all sins were equally sinful ; whoever broke the least commandment was guilty of the whole law. Similarly, in any one of the manifestations of wisdom, commonly distinguished as particular virtues, all wisdom was somehow involved ; though whether these virtues were specifically distinct, or only the same knowledge in different relations, was a subtle question on which the Stoics do not seem to have been agreed.~~

~~Was, then, this rare and priceless knowledge something which it was possible for man to attain, or were human shortcomings really involuntary? There is an obvious danger to moral responsibility involved in the doctrine that vice is involuntary; which yet seems a natural inference from the Socratic identification of knowledge with virtue. Hence Aristotle had already been led to attempt a refutation of this doctrine; but his attempt had only shown the pro- found difficulty of attacking the paradox, so long as it was admitted that no one could of deliberate purpose act con- trary to what seemed to him best. Now,~~

~~Aristotle's diver- gence from Socrates had not led him so far as to deny this ; while for the Stoics who had receded to thie original Socratic position, the difficulty was still more patent. In fact, a philosopher who maintains that virtue is essentially knowledge has to choose between alternative paradoxes : he must either allow vice to be involuntary, or affirm ignorance to be voluntary. The latter horn of the dilemma is at any rate the less dangerous to morality, and as such the Stoics chose it. But they were not yet at the end of their perplexities ; for while they were thus driven on one line of thought to an extreme extension of the range of human volition, their view of the physical universe invalved an equally thorough-going determinism. How could the vicious man be responsible if his vice were strictly pre- determined? The Stoics answered that the error which was the essence of vice was so far voluntary that it could be avoided if men chose to exercise their reason; no doubt it depended on the innate force and firmness? of a man's soul whether his reason was thus effectually exercised ; but moral responsibility was saved if the vicious act proceeded from the man himself and not from any external cause.~~

~~With all this we have got little way towards ascertaining the positive practical content of this wisdom. How are we to emerge from the barren circle of affirming (1) that wisdom is the sole good and unwisdom the sole evil, and (2) that wisdom is the knowledge of good and evil; and attain some method for determining the particulars of good conduct? Both Cynicism and Stoicism stood in need of such a method to complete their doctrine, since neither school was prepared to maintain that what the sage does is indifferent (no less than what befalls him), provided only he does it with a full conviction of its indifference. The Cynics, however, seem to have made no philosophical ee a~~

~~? The Stoics were not quite agreed as to the inalienability of virtue, but they were agreed that, when once possessed, it could only be lost through the loss of reason itself.~~

~~Hence some members of the school, without rejecting the definition of virtue = knowledge, also defined it as " strength and force."~~

~~Ne i sel ae.~~

~~provision for this need; they were content to mean by virtue what any plain man meant by it, except in so far as their sense of independence led them to reject certain received precepts and prejudices. The Stoics, on the other hand, not only worked out a detailed system of duties—or, as they termed them, " things meet and fit" (xa@jxovra) for all occasions of life ; they were further especially concerned to comprehend them under a general, formula. They found this by bringing out the positive significance af the notion of Nature, which the Cynic had used chiefiy in a negative way, as an antithesis to the " conscntions" (vopos), from which his knowledge had madc him free. Even in this negative use of the notion, it is necessarily implied that whatever in man is "natural "—that is, prior to and uncorrupted by social customs and conventions, —must furnish valid guidance for conduct. But whence can this authority belong to the natural, unless nature, the ordered creation of which man is a part, be itself somehow reasonable, an expression or crabodiment of divine law and wisdom ? The conception of the world, as organized and filled by divine thought, was common, in some form, to all the philosophies that looked back to Socrates as their founder,—the Megarians, as we saw, even maintaining that this thought was the sole reality. This latter doctrine harmonized thoroughly with the Stoic view of human good ; but being unable to conceive substance idealistically, they (with considerable aid from the earlier system of Heraclitus) supplied a materialistic side to their pantheism,—conceiving divine thought as an attribute of the purest and most primary of material substances, a subtle fiery ether, They held the physical world to have been developed out of Zeus, so conceived ; to be, in fact, a modification of his eternal substance into which it would ultimately be con. sumed and re-absorbed; meanwhile it was throughout permeated with the fashioning force of his divine spirit, and perfectly ordered by his prescient law, This theological view of the physical universe had a double effect on the ethics of the Stoic. In the first place it gave to his cardinal conviction of the all-sufficiency of wisdom for human wellbeing a root of cosmical fact, and an atmo. sphere of religious and social emotion. The exercise of wisdom was now viewed as the pure life of that particle of divine substance which was in~~

~~very truth the “ god within him ;” the reason whose supremacy he maintained was the reason of Zeus, and of all gods and reasonable men, no less than his own ; its realization in any one individual was thus the common good of all rational beings as such ; “the sage could not stretch out a finger rightly without thereby benefiting all other sages,’—nay, it might even be said that he was “as useful to Zeus as Zeus to him.”? But again, the same conception served to harmonize the higher and the lower elements of human life. For even in the physical or non-rational man, as originally constituted, we may see clear indications of the divine design, which it belongs to his rational will to carry into conscious execu- tion ; indeed, in the first stage of human life, before reason is fully developed, uncorrupted natural impulse effects what is afterwards the work of reason, Thus the formula of “living according to nature,” in its application to man as the “rational animal,” may be understood both as directing that reason is to govern, and as indicating how that govern- ment is to be practically exercised. In man, as in every other animal, from the moment of birth natural impulse prompts to self-preservation, and to the maintenance of his physical frame in its original integrity ; then, when reason has been developed and has recognized itself as its own sole good, these “‘ primary ends of nature” and whatever~~

~~3 It is apparently in view of this union in reason of rational beings that friends are allowed to be “‘ external goods’ to the sage, and that the possession of good children is also counted a good.~~

~~AT HLGs~~

~~promotes these still constitute the outward objects at which reason is to aim; there is a certain value (éé/a) in them, in proportion to which they are “ preferred” (zponyéva) and their opposites “ rejected” (éromponypeva) ; indeed, it is only in the due and consistent exercise of such preference and rejection that wisdom can find its practical manifestation. In this way all or most of the things commonly judged to be “‘goods”—health, strength, wealth, fame,! &c.,—are brought within the sphere of the sage’s choice, though his real good still is solely in the wisdom of the choice, and not in the tluing chosen ; just as an archer~~

~~aims at a bull's eye, his end being not the mark itself, but the manifestation of his skill in hitting it.~~

~~It is to be observed that the adoption of " conformity to nature," as the general positive rule for outward conduct, originated in the Acadeinic school, which, after Plato's death, seems to have separated ethics from ontology as completely us Aristotle. We find " uature" nsed as a cardinal notion in ethics both by Speusippus, Plato's immediate successor, and by Xenocrates, the contemporary of Aristotle. Indeed, their fundamental doctrine apparently differed from the Stoic's only in calling " good" what the latter called " preferred," and consistently affirming that virtue was sufficient by itself for happiness, but not for perfect happiness. A view nearly the same, but allowing more import- ance to outward circumstances, was maintained by the Peri- patetics ; on whom, when the energies of Plato's school were absorbed in scepticism (250-100 B.c.), it chiefly devolved to maintain the more moderate? claims of morality in contrast to the paradoxes of Stoicism. It is easy to understand how the one school thought it mere perversity~~

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~~its members should form sexual unions, produce children, and bestow care on their rearing and training. But beyond this nature did not seem to go in determining the relations of the sexes; accordingly, we find that community of wives was a feature of Zeno's ideal commonwealth, just as it was of Plato's ; and other Stoics are represented as main- taining, and illustrating with rather offensive paradoxes, the conventionality and relativity of the received code of sexual morality; while, again, the strict theory of the school recognized no government or laws as true or bind- ing except those of the sage; he alone is the true ruler, the true king. So far, the Stoic " nature" seems in danger of being as revolutionary as Rousseau's. Practically, however, this revolutionary aspect of the notion was kept for the most part in the background ; the rational law of an ideal community was peacefully undistinguished from the positive ordinances and customs of actual society ; and the "patural" ties that actually bound each man to family, kinsmen, fatherland, and to unwise humanity generally, supplied the outline on~~

~~which the external manifestation of justice was delineated. It was a fundamental maxim that the sage was to take part in public life; and it does not appear that his political action was to be regulated by any other principles than those commonly accepted in. his com- munity. Similarly, in the view taken by the Stoics of the duties of social decorum, and in their attitude to the popular religion, we find a fluctuating compromise between the dis- position to repudiate what is artificial and conventional, and the disposition to revere what is actual and established, which both equally spring from the very core of their creed.~~

~~Among the primary ends of nature, in which wisdom re- Stoics cognized a certain preferability, the Stoics included freedom and from bodily pain ; but they refused, even in this outer court be¢on-~~

~~to refuse the common names of "good" and "evil" to things " preferred " and " rejected," and patent inconsistency to make wisdom manifest itself in choosing among objects~~

~~that wisdom knew to be indifferent; while to the other it seemed the essence of philosopby to be thus independent of outward things while yet exercised upon them.~~

~~So far we have considered the "nature " of the individual man as apart from his social relations ; but it is obvious that the sphere of virtue, as commonly conceived, lies chiefly in these, and this was fully recognized in the Stoic account of duties (ka@jxovra) ; indeed, their exposition of the "natural" basis of justice, the evidences in man's mental and physical constitution that he was born not for himself but for mankind, is the most important part of their work in the region of practical morality. Here, however, we especially notice the double significance of "uatural," as applied to (1) what actually exists everywhere or for tlie most part, and (2) what would exist if the original plan of man's life were fully carried out; and we find that the Stoics have not clearly harmonized the two elements of the notion. That man was "naturally " a social animal Aristotle had already taught; that all rational beings, in the unity of the reason that is common to all, form naturally one community with a common law was (as we saw) an immediate~~

~~inference from the Stoic conception of the ulliverse as a whole. That the members of this “ city of Zeus” should observe their contracts, abstain from mutual harm, combine to protect each other from injury, were obvious points of natural law; while, again, it was clearly necessary to the preservation of human society that~~

~~1The Stoics seem to have varied in their view of “ good repute,” evdotla ; at first, when the school was more under the influence of Cynicism, they professed an outward as well as an inward indifference to it ; ultimately they conceded the point to common sense, and includ- ed it among mponypéva.~~

~~2 There were different degrees of this moderation, but in no case was it very moderate ;—if we may judge from the extent to which Aristotle’s successor Theoplirastus was attacked for his weakness in couceding that there was a degree of torture which would prevent a good man from being happy.~~

~~of wisdom, to find a place for pleasure. the latter was not an object of uncorrupted natural impulse, but an ‘“aftergrowth,” a mere consequence of natural im- pulses attaining their ends. They thus endeavoured to resist Epicureanism even on the ground where the latter seems prima facie strongest; in its appeal, naniely, to the natural pleasure-seeking of all living things. Nor did they merely mean by pleasure (7d0v}) the gratification of bodily appetite; we find (e.g.) Chrysippus urging, as a decisive argument against Aristotle that pure speculation was “a kind of amusement; that is, pleasure.” This being so, the distinction that they drew between pleasure, and the “joy and gladness” (xapd, cdfpoovvy) that accompanied the exercise of virtue, cannot but seem somewhat arbitrary. We must observe, however, that even this “ moral pleasure,” as a modern would consider it, though inseparable in the Stoic view frora welibeing, was not its most essential con- stituent. It is only by a modern misrepresentation of Stoicism that tranquillity or serenity of soul is taken as the real ultimate end, to which the exercise of virtue is merely ameans. In Zeno’s system, as in Aristotle’s, it is good activity, and not the feeling that attends it, which con- stitutes the esseuce of good life. Atthe same time, since pleasant~~

feeling of some kind must always have been the chief element in the common conception of Greek evdaipovia as well as of English "happiness," it is probable that the serene joys of virtue and the griefiessness which the sage was conceived to maintain amid the worst tor- tures, formed the main attractions of Stoicism for ordinary minds. In this sense it may be fairly said that Stoics and Epicureans made rival offers to mankind of the same kind of happiness ; and the philosophical peculiarities of either system may be equally traced to the same desire of maintaining that independence of the changes and chances of life which seemed essential to a settled serenity of soul. The Stoic claims on this head were the loftiest; as the VIII — 74

They held that

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wellbeing of their sage was independent, not only of exter- nal things and bodily conditions, but of time itself ; it was fully realized in a single exercise of wisdom and could not be increased by duration. This paradox is violent, but it is quite in harmony with the spirit of Stoicism; and we are more startled to find that the Epicurean sage, no less than the Stoic, is to be happy even on the rack ; that his happiness, too, is unimpaired by being restricted in duration, when his mind has apprehended the natural limits of life ; that, in short, Epicurus makes no less strenuous efforts than Zeuo to eliminate imperfection from the conditions of human existence. 'This characteristic, however, is the key to the chief differences between Epicureanism aud tle more naive hedonism of Aristippus. The latter system give the simplest and most obvious answer to tbe inquiry after ulti- mite good for man; but besides being liable, when developed consistently and unreservedly, to offend the com- mon moral consciousness, it conspicuously failed to provide the "completeness" and " security" which, as Aristotle says, "one divines to belong to man's true Good." Philo- sophy, in the Greek view, should be the art as well as the science of good life ; and hedonistic philosophy would seem a bungling and uncertain art of pleasure, as pleasure is ordinarily conceived. Nay, it would even be found that the habit of philosophical reflection often operated adversely to the

~~attainment of this end, by developing the thinker's self-consciousness, so as to disturb that normal relation to external objects on which the zest of ordiuary enjoyment depeuds. Hence we find that later thinkers of the Cyrenaic school felt themselves compelled to change their fundamen- tal notion ; thus Theodorus defined the good as " gladness"~~

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~~"natural wealth " is no nore than any man can earn. When further we are told that the attainment of happiness depends almost entirely upon insight and right calculation, fortuue having very little to do with it; that the pleasures and pains of the mind are far more important than those of the body, owing to the accumulation of feeling caused by memory and anticipation; and that an indispensable con- dition of mental happiness lies in relieving the mind of all superstitions, which can only be effected by a thorough knowledge of the physical universe, —we see that an ample place is secured in this systein for the exercise of the philo- sophic inteilect. So again, in the stress that Epicurus lays on the misery which the most secret wrong-doing must necessarily cause the doer, from the perpetual fear of dis- covery, and in his exuberant exaltation of the value of dis- interested friendship, we recognize a sincere, though not completely successful, effort to avoid the offence that con- sistent egoistic hedonism is apt to give to ordinary human feeling. As regards friendship, indeed, the example of Epicurus, who was a man of eager and affectionate tempera- ment, and peculiarly unexclusive sympathies,' was probably more effective than his teaching. The genial fellowship of the philosophic community that he collected in his garden remained a striking feature in the traditions of his school ; and certainly the ideal which Stoics and Epicureans equally cherished, of a brotherhood of sages united in harmonious smooth-flowing existence, was most easily realized on the Epicurean plan of withdrawing from political and dialectical conflict to simple living and serene leisure, in imitation of the eternal leisure of the gods apart from the fortuitous concourse of atoms that we call a world.~~

~~(xapa) depending on wisdom, as distinct from mere pleasure, while Hegesias proclaimed that happiness was un- attainable, and that the~~

~~chief function of wisdom was to render life painless by producing indifference to all things that give pleasure. But by such changes their system lost~~

~~The two systems that have just been described were those Later that most prominently attracted the attention of the Greek ancient world, so far as it was directed to ethics, from Philo- their almost simultaneous origin to the end of the 2d S0PPy:~~

~~a. n Stoicism century A.D., when Stoicism almost vanishes from our in Rome,~~

~~Epicurus,~~

~~the support that it had had in the pleasure-seeking tendencies of ordinary men; indeed, with Hegesias the pur- suit of pleasure has turned into its opposite, and one is not surprised to learn that this hedonist's lectures were forbidden as stimulating to suicide. It was clear that if philosophic hedonism was to be established on a broad and firm basis, it must somehow combine in its notion of good what the plain man naturally sought with what philosophy could plausibly offer. Such a combination was effected, with some little violence, by Epicurus; whose system with all its defects shewed a remarkable power of standing the test of time, as it attracted the unqualified adhesion of generation after generation of disciples for a period of more than six centuries.~~

~~Epicurus maintains, on the one hand, as emphatically as Aristippus, that pleasure is the sole ultimate good, and pain the sole evil; that no pleasure is to be rejected except for its painful consequences, and no pain to be chosen except as a means to greater pleasure; that the stringency of all laws and customs depends solely on the legal and social penalties attached to their violation; that, in short, all vir- tuous conduct and all speculative activity are empty and useless, except as contributing to the pleasantness of the agent's life. And he assures us that he means by pleasure what plain men mean by it; and that if the gratifications of appetite and sense are discarded, the notion is emptied of its significance. So far the system would seem to suit the inclinations~~

~~of the most thorough-going voluptuary. But its aspect changes when we learn that the highest point of pleasure, whether in body or mind, is to be attained by the mere removal of pain or disturbance, after which pleasure admits of variation only and not of augmentation ; that therefore the utmost gratification of which the body is capible may be provided by the simplest means, and that~~

~~view. But side by side with them the schools of Plato and Aristotle still maintained a continuity of tradition, and a more or less vigorous life; and philosophy, as a recognized element of Greco-Roman culture, was understood to be divided among these four branches. The internal history, however, of the four schools was very different. We find no development worthy of notice in Aristotelian ethics ; in fact the philosophic energy of this school seems to have been somewhat weighed down by the inheritance of the master's vast work, and distracted by the example of his many-sided activity. The Epicureans, again, from their unquestioning acceptance of the "dogmas"? of their founder, almost deserve to be called a sect rather than a school. On the other hand, the changes in Stoicism are very noteworthy ; and we are peculiarly well able to trace them, as the only original writings of this scliool which we possess are those of the later Roman Stoics. These changes may be partly attributed to the natural inner-development of the system, partly to the reaction of the Roman mind on the essentially Greek doctrine which it received,—a reaction all the more inevitable from the very affinity between the Stoic sage and the ancient Roman ideal of manliness. It was natural that the earlier Stoics should be chiefly occupied with delineating the inner and outer characteristics of ideal wisdom and virtue, and that the gap between the ideal sage and the actual philo- sopher, though never ignored, should yet be somewhat overlooked. But when the question " What is man's good?" had been answered by an elaborate exposition of perfect wisdom, tle otler question ""How may a man~~

~~1 Tt is noted of him that he did not disdain the co-operation either of women or of slaves in his philosophical labours.~~

~~2 The last charge of Epicurus to his disciples is said to have been, Tay Soypdtwy peuvjoba.~~

~~History of Plato's school.~~

~~hora TCs~~

~~emerge from the misery and folly of the world, and get on the way towards wisdom?" would naturally attract atten- tion; and the preponderance of moral over scientific interest, which was characteristic of the Roman mind, would tend to give this question especial prominence. Thus philosophy, in the view of Seneca and Epictetus, comes to present itself as the healer to whom men come from a sense of their weakness and disease,—whose business is "with the sick not with the whole;" the wisdom by which she heals is not something that needs long disserta- tions or dialectical subtleties, but rather continual practice, self-discipline, self-examination. The same sense of the gap between theory and fact gives to the religious element of Stoicism a new force and a new aspect; the soul, con- scious of its weakness, leans on the thought of God, and in the philosopher's attitude towards external events, pious resignation preponderates over self-poised indifference ; the old self-reliance of the reason, looking down on man's natural life as a mere field for its exercise, shrinks and dwindles, making room for a positive aversion to the flesh as an alien element imprisoning and hampering the spirit ; the body has come to be a "corpse which the soul sustains,"' and life a "sojourn in a strange land;"2 in short, the ethical idealism of Zeno has begun to borrow from the metaphysical idealism of Plato.~~

~~In no one of these schools was the outward coherence of tradition so much strained by inner changes as it was in Plato's. The alterations, however, in the metaphysical position of the Academics seem to have had less effect on their ethical teaching than might be expected, as, even during the period of Scepticism, they appear to have presented as probable the same general view of human good which Antiochus afterwards dogmatically announced as a revival of the common doctrine of the 'ancients "— Plato and Aristotle. And during the eventful period of a century and a half that intervenes between~~

~~Antiochus and Plutarch, we may suppose the school to have maintained the old controversy with Stoicism on much the same ground; accepting the formula of "life according to nature," but demanding that the "good" of man should refer to his nature as a whole, the good of his rational part being the chief element, and always preferable in case of conflict, but yet not absolutely his sole good. When, how- ever, we have come to Plutarch, the same tendencies of change show themselves that we have noticed in later Stoicism. The conception of a normal harmony between the higher and lower elements of human life has begun to be disturbed, and the side of Plato's teaching that deals with the inevitable imperfections of the world of concrete experience becomes again prominent. For example, we find Plutarch adopting and amplifying the suggestion in Plato's latest treatise (the Laws) that this imperfection is due to a bad world-soul that strives against the good,—a suggestion which is alien to the general tenor of Plato's doctrine, and had consequently lain unnoticed during the intervening centuries. We observe, again, the value that Plutarch attaches, not merely to the sustainment and consolation of rational religion, but to the supernatural communications vouchsafed by the divinity to certain human beings in certain states,—as in dreams, through oracles, or by special warnings, like those of the genius of Socrates. For these flashes of intuition, he holds, the soul should be prepared by tranquil repose, and the subjugation of sensuality through abstinence. The same estrangement between mind and matter, the same ascetic effort to attain by aloofness from the body a pure receptivity for divine or serni-divine influences, is exhibited in the revived Pytha- goreanism of the first and second centuries a.p. But the~~

~~1 Kpictetus. . 2 Marcus Aurelius.~~

~~O87~~

~~general tendency that we are noting did not find its full expression in a reasoned philosophical system until we come to the latest-born of the great thinkers of antiquity— the Egyptian Plotinus.~~

~~The system of Plotinus (205-270 a.p.) is a striking Neo-Pla- development of that element of Platonism which has had t°™s"-~~

most fascination for the medizeval and even for the modern mind, but which had almost vanished out of sight for six centuries. At the same time the differences between this Neo-Platonism and the original Platonism are all the more noteworthy from the reverent adhesion to the latter which the former always maintains. Plato, we saw, identified good with the real essence of things; and this, again, with that in them which is definitely conceivable and knowable. It belongs to this view to regard the imperfection or bad- ness of things as somewhat devoid of real being, and so in- capable of being definitely thought or known ; accordingly, we find that Plato has no technical term for that in the concrete sensible world which hinders it from perfectly ex- pressing the abstract ideal world, and which in Aristotle's system is distinguished as absolutely formless matter (3A7). And so, when we pass from the ontology to the ethics of Platonism, we find that, though the highest life is only to be realized by turning away from concrete human aftsirs and their material environment, still the sensible world is not yet an object of positive moral aversion; it is rather something which the philosopher is seriously concerned to make as harmonious, good, and beautiful as possible. But in Neo-Platonism the inferiority of the condition in which the embodied human soul finds itself is more intensely and painfully felt ; hence an express recognition of formless matter (vAy) as the " first evil," from which is derived the " second evil," body (oGpua), to whose influence all the evil in the soul's existence is due. Accordingly the ethics of Plotinus represent, we may say, the moral idealism of the Stoics cut loose from nature. The only good of man is the pure existence of the soul, which in itself, apart from the contagion of the body, is perfectly free from error or defect ; all higher or j hilosophic virtues (as distinguished from the merely "civic" forms of prudence, temperance, justice, and courage) are essentially purifications from this contagion; until the highest mode of goodness is reachied, in which the soul has no community with the body, and is entirely turned towards reason. It should be observed that Plotinus himself is still too Platonic to hold that the absolute mortification of natural bodily appetites is required for purifying the soul; but this ascetic inference was drawn to the fullest extent by his disciple Porphyry.

~~There is, however, a yet higher point to be reached in the upward ascent of the Neo-Platonist from matter ; and here the divergence of Plotinus from Platonic idealism is none the less striking, because it can to some extent sup- port itself on Platonic authority. The cardinal assumption of Plato's metaphysic is, that the real is definitely thinkable end knowable in proportion as it is real ; so that the further the mind advances in abstraction from sensible par- ticulars and apprehension of real being, the more definite and clear its thought becomes. Plotinus, however, urges that, as all thought involves difference or duality of some kind, it cannot be the primary fact in the universe, what we call God. He must be an essential unity prior to this duality, a Being wholly without difference or determina- tion; and, accordingly, the highest mode of human exist- ence, in which the soul apprehends this absolute, must be~~

- ~~The ultimate notion in Plato's ontology is, as we saw, the " good:" and hence he is led to describe this good as " beyond thought and being" (éréxewa vod Kal ovotas). The phrase might certainly suggest the metaphysical doctrine of Plotinus, though we cannot suppose that his theosophic inference presented itself even dimly to the mind of Plato.~~

~~one in which all definite thought is transcended, and all consciousness of self lost in the absorbing ecstacy. Porphyry tells us that his master 'Plotinus attained the highest state four times during the six years which he spent with him.~~

~~Neo-Platonism is originally Alexandrine, and more than a century of its existence has elapsed before we find it flourishing on the old Athenian soil. Hence it is often re- garded as Hellenistic rather than Hellenic, a product of the mingling of Greek with Oriental civilization. But how- ever Oriental may have been the cast of mind that eagerly embraced the theosophic and ascetic views that have just been described, the forms of thought by which these views were philosophically reached are essentially Greek; and it is by a thoroughly intelligible process of natural develop- ment, in which the intensification of the moral~~

conscious- ness represented by Stoicism plays an important part, that the Hellenic pursuit of knowledge culminates in a prepara- tion for ecstacy, and the Hellenic idealization of man's natural life ends in a settled antipathy to the. body and its works. At the same time we cught not to overlook the affinities between the doctrine of Plotinus and that remark- able combination of Greek and Hebrew thought which Philo Judeeus had expounded two centuries before; nor the fact that Neo-Platonism was developed in conscious antagonism to the new religion which had spread from Judea, and was already threatening the conquest of the Greco-Roman world, and also to those fantastic hybrids of Christianity end later paganism, the Gnostic systems; nor, finally, that it furnished the chief theoretical support in the last desperate struggle that was made under Julian to retain the old poly- theistic worship. 'To the new world of thought, that after the failure of this struggle was definitely established upon the ruins of the old, we have now to turn.

III. Curistianiry anD Mrpi"#vaL Ernics.—In the present article we are not concerned with the origin of the Christian religion, nor with its outward history ; the causes of its resistless development during the first three centuries ; its final triumph over paganism ; its failure to check the decay of the Hellenistic civilization that ceutered in Con- stantinople, or to withstand in the east and south the force of the new religious movement that burst from Arabia in the 7th century ; its success in dominating the social chaos to which the barbarian invasions reduced the Western empire; the important part it took in educing from this chaos the new civilized order to which we belong ; the complex and varying relations in which it has since stood to the political organizations, the social life, the progressive science, the literary and artistic culture of our modern world. Nor have we to consider the special doctrines that have formed the bond of union of the Christian communities in any other than their ethical aspect, their bearing on the systematization of human aims and activities. This aspect, however, must necessarily be prominent in discussing Christianity, which cannot be adequately treated if con- sidered merely as a system of theological beliefs divinely revealed, and special observances divinely sanctioned ; as it essentially claims to rule the

~~whole man, and leave no part of his life out of the range of its regulating and trans- forming influences. It was not till the 4th century A.D. that the first attempt was made to offer anything like a systematic exposition of Christian morality; and nine centuries more had passed away before a genuinely philosophic intellect, trained by a full study of the greatest Greek thinker, undertook to give complete scientific form to the ethical doctrine of the Catholic church, Before, however, we take a brief survey of the progress of systematic ethics from Ambrose to Thomas Aquinas, if may be well to examine the chief features of the new moral consciousness that had spread through~~

~~Tan ce~~

~~Greco-Roman civilization, and was awaiting philosophic synthesis. In making this examination it will be con- venient to consider first the new form or universal charac- teristics of Christian morality, and afterwards to note the chief points in the matter or particulars of duty and virtue which received an important development or emphasis from the new religion.~~

~~The first point to be noticed is the new conception of Christian~~

~~morality as the positive law of a theocratic community, and~~

~~possessing a written code imposed by divine revelation, J~~

~~A aes " . a and sanctioned by express divine promises and threatenings. ane F~~

~~It is true that we find in ancient thought, from Socrates downwards, the notion of a law of God, eternal and immutable, partly expressed and partly obscured by the various and shifting codes and customs of actual human societies. But the sanctions of this law were vaguely and, for the most part, feebly imagined; its principles were essentially unwritten and unpromulgated, and thus not referred to the external will of an Almighty Being who claimed unquestioning submission, but rather to the reason that gods and men shared, by the exercise of which alone they could be adequately known and defined. Hence, even if the notion of law had been more prominent than it was in ancient ethical thought, it could never have led toa juridical, as distinct from a philosophical, treatment of morality. In Christianity, on the other hand, we early find that the method of moralists determining right conduct is to a great extent analogous to that of jurisconsults inter- preting a code. It is assumed that divine commands have been implicitly given for all occasions of life, and that they are to be ascertained in particular cases by interpretation and application of the general rules obtained from texts of scripture, and by analogical inference from scriptural examples. This juridical method descended naturally froin the Jewish theocracy, of which Christendom was a univer- salization. Moral insight, in the view of the most thought- ful Jews, was essentially knowledge of the divine law, to which practical efficacy was given by trust in God's promises and fear of his judgments; this law having been partly written and promulgated by Moses, partly revealed in the fervid utterances of the later prophets, partly handed down through oral tradition from immemorial antiquity, and having further, before Judaism gave birth to Christianity, received an extensive development through the commentaries and supplementary maxims of several generations of students. Christianity inherited the notion of a written divine code acknowledged as such by the " true Israel"—now potentially including the whole of mankind, or at least the chosen of all nations,—on the sincere acceptance of which the Christian's share of the divine promises to Israel depended. And though the ceremonial part of the old Hebrew code was altogether rejected, and with it all the supplementary jurisprudence' resting on tradition and erudite commentary, still God's Jaw was believed to be contained in the sacred~~

~~books of the Jews, supplemented by the records of Christ's teaching and the writings of his apostles. By the recognition of this law the church was constituted as an ordered community, essentially distinct from the state; the distinction between the two was sharpened and hardened by the withdrawal of the early Christians from civic life, to avoid the perform- ance of idolatrous ceremonies imposed as official expressions of loyalty, and by the persecutions which they had to endure, when the spread of an association apparently so hostile to the framework of ancient society had at length caused the imperial government serious alarm. Nor was the antithesis obliterated by the recognition of Christianity as the state religion under Constantine. The law of God and its interpreters still remained quite distinct from the secular. law and jurists of the Roman empire; though the former~~

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~~was of course binding on all mankind, the church was none the less a community of persons who regarded themselves as both specially pledged and specially enabled to obey it,— a community, too, that could not be entered except by a solemn ceremony typifying a spiritual new birth.~~

~~Thus the fundamental difference between morality and (human) legality only came out more clearly in conse- quence of the jural form in which the former was con- ceived. The ultimate sanctions of the moral code were the infinite rewards and punishments awaiting the immortal soul hereafter ; but the church early felt the necessity of withdrawing the privileges of membership from persons guilty of grave offences, and only allowing them to be gradually regained by a solemn ceremonial expressive of repentance, protracted through several years; while in the case of still graver sins this exclusion lasted till death, or was even made absolute. For minor offences, again, all Christians were called upon to express penitence cere- monially, by fasting and abstinence from permitted pleasures, as well as verbally in public and private devo- tions. " Excommunication " and " penance" thus came to be temporal ecclesiastical sanctions of the moral law ; as the graduation of these sanctions naturally became more careful and minute, a~~

~~correspondingly detailed classification of offences was rendered necessary ; the regulations for observing the ordinary fasts and festivals of the church became similarly elaborate; and thus a system of ecclesi- astical jurisprudence, prohibitive and ceremonial, was gradually produced, somewhat analogous to that of the rejected Judaism, At the same time this tendency to develop and make prominent a scheme of external duties has always been balanced and counteracted in Chris- tianity by the ineffaceable remembrance of its original antithesis to Jewish legalism. We find that this antithesis, as fantastically understood and exaggerated by some of the Gnostic sects of the 2d and 3d centuries A.D., led, not merely to theoretical antinomianism, but even (if the charges of their orthodox opponents are not entirely to be discredited) to gross immorality of conduct. A similar tendency has shown itself at other periods of church history. And though such antinomianism has always been sternly repudiated by the moral consciousness of Christen- dom, it has never been forgotten that " inwardness," rightness of heart or spirit, is the special and pre-eminent characteristic of Christian goodness. It must not, of course, be supposed that the need of something more than mere fulfilment of external duty was ignored even by the later Judaism. Rabbinic erudition could not forget the 'repression of vicious desires in the tenth commandment, the stress laid in Deuteronomy on the necessity of heartfelt and loving service to God, or the inculcations by later prophets of humility and faith. 'The real and only Pharisee," says the Talmud, "is he who does the will of his Father because he loves Him." But it remains true that the contrast with the "righteousuess of tle scribes and pharisees" has always served to mark the requirement of "inwardness" as a distinctive feature of the Christian code,—an inwardness not merely negative, tending to the repression of vicious desires as well as vicious acts, but also involving a positive rectitude of the inner state of the soul.**

~~Christian In this aspect Christianity invites comparison with Een Stoicism, and indeed with pagan ethical philosophy gener- Picard ally, if we except the hedonistic schools. Rightness of ness. | purpose, preference of virtue for its own sake, suppression~~

of vicious desires, were made essential points by the Aris- totelians, who attached the most importance to outward circumstances in their view of virtue, no less than by the Stoics, to whom all outward things were indifferent. The fundamental differences between pagan and Christian

ethics do not depend on any difference in the value set on rightness of heart or purpose, but on different views of the essential form or conditions of this inward rightness, In neither case is it presented purely and simply as moral rectitude. By the pagan philosophers it was always conceived under the form of Knowledge or Wisdom, it being inconceivable to all the schools sprung from Socrates that a man could truly know his own good and yet deliberately choose anything else. This knowledge, as Aristotle held, might be permanently precluded by vicious habits, vr temporarily obliterated by passion, but if present in the mind it must produce rightness of purpose. Or even if it were held with some of the Stoics that true wisdom was out of the reach of the best men actually living, it none the less remained the ideal condition of perfect human life ; though all actual men were astray in folly amd misery, knowledge was none the less the goal towards which the philosopher progressed, the realization of his true nature. By Christian evangelists and teachers, on the other hand, the inner springs of good conduct were generally conceived as Faith and Love. somewhat complex ethical import; it seems to blend several elements differently prominent in different. minds. Its simplest and commonest meaning is that emphasized in the contrast of " faith" with "sight ;" where it signifies belief in the invisible divine order represented by the church, in the actuality of the law, the threats, the promises of God, in spite of all the influences in man's natural life that tend to obscure this belief. Out of this contrast there ultimately grew an essentially different opposition between faith and knowledge or reason, according to which the theological basis of ethics was contrasted with the philo- sophical ; the theologians maintaining sometimes that the divine law is essentially arbitrary, the expression of will, not reason; more frequently that its reasonableness is inscrutable, and that actual human reason should con- fine itself to examining the credentials of God's messen- gers, and

~~not the message itself. But in early Chris- tianity this latter antithesis was as yet undeveloped ; faith means simply force in clinging to moral and religious con- viction, whatever their precise rational grounds may be; this force, in the Christian consciousness, being inseparably bound up with personal loyalty and trust towards Christ, the leader in the battle with evil that is being fought, the ruler of the kingdom to be realized. So far, however, there is no ethical difference between Christian faith and that of Judaism, or its later imitation, Mahometanism ; except that the personal affection of loyal trust is peculiarly stirred by the blending of human and divine natures in Christ, and the rule of duty impressively taught by the manifestation of His perfect life. A more distinctively © Christian, and a more deeply moral, significance is given to the notion in the antithesis of "faith" and "' works." Here faith means more than loyal acceptance of the divine law and reverent trust in the lawgiver ; it implies a conscious- ness, at once continually present and continually tran- scended, of the radical imperfection of all human obedience to the law, and at the same time of the irremissible con- demnation which this imperfection entails. The Stoic doctrine of the worthlessness of ordinary human virtue, and the stern paradox that all offenders are equally, in so far as all are absolutely, guilty, find their counterparts in Christianity ; but the latter, while maintaining this ideal severity in the moral standard, with an emotional con- sciousness of what is involved in it quite unlike that of the Stoic, at the same time overcomes its practical exclusiveness through faith. This faith, again, may be conceived in two modes, essentially distinct though usually combined. In one view it gives the believer strength to attain, by God's supernatural aid or "grace," a goodness of which he is~~

~~Of these notions the former has a Faith.~~

~~Love.~~

~~Purity.~~

~~Distinc- tive par- ticulars of Chris- tian mor- ality.~~

naturally incapable; in another view it gives him an assurance that, though he knows himself a sinner deserving of utter condemnation, a perfectly just God still regards him with favour on account of the perfect services and suffering of Christ. Of these views the former is the more catholic, more universally present in the Christian con- sciousness ; the latter more deeply penetrates the mystery of the atonement, as learnt by the chief Protestant churches from the Pauline epistles.

But faith, however understood, is rather an indispensable pre-requisite than the essential motive principle of Christian good conduct. This is supplied by the other central notion, love. Onlove depends the " fulfilling of the law," and the sole moral value of Christian duty—that is, on love to God, in the first place, which in its fullest develop- ment must spring from Christian faith; and, secondly, love to all mankind, as the objects of divine love and sharers in the humanity ennobled by the incarnation. This derivative philanthropy, whether conceived as mingling with and intensifying natural human affection, or as absorb- ing aud transforming it, characterizes the spirit in which all Christian performance of social duty is to be done; loving devotion to God being the fundamental attitude of mind that is to be maintained throughout the whole of the Christian's life. But further, as regards abstinence from unlawful acts and desires prompting to them, we have to notice another form in which the inwardness of Christian morality manifests itself, which, though less distinctive, should yet receive attention in any comparison of Christian ethics with the view of Graeco-Roman philo- sophy. The profound horror with which the Christian's conception of a suffering as well as an avenging divinity tended to make him regard all condemnable acts was tinged with a sentiment which we may perhaps describe as a ceremonial aversion moralized,— the aversion, that is, to fouluess or impurity. In all religions to some extent, but especially in Oriental religions, the natural dislike of material defilement has been elevated into a religious senti- ment. In Judaism, in particular, we find it used to sup- port a complicated system of quasi-sanitary abstinences and ceremonial purifications; at the same time, as the ethical element predominated in the. Jewish religion, a moral symbolism was felt to reside in the cereinonial code, and thus aversion to impurity came to be a common form of the ethico-religious sentiment. Then, when

~~Christianity threw off the Mosaic ritual, this religious sense of purity was left with no other sphere besides morality ; while, from its highly idealized character, it was peculiarly well adapted for that repression of vicious desires which Christianity claimed as its special function.~~

~~When we examine the details of Christian morality, we find that most of its distinctive features are naturally con- nected with the more general characteristics just stated; though many of them may also be referred directly to the example and precepts of Christ, and in several cases they are clearly due to both causes, inseparably combined. We may notice, in the first place, that the conception of morality as a code which, if not in itself arbitrary, is yet to be accepted by men with unquestioning submission, tends naturally to bring into prominence the virtue of obedience~~

~~"to authority; just as the philosophic view of goodness as the~~

~~realization of reason gives a special value to self-determina- tion and independence (as we see more clearly in the post- Aristotelian schools where ethics is distinctly separated from politics). Again, the opposition between the natural world and the spiritual order into which the Christian had been born anew led not merely to a contempt equal to that of the Stoic for wealth, fame, power, and other objects of worldly pursuit, but also, for some time at least, to a com- parative depreciation of the domestic and civic relations of~~

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~~the natural 'man ; while a keen sense of man's impotence to make this disengagement of the spirit complete induced the same hostility to the body as a clog and hindrance, that we find to some extent in Plato, but more fully developed in Neo-Platonism, Neo-Pythagoreanism, and other products of the mingling of Greek with Oriental thought. This latter feeling is exhibited in the value set on fasting in the Christian church from the earliest times, and in an extreme form in the self-torments of later monasticism ; while both tendencies, anti-worldliness and anti-sensualism, seem to have combined in causing the preference of celibacy over marriage which is common to most early Christian~~

~~writers. Patriotism, again, and the sense of civic duty, the most elevated and splendid of all social sentiments in the general view of Graeco-Roman civilization, tended, under the influ- ence of Christianity, either to expand itself into universal philanthropy, or to concentrate itself on the ecclesiastical community. ‘ We recognize one commonwealth, the world,” says Tertullian ; “we know,” says Origen, “that we have a fatherland founded by the word of God.” We might further derive from the general: spirit of Christian unworldiness that repudiation of the secular modes of conflict, even in a righteous cause, which substituted a passive patience and endurance for the old pagan virtue of courage, in which the active element was prominent. Here, however, we clearly trace the influence of Christ’s express prohibition of violent resistance to violence, and his inculcation, by example and precept, of a love that was to conquer even natural resentment. An extreme result of this influence isshown in Tertullian’s view, that no Christian could properly hold the office of a secular magistrate in which he would have to doom to death, chains, imprisonment; but even more sober writers, such as Ambrose, extend Christian passivity so far as to preclude self-defence even against a murderous assault. The com- mon sense of Christendom gradually shook off these extra- vagances ; but the reluctance to shed blood lingered long, and was hardly extinguished even by the growing horror of heresy. We have a curious relic of this in the later times of ecclesiastical persecution, when the heretic was doomed to the stake that he might be punished in some manner “short of bloodshed.” 2~~

~~It is, however, in the impulse given to practical benefi- cence in all its forms, by the exaltation of love as the root of all virtues, that the most important influence of Chris- tianity on the particulars of civilized morality is to be found ; although the exact amount of this influence is here somewhat difficult to ascertain, since it merely carries further a development distinctly traceable in the history of pagan morality considered by itself. This development clearly appears when we compare the different post-Socratic systems of ethics. In Plato’s exposition of the different virtues there is no mention whatever of benevolence, although his writings show a keen sense of the importance of friendship as an element of philosophic life, especially of the intense personal affection naturally arising between master and disciple.~~

~~Aristotle goes somewhat further in re- cognizing the moral value of friendship (p:Aéa); and though he considers that in its highest form it can only be realized by the fellowship of the wise and good, he yet extends the notion so as to include the domestic affections, and takes notice of the importance of mutual kindness in binding together all human societies. Still in his formal statement of the different virtues, positive beneficence is only discernible under the notion of ‘ liberality ;” in which form its excellence is hardly distinguished from that of graceful profusion in self-regarding expenditure. Cicero,~~

~~1 E.g., Justin Martyr, Origen, Tertullian, Cyprian. 2 Citra sanguinis effusionem.~~

~~on the other hand, in his well-known paraphrase of a Stoic treatise ou external duties (officia), ranks the rendering of positive services to other men as a chief department of social duty; and the Stvics generally recognized the universal fellowship and natural mutual claims of buman beings as such. Indeed, this recognition in Jater Stoicism is sometimes expressed with so much warmth of feeling as to be hardly distinguishable from Christian philanthropy. Nor was this regard for humanity merely a doctrine of the school. Partly through the influence of Stoic and other Greek philosophy, partly from the natural expansion of human sympathies, the legislation of the empire, during the first three centuries, shows a steady development in the direction of natural justice and humanity ; and some similar progress may be traced in the general tone of moral opinion. Still the utmost point that this development reached fell considerably short of the standard of Christian charity. Without dwelling on the immense impetus given to the practice of social duty generally by the religion that made beneficence a form of divine service, and identified “piety” with “pity,” we have to put down as definite changes introduced by Christianity into the current moral view—(1) the severe condemnation and final suppression of the practice of exposing infants ; (2) effective abhorrence of the barbarism of gladiatorial combats; (3) immediate moral mitigation of slavery, anda strong encouragement of~~

~~emancipation ; (4) great extension of the eleemosynary pro- vision made for the sick and the poor. As regards alins- giving, however—the importance of which has caused it to usurp, in modern languages, the general name of " charity " —it ought to be observed that Christianity merely univer- salized a duty which has always been inculcated and main- tained in conspicuous fulness by Judaism, within the limits of the chosen people. The same may be said of the stricter regulation which Christianity enforced on the relations of the sexes ; except so far as the prohibition of divorce is concerned, and the stress laid on "purity of heart" as contrasted with merely outward chastity. Even the peculiarly Christian virtue of humility, which presents so striking a contrast to the Greek " highmindness," was to some extent anticipated in the Rabbinic teaching. Its far greater prominence under the new dispensation may be partly referred to the express teaching and example of Christ ; partly, in so far as the virtue is manifested in the renunciation of external rank and dignity, or the glory of merely secular gifts aud acquirements, it is one aspect of the unworldliness which we have already noticed; while the deeper humility that represses the claim of personal merit even in the saint belongs to the strict self-examina- tion, the continual sense of imperfection, the utter reli-~~

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~~all other modes of human existence as pure philosophic speculation did in the view of Plato, Aristotle, and the Neo-platonists ; indeed, the more learned of the eastern monks spoke of themselves as withdrawing from the world to the " pursuit of wisdom" (¢iAocodia). Again, just as the Stoics held wisdom to be indispensable to real rectitude of conduct, while at the same time they included under the notion of wisdom a grasp of pliysical as well as ethical truth; so the similar emphasis laid on inwardness in Christian ethics caused orthodoxy or correctness of re- ligious belief to be regarded as essential to goodness, and heresy as the most fatal of vices, corrupting as it did the very springs of Christian life. To the philosophers, how- ever, convinced as they were that the multitude must neces- sarily miss true wellbeing through their folly and ignorance, it could never occur to guard against these evils by any other method than that of providing philosophic instruction for the~~

~~few; whereas the Christian clergy, whose function it was to offer truth and eternal life to all mankind, naturally regarded theological misbelief as insidious pre- ventable contagion. Indeed, their sense of its deadliness was so keen that, when they were at length able to control the secular administration, they rapidly overcame their aversion to bloodshed, and initiated that long series of reli- gious persecutions to which we find no parallel in the pre- Christian civilization of Europe. It was not that Christian writers did not feel the difficulty of attributing criminality to sincere ignorauce or error. But the difficulty is not really peculiar to theology; and the theologians usually got over it (as some philosophers had surmounted a similar perplexity in the region of ethics proper) by supposing some latent or antecedent voluntary sin, of which the apparently involuntary heresy was the fearful fruit.~~

~~Lastly, we must observe that in proportion as tle legal conception of morality as a code of which the violation deserves supernatural punishment predominated over the philosophic view of ethics as the method for attaining natural felicity, the question of man's freedom of will to obey the law necessarily became prominent. At the same time it cannot be broadly said that Christianity took a de cisive side in the metaphysical controversy on free-will and necessity ; since, just as in Greek philosophy the need of maintaining freedom as the ground of responsibility clashes with the conviction that no one deliberately chooses his own harm, so in Christian ethics it clashes with the attri- bution of all true human virtue to supernatural grace, as well as with the belief in divine forcknowledge. All we can say is that in the development of Christian thought the conflict of conceptions was far more profoundly felt, and far more serious efforts were made to evade or transcend it.~~

~~ance on strength not his own, which characterize the inner moral life of the Christian. Humility in this latter sense, "before God," is an essential condition of all truly Christian goodness.~~

~~Obedience, patience, benevolence, purity, humility,~~

~~In the preceding account of Christian morality, it has Develop- been already indicated that the characteristics delineated ment of did not all~~

~~exhibit themselves simultaneously to the same 0P!710n~~

~~extent, or with perfect uniformity throughout the church. aed~~

~~Partly the changes in the external condition of Christianity, tianity,~~

~~alienation from the "world" and the " flesh, " are the chief novel or striking features which the Christian ideal of prac- tice suggests, so far as it can be placed side by side with that commonly accepted in Graeco-Roman society. But we have yet to notice the enlargement of the sphere of ethics due to its close connexion with theology ; for while this added religious force and sanction to ordinary moral obligations, it equally tended to impart a moral aspect to religious belief and worship. " Duty to God"—as distinct from duty to man—had not been altogether unrecognized by pagan moralists, though the rather dubious relations of even the more orthodox philosopliy to the established poly- theism had generally prevented them from laying much stress upon it. But in the views of many Christians, religious worship and contemplation as far surpassed~~

~~and the different degrees of civilization in the societies of which it was the dominant religion, partly the natural process of internal development, continually brought different features into prominence; while again, the important antagonisms of opinion that from time to time expressed themselves in sharp controversies within Christen- dom frequently involved ethical issues—even in the Eastern church until the great labour of a dogmatic construction began in the 4th century, and in the Western church always. Thus, for example, the anti-secular tendencies of the new creed, to which Tertullian (160-220) gave violent and rigid expression, were exaggerated in the Montanist heresy which he ultimately joined ; on the other hand, Clemens of Alexandria, in opposition to the general tone of his age, maintained the value of pagan philosophy for~~

~~Augie tine.~~

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~~the development of Christian faith into true knowledge (Gnosis), and the value of the natural development of man through marriage for the normal perfecting of the Chris- tian life. So again, there is a marked difference between the writers before Augustine and those that succeeded him in all that concerns the internal conditions of Christian morality. By Justin and other apologists the need of redemption, faith, grace is indeed recognized, but the theological system depending on these notions is not suf- ficiently developed! to come into even apparent antagonisin with the freedom of the will. Christianity is for the most part conceived as essentially a proclamation through the Divine Word, to immortal beings gifted with free choice, of the true code of conduct sanctioned by eternal rewards and punishments, 'This legalism contrasts strikingly with the efforts of pagan philosophy to exhibit virtue as its own reward ; and the contrast is triumphantly pointed out by more than one early Christian writer. Lactantius (cic. 300 A.D.), for example, roundly declares that Plato and Aris- totle, referring everything to this earthly life, '" made virtue mere folly ;" though himself maintaining, with pardonable inconsistency, that man's highest good did not consist in mere pleasure, but in the consciousness of the filial relation of the soul to God. It is plain, however, that on this external legalistic view of duty it was impossikle to main- tain a difference in kind between Christian and pagan morality ; the philosopher's conformity to the rules of chastity and beneficence, so far as it went, was indistin- guishable from the saint's. But when this infereuce was developed in the teaching of Pelagius, it was repudiated as heretical by the church, under the powerful leadership of Augustine (354-430) ; and the doctrine of man's inc.- pacity to obey God's law by his unaided moral energy was pressed to a point at which it was difficult to reconcile it with the freedom of the will. Augustine is fully aware of the theoretical indispensability of maintaining Free Will, from its logical connexion with human responsibility and divine justice ; but he considers that these latter points are sufficiently secured if actual freedom of choice between good and evil is allowed in the single case of our progenitor Adam.? For since the natura seminalis from which all men were to arise already existed in Adam, in his voluntary preference of self to God humanity chose evil once for all ; for which ante-natal guilt all men are justly condemned to perpetual absolute sinfulness and~~

~~consequent punishment, untess they are elected by God's unmerited grace to share the benefits of Christ's redemption. Without this grace it is impossible for man to obey the " first greatest con:mand- ment" of love to God ; and, this unfulfilled, he is guilty of the whole law, and is only free to choose between degrees of sin; his apparent external virtues have no moral value, since inner rightness of intention is wanting. " All that is not of faith is of sin ;" and faith and love are mutually involved and inseparable ; faith springs from the divinely imparted germ of love, which in its turn is developed by faith to its full strength, while from both united springs hope, joyful yearning towards ultimate perfect fruition of the object of love. These three Augustine (after St Paul) regards as the three essential elements of Christian virtue ;~~

~~fT 1 is~~

~~only the same love to God in different aspects or exercises, The severe uncompromising mysticism of this view may be at once compared and contrasted with the philosophical severity of Stoicism. Love of God inthe former holds the same absolute and unique position as the sole element of moral work in human action, which, as we have seen, was occupied by knowledge of Good in the latter ; and we may carry the parallel further by observing that in neither case is this severity in the abstract estimate of goodness necessarily conuected with extreme rigidity in practical precepts. Indeed, an important part of Augustine's work as a moralist lies in the reconciliation which he laboured to effect between the anti-worldly spirit of Christianity and the necessities of secular civilization. For example, we find him arguing for the legitimacy of judicial punish- ments and military service against an over-literal interpre- tation of the Sermon on the Mount. And, more generally, by adopting and giving currency to the well-known distinc- tion between evangelical "counsels" and "commands," he defended the life of marriage and temperate enjoyment of natural good against the attacks of the more extravagant advocates of celibacy and self-abnegation ; although he fully admitted the superiority of the latter method of avoiding the contamination of sin.~~

~~The attempt to Chiristianize the old Platonic list of Ambrose,~~

virtues, which we have noticed in Augustine's system, was probably due to the influence of his master Ambrose ; in whose treatise De oficiis ministrorum we find for the first time an exposition of Christian duty systematized on a plau borrowed from a pre-Christian moralist. It is inter- esting to compare Ambrose's account of what subsequently came to be known as the " four cardinal virtues " with the corresponding delineations in Cicero's* De-offictis which has served the bishop as a model. Christian Wisdom, so far as speculative, is of course primarily theological ; it has God, as the highest truth, for its chief object, and is therefore necessarily grounded on faith. Christian Fortitude is essentially firmness in withstanding the seductions of good and evil fortune, resoluteness in the conflict perpetually waged against wickedness without carnal weapons—though Ambrose, with the Old Testament in his hand, will not quite relinquish the ordinary martial application of the virtue. " 'Temperantia" retains the meaning of " obsery- ance of due measure" in all conduct, which it had in Cicero's treatise ; though its notion is partly modified by being blended with the newer virtue of humility; while in the exposition of Christian Justice the Stoic doctrine of the natural union of all human interests is elevated to the full height and intensity of evangelical philanthropy ; the brethren are bidden to regard all things useful as the common property of all. Ambrose, we should observe, is thoroughly aware of the fundamental union of these different virtues in Christianity, though he does not, like Augustine, resolve them all into the one central affection of love of God.

The combination which Augustine introduced . between these four cardinal virtues and the triad of Christian graces, Faith, Hope, and Love, determined the ground-plan of the treatment of systematic ethics for subsequent ecclesi-

astical writers generally. In antithesis to this list of Ecclesi- virtues, an enumeration of the chief deadly sins obtained on currency. These were at first commonly reckoned as jn the eight ; but a preference for mystical numbers characteristic 'Dark of medizval theologians finally reduced the received list Ages." to seven. The statement of them .is somewhat variously

~~given by different writers,—Pride, Avarice, Anger, Glut-~~

~~along with these he recognizes the fourfold division of virtue into prudence, temperance, courage, and justice; which, however, he explains to be in their true natures~~

~~_ | To show the crudity of the notion of redemption in early Christian-~~

~~ity, it is sufficient to mention that many fathers represent Christ's ran-~~

~~Som as having' been paid to the devil; sometimes adding that by the~~

~~concealment of Christ's divinity under the veil of humanity a certain~~

~~deceit was (fairly) practised on the great deceiver.~~

~~e ea itsis to be observed that Augustine does not himself understand by freedom" the power of willing either good or evil, but the power of~~

~~willing good, The highest freedom, in his view, excludes the possibility of willing evil.~~

~~3 Cicero's works are unimportant in the history of ancient ethics, as their philosophical matter was entirely borrowed from Greek treatises now lost; but the influence exercised by them (especially by the De~~

~~i Officiis) over niedizval and even modern readers was very considerable.~~

~~Medieval~~

~~moral philo- sophy.~~

~~Hea bes~~

~~tony, Unchastity, are found in all the lists; the remaining two (or three) are variously selected from among Envy, Vain-glory, and the rather singular sins Gloominess (Tris- titia) and Languid Indifference (Acidia or Acedia, from Greek axydia). These latter notions show pretty~~

~~plainly, what indeed might be inferred from a study of the list as a whole, that it especially represents the moral experience of the monastic life ; which for some centuries was more and more unquestioningly regarded as in a peculiar sense " religious." It should be observed that the (also Augustinian) distinc- tion between " deadly " and " venial " sins had a technical reference to the quasi-jural administration of ecclesiastical discipline ; which grew gradually more organized as the spiritual power of the church established itself amid the ruins of the Western empire, and slowly developed into the theocracy that almost dominated Europe during the latter part of the Middle Ages. ' Deadly" sins were those for which formal ecclesiastical penance was held to be necessary, in order to save the.sinner from eternal damnation; for "'venial " sins he might obtain forgiveness, through prayer, almsgiving, and the observance of the regular fasts. We find that " penitential books" for the use of the confessional, founded partly on .traditional practice and partly on the express decrees of synods, come into general use in the 7th century. At first they are little more than mere inventories of sins, with their appropriate ecclesiastical punishments ; gradually cases of conscience come to be discussed and decided, and the basis is laid for that system of casuistry which reached its full development in the 14th and 15th centuries. This elaboration of ecclesiastical jurisprudence, and indeed the general relation of the church to the ruder races with which it had to deal during this period, necessarily tended to encourage a somewhat external view of morality ; but a powerful counterpoise to this tendency was continually maintained by the Augustinian doctrine, transmitted through Gregory the Great, Isidore of Seville, and other influential writers of the philosophically barren period that intervened between the destruction of the Western empire and the rise of Scholasticism.~~

~~The great effort of the scholastics to philosophize in harmony with the Christian dogma attained its completest result in the teaching of Thomas Aquinas. But before giving a brief account of the ethical part of his system, it will be well just to notice the salient points in the long and active discussion that led upto it,—the dogmatic construc- tion of Anselm, the bold questions and suggestive paradoxes of Abelard, the subtle distinctions of Petrus Lombardus, and the novel Aristotelian~~

~~erudition of Albertus Magnus ; nor must we overlook the Neo-Platonic mysticism of Johannes Scotus (Erigena), though separated in time and thought from the main course of scholasticism. In the pantheistic system of this earliest of the great medieval thinkers (civc. 810-877), the chief philosophic element is supplied by the influence of Plotinus, transmitted through an unknown author of the 5th century, who assumed the name of Dionysius the Areopagite. Accordingly the ethical side of his doctrine has the same négative and ascetic char- acter that we have observed in Neo-Platonism, God is the only real Being ; evil is essentially unreal and incognizable, and the concrete world of individuals only real in so far as it partakes of the divine nature ; the true aim of man's life is to return to perfect union with God out of the degraded material existence into which he has fallen. This doctrine found no immediate acceptance, and was certainly unortho- dox enough to justify the condemnation which it subse- quently received from Pope Honorius IIL; but its influence, together with that of the Pseudo-Dionysius, had a consider- able share in developing the more emotional orthodox mysticism of the 12th and 13th centuries; and Neo-Platonism remained a distinct element in medieval thought,~~

~~though obscured by the growing influence of Aristotle, un- til its revival in the age of the Renaissance. Passing on to Anselm (1033-1109), the first real scholastic of importance, we observe that the Augustinian doctrine of original sin and man's absolute need of unmerited grace is retained in his theory of salvation; he also follows Augustine in de- fining freedom as the " power not to sin ;" though in saying that Adain fell "spontaneously" and " by his free choice," though not " through its freedom," he has implicitly made the distinction that Petrus Lombardus afterwards expressly draws between the freedom that is opposed to necessity and freedom from the slavery to sin. Anselm further softens the statement of Augustinian predestinationism by explain- ing that the freedom to will is not strictly lost even by fallen man ; it is inherent in a rational nature, though since Adam's sin it only exists potentially in humanity,—like the faculty of sight in a dark place, —except where it is made actual by grace. In amore real sense Abelard~~

~~(1079~1142) tries to establish the connexion between man's ill desert and his free consent; boldly asserting that the inherited propensity to evil is not strictly a sin, which is only com- mitted when the conscious self yields to vicious inclination. With a similar stress on the self-conscious side of moral action, he argues that rightness of conduct depends solely. on the intention; at one time pushing this doctrine to the paradoxical assertion that all outward acts as such are indifferent.! In the same spirit, under the reviving in- fluence of ancient philosophy (though as yet imperfectly known), he argues that the old Greek moralists, as incul- cating a disinterested love of good—and so implicitly love of God as the highest good—were really nearer to Christianity than Judaic legalism was. Nay, further, in the Christian " love to God" he distinguishes the disinte- rested love of God for Himself from the affection of which the real object is the happiness which God gives, and re- gards the former alone as pure. The general tendency of Abelard's thought was suspiciously regarded by contem- porary orthodoxy ;? and the over-subtlety of the last-men- tioned distinction provoked vehement replies from more than one of the orthodox mystics of the age. 'Thus, Hugo of St Victor (1077-1141) argues that all love is necessarily so far "interested" that it involves a desire for union with the beloved; and since eternal happiness consists in this union, it cannot truly be desired apart from God; while Bernard of Clairvaux (1091-1153) more elaborately distin- guishes four stages by which the soul is gradually led from (1) merely self-regarding desire for God's aid in distress, to (2) love Him for His loving-kindness to it, then also (3) for His absolute goodness, until (4) in rare moments this love for Himself alone becomes the sole all-absorbing affection. This controversy, as well as others, Petrus Lombardus en- deavoured to compose by the scholastic art of taking dis- tinctions, of which he was a master. His famous treatise, Libri Sententiarum, though not systematic or profound, deserved the place it long held as a text-book of Catholic theology, by its combined comprehensiveness and minute- ness of view, and its sobriety of judgment. It is mainly based on Augustinian doctrine, though we find in it a dis- tinct softening of the traditional antithesis between nature and grace ; somewhat anticipating the remarkable union of Aristotelian and Christian thought, which, in the succeeding century, when the study of Aristotle had been revived by the~~

influence of the great Arabian commentators, was initiated by Albert the Great and completed by Thomas Aquinas. i rr ee ee ee 1 Abelard afterwards retracted this view, at least in its extreme form ; and in fact does not seem to have been fully conscious of the difference between (1) unfulfilled intention to do an act objectively right, and (2) intention to do what is merely believed by the agent

to be right. 2 He was condemned by two synods, in 1121 and 1140. Vill. — 75

Thomas

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The moral philosophy of Thomas Aquinas is Aristo-

Aquinas. telianism with a Neo-Platonic tinge, interpreted and supple-

mented by Christian dogma. All action or movement of all things irrational as well as rational is directed towards some end or good,— that is, really and ultimately towards God Himself, the ground and first cause of all being, and unmoved principle of all movement. This universal striv- ing after God, since He is essentially intelligible, exhibits itself in its highest form in rational beings as a desire for knowledge of Him; such knowledge, however, is beyond all ordinary exercise of reason, and may only be partially revealed to man here below. Thus the swmmum bonum for man is objectively God, subjectively the happiness to be derived from loving vision of His perfections; although there is a lower kind of happiness to be realized here below in anormal human existence of virtue and friendship, with mind and body sound and whole and properly trained for the needs of life. The higher happiness is given to man

by free grace of God; but it is only given to those whose |

heart is right, and as areward of virtuous actions. Passing to cousider what actions are virtuous, we first observe generally that the morality of an act is in part, but only in part, determined by its particular

~~motive ; it partly depends on its external object and circumstances, which render it either objectively in harmony with the " order of reason" or the reverse. In the classification of particular virtues and vices, we can distinguish very clearly the elements sup- plied by the ditferent teachings which Thomas has imbibed. In dividing the " natural" virtues into intellectual and moral, giving his preference to the former class, and distin- guishing in it the "intellect" that is conversant with prin- ciples, the " science" which deduces conclusions, and the "'wisdom" to which belongs the whole process of knowing the sublimest objects of knowledge, Thomas follows Aristotle closely ; his distinction among moral virtues of the justice that renders others their due from the virtues that control the appetites and passions of the agent himself, re- presents his interpretation of the Nicomachean ethics ; while his account of these latter virtues is a simple transcript of Aristotle's, just as his division of the non-rational element of the soul into "concupiscible" and "'irascible" is the old Platonic one. In arranging his list, however, he defers to the established doctrine of the four cardinal virtues ; accordingly, the Aristotelian ten have to stand under the higher genera of (1) the prudence which gives reasoned rules of conduct, (2) the temperance which restrains the passions, and (3) the fortitude that strengthens the soul against them. But before these virtues, which belong to the nature of man asa rational creature, and can be ac- quired, though not perfectly, as a mere natural result of training and practice, are ranked the three "theologic " virtues, faith, love, and hope, supernaturally "instilled " by God, and directly relating to Him as their object. By faith we obtain that part of our knowledge of God which is beyond the range of mere natural wisdom or philosophy ; naturally (e.g.), we can know God's existence, but not His trinity in unity, though philosophy is useful to defend this and other revealed verities. Faith is the substantial basis of all Christian morality, but without love—the essential form of all the Christian virtues—it is " formless " (infor- mis). Christian love is conceived (after Augustine) as primarily love to God (beyond the natural yearning of the creature after its ultimate good), which expands into love towards all God's creatures as created by Him, and so ulti- mately includes even self-love. But creatures are only to be loved in their purity as created by God; all that is bad in them must be an object of hatred till itis destroyed. In the~~

~~classification of sins the Christian element pre- dominates ; still we find the Aristotelian vices of excess and defect, along with the modern divisions into "sins~~

~~"iris~~

~~against God, neighbour, and self," " mortal and venial sins," &c.~~

~~When from the essentially jural notion of sin we pass to the discussion of law, we observe another element in Thomas's doctrine, drawn from a different part of the renascent intel- lectual activity of Europe,—from the study, namely, of Roman jurisprudence, which attained in the 12th century so rapid and brilliant a revival in Italy. This side of Thomas's system is specially important to notice, since it is just this blending of theological conceptions with the abstract theory of the later Roman law that gave the start- ing-point for independent ethical thought in the modern world. Under the general idea of law, defined as an "ordinance of reason for the common good," promulgated by him who has charge of the community, Thomas distin- guishes (1) the eternal law or regulative reason of God which embraces all His creatures, rational and irrational ; (2) 'natural law," being that part of the eternal law that relates to rational creatures as such ; (3) human law, which properly consists of more particular deductions from natnral law adapted to the circumstances of particular societies ; (4) divine law specially revealed to man. As regards natural law, he teaches that God has firmly implanted in the human mind a knowledge of its immutable general prin- ciples, although the applications of them may sometimes be obscured: and perverted by bad education and custom. Human law is required, not merely to determine the details for which natural law gives no clear guidance, but also to supply the force necessary for practically securing, among imperfect men, the observance of the most necessary rules of mutual behaviour. A further force is supplied by the revealed code of the decalogue and the gospel combined, which again goes beyond natural law in directing the way to eternal life. We have, however, to distinguish in the case of the gospel between (1) absolute commands and (2) " counsels, " which latter recommend, without posi- tively ordering, the monastic life of poverty, celibacy, and obedience, as~~

~~the best method of effectively turning the will from earthly to heavenly things. Finally, to express the manner in which the moral law operates in the mind, Thomas uses and defines the specially Christian notion of conscience, distinguishing the "synderesis "! (evyrnpyjcts) by which moral principles are permanently retained froin the " couscientia " by which they are applied to particular cases.~~

~~But how far is man able to attain either natural or Christian perfection? This is the part of Thomas's system in which the cohesion of the different elements composing it seems weakest. He is scarcely aware that his Aristo- telianized Christianity inevitably combines two different difficulties in dealing with this question: first, the old pagan difficulty of reconciling the position that will is a rational desire always directed towards apparent good with the freedom of choice between good and evil that the jural view of morality seems to require; and, secondly, the Christian difficulty of harmonizing this latter notion with the absolute dependence on divine grace which the religious consciousness affirms. The latter difficulty Thomas, like many of his predecessors, avoids by supposing a "' co-opera- tion" of free-will and grace, but the former he does not fully meet. It is against this part of his doctrines that the most important criticism, in ethics, of his rival Duns Scotus (1266-1308) was directed. He urged that will could not be really free if it were bound to reason, as Thomas (after Aristotle) conceives it ; a really free choice must be perfectly indeterminate between reason and unreason. Scotus consistently maintained that the divine~~

~~+The "synderesis" of the Catholic mystics is a different notion; it is the "apex mentis," the highest faculty of the mind, by which tle most perfect communion with the Divine nature is realised.~~

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~~will is similarly independent of reason, and that the divine ordering of the world is to be conceived as absolutely arbi- trary,—a point on which he was followed by the acute in- tellect of William of Occam (d. 1347). This doctrine is obviously hostile to all reasoned morality; and in fact, not- withstanding the dialectical ability of Scotus and Occam, the work of Thomas remained indubitably the crowning result of the great~~

~~constructive effort of medizval philo- sophy. The effort was, indeed, furedoomed to failure, since it attempted the impossible task of framing a cohe- rent system out of the heterogeneous data furnished by Scripture, the fathers, the church, and "the Philo- sopher"—equally unquestioned, if not equally venerated, authorities. Whatever philosophic quality is to be found in the work of Thomas belongs to it in spite of, not in consequence of, its method. Still, its influence has been great and long-enduring,—in the Catholic Church primarily, but indirectly among Protestants, especially in England, since the famous first book of Hooker's Lcclesi- astical Polity is to a great extent taken from the Summa Theologve.~~

~~Partly in conscious antagonism to the erudite labours and dialectical conflicts of the schoolmen, yet with close affinity to the central ethico-theological doctrine which they read out of or into Aristotle, the mystical manner of thought continued to maintain itself in the church. Philosophically it leant upon Neo-Platonism, but always blending the Christian element of love with the ecstatic vision of Plotinus, and sometimes giving the former a~~

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~~Reformation. A plain man perplexed by such disagree' ments might naturally hold that any opinion maintained by a pious and orthodox writer must be a tolerably safe one to follow; and thus weak consciences might be subtly tempted to seek the support of authority for some desired relaxation of a moral rule. It docs not, however, appear that this danger assumed formidable proportions until after the Reformation ; when, in the struggle made by the Catholic church to recover its hold on the world, the principle of authority was, as it were, forced into keen competition with that of private judgment for the guidance of men's consciences. To the Jesuits, the foremost champions in this struggle, it seemed indispensable that the confessional should be made attractive; for this pur- pose ecclesiastico-moral law must be somehow " accommo- dated" to worldly needs ; and the theory of " Probabilism " supplied a plausible method for effecting this accommoda- tion. The theory proceeded thus:—A layman could not be~~

~~expected to examine minutely into a point on which the learned differed; therefore he could not fairly be blamed for following any opinion that rested on the authority of even a single doctor; therefore his confessor must be authorized to hold him guiltless if any such " pro- bable" opinion could be produced in his favour; nay, it was his duty to suggest such an opinion, even though opposed to his own, if it would relieve the conscience under his charge from a depressing burden. The results to which this Probabilism, applied with an earnest desire to avoid dangerous rigour, led in the 17th century were~~

~~revealed to the world in the immortal Lettres Provinciales of Pascal. The Re: In tracing the development of casuistry we have been forma- carried beyond the great crisis through which Western a Christianity passed in the 16th century. The Reformation tion to which Luther initiated may be viewed on several sides, modern even if we consider only its ethical principles and effects, ethical apart from the political and social aims and tendencies with Philc-~~

~~decided predominance. Inits more moderate form, keeping wholly within the limits of ecclesiastical orthodoxy, this mysticism: is represented by Bonaventura and Gerson ; while it appears more independent and daringly construc- tive in the German Eckhardt, advancing in some of his followers to open breach with the church, and even to practical immorality.~~

~~In the brief account above given of the general ethical ane~~

~~Casuistry and Jesu- itry.~~

~~view of Thomas Aquinas no mention has been made of the detailed discussion of particular duties included in the Summa Theologve,; in which, for the most part, an excel- lent combination of moral elevation with sobriety of judg- ment is shown, though on certain points the scholastic pedantry of definition and distinction is unfavourable to due delicacy of treatment. As the properly philosophic interest of scholasticism faded in the 14th and 15th centuries, the quasi-legal treatment of morality came again into promi- nence, borrowing a good deal of matter from Thomas and other schoolmen. The best known~~

~~Summa Casuum Con- scientice, compiled for the conduct of auricular confession, belong to the 14th and 15th centuries. As the chief of these we may mention the Astesana (14th century) and the Angelica (15th century) by two Franciscans, Astesanus and Angelus de Clavasio respectively. It was inevitable that, in proportion as this casuistry assumed the character of a complete and systematic penal jurisprudence, its precise determination of the limits between the prohibited and the allowable, with all doubtful points closely scru- tinized and illustrated by fictitious cases, would have a tendency to weaken the moral sensibilities of ordinary minds ; while, again, the more industry and ingenuity were spent in deducing conclusions from the diverse authorities accepted in the church, the greater necessarily became the number of points on which doctors dis- agreed; and the central authority that might have repressed serious divergences was wanting in the period of moral weakness! that the church went through, be- tween the death of Boniface VIII. and the counter-~~

~~1 The refusal of the council of Constance to condemn Jean Petit's advocacy of assassination is a striking example of this weakness. Cf. Milman, Lat. Christ., book xiii. c. 9.~~

~~which it was connected in different European countries. It maintained the simplicity of Apostolic Christianity against the elaborate system of a corrupt hierarchy, the teaching of scripture alone against the commentaries of the fathers and the traditions of the church, the right of private judgment against the dictation of ecclesiastical authority, the individual responsibility of every human soul before God in opposition to the papal control over purgatorial punishments, which had led to the revolting degradation of venal indulgences. Reviving the original antithesis between Christianity and Jewish legalisin, it maintained the inwardness of faith to be the sole way to eternal life, in contrast to the outwardness of works ; returning to Augustine, and expressing his spirit in a new formula, to resist the Neo-Pelagianism that had gradually developed itself within the apparent Augustinianism of the church, it maintained the total corruptien of human nature, as contrasted with that "congruity" by which, according to the schoolmen, divine grace was to be earned ; renewing the fervent humility of St~~

~~Paul, it enforced the universal and absolute imperativeness of all Christian duties, and the inevitable unworthiness of all Christian obedience, in opposition to the theory that "condign " merit might be gained by "supererogatory " conformity to evangelical "counsels." It will be seen that these changes, however profoundly important, were, ethically considered, either negative or quite general, relating to the tone and attitude of mind in which all duty should be done. As regards all positive matter of duty and virtue, and most of the prohibitive code for ordinary men, the tradition of Christian teaching was carried on substan- tially unchanged in the discourses and writings of the Reformed cliarches. Even the old method of casuistry was~~

~~Grotius,~~

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~~maintained! during the 16th and 17th centuries ; though scriptural texts, interpreted and supplemented by the light of natural reason, now furuished the sole principles on which cases of conscience were decided. But in the 17th~~

~~century the interest of this quasi-legal treatment of~~

~~morality gradually faded ; and the ethical studies of edu- cated minds were occupied with the attempt, renewed after so many centuries, to find an independent philosophical basis for the moral code. The renewal of this attempt was only indirectly due to the Reformation ; it is rather to be connected with the more extreme reaction from the medieval religion which was partly caused by, partly expressed in, that enthusiastic study of the remains of old pagan culture that spread from Italy over Europe in the 5th and 16th centuries. To this ' hurmanism" the Reformation seemed at first more hostile than the Roman hierarchy ; indeed, the extent to which this latter. had allowed itself to become paganized by the Renaissance was one of the points that especially roused the Reformers' indignation. Not the less important is the indirect stimulus given by the Reformation towards the develop- ment of a moral philosophy independent alike of Catholic and Protestant assumptions, Scholasticism, while reviving philosophy as a handmaid~~

~~to theology, had metamorphosed its method into one resembling that of its mistress ; thus shackling the renascent intellectual activity which it stimulated and exercised by the double bondage to Aris- totle and to the church. When the Reformation shook the traditional authority in one department, the blow was necessarily felt in the other. Not twenty years after Luther's defiance of the pope, the startling thesis 'that all that Aris- totle taught was false" was prosperously maintained by the youthful Ramus before the university of Paris ; and almost contemporaneously the group of remarkable thinkers in Italy who heralded the dawn of modern physical science— Cardanus, Telesius, Patritius, Campanella, Bruno—began to propound their un-Aristotelian theories of the constitu- tion of the physical universe. It was to be foreseen that a similar assertion of independence would make itself heard in ethics also; and, indeed, amid the clash of dogmatic convictions, the variations and aberrations of private judg- ment, that the multiplying divisions of Christendom exhibited after the Reformation, reflective persons would naturally be led to seek for an ethical method that might claim universal acceptance from all sects.~~

~~IV. MoperRn, ESPECIALLY EnoLisu, Eraics.—The need of such independent principles was most strongly felt in the region of man's civil and political relations, especially the mutual relations of communities. Accordingly we find that modern ethical controversy was commenced in the form of a discussion of the law of nature, of which first Albericus Gentilis (1557-1611), then Hugo Grotius (1583 -1645) in his epoch-making work on international law, endeavoured to give a complete theoretical view. Natural law, according to Grotius, is that part of divine law which follows from the essential nature of man ; it is therefore as unalterable even by God himself as the truths of mathe- matics, although it may be overruled in any particular case by express revelation; hence it is cognizable a prior, from the abstract consideration of human nature, though its existence may also be known a@ posteriori from its universal acceptance in human societies. The conception, as we have seen, was taken from the later Roman jurists ; by them, however, the law of nature was hardly conceived as actually having a substantive existence independent of positive codes; it was~~

~~rather something that underlay existing law, and was to be looked for through it, though~~

- ~~As the chef English casuists we may mention Perkins, Hall, Sander-~~

~~son, as well as the more eminent J Tayl . tantium appeared 1660. eremy Taylor, whose Ductor Dubi~~

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~~it might perhaps be expected ultimately to supersede it, and in the meanwhile represented an ideal standard, by which improvements in legislation were to be guided. Hence they do not seem to have framed, except in poetical or mytlucal imagination, the notion of a state of nature in which human beings were governed by the law of nature alone. But as soon as the principles of this code were contemplated as determining international rights and duties, it was obvious that in the present mutual relations of independent nations, regarded as corporate units, we have an actual example of this state of nature. Thus it was an easy step to suppose definitely that in prehistoric times individuals or single families lived similarly side by side,—under none other than such " natural" laws as those prohibiting mutual injury, and mutual interference with each other's use of the goods of the earth that were common to all, giving parents authority 'over their children, impos- ing on wives a vow of fidelity to their husbands, and obliging all to the observance of compacts freely entered into. It was not, of course, assumed that these laws were universally obeyed ; indeed, one point with which Grotius is especially concerned is the natural right of private war, arising out of the violation of more primary rights, Still a general observance was involved in the idea of a natural law as a " dictate of right reason indicating the agreement or disagreement of an act with man's rational and social nature ;" and we may observe that it was especially necessary to assume such a general observance in the case of contracts ; since it was by an "express or tacit pact " that the right of property (as distinct from the mere right to non-interference during use) was held to have been instituted ; and only by a similar '"~~

~~fundamental pact " could men be thought to pass legitimately from the state of nature to that of an organized society.~~

~~The ideas above expressed were not peculiar to Grotius ; in particular the doctrine of the "fundamental pact" as the jural basis of government had long been maintained, especially in England, where the constitution historically established readily suggested such a compact. At the same time the rapid and remarkable success of Grotius's treatise would bring his view of Natural Right into pro- minence, and would suggest to penetrating minds such questions as—" What is man's ultimate reason for obeying these laws? Wherein does this their agreement with his rational and social nature exactly consist? How far, and in what sense, is his nature really social ?"~~

~~It was the answer which Hobbes (1588-1679) gave to Hobbes,~~

~~these fundamental questions that supplied the starting-point for independent ethical philosophy in England. The nature of this answer was determined by the psychological views to which Hobbes had been led, partly under the influence of Bacon,? partly perhaps through association with his younger contemporary Gassendi, who, in two treatises, published between the appearance of Hobbes's De Cive (1642) and that of the Leviathan (1651), endeavoured to revive interest in the lifeand teaching of Epicurus. Hobbes's psychology is in the first place materialistic; he holds, that is, that in any of the psychophysical phenomena of human nature the reality is a material process of which the mental feeling is a mere "appearance." Accordingly he regards pleasure as essentially motion "helping vital action," and pain as motion "hindering" it. There is no logical connexion between this theory and the doc- trine that appetite or desire has always pleasure (or the absence of pain) for its object; still a materialist,~~

~~2 This influence was not exercised in the region of ethics. Bacon's brief outline of jmoral philosophy (in the Advancement of Learning) is highly pregnant and suggestive ; but the outline was never filled in, and does not seem to have had any effect in determining the subse- quent course of thought in England. ;~~

~~framing a system of psychology, will naturally direct his attention to the impulses arising out of bodily wants, whose obvious end is the preservation of the material organism; and this, together with a philosophic wish to simplify, may lead him to the conclusion that all human impulses are similarly self-regarding. This, at any rate, is Hobbes's cardinal doctrine in moral psychology, that each man's appetites or desires are naturally directed either to the preservation of his life, or to that heightening of it which he feels as pleasure ;! including the aversions that are similarly directed "fromward" pain. Hobbes does not distinguish instinctive from deliberate pleasure-seeking ; and he confidently resolves the most apparently unselfish emotions into phases of self-regard. Pity he finds to be grief for the calamity of others, arising from imagination of the like calamity befalling oneself; what we admire with seeming disinterestedness as beautiful (pwlchrum) is really "pleasure in pronise;" when men are not immediately seeking present pleasure, they desire power as a means to future pleasure, and thus have a deriva- tive delight in the exercise of power that prompts to what we call benevolent action. Since, then, all the voluntary actions of men tend to their own preservation or pleasure, it cannot be reasonable to aim at anything else; in fact, nature rather than reason fixes this as the end of human action, to which it is reason's function to show the means. Hence if we ask why it is reasonable for any individual to observe the rules of social behaviour that are commonly called moral, the answer is obvious that this is only indirectly reasonable, as a means to his own preservation or pleasure. It is not, however, in this, which is only the old Cyrenaic or Epicurean answer, that the distinctive point of Hobbism lies; but rather in the doctrine that even this indirect reasonableness of the most fundamental moral rules is entirely conditional on their general observance, which cannot be secured without the intervention of government. J.g., it is not reasonable for me to perform my share of a contract, unless I have ade- quate reason for believing that the other party will perform his; and this adequate reason I cannot have, except in a state of society in which he will be punished for non-per- formance. 'Thus the ordinary rules of social behaviour are only hypothetically obligatory in any society, until~~

~~they are actualized by the establishment of a strong central authority. On the other hand, Hobbes yields to no one in maintaining the paramount importance of moral regulations. The precepts of good faith, equity, requital of benefits, forgiveness of wrong so far as security allows, the prohibi- tion of contumely, pride, arrogance, and other subordinate rules, he still calls "immutableand eternal laws of nature,"— meaning that, though they do not unconditionally bind us to realize them, they always bind to a desire that they should be realized. The pre-social state of man, in his view, is also pre-moral ; but itis therefore utterly miserable. It is a state in which every one has a right to everything that may conduce to his preservation ;? but it is therefore also a state of war in which every man's hand is against his neighbour's,—a state so wretched and perilous that it is the first dictate of rational self-love to emerge from it~~

~~1 He even identifies the desire with the pleasure, apparently regard- ing the stir of appetite and that of fruition as two parts of the same ** motion."~~

~~2 In spite of Hobbes's uncompromising egoism, there is a noticeable discrepancy between his theory of the ends that men naturally seek and his standard for determining their natnral rights. This latter is never Pleasure simply, but always Preservation—though on occasion he enlarges the notion of " preservation" into " preservation of life so as not to be weary of it." His view seems to be that in a state of nature most men will fight, rob, &c., "for delectation merely" or "for glory," and that hence all men must be allowed an indefinite right to fight, rob, &c., 'for preservation."~~

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~~into social peace and order. Hence Hobbes's ideal constitu- tion naturally comes to be an unquestioned and unlimited— though not, necessarily monarchical—despotism. Whatever the government declares to be just or unjust must be taken to be so, since to dispute its dictates would be the first step towards anarchy, the one paramount peril outweighing all particular defects in legislation and administration. It is perhaps easy to understand how, in 1651, a peace-~~

~~loving philosopher, weary of the din of warring sects, should regard the claims of individual conscience as essentially anarchical, and the most threatening danger to social well- being ; but however strong might be men's yearning for order, a view of social duty, in which the only fixed positions were selfishness everywhere and unlimited power somewhere, could not but appear offensively paradoxical.~~

~~However, offensive or not, there was an originality, a force, an apparent coherence in Hobbism which rendered it undeniably impressive ; in fact, we find that for two genera- tions the efforts to construct morality on a philosophical basis take more or less the form of answers to Hobbes. From an ethical point of view Hobbism divides itself naturally into two parts, which are combined by Hobbes's peculiar political doctrines into a coherent; whole, but are not otherwise necessarily connected. Its theoretical basis is the principle of egoism, that it is natural and so reason- able for each individual to aim solely at his own pre- servation or pleasure; while, for practically determining the particulars of duty it makes morality entirely depen- dent on positive law and institution. It is this latter part. or aspect of the system which is primarily attacked by the first generation of writers that replied to Hobbes. This attack, or rather the counter-exposition of orthodox doctrine, is conducted on different methods by the Cambridge moralists and by Cumberland respectively. The latter retains the legal view of morality, and endeavours, while showing the actuality of the laws of nature, to systematize them by reducing them to a single principle. The former, regarding morality primarily as a body of truth rather than a code of rules, insist on its absolute character and intuitive certainty.~~

~~Cudworth was the most distinguished of the little group The Cam- of thinkers at Cambridge in the 17th century, commouly bridge known as, the "Cambridge Platonists," who, embracing ™™- what they conceived to be Platonic principles, but also G.a- strongly influenced by the new thought of Descartes, en- worth."~~

~~deavoured to blend rational theology with religious philo- sophy. In histreatiseon Hternal and Immutable Morality (which was not~~

~~published till more than 40 years after his death in 1688), his main aim is to maintain the " essential and eternal distinctions of good and evil" as independent of mere will, whether human or divine. These distinctions, he insists, have an objective reality, cognizable by reason or intellect as much as any physical fact; and he endeavours to refute Hobbism—which he treats as a " novantique philosophy," a mere revival of the relativism of Protagoras —by the following argumentum ad hominem. He argues that Hobbes's atomic materialism involves the conception of an objective physical world, the object not of sense that varies from man to man, but of the intellect that is the same in all; there is therefore an inconsistency in refusing to admit a similar exercise of intellect in morals, an objec- tive world of duty, which the mind by its normal activity clearly apprehends as such. Cudworth, in the work above mentioned, gives no systematic exposition of the ethical principles which he holds to be clearly apprehended. But we may supply this deficiency from the Lnchiridion Ethicum of Henry More, another thinker of the same school. More gives a list of 23 " Noemata Moralia," the truth of which will, he says, be immediately manifest. Some of these are purely egoistic,—as (¢.g.) that goods differ in quality as~~

~~More,~~

~~Cnmber- Matter thoroughly modern.~~

~~land.~~

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~~well as duration, and that the superior good is always to be preferred, and similarly the lesser evil; that absence of a given amount of good is preferable to the presence of equi- valent evil ; that future good or evil is to be regarded as much as present, if equally certain, and nearly as much if very probable. Objections, both general and special, might be urged by a Hobbist against these modes of formulating man's natural pursuit of self-interest ; but the serious controversy between Hobbism~~

~~and modern Platonism did not relate to such principles as these, but to others which demand from the individual a (real or apparent) sacrifice for his fellows. Such are the evangelical principle of "doing as you would be done by;" the principle of justice, or " giving every man his own, and letting him enjoy it without interference ;" and especially what More states as the abstract formula of benevolence, that "'if it be good that one man should be supplied with the means of living well and happily, it is mathematically certain that it is 'doubly good that two should be so supplied, and so on." If we ask what motive any individual has to conform to these social principles when they conflict with his natural desires, Cudworth gives no explicit reply, and the answer of More is hardly clear. On the one hand he maintains that these principles express an absolute good ; which is to be called intellectual because its essence and truth are defined and apprehended by the intellect. We might infer from this that the intellect, so judging, is itself the proper and complete determinant of the will, and that man, as a rational being, ought to aim at the realization of absolute good for itsownsake. But this does not seem to be More's view. He explains that though absolute good is dis- cerned by the intellect, the "sweetness and flavour" of it is apprehended, not by the intellect proper, but by what he calls a "boniform faculty ;" and it is in this sweetness and flavour that the motive to virtuous conduct lies; ethics is the 'art of living well and happily," and true happiness lies in "the pleasure which the soul derives from the sense of virtue." In short, Platonism, in More's mind, has been so far modernized that it turus out as hedonistic as Hob-bism; the difference between the two lies merely in the degree of refinement of the pleasure that is taken as ultimate end.~~

~~It is to be observed that though More lays down the abstract principle of regarding one's neighbour's good as much as one's own with the full breadth with which Christianity inculcates it, yet when he afterwards comes to discuss and classify virtues he is too much under the influence of Platonic-Aristotelian thought to give a distinct place to benevolence, except under the old form of liberality. In this respect his system presents a striking contrast to Cumberland's, whose treatise De Legibus Nature (1672), though written like More's in Latin, is yet in its ethical Cuinberland is a thinker both original aud comprehensive, who~~

~~has furnished material to more than one better-known moralist ; but his academic prolixity and discursiveness, his academic language, and a want of clearness of view in spite of an elaborate display of exact and complete demonstration, have doomed his work to oblivion. At any rate he is noteworthy as having been the first to lay down that "regard for the common good of all" is the supreme rule of morality or Law of Nature, to which all other rules and virtues are strictly subordinate. So far he may be fairly called the precursor of modern utilitarianism. It is, however, important to notice that in his "good" is included not merely happiness but " perfec- tion;" and he does not even define perfection so as to exclude from it the notion of moral perfection or virtue, and save his theory from an obvious logical circle. A notion so vague could not possibly be used for determining the subordinate rules of morality with any precision; but~~

~~in fact Cumberland does not attempt this; his supreme principle is not designed to rectify, but merely to support – and systematize, common morality. This principle, as was said, is conceived as strictly a law, and therefore referred to a lawgiver, God, and provided with a sanction in the effects of its observance or violation on the agent's happi- ness. 'That the divine will is expressed by the proposition "that all rationals should aim at the common gvod of all," Cumberland, "not being so fortunate as to possess innate ideas," tries to prove by a long inductive examination of the evidences of man's essential sociality exhibited in his physical and mental constitution. His account of the sanction, again, is sufficiently comprehensive, including both the internal and the external rewards of virtue and punishments of vice ; and he, like later utilitarians, explains moral obligation to lie in the force exercised on the will by these sanctions; but as to the precise manner in which individual is implicated with universal good, and the operation of either or both in determining volition, his view seems either indistinct or inconsistent.~~

~~The clearness which we seek in vain from Cumberland is found to the fullest extent in a more famous writer,~~

~~whose Essay on the Human Understanding (1690) was Locke.~~

~~already planned when Cumberland's treatise appeared. Aud yet Locke's ethical opinions have been widely mis- understood ; since from a confusion between "innate ideas " and ' intuitions," which has been common in recent ethical discussion, it has been supposed that the founder of English empiricism must necessarily have been hostile to "intui- tional" ethics. The truth is that, while Locke agrees entirely with Hobbes as to the egoistic basis of rational conduct, and the interpretation of "good" and "evil" as '"'pleasure" and "pain," or that which is productive of pleasure and pain, he yet agrees entirely with Hobbes's opponents in holding ethical rules to be actually obligatory independently of political society, and capable of being scientifically constructed on principles intuitively known. This morality he conceives as the law of God, carefully distinguishing it, not only from civil law, but from the law of opinion or reputation, the varying moral standard by which men actually distribute praise and blame ; as being divine it is necessarily sanctioned by adequate rewards and punishments. He does not, indeed, speak of the scientific construction of this code as having been actually effected, but he affirms its possibility in language remarkably strong and decisive. 'The idea," he says, "of a Supreme Being, infinite in power, goodness, and wisdom, whose workman- ship we are, and upon whom we depend, and the idea of ourselves, as understanding rational beings, being such as are clear in us, would, I suppose, if duly considered and pursued, afford such foundations of our duty and rules of action, as might place morality among the sciences capable of demonstration, wherein, I doubt not, but from self-evi- dent propositions, by necessary consequences as incontes- tible as those in mathematics, the measures of right and wrong might be made out." As Locke cannot consistently inean by God's " goodness " anything but the disposition to give pleasure, it would seem that the supreme rule of his system, as of Cumberland's, must prescribe universal benevolence ; though the only instances which he gives of intuitive moral truths are the purely formal propositions, "No government allows absolute liberty," and " Where there is no property there is no injustice."~~

~~We might give, as a fair illustration of Locke's general Clarke.~~

~~conception of ethics, a system which is frequeutly repre- sented as diametrically opposed to Lockism; namely, that expounded in Clarke's Boyle lectures on the Beng and Attributes of God (1704). It is true that Locke is not particularly concerned with the ethico-theolo- gical proposition which Clarke is most anxious to~~

~~EoPabi < §~~

~~maintain,—that the fundamental ru'es of morality are independent of arbitrary will, whether divine or human. But in his general view of ethical principles as being, like mathematical principles, essentially truths of relation, Clarke is quite in accordance with Locke ; while of the four fundamental rules that he expounds, Piety, Equity, Benevolence, and Sobriety (which includes self-preservation), the first is obtained, just as Locke suggests, by " comparing the idea" of man with the idea of an infinitely good and wise being on whom he depends ; and the second and third are axioms self-evident on the consideration of the equality or similarity of human individuals as such. The second axiom of equity—that " whatever I judge reasonable or unreasonable for another to do for me, that by the saine I declare reasonable or unreasonable that I in the like case should do for him," is merely a formal statement of the golden rule of the gospel.1 We may observe that, in stating the principle of benevolence, "since the greater good is always most fit and reasonable to be done, every rational creature ought to do all the good it can to its fellow-creatures," Clarke avowedly follows Cumber- land, from whom he quotes the further sentence that "universal love and benevolence is as plainly the most direct, certain, and effectual means to this good as the flowing of a point is to produce a line." The quota- tion may remind us that the analogy between ethics and matheniatics ought to be traced further back than Icke; in fact, it results from the influence exercised by Cartesianism over English thought generally, in the latter half of the 17th century. It must be allowed that Clarke is misled by the analogy to use general ethical terms (" fitness," " agreement" of things, &c.), which overlook the essential distinction between what is aud what ought to be; and even in~~

~~one or two expressions to overleap this distinction extravagantly, as (e.g.) in saying thit the man who " wilfully acts contrary to justice wills things to be what they are not and cannot be." What he really means is less paradoxically stated in the yeneral proposition that " originally and in reality it is natural and (morally speak- ing) necessary that the will should be determined in every action by the reason of the thing and the right of the case, as it is natural and (absolutely speaking) necessary that the understanding should submit to a demonstrated truth." Here no doubt Clarke is opposed to Locke; and even goes beyond the Platonists in affirming the immediate abso- lute determination of will by reason. But though it is an essential point in Clarke's view that what is right is to be done as such, apart from any consideration of pleasure or pain, it is to be observed that he is not prepared to apply this doctrine in its unqualified form to such a creature as man, who feels as well as reasons. At least when he comes to argue the preferability of virtue to vice in refer- ence to actual human choice, he does not make more than the very moderate claim that "virtue deserves to be chosen for its own sake, and vice to be avoided, though a man was sure for his own particular neither to gain nor lose anything by the practice of either." He fully admits that the ques- tion is altered when vice is attended by pleasure and profit to the vicious man, virtue by loss and calamity ; and even that it is " not truly reasonable that mien by adhering to virtue should part with their lives, if thereby they deprived themselves of all possibility of receiving any advantage from their adherence."~~

~~The truth is that the impressive carnestness with which Clarke enforces the doctrine of rational morality only ren- ders more manifest the difficulty of establishing ethics on an independent philosophical basis; so long at least as the~~

~~1 Even Hobbes accepts the golden rule in its negative application ("* Do not unto others," &c.) as summarizing his "law of nature."~~

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~~psychological egoism of Hobbes 1s not definitely as- sailed and overthrown. Until this is done, the utmost demonstration of the~~

~~abstract reasonableness of social duty only leaves us with an irreconcilable antagonism between the view of abstract reason and the self-love which is allowed to be the root of man's appetitive nature. Let us grant that there is as much intellectual absurdity in acting unjustly as in denying that two and two make four ; still, if a man has to choose between absurdity and unhappiness, he will naturally prefer the former; and Clarke cannot maintain that such preference is irrational 7?~~

~~It remains to adopt another line of reasoning ; instead uf presenting the principle of social duty as abstract reagon, liable to conflict to any extent with natural self-love, we may try to exhibit the naturalness of man's social affections, and demonstrate a normal harmony between these and his self-regarding impulses. This is the line of thought which~~

~~Shaftesbury (1671-1713) may be said to have initiated. ghaftes- Not, of course, that he is original in insisting on the actual bury.~~

~~fact of natural affections binding men to their fellows ; Cumberland, to say nothing of earlier writers, had dwelt on this atsome length. But no moralist before Shaftesbury had made this the cardinal point in his system; no one had undertaken to distinguish clearly, by careful analysis of experience, the disinterested and self-regarding elements of our appetitive nature, or to prove inductively their per- fect harmony. He begins by attacking the egoistic inter- pretation of good which Hobbes had put forward, and which, as we have seen, was not neccssarily excluded by the doctrine of moral intuitions. This interpretation, he says, would be only true if we considered man as a wholly unrelated individual, Such a ,being we might doubtless call ' good," if his impulses and dispositions were harmonized and adapted to the attainment of his own felicity. But man we must and do consider in relation to a larger system of which he forms a part, and so we only call him "good" when his impulses and dispositions are so graduated and balanced as to tend towards the good of this whole. And observe, he adds, we do not attribute good- ness to him merely because his outward acts have this tendency ; the worst of men may be chained from harm, and lashed into usefulness by the fear of punishment. When we speak~~

of a man as " morally " good, we mean that his dispositions or affections are such as tend of themselves to promote the good or happiness of human society. Hobbes's moral man, who, if let loose from governmental constraint, would straightway spread ruin among his fellows, is not what we commonly agree to call such. Moral goodness, then, involves disinterested affections, whose direct object is the good of others ; but Shaftesbury does not mean (as he has been misunderstood to mean) that only such bene- volent social impulses are good, and that these are always good. On the contrary, he is careful to point out, first, that immoderate social affections defeat themselves, miss their proper end, and are therefore bad; secondly, that as an individual's good is part of the good of the whole " self- affections" existing in a duly limited degree are morally good. 'The moral ideal, in short, consists in due com- bination of both sorts of " affections," tendency to promote general good being taken as the criterion of the right mixture or balance. This being established, the main aim of Shaftesbury's argument is to prove that the same balance and blending of private and social affections, which tends naturally to public good, is also conducive to the happiness of the individual in whom it exists. Taking the different impulses in detail, he first shows how the

2 It should be observed that, while Clarke is sincerely anxious to prove that most principles are binding independently of Divine ap- pointment, he is no less concerned to show that morality requires the practical support of revealed religion.

Mande- ville.

individual's happiness is promoted by developing and exercising his social affections, mental pleasures being snperior to bodily, and the pleasures of benevolence the richest of all. In discussing this he distinguishes, with well-applied subtlety, between the pleasurableness of the benevolent emotions themselves, the sympathetic enjoy- ment of the happiness of others, and the pleasure arising from a consciousness of their love and esteem. He then exhibits the unhappiness that results from any excess of the self-regarding impulses, bodily appetite, desire

~~of wealth, emulation, resentment, even love of life itself; and ends by dwelling on the intrinsic painfulness of all malevolence.~~

~~One more special impulse remains to be noticed. We have seen that goodness of character consists in a certain balance and harmony of self-regarding and social affections. But virtue, in Shaftesbury's view, is something more ; it implies a recognition of moral goodness and immediate preference of it for its own sake. This immediate pleasure that we take in goodness (and displeasure in its opposite) is due to a susceptibility which he calls the "reflex" or "moral" sense, and compares with our susceptibility to beauty and deformity in external things ; it furnishes both an additional direct impulse to good conduct, and an additional gratification to be taken into acconnt' in the reckoning which proves the coincidence of virtue and happiness. This doctrine of the moral sense is sometimes represented as Shaftesbury's cardinal tenet; but though characteristic and important, it is not really necessary to his main argument; it is the crown rather than the key-stone of his ethical structure.~~

~~The appearance of Shaftesbury's Characteristics (1713) marks a turning-point in the history of English ethical thought. With the generation of moralists that followed the consideration of abstract rational principles falls into the background, and its place is taken by introspective study of the human mind, observation of the play of the various impulses and sentiments. This empirical psychology had not indeed been neglected by previous writers. More, among others, had imitated Descartes in a discussion of the passions, and Locke's essay had given a atill stronger impulse in the same direction ; still, Shaftesbury is the first moralist who distinctly takes psychological experience as the basis of ethics His suggestions were developed by Hutcheson into one of the most elaborate systems of moral philosophy which we possess; through Hutcheson, if not directly, they influenced Hume's speculations, and are tlius connected with later utilitarianism; while again, the substance of Shaftesbury's main argument was adopted by Butler, though it could not pass the scrutiny of that powerful and cautious intellect without receiving important modifications and additions. On the other hand, the ethical optimism of~~

~~Shaftesbury, connected as it was with a natural theology that implied the Christian scheme to be superfluous, challenged attack equally from orthodox divines and from infidel pessimists. Of these latter Mandeville, the author of Zhe Fable of the Bees, or Private Vices Public Benefits (1724), was a conspicuous if not a typical specimen. He can hardly be called a "moralist," and though it is impossible to deny him a considerable share of philosophical penetration, his anti-moral paradoxes have not even apparent coherence. He is convinced that virtue (where it is more than a mere pretence) is purely artificial; but not quite certain whether it is a useless trammel of appetites and passions that are advantageous to society, or a device creditable to the politicians who introduced it by playing upon the " pride and vanity " of the " silly creature man." The view, however, to which he gave eccentric expression, that moral regulation is something alien to the natural man, and imposed on him from without,~~

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~~seems to have been very current in the polite society of his time, as we learn both from Berkeley's Alciphron and from Butler's more famous sermons.~~

~~The view of "human nature" against which Butler preached was not exactly Mandeville's, nor was it properly to be called Hobbist, although Butler fairly treats it as having a philosophical basis in Hobbes's psychology. It was, so to say, Hobbism turned inside out,—rendered licen- tious and anarchical instead of constructive. Hobbes had said "the natural state of man is non-moral,' unregulated ; moral rules are means to the end of peace, which is a means to the end of self-preservation." On this view morality, so far as Hobbes deals with it, though conven- tional and dependent for its actuality on the social com-pact which establishes government, is actnally binding on man as a reasonable being. But the quasi-theistic assump- tion that what is natural must be reasonable remained iu the minds of Hobbes's most docile readers; and in com- bination with his new thesis that unrestrained egoism is natural, tended to produce results which, though not per-~~

~~Butler,~~

~~haps practically subversive of peace, were at any rate~~

~~dangerous to social well-being, To meet this view Butler does not content himself, as he is sometimes carelessly sup- posed to do, with simply insisting on the natural claim to authority of the conscience which his opponent repudiated as artificial; he also uses a more subtle and effective argument ad hominem. He first follows Shaftesbury in ex- hibiting the social affections as no less natural than the appetites and desires which tend more directly to self-pre- servation; then going further and reviving the Stoic view of the prima nature, the first objects of natural appetites, he argues that pleasure is not the primary aim even of the impulses which Shaftesbury allowed to be " self-affections ; " but rather a result which follows upon their attaining their natural ends. Thus the object (e.g.) of hunger is not the pleasure of eating but food; hunger is, therefore, strictly speaking, no more "interested" than benevolence ; granting that the pleasures of the table are an important element in the happiness at which self-love aims, the same may certainly be said for the pleasures of love and sympathy. Further, so far from bodily appetites (or other particular desires) being forms of self-love, there is no one of them which under certain circumstances may not come into conflict with it. Indeed, it is common enough for men to sacrifice to passion what they know to be their true interests ; at the same time we do not cousider such conduct 'natural " in mau as a rational being; we rather regard it as natural for him to govern his transieut impulses. Thus the notion of natural unregulated egoism turns out to be a psychologi- cal chimera; for (1) man's primary impulses cannot be sweepingly ¢alled egoistic in any sense, since the objects of all are other than his own happiness, and the tendencies of some are as obviously social in the first instance as those of others are self-regarding ; and (2) a man cannot be con- sistently egoistic without being continually self-regulative. Indeed, we may say that an egoist must be doubly self- regulative, since rational self-love ought to restrain not only other impulses, but itself also; for as happiness is made up of feelings that result from the satisfaction of impulses other than self-love, any over-development of the latter, enfeebling these other~~

~~impulses, must proportionally diminish the happiness at which self-love aims. If, then, it be admitted that human impulses are naturally under goverument, the naturai claim of conscience or the moral faculty to be the supreme governor will be hardly denied. But has not self-love also, by Butler's own account, a similar authority, which may come into conflict with that of conscience? Butler fully admits this, and, in fact, grounds on it animportant criticism of Shaftesbury. We have seen that in the latter's system the "moral sense" is not abso-~~

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~~lutely required, or at least is only necessary as a substitute for enlightened self-regard ; since if the harmony between prudence and virtue, self-regarding and social impulses, is complete, mere self-interest will prompt a duly enlightened mind to maintain precisely that " balance" of affections in which goodness consists. But to Butler's more cautious mind the completeness of this harmony did not seem sufii-~~

~~ciently demonstrable to be taken as a basis of moral teach- |~~

~~ing; he has at least to contemplate the possibility of a man being convinced of the opposite ; and he argues that unless we regard conscience as essentially authoritative—which is not implied in the term "moral sense"—such a man is really bound to be vicious; "since interest, one's own happiness, is a manifest obligation." Still on this view, even if the authority of conscience be asserted, we seem reduced to an ultimate dualism of our rational nature. Butler's ordered polity of impulses turns out to be a polity with two independent governments. Butler does not deny this, so far as mere claim to authority is concerned ;1 but he maintains that, the dictates of conscience being clear and certain, while the calculations of self-interest lead to merely probable conclusions, it can never be practically reasonable to disobey the~~

~~**former, even apart from any proof which religion nay furnish of the absolute coincidence of the two in a future life.**~~

~~**This dualism of governing principles in Butler's system, and perhaps, too, his revival of the Platonic conception of human nature as an ordered and governed community of impulses, may be partly attributed to the influence of Wollaston's Religion of Nature Delineated (1722). Here, for the first time, we find " moral good " and " natural good" or " happiness " treated separately as two essentially distinct objects of rational pursuit and investigation; the harmony between them being regarded as matter of religious faith, not moral knowledge. Wollaston's theory of moral evil as consisting in the practical contradiction of a true proposi- tion, closely resembles the most paradoxical part of Clarke's doctrine, and was not likely to approve itself to the strong common sense of Butler ; but his statement of happiness or pleasure as a "justly desirable" end at which every rational being "ought" to aim corresponds exactly to Butler's conception of self-love as a naturally governing impulse; while the "moral arithmetic" with which he compares pleasures and pains, and endeavours to make the notion of happiness quantitatively precise, is an anticipation of Benthamism.**~~

~~**There is another side of Shaftesbury's harmony which Butler was ultimately led to oppose in a more decided manner,—the opposition, namely, between conscience or the moral sense and the social affections. In the Sermons, indeed (1729), Butler seems to treat conscience and calm benevolence as permanently allied though distinct principles, but in the Dissertation on Virtue, appended to the Analogy (1739), he maintains that the conduct dictated by con- science will often differ widely from that to which mere re- gard for the production of happiness would prompt. We may take this latter treatise as representing the first in the development of English ethics, at which what were after- wards called " utilitarian" and "intuitional" morality were first formally opposed; in earlier systems the antithesis is quite latent, as we have incidentally noticed in the case of Cumberland and Clarke.2 The argument in Butler's disser- tation was probably directed against Hutcheson, who in his "inquiry coucerning the original of our**~~

ideas of virtue" had definitely identified virtue with benevolence. The identifi- aces 5 lyn tli pe ae eee

1In a remarkable passage near the close of his eleventh sermon, Butler seems even to allow that conscience would have to give way to self-love, if it were possible (which it is not) that the two should come into ultimate and irreconcilable conflict.

2 Of. ante, p. 598-9.

cation is slightly qualified in Hutcheson's posthumously pub- lished System of Moral Philosophy(1755); in which the gene- ral view of Shaftesbury is more fully developed, with several uew psychological distinctions, including Butler's separation of "calm " self-love and benevolence from the "turbulent " passions, selfish or social. Hutcheson also follows Butler in laying stress on the "governing " character of the moral sense ; but he still regards "kind affections" as the principal objects of moral approbation—the "calm" and " exten- sive " affections being preferred to the turbulent and narrow —together with the desire aud love of moral excellence which is ranked with universal benevolence, the two being equally worthy and necessarily harmonious. Only in a secondary sense is approval due to certain " abilities and dispositions immediately connected with virtuous affec- tions," as candour, veracity, fortitude, sense of honour ; while in a lower grade still are placed sciences and arts, along with even bodily skills and gifts ; indeed, the appro- bation we give to these is not strictly moral, but is referred to the "'sense of deceucy or dignity," which (as well as the seuse of honour) is to be distinguished from the moral sense. Calm self-love Hutcheson regards as morally indifferent ; though he enters into a careful analysis of the elements of happiness,® in order to show that a true regard for private interest always coincides with the moral seuse and with benevolence. While thus maintaining Shaftesbury's "harmony " between public and private good, Hutcheson is still more careful to establish the strict disinterestedness of benevolent affections. Shaftesbury had conclusively shown that these were not in the vulgar sense selfish; but the very stress which he lays on the pleasure

~~inseparable from their exercise suggests a subtle egoistic theory which he does not expressly exclude, since it may be said that this "intrinsic reward" constitutes the real motive of the benevolent man. 'To this Hutcheson replies that no doubt the exquisite delight of the emotion of love is a motive to sustain and develop it ; but this pleasure cannot be directly obtained, any more than other pleasures, by merely desiring it; it can only be got indirectly by cultivating the affection, which is thus obviously distinct from the desire for benevolent pleasure, being (as is ordinarily supposed) an immediate desire for other's good. He points to the fact that the imminence of death often intensifies instead of diminishing a man's desire for the welfare of those he loves, as a crucial experiment proving the disinterestedness of love; adding, as confirmatory evidence, that the sympathy and admiration commonly felt for self-sacrifice depends on the belief that it is something different from refined self-seeking.~~

~~It remains to consider how, from the doctrine that affection is the proper object of approbation, we are to deduce moral rules or "natural laws" prescribing or pro- hibiting outward acts. It is obvious that all actions conducive to the general good will deserve our highest approbation if done from disinterested benevolence ; but how if they are not so done? In answering this question, Hutcheson avails himself of the scholastic distinction between "material" and "formal" goodness. 'An action," he says, "is materially good when in fact it tends to the interest of the system, so far as we can judge of its tendency, or to the good of some part consistent with that of the system, whatever were the affections of the agent. An action is formally good when it flowed from good affection in a just proportion." On the pivot of this distinction Hutcheson turns round from the point of view of Shaftesbury to that of later utilitarianism. His treat-~~

~~3 It is worth noticing that Hutcheson's express definition of the object of self-love includes " perfection " as well as " happiness ;" but in the working out of his system he considers private good exclusively~~

~~as happiness or pleasure. VIIL — 76~~

~~Hume.~~

ment of external rights and duties, though decidedly in- ferior in methodical clearness and precision, does not differ in principle from that of Paley or Bentham, except that he lays greater stress on the immediate conduciveness. of actions to thé happiness of individuals, and more often refers in a merely supplementary or restrictive way to their tendencies in respect of general happiness. It may be noticed, too, that he still accepts the "' social compact" as the natural mode of constituting government, and regards the obligations of subjects to civil obedience as normally dependent on a tacit contract; though he is careful to state that consent is not absolutely necessary to the just establishment of beneficent government, nor the source of irrevocable obligation to a pernicious one.

An important step further in political utilitarianism was taken by Hume in his Z"reatise on Human Nature (1739). Hume concedes that a compact is the natural means of peacefully instituting a new government, and may therefore be properly regarded as the ground of allegiance to it at the outset; but he urges that, when once it is firmly established, the duty of obeying it rests on precisely the same combination of private and general interests as the duty of keeping promises ; it is therefore absurd to base the former on the latter. Justice, veracity, fidelity to compacts and to governments, are all co-ordinate; they are all "artificial " virtues, due to civilization, and not belonging to man in his "ruder and more natural" condition ; our approbation of all alike is founded on our perception of their useful consequences. It is this last position that constitutes the fundamental difference between Hutcheson's ethical doctrine and Hume's.!_ The former, while accepting utility as the criterion of " material goodness," had adhered to Shaftesbury's view that dispositions, not results of action, were the proper object of moral approval; at the same time, while giving to benevolence the first place in his account of personal merit, he had shrunk from the paradox of treating it as the sole virtue, and had added a rather undefined and unexplained train of qualities,— veracity, for- titude, activity, industry, sagacity,—immediately approved in various degrees by the " moral sense" or the " sense of

~~dignity." This naturally suggested to a mind like Hume's, anxious to apply the experimental method to psycho- logy, the problem of reducing these different elements of personal merit—or rather our approval of them—to some common principle. The old theory that referred this approval entirely to self-love is, he holds, easy to disprove by "crucial experiments" on the play of our moral senti- ments ; rejecting this, he finds the required explanation in the sympathetic pleasure that attends our perception of the conduciveness of virtue to the interests of human beings other than ourselves. He endeavours to establish this inductively by a survey of the qualities, commonly praised as virtues, which he finds to be always either useful or immediately agreeable, either (1) to the virtuous agent himself or (2) to others. In class (2) he includes, besides the Benevolence of Shaftesbury and Hutcheson, the useful virtues, Justice, Veracity, and Fidelity to compacts; as well as such immediately agreeable qualities as politeness, wit, modesty, and even cleanliness. The most original part of his discussion, however, is concerned with qualities imme- diately useful to their possessor. The most cynical man of the world, he says, with whatever "sullen incredulity " he may repudiate virtue as a hollow pretence, cannot really refuse his approbation to " discretion, caution, enterprise, industry, frugality, economy, good sense, prudence, discern- ment ;' nor again, to "temperance, sobriety, patience, perse- verance, considerateness, secrecy, order, insinuation, address, Ee ee ee~~

~~} Hume's ethical view was finally stated in his Inquiry into the~~

~~Principles of Morals (1751), which is at Ff. once more popular and more purely utilitarian than his earlier work, i '~~

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~~presence of mind, quickness of conception, facility of expression." It is evident that the merit of these qualities in our eyes is chiefly due to our perception of their tendency to serve the person possessed of them; so that the cynic in praising them is really exhibiting the unselfish sympathy of which he doubts the existence. Hume admits the difficulty that arises, especially in the case of the "artificial" virtues, such as justice, &c., from the undeni- able fact that we praise them and blame~~

~~their opposites without consciously reflecting on useful or pernicious con- sequences ; but considers that this may be explained as an effect of "education and acquired habits."2 :~~

~~So far the moral faculty has been considered as contem- plative rather than active; and this, indeed, is the point of view from which Hume mainly regards it. If we ask what actual motive we have for virtuous conduct, Hume's answer is not quite clear. On the one hand, he speaks of moral approbation as derived from " humanity and bene- volence," while expressly recognizing, after Butler, that there is a strictly disinterested element in our benevolent impulses (as also in hunger, thirst, love of fame, and other passions). On the other hand, he does not seem to think that moral sentiment or "taste" can 'become a motive to action," except as it 'gives pleasure or pain, and thereby constitutes happiness or misery." It is difficult to make these views quite consistent; but at any rate Hume emphatically maintains that "'7eason is no motive to action," except so far as it "directs the impulse received from appetite or inclination;'" and recognizes—in his later treatise at least—no "obligation" to virtue, except that of the ageut's interest or happiness.~~

~~But even if we consider the moral consciousness merely as a particular kind of pleasurable emotion, there is an obvious question suggested by Hume's theory, to which he gives no adequate answer, If the essence of "moral taste" is sympathy with the pleasure of others, connected by trans- ference with the qualities that tend to cause such pleasure, why is not this specific feeling excited by other things beside virtue? On this point Hume contents himself with the vague remark that "there are a numerous set of passions and senti- ments, of which thinking rational beings are by the original constitution of nature the only proper objects." The truth is, that Hume's notion of moral approbation was very loose, as is sufficiently shown by the list of "useful and agree- able" qualities which he considers worthy of approbation.? It is therefore hardly surprising that his theory should leave the specific quality of the moral sentiments a fact still need- ing to be explained. An original and ingenious solution of this problem was offered by his contemporary Adam Smith, in his Theory of Moral Sentiments (1759).~~

~~pathetic pleasure in the perceived or inferred effects of virtues and vices on which Hume laid stress. He does not, however, think that the essential part of common moral sentiment is constituted by this, but rather by a more direct sympathy with the impulses that prompt to action or expression. The spontaneous play of this sympathy he treats as an original and inexplicable fact of human nature, but he considers that its action is powerfully sus- tained by the pleasure that each man finds in the accord~~

~~? Hume remarks that in some cases, by " association of ideas,' the rule by which we praise and blame is extended beyond the principle of utility from which it arises ; but he allows much less scope to this explanation in his second treatise then in his first.~~

~~3 In earlier editions of the Inquiry Hume expressly included all approved qualities under the general notion of "virtue." In later editions he avoided this strain on usage by substituting or adding ""merit" in several passages,—allowing that some of the laudable qualities which he mentions would be more commonly called "talents," but still maintaining that "there is little distinction made in our in- ternal estimation" of " virtues" and " talents."~~

~~Adam Smith Adam does not deny the actuality or importance of that sym- Smith.~~

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~~of his feeling with another's. By means of this primary element, compounded in various ways, Adam Smith ex: plains all the different phenomena of the moral conscious- ness. He takes first the semi-moral notion of " propriety " or "decorum," and endeavours to show inductively that our application of this notion to the social behaviour of another is determined by our degree of sympathy with the feeling expressed in snch behaviour. "To approve of the passions of another as suitable to their objects is the same thing as to sympathize with them." Similarly we disapprove of passion exhibited in a degree to which our sympathy cannot reach ; and even, too, when it falls short; since, as he acutely points out, we often sympathize with the merely imagined~~

~~feelings of others, and are thus disappointed, when we find the reality absent. Thus the prescriptions of good taste in the expression of feeling may be summed up in the principle, "reduce or raise the expression to that with which spectators will byinpathize." When the effort to restrain feeling is exhibited in a degree which surprises as well as pleases, it excites admiration as a virtue or excellence; such excellences Adam Smith quaintly calls the "awful and respectable," contrasting them with the "' amiable virtues" which consist in the opposite effort to sympathize, when exhibited in a remarkable degree. From the sentiments of propriety and admiration we proceed to the sense of merit and demerit. Here a more complex pheno- menon presents itself for analysis; we have to distinguish in the sense of merit—(1) a direct sympathy with the sentiments of the agent, and (2) an indirect sympathy with the gratitude of those who receive the benefit of his actions. In the case of demerit a direct anti- pathy to the feelings of the misdoer takes the place of sympathy; but the chief part of the sentiment excited is sympathy with those injured by the misdeed. The object of this sympathetic resentment, impelling us to punish, is what we call injustice ; and thus the remarkable stringency of the obligation to act justly is explained, since the recog- nition of any action as unjust involves the admission that it may be forcibly obstructed or punished. To the obvious objection that we often approve and disapprove without sympathizing, it is replied that in such cases we correct or supplement present feelings by the general rules derived from' preceding experience of our ordinary sentiments. Similarly the received maxims to which we commonly appeal as recognized standards of judgment are formed by the concurrent and mutually confirmed sympathies of man- kind generally. Moral judgments, then, are expressions of the complex normal sympathy of an impartial spectator with the active impulses that prompt to and result from actions. When, however, such judgments are passed on our own con- duct, a further complication of the fundamental element is required to explain them. What we call our conscience is really sympathy with the feelings of an imaginary impartial spectator looking at our conduct. Such a spectator, it is true, would not have full means for forming a judgment, but these we can supply in imagination ; thus, " praise- worthy" (as distinguished from~~

~~actually praised) conduct may be defined as "that with which an impartial and fully informed spectator would sympathize."~~

~~That the general rules of morality impressed on us by this complicated play of sympathy are "justly to be regarded as the laws of the Deity," Adam Smith takes care to assure us; but it can hardly be said that his theory affords any cogent arguments for this conclusion, or in any way establishes these rules as objectively valid. In the same way Hume insists emphatically on the "reality of moral obligation ;" but is found to mean no more by this than the real existence of the likes and dislikes that human beings feel for each other's qualities. The fact was, that~~

~~amid the observations and analysis of feelings te which the moral sentimentalism of Shaftesbury's school had led, the fundamental ethical questions ' What is right" and " Why?" had been allowed to drop into the back- ground, and the consequent danger to morality was mani- fest. The binding force of moral rules becomes evanes- cent if we admit, with Hutcheson, that the "sense" of them may properly vary from man to man as the palate: does ; and it seems only another way of putting Hume's doctrine, that reason is not concerned with the ends of action, to say that the mere existence of a moral sentiment is in itself no reason for obeying it. A reaction, in one form or another, against the tendency to dissolve ethics into psychology was inevitable; since mankind generally could not be so far absorbed by the interest of psychological hypo- thesis as to forget their need of establishing practical prin- ciples. It was obvious, too, that this reaction might take place in either of the two lines of thought, which, having been peacefully allied in Clarke and Cumberland, had become distinctly opposed to each other in Butler and Hutcheson. It might either fall back on the moral princi- ples commonly accepted, and, affirming their objective validity, endeavour to exhibit them as a coherent and complete set of ultimate ethical truths; or it might take the utility or conduciveness to pleasure, to which Hume had referred for the origin of most sentiments, as an ultimate end and standard by which these sentiments might be judged and corrected. The former is the line~~

~~adopted with substantial agreement by Price, Reid, Stewart, and other members of the still existing Intuitional school ; the latter method, with considerably more divergence of view and treatment, was employed independently and almost simultaneously by Paley and Bentham in both ethics and politics, and is at the present time widely maintained under the name of Utilitarianism.~~

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~~Price's Review of the Chief Questions and Difficulties of Price.~~

~~Morals was published in 1757, two years before Adam Smith's treatise. In regarding moral ideas as derived from the "intuition of truth or immediate discernment of the nature of things by the understanding," Price re- vives the general view of the earlier school of rational moralists; but with several specific differences which it is imiportant to notice. Firstly, his conception of "right" and "wrong" as "single ideas" incapable of definition or analysis—the notions "right," " fit," " ought," * duty," "obligation," being coincident or identical—at least avoids the confusions into which Clarke and Wollaston had been led by pressing the analogy between ethical and physical truth. Secondly, the emotional element of the moral consciousness, on which attention had been' con- centrated by Shaftesbury and his followers, is henceforth~~

~~distinctly recognized as accompanying the intellectual intui- ~~

~~tion, though it is carefully subordinated to it. While right and wrong, in Price's view, are "real objective qualities" of actions, moral " beauty and deformity" are subjective ideas; representing feelings which are partly the necessary effects of the perceptions of right and wrong in rational beings as such, partly due to an "implanted sense" or varying emotional susceptibility. Thus, both reason and sense or instinct co-operate in the impulse to virtuous conduct, though the rational element is primary and paramount. Price further distinguishes the perception of merit and demerit in agents as another accompaniment of the perception of right and wrong in actions; the former being, however, only a peculiar species of the latter, since, to perceive merit in any ove is to perceive that it is right to reward him. It is to be observed that both~~

~~Price and Reid are careful to state that the merit of the agent depends entirely on the intention or 'formal rightness" of his act ; aman is not blameworthy for unintended evil, though he~~

~~may of course be blamed for any wilful neglect which has caused him to be ignorant of his real duty. When we turn to the subject matter of virtue, we find that Price, in comparison with More or Clarke, is decidedly laxer in accepting and stating his ethical first principles ; chiefly because he (like Reid and Stewart afterwards) appeals tocom- mon sense rather than abstract reason as the judge of moral evidence. Thushemaintains with Butler that gratitude, vera- city, fulfilment of promises, and justice are obligatory inde- pendently of their conduciveness to happiness ; but he does not exactly exhibit the self-evidence of the abstract proposi- tion "that truth ought to be spoken;" he rather argues, by an inductive reference to common moral opinion, that "we cannot avoid pronouncing that there is an intrinsic rectitude in sincerity." Similarly in expounding justice,— "that part of virtue which regards property,""—he seems prepared to accept en bloc as ultimate the traditional principles of Roman jurisprudence, which refer the right of property to " first possession, labour, successiou, and dona- tion." We must bear in mind that Price's task is consider- ably more difficult than that of the earlier rational moralists ; owing to the new antithesis to the view of Shaftesbury and Hutcheson by which his controversial position is compli- cated, so that he is specially concerned to show the existence of ultimate principles besides benevolence. Not that he repudiates the obligation either of rational benevolence or self-love ; on the contrary, he takes more pains than Butler to demonstrate the reasonableness of either principle. "There is not anything," he says, "of which we have more undeniably an intuitive perception, than that it is 'right to pursue and promote happiness,' whether for ourselves or for others," Finally, Price, writing after the demonstration by Shaftesbury and Butler of the actuality of disinterested im- pulses in human nature, is bolder and clearer than Cudworth or Clarke in~~

~~insisting that right actions are to be chosen because they are right by virtuous agents as such,—even going so far as to lay down that an act loses its moral worth in proportion as it is done from natural inclination.~~

~~On this latter point Reid, in his Mssays on the Active Powers of the Human Mind (1788), adopts a more moderate and less Stoical conclusion, only maintaining that " no act can be morally good in which regard for what is right has not some influence." This is partly due to the fact that Reid builds more distinctly than Price on the foundation laid by Butler; especially in his acceptance of that duality of govern- ing principles which we have noticed as a cardinal point in the latter's doctrine. Reid considers "regard for one's good on the whole" (Butler's self-love) and " sense of duty " (Butler's conscience) as two essentially distinct and co- ordinate rational principles, though naturally often compre- hended under the one term, Reason. The rationality of the former principle he takes pains to explain and establish ; in opposition to Hume's doctrine that it is no part of the function of reason to determine the ends which we ought to pursue, or the preference due to one end over another. He urges that the notion of " good! on the whole" is one which only a reasoning being can form, involving as it does abstraction from the objects of all particular desires, and comparison of past and future with present feelings ; and maintaius that it is a contradiction to suppose a rational being to have the notion of its Good on the Whole without a desire for it, and that such a desire must naturally regu- late all particular appetites and passions. It cannot reason- ably be subordinated even to the moral faculty; in fact,~~

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~~a man who doubts the coincidence of the two—which on religious grounds we must believe to be complete ina morally governed world—is reduced to the " miserable dilemma whether it is better to be a fool or a knave." As regards the moral faculty itself, Reid's statement coincides in the main with Price's ; it is both intellectual and active, not merely perceiving the "rightness" or "moral obligation" of actions~~

~~(which Reid conceives as a simple unanalysable relation between act and agent), but also impelling the will to the performance of what is seen to be right. Both thinkers hold that this perception of right and wrong in actions is accompanied by a perception of merit and demerit in agents, and also by a specific emotion; but whereas Price conceives this emotion chiefly as pleasure or pain, analogous to that produced in the mind by physical beauty or deformity, Reid regards it chiefly as beuevolent affection, esteem, and sympathy (or their opposites), for the virtuous (or vicious) agent. This "pleasurable good-will," when the moral judgment relates to a man's own actions, becomes " the testimony of a good conscience—the purest and most valuable of all human enjoyments." Reid is careful to observe that this moral faculty is not "innate " except in germ ; it stands in need of "education, training, exercise (fer which society is indispensable), and habit," in order to the attainment of moral truth. He does not with Price object to its being called the " moral sense," provided we understand by this a source not merely of feelings or notions, but of "ultimate truths." Here he omits to notice the important question whether the premises of moral rea- soning are universal or individual judgments; as to which the use of the term "sense" seems rather to suggest the second alternative. Indeed, he seems himself quite unde- cided on this question; since, though he generally represents ethical method as deductive, he also speaks of the " origi- nal judgment that this action is right and that wrong."~~

~~The truth is that, since Reid accepts the common moral opinion of maukind as a final test of the truth of ethical theories, the construction of a scientific method of ethics is a matter of no practical moment tohim. 'Thus, though he offers a list of first principles, by deduction from which these common opinions may be confirmed, he does not pre- sent it with any claim to completeness. Besides maxims relating to virtue in general,—such as (1) that there is a right and wrong in conduct, but (2) only in voluntary con- duct, and that we ought (3) to take paius to learn our duty, and (4) fortify ourselves against temptations to deviate from it—Reid states five fundamental axioms. The first of these is merely the principle of rational self-love, " that we ought to prefer a greater to a lesser good, though more distinct, and a~~

less evil to a greater,”—the mention of which seems rather inconsistent with Reid’s distinct separa- tion of the “moral faculty” from “ self-love.” The third is merely the general rulcof benevolence statedin the somewhat vague and lax Stoical phrase, that “no one is born for him-self only.” The fourth, again, is the merely formal prin- ciple that “ right and wrong must be the same to all in all circumstances,” which belongs equally to all systems of objective morality ; while the fifth prescribes the religious duty of “veneration or submission to God.” Thus, the only principle which might not be equally well stated by Paley or any religious utilitarian is the second (also Stoical), ‘that so far as the intention of nature appears in the con- stitution of man, we ought to act according to that inten- tion,” the vagueness? of which is obvious.

A similar incompleteness in the statement of moral Dugald » It is to be observed that whereas Price and Stewart (after Butler) principles is found if we turn to Reid’s disciple, Dugald Stewart. identify the object of self-love with happiness or pleasure, Reid conceives this “ good” more vaguely as including perfection and happiness; though he sometimes uses “ good” and happiness as convertible terms,

and seems practically to have the latter in view in all that he says of self-love.

2 E.g., Reid proposes to apply this principle in favour of monogamy, arguing from the proportion of males and females born; without explaining why, if the intention of nature hence inferred excludes occasional polygamy, it does not also exclude occasional celibacy.

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Stewart, whose Phelosophy of the Active and Moral Powers of Man(1828) contains the general view of Reid and Price,—

tal axioms or intuitively known premises of moral reasoning. Intui- And if the controversy which this school has conducted with tional

~~Whewell.~~

~~expounded with more neatness and grace, but without important original additions or modifications. Stewart Jays stress on the obligation of justice as distinct from benevolence ; but his definition of justice represents it as essentially impartiality,—a virtue which (as was just now said of Reid's fourth principle) must equally find a place in the utilitarian or any other system that lays down uni- versally applicable rules of morality. Afterwards, how- ever, Stewart distinguishes "integrity or honesty" as a branch of justice concerned with the rights of other men, which form the subject of "natural jurisprudence." In this department he lays down the moral axiom " that the labourer is entitled to the fruit of his own labour" as the principle on which complete rights of property are founded ; maintaining that occupancy alone would only confer a transient right of possession during use. The only other principles which he discusses are veracity and fidelity to promises, gratitude being treated as a natural instinct prompting to a particular kind of just actions.~~

~~It will be seen that neither Reid nor Stewart offers more than a very meagre and tentative contribution to that ethical science by which, as they maintain, the received rules of morality may be rationally deduced from intuitive first principles. A more ambitious attempt in the same direction was made by Whewellj in his Elements of Morality (1846). Whewell's general moral view differs from that of his Scotch predecessors chiefly in a point where we may trace the influence of Kant; viz., in his rejection of self-love as an independent rational and govern. ing principle, and his consequent refusal to admit happiness, apart from duty, as a reasonable end for the individual. The moral reason, thus left in sole supremacy, is represented as enunciating five ultimate principles,—those of benevo- lence, justice, truth, purity, and order. With a little strain- ing these are made to correspond to five chief divisions of Jus,—personal security (benevolence being opposed to the ill-will that commonly causes personal injuries), property, contract, marriage, and government ; while the first, second, and fourth, again, regulate respectively the three chief classes of human motives,—affections, mental desires, and appetites. Thus the list, with the addition~~

~~of two general principles, "' earnestness" and "moral purpose," has a certain air of systematic completeness. When, however, we look closer, we find that the principle of order, or obedience to government, is not seriously intended to imply the political absolutism which it seems to express, and which English common sense emphatically repudiates ; while the formula of justice is given in the tautological or perfectly indefinite proposition "that every man ought to have his own." Whewell, indeed, explains that this latter formula must be practically interpreted by positive law, though he inconsist- ently speaks as if it supplied a standard for judging laws to be right or wrong. The principle of purity, again, "' that the lower parts of our nature ought to be subject to the higher," merely particularizes that supremacy of reason over non-rational impulses which is involved in the very notion of reasoned morality. Thus, in short, if we ask for a clear and definite fundamental intuition, distinct from re- gard for happiness, we find really nothing in Whewell's doctrine except the single rule of veracity (including fidelity to promises) ; and even of this the axiomatic character be- comes evanescent on closer inspection, since it is not main- tained that the rule is practically unqualified, but only that it is practically undesirable to formulate its qualifications.~~

~~On the whole, it must be admitted that the doctrine of the intuitional school of the present and preceding century has been developed with less care and consistency than might have been expected, in its statement of the fundamen-~~

~~utilitarianism had turned principally on the determination of the matter of duty, there can be little doubt that it would have been forced into more serious and systematic effort to define precisely and completely the principles and method on which we are to reason deductively to particular rules of conduct.! But in fact the difference between in- tuitionists and utilitarians as to the method of determining the particulars of the moral code was complicated with a more fundamental disagreement as to the very meaning of 'moral obligation." This Paley and Bentham (after Locke) interpreted as merely the effect on the will of the pleasures or pains attached to the observance or violation of moral rules, combining with this the doctrine~~

~~of Cumberland or Hutcheson, that "general good" or " happiness" is the final end and standard of these rules ; while they eliminated all vagueness from the notion of general happiness by defining it to consist in "excess of pleasure over pain "— pleasures and pains being regarded as " differing in nothing but continuance or intensity." The utilitarian system gained an attractive air of simplicity by thus using a single perfectly clear notion—pleasure and its negative quantity pain—to answer both the fundamental questions of morals, "' What is right?" and " Why should I do it?" But since~~

~~there is no logical connexion between the answers that have.~~

~~thus come to be considered as one doctrine, this apparent unity and simplicity has really hidden fundamental disa- greements, and caused no little confusion in current ethical debate.~~

~~In Paley's Principles of Moral and Political Philosophy?~~

~~1 We may observe that some recent writers, who would generally be included in this school, avoid in various ways the difficulty of construct- ing a code of external conduct. Sometimes they consider moral intui- tion as determining the comparative excellence of conflicting motives~~

~~(James Martineau), or the comparative quality of pleasures chosen~~

~~(Laurie), which seems to be the same view in a hedonistic garb; others hold that what is intuitively perceived is the rightness or wrongness of individual acts,—a view which obviously renders ethical reasoning prac- tically superfluous.~~

~~® The originality—such as it is—of Paley's system (as of Bentham's) lies in its method of working out details rather than in its principles of construction. original and suggestive, though diffuse and whimsical, work of Abraham Tucker (Light of Nature Pursued, 1768-74). In this treatise, as in Paley's, we tind "every man's own satisfaction, the spring that actuates all his motives," connected with "general good, the root whereout all our rules of conduct and sentiments of honour are to~~

~~branch," by means of natural theology demonstrating the " unniggardly goodness of the author of nature."" Tucker is also careful to explain that satisfaction or pleasure is " one and the same in kind, however much it may vary in degree, . . . whethera man is pleased with hearing music, seeing)Tospects, tasting dainties, performing laudable actions, or making agreeable reflections," and again that by "general good" he means * quantity of happiness," to which "every pleasure that we do to our neighbour is an addition." There is, however, in Tucker's theological link between private and general happiness a peculiar ingenuity which Paley's common sense has avoided. He argues that men having no free will have really no desert; therefore the divine equity must ultimately distribute happiness in equal shares to all ; therefore I must ultimately increase my own happiness most by conduct that adds most to the general fund which Providence administers.~~

~~But in fact the outline of Paley's utilitarianism is to be found a generation earlier,—in Gay's dissertation prefixed to Law's edition of King's Origin of Evil,—as the following extracts will show :—" The idea of virtue is the conformity to a rule of life, directing the actions of all rational creatures with respect to each other's happiness ; to which every one is always obliged …. Obligation is the necessity of doing or omitting something in order to be happy… . Full and complete obligation which will extend to all cases can only be that arising from the authority of God. . . . The will of God [so far as it directs behaviour to others] is the immediate rule or criterion of virtue .. . but it is evident from the nature of God that he could have no other design in creating mankind than their happiness ; and therefore he wills their happiness ; therefore that my behaviour so far as it may be a means to the happiness of mankind should be such ; so this happi- ness of mankind may be said to be the criterion of virtue once removed,'*~~

~~The same dissertation also contains the germ of Hartley's system, as we shall presently notice.~~

~~Paley expressly acknowledges his obligations to the.~~

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~~Paley.~~

~~Bentham and his school.~~

~~(1785), the link between general pleasure (the standard) and private pleasure or pain (the motive) is supplied by the conception of divine legislation. To be "obliged " is to be " urged by a violent motive resulting from the com- mand of another ;" in the case of moral obligation, the com- mand proceeds from God, and the motive lies in the expec- tation of being rewarded and punished after this life. The commands of God are to be ascertained "from scripture and the light of nature combined." Paley, however, holds that scripture is given less to teach morality than to illustrate it by example and enforce it by new sanctions and greater certainty, and that the light of nature makes it clear that God wills the happiness of his creatures. Hence, his method in deciding moral questions is chiefly that of esti- mating the tendency of actions to promote or diminish the general happiness. To meet the obvious objections to this method, based on the immediate happiness caused by admitted crimes (such as " knocking a rich villain on the head"), he lays stress on the necessity of general rules in any kind of legislation ;! while, by urging the importance of forming and maintaining good habits, he partly evades the difficulty of calculating the consequences of particular actions. In this way the utilitarian method is freed from the subversive tendencies which Butler and others had dis- cerned in it; as used by Paley, it merely explains the current moral and jural distinctions, exhibits the obvious basis of expediency which supports most of the received rules of law and morality, and furnishes a simple solution, in harmony with common sense, of some perplexing casuistical questions. Thus (e.g.) "natural rights" become rights of which the general observance would be useful apart from the~~

~~institution of civil government ; as distinguished from the no less binding "adventitious rights," the utility of which depends upon this institution. Private property is in this sense "natural," from its obvious advantages in encouraging labour, skill, preservative care ; though actual rights of property depend on the general utility of con- forming to the law of the land by which they are deter- mined. So, again, many perplexities respecting the duties of veracity and good faith are solved, so as to avoid jesuitical laxities no less than superstitious scruples, by basing their obligation on the utilities general and particular of satisfying expectations deliberately produced. So, too, the general utilitarian basis of the 'established sexual morality is effectively expounded. We observe, however, that Paley's method is often mixed with reasonings that belong to an alien and older manner of thought ; as when he supports the claim of the poor to charity by referring to the intention of mankind " when they agreed to a separa- tion of the common fund," or when he infers that monogamy is a part of the divine design from the equal numbers of males and females born. In other cases his statement of utilitarian considerations is fragmentary and unmethodical, and tends to degenerate into loose exhortation on rather trite topics.~~

~~In unity, consistency, and thoroughness of method, Bentham's utilitarianism has a decided superiority over Paley's. He throughout considers actions solely in respect of their pleasurable and painful consequences, expected or actual; and he fully recognizes the need of making an exhaustive and systematic register of these consequences, free from the influences of common moral opinion, as expressed in the "eulogistic" and '"dyslogistic" terms in ordinary use. Further, the effects that he estimates are all of a definite, palpable, empirically ascertainable quality ; they are such pleasures and pains as most men feel and all~~

~~1 It must be allowed that Paley's application of this argument is somewhat loosely reasoned, and does not sufficiently distinguish the consequences of a single act of beneficent manslaughter from, the consequences of a general permission to commit such acts. ;~~

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~~can observe to be felt, so that all political or moral infer- ences drawn by Bentham's method lie open at every point to the test of practical experience. Every one, it would seem, can tell what value he sets on the pleasures of ali- mentation, sex, the senses generally, wealth, power, curiosity, sympathy, antipathy (malevolence), the goodwill of individuals or of society at large, and on the correspond- ing pains, as well as the pains of labour and organic disorders ;? and can pretty well guess the rate at which they are valued by others ; therefore if it be once granted that all actions are determined by pleasures and pains, and are to be tried by the same standard, the art both of legislation and of private conduct is apparently placed on a broad, simple, and clear empirical basis. Bentham, no doubt, seems to go beyond the limits of mundane experi- ence in recognizing "religious" pains and pleasures in his fourfold division of sanctions, side by side with the "¢ physical," " political," and "moral" or "social ;" but the truth is that he does not seriously take account of them, except in so fur as religious hopes and fears are motives actually operating, which therefore admit of being observed and ineasured as much as any other motives. He does not himself use the will of an omnipotent and benevolent being as a means of logically connecting individual and general happiness. He thus undoubtedly simplifies his system, and avoids the doubtful inferences from nature and Scripture in which Paley's position is involved; but this – gain is dearly purchased. For in answer to the question that immediately arises, How then is the maximum happiness of any individual shown to be always conjoined with the maximum general happiness, he is obliged to admit that "the only interests which a man is at all times sure to find adequate motives for consulting are his own." Indeed, in many parts of his vast work, in the department of legislative and constitutional theory, it is rather assumed that the interests of some men will continually conflict with those of their fellows, unless we alter the balance of prudential calculation by a careful readjustment of penal- ties. But on this assumption a satisfactory system of private conduct on utilitarian principles cannot be con- structed until legislative and constitutional reform has been perfected. And, in fact, " private ethics," as conceived by Bentham, does not exactly expound~~

~~such a system; but rather exhibits the coincidence, so far as tt extends, between private and general happiness, in that part of each man's conduct that lies beyond the range of useful legislation. It was not his place, as a practical philanthropist, to dwell on the defects in this coincidence ;3 and since what men generally expect from a moralist is a completely reasoned account of what they ought to do, itis not surprising that some of Bentham's disciples should have either ignored or endeavoured to supply the gap in his system. One section of the school even maintained it to be a cardinal doctrine of utilitarianism that a man always gains his own greatest happiness by promoting that of others ; another section, represented by John Austin, apparently returned to Paley's position, and treated utilitarian muorality* as a code of divine legislation; others, with Grote, are content to abate the severity of the claims made by~~

~~2 This list gives twelve out of the fourteen classes in which Bentham~~

~~arranges the springs of action, omitting the religious sanction (inen~~

~~tioned afterwards), and the pleasures and pains of self-interest, which include all the other classes except sympathy and antipathy.~~

~~3 In the Deontology published by Bowring from MSS. left after Bentham's death, the coincidence is asserted to be complete; but it seems doubtful whether this can be accepted as Bentham's real doctrine, even in his later days.~~

~~4 It should be observed that Austin, after Bentham, more frequently uses the term " moral " to connote what he more distinctly calls " positive morality," the code of rules supported by common opinion in any society.~~

~~Varieties of utili- tarian doctrine.~~

~~J.S. Mill.~~

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~~“general happiness ” on the individual, and to consider utilitarian duty as practically limited by reciprocity ; while J.S. Mill, who has done more than any other member of the school to spread and popularize utilitarianism in ethics and politics, exalts the “ moral hero” for voluntarily sacri- ficing his own happiness to promote that of others—a phe- nomeuon, it should be observed, which iu Bentham’s view is not even possible.~~

~~The fact is that there are several different ways in which a utilitarian system of morality may be used, without de- ciding whether the sanctions attached to it are always adequate. (1) It may be presented as practical guidance to all who choose “ general good” as their ultimate end, whether they do so on religious grounds, or throngh the predominance in their minds of impartial sympathy, or because their conscience acts in harmony with utilitarian principles, or for any combination of these or any other reasons ; or (2) it may be offered as a code to be obeyed not absolutely, but only so far as the coincidence of private and general interest may in any case be judged to extend; or again (3) it may be proposed as a standard by which men my reasonably agree to praise and blame the conduct of others, even though they: may not always think fit to act on it. We may regard morality asa kind of supplementary legislation, supported by public opinion, which we may expect the public, when duly enlightened, to frame in accordance with the public interest. Still, even from this point of view, which is that of the legislator or social re- former rather than the moral philosopher, our code of duty must be greatly influenced by our estimate of the degrees in which men are normally influenced by self-regard (in its ordinary sense of regard for interests not sympa- thetic) and by sympathy or benevolence, and of the range within which sympathy may be expected to be gene- rally effective. Thus, for example, the moral standard for which a utilitarian will reasonably endeavour to gain the support of public opinion must be essentially different in quality, according as he holds with Bentham that nothing but self-regard will “serve for diet,” though “for a dessert benevolence is a very valuable addition ;” or with J. S. Mill that disinterested public spirit should be the prominent motive in the performance of all socially useful work, and that even hygienic precepts should be inculcated, not~~

~~chiefly on grounds of prudence, but because " by squandering our health we disable ourselves from rendering services to our fellow-creatures."~~

~~Not less important is the interval that separates Ben tham's polemical attitude towards the moral sense from Mill's conciliatory position, that "the mind is not ina state conformable to utility unless it loves virtue as a thing desirable in itself." Such love of virtue Mill holds to be in a sense natural, though not an ultimate and inexplicable fact of human nature; it is to be explained by the "Law of Association" of feelings and ideas, through which objects originally desired as a means to some further end come to be directly pleasant or desir- able. Thus, the miser first sought money as a means to comfort, but ends by sacrificing comfort to money; and similarly though the first promptings to justice (or any other virtue) spring from the non-moral pleasures gained or pains avoided by it, through the link formed by repeated virtuous acts the performance of them ultimately comes to have that immediate satisfaction attached to it which we distinguish as moral. Indeed, the acquired teudency to virtuous conduct may become so strong that the habit of willing it may continue, "'even wlhien the reward which the virtuous man receives from the conscious- ness of well-doing is anything but an equivalent for the sufferings he undergoes or the wishes he may have to renounce." It is thus that the before-mentioned self-sacri-~~

~~fice of the moral hero is conceived by Mill to be possible and actual. The moral sentiments, on this view, are not phases of self-love as Hobbes held ; nor can they be directly identified with sympathy, either in Hume's way or in Adam Smith's ; in fact, though apparently simple they are really derived in a complex manner from self-love aud sympathy conibined with more primitive impulses. Justice (¢.g.) is regarded by Mill as essentially resentment moralized by enlarged sympathy and intelligent self-interest ; what we mean by injustice is harm done to an assignable individual by a breach of some rule for which we desire the violator to be punished, for the sake both of the~~

~~person injured and of society at large, including ourselves. As regards moral sentiments generally, the view suggested by Mill is more definitely given by the chief living representative of the associationist school, Professor Bain ; by whom the dis- tinctive characteristics of conscience are traced to " educa- tion under government or authority," though prudence, disinterested sympathy, and other emotions combine to~~

~~'swell the mass of feeling vaguely denoted by the term~~

~~moral, Tlie combination of antecedents is somewhat differently given by different writers; but all agree in representing the conscience of any individual as naturally correlated to the interests of the community of which he is a member, and thus a natural ally in enforcing utili- tarian rules, or even a valuable guide when utilitarian calculations are difficult and uncertain.~~

~~This substitution of hypothetical history for direct Associa-~~

~~analysis of the moral sense is really older than the utili- tariauisin of Paley and Bentham, which it has so profoundly modified. The effects of association in modifying mental phenomena were noticed by Locke, and made a cardinal point in the metaphysic of Hume; who also referred to the principle slightly in his account of justice and other "' artificial" virtues. Some years earlier, Gay,! admitting Hutcheson's proof of the actual disinterestedness of moral aud benevolent impulses, had maintained that these (like the desires of knowledge or fame, the delight of reading, hunting, and planting, &c.) were derived from self-love by "the power of association." But a thorough and syste- matic application of the principle to ethical psychology is first found in Hartley's Observations on Man (1748). Hartley, too, was the first to conceive association as pro- ducing, instead of mere cohesion of mental phenomena, a quasi-chemical combination of these into a compound apparently different from its elements. He shows elabo- rately how the pleasures and pains of "imagination, ambition, self-interest, sympathy, theopathy, and the moral sense " are developed out of the elementary pleasures and pains of sensation ; by the coalescence into really complex but apparently single ideas of the '" miniatures " or faint~~

feelings which the repetition of sensations contémporaneously or in immediate succession tends to produce in cohering groups. His theory assumes the correspondence of mind and body, and is applied part passu to the formation of ideas from sensations, and of ‘ compound vibratiuncules in the medullary substance ” from the original vibrations that arise in the organ of sense.? The same general view was afterwards developed on the psychical side alone by James Mill in his Analysis of the Human Mind, with much vigour and clearness. The whole theory has been

‘In the before-mentioned dissertation. Cf. note 2 to p. 605. Hartley refers to this treatise as having supplied the starting-point for his own system.

? It should be noticed that Hartley’s sensationalism is far from leading him to exalt the corporeal pleasures. On the contrary, he tries to prove elaborately that they (as well as the pleasures of imagination, ambition, self-interest) cannot be made an object of primary pursuit without a loss of happiness on the whole,—one of his arguinents being that these pleasures occur earlier in time, and ‘that which is prior in the order of nature is always less perfect than that which is posterior,”

persistently controverted by writers of the intuitional school, who (unlike Hartley) have usually thought that this derivation of moral sentiments from more primitive feelings would be detrimental to the authority of the former. The chief argument against this theory has been based on the early period at which these sentiments are manifested by children, which hardly allows time for association to produce the effects ascribed to it. This argument has been met in recent times by the application to mind of the physiological theory of heredity, according to which changes produced in the mind (brain) of a parent, by association of ideas or otherwise, tend to be inherited by his offspring ; so that the development of the moral sense or any other faculty or susceptibility of existing man may be hypothetically carried

~~back into the prehisturic life of tle human race, without any change in the manner of derivation supposed. At present, however, the theory of heredity is usually held in conjunction with Darwin's theory of natural selection ; according to which different kinds of living things in the course of aseries of generations come gradually to be endowed with organs, faculties, and habits tending to the preservation of the individual or species under the condi- tions of life in which it is placed. Thus we have a new zoological factor in the history of the moral sentiments ; which, though in no way opposed to the older psychological theory of their formation through coalescence of more primitive feelings, must yet be conceived as controlling and modifying the effects of the law of association by: pre- venting the formation of sentiments other than those tending to the preservation of human life. The influence of the Darwinian theory, moreover, has extended from historical psychology to ethics, tending to substitute '" pre- servation of the race under its conditions of existence " for "happiness" as the ultimate end and standard of virtue.~~

~~Before concluding this sketch of the development of English ethical thought from Hobbes to the present time, it will be well to notice briefly the views held by different moralists on the question of free-will,—so far, that is, as they have been put forward as ethically important. We must first distinguish three meanings in which " freedom " is attributed to the will or "inner self" of a human being, viz., (1) the general power of choosing among different alternatives of action without a motive, or against the resultant force of conflicting motives; (2) the power of choice between the promptings of reason and those of appetites (or other nou-rational impulses) when the latter conflict with reason; (3) merely the quality of acting rationally in spite of conflicting impulses, however strong, the non posse peccare of the medieval theologians.! It is ob- vious that " freedom " in this third sense is in no way incom- patible with complete determination ; and, indeed, is rather an ideal state after which the moral agent ought to aspire than a property which the human will can be said to possess. In the first sense, again, as distinct from the second, the assertion of " freedom" has no ethical signifi- cance, except in so far as it introduces a general uncertainty into all our inferences respecting human conduct. Even in the second~~

~~sense it hardly seems that the freedom of a man's will can be an element to be considered in examining what it is right or best for him to do (though of course the clearest convictions of duty will be fruitless if a man has not sufficient self-control to enable him to act on them); it is rather when we ask whether it is just to punish him for wrong doing that it seems important to know whether he could have done otherwise. But in spite of the strong interest taken in the theological aspect of~~

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~~this question by the Protestant divines of the 17th century, it does not appear that English imoralists from Hobbes to Huime laid any stress on the relation of free- will either to duty generally or to justice in particular. Neither the doctrine of Hobbes, that deliberation is a mere alternation of competing desires, voluntary action imme- diately following the "last appetite," nor the hardly less decided Determinism of Locke, who held that the will is always moved by the greatest present uneasiness, appeared to either author to require any reconciliation with the belief in human responsibility. Even in Clarke's system, where Indeterminism is no doubt a cardinal notion, its importance is metaphysical rather than ethical; Clarke's view being that the apparently arbitrary particularity in the constitution of the cosmos is really only explicable by reference to creative free-will. In the ethical discussion of Shaftesbury and sentimental moralists generally this question drops naturally out of sight; and the cautious Butler tries to exclude its perplexities as far as possible fromthe philosophy of practice. But since the reaction, led by Price and Reid, against the manner of philosophiz- ingthat had culminated in Hume, free-will has been generally maintained by the intuitional school to be an essential point of ethics ; and, in fact, it is naturally connected with the judgment of good and ill desert which these writers give as an essential element in their analysis of tle moral consciousness. An irresistible motive, it is forcibly said, palliates or takes away guilt ; no one can blame himself for yielding to necessity, and no one can properly be punished for what he could not have prevented. In answer to this argument some necessarians have admitted that punish- ment can only be legitimate if it be beneficial to the person punished; others, again, liave held that the~~

~~law- ful use of force is to restrain lawless force ; but most of those who reject free-will defend punishment on the ground of its utility in deterring others from crime, as well as in correcting or restraining the criminal on whom it falls.~~

~~In the preceding sketch we have traced the course of French English ethical speculation without bringing it into relation influence~~

~~with contemporary European thought on the same subject.~~

~~And in fact almost all the systems described, from Hobbes cinics.~~

~~downward, have been of essentially native growth, showing hardly any traces of foreign influence. We may observe that ethics is the only department in which this result ap- pears. The physics and psychology of Descartes were much studied in England, and his metaphysical system was certainly the most important antecedent of Locke's ; but Descartes hardly touched ethics proper. So again the con- troversy that Clarke conducted with Spinoza, and afterwards with Leibnitz, was entirely confined to the metaphysical region. Catholic Frauce was a school for Englishmen in many subjects, but not in morality; the great struggle between Jansenists and Jesuits had a very remote interest for us. It was not till near the close of the 18th century that the impress of the French revolutionary philosophy begins to manifest itself on this side the channel; and even then its influence is mostly political rather than ethical. It is striking to observe how even in the case of writers such as Godwin, who were most powerfully affected by the French political movenient, the moral basis, on which the new social order of rational and equal freedom is constructed, is almost entirely of native origin ; even when the tone and spirit are French, the forms of thought and manner of reasoning are still purely English. In the derivation of Beuthamism alone—which, it may be observed, first become widely known in the French paraphrase of Dumont—an important element: is supplied by the works of a French~~

~~writer, Helvetius ; «as Bentham himself was fully conscious. Helve-~~

~~7 It may be observed that in the view of Kant and others (2) and : : 5 It was from Helvetius that he learnt that, men being +s.~~

~~(3) are somewhat confusingly blended.~~

~~Price~~

~~universally and solely governed py self-love, the so-called moral judgments are really the common judgments of any society as to its common interests; that it is therefore futile on the one hand to propose any standard of virtue, except that of conduciveness to general happiness, and on the other hand useless merely to lecture men on duty and scold them for vice; that the moralist's proper function is rather to exhibit the coincidence of virtue with private happiness; that, accordingly, though nature has bound men's interests together in many ways, and education by developing sym- pathy and the habit of mutual help may much extend the connexion, still the most effective moralist is the legislator, who by acting on self-love through legal sanctions may mould human conduct as he chooses. 'These few simple doctrines give the ground plan of Bentham's indefatigable and life-long labours.~~

~~So again, in the modified Benthamism which the per- suasive exposition of J. 8. Mill recently made popular in~~

~~609~~

~~and countries, without regard to their specific differences. But in the Comtian conception of social science, of which ethics and politics are the practical application, the know- ledge of the laws of the evolution of society is of funda- mental and continually increasing importance ; humanity is regarded as having passed through a series of stages, in each of which a somewhat different set of laws and institu- tions, customs and habits, is normal and appropriate. Thus present man is a being that can only be understood through a knowledge of his past history ; and any effort to construct for him a moral and political ideal, by a purely abstract aud unhistorical method, must be necessarily futile ; whatever modifications may at any time be desirable in positive law and morality can only be determined by the aid of "social dynamics."~~

~~This view extends far beyond the limits of Comte's special school or sect, and, indeed, seems to be very widely accepted among educated persons at the present day.~~

~~When we turn from French philosophy to German, we German: find the influence of the latter on English ethical thought influence almost insignificant untila very recent period. In the 17th ™ Evs- century, indeed, the treatise of Puffendorf on the Law of |~~

~~England, the influence of a French thinker, Auguste Comte (Philosophie Positive, 1829-42, and Systéme de Politique Positive, 1851-4) appears as the chief modifying element. This influence, so far as it las affected moral as distinct~~

~~Comte.~~

~~ethics.~~

~~from political speculation, has been exercised primarily through the general conception of human progress ; which, in Comite's view, consists in the ever-growing preponderance of the distinctively human attributes over the purely animal, social feelings being ranked highest among human attri- butes, and highest of all the most universalized phase of human affection, the devotion to humanity as a whole. Accordingly, it is the development of benevolence in man, and of the habit of " living for others," which Comte takes as the ultimate aim aud standard of practice, rather than the mere increase of happiness. He holds, indeed, that the two are inseparable, and that the more altrwisticany man's sentiments and habits of action can be made, the greater will be the happiness enjoyed by himself as well as by others. But he does not seriously trouble himself to argue with egoism, or to weigh carefully the amount of happiness that might be generally attained by the satisfaction of egoistic propensities duly regulated ; asupreme unquestion- ing self-devotion, in which all personal calculations are sup- pressed, is an essential feature of his moral ideal. Such a view is almost diametrically opposed to Bentham's concep- tion of normal human existence; the newer utilitarianism of Mill represents an endeavour to find the right middle path between the two extremes.~~

~~It is to be observed that, in Comte's view, devotion to humanity is the principle not merely of morality but of religion; 2e¢, it should not merely be practically pre- dominant, but should be manifested and sustained by regular and partly symbolical forms of expression, private and public. This side of Comte's system, however, and the details of his ideal reconstruction of society, in which this religion plays an important part, have had but little influence either in England or elsewhere. It is more im- portant to notice the general effect of his philosophy on the method of determining the particulars of morality as well as of law (as it ought to be). In the utilitarianism of Paley and Bentham the proper rules of conduct, moral and legal, are determined by comparing the imaginary con- sequences of different modes of regulation on men and women, conceived as specimens of a substantially uniform and unchanging type. It*is true that Bentham expressly recognizes the varying influences of climate, race, religion, government, as considerations which it is important for the legislator to take into account; but his own work of social construction was almost entirely independent of such considerations, and his school generally appear to have been convinced of their competence to solve all important ethical and political questions for human beings of all ages~~

*

~~Nature, in which the general view of Grotius was restated with modifications, partly designed to effect a com- promise with the new doctrine of Hobbes, seems to have been a good deal read at Oxford and elsewhere. Locke includes it among the books necessary to the complete education of a gentleman. But the subsequent develop- ment of the theory of conduct in Germany dropyed almost entirely out of the cognizance of Englishmen; even the long dominant system of Wolff (d. 1754), imposing in its elaborate and complete construction, was hardly known to our best informed writers. Nor did the greater fame and more commanding genius of Kant (1724-1804) procure him any English disciples of note, or even lead to the serious study of his ethical system by English moralists, until the second quarter of the present century. We find, however, distinct traces of Kantian inflvence in Whewell and other recent writers of the intuitional school; and the continually increasing in- terest in the products of the German mind which English- men have shown during the last 40 years has caused the works of Kant to be so widely known that it would hardly be fit to close the present article without some account of his ethical doctrines.~~

~~The English moralist with whom Kant has most affinity Kant.~~

~~is Price ; in fact, Kantism, in the ethical thought of modern Europe, holds a place somewhat analogous to that occupied by the teaching of Price and Reid among ourselves. Kant, like Price and Reid, holds that the reason declares the imme- diate obligation of certain kinds of conduct, or (to use his phrase) issues " categorical imperatives." Like Price he holds that an action is not good unless done from a good motive, and that this motive must be essentially different from natural inclination of any kind; duty, to be duty, must be done for duty's sake; and he argues, with more subtlety than Price or Reid, that though a virtuous act is no doubt pleasant to the virtuous agent, and any violation of duty painful, this moral pleasure (or pain) cannct strictly be the motive to the act, because it follows instead of preceding the recognition of our obligation to do it.!~~

~~1 Singularly enough, the English writer who approaches most nearly to Kant on this point is the utilitarian Godwin, in his Political Justice. In~~

~~Godwin's view, reason is the proper motive to acts conducive to general happiness: reason sllows me that the happiness of a number of other men is of more value than my own; and the perception of this truth affords me at least some inducement to prefer the former to the latter. And supposing it to be replicd that the motive is really the moral uneasiness involved in choosing the selfish alternative, Godwin answers that this uneasiness, though a " constant step" in the process of yolition, is a merely " accidental" step,—" I feel pain in the~~

~~VII. — 77~~

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~~With Price, again, he holds that rightness of intention and motive is not only an indispensable condition or element of the rightness of an action, but actually the sole deter- minant of its moral worth ; but with more philosophical penetration he draws the inference—of which the English moralist does not seem to have dreamt—that there can be no separate rational principles for determining the "material" rightness of conduct, as distinct from its "formal" rightness; and therefore that all rules of duty must admit of being deduced from the one general principle that duty ought to be done for duty's sake. This deduction is the most original part of Kant's doctrine. The dictates of reason, he points out, must necessarily be addressed to all rational beings as such; hence, my inten- tion cannot be right unless I am prepared to will the principle on which I act to be a universal law. He considers that this fundamental rule or imperative "act on a maxim which thou canst will to be law universal" supplies a sufficient criterion for determining particular duties in all cases. The rule excludes wrong conduct with two degrees of stringency. Some offences, such as breach of contract, we cannot even conceive universalized ; as soon as every one broke promises no one would make them. Other maxims, such as that of leaving persons in distress to shift for themselves, we can easily conceive to be universal laws, but we cannot without contra- diction will them to be such; for when we are ourselves in distress we cannot help desiring that others should help us.~~

~~Another important peculiarity of Kant's doctrine is his development of the connexion between duty and free-will. He holds that it is through our moral consciousness that we know that we are free; in the cognition that I ought to do what is right because it is right and not because I like it, it is implied that this purely rational volition is possible ; that my action can be determined, not " mechani- cally," through the necessary operation of the natural stimuli of pleasurable and painful feelings, but in accord- ance with the laws of my true, reasonable self. The realization of.reason, or of human wills so far as' rational, thus presents itself as the absolute end of duty; and we get, as a new form of the fundamental practical rule, " act so as to treat humanity, in thyself or any other, as an end always, and neverasa means only." We may observe, too, that the notion of freedom connects ethics with jurisprudence in a simple and striking manner. The fundamental aim of jurisprudence is to realize external freedom by removing the hindrances imposed on each one's free action through the interferences of other wills. Ethics shows how to realize internal freedom by resolutely pursuing rational ends in opposition to those of natural inclination, But what practicable ends are there which reason prescribes, and which can therefore be stated absolutely as ends at which human beings ought to aim whatever their actual desires may be? There are two such ends, Kant lolds,—perfection and happiness ; more precisely, what we are morally bound to seek is perfection for ourselves and happiness for others ; since (1) no one can directly promote the moral perfection of others, depending as it does on free choice of right ; and (2) one's own happiness being necessarily an object of natural desire cannot also be regarded as a duty. The latter limitation contrasts strikingly with the view of Butler and Reid, that man, as a rational being, is under a " mani- fest obligation " to seek his own interest. The difference, however, is not really so great as it seems ; since in another part of his system Kant fully recognizes the reasonableness of selflove. Though duty, in his view, excludes regard for private happiness, the summum bonum is not duty alone,~~

~~neglect of an act of benevolence, because benevolence is judged by me to be conduct which it becomes me to adopt."~~

~~ETHHies~~

~~but duty and happiness combined ; the demand for happi- ness as the reward of duty is so essentially reasonable that we must postulate a universal connexion between the two is the order of the universe; indeed, the prac- tical necessity of this postulate is the only adequate rational ground that we have for believing in the existence of God. .~~

~~Before the ethics of Kant had begun to be seriously studied in England, the rapid and remarkable development of metaphysical view and method of which the three chief~~

~~stages are represented by Fichte, Schelling, and Hegel Heed,~~

~~respectively had already taken place ; and the system of: the latter was occupying the most prominent position in the philosophical thought of Germany. Hegel's ethical doctrine (expounded chiefly in his Philosophie des Rechts, 1821) shows a close affinity, and also a striking contrast, to Kant's. He holds, with Kant, that duty or good conduct consists in the conscious realization of the free reasonable will, which is essentially the same in all rational beings. But in Kant's view the universal content of this will is only given in the formal condition of "only acting as one can desire all to act," to be subjectively applied by each rational agent to his own volition ; whereas Hegel conceives the universal will as objectively presented to each man in the laws, institutions, and customary morality of the community of which he isa member. Thus, in his view, not merely natural inclinations towards pleasures, or the desires for selfish happiness, require to be morally resisted ; buteven the prompting of theindividual's conscience, theim- pulse to do what seems to him right, if it comes into conflict with the common sense of his community. It is true that Hegel regards the conscious effort to realize one's own con- ception of good as a higher stage of moral development than the mere conformity to the jural rules establishing property, maiutaining contract, and allotting punishment to crime, in which the universal will is first expressed; since~~

~~'in such conformity this will is only accomplished acci-~~

~~dentally by the outward concurrence of individual wills, and is not essentially realized in any of them. He holds, however, that this conscientious effort is self-deceived and futile, is even the very root of moral evil, except it attains its realization in harmony with the objective social relations in which the individual finds himself placed. Of these re- lations the first grade is constituted by the family, the second ty civil society, and the third by the state, the organization of which is the highest manifestation of universal reason in the sphere of practice.~~

~~Hegelianism appears as a distinct element in English ethical thought at the present day; but the direct influence of Hegel's system is perhaps less important than that in- directly exercised through the powerful stimulus which it has given to the study of the historical development of human thought and human society. According to Hegel, the essence of the universe is a process of thought from the abstract to the concrete ; and a right understanding of this process gives the key for interpreting the evolution in time of European philosophy. So again, in his view, the history of mankind is a history of the necessary~~

~~1Jn Kantisin, as we have partly seen, the most important ontological beliefs—in God, freedom, and immortality of the soul—are based on necessities of ethical thought. In Fichte's system the connexion of 'ethics and metaphysics is still more intimate; indeed, we may compare it in this respect to Platonism; as Plato blends the most fundamental notions of each of these studies in the one idea of good, so Fichte blends them in the one idea free will. ' Freedom," in his view, is at once the foundation of all being and the end of all moral action. In the systems of Schelling and Hegel ethics falls again into a subordinate place; indeed, the ethical view of the formeris rather suggested then com- pletely developed. Neither Fichte nor Schelling has exercised more than the faintest and most indirect influence on ethical philosophy in England ; it therefore seems best to leave the ethical doctrines of each to be explained in connexion with the rest of his system…~~

~~KT H—~~

~~development of the free spirit through the different forms of political organization: the first being that of the Orien- tal monarchy, in which freedom belongs to the monarch only; the second, that of the Greco-Roman republics, in which a select body of free citizens is sustained on a basis of slavery; while finally in the modern societies, sprung from the Teutonic invasion of the decaying Roman empire, freedom is recognized as the natural right of all members of the community. The effect of the lectures (post-~~

~~PE 6I1~~

~~humously edited) in which Hegel's 'Philosophy of History" and "History of Philosophy" were expounded has extended far beyond the limits of his special school ; indeed, the pre- sent predominance of the historical method in all depart- ments of the theory of practice is not a little due to their influence. What place the study of history ought to take in the systematic establishment of fundamental ethical principles or of particular moral rules is, however, still a matter of eager controversy. (Hl. 8.)~~

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IV. Modern Ethics—continued.

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~~(Kant, Hegel)~~

~~ETHIOPIA, or AruioriA, in Greek Ai@orda, the ancient | classical designation of a country and kingdom of North- | eastern Africa, lying immediately to the S. of Egypt, and | extending eastwards to the Red Sea, but with no definitely | marked boundaries in any other direction. According to the " folk's etymology" of the Greeks, tlle name was equivalent to the "land of the scorched faces," from aifew, to burn, and oy, the countenance, and this supposed derivation doubtless reacted on the employment of the word, and increased the vagueness of its meaning; but in all pro- bability it was really, like the name of Egypt itself, a corruption of some Egyptian original now unknown. The knowledge of this country possessed by tlie earlier Greeks was extremely slight, and greatly corrupted by mythical additions. To the generation among whom the Homeric poems took their rise the Ethiopians were tlie remotest inhabitants of the world, and received the gods themselves as familiar guests. They are twice mentioned by Hesiod, who calls their king by the Egyptian name of Memnon. Herodotus acquired a considerable amount of information about their connexion with Egypt, and Democritus is said to have travelled as far south as Meroe, and to have written an account of its hieroglyphics ; but it was not till the invasion of Ptolemy Philadelphus that~~

~~the Greeks began to be familiar with the country, From Herodotus downwards we hear of a great many separate tribes, most of whom are designated by Greek epithets descriptive of some real or supp»sed peculiarity, as the Ichthyopbagi or Fish-eaters, the Macrobii or Long-livers, the Troglodytes or Cave-dwellers. To only a few of them can their proper geographical position be assigned, and of none of them can we with certainty determine the ethno- graphical affinities. The name Ethiopian, indeed, must be regarded not as an ethnographical but as a politico-geographi- cal designation. It has been applied, both in ancient and modern times, to peoples of different race who have occu-~~

~~pied the country to the south of Egypt and the south- western part of Arabia, much in the same way as the name Englishman is used by foreigners for any native of the British Islands, whether he be of Germanic or Celtic descent ; and in this respect it probably differs from the quasi-synonymous Cushite of Hebrew ethnology and the An of the Egyptian inscriptions. The inhabitants of Meroe or Southern Ethiopia were a reddish-brown people, and are so represented on the monuments; but they were surrounded by, and perhaps intermingled with, a number of dark-skinned tribes, whose effigies indicate affinity with the negro. Modern research enables us to trace the main outlines of Ethiopian history, but with the same indefinite- ness of chronology which attaches to so much of the history of Egypt. Of its earlier epochs we are profoundly igno- rant. The Greeks had a tradition that the Egyptians were indebted to the Ethiopians for the first impulse of their civilization ; but recent investigators maintain that the relation between the two peoples must have been exactly the reverse of this, and their view is supported by the fact that as we advance up the river the monuments are evidently of later date and poorer workmanship, as if the southern builders were only.sccond-rate imitators of their northern predecessors (cf. Brugsch, Geschichte Agyp- ten's, 1877). The Pharaohs of the XII. Egyptian Dynasty — the Usurtesens or Osortasens and Amenemhats — repulsed the encroachments of the Ethiopians and invaded their country. By Usurtesen III. a frontier fortress was erected at Semneh; and he forbade the people to the south to enter Egypt except for the purpose of trading in cattle. During the XVIII. Dynasty we find the kings of Egypt partly in friendly and partly in hostile relations with their Ethiopian neighbours, Aahmes married an Ethiopian princess, and received the assistance of her family in the expulsion of the shepherd kings. Amenhotep (Amenophis) I. his son, and Thothmes (Tuthmosis) I. his grandson, both**

G12 extended the Egyptian dominion towards the south, and the supremacy of Tuthmosis III. seems to have been widely acknowledged throughout the Ethiopian region. When Amenhotep II., as we are informed by an inscription in the Nubian temple of Amadas, brought back from luis conquests the dead bodies of the kings he had slain, one of them was sent to adorn the walls of Napata, the Ethiopian city now identified with Jebel Barkal. Amenhotep III, Horemhebi, and the more

~~*warlike Ranieses or Ramessu L. are all mentioned as in possession of the Ethiopian supremacy, but as engaged from time to time in wars within the region. Amenhotep III. founded at Napata a great fortress-temple for the god Amon-ra of Thebes. A general revolt took place against Ramses II. and the importance of the wars that followed is shown by the extensive sculptures and puntings in regard to them still preserved at Ipsambul (Abu-simbel) and Beit Walli. During the XXII. Egyptian Dynasty the independence and power of the principal Ethiopian potentate had increased so much that Azerch- Amen, of Napata, the Zerah of the Biblical narrative, conquered all the valley of the Nile, and advanced against Syria and Judah ; the defeat, however, inflicted on him at Zephathah by King Asa was so complete that he withdrew again within his original frontiers. Piankhi Meriamen, the priest-king of Napata, whose family had an Egyptian origin, took advantage of the confusion into which Egypt had fallen during the XXILI. Dynasty, and succeeded in establishing his authority ; and for several generations Ethiopian influence was predominant in Egypt. Tirhakah especially was a monarch of great power, as is attested by his monuments at Napata and elsewhere. The great Egyptian Psametik was enabled by foreign assistance to restore a native dynasty; but the excessive favour which he showed to those who had helped him to his throne so displeased the Egyptian military caste that they emigrated to Ethiopia to the number, according to Herodotus, of 240,000. At Ipsambul (Abu-simbel) there is a Greek inscription on oue of the great colossi of Ramses pur- porting to have been engraved by the Greek n-ercenaries who accompatied the expedition of Psametik against his runaway subjects. The Persian invader Cambyses, who brought the Egyptian independence to a close, failed in his*~~

~~*attack on the Ethiopian kingdom; but the change in the —*~~

~~*condition of Egypt helped to open up Ethiopia to Greek enterprise and influence. Under the Ptolemies various Greek colonies—Dire-Berenices, Adulis, Arsinoe—were established on the Ethiopian coast of the Red Sea, and Greek learning was introduced into the Ethiopian court. Ptolemy Philadelphus invaded the country, but came to terms with the king, Ergamenes or Arkamen, who is reported to have relieved the royal power from the ecclesiastical bondage under which it had long suffered, by*~~

~~*putting the priests to death and plunderiig their temples. Arkamen's name occurs on the monuments at Debod or Tabet. In the reign of Augustus, C. Petronius had to defend the Egyptian frontiers against an invasion under Queen Candace: in the second campaign he ex- torted the submission of the country, which continued nominally Roman till the reign of Diocletian. A garrison was established at Primis or Ibrim, and a troop of German horse had its head-quarters at Pselchis. There is still a very perfect Roman camp at Mehendi, to the south of Hierasykaminos. About the Ist century of the Christian era a new kingdom seems to have grown up at Axume. The king Zoskales is mentioned by the author of the Periplus of the Erythrean Sea, who also tells us that he was acquainted with Greek ; he may be identified with the Za Hagalé or Hekla of the Ethiopian list of kings. In the sixth century the Christians of Yemen, being oppressed by the dynasty of Jewish proselytes who at that time held*~~

~~*ET aerorwt &*~~

~~*the throne of the Himyarites, asked and obtained the assistance of the Axumite monarch; but- the Ethiopian sovereignty thus established only lasted for about seventy ears.*~~

~~*: Compare Eaypt, vol. vii. pp. 730-748 ; AByssINrA, vol. i., and the works of Salt, &c., there referred to ; and in addition Lenormant, Manuel de Vhistoire orientale ; Records of the Past, vol. iv.; Vivien de Saint Martin, "Kclaire. geogr. et hist. sur Pinseription d' Adulis," in Journol Asiatique, 1863, published separately in 1864, and his Le Nord del Afrique dans Vantiquité greeque et romaine, 1863.*~~

~~*Eruiopran, or Geez, is the name given in modern philology to a language of the Semitic family, which is still used in Abyssinia for literary and ecclesiastical purposes. It shows the closest affinity in grammatical structure with Arabic. The verb has ten conjugations, of which two are peculiar, and the remaining eight analagous to as many of the ten Arabic conjugations. The noun presents a greater similarity to the Hebrew noun, though at the same time it has decidedly Arabic characteristics. There is no dual form either in noun or verb. About a third of the vocables of the language have been traced to Arabic roots, while others find their counterparts and kindred in Aramaic and Hebrew. A considerable*~~

~~number of words have been imported from foreign tongues—some as mere exotics by translators and scholars,.but many others through direct popular intercourse with foreign nations. Aramaic, Hebrew, and Greek have been chiefly laid under contri- bution, the last especially for words technical to Christianity. Of course it is often difficult to decide in the case of Aramaic and Arabic vocables whether they are real borrow- ings since the differentiation of the languages, or are part of the original common stock of the Semitic. There are at least two modern languages which have sprung from the ancient Geez, distinguished in modern philology by the con- ventional names of Tigrifia and Tigré, both derived from the native Tigraj, which is applied to either indifferently. The Tigré, spoken by the half-nomadic races on the fron- tiers of Nubia and Sennaar is, at least among one tribe, the Habab, extremely like the parent speech ; the Tigrifia, on the other hand, is corrupt both in its sounds, its inflexions, and its vocabulary, and bears evidence more especially of Amharic influence. Tigré has been very partially inves- tigated : Merx published, in 1868, a vocabulary and gram- matical sketch; Munziger's vocabulary is printed in Dillmann's Lexicon ; and a Tigré translation of the gospel of Luke by Kugler and Isenberg exists in manuscript. The Tigrifia, or rather the Adoan dialect of the Tigrifia, was treated pretty fully by Dr Pretorius in his Grammatik der Tigrita Sprache, 1872, and he has since published, in the Ztschrft. d. Deut. Morg. Ges., 1874, a paper on the two dialects of Hamasén and Tanben, which differ considerably in vocabulary as well as in pronunciation, but are mutually intelligible. Another dialect mainly of Ethiopic character is spoken by the people of Harrar, who form a small Semitic enclave in the Hamitic population to the east of southern Abyssinia. Its peculiarities have been investi- gated by Burton, First Footsteps in East Africa, 1856, and by Preetorius in Zéschr. d. Deut. Morg. Ges., 1869. The affinity of the Geez alphabet has given rise to no small discussion: Ludolf brought it into comparison with the Samaritan, De Lacy with the Greek and Coptic, and Lepsius with the Devanagari, but in the opinion of most Semitic investigators, its Semitic origin has been proved by the discovery of the cognate Himyaritic alphabet or musnad (cf. Renan, frst. des Langues Sémitiques, p.~~

~~308).~~

~~*The literature of the Ethiopian language, like that of Armenian, is almost exclusively Christian, and, indeed, with comparatively slight exceptions, theological or ecclesiastical. Only a few inscriptions have been preserved of the pre- Christian period, the most notable being tiiese of Axum*~~

~~*kT II—*~~

~~*and Adulis, but it is not improbable that light will be ob- |*~~

~~*tained on the earlier times from the inscriptions of Southern Arabia, which are beginning to receive special attention. The language of the Axum inscriptions is the same as that of the Bible, and contains the Amharic element. The forms of the letters vary, and the older forms are liker the Himyaritic. Vowel signs are irregularly employed, and sometimes omitted, and the numeral notation is peculiar. The work which forms the standard of a classical style is the version of the Bible. According to native tradition it was made from the Arabic, either by the first bishop Frumentius (Abba Salama) or by the " Nine Saints" of the 5th century; but internal evidence goes to prove that it was really derived from the Greek version in use in the Alexandrian church. In the course of centuries it has un- dergone numberless alterations at the hands of copyists ; but even its most corrupted condition leaves it clear that it must have been characterized by great fidelity to the Greek text. Among the MSS. of the Old Testament Professor Dillmann distinguishes three classes : the first, which seldom occurs, preserves in the main the original translation; the second, and most numerous, contains a text revised accord- ing to the Greek ; and the third has been improved by com- parison with the Hebrew. Besides the ordinary canonical books of the English Bible, and the ordinary apocryphal books, with the exception of the Maccabees, the Ethiopian canon includes a number of works of various interest and value, as the Kufale or Book of the Jubilees, the Book of Enoch, and the Ascension of Isaial,—concerning which consult ApocaLyptic LITERATURE, vol. ii. The books of the Maccabees were eitlier never translated or have been lost, but their place has been supplied by spurious productions of the same name. Several apocryphal books are also in- corporated with the New Testament, which is usually reckoned to contain 35 altogether. It was printed in 2 vols. at Rome, 1548, in the*~~

~~London Polyglot, and in 1830 by the London Bible Society, under the editorship of Th. P. Platt. Dillmann published the Octateuch, Leipsic, 1853, the four books of the Kings, Leipsic, 1861-1871, Enoch, 1851, and the book of the Jubilees, 1859 ; and R. Lawrence published the Ascensio Jesaiw, 1819, and the Apocalypse of Ezra, 1820, at Oxford. (Cf. Dillmann's article on the Aithiopische Bibeliibersetzung in Herzog's Real-Encyclopdidie, 2d edition, 1877.) Of the numerous works which rank as ecclesiastical authorities in the Ethiopian church, it is sufficient to mention the Cyrillus, which contains, not only several dogmatic treatises of Cyril of Alexandria, but also similar productions of several others of the fathers ; the Synodus, which includes, inter alia, the constitutions and statutes of the apostles, the canons of the councils of Ancyra, Neocesarea, Sardis, Antioch, and Nica, an ex- position of the Nicene creed, and an exposition of the Decalogue ; the Mafshafa kiddn za egziena Iyasus, or the Testament of our Lord Jesus (usually quoted as the Kidan), which treats of various ecclesiastical, liturgical, and eschatological matters; the Genzat or Mafshafa Genzat, and the Mafshafa Kedr, containing respectively the burial service and other sections of the ritual ; the Philexius, a~~

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~~rnonastic treatise, probably translated into Ethiopic in the 14th century, and deriving its name from Philoxenus of Manbig. Among the poetic works are a collection of hymns in honour of the saints of the Ethiopian calendar, entitled Lrziabkhan nagsa, or " May God reign," and the Organona Marydm,a eulogy of the Virgin in rhythmic prose. The MSS. of the Mavdséét or Antiphonary sometimes con- tain an interesting musical notation, which, according to native tradition, was introduced by a saint who lived in the 6th or 7th century. Certain works called Savdsev or guides are devoted to the illustration of the Ethiopian language, but they are very poor, and make no distinction between grammatical, lexicographical, and historico-scientific information, standing thus on the same level with such a work as Elyot's Zatin Dictionary. 'The historical works, as fur example those concerning Alexander of Macedon, are of little moment ; and the real value of the lists of early kings of Ethiopia is still a matter of dispute. According to Pretorius, one of the most recent~~

~~*investigators (Zéschr. d. Deut. Morg. Ges., 1870), all the statements made in Ethiopian literature about the earlier history of the country have been in the main derived from Arabic legends not earlier than the 14th century, and then reconstructed with the assistance of the king-lists, which alone have some degree of historic credibility. The European libraries which possess the richest collections of Ethiopian MSS. are the British Museum, the Bodleian, the Royal Library at Vienna, and the National Library at Paris. Ruppell's collections are preserved at Frankfort-on-the-Maine, and Krapff's at Tiibingen and Wiirtemberg. The Bodleian catalogue was published by Dillmann, 1858; D'Abbadie's Catalogue raisonné de manuscripts éthiopiens appeared in 1859; and a list of the Magdala collection in the British Museum, consisting of upwards of 300 MSS., was contributed to the Zischr. d. Deut. Mory. Ges., 1870, by William Wright. Ewald gives a list of the Wiirtemberg MSS. in Zéschr. fiir die Kunde des Morgenlandes, 1843, and of the Tiibingen MSS. in Ztschr. d. Deut. Morg. Ges., 1847. Dorn had already made known the few works possessed by the St Petersburg library, in the Bull. de Acad., May and October 1837. The Vienna collection is dealt with by Fr. Miiller in Zéschr. d. Deut. Morg. Ges., 1862. The first scholar who turned his attention to Ethiopian was Potken of Cologne about 1513. A gram- mar and dictionary were published by Jacob Wemmers, a Carmelite of Antwerp in 1638; and in 1661 appeared the first edition of the great lexicon by Job Ludolf, who, in the 1702 edition, prefixed a Dissertatio de harmonia linguce ath. cum. cet. ortent., and was also the author of Comment. de Hist. eth.*~~

~~*Modern works connected with the subject are :—Hupfeldt, Exer- citationes Aithiopicw, 1825; Dorn, De psalicrio ethiopico, 1825 ; Tuch, De Aithiop. linguce sonorum proprictatibus quibusdam, 1854, and De eth. lingue son. sibilantium usu, 1854 ; Ewald, Ucber des athiop. Buch's Henokh Entstchung, 1854; D'Abbadie, Herma Pastor Ethiopice, 1860; Schrader, De Lingue Aithiopice indole, 1860; Ceriani, Afonumenta sacra et profana e codicibus Bibvl. Ambrosiane, Milan, 1861; Rodwell, dthiopic liturgies and prayers, 1865; Physiologus awthiopice, 1877.*~~

~~*ETH®MOGHRAPHY AND ETHNOLOGY*~~

~~*L / frrition.—Ethnography embraces the descriptive | anthropology as anthropology does into zoology, and*~~

~~*details, and ethnology the rational exposition, of the human aggregates and organizations known as hordes, clans, tribes, and nations, especially in the earlier, the savage and barbarous, stages of their progress. Both belong to the general science of anthropology or the natural history of mankind, being related to it as parts to a whole. Ethnography and ethnology, indeed, run up into*~~

~~*zoology into biology. No very sharp line can be drawn between these two sciences themselves, their differences being mainly those between the particular and the general, between the orderly collection of local facts, and the principles according to which they may be grouped and interpreted. Ethnographists deal with particular tribes, and with particular institutions and particular customs*~~

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~~*prevailing among the several peoples of the world, and especially among so-called savages. Ethnologists bring simultaneously under review superstitions, legends, customs, and institutions which, though scattered in distant regions of the earth, have some common basis or significance. Ethnography and ethnology run as easily one into another, as the two sections of general anthropology, viz., (1) anthro- pology proper, as expounded by anatomists and physiologists, who deal with the different races of man, their elements, modifications, and possible origin; and (2) demography, which, as constituted by the researches of Quételet and his friends and disciples, as Farr, Galton, Guillard, and Bertillon, treats of the statistics of health and disease, of the physical, intellectual, physiological, and economical aspects of births, marriages, aud mortality.*~~

~~*Ethnography, etlinology, and anthropologyare interwoven with philology, jurisprudence, archeology, geography, and the various branches of history. A fact may require to be investigated successively by linguists, anatomists, and mathe- maticians. In current language ethnography and ethnology are often used indiscriminately, but if a distinction is to be made between them, an instinctive perception teaches us to speak of*~~

~~*ethnographic facts and ethnological theories, of ethnographic literature and ethnological science,—ethnology being related to ethnography as the wine to the grape.*~~

~~*II. Division.—Just as the lines which separate ethno- logy, anthropology, and history one from another are vaguely traced, so are the boundaries of tlie several provinces of ethnology themselves indefinite. We are obliged, for the sake of convenience, to draw up classifica- tions, but the more rigorous we make them the more arti- ficial they become. 'Nature,' as Lamarck has said, " recognizes neither kingdoms, nor classes, nor orders, nor genera, nor sub-genera; nature recognizes nothing but individuals." The older sciences may be tabulated to a degree which the younger sciences cannot allow, and ethnology is one of the youngest of all,—its existence, even its name, not dating further back than the present genera- tion. Ethnologists are pioneers in a new field of inquiry,—squatters in the Far West of learning. Intent on open- ing the first paths through the dark forest of prehistoric times, on driving the first plough through these virgin prairies, they erect no structures which pretend to more than a provisional character. They throw up now a log cabin, and now a wooden shanty, leaving to their successors the work of building substantial houses of brick, and in the far future stately edifices of enduring marble.*~~

~~*_ At first sight it might appear convenient to divide ethnology into two great branches :—(1) historic ethnology, comprising researches into the origin, the filiation, the customs and institutions of wild and barbarian tribes still existing, or of whom we have authentic records; (2) pre-historic ethnology, comprising similar researches into the early condition of man, but founded necessarily on deduc- tions, and not on positive testimony. But the fitness and the simplicity of this division are more apparent than real. The two sections as thus indicated caunot be treated apart, because so few or incomplete are the vestiges of prehistoric man that they cannot furnish a basis for sound theories unless these remains are studied in the light of the know- ledge which we possess of tribes existing in the non-civilized state, and who thus form the connecting link between historic and prehistoric man. Being a part of natural his- tory, anthropology deals principally with the question of the several races, their*~~

~~*anatomy, physiology, and pathology. It seeks to determine which are the permanent varieties, by the crania, by the facial features, by the stature and proportion of the body, by the miscroscopic structure of the hair, by the colour of the skin. It analyses the great*~~

~~*exhumed from beneath the rubbish of ages.*~~

~~*ETS NOGA aA YH*~~

~~*problems of evolution. It assigns to food, to climate, to what the French call the mliew, and the Americans "the surroundings,"—the share which each has had in producing or fostering the variations of human types. Ethnography does not discuss anew the solutions presented by anthro- pology, but accepts them as generally true, and observes if they fit and work satisfactorily in its department. The task, thus limited in order to secure its better execution, is still a gigantic one. HHuman development branches out into a multitude of ramifications, which may be brought under the following heads :*~~

~~*1. Material Development.*~~

~~*2. Family i 5. Religious 3*~~

~~*38. Social a 6. Moral ne*~~

~~*III. Method.—Astronomy starts from the principle that the laws of mathematics and those of light and matter are universal,—that they are true not only on the earth but throughout the universe. Ethnology takes its stand on the assumption that the laws of intelligence have always been what they are, and have always operated as they do now, that man has progressed from the simple to the complex, from the particular to the general. This assump- tion does not interfere with the discussion which the anthropologists carry on respecting monogeny or polygeny,—that is to say, the common or multiplex origin of the different races which inhabit the earth, nor does it affirm that the progress has been always continuous and well- marked. It recognizes the fact that some races may have been stationary and some may even have retrograded. It postulates simply that mankind, whatever be its origin, is, or has become, a mass*~~

~~practically homogeneous, more uniform than diverse. The wide differences between civilized and uncivilized man are now admitted to be only differences in degree,—actual civilization being the adult age, and savagery the infancy of mankind. 'The condi- tions and habits of existing savages," says Sir John Lub- bock, 'resemble in many ways those of our own ancestors at a period now long gone by; they illustrate the earlier mettal stages through which the human race has passed." To the casual observer, savages seem to be, as to Dr Johnson, all alike, and in fact they are so in comparison with our- selves; but to the close observer who compares savages with savages, they are easily distinguishable. Although contemporaries, they are separated by differences in cul- ture so great that it would seem the work of centuries for the more backward to attain the state already reached by the more advanced. Great, indeed, are the facilities which ethnology confers on the historian who may, for example, explain the condition of the Israelites under the Judges by that of the Maories of New Zealand, as they were almost within the present generation, or may compare the earliest Aryan races with the Malay-Indian populations of to-day. By its aid the philosopher may trace an institu- tion through all countries and in every period, accumulating illustrations of its progressive stages, and piecing them together in their natural sequence like the scattered bones of an extinct animal. Uncivilized countries are for us a standing exhibition of prehistoric matters, museums where we find duplicates of objects which were thought to be lost or which were forgotten ; each of them is a Pompeii, To study wild tribes is, as it were, to discover in the forests of Central America an ancient city, not crumbling and desolate, but still inhabited by a race preserving the old Maya habits and manners. The laying bare of all these scientific riches gave the impulse to which we owe ethnology. It does not require much reflection to under- stand that the principle just developed is an instance of the great law of evolution. According to the naturalist of the modern school, evolution has transformed successively the~~

~~*animal genera; according to the anthropologist, it has trans- formed the races of man; and, according to the ethnologist, it has transformed human thought. It must be confessed that evolution has yet opponents who contend that history records, not progress, but degeneration from a state of inno- cence and bliss, from an age of gold or Saturnian cycle. This doctrine, borne out by the unanimous testimony of all tradition, was assumed at one time to be beyond dispute, and had nearly become an article of faith. But in recent times it has not remained unchallenged. In answer to its assailants, the theory of degeneration has, within this cen- tury, been reasserted with great ingenuity and vehemence by ultramontane writers, such as De Maistre and De Bonald, and in our own country it has been more recently defended by Whately with characteristic vigour. But an effective reply has been given by such writers as Lubbock and Tylor, especially the latter, who concludes an exhaustive discussion by these words, to which most ethnologists will subscribe :—.*~~

~~*'* We may fancy ourselves looking on civilization as in personal figure she traverses the world; we see her lingering or resting by the way, and often deviating into paths that bring her toiling back to where she had passed by long ago; but, direct or devious, her path lies forward ; and if now and then she tries a few backward steps, her walk soon falls into a helpless stumbling. It is not according to her nature ; her feet were not made to plant uncertain*~~

~~*steps behind her ; for both in her forward view and in her onward gait she is of only human type."—Zarly Culture, ii.*~~

~~*To the facts and reasonings adduced by the natu- ralists Mr HIerbert Spencer adds the weight of spccu- lative argument :—" Each organism, "he says, " exhibited within a short space of time a series of changes which, when supposed to occupy a period indefinitely great, and to go on in various ways instead of one way, gives us a tolerably clear conception of organic evolution in general. The whole exhibits one grand scheme of progression." These words are the substance of the whole philosophy of evolution, which, sketched out by Maupertuis, Lamarck, and Goethe, reasserted and victoriously demonstrated by Darwin and Wallace, and*~~

~~taken up by Huxley, Virchow, Quatrefages, Broca, and Haeckel, now underlies all etlino- logical research.~~

~~In the view of its supporters, evolution has not only in past ages differentiated genera and species, but is at work to-day in transforming the actual types. Here may be the place to advert to the great law, of which Von Baer and Agassiz were the most thorough and_ successful exponents, namely, "that the development of the in- dividual is an epitome of that of the species." The human embryo, for example, passes rapidly through all the principal phases, in one or other of which whole series of inferior animals stay permanently, in such a manner that every new generation repeats in au abridged manner those that have gone before. Of the many corollaries which follow from this theory, the most important seems to be that, however much some groups of animals may differ from each other in structure and habits, they must have descended from the same parent form, if they are found to pass through similar embryonic stages. This is heredity. Ethnologists, again, have not been slow in borrowing this law from anatomists. The embryo going over the same organic form as the species, they argue that the child too must repeat the intellectual developments of past mankind. Parents, and not only the observers among them, had already reversed the opinion of the philosophers that savages are children by saying that children are savages. 'The remarkable similarity between their idcas, language, habits, and character, though generally admitted, had been regarded merely as a curious accident ; but coiu- cidences of such vast magnitude are not to be considered as merely accidental. Everybody knows, and the fact is as~~

~~are intellectual fossils.~~

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~~important as it is obvious, liow boys delight in romping, running, leaping, boating, swimming, and all out-door exercises, aud how their favourite heroes are the Red Rover, Robin Hood in the forest green, Robinson Crusoe in the solitude of lis island home, where he had to begin all anew.~~

~~Peculiar instances of the general law of inheritance have been called atavism. It occurs often that one individual is the exact countertype of his~~

~~grandfather, or some more remote ancestor. By this law, still a very obscure one, ethnologists explain how men are occasionally met with who live in the midst of our civilization as mere savages. The passion manifested by many people for hunting and fishing as a sport, for a tramping roving life, the frequent falling or relapse of French settlers in Canada (the Bois brfilés) into Indian habits, are supposed to be manifestations of atavism. But our stiff and rigid civilization is averse to those old fashioned individuals, who roam about, living from hand to mouth; the existing system of law can scarcely be brought to distinguish them from criminals, Moralists attribute to atavism a large number of offences which lawyers attribute to guilty dispositions. Now-a-days more than one Boadicea emerges into a brief celebrity upou being sentenced to hard labour in the house of correction ; more than one Cassivellaunus has been severely flogged and sent to penal servitude. Mr Dugdale, an industrious statistician of New York, has traced to its common ancestor a family, the Jukes, consisting of 1200 people, of which the majority are patupers, thieves, or prostitutes, iu a greater or less degree, and who are computed to have cost the state in prison maintenance, almshouse relief, &c., something like £260,000. The ancestor was a descendant of the early Dutch settlers, and lived much as backwoodsmen do now upon the Indian frontiers. HIe is described as a "hunter and fisherman, a hard drinker, jovial-and com- panionable, averse to steady toil, working hard by spells and idling by turns, becoming blind in his old age, and his blindness has been entailed upon his children aud grandchildren."~~

~~It is uot, however, owiug to atavism, but to the merc continuance of an old order of things, that so many of our ill-educated classes, shepherds, agricultural labourers, and even factory hands, are as little developed, and live a life as little intellectual as savages. Latent in our small hamlets and large cities there is more savagery than many reformers are aware of, and it needs but little experience to discover something of the old barbarity lurking still in minds and hearts under a thin veil of civilization.~~

~~Atavism is a word applied to persons; survival, an expressive word for which we are indebted to Tylor, has a similar meaning, but is applied to things. Survivals are habits, ideas, or expressions which are senseless and per- fectly inexplicable by the light of our present modes of life and~~

~~thought, but can be explained by reference to similar customs or prejudices which are still to be found among distant tribes, or which are mentioned by ancient writers. The word survival corresponds exactly to the Latin word superstition, meaning the remainder or residue of | bygone ages. But as the use of the word superstition is' practically restricted to matters pertaining to religion and magic, a more general word had to be coined. " Survivals," says Tylor, "are milestones on the way of culture." They Just as spear-heads and frag- ments of ancient pottery are disinterred by the plough. in the midst of our fields, so survivals may be picked out in our daily conversation, in our habits and manners, but it requires a trained intelligence to detect them. Their original meaning has been lost, and they have: been modified and distorted to serve modern purposes. Survivals may be compared to those muscles or pieces of~~

~~bone which are retained in the bodies of animals and even |~~

~~in the human frame, as relics of a former construction. But sooner or later they will fall to the ground. Nature closely husbands her means ; she may keep for a while forms that are apparently useless ; it seems that she has forgotten them, or that she intends to fall back on them in case of failure; but when the new type is firmly settled, everything that is not serviceable disappears.~~

~~The scientific exploration of caverns with a view to dis- covering the remains of ancient men and beasts, as Pengelly has described it in the case of the Kent Cave, may serve as a model to ethnographers. The explorers did not leave an inch of soil untouched ; all the mound was dug out yard by yard, and carefully sifted; nothing was taken up, nothing thrown away without good reason; the objects collected were labelled with care, and even the nature and the condition of the refuse recorded. So the main work of the ethno- grapher consists in scooping the historic or the prehistoric soil, in picking up everything that has lived, or that has been touched by living hands, and not rejecting as valueless anything aslong as he is not perfectly cognizant of its nature. Thus he finds precious things and valuable information wherethe ignorant sees but heaps of offal and scourings. And when he travels, especially in semi-civilized countries,~~

~~*there is no limit to the things he may look and inquire after ; the less the people are civilized, the richer the harvest he may gather in. One investigator prefers to study the people themselves, another their institutions. But whatever be the study, the first rule will always be to observe the facts with unprejudiced eyes; to draw a deep line of demarcation between them and all mere conjectures. Besides, all explanations have to be called in question, even those which seein sensible and judicious ; the student is in duty bound to distrust every theory and interpretation, especially his own glosses and commentaries. Rushing to conclusions is a fault into which beginners are sure to fall. The unscientific mind resembles the child in many respects, and in none more than this; it is impatient and cannot bear suspense. Ready acquiescence in the assertion of others is dangerous, and easy conviction in one's own ideas is the worst bane to science.*~~

~~*One single fact well observed, well authenticated, is a positive gain, and may turn out to be of the highest value in future studies. But a single fact proves too much or too little ; as long as it stands alone, nobody can know whether it demonstrates a general law, or only an exception, as we see by the controversies still held on the famous skull of Neanderthal. Laws are obtained by grouping analogous facts in series. In nature, as in history, a series may be termed the development of an idea. Therefore, when the ethno- grapher does not restrict himself to the simple description of a single subject, of a single locality, of a single custom, he will have to search for analogous facts, that he may give the reader a scale of comparison. Jor he would expose himself and his readers to gross errors if he were to conclude from a single trait to the whole institution, or from a single institution to the whole national organization. Such primi- tive populations as the Aleutians or the Todas it would be easy to represent as living either in a moral paradise or in a moral hell, according as one chose to regard only the attractive or only the repulsive side of their character. A fine ethnographical portrait, which is an abstract representa- tion, will be always difficult to draw. In the sketch of that collective individual, a nation, the features must be impressed with the many lines and furrows which the wear and tear of existence have left on the original. In describing an institution which is a collective fact, the numerous and contradictory feelings must be indicated which it stirred up*~~

~~*in the many minds and hearts on which it acted, and which reacted on it. But masters only know*~~

~~*ETHN@QGEAEHS*~~

~~*how to blend light and shade—how with some few colours to express a multitude of things.*~~

~~*Ethnology, having entered on the scientific stage of development, requires to be treated as a science. The fields of anthropology and ethnology are no longer the tilting-yard for fancies against opinions, for hypotheses against guesses; they are now the place where facts well authenticated are stored up and gathered into orderly groups. Ethnology has become a science of observation, a branch of natural history. It was born the last of all sciences, not because it is the most difficult, but, on the contrary, because, being easy enough, people have dealt with it too lightly. Everybody thought himself able to judge, and his sentences expressed his biases or dislikes. Now, ethno- logy requires of its adepts that they be as unprejudiced as mathematicians, that they discard all preconceived judgments as much as do the chemists and physicists. Ethno- graphers must be exact observers and faithful recorders. Science and virtue alike begin and prosper by the same means— by sincerity and by effort.*~~

~~*IV. Material Development.—Any inquiry into the mate- rial progress of man bears upon a multitude of details. Briefly stated, the most important are Food, its nature and its preparation ; Weapons, Tools, and Implements; Shelter and Clothing; Domestic and Public Fires; Barter and Trade.*~~

~~*F'ood.—Man has been defined as a digestive tube. He is happily something else as soon as his most imperious physical wants are satisfied, but it must be confessed that, until the cravings of his hunger or thirst are allayed, he is little better than a ravenous brute. For the states- man and the economist there is scarcely any question of more gravity than that of subsistence, even in the face of our enormons accumulation of wealth, in spite of our gigantic means of communication. 'There are four great phases through which nations pass, or have passed,— hunting and fishing, sheep and cattle tending, agriculture, and industry ; and these are*~~

~~*nothing else than a succession of improvements in the means of raising food. All the results of manifold culture converge towards a grand total, — more food for more men, better food for every man, and consequently lives longer and more numerous. A simple calculation shows how much modern industry increases the amount of disposable food. From the United States census, showing the extent of land occu- pied by the Redskins?in 1825, it was calculated that the hunting tribes, although they raised some maize, required 1°75 square miles per head. At that rate, all Europe, including Russia, could feed two millions of Indians and no more; but, thanks to its agriculture and to its industry, it supports three hundred millions of inhabitants. It would be hazardous to estimate how many more Indians the North American prairies might feed, if those Indians had taken to bison breeding iustead of bison hunting. According as the chief produce of the herd is to be milk or meat, the calculations would vary by large amounts. Nor ought the yield of our improved breeds to be taken as the measure. But, to proceed, it is reckoned that an area under wheat affords from ten to twelve times more human food than it would give under grass for cattle or sheep. That ratio, ten or twelve to one, may express in human lives the progress which was realized when husband- men succeeded to nomad communities. With the intro- duction of steam as our great mechanical agent, we are entering the period of large cities. Human anthills of one million souls and more exist already in many parts of the world ; they increase constantly both in absolute numbers and relatively to the population at large. It is already necessary that the supply of food to these immense agglo- merations of " digestive tubes " be as regular as clockwork.*~~

~~*ETANOGR AP HY*~~

~~*For the chief information we have on the subject of human food in prehistoric times, we are indebted to Pro- fessor Riitimeyer, who examined the fauna of the lake dwellings in Switzerland, and to Steenstrup and Thomsen, who dug up the shell mounds of Denmark. They have displayed in their researches an amount of science and sagacity which is an honour to our century.*~~

~~*The quality of food is calculated to exert a great in- fluence upon the temperament, the health, the vigour, and the intelligence of men. 'There is thus some truth in Buckle's statement that the history of the most civilized nations may be explained by the chemical constituents of their food; but until the action of aliments on bodily and intellectual organisms is better known, the discussion would be premature. Besides, the subject belongs to anthro- pology, and if ethnologists mooted it, they would trespass upon their neighbours' preserves. Werc primitive men a set of cannibals? Plausible reasons may be given for and against such a view. As men can feed on men but excep- tionally, the question would be better discussed in the chapters relating to religious sacrifices and to the progress of morality and intelligence. 4*~~

~~*Weapons, T'ools, and Implements.—Ethnology centres in this study, and by far the greatest number of ethnologists have made it the chief subject of their researches. They go everywhere, beating about all corners, looking for potsherds, bones, teeth, chirts, nephrites, flints, and every- where their search is more or less successful. x ungue leonem is their motto. As the tool, so the work and 60 the workman ; as the arrow-point, so the archer. And they are right. Man is a tool-using, or, as Franklin defined him, a tool-making animal. These weapons, these imple- ments were subservient to the tyrannic necessity of obtain- ing food. The better the weapons, the more regular the supply of nourishment, and as the food changed, the tools had to be changed. Wood, bones, and rough stones were first used, then polished stones, afterwards bronze, and lastly iron,—each marking a new era. Strong doubts, however, begin to be entertained in many quarters about the separation in two periods each of the stone and of the metallurgic ages : it is objected, first, that polished stones were used as articles of luxury, or where flints could not be had, and, secondly, that the finding of bronze imple- ments much older than any of iron does not prove that bronze was invented before iron, because bronze keeps in a tolerable state of preservation when iron, which oxidizes readily, has long disappeared; and, moreover, it is asserted by technologists that iron or steel tools arc indispensable in the fabrication of bronze. Be that as it may, every invention was more than a simple addition to the old stock; it was an advance in quality and variety as much as in quantity; it marked a new progress in intelligence. Tylor says—*~~

~~*‘The ethnographer’s business is to classify such details with a view to making out their distribution in geography and history, and the relations which exist among them. To the ethnographer, the bow and arrow is a species, the habit of flattening children’s skulls is a species, the practice of reckoning numbers by ten is a species. The geographical distribution of these things, and their transmission from region to region, have to be studied as the naturalist studies the geography of his botanical and zoological species. Just as certain plants and animals are peculiar to certain districts, so it is with such instruments as the Australian boome-rang, the Polynesian stick-and-groove for fire-making, the tiny bow and arrow used as a lancet or phleme by tribes about the Isthmus of Panama; and in like manner with many an art, myth, or custom, found isolated in a peculiar field. Just as the catalogue of all the species of plants and animals of a district represents its flora and fauna, so the list of all the items of the general life of a people represents that whole which we call its culture. And just as dis- tant regions so often produce vegetables and animals which are analagous, though by no means identical, so it is with the details of the civilization of their inhabitants. How good a working analogy there really is between the diffusion of plants and animals*~~

~~*and the diffusion of civilization comes well into view when we uotice how far the same causes have produced both at once. In district after district, the same causes which have introduced the cultivated plants and domesticated animals of civilization have brought in with them a corresponding art and knowledge. The course of events which carried horses and wheat to America carried with them the use of the gun and the iron hatchet, while in return the old world received not only maize, potatoes, and turkeys, but the habit of smoking and the sailor’s hammock.”*~~

~~*House and Shelter.—Previous to the recent scientific movement to which we owe ethnology under its present form, architects had already divined and applied to their art ethnological principles. They had understood that the most superb temples and palaces, the most splendid monuments, when they have a national character, repro- duce on a large scale the modest*~~

~~*abodes of the country people. A greater care is bestowed on the construction of a princely hall, its materials are more costly, the proportions more stately ; but in most cases it is a poor man's cottage magnified. So a church may be but the enlargement of a sepulchre. If the homesteads of the earlier inhabitants were caves or some piled-up slabs, if they were tents or log cabins, the primitive physiognomy will be still detected in the disposition of the magnificent buildings, and even in the costly furniture. For one sees in the Egyptian temples that their columns were imitations of Nile reeds tied in a bundle, that their walls were an imitation of plaited mats. What is called the architectural style is the character of the nation and of the epoch expressed in wood, stone, or brick.*~~

~~*Fire.—After some discussion, it appears now to be the general belief that there has not been within historical times any race of men ignorant of fire. There is certainly a wide chasm between civilized and uncivilized men, but none so deep as would imply the absence of fire, the use of fire being the great practical distinction between man and brute. We have to avoid the double danger of supposing uncivilized tribes to be either too intelligent or too stupid. Indeed, if it had not been for fire, mankind could not possibly have become what it is. It is a theory amongst architects, to whose relations towards cthnology we have just adverted, that the first buildings of men, inhabitants of caves, holes, or trees, were not dwellings for themselves, but simple hearth-places protected by reed walls and some thatching against wind and rain. They believe that on this model of a prytaneum, or abode of the firegod, the abode of his priest, and then of the kings and the chiefs of noble families, were successively erected, and that it is only in later times that all families obtained a fire-place of their own.*~~

~~*We have spoken of tools and weapons ; their history and that of modern industry are inseparable from the history of fire. Everywhere the stone celts and arrows were alleged imitations of thunderbolts, and are still believed by many villagers to have been once hurled down from the skies. Fire is mixed up with whatever men had to tell about things of the earth, of heaven, or of hell. Fire lore is a science by itself.*~~

~~*Commerce and Industry.—Slaves have been, perhaps, the first commodity purchased by the pastoral from the hunting and warlike tribes. Lindenschmidt and Peschel have reacted against the current belief that the tools and implements of bronze and steel had been manufactured in the countries where they have been found. They note that commerce already existed in the earliest ages of which we have any notice. It must have been by barter that the cave dwellers of Perigord, in the reindeer period, obtained rock crystals, Atlantic shells, and the horns of the Polish saiga antelope. The Phcenicians, and thcir descendants the Carthaginians, were attracted to and retained in Spain by the quarrying of silver ore. Tin has promoted civilization*~~

~~*even more than silver, for without tin bronze cannot be produced, 'The Celts may have had some skill in metal- lurgy, as they taught the Romans the art of tinning utensils, and were taught by them the fabrication of coins. Im- portant mines were worked in the Scilly Islands and in Cornwall. If Carthaginian or Phoenician vessels ever reached the west coast of France or entered the Channel, they must have been in quest of tin, and probably too of débouchés for their manufactured bronze. At all events there was intercourse between the northern countries and the Mediterranean by land. That such land traffic existed is proved by the early foundation and prosperity of Mar- seilles; moreover, the lumps of tin ore which have been found among the Swiss relics of the bronze age must have reached Helvetia by inland commerce. It was owing to the presence of tin that the Celts of Gaul and Britain were of far higlier social development than the Teutons of the time of Cesar. The possession of an article of export so indispensable, and the fact that tin was in such great request in the age of bronze, was in itself the means of promoting civilization, for commerce at a very early period brought the Britons into contact with the Medi- terranean nations, and especially with the Etruscans, the great bronze-smiths of antiquity. The inhabitants of the coast of the North Sea, and still more of the Baltic, pos- sessed an analogous property in amber. It is doubtless to this coveted substance that*~~

~~*the numerous "finds" on the shores of the Baltic are due, where Greek and Roman coins, as well as bronze instruments, were brought, some by way of the Euxine and Pannonia, along the Danube, some along the Rhone and the Rhine, and even some few across the huge barrier of the Alps.*~~

~~*The obsidian blades which are occasionally met with in ancient graves to the east of the Mississippi must have reached by barter the places where they are now discovered. We must not imagine that the Redskins had no intercourse but that of murderous feuds. Merchant boats passed along the great rivers, and transit dues were taken by the chiefs. In South America, curare, the arrow poison, the preparation of which was understood only by a few hordes, formed a valuable article of commerce among the Indians of the Amazon, so that people living near the Napo were obliged to make canoe voyages of three months' duration in order to procure it. Even where bands of hawkers and pedlars did not wander through the country, goods, such as nephrit hatchets, salt, cnrious shells, colouring stuffs, were bartered between horde and horde; and thus a system of intercourse might have extended throughout an entire quarter of the world. English wares, deposited at Mom- bas on the eastern side of South Africa, have been recog- nized at Mogador, on the west coast of Northern Africa. From these circumstances we assume that commerce has existed in remote ages and among most inhabitants of the world. And we must not lose sight of the fact that if we find trade and emporiums in one place, some corre- sponding industries and manufactures must exist elsewhere in connexion with them.*~~

~~*V. Family Development.—To say that of all institutions the family is the oldest and most sacred, that from it all social rights and duties are derived, like branches from the parent stem, would be considered a truism. Nothing looks more plausible than the universal traditions, appa- rently well founded on historical records, according to which the founder of the nation, the ancestor, as he is called, had sons, who founded families, which increasing at every generation, became so many tribes, which coalesced as time went on. HIstorians and moralists have not been slow to credit the poets whose idylls described in glorious colours these*~~

~~*primitive families. It was the belief that, notwith- standing the expulsion of man from paradise, and the*~~

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~~*murder of Abel by his brother Cain, the progenies of our first parents led a gladsome life, scarcely less inno- cent than it was when lambs and lions frolicked together on the banks of the Gihon and the Pison. Directly after the deluge the so-called patriarchal family is thought to have arisen. Perhaps even then it was a little tainted with, polygamy and some other minor defects, but on the whole, it was a model of virtue, worthy to be set as an example to a degenerate posterity. Modern re- search flatly contradicts this common-place romance, denies these self-evident propositions which have become historical axioms. Science is no longer of opinion that tribes and nations have been evolved from the family; on the con- trary, it holds that the family has been evolved from tribes and hordes. It is not denied that the first step in the path of material and moral progress began with the rear- ing of a family, and that family cares have been the most powerful agents of civilization, but it is denied that the family has existed in a perfect state from the beginning. The family had to grow like every thing else. As we see it now, it is an institution of a comparatively recent date.*~~

~~*In the same manner the belief, conscious or unconscious, has prevailed in most minds that monogamy was the first law of marriage, and that polygamy and polyandry have been wilful departures from a known rule. The reverse appears now to be the fact. In a book which was published as far back as 1861 Professor Bachofen of Basel pro- pounded a theory, deduced from a careful study of classical literature, that true marriage, unknown to the hunting, the fishing, and the nomadic tribes, arose with the spreading of agriculture, the husbandman wedding the wife at the same time that he wedded the soil. Previous to " husbandry" in both senses of the word, pre- vious to any regulation in the matter, the females and the children, he contends, were the common property of all the males of the tribe. In some legends this state of things was symbolized by the spontaneous vegetation of the marshes, rushes and wild asparagus. But the woman, spoil of the victors, passed or knocked about from man to*~~

~~man, and even from tribe to tribe, yearned after a better regulated state of things. Under her influence, the rudiments of the family grew into shape. Paternity was an idea which did not and could not have a place in such societies. A child had a hundred fathers or none, but he had one mother; he knew the breasts which had given him suck. In this state of human relations, descent was traced exclusively through mothers. The first kinship was between the offspring of a common female ancestor. 'To trace descent through the male is an idea of far Jater date. By this discovery (for it deserves to be ranked as a dis- covery) a flood of light was thrown on a whole region of the obscure past. It is assumed that under the influence of the then recent idea of motherhood diverse religions arose, all having as principle the worship of Mother Earth, Demeter. And starting from the supposition that religions have been always the expression of the deepest thought and the loftiest aspirations of their worshippers, that practice was the exact counterpart of philosophy, Professor Bachofen inferred that, the Divine Mother having been recognized as the fountain of existence and the source of all right, the human mother was likewise the fountain of authority; and that in some places, and for a certain period at least, woman as such had exercised political power, and had enjoyed a certain degree of social supremacy,—a startling conclusion, which the stories and traditions respecting Oriental queens did not sufficiently justify.~~

~~In originating the theory of gynecocracy so-called, the limit of valid deduction had been overstepped, but the great law of maternal filiation has proved sound, Mean- while, in his Lssay on Primitive Marriage, M'Lennan~~

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~~had come to the same conclusions as the author of AMutterrecht, about the system of kinship through females only. He made the system clear, not by abstract and far- fetched considerations, or on scanty testimony transmitted by Herodotus, Hesiod, or A'schylus, but by the unmis- takable instances which ethnography most abundantly supplies. It is now admitted as a fact that maternal kinship was anterior to the paternal, or, as Sir John Lubbock puts it, "children were not in the earliest times~~

~~*regarded as related equally to their father and their mother; but the natural progress of ideas is, first, that a child is related to his tribe generally; secondly, to his mother, and not to his father; thirdly, to his father, and not to his mother; lastly, and lastly only, that he is related to both." M'Lennan had been led to formulate the principle by a careful study of that old Roman legend, the Rape of the Sabines. He demonstrated that the legend was in accord- ance, not only with the practice still prevalent in many savage countries of capturing wives by violence, but with the sham fights and mock scuffles which, even in our days and in Europe, take place between the bridegroom's party, pretending to carry off the bride, and the bride's party, pretending to ward off the bridegroom's attack. He showed that the symbol implied something more than the mere law- lessness of savages, and proved the fact that at one time wives were systematically obtained by theft or force. And as real capture could not have been practiced by peaceful neighbours in the midst of the same community, it was necessary to infer that wives were captured from other tribes, whence the distinction between exogamous tribes, marrying outside the pale of their community, and endogamous tribes, marrying within it. He supposes that the origin of exogamy is to be connected with the practice in early times of female infanticide, which, rendering women scarce, led at once to polyandry within the tribe, and the capturing of women from without. To tribes surrounded with enemies, struggling against the difficulties of existence, sons were a source of strength, both for defence and in the quest for food; daughters a source of weakness,—they ate and did not hunt. They weakened their mothers when young, and when grown up were a temptation to surrounding tribes. Hence tle cruel custom which made the primitive human hordes prey upon one another for wives.*~~

~~*Tylor, who has also called attention to exogamy, regards it as mainly due, not to infanticide, but to the beneficial effect of marrying out-and-out, and to the physiological evils of marrying in-and-in. This theory is favoured by estab- lished maxims, breeding in-and-in being perhaps held by public opinion as more noxious to the human species than professional breeders think it for animal stock. As an exogamous tribe increased and enlarged its territory, it may have become endogamous for practical reasons. Sir Jolin Lubbock suggests another motive. "Endogamy seems to*~~

have arisen from a feeling of race pride, and a disdain of surrounding tribes, which were either really or presumably in a lower condition." Sir Henry Maine is very suggestive :— "The barbarous Aryan is not generally monogamous, but exogamous. He hag a most prodigious table of prohibited degrees. The Mussulman, however, is not only poly-gamous, but endogamous; his law permits comparatively near relatives to intermarry. The comparative liberty of intermarriage is a part of the secret of Mahometanism's suc- cess in India." .

Lewis Morgan, an American who lad studied by per- sonal intercourse the organization of the family among the Seneca Indians, into whose tribe he was adopted, says, in his Ancient Society, that exogamy and endogamy are not as antagonistic and contradictory to each other as they are supposed to be. According to him, the com-

munity at large is often practically endogamous, while the gentes, or set of families, which constitute it are rigorously exogamous. 'The lineage is in most cases through descent in the female line, and the males are obliged to marry into other gentes.

Family institutions are in themselves an interesting object of study, and they have besides a wide practical bearing, as they are everywhere inseparably connected with the rules of property and inheritance. They may be conveniently discussed under the following heads :—

Marriages communal and free to all members of the tribe—Hetzrism or Promiscuity—Woman Capture—Female Infanticide—Marriages communal, but restricted to certain sets of persons—Endogamy—Exogamy—Adelphogamy—Levirate—Polygamy—Polyandry—Mazriages by Pairs—Monogamy—Courtships—Bridals—Marriage by trial—Nuptial customs—Divorce—Widowhood—Re-marriage—Birth Ceremonies—The Cowvade (a custom which was held to be the quintessence of absurdity, until it was shown to be a symbol by which the father acknowledged the child, and especially the son, to be his)—Ceremonies observed at the giving of the name, at the cutting of the first tooth, and upon arrival at puberty or nubility—Old age and infirmities—

~~*Parents' killed by their children through filial piety, or from poverty—Iuneral rites, few of which, if any, can be explained unlcss they are looked at in the light of religions ceremonies.*~~

~~*VIs Social Development.—Sociology narrates how men became grouped in political communities, how they con- stituted authority and property, how they originated castes and guilds, and by degrees separated into high and low, rich and poor. Of all the fields in ethnology, none is at present cultivated with more care and intelligence than that which deals with the history of society, and none perhaps with a greater prospect of fruitful results.*~~

~~*Grouping in Hordes, Tribes, or Nations—Man i3 a gregarious animal. Society develops intelligence, comfort, the sentiments of justice and equality, of fraternity, good- will, and cheerfulness to a degree which would have been unattainable in a severe and prolonged solitude. The first hordes were scattered over vast areas, and were each very small. It is probable that they were recruited not only from within by births, but from without by capture of women and children, and by the voluntary or forced accession of their neighbours to their ranks. We draw a distinction between the human horde, which we hold to be superior only in degree to a herd of brutes, and the tribe, in which we recognize the first buddings of culture. The love of the mother for the young is an impulse to in- telligence and devotion among all higher animals. The certainty of parturition at a period fixed for every species induces precaution and forethought. The rudiments of true humanity we conjecture therefore to have been the acknowledgment of motherhood by the tribe, and the first regular provision for the care of the expected infant. As it has been said already, the family had its origin in the gathering of children round their mother. These children became to one another brothers and sisters by the remembrance of the care they had enjoyed in common. They kept together; so did their children and their children's children ; and the ges took shape and life.*~~

~~*Probably the original horde was by degrees remodellcd into tribes by the gentes which had taken birth in it, The word gens, equivalent to clan, sept, or totem, being the best known of all, may be used in a general sense*~~

~~*to denote all kindred institutions. The tribe became an organization of gentes. An Indian tribe, according to Lewis Morgan, is composed of several gentes, developed from two or more, all the members of which are inter- mingled by marriage, and all of whom speak the same dialect. To a stranger the tribe is visible, and not the gens. It is highly convenient for a tribe to contain at least two gentes, which, if they choose to intermarry, would find wives at their own door. A fundamental law of the*~~

~~*gens prohibited marriage between gentiles, or members of the same gens. For most communities were deeply averse to consanguineous marriages, which they branded with the infamous name of incest, though some others held them to be highly commendable. The original rule was that all descendants by the same mother were to be regarded as brothers and sisters, and they were soon forbidden to con- tract matrimonial unions. As there was no relationship by the father's side, the patriarch Abraham could in all propriety take his sister, or rather his half-sister, as a wife. And such a tribe, consisting of two gentes only, intermarrying constantly, might be composed of first cousins only, and be strictly endogamous nevertheless.*~~

~~*Further rights and duties of the gentiles were the reci- procal obligations of help, defence, and redress of injuries against any one from without. They had the same religious rites, and a common burial place. The archaic gens inherited the property of its members, as they were taken away by death, and redistributed it every year, or at stated periods. All children of earth return by death to her bosom, and all the gentiles were brought to rest in a common burial place. The gens was primarily a great motherhood, and the gentiles, all of them, were supposed to be brothers and sisters, and to live in their mother's home.*~~

~~*As in the course of time the gentes increased, they segre- gated to a certain extent, but maimtained their association for certain common objects; the enlarged association was called a phratria or brotherhood. Each of the four tribes of the Athenians was organized in three phratrias, each composed of thirty gentes. The Roman curia was the analogue of the Grecian and the Iroquois phrateias.*~~

~~*In the normal course of events the tribes increased and segregated as the gentes had formerly done. And 'as the gentes had recoalesced in phratrias, so did the tribes reunite in confederacies. Where one Indian tribe had divided into several, and the subdivisions occupied independent but adjacent territories, the confederacy reinte- grated them in a higher organization, on the basis of the common gentes which they possessed, and of the affiliated dialects which they spoke. The confederacy had the gentes for its basis, and the mother language as the measure of its extent. Its formation required the highest skill. The Troquois ascribed the origin of theirs to divine inspiration ; they considered it to be "the masterpiece of wisdom." To bring many tribes together, to conciliate the conflicting interests in a superior organization, and make it work, re- quires an intelligence much superior to that which is required for gaining victories in the battlefield. Therefore confederacies have been always rare achievements. 'The common course of events has been rather that tribes have become nations, not by peaceful and voluntary aggregation, but by the bloody work of war and conquest, by constant encroachments on the territory of neighbours, by killing part of them, and enslaving the rest.*~~

~~*Authority.—When not actually engaged in a war or in a hunting expedition, wild tribes are often without recog- nized chiefs. In case of need, in dangerous emergencies, natural superiority soon asserts itself, and the boldest, strongest, most intelligent, or most experienced steps forward as leader. With the children of nature authority is of a more transient and less definite character than with us. Their aggregations are, as a rule, very small. In order to understand the most ancient condition of human society, says Sir Henry Maine, all distances must be reduced, and we must look at mankind, so to speak, through the wrong end of the historical telescope. Many anthropologists are of opinion that civilization has increased the differences in the anatomy of man and woman, in the stature of giants and dwarfs. There is stronger evidence that it has in- creased intellectual differences, The oscillations on either*~~

~~*side of the average line of learning and intellect are widest in our populous and complicated communities, where the talented are more talented, and the stupid more stupid than elsewhere. In small bodies politic, there is not the saine necessity for strict discipline as in the large ones. And the larger they grow, totis paribus, the more despotic they become. History has shown it to be the case with all great monarchies, which in times ancient and modern have been synonymous with despotisms. When conquering Rome overstepped the limits of the Italian territory, she ceased to be a republic, and despite the desperate efforts of her best citizens she became an empire. 'The larger the territory, the greater are the inequalities between the inhabitants, and the greater the danger of despotism. 'To our eyes kingdoms like those of Dahomey, of Ashantee, or of Uganda, may not appear very large, but to negroes, whose minds are unable to grasp any thing very complex, they seem immeuse. In fact, somie savage rulers believe themselves to be real gods,— believe without a shadow of doubt that their ancestor created heaven and earth ; they are persuaded that the limits of the habitable world are not far beyond the boundaries of their petty dominions. We are expressly told by travellers that their subjects hold them in greater reverence than divinities. The innumerable varieties of governments is perplexing to ethnologists, who find often the most hetero- geneous forms side to side, and see intelligent and courage- ous nations submit to a tyranny which would often appear intolerable to their neighbours. Forces are constantly in operation, of which some tend to increase the liberty of the citizen, and some to increase the authority of government. If we are believers in the general principle that self-govern- ment is the best, then we shall be astonished to find how often it has been obtained by nations which we deem much inferior to ourselves. So-called savages possess a degree of freedom and enjoy an absence of restraint which well may kindle the enthusiasm of the youthful readers of Fenimore Cooper, and provoke melancholy reflections in many people who feel over-governed, and ruled down, who complain that the price which we pay for the blessings of civilization is too high.*~~

~~*For the men who exercise power, it is dangerous not to have an eye open, if not to the general benefit, at least: to the interest of some powerful class. This fact is often disregarded ; historians easily overlook the*~~

~~*circumstance that a ruler, however violent, rash, and headstrong, is in most cases but the tool, conscious or unconscious, of a party. Because orders are given in his name alone, it is not remembered that in reality he acts not in his personal capacity, but as the general manager of a joint-stock company with numerous shareholders. If we revert to the historic origin of authority, it is highly probable that the gens, to which is attributed the interior organization of the tribe, has been also the most efficacious constituent of political power. The most powerful gens taking the lead of the other gentes, the head of that gens became easily the regular chief of the tribe. Such a government might as easily become republican as monarchical or oligarchic. To the Commoners of the English Parliament corresponds the assembly of the people,—that is, of all the gentiles ; to the senate, or Lords, corresponds the council of the elders and chiefs of gentes. Either the council, or the assembly, or both together, entrusted the executive power to one pre-eminent official, who may have exercised at once the functions of priest, general, and chief justice,—for in early times the cumulation of offices was the rule, and the division of labour was the exception. In his interesting book, La Cité Antique, which depicts society under the posteriur gentile organization, M. Fustel de Coulanges represents the paterfamilias as being at once a tiller of the soil, a warvior, a judge in his own household~~*~~

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~~*invested with the power of life and death over his wife, his children, and his slaves,—a priest and an offerer of sacrifice, when officiating before his sacred hearth. The rex or basileus, acting on behalf of the whole city, was the representative paterfamilias, acting in the name and on behalf of all his brethren.*~~

~~*Property is an institution which stands second in importance to none. Property went on increasing in amount from the hunting and fishing period to the pastoral, and from the pastoral to the agricultural—not to stop there. Riches increased in proportion to the intelligence and to the amount of work done. As riches accumulated, so increased not only the greed but, what is an apparent con- tradiction, the need for them. The men in authority, the strong, took more than their share, the weak*~~

~~*growing con- stantly weaker, the poorer becoming either paupers or slaves. When riches were made fairly abundant by agriculture, the pristine gens with maternal kinship had to give way to the gens with paternal kinship; for it was contrary to logic that the privileges of riches and power should be still bestowed by enslaved women, when the circumstances of family life established a sufficient certitude of paternity. Thus internal revolutions modified totally the character of the gens in the course of time. It had begun by being feminine in character, it ended in being exclusively masculine. Originally property was held in common by all gentiles; by degrees its ownership became restricted to constantly diminishing circles of relations, and finally an end was niade of collective property ; the principle of private ownership obtained the victory, and reigned supreme as it does now.*~~

~~*And when, in the leading states, the principle of collective property which underlay the gens had lost its vital force, the gens fell or was overthrown and crumbled to dust. This mighty fabric, the most considerable perhaps of all human institutions, has broken down everywhere, but it has not been totally destroyed. Its débris lie broadcast over the earth, from Rajputana to Scotland and Ireland, and thence to America. In the still existing Howse or Village Communities in the Hast and West, as described by Sir Henry Maine, we see living remnants of that institution in which formerly all ideas of peace, industry, justice, and progress had centred. Once the gens was all, and it was believed that it would remain all to all time. At that period, the gens was a political and a religious no less than a family institution; each gens was a complete state in itself. Where the gentes absorbed all the members of the tribe, leaving nobody out of its pale, and giving a fair share to all, the institution was perfectly compatible with progress, at least for a long time. But it happened other-Wise in many instances, and especially among the gentes which are the best known to us, those of Greece and Rome. There the gentes took advantage of the fact that they were the first organized body to arrogate all power, and most obstinately they kept it, making themselves a privileged class, ruling a mob of paupers, exiles, fugitives, runaway slaves, and their progeny the proletariate. Theoretically the gens might have endured for ever, if it had consented to take up outsiders. But collective bodies lack generosity, especially when they are powerful. The*~~

~~gentiles went on increasing the number of non-gentiles by their raids and wars, conquering and enslaving other free men, until the privileged ones were outnumbered, outwitted, and finally ousted from power by the multitude of the non- possessors. And thus sovereignty, which for long ages rested upon the family system, rests now upon the terri- torial system,~~

~~VII. Jntellectual Development, Language, Irterature, and Arts.—To no other auxiliary science is ethnology so much indebted as to philology. Not long ago the two~~

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~~sciences were confounded with each other, and purely linguistic disquisitions went nnder the name of " ethno- graphic researches," as in the Aélas of Balbi, where the word "ethnography" occurs perhaps for the first time (in~~

~~1826).~~

~~Formerly the words "nations" and "languages" were synonymous, In Genesis the confusion of the tongues is said to have caused the separation of mankind into nations, A language is to be considered as the collective brain of anation ; the vocabulary shows the richness of its ideas, the syntax how it works them. While our lexicographers count their words by the ten thousands, we are assured that the savage is scarcely able to use more than twelve hundred words, and that many English rustics have not more than four or five hundred words at their disposal. A nation's language is tlle sum of its developed intellect, the record of its previous intellectual efforts. From that store of accumulated ideas and feelings our children draw the best part of their information, the most of their morals. Our mother tongue is our intellectual motherland.~~

~~For a long time, the element of race had been considered to be the greatest of all ethnological factors. Some even drew between Aryans and non-Aryans a line which would have been scarcely sharper if it had been between men and brutes. But after all, affinity of blood seems to have much less influence on men tlian the affinity of reli- gions, and the~~

~~*affinity of religions less than the affinity of languages, at least in modern times,—for this reason, that language is the sum and religion a part only of our thoughts. A curious example of the power of language is observed in Roumania. Its inhabitants claim descent from Italian colonists, an obscure and certainly very mixed stock. For a time they were thought to have disappeared among the Slavs, whose Greek religion had already conquered them, and already acted powerfully on their language. But the language which had been brought to the plains of Moldo-Wallachia by poor soldiers and ignorant peasants stubbornly resisted extinction, and at last obtained the advantage over its invader, because as a vehicle of thought it brought with it the ideas and memories which are preserved in the pages of Virgil and Cicero, and finally the Roumanians elected to enter into the fellowship of Latin nations. It is the English language which in the United States has welded into one nation the motley crowd of immigrants landing from so many countries and professing so many religions.*~~

~~*Ethnologists, as such, are not concerned to inquire into the difficult problem of the origin of languages, which is to be worked out by the professed philologists. _The solu- tions, however, which seem self-evident to linguists on mere philologic grounds, if they do not tally with ethnological experience, will have their acceptance postponed by ethnologists until further examination. For example, some authors will have it that nations must be considered as belonging to different races, and descended from ancestors of totally inconsonant minds, if one uses as a prefix what another would use as a suffix, or if one puts the attribute after the substantive when another puts it before. Between the isolating, the agglutinative, and the inflexional languages they have drawn the same distinctions as those established by the botanists between acotyledonous, monocotyle- donous, and dicotyledonous plants; and they want the ethnologists to classify nations accordingly,—the last of the three, v.¢., the inflexional, being supposed to have a pre- ponderance as great as that of the vertebrates over the in- vertebrates. And, furthermore, considering that the in- flexional languages are less sonorous and abundant in forms than they were in their earlier stages, philologists took much to heart what they regarded as a linguistic deteriora- tion, From that degeneration theory there is an easy transi-*~~

tion to the belief that language is a divine revelation, or |

at least a sudden and spontaneous birth in the soul of every race (Renan). This theory, which presupposes the plurality of races, may be very acceptable to philologists, but is one with which most ethnologists do not agree. Whiere philo- logists see a difference in nature, ethnologists see rather a difference in degree; they object that "it must not be by any means supposed that complexity in language implies excellence or even completeness."

What mere philologists call debasement, philologists who are also philosophers call improvement. Mere artists or calligraphers may deplore the deterioration of hiero- glyphics with elaborate drawings into a cursive, demotic writing, which has led to the adoption of our unpicturesque alphabets. " The phonic alteration," says an able linguist, Mr Michel Bréal, "helped the emancipation of thought ; it furthered the first steps of man in the path of abstract thought; it gave to the human mind the same assistance as algebra gives to the mathematician, when it substituted sigus more abstract still" Mr Sweet (Language and Thought), considering it an amelioration that English has cast off "an effete inflexional system," does not lament that "' English is to be compared in part with agglutinat- ing in part with isolating languages, such as Chinese."

These reservations are made not because ethnologists think little of philology applied to ethnologic research, but rather because they know that alliance to be a vital necessity, aud hope by concerted action to increase its usefulness. Philology, like history, was long limited to a study of the Greek and Latin languages, until it was made a totally new science by the discovery of Sanskrit, and by the vocabularies which travellers collected from all parts of the globe. In the hand of modern observers, such as Bopp, Schleicher, Fick, Max Miller, Friedrich Miller, Curtius, Pictet, philo- logy has become a sort of telescope by which human sight penetrates the night of centuries long past. '" By marvel- lous efforts of sagacity it has reconstituted the social state, the uses, the ideas, the beliefs of the ancient Aryas, whose moral history is now better known to us than some periods of Roman history. It has discovered bonds of parentage

~~*between nations, which, as the Greeks and Persians did, reproached each other with being barbarians, and it has descried a diversity of origin between natious, which, as the Greeks and Egyptians, thought themselves to be closely allied" (Bréal). How the sagacity of the philo- logists adds to the achievements of ethnology is shown by Peschel, who thus sums up the results of their labours for finding out where was the cradle of our Indo-European ancestors :—*~~

~~*'" When the anvient vocabulary of the primordial Aryan age is restored by collecting the roots common to all the inembers, we at the same time obtain an outline of the social condition of these nations in the most ancient period. We thus learn that they already tilled the ground, ploughed it with oxen, used carriages with wheels, kept cattle for the production of milk, and ventured on a neighbour- ing sea in rowing boats, but did not use sails. It is more than doubtfal whether they smelted metals, especially as the name for bellows is not derived from the primordial place of abode. As they were not acquainted there with the ass and the cat, both ancient domestic animals in Africa, they had not as yet inter- changed any of the treasures of civilization with the Egyptians. As they had the same terms for snow and winter, and the other seasons afterwards received different names, we may be certain that in aneient Arya there was an alternation of hot and cold months. In these primitive abodes dwelt bears, wolves, and otters, but there were neither lions nor tigers. It lay eastward of Nestus in Mace- donia, which in the time of Xerxes was the limit of the European lion. It was also further north than Chuzistan, Irak-Arabi, and even than Assyria, where lions are still to be met with. It cannot have included the high lands of west Iran and the southern shores of the Caspian Sea, for tigers still wander in search of prey as far as those districts. Hence every geographer will probably agree that the Indo-Europeans occupied both slopes of the Caucasus, as well*~~

~~*as the remarkable gorge of Dariel, and were in the habit of visiting either the Euxine or the Caspian Sea, perhaps both."*~~

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~~*Mr Hyde Clarke shows that the original names of some African weapons are still names of stones,—an interesting circumstance, as the belief gains*~~

~~*ground in some quarters that the despised Negro invented the smelting and the working of iron, a discovery which ranks second to none, and to which are mainly due the wonders of our modern civilization in this, the true Iron Age. Geiger claims to have proved that, as recently as the Homeric period, men hada very imperfect aud even deficient perception of colours. Bolder still is Herr Fick, who has construed some hundreds of proper names by which the " Proeth- nians," supposed aucestors of the Celts, Germans, and Zends, may have been called before Sanskrit was yet born. Many other proofs might be given that philologists, who quite recently dared not, as it were, lose sight of the Medi- terranean coasts, now uavigate the most distant seas, far beyond the Ultima Thule of yore.*~~

~~*Language is the highest work of a nation, a work of art, and often a nation's only one. The study of languages leads to the study of popular poetry, of songs, of dances, and of music, all subjects upon which we possess a mass of information, but little knowledge. The details are ready, collected from all parts of the world, but the synthesis has . not yet been made.*~~

~~*It is a curious fact that very accurate and even artistic etchings made on bone or horn, with the point of a flint, are found in the remains of the early stone age, but are wanting not only in the later part of the stone age, but also throughout the so-called bronze period. The orna- mentation of pottery was very rude and scanty, progressing very slowly, but in the age following it seems to have taken a start—imitations of plants and animals being essayed. The Eskimo are fair draughtsmen. The Indians draw like children. Polynesians do not draw, but carve and paint. The Bushmen and Kaffirs have no idea of perspective, the Chinese very little. Drawing on a flat surface re- quires a certain degree of thought, and encountered pro- bably much prejudice, because it was supposed to catch the shadow, or the soul of the objects. Carvings and mould- ings in clay were easier, not to execute, but to attempt. It is beyond question that personal ornament was the be- ginning of art. Savages are passionately fond of adorning their persons with painting (probably the hunters of Cro-Magnon, Schussenried, and Thayingen bedaubed themselves with the ochre found near their bones), with tattooing, with all sorts of necklaces, bracelets, necklets, armlets, leggings, breast-plates, and stomachers, with*~~

~~*fantastic head- gear, and quills, pearls, shells, and rings through tlie nose, ears, and lips. Even the front teeth have been inlaid with shining knobs, as among the Dyaks. We are, in this depart- ment, encumbered by a mass of details, which require to be systematically arranged, examined, and compared, in order that they may become part of a science, or even a science by itself,*~~

~~*VIIL. Religious Development, Myths and Legends, Magre and Superstetion.——Controversies have been waged upon this question—" Do any tribes exist which have no kind of religion?" What made the dispute interminable, and of little profit, is the fact that the disputants attached different meanings to the same word. Reports of missionaries were quoted, some affirming, some denying. Thus facts have been brought forward to prove either that the Russian peasants are very religious or very irreligious. The truth is that the religion of these simple-minded people is so nixed up with superstition that rigorous critics who main- tain that superstition is the reverse of religion, as much as of morals, have no difficulty in proving that many of these country folks practice real shamanism under the cloak of Greek Christianity. But ethnologists are not expected to be either severe or indulgent; they have to give a defini-*~~

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~~*tion covering the ground occupied by all religions, be they true or false. Their definition of the word, although a philosophic one, falls in with that which many theologians have formulated. 'Religion is the feeling which falls upon man in the presence of the unknown." Man fears and must fear the unknown, becausc the unknown may be dangerous and terrible, because the infinite is hidden in the unknown. Man personifies the Unknown; when his mind is strongly excited, he cannot do otherwise. And that personification he seeks to propitiate.*~~

~~*As regards superstitions, while moralists and social re- formers consider them to be baneful weeds which it is their duty to dig out and destroy, ethnologists consider them as wrecks of former beliefs, over which the waves of many centuries have washed. The symbol has remained, but its significance is gone; the comprehension, never more than superficial, becanie lost, but the reverence was great, and survived. Thus, paganism*~~

~~*underlies Christianity still, especially among ignorant rustics, a fact which the word pagan itself illustrates (pagand, country folk).*~~

~~*Classic paganism, the product of a late idealism, was in its theory too philosophic to be understood except by the few; it propounded the worship of the sun and ether as male principles and sources of light, heat, and life. It had suc- ceeded to the so-called chthonic religions, of which Professor Bachofen (Jfutterrecht) and M. Jules Baissac (Les Origines de la Religion) have been the exponents. The Earth Mother was then the centre of stellar, solar, and lunar deities, lunar deitics especially, the moon being often considered as of the male sex. Irom internal evidence, it may be supposed that these religions were devised under the influence of agricul- tural practices, when the idea of paternal filiation began to be slowly evolved from the maternal. And the chthonic rcligions were themselves in their origin an innovation upon animal worship, which corresponded to the rise of Totemism (M'Lennan, Spencer) upon Shamanism, and the still ruder Fetichism. The lowest religions are characterized by their containing the greatest proportion of magic and the least of science and morality. In that stage, the invisible powers of witchcraft and sorcery are made to explain what- ever is not understood,—even the fact of natural death, the explanation of which one would have thought to be the first to loom on these dark intelligences. But seeing around them so many violent deaths, among men as well as among brutes, they believed that all death, and even all diseases, were owing to magic.*~~

~~*Magic has been analysed. Its essence is the belief in the action of spirits or souls of dead men. That belief is called Animism (g.v.) by Tylor, whose researches on the subject constitute one of the most important results of English ethnology. He says—*~~

~~*'* Animism characterizes tribes very low in the scale of humanity, and thence ascends, deeply modified in its transmission, but from first to last preserving an unbroken continuity, into the midst of high culture. Animism is the groundwork of the philosophy of religion, from that of the savages up to that of civilized men; but although it may at first seem to afford but a meagre and bare de- finition of a minimum of religion, it will be found practically sufficient ; for where the roots are, the branches will*~~

~~*generally be produced. The theory of animism divides into two great dogmas, forming parts of one consistent doctrine; first, concerning souls of individual creatures, capable of continued existence after death; second, concerning other spirits, upward to the rank of powerful deities. Spiritual beings are held to affect or control the events of the material world, and man's life here and hereafter; and it being considered that they hold intercourse with men and receive pleasure or displeasure from human actions, the belief in their existence leads naturally sooner or later, to active reverence and propitiation."*~~

~~*Indications are not wanting that prehistoric men were addicted to magic. In the Swiss lake-dwellings, crescent- shaped implements in baked earth have been found, which are supposed by some to be amulets, and related to moon*~~

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~~*worship; and the absence of all bones of hares in the kitchen middens is generally explained by a superstitious avoidance of that animal's flesh.*~~

~~*Superstition or prehistoric religion still survives even in the heart of civilized Europe, where many of its bizarre and grotesque practices are to be found similar to those prevailing in China, and in the dark corners of Africa and Australia. How is this universal prevalence to be ex- plained? Does it prove that the communications between distant members of the human family were more active than it is commonly supposed that they were? Does it prove that we did all come from the same stock? Or is the true explanation this, that the similarity of effects results from the similarity of causes, and that men evolved analogous beliefs because they have analogous minds? Mr Herbert Spencer (Animal Worship) is of opinion that, considering the sum of knowledge which primitive men possessed, and the imperfection of their signs of language and thought, the conclusions which they arrived at were after all the most reasonable. Till recently sensible men did but shrug their shoulders when they heard of super- stitions. They had little thought of collecting them with care, and still less of studying them in earnest as subjects of scientific inquiry, and precious as embodying the oldest accessible thoughts of mankind. Some beginning has been made. Brandes, Henderson, and Wright in*~~

~~*England, Wuttke in Germany, Kreutzwald in Esthonia, Grohmann in Bohemia, Dennys and Doolittle in China, and many others have collected precious documents. A mass of material lies scattered about, especially in books of travels. Explorers in this field of inquiry ought not to be repelled by the amount of nonsense they encounter; the more absurd the text, the more ancient and genuine it probably is. Most things would be inexplicable if they stood alone, but one explains another. Here, as in natural history, the value and signification of the individual object is best perceived when it is examined in the series to which it belongs.*~~

~~*Fairy tales and popular legends find little favour with many enlightened people. Of course if these tales were to be taken literally, they would be pronounced pure nonsense, but their meaning, like that of poetry, is an ideal one; they are intended to please and invigorate the imagination of children. In ancient times, when their primitive form and meaning were less altered, they had a higher purpose. Those mixed up with animal stories of a certain character appear to have been Buddhist parables intended to teach fairness and goodness towards "the weaker brethren." But although twenty centuries old and more, they belong to the later creations in the development of human thought. The oldest stories are scraps of prehistoric myths, cosmologies, and epics. Although they have been patched up a thousand times, they have still kept enough of their original traits to be still recognizable.*~~

~~*And it is not only popular tales and proverbs which are to be regarded as records of ancient lore, but also children's plays, nursery rhymes, and infantine dances, as has been pointed out by Tylor and by Rochholz (Kinderlied und Kinderspiel). Among Kirghiz, Chinese, Redskins, and Bantu negroes, counterparts have been found to the Ziad and the Odyssey, to the grand myths of Hercules and Pro- metheus, to the traditious of the Argonauts, of Danae, Andro- mede, Proserpine, not to forget the most charming romance of Psyche. During the Middle Ages many of those tales were bedaubed with theological additions, and transformed into hagiologies and "Golden Legends." As such they had a separate existence, but fortunately they did not obliterate the recollection of the originals from which they sprang. Struck with a happy idea, and*~~

~~*wishing to prove that the moderns were as good as the ancients, Charles Perrault put his Contes into writing, which he little suspected to be*~~

~~*as old, andeven of the same covey as those of the Greeks. His narrations were gems of elegant simplicity, and their success caused them to be followed by many similar pro- ductions, which were enjoyed as light literature, their scientific import being little suspected, until the brothers Grimm collected the Deutsche Hausmarchen, one of the most popular books published in this century. These savants opened a most fertile field of investigation by their discovery that many German popular tales had for their sub- stratum German mythology. Adalbert Kiihne's Herabkunft des Feuers marked a new step. He showed most clearly that our tales have the same relation with the old Vedan mythology as our languages with the Sanskrit. Benfey proved by other considerations the same thesis, Following them, M. Bréal gave in his Mythe de Cacus a model of science made clear and pleasant. A host of diligent searchers, mostly Germans, for the Germans have taken the lead in this department, devoted themselves to collecting, translating, commenting upon popular tales, songs, and mythology. Folklore now constitutes quite a special litera- ture. We have already legends from all five parts of the world, legends from nearly every important country, and in some countries from almost every province. The immense task of sifting and reconstructing prehistoric mythology has next to be commenced.*~~

~~*IX. Justice and Morals.—Law is anterior to justice. The lower races, says Lubbock, are deficient in any idea of right, though quite familiar with that of law. In fact, civil law, in its origin, is a custom and nothing else,—a custom nieeting some particular want. Therefore laws will not last if they be arbitrary, if they be founded on the caprice of a leyislator, and do not subserve the interests of the majority. True laws are the expression of the people's will; legislature and magistracy are delegations of the people's authority. In primitive communities such delega- tion is often uncalled for; the community acts directly as judge and law-giver, its resolutions being guided not by abstract principles of justice, but by self-interest and a desire for self-preservation,—seldom, if ever, by unselfish*~~

~~*considerations. "Salus populi suprema lex." As the community enlarges this feeling widens and becomes generalized ; by degrees the idea of justice is evolved out of common convenience. Absorbed by their petty local interests, early tribes could scarcely realize the idea of absolute justice, which is inseparable from the idea of mankind at large. Both ideas are of a recent origin; they seem contemporaneous with the rise of the Roman empire, when it strove to take possession of the whole world, and when the positive principles of jurisprudence were set forth with a logic, a vigour, and a lucidity not surpassed, not even equalled since. Our civilized countries have enriched them- selves with a ponderous apparatus of written laws, which are, or are affirmed to be, the outgrowth of customary laws, and an accepted fiction sets forth that every citizen knows and understands perfectly that immense miscellany of rules and statutes.*~~

~~*Criminal law has a similar origin ; it is the part of justice evolved out of vengeance, which, from being with some animals and the lowest tribes a boundless passion, was by degrees restrained, acquired a definite form, and became the law of retaliation,—" an eye for an eye and a tocth for a tooth." From that principle men were sure to infer, "Do not to others what thou wouldst not like to be done to thyself,'—the negative side of a principle which was far sooner understood than its positive side, 'Do unto others as ye would that men should do unto you." The abandonment of vendetta is one of the steps which lead from semi-civilization towards civiliza- tion. But its adoption by primitive communities had in its time heralded an improved state of. things. Its prin-*~~

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~~*ciple is that all the members of a gens are bound to avenge the death or the hurt of any individual member, Thereby the gentiles were involved in continual troubles, By degrees they came to find out that the surest way to minimize the troubles arising out of vendetta was to avoid its causes. This led to the softening of manners. The next step was for the gens to impose upon its affiliates the obligation to resort directly to its tribunal in case of offences. Thus by degrees redress came to be substituted for revenge, and justice taken at one's own hand to be re- garded as fit only for barbarians.*~~

~~*Like the tribe, the gens was for its members an enlarged self, and its motto was—One for all, all for one,—an ideal motto among brothers in a brotherhood, but one fit also to promote' strifes of brotherliood against brotherhood. Friendship, honesty, justice, and even self-sacrifice within the circle of kinship; cunning, violence, murder, ruthless brutality outside. The gentile stood by the gentile for weal or woe, for wrong or right. Men's minds and hearts are now so far enlarged that they can embrace the idea of a whole country, their own. But have we gone really much further ?*~~

~~*X. Progress.—Ethnology, in its actual state, centres upon the theory of progress. It has not only to prove the exist- ence of progress, it has to demonstrate how it operates, and to measure the amount of its work in the different periods. Progress, put in question in all the branches of human development, is nowhere more fiercely discussed than in its relation to justice and morals. This is the most import- ant, the most interesting, and also the most perplexing theme. It is the easiest to discourse upon, as there are no external standards by which to measure internal phenomena, no fixed canon by which to compute the ever-shifting corre- lations between the two great principles of social order and individual liberty—custom and progress, which, far from working harmoniously together, clash so often one against the other. This question is not merely a theoretical one ; it has very practical bearings, now that our civilization is about to take possession of all the world,—now that repre- sentatives of our culture invade in so many places the soil occupied by less advanced communities. Before the last remainders of ancient ages be destroyed, it is certainly worth while to pause and to consider, Are we right in doing away with them, and will the world at large be a gainer by it? The United States, the colonial administrations, are constantly called on to deal with native reserves, native wars, and, alas ! with native extermination. We cannot forget that the landing of Columbus at Guanahani cost the lives of many millions of American and African aborigines, and that the last Tasmanian, the last Guancho, the last Beothus, have been "improved" off the face of earth. We can hardly regard with unmixed feelings the prospect that the whole of the African continent will soon be open to " European enterprise."*~~

~~*We will give an epitome of the debates which are carried on, striking off many arguments for the sake of brevity. It will be but fair to give the first word to a friend of the attacked and (must we say ?) the doomed races.*~~

~~*Mr Wallace, after having given a charming picture of some Malay communities which he had visited, tellsus:. .. ‘ Each man scrupulously respects the rights of his fellow, and any infraction of these rights rarely or never takes place. In such community all are nearly equal. There are none of these wide distinctions of cduca- tion and ignorance, wealth and poverty, master and_ servant, which, while it increascs-wealth, produces also conflicting interests ; there is not that severe competition and struggle for existence or for wealth which the population of civilized countries inevitably creates. . . It is very remarkable that among people in a very low stage of civilization we find some approach to a perfect social state. It is not too much to say that the most of our populations have not at all advanced beyond the savage code of morals, and have in many cases sunk below it.”*~~

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~~*Such pictures as that drawn by Mr Wallace are not unfrequent, and we might have transcribed many pleasant descriptions of the peace, concord, and fraternity reigning among the Todas, Aleutians, and some other primitive communities,*~~

~~*Now comes the indictment by Lubbock, Tylor, and others. It is a heavy one.*~~

~~*‘“The Veddahs of Ceylon are of opinion that it signifies little whether they do right or wrong” (Davies). “To Australians the words good and bad had reference to taste or bodily comfort, and did not convey any idea of right or wrong. . . . The whole tendency of their system is to give every thing to the strong, to the prejudice of the young, and more particularly to the detriment of woinen” (Lang). . .“‘l’o believe,” says Sir George Grey, “that man ina savagestate is endowed with freedom, either of thought or action, is crroneous in the highest degree. . . . Offences, in Fijian estima- tion, are light or grave according to the rank of the offender. . . In Tahiti the missionaries considered that no less than two-thirds of the children were*~~

~~*murdered by their parents." . . . "Conscience does not exist in Eastern Africa. Repentance expresses regret for missed opportunities of mortal crime. Robbery constitutes an honourable man. Murder—the more atrocious the midnight crime the better—makes the hero" (Burton).*~~

~~*And is civilization any thing else? reply the others. Is it not the same struggle for existence, but here on a gigantic scale? Is not our incessant battle for life little short of wholesale murder ? Is it not accompanied with the same envy, with the same remorse- less hatred, but under a thicker veil of perfidy and hypocrisy? The Anthropological Society in London was told by the late Winwood Reade that among the savages of Africa he had not seen anything as bad as the pauperism, as the mass of misery and degradation to be found in our large cities. The Anthropological Society of Paris was told by Mr Coudereau that in our modern Europe the moral and intellectual development of the multitude is not superior to that of the Dahomians. It was said by Mr Lavrof: " Between our peasants and the primitive savages there is little difference. The religions and the most advanced philosophies, which hold so large a place in the history of mankind, have never been taken up in reality except by a minority numerically insignificant. Were they profitless to the majority? No, they enriched it with new amulets, new magical signs, new forms of divination. And when practical results of science, such as the electric telegraph, enter into common use, their real signification is as little understood by our country folks as it would be by the Marquesas Islanders."*~~

~~*Although there may have been some exaggeration in the expression, the facts which have been alleged on both sides are true; none is to be explained or trifled away.*~~

~~*Thus it is evident that among civilized men all is not satisfactory, while among uncivilized all is not unsatisfac- tory. We are led to infer that civilization amplifies and intensifies its elements. We had already occasion to note that among ourselves the extremes are wider apart than among the barbarians. We can say that we are at once materially much better and much worse off, and morally much better and much worse than savages. And as to man himself it can be said that of all ferocious*~~

~~*brutes he is the most cruel, and of all gentle animals the most affec- tionate.*~~

~~*Can material progress be disputed? An increased pro- duction of food has enabled greater numbers of men to live; their daily ration of eatables and drinkables has been increased; the quality of their vestments has been im- proved; most people do not dwell in damp holes dug in the earth; they do not any longer roost in the branches of trees. Not to speak of other comforts, the invention of lucifer matches and of candles have been splendid achiev- ments in their day. That the intellectual progress has been prodigious from the time when our forefathers were unable to count their own fingers, even of one hand, as Spix and Martius tell of the Brazilian Wood Indians, to the transformation of mathematics into a powerful scientific engine, to the calculations of Newton and Laplace, to the wonders of spectral analysis, is a position nobody dares to impugn.*~~

~~*Material and intellectual development being satisfactorily settled, we touch upon the vexed question of moral pro- gress. Mr Wallace says—' While civilized communities*~~

~~*have increased vastly beyond the savage state in intellectual achievements, we have not advanced equally in morals." It may be said with equal truth that this progress has been immense, aud that it has been ridiculously small,—immense, if we consider that there is an infinite distance between nothing and something ; very small indeed, if we gauge the precise amount of that something. But that actual something will appear larger if we trace it to its original state, of which we do not find the like among the present savages. Their abject condition, abject as it has been depicted, is yet vastly superior to that of the supposed primeval man. Everything tends to prove that mankind, far from being born with a vivid sense of right and wrong, as the common doctrine will have it, had to evolve a moral sense by a long process. Through ages man must have collected sensations of a peculiar sort, which at first wero slightly perceptible, and which, when accumulated, became that positive perception, the most to be cared for of our inherited abilities. 'The world is very young," said Mrs Mill, "and has only just begun to cast off injustice." And we hold to be survivals of antecedent ages the instances*~~

~~*which show among civilized and uncivilized an utter absence of morality, the lack of all fairness and generosity. But in our times these instances are exceptions. On the average, we know better than the Bechwana, who, being asked what it meant 'to be good," was much puzzled, but finally answered, "To be good it is to possess a wife and cows, and to steal one neighbour's wife and cows;" or than the Pawnee, who said, 'He is a good man who is a hunter sly, crafty as a fox, daring and strong as a wolf."*~~

~~*A last question arises—If moral progress be a positive fact, how could it be denied by intelligent observers ? First, progress is far from being always evident. Its course runs not incessantly onwards in a straight line at a uniform speed; it proceeds by irregular motions and some- times by curved, by broken, or even by spiral lines. Then we are apt to underrate a progress which has become a habit. The pleasure which an improvement gives us does not last longer than its novelty. Very soon we become used to it—and then we become conscious that some evil, which we had till then borne patiently, has grown insuffer- able, and must be quickly done away with. We feel to the quick injustices and iniquities which ages ago we would have submitted to without complaint,—of which we would have been participants. 'Till mankind reaches some goal yet unknown to us, its motto seems to be, Never to rest, never to be thankful.*~~

~~*Thus ethnology may be considered as the science which builds up the history of material and intellectual progress, which retraces the evolution of that attribute, precious and delicate, of which Dr Maudsley has finely said, "Morality, the last acquired faculty of man, is the first which he is liable to lose."*~~

~~*XI. The Bibliography of ethnology may be regarded either as very extensive or unimportant, according as we include all books in which ethnological subjects are treated, or as we exclude all books which have not ethnology for their primary object. Although possessed of immense territories in copartnership with the sister sciences, ethnology holds but a limited province of its own. This remark disposes of the largest mass of ethnographical bibliography, in a work which contains bibliographies of other sciences.*~~

Works which take up the new science as a whole, and bring its various problems together, cannot as yet be very numerous, especially if the demarcation between ethnology and anthropology is main- tained. In the preceding pages the titles of most current books which are acknowledged as authoritative have been mentioned, and for brevity's sake will not be repeated. One of the most important publications, the object of which is to set the science on a solid foundation, is in progress. The Descriptive Sociology commenced in 1867 by Mr Herbert Spencer, devised, classified, and arranged by hin, is compiled and abstracted by Messrs James Collier, Richard Scheppig, and David Duncan. "The digests of materials, thus brought together, will supply the student of social science with data, standing towards his conclusions in a relation like that of

which accounts of the structures and funetions of different types of animals stand to the conelusion of the biologist. Until there had been such systematic descriptions of different kinds of organisms as made it possible to compare the connexions and forms and actions and modes of origin of their parts, the science of life could make no yrogress; and in like manner, before there can be reached in socio- ibe generalizations worthy to be called scientific, there must be definite. accounts of the institutions and activities of societies, of various types and in various stages of evolution, so arranged as to furnish the means of ascertaining what social phenomena are habitually associated."

In the three volumes of Adolf Bastian, Der Mensch in der Geschichte, we have already a kind of ethnological encyclopedia, a mine of interesting facts, collected from the most various sources. The author is a man of great reading, and has himself travelled over the known world. But in 1860, when the book was written, ethno- logy had not come of age, and instead of allowing the facts to speak for themselves, he marshalled them in ungainly array to make them support metaphysical theses.

Amongst other important books relating to general ethnology are to be named—Klemn's Allgemeine Culturgeschichte der Men- schhett;

~~*Caspari's Urgeschichte der Menschheit; Fr. von Hellwald's Culturgeschichte ; Waitz's Anthropologie der Naturvilker; Fr. Mil- ler's Allgemeine Ethnographie; Gerland's Anthropologische Bettrdge ; Facr und Schaafhausen, Der vorgeschichtliche Mensch; Huxley's Methods and Results of Ethnology ; Brace's Manual of Ethnology ; Von Martins, Ethnographic. Mr H. Bancroft's Native Races of America and Meinike's Polynesia cover only parts of our ground, but deserve exceptional record here, from the amount of informa- tion which they afford.*~~

~~*Ethnographical maps have been published by Berghaus, Schafarik, Fuchs, Czoernig, Waitz, and others. In Germany, Denmark, and Sweden "maps of the finds" are in progress. Dupont has given out important Synoptic Tables.*~~

~~*An ethnological feat, accomplished with the resources of a national budget, that of Austria, is the Novara Eapedition, which continues the series of the great scieutifie travels, such as those of the " Beagle" and the " Astrolabe," and those accomplished by Cook, Forster, and Bougainville. The relations given by travellers of what they have seen in foreign parts compose an immense col- lection, which ethnographers have now to classify, and to sift carefully in order to extract from it all that is useful. Modern deseriptions have their peculiar merits, but the value of earlier writers increases in proportion as civilization, which is gradu- ally imported everywhere, destroys the old order of things, and gives an uniform tinge to the intellects and the institutions of all races. Narrations of the medieval travellers, such as Marco Polo and Ibn Batutah, were never found so interesting as they are now. We peruse again the stories of the Conquistadores, the bar- barous heroes of modern culture, and those of their twin brothers, the Conquerors of Faith, the missionaries of the third Christian period, Franciscans, Dominicans, Jesuits, whose work among the Indians of North and South America, among the races of Africa, the Chinese, and the Japanese, is related in the celebrated collection of the Lettres Edifiantes. Acosta, Lafitau, Charlevoix, Duhalde, Dobrizhoffer, have given to the world much information, as have also the modern missionaries, chiefly Protestants, among whom we may cite Williams, Ellis, Isenberg, Krapf, Moffat, Callaway, Casalis, Hue, Eitel, Metz, and, above all, Livingstone.*~~

~~*Although ethnology be a new science, it must not be considered as anew invention. Thirty years ago nota few books were written in France and Germany, which, expounding the "philosophy of history" then in vogue, would now-a-days have expounded the " pro- gress of culture." The most antiquated, inspired by the schools of Hegel and Schelling, contain less of history than of so-called philo- sophy ; the best, inspired rather by Herder and Vico, contain more of facts than of metaphysics. nologists without knowing it,—among them, Buckle, whose Civiliza- tion in England may be considered as one of the works which open the new period of history, as modified by ethnology.*~~

~~*The bibliography of a science giving its history in a condensed form, it must be said that the corner-stones of any ethnographer's*~~

~~*Some of their authors were already eth- °*~~

~~*ETHNOGRAYPHT*~~

~~*library are the works of the great historians Herodotus and Tacitus, and that the first expounder of the modern principles of ethnology is the poet Lucretius.*~~

~~*In contrast with the paucity of the publications which profess to give the synthesis of ethnology, onc may notice the super- abundance of books, memoirs, essays, and lesser works which discuss all kinds of ethnologic matters and points of detail. Ethno- logy being in great favour with the public, there appear in reviews and magazines, and even in the weekly and daily press, articles which an ethnographer should diligently collect.*~~

~~*The learned societies scattered throughout the civilized world act in scientific matters as the lakes and reservoirs of the high lands do in the hydrographic system; they collect and purify the waters of torrents and rivulets, they regulate their outlet. In all European eapitals, and in some other eities, as Washington, Toronto, Rio Janeiro, Calcutta, Yeddo, Tiflis, Melbourne, Cairo, savants and scientists meet in Academics, and, in the Z'ransactions of their diverse sections, ethnology comes in for a part of their attention. Societies of anthropology and ethnology have constituted them- selves as separate bodies in London, Paris, Rome, Florence,*~~

~~*Madrid, Vienna, Berlin, Dantzig, Leipsic, Dresden, Munich, and Stuttgart.*~~

~~*From their influence and the date of their foundation, the societies of London and Paris are to be ranked first. 'To the impulse given by the Société Anthropologique are often ascribed the great 'strides recently made by anthropology. This association was founded by men who mostly went to work with a precision which originated in the methods of anatomy, physiology, archeology, paleontology, and philology, the lights from which they projected simultaneously on their favourite scienee. The vastness of Great Britain's colonial empire, the diversity of its climes, races, and creeds, the magni- tude of England's commercial navy, which has become the general carrier of the world, the facility with which Englishmen emigrate or travel abroad, have given to ethnographie matters in this country an interest and an importance which they have not elsewhere. Hence the directness and the variety of the communications which are transnutted to the Anthropological Institute in London. The character uf the two societies reflects itself in their publications ; the Revue d' Anthropologie, as edited by Dr Paul Broca, has a pre- ference for biology, and the Journal of the Institute, as edited by Mr John Evans and Major-General Lane Fox—the best authorities on flints and on primitive weapons and implements—has a marked—preference for archeology and the domestic arts. In almost every considerable town of Germany there is some society affiliated to the large Deutsche Gesellschaft fiir Anthropologie, Ethnologie, und Urgesehichte, which numbers about 2000 members, and issues the Archiv fiir Anthropologie already named, edited by Dr Virchow, Eck, Lindenschmidt, with many collaborateurs, mostly physicians and naturalists.*~~

~~*Another publication, more ethnological in eharacter, is the Zeitschrift fiir Ethnologie, edited by the great traveller and most learned man, Adolf Bastian. In the Scandinavian countries, and in Hungary, patriotism fosters the preliistoric studies by the hope of throwing some light on the misty figures of gigantie ancestors. Since the discovery of the lake-dwellings, by which a sudden in- terest was awakened in archeological pursuits, ethnology has been a favourite study in Switzerland. Italy, which also had lake- dwellings as well as terramare, whole cities buried in the*~~

~~*soil, &c., and which teems with precious remains of Roman, Greek, Etruscan, and Oriental origin, addicts herself with some zeal to these re-searches, the results being given forth especially in the Archivio dell' Antropologia e Etnologia, and the Paleo-ctnologia Italiana.*~~

~~*Not to be omitted are the Tour du Monde, which has been trans- lated perhaps in every civilized language, and even into Japanese; the Globus of Herr Karl Andrée; the Ausland of Fr. von Hell- wald; the Matériaux pour servir a UVhistoire primitive et naturelle de Vhomme of Cartailhae and Fontdouce. Many publications which give occasionally valuable ethnographic information, but which bestow on geography, history, and philology the largest share of their attention, must be passed over. (E. RE.)*~~

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~~*Plate VII.*~~

~~*ETNA*~~

~~*ETNA. Mount Etna, one of the most celebrated volcanoes in the world, is situated on the eastern sea-board*~~

~~*of Sicily. Its position was first accurately determined in 1814 by Captain Smyth, who found the longitude of the*~~

~~*highest bifid peak of the great crater to be 15° east of*~~

~~*Greenwich, and the latitude 37° 43’ 31” N. These results have been very generally accepted by later writers.*~~

~~*There can be no doubt that the name of Etna·—Airva—is derived from &6w, to burn. This name was known to Hesiod. The more modern name Mongibello, by which the mountain is still commonly known to the Sicilians, is a combination of the Italian monte and the Arabic gibel. During the Saracenic occupation of Sicily (827-1090), Etna was called*~~

~~*Gibel Uttamat, the mountain of fire; and the second portion of Mongibello is a relic of the Arabic name.*~~

~~*Historical References and Descriptions,—Etna is often alluded to by classical writers. By the poets it was feigned to be the prison of the giant Enceladus or Typhon, by others the forge of Hephaestus. The flames proceeded from the breath of Enceladus, the thunderous noises of the mountain were his groans, and when he turned upon his side, earthquakes shook the island. Pindar (522-442 B.o.), in his first Pythian Ode, for Hiero of Aitna, winner in the chariot race in 474 32.c., exclaims :—" He (Typhon) is fast bound by a pillar of the sky, even by snowy Etna, nursing the whole year's dazzling snow.*~~

~~*uproar to the wide deep sea." Alschylus (525-456 B.c.) speaks also of the "mighty Typhon" (Prom. Vinctus). Thucydides (471-402 B.c.) alludes in the last lines of his third book to three early eruptions of the mountain.*~~

~~*Many other early writers speak of Etna, among them*~~

~~*Theocritus, Virgil, Ovid, Livy, Seneca, Lucan, Petronius, Dion Cassius, Strabo, Diodorus Siculus, and Lucilius junior. While the poets on the one hand had invested Etna with various supernatural attributes, and had made it the prison of a chained giant, and the workshop of a swart god, Lucretius and others endeavoured to show that the erup- tions and other phenomena of the mountain could be ex- plained by the ordiuary operations of nature. These ideas were developed by Lucilius junior (the friend of Seneca, to whom he addressed his Questiones Naturales) in a poem consisting of 640 Latin hexameters, entitled tna. Many of the myths developed by the earlier poets had their home upon the very sides of Etna :—Demeter, torch in hand, seeking Persephone; Acis and Galatea; Polyphemus and the Cyclops.*~~

~~*Tf we pass to more modern times we find mention of Etna by Dante, Petrarch, Cardinal Bembo, and other Middle Age writers. In 1541 Fazzello made an ascent of the mountain, which he briefly describes in the fourth chapter (entitled "De Attna Monte et ejus ignibus") of his work De Mebus Siculis, He also gives a brief history of the mountain. In 1591 Antonio Filoteo, who was born on Etna, published a work in Venice,*~~

~~*entitled Zine Topographia, Incendiorum AStneorum Historia, in which he describes an eruption which he witnessed in 1536. He asserts that the mountain was then (as now) divided into three "regions "—the first very arid, rugged, uneven, and full of broken rocks; the second covered with forests; and the third cultivated in the ordinary manner. Of the height he says, " Ascensum triginta circiter millia passuum ad plus habet."*~~

~~*The great eruption of 1669 was described at length by the naturalist Borelli in the year of its occurrence. It also formed the subject of a paper in the Philosophical Trans- actions : and a brief account of it was given by the earl of Winchelsea, English ambassador at Constantinople, who was*~~

~~*length her Whereout pure springs of unapproach- able fire are vomited from the inmost depth : in the day- time the lava streams pour fortha lurid rush of smoke, but in the darkness a red rolling flame sweepeth rocks with*~~

~~*627*~~

~~*returning home by way of the Straits of Messina at the time. As the eruption of 1669 was the most considerable eruption of modern times, it attracted a good deal of atten- tion, and was described by several eye-witnesses. A map in the Bibliothéque Nationale in Paris gives an imaginary view of the mountain during this eruption. It is the ear- liest map of the mountain which the library possesses, and is entitled "Plan du Mont Etna, commumement dit Mont Gibel, en V'Isle de Scicille, et de t'jncédie arrive par un tréblement de terre, le 8° Mars dernier 1669." Further, in the sacristy of the cathedral of Catania there isa curious wall-painting, which represents broad red streams of lava descending from the Monti Rossi and overwhelming the city. Towards the middle of the next century the mountain was ascended and described by Count D'Orville (1727), by the German Riedesel in 1767, and by Sir William Hamil- ton, the English ambassador at Naples, in 1769. During the twenty succeeding years it was described by Borch, Swinbourne, Denon, Spallanzani, Faujas de Saint-Fond, and Houel. 'The last, in his Voyage pittoresque dans les Deuw Siciles, 1782-1786, has given a capital account of the mountain, accompanied by some excellent engravings. In 1776 a clever Irishman*~~

~~*uamed Patrick Brydone published two volumes of a Zour in Sicily and Malta, in which he describes at some length his ascent of Etna, and he further states as many facts concerning the history of the mountain as he could collect from the Canon Recupere and others. His account is more complete than any which had appeared in English up to that time, and he is fre- quently quoted in every account of the mountain with which we have met.*~~

~~*It was reserved, however, for the Abate Francesco Ferrara, professor of physical science in the university of Catania, to write the first history of Etna which has any claim to com- pleteness. It is entitled Descrizione dell' Etna, con la storia delle eruzioni e il catalogo dei prodotti. The first edition appeared in 1793, and a second was struck off at Palermo in 1818. It is illustrated by a map, and by some rather rough engravings. The author was born upon the mountain, and was witness to some of its grandest phenomena. His work has evidently been to a great extent a labour of Jove. Itisfull of personal observations, while it embodies the principal results of other observers, and furnishes the foundation of all that has since been written about Etna. During 1814-16 Captain Smyth, acting under the direction of the lords of the Admiralty, made a survey of the coast of Sicily, and carefully deter- mined the latitude and longitude of Etna; he also accu- rately measured the height and examined the surroundings of the mountain. His results were published in 1824, and are still often quoted as the most accurate which exist. In 1824 Dr Giuseppe Gemellaro, who lived all his life upon Etna, and made it his constant study, published au " Historical and Topographical Map of the Eruptions of Etna from the Era of the Sicani to the year 1824." In it he shows the extent of the three regions, Coltivata, Selvosa, and Deserta; he lays down the places of the minor coues to the number of seventy-four!; and he traces the course of the various lava streams which have flowed from them and from the great crater. About 1847 Baron Sartorius von Waltershausen commenced a minute survey, and a com- plete examination of the mountain, both geologically and otherwise. He was assisted by a brother professor, and by two Sicilians, and their labours resulted in the production of a fine atlas of Etna, which even in its incomplete form costs £12. Owing to the death of Von Waltershausen, the work was never quite completed, but, as it 1s, it supplies the most*~~

~~exhaustive history of any one mountain on the face of the earth. Sir Charles Lyell visited Etna three times (in 1824, 1857, 1858), and he has embodied the results of his~~

~~resoarches in a paper communicated to the Royal Society, and in a lengthy chapter in his Principles of Geology. HIs investigations have contributed much to our know- ledge of the geological characteristics of the mountain.~~

~~The most important recent contribution to our knowledge of Etna has been the fine map of the Stato Maggiore con- structed by order of the Italian Government between 1864 and 1868. It embraces the whole of Sicily, and is laid down on the unusually large scale of 1 in 50,000, or 1:266 inch to the mile. The portion relating to Etna and its immediate surroundings occupies four sheets. Plate VII. is a reproduction of this map on a smaller scale. All the small roads, paths, and rivulets are introduced ; the minor cones and monticules are placed in their proper positions; and the elevation of the ground is given at short intervals of space over the map. A careful examination of this map shows us that it represents the first accurate survey of the entire mountain. It shows us that distances, areas, and~~

~~heights have been repeatedly misstated, the minor cones |~~

~~misplaced, and the trend of the coast-line misrepresented.~~

~~HEIGHT.—The height has been often determined. The earlier writers had very exaggerated notions on the subject, and a height of three and even four miles has been assigned. Brydone, Saussure, Shuckburgh, and others obtained ap- proximations to the present height; it must be borne in mind, however, that the cone of a volcano is liable to variations in height at different periods, and a diminution of more than 300 feet has occurred during the course of a single eruption of Etna, owing to the falling of the cone of cinders into the crater. During the last sixty years, how- ever, the height of the mountain has been practically con- stant. In 1815 Captain Smyth determined it to be 10,874 feet. In 1826 Sir John~~

~~*Herschell, who was unacquainted with Smyth's results, estimated it at 10,8724 feet. The new map of the Stato Maggiore gives 3312°61 metres= 10,867'94 feet. The radius of vision from the summit is very variously stated. Smyth gives it as 150:7 miles, and this we are inclined to adopt as the nearest approach to the truth, because he was an accurate observer, and he made careful corrections both for error of instruments and for refraction. This radius gives an horizon 946·4 miles in circumference, and an included area of 39,900 square miles,—an area larger than that of Ireland.*~~

~~*Boundaries.—The road which surrounds the mountain is carried along its lower slopes, and is 87 miles in length. By reference to the map it will be seen that it passes through the towns of Paternd, Biancavilla, Adernd, Bronte, Randazzo, Linguaglossa, Giarre, and Aci Reale, By some writers it is considered to define the base of the mountain, which is hence said, most erroneously, to have a circumference of 87 miles; but the road frequently passes over high beds of lava, and it winds considerably. It is about 10 miles from the crater on the north, west, and east sides of the mountain, increasing to 16 miles at Paternd (S.W.). The elevation on the north and west flanks of the mountain is nearly 2500 feet, rising at its maximum elevation to 3852 feet, while on the south it falls to 1500 feet, and on the east to within 50 feet of the level of the sea. It is quite clear, therefore, that this road cannot be taken as the limit of the base. The natural boundaries of Etna are the rivers Alcantara and Simeto on the north, west, and south, and the sea on the east to the extent of 23 miles of coast, along which lava streams have been traced, sometimes forming headlands several hundred feet in height. The base of the mountain, as defined by these boundaries, is said to have a circumference of " at least 120 miles ; " an examination of the new map, however, proves that this is overestimated. If we take the sea as the eastern boundary, the river Alcantara (immediately beyond which Monte di Mojo, the most northerly minor*~~

~~*cone of Etna, is situated) as the northern boundary, and the river Simeto as the boundary on the east and south, we obtain an approximate*~~

~~circumference of 91 miles for the base of the mountain. In this estimate the smal] sinuosities of the rivers have been neglected, and the southern circuit has been completed by drawing a line from near Paterno to Catania, because the Simetu runs for the last few miles of its course through the plain of Catania, quite beyond the most southerly lava stream.~~

~~Area.—The area of the region inclosed by these boundaries is approximately 480 square miles. Reclus gives the area of the mountain as 1200 square kilometres = 461 square miles (Nouvelle Geographie Universelle, 1875).~~

~~Population.—There are 2 cities, Catania and Aci Reale, and 63 towns or villages on Monnt Etna. It is far more thickly populated than any other part of Sicily or Italy ; for while the population of Italy per square kilometre is 90, and of Sicily 88, that ef the habitable zone of Etna is 550, No less than 300,000 persons live on the mountain, Thus, with an area rather larger than that of Bedfordshire (462 square miles), it has more than double the population ; and with an area equal to about one-third that of Wiltshire, the population of the mountain is greater by nearly 50,000.~~

~~General Aspect.—The general aspect of Etna is that of a pretty regular cone with very gentle slopes covered with vegetation, except near the summit. The regularity is broken on the east side by a slightly oval valley, four or five miles in diameter, called the Val del Bue. It com- mences about two miles from the summit, and is bounded on three sides by nearly vertical precipices from 3000 to 4000 feet in height. The bottom of the valley is covered with lavas of various dates, and several minor craters have from time to time been upraised from it. Many eruptions have commenced in the immediate neighbourhood of the Val del Bue, and Lyell believes that there ouce existed a crater of permanent eruption in the valley. Mount 'Vesuvius might be almost hidden away in the Val del Bue.~~

~~Regions.—The Val del Bue is altogether sterile, having been the frequent scene of both fire and flood, but the mountain at the same level, as its middle and lower portions, is on its other sides clothed with forests. The surface of the mountain has been divided into three zones or regions—~~

~~*the Predemontana or Coltivata, the Selvosa or Nemorosa, and the Deserta or Discoperta.*~~

~~*The lowest of these, the Cultivated Region, yields in abundance all the ordinary Sicilian products. The surface soil, which consists of decomposed lavas, is extremely fertile, although of course large tracts of land are covered by recent lavas, or by those which decompose but slowly. In this region the vine flourishes, and abundance of com, olives, pistachio nuts, mulberries, oranges, lemons, figs, and other fruit-trees. The breadth of the Coltivata varies 3 it terminates at an approximate height of 2000 feet, A circle drawn with a radius of ten miles from the crater roughly defines the upward limit of this region. The elevation of points on the circumference of such a circle is 2310 feet on the north near Randazzo, 2145 feet on the south near Nicolosi, 600 feet on the east near Mascali, and 1145 feet on the west near Bronte. The breadth of the cultivated zone is about two miles on the nortli, east, and west, and nine or ten miles on the south, if we take for the base of the mountain the limits proposed above.*~~

~~*The Woody Region commences where the Cultivated Region ends, and it extends as a belt of varying width to an approximate height of 6300 feet. It is terminated above by a circle having a radius of about a mile and a half from the great crater. There are fourteen separate forests in this region,—some abounding with oak, beech, pine, and poplar, others with the chestnut, ilex, and cork tree. The celebrated Castagno di Cento Cavalli, one of the largest*~~

~~*and oldest trees in the world, is in the forest of Carpinetto, on the east side of the mountain, five miles above Giarre. The breadth of the Regione Selvosa varies considerably : in the direction of the Val del Bue it is very narrow, while elsewhere it often has a breadth of from six to eight miles.*~~

~~*The Desert Region is embraced between the limit of 6300 feet and the summit. It occupies an area of about ten square miles, and consists of a dreary waste of black sand, scoriz, ashes, and masses of ejected lava. In autumn, winter, and spring it remains permanently covered with snow,*~~

~~*and even in the height of summer snow may be found in certain rifts near the summit.*~~

~~*Minor Cones.—A remarkable feature of Etna is the large number of minor cones which are scattered over its sides. They look small in comparison with the great mass of the mountain, but in reality some of them are of large dimen- sions. Monte Minardo, near Bronte, the largest of the minor cones, is still 750 feet in height, although its base has been raised by modern lava streams which have flowed around it. There are 80 of the more conspicuous of the minor cones, but Von Waltershausen has mapped no less than 200, within a ten-mile radius of the crater, neglecting many nionticules of ashes. According to Reclus, there are 700 minor cones, while Jukes asserts that there are 600; these statements undoubtedly include the most insignificant monticules, and also the bocche and boccarelle, from which lava or fire has issucd. If these be included, no doubt the above numbers are not exaggerations. The only large and important minor cone which has been raised during the historical period is the double mountain known as Monti Rossi, from the red colour of the cinders which compose it. This was raised from the plain of Nicolosi during the eruption of 1669 ; itis 450 feet high, and two mniles in circumference at the base. In a line between the Monti Rossi and the great crater 33 of the more important minor cones may be counted, and Captain Smyth was able to discern 50 from an elevated position on the mountain. Many of them are covered with vegetation, as the names Monte Faggi, Monte Ilice, Monte Zappini, indicate. In many instances the names have not been happily chosen, and several cones in different parts of the mouutain bear the same name: Monte Arso, Monte Nero, Monte Rosso, Monte Frumento, are the most common of these duplicates.*~~

~~*Ascent of the Mountain.—The best period for making the ascent of Etna is between June and September, after the melting of the winter snows, and before the falling of the autumnal rains, In winter there are frequently nine or ten miles of snow stretching from the summit downwards, the paths are obliterated, and the guides sometimes refuse to accompany travellers. Moreover violent storms often rage in the upper regions of the mountain, and the wind acquires a force which it is difficult to withstand, and is at the same time piercingly cold. The writer of this article made the*~~

~~ascent of the mountain in the month of August 1877, accompanied by a conrier and a guide. The weather was fine and bright, and there had been no rain for more than three months. The temperature in the shade at Catania, and generally along the eastern coast of Sicily, was a mean of 82° Fahr. The party left Catania soon after mid-day, and drove to Nicolosi, 12 miles distant, and 2288 feet above the sea. The road for some distance lay through a very fertile district ; on both sides there were corn-fields and vineyards, and gardens of orange and lemon trees, figs and almonds, growing in the decomposed lava. The road passes through several small villages,—Pasquali, Gravina, and Mascalucia—the last a town of 4000 inhabi- tants. Soon after this the Monti Rossi are seen apparently close at hand, the village of Torre di Grifo is passed, and the road then euters a nearly barren district, covered with the lava of 1537. The only prominent vegetation is a~~

~~peculiar tall broom (Genisia Hlnensis), which flourishes licre. Nicolosi was reached at half-past 4 o'clock, and after dinner in the one room of the very primitive inn, a start was made for the summit at 6 o'clock. For a short distance above Nicolosi stunted vines are seen growing in black ashes, but these soon give way to a large tract covered with lava and ashes, with here and there patches of broom. At half-past eight o'clock p.m. the temperature was 66° Fahr. About 9 o'clock the Casa del Bosco (4216 feet) was reached, at the foot of Monte Rinazzi, a small house in which several men live who have charge of the forest. After an hour's rest, the ascent of the higher regions was commenced, a great-coat and a double waistcoat being put on as a protection against the increasing cold. The air was extraordinarily still at this time; the flame of a candle placed near the open door of the Casa del Bosco did not flicker. The ascent from this point led through forests of pollard oaks, in which it was quite impossible to see either a path or any obstacles which might lie in one's way. The guide carried a lantern, and the mules seemed well accustomed to the route. At about 6300 feet above the sea the Regione Deserta was entered, a lifeless waste of black sand, ashes, and lava; the ascent now becaine moro steep, and the air was bitterly cold. There was no moon, but the stars shone in extraordinary numbers and with wonderful brilliancy,~~

~~*sparkling like particles of white-hot steel. The milky way gleamed like a path of fire, and meteors flaslied across the sky in such numbers as to baffle any attempt to count them. The vault of heaven seemcd to be much nearer than when seen from the earth, and also more flat, aud as if only a short distance overhead, and some of the brighter stars appeared to be hanging down from the sky. The idea of erecting an observatory on Mount Etna was brought forward last year, when Professor Tacchini, the astronomer-royal at Palermo, communicated a paper to the Accademia Gioenia, entitled Della Conventenza*~~

~~*| ed utilita di erigere sull' Etna una stazione Astronomico-*~~

~~*Meteoroiogico, in which he refers to the extraordinary blueness of the sky as seen from the higher regions of Etna, and the appearance of the sun in a telescope, which is "whiter and more tranquil" than when seen from below; moreover the spectroscopic lines are defined with wonderful distinctness.*~~

~~*Toiling along the slopes of the Regione Deserta, at length the travellers reach the Piano del Lago, or Plain of the Lake, so called because a lake produced by tho melting of the snows existed herc till 1607, when it was filled up by lava. The air is now excessively cold, and a sharp wind is blowing. Progress is very slow, the soil consists of loose ashes, and the mules frequently stop. Tho guide maintains that the Casa Inglesi is quite near, but the stoppages become so frequent that it seems a long way off; at length it becomes necessary to dismount, and after a toilsome walk the small lava-built house called the Casa Inglesi is reached (1.30 a.m., temperature 40° Fahr.) It stands at a height of 9652 fcet above the sea, near the base of the cone of the great crater. The Casa Inglesi takes its name from the fact that it was erected by the English officers stationed in Sicily in 1811. It has suffered severely from time to time from the pressure of snow, and from earthquakes, but it was thoroughly repaired in 1862, on the occasion of the visit of Prince Humbert, and is now in tolerable preservation. At 3 A.m. the Casa Inglesi is left for the summit of the great crater, 1200 feet above, in order to be in time to witness the sunrise. The road lay for a short distance over the upper portion of the Piano del Lago, and the walking was very difficult. The brighter stars had disappeared, and it was much darker than it had been some hours earlier. The guide led the way with a lantern. The asceut of the cone was a very*~~

~~*stiff piece of work. It consists of loose ashes and blocks of lava, and it slopes at an angle of "45° ormore," accord- ing to one writer, and of 33°, according to another. Pro- bably the slope varies on different sides of the cone; on the side the ascent described was made the 45° certainly seems the more probable. Fortunately there was no strong wind, and no experieuce of the sickness of which travellers constantly complain in the rarefied air of the summit. The highest point was reached at 4.30 A.M., temperature 47° Fahr. Steam and snlphurous acid issued from the ground, and the cinders were so hot in some places that it was necessary to choose a enol place to sit downon. A thermometer inserted just bencath the soil from which steam issued registered 182° Fahr. Nearly all the stars had now faded away. The vault of heaven was a pale blue, becoming a*~~

~~*darker and darker grey towards the west, where it was nearly black. Just before sunrise the sky had the appearance of an enormous arched spectrum extremely extended at the blue end. Above the place where the sun would presently appear there was a brilliant red, shading off in the direction of the zenith to orange and yellow; the latter was succeeded by pale green, this by a long stretch of pale blue, then darker blue, and dark grey, ending opposite to the rising sun with black. This effect was quite distinct; it lasted some minutes, and was very remarkable. It was succeeded by the usual rayed appear- ance of the rising sun, and at ten minutes to 5 o'clock the upper limb of the sun was seen above the mountains of Calabria. Examined by the spectroscope, the Fraunhofer lines were extremely distinct, particularly two lines near the redend of the spectrum. The top of the mountain was now illuminated, while al] below was in comparative dark- ness, and a light mist floated over the lower regions. The party was so fortunate as to witness a phenomenon which is not always visible, viz., the projection of the shadow of the mountain across the island, an hundred miles away. The shadow appeared to be vertically suspended in space, at or beyond Palermo, and to be resting on a slightly misty atmosphere; it gradually sank until it reached the surface of the island, and as the sun rose, the shadow of course approached nearer and nearer to the base of the mountain. In ashort time the flood of light destroyed the fine effects of light and shadow which were at first visible. The raountains of Calabria appeared very close ; the east coast of Sicily could be traced until it ended at Cape Passaro and turned to the west, forming the southern boundary of the island, while to the west distant mountains appeared.*~~

~~*The crater was then examined,—a vast abyss nearly 1000 feet in depth, shut in by precipitous sides, Its dimensions vary, but it is now between two and three miles in circum- ference. Sometimes it is 'nearly full of lava, at other times it appears to be bottomless. At the present time it is like an inverted cone; its sides are covered with incrustations of sulphur and ammonia salts, and jets of steam perpetually issue from crevices in its sides. Near the summit was found a deposit several inches in thickness of a white substance, apparently lava decomposed by the hot effluent gases. Hydrochloric acid is said to frequently issue from the crater; the most abundant gases appeared to be sul- phurous acid and steam. The interior*~~

~~*of the crater reminds one in many respects of the Solfatara near Puzzuoli. During the descent from the cone various specimens of ash and cinder were collected—some red, others black and very vesicular, others highly crystalline, some pale pink. The steep slope of the cone was well shown by the fact that although the surface is either extremely rugged owing to the accumulation of masses of lava, or soft and yielding on account of the accumulation of cinders, a large mass of lava, set rolling near the summit, rushes down with increasing velocity until it bounds cff to the plain below.*~~

~~*ETNA*~~

~~*A striking feature presented during the descent from*~~

~~*| the mountain was the apparent nearness of the minor cones*~~

~~*below, and of the villages at the base of the mountain. The latter seemed to be painted on a vertical wall, and although from ten to fifteen miles distant, they appearcd almost within a stone's throw. 'This curious cffect, which has often been observed before, is due to atmospheric refraction.*~~

~~*The different specimens of lava were found to present a wonderful similarity of structure and composition. The main constituents are olivine, magnetite, and felspar. The crystals of the latter are much larger in some specimens. than in others. Sometimes olivine prevails, sometimes felspar. A specimen of lava of 1535 found near Borello was ground until it was sufficiently transparent to be examined under the microscope by polarized light. It was found to contain good crystals of augite and olivine, and well striated labradorite and magnetite.*~~

~~*Eruptions.—A list of all the eruptions of Etna from the earliest times, has been given by several writers, notably by Ferrara in his Descrizione dell' Hina, and by Gemellaro.*~~

~~*The first eruption within the historical period probably happened in the 7th century B.c.; the second occurred in the time of Pytha- goras. The third eruption, which occurred in 477 B.c., is men- tioned by Thucydides, and it must be the eruption to which Pindar and Alschylus allude. An*~~

~~*eruption mentioned by Thucydides occurred in the year 426 B.c. An outburst of lava took place from Monte di Mojo, the most northerly of the minor cones of Etna, in 396 B.c., and following the course of the river Acesines (now the Alcantara) entered the sea near the site of the Greek colony of Naxos (now Capo di Schiso). We have no record of any further eruption for 256 years, viz., till the year 140 B.c. Six years later an eruption occurred, according to Orosius and Julius Obsequens; and Fulvius Flaccus and the same authorities men- tion an eruption in the year 126 8.c. Four years later Katana was nearly destroyed by a new eruption, 122 B.c. An erup- tion, of which we possess no details, occurred during the civil war between Cesar and Pompey, 49 B.c. Livy speaks of an eruption and earthquake which took place (48 B.c.) shortly before the death of Cesar, which it was believed to portend. In 38 B.c. and 32 B.C. eruptions occurred. The next eruption of which we hear is that mentioned by Suetonius in his life of Caligula. This was in 40 A.p. An eruption is stated to have occurred in 72 a.p. after which Etna was quiescent for nearly two centuries, but in the year 253, in the reign of the emperor Decius, a violent erup- tion lasting 9 days occurred. According to Carrera and Photius, an eruption occurred in the year 420. We now find no further record for nearly 400 years. Geoffrey of Viterbo states that an eruption occurred in 812, when Charlemagne was in Messina. After another long interval, in this case of more than three centuries and a half, the mountain again entered into eruption. In February 1169 one of the most disastrous eruptions on record occurred. A violent earthquake, which was felt as far as Reggio, destroyed Catania in the course of a few minutes, burying 15,000 persons beneath the ruins. It was the vigil of the feast of St Agatha, and the cathedral of Catania was crowded with people, who were all buried beneath the ruins, together with the bishops and forty-four Benedictine monks. The side of the cone of the great crater towards Taormina, fell into the crater. According to Nicola Speziale, there was a great eruption from the eastern side of the mountain in 1181. Lava descended from the eastern side of the mountain in 1285 ; in 1329 Nicola Speziale was in Catania, and he witnessed a very violent eruption, of which he has left us an account. On the evening of June the 28th, about the hour of vespers, Etna was strongly con- vulsed, terrible noises were emitted, and flames issued from the south side of the mountain. A new crater, Monte Lepre, opened near the Val del Bue, above the rock of*~~

~~Musarra, and emitted Jarge quantities of dense black smoke. Soon afterwards a torrent of lava poured from the crater, and red hot masses of rock were pro- jected into the air. Four years after the last cruption, it is recorded by Silvaggio that a fresh outburst took place. A manuscript~~

~~-preserved in the archives of the cathedral of Catania mentions an~~

~~cruption which occurred on the 6th of August 1371, which caused the destruction of numerous olive groves near the city. An erup- tion which lasted for twelve days commenced in November 1408. A violent earthquake in 1444 caused the cone of the mountain to fall into the great crater. An eruption of short duration, of which we have no details, occurred in 1447. After this Etna was quiescent for 89 years. Cardinal Bembo and Fazzello mention an eruption which occurred towards the close of the 15th ecutury. In March 1536 a quantity of lava issued from the great crater, and several~~

~~| new apertures opened near the summit of the mountain and~~

~~i~~

~~emitted lava. A year later, in May 1537, a fresh outburst occurred. A number of new mouths were opened on the south slope of the mountain near La Fontanelle, and a quantity of lava was emitted, which flowed inthe direction of Catania, destroying a partof Nicolosi, and St Antonio. In four days the lava had run fifteen miles. The cone of the great crater suddenly fell in, so as to become level with the Piano del Lago. The height of the mountain was thus diminished by 320 feet. Three new craters opened in November 1566, on the north-east slope of the mountain. In 1579, 1608, 1607, 1610, 1614, and 1619, unimportant eruptions occurred. In February 1633 Nicolosi was partially destroyed by a violent earthquake, and in the following December earthquakes became frequent around the mountain. In 1646 a new mouth opened on the north-east side, and five years later several new mouths opened on the west side of the mountain, and poured out vast volumes of lava, which threatened to overwhelm Bronte. We have a more detailed account of the ernption of 1669 than of any previous eruption. It was observed by many men of different nations, and we find accounts of it in the Philosophical~~

~~*Transactions, and in several separate narra- tives in French and Italian. Perhaps the most accurate and com- plete description is that given by Alfonso Borelli, professor of mathematics in Catania. The eruption was in every respect one of the most terrible on record. On the 8th of March the sun was obscured, and a whirlwind blew over the face of the mountain ; at the same time earthquakes were felt, and they continued to increase in violence for three days, at the end of which Nicolosi was con- verted into a heap of ruins. On the morning of the 11th a fissure nearly 12 miles in length opened in the side of the mountain, and extended from the Piano di St Leo to Monte Frumento, a mile from the summit. The fissure was only six feet wide, but it seemed to be of unknown depth, and a bright light proceeded from it. Six mouths opened in a line with the principal fissure, and emitted vast volunies of smoke, accompanied by low bellowing, which could be heard 40 miles off. Towards the close of the day a crater opened about a mile below the others, and ejected red-hot stones to a considerable distance, and afterwards sand and ashes, which covered the country for a distance of 60 miles. The new crater soon vomited forth a torrent of lava, which presented a front of 2 niiles. It encircled Monpilieri, and afterwards flowed towards Belpasso, a town of 8000 inhabitants, which was speedily destroyed. Seven mouths of fire opened around the new crater, and in threc days united with it, forming one large crater 800 feet in diameter. The torrent of lava had continued to flow, and it destroyed the town of Mascalueia on the 28rd of March. On the same day the crater cast up great quantities of sand, ashes, and sczorix, and formed above itself the great double coned hill called Alonti Rosst, from the red eolour of the ashes of which it is mainly composed. On the 25th very violent earthquakes occurred, and the cone of the great central crater was shaken down into the crater, for the fifth time since the first century A.p. The original current of lava had divided into three streams, one of which destroyed San Pietro, the second Camporotondo, and the third the lands about Mascalucia, and afterwards the village of Misterbianco. Fourteen villages were afterwards destroyed, and the lava made its way towards Catania. At Albanello, two miles from the city, it undermined a hill covered with corn fields, and carried it forward a considerable distance ; a vineyard was also seen to be floating on its fiery surfaee. When the lava reached the walls of Catania it accumulated without pro- gression, until it rose to the top of the wall, 60 feet in height,*~~

~~*and it then fell over in a fiery cascade, and overwhelined a part of the city. Another portion of the same stream threw down 120 feet of the wall, and flowed through the city. On the 23rd of April the lava reached the sea, which it entered as a stream 600 yards broad and 40 feet deep. The stream had moved at the rate of 13 miles in twenty days, but as it cooled it moved less quickly, and during the last 23 days of its course it only moved two miles. On reach- ing the sea the water of course began to boil violently, and clouds of steam arose, carrying with them particles of scoriz. The volume of lava emitted during this eruption amounted to many millions of cubic feet. Ferrara considers that the length of the stream was at least 15 miles, while its average width was between 2 and 3 miles, so that it covered at least 40 square miles of surface.—*~~

~~*For a few years after this terrible eruption Etna was quiescent, but in 1682 a new mouth opened on the east side of the mountain, and lava issued from it and rushed down the precipices of the Val del Bue. In 1688 a torrent of lava burst from an opening in the great cone, and in the following year lava was emitted from a mouth in the Val del Bue. Early in January 1693 clouds of black smoke were poured from the great crater, and loud noises, resembling the dis- charge of artillery, were heard. A violent earthquake succeeded, and Catania was shaken to the ground, burying 18,000 of its inhabitants. It is said that in all fifty cities and towns were destroyed in Sicily, together with from 60,000 to 100,000 inhabitants. Lava was emitted from the crater, the cone of which was lowered by the eruption. In the following year Etna again entered into eruption. In March 1702 three mouths opened in the Contrada del Tri- foglietto, near the head of the Val del Bue. In 1723, 1782, 1735,*~~

~~*NA 631*~~

~~*1744, and 1747 slight e1uptions occurred. arly in the year 1755 Etna began to show signs of disturbance ; a great colunmn of black smoke issued from the crater, from which forked lightning was frequently emitted. Loud detonations were heard, and two streams of lava issued from the crater. A new mouth opened uear Roeca di Musarra in the Val del Bue, four miles from the summit, and a quantity of lava was ejected from it. An extraordinary flood of water descended from the Val del Bue,*~~

~~*carrying all before it, and strewing its path with large blocks. Recupero estimated the volume of water at 16,000,000 cubic feet, probably a greater amount than could be furnished by the sudden melting of all the winter's snow on the mountain. It formed a channel 2 miles broad, and in some places thirty-four feet deep, and it flowed at the rate of a miile in a minute and a half during the first twelve miles of its course. Lyell con- siders that the flood was probably produced by the melting not only of the winter's snow, but also of older layers of ice, which were suddenly liquefied by the permeation of hot steam and lava, and which had been previously preserved from melting by a deposit of sand and ashes, as in the case of the ancient wlacier found near the summit of the mountain in 1828. In November 1758, a smart shock of earthquake caused the cone of the great crater to fall in, but no eruption occurred at the time. In 1759, 1763, 1766, and 1780 eruptions occurred, and on the 18th of May in 1780 a fissure opened on the south-west side of the nountain, and extended from the base of the great crater for seven milcs, terminating in a new mouth, from which a stream of lava emanated. This encountered the cone of Palmintelli in its course, and separated into two branches, each of which was about 4000 feet wide. Other mouths opened later in the year, and emitted larger quantities of lava, while in 1781 and 1787 thcre were slight eruptions. Five years afterwards a fresh outburst occurred ; earthquakes were prevalent, and vast volumes of smoke were carried out to sea, seeming to form a gigantic bridge between Sicily and Africa. A torrent of lava flowed towards Adernd, and a second flowed into the Val del Bue as far as Zuccolaro. A pit called La Cisterna, forty feet in diameter, opened in the Piano del Lago near the great cone, and ejeeted smoke and masses of old lava saturated with water. Several inouths opened below the crater, and the country round about Zaflarana was desolated. In 1797, 1798, 1799, 1800, 1802, 1805, and 1808 slight eruptions occurred. In Marcli 1809 no less than twenty-one mouths of fire opened between the summit of the mountain and Castiglione, and two years afterwards more than thirty mouths opened in a line running eastwards from the summit for five miles. They ejected jets of fire, accompanied by much smoke. In 1819 five new mouths of fire opened near the scene of the eruption of 1811 ; three of these united into one large crater, and poured forth a quantity of lava into the Val del Bue. 'The lava flowed until it reached a nearly perpendicular precipice at the head of the valley of Calanna, over which it*~~

~~*fell in a cascade, and being hardened by its descent, it was forced against thc sides of the tulaceous rock at the bottom, so as to produce an extraordiary amount of abrasion, accompanied by clouds of dust, worn off by the friction. Mr Scrope observed that the lava flowed at the rate of about a yard an hour nine months after its emission. Eruptions occurred in 1831, 1832, 1838, and 1842. Near the end of the following year, fifteen mouths of fire opened near the crater of 1832, at a height of 7000 feet above the sea. They began by discharging scoriz, and sand, aud afterwards lava, which divided into three streams, the two outer of which soon came to a stand- still, while the central stream continued to flow at the rapid rate of 180 feet a minute, the descent being an angle of 25°. 'The heat at a distance of 120 feet from the current was 90° F. A new crater opened just above Bronte, and discharged lava which threatened the town, but it fortunately encountered Monte Vittoria, and was diverted into another course. While a number of the inhabi- tants of Bronte were watching the progress of the lava, the front of the stream was suddenly blown out as by an explosion of gunpowder. In an instant red hot masses were hurled in every direction, and a cloud of vapour enveloped everything. Thirty-six persons were killed on the spot, and twenty survived but a few hours. The great crater showed signs of disturbance, by emitting dense volumes of smoke, and loud bellowings, also quantities of volcanic dust saturated with hydrochloric acid, which destroyed the vegetation wherever it fell. A very violent eruption, which lasted more than nine months, commenced on the 26th of August 1852. It was first witnessed by a party of six English tourists, who were ascending the mountain from Nicolosi in order to witnesss the sunrise from the summit. As they approached the Casa Inglesi, the crater commenced to give forth ashes and flames of fire. In a narrow defile they were met by a violent hurricane, which over-threw both the mules and the riders, and urged them towaid the precipices of Val del Bue. They sheltered themselves beneath some masses of lava, when suddenly an earthquake shook the moun- tain, and the mules in terror fled away. They returned on foot towards daylight to Nicolosi, fortunately without having sustained injury. In the course of the night, many bocche del fuoco opened in that part of the Val del Bue called the Balzo di Trifoglietto,*~~

~~*and a great fissure opened at the base of Giannicola Grande, and a crater was thrown up, from which for seventeen days showers of sand and seorize were ejected. During the next day a quantity of lava flowed down into the Val del Bue, branching off so that one stream flowed to the foot of Monte Finocchio, while the other flowed to Monte Calanna. 'The eruption continued with abated violence during the early months of 1853, and did not fully cease till May 27th. The entire mass of lava ejected is estimated to be equal to an area six miles long by two miles broad, with an average depth of about twelve feet. In October 1864 frequent shocks of earthquake were felt by the dwellers on Etna. In January 1865 clouds of smoke were emitted by the great crater, and roaring sounds were heard. On the night of the 30th a violent shock was felt on the north-east side of the mountain, aud a mouth opened below Monte Frumento, from which lava was ejected. It flowed at a rate of about a mile a day, and ultimately divided into two streams. By March 10th the new mouths of fire had increased to seven in number, and they were all situated along a line stretch- ing down from the summit. 'he three upper craters gave forth loud detonations three or four times a minute. Since 1865 the mountain has been in a quiescent state.*~~

~~*It will be seen from tle foregoing account that there is a great similarity in the general character of the erup- tions of Etna. Earthquakes presage the outburst; loud explosions .are heard; rifts and bocche del fuoco open in the sides of the mountain ; smoke, sand, ashes, and scoriz are discharged ; the action localizes itself in one or more craters ; cinders are thrown out and accumulate around tlie crater in a conical form ; ultimately lava rises through the new cone, frequently breaking down one side of it where there is least resistance, aud flowing over the surrounding country. Then the eruption isatanend. Out of the 78 ernptions mentioned above, a comparatively small number hive been of extreme violence, while many lave been of a slight and harmless character.*~~

~~*According to Lyell, Etna is rather older than Vesuvius, — perhaps of the same geological age as the Norwich Crag. At Trezza, on the eastern base of the mountain, basaltic rocks occur associated with fossiliferons Pliocene clays. The earliest eruptions of Etna are older than the Glacial period in Central and Northern Europe. If all the minor cones and*~~

~~*monticules could be stripped from the mountain, the diminution of bulk would be extremely slight. Lyell concludes that, although no approximation can be given of the age of Etna, " its foundations were laid in the sea in the newer Pliocene periud." From the slope of the strata from one central point in the Val del Bue he further con- cludes that there once existed a second great crater of per- manent eruption.*~~

~~*Such are the principal facts in the history of a volcano, justly called famoso, immenso, terribile, which has excited the wonder of all nations in all ages of the history of the world. (G. F. R.)*~~

~~*ETON, a village in Buckinghamshire, is situated on the left bank of the Thames, 21 miles W.S.W. of London, and is connected with Windsor on the opposite bank of the river by a cast-iron bridge erected in 1824. Eton is chiefly celebrated for its college, founded by Henry VI. in 1441, and endowed mainly from the revenues of the alien priories which were suppressed by Henry V. By Edward IV. its possessions were considerably curtailed; but on account of benefactions and the rise in the value of property, its annual income has gradually increased from £652 in the year 1506 till it now exceeds £20,000. The original founda- tion consisted of a provost, 10 priests, 4 clerks, 6 choristers, a schoolmaster, 25 poor and indigent scholars, and the same uumber of poor men or beadsmen. In 1443 the number of scholars was increased to 70, and the number of beads- men reduced to 13. Until lately the government of the college was in the hands of the provost and fellows ; but in 1870 the commissioners authorized by the Act of Parlia- ment of 1868 appointed the "new governing body" of Eton to consist of the provost of Eton, the provost of King's College, Cambridge, 5 representatives 'nominated respec-*~~

~~*tively by the university of Oxford, the university of Cam- bridge, the Royal Society, the lord chief justice, and the masters, and 4 representatives chosen by the rest of thie governing body. By this governing body the foundation was in 1872 made to consist of a provost and 10 fellows (not priests, but merely the other members of the governing body other than the provost), a headmaster of the school, and a lower master, at least 70 sckolars, and not more than two chaplains or conducts. Originally it was*~~

~~*necessary that the scholars should be born in England, of lawfully married parents, and be between eight and sixteen years of age ; but according to the statutes of 1872, the scholarships are now open to all boys who are British subjects, and between twelve and fifteen years of age. A number of foundation scholarships for King's College, Cambridge, are open for competition amongst the boys; and there are besides several valuable extra scholarships and exhibitions, most of which are tenable only at Cainbridge, some at Oxford, and some at either university. Besides the scholars of the foundation, Etou College is attended by about 850 scholars, who are either boarded with the masters or reside in private houses, and are called "oppidans." The total expenses of a boy educated as an oppidan average £200 a year. At one time the course of iustruction was almost wholly classical; aud although there were masters for other subjects, these were unconnected with the general business of the school, and were attended at extra hours. But in 1851 mathematics was incorporated into the curricu- lum of the school, and in 1869 physical science was intro- duced as a regular subject. The teachers of modern languages, of mathematics, and of physical science have now the same status, in regard to authority in and out of school, as the teachers of Latin and Greek. Among the celebrated men educated at Eton may be mentioned Sir Robert Walpole, Harley earl of Oxford, Lord Bolingbroke, Earl Camden, the famous earl of Chatham, the Hon. Robert Boyle, Lord Lyttelton, Gray, Shelley, Horace Walpole, West, Waller, Fox, Canning, the marquis of Wellesley, Hallam the historian, the duke of Wellington, Dean Milman, and the earl of Derby. The singular custom termed the montem, which was observed here triennially on Whit-Tuesday, has now been abolished. 'The last celebra- tion of it took place in 1844, It consisted of a procession of the boys in a kind of military order, with flags and music, headed by their " captain," to a small mound called Salt Hill, near the Bath road, where they levied contribu- tions, or "salt," from the passers-by and spectators, The sum collected sometimes exceeded £1000,—the. surplus, after deducting certain expenses, becoming the property of the "captain" of theschool. The building of Eton College was commenced in 1441, and the school was opened in 1442 ; but the whole original structure was not completed till fifty years afterwards. A new wing was completed in 1846; another block of buildings, containing 15 class-rooms, a music room, and an observatory, was built in 1861; these have been*~~

~~*subsequeutly enlarged, and since the incorpora- tion of physical science into the course of studies, an admirable cliemical laboratory lias been erected. The older buildings consist of two quadrangles, built partly of free- stone but chiefly of brick. The outer quadrangle, or schiool- yard, is inclosed by the chapel, schools, dormitories, and masters' chambers, and has in its centre a bronze statue of the royal founder. The buildings inclosing the inner or lesser quadrangle contain the residence of the fellows, the library, hall, and various offices. The chapel, on the south side of the outer court, is a fine Gothic edifice, containing some interesting monuments, among which is one to Sir Henry Wotton, wlio was long provost of the college; and at the west end of the antc-chapel is a fine marble statue of the founder in his royal robes, by Bacon. The chapel*~~

~~*Early inhabi- tants.*~~

~~*ET R—*~~

~~*has lately been beautified and decorated, and a number of stained-glass windows have been introduced. The library contains a curious and valuable collection of books, a collec- tion of Oriental and Egyptian manuscripts, and some beautifully illuminated missals. There is also a large library for the use of the boys. From the foundation of Eton College the college chapel was used as the parish church until 1854, when a handsome chapel-of-ease was erected at the cost of £8000. With the secularization of the college, the parish of Eton was in 1875 erected into an independent vicarage with the former chapel-of-ease as its parish church. In 1871 the population of the local board district of Eton (exclusive of the Eton boys) was 2806; of the parish, 3261.*~~

~~*See Memoirs of Eminent Etonians, with Notices of the Early History of the College, by E. 8. Creasy (1850); Sketches of Eton (1873); History of Eton College from 1440 to 1875, by H.C. M. Lyte, M.A. (1875); Memoirs of Celebrated Etonians, by J. Heneage Jesse (1875); and The Eton Portrait Gallery, by a Barrister of the Inner 'Temple (1875).*~~

~~*ETRURIA. When or by what road the Rasena (Etrusci) reached their permanent seats in Etruria proper is by no means certain, though from the fact of their principal towns being well inland, from the tradition of*~~

~~their having been previously settled in Umbria, from the survival of their peculiar language down to late times among a people of the Rhetian Alps, and from the discovery of works of art in this district corresponding with the earliest Etruscan~~

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~~Perusiase~~

~~am~~

~~+: ;~~

~~Sa rustumerim VS Fidende~~

~~Chart of Etruria.~~

~~remains, there would seem to be considerable probability in the theory of their first settlement in Italy having been about the mouth of the Po, whence their progress would be through Umbria and across the Apennines. At the same time, it is to be remembered that, though "Rasena" was the national name of this people, yet there is strong~~

~~ET R 633~~

~~evidence for supposing that the nationality, as we know it under the classical names of Etrusci or Tyrrheni (Tuppyvod, Tvpoyvoé), included another race which, if not nearly allied to the Greeks, had a singularly similar disposition towards the arts, such as it is hardly possible the original Rasena could have brought with them directly from the north. It would account for this other race, if we could accept the tradition (Herodotus, i. 94, Strabo, v. 220) of a body of Lydians having landed in Umbria aid colonized Etruria, naming it after their leader Tyrsenus. This Lydian origin was accepted by the Etrnscans themselves in late times (Tacitus, Ann., i. iv. 55), and many have seen a confirma- tion of it in the similarity of the tombs and tumuli exist- ing in both countries, and in the records of a singular community between them in such matters as music, games, and costume. Yet a native historian of Lydia (Xanthus) said~~

~~*nothing of the emigration from that country, and Dionysius, who cites him, maintained that the language spoken in Etruria had nothing in common with that of Lydia. The legend of Herodotus is an attempt to explain the name of "Tyrrhenia" as applied by the Greeks to Etruria, owing, doubtless, to its being largely imhabitated by members of that same Tyrrhenian race which was found en the coast of Asia Minor and in Thrace, which people Thucydides (iv. 109) identifies with the Pelasgians, while Herodotus himself (1.57) speaks of the Tyrrhenian town of Creston, by which he means Cortona in Etruria according to Dionysius, as Pelasgic. Another tradition asserted that Pelasgians from Thessaly had en- tered Italy from the Adriatic at Spina and founded Cortona. While then the Tyrrhenians and Pelasgians were practi- cally the same people, it will be sufficient to use the former name to designate the apparently foreign element in the nationality of the Rasena. In historical times the chief seat of the Tyrrhenians outside of Etruria was in Thrace, where they worked the rich silver mines, and to judge from their coins (e.g., those of the Edones and Bisaltz) were gifted with much the same disposition towards fine art which is observed in Etruria. From this position in a northern region, and from the traditions of members of the same race having entered Italy from the north-east, it is not unreasonable to suppose that they may have gradually made their way round by land, and may, in fact, have joined the Rasena while they were yet in their settlements at the mouth of the Po. So complete a blending of two races as appears in the Etrusci could scarcely take place unless the original contact had been during a primitive stage of civilization. No doubt there were other Tyrrhenians besides those of Thrace. There were those who were known chiefly as pirates, or as successful in seafaring, and from the circumstance of Czere, which previously had the Tyrrhenian name of Agylla, having been near the coast, it would seem as if part at least of the Tyrrhenians had entered Etruria by sea on the west coast.*~~

~~*It is common enough to find mention of the twelve cities Cities.*~~

~~*of Etruria, but nowhere are their respective names recorded.*~~

~~*1 Compare the tomb of Alyattes, still existing, and deseribed by Herodotus (i. 93), with that of Cueumella at Vulei. Tradition said that the Lydian*~~

~~trumpet and the Phrygian double flute had been introduced into Rome from Etruria; that the pretexta or official robes, the eagle as a standard, and the game of dice had been brought from Lydia to Etruria. Livy (iv. 17) tells how Lars Tolumnius determined, by means of dice, the fate of the Roman ambassadors who were sent to him at Veii (ef Plutarch, Vit. Rom., xxxiii.); and Festus (s. v. " Sardi") mentions the custom aecording to which, on oceasions of saerifice for vietory at Rome, an old man, dressed in purple, was led to the Capitol, attended by a herald, who proclaimed " Sardians to be sold;" and they explain this eustom as having sur- vived from the sale of prisoners after the eapture of Veii, which prisoners were Sardians, since Etruria had been eolonized by Sardians This eustom, however, seems rather to have originated after the taking of Sardinia by Tib. Sempronius Gracehus.~~

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~~Veii.~~

~~634~~

~~The probability is that in process of time this or that city fell out of the league, and was replaced by towns of more cecent growth, till in the end there were at least seventeen presumable claimants for the title of one of the twelve. This is the case as regards Etruria proper, but there was a time when similar leagues appear to have existed among the Etruscan cities in the neighbourhood of the Po (Etruria Circumpadana), and again among those of Campania. As to the confederation of twelve cities in Etruria proper, and the political principles on which it was founded, nothing is positively known, except that the principles were essen- tially aristocratic, mucli as in early Rome under the kings. The kings were elective for life, and were held in check by the principes or Lucumos who represented the real power of each state. In national enterprises one of the kings was chosen for supreme command, having a lictor from each city. The surroundings of official dignity found after- wards in Rome, the purple robe, the preetexta, the twelve lictors and fasces, the apparitores, the curule chair, and triumphal processions, were derived from Etruria, and in- dicate the nature of her constitution. The representatives met at the temple of Voltumna, the locality of which is not known (Livy, iv. 23),~~

~~*apparently in spring; but it would seem that, in fact, the confederation was far from strictly maintained, at any rate in the matter of external policy. For internal affairs they had certain books (libri discipline Etrusccee) in which they were instructed as to the founding and consecration of public or religious build- ings, the distribution of the people into tribes, curiz and centuriz, the constitution of armies, and the management of everything pertaining to peace or war (Festus, s. v. "Rituales"). These books were divided into three sections, the third, libri rituales, being those to which reference has just been made. The other two were devoted to divina- tion, an art in which the Eiruscans surpassed all other nations. The first part was the libri haruspicini, contain- ing instructions for divining the will of the gods from abnormal conditions observed in the entrails of animals slain in sacrifice, or from unusual natural phenomena. The second part was the libri fulgurales, treating of divina- tion from lightning. By such means the gods were believed to indicate their wishes towards men, and, indeed, had declared so much through the divine seer, Tages, a miracu- lous dwarf whom a labourer ploughing one day found in his furrow. Though then but a boy, Tages had grey hair, and was wise as if of a great age. His sayings, delivered always in verse, like oracles, were taken down by Tarchon, and formed the books in question. archon was the founder of Tarquinii, and from this town proceeded the other cities and their organization. Such is the legend, and in the early history of Etruria we have, as elsewhere, only legend, known mainly through the annals of Rome, which, when they go back to a period before the introduc- tion of writing (apparently in the 7th century. 3.c.) must be largely imaginary, and even long after this, are highly coloured.*~~

~~*First in importance among the Etruscan cities was Veuw, the site of which has been identified at Isola Far- nese, about 11 miles from Rome, its great rival and ultimate victor. Strong by its natural position on a high cliff, and fortified with massive walls, rich in its own territory, and commanding the assistance of its subject towns, Sabata, Sutrium, Nepete, and Capena, it maintained an almost constant state of war with Rome from the legendary times of Romulus down to its capture by Camillus, 396 B.c., after which, by a decree of the Roman senate, it was forbidden to be inhabited (Livy, v. 6). The spoils then carried away indicated its wealth, and doubt- less this,*~~

~~together with other measures then taken, led to the desolation which now reigns on the site. Of the 14 re-~~

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~~corded wars with Rome, the most memorable were—the 7th (509-8B.c.), in which, to replace Tarquinius Superbus on the throne of that city, Porsena of Clusium marched to its gates, though in a previous battle the Etruscans had been declared vanquished by a mysterious voice in the night, because they had lost one man more than the Romans; the 9th and 10th (482-476 B.c.),in which occurred the treacherous massacre of the Fabii, who, with their clients, to the number, it is said, of 4000, had voluntered to hold Veii in check from their camp on the Cremera ; the 12th, in which their king Tolumnius was slain, and the 14th, in which the Romans, to whose gates the Veientes had so often carried terror, laid seige to Veii, and in the tenth year took it, as is said by the stratagem of a cuniculus or mine up through the rock of the citadel. Those who believe this story, point out that Camillus may have obtained his idea from the cuniculus or outlet of the waters of the Alban lake, which also at this time was made to play a miraculous part. The waters of the lake were observed with alarm to be rising and threatening to overflow. The oracle at Delphi was consulted, and in consequence of its advice this outlet was made by the Romans in the space of a year (Livy, v. 15, 16).~~

~~Scarcely less important than Veii, and like it also Tarqui-~~

~~undoubtedly one of the twelve cities, was Varquinii, now Corneto, the queen of the Maremma, towards which Gravisce seems to have served as the port by which its great trade was carried on. The story runs that among those who preferred exile to the tyranny of Cypselus in Corinth in the early part of the 7th century B.c. was a wealthy merchant, Demaratus, who, accompanied by certain artists with mythical names (Eucheir, Diopus, and Eugrammus), settled in Tarquinii, which it is to be presumed was then sufficiently advanced in civilization to offer prospects of comfort, and to have been known to the traders of Corinth at least. Demaratus married a lady of Tarquinii, and had a son Lucumo or Lucius, who, though rich, suffered from being looked down on as a foreigner, and, to escape this, inigrated to Rome, where in time he rose to the~~

~~highest office of king, under the title of Tarquinius Priscus, and compelled the submission of the whole of Etruria, the token of which was the insignia of the twelve fasces, repre- senting the twelve cities. HIe was succeeded by Servius Tullius, or Mastarna, as the Etruscans called him, under whose rule Etruria revolted, but without final success. Then came Tarquinius Superbus and his expulsion from Rome, on which occasion Tarquinii and Veii sent an army to endeavour to reinstate him. In the battle which fol- lowed, Aruns Tarquinius and Junius Brutus thie first consul fell by each other's hands. From this time Tar- quinii was quiet for a century, till 397 B.c., when it joined Veii against Rome unsuccessfully, and thus revived a series of wars, in which, though generally worsted with severe loss, she yet maintained her independence down to the defeat at the Vadimonian lake, 283 B.c. Towards the close of the second Punic war, when the Etruscan cities had to furnish Scipio's fleet each with its staple commodity, Tar- quinii supplied sail-cloth.~~

~~Corn and other provisions were supplied by Cere, a town which, if less famous in war than the two al- ready described, was better known in the arts of peace. No doubt, in the legendary age, when it was ruled by the cruel Mezentius (4neid, viii. 482), it was sufficiently warlike, but in later times it rarely joined in the struggles against Rome, where, indeed, its people stood in high favour for having sheltered the Roman vestals and the Flamen Quirinalis from the Gauls (389 B.c.). From the privileges enjoyed by the Czerites in Rome arose, it was said, the word "czerimonia." It is recorded to the honour of Cere that she abstained from the piracy~~

~~Falerii.~~

~~Volci.~~

~~EPR UR~~

~~common among coast towns in early times (Strabo, v. 220) ; and it is a proof both of her advancement in civilization and of her reputation among the Greeks that she had a treasury at Delphi, where it was known as the treasury of Agylla, such having been the original name of the city. HIow the change of name arose is accounted for (Strabo, v. 220) with the ingenuity characteristic of ancient deriva- tions. Agylla had been founded~~

~~*by Pelasgians from Thes- saly, but was afterwards captured by the Tyrrhenians from Lydia (cf. Aneid, v. 479), who, having enquired the name of the town they were besieging, and having been answered by some one from the walls with a word which they took to be the Greek yaipe, adopted this as the new name of the city. Herodotus (i. 167) speaks of it as Agylla, and relates how it joined the Carthaginians against the Phoceeans of Alalia in Corsica (about 534 B.c.), and, having carried away its share of the booty and of the prisoners, put the latter to death. Upon this followed a plague, as to which the Agylleans consulted the oracle at Delphi, and were told in reply that the way to appease the Phoczeans would be to institute public festivals of athletic games and horse-racing. The sea-port was Pyrgi, cele- brated also for the wealth of its temple of Eileithyia, which Dionysius, the tyrant of Syracuse, ransacked (384 B.c.), taking from it 1000 talents, and spoils to the value of 500 talents more. As evidence of the high antiquity of the arts in Overe, there is the statement of Pliny (xxxv. 4—6) that paintings existed there older than the foundation of Rome. It was said to have been the last refuge of the Tarquins, and in confirmation of this is the modern dis- covery of a large sepulchre belonging to a family of that name, as seen from the numerous inscriptions init. Little remains except ¢wmuli and sepulchres, among which the most famous is that known as the Regulini-Galassi tomb, the masonry of which is Pelasgic in character.*~~

~~*In close political relationship to Veii, and probably reckoned as one of the twelve cities, though its population (the Falisci) was not purely Etruscan, was /aleri, originally on a high bare rock, but afterwards under Roman compulsion transferred to the broad plain which stretches to the Tiber, the Aquum Faliscum as it was called, to indicate the plain, not the justice of the people. The very ancient Fescennium seems to have been included in its territory. Trusting in its natural strength, Falerii vainly made light of the Roman siege conducted by Camillus (391 B.c.). It was on this occasion, as told by Livy (v. 27), that an official of Falerii, to whom was entrusted the education of the sons of the better class, led his pupils outside the city for their exercises as in times of peace, and by daily increasing the distance of their walks avoided suspicion, till at last he reached the Roman camp and offered to surrender the boys to Camillus, who, indignant at the treachery of the man, ordered him to be stripped,*~~

~~bound, and handed over to his pupils to be led back and punished. The habit of appoint- ing an official of this kind is spoken of as a Greek one, and, in connexion with the legendary foundation of Falerii by Halesus or Haliscus, a son of Agamemnon, together with the fact of its temple of Juno being the counterpart of the temple of that goddess at Argos, is taken as evidence of a strong Greek element in the town. Strabo (v. 226) quotes the opinion of some that the Falisci were not Tyrrhenians, but a distinct nationality.~~

~~One of the twelve cities also was Volci (Vulci) ap- parently, though the historical notices of it are but few, and Jeave no impression of any great power. Yet its remains, as discovered in numerous sepulchres, show that it must have been an important city. Of these the tumulus of Cucumella, as it is now called, is remarkable not only for its size (200 feet in diameter, and 40 to 50 feet high still), but also for its general similarity to the tomb of~~

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~~Porsena at Clusium, of which we have only the description as quoted by Pliny (xxxvi. 13, 19), and to the tomb of Alyattes in Lydia. Up to 1830 this tomb at Vulci was encircled round the base with a massive wall, which is now gone. In the heart of the mound were discovered two loosely built towers, one of them square, the other conical, which perhaps may be fairly compared with the pillars in the tomb of Porsena and the otpor in that of Alyattes. From the other sepulchres of Vulci has been obtained a vast number of antiquities, uot a few of which are of the first importance for the history of art in Etruria, and will be afterwards referred to. Etruscans Felsuna, as appears from its coinage, and now Bolsena, was one of the most powerful and warlike of the Etruscan states. The original site, it has been thought, was at Orvieto, which the Romans after a long and arduous siege destroyed, compelling the Volsinii to settle on the low ground at Bolsena. (Livy, x. 25), had been founded by the Umbrians, but became one of the principal cities of Etruria, being apparently at the height of its fame under the rule of its king Porsena, who to reinstate Tarquinius Priscus made that march to Rome (505 B.c.) with which are~~

~~*associated the undying legends of Roman hervism in the persons of Horatius, Sczvola, Cleelia, and Publicola (Livy, ii. 11-13). Before this we find Clusium joined with other Etruscan cities on the side of the Latins against Tarquinius Priscus. Afterwards it was the assistance given by Rome to Clusium which drew down the Gauls on the former in 389 B,C. At the close of the second Punic war Clusium furnished corn and fir for ship-building tothe Roman fleet. Mention has been made of the tomb of Porsena said to have existed at Clusium. In one place labyrinthine passages have been found among the tombs, such as appear to correspond to one of the features in the description of that sepulchre.*~~

~~*Arretiwm (Arezzo) was one of the twelve cities, but famous Arretium.*~~

~~*chiefly in comparatively recent times. In 301 B.c. the citizens rose against the tyranny of their great family, the Cilnii, and drove them to exile in Rome, where their cause was taken up with this practical result, that a Roman army defeated the Arretines at Russelle. Afterwards the city joined in league with the Gauls and Umbrians against Rome, but again was defeated. Next it was besieged by the Gauls. There is no record of its final submission to Rome. In the second Punic war it furnished corn, implements, and material of war for the Roman fleet. During the civil wars it took the side of Marius, and would in consequence have lost all rights but for the intercession of Cicero. The present site does not appear to be that of the ancient town. Of its walls, which were said to have been built of brick, there is no trace. Conspicuous still for its stupendous*~~

~~*walls and towers, commanding a high bare rock, is Cortona, Cortona.*~~

~~*where everything that remains is in harmony with the tra- dition of its extraordinary antiquity. Of other records*~~

~~*there are scarcely any. Like Perusia (Perugia) it had Perusia.*~~

~~*once been an Umbrian city, and like it also one of the twelve states of Etruria. Parts of the walls of Perusia remain, and many objects of great interest have been found on its site, none more precious, however, than the " Cippus of Perugia," with its long Etruscan inscription. Perusia comes first into notice arrayed against Fabius, wlio com- pelled her to sue*~~

~~*for peace. In the following year she was again at war, and shared in the disaster at the Vadi- monian lake. Other defeats followed, but not even that in which Fabius slew 4500 of her men, and took 1740 prisoners, was sufficient to reduce her to obedience to Rome, though that event followed not long after. In the second Punic war she supplied corn and fir to the Roman fleet. In the civil wars she took an active part, and when besieged by Octavius Czesar yielded only to famine. A great fire*~~

~~*Volsinw, called by the Volsinii.*~~

~~*Clusium (Chiusi), originally Camars Clusium.*~~

~~*Vola- terre,*~~

~~*Popu- lonia,*~~

~~*Russell,*~~

~~*Natural resources.*~~

~~*636*~~

~~*followed, after which the city was rebuilt by Augustus. Even under the empire it maintained a position of import- ance.*~~

~~*Volaterre, called Velathri on its coinage, and now Volterra, of which the massive walls from 4 to 5 miles in circuit still stand on a great bare height visible far round, appears to have been one of the twelve cities, notwithstand- ing the fact of its having taken part with the Latins against Tarquinius Priscus. Almost nothing, however, is known of its history except the record of a defeat (298 B.c.) inflicted by L. Cornelius Scipio (Livy; x. 12), the battle having raged all day till darkness set in. The Etruscans deserted their camp in the night. Though considerably inland, Volaterre is cited as having supplied tackling and other gear for Scipio's fleet, from which it would appear that she had been maritime, trading probably in the main through the port of Populonia, which is said to have been colonized by her. Possibly also the island of Elba with its rich mines belonged to Volaterre. Its territory was extensive. During the civil wars it*~~

~~*took the side of Marius, and after a siege of two years had to surrender, and only for a time escaped having to receive a military colony through the exertions of Cicero. Besides the walls there remain still several sepulchres of great interest, in par ticular that of the Cecine family, famous in Roman history, and the ruins of two dome-shaped chambers, resembling in their construction the so-called tomb of Agamemnon at Mycene. Populonia, called Pupluna on its coins, furnished iron obtained from the mines of Elba for Scipio's fleet. During the civil war it was destroyed by Sulla. Parts of the walls of huge masonry remain. Jéwsselle (Roselle) still survives in its walls of colossal masonry, but otherwise is a wilderness. Its history is uneventful, except for its siege by the Romans (294 B.c.), when it lost 2000 as prisoners and as many more slain (Livy, x. 37). Itfurnished corn and fir for the fleet of Scipio. Vetwloniais given asone of the twelve cities, but little is known of it from records, and scarcely anything from remains, if, as appears to be the case, Mr Dennis is right in identifying its site on the coast near Telamone, which he presumes would have been its port. Pisce, on the coast, was said to have been founded by Tarchon as a barrier against the Ligurians. Luna and Luca were pro- bably included in its territory. Of Fesulw the huge walls on an impregnable height still remain. In Roman times the inhabitants moved to the lower ground of Florence. At Cosa and Saturnia are remains of massive walls, and at the latter place a peculiar form of tomb, which seems to date from a very early and at any rate a rude age. Salpenum and Aurinia arc mentioned also among the Etruscan cities, Outside of Etruria proper, but still claiming to be Etruscan towns, we have, in Etruria Circumpadana, /elsini, afterwards called Bononia, said to have been at the head of the league formed by this district, Melpum, Mantua, Spina, Ravenna, Hatria, and Cupra. In Campania again were the following cities which Etruria was said to have founded or sent colonists to, but without the effect of making them practically Etruscan towns :— Capua, Nola, Pompeii, Herculaneum, Surrentum, Marcina, Salernum.*~~

~~*These, then, are the towns of Etruria. Tn their reeords and in their ruins they survive as monuments of a life spent in extraordinary activity, and highly honoured in death. No country has left such wealth in its tombs. Nowhere have such battlements endured till now. Nature aast have*~~

~~*largely aided the Etruscans with her fertility, whero now she is either exuberant to the degree of being a wilderness or pestilential as in the Maremma. Evidence of its natural prodacts has been seen in the corn, fir wood, and iron, supplied to the Roman fleet, Its rivers and*~~

~~*YR vUras*~~

~~*lakes must have assisted agriculture ("sic fortis Etruria crevit," Virg., Georg., il. 533), on which the country appears to have relied even more than on commerce, since with a large sea coast it had comparatively few ports. The exceeding unhealthiness of the coast district anciently as now may have had much to do with this result. Yet their commerce was such as to place the inhabitants in 4 position to make treaties with that powerful nation of traders the Carthaginians, as, for instance, in the mutual agreement that the latter should hold Sardinia, while the Etruscans retained Corsica. To the Athenian expedi- tion against Sicily in the Peloponnesian war Etruria sent three ships, probably more from enmity to Sicily than from friendship to the Athenians. Their success in piracy was too well known in early times. The greater part of the country is broken up by chains and ridges of hills. The supply of timber was large, and doubtless profitable, as were also the pastures, from which a consider- able trade in cattle rearing and wool spinning was derived. The numerous lakes—Lacus Ciminius, Sabatinus, Vadi- monius, Clusinus, Thrasymenus,and Volsinius withits basalt rocks, afforded extensive occupation in fishing, as did the forests for hunting. Wine, largely produced, was nowhere so fine as at Luna. Flax and linen were grown at Falerii and Tarquinii. Besides iron and copper, there was a supply of silver and gold. The variegated marble of Luna was greatly prized. Volaterre: yielded alabaster, Arretium a clay peculiarly adapted for pottery, for which in later times it was celebrated. Tufa or travertine could be obtained in massive blocks from many places. There were numerous warm and sulphurous springs. The country had once been volcanic in many places, the extinct craters serving as basins for lakes. The most fertile and most highly cultivated districts were in the north at the foot of the Apennines, and aloug the upper valleys of the Arno and Tiber. The chief rivers were the Clanis, the Amus (Arno), and the Umbro.*~~

~~*During the early period the natural resources of Etruria Customs,*~~

~~*must have been severely drained by her wars with Rome. Afterwards, when she sank into dependence, there arose private wealth, and the individual Etruscan became pinguis et obesus, an expression which is abundantly verified by the portrait sculptures on their sarcophagi. Their extra- vagance in diet was a reproach, and in connexion with this their habit of reclining at banquets, as constantly seen in their works of art, was remarked on as similar to that of the Greeks; while the presence on these occasions of women who joined in the toasts, contrary to the customs of the Greeks and the Italic nations, was pointed out as consistent with the origin of the Etruscans from diyvdia, where no less indulgence was said to have been allowed to women, and where also, as in Etruria, it was very usual to trace descent from the maternal side. Etrnscan dancers, who appear to have attended private as well as public ceremonies, were distinguished for the skill with which, without words, and only by action and gesture, they represented a story. Different from this may have been the armed dance, since it recalls that of the Salii in Rome, who accompanied their movements by songs of heroic deeds of old. Athletic contests, such as those of tlie Roman circus, together with displays of gladiatorial fights, were part of the amusements, and it seems almost certain that the latter form of excitement was derived by Rome from Etruria. The flute, trumpet, and dituas were the favourite musical instruments. Their literature consisted mainly of religious verses and national songs, of which, however, nothing is known. To these must be added the form of satyric songs 'vhich originated in I'escen- nium, a place belonging to Etruria, In science, especially in medicine, and in philosephy their knowledge was*~~

~~*Mytho- logy.*~~

~~*EP PeURT Sa*~~

~~*highly reputed. As regards time, they reckoned by lunar months, and appear to have had some principle of intercalation, to equalize the solar and the lunar year. The lapse of each year was recorded by driving a nail into the door of the temple of Nortia at Volsinii, a habit which passed over to Rome. 'The month was divided into weeks of eight days, the eighth*~~

~~*being set apart for marketing and house affairs ; the day began at noon. Next to years they counted by se@cula, each representing the longest life of the time, and reaching in some cases to 123 years, but with an average apparently of about 100 years. 'he Etruscan nation was to endure ten secula. The beginning of the 10th was announced in the year 44 Bc. The festivity of the Etruscans was accompanied by excess in personal ornaments and in dress; the toga picta, tunica pal- mata, the preetexta, the corona Etrusca, and the rich sandals which figured in Rome as insignia of office, had been introduced from Etruria, where also no doubt they served to mark the principes or lucumones as distinct from the mass of the people to whose lot it is in the highest degree improbable that such luxury as has been spoken of could have fallen. Their food was pulse, which may have been sweeter at Volsinii from being ground in curiously contrived mills (mole versatiles) of basalt (Pliny, xxxvi. 18, 29). Clientship, developed to the full in Rome, had first been proved practicable in Etruria, as was also the employment of slaves. The division of the people into three tribus and twelve curiw at Mantua has been taken as representing the general principle of division, and this would seem to be confirmed by the tradition of the three names of Ramnes, Tities, and Luceres having been adopted for the Roman tribus from Etruria. To the books of discipline, by which public and private affairs were regulated, reference has already been made. 'There appears to have been also a fourth section of these books, libri fatales, dealing with common incidents. The interpretation of all these books and the conduct of such ceremonies as they prescribed belonged exclusively to the noble families, some of which had hereditary rights to the priesthood. In each state were always ten boys of such families undergoing instruction for this purpose. But besides the regular societies or colleges of Haruspices to which the Romans sent for aid when perplexed by serions portents, there were apparently others who obtained a vicarious living by ministering tv the all-pervading superstition of the people. Instead of an oracle common to the whole nation as the Greeks had at Delphi, each state or city of Etruria had its own complicated machinery for discovering the will of the gods. (See Aucurs.) Certain deities revealed their will by lightning, others otherwise.*~~

~~*The gods (esar) were of two classes, the Dit Consentes, who directly managed the affairs of the world, and certain nameless deities above and controlling them in such a way as Tate is above Zeus in the liad. At the head of the former was Jupiter (called Vinca in Etruscan), with whom were associated Juno (Unt) and Minerva (Afenrfa), forming a supremacy of three for the protection of states, as may be inferred from the legend of Tarquinius having adopted them as the three chief deities of Rome. Their functions, however, were in each case different from those of the corresponding divinities of Rome and Greece, Jupiter being at once ruler of all in peace, god of war, and source of fertility in the earth, while Juno similarly was worshipped as "regina" in Veii, as cwritis, an armed goddess, at Falerii, and as associated with Vulcan at Perusia, thus taking the place of the Greek Aphrodite and representing fertility. Minerva, again, was winged besides being armed, had the functions of Fortuna or Fate, and from her symbol of the serpent was a deity of the powers of the earth. The Etruscan name of Venus was Z'uran,*~~

~~*of Vulcan, Sethlans, of Bacchus, Phuphluns, of Mercury, Turms. Besides the other Greek deities who were in ong way or another adopted into the Etruscan system, such as Apollo, Helios, Ares, Poseidon, Heracles, and the Dioscuri, a number of names have been handed down, some of which obviously designate gods of Latin or Sabine origin, while others may be synonyms of one and the same deity obtaining in different localities. The list includes Janus, Silvanus, Jnuus, Saturnus, Summanus, Vejovis, Soranus, Mantus, Pales, Nortia, Feronia, Voltumna, Mania, Eilei- thyia, Horta, Ancharia, Fortuna, Ceres, and others. To these were attached numerous genii of various powers and functions. As ruler of the lower world was the grim god Mantus with his hammer, and his associates Mania, Charnn, and the Furie. Among the Lares Familiares were included the shades of deceased persons. The Penates watched over household plenty and prosperity. A goddess of Fate who occurs frequently on the monuments is Lasa, probably a feminine derivative from Lar, ruler, as in Lars Porsena. From what combination of early races, or from what promiscuous habit of adopting foreign deities, this complicated system arose cannot now be decided.*~~

~~*For these gods temples were necessary, but in no case Architec- have they survived. Yet from records it would seem that te.*~~

~~*they differed from those of Greece in no essential particular except in the ground plan, which, instead of being much greater in length than in breadth, was nearly square, to be in conformity with the ¢emplum or arbitrary division of the heavens prescribed by the sacred books. The theatres have been more fortunate, as at Fiesole, where the massive ruins still show how in this form of construction also the Etruscans had been indebted to the Greeks. Of amphi- theatres or circi there are no remains. 'There is, however, one form of construction in which they are allowed to have been first, that is the arch, as seen among other places best of all in the Cloaca of Rome, the building of which tradition regularly assigned to the Etruscans in the time of the Roman kings. How the perfect arch was developed may be seen from the apparent vaulting in the Regulini-Galassi tomb at Cervetri aud elsewhere, a system of masonry which the Etruscans had in com- mon with the builders of the so-called Tomb of Aga- memnon at Mycenz. The earliest tombs seem to be those in the form of a well, sunk in the ground and lined with stones, containing a vase with the ashes and burnt remains of the dress and ornaments of the deceased. In this early period cremation appears to have been the rule, if, indeed, it was not always more or less a favourite form of sepulture. Next we have twoclasses of tombs. First the tumuli, consisting of chambers encircled by a massive wall, and covered with a mound of earth corresponding to the tumulus of Alyattes in Lydia and other parts of Asia Minor, as well as to the Nuraghe of Sardinia. Of this general type doubtless was the tomb of Porsena at Clusium, in spite of the probably fantastic description of it already referred to. Its labyrinthine chambers have been identi- fied. The tumulus of Cucumella at Vulci has also Leen mentioned Then we have tombs hewn in the rock, sometimes including several chambers connected with each other, and frequently adorned, like those of Lycie, with architectural fronts as of small temples. In these chambers were placed the sarcophagi and urns, for the most part richly sculptured, in general with subjects of design adapted from the Greeks, and having frequently on the lids reclin- . ing figures intended either as portraits or in some other way to represent the deceased, whose name and descent are painted on the front. In many cases the walls of those chambers are richly*~~

~~decorated with paintings, not exclusively but mostly reproducing scenes of festivity. The dead were accompanied in their resting-place by numerous~~

~~Lan- guage.~~

~~presents of painted vases, armour, and other objects. As a rule a special district or cemetery was set apart for the dead, but how far it was laid out so as to correspond with the quarters of each town cannot now be determined. For the construction of the dwelling-houses and 'Tuscan architecture generally see ARCHITECTURE, vol. ii. p. 414.~~

~~[LanauacE.—By Etruscan is meant the language which was spoken by the Rasena in Etruria more or less during the last thousand years Bc. until it succumbed to the Latin. It was the predominant language of Campania also from 800 to 400 B.c., at which time it yielded to the Oscan. Soon after this, owing to the incursions of the Gauls, it lost its hold on what was apparently its oldest home in Italy, the valley of the Po, but continued to exist in a debased form in the time of Livy (v. 33) among certain peoples of the Alps, in particular among the Rheti. 'fo the ancients Etruscan sounded barbarous. Dionysius (i. 36) declared it to be related to no other language. Still there was a time when among the better class of Romans Etruscan was taught, just as afterwards was Greek (Livy, ix. 36), Its remains as preserved by writers are few and frequently misrepresented, including about 60 names of places, 28 rivers, several islands, hills, woods, and lakes. Of names of persons there are 7 prenomina, and 50 gentile names and cognomina together, a few names of deities, heroes, and mythical kings, 7 names of months, and about 30 glosses, mostly from Hesychius, Servius, and Festus, and in part very doubtful. Altogether there are a little over 200 words, and of those many are local names, and have obviously originated among peoples of the Ligurian, Umbrian, and Latin races conquered by the Etruscans. The Etruscan inscriptious discovered on anti- quities up to the present time will be found in Fabretti's Corpus Inscriptionum Italicarum, with "Glossarium Itali- cum," Turin, 1867; "Primo Supplemento," 1872, "Sec. Suppl," 1874. The total number now reaches to about 5000, and increases yearly at the rate of 100 to 200. Unfortunately they include only 15 bi-~~

~~*linguals (Lat. and Etr.), and these are very short, containing almost nothing but names. Except the " Cippus of Perugia" found in 1822, which has 46 lines, Etruscan inscriptions are all short, there being for instance only five which have more than 20 words. Four-fifths of them are sepulchral, with the mere indication of names or relationship. A few names of towns have been preserved on coins, as also the numerals from 1 to 6, on a pair of ivory dice. Altogether there are about 200 words which appear not to be names.*~~

~~*Lepsius (Inscript. Umbr. et Oscce, Leipsic, 1841) was the first to determine definitely the character of the Etruscan alphabet. Its companion and northern variants were pointed out by Mommsen (Unteritalische Dialekte, Leipsic, 1840), and according to those authorities it was derived from a Greco-Chalcidian prototype current on the west coast of Italy. In its common form it has the following 19 letters : —*~~

~~*A, 2, a; my k, H, 8, - J, iM, 11,11, M, q, ?; of V, JV, (She a, C, e, Vv; Z, h, 6, 1, 1, m, Nn, Pp, 8, Tr, 8, t, u, x f. Of these ¢ is a tenwis, 0=th, y=ch, s' is soft, while the other letters have the usual force. Exceptionally > = occurs as anarchaic form of c¢; © =¢d=ph, mostly in forcigu words, and A,=m (Umbrian). The mediz 46, g, d, and the vowel o, though they often occur in words handed down by writers as Etruscan, are never found in the inscriptions. (For other peculiarities see Fabretti, " Osser-*~~

~~*es i ee Corp. Inscr. Ital. Pr. Suppl., p.*~~

~~*The first who attempted to explain the Etruscan inscrip-*~~

~~*HTRURISA*~~

~~*Oper. Dempster., Flor, 1726). He was followed by Giov. Batt. Passeri (Paralipomena in Th. Dempster, Lucca, 1767), who sought to prove them to be in an Italic language,—in fact, a dialect of the Latin. This opinion has maintained its ground with many, and only quite recently we find the great work of Corssen (Die Sprache der Ltrusker, Leipsic, 1874-5) devoted to the elaboration of a strictly scientific basis for it. On the other hand, Ottfried Miiller (Die Htruscer, Breslau, 1828) had observed certain*~~

~~distinctly foreign elements in the language, and had pointed them out clearly enough, without, however, venturiug upon any conjecture as to their source. HIs views, though adopted by Niebuhr, Mommsen, and Aufrecht, have not satisfied others less skilled in these inquiries, who have endeavoured to trace the Etruscan to a Celtic, Germanic, Slavic, Albanian, Basque, Semitic, and lastly a Turanian origin (Isaac Taylor, Etruscan Researches, London, 1874) 'These attempts have all failed, and Miiller's attitude of reserve appears to be decidedly the best under the circumstances. (See W. Deecke, Corssen wad dre Sprache der LIItruscer, Stuttgart 1875; Liruscische Forschungen, 1875-6; and the new edition of O. Miiller's Die HIruscer, Stuttgart, 1877.) Asa specimen of how the Etruscan language sounded may be given the inscription from a tomb at Perugia known as the Torre di San Manno. It is the third -longest of existing inscriptions. The siugle words are separated from each other by two dots and the lines by a vertical stroke. The last part, which is in brackets, cannot be read with certainty :—cehen: suSi: hinSiu: Sues': sians': etve: Saure: lautnes'cle: caresri: aules': larSial: precuSuras': | larSialisvle : cestnal: clenaras'i: eS: fanu : lautn : precus' : ipa: murzua: cerurum: ein | heczri: tunur: clutiva : zelur [vs: cetiver: apas]. The simple vowels are a, ¢, 2, u. Length is rarely indicated except in some doubtful cases by means of repeating the vowel. Modification of the vowels, such as occurs in various forms in the Indo-Germanic, Germanic, Semitic, and Turanian languages, is foreign to the Etruscan. It has no prefixes, and the accent appears to have been always on the first syllable, and in consequence of this arose the habit of alliding vowels in the middle of words to such an extent as to bring about frequently very disagreeable combinations of consonants, An extreme case is that of Elysntre='AA€favdpos. Some- times it may be due to a method of writing, though there is no evidence whatever of vowels being inherent in consonants. The diphthongs are ai, au, ei, 2a, ve, 1, ut, and aid, die, eia, ele, via, and again ae, ea, ew, ua, ue, which latter appear not to be original forms. The consonants are p, d (almost only in foreign words); ¢, (4), x,t, 05 J, r;m,n3;8(s'),2;v,f, k. The aspiration of the tenues is very frequent, sometimes also of the mediz in foreign words, in which cases f and h take the place of ¢, hof x. Itis doubtfulwhether / and ' interchange with 6 ; h is sometimes allided, The hard fis common to the Etruscan and the Italian languages, as is also its interchange with. Assibil- ation (é.g., in the name~~

~~pethne?, which also occurs as petsnet, pesnet, peznet) iscommon. Nasal letters often fall out before mutes, and 2 when preceding a labial becomes m frequently, e.g., lange, lame ; s never changes to 7, and the interchange of @ and y is doubtful. With regard to the suffixes indicating masculine nouns, which have been wrongly used as an argument for the Italic character of the Etruscan, the most numerous series ends in a; the next is that in e; endings in 7 and w are comparatively rare, in ?¢ and zw less so, while 7a occurs only exceptionally. Con- sonant endings are few. There is nosuflix in 7, ¢, 2, 2, f, 2. The greater part of the feminine words, also chiefly names of persons, are derived from the masculine by the suffix 2a ; not seldom nia, ta, Oa occur; also the diminutives za and~~

~~tions was Phil, Buonarroti (Hxplic. et Conject. ad Monum, | la, Besides these, however, are a number of feminine~~

~~ETRURIAa~~

~~words without corresponding masculines. As yet there is no trace of a neuter. Positive traces of declension are few. In the older inscriptions the nom. sin. in masculines ends in s (s'), which afterwards is dropped. The gen. sing. in masculine words ending in vowels, and in fem. words end- ing in consonants, is formed by sa, occasionally ssa=s'a= za, and shortened to s, s',z. The connecting vowels z and u are used after 7 and 7, @g., vele, gen. sing. velus(a). But in masculines ending in consonants, and feminines ending in vowels, the gen. sing. takes J, originally perhaps /a, or with connecting vowel al. But this system in the formation of the genitive seems to have been interrupted at an early period by the more general use of the ending sa, A remarkable peculiarity of the Etruscan is the apparently capricious doubling and trebling of the genitive suffix, eg., sla (s'Ia), and stisa (slis'a) in masculines ; lisa [lisa, lis'a, alisa (alis'a), alis', contracted to alsa, ls, Is', als, als'| and lisala (lisla, alisala, alisla, perhaps Jis-v-le)inmasculineand feminine. The dat. sing. is formed by the suffix si (s'7) attached to the nom., e.g., clan (son), dat. clensi (with modification of the vowel). An accusative singular is probably to be found in the phrase arse verse =averte ignem, as handed down by Festus, in which case it would. be similar to the nominative as in plural words. Few other cases in the singular have been traced. Possibly sar is an instance of~~

~~*the nom. pl. ; it would correspond to the conjectural acc. pl. of clenar from clan = son, from which the dat. pl. is clenaras't.*~~

~~*As to conjugation only one form is certain, 7.¢., the perf. 3 sing. in ce (ke), as in turce (turuce, turke) =dedit ; lupuce =mortuus or mortua est ; salce = obiit (mortem) ; amce= fuit ; arce=habuit; zilaynuce = magistratum gessit (?). As to lupuce, however, and zilaxnuce, there is some doubt. No augment or reduplication is known. It is possible that the phrase arse verse contains an imperative ; m? appears posi- tively to mean "I am." The numerals may be given as follows :—6u (6un)=1; ci=2; max=3; zal (esal, esl) =4; sa=5; hut (huth)=6; semp=7; ceep=8 (10-2). The tens are formed by alch(a)l, but irregularly, eg., cealchl (celchl)=20; muvalchl (mealchl)=30. In mixed numbers the units preceded the tens. Peculiar forms are ciemzathrm, probably =2 and 40, and Sunest muvalchl, pro- bably 1 and 30; s added to numerals may indicate the genitive. When z is added it seems to indicate repetition, e.g., eslz=4 times. Pronouns and adverbs appear to be re- presented by the forms eca, cehen, ta, eth, and a few others. An is perhaps a preposition. The present writer believes he has discovered with certainty two enclitic conjunctions, c (originally perhaps ce) and m (with vowel) wm, em, both equal to "and," eg., puiac and puiam =" and wife."*~~

~~*The following is a list of the words which have been made out from the inscriptions with tolerable certainty:—nets'vis trutnvt = haruspex ; fronta (Greek ?)=fulgurator; avil=life; ril—=year; tiv= month; tusurthir=husband; puia=wife; clan=son; sec (scch, s'cc, s'cch) =daughter; thura=grandson; lautni=freedman; lautnita= freedwoman; etera=slave ; eteraia=female slave ; tusna=swan; aefla= dog; krankru= panther; swti (sutht, s'uthi)=tomb; suthina = sepulchral object; swina=sarcophagus; nesl=grave; naper =niche (of tomb); cela (Ital.?)=sepulchral chamber ; twlar=tombstone (plural?); cesw=coffin; mulvannice (mulenike, &c.) =sepulchral; hinthia =shade, shade of the dead; farthana (harthna) =monument; sicres (rcs')=image ; tins'cvil=dedicated object ; alpan=work of art; cape (kapi, Italian?) =cup; ath(w)mic=lamps; neviku =earthen ware vase; mipe—vase; huins=fountain; svalce—died, leine (line) =lived; tur(w)ce=gave; amce=was; arce=had; zilachnuce = magis- tratum gessit;*~~

~~zilachnthas=magistratus; mi—I am. To these may be added, besides the numerals and particles just cited, the follow- ing names of deities :—Tinia (Tina)=Zeus; Uni=Hera; Sethlans =Hephestus; Zwrmus=Hermes ; Fuflunus= Bacchus ; Turan= Aphrodite ; Laran (Lalan?) =Ares ; Lala=Selene; Thesan= Kos ; Usil (Italian ?)=Helios ; Menrva (Italian ?)=Minerva; Maris= Dioscurus; Lasa=a subordinate goddess; and many other dcities not yet accurately identified. From ancient writers we know also Mantus=Hades, Nanos or Nanas=the Ktruscan Ulysses, and cer- tain names of months:—Vel©itanus = March; Ampiles = May; Aclus =June; Zraneus=July ; Ermius=August ; Celius=September;~~

~~Xoffer (Utofer in Corssen)=October. Lastly, we have the glosses: wsar, aisar=deus; aisoi=Oeol ; falando (or falandum ?)=celum; aukelos="Ews ; andas=Bopéas ; arimos=mlOnkos ; danmnos=trnos ; antar=terds 5 arakos=tépat ; g(i)nis= yépavos ; capys=falco; capua =cui pollices pedum curvi sunt ; burros=KdyOapos ; ataison=dva- dévdpas (wine); arse verse=averte ignem, agaletora=naida; lucumo =princeps; druna=épxh; lanista=carnifex; hister=mimus; ludius =saltator; swbulo=tibicen; nepos=helluo; gapos=sxnma; velites= light-armed; baltews=strap of sword ; cassis=metal helmet; man- tissa=additamentum ponderis; Jdus=middle of mouth; atrus= ending of word for the day after a festival. This list could be easily increased by conjectures. (W. DE.)]~~

~~Art.—It appears from a statement of Varro, quoted by Art.~~

~~Censorinus (De Die Natali, xvii. 5 fol.), that Etruscan history was divided into ten periods or sewcula, and it is known otherwise that the tenth of these periods began in the year 44 p.c. The first four secula are given as lasting each 100 years, the fifth 123, the sixth 119, the seventh 119, and allowing for the eighth and ninth each an average of 120 years, we obtain the year 1044 B.c. as the beginning of Etruscan chronology, a date which curiously corresponds with that usually assigned to those great movements of races in Greece with which the Etruscan traditions were associated. The really important point, however, in these figures, as Helbig (Annali dell' Inst. Arch. 1876, p. 230) has lately shown, is the circumstance that the first four periods are given in round numbers, and~~

~~*thus justify the inference that the keeping of regular records had not begun till the fifth period, commencing 644 3B.c., a date which at the most would not be more than a century after the first introduction of the Greek alphabet into Italy by means of the Greek colonists. Apparently the oldest alphabet as yet discovered on Etruscan remains is that known as the Chalcidian-Greek. It occurs on a vase from the Regulini- Galassi tomb at Czre, and in all probability it had not reached the Etruscans before the end of the 8th century B.c. No doubt everything tends in this early period to connect the Etruscans, not with the Greeks, but with the Cartha- ginians and the people of Italy and Sicily opposing the then active Greek colonization, which must have seriously threatened their trade. In 537 3.c. they united with the Carthaginians, as has been mentioned, to drive out the Phoceeans from Corsica. Such was the inflnence of Car- thage in 509 zc. that even the Romans accepted a com- mercial treaty with her; and among the ascertained dates of objects from Etruria may be mentioned 673-527 B.c. as that to which certain porcelain vases with hieroglyphics from Vulci and Cere are definitely assigned,— which vases again point to commerce with a people who understood and could imitate hieroglyphics. We have thus in the 7th and Gth centuries B.c. a picture of activity and fre- quent contact among the trading and advanced peoples of the Mediterranean which, though it implies a degree of national hostility on the part of the Etruscans towards the Greeks, need not exclude the intercourse of traders, nor a readiness to profit by the industrial and artistic skill of the Greeks. Otherwise it would be impossible to account for the legend which states that in the time of Cypselus, the tyrant of Corinth 660 B.c. (Pliny, xxxv., 12, 43), Demaratus, accompanied by certain artists, Eucheir, Diopus, and Eugrammus, settled in Etruria, and gave the first impulse to plastic art in Italy. These names sound legendary, but it may be taken that they would not have been invented unless to account for a fact which in this case is the very marked resemblance between the early art of Etruria and of Greece, a resemblance which could not have been accidental, or at any rate need not be supposed to have been so when the means of communication were so plentiful. We know, for instance, that the Etruscan silver coinage was struck on the Attic system as arranged by Solon about 590 B.c., having similar designs (e.g., the face of the Gorgon), the same weight, the same nominal,*~~

with the stater as its unit and the drachme as its half, and with apparently the same sign of the half as that used at Athens for the hemiobol (Mommsen, Rémisches Mtinzwesen, p. 218). Tuscan architecture, essentially Greek, approaches most closely to the early Ionic-Attic style. The general impression, however, has been that it was through Corinth rather than through Athens that Etruria came into contact with Greek art, and this not so much because of the legend just quoted as because both Corinth and Etruria enjoyed the same high reputation in antiquity for unrivalled skill of working in terra-cotta and in bronze. But doubtless there were many different sources of contact.

As regards skill in the execution of artistic designs, it would seem as if all that the Etruscans ever attained in this direction had been learnt from the Greeks, and, it will be fair to suppose, from Greeks resident among them. But when we come to the subjects of these designs, it is clear that there is a difference between the early aud late works in this respect, that, while in the latter the subjects as well as the style are almost always Greek, in the former there are certain obviously Oriental features. Under the circumstances it could scarcely have been otherwise, since at least from the 4th century B.c. onwards the Greeks ruled supreme in matters of art, whereas in the early period of the 7th and 6th centuries, their artistic productions, though then also doubtless by far the best attainable, had yet to compete against those of the Phcenicians or their kinsmen the Carthaginians, who in fact had been longer in the market. The characteristic of Phoenician art was its mixture and blending of the two elements of design, originally peculiar to Assyria and Egypt, upon which was afterwards engrafted, when the Greek style had developed itself, a distinctly Greek element. That Pheenician productions of the earlier class were imported into Etruria is seen for example in the silver vases from the Regulini-Galassi tomb at Cere (dZus. HtruscoVaticano, i., pl. 63-66), which, always suspected to have been Phoenician, were proved to be such fron: their identity of style with another silver vase found at Preeneste in 1875, and bearing a Pheenician inscription (AZonwmenti dell' Inst. Arch. Rem. x., pl. 32, fig. 1). This again is artistically identical with the silver pateree from Cyprus, descriptions of which are collected by Helbig in the Annalz

~~*dell' Inst. Arch., 1876, p. 199-204. Further evidence of Pheenician importations is to be found in the porcelain vases with hieroglyphics already mentioned, in the ostrich eggs ornamented with designs from a tomb at Vulci, and now in the British Museum, and in the richly engraved shell of the species Z'ridacna squamosa peculiar to the Red Sea and Indian Ocean, also now in the British Museum. At the same time, even if this importation of works of art had been on a much greater scale than there is as yet reason to suppose it to have been, it is clear that all the artistic influence derivable in this way must have been small compared with that which would naturally have been exercised on the Etruscans by the Greek colonists of Italy, and still more by the Greek artists who had made Etruria their home, as may be inferred from the legend already quoted. (See Mommsen, History of Rome, Eng. Transl., i., p. 248, who says, " The Italians may have bought from the Phoenicians; they learned only from the Greeks;" and again, p. 247, " Italian art developed itself not under Pheenician but exclusively under Hellenic influence.") Besides, the Oriental features of which mention has been made in early Etruscan art were in point of fact common in a high degree to early Greek art also, and it may have been through this channel that they found their way, rather than by direct contact with the Phoenicians or Carthaginians. In dealing with the artistic remains of the Etruscans, it will be more convenient to take them in classes, according to their material cr the purpose they served, than in groups of a*~~

~~*HT hUeRad &*~~

~~*historical sequence. Strictly speaking there appears to be no historical development in them. There are arcliaic works, there are very late works, and there are works of a middle stage, but there is no growth from one to the other. The process of change consists of a leap to the next new phase of art developed by the Greeks, who, so to speak, set the fashion. It happens also that certain classes of objeets went out of use or came into use with particular periods of art, and with the aid of this circumstance it will be possible to observe something approaching a historical order. We begin with the scarabs.*~~

~~*Scarabs.— These are gems consisting usually of carnelian Scarabs,*~~

~~*or banded agate, cut in the form of beetles (scarabzi), and having a flat face on which a design is engraved in intaglio. They are pierced transversely, and were attached by swivels to rings either to be worn on the finger or to be hung on a chain round the neck. The form of the scarab suggests an origin in Egypt, where, in fact, they have been found in great numbers. But excepting the form there is singularly little in common between the scarabs of Etruria and of Egypt. This is the more remarkable since the Carthaginians, from whom—or from the Pheenicians—it is naturally supposed the Etruscans had obtained the notion of this form of ornament, have left in Sardinia (at Tharros, Sulcis, and Cagliari) con- siderable numbers of scarabs, the designs of which are for the most part, though not purely Egyptian, yet obviously derived from that source. These Sardinian scarabs are cut in green jasper, the favourite material in Egypt, or occasionally in porcelain or glass, materials equally utilized in that country. Then also there is the fact that as yet only one or two scarabs have been found in Greece, and indeed very few engraved gems of any shape showing a fairly developed art comparable with that of the Etruscan scarabs, so that from both sides it would seem as if the Etruscans must have been dependent for models in this branch of their art on the Phcenicians or Carthaginians. On the other hand, there was a law of Solon's (Diog. Laert., i. 57) forbidding gem-engravers to keep casts or seals of rings engraved by them, and from this it is to be inferred that in his time the art was practised with the success then attending the other arts. This being admitted, the result obtained from an examination of the scarabs becomes clear. The designs, with few exceptions, are purely Greek, and as a rule they indicate the 7th and 6th centuries 8.c. as the period of their origin; that is to say, the work- manship on them corresponds to the Greek workmanship of that period. So also the subjects represented. If, for instance, we take either the remains of Greek art or the existing descriptions of works executed at this time bnt now lost, ¢.g., the chest of Cypselus (Pausanias, v. 17), the throne of Apollo at Amycle (Pausanias, ili. 18), and the paintings of Polygnotus at Delphi (Pausanias, x. 25-31), it will be seen that the chief delight of artists was then in rendering the exploits of heroes, and that figures of deities occur in comparison very rarely. Nor is this remarkable, since if was in this period that the Greeks carried the worship of their heroic but legendary ancestors to its highest point. The same result will be found fin the*~~

~~*Etruscan scarabs, if we take as fairly representative the collection in the British Museum. Out of 197 specimens, excluding those which are of too rude workinanship to be of interest in the question, 167 have subjects drawn entirely from Greek legends of heroes; of the remainder 10 represent Greek divinities, 18 such fabulous beings as centaurs, gorgons, satyrs, sirens, and harpies, all more or less connected with the heroic legends of Greece. Only two give native Etruscan deities or personifications. (See Contemporary Review, 1875, p. 729.) An entirely similar state of things will be found by reference to thie lists of*~~

~~*ETHOS*~~

~~*scarabs published in the "Impronte Gemmarie" (Bullet. d. Inst. Arch. Rom., 1831, p. 105; 1834, p. 116; 1839 p. 99). Of the Greek divinities : in the Museum collection, two are represented by heads of Athene obviously copied from an early coin of Corinth, while the two heads of the gorgon in the list stand in the saine relation to a series of silver coins till re- Fre, 1.—Philoctetes wounded cently ascribed to Athens, but in ie foot : LSet in now by some high authorities 'donyx. From Annali, Sven' to Attica. Nor are 1957 pl. II, fig. 5.*~~

~~*these the only instances in which Greek coins have been used as models to imitate. Still, notwithstanding this, coupled also with the fact that the processes of die- sinking and gem-engraving were almost identical, it is clear in many cases that the Etruscans had not confined themselves to models from this class of objects, but lad*~~

~~*skill enough to adapt designs from other sources, aud | especially from statues or figures sculptured in the round |*~~

~~*as more suitable than reliefs, at least where the gem*~~

~~*looked at as was frequently the case. A certain number*~~

~~*of the designs are clearly treated as reliefs, but the. majority exhibit a minuteness of anatomical detail and |*~~

~~attitudes more appropriate to sculpture in the round, not necessarily, however, always to statues strictly so- cilled, since in many cases the attitude is such that the figure could not have stood unless in one or other of the various positions assigned to figures in the pediments of temples, as for instance among the sculptures from gina in Munich, where the sanie minuteness and exactness of anatomy will be seen in the perfection to which it had attained in Greece at the close of the 6th century B.c. That the Tuscan temples were also decorated with sculp- tures in the pediments is known, not, however, the extent to which the designs may have keen derived from the Greeks, though from the analogy of the rest of Etruscan art the probability is that they were pretty closely copicd; and when Pliny (xxxv. 154), on the authority of Varro, speaks of the sculptures in all the temples of Rome previous to 493 Bc. being "Tuscan," it is fair to suppose that his Tuscanica signa would correspond both in style and in subject to carly Greek art of the period previous to this date. That view of the case would explain why so many of the scarabs come to have subjects best suited to the decoration of temple pediments, and to indicate further at what period this particular process of studying from Greek models took place ; it may be added that the oldest statue of a deity in Rome,—that of Diana in the temple on the Aventine, dedicated, according to tradition, between 577 and 534 B.c.—represented the type of the Ephesian Artemis familiar in early Greek and Etruscan art. On the scarabs, draped figures are in a great minority, the preference being, as in early Greek sculpture, for the nude, with a great display of physical structure. In a considerable uumber of cases the names of the personages represented are inscribed on the gems in Etruscan characters, a habit which prevailed also in early Greek art. Some few scarabs have a figure en- graved in relief on the back. With comparatively rare exceptions, the intaglio is surrounded with a cable border, and when gems are found with this border but without being scarabs, it is usual to describe them as scarabs which have been cut down in more recent times for the sake of the stone, not always correctly so, since this border appcars to have been occasionally adopted by Roman gem-engravers of later times. It is not impossible also that a number of the scarabs now existing, as to which generally there is little or no information concerning their prevenance, may~~

~~*have been made in Rome about the time of Augustus, when a taste prevailed for the revival of archaic art. Otherwise the production of scarabs, to judge from their style, must have ceased before the beginning of the 5th century z.c. When it began is a question which depends on when xreek sculpture attained mastery in rendering the human form (probably from the 8th to the 6th centuries 3.c.), since it is at this stage of the art that the scarabs, so to speak, strike into it. They have none of those grotesquely conceived animals executed on steatite or other soft stones which abound ou the carliest Greek gems. From the general considerations already stated, and from tle likeli- hood that the Etruscan period of imitation would not be before the last stage of archaic art in Greece, the 6th*~~

~~*century B.c. will be a reasonable terminus a quo for its start.*~~

~~*Coins.—Considered as works of art, the coins may be Coins,*~~

~~*classed next to the scarabs, from the similarity of the pro- cesses by which they are made, and the limited field which they present for design. It has been already said that the silver coinage of Etruria was struck on the Attic standard*~~

~~*_ as introduced by Solon in the beginning of the 6th century was translucent, and could be held up to the light to be-*~~

~~*B.c. The gold coinage is according to the Miletus standard, which appears to have been the oldest gold standard in European Greece, including Athens, whence doubtless it was obtained by Etruria along with the silver standard (Mommsen, Rim. Miinzwesen, p. 28). The majority of tho silver and gold, as well as the light copper coins belonging to the same system, are stamped only on one side, in accordance with the early custom, the types being essen- tially Greek, among them the head of the gorgon (fig. 2) similar to that referred to on the scarabs, a*~~

~~*and the cuttle-fish such as appears on ~% Greek coins, and very frequently on the /#//# early pottery from Ialysus in Rhodes, and FE @ ZS the ornaments from Mycenz and Spata PRG in Attica. Whatever may be the date ultimately assigned to the antiquities just ~ mentioned, it may be*~~

~~*taken as certain Fie. 2.—Coin of that the Etruscan coins in question do not Populonia. Brit. go back to an earlier time than that of ™vs-*~~

~~*Solon (about 590 3B.c.), and may be half a century later, or even much more in some instances. Others with different types are distinctly late.*~~

~~*fs!*~~

~~*40*~~

~~*Black Ware.—Connected in a measure with the en- Black graved gems is a series of black terra-cotta vases, many of ware.*~~

~~*which are ornamented with bands of figures in low relief pressed out in the clay when it is soft by means of an engraved cylinder rolled round the vase in such a way that the same design is constantly being repeated each time the cylinder completes a revolution. Frequently the designs are purely Oriental, either Egyptian or Assyrian, as if made directly from imported cylinders. In other cases they consist of rows of animals, the lion, deer, sphinx, and panther, followed by a winged human figure moving at speed, and perhaps representing such a being as the gorgon, altogether presenting precisely the same appearance as those early painted vases found in Greek localities, and attributed to a period of prevailing Oriental influence very justly supposed to have been communicated to the Greeks by the Pheenicians, since on Pheenician silver vases, as that of Curium (Cesnola, Cyprus, p. 329), very similar bands of animals occur. The nearer we approacn to the main centres of Phcenician industry, as for instance at Camirus in Rhodes, the more frequent are these designs of animals. Among the cases where the design is essentially of Hellenic origin may be mentioned a large circular dish in the British Museum, having the representation of a banquet scenc with two couches, and attendants dancing and playing on the flute, constantly repeated in two rows VOL — 81*~~

~~*Jewel- lery.*~~

~~*642*~~

~~*round the lip. Subjects of this kind (see Plate Vie) abound in early Etruscan art, and, so that there may be no doubt as to whence they were derived, on the early Greek vases found in Etruria. The date of this Greek pottery would then determine that of the Etruscan, and by means of the inscriptions not seldom occurring on the former, we arrive at a period not muchif at all before 600 B.c., a result which again brings us to what has already appeared to have been the first great period of contact between the Etruscans and Greeks. It is to be observed also that the earlier system of vase decoration in Greece, by means of geometric patterns, is not found in Etruscan ware. Further, on the black vases in question are to be seen often figures modelled in the round which could not have been derived from Greece before 600 B.c., since it was not till then that sculpture in the round was fairly introduced there, and could not well have been derived from Assyria, since that country appears to have never developed this branch of art, while as regards Egypt it may be answered that the figures are in no way of an Egyptian type. This black ware seems to have been chiefly a local fabric of Clusium. Still at one time it may have been general in Etruria and also in Latium, which as at Albano has yielded from under the lava a series of very ancient vases of this same texture, but without the characteristic ornamentation, which, as has been said, limits the Etruscan pottery to a period not earlier than 600 8.c., and possibly in some cases to at least a century later than this.*~~

~~*Jewellery.—Their tombs have preserved ample evidence of the passion of the Etruscans for rich dresses and personal ornaments, the former surviving in the wall-paintings, the latter in actual specimens of goldsmith's work, consisting of necklaces, ear-rings, wreaths, bracelets, finger-rings, and fibulee for fastening the dress. From a comparison of any large collection of these ornaments, such as that of the British Museum or of the Vatican Museum, with the same class of objects from Greece, it will be observed as a rule that where a pattern of any kind has to be produced, the Greek accomplished it skilfully and rapidly by means of fine gold wire soldered down into the required design,—that is, by filigree, as it is called ; while the Etruscan preferred to give it by sometimes innumerable and almost imperceptibly minute globules of gold, each separately made, and all soldered down in the necessary order—that is to say, by granulated work. But these characteristics, essentially*~~

~~cor- rect as they are, do not hold in all cases, since, on the one hand, there are numbers of Etruscan specimens where the granulated work is not employed, though it would be difficult to point to any one where the true filigree system takes its place, and since, on the other hand, granulated work is found onthe early Greek ornaments from Camirus in Rhodes, now in the British Museum (for a specimen of these ornaments, see the article ARcHmOLOGY, vol. ii. p. 350), The latter circumstance, exceptional though it is at present, may still serve to show how it may have been through the Greeks that this process of working in gold reached Etruria, in which case it must have happened at a period scarcely later than 600 B.c., the Camirus figures corresponding very markedly with the descriptions of certain figures on the chest of Cypselus. No dovbt this process of working may equally well have been obtained through the Phoenicians, if we may judge by the specimens from their settlements in Sardinia, and to some degree in Cyprus, and on the whole it is likely that in this matter of personal ornament the Etruscans were more in sympathy with the Phoenicians and orientals than with the Greeks. The bracelets, armlets, necklaces, and finger-rings worn by men on the Assyrian sculptures were precisely such as appealed to Etruscan tastes, and were not well to be had through the medium of the Greeks, unless perhaps the Greeks of~~

~~Cyprus, who worked side by side with the Pheenicians. The three gold necklaces engraved by Cesnola (Cyprus, pl. 22-24) might have been obtained from Etruscan tombs, instead of froma treasure chaniber in Cyprus, so far as the workmanship is concerned. In any case the original in- vention of so toilsome a process as that of the granulated work, while it cannot fairly be ascribed to the Greeks, may well have been due to the Phcenicians, whose greatest fame in very early times was for their skill in metal work, and whose products of this nature—for example, the silver pateree of the Regulini-Galassi tomb at Ceere—have been traced to Etruria as well as to Latium (Preeneste) and the coast of Italy (Salerno). From the fact that with the loss of their national independence there came rather an increase than otherwise of private wealth among the Etruscans, and a consequent continuation of the demand for jewellery, it~~

~~*happens that there is among their remains material for the study of this branch of their art or industry in its latest as well as its earliest stages. In the earliest specimens there is a preference for figures of animals in rows, as on the early vases, followed by winged figures of deities, the artistic element of form being always very rude and mechanical. Jn later times the human form is introduced faithfully, true to the Greek type, and representing personages from Greek legend or mythology. Gold was the favourite material, and with it were employed amber, glass, precious stones, occasionally enamel, and seldom silver, The precious stones most in use, either for finger-rings or for necklaces, were the carnelian and agate, cut either as scarabs or as beads. Glass was made into beads. Amber served a variety of purposes, as beads, ornaments of fibule, where it is employed with gold, and amulets, of which one specimen in the British Museum is in the form of an ape of a species peculiar to India (Macacus rhesus), whence the knowledge of it has been supposed to have been conveyed by the ships of Tarshish which brought apes and peacocks from that quarter. The amber itself was obtained first of all from about the mouth of the Po, and afterwards from the Baltic as now; but whether, as has been lately maintained (Helbig, Real Accademia der Lancet, Rome, 1876-7), the artistic remains in this material can be all grouped into one of two classes, representing a very early and a very late period with no intermediary stage, is a ques- tion on which perhaps more remains to be said before it is finally settled.*~~

~~*Bronzes.—Among the articles still pertaining to personal Bronzes*~~

~~*use is the series of bronze mirrors the extent of which may be conceived from the fact that a considerable number liave been found since the publication of Gerhard's work (Ltruskische Spiegel, 1843-1867), with 430 plates, many of which give from four to six examples. 'These mirrors are polished on one side, and on the other have a design engraved on the bronze, taken in the majority of cases from Greek legend or mythology, and no less from an artistic point of view founded on Greek models (see fig. 3). But while this is obvious enough, it is remarkable that as yet probably not more than six engraved mirrors have been discovered in Greece itself, and except in one case even these cannot be said to bear any analogy of design to the Etruscan mirrors. Perhaps it deserves to be*~~

~~*cousidered that these few speci- mens come from Corinth, whence, as tradition said, Greek art was introduced into Etruria. But it is not enough to sup pose the first impulse towards work of this kind to have come from Greece. It is necessary to find, if not mirrors, some other classes of objects which could have supplied the Etruscans with the multitude of entirely Greek designs which they have reproduced. No doubt the painted vases were largely drawn up, especially the shallow pater, with designs on a circular space in the centre, as may be seen, for example, in the three mirrors in Gerhard (pl. 159, 160), where the group of Peleus carrying off Thetis, familiar on*~~

~~*HTRUBTA*~~

~~*vases, is reproduced with the difference that the attributes of Heracles (bow and club) are given to Peleus. In the*~~

~~*if) b3 KS*~~

~~*Le,*~~

~~*line*~~

~~*RR*~~

~~*My*~~

~~*Fig. 3.—Bronze Mirror: Menad. From Gerhard, pl. 96.*~~

~~*rnirrors just mentioned the figures are rendered in low, flat relief, but this is very exceptional. In other cases also the groups appear to be taken from the centres of pediment sculptures on temples, the figures, diminishing in scale towards each side, being made to fit into the narrowing circle of the mirror. Artistically they may be arranged in three classes. The first is an archaic style, in which the subjects, drapery, and general treatment of the figures have much of a local Etruscan character, though still on the model of early Greek work; the second a free style, where everything seems Greek of about the 4th century B.c., except the names of the persons inscribed in Etruscan. Mirrors of this style have been found in*~~

~~*Latium at Preneste, along with bronze ciste similarly decorated with engraved designs ; occasionally both on the cistz and the mirrors are inscriptions in early Latin. The finest example of these utensils is that known as the Ficoroni cista, which, but for its bearing the name of a Latin artist, might be regarded as an excellent example of Greek art in the 4th century B.c., at which period it appears to have been largely spread in Latium as well as Etruria (Miller, Denkmdler, No. 309, and Bronsted, Den Ficoroniske Cista, Copenhagen, 1847). Thethird isa late and barbarous native style. The range of subjects is wide. Still it will be noticed that the almost exclusive use of mirrors by women has rendered subjects otherwise familiar, such as scenes of war, inappropriate. The labours of Heracles were much admired, as were incidents in the story of Helen, yet neither of them occur so frequently as scenes between satyrs and meenads, or the common representation of ladies at their toilet. In great numbers, but always on small or poor ex- amples, appear certain figures which have been identified as the Cabiri, and in any case seem to have been household genii. A small number of circular mirror-cases have been found, ornamented with reliefs, of which both the subjects and the execution are in the majority of instances purely Greek, of a comparatively late period.*~~

~~*Of skill in bronze casting there is little evidence among the Etruscan remains. Inonespecimen in the British Mu-*~~

~~*| with it, are engraved in Micali | (Mon. Ined., pl. vi.—viii.) It will | be seen from the porcelain vases*~~

~~*| thian vases, that the origin of the contents of this tomb properly*~~

~~*seum from Sessa on the Volturno (see CostuMg, vol. vi. p. 455, fig. 6), a core of iron has been employed, which by ex- panding has burst the figure down the side; and again in another specimen in the national collection a female bust from the Polledrara tomb (Grotta of Isis) at Vuleci, it will be seen that the art of casting was unknown when it was executed. It is made of a number of thin pieces of bronze plate beaten out into the form of parts of the bust, and all fastened together, sometimes*~~

~~*with fine nails, but apparently also in places with some sort of solder. On the other hand, to judge from the vases found in this tomb, which are made of pieces rivetted together with nails, it would seem as if solder could hardly have been known. The same process of uniting parts together occurs in the very ancient silver relief from Perugia (Millingen, Uned. Mon., pt. ii, pl. 14). The bust from Vulci, and the vases and other antiquities discovered*~~

~~*and scarabs among them bear- ing hieroglyphics, and from the | ostrich eggs with designs resem- — bling those of the early Corin-*~~

~~*belongs, not only to a period of intercourse with Egypt, but to a period when that intercourse was conducted by the Pheceni- cians, who alone knew how to adapt designs from the Greeks on the one hand, as well as from the Egyptians on the other. In- deed, one of the scarabs bears the cartouche of Psammetichus, whose date is 666 B.c.; and Fic, 4, — Bronze Statuette. though it might have been made Brit. Mus. From Micali, considerably after this time, it PI- *iil. fig. 1.*~~

~~*obviously could not have come into existence before, On the whole, 600 B.c. may be set down as probably the date of these antiquities. As regards the mass of exist- ing statuettes cast in the round, they bear generally, except in the matter of dress, distinct evidence of Greek origin, not only in the style and execution, but also in the subjects (see fig. 4). Still it is noticeable, especially among the later specimens, that a very marked spirit of realism is blended with the original idealism of the Greek prototypes. This realism of the Etruscans comes out very strikingly in the portrait sculpture of their sarcophagi, and probably was a phase of artistic capacity which they shared with the Romans. The purpose of these bronze statuettes was to surmount vases and candelabra, or to serve as handles of mirrors.*~~

~~*Terra-cottas.—The skilful modelling of terra-cotta, for Terra-*~~

~~*which the Etruscans were celebrated, was, it appears, chiefly ¢ directed to the production of ornamental tiles, sarcophagi, and statues, rather than those small and mostly graceful statuettes which are found in large numbers in Greek localities. 'The statues which were placed on the*~~

~~*pediments of temples have naturally perished. Specimens of the tiles and a large number of sarcophagi, however, remain, the latter being for the most part of a late period, and executed under the influence of a completely developed Greek art. Fortunately two sarcophagi of the greatest interest for the study of the early art of Etruria have been found at Cere. The one, now in the Louvre (engraved, Mon. d. Inst. Arch. Rom., vi. pl. 59; cf. Annali, 1861, p. 402), has a male and*~~

~~*ottas.*~~

~~*Plate VIII.*~~

~~*644*~~

~~*female figure of about life size reclining on the lid. The other (for engraving of which see Plate VIII.) is now in the British Museum, and while having asimilar group of figures of about life size on the lid, is besides richly decorated with bas-reliefs round the four sides. In both sarcophagi colours are freely employed, which originally must have been slightly staring, and increase the effect of realism, which in the figures on the lids is all the more conspicuous by comparison with the reliefs, where the true early Greek spirit, as seen on tlie vases, is strictly maintained. The reason of this difference may partly lie in the fact that Greek models for the reliefs were easily enough obtained, while on the other hand Greek figures approaching in re- semblance those on the lid here must at least have been very scarce. At the same time it is also to be remembered that owing to the impossibility of counting on the places where the terra-cotta might shrink, or to what extent this might go, no other treatment would be suitable except that of a bold, rough realism, the effect of which could not easily be destroyed. With the reliefs there was no such danger. The type of face shown iu these figures is not to be taken as that of the early Etruscans, for this reason that their essential peculiarities, the sloping forehead, and eyes and the corners of the mouth turned upwards, are obviously mannered exaggerations of the early Greek style of render-ing these features, for which undoubtedly there may have been some small grounds in the actual features of the people. Besides on the reliefs there is very little of this exaggeration. The attitude of the figures on the lid is that of a man and wife at a banquet sceue, probably here intended to*~~

~~*indicate the eternal banquet which appears to have been considered the lot of the happy in the next world. The sarcophagus, to judge from the inscription painted on it, was that of a lady named Thania Velai Matinai Unata. Another inscription painted along the lid reads Jt vela vesnas me vepe tursi kipa, which, according to the interpretation of Corssen (i. p. 784), is the dedication of the monument. From the character of the letters it has been thought that this sarco- phagus need not be earlier than the end of the 6th century B.C., a period which would not be unsuitable to the work- manship, if we allow that it may have retained many traditions from an earlier time, which in Greece generally had by then been abandoned. The relief on the front represents a combat of two armed men, of whom the one has received a mortal blow and is falling. From the wound lus soul has escaped, and is seen in the shape of a winged figure bounding away on the extreme right. The soul of the victorious warrior comes tripping in on the extreme left. This manner of representing the soul recalls in some degree the sepulchral vases of the Athenians, where it appears as a small winged figure, and recalls also the psychostasia of very early times, in which the souls of two combatants were supposed to be placed in a balance and weighed against each other while the fight was pro- ceeding. It will be seen also that the wounded warrior is already being devoured by the dog of the battle field, thus giving an instance of what is called prolepsis, and is not unfamiliar in early art. That is to say, the artist has attempted to realize two separate moments of the action, first the actual wounding, and secondly the consequence of it, viz., —that the body of the vanquished is left to be devoured by dogs and kites, a fate which the heroes of the Jiiad often promise their opponents inbattle.1 That the con:- batants here are Achilles and Memnon is not improbable, and in this case the principal female figures will be respectively*~~

~~*al — . Se * : s s. A similar instance of prolepsis is when Perseus is figured cutting off the head of Medusa, and already holds at his side Pegasus, the*~~

~~*winged horse, which did not spring from her until her head was entirely off,*~~

~~*Ee te tee*~~

~~their mothers Thetis and Eos, each with anattendant; themale attendant on each side perhaps was attached to the warriors themselves. The story begins on one of the ends of the sarcophagus with the two warriors parting for battle; in the front is the combat; on the other end the mourning, and on the back the eternal banquet. The feet are formed by four sirens in their capacity as daughters of the earth sent by Persephone to assist mourners to wail for the dead (Eur- pides, //elena, 167). In other cases the sirens were thought of as carrying away the souls of the dead, as on the Harpy monument from Xanthus in Lycia. The later urns and sarcophagi will be found collected in Brunn's 2tdlievt delle Urne Etrusche, Rome, 1870.~~

~~Vase Painting.—It has been proved that the great mass Vases.~~

~~of painted vases found in Etruria, and familiarly called Etruscan, are productions of Greek workmen. The subjects, the style, and the inscriptions are all Greek. But side by side with them are certain undoubtedly Etruscan vases, the very small number of which would suggest that in this direction at least the Greek models defied imitation if in- deed the attempts in question did not clearly show this. At the same time it must be admitted that between the early Corinthian vases of about the 7th century 3B.c., dis- covered in Etruria, and the probably contemporary speci- mens of native work there is no very great difference. It was the later development which the Etruscaus could not follow. Specimens of early imitation found at Cere will be seen engraved in the Monwmenti d. Inst. Arch. Roma, vi. pls. 14, 15, 33, 36; vi-vii, pl. 73, the peculiarities of which, such as in costume, type of face, disproportion between figures of men and of animals, are pointed out in detail by Helbig, Annali d. Inst. Arch. Rom., xxxv., p. 210, fol. The style of the originals, including the correct degree of subordination in the design to the vase which it adorns, is lost, and in its place stands out a certain gross reality in conflict with the form of the vase. It docs not follow that these imitations were made contemporary with the originals (about the end of the 7th century B.c.), but a strong argument in favour of such a view might be found in a vase from the Polledrara tomb at Vulci, the antiquities of which have been shown to belong to this period. The vase in question like the others has a design purely Greek in its subject and~~

~~*general treatment——Theseus struggling with the Minotaur, while Ariadne holds the clue, a chorus, chariots, and centaurs with human forelegs. But it differs in this respect, that the ontlines of the figures are drawn with a crude red colour upon the varnished surface of the vase, not as in other cases on spaces left unvarnished. From that circumstance, and from the general effect of these Cretan vases as compared with the reliefs on the large sarcophagus, just described, from the same locality, it will be seen that the skilled workman of Etruria turned more readily to modelling in terra-cotta than to the complicated and difficult process of vase-painting. As regards the few attempts made in late times it may be said that they also fail in the direction of grossness. See, for example, the vase in the British Museum with Ajax falling on his sword and Acton defending himself from his hounds. Mention, however, should be made of one specimen in the Museum collection where all the technical skill of a Greek potter is displayed, and its Etruscan origin revealed only by the subject and by certain details familiar in the mirrors, The composition of the scenes is in some respects like that of a picture with perspective, which, while it is not a feature of Greek vases, can neither be called Etruscan on the ground of any known analogy.*~~

~~*Mural painting.—The mural paintings of the Etruscans Mural are known only from their tombs, the inner walls of which painting.*~~

~~*it was not unusual to decorate in this manner, the work being executed on a prepared ground of white stucco, and*~~

~~*ET T—HTT*~~

~~*with a considerable variety of colours, red, brown yellow, carnation, blue, green, and black, to indicate flesh, hair, dress, armour, and other adjuncts. The principal localities in which these paintings have been discovered are Veii, Chiusi, Vulci, Czere, and Tarquinii. The most important of them will be found engraved in the Afonumente d. Inst. Arch. fom., those of Tarquinii in vol. i, pls. 32-3; vi., pl. 79; viii., pl. 36, and ix., pls. 13-15e; from Caere, vi., pl. 30; from Vulci vi., pls. 31-2 ; from Chiusi, v., pls. 16, 17, 33, 34; from Veii, Micali, Afon. Jned., pl. 58, figs. 1-3. For the state of opinion concerning the antiquity of this art in Etruria, see Helbig in the Annalé d. Inst. Arch. Lom., 1863, p. 336, and again*~~

Annali, 1870, p. 5-74, in reply to Brunn who had criticised his theory in the meantime in the Annali, 1866, p. 442. Both wrote from personal in- spection, and from an acquaintance with Etruscan remains such as no other writers possess. If they differ as to whether this or that painting is older than another, they yet appear to be agreed on the main points that, taken alto- gether, these paintings represent three successive stages of the art, the oldest stage being characterized as Tuscan and as exhibiting little of Greek influence, the secoud as strongly marked by the features of Greek painting in the phase in which it was left by Polygnotus, and the third as completely

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Fig. 5.—Scene from Mural Painting at Tarquinii. umenti d. Inst. Arch., i., pl. 32.

From the Afon-

underthe domination of Greek art asit existed in the Hellen- istic age. It is not meant that this oldest or Tuscan school was. an original creation, but only that with perhaps no better models than Greek vases, the Etruscans then developed a system of mural painting which may be called their own, the more so since its spirit of localizing its subjects by giv- ing the figures native dress and types of face is seen at times surviving in the later stage. The tomb at Veii is assigned by Helbig to the first period, and in any case it raust be ranked as early, since that town was destroyed in 396 B.c. Obviously very early are also the pictures from Cre (Monument, vi., pl. 30), where a female is being brought to an altar to be sacrificed. In the scene is an ancient statue (xoanon), a curious figure of a soul in the air, two warriors and two figures sitting face to face. It is, however, in the paintings of the second period, especially those of Tarquinii (see fig. 5), that the Etruscan show to the best advantage, as having the delicacy and

refinement of drawing combined with nobility of figure ascribed by tradition to Polygnotus, and still traceable on the earlier examples of the Greek vases with red figures, wearing thin transparent draperies which do not conceul the forms and movements of the limbs. Here the Etruscan artist has a complete command of skill, and is obviously conscious of it from the precision with which he carries out his finest lines. The types of his figures are of pure Greek beauty, and their movement such as that on the best vases. No doubt these particular paintings are exceptional among those that remain now, but in what relation they had stood to the general

run at the time when they were executed is another question. The others sin more or less in the direction already pointed out as characteristic of the Etruscans, a certain gross realisra under which there probably lay artistic strength of some kind. As regards the latest stage it has little to distinguish it from Greek work except the occasional presence of peculiarly Etruscan demons, Etruscan inscriptions explain- ing the subjects, and again frequently the native realism carried sometimes to the extent of being nearly grotesque. In the early specimens the subjects consist mostly of banquet scenes attended by dances to music apparently in groves, perhaps those of Elysium and games sucli as ac- companied fnneral obsequies in Greece and probably also in Etruria. Doubtless these representations in the interiors of tombs were intended to realize the future life of the deceased. (A, S. M.) ETTLINGEN, the chief town of a district in the circle of Carlsruhe, Baden, Germany, is situated at the entrance of the valley of the Alb, on the railway from Manheim to Basel, 44 miles south of Carlsruhe. Agriculture, the rear- ing of cattle, and the cultivation of madder and various kinds of fruits employ a portion of the population ; but they are chiefly engaged in manufactures, paper-making, cotton- spinning, weaving, cloth-dressing, and starch-making. Ettlingen possesses an old castle built on the site of a toman fortress. This castle was burnt by the Frenen in 1689, but was rebuilt at the begiuning of the 18th century. The first notice of Ettlingen dates from the beginning of the 12th century. It was a free town till 1234, when it was presented by the emperor Frederick II. to the margrave of Baden. In 1644 it was

~~conquered by tlie Weimar troops under Taupadel, and near the town Moreau was defeated by the archduke Charles 9th and 10th July~~

~~1796. In and around Ettlingen a large number of Romau antiquities have been found. The population in 1875 was~~

~~5286.~~

~~ETTMULLER, Ernst Moniz Lupwice (1802-1877), an able and erudite philologist, who has contributed largely to the critical literature of the Germanic tongues. He was born at Gersdorf near Lébau, in Saxony, October 5, 1802, was privately educated by his father, the Protestant pastor of the village, entered the gymnasium at Zittau in 1816, and studied from 1823 to 1826 at the university of Leipsic. After a period of about two years during which he was partly abroad and partly at Gersdorf, he proceeded to Jena, where in 1830 he delivered, under the auspices of the uni- versity, a course of lectures on thie old Norse poets. Three years later he was called to occupy the mastership of German language and literature at the Zurich gymnasium ; and in 1863 he left the gymnasium for the university, with which he had been partially connected twenty years before. His death took place at Zurich, 1877. To the study of English Ettmiiller contributed by an alliterative translation of Beowulf, Zurich, 1840, an Anglo-Saxon chrestomathy entitled Hngla and Seaxna scopas and boceras, Quedlin- burg, 1850, and a well-known Lexicon Anglo-Saxonrcum, Qued., 1851, in which the explanations and comments are given in Latin, but the words unfortunately are arranged according to their etymological affinity, and the letters ac- cording to phonetic relations. He edited a large number of High and Low German texts :— Kunech Laurin, Jena, 1829; Wartburgkrieg, Jena, 1830; Sant Oswaldes Leben, Zur. 1835 ; Ortnides mervart unde tét, Zur. 1838 ; Hadloubes Lieder und Spriiche, Zur. 1840 ; Heinrich's von Meissen des Frauenlobes Leiche, Spriiche, Streitgedichte und Lieder, Qued., 1843; Frowen Helchen Stine, Zur. 1846; Heinrich's von Veldecke Eneide, Leipsic, 1852 ; Theophilus, Qued. 1849 ; Dat Spil van der upstandinge, Qued. 1850 ; Wizlawes IV. Ineder und Sprtiche, Qued. 1852 ; and to the study of the Scandinavian literatures he contributed an edition of the~~

~~*Voluspa, Leipsic, 1831, a translation of 'the Leder der Edda von den Nibelungen, Zur. 1837, and an old Norse reading book and vocabulary. He isalso the author of a Handbuch der Deutschen Literaturgeschichte, 1847, which includes the treatment of the Anglo-Saxon, the Old Seandi-navian, and the Low German branches; and he popularized a great deal of literary information in his Herbstabende und Winterndchte: Gesprdche tiber Dichtungen und Dichter, 3 vols., Stuttgart, 1865-1867. The alliterative versification which he admired in the old German poems he himself cmployed in his Deutsche Stammkénige, Zur. 1844, and Das verhdngnissvolle Zahnweh, oder Karl der Grosse und der Heiliger Goar, Zur. 1852.*~~

~~*ETTMULLER, Micuaet (1644-1683), a German physician, born at Leipsic, May 26, 1644. After having studied languages, mathematics, and philosophy at his native town, he went to Wittenberg, and, returning to Leipsic, obtained a medical diploma there in 1666. He travelled in Italy, France, and England, and then retired to Leyden, where he had intended to spend some time in study ; but he was suddenly recalled to Leipsic in 1668, and received the degree of doctor immediately after his arrival. He was admitted a member of the faculty of medicine in 1676. About the same time the university of Leipsic confided to him the chair of botany, and appointed him extraordinary professor of surgery, the duties of which he discharged with distinction. He died on the 9th March 1683. Although Ettmiiller only wrote short dissertations and mere opuscula, he enjoyed an immense reputation. He had the art of interesting and fixing the attention by a ready elocution, and by arguments sometimes much more specious than solid.*~~

~~*The following is a list of his works :—De Singularibus, a thesis defended by Ettmiiller in 1663 ; Medicina Hippocratis Chimica, Leipsic, 1670; Vis Opti diaphorectica, Leipsic, 1679; Chimia Rationalis ac Experimentalis curiosa, Leyden, 1684; Medicus Theorta ct Prawi gencrali instructus, Frankfort and Leipsic, 1685. Various editions of his collected works have been published, but the best is that of his son, who was also a physician of some emin- ence, entitled Opera Medica theorctica-practica per filium Michac- lem Ernestum, etc., Frankfort, 1708, 3 vols. fol. There is no com-*~~

~~*plete translation of the works of Ettmiiller, but there are numerous German, English, and French translations of the different treatises.*~~

~~*ETTY, Wituiam, R.A. (1787-1849), onc of the most eminent of British painters, was born at York, 10th March 1787. HIs father had been in early life a miller, but had finally established himself in the city of York as a baker of spice-bread. HIe showed from his earliest years a talent for drawing, and used to make sketches whenever he could find opportunity. After some scanty instruction of the most elementary kind, the future painter, at the age of eleven and a half, left the paternal roof, and was bound apprentice in the printing-office of the Mull Packet. Amid many trials and discouragements he completed his term of seven years' servitude, and having in that period come by practice, at first surreptitions, though afterwards allowed by his master "'in lawful hours," to know his own powers, he removed at the close of it to London. The kindness of an elder brother and a wealthy uncle, William Etty, himself an artist, stood him in good stead during lus long and noble struggle against the trials and difficulties that beset the career of nearly every person who adopts the profession of art for its own sake. HIe commenced his training by copying without instruction from nature, models, prints, &c.,—his first academy, as he himself says, being a plaster-cast shop in Cock Lane, Smithfield, HIere he made a copy from an ancient cast of Cupid and Psyche, which was shown to Opie, and led to his being enrolled in 1807 as student of the Academy, whose schools were at that time conducted in Somerset HIouse. Among his fellow scholars at this period of his career were some who in after years rose to eminence in their art,*~~

~~*ETT—ETT*~~

~~*such as Wilkie, HIaydon, Collins, Constable. HIs uncle generously paid the necessary fee of one hundred guineas, and in the summer of 1807 he was admitted to bea private pupil of Sir Thomas Lawrence, who was now at the very acme of hisfame. tty himself always looked on this privilege as one of incalculable value, and till his latest day regarded Lawrence as one of the chief ornaments of British art. For some years after he quitted Sir Thomas's studio, even as late as 1816, the influence of his preceptor was*~~

~~*traceable in the mannerism of his works; but his later pictures prove that he had completely outlived it. 'Though he had by this time made great progress in his art, his career was still one of almost continual failure, hardly cheered by even a passing ray of success. In 1811, after repeated rejections, he had the satisfaction of seeing his Telemachus rescuing Antiope on the walls of the Academy's exhibition-room. It was badly hung, however, and attracted little notice. For the next five years he persevered with quiet and constant energy in overcoming the disad vantages of his early training with yearly growing success, and he was even beginning to establish something like a name when in 1816 he resolved to improve his knowledge of art by a journey to Italy. After an absence of three months, however, he was compelled to return home without having penetrated farther south than Florence. Struggles and vexations still continued to harass him, but he bore up against them with a patient endurance and force of will which ultimately enabled him to rise superior to them all. In 1820 his Coral-finders, exhibited at the Royal Academy, attracted much attention, and its success was more than equalled by that of Cleopatra's arrival in Cilicia, shown in the following year. In 1822 he again set out on a tour to Italy, taking Paris on his way, and astonishing his fellow-students at the Louvre by the rapidity and fidelity with which he copied from the old masters in that gallery. On arriving at Rome he immediately resumed his studies of the old masters, and elicited many expressions of wonder from his Italian fellow-artists for the same qualities which had gained the admiration of the French. Though Etty was duly impressed by the grand che/s doeuvres of Raphael and Michelangelo at Rome, he was not sorry to exchange that city for Venice, which he always regarded as the true home of art in Italy. HIs own style as that of the most distinguished English colourist of any period held much more of the Venetian than of any other Italian school, and he admired his prototypes with a zeal and exclusiveness that sometimes bordered on extravagance. Early in 1824 he returned home to find that honours long unjustly withheld were awaiting him. In that year he was made an associate of the Royal Academy, and in 1828 he was promoted to the full dignity of an Academician. In the interval beteen these dates he had produced the Combat (Woman interceding for the Vanquished), and the first of the series of three pictures on the subject of Judith, both of which ultimately came into the possession of the Scottish Academy, which*~~

~~*body, to their credit be it told, were the first to discern and publicly appreciate the genius of Etty, and the value of his contributions to art. Etty's career was from this time one of slow but uninterrupted success. His works were not now as formerly allowed to remain upon his hands unsold; and though the prices which they fetched were almost incredibly small in comparison with the value now attached to them, yet they satisfied the artist's requirements, and even tempted bim to persevere in the dangerous career of high art. In 1830 Etty again crossed the Channel with the view to another art tour through the Continent ; but he was overtaken in Paris by the insurrec- tion of the Three Days, and was so much shocked by the sights he was compelled to witness in that time that he*~~

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~~*returned home with all convenient speed. During the next ten years of his life the zeal and unabated assiduity of his studies were not at all diminished, and he continued with marvellous regularity his various routine duties in connexion with the academy, though his health was far from robust, and his circumstances were now such as to put it in his power to dispense with the multifarious drudgery which the fulfilment of these duties demandcd. He was a constant attendant at the Life School, where he used to work regularly along with the students, notwith- standing the remonstrances of some of his fellow Acade- micians, who thought the practice undignified. The course of his studies was only interrupted by occasional visits to his native city, and to Scotland, where he was welcomed with the utmost enthusiasm, and féted with the most gratifying heartiness by his brother-artists at Edinburgh. On the occasion of one of these visits he gave the finishing touches to the trio of Judiths, which form not the least interesting or valuable feature in tlie collection of the Scottish Academy. In 1840, and again in 1841, Etty undertook a pilgrimage to the Low Countries, to seek and examine for himself the masterpieces of Rubens which exist in many of the churches and public galleries there. Two years later he once more visited France with a view to collecting materials for what he called " his last epic," his famous picture of Joan of Arc. This subject, which would have tasked to the full even his great powers in the prime and vigour of manhood, proved almost too*~~

~~*serious an undertaking for him in his old age. It exhibits, at least, amid great excellences, undeniable proofs of decay on the part of the painter; yet it brought a higher price than, any of his earlier and more perfect works, viz, £2500. In 1848, after completing this work, he retired to York, having realized a comfortable independence. Even his advanced years and increasing infirmities were as yet unable wholly to quench his artistic enthusiasm, for when his health allowed, he worked as assiduously as in his younger days. One wish alone remained for him now to gratify ; he desired to see a " gathering" of his pictures. With much difficulty and exertion he was cnabled to assemble the great majority of them from various parts of the British islands; and so numerous were they that the walls of tho large hall he engaged in London for their exhibition were nearly covered. This took place in the summer of 1849; on the 13th November of that same year Etty died. HIe received the honours of a public funeral in his native city, where he was highly respected.*~~

~~*Etty holds a secure place among English artists, though it is neither the place assigned to him during the early part of his career nor that to which he attained during the last thirty years of his life. Unjust neglect was followed in his case, as in that of some others, by undue and indiscriminate eulogy. HIs unflinching perseverance in the face of unusual difficulties and discouragements is beyond all praise. HIs drawing was frequently incorrect, but in feeling and skill as a colourist he has scarcely been equalled by any other English artist. HIs most conspicuous defects as a painter were the result of insufficient general culture and narrowness of sympathy.*~~

~~*See Etty's autobiography, published in the Art Journal for 1849, and the Life of William Etty, R.A., by Gilchrist, 2 vols. 1855.*~~

~~*EU, a town of France in the department of Seine- Inférieure, arrondissement of Dieppe, is situated on the railway from Longpré to Tréport, and on the river Bresle 9 miles from its mouth at Tréport, and is 17 miles E.N.E. of Dieppe. sailcloth, hemp, linen, and oil, and a considerable trade in fish, corn, and wood. It is the seat of a tribunal of com- merce and of a communal college, and has three ancient*~~

~~*Tt has manufactories of lace, waxcloth and*~~

~~buildings of importance :—the beautiful Gothic church built in the 12th century, whose crypt contains the monu- ments of the counts of Eu; the college church, in which are the tombs of Henry of Guise and of his wife Katherine of Cleves ; and the Chateau d'Eu.~~

~~The countship of Eu dates from the 11th century, and is descended from a side branch of the Norman kings. After the dying out of this branch it came finally into the possession of the St Pols. In 1475 the town and castle were destroyed by Louis XI. to prevent them falling into the hands of the English; but when through marriage the countship passed into the possession of Henry, duke of Guise, he rebuilt the castle in 1581. When the house of Guise was extinguished in 1675, Eu was purchased by the princess of Montpensier, and came thus into the possession of the duke of Maine, whence it passed into that of the duke of Penthiévre, grandfather by the mother's side of Louis Philippe. In 1795 the chateau was converted into a military hospital, but Louis Philippe commenced its restoration in 1821, and made it his principal sum- mer residence. Here he received Queen Victoria in 1843. It con- tained a large picture gallery of historical portraits, but in 1852 these were removed to England. From 1852 till the last French revolution the chateau belonged to Napoleon ITJ. 'The population of Eu in 1872 was 3835.~~

~~EUBCEA (pronounced Zvvia in the modern language), the largest island after Crete in the Augean Sea, is separated from the coasts of Attica, Boeotia, Locris, and Thessaly by the Euboic Sea, which, at its narrowest part between Chalcis and the Beeotian shore, is called the Euripus. The length of the island, whose general outline is long and narrow, is about 90 miles; its breadth varies considerably,—at the broadest part it measures about 30 miles, at the narrowest not more than four. Its general direction is from N.W. to S.E., and it is traversed throughout its entire length by a mountain range, which forms part of the chain that bounds Thessaly on the E. under the names of Ossa and Pelion, and is further continued beyond the extremity of Kuboa in the lofty islands of Andros, Tenos, and Myconos. The prin- cipal peaks of this range, some of which attain a great elevation, group themselves into three knots, in the north,~~

~~*the centre, and the south of the island, which they thus divide with some completeness into three portions. Towards the north, opposite the Locrian territory, the highest peaks are Mounts Macistus (Kandili) and Telethrius, the former 3967, and the latter 3186 feet above the sea. Mount Telethrius was famed in ancient times for its medi- cinal plants, and at its foot are the celebrated hot springs, near the town of Aldepsus, called the Baths of Hercules, which were used, we are told, by the dictator Sulla, and have now been converted into an extensive bathing estab- lishment, though the arrangements are of a rude description. These sources, which are strongly sulphurous, rise a short distance inland at several points, and at last pour them- selves steaming over the rocks, which they have yellowed with their deposit, into the Euboic Sea. Opposite the entrance of the Maliac Gulf is the promontory of Cenzeum, the highest point behind which, rising to an elevation of 92211 feet, is now called Lithada, the name being a corrup- tion of Lichades, as the islands were called that lie off the extremity of the headland. Here again we meet with the legends of Hercules, for this cape, together with the neigh- bouring coast of Trachis, was the scene of the events con- nected with the death of that hero, as described by Sophocles in his Zrachinie. Near the N.E. extremity of the island, and almost facing the entrance of the Gulf of Pagase, is the promontory of Artemisium, celebrated for the great naval victory gained by the Greeks over the Persians, 480 p.c. Towards the centre, to the N.E. of Chalcis, rises the highest of its mountains, Dirphys or Dirphe, now Mount Delphi, 5725 feet above the sea, the bare summit of which is not entirely free from snow till the end of May, while its sides are clothed with pines and firs, and lower down with chestnuts and planes. It is one of the most conspicuous summits of eastern Greece and*~~

~~*from its flanks the promontory of Chersonesus projects into the Aigean. At the southern extremity the highest moun- tain is Oche, now called St Elias, rising to the height of 4606 feet. 'The south-western promontory was named Gerestus, the south-castern Caphareus ; the latter of these was ill-famed on account of its dangers to navigation, for, being an exposed point, it attracts the storms, which rush between it and the neighbouring cliffs of Andros as through a funnel. The whole of the*~~

~~*eastern coast was rocky and destitute of harbours, especially the part called Coela, or "'the Hollows," where part of the Persian fleet was wrecked, which probably lay between the headlands of Chersonesus and Caphareus. So greatly was this dreaded by sailors, that the principal line of traffic from the north of the /Egean to Athens used to pass by Chalcis and the Euboic Sea.*~~

~~*Kubcea was believed to have originally formed part of the mainland, and to have been separated from it by an earthquake. This is the less improbable because it lies in the neighbourhood of a line of earthquake movement, and both from Thucydides and Strabo we hear of the northern part of the island being shaken at different periods, and the latter writer speaks of a fountain at Chalcis being dried up by a similar cause, and a mud volcano formed in the neigh- bouring plain. Evidences of volcanic action are also trace- able in the legends connected with Hercules at Adepsus and Cene#um, which here, as at Lemnos and elsewhere in Greece, have that origin. Its northern extremity is separated from the Thessalian coast by a strait, which at one point is not more than a mile and a half in width. From the promontory of Cenwum southwards for about fifteen miles the depth of the channel is so great that half a mile from the shore no bottom has been found with 220 fathoms of line ; the water, however, gradually shoals from this point to Chalcis. In the neighbourhood of that town, both to the north and south, the bays are so confined as readily to explain the story of Agamemnon's fleet having been detained there by contrary winds. At Chalcis itself the strait, assuming the name of Euripus, contracts to a breadth of not more than 120 feet, and is divided in the middle by a rock, on which now stands a castle. The channel towards Bootia is spanned by a stone bridge, that towards Chalcis by one of wood; the latter is by far the decper channel. The extraordinary changes of tide which take place in this passage have been a subject of wonder from classical times to the preset day, and are not yet explained. As you stand on the bridge you will see the current running like a river in one direc- tion, and shortly afterwards it will be running with equal velocity in the other. Strabo speaks of them as varying seven times in the day, but it is more accurate to say, with Livy, that they are irregular. They are re- ferred to in several passages of the Attic tragedians. A bridge was first constructed here in the twenty-first year of*~~

~~*the Peloponnesian war, when Eubcea revolted from Athens; and thus the Bceotians, whose work it was, contrived to make that country "an island to every one bué themselves." Hence Ephorus remarked that nature might almost be said to have made that island part of Becotia. The Becotians by this means secured a powerful weapon of offence against Athens, being able to impede their supplies of gold and corn from Thrace, of timber from Macedonia, and of horses from Thessaly, for, as has been already said, their traffic from the north used to pass by this way. The name Euripus was corrupted during the Middle Ages into Evripo and Egripo, and in this latter form transferred to the whole island, whence the Venetians, when they occupied the district; altered it to N egroponte,*~~

~~*with reference to the bridge which connected it with the mainland,*~~

~~*eS Cae*~~

~~*The rivers of Eubcea are few in number and scanty in volnme, as is natural in a rocky island, where they have so | shorta distance to run. In the north-eastern portion the*~~

~~*Budorus flows into the /Zgean, being formed by two streams which unite their waters in a small plain, and were perhaps the Cereus and Neleus concerning which the story was told that sheep drinking the water of the one became white, of the other black. On the north coast, near Histiea, is the Callas ; and on the western side the Lelantus, near Chalcis, flowing through the plain of the same name. This plain, which intervenes between Chalcis and Eretria, and was a fruitful source of contention to those cities, is the most considerable of the few and small spaces of level ground in the island, and was fertile in corn. Aristotle, when speak- ing of the aristocratic character of the horse, as requiring fertile soil for its support, and consequently being associated with wealth, instances its use among the Chalcidians and Eretrians, and in the former of those two states we find a class of nobles called Hlippobote. This rich district was afterwards occupied by Athenian cleruchs. The next largest plain was that of Histiaa, and at the present day this and the neighbourhood of the Buderus (Achmet-Aga) are the two best cultivated parts of Euboa, owing to the exertions of foreign colonists. The mountains afford excel- lent pasturage for sheep and cattle, which were reared in great quantities in ancient*~~

~~*times, and seem to have given the island its name; these pastures belonged to the state. The forests are extensive and fine, and are now superin- tended by Government officials, called daco@vAaxes, in spite or with the connivance of whom the timber is being rapidly destroyed—partly from the merciless way in which it is cut by the proprietors, partly from its being burnt by the shepherds, for the sake of the beautiful grass that springs up after such conflagrations, and partly owing to the goats, whose bite kills all the young growths. In the mountains were several valuable mines of iron and copper; and from Carystus, at the south of the island, came the green and white marble, the modern Cipollino, which was in great request among the Romans of the imperial period for architectural purposes, and the quarries of which belonged to the emperor. The scenery of Eubcea is perhaps tle most beautiful in Greece, owing to the varied combins- tions of rock, wood, and‘ water; for from the uplands the sea is almost always in view, either the wide island- studded expanse of the A®gean, or the succession of lakes formed by the Euboic Sea, together with mountains of exquisite outline, while the valleys and maritime plains are clothed either with fruit trees or with plane trees of magnificent growth. On the other hand, no part of Greece is so destitute of interesting remains of antiquity.*~~

~~*Like most of the Greek islands, Euboca was originally known under other names, such as Macris and Dolichie from its shape, and Ellopia and Abantis from the tribes inhabiting it. The races by which it was occupied at an early period were different in the three districts, into which, as we have seen, it was naturally divided. In the northern portion we find the Histiei and Ellopes, Thessalian races, which probably had passed over from the Pagasean Gulf. In central Eubcea were the Curetes and Abantes, who seem to have come from the neighbouring continent by way of the Euripus; of these the Abantes, after being reinforced by Ionians from Attica, rose to great power, and exercised a sort of supremacy over the whole island, so that in Homer the inhabitants generally are called by that name. The southern part was occupied by the Dryopes, part of which tribe, after having been expelled from their original seats in the south of Thessaly by the Dorians, migrated to this island, and established themselves in the three cities of*~~

~~*,; Carystus, Dystus, and Styra. The name of the last-men-*~~

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~~*tioned placc, however, gives evidence of a previous Pheeni- cian settlement, for it is a corruption of Astarte, which is found in the form Astyra at several places on the coasts of the Aigean. The Pheenicians were attracted hither, as they were to other points on the shores of Greece, by the purple- mussel, which was obtained in the Euboic Sea. The popn- lation at the present day is made up of elements not less various, for many of the Greek inhabitants seem from their costumes to have immigrated, partly from the main- land, and partly from other islands; and besides these, the southern portion is occupied by Albanians, who probably have come from Andros; in the mountain districts nomad Wallach shepherds are found; and at Chalcis there are a certain number of Turkish and Jewish families, who live quietly with the other inhabitants, and arc not molested.*~~

~~*The history of the island is for the most part that of its two principal cities, Chalcis and Eretria, the latter of which was situated about 15 miles S.E. of the former, and was also on the shore of the Euboic Sea. The neighbourhood of the fertile Lelantian plain, and their proximity to the place of passage to the mainland, were evidently the causes of the choice of site, as well as of their prosperity, Both cities were Ionian settlements from Attica, and their import- ance in early times is shown by their numerous colonies in Magna Grecia and Sicily, and such as Cume, Rhegium, and Naxos, and on the coast of Macedonia, the projecting portion of which, with its three peninsulas, hence obtained the name of Chalcidice. In this way they opened new trade routes to the Greeks, and extended the field of civilization. How great their commerce was is shown by the fact that the Euboic scale of weights and measures was in use at Athens and among the Ionic cities generally. They were rival cities, and at first appear to have been ejually powerful; one of the earliest of the sea- fights men- tioned in Greek history took place between them, and in this we are told that many of the other Greek states took part. It was in consequence of the aid which the people of Miletus lent to the Erctrians on this occasion that Eretria sent five ships to aid the Jonians in their*~~

revolt against the Persians; and owing to this, that city was the first place in Greece Proper to be attacked by Datis and Artaphernes in 490 B.c. It was utterly ruined on that occasion, and its inhabitants were transported to Persia. Though it was restored after the battle of Marathon, on a site at a little distance from its original position, it never regained its former eminence, but it was still the second city in the island. From this time its neighbour Chalcis, which, though it suffered from a lack of good water, was, as Strabo says, the natural capital from its commanding the Euripus, held an undisputed supremacy. Already, however, tliis city had suffered from the growing power of Athens, In the year 506, when the Chalcidians joined with the Beeotians and the Spartan king Cleomeues in a league against that state, they were totally defeated by the Athenians, who established 4000 Attic colonists on their lands, and seem to have reduced the whole island to a con- dition of dependence, Again, in 446, when Eubcea endea- voured to throw off the yoke, it was once more reduced by Pericles, and a new body of settlers was planted at Histiza in the north of the island, after the inhabitants of that town had been expelled. This event is referred to by Aristophanes in the Clouds (212), where the old farmer, on heing shown Eubcea on the map "lying outstretched in all its length," remarks,—"I know; we laid it prostrate under Pericles." The Athenians fully recognized its im- portance to them, beth as supplying them with corn and cattle, as securing their commerce, and as guaranteeing them against piracy, for its proximity to the coast of Attica rendered it extremely dangerous to them when in other

hands, so that Demosthenes, in the De Corona, speaks of a time when the pirates that made it their headquarters so infested the neighbouring sea as to prevent all navigation. But in the 21st year of the Peloponnesian war the island succeeded in regaining its independence. After this, we find it taking sides with one or other of the leading states, until, after the battle of Chzeronea, it passed into the hands of Philip, and finally into those of the Romans. By the great Demetrius Poliorcetes, Chalcis was called one of the three fetters of Greece, Demetrias on the Gulf of Pagase and Corinth being the other two.

~~*In modern history Eubcea or Negropont comes once more prominently into notice at the time of the fourth crusade. In the partition of the Eastern empire by the Latins which followed that event, the island was divided into three fiefs, the occupants of which ere long found it expedient to place themselves under the protection of the Venetian republic, which thenceforward became the sovereign power in the country. For more than two centuries and a half during which they remained in possession, it was one of the most valuable of their dependencies, and the lion of St Mark may still be seen, both ever the sea gate of Chalcis (Negropont), and in other parts of the town. At length in 1470, after a valiant defence, this well-fortified city was wrested from them by Mohammed II., and the whole island fell into the hands of the Turks. One desperate attempt to regain it was made by Morosini in 1688, when the city was besieged by land and sea for three months; but owing to the strength of the place, and the disease which thinned their ranks, the assailants were forced to withdraw. At the conclusion of the Greek War of Independence, in 1830, the island was delivered from the Turkish sway, and constituted a part of the newly established Greek state. The present population of Chalcis is about 5000 souls. (i. Reims)*~~

~~*EUBULIDES, a native of Miletus, was a philosopher of the Megaric school. The principal events in his personal history are quite unknown. Indirect evidence shows that he was a contemporary, whether older or younger is not certain, of Aristotle, whose philosophy he attacked with great bitterness, and that he numbered Demosthenes for a while among his pupils. He is not known to have written any independent work, and his name has been preserved chiefly on account of some celebrated, though false and captious, syllogisms of which he was the reputed author. There is reason to believe that some of these were due to others of the Megaric school.*~~

~~*EUCALYPTUS, a genus of trees of the natural order Myrtacee, mostly, if not all, indigenous to Australia and Tasmania. In Australia the Eucalypti are commonly called " oum-trees," or "stringy-bark trees," from their gummy or resinous products, or fibrous bark, The genus, from the evidence of leaf remains, appears to have been repre- sented by several species in Eocene times (see Schimper, Traité de Paléontographie*~~

~~*Végétale, 1874). The leaves are leathery in texture, hang obliquely or vertically, and are studded with glands which contain a fragrant volatile oil, The flowers are apetalous, and resemble those of the myrtle, and the bud is closed by a lid, which is dis- carded when the flower expands. Within the hardened calyx, which constitutes the fruit, very numerous minute seeds are contained. The Eucalypti are rapid in growth, and many species are of great height, H. amygdalinu attaining to even as much as 480 feet, or 150 feet more than the highest specimen of the Wellingtonia (Sequoia) gigantea, with a diameter of 81 feet (see Journ. of Forestry, March, 1878). The Blue Gum-tree, 4. globulus, Labill., is so called from the rounded form of its operculated calyx, The leaves of trees froin three to five years of age are large, sessile, and of a glaucous-white colour, and grow horizon- tally ; those of older trees are ensiform, 6-12 inches long,*~~

~~*and bluish-green in hue, and are directed downwards. The flowers are single or in clusters, and nearly sessile. This species is one of the largest trees in the world, and may attain a height of 375 feet. Since 1854 it has been suc- cessfully introduced into the south of Europe, Algeria, Egypt, Tahiti, New Caledonia, Natal, aud India, and has been extensively planted in California, and, with the object of lessening liability to droughts, along the line of the Central Pacific Railway. It would probably thrive in any situation having a mean annual temperature not below 60° F., but it will not endure a temperature of less than 27° F. At Cannes the tree was raised from seed in March 1362, and in 1872 had reached a height of 60 feet (see Trans. Bot. Soc. Hdinb., xii. 153). Its property of destroying the miasma of marshy districts is probably attributable to the drainage effected by its roots, rather than to the antiseptic exhalations of its leaves. To the same cause, also, is ascribed the gradual disappearance of inosauitoes in the neighbourhood of plantations of this tree, as at Lake Fezzara, in Algeria. Since about 1870, when the tree was planted in its cloisters, the monastery at St Paolo a la tr$ Fontana has become habitable through- out the year, although situated in one of the most fever- stricken districts of the Roman Campagna (see R. D. Glover,*~~

~~*Pharm. Journ. and Trans., Feb. 5, 1876). An essential oil is obtained by aqueous distillation of the leaves of this and other species of Eucalyptus, which, according to Faust and HOmeyer (Ber. deutsch. Chem. Ges., 1874, 1429), con- sists of cymol, an oxidized compound allied to cymol, and two terpenes. The oil has a camphoraceous odour, and is employed in perfumery, and for the making of varnishes. Except as regards its action on light, the oil of Z. oleosa is similar in smell and other properties to cajeput oil. £#. globulus, E. resinifera, and other species yield what is known as Botany Bay kino, an astringent dark-reddish amorphous resin, which may be obtained in a semi-fluid state by making incisions in the trunks of the trees. The kino of #. gigantea contains a notable proportion of gum. From the leaves and young bark of 4. mannifera and L. viminalis is procured Australian manna, a hard, opaque, sweet substance, containing melitose. On destructive dis- tillation the leaves yield much gas, 10,000 cubic feet being obtained from one ton. The wood is extensively used in Australia as fuel, and the timber is of remarkable size, strength, and durability. The bark of different species of Eucalyptus has been used in paper-making and tanning, and in medicine as a febrifuge. The tincture of Eucalyp- tus, for the preparation of which the narrow leaves are reputed to be the best, has a warm, aromatic, and bitter taste, somewhat like that of cubebs. It excites the flow of saliva when in the mouth, and is a powerful diaphoretic. Its administration augments the alvine evacuations, lowers arterial tension, and inereases the action of 'the heart, and has been found efficacious in hysteria, asthma, chorea, cerebral aneemia, and more especially in bronchorrheea and chronic catarrh of the bladder. According to Bartholow, it is far inferior to quinine in intermittent fever. Eucalyptus leaves are smoked for the relief of asthma, bronchitis, and whooping-cough, and have been employed instead of lint for dressing wounds. From the blossoms of the Red Gum-tree, /. rostrata, the natives of West Australia' pre- pare a favourite beverage by steeping tliem in water.*~~

~~*For further details see Bentley, On the Characters, Properties, and Uses of Eucalyptus Globulus and other spceies of Eucalyptus, 1874; The Year Book of Pharmacy, 1874, pp. 29-31, and E. Cosson, '* Note sur l'acclimatation de l'Eucalyptus Globulus," in Bullet. de la Soe. de Géoyr., vi. sér., t. 9, p. 641, where numerous references to works on the subject*~~

~~will be found; R. Bartholow, Practical Treatise on Materia Medica, 1877; Planchon, "1? Eucalyptus Globulus au point de vue botanique, &c.," in Rev. des Deux Mondes,~~

~~a ae 1 For a figure, see Bentley and Trimen, Jfedical Plants, ab. ;~~

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~~EUCHARIST, the sacramental ordinance instituted by Christ and enjoined on His church as of perpetual obligation, in which bread broken and wine poured out, after solemn benediction by the appointed minister, are partaken of by the faithful in commemoration of His atoning sufferings and death, and the benefits thereby purchased for mankind, and as a means by which those benefits are conveyed to the worthy recipient. This ordinance has been constantly observed, without essential variation, by all sections of thie Christian church, from the time of its appointment to the present day. 'he only exception is that of the Quakers (or "Society of Friends"), who, from an exalted idea of the spiritual nature of Christianity, have discarded the Eucharist, together with all other religious symbolical acts. All other Christians have at all times agreed in regarding the Eucharist as their highest act of worship, and the most solemn ordinance of religion.~~

~~To understand the Eucharist aright we must go back to the history of its institution. This is given by the three first evangelists in their gospels, and by St Paul in his first. epistle to the Corinthians (Mat. xxvi. 26-27 ; Mark xiv. 29-24; Luke xxii, 19-20; 1 Cor. xi. 23-25). 'These narratives inform us that the Eucharist was ordained by Christ at the close of the paschal supper which He had eaten with His disciples the night preceding the day of His crucifixion ; that~~

~~'*As they were eating, Jesus took bread, and having given thanks, blessed and brake it, and give it to His disciples, and said 'Take, eat ; this is My Body which is being given for you. Do this for a memorial of Me.' In the same manner also He took the cup after they had supped, and having given thanks, gave it to them, saying, 'Drink ye all of this: for this is My Blood of the new covenant' — or 'the new covenant in My Blood '— ' which is being shed for you~~

~~*and for many, for the remission of sins, Do this as often as you drink, for a memorial of Me.'"*~~

~~*The first subject for remark is the connexion of the Eucharist with the Paschal celebration. In the Paschal Supper the flesh of a lamb was solemnly eaten in rement- brance of the preservation of the Israelites, by means of the blood of a lamb, from the destruction brought upon the Egyptians, and of the consequent emancipation of the nation frem slavery to Pharaoh. In the Eucharist the same act, that of eating, assumes a similar commemorative force. The broken bread, declared by Christ to be a symbol of His crucified Body, taken and eaten, together with the drinking of the wine, declared to be a symbol of His shed Blood, be- comes, in virtue of His institution, a memorial of His sacritice as the Lamb of God who, by His death, has taken away the sin of the world, delivering man from the wrath of God, and setting him free from the slavery of evil. In this, however, the Eucharist transcends the passover which was its type, that the one was a bare commemoration, the other unites with it anfactual participation in the spiritual blessings thus commemorated. However much various sections of the church have differed as to the mode and the degree in which these blessings are conveyed, and the exact relation borne by the bread and wine to the Body and Blood of our Lord, there has been a substantial agreemeut as to the fact that the fruits of the sacrifice of Christ are in the Eucharist in a special manner imparted to the souls of worthy reci- pients.*~~

~~*So mucli we may learn as to the nature of the rite from tlie occasion of its first institution. An examination of the mode of its institution by Christ will show what ceremonial actions may be regarded as essential to the truth of its symbolical character. These are—(1) the benediction and consecration, 7.¢., the setting apart from profane uses, by solemn prayer and thanksgiving, of bread and wine; (2) the fraction or breaking of the bread and the pouring out of the wine into the cup; (3) the delivery and dis- tribution of the "elements "—as the bread and wine are*~~

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~~*termed—to the communicants ; (4) the declaration accom- panying this distribution, that these elements both symbolize the sacrifice of Christ's*~~

~~*death, and also convey to the faithful partaker the benefits of that sacrifice; and (5) the actual partaking of these elements by the acts of eating and drinking. These several actions are all included in Christ's command, '" Do this in remembrance of Me."*~~

~~*The various names by which this holy rite has been designated, each expressing one view of its manifold nature, will help us towards a comprehension of its meaning and purpose.*~~

~~*1. The term Hucharist, though not found in this sense in Holy Scripture, came into use in the earliest times, and found such acceptance that it became the most frequent designation of the Lord's Supper both in the Western and the Eastern Church. It first appears in the letters ascribed to Ignatius, 107 a.p. (Hpist. ad Philad., c. iv.; ad Smyrn., c. vi.), and is used by Irenzeus, who says that after consecra- tion "it is no longer common bread, but eucharist" (lib. iv.c.18,§5). Justin Martyr, 140 a.p., after describing the sacred meal, says, " This partaking is called by us the Eucharist " (Apolog., i. c. 66). Origen also speaks of "the bread called Eucharist" (Contr. Cels., lib. viii. § 57). The term is also continually found in this sense in Tertullian, Clemens Alexandrinus, andCyprian. Eucharist, edxapioria, signifies ' thanksgiving," and its use for the sacramental feast is derived from the thanksgiving of our Lord at the institution of the rite (evyapioryoas éxAacev). 'The ele- ments over which thanks had been offered readily assumed the name of the act of thanksgiving, and so the word eucharistia came to be simply equivalent to the sacramental bread and wine, and was sometimes restricted to the bread alone. 'In the earliest liturgies thanksgiving was, next to the reception, the chief part of the celebration, a circum- stance which without doubt served greatly to promote the general adoption of the name" (Scudamore, WVotztia Eucharistica, p. 8). It is thus St Chrysostom explains the term: " The awful mysteries, laden with mighty salva- tion, which are celebrated atevery communion, ... are culled Eucharist, because they are the commemoration of many benefits, and by all means they work upon us to be thankful" (Homil. xxv. i Matt., § 3).*~~

~~*2. Another familiar name is the Communion, or the [Holy Communion. This is derived from the words of St Paul, 1 Cor. x. 16,17. 'The cup of*~~

~~*blessing whicli we bless, is it not the communion (xowwvia) of the blood of Christ ? Tle bread which we break, is it not the communion of the body of Christ? For we, the many, are one bread and one body ; for we all partake of that one bread." The general use of this term is not so early as of the word " eucharist, " but it is found in Ireneeus, 167 a.p., who speaks of slaves who have heard from their masters that "the divine com-munion is the body and blood of Christ " (ragm., xiii.), and it isused by Hilary, Basil, and Chrysostom. St Paul's words show that the leading idea contained in this name is, that by means of this sacrament all faithful recipients become partakers of the body and blood of Christ, and receive a communication of the blessings of His sacri- fice. But they also express another fundamental truth, expressed in the Apostles' Creed as " the communion of saints," viz., the communion or fellowship which all Christians have with one another, as members of one body, sharers in one life, of which the joint participation of this sacrament is an outward symbol and pledge. "By this sacrament is signified and sealed that union which is among our Saviour's true disciples communicating therein; their being together united in consent of mind and unity of faith, in mutual good will and affection, in hope and tendency to the same blessed end, in spiritual brotherhood and society ; especially on account of this communion with*~~

~~*Gol Christ, which most closely ties them one to another ; they, partaking of this one individual food, become translated, as it were, into one body and substance" (Barrow, Doctrine of the Sacraments, vol. v. p. 602, ed. 1818). To establish this union is declared by Christ to be one great purpose of His incarnation and death and high priestly intercession (John xvii. 22-23), And the Eucharist by its symbolism sets forth the truth that the only way of thus uniting men to each other is by first uniting them to Christ. They must be one with Him before they can be one with each other 7x Him. " The union of mankind, but a union begun and subsisting only in Christ, is what the Lord's Supper sacramentally expresses" (Hece Homo, p. 175). Participation in the Eucharist being thus the chief outward sign and pledge of communion and fellowship with the church, admission to this sacrament was practically identi- fied with a recognition of a claim te membership in the church, while to be repelled*~~

~~*from it amounted to exclusion from the Christian body, such exclusion receiving the name of excommunication.*~~

~~*3. Another designation of this sacrament, derived from Holy Scripture, is the Lord's Supper. It is so called by St Paul himself, who when speaking ef its unworthy re- ception, says, "When ye come together into one place, this is not to eat the Lord's supper," 1 Cor. xi, 20. The special appropriateness of this name, taking us back to the | time and place of its first institution by Christ, "' the same night that He was betrayed," secured for it an early and wide reception, and we find Chrysostom and Augustine employing it as a familiar term. "He gave the supper consecrated by His own hands to the disciples. We have not sat down at that feast, and yet by faith we daily eat the same supper" (August., Serm. cxii., c. 4), The name "supper" indicates also the original idea of the sacred rite asa common meal, "the most natural and universal way of expressing, maintaining, and, as it were, ratifying" corporate union. 'The meal consists of bread and wine, the simplest and most universal elements of food; and when men of different nations or degrees sit and kneel together, and receive, as from the hand of God, this simple repast, they are reminded in the most forcible manner of their common human wants, and their common character as pensioners on the bounty of the universal Father" (/cce Homo, pp. 173, 174). And thus this designation guards against a common but dangerous misconception of the sacrament.*~~

~~*4, The term "oblation" or " offering" (xpoopopa) was originally applied to each of the various offerings made by the faithful at the celebration of the Eucharist, e.g., the oblation of alms in kind or money for the poor, gifts for the support of the clergy, and the maintenance of the fabric of the church and ats services; the special oblation of bread and wine for the purpose of the celebration; and the spiritual oblation of the Body and Blood of Christ in the eucharistic commemoration, Gradually its reference became narrowed. We notice the process of restriction in the writings of Cyprian, 250 a.p., and find it established by the time of Cyril of Jerusalem, 350 a.p. Hencefor- ward, " the oblation " signifies the commemoration of the self-oblation of Christ on the cross. '"' To attain to the oblation" or to "partake of the holy oblation" meant to receive, and to impart "the oblation" was to administer the blessed sacrament." In the*~~

~~*liturgy of the Church of England the word " oblation" is only used of the "alms" and other offerings of the congregation (with a special reference to the presentation of the elements of bread and*~~

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~~*wine), and of the actual death of Christ as "a full, perfect, and snflicient sacrifice, oblation, and satisfaction for the sins of the whole world," while the idea is also extended to the spiritual oblation of themselves by the faithful communi- cants in the words—' Here we offer and preseut ourselves, our souls and bodies, to be a reasonable sacrifice."*~~

~~*5. From "oblation" we are naturally led to the con- sideration of the term Sacrifice, which from primitive times has been applied to the Eucharist. The original reference of this term, as of the term "oblation," was to the bread and wine and other thank-offerings presented at the cele- bration. But its application was gradually extended so as to embrace the whole rite, and especially the central act, the presentation of the elements to God as a memorial of the sacrifice of the death of Christ. In this sense the Eucharist is spoken of from the time of Tertullian down- wards, as "'a commemorative sacrifice," 7.¢., a rite, instituted by Christ himself, in which the church commemorates and pleads before the Father the one all-sufficient sacrifice made by His Son on the cross. This is no fresh immolation of the body of Christ, but a representation of that sacrifice which was once for all accomplished on Calvary, by which, according to St Paul's words (1 Cor. xi. 26), we "do show" or "proclaim" (katayyéAAere) "the Lord's death till He come." The true sense in which the Eucharist may be called a sacrifice is clearly set forth in the following pas- sage from the learned and pious Bishop Beveridge :—*~~

~~*"The sacrifice that is most proper and peculiar to the gospel is the sacrament of our Lord's Supper, instituted by our Lord himself, to succeed all the bloody sacrifices of the Mosaic law. For though we cannot say, as some absurdly do, that this is such a sacrifice whereby Christ is again offered up to God both for the living and the dead, yet it may as properly be called a sacrifice as any that was ever offered, except that which was offered by Christ himself,—for His, indeed, was the only true expiatory sacrifice that ever was offered. Those under the law were only*~~

~~*types of His, and were called sacrifices only upon that account, because they typified and represented that which He was to offer for the sins of the world. And therefore the sacrament of Christ's body and blood may as well be called by that name, as they were. They were typical, and this is a commemorative sacrifice. They foreshowed the death of Christ to come; this shows His death already past… .. This is pro- perly our Christian sacrifice, which neither Jew nor Gentile can have any share in (Heb. xiii. 10). We have an altar where we par- take of the great sacrifice which the eternal Son of God offered up*~~

~~*for the sins of the whole world, and ours among the rest." —(Sermon vill. vol. i. p. 50; Libr. Angl. Cath. Theol.)*~~

~~*6. Finally, we have the names, the Sacrament of the Body and Blood of Christ, the Sacrament of the Eucharist, the Sacrament of the Altar. This is not the place to speak of the origin and meaning of the word sacrament as an eccle- siastical term. Suffice it to say that the word " sacra- nent," when applied to the Eucharist, is used in its derived sense as an ontward and visible symbol of some inward and spiritual truth, or work of grace,— in the same sense in which Augustine says of the bread and cup that they are "' therefore called sacraments, because in them one thing is seen, another understood " (Serm. eclxxi.).*~~

~~*We must not altogether pass over the word mass, "missa," by which the Eucharist is commonly known in the Roman church. Unlike the other designations of which we have been speaking, this has no essential connexion with the eucharistic rite, —"missa," originally meaning no- thing more than the dismissal of a congregation. 'Ite, missa est," is the formula with which the Roman eucharistic service concludes. " By degrees," writes Waterland, " it came to be used for an assembly and for church service. From signifying a church service in general, it came at length to denote the communion service in particular, and so that most emphatically came to be called the mass" (Of the Institution of the Holy Communion, ch. 1). This naine Is not found in Holy Scripture; it was unknown to the first ages of the church ; the earliest known example of*~~

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~~*its use is in Ambrose (Zpist. 20 [33], §4, ad Marcellin.) "missam facere ccepi," and it is unmeaning and inappro- priate as a name of the sacrament to which it has acci- dentally attached itself, and it has been therefore wisely disused by the reformed church (cf. Scudaniore, w.s., p. 3).*~~

~~*We now proceed to speak of the mode and time of the celebration of the Eucharist. It is evident from St Paul's words and practice (1 Cor. xi. 17-34; Acts xx. 7) that in the apostolic church the administration took place, after our Lord's pattern, in the evening, and in close connexion with an ordinary meal. The disorders referred to by the apostle, which indicated the danger of this connexion, be- fore long caused a separation of the religious from the ordi- nary meal, and invested the Eucharist with a character of special sacredness. The time of celebration, we learn from the notices in the earlier fathers, was either after nightfall or before daybreak, these times being selected so as to avoid attracting the attention of their heathen neighbours. Pliny, in his well-known letter to Trajan, 104 a.p., speaks of the Christians in Bithynia coming together on a set day before it was light, "to sing to Christ as God, and' bind themselves by a sacrament (sacramento) to commit no crime." 'Tertullian also speaks of the reception of "the sacrament of the Eucharist in assemblies even before dawn." (De Cor. Mil., c. iii.) The evening celebration lingered on for a while, but it was gradually given up, and entirely ceased by the 4th century, except on some special days, such as the eves of Christmas, Easter, and Pentecost. The earliest account of the celebration of the Eucharist, that of Justin Martyr, c. 140 a.p., shows the extreme simplicity of the rite at that time. The day of administration was Sunday. It took place at the conclusion of the common prayer, and was preceded by the kiss of peace. The cele- brant was "the president of the brethren" (6 apoeords tov ddeApov). The materials of the sacrament were "bread and a cup of wine mixed with water." After prayer and praise offered by the president, to which the congregation responded "amen," the "deacons" gave to each one present, " to partake of the bread, and wine mixed with water, over which the thanksgiving had been pro- nounced" (edxapucGér7os, "consecrated as an eucharist"), and carried away a portion to those who were absent from tlie rite. This food, he concludes, is "called by us the Eucharist " (Apolog., i. c. 65-67). St Cyril of Jerusalem*~~

~~*furnishes us with a detailed description of the eucharistic celebration in the middle of the 4th century (c. 347 a.p.). By this time the ritual had become fixed, and of a some- what elaborate character. The ceremonial commenced with the celebrant and presbyters washing their hands. This was followed by the kiss of peace, the " Surswm Corda," the "Vere Dignum," the " Sanctus," the "Hpiclesis," or invo- cation to the Holy Spirit to sanctify the elements lying on the Holy Table, the Prayer for all conditions of men, and the Commemoration of the departed. These were succeeded — forming the point of transition to the more distinctly sacramental portion of the service — by the Lord's Prayer, the "Sancta Sanctis" (corresponding to the "fencing the table" of the Presbyterian Church), the Unus Sanctus, &c., and Communion. The minute directions Cyril gives as to the manual actions in communicating, and the application of the consecrated elements to the eyes and other organs of sense, indicate a wide departure from primitive simplicity, and a growing tendency to regard the eucharist as a religious charm (Catech., xxiii; Mfy- stagog., v.). The account of the ritual presented by St Chrysostom (2 Cor., Homil. xviii.) corresponds in all essential points with that given by Cyril, and we gather from the writings of St Augustine that the canon of the North African churches differed little from it. We may conclude, therefore, that by the middle of the 4th century*~~

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~~*the eucharistic ritual was established with an essential uni- formity in all parts of the Catholic Church, and in a form corresponding in its chief outlines with the canon of the extant primitive liturgies. Of these liturgies the most im- portant, as having the best grounded claim to a primitive character (though overlaid with later additions from which it is not easy to disentangle the primitive elements), are those which bear the titles of the liturgy of St James, St Mark, Nestorius, the Ambrosian and Gregorian, and the Gallican liturgies.*~~

~~*With regard to the frequency of Holy Communion, although it has been concluded with much prokability from Acts il. 46 that the earliest Christians, in the first fervour of their faith, partook of the Eucharist daily, appearances are rather in favour of a weekly celebration on the*~~

~~*Lord's day being the rule in the apostolic and primitive church. Tt was on "the first day of the week" that the Christians met for breaking bread at Troas (Acts xx. 7); and St Paul's direction to the Corinthian Christians to lay by for the poor on that day may be reasonably associated with the obla- tions at the time of celebration. Pliny tells us that it was ona "fixed day," stato die, the Cliristians in Bithynia came together for prayer and communion, and, as we have seen, Justin Martyr speaks of Sunday by name (1) Aeyonévy 7Alov pépa) as the day of celebration. When Christianity be- came the established religion of the Roman world, the daily celebration of the Eucharist became the general rule, though the words of Augustine —" in some places uo day passes without an offering ; in others, offering is made on the Sabbath only, and the Lord's day ; in others on the Lord's day ouly" (Epist. 118, ad Januarvum)—prove that the rule was not universal.*~~

~~*The liturgy of the Church of England, by providing acollect epistle and gospel, evidently contemplates the celebration of the Eucharist every Sunday and holy day of the year. No strict rule, however, on the subject is laid down in any of her formularies. The frequency of the administration is left to the discretion of the parish priest, with this proviso, that it befrequent enough to enable every parishioner to comply with the rubric which enjoins that "he shall com- municate at the least three times in the year, of which Easter to be one." In the Roman Church, the mass being the chief religious service, absorbing into itself nearly all public acts of worship, the Eucharist is celebrated daily in all churches, and in churches where there are many altars many times a day.*~~

~~*This article may be suitably concluded with a brief state- ment of the doctrinal views respecting the Eucharist of some of the chief churches of Christendom, drawn from their authoritative documents.*~~

~~*To commence with the Roman Church. With regard to the doctrine known as transubstantiation, it must here suffice to say that the Church of Rome teaches that the whole sub- stance of the bread and wine in the Eucharist is converted by consecration into the Body and Blood of Christ, in such a manner that Christ in His entirety, including His human soul and His divine nature, are contained in the elements ; and that with such*~~

~~*a thorough transmutation that not only is the whole Christ contained in the wine as well as in the bread, but with the same completeness in each particle of the bread, and in each drop of the wine. The denial of the cup to the laity, therefore, does not deprive them of any blessing, inasmuch as whosoever receives even a crumb of the consecrated bread receives Christ in His completeness, and that not only by spiritual, but by actual and real manducation. The Church of Rome also teaches that the Eucharist is a propitiatory sacrifice offered to God the Father on every occasion when this sacrament is celebrated, and that not only for the sins of those who partake of it, but for those of all mankind, as well dead as living.*~~

~~*| (See decrees of ;Council of Trent, canon 1-6, 8; and Catechismus ad Parochos, pp. 246, 249, 250, ed. 1567, Louvain.)*~~

~~*The eucharistical doctrines of the Orthodox Greek Church may be best gathered from the 'Op6ddegos dpodoyia THS wlaTews THS KaOodrKkHs Kal amrooTodiKyS ékKAnolas THs évaroAukys, subscribed by the chief patriarchs, and published in 1643. This document shows that the Greek Church is at one with that of Rome with regard to transubstantiation and the sacrifice of the mass. In Questio 107 it is laid down that the intention of the celebrant is essential for the validity of the rite, and that immediately on the pronuncia- tion of the Zpiclesis, transubstantiation takes place, and the bread is changed into the very Body of Christ and the wine into His very Blood, the species of bread and wine alone remaining. The same article declares the benefits of the sacrament to be—(1) the commemoration of the sinless pas- sion and death of Christ ; (2) a propitiation and reconcilia- tion before God for the sins as well of the dead as of the living ; (3) the presence of Christ in the communicant fur- nishing a safeguard against the temptations and perils of the devil (Kimmel, Monumenta Fidei Eccl. Orient., pp. 180- 184). It was also definitely declared in the Confession of Dositheus, at the synod of Jerusalem, 1672, that un- believers as well as believers are partakers of Christ in the Eucharist, the one receiving Him to eternal life and the other to eternal damnation; and that it is one and the same Christ, not many, that is partaken of in all the Eucharists throughout the world; and*~~

~~*that He cannot be divided, but is present in His entirety in the smallest por- tion of the bread and wine (Jbid., p. 458-60).*~~

~~*While the Continental Reformers were of one mind in re- pudiating the Roman doctrine of transubstantiation and the sacrifice of the mass, very wide differences existcd between them in their estimate of the grace imparted by the Eucharist, and the mode of the presence of Christ in that sacrament.*~~

~~*The symbolical books of the Lutheran Church, following the teaching of Luther himself, declare the doctrine of the real presence of Christ's body and blood in the eucharist, together with the bread and wine (consubstantation), as well as the ubiquity of His body, as the orthodox doctrine of the church. One consequence of this view was that tle un- believing recipients are held to be as really partakers of the body of Christ in, with, and under the bread as the faithful, though they receive it to theirown hurt. (Hagen- bach, //ist. of Doctr., i1., 300).*~~

~~*Of all the Reformers, the teaching of Zwingli was the furthest removed from that of Luther. At an early period lie asserted that the Eucharist was nothing more than food for the soul, and had been instituted by Christ only as an act of commemoration and as a visible sign of His body and blood (Christenliche Ynleitung, 1523, quoted by Hagenbach, fist. of Doctr., li. 296, Clark's translation). But that Zwingli did not reject the higher religious*~~

~~_significance of the Eucharist, and was far from degrading the bread and wine into “ nuda et inania symbola,” as he was accused of doing, we see from his fider Ratio ad Carolum Imperatorem (Ib., p. 297).~~

~~The views of Calvin were intermediate between those of his two great contemporaries. ‘Though he pointed out the sacramental character, and together with it the more profound mystical significance of the Lord’s Supper more distinctly than Zwingli, according to his own interpreta- tion it is the believer only who partakes in a spiritual manner of Christ’s body existing in heaven” (Hagenbach, ii. 293, § 258). While Zwingli lays principal stress upon the historical fact, and the idea of an act of commemora- tion; Calvin attaches greater importance to the intimate union of the believers with Christ. Thus in his opinion~~

~~the Eucharist is not only a commemoration of a past event, but also the pledge and seal of something then actually present. As bread and wine sustain our earthly body, so the body and blood of Christ nourish and refresh our spiri- tual nature (Hagenbach, u.s., p. 302). With regard to the purticipation of unbelievers, the Helvetic Confession lays down definitely that they who approach the Lord’s Table without faith partake of the sacrament alone, but have no share in the “‘res sacramenti” which is the source of life and salvation (Corpus Confession., p. 73).~~

~~The doctrine of the Church of England, as set forth in her 28th Article, is that ‘ the supper of the Lord is not only asign of the love that Christians ought to have among themselves one to another, but rather is a sacrament of our redemption by Christ’s death, insomuch that, to such as rightly, worthily, and with faith receive the same, the bread which we break is a partaking of the body of Christ, and likewise the cup of blessing is a partaking of the blood oMChrist.. . 4 The body of Christ is given, taken, and eaten in the supper only after an heavenly and spiritual manner, and the means whereby the body of Christ is re- ceived and eaten in the supper is faith.” The teaching of the Catechism is to the same effect, viz , that the sacrament of the Lord’s supper was ordained ‘for the continual remem- brance of the sacrifice of the death of Christ, and of the benefits~~

~~*which we receive thereby." It teaches also that '"'the body and blood of Cliist are verily and indeed taken and received by the faithful," to "the strengthening and refreshing of our souls by the body and blood of Christ as our bodies are by the bread and wine."*~~

~~*The doctrine of the Presbyterian Churches of Scotland, as declared in the Confession of Faith, agreed upon by the Assembly of Divines at Westminster, and approved by the General Assembly in 1647, and established by Acts of Par- liament in 1649 aud 1690, as "the publick and avowed confession of the Church of Scotland," is that the Lord's supper was instituted by Christ, to be observed to the end of the world " for the perpetual remembrance of the sacri- fice of Himself in His death; the sealing all benefits thereof to true believers; their spiritual nourishment and growth in Him; their further engagement in and to all duties which they owe to Him; and to be a bond and pledge of their communion with Him, and with each other as members of His mystical body. In the sacrament Christ is not offered up to His Father, nor any real sacrifice made at all for remission of sins of the quick or dead, but only a com- memoration of that one offering up of Himself, by Himself upon the cross, once for all, and a spiritual oblation of all possible praise unto God for the same….. The outward elements in this sacrament, duly set apart to the uses ordained by Christ, have such relation to Him crucified as that truly, yet sacramentally only, they are sometimes called by the name of the things they represent,—to wit, the body and blood of Christ,—although in substance and nature they still remain truly and only bread and wine. Worthy receivers outwardly partaking of the visible elements in this sacrament do then also inwardly by faith, really and indeed, yet not carnally and corporally, but spiritually, re- ceive and feed upon Christ crncified and all benefits of His death, the body and blood of Christ being then not corpor- ally or carnally in, with, or under the bread and wine, yet as really, though spiritually, present to the faith of believers in that ordinance as the elements themselves are to their outward senses" (chapters xxix. §§ 1, 2, 5, 7).*~~

~~*Authorities.—Hagenbach, History of Doctrines, vol. ii.; Scuda- more, Notitia Hucharistica ; Hooker, Keeles. Polity, bk. v.; Barrow, Doctrine of the Sacraments ; Jeremy Taylor, Real Presence of Christ ; Waterland On*~~

~~*the Eucharist ; Wilberforce, Doctrine of the Eucha- vist ; Calvin, Institutio, lib. iv.; Confessionum Fidei diversarum*~~

~~*Hicelesiarwm Corpus; Coneilii Tridentini Decreta; Catechismus ad Parochos ; Kimmel, Monum. Fidei Eccl. Orient. (ES-Vs)*~~

~~*KUC—EU-OC*~~

~~*EUCHRE, a game at cards, much played in America. Euchre is said to be a corruption of the word écarté ; the game is believed to have been first played by the French settlers in Louisiana, but at what date is uncertain. Euchre is played with thirty-two cards, the twos, threes, fours, fives, and sixes being rejected from a complete pack. The players cut for deal, and the lowest deals. The non-dealer then cuts to his opponent, who deals five cards to each, by two at a time and three at a time, or vice versa. The dealer turns up the top of the undealt cards for trumps. In suits not trumps the cards rank as at whist; in the trump suit the knave (called the right bower) is the highest trump, and the other knave of the same colour, black or red, as the case may be (called the left bower), is the next highest, this card being, of course, omitted from the suit to which it would otherwise belong. The other trumps rank as already stated, the queen being next above the ten.*~~

~~*Two-handed Euchre.—The non-dealer looks at his hand and decides whether he will play it. If content, ze. if he thinks he can win three tricks, he says " orderit up." The dealer then puts out from his hand any card he pleases, face downwards, and is entitled to take the trump card into his hand; but the card is generally left on the pack until wanted in the course of play. If the non-dealer is not content, he says ' pass." 'The dealer then has the option of taking up the trump as before, or of passing also. If the trump is ordered up or taken up the play of the hand commences ; if both pass, the dealer places the trump card face upwards under the pack, called turning it down. The non-dealer has then. the option of making it, we., of naming any suit, except the one turned up, saying, " make it spades," or any suit he prefers, and that suit becomes trumps, or of passing again, saying, "pass again." If he makes it, the play begins : if he passes again, the dealer has similarly the option of making it. If both pass a second time the hand is thrown up, and the other player deals When the*~~

~~turn up is red and tlie trump is nade red it is called making it next; the same if black is made black. If the trump is made of a ditferent colour from the turn up, it is called crossing the suit. Ifthe hand is played, the non-dealer leads; the dealer plays to the card led. IIe must follow suit if able, otherwise he may play any card he pleases. If the left bower is led a trump must be played to it. The highest card of the suit led wins the trick ; trumps win other suits. The winuer of the trick leads to the next. Ifthe player who orders up, takes up, or makes the trump, wins five tricks, he scores two, calleda march; if he makes three or four tricks he scores one, called the poont. If he fails to make three tricks he is ewchred, and his opponent scores two. The game isfive up. By agreenient, a player who makes more than five may carry the surplus (called a dap) to the next game. Also it is sometimes agreed that a love game (or durch) shall count double. The game may be reckoned without reference to the adverse score ; or it may be played with points, that is, the winner receives from the loser as many points as he wants of game.~~

~~Three-handed or Cut-throat IIuchre.—The option of playing or passing goes to each in rotation, beginning with the player to the dealer's left. Three cards, one from each hand, constitute a trick. The player who orders up, takes up, or makes the trump plays against the other two, except at independent euchre, when each plays for himself. If the attacking player is euchred, he is set back two points. Thus if he is love, and is euchred, he has seven points to make instead of five.~~

~~Four-handed Euchre is generally played with partners, who are cut for and sit opposite each otheras at whist. If the first hand passes, the second may say "I assist," which means that the dealer (his partner) is to take up the trump.~~

~~KEUC—EIIUCO~~

~~The hand is then played as at whist, four cards constituting a trick. The eldest hand has the next deal. If a player has a very strong hand he may play alone single-handed against the two adversaries. IIis partner cannot object. A player can declare to play alone when he or his partner orders up, or when his partner assists, or when he makes the trump, or (if dealer) when he takes up the trump, but not when the adversary orders up,~~

~~*assists, or makes the trump. If tlie lone player wins a march he scores four, if he wins three or four tricks he scores one ; if he fails to win three tricks the opponents score two.*~~

~~*Hints.——1. The chances are that the dealer has one trump in hand; if you order up, you must expect to meet two trumps. Therefore, you should not order up unless your hand gives you a two to one chance of winning three tricks against two trumps, and your cards are such that you would have a worse chanee if you made the trump. If strong in trumps and cqually strong in another suit, it is always right to pass. Also, if you have the point. eertain, whether you make the trump or not, you should pass, in hopes the dealer may take up the trump.*~~

~~*9. If you pass and the dealer turns it down, you should not make the trump unless you have a two to one chance of winning three tricks against one trump.*~~

~~*8. If you hold good cards in two suits of different colours, and you make the trump, you should make it next. For, the dealer having turned it down in one colour, is less likely to hold a bower of that colour than of the other. At the four-handed game the non dealer and his partner should also avoid crossing the suit. But if the dealer's partner makes the trump, he should not hesitate to cross the suit, as the dealer, having turned it down, has probably no bower in that suit.*~~

~~*4. At four-handed euchre, the eldest hand should be very strong to order it up ; but the second player should assist if he has some- thing more than one tvick, e.g., an ace and a trump, or two aces. 1f, however, he is strong in the non-trump suits, he should not assist unless he ean be pretty surc of making two tricks. The third hand should be cautious of ordering up, as his partner, having passed, must be weak. This applies with still more force to taking up by the dealer, as his partuer, not having assisted, must be very weak. To take up the dealer should be pretty sure of two tricks, and have a chance ofa third.*~~

~~*5. If the dealer takes up the trump he should keep two cards of a suit, unless his single card is an ace, Thus, with queen, seven of one suit and king single of another, the king should be disearded.*~~

~~*6. Lead from a guarded suit unless in fear of losing a march, when lead your highest single card. Lead from a sequence of three trumps. At four-handed euchre always lead a trump with three. Also lead a trump if you have made it next ; if your left hand adversary has assisted (unless a bower is turned up) ; and if your partner orders up, assists, takes up, or makes the trump. Further, lead a trump if you have lost two tricks and won the third, unless your partner has dealt and still has the turn up in hand.*~~

~~*7. As a rule make tricks when able. Passing or finessing is seldom good play,*~~

~~*8. If your partner orders up, assists, takes up, or makes the trump, trump the trick whenever you can.*~~

~~*9. In discarding during the play, as a rule, keep a guarded card in preference to a single one, except a single acc.*~~

~~*10. If the adversary is at three do not order up unless you have very good cards. If the adversary is at four take up the trump on a light hand.*~~

~~*11. At four-handecd euchre, if the dealcr is one or two, and the eldest hand four, he should order up, unless he has one eertain triek, in order to prevent the opponent from playing alone. This position is called the bridge.*~~

~~*12. At four-all, if the eldest hand or third hand has a trick and the chance of a second, and such eards that he would be uo better off if he made the trump, he should order it up.*~~

~~*13. The eldest hand, and next to him the dealer, may play alone on weaker hands than the other players. The leader, with a lone hand, should lead his winning trumps ; if two trieks are thus made, and the leader has a losing trump, he should then lead his best card out of trumps.- When playing against a lone hand, lead an ace. If you have not one, lead your highest eard out of trumps, except with a guarded king and another suit, when lead the latter. Also, keep eards of the suits your partner diseards, but do not throw an ace, even if your partner keeps your ace suit.*~~

~~*Laws or Evcure.—Dealing.—1. If the dealer gives too many or too few eards to any player, or if he turns up two cards, it is a misdeal, and the next player deals. 2. If the dealer exposes a card, or if there is a faced eard in the pack, there must be a fresh deal. Playing.—3. Any one playing with the wrong number of eards can score nothing that hand. The same if, when the trump is ordered*~~

~~*up, the deaier omits to discard before he or his partner plays. 4, When more than two play, exposed cards can be called. Also a card led out of turn may be called, or a suit from the side offending at their next Icad. 5. A player not following suit when able may correct his mistake before the trick is turned and quitted or he or his partner plays to the next trick, the card played in error being au exposed card. Ifthe error is not correeted a revoke is established. A player revoking is euchred, and eanuot score anything that hand. 6. A player making the trump must abide by the suit first named. 7. If, after the trump is turned, a player reminds his partner that they are at the point of the bridge, the latter loses the right to order up. 8. Each player has a right to see the last trick. (H. J.)*~~

~~*EUCLID. Of the lives of the Greek mathematicians generally very little is known, and among the number Euclid is no exception; we are ignorant not only of the dates of his birth and death, but also of his parentage, his teachers, and the residence of his early years. In some of the editions of his works, as will be seen, he is called Megarensis, as if he had been born at Megara in Greece, a mistake which arose from confounding him with another Euclid, a disciple of Socrates. Proclus, the Neo-platonist (412-485 a.p.), is the authority for most of our informa- tion regarding Euclid, which is contained in his commen- tary ou the first book of the Llements. HIe there states that Euclid lived in the time of Ptoleniy I., king of Egypt, who reigned from 323 to 285 B.c., that he was younger than the associates of Plato, but older than Eratosthenes (276-196 x.c.) and Archimedes (287-212 8.c.) Euclid is said to have founded the mathematical school of Alexandria, which was at that time becoming a centre, not only of commerce, but of learning and research, and for this service to the cause of exact science he would have deserved com-*~~

~~*memoration, even if his writings had not secured him a worthier title to fame. Proclus preserves a reply made by Euclid to King Ptolemy, who asked whether he could not learn geometry more easily than by studying the Llements— "There is no royal road to geometry." Pappus of Alexandria, whose date is rather uncertain, but is probably a century earlier than that of Proclus, says that Euclid was a man of mild and inoffensive temperament, unpretending, and kind to all genuine students of mathematics. This being all that is known of the life and character of Euclid, it only remains therefore to speak of his works.*~~

~~*Among those which have come down to us the most remarkable is the Hlements (Srocxeia). They consist of thirteen books ; two more are frequently added, but there is reason to believe that they are the work of a later mathematician, Hypsicles of Alexandria. At the outset of the first book occur the definitions or explanations of the meanings of the terms employed; the postulates, which limit the instruments to be used in the constructions to the ruler and the compasses; and the axioms or common notions, the fundamental principles from which mathemati- cal truths are deduced. The propositions, which consist of both theorems and problems, deal with rectilineal figures, principally the triangle and the parallelogram, and the book concludes with the celebrated Pythagorean theorem and its converse. The second book is occupied with the consideration of the rectangular parallelograms contained by the segments of straight lines, and their relation to certain squares. It contains only two problems, the one to divide a straight line in medial section ("the divine section," as it was afterwards called), and the other which shows how to effect the quadrature of any rectilineal area. The third book, prefaced with a few definitions, discusses the pro- perties of circles. The fourth book contains no theorems. he problems are on the inscription in, and circum- scription about, circles of triangles, squares, and certain regular polygons, and on the inscription of circles in, and the circumscription of circles about, some of these figures. . Though, in the definitions preliminary to this book, Euclid explains when a rectilineal figure is in-*~~

~~*scribed in and circumscribed about another rectilineal*~~ |

~~figure, he has given no proposition showing how in any case such inscription or circumscription may be effected. The equilateral triangle, the square, the regular pentagon, and such regular polygons as can be derived from these, were the only regular figures known to be inscriptible in a circle by means of elementary geometry, till Gauss dis- covered, in 1796, that the circumference of a circle could be divided into 17 equal parts. In his Disqutsitiones Arithmetic, published in 1801, it is proved that there can be inscribed in a circle any regular polygon, the number of whose sides is prime, and is denoted by 2”+1. Euclid’s second book presupposes, that is, depends to some extent upon, the first; the third presupposes both the first and second ; the fourth presupposes the first three ; and all four are largely concerned with the discussion of the absolute equality or inequality of certain magnitudes. The fifth book stands alone, depending upon none of the preceding books, and contains the theory of proportion, with respect not merely to geometrical magnitudes, such as lines, angles, areas, solids, but to any magnitudes of which multiples can be formed, The diagrams consist of straight lines, probably for convenience of construction, but the enunciations of the propositions and the reasoning are perfectly general. With the exception of his treatment of parallels, Euclid’s doctrine of proportion has been the subject of more discussion than any other part of the Hlements. The foundation of the doctrine is the criterion of proportionality laid down in the famous fifth definition. The necessity or the appropriate- ness of such a criterion can be seen only when the distinc- tion between number and magnitude has been clearly apprehended, or, what amounts to the same thing, when an adequate conception has been formed of incommensurables. The ordinary arithmetical test of proportionality will then be found to suit only certain cases which occur—those, namely, where the magnitudes considered are commen- surable, and if the theory of proportion is to be rigorous and complete (as Euclid’s is), it must be extended to incom- mensurables by the notions of continuity and limits. The difficulty therefore which is felt by readers of the fifth book in grasping Euclid’s doctrine is due mainly to the nature of the subject, and no very material simplification of the full treatment of proportion is possible. The sixth book contains the application of the theory of proportion, mostly to rectilineal figures. In the last proposition, the second part of which is due to Theon, it is noteworthy that the restricted~~

~~*definition of an angle, given in the first book, and adhered to throughout, istacitly abandoned. The seventh, eighth, and ninth books are arithmetical, that is, treat of the properties of numbers. The definitious relating to them occur at the beginning of the seventh book, and some of these show perhaps the tendency of the Greeks, natural enough to a scientific people with a defective numerical notation, to consider quantity from a geometrical point of view. A number composed of two factors was called a plane number, one composed of three a solid number, and tle factors themselves were called sides. The test by which numbers are recognized to be proportionals is diffcrent from that given iu the fifth book, for here it requires to be ap- plied only to quantities which are commensurable, namely, integers. The last proposition of the ninth book shows how to construct a perfect number, that is, a number which is equal to the sum of all its divisors; for example, 6=14243, 28=1424447414, &. The tenth book is the longest of the IIlements. It is occupied with the consideration of commensurable and incommensurable magnitudes, and ends with the proposition that the diagonal and the side of a square are incommensurakle. With regard to strsight lines, Euclid distinguishes between those which are commensurable or incommensurable in length,*~~

~~*E U°Gel tT*~~

~~*and those which are so in power, the latter being defined to be straight lines the squares on which have or have not a common measure. There are three sets of definitions to this book, the second set inserted before the forty-ninth pro- position, and the third before the eighty-sixth. The eleventh, twelfth, and thirteenth books treat mainly of solid geometry. In the eleventh are given the definitions which serve for the three books, the principal properties of straight lines and planes, of solid angles, and of parallelepipeds. The twelfth book begins with two theorems of plane geometry, and then discusses chiefly the properties of pyramids, cones, and cylinders. The last two propositions relate to spheres, the last being to prove that spheres have to one another the triplicate ratio of their diameters. In this book is exemplificd the method of Exhaustions, whicli is founded on the principle that by taking away from a magnitude more than its half, from the remainder niore than its half, and so on, a remainder is at length reached which is less than any assignable*~~

~~*magnitude (book x. prop. 1). Other applications of this method, the nearest approach made by the ancients to the differential calculus, are to be found in the works of Archimedes (see his Measurement of the Circle, Conoids and Spheroids, Sphere and Cylinder). The thirteenth book treats of lines divided in extreme and mean ratio, of some regular figures inscribed in circles, and of the five regular solids, the last proposition being to ex- hibit the edges of these five solids, and to compare them with one another.*~~

~~*The question has often been mooted, to what extent Euclid, in his Hlements, is a discoverer or a compiler. To this question no entirely satisfactory answer can be given, for scarcely any of the writings of earlier geometers have come down to our times. We are dependent on Pappus and Proclus for the scanty notices we have of Euclid's pre- decessors, and of the problems which engaged their atten- tion; for the solution of problems, and not the discovery of theorems, would seem to have been their principal object. From these authors we learn that the property of the right- angled triangle had been found out, the principles of geometrical analysis laid down, the restriction of construc- tions in plane geometry to the straight line and the circle agreed upon, the doctrine of proportion, as well as loci, plane and solid, and some of the properties of the conic sections investigated, the five regular solids (often called the Platonic bodies) and the relation between the*~~

~~*The first six and, less frequently, the eleventh and twelfth books are the only parts of the Elements which are now read in the schools or universities of the United Kingdom ; and, within recent years, strenuous endeavours have been made by the Association for the Improvement of Geometrical Teaching to supersede even these. On thie Continent, Euclid has for many years been abandoned, and his place supplied by numerous treatises, certainly not models of geometrical rigour and arrangement. The fact that for twenty centuries the Elements, or parts of them,*~~

~~*| have held their ground as an introduction to geometry is a*~~

~~*Eee LD*~~

~~*proof that they are, at any rate, not unsuitable for such a purpose, They are, speaking generally, not too difficult for novices in the science; the demonstrations are rigorous, ingenious, and often elegant; the mixture of problems and theorems gives perhaps some variety, and makes their study less monotonous; aud, if regard be had merely to the metri- eal properties of space as distinguished from the graphical, hardly any cardinal geometrical truths are omitted. With these excellences are combined a good many defects, some of them inevitable to a system based on a very few axioms and postulates. Thus the arrangement of his propositions seems arbitrary; associated theorems and problems are not grouped together ; the classification, in short, is imperfect. That is the main objection to the retention of Euclid as a school-book. Other objections, not to mention minor blemishes, are the prolixity of his style, arising partly from a defective nomenclature, his treatment of parallels depend- ing Qn an axiom which is not axiomatic, and his sparing use of superposition as a method of proof. A text-book of geometry which shall be free from Euclid's faults, and not coutain others of a graver character, and which shall at the same time be better adapted to purposes of elementary in- struction, is much to be desired, and remains yet to be written.*~~

~~*Of the thirty-three ancient books subservient to geometrical analysis, Pappus enumerates first the Data (Acdoueéva) of Euclid. IIe says it contained 90 propositions, the scope of which he describes ; it now consists of 95. It is not easy to explain this discrepancy, unless we suppose that some of the propositions, as they existed in the time of Pappus, have since been split into two, or that what were once scholia have since been erected into propositions. The object of the Datais to show that when certainthings—lines, angles, spaces, ratios, &c.—are given by hypothesis, certain other things are given, that is, are determinable. The book, as we are expressly told, and as we may gather from its contents, was intended for the investigation of problems ; and it has been conjectured that Euclid must have extended the method of the Data to the investigation of theorems. What prompts this conjecture is the similarity between the analysis of a theorem and the method, common enough in the IIlements, of reductio ad absurdum,—the one setting out from the supposition that the theorem is true, the other from the supposition that it is false, thence*~~

~~*in both cases dedu- cing a chain of consequences which ends in a conclusion previously known to be true or false.*~~

~~*The Introduction to Harmony (Eicaywyh 'Appovixy), and the Section of the Scale (Kararouy Kavévos), treat of music. There is good reason for believing that one at any rate, and probably both, of these books are not by Euclid. No men- tion is made of them by any writer previous to Ptolemy (140 a.p.), or by Ptolemy himself, and in no ancient codex are they ascribed to Euclid.*~~

~~*The Phenomena (Pawdpeva) contains an exposition of the appearances produced by the motion attributed to the celestial sphere. Pappus, in ths few remarks prefatory to his sixth book, complains of the faults, both of omission and commission, of writers on astronomy, and cites as an example of the former the second theorem of Euclid's Phenomena, whence, and from the interpolation of other proofs, Gregory infers that this treatise is corrupt.*~~

~~*The Optics and Catoptrics ('Omrixd, Karorrpuxd) are ascribed to Euclid by Proclus, and by Marinus in his pre- face to the Dafa, but no mention is made of them by Pappus. This latter circumstance, taken in connexion with the fact that two of the propositions in the sixth book of the Mathematical Collection prove the same things as three in the Optics, is one of the reasons given by Gregory for deeming that work spurious. Several other reasons will be found in Gregory's preface to his edition of Euclid's works.*~~

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~~*Tn some editions of Euclid's works there is given a book on the Divisions of Superfictes, which consists of a few pro- positions, showing how a straight line may be drawn to divide in a given ratio triangles, quadrilaterals, and penta- gons. This was supposed by John Dee of London, who transcribed or translated it, and entrusted it for publication to his friend Federic Commandine of Urbino, to be the treatise of Euclid referred to by Proclus as 76 wepi duoupéccewv BiBAtov. Dee mentions that, in the copy from which he wrote, the book was ascribed to Machomet of Bagdad, and adduces two or three reasons for thinking it to*~~

~~*be Euclid's. This opinion, however, he does not seem to have held very strongly, nor does it appear that it was adopted by Com- mandine. The book does not exist in Greek.*~~

~~*The fragment, in Latin, De Levi et Ponderoso, which is of no value, and was printed at the end of Gregory's edition only in order that nothing might be left out, is mentioned neither by Pappus nor Proclus, and occurs first in Zamberti's edition of 1537. There is no reason for supposing it to be genuine.*~~

~~*The following works attributed to Euclid are not now extant :—*~~

~~*1. Three books on Porisms (Hepi rév Topirparwv) are mentioned both by Pappus and Proclus, and the former gives an abstract of them, with the lemmas assumed. A porism, according to Pappus, was neither a theorem nor a problem, but something of an intermediate form, which yet could be enunciated as a theorem or asa problem. Later geometers, he says, defined it to be a local theorem wanting part of the hypothesis, but this definition he censures as imperfect. After the publication of Commandine's trans- lation of Pappus (1588), many attempts were made to extract from this unsatisfactory description a clear idea of what a porism was, and, with the help of the lemmas, to restore Euclid's books. The mystery, which baffled the penetration even of Edmund Halley, was not resolved till the time of Simson, who, in 1722, gained some insight into the subject, and whose posthumous treatise De Porismatibus appeared in 1776. Simson's views have been objected to by recent French writers, such as M. Paul Breton, and M. Michel Chasles ; but for a discussion of the subject recourse must be had to the article Porism. Here it will be suffi- cient to state Simson's definition, which is, —" A porism is a proposition in which it is proposed to demonstrate that one or more things are given, between which and every one of innumerable other things, not given but assumed according to a given law, a certain relation, described in the proposition, is to be shown to take place ;" and to refer to Simson's Opera Reliqua ; Playfair's paper On the Origin and Investigation of Porisms,; Trail's Life of Dr Simson ; Breton's Recherches Nouvelles sur les Porismes d' EHuclide, and his Question des*~~

~~*Portsmes; Vincent's Considérations sur les Porismes,; and Chasles's Les Trois Livres de Porismes @ Euclide.*~~

~~*2. Two books are mentioned, named Térwv pods éxupaveia, Which is rendered Locorwm ad Superficeem by Commandine and subsequent geometers. These books were subservient to the analysis of loci, but the four lemmas which refer to them, and which occur at the end of the seventh book of the Mathematical Collection, throw very little light on their contents. Simson's opinion was that they treated of curves of double curvature, and he intended at one time to write a treatise on the subject. (See Trail's Life, pp. 60-62, 100-105).*~~

~~*3. Pappus says that Euclid wrote four books on the Conic Sections (BiBAta récoapa Kwvixdv), which Apollonius amplified, and to which he added other four. It is known that, in the time of Euclid, the parabola was considered as the section of a right-angled cone, the ellipse that of an acute-angled cone, the hyperbola that of an obtuse-angled*~~

~~*cone, and that Apollonius was the first who showed that the three sections could be obtained from anycone. There is good ground therefore for supposing that the first four books of Apollonius's Comics, which are still extant, resemble Euclid's Conics even less than Euclid's IIlements do those of Eudoxus and Theeetetus.*~~

~~*4, A book on Fallacies (Ilept Wevdapiwv) is mentioned by Proclus, who says that Euclid wrote it for the purpose of exercising beginners in the detection of errors in reasoning.*~~

~~*This notice of Euclid would be incomplete without some account of the earliest and the most important editions of his works. Passing over the commentators of the Alex- andrian school, the first European translator of any part of Euclid is Boetius (500 a.p.), author of the De Consolatione Philosophie. His EIIuclidis Megarensis Geometrie libri duo contain nearly all the definitions of the first three books of the ZIIlements, the*~~

~~*postulates, and most of the axioms. The enunciations, with diagrams but no proofs,*~~

~~*"are given of most of the propositions in the first, second, and fourth books, and a few from the third.*~~

~~*Some centuries afterwards, Euclid was translated into Arabic, but the only printed version in that language is the one made of the thirteen books of the HIements by Nasir Al-Din Al-Tusi (13th century), which appeared at Rome in 1594. Judging from the unusual number of diagrams in this edition, the translation of Euclid's text is probably rather free.*~~

~~*The first printed edition of Euclid was a translation of the fifteen books of the HIements from the Arabic, made, it is supposed, by Adelard of Bath (12th century), with the comments of Campanus of Novara. It appeared at Venice in 1482, printed by Erhardus Ratdolt, and dedicated to the doge Giovanni Mocenigo. This edition represents Euclid very inadequately ; the comments are often foolish, propositions are sometimes omitted, sometimes joined together, useless cases are interpolated, and now and then Euclid's order changed.*~~

~~*The first printed translation from the Greek is that of Bartholomew Zamberti, which appeared at Venice in 1505. Its contents will be seen from the title: HIuclidis megarésis philosophi platonict Mathematicaruz disciplinara Janitoris : HIabent in hoc volumine quiciigz ad muthematicad substantia aspirdt: elemetorum libros xiii ci expositione Theonis tmsignis mathematici . . . . . Quibus… . adjuncta. Deputatum scilicet HIuclidi volumé xiiit ci expositioe HIypsi. Alex. Ltidégz Phaeno. Specu. Perspe. cum expositione Theonis. ac mirandus ille liber Datorum cum expositise Pappi Mechanici una ct Marini dialectici protheoria. Bar. Zaber. Vene. Interpte.*~~

~~*The first printed Greek text was published at Basel, in 1533, with the title EvxAeidov Srovxetwy BiBr> ue &x Tov Oéwvos cvvoverdy. It was edited by Simon Grynzus from two MSS. sent to him, the one from Venice by Lazarus Bayfius, and the other from Paris by John Ruellius. The four*~~

~~*books of Proclus's commentary are given at the end from an Oxford MS. supplied by John Claymundus.*~~

~~*The English edition, the only one which contains all the extant works attributed to Euclid, is that of Dr David Gregory, published at Oxford in 1703, with the title, Euxreidou ra coldueva. Luclidis que supersunt omnia. The text is that of the Basel edition, corrected from the MSS. bequeathed by Sir Henry Savile, and from Savile's annotations on his own copy. The Latin translation, which accompanies the Greek on the same page, is for the most part that of Commandine.*~~

~~*The French edition has the title, Les Oeuvres d'Euclide, eis en Latin et en Frangais,*~~ ~~`aprés un manuscrit 7 pane pies resté wnconnu Jusqu a nos Jours. Par published : paul seal des oeuvres`~~ ~~*Archiméde. It was*~~

~~*ree volumes, the first of which ap-*~~

~~*EUCLID*~~

~~*peared in 1814, the second in 1816, and the third in 1818, It contains the Hlements and the Data, which are, says the editor, certainly the only works which remain to us of this ever-celebrated geometer. The texts of the Basel and Oxford editions were collated with 23 MSS., one of which belonged to the library of the Vatican, but had been sent to Paris by the Comte de Peluse (Monge). 'The Vatican MS. was supposed to date from the 9th century; and to its readings Peyrard gave the greatest weight.*~~

~~*What may be called the German edition has the title RixdeiSov Srorxeta. Luclidis Hlementa ex optimis libris mn usum Tironum Groce edita ab Ernesto Ferdinando August. It was published at Berlin in two parts, the first of which appeared in 1826, and the second in 1829. All the above-mentioned texts were collated with three other MSS.*~~

~~*Of translations of the Hlements into modern languages the number is very large. The first English translation, published at London in 1570, has the title, Zhe Hlements of Geometrie of the most auncient Philosopher Huclide of Megara. Faithfully (now first) translated into the*~~

~~*Huglishe toung, by H. Billingsley, Citizen of London. Whereunto are annexed certaine Scholies, Annotations, and Inventions, of the best Mathematiciens, both of time past, and in this our age. The first French translation of the whole of the Elements has the title, Les Quinze Livres des Elements a Euclide. Traduicts de Latin en Franco. Par D. Henrion, Mathematicien, The first edition of it was printed in 1614, and a second, corrected and augmented, was published at Paris in 1623. An Italian translation, with the title, Huclide Megarense acutissimo philosopho solo in troduttore delle Scientie Mathematice. Diligentemente rassettato, et alla integrita ridotto, per il degno professore dt tal Scientie Nicolo Tartalea Brisciano, was published at Venice in 1569; a Spanish version, Los Sevs Lnbros primeros de la geometriade Luclides. Traduzidos en légua Espaiiola por Rodrigo Gamorano, Astrologo y Mathematico, at Seville in 1576; anda Turkish one at Bulak in 1825. Dr Robert Simson's editions of the first six and the eleventh and twelfth books of the Zlements, and of the Data, which form the basis of all the modern school texts of Euclid, are so common that it is not considered necessary to describe them.*~~

~~*Authorities.—The authors and editions above referred to; Fabricii Bibliotheca Greca, vol. iv.; Murhard's Littcratur der Mathematischen Wissenschaften ; Heilbronner's Historia Matheseos Universe ; De Morgan's article " Kucleides" in Smith's Dictionary of Biography and Mythology. (J. S. M.)*~~

~~*EUCLID, of Megara, a Greek philosopher, the founder of the Megarian school, was born in the latter half of the 5th century B.C., probably at Megara, though Gela in Sicily has also been named as his birth-place. He was one of the most devoted of the disciples of Socrates. If we may believe Aulus Gellius, such was his enthusiasm that, when a decree was passed forbidding the Megarians to enter Athens, he regularly visited his master by night in the disguise ofa woman ; and he was one of the little band of intimate friends who had the privilege of listening to the hero's last dis-course. After his master's death, he withdrew, with a number of his fellow-disciples, to Megara ; and it has been conjectured, though there is no direct evidence, that this was the period of Plato's residence in Megara, of which in- dications appear in the Z'hecetetus. The*~~

~~*fundamental prin- ciple of Euclid's philosophy was a combination of the Eleatic conception of Being—the One and All, and the Socratic conception of the Good. Being is immaterial and unchangeable, and is identical with the Good, which is the same as God, as Reason, and (following the Socratic doc- trine) as Wisdom, and which alone truly exists. Thus the existence of evil was denied; and the main object of the Megarian, as it was of the Eleatic dialectic, was to prove*~~

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~~*the conceptions of division, number, becoming, motion, and possibility to be self-contradictory and false. With Plato, Huclid taught that sense has cognizance of the changeable and unreal only, while thought penetrates to unchangeable Being, to the Good. The Megarian school prided itself first of all upon its dialectic. Euclid's dialectic differed greatly from that of his master Socrates, in marked contrast to whom he repudiated the principle of analogical reasoning as unsound. His favourite method of attacking an oppon- ent was by the reductio ad absurdum, which was also a favourite method with his followers, whose arguments degenerated into trivial sophisms, which laid them frequently open to an attack with their own weapon, and which earned for them the contemptuous name of the "Epiorixot or "wranglers." Of Euclid's followers the chief were Eubulides, who taught Demosthenes, wrote against Aristotle, and invented several trifling but ingenious paradoxes, of which the most famous is the Sorites ; Diodorus Chronus, the author of certain arguments to prove the impossibility of motion ; Philo; and, most famous ofall, Stilpo, who was distinguished by the attractiveness of his lectures.*~~

~~*. Our knowledge of Euclid's philosophy is borrowed from scattered passages in Plato, and from Diogenes Laertius. See Zeller, Socrates and the Socratic Schools ; Dyeck, De Megaricorum Doctrina (Bonn, 1827); Mallet, Histoire de U' Ecole de Mégarc (Paris, 1843) ; Ritter, Ucber die Philosophie der Meg. Schule; Prantl, Geschichte der Logik, i., 38; Henne, L' Ecole de Mégare (Paris, 1843).*~~

~~*EUDOCIA, the wife of Theodosius II., was the daughter of the Athenian sophist Leontius, or Leon. It is impossible to fix the date of her birth more precisely than in the last decade of the 4th century, though by an*~~

~~*inference from a statement of Nicephorus Callistus (xiv. 50) the year 393-4 has been fixed upou. She was called Athenais prior to her conversion to Christianity. By her futhershe was carefully instructed in literature and the sciences; and so high an estimate did the philosopher form of her beauty and merit that, thinking any other endowment unnecessary, he divided his whole patrimony between his two sons. Athenais, however, resented this as an injustice, and carried her plea to Constantinople before the emperor. Here she gained access to Pulcheria, the sister of 'Theodosius, and by her she was secretly destined to be the wife of the emperor. The probable date of her marriage is 421. Be- fore her elevation to the throne, she renounced paganism aud was baptized. It was not, however, till the birth of a daughter that she received the title of Augusta (423). Her brothers she not only forgave, but raised tothe dignity of consuls and prefects. About 438 Eudocia made an ostentatious pilgrimage to the Holy Land, distributing alms and donations for pious purposes with a munificence which exceeded that of the great Helena, and she returned to Constantinople in the following year with precious relics of St Stephen, St Peter, and the Virgin. Her peace, how- ever, was soon after disturbed by the jealousy of her husband, on account, it is said, of his observing a beautiful apple which he lad presented to her in the hands of Paulinus, his master of the offices. The execution of the supposed favourite, and the retirement of Eudocia in 449 to Jerusalem, did not appease the anger of the emperor, who despatched a messenger for the purpose of putting to death two ecclesiastics who had gained her confidence. The assassination of his envoy provoked the emperor still further, aud Eudocia was stripped of her royal honours, and degraded in the eyes of the nation. In Jerusalem Eudocia became infected with the Eutychian heresy, and through lier influence it made considerable progress in Syria, but tle misfortunes of her daughter Licinia Eudocia led her to obtain a reconciliation with Pulcheria, and through her mediation and that of her brothers she afterwards returned to the communion of the church, She died at Jerusalem about 460, and was buried in the church of St Stephen.*~~

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~~*With her latest breath she protested that she had never transgressed the bounds of innocence and friendship. Eudocia continued through life to*~~

~~*cultivate her early literary tastes. She composed a paraphrase on the Octateuch in heroic verse, a paraphrase of Daniel and Zechariah, and a poem on the martyrdom of St Cyprian. To these are added a poem on her husband's victory over the Persians, and, according to Zonaras, a cento of the verses of Homer applied to the life and miracles of Christ, but her authorship of the latter is generally disputed by critics.*~~

~~*EUDOCIA AUGUSTA, of Macrembolis, lived in the second half of the 11th century. She was the wife of the emperor Coustantine XI., and after his death of Romanus*~~

~~*'IV. She had sworn to her first husband on his deathbed*~~

~~*not to marry again, and had even imprisoned and exiled Romanus, who was suspected of aspiring to the throne. Perceiving, however, that she was not able unaided to avert the invasions which threatened the eastern frontier of the empire, she revoked her oath, married Romanus, and with his assistance dispelled the impending danger. She did not live very happily with her new husband, who was war- like and self-willed, and when he was taken prisoner by the Turks she was compelled to vacate the throne in favour of her son Michael and retire to a convent, where she died at an advanced age. She compiled a dictionary of mythology entitled Iwvua (Collection of Violets), which has been pub- lished by Villoison in his Anecdota Greca, Venice, 1781.*~~

~~*EUDOXUS, a physical plilosopher, was a native of Cnidus, and flourished about tlie middle of the 4th century B.C. It is chiefly in his quality of astronomer that his name has descended to our times. What particular service he rendered to that science beyond introducing the Egyptian sphere into Greece, and correcting the length of the year, cannot now be ascertained. Of his personal history it is known, from a life by Diogenes Laertius, that he studied at Athens under Plato, but being dismissed by that philo- sopher, passed over into Egypt, where he remained for six- teen months, and that he then went to Cyzicus and the Propontis, where he taught physics, and ultimately migrated with a band of pupils to Athens, where he died in the fifty- third year of his age. Eudoxus is frequently referred to by ancient writers. Strabo attributes to him the introduction of the odd quarter day into the year. According to*~~

~~*Vitruvius he invented a solar dial. The Phenomena of Aratus is a poetical account of the astronomical observations of Eudoxus. Several works have been attributed to him, but they are all lost.*~~

~~*EUDOXUS, of Cyzicus, a Greek navigator who flourished about 130 B.c. He was employed by Ptolemy Euergetes to make a voyage to India. After two of tliese he circum- navigated Africa from the Red Sea to Gades. An attempt to make the return voyage was unsuccessful.*~~

~~*EUGENE, Frangots (1663-1736), commonly called PRINCE EUGENE oF Savoy, one of the greatest generals of his time, born at Paris on the 18th October 1663, was the fifth son of Eugene Maurice, count of Soissons, who was grandson of the duke of Savoy, Charles Emmanuel J., and of Olympia Mancini, niece of Cardinal Mazarin. Originally destined for the church, Eugene was known at court as the petit abbé ; but his own predilection was strongly for the army. His mother, however, had fallen into disgrace at court, and his application for a commission, repeated more than once,. was refused by the king, Louis XIV., prompted probably by the minister lLouvois. This engendered in him what proved to be a life-long resentment against the king and his native country. Having quitted France in disgust, he proceeded to Vienna, where the emperor Leopold, who was allied to his family, received him kindly, and granted him permission, along with several other Frenchmen of distinction, to serve against the Turks*~~

~~*under the banners of Austria. His first campaign was that of 1683, in which he so distinguished himself that the emperor gave him the command of a regiment of dragoons. After several other campaigns he became major-general ; and it was in that capacity that he served at the siege of Belgrade in 1688. At the instigation of Louvois, a decree of banishment from France was now issued against all Frenchmen who should continue to serve in foreign armies. 'I shall return into France in spite of him," said Eugene, when the news was communciated to him ; and he continued his brilliant career in foreign service, one great stimulus to his ambition being the hope that he might be able to enter his native country as an invader.*~~

~~*Prince Eugene's next employment was in a service that re- quired diplomatic as well as military skill. He was sent by the emperor Leopold to Italy with the view of binding the duke of Savoy to the coalition against France, and of co-operating with the Italian and Spanish troops. The first engagement with Catinat at Staffarde resulted in the defeat of the coalition; but in the spring of 1691 Prince Eugene, having secured reinforcements, caused the siege of Coni to be raised, took possession of Carmagnole, and in the end completely defeated Catinat. He followed up his success by entering Dauphiné, where he took possession of Embrun and Gap. After another campaign, in which there was little eventful, the further prosecution of the war was abandoned owing to the defection of the duke of Savoy from the coalition, and Prince Eugene returned to Vienna, where he soon afterwards received the command of the army in Hungary.*~~

~~*It was about this time that Lonis XIV. secretly offered him the baton of a marshal of France, with the government of Champagne which his father had held, and also a pension of two thousand pistoles. But Eugene rejected these offers with indignation, and proceeded to combat the Turks com- manded by the sultan Kara-Mustapha in person. After some able marches and skilful manceuvres, he surprised the enemy (September 11, 1697) at Zentha, on the Theiss, in a canip retrenched en téte de pont ; and, after an attack as vigorous as it was daring, he killed twenty thousand of them, drove ten thousand into the river, made prisoners of the remainder, and took the whole of their artillery and baggage. The victory was one of the most complete and important ever won by the Austrian arms. The earlier historians and biographers of Prince Eugene have generally stated that the battle of Zentha was fought against express orders from the court of Vienna, that Eugene was placed under arrest for violating these orders, and that a pro- posal to bring him before a council of war was frustrated only by the threatening attitude assumed by the citizens of Vienna. It is somewhat curious that a story so minute in its details should, as is now agreed on all hands, be utterly devoid of foundation. It is in fact so pure a fabrication that the latest biographers do not even allude to it. Im- mediately after the battle Eugene returned to Hungary ; and, after a campaign distinguished by no remarkable event, a*~~

~~*treaty of peace was at length concluded with the Turks at Carlowitz, on the 26th January 1699.*~~

~~*Prince Eugene's next opportunity of distinguishing him- self in active service came in the war of the Spanish suc- cession, At the commencement of the year 1701, he was sent into Italy once more to oppose his old antagonist Catinat. He achieved a rapid success, forcing the French army, after sustaining several checks, to retire behind the Oglio, where a series of reverses equally unexpected and severe led to the recall of Catinat in disgrace. The duke of Villeroi, an utterly inexperienced general who succeeded to the command of which Catinat had been deprived, having ventured to attack Eugene at Chiari, in an im- pregnable position, was repulsed with great loss. And this*~~

~~*EUGENE*~~

~~*first check was only the forerunner of more sigual reverses ; for, in a short time, Villeroi was forced to abandon the whole of the Mantuan territory, and to take refuge in Cremona, where he seems to have considered himself as se- cure in the midst of his staff. By means of a stratagem, how- ever, Eugene penetrated into the city during the night, at the head of 2000 men, and, though he found it impossible to hold the town, succeeded in carrrying off Villeroi as a prisoner. Butasthe duke of Vendéme, a much abler general, replaced the captive, the incursion, daring though it was, proved any- thing but advantgeous to the Austrians. The superior generalshiip of his new opponent, and the fact that the French army had been largely reinforced, while reinforcements had not been sent from Vienna, forced Prince Eugene to confine himself to a war of observation, without important results, though fertile in most useful lessons to students of military science. This campaign was terminated by the sanguinary battle of Luzara, fought on the Ist of August 1702, in which each party claimed the victory. Both armies having entered into winter quarters, Eugene returned to Vienna, where he was appointed president of the council of war. He then set out for Hungary in order to combat the insur- gents in that country ; but his means proving insufficient, he effected nothing of importance. The revolt was, how- ever, put down by the success which General Heister obtained in another*~~

~~*quarter. Prince Eugene accordingly proceeded to Bavaria, where, in 1704, he made his first campaign along with Marlborough. Similarity of tastes, views, and talents soon established between these two great men a friendship which is rarely to be found amongst military chiefs, and which contributed, more than all other causes put together, to the success which the allies obtained. The first arid perhaps the most important of these successes was that of Hichstédt or Blenheim, gained on the 3d of August 1704, where the English and imperial troops triumphed over one of the finest armies that France had ever sent into Germany.*~~

~~*But since Prince Eugene had quitted Italy, Vendéme, who commanded the French army in that country, had obtained various successes against the duke of Savoy, who had once more deserted France and joined Austria. The emperor deemed the crisis so serious that he recalled Eugene and sent him to Italy to the assistance of his ally. Vendéme at first opposed great obstacles to the plan which the prince had formed for carrying succours into Piedmont ; but after a variety of marches and counter-marches, in which both commanders displayed signal ability, the two armies met at Cassano (August 16, 1705), where a deadly engagement ensued, and Prince Eugene received two severe wounds, which forced him to quit the field. This accident decided the fate of the battle, and for the time suspended the prince's march towards Piedmont. Vendéme, however, was recalled, and La Feuillade (who succeeded him) was incapable of long arresting the progress of such a com- mander as Eugene. After once more passing several rivers in presence of the French army, and executing one of the most skilful and daring marches he had ever performed, the latter appeared before the entrenched camp at Turin, which place the French were now besieging with an army eighty thousand strong. Prince Eugene had only thirty thousand men ; but his antagonist was the duke of Orleans, who, though full of zeal and courage, wanted experience. Besides, by a secret order of Louis XIV., who had, in fact, transferred the command to Marsin, the young prince was restricted to the execution of an ill-conceived plan, which neutralized the advantage of superior numbers, and put it in the power of the enemy to select his point of attack. With equal courage and address, Eugene profited by the misunderstanding which the exhibition of such an order could not fail to produce between the French generals;*~~

~~*i OG*~~

~~*and having on the 7th September 1706 attacked the French army in its eutrenchments, he gained a complete victory, which decided the fate of Italy. This brilliant achievement, the result of the most masterly combinations, and in several respects the prototype of the campaign of Marengo in 1800, affords one of the most remarkable examples of the difficulty of defending extensive lines even against an inferior army, massed upon one or two points. As soon as the duke of Orleans observed the imperial army approaching, he wished to march out of the lines with the whole French army, and to deliver battle in the open field, where he could have availed himself of his great numerical superiority, but he was restrained by Marsin, who, by this absurd interposition, sealed the fate of the French army, and lost Italy. In the heat of the battle Eugene received a wound, and was thrown from his horse into a ditch. As a recompense for so important services the prince received the government of the Milanese, of which he took possession with great pomp on the 16th April 1707.*~~

~~*The attempt which he made against Toulon in the course of the same year failed completely, because the invasion of the kingdom of Naples retarded the march of the troops which were to have been employed in it, and this delay afforded Marshal de Tessé time to make good dispositions. Obliged to renounce his project, therefore, the prince repaired to Vienna, where he was received with great enthusiasm both by the people and by the court. "TI am very well satisfied with you," said the emperor, "excepting on one point only, which is, that you expose yourself too much," This monarch immediately dispatched Eugene to Holland, and to the different courts of Germany, in order to forward the necessary preparations for the campaign of the following year, 1708.*~~

~~*Early in the spring of 1708 the prince proceeded to Flanders, in order to assume the command of the forces which his diplomatic ability had been mainly instrumental in assembling. This campaign was opened by the victory of Oudenarde, to which the perfect union of Marlborough and Eugene on the one hand, and the misunderstanding between Vendéme and the duke of Burgundy on the other, seem to have equally contributed.*~~

~~*The duke imme- diately abandoned the Low Countries, and remaining in observation made no attempt whatever to raise the siege of Lille, where Boufflers distinguish himself by a glorious defence. To the valour of the latter Eugene paid a flatter- ing tribute, and invited him to prepare the articles of capitu- lation himself, with the words, "I subscribe to everything beforehand, well persuaded that you will not insert any thing unworthy of yourself or of me." After this import- ant conquest, Eugene and Marlborough proceeded to the Hague, where they were received in the most flattering manner by the public, by the states-general, and, above all, by their esteemed friend the pensionary Heinsius. Negotiations were then opened for peace, but proved fruit- less. The campaign of 1709 was opened in Flanders by two hostile armies, each a hundred and fifty thousand strong. That of the French was commanded by Villars, who, fearing to compromise himself in opposition to such great captains as Marlborough and Eugene, remained upon the defensive, and suffered them to take Tournay without opposition. Having gone to succour Mons he was followed by the allies, who attacked him at Malplaquet on the 9th of September, in a formidable position, where he had had time to entrench himself. The attack was made with equal vigour and ability ; but owing to the strength of the French position, and the tenacity with which it was maintained, the victory was purchased at tlie cost of twenty-five thousand men killed on the field of battle, and the Dutch infantry was almost annihilated. Although the allies remained masters of the field of battle, this barren advantage had been so*~~

~~*dearly bought that they found themselves soon afterwards out of all condition to undertake any thing. Their army accordingly went into winter-quarters, and Prince Eugene returned to Vienna, whence the emperor almost immediately dispatched him to Berlin. From the king of Prussia the prince obtained every thing which he had been instructed to require ; and having thus fulfilled his mission, he returned into Flanders, where, excepting the capture of Douai, Bethune, and Aire, the campaign of 1710 presented nothing remarkable. On the death of the emperor Joseph I. in April 1711, Prince Eugene, in concert with the empress, exerted his utmost endeavours to secure the crown to the archduke, who*~~

~~afterwards ascended the imperial throne under the name of Charles VI. In the same year the changes which had occurred in the policy, or rather the caprice, of Queen Anne, brought about an approximation between England and France, and put an end to the influ- ence which Marlborough had hitherto possessed. When this political revolution became known, Prince Eugene im- mediately repaired to London, charged with a mission from the emperor to re-establish the credit of his illustrious com- panion in arms, as well as to re-attach England to the coalition, The mission having proved unsuccessful, the emperor found himself under the necessity of making the campaign of 1712 with the aid of the Dutch alone. The defection of the English, however, did not induce Prince Eugene to abandon his favourite plan of invading France. He resolved, at whatever cost, to penetrate into Champagne; and in order to support his operations by the possession of some important places, he began by making himself master of Quesnoy. But the Dutch, having been surprised and beaten in the lines of Denain, where Prince Eugene had placed them at too great a distance to receive timely support in case of an attack, he was obliged to raise the siege of Landrecies, and to abandon the project which he had so long cherished. This was the last campaign in which Austria acted in conjunction with her allies. Abandoned first by England and then by Holland, the emperor, not- withstanding these desertions, still wished to maintain the war in Germany ; but the superiority of the French army prevented Eugene from relieving either Landau or Freiburg, which were successively obliged to capitulate; and seeing the empire thus laid open to the armies of France, and even the hereditary states themselves exposed to invasion, the prince counselled his master to make peace. Sensible of the prudence of this advice, the emperor immediately entrusted Eugene with full powers to negotiate a treaty of peace, which was concluded at Rastadt, on the 6th of March 1714. On his return to Vienna, Prince Eugene was em- ployed for a time in matters of internal administration ; but it was not long before he was again called on to assume the command of the army in the field. In the spring of 1716 the emperor, having concluded an offensive alliance with Venice against Turkey, appointed Eugene to command the army of Hungary; and at Peterwaradin, with a force not exceeding sixty thousand men, he gained (5th August 1716) a signal victory over the Turks, who had not less than a hundred and fifty thousand men in the field. In~~

~~*recogni- tion of this service to Christendom the pope sent to the victorious general the consecrated rapier which the court of Rome was accustomed to bestow upon those who had triumphed over the infidels. But the ensuing campaign, that of 1717, was still more remarkable on account of the battle of Belgrade. After having besieged the city for a month he found himself in a most critical, if not hopeless, situation. The force opposed to him numbered six times his own army, which besides was become smaller every day owing to the prevalence of dysentery. In these circumstances the only possible deliverance was by a bold and decided stroke. Accordingly on the morning of the*~~

~~*16th August 1717 Prince Eugene ordered a general attack, which resulted in the total defeat of the enemy with an enormous loss, and in the capitulation of the city six days afterwards. The prince was wounded in the heat of the action, this being the thirteenth time that he had been hit upon the field of battle. On his return to Vienna he received, among other testimonies of gratitude, a sword yaiued at eighty thousand florins from the emperor. In the following year, 1718, after some fruitless negotiations with a view to the conclusion of peace, he again took the field; but the treaty of Passarowitz (21st July 1718) put an end to hostilities at the moment when the prince had well-founded hopes of obtaining still more important successes than those of the last campaign, and even of reaching Constantinople, and dictating a peace on the shores of the Bosphorus.*~~

~~*As the government of the Netherlands, formerly con- ferred upon Eugene, had now for some reason been bestowed on a sister of the emperor, the prince was appointed vicar-general of Italy, with a pension of three hundred thousand florins. Though still retaining his official position and much of his influence at court, his personal relations with the emperor were not so cordial as before, and he suffered from the intrigues of the anti- German party. During the ten years of peace which ensued, Eugene occupied himself with the arts and with literature, to which he had hitherto been able to devote little of his time. This new interest led him to correspond with many of the most eminent men in*~~

~~*Europe. But the contest which arose out of the succession of Augustus II. to the throne of Poland having afforded Austria a pretext for attacking France, war was resolved on, contrary to the advice of Eugene. In spite of this, however, he was appointed to command the army destined to act upon the Rhine, which from the commencement had very superior forces opposed to it; and if it could not prevent the capture of Philipsburg after a long siege, it at least prevented the enemy from entering Bavaria. Prince Eugene, having now attained his seventy-first year, no longer possessed the vigour and activity necessary for a general in the field, and he welcomed the peace which was concluded on the 3d of October 1735. On his return to Vienna, his health declined more and more, and he died in that capital on the 21st April 1736, leaviug an immense inheritance to his niece the Princess Victoria of Savoy.*~~

~~*Of a character cold and severe, Prince Eugene had almost no other passion than that of glory. IIe died unmarried, and seemed so little susceptible to female influence that he was styled a Mars without a Venus. Although one of the greatest generals of his time, military science is not indebted to him for any remarkable improvemennt. IIis operations were not directed according to any positive method, nor conformable to invariable principles ; it was by sudden inspirations, and an admirable rapidity of coup Veil, that he conducted himself on the ground according to the circumstances and the men he had to deal witli; and upon all occasions he took the greatest pains to ascertain the character of the generals who were opposed to him. Despising the lives of his soldiers as much as he exposed his own, it was always by persevering efforts and great sacrifices that he obtained victory. IIis almost invariable success raised the reputation of the Austrian army to a point which it has never reached either before or since his day. War was with him a passion. Always on the march, in camps, or on the field of battle during more than fifty years, and under the reign of three einperors, he hed scarcely passed two years together without fighting. Prince Eugene was a man of the middle size, but, upon the Whole, well made; the cast of his visage was somewhat*~~

~~*eyes were black and animated, and his complexion such as became a warrior. His funeral oration, composed in Italian by Cardinal Passionei, was translated into French by Madame du Boccage, 1759.*~~

~~*See Histoire du Prince Eugene (Amst. 1740, Vienna, 1755) by Mauvillon, published anonymously ; Histoire Militaire du Prince Eugéne, du Duc de Marlborough, et du Prince du Nassau, by Dumont (Hague, 1729) ; Prinz Eugen von Savoyen, by Von Arneth (3 vols. Vienna, 1858-9); Prinz Eugen von Savoyen, by Von Sybel (London,*~~

~~*1868).*~~

~~*EUGENIUS, the name of four popes.*~~

~~*Eucentus I. was a native of Rome. Elected pope in 654, on the banishment of Martin I. by the emperor Con- stans II., he showed greater deference than his predecessor to the emperor's wishes, and made no public stand against the patriarchs of Constantinople. He died in 657, and was canonized, his day being the 2d of June, although according to Anastasius, he died on the Ist of that month.*~~

~~*Evaentivs II. was a native of Rome, and was chosen to succeed Pascal I. in 824. Another candidate, Zinzinnus, was proposed by the plebeian faction, and the presence of the emperor Lothair was necessary in order to maintain the authority of the new pope. Lothair took advantage of this opportunity to redress many abuses in the papal ad- ministration, to vest the election of the pope in the nobles, and to confirm the statute that no pope should be con- secrated till his election had the approval of the emperor. A council which assembled at Rome during the reign of Eugenius passed several enactments for the restoration of church discipline, took measures for the foundation of schools and chapters, and decided against priests wearing a secular dress or engaging in secular occupations. Eugenius also adopted various provisions for the care of the poor and of widows and orphans, and on that account received the name of 'father of the people," an epithet not alto- gether appropriate, if he was, as he is said to have been, the author of the "ordeal of cold water." He died in 827.*~~

~~*Evcerntus IIL, a native of Pisa, was elected pope in February 1145. When called to occupy this supreme position he was only abbot of the Cistercians, aud he owed his elevation partly to the fact that none were eager to accept an office the duties of which were at the time so diffi- cult and dangerous, but chiefly to his being the friend and pupil of Bernard of Clairvaux, the most influential eccle- siastic of the Western church, and'a strong assertor of the pope's temporal authority. The choice had not, however, the approval of Bernard, who remonstrated against the election on account of the 'innocence and simplicity " of Eugenius; but after the choice was made he took advan- tage of the qualities in Eugenius which he objected to, so as virtually to rule in his name. Duriug nearly the whole of his pontificate Eugenius was unable to reside in Rome. Hardly had he left the city to be consecrated in the monastery of Farfa, when tlie citizens, under the influence of Arnold of Brescia—the great opponeut of the pope's temporal power—established the old Roman consti- tution, and elected Giordano to be " patrician." Eugenius appealed for help to Tivoli and to other cities at feud with Rome, and with their aid was successful iu making such conditions with the Roman citizens as enabled him for a time to hold the semblance of authority in his capital; but as he would not agree to a treacherous compact against Tivoli, he was compelled to leave the city in March 1146. He stayed for some time at Viterbo and then at Siena, but ultimately went to France. On hearing of the fall of Edessa, he had, in December 1145, addressed a letter to Louis VIL. of France, calling on him to take part in another crusade; and at a great diet held at Spires in 1146 the emperor Conrad III. also, and many of his nobles were, by the eloquence of Bernard, incited to dedicate themselves to the*~~

~~*long, his mouth moderate, and almost always open; his | holy warfare. After holding councils at Paris, Rheims, and*~~

~~*EUG—EUG*~~

~~*Traves, Eugenius, in 1149, returned to Italy, and took up his residence at Viterbo. In 1150, through the aid of the king of Sicily, he was able again to enter Rome, but the jealousy of the republicans soon compelled him to retire. The emperor Frederick Barbarossa had promised to aid him against his revolted subjects, but the death of Eugenius, at Tivoli, June 7,*~~

~~*1153, prevented the fulfilment of the engagement. Though the citizens of Rome were jealous of the efforts of Eugenius to assert his temporal authority, they were always ready to recognize him as their spiritual lord, and they besides deeply reverenced his personal character. Accordingly he was buried at the Vatican with every mark of respect, and his tomb soon acquired an extraordinary fame for miraculous cures.*~~

~~*Evucentus IV. (1383-1447), born in 1383, was the son of a Venetian merchant, and bore the name of Gabriel Condolmieri. His mother was the sister of Gregory XIL., and when Gregory mounted the papal throne in 1406, Gabriel, then a Celestine monk, became bishop of Sienna. In 1408 he was made cardinal, and on the death of Martin V. he was elected pope, March 3, 1431. Martin V. belonged to the house of Colonna, and the rich treasures which he had accumulated during his pontificate remained in their hands. Eugenius, however, claimed their possession, as the papal successor of Martin, and this being refused, he, with the aid of the rival faction of the Orsini and the general body of the Roman citizens, seized all the Colonnas who were in Rome, captured their castles in the surrounding country, and compelled the prince of Salerno to make humiliating terms. With the large sum of money acquired from the Colonnas he was enabled soon afterwards to quell a revolt which had assumed serious dimensions in the Roman states, and for a time his power was undisputed throughout all his dominions. The augury thus presented of a pontificate of exceptionable prosperity and influence was not, however, fulfilled, for the after career of Eugenius was chiefly a succession of humiliations, and during the greater part of it there existed the scandal of a church "divided against itself." It is doubtful whether even Martin V., if he had lived, could have longer delayed the serious quarrel between pope and council which was the chief feature of Engenius's pontificate; but the latter had neither his prede- cessor's family influence; nor his practical prudence, per- sonal popularity, or steadfast will, He was a patron and friend of learning, and is admitted to have practised with exemplary conscientiousness all the virtues of his order, but he can scarcely be allowed any other commenda- tion. At times he manifested a certain degree of dexterity in gaining his end, but as he was ignorant of the world, and.unable to appreciate the motives and interests which exist beyond the pale of a monastery, he was in a great*~~

measure necessarily deprived of the knowledge which could guide him safely through complicated circumstances. In addition to this he was a strong and hard dogmatist, bitter and relentless in his hatred of heresy, and keenly suspicious of anything that in the faintest way seemed to cast a doubt on the dignity, infallibility, and unlimited authority of his office. On the very day that he was chosen pope the council appointed by his predecessor met at Basel. Three principal subjects were to engage its attention,—the reconciliation of the Hussites, the reform of the church, and the reunion of, the Greek and Latin churches. A great victory gained by the Hussites a few weeks after the council met seemed, in the opinion of the majority of the members, to lend to the two former subjects an additional and supreme urgency, and they actually arranged to receive a deputation of the Hussites for the purpose of agreeing to a peaceable settlement of the points in dispute. Such a proposal, however, at once excited the alarm of Eugenius, — alarm regarding his own authority, and alarm at the mani-

fostation of such signs of clemency towards heretics. His fears were doubtless nourished by the Roman curia, who foresaw the injury that would result to their own interests through the threatened reforms; and on November 12, induced partly by his own misgivings and partly by their advice, Eugenius wrote the cardinal Czsarini, president of the council, ordering him to dissolve it, and summon another to meet two years afterwards at Bologna, Against this command Cwsarini strongly remonstrated, but Eugenius was inflexible, and the council, obtaining the support of the emperor and the duke of Milan, proceeded to act independently of the pope's authority. He fulminated letters of excommunication against all who should attend it, but the number of its members went on increasing; and, gaining confideuce by its accessions, it cited him on April 20, 1432, to appear before it in less than three months, and on September 6, as he did not obey the summons, declared him guilty of schism. Eugenius, to gain the support of Sigismund, had granted him the imperial crown, but since Sigismund remained faithful to the council, Eugenius was compelled to yield, and in 1433 he revoked his bull of dissolution. In'the following year the Colonnas, aided by the Visconti,

~~*compelled Eugenius to flee from Rome. He escaped in disguise to Florence, and afterwards, notwith- standing an offer of assistance from the patriarch of Alex- andria, took up his residence at Bologna, Meantime the essential subjects of dispute between him and the council, so far from being settled, were gradually leading to a crisis, and when finally the council endeavoured to deprive hin of the power of conferring benefices, he in 1437 sought to change the place of meeting to Ferrara, on the ground that the latter place was more suitable for discussing thie reunion with the Greek church. The council replied by summoning him to appear before them within sixty days,*~~

~~*'at the end of which time they, on his failing to appear,*~~

~~*suspended him from his functions. In January 10, 1438, the opposition council, supported by the emperor and the patriarch, met at Ferrara, but on account of an outbreak of the plague, the place of meeting was changed to Florence. Here the act declaring the reunion of the Greek and Latin churches was published July 6, 1439, Meantime, the council at Basel proceeded to elect as pope Amadeus duke of Savoy, under the title of Felix V., and continued the work of reform until 1443. In October of that year Eugenius, with the aid of Alphonso king of Aragon, whose claim to the throne he had supported in opposition to René of Anjou, was enabled to enter Rome; and in 1447, through the subtle but unprincipled craft of /Eneas Sylvius Piccolomini, who had forsaken his old master Amadeus, the whole of Germany was induced to declare against the antipope. The same day, however, that news reached Eugenius of this diplomatic triumph, he was seized with a mortal illness; and, after only lingering to sign the treaty of pacification, he died 23d February 1447. Nor does he appear to have gained much comfort from this final act of his pontificate, regarding it rather as a ne- cessary but disagreeable compromise than as the means of attaining his original purpose, for he is said to have exclaimed on his deathbed,—"O Gabriel, Gabriel, better would it have been for you to have been neither pope, nor cardinal, nor bishop, but to have finished your days as yon commenced them, following peaceably in the monastery the exercises of your order."*~~

~~*See Platina, Vite Pontificwm; Aineas Sylvius, De Concilio Basil- tense, and various passages in his other works; Muratori, Ann. d'Italia; Artaud de Montor, Histoire des Souverains Pontifes romains; Gregorovius, Geschichte der Stadt Rom im Mittelalter ; and Milman, History of Latin Christianity.*~~

~~*EUGUBINE or IGUVINE TABLES, Tabule Hugu- Linc, are seven tablets of brass containing a series of sacer- dotal inscriptions in the ancient Umbrian language, of*~~

~~*664*~~

~~*inestimable value to the student of Italian linguistic. Ac- cording to Concioli, they were discovered in 1444 amid the ruins of a theatre in the vicinity of Gubbio (the ancient Eugubium or Iguvium), and according to Passeri, they were bequeathed in 1456 by a private citizen to the public authorities of the town. Considerable doubt exists as to the original number of the tablets. Concioli asserts that nine were discovered, but that two were taken to Venice in 1540 and never brought back ; other early notices speak of eight, and even M. Bréal is inclined to hope that the Venetian tablets may yet be recovered. The seven are preserved in the palazzo municipale of their native city, and much more truly than Dante's missal-painter Oderisi they form Vonor di Hugubio. Taken altogether they furnish 447 lines, for the most part continuous and entire. Tables I., IL, V., and VI. are engraved on both sides, but a considerable blank space is left on one side in the case of II. and V., and the back of VIL. contains only a few lines. The inscriptions read from right to left ; those of V. and VII., and nearly all on the obverse of V., are in Roman letters; the rest, which are pretty certainly of earlier date, are in Etruscan letters. According to M. Bréal, they may be ascribed to the first and secoud century A.D. For three centuries after their discovery nothing was known as to the contents of the tables : Sal- masius confessed he could not even say whether they should be read from right to left or from left to right. The first attempt at divining their meaning was made by Bernardinus Baldus in the beginning of the 17th century, aud he was followed by Adrian van Schrieck who believed he had got possession of the oldest monument of the Low German language, and interpreted accordingly.*~~

~~*Olivieri recognized the naine of Eugubium in one frequently recur- ring word. Louis Bourget pointed out that one of the tablets written in the Etruscan letters corresponded in the main with two written in Roman letters. C. O. Miiller, in his great work Die Htrusken, showed that in spite of the use of Etruscan letters the language of the inscriptions was totally different from the Etruscan language. Lepsius added greatly to the epigraphical criticism of the tablets, and Lassen and Grotefend made several successful attempts at interpretation. And finally Aufrecht and Kirchhoff, summing up the labours of their predecessors, and working according to strict scientific method, brought the interpreta- tion of the tables to a degree of perfection that could hardly have been hoped for, though there still remains in matters of detail sufficient scope for such investigators as Bréal, Ebel, Corssen, Ascoli, Zeyss, Savelsberg, and Bugge. 'The tables contain the acts of a corporation of priests called the Attidian Brethren, who had authority over a considerable region, and probably derived their name from an ancient town Attidium, cerresponding to the modern Attigio. The brethren were twelve in number, and acted under the presi- dency of an adfertur. They offered sacrifices to a large number of gods and goddesses—Jupiter, Sancus, Mars, Fisus, Grabovius, Cerfius, Vofionus, Tefer, &c., many of whom are altogether unknown to the classical student, and probably belonged to an indigenous Umbrian cult. Tables VI. and VIL. give details of a purification of the Fisian Hill and a lustration of the people of Iguvium; and table II. furnishes a list of the tribes who had a right to participate in a certain sacrifice.*~~

~~*Literature :—Antonio Concioli, Annot. in statuta civ. Eugubii, Maccrate, 1673 ; Bernardinus Baldus, Divinatio in Tab. eneam Engub. lingua Hetrusea veteri perseriptam, 1618; Adrian von Schrieck, Van 't Beghin der cerster Voleken van Europen, Ypres, 1614; Philip Buonarroti in appendix to Dempster's De Etruria Regati, 1724; Bourguct, Bibliotheque I talique ou Hist. litt. de V Italie, vol. i.; A. Franciscus Gorius, Museum Ktruseum, Florence, 17387 ; Olivieri, Saggto di Dissert. aecad. di Cortona, 1742 ; Passeri, Lettere*~~

~~*dtoneagliese, 1789, Contin. delle lett. Rone. in Angiola Calogera's*~~

~~collection of scientific and philological works, vol. xxvi., Venice, 1742, and In Dempsteri libros de Etruria Reg. Paralivomena, Lucca, 1767; Lanzi, Saggio di Lingua Etrusea, Rone, 1789; Lassen, Beitrige zur Dewutung der Eugubinischen Tafeln, Bonn, 1833 ; Lepsius, De tabulis Eugubinis, Berlin, 1833 ; and Inseript. Umbriew et Osece, with folio atlas, Leipsic, 1841; Grotefend, Rudimenta lingue Ombriee, 1835-6-7-8-9; C. Jannellis, Inseript. Ose et Tabb. Eugub. latina interpret. tentate, Naples, 1841; Millingen in Zrans. of the Roy. Soe. of Lit., 1847 ; Aufrecht and Kirchhoff, Die Umbr. Sprachdenkmédler, Berlin, 2 vols., 1849 and 1851; Panzerbieter, Queestiones Umbriew, —programm for the Gymnasium Bernhardinum at Meiningen, 1851; Francis W. Newman, Zhe Teat of the Iguvine Inseriptions, with interl. Latin trans. and notes, London, 1864; Louis de Baeker, Les Tab. Hugubines, Paris, 1867 ; Ariodante Fab- retti, Corpus tuserip. antiquioris evi et gloss. ital., Turin, 1867 ; Bréal, Les Tables Eugubines, 1875, and his review of the history of the investigation, in Rev. des D. Mondes, Nov. 1875 ; F. Biicheler, Popult Iguvini Lustratio, Bonn, 1876.~~

~~EULENSPIEGEL, in French Ulespiegle, in older English Howleglas, one of the most popular of European chapbooks, consisting in all its innumerable rifacimentos of stories of ludicrous roguery, in which the love of fun is not unmingled with the love of mischief. The name in its present form is equivalent to Noctuz Speculum or Owl's Mirror, and may be compared with such appellations as Schwabenspiegel, Sachsenspiegel, Laleuspiegel, Speculum historiale, Speculum Conversionis Peccatorum, Speculum de Passione Domini nostri Jesu Christi, the Mirror of the World, the Mirror for Magistrates, the Steele Glas, and a hundred others of the same type. It may possibly have arisen early in the Middle Ages, and it is distinctly mentioned in a book De Generibus Ebriosorum, or "Concerning the kinds of drunkards," published in 1515. No definitive explanation has been given of the origin of the name, but one inter- pretation makes it rest on the fact that man recognizes his faults no more than an owl that looks into a mirror, and another finds the original form in the Low German U1 en Spiegel, or Ul] den Spiegel, which would signify " Cleanse the looking glass." The popularity of the book has not~~

~~only enriched literary German with the words Lulen- spreyele', waggery, Hulenspregeln, to play the wag, &c., but it has furnished French with esprégle and espiéglerte. Ben Jonson refers in his Afasque of Mortune and his Sad Shepherd to Owl-glass, Ulenspiegle, and Owlspiegle, and Taylor makes a peculiar use of the word when he says—~~

~~"Ride on my best invention like an asse To the amazement of each Owliglasse."~~

~~According to an old tradition, the tricks and jests of the collection are attributed to a certain Till or Tyll Eulen- spiegel, otherwise Till the Saxon or Tylus Saxonicus, who was born at Kneitlingen near Schoppenstadt, in the duchy of Brunswick, and was the son of Claus Eulenspiegel and Anna Wortbeck. He is usually stated to have been buried in 1350 at Molln, about four leagues from Lubeck, but the people of Damme in Belgium claim that his grave is with them. At Molln, to quote an old book of travels cited by Nares, the townsmen 'yearly keep a feast for his memory, and yet show the apparell he was wont to wear ;" and his tomb was adorned with a fantastic effigy, holding in one hand a little tankard with a jack-in-a-box, and in the other a basket full of little mannikins with fool's caps on their heads. That there was such a person as Tyl seems not improbable, but what connexion he had with the Owl- glass it is hard to discover: Eulenspiegel at ieast is pretty certainly a later addition to his name. Mr William F. Thoms found the Irish peasantry telling stories of Old LEspeel, and a writer in the Gentleman's Magazine, Septem- ber 1877, Mr David Fitzgerald, "met with pretty clear traces of Eulenspiegel in the traditions of the county of Limerick, where he figures as one Ulas, whose confession, like that of his prototype, is yet a favourite tale."~~

~~The book was originally, it would appear, composed in Low~~

~~German ; and, according to Lappenberg, the High Geriman version~~

~~priuted at Strasburg in 1519 and hitherto regarded as the editio princeps was the work of Thomas Murner the Franciscan monk. A Latin translation was made by Nemins ; and another by Periander appeared at~~

~~*Frankfort-on-Maine in 1567 as Noctuce Speculum, omnes res memorabiles variasque et admirabiles Tyli Saxonict machinationes complectens. An English translation called Howle- glas his life, printed at London by Copeland, is preserved among the Garrick plays in the British Museum; extracts from it are given in W. F. Thoms's Lays and Legends of various countries: Germany. French translations appeared at Lyons in 1550, at Orleans, 1571, at Antwerp, 1579, at Rouen, 1701. Delepicrre published an edition at Bruges, 1835, and another at Brussels, 1840 ; and a complete trans- lation into modern French from the 1519 edition was printed at Paris by P. Jannet, 1858. An English edition was published in 1860, under the direction of Kenneth R. H. Mackenzie, and with illustrations by Alfred Crowquill. In 1865 appeared a photolitho- graphic reprint of the Lower Saxon version, originally printed by Servais Kruffter (Servetius Cruftanus). There is no complete copy of the original, but portions in the Royal Library at Vienna and in the Royal Library at Berlin complete each other. See Gorres, Die deutschen Volksbiicher, 1807; Lappenberg, Zulenspiegel, 1854.*~~

~~*EULER, Leonarp (1707-1783),.one of the most dis- tinguished mathematicians of the 18th century, was born at Basel on the 15th of April 1707, his father Paul Euler, who had considerable attainments as a mathematician, being Calvinistic pastor of the neighbouring village of Riechen. After receiving preliminary instructions in mathematics from his father, he was sent to the university of Basel, where geometry soon became his favourite study. HIs genius for analytical science gained for him a high place in the esteem of John Bernoulli, who was at that time one of the first mathematicians in Europe, as well as of his sons Daniel and Nicholas Bernoulli. HIaving taken his degree as master of arts in 1723, Euler afterwards applied himself, at his father's desire, to the study of theology and the Oriental languages with the view of entering the church, but, with his father's consent, he soon returned to geometry as his principal pursuit. At the same time, by the advice of the younger Bernoullis, who had removed to St Peters- burg in 1725, he applied himself to the study of physi- ology, to which he made a happy application of his mathe- matical knowledge ; and he also attended the medical lec- tures of the most eminent professors of Basel. While he was keenly engaged in physiological researches, he composed a dissertation on the*~~

~~*nature and propagation of sound, and an answer to a prize-question concerning the masting of ships, to which the French Academy of Sciences adjudged the second rank in the year 1727.*~~

~~*In 1727, on the invitation of Catherine I., Euler took up his residence in St Petersburg, and was made an associate of the Academy of Sciences. In 1730 he became professor of physics, and in 1733 he succeeded his friend Daniel Bernoulli in the chair of mathematics. At the commence- ment of his new career he enriched the academical collec- tion with many memoirs, which excited a noble emulation between him and the Bernoullis, though this did not in any way affect their friendship. It was at this time that he carried the integral calculus to a higher degree of perfection, in- vented the calculation of sines, reduced analytical operations to a greater simplicity, and threw new light on nearly all parts of abstract or pure mathematics. In 1735 a problem proposed by the academy, for the solution of which several eminent mathematicians had demanded the space of some months, was solved by Euler in three days, but the effort threw him into a fever which endangered his life and deprived him of the use of his righteye. The Academy of Sciences at Paris in 1738 adjudged the prize to his memoir on the nature and properties of fire, and in 1740 his treatise on the tides shared the prize with those of Colin Maclaurin and Daniel Bernoulli,—a higher honour than if he had carried it away from inferior rivals.*~~

~~*In 1741 Euler accepted the invitation of Frederick the Great to Berlin, where he was made a meinber of the Academy of Sciences and professor of mathematics. IIe*~~

~~*enriched the last volume of the Afélanges or Miscellanies of Berlin with five memoirs, and these were followed, with an astonishing rapidity, by a great number of important researches, which are scattered throughout the annual memoirs of the Prussian Academy. At the same time he continued his philosophical contributions to the Academy of St Petersburg, which granted him a pension in 1742. The respect in which he was held by the Russians was strikingly shown in 1760, when a farm he occupied near Charlotten- burg happened to be pillaged by the invading Russian army. On its being ascertained that the farm belonged*~~

~~*to Euler, the general immediately ordered compensation to be paid, and the empress Elizabeth sent an additional sum of four thousand crowns. In 1766 Euler with difficulty obtained permission from the king of Prussia to return to Petersburg, to which he had been originally invited by Catherine IT. Soon after his return to St Petersburg a cataract formed in his left eye, which ultimately deprived him almost entirely of sight. It was in these circumstances that he dictated to his servant, a tailor's apprentice, who was absolutely devoid of mathematical knowledge, his Elements of Algebra, a work which, though purely elementary, displays the mathematical genius of its author, and is still reckoned one of the best works of its class. Another task to which he set himself immediately ufter his return to St Petersburg was the preparation of his Lettres & une'Princesse d' Allemagne sur quelques sujets de Physique (3 vols., 1768-72). They were written at the request of the princess of Anhalt-Dessau, and contain an admirably clear exposition of the principal facts of mechanics, optics, acoustics, and physical astronomy. Theory, however, is frequently unsoundly applied in it, and it is to be observed generally that Euler's. strength lay rather in pure than in applied mathematics. In 1755 Euler had beenelecteda foreign member of the Academy of Sciences at Paris, and some time afterwards the academical prize was adjudged to three of his memoirs Concerning the Inequalities in the Motions of the Planets. The two prize-questions pro- posed by the same academy for 1770 and 1772 were de- signed to obtain a more perfect theory of the moon's motion. Euler, assisted by his eldest son Johann Albert, was a com- petitor for these prizes, and obtained both. In the second memoir he reserved for further consideration several ine- qualities of the moon's motion, which he could not determine in his first theory on account of the complicated calculations in which the method he then employed had engaged him. IIe afterwards reviewed his whole theory with the assistance of his son and Krafft and Lexell, and pursued his researches until he had constructed the new tables, which appeared, together with the great work, in 1772. Instead of confining himself, as before, to the fruitless integration of three differential equations of the second degree, which are furnished by mathematical principles, he reduced them to the three ordinates which determine the place of the moon; and he divided into*~~

~~*| classes all the inequalities of that planet, as far as they*~~

~~depend either on the elongation of the sun and moon, or upon the eccentricity, or the parallax, or the inclination of the lunar orbit. The inherent difficulties of this task were immensely enhanced by the fact that Euler was virtually blind, and had to carry all the elaborate computations it involved in his memory. A further difficulty arose from the burning of his house and the destruction of the greater part of his property in 1771. His manuscripts were fortunately preserved. His own life was only saved by the courage of a native of Basel, Peter Grimmon, who carried him out of the burning house.~~

~~Some time after this the celebrated Wenzell, by couching the cataract, restored Euler's sight ; but a too harsh use of the recovered faculty, along with some carelessness on the part of the surgeons, brought about a relapse. With the .~~

~~VIII. — 84~~

~~666~~

~~assistance of his sons, and of Krafft and Lexell, however, he continued his labours, neither the loss of his sight nor the infirmities of an advanced age being sufficient to check his activity. Having engaged to furnish the Academy of St Petersburg with as many memoirs as would be sufficient to complete its acts for twenty years after his death, he in seven years transmitted to the academy above seventy memoirs, and left above two hundred more, which were revised and completed by another hand.~~

~~Euler's knowledge was more general than might have been expected in one who had pursued with such unremitting ardour mathematics and astronomy as his favourite studies. He had made very considerable progress in medical, botanical, and chemical science, and he was an excellent classical scholar, and extensively read in general literature. He was much indebted to an uncommon memory, which seemed to retain every idea that was conveyed to it, either from reading or meditation, He could repeat the Mneid of Virgil from the beginning to the end without hesitation, and indicate the first and last line of every page of the edition which he used. Euler's constitution was unconi- monly vigorous, and his general health was always good. He was enabled to continue his labours~~

~~*to the very close of his life, so that it was said of him that he ceased to calculate and to breathe at nearly the same moment. His last subject of investigation was the motion of balloons, and the last subject on which he conversed was the newly discovered planet Herschel. On the 18th September 1783, whilst he was ainusing himself at tea with one of his grand- children, he was struck with apoplexy, which terminated his illustrious career at the age of seventy-six. Luler's genius was great, and his industry still greater. His works, if printed in their completeness, would occupy from 60 to 80 quarto volumes. He was simple and upright in his character, and had a strong religious faith. He was twice married, his second wife being a half-sister of his first, and he had a numerous family, several of whom attained to distinction, His éloge was written for the French Academy by Condorcet, and an account of his life, with a list of his works, was written by Von Fuss, the secretary to the Imperial Academy of St Petersburg.*~~

~~*The works which Enler published separately are—Dissertatio phy- sica de Sono, Basel, 1727, in 4to ; Mechanica, sive Motus scientia analytice exposita, Petersb., 1786, in 2 vols. 4to ; Hinleitung in die Arithmetik, ibid. 1738, in 2 vols. 8vo, in German and Russian ; Tentamen Nove Theorie Musice, ibid. 1739, in 4to; Methodus inventendi lineas curvas, maximi minimive proprietate gaudentes, Lausanne, 1744, in 4to; Theoria motuum Planetarum et Cometarum, Berlin, 1744 in 4to; Beantwortung, etc., or Answers to different Questions respecting Comets, ibid. 1744, in 8vo ; Newe Grundsétzc, ete., or New Principles of Artillery, translated from the English of Benjamin Robins, with notes and illustrations, ibid. 1745, in 8vo ; Opuscula varii argumenti, ibid. 1746-51, in 3 vols. 4to ; Nove et correcte Tabule ad loca Lune computanda, ibid. 1746, in 4to; Tabule Astronomice Solis et Lune, ibid. 4to; Gedanken, etc., or Thoughts on the Elements of Bodies, ibid. 4to; Rettwng der Gott- lichen Offenbarung, etc., Defence of Divine Revelation against Free- thinkers, ibid, 1747, in 4to ; Introductio in Analysin Infinitorum, Lausanne, 1748, in 2 vols. 4to; Scientia Navalis, seu Tractatus de construendis ac dirigendis navibus, Petersb. 1749, in 2 vols. 4to ; Theoria motus Lame, Berlin, 1753, in 4to ; Dissertatio de principio minime actionis, una cum examine Objectionum cl. prof. Kenigii, ibid. | 1753, in 8vo; Institutiones Calculi Differentials, cum ejus usu in analyst Infinitorum ac doctrina Serierum, ibid. 1755, in*~~

~~*4to; Constructio Lentiwm Objectivarum, etc., Petersb. 1762, in 4to; Theoria motus corporum solidorum sen rigidorum, Rostock, 1765, In 4to; Institutiones Calewli Integralis, Petersb. 1768-1770, in 3 vols. 4to ; Lettres & une Princess d' Allemagne sur quelqucs sujcts de Physique et Philosophie, Petersb. 1768-1722, in 3 vols. 8vo ; Anleitung zur Algebra, or Introduction to Algebra, ibid. 1770, in 8vo ; Dioptrica, ibid. 1767-1771, in 8 vols. 4to; Theoria motuum pe nova mcethodo pertractata, ibid. 1772, in 4to; Nove Tabule Malin ibid. in 8vo ; Théorie compléte de la construction et de la aan. poss Vaisscaux, ibid. 1778, in 8vo ; Eclaircissements sur , as ve a Javeur tant des Veuves que des Morts, without a*~~

~~*i Upuscula Analytica, Petersb. 1788-1785, in 2 vols. 4to.*~~

~~*EUM—EUN*~~

~~*EUMENES, a native of Cardia, a city in the Thracian Chersonesus, was born 360 B.c., and died in 315. Ata very early age he was employed as private secretary by Philip king of Macedonia, and on the death of that prince he was continued in the same office by Alexander. In this capacity he accompanied Alexander into Asia. The esteem in which he was held by his royal master was proved by his being retained in confidence in spite of the enmity of Hephestion, by his appointment to a high military com-mand, and by his marriage to Artonis, the daughter of Artabazus. Upon the death of Alexander, the provinces and armies were divided amongst his generals, and the countries assigned to Eumenes were Cappadocia and Paphlagonia, with the sea-coast of Pontus as far as Trapezus ; but as they were not yet subdued, Leonnatus and Antigonus were charged by Perdiccas to put him in possession. Antigonus, however, disregarded the orders of Perdiccas ; and Leonnatus, having in vain attempted to induce Eumenes to accompany him to the assistance of Antipater in Europe, made an unsuccessful attack on his life. Eumenes, however, escaped his vengeance and joined Perdiccas, who assisted him in taking possession of Cappadocia. When Craterus and Antipater, having reduced Greece, determined to pass into Asia and overthrow the power of Perdiccas, their first blow was aimed at Cappadocia; and in the emergency Eumenes was appointed commander of all the forces in the neighbouring countries. But*~~

~~*to this Neopto- lemus, one of the generals, refused to submit ; and being defeated by Eumenes, he fled to Antipater and Craterus. The presence of Antipater was required in Cilicia, and the army destined to act against Eumenes was therefore com- manded by Craterus and Neoptolemus. They were, how- ever, completely defeated ; Neoptolemus was killed, and Craterus died of his wounds, 321 B.c. When the Mace- donian chiefs received intelligence of the defeat of two of their generals by one whom they considered a stranger, only a few days after the death of Perdiccas, they con- demned Eumenes to death, and charged Antipater and Antigonus with the execution of their order. Humenes was at first successful, but being defeated through the treachery of one of his officers, he fled to Nora, a strong fortress on the confines of Cappadocia and Lycaonia. Here he made a successful resistance, and was afterwards appointed by Olympias to command the army against Antigonus, whose intentions could no longer be misunder- stood. He gained a battle against his adversary, but un- fortunately lost the baggage and women belonging to his Macedonian phalanx. Antigonus offered to restore them on condition that the soldiers would surrender Eumenes into his hands. The offer was complied with, and Eumenes, having been thus basely betrayed, was put to death in the forty-fifth year of his age. (Plutarch, Life of Lumenes ; Nepos ; Diodor. Sic., xviii. 30.)*~~

~~*EUMENIDES. See ERINyYEs.*~~

~~*EUNAPIUS, a Greek sophist and historian, born at Sardis 347 a.p. In his native city he studied under his relative the sophist Chrysanthius, from whom it is supposed that he imbibed the enmity to Christianity which his works display. While still a youth he went to Athens, where he became a favourite pupil of Proeresius. He possessed a considerable knowledge of medicine. In his later years he seems to have resided at Athens, teaching rhetoric. There is evidence that he was still living in the reign of the younger Theodosius. He was the author of two works, one entitled Lives of the Sophists (Biou prtocdguwv xal cogiorov), and the other consisting of a continuation of the history of Dexippus. The former work is still extant, but of the latter only excerpts remain. The style of both works is bad, and they are written in a spirit of bitter hostility to Christianity. The Lives of the Sophists, which*~~

~~deals chiefly with the contemporaries of the author, is valu- able as the only source for the history of the philosophy of that period. The best edition is that of Boissonade with notes by Wyttenbach (Amsterdam, 1822). See a notice of Eunapius by Cousin in his /ragments philosophiques pour servir a Vhistoire de la philosophie (1865).~~

~~EUNOMIUS, one of the chief leaders of the extreme or Anomecean Arians, who are sometimes accordingly called Eunomians, was born at Dacora in Cappadocia early in the 4th century. Under the advice of the Arian bishop Secundus of Antioch, he was sent to Alexandria to study theology under Aetius, whose secretary he became. IIe afterwards came under the influence of Eudoxius of Antioch, where he was ordained deacon. On the recom- mendation of Eudoxius he was appointed bishop of Cyzicus in 360. In this position he gave unrestrained utterance to his extreme Arian views, with the result that the inhabi- tants of Cyzicus lodged a complaint against him, and Eudoxius was compelled, by command of the emperor Constantine, to depose him from the bishopric within a year of his elevation to it. During the reigns of Julian the Apostate and Jovian, he resided in Constantinople in closeintercourse with Aetius, consolidating an heretical party and consecrating schismatical bishops. IIe next resided at Chalcedon, from which he was banished to Mauritania by the emperor Valens for harbouring tlie rebel Procopius. IIe was recalled, however, before he reached his destination. In 383 the emperor Theodosius, who had demanded a declaration of faith from all party leaders, punished Eunomius for continuing to teach his distinctive doctrines, by banishing him to Halmyris in Meesia. IIe afterwards resided at Chalcedon and at Czesarea in Cappadocia, from which he was expelled by the inhabitants for writing against their bishop Basilius. IIis last days were spent at Dacora his birthplace, where he died about 394. The writings of Eunomius were held in high reputation by his party, and their influence was so much dreaded by the orthodox, that more than one imperial edict was issued for their destruction (Cod. Theod., xvi. 34), Consequently his commentary on the epistle to the Romans, mentioned by the historian Socrates, and his epistles, mentioned by Philostorgius and Photius, are no longer extant. IIis first apologetical~~

~~work (AzoAoyyrixds), written probably about 360 or 365, has been entirely recovered from the celebrated refutation of it by Basilius, and may be found in Fabricius's Bibl. Gr., viii, pp. 262-305, A second apology, written before 379 (imép dodoyias dodoyia), exists only in the quotations given from it in a refutation by Gregory of Nyssa. The exposition of faith ("Ex@ecus Ths micrews), called forth by the above-mentioned demand of Theodosius, is still extant, and has been edited by Valesius in his notes to Socrates, and by Rettberg in his Marcelliana. The doctrine of Eunomius, as displayed in these works, was developed by an exclusively logical application of the fundamental idea of the unity of God to the orthodox Trinitarian view. Denying alike the homoousian and the homoiousian theory, he was dialecti- cally probably the ablest and most consistent defender of Anomceanism, or the doctrine according to which the Son is essentially or substantially different from the Father. According to Socrates (v. 24), HEunomius carried his doctrine to a practical issue by altering the baptismal formula. Instead of baptizing in the name of the Trinity, he baptized in the name of the Creator and into the death of Christ. This alteration was regarded by the orthodox ag so serious that Eunomians on returning to the church were re-baptized, though the Arians were not. The Eunomian heresy was formally condemned by the ecu- menical council of Constantinople. The sect maintained a separate existence for some time, but gradually fell~~

~~away owing to internal divisions. It may be noted that Whiston's Hunomianismus Redivivus contains an English translation of the first apology of Hunomius.~~

~~EUNUCH (eévodxos), an emasculated person. From remote antiquity among the Orientals, as also at a later period in Greece, eunuchs were employed to take charge of the women, or generally as chamberlains,— whence the name, of tiv. edviv éxovres, ¢.¢., those who have charge of the bedchaniber. Their position in the harems of princes affording them the ready means of access to the royal person, it is not surprising that they were. frequently enubled to exercise an important influence over princes, and even to raise themselves to stations of great trust and power. Hence~~

~~*the term eunuch in Egypt came to be applied to any couré officer, whether a castratus or not. The vulgar notion that eunuchs are necessarily deficient in.courage and in intellec- tual vigour is amply refuted by history. We are told, for example, by Herodotus that in Persia they were especially prized for their fidelity ; and they were frequently promoted to the highest offices. Narses, the famous general under Justinian, was a eunuch, as was also Hermias, governor of Atarnea in Mysia, to whose manes the great Aristotle offered sacrifices, besides celebrating the praises of his patron and friend in a poem (still extant), addressed to Virtue (see Lucian's dialogue entitled Hunuchus). To multiply instances were superfluous. The capacity of this class of persons for public affairs is strikingly illustrated by the histories of Persia, India, and China; and we need only allude to the power exercised by the eunuchs under the later Roman emperors. The hideous trade of castrating boys to be sold as eunuchs for Moslem harems has continued to modern times, the principal district whence they are taken being the inland of north-eastern Africa. As the larger proportion of children die after the operation (gene- rally total removal), such as recover fetch at least three or four times the ordinary price of slaves. Even more vile, as being practised among a civilized European nation, has been the Italian practice of castrating boys to prevent the natural development of the voice, in order to train them as adult soprano singers, such as might till lately be heard in the Sixtine Chapel. Though such mutilation is a crime punishable with severity, the supply of "soprani" never failed so long as their musical powers were in demand in high quarters. Driven long ago from the Italian stage by public opinion, they remained the musical glory and moral shame of the papal choir till the accession of the present pope (Leo XHT.), one of whose first acts was to get rid of them. Mention must here also be made of the class of voluntary eunuchs, who have emasculated them- selves, or caused the operation to be performed on them, for the avoidance of sexual sin or temptation. This unnatural development of asceticism appears in early Christian ages, its votaries acting on the texts Mat. xix. 12, v. 28-30. Origen's case is the most celebrated example, and by the 3d century there bad arisen a sect of eunuchs, of whom Augustine says (De Heres., c. 37), "Valesii et seipsos castrant et hospites suos, hoc modo existimantes Deo se debere servire" (see Neander, History of Chr. Church, vol ii. p. 462; Bingham, Antig. Chr. Church, book iv. chap. 3). Such practices have been*~~

always opposed by the general body of the Christian churches, but have not even now ceased. It recently came into notice how large and prosperous a secret sect of the kind exists in Russia, whose practice of castration is ex- pressed in the name of Skopzi, by which they are commonly described. (For details see F, v. Stein in Zeitschrift fiir Ethnologie, 1875, p. 37, and Journal of Anthropology, 1870; also Haxthausen, Russian Empire, vol. i.) (E. B.T.)

EUPATORIA, a seaport town of European Russia, at the head of a circle in the government of Taurida, about 50

miles N.W, of Simpheropol, on a sandy promontory in the north of Kalamita Bay, in 45° 12" N. lat. and 33° 5' E. long. Of its numerous ecclesiastical buildings, which comprise 16 mosques, three synagogues, an Armenian, an Orthodox, and a Catholic church, only two are of special interest, the Karaite synagogue and one of the mosques, which has four- teen cupolas, and is built after the plan of St Sophia in Con- stantinople. The shipping accommodation is poor, the port or rather roadstead having a sandy bottom, and being exposed to violent storms from the N.E. Small vessels cast anchor near the town in a depth of 18 or 15 feet. The trade is principally in grain, skins, cowhair, felt, tallow, and salt. In 1861, out of a population of 7081, 3422 were Mahometans, 1228 Karaite Jews, and 175 Talmudists. In 1871 the total was 8294.

It is believed that in the 5th century B.c. there was a town Coronitis, in this part of the Chersonese, and according to some authorities it was near this spot that a military post called Eupatorium was established in the 1st century A.D. by Diophantes, the general of Mithradates Eupator. About the end of the 15th century the Tatars built the fortress of Gezlevé on the present site, and it became the centre of one of the principal towns of the Crimea. It was oc- cupied for the first time by the Russians under Marshal Munich in 1736, and for the second time in 1771 by Prince Dolgorukoff. Its annexation to Russia took place in 1788, and in the following year it was made the chief town of a circle. In 1854the Anglo-French troops were landed at Eupatoria, and in February 1855 the town was occupied by the Turkish forces under Omer Pasha.

~~*EUPEN (French Wéaw), the chief town ofa circle in the district of Aix-la-Chapelle, Rhenish province of Prussia, is situated in a beautiful valley at the confluence of the Hill and Vesdre, on the Rhenish railway, 9 miles south of Aix- la-Chapelle. It is a flourishing commercial town, and besides cloth and buckskin mills, it has net and glove manufactories, soapworks, dyeworks, tanneries, and breweries, and also carries on a considerable trade in cattle, butter, and cheese. It has a Protestant and 6 Catholic churches, a Franciscan monastery, a town school of a high grade, an orphanage, a hospital, an infirmary, and a lunatic asylum. Eupen until 1801 was under the govern- ment of Austria, and belonged to the duchy of Limburg, but at the peace of Lunéville it came into the possession of France, and in 1814 into that of Prussia. The population in 1875 was 14,895.*~~

~~*EUPHORBIUM, an acrid dull yellow or brown resin, consisting of the concreted milky juice of Huphorbia resini-*~~

~~*Jera, Berg., a cactus-like perennial plant of the natural order , Euphorbiacez, indigenous to Morocco. It is procured by —*~~

~~*making incisions in the branches of the plant, and allowing the juice to harden in the heat of the sun. In collecting it, the protection of the mouth and nostrils by a cloth is requisite, as the dust occasions violent sneezing if inhaled. Euphorbium has a taste at first little marked, but afterwards hot and acrid. It dissolves in alcohol, ether, and turpen- tine ; in water it is only slightly soluble. Its constituents, according to Fliickiger, are 38 per cent. of an amorphous resin, to which the drug owes its acridity, and 22 per cent. of euphorbon,—together with mucilage, malates, and mineral compounds. Pliny states that the name of the drug was given to it in honour of Euphorbus, the physician of Juba IL, king of Mauritania. In former times euphorbium was valued in medicine for its drastic, purgative, aud emetic properties ; and as an errhine it is still occasionally resorted to. On account of the violence of its action, it requires to be mixed for use with starch or flour. As a vesicant it has been employed as a substitute for cantharides in veterinary practice.*~~

~~*Sce Fltickiger and Hanbury, Pharmacographia, 1874; Bentley and Trimen, Medical Plants, tab. 240.*~~

~~*EUPHORION, a Greek poet and grammarian, was the son of Polymnetus, and was born at Chalcis in Eubcea in the 126th Olympiad, 274 3.c. He studied philosophy under*~~

~~*Lacydes and Prytanis, and poetry under Archebulus the Therean. After amassing great wealth, he retired (221 B.c.) to the court of Syria, and there assisted Antiochus the Great in forming the royal library at Antioch, which it was intended should rival that of Alexandria ; and in this employment he died probably about 200 B.c. His poetry was principally epic, but he was also an epigrammatist, and has besides been supposed, though without sufficient reason, to have written dramas. Only a few fragments of his works have been preserved; but from the opinions expressed by ancient writers, it appears that he was constantly in search of archaic and obsolete expressions, and that the erudite character of his allusions rendered him so obscure as to be understood with difficulty. His works appear to have been popular as late as the times of the emperor Tiberius.*~~

~~*The fragments have been edited by Meineke under the title De Euphorionis Chalcidensis Vita et Scriptis, &c., Dantzic, 1823. This work with amendments has been published by Meineke in his Analecta Alexandrina, Berlin, 1848. See also Clinton's Fausti Hel- lenict, vol. ii. p. 511; Fabricius, Bib. Greec., vol. i. p. 594; Heyne, De Euphorione, Excurs. iii, ad Virg. Bucol. and Eaxcurs. v. ad Ain, ll.*~~

~~*EUPHRANOR, a painter and statuary of Greece, who flourished about the middle of the 4th century B.c., was born in the territory of Corinth, but, having practised his art and acquired his renown at Athens, is always identified with the Athenian school. In sculpture he produced a great number of pieces, from colossal life-figures to drinking cups. Of the finest of these, a figure of Paris, a beautiful copy now exists in the Museo Pio-Clementino in the Vatican. His principal pictorial work was extant in the time of Pausanias in one of the porches of the Ceramicus. It represented on one side of the wall the twelve gods, and on the other Theseus as the founder of the equal polity of Athens. Among the pupils of Euphranor were Antidotus, Carmanides, and Leonidus of Anthedon. He was the author of some works on colour and proportion, which seem to have been the characteristic excellences of his own pieces.*~~

~~EUPHRATES. The Euphrates has been one of the best known rivers of the world from the remotest antiquity. It may be considered, roughly speaking, as divided into three portions, the upper, middle, and lower divisions, each of which is distinguished by special physical features, and each of which has played a conspicuous part in the world's history, retaining to the present day monumental evidence of the races who have lined its banks. The upper division is formed of two arms, called respectively the Frat! and the Murdd (different forms in all probability of the same name), which rise, the one a short distance to the N.E. of Erzeroum, and the other to the N.W. of Lake Van near Diyadin, and which unite in the vicinity of Keban Maaden, about 39° N. lat. and 39° E. long, on the high road conducting from Sivas to Diarbekir. This upper division of the river bisects the plateau of Asia Minor, and has thus been traversed by all the nations who have passed successively from Asia into eastern Europe. It still exhibits at Paloo, at Malatieh, and in some other places, on the precipitous rocks which form its banks, cuneiform inscriptions of the Scytho-Arian dynasty, which ruled in Armenia in the 8th century B.c. Here the general~~

~~1 The original name of the Euphrates, Burat or Purat, represents probably a very old Asiatic root, Bur or Pur (corresponding with the Welsh Bwrw and English "pour"), with a Semitic feminine ending. The full form of Hufrat, whence the Gr. Ei¢pdrys, is first found in the inscriptions of Darius Hystaspes, the initial syllable having been prefixed apparently by the Persians, in order to obtain a suitable Arian etymology for the name Hufrat, signifying "the good abound- ing." The fluvial root Bur is perhaps to be recognized in Borysthenes, Kha-bur, and some other names.~~

~~character of the Euphrates is that of a river of the first | ing the left bank or Jeziréh, as the 'Anezeh possess the~~

~~order struggling through high hills or rather low mountaius, prolongations of the chain of Anti-Taurus, and making an exceedingly~~

~~tortuous course as it forces its way over a rocky or a pebbly bed from one natural barrier to another. As it winds round its numerous barriers it carries occasionally towards each of the cardinal points a considerable body of water and is shallow enough in some places for loaded camels to pass in autumn, the water rising to about 44 feet. The general direction of the left arm of the Euphrates, which is termed the Murdd-chii, and which, rising near Diyadin, skirts the plains both of Mush and Kharput, is westerly as far as its junction with the right arm near Keban Maaden. This right arm again, which rises near Erzeroum, and which, though of inferior length and size, is generally regarded as the true Euphrates, runs south- westerly by Erzingin Kamakh (Kumukh of the inscriptions, and Gr. Koupaynvy) and Egin to the point of junction. There, however, the direction of the river changes. Meet- ing obliquely the Anti-Taurus, which afterwards rises into the Jujik-dagh (the Mount Abus of antiquity), it is forced to the south through some very precipitous gorges to the vicinity of Malatieh, It then crosses the broken country between the Auti-Taurus and Taurus, and finally forces its way through the latter range in a succession of rapids and cataracts for a space of about 40 miles, till it emerges upon the great Syrian plain, a short distance above Samsat, the ancient Samosata, where Lucian dwelt and wrote. The Euphrates now enters on its middle division, which may be considered to extend from Samsdt to Hit. The direction here is at first S.W., then S., and afterwards S.E. from about the 36th parallel of latitude to its embouchure in the Persian Gulf. The river in this part of its course runs through a valley of a few miles in width, which it has eroded in the rocky surface, and which, being more or less covered with alluvial soil, is pretty generally cultivated by artificial irrigation. The method of irrigation is peculiar, dams of solid masonry being run into the bed of thie river, frequently from both sides at once, so as to raise the level of the stream and thus to give a water power of several feet in height which is used to turn a gigantic wheel some- times 40 feet in diameter. The water is thus raised to a trough at the top of the dam, and from thence is distri- buted among the gardens, and melon beds, and rice fields, occupying the valley between the immediate bed of the river and the rocky banks which shut it out from the desert. The wheels, which are of the most primitive construction, being made of rough branches of trees, with 100 or 150 rude clay vessels slung on the outer edge, raise a prodigious amount of water, and are moreover exceedingly picturesque,~~

~~*the dais or aqueducts to which they are attached being often formed of a series of well-built Gothic arches; but they are great impediments to navigation, as they cause a current of six or seven knots an hour, which cannot be surmounted by any ordinary steam power. In some parts of the river 300 of these wheels have been counted within a space of 130 miles, aud when our steamers first appeared upon the river, not forty years ago, at least one-third of tlle wheels were in working order; but they have since fallen very generally into ruin, the Arab population, which used to cultivate the immediate banks of the river, having for the most part moved further off into the desert. The rocks which form the river banks during this part of its course are composed of gypsum, sandstone, and conglomer-. ate with mica and felspar, and at some points, as at Helebi-Jelebi (the Zabé and Zal4 of the Arabs) approach close to the water's edge. Beyond the rocky banks on both sides is the open desert, covered in spring with a luxuriant verdure, and dotted here and there with the black tent of the Bedouin, the great tribe of Shamar hold-*~~

~~*right bank or Shamiyeh. The middle course of the Euphrates has also played a great part in history. In very early times it formed a boundary between the empire of Assyria to the east and the great nation of the Khetta, or Hittites, to the west; and the capital of the latter people, known in Scripture as Carchemish (2 Chron xxxv. 20), was built upon its banks. The ruins of this city, now known as Yerdbolus, a corruption of the Greek Hierapolis, have been recently examined by Mr George Smith, and are found to contain numerous well-preserved bas-reliefs (with inscriptions in the Hamathite character), which prontise to be of the utmost importance as forming the connecting link that has been long sought between Egyptian and Assyrian art. In the vicinity of Hierapolis, or Carchemish, was the upper passage of the Euphrates on the road conducting from Syria to Nineveh. The site is now known as Bir or Birejek, but it retained the title of Zugma (Greek, fedypa), according to the Arab geographers, to comparatively modern times (see Yacut in voce), and the remains of the old bridge were still to be seen there in the 7th century of the Hegira, popularly known as the Jisr Membij, or bridge of Membij, the Arabic form of the Syriac Mabog or Hieropolis. The lower passage of the Euplirates conducting from Syria to Babylonia, which retained, among the Greeks, the old Semitic title of Thapsacus (or nDpaN 1 Kings v. 4, &.),*~~

~~*is usually placed at Der, 200 miles lower down the river; but Captain Lynch, who carefully examined the country, would prefer the position of Phunsah above Racca, where he found the remains of an ancient bridge. The Euphrates is singularly deficient in tributaries after it leaves the mountains; with the exception, in- deed, of the Sanjeh (Siyyas of the Greeks) and the Sajur (Sangar of the Assyrian inscriptions) on the right bank, and the Bilikh and Khabér on the left, which have retained their present names unchanged for thirty centuries, there is no affluent to the Euphrates of any con- sequence after it has once broken through the Taurus range. In antiquity, indeed, there would seem to have been a river named Araxes by Xenophon, and Saocoras by Ptolemy, which descended from the Sinjar hills, and, running due south, joined the Euphrates between Der and Annah; but no traces of such a stream are now to be found, and it has been suggested therefore that its disappearance may be due to the same upheaval of the land at the south-eastern foot of the Sinjar hills, which diverted the Nisibin river (Gozan of scripture, Mygdonius of the Greeks, and Hermas of the Arabs) from its ancient course by Hatra to Tekrit on the Tigris, and forced it to join the Khabitr and ulti- mately the Euphrates.*~~

~~*During the Mahometan period there were many flourish- ing towns ou the banks of the river in the middle part of its course. The geographers mention in succesion Somei- sat, Rum-Kaleh, Jisr-Mambej or Bir, Beles, El Ja'aber (or Dusar), Racca (Nicephorium at the mouth of the Bilikh), Kerkessich (Circessium at the mouth of the Khabur), Rahbeh, Dér-el-K4im (Gordian's tomb? and the bound- ary between the Roman and Persian empires), Annah (or Anatho), Haditheh, Alis, Nauseli, and Hit. Many of these cities are now in ruins, but the sites can for the most part be identified, and they would all well repay a careful examination; at present the most consider- able towns are Samsat, Bir, Annuh, and Hit. From Bir io Ja'aber the river is rather sluggish, running over a sandy or pebbly bed; further down, and as far as Hit, the general character of the bed is rocky, and between Annah and Hit, it is thickly studded with islands, on which were built in former times the castles and treasuries of the rulers of the land, many of these islands being still inhabited.*~~

~~*Hit,! which may be fixed on as the point of demarcation between the middle and lower divisions of the river, stands at the head of the alluvial deposit. Itis distant about 750 miles by the windings of the river from the point where the Euphrates breaks through the Taurus range, and the further course of the stream measures about 550 miles to the sea. The hills and cliffs and rocky banks which have hitherto lined the river disappear, and, with the exception of one limited tract a short distance above Babylon, named E} Haswa, there is not a stone ora pebble to be seen on the sur- face of the desert all the way to the sea. In the immediate vicinity of Hit a large canal was taken off on the right bank of the river, which followed the extreme skirt of the alluvium the whole way to the Persian Gulf, and thus formed an outer barrier, strengthened at intervals with watch- towers and fortified posts, to protect the cultivated land of the Sowdd against the incursions of the desert Arabs. This gigantic work, the line of which is still to be traced throughout its course, was formerly called the Khandak- Sabir, or " Sapor's trench," being historically ascribed to the Sassanian king, Shaptr Dhulaktdf, but it is known in the country as the Cherra-Saideh, and is in popular tradi- tion believed to have been excavated by Bokhtunasr (Nebuchadnezzar) for his favourite '"sultaneh," Safdeh, "the fortunate." The great irrigating canals, however, which especially distinguished Babylonia, were derived from the left bank of the river, and watered the country between the Euphrates and the Tigris. Many of them must have been of the most remote antiquity, as the majority of the primi- tive capitals—such as Kuthd, and Niffer, and Larsa, &., sister cities of Babylon—were built upon their banks, and are thus proved to be of a later date than the canals. In the time of the Arabs the chief canals were the Nahr Isa, the Nahr Sarsar, the Nahr Malcé (the royal river of the Greeks), and the Nahr Kuth4, and the cuts from these main channels, reticulating the entire country between the rivers, converted it into a continuous and luxuriant garden. The most important canal, however, was the large stream which left the Babylonian branch of the Euphrates just above the city, and under the name of the Arakhat? (Archous of the Greeks and Serrdt and Nil of the Arabs) ran due east to the Tigris, irrigating all the central part of the Jezireh, and sending down a branch as far south as Niffer. At the present day it is easy to distinguish these great primitive water courses from the lateral ducts which they fed, the former being almost without banks, and merely traceable by the*~~

~~*winding curves of the layers of alluvium in the bed, while the latter are hedged in by high banks of mud, heaped up during centuries of dredging. Not a hundredth part of the old irrigation system is now in work- ing order. A few of the mouths of the smaller canals are kept open so as to receive a limited supply of water at the rise of the river in May, which then distributes itself over the lower lying lands in the interior, almost without labour on the part of the cultivators, giving birth in such localities*~~

~~*1 The true name of this place seems to have been Jhi, which is often found in the Talmud in the compound form of Jhi-da-kira, or ** Thi of the Bitumen," from the famous bituminous springs in the vicinity. Herodotus wrote the name as"Is, with the Greek nominatival ending, while in Hi¢ we have the Arabic feminine suffix. Isidore gives the form of AelaoAis; Ptolemy has "Id:cdépa, Ammianus Dia- cira, and Zosimus Adxipa,—the thre last forms all referring to the bitumen springs. The name has not been recognized in the Assyrian inscriptions, though it is curious to observe that in Proto-Babylonian " Bitumen" was named Jttu, a form very much resembling the modern Hit.*~~

~~*2 The Assyrian Arakhat means "the road," and is thus precisely synonymous with the Arabic Serrdét, while the Bedouin of the present day apply to different portions of this canal the names of Derb and Sak, with the same meaning. At the time of the Arab conquest the rin of Serrdt-el-Jamasb was that chiefly in use, but in later times the upper and lower divisions of the canal were more often called " the two Zabs," after the famous river of that name in Assyria,*~~

~~*EUPHRSA TER*~~

~~*to the most abundant crops; but by far the larger portion of the region between the rivers is at present an arid, howling wilderness, strewed in the most part with broken pottery, the evidence of former habitation, and bearing nothing but the camel thorn, the wild caper, the colocynth- apple, wormwood, and the other weeds of the desert. It must further be borne in mind that the course of the river and the features of the country on both banks are subject to con- stant fluctuation. Between Hit, it is true, and Felugia (near the ancient Perisabor, Anddr of the Arabs) which is at the head of the canal system, no great change is possible owing to the height*~~

~~*of the river banks, but lower down every- thing depends on the care bestowed on_ the artificial embankments of the stream. When the Euphrates, for instance, breaks through at Felugia, and fills the Saklawieh canal (in the line of the old Nahr 'Jsé) the whole country west of Baghdad is submerged, and a still more important flooding occurs lower down near Mussiib, at the head of the inodern Hindieh canal. Here in all ages there has been a great bifurcation of the river. We may infer that the right arm was the original bed, and the left arm, on which Babylon was built, the artificial derivation, because from the earliest times, as we learn from the cuneiform inscriptions, the Babylon stream has always been called the river of Sippara and not the Euphrates. In the time of Alexander, it is true, the nomenclature had been reversed, the right arm being then known as the Pallacopas, which means an artificial canal ;3 but under the Arabs and until comparatively modern times, the old distribution has again prevailed, the Euphrates being always described in his- tory as the river which flowed directto Kufa (near themodern Nejef, the tomb of Ali), while the present stream, passing along the ruins of Babylon to Hillah and Diwanieh, has been universally known as the Nalir Surd, a mere corrup- tion of the ancient title of Sippara.t At the present day the preservation of the embankments at the point of bifurca- tion demands the constant care of the Baghdad Government. The ubject is to allow sufficient water to drain off to the west- ward for the due irrigation of the lands cultivated by the Khezzail Arabs below Nejef, whilethe Hillah bed still retains the main volume of the stream, and is navigable to the sea; but it frequently happens that the dams at the head of the Hindfeh are carried away, and that a free channel being thus opened for the waters of the river to the westward, the Hillah bed shoals to 2 or 3 feet, and is everywhere ford- able. But whether the main body of the stream may flow in the right arm or in the left, the lower portion of the Euphrates — that is, a tract of 200 miles in length intervening between Diw4nfeh and the junction of the two great rivers at Korna,— forms and has always formed a succession of reedy lagoons of the most hopeless character. 'These were the Paludes Chaldaici of antiquity, the "7 Batihdt of the Arabs, and they are best known to us at present as the Lemltin marshes, though that name is by no means of general application. It may be doubted if the fall of the*~~

~~*3 The first element of this compound may be compared with the Hebrew 355, " division," a root which has also produced the Arabic name of Pelugia; aud in the second element we may perhaps recognize the 4) or Jow/, which was the name given to the natural depression now filled by the "sea of Nejef."*~~

~~*4 The two Sipparas, represented in the Bible by the dual form of Sepharvaim, were situated on the Euphrates near the point of bifurca- tion, but the exact spot cannot now be recognized, owing to the frequent destruction and reformation of the banks of the river in this part of its course. Under the form of Surdn or Sura, the place became famous in the Middle Ages as the site of a great Jewish academy, while the bridge by which the river was crossed on the high road from Baghdad to Kufa was also known as the Jisr-Surd. The name still appertains to some remains, of no great mark or extent, immediately above the site of Babylon, but the old city of Sippara was probably higher up the river, and not far from the modern town of Mufsaéib.*~~

~~*Euph- rates valley.*~~

~~*EvPanRATES*~~

~~*671*~~

~~*land will ever admit of these marshes being drained, and | across the desert from Bussorah to Aleppo on one line,*~~

~~*certainly in its present condition a more unproductive and unpromising iract of country than the lake region can hardly be conceived. The navigation through the long lines of reeds is subject to constant interraption, the climate is pestilential, the inhabitants wild and inhospitable, and yet there are many mounds and ancient sites among the marshes that would well repay excavation, dating as they do from the earliest Chaldean times. The antiquities, indeed, of the lower Euphrates are all of the highest interest, for here were established the earliest seats of civilization, and here accordingly were localized the tradi- tions of a terrestial paradise. Erech (modern Warka) and "Ur of the Chaldees" (now Mugheir) were both in the immediate vicinity of the river, the banks*~~

~~*of which, below the junction of the Samawa branch, the ontpour of the Hindieh waters, everywhere bear evidence of a teeming population in ancient times. From Korna, where the Tigris and Euphrates at present unite, the river sweeps ou in its majestic course to Bussorah; it is here 1000 yards in width, and from 3 to 5 fathoms deep, so as to be navi- gable by vessels of war, which not unfrequently ascend as far as the junction. Bussorah, which was formerly a very considerable city, but has now dwindled to a small town of 10,000 inhabitants, lies in a creek at a distance of a couple of miles from the river. Off the mouth of the creek, however, the Euphrates usually presents a soniewliat animated appearance, the head-quarters of the Turkish naval force in the Persian Gulf being here established, and several mercantile steamers from Bombay and Baghdad being also not unfrequently anchored in the roads. The native craft is likewise numerous, and occasionally the port is visited by a vessel of war from the British squadron in the gulf. From Korna to Bussorah the banks of the river are wellcultivated, and the date groves are almost continuous. Twenty-five miles further down the river Karin from Shuster and Dizful throws off an arm, which seems to be artificial, into the Euphrates. This arm is named the Haffér, and at the confluence is situated the Persian town of Mohamrah, a place which is most conveniently placed*~~

~~*for trade, and which in the future is likely to become a)*~~

~~*place of much consequence. In the vicinity of Mohamrah was situated, at the time of the Christian era, the Parthian city of Spasini-Charax, which was succeeded by Bahman Ardeshir (uow Bamishir) under the Sassanians, and by Moharzi under the Arabs, The left bank of the river from this point belongs to Persia. It consists of an island named Abadan, about 45 miles in length, which has been formed by the alluvial deposits brought down by the river during the last fifteen centuries. New land, indeed, is yearly rising at the mouth of the river; and Fao, where we have established our telegrapilic terminus connecting the Bombay and Constantinople wires, although at present on the sea-shore, is not likely long to remain so, The entire length of the Euphrates from its source near Diadin to Fao canuot be less than 1600 miles, and for three-quarters of*~~

~~that distance, or as far as Bir, it is more or less navigable by light boats and rafts.~~

~~The Euphrates valley, independently of its great natural advantages, has attracted some attention in recent times from its geographical position, forming as it does the most direct line of transit between the Mediterranean and the Persian Gulf, and thus offering an alternative means of communica- tion with India, not greatly inferior to the route through Egypt. During our wars with Napoleon, early in the present century, and indeed up to the time when the introduction of~~

~~steam navigation rendered the Red Sea accessible at ail sea- |~~

~~sons of the year, the political correspondence of the home and Indian Governments usually passed by what is called "the~~

~~Euphrates route," swift dromedaries conveying the mails —~~

~~while Tartars on post horses on the other rode from Baghdad direct to Constantinople ; and even to the present day these postal lines are kept up with some modifications for the conveyance of correspondence between Baghdad and Europe. 'The greater facilities and the greater expedi- tion of the Egyptian route,—especially since the construction of railways from Alexandria to Suez, and yet more recently the opening of the Suez Canal, —have, it must be allowed, established that line in popular estimation «s the high road to India, but still not entirely to the exclusion of the Euphrates valley route. Various plans, indeed, have been suggested and partly executed at different times, with a view to opening up commuuication between the Mediter- ranean and the Persian Gulf. The British Government commenced in 1835 by sending out Colonel Chesney at the head of an expedition to Syria, with instructions to transport two steamers from the Mediterranean to the Euphrates, and after putting them together at Bir, N.E. of Aleppo, to attempt the descent of the river to the sea, One of these steamers was lost in a squall during the passage down the river, but the other performed the voyage in safety, and thus demonstrated the practicability of the down- ward navigation. Following on this first experiment, the East India Company, in 1841, proposed to maintain a permanent flotilla on the Tigris and Euphrates, and sent two~~

~~vessels accordingly, the "Nitocris" and the "Nimrod," under the command of Captain Campbell of the Indian Navy, to attempt the ascent of the latter river. The experiment was so far successful that, with incredible ditticulty, the two vessels did actually reach Beles, about the same parallel as Aleppo, but the result of the expedition was to show that practically the river could not be used as a high road of commerce, the continuous rapids and falls during the low season, caused mainly by the artificial obstructions of the irrigating dams, being insurmountable by ordinary steam power, aud the aid of hundreds of hands~~

~~_ being thus required to drag the vessels upthe stream at those~~

~~points by main force; and all subsequent experience has confirmed this view, so that at the present day, although many of the dams have been cleared away, and the naviga- tion of the river has been generally much improved, the Turkish authorities do not attempt to run their steamers up aud down throughout the year, but content themselves with a few trips between Beles and Hillah, while the river remains in flood from April to August, with the political object of controlling the riverain tribes rather than for purposes of commerce. The unsuitability of the Euphrates for continuous steam navigation was no sooner clearly~~

~~| ascertained than public attention began to be directed to a~~

~~communication between the Mediterranean and the Persian Gulf by rail, and from that time to the present, under a hundred different forms, the Euphrates valley railway has been under the consideration both of the political and the commercial world. In the year 1872 a select committee of the House of Commons reported generally in favour of the line, remarking that about £10,000,000 sterling would probably be sufficient to cover the expense of a railway along the shortest route between the seas ; and adding that the principal advantages to be derived from such an expenditure would be : —Hst, the more rapid trausmission of the mails between England and India ; 2d, the posses- sion of an alternative and more rapid route for the convey- ance of troops; and 3d, tho great extension of commerce which would follow from the opening up of such a line of communication between India and England. How the money was to be obtained, however, the committee did not venture to recommend.~~

~~They merely suggested that the English Government should enter into communication with the Turkish Government, with a view to some~~

~~arrangement for a joint responsibility in raising the necessary funds, and it was on this money question that the whole scheme, and a great number of similar private schemes, fell through. It is pretty certain, indeed, that a railway of 1000 or 1200 miles through the Syrian and Mesopotamian deserts, dependent for its support entirely on the termini upon the two seas, can never be pecuniarily remunerative; and so long, therefore, as the British Government retains its hold on the Egyptian line it can hardly be worth its while to embark on so costly an under- taking merely for its possible political advantages. If the Sublime Porte had retained its position in the political world, it might have been a sound and proper measure of domestic economy to have laid down a railway from the Mediterranean to the Persian Gulf, with a view to develop- ing the resources of the intermediate countries, and con- solidating the power of the central government. Midhat Pasha, indeed, the author of the Turkish constitution, had thus some years ago, when he was governor of Baghdad, actually completed the preliminary surveys for a line from Tripoli on the Mediterranean, across the desert to Tekrit on the Tigris, and thence by Baghdad to Bussorah; and if he had remained in office the project would have been pro- bably executed; but under present circumstances, when Asiatic Turkey threatens to become yearly more hopelessly disorganized, there is no reasonable prospect of such a scheme being resumed under native auspices. It is only, indeed, in the possible event of the Tigris and Euphrates valleys falling into the hands of a European power that we can look with any hope to the construction of railways, or the scientific embankment of the rivers, or the excavation of canals, or any of those measures of internal improvement which, however, if executed with care and skill, would soon restore these now desolate regions to their former exceptional condition of populousness, wealth, and general prosperity.~~

~~It may be of interest to add that the India Office has recently employed Captain Felix Jones, an accomplished officer of the late Indian navy, and~~

~~*one of the most experienced surveyors of that noble service, in constructing a map of the Euphrates and Tigris upon a large scale. All the charts and plans executed by Col. Chesney, Capt H. B. Lynch, and the various officers of the Indian navy who have been employed during the last 40 years on the survey of Mesopotamia, and most of whose memoirs have been pub- lished in the current volumes of the Royal Geographical Society's Journal, have been utilized for the purpose, and the result has been the production of a map not less remarkable as a specimen of the highest cartographic skill than for its general scientific accuracy and its unusual fulness of detail. It is to be hoped that this map will be soon engraved, and thus rendered generally accessible to the public. (CSR)*~~

~~*EUPION (Greek, ed, well, zéwy, fat), a hydrocarbon of the paraffin series, discovered by Reichenbach in wood-tar. It is a colourless and highly volatile and inflammable liquid, having at 20° C. a specific gravity of 0-65, and ex- panding considerably when heated. It is unaffected by alkalies and mineral acids, and unites directly with the haloid elements. Eupion is formed in the destructive dis- tillation of many substances, as wood, coal, caoutchouc, bones, resin, and the fixed oils. It is most conveniently prepared from rectified bone oil and rape and hemp seed oils, by treatment with sulphuric acid. Like other liquids of similar composition, it is employed for illuminating pur- poses, and, mixed with rape and cotton-seed oils, for the lubrication of machinery.*~~

~~*EUPOLIS, an Athenian poet of the Old Comedy, and, in the judgment of Horace, ranking, along with Cratinus and Aristophanes, as the greatest of that school, was the son of Sosipolis, and was born 445 po. Nothing whatever is known of his personal history. With regard to his death, he is said to have been thrown into the sea by Alcibiades, who had suffered from his attacks in the Baarat. Cicero,*~~

~~*however, points out that Eratostlenes mentions plays pro- duced by Eupolis after the Sicilian expedition in which Alcibiades is said to have taken this revenge. It is much more likely, therefore, and much more generally believed, that he fell at the battle either of Cynossema, 411 B.c., or of Aigospotami, 408 B.c. Toa lively and fertile fancy Eupolis added a*~~

~~sound practical judgment, which prompted him to a thorough mastery of the mechanical part of his art. The result of his studies was that he was reputed to equal Aristophanes in the elegance and purity of his diction, and Cratinus in the command of the most bitter irony and pun- gent sarcasm. Very curious and complicated relations subsisted between Eupolis aud Aristophanes, who accused each other with the bitterest virulence, not only of imitation but of plagiarism. Some of these attacks will be found described in various parts of the scholia upon Aristophanes. The plays of Eupolis are said to have numbered in all seventeen. Meineke gives the names of fifteen which he considers genuine, and an analysis of those whose subjects can be decided from the surviving fragments,~~

~~EUPOMPUS, one of the most celebrated of Greek painters, was a native of Sicyon, and a contemporary of Zeuxis and Parrhasius, who flourished in the 4th century B.c. He was the head of the Sicyonian school of art, and was held in very high esteem by his countrymen. "When Lysippus the sculptor was beginning his career, he con- sulted Eupompus as to whom he should take for his model. "Take nature herself for your model," replied Eupompus, "and be not shackled by the trammels of any predecessor." No mention is made of more than a single piece by Eupom- pus—a victor in the games bearing a palm.~~

~~EURE, a department in the north-east of France, one of the five formed out of the old province of Normandy, is bounded on the N. by the department of Seine Inférieure, W. by Calvados, S. by Orne and Eure-et-Loir, and E. by Seine-et-Oise and Oise. It has an area of 2420 square miles, and lies between 48° 39' and 49° 29' N. lat., and 0° 15' and 1° 45' E. long. The surface is flat, with some ranges of low hills, none of them exceeding 300 feet in height. The Seine flows from S.E. to N.W. through the department dividing it into two unequal parts, and after touching the frontier at two or three points forms near its mouth part of the northern boundary. All the rivers of the department flow into the Seine,—on the right bank the Audelle and the Epte, and on the left the Eure with its tributaries the Avre and the Iton, and the Rille with its tribu- tary the Charentonne. 'The Eure, from which the depart- ment takes its name, rises in Orne, and flowing first east and then west through Eure-et-Loir, falls into the Seine 6 miles below Louviers, after a course of 93 miles. The~~

~~*Rille likewise rises in Orue, and flows generally northward to its mouth in the estuary of the Seine. The climate is mild, but moist and variable. The soil is generally clayey, resting on a bed of chalk; but along the Seine there are some barren sandy tracts quite incapable of cultivation. A great part of the department, however, is very fertile and well tilled. he chief cereal cultivated is wheat, but flax also is largely grown. 'There is a wide extent of pasturage on which are reared a considerable num- ber of cattle and sheep, and especially those horses of pure Norman breed for which the department has long been celebrated. Fruit is very abundant, especially apples and pears, from which much cider and perry are made, and vine- yards on the Seine, Eure, and Avre yield a considerable quantity of wine. Wild game, especially of the winged sorts, is very plentiful, and the rivers abound in fish. Iron ore is very abundant, and the department is noted for its mining and manufacturing industry. Cotton, linen, and woollen cloths of every kind are fabricated. There are large establishments for making copper ware of all kinds,*~~

~~*Life,*~~

~~*HUR—EUR*~~

~~*the various descriptions of paper, nails, pins, and needles, glass for windows and glass bottles, and jewellery and trinkets. Such goods form the trade; and, in addition to these, firewood, timber, cattle, honey, wax, and corn are furnished to the district surrounding the department. Eure is divided into the following arrondissements :— Evreux, Louviers, Les Andelys, Bernay, and Pont-Audemer ; and its capital is Evreux. Notwithstanding the number of industries carried on in the department the population has for some time been decreasing ; while in 1851 it was a it was cnly 377,874 in 1872, and 373,629 in*~~

~~*6.*~~

~~*EURE-ET-LOIR, a department in the northern part of France, formed out of portions of Orléanais, Maine, and Isie-de-France, is bounded on the N. by the department of Eure, W. by Orne and Sarthe, 8. by Loir-et-Cher, S.E. by Loiret, and N.E. by Seine-et-Oise. It has an area of 2361 square miles, and lies between 47° 57' and 48° 57' N. lat., and 0° 44' and*~~

~~2° 0’ E, long. The western and north-western parts consist of undulations of hilland valley, with springs, rivulets, and small lakes. The eastern part is a level and uniform and very fruitful plain. The northern part is watered by the Eure, with its tributaries the Végre, Blaise, and Avre, a small western portion by the Hiuisne, and the southern by the Loir with its tribu- taries the Connie and the Ozanne. The air is pure, and the climate mild, and not subject to sudden changes. The soil consists, for the most part, either of clay intermixed with sand or of calcareous earth, and is on the whole fruitful; but in some portions of the 8.W. it is sandy and, dry, and many tracts of land are so poor as to be uncultivated. The agriculture is better conducted than in most of the depart- ments of France, and the average yield of the various kinds of corn is about three times greater. The wheat is remarkably fine; and among the other agricultural products are rye, barley, oats, hemp, flax, beet-root, melons, and onions. Wine is not extensively produced, nor of the best quality ; but in some parts there is an, abundant supply of apples, from which cider is made as the common drink of the inhabitants, The extensive meadows supply pasturage for a large number of cattle and sheep, the average yield of wool being double that of any of the other departments. There are some iron mines, and granite, marble, and gypsum quarries. but leather, paper, cotton goods of various kinds, serges, flannels, and other coarse woollens, hosiery, hats, caps, household linen (such as sheetings and table linen), and some earthenware are furnished. The department has Chartres, for its capital, and is divided into the arrondisse- ments of Chartres, Chiteaudun, Dreux, and Nogent-le- Rotrou. The population, which in 1851 was 415,777, was 282,622 in 1872 and 283,075 in 1876.~~

~~EURIPIDES is the mediator between ancient and modern drama. No great poet is more difficult to estimate justly, and none has been judged more unfairly. HIe can- not claim the full excellence of the school from which he began the departure, nor yet that of the school which at last arose on the foundations laid by him. HIis time forced an inner conflict on the art to which his genius was devoted. We must try not to look at him either wholly from a modern stand-point or wholly from that of the age which he closed, but rather to place ourselves, as far as we can, at the line of separation on which he stood, and endeavour to see how he dealt with the perplexing forces of an inevitable transition.~~

~~All that is known about his outward life may be shortly~~

~~480-406 told. He was born in 480 3.c., on the very day, according~~

~~B.C.~~ |

~~to the legend, of the Greek victory at Salamis, where his~~

~~The manufactures are not extensive ; ;~~

~~673~~

~~meant to commemorate the first check of the Persian fleet at Artemisium. His father Mnesarchus was at least able ta give him a liberal education ; it was a favourite taunt with the comic poets that his mother Clito had been a herb-seller—a quaint instance of the tone which public satire could then adopt with plausible effect. At first he was intended, we are told, for the profession of an athlete, —— a calling of which he has recorded his opinion with some- thing like the courage of Xenophanes. He seems also to have essayed painting; but at five-and-twenty he brought out his first play, the Peliades, and thenceforth he was a tragic poet. At thirty-nine he gained the first prize, and in his career of about fifty years he gained it only five times in all. This fact is perfectly consistent with his unquestionably great and growing popularity in his own day. Throughout life he had to compete with Sophocles, and with other poets who represented tragedy of the type consecrated by a splendid tradition. It was but natural that the judges should crown works of that school more frequently than the brilliant experiments of an innovator. The hostile criticism of Aristophanes was witty ; and, what has not always been observed, it was true, granting the premise from which Aristophanes starts, that the tragedy of Aischylus and Sophocles is the only right model. Its unfairness, often extreme, consists in ignoring the changing conditions of public feeling and taste, and the possibilities, changed accordingly, of an art which could exist only by continuing to please large audiences. It has usually been supposed that the unsparing derision of the comic poets contributed nota little to make the life of Euripides at Athens uncomfortable ; and there is certainly one passage (in a fragment of the~~

~~*Melanippe,—Nauck, Frag. 495) which would apply well enough to his persecutors :—*~~

~~*&vipay 5& moAAol Tod yéAwrTos obvera*~~

~~*goKovor xdpiras Keptépous' eye 5é mws*~~

~~*fio® yedolous, otrwes copay mépt*~~

~~*axdrw' €xovet ordpata. ~*~~

~~*To raise vain laughter, many exercise*~~

~~*The arts of satire; but my spirit loathes*~~

~~*hese mockers whose unbridled mockery*~~

~~*Invades grave themes.*~~

~~*The infidelity of two wives in succession is alleged to explain the poet's tone in reference to the majority of their sex, and to complete the picture of an uneasy private life. HIe appears to have been repelled by the Athenian demo- cracy, as it tended to become less the rule of the people than of the mob. Thoroughly the son of his day in intellectual matters, he shrank from the coarser aspects of its political and social life. HIis best word is for the small farmer (autourgos), who does not: often come to town, or soil his rustic honesty by contact with the crowd of the market-*~~

~~*lace.*~~

~~*About 409 3.c. Euripides left Athens, and after a residence in the Thessalian Magnesia repaired, on the in- vitation of King Archelaus, to the Macedonian court, where Greeks of distinction were always welcome. In his Archelaus Euripides celebrated that legendary son of Témenus, and head of the Témenid dynasty, who had founded Aigs; and in one of the meagre fragments he evidently alludes to the beneficent energy of his royal host in opening up the wild land of the North, It was at Pella, too, that Euripides composed or completed, and perhaps produced, the Bacche. Jealous courtiers, we are told, contrived to have him attacked*~~

~~*and killed by savage dogs. It is odd that the fate of Acteeon should be ascribed, by legend, to two distinguished Greek writers, Euripides and Lucian; though in the former case at least the fate has not such appropriateness as the Byzantine biographer discovers in the latter, on the ground that its victim*~~

~~*Athenian parents had taken refuge; and a whimsical fancy has even suggested that his name—son of Huripus—was*~~

~~*"had waxed rabid against the truth." The death of Death, Euripides, whatever its manner, occurred in 406 B.c., when #06 B.c. VIIL — 85*~~

~~*EURDPIDES*~~

~~*mined. Secondly, scepticism had begun to be busy with New con. the legends which that religion consecrated. Neither gods ditions nor heroes commanded all the old unquestioning faith. With*~~

~~*é : : : hich Lastly, an increasing number of the audience in the theatre Euripidal*~~

~~*674*~~

~~*'he was seventy-four. Sophocles followed him in a few months, but not before he had been able to honour the memory of his younger rival by causing his actors to appear with less than the full costume of the Dionysiac*~~

~~*festival. Soon afterwards, in the Frogs, Aristophanes pro- nounced the epitaph of Attic Comedy on Attic Tragedy.*~~

~~*The historical interest of such a life as that of Euripides consists in the very fact that its external record is so scanty—that, unlike Aischylus or Sophocles, he had no place in the public action of his time, but dwelt apart as a student and a thinker. He has made his Medea speak of those who, through following quiet paths, have: incurred the reproach of apathy (fa0upiav). Undoubtedly enough of the old feeling for civic life remained to create a prejudice against one who held aloof from the*~~

~~affairs of the city. Quietness (drpaypocvvy), in this sense, was still regarded as akin to indolence (dpyia). Yet just here we see how truly Euripides was the precursor of that near future which, at Athens, saw the more complete divergence of society from the state. His work is his biography. The first requisite for a just appreciation, both cf the artist and of the man, is rightly to apprehend the conditions under which his work was done.~~

~~began to be destitute of the training, musical and poetical, had to which had prepaied an earlier generation to enjoy the deal.~~

~~chaste aud placid grandeur of ideal Tragedy.~~

~~Euripides made a splendid effort to maintain the place His effort of Tragedy in the spiritual life of Athens by modifying its t meet~~

~~interests in the sense which his own generation required. Could not the heroic persons still excite interest if they were made more real,—if, in them, the passions and sorrows of every-day life were portrayed with greater vividness and directness? And might not the less cultivated part of the audience at least enjoy a thrilling plot, especially if taken from the home-legends of Attica? Euripides became the virtual founder of the Roraantic Drama.~~

~~In so far as his Obstacles~~

~~work fails, the failure is one which probably no artistic t° his~~

~~tact could then have wholly avoided. The frame within which he had to work was one which could not be stretched to his plan. The chorus, the masks, the narrow stage, the conventional costumes, the slender opportunities for change of scenery, were so mauy fixed obstacles to the free~~

~~Relation In an age which is not yet ripe for reflection or for the | development of Tragedy in the new direction. But no man~~

~~*ofhis subtle analysis of character, people are content to express | of his time could have broken free from these traditions ;*~~

~~*sia to in general types those primary facts of human nature | in attempting to do so he must have wrecked either his is age.*~~

~~*Artistic limit of: tragedy.*~~

~~*The chorus.*~~

~~*which strike every one. Achilles will stand well enough for the young chivalrous warrior, Odysseus for the mun of resource and endurance, even without such elaboration of detail as would enable us surely to recognize the very man—to say, if we met him, this is the Achilles, the Odysseus, whose exact portrait we know. The poetry of such an age presents types rather than individuals. In the case of the Greeks, these: fypes had not merely an artistic and a moral interest; they had, further, a religious interest, because the Greeks believed that the epic heroes, sprung from the gods, were their own ancestors. Direct lineage was the ground on which the Greeks trusted that the Greek gods would help them against other men, speak- ing barbarian tongues, and other gods, the progenitors of barbarians. Greek Tragedy arose when the choral worship of Dionysus, the god of physical rapture, had engrafted upon it a dialogue between actors who represented some persons of the legends consecrated by this faith. Now, in order that the representation should express these persons without transgressing the typical character of the legends themselves, and thereby straining or lowering this faith, it is necessary to observea limit. The dramatist was obliged to refrain from multiplying those minute touches which, by individualizing the characters too highly, would bring them closer, indeed, to daily experience, but would detract from their general value as types in which all Hellenic humanity? could recognize its.own image glorified and raised a step nearer to the immortal gods. This necessity was further*~~

~~*enforced by the existence of the Chorus, the original element |,*~~

~~*of the drama, and the very essence of its nature as an act of Dionysiac worship. Those utterances of the Chorus, which to the modern sense are*~~

~~*so often platitudes, were not so to the Greeks, just because the moral issues of Tragedy were felt to have the same typical generality as these comments themselves. #*~~

~~*_An unerring instinct keeps both Auschylus and Sophocles within the limits imposed by this law. Euripides was only fifteen years younger than Sophocles. But, when Euripides began to write it must have been clear to any man of his genius and culture that, though an established prestige might be maintained, a new poet who sought to construct Tragedy on the old basis would be building on sand. For, first, the popular religion itself —the very foundation of Tragedy—had been under-*~~

~~*fame or his art. It is not the fault of Euripides if inso much of his work we feel the want of harmony between matter and form. Art abhors compromise; and it was the mis- fortune of Attic Tragedy in his generation that nothing but a compromise could save it. A word must be said on the two devices which have become common phrases of reproach against him—the prologue, and the deus ex machina. and sometimes ludicrous expedient. remembered that the audiences of his days were far from being so well versed as their fathers in the mythic lore, and that, on the other hand, a dramatist who wished to avoid trite themes had now to go into the by-ways of mythology. A prologue was often perhaps desirable or necessary for the instruction of the andience, As regards*~~

~~*Success,*~~

~~*Doubtless the prologue is a slipshod The pro- But it should be !°sue.*~~

~~*the deus ex machina, a distinction should be observed The deus*~~

~~*between those cases in which the solution is really @ mechanical, as in the Andromache and perhaps the °*~~

~~*Orestes, and those in which it is warranted or required by the plot, as in the Hippolytus and the Bacche. The choral songs in Euripides, it may be granted at once, have often nothing to do with the action.*~~

~~*ma*~~

~~*hind.*~~

~~*But the chorus was The*~~

~~*the greatest of difficulties for a poet who was seeking to chorus.*~~

~~*present drama of romantic tendency in the plastic form consecrated by tradition. So far from censuring Euripides on this score, we should be disposed to regard his manage- ment of the chorus as a signal proof of his genius, originality, aud skill*~~

~~*tom*~~

~~*In a poetical career of about fifty years Euripides is said Works.*~~

~~*to have written 92 dramas, including 8 satyr-plays. The best critics of antiquity allowed 75 as genuine. Nauck has collected 1117 Euripidean fragments. Among these, numbers 1092-1117 are doubtful or spurious; numbers 842-1091 are from plays of uncertain title; numbers 1-841 represent fifty-five lost pieces, among which some of the best known are the: Andromeda, Antiope, Bellerophon, Cresphontes, Hrectheus, Edipus, Phaethon, and Telephus.*~~

~~*(1.) The Alcestis, as the didascaliz tell us, was brought Alcestis.*~~

~~*out in Ol. 85. 2, z¢., at the Dionysia in the spring of 438 B.C., as the fourth play of a tetralogy comprising the Cretan Women, the Alemcon at Psdphis, and the Telephus. The Alcestis is altogether removed from the character, essentially grotesque, of a mere satyric drama. On the other hand, it*~~

~~*Medea.*~~

~~*EUDiRLI PI DES*~~

~~*has features which distinctly separate it from a Greek tragedy of the normal type. First, the subject belongs to*~~

~~*none of the great cycles, but to a by-way of mythology, and.*~~

~~*involves such strange elements as the servitude of Apollo in a mortal household, the decree of the fates that Admetus must die on a fixed day, and the restoration of the dead Alcestis to life. Secondly, the treatment of the subject is romantic and even fantastic,—strikingly so in the passage where Apollo is directly confronted with the demonic figure of Thanatos. Lastly, the boisterous, remorseful, and generous Heracles makes—not, indeed, a satyric drama—bat a distinctly satyric scene—a scene which, in the frank original, hardly bears the subtle interpretation which in Balaustion is hinted by the genius of Mr Browning, that Heracles got drunk in order to keep up other people's spirits. When the happy ending is taken into account, it is not sur- prising that some should have called the Alcestis a tragi- comedy. But we cannot so regard it. The slight and purely incidental strain of comedy is but a moment of relief between the tragic sorrow and terror of the opening and the joy, no less solemn, of the conclusion. In this respect, the Alcestts might more truly be compared to such a drama as the Winter's Tale; the loss and recovery of Hermione by Leontes do not form a tragi-comedy because we are amused between-whiles by Autolycus and the clown. It does not seem improbable that the Adcestis—the earliest of the extant plays—may represent an attempt to substitute for the old satyric drama an after-piece of a kind which, while preserving a satyric element, should stand nearer to Tragedy. The taste aud manners of the day were perhaps tiring of the merely grotesque entertainment that old usage appended to the tragedies; just as, in the sphere of comedy, we know from Aristophanes that they were tiring of broad buffoonery. An original dramatist may have seen an op- portunity here. However that may be, the Alcestis has a peculiar interest for the history of the drama. It marks in the most signal manner, and perhaps at the earliest moment, that greaf&movement which began with Euripides,—the movement of transition from the purely Hellenic drama to the rdmantic.*~~

~~*(2.) The Medea was brought out in 431 B.c. with the Philoctetes, the Dictys, and a lost satyr-play called the Reapers (Theristw). Euripides gained the third prize, the first falling to Euphorion, the son of Auschylus, and the second to Sophocles. If it is true that Euripides modelled his Medea on the work of an obscure predecessor, Neophron, at least he made the subject thoroughly his own. Hardly any play was more popular in antiquity with readers and spectators, with actors, or with sculptors. Ennius is said to have translated and adopted it. We do not know how far it may have been used by Ovid in his lost tragedy of the same name; but it certainly inspired the rhetorical performance of Seneca, whjch may be regarded as bridging the interval between Euripides and modern adaptations. We may grant at once that*the Medea of Euripides is not a faultless play ; that the dialogue between the heroine and Aigeus is not happily conceived ; that the murder of the children lacks an adequate dramatic motive; that there is something of a moral anti-climax in the arrangements of Medea, before the deed, for her personal safety. But the Medea remains a tragedy of first-rate power. It is admir- able for the splendid force with which the character of the strange and strong-hearted woman, a barbarian friendless among Hellenes, is thrown out against the background of Hellenic life in Corinth. Those modern versions of the drama which have recently been illustrated by actresses of genius develop the romantic element beyond the limit of Euripides ; he has nothing like the wavering and the final obedience to a Greek instinct of the children who have to make their choice—who slowly and silently turn away from*~~

~~*their barbarian mother, and move towards the outstretched arms of Jason. Yet the essential motive of the pathos there is true to the Greek poet's conception. It is the pro- found contrast between the Greek and the non-Greek nature—the hopeless isolation in Greece of the alien who has left everything to follow Jason—that Euripides has drawn with such mastery. It may be asked, could either Aischylus or Sophocles, in their different manifestations of the genuinely Hellenic spirit, have shown this more cosmopolitan sympathy, this insight into the strength and the*~~

~~*anguish of a nature not Hellenic? Here, too, Euripides belongs to the coming time.*~~

~~*(3.) The extant Hippolytus—sometimes called Stephane- Hippo- phoros, the " wreath-bearer," from the garland of flowers /ytus.*~~

~~*which, in the opening scene, the hero offers to Artemis— was not the first drama of Euripides on this theme. In an earlier play of the same name, we are told, he had shocked both the moral and the esthetic sense of Athens. In this earlier Hippolytus, Pheedra herself had confessed her love to her step-son, and, when repulsed, had falsely accused him to Theseus, who doomed him to death; at the sight of the corpse, she had been moved to confess her crime, and had atoned for it by a voluntary death. 'his first Hippolytus is cited as Wippolytus the Veiled (kadvmropevos), either, as Toup and Welcker thought, from Hippolytus covering his face in horror, or, as Bentley with more likelihood suggested, because the youth's shrouded corpse was brought upon the scene. It can scarcely be doubted that the chief dramatic defect of our Hippolytus is connected with the unfavourable reception of its predecessor. Euripides had been warned that limits must be observed in the dramatic portrayal of a morally repulsive theme. In the later play, accordingly, the whole action is made to turn on the jealous feud between Aphrodite, the goddess of love, and Artemis, the goddess of chastity. Phzedra not only shrinks from breath- ing her secret to Hippolytus, but destroys, herself when she learns that she is rejected. But the natural agency of human passion is now replaced by a supernatural machinery; the slain son and the bereaved father are no longer the martyrs ofvsin, the tragic witnesses of an inexor- able law ; rather they and Pheedra are alike the puppets of a divine caprice, the scapegoats of an Olympian quarrel in which they have no concern. But if the dramatic effect of the whole is thus weakened, the character of Pheedra is a fine psychological study; and, as regards form, the play is one of the most brilliant. Boeckh (De Tragediae Gree. Principiis, p. 180 f.) is perhaps too ingenious in finding an allusion to the plague at Athens (430 B.c.) in the & xaxa Ovyrav orvyepai re vooot of v. 177, and in v. 209 f, ; but it can scarcely be doubted that he is right in suggesting that the closing words of Theseus (v. 1460)*~~

~~& xrelv' "AOnvav Tlaaradsos O'dpiouara, olov orephoeod' avipés,~~

~~and the reply of the chorus, xowvov 76d' axos, &c., contain a reference to the recent death of Pericles (429 B.c.).~~

~~(4.) The Hecuba may be placed about 425 B.c, Thucy- Hecuba,~~

~~dides (iii. 104) notices the purification of Delos by the Athenians, and the restoration of the Panionic festival there, in 426 B.c.—an event to which the choral passage, v. 462 f., probably refers. It appears more hazardous to take v. 650 f. as an allusion to the Spartan mishap at Pylos. The subject of the play is the revenge of Hecuba, the widowed queen of Priam, on Polymestor, king of Thrace, who had murdered her youngest son Polydorus, after her daughter Polyxena had already been sacrificed by the Greeks to the shade of Achilles. The two calamities which befall Hecuba have no direct connexion with each other. In this sense it is an unanswerable objection that the play lacks unity of design. On the other hand, both events serve the same end,—viz., to heighten the tragic pathos~~

~~with which the poet seeks to surround the central figure of Hecuba. 'The chief interest of the drama consists in its illustration of the skill with which Euripides, while failing to satisfy the requirements of artistic drama, could sustain interest by an ingeniously woven plot. It is a representa- tive Intriguenstiick, and well exemplifies the peculiar power which recommended Euripides to the poets of the New Comedy.~~

~~(5.) The Andromache, according toa notice in the Scholia Veneta (446) was not acted at Athens, at least in the author's life-time ; though some take the words in the Greek argument (7d Spaya trav Sevrépwv) to mean that it was among those which gained a second prize. The invective on the Spartan character which is put into the mouth of Andromache contains the words, ddikws ebrvyetr' dv "EAAdSa, and this, with other indications, points to the Peloponnesian successes of the years 424-422 B.c. Andromache, the widow of Hector, has become the captive and concubine of Neoptolemus, son of Achilles. During his absence, her son Molossus is taken from her, with the aid of Menelaus, by her jealous rival Hermione.~~

~~*Mother and son are rescued from death by Peleus; but meanwhile Neoptolemus is slain at Delphi through the intrigues of Orestes. The goddess Thetis now appears, ordains that Andromache shall marry Helenus, and declares that Molossus shall found a line of Epirote kings, while Peleus shall become immortal among the gods of the sea. The Andromache isa poor play. The contrasts, though striking, are harsh and coarse, and the compensations dealt out by the deus-ex-machina leave the moral sense wholly unsatisfied. Technically the piece is noteworthy as bringing on the scene four characters at once—Andromache, Molossus, Peleus, and Menelaus (v. 545 f.)*~~

~~*(6.) The Zon is an admirable drama, the finest of those plays which deal with legends specially illustrating the tra- ditional glories of Attica. It is also the most perfect ex- ample of the poet's skill in the structure of dramatic intrigue. For its place in the chronological order there are no data except those of style and metre. Judging by these, Hermann would place it " neither after Ol. 89, nor much before "—.e., somewhere between 424 and 421 B.c.; and this may be taken as approximately correct. The scene is laid throughout at the temple of Delphi. The young Ion is a priest in the temple of Delphi when Xuthus and his wife Creusa, daughter of Erechtheus, come to inquire of the god concerning their childlessness ; and it is discovered that Ion is the son of Creusa by the god Apollo. Athena herself appears, and commands that Ion shall be placed on the throne of Athens, foretelling that from him shall spring the four Attic tribes, the Teleontes (priests), Hopletes (fighting-men), Argadeis (husbandmen) and Aigikoreis (herdsmen). The play must have been peculiarly effective on the Athenian stage, not only by its situations, but through its appeal to Attic sympathies.*~~

~~*(7.) The Suppliants who give their name to the play are Argive women, the widows of Argive warriors slain before the walls of Thebes, who, led by Adrastus king of Argos, come as suppliants to the altar of Demeter at Eleusis. Creon, king of Thebes, has refused burial to their dead lords. The Athenian king Theseus demands of Creon that he shall grant the funeral rites ; the refusal is followed by a battle in which the Thebans are vanquished, and 'the bodies of the Argive dead are then brought to Eleusis. At the close the goddess Athena appears, and ordains that a close*~~

~~*alliance shall be formed between Athens and Argos. Some refer the play to 417 3.c., when the democratic party at Athens rose against the oligarchs. But a more probable date is 420 B.c., when, through the agency of Alcibiades, Athens and Argos concluded a defensive alliance. The play has a strongly marked rhetorical*~~

~~*character, and is, in fact, a panegyric, with an immediate political aim, on Athens as the champion of humanity*~~

~~*against Thebes.*~~

~~*(8.) The Heracleide,—a companion piece to the Suppli- Hera-*~~

~~*ants, and of the same period,—is decidedly inferior in merit. cleide. Here, too, there are direct references to contemporary history. The defeat of Argos by the Spartans in 418 B.c. strengthened the Argive party who were in favour of discarding the Athenian for the Spartan alliance (Thue. v. 76). In the Heraclede, the sons of the dead Heracles, persecuted by the Argive Eurystheus, are received and sheltered at Athens. Thus, while Athens is glorified, Sparta, whose kings are descendants of the Heracleida, is reminded how unnatural would be an alliance between herself and Argos.*~~

~~*(9.) The ZHeracles Mainomenos, which, on grounds of Heracles style, can scarcely be put later than 420-417 B.c., shares Maimo- with the two last plays the purpose of exalting Athens in the person of Theseus. Heracles returns from Hades,—whither, at the command of Eurystheus, he went to bring back Cerberus,—just in time to save his wife Megara and his children from being put to death by Lycus of Thebes, whom he slays. Ashe is offering lustral sacrifice after the deed, he is suddenly stricken with madness by Lyssa (Fury), the demonic agent of his enemy the goddess Hera, and in his frenzy he slays his wife and children. Theseus finds him, in his agony of despair, about to kill himself, and persuades him to come to Athens, there to seek grace and pardon from the gods. The unity of the plot may be partly vindicated by observing that the slaughter of Lycus entitled Heracles to the gratitude of Thebes, whereas the slaughter of his own kinsfolk made it unlawful that he should remain there ; thus, having found a refuge only to lose it, Heracles*~~

~~*has no hope left but in Athens, whose praise is the trve theme of the entire drama.*~~

~~*(10.) Iphigenia among the Tauri, which metre and diction Iphigenia*~~

~~*mark as one of the later plays, is also one of the best,—#ong excellent both in the management of a romantic plot and in the delineation of character. The scene is laid at the temple of Artemis in the Tauric Cheronese (the Crimea)—ou the site of the modern Balaclava. Iphigenia, who had been doomed to die at Aulis for the Greeks, had been snatched from that death by Artemis, and had become priestess of the goddess at the Tauric shrine, where human victims were immolated. Two strangers, who had landed among the Tauri, have been sentenced to die at the altar. She discovers in them her brother Orestes and his friend Pylades. They plan an escape,—are recaptured,—and are finally delivered by the goddess Athene, who commands Thoas, king of the land, to permit their departure. Iphigenia, Orestes, and Pylades return to Greece, and establish the worship of the Tauric Artemis at Brauron and Hale in Attica. The drama of Kuripides necessarily sug- gests a comparison with that of Goethe; and many readers will probably also feel that, while Goethe is certainly not inferior in fineness of ethical portraiture, he has the advantage in his management of the catastrophe. But it is only just to Euripides to remember that, while his competitor had free scope of treatment, he, a Greek dramatist, was bound to the motive of the Greek legend, and was obliged to conclude with the foundation of the Attic worship.*~~

~~*(11.) The Zvroades appeared in 415 B.c. along with the Troades,*~~

~~*Alexander, the Palamedes, and a satyr-play, the Sisyphus. It is a picture of the miseries endured by noble Trojan dames,—Hecuba, Andromache, Cassandra,—immediately after the capture of Troy. There is hardly a plot in the proper sense,—only an accumulation of sorrows on the heads of the passive sufferers. The piece is less a drama than a pathetic spectacle, closing with the crash of the Trojan towers in flame and ruin. The Z'roades is indeed*~~

~~*the Tauri.*~~

~~*Helena.*~~

~~*Phenis- see.*~~

~~*Electra.*~~

~~*EURIPIDES*~~

~~*remarkable among Creek tragedies for its near approach to tlle character of melodrama. It must be observed that there is no ground for the inference—sometimes made an accusation against the poet—that the choral passage, v. 794 f., was intended to encourage the Sicilian expedition, sent forth in the same year (415 3.c.). The mention of the "land of Aitna over against Carthage" (v. 220) speaks of it as "'renowned for the trophies of prowess,"—a topic, surely, not of encouragement but of warning.*~~

~~*(12.) The HIelena—produced, as we learn from the Aristophanic scholia, in 412 B.c., the year of the lost Andromeda,—is not one of its author's happier efforts. It is founded on a strange variation of the Trojan myth, first adopted by Stesichorus in his Palinode—that only a wraith of HIelen passed to Troy, while the real HIelen was detained in Egypt. In this play, she is rescued from the Egyptian king, Theoclymenus, by a ruse of her husband Menelaus, who brings her safely back to Greece. The romantic element thus engrafted on the Greek myth is more than fantastic: it is.well-nigh grotesque. We are, in fact, daugerdusly close to the vergeof parody. The comic poets—notably Aristophanes in the Thesmophoriazusee—felt this ; uor can we blame them if they ridiculed a piece in which the mode of treatment was so discordant with the spirit of Greek tradition, and so irreconcilable with all that con- stituted the higher meaning of Greek Tragedy.*~~

~~*(13.) Pheenissce was brought out, with the @nomaus and the Chrysippus, in 411 B.c., the year in which the recall of Alcibiades was decreed by the army at Samos, and, after the fall of the Four HIundred, ratified by the Assembly at Athens (Thue, viii. 81,97). The dialogue between Iocaste aud Polyneices on the griefs of banishment (ré 76 orépeo Oar martpioos, V. 388 f.) has a certain emphasis which certainly looks like an allusion to*~~

~~*the pardon of the famous exile. The subject of the play is the same as that of the Auschylean Seven against Thebes—the war of succession in which Argos supported Polyneices against his brother Eteocles. The Pheenician maidens who form the chorus are imagined to have been on their way from Tyre to Delphi, where they were destined for service in the temple, when they were detained at Thebes by the outbreak of the war—a device which affords a contrast to the Auschylean chorus of Theban elders, and which has also a certain fitness in view of the legends connecting Thebes with Phoenicia. But Euripides has hardly been successful in the rivalry—which he has even pointed by direct allusions—with schylus. The Phenisse is full of brilliant passages, but it is rather a series of effective scenes than an impressive drama.*~~

~~*(14.) Plutarch (Zys. 15) says that, when Athens had surrendered to Lysander (404 B.c.) and when the fate of the city was doubtful, a Phocian officer happened to sing at a banquet of the leaders the first song of the chorus in the HIlectra of Euripides—*~~

~~*"Ayaucuvovos ® Kdpa, HAvoov, "HrAЄKTpa, woTt cay wypoTepay avdrdy, and that " when they heard it, all were touched, so that it seemed a cruel deed to destroy for ever the city so famous once, the mother of such men." The character of the Electra, in metre and in diction, seems to show that it be- longs to the poet's latest years. If Miiller were right in referring to the Sicilian expedition the closing passage in which the Dioscuri declare that;they haste "to the Sicilian sea, to save ships upon the deep" (v. 1347), then the play could not be later than 413 B.c. But it may with more probability be placed shortly before the Orestes, which in some respects it much resembles: perhaps in or about the year 410 B.c. No play of Euripides has been more severely criticised. The reason is evident. The Choephori of Mschylus and the HIlectra of Sophocles appear to invite a direct comparison with this drama. But, as the present*~~

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~~*writer has ventured to suggest elsewhere,! such criticism as that of Schlegel should remember that works of art are proper subjects of direct comparison only when the theories of art which they represent have a common basis. It is surely unmeaning to contrast the elaborate*~~

~~*homeliness of the Euripidean Zlectra with the severe grandeur of its rivals. fEschylus and Sophocles, as different exponents of an artistic conception which is fundamentally the same, may be profitably compared; Euripides interprets another con- ception, and must be tried by other principles. HIs Electra is, in trath, a daring experiment—daring, because the theme is one which the elder school had made peculiarly its own. We are unable to share Hartung's entliusiasm for the success of the experiment. But we protest against the injustice of trying it by a standard foreign to the poet's aim,*~~

~~*(15.) The Orestes, acted in 408, bears the mark of the Orestes.*~~

~~*age in the prominence which Euripides gives to the assembly of Argos,—which has to decide the fate of Orestes and Electra,—and to rhetorical pleading. The plot proceeds with sufficient clearness to the point at which Orestes and Electra have been condemned to death. But the later portion of the play, containing the intrigues for their rescue and the final achievement of their deliverance, is both too involved and too invonsequent for a really tragic effect. Just as in the HIlectra, the heroic persons of the drama are reduced to the level of commonplace. There is not a little which borders on the ludicrous, and it can be seen how easy would have been the passage from such tragedy as this to the restrained parody in which the Middle Comedy delighted. It is, however, inconceivable that, as some have supposed, the Orestes can have been a deliberate compromise between tragedy and farce. It cannot have been meant to be played, as a fourth piece, instead of aregular satyricdrama. Rather it indicates the level to which the heroic tragedy itself had descended under the treatment of a school which was at least logical. The celebrity of the play in the ancient world,—and, as Mr Paley observes, there are more ancient quotations from the Orestes than from all the extant plays of AXschylus and Sophocles together—is perhaps partly explained by the unusually frequent combination in this piece of striking sentiment with effective situatiou.'*~~

~~*(16.) The Iphigenia at Aulis, like the Bacche, was Iphigenia It is a % Aulis.*~~

~~*brought out only after the death of Euripides. very brilliant and beautiful play,—probably left by the author in an unfinished state,—and has suffered from interpolation more largely, perliaps, than any other of his works. As regard its subject, it forms a prelude to the Iphigenia in Tauris. Iphigenia has been doomed by her father Agamemnon to die at Aulis, as Calchas declares that Artemis claims such a sacrifice before the adverse winds can fall.*~~

~~*The genuine play, as we have it, breaks off at v. 1508, when Iphigenia has been led to the sacrificial altar. A spurious epilogue, of wretched workmanship (v. 1509- 1628), relates, in the speech of a messenger, how Artemis saved the maiden. We may, however, congratulate our- selves on possessing, even in its present form, so large a part of this fine work,—probably the latest upon which Euripides was engaged.*~~

~~*(17.) The Bacche, unlike the preceding play, appears Zacche.*~~

~~*to have been finished by its author, although it is said not to have been acted, on the Athenian stage at least, till after his death. It was composed, or completed, during the residence of Euripides with Archelaus, and in all pro- bability was originally designed for representation in Macedonia,—a region. with whose traditions of orgiastic*~~

~~*1 Introduction to the Hlectra of Sophocles, p. xiii., in Catena Classicorum, 2nd edit.*~~

~~*Cyclops.*~~

~~*Rhesus.*~~

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~~*worship the Dionysus myth was so congenial. The play is sometimes quoted as the Pentheus. It has been justly observed that Euripides seldom named a piece from the chorus, unless the chorus bore an important part in the action or the leading action was divided between several persons. Possibly, however, in this instance he may designedly have chosen a_ title which would at once interest the Macedonian public. Pentheus would*~~

~~*suggest a Greek legend about which they might know or care little. The Bacche would at once announce a theme con- nected with rites familiar to the northern land.*~~

~~*It is a magnificent play, alone among extant Greek tragedies in picturesque splendour, and in that sustained glow of Dionysiac enthusiasm to which the keen irony lends the strength of contrast. If Euripides had left nothing else, the Bacche would place him in the first rank of poets, and would prove his possession of a sense rarely manifested by Greek poets,—perhaps by no one of his own contemporaries in equal measure except Aristophanes,—a feeling for natural beauty lit up by the play of fancy. Mr R. V. Tyrrell, in his edition of the Bacche, has given the true answer to the theory that the Bacche is a recantation. Euri- pides had never rejected the facts which formed the basis of the popular religion. He had rather sought to interpret them in a manner consistent with belief in a benevolent Providence. 'The really striking thing in the Bacchee is the spirit of contentment and of composure which it breathes,—as if the poet had ceased to be vexed by the seeming contradictions which had troubled him before. Nor should it be forgotten that, for the Greek mind of his age, the victory of Dionysus in the Bacche carried a moral even more direct than the victory of Aphrodite in the Hippolytus. The great nature-powers who give refreshment to mortals cannot be robbed of their due tribute without provoking a nemesis. The refusal of such a homage is not, so the Greeks deemed, a virtue in itself: in the sight of the gods it may be only a cold form of %Bpus, overweening self-reliance—the quality personified in Pentheus.*~~

~~*The Bacche was always an exceptionally popular play,—partly because its opportunities as a spectacle fitted it for gorgeous representation, and so recommended it for per- formance at courts and on great public occasions. " Deme- trius the Cynic " (says Lucian) "saw an illiterate person at Corinth reading a very beautiful poem,—the Bacche of Euripides, I think it was; he was at the place where the messenger narrates the doom of Pentheus and the deed of Agave. Demetrius snatched the book from him and tore it up, saying, 'it is better for Pentheus to be torn up at once by me than to be mangled over and over again by you.'"*~~

~~*(18.) The Cyclops, of uncertain date, is the only extant example of a satyric drama. The plot is taken mainly from the story of Odysseus and Polyphemus in the 9th book of the Odyssey. In order to be really successful in farce of this kind, a poet should have a fresh feeling for the nature of the art parodied. It is because Euripides was not in accord with the spirit of the heroic myths that he is not strong in mythic travesty. HIs own tragedies,—such as the JZelen, the Electra, and the Orestes,—had, in their several ways, contributed to destroy the meaning of satyric drama. 'They had done gravely very much what satyric drama aimed at doing grotesquely. They had made the heroic persons act and talk like ordinary men and women. The finer side of such parody had lost its edge; only broad comedy remained.*~~

~~*_(19.) The Rhesus is still held by some to be what the didascalize and the grammarians call it,—a work of Euri- pides; and Mr Paley has ably supported this view. But the Scepticism first declared by Valcknir has steadily gained ground, and the ?hesus is now almost universally recognized*~~

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~~*as spurious. The art and the style, still more evidently the feeling and the mind, of Euripides are absent. If it cannot be ascribed to a disciple of his matured school, it is still less like the work of an Alexandrian. The most probable view seems to be that which assigns it to a versifier of small dramatic power in the latest days of Attic Tragedy. It has this literary interest, that it is the only extant play of which the subject is directly taken from our Jliad, of which the tenth book,—the AodAdvera,—has been followed by the playwright with a closeness which is sometimes mechanical.*~~

~~*When the first protests of the comic poets were over, Euripides was secure of a wide and lasting renown. As the old life of Athens passed away, as the old faiths lost their meaning and the peculiarly Greek instincts in art lost their truth and freshness, A'schylus and Sophocles might cease to be fully enjoyed save by a few; but Iuripides could still charm by qualities more readily and more universally recognized. The comparative nearness of his diction to the idiom of ordinary life rendered him less attractive to*~~

~~*the grammarians of Alexandria than authors whose erudite form afforded a better scope for the display of learning or the exercise of ingenuity. But there were two aspects in which he engaged their attention. They loved to trace the variations which he had introduced into the standard legends). And they sought to free his text from the numerous interpolations which even then had resulted from his popularity on the stage. Philochorus (about 306-260 B.c.), best known for his Aéthis, dealt, in his treatise on Euripides, especially with the, mythology of the plays. From 300 Bo. to the age of Augustus, a long series of critics busied themselves with this poet. The first systematic arrangement of his reputed works is ascribed to Diczearchus and Callimachus in the early part of the 3d century B.c, Among those who furthered the exact study of his text, and of whose work some traces remain in the extant scholia, were Aristophanes of Byzantium, Callistratus, Apollodorus of Tarsus, Timachidas, and pre-eminently Didymus; probably also Crates of Pergamus and Aristar- chus. At Rome Euripides was early made known through the translations of Ennius and the freer adaptations of Pacuvius. When Hellenic civilization was spread through the East, the mixed populations of the new settlements welcomed a dramatic poet whose taste and whose senti- ment were not too severely or exclusively Attic. The Parthian Orodes and his court were witnessing the Bacche of Euripides when the Agave of the hour was suddenly enabled to lend a ghastly reality to the terrible scene of frenzied triumph by displaying the gory head of the Roman Crassus. Mommsen has noted the moment as one in which the power of Rome and the genius of Greece were simul- taneously abased in the presence of sultanism. So far as Euripides is concerned, the incident may suggest another and a more pleasing reflection; it may remind us how the charm of his humaue genius had penetrated the recesses of the barbarian East, and had brought to rude and fierce peoples at least some dim and distant apprehension of that gracious world in which the great spirits of ancient Hellas had moved. A quaintly significant testimony to the popularity of Euripides is afforded by a strange composition, probably of the 4th century a.pD., the Xpuords wacyxwr. This drama, narrating the events which preceded and attended the Passion, is a cento of no less than 2610 verses, taken from the plays of Euripides, principally from the Bacche, the Troades, and the Rhesus. The traditional ascription of the authorship to Gregory of Nazianzus is now generally rejected ; a more probable*~~

~~conjecture assigns it to Apollinaris of Laodicea, and places the date of composi- tion ab about 330 a.p. Although the text used by the~~

~~Literary history of Euripides.~~

~~Alexan- dria.~~

~~Influence of Euri- pides on Hellen- ism.~~

~~The Xpta- Tos Tac xXwv.~~

~~BU RIlPIdDE s~~

~~author of the ceuto may not have been a good one, the value of the pizce for the diplomatic criticism of Euripides is necessarily very considerable ; and it was diligently used both by Valcknar and by Porson. Dinte's* Dante, who does not mention Aischylus or Sophocles, mention places Euripides, with the tragic poets Antiphon and of Euri- Agathon, and the lyrist Simonides, in the first circle of pides. Purgatory (xxii. 106), among those 1u1€ Greci, che gia di lauro ornar " fronte. Casaubon, in a letter to Scaliger, salutes that scholar as worthy to have lived at Athens with Aristuphanes and Euripides—a compliment which certainly implies respect Popula- for his correspondeut's powers as a peace-maker. In popular rity of —_ literature, too, where ASschylus and Sophocles were as yet Euripes little known, the 16th and 17th centuries testify to the a 17th favour bestowed upon Euripides, Gascoyne's Jocasta, centuries. played at Gray's Inn in 1566, was a free transcript from the Phenisse. Among early French translations from Euripides, may be mentioned the version of the Iphigenia in Tauris by Sibilet in 1549, and that of the /Fecuba by Racine. Bouchetel in 1550. About a century later Racine gave the world his Andromaque, his Iphigénie, and his Phedre, and many have held that, at least in the last named of these, "the disciple of Euripides" has excelled his master. Bernhardy notices that the performance of the Mippolytus at Berlin in 1851 seemed to show that, for the modern stage, the Phedre has the advantage 'of its Greek original. Racine's great English contemporary seems to have known and to have liked Euripides better than the other Greek Milton, tragedians. In the Reason of Church Government Milton certainly speaks of "those dramatic constitutions in~~

~~*which Sophocles and Euripides reign ;" in the preface to his own drama, again, he joins the names of Aischylus, Sophocles, and Euripides,—" the three tragic poets unequalled yet by any." But the Samson Agonistes itself clearly shows that Milton's chief model in this kind was the dramatist whom he himself has called—as if to suggest the skill of Euripides in the delineation of pathetic women—"sad Electra's poet;" and the work bears a special mark of this preference in the use of Euripidean monodies. In the second half of the 18th cen- 18th century such men as Winckelmann (1717-1768) and*~~

~~*ie Lessing (1729-1781) gave a new life to the study of the feeling antique. Hitherto the art of the old world had been better*~~

~~*for Greek known through Roman than through Greek interpreters, art. The basis of the revived classical taste had been Latin. But now men gained a finer perception of those characteris- tics which belong to the Greek work of the great time, a fuller sense of the: difference between the Greek and the Roman genius where each is at its best, and generally a clearer recognition of the qualities which distinguish ancient art in its highest purity from modern romantic types. Euripides now became the object of criticism from a new*~~

~~*Reaction against*~~

~~*nst_ Sophocles as representatives of that ideal Greek tragedy Euripides.*~~

~~*which ranges with the purest type of sculpture. Thus tried, he was found wanting; and he was condemned with all the rigour of a newly illuminated zeal. Niebuhr (1776-1831) judged him harshly ; but no critic approached Schlegel. Schlegel (1767-1845) in severity of one-sided censure. Schlegel, in fact, will scarcely allow that Euripides is toler-*~~

~~*Tieck, able except bycomparison with Racine. Tieck (1773-1853) showed truer appreciation for a brother artist, when he described the work of Euripides as the dawn of a romantic*~~

~~*Goethe. poetry haunted by dimyearnings and forebodings. Goethe—*~~

~~who, according to Bernhardy, knows Euripides only "at a great distance" (derihn aus weiter Ferne kenut)—certainly admired him highly, and has left an interesting memorial of Euripidean study in his attempted reconstruction of the lost Phaethon. There are some passages in Goethe's conver-~~

~~point of view. He was compared with Aischylus and~~

~~sations with Eckermann which form effective quotations against the Greek poet's real or supposed detractors. 'To feel and respect a great personality, one must be something oneself. All those who denied the sublime to Euripides, were either poor wretches incapable of comprehending such sublimity, or shameless charlatans, who, in their presump- tion, wished to make more of themselves than they were." "A poet whom Socrates called his friend, whom Aristotle lauded, whom Alexander admired, and for whom Sophocles and the city of Athens put on mourning on hearing of his death, must certainly have been some one. Ifa modern man like Schlegel must pick out faults in so great an ancient, he ought only to do it upon his knees." (Symonds, Greek Poets, i. 230.) We yield to no one in admiration of Goethe ; but we cannot think that these rather bullying utterances are favourable examples of his method in esthetic discussion ; nor have they any logical force except as against those—if there be any such—who deny that Euripides isa great poet. One of the most striking of recent criti- cisms on Euripides is the sketch by Mommsen in his Momm- history of Rome. It is, in our opinion, less than just to s°- Euripides as an artist. But it indicates, with true histori- cal insight, his place in the development of his art, the operation of those external conditions which made hini what he was, and the nature of his influence on succeeding ages.~~

~~The manuscript tradition of Euripides has a very curious Manu- aud instructive history. It throws a suggestive light on script, the capricious nature of the process by which some of the i ae greatest literary treasures have been saved or lost. Nine pides. plays of Euripides were—selected, probably in early Byzan- tine times, for popular and educational use. These were,—Alcestis, Andromache, Hecuba, Hippolytus, Medea,~~

~~*Orestes, The nine Pheenissee, Rhesus, Troades. This list includes at least two plays. plays, the Andromache and the T'roades, which, even in the small number of the extant dramas, are universally allowed to be of very inferior merit—to say nothing of the Rhesus, which is generally allowed to be spurious. On the other hand, the list omits at least three plays of first-rate beauty and excellence, the very flower, indeed, of the extant collec- tion—the Jon, the Iphigenia in T'auris, and the Bacche—the last certainly, in its own kind, by far the most splendid work of Euripides that we possess, Had these three plays been lost, it is not too much to say that the modern esti- mate of Euripides must have been decidedly lower. But all the ten plays not included in the select list had a narrow escape of being lost, and, as it is, have come tv us in a much less satisfactory condition.*~~

~~*Kirchhoff has been the first, in his editions, thoroughly Kirch- to investigate the history and the affinities of the Euripidean hof's ac: manuscripts, All our MSS. arc, he thinks, derived from a count of lost archetype of the 9th or 10th century, which contained '¢ ™S°- the nineteen plays (counting the Rhesus) now extant.*~~

~~*From this archetype a copy, also lost, was made about 1100*~~

~~*A.D., containing only the nine select plays. This copy be- MSS. of came the source of all our best MSS. for those' plays. They the nine are,—(1) Marcianus 471, in the library of St Mark at P!@ys- Venice (12th century) : Andromache, Hecuba, Hippolytus*~~

~~*(to v. 1234), Orestes, Pheenisse ; (2) Vaticanus 909, 12th century, nine plays; (3) Parisinus 2712, 13th century, 7*~~

~~*plays (all but 7voades and Rhesus). Of the same stock, but inferior, are (4) Marcianus 468, 13th century: Hecuba, Orestes, Medea (v. 1-42), Orestes, Phanisse ; (5) Havniensis*~~

~~*(from //afnic, Copenhagen, according to Mr Paley), a late transcript from a MS. resembling Vat. 909, nine plays. A second family of MSS. for the nine plays, sprung from the*~~

~~*same copy, but modified by a Byzantine recension of the*~~

~~*13th century, is greatly inferior.*~~

~~*The other ten plays have come to us only through the MSS. of preservation of two MSS., both of the 14th century, and the other both ultimately derived, as Kirchhoff thinks, from the DTS:*~~

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~~*archetype of the 9th or 10th century. These are (1) Palatinus 287, Kirchoff's B, usually called Rom. C., tnirteen plays, viz., six of the select plays (Androm., Med., Rhes., Hipp., Ale., Troad.), and seven others—Bacchee, Cyclops, Heracleide, Supplices, Ion, Iphigenia in Aulide, Iphigenia in Tauris; and (2) Flor. 2, Elmsley's C., eighteen plays, viz., all but the Zroades. This MS. is thus the only one for the Helena, the Electra, and the /ercules Purens.*~~

~~*MSS. of By far the greatest number of Euripidean MSS. contain*~~

~~*three plays.*~~

~~*Scholia.*~~

~~*Editions.*~~

~~*4*~~

~~*Plate IX.*~~

~~*only three plays,—the Zecuba, Orestes, and Phoenissee—these having been chosen out of the select nine for school use—probably in the 14th century.*~~

~~*It is to be remembered that, as a selection, the nine chosen plays of Euripides correspond to those seven of ZEschylus and those seven of Sophocles which alone remain to us. If, then, these nine did not include the Iphigenia an Tauris, the Fon, or the Bacche, may we not fairly infer that the lost plays of the other two dramatists comprised works at least*~~

~~*equal to any that have been preserved? May we not even reasonably doubt whether we have received those masterpieces by which their highest excellence should have been judged 2*~~

~~*The extant scholia on Euripides are for the nine select plays only. The first edition of the scholia on seven of these plays (all but the Z'roades and Rhesus) was published by Arsenius—a Cretan whom the Venetians had named as bishop of Monemvasia, but whom the Greeks had refused to recognize—at Venice, in 1534. The scholia on the Troades and Rhesus were first published by L. Dindorf, from Vat. 909, in 1821. The best complete edition is that of W. Dindorf, in 4 vols., 1863. The collection, though loaded with rubbish—including worthless analyses of the lyric metres by Demetrius Triclinius—includes some invalu- able comments derived from the Alexandrian critics and their followers.*~~

~~*Editiones principes.—1496. J. Lascaris (Florence), Alcdca, Hip- polytus, Alcestis, Andromache. 1503. M. Musurus (Aldus, Venice) Eur. Tragg. XVI., to which in vol. ii, the Hereules Furens was added as an 18th; %.¢., this edition contained all the extant plays except the Electra, which was first given to the world by P. Vic- torius from Florentinus C. in 1545, The Aldine edition was re- printed at Basel in 1537.*~~

~~*The complete edition of Joshua Barnes (1694) is no longer of any critical value. The first thorough work done on Euripides was by L. C. Valcknir in his edition of the Phwnisse (1755), and his Dia- tribe in Eur. perditorum dramatum relliquias (1767), in which he argued against the authenticity of the Rhesus.*~~

~~*Principal cditions of selected plays.—J. Markland (1768-1771): Supplices, Iphigenia A., Iphigenia T.—Ph. Brunck (1779-1780): Andromache, Medea, Orestes, Hecuba.—l. Porson (1797-1801): Hecuba, Orestes, Phoenissee, Medea,—H. Monk (1811-1818): Hip- polytus, Alcestis, Iphigenia A., Iphigenia T.—P. Elmsley (1813- 1821): Medea, Bacche, Ucraclide,' Supplices,—G. Hermann*~~

~~*KUR*~~

~~*UROPE s the smallest of those divisions of the land- surface of the globe which are usually distinguished*~~

~~*by the conventional name of continents ; but favoured as it is at once by its position, its configuration, and its climate, it has played the most important part in the modern history of the world, more especially since the 16th century. The ultimate civilization of mankind must in great measure be what Europe makes it ; and though, as centuries roll on, the auxiliary energies of other regions and races, receiving new impulse and development, will undoubtedly lend potent contributions to the common historic movement, the period must still be distant when Europe shall have fallen from its position of controller and pioneer. It has justly become a commonplace of geography to describe it a8 a mere peninsula of Asia, but, except in a purely geographical aspect, it is a peninsula as the head is a peninsula of the*~~

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~~*(1831-1841) Hecuba (animadv. ad RB. Porsoni notas, first in 1800), Orestes, Alcestis, Iphigenia A., Iphigenia T., Helena, Ion, Hercules Furens.—C. Badham (1851-1853): Iphigenia T., Helena, Ion.—R. Y. Tyrrell (1871): Baechw.—For young students: A. Sidg- wick (1871-1873): Cyclops, Electra, Ion, Iphigenia T.*~~

~~*Reecnt Complete Editions.—W. Dindorf (1870, in Poet. Scenict, ed. 5).—A. Kirchhoff (1867).—F. A. Paley (1872, 2d. ed.) with commentary.*~~

~~*English Translations.—R. Potter.—Bacche : Milman, Thorold Rogers, E. 8. Shuckburgh.—Medca : Mrs Webster.—Alcestis (a Transcript," in Balaustion): R. Browning.—Hecuba ("A Trojan Queen's Revenge"): Beesley.*~~

~~*Goethe's reconstruction of Euripides's lost Phacthon, in the 1840 ecition of his works, vol. 33, pp. 22-48. (RACH)*~~

~~*EUROPA, in Greek mythology, a daughter of Agenor, or, as some said, of Phoenix. According to the story, she was born in Pheenicia, the purple land, a region belonging to the same aerial geography with Lycia, Delos, Ortygia, Lycosura, and many others. When Pheenicia became to the Greeks the name of an earthly country, versions of the myth were not long wanting which asserted that Agenor was born in Tyre or Sidon. Agenor, it is said, was the husband of Telephassa; but Telephassa is the feminine form of the name Telephus, a word conveying precisely the same meaning with Hecatus, Hecate, Hecatebolus, well known epithets of the sun and moon. The beauty of Europa attracted to her the love of Zeus, who approached her in the form of a white bull, and carried her away to Crete, where she became the mother of Minos, Rhadaman- thus, and Sarpedon. Meanwhile her brother Cadmus, under a strict charge never to return without her, set out on the weary search with his mother Telephassa, who died on the plains of Thessaly. At Delphi he learnt that he must follow a cow which would guide him to the place where he must build the city. The cow lay down on the site of Thebes; but before he could offer the animal as a sacrifice to Athene, he had to. fight with the dragon which haunted the well. Cadmus alone could conquer it ; and he did so, like Apollo, in single combat, while the dragon's teeth which he sowed produced a harvest of armed men who slew each other, leaving five only to become the ancestors of the Thebans. Athene now made him king of Thebes, while Zeus gave him Harmonia as his bride. According to one version of the tale, Cadmus and his wife, at the end of their career, were changed into dragons, and so taken up to Elysium. The names in this myth may seem to explain themselves completely by a comparison with those of other Greek legends. Among these are Agenor, Telephassa, Sarpedon. Others are not less clearly Semitic, Cadmus being the ground form of the Semitic Kedem, the East, just as Melicertes reproduces the Syrian Melcarth or Moloch*~~

~~*OPE*~~

~~*body, Its individuality and its solidarity with the neigh- bouring continents, its originality and its indebtedness, must be equally emphasized if a just conception is to be formed of its characteristics. All its dominant and, perhaps, nearly all its distinguishable peoples, its*~~

~~*languages, its religions, its philosophies, its social organizations, have — had their origin outside of its boundaries, and have been forced by modern science to recognize their kindred else- where. But under its modifying influences everything has been deeply and permanently differentiated : its people are more thoroughly conscious of their dissimilarities from, than of their consanguinity with, the peoples of the East and the South ; its dominant religion at least has in large measure forgotten or belied its original character and scope; its philosophies have taken colouring and shape from the practical and political life of the people ; and its*~~

~~*Bound- aries.*~~

~~*EUROPE*~~

~~*68]*~~

~~*social organizations have been disintegrated and re-formed | really form the prominences of a submerged plateau which*~~

~~*under the pressure of new necessities and desires. And in a way in which they have never been realized before, it has within the present century realized two master principles of progress—the regularity of nature and its amenability to multiplex investigation and control, and the necessity of impartial recognition at once of the moral individuality of the individual and the social and political solidarity of the several members of the community,*~~

~~*Though Europe is naturally the best known of all the regions of the globe, yet even of its physical features an absolutely correct registration has not been attained. Itis the only continent of which we possess an approximately complete cartography ; but in spite of the geodetic labours which have been carried on since about the middle of last century with ever growing activity, much has still to be laid down on very unsatisfactory data, While in some districts, for instance, of England or France, we can find on our maps the exact locality of every hamlet or homestead, every streamlet or clump of trees, there are portions of several other countries where the main physical features are but vaguely*~~

~~indicated. A considerable part of Finland is prac- tically unexplored; and it was not until 1875 that tlie labours of Kanitz furnished a fair representation of the Balkan range. Nor is it only about such outlying regions as Turkey and Finland that our information is either scanty or of the most recent acquisition ; the topographical survey of Switzerland, which first provided the Alpine traveller with an authentic guide, was completed by Dufour only in 1865, and the corresponding surveys of England, Italy, Spain, Russia, &c., are still in progress. 'Till the last country in Europe has been thus triangulated, we must be content with more or Jess approximate estimates of areas and distances ; in two recent statements of the area of Por- tugal there is a difference of no less than 104 English square miles (4°89 German geog. sq. m., or 269°05 sq. kil.), — so that the possible error for the whole of the continent must be something considerable. Even the astronomical distance between Paris and Berlin cannot be given with absolute accuracy.~~

~~Owing to its peninsular conformation the present boundaries of Europe are on three sides easily stated: its western shores form the irregular rim of the great basin of the North Atlantic, and bear witness in their dilapidated headlands and sandy dunes to the power and fury of its tides and storms; on the N. it lies along the Arctic Ocean ; and on the 8. it is separated from Africa and Asia by the Mediterranean, the Sea of Marmora, the Black Sea, and their connecting straits. Towards the east, on the other hand, the boundary is almost purely conventional: the Ural Mountains, indeed, may be regarded as furnishing a sort of natural barrier, but they leave a considerable gap both towards the N, and the 8.' In the 8, the river Ural is usually accepted as the line of demarcation, though the plain through which it flows is perfectly similar on both sides, and it forms neither a geological, faunal, botanical, political, nor historical limit. In the administrative divisions of the Russian empire, which has no desire to~~

~~make a severe distinction between its Asiatic and European.~~

~~territory, even the line of the Ural Mountains is disre- garded: 39,545 square miles (1860:02 German geog. sq. miles, 102,418'1 sq. kil.) of the government of Orenburg, 49,333 square miles (2320-425 German geog.~~

~~*sq. m., 127,769°3 sq. kil.) of the government of Perm, and 297°6 sq. miles (14 Germ. geog. sq. m., 812·9 sq. kil.) of the government of Ufa lie to the E. of the range. Across the peninsula between the Black Sea and the Caspian, the line of the Caucasus is now accepted as the boun- dary. The British islands have been separated from the Continent in a comparatively recent geological period, and*~~

~~*at one time must have presented a long and regular coast to the Atlantic. Iceland, though distant more than 600 miles, and geologically, it may be, of independent origin, is usually reckoned as aul outlying portion of Europe. Nova Zemlya and Waigatch may also be included; but Spitzbergen is more accurately assigned to the Arctic archipelago, In the Mediterranean the Balearic islands are conventionally attached to Spain, Corsica to France, and Sardinia, Sicily, and the Pantellarian grouplet to Italy. Malta is also re- garded as European. Among the central islands of the great archipelago between the Balkan peninsula and Asia Minor it is hard to find a line of demarcation; but the Cyclades, as part of the kingdom of Greece, may be con- sidered to belong to the western, and the rest of the islands to the eastern continent. Properly speaking, they are both Asiatic and European, and for that very reason neither European nor Asiatic.*~~

~~*The four coruers of Europe are marked by the moutli Extent.*~~

~~*of the Kara on the Arctic Ocean in the N.E., 69° N. lat. and 65° E. long.; by the North Cape on the Arctic Ocean in the N.W., 71° 11' N. lat. and 25° 50' E. long. ; by Cape Tarifa on the Atlantic in the 8.W., 36° N. lat. and 5° 36' W. long. ; and by Cape Apsheron on the Caspian Sea in the 8.E., 40° 12' N. lat. and 50° 20' E. long. Its most northern point as a continent is Cape Nordkun in Norway, 71° 7' N. lat. ; its most southern, Cape Matapan in Greece, 36° 24' N. lat. ; its most western, Cape da Roca in Portugal, 9° 31' W. long. ; and its most eastern, a spot at the junction of the Ural range with the Grossland's Ridge in 66° E. long. A line drawn from Cape St Vincent in Portugal to the Ural Mountains near Ekaterinburg has a length of 3293 miles, and finds it centre in the W. of Russian Poland. From the mouth of the Kara to the mouth of the Ural river the direct distance is 1600 miles, but the boundary line has a length*~~

~~of 2400 miles. The total area of the continent, according to Behm and Wagner's calculation, is 179,833°37 German sq. miles, 9,902,149 sq. kilometres, or 3,823,383°32 Eng- lish sq. miles; so that it forms rather more than a thir- teenth part of the whole land surface of the globe. Asia is about 45 times, and America about 4% times as large. The total population in round numbers is 309,178,300, which gives an average of 1719 for the German mile, 31:2 for the square kilometre, and 80:8 for the English sy. mile—considerably more than the average of any other of the continents.~~

~~Two of the most striking features in the general con- Coast- formation of Europe are the great number of its primary line.~~

~~and secondary peninsulas, and the consequent exceptional development of its coast-line,—an irregularity and develop- ment which have been the most potent of the physica] factors of its history. The peninsulas which are of most historic interest are those which trend southward into the Mediterranean :—the Balkan peninsula terminating in the wonderful cluster of peninsulas and islands which bears the name of Greece, the long Italian peninsula with Sicily at its foot, and the massive Pyrenean peninsula, so thorouglily shut off by its mountain isthmus that in ordinary language it is distinguished as the Peninsula par excellence. The northern peninsulas are mucli less synimetrical in their arrangement, and have exercised less influence on the history of Europe. The total coast-line is estimated at 19,820 niles, of which about 3600 belong to the Arctic Ocean, 8390 to the Atlantic, and 7830 to the Black Sea and Mediterranean. This gives 1 mile of coast to 192 miles of area, which is a higher rate than that of any of the other continents. Much of this coast-line, more especially in Norway and Spain, is of course practically useless as far as commerce is concerned, owing to the absence of natural harbours ; but even when such portions are withdrawn, the~~

~~VITT.—86~~

~~Changes of coast- line.~~

~~682 EUR~~

~~*facilities for maritime activity arc exceptionally great. That so small a part of the total belongs to the Arctic Ocean, which lies ice-bound during many months of the year, and so large a part to the Mediterranean, with its comparative freedom from winter and storm, has been of no small importance to the progress of the European peoples.*~~

~~*The coast-line of Europe is in its general features very much the same as it was at the commencement of the true historic period ; but when it is examined in detail it is found to have undergone a number of important local changes, some at least of which are due to causes that are at work over very extensive areas. These changes may be conve- niently classified under four heads :—the formation of deltas by the alluvium of rivers ; the increase of the land-surface due to upheaval; the advance of the sea by reason of its ovm erosive activity; and the advance of the sea through the subsidence of the land. The actual form of the coast, however, is frequently due to the simultaneous or successive action of several of the causes—sea and river and subter- ranean forces helping or resisting each other, Our informa- tion is naturally most complete in regard to the Mediter- ranean coasts, as these were the best known to our first book-writing nations. There we find that all the great rivers have been successfully at work—more especially the Rhone, the Ebro, and the Po. The activity of the Rhone, indeed, as a maker of new land, is really astonishing. The tower of St Louis, erected on the coast in 1737, is now upwards of four miles inland; the city of Arles is said to be nearly twice as far from the sea as it was in the Roman period. The present St Gilles was probably a harbour when the Greeks founded Marseilles, and Aigues Mortes, which took its place in the Middle Ages, was no longer on the coast in the time of St Louis. According to a calculation quoted by M. Reclus, the total alluvium of the river in the space of a year is 17,000,000 cubic metres, or 590,000,000 cubic feet; and this estimate is supported by M. Reybert, who found that the new land formed between 1841 and 1859 implied an annual deposit of nearly 19,000,000 cubic metres, or 671,000,000 cubic feet. The increase of the land is observ- able, not only in the immediate neighbourhood of the mouth, but round almost the whole of the gulf of Lyons, and is, of course, partly due to the alluvium of minor rivers. At the mouth of the Hérault, according to Fischer,! the coast advances at least two metres or about seven feet annually ; and it*~~

~~requires great labour to keep the harbour of Cette from being silted up. The Po is even more efficient than the Rhone, if the size of its basin be taken into ac- count. Were it not counteracted in some measure, it would soon, with the assistance of the Isonzo, the Adige, and the neighbouring streams, turn the northern part of the Adriatic into a plain. Ravenna, which was at one time an insular city like Venice, has now a wide stretch of downs partly covered with pine forest between it and the sea. Aquileia, one of the greatest seaports of the Mediterranean in the early centuries of the Christain era, is now 7 miles frem the coast, and Adria, which gives its name to the sea, is 13. And this increase of the land has gone on in spite of the fact that both cities are on the northern part of an area of~~

~~subsidence which apparently extends southwards along the |~~

~~whole Dalmatian coast. The islands on which Venice is~~

~~built have sunk about three feet since the 16th century :~~

~~the pavement of the square of St Mark's has frequently re- quired to be raised, and the boring of a well hag shown that a layer of vegetable remains, indicating a flora identical with that observed at present on the neighbouring main- land, exists at a depth of 400 feet below the alluvial de- posits. At Zara ancient pavements and mosaics are found ne~~

- ~~" Kiistenveriinderungen im Mittelmeergebiet," i Zi os . ip 3 Ges. fir Erdkunde zu Fae 1878 cor ed~~

~~OPE~~

~~below the sea-level, and the district at the mouth of the Narenta has been changed into a swamp by the advance of the sea. A process of elevation, on the other hand, is indicated along nearly all the coasts of Sicily, round the bay of Naples and the bay of Gaieta, at the southern end of Sardinia, the east of Corsica, and perhaps in the neigh- bourhood of Nice. The borings of pholads are found at a height of 600 feet on Monte Pellegrino; the ancient harbour which gave its name to Palermo (Panormus) is now nearly covered by the modern town; and the Grotto of San Ciro, which now les 6000 feet inland, and at a height of more than 220 feet, must have~~

~~*had a direct com- . munication with the sea during the period of human occu- pation. That the rise thus rendered evident is taking place over a wide area is shown by similar facts observed on the African coast. The Tunisian harbour of Porto Farina, which had a depth of 30 or 40 feet in last century, can hardly be trusted for 2; and this change can only be very partially due to the action of the Medjenda river, as it brings down but little alluvium. If the movement be maintained the Mediterranean will again be divided into two basins by the old ridge between Sicily and Africa whose existence has been posited to explain the present distribution of zoological fossils. Passing eastward to the Balkan peninsula, we find considerable changes on the coast-line of Greece; but as they are only repetitions on a smaller scale of the phenomena already described, it is sufficient to indicate the Gulf of Arta and the mouth of the Spercheius as two of the more im- portant localities. The latter especially is interesting to the historian as well as to the geologist, as the river has greatly altered the physical features of one of the world's most famous scenes—the battle-field of Thermopyle.*~~

~~*If we proceed to the Atlantic seaboard we observe, as we might expect, great modifications in the embouchures of the Garonne and the Loire, but by far the most remarkable : oscillations of sea and Jand have taken place in what are emphatically the Low Countries of Europe. It is one of the familiar facts of geography that a large part of the soil of Holland with its villages and cities is many feet below the level of the sea; but it is not so generally known that about a fifth of the area of the country is thus situated. The story of the contest carried on along the coast between man and nature has often been told, and is well worth the telling. If success is to be measured by the amonnt of territory acquired, nature has hitherto had the best of the battle, and no wonder, if it be true that the very ground on which man has built his ramparts against the sea is slowly sinking under his feet. Such, at least, is the opinion of Elie de Beaumont and other geologists of note: in fact the whole maritime region from the Scheldt to the Weser is an area of subsidence. The Dutchman, however, does uot intend to give up the contest. It was only in 1395 that he finally lost possession of the 500,000 hectares or 1,236,570 English acres of good land which are now covered by the Zuyder Zee; and he hopes to get the best part of it back again. A scheme has been proposed by which the*~~

~~*whole southern portion, with an area of 195,000 hectares (481,872 acres),will be inclosed by a dyke extending from Enkhuizen to Kampen; and thefeasibility of the enterprise is sufficiently attested by tlie brilliant success of the Haarlem engineers who, at a cost of less than £765,000, have recovered the area of the Haarlem Lake which had been lost inthe 16th century. Further east along the coast, between the Elbe and the Eider, it is hard to say whether land or sea is gaining: on the one hand it is stated that the ruins of the castle of Schlei are now covered by the sea, and that a forest of historic identity is totally destroyed ; while on the other it is equally certain that the parish of Busum in the north part of Ditmarsh was made land-fast only in the 16th century, that the Friedrick Koog, an area of new alluvial land five*~~

~~*Vol- canoes and earth- quakes,*~~

~~*a UO Le*~~

~~*miles long and two miles broad, was endyked in 1853, and that islands are being formed further out towards the sea.*~~

~~*The Baltic shores of Germany display the same phenomena of local gain and loss ; and there is more than a suspicion that the whole line lies along an area of subsidence. In the western section the inroads of the sea have been very extensive : the island of Riigen would no longer serve for the disembarkation of an army like that of Gustavus Adolphus; Wollin and Usedom are growing gradually less ; large stretches of the mainland are fringed with submerged forests ; and at intervals the site of well-known villages is occupied by the sea. Towards the east the great rivers are successfully working in the opposite direction. In the gulf of Dantzic the alluvial deposits of the Vistula cover an area of 1600 square kilometres or 615 square miles; in the 13th century the knights of Marienburg inclosed with dykes 900 sq. kil., or 346 sq. m., and 180 sq. kil., or 69 sq. m., were added in the course of the 14th. The Memel is silting up*~~

~~*.the Kurische Haff, which, like the Frische Haff, is separated*~~

~~*from the open sea by a line of dunes comparable with those of the Landes in France.*~~

~~*A large amount of evidence has gradually accumulated in favour of the hypothesis that the Scandinavian peninsula is in process of elevation. Within the last two centuries fiords have been left dry or broken into lakes, reefs have been tured into islands, bays into pasture grounds. M. Reclus has pointed out that the presence of certain beds of oysters goes to show that the lakes Malar, Hjelmar, and Wener are remains of a channel which at no distant date communicated between the Baltic and the North Sea; but the facts of marine distribution, as stated by Forbes, are rather against the opinion of Celsius, that there was also*~~

~~*4 connexion with the Arctic Ocean as late as the time of*~~

~~*the first Roman exploration. At Pitea, in the Gulf of Bothnia, the land is said to have gained a mile in 45 years, and at Lulea a mile in 28 years.!*~~

~~*It is only right, however, to mention that the state- ments made in the preceding paragraphs in regard to areas of subsidence and elevation are by several geologists con- sidered to be of very dubious validity. The data, they believe, are much too slight and fragmentary for the con- clusions, and some of the most important are open to quite different interpretations. The so-called strand or coast-lines of the Scandinavian peninsula, for example, are still the subject of keen controversy among northern in- vestigators, and a large polemical literature is the result. Till the question as to the origin of these remarkable appearances is finally settled, the recent elevation of the peninsula must be regarded as little more than a provi- sional hypothesis."*~~

~~*The changes briefly indicated above take place so gradually for the most part that it requires careful observa- tion and comparison of data to establish their reality. The Dutchman does not feel the subsidence of his well-defended flats, and the Norwegian is quite unconscious that he is being raised along with his pine-clad hills. It is very different with those changes which we usually ascribe to voleanic agency: they force themselves on the attention, and find a permanent place in the memory of the people. And yet it is only the scientific registration of the phenomena which gives any accurate idea of their frequency and extent. To the popular apprehension Europe is a fairly stable portion of terra firma, and we are accustomed to contrast the uncomfortable tendency to*~~

~~*1 Compare Howorth " On Recent Elevations of the Earth's Surface in the Northern Circumpolar Region," in Jour. Roy. Geog. Soc., 1873, and Adolf von Hoff, Gesch. d. Verdnd. d. Erdoberfliche, 1822, 1823, 1834.*~~

~~*2 Compare Keilhau On the Rise of Land in Scandinavia ; Kjerulf, Om Skuringsmirka, &c., t Norge, 1872; Sexe, On gamle Strandlinier i fast Klippe, 1874. ;*~~

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~~*oscillation exhibited by such a region as Colombia or Peru in South America. But it is not so stable as it appears. Besides the great outlying "hearth" of Iceland, there are four centres of volcanic activity in Europe —all of them, however, situated in the Mediterranean. Vesuvius on the western coast of Italy, Etna in the island of Sicily, and Stromboli in the Liparian group, have been familiarly known from the earliest historic times; but the fourth has only attracted particular attention since last century. It lies in the Archipelago, on the southern edge of the Cyclades, near the little group of islets called Santorin. The region was evidently highly volcanic at an earlier period, for Milo, one of the nearest of the islands, is simply a ruined crater still presenting smoking solfataras and other traces of former activity. The present crater ot Santorin is subaqueous, but it has already raised a con- siderable mass of material above the surface. The devasta- tion produced by the eruptions of the European volcanoes are usually confined within very narrow limits; and it is only at long intervals that any part of the continent is visited by a really formidable earthquake. There is little danger when the tremor has to be verified by glass cylinders on a sanded floor. Minor shocks, however, are exceedingly numerous. Dr Volger found that during the first fifty years of the 19th ceatury the average number per annuum was, in Switzerland, no less than fifty ; and he indicates the following localities as habituellen Stossgebiete or areas of fre- quent disturbance : —(1) in the region of the Jura, the valley of the Birs to the S. of Basel, the valley of the Orbe, the Val de Travers, the valley of St Imier, the district at*~~

~~*| the confluence of the Aar and the Limmat, &ec.; and (2) in*~~

~~*the Alpine region, the valley of the Durance and the Drac, of the Arc and the Isére, nearly the whole line of the Arve, the upper valley of the Rhone almost without interruption tothe Lake of Geneva, part of the valley of Adige to the S. of Trent, and the valleys of the Drave and the Gail to the W. of their confluence. A table drawn up by Dr Suess registers about 116 earthquakes in Lower Austria from 1021 down to 1870, and of these 53 belong to the present century.? Of all European earthquakes in modern times, the most destructive are that of Lisbon in 1755, and that of Calabria in 1783; the devastation produced by the former has become a classical instance of such disasters in popular literature, and by the latter 100,000 people are said to have lost their lives. Calabria again suffered severely in 1865 and 1870.*~~

~~*If Russia be left out of account, Europe may be gene- rally characterized as a mountainous region,—the ratio of highlands and lowlands being, according to Von Kldden's calculation, approximately as follows :*~~

~~*Total Area. | HIghlands. | Lowlands.*~~

~~*English English English sq. miles. sq. miles. sq. miles.*~~

~~*Continental portion, without ;*~~

~~*peninsulas and islands … EN) | a ee Greater peninsulas …….0.66 835,715 | 641,286 194,429 Great Britain and Ireland…… 115,918 | 60,125 55,788 OpheriSlands ence. <.qeoseeeeees 64,738 | 47,857 | 16,881*~~

~~*In other words, the purely continental portion has 21°44 per cent. of highlands to 78°56 per cent. of lowlands ; the peninsular portion 76°74 per cent. to 23-26 per cent.; Great Britain and Ireland 51°87 per cent. to 48°13 per cent.; and the remaining islands 73:92 to 2608. There are none of the individual mountains that attain more than a mode- rate elevation if they are compared with the mountains of Asia and South America. Mont Blanc, the loftiest of all, has an altitude of only 15,781 feet, while M. Everest, in*~~

~~*3 See Zeitschrift der K. Academie zu Wien, 1874 and 1875, and Peterinann's Mittheilungen, 1856.*~~

~~*Relief*~~

~~*Moun- tains.*~~

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~~*HDR OP &*~~

~~*the Himalayas, is 29,000 feet high, and Chimborazo and | is really overtopped by a large number of the other groups,*~~

~~*Aconcagua, in the Andes, are respectively 20,677 and*~~

~~*23,910, ;*~~

~~*The whole continent is formed ona small scale of relief, though this scale is not so small as has usually been stated on the authority of Humboldt. The mean elevation of Asia, according to his calculations, was 351 metres (1151 E. ft.); of South America, 344 metres (1128 E. ft.); of North America, 227 metres (744 E. ft.); and of Europe only 204 metres (669 E. ft.) In 1874 Dr Gustav Leipoldt published the results of a new calculation, which, being carefully conducted and based on a much more extensive collection of data, must replace the estimates of Humboldt. The following is a table of his principal findings, giving an average of 296°838 metres, or 973°7 English feet :—*~~

~~*Leipoldt's Table of Mean Elevation.*~~

~~*Metres. English Feet. Swatzerlondiay.. posers cccustesiuacesnansere 129991 4264°74 Iberian Peninsula(Spain and Portugal)} 700°60 2298 52 Balkan Peninsula (Turkey and Greece); 579°50 1901°21 ZAUISIUIS) non ponbonasncOuTenUeer aabeemenaonceeen. 517°87 1699-02 Apennine Peninsula (Italy)..... aly /oilr/ 1696 °73 IS OINCETIE Val Vans ivets casiiioteesies Sesetecmemnie cee 42810 1404°51 EIR C Getter svarcccee seve de aeieetoene recourse ae 393°84 129211 AROMMUTENL A) onees cnccesesauseavescade otees oenegs 282°28 926°19 Gineaity BiiGatait. vies. s.- ssaetes seeee ese: 217°70 714°22 COTM GD PE AM OME co sses cede dnaseecnsvences 213°66 700°97 GUsSl eres cacti deen*~~

~~atigcssscsees: steer 167°09 548°18 Beloit teins .aa-ares cennenee ates anecae atte 163°36 535°95 IDierivane yd '¢ Aepeenenpancesoboceedussuseenoubadb: 35°20 115°48 Netherlands, excluding Luxembourg 9°61 81°52 and parts below sea-level……..~~

~~If the materials which are employed in producing the relief of the various countries were equally distributed over the surface of the continent, their respective contribu- tions would arrange them in the following order :—~~

~~Metres. English Feet.~~

~~Russia would raise the continent. 90°46 296°7 The Iberian Peninsula……. 43°24 142°0 MCAMOMMEAIA "ee lackaaasesete cesueessnesn Sse) 108°9 AMISUIE Weer coc. cs ttteee +. toasts 82°87 107°8 The Peninsula of the Balkaun…... 26°68 87'5 ITTENIC®, GaBGee pep oatten On nonG ACO a ceeem eae 21:19 69°5 The Peninsula of the Apennines .| 15°62 51:2 The German Empire……..0065 11:91 39°0 CGrealaribain c..crencdeste rece teet ee. 7:05 Ds pil IIISAVAEZOE NC erences ccenainsess couenneee 5°40 a7, Denmark and Iceland……. 5'11 16°7 NOUN Anis rern cnc creche me eee ee 3°48 11°4 p3)2)0- "1 ee cP 0°49 16 Netherlands: ...0.c0c00ss0secreerocescce 0°19 '6 100123) LARA RR a Scr eR 296'83 973°7~~

~~It is noticeable that Russia stands first on the list on account of its immense area, in spite of the fact that its mean elevation is less than that of nearly every other country.~~

~~The central ridge of Europe is formed by a complex of from thirty to fifty distinct massifs, which from time immemorial have borne the name of the Alps, or, if the usual etymology be correct, the White Mountains. They are closely grouped together over an area of about 74,000 or 75,000 square miles, extending from 5° to 16° E. long., and curving round from the Gulf of Lyons to the neighbour- hood of Vienna. According to Dr Leipoldt, if the material of which they are composed were equally distributed over the surface of the continent it would raise the level 27-23 metres, or 89 English feet. Mount St Gotthard, situated in 5° 36' E. long, is usually considered as the central massif ; but instead of being, as was long~~

~~*supposed, the highest part of the system, and consequently of the European continent, it*~~

~~*The honour of being the loftiest summit is now, as already stated, assigned to Mont Blanc, which, in its terminal peak, named Dufour Spitz, in memory of the great surveyor of Switzerland, reaches a height of 15,781 feet. In general the mountains of the western parts of the range are loftier and more closely ranked, while those towards the east not only diminish in height but spread out over a wider area; and on*~~

~~*| the whole the southern sides are steeper than the northern.*~~

~~*Full details of the intricate divisions of the Alps are given in a separate article. As the birth-place of its mightiest rivers, the natural barrier between its mightiest peoples, a prime factor in the distribution of its climates, and in modern times the noblest of all international " play-grounds," the Aips act a part of multiform munificence in the economy of the continent.*~~

~~*With the exception of the Pyrenees and its dependencies, all the mountains of southern and central Europe may be regarded as secondary portions of the general Alpine system. If it were possible with more than human reach of sight to take an outlook northwards from some commanding peak on the northern skirts of the great chain, the whole country for two hundred miles and more would appear occupied by irregular lines and groupings of mountains and hills ris- ing from a kind of table-land, and intersected by the deep- cut valleys of the larger rivers. Towards the north-west the most conspicuous heights are those of the Jura proper, which runs parallel with the Alps, and is only separated from them by the valleys of the Rhone and the Aar, the latter a main tributary of the Rhine. The German Jura trends north-east, the Black Forest north from the eastern extremity of the Jura proper, and fronting the Black Forest on the other side of the Rhine lie the Vosges. Further north the Rhine valley is defined on the west by the Hardt, the Hochwald, the Eifel, and the Ardennes ; and on the east by the Odenwald, the Westerwald, and the Taunus. North of the German Jura lie the Franconian heights, which are separated by the valley of the Main from the Spessart, the Rhon, and the Thiiringerwald. From the Thiiringerwald south-east run the*~~

~~*successive clusters of the Frankenwald and the Fichtelgebirge ; and from this last massif eastward extends the Erzgebirge as far as the valley of the Elbe, and south-eastwards the Bohmerwald, along the valley of the Danube. Beyond the Elbe, and forming the eastern rim of the upper basin, are the Riesengebirge and the so-called Sudetic chain, which, by its southern extremity, approaches the Carpathian mountains; and these again, in company with the Transylvanian mountains, curve south and enclose the great Hungarian plain. The Balkan to the south of the Danube is practically on the one hand a continuation of the Transylvanian range, and on the other it is connected by the mountains of Carinthia, Dalmatia, Bosnia, and Servia with the eastern extremity of the Alps. The Apennines are still more closely connected with the western extremity, and the mountains of Auvergne and the Cevennes in France may also be regarded as outliers of the system.*~~

~~*Several of the ranges, however, are sufficiently distinct in position and general characteristics to be treated apart. The Apennines form an uninterrupted chain extending south to the Straits of Messina. Their mean height varies from 2600 feet in one part to 6400 in another; and among the loftiest peaks are Monte Cimone, 7060; Alpe di Cam-poraghena, 6537 ,; Monte Sibilla, 7188 ; Gransasso, 9493 ; La Majella, 9314 ; Monte Pollino, 7441 ; and Aspromonte, 6375. The Carpathians are about 520 miles long, and attain their greatest elevation in Butschetie, which has an altitude of 9528 feet. The declivities of the range are steepest on the southern side. The Balkans, or Heemus, run 400 miles east and west to the south of the Danube valley.*~~

~~*Rivers.*~~

~~*6 UR O PE*~~

~~*Their mean elevation is about 5000-5600 feet; but it is ouly from the southern side that they present a really mountainous appearance ; on the northern they gradually descend by a succession of terraces, and, with few excep- tions, the summits have gently ronnded contours. The culminating point is Tchar Dagh, which rises to a height of about 9700 feet. Connected with the Balkans by its western extremity is the range of the Despoto Dagh, or Rhodope, which stretches eastward along the north*~~

~~*of the /Egean, and in some points reaches a height of 80U0 feet. Nearly the whole country to the south in Thessaly and Greece is occupied by irregular groups and lines of moun- tains and hills, among which the most important are the Pindus and Olympus. Besides the Alpine system and the secondary systems which are grouped along with it, there are several others rendered quite distinct by their position and structure.*~~

~~*The Pyrenees are next to the Alps in elevation. They extend across the isthmus between France and Spain for a distance of 240 miles, and are practically con- tinued by the Cantabrian Mountains for 260 miles more. The loftiest summit, Mont Perdu, has an altitude of 11,270 feet. The south side of the Pyrenees proper is the more rugged and precipitous; but the Cantabrian Mountains present their steepest face tothe north. All the minor mountain ranges of Spain are connected with each other and with the Pyrenees. The highest is the Sierra Nevada in the south. The chain of the Dovre-Fjeld, Dofrines, or Scandinavian Alps is about 1000 miles in length, and has a general elevation of from 3000 to 6000 feet. Properly speaking, it is not so much a range of mountains as a plateau, broken up by deep-cut ravines and fiords. The western side is precipitous, and the eastern de- scends gradually to the Gulfof Bothnia. The Urals extend from north to south through 20° of latitude, witha breadth of about 40 miles. They rise slowly from the plain on both sides, and at the place where they are crossed by the road frum Moscow to Siberia the ascent and descent is hardly noticeable. A considerable proportion of the range lies between 3000 and 4000 feet above the sea; a few peaks attain an altitude of 5000 ; and one, Toll-pors, is not much under 5500.1*~~

~~*Tf the European mountains are arranged according to their greatest elevations, they rank as follows :—(1) the Swiss Alps, with their highest peaks 15,000 feet or upwards; (2) the Sierra Nevada, the Pyrenees, and Etna, about 11,000 feet ; (3) the Apennines, the Corsican Mountains, the Car- pathians, the Balkans, and the Despoto Dagh, from 8000 to 9000 ; (4) the Guadarrama, the Scandinavian Alps, the Dinaric Alps, the Greek Mountains, and the Cevennes, between 6000 and 8000 ; (5) the mountains of Auvergne, the Jura, the Riesengebirge, the mountains of Sardinia, Majorca, Minorca, and the Crimea, the Black Forest, the Vosges, and the Scottish Highlands, from 4000 to 6000.*~~

~~*The table given on page 686 furnishes a comparative view of the principal European streams taken in the order of their length.*~~

~~*In various parts of Europe, more particularly in cal- careous regions, there are subterranean or partially sub'er- ranean rivers. Of these the most remarkable are the Sorgue of Vaucluse, the Touvre of Angouléme, the Timavo of Istria, and the Poik or Planina. The first has been traced for 10 or 15 miles below ground; and the Timavo when it issues from the mountain is already navigable. Along the French coast several subterranean affluents of the Mediterranean have been discovered, and some of them are evidently of considerable size. The Garonne itself, which rises in the glaciers of Mount Maladetta, passes*~~

~~*1 Gf, '*Profi] des Ural-Gebirges," in Zeitschr. fir Hrdkunde zu Berlin,*~~

~~*1858.*~~

~~*685*~~

~~*under Mont Poumar for a distance of 4 kilometres. The subterranean course of the streams is frequently indicated by peculiar vents or pits caused by the subsidence of the soil; they are popularly known in Greece as catavothra, in Carinthia as dolinas, and in France by a great number of local names, such as embucs, gourgs, bott-tout, anselmons, ie"*~~

~~*Europe has no Niagara, and, indeed, few of its larger rivers present anything approaching to a real cataract. The Rhine takes a plunge of about 50 feet at Schaffhausen; and there are a series of rapids in the lower course of tlie Dnieper and the Dniester. In Sweden the Gotha-Elf falls 100 feet at Trollhata; the Hjommel Sayka or Hare's leap of the Lulea is 250 feet high; and the Riukan Fos or "Smoking Force" at Mjésvand is no less than 800. The famous Staubbach in the neighbourhood of Lauterbrunnen has a descent of 980 feet, but it is a mere brook, and in summer almost dries up; it takes its name, as is well known, from the dust-like appearance of the spray into which the water is changed by the tremendous descent.*~~

~~*Several of the more important rivers are of very irregular flow, and some are subject to really formidable floods. In 1877 there were disastrous inundations of the Danube : 12,000 people were rendered lhomeless in one of the suburbs of Buda Pesth, hundreds of houses were undermined, wlule villages were submerged, and large quantities of property were swept away. Thi floods in the Netherlands the same year were severe enough to necessitate Government help for the sufferers. Large areas in Saxony and Silesia were under water; the Elbe, the Vistula, the Nogat, and the Oder, all overflowed their banks or burst their dikes, it was feared that the whole line of railway between Thorn and Posen would be carried away, and in some districts there was considerable loss of life. If all the damage produced in this way since the beginning of the cen- tury could be calculated, it would be found to repre- sent an enormous sum. The floods of the Loire alone, in 1856, carried off about £8,000,000 worth of pro- perty ; and those in the south of France in 1875 caused a loss of about £3,000,000. In most Continental countries there have been consequently undertaken extensive en- gineering works, partly to prevent inundations, and partly to render the rivers more serviceable for navigation and irrigation. France has been especially active in this matter, several of her most important streams being very difficult to regulate. The Loire, for example, varies at Orleans from 25 cubic metres or 780 feet per second to 10,000 metres or 315,000 feet in the same time ; the Sadne, in 1855, varied from 3,825,450 cubic feet per minute to 174,086; and the Rhone at Geneva, in 1858, which was a minimum year, from 740,000 cubic feet to 195,000.23 The engineering works have been especially successful on the Seine and Yonne, where several new methods have been tested for storing the surplus water of one season, and utilizing it during the period of deficient supply.* In Italy the Po, the Arno, and the Tiber are notorious for their floods; but the first two are now among tlie most striking examples of a satisfactory system of embankment. At Cremona, on the Po, which is 171 miles inland and 104 feet above sea-level, the flood of 1840 rose 18 feet, that of 1855 rose 19 feet, and that of 1857 20 feet, above summer low-water. On the last occasion the banks above Cremona were burst, and avast area of country was submerged; but such a disaster is now comparatively rare. or the irrigation of the Lom- bard plain no less than 762,838 cubic feet per minute are drawn off by the canals.*~~

~~2 See E. Reclus, La Terre, vol. i.~~

~~3 See Beardmore's Manual of Hydrography, 1862.~~

~~4 See Blerzy, " Etudes sur les travaux publics," in Revue des Deux Mondes, 1875.~~

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~~Name of River. Source. Mouth.~~

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~~*HUROPE*~~

~~*Comparative View of the Principal European Rivers taken in the Order of their Length.*~~

~~*(Based on Glogau's Table.)*~~

~~*GOALS... cas cave aa England, Gloucester…..... German Ocean*~~

~~*eee eeeoee*~~

~~*Direct distance of*~~

~~*source from Eng. miles*~~

~~*mouth.*~~

~~156 161 101~~

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~~110~~

~~Develop-~~

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~~2130~~

~~1613 1309 1272 1185 1120 1050 931 853 843 788 723 696 682 608 599 594 594 557 553 546 544 540 539 525 521 511 493 474 447 447 442 438 428 410 401 396 391 391 378 373 364 359 336 336 322 313 308 304 299 299 290 290 281 281 276 272 267 262~~

~~Basin Area. Eng. sq. miles.~~

~~517,272 299,435 90,889 193,195 170,638 117,996 188,795 87,168 65,057 54,980 142,701 58,748 69,309 27,553 46,560 15,966 34,250 41,670 14,669 46,922 22,536 16,540 34,000 31,444 36,781 27,000 23,322 36,355 21,988 15,562 36,525 34,654 26,767 19,411 19,347 22,663 44,498 28,728 6,808 38,481 28,234 19,836 31,465 60,805 8,142 11,204 9,897 12,756 10,205 21,260 18,220 11,098 6,128 8,828 5,038 8,355 5,655 19,389 21,622 9,652 4,719 31,125 7,292 2,912 8,504 10,247 7,526 6,122 15,668 8,822 9,141 5,357 10,034 6,390 4,613 5,102~~

~~Lakes.~~

~~BEQ@ROPE~~

~~Since the city of Rome has again become the capital of Italy the attention of the Italians has been specially turned to the Tiber, and several schemes of Herculean magnitude have been discussed. Garibaldi's project was adopted by both houses of the Parliament and sanctioned by the Government in 1875. During the present century the Danube, which is the most international of [uropean rivers, has been greatly improved as a water-way, by the rectification of its course in the neighbourhood of~~

~~*Vienna, by the clearing of the passage of the Iron Gates, and by the maintenance of a proper channel at the delta. It is almost needless to mention the works that have been carried on for the deepening of the seaward section of all the greater rivers, and the removal of the bars at their mouths ; perhaps in this department the most remarkable results are exhibited by the Clyde.*~~

~~*In the accompanying table, for which we are indebted to Glogau, the principal lakes of Europe are arranged according to their size. If we examine their distribution we find they can easily be classified into groups. The*~~

~~*Height*~~

~~*= Se German | English Name of Lake. Country. Lad ee mnitese | tetas*~~

~~*vee 413-00 8780°66*~~

~~*Ae 228°39 4855°73*~~

~~*140 99°50 2115743*~~

~~*96 51°31 1090°88*~~

~~*405 49°70 1056°65*~~

~~*256 47°30 1005-63*~~

~~*Oe 45°00 956°73*~~

~~*261 42°26 898-47*~~

~~*282 35°40 752°62*~~

~~*MPO: crake ssssacsetessesess 123 25°25 536°83 MRICLO OZELO sss esc2s0scee. 33 21°40 454-97 Segosero aes 21°39 454-76 Imandra oor 19:90 423-08 ERLCLISN. coscces 804 19°50 414-58 Wygosero. bee 19°10 406°07 Platten ….. 457 18-00 382°69 WIGOR esse. <6 390 17°30 867-81 MMC Mecsece=-entec-vcceseeee ” 107 16°79 356°96 Store Luleo-Wattnen*~~

.| Sweden……. se+0 axe 16°50 350°80 Stor Afvan = 843 14:90 816-78 Heol Giltesesteressstscesseres er 14°32 304°45 HEN CV Dicescsescesesossosses 1230 11-20 238-11 MROIMPEO Necctsccescesseve ees 1342 9°60 204-10 MEO Olcsccrscnesescessscs 984 9°10 193-47 Boden-See 1305 [8°92 189-64 HAjelmar 92 8°90 189°22 Siljan 545 8-20 17438 Neagh 48 G22 153°50 Garda 227 6°60 140°32 Mjésen 4]1 6°50 138-19 Neusiedler, 367 5°50 11693 RIGUEME Minecssecdeesayeseceels crs 5°34 113°53 IVAILZVAUEEN cosuseeseees essa TRS seecreepencerroos, 115 4-96 105°45 Neufehatel… i 1426 4°36 92°69 Yalpukh..:..... one 417 88°65 Lago Maggiore 646 3°70 78°66 IGIMCT. sccstesence 918 3°62 76°96 WOTTID) << csesc+e-escesnseuns 30 3°20 68°03 Lago di Como 700 2:90 61°65

Alpine lakes break up into a southern and northern subdivi- sion—the former consisting of Lago Maggiore, Lago di Como, Lago d'Iseo, and Lago di Garda, all connected by affluents with the system of the Po; and the latter the lake of Geneva threaded by the Rhone, Lakes Constance, Zurich, Neufchatel, Biel, and other Swiss lakes belonging to the basin of the Rhine, and a few of minor importance belonging to the Danube. As factors in the historical development of the Alpine countries the first rank must be assigned to Geneva, Constance, and Como. Next in interest to the Al- pine group comes the Swedish—Wener, Wetter, Malar, and Hjelmar, lying between the Baltic Sea and the Skagerrack, and nearly as famous as their Scotch and English rivals for the beauty of their scenery. The North Russian lakes, Ladoga, Onega, &c., are mainly noticeable as the largest members of what in some respects is the most remarkable system of lakes inthe continent—the Finno-Russian, which consists of an almost countless number of comparatively small irregular basins formed in the surface of a granitic plateau. In Finland proper they occupy no less than a twelfth of the total area. It isimpossible to take individual

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account of the multitudinous small lakes that diversify the surface of every country in Europe, with the partial excep- tion of Spain; but their influence on the climate and hydrography of the continent must not be overlooked, All of them help to increase the area of evaporation, and

~~*many even of those which are almost nameless act as reservoirs for rivers. Nearly all the rivers of Sweden, for example, have their origin in a lake or tarn; and the same is the case with many of the streams of the northern Pyrenees. The total area'of the lakes given in the table is no less than 28,450 square miles, or abont the united area of the Nether- lands and Switzerland.*~~

~~*A few of the number are very shallow. The Neusiedler See, for example (the Peiso Lacus of the Latins and Fertotava of the Hungarians), completely dried up in 1864, and left its bed covered for the most part with a deposit of salt.} Others not mentioned in the table have been partially or com- pletely drained by human labour. The Copais in Beotia was attacked by Greek engineers as early as the time of Alexander the Great; but the tunnels which they con- structed to carry off its waters have been choked up, and the lake is again in a state of nature. Lake Fucino or Lago Celano, in the Abruzzo in Italy, was doomed to destruction by the emperor Claudius; but the works which he con- structed proved ineffectual, and it was not till 1862 that a large part of the basin was turned into dry land. The progress of agriculture has greatly diminished the quantity of marsh land in Europe, and there are only one or two really extensive regions which deserve the name. Most important of all are the Minsk marshes in Russia, and ou these large encroachments are gradually being made. The draining of the Pomptine marshes in Italy made Pope Pius VII. famous in the 18th century ; and at the present moment those of Ferrara are sharing the same fate.*~~

~~*Geologists have as yet come to no agreement regarding the origin of the principal mountain ranges, and still less do they furnish a consistent and connected history of the shaping of the continent. It will consequently be sufficient to indicate the general distribution of the various furma- tions, and the more important basins of deposition for the sedimentary rocks.2_ The typical basin is that which takes its name from Paris: in it the successive stratifications are arranged in an exceptionally symmetrical manner. To the south-east lies the basin of Bordeaux, separated by a plateau of granite and gneiss; to the north, on the other side of the Channel], the London basin; and to the north- east the basin of the lower Rhine. Further east comes the basin of the lower Weser, divided into two*~~

almost in- dependent portions by the Harz mountains; and to the south-east is the Prague basin, which presents only frag- mentary remains of its sedimentary deposits. Nearly the half of European Russia belongs to the Moscow basin, which, in the south-east, is conterminous with the probably more modern basin of the Caspian. The whole of the south of the continent, from the Pyrenees to the Caucasus, belongs to the Mediterranean basin, which is one of the greatest in the world, and has its northern limit marked by the Cevennes, the Jura, the Thiiringerwald, the Bohm- erwald, and the Arratyne plateau. The total surface area occupied by the plutonic and metamorphic rocks is far from inconsiderable; but, with the exception of the great mass of the Scandinavian peninsula, Finland, and Lapland, and the long line of the Urals, the individual portions are of comparatively small extent. In the Spanish peninsula they stretch from Corunna south to the Tagus, appear again in the neighbourhood of Evora, form the western part of the Sierra Guadarrama, and rise in islets above the Silu-

1 See Ascherson,. " Die Austrocknung des Neusiedler Sees," in Z. der Ges. fir Erdkunde zu Berlin, 1865. 2 See map in Petermann's AMittheilungen, 1878.

Geologi- cal for- mations.

Minerals.

rian formations to the south. In France they constitute, not only the great plateau already mentioned between the Paris and the Bordeaux basin, but also the massive penin- sula of Brittany; and in eastern Germany they are the predominant rocks of the Erzgebirge, the Sudetic chain, the Bohmerwald, and the inclosed area. They again appear in isolated masses of considerable extent along the inner side of the Carpathians; and in Turkey they reach from Novi-Bazar to the Black Sea, and from the south of the Balkans to the Aigean. It need hardly be added that they constitute the main mass of the Alps. The only country where the Silurian rocks have a large surface area is the Spanish peninsula, and there they are mainly confined to the western half. They show a long line in the Ural

~~range, stretch from Lake Ladoga along the south of the Gulf of Finland, rise above the Baltic in the islands of Dago, Osel, Gottland, and Oland, and appear sporadically throughout Scandinavia. Their very name comes from the fact that they are present in England. The other Paleozoic formations—Devonian, Carboniferous, and Permian—are widely developed. In Russia they stretch from the Baltic to the Oka, and from the White Sea to Voronezh; they occupy a considerable area to the west of the lower Don, and are laid bare in the valley of the Dniester. In Western Europe they are best represented in the countries on each side of the lower Rhine, in the British Islands, and in northern Spain; but they occur here and there in several other quarters. The Secondary formations are still more extensively distributed,—the Triassic and Jurassic forming a large proportion of central Germany, a good part of France, much of England, and nearly the whole of the eastern por- tion of European Russia. To the Cretaceous rocks alone belong a large part of the Paris basin, part of the lower Rhine basin, all the Danish or Cimbric peninsula, the great range of the Carpathians, the Balkan range, nearly the whole of Greece, Albania, Montenegro, Dalmatia, Servia, and a wide tract in the centre of southern Russia. The Secondary are in their turn exceeded by the Tertiary formations, which furnish the continent with some of its most valuable agricultural areas. The Miocene alone occupies a considerable part of the Paris basin, part of the basins of the lower Rhine and the lower Weser, the Lombardy plain, the Ilungarian plain, Galicia, and Bessarabia, not to mention the valley of the Ebro and other extensive tracts in Spain. The Pliocene is best represented in the Caspian basin and the Ponto-Caspian depression, and along the Russian coast from the Danube to the Don.~~

~~Europe is richly furnished with mineral wealth, and the distribution is not so irregular as might appear from the actual state of the mining industry in the different countries. For the precious metals it is mainly indebted to other quarters of the globe, but it possesses abundant stores of~~

~~and the countries of the Austrian-Hungarian monarchy are especially distinguished by the value and variety of their deposits ; and Belgium and~~

~~*Sweden are largely indebted for their national prosperity, the one to its coal and the other to its iron. Spain naturally ranks high in this de- partment, but the working of its mines is in a backward condition. In the lands of the Turkish empire matters are still worse, and Greece has comparatively little to show except the silver mines of Laurion, Roumania exports salt and petroleum, and Servia, since it became indepen- dent, has begun again to work its iron and copper mines. In the Russian empire there are valuable coal-beds in the European territory, but the richest mineral area lies on the Asiatic side of the Urals.*~~

~~*Platinum has hitherto been obtained nowhere in Europe except in the auriferous sands in the Russian government of Perm, which yield from 900 to 1000 kilogrammes a year. Gold, on the other hand, is widely diffused, but it occurs for the most part in such insignificant quantity as not to repay the expense of collecting. The total produc- tion is about 6900 kilogrammes per annum, and by far the greater part is furnished by Russia. The gold mines of Spain were at one time famous, and there was a consider- able population supported by gold-washing in Transylvania aud Roumania. Silver is much more abundant than gold, but it is less extensively distributed. There are productive mines in the Erzgebirge, the Carpathians, the Urals, the Norwegian Dovre-Fjeld, and the Sierra Morena, as well as in Sardinia and England, The total yield is about 300,000 kilogrammes per annum. A considerable proportion is obtained during the working of the lead mines, which are of great importance in several countries, more especially in Spain, Germany, and Belgium, where the supply of lead exceeds the local demand. In Spain, which has a large export, the lead mines are mainly situated in Murcia, Almeria, and Jaen; in France the most important are in the Puy-de-Déme; in Britain in Durham and Northum- berlarid ; in Austria in Carinthia, Bohemia, Tyrol, and Galicia ; and in Hungary at Neusohl and Nagybanya. In the German empire, Prussia, Saxony, Brunswick, and Anhalt are most productive ; and in Italy, Sardinia, Tus- cany, and Lombardy. In Portugal there are 15 mines ; and in Turkey lead ore exists at Gallipoli, and at Olovo in Bosnia. The total amount of copper obtained throughout the continent is estimated at about 589,000 cwt. yearly. The only countries that can afford to export are Spain, Sweden, and Norway; but Germany, Britain, Russia, Belgium, and Hungary are all great producers. In Britain*~~

~~the mines are mainly situated in Cornwall, Devon, and Chester; in Germany they are widely distributed, but the most productive are in the districts of Merseburg and Arns- berg in Prussia; in Hungary they chiefly occur in the Car- pathian mountains. Of all the Spanish mines the best~~

~~iron ores, lead, copper, coal, and salt. Britain, Germany, | known are those of Rio Tinto and Tharsis in the province~~

~~Table showing Statistics of the Produce of several of the more important Metals. The years vary from 1871 to 1875, and in the case of Spain from 1869 to 1872.~~

~~Gold. Silver. Quicksilver. Tin. Copper. Lead. Zinc, Antimony. PATISELI AN cree ne 13°59 kil.| 23,740 kil.) 3,350 cwt. 1,848 ewt. 3,945 ewt. 34,720 cwt. 35,528 ewt. |1291 ewt. Belgium……. Rd ve vee ae 51,366 cwt. 146,516 cwt. 1,442,494 ewt. uti NranCeRs……e 410°5 kil. | 34,454 lal. os ie 423,508 cwt. 423,824 cwt. 163,925 cwt. /2368 cwt. Germany …… 327 kil. |127,007kil.| 45 kil. | 2,000cwt. ge iy Loe ee 5) Ks 3 9,138,046 cwt. | 361 cwt. Great Britain.| 393 oz. 483,422 oz. 170,000 cwt. 93,900 cwt. 1,173,340 ewt. 472,280 ewt. Italy ….csceee. 450 kil. | 3,500kil.| 2,740 ewt. . 11,786 ewt. "> ewt. 3,754 860 omt Russia … sce 4789 kil, es : 155 ewt. 58,520 cwt. Bee 62,055 cwt. Spain… 22,500 kil. | 40,540 ewt. 149,300 owt. Aly 40,544 owt. ee 1686kil.| 4,000 kil. 12,410 ewt.~~

~~1 Based largely on data furnished by Mr Robert Hunt, F.R.S.~~

~~Climate.~~

~~KEUROPE~~

~~of Huelva (of which the latter is capable of yielding 500,000 tons of iron pyrites annually). More than a third of all the zine obtained in Europe is contributed by Belgium, and nearly as much is furnished by Germany. The principal Belgian mines are in the province of Liége, and the principal German mines at Oppeln in Upper Silesia. Tin is found only in a few localities. The richest mines are those of Cornwall in England, which have been worked from the earliest historic period; and next in importance are the Austrian mines in the Erzgebirge. Mercury is~~

~~*practically peculiar to Spain and Hungary, though it is obtained in small quantities at Vallalta in the Italian province of Belluno, at Santa Fiora in the province of Grosseto, and in Germany at Deuxponts in the Pala- tinate, and is also known to exist in Bosnia and Roumania. The principal Austrian mines are at Idria in Carniola, and the principal Spanish mines at Almaden and Almadalejo in Ciudad Real.*~~

~~*The salt production of Europe amounts to about 95,000,000 or 100,000,000 cwt. per annum. To this total no contri- bution is made by Finland, Sweden, Denmark, Luxem- bourg, Belgium, Servia, or Montenegro. It is partly pro- cured from mines, partly from springs, and partly from salt lakes and the ocean. The most productive mines are in the Carpathians (at Wieliczka and Bochnia in East Galicia), and at Salzburg on the north side of the Alps; there are also extensive deposits in Chester and Worcester in England, in the departments of Upper Saédne and Ariége in France, at Wilhelmsgliick and Friedrickshall in Wiirtemberg, at Berchtesgaden in Bavaria, at Leo- poldshall in Anhalt, at Stassfurt and Erfurt in Prussian Saxony, at Stettin in Hohenzollern; and at Sprunberg in Brandenburg, at Cardona, Pinoso, Gerry y Villanueva, in Spain, and in the districts of Prahova, Valcea, and Bacau in Roumania. Salt springs are still more widely distributed. Bay salt is largely manufactured in France, both on the Mediterranean and Atlantic 'seaboards; in Russia, along the coasts of the Black Sea; in Spain, at Cadiz and Torrevieja, &c.; in Italy, in Sardinia, Sicily, and Elba; in Turkey, at the mouth af the Danube, and in the island of Crete; and in Greece, in the island of Santa Maria. The salt lakes of Bessarabia alone yielded on an average 13,924,000 cwt. yearly from 1819 to 1850, and carriers come for supplies from Poland, Volhynia, Kieff, and Tchernigoff. About 230 waggons are loaded daily in the season.)*~~

~~*Full details on the European coal-fields have already been given in the article Coat, vol. vi. p. 55-58; and the reader will find a similar account of the iron mines under Iron. Sulphur mining is one of the greatest industries of Italy and Sicily, forming, indeed, almost the exclusive means of support for Girgenti and some other towns ; graphite is obtained in Bohemia and Moravia, Bavaria, England, Russia, Sweden, and Spain; alum more particu- larly from Scotland, Bohemia, Germany, Russia, and*~~

~~*Spain ; asphalte from Switzerland, Italy, Brunswick, Dal- matia, and Tyrol; and petroleum from the Carpathian mountains, Alsace, Lorraine, France, &c.*~~

~~*The four great determining facts in regard to the climate of Kurope are these: its northern borders are within the Arctic circle ; in the south its most southern points are 9 degrees of latitude from the tropic of Cancer; to the east extends for 5000 miles the continuous land surface of Asia ; to the west lie the waters of the Atlantic. Of minor but by uo means small importance are the presence of the Medi- terranean along the south, and the peculiar character of the African continent. To the ameliorating influence of the*~~

~~*_1See "Ueber die Bessarabischen Salzseen," in 7. fir Hrd. zu Berlin, 1859.*~~

~~*ocean must be ascribed the main features that distinguish the climate from that of the corresponding portions of Asia, and assimilate it so largely to the insular type. Like other great masses of water, the Atlantic is less exposed to rapid thermometric oscillations than the surface of the land, and its contiguity tends to produce a similar stability. Slowly but continually it is surrendering the heat which it has gathered in the regions of the sun, Though no problem of physical geography is more keenly debated than the method by which the heat is conveyed and distributed, the fact is ad- mitted on all hands that such conveyance and distribution does take place. Part of the work is done directly by means of currents, part indirectly by means of winds. The — questions in dispute are mainly — what are the currents, how are they produced, and what is the area of their individual influence? While one physicist ascribes all the credit to the Gulf Stream, another argues that the Gulf Stream has spent both its impetus and its heat long before it approaches the European seas, and that its contributions, if there be any at all, are altogether infinitesimal. Be that as it may, the influence of the ocean as a whole is easily verified ; a glance at a map with isothermal lines at once indicates its extent. The line, for instance, of 36° of mean annual temperature, which in the east of the continent passes near Orenburg, reaches as far*~~

~~*north as 73° in the sea between Iceland and Norway. As the complement to this stands the fact that the temperature of the East Spitzbergen Sea is still so high that no true polar ice finds its way further south than 75° N. lat., while on the American coast it is carried down to 36° N. lat. In other words, if the European conditions were the same as the American, instead of the polar ice never being seen at the North Cape, it would come sailing down past the straits of Gibraltar.?*~~

~~*As regards its rainfall Europe belongs in the main to Rainfall.*~~

~~*the zone which is characterized by irregularity of seasonal distribution ; its southern portions to the sub-tropical zone distinguished by the dryness of its summers. The line of demarcation runs at a little distance to the north of the Spanish coast of the Bay of Biscay, continues along the northern slope of the Pyrenees, turns north-eastwards to the neighbourhood of Valence on the Rhone, curves south- ward to Genoa, follows the line of the Northern Apennines, strikes across the Adriatic from Rimini to the neighbourhood of Zara, and proceeds by way of Seraievo, Novi-Bazar, and Sofia to the coast of the Black Sea, south of Zozopoli. Within the sub-tropical zone the maximum rain- fall occurs during winter in the south of Spain and Italy ; during autumn and spring in central and northern Spain, the south of France, and northern and central Italy. In the zone of irregular distribution Scotland, Ireland, and western England have tlicir maximum in winter; western France, eastern England, the coast regions of the Low Countries and Denmark, and the greater proportion of Nor- way have theirs in the autumn; while in eastern France, the German Empire, Austria, Hungary, Russia, and Sweden it falls in summer. The general conditions that determine the quantity of rain in a given district are well known,—the height and direction of the mountains, proximity to the coast, and so on, As most of our rain is brought by south- west and west winds, the western parts of the continent have on the whole a heavier rainfall than the eastern ; though to the south of the Alps and the Pyrenees the relief of the peninsulas, and the presence of such a large secon- dary reservoir of evaporation as the Mediterranean, produce great irregularities. The following statistics show the in- fluence of a western position :— fe eg el 2 See Petermann's*~~

~~*Mittheilungen, 1877, p. 24, and the works of | Carpenter, Croll, Dove, and Buchan, Vill. — 87*~~

~~*Winds.*~~

~~*690*~~

~~*West. a Inches. East —— Inches. Galway …... 129°5 50°9 || Dublin…... 74:2 29°2 SIR) oseeonpor VAST ERs: 101°4 || Aberdeen ..| 74°8 29°4 Penzance….| 105°4 42°6 || London…..) 62°4 24°5 Bergen …... 225°8 88°8 || Christiania.) 53°7 211 Gothenburg.| 827 32°4 || Stockholm.) 4071 157 Piaeum …... 74°8 20°4 || Liibeek…... 57°0 22°4*~~

~~*The greatest maxima of rainfall are registered at Stye-Pass in the west of England, 189‘49 inches or 481-2 centimetres, and at Seathwaite, 152-14 inches or 386-7 centimetres. Next comes Glencroe in Argyllshire, with 128°60 inches or 326-4 centimetres. The Venetian and Lombard Alps furnish such maxima as Tolmezzo 95°9 inches or 243°6 centimetres, and Sta Maria 97:7 inches or 248°3 centimetres ; and in general it may be said that the rainfall exceeds 40 inches or 100 centimetres along the whole line of the Alps from Chambery to the neighbourhood of Vienna in the east, and to the sea-coast in the south, down the central ridge of the Apennines to the latitude of Gaeta, along the line of the Balkans, in the Dalmatian, Montenegrine, and Albanian highlands, all round the north and west of Spain and Portugal from Cape Roca to the eastern end of the Pyrenees, in a large proportion of Ireland, Scotland, and Western England, and throughout nearly the whole of Norway. The plateaus are usually well watered, though their maxima are much below the maxima of the mountains; but the great Iberian plateaus are an exception to the rule. The rainfall of Salamanca is only 9°4 inches or 24:0 centimetres, and that of Albacete 10°3 inches or 26-3 centimetres—a fact which is to be aseribed partly to the exhaustion of the rain-clouds by the mountains of Galicia and Portugal, and partly to the treeless condition of the table-land itself. The average throughout Sweden and the greater part of Russia, in the Hungarian plain, the northern half of Bohemia, and the district of Germany from Halle to Dantzic, ranges from 40 to 55 centimetres or 15-7 to 21°6 inches. The lower part of the basin of the Dnieper, the whole of the basin of the Don, and the country watered by*~~

~~the middle division of the Volga receive no more than from 25 to 40 centimetres or 9‘8 to 15-7 inches ; while the great Aralo-Caspian depression, including about 100 miles of the Lower Volga, is an almost rainless region,!~~

~~In western Europe by far the most prevalent wind is the S.W. or W.S.W. It represents 25 per cent. of the annual total ; while the N. is only 6 per cent., the N.E. 8, the E. 9, the S. 13, the W. 17, andthe N.W. 11. Of the summer total it represents 22 per cent., while the N. is 9, N.E. 8, E. 7,S.E. 7, W. 21, and N.W. 17. In south- eastern Europe, on the other hand, the prevailing winds are from the N. aud E.—+the E. having the preponderance in winter and autumn.? Of local winds the most remark- able are the Fohn, in the Alps, distinguished for its warmth and dryness; the Rothenthurm wind of Transylvania, which has similar characteristics ; the boro of the Upper Adriatic, so noticeable for its violence; the mistral of southern France; the Etesian winds of the Mediterranean; and the sirocco, which proves so destructive to the southern vege- tation. Though it is only at comparatively rare intervals that the winds attain the development of a hurricane, the destruction of life and property which they occasion, both by sea and land, is on the aggregate of no small moment. About six or seven storms from the west pass’ over the continent every winter, usually appearing later in the ros a Sta Kriimmel’s papers and map in Zéschr. fir Erdkunde zu~~

~~TN as quoted by Wojeikof, Die Atmosphirische Circula-~~

~~HUROPE~~

~~southern districts, such as Switzerland or the Adriatic, than in the northern districts, as Scotland and Denmark. As instances of the exceptional strength which is sometimes displayed, it may be mentioned that in April 1800 men and cattle were actually lifted from the ground by the force of the storm, and in November of the same year about 200,600 trees were blown down in the Harz mountains alone.~~

~~The snow-line is subject, as is well known, to great local Snow variations. In the western and central Alps it lies about 8860 line. feet above the sea, and in the eastern Alps on an average about 330 feet higher. In~~

~~exceptional instances, of course, the snow disappears at a much greater altitude, and even such summits as the Jungfrau (13,671 feet), the Strahlhorn (13,750), and the Chaberton are occasionally stripped completely bare. The whole range of the Pyrenees, where the line usually lies about 8950 feet on the north side and. about 10,000 on the south, is sometimes in the same con- dition. In Norway, towards the North Cape, the snow-line is 2360 feet, in the island of Seiland about 3200, on Sulitjelma about 3970, on Dovre 5540, on Jotune 4910, on Sululand 5300, and at Folgefonden 4800,—a difference of from 400 to 1000 feet being observable between the eastern and western side of the peninsula, mainly due to the more abundant precipitation on the latter. On the western side of the Caucasus the mean elevation is 11,700 feet, on the eastern 14,100. There are no nevados in the Urals, though some of the summits exceed 5000 feet in altitude. The Alps and the Scandinavian mountains are the only ranges that possess a fully developed glacier system, but both the Pyrenees and the Caucasus have individual specimens of considerable extent. The most important of the Pyrenean group are the Maladetta, the Cabrioules, the Mont Perdu, the Bréche de Roland, the Vignemale, and the Néouville glaciers.~~

~~The principal botanical regions of Europe have already Botany. been indicated in the article Disrrrpurion. According to Schouw's nomenclature, the Mediterranean countries belong to the region of Labiatee and Caryophyllace ; the countries of northern Europe, about as far as the neighbourhood of the Arctic circle, to the region of Umbelliferee and Cruciferee ; and the small remaining portion to the region of the Saxi- frages and Mosses. The varying relief of the continent, and the consequent variety of climatic conditions, give rise to many infractions of this general rule,—the most remark- able being furnished by the Alps, which are high enough to have a large arctic area, and by the steppes of Russia, which, as is well known, also afford a peculiar environment.3 The Arctic region, whether in the Alps or elsewhere, is distinguished by the shortness of its period of vegetation and thie smallnumber of its annual plants; the north-European region has a long period of vegetation and a regular winter rest ; the Mediterranean region has a long period of vernal growth, a protracted summer siesta, a short period of autumnal growth, and a winter rest varying greatly according to~~

~~*locality ; and the steppe region has a short period of ex- uberant vernal growth, limited on the one hand by a severe winter, and on the other by a parching summer. The nearest approach to tropical conditions is made by the south of Spain. In the Vega of Murcia there is no set time to sow and time to reap; every month brings its fruit, and spring and autumn keep pleasant fellowship throughout the year. The ground is no sooner cleared of its crop than it is again under the plough, and within a few weeks it is green with another blade.**~~

~~*No exact statement can be given in regard to the number*~~

~~*3 Cf. Grisebach, " Die Vegetationsgebiete der Erde" (with map), in Petermann's Afittheilungen, 1866. :*~~

~~*4 Of. Brehm, " Zur Zoologischen Geographie Spaniens," in Zéschr. fir Erdkunde zu Berlin, 1858.*~~

~~*UO RLO Pee*~~

~~*of genera and species represented in the European floras. Several districts have only been partially explored by the botanist ; he not unfrequently finds it difficult to decide whether a given plant has a right to be admitted into his lists ; and he is naturally more interested in estimating the comparative richness of his scientific regions than of such conventional areas as the continents. Hinds, reckoning all known epecies of plants at 134,000, allows 11,200 to Europe; while Friedrich Nyman, in his Sylloge Flore Europe, 1854-1855, gives 1115 genera and 9738 species*~~

~~*691*~~

~~*frequent still. The plants of the higher regions are often carried down by the rivers, and effect a permanent settle- ment in the plains; and from time to time a foreign army leaves the seeds of a foreign flora on its camping-ground. Thus the Campanula pusilla, for example, has floated down from the Alps to Strasburg, and the Bunias orventalrs has grown in the Bois de Boulogne since the Cossacks were there in 1815. There is a limit of course to such introduc- tions and immigrations: of plants as of men it is equally true non omnes omnia possunt.*~~

~~*according to Fries's classification, and assigns 883 genera and 8104 species to the dicotyledons, 206 genera and 1544 species to the monocotyledons, and 26 genera and 90*~~

~~*The most important economical position is held by the Culti- cereals. Wheat is most extensively cultivated in Russia, vated Austria, the Danubian principalities, France, England, and P/@™*-*~~

~~*species to the acotyledons. In all probability the numbers, especially of the species, are below the truth. The total number of so-called useful plunts cultivated in European gardens is stated by Professor Géppert at from 2400 to 2500; but a large proportion of these are mere exotics. The extent, indeed, to which this is the case, even with many species of wide distribution, is one of the most strik- ing facts in botanical geography. The vine, the olive, the fig tree, and the mulberry were not improbably brought from Syria or Asia Minor by the Greeks ; the Arabians in- troduced the cotton plant ; the walnut and the peach are originally from Persia, the apricot from Armenia, and the sugar-cane and the orange from China, The leek and the onion, the mustard plant and the cumin, the laurel and the myrtle, are all Asiatic. For the pomegranate we are probably indebted to the Phcenicians, and the quince still bears the name which it received from the town of Cydonia in Crete. The cypress is a native of the neighbourhood of Herat, the plane tree of the Taurus, the chestnut possibly of Armenia. lLucullus, the conqueror of Mithradates, brought the first cherry-tree to Europe; and some less famous Roman of the first century after Christ was the in- troducer of the pistachio. Maize, tobacco, and the potato are well known to be of American origin, and the same is the case with the agave and the opuntia, two of the most char- acteristic plants of the Mediterranean region. The scarlet oak was brought from North America to England in 1691; the cedar of Lebanon was first planted in British soil in 1683; and among recent additions are the Douglas pine from the Rocky Mountains, the deodara from the Hima- layas, the Wellingtonia gigantea from California, and the Eucalyptus Globulus from Australia. The last is being planted in thousands in southern Europe, and has produced a greater sensation than perhaps any other botanical stranger. It would be easy to continue the list to an indefinite ex- tent, and it would require to be supplemented by a list of*~~

~~*floral additions that have taken place within historic time without the intentional intervention of mav. This second class is also a numerous and continually increasing one.! In the neighbourhood of Port Juvenal, near Montpellier, 487 exotics from America, Asia, Australia, and New Zea-land were collected by Godron, and of these 52 species were new to science. The Anacharis Alsinastrum or Hlodea canadensis,? from Canada, now luxuriates in the rivers of England and Prussia, where it was quite unknown about 1850; and the Hriocaulon septangulare has found a new home in the streams of Ireland. In the former instance the rapid diffusion is all the more remarkable as the plant is dicecious, and only one sex has reached Europe. It will be readily understood that if the introduction of new species into the continent is of frequent occurrence, the migration of indigenous species from district to district must be more ee*~~

~~*1 ee Zeyss, Versuch einer Geschichte der Pflanzen-Wanderung ; Blyth, Essay on Immigration of the Norwegian Flora during alternat- ing Rainy and Dry Periods, 1876 ; Robert Brown, in Geographical Magazine, 1874.*~~

~~*2 See K. Bolle, in Zeitschrift fir Erdk. zu Berlin, 1865.*~~

~~*Germany. The parallel of 57° or 58° may be taken as its northern limit, though it is grown as far north as 65°, and is found to ripen in the island of Dyro in 69° 5'. Spelt (Triticum Spelta) is mainly cultivated in south-western Germany, Switzerland, and Belgium. Barley is cultivated in West Finmark as far as 70°, and is part of the usual crop in all countries of the continent. Oats are more frequent in the central and northern regions; their practical polar limit is 69° 28', though they lave been known to ripen at Hammerfest in 70° 37'. Rye is an important crop in nearly all the great grain-growing countries, but it is especially in favour in the east and north; its northern limit is between 69° and 70°. Maize has been grown in 63° 15', reaches its practical limit in 59° 55', and is exten- sively cultivated only in the southern parts of the continent. Sorgho (Sorghum saccharatum) from China and a few other foreign cereals have been successfully introduced, but are hardly anything more than agricultural curiosities. The next place belongs to the potato, which has spread over an enormous area in central and northern Europe. It has been grown as*~~

~~*far north as the island of Magero in 71° 7'N. lat., or about four miles 8.E. of the North Cape. The greatest producers are Germany, Belgium, Sweden, the Netherlands, Norway, and Switzerland. A considerable variety of legu- minous plants are grown in Europe either for their fruit or forage—beans, pease, lupines, clover, lucerne, sainfoin, &e. The common pea (Pisum arvense) and the common bean (Vicia Faba) have their northern limits respectively at 64° 41' and 67°17'. A species of lupine (Lupinus linifolius) furnishes a substitute for coffee both in Norway and Tyrol. The vine can be grown without protection in southern Scandinavia, and has been known to ripen its grapes in the open air at Christiansund in 63° 7'; but its cultivation is of no importance north of 474° on the Atlantic coast, 503° on the Rhine, and from 50° to 52° in Russia. The following is the average wine-production of the several countries :—France, 42,000,000 hectolitres (or 924,000,000 gallons) ; Italy, 30,300,000 ; Austria-Hungary 23,000,000; Spain, 20,000,000; Germany, 4,440,500 ; Switzerland, 1,155,000; Greece, 1,150,000; Roumania, 1,000,000; Russia, 614,000. A special Greek variety of vine is the source of the currants of commerce ; it is culti- vated in the Peloponnesus, Cephalonia, Zante, Ithaca, and Santa Maura, and yields an annual average export of 128,000,000 ib. The olive, with its double crop, is one of the principal objects of cultivation in Italy, Spain, and Greece, and is not without its importance in Portugal, Turkey, and southern Austria, The average total of the oil harvest in these countries amounts to about 140,000,000 gallons; and of this Italy alone produces about 66,000,000.*~~

~~*Besides the turnips and other roots which furnish so much of the winter-fodder required by the northern farmer, the beet holds an important economic position in central Europe as a producer of sugar. Tobacco is extensively grown from Sicily to Sweden, but its cultivation is forbid- den in England, Spain, and San Marino, and in Austria it is astate monopoly. Its northern limit is about 63° 26". It*~~

~~*receives special attention in Turkey, Greece, Russia, Germany, France, and Switzerland. Hemp and flax have a very wide distribution, the former*~~

~~*furnishing a valuable export to Archangel in the north and to Italy in the south. Among all European countries Russia is the greatest producer: during their church fasts her vast popu- lation make an enormous consumption of hemp oil. Hop- growing is hardly known in the south, but forms an important industry in England, Austria, Germany, and Belgium. The plant grows wild in Norway as far north as 64° 12'... Among the exotics exclusively cultivated in the south are the sugar-cane, the cotton-plant, and rice. The first, which is found in Spain and Sicily, is of little practical moment; the second holds a secondary position in Turkey and Greece; and the third is pretty extensively grown in special districts of Italy, more particularly in the valley of the Po. Of the vast number of fruit trees which flourish in different parts of the continent only a few cin be nientioned. Their produce furnishes articles of export to Austria-Hungary, Germany, France, Belgium, Italy, and Spain. In Sardinia the acorn of the Quercus Ballota is still used as food, and in Italy, France, and Austria the chestnut is of very common consumption. In the Mediterranean region the prevailing forms—which the Germans conveniently sum together in the expression Siid- friichte, or southern fruits—are the orange, the citron, the almond, the pomegranate, the fig, and tle carob-tree. The importance of these fruits to Italy and Spain is too well known to require more than passing mention. Sicily, which was one of the great granaries of the Roman empire, is now almost a continuous orchard. In recent years a new kind of pistachio—the cacahuetes, or mani—has been culti- vated in Spain, and its fruit extensively exported. The palm trees have a very limited range: the date palm (Phenix dactylifera) ripens only in southern Spain with careful culture; the dwarf palm (Chamerops humilis) forms thickets along the Spanish coast and in Sicily, and appears less frequently in southern Italy and Greece.*~~

~~*Such are the main economic plants of Europe; but the list might be indefinitely extended if we were to include all*~~

~~*EUROPE*~~

~~*the plants which enter into the flora cibaria of the various regions—from the caper-bush of the south to the Poly- gonum viviparum and Oxyria reniformis consumed by the Laplanders in the north.)*~~

~~*When the Aryan peoples began their immigration Forests,*~~

~~*into Europe a large part of the surface must have been covered with primeval forest; for even after long centuries of human occupation the Roman conquerors found vast regions where the axe had made no lasting impression. The account given by Julius Cesar of the Sylva Hercynia is well known : it extended, he tells us, for sixty days' journey from Helvetia eastward, and it probably included what are now called the Schwarzwald, the Odenwald, the Spessart, the Rhon, the Thiiringerwald, the Harz, the Fichtelgebirge, the Erzgebirge, and the Riesengebirge. Since then the progress of population has subjected many thousands of square miles to the plough, and in some parts of the continent it is only where the ground is too sterile or too steep that the trees have been allowed to retain possession. The consumption of timber has of necessity been enormous, more especially on account of the climatic condition of the continent and the maritime activity of a large part of its inhabitants. To the dweller in the warmer regions of the earth the chief value of a tree is not unfre-quently its shade; by the European its worth is as often estimated by the quantity of heat it will yield on his hearth. Several countries, where the destruction has been most reck- less, have been obliged to take systematic measures to con- trol the exploitation and secure the replantation of ex-hausted areas.? To this they have been constrained not only by lack of timber and fuel, but also by the prejudicial effects exerted on the climate and the irrigation of the country by the denudation of the high grounds. But even now, on the whole, Europe is well wooded, and two or threo countries find an extensive source of wealth in the export of timber and other forest productions, such as turpentine, tar, charcoal, bark, bast, and potash.*~~

~~*According to the calculations of A. Bernhardt,' the following table gives an approximate view of the forest*~~

~~*areas in the several countries :—*~~

~~*Proportion per Proportion per Total Arca. Forest Area. Head of Total Ifead of Forest*~~

~~Population. Area, Area, Tleetares. Aeres. Heetares. Acres. Heetares.| Acres. |Ileetares.| Aeres, GEECCE! vaecicinesa esses 5,010,000 12,380,411 701,500 1,733,504 | 1,350,000 (1863) 3357/ 9°1 O52 1:28 HUB GW. o. dosslen senees 52,747,460 130,346,358 | 12,660,000 | 31,284,632 | 18,000,000 2°9 Aal 0°70 1-72 tales wc seamen cs eceseee 29,407,546 72,670,163 4,220,773 | 10,480,120 | 26,300,000 1:18 2°9 0°17 0°42 iS) 0.2100 a angencanee scnence 49,983,160 128,515,386 | 10,186,045 | 25,171,148 | 15,673,536 (1860) 3°18 7°85 | 0°65 1°60 Portugal……..0… w| 9,277,610 22,926,273 463,880 | 1,146,312 | 4,188,410 (1864)| 2°21) 5°46 O-11 | 0°27 Austria-Hungary …| 62,254,000 153,838,349 | 18,343,810 | 45,330,122 | 35,672,078 (1868)| 1°70 4°90 | 0°514| 1:27 Germanys…..- seeecn 54,102,769 133,695,516 13,924,529 34,409,460 | 40,089,170 (1867) 1°30 3°21 0°35 0°86 Switzerland…….. 4,140,412 10,231,537 724,572 1,790,518 2,670,000 (1866) 1°55 3°83 Oni 0°66 I UENIVES) Soupanonanoenodc 52,789,874 130,451,169 8,353,238 20,642,020 | 36,000,000 (1871) 1°44 38°55 0:23 0°56 Belg mimiges oc… se 2,945,539 7,278,839 313,096 773,704 | 4,829,320 (1866) 0°60 1:48 | 0°065} 0°16 Netherlands …….. 8,545,313 8,760,964 248,172 613,267 | 3,852,028 (1869) 0°92 2°29 | 0°06 0°14 Great Britain…….. 31,566,392 78,004,973 1,262,656 8,120,199 | 35,500,000 (1871) 1:07 2°64 0°04 aia | MTSE hcapapeeneooroonoc 546,657,704 | 1,350,867,718 | 169,500,000 | 418,858,230 | 69,000,000 (1871) 7°92 | 19°5 2°45 6°05 SWEGEM. ….cceeceeseees 44,150,700 109,102,560 12,812,800 31,662,222 4,158,000 (1869) | 10°5 25‘9 3°08 761 NGBWAY 5.5 .sincespisniiess 31,659,500 78,235,056 | 19,185,657 | 47,410,444 | 1,701,478 (1865)| 18°6 45°9 | 112 27°6 Deniers asics saescces 3,815,658 9,429,025 228,939 565,740 | 1,783,565 (1870) Diallsy Seo Leow, 0°29~~

~~The average proportion for all Europe being rather more than 25 per cent., four countries rise considerably higher in the scale: viz., Norway 66, Russia 31, Austria-Hungary 295, and Sweden 29:02 ; and the others rank as follows :— Germany' 25°7, Turkey 24 (2), Spain 20°38, Switzerland 17°5, France 15-8, Italy 14°39, Greece 14, Belgium 10°6, Netherlands 7, Denmark 6, Portugal 5, and Great Britain 4. Other statisticians rate the proportion for the continent at nearly a third, and arrange the states in a somewhat different order.~~

~~*The Scandinavian countries have a large timber trade.*~~

~~*In Sweden and Norway the most usual trees are coniferous ; but in the former a certain number of birches, alders, and ash-trees are intermingled, and towards the south the oak and the beech occur. This last is the characteristic tree of Denmark ; though some other species, which were common*~~

~~*1Yor a popular account of the European floras see Henfrey's Vegetation of Europe, 1852 ; for fuller details the works of Grisebach, Parlatore, Ledebour, and Boissier; and for a table of the arctic limits of a large variety of plants Schiibeler's Phanzenwelt Norwegens. 2 J. C. Brown, Reboisement in France, 1876. | 3 See Zeitschrift fir Korst- und Jagdwesen, Berlin, 1872.*~~

~~*Zoology.*~~

~~*Manm- mals,*~~

~~*EUROPE*~~

~~*in the prehistoric period, are not without importance, and coniferous trees have been again introduced. The Russian forest area is mainly in tlie northern part of the country, but it is separated from the Arctic coast by a wide trecless belt. Towards the south there are no great stretches of woodland, and for the most part the only trees are found along the banks of the rivers. The Mennonites on the Sea of Azoff have formed plantations, and there are others in the land of the Don Cossacks. The fir-tree ig fonnd as far south as 48° N. between Novomovskovsk and Pavlograd in the government of Kharko#.1 The most widely distributed tree is the pine; and of the deciduous trees the most frequent are the birch, the aspen, and the oak. In the north of Russia alone the annual production of tar amounts to 297,000,000 ib. In Austria-Hungary there is still abundance of woed, especially in ihe Alps and the Car- pathians; but in some quarters, more particularly in Tran- sylvania, the most reckless destruction is allowed to take place. 'The principal trees are the pine, the fir, the beech, the oak, the larch, and the hornbeam; next come the ash, the elm, the maple, and the birch; and in the third place, the acacia, the*~~

~~*poplar, and the Gétterbuum. According to the Bulletin of the Geographical Society of Belgium, the value of the timber obtained on the lands of the Hungarian crown amounts annually to about £1,042,000. In Ger- many, the pine and fir are most frequent in the south, and the oak and birch in the west and south-west; while in the central district coniferous and deciduous trees are about equally common. Inno part of Europe are the forests under more judicious management. France is most indebted to the oak, the birch, the chestnut, the fir, and the pine; but they fail to satisfy the home consump- tion, The poplar gives a peculiar character to its southern landscapes, and the chestnut furnishes a valuable addition to its alimentary resources. Italy has a rich variety of types—the silver fir (Addes pectinata) and other conifers, the Quercus sessiliflora, the cork-tree, and other oaks, the chestnut, the sycamore, the mountain ash, the evergreen oak, It exports manna, which is obtained from the ash tree, galls, and turpentine. Switzerland not only supplics a great internal demand for timber, but is able to con- tribute to foreign markets. The common trees are for the most part the same as in Austria-Hungary. In Spain and Portugal the first rank as an economic factor belongs to the cork tree, which yields in the former country about £3,820,000 worth of bark for export, and gives employment to thousands of the population. The oak, the red birch, the chestnut, the cypress, the plane, and several conifers are also of importance. In Portugal the largest individual forest—the royal domain of Leiria—consists mainly of the Bordeaux pine.*~~

~~*According to the system proposed by Dr Sclater, and adopted by Mr Wallace, the most recent English writer on the distribution of animals, Europe belongs to the great Palearctic Region, which also includes the most part of the continent of Asia and a broad belt along the north of Africa, The northern and central portions of Europe con- stitute a special sub-region, distinguished as the '"Euro- pean" par excellence ; and the southern portions in con- junction with the African belt constitute the Mediterranean sub-region. The line of demarcation between these two is almost the same as that which separates the zone of sub- tropical rains from the zone of rain at all seasons of the year, the only important difference being that, while the Italian Alps and the Lombard plain belong meteorologi- cally to the north, they are zoologically assigned to*~~

~~*the south. According to Mr Wallace, the " European " sub- region contains two distinctive genera of mammals, the*~~

~~*1 See Wojeikof, Die Atmosphdrische Circulation, 1874.*~~

~~*Mygale or musk-rat and the Rupicapra or chamois, and its characteristic forms are the mole, the hedgeliog, the shrew, tlle badger, the bear, the wolf and the fox, the weasel, the otter, the hare and the rabbit, and the dormouse. In the Mediterranean sub-region a similar position is held by the Dama or fallow deer, the civet, the hyena, and the por- cupine. In former geological periods not only were the Quadrumana represented in Europe by several species, but one of those, the Dryopithecus, discovered in the Miocene formations, probably approached nearer to man than any of the existing anthropoids. At present the only species of the order in the continent is the MJacacus inuus, a little monkey about a foot and a half long, which disports itself about the rock of Gibraltar, but strangely enough has Asiatic rather than African aflinities. The cosmopolitan Cheiroptera or bats are well represented,—no fewer than thirty species of the family Vespertilionide alone being described. Terhaps the most common species throughont central Europe is the Vespertilio pipistrellus or ordinary British bat, but several others, as the Vespertilic discolor and the Vespertilio limnophilus, have a wide range. Of the genus Sorex among the Insectivora there are at least ten species, the Sorex tetragonurus or common shrew inhabiting nearly every country in the continent. An Italian species, Sorex etruscus or Crocidura etrusca, is re- markable as the smallest of all known quadrupeds. Besides the Mygale muscovitica, already mentioned as peculiar to the European sub-region, there is another species, the Mygale pyrenaica. The common hedgehog (Lrinaceus europeus) is universally distributed; and a smaller species, FE. auritus, is found in the province of Astrakhan. The ordinary English mole, Z'alpa europea, is unknown in Ireland, and in southern Italy gives place to the Talpa ceca. There are comparatively few of the larger members of the Carnivora, and their domain is continually being diminished. The brown bear, or Ursus arctus, is still found in the Pyrenees, here and there in the Alps, in the Carpa- thians, and the*~~

~~*Scandinavian mountains; and his polar cousin, the Ursus maritimus, is met with along the arctic coasts. 'To the general distribution of the badger tlicre appears to be no exception. 'The glutton is for the most part confined to the forest regions of the countries that border the Arctic Ocean. The genus J/ustela is repre- sented, not only by the polecat and the weasel, but by the martin, the pine-martin, and the ermine, all of which are pretty familiar in most of the sub-region, though it is only in the colder countrics that their value as fur-bearers is developed. The Jlustela boccumela or honey-weasel appears to be confined to Sardinia; and it is questionable if the ferret, Mustela furo, introduced by man from Africa, exists in the wild condition. An important place in the fauna of Europe is still held by the wolf and the fox, the former being from its numbers the most formidable of man's feral antagonists. It will be a long time ere the more mountainous countries of the Continent can boust, like Britain and Ireland, that their last wolf is killed, and the " tabunchiks" or horse-herds of Russia will probably for many generations have to renew their annual battles with the famished packs. It is indeed asserted that since the abolition of serfdom the number of wolves has considerably increased, since the peasants are no longer obliged, as they formerly were by their landlords, to organize regular hunting expeditions. Besides the common or grey wolf, Canis lupus, of universal distribution, there is a black species, Canis lycaon, of less frequent occurrence. The jackal, Canis aureus, is found in southern Russia, Greece, and Turkey. There are at least four species of fox:—the Canis vulpes, well-known in western, central, and northern Europe; the Canes melanogaster, orblack-bellied fox, familiar in Italy, Sicily, and Sardinia; the Canis lagopus, arctic or blue fox, whose most popular name indicates its localities ;*~~

~~*and the Canis corsac, whose large packs make incursions from Tartary as far west as the Volga. — The civet is found in France and Spain. Of the five or six species which re- present the cat tribe, or genus Felis, even the most widely diffused, the Melis lynx or common lynx, is growing scarce in all except the more mountainous regions ; and the Felis borealis or northern lynx is familiar only in Norway and Sweden. In spite of the keen pursuit to which they are subjected the seals may still be seen, though in*~~

much diminished numbers, on the shores of all European seas, in-cluding the Baltic and the Caspian. The Caspian species belongs to the same genus (Callocephalus of Dr Gray) with those of the Arctic Ocean, which probably indicates that the connexion between these two habitats was more recent than tle counexion between the Caspian and the Mediterranean. It is doubtful whether we should include the walrus in the list of European fauna, though it is common about Spitzbergen, and occasionally appears pretty far south. The next animal which presents itself in the or- dinary system of classification is one of the most interesting, on account of its rapid disappearance before the march of civilization. The natural limits of the beaver were between 33° and 67° N. lat., and within that area it was formerly present in great numbers. On the coasts of the Black Sea, where it was abundant in the beginning of the Christian era, it is no longer to be found, and it is about 500 years since it disappeared from England. Its present habitats are mainly in Poland, Russia, Sweden, Finland, aud Lapland ; though it still built its dams in the Moldau, the Neubach, the Landsee, the Danube, and the Salzach in Austria, at least as late as 1866.1 It has left its mark on our geographical nomenclature in such names as Biberach, Bibersburg, and Beverley. The genus Arvicola, or water-vole, is represented by abont ten or eleven species, some of which are very widely distributed, while others are limited to very small areas—the Arvicola nivalis to the Alpine region, the Arvicola destructor to Italy. No small notoriety belongs to the members of the genus Zemmus on account of their strange migrations and the destructive effects of their visits. There are three or four species, the best known of which is the Lemmus norwegicus, or Norwegian lemming. Equally notorious for their destructive capabilities, and much more general in their distribution, are the rats and mice, which constitute the next natural order. The most prevalent species, the Afus decumanus, or common brown rat, was first observed in Europe in 1727, but since then has taken possession of country after country and expelled several weaker congeners. Nine species are described, including the well-known house mouse, or A/us musculus, and a special Iceland variety. The common hamsters, distinguished by their provident preparation for the winter, are found in Poland, Silesia, Belgium, and Alsace; and two cognate species occur in southern Russia. The same region pre- sents three species of Dipus, or jerboas. The next genus is almost peculiar to the " European"

~~*sub-region: Spalax typhlus, perhaps the only species, being confined to southern Russia, Hungary, Moldavia, Greece, and western Asia. The bobak (Arctomys bobak) inhabits Bukovina and the southern parts of Poland and Russia ; the marmot, Arctomys marmotta, is restricted to the snowy regions of the Alps ; and the Arctomys citillus is found in Austria, Bohemia, Poland, and South Russia. One species of squirrel, the Scvurus vul- garis, is familiar in all the wooded districts of Europe; and another, Sciurus alpinus, belongs to the Alps and the Pyrenees. The flying squirrel, Pleromys stbericus, is found in the forests of Lithuania, Lapland, and Finland. A considerable range is assigned to the dormouse, or Myoxus, in*~~

- ~~*See "Die Verbreitung des Bibers in Europa," in Petermann's AMittheilungen, 1856.*~~

~~*EUROPE*~~

~~*its three specles—Myorus glis, Myoxus nitela, and Myoxus avellanarius, of which the last is the most common. On the other hand, the porcupine, or Hystrix, is limited to Greece, Italy, and Spain. Hares and rabbits, which form the genus Lepus, have a very wide range, and present but little variety. The distribution of species, however, is peculiar,—the common rabbit, for example, being abundant in England, France, and Spain, but absent from Silesia, Galicia, and Russia, and a large part of Italy. The Ruminantia have suffered even more than the larger Carnivora from the encroachments of man; the aurochs, (Bos wrus) which at one time had a wide range, is now confined to Lithuania; the Bos scoticus exists in a half-tame condition in a few parks in England and Scot- land; the ibex or steinbock is growing scarce in the Alps and Carpathians; and the musmon or wild sheep is only to be met with in Sardinia and Corsica, part of Spain, and some of the Greek islands. The chamois, however, is still fairly common in the Alps of Switzerland, France, and Germany, in the Apennines and the Carpathians, and also in Greece. The only proper antelope, Antilope saga, occurs but rarely in the country to the north of the Black Sea. Fallow deer are found wild in Spain and Sardinia, but elsewhere are protected by man. The elk is still to be met with in Lithuania, Russia, and Scandinavia; the red deer in Scotland,*~~

~~*Scandinavia, Germany, and Spain; and the roebuck (Cervus capreolus) in the Scottish HIgh- lands, the Apennines, the Carpathians, and the Sierra de Segura. Of the great Pachydermatous order, which has left such abundant remains of its hippopotami, elephants, and woolly rhinoceroses in our Pleistocene formations, the only representative in a feral condition is the wild boar, or Sus scrofa, which is found in various regions from Spain to the Caucasus, but does not venture north of the Baltic. The larger Cetacea are growing scarce in the European seas; but the common whale, Balena mysticetus, still comes as far south as the Mediterranean; and the sper- maceti and the rorqual are captured in the northern regions. The dolphins, grampuses, and porpoises are pretty coin- monly represented throughout the various seas, now by oue species now by another.*~~

~~*HOw rich the avifauna of the European continent really Birds.*~~

~~*is may be judged by consulting such noble monographs as those of Gould, Sharpe and Dresser, or Bree ; but it must be borne in mind that it is a variable quantity, and that no monographs can long represent the exact state of the case. The extinction or introduction of mammalian species is easily observed ; but the continual movements of the feathered tribes are less easily ascertained. This has been clearly shown by C. A. Westerland in his account of the geogra- phical distribution of the birds in Sweden and Norway. HIe gives a great many data which prove that southern species not unfrequently move northwards, and that there is a re- gular tendency of Asiatic and European birds to migrate to the west; while on the other hand it is well known that western winds bring American strangers to our shores. The Jfuscicapa albicollis has been denizened in Gothland for no more than thirty years; and the Alauda cristata, first observed in 1833, now regularly breeds in Scania. Lmberiza rustica, indigenous to Asia and north- eastern Europe, appeared at HIaparanda in 1821, and now spends its sumniers in Lapland. Similar facts might be quoted for country after country and district after district. The jackdaw began to build in Murcia in Spain about 1850, and it is now one of the commonest species; in Thuringia the magpie, once abundant, is growing rapidly scarce. Altogether, according to Degland and Gerbe's classification, there are 247 genera and 531 species more or less*~~

~~*belonging to the continent; but of these hardly oue or two are peculiarly its own. As characteristic of*~~

~~*Fishes.*~~

~~*EUR*~~

~~*his northern sub-region, Mr Wallace names the thrushes, warblers, rudlings, tits, pipits, wagtails, buntings, house- sparrows, linnets; and of the Mediterranean sub-region, the Luscineola, the Pyrophthalma (Curruca melanocephala of Degland), and the Bradyptetus or bouscarle (Cettia of Degland) among the Sylviide; Zelephonus among the shrikes; JZalcyon and Ceryle among the king-fishers ; the quail-like Z'wrniz among the Galline; and Gyps, Vultur, and Meophron among the vultures. The bearded vulture, or lammer-geier (Gypaetos barbatus), is the largest of European birds; it is found in gradually diminishing num- bers in the French and Swiss Alps, the Ligurian moun- tains, the Caucasus, and perhaps tlie Pyrenees. Vultur monachus or arrianus is common in Sardinia, the Pyrenees, and Bessarabia ; Veophron percnopterus in France, Switzer- land, Spain, Greece, and southern Russia. The golden eagle (Aquila chrysaetus), which is the largest in Europe, builds equally among the rocks of the Alps, the Pyrenees, and the Grampians, and on the treeless steppes of Russia. Next in size comes the imperial eagle, which belongs to the south of the continent ; and then follows a list of lesser eagles, hawks, buzzards, kites, &c., to the number of forty species more or less, the genus /'alco alone being represented by eleven. The owl family, Strigidz, counts ten species, noblest of which is Bubo maximus, the eagle-owl, or grand duc of the French, almost rivalling the golden eagle in size ; it is found not only in the French mountains, but in Switz- erland, Italy, Sicily, Bessarabia, and the Crimea. The passerine order is represented by a great variety of genera and species, many of which have a wide range, and are known by the most familiar names in all the countries of the continent. In direct economic importance the first place is held by the gallinaceous order, the Grallatores, and the Palmipedes, which furnish all the species that are distinguished as game, and a great many others that are largely used as food. A few of the smaller birds are tlius appropriated in special districts: the lark, for example, is caught in*~~

great numbers in the neighbourhood of Halle and Leipsic, and the blackbird shares a similar fate in Corsica.}

From its mountain-lakes to the surrounding ocean the waters of Europe are for the most part well stocked with fish, No complete summation has been made of the number of genera and species represented; but it is suggestive of no small variety to learn that thirty-five species have been found in the lakes of Tyrol alone, lying between 200 and 8000 feet above the level of the sea. A consider- able proportion of the genera are cosmopolitan, and a still greater number range over wide areas outside of Europe. As peculiar to his "European" sub-region, Mr Wallace mentions two genera of the perch family—the Aspro, and the Percarina of the Dniester. Among characteristic forms are the stickleback (Gasterosteus), found as far south as Italy; the pike (sox), which ranges from Lapland to Turkey; the Sclwrus of the Swiss lakes and German rivers; and several members of the carp family or Cyprinide, including the carp proper (Cyprinus), the roach, tench, bream, bleak, &c. Of much more practical importance are the Salmonide, among which the salmon holds the first place. This noble fish is found in all the rivers of the Atlantic versant as far south as the Loire, and especially in Scotland, Norway, and Iceland it proves an abundant source of wealth. In southern Russia, where the river- fisheries attain a development unknown in any other part of Europe, its place is supplied by the sturgeon, the sterlet, and the sevruga, and economically at least by several species belonging to the perch family, which hold an im- portant position in virtue of their abundance. The greatest

pt

1 Sce also Fritsch, Naturgeschichte der Vogel Europas.

sea fisheries of Europe are those of the German Ocean, from which England, Scotland, Norway, Holland, and France have long reaped magnificent harvests, and_in which Germany has more recently begun to share. The value of the sea fish exported from Britain, Norway, and Holland is about £4,000,000 per annum. It is needless to mention the

~~*names of the principal species—herring, cod, &c.; and the conger-eels of the Channel islands, the pil- chards of the Cornish coast, and the sardines of France are almost as familiarly known. In the Baltic there is great abundance of various smaller kinds of fish—more par- ticularly the sprat, the sardine, and several members of the perch family; and some of the Salmonide are of consider- able economic importance. No less than 300,000 tons of sardines have been caught in a single year at the mouth of the Dwina, and the Esthonians may almost be said to subsist on a fish which they name the "kilka." In the Mediterranean the tunny, the sardine, and the anchovy give existence to the most extensive fisheries,—the first passing in enormous shoals from the straits of Gibraltar eastward to the Black Sea, and skirting in its passage the coasts of Sardinia, Naples, and Sicily. The people of Comacchio on the Adriatic, to the number of 5000, are supported by the capture of the mullet, the eel, and the "aequadella," which enter their lagoons from the sea by a canal, and are prevented from returning by an ingenious system of sluices and water-gates. Among the minor animals of the European seas there are none except thie oyster that have the commercial importance of the trepang of the Eastern archipelago; but several species of shell- fish, urchins, aud crustaceans are extensively consumed. Oyster-beds are found on most of the Atlantic coasts, and the artificial culture of the species has recently received a great development, especially in France and England: the produce of Cancale and Granville in the bay of St Michel, of Essex and Kent, of Ostend in Belgium, and Bolslan in Sweden are in high repute. The sponge and the coral fisheries of the Mediterranean are both vigorously pursued, the former with most success in the AZgean, and the latter on the coasts of Sardinia, Corsica, and Andalusia.?*~~

~~*Though the reptiles as a class are represented by about Reptiles.*~~

~~*forty genera, the species are for the most part inconspi- cuous, and in no instance formidable. The three land tortoises are all confined to the south, and one of them has its only European habitat on the Caspian. There are as many fresh-water tortoises, but only one, Lmys lutaria, reaches as far north as Prussia. The turtle is principally caught in the Mediterranean ; the chameleon is peculiar to Spain; the gecko and the //emidactylus*~~

~~*verruculatus are confined to the southern regions; and the Phyllodactylus europeus has only been discovered in Sardinia. Stellio vulgaris, very common in Greece, is the only member of the large family of the Iguanide that exists in Europe. On the other hand, there is a great variety of lizards (Lacertidee and Chalcidic), and several are of wide distribution. The Gongylus ocellatus, or spotted skink, is found on the shores of the Mediterranean.*~~

~~*2 See Von Siebold, Die Siisswasserfische von Mitteleuropa, 1863.*~~

~~*Insects.*~~

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~~*sented by the common aud the esculent frog, the latter of which is absent only from the British Islands; the genus Alytes by A. obstetricans, which sets the example of the cnrious human custom of the cowvade; and the genus Hyla by HI. viridis, or the common tree-frog, whose sten- torian croak may be heard in every country of the continent. The salamanders and newts are represented by five genera: the genus Z'riton contains seven species, of which 7'riton cristatus is most commonly distributed. They would bring the list of European reptiles toaclose if it were not for the presence in the caves of Carinthia and Carniola of the famous Proteus anguinus, or olm of the Germans, whose history is one of the most curious of those elucidated by moderu naturalists.)*~~

~~*Insects do not play so conspicuous and ostentatious a part in Europe as in some of the warmer regions of the globe ; it is only in spccial localities or exceptional seasons that their destructive or irritating influence becomes formid- able to man. There are not many towns like Fasano, where the inhabitants have in summer to leave their usual residences to the occupancy of flies; and if the European horticulturist has a hard battle to fight with caterpillars, ear. wigs, and wasps, he generally succeeds in gaining a fair crop afterall. Themosquito aud the tarantula arc the most venom- ous of those which attack the human species. The loeust, which spreads such alarm in Africa and Asia, appears in western Europe only at.intervals and in demoralized detach- ments ; though in the south of France it is found worth while to offer a reward for the collection of the*~~

~~*insects and their eggs. In Turkey, the Danubian principalities, and southern Russia it sometimes commits tremendous ravages ; and all efforts of the agricultural population are futile to check the advance of the countless swarms. The year 1860 was unhappily distinguished by the severity of the attack, But if insects play an inconspicuous, they by no means play a small part in the European regions, In the northern sub-region, among the characteristic Lepidoptera, are Parnassius, Aporia, Leucophasia, Colias, Argynnis, Vanessa » and of the Coleoptera, Carabide, Staphylinide, and Curculionede are especially abundant. The Mediter- ranean sub-region has two peculiar genera af butterflies—Thais and Doritis, and Anthocharis and Zegis are chayac- teristic; of the Coleoptera, Carabidae, Copride, Buprestide, Cantharide, and Curculionide are abundant. The three insects of greatest economic importance are the silk-moth, the bee, and the cantharis. The silk-worm, since its intro- duction in the 6th century, has become an important object of cultivation in Italy, Turkey, Greece, France, Spain, and Portugal, and has even proved remunerative in Prussia, Bavaria, and central Russia; and recently a new species from Japan, which feeds on the oak and not on the mnl- berry, has been successfully reared in the Baltic provinces. Bee-keeping is an extensive industry in Italy, France, Switzerland, Russia, and Sweden; and in Greece the tax on bees furnishes £1600 to the revenue. The cantharis is a native, not only of Spain, as its popular name of Spanish fly imports, but also of France, Germany, Italy, Hungary, and South Russia, and even oceurs in the south of England.*~~

~~*After the declaration of Mexican independence in 1820 the*~~

~~*cultivation of the cochineal insect was introduced into the Spanish province of Granada with such success that no less than 801,915 ib of raw cochineal was exported to England in 1850. The present generation has seen two very unwelcome additions to the number of European in- sects—the Phylloxera vastatrix and Doryphorus decem- Hineata or Colorado beetle, of which the former has com-*~~

~~*' 1 See Blasius, aturgeschichte der Stiugethiere Deutschlands und der angrenzenden Linder : Lord Clermeut, Guide to the Quadrupeds and*~~

~~*Reptiles of Europe, 1859 ; Schrieber, erpetologia Europa ; and Dr Sclater, in Nature, Sept. 1875.*~~

~~*EUVUEOPE*~~

~~*pletely ruined a large proportion of the French vineyards and the latter has threatened to play similar havoc with the potato crop.*~~

~~*The horse holds the first place among the domestic Domestic animals of Europe, and in no other region has it developed 2vimals.*~~

~~*a greater variety of type. Whether the present species is of European origin has not been quite decided; but remains of a similar form occur in the Pliocene and Pleistocene strata, and it is evident that the prehistoric peoples set the example of that hippophagy which scar- city of animal food has again introduced into Europe. Now at least there are no wild horses on the continent, though they are mentioned as late as the 8th century in a letter of Pope Gregory to Boniface.? Horse-breeding is a highly important industry in almost all countries, and in several, as Russia, France, Hungary, and Spain, the state gives it exceptional support. Those which have the greatest export trade are Russia, Denmark, Austria-Hungary, Ger- many, the Netherlands, and Belgium. The Hungarians are a specially horse-loving people, counting in 1871 no fewer than 141 horses to the thousand inhabitants, instead of 67 as in Austria. Almost every district of the con- tinent has a breed of its own: Russia reckons those of the Bashkirs, the Calmucks, the Don-Cossacks, the Estho- niaus, aud the Finlanders as among its best; France sets store by those of Flanders, Picardy, Normandy, Limousin, and Auvergne; Germany by those of Hanover, Oldenburg, and Mecklenburg, which indeed rank among the most powerful in the world; and Great Britain by those of Suffolk and Clydesdale. The English racers are famous throughout the world, and Iceland and the Shetland Islands are well known for their hardy breed of diminu- tive ponies. The ass and the mule are most abundant in the southern parts of the continent, more especially in Spain and Italy. In the one country they number about 2,320,000, and in the other about 1,000,000. The camel is not popularly considered a European animal; but it is reared in Russia in the provinces of Orenburg, Astrakhan, and Taurid, in Turkey on the Lower Danube, and iu Spain at*~~

~~*Madrid and Cadiz; and it has even been introduced into Tuscany. One of the strangest sights of southern Russia to a traveller fram the west is the huge ungainly creature yoked to what is practically a toy cart. A much more important beast of burden in eastern and southern Europe is the ox: the long lines of slow- moving wains in Roumania, for example, are not unlike what one would expect in Cape Colony. In western Europe it is mainly used for the plough or fattened for its flesh. The Netherlands, Denmark, Servia, Roumania, Turkey, Russia, Italy, Sweden, Spain, and Germany are all exporters of cattle; and all the other countries are more or less engaged in cattle-breeding for their own demands. It is estimated that there are about 100 distinct local varieties or breeds in Europe, and within the last hundred years an enormous advance has been made in the development and specialization of the finer types. The cows of Switzerland and of Guernsey may be taken as the two extremes in point of size, and the " Durhams" and ' Devonshires" of England as examples of the results of human supervision and control. The Dutch breed ranks very high in the production of milk. The buffalo is frequent in the south of Europe, more especially in Transylvania and Italy; in the former country the number is about 58,000, and in the latter about 40,000. Great attention is given to dairy-farming in Great Britain, France, Germany, Switzerland, Denmark, Austria, and part of Italy. Switzerland, the Netherlands, Austria, Denmark, Ireland, and Finland are exporters of cheese or*~~

~~*2Hehn, Culturpflanzen und Hausthiere, 1877.*~~

~~*Races.*~~

~~*EUR*~~

~~*butter, or both; Italy, though famous for the so-called Parmesan cheese, requires a large import, and the abun- dance of olive oil discourages the mauufacture of butter. Sheep are of immense economic value to most European countries, and form an important article of export for the Netherlands, Germany, Austria, Hungary, Russia, Italy, Portugal, Denmark, Servia, Roumania, and Sweden. The local varieties are even more numerous than in the case of the horned cattle, and the development of remarkable breeds quite as wonderful. In all the more*~~

~~mountainous countries the goat is abundant, especially in Spain, Italy, and Germany. The swine is distributed throughout the whole continent, but in no district does it take so ligh a place as in Servia, where there are no fewer than 1062 to~~

~~OPE 697~~

~~1000 inkabitants, a proportion which more than doubles the next highest, which is afforded by Luxembourg. Spain ranks third in the list, and has a large export of hams and sausages. In the rearing and management of poultry France is the first country in Europe, and has consequently a large surplus of both fowls and eggs. The latter pro- duce is also exported by Austria and Spain. In Pom- merania, Brandenburg, West Prussia, Mecklenburg, and Wiirtemberg, the breeding of geese has become a great source of wealth, and the town of Strasburg is famous all the world over for its pédtes des fovés gras.~~

~~The following tables show the distribution of the more important domestic animals in the principal couutries of Europe :—~~

~~To one sq. sq.~~

~~Year, Tlorses. kioeaatre: ere 2 | mi nee Cattle. eee Te : itis sie Ttaly …..sesseeeerreeeees 1868 1,196,128 4°0 10°3 44°6 8,489,125 11°8 30°5 130°2 (uonk Britain ……. 1874 | 2,226,739 9°6 24°8 84:9 6,125,491 26°6 68°8 233°6 Ireland ere teeniGneee 1874 525,770 6°2 16°0 97°2 4,118,113 48°9 126°6 761°0 USS NSUIS sires eiee etaiesistdsiee'e | 1870 | 16,160,000 3°0 iit 227°0 22,770,000 4-2 10°8 319°9 ee 1874 446,309 1:0 25 105-0 2,103,819 4°7 12:1 494°8 Norway ..cccccccccccccc} 1865 150,000 1°0 2°5 85°1 950,000 3-0 nel 588°8 IDyesnrincht 4S aonecoeaeeognod| 1871 316,570 8°3 21°4 177°4 1,288,898 32°2 83°3 133°9 German Empire…..... | 1878 3,352,231 6°2 16°0 81°6 15,776,702 29°2 75°5 384°2 Metherlands …….--- 1872 247,888 76 19°6 67°5 1,377,002 41°9 108°4 374°8 Belgium ……..000. 0000 1866 283,163 9°6 24°8 556 1,242,445 42,2 109°2 244°2 IMEC ae «cos csireviessneeels 1872 2,882, 851 54 13°9 79°8 11,284,414 pales} 551 312°6 BIOEUU PAL... .screeseceseees 1870 78,716 1:0 275 18°2 520,474 56 14°4 119°2 RPTHIM. 0.2 .ceecreeree veers 1865 680,373 4:5 11°6 sae 2,904,598 57~~

~~14:7 172°5 ANWISTHISIEL «sp pag pBRO SUB ABEOSe 1871 1,367,028 6°7 17°3 67°0 7,425,212 24°7 63°9 364°1 Hungary ……..-.-.0+ 1871 2,179,811 2°4 6°2 140°5 5,279,193 16‘3 42°2 340°4 SVG ZETI GMC! gecccenserers 1866 100,324 2°0 Bal 37°6 998,291 24:0 62°1 872°3 Grecces ….. cece eee see ceed 1867 98,938 1:0 2°5 67‘8 109, 904 20a 56~~

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~~E (0) ; ‘To one sq. Tol i 5~~

~~Year. | Sheep and Goats. ee on Oe. ” Gis Swine. sip: i. ae “4 Witiiec ib qe eneeene eecoepecaee 1868 8,674,527 29°3 75°8 823°7 1,574,582 58 15° 58°7 reatmoritarn..... <1. 1874 80,313,914 131°4 340°'1 1156°3 2,422, 832 10°5 yar 92°4 ine) 2180 | poaoanopesopeanene 1874 4,487,613 BET 136°4 820°0 1,096,494 13:0 3 202°6 TRGSER®, cagpsenesonnopoosese 1870 | 48,132,000 9°0 23°3 676‘3 9,800,000 1:8 137 °7~~

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~~German Empire…….. | 1873 | 24,999,406 46:2 119°6 608°8 7,124,088 11°6~~

~~Netherlands ……..+. | 1872 855, 265 26°0 67°3 232°8 820,129 1G}~~

~~Belgium …...c.0+—00es| 1866 586,097 19°0 491 115°2 632,301 9°7 UEATICE oe. ci ccensences 1872 | 24,589,647 19°9 51°5 681°1 5,877,231 S165 Portugal …….. s0+0+ | 1870 2,706,777 46°5 120°3 619°7 776,868 WOe Spain ….ccecceeeeeseereces, 1865 | 22,054,967 29°2 055 1310°0 4,264,817 8°4 /AWENINE gaoaneenbocadenho. | 1871 5,026,398 45°5 a 7 246°4 2,551,473 8°5 Hungary ….ceseeeeeeeee | 1871 | 15,076,997 16°7 43°2 972°1 572,951 ci Switzerland……..++++! 1866 447,001 46°5 120°3 167°4 304,428 7°4 (GORGES ao conpapnbessegadnon! 1867 2,539,538 10°8 27°9 1742°0 55,776 Gi~~

Ethnology is still in its infancy, painfully learning its first principles, and gradually discovering true methods of verifying its data and generalizing their teachings, There is such a thing as race; but we cannot be said to have attained to any single test or any combination of tests which does not leave our classifications more or less un- certain, We can ascertain whether the majority of a given people have dark hair or light, whether they are dolicho- cephalic, mesocephalic, or brachycephalic, or exhibit several varieties of skull; but it has still to be proved how far guch characteristics are permanent, and as permanent avail- able for our purpose. Europe in every square mile of its surface gives the lie to the supposition that consanguinity is implied by community of speech: Celts are equally eloquent in English and French; Slavonians equally enthu- siastic for the dignity of Deutschland or the glory of Greece.! There are, perhaps, only two peoples in Europe of whom we can be said to have anything like ethnological statistics,

Jews and the Gipsies; and in both cases it is due to

1 Compare ETHNOGRAPHY, +p. 621 of the present volume.

the fact that they have so long been treated as social or religious pariahs. It is easy to ascertain how many men in Europe use French as their mother-tongue; but we have no means, apart from historic evidence, which applies only to individual instances, of kmowing whether three generations back any man's progenitor was a Corsican, a German, or a Breton, And if there is one fact to which every new investigation gives additional emphasis it is this, that there is no nationality, and no individual component of a nationality, which can establish the purity of its blood. What to the superficial observer are the most homogeneous peoples turn out on closer examination to be only con- glomerates in which the elements are better assimilated. In Wiirtemberg, for example, as is shown by H. v. Holder, the so-called German population is composed of Romans, Vindelicians, Rhetiaus, Avars, Hungarians, Slaves, Swiss, Swedes and others introduced during the Thirty Years' War, Waldensians, Tyrolese, and Jews.? Still it is true (to Ma

~~2H. vy. Holder, Zusammenstellung der in Wiirttemberg vorkommen- den Schidelformen, 1876.~~

~~VIL — 88~~

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~~borrow another analogy from geology), that if all are more or less obviously conglomerates, the materials have pro- bably been derived for the most part from strata of the same formation. If the Frenchman is partly German, partly Celtic, German and Celt do not differ from each other more than limestone, marble, and chalk.~~

~~From recent researches it is now familiarly known that Furope had its human inhabitants in the Pleistocene period. They are distinguished by the name of the Paleolithic or Old Stone people, in contrast to a later population still in the same stage of civilization. Their remains have been dis- covered in England, Belgium, France, Germany, and Switzerland ; and some investigators are disposed to recog- nize two varieties, distinguished as the men of the caves and the men of the river-beds.1_ Having possibly entered Europe before the first glacial period, they were certainly there at the final transition to the present conditions of climate. They lived by hunting and fishing, and in general charac- teristics appear to have been similar to the Eskimo, with whom some are disposed to identify them. If this iden- tification be a mistake (and at best it is very problema- tical), they have left no distinct representatives behind them. What progress they had made in the arts, necessi- tated by their mode of life, may be in some measure esti- mated by the remarkable relics of their implements and weapons still recognizable; but there are no sufficient data to decide whether they were in astate of advance or decline ; the difference of finish in different specimens of the same handiwork may be due to different degrees of care or skill possessed by contemporaneous workmen. As far as can be judged, the continent of Europe again ceased for a time to be a human habitation; and when light breaks in once more it is found in possession apparently of two races both in the Stone stage of civilization, and known by the common name of the Neolithic or New Stone peoples. In the meantime the fauna of Europe had changed and become in the main what it stil] is. The chief point of interest attaching to~~

these Neolithians is how far the brachycephalic, and pre- sumably the older, variety is still traceable in our modern population.

There are several peoples, most of them of small numeri- cal importance, which are undoubtedly aliens from the commonwealth of the Aryan race now dominant through- out the greater part of the continent,—the Turks, the Magyars, the Finns, Esthonians, and Lapps, the Votiaks, and the Basques; and we know that in the Roman period of the historic epoch the Iberians, the Ligurians, and possibly the Etruscans and the Rheetians, occupied a similar position. The Turks and the Magyars are at once put out of the question by the fact that there is documentary evidence of their arrival in Europe long after the Christian era; and the dubiety which attaches to the affinity of the Etruscans and the Rheetians renders their classification im- practicable. The Votiaks nay be left out of account, from their almost Asiatic localization ; so that there only remain four actual and two historical peoples to be considered. Three of the four—the Finns, Esthonians, and the Lapps—may be bracketed together as Ugrians or Uralians, or under any other convenient name (though the Lapps may possibly be more distinct than this would make them), so that practically we have two actual and two historical. Arranged geographically, the Ugrians constitute a north- eastern or Baltic group ; and the Basques, the Iberians, and the Ligurians a southern or Mediterranean group. Of the Ligurians little further is certainly known than that in historic times they occupied the north-western slopes of the Apennines, or the modern Piedmont, and extended west

1

See, among other works,

D ki i" 7 ' L'homme fossile, awkin's Cave Hunting and Troyon's

HUROPE

to the mouth of the Rhone; but probable traces of their presence have been collected as far south as the mouth of the Tiber and as far north as the Loire or Liger. Of their language we are absolutely ignorant, and their classification is almost purely hypothetical. They evidently lost

~~*ground at a very early period from the encroachments of various peoples, and among others from the inroads of the Iberians, whom we have now to consider. This people is specially connected with the Spanish peninsula, which derived from them the popular name of Iberia; but they appear also to llave occupied Sardinia, Corsica, and Sicily, may possibly, as some maintain, have been one of the primitive elements of the population of Italy, and, according to a hint of Tacitus, probably extended as far north as Brittany. At the time of the Roman conquest of Spain they were already largely mingled with Celtic blood, a fact which was indicated by the name of Celtiberians. There is no reason to suppose that they have died out or been exterminated, and consequently it is presumably possible to discover them more or less distinctly among the mingled population of modern Spain. ere the Basques at once present them- selves, a peculiar people speaking a peculiar language, and occupying the very part of the country where from analogy we might expect to find the remains of an ancient race. In what respect do the Basques agree with our knowledge about the Iberians? The Iberians, as has just been stated, were no longer homogeneous at the time of the Roman con- quest; and the Basques, according to cranial data, exhibit an interfusion of blood: " they possess a moderate brachy- cephalism and a strongly marked dolichocephalism." The Iberians, however, were clearly distinguishable from the Celts; and the same is true of the Basques. The Iberians are described as of short stature, slight build, and dark complexion; and a similar account may be given of the Basques. The identification of the two peoples is con- sequently accepted by a large number of anthropologists ; but the unanimity is hardly so great in regard to their further identification with the Ugrians of the north-east. In favour of the generalization, there is a certain simi- larity of physical type, and the probability, as it appears to a large school of investigators, that the Finns and Esthonians are, like the Basques, the remains of a popu- lation which formerly extended to the south and west over a much wider area; against the generalization is the fact that no closer connexion lies between the Basque language and the Finnish than that they both belong to the agglu- tinative family, and it is quite as probable that the Ugrians have come in from the north and east at a com paratively modern period. If we adopt the bolder hypothesis in its full extent, and it is adopted by many investigators, the continent of Europe was originally inhabited by a small, swarthy, brachycephalic race,*~~

~~who were formerly represented in historic times by Iberians, Ligurians, and other less known peoples, and in modern times are still partially represented by the Basques, the Esthonians, and the Finns, who have retained their non- Aryan speech, and by smaller groups in England, Brittany, Prussia, and Spain, who have adopted the alien languages spoken in their vicinity. By some a still further identi- fication is ventured with the Berbers of North Africa ; and a few, as Hyde Clarke and Homalius d'Halloy, maintain that the so-called Aryan immigration was only in a com- paratively small degree an introduction of a new race, and ought rather to be viewed as the diffusion of a civilization. Whatever dispute, however, such ethnological innovators may raise, there can be no question as to the almost universal predominance of the Aryan influences in the historic times ; and though anything like chronology is for the most part out of the question, the general features of the great move- ment to which these influences are due can be stated with~~

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~~considerable certainty. Four great Aryan detachments are easily distinguished, and may for convenience be designated by the very imperfect and somewhat misleading names of the Greeco-Latin or Southern, the Celtic or Central, the Teutonic or Northern, and the Slavonic or North-Eastern. Whether the Southern or the Celtic was the first of the two to enter Europe is altogether unknown: one offshoot from a common stock may easily maintain a nomadic or semi- nomadic state for a longer time than another and a later off- shoot. The southern detachment was probably a succession of detachments,—the first represented, it may be, by the old progenitors of the Albanians and the so-called Pelasgic tribes, the second by the various tribes who settled in Italy, and the third by the Hellenic or Greek tribes. The Greeks at least appear to lave entered Europe by way of Asia Minor and the Archipelago, and the Italian tribes may have followed a similar route. A more northern line of march, or nomadic progress, was chosen by the Celts, of whose passage up the valley of the Danube we have a trace in the Boii, the Celtic people who have given their name to the now Germanized kingdom of Bavaria, If the opinion of Virchow, based on the presumed incorporation of ancient historical materials in the Ora Maritima of Avienus, be correct,~~

~~they reached southern Gaul and Spain about the 6th century B.c.t The Teutons or Germans began to be known to the Romans shortly before the Christian era, and in the 4th century a.p. pushed westward within the boundaries of the empire. The Slavonians have never advanced much beyond the Elbe in the north, but towards the south they extended in the course of the 9th and 10th centuries into Austria on the one hand and Greece on the other. Of the Semitic peoples, the Jews, which are now the most important, bave entered in successive detach ments, more in the fashion of ordinary immigrants; the Arabs, who contributed largely to the progress of European civilization, but have left little trace of their blood except in southern Spain, crossed into that country in 710. The settlement of the Hungarians dates from the 10th century, and that of the Ottoman Turks, the last great addition to the ethnological conglomerate of Europe, dates no further back than the 14th.~~

~~The following table, founded (as all such estimates are) mainly on linguistic and political data, is given by Dr Brachelli as an approximate survey of the numerical im- portance of the various peoples of Europe. A strictly ethnographical classification will probably be always im- possible, and certainly cannot be attained in the present state of scientific statistics. In many cases the possible error in the summation is very considerable: the Jews, for example, here given at 3,000,000, are reckoned at 3,226,858 in an interesting article in the Journal of the Society of Biblical Archeology, 1876,—2,647,036 of them being assigned to Russia.~~

~~CPR ME PATIOS 5.5 ae. vie ssaneveses Ya'esgegumuanians 94,980,000 Germans, Dutch, and Flemish……06 58,100,000 PEEMPALES icio'ss o/c slaaidinrlne uses ssiaieeeeabeneeeree reteene 28,800,000 Swedes, Norwegians, Danes, Icclanders 8,080,000~~

~~Greco-Latin peoples……. Soe a sonGea eae oee eau er 96,410,000 Erench and! WalloOns?....sccscsevessssserssucesee 37,000,000 GAINS. PTIMNATIS2 6… ccssceresesecescsosses 27,800,000 Spaniards and Portuguesc……..s.ceccseseees 20,800,000 Roumanians, Moldavians, Wallachs……. 8,030,000 Greeks and Lellenized Wallachians…….. 2,720,000 Rheetians or Ladinians,……..ccocessseereseess 60,000~~

~~SIA MOC [oe Ne sce cs npc ccienartanamdia ccaiamunenih 82,170,000~~

~~*Russians and Ruthenians……55,000,000 ; ee y IROMGS settee: sccscareecscvsscncuccse:steesesres 9,700,000 en ae Bohemians, Moravians, Slovaks….. 6,500,000 NMOTIOSY sate ceness scssenceseactencaes as «. 140,000 Croatians, Servians, Bosniaks 5,800,000 South Slavs Bulgarians ……..56. 3,800,000 Slovenians ….. 1,230,000 Carry forWard…….:…..0 273,560,000*~~

~~*1 See Virchow, ‘ Les peuples primitifs de ’ Europe,” in Za Revue Scient. de la France, 1874.*~~

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~~*Brought forward……0. 278,560,000 CeT ES 5 crepe eee eens Dols one neers s gieaas 4,100,000 Semele peawpbeme . «25.5 esc cnesvases cs erses se sbusgumonees 3,200,000 OW Steedttsctes steustessccoresucarcosesrasestesectece 3,000,000 Maltese, Moriscos, and ATabs……..000000-. 200,000 Lithwanians®, ...0 0 eaencce nee ee ee 2,800,000 BAN aT SM se ee eccns cece ccc eace eee ne eee 1,300,000 TBs pee cuanoeretenocon ianen aa.ccoseecockmandadous tobe 700,000 pS eestor acs ass ccna) thasgecaavun so ce-ccepeemeeneennn: 600,000 Circassians chase eee een acs eee 400,000 ATIMGIATS Pare ceca. cater cacarne eee cet err 260,000 Total of Aryanized populations……. 286,920,000 oN Ti pa oo: ee ee er 5,920,000 PRAMS OG IEE 5 vic coeceseceessesinestechisecnesssos 4,710,000 Total of Uralian population……4. 10,630,000 Ee OE TEES EOE. nn. anscyilasad. Saceesenvedeetedes 2,500,000 OSMAN ES est eesisessssstetesssensadens disessswvas ewes 1,200, 000 IMO en icyiesarissees. vciewaaesoassaeededsens o0 100,000 Total of Mongolians……. tetas os 00;000*~~

~~*Although language is no test of race, it is the best evi- Lan- dence for present or past community of social or political guage.*~~

~~*life; and nothing is better fitted to give a true impression of the position and relative importance of the peoples of Europe than a survey of their linguistic differences and affinities? The following table contains the names of the various languages which are still spoken on the Continent, as well as of those which, though now extinct, can be clearly traced in*~~

~~other forms. Two asterisks are employed to mark those which are emphatically dead languages, while one indicates those which have a kind of artificial life in ecclesiastical or literary usage.~~

~~I, ARYAN (Indo-Germanic, Indo-European, Celto-Germanic). 1, Inpic branch, represented DY ……..seeevereeseeee GIPSY dialects, 2. IRANIC branch, wa we (a) Ossetian.~~

~~" "~~

~~(6) Armenian,~~

~~3. HELLENIC branch, ,, syieeiietessecerratrsess) | 7G) nGMeeks~~

~~(0) Romaie.~~

~~(c) Neo-Iellenie, 4, IraLic branch, ns $ « *(a) Latin.~~

- ~~Oscan. **(c) Umbrian, &e. (ad) French. (e) Walloon. (f) Provengal. (g) Italian. (A) Ladin (Rumonsh, Rum- ansh, Rheto-Romance), (7) Spanish. (J) Portuguese. (4) Roumanian, (a) Irish. (b) Erse or Gaelic. (c) Manx. (d) Welsh. **(e) Cornish. (f) Low Breton. aasceaecenes **(@) Gothic. ' **(6) Norse or Old Norse. (c) Icelandic and Faroese, (d) Norwegian. (€) Swedish. (f) Danish. **(g) Saxon, Anglo-Saxon, or First English. (A) English. **(7) Old Saxon. (/) 'Platt-Deutsch German, © Dutch Netherlandish. (m) Frisic. (*t(n) Old HIgh German, (0) Middle lligl German. (p) New lligh or Literary German. *(a) Church Slavonic. (6) Russian. (c) Ruthenian, Rusniak, or Little-Russian, (dq) White Russian or Biclo- Russian. (ce) Bulgarian. (7) Servo-Croatian. (9) Slovenian, (i) Czech (Bohemian.) (7) Slovakian, (J) Polish. (k) Sorbian (Wendic, Lusa- tian.) *() Polabian.~~

~~COU Ualbatecdesseesece seraseseverecesesstecee(:~~

~~5. CrLT1c branch, represented by …….. Seceees A~~

~~6, TEuTONIC branch, represented by~~

~~*Scandinavian… sescccccc pteescssessnares*~~

~~*Low German ree Rtosssocscccorsemereeset or Low*~~

~~*LTigh GErMan..ercveseresoessavevovvvencens*~~

~~*Pee ecccccccre*~~

~~*7. SLAVONIC branch, represented by*~~

~~*South-Eastern*~~

~~*seer reece ecccccccrerecetes*~~

~~*Wiestetiztsrcssssccccccccesoasnsteertsaamteerss «*~~

- ~~*See on the whole subject Hovelacque's Science of Language, Latham's Nationazities of Europe, and the same author's Philology.*~~

~~*700*~~

~~*8, Lerric branch, represented DY…….ceseree **(q) Old Prussian, s oes a (6) Lettish. (c): Lithuanian. SE HOO EC ICOECLOCIOIOOL: **2(a) Old Dacian. |. UNATTACHED.....0ccercevesoeses oe (6) Albanian.*~~

~~*11, SEMITIC.*~~

~~*1, CANAANITIC branch, represented by …….. *(@) Hebrew. ; : E **(6). 'Phoenielan or Punic. 2, ABABIC branch, represented DY…….cccccs ** (a) Arabie.*~~

~~*&(6) Mosarabie. : ; (c) Maltese. ~ JIL. FINNO-TATARIC (Turanian, Uralo-Altaic, &c.) 1. SamoyepDIC branch or group, represented b*~~

~~*(a) Yurak.*~~

~~*(a) Finnish proper or Suonic. (6) Karelian.*~~

~~*(c) Tehudie.*~~

~~*(d) Vepsie.*~~

~~*(e) Votiek.*~~

~~*(f) Crewinian.*~~

~~*(g) Esthonian.*~~

~~*(a) Livonian.*~~

~~*(7) Lapponic.*~~

~~*(J) Tcheremissian.*~~

~~*(&) Mordvinian.*~~

~~*(1) Permian,*~~

~~*(m) Votiak.*~~

~~*(n) Siryenian.*~~

~~*(0) Magyar or Hungarian. (a) Kazak Khirghiz.*~~

~~*(6) Nogairie.*~~

~~*(c) Tchuvak.*~~

~~*(d) Turkish.*~~

~~*4, UNATTACHED .....csccccsccceresnccccsccccsccccsccsccercsoccccsssasens Basque.*~~

~~*From this conspectus it appears that there are still about 60 distinct languages spoken in Europe, without in- cluding Latin, Greek, Old Slavonic, and Hebrew, which are still used in literature or ecclesiastical liturgies. Besides, as we shall presently see, all those which are spoken over extensive territories, and some even which are confined within very narrow limits, are broken up into several dis- tinct dialects. Most of the*~~

~~*number, however, are destined to disappear within a comparatively short period, before the encroachments of the few which are especially favoured by political circumstances and literary culture. The process is rapidly going on, and everything tends to its acceleration. Some, indead, whose doom appeared almost sealed in the end of last century, have gathered fresh life and repulsed the intrusive language by which their existence was threatened ; and on others a temporary and melancholy restoration has been inflicted by the mistaken enthusiasm of a patriotic minority. English, French, German, Russian, Italian, and Spanish will probably for a long time share the real dominion of Europe ; Dutch and the Scandinavian tongues will maintain their ground, but they hardly give promise of expansion; Bohemian, Hungarian, and the South-Slavonic have made good their position; and Neo- Hellenic, under favouring circumstances, may get possession*~~

~~*of the territory of its nobler ancestor.*~~

~~*8. TURKISH or TATAR group, represented by..*~~

~~*Greek and Latin may fairly claim the first place in a historic sketch, on account of the immense and varied influence they have exerted, directly or indirectly, on the popular and literary language of all the prominent peoples of Europe. The former, which is preserved in what is at once the most perfect and the most multi- form of the older literatures of the world, was spoken wherever a Greek city was established in Asia, Europe, or Africa. It had several well-marked phonetic dialects:—the Molic, represented in Europe by the Beotian variety; the Doric, employed in Sparta and most of the other Peloponnesian states, as well as in other colonies of Sicily and Southern Italy; and the Ionic, which in the Attic dia- lect attained its noblest development, and became the principal literary form. A rude dialectof the Molian type was spoken in Thessaly ; and in several districts of northern Greece other varieties must have had their home, some of them probably so divergent from the more cultured dialects as to be unrecognizable by the rough and ready philology of the ancient Greeks. After the extension of the political power of the Hellenic race by the Hellenized Macedonians the Attic dialect became in a necessarily modified guise the language of at least the educated classes*~~

~~*over a wide foreign area. This kowy dSiddexros, or common dialect as it was called, was that in which all the Christian Scriptures were, if not originally penned, at least most potently disseminated ; and some time after the establishment of the seat of the empire at Constantinople it was adopted as the official language of Eastern Europe, and developed or degenerated into what is distinguished as Byzantine Greek. Amid all the linguistic confusion of medizval and modern times in the Balkan peninsula the old Hellenic speech maintained a precarious and degraded life*~~

~~*HURAT S*~~

~~*in the so-called Romaic of the Greek people, still recognizable to the philologist, but to the vulgar ear and eye very successfully disguised. It is still spoken, not only in the modern kingdom of Greece, but in Thessaly and other parts of Turkey along the coasts of the Agcan and the Sea of Marmora, and in the Greek settlements of southern Russia. Sinee the declaration of national independence an attempt has been made to go back to something liker the langnage of Xenophon; but as yet the Neo-Hellenic is almost purely a literary form, unintelligible to the great bulk of the people in the country. At best it is only a compromise between ancient Greek and Romaie, neither conforming to the classieal standard of the one nor systematically aecepting the grammatical changes developed in the other. As edueation advances, —and it is advancing rapidly under theeontrol of the central administration,—it will probably take root among the people, and under the vivifying influences of national life grow up into a national speech. The aneient common dialeet is still used in the liturgieal serviees of the Oriental Church. The alphabet has been employed by several eommunities in the Turkish empire for their Turkish dialects,—among others by the people of Mariupol.!*~~

~~*Latin was only one of a number of elosely related languages domiciled in the peninsula of the Apennines, and by several of these it was affeeted much in the same way in which English is affeeted by German or French. Most of the number have left neither litera- ture nor history behind them, but they must still be differentiating factors in the dialeets of modern Italy. Oscan, whieh was spoken in a large part of the country south of*~~

~~*Rome, and Umbrian, which takes its name from a district to the north, are both known to us from inscriptions,—the latter by the remarkable liturgical series called the Kugubine Tables. The Latin language kept pace with the extension of the Roman empire till it came into contact with the higher culture of Greece and the East ; as an aggressive lan- guage it has no historic parallel, for though the area of English has advanced as rapidly in modern times, this advance has mainly found place where English-speaking people have ontnuinbered the foreign elements in the population. It continued to be the language of nearly all European literature for centuries after it had ceased to be a spoken speech ; and it was the language of all learned litera- ture well on in the 17th century. It is still used in the liturgy of the Roman Catholic Church, and still forms the most potent lin guistic element in all European education. Its alphabet is more widely employed than any other in Europe, and is at the present moment gaining ground against the " Gothic" characters of modern Germany, as it did in early ages against the Saxon characters in England.*~~

~~*Of the languages which have sprung from Latin, French resembles it most in its fortunes, though not in its forms. It is the official, literary, and educational language of the country whose name it bears, and is daily becoming more and more the popular language as well. Based as it is on the old langue @'eil of the north, it has gained the superiority over the dialects of Burgundy, Picardy, and Normandy, and the more cultured Provengal of the south, has already reduced them to the rank of mere patois, and is gradually diminishing even their local importance. On the north-west it is more slowly displacing the Breton, and in the south making inroads on the Basque. It was nearly naturalized among a large part of the inhabitants of Alsace-Lorraine, and is still spoken by upwards of 200,000 of the new citizens of theGerman empire. InSwitzerland it is the mother tongue of about 600,000 people, being dominant in Neufchatel, Geneva, and Vaud, and sharing the ground with German in Freiburg, Valais, and Bern. In Belgium it is the principal speech of the educated classes. No European language has had such an extensive foreign history within the continent. Not only was the closely related Norman French introduced into England in the 11th century, with such striking effect on the English voca- bulary, but at several subsequent periods literary French has been potently at work. Inthe decadent period*~~

~~of German literature iL largely supplemented the German language among the upper classes, and for a time furnished a large proportion of his voeabulary to the nominal writer of German. In Russia there was a similar French period about the beginning of the 18th eentury, which has left its influence to this day on the official publieations of the Government. And in spite of the growing claims of German and English, French is still aequired by a greater number of foreigners than any other modern tongue.~~

~~The language usually known as Italian is not so much the national language of Italy as the language of a special distviet. The other dialeets have not sunk to the level of patois; and at the present moment it is a matter of keen debate what is to be eonsidered the true standard for the people at large. From Venice to Palermo there is a rich variety of forms which have received more or less of literary culture; and the pretensions of Florenee to be the sole and final arbitress are far from being unanimously admitted. Whatever position be assigned to Tusean as the language of edu- eation, it will be a long time before it attain the predominanec in EEE ~~

~~1 See Blau in Zeitschrift der deutsch. Morgenl. Ges., 1874.~~

~~#£UG,OPE~~

~~Italy which French possesses in France. The dialects are usually divided into three main groups : —those of Upper Italy, including Genoese, Piedmontese, Venetian, A'milian, and Lombard; those of Central Italy, including Tuscan, Roman, and Corsican; those of Southern Italy, including Neapolitan, Calabrian, Sicilian, and Sar- dinian. From Italian the other peoples of Europe have borrowed many terms for artistic teehnicalities, but comparatively little which belongs to everyday life.~~

~~Literary Spanish or Castilian is in much the same position as literary Italian, with this difference, that its literary precedence is more definitely established. A large area is still occupied by Catalonian or Catalan, both in Catalonia proper, in Valencia, and in Majorca; and the speech of the Galieians is much more akin to Portuguese. In Catalonia rich and poor, citizens and peasants, speak the provincial language; in Valencia and~~

~~*Majorea only the cultivated classes employ Castilian. On the whole, how-ever, the Castilian territory is on the increase, and it is making its most rapid acquisitions from the Galician and Basque.!_ Spanish is naturally distinguished from the other Neo-Latin languages by the greater number of words which it has borrowed from Arabic.*~~

~~*Portuguese is really what the name implies, and has to eontend against no alien idioms. In comparison with Spanish it has di- verged further from the Latin type. It has been equally indebted to Arabic, and has also a considerable French element.*~~

~~*Walloon, the language spoken by the Latinized people of the Low Countries, is now a mere patois. Ladin is spoken by about 580,000 persons who occupy several considerable areas in the Alpine region, from the valley of the Rhine in the west to the neighbourhood of Aquileia on the Adriatic in the east.?_ Roumanian is not only the national language of the country of that name, but is used by a eonsiderable population in Servia, Hungary, Transylvania, Buko- vina, Bessarabia, Roumelia, Thessaly, and Albania. In Roumania it is the object of increasing literary culture; and in spite of the foreign influences to which it has been so long exposed, it d-es not present much variety of dialect in the other districts.*~~

~~*Of the Teutonic languages the Gothic furnishes the oldest literary monument—the translation of the Scriptures by Ulphilas or Wulfila, who flourished in the latter part of the 4th century ; but it is totally extinct, and among the living representatives of the branch the first place is due to what is popularly known as German par excellence,—that is, the modern literary or cultured form of HIgh German, This is usually dated from Luther's translation of the Rible, which marks the transition from the " Middle" to the "New" period. It is not only the recognized speech of the various states of the German empire, but either in its cultured shape or in tributary dialects it is spoken by about 9,000,000!people in Austria-Hungary, and by nearly 2,000,000 in Switzerland. It has lost ground through the revival of Bohemian and HIungarian, but has gained on all the minor linguistic enclaves. Along the frontier regions of Russia and Poland it is partially retreating, partially advancing : Russia naturally discourages the German element in the Baltic provinces, and Germany as*~~

~~*naturally the Polish element in Prussia. In both districts, Gerinan is the language of higher education. Whatever repressive measures Russia may adopt, it can plead, not only the example of Germany, but the fact that it is only attempt- ing to recover ground that has been lost by the Slavonic tongues. Slavonic names of places occur as far west as Hanover, though the Gerinans frequently disguise or destroy them. Where it meets the Italian frontier the Teutonic language is retrogressive. Botzen in the end of last century was a border town of the German areca ; it is now thoroughly Italianized ; and even Meran, several miles up the valley of the Adige, and 60 niles from the political frontier, is rapidly losing its Teutonic character. That the movement has been in this direction for centuries is clear; but it is doubtful whether the present German enclaves of the Sette Communi and Tredici Communi were always insular, or are to be taken as proof that the Teutonic frontier formerly extended as far south as the neighbourhood of Verona and Vicenza.®*~~

~~*The territorial relations of the Scandinavian languages are suf- ficiently indicated by their names. They are nowhere aggressive, except where they come into contact with Finnish and Lapp. All of them, even the Faroese, have a certain amount of literature; but three only, Danish, Swedish, and Icelandic, are vigorously cultivated. Norway is mainly indebted for its books to Sweden and Denmark, and its language is slowly passing intoa patois. Danish has under- gone the greatest changes from the old Norse type, and naturally from its position has been most affected by foreign influences.*~~

~~*Of the Low Geran group the Old Saxon, formerly spoken between the Rhine and the Elbe, has left several remarkable literary monuments ; and two or three ofits dialeets, now bracketed together as Anglo-Saxon, furnished the basis of the present English language,*~~

~~*1M. Tubino, Revwe Scientifique, 1876, p. 204.*~~

- ~~*For details see Ascoli's map at the end of his Archivio Glottologico Italiano, vol. i.*~~

~~*3 See Petermann's Mittheilungen, 1866, and Charnock in Journ. of Anthropological Institute, 1873.*~~

~~which, however, by its mere vocabulary has nearly as much right to be considered a member of the Latin or Italie branch. The only modern representative of the group besides English which ranks as a literary language is Dutch, which is spoken iu Holland, and, under a slightly modified form known as Flemish, in a large part of Bel- gium. Along the coast and islands of the North Sea the current dialects, varying from district to district in an almost exceptional manner, are remnants of the old Frisian tongue, whose oldest written documents date from the 13th century ; and the popular language of the countries between the Rhine and Weser and the Weser and Elbe, where it is not Dutch or Frisian, is Platt-Deutsch, which, while overshadowed by the High German, has recently attained a certain literary position through the writings of Fritz Reuter.~~

~~The Celtic languages are all without exception decadent, —the most tenacious of life being the Welsh and the Breton. The people who still retain them as their mother tongues are becoming more and more accustomed to the simultaneous use of the dominant languages around. The Welshman and the Scottish Highlander learn English, the Breton French. Cornish died out last century, and left only a few fragmentary texts ; Irish is rapidly following it, but will be preserved in a considerable literature ; Welsh alone has a fairly vigorous literature at the present time.~~

~~According to Professor Zerffi, there are no less than seventeen Slavonie dialects. The most important is Russian, or Great Rus- sian, the national speeeh of the empire whose name it bears. At present it is spoken by about 34,390,000 of the 65,705,000 of the total population; and its area is rapidly being extended by the direct agency of the Government. In 1871 it was made the official language of Poland, and rendered obligatory in all the law courts of the country ; and in 1876 it became practically the only permissible form in Little Russia, where all popular literature and public notices in the local language were prohibited. While it retains a rich in- flexional system, Russian has enriched its vocabulary by a large foreign element, from French, English, and German; and its scientific terms are~~

for the most part those of Western Europe. As a written language it is deeply indebted to the Church Slavonie. Closely cognate is the Little Russian, or Ruthenian, already men- tioned, which is spoken by about 14,201,280 people in Russia and upwards of 3,000,000 in Austria. Its Russian area includes Vol- hynia, Podolia, Kieff, Kherson, Ekaterinoslaff, Kharkoff, Poltava, Tehernigoff, Minsk, Grodno, and Lublin, as well as portions of Astrakhan, the Don Cossack Country, Saratoff, and Veronezh; in Austria it is mainly confined to Galicia. Possessing as it does a rich store of popular tales and songs, and employed by several writers of great ability during the present century, it ranks much higher than the third Russian dialeet—the White Russian—which is the current speech of about 3,592,000 people, for the most part in Grodno, Minsk, Mohileff, Vilna, and Vitebsk, and is mainly dis- tinguished by Lithuanian and Polish elements. 'Ihe second place in the Slavonic group may be assigned to Polish, which in spite of politieal disasters is still spoken by a large but seattered population. It is estimated that there are 3,905,871 Poles in Russian Poland, 2,450,000 in Prussia, 2,465,000 in Austria-Hungary, and 861,000 in European Russia. An extensive and vigorous literature will preserve the language even ifit pass, as seems not improbable, altogether from the lips of men. Czech, or T'sekh, is the national language of Bo- hemia, and is also largely spoken in Moravia and north-western Hungary, where it is usually known by the names of Moravian and Slovak. The differences between the dialects of the several countries are on the whole comparatively slight ; but as between Bohemian proper and Slovak, they are suffieiently marked to lead some philologists to recognize the Slovak as a separate language. There is a rich Bohemian literature which, dating fiom the 10th cen- tury, has after along period of depression and threatened extinction received a new development in modern times. Bulgarian is distri- buted throughout European Turkey far beyond the district that bears the name of Bulgaria, and it also appears in eastern Roumania and south-western Russia. A very small proportion of the people by whom it is used are of Slavonie blood ; and it has departed more than any other Slavonie language from the eommon type. Its literature is almost exclusively modern, and would be of little moment were it not for its possible value toa possible nation. A much higher position has been attained by the Servo-Croatian, which is spoken by abont 5,500,000 people, in Servia, Bosnia, Montenegro, southern Hungary, Slavonia,

Croatia, Istria, and Dalmatia. Its dialects though numerous are so slightly differentiated that with any one of them a traveller ean make himself understood by those accustomed toany other. It is usual to divide them into three groups—a west- ern or Istrian, a southern or Dalmatian, and an eastern or Servian. Even if the political unification of the Sonth Slavonians should never be realized, the future of the Servo-Oroatian is secured by the vigor- ous literary development which is encouraged both at Agram and Belgrade. Unfortunately it is written and printed in two alphabets—the Cyrillian being employed by the Servians and the Latin by the Croatians. The remaining Slavonic tongues are of little practi- cal importance except to the philologist. The Wends are being rapidly Germanizcd, and are now estimated at about 137,000, princi-

pally situated within an area of rudely elliptical form, with its two foci represented by Bautzen and Kottbus. Sinee 1849 their numbers have diminished by upwards of 4200. The language shows two distinct varieties.' : a

The Lettie branch though decadent is interesting as linguistieally the oldest of the Aryan languages in Europe. The Lithuanians werein the Middle Ages one of the most powerful peoples of the Bal- tic region, but fell into a secondary place by the incorporation of their country with Poland in 1386. Their language is still retained by about 150,000 or 200,000 people in Germany, and by about 1,434,750 in Russia, where those of the western part of the govern- ment of Kovno and the northern part of the government of Suwalki are known as Shomudes or Samogitians. Two dialects are recognized—the HIgh or Southern, and the Low or Northern. The Letts still number more than 1,000,000, situated in Courland, Livonia, and Vitebsk. Old Prussian, extinct two hundred years ago, was very similar to Lithuanian. With regard to the two languages marked in the table as " unattached," almost nothing is known of Old Dacian, and the history of Albanian is but partially elucidated. The Skipitars, Arnauts, or Albanians are one of the most remarkable peoples of south-eastern Europe. They not only occupy Albania proper, but also appear in considerable numbers throughout the rest of European Turkey

~~*and Greece, —forming, it is calculated, a total of 1,500,000. The colonies which settled in Italy and Sicily, though amounting to nearly 90,000, have given up their native language. Hahn, who was the first to make a thorough investigation of the sub- ject, distinguishes two dialects —the Toskan and the Gegian, —which are as distinct as High German and Platt-Deutsch. Besides the Greek alphabet another of dubious origin is also employed."*~~

~~*The Semitic languages are mere exotics in modern Europe. Hebrew, the most widely distributed, is little more than the ecclesiastical language of the Jews, who for the most part employ the common language of the country in which they reside not only in public intercourse but also in private. At the same time it is regularly taught in their schools, furnishes them with a number of familiar every-day expressions, and is not only the language of the professional literature of theologians, but appears in frequent quotations in their popular periodicals. Arabic, at one time the dominant language not only of southern Spain but of Sicily and part of Italy, is nowhere the usual speech of any European com- munity ; but it is familiar to the educated classes of Turkey. Maltese can still be recognized as of Arabic derivation, but has in- corporated a vast mass of foreign words. Mosarabic has been ex- tinct at least since the 18th century: the liturgical service in the ti of Toledo, which still bears the name, is performed in*~~

~~*atin.*~~

~~*The most important of the Finno-Tataric languages are the Turkish, the Hungarian, and the Finnish. The first varies greatly in its vocabulary in different places and grades of society'; and the official form is largely composed of Arabic words. As a popular speech in Europe it has a very limited and discontinuous area, Hungarian, on the other hand, has maintained or recovered a remark- able degree of homogencousness, and occupies on the whole a very compact territory in spite of the intrusion of German; while its literature ranks as one of the most vigorous of the secondary litera- tures of Europe. Finnish proper is spoken by 1,710,274 people in the Russian empire (of whom 1,615,613 are in the duchy of Finland), and by 14,980 in Sweden and 7637 in Norway; while the closely*~~

~~*cognate Karelian numbers 303,277 in Russia. The Tchudes, Vepses, and Votes, who amount to 48,000 in all, live in the governments ofOlonetz, Vologda, Novgorod, and St Petersburg, in the neighbour- hood of Lakes Ladoga and Onega. Their languages or dialects are very similar to Esthonian, which, with the exception of Hungarian, ranks as the most literary member of the group, and is spoken by upwards of 749,000 people. Livonian lingers as the speech of a few thousand seafaring folk in Courland. The Lapps contribute 17,178 to the population of Norway, 6700 to that of Sweden, and 7497 to that of Russia. Their language is divided into four dialects. The Tcheremisses, Mordwines, and Votiaks are grouped together as Finns of the Volga,—the first, to the number of about 260,000, situated in the country between the rivers Viatka and Vetluga; the second being scattered, to the number of about 792,000, through the governments of Samara, Saratoff, Simbirsk, Pensa, Nizhni- Novgorod, Tamboff, Kazan, Ufa, Orenburg, and Astrakhan; and the third, about 240,500 strong, occupying the western half of the government of Viatka. Another group is composed of the Permians, Siryenians, and Voguls. The two former were at one time one people, and had considerable fame in the Middle Ages for their com- mercial activity ; they are now mere hunters, fishers, and pedlars, and number respectively about 67,000 and 85,400 people in Perm, Vologda, and Arehangel. The Voguls are a little colony from Asia, 2000 strong, in the government of Perm. The total number*~~

~~*; 1See " Das Sprachgebiet der Lausitzer Wenden vom 16 Jahrhundert a = Gegenwart," by Dr Andree, in Petermann's Mittheilungen, 2 See Hahn, Albanesische Studien, Jena, 1854.*~~

~~*of Tatars in Russia is said to be 1,212,610. They are found in all the sixty-one governments, with the exception of nine; but are most numerous in Kazan, Simbirsk, Ufa, and Viatka, They are closely connected with the Bashkirs of Ufa, Orenburg, Perm, and Viatka, who altogether amount to 757,000. The Nogaians, who live in the neighbourhood of the Sea of Azoff, are a mixed people, con- taining remnants of the Khazars, Petchenegs, and Cumanians; the Tchuvashes are a Tatarized branch of the Finns of the Volga; and the Meshtcheryaks of Ufa, Orenburg, Pensa,*~~

~~*and Kazan are also of Finnish deseent. The first still number 15,000, though a large number emigrated to Turkey after the Crimean war, the second 569,000, the third 186,000. The language of the Nogaians is the same with that of the Tatars proper, and that of the Tchuvashes seems to lie midway between Nogairie and Turkish. The Kirghiz, of whom there are 156,000 in Astrakhan and Oren- burg, speak a dialect which is equally difficult of comprehension to the Tatar of Kazan and the Bashkir ; and the Calmucks—107,000 in Astrakhan—are still more widely separated by language from their nearest kin.®*~~

~~*Basque, which is spoken in the Pyrenean districts of France and Spain, is an agglutinative language, but cannot be classificd. It is dying out more rapidly in the Spanish than in the French territory.**~~

~~*In 1877, as appears by the table on page 703, the Political European territory was distributed among 18 distinct divisions.*~~

~~*political totalities (exclusive of the petty states of San Marino, Andorra, Monaco, and Luxembourg), viz.—the German empire, the Russian empire, the Ottoman cmpire, the united monarchy of Austria-Hungary, the united king- dom of Great Britain and Ireland, the republic of France, the kingdoms of Italy, Spain, and Portugal, the kingdoms of Belgium and of the Netherlands, the kingdom of Den- mark, the united monarchy of Norway and Sweden, thc kingdom of Greece, the republican confederation of Switzer- land, and the principalities of Montenegro, Servia, and Roumania. Several of these consist of a greater or smaller number of partially independent states connected with each other according to very different degrees of political copart- nery. he German empire, as one of the most recent as well as most extensive, naturally presents an unusual num- ber of anomalies. Founded April 16, 1871, it comprises no fewer than twenty-six states under the presidency of the kingdom of Prussia, and these states are very dissimilar in size, constitution, rank, and general importance. Jour, including Prussia, are kingdoms, six are grand-duchies, five are duchies, seven are principalities, and three are frec cities. The organization by which they are united consists mainly of a federal council or Bundesrath, in which the individual states are represented by the nominees of their several*~~

~~*governments, and a Reichstag, or Imperial Diet, the members of which are elected by universal suffrage. All military power is centralized in the hands of the emperor : his consent is necessary for all important appointments in the different divisions of the army, and he can command the erection of fortresses on the soil of any of the states, and if occasion requires can declare any part in a condition of siege. The practical dominancy of Prussia is further secured by the fact that it possesses 236 of the 397 mem- bers who compose the Imperial Diet. As separate states, Prussia, Wiirtemberg, Saxony, and Bavaria are all consti- tutional monarchies, each with its parliament or Laznds- tag, consisting of an upper and a lower house. The various grand-duchies, duchies, and principalities have their several Stdnde, or states, some consisting of two chambers and some of one, and presenting considerable variety in the amount of representation accorded to different elements of the community, in the rules of election, and in the length of period for which it is valid, That unusual combination of geographical names, Austria-Hungary, and itsequally unusual adjective Austrian-Hungarian, which are so uncouth and bewildering to the ordinary reader, are an attempt to indi- a ee ll,*~~

~~*3 See "Die Volker Russlands," in Petermann's Mittheilungen, 1877,*~~

~~*and Wallace's Russia, 1877. 4 See Broca's collected papers on Ethnology.*~~

~~*EUROPE*~~

~~*German geog. Square square miles. kilometres. | I. GERMAN EMPIRE. . 9,818°420 640,680°71 (A.) Kinepomus— DRS SIM ccescsecrersocsuuctessste recess terete eee ne ene 6,326°20€ 348,339°29 Bavaria 1,877°761 75,863°49 Saxony 272 288 14,992-97 Wiirtemberg 354-207 19,503°69 (B.) Granp Ducnies— IGRI cceveceeesscesers Weseceeslecceuscccssetsnten@Maccerscesen BooKIOGOE 273°788 15,075-00 ELSA fecce cite sents occas' cvacHIG AVWER IT ete 23:05 s0ccccescosteeivescesecssticcteee ee 66°030 3,635°80 MUCEHONDUNBIStVelitiz: .szs0eeeesetees cso cccecreer cee cose 53°2038 2,929°50 IMEMDME Daeccccctcss:;sersrteeeee ete enero nn ee 116°224 6,899°60 (€.) Ducnres— IB EOP LC ete eet se csucs ov alsseeee so oe eR eER Ee eT. 677022 3,690°43 Saxe-Meiningen……- 44°829*~~

~~2,468°41 Saxc-AItenburg……ccccccseees 24°000 1,321°50 BAxC-CODUMS And Guthiises.scseccososssescses voscecdiecceccacase 35‘786 1,967°75 PANNELL noetone reer ence errno ter cee geootioccedere 42°630 2,347°35 (D.) PRiIncrparities (YF URSTENTHUMER)— Schwartzburg-Rudolstadt …..cccccsscsssscsssssscesssccesserecc 17110 942-13 Schwartzburg-Sondershausen ……..cccecccesesescesecceoees 15°G57 862-11 Waldeck siceeccescsssrseceetinrrraneresoses 7 20°615 1,135°10 tcuss, Elder TEIN Cie csccevescercssscrseccesecss 006 5-746 316°39 Reuss, Younger Line.. Ueaenerennvecesivecnndecetiecestiessivocre 15-060 829-20 ApOMMePETD UTES IOIDT) Corecess ccsenstcsesoatesessescccecarcceaetévsuee &:050 443°30 Lippe-Dctimold ….. Sestesesecseeccersesecesees vearecnaecceesn aac 20°600 1,134°30 (f.) Free Crtizs— Liibeck ,…… COSSTOSHOOSaE ECS nOnaUEAnEHOoENeanCemoE Receseees oetiad 5185 282°73 4546 250°29~~

~~7-396 407-22~~

~~(F.) Invertat Terrrrorr— PANG CO—TEOWIAITI Cos .c. ois,csescconscstttes snseeteoeenteetee Rertteee 263°548 14,511-74 TI, AUSTRIAN-HUNGARIAN EMPIRE. ……cccccscosscooes s-+-|— 11,333‘308 624,044-89 (A.) COUNTRIES REPRESENTED IN TNE IMPELIAL COUNCIL.. §,451°781 500,190:90 Archduchy of Austria below the Enns.,……..06 tescecee 360:028 19,824°17 Archduchy of Austria above the Enns……. 217°873 11,996°70 Duchy Ofte SalZDulse..csccesecascaccsceessseasertces 1307186 7,165°66 Duchy of Styria …….. 407°788 22,454-04 Duchy of Carinthia… 1887390 10,373°32 Duchy of Carniola……. F 181397 9,988°33 Austro-Illyrian Coastland | (town, “and territory 0 . be Trieste, countship of silt margravate of cee 145-081 7,988°59 Tyrol and Vorarlbcrecescccee 532°604 29,326°81 Kingdom of Bohemia……sscccsssccees ce 943°572 51,955°78 Margravate of Moravia socbocsonnounoaie (00005 403°713 22,229°61 Wuchys0f Silestak.ersscssss.- Sonce0d 93-486 5,147°53 Kingdom of Galicia… seesees 1,425°58+ 78,496°77 DG byBOU WMSOVINAL. ccosctreestecesecetee teeeeen meee eee 189-800 10,451°00 Ing dom Of DAIMBEM st:..—..c0oceeee- eos Pheqseacenggaanorisr 252°326 12,792°57 (B) LANDS OF THE TLUNGARIAN~~

~~CROWN....ccssssescccccscceseres 5,881°527 323,853°99 Mine domnof Miungwy,..ccsrescseccecessssscceossssscss ss deeses coos 4,094:254 225,441°55 Principality of Transylvania… oa ecceeveveescceseesescscccacess 997-917 54,948-20 rece City#ot: Hiltnie.. ses, .; sesscccessseeccoss eee 0°355 19°57 Kingdoms of Croatia and Slavonia… 789°000 43,444°67 Pe STU RUSS TG TOE csc… « ascarrerneeeeerenneeeee| ~·~ 98,252°101 5,410,046-4 | Russia proper…..... 89,156°693 4,909,193-7 Russian Poland… 2,312 201 127,316°5 Grand Duchy of Finland .. 6,783°807 373,526°2 Ti Viz SEAN CG caseccccnseesesencacuaedecsveceaestees see saeeate. par aeeeseeeae 9,599°38 528,576°75 NV SMLEIPAMIE YS. ccenewereceoee DOSnceaNeRE oe soranssnestestendsiaserea-ereaseseccete css 5,881°53 | 296,522°51 Vil. ISIATING:...00+ veeesvesoesvssssatescsseees Seesnsgecedissesttnssscseseuernes 9,208°30 507,036-00 ! WII. TAOUIIOU (Ge Ur econ cenceeccencosccoconcocnenacsooecnoreocbonennan.i CORIO 1,627°698 89,625°29 Vii. (SWLIZEREAN Dy -csestecccestesce Saichesuedtesnsesenenerenrtctecteecnces 751°88 41,400°82 NS PG cetseccesscsssssxsvcececssserstecenssssssescecesccenoee® ASccouod orace 534°936 29,455°16 X, NETIERLANDS... suaseuseusenseressrsccceseuuercorscssnessesceres 644°04 35,461°26 Including Grand. Duchy of Luxembourg. BeOCROEANACSEED 47-00 2,587°45 PN EMDOIN WAIN... sseeeccerees Poeeeeseerensecscscscsecsees oo0dercevescesconaceses 694°42 88,236°78 XII, NORWAY Ad SW. eae 13,$30°33 761,539°45 Sweden… Restssceereeccccuceettteerssicasseee nine 8,078°85 444,845:71 INOLWiYarescecesees PELRELCOSEO soeesens eae SOOOECE CE CONOR COSTE CLIO 5,751°48 316,693°74 XIII. GREAT BRITAIN AND IRELAND..... sevesencescesenes 5,719°841 314,951-02 England 2,742°68 151,026-08 Scotland 1,432°81 78,895°19 THCIAWG:....0550c +085 ; 1,530-10 84,252-11 XIV. EUROPEAN TURKEY 363,542 SNA V cope OUAUNAR oss ccecccessescccancasecassaceecs | ossstenesstacestescesenetar 121,204 AAVAIE SIRAVANAE nertotcccessescccecccescuceasisvesstcsbassestsscerscccersacstcccesseets 43,555 KVP MONTENEGRO). covcesastecouscessosessvvcevescaseeccenssteressesivsecssecs 4,427 XVEI, GREECE... eT OTE cn errr. 5,128 XIX, ANDORRA Wen. Cr ae ee ae eee~~

~~385 EX SAIN ILA UENO Bie~~
~~woromme cocecustroncccccsscosetsnesetusescc—sccetoenes oxo 61’S~~
~~XENI MIO NING Otieccccccccesscescuessitseccecctrsenteectrenente~~
~~tttrran=n succeroneesse 15~~

~~1 Induding 14-23 German or 302°57 English square miles of islands not given in the separate kingdoms.~~

~~English~~

~~square miles.~~

~~209,746°88~~

~~134,499°56 29,292°16 5,789°03 7,530°68~~

~~5,820°92~~

~~2.96446~~

~~5,136°79 1,403°84~~

~~1,13113 2,471-09~~

~~1,424-93 953-09 510-25 75977~~

~~906°34~~

~~863°77 332°67~~

~~488:23 12216 32018 171-14 43797~~

~~10917~~

~~96°65~~

~~157-24~~

~~5,608-21~~

~~240,954–06~~

~~115,908°68 7,654°44~~

~~4632–13 2,766:78~~

~~8,669°85~~

~~4,005*30~~

~~3,856°62 3,084°52~~

~~11,328 53 20,061:00~~

~~8,583°22 1,987°57~~

~~30,308–91~~

~~4,035°28 4,939°41~~

~~125,045–34~~

~~87,046°70~~

~~21,216–41 154 16,774 69~~

~~1,895,520°94~~

~~49,159 01 144,228–48~~

~~204,089°53~~

~~195,774–90~~

~~113,781°13~~

~~13,692°73 999°25~~

~~14,763–85~~

~~294,012°49~~

~~171,762-00~~

~~122,280°49~~

~~121,607-661~~

~~58,311-38~~

~~30,462°70~~

~~32,531:09~~

~~140,369°51~~

~~46,799°05~~

~~16,817°21 1,702°36~~

~~19,353°18~~

~~148-82~~

~~23°81~~

~~574~~

~~2,088,908”44 65,807,767~~

~~114,415°09~~

~~34,605°99~~

~~159,854-94~~

~~40,107,229~~

~~24,039,648 4,824,621 2,423,748 1,778,396~~

~~1,434,970 823,138 560,618 282,928~~

~~98,770 315,622~~

~~302,792 180,335 141,446 168,851, 197,041~~

~~75,116 67,538 56,807 43,889 88,097 31,186~~

~~111,248~~

~~48,538 109,572 305,196~~

~~1,597,228~~

~~35,904,435 20,394,980 1,990,708 736,557 153,159 137,990 337,094 466,334 600,525~~

~~885,789 5,140,544 2,017,274 513,352 5,444,689 513,404 456,961~~

~~15,509,455 11,530,397 2,115,024 17,884 1,846,150~~

~~63,058,934 5,705.607 1,830,853~~

~~37,882,225~~

~~25,023,810~~

~~15,408,184~~

~~3,698,362 2,510,494 4,836,566~~

~~3,870,179 202,313~~

~~1,600,551~~

~~5,561,216~~

~~3,859,728 1,701,478~~

~~29,321,079 20,066,224 3,062,294~~

~~5,412,377~~

~~1,216,186~~

~~120,000 1,325,341 10,000 7,308 3,127~~

~~Population.~~

~~3,864,848~~

~~(1867)~~

~~(1869)~~

~~(1858)~~

~~(1867)~~

~~(1861)~~

~~(1861) (1860)~~

~~(1861) (1860)~~

~~(1863) (1862)~~

~~(1860)~~

~~(1860) (1865)~~

~~(1861)~~

~~(1860) (1866)~~

~~(est.)~~

~~*(1863)*~~

~~*(est.)*~~

~~*(1869) (2867)*~~

~~*703*~~

~~*Population.*~~

~~*41,058,139 (1871)*~~

~~*24,693,066*~~

~~*4°861,402*~~

~~*2‘556,244 1,818,494*~~

~~*1,461,428 852,843 557,897 286,188*~~

~~*96,982 316,640*~~

~~*311,715 187,884 142,132 174,339 208,354*~~

~~*75,523 67,191 56,218 45,094 89 032 32,051*~~

~~*111,153*~~

~~*52,158 122‘565 338,974*~~

~~*1,549,459*~~

~~*21,169,341 (1874) 2,087,930 741,918 153,386 1,164,512 338,045 465,065*~~

~~*610,899*~~

~~*890,835 5,287,244 2,056,081*~~

~~*544,459 5,827,798*~~

~~537,815~~

~~460,327~~

~~65,704,459 (1870) 6,026,421 (1870) 1,382,622 (1874)~~

~~26,801,154 (1874)~~

~~16,641,980 (1867)~~

~~4,298,881~~

~~2,669,147 (1870)~~

~~5,336,634 (1874)~~

~~8,972,421 (1874)~~

~~205,158 (1874) 6,156,559~~

~~4,341,559 1,815,000~~

~~1,874,000~~

~~(1874) (1876)~~

~~83,444,419 (1877) 24, 547, 309~~

~~3, ‘560, 715~~

~~5,336,395~~

~~8,500,000 (apprx.)~~

~~5,073,000 (1873) 1,377,068 (2875)~~

~~190,000 (est.)~~

~~1.457,894 (1870)~~

~~12,000 (est.)~~

~~7,816 (1874)~~

~~┤~~

~~5,741 (1873)~~

~~Popula- tion.~~

~~704:~~

~~cate the relation of complete political equality established between the two great sections of what is popularly known as the Austrian empire. Each has its own parliament,—in Austria called the Reichsrath or Imperial Council, and in Hungary the /eichstag or Imperial Diet; each its own ministers, budget, and other administrative machinery; and the transactions between the two couutries not unfrequently show like the transactions between two independent powers. he same person is monarch over both, and the united army is under his command, but there practically the unification ceases. Russia ig an hereditary monarchy, nominally governed by tle absolute will of the emperor or czar, but really by this in combination with a system of four great councils. Finland still retains its separate parliament, in- stituted in 1772, and supplemented by an imperial senate under the presidency of a governor-general. Switzerland is a confederation of twenty two states, with a republican government. The supreme legislative power is in the hands of the federal assembly, which is composed of a national council or NVationalrath, and a council of states or Stdénde- vath,—the members of the former being chosen by the people of Switzerland in general, and the members of the latter by the people of the individual cantons. The executive power is entrusted to a federal council, and the highest judicial authority to a federal tribunal, consisting respectively of seven and eleven members, nominated for three and six years by the federal assembly. Sweden and Norway are two kingdoms under one king, with separate government, constitution, and laws. In Sweden the legis- lative power is mainly in the hands of the diet, which consists of two elective chambers, while the executive is in the hands of the king and a council of state. The con-~~

~~*stitution of Norway is rather more democratic: the full legislative power belongs to the Storthing, and the king has no right of veto if the same bill passes three times. The common affairs of the two countries are decided in a council of state consisting of representatives of each.*~~

~~*Such are the most abnormal political arrangements in Europe. Britain, Belgium, Denmark, Italy, the Nether- lands, Portugal, Spain, Roumania, Servia, are hereditary monarchies, with a parliament of two chambers and a responsible ministry. Greece differs in as far as it has only onechamber. Montenegro is an hereditary monarchy, with a senate; Monaco an hereditary principality, with a council of state; and Andorra and Sau Marino are both republics, with a general council.*~~

~~*It may be safely affirmed that the population of Europe has been steadily increasing since the time of the great Revolution, though it is impossible to ascertain exactly the average rate. The number in 1787 is said to have been 144,000,000; at the peace of 1815, 180,000,000; in 1833, according to Balbi, 227,000,000 ; in 1854, 258,778,850 ; and in 1874, according to Behm and Wagner, 309,178,300. If the earlier estimates, which are little better than guesses, even approximate to the truth, we would have in 59 years an average annual increase of 1,850,000. In England and Prussia rather more than one per cent. of increase takes place every year, while in France during the greater part of the century the gain has been considerably less, and in exceptional years there has even beena decrease. If then we adopt one per cent, as the mean for Europe, the 180,000,000 people in Europe ought, in 1874, to be represented by 323,769,000. 'Two causes have greatly diminished thie growth—war and emigration. In the Crimean war the direct loss was 386,000 soldiers ; that of the French army iu Italy was 10,173; and that of the German army in 1866 between 10,000 and 11,000. In the war of 1871-72 the*~~

~~*- victors lost 45,000 and the conquered a still greater number.*~~

~~*The total loss since 1855 cannot be less than a million at tue very least. Of the extent to which emigration from*~~

~~*HURO?TS*~~

~~*Europe has gone on during the present century every one lias some idea; the immense territory occupied by people of European descent speaks for itself. Since 1820, Germany has contributed about two million inhabitants to the United States alone; since 1815, Great Britain and Ireland have seen no less than from eight to nine millions of their popu- lations leave their shores for ever. The drain on other countries, however, has been much less,—France, for ex- ample, counting her loss by emigration in the ten years from 1849 to 1858 as 200,000, and Austria her loss from 1850 to 1868 at no more than 58,000.*~~

~~*The general rule that, other conditions being equal, the population decreases with the elevation of the country, holds especially true of Europe. None of its larger cities lie far*~~

~~*above the sea-level. The highest point of permanent human –*~~

~~*occupation is the hospice of St Bernard—at an altitude of 2472 metres, or 8108 feet ; and the highest village, St Veron la Ville, in the neighbourhood of Briangon, has an altitude of 2009 metres, or 6589 feet. There is a little hamlet of Ger- man immigrants called Juf, 108 feet higher, in the Swiss valley of the Avers, a tributary of the Rhine. Chaux de Fonds, a town of nearly 20,000 inhabitants in the Jura, stands at an altitude of 1000 metres, or 3280 feet, and the average elevation of the Engadine, with its numerous vil- lages, is about 6000 feet. The highest inhabited spot in the Dovre-Fjeld is said to be Hjerkin, at 3152 feet above the sea; in the Grampians Corrour (Inverness-shire) at 1738, in the Harz the Brockenhaus at 3739, and in the Pyrenees Mont Louis at 5208.!*~~

~~*The districts of densest population, or nearly 400 to the square mile, are the lower valley of the Thames, the neigh- bourhood of Newcastle, and the area which includes Liver- pool, Birmingham, Sheffield, and Leeds, in England, the district between Boulogne and Liége, the neighbourhood of Cologne and Elberfeld-Barmen, the valley of the Rhine for some distance above the junction of the Maine, part of the valley of the Neckar, the country to the south of Leipsic, the vicinity of Prague, a large portion of the valley of the Po, especially round about Milan, the neighbourhood of Naples, and a little district round about Oporto. Most of these districts of densest population are surrounded by areas in which the ratio varies*~~

~~*from 280 to 380 inhabitants per square mile. In France the only districts approaching the higher figure are the vicinity of Paris and of Lyons; and in Spain the only spot reaching the lower is San Sebastian. Bound about Barcelona and on the coast between Cartagena and the mouth of the Jucar there are from 190 to 240 per square mile. In no part of the Russian territory does the ratio rise higher than 140, and most of it varies from 25 to 95. The same low figures are applicable to the whole Scandinavian peninsula, with the exception of the most southern part of Sweden, which, with eastern Denmark, attains a ratio of 150 per square mile.? In a large part of Norway indeed, as well as in both the north and the south-east of Russia, the ratio is not more than from 3 to 5. The only other portions of the globe which reach the highest European density are the valley of the Ganges, part of the Chinese empire, and possibly some parts of central Africa.*~~

~~*The numerical relation between the sexes is different Propor-*~~

~~*in different countries as well as in the differently con- stituted portions of the same national community. The niost prominent causes that interfere with the equilibrium are the greater destruction of men in time of war, and the greater removal of men by emigration. The following table gives the relations in the principal countries :—*~~

~~*1Cf Berghaus, ‘“‘Héhentafel von 100 Gebirgsgruppen aus allen Erdtheilen,” in Behm’s Geogr. Jahrbuch, 1874.*~~

~~*2 See Behm and Wagner’s map, ‘“‘Dichtigkeit der Bevolkerung in Europa,” in Petermann’s Mittheil., Erginzungsheft Num. 35, 1874.*~~

~~*tions*~~

~~*of the sexes.*~~

~~*Popula- tion of cities.*~~

~~*HYURorp kl*~~

| Excess or Males. Females. Defect of | Females. IGS As) US Offer «cee sansiere ..(84,210,210 35,154,331 | +944,121 German Empire, 1871 .|20,154,109 20,906,737 | + 752,628 Prussia, 1871 ……. «| 12,169,274 12,523,807 +354,533 | Bavaria, 1871 2,368,558 2494892 | +126,334 WG, UBT a sseeeseveneenssonee 1,248,799 1,307,445} + 58,646 Wiirtemberg, 1871 ……4- 876,164 942,375 + 66,211 CIC lirsssercevcs-sceseseeres. 712,551 749,011 + 36,460 FIGs WET. Fsccgssnsnseosossesess 421,849 431,045} + 9,196 Mecklenburg, 1871 …… 319,096 335,783 + 16.687 lfanse Towns, 1871 …… 249,685 263,849 + 14,164 Oldenburg, 1871 …..escccerseeee 155,336 159,123 + 3,787 Brunswiek, 1871 ……006 155,540 156,630 + 41,090 Anhalt, 1871 ……scessesecevenes 103,579 99,858 + 3,721 Lippean states, Waldeck, and ¢ 1871……. 96,927 102,491] + 5,564 Pyrmont, UTC es PLA + vinissisenpssiesineniins 17,982,511 |18,120,410 | +137,899 Austria-Hungary, 1869 …... 17,737,175 |18,167,260 | +430,085 Austrian portion …… 9,991,487 |10, 408,493 | + 412,066 Hungarian division……. 7,745,688 | 7,763,767 | + 18,079 RGreat vita, US7 1 svccse… 115,584,132 |16,261,247 | +677,115 i ae 13,472,262 |13,328,892 | — 143,370 BS Risen. oor vavner scr ves 8,324,000 | 8,475,000 | 151,000 Belgium, 1866 …….6..00. 2,419,639 | 2,408,194 | — 11,445 ROWIMANIA, USGOws es… eres. 2,276,558 | 2,148,403 | — 128,555 Portugal, 1864……. ……| 2,005,540 | 2,182,870 | +177,336 DMEM CTs LOMO saissssiciaces eismsisinin 2,016,653 | 2,151,872 | +135,219 | Netherlands, 1869 …… 1,764,118 | 1,815,411 | + 51,293 Switzerland, 1870…… 1,364,814 | 1,804,883 |} — 59,981 Denmark, 1870….. .....0.00.. 918,788| 945,708} + 26,820 TetOniTNGL, i515) gempeeseeEoEeeorse 878,537 928,711 | + 45,174 Norway, 1865…….. Sransomeee 835,947 865,809 | + 29,862 GRCCCR 1 OFU 220.000 ccervenesn| OSs 116 708,718 | — 50,458 PIES, WOUOs .. cissn. tee ovr venens 626,681 589,444 | — 37,237 Luxembourg, 1871 …… | 98,245] 99,288] + 1,038

Portugal and Greece represent the two extremes—the former having far above the normal number of females, or 1088 to every 1000 males, and the latter far above the normal of males, or nearly 1072 to every 1000 females. The following table gives the order of the various countries :—

Females to Femalcs to

~~1000 Males, 1000 Males, MISE lerigacics sven sses++ =e 1088 Wenmiark,.....0. 000.0000 VAICCIMD CUES. scac oc scsreee 1076 JRDIIRE ET ipmeneoncoaceecoenacec 1029 OCS Tn 1067 JESS) gpppocanspennsdc pbcenen 1028 Lippe states ……. -. 1057 Oldenburg……. seceteernnd' 1027 Iansc VOWNS.....<..00-006 1056 Austria-Hungary ....1024 IB EAVERELD, coptag goepppapenos 10538 JEG SES spapeppongpgsnecaoeuneos 1022 Mecklenburg..... 1052 BUA cairsneecescanees) => -eq dee PBIIOED ccccsecswess re ecesveeen 1052 Luxembourg……L011 ThivillehOVEl so coecospngne Geode 1051 LN ELI Ge sennsadooog0dene Rascinae 1008 SREY eres «noe vc onccene 1047 BrHOAOR… ...ccvsrersere 1007 Stvitzerland……..0-ss 1046 Hungarian lands ……..1002 Great Britain:.. .....- 1043 Tee s.so iceainn san en aiene 995 Austrian lands'..... -.m 1041 ORY. os die ece ce aeaa eNeu 989 German empire … ..... NO Stamee MEOUMNEIMIE » nose seusectre nee 944 JNSTITENIE Gepeno: Gaecodepodco+ 1037 DELVIG 20 +000: sisderesaneanen – 940 YORWEY: «. ceveecce.s.- » OBS (CiREEGEsneoanboce 933 Netherlands…. ... 1030~~

~~For Russia proper the census of 1858 gave 33,655,824 males to 35,275,904 females, or 1000 to 1048.~~

~~During the present century the industrial development of the more advanced countrics has led to a remarkable aggregation of the people into cities, and facilities of travel have in many cases caused a large part of the city popula- tion to take up their residence in suburbs more or less separate from the central nucleus. In the following list of the towns and citics in Europe with more than 100,000 inhabitants it is noticeable that no fewer than twenty-one belong to Britain, and that nine of these are among the thirty, most of which are or have been political capitals, Whose inhabitants exceed 200,000.~~

~~Mond Gnt……0 (1874), 488,407 QMPMAS wcaserccsres severe 851,792 | 11. Nuples ……00s . (1871), 448,335 B. VIENNA. .cosseeesoeeeee 970,000 | 12. Birningham . (1874), 360,892 A, Berlim…..c.ssscecsseee 920,000 | 18. Brusscls . . (1874), 345,017 5. St Petersburg …..... 691,093 | 14. Madrid . (1870), 332,024 G. MOSCOW. ... -.eeeeeeeees 611,974 | 15, Lyons. . (1872), 323,417 7, Constantinople…... 600,000 | 16, Dublin… see~~

~~(1874), 314,666 8. Liverpool…….. Ap 510,640 | 17, Marscilles …..+.+006 (1872), 312,864 9. GlASZOW.cecesseverveee 508,109 | 18. Amsterdam …….06 (1873), 281,944~~

~~705~~

~~279,502 48, Stoke-upon-Trent… (1871), 130,985~~

~~278,798 | 49. Gen0a…..scsceoreees (18 130,269~~

~~270,476 | 50. Cologne 129,233~~

~~JGII85N| SL. VEMICe…..2.5---.—00 128,901~~

~~261,029 | 52. Ghent…….. 128,424~~

~~244,484 | 53. Rotterdam. 125,893~~

~~240,251 | 54. Toulouse 124,852~~

~~219,398 | 55, Portsmouth… 120,436~~

~~219,318 | 56. Dundee 119,141~~

~~212,644 | 57. Nantes…... 118,517~~

~~211,691 | 58. Seville …... 118,298~~

~~eee 207,997 | 59. Bologna 115,957~~

~~31, Copenhagen…….. (1874), 195,000 | 60. Magdeburg Rvescssese (LOM: D4 og~~

~~$2. Bordeaux ……..+.. (1872), NOS*O55 WP GU WiCCes… c..ccsscseeseees (1874), 113,774~~

~~33. Barcelona …...0..006 (1860), 189,948 | 62. Oldham Peuneveteneerere 113,100~~

~~*Eneate ceccheponnanoNHO0 roa eae kong Rouesbere eae*~~

~~*A839 110) Esapepeopegocnoodd ‘ 2, P NLESSI 1 Gseess ssscesssises 804*~~

~~*a Breese ee mean Cam). ud = see Etienne…….. 110,814*~~

~~*b Beliasbtes.sccasecresese 14 STA AGOM a ainevoeeec eee 109,319*~~

~~*38. Munich….. neon (lela 169,693 | 67. Valencia .. 107,703*~~

~~*39. Florence. (1871), 167,093 | 68. Leipsic….. 106,925*~~

~~*40. Bradford (1871), 163,056 | 69, Leicester . 106,202*~~

~~*a Oaeeee woe en : Sani 104,378*~~

~~*MINE). , . Hanover… 104,243*~~

~~*st a asta), ara & Seemed 5 103,998*~~

~~*. Antwerp …. 500 A WORLOUCNIE. .csesscscsessees 102,470*~~

~~*45. Bucharest …….00+ (1860), 141,754 | 74. Rigaws.sss.ssssee (1874), 102043*~~

~~*= Baa eale-onetiyne mea eae 75, Adrianople…….. (1874), 100,000 POLL cessteosseussessees . H*~~

~~*There are nine with 90,000 or upwards—Leghorn, the Hague, Ma- laga, Stuttgart, Frankfort-on-the-Maine, Jassy in Roumania, Sarra- toff, La Valette in Malta, and Saloniki or Thessalonica; sixteen have more than 80,000—Oporto, Dantzic, Aberdeen, Murcia, Lemberg, Le Havre, Nottingham, Strasburg, Preston, Catania, Nuremberg, Bremen, Bolton, Gratz, Norwich, and Christiania ; eighteen lic between 80,000 and 70,000—Wilna, Kieff, Kazan, Cork, Blackburn, Stettin, Roubaix, Barmen, Aix-la-Chapelle, Altona, Briinn, Ferrara, Rheims, Cadiz, Elberfeld, Trieste, Huddersfield, and Szegedin ; twenty-one are upwards of 60,000—Diisseldorf, Toulon, Plymouth, Wolverhampton, Chemnitz, Lucca, Geneva, Saragossa, Granada, Verona, Brest, Padua, Halifax, Devonport,*~~

~~*Amiens, Rochdale, Utrecht, Nismes, Versailles, Gothenburg, Nikolaieff; thirty-six between 50,000 and 60,000-Greenock, Brunswick, Montpellier, Tula, Krefeld, Alessandria, Swansea, Zurich, Modena, Posen, Maria-Theresiopol, Croydon, Limoges, Carthagena, Mainz, South- ampton, Palma, Stockport, Miilhausen, Nancy, Halle, Berdicheff, Bath, Nice, Jerez de la Frontera, Rennes, Merthyr-Tydvil, Essen, Metz, Augsburg, Reggio, Bari, Pisa, Seraievo, Gallipoli, Philippopel.*~~

~~*It must of course be kept in mind that lists like the above can only present an approximate view of the facts,—first, because the censuses or estimates of the various places are not strictly con- temporaneous and do not proceed on the same methods; and, secondly, because the areas to which they apply are deter- mined by different considerations in different cases. It is not unfrequently hard to say what ought to be accepted as_ the limits between town and not-town,—whether ancient villages and hamlets to which the city has grown outwards, or the modern suburbs which it has built at short distances, should be included or excluded. With those cities which have kept the characteristics of the walled towns of the medieval period the matter is easily settled, but in most cases the modern city has either got rid of its walls and turned their site into promenades or boulevards, or, retaining*~~

~~*| them as an interesting historical monument, has overflowed their*~~

~~*limits in all available directions. In some very modern instances, such as Elberfeld-Barinen in Prussia, clusters of dwelling-houses and industrial establishments have sprung up sporadically along a convenient valley ; and while there are large gaps in what we may call the area of architectural occupation, the various groups have a complete community of social and commercial life. Municipal boundaries give us but little assistance, for these are modified not only by the different municipal systems of the different countries, but also by all kinds of local conveniences, traditions, and rivalries.*~~

~~*An enormous increase has taken place since the French Revolution, and indeed within a much shorter period, ip the size of the military establishments throughout Europe. The rivalries and jealousies of the various nations have led them to vie with each other in the strength of*~~

~~their armies and navies; and as it is impossible to withdraw more than a certain number of men from productive labour to non-pro- ductive drill and display, a strange return, under greatly niodified conditions, has been made to that earlier state of society in which the army was the whole mass of the male population capable of bearing arms. Universal obligation or liability to personal service as a soldier is recognized by Germany, Austria, Hungary, Greece, Italy, France, Spain, Portugal, Denmark, Switzerland, and Turkey. In Belgium the army is recruited by conscription, in Russia mainly by~~

~~conscription, and in the Netherlands and in Norway and °~~

~~Sweden partly by conscription and partly by voluntary VITl. — 89~~

~~enlistment. According to the Swiss constitution, there can be no standing army within the federal territory. The following table, quoted by Kolb from a paper by Freiherr von Fircks in the Journal of the Prussian statistical bureau, gives an estimate of the military forces of the principal states in 1859 and 1874 :—~~

~~1859, 1874.~~

~~Available Available Total Total for fe Army. | ogtence. | A™Y: | offence. GiePMANIY ee: «sae one 836,800 | 483,700 |1,261,160 Austria-Hungary ….| 634,400] 448,800) 856,980 F Russia (European). .../1,184,200 | 604,100 |1,401,510 | 665,890 IUATICE hint sree wae 640,500 | 438,000} 977,600} 525,700 ee oy ae ae | ee : wale. 58,550| 42,200] 64,320! 39,430 Great Britain …..... 245,800 77,300 ra 71,860 Denmtatlers~~

~~Bi sae 4,230,550 [2,459,750 [6,110,690 [3,012,560~~

~~Thus the only nation which had decreased its force during that period was Denmark; France, instead of having one soldier to every 58 of the population, had one to every 37; Great Britain, instead of one to 119, had~~

~~one to 71. Since:1874 matters have not greatly changed. According to the Almanac de Gotha for 1878, the several states rank as follows, taken in the order of the strength of their forces in time of peace :—~~

~~ASIESEIE eycericee cee conse see TSGGO8 | Belotutayy……0:/del> seco 45,970 IBVATICE) oy raicavensvceoe ane 494,105 | Sweden…….. er 36,495 German yarn. .cenee ecient 478 8240 | Wennmark …..2…sc..-0.08 35,699 Austria-Hungary …… 296,218 | Postural ……0.c00- 34,203 Great Britain ……. 283,872 | Montenegro…… 30,000 PERS eas 0 ts sexe Geren en 2207690 || Rowmanta ……01-5 17,169 UD ilo get apeppocudvacéce T57, 007 | BUORWEW 6 cecsceencsoeans 12,755 Switzerland… 2-01 elOGMlO2: | MCmeeccebes,.. screenees auaate 12,188 SPAMS aesneesienins sees socis TOOKOOOR TSenvisecneederesss: .. 4,222 Netherlands……- 52,930 | Luxembourg…… 634~~

~~The total amounts to upwards of 3,000,000, or very nearly the population of Scotland or of the largest city in the world : in other words it forms one per cent. of the whole~~

~~EUROPE~~

~~in 1877 decided in favour of Britain, which not only manufactures her own armoured ships, but has constructed a large number of vessels for Russia, Turkey, Spain, Hol- land, Italy, Denmark, Greece, and Portugal.~~

~~A most important result of the military expenses of the national different countries has been the extraordinary development debts.~~

~~of national debts. In 1848 the total for all the European states was about £1,700,000,000 ; by 1873 it had increased to £4,680,000,000, or at the rate of £119,000,000 annually. Each successive war—the Crimean, the French-Austriaun, the Prussian-Austrian, and the French-German—has added to the load. Mr Robert Dudley Baxter, in a paper in the Journal of the Statistical Society, 1875, arranged the countries in groups according to the rate of interest they paid on the market price. The states of low interest, pay- ing from 3 to 4 per cent., were the United Kingdom, Den- mark, Holland, Belgium, and Germany; the states of moderate interest, 5 to 64 per cent., Russia and France ; the states of high interest, 64 to 10~~

per cent., Portugal, Hungary and Austria, Italy, and Turkey; while Spain, paying upwards of 16 per cent., ranked as astate of exces- sive interest. According to a table furnished by Dr Kolb, if the several national debts were equally distributed over the respective populations every inhabitant of Portugal would have to pay about £27, every inhabitant of France about £25, 4s., of Great Britain £24, 15s., of Spain £22, 10s., of the Netherlands £18,°18s., of Italy £16, 16s., of Turkey £138, of Austria-Hungary £10, of Belgium £5, 17s, and of Russia £5, 5s. The country which ranks lowest is Switzerland, which has no standing army,—the average for every man being there only about 8s. or 9s Were it not for the enormous development of European. commerce such a state of matters could not be supported, and even as it is several countries have been practically, if not formally, bankrupt during the present century. The following table gives the annual revenues of the different countries :—|

Income.

Expenditure.

France (1877)

£106,885,620 £106, 691, 868

*population of the Continent, more than one in fifty of the Besea (a) (i877) a Sra ae male population, or probably about one in fifteen of the adult Italy (1877) 59, 564,396 56,915,096 male population. The expense incurred is enormous,—the Austria (1877) 37,663,781 40,556,947 average sum paid by each individual for the defence of his ey eee ae i i — pain oop dacaeHnangoooNd 5 ; ‘ i country being, segoreling ip We Almanac de Gotha. —, Hungary (1877) OF Sai ode Ren 1. France ….c:cceeceese0e-24°86 | 11. Denmark..,.....0.0. 6°58 Belgium (1877) 10,161,830 9,857,700 @ Biggar sy oes say onsen 21°45 | 12. Greece ……..0000. sive OPS Netherlands (1876) 8,642,556 9,589,139 8. Germany voc cscseecsesene TO*10«| 8) Nongray 2… .000.:..008s 5°67 Portugal (1877). —5,346,661 5,510, 200 4, Spaitsss. vevseseeses 8°81 | 14, Switzerland…….. 4°51 Sweden (1878) 4,782,778 4,782,778 a eee aden B68 | 15, Titkey ..<- sossiseunes 3:88 Roumania (1876) 0.2.2… 8,915,776 3,915,776 6, BOMB o.ccs60.0055 aos Bio, | 16, ROW MAMIs….c.0g..00*

~~3°65 Denmark (1877-8) 2,734,189 2,239,443 7. Portugal ……ssses. 7°58 | 17, Servia cece. 3°21 Norway (1877-8) 2,235,000 2,235,000 8, Austria-~Hungary….., 7°35 | 18, Luxembourg …….. 2°46 Switzerland (1876) 1,659, 496 1,704,880 ee ne eer ee 7‘26 | 19. Montenegro……. 2°14 Greece (1877) 1,401,678 1,466,760. HO} SiedGlitew ss sveccdensenert 6°93 | 20. Netherlands……. 2°06~~

~~The commerce of Europe may be said to have had its Com-~~

~~The maritime nations, almost without exception, maintain beginning when the people of the early stone period bartered merce,~~

~~a considerable navy for warlike purposes ; and the greater powers have lavished their wealth on experiment after ex- periment in the endless task of mutual competition for the most destructive and indestructible fleet. In 1877-78 Britain had 58 ironclads (of which 47 are described as efficient), France 58, Germany 20, Russia 29, Austria- Hungary 14, Italy 16, Turkey 15 large and 18 small, Spain 10, and the Netherlands 17. The difference of size and structure of the individual vessels makes the fleets of the several countries practically incommensurable in a general survey; and without the actual test of conflict it would be hard to say which of the approximately equal equipments 1s the most powerful. An American official! investigator~~

~~} King, Zhe War Ships of Europe.~~

~~on from horde to horde the flint or jade best fitted for their weapons, and there is reason to believe that far back in prehistoric times the amber of the Baltic found its way across the Alps to add a new element to Italian decoration. It was not till the Roman period, however, that the great lines of traffic were distinctly laid; Rome was the first European city whose necessities and desires formed as it were a great centre of combustion requiring a continual current from all directions to feed the ever-brightening flame. Since the 10th century, when the northern nations had finally settled in their present seats, the commercial activity of the continent has increased from generation to generation, and in none has it made a greater advance than in the present. Europe has now a hundred Romes; and~~

~~*the mightiest of them is to the Rome that then was as the world of the 19th century is to the " world" of the first. Along with increased necessities and more varied desires have been developed greater possibilities of supply and satisfaction ; and the commerce of Europe has become the commerce of the globe.*~~

~~*The great indispensables are food and clothing, and in regard to neither of these is Europe self-sufficing. Austria, Russia, Roumania, and Denmark are the only countries that grow a sufficient quantity of the cereals to maintain a regular export, and even these are indebted to foreign supply for much of their ordinary food materials. Russia annually produces about 644,000,000 bushels of grain, and of this she can spare upwards of 120,000,000. The chief corn-growing districts are New Russia and Bessarabia, and the principal ports of outlet are Odessa, Taganrog, Rostoff, Mariupol, and Berdiansk. England and France purchase most of the wheat, and Germany most of the rye. Austria- Hungary produces about 400,000,000 bushels; but it is only in favourable years that the export exceeds the import. Roumania has an average harvest of about 89,000,000 bushels, and exports to the value of about £4,500,000. Denmark counts about 79,000,000 bushels of produce, and has a surplus of 65,000,000. England and Ireland derived in 1874 about 63 per cent. of its foreign wheat from the United States and Canada, 11 per cent. from Russia, 8 per cent. from Germany, and 4 per cent. from Chili. The value of the whole import amounted to upwards of £51,000,000 ; and it is calculated that on the average England requires the produce of about 4,500,000 acres of foreign wheat fields. The average harvest in France yields about 658,000,000 bushels; and in favourable years she has a small export. Germany produces about 715,000,000, but requires at least £80,000,000 worth additional. Belgium's medium harvest reaches 64,000,000 bushels, but it is never sufficient for the population; in 1873 they paid upwards of £64,000,000 for foreign supplies. The Netherlands produce about 31,006,000, and purchase to the extent of £3,000,000. The Italian harvest furnishes about 282,000,000 bushels, besides 27,000,000 bushels of rice, but the import exceeds the export sometimes to a very high value. In favourable years Sweden and Norway yield 82,000,000*~~

~~bushels: the former country exports oats and barley, and imports rye, wheat, and meal; the latter, with a surplus of oats, requires a large foreign supply of all other grains. The Spanish produce varies from 27 to 200 millions of bushels, but about £2,300,000 worth have to be imported. Portugal, with a mean harvest of 30,000,000 bushels, purchases to the amount of £250,000. For the whole of the continent the total harvest may be stated at about 4,893,000,000 bushels.~~

~~Europe finds greater difficulty in satisfying its demands for animal food, The average consuimption per head of population is rising in all the principal countries; and though the modern stock-raiser can produce a greater quantity of flesh per ox or sheep, it is in several districts found more profitable to turn the ground to other uses, and sheep and cattle farming are consequently on the decline. There has thus grown up a great import trade, not only of living animals, but, within the last twenty years, of preserved meat, the principal sources being North and South America and Australia. The trade is yet in its infancy, and trustworthy statistics are not readily accessible.~~

~~An ever-growing addition to the food supplies of Europe~~

~~is made in the form of what are called colonial wares—.~~

~~sugar, tea, coffee, &e. Though the native production of beet sugar amounts on an average to 22 or 23 million ewt. per annum, that would only furnish about 7 ib on an average to each inhabitant; while as far back as 1866, ac- cording to Robért Burger's calculation, the average demand~~

~~107~~

~~was more than 11 ib per head, and in Britain bad reached about 42 tb. The consumption, moreover, has since then increased enormously—Great Britain having advanced to 62 tb per head, France from 13 Ib to 19 tb, and Germany from 10 tb to 15 ib. Almost the same might be said of tea, in the consumption of which Britain again stands first, re- quiring about 4 tba head per annum; and of coffee, of which Belgium requires the greatest average supply, or about 9 Ib a head. And to all this must be~~

~~added the multitudinous articles of consumption from far and near that give such a cosmopolitan air even to an ordinary grocer's shop. For that most universal of all clothing materials, cotton, Europe is almost entirely indebted to other parts of the world ; and though it grows a large quantity of wool and no inconsider- able amount of silk, its demand for both far exceeds its domestic supply. So much, however, of what it imports is again exported in the form of manufactured goods, that it is almost impossible to obtain a correct estimate of its true consumption. For details on these enormous trades the reader may consult the separate articles. The European production of wool was reckoned in 1871 at upwards of 562,370,000 ib,—England contributing 159,000,000, France 91,108,000, and Russia 90,760,000 to the total. The production of silk is about 12,000,000 ib.~~

~~Some idea of the relative position of the separate countries in the general traffic of the world may be ob- tained from the following table of the strength of the com- mercial marine:—? |~~

~~| Vessels~~

~~of all Steamers. Tons. Men.~~

~~kinds. Great britain. BYGE WAG ss ow. .caavteveterees 6,990 118 | 1,020,000} 48,000 oan. cet cnciere ose 2,000 52 491,000 | 16,000 SRPMS cashiev ese secerchos 4,500 150 392,000 | 20,000 (Greece cee camimemcnse spies 2,100 i 392,000 | 20,000 IME oo. cre toineatcoes' 3,160 192 383,000 | 20,000 ated Bocas es 3,000 95 373,000 | 32,000 SEMEN! .e .ccssasssnennienne 3,300 390 858,000 | 32,000 Wenymankaererse csc. -nee 2,800 88 186,000 Bi MAAC, cai cccicosaae ans sessis 1,500 10 176,000 6,000 POFEU BAL «10. 2200.ceseesener 800 16 113,000 8,000 BolGiWD…….6.cr 0000000 70 Wo 30,000 1,400~~

~~Approximate totals..) 87,100 | 5,544 [15,863,000 | 550,000~~

~~Tf it were not for the enormous development which has Indus= its manufacturing industries, Europe tries.~~

been attained by would have no means of paying for what the other con- tinents can afford to send; it has comparatively few raw materials which it can give in exchange, and so it pays for them with its labour and its skill. The countries which rank as emphatically industrial are Great Britain, France, Saxony, Switzerland, Belgium, Wiirtemberg, Prussia, and Alsace-Lorraine. In the manufacture of iron Britain stands at the head of the list, especially for steel, wire, rails, and cast-iron. In the first department its principal rivals are Germany, France, Austria-Hungary, Sweden, and Belgium ; in the second Germany, France, Sweden, and Belgium are also exporters, and Austria-Hungary and Italy manufacture for their own markets; and in the third the state of matters is much the same, with the exception that several other countries are also producers in a small way. The manufacture of cast-iron is more widely distributed, form- ing an important industry not only in most of the coun- tries already named, but also in Italy, Spain, the Nether- lands, &c. The same position of supremacy belongs te

1 See Neumann-Spallart's contributions on the Trade of the World to the several volumes of Behm's Geographisches Jahrbuch.

Britain for its cutlery, though a great deal of attention is devoted to this department by all the chief Continental nations. Austria, for example, produces yearly about 600,000 scythes, more than 1,000,000 sickles, and about 200,000 straw knives, and of the first it exports a large number, especially to Russia. Vienna has a great manu- factory of fire-proof safes, and ranks with Steyr, Letten, Ferlach, Weipert, and Prague, in the production of military weapons. Prussian pens and needles are well known throughout the continent; and still better her cannon and needle-guns. In the manufacture of copper, brass, and lead, the first place belongs to France and Great Britain ; and in that of zinc to Belgium, Great Britain, and Prussia. In bronze France is distinguished both by the quantity and variety of her productions. Great Britain, France, Austria, and Germany are tlie only countries in which scientific in- struments are made in large numbers, and with excellent finish ; in the manufacture of musical instruments the same countries stand high, but have a greater

~~*number of competi- tors. In watchmaking Britain, France, and Switzerland carry off the palm; the Belgian clocks are accounted excel- lent; and the products of the Black Forest in the same de- partment are too well known to need even a passing mention. The ruder branches of the ceramic art are almost universally cultivated, but only a few countries furnish a large export of the finer wares. Porcelain is largely manufactured in Bohemia, at the royal potteries of Meissen and Berlin in Prussia, at Dresden in Saxony, at Limoges in France, at Copenhagen in Denmark, at the imperial potteries of St Petersburg, and at Stoke-upon-Trent and Worcester in England. Freiburg in Breisgau supplies the markets of a large part of the world with porcelain button knobs and beads; and the Thiiringerwald and Sicily are noted for their little porcelain figures and ornaments. The manufacture of glass is also of the widest distribution. Austria-Hungary numbers about 300 glass-works, Germany rather more, Britain upwards of 220, France 175, Italy 70, and so on. Bohemia gives its name to a well-known class of goods; France takes the first place for its beads and glass-jewellery ; and Belgium is perhaps even better known for supplying the common wants of the glazier. The polishing of precious stones is carried to greatest perfection in France; but Vienna, St Petersburg, London, Dublin, Berlin, and several other great cities also rank high. Amsterdam has long been the principal seat of the diamond trade. Bohemia and Baden find a valuable industry in the working up of their garnets and rock crystals; and Oberstein in Olden- burg is remarkable as the source of nearly all those fancy articles in agate which, under various names—Scotch pebbles and the like—are sold throughout Europe. Rome is the principal seat of the production of cameos and mosaics, and marble-cutting has attained its greatest de- velopment,in Tuscany. It is impossible to enter into detail on the various industries which use: wood as their raw material; almost every country and district has its share, and they differ not so much in the nature as the finish of the articles which they produce. In the produce of the turning-lathe Austria, Germany, England, and France rank highest, and they also keep their position in the depart- ment of wood-carving. Italy is first in straw-plaiting, Which is of prime importance in Tuscany; and next come Switzerland and Belgium. Leather-making and its asso- ciated industries are of universal distribution ; the brush- manufacture*~~

~~*has reached its fullest development in England ; and hair is most successfully turned to artistic account in France. ae*~~

~~*In the great department of spinning and weaving Britain stands facile princeps, Of the cotton manufacture, especially, it has long been the greatest centre, not only in Europe bus in the world; but within the present generation the*~~

~~*pa*~~

~~*BC RDP*~~

~~*industry has been rapidly developing in Germany, France, Russia, and several other Continental countries. The relative position of each is indicated by the following table of the number of spindles employed in the trade: —*~~

~~*Bngland'.....:,. S89¥D00;000) | (Spain. ai.c.. ees 1,400,000 JDERTOO conpneonege 5,200,000 | Belgium…….. 650,000 Germany…..... HelOOMOOM) Mtalive… eee 500,000 Switzerland …. 2,060,000 | Scandinavian 300.000 WRUSSIG, cote essen es 2,000,000 SIHBINAS aneno aan :*~~

~~*EATUSUDIAN sree scree 1,600,000 | Netherlands…... 280,000*~~

~~*In wool-spinning and cloth-weaving the chief countries are again Britain, Germany, France, and Belgium, and to these succeed Austria, Italy, Russia, Sweden, and Spain. As minor or domestic industries both branches have a very wide distribution, The greatest amount of silk is spun in Italy and France, and the latter country holds the first place in silk-weaving, though she has powerful competitors in Germany, Britain, and Switzerland. Great Britain again outstrips all her rivals in the general manufactures of flax, hemp, and jute ; in linen thread she is excelled by France, and in the extent of its rope works by Russia. Linen weaving is widely distributed as a domestic industry, and is rapidly developing as a factory industry in Germany, Belgium, and the Netherlands. The state of the paper trade may be gathered from the following statistics for 1874 : —*~~

~~*Produce. Cut. Pe SUMMBOLYo.05, visor eva dtiecensecs 428 3,585,000 ie) BY STI en ane eaacs aera nae 274 3,535,000 TANCE. a a es 404 2,907,000 MeN ET ay ise ASE 180 1,414,000 ecco conrmm carina 67 943,000 UMM ae. ca akeaeeeenaes 66 658,000 POM AMUED 60 a ssites te fences cov ces 19 442,000 *Norway and Sweden……. 20 265,000 A STUBIIL 7 3 ASRS W/ 255,000 eT oll yn aes he conretocenae. 10 \ 141,000 PRORUIOI oip5.c'scinacauvaciecosnas 19 117,000 DETIINGTIS Giccices tastes sve wicca 5 70,000 SMeZeTATIGe seccwaacweceoeees 30 l 19,000*~~

~~*The countries marked by an asterisk export part of their production. In paper-staining France ranks first, and Britain in the making of papier-maché. Sugar-refining is of most importance in Britain, France, the Netherlands, Belgium, and Germany; and the more modern manu-facture of chocolate flourishes best in France and Spain. Britain brews a greater quantity of beer than any other country, and Germany, Austria, and Belgium come next in order, Germany and France are the greatest manufacturers of brandy, and Holland has almost given its name to one of the principal liquors ; but this whole department of in- dustry is of the very widest distribution. Among the more peculiar and local branches may be mentioned the Kirsch- wasser and Eau de Cologne of Germany, the plum brandy of Roumania, Servia, and Bosnia, the aniseed liqueur of Albacete in Spain, and the famous productions of the monastic establishment at Chartreuse. Vinegar is most largely and successfully manufactured in France. In the preparation of tobacco, Germany stands first; and the Netherlands are indebted for a large trade in this depart-ment to their East Indian colonies. The soap manufacture has reached its highest development in France and Britain; while the greatest exporters of tallow are Russia, Roumania, and Servia. Sweden is especially famous for its matches, which are sent to all parts of the world. The preparation of ultramarine is of great importance in Germany ; and Austria has unrivalled manufactures of white lead in Carinthia.*~~

~~*Such are a few of the main features of that wonderful industrial activity which is daily acquiring a more varied aspect and extending over a wider area. The younger*~~

~~*Rail- ways.*~~

~~*Uk OP BE*~~

~~*nations are developing their resources, and turning their attention to industries that they had long neglected ; and in the older nations almost every year sees an addition to the bewildering multiplicity of human occupations.*~~

~~*While most of the several countries, as appears by the accompanying table, are on the whole fairly supplied with internal railway communication, and a few have developed a nearly perfect system of primary and secon- dary lines, much has still to be done before the general international system will be approximately complete. Of natural obstacles the mountains are the most formidable, and at the head of the mountains in this respect, as in others, stand the Alps. Between all the countries of northern and central Europe regular trafic is easily main- tained: the north of France, Belgium, Holland, aud the north of Germany are practically one as far as the great network of railways is concerned. Between France and southern Germany the connexion is not so close, though the Franco-German frontier is crossed by four or five lines, and the Swiss system, which is well developed, affords several additional routes. Between Germany and Austria there are almost equal facilities, more especially along the borders of Bohemia and Saxony. Eastwards and southwards in Poland, Russia, and Austria, tlle meshes of the net grow very wide, but the main threads are knotted together and satisfy the necessities of international communication. Such is the state of the case in the countries of central Europe ; but if the traveller wishes to proceed by rail to any of the three southern peninsulas, he finds himself in a very different position, From France he can enter Spain only by two routes, one of which takes him round the western end of the Pyrenees, and the other, opened in 1878, round the eastern end; at all other parts of the frontier the mountains bid defiance to the engineer. From Spain, where he will find the internal system still very incomplete, the traveller may cross the Portuguese frontier and proceed by rail direct to Lisbon, but if he wish to reach Oporto without visiting Lisbon he must resign himself to the old-fashioned road. HIs case is better if he turn in the direction of*~~

~~*Italy: from France he may glide into Italy through the tunnel of the Col de Frejus, or as it is popularly called Mont Cenis, which was completed in 1870 and opened in 1871; or from Bavaria he may traverse the other extremity of the Alps by the Brennerbahn, and reach the Lombard plain by the valley of the Adige. By all other routes he mnst in the meantime accept the service of the diligence ; but workmen have been busy since 1871 under the massif of St Gotthard, and within a few years he may be able to pass right through from Zurich to Bellinzona and Milan It has also been proposed to effect a communication between the railways of north Italy and the line of the Rhone valley by means of a tunnel through the Simplon ; and one German engineer at least, Sturm, has a scheme for boring under Mont Blanc itself. Once in Italy, the traveller can proceed as far as Otranto at the eastern end of the peninsula, or to Reggio at the western. If, instead of Italy, it be his desire to visit the countries to the south of the Danube, the railway altegether fails him. By Austrian lines he may reach Sessek on the Save, Essek on the Drave, or Bazias on the Danube; or if he go round by Galicia, he may proceed south through Bulgaria, cross the Danube at Rustchuk, and continue as far as Varna on the Black Sea. But at no point is there any connexion with the Turkish system, or rather fragmen- tary beginnings of a system : the lines from Constantinople and Aghatch which meet to the south of Adrianople, stop short in the valley of the Maritza, and the line from Saloniki proceeds only as far north as Uskub. In Greece there is but one little line, from the Pireus to Athens. By the Russian railways the traveller can journey direct*~~

~~*south to Odessa, Nicolaieff, or Sebastopol on the Black Sea, to Taganrog or Rostoff on the Sea of Azoff, or even to Vladikavkas in the Caucasus. Eastward he may advance as far as Tsaritsin or Saratoff on the Volga, and to Orenburg at the end of the Ural range. North-eastwards his limits are Nizhni-Novgorod and Vologda, According to the plans of the Russian Government, a few years will see the construction of lines of communication with eastern Siberia on the one hand and the new provinces of central Asia on the other. It is sufficient to mention the pro- jected tunnel between France and England. The following table gives the length of the railway lines in the several countries for 1860 and 1875 :—*~~

1860. 1875.

Kilometres, Miles. Kilometres. Miles. Great Britain …| 16,791 10,433 26,870 16,696 Belgium..... 1,729 1,074 3,517 2,185 Germany ……..... 11,253 6,997 27,980 17,386 France ……..000. 9,316 5,790 21,587 13,413 PAISUING o5s0sn007 008 5,402 3,436 17,368 10,792 UUSSIAN yescas ss cee 1,384 869 18,488 11,488 MGM so si ssicess ose 1,705 1,055 7,704 4,787 SGM c csicase sees. 1,916 1,190 5,796 3,601 Sweden……..... 467 290 4,138 2,571 Netherlands…... 259 160 1,895 17 Switzerland …... 936 598 2,066 78! TRUEKEY 552 ..0.020- a ae 1,537 955 Roumania……..... ane aah 1,288 766 Denmark……..... 109 677 1,260 782 Portugal ……..... 1381 814 1,033. 641 NOT WEY .0 68 42°2 555 344 GTECCEN ioc cccceese See ee 12 74

Since 1875 the railway contractors have not been idle. At the end of 1876 there were 16,872 miles open for traffic in Great Britain, and upwards of 5000 miles in course of construction. In the beginning of 1877 the Belgian lines amounted to 2228 miles or 3580 kilometres, and the French lines to 14,078 miles or 22,671 kilometres.

The telegraphic system, as appears by the accompanying table, is well developed throughout the continent, more especially in Switzerland, Great Britain, Belgium, Bavaria, and Wiirtemberg. As far as it is international, it is largely indebted to British enterprise and capital, and many of the most important companies have their centres in London. All the maritime countries have submarine cables. Norway has no fewer than 193, with a total length of 1233 nautical miles ; Denmark 29, with a length of 101 miles; and Holland 18, with a length of 36. The three Russian cables of the Baltic have a total length of 62 miles, and unite Cronstadt with the capital, and the islands Osel and Alend with the continent. Of the 12 Italian cables the most important, about 118 miles long, communicates with Sardinia ; and of the 6 Spanish three are devoted to Ivica, Minorca, and Majorca. Most of the 26 French cables are short, with the exception of that which stretches across'the Mediterranean from Marseilles to Algiers. Great Britain has a large number communicating with various parts of the continent, as well as witli Ireland, the Channel Islands, Orkney and Shetland, the Hebrides, &c. Of prime import- ance to the

~~*continent at large are the great transatlantic cables, four of which have their European termini in the west of Ireland, while a fifth, the longest yet laid down, stretches from Brest in Brittany 2585 miles to St Pierre near Newfoundland, and a sixth from J.isbon to-Pernambuco in Brazil. Two others are projected—one from Portugal, and another from the Shetland Islands round by the Faroes, Iceland, Greenland, &c. Direct communication is main- tained between England and India by the lines of the Eastern Telegraph Company, and other lines continue the system as far as Australia on the one hand and Japan on the other.*~~

~~*Canals.*~~

~~*Educa- tion.*~~

~~*710*~~

~~*EUROPE*~~

~~*Telegraphic Communication in Europe in 1875.*~~

~~*LINES. Kilometres. English miles.*~~

~~*4 a*~~

~~*Great Britain and Ireland……..:ccseeeee 38,858 '0 24,145 JRC sneer odbc pabonoaconconegnpennod cago a5 51,614°9 32,072 Russia (1874), including Asiatic lines…} 62,350°0 38,719 German Tm Qiies…cg-+- sectseenten oso aeeee 45,7795 28,446 Austria and Hungary…….0..ccsesreee 36, 262°4 22,532 TRY' feccerss oss veag ct oncenr en tecveceomas ot 20,756°0 12,897 THOS 0. iF 000.50 sc otMME AW ce nesntnsncsesenne 25, 232°0 15,678 Spain … ssercevseverssssssasvocsccsesesceaccceeenes 11,754°0 7,308 Bele… 25. Me ccaecie eee rece aie 4,959°0 3,081 Sa (0 haan Sco pea Eb Onana io poseaepandecieoonte 7,959°4 4,945 ShMaSa II! panderssepenacnpeonmocouanccoosouds 6,334°0 8,935 INGPW ON caernerses scace senses Lact eG OCSOGdEOE lis 4,458 Niethenlandgea.sccs:csusoee sts seeteccccenemet 8,440°4 UBF Deminavle acs cteacscte mecca saree tte 2,780°0 127 POROMAL.*~~

.....00000cesecrdvsesreereassaestes sone 38,5330 2,195 IPS rier Wook. og aeinan sobnAEdee ec osbardoeceroo Catone 8,820°6 2,373 GiGi > PI dos teovontionodectepennpadocadpns 2,565°9 1,593 (Slama), (CuEV/24 We cepeoqaseesonuendoconogda uabcod 1,461°3 907 THMROTIDOUTE UF cece. ceeevessnesnecccnseneres 290°0 180

Within recent years fresh attention has been directed to the older canal-system, which was by many regarded as having had its day. Not only are the canals which had fallen into partial decay being in many cases restored, but new canals are either constructed or planned. With-

out entering into the details of the separate national |

systems, some idea may be formed of the extent of this means of communication by the following facts. We may pass from the Rhone to the Loire, and from either river to the Seine; the Seine in its turn is connected with the Meuse and the Rhine; the Rhine communicates with the Danube in the south, and with the Ems and the Weser in the north; the Weser is already in communication with the lower part of the Elbe, and it is proposed to' construct a line of canals to unite these rivers further inland; from the Elbe we pass by the Spree system to the Oder; the Oder, by means of its tributary the Wartha, gives access to the Vistula; and the Bug, a tributary of the Vistula, brings us to the great Russian network of rivers and canals by which we can journey from the Baltic to the Black Sea or the Caspian, or from either of these to the White Sea in the north. Thus it appears in brief that water highways exist between all the great river systems and all the prin- cipal seas. It was only in the summer of 1876 that the Dutch opened a new canal between Amsterdam and the sea , in 1877 the senate of Finland voted 200,000 rubles for a canal between the Baltic and the White Sea; and very extensive additions are proposed to the German system. A scheme has even been started by an American engineer, H. C. Spalding, for connecting the Black Sea and the Caspian, and thus increasing the area of the latter at the expense of the neighbouring steppes; and a less quixotic proposal contemplates a canal from the Don to the Volga across the ridge of nearest approximation. In France there is already a line of water-way between the Bay of Biscay and the Mediterranean, but it is only available for inland traffic ; and the

~~*proposal is now entertained of constructing nothing less than a ship canal. An earlier and more extravagant project to make such a canal through Spain from Bilbao to the valley of the Ebro has naturally remained a dead letter.*~~

~~*Since the 18th century, there has been great advance in the general educational condition of Europe. That it is the duty of every state, if not to provide instruction for the rising generation of citizens, at least to see that it is provided, is a principle more and more thoroughly re- cognized and acted upon; and the obscurantist doctrine that the lower classes become more revolutionary and*~~

~~*dangerous by becoming more intelligent and better in—*~~

~~*WIRES. . Stations. Pe ae Telegramis.*~~

~~*Kilometres. English miles. 176,352°7 109,515 5607 11,988 21,062,978 135,944°3 84,473 4266 5,069 10,981,863 120,522°0 74,844 1615 1,754 3,777,041 157,912°4 98,123 5550 6,429 18,895,925 108,147°6 67,200 38099 2,956 6,803,549 62,224°0 38,664 19538 8,200 5,571,846 48,650°0 80,230 444 1,240 1,210,756 26,728°0 16,608 222). 385 1,283,907 21,094°0 ey Noy 586 1,088 4,117,487*~~

~~*19,3877‘4 12,040 521 475 1,387,717*~~

~~*15,442°6 9,595 1002 1,349 2,896,925 12, 405°0 7,708 72 297 781, 482 12,332°0 7,062 3380 379 2,374,926*~~

~~*7,653‘0 4,755 2038 233 912,310*~~

~~*4,656°4 2,893 147 225 461,971 6,842°4 45251 167 212 977,269 3,165°0 1,966 60 120 249,673 2,145°0 1,332 a7 52 165, 256 445°0 276 38 26 62,809*~~

~~*formed is less frequently employed as an open argument. Even in Turkey a law was at least passed in 1869 requiring the establishmeut of secondary schools and gymnasiums in the principal towns ; and education is one of the matters dealt with in the proposed reforms of*~~

~~*1878. How slow the movement has been even in the more civilized countries is strikingly shown by the fact that England has not yet realized the far-sighted schemes suggested more than a thousand years ago by her wise West Saxon king, Alfred. The educational reformers of almost every country have had a hard battle to fight in their endeavours after a satis-factory organization, and compromise and half-measures have frequently been the order of the day. From time immemorial the clergy have had, and they certainly for a long time had a right to have, a predominant share in the control of all educational matters throughout Europe ; the sacred books of the various forms of religion or doctrinal compendiums of individual sects have been the most familiar manuals of primary instruction; and even when the teacher has been a layman,f ecclesiastical supervision more or less efficient has been added. The present ten- dency, even in countries like Italy on the one hand, and Sweden on the other, where there is little difference of creed among the population, is decidedly in favour of the teachers being laymen and the instruction secular. That the clergy do not readily acquiesce in the changes that diminish their influence is excusable; but at the same time their demands have occasioned the most lamentable obstruction to educa- tional progress.*~~

~~*In order that primary education may be rendered univer- sal, it has been found necessary to make it compulsory ; and this has been done either directly or indirectly in all the great countries of Europe. It is now easier to name those that have not adopted direct compulsory measures than those that have adopted them. The former list in- cludes France, Russia (with the exception of the Baltic provinces), Finland, Belgium, Turkey, Servia, and Monte- negro. In England, the gradual extension of the school- board system practically involves the extension of com- pulsory education, though the question is left in the hands of local authorities instead of being decided once for all by the central legislation. Owing to the differences existent between the organizations of the several countries, it is impossible to institute an exact comparison; but the fol- lowing table, revised from Brachelli's, presents an approxi- mate survey : —1*~~

~~*1 The numbers for Great Britain represent those schools only which are under Government inspection, and do not include the statistics for*~~

~~*Treland.*~~

~~*EUROPE*~~

~~*Schools of Scholars to*~~

~~*Year. popular Schelars. every 1000*~~

~~*Instruction. inhabitants. Switzerland ……. 1872 5,088 413,789 German empire ..| 1872 56,000 6,000,000 Luxembourg …... 1874 644 28,437 EN{OTWANYs.000css0s0-+. 1873 6,502 243,969 SNVCON Fi… esos. 1875 8,123 606,876 Netherlands …... 1873 3,790 500,059 Denmark……..... 1867 3,064 226,679 WTATICS! .....e0se00s 1872 | 70,179 4,720,000 Belgium ……..... 1872 | 5,678 618,937 PANISUT Als cs os ov cesses 1875 15,166 2,134,683 Hapeary ……..... 1872 16,300 1,464,775 Great Britain ….. | 1876 17,787 2,340,277 RUSS ciescisse nice 1873 27,760 1,381,972 LUGIN? pegeeneeconenee 1873 42,920 1,827,381 CMECCE Tc cs.es sesess 1874 Wey 81,449 Wimilatide…...0+5++. 1873 1,382 76,477 Co ee 1870 3,500 140,000 Roumania……... 1873 Qe22 82,145 OBVIE, oMic sce. ceo 1874 517 23,278 rn 23,183 | 1,009,037*~~

~~*The countries of southern aud eastern Eurupe are all very low in the scale; but several of them, and notably Italy, Greece, and Russia, are making rapid advances. The last of these has great difficulties to contend against in the extent of its territory and the sparseness of its popula- tion; but such a fact as the following speaks for itself: "In 1866," says M. Hippeau,! "in every 100 conscripts only one could read and write; in 1870 this nuinber lad risen to li in the 100." Several of the local boards have recom- mended the adoption of obligatory attendance at school. Much less hopeful is the condition of Spain, where at thie last cansus (1860) 72 per cent. of the population could neither read nor write. Yet even there the movement is in the right direction. A fine contrast is afforded by the Scandinavian countries, where the peasantry have long been accustomed to relieve the tedium of their winter nights by reading the sagas of their native land, and by some of the Swiss cantons, where there are only 4 per cent. of the population totally uneducated. In France, according to the official statistics of 1875, there are 30 persons in every 100 unable to read or write ; and in Belgium, according to the results of the census of 1866,*~~

~~42 in every 100 above seven years of age are in the same condition. The high position of the German empire is mainly due to Prussia, which may be re- garded as the forerunner of educational progress in Europe. Among the other states the differences are very consider- able. Brunswick, Anhalt, Oldenburg, Saxony, and Thur- ingia rise above the average of 152 scholars to the 1000 in- habitants ; Mecklenburg and Bavaria sink as low as 121 and 126 respectively. A high position is held by tlie free city of Bremen, where the public expenditure for education has risen from 0°60 of a mark in 1847-51 to 8°45 marks in 1872-76 for each head of the population. In Austria the con- trasts between the provinces are enormous,—every tlousand inhabitants in Silesia, Bohemia, Moravia, or Tyrol send- ing from 130 to 136 children to school ; while in Galicia, Dalmatia, and Bukovina the numbers are only 29, 23,and 19.~~

~~If statistics are unsatisfactory in regard to the condition of primary schools, they are still more unsatisfactory as re- gards the institutions for the training and education of the primary teacher. Till some approximation be made be- tween the systems of the several countries, it conveys almost no information to say that in Prussia there are 107 and in Russia 45, in Switzerland 32 and in Portugal 6. And still more impossible is it to institute a comparison with respect to the secondary schools and the various insti-~~

~~eee~~

~~1M. Hippeau's volumes, L'instruction publique en Italie, 1875, L' instruction publique en Russie, 1878, &c., afford a convenient popular account of the education of most of the principal countries,~~

~~tutions devoted to instruction in special departments of art or science. Inall the more advanced countries they are in- creasing in number and in the specialization of their work."~~

~~In Germany there are twenty-one universities, including the academy of Miinster, with about 1983 professors and teachers, and a total attendance of 19,000 students, The best known are Berlin, Leipsic, Géttingen, Halle,~~

~~*Tiibingen, Bonn, Heidelberg, Jena, and Erlangen. In Austria- Hungary there are ten, with 1018 professors, and upwards of 12,000 students. Italy numbers one more than Ger- many, with 1093 professors, and not far from 10,000 students. Russia has nine, including the Finland university of Helsingfors, and the practically German university of Dorpat. The total teaching staff numbers upwards of 600, and the students more than 7000. The four Scandinavian universities of Upsala, Lund, Christiania, and Copenhagen, count 280 professors and 2700 students, There are four in Holland, inclusive of the Amsterdam Academy, and four in Belgium, the number of professors being respectively 149 and 229, and that of students 2056 and 2272, Since the addition of Geneva, Switzerland has the like number, with a teaching staff of 250 to 300, and an attendance of upwards of 1200. Spain boasts of ten universities with 400 professors, and, if her statistics are correct, has more than 15,000 students. Portugal, in its one famous institute at. Coimbra, has about 1000 students, many of whom are from Brazil and tlie colonies, A university was founded at Athens in 1837, another at Belgrade in 1838, and a third and fourth at Bucharest and Jassy in 1864. The pro- fessors number in all 128, and the students upwards of 2000. In France the organization of the higher education is peculiar: Bordeaux and Lyons are the cnly two cities besides Paris which have all the five faculties of theology, law, medicine, science, and literature, and it is only in Paris that tliey are incorporated into a "university." In sixteen other towns there exist one or more of the separate faculties, The professors in France exceed 420, with 14,500 students. The Catholics have free " universities " at Angers, Lyons, and Paris. Making allowance for defect-, ive statistics, it may be said that continental Europe has about 7000 persons engaged in university teaching, and that the students number from 88,000 to 90,000. In Britain the universities differ greatly from each other in constitution and arrangement. Oxford and Cambridge have together about 80 professors and over 5000 undergraduates, London university, which is merely an ex- amining board, had 17,312 candidates for matriculation in 1877. Durham numbers 5 professors and 109 students. In the four Scotch universities there are 102 professors and about 5000 students. The Queen's university, Ireland, has 54 professors and 745 students, and the Dublin univer- sity 39 professors and 1200 students.*~~

~~Europe, and especially northern and Germanic Europe, has long been distinguished from eastern and soutliern countries by the greater social and educational equality ex- isting between the sexes ; but in this, as in so much else, there is still abundant room for improvement. A powerful movement has set in towards a fuller recognition of the rights of woman; and the right to instruction is recognized as one of the most fundamental. A greater assimilation is in most of tlie more civilized countries being effected be- tween the education given to boys aud girls ; and a power- ful party, with powerful arguments, support the thesis that equal opportunities should also be afforded to young nen and to young women. In Prussia the general movement is represented by the Victoria or Lette Union at Berlin, and the Otto Petter Union at Leipsic, both of which have~~

~~2 See an interesting Report on Weaving and other Technical Schools of — Continent, presented to the Clothweavers Company of London, 1877. "ee~~

~~founded institutions for the higher education of women. The Jews of Frankfort-on-the-Maine have established two important schools—the Philanthropinum and the Afiister- schule; and the city of Carlsruhe has had a superior school for girls since 1826. The university of Zurich has set the example of the free admittance of women; the London University opened its gates to them in 1877; and the older universities of England and Scotland have at least sanctioned extramural lectureships and condescended to ex- amine if not to teach them. A women's college has been opened at St Petersburg by Catherine Dikhova under imperial patronage; Hungary has a similar institution ; and so the innovation is becoming familiar, and within a gene- ration or two the condition of female education at thie be- ginuing of this century bids fair to appear a semi-barbarian state of things hardly credible at so recent a date,~~

~~To recapitulate, European education is being more widely diffused, is passing from the control of the clergy or the private citizen into the hands of the state, is becoming more secular and less sectarian, and in its higher~~

~~*depart- ments shows a growing catholicity towards the more modern aspects of thought and life.*~~

~~*Europe is pre-eminently the country of monotheism, which forms the central doctrine, not only of its dominant religion, Christianity, but also of the minor rivals Judaism and Mahometanism. To none of these three religions has it given birth; and, what is more remarkable, its peculiarly Aryan population have adopted their religion from a Semitic people. 'The various nations of Europe were still polytheistic when they first entered within the historic horizon ; and this polytheism has left more numerous traces of its influence than superficial observers might imagine. Not ouly have the gods of the Greek and Roman pantheons and their ruder rivals of the north obtained an immortality in the literature and art of all the cultured nations of Europe, but amid the manifold traditions and half-unconscious beliefs of the common people there are fragments of older and baser creeds. Much has still to be done before the amount of such survivals can be estimated with anything like accuracy, but that their number is considerable has been already well established.! Nor need it be matter of surprise when we consider how recent the introduction of Christianity into Europe really is, and how, to vast masses of men, it came, not as a conviction of the intellect or a captivation of the heart, but as the infliction of a conqueror or the command of a king; and how, even when it was adopted through the persuasive eloquence of genuine missionaries, it obtained, in many cases, but a divided allegiance, and had to accept and sanctify as best it might the rites and symbolism of the religion which it expelled. That the English still speak of Wednesday and Thursday, that the French have their Vendredi and Mardi, the Italians their Venerdi and Martedi, is of purely historic interest, and implies no lingering attachment to Woden or Thor, to Venus or Mars ; but there is no country in Christian Europe in which the popular ideas about supernatural agency in general are not the mongrel products of paganism and Christianity.*~~

~~*Christianity in Europe is broken up into three main divisions,—the Roman Catholic Church, the Greek or Eastern Church, and the Protestant or Evangelical Church ; and each of these has received more or less numerous modifications and subdivisions under the influence of*~~

~~different political and social environments. Roman Catholicism not only can boast of the greatest number of adherents, but has the greatest claim to unity, at least in its external organization, and stands in direct contrast to many portions of the Protestant Church, which, while maintaining the superiority of their respective creeds, ac- en ee~~

~~1 See Tylor, Primitive Culture, vol. ii.~~

~~EUROPE~~

~~knowledge the local and temporary character of their con- stitutions. 'The unity, however, has all along been more nominal than real,—rather the beau-ideal of the administra- tive hierarchy than the actual condition of the organization which they control. Discordant elements have frequently threatened a disruption; severe contests have taken place between the spirit of centralization in Rome and the desire for local independence in individual countries ; and in the present century the irreconcilability of two great parties has given rise to the so-called Old Catholics in Germany and Switzerland, who in the latter country at least seem likely to break up into two distinct sections. There arc two religious communities in Europe which occupy a special relation to the Roman Catholic Church, the United Grecks and the United Armenians, otherwise known as Catholics of the Greek rite and Catholics of the Armenian ritc, 'They both acknowledge the supremacy of tle pope, but they are permitted to retain many pecu- liarities of organization and ritual. The United Greeks have an archbishop at Gran in Hungary, and another at Lemberg in Galicia. The United Armenians are found in Russia and Austria, but are still more numerous in the Ottoman empire. A schism not unlike that of the Old Catholics broke out amongst them in 1869. The pope by the bull Reversuris claimed to exercise certain rights which his predecessors had never enforced, and the Armenians not only rebelled, but drove their patriarcl Hussan into exile because he supported the papal authority. The small church of Utrecht, which dates from the year 1704, retains the doctrines of the church of Rome, but emphiasizes the superiority of the councils over the pope, and has no connexion with the papal organization.~~

~~*The Greek Church has been divided by political in- fluences into several independent communities, each with its own organization, but all united by 2 common creed, and tle consciousness of a common historic origin. The head of the whole church was at oue time the patriarch of Constantinople ; but he never had the same supremacy as the pope, and has gradually sunk to be little more than the head of that branch which is subject to the Porte. The Greek Church of Russia began to establish its independence in the middle of the 13th century; till about the middle of the 15th it sent its nominees for the office of metro- politan of Kieff to the patriarch of Constantinople for con- secration ; afterwards the cousecration was performed by a coancil of Russian bishops ; and in 1589 the metropolitan was raised to be the ecclesiastical peer of the patriarch. Peter the Great allowed the office to lapse, and supplied its place by a council or synod, which still remains the central authority in the Russian church, the emperor being re- cognized as the supreme defender of the faith, and practically holding the place of chief administrator. The Austrian branch of the Greek Church is also governed by a general synod composed of all the bishops under the presidency of the patriarch of Carlowitz, and three pro- viucial synods, the Austrian proper meeting at Czernowitz, the Servian at Carlowitz, and the Roumanian at Her- mannstadt. After the declaration of the political inde- pendence of Greece, it was natural that there should arise a desire for the independence of the uational church ; and the patriarch of Constantinople was obliged to recognize its autonomy in 1850. A similar movement took place in Bul- See in 1870. Though the Greek church is dominant in*~~

~~*Russia, there is a very considerable number of sectarian communities. Chief of these are the ‘ Raskolniks” (sepa- ratists or non-conformists), who seek to maintain a mcre scrupulous accuracy in the ritual than the state church enforces. Of totally different character are the heretical sects, some of whora, as the Molokani, show great reverence for the letter of scripture, while others, as the Skoptsi or*~~

~~*mi UROP EH*~~

~~*Eunuchs, profess the wildest anti-scriptural doctrines, and are carried into excesses of practical fanaticism.*~~

~~*The Protestant churches of Western Europe, which have so marvellously exemplified what naturalists call propaga-*~~

~~*713*~~

~~*The political history of Europe begins with the Greeks ; Changes but while they contributed more extensively than any of terri-, people have done since to the theory of government, they Muah*~~

~~*: : Act ,. ~ distribu- have left practically no trace of their political organization i*~~

~~*tion by fission, may be doctrinally divided into two great groups,—the "' Lutheran," which maintain'the platform of the great Reformer ; and the "Reformed," which have advanced further in their divergence from Roman Catho- licism. Politically there are three great classes—state churches, free churches enjoying state endowments, and free churches which either from necessity or choice are en- tirely independent. To the Lutheran group belong the state churches of Sweden, Norway, and Denmark, and that form prevails also in Prussia, Hanover, and the Baltic provinces of Russia ; the "Reformed" includes the Calvinistic churches of Holland and Scotland, and a great number of eccle- siastical organizations in England, Scotland, Switzerland, Germany, and France. The established church of Eng- land, though frequently classed with the Lutheran group, has so many points of contact in doctrine and ritual, both with Calvinism on the one hand and Roman Catholicism on the other, that it may be allowed to stand by itself. In Prussia, Baden, and a few of the smaller German states, the two parties are associated under the title of the United Lutheran Church, and have very close relations with the political administration. It is impossible to do more.than mention the minor subdivisions of Moravians, Episcopalians, Presbyterians, Methodists, Independents, Quakers, Uni- tarians, for which the reader may consult the separate articles, and such works as Staudlin's Kirchliche Geographe, Wagger's K. Statistik, Déllinger's The Church and the Churches, and De Mestral's Tableau de U Eglise Chrétienne,*~~

~~*Mahometanism or Islam has comparatively few adherents in Europe, and has moreover ceased to be aggressive. If it still occupies in Constantinople one of the noblest of Christian churches, it is more than six hundred years since it surrendered in Cordova one of the noblest of its mosques. Its adherents are mainly Turks, Tatars, and Slavonians ; and outside of Turkey they are nowhere very numerous ex- cept in southern Russia. Judaism, which at one time had no small proselytizing energy, has for a long period in Europe been nothing but the religion of the people of Jewish descent. It is divided into two great organizations, the so-called orthodox party representing traditionalism, and the reformed party representing freedom of thought. Even among the orthodox considerable laxity of observance is creeping in, and marriages with Christians are growing more and more frequent. Buddhism is still professed by the Calmucks of southern Russia; and the Tcheremisses, and several cognate tribes, and part of the Lapps, Finns, and Samoyedes, still preserve their pagan creeds and customs. The following table from Brachelli gives approximately the numerical strength of the various religions :—*~~

~~*Other Christians, chiefly Protestants.*~~

~~*Countries. Catholics. Greeks. Jews.*~~

~~*100 300 3,100*~~

~~*3,000 512,200 3,052,700 1,375,800 _ 49,400 40,000 2,277,000 40,000 7,000 1,500 68,000 600 4,300 1,800 25*~~

~~*14,867,500 25,630,700 27,904,300 35,388,000*~~

~~*54,000,000 2,092,000*~~

~~*Switzerland ….. Belgium …..... Netherlands …. Luxembourg …*~~

~~*16,500,000 3,950,000 10,000 650,000*~~

~~*‘2,600*~~

~~*1,442,000 100,000*~~

~~11;000,000 4,500,000~~

~~Total (ap- proximate)~~

~~145,850,000~~

~~69,500,000 | 71,460,000 | 4,500,000 | 6,600,000~~

~~in the present association of states. From first to last, in spite of religious and political confederations, and of the unifying influence of the Macedonian hegemony, they re- tained what in modern phraseology would be called their particularism,—each city or state working out its own political development and testing the value of the various forms of political life for itself The Greeks were not a conquering people ; they felt nothing of the land-hunger of modern nations ; and even the great conquests to which they were led by the Asiatic genius of Alexander the Great did not present themselves as acquisitions of territory. They were great founders of cities, and their colonies were distributed, along the coasts of Europe from Spain in the west to the Black Sea in the east; but if all the ground that they thus occupied were added together, it would form a comparatively small country. The city, wherever it was, continued an integral part of Hellas, but Hellas was rather the name of a people and a civilization than of a country or a state. In this respect no greater contrast could be found than that afforded by the next people of European history. The history of Rome is almost from its beginning to its close a history of conquest; the limits of its territorial advance were no sooner fixed than the period of decadence set in, Where the Greeks had planted a city the Romans subjugated a region. And thus it is that to the present day the lines of Roman organization are as distinctly traceable on the political map as the lines of Roman roadway in local topographies.~~

~~As the Greeks had been the great defenders of Europe from the encroachments of Persian ambition, so the Romans repulsed the Semitic power of the Carthaginians ; and as the defence against the Persians was the great determinat- ing factor in later Greek development, so the repulse of the Carthaginians was the prime factor in the later Roman development, The Punic wars led to the conquest of Sicily and Spain ; and the conquest of these gave at least a new emphasis to what was~~

already perhaps a national tendency. In 227 B.c. proconsuls were appointed for the province of Sicily and the province of Sardinia and Corsica; the second Punic war left Rome master in 201 of the greater part of Spain and supreme in the western Mediterranean ; the capture of Numantia in 133 put the rest of Spain in its power; the battle of Pydna secured the subjugation of Greece; the campxigns of Julius Cesar added the vast territory of Gaul to its domain; and when Augustus effected the great change in the constitution which left its effete nomenclature to the 19th century, he was able to adopt the Danube, the Rhine, and the ocean as the north- eastern boundary of the European part of his empire. His rule was paramount in all the region which now comprises Portugal, Spain, France, Belgium, western Hol- land, Rhenish Prussia, parts of Baden and Wiirtemberg, most of Bavaria, Switzerland, Italy, Tyrol, Austria Proper, Western Hungary, Croatia, Slavonia, Servia, Turkey in Europe, and Greece. The populations of many of these countries had already begun to be Romanized in language and customs, but most of them were still distinctly aliens. During the succeeding centuries of the empire a few comparatively unimportant oscillations of frontier took place, and a few additional elements were added to the motley conglomerate of Roman citizenship; but the main features were still the same when Constantine intro- duced his new administrative distribution, and fixed the seat of government in the city which still bears his name, Christianity, which new received the sanction of the civil power, had gradually changed from an organ of

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Plate X.

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political disintegration into an organ of political union. The worship of Christ and the service of the empire formed two powerful bonds of association between the members of discordant races, and even proved strong enough to break up several tribes into two sections, — one of which was Christian and imperial, and the other pagan and barbarian. But even in the reign of Constantine the frontiers were with difficulty maintained: he had himself to resume the contest more than once with several

~~*powerful Germanic peoples. Before long, the whole of the outer world to the north-east was in motion. The Visigoths, or West Goths, were pressing on the lower Danube; behind them, in the countries of the Bug and Dnieper, lay the East Goths; and further east were the warlike, horse-loving Alans in the country of the Don and the Volga. Other German tribes or confederations—Franks, Saxons, Alemanni, Longobards—had settled or were settling along the upper Danube and the Rhine, and had crossed or were crossing into Roman territory. Far to the east, over the country now known as Russia, the Scythians and Sarmatians were nomadizing; aud in the outskirts, along the Ural, we can dimly distinguish the Magyars, the Avars, the Petchenegs, and other tribes that were afterwards to force their way westward. In the reign of Valens a new impetus was given to the barbarian hordes. The Huns, a wild nomadic people, suddenly appeared on the lower Don, subjugated the Alans and the East Goths, and drove the defeated West Goths across the Roman frontiers. As a Christian people the fugitives obtained permission to settle on the south of the Danube; but the treatment they received from the Roman officials drove them to rebellion; they defeated Valens in the great battle of Adrianople, and threatened to invade Italy itself; and it was not till the reign of Theodosius that they were persuaded by import- ant concessions to take peaceful possession of lands in Meesia, Dacia, and Thracia.*~~

~~*Hitherto the empire had, in spite.of all the confusion of rival emperors and intrusive tribes, maintained a theoretical unity; in 395 A.D. a division was effected which practically proved definitive, Arcadius, the eldest son of Theodosius, became emperor of the East, with his capital at Constanti-nople ; and Honorius his brother became emperor of the West, with his capital not at Rome but at Ravenna, Had the Roman territory been confined to Europe the division would have been extremely unequal, as Arcadius only re- ceived the country to the south of the Danube and east of the Drinus, or, in other words, little more than European Turkey and Greece; like the sultan's, his possessions were mainly in Asia and Africa.*~~

~~*Instead of tracing the gradual disintegration of the Western empire, with its monotonous detail of invasions, concessions, repulses, &c., it will be well to pass down to the 6th century, and see what has been effected in the*~~

~~*in- terval We now find the German race almost everywhere in the ascendant. England isin the hands of the English ; the kingdom of the Franks extends from Brittany to Thuringia; the West Goths are dominant in the greater part of Spain and nearly all the country to the south of the Loire; the Suevi are in possession of the remainder of Spain; the Burgundians occupy a compact territory, which includes, besides the basin of the Rhone and Saone, parts of the contiguous basins of the Rhine, the Seine, and the Loire ; and the East Goths, under the sanction of the em- peror of the East, hold sway in the rest of western Europe, from Provence to the Danube and from the Alps to the Sicilian Strait. Outside of the old frontier the Gepidee (also German) have established a kingdom in the country to the north of the Danube; on the north-west they are conterminous with the Lombards; the Thuringians are established to the west of the Béhmerwald; the Saxons lie between the Meuse and the Oder; the Danes are in*~~

~~*possession of Denmark, and the other Scandinavian peoples hold the country from which they derive their name. It would seem as if Europe were in a fair way to become a German confederation, or, it might be, a German empire. But all over the old Latin area the Germans are ceasing to be Germans; and beyond that area, both in Europe and Asia, there are other peoples destined to play a part in the settlement of the West. The Bulgarians, a Mongolian tribe, have reached the country between the Dnieper and the mouth of the Danube; the Czechs or Bohemians, already occupy the country which now bears their name; the Croats are to the north of the Lombards ; and other Slavonic tribes have pushed south to the coast of the Adriatic.*~~

~~*If we again pass down for about two centuries, the whole Piate scene is changed. The West Goths and Hast Goths have XI.*~~

~~*almost disappeared,—the former only living on in the little kingdom of Asturia in the north of Spain; to the south of the Ebro and the Douro the country is in the hands of Arabs, or Moors, who first crossed the Strait of Gibraltar in 711; the king of the Franks is that Charles the Great, or Charlemagne, who is the mightiest monarch Europe has seen since*~~

~~*Constantine, and he has not only extended his kingdom on all sides, but he has been chosen emperor of the West, and his authority is acknowledged from the Ebro to the Elbe, and from the North Sea to the Tiber. A new political power has arisen in the pope, or bishop of Rome, whose spiritual supremacy is beginning to be widely recog- nized. The Eastern or Byzantine empire is more and more exposed to the intrusion of Slavonians : they have under the name of Servians established a considerable kingdom be- tween the Adriatic and the middle Danube, and, mingled with other races like the Bulgarians and the Avars, they occupy a large region to the north of the Danube. Jn the country to the north of the Black Sea, as far east as the Volga, has grown up a great kingdom called the kingdom of the Khazars, with its capital at Balangiar or Astrakhan ; the people is mainly of Ugrian stock, but it has accepted the Jewish religion, and, allowing complete religious tolera- tion, is mingled with representatives of many nationalities; politically it continues important for centuries as a bulwark against the advance of the Slavonic tribes from the north. Of all these states from the Atlantic to the Volga the one that showed most powerfully at the time, and which has lived most prominently in historic record, is undoubtedly the empire of Charles the Great; but of all it was the first to perish: even the nucleus of his kingdom was divided into two—that of the West Franks and that of the East Franks.*~~

~~*By the end of the 10th century the map again presents great modifications. The Mahometans are still in possession of a great part of Spain, and the northern region has been broken up into several independent states—the kingdom of Leon, the little kingdom of Pampeluna, and the count- ship of Castile or Burgos, The western Franks now form the kingdom of France with its capital at Paris, and since 987 have been ruled by the dynasty of Capet, which will continue to modern times. The duchies of Gascony, Aquitaine, Burgundy, and Normandy, and the countships of Flanders, Champagne, and Toulouse, have been gather- ing strength, and will maintain for centuries a certain amount of independence. Germany has recently become the representative of the Roman empire through the corona- tion of Otto the Great of Saxony ; and Otto IIT. is forming plans for the increase of the imperial power. HIs authority is recognized by the dukes, not only of Lorraine, Alemannia,*~~

~~*Bohemia, and Carinthia, but by those of Spoleto, Benevento, and Salerno, as well as by the minor potentates of Italy, with a few exceptions in the far south. The duchy of Poland and the kingdom of Hungary are less formally and*~~

~~*Plate XII.*~~

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~~*steadily subordinate. Between Germany and France lies the kingdom of Burgundy or Arles, which must not be con- founded with the duchy of Burgundy, and whose limits extend from Basel to Provence, including all the lower basin of the Rhone. In the Balkan peninsula the Servian prin- cipality maintains its independence, and the Bulgarians have extended their power from the Danube southwards to Thermopyle. Among the peoples to the east the Russians are already the most powerful; and the great empire of the Khazars has disappeared.*~~

~~*During the next five centuries Europe was full of hurry to and fro, of petty strivings and plunderings, of great wars and invasions, of crusades and conquests. At one time it appeared as if the Scandinavian peoples were to take posses- sion of England, and at another as if the English were to become masters of France; the French attempted the an- nexation of Italy; the most powerful of the Italian com- monwealths extended its authority over the islands and mainland of Greece ; all Europe sent forth its armies for the recovery of the sacred sepulchre; and all Europe was in alarm at the advance of the Ottoman power. Amidst all the confusion and conflict, the modern nations were slowly taking shape under the influence of a rapidly developing feudalism, and by the time we reach the 16th century we can speak of France and Germany, of Spain and Portugal, of Poland, Russia, and Turkey, with some- thing of the same meaning in the words as they possessed till the Great Revolution.*~~

~~*In the second decade of the 16th century the house of Hapsburg, in the person of Charles V., attained an unpre- cedented preponderance. Through the action of the Jaws of inheritance he acquired the Netherlands, the Spanish monarchy with the kingdom of Naples, and the Austrian states of his paternal grandfather; and in 1519 he was elected to*~~

~~*the imperial throne. On his abdication he left the German states to his brother Ferdinand, and the rest of his possessions to his son Philip. Between the various countries thus absurdly united with the Spanish crown there was no kind of cohesion, and even in a period of re- pose the association could hardly have been expected to last. The 16th century was anything but a period of repose. The extent of the new monarchy raised the rivalry of England and France ; the Turkish power was dangerously ageressive in the east; and religious discord added a new and potent element of disintegration. War followed war in rapid succession; and many of the most flourishing parts of the continent were laid waste with a desolation which centuries of peace but partially effaced.*~~

~~*It was not till 1648 that the treaty of Westphalia gave the greater part of the continent another period of repose. The contest of which it was the immediate termination left Sweden the most powerful of the Scandinavian states, with important acquisitions from Denmark and Norway, from Germany, Russia, and Poland. The Protestant Netherlands and Switzerland were now formally recognized as independent. In Germany the house of Hapsburg was no longer in a position of undisputed fsupremacy ; the houses of Hohenzollern, Saxony, and Wittelsbach had all gained in importance ; and, instead of a powerful kingdom, there was nothing but a "lax confederation of states." The authority of Spain was still acknowledged in Naples and Sicily, in Milan and Sardinia, as well as in the Catholic portion of the Netherlands. Venice was the principal native power in the north of Italy, and a large part of the central region was in the hands of the church. France had increased her territory by the acquisition of Alsace, and was the most formidable military state in the continent. The three kingdoms of the English crown had for some time been united under a common dynasty. Russia was recovering her position; Poland was already beginning to*~~

~~*decline ; the Turkish power was losing ground before the Germans and Hungarians, and, as a natural consequence, the Hungarian kingdom was gathering strength.*~~

~~*The rest of the 17th century was mainly remarkable for the series of wars with which the name of Louis XIV. of France is more immediately associated. They produced in the long run comparatively small alterations in the partitioning of territory, as the treaty of Ryswick was in the main an instrument of restoration. Of much greater effect was the death of Charles II. of Spain in 1700, followed as it was by the war of the Spanish succession, in which all the principal states were more or less embroiled. At the close of the contest ,the Bourbons of, France got pos- session of Spain, Sicily, and Parma; the Austrian branch of the house of Hapsburg obtained the Spanish Netherlands, Naples, Sicily, and Milan; the Prussian kingdom of the Hohenzollerns was formally recognized and its territory increased ; the duke of Savoy became king of Sardinia ; and England secured the occupation of Gibraltar and Minorca. 'The principal effect of the wonderful campaigus of Charles XII. of Sweden was to leave his country in a condition so exhausted that, at the peace of 1720-1, it had to give up a great part of what it had acquired during the 17th century. A totally different result attended the equally daring but more politic enterprises of Frederick the Great, who greatly increased his territory and secured for his kingdom a brilliant future in Europe. About the same time, under Peter the Great, Russia was making con- quests both in south and north, and was preparing to take her place side by side with the western powers.*~~

~~*Tn the latter half of the 18th century, or, more precisely, about the year 1785, the political map presented the follow- ing divisions, The German empire under Joseph II. extended over an area of about 255,120 square miles, had a population of upwards of 26,000,000, and consisted of no fewer than 289 states, of which 61 were free cities. The portion of the Austrian possessions which was not included in the empire had an area of 152,000 square miles, and a population of 9,250,000; and the corresponding portion of Prussia had an area of 29,764 square miles, and a population of 1,500,000. To France, at that time under Louis XVI., belonged no less than 201,970 square miles, and a population of 26,000,000. The inhabitants of Great Britain and Ireland numbered no more than 12,000,000 ; and Spain, with her area of 195,600 square miles, had only about 10,500,000. Italy was broken up among eleven states, and her total population was estimated at 16,250,000. The kingdom of the Two*~~

~~*Sicilies included the island of Sicily and all the southern portion of the peninsula as far north as Terracina in the west and Ascoli in the east ; to the north lay the States of the Church, extending in the east to the mouth of the Po, and in the west to the borders of Tuscany ; Tuscany in its turn was conterminous with the territory of Lucca and the duchy of Modena ; to the west of Modena lay the territory of Genoa and the duchy of Parma; the duchy of Milan stretched along the northern half of the valley of the Po from Lucarno to Mirandola ; the kingdom of Sardinia included Savoy and all the'country westwards to the frontiers of Switzerland and France ; and the republic of Venice stretched its authority from Lucca in the west to Aquileia in the east, as well as along the Dalmatian coast to the neighbourhood of the Narenta. | The republic of the united Netherlands had 7290 square miles of territory, and 2,250,000 of a population. Norway was politically united with Denmark; and the king of Denmark, Christian VII., consequently held sway over an area of 165,830 square miles, and a population of 2,250,000. The Swedish territory was about 233,860 square miles, but the population was only 3,000,000. Switzerland occupied 14,880, with .1,750,000 inhabitants, The republic of*~~

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~~*Poland, in spite of the partition of 1772, by which it lost 6600 square miles, still possessed a territory of upwards of 223,000 square miles, and a population of about 14,000,000. Russia held 1,593,300 square miles, and Turkey about 245,000; and their respective populations amounted to 25,000,000 and 15,000,000.!*~~

~~*In 1789 the great French Revolution had fairly com- menced, and for the next quarter of a century the history of Europe is little more than a history of France and her friends, and France and her foes. Never since the invasions of the Germanic nations had there been such a complete overturning of all existing political arrangements as was effected by the daring despotism of Napoleon. In 1812 the French empire included, not only France, Belgium, Holland, and Luxembourg, but also the whole country to the left of the Rhine, the mainland of Sardinia, part of Modena, Tuscany, and Rome, Geneva, Neufchatel, and Valais—a total area of no less than 339,000 square miles, with an aggregate population*~~

~~*of 42,366,000. The 35 states of the confederation of the Rhine, including the kingdoms of Westphalia, Saxony, Bavaria, Wiirtemberg, the grand duchies of Frankfort, Berg, Baden, Hesse, and Wurzburg, were under the protection of Napoleon; a similar position was held by the kingdoms of Italy and Naples, by Illyria and the grand duchy of Warsaw; and French influence was paramount in Switzerland, Prussia, Austria, and Denmark. England and Russia were the only truly independent states of real political importance; Spain and Portugal were fight- ing for their existence; and Sweden on the one hand, and Turkey on the other, were practically outside of Europe.*~~

~~*At the great monarchical congress of Vienna, an attempt was made to restore nearly everything that the Revolution had undone. Austria recovered East Galicia from Russia, and Tyrol and Salzburg from Bavaria; and in compen- sation for Belgium, &c., she obtained the Lombardo- Venetian kingdom of Italy, as well as Dalmatia and Parma. A kingdom of the Netherlands was constructed out of Belgium, Holland, and the German duchy of Luxembourg. The kingdom of Sardinia was restored to Victor Emmanuel and strengthened by the addition of Genoa; and Modena and Tuscany were assigned the one to Duke Francis IV. and the other to Ferdinand the brother of the Austrian emperor. Naples and Sicily, as the kingdom of the Two Sicilies, were given back to the former king Ferdinand; Spain and Portugal to Ferdinand VIL and the house of Braganza respectively. Russia incorporated Finland, Bessarabia, part of Moldavia, &c.; the kingdom of Poland was governed under Russian suzerainty by a vice-king, with a free constitution; Cracow was declared a free state under the protection of Austria, Russia, and Prussia. Switzerland was allowed to retain its federa- tive system, and its neutrality was guaranteed. Prussia'not only got what she had lost by the peace of Tilsit, but re- ceived a part of Poland, including Dantzic and Posen, the half of the kingdom of Saxony, and a flourishing territory on the middle and lower Rhine; Bavaria obtained the Palatinate of the Rhine; and Hanover, augmented by East Frisia, was made a kingdom. The restoration of a German empire being rendered impracticable by the particularist tendencies of several of the larger states, a German con- federation, or Deutsches Bund, was substituted, under the presidency of Francis of Austria and his successors. The diet of this confederation had*~~

~~*its seat at Frankfort-on-the- Maine, and consisted of the representatives of no fewer than 38 sovereign states, which, besides the German dominion of Austria, included the five kingdoms of Prussia, Bavaria, Hanover, Saxony, and Wiirtemberg, the electoral principality of Hesse-Cassel, seven grand-duchies, nine duchies, ten prin-*~~

~~*1 See Kolh, Handbuch der Statistik,*~~

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~~*EUROPE*~~

~~*cipalities, the landgravate of Hesse-Homburg, and the four free -cities, Frankfort, Hamburg, Bremen, and Liibeck. England obtained possession of Malta in the Mediterranean and of Heligoland off the Danish coast; and the Ionian islands were placedunder an English protectorate.*~~

~~*And now a new glacial period of absolutism threatened to invade Europe. Alexander of Russia, Frederick William of Prussia, and Francis of Austria united in a Holy Alliance, which, based, perhaps honestly enough, on the noblest humanitarian professions, proved practically an association for the strict preservation of the royal prero- gative against the encroachments of the people. The pro- mise of constitutional government made by many of the sovereigns to their subjects was forgotten or ignored, and even when a constitution was granted it was not unfre- quently another form of despotic machinery. The Bour- bons bourbonized in France and Spain, and the policy of Metternich was dominant in Austria and Italy. The pope did his best to restore the supremacy of the clergy by con- cordats with the several states of Catholic Europe; the Jesuits were re-established, and soon recovered a large part of their influence; and even the Knights of St John were called back to a futile existence.*~~

~~*But the principles of the Revolution were not dead ; they only slumbered, and before long they gave signs of awaking. Neither the political distribution of the European territory established by the Congress of Vienna, nor the political doctrines which mainly conditioned the distribution, were destined to endure. The July revolution in France (1830), which drove out Charles X. and introduced the constitutional*~~

~~*government of Louis Philippe, was a signal of change. In the same year the independence of Greece was permanently secured, after the treaty of Adrianople had closed the Russo- Turkish war; and the separation of Belgium from Holland was recognized by the five great powers in the London con- ference. A great struggle for national existence burst out in Poland—only, however, to end in its complete incorpora- tion with Russia. By 1848 constitutionalism had made no small progress; Russia, Austria, and Prussia were, indeed, as absolutist as ever, but, besides England, France, and Switzerland, Spain and Portugal, Holland and Belgium, Norway and Sweden, Denmark, Greece, and the greater number of the minor German states had all attained a cer- tain amount of political freedom. In Germany, Duke Charles Augustus of Saxe-Weimar had given his subjects a constitution as early as 1816; Nassau, Bavaria, and Baden followed the example in 1818 ; and after violent dis- turbances the people of Wiirtemberg secured the same privi- leges. If the July revolution of 1830 had been potent, much more potent was the more radical revolution of February 1848. The storm swept over the Continent, and when it had ceased the political aspect of Europe had changed. By the dreadful " Days of March," the king of Prussia, Frederick William IV., was forced to become a " constitutional king," and a national assembly was soon after instituted. In Austria, Metternich had to flee for his life, and Ferdinand was constrained to submit to the demands of the Liberals. In Italy, Rome expelled the pope and declared itself a re- public ; Sicily expelled the Bourbons and chose the duke of Genoa as their king; and the northern states rose against Austrian domination. A reaction, however, soon again setin. France passed from a republican to a strongly monarchical government ; the Prussian king cancelled his constitution and issued another in its stead; Austria was successful in putting down the Hungarian and Bohemian patriots and inflicting a terrible revenge ; and Italy saw the defeat of the array of Charles Albert, and had to submit again to Austrian despotism in Lombardy, papal despotism in Rome, and Bourbon despotism in Sicily and Naples. The hope of a real German unity based on constitutional*~~

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~~principles, which had been raised by the great Frankfort parliament, died away ; Austria was still in the ascendant, aud under her countenance and support all liberal. move- meuts were violently suppressed in the south German states. The first great disturbance of the sullen and sultry peace which settled down over Europe was occasioned by the claim of Russia to the protectorate of the Greek Christians in the Turkish empire, and her invasion of the Danubian principalities. England and France determined to maintain the integrity of Turkey, and the Crimean war was the re- sult. By the treaty of Paris, which closed the contest (March 1856), Russia ceded a small piece of territory to the north of the Danube, the navigation of the river was de- clared free, Moldavia and Wallachia were increased by the addition of the Russian surrender and placed along with Servia under the protection of the contracting powers, and the neutrality of the Black Sea was.established. 'The real power of Turkey was hardly increased; and in 1859 she lad to utter useless protests against the principalities of Wallachia and Moldavia, which united into one under the name of Roumania, and chose Alexander Cusa, a Moldavian nobleman, as their chief. The Italian kingdom of Sardinia, which had joined in the Crimean war as an ally of England and France, was soon to play a much more brilliant part in Europe. With the powerful assistance of France it drove Austria out of Lombardy, and practically secured the leader- ship among the states of Italy. In 1860 the first Italian parliament contained representatives, not only of Sardinia and Lombardy, but also of Tuscany, Modena, Parma, and the Roman Legations, all these states having voted by general suffrage to cast in their lot with Sardinia. The same year saw tle marvellous campaigns of Garibaldi; and on the 17th March 1861 Victor Emmanuel was recog- nized as king of Italy by all the Italian states except Austrian Venetia and the city of Rome. In 1864 another important alteration of political boundaries was effected in the north. The provinces of Schleswig-Holstein, occupied by a partly Danish and partly German population, were conquered by the united forces of the German confederation. Before long it was evident that Prussia meant to appro- priate them to herself as of great service to the development of her marine. By the Gastein convention of 1865 it was~~

~~*Another step in the unification of Germany was taken in 1868 by the reconstruction of the Zollverein or customs union. Meanwhile Austria had been turning her attention: to her doniestic difficulties, and had settled the most im- portant by the recognition of the autonomy of Hungary, which was henceforth to be associated with Austria proper on equal terms. In June 1867 Francis Joseph and his con- sort were formally crowned at Pesth as king and queen of Hungary. The year 1870 saw the completion of Italian unity by the occupation and annexation of the city of Rome, and, what was of still greater consequence to Europe at large, the rise of a dispute between France and Prussia about the succession to the throneof Spain. The matter was of little real moment to either, but the French Government was eager for the fray, and Prussia was not slow to take up the gage. If the strength of the two combatants be considered, the terrible conflict was soon over. The German troops, who had crossed the frontier in August 1870, entered Paris in March 1871; the preliminary peace had been signed at Versailles in February ; and the final peace was concluded 10th May. Prussia's position in Germany and Europe was established, and her king had been recognized as emperor of the German confederation on 18th June, in the palace of Versailles, 'Europe again enjoyed peace for a few years ; but in 1877\Russia declared war against Turkey, ostensibly as protector of the Christian populations who were suffering from the anarchy of her government. In Europe and Armenia the conflict continued with growing success on the part of the Russians till the preliminary peace of San Stefano. The alterations demanded by Russia were of the most sweep- ing kind, and would practically have removed Turkey from the rank of a European power, as the territory to be left under her control was both of small extent and discon- tinuous. The conclusion of the treaty on such conditions was strongly opposed by the British Government, and for a time it almost appeared as if Europe were to be involved in a far more terrible war than that which had come toa close. After much political finessing it was at length decided that the matter in dispute should be submitted to an international congress, and the plenipotentiaries of the various powers accordingly met at Berlin on Thursday, 13th June 1878.*~~

~~*arranged that the government of Schleswig should fall to Prussia and that of Holstein to Austria, while Lauenburg was yielded to Prussia for 24*~~

~~*millions of Danish rixdollars. This treaty, however, proved only a very temporary settle-*~~

~~*Such in the most meagre outline are the principal changes Rise of the in the political distribution of the territory of Europe. A present clearer idea of the rise of the several powers of the present territorial time may be obtained from the following equally rapid divisions.*~~

~~*ment,—the real question at issue being whether Prussia or Austria was to be the dominant power in Germany. The diet, which, according to the treaty of Vienna, ought to have been arbiter between them, was too weak to give effect to any decision: it sided with Austria, and mobilized its army hy the decree of 14th July, By 3d July 1866 the fate of Germany was decided by the battle of Koniggriitz or Sadowa, and ou the 23d of August the treaty of Prague was signed. 'The Austrians ceded the Venetian territory to the Italians (who had naturally seized the opportunity of the war), gave up their claim to Schleswig-Holstein, and pro- mised to recognize the German confederation and any terri- torial changes effected within its limits. In 1866-67 the confederation was constituted, under the direction of Prussia, to include all the German states to the north of the Maine; they were to have one common federai legislation and a federal army, while in everything Prussia was to have the pre-eminence. The duchy of Luxembourg in the same years threatened to involve Europe in a new war, as Prussia refused to permit its transfer by the king of Holland to the French emperor; but peace was secured by a conference of the great powers in London (May 1867), who guaranteed the neutrality of the territory and secured the dismantling of its fortresses.*~~

~~*survey.*~~

~~*Grohe Britain began in the little Saxon kingdom of Wessex, which, according to the usual account, dates from Cerdic's scttlement in 519 a.p., and by 880 had extended its authority as far north as the Forth and Clyde The remoter portions of this territory afterwards gravitated now to England and now to Scotland, till at last the boundaries between the two kingdoms became what they still remain. Wales was subjugated by Edward L in 1282; and the conquest of Ireland, begun in 1169 under; Henry H., was completed by 1610. The English and Scottish crowns were*~~

~~*united on the accession of James of Scotland to the English throne in 1603, and the two countries became politically one by the Act of Union in 1707. The repre- sentation of Ireland in the English parliament dates only from 1801.*~~

~~*France practically had its commencement when Hugh Capet united the duchy of Francia with the minor territories still left in the hands of the petty Carolingian kings, and established the capital at Paris. Its subsequent growth was very gradual, and the successive additions were obtained partly by conquest, partly by purchase, and partly by matrimonial alliances, Philip I, bought the duchy of Berri; Philip Augustus secured possession of Anjou, Maine,*~~

~~*Touraine, and Poitou, and of N ormandy, Vermandois, Alengon, Auvergne, and Evreux ; St Louis obliged the count of Toulouse not only to give up part of his territory, but also to recognize the reversionary rights of the crown; Philip IV. added the countship of Lyonnais, and John incorporated Champagne and Brie. With the accession of the house of Valois the duchy of that name naturally became part of the royal domain, and shortly afterwards Daupliné was obtained from the childless Hubert IJ. The long English wars interrupted the advance and dismembered the king- dom, and it was not till 1450 that the king of France was again in possession of his full inheritance. In 1477 the great duchy of Burgundy was incorporated with the crown ; Provence, the Boulonnais, and Picardy were all acquired in 1481; and in 1488 the death of the last duke of Brittany paved the way for the incorporation of his duchy. Henry IV. brought part of Navarre, Bearn, and Foix; Louis XIII. united Artois with the crown; and Louis XIV. secured not only the greater part of Alsace, but also French Flanders, and Franche Comté. Corsica, which had been conquered from Genoa in 1768, and Avignon and the Venaissin, which had been held by the popes, were incor- porated in 1791.*~~

~~*Austria was originally a mark established by Charles thie |*~~

~~*Great for the defence of Bavaria against the Avars. It was made a ducliy by Frederick Barbarossa in 1156, and in 1192 was increased by the*~~

~~*addition of Styria. The acqui- sition of Corinthia, Tyrol, and Trieste took place in the 14th century; and in 1453 the duchy was made an arcli- duchy by the emperor Frederick. Dalmatia was gained by the treaty of Cambray in 1508; Hungary, Bohemia, and Silesia, by the marriage of the archduke Ferdinand, the brother of Charles V., with the Hungarian princess in 1526; Galicia and Lodomeria at the partition of Poland in 1772; and Bukovina from Turkey in 1778.*~~

~~*The present German empire dates, as has been seen, only from 1872. Prussia, conquered from the pagan Slavonians by the Teutonic knights of the 13th century, was in 1525 granted by the Polish king Sigismund I. as an hereditary duchy to Albert of Brandenberg, and in 1611 became independent of the Polish crown. In 1701 Duke Frederick was permitted by the emperor to assume thie title of king of Prussia; and under his grandson Frederick the Great the territory of the new kingdom was increased by Silesia and large parts of Poland. In 1866 Hanover, Hesse-Cassel, Nassau, and Frankfort were annexed.*~~

~~*The battle of Morgarten in 1315 secured the inde- penderice of the Forest Cantons of Switzerland ; and in 1352 the first real confederation was formed by Schwyz, Uri, Unterwalden, Lucerne, Zurich, Glarus, Zug, and Bern. Aargau or Argovia and Thurgau or Thurgovia were annexed in 1415, and Ticino or Tessin in 1418. Soleure or Solothurn and Freiburg or Fribourg joined the confederacy in 1481, Basel and Schaffhausen in 1501, and Appenzell in 1513; St Gall, Geneva, Neufchatel or Neuenburg, Valais or Wallis, and the Grisons or Graubiinden shortly afterwards became associated states; and in 1536 Vaud or Waadt was conquered from the dukes of Savoy.*~~

~~*The kingdom of Spain was formed by the union of Castile and Aragon in 1479. Castile had become a king- dom in 1033, and had successively incorporated Toledo, Leon, and Galicia; and Aragon, which represented the older kingdom of Sobrarve, had gradually got possession of Catalonia and the countship of Barcelona, Valencia, Majorca, Minorca, and Ivica. The conquest of Granada in 1492 and of Navarre in 1512 completed the territorial extension. Portugal, which has more than once been in- corporated with Spain, was erected into a kingdom in 1139.*~~

~~*The beginnings of the Russian euipire are usually traced to a body of Scandinavian adventurers in the 9th century,*~~

~~*but the real commencement of the present monarchy is tlie grand duchy of Moscow, which, in the 14th century, under Ivan Kalita, began to be paramount among the various Russian principalities. During the next 200 years these were gradually subdued, the last and greatest of all, Novgorod, being incorporated in 1478. In 1654 the chief of the Zaporogian Cossacks recognized the Russian supre- macy, aud Smolensk and part of White Russia were annexed. In 1721 Livonia, Esthonia, Ingermanland, and part of Finland were ceded by Sweden; in 1742 another part of Finland was added; in 1772 the northern and eastern portions of White Russia, and in 1774 Azoff, Kertch, Yenikale, and Kinburn. The whole of the Crimea was incorporated in 1783, and ten years after, Volhynia, Podolia, and the government of Minsk. The year 1795 saw the annexation of Lithuania, Courland, and Samogitia, and the first decade of the 19th century the successive incorporation of Georgia, Mingrelia, and the remainder of Finland. Imeritia was added in 1810, Bessarabia in 1812, and the duchy of Warsaw in 1815; and the conquest of the Caucasian region was conipleted in 1859-1864.*~~

~~*The Scandinavian kingdoms date from the 8th and 9th ceuturies; and their territory has been at various periods very differently distributed among themselves. An amal- gamation was effected by the union of Calmar in 1397, and lasted till 1524. The present union of Norway and Sweden dates from the treaty of Kiel in 1814.*~~

~~*To no man, however vast his experience and varied his General*~~

~~*sympathies, is it granted to form even an approximate estimate of all the multitudinous forces that are at work within the limits of a single country, and still less is it pos- sible to form such an estimate if the field of observation include the heterogeneous activities of such an area as Europe. 'The local current is apt to be taken for the gene- ral, and the recoil of the wave for the retreat of the tide. Still there are movements and tendencies which force them- selves on the notice of even the superficial observer, about whose present potency there can be no question, whatever antagonistic tendencies may be secretly gathering strength below the*~~

~~*surface or in the remoter parts of the area. Of several of these mention more or less distinct has already been made, but it may be well to attempt a more systematic survey.*~~

~~*We have seen that nationalism is powerfully at work ; Nation. the tendency to give practical application in the political alism.*~~

~~*domain to the principle familiarily expressed in the phrase qui se ressemble s'assemble, birds of a feather flock together. The so-called nations of Europe are still in painful process of formation,—some in one stage and some in another, but all without exception very imperfectly organized. As a mere vocable the word nation is old enough, but the thought which it now vaguely expresses is a thought that men are but beginning to think. Europe has had its tribes and its kingdoms, its village-communities, its cities, its Achzan leagues, its Hanseatic confederations, its re- publics, its empires; itis only developing its nations. Hence in part the difficulty of attaining a satisfactory definition of nationality ; and hence the endless collisions and con- fusions that arise in the practical application of the principle. If all people of the same blood spoke the same language, held the same religion, and occupied continuous territory, the whole question would be solved. But, as lias been seen, this is as far as possible from being the case in Europe ; and neither blood, uor language,.nor religion, nor continuity of territory can be accepted as master of the practical arrangement. The principle of nationalism has consequently to work by compromise. It sometimes appears as a restorative and conservative, sometimes as an innovating andcreative force; and any attempt to insist that it shall be exclusively this or that is certain to be abortive.*~~

~~*Interna- tionalism.*~~

~~*is equally potent.*~~

~~*"oURO?P &*~~

~~*Here it is on the side of the weak and oppressed, and seems humane and benign; there on the side of the strong and despotic, and seems stern and cruel, In spite of all difficulties and opposition it is making rapid*~~

~~*progress, and is likely to be a powerful factor in Europe for generations to come,—building up political unities, rehabilitating de- cadent languages, and calling new literatures into life. Greece and Italy, Belgium and Bohemia, Hungary and Roumania, are testimonies of its power in the past decades of the century: who will say what it will have accom- plished before the century is done?*~~

~~*As a natural complement of nationalism we have interna- tionalism, which in certain aspects may be regarded as a stage in the progress to cosmopolitanism. Just in propor- tion as the various nations develop and recognize their national individuality they become conscious of their true relations to each other, and find the necessity of regulating their mutual intercourse and common activity ; isolation is impossible. Reciprocity must increase with the capacities and desires of each: there are many things which can be attained only by concerted action or division of labour. The tendency of internationalism is displayed in the purely political domain by the growth of international law, and the gradual endeavours after a system by which interna- tional disputes may be settled by arbitration and discussion rather than by armaments and devastation. That it will end before long in something like a confederation of European states the optimist believes and the philanthropist hopes. Every European congress familiarizes the idea and establishes the habit. In the social domain the tendency Facilities of travel and accumulation of*~~

~~*wealth are annually leading a greater proportion of the*~~

~~*citizens of one country to make personal acquaintance with the citizens of another. Ignorance and bigotry are natur- ally lessened, though there ara indeed an ignorance and a bigotry which return from abroad only more ignorant and bigoted than before. It needs no special insight to recognize the importance to the great progress of the world of such an innovation as the railway; but it would require more than human grasp of intellect to estimate the enormous extent and complexity of its influence. It is the one touch of art which will make the whole world kin. As a mighty upheaval lifts an archipelago of islands into a continent, so is this one power heaving Europe into unity. The move- ment is perhaps most noticeable in matters of little intrinsic importance as in the gradual dying out of*~~

~~*national and provincial costumes before the invasions of Parisian taste : but to the philanthropist nothing can be uninteresting that either indicates or accelerates the advance. In literature and art we have a still more important de- velopment of internationalism; for it was in this domain that it first made itself powerfully felt. Though Spain, France, England, Germany, and Holland have each given birth to distinct schools of painting, the influence of Italy has been paramount from the beginning ; and though the literatures of the several countries are distinguished from each other by much that is characteristically local and national, they have all been based more or less directly on the classical work of Greece and Rome, and undergone continual modifications from their mutual interaction. It is hard to conceive what would have been the progress of English literature apart from the influence of Dante and Boccaccio, or, in later times, the progress of French litera- ture if Voltaire and lis contemporaries had received no inspiration from this side the Channel. To write the history of any literature is impossible if no account is taken of its foreign indebtedness. This mutual interaction is rapidly increasing, and in spite of the recent additions to the number of distinct literary areas, it is imprinting more and more of a common character on the whole. The novels of*~~

~~*a Scott or the poems of a Byron sweep over the Continent, and come back in manifold reverberations from Germany aud France, fron Sweden and Spain. If the phrase the republic of letters is appropriate, still more appropriate is the republic of science ; if literature is becoming interna- tional, science is international. However bitter the jealousies that may separate France and Germany, the French savant watches eagerly for the work of his German compeer, and the German cannot afford to disdain the con- tributions of the Frenchman. International congresses of the representatives of particular departments of research are becoming mere matters of course ; a meteorological congress met at Vienna in 1868, a health congress at Brussels in 1877. An association ultimately joined by nearly all the Continental nations was formed at Berlin in 1866 to determine the meridian between Palermo and Christiania, and thus furnish a standard unit for Europe; and in 1877 a geographical congress*~~

~~*for the exploration of Africa was opened under the presidency of the king of the Belgians. How necessary such co-operation really is is shown by the loss that science has already sustained from the existence of different methods of registration and observation: the labour of years has not unfrequently been rendered utterly useless to the general progress by the employment of incommensurable systems. Considerable advances have happily been made towards the universal adoption of the same metrical and monetary standards. The Frencli system of weights and measures was introduced into the Netherlands in 1820, into Spain in 1859, into Portugal in 1868, into Germany in 1872, and into Roumania in 1876. In 1881 it will become obligatory in Norway and Sweden. A monetary league, by which they agreed to perfect reciprocity of currency, ,was formed in 1865 by France, Italy, Belgium, and Switzerland, and they were joined by Greece in 1875, and by Roumania in 1876. Uniformity of coinage was established throughout the German empire in 1872, and in 1875 the Scan- dinavian states agreed to adopt a common system. In 1874 a postal union was constituted by a convention at Bern between Austria-Hungary, Belgium, Denmark, France, Germany, Great Britain, Greece, Italy, Luxembourg, the Netherlands, Norway, Portugal, Roumania, Russia, Servia, Spain, Sweden, Switzerland, anda Turkey; and this has been followed by a similar telegraphic union.*~~

~~*A third tendency fostered by the same conditions as Tolera- internationalism is what is known as religious and political tion.*~~

~~*toleration, The name is an unhappy one, as it implies the mutual obnoxiousness of the various religious and political parties, but the time has hardly come when it can be con- sidered a misnomer ; the foremost countries of Europe are still far from having attained the full enjoyment of that intellectual liberty which formed the ideal of a Milton, a De Tocqueville, or a Stuart Mill. Thanks, indeed, to the influence of the French Nevolution, rapid progress has been made during the present century, and the severer forms of persecution have fallen decidedly out of fashion. The Jews are the most notable monument of the change. Their his- tory for centuries was full of blood and tears; they were despised and rejected ; their very name was a byword and reproach. The 19th century has seen them gradually ad- mitted to all the rights of citizens in the most*~~

~~*flourishing countries of the continent, guiding the destinies of nations and mingling their blood with the proudest nobilities. In the more backward and conservative countries they still labour under many disadvantages : from Norway and Russia Proper they are excluded by law, and in Portugal and Spain they are emphatically aliens. The same number of Dr Lehmann's Der Israelit, one of the organs of the orthodox party, re- ports that Roumania is prepaing a law for the civic and political equalization of the native Jews, and that in*~~

~~*Bulgaria the hatred against the Jews is so great that, on the evacuation of Rustchuk by the Turks, the Bulgarians sent a deputation requesting the Russian commander to expel the whole Jewish community and to plunder their shops. The liberal movement of Roumania was dictated partly by a desire to obtain the sympathy of Western Europe; for until recently persecution of the Jews was carried on as vigorously there as in the neighbouring countries. Between Roman Catholics and Protestants the ancient feud has lost some of its bitterness. In Scotland and England the legal emancipation of the Catholics in 1829 has been followed by social changes of great im- portance, the extent of which may be estimated by the little opposition which was offered to the restoration of the Roman Catholic hierarchy in Scotland in 1878. In Prussia and throughout the German empire there has been a recrudescence of animosity between the confessions ; but it is to be observed that the contest is rather between the state and a political party than between the Catholics as Catholics and the Protestants as Protestants, In fast, it is only part of a wider contest which is being fought under varying forms throughout the greater part of Europe, as to whether the state or the church is to be the dominant power, Many of the measures which the Government has adopted have certainly led to what is practically religious persecution ; but this persecution is totally different in its character from the persecutions of the Huguenots in the 17th century. The most extreme exertions of power have been the suppression of religious communities, the removal and appointment of priests and bishops by the civil authorities, the prohibition of religious processions, and in 1876 the closing of all Catholic schools and the assertion of complete state control over all church property. In*~~

~~*Switzerland the movement was similar; the Old Catholic party was re-cognized by the state in 1875, and the cathedrals of Bern and Geneva handed over to its clergy. In Belgium the Liberal and Protestant minority have excited violent disturbances in several cities, as Ghent and Brussels, and the social fermentation has been carried to dangerous extremes; but by the constitution there is full religious liberty, all the churches are subsidized by the Government, and by a curiousanomaly the heaviest subsidy is paid to the weakest denomination. The relations established between Italy and the pope, by the absolute irrecon- cilability of their territorial claims, has naturally led the Italian Government to adopt a strongly anti-ecclesiasti- cal policy: the state religion is Roman Catholicism, but the suppression of monasteries has been vigorously carried out, and religious processions outside of the churches can only take place by special permission of the prefects. The constitution sanctions full religious liberty. In France Roman Catholics, Protestants, and Jews all receive grants from the public treasury. The Russian Government exercises its authority in favour of the Greek church in a way that frequently infringes on the liberties*~~

~~*EUROPS*~~

~~*the pale of the establishment; but at the same time the profession of any creed is legally allowed. Spain, by the last of her many revolutions, has taken a step backwards : private worship is still permitted to non-Catholic religions, and foreigners are considered inviolable, but all public manifestations, by printed notices, emblems, or otherwise, are strictly prohibited.*~~

~~*It has happily become impossible for even the most re- Humwi- trograde of nations to recall the days of the Inquisition,—a tarianism,*~~

~~*fact that is at least partly due to the influence of another great movement, which may be distinguished as humani- tarianism. This movement is evident in so many depart- ments of thought and action, here introducing a less painful process of killing into the slaughter-house, and there affect- ing the decision of questions of speculative theology, that only afew suggestive facts need be mentioned. The penal codes of all European nations have been cleared of most of their medieval barbarism ; and the*~~

~~*infliction of direct physical suffering is reserved for the more brutal class of criminals. Instruments of torture are mere antiquarian curiosities. The punishment of death, once the common penalty for trivial and heinous offences, already appears to many minds as altogether inhuman, and has been com- pletely abolished or discontinued in Holland, Belgium, Por- tugal, Switzerland, and Roumania. The bill for its abolition in Italy in 1875 was lost by 73 to 36, and the district of Tus- cany, which had adopted the abolition about twenty years before, was forced to conform to the general law. In 1876, however, the committee for the revision of the penal code unanimously voted for the abolition. The introduction of private instead of public executions is a step in the same direction, though like many,other partial measures it may delay the complete disuse of capital punishment. Mention may also be made of the amelioration of prison discipline, of the magnificent progress in the treatment of the insane which has been effected by the philanthropists of the last two generations, of the enormous increase which has taken plate in the number of our hospitals, asylums, and benevolent institutions, and of the growing attention that ;is paid to relief of the sufferings of the lower animals. Whatever be the wisdom of the measure, the law of 1876 in Eng- land in regard to vivisection speaks volumes for the advance of the humanitarian movement. In this respect as in others the various European nations are in very different stages: while the English magistrate is fining a collier or carter for lending his countenance to a cockfight, the Spanish magistrate is applauding the exploits of a pocador or matador. That we are approximating to a unity of sentiment is shown among other things by the support which has been given to the Geneva convention for the mitigation of the sufferings of the wounded in war, which was formed in 1864 by the representatives of Baden, Belgium, Denmark, France, Hesse, Italy, the Netherlands, Prussia, Switzerland, and Wiirtemberg, and which has since obtained the adhesion of Greece, Great Britain, and*~~

~~*of other religionists, and no secession can take place from | Turkey (H. A. W.) INDEX.*~~

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~~*IHKUR—EUS*~~

~~*EURYDICE. See Orpnevs.*~~

~~*HURYMEDON, an Athenian general, who, in the 5th year of the Peloponnesian war, 428 B.c., was sent by the Athenians, with a fleet of 60 vessels, to intercept the Peloponnesian fleet which was sailing to attack Corcyra, at that time rendered defenceless through internal feuds. On his arrival he found that Nicostratus with a small squadron from Naupactus had placed the island in security, but he took the command of the combined fleet, which, however, the absence of the enemy prevented from achieving any other end than merely to countenance and support by its presence the cruelties inflicted by the democratic party on their political opponents. In the following summer, in joint command along with Hipponicus of the land forces of the Athenians, he, in concert with the fleet commanded by Nicias, ravaged the district of Tanagra; and in 425 z.c., conjointly with Sophocles, he was sent in command of an expedition destined for Sicily. After leaving they learned that the enemy's fleet was at Corcyra, but they were delayed by stormy weather from arriving there in time to attack them. They had been comnianded in any case to touch at Corcyra, in order to deliver the democratic party from the attacks of the oligarchical exiles, who had taken up a posi- tion on a hill near the city, and were threatening it with cap- ture. On the arrival of the Athenian fleet the oligarchical leaders surrendered themselves on condition that they should be sent to Athens to be judged ; but they were treacherously induced to make an attempt to escape, and on that account were delivered up to the fury of their opponents. Eury- medon tlien proceeded to Sicily, but immediately on his arrival there a pacification was concluded by Hermocrates, to which Eurymedon and Sophocles were induced to agree. The terms of the pacification did not, however, satisfy the Athenians, who*~~

~~*attributed its conclusion to bribery, and punished two of the chief agents in the negotiation by banishment, while Eurymedon was sentenced to pay a heavy fine. In 414 Euryniedon, sent with Demosthenes to reinforce the Athenians at the siege of Syracuse, was defeated and slain in the first of two battles fought before its walls.*~~

~~*EURYSTHIEUS. See Hercurezs.*~~

~~*EUSEBIUS, of Czesarea, surnamed Pamphili, ze. the friend of Pamphilus, and well known as the father of eccle- siastical history, was born probably in Palestine about the year 265. The date of his birth is, however, uncertain, and varies between 260 and 270. We know little of his youth beyond the fact that he was a diligent student of sacred literature, his biography by his episcopal successor Acacius having perished. It was as a student, and probably as holding some inferior office in the church at Czesarea, that he became connected with Pamphilus who was at the head of a theological school there, and devoted himself to the collection of a church library, especially to the care and de- fence of the writings of his great master Origen. In the course of the Diocletian persecution, which broke out in 303, Pamphilus was imprisoned for two years, and finally suffered martyrdom. During the time of his imprisonment (307-9) Eusebius distinguished himself by assiduous devo- tion to his friend, spent days with him in affectionate in- tercourse, and is supposed to have actively assisted him in the preparation of an apology for Origen's teaching, which survives in the Latin of Rufinus (Routh., felzq., iv. 339). After the death of Pamphilus Eusebius withdrew to Tyre, where he was kindly received by the Bishop Paulinus, and afterwards, while the Diocletian persecution still raged, went to Esypt, where he was imprisoned, but soon released. HIs release at the time suggested an accusation made against him more than twenty years afterwards by Potamon, the fiery bishop of Heraclea, that he had apostatized. " Who art thou, Eusebius," exclaimed Potamon at the famous*~~

~~*prison in the time of the tyrants?*~~

~~*(21*~~

~~council of Tyre, which condemned Athanasius, "to judge the innocent Athanasius. Didst thou not sit with me in They plucked out my eye for my confession of the truth; thou camest forth un- hurt. How didst thou escape?" The coarseness of the accusation, however, was only in the spirit of the times, and it rests on no evidence whatever, 'The elevation of Eusebius to the see of Cwsarea so soon afterwards, in 315 at latest—probably 313—is of itself sufficent to dispose of any such charge. Here Eusebius laboured and became a conspicuous figure in the church till the year of his death, 340. The patriarchate of Antioch was put within his offer in 331, but he preferred the less eminent sphere associated with his early studies and friends, and as probably more con- genial to his hterary tastes and pursuits.~~

~~The character of Eusebius, both as a man and a theo- logian, is intimately bound up with the part which he took at the council of Niczea, and afterwards in the great controversy connected with the work of that council. His conduct and his views have been differently judged, according to the estimate which later critics have formed of the merits of this controversy, and the dogmatic prejudices which on one side or the other it is apt to engender. Dr Newman, for example, in his history of the Arians in the 4th century, speaks of him as "openly siding with the Arians, and sanc- tioning and sharing their deeds of violence," while most Anglican scholars, from Bull and Cave to Dr Samuel Lee of Cambridge, who translated the Zheophania of Eusebius in 1843 from a recently recovered Syriac MS., have warmly defended his orthodoxy. Tle same division of opinion regarding him has prevailed more or less in other quarters, and even in the age succeeding his own. It is only in the scientific theology of Germany, and especially in Dorner's great work on the Person of Christ, that his true theological position can be said to have been made clear. He was certainly not Arian, however he may have defended Arius personally, any more than he was Athanasian. He was really the representative of the indeterminate theology of the church on the great point in dispute, before the lines of controversy on the one side and the other had hardened into the formule which have become identified with the two positions known as Arianism and Athanasianism. To judge and still more to condemn him from one side or the other is to mistake the law of the historical development cf dogma, and to apply to~~

~~*him conclusions which belong to a later type of thought than that in which he had been trained. This will be best seen by a brief explanation of his stand-point, both personal and theological, throughout the controversy.*~~

~~*When the Arian controversy broke forth, about 319, Arius, who possibly may have known something of Eusebius during his stay in Egypt, besought his interven- tion to pacify the misunderstanding between him and his bishop, Alexander. Eusebius responded so far as to write two letters to Alexander explaining that Arius was misrepre- sented (Fragm. in Mansi, xiii. 316). This fact is of interest, as showing his natural attitude in the controversy before the calling of the council of Niczea. At this council he attended as the special friend of Constantine, whom he was appointed to receive with a panegyrical oration, and at whose right hand he enjoyed the honour of sitting. Not only so, but he prepared and submitted the first draft of the creed whicli was afterwards, with well-known and significant additions, adopted by the council. The whole difference between Eusebius and the Athanasians centred in these additions, and in fact in the famous expression ""Homoousion"—" of the same substance" which was judged. necessary by the council to express the true relation of the Father and the Son. He resisted this expression to the last, and only at length accepted it and subscribed the creed*~~

~~*at the dictation of the emperor. After the Council he con- tinued to identify himself with the fortunes of the Arian rather than of the Athanasian party, and his great favour at court and his influence with the imperial authorities enabled him to protect the one party at the expense of the other. It is this personal attitude which has mainly identified him with Arianism. In so far as he was a partisan, and lent himself to the persecution of the '6 orthodox " or Athanasians, the conduct of Eusebius is deserving of the censure that has been bestowed upon it. But it is to be remembered that from his own theological stand-point he was disposed to regard the treatment of Arius by his opponents as indefensible, and to consider his opinions as tenable within the church. Iu short the*~~

~~*Athanasians were to him the innovators in doctrine rather than Arius, who only maintained a stand-point that many had held in the church before him, even if he rest- lessly drew unfounded conclusions from it, whereas the Athanasian development evidently appeared to Eusebius to go beyond the older and less determinate doctrine in which he had been trained. The special defect of Eusebius seems to have been a lack of that spiritual and speculative insight which sees the true drift of opinions, and detects below the surface of language a true from a false line of development of Christian thought. As Dorner says of the theological position at the time, it was clear that the church had arrived at a point at which it could not stand still, but must choose one or other of two courses, —either to take a step in advance and define the indefinite, or to go back- wards either into heathenism or into Judaism.*~~

~~*The opinions of Eusebius hiniself may be summarized as follows. God is with him One, or the Monas, exalted in his supreme essence above all plurality. He is Being abso- lutely, 76 "Ov, or the primal substance, 4 azpadry Odcia. Thus essentially conceived, God is infinitely above the world, His relation to which is in and through the Son, "who is the image of the invisible, the first born of every creature " (Col. i 15). He would have substituted the Greek of the latter expression, tpwrdroxos maons Kricews, instead of the formula finally adopted in the Nicene creed, that the Son is éuoovovs 7G warpi, "of the saime sub- stance with the Father." But in no seuse did he recognize the;Son as Himself a creature or as sprung like other creatures, é§ ovk dvtwy. He was not "the same as the Father, of equal power and glory," because the idea of the Divine is conceivably complete in God as One; but He was begotten of the Father before all worlds or eons. He wasina true sense dvdpxpos, " without beginning in time." Eusebius repudiated therefore the Arian formula, "There was a time when the Son was not;" he could even say, "the Son was always with the Father," 76 warpi ds vidv 84 ravrds wvdvta (Dem. Hv., 4, 8), yet he shrunk from calling the Son ovvaidios or "co-eternal" with the Father. While holding, in short, in his own sense to the true divinity of the Son, he shrunk from attempting to define either with the Arians or the Athanasians the relation between the Father and the Son, as beyond human conception. The nearest image by which the relation could be conceived was that of ciwdéa (Dem. Ev., 4, 3), or the relation*~~

~~*between a flower and its perfume. He seems to have preferred this to the image of light and its brightness, or " light of light,"—although both this phrase and the associated phrase "God of God " surviving in the Nicene creed were in the original " profes- sion of faith" which he submitted to the council. From this brief statement it is evident that Eusebius was not himself doctrinally an Arian, however he may have favoured the Arian party. He was separated from it on the essential point, that the Son was in no sense a creature or made, é& otk évrwv. The name Exoucontian, by which the Arians came to be specifically known, could never have been*~~

~~*applied to him. On the other hand, he is separated from the Athanasians chiefly by the twofold conception of Deity, now as the semi-Platonic Monas or "Ov, abiding in un- approachable self-existence, and now as the Divine Father self-revealing Himself in the Son, and in the world created by the Son. As his mind dwelt on the idea of Deity pure and simple, or as absolute Being, he seems to have recoiled from the identity of the Supreme God with the Logos; but as he dwelt on the idea of the Divine i relation to the world, he saw in the Logos or Son the full expression of the Divine—the organ or power through whom all created exist- ence iscalled into being. There is, in other words, with him a " sensus eminens" in which God is One, alone in power and glory ; but the Christian or revealed conception of God is nevertheless acknowledged by him as Trinitarian. Ac- cording to Dorner's explanation of the Eusebian theology, "God's being a Trinity depends on His will. At the same time this does not mean that God might be other than Trinitarian, for itis impossible to God not to will the perfect."*~~

~~*These views of Eusebius are chiefly contained in his well- known Demonstratio Hvangelica, in the first book of his lately discovered treatise on the Zheophania, and in his treatise against Marcellus, who in extreme reaction from Arianism taught a doctrine approaching Sabellianism.*~~

~~*It only remains further to add that Eusebius is undoubt- edly more of a writer and critic than of a thinker. He is admitted to have excelled in mere erudition all the church fathers, hardly excepting Origen and Jerome. But his writings are arid and artificia] in style, with an air of com-*~~

~~*pilation rather than of original power. His Zcclesiastical History is destitute of method or graphic interest of any kind, but is a valuable repertory of the opinions of the Christian writers of the 2d or 3d century, whose works have otherwise perished. It has been charged with person- ality and inaccuracy by Gibbon, but without adequate evi- dence. (See general estimate of Eusebius as an historian, article CourcH History, vol. v., p. 764.) The personal rela- tions of Eusebius to Constantine have been, like other points of his life, variously judged. He was undoubtedly more of.a courtier than was becoming in a Christian bishop, and in his Life of Constantine has written an extravagant panegyric rather than a biography of the emperor. Altogether he is a conspicuous and significant, rather than a great or noble figure in the history of the church.*~~

~~*Of Eusebius's works the most important are the following :—*~~

~~*1. The Zcclesiastical History, in ten books,—comprising the history of the church from the ascension of Christ to the defeat and death of Licinius, 324 4a.p. 2. The Chronicon, in two books,—com- prising an historical sketch, with chronological tables, of the most important events in the history of the world from the days of Abraham till the twentieth year of the reign of Constantine. This work, which is one of great importance in the study of ancient history, was published in its complete form for the first time at Milan in 1818. 3. The Preparatio Evangelica, in fifteen books,—a collection of facts and quotations from the work of nearly allthe philosophers of antiquity, intended to prepare the reader's mind for the acceptance of the Christian evidences. 4. The Demonstratio Evangelica, in twenty books, of which ten are extant,—a learned and valuable treatise on the evidences themselves. It is intended to complete the Christian argument for which the previ- ous work was a preparation. In addition there are various minor works of Husebius, viz., the Theophania, in four books, translated from a Syriac MS., discovered by Tattam in an Italian monastery in 1889; his treatises against Marcellus in two books, and against Hierocles ; his life of Constantine—De vita, Constantini; and his Onomasticon, a description of the towns and places mentioned in Holy Scripture, arranged in alphabetical order. For accounts of Eusebius himself and his opinions, see Herzog's Hncy., 8. voc.; Schaff, Church Hist., ii. 872-9 ; Introd. to Lee's translation of the*~~

~~*Theophania; Dorner's Hist. of the Person of Christ, ii. 217, et seq.,—Translation in Clark's Foreign Theological Library. Gs Ty*~~

~~*EUSEBIUS, of Emesa, a learned ecclesiastic of the Greek church, was born at Edessa about the beginning of the 4th century. After receiving his early education in*~~

~~*his native town, he studied theology at Czsarea and Antioch, and philosophy and science at Alexandria. Among his teachers were Eusebius of Czesarea and Patrophilus of Seythopolis. The reputation he acquired for learning and eloquence led to his being chosen in 341 by the synod of Antioch to succeed Athanasius as archbishop of Alexandria, an appointment which he, however, declined. He accepted instead the small bishopric of Emesa in Phoenicia, but, on account of his reputation as an astrologist, the people opposed his settlement, and although they were ultimately induced, through the intervention of the bishop of Antioch, to receive him peacefully, he soon after- wards, either because of the discontent of his flock or on account of his love for a studious life, resigned his office and retired to Antioch. His fame as an astrologer com- mended him to the notice of the emperor Constantine, with whom hebecame a great favourite, and whom he accompanied on many of his expeditions. The theological sympathies of Eusebius were with the semi-Arian party, but he seems not to have had a very strong interest in the controversy. He has the reputation of having been a man of extraordin ary learning, great eloquence, and considerable intellectual power, but of his numerous writings only a few fragments are now in existence.*~~

~~*EUSEBIUS of Nicomedia is the only other of the many early fathers or bishops of the church bearing the name who claims our notice. He was the defender of Arius in a still more avowed manner than his namesake of Cesarea, and from him the Eusebian or middle party specially derived their narac. He was known amongst them by the epithet of Great. He was a contemporary of the bishop of Cxsarea and united with him in the enjoyment of the friendship and favour of the imperial family.- He is said to have been connected by his mother with the em- peror Julian. He was first bishop of Berytus (Beyrout) in Phoenicia, but his name is especially*~~

~~*identified with the see of Nicomedia, which, from the time of Diocletian till Constantine established his court at Byzantium, was regarded as the capital of the Eastern empire. HIe warmly espoused the cause of Arius in his quarrel with his bishop Alexander, and wrote a letter in his defence to Pau- linus, bishop of Tyre, which is preserved in the Church HIistory of Theoderet. HIis views appear to have been identical with those of his namesake in placing Christ above all created beings, the only begotten of the Father, but in refusing to recognize HIim to be "of the same substance" with the Father, who is alone in essence and absolute being.*~~

~~*At the council of Niceea Eusebius of Nicomedia earnestly opposed, along with his namesake of Cesarea, the insertion of the HIomoousion clause, but after being defeated in his object he also signed the creed in his own sense of dovos sar ovoiav. HIe refused, however, to sign the anathema directed against the Arians, not, as he afterwards explained, because of his variance from the Athanasian theology, but 'because he doubted whether Arius really held what the anathema;imputed to him" (Sozom., ii, 15). After the council he continued zealously to espouse the Arian cause, and was so far carried away in his zeal against the Athan- asians that he was temporarily banished from his see, and visited with the displeasure of the emperor as a disturber of the peace of the church. But his alienation from the court was of short duration. HIe retained the confidence of the emperor's sister Constantia, through whose special influence he is supposed to have been promoted to the see of Nicomedia, and by her favour be was restored to his position, and speedily acquired an ascendency over the mind of the emperor no less than that of his sister. HIe was selected to administer baptism to him in his last illness. There seems uo doubt that Eusebius of Nicomedia was more of a*~~

~~*politician than a theologian. HIe was certainly a partisan in the great controversy of his time, and is even credited (although on insufficient evidence) 'with having used dis- graceful means to procure the deposition of Eustathius, the " orthodox" bishop of Antioch (Theodoret, i. 21). HIis restless ambition and love of power are not to be denied. To the last he defended Arius, and at the time of the latter's sudden death, 337, it was*~~

~~*chiefly through his menace, as representing the emperor, that the church of Constantinople had been thrown into such anxiety as to whether the leader should be re-admitted to the bosom of the church. Eusebius himself died in 342.*~~

~~*EUSTATHIIUS, Sz, bishop of Bercea, was a native of Side in Pamphylia. By the council of Nice, in which he distinguished himself by his zeal against the Arians, he was promoted in 325 to the patriarchate of Antioch. So violent was the feeling among the Arians against him, that a synod of Arian prelates, convened at Antioch in 330, brought about his deposition on a charge of Sabellianism, as well as of various instances of unfaithfulness to his vows of celibacy. He was banished to Thrace, where he died probably in 359 or 360. Of several works attributed to Eustathius there is only one which can with certainty be pronounced his—an address, namely, to the emperor Constantine, delivered during the sitting of the council of Nice.*~~

~~*EUSTATHIIUS, archbishop of Thessalonica, was a native of Constantinople, and flourished during the latter half. of the 12th century. He was at first a monk, and afterwards teacher of rhetoric in his native city. In 1174 or 1175 he was chosen bishop of Myra in Lycia, and shortly after- wards archbishop of Thessalonica. Such of his works.as have descended to our times display a comprehensiveness and variety of erudition, that fairly entitle him to the praise of being the most learned man of his day. The most important of these is his Commentary on the Ltiad and Odyssey of Homer, a work valuable as comprising large extracts from the scholia of other critics, whose works have now perished, such as Apion, Heliodorus, Aristarchus, Aristophanes of Byzantium, &c. This com- mentary was first published at Rome, 1542-50, in 4 vols., and was reprinted at Leipsic, in 1825-29, under the editorial care of G. Stallbaum. Eustathius also wrote a commentary on Dionysius the geographer, first printed by Robert Stephens in 1547, and frequently reprinted since. A commentary on Pindar, which he is known to have written, has been lost. He is also the author of various religious works, chiefly against the prevailing abuses of his time, which almost anticipate, though in a milder form, the denunciations of Luther. The year of Eustathius's death is uncertain, some placing it in 1194, and others a few*~~

years later. The funeral orations pronounced in his honour by Euthynius and Michael Choniates are still in MS. in the Bodleian library.

EUTERPE, the muse of lyric poetry. See Muss.

EUTROPIUS, a Roman historian who lived in the latter half of the 4th century. Both his surname and the place of his birth are unknown, but from certain statements in his history it appears that he held the office of a " secre- tary" under Constantine the Great ; and the fact that his history is dedicated to Valens shows that he was alive in the reign of the latter emperor. This work, published under the title of Breviarium Historie Romane, is a com- pend in ten books of the entire Roman history from the foundation of the city to the accession of Valens. This treatise has been compiled with· considerable care from the best accessible authorities, and is written generally with im- partiality, and in a clear and simple style. Besides chroni- cling events, Eutropius usually gives brief characteristics of the leading historical personages. Although his Latin

style in some instances differs from that of the purest models, the work was for a long time a favourite elementary school-book. As a history its independent value is not great, and occasional mistakes have been discovered in it, both in regard to matters of fact and in chronology ; but it is sometimes serviceable in supplying the lacunz occurring in history from the total loss of some of the classics, and the imperfect state in which others have come down to us. There have been many editions of Eutropius. That by Havercamp was reputed the best till the appearance of the more complete and critical ones by Tzschucke, Leipsic, 1798, and Grosse, Halle, 1813. Several other editions have been published since that of Grosse, the best being that of Guil. Hartel, Berlin, 1872. Of the two Greek translations of Eutropius, that by Capito Lycius has long since perished ; the more recent version of Pzeanius, which is rather a peri- phrasis than a translation, will be found incorporated with the best editions of the Latin text.

EUTYCHES, the founder of the sect of the Eutychians, was a presbyter and archimandrite at Constantinople, and first came into notice in 431

~~*A.D. at the council of Ephesus, where, as a zealous adherent of Cyril and the Alexandrine school, he vehemently opposed the doctrine of the Nes-torians. They were accused of teaching that the divine nature was not incarnated in but only attendant on Jesus, being superadded to his human nature after the latter was completely formed. In opposition to this Eutyches went so far as to aftirm that after the union of the two natures, the human and the divine, Christ had only one nature, that of the incarnate Word, and that therefore HIs human body was essentially different from other human bodies. In this he went beyond Cyril and the Alexandrine school generally, who, although they expressed the unity of the two natures in Christ so as almost to nullify their duality, yet took care verbally to guard themselves against the accusation of in any way circumscribing or modifying his real and true humanity. It would seem, however, that Eutyches differed from the Alexandrine school chiefly from inability to ex- press his meaning with proper guardedness, for equally with them he denied that Christ's human nature was either transmuted or absorbed into his divine nature. The energy and imprudence of Eutyches in asserting his opinions led to his being accused of heresy by Eusebius, bishop of Dorylzeum, at a council presided over by Flavian at Con-stantinople in 448. As his explanations were not con- sidered satisfactory, the council deposed him from his priestly office and excommunicated him; but in 449, at a council convened by Dioscorus of Alexandria and overawed by the presence of a large number of Egyptian monks, not only was Eutyches reinstated in his office, but Eusebius and Flavian, his chief opponents, were deposed, and the Alexandrine doctrine of the "one nature" received the sanction of the church. Two years afterwards, however, by a council which met at Chalcedon, the synod of Ephesus was declared to have been a "robber synod," its proceed- ings were annulled, and, in opposition to the doctrines of Eutyches, it was declared that the two natures were united in Christ, but without any alteration, absorption, or confu- sion. Eutyches died in exile, but of his later life nothing is known. After his death his doctrines obtained the sup- port of the empress Eudocia, and made considerable pro- gress in Syria. In the 6th century they received a new impulse from a monk of the name of Jacob, who united the various divisions into which the Eutychians, or Monophy-sites, had separated into one church, which exists at the prea time — the name of the Jacobite Church, and*~~

~~*as numerous adherents in Armenia, Egypt, and Ethiopia. _EUYUK, or Uviix, a Turkish village of Asia Minor, is a about 75 miles W.S.W. of Amasia, and 28 miles south of the Kizil Irmak river, on a small hill which is a*~~

~~*spur from higher hills to the north of it. It consists of only about twenty houses, but contains perhaps the most important ruins in Asia Minor. They are the remains of a large building, and consist of colossal blocks of granite con- taining a great variety of sculptures very little defaced. The upper portion of the walls seems to have been formed of clay, as there are no remains of overturned materials. In form the building resembles an Assyrian palace, and has been conjectured by some to have been erected by the builders of the palaces of Nineveh, adopting in this instance, as they are known to have done in others, Egyptian figures and emblems. But not merely from the spliunxes, but from the character of the human figures, Van Lennep considers that it was more probably a temple erected by Egyptians, who adopted an Assyrian form of building ; and he conjec- tures that it dates back to the earliest Egyptian conquests in Asia Minor.*~~

~~*See Hamilton's Asia Minor, 1842 ; Barth's Reise von Trapezunt nach Skutart, 1860; and Van Lennep, Asta Minor, 1870.*~~

~~*EVAGORAS, king of Salamis, is said to have been descended from a family who claimed Teucer, brother of Ajax, as their progenitor, and who for a long period had been rulers of Salamis until expelled by. a Phcenician exile. Evagoras, notwithstanding the expulsion of his ancestors, seems to have been born at Salamis, and lived there till the throne was again usurped by a Cyprian noble,— when, either from a prudent resolve to avoid the possi- bility of danger, or on account of information which he re- ceived of the usurper's designs against his life, he fled to Cilicia. Thence he returned secretly to Salamis in 410 3B.c.; and, having with the aid of a small band of adherents over- powered the guards of the palace and put the tyrant to death, he mounted the throne. According to Isocrates, Evagoras was a just and wise ruler, whose aim was to pro- mote alike the general wellbeing of his state and the welfare of his individual subjects, and this not merely by an increase of wealth*~~

~~*and of the luxuries which it can provide, but by the cultivation of ,the Grecian arts of refinement and civilization, which had been almost obliterated in Salamis by; a long period of barbarian rule. HIe endeavoured in every way to proniote friendly relations with the Athenians, and after the defeat of the Athenian general Conon at figospotami, he gave him refuge and a cordial reception. HIe also endeavoured, at least for a time, to secure the friendship of Persia, and concluded a treaty with Artaxerxes IL., whose aid he secured for the Athenians against Lacedemon. Conjointly with the Persians and Athenians, he assisted in gaining the battle of Cnidus, 394 B.c., and for this service his statue was placed by the Athenians side by side with that of their general Conon in the Ceramicus. Not long after this his friendly relations with Persia seem to have been annulled, very probably because the Persian mouarch was jealous of his enterprising and independent spirit, and of his increasing influence. Direct war between him and Persia did not, however, occur until after the peace negotiated by Antalcidas, 387; but he took advantage of the Persians being otherwise engaged to extend his rule over the greater part of Cyprus, and to stir up revolt among the Cilicians. As soon as the Persianswere free to devote their whole attention to him, these acts were speedily revenged. HIe was totally defeated by a largely superior Persian force, and compelled to flee to Salamis, which: the Persians closely invested, and in all probability would soon have succeeded in capturing, had not dissensions broken out between the two generals, of which Evagoras took advantage to conclude a peace with one of them. By the terms of this peace, Evagoras was allowed to remain nominal king of Salamis, but: apparently under the authority of Persia, and at all events with his independence, if not altogether overthrown, at 'east very much crippled. About ten years after this,*~~

~~*EVA—EVA*~~

~~*374 B.c., Evagoras was assassinated by a eunuch from motives of private revenge.*~~

~~*EVAGRIUS, surnamed Scholasticus and Ex-Preefectus, was born at Epiphania in Syria, 536 a.p. From his sur- name he is known to have*~~

been an advocate, and it is sup- posed that he practised at Antioch. He was the legal adviser of Gregory, patriarch of that city ; and through this connection he was brought under the notice of the emperor Tiberius, who honoured him with the rank of questorian. His influence and reputation were so consider- able that on the occasion of his second marriage a public festival was celebrated in his honour, which, however, was interrupted by a terrible earthquake, said to have destroyed

60,000 persons. Evagrius's name has been preserved by | understood, however, Ist, that such a summary "is not to

his Hecclesiastical History, extending over the period from the third general council (that of Ephesus, 431) to the year 594. Though not wholly trustworthy, this work is tolerably impartial, and appcars to have been compiled from original documents, but it is disfigured by the unquestion- ing credulity characteristic of the age. that contained in Reading's Greek Ecclesiastical Historians, Cambridge, 1720. It is also translated in Bagster's work bearing the same title.

EVANDER. In the Roman tradition, as given by Livy, i. 5-7, the story of the Arcadian Evander is connected with the arrival of Hercules in Italy and his recovery of the cattle of Geryon from the robber Cacus. Evander, having left the Arcadian town of Pallantium, becomes the eponymus, or name-giver, of the Palatine, one of the seven hills of Rome. This is only one of many Greek legends adopted by the Romans for the purpose of connecting Italian places with others of like-sounding names in Greece. The time when this story was embodied into Latin tradition cannot be precisely ascertained ; but we may safely assign it to the period when Greek influence began to make itself widely felt in the Italian peninsula. The story is told with many variations, inconsistencies, and contradictions. According to Pausanias (viii. 43, 2), Evander was the son of Hermes and a daughter of the river Ladon; others spoke of him as a son of Echemus and Timandra. The motives which led him to leave Arcadia are also variously stated. The Latin writers made hima son of Mercury and the prophetess Carmenta, whose name belongs strictly to Italian mythology. So again, while one version of the story represents him as being hospitably welcomed in Italy, another speaks of him as gaining a

~~*footing in it by force, and after slaying Herilus, king of Preeneste. It would follow of necessity that the Italian legend would describe Hivander as one who introduced Greek customs and rites into his new country, and would attribute to him such inventions as those which the Theban myth assigned to the Phoenician Cadmus. See Dion. Hal. i. 33; Cornewall Lewis, Credibility of Early Roman History, ch. viii. § 4.*~~

~~*EVANGELICAL ALLIANCE, an association of dif- ferent Christian denominations formed in London in August 1846, at a conference of more than 800 clergymen and laymen from all parts of the world, and embracing up- wards of fifty sections of the Protestant church. Though the proposal for an alliance was first mooted in England, it ultimately obtained wide support in other countries, more especially in America, and organizations in connexion with it now exist in the different capitals throughout the world. The object of the Alliance, according to a resolution of the first conference, is 'to enable Christians to realize in themselves and to exhibit to others that a living and everlasting union binds all true believers together in the fellowship of the church." At the same conference the following was adopted as the basis of the Alliance : —" Evangelical views in regard to the divine inspiration, authority, and sufficiency of the Holy Scrip-*~~

~~*The best edition is |*~~

~~*tures ; the right and duty of private judgment in the inter- pretation of the Holy Scriptures ; the unity of the Godhead and the Trinity of persons therein ; the utter depravity of human nature in consequence of the fall; the incarnation of the Son of God, His work of atonement for sinners of mankind, and His mediatorial intercession and reign; the justification of the sinner by faith alone ; the work of the Holy Spirit in the conversion and sanctification of the sinner ; the immortality of the soul, the resurrection of the body, the judgment of the world by our Lord Jesus Christ, with the eternal blessedness of the righteous and the eternal punishment of the wicked; the divine institution of the Christian ministry, and the obligation and perpetuity of the ordinances of Baptism and the Lord's Supper ;'—it being*~~

~~*be regarded in any forial or ecclesiastical sense as a creed or confession ;" and 2d, that "the selection of certain tenets, with the omission of others, is not to be held as implying that the former constitute the whole body of important truth, or that the latter are unimportant." Annual conferences of branches of the Alliance arc held in England, America, and several Continental countries ; and it is provided that a general conference, including represen- tatives of the whole Alliance, be held every seventh year, or oftencr if it be deemed necessary. Such conferences have been held in London in 1851; Paris, 1855; Berlin, 1857 ; Geneva, 1861; Amsterdam, 1867; New York, 1873. They are occupied with the discussion chiefly of the "best methods of counteracting infidelity," promot- ing Christian union, organizing Christian agencies, and generally advancing the cause of Christianity,—every sub- ject being avoided which might give rise to any serious divergence of opinion among the members. 'The various organizations of the Alliance lend their aid to any depart- ment of Christian effort requiring special help; and on several occasions their influence has been advantageously employed in cases of religious persecution.*~~

~~*See Reports of the Proceedings of the different general conferences, which have been published under the following titles:—The IIvan- gelical Alliance, London, 1847; The Religious Condition of Christen- dom, London, 1852; The Religious Condition of Christendom, London, 1859 ; The Geneva Conference of the Evangelical Alliance, London, 1862; Hvangelische Alliantie, Rotterdam, 1867, and Proceedings of the Amsterdam Conference, London, 1868; and Evangelical Alliance Conference 1873, New York, 1874.*~~

~~*EVANGELICAL ASSOCIATION, an American reli gious denomination originated about the beginning of the present century by Jacob Albrecht, a German Lutheran of Pennsylvania. About 1790 he began an itincrant mission among his fellow-countrymen, chiefly in Pennsylvania ; and his labours meeting with considerable success, he was, at an assembly composed of representatives of the different stations, elected in 1800 presiding elder or chief pastor, and shortly afterwards rules of government were adopted somewhat similar to those of the Methodist Episcopal Church. In 1816 the first annual conference was heid, and in*~~

1843 there was instituted a general conference, com- posed of delegates chosen by the annual conferences and constituting the highest legislative and judicial authority in the church, The members of the general conference hold office for four years. In 1873 the association com- prised 15 annual conferences, consisting of over 600 itinerant and 400 local preachers, possessed 4 training colleges, and numbered 83,195 members.

EVANGELICAL UNION, a religious denomination which originated in the deposition of the Rev. James Morison, minister of a United Secession congregation in Kilmarnock, Scotland, for certain views regarding faith, the work of the Spirit in salvation, and the extent of the atoneinent, which were regarded by the supreme court of his church as anti-Calvinistic and heretical. HIs deposi-

tion took place in 1841; and his father, who was minister at Bathgate, and other two ministers being deposed not long afterwards for similar opinions, the four met at Kil- marnock in May 1843, and, on the basis of certain doctrinal principles, formed themselves into an association under the name of the Evangelical Union, "for the purpose of countenancing, counselling, and otherwise aiding one another, and also for the purpose of training up spiritual and devoted young men to carry forward the work and 'pleasure of the Lord.'" The doctrinal views of the new denomination gradually assumed a more decidedly anti- Calvinistic form, and they began also to find many sym- pathizers among"the Congregationalists of Scotland. Nine students were expelled from the Congregational Academy for holding " Morisonian" doctrines, and in 1845 eight churches were disjoined from the Congregational Union of Scotland and formed a connexion with the Evangelical Union. In 1858 the Evangelical Union issued a new doctrinal statement superseding that of 1843. The Union exercises no jurisdiction over the individual churches con- nected with it, and in this respect it adheres to the Inde- pendent or Congregational form of church government ; but-while the affairs of those of its congregations which originally belonged to the Independent denomination are managed by meetings of all the communicants, those con- gregations which originally were Presbyterian vest their government in a body of elders.

~~*The churches connected with the Evangelical Union number nearly 90, only a few of which are in England. Its ministers are eligible for Congregational churches in England, and for some time negotiations have been in progress for an amalgamation of the denomination with the Congregational Union of Scot- land. See Lvangelical Union Annual, and History of the Evangelical Union, by F. Ferguson, D.D. (Glasgow, 187 6).*~~

~~*EVANS, Sir De Lacy (1787-1870), a distinguished British soldier, son of John Evans of Milltown, Limerick, Ireland, was born in 1787. HIe was educated at Woolwich Academy, and entered the army in 1807 as ensign in the 22d regiment of foot. HIs regiment was immediately after wards gazetted for India, and during his stay of three years in that country he served with distinction in various actions, In 1812, as lieutenant of the 3d Dragoons, he joined the Peninsular army of Wellington; and in the Portuguese and Spanish campaigns of 1812, 1813, and 1814 he acquired a high reputation both for military skill and for personal bravery. HIe was rapidly promoted by merit, and in 1814 received the rank of lieutenant-colonel, The same year, in command of the 5th West India Regiment, he was sent to take part in the war against the United States, where he specially distinguished himself at the capture of Washington, and shared in the attack on Baltimore and the operations before New Orleans. HIe returned to England in the spring of 1815 in time to accompany the expedition of Wellington to Flanders, and was assistant quartermaster-general at Quatre Bras and Waterloo. As a member of the staff of the duke of Wellington he accompanied the English army to Paris, and remained there during the occupation of the city by the allies. In 1831 Evans entered the HIouse of Commons as Liberal member for Rye ; but in the election of 1832 he was an unsuccessful candidate both for that borough and for Westminster. For the latter constituency he was, however, returned in 1833, and, with the exception of the parliament of 1841-46, continued to represent it till 1865, when he retired from political life. HIs parlia- mentary duties did not, however, interfere with his career as a soldier. In 1835 he was sent in command of 10,000 men (the "Spanish Legion") to aid the queen of Spain against Don Carlos. HIe remained two years, and gained several brilliant though bloody victories ; and on his return*~~

~~in 1839 he was, in recognition of his achievements, created Knight Commander of the Bath. In 1846 he attained the rank of major-general ; and in 1854, on the breaking out of the Russian war, he was appointed to the command of the second division of the army of the Hast. At the battle of the Alma his quick comprehension of the features of the combat largely contributed at various critical periods to the victory. On the 26th October, by the skilful manner in which he handled his troops, he brilliantly defeated, at a nominal loss, a large division of Russian forces which had attacked his position on Mount Inkerman. Illness and fatigue compelled him a few days after this to leave the command of his division in the hands of General Penne- father ; but he rose from his sick-bed on the day of the battle of Inkerman, November 5, and declining to take the supreme command of his division from General Pennefather, he generously aided him in his long-protracted struggle by his countenance and advice. On the return of Evans to England in the following February invalided, he received for his services in the Crimea the thanks of the House of Commons, and the same year he was made Knight Grand Cross of the Order of the Bath, and the university of Oxford conferred on him the degree of D.C.L. In 1856 he received the Grand Cross of the Legion of Honour, and in 1861 he was gazetted general. He died 9th January~~

~~1870.~~

~~EVANS, Oxtver (1755-1819), an American mechani- cian, was born at Newport, Delaware, in 1755. He was at an early age apprenticed to a wheelwright, and: at the age of twenty-two he invented a machine for making card- teeth in lieu of the old method of making them by hand. In 1780 he became partner with his brothers, who were practical millers ; and two years later he completed an in- vention which totally changed the structure of flour mills. About the same time he discovered the application of steam to land carriages, and in 1786 he endeavoured to obtain patents for the two inventions from the State of Pennsyl- vania. A patent for the former was granted in 1787, but the latter request was considered too absurd to merit con- sideration, It was granted, however, in 1797 by the. State of Maryland. About this time he sent drawings and speci- fications~~

~~*of his plans to England, but they were received there with the same incredulity as in America. Meantime he made use of theengine he had invented—the first constructed on the high-pressure principle—for his flour mill; and in 1803 he constructed a steam dredging machine, which also propelled itself onland. Evans used all his means in experi- ments on his invention; and though he did not live to:see its full application, he was confident that its results would be as great as they have actually turned out to be. In 1819 a fire broke out in his factory at Pittsburg, and its con- sequences were so disastrous to his immediate hopes that' he did not long survive its occurrence, dying April 21, 1619.*~~

~~*EVANSON, Epwarp (1731-1805), a theological writer whose views gave rise to much controversy, was born at Warrington, in Lancashire, April 21, 1731. At the age of seven he was placed under the care of an uncle, vicar of Mitcham, in Surrey. At fourteen he entered Emmanuel College, Cambridge, where he graduated B.A. in 1749. In 1753 he took his degree of M.A.; and, after being ordained, he officiated for several years as curate at Mitcham. In 1768 he became vicar of South Mimms near Barnet; and in November 1769 he was presented to the rectory of Tewkes- bury, with which he also held the vicarage of Longdon. In the course of his studies and inquiries after truth he dis- covered what he thought important variance between the teaching of the Church of England and that of the Bible, and he did not conceal his convictions. HIe allowed him- self in reading the service to alter or omit phrases which seemed to him untrue, and in reading the Scriptures to*~~

~~*point out errors in the translation, a practice which was offensive to many of his congregation. A crisis was brought on by his sermon on the resurrection preached at Easter 1771 ; and in November 1773 a prosecution was instituted against him in the Consistory Court of Gloucester. HIe was charged with "depraving the public worship of God contained in the liturgy of the Church of England, assert- ing the same to be superstitious and unchristian, preaching, writing, and conversing against the creeds and the divinity of our Saviour, and assuming to himself the power of making arbitrary alterations in his performance of*~~

~~*the public worship." A protest was at once signed and published by a large number of the parishioners against the prosecution. The case was carried by appeal to the Court of Arches and the Court of Delegates, and was ultimately quashed on merely technical grounds in 1777. Mean-while Evanson had made his views generally known by several publications. In 1772 appeared anonymously his Doctrines of a Trimity and the Incarnation of God, examined upon the Principles of Reason and Common Sense. This was followed in 1777 by A Letter to Dr Hurd, Bishop of Worcester, wherein the Importance of the Prophecies of the New Testament and the Nature of the Grand Apostasy predicted im them are particularly and impartially con- sidered. The author had before this time retired to Longdon, leaving his curate in charge at Tewkesbury. In 1775 he was appointed domestic chaplain to the solicitor- general, and at the close of 1777 heresigned both his livings, and retired to Mitcham. In 1786 he married. He soon after wrote some papers on the Sabbath, which brought him into controversy with Dr Priestley, who published the. Whole discussion (1792). In the same year appeared Evanson's work entitled The Dissonance of the four generally received Evangelists, to which replies were published by Dr Priestley and D. Simpson, M.A. (1793), Evanson rejected most of the books of the New Testa- ment as forgeries, and of the four gospels he accepted only that of St Luke. In 1802 he published Reflections upon the State of Religion in Christendom, in which he attempted to explain and illustrate the mysterious foreshadowings of the Apocalypse. This he considered the most important of his writings. Shortly before his death he completed his Second Thoughts on the Trinity, in reply to a work of the bishop of Gloucester. The story of the life, investiga- tions, and conflicts of this heretical churchman of a lundred years ago is full of interest, especially for its anticipations of some of the momentous discussions of the present day. He died at Colford, in Gloucestershire, Sep- tember 25, 1805. A narrative of the circumstances which led to the prosecution of Evanson was published by N. Havard, the town-clerk of Tewkesbury.*~~

~~*EVANSVILLE, a city of America, capital of Vanderburg county, Indiana, is situated on a high bank of the Ohio river, 200 miles below Louisville, Kentucky—measuring by the windings of the river, which double the direct distance. On account of the peculiar bend of the river at this «point,*~~

~~*Evansville is built somewhat in the shape of a crescent, and is sometimes called the "Crescent City." It has railway communication in various directions ; and the Wabush and Erie Canal, completed in 1853, extends from it to Toledo, Ohio, a distance of 400 miles. Evansville is a busy commercial and manufacturing town, and is rapidly increasing. It is the principal shipping port for the grain and pork of south-western Indiana ; and among its other articles of export are lime, cotton, dried fruit, and tobacco. It has flour mills, breweries, iron founderies, tanneries, machine shops, and woollen and cotton factories. Coal and iron ore are found in the vicinity. The principal buildings are the court-house, the city hall, the high school, the marine hospital, and a new building in which*~~

~~*are included the post-office, the United States courts, and the custom-house. The population, which in 1860 was 11,484, had increased in 1870 to 21,830.*~~

~~*EVAPORATION is that process by which liquids and solids assume the gaseous state at their free surfaces. The rate at which evaporation takes place depends upon the temperature of the liquid or solid, the extent of the exposed surface, and the facility with which the gaseous particles can escape from the neighbourhood of the surface either by diffusion through the air or by the motion of the air itself. Hence a strong wind will generally accelerate the process of drying. The passage from the gaseous into the liquid condition, or condensation, and into the solid condition, or sublimation, are processes the converse of evaporation. The evaporation of a liquid is a phenomenon which we observe daily, and that of a solid sometimes presents itself to our notice, as when snow vanishes by evaporation during a long frost though the temperature never rises to the freezing point. Camphor and iodine also readily evaporate at ordinary temperatures without liquefying, and sublime on the surfaces of the vessels in which they are placed.*~~

~~*A gas is a substance a finite portion of which will distribute itself through any space, however great, to which it has free access. A substance which can exist in the liquid or solid state at ordinary temperature and under ordinary atmospheric pressure is usually, when in the gaseous condition,*~~

~~called a vapour ; but, though it is easy to give arbitrary definitions, no satisfactory distinction between gases and vapours has yet been made. In fact, the word "vapour" is rapidly giving place to "gas" in most instances. The greatest amount of any substance which can exist in the gaseous condition in the unit of volume depends upon the temperature, but is almost independent of the presence of any other vapour or gas, provided that such gas or vapour possess no chemical affinity for the substance in question. When a portion of space contains as much of any vapour as can exist in it at the temperature, it is said to be satwrated with that vapour. Any reduction of temperature will then be accompanied by condensation of part of the vapour, and the space will remain saturated at the new temperature ; while if any increase of temperature occur, the space will cease to be saturated with the vapour it contains, and further evaporation will take place if any of the corresponding liquid be present, but if not the space will remain unsaturated, and the vapour it contains is then said to be super-heated. If the fall of temperature be caused by the introduction of a solid body sufficiently! cold, condensation will first take place in the layer of air next the body, forming dew upon its surface if the temperature be above that at which the vapour solidifies, but hoar-frost if the temperature be below that point, in which case we have an example of sublima- toon. If the reduction of temperature be occasioned by the introduction of a quantity of cold air or other gas, or by the rapid expansion of the vapour itself, together with any other vapours or gases which may occupy the same space, the condensed liquid assumes the state of cloud, fog, or mist. The temperature at which a portion of space is saturated with the ;aqueous vapour which it actually contains was called by Dalton the dew-point. Some vapours, like steam at 100° C., if allowed to expand without receiving heat, and in expanding to do the full amount of work corresponding to the greatest pressure they can exert, suffer partial condensation, because the increase in the space occupied does not compensate for the reduction of temperature; but there are other vapours which become super-heated by expansion, because the increase in volume more than compensates for the reduc- tion of temperature.~~

~~When the temperature of a liquid is such that the~~

~~*pressure of its vapour is less than that to which the liquid is exposed, evaporation will go on at 1ts free surface only , but if the temperature is raised so that the pressure of the vapour is greater than that exerted upon the liquid, bubbles of vapour can exist within the liquid itself, and if once formed will rise through the liquid and escape at the surface. This phenomenon is called ebullition or boiling ; and the temperature at which the pressure of the vapour of a substance is equal to the standard atmospheric pressure is called its botling-point. The standard atmospheric pressure generally adopted is that exerted by a column of mercury 760 millimetres in height at 0° C. at the sea level in latitude 45°. This is equivalent to about 29:905 inches of mercury at 0° C, at the sea-level in the latitude of London. The pressure of a megadyne per square centi-metre has been proposed as the standard atmosphere, but this has not yet been generally adopted.*~~

~~*When a quantity of water is heated from the lower surface, the water near the bottom is at a higher tempera- tnre than the superincumbent layers, and the bubbles of steam formed there on rising are surrounded by water at a temperature below the boiling-poiut, and, being conse- quently unable to sustain the pressure to which they are exposed, they collapse with a slight sound. These sounds repeated in rapid succession constitute the "singing" of the kettle, and are exchanged for a very mucli softer sound when the whole of the water reaches the boiling- point, and steam bubbles escape from the surface. Though bubbles of pure steam once produced can exist under atmospheric pressure if the temperature be above the boiling- point, yet such bubbles will not necessarily be produced in pure water as soon as it reaches that temperature. If water which has been carefully freed from air by long boiling be heated in a clean glass vessel, its temperature may be raised considerably above the boiling-point ; but as soon as the continuity of the water is broken by the formation of a bubble of steam, ebullition cnsues with explosive violence, and the temperature falls nearly to the boiling-point. Drops of water suspended in a mixture of linseed oil and oil of cloves of the same specific gravity have been heated by Dufour to 180° C., and generally fatty oils poured on the surface of water tend to prevent ebullition. It has been stated that the boiling of pure water has not yet been observed. Certain solutions, especially strong solutions of caustic alkalies, are very liable to an*~~

~~*explosive evolution of steam at intervals, and the best way of preventing it is the introduction, when possible, of a small piece of a metal which can decompose water.*~~

~~*Though the temperature at which water boils depends on the impurities which it contains, and the nature of the vessel in which it is placed, yet the temperature of the steam above the water depends only on the pressure. This has been long acknowledged when the quantity of impurity dissolved in the water is small, and in order to determine the boiling-points upon thermometers they are immersed in the steam above boiling water without allowing their bulbs to touch the water. When the quantity of salt dissolved is very great, the temperature of the boiling solution is generally very much above the boiling-point of water. Thus, according to Faraday, saturated solutions of common salt, nitre, and potassic carbonate boil at 109°, 115°6°, and 140° C. respectively. The temperature of ebullition of a saline solution is sometimes employed to determine the percentage of salt present. Notwithstanding the high temperature of the solution, it seems that the temperature of the steam when first liberated from the solution is the same as that produced by water boiling at the same pressure. 'This conclusion is supported by Datour, though Magnus and some others were of a*~~

~~*different opinion. If a thermometer with a clean unpro: tected bulb be immersed in the steam above a concentrated saline solution boiling at ordinary pressure, its temperature will quickly rise to 100° C., then become almost stationary, and afterwards slowly rise to a temperature somewhat below that of the liquid, and depending on its nearness to the solution and the facilities which are offered for the escape of heat from the bulb. On removing the thermo- meter and allowing it to cool, there will generally be found a quantity of salt sticking to the bulb which has been splashed upon it from the solution. If the bulb of a ther- mometer be covered with cotton which has been sprinkled with some salt, and be then immersed in steam, whether above a saline solution or above boiling water, its tem- perature will quickly rise considerably above the boiling-point, and several thermometers whose bulbs have been covered with*~~

~~*different salts will indicate different tempera- tures if suspended side by side in the same vessel of steam, ieading us to suspect that the high temperature recorded by the thermometer above the saline solution may be due in part at least to salt which has been splashed upon the bulb. If the bulb be protected from splashes by a metal screcn placed below it, and from condensed water trickling down the stem by a guard placed above it, the temperature will at once rise to 100° C.; but the further rise of temperature will be so slow that it may be accounted for by the radiation from the liquid and from the metal screen, which of course becomes heated in the same way as a naked thermometer placed in its position, If a test tube con- taining mercury be immersed in the solution, and the thermometer bulb placed in it till it reaches the same temperature, on raising it into the steam the temperature will be seen to fali considerably.*~~

~~*Tf a small quantity of a liquid be placed in a metal vessel whose temperature has been raised very much above the boiling-point of the liquid, vapour will be produced so rapidly from the under surface of the liquid that it will be supported on a cushion of its own vapour, and thus prevented from coming into contact with the metal, the separation being so complete that if the liquid be an electrolyte a current from an ordinary battery cannot be made to pass from the liquid to the metal. This condition of the liquid is called the spheroidal state, and is often referred to as Leidenfrost's phenomenon. It may fre- quently be noticed that the drop isin a state of rapid rota- tion. If by any means an indentation is made in the surface of the drop, vibrations will be sct up in it, causing the horizontal section to pass into the form of a curvilinear polygon, in the same manner as the edge of a bell changes its form when struck. The surface of the drop then presents a "beaded" or corrugated appearance, formed by the superposition of the retinal images of the drop in the two extreme conditions which it assumes, and therc- fore always presenting an even nuinber of corrugations corresponding to the vibrating segments. Surface tension of course supplies the forces necessary to produce the vibrations. When a ventral segment projects beyond the mean surface of the drop so as to form a " bead," more surface is exposed by it to the heating action of the metal than when it is in its mean position, and when it lies within the mean, or spheroidal, surface so as to form a "flute," less surface is exposed by it ; but as the generation of steam cannot be*~~

~~*instantaneous, more steam will escape from the seginent while it is receding towards the centre than while it is advancing, and thus the pressure of the escaping steam upon each ventral segment will vary with the phase of vibration in such a manner as to supply the energy necessary to the continuance of the motion. If the drop be examined by ordinary daylight a fluted outline can be distinctly seen within the beaded outline, but if it*~~

~~*BVAPOWA T I @N*~~

~~*be instantaneously illuminated by electric sparks, the Separate vibration forms will be seen presenting half as many beads and flutes as are presented when the images are superposed through the employment of a continuous light. The lowest temperature at which the spheroidal condition can be produced varies with the nature of the heated surface, the liquid, and the temperature of the liquid when poured into the vessel. It is in virtue of this condition that Faraday found it possible to freeze mercury in a red hot vessel. When the metal is allowed to cool sufficiently, tlie liquid comes into contact with it, and is wholly or partially converted into vapour with explosive violence. In highly rarefied air water will assume the spheroidal condition at very low temperatures, in consequence of evaporation being accelerated by the diminution of pressure.*~~

~~*Previous to the introduction of the molecular theory of gases many theories were proposed to explain the diffusion of aqueous vapour through the air. Halley supposed that vapour consisted of small hollow spherules or vesdcles filled with an awra considerably lighter than air, which caused them to ascend like balloons, and Atwood followed his hypothesis. Even after the similarity of vapours to air and other so-called permanent gases had been fully recognized, the vesicular theory was still held in a modified form to explain the suspension of cloud and fog; but in the case of very small drops the resistance of the air is sufficient to prevent the drops acquiring more than an extremely small velocity in consequence of their weight. lfooke supposed that air contains aqueous vapour in a state of chemical solution ; but this theory, like the preceding, fails to explain evaporation in vacuo. De Saussure believed that water was first converted into vapour by the action of heat, and then absorbed*~~

~~*by the air on account of a chemical affinity; while Halley, Leroy, and Franklin thought that the attraction of the air was instrumental in the first formation of vapour. 'The advocates of a still older theory maintained that aqueous vapour was a com- bination of water particles with those of fire, which caused them to ascend, and that contrary winds blowing the particles of water together loosened the fire particles from them, thus allowing them to descend as rain.*~~

~~*Desaguliers seems to have been the first to identify the nature of steam with that of aqueous vapour at ordinary temperatures, and to recognize the fact that steam is a transparent gas, while the cloud produced by a ject of steain is really condensed water. In a letter to the presi- dent of the Royal Society (Phil. Trans., 1729, p. 6), Desaguliers maintained that the cause of vapour rising in the air is a force of repulsion between its particles, which separates them so far from each other as to render the vapour specifically lighter than air. The resistance offered by water to compression he accounts for by a similar repul- sion. From some experiments with a steam engine he concluded that water in being converted into steam under ordinary atmospheric pressure expands tuo about 14,000 times its original volume instead of about 1650 times as it actually does. Shortly after the above-mentioned letter was written, Desaguliers, in "An Essay on the Cause of the Rise of Vapours and Exhalations in the Air" (Natural Philosophy, pt. ii.), attributed the repulsion between the particles of vapour to an electrical action, sup- posing that the particles of water were first electrified from the air and then repelled by the air and by one another.*~~

~~*In 1783 De Saussure published his Lssazs sur ?' Hygro- métrie, which give an account of many experiments executed on a great scale, and in some cases leading him to correct conclusions. By placing a known weight of dry potassic carbonate in a large glass balloon filled with air and satu- rated with aqueous vapour, and finding the increase in the weight of the carbonate produced by absorption, he deter-*~~

~~*i*~~

~~*inined the amount of vapour originally present. By filling the balloon with dry air, and suspending in it a piece of wet linen, he determined the*~~

~~amount of the water which evapo- rated from the loss of weight experienced by the linen. These experiments were repeated with the balloon filled with hydrogen and carbonic anhydride, and with mixtures of these gases, and both methods led to the same result, indicating that the amount of vapour was the same, if the temperature remained constant, whatever gas were present. The inferences he derived from his experiments at different temperatures were not, liowever, justifiable; nor is there any ground for his division of vapour into four classes, viz., pure elastic vapour, dissolved elastic vapour, vesicular vapour, and concrete vapour, the last of which really con- sists of liquid drops.~~

~~Delue (Phil. Trans., 1792) enunciated the theory that the quantity of vapour which can exist in any space de- pends only on the temperature, and is independent of the presence of any other vapour or gas with which it has no tendency to combine chemically, being always the same as if nothing but the vapour occupied the space ; and this he verified by placing his hygrometer with a little water under the receiver of an air-pump, and showing that the indica- tions of the hygrometer were independent of the pressure of the air. Deluc was the first to propose that the hygrome- tric state of the air should be measured by the ratio of the amount of vapour existing in it to that required to saturate it at the temperature it possesses. A more convenient measure has been proposed by Balfour Stewart, viz., the quantity of vapour associated with the unit of mass of dry air.~~

~~But it is to Dalton that we are chiefly indebted for a clear statement of the laws of evaporation. In his Metcoro- logical Essays (1793, p. 134) he states that "evaporation and the condensation of vapour are not the effects of chemi- cal affinities, but aqueous vapour always exists as a fluid sut generis diffused amongst the rest of the aerial fluids." Thus water at 80° Fahr. is on the point of boiling under a pressure of 1°03 inches of mercury, and from this he con- cludes that in the presence of dry air water at 80° Fahr. will evaporate 'till the density of its vapour, considered abstractedly, becomes 51,th of what it is under a pressure of 30 inches, and its temperature 212°." This statement, though inaccurate inasmuch as it takes no account of: the expansion of a given mass of steam at constant pressure when its temperature is raised from 80° Fahr. to 212°~~

~~*Fahr., yet shows that Dalton had discovered the true law of eva- poration, and thoroughly understood its applications. If we substitute pressure for density, the statement becomes correct, Again, on page 201 of the HIssays he states his conviction, as the result of experiments and observations,*~~

~~*""That the vapour of water (and probably of most other liquids) exists at all temperatures in the atmosphere, and ts capable of bearing any known degree of cold without a total condensation, and that the vapour so existing is one and the same thing as steam or vapour of 212° or upwards. The idea, therefore, that vapour cannot exist in the open atmosphere at a lower temperature than 212°, unless chemically combined therewith, I consider as erroneous; it has taken its rise from the supposition that air pressing upon vapour condenses the vapour equally with vapour pressing upon vapour,— a supposition we have no right to assume, and which, I apprehend, will plainly appear to be contradictory to rcason and unwarranted by facts; for when a particle of vapour exists between two particles of air, let their qa and opposite pressures upon it be what they may, they cannot bring it nearer to another particle of vapour, without which no condensation can take place, all other circum- stances being the same; and it has never been proved that the vapour in a recciver from which all the air has been exhausted is precipitated upon the admission cf perfectly dry air. HIence, then, we conclude, till the contrary can be proved, that the condensation of vapour cxposed to the common air does not in any way depend upon the pressure of the air."*~~

~~*(The italics are Dalton's.) In these remarks Dalton*~~

~~*manifests a clear appreciation of the true state of the case.*~~

~~*In his experiments he aimed directly at the root of the Vink — 92*~~

~~*730*~~

~~*matter, and the results at which he arrived are perfectly conclusive within the errors of his experiments. First he measured the pressure of a quantity of dry air kept at constant volume for every degree on Fahrenheit's scale between the freezing and boiling points ; then he found the pressure of pure steam in contact with water for every degree*~~

~~*through the same range, and lastly the rate of increase of pressure of a quantity of air kept at constant volume but in contact with water when the temperature varied. The results showed that at each particular temperature the pressure of the air saturated with vapour was exactly equal to that corresponding to the dry air together with that exerted by vapour alone when in contact with water at the same temperature; from which he inferred that there is either no chemical action between the air and vapour, or such action in no way affects the question at issue with gases other than air and vapours other than aqueous. This conclusion is frequently ex- pressed by saying that gases and vapours behave to one another as vacua. Most of these experiments were published in a paper in the Manchester Memoirs, vol. v.*~~

~~*Dalton was the first to give a table of the maximum pressure of steam for temperatures from 80° to 212° Fahr.*~~

~~*The researches of Desormes, Gay Lussac, and Daniell all tend to corroborate Dalton's theory and the accuracy of his experiments, the results of which may be summed up in two statements, sometimes cited as Dalton's laws, viz.:—*~~

~~*{. In a space which contains a liquid and its vapour only, the liquid will continue to evaporate until the pressure of its vapour attains a determinate amount depen- dent only on the temperature.*~~

~~*II. In a space containing dry air or other gas or gases a liquid will continue to evaporate until the pressure exerted by its vapour alone is the same as if no air or other gas were present.*~~

~~*The more recent researches of Regnault and Andrews have shown that the second law is not quite true. It was, however, a great step in advance, and is sufficiently accurate for all the purposes of chemical analysis and hygrometry. Two or more vapours will act towards one another as vacua when, and only when, their liquids have no affinity for one another. Whin this is not the case, the pressure exerted by the vapour above the surface of the mixed liquids is frequently much less than that which can be exerted by the vapour of the more volatile liquid alone. Thus sulphuric acid will absorb aqueous vapour, and alcohol will absorb ether vapour,*~~

~~reducing the pressure to a small fraction of that exerted by the ether vapour alone. Bisulphide of carbon and paraffin oil also diminish the pressure of ether vapour. Since a mixture of liquids may boil when the pressure of the vapour produced exceeds that to which the liquid is exposed, it follows that a mix- ture of liquids which have no tendency to dissolve one another will boil at a temperature below the boiling-point of either of them; but when the liquids have an affinity for each other the boiling-point of the mixture will be above that of the more volatile constituent.~~

~~The method employed by Gay Lussac for the measure- ment of the pressure of aqueous vapour at low temperatures has not since been improved upon. HIe employed a barometer tube whose length was considerably greater than the height of the barometer, and having bent the upper portion (above the mercury) over so as to slope downwards at an angle of about 60° with the horizon, he immersed the closed end in a:cold mixture at the tempera- ture for which the pressure was to be measured, and injected little water into the barometer tube. The vapour pro- duced condensed in the cold part of the tube, and this process of distillation continued until the whole of the water had evaporated from the surface of the mercury,~~

~~EV & POeR APE wo NN~~

~~leaving it free to rise and fall in the tube. The pressure of the vapour was afterwards always that due to the temperature of the coldest part of the tube, for if at any time it exceeded this pressure, condensation would com- mence and continue until the pressure was reduced to this amount. A barometer tube dipping into the same trough of mercury, and containing no water, was placed by the side of the experimental tube, and the difference in the level of the mercury in the tubes was read by means of a microscope sliding on a graduated pillar, this difference obviously indicating the pressure of the vapour.~~

~~The rate at which evaporation takes place has been the subject of much inquiry. In 1772 Dr Dobson of Liver- pool (Phil. Zrans., lxvii.) placed a cylindrical vessel, 12 inches in diameter, by the side of a rain-gauge, and, allowing for the rain which fell into it, determined the total eva- poration~~

~~*during each month for four years. Dalton and Hoyle imitated more closely the conditions presented by the soil, and filled a vessel three feet in depth with gravel and sand, covering it with earth and sinking it in the ground; a pipe was placed near the top and one near the bottom in order to collect any water which might be free to run off, while the amount of rain received was measured by a rain-gauge placed close to the vessel. At the commence- ment of the series of observations the contents of the vessel were saturated with water, and the difference between the amount of rain received and of water that escaped by the pipes indicated the amount of evaporation.*~~

~~*From observations of the rate of evaporation of water contained in a shallow tin dish Dalton concluded that at different temperatures in calm air the rate of evaporation is proportional to the maximum pressure of steam at that temperature, diminished by the pressure of the vapour already existing in the air, which pressure is determined from an observation of the dew-point, and that when the air is in motion the rate of evaporation increases with the velocity of the wind. It really depends not only on the temperature, but on the rate at which the vapour cau escape from the neighbourhood of the liquid, and evapora- tion therefore proceeds more quickly when the pressure of the air is diminished. Some considerations on the subject . will be found in the article Dirruston.*~~

~~*Many of Dalton's experiments were subsequently repeated in a modified form by Daniell, who examined the pressure of steam at various temperatures, and in the presence of other gases, as well as the rate of evaporation. 'The chief monument of Daniell's work on this subject is his dew- point instrument. Hutton was the first to suggest thie determination of the hygrometric state of the air from the cold produced by evaporation; and Sir John Leslie employed the same method, in connexion with the differen- tial thermometer. For the theory of Mason's dry and wet bulb thermometers, or, as it is sometimes called, August's psychrometer, see article DIFFUSION.*~~

~~*In 1823 the determination of the maximum pressure of aqueous vapour at different temperatures was referred to a commission of the Academy of Paris, and the work was undertaken by Dulong and Arago. They*~~

~~*measured the pressure of steam at temperatures ranging from 100° C. to 224° C., by observing the compression of a quantity of air imprisoned by mercury in a tube. About the same time a committee of the Franklin Institute of Pennsylvania*~~

~~*measured the temperature of steam in contact with water,*~~

~~*at pressures varying from one to ten atmospheres; but the results of the two series of experiments did not agree very well. It was partly on this account that Regnault determined to investigate the subject more thoroughly, and it is to him we are indebted for a table of the pressure of aqueous vapour over a range of temperature varying from —32° C. to 230° C. Some of his results, together with*~~

~~*BV AP ORS TE&ON*~~

~~*some obtained by Magnus, will be found in the accompany- ing table. The pressures are measured in millimetres of*~~

~~*Table of Pressure of Aqueous -Vapour.*~~

~~*7 Pressure in Millimetres Pressure in Millimetres Temperature [+ spe Temperature in Degrees of Mereury. in 7 egrees of Mercury. Centigrade. |” S| ss Centigrade. | Magnus, | Regnault. Magnus. | Regnault. Scr *310 105 907157 906°41 S06 “365 110 1077°261 1075°37 acc “553 115 1272°986 1269°41 “916 “841 118 1403°915 139902 1°403 1°284 120 een 1491°28 2°109 1°963 125 1743°88 3°115 3°004 130 2030°28 4°525 4°400 135 2353‘73 6471 6°534 140 2717°63 9°126 9°165 145 3125°55 12°677 12°699 150 3581°23 17°396 17391 155 4088°56 23582 23°550 160 465162 31602 31548 165 5274°54 41°893 41°827 170 5961°66 54969 54°906 175 6717°43 71°427 71°391 180 7546°39 91°965 91°965 185 845323 117°378 117-478 190 9442°70 148°579 148°791 195 10519°68 186°601 186°945 200 11688°96 232°606 233°093 205 12955°66 287°898 288517 210 1432480 853‘926 354643 215 15801°33 432°295 433°441 220 17390°36 524°775 525°450 225 | 19097°04 633‘305 633°778 230 20926740 760000 760°000*~~

~~mercury at 0° C. 60 metres above the level of the sea in the latitude of Paris. An account of Regnault's researches on this subject will be found in the Mémoires de I' Institut, tome xxi., the Wouvelles Annales de Chimie, xi. 334, and xiii, 396, and in the first volume of the publications of the Cavendish Society. The researches of Magnus, who arrived independently at nearly the same results as Regnault, were published in Poggendorff's Annalen, |xi. 225. Regnault also determined the density of aqueous vapour in air and in vacuo for temperatures between 0° C. and 25° C., and concluded that when the pressure is not very great nor the air nearly saturated (for when it is nearly saturated there is probably deposition of moisture upon the glass vessels), the density may be calculated from the known density of steam at the boiling-point and under ordinary atmospheric pressure by supposing it to obey "the gaseous laws." According to Regnault the mass of a litre of dry air at 0° C., and under a pressure of 760 nillimetres of mercury, is 1:293187 grammes, and the density of steam, compared with air at the same pressure and temperature as unity, is '6235. Hence, by help of the table of pressures, the amount of aqueous vapour in any given volume can be determined when we know the dew- point and the temperature of the air. If P denote the pressure of vapour at the dew-point in millimetres of mercury, the mass of vapour in a litre of air at ¢° C. will be iP 273 Tezdso187 × 760 × 27344 A curve which represents the relation between the pres- sure and volume of the unit mass of steam in contact with water as the temperature changes is called the steam line, and the corresponding curve for aqueous vapour in contact with ice is called the hoar-frost line. Since water can be cooled below the freezing-point without solidifying, it is possible to obtain data for drawing the steam line correspond- ing to a range of temperature below 0° C. This Regnault did, and his results showed that the steam line so continued does not coincide with the hoar-frost line, but that the two intersect very obliquely just above the freezing-point. Regnault supposed that this must be due to errors of measurement, and drew his steam line so as to coincide with the hoar-frost line ; but it has since been shown from theoretical considerations, by James Thomson, that such a~~

~~grammes.~~

~~difference must exist, and that the point of intersection of the two curves corresponds toa particnlar relation between the pressure, volume, and temperature for which ice, water, and steam can all exist together in equilibrium, no other gas or vapour being present in the inclosure. On ex- amining Regnault's results, the intersection of the curves was found to be distinctly indicated by them. At this point the steam line, ice line, and hoar-frost line inter- sect, and it has therefore been called the triple point. The corresponding temperature is a little above 0:007° C.~~

~~The number of units of heat absorbed by the unit of mass of a substance, in passing from the solid or liquid into the gaseous condition, without change of temperature, is called the latent heat of vaporization. According to Andrews, the latent heat of steam at 100° C. is 535-9, or a gramme of water in being converted into steam at 100° ©. would ab- sorb sufficient heat to raise 535-9 grammes from 0° to 1° C,~~

~~Soon after Dr Black enunciated his theory of latent heat, James Watt examined the latent heat of steam produced at different temperatures, and concluded that, when added to the amount of heat required to raise the unit of mass of water from 0° C. to the temperature at which the steam is formed, the result, often called the total heat of steam, is the same for all temperatures. This statement is known as Watt's law, but is far from true, for Regnault has shown experimentally that when steam is produced at a temperature of 7° C. its total heat is represented by 606:°5+°305¢ within the limits of error of his ex- periments. Putting ¢ equal to 100, this formula gives for the total heat of steam at 100° C. the value 637, and its latent heat is therefore about 536, since about 101 units of heat are required to raise the unit mass of water from 0° C. to 100° C. At 0° C. the latent heat of steam is 606°5. The latent heat of steam is greater then that of any other known vapour. According to Favre and Silbermann, the latent heat of the vapours of alcohol and ether are 208°31 and 91°11 respectively; and according to Andrews, they are 202°4 and 90°45 respectively.~~

~~In consequence of the great amount of heat absorbed in evaporating, volatile liquids are frequently employed for the purpose of producing cold. The cryophorus of Wol- laston consists of a glass tube with a bulb at each~~

~~*end, one of which is partially filled with water. The air is removed by boiling the water and sealing the tube when full of steam. On turning all the water into one bulb, and placing the other in a mixture of pounded ice and salt, the pressure of vapour will be diminished by condensation taking place in the cold bulb, and this allows such rapid evaporation to take place in the other bulb that the water remaining in it becomes readily frozen. Gay Lussac showed that water placed ina vacuum at 8° C., or in per- fectly dry air at 2° C., may be frozen by evaporation. The action of Carré's freezing-machine depends upon the heat absorbed by the rapid evaporation of ammonia, which has been liquefied by pressure.*~~

~~*Solid carbonic anhydride dissolved in ether will produce by evaporation 7m vacuo a temperature of about—110° C., and Natterer, by means of a mixture of liquid nitrous oxide and bisulphide of carbon evaporating in vacuo, obtained a temperature which he estimated at ~ 140° C.*~~

~~*When a vapour passes into the liquid or solid state a quantity of heat is produced equal to that absorbed in evaporating at the same temperature. Thus, if a gramme of steam be made to pass into 5°36 grammes of water at 0°, it will raise the temperature of the water almost to 100° C., and if steam at 100°C. be blown into a saturated solution of common salt, the temperature will rise to 109° C. before the steam will pass freely through it.*~~

~~*In 1822 Cagniard de la Tour inclosed a quantity of alcohol in a strong tube, so as to occupy about two-fifths of*~~

~~*its volume. A pellet of mercury was employed to separate the alcohol from some air, the compression of which served to measure the pressure in the tube. On heating the alcohol to about 225° C. (according to De la Tour) it ex- panded to about twice its volume, and then suddenly disappeared, the pressure being (according to the same authority) about 129 atmospheres. When the quantity of alcohol filled a much greater portion of the tube, the tube burst. The experiment was repeated with ether, naptha, and water, with similar results ; but in the case of water it was necessary to add a little sodic carbonate to prevent the water dissolving the glass. The*~~

~~*experiments have since been repeated by Faraday, and stil] more recently by Andrews. It was first noticed by Wolf (Ann. de Chimie, xlix. 230), afterwards by Drion (Ann. de Chimie, lvi. 221), who examined Wolf's results, experimenting with ether, and with ethylic chloride, and subsequently by Andrews, that the curvature of the surface of the liquid decreases as the tem- perature is raised, indicating a diminution in the surface tension, while the surface itself becomes less strongly marked, till it entirely loses its curvature, and then vanishes altogether, only a flickering hazy appearance being visible in different parts of the tube. The temperature at which the liquid and gaseous states merge into one another has been called by Andrews the critical point. Mendelcef calls it tlie absolute bowling-point. The temperatures and pres- sures corresponding to the critical points of some substances are given in the following table :—*~~

~~*Pressure in*~~

~~*Temperature. P atmospheres.*~~

~~*Carbonic bisulphide Water*~~

~~*According to Drion, the critical points of ether, ethylic chloride, and sulphurous anhydride are 190°'5 C., 184° C., and 157° C. respectively. Wolf experimented upon the diminution of the surface tension of ether, water, and other liquids in capillary tubes, and finding it diminish uniformly as the temperature increased between 0° C. and 100° C., he calculated the temperatures at which the surface tension would entirely vanish, and obtained 217° C. for ether and 537° C. for water.*~~

~~*Van der Waals (Over de Continuitect van den Clas- en Vioerstofloestand, vii.), by taking into account the mutual attraction of the molecules and the volume occupied by the molecules themselves, has arrived at an equation which represents in 2 somewhat rough manner the relation be- tween the volume, temperature, and pressure of a sub- stance. When the pressure and temperature are given, there are generally three roots representing the volume in the liquid, gaseous, and unstable states respectively. At the critical point these three roots become equal.*~~

~~*From the values of the volume and pressure of water and steam at 0°, 100°, and 200° C., as deduced by Rankine from the observations of Regnault, Clerk Maxwell has calculated that the critical temperature for water should be about 434° C., the critical pressure about 378 atmo- spheres, and the critical volume about 2°52 cubit centi- metres per gramme.*~~

~~*Dr Andrews has constructed an apparatus for the lique- faction of carbonic anhydride, in which the gas is contained in a thermometer tube whose lower portion is much wider than the upper part, and immersed in mercury contained in a test tube, which is placed in a copper cylinder filled with water, to which pressure is applied by inserting a steel screw. The lower end of the glass tube is open, and the upper part projects beyond the copper cylinder. If the*~~

~~*EVAPOR RDC*~~

~~*carbonic anhydride be heated beyond the critical point, pressure being applied so as to keep some of the substance liquid until the critical point is reached, and if the gas be then allowed to cool under this pressure, it will pass con- tinuously into the liquid state without any change in the nature of the contents of the tube being apparent. On relieving the pressure the liquid will boil.*~~

~~*By the simultaneous application of cold and pressure Faraday succeeded in reducing to the liquid state all known gases except hydrogen, oxygen, nitrogen, nitric oxide, carbonic oxide, and marsh gas, and in solidifying many of them. The cooling was effected by the evapora- tion in vacuo of solid carbonic anhydride dissolved in etlier, which produced a temperature of about — 110° C. ; and by this means carbonic anhydride, chlorine, nitrous oxide, ammonia, cyanogen, and some other gases were liquefied by cold alone at atmospheric pressure. Faraday was of opinion that — 110° C. is above the critical temperature of air, oxygen, hydrogen, nitrogen, carbonic oxide, and marsh gas. Andrews subsequently reduced air to x75 of its volume at ordinary pressure and temperature by means of pressure and the cold produced by the same freezing mixture as was employed by Faraday. HydrogEn was reduced to ~4, of its volume, oxygen to ~¢,, and nitric oxide to 445, but no liquefaction ensued.*~~

~~*Towards the close of 1877 Cailletet, at Chatillon-sur- Seine, compressed air and other so-called permanent gases in an apparatus very similar to that of Andrews, but provided with a means of suddenly relieving the pressure. The compressed gases were cooled to — 29° C., and the cold produced by the sudden expansion when the pressure was relieved was so intense that in each case a liquid spray was produced. About the same time Pictet, at Geneva, succeeded, not only in liquefying all the gases which had previously resisted liquefaction, but also in solidifying hydrogen, his method depending on the cold produced by expansion, as in Cailletet's experiment, but the compressed gases being cooled by him to a much lower temperature before expansion than was employed by Cailletet.*~~

~~*Some of the laws of evaporation admit of easy explana- tion, in accordance with the dynamical theory of the con- stitution of bodies. When a particle of liquid in the course of its wanderings reaches the bounding surface with more than a certain normal velocity, it is able to pass through the surface and get quite clear of the liquid, when it becomes a particle of gas or vapour. The number of particles passing through a square centimetre of the surface from the liquid will depend upon the velocity of the liquid particles, and therefore on the temperature of the liquid, but it will be entirely independent of the condition of affairs outside the liquid. Hence, the quantity of liquid which evaporates in a second will not depend upon the pressures of any gases or vapours above the liquid, but only on thetemperature. Whenever a particle of vapour moves towards the surface of the liquid and reaches it, it enters the liquid and is condensed. The quantity of vapour so condensed in a second will depend on the velocity of translation of the particles of vapour and the number of such particles in each cubic centimetre of the space above the liquid, but will not be sensibly affected by the presence of particles of other gases or vapours in the same space. As the density of the vapour increases, the number of particles which enter the liquid per second will increase proportionally, and at length will become equal to the number which leave it. When this is the case evaporation appears to cease; but it is not a cessation of evaporation which actually takes place, but an increase in the rate of condensation which produces a condition of*~~

~~*dynamical equilibrium. If there be a quantity of another gas above the surface of the liquid, its presence will hinder the diffu-*~~

~~*Ev bev eG*~~

~~*sion of the vapour just formed, thus causing the amount of vapour near the liquid to approach more nearly to the state of saturation than would otherwise be the case, and thus the rate of condensation will be increased and the apparent rate of evaporation diminished. Nevertheless, we must conclude that the amount of vapour ultimately contained in each cubic centimetre of the space above the liquid, when no further evaporation takes place, will be the same as if no other gas or vapour were present, if we do not consider the space actually occupied by the particles themselves, for the number of particles prevented from entering the liquid by reflection from the foreign gas or vapour, will be exactly equal to the number which after leaving the liquid are re- flected and caused to re-enter the liquid by the same means.*~~

~~*For further information on this subject the reader is re- ferred, among other articles, to Dirrusion, Heat, and MzrTEorooey. (w. G.)*~~

~~*EVE, the English transcription, through the Latin Zva and Greek Eva, of the Hebrew name 730 Havva, which, according to Gen. iii. 20, was given by Adam to his wife because she was "mother of all living." Taken literally, the word means /zfe, and in this sense it occurs in Pheeni- cian, though not in Hebrew, which uses as a common noun the slightly different form 10, So the Septuagint cor- rectly renders the word by Zoy. The rendering lifegiver (Symmachus, Zwoyédvos) is philologically less satisfactory, though still supported by Riehm.!*~~

~~*Iu the Old Testament Eve is mentioned only in the so- called Jehovistic narrative of Gen. ii—iv. In this narrative, which it is unnecessary to repeat, the original creation of woman is so set forth as to teach the ethical value and dignity of the relation of marriage, which, according to God's original ordinance, is not founded on sensual instincts, but corresponds to a necessity of that higher part of man's nature which raises him above the brute creation (Gen. ii. 18-20). The relation of the wife to her husband is one of dependence (comp. 1 Tim. ii. 13, but*~~

~~*especially 1 Cor. xi. 8, 9, which rightly interprets the significance of the creation of Eve from Adam's rib) but not of subjection. The woman is not the servant of her husband, but a "help meet for him "—more literally a help corresponding to him— without which he would be himself incomplete. And so marriage constitutes the closest human relationship, and establishes between husband and wife a union, or rather a unity, stronger than the ties of blood (Gen. ii, 24). On the other hand, the dominion of the husband over the wife characteristic of antique society is represented as a fruit of the fall (Gen. iii. 16), and connected with the predominance of sensual passion (desire) over the ethical attachment of the sexes. These ideas reappear more or less clearly in various parts of the Old Testament,—in the description of true love in Canticles, and in what is said of marriage in the Proverbs, especially in the doctrine, Prov. it. 17, that marriage is a "divine covenant." But there is no direct reference to the narrative of Genesis in the other canonical books of the Old Testament, though some interpreters seek an allusion to the creation of Adam and Eve in the obscure passage Mal ii. 15. In the apocryphal book of Tobit (viii. 6, 7) the pure relation of true marriage is illustrated by reference to Gen. ii.;2 but it is only in the New Testament that the original ideal of married life is authoritatively set forth by our Lord as the rule of a higher morality than that of Mosaism (Mat. xix.; Mark x.) The abrogation of*~~

~~*1 Other ancient etymologies, which have no scientific value but are in part connected with curious speculations, may be found in the Ono-mastiea (Ed. Lagarde, 1870) and in Fabricius, Codex Pseudep. V. T., p. 108. The recent conjecture of Kleinert, who connects the name with Arabic el hawdnt, the longest ribs, is philologically inadmissible.*~~

~~*2 Another reference to the creation of woman appears in the Latin text of Ecclesiasticus xvii. 5. but is lacking in the Greek.*~~

~~*133*~~

~~*the one-sided law of divorce, and the restoration of marriage to the ideal instituted before the fall, involve the abolition in Christian society of the antique subjection of woman (comp. Hosea ii. 16). The other parts of the history of Eve have less importance for biblical theology and ethics, and receive little more than casual notice in the New Testament (2 Cor. xi. 3; 1 Tim ii. 14, 15).*~~

~~*To this notice of the biblical materials on the subject niay be added a brief indication of the legendary additions to the narrative of Genesis, and some account of the way in which that narrative has been treated by theologians and scholars in different ages.*~~

~~*Legends.—The earliest source for the legendary history of Eve which remains to us is the book of Jubilees or Lepto- genesis, a Palestinian work, composed before the destruction of the temple by Titus (see ApocaLyptio LitERATURE). In this book, which was largely used by Christian writers, we find a chronology of the lives of Adam and Eve and the names of their daughters,—Avan and Azura.? The Targum of Jonathan informs us that Eve was created from the thirteenth rib of Adam's right side, thus taking the view, still soberly maintained by Delitzsch, that Adam had a rib more than his descendants. The Jewish Midrasli and the Talmud contain many other stories, always absurd and often disgusting, of which a sufficient account may be found in Bartolocci's Bzbliotheca Rabbinica, and Eisen-. menger's Hntdecktes Judenthum. 'The curious reader may also consult Breithaupt's Latin translation of Jarchi On the Pentateuch (Gotha, 1710), and Wagenseil's*~~

~~*Sota (pp. 637, 751). Some of the Jewish legends show clear marks of foreign influence. Thus the notion that the first man was a double being, afterwards separated into the two persons of Adam and Eve (Berachot, f. 61; Hrubin, f. 18), may be traced back to Philo (De mundi opif., § 53; comp. Qucest. in Gen., lib. i. § 25), who borrows the idea, and almost the words, of the myth related by Aristophanes in the Platonic Symposium, which, in extravagant form, explains the passion of love by the legend that male and female originally formed one body. This myth, which is treated with much respect by later Platonists, may have come from the Kast, but it is not Semitic. There is an analogous Eranian legend in the Bundehesh,' and an Indian legend, which, ac- cording to Spiegel, has presumably an Eranian source.®*~~

~~*Legendary developments of the history of Adam and Eve were not confined to the Jews, but were equally popular in the Christian church and among the heretical sects. The apocryphal literature of the subject is noticed in the article ApAaM; but a reference may here be added to the history of Adam and Eve published by Ceriani, Monwmenta sacra et profana, tom. v., Milan, 1868. Anidea of the contents of this literature may be derived from Reensch's Buch der Jubilien. See also Fabricius, Codex Pseudep. V. 7', p. 95 seq.*~~

~~*History of Interpretation.—The following remarks are supplementary to what has been already said in the article ADAM.*~~

~~*Minds trained under the influence of the Jewish Haggada, in which the whole biblical history is freely intermixed with legendary and parabolic matter, would not naturally formu- late the question how far the story of Gen. ii.—iv. is to be regarded as literal history? But that question necessarily arose when Jewish learning came into contact with Greek thought. Josephus, in the prologue to his Archwo-*~~

~~*3 These names underwent many transformations in the course of time. The various forms are carefully catalogued by Reensch, Buch der Jubilien, p. 873 (Leipsic, 1874). Jewish, Mahometan, and Chris- tian notions about the children of the Protoplasts are collected with his usual learning by Selden, De Jure Naturali, &c., lib. v. cap. 8.*~~

4 Spiegel, Zrdnische Alterthumskunde, vol. i. p. 511.

5 Muir's Sanscrit Texts, vol. i. p. 25.; ef. Spiegel, op. czt., vol. i. p.

458.

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logy, reserves the problem of the true meaning of the Mosaic narrative, but does not regard everything as strictly literal. Philo, the great representative of Alex- andrian allegory, expressly argues that in the nature of things the trees of life and knowledge cannot be taken otherwise than symbolically. HIs interpretation of the creation of Eve is, as has been already observed, plainly suggested by a Platonic myth. The longing for reunion which love implants in the divided halves of the original dual man is the source of sensual pleasure (symbolized by the serpent), which in turn is the beginning ofall transgres- sion. Eve represents the sensuous or pereeptive part of man's nature, Adam tlie reason. The serpent therefore does not venture to attack Adam direetly. It is sense which yields to pleasure, and in turn enslaves the reason and destroys its immortal virtue. This exposition, in which the elements of the Bible narrative become mere symbols of the abstract notions of Greek philosophy, and are adapted to Greek eoneeptions of the origin of evil in the material and sensuous part of man, was adopted into Christian theology by Clement and Origen, notwithstanding its obvious ineonsisteney with the Pauline anthropology, and the difficulty which its supporters felt in reeonciling it with the Christian doctrine of the excellenee of the married state (Clemens Alex., Stromata, p. 174). These diffieulties had more weight with the Western chureh, which, less devoted to speculative abstractions and more deeply influenced by the Pauline anthropology, refused, especially sinee Augustine, to reduee Paradise and the fall to the region of pure zntelligibilia; though a spiritual sense was admitted along with the literal (Aug., Cav. Ded, xiii. 21),}

The history of Adam and Eve became the basis of anthropological discussions which acquired more than speculative importanee from their connexion with the doctrine of original sin and the meaning of the sacrament of baptism. One or two points in Augustinian teaching

~~may be here mentioned as having to do particularly with |~~

~~Eve. The question whether the soul of Eve was derived from Adam or directly infused by the Creator is raised as an element in the great problem of traducianism and creationism (De Gen. ad lit. lib. x.). And it is from Augustine that Milton derives the idea that Adam sinned, uot from desire for the forbidden fruit, but because love forbade him to dissociate his fate from Eve's (¢bid., lib. xi. sub fin.). Medizeval discussion moved mainly in the lines laid down by Augustine. A sufficient sample of the way in which the subject was treated by the schoolmen may be found in the Summa of Thomas, pars i., qu. xcii., De pro- ductione mulveris.~~

~~The Reformers, always hostile to allegory, and in this matter especially influenced by the Augustinian anthro- pology, adhered strictly to the literal interpretation of the history of the Protoplasts, which has eontinued to be generally identified with Protestant orthodoxy. The dis-integration of the eonfessional doctrine of sin in last eentury was naturally associated with new theories of the meaning of the biblieal narrative ; but neither renewed forms of the allegorieal interpretation, in which everything is reduced to abstract ideas about reason and sensuality, nor the attempts of Eichhorn and others to extract a kernel of simple history by allowing largely for the influenee of poetical form in so early a narrative, have found lasting acceptance. On the other hand, the strict historical interpretation is beset with difficulties which modern interpreters have felt with increasing foree, and which there is a growing disposition to solve by adopting in one or other form what is ealled the~~

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~~J Thus in medieval theology Eve is a type of the church, and her formation from the rib has a mystic reason, inasmuch as blood and water (the sacraments of the church) flowed from the side of Christ on the cross (Thomas, Summa, par, i. qu. xcii,)~~

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~~"mythical" theory of the narrative. But interpretations pass under this now popular title which have no real claim to be so designated. What is~~

~~*common to the "mythical" interpretations is to find the real value of the narrative, not in the form of the story, but in the thoughts which it embodies. But the story cannot be called a myth in the strict sense of the word, unless we are prepared to place it on one line with the myths of heathenism, produced by the unconscious play of plastic fancy, giving shape to the impressions of natural phenomena on primitive observers. Such a theory does no justice to a narrative which embodies profound truths peculiar to the religion of revela- tion. Other forms of the so-called mythical interpretation are little more than abstract allegory in a new guise, ignoring the fact that the biblical story does not teach general truths which repeat themselves in every individual, but gives a view of the purpose of man's creation, and of the origin of sin, in connexion with the divine plan of re- demption. Among his other services in refutation of the unhistorical rationalism of last century, Kant has the merit of having forcibly recalled attention to the fact that the narrative of Genesis, even if we do not take it literally, must be regarded as presenting a view of the beginnings of the history of the human race (Muthmasslicher Anfang der Menschengeschichte, 1786). Those who recognize this fact ought not to call themselves or be called by others adherents of the mythical theory, although they also re- cognize that in the nature of things the divine truths brought out in the history of the creation and fall could not have been expressed either in the form of literal history or in the shape of abstract metaphysical doctrine ; or even although they may hold,—as is done by many who accept the narrative as a part of supernatural revelation,—that the specific biblical truths which the narrative conveys are presented through the vehicle of a story which, at least in some of its parts, may possibly be shaped by the influence of legends common to the Hebrews with their heathen neighbours. It must, however, be remembered that speculation as to the affinities of Genesis with other and especially Babylonian legends has of late far outrun the bounds of scientific method; and this caution has a special application to the supposed Babylonian history of the fall. See Von Gutschmidt's Neue Beitrdge, p. 146 (Leipsic, 1876). (W. RS.)*~~

~~*EVELYN, Joun (1620-1706), the diarist and author of Sylva, was born at his father's seat at Wotton, in Surrey, on the 31st October 1620. He was the younger son of a country gentleman of large estate, and much*~~

~~*respeeted throughout the counties of Surrey and Sussex, of which he was high sheriff, one high sheriff at that time serving for both counties. Notwithstanding the wealth and position of his family, John Evelyn was eduoated at the free seliool of Lewes, where his maternal grandfather resided. While still at school, he was admitted into the Inner Temple ; and in the following month, at the age of sixteen, he entered Balliol College, Oxford, as a fellow-commoner. In July 1641, having lost his father during the previous year, he retired from England, which was then on the eve of eivil war. Before proeeeding with his travels, he expressed his sympathy with the cause of the queen of Bohemia, which was dear to all Protestant Englishmen, by serving in her army for afew days, "' according to the compliment." The ten following years he spent abroad, only making brief visits to England.*~~

~~*It is with this period of travel that his famous Diary, which he had commeneed in iniitation of his father at eleven years of age, begins to be full and interesting, This diary is for many reasons of value to the student of history and manners. It comprises the long period, so rich in great events, between the outbreak of*~~

~~*EVE—EVE*~~

~~*the civil war and the accession of Anne. Written with no thought of publication, it embodies the frankest expression of its author's opinions, and affords much curious and interesting information which the historian would have probably passed over, but which throws a strong light upon the customs and feelings of the age. And Evelyn's statements are always worthy of at least a respectful hearing. In an age of fiercest political and ecclesiastical conflict, himself subject to strong tempta- tions to partisanship, he maintained throughout life the same calm temperance of judgment; and, amid general profligacy, the purity and integrity of his character remained unstained. The competence of his fortune and the moderation of his ambition rendered him politically independent. HIs attachment to monarchy did not blind him to the vices of kings. Though an earnest Protestant and a firm Episcopalian, he did no' allow himself to be carried away into the extravagant bigotry so common among his contemporaries ; he deprecated the persecution of the Protestant*~~

~~*dissenters, and though he wrote against the Jesuits, he refused to join in the mad hatred with which all who professed the Roman Catholic faith were popularly regarded.*~~

~~*In 1652 Evelyn returned home with his wife, the amiable and talented daughter of Sir Richard Browne, and settled at Sayes Court, the house afterwards famous as the residence of Peter the Great. Though well known to be a royalist, he was not molested, except on one oecasion, when he was arrested by a party of fanatic soldiers for observing Christmas Day, but, nothing else being proved against him, was at onee released. On the death of Cromwell, he published an Apology for the Royal Party, and tried in vain to persuade Colonel Morley to declare for Charles II. From the Restora- tion till his death in 1706 he enjoyed unbroken court favour. In the reign of James II., during the absence of the earl of Clarendon in Ireland, he acted as one of the commissioners of the Privy Seal, and honour- ably distinguished himself by refusing, at the risk of offending the king, to sigu an illegal licence of popish books. But, with this exception, he never accepted au office of political importance. His life, however, was filled with useful work. He was commissioner for improving the streets and buildings of London, for " charitable uses" (¢. ¢., for examining into the affairs of charitable institutions), and for taking care of the wounded who were brought home during the Dutch war, commissioner of the mint, commissioner of trade and plantations, &. His love of science led to his being chosen seeretary of the Royal Society, and he twice declined the presidency. It was through his influence that the Arundelian marbles and the library and MSS. of the earl of Arundel were presented to the university of Oxford, a service which the university recognized by conferring upon him the degree of D.C.L. His writings were exceedingly numerous. The best known were his Diary and Sylva, an elaborate treatise on arboriculture. Among the others may be mentioned Navigation and Commerce, their Original and Progreess, intended as an introduction toa history of the Dutch war, which he both commenced and laid aside at the command of Charles II.; @ Parallel of Ancient and Modern Architecture; Public Employment preferred to Solitude ; and The History of the Four Great Impostors. The first collection of Evelyn's miscellaneous writings, several of which had been published*~~

~~anonymously, ap- peared in 1825, printed in facsimile, and edited by W. Upcott.~~

~~EVEMERUS, or EUHEMERUS, a Greek mythographer, who flourished in the latter half of the 4th century B.c. The place of his birth is unknown, but most probably it~~

~~was either Messina in Sicily or Agrigentum. He is noted chiefly for his Sacred History (Iepa dvorypady), founded professedly on archaic inscriptions which he had collected during his travels in various parts of Greece, and more especially on those observed on the temple of Jupiter Triphylianus, in the island of Pancha. In this work he introduced a new method of interpreting the popular myths, asserting that the gods who formed the chief objects of popular worship had been originally heroes and con- querors, who had thus earned a claim to the veneration of their subjects. Till the end of the last century there were many who accepted this system of Evemerus, and the early Christians especially appealed to it as a confirmation of their belief that the ancient mythology was merely an agercgate of fables of human invention. Evemerus was a firm upholder of the Cyrenaic philosophy, and by many ancient writers he was regarded as an atheist. His work was translated by Ennius into Latin, but the work itself is lost, and of the translation only a few fragments, and these very short, have come down to us.~~

~~EVERDINGEN. Three painters of this name are recorded in the history of Dutch art,—all of them related; but one only deserves to be remembered.~~

~~ALLART von EvERDINGEN (1621-21675), the son of a Government clerk at Alkmaar, was born, it is said, in 1621, and educated, if we believe an old tradition, under Roeland Savery at Utrecht. He wandered in 1645 to Haarlem, where he studied under Peter de Molyn, and finally settled about 1657 at Amsterdam, where he re- mained till his death, It would be diffieult to find a greater contrast than that which is presented by the works of Savery and Everdingen. Savery inherited the gaudy style of the Breughels, which he carried into the 17th ecntury ; whilst Everdingen~~

realized the large and effcc- tive system of coloured and powerfully shaded land- scape which marks the preeursors of Rembrandt. It is not easy on this account to believe that Savery was Everdingen's master, while it is quite within the range of probability that he acquired the elements of landscape painting from De Molyn. Pieter de Molyn, by birth a Londoner, lived from 1624 till 1661 in Haarlem. He went periodically on visits to Norway, and his works, though scarce, exhibit a broad and sweeping mode of execution differing but slightly from that transferred at the opening of the 17th century from Jan van Goyen to Solomon Ruysdael. His etchings have nearly the breadth and effect of those of Everdingen. It is still an open question when De Molyn wielded influence on his clever disciple. Alkmaar, a busy trading place near the Texel, had little of the picturesque for an artist except polders and downs or waves and sky. Accordingly we find Allart at first a painter of coast scenery. But on one of his expeditions he is said to have been cast ashore in Norway, and during the repairs of his ship he visited the inland valleys, and thus gave a new course to his art. In early pieces he cleverly represents the sea in motion under varied, but mostly clouded, aspeets of sky. Their general intonation is stroug and brown, and effects are rendered in a powerful key, but the execution is much more uniform than that of Jacob Ruysdael. A dark scud lowering on a rolling sea near the walls of Flushing characterizes Everdingen's Mouth of the Schelde in the Hermitage at St Petersburg. Storm is the marked feature of sea-pieces in the Stedel or Robartes collections ; and a strand with wreckers at the foot ofa cliff in the Munich Pinakothek may be a reminiscence of personal adventure in Norway. But the Norwegian coast was studied in calms as well as in gales; and a fine canvas belonging to Professor Piloty at Munich shows fishermen on a still and sunny day taking herrings to a-snioking hut at the foot of a Norwegian crag. The earliest of

Everdingen's sea pieces belongs to Mr Von Friesen at Dresden, and bears tlie date of 1640. After 1645 we meet with nothing but representations of inland scenery, and par- ticularly of Norwegian valleys, remarkable alike for wild- ness and a decisive depth of tone, 'Tlie master's favourite theme is a fall in a glen, with mournful fringes of pines in- terspersed with

~~*birch, and log huts at the base of rocks and craggy slopes. The water tumbles over the foreground, so as to entitle the painter to the name of " inventor of cas- cades." It gives Everdingen his character as a precursor of Jacob Ruysdael in a certain form of landscape composi- tion; but though very skilful in arrangement, and clever in effects, Everdingen remains much more simple in execn- tion; he is much less snbtle in feeling or varied in touch than his great and incomparable countryman. Five of Everdingen's cascades are in the museum of Copenhagen alone : of these, one is dated 1647, another 1649. In the Hermitage at Petersburg is a fine example of 1647; another in the Pinakothek at Munich was finished in 1656. English public galleries ignore Everdingen ; but one of his best-known masterpieces is the Norwegian glen belonging to Lord Listowel. Few Continental museums lack pictures by this master. Their value in the market is about a third to a half of those of Ruysdael ; but excepting the later and more neglected pieces, they are all clever and generally attractive. At Amsterdam, we may think, Everdingen chiefly produced etchings and drawings, of which there are much larger and more numerous specimens in England than elsewhere. Being a collector as well as an engraver and painter, he brought together a large number of works of all kinds and masters ; and the sale of these by his heirs at Amsterdam on the 11th of March 1676 gives an approxi- mate clue to the date of the painter's death.*~~

~~*EVEREST, Sir Georee (1790-1866), C.B., a distin- guished surveyor and geographer, was the son of Tristram Everest of Gwerndale, Breckuockshire, and was born there July 4, 1790. From school at Marlow he proceeded to the military academy at Woolwich, where he attracted the special notice of the mathematical master, Dr Hutton, and passed so well in his examinations that he was declared fit for a commission before attaining the necessary age. Hav- ing gone to India in 1806 as a cadet in the Bengal Artillery, lie was selected by Sir Stamford Raffles to take part in the reconnaissance of Java (1814-1816) ; and after being em- ployed in various engineering works throughout India, he was appointed in 1818 assistant to Colouel Lambton, tlie founder of the great trigonometrical survey of that country. In 1823, on Colonel Lambton's death, he succeeded to the post of superintendent of the survey; in 1830 he was appointed by tle court of directors of the East India Company surveyor-*~~

~~*general of India; and from that date till his retiremeut from the service in 1843 he continued to discharge the laborious duties of both offices. During the rest of his life he resided in England, where he became fellow of the Royal Society and an active member of several other scientific associations. In 1861 he received the honour of knighthood, and he was chosen vice-president of the Royal Geographical Society in 1862. He died at Greenwich, December 1, 1866. The geodetical labours of Sir George Everest rank among the finest' achievements of their kind; and more especially his measurement of the meridional are of India, 114° in length, is accounted as un- rivalled in the annals of the science. In great part the Indian survey is what he made it. The name of Everest has been given in his honour to the highest ascertained peak of the Himalayas, and thus of the world.*~~

~~*His works are purely professional:—A paper in vol. i. of the Memoirs of the Royal Astronomical Societ , pointing out a mistake in La Caille's measurement of an are of the meridian which he had discovered during sick-leave at the Cape of Good Hope; An*~~

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~~*account of the measurement of the arc of the meridian between the parallels of 18° 3' and 24° 7', being a continuation of the Grand Meridional Are of India, as detailed by Lieut.-Col. Lambton in the volumes of the Asiatie Society of Calcutta, London, 1830; An account of the measurement of two seetions of the Meridional Are of India bounded by the parallels of 18° 8' 15", 24° 7' 11", and 20° 30' 48", London, 1847. .*~~

~~*EVERETT, Avexanper Hixxy (1792-1847), an Ameri- can author and diplomatist, born at Boston, March 19, 1792, was the son of Rev. Oliver Everett, for some time a Congregational minister in Boston, and afterwards judge of probate for Norfolk County. He graduated at Harvard College, Cambridge, in 1806, taking the highest honours of his year, though the youngest member of his class. He spent one year as a teacher in Philip's Academy, Exeter, and then began the study of law in the office of John Quincy Adams, afterwards president of the United States. In 1809 Adanis was appointed minister to Russia, and Everett accompanied him as his private secretary, remain- ing attached to the American legation in*~~

~~*Russia until 1811. HIs assiduity in the diplomatic career resulted in his promotion successively to the position of secretary of legation and afterwards of chargé d'affaires at the HaguC. HIe was subsequently minister to Spain, under the presi- dency of JobN Quincy Adams. At that time Spain recognized none of the Governments established by her revolted colonies, and Everett became the medium of all communications between the Spanish Government and the several nations of Spanish origin which had been established, by successful revolutions, on the other side of the ocean, HIe died, May 29, 1847, at HIong Kong, whither he had been sent as commissioner of the United States, before the present system of diplomatic intercourse with China was inaugurated.*~~

~~*Everett was not, however, so distinctly a diplomat as a man of letters, HIs long residence in Europe, and his intimate acquaintance with the French, German, Italian, aud Spanish languages, resulted in wide and accurate acquaintance with the literature of the Continental states. HIe studied their political system at the samie time, and in industrious and constant authorship published the results of his observations on social systems and literature. HIs co-operation was relied upon by the founders of the Worth American Ieview, the earliest American quarterly, and he was editor of that journal from the year 1829 to October 1835. In 1822 he published in London and in Boston A General Survey of Europe, which discusses the Conti- nental system and the balance of power as they were adjusted after the fall of Napoleon. It attracted general attention, and was translated into German, French, and Spanish. In 1825 he published in London and Boston America, a soinewhat similar description of the nations of North and South America, This book also was translated into the principal European languages. In 1822 he published New Ideas of Population, suggested by Malthus's works, and replying to that author by a wider exposition than Malthus gave to the possibility of general and easy emigration. Some of his literary papers from the North American Review and the Democratic Review, and a volume of poems, have been published in Boston. No American writer of his time was better known on the continent of Europe.*~~

~~*EVERETT, Epwarp (1794-1865), brother of the pre- ceding, was born in Dorchester, near Boston, on the 11th November 1794. HIs father died in*~~

~~*lis childhood, and his mother removed to Boston with her family after her husband's death. When he was little more than thirteen he entered Harvard College; and as the fnll under- graduate course is four years, he became " bachelor of arts" at seventeen. He then took the first college honours of his class. While at college he was the chief editor of Z'he*~~

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~~*Lyceum, the earliest in the series of college journals pub- lished at the American Cambridge. His verses and his prose essays then show some of the facility and grace which appear in his later writings, and much of the humour which in later times he was always trying to repress. His earlier predilections were for the study of law, but the advice of Joseph Stevens Buckminster, a distinguished preacher in Boston, led him to prepare for the pulpit, and in this calling he at once distinguished himself. He was called to the ministry of one of the largest Boston churches before he was twenty years old. His sermons and his theological writings attracted wide attention in that com- munity. But his tastes were then, as always, those of a scholar ; and in 1814, after a service of little morc than a year in the pulpit, he resigned his charge to accept a pro- fessorship of Greek literature in Harvard College. After nearly five years spent in Europe in preparation, he entered with alacrity on his duties, and, for five years more, gave a vigorous impulse, not simply to the study of Greek, but to all the work of the college. About the same time he assumed the charge of the North American Review, which now became a quarterly; and he was indefatigable in con-*~~

~~*tributing on a great variety of subjects, with a spirit like'*~~

~~*Sydney Smith's in the earlier days of the Hdinburgh Renew. He vigorously defended American institutions against the sneers of English travellers, and had reason to congratulate himself on the success of a series of articles written to bring about a better mutual understanding between Englishmen and Americans. The success of his lectures in Cambridge, and the enthusiasm aroused by tke rebellion in Greece, led him to deliver a series of popular lectures on Greek antiquities in Boston. They were the first lectures on purely literary or historical subjects ever delivered in America, and were the first steps toward a system of popular*~~

~~*entertainment and education which now has very wide sweep in the United States. HIe was eagerly engaged in the measures taken in the United States for the relief of Greece in her struggle.*~~

~~*In 1824 he was chosen a member of Congress, and held a seat for ten years, supporting generally the administration of Adams, and in opposition to that of Jackson, which succeeded it. As a member of the house of representatives lhe appears to have devoted himself mainly to the discharge of that part of the public business which devolved upon him. HIe took the floor less frequently taan might perhaps have been expected from a person accustomed to public speaking, and able to command the ear ef the house. It will be found, however, on looking back to the transac- tious of the ten years' sessions during which he was a member, that he bore a part in almost every important debate. HIe was on the committee of foreign affairs during the whole time of his service in Congress. Of all the most*~~

~~*important select committees, such as those on the Indian*~~

~~*relations of the State of Georgia, the Apportionment Pill, and the Bank of the United States, Everett was a member, and drew the report either of the majority or the minority. The report on the congress of Panama, the leading measure of the first session of the nineteenth Congress, was drawn by Everett, although the youngest member of the com- mittee, and just entered Congress. HIe led the opposition to the Indian policy of General Jackson (the removal of the Indians, without their consent, from lands guaranteed to them by treaty). In the winter of 1835 he was nomi- nated as governor of Massachusetts, and was chosen in the autumn of the same year. HIe brought to the duties of the office the untiring diligence which is the characteristic of his public life. We can only allude to a few of the mea- sures which received his efficient support,—e.g., the estab- lishment of the board of education, the first of such boards in the United States, the scientific surveys of the State,*~~

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~~*the first of such public surveys, the criminal law commis- sion, and the preservation of a sound currency under the panic of 1837.*~~

~~*Everett filled the office of governor for four years. The political parties in Massachusetts were at this time very uearly balanced, and divisions of opinion on local questions .(the militia and temperance laws) caused his defeat at the election in November 1839. Judge Morton, the opposing candidate, succeeded by a single vote, out of more than a hundred thousand. Everett availed him- self of this opportunity, the following spring, to make a visit with his family to Europe. In 1841, while residing in Florence, he was named United States minister to England, and arrived in London to enter upon the duties of his mission at the close of that year. Great questions were at that time open between the two countries,—the north-eastern boundary, the affair of M'Leod, the seizure of American vessels on the coast of Africa, in the course of a few montlis the affair of the "Creole," to which were soon added Oregon and Texas. His position was more difficult by the frequent changes that took place in the department at home, which, in the course of two years, was occupied successively by Messrs Webster, Legaré, Upshur, Calhoun, and Buchanan. From all these gentle- men Everett received marks of approbation and confi- dence.*~~

~~*By the institution of the special mission of Lord Ashbur- ton, the direct negotiations between the two Governments were, about the time of Everett's arrival in London, trans- ferred to Washington. It appears, however, from docu- ments that have from time to time been communicated to Congress, that various topics connected with all the sub- jects in dispute were incidentally treated in the correspon- dence of the American minister at London both with his own and the British Government. Many elaborate notes to Lord Aberdeen and despatches to the American secretary cf state have in this way come before the public, forming, however, it is believed, but a small part of the documents of both classes prepared by Everett during his mission. It appears, indeed, that, from the concurrence of a variety of causes, the amount of business transacted at the American legation from 1841 to 1845 was more than double that of any former period of equal duration.*~~

~~*Immediately after the accession of Polk to the presidency Everett was recalled. Shortly before lis return the presi- dency of Harvard College was vacated by the resignation of Hon. Josiah Quincy, and Everett was*~~

~~*strongly urged by the friends ard governors of the institution to accept this office, which he did in the month of January 1846. HIe filled this place of equal distinction and usefulness for about three years. It was a position congenial with his tastes, in harmony with the early associations of his life, and one which seemed to premise large opportunity of applying for the benefit of the rising generation the fruit of his maturer studies and varied experience in life. HIus health unfortu- nately soon began to suffer, and before long became seriously impaircd under tle burdens and cares of the office, and he was compelled at the close of the year 1848 to tender his resignation. Relieved of this charge, he supposed that at last he was to enjoy literary or scholarly leisure, and was already preparing for a treatise on the law of nations, But, on the death of his friend Webster, to whom he had always been closely attached, and of whom he was always a confidential adviser, he was named by President Fillmore secretary of state, and he held that post for the remaining months of Fillmore's administration, leaving it to go into senate as the representative of Massachusetts. Under the work of the long session of 1853-54, in which that " Kansas-Nebraska " question first appeared in form which ripened into the American civil war, his health gave way*~~

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~~*HIe resigned his seat, on the orders of his physician, and retired to what was called private life.*~~

~~*But, as it proved, the remaining ten years of his life most widely established his reputation and influence throughout America. As early as 1820 he had established a reputa- tion, such as few men in later days have enjoyed, as an orator. HIe was frequently invited, as other public men are invited in America, to deliver an "oration" on one or another public topic of historical or other interest. With him these "orations," instead of being the ephemeral entertainments of an hour, became careful studies of some important theme, so that the collected edition of them is now one of the standard books of reference in an American's library. Eager to avert, if possible, the impending conflict of arms, Everett. prepared an "oration" on Washington, which he delivered in every part of America. In a printed*~~

~~*note accompanying the published edition of it, he names nearly one hundred and twenty-five occasions, in almost every State in the Union, in every section but the extreme south-west, where it was repeated. This exception was caused only by illness in his family, after he had received invitations to go to that quarter also. He travelled really as an ambassador of peace among irritated States. The eagerness to hear him was so great that, from the first, his hosts arranged, almost always, that tickets should be sold to all auditors; and as he travelled wholly at his own charges, the audiences thus contributed more than one hundred thousand dollars for the purchase of the old home of Washington at Mount Vernon, and the securing it as a shrine for American patriotism.*~~

~~*Everett's name, in direct violation to his wishes, was presented, with Mr Bell's, as a candidate of North and South jointly for vice-president in the election of 1860, when Abraham Lincoln was elected. The civil war followed. Reconciliation was impossible, and he gave all his learning, zeal, and eloquence, to the support of the national govern- ment. For four years he was the trusted adviser of every department ; he was called upon in every quarter to speak at public meetings. He delivered the last of his great ora- tions at Gettysburg, after the battle, on the consecration of the national cemetery there. In February of 1865 the suc- cess of the national arms, was certain. He had the pleasure of speaking at a public meeting in Boston to raise funds for the Southern poor in Savannah, just taken by General Sherman. At that meeting he caught cold, which was followed by sudden illness, and by his death January 15,*~~

~~*1865.*~~

~~*In Everett's life and career was a combination of the results of diligent: training, unflinching industry, delicate literary tastes, and unequalled acquaintance with modern politics. This combination made him in America an en- tirely exceptional person. He was never loved by the politi- cal managers ; he was always enthusiastically received by assemblies of the people. He would have said himself that the most' eager wish of his life had been for the higher edu- cation of his countrymen. His orations have been collected in four volumes. A work on public law, on which he was engaged at his death, was never finished. (E. E. H.)*~~

~~*(EVESHAM, a municipal and parliamentary borough and market town of Worcestershire, England, is situated in the vale of Evesham, 15 miles S.E. of Worcester, on the Mid- land and Great Western Railways, and on the river Avon, over which there is an ancient stone bridge of eight arches, connecting it with Bengeworth parish, which forms part of the borough. It is a well-built town, and its two main streets are wide and clean. The surrounding land is of great fertility, and is occupied chiefly as market gardens. The inhabitants of the town are mostly employed in the rearing of garden produce, but there are also manufactories for agricultural implements, and for gloves and hosiery.*~~

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~~*The principal buildings are the old town-hall, the churches of All-Saints, St Lawrence, and St Peter's, and the grammar school. Evesham is a place of considerable antiquity, a monastery having been founded there as early as the begin- ning of the 8thcentury. Of this building almost the only remnant is a magnificent tower, built not long before the Reformation. This tower, which is considered the best extant specimen in England of the Pointed ecclesiastical style of the 16th century, is 110 feet high and 28 feet square at the base. At Evesham was fought, on the 14th August 1265, the famous battle between Prince Edward, afterwards Edward I., and Simon de Montfort, earl of Leicester, in which the. latter was totally defeated, and he and his son slain. Previous to 1867 Evesham returned two members to parliament, but it now returns only one. The population in 1871 was 4888. .*~~

~~*EVIDENCE. It is necessary to distinguish two com- mon meanings of the word evidence which are not unfrequently confused. Evidence sometimes means the ascertained facts from which we infer the existence of some other fact or principle. It also means the testimony of persons as to the existence of facts, from which testimony we infer that these or other facts do or do not exist. It is the latter sense alone which is appropriate in speaking of judicial evidence, The rules of the law of evidence are based chiefly on considerations relating to human testimony. Their fundamental purpose is to guard and test the truth- fulness of statements as to matters of fact made in a court of justice. The further question, what conclusion*~~

~~*is to be drawn from the facts, supposing them to be true, is the subject of few if any specific rules. The general theory oz relevancy excludes testimony relating to facts from which no conclusion whatever could be drawn with reference to the facts in.issue. On the other hand, in the case of what is called " conclusive proof," the law directs that on certain evidence the judge must regard some fact as proved and reject any evidence offered against it. Between these two extremes the law leaves the relation between facts in evidence and facts in issue to the unaided logic or common sense of the tribunal.*~~

~~*The theory of relevancy above alluded to lies at the root of the law of evidence, and requires some preliminary explanation. The phrase is not one of common use in English text books, and nothing like a statement of the general principle is to be found in them. Roscoe, for instance (Digest of the Law of Evidence at Nisi Prius), simply states that, 'as the object of pleading is to reduce the matters in difference between the parties to distinct and simple issues, so the rules of evidence require that no proof, oral or documentary, shall be received that is not referrible to thoseissues. All evidence of matters which the*~~

~~*'courts judicially notice, or of matters immaterial, superflu-*~~

~~*ous, or irrelevant, is therefore excluded." And again, "Iu general, evidence of collateral facts, not pertinent to the issue, is not admissible." We are left to collect from the abundant wealth of decided cases what things are relevant and material, and what things are irrelevant and super- fluous. A statement of the general result of the cases will be found in Sir James F. Stephen's recently published Digest of the Law of Evidence. In the introduction to an edition of the Indian Evidence Act, by the same author, the theory of relevancy thus deduced from the decided cases is fully explained, and its connexion with the general laws of experimental inquiry pointed out.*~~

~~*1 Sir James Stephen's definition is— Evidence means—(l) all state- ments which the judge permits or requires to be made by witnesses in court in relation to matters of fact under inquiry; such statements are called oral evidence; and (2) all documents produced for the inspec- tion*~~

~~*of the Court or judge; such documents are called documentary evi- dence." —Digest of the Law of Lvidence,*~~

~~*EVIDENCE*~~

~~*The distinction sometimes drawn between direct and circumstantial evidence is of popular rather than legal interest. The fact in issue may be proved either by the testimony of persons who swear to it as a matter of per- sonal knowledge, or by the testimony of persons who swear to other facts from which the existence of the fact in issue is inferred. In the former case the evidence is said to be direct, in the latter circumstantial, The pro- bative force of these two sorts of evidence has been dif-*~~

~~*ferently estimated. On the one hand, it has been said*~~ |

~~*(and this we should think is the more popular view) that a conclusion arrived at merely from inference is not so trustworthy as the positive assertion of a sane and honest witness who testifies to what he has actually seen or heard. The explanation would seem to be that men have less confidence in their own powers of reasoning than in the assertions of others. It is hardly necessary to point out that'in both cases a process of inference is necessary— that we infer the existence of the fact from the fact that the witness swears to it, and that this inference like others is exposed to the chances of error. On the other hand, the numberless instances on which positive direct testi- mony as to matters of fact has been subsequently shown to be entirely false or erroneous, has led to the opposite opinion that circumstantial is more trustworthy than direct evidence. Apart from the possibility of deliberate falsehood in the witness, there is the chance of his having been utterly and unaccountably mistaken. Everybody can recall striking instances of this—especially in cases of per- sonal identity.1 Accordingly, it has been said, in the phrase of Paley, that "' circumstances cannot lie," or, as it was put "by Mr Justice Buller in Donnellan's case, "a pre- sumption which necessarily arises from circumstances is very often more convincing and more satisfactory than any other kind of evidence, because it is not within the reach and compass of human ability to invent a train of circum- stances which shall be so connected together as to amount to a proof of guilt without affording opportunities for con- tradicting' a great part, if not all*~~

those circumstances." The facts in eireumstantial evidence are, however, like the faets in direet evidence, to be taken subject to the possi- bility of mistake or falsehood on the person narrating them, aud the process of inference has its own peculiar dangers. The anno domint water-mark on writing paper has often been the instrument of convicting persons of forgery; but "it is beyond a doubt," says Mr Wills, 'and instanees of tle kind have recently occurred, that issues of paper have taken place bearing the water-mark of the year succeeding their distribution." Circumstantial evidence eorresponds to *'faets relevant to the issue," as defined in this article. The English law of evidence is perhaps the most perfect example we possess of what Bentham calls judge-made law. It is substantially the creation of successive genera- tions of judges in the courts of common law. It grew up as a thing of eustom and practice, and it is not so very long sinee different customs prevailed on different circuits. Thus, 'Lord Ellenborough, in one instanee quoted by Sir J. Stephen, spoke of the practices of the Northern and Western Cireuits as being different from that of the Oxford Circuit. It was made by judges for juries, and this fact no doubt serves to explain many of its peculiarities.

1 A very remarkable example is given by Mr Wills in his essay on The Rationale of Circumstantial Evidence. Sir Thomas Davenant, an eminent barrister, a gentleman of acute mind and strong understand- ing, swore positively to the persons of two men whom he charged with robbing him in the open daylight. But it was proved, on the most conclusive evidence, that the men on trial were at the time of the robbery at so remote a distance from where Sir Thomas was robbed that the thing was 1mpossible. The consequence was that the men were acquitted ; and some time afterwards the robbers were taken, and the articles stolen from Sir Thomas and his lady found upon them. _

Without adopting Bentham's opinion that these were deliberately intended to subserve the " sinister interests " of the lawyers, we may admit that they were founded largely on distrust of the eapacity of the tribunal to which the issues of fact belong. HIenee doubtless those number- less presumptions by which a eonclusion is imposed on the jury until positive

~~*evidence is offered to set it aside. Hence also that monstrous system of exclusions by which any person whose position was such as to make it in the least degree likely or possible that he would tell a false- hood, was withdrawn from the hearing of the jury. Only the most contemptuous disbelief in the sagacity of jury- men can account for the exclusion of the only witness cognizant of the transaction in question,..simply because he has a slight pecuniary interest in the result. It may be conjectured that if, trial by jury had not been the practice of the common law—if the judges had acquired the power of deciding issues of fact as well of law—many of the most obnoxious rules of evidence would never have existed.*~~

~~*The legislature has interfered mainly for the purpose of putting an end to these exclusions. Certainly the most important of the statutes dealing with the law of evidence are those which make classes of persons, formerly excluded, competent to testify. The source of this continuous reform is to be found in the treatise of Bentham, which, for the first time, examined the traditionary law by the light of practical utility. Starting with the fundamental principle that the great object in judicial evidence is the discovery of truth, he hunted down with mercileess rigour the artificial rules which closed out the surest sources of evidence. The success of his attack has been complete. In 1843 the exclusion of persons by reason of interest or crime was abolished (6 and 7 Vict. c, 85), but the incapacity of the parties to an action was allowed to remain. This in turn was abolished with certain exceptions by the 14 and 15 Vict. c. 99. By 32 and 33 Vict. c. 68, parties were allowed to give evidence in actions for breach of promise (subject to the requirement of corroboration), and husbands and wives in proceedings for adultery. The last Act of this sort was passed in 1877, and is a curious instance of the guarded way in which the legislature has approached this subject. It simply provides that, on the trial of any indictment or other proceeding for the non-repair of any public highway, bridge, or for a nuisance, or of any other indictment or proceeding instituted for the purpose of trying or enforcing a civil right only, every defendant to such indictment or proceeding, and the wife or hnsband of any such defendant, shall be admissible witnesses, and compellable to give evidence. Husband and wife are now excluded only in purely criminal cases, and in course of time no doubt that exclusion also will be brought to an end. Religious disabilities (enforced by the necessity of an*~~

~~oath) have also been gradually got rid of by successive enactments, the most important being the 24 and 25 Viet. c. 66, and 32 and 33 Viet. cc. 68. With these exceptions, the legislature has left the leading principles of the law untouched.~~

~~In attempting to give an outline of the law of evidence in this country we shall follow in the main the division adopted by Sir J. Stephen in his very useful Digest. English text books on the law of evidence owe their enormous bulk to the introduction of rules which properly belong to the substantive law, or to the rules of practice in the tribunals. — Confining ourselves to tho general principles of evidence, we shall notice shortly the following heads :—Ist, What facts may be proved in a court of law ; 2d, By what kind of evidence they must be proved; and, 3d, By whom, and in what manner, the evidence must be produced, . ;~~

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~~1. Sir J. Stephen states the general rule as follows :— " Evidence may be given in any action of the existence or non-existence of any fact in issue, and of any fact relevant to any fact in issue, and of no others." Relevant facts here means simply facts (other than those in issue) which may be proved, and would include cases of relevancy strictly so-called,—z.e., facts relevant in the sense that from their existence you may infer the existence of the facts in issue. There are minor classes of facts, not being facts in issue, and not being relevant facts in this sense, which nevertheless may be proved. For example, "facts which, though not in issue, are so connected with facts in issue as to form part of the same transaction," and "facts which are neces- sary to be known to explain or introduce a fact in issue," may be proved; but to say that they are relevant tends to obscure the theory of relevancy.*~~

~~What facts, then, are to be regarded as relevant to facts in issue? English law, as we have seen, makes no attempt to answer this question otherwise than by the enumeration of decided cases. The general definition of relevancy in Stephen's Digest is the following :—F'acts, whether in issue or not, are relevant to each other when one is, or probably may be, or probably may have been—the cause of the other, the effect of the other, an effect of the same cause, a cause of the same effect,—or when the one~~

~~*shows that the other must or cannot have occurred, or probably does or did exist, or that any fact does or did exist or not, which in the common course of events would either have caused or have been caused by the other.?*~~

~~*There is little doubt that this is a correct statement of the general principle embodied in the decided cases of the law of England. Facts may be proved from which legiti- mate inferences may be drawn as to the existence of the facts disputed at the trial, and this inference depends on the existence of a causal connexion between the two sets of facts. The theory of relevancy thus becomes, as Sir James Stephen (Indian Evidence Act) has pointed out, a particu- lar case of the general theory of induction; and the ques- tion whether facts are relevant to each other or not may become co- extensive with the entire field of human know- ledge. Bentham has pointed out, in his chapter on '" Real evidence, or evidence from things" (Rationale of Judicial Evidence, book v. c. 3), that*~~

~~*'*There is scarce an imaginable distinction or observation an indi- cation of which could, with reference to the subject of the present work, be charged with being altogether irrelevant ; for in one way or other, and even in each instance in various ways, there is not an imaginable fact the existence of which is not capable of being taken for the subject of inquiry in a court of judicature. If, therefore, the whole encyclopedia were to be crowded into the body of this work, and into this part of it in particular, there is not a page of it that would, strictly speaking, be irrelevant with regard to the subject of this work."*~~

~~*It is perhaps hardly necessary to give instances in illus- tration of the general definition of things relevant. The conduct of a person charged with an offence is one of the most common and the most obvious cases. Thus, "any fact which supplies a motive for such an act, or which con- stitutes preparation for it, any subsequent conduct of such person which appears to have been influenced by any such act, and any act done in consequence of any such act by or by the authority of that person," may obviously lead to inferences as to the act itself. One of Sir James Stephen's illustrations may be cited :— hee ae*~~

~~_ | Ina later edition of the Digest, the phrase "deenied to be relevant" is substituted for "relevant."~~

- ~~This definition is borrowed from a pamphict on the Theory of relevancy for purposes af judicial evidence, by George Clifford i Bombay, 1875. Mr Whitworth examines the case of~~

~~uller, tried at the Old Bailey in 1864, and shows how the items of~~

~~ia é ea fall under one or other of the above heads of~~

~~EVIDENCE~~

~~'¢The question is whether A wrote an anonymous letter threaten- ing B, and requiring B to meet the writer at a certain time and place to satisfy his demands. The fact that A met B at that time and place is relevant, as conduct subsequent to and affected by a fact in issue (an effect of that cause). The fact that A had a reason unconnected with his letter is relevant as rebutting the inference suggested by his presence (the effect of another cause.)"~~

~~The limit of relevancy is sometimes expressed by the saying that collateral facts are not admissible in evidence unless pertinent to the issue, but, as usual, we are left to collect the meaning of collateral from the decided cases. The typical case is perhaps that of Holcombe v. Hewson (2 Campbell, 391), where, on a question whether the beer sup- plied by plaintiff to defendant was good, the plaintiff was not allowed to prove that the beer he supplied to his other cus- tomers was good. In Phillips On Evidence it is stated that an admission by a prisoner that he had committed a similar offence at another time ought not to be received in evi- dence. To an enumeration of such cases Roscoe (Hvidence at Nisi Prius, p. 89) adds generally that all proof of facts which merely tends to create an unjust prejudice, or unduly to influence the jury, or occupy the time of the court in irrelevant inquiries, is inadmissible; but if the proof be directly or indirectly pertinent to the issue, it will be admitted ;—which seems to come to this, that mere simi- larity in circumstances or coincidence in time will not make one fact relevant to another unless some causal connexion between them is made apparent. Thus, in the beer~~

~~*case above mentioned, the evidence might have been made relevant by showing that the beer supplied to all the custo- mers was the same. Sir James Stephen's Digest contains several headings of exceptions to the rule excluding colla- teral evidence, but they will be found, we think, to be all cases of the general rule of relevancy. Some bond of con- nexion, as cause and effect, will be found to have been established between them. Thus, when the intention of an act is in question (as in the case of a man accused of setting fire to his house in order to get insurance money), other instances of similar acts (as that the prisoner had previously had two houses burnt, each being insured, and the insurance having been paid) may be adduced.*~~

~~*But it must not be supposed that the law admits as evi- dence all facts which are, ina strictly logical sense, relevant. The most considerable and important exception is thet of hearsay evidence. Jn ordinary life we should regard a state- ment made to us at second hand not only as relevant to the fact it asserts, but as sufficient and satisfactory proof, if both of our informants are persons of creditable character and intelligence. In point of fact, the immense bulk of our knowledge and belief on all sorts of subjects is founded on hearsay evidence, many times more remote than in the case we have supposed. The general rule of law excludes all such evidence. ' The fact that a statement was made by a person not called as a witness is not regarded as relevant to the truth of the matter asserted thereby." The reason is sufficiently obvious. A deponent in court tells his story under securities for its truthfulness. HIe may be cross- examined. HIe may be punished for telling lies. But for these securities it would hardly be safe, considering the consequences attaching to every issue in a court of justice, to act upon any testimony whatever. These securities do not exist in the case of extra-judicial statements by persons not called before the court, and accordingly, as a general rule, no evidence can be offered regarding them. The ex- tent, and perhaps the apparent severity of the rule, may be illustrated by the case in which it was held that, in a ques- tion of the validity of a will, the declaration of one attesting witness, since deceased, that he forged it, cannot be offered in evidence.*~~

~~*This rule, however, has its exceptions, which are classified*~~

| in Stephen's Degest under the heads of "admissions or con-

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fessions ; statements by deceased declarant ; evidence given on a former occasion ; statements made under special cir- cumstances ; judgments of a court of justice." An admission is defined. to be a statement suggesting any inference as to facts unfavourable to the conclusion contended for by the person by whom or on whose behalf it is made, and may be given in general in evidence against him. In civil actions, statements of this sort, made without prejudice or on ex- press condition that they are nct to be used in evidence, may uot be admitted. An important class of admissions is that of confessions in criminal cases. A voluntary confes- sion may be used in evidence against a prisoner, but a con- fession caused by " any inducement, threat, or promise, proceeding from a person in authority," is not admissible. But a confession made under promise of secrecy, or in con- sequence of deception, may be used in evidence. Dying declarations, made in immediate prospect of death, are ad- missable in trials for the murder or manslaughter of the deceased. Declarations made in the ordinary course of business or duty by deceased persons are admitted as relevant to the matter to which they relate. Anda decla- ration by a deceased person is admissible "if he had peculiar means of knowing the matter stated, if he had no interest. to misrepresent, and if it was opposed to his pro- prietary interest."! Declarations relating to public rights or customs by competent persons may be used in evi- dence after their death. In pedigree cases, statements by deceased blood-relations, made before litigation, are to be admitted. The statutes 11 and 12 Vict. c. 42 and 30 and 31 Vict. c. 35 allow depositions of deveased witnesses to be used in certain criminal cases. In civil cases the evi- dence of a deceased witness may be used at a subsequent trial raising the same issues. Among the miscellaneous cases of admissible hearsay evideuce may be mentioned facts of a public nature recited in statutes and proclama- tions. entries in public records, and statements in maps, and plans, and accredited historical works. Judgments are conclusive proof of "the state of things which they effect," and as between parties of the facts actually in issue.

~~*Another instance of departure from the logical theory of relevancy is the evidence of opinion. The general rule, as enunciated by Stephen (Diyest, part i. c. 5), is 'that the fact that any person is of opinion that a fact in issue or relevant to the issue does or does not exist is not regarded as relevant to the existence of such fact." A distinction, which Sir J. Stephen does not notice, must*~~

~~*1 Jn the leading casc of Higham v. Ridgway, an entry in tke book of a deceased man-midwifc, stating the birth of a child on a certain day and the payment of his fee for attendance, was admitted in evidence to prove the birth on that day. The acknowledgment of payment was held to be "against the declarant's interest,' and rendered the whole statement admissible. The distinctions made by judges in cases of declarations by persons deceased run very fine. A declaration made by a person in the course of his business or duty will not let in any- thing but the statement it was his duty to make. Thus a declaration by a deceased sheriff's officer as to the time and place of an arrest effected by him was admitted so far only as the time was concerned, because it was not his official duty to make a note of the place. If, however, the statement had contained such a note as "received for the same five shillings" (which would be a statement against interest), the evidence as to place would have been admitted. Again, in the Sussex Peerage case, it was held that a declaration made by a clergy- man that he had performed a marriage under circumstances which would make him liable to pecuniary penaltics was held not to be a "statement against interest" within the meaning of the rule. On the other hand, a statement made by a tenant that he paid rent for his house was held to be admissible as against interest, becaose it rebutted the presumption founded on the fact of possession that if belonged to him in fee simple. The tendency of judicial decisions since the principal case (Higham v. Ridgway) has been to limit the operation of the rule. Ina recent case, however (Leyden v. Lord St Leonards), the judges expressed an opinion that the best rule would be to admit all declarations made by deceased persons, where they had peculiar means of knowing the fact testified, and had no interest to misrepre seut it,*~~

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~~*be drawn between two senses in which the word opinion may be used. In common parlance, the belief of a scientific witness on some technical point, aud the belief of an ordinary witness as to some fact perceived by himself, would witli equal propriety be described as opinion. And it would not be difficult to show that psychologically they are the same thing. The opinion in each case is the result of a process of reasoning. In each case one reasons from a number of facts toa conclusion, The belief of a witness in a question of personal identity is based on a number of facts as to which he has no doubt, e.g., the size, the build, the gait, the clothes of the person in question. The law, however, draws a broad distinction between this kind of inference and the open and deliberate inference as to matters not directly perceived by the senses. It dis- tinguishes between facts and inferences, holding in dis- regard of psychology that the former are directly perceived ; but it does not insist upon absolute certainty in the per- ception. A witness may " believe" or "think" or "be of opinion" that he saw A. on a given day, or he may say positively that he did see him. The strength of his per- suasion will be considered by the tribunal, but his evidence will not be rejected because lis persuasion is weak. Or, as Mr Taylor puts it, 'the law does not require him to speak with such expression of certainty as to exclude all doubt." By opinion then is meant not merely a lower degree of persuasion, a more feeble belief, but a belief held as the result of inference and not of direct perception. There is nothing in the feebleness with which a witness's belief in the existence of a fact is expressed or held to make it irrelevant. But asa general rule, opinion in the other sense is not adnuissible in evidence at all. It is the business of the tribunal of the jury to form such opinions for them- selves. Indeed, the exclusion of opinion in evidence is put on this very ground in some of the decided cases. Thus, in an insurance case, a new trial was granted because the opinion of a witness had been admitted as to whether the communication of particular facts would have varied the terms of the policy—the court holding that this was a question for the jury alone. But the general rule has its exceptions, which may almost all be included "in the opinion of experts." In matters of science and skill requiring special study and education, the opinion of persons so qualified (experts) may be given in evidence. The law of a foreign country, and the examination of hand-writing, are amoug such matters. But an expert cannot give an opinion as to the existence of the facts on which his opinion is based,*~~

~~*although of course he may testify to them if he has perceived them himself. In thus excluding opinion on all but technical subjects, the law is stricter than the logic of ordinary life. The opinion of others tells for something in the formation of our own opinions, and no doubt ought to tell for something. This, however, is not the place for an examination of the influence of authority in matters of reasoning. It is sufficient to point out that in law it is reduced to a minimum.*~~

~~*2. HOw facts that may be given in evidence are to be proved.—First of all we must set aside a considerable class of facts which need not be proved, because they are already supposed to be known to the court. The judge takes "judicial notice" of them. These are for the most part facts relating to the constitution, including, of course, the entire body of law administered in all the courts of the country, from whatever source it may be derived. The courts will also take judicial notice of the accession and sign manual of the queen and her successors, of thie existence and title of every state and sovereign recognized by her Majesty, of the names, titles, functions, signatures, &c., of the judges of the supreme court, of the great seal, privy seal, seals of the courts of justice, and of certain*~~

~~*corporations, ¢.g., of London, of the universities, also of the beginning and termination of war, and the articles of war, the extent of her majesty's dominions, the divisions of time, the meauing of English words, &c. (see Stephen's Digest, pt. ii. c. 7.) And, of course, facts which have been admitted for the purposes of the trial by the parties or their agents need not be proved. All other facts must be proved, either by oral or documentary evidence. Oral evidence is the testimony of a witness delivered before the court as to what he has himself actually seen or heard. All facts may be proved by oral evidence, except in some special cases where the law requires documentary evidence. A "document," in this sense, extends to any record, whether expressed in writing or symbols, aud no inatter what may be the nature of the substance on which it is recorded. A gold watch with an inscription on it, ora tombstone, is a document.*~~

~~*The most important rule in this branch of the subject is that which requires the contents of a document to be proved by the document itself. The law requires the " best evidence " procnrable in cach case, and if a document is in existence it is better evidence than any second-hand account of its contents. This is called primary evidence. But secondary evidence, either by means of written copies or oral accounts, is to be admitted in certain cases. If it is proved that the instrument has been lost or destroyed, or that it is in the hands of the opposite party, who, after notice, has refused to produce it, then "secondary" evidence of its contents may be given. So when the original is of such a nature that it cannot be easily moved (as, ¢.g., a libel written on a wall), secondary evidence may be given. Secondary evidence includes (besides oral accounts by persons who have seen the original)—(1) examined copies, exemplifications, office copies, and certi- fied copies; (2) other copies made from the original and proved to be correct; (3) counterparts of documents as against the parties who did not execute them (Stephen, Digest, part ii., c. 9). Public documents in general must be proved either by the production of the original or by the official copies in class (1) above. Stephen states the rule requiring documentary evidence in special cases as follows :—'" When any judgment of any court or any other judicial or official proceeding, or any contract or grant, or any other disposition of property, has been reduced to the form of a document or a series of documents, no evidence mav be given except the document itself, or secondary evidence" where such is admissible. The importance of this rule with reference to contracts will be at once apparent. When the contract has been reduced to writing, parole (or oral) evidence cannot be admitted to prove its contents. The writing itself, or secondary evidence, must be produced, and no variation of its terms can be proved by oral evidence. Thus, where goods were insured generally in ships from a particular port, and the ship in which they were shipped was lost, evidence could not be given that that particular ship was excepted from the policy. The mere fact that a memorandum was made, not intended to have effect as a contract, will not exclude oral evidence of the transaction. And certain facts, collateral to the contract, may be proved by oral evidence. , Thns fraud, or want of consideration, or any circumstances which would affect its validity, may be so proved.*~~

~~*Of course, in the interpretation of contracts containing doubtful, technical, or unintelligible expressions, or using common words in a non-natural sense, recourse must be had to oral evidence. Thus the expression a " bale of gambier," in a written contract, may be proved by verbal evidence to mean a compressed package weighing two cwt. And where the expression "ten thousand rabbits" ocenrred in a lease, evidence to show that a thousand, in relation to*~~

~~*rabbits, meant twelve hundred, was admitted. But when the document is utterly unmeaning (as where a legacy is left to), oral evidence cannot be resorted to for the purpose of supplying a meaning. Where more than one meaning is possible, reference may be to the surround- ing circumstances, or the fact to which the document was or may have been intended to refer. These rules, it need hardly be said, apply only. as between parties, and where the legal rights and obligations dependent on the instru- ment are in question.*~~

~~*Certain presumptions (7.¢., conclusions of fact adopted until they are disproved) relating to documents may be mentioned here. Thus a document is presumed to have been executed on the day on which it bears date. Again, where a document is not produced after due notice, it is presumed to have been duly stamped. And it is a most important presumption with reference to documents pur- porting and proved to be thirty years old, and produced from what appears to be the proper custody, that the signatures, execution, and attestation are as they purport to be. Or, as it is sometimes expressed, " when a deed is thirty years old, it proves itself." Alterations and interlineations in a deed are presumed to have been made before execution; in a will they are presumed to have been made afterwards. The nature of such presumptions is explained below.*~~

~~*One more rule with regard to documentary evidence may be added. When the law requires an instrument to be attested (e.g. a will), it cannot be used in evidence unless one attesting witness is called to prove its execution, if there be an attesting witness alive and capable of giving evidence. If there be no such witness, the signature of at least one*~~

~~attesting witness, and of the person executing the deed, must be proved to be in their respective hand- writings. This rule was said by Lord Ellenborough to be as "fixed, formal, and universal as any that can be stated in a court of justice." It formerly extended to all docu- ments actually attested, not merely to those required to be attested by law.~~

~~3. Burden of proof, competency of witnesses, d&c.—The general rule is that the burden of proof lies on the person who asserts the affirmative, or, as it is more accurately ex- pressed by Sir J. Stephen, " whoever desires any court to give judgment, as to any legal right or liability dependent on the existence or non-existence of facts which he asserts or denies to exist, must prove that these facts do or do not exist." And the burden of proof, and the right of begin- ning in anaction, lie on the party against whom judgment would be given if no evidence at all were offered in the case, Again, the effect of a presumption (presumptio facti, as distinguished from preswmptio juris or conclusive proof) is to throw the burden of proof on the party who denies it as a matter of fact. And here it may be convenient to say a word or two with reference to presumptions, Writers on the law of evidence generally distinguish between presump- tions of law and presumptions of fact—the latter being, the former not being, rebuttable by counter-evidence. 'The subject occupies a considerable space in most books on evi- dence. Sir J. Stephen regards it as falling properly under specific divisions of the substantive law. Thus the pre- sumption that everybody knows the law he regards as be- longing to the criminal law and not to the law of evidence. Presumptions of this sort (preswmptiones juris et de jure) are an indirect way of expressingsome legal principle. In the~~

~~| last case the rule is that ignorance of the law is no excuse~~

~~for an illegal act, and the so-called presumption looks like an artificial and characteristic reason invented for its ex- planation. Presumptions of fact, z.¢., conclusions which ou certain evidence must be adopted by the court until and unless they are disproved by counter-evidence, are cases in which the task of inference is taken out of the hands of~~

~~EVIDENCE~~

~~*the jury altogether. They are strongly objected to by Bentham (Lationale of Judicial Lvidence, Introduction, c, 22) ou this very ground. 'On trial for a criminal offence, amongst others murder, in this and that case the law pre- sumes malice. Of the presumption in this case, what is the plain English? That fearing that by a jury the man would be acquitted, the determination of the judge is that he shall be convicted." If the presumption, however, is the safest conclusion to act on in the circumstances, there would seem to be no harm in saving the jury the trouble of drawing the inference for themselves.*~~

~~*Besides these two classes of presumptions, and along with them, legal writers often discuss the presumptions which are said to be within the province of the jury itself. These are neither more nor less than various degrees of probability, in cases of circumstantial evidence ; thus the leading text book on criminal practice (Archbold), following Coke and Blackstone, states that these presumptions are of tliree kinds—violent, probable, and light or rash. A case of violent presumption, generally given as an illustration, is where a person is found in a house run through the body, and a man is seen running away with a drawn sword in his hand, no other person being found about the premises. The conclusion that this man is the murderer is irresisti- ble. The other cases are simply inferior degrees of proba- bility established by circumstantial evidence, the lowest degree being described as such that it ought to have no weight with us atall, The distinctions are of no value, and are probably retained in text books because they are described by the same name as the two classes of legal pre- sumptions above described—those, namely, which Sir J. Stephen distinguishes as " conclusive proof " and " pre- sumption" respectively.*~~

~~*Presumptions of the second class abound in every branch of the law, and are to be explained with reference to its peculiar principles. Of the more general presumptions a. number of examples have been collected in Stephen's Digest, part iii. c. 14. One of the most common is the pre- sumption of death after seven years' absence which has been a good deal debated in the courts, but may now be considered to besettled. A person who has not been heard of for seven years is presumed to be dead, unless the circumstances are such as to account for his absence otherwise. But*~~

there is no presumption as to his having been dead at any particular time, ¢.g., if a person was last heard of in 1860, the court in 1870 presumes that he is dead, but not that he was dead in 1867. The question of survivorship, where two or more persons are shown to have perished by the same catas- trophe, as in cases of shipwreck, has been much discussed. Tt was at onetime thought that there might be a presump- tion of survivorship in favour of the younger as against the older, of the male as against the female, &c. But it is uow clear that there is no such presumption. Another common case is the presumption of legitimacy in favour of persons born during the continuance of lawful wedlock. The presumption of regularity in official proceedings (oma esse rite acta) is also one of Irequent occurrence.

The effect of presumptions may be compared with that of estoppel. The former establishes against a party a conclusion which stands unless and until he positively disproves it. By estoppel a party is prevented from dis- proving a fact which he has actually or constructively asserted, Jor examples see article EsropPE..

With few exceptions all witnesses are now competent to testify in courts of justice. The following are the chicf exceptions :—(1) persons incapacitated by extreme youth, or mental disease; and (2) in criminal cases the wife or husband of a prisoner, except when the prosecution is for injury or violence to such wife or husband. The old rules of exclusion have been noticed supra.

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Certain classes of facts are protected from disclosure on various grounds. Thus, no person can be compelled to disclose communications made to him by his wife during marriage, and servants of the state cannot be compelled to give evidence in official matters without the consent of the head of the departraent to which they belong. But perhaps the most important case is that of communications between lawyer and client. The lawyer is not allowed to disclose such communications without the client's assent, nor can the client be compelled to disclose such communi- cations himself. The rule, however, will not extend to communications in furtherance of any crime or fraud. Medical men and clergymen have no

~~*such privilege. There is, however, a general consensus of opinion in favour of protecting confessions made by prisoners to their spiritual advisers; and judges have from time to time expressed their reluctance to compel disclosure in such cases. To this class also belongs the rule that no person can be compelled to answer a question tending to criminate himself, although the fact that the answer might expose him to a civil action will be no protection.*~~

~~*In some few cases the evidence of more than one witness is required. Thus, in trials for treason, there must be at least two witnesses testifying to the same act or to different acts of the same treason, except when the treason consists in an attempt on the life or person of the queen, So in perjury, one witness, unless corroborated by circumstances, will not be sutticient to convict the prisoner. In actions for breach of promise of marriage, in affiliation cases, and in prosecutions when the only witness is an accomplice, such corroboration is also necessary. Otherwise in the law of England the testimony of one witness is sufficient to prove any fact.*~~

~~*The general rule is that testimony must be given on oath, but an oath is binding if administered in any form which the witness declares to be binding. By recent enactments, however, a person objecting on grounds of religious belief to the taking of any oath may be permitted to make a solemn affirmation instead ; and any person who objects to take an oath, whether on religious grounds or not, or is objected to as incompetent to take an oath, may' " solemnly promise and declare." In all cases the punishment of per- jury attaches.*~~

~~*At the trial a witness is first of all examined by the party producing him (examination-in-chief); he is then cross- examined by the opposite party, and re-examined by his own party. The re-examination must refer to matters arising out of the cross-examination. There are certain questions which may be asked in cross-examination only. Thus, in the examination-in-chief, leading questions (i.e., questions suggesting their own answer) are not allowed; in cross-examination they are. So alsoin cross-examination a witness may be asked any question tending to test his accuracy or credibility, or to destroy his credit by in- juring his character,*~~

~~*and he must answer them, however disgraceful may be the imputation they convey. N*~~

~~*1 The unlimited licence of cross-examination to character is the one flagrant abuse of the existing law of evidence; and but for the restraint imposed upon counsel, partly by public partly by professional opinion, would be a much more serious evil than it is. The illustration in Stephen's Digest is a notorious but perfectly fair example. "The question is whether A. committed perjury in swearing that he was R.T. B. depones that he made tattoo marks on the arm of R. T., which at the time of the trial were not and never had been on the arm of A. B. may be asked and compelled to answer the question, whether many years after the alleged tattooing, and many years before the occasion on which he was examined, he committed adultery with the wife of one of his friends.""* The Indian Evidence Act restricts the licence of eross-examination by the following provisions :—(1) Such questions are proper if they are of such a nature that the truth of the imputa- tion would seriously affect the opinion of the court as to the credi- bility of the witness on the matter to which he testifics; (2) Such*~~

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~~*evidence, however, can be led to contradict the answer in the latter case, unless it refer to a previous conviction, or to circumstances tending to throw doubt on the impar- tiality of the witness. A witness may in cross-examina- tion, and a witness proving hostile or adverse to the party calling him, may, in examination-in-chief, be asked whether he had not on a former occasion made statements inconsistent with his present statements. The credit of a witness may also be impeached by the other party calling witnesses to swear that they believe him to be unworthy of belief, and counter-evidence may be given in reply. The*~~

~~*questions are improper if the iniputation would not affect, or would affect in a slight degree, the opinion of the court as tothe credibility of the witness on the matter to which he testifies ; (3) Such questions are improper if there is a great disproportion between the importance of the imputation made against the witness's character and the importance of his evidence."*~~

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~~theory of the proceedings is that a witness will tell his story in the most favourable way for the party calling him and against his opponent.~~

~~The improper admission or rejection of evidence was formerly a frequent ground for applications for new trial ; under the Judicature Act a new trial will only be granted on such ground when some substantial wrong nas been occasioned thereby.~~

~~The following are the most important writers on the law of evidence :— John Pitt Taylor (two vols. 8vo, 6th edition, London, 1872) ; Henry Roscoe (Digest of the Law of Evidence on the trial of actions at Nist Prius,13th edition, by Dayand Powell, London, 1875); A. M. Best (On the Principles of the Law of Evidence, with elemen- tary rules for the interrogation of witnesses, 6th edition, London, 1875); Edmund Powell (Principles and Practice of the Law of Evi- dence, 4th edition, London, 1875) ; Sir J. F. Stephen (Digest of the Law of Evidence, London, 1877) ; 8. Greenleaf (On the Law of Evi- | dence, 8 vols. 18th edition, Boston, 1876). (HE. RB.)~~

~~EVOLUTION~~

~~J. Evoxturion 1n BioLocy.~~

~~N the former half of the 18th century, the term "'evolu- tion" was introduced into biological writings, in order to denote the mode in which some of the most eminent physiologists of that time conceived that the generation of living things took place; in opposition to the hypothesis advocated, in the preceding century, by Harvey in that remarkable work! which would give him a claim to rank among the founders of biological science, even had lhe not~~

~~been the discoverer of the circulation of the blood.~~

~~*One of Harvey's prime objects is to defend and establish, on the basis of direct observation, the opinion already held by Aristotle; that, in the higher animals at any rate, the formation of the new organism by the process of gene- ration takes place, not suddenly, by simultaneous accretion of rudiments of all or the most important of the organs of the adult; nor by sudden metamorphosis of a forma- tive substance into a miniature of the whole, which subse- quently grows; but by epigeness, or successive differentia- tion of a relatively homogeneous rudiment into the parts and structures which are characteristic of the adult.*~~

~~*'Et primd, quidem, quoaiam per epigenesin sive partium super- exorientium additamentum pulluin fabricari certum est: quenam pars ante alias omnes exstruatur, et quid de illa ejusque generandi modo observandum veniat, dispiciemus. Ratum sane est et in ovo manifesté apparet quod Aristoteles de perfectorum animalium genera- tione enuntiat : nimirum, non omnes partes simul fieri, sed ordine aliam post aliam ; primimque existere particulam genitalem, cujus virtute postea (tanquam ex principio quodam) relique omnes partes prosiliant. Qualem in plantarum seminibus (fabis, puta, aut glandibus) gemmam sive apicem protuberantem cernimus, totius future arboris principium. Lstque hee particula velut filius eman- etpatus seorsumgue collocatus, et prineipium per se vivens; unde postea membrorum ordo dcseribitur ; et quecunque ad absolvemdum animal pertinent, disponuntur.2 Quoniam enim nulla pars se tpsam generat ; sed postquam generata est, se ipsain jam auget ; ideo cam primum oriri necesse est, que principium augendi eontineat (sive enim planta, sive animal est, weque onvnribus inest quod vim habcat vegetandt, sive nutriendi),? simulque reliquas omnes partes suo quamque ordine distinguat et formet ; proindeque in eadem primo- genita partieula anima primario inest, sensus, motusque, et totius vite auetor et principium." (Hzereitatio 51.)*~~

~~*Harvey proceeds to contrast this view with that of the "Medici," or followers of Hippocrates and Galen, who, "badly philosophizing," imagined that the brain, the heart, and the liver were simultaneously first generated in the form of vesicles; and, at the same time, while expressing his agreement with Aristotle in the principle of epigenesis, he maintains*~~

~~*that it is the blood which is the primal genera- tive part, and not, as Aristotle thought, the heart.*~~

~~*1 The Ezercitationes de Generatione Animalium, which Dr George Ent extracted from him and published in 1651.*~~

~~*2 . * ° . on ; De Generatione Animalium, lib. ii. eap. x, Pe Generatione, lib. ii. cap. iv,*~~

~~*In the latter part of the 17th century, the doctrine of epigenesis thus advocated by Harvey was controverted on the ground of direct observation by Malpighi, who affirmed that the body of the chick is to be seen in the egg before the punctum sanguineum makes its appearance. But from this perfectly correct observation a conclusion which is by no means warranted was drawn ; namely, that the chick as a whole really exists in the egg antecedently to incubation ; and that what happens in the course of the latter process is no addition of new parts, "alias post alias natas," as Harvey puts it, but a simple expausion or unfolding of the organs which already exist, though they are too small and inconspicuous to be discovered. The weight of Malpighi's observations therefore fell into the scale of that doctrine which Harvey terms metamorphosis, in contradistinction to epigenesis.*~~

~~*The views of Malpighi were warmly welcomed on philo- sophical grounds by Leibnitz,4 who found in them a support to his hypothesis of monads, and by Malebranche ;> while, in the middle of the 18th century, not only specula- tive considerations, but a great number of new and interest- ing observations on the phenomena.of generation, led thie ingenious Bonnet, and Haller,® the first physiologist of the age, to adopt, advocate, and extend them.*~~

~~*Bonnet affirms that, before fecundation, the hen's egg*~~

~~*4' Cependant, pour revenir aux formes ordinaires op aux Ames matérielles, cette durée qu'il leur faut attribuer, a la place de celle qu'on avoit attribuée aux atomes pourroit faire douter si elles ne vont pas de corps en corps ; ce qui seroit la métempsychose, 4 peu prés comme quelques philosophes ont cru la transmission du mouvement et celle des*~~

~~espéces. Mais cette imagination est bien éloignée de la nature des choses. Il n'y a point de tel passage; et c'est ici ot les transfor- mations de Messieurs Swammerdam, Malpighi, et Leewenhoek, qui sont des plus excellens observateurs de notre tems, sont venues 4 mon secours, et m'ont fait admettre plus aisément, que]'animal, et toute antre substance organisée ne commence point lorsque nous le croyons, et que sa generation apparente n'est qu'une développement et une espece d'augmentation. Aussi ai je remarqué que l'auteur de la Recherche de la Verité, M. Regis, M. Hartsoeker, et d'autres habiles hommes n'ont pas été fort éloignés de ce sentiment." Leibnitz, Sys- téme nouveau de la Nature, 1695. The doctrine of " Emboitement " is contained in the Considérations sur le prinetpe de vie, 1705 ; the preface to the Zheodicée, 1710; and the Principes de la Nature et de la Grace (§ 6), 1718.~~

~~5 "¢T) est vrai que la pensée la plus raisonnable et la plus conforme 4 l'experience sur cette question tres difficile de la formation du foetus ; c'est que les enfans sont déja presque tout formés avant méme l'action par laquelle ils sont congus; et que leurs méres ne font que leur donner laccroissement ordinaire dans le temps de ia grossesse." De la Recherche de la Verité, livre ii. chap. vii. p. 384, 7th ed., 1721.~~

~~€ The writer is indebted to Dr Allen Thomson for reference to the evidence contained in a note to Ialler's edition of Boerhaave's Prelec- tiones Academice, vol, v. pt. ii. p. 497, published in 1744, that Haller originally advocated epigenesis,~~

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~~contains an excessively minute but complete chick ; and that fecundation and incubation simply cause this germ to absorb nutritious matters, which are deposited in the interstices of the elementary structures of which the minature chick, or germ, is made up. The consequence of this intussusceptive growth is the " development" or "evolution" of the germ into the visible bird. Thus en organized individual (tout organisé) "is a composite body consisting of the original, or elementary, parts and of the matters which have been associated with them by the aid of nutrition;" so that, if these matters could be extracted from the individual (tow), it would, so to speak, become concentrated in a point, and would thus be~~

~~*restored to its primitive condition of a germ, "just as, by extracting from a bone the calcareous substance which is the source of its hardness, it is reduced to its primitive state of gristle or membrane."?!*~~

~~*"Evolution" and "development" are, for Bonnet, synonymous terms; and since by "evolution" he means simply the expansion of that which was invisible into visibility, he was naturally led to the conclusion, at which Leibnitz had arrived by a different line of reasoning, that no such thing as generation, in the proper sense of the word, exists in nature. The growth of an organic being is simply a process of enlargement, as a particle of dry gelatine may be swelled up by the intussusception of water; its death is a shrinkage, such as the swelled jelly might undergo on desiccation. Nothing really new is produced in the living world, but the germs which develop have existed since the beginning of things; and nothing really dies, but, when what we call death takes place, the living thing shrinks back into its germ state.?*~~

~~*The two parts of Bonnet's hypothesis, namely, the doctrine that all living things proceed from pre-existing germs, and that: these contain, one inclosed within the other, the germs of all future living things, which is the hypothesis of "embottement ;" and the doctrine that every germ contains in miniature all the organs of the adult, which is the hypothesis of evolution or development, in the primary senses of these words, must be carefully distinguished. In fact, while holding firmly by the former, Bonnet more or less modified the latter in his later writings, and, at length, he admits that a "germ" need not be an actual miniature of the organism; but that it may be merely an " original*~~

~~*reformation" capable of producing the latter.?*~~

~~*But, thus defined, the germ is neither more nor less than the " particula genitalis" of Aristotle, or the " primordium*~~

~~*1 Considérations sur les Corps organtsés, chap. x.*~~

~~*2 Bonnet had the courage of his opinions, and in the Palingénésie Philosophique, part vi. chap. iv., he develops a hypothesis which he terms "évolution naturelle;" and which, making allowance for his peculiar*~~

~~*views of the nature of generation, bears no small resemblance to what is understood by " evolution"' at the present day :—*~~

~~*'Si la volonté divine a eréé par un seul Acte 1'Universalité des étres, d'ot venoient ces plantes et ces aniinaux dont Moyse nous decrit la Production au troisieme et au cinquieme jour du renouvellement de notre monde ?*~~

~~*" Abuserois-je de laliberté de conjectures si je disois, que les Plantes et les Animaux qui existent aujourd'hui sont parvenus par une sorte devolution naturelle des Etres organisés qui peuplaient ce premier Monde, sorti immédiatement des Mains du CREATEUR?....*~~

~~*'Ne supposons que trois révolutions. La Terre vient de sortir des Mains du Createur. Des causes preparées par sa SAGESSE font développer de toutes parts les Germes. Les Etres organisés conimen- cent & jouir de l'existence. Ils étoient probablement alors bien dif- férens de ce qu'ils sont aujourd'hui. Ils l'etoient autant que ce premier Monde différoit de celui que nous habitons. Nous manquons de moyens pour juger de ces dissemblances, et peut-étre que le plus habile Naturaliste qui auroit été placé dans ce premier Monde y auroit entiére- ment méconnu nos Plantes et nos Animaux."*~~

~~*3 ¢¢Qe mot (germe) ne désignera pas seulement un corps organisé réduit en petit; il désignera encore toute espéce de préformation originelle dont un Tout organique peut résulter comme de son principe immédiat." — Palingénésie Philosophique, part x. chap. ii.*~~

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~~*vegetale" or "ovum" of Harvey; and the " evolution" of such a germ would not be distinguishable from ** epigenesis."*~~

~~*Supported by the great authority of Haller, the doctrine of evolution, or development, prevailed throughout the whole of the 18th century, and Cuvier appears to have substantially adopted Bonnet's later views, though probably he would not have gone all lengths in the direction of "emboitement." In a well-known note to Laurillard's Eloge, prefixed to the last edition of the Ossemens fossiles, the "radical de l'étre" is much*~~

~~*the same thing as Aristotle's "'particula genitalis" and Harvey's "ovum." 4*~~

~~*Bonnet's eminent contemporary, Buffon, held nearly the same views with respect to the nature of the germ, and ex- presses them even more confidently.*~~

~~***Ceux qui ont cru que le cur étoit le premier formé, se sont trompés; ceux qui disent que c'est le sang se trompent aussi: tout est formé en méme temps. Sil'on ne consulte que l'observation, le poulet se voit dans]'ceuf avant qui'il ait été couvé."5*~~

~~*"J'ai ouvert une grande quantité d'ceufs 4 differens temps avant et aprés Tincubation, et je me suis convaincu par mes yeux que le poulet existe en entier dans le milieu de la cicatrule au moment qu'il sort du corps de la poule."é*~~

~~*The '"moule intérieur' of Buffon is the aggregate of elementary parts which constitute the individual, and is thus the equivalent of Bonnet's germ," as defined in the passage cited above. But Buffon further imagined that innumerable " molecules organiques " are dispersed through- out the world, and that alimentation consists in the ap- propriation by the parts of an organism of those molecules which are analogous to them. Growth, therefore, was, on this hypothesis, partly a process of simple evolution, and partly of what has been termed syngenesis. Buffon's opinion is, in fact, a sort of combination of views, essentially similar to those of Bonnet, with others, somewhat similar to those of the " Medici" whora Harvey condemns. The "molecules organiques" are physical equivalents of Leib- nitz's "monads."*~~

~~*It is a striking example of the difficulty of getting people to use their own powers of investigation accurately, that this form of the doctrine of evolution should have held its ground so long; for it was thoroughly and completely ex- ploded, not long after its enunciation, by Caspar Frederick Wolff, who in his Zheoria Generationis, published in 1759, placed the opposite theory of epigenesis upon the secure foundation of fact, from which it has never been displaced. But Wolff had no immediate successors. The school of Cuvier was lamentably deficient in*~~

~~*embryologists; and it was only in the course of the first thirty years of the pre- sent century, that Prévost and Dumas in France, and, later on, Déllinger, Pander, Von Bar, Rathke, and Remak in Germany, founded modern embryology; and, at the same time, proved the utter incompatibility of the hypothesis of evolution as formulated by Bonnet and Haller, with easily demonstrable facts.*~~

~~*Nevertheless, though the conceptions originally denoted by "evolution" and "development" were shown to be untenable, the words retained their application to the process by which the embryos of living beings gradually make their appearance; and the terms ' Development,"*~~

~~*4<""M,. Cuvier considérant que tous les étres organisés sont dérivés de parens, et ne voyant dans la nature aucune force capable de produire Vorganisation, croyait 4 la pré-existence des germes; non pas 4 la pré-existence d'un @tre tout formé, puisqu'il est bien évident que ce n'est que par des développemens successifs que]'étre acquiert sa forme; mais, si l'on peut s'exprimer ainsi, 4 la pré-existence du radical de Vétre, radical qui existe avant que la série des évolutions ne commence, et qui remonte certainement, suivant la belle observation de Bonnet, plusieurs generations."—Laurillard, Eloge de Cuvier, note 12.*~~

~~*5 Histoire Naturelle, tom. ii. ed. ii. 1750, p. 350.*~~

~~*8 Tbid., p. 351.*~~

~~*? See particularly Buffon, J.c. p. 41.*~~

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~~*" Entwickelung," and " Evolutio" are now indiscriminately used for the series of genetic changes exhibited by living beings, by writers who would emphatically deny that "Development" or "Entwickelung" or " Evolutio," in the sense in which these words were usually employed by Bonnet or Haller, ever occurs.*~~

~~*Evolution, or development, is, in fact, at present employed in biology as a general name for the history of the steps by which any living being has acquired the tnorphological and the physiological characters which dis- tinguish it, As civil history may be divided into bio- graphy, which is the history of individuals, and universal history, which is the history of the human race, so evolu- tion falls naturally into two categories,—the evolution of the individual, and the evolution of the sum of living beings. It will be convenient to deal with the modern doctrine of evolution under these two heads.*~~

~~*1. The Evolution of the Individual.*~~

~~*No exception is, at this time, known to the general law, established upon an immense multitude of direct observa- tions, that every living thing is evolved from a particle of matter in which no trace of the distinctive characters of the adult form of that living thing is discernible. This particle is termed a germ. Harvey! says—*~~

~~*'¢Omnibus viventibus primordium insit, ex quo et a quo pro- veniant. lLiceat hoc nobis primordiwm vegetale nominare ; nempe substantiam quandam corpoream vitam habentem potentia; vel quoddam per se existens, quod aptum sit, in vegetativam formam, ab interno principio operante, mutari. Quale nempe primordium, ovum est et plantarum semen ; tale etiam viviparorum conceptus et insectorum vermis ab Aristotele dictus: diversa scilicet diversorum viventium primordia."*~~

~~*The definition of a germ as " matter potentially alive, and having within itself the tendency to assume a definite living form," appears to meet all the requirements of modern science. For, notwithstanding it might be justly questioned whether a germ is not merely potentially, but rather actually, alive, though its vita] manifestations are reduced to a minimum, the term " potential" may fairly be used in a sense broad enough to escape the objection. And the qualification of " potential" has the advantage of remind- ing us that the great characteristic of the germ is not so much what it is, but what it may, under suitable condi- tions, become. Harvey shared the belief of Aristotle—whose writings he so often quotes, and of whom he speaks as his precursor and model, with the generous respect with which one genuine worker should regard another*~~

~~—that such germs may arise by a process of " equivocal generation " out of not-living matter; and the aphorism so commonly ascribed to him, "'omne vivum ex ovo," and which is in- deed a fair summary of his reiterated assertions, though incessantly employed against the modern advocates of spontaneous generation, can be honestly so used only by those who have never read a score of pages of the Lxercitationes. Harvey, in fact, believed as implicitly as Aristotle did in the equivocal generation of the lower animals. But, while the course of modern investigation has only brought out into greater prominence the accuracy of Harvey's conception of the nature and mode of development of germs, it has as distinctly tended to dis- prove the occurrence of equivocal generation, or abiogenesis, in the present course of nature. In the immense majority of both plants and animals, it is certain that the germ is not merely a body in which life is dormant or potential, but that it is itself simply a detached portion of the substance~~

~~of a pre-existing living body; and the evidence has yet to~~

~~be adduced which will satisfy any cautious reasoner that~~

~~1Huercitationes de Generatione.~~

~~(de Gre Ex. 62, Ovum esse primordium com- mune onnibus animalibus,~~

~~EVYOLUTIGQR~~

~~" omne vivum ex vivo " is not as well established a law of the existing course of nature as "'omne vivum ex ovo."~~

~~Tn all instances which have yet been investigated, the substance of this germ has a peculiar chemical composition, consisting of at fewest four elementary bodies, viz., carbon, hydrogen, oxygen, and nitrogen, united into the ill-defined compound known as protein, and associated with much water, and very generally, if not always, with sulphur and phosphorus in minute proportions. Moreover, up to the present time, protein is known only as a product and con- stituent of living matter. Again, a true germ is either devoid of any structure discernible by optical means, or, at most, it is a simple nucleated cell.?~~

~~*In all cases, the process of evolution consists in a succession of changes of the form, structure, and functions of the germ, by which it passes, step by step, from an extreme simplicity, or relative homogeneity, of visible struc- ture, to a greater or less degree of complexity or hetero- geneity ; and the course of progressive differentiation is usually accompanied by growth, which is effected by intus- susception. 'This intussusception, however, is a very different process from that imagined either by Buffon, or by Bonnet. The substance by the addition of which the germ is enlarged is, in uo case, simply absorbed ready-made from the not-living world and packed between the elementary constituents of the germ, as Bonnet imagined ; still less does it consist of the " molecules organiques" of Buffon. The new material is, in great measure, not only absorbed but assimilated, so that it becomes part and parcel of the molecular structure of the living body into which it enters. And, so far from the fully developed organism being simply the germ plus the nutriment which it has absorbed, it is probable that the adult contains neither in form, nor in substance, more than an inappreciable fraction of the constitutents of the germ, and that it is almost wholly made up of assimilated and metamorphosed nutriment. In the great majority of cases, at any rate, the full grown organism becomes what it is by the absorption of not- living matter, and its conversion into living matter of a specific type. As Harvey says (Ex. 45), all parts of the body are nourished "ab eodem succo alibili, aliter aliterque cambiato," "ut plantee omnes ex eodem communi nutri- mento (sive rore seu terres humore)."*~~

~~*In all animals and plants above the lowest, the germ is a nucleated cell, using that term in its broadest sense ; and the first step in the process of the evolution of the in- dividual is the division of this cell into two or more portions. The process of division is repeated, until the organism, from being unicellular, becomes inulticellular. The single cell becomes a cell-aggregate ; and it is to the growth and metamorphosis of the cells of the cell-aggregate thus produced, that all the organs and tissues of the adult owe their origin.*~~

~~*In certain animals belonging to every one of the clef groups into which the Metazoa are divisible, the cells of the cell-aggregate which results from the process of yelk division, aud which is termed a morula, diverge*~~

~~*from one another in such a manner as to give rise to a central space, around which they dispose themselves as a coat or envelope; and thus the morula becomes a vesicle filled with fluid, the planwla. The wall of the planula is next pushed in on one side, or invaginated, whereby it is converted into a double walled sac with an opening, the blastospore, which leads into the cavity lined by the inner wall. This cavity is the primitive alimentary cavity, or archenterom,; the inner, or invaginated, layer is the hypoblast, the outer the epzblast; and the embryo, in this*~~

~~*2 In some cases of sexless multiplication the germ is a cell-aggre- gate—if we call germ only that which is already detached from the parent organism.*~~

~~*HYOLUTIO*~~

~~*In all the higher animals, a } play the part of Buffon's "'moules organiques," and mould*~~

~~*stage, is termed a gastrula. layer of cells makes its appearance between the hypoblast and the epiblast, and is termed the mesodlast. In the further course of development, the epiblast becomes the ectoderm or epidermic layer of the body; the hypoblast becomes the epithelium of the middle portion of the alimentary canal; and the mesoblast gives rise to all the other tissues, except the central nervous system, which originates from an ingrowth of the epiblast.*~~

~~*With more or less modification in detail, the embryo has been observed to pass through these successive evolutional stages in sundry Sponges, Ccelenterates, Worms, Echino- derms, Tunicates, Arthropods, Mollusks, and Vertebrates; and there are valid reasons for the belief, that all animals of higher organization than the Protozoa agree in the general character of the early stages of their individual evolution. Each, starting from the condition of a simple nucleated cell, becomes a cell-aggregate; and this passes through a condition which represents the gastrula stage, before taking in the features distinctive of the group to which it belongs. Stated in this form, the " gastrea theory" of Haeckel appears to the present writer to be one of the most important and best founded of recent generalizations.*~~

~~*So far as individual plants and animals are concerned, therefore, evolution is not a speculation but a fact; and it takes place by epigenesis.*~~

~~*'Animal. . . per epigenesin procreatur, materiam simul attrahit, parat, concoquit, et eddem utitur; formatur simul et augetur. .. . primum futuri corporis concrementum . . . prout augetur,*~~

~~*dividitur sensim et distinguitur in partes, non simul omnes, sed alias post alias natas, et ordine quasque suo emergentes,"!*~~

~~*In these words, by the divination of genius, Harvey, in the 17th century, summed up the outcome of the work of all those who, with appliances he could not dream of, are continuing his labours in the 19th century.*~~

~~*Nevertheless, though the doctrine of epigenesis, as un- derstood by Harvey, has definitively triumphed over the doctrine of evolution as understood by his opponents of the 18th century, it is not impossible that, when the analysis of the process of development is carried still further, and the origin of the molecular components of the physically gross, though sensibly minute, bodies which we term germs is traced, the theory of development will approach more nearly to metamorphosis than to epigenesis. Harvey thought that impregnation influenced the female organism as a contagion; aud that the blood, which he conceived to be the first rudiment of the germ, arose in the clear fluid of the "colliquamentum" of the ovum by a process of concrescence, as a sort of living precipitate. We now know, on the contrary, that the female germ or ovum, in all the higher animals and plants, is a body which possesses the structure of a nucleated cell ; that impregnation consists in the fusion of the substance? of another more or less modi- fied nucleated cell, the male germ, with the ovum; and that the structural components of the body of the embryo are all derived, by a process of division, from the coalesced male and female germs. Hence it is conceivable, and indeed probable, that every part of the adult contains molecules derived both from the male and from the female parent; and that, regarded as a mass of molecules, the entire organism may be compared to a web of which the warp is derived from the female and the woof from the male. And each of these may constitute one individuality, in the same sense as the whole organism*~~

~~*is one individual, although the matter of the organism has been constantly changing. 'The primitive male and female molecules may*~~

~~*1 Harvey, Hxercitationes de Generatione, Ex. 45, Quenaim sit pullt materia et quomodo fiat in Ovo.*~~

~~*2 Not yet actually demonstrated in the case of the phenogamous plants.*~~

~~*the assimilated nutriment, each according to its own type, into innumerable new molecules. From this point of view, the process, which, in its superficial aspect, is epigenesis, appears, in essence, to be evolution, in the modified sense adopted in Bonnet's later writings; and development is merely the expansion of a potential organism or " original preformation" according to fixed laws.*~~

~~*2. The Evolution of the Sum of Living Beings.*~~

~~*The notion that all the kinds of animals and plants may have come into existence by the growth and modification of primordial germs is as old as speculative thought ; but the modern scientific form of the doctrine can be traced historically to the influence of several converging lines of philosophical speculation and of physical observation, none of which go further back than the 17th century. These are :—*~~

~~*1. The enunciation by Descartes of the conception that the physical universe, whether living or not living, is a mechanism, and that, as such, it is explicable on physical principles.*~~

~~*2. The observation of the gradations of structure, from extreme simplicity to very great complexity, presented by living things, and of the relation of these graduated forms to one another.*~~

~~*3. The observation of the existence of an analogy between the series of gradations presented by the species which compose any great group of*~~

~~*animals or plants, and the series of embryonic conditions of the highest members of that group.*~~

~~*4, The observation that large groups of species of widely different habits present the same fundamental plan of structure ; and that parts of the same animal or plant, the functions of which are very different, likewise exhibit modifications of a common plan.*~~

~~*5. The observation of the existence of structures, in a rudimentary and apparently useless condition, in one species of a group, which are fully developed and have definite functions in other species of the same group.*~~

~~*6. The observation of the effects of varying conditions in modifying living organisms.*~~

~~*7. The observation of the facts of geographical distribu- tion.*~~

~~*8. The observation of the facts of the geological succes- sion of the forms of life.*~~

~~*1. Notwithstanding the elaborate disguise which fear of the powers that were led Descartes to throw over his real opinions, it is impossible to read the Principes de la Philosophve without acquiring the conviction that this great philosopher held that the physical world and all things in it, whether living or not living, have originated by a pro- cess of evolution, due to the continuous operation of purely physical causes, out of a primitive relatively formless matter.'*~~

~~*The following passage is especially instructive :—*~~

~~*'* Et tant s'en faut que je veuille que l'on croic toutes les choses que j'écrirai, que m¢me je pretends cn proposer ici quelques unes que je crois absolument étre fausses ; & savoir, je ne doute point que le monde n'ait été créé au commencement avec autant de per- fection qu'il en a; en sorte que le soleil, la terre, la lune, et les étoiles ont été dés lors ; et que la terre n'a pas eu seulement en soi les semences des plantes, mais que les plantes méme en ont couvert une partie; et qu' Adam et Eve n'ont pas été créés enfans mais en Age d'hommes parfaits. La religion chrétienne veut que*~~

~~*nous le croyons ainsi, et la raison naturelle nous persuade entiérement cette verité ; car si nous consid¢rons la toute puissance de Dieu, nous devons juger que tout ce qu'il a fait a eu dés le commencement*~~

~~*3 As Buffon has well said :—" L'idée de ramener l'explication de tous les phénoménes a des principes mecaniques est assurement grande et belle, ce pas est le plus hardi qu'on peut faire en philosophie, et c'est Descartes qui l'a fait."—J.c. p. 50.*~~

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~~*toute la perfection qu'il devoit avoir. Mais ncanmoins, comme on connditroit beaucoup mieux quelle a été la nature d'Adam et celle des arbres de Paradis si on avoit examiné comment les enfants se forment peu peu dans le ventre de leurs méres et comment les plantes sortent de leurs semences, que si on avoit seulement considéré quels ils ont été quand Dieu les a créés: tout de méme, uous ferons mieux entendre quelle est généralement la nature de toutes les choses qui sont au monde si nous pouvons imaginer quelques prin- eipes qui soient fort intelligibles et fort simples, desquels nous puissions voir elairement que les astres et la terre et enfin tout ce monde visible auroit pu étre produit ainsi que de quelques semences (bien que nous saehions qu'il n'a pas éte produit en eette fagon) que si nous la decrivions seulement comine il est, ou bien comme nous croyons quila étécréé. Et parceque je pense avoir trouvé des principes qui sont tels, je tacherai ici de les expliquer."?*~~

~~*If we read between the lines of this singular exhibition of force of one kind and weakness of another, it is clear that Descartes believed that he had divined the mode in which the physical universe had been evolved ; and tlie T'raité de Vvhomme and the essay Sur les Passions afford abundant additional evidence that he sought for, and thought he had found, an explanation of the phenomena of physical life by deduction from purely physical laws.*~~

~~*Spinoza abounds in the same sense, and is as usual per- fectly candid—*~~

~~*'* Nature leges et regule, secundum quas omnia fiunt et ex unis formis in alias mutantur, sunt ubique et semper cadem.*~~

~~*Leibnitz's doctrine of continuity necessarily led him in the same direction; and, of the infinite multitude of monads with which he peopled the world, each is supposed to be the focus of an endless process of evolution and involution. In the Protogewa, xxvi., Leibnitz distinctly suggests the mutability of species—*~~

~~*'* Alii mirantur in saxis passim species videri quas vel in orbe cognito, vel saltem in vicinis locis frustra queras. Ita Cornua Ammonis, que ex nautilorum numero habeantur, passim et forma et magnitudine (nam et pedali diametro aliquando reperiuntur) ab omnibus illis naturis discrepare dicunt, quas prebet mare. Sed quis absconditos ejus recessus aut subterraneas abyssos pervesti- gavit? quam multa nobis animalia antea ignota offert novus orbis ?*~~

~~*Et credibile est per magnas illas conversiones etiam: animalium species plurimum immutatas."*~~

~~*Thus in the end of the 17th century the seed was sown which has at intervals brought forth recurrent crops of evolutional hypotheses, based, more or less completely, on general reasonings.*~~

~~*Among the earliest of these speculations is that put forward by Benoit de Maillet in his Zelliamed, which, though printed in 1735, was not published until twenty- three years later. Considering that this book was written before the time of Haller, or Bonnet, or Linnzus, or Hutton, it surely deserves more respectful consideration than it usually receives. For De Maillet not only has a definite conception of the plasticity of living things, and of the production of existing species by the modification of their predecessors ; but he clearly apprehends the cardinal maxim of modern geological science, that the explanation of the structure of the globe is to be sought in the deduc- tive application to geological phenomena of the principles established inductively by the study of the present course of nature. Somewhat later, Maupertuis® suggested a curi- ous hypothesis as to the causes of variation, which he thinks may be sufficient to account for the origin of all animals from a single pair. Robinet* followed out much the same line of thought as De Maillet, but less soberly ; and Bonnet's speculations in the Palingénéste, which*~~

~~appeared in 1769, have already been mentioned. Buffon (1753-1778), at first a partisan of the absolnte immutability of species, subse-~~

~~1 Princtpes de lu Philosophe, Troisiéme partie, § 45.~~

~~2 Tithiccs, Pars tertia, Preefatio.~~

~~3 Systéme de la Nature. Essar sur la Formation des Corps Organisés, 1751, xiv.~~

- ~~Considérations Philosophiques sur la gradation naturelle des formes de Vétre; ou les essais de la nature qui apprend a faire Uhomme, 1768.~~

~~quently appears to have believed that larger or smaller groups of species have been produced by the modification of a primitive stock; but he contributed nothing to the general doctrine of evolution.~~

~~Erasmus Darwin (Zoonomia, 1794), though a zealous evolutionist, can hardly be said to have made any real ad- vance on his predecessors; and, notwithstanding that Goethe (1791-4) had the advantage of a wide knowledge of morpho- logical facts, and a true insight into their signification, while he threw all the power of a great poet into the expression of his conceptions, 3t may be questioned whether he supplied the doctrine of evolution with a firmer scientific basis than it already possessed. Moreover, whatever the value of Goethe's labours in that field, they were not published before 1820, long after evolutionism had taken a new departure from the works of Treviranus and Lamarck—the first of its advocates who were equipped for their task with the needful large and accurate knowledge of the phenomena of life, asa whole. It is remarkable that each of these writers seems to have been led, independently and contem- poraneously, to invent the same name of " Biology " for the science of the phenomena of life; and thus, following Buffon, to have recognized the essential unity of these phenomena, and their contradistinction from those of inani- mate nature. And itis hard to say whether Lamarck or Treviranus has the priority in propounding the main~~

~~*thesis of the doctrine of evolution; for though the first volume of Treviranus's Biologie appeared only in 1802, he says, in the preface to his later work, the IIrscheinungen und Gesetze des organischen Lebens, dated 1831, that he wrote the first volume of the Biologie "nearly five-and-thirty years ago," or about 1796.*~~

~~*Now, in 1794, there is evidence that Lamarck held doc- trines which present a striking contrast to those which are to be found in the Philosophie Zoologique, as the fol- lowing passages show :—.*~~

~~*685. Quoique mon unique objet dans cet article n'ait été que de traiter de la cause physique de l'entretien de la vie des étres organiques, malgré cela j'ai osé avaneer en débutant, que l'existence de ces étres étonnants n'appartiennuent nullement a la nature; que tout ce qu'on peut entendre par le mot natwre, ne pouvoit donner la vie, c'est-4-dire, que toutes les qualités de la matiére, jointes 4 toutes les circonstanees possibles, et méme a l'activité répandue dans l'univers, ne pouvaient point produire un étre muni du mouvement organique, capable de reproduire son semblable, ct sujet & la mort.*~~

~~*686. Tous les individus de cette nature, qui existent, proviennent d'individus semblables qui tous ensemble constituent l'espéce entitre. Or, je crois qu'il est aussi impossible 4 l'>homme de connditre la cause physique du premier individu de chaque espéce, que d'assigner aussi physiquement la cause de l'existencc de la matiere ou de l'univers entier. C'est au moins ce que le résultat de mes connaissances et de mes réflexions me portent & penser. S'il existe beaucoup de variétés produites par l'effet des circonstances, ces variétés ne déna- turent point les espéces ; mais on se trompe, sans doute souvent, en indiquant comme espéce, ce qui n'est que vari¢té; et alors je sens que cette erreur peut tirer 4 conséquence dans les raisonnements que l'on fait sur cette matitre.?*~~

~~*The first three volumes of Treviranus's Beologze, which contains his general views of evolution, appeared between 1802 and 1805. The Recherches sur [organisation des corps vivants, which sketches out Lamarck's doctrines, was pub- lished in 1802; but the full development of his views, in the Philosophie Zoologique, did not take place until 1809.*~~

~~*The Biologie and the Philosophie Zoologique are both very remarkable productions, and are still worthy of atten-*~~

~~*1 Recherches sur les causes des principaux faits physiques, par J. B. Lamarck. Paris. Seconde année de la République. In the preface, Lamarck says that the work was written in 1776, and presented to the Aeademy in 1780; but it was not published before 1794, and at that time it presumably expressed Lamarek's mature views. It would be interesting to know what brought about the ehange of opinion mani- fested iu the Recherches sur Corganisation des corps vivants, published only seven years later.*~~

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~~*tive study, but they fell upon evil times. The vast authority of Cuvier was employed in support of the traditionally respectable hypotheses of special creation and of catastro- phism; and the wild speculations of the Discours sur les kévolutions de la Surface du Globe were held to be models of sound scientific thinking, while the really much more sober and philosophical hypotheses of the Hydrogeologie were scouted. For many years it was the fashion to speak of Lamarck with ridicule, while Treviranus was altogether ignored.*~~

~~*Nevertheless, the work had been done. The conception of evolution was henceforward irrepressible, and it incessantly reappears, in one shape or another,! up to the year 1858, when Mr Darwin and Mr Wallace published their Theory of Natural Selection. The Originof Species appeared in 1859; and it is within the knowledge of all whose memories go back to that time, that, henceforward, the doctrine of evolu- tion has assumed a position and acquired an importance which it never before possessed. In the Origin of Species, and in his other numerous and important contributions to the solution of the problem of biological evolution, Mr Darwin confines himself to the discussion of the causes which have brought about the present condition of living matter, assuming such matter to have once come into existence. On the other hand, Mr Spencer? and Professor Haeckel? have dealt with the whole problem of evolution. The profound and vigorous writings of Mr Spencer embody the spirit of Descartes in the knowledge of our own day, and may*~~

~~*be regarded as the " Principes des Philosophie " of the 19th century; while, whatever hesitation may not unfrequently be felt by less daring minds, in following Haeckel in many of his speculations, his attempt to sys- tematize the doctrine of evolution' and to exhibit its in- fluence as the central thought of modern biology, cannot fail to have a far-reaching influence on the progress of science.*~~

~~*If we seek for the reason of the difference between thie scientific position of the doctrine of evolntion a centnry ago, and that which it occupies now, we shall find it in the great accumulation of facts, the several classes of which have been enumerated above, under the second to the eighth heads. For those which are grouped under the second to the seventh of these classes, respectively, have a clear significance on the hypothesis of evolution, while they are unintelligible if that hypothesis be denied. And those of the eighth group are not only unintelligible without the assumption of evolution, but can be proved never to be discordant with that hypothesis, while, in some cases, they are exactly such as the hypothesis requires. The demonstration of these assertions would require a volume, but the general nature of the evidence on whicli they rest may be briefly indicated.*~~

~~*2. The accurate investigation of the lowest forms of animal life, commenced by Leeuwenhoek and Swammerdamn, and continued by the remarkable labours of Reaumur, Trembley, Bonnet, and a host of other observers in the latter part of the 17th and the first half of the 18th cen- turies, drew the attention of biologists to the gradation in the complexity of organization which is presented by living beings, and culminated in the doctrine of the " échelle des étres," so powerfully and clearly stated by Bonnet; and, before him, adnmbrated by Locke and by Leibnitz. In the then state of knowledge, it appeared that all the species of animals and plants could be arrauged in one series; in such a manuer that, by insensible gradations, the mineral passed into the plant, the plant into the polype, the polype into the worm, and so, through gradually higher forms of life, to man, at the summit of the animated world.*~~

~~*1 See the " Historical Sketch" prefixed to the last edition of the Origin of Species.*~~

~~2 First Principles and Principles of Biology, 1860-1864.~~

~~3 Generelle Morphologie, 1866.~~

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~~Bat, as knowledge advanced, this conception ceased to be tenable in the crude form in which it was first put forward. Taking into account existing animals and plants alone, it became obvious that they fell into groups which were more or less sharply separated from one another; and, moreover, that even the species of a genus can hardly ever be arranged in linear series. Their natural resemblances and differences are only to be expressed by disposing them as if they were branches springing from a common hypo- thetical centre.~~

~~Lamarck, while affirming the verbal proposition that animals form a single series, was forced by his vast acquaintance with the details of zoology to limit the asser- tion to such a series as may be formed out of the abstrac- tions constituted by the common characters of each group.4~~

~~Cuvier on anatomical, and Von Baer on embryological grounds, made the further step of proving that, even in this limited sense, animals cannot be arranged in a single series, but that there are several distinct plans of organi- zation to be observed among them, no one of which, in its highest and most complicated modification, leads to any of the others.~~

~~The conclusions enunciated by Cuvier and Von Baer have been confirmed in principle by all subsequent research into the structure of animals and plants. But the effect of the adoption of these conclusions has been rather to sub- stitute a new metaphor for that of Bonnet than to abolish the conception expressed by it. Instead of regarding living things as capable of arrangement in one series like the steps of a ladder, the results of modern investigation com- pel us to dispose them as if they were the twigs and branches of a tree. The ends of the twigs represent individuals, the smallest groups of twigs species, larger groups genera, and so on, until we arrive at the source of all these ramifica- tions of the~~

~~*main branch, which is represented by a common plan of structure. At the present moment, it is impossible to draw up any definition, based on broad anatomical or developmental characters, by which any one of Cuvier's great groups shall be separated from all the rest. On the contrary, the lower members of each tend to converge towards the lower members of all tlie others, The same may be said of the vegetable world. The apparently clear distinction between flowering and flowerless plants has been broken down by the series of gradations between the two exhibited by the Lycopodiacew, Rhizocarpee, and Gymnospermee. The groups of Mung, Lichenee, and Alge have completely run into one another, and, whien tlic lowest forms of each are alone considered, even the animal and vegetable kingdoms cease to have a definite frontier.*~~

~~*If it is permissible to speak of the relations of living forms to one another metaphorically, the similitude chosen must undoubtedly be that of a common root, whence two main trunks, one representing the vegetable and one the animal world, spring; and, each dividing into a few main branches, these subdivide into multitudes of branchlets and these into smaller groups of twigs.*~~

~~*As Lamarck has well said 5—*~~

~~*Il n'y a que ceux qui se sont longtemps ct fortement occupés de la détermination des espéces, et qui ont consulté de riches collaetione! qui peuvent savoir jusqu'a quel point les espéces, parmi les corps vivants se fondent les unes dans les autres, ct qui ont pu se con- vaincre que, dans les parties ok nous voyons des cspeéces isolés, ccla n'est ainsi que parcequ'il nous en manque d'autres qui en sont plus voisines et que nous n'avons pas encore recueillies.*~~

~~*Je ne veux pas dire pour cela que les animaux qui existent for- ment une série trés-simple et partout également nuancée; mais je dis qwils forment unc série rameuse, irréguliérement graduée et qui*~~

~~*4 <7] s'agit done de prouver que la série qui constitute l'échelle animale réside essentiellement dans la distribution des masses princi- pales qui la composent et non dans celle des espéces ni méme toujours dans celle des genres." —Phil. Zoologique, chap. v.*~~

~~*5 Philosophic Zoologique, premitre partie, chap. iii.*~~

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~~*na point de discontinuité dans ses parties, ou qui, du moins, n'en a toujours pas eu, Sil est vral que, par suite de quelques especes perdues, il s'en trouve quelque part. | Il en resulte que les espéces qui terminent chaque rameau de la série générale tiennent, au moins dun cdté, & d'autres espéces Vvoisines qui se nuancent avee elles. Voild ce que état bien connu des choses me met maintenant & portée de demontrer. Je n'ai besoin d'aucune hypothése ni d'aueune supposition pour cela : j'en atteste toutes naturalistes observateurs.*~~

~~*3. In a remarkable essay 1 Meckel remarks—*~~

~~*"There is no good physiologist who has not been struck by the observation that the original form of all organisms is one and the same, and that out of this one form, all, the lowest as well as the highest, are developed in such a manner that the latter pass through the permanent forms of the former as transitory stages. Aristotle, Haller, Harvey, Kielmeyer, Autenrieth, and many others have either made this observation incidentally, or, especially the latter, have drawn particular attention to it, and drawn therefrom results of permanent importance for physiology."*~~

~~*Meckel proceeds to exemplify the thesis, that the lower forms of animals represent stages in the course of the development of the higher, with a large series of illustra- tions.*~~

~~*After comparing the Salamanders and the perenni- branchiate Urodela with the Tadpoles and the Frogs, and enunciating the law that the more highly any animal is organized the more quickly does it pass through the lower stages, Meckel goes on to say—*~~

~~*" From these lowest Vertebrata to the highest, and to the highest forms among these, the comparison between the embryonic condi- tions of the higher animals and the adult states of the lower can be more completely and thoroughly instituted than if the survey is extended to the Invertebrata, inasmuch as the latter are in many respects constructed*~~

~~*upon au altogether too dissimilar type ; indeed they often differ from one another far more than the lowest verte- brate does from the highest mammal ; yet the following pages will show that the comparison may be also extended to them with interest. In fact, there is a period when, as Aristotle long ago said, the em- bryo of the highest animal has the form of a mere worm, and, devoid of internal and external organization, is merely an almost struc- tureless lump of polype-substanece. Notwithstanding the origin of organs, it still for a certain time, by reason of its want of an inter- nal bony skeleton, remains worm and mollusk, and only later enters into the series of the Vertebrata, although traces of the vertebral column even in the earliest periods testify its claim to a place in that series." — Op. cit. pp. 4, 5.*~~

~~*Tf Meckel's proposition is so far qualified, that the com- parison of adult with embryonic forms is restricted within the limits of one type of organization; and, if it is further recollected, that the resemblance between the permanent lower form and the embryonic stage of a higher form is not special but general, it is in entire accordance with modern embryology ; although there is no branch of biology which has grown so largely, and improved its methods so much since Meckel's time, as this. In its original form, the doctrine of "arrest of development," as advocated by Geoffrey and Hilaire and Serres, was no doubt an over-statement of the case. It is not true, for example, that a fish is a reptile arrested in its development, or that a reptile was ever a fish; but it is true that the reptile embryo, at one stage of its development, is an organism which, if it had an independent existence, must be classified among fishes; and all the organs of the reptile pass, in the course of their development, through conditions which are closely analogous to those which are permanent in some fishes.*~~

~~*4, That branch of biology which is termed Morphology is a commentary upon, and expansion of, the proposition that widely different animals or plants, and widely different parts of animals or plants, are constructed upon the same plan. From the rough comparison of the skeleton of a bird with that of a man by Belon, in the sixteenth century (to go no further back), down to the theory of the limbs and*~~

~~*5 "'Entwurf einer Darstellung der zwischen dem Embryozustinde der hoheren Thiere und dem permanenten der niederen stattfindenden Parallele," Beytrage zur Vergleichenden Anatomie, Bd. ii. 1811.*~~

~~*the theory of the skull at the present day; or, from the first demonstration of the homologies of the parts of a flower by C. F. Wolff, to the present elaborate analysis of the floral organs, morphology exhibits a continual ad- vance towards the demonstration of a fundamental unity among the seeming diversities of living structures. And this demonstration has been completed by the final establish- ment of the cell theory, which involves the admission of a primitive conformity, not only of all the elementary*~~

~~*struc- tures in animals and plants respectively, but of those in the one of these great divisions of living things with those in the other. Noa priori difficulty can be said to stand in the way of evolution, when it can be shown that all animals and all plants proceed by modes of development, which are similar in principle, from a fundamental proto- plasmic material.*~~

~~*5. The innumerable cases of structures, which are rudi- mentary and apparently useless, in species, the close allies of which possess well developed and functionally important homologous structures, are readily intelligible on the theory of evolution, while it is hard to conceive their raison Wétre omwany other hypothesis. However, a cautious reasoner will probably rather explain such cases deductively from the doctrine of evolution, than endeavour to support the doctrine of evolution by them. For it is almost impossible to prove that any structure, however rudimentary, is useless — that is to say, that it plays no part whatever in the economy; and, if it is in the slightest degree useful, there is no reason why, on the hypothesis of direct creation, it should not have been created. Nevertheless, double- edged as is the argument from rudimentary organs, there is probably none which has produced a greater effect in pro- moting the general acceptance of the theory of evolution.*~~

~~*6. The older advocates of evolution sought for. the causes of the process exclusively in the influence of varying conditions, such as climate and station, or hy- bridization, upon living forms. Even Treviranus has got no further than this point. Lamarck introduced the con- ception of the action of an animal on itself as a factor in producing modification. Starting from the well-known fact that the habitual use of a limb tends to develop the muscles of the limb, and to produce a greater and greater facility in using it, he made the general assumption that the effort of an animal to exert an organ in a given direc- tion tends to develop the organ in that direction. But a little consideration showed that, though Lamarck had seized what, as far as it goes, is a true cause of modifica- tion, it is a cause the actual effects of which are wholly inadequate to account for any considerable modification in animals, and which can have no influence at all in the vegetable world ; and probably nothing contributed so much to discredit evolution, in the early part of this century, as the floods of easy ridicule*~~

~~*which were poured upon this part of Lamarck's speculation. The theory of natural selection, or survival of the fittest, was suggested by Wells in 1813, and further elaborated by Matthew in 1831. But the pregnant suggestions of these writers remained practically unnoticed and forgotten, until the theory was independently devised and promulgated by Darwin and Wallace in 1858, and the effect of its publication was immediate and profound.*~~

~~*Those who were unwilling to accept evolution, without better grounds than such as are offered by Lamarck or the author of that particularly unsatisfactory book, the Vestzges of the Natural HIstory of the Creation, and who therefore preferred to suspend their judgment on the question, found in the principle of selective breeding, pursued in all its ap- plications with marvellous knowledge and skill by Mr Dar- win, a valid explanation of the occurrence of varieties and races; and they saw clearly that, if the explanation would*~~

~~*apply to species, it would not only solve the problem of their evolution, but that it would account for the facts of teleology, as well as for those of morphology; and for the persistence of some forms of life unchanged through long epochs of time, while others undergo comparatively rapid metamorphosis.*~~

~~*HOw far " natural selection " suffices for the production of species remains to be seen. ew can doubt that, if not the whole cause, it is a very important factor in that operation ; and tliat it must play a great part in the sorting out of varieties into those which are transitory and those which are permanent.*~~

~~*But the causes and conditions of variation have yet to be thoroughly explored ; and the importance of natural selec- tion will not be impaired, even if further inquiries should prove that variability is definite, and is determined in certain directions rather than in others, by conditions inherent in that which varies. It is quite conceivable that every species tends to produce varieties of a limited number and kind, and that the effect of natural selection is to favour the develop- taent of some of these,*~~

~~*while it opposes the development of others along their predetermined lines of modification.*~~

~~*7. No truths brought to light by biological investigation were better calculated to inspire distrust of the dogmas intruded upon science in the name of theology, than those which relate to the distribution of animals and plants on the surface of the earth. Very skilful accommodation was needful, if the limitation of sloths to South America, and of the ornithorhynchus to Australia, was to be reconciled with the literal interpretation of the history of the deluge ; and, with the establishment of the existence of distinct provinces of distribution, any serious belief in the peopling of the world by migration from Mount Ararat came to an end.*~~

~~*Under these circumstances, only one alternative was left for those who denied the occurrence of evolution ; namely, the supposition that the characteristic animals and plants of each great province were created, as such, within the limits in which we find them. And as the hypothesis of "specific centres," thus formulated, was heterodox from the theological point of view, and unintelligible under its scientific aspect, it may be passed over without further notice, as a phase of transition from the creational to the evolutional hypothesis.*~~

~~*8. In fact, the strongest and most conclusive arguments iu favour of evolution are those which are based upon the facts of geographical, taken in conjunction with those of geological, distribution.*~~

~~*Both Mr Darwin and Mr Wallace lay great stress on the close relation which obtains. between the existing fauna of any region and that of the immediately antecedent geological epoch in the same region; and rightly, for it is in trath inconceivable that there should be no genetic counection between the two. It is possible to put into words the proposition, that all the animals and plants of each geological epoch were annihilated, and that a new set of very similar forms was created for the next epoch, but it may be doubted if any one who ever tried to form a distinct mental image of this process of spontaneous generation on the grandest scale, ever really succeeded in realizing it.*~~

~~*Within the last twenty years, the attention of the best paleontologists has been withdrawn from the hodman's work of making " new species" of fossils, to the scientific task of completing our knowledge of individual species, and tracing out the succession of the forms presented by any given type in time.*~~

~~*Those who desire to inform themselves of the nature and extent of the evidence bearing on these questions may consult the works of Niitimeyer, Gaudry, Kowalewsky,*~~

~~*Vol*~~

~~*Marsh, and the writer of the present article. It must suffice, in this place, to say that the successive forms of the Equine type have been fully worked out; while those of nearly all the other existing types of Ungulate mammals and of the Carnivora have been nearly as closely followed through the Tertiary deposits; the gradations between birds and reptiles have been traced; and the modifications undergone by the Crocodilia, from the Triassic epoch to the present day, have been demonstrated. On the evidence of paleontology, tlie evolution of many existing forms of animal life from their predecessors is no longer an hypo- thesis, but an historical fact ; it is only the nature of the physiological factors to which that evolution is due whicli is still open to discussion. . (i, Me Ht.)*~~

~~*H. EvoLurion In PHELOSOPHY.*~~

~~*Definition.—The modern biological doctrine of evolu- tion, which regards the higher forms of life as gradually arising out of the lower, owes its chief philosophic signi- ficance to the fact that it renders definite and precise one part of a general theory of the world viewed as an orderly succession of events or as a process of be- coming. This theory is put forward as an answer to one of 'the two problems of philosophy conceived as an interpretation of real existence. 'The first of these pro- blemns concerns itself with what may be called the stati- cal aspect of the world, and inquires into the ultimate uature of all reality (matter and mind), viewed as coexistent and apart from time. The second problem treats of the dynamical aspect of the world, and has to do with the pro- cess by which the totality of things has come to be what it is, and is still being*~~

~~*transformed, It is this latter problem which the various theories of evolution seeks to solve.*~~

~~*The most general meaning of evolution may be defined as follows: Evolution includes all theories respecting the origin and order of the world which regard the higher or more complex forms of existence as following and depend. ing on the lower and simple forms, which represent the course of the world as a gradual transition from the inde- terminate to the determinate, from the uniform to the varied, and which assume the cause of this process to be immanent in the world itself that is thus transformed. All theories of evolution, properly so called, regard the physical world as a gradual progress from the simple to the complex, look upon the development of organic life as conditioned by that of the inorganic world, and view the course of mental life both of the individual and of the race as correlated with a material process. This definition covers roughly the principal historical systems bearing the namie of evolution, as well as others which have hardly as yet been characterized by this title.*~~

~~*It is clear by this definition that we cannot now press the etymological force of the word. Evolution has no doubt often been conceived as an unfolding of something already contained in the original, and this view is still coni- monly applied to organic evolution both of the individual and of the species. It will be found that certain metaphy- sical systems of evolution imply this idea of an unfolding of something existing in germ or at least potentially in the antecedent. On the other hand, the modern doctrine of evolution, with its ideas of elements which combine, and of causation as transformation of energy, does not necessarily imply this notion. It may be remarked that some of the arguments brought against the modern doctrine rest on the fallacious assumption that the word is still used in its ety- mological sense, and that consequently that which evolves must contain in some shape what is evolved (e.g., inorganic matter must contain life and consciousness).*~~

~~*Evolution is thus almost synonymous with progress,*~~

~~*though the latter term is usually confined to processes of development in the moral as distinguished from the physical world. Further, this idea, as Mr Spencer remarks, has rather a subjective than an objective source, since it points to an increased value in existence as judged by our feelings. At the same time, inasmuch as conscious and more particularly human life is looked on by the evolutionist as the highest phase of all development, and since man's development is said to be an increase in well-being and happiness, we do not greatly err when we speak of evolution as a transition from the lower to the higher, from the worse to the better. An- other respect in which tlre whole process of evolution may be said to be a progress is in its relation to our perceptions as esthetic spectators, the higher phases of the process being the more varied, the fuller, and the more perfect. Apart from these subjective estimates, evolution is first of all as*~~

~~*a whole a progress from the lower to the higher, in the-*~~

~~*sense that itis a substitution of a complex for a simple type of existence; and it is such a progress, secondly, in the narrow sense of organic development if not in the wider sense of cosmic development, inasmuch as all advance im- plies a larger measure of adaptation and so of permanence.*~~

~~*Problems solved by Evolution.—The hypothesis of evolu- tion aims at auswering a number of questions respecting the becoming or genesis of things. Of these the first is the problem of explaining change, that is to say, of accounting for that incessant process of transformation which the world manifests. The form which this question has com- monly taken is, "What is motion, and how does it arise?" The second inquiry relates to the factor of intelligible order in the world, to the existence of general classes of things, including minds, of universal laws, and finally to that appearance of a rational end towards which things tend. Thirdly, it is necessary to account for the origin of organic beings which appear to be subordinated to different prin- ciples from those which control inorganic bodies. Lastly, we have the apparent mystery of a genesis of conscious minds in dependence on physical bodies. These are the principal inquiries which the various theories of evolution aim more or less completely at*~~

~~*answering. Asa subordinate question, we may mention the meaning of human history, and its relation to physical processes.*~~

~~*Evolution, Creation, and HImanatwn.—In seeking to answer these questions, the hypothesis of an evolution of the cosmos with all that it contains competes, in part at least, with two other principal doctrines respecting the origin of the world. These are the theory of direct creation by a personal Deity and that of emanation.*~~

~~*Tt is clear that the doctrine of evolution is directly anta- gonistic to that of creation. Just as the biological doctrine of the transmutation of species is opposed to that of special creations, so the idea of evolution as applied to the forma- tion of the world as a whole, is opposed to that of a direct creative volition. It substitutes within the ground which it covers the idea of a natural and necessary process for that of an arbitrary volitional process.*~~

~~*The theory of a personal Creator auswers the questions enumerated above by referring the form of the world to an act of direct creation. As an extreme doctrine, it views matter as well as form as the product of divine volition ; in a modified form, it conceives the Deity as simply fashioning the uncreated material of the world; and ina still more restricted form, it regards the universal laws or forms which are impressed on things as co-eternal with the Deity. Advancing knowledge has gradually limited the sphere of direct creative activity, by referring the present order of the world to the action of secondary causes. HIence this theory only now competes with the hypothesis of evolution at one or two points, more especially the pro- duction of living forms, the origin of the hunan mind, and*~~

~~*HY OLwTiew*~~

~~*the nature of history,—which last is conceived as somehow controlled by divine action in the shape of Providence. The question how far the doctrine of evolution, in its most ex- tended and elaborate form, absolutely excludes the idea of creative activity need not be dwelt on here. It is sufficient to say that the theory of evolution, by assuming an intel-*~~

~~*ligible and adequate principle of change, simply eliminates the notion of creation from those regions of existence to which it is applied,*~~

~~*The doctrine of emanation, which had its origin in the East, and was devcloped by the Neoplatonists, Gnostics, aud Cabalists, is a philosophic transformation of the idea of an original creation of the world. It regards the world as a product of the divine nature, and so far it is a theory of creation. On the other hand, it conceives of this pro- duction as necessary, and analogous rather to a physical than to a moral action. In this respect it agrees with the doctrine of evolution. It further coincides with this doctrine in the recognition of a scale of existence. It differs from this last inasmuch as it reverses the order of evolution, by making the original stage the most perfect and all later stages a succession of degradations. In one respect, the theory of emanation has a curious relation to that of evolu- tion. As we have seen, the process of evolution is from the indeterminate to the determinate. This is often expressed as a progress from the universal to the particular. Thus the primordial matter assumed by the early Greek physicists may be said to be the universal substance out of which particular things arise. The doctrine ef emanation again regards the world as a process of particularization. Yet the resemblance here is more apparent than real. The universal is, as Mr Spencer remarks, a subjective idea; and the general forms, existing ante res, which play so pro- rainent a part in Greek and medieval philosophy, do not in the least correspond to the homogeneous matter of the physical evolutionists. The one process is a logical opera- tion, the othera physical. The theory of emanation, which had its source in certain moral and religious ideas, aims first of all at explaining the origin of mental or spiritual existence as an effluence from the divine and absolute spirit. In the next place, it seeks to account for the general laws of the world, for the universal forms of existence, as ideas which emanate from the Deity. By some it was developed into a complete philosophy of the world, in which matter itself is viewed as the lowest emanation from the absolute. In this form it stands in sharp antithesis to the doctrine of evolution, both because the former views the world of particular things and events as essentially unreal and illusory ; and because the latter, so far as it goes, looks on matter as eternal, and seeks to explain the general forms of things as we perceive them by help of simpler assumptions. In certain theories known as*~~

~~doctrines of emanation, only mental existence is referred to the absolute source, while matter is viewed as eternal and distinct from the divine nature. In this forin the doctrine of emanation approaches, as we shall see, certain forms of the evolution theory.~~

~~Forms of Doctrine of Evolution.—Let us now see how the doctrine of evolution deals with the problems of becoming as above defined. And here it becomes necessary to dis: tinguish between different ways of formulating and inter- preting the idea of evolution. The various modes of con- ceiving and interpreting the idea of a natural evolution of things depend on the answers given to three principal questions respecting the nature and causes of the process. These are:—I. HOw far is the process a real objective one? II. What is the nature of that reality which makes the content, so to speak, of the process cf evolution? and III. HOw is the process effected 1~~

~~I. First of all, very different views may be taken of the reality of the process of becoming, generation, and transfor-~~

~~VY Ou U iP Oss~~

~~mation. Onthe oneside we have the extreme view of the Elea- tics, that there is no such thing as change or individual object, that real being is one and unchangeable, and that what ap- pears like the formation and destruction of things is an illu- sion of the senses. At tlie other extreme we have the view that all reality consists in the process of becoming, or self-realization, and that nothing persists save this law of evolu- tion itself. Between these two extremes there lie a number of intermediate conceptions, as that of a varying and pro- gressive activity, of a persistent force, or of a gradual manifestation of an unchanging substance. The reality of the process is viewed in a peculiar light from the stand-point of modern Subjective Idealism, which regards time as nothing but a mental form. It is to be added that the process of cosmic evolution may present different degrees of reality. Thus to the ancient atomists the real part of the process is the combination of atoms. There is no absolute generation or destruction of things. Further, the evolution of the world of sensible qualitics (colour, dc.) of things, is illusory, and has only a subjective existence in our sensations. The modern scientific doctrine of evolu- tion~~

~~*carries out this view of its reality, both by its con- ception of the material world as objectively real only in its forces and movements, and by its doctrine of the conservation of energy, which teaches that amid all change and transformation there is something (though not neces- sarily a metaphysical thing) which persists.*~~

~~*II. Secondly, the view of evolution will vary according to the conception of that substance or real thing which enters into the process and constitutes its essential content. We have said that the problems of being and becoming (esse and fiert) are distinct, yet they cannot be discussed in perfect isolation. More particularly our idea of becoming must be determined by our notion of that existing reality which underlies the process.*~~

~~*It follows from our definition of evolution that its main problem is to conceive of material and mental development in their mutual relation. There are various ways of effect- ing this result. First of all, the material and the mental may be regarded from a dualistic point of view as perfectly distinct kinds of reality. According to this view, physical evolution as taking place in the inorganic world, and mental evolution as unfolded in man's history, are two unconnected processes. Further, the fact of thcir correla- tion in organic development must either be left unexplained altogether, or can only be referred to the arbitrary action of some supernatural power.*~~

~~*Opposed to this dualistic conception of reality there are the monistic couceptions, which conceive of all parts of the process of evolution as homogeneous and identical. Of these the first is the materialistic, which assumes but one substance, and regards mind as but a property or particular manifestation of matter. On this view, mental evolution is simply one phase of material, and the whole course of cosmic evolution may be described as a production of mind out of matter.*~~

~~*The next monistic conception is the spiritualistic, which assumes but one substance—mind, and resolves the reality of the material world into a spiritual principle! According to this way of looking at the world-process, material and mental evolution are but two continuous phases of one*~~

~~spiritual movement. From the operation of inanimate nature up to human history it is the same spiritual reality which manifests itself.~~

~~Finally, there is the monistic conception in the narrow modern sense, viz., that which views the material and the mental as two sides of one and the same reality. Accord-~~

~~1 Of course, there is a transition from the dualistic theory to the spiritualistic in those doctrines which allow a certain reality to matter, but only as something dead or existing potentially.~~

~~ing to this view, physical evolution as manifested in the material world, and mental evolution as seen in human life, may each be regarded as a two-sided process. The first is simply that part of the process in which the material side is most conspicuous ; the second, that in which the mental side is so. This monistic conception shows itself in a num- ber of forms,— from the crude semi-mythological conception of a cosmic organism or world-animal, which is at once body and soul, up to the metaphysical doctrine of one substance with two attributes.~~

~~III. In the third place, the form of the doctrine of evolution will vary according to the conception of the force or activity which effects the process. This point, though closely related to the last, is not identical with it. It is one thing to understand what it is that evolves itself, another thing to comprehend how the process is brought about. The latter point is of even greater importance for studying the various theories of evolution than the former,~~

~~There are two strongly contrasted modes of viewing all action or change. 'The first is drawn from the region of physical events, and views the change as conditioned by antecedents or efficient causes. This way of looking at change gives the mechanical view of evolution. The second is drawn from the region of our conscious volitions regarded as themselves undetermined by antecedent causes, and con- ceives of change as related to and determined by some end or purpose. This gives the tcleological view of evolution. Although there is a natural affinity between the~~

~~*mechanical and the materialistic conception of evolution on the one side, and between the teleological and the spiritualistic on the other, they are not exactly co-extensive. The teleologi- cal view does no doubt imply the acceptance of a spiritual or quasi-spiritual principle; it refers the form and order of the world to the action of an intelligence (conscious or unconscious) which combines particular events as means to some comprehensive end. The mechanical view, on the other hand, does not necessarily imply the acceptance of a material principle as the one reality. It is applicable to mind as well as to body. Thus, on the determinist theory, mental devclopment is as much a mechanical process as physical development.*~~

~~*Adopting this distinction between the mechanical and teleological conception of evolution as the essential one, we may roughly classify the various systems of evolution under the three heads :—(a), those in which the mechanical view predominates ; (6), those in which the teleological view pre- dominates ; and ©, those in which the two views are com- bined in some larger conception.*~~

~~*(a) The mechanical interpretation may first of all be com- bined with a dualistic theory. Such would be Descartes's doctrine of evolution if it had been fully worked out on its mental side. Jt has been observed, however, that the mechanical view is naturally allied to the materialistic theory. Systems of evolution which arise out of this com- bination seek to resolve all appearance of order and purpose in the physical world into the combined effect of elementary forces or actions. 'They adopt a mechanical conception of organic bodies and their processes. Finally, they regard mental life and its evolution as a process of combination exactly analogous to that of physical evolution and closely correlated with a certain mode of this process. In this way they lead to a materialistic conception of man's origin and development as conditioned by physical circumstances and organic changes.*~~

~~*This thorough-going materialistic way of viewing the origin and formation of the world finds its greatest obstacle in the genesis of conscious life. HIence it has from the earliest been modified in one or two ways so as to provide a primordial source of sensation and*~~

~~*thought, without, however, abandoning a strictly mechani-*~~

~~*to4*~~

~~*cal view of the process. The first and crude form in which this modification presents itself is that of an original, thin, quasi-material substance (as ether), which may serve as the raw material, so to speak, of individual minds. The formation of these minds, however, is regarded as a strictly mechanical process, and related to that of physical evolution in the narrow sense. 'This theory of the origin of mental existence clearly approaches one of the forms of the doctrine of emanation already referred to. We have only to conceive of the primordial mental substance as the infinite being, transcending our finite world, and the doctrine becomes one of emanation. The second modification of this view consists in the theory that all parts of matter are endowed with sensibility, but that the sensations are not themselves (as teleological fac- tors) the productive force in the process, but are rather the appendages of the real factors. The world forms itself according to strictly mechanical laws of combination, and the evolution of the various grades of mind in the organic region takes place by a composition of elementary feelings exactly similar to the process of material combination.*~~

~~*Before leaving the systems which are based on the mechanical view, a bare allusion must be made to a recent suggestion that all things consist ultimately of mental sub- stance ("mind-stuff"), which combines itself both in the material world and in the region of conscious mind accord- ing to strictly mechanical principles.*~~

~~*(6) The second mode of viewing the process of evolution subordinates the idea of physical cause to that of final cause. The force which effects the continual production and transformation of things is conceived of more or less distinctly after the analogy of a rational impulse towards an end, and the process is regarded as determined or con- ditioned by this element of purpose.*~~

~~*This teleological view of evolution may be found ina number of systems of nature, which look on the material world as at once bodily and vital or spiritual, though it is often difficult to say whether any particular system*~~

~~*should be called dualistic or monistic (in the narrow sense). Thus we have the evolution of the physical world referred to a vital principle which pervades all matter, and of which the essential nature is productivity, to a formative plastic principle which moulds the dead material into various shapes, to an organizing cosmic force, and soon. In all these conceptions, which appear to aim more especially at an explanation of organic forms and life, the element of purpose appears in a nascent shape. Nature is personified as a worker who aims unconsciously and instinctively at some dimly descried end, such as the most various produc- tion, the progressive manifestation of life, and so on. In some of these systems, notably in the Aristotelian, the genesis of conscious mind is explained along with that of organic life by means of the supposition that mind is but the formative principle of the individual organism.*~~

~~*The idea of purpose becomes more definite, and, at the same time, a further step is taken towards the explanation of mental life as a development out of physical, in those systems which project a distinct spiritual principle into nature. The way in which this is frequently done is by means of the theory of a world-soul which animates the whole of the material world and directs all parts of its evolution. When this spiritual principle is regarded not only as the formative force, but also as the substantial source of conscious mental life, which has eternally coexisted with matter, we have, as already remarked, a pantheistic conception of evolution which, like another and cognate conception already referred to, approximates to one form of the emanation theory.*~~

~~*The full development of this way of regarding the world and its evolution as the work of a spiritual principle aiming*~~

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~~*towards an end is to be found in certain doctrines of Objective Idealism, which resolve all material existence into a mode of mental existence—will and thought. These theories clearly simplify the conception of evolution to the utmost, by the identification both of the substantial reality which enters into all parts of the world-process, and of the rationale of all parts of the process itself. In the systems now referred to, the mechanical idea is wholly taken up into the teleological. Purpose is the highest law of things,*~~

~~*and it is one purpose which manifests itself through all stages of the world's evolution,—in the region of inorganic nature, of organic life, and of human history. The first genesis of conscious life is explained as a particular moment in this process. In some spiritualistic systems an attempt is made to combine the mechanical (causal) and teleological ideas under the notion of logical development. Yet as a rule the teleological way of conceiving the process predo- minates.*~~

~~*(c) The systems which seek to combine the teleological and the mechanical view of evolution are for the most part based on the monistic idea that the material and the mental are two equally real aspects of one thing. It is clear that this conception of reality provides a way of doing justice to both modes of looking at evolution. In this manner the systems now spoken of are able to regard all parts of evolu- tion as identical in nature, being alike links in a chain of purposeful effects.*~~

~~*This way of regarding the world in its process of evolu- tion will vary according to the particular view of the one reality underlying material and mental phenomena. Thus we may have a universalistic conception of evolution as the two-sided activity of one undivided substance. This idea passes easily into a pantheistic view of the world- process as determined by a divine reason which is also the principle of necessity. In the second place, we may have an individualistic conception of this two-sided process, according to which the world arises out of the unceasing activity of an indefinite number of elements endowed with motion and sensation, and so comprehending a mechanical aud a teleological factor. It has already been remarked, however, that this conception may be combined with a strictly mechanical view of evolution.*~~

~~*History of the Idea of Evolution.—The doctrine of evolution in its finished and definite form is a modern product. It required for its formation an amount of scientific knowledge which could only be very gradually acquired. It is vain, therefore, to look for clearly defined and systematic presentations of the idea among ancient writers. On the other hand, nearly all systems of philo- sophy have discussed the problems underlying evolution. Such questions as the origin of the cosmos as a whole, the production of organic beings and of conscious minds, and the*~~

~~meaning of the observable grades of creation, have from the dawn of speculation occupied men's minds; and the answers to these questions often imply a vague recog- nition of the idea of a gradual evolution of things. Accordingly, in tracing the antecedents of the modern philosophic doctrine we shall have to glance at most of the principal systems of cosmology, ancient and modern. Yet since in these systems the two inquiries into the esse and fiert of the world are rarely distinguished with any precision, it will be necessary to indicate very briefly the general out- lines of the system so far as they are necessary for under- standing their bearing on the problems of evolution.~~

~~Mythological Interpretation.—The problem of the origin of the world was the first to engage man's speculative activity. Nor was this line of inquiry pursued simply as a step in the more practical problem of man's final destiny. The order of ideas observable in children sug- gests the reflection that man began to discuss the~~

~~'" whence " of existence before the " whither." At first, as in the case of the child, the problem of the genesis of things was conceived anthropomorphically : the ques- tion "' How did the world arise?" first shaped itself to the human mind under the form " Who made the world?" As long as the problem was conceived in this simple manner there was, of course, no room for the idea of a necessary self-conditioned evolution. Yet the first indistinct germ of such an idea appears to emerge in com- bination with that of creation in some of the ancient systems of theogony. (See article Cosmocony.) Thus, for example, in the myth of the ancient Parsees, the gods Ormuz and Ahriman are said to evolve themselves out of a primordial matter. It may be supposed that these crude fancies embody a dim recognition of the physical forces and objects personified under the forms of deities, and a rude attempt to account for their genesis as a natural pro- cess. These first unscientific ideas of a genesis of the per- manent objects of nature took as their pattern the process of organic reproduction and development, and this, not only because these objects were regarded as personalities, but also because this particular mode of becoming would most impress these early observers. This same way of~~

~~*looking at the origin of the material world is illustrated in the Egyptian notion of a cosmic egg out of which issues the god (Phta) who creates the world.*~~

~~*Indian Philosophy.—Passing from mythology to specula- tion properly so called, we find in the early systems of philosophy of India theories of emanation which approach in some respects the idea of evolution. Brahma is conceived as the eternal self-existent being, which on its material side unfolds itself to the world by gradually condensing itself to material objects through the gradations of ether, fire, water, earth, and the elements. At the same time this eternal being is conceived as the all-embracing world- soul from which emanates the hierarchy of individual souls. In the later system of emanation of Sankhja there is a more marked approach to a materialistic doctrine of evolution. If, we are told, we follow the chain of causes far enough back we reach unlimited eternal creative nature or matter. Out of this " principal thing" or "original nature" all material and spiritual existence issues, and into it will return. Yet this primordial creative nature is endowed with volition with regard to its own development. Its first emanation as plastic nature contains the original soul or deity out of which all individual souls issue.*~~

~~*Early Greek Physicists.—Passing by Buddhism, which, though teaching the periodic destruction of our world by fire, d&c., does not seek to determine the ultimate origin of the cosmos, we come to those early Greek physical philoso- phers who distinctly set themselves to eliminate the idea of divine interference with the world by representing its origin and changes as a natural process. The early Ionian physi- cists, including Thales, Anaximander, and Anaximenes, seek to explain the world as generated out of a primordial matter which is at the same time the universal support of things. This substance is endowed with a generative or transmutative force! by virtue of which it passes into a succession of forms. They thus resemble modern evolu- tionists, since they regard the world with its infinite variety of forms as issuing from a simple mode of matter. More especially the cosmology of Anaximander resembles the modern doctrine of evolution in its conception of the inde- terminate (73 dreipov) out of which the particular forms of the cosmos are differentiated. Again, Anaximander may be said to prepare the way for*~~

~~*more modern conceptions of material evolution by regarding his primordial substance as*~~

~~*1 According to Ueberweg (who calls their systems Hylozoism), they all conceived of this matter as vital.*~~

~~*eternal, and by looking on all generation as alternating with destruction, each step of the process being of course simply a transformation of the indestructible substance. Once more, the notion that this indeterminate body contains potentially in itself the fundamental contraries—hot, cold, &c.,—by the excretion or evolution of which definite sub- stances were generated, is clearly a forecasting of that antithesis of potentiality and actuality which from Aristotle downwards has been made the basis of so many theories of development. In conclusion, it is noteworthy that though resorting to utterly fanciful hypotheses respecting the order of the development of the world, Anaximander agrees with modern evolutionists in conceiving the heavenly bodies as arising out of an aggregation of diffused matter, and in assigning to organic life an origin in the inorganic materials of the primitive earth (pristine mud). The doctrine of Anaximenes, who unites the conceptions of a determinate and indeterminate original substance adopted by Thales and Anaximander in the hypothesis of a primordial and all- generating air, is a clear advance on these theories, inas- much as it introduces the scientific idea of condensation and rarefaction as the great generating or transforming agencies. For the rest, his theory is chiefly important as emphasizing the vital character of the original substance. The primor- dial air is co1ceived as animated. Anaximenes seems to have inclined to a view of cosmic evolution as throughout involving a quasi-spiritual factor. This idea of the air as the original principle and source of life and intelligence is much more clearly expressed by a later writer, Diogenes of Apollonia. Diogenes made this conception of a vital and intelligent air the ground of a teleological view of climatic and atmospheric phenomena. It is noteworthy that he sought to establish the identity of organic and inorganic matter by help of the facts of vegetal and animal nutri- tion.*~~

~~*Diogenes distinctly taught that the world is of finite duration, and will be renewed out of the primitive substance.*~~

~~*Pythagoreans.—We may pass by that curicus mode of conceiving the world as a development out of numbers regarded as active principles which was adopted by the Pythagoreans, since it is too remote from modern concep- tions of cosmic evolution.?*~~

~~*Eleatics.—The Eleatics, Xenophanes, Parmenides, and Zeno need to be referred to here simply on the ground of their denial of all plurality and individuality in objects and of any real process of change, development, or transforma- tion in the world. It may be added, however, that both Xenophanes and Parmenides have their way of regarding the origin of the cosmos and of animal and human life, though these conjectures are put forward as matters of "opinion," having to do with the illusory impressions of the senses only.*~~

~~*Heraclitus.—The next Greek thinker, Heraclitus, de- serves a prominent place in a history of the idea of evolu- tion. This writer distinctly sides with the Ionian physi- cists, as against the Eleatics, by asserting the reality of motion, change, and generation. He differs from the former, as Grote observes, by regarding the problem of change rather as one of ontology than of physics. Heraclitus conceives of the incessant process of flux in which all things are involved as consisting of two sides or moments—generation and decay—which are regarded as a confluence of opposite streams. In thus making transition or change, viewed as the identity of existence and non- existence the leading idea of his system, Heraclitus antici- pated in some measure Hegel's peculiar doctrine of evolu-*~~

~~*2 Grote calls attention to an analogue of this notion of number in Oken's Elements of Physio-Philosophy. See his Plato, i. p. 10, note E.*~~

~~*tion as a dialectic process.1 At the same timc, we may find expressed in figurative language the germs of thoughts which enter into still newer doctrines of evolution. For example, the notion of conflict (aéA«os) as the*~~

~~*father of all things and of harmony as arising out of a union of dis- cords,? and again of an endeavour by individual things to maintain themselves in permanence against the universal process of destruction and renovation, cannot but remind one of certain fundamental ideas in Mr Darwin's theory of evolution. According to Grote, it is doubtful how far Heraclitus intended to supply by his idea of fire a physical, as distinguished from a metaphysical, doctrine of the world- process.*~~

~~*Empedocles.—Empedocles took an important step in the direction of modern conceptions of physical evolution by teaching that all things arise, not by transformations of some primitive form of matter, but by various combinations of a number of permanent elements. Further, by maintaining that the elements are continually being combined and separated by the two forces love and hatred, which appear to represent in a figurative way the physical forces of attraction and repulsion, Empedocles may be said to have made a considerable advance in the construction of the idea of evolution as a strictly mechanical process. It may be observed, too, that the hypothesis of a primitive compact mass (spherus), in which love (attraction) is supreme, has some curious points of similarity to, and contrast with, that notion of a primitive nebulous matter with which the modern doctrine of cosmic evolution usually sets out. Empedocles tries to explain the genesis of organic beings, and, according to Lange, anticipates the idea of Mr Darwin that adaptations abound, because it is their nature to perpetuate themselves. He further recognizes a pro- gress in the production of vegetable and animal forms, though this part of his theory is essentially crude and unscientific. More important in relation to the modern problems of evolution is his thoroughly materialistic way of explaining the origin of sensation and knowledge by help of his peculiar hypothesis of effluvia and pores. The sup- position that sensation thus rests on a material process of absorption from external bodies naturally led up to the idea that plants and even inorganic substances are pre- cipient, and so to an indistinct recognition of organic life as a scale of intelligence.*~~

~~*Anaxagoras.—The doctrine of Homemeries, propounded by Anaxagoras, agrees with that of Empedocles in assigu- ing the origin of things to combinations and redistributions of certain primordial forms of matter.*~~

~~*Yet these are less simple than the elements of the other thinker. Moreover, the idea that the diversity of things arises from a preponderance of certain elements, and not from the mere fact of various combination, removes the theory of Anaxagoras further from modern conceptions of cosmic evolution than that of Empedocles.4 According to Grote's interpretation, Anaxagoras, in his conception of nous as the originator of movement and order which manifests itself as the vital principle in plants as well as in animals and man,*~~

~~*'i is brought out by F. Lassalle, Die Philosophie Herakleitos, Pp. :*~~

- ~~*Zeller observes that Heraclitus fails to tell us what are the elements which conflict.*~~

~~*8 Grote says the idea of these multifarious forms of matter was suggested by the phenomena of animal nutrition. —Plato, i. 55.*~~

~~*'It is observed by Ferrier that the doctrine of Anaxagoras reverses the order of the Atomists, by regarding the transition as one from the complex to the seemingly simple. It is no doubt true that the chief aim of Anaxagoras was to explain not so much the diversity as the orderly arrangement of individual things. Yet his conception of the primal chaos involves at least the notion of an apparent homogencity or uniformity, no particles being distinguishable from the rest. (See*~~

~~*ae op. cit. i. 51). Grote even assimilates the chaos of Anaxagoras o the primordial indeterminate of Anaximander.*~~

~~*EVO EU TA a*~~

~~*would appear to lean rather to a monistic and purely materialistic than to a dualistic conception of evolution.*~~

~~*Atomists.—In the theory of Atomism taught by Leucip- pus and Democritus we have the basis of the modern mechanical conceptions of cosmic evolution. Here the endless harmonious diversity of our cosmos, as well as of other worlds supposed to co-exist with our own, is said to arise through the various combination of indivisible material elements*~~

~~*differing in figure and magnitude only. The force which brings the atoms togetlcr in the forms of objects is inherent in the elements, and all their motions are necessary. 'The origin of things, which is also their substance, is thus laid in the simplest and most homogeneous elements or principles. The real world thus arising consists only of diverse combinations of atoms, having the properties of magnitude, figure, weight, and hardness, all other qualities bcing relative only to the sentient organism. The problem of the genesis of mind is practically solved by identifying the soul, or vital principle, with heat or fire which pervades in unequal proportions, not only man and animals, but plants and nature as a whole, and through the agitation of which by incoming effluvia all Sensation arises.*~~

~~*The Sophists—Critias.—Of the Sophists there is but onc whose doctrine need concerns us here, namely, Critias. In a fragment of his writings we meet with a speculation on the past development of man, which is curious as distinctly recognizing the upward direction of human history, and so as contrasting with the prevailing view of this history as a gradual detcrioration. Critias tells us there was a time when the life of man was lawless (éraxtos and beast-like (Oypiwdys), when he was a slave of force, and when no honour was paid to the good nor punish- ment administered to the bad. Laws having arisen, evil actions which could no longer be done overtly were still practised in secret, and at this stage a wise man arose who sought to instil terror into the minds of the people, and so conceived the Deity, who is made the more terrible by being localized in the region whence proceed thunder and lightning.*~~

~~*Plato.—Plato needs to be referred to here only because of the strongly marked opposition of his philosophy to the teaching of evolution. It is true (as Zeller remarks) that Plato's whole philosophy was directed less to the explana- tion of becoming than to the consideration of being. So far, however, as the highly mythical cosmology of the Timeus may be taken as indicating Plato's way of looking at the successive order of the world, we see that it widely deviates from that of the evolutionist. Thus the notion of the Demiurgus is distinctly contradictory of the idea of a natural process of evolution. Again, the supposition that the world of particular things is somehow determined by pre-existing universal ideas lends itself rather to*~~

~~*a theory of emanation as a descent from the more perfect to tle less perfect than to a doctrine of evolution. It became tlic basis of that doctrine of universal essences or types which for ages interfered with a scientific explanation of organic forms. Again Plato exactly reverses the order of evolution in his way of looking at the scale of organic beings and souls, since he sets out with the highest and most perfect. the divine cosmos, and passes downwards to man and the lowcr animals viewed as successive degradations.*~~

~~*LHarly Platonists.—Among the early followers of Plato, Speusippus deserves mention here in so far as he assimilated the course of the world to the development of the individual by regarding it as a progress from imperfection to per- fection.> Xenocrates again appcars to have viewed the*~~

~~*5 Speusippus differed from Plato by making good the end and not the efficient cause of being (sce Zeller, Plato, p. 568 sq.).*~~

~~*CY OR U P41 Ome*~~

~~*whole of the cosmos as a graduated scale of animate existence,*~~

~~*Aristotle.—Aristotle is much nearer a conception of evolution than his master. It is true he sets out with a transcendent Deity, and follows Plato in viewing the crea- tion of the cosmos as a process of descent from the more to the less perfect according to the distance from the original self-moving agency. Yet on the whole Aristotle leans to a teleological theory of evolution, which he inter- prets dualistually by means of certain metaphysical distinc- tions. Thus even his idea of the relation of the divine activity to the world shows, as Zeller and Lange remark, a tendency to a pantheistic notion of a divine thought which gradually realizes itself in the process of becoming. Aris- totle's distinction of form and matter, and his conception of becoming as a transition from actuality to potentiality, provides a new ontological way of conceiving the process of material and organic evolution.! To Aristotle the whole ef nature is instinct with a vital impulse towards some higher manifestation. Organic life presents itself to him as a progressive scale of complexity determined by its final end, namely, man." In some respects Aristotle approaches the*~~

~~*modern view of evolution. Thus, though he looked on species as fixed, being the realization of an unchanging formative principle (gvovs), he seems, as Ueberweg observes, to have inclined to entertain the possibility of a spontaneous generation in the case of the lowest organisms. Aristotle's teleological conception of organic evolution often approaches modern mechanical conceptions. Thus he says that nature fashions organs in the order of their necessity, the first being those essential to life. So, too, in his psychology he speaks of the several degrees of mind as arising accord- ing to a progressive necessity.2 In his view of touch and taste, as the two fundamental and essential senses, he may remind one of Mr Spencer's doctrine. At the same time Aristotle precludes the idea of a natural development of the mental series by the supposition that man contains, over and above a natural finite soul inseparable from the body, a substantial and eternal principle (vots) which enters into the individual from without. Aristotle's brief suggestions respecting the origin of society and governments in the Politics show a leaning to a naturalistic interpretation of human history as a development conditioned by growing necessities.*~~

~~*Strato.—Of Aristotle's immediate successors one deserves to be noticed here, namely, Strato of Lampsacus, who de- veloped his master's'cosmology into a system of naturalism. Strato appears to reject Aristotle's idea of an original source of movement and life extraneous to the world in favour of animmanent principle. All parts of matter have an inward plastic life whereby they can fashion themselves to the best advantage, according to their capability, though not with consciousness,*~~

~~*The Stoics.—In the cosmology of the Stoics we have the germ of a monistic and pantheistic conception of evolution. All things are said to be developed out of an original being, which is at once material (fire) and spiritual (the Deity), and in turn they will dissolve back into this primordial source. At the same time the world as a developed whole is regarded as an organism which is permeated with the divine Spirit, and so we may say that the world-process is a self-realization of the divine Being. The formative principle or force of the world is said to contain the several rational germinal forms of things. Individual things are supposed to arise out of the original being, as animals and*~~

~~*1 Zeller says that through this distinction Aristotle first made possible the idea of development.*~~

~~*2 Sec this well brought out in Mr G. H. Lewes's Aristotle, p. 187.*~~

~~*3 Grote calls attention to the contrast between Plato's and Aristotle's way of conceiving the gradations of mind (Aristoéle, ii. 171).*~~

~~*plants out of seeds. Individual souls are an efflux from the all-compassing world-soul. The necessity in the world's order is regarded by the Stoics as identical with the divine reason, and this idea is used as the basis of a teleological and optimistic view of nature. Very curious, in relation to modern evolutional ideas, is the Stoical doctrine that our world is but one of a series of exactly identical ones, all of which are destined to be burnt up and destroyed.*~~

~~*Lhe Lpicureans—Lucretius.—The Epicureans differed from the Stoics by adopting a purely mechanical view of the world-process. Their fundamental conception is that of Democritus; they seek to account for the formation of the cosmos, with its order and regularity, by setting out with the idea of an original (vertical) motion of the atoms, which somehow or other results in movements towards and from one another. Our world is but one of an infinite number of others, and all the harmonies and adaptations of the universe arc regarded as a special case of the infinite pos- sibilities of mechanical events. Lucretius regards the primitive atoms (tirst beginnings or first bodies) as seeds out of which individual things are developed. All living and sentient things are formed out of insentient atoms (e.7., worms spring out of dung). The peculiarity of organic and sentient bodies is due to the minuteness and shape of their particles, and to their special motions and combinations. So, too, mind consists but of extremely fine particles of matter, and dissolves into air when the body dies. Lucretius traces, in the fifth book of his poem, the progressive genesis of vegetal and animal forms out of the mother-earth. He vaguely anticipates the modern idea of the world as a sur- vival of the fittest when he says that many races may have lived and died out, and that those which still exist have been protected either by crafts courage, or*~~

~~speed. Lucretius touches on the development of man out of a primitive, hardy, beast-like condition. Pregnant hints are given respecting a natural development of language which has its germs in sounds of quadrupeds and birds, of religious ideas out of dreams and waking hallucinations, and of the art of music by help of the suggestion of natural sounds. Lucretius thus recognizes the whole range of exist- ence to which the doctrine of evolution may be applied.~~

~~Neo-Piatonists.—In the doctrines of the Neo-Platonists, of whom Plotinus is the most important, we have the world- process represented after the example of Plato as a series of descending steps, each being less perfect than its prede- cessors, since it is further removed from the first cause.# The system of Plotinus, Zeller remarks, is not strictly speaking one of emanation, since there is no communication of the divine essence to the created world; yet it resembles emanation inasmuch as the genesis of the world is conceived as a necessary physical effect, and not as the result of voli- tion. In Proclus we find this conception of an emanation of the world out of the Deity, or the absolute, made more exact, the process being regarded as threefold—(1) persis- tence of cause in effect, (2) the departure of effect from cause, and (3) the tendency of effect to revert to its cause.~~

~~Lhe Lathers.—The speculations of the fathers respecting the origin and course of the world seek to combine Chris- tian ideas of the Deity with doctrines of Greek philosophy. The common idea of the origin of things is that of an ab- solute creation of matter and mind alike. The course of human history is regarded by those writers who are most concerned to refute Judaism as a progressive divine educa- tion. Among the Gnostics we meet with the hypothesis of emanation, as, for example, in the curious cosmic theory of Valentinus.~~

~~Middle Ages—EKarly Schoolmen.—In the speculative~~

~~4 Zeller observes that this scale of decreasing perfection is a necessary consequence of the idea of a transcendent deity.~~

~~*writings of the Middle Ages, including those of the sclicol- men, we find no progress towards a more accurate and scientific view of nature. The cosmology of this period consists for the most part of the Aristotelian teleological view of nature combined with the Christian idea of the Deity and His relation to the world. In certain writers, however, there appears a more elaborate transformation of the doc- trine of creation into a system of emanation. According to John Scotus Erigena, the nothing out of which the world is created is the divine essence. Creation is the act by which God passes through the primordial causes, or univer- sal ideas, into the region of particular things (processto), in order finally to return to himself (reversio). The transition from the universal to the particular is of course conceived as a descent or degradation. A similar doctrine of emana- tion is to be found in the writings of Bernhard of Chartres, who conceives the process of the unfolding of the world as a movement ina circle from the most general to the indivi- dual, and from this back to the most general. This move- ment is said to go forth from God to the animated heaven, stars, visible world, and man, which represent decreasing degrees of cognition. .*~~

~~*Arab Philosophers.—Elaborate doctrines of emanation, largely based on Neo-Platonic ideas, are also propounded by some of the Arabic philosophers, as by Alfarabi and Avicenna. The leading thought is that of a descending series of intelligences, each emanating from its predecessor, and having its appropriate region in the universe.*~~

~~*Jewish Plalosophy.—In the Jewish speculations of the Middle Ages may be found curious forms of the doctrine of emanations, uniting the Biblical idea of creation with elemcuts drawn from the Persians and the Greeks. In the later and developed form of the Cabala, the origin of tlie world is represented as a gradually descending emanation of the lower out of the higher. Among the philosophic Jews, the Spanish Avicebron, in his Mons Vite, expounds a curious doctrine of emanation. Here the divine will is viewed as an efflux from the divine wisdom, as the inter- mediate link between God, the first substance and all things, and as the fountain out of which all forms emanate. At the same time all forms, including the higher intelligible ones, are said to have their existence only in matter. Matter is the one universal substance, body and mind being merely specifications of*~~

~~*this. 'Thus Avicebron approaches, as M. Munk observes,! a pantheistic conception of the world, though he distinctly denies both matter and form to God.*~~

~~*Later Scholastics.—Passing now to the later schoolmen, a bare mention must be made of Thomas, who elaborately argues for the absolute creation of the world out of nothing, and of Albertus Magnus, who reasons against the Aristo- telian idea of the past eternity of the world. More import- ance attaches to Duns Scotus, who brings prominently for- ward the idea of a progressive development in nature by means of a process of determination. The original sub- stance of the world is the materia primo-prima, which is the immediate creation of the Deity. This serves Duns Scotus as the most universal basis of existence, all angels having material bodies. This matter is differentiated into particular things (which are not privations but perfections) through the addition of an individualizing principle (heeccceitas) to the universal (quidditas). is represented by the figure of a tree, of which the seeds and roots are the first indeterminate matter, the leaves the accidents, the twigs and branches corruptible creatures, the blossoms the rational soul, and the fruit pure spirits or angels. It is also described as a bifurcation of two twigs, mental and bodily creation out of a common root. One*~~

~~*1 Mélanges de philosophie juive et arabe, p. 225.*~~

~~*The whole world |*~~

~~*EVOLUTION*~~

~~*might almost say that Duns Scotus recognizes the principle of a gradual physical evolution, only that he chooses to re- present the mechanism by which the process is brouglit about by means of quaint scholastic fictions.*~~

~~*Revival of Learning.—The period of the revival of learn- ing, which was also that of a renewed study of nature, is marked by a considerable amount of speculation respecting the origin of the universe. In some of these we see a re- turn to Greek theories, though the influence of physical dis- coveries, more especially those of Copernicus, Kepler, and Galileo, is distinctly traceable.*~~

~~*Telesio.—An example of a return to early Greek specu- lation is to be met with in Bernardino Telesio. By this writer the world is explained as a product of three prin- ciples,—dead matter, and two active forces, heat and cold. Terrestrial things arise through a confluence of heat, which issues from the heavens, and cold, which comes from the earth. Both principles have sensibility, and thus all pro- ducts of their collision are sentient, that is, feel pleasure and pain. The superiority of animals to plants and metals in the possession of special organs of sense is connected with the greater complexity and heterogeneity of their structure.*~~

~~*Giordano Bruno.—In the system of Giordano Bruno, wlio sought to construct a philosophy of nature on the basis of new scientific ideas, more particularly the doctrine of Copernicus, we find the outlines of a theory of cosmic-evolution conceived as an essentially vital process. Matter and form are here identified, and the evolution of the world is presented as the unfolding of the world-spirit to its perfect forms according to the plastic substratum (matter) which is but one of its sides. This process of change is con- ceived as a transformation, in appearance only, of the real unchangiug substance (matter and form). All parts of matter are capable of developing into all forms; thus the materials of the table and chair may, under proper cir- cumstances, be developed to the life of the plant or of the animal. The elementary parts of existence are the minima, or monads, which are at once material and mental. On their material side they are not absolutely unextended, but spherical. Bruno looked on our solar system as but one out of an infinite number of worlds. HIs theory of evolution is essentially pantheistic, and he does not employ his hypothesis of monads in order to work out a more mechanical conception.*~~

~~*Campanella.—A word must be given to one of Bruno's contemporary compatriots, namely Campanella, who gave poetic expression to that system of universal vitalism which Bruno developed. HIe argues, from the principle quic- quid est in effectibus esse et im causis, that the elements and the whole world have sensation, and thus he appears to derive the organic part of nature out of the so-called " inor- ganic."*~~

~~*Boehme.—Another writer of this transition period deserves a passing reference here, namely, Jacob Boehme the mystic, who by his conception of a process of inner diremption as the essential character of all mind, and so of God, prepared the way for later German theories of the origin of the world as the self-differentiation and self-externalization of the absolute spirit.*~~

~~*Hobbes and Gassendr.—The influence of an advancing study of nature, which was stimulated if not guided by Bacon's writings, is seen in the more careful doctrines of materialism worked out almost simultaneously by Hobbes and Gassendi. These theories, however, contain little that bears directly on the hypothesis of a natural evolution of things. In the view of Hobbes, the difficulty of the genesis of conscious minds is solved by saying that sensa- tion and thought are part of the reaction of the organism on external movement. Yet Hobbes appears (as Clarke points out) to have vaguely felt the difficulty; and in a*~~

~~*passage of his Physics (chap. 25, sect. 5) he says that the universal existence of sensation in matter cannot be dis- proved, though he shows that when there are no organic arrangements the mental side of the movement (phantasma) is evanescent. The theory of the origin of society put forth by Hobbes, though directly opposed in most respects to modern ideas of social evolution, deserves mention here*~~

~~*by reason of its enforcing that principle of struggle (bellum !*~~

~~*omnium contra omies) which has played so conspicuous a part in recent doctrines of evolution. Gassendi, with some deviations, follows Epicurus in his theory of the formation of the world. 'The world consists of a finite number of atoms, which have in their own nature a self-moving force or principle. These atoms, which are the seeds of all things, are, however, not eternal but created by God. Gassendi distinctly argues against the existence of a world- soul or a principle of life in nature.*~~

~~*Descartes.—In the philosophy of Descartes we meet with a dualism of mind and matter which does not easily lend itself to the conception of*~~

~~*evolution. His doctrine that consciousness is confined to man, the lower animals being unconscious machines (automata), excludes all idea of a progressive development of mind. Yet Descartes, in his Principia Philosophia, laid the foundation of the modern mechanical conception of nature and of physical evolution. In the third part of this work he inclines to a thoroughly natural hypothesis respecting the genesis of the physical world, and adds in the fourth part that the same kind of explanation might be applied to the nature and formation of plants and animals. He is indeed careful to keep right with the orthodox doctrine of creation by saying that he does not believe the world actually arose in this mechanical way out of the three kinds of elements which he here sup- poses, but that he simply puts out his hypothesis as a mode of conceiving how it might have arisen. Descartes's account of the mind and its passions is thoroughly materialistic, and to this extent he works in the direction of a material- istic explanation of the origin of mental life.*~~

~~*Spinoza.—In Spinoza's pantheistic theory of the world, which regards thought and extension as but two sides of one substance, the problem of becoming is submerged in that of being. Although Spinoza's theory attributes a mental side to all physical events, he rejects all teleolo- gical conceptions and explains the order of things as the result of an inherent necessity. He recognizes gradations of things according to the degree of complexity of their movements and that of their conceptions. To Spinoza (as Kuno Fischer observes) man differs from the rest of nature in the degree only and not in the kind of his powers. So far Spinoza approaches the conception of evolution. He may be said to furnish a further contribution toa meta- physical conception of evolution in his view of all finite individual things as the infinite variety to which the unlimited productive power of the universal substance gives birth. Mr F. Pollock has taken pains to show in more than one essay how nearly Spinoza approaches certain ideas contained in the modern doctrine of evolution, as for example that of self-preservation as the determining force in things.*~~

~~*Cudworth.—One or two English writers belonging to the latter part of the 17th century must be glanced at here. Of these the first is Cudworth, who, in his work Zhe True Intellectual System of the Universe, elaborately*~~

~~criticises the various "atheistic" modes of explaining the origin and form of the world as a natural process. Cudworth emphasizes especially the difficulty of explaining the rise of consciousness, and seeks to show how the early Greek atomical physiologists were driven to assume a spiritual principle over and above their material elements. He dwells on the signs of purpose in nature, and argues that~~

~~no fortuitous combination of elements could have sufficed to produce that balance of male and female individuals on which the preservation of species depends. Yet though thus an anti-evolutionist, Cudworth provides a way of in- terpreting the evolution of life by means of an immanent principle, since he refers the forms of nature to a plastic principle, which does not involve consciousness, though it may be called a drowsy unawakened cognition.~~

~~Locke.—In Locke we find, with a retention of certain anti-evolutionist ideas, a marked tendency to this mode of viewing the world. 'To Locke the universe is the resnit of a direct act of creation, even matter being limited in dura- tion and created. Even if matter were eternal it would, he thinks, be incapable of producing motion ; and if motion is itself conceived as eternal, thought can never begin to be. The first eternal being is thus spiritual or " cogitative," and contains in itself all the perfections that can ever after exist. He repeatedly insists on the impossibility of senseless matter putting on sense! Yet while thus placing himself at a point of view opposed to that of a gradual evolution of the organic world, Locke prepared the way for this doctrine in more ways than one. First of all, his genetic method as applied to the mind's ideas—which laid the foundations of English analytical psychology—was a step in the direction of a conception of mental life as a gradual evolution. Again he works towards the same end in his celebrated re- futation of the scholastic theory of real specific essences. In this argument he emphasizes the vagueness of the boundaries which mark off organic species with a view to show that these do not correspond to absolutely fixed divisions in the objective world, that they are made by the mind, not by nature. This idea of the continuity of species is developed more fully in a remarkable~~

~~*passage (Essay, bk. iii. ch vi. § 12), where he is arguing in favour of the hypothesis, afterwards elaborated by Leipnitz, of a graduated series of minds (species of spirits) from the Deity down to the lowest animal intelligence. He here observes that "all quite down from us the descent is by easy steps, and a continued series of things, that in each re- move differ very little from one another." Thus man approaches the beasts, and the animal kingdom is nearly joined with the vegetable, and so on down to the lowest and " most inorganical parts of matter." Finally, it is to be observed that Locke had a singularly clear view of organic arrangements (which of course he explained accord- ing to a theistic teleology) as an adaptation to the circum- stances of the environment or to "the neighbourhood of the bodies that surround us." Thus he suggests that man has not eyes of a microscopic delicacy, because he would receive no great advantage from such acute organs, since though adding indefinitely to his speculative knowledge of the physical world they would not practically benefit their possessor (e¢g., by enabling him to avoid things at a con- venient distance).°*~~

~~*Idea of Progress in History.—Before leaving the 17th century we must just refer to the writers who laid the foun- dations of the essentially modern conception of human his- tory asa gradual upward progress. According to Prof. Flint,* there were four men who in this century seized and made*~~

~~*1 Yet he leaves open the question whether the Deity has annexed thought to matter as a faculty, or whether it rests on a distinct spiritual principle.*~~

~~*2 Locke half playfully touches on certain monsters, with respect to which it is difficult to determine whether they ought to be called men. (Essay, book iii. ch. vi. sect. 26, 27.)*~~

~~*3 A similar coincidence between the teleological and the modern evo- lutional way of viewing things is to be met with in Locke's account of the use of pain in relation to the preservation of our being, bk. ii. ch. vii. sect. 4.*~~

~~*4 Philosophy of History, Introduction, p. 28 sqq., where an ins teresting sketch of the growth of the idea of progress is to be found,*~~

prominent this idea, namely, Bodin, Bacon, Descartes, and Pascal. The former distinctly argues against the idea of a deterioration of man in the past. In this way we see that just as advancing natural science was preparing the way for a doctrine of physical evolution, so advancing historical re- search was leading to the application of a similar idea to the collective human life.

English Writers of the 18th Century—Hume.—The theo logical discussions which make up so large a part of the English speculation of the last century cannot detain us here. There is, however, one writer who sets forth so clearly the alternative suppositions respecting the origin of the world that he claims a brief notice. We refer to David Hume, In his Dialogues concerning Natural Re- ligion he puts forwards tentatively, in the person of one of his interlocutors, the ancient hypothesis that since the world resembles an animal or vegetal organism rather than a machine, it might more easily be accounted for by a pro- cess of generation than by an act of creation. Later on he develops the materialistic view of Epicurus, only modify- ing it so far as to conceive of matter as finite. Since a finite number of particles is only susceptible of finite trans- positions, it must happen (he says), in an eternal duration that every possible order or position will be tried an infinite nuniber of times, and hence this world is to be regarded (as the Stoics maintained) as an exact reproduction of previous worlds. The speaker seeks to make intelligible the appearance of art and contrivance in the world as a result of a natural settlement of the universe (which passes through a succession of chaotic conditions) into a stable condition, having a constancy in its forms, yet without its several parts losing their motion and fluctuation.

Priestley.—The English materialists of the latter part of the century did little to work out the idea of evolution. Priestley needs to be mentioned here only by reason of his clear recognition of human progress.

Monboddo.—Of other British writers of the period, Lord Monboddo must be named on account of his curious speculations respecting the origin of man. In his Ancient Metaphysics (vol. iii.), Monboddo conceives man as

~~*gradually elevating himself from an animal condition, in which his mind is immersed in matter, to a state in which mind acts independently of body. In his equally voluminous work, The Origin and Progress of Language, Monboddo brings man under the same species as the orang-outang. He traces the gradual elevation of man to the social state, which he conceives as a natural process determined by "the necessities of human life." He looks on langnage (which is not "natural" to man in the sense of being necessary to his self-preservation) as a consequence of his social state.*~~

~~*French Writers of the 18th Century.—Let us now pass to the French writers of the last century. Here we are first struck by the results of advancing physical speculation in their bearing on the conception of the world. Careful attempts, based on new scientific truths, are made to explain the genesis of the world as a natural process. Maupertuis, who, together with Voltaire, introduced the new idea of the universe as based on Newton's discoveries, sought to account for the origin of organic things by the hypothesis of sentient atoms. Buffon the naturalist speculated, not ouly on the structure and genesis of organic beings, but also on the course of formation of the earth and solar system, which he conceived after the analogy of the development of organic beings out of seed. Diderot, too, in his varied in- tellectual activity, found time to speculate on the genesis of sensation and thought out of a combination of matter endowed with an elementary kind of sentience. De la Mettrie worked out a materialistic doctrine of the origin of things, according to which sensation and consciousness are*~~

~~*nothing but a development out of matter. He sought (Lhomme-machine) to connect man in his original condition with the lower animals, and emphasized (L'homme-plante) the essential unity of plan of all living things. Helvetius, in his work on man, referred all differences between our species and the lower animals to certain peculiarities of organization, and so prepared the way for a conception of human development out of lower forms as a process of physical evolution, Charles Bonnet met the difficulty of the origin of conscious beings much in the same way as*~~

~~*Leibnitz, by the supposition of eternal minute organic bodies to which are attached immortal souls. Yet though in this way opposing himself to the method of the modern doctrine of evolution, he aided the development of this doctrine by his view of the organic world as an ascend- ing scale from the simple to the complex. Robinet, in his treatise De la Nature, worked out the same conception of a gradation in organic existence, connecting this with a general view of nature as a progress from the lowest inorganic forms of matter up to man. 'The process is con- ceived as an infinite series of variations or specifications of one primitive and common type. Man is the chef dewvre of nature, which the gradual progression of beings was to have as its last term, and all lower creations are regarded as pre-conditions of man's existence, since nature " could only realize the human form by combining in all imaginable ways each of the traits which was to enter into it." The formative force in this process of evolution (or " metamor- phosis") is conceived as an intellectual principle (idée génératrice). Robinet thus laid the foundation of that view of the world as wholly vital, and as a progressive unfolding of a spiritual formative principle, which was afterwards worked out by Schelling. It is to be added that Robinet adopted a thorough-going materialistic view of the depen- dence of mind on body, going even to the length of assign- ing special nerve-fibres to the moral sense. The system of HIolbach seeks to provide a consistent materialistic view of the world and its processes. Mental operations are identified with physical movements, the three conditions of physical movement, inertia, attraction, and repulsion, being in the moral world self-love, love, and hate. HIe left open the question whether the capability of sensation belongs to all matter, or is confined to the combinations of certain materials. HIe looked on the actions of the individual organism and of society as determined by the needs of self-preservation. HIe conceived of man asa product of nature that had gradually developed itself from a low condition, though he relinquished the problem of the exact mode of his first genesis and advance as not soluble by data of experience. HIolbach thus worked out the basis of a rigorously materialistic conception of evolution.*~~

~~*The question of human development which HIolbach touched on was one which occupied many minds both in aud out of France during the past century, and more especially towards its close. The foundations of this*~~

~~*theory of history as an upward progress of man out of a barbaric and animal condition were laid by Vico in his celebrated work Principu di Scienza Nuova. In France the doctrine was represented by Turgot and Condorcet.*~~

~~*Of the English writers who discussed the question of man's development we have already spoken. The German speculations on the subject will be touched on presently.*~~

~~*German Writers of the 18th Century—Leibnitz.—In Leibnitz we find, if not a doctrine of evolution in the strict sense, a theory of the world which is curiously related to the modern doctrine. The chief aim of Leibnitz is no doubt to account for the world in its static aspect as a co-existent whole, to conceive the ultimate reality of things in such a way as to solve the mystery of mind and matter. Yet by his very mode of solving the*~~

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~~*problem he is led on to cunsider the nature of the world- process, By placing substantial reality in an infinite number of monads whose essential nature is force or activity, which is conceived as mental (representation), Leibnitz was carried on to the explanation of the successive order of the world. IIe prepares the way, too, for a doctrine of evolution by his monistic idea of the substantial similarity of all things, inorganic and organic, bodily and spiritual, and still more by his conception of a perfect gradation of existence from the lowest " inanimate" objects, whose essential activity is confused representation, up to the highest organized being—man—with his clear intelli- gence! Tnrning now to Leibnitz's conception of the world as a process, we see first that he supplies, in his notion of the underlying reality as force which is re- presented as spiritual (quelque chose @analogique au senti- ment et & Pappétt), both a mechanical and a teleological explanation of its order. More than this, Leibnitz supposes that the activity of the monads takes the form of a self-evolution. It is the following out of an inherent tendency or impulse to a series of changes, all of which were virtually pre-existent, and this process cannot be interfered with from without. As the individual monad, so the whole system which makes up the world is a gradual development. In this case, however, we cannot say that each step*~~

~~*goes out of the other as in that of individual development. Each monad is an original independent being, and is determined to take this particular point in the universe, this place in the scale of 'beings. We see how different this metaphysical conception is from that scientific notion of cosmic evolution in which the lower stages are the antecedents and conditions of the higher. It is probable that Leibnitz's notion of time and space, which approaches Kant's theory, led him to attach but little importance to the successive order of the world. Leibnitz, in fact, presents to us an in- finite system of perfectly distinct though parallel develop- ments, which on their mental side assume the aspect of a scale, not through any mutual action, but solely through the determination of the Deity. Even this idea, however, is incomplete, for Leibnitz fails to explain the physical aspect of development. Thus he does not account for the fact that organic beings—which have always existed as pre- formations (in the case of animals as animaux spermatiques) come to be developed under given conditions. Yet Leibnitz prepared the way for a new conception of organic evolution, The modern monistic doctrine, that all material things consist of sentient elements, and that consciousness arises through a combination of these, was a natural transformation of Leibnitz's theory.?*~~

~~*Lessing.—Of Leibnitz's immediate followers we may mention Lessing, who in his Zducation of the Human Race brought out the trnth of th'e process of gradual develop- ment underlying human history, even though he expressed this in a form inconsistent with the idea of a spoutancous evolution.*~~

~~*' Herder.—Herder, on the other hand, Lessing's contem- porary, treated the subject of man's development in a thoroughly naturalistic spirit, In his Zdeen sur Philo- soplue der G'eschichte, Herder adopts Leibnitz's idea of a graduated scale of beings, at the same time conceiving of the lower stages as the conditions of the higher. Thus*~~

~~*1 Mr Lewes points out that Leibnitz is inconsistent in his account of the intelligence of man in relation to that of lower animals, since when answering Locke he no longer regards these as differing in degree only.*~~

~~*? Both Mr Lewes and Prof, Du Bois Reymond have brought ont the points of contact between Leibnitz's theory of monads and modern bio-*~~

~~logical speculations (Zist. of Phil. ii. 287, and Leibnitesche Gedanken~~

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~~in der modernen Naturwissenschaft, p. 23 sq.).~~

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~~man is said to be the highest product of nature, and as such to be dependent on all lower products. All material things are assimilated to one another as organic, the vitaliz- ing principle being inherent in all matter, The develop- ment of man is explained in connection with that of the earth, and in relation to climatic variations, é&c, Man's mental faculties are viewed as related to his organization, aud as developed under the pressure of the necessities of life.®~~

~~Avant.—Kant's relation to the doctrine of evolution is a many-sided one. In the first place, his peculiar system of subjective idealism, involving the idea that time is but a mental form to which there corresponds nothing in the sphere of noiimenal reality, serves to give a peculiar philosophical interpretation to every doctrine of cosmic evolution. Kant, like Leibnitz, seeks to reconcile the mechanical and teleological views of nature, only he assigns to these different spheres. 'The order of the inor- ganic world is explained by properly physical causes. In his Naturgeschichte des Himmels, in which he anticipated the nebular theory afterwards more fully developed by Laplace, Kant sought to explain the genesis of the cosmos as a pro- duct of physical forces and laws. The worlds, or systems of worlds, which fill infinite space are continually being formed and destroyed. Chaos passes by a process of evolu- tion into a cosmos, and this again into chaos. So far as the evolution of the solar system is concerned, Kant held these mechanical causes as adequate. For the world asa whole, however, he postulated a beginning in time (whence his use of the word creation), and further supposed that the impulse of organization which was conveyed to chaotic matter by the Creator issued from a central point in the infinite space spreading gradually outwards.4 While in his cosmology Kant thus relies on mechanical conceptions, in his treatment of organic life his mind is, on the contrary, dominated by teleological ideas. An organism was to him something controlled by a formative~~

~~organizing principle. It was natural, therefore, that he rejected the idea of a spontaneous generation of organisms (which was just then being advocated by his friend Forster), not only as unsup- ported by experience but as an inadequate hypothesis. Ex- perience forbids our excluding organic activity from natural causes, also our excluding intelligence from purposeful (zweckthdtigen) causes ; hence experience forbids our defin- ing the fundamental force or first cause out of which living creatures arose.° Just as Kant thus sharply marks off the regions of the inorganic and tlie organic, so he sets man in strong opposition to the lower animals. His ascription to man of a unique faculty, free-will, forbade his conceiving our species as a link in a graduated series of organic developments. In his doctrine of human development he does indeed recognize an early stage of existence in which our species was dominated by sensuous enjoyment and in- stinct. He further conceives of this stage as itself a pro- cess of (natural) development, namely, of the natural dis- position of the species to vary in the greatest possible manner so as to preserve its unity through a process of self- adaptation (Azarten) to climate. This, he says, must not be conceived as resulting from the action of external causes, but is due to a natural disposition (Analge). From this~~

~~3 For Herder's position in relation to the modern doctrine of evoln- tion see F. von Barenbach's Herder als Vorgdnger Darwins, a work which tends to exaggerate the proximity of the two writers.~~

~~"Kant held it probable that other planets besides our earth are inhabited, and that their inhabitants form a scale of beings, their perfection increasing with the distance of the planet which they inhabit from the sun.~~

- ~~Kant calls the doctrine of the transmutation of species 'a hazardous fancy of the reason." 'Yet, as Strauss and others have shown, Kant's mind betrayed a decided leaning at times to a more mechanical conception of organic forms as related by descent.~~

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~~capability of natural development. (which already involves a teleological idea) Kant distinguishes the power of moral self-development or self-liberation from the dominion of nature, the gradual realization of which constitutes human history or progress. This moral development is regarded as a gradual approach to that rational, social, and political state in which will be realized the greatest possible quantity of liberty. Thus Kant, though he appropriated and gave new form to the idea of human progress, conceived of this as wholly distinct from a natural (mechanical) process. In this particular, as in his view of organic actions, Kant distinctly opposed the idea of evolution as one universal process swaying alike the physical and the moral world.~~

~~Schelling.—In the carlier writings of Schelling, containing the philosophy of identity, existence is represented as a becoming, or process of evolution. Nature and mind (which are the two sides, or polar directions, of the one absolute) are each viewed as an activity advancing by an uninterrupted succession of stages. The side of this process which Schelling worked out most completely is the negative side, that is, nature Nature is essentially a process of organic self-evolution. It can only be understood by subordinating the mechanical conception to the vital, by conceiving the world as one organism animated by a spiritual principle or intelligence (Weltseele). From this point of view the pro- cesses of nature from the inorganic up to the most com- plex of the organic become stages in the self-realization of nature. All organic forms are at bottom but one organiza- tion, and the inorganic world shows the same formative activity in various degrees or potences. Schelling conceives of the gradual self-evolution of nature in a succession of higher and higher forms as brought about by a limitation of her infinite productivity, showing itself in a series of points of arrest. The detailed exhibition of the organizing activity of nature in the several processes of the organic and inorganic world rests on a number of fanciful and unscientific ideas. Schelling's theory is a bold attempt to revitalize nature in the light of growing physical and physiological science, and by so doing to comprehend the unity of the world under the idea of one principle of organic development. HIs highly figurative language might leave us in doubt how far he conceived the higher stages of this evolution of nature as following the lower in time. In the introduction to his work Von der Weltseele, however, he argues in~~

~~*favour of the possibility of a transmutation of species in periods incommensurable with ours. The evolu- tion of mind (the positive pole) proceeds by way of three stages,—theoretic, practical, and sthetical activity. Schelling's later theosophic speculations do not specially concern us here.*~~

~~*Followers of Schelling.—Of the followers of Schelling a word or 'wo must be said. Heinrich Steffens, in his Anthropologie, seeks to trace out the origin and history of man in connexion with a general theory of the development of the earth, and this again as related to the formation of*~~

~~*the solar system. All these processes are regarded as a-*~~

~~*series of manifestations of a vital principle in higher and higher forms. Oken, again, who carries Schelling's ideas into the region of biological science, seeks to reconstruct the gradual evolution of the material world out of original matter, which is the first immediate appearance of God, or the absolute. This process is an upward one, through the formation of the solar system and of our earth with its inorganic bodies, up to the production of man. The process is essentially a polar linear action, or differentiation from a common centre. By means of this process the bodies of the solar system separate themselves, and the order of cosmic evolution is repeated in that of terrestrial evolution. The organic world (like the world as a whole) arises out of a primitive chaos, namely, the*~~

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~~*infusorial slime. A somewhat similar working out of Schelling's idea is to be found in Oersted's work entitled The Soul in Nature (Eng. trans.). Of later works based on Schelling's doctrine of evolution mention may be made of the volume cntitled Natur wnd Idee, by G. F. Carus. According to this writer, existence is nothing but a be- coming, and matter is simply the momentary product of the process of becoming, while force is this process constantly revealing itself in these products.*~~

~~*Hegel.—Like Schelling, Hegel conceives the problem of existence as one of becoming. He differs from him with respect to the ultimate motive of that. process of gradual evolution which reveals itself alike in nature and*~~

~~*in mind. With Hegel the absolute is itself a dialectic process which contains within itself a principle of progress from difference to difference and from unity to unity. "'This process (Mr Wallace remarks) knows nothing of the distinctions between past and future, because it implies an eternal present." This conception of an immanent spontaneous evolution is applied alike both to nature and to mind and history. Nature to Hegel is the idea in the form of hetereity ; and finding itself here it has to remove this exteriority in a progressive evolution towards an existence for itself in life and mind. Nature (says Zeller) is to Hegel a system of gradations, of which one arises necessarily out of the other, and is the proximate truth of that out of which it results. There are three stadia, or moments, in' this process of nature—(1) the mechanical moment, or matter devoid of individuality ; (2) the physical moment, or matter which has particularized itself in bodies—the solar system ; and (3) the organic moment, or organic beings, beginning with the geological organism—or the mineral kingdom, plants, and animals. Yet this process of development is not to be conceived as if one stage is naturally produced out of the other, and not even as if the one followed the other in time. Only spirit has a history; in nature all forms are contemporaneous.! Hegel's interpretation of mind and history as a process of evolution has more scientific interest than his conception of nature. His theory of the development of free-will (the objective spirit), which takes its start from Kant's conception of history, with its three stages of legal right, morality as determined by motive and instinctive goodness (Sittlichkeit), might almost as well be expressed in terms of a thoroughly naturalistic doctrine of human development. So, too, some of his conceptions respecting the development of art and religion (the absolute spirit) lend themselves to a similar interpretation, Yet while, in its application to history, Hegel's theory of evolution has points of resem- blance with those doctrines which seek to explain the world-process as one unbroken progress occurring in time, it constitutes on the whole a theory apart and suz generis. It does not conceive of the érganic as succeeding on the inorganic, or of conscious life as conditioned in time by lower forms. In this respect it resembles Leibnitz's idea of the world as a development; the idea of evolution is in each case a metaphysical as distinguished from a scientific one.2 Hegel gives a place in his metaphysical system to the mechanical and the*~~

~~*teleological views; yet in his treatment of the world as an evolution the idea of end or purpose is the predominant one.*~~

~~*Of the followers of Hegel who have worked out his*~~

~~*1 Hegel somewhere says that the question of the eternal duration of the world is unanswerable: time as well as space. can be pre- dicated of finitudes only.*~~

~~*2Mr Wallace (Logic of Hegel, Proleg. pp. 48, 49) speaks of Hegel's system of evolution as having been in a sense the transfor- mation into a philosophic shape of the biological doctrine of evolution as suggested by Treviranus and Lamarck. Yet this relation is by no means obvious.*~~

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~~*peculiar idea of evolution it is hardly necessary to speak. | Yet though Comte did not contribute to a theory of cosmic*~~

~~*A bare reference may be made to Rosenkranz, who in his work Hegel's Naturphilosophie, seeks to develop Hegel's idea of an earth-organism in the light of recent science, recognizing in crystallization the morphological element.*~~

~~*Schopenhauer.—Of the other German philosophers immediately following Kant, there is only one who calls for notice here, namely, Arthur Schopenbauer. This writer, by his conception of the world as will which objectifies itself in a series of gradations from the lowest manifes- tations of matter up to conscious man, gives a slightly new shape to the evolutional view of Schelling, though he deprives this view of its optimistic character by denying any co-operation of intelligence in the world-process, In truth, Schopenhauer's conception of the world as the activity of a blind force is at bottom a materialistic and mechanical rather than a spiritualistic and teleological theory. Moreover, Schopenhauer's subjective idealism, and his view of time as something illusory, hindered him from viewing this process as a sequence of events in time. Thus he*~~

~~*ascribes eternity of existence to species under the form of the " Platonic ideas." As Ludwig Noiré observes,! Schopenhauer has no feeling for the problem of the origin of organic beings. HIe says Lamarck's original animal is something metaphysical, not physical, namely, the will to live. " HIvery species (according to Schopenhauer) has of its own will, and according to the circumstances under which it would live, determined its form and organization, — yet not as something physical in time, but as something metaphysical out of time."*~~

~~*Von Baer.—Before leaving the German speculation of the first half of the century, a word must be said of Von Baer, who not only reached those ideas of individual and serial development which are at the basis of the modern doctrine of organic evolution, but who recognized in the law of this development the law of the universe as a whole. In his Lntwickelungsgeschichte der Thiere (p. 264) he dis- tinctly tells us that the law of growing individuality is "the fundamental thought which goes through all forms and degrees of animal development and all single relations. It is the same thought which collected in the cosmic space the divided masses into spheres, and combined these to solar systems; the same which caused the weather-beaten dust on the surface of our metallic planet to spring forth into living forms." Von Baer thus prepared the way for Mr Spencer's generalization of the law of organic evolution as the law of all evolution.*~~

~~*Early Half of the Century—English Writers.—We may here conveniently break off our review of German evolu- tionists, returning to the writers of the latter part of the century presently. The thinkers outside Germany who in the first half of the century contributed elements to the growth of the idea of evolution are too unimportant to de- tain us here. In the English philosophy of this period questions of cosmology play a very inconsiderable part. The development of the analytical psychology, especially by the two Mills, may be referred to, Also an allusion may be made to the discussions respecting the nature of cause. Among these Sir W. HIamilton's definition of cause (Lectures on Metaphysics, ii. 377) is specially interesting as appearing to tell against the production of mind out of matter,*~~

~~*French Writers—Comte.—In France during this period the name of Auguste Comte is the only one that need arrest our attention. Comte's principles of positivism, which re- stricted all inquiry to phenomena and their laws, are said by his recent disciples to exclude all consideration of the ultimate origin of the universe, as well as of organic life,*~~

~~*ao re*~~

~~*1 Der monistische Gedanke, p. 238 sq.*~~

~~*organic evolution, he helped to lay the foundations of a scientific conception of human history as a natural process of development determined by general laws of human nature together with the accumulating influences of the past. Comte does not recognize that this process is aided by any increase of innate capacity; on the contrary, pro- gress is to him the unfolding of fundamental faculties of human nature which always pre-existed in a latent condi- tion; yet he may perhaps be said to have prepared the way for the new conception of human progress by his inclusion of mental laws under biology.*~~

~~*Italian Writers—In Italy during this period there meet us one or two thinkers who concern themselves with the interpretation of the world-process. Ant. Rosmini follows Campanella in endowing chemical atoms with sensi- bility and life, and he bases the hierarchy of beings in the universe on the different degrees of this sensibility. At the same time he follows Bruno in speaking of the totality of the world as an organism endowed with a soul which in- dividualizes itself in the innumerable existences of the uni- verse. Spontancous generation is to Rosmini a necessary consequence of his theory of a universal life. Other Italian writers adopt Hegel's notion of the world as aself-evolution of the idea. Of these it is enough to mention Terensio Mamiani, who gives an optimistic turn to his conception of evolution by viewing it as a progressive union of the finite with the infinite. Mamiani argues against Darwin, and holds that all specific forms are fixed for all time.*~~

~~*Modern Doctrine of Evolution—We now approach the period in which the modern doctrine of evolution in its narrow sense has originated. This doctrine is essentially a product of scientific researcli and speculation. It*~~

is a necessary outcome of the rapid advance of the physical sciences. Its final philosophic form cannot yet be said to be fixed. It may be defined as a natural history of the cosmos including organic beings, expressed in physical terms as a mechanical process. In this record the cosmic system appears as a natural product of elementary matter and its laws. The various grades of life on our planet are the natural consequences of certain physical processes involved in the gradual transformations of the earth. Conscious life is viewed as conditioned by physical (organic and more especially nervous) processes, and as evolving itself in close correlation with organic evolution. Finally, human develop- ment, as exhibited in historical and prehistorical records, is regarded as the highest and most complex result of organic and physical evolution. This modern doctrine of evelution is but an expansion and completion of those physical theories which opened the history of speculation. It differs from them in being grounded on exact and verified research, As such, moreover, it is a much more limited theory of evolution than the ancient. It does not concern itself (as yet at least) about the question of the infinitude of worlds in space and in time. It is content to explain the origin and course of development of the world, the solar or, at most, the sidereal system which falls under our own obser- vation. It would be difficult to say what branches of science had done most towards the establishment of this doctrine. We must content ourselves by referring to the progress of physical (including chemical) theory, which has led to the great generalization of the conserva- tion of energy; to the discovery of the fundamental chemical identity of the matter of our planet and of other celestial bodies, and of the chemical relations of organic and inorganic bodies; to the advance of astronomical specula- tion respecting the origin of the solar system, &.; to the growth of the new science of geology which has necessitated the conception of vast and unimaginable periods of time in the past history of our globe, and to the rapid march of

the biological sciences which has made us familiar with the simplest types and elements of organism ; finally, to the recent development of the science of anthropology (includ- ing comparative psychology, philology,

~~*&c.), and to the vast extension and improvement of all branches of historical study.*~~

~~*English Writers—Darwin.—The honour of working out this theory of evolution on a substanial basis of fact belongs to England. Of the writers who have achieved this result Mr Darwin deserves the first notice. Though modestly confining himself to the problem of accounting*~~

~~*for the evolution of the higher organic forms out of the lower, Mr Darwin has done much to further the idea of a gradual evolution of the physical world. The philosophic significance of the hypothesis of natural selection, especially associated with Mr Darwin, is due, as Professor HHelmholtz points out, to the fact that it introduces a strictly me- chanical conception in order to account for those intricate arrangements known as organic adaptations which had before been conceived only in a teleological manner. By viewing adaptations as conditions of self-preservation, Mr Darwin is able to explain how it is that the seemingly pur- poseful abounds in organic nature. In so doing he has done much to eliminate the teleological method from biology. It is true that, in his conception of seemingly spontaneous variations and of correlations of growth, he leaves room for the old manner of viewing organic development as controlled by some internal organizing principle. Yet his theory, as a whole, is clearly a heavy blow to the teleological method. Again, Mr Darwin has greatly extended the scope of mechanical interpretation, by making intelligible, apart from the co-operation of intelligent purpose, the genesis of the organic world as a harmonious system of distinct groups, a unity in variety, having certain well-marked typical affinities. HHow greatly this arrangement has helped to support the idea of an ideal plan, we have had occasion to observe. Mr Darwin in his doctrine of the organic world as a survival refers this appearance of systematic; plan to perfectly natural causes, and in so doing he gives new mean- ing to theancient theory that the harmony of the world arises out of discord. Once more, Mr Darwin's hypothesis is of wide philosophic interest, since it helps to support the idea of a perfect gradation in the progress of things. The variations which he postulates are slight, if not infinitesimal, and only effect a sensible functional or morphological change after they have been frequently repeated and accumulated by heredity.*~~

Mr Darwin's later work, in which he applies his theory of the origin of species to man, is a valuable contribution to a naturalistic conception of human development. The mind of man in its lowest stages of development is here brought into close juxtaposition to the animal mind, and the upward progress of man is viewed as effected by natural causes, chief among which is the action of natural selection. Mr Darwin does not inquire into tle exact way in which the mental and the bodily are connected. HIe simply assumes that, just as the bodily organism is capable of vary- ing in an indefinite number of ways, so may the mental faculties vary indefinitely in correspondence with certain physical changes. In this way he seeks to account for all .the higher mental powers, as the use of language and reason, the sentiment of beauty, and conscience.

Finally, Mr Darwin seeks to give a practical and ethical turn to his doctrine. HIe appears to make the end of evolu- tion the conscious end of man's action, since he defines the general good as "the rearing of the greatest number of individuals in full health and vigour, and with all their faculties perfect under the conditions to which they are serie _Further, in his view of the future of the race, Mr Darwin leaps to the idea that the natural process

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which has effected man's first progress must continue to be an important factor in evolution, and that, consequently, it is not well to check the scope of this process by undue restraints of population, and a charitable preservation of the incompetent.

A, R. Wallace.—Mr A. R. Wallace, who shares with Mr Darwin the honour of establishing the doctrine of natural selection, differs from the latter in setting mucli narrower limits to the action of this cause in the mental as well as the physical domain. Thus he would mark off the human faculty of making abstractions, such as space and time, as powers which could not have been evolved in this way. Mr Wallace leans to the teleological idea of some superior principle which has guided man in his upward path, as well as controlled the whole process of organic evolution. This law is connected with the absolute origin of life and organization.

~~*Herbert Spencer.—The thinker who has done more than any one else to elaborate a consistent philosophy of evolu- tion on a scientific basis is Mr Herbert Spencer. First of all he seeks to give greater precision to the conception of this universal process. Evolution is a change from the homogeneous to the heterogeneous, from the indefinite or undetermined to the definite or determined, from the inco- herent to the coherent. Again, Mr Spencer seeks to show that the causes of evolution are involved in the ultimate laws of matter, force, and motion, among which he gives great prominence to the modern doctrine of the conservation of energy. 'hus the rationale of the process shapes itself to Mr Spencer as a distinctly mechanical problem. HIe sets out with the assumption of a limited mass of homo- geneous matter acted upon by incident forces, and seeks to show how, by help of two laws,—namely, the instability of the homogeneous, and the multiplication of the effects of any such incident force,—the process known as evolution is brought about. This process is illustrated in the genesis of the solar system, for the explanation of which Mr Spencer makes use of the nebular hypothesis, in the formation' of our planet, as well as the development of organic aud mental life. Mr Spencer does not, however, conceive of this process of evolution as unlimited in time. As in the development of the individual organism, so in that of organic beings as a whole, of the earth, and of the solar system, there is a conflict between the forces of which the action is integrating or consolidating and those of which the action is disintegrating. The process of evolution always tends to an equilibration between these conflicting forces and ultimately to a dissolution of the products of evolution. Thus the solar system is a moving equilibrium which is destined to be finally dissipated into the attenuated matter out of which it arose. Mr Spencer thus approaches the earliest theories of cosmic evolution when he tells us (First Principles, p. 482) that vast periods in which the forces of attraction pre- vail over those of repulsion, alternate with other vast periods in which the reverse relation holds. The mechani- cal theory of evolution thus laid down in the Furst Principles is applied in Mr Spencer's later works to the explanation of organic, mental, and social evolution. The full explanation of the processes of inorganic evolution finds no place in the writer's system. Mr Spencer seeks, in the Principles of Biology, to conceive of organic bodies and their actions in mechanical terms. Life is regarded as essentially a correspondence of internal actions in the*~~

~~*organism to external actions proceeding from the environ- ment, and the object of Mr Spencer's volumes is to explain on mechanical principles the growth of this correspond-*~~

~~*=! The writer suggests that the whole sidereal system may be the result of a similar process,*~~

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~~*ence from the lowest to the highest. HIe excludes all con- sideration of the question how life first arose, though it is clear that he regards the lowest forms of life as continuous in their essential nature with sub-vital processes. It is in the later volumes, dealing with mental and social evolu- tion, that Mr Spencer's exposition becomes most interest- ing to the student of philosophy. In the Principles of Psychology, he seeks to deal with mind as an aspect or correlate of life which begins to manifest itself when the process of adjustment to environment, in which all life consists, reaches a certain degree of complexity. Mr Spencer indulges in no hypothesis respecting the universal co-existence of sentience with matter and force. HIe thinks we must accept the distinctions which common-sense has established, and so limit feeling or consciousness to organic beings endowed with a nervous system. 'Thus, just as he does not seek to explain the first appearance of life as a whole, so he does not seek to explain the first dawn of mental life. Mr Spencer's unit of consciousness is the blurred undetermined feeling which answers to a single nervous pulsation or shock. Assuming this he seeks to trace the gradual evolution of consciousness. Sensations arise by a nuinber of rapid successions of such elementary feelings variously combined, and all more composite states of mind arise by a similar process of combination of these feelings. Thus mental evolution is a progressive composi- tion of units of feeling in more and more complex forms, and united by more complex relations. Mr Spencer's con- ception of mind thus excludes all fundamental distinctions of faculty. Instinct, memory, reason, the emotions and volitions, alike develop themselves in divergent directions out of a common elementary process. They arc, moreover, all related to one and the same biological process, being incidental accompaniments of the actions by which tle organism responds and adjusts itself to the forces of its environment.*~~

~~According as these actions are more complex, and consequently less immediate, the mental actions which accompany them vary in character from reflex action up to deliberate volition, from the most simple presentative feeling or sensation up to the most complex representative and re-representative feeling or emotion. It would be im- possible to point to all the applications which Mr Spencer has made of his principle of evolution to the questions of psychology. We may just mention among other points of interest his altempt to explain the innate intuitions of space, moral right, &c., as mental dispositions handed down from progenitors and embodying the uniform expe- rience of many generations, his ingenious endeavour to account for the coincidence between pleasures and pains and actions beneficial and injurious to the organism, and his conception of the esthetic interest as a growth out of the play-impulse, which is the tendency of activities that have become developed beyond the immediate needs of existence to vent themselves.~~

~~Mr Spencer's elaboration of the subject of social evolu- tion las not been carried far enough for us to understand the full bearing of his ideas. Yet the fundamental con- ceptions are given us. The writer regards society, after the analogy of an individual organism, as possessing a number of various structures or organs and functions, and as tending to evolve itself by a series of adjustments to its environment, physical and social. All ideas and institutions display this process of evolution no less than societies as wholes. History is to our author essentially the record of this social evolution. It is to be observed that Mr Spencer attributes to society a certain sponta- neous tendeucy to evolution apart from natural selce- tion. He looks on progress as a gradual process of self-~~

~~adaptation of man to the conditions of his environment, | conscious mental life.~~

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~~plete and human happiness perfect. In this respect Mr Spencer's conception of man's history and destiny wears an optimistic tinge when compared with that very vaguely shadowed forth by Mr Darwin.~~

~~*To Mr Spencer, as to Mr Darwin, the doctrine of evolu- tion seems to supply the end of conduct. He conceives of morality as essentially an observance of the laws of life, the individual and the collective. At the same time, since Mr Spencer regards the moral sense as a growth out of feelings of pleasure and pain (racial experiences), closely identifies the ends of life and happiness, and distinctly teaches that social evolution or progress makes for an increase of happi- ness, his ethical doctrine does not materially differ from that of utilitarianism.*~~

~~*So far we have said nothing respecting the metaphysical basis which Mr Spencer seeks to give to his doctrine of evolution. It is generally agreed that tlis does not really belong to lus doctrine of evolution itself. Mr Spencer is a thorough-going realist. From his general scheme of evolution one would be prepared to find him avowing lumself a materalist. Yet he seeks to avoid this con- clusion by saying that it is one unknowable reality which manifests itself alike in the material and in the men- tal domain. At the same time, this unknowable is com- monly spoken of as force, and in many places seems to be identified with material force. Mr Spencer makes little use of his metaphysical conception in accounting for the evolu- tion of things. He tells us neither why the unknowable should manifest itself in time at all, nor why it should appear as a material world before it appears under the form of mind or consciousness. Indeed Mr Spencer's doctrine of evolution cannot be said to have received from its author an adequate metaphysical interpretation. The idea of the unknowable hardly suffices to give to his system an intelli- gible monistic basis. In truth, this system seems in its essence to be dualistic rather than monistic.*~~

~~*Metaphysical Interpretation—Professor Cliford.—Of the very few who have dealt with the metaphysical interpreta- tion of the scientific doctrine of evolution, Professor Clifford deserves special notice. In an essay entitled " On things in themselves," published in Afind (No. ix.), as well as in other and earlier papers, Mr Clifford, starting from the basis of empirical idealism which asserts that material objects are nothing but states of consciousness, argues that the reality answering to them is in all cases something mental. Thus all existence—including what we call minds as well as bodies—consists in aggregates of elementary "mind*~~

~~stuff," the elements themselves corresponding to Mr Spencer's units of feeling. The writer expressly argucs that his idea of a continuity of mental existence through- out the pliysical (phenomenal) world is the direct conse- quence of the doctrine of evolution. This theory is curious as providing a monistic and quasi-spiritualistic conception of evolution, which is at the same time a mechanical one.~~

~~Problems of Organic Evolution.—G@. II. Lewes.—Among the writers who have worked on the lines laid down by our two great evolutionists, a high place must be given to Mr G. II. Lewes, who in his biological and psycho- logical writings, and more especially the Problems of Life and Mind, adopts a view of the relations of mind and life or organization closely resembling in its essentials that of Mr Spencer. 'To Mr Lewes consciousness is but a more complex form of mental life which is correlated with the actions of all the nervous centres, its lowest form being sentience. IIe appears to look on mind in all its grades as but the other side or face of the bodily processes which it accompanics. Yct he has not so far made use of this monistic conecption in explainiug the gradual evolution of Indeed, though Mr Lewes's writings~~

~~and anticipates an age when this adjustment witl be com- | are pervaded with the idea of organic evolution, his dis-~~

~~cussion of the nature and laws of organism in his last volume, The Physical Basis of Mind, might seem ever and again, by its sharp separation of organic and inorganic (mechanical) processes, to tell against the supposition of an evolution of life out of inorganic matter.~~

~~J. J. Murphy.—The question of the genesis of life and mind receives a peculiar treatment in Mr J. J. Murphy's IIabit and Intelligence. In this work the teachings of the evolutionists are largely accepted, while an attempt is made to reconcile these with a teleological view of nature. The process of inorganic and of organic nature is each recognized as one of evolution; but while the former is viewed as the result of mechanical principles, the latter is said to imply an intelligent or formative principle as well. Mechanical principles do indeed operate in organisms, this is the~~

~~*region of habit ; but over and above this, vital pro- cesses involve a controlling intelligence. The author adopts the hypothesis that the Creator endowed vitalized matter at the first with intelligence under the guidance of which it organizes itself. Evolution is largely the result of this vital intelligent principle, only a small part being attributable to mechanical causes, such as natural selection.*~~

~~*Evolution and Psychology.—The speculations of Mr Darwin and Mr Spencer have had a powerful influence on recent English psychology, which promises to become com- parative, not only in the sense of including a comparison of ethnological mental characteristics, but also in the wider sense of bringing liuman intelligence into relation to that of the lower animals. Among writers who have laboured in this construction of a theory of mental evolution, mention must be made of the late Mr D. Spalding.? Again, Mr Chauncey Wright, in his remarkable essay The Evolution of Self-Consciousness (printed in a collee- tion of his works), made a brilliant attempt to represent man's highest mental operations as evolved out of simple processes common to man and the lower animals, The influence of evolutional ideas is further traceable in the latest work of Mr A. Bain (Zimotions and Will, 3d edition), and in the works of Dr Maudsley and other living psycho- logists. The relation of the doctrine of evolution to psychology is handled in an essay by Mr J. Sully (Sensa- zion and Inturtion, ch. i.).*~~

~~*Anthropology.—The application of the doctrine of evolution to the question of man's origin and development has engaged the atterition of a number of writers. Ina sense all recent anthropologists and historians of culture may be said to have worked in this direction. Special attention niust, however, be called to those writers who have sought directly to apply the fundamental ideas of evolution to these problems. Mr Bagehot's Physics and Politics is remarkable as illustrating the employment of the doctrine of natural selection in order to explain certain aspects of political progress. Still more important is the contribution made by Mr Fiske, in his Cosmic Philosophy, to the theory of man's origin and development. Mr Fiske's work is a full exposition of Mr Spencer's: doctrine of evolution. In addition to this it contains interesting speculations*~~

~~*respecting the steps by which man's distin- guishing intelligence and sociality were first acquired and afterwards developed.*~~

~~*_ Relation to HIthics.—The application of the doctrine of evolution to our ethical aud religious ideas has engaged a number of writers. In Mr A. Barratt's Physical Ethics the development of man's moral sense out of feelings of pleasure and pain is traced in connexion with his organic and social evolution on which it is said to depend. By concelving of all matter as endowed with sensibility*~~

~~*1 ' : . : a La an essay on " Instinct? in Maemillan's Magazne, vol, xxvii. p.*~~

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~~*(pleasure and pain), Mr Barratt is able to connect man's moral evolution with the whole process of organic and of cosmic evolution. The idea of a natural growth of the moral sense out of simpler impulses and instincts may also be frequently found in contemporary English literature. On the other hand, this consequence of the evolution theory has been strenuously opposed in the interests of a thorough- going intuitive ethics as, for example, by Mr St George Mivart, in his work, Zhe Genesis of Species, and by Mr R. H. Hutton.?*~~

~~*Again the question has been discussed whether the doc- trine of evolution contributes towards the determination of the end or standard of morals, Mr Sidgwick has shown that it cannot well do this merely by proving how the moral sense has arisen. It is easy, however, to look upon the natural process as a tendency towards an end, and to conceive of our conscious actions as being bound by this tendency, so that the highest end of our existence must be to co-operate with the natural forces. This idea pervades a good deal of contemporary literature. It appears with special distinctness in the writings of Pro- fessor Clifford? and Mr F. Pollock* and in the able work of Miss Simcox on Natural Law. On the other hand, Mr H. Sidgwick® has made an elaborate study of the bearings of evolution on the ethical end, and reduces these to insignificant proportions. This writer criticises Mr Darwin's definition of the general good, and argues that the idea of a mere quantity of life is inadequate to*~~

~~*supply a definite end of conduct. Nevertheless life ({jv) is the prime condition of wellbeing («d Gjv), and so far the evolu- tionist is right in making life a secondary aim. The differentia of wellbeing, however, requires further inter- pretation, which can only be supplied by the utilitarian principle. At the same time the doctrine of evolution guides us in the pursuit of this ultimate end, in so far as increase of happiness accompanies organic progress, or elevation in the scale of existence. Mr Sidgwick further points out how little the doctrine of evolution assists the utilitarian in dealing with social and political problems.*~~

~~*Relation to Religion.—The bearing of the doctrine of evolution on religion has formed the theme of a host of minor writings. On the whole, Mr Darwin's doctrine has been said (as it is by the author himself), not only to be compatible with the idea of an original creation of the world, but to supply a higher conception of the divine attributes than the hypothesis of special creations; on the other hand, Mr Spencer's doctrine, distinctly excluding as it does the idea of creative activity, has called forth strong opposition from a number of theological writers, among whom the most powerful is certainly Professor Martineau.® In connexion with the subject of the relation of the evolu- tion doctrine to religious ideas, it is worthy of remark that this doctrine appears to be serving as the starting-point for a new quasi-religious conception of nature. The idea of the cosmos and its forces as the author and source of our being easily lends itself to a kind of pantheistic sentiment towards nature. In Mr Spencer's own writings it is the*~~

~~*2 See Essays, vol.i. essay 8, "Science and Theism," in which it is said that "the Darwiniau theory is quite incapable of explaining the specifically human phenomenon of the rise of what may be called an anti-Darwinian conscience, which restrains and subordinates the principle of competition."*~~

~~*8 See especially an article entitled " Right and Wrong," in the Fort-nightly Review, vol. xviii. new series, p. 794 sq.*~~

~~*4 See an article on " Evolution and Ethics," in Mind, No, 8.*~~

~~5 See an article headed "The Theory of Evolution in its relation to Practice," in Mind, No. 1; cf. Methods of Ethics, 2nd edition, pp. 69, 70 et passim. :~~

~~6 See the pamphlet Modern Materialism, in which Professor Tyndall's version of evolution is severely criticised ; also an article "The Place of Mind in Nature and Intuition in Man," Contemp. Rev., vol. xix. p. 606 sq.~~

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~~unknowable force ever sustaining the evolving worlds which is said to excite this emotion. In the work of Miss Simcox already referred to, and the occasional papers of Professor Clifford,! it is rather visible nature itself which is thus elevated into a religious object.~~

~~Recent French Writers——The French thought of the latter part of the century offers us but little in the way of a discussion of the problems with which evolution has to do. 'The activity of biological speculation appears to have influenced but a few philosophic minds. Naturalists have of course discussed the doctrine of evolution, and one of these, E. Quinet, in his work La Creation, seeks to apply Mr Darwin's theory to problems of art and morality. Thus the ideal of art should, he thinks, be based on the doctrine of evolution, and be "the presentment of superior forms which slumber still in the bosom of actual things," or the embodi- ment of "the possible development of the human type in the prugress of natureand man." So the ideas of duty and virtue are to be based on this doctrine. Man is the only animal which can retrograde, and evil is retrogression in the path laid down by nature. It is an anachronism, or a revolt of man against himself. Among philosophic writers proper, the first place must be given to M. Th. Ribot, who, in his sympathetic exposition of Mr Spencer's doctrine of evolution in his Recent Hnglish Psychology, and in his interesting psychological study On /Teredity, shows himself to be deeply pervaded with the new ideas, more especially in their bearing on mental phenomena. M. Ribot regards mental evolution as depending on material, but adds that the recognition of this connexion between the two domains of phenomena is compatible with idealism no less than with materialism. He would eliminate the conception of pro- gress as a subjective one, and says that the idea of histori- cal progress must be taken up into that of an~~

~~*objective cosmic process. M. Ribot makes many interesting applica- tions of his law of mental heredity, which he rightly regards as a factor in mental evolution ; as, for example, when he speaks of free- will as expressing the fixed personal factor in conduct,—namely, the inherited character. Of other philo- sophic writers who have been affected by the English doc- trine of evolution, it is sufficient to name the late Léon Dumont, who was one of the first in France to apply the ideas of Mr Darwin and Mr Spencer to problems of psychology ; and Professor A. Espinas, who in his work Des Sociétés Animales aims at furthering the theory of man's psychical derivation from lower types of mind. A writer who appears to be in a less distinct manner in- fluenced by the idea of evolution is M. Taine, in whose psychological and historical studies the indirect effect of a study of English evolutionists is traceable. On the other hand, the older and teleological view of the world has not wanted its defenders. 'The most signal supporter of this direction, in the face of the doctrine of evolution, is M. Paul Janet, who, in his earlier work Le Materialisme Contem- porain, and still more in his recent publication Les Causes finales, draws a sharp line between the regions of the organic and the inorganic, and maintains that the complex arrangements of the latter are only explicable by means of teleological conceptions.*~~

~~*Recent German Writers—Materialists—In Germany the recent progress of speculation, since the time of the great systems, has exhibited a decided bent towards the problems which group themselves around the doctrine of evolution. First of all the efforts of the materialists directly tended to the formation of a consistent doctrine of cosmic evolution. Their earlier writings appeared just before the epoch-mak- ing publication of Mr Darwin, but the ideas of the latter*~~

~~*5 See especially an article on "Cosmi¢ Emotion," in the Wineteenth Century, October 1877.*~~

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~~*have been incorporated in their later publications. In Moleschott's Der Kreislauf des Lebens the whole order of things is conceived as a continual flux and exchange of material elements, which accounts for all psycliic life no less than for bodily life, and of which man, equally with the lower*~~

~~*animals, is a temporary product. L. Biichner has sought, in his work on Jfan and his Siw Lectures on the Darwinian Theory, to defend the new doctrine of organic evolution as a necessary factor in the materialistic concep- tion of the world. The latter work connects Darwinism with the whole history of materialism. The former is a somewhat feeble attempt to attach man's ideal aims in the future to the evolutionist's conception of his past history. The writer appears to think that something equivalent to the process of natural selection is to effect man's future progress, but the idea is not presented with any definitencss or precision.*~~

~~*Combination of Mechanical and Teleological View of Evolution.—After the materialists we come to a number of writers, who, under the influence of advancing physical and physiological science, have sought to construct a mechani- cal conception of the order of the world. Some of these have contented themselves with sketching a natural history of the cosmos, others have connected their mechanical con- ception with peculiar philosophical ideas.*~~

~~*Czolbe.—A curious combination of the mechanical and teleological conceptions of the world is to be met with in the system of Czolbe. In his first works, Die neue Darstellung des Sensualismus and Die Entstehung des Selbst- Bewusstsein's, Czolbe regards the world as a product of ele- mentary matter and organic forms both of which are eternal. According to this view, sensation and consciousness are products of particular combinations of movements (circular). To these two original principles he adds, later on, feelings and sensations themselves, which exist in a latent state throughout space, and form a kind of world-soul. Still later, he finds the substantial support of atoms and sensa- tions alike in space, in which feelings are located no less than the material elements. 'To Czolbe our visible world, together with conscious minds, is thus a mosaic formed out of these elements, which group themselves according to mechanical laws in bodies and conscious minds, He thus adopts a theory of uatural evolution which evades the difficulty of explaining the organic as a product of the inorganic, and mind as a product of matter. But he only achieves this by assuming the eternity cf all organic forms, and by conceiving of the elementary sensations as themselves spatial or "extensional." Though the mecha- nical view of the world-order is most*~~

~~*prominent in Czolbe, he combines with this a teleological and optimistic view, according to which all things make for the greatest pos- sible perfection of conditioned happiness in every sentient creature.*~~

~~*G. T. Fechner.—Another writer who combines the mecha- nical view of the world with a curious metaphysical system is G. T. Fechner. Passing by his earlier works, in which he develops his idea of the world as a gradation of souls (including those of plants, an earth-spirit, &.), we may best turn to his later work Minige Ideen zur Schipfungs- und Entwickelungs- Geschichte der Organismen. Fechner takes a thoroughly mechanical view of the difference between organic and inorganic matter. But by help of this very difference he seeks to prove that the latter is a product of the former, and not conversely. The great law which determines the evolution of the world is the tendency to greater and greater stability, which law at once supplies a mechanical and a teleological conception of the universe. Organic bodies differ from inorganic in that their molecules are in a less stable condition than those of the latter. Hence we must suppose that the original source of the*~~

~~*material world is an organism, namely, a primitive ““cosm- organic” condition of our earth. _This primitive matter has gradually differentiated itself into the regions of the organic and the inorganic, and the former again into the animal and vegetable kingdoms. Consciousness was breathed into the cosmorganic matter by the Creator and so pressed out, as though from the bellows of an organ, into all living creatures. This process of evolution is directed towards an end, namely, the greatest possible degree of mutual adaptation of parts, or the most stable condition; and conscious action is but the subjective side of this tendency.)*~~

~~*Lotze.—The mechanical view of the world, as wrought out by modern science, is fully recoguized and yet surmounted in the cosmological doctrine put forth by Hermann Lotze in his Mikrokosmus. Lotze defends the mechanical method as applicable to all departments of phenomena, and insists on this way of viewing organic processes. At the same time he holds that the mechanical interpretation of nature is limited at every*~~

~~*point. 'The inadequacy of this view may be seen in the attempt to apply it to the question of the genesis of the world and its order. On the one hand, Lotze accepts the teachings of modern specu- lation respecting the evolution of the solar system, the genesis of the organic out of the inorganic, the continuity of man with the lower animal world; and]iis exposition and defence of this idea of evolution as the result of mechanical laws is extremely able and interesting. Again, Lotze seeks to bridge over the gulf between material and spiritual evolution by bringing human development into close rclation to the processes of nature as a whole. Yet, while thus doing justice to the mechanical conception of the gradual genesis of the world, Lotze strenuously affirms the limitations of this kind of explanation. In the first place, he maintains that the mechanical processes them- selves cannot be understood except by help of ideas respect- ing the real internal nature of the elements cencerned. This nature he describes as life, and thus he endows all parts of matter with feeling (though he distinctly rejects Czolbe's idea of a world-soul which includes these feelings). In this internal activity Lotze finds a teleological element, viz., a striving towards self-preservation and development, This idea he seeks to blend with that of mechanical rela- tions ainong the elements, so as to make the whole upward process of physical evolution the product of purposeful impulses. Thus the first genesis of organisms is repre- sented as a combination of elements (accidentally meet- ing), through which there is effected a summation of the separate ends of the elements, to a purposeful equilibrium of a composite whole.? This may be called the first stage of his teleology. In addition to this, Lotze looks at the world-process as a gradual unfolding of a creative spiritual principle, which he sometimes figuratively describes as the world-soul, more commonly, however, as the infinite sub- stance. This assumption, he says, is necessitated by the very process of cosmic evolution, the absolute beginning and end of which we are wholly unable to conjecture. HOwever far back the evolutionist may go he always has to assume some definite arrangement of parts,—some general laws of action of which he can give no account. The con- ception of the atomists, that in the beginning of things*~~

~~*1 Tn a new edition of his work Fechner avows himself a convert to Mr Darwin's theory of organic descent.*~~

? Lotze does not express himself very clearly with respect to the ques- tion of the first genesis of mind. In the Mikrokosmus (ii. p. 33) he appears to find the "sparks" of mental life in the atoms which he here conceives of after the manner of Leibnitz's monads. In another place, however (Medicinische Psychologie, pp. 164, 165), Lotze tells us that mind is the direct product of the original creative activity,

which is stimulated to create by the stimulus involved in the formation of the physical germ,

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there was an indefinite number of possibilities, is unthink- able, and the modern doctrine of evoiution, by conceiving of the existing world as a survival of certain forms from among many others actually produced, but lacking in the conditions of stability, plainly makes no such absurd sup- position. Hence, there must aiways be a certain order to be aceounted for, and science is wholly inadequate to effect this explanation. This conducts to a teleological view of the world-process, as directed by mind towards some end which we cannot distinctly recoguize. Lotze's criticisms of previous attempts to formulate the end of the world-process are not the least valuable part of his discussion of the pro- blems of evolution. He shows that neither the notion of a progressive effort towards the highest unfolding of mental life, nor that of an impulse towards the greatest variety of manifestations of one and the same fundamental form, adequately represeuts the order of organic forms. Here Lotze shows again a due recognition of the mechanical aspect of the world-process, and argues that the evolution of the organic world is no immediate consequence of the self-evolviug ideas, but only the form in which the com- mands of these ideas are capable of being realized on our earth,—that is to say, with our terrestrial conditions. A somewhat similar view of cosmic and organic evolution, as at once a mechanical and a teleological process, is to be found in Ulrici's Gott und die Natur.

Mechanical Doctrines of Evolution.—Over against these attempts to carry up a mechanical conception of evolution into a teleological must be set a

~~*number of works which content themselves, in the spirit of positive science, with expounding « doctrine of evolution on a strictly mechanical basis. Of these we may first mention C. Radenhausen (Isis), who, in his interesting work Der Mensch und die Welt, expounds the idea of a gradual evolution of the solar system, the earth, and organic life. In the growth of the individual man tie past evolution of the world is repre- sented. A temperate statement of the doctrine of modern evolution is to be found in Dr Ch. Wiener's volume Die Grundztige der Weltordnung. The probiems of the origin of organic life and of the genesis of the nervous system are both said to be as yet insoluble. With this may be compared another interesting presentation of tle doc- trine of evolution,—nainely, H. J. Klein's Lntwickelungs- geschichte des Kosmos. The mechianical causes of evolution are clearly set forth in a work of the Herbartian C. §. Cornelius, Ueber die Entstehung der Welt. Cornelius argues against Czolbe's hypothesis of the past eternity of organic life. Organisms first arose under some quite special physical conditions. A very curious feature in this volume is the criticism of Mr Darwin's doctrine of descent, which is said.to involve mystical ideas, &c.*~~

~~*Lange.—Araong later works touching on the problems of evolution the History of Materialism of Lange deserves mention here. Lange accepts the modern liypothesis of evolution, and justifies the mechanical conception of its various stages. It is trne that in his criticism of Mr Darwin's theory he assumes some internal formative principle (as held to by Niageli and Kolliker) as supple- mentary to the factor of utility emphasized by Mr Darwin. Yet le does not appear to regard this process as other than a mode of mechanical action. Lange's greatest difficulty in view of a consistent materialistic doctrine of evolution is to expiain tue genesis of conscious life. The difficulty of the atomistic theory, even when we add a rudimentary scnsibility to the elements, is to determine "' where and how the transition is effected from the mani- foldness of the collisions of the atoms to the unity of sensation." Lange supplements his mechanical view of the world by the Kantian conception of the adaptation of the world by reason of its generalities or uniformities to*~~

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~~*our intelligence. He argues, with Lotze, that in seeking to frame a theory of physical evolution we must always assume, over and above tlie eternal atoms, a special initial arrangement of these, without which the order of events would be inconceivable. This modest kind of teleology (he says) is not only not opposed to Mr Darwin's doctrine ; it is its necessary pre-supposition, "The formal purpose- fulness of the world is nothing else than its adaptation to . our understanding." Lange seems further disposed to accept Kant's theory of organism as manifesting objective purpose, though he will not allow that this explains anything, all explanations being by way of the principle of mechanical causation.*~~

~~*Noiré.—In Ludwig Noiré we have a writer who accepts all the teaching of scientific evolutionists, and at the same time seeks to give to the doctrine a metaphysical and monistic interpretation. In his two volumes Die Welt als Lintwickelung des Geistes and Der Monistische Gedanke, Noiré assumes tlie existence of elementary atoms or "monads " endowed with the twofold properties of motion and sensation. Time and space are not simply forms of intuition, but forms of appearance (Erscheinungsformen) of these fundamental properties. The process of evolution from the simple to the complex, has its ground in the latter property, sensation, which gives its direction to motion (which latter is unchangeable in amount), and which involves a tendency or impulse to further differenti- ation. The purposefulness of the process of evolution is due to its being the work of a mental principle (sensation). The formation of inorganic bodies is the preliminary step in the process, and involves an obscure mode of conscious- ness. The genesis of consciousness is said to be effected by means of a certain mode of collision among the atoms, though this point is not made very clear. Noiré's doctrine of evolution appears to waver somewhat between a mechan- ical theory (atoms endowed with sensibility, but acting according to strictly mechanical laws) and a distinctly spiritualistic and teleological doctrine, such as that of Schelling and Hartmann.*~~

~~*Hartmann.—The writings of E. von Hartmann have a special interest, as illustrating how Mr Darwin's doctrine of organic development is regarded from tlie point of view of a thorough-going metaphysical teleology. 'To Hartmann the world is a manifestation in time—which is real as applying*~~

~~*to the activities of this principle—of an ontological prin- ciple, styled the unconscious, which is at once will and intelligence. The process of evolution, from the simplest taaterial operations up to conscious human actions, depends on the progressive domination of will, which is the blind force, and answers to the mechanical aspect of the world, by intelligence, which gives to this force form and direction, and answers to the logical and teleological aspect of the world. The cnd of the process for which this unconscious makes is not, as Hegel says, self-consciousness, but non-existence, to which consciousness is the immediate pre- condition. Hartinann has devoted a separate volume to Me Darwin's theory (Wahrheit und Irrthum im Darwin- wsmus), in which le shows lumself disposed to accept the principle of natural selection as the mechanical means whicl the unconscious makes use of in order to effect a certain amount of the upward organic progress towards Which it strives.*~~

~~*Influence of Darwinism in Germany.—We will close the sketch of the recent German discussion of evolution-pro- blems, and so our historical review as a whole, by a brief reference to the philosophic and quasi-philosopliic literature which has sprung up in Germany under the direct influence of Mr Darwin's doctrine. It is not a little curious that, of the two great English evolutionists, the one who has most stimulated German philosophical thought is the writer*~~

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~~*who has confined himself to questions of natural science, while the writer who has built up the idea of organic descent into 1 complete cosmological theory is only now beginning to be known in that country.*~~

~~*(a) Darwinism and Methodology.—First of all, then, a hare allusion must be made to certain criticisms of Mr Darwin's biological hypothesis' as legitimate instruments of a sound natural pliulosophy. It may surprise some English readers to learn that tlie doctrine of the descent of species by natural selection has been denounced in Germany as partaking of the vices of a spurious and teleo- logical natural philosophy. The writer who has taken most pains to show up the philosophic unsoundness of Mr Darwin's procedure is A. Wigand (Der Darwinismus und dee oC Newton's und Cuvier's, see especially vol, ii.*~~

~~*(6) Darwinism and Cosmology.—Turning now to the influences of Darwinism on German thought, we may best begin with the more circumscribed branches of speculation, Physical speculation in Germany is being slowly affected by Mr Darwin's theory. A curious example of this is to: be met with in a little work by Dr Karl du Prel, entitled Der Kampf ums Dasein am Himmel. This work is of real philo- sophic interest as illustrating how Mr Darwin's way of con- ceiving self-preservation, as the effect of natural superiority in respect of adaptability to the conditions of existence, may be extended beyond the organic world to the cosmos as a whole. Du Prel regards the cosmic bodies as analogous to competing organisins, space standing for the means of exist- ence for which they struggle, and the force of attraction and the fitness of the body's movement in relation to those of other bodies representing organic efficiency. Those bodies which have these advantages survive, whereas those which lack them are extinguished either by being dissipated or fused with other bodies.*~~

~~*(c) Darwinism and Anthropology.—Passing by the bio- logical speculations respecting the ultimate origin of living forms to which Darwinism has given rise, we pass to those aspects of anthropology which have a peculiar philosophic interest. In a sense it may be said that Mr Darwin's speculations, especially as carried out by himself in his Descent of Man, have powerfully influenced the whole of recent anthropological speculation; for writers like A. Bastian (Schipfung und Entstehung and Der Mensch in der Geschichte), who still hold to the doctrine of the fixity of species, and the essential difference between human history and sequences of natural events, are now the exceptions. With anthropology, we must connect that new science of comparative human psychology (Vélkerpsychologie) which has sprung up of late years.*~~

~~*Origin of Language.—Of the problems which fall under this science of man's genesis and development, none has more of philosophic interest than the question of the origin of language. 'This question, which lies at the very thres- hold of a proper understanding of the relation of man's mental nature to that of the lower animals, is touched on by Mr Darwin himself in his Descent of Man. In Germany it is being earnestly discussed by a number of writers, on whom the influence of Mr Darwin's theory of*~~

~~*human descent is very marked. Among the writers who have explicitly applied the method of evolution, as defined by Mr Darwin, to the explanation of language, may be men- tioned A. Schleicher,! L. Geiger,? Dr G. Jager,? Wilhelm Bleek,* and Ernest Haeckel. Jiger, who assumes that man is the immediate descendant of ape-like progenitors,*~~

~~*1 Die Darwin' sche Theorie und die Sprachwissenschaft. 2 Der Ursprung der Sprache. 3 Ueber den Ursprung der menschlichen Sprache. 4 Ueber den Ursprung der Sprache. ° The History of Creation, ii. p. 300 sq. VU — 97*~~

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~~*connects the first beginnings of human speech with a superiority in the command of the actions of respiration which is involved in man's erect posture.*~~

~~*(2) Darwinism and Psychology.—From anthropology we pass to psychology. Here the influence of Darwinism meets us too. Among recent psychologists W. Wundt, in his Grundztige der physiologischen Psychologie, makes fre- quent use of the doctrine of a gradual evolution of mental dispositions by means of heredity. He would, for example, explain the rapidity with which the space-perception is formed in the infant mind by help of such an inherited dis- position. Wundt appears to lean to the hypothesis of ulti- mate sentient elements, by the summation of whose rudi- mentary feelings arises the unity of consciousness.*~~

~~*The wider consequences of Mr Darwin's theory in the domain of psychology are briefly indicated by Dr Georg von Giz'ycki, in his little work Die philosophischen Con- sequenzen der Lamarck-Darwin'schen Entwicklungstheorie. He argues against attributing sensation to all material things, which supposition (unlike Professor Clifford) he does not regard as a necessary consequence of the evolution hypo- thesis. He distinctly seizes the bearing of this doctrine on our conception of mind (animal as well as human) as identical in its fundamental laws, and as presenting to the psychologist a single serial development; and he still further follows Mr Spencer in connecting all mental activity with vital functions essential to the preservation of the in- dividual and of the race.*~~

~~*Finally, he adopts the view that the mental organism depends on the laws of the external universe. 'The harmony or adaptation which we see holding between thoughts and things must be inter- preted as the effect of the latter acting on and modifying the former in conformity with themselves.*~~

~~*Darwinism and Ethics and Religion.—Passing now to the region of practical philosophy, we find that Darwinism has occasioned in Germany, as in England, a good deal of curious speculation, Among the many writers who have touched on the aspects of Darwinism we can only refer to one or two. Among these we may mention Dr Paul Rée, who, in a recent work, Der Ursprung der moralischen Empyfindungen, argues that moral dispositions or altruistic impulses havo been developed as useful to society, yet rather oddly combines with this idea the pessimistic doctrine that man is not on the whole growing more moral. Again Dr Giz'ycki, in the work just referred to, emphasizes the bearing of the doctrine of human descent on our feeling towards the lower animals as closely linked to ourselves. He goes on to show that this doctrine involves the most definite and stringent form of determinism, and so has a bearing on our ideas of right and wrong, blame, &c, The writer thinks Darwinism by no means excludes a teleologi- cal conception of the world as a process striving towards the highest manifestation of mental life, and this idea lead- ing back to that of an absolute first cause of the order of the world, becomes the starting-point for religious and esthetic aspiration. In Dr G. Jager's work, Die Darwin'sche Theorie und thre Stellung zu Moral und Religion, we find a practical deduction from Darwinism which curiously contrasts with that of Dr Giz'ycki. Jager argues that this doctrine teaches us to place ourselves in the greatest pos- sible opposition to the lower animals. The aim of morality, as taught by Darwinism, must be to develop to the utmost those excellences which mark off man from the brute. The author seeks to account for the genesis of social institutions and religious ideas, as utilities which benefited those com- munities possessing them in the struggle for existence.*~~

~~*A work in which are traced the ethical and religious consequences of the doctrine of evolution is The Old Faith and the New of David Strauss.*~~

~~*According to Strauss, all morality has its root in the recognition and realization of*~~

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~~*the idea of kind in onrselves and in others, IIe argues from the fact that nature has produced man as her last and highest achievement, and the lower forms of creatures but as steps in the progress towards man, that our end and aim must be the furtherance of that which marks us off from the brutes. Religion again begins with the sense of unity with nature, and the new doctrine of the cosmos enables us to regard nature as the source whence our life, as all life, springs.*~~

~~*Interpretation of Modern Scientific Doctrine—A word or two, in conclusion; respecting what is known as the modern doctrine of evolution. It is important to empha- size the fact that this is a scientific doctrine, which has been built up by help of positive research. As such, of course, it embodies the mechanical, as distinguished from the teleological, view of nature's processes. Yet it still awaits its final philosophic interpretation. We cannot yet say under what head of our historical scheme it is destined to fall.*~~

~~*We think the question of the universal applicability of the doctrine to physical and mental phenomena may be allowed. There are no doubt wide gaps inour knowledge of both orders. Thus it may reasonably be doubted whether physical theory can as yet enable us fully to see the necessity of that uni- versal process from the homogeneous to the heterogeneous in which evolution consists; yet ina rough and vague way the process is being made theoretically intelligible. Again, the transition from the inorganic to the organic is, as Professor Tyndall has lately told us, far from being con- ceivable in the present state of our knowledge; and this seems to be implied in the remarkable hypothesis by which Professor Helmholtz and Sir W. Thomson seek to account for the first appearance of life on our planet. Yet we may reason from the general tendencies of research that this step may some day be hypothetically explained in physical and mechanical terms. Again, in spite of Mr Speuncer's brilliant demonstration of the general continuity of mental life, much remains to be done before all the steps in the process (¢.g., from particular to general knowledge, from single feelings to self-consciousness) are made plain. Never- theless, we may even now dimly 'see how such mental processes may be knit together in one larger process.*~~

~~*Allowing, then, that the doctrine of evolution as a scientific hypothesis is probably true, the question arises, what is its exact philosophical purport? How far does it help to unify our knowledge, and is it the final explana- tion of the complex events of our world ?*~~

~~*First of all, then, as a unifying generalization, it is clearly limited by the fact of the correlation of mental and physical evolution. These two regions of phenomena may be seen to manifest the same law, yet they*~~

~~*cannot be identified. All the laws of physical evolution can never help us to understand the first genesis of mind; and this difficulty is in no way reduced by Mr Spencer's con- ception of a perfect gradation from purely physical to conscious life. The dawn of the first confused and shape- less feeling is as much a "mystery" as the genesis of a distinct sensation. Our best exponents of evolution, including Professor Du Bois Reyniond (Ueber die Grenzen des Naturerkennens, p. 25 sq.), fully recognize this diffi- culty. We have here much the same "mystery" which meets us in the conversion of a nerve-stimulus into a sensation in the developed organism. The sequence is unlike any properly physical succession, and so cannot be further explained by being brought under a more general law. Not only so, the doctrine of the conservation of energy, as applied to organic processes, leads to the con- clusion that the genesis of mind in general and of every single mental phenomenon is, from a physical point of view, something non-essential,*~~

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~~*We may, no doubt, avoid this difficulty, in appearance at least, by assuming that all material processes down to the vibrations of the indivisible atoms are accompanied with a mode of feeling. This may, of course, be proposed as a properly scientific hypothesis, and as involving no metaphysical assumptions respecting the nature of atoms. The great difficulty here would be, how we are to conceive of modes of sensibility that do not enter into a collective consciousness, and which appear to lack all the character- istics of our own conscious life.*~~

~~*Even, however, if this huge difficulty of the genesis of mind is got over, there still remain limits to the explana- tion effected by the doctrine of evolution, Thus, while it might be able to deduce all the processes of physical evolution from a few assumptions respecting primitive matter and its laws, it would have no such data for resoly- ing all these steps in the imental process which result in a leterogeneous mode of feeling. How, for instance, is it to account on general principles, and by @ priori reason- ing, for the differentiation of a vague tactual sensibility into what we know as sight and hearing—sensibilities which underlie all our ordinary conceptions of the physical world? Here are manifestly set rigid*~~

~~*limits to the explanation effected by the doctrine of evolution, the limits which J. §. Mill has laid down as those of all kinds of explanation of phenomena. The doctrine by no means helps us to resolve all laws of succession into one.*~~

~~*The other limits set to the explanatory power of the modern doctrine have already been hinted at. Thus the doctrine sets out from a given point in time, at which it assumes a definite arrangement of material (and mental) elements to have obtained. "Of the beginning of the universe," says Professor Clifford, "we know nothing at all." Again, Professor J. Clerk Maxwell tells us} that we must from the first assume an infinite number of molecules exactly alike in their weight and rate of vibration ; and he distinctly argues against the supposition that this system of like elements can have been evolved. There is room then for the question, how this particular order of elements arose. And even if we go further back, and make with Mr Spencer the large assumption that these various classes of molecules have been evolved from perfectly homogeneous first elements, one may still ask for an explanation of this original homogeneity. In short, it is plain that every doctrine of evolution must assume some definite initial arrangement, which is supposed to contain the possibilities of the order which we find to be evolved, and no other possibility.*~~

~~*Such being the limits set to the scope of explanation by the idea of evolution, the question arises whether these apparently permanent gaps in our scientific knowledge can be filled up by extra-scientific speculations. One may seek to show the need of such a metaphysical interpretation of evolution by a reference to the very nature of the doctrine. As a scientific truth, it is simply the highest generalization respecting the order of phenomena in time, and as such makes no assumptions with regard to the ultimate nature of that matter, force, and mind, of which it speaks. What, it may be asked, are the realities corresponding to these terms, and how are we to conceive of their mutual relations 4 Each of the supposed deficiencies in the doctrine of evolu- tion just referred to leads us back to those various metaphy- sical doctrines in which, as we have seen, the idea of evolu- tion has usually clothed itself. In order to understand what Mr Martineau calls the whence as distinguished from the when, and to provide a substantial support for the*~~

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~~1 Discourse on Molecules. See also the very interesting section on the '¢ Nature and Origin of Molecules," which conclndes the work on the Theory of Heat,~~

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~~thread of phenomenal events, it would seem as if we must fall back on some ultimate philosophic assumption respect- ing the efficient principle in the process.~~

~~With respect to metaphysical dualism, it must be said that it leaves us pretty much where we were. The corre- lation of two distinct substances and their manifestations, in the way required by the doctrine of evolution (whether this correlation be universal or not), needs explanation as much as the correlation of the two sets of phenomena. On the other hand, materialism, spiritualism, and the so-called monism, have each their merits and their drawbacks as helps to the interpretation of evolution. If materialism recommends itself by assuming the fewest possible prin- ciples, it is exposed to the objection that it bids us conceive a reality which is wholly distinct from mind. Further, it fails to give any intelligible account of the rise and pro- gress of mental activity. Again, spiritualism assists us in accounting for the genesis of mind, and for the appearance of intelligent order in the world. Yet it is questionable whether this doctrine, assuming as it does some form of un- conscious mind (whether as world-soul or as elements of feeling), is not beset with as many difficulties as it resolves. Further, it may be doubted whether the spiritualistic idea, in its common pantheistic form, has yet succeeded in render- ing intelligible the fixed mechanical order which marks all stages of evolution. Finally, it may be allowed that the monistic doctrine of one reality with two faces does in appearance lift us over the difficulties which beset the materialistic and the spiritualistic interpretation of evolu- tion. Only is it in truth anything more than a verbal simplification, and does it not rather leave us confined in that dualism where science has to land us ?**

~~*It would thus seem that the doctrine of evolution has by no means as yet received its final philosophic character. No one of the metaphysical doctrines which are at our command isso plainly and completely adapted to transform it into a final doctrine of existence, that it must of necessity be accepted at once and by all.*~~

~~*To this we must now add that to many minds this resort to a metaphysical principle as the support of the process of evolution will not be held to be necessary. A positivist, who thinks that our knowledge of the universe must for ever be limited to phenomena, is at perfect liberty to accept the doctrine of evolution and to regard it as an ultimate expression for the order of the world. Nay more, the empirical idealist—who may perhaps be defined as a posi- tivist that has fully analysed his "' phenomena "—can accept and give a meaning to the doctrine of evolution as formu- lating the order of sensations, actual and possible, of con- scious minds. Mr Spencer somewhere says that, if idealism is true, evolution isa dream. Yet this assertion may be reasonably disputed. It may perhaps seem staggering to be told that evolution postulates vast periods of time in which there existed no mind to experience the sensations into which the world is on the idealistic hypothesis resolved. Yet this difficulty is only apparent, since past physical evolution stands for a projection, so to speak, of now existing minds, and for an order of sensations conceived as possible under other and imaginable circumstances.? To the empiri- cal idealist physical evolution stands for an imagined order of perceptions in an indefinite number of minds, mental evolution for actual successions of feeling in many minds, and the transition from the one to the other means the suc- cession of actual states of consciousness on possible or imagined states. The unity of the world-process arises from the ability of the individual mind, which now reflects*~~

~~*2 It may be added that the hypothesis of the uniform correlation of the physieal and the mental enables us to assign an element of actuality (mental life) to the remote periods here spoken of.*~~

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~~*on these many successions, to gather them up by a series of acts of imagination into a collective ideal experience for itself.*~~

~~*Thus the doctrine of evolution seems to be susceptible of statement in terins of idealism as easily as in terms of real- ism. In truth, each mode of viewing the process is at once possible and beset with difficulties. The difficulty of giving an idealistic interpretation arises from the popular distinc- tion of mind or perception and something beyond and in- dependent of this. The difficulties of giving a realistic in- terpretation have in part been stated already in speaking of the different realistic interpretations (matcrialism and spiritualism). To these inust be now added the fundamen- tal obstacle to all realism, which shows itself, in a specially striking way, in relation to the doctrine of evolution,— naniely, the difficulty of conceiving in terms of human con- sciousness something which is independent of, antecedent to, and creative of, this consciousness.*~~

~~*It may be asked, perhaps, whether the doctrine of evolu-*~~

~~*tion, by providing a new conception of the genesis of our cognitions, has anything to say to the question of a real independent object. What the doctrine effects with respect to such cognitions as those of space is to show that the bare fact of intuitiveness or innatcness does not establish their non-empirical or transcendental origin. Similarly it may be held that the doctrine opens a way of accounting for the growth of the idea of independent realities, suppos- ing this to bé now an innate disposition of the mind—viz., by regarding this idea as arising in a succession of many generations, if not out of, yet by help of, certain elements or aspects of experience. It may, however, be maintaincd that the idea is not even suggested by experience; if so, it would follow from the evolution theory that its present 'persistence represents a permanent mental disposition to think in a particular way. Even then, however, the question would remain open whether the permanent dis- position were an illusory or trustworthy tendency, and in deciding this point the doctrine of evolution appears to offer us no assistance.)*~~

~~*As a scientific doctrine, whatever its ultimate interpreta- tion, evolution has a bearing ou our practical, ¢.¢., moral and religious ideas. 'This has already been shown in part by writers from whom we have quoted. Among other results, this doctrine may be said to give new form to the determinist*~~

~~*theory of volition, and to establish the rela- tivity of all moral ideas as connected with particular stages of social development. It cannot, as Mr Sidewick has shown, provide a standard or end of conduct except to those who are already disposed to accept the law segut naturam as the ultimate rule of life. To such it furnishes an end, though it would still remain to show how tlie end said to be unconsciously realized by nature, the well-being of individuals and of communities, is to be adjusted to the ends recognized in common-sense morality, including the happiness of all sentient beings. It may be added that tle doctrine, by assigning so great an importance to the laws of inheritance as means of raising the degree of organization and life, may be expected to exert an influence on onr ideas of the solidarity of the present generation and posterity, and to add a certain solemnity to all the duties of life, prudential morality included.*~~

~~*The bearing of the doctrine of evolution on religious ideas is not so easy to define. Mr Spencer considers the ideas of evolution and of a pre-existing mind incapable of being united in thought (see his rejoinder to Dr Martineau, Contemporary Review, vol. xx. p. 141 sq.). Yet, according to Oe*~~

- ~~*For a discussion of the relations of this doctrine to realism, see*~~

~~*the essay already referred to in Mr Sully's volume Sensation and Intuition. ,*~~

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~~*others, the idea is by no means incompatible with tlie notion of an original Creator, though it serves undoubtedly to remove the action of sucha being further from our ken. At first sight it might appear that the doctrine as applicd to the subjective world, by removing the broad distinction between the human and the animal mind, would discourage the hope of a future life for man's soul. Yet it may be found, after all, that it leaves the question very much where it was. It may perhaps be said that it favours the old disposition to attribute immortality to those lower forms of mind with which the human mind is found to be con- tinuous. Yet there*~~

~~*is nothing inconsistent in the supposi- tion that a certain stage of mental development qualifies a mind for immortality, even though this stage has been reached by a very gradual process of development. And if, as might be shown, the modern doctrine of evolution is susceptible of being translated into terms of Lcibnitz's hypothesis of indestructible monads, which include all grades of sonls, then it is clearly not contradictory of the idea of immortality.*~~

~~*Very interesting is the bearing of the doctrine of evolu- tion on that esthetico-religious sentiment towards tle world which has taken the place of older religious emotions in so many minds. First of all by destroying the old anthro- pocentric view of uature, according to which she is distinct from and subordinated to man, this doctriue favours that panthcistic sentiment which reposes on a sense of ultimate identity between ourselves and the external world. Ina sense it may be said that the new doctrine helps to restore the ancient sentiment towards nature as our parent, the source of our life. It is well to add, however, that the theory of evolution, by regarding man as thie last and highest product of nature, easily lends support to the idea that all things exist and lave existed for the sake of our race. This seems, indeed, to be an essential ele- ment in any conception we can form of a rationally evolved universe,*~~

~~*A reference must be made, in closing this article, to the opti- inistic aspect of the doctrine of evolution. That there isa tone of optimism in much of the morc popular exposition of the doctrine of evolution needs not be proved. There is no doubt, too, that both in Mr Darwin's and Mr Spencer's theories there are ideas which tend to support a cheerful and contented view of things. The idea of the survival of the fittest, and of evolution asa gradual process of adapta- tion to environment, lend themselves to this kind of thought. Indeed, Du Bois Reymond, in the lecture on Leibuitz already referred to, seriously argues that the doc- trine of evolution provides ascientificequivalent to that philo- sopher's remarkable conception of the best of all possible worlds. On the other hand, as the present writer has else- where shown, Mr Darwin's doctrine of evolution contains elements which are fitted to tone down our estimate of tue value of the world viewed as the seat of conscious sentient life. The pain involved in the renewed struggle for ex- istence is a large drawback*~~

from the gains of human pro- gress and of organic development as a whole. More than this, the principle of natural selection appears almost to favour a pessimist view of the world, in so far as it im- plies the tendency of organic forms to multiply down to the limits of bare existence.

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~~*EVORA, a city of Portugal, capital of the province of Alemtejo, is situated on an eminence in the centre of a fer- tile plain, 85 miles E, by S. of Lisbon. It is surrounded by ramparts flanked with towers, and has two forts, but all in a ruinous condition, and quite useless as means of defence. The streets are narrow, crooked, and filthy, and the houses old*~~

~~*and ill-built. The cathedral is a magni- ficent Gothic edifice with an altar in the Italian style, extremely rich, and decorated with variously coloured marbles. Evora is the see of an archbishop, and besides the cathedral has several churches, convents, and hospitals, a house of charity, barracks, a diocesan school, and a museum. A university, founded in 1550, was abolished on the expulsion of the Jesuits in the 18th century, An ancient aqueduct and an ancient tower, till a few years ago in pretty good preservation, have been partly demolished to make room fora market. They were long believed to have been of Roman origin, but are now known to have been constructed about 1540 in the reign of Don John Tu., at the instance of an antiquarian named Resende. The aqueduct was constructed on the site of the old Roman ene. The remains of what is said to have been a temple of Diana still exist, but the place is now used as a slaughter-house. Evora, under the name of Ebora, was an important military station in the time of the Romans, and was called Liberalitas Julie on account of certain municipal privileges bestowed on it by Cesar. In 712 it was conquered by the Moors and named Jabura, but they were deprived of it in 1162 by an order of Christian knights.*~~

~~*EVREUX (the ancient Mediolanum, and afterwards IIburovices), a town of France, capital of the department of Eure, is situated on the Iton, an affluent of the Eure, 67 miles W.N.W. of Paris by railway. The town is generally well built, and still contains many antique timber-framed houses. It is the seat of a bishop, and its cathedral is one of the most ancient and curious in France. It dates from the 11th century, and is a very imposing cruciform structure, though not uniform in style. The north transept and the portal are in the flamboyant Gothic, elaborately ornamented; the west front is in the Italian style. The beautiful rose window in the south transept, and the*~~

~~*wooden sereens of the side chapels round the choir, showing the flamboyant Gothic style modified by the reviving Italian, also merit notice. The lady chapel is of elegant architecture, with painted glass equally remarkable for its fine execution and perfect preservation. At the intersec- tion of the nave and transepts rises an octagonal tower supported on four pillars, and surmounted by a pyramidal spire of open stonework. The church of St Taurin also displays various styles of*~~

~~*architecture, and contains the shrine of St Taurin, a work of the 13th century. The episcopal palace, which dates from the 15th century, is a beautiful structure. Among the other objects of interest are the clock-tower built in the 15th century, the abbey of St Saviour, the ancient Séminaire des Eudistes now used aS a prison and assize buildings, tle museum of antiquities, the town-hall, the prefect's residence, the theatre, the public library, the botanic garden, and the promenades. Evreux is famed for its manufacture of tools, and for stocking making; brewing, distilling, dyeing, tanning, and papermaking are its other principal industries. At Vieil Evreux the remains of a Roman theatre, a palace, baths, and an aqueduct have been discovered, and various relics which are now deposited in the Musée d'Antiquités,*~~

~~*Evreux existed at a very early period. About the end of the 10th century Richard I. of Normandy gave it to his son Robert; and early in the 12th century it came by inheritance into the house of Montfort, from whom it was bought by Philip Augustus of France. Philip Il. gave it to his brother Prince Louis, who in 1816 was created Count of Evreux. Count Philip of Evreux acquired by marriage the kingdom of Navarre, and Charles III. of Navarre sold it to Charles VI. of France. Charles VII. gave it in 1426 to John Stuart, earl of Darnley, after whose death it again came into the possession of the crown, Charles IX. bestowed it, along with the title, on his brother the duke of Alengon, but on his death in 1584, it finally returned into the possession of the crown.*~~

~~*EWALD, HeinrichGrorc August von (1803-1875), Orientalist, biblicist, and theologian, was born, November 16, 1803, at Gottingen, where his father followed the occupation of a linen-weaver. After receiving the usual preliminary training, he entered the university of his native town in 1820; and there, with Eichhorn as teacher, he at once began to devote himself specially to the study of Hebrew and its cognates. At the close of his acadentical career in 1823 he was appointed to a mastership in the*~~

~~*(74*~~

~~*gymnasium at Wolfenbiittel; but soon afterwards (in the spring of 1824) he was, at the instance of Eichhorn, recalled to Guttingen as repetent, or theological tutor, and in 1827 (the year of Bichhorn's death) he became*~~

~~*professor extra- ordinarius in philosophy, and lecturer in Old Testament exegesis, In 1831 he was promoted to the position of professor ordinarius in philosophy ; and in 1835 he entered the faculty of theology, taking the chair of Oriental languages. Two years later occurred the first important episode in his studious life, which until then had been uninterrupted in its even tenor except by journeys in 1826, 1829, and 1836 to Berlin, Paris, and Italy, for the purpose of consulting rare and important oriental manuscripts. In 1837, on the 18th November, along with six of his colleagues (Dahlmann the historian, Weber the electrician, Gervinus the critic, the brothers Grimm, and W. E. Albrecht) he signed a formal protest against the arbitrary proceeding of King Ernst August (duke of Cumberland) in abolishing the liberal constitution of 1833, which had been granted to the Hanoverians by his predecessor William IV. This bold action of the seven professors made them very popular and famous in the country; but it led to their speedy expulsion from the university (14th December). Early in 1838 Ewald received a call to Tiibingen, and there for upwards of ten years he held a chair as professor ordinarius, first in philosophy and afterwards, from 1841, in theology. To this period belong some of his most important works, and also the commence- ment of his bitter feud with F. C. Baur and the Tiibingen critical school. In 1848, "the great shipwreck-year in Germany," as he has called it, he was invited back to Gottingen on honourable terms,—the liberal constitution having been restored. He gladly accepted the invitation, for though well treated in Wiirtemberg (he had been en- nobled by the king in 1841), he had never learned to re- gard his sojourn there as anything else than a period of exile. In 1862-63 he took an active part in a movement for reform within the Hanoverian church, and he was a member of the synod which passed the new constitution. He had an important share also in the formation of the Protestantenverein, or Protestant association, in September 1863. But the chief crisis in his life arose out of the great political events of 1866. His loyalty to King George (son of Ernst August) would not permit him to take the oath of allegiance to the victorious king of Prussia, and in conse- quence of his refusal to do so he was ultimately placed on the retired list, though with the full amount of his salary as pension. 'Perhaps even this degree of severity might have been held by the Prussian authorities to be unneces- sary, had Ewald been less exasperating in his language. The violent tone of some of his printed manifestoes about this time, especially*~~

~~*of his Lob des Kénigs u. des Volkes, led to his being deprived of the venta legendi (1868), and also to a criminal process, which, however, resulted in his acquittal (May 1869). Then, and on two subsequent occa- sions, he was returned by the city of Hanover as a member of the North German and German parliaments. In June 1874 he was found guilty of a libel on Prince Bismarck, whom he had compared to Frederick II. and Napoleon III. — to the former in "his unrighteous war with Austria and his ruination of religion and morality," to the latter in his way of "picking out the best time possible for robbery and plunder." For this offence he was sentenced to undergo three weeks' imprisonment. He died in his 72d year, of heart-disease, May 4, 1875.*~~

~~*From the above brief sketch it will be seen that, even apart from his contributions to philological and biblical science, Ewald was no common man. In the whole course of his public life he displayed in a very high degree many noble characteristics, — perfect simplicity and sincerity, in-*~~

~~*tensest moral earnestness, sturdiest independence, absolute fearlessness. It would be difficult to say whether the intel- lectual or the emotional side of his nature was most highly developed. He loved with peculiar intensity, loved free- dom and truth in every domain, in politics as well as in science and in religion; and just because he loved them with all his great might, he could not help hating all that he believed to be opposed to them. It was impossible for him to be a mere critic; no reader can understand Ewald's posi- tion who allows himself to forget that his whole being was possessed with a passionately devoted faith. It was natural that such a man should be frequently engaged in contro- versy, and equally natural that in these circumstances the " defects of his qualities " should often become painfully apparent. It cannot be denied that in his manner of speak- ing about his opponents he often overstepped the limits of charity and even of justice. The peculiar character of his intellect, which was rather intuitive than inductive, made him neither a very fair nor a very effective controversialist. No one equalled him in the power of comprehending in a single survey a vast circle of complicated facts, and almost instinctively divining their scientific unity ; but the results attained in this way*~~

~~*presented themselves to his mind with such intuitive conviction that he was impatient of all ob-*~~

~~*jection, and little able to do justice to scholars of a different*~~

~~*mental habit. Yet in controversy he probably received injustice more often than he inflicted it ; even his extremest views have generally been found to contain much that is true and valuable; and the great Arabist Fleischer 1s almost the only scholar who gained a conspicuous victory over him on an unambiguous philological issue. As a teacher he hada remarkable power of kindling enthusiasm ; and he sent out many distinguished pupils, among whom may be mentioned Hitzig, Schrader, Néldeke, Diestel, and Dillmann. His disciples have not been all of one school, any more than were those of Socrates; but many eminent moderns who are apparently farthest removed from his influence are only developing some of the fruitful ideas which in the exuberance of his wealth he was wont to fling out by handfuls.*~~

~~*Of no writings more truly than of his could it be said that they are the reservoirs into which, without any waste, the entire energy of a life has been stored. For more than half a century his pen was never idle; from 1823 onwards hardly a year passed which was not marked by the appear-ance of some highly important contribution to the sciences he loved. By the publication of his Hebrew Grammar he inaugurated a new era in biblical philology. All subsequent works in that department have been avowedly based on his. It has already been superseded in parts, especially in its accidence; but the syntax still remains unexcelled for the sagacity with which dry rules are made intelligible and in- teresting by continued reference to the fundamental laws of language and thought. But even when his Lehrbuch shall have become entirely antiquated, to him will always belong the honour of having been, as Hitzig has called him, " the second founder of the science of Hebrew language." As an exegete and biblical critic no less than as 4 grammarian he has left his abiding mark. It is hardly an exaggeration to say that the publication of his Geschichte des Volkes Israel was epoch-making in that branch of research, as much as was the work of Niebuhr in relation to the history of Rome. It its final form, the result of thirty years' labour, it is a noble monument to the*~~

~~genius of its author. No one can fail to be struck with the profundity of insight and patience of research which it displays. While in every line it bears the marks of Ewald's intense individuality, it is at the same time a highly characteristic product of the age, and even decade, in which it first appeared. If it is obviously the outcome of immense learning on the part of its author,~~

~~HW ALD~~

~~it is no less manifestly the result of the speculations and researches of many laborious predecessors in all depart- ments of history, theology, and philosophy. Especially is it indebted to the so-called "destructive" criticism. The Reformation had destroyed that medieval conception of the Bible which took no account of literary history or doctrinal development at all; and subsequent researches, especially since those of Astruc, had made it abundantly clear that the conditions under which the Old Testament books had come into being were much more complicated than had been at one time supposed. Criticism, however, could not possibly rest satisfied with these purely negative results. If for a time it seemed as if the sacred literature had been reduced to a mere chaos of fragments, which men might well despair of ever being able to reduce to harmony and order, the historical sense had been developing no less remarkably than the spirit of criticism. Taught by some of the more modern schools of philosophy, men had been learning to take larger, and therefore juster, views of the principles that underlie all national histories and the general history of the human race. It was impossible that such a phenomenon as the Jewish people and their litera- ture should be permanently set aside as wholly incom- prehensible. The world was only waiting for a bold and vigorous constructive genius like that of Ewald to bring together the scattered fragments, and construe them into an intelligible unity ; to show, for example, that, if the Psalter could no longer be regarded as the record of the spiritual experience of the individual to whom it had been tradi- tionally ascribed, it became all the more precious when known to embody all the highest aspirations and purest joys and noblest sorrows of many centuries of national life; and that if the legislation of the Pentateuch was not indeed, as had once been supposed, the work of a few quiet months, it gained in interest and instructiveness when known to be~~

~~*the slow growth of many busy generations, Taking up the idea of a divine education of the human race, which Lessing and Herder had made go familiar to the modern mind, and firmly believing that to each of the leading nations of antiquity a special task had been pro- videntially assigned, Ewald felt no difficulty about Israel's place in universal history, or about the problem which that primitive and highly endowed race had been called upon to solve. The lustory of Israel, according to him, is simply the history of the manner in which the one true religion really and truly came into the possession of mankind. Other nations, indeed, had attempted the highest problems in religion; but Israel alone had, in the providence of God, succeeded, for Israel alone had been inspired. Such is the supreme meaning of that national history which began with the exodus and culminated (at the same time virtually terminating) in the appearing of Christ, the supremely perfect revelation or self-manifestation of God. The historical interval that separated these two events is treated as naturally dividing itself into three great periods, those of Moses and the theocracy, of David and the monarchy, of Ezra and the hagiocracy. The periods are externally indicated by the successive names by which the chosen people were called—Hebrews, Israelites, Jews. The events prior to the exodus are relegated by Ewald to a preliminary chapter of primitive history ; and the events of the apostolic and post-apostolic age are treated as a kind of appendix. The entire construction of the history is based, as has already been said, on a critical examination and chronological arrangement of the available docu:ments. So far as the results of criticism are still uncertain with regard to the age and authorship of any of these, Ewald's conclusions must of course be regarded as unsatisfactory ; and it cannot be denied that later investigations have shown that in many important points his firm faith that*~~

~~*finality had been attained was illusory. These admissions, however, hardly atfect the permanent value of his work. It will continue to be a storehouse of learning for all sub- sequent investigators in the field of sacred history, and it will be increasingly recognized as a work of rare genius, It would be impossible to praise too highly the con- Scientiousness with which the*~~

~~*minutest features of the history have been carefully scanned ; the marvellous power of combination which, at even the most unlikely points, can draw the most graphic illustrations from contemporary prophets and poets; the vividness with which, not only the politics, but also the religion, the arts, the literature, the domestic life, of each sucesssive period are depicted ; the loving enthusiasm of the student who believes that those only are the enemies of the Bible who fail to investi- gate it, or who fail to investigate it thoroughly,*~~

~~*In his work on biblical theology, he can hardly be said to have been so successful as in some of his earlier efforts. Though a suggestive and therefore a useful book, its con- clusions are vitiated in many cases by a glaring departure from the inductive method, the interpretations being often speculative rather than biblical, and unduly dominated by a preconceived metaphysico-religious system of the universe.*~~

~~*Subjoined is a list of the more important of his works :—Die Com- position der Genesis kritisch untersucht (1828) [an acute and able at- temptto account for the use of the two namesof God without recourse to the document-hypothesis ; he was not himself, however, perma- nently convinced by it]; De metris evrminum Arabicorum (1825) ; Das Hohelied Salomo's iibersetet u. erklirt (1826; 8rd ed. 1866) ; Kritische Grammatik der hebr. Sprache (1827) [this afterwards became the*~~

~~*The following have been translated into English :—Hebrew Gram- mar, by Nicholson (from 2ud German edition), Lond. 1836; Jn- troductory Hebrew Grammar (from 8rd German edition), Lond. 1870; History of Israel, 5 vols. (corresponding to vols. i.iv. of the German), by Russell Martineau and J. Estlin Carpenter, Lond. 1867-74; Antiquities of Israel, by H. 8. Solly, Lond. 1876 ; Commentary on the Prophets of the Old Testament, by J. Frederick Smith, 2 vols., Lond. 1876-77 ; Isaiah the Prophet. chaps. i.-xxxili., by O. Glover, Lond. 1869; Life of Jesus Christ, also by O. Glover, Lond. 1865. (i, 8 Bis)*~~

~~*EWALD, Jowannes (1743-1781), the greatest lyrical poet of Denmark, was the son of a melancholy and sickly chaplain at Copenhagen, where he was born on the 18th of November 1743. At the age of eleven he was sent to school at Schleswig, his father's birth-place, and returned to the*~~

capital only to enter the university in 1758. HIs father was by that time dead, and in lis mother, a frivolous and foolish woman, he found neither sympathy nor moral support. At fifteen, he fell passionately in love with "the delicate, noble, majestic Arense," a girl whose father, later on, married the poet's mother; and the romantic boy resolved on various modes of making himself admired by the young lady. HIe began to learn Abyssinian, for the purpose of going out as a missionary to Africa, but this scheme was soon given up, and he persuadec| a brother, four

years older than himself, to run away that they might enlist as hussars in the Prussian army. 'They managed to reach Hamburg just when the Seven Years' War was commencing, and were allowed to enter a regiment. But the elder brother soon got tired and ran away, while the poet, after a series of extraordinary adventures, deserted to the Austrian army, where from being drummer he rose to being sergeant, and was only not made an officer because he was a Protestant. In 1760 he was weary of a soldier's life, and deserted again, getting safe back to Denmark. For the next two years he worked with great diligence at the uni- versity, but the Arense for whom he had gone tlirough so much hardship and taken so much pains married another man almost immediately after Ewald's final and very suc- cessful examination. The disappointment was one from which he never recovered. HIe plunged into dissipation of every kind, and gave his serious thoughts only to poctry. In 1763 his first work, a perfunctory dissertation De Pyrologia Sacra, first saw the light. In 1764 he made a considerable success with a short prose story, Lykkens Tempel (The Temple of Fortune), which was translated into German and Icelandic. On the death of Frederick V., however, Ewald first appeared prominently as a poet; he published in 1766 three Elegies over the dead king, which were received with universal acclamation, and of which one, at least, is a veritable masterpiece. But his dramatic poem Adam og Eva (Adam and Eve), by far the finest imagina- tive work produced in Denmark up to that time, was re- jected by the Society of Arts in 1767, and was not published until 1769. At the latter date, however, its merits were perccived. In 1770 Ewald attained success with Phlet, a narrative and lyrical poem, and still more with his splendid Rolf Krage, the first original Danish tragedy. For

~~*the next ten years Ewald was occupied in producing one brilliant poetical work after another, in rapid succession. In 1771 he published De brutule Klappers (The Brutal Clappers), a tragi-comedy or parody satirizing the dispute then raging between the critics and the manager of the Royal Theatre; in 1772 he translated from the German the lyrical drama of Philemon and Baucis, and brought out his comedy of Harlequin Patriot, a satire on tlie passion for political scribbling created by Strucusec's introduc- tion of the liberty of the press. In 1773 he published Pebersvendene (Old Bachelors), a comedy. In 1771 he had already collected some of his lyrical poems under the title of Adskilligt af Johannes Ewald (Miscellanies). In 1774 appearcd the heroic opera of Balder's Déd (Balder's Death), and in 1779 the finest of his works, the lyrical drama Fiskerne (The Fishers), which contains the Danish National Song, " King Christian stood by the high Mast," his most fimous lyric. In the two poems last mentioned, however, Ewald passed beyond contemporary taste, and these great works, the pride of Danish literature, were coldly received. But while the new poetry was slowly winning its way into popular esteem, the poet did not lack admirers, and at tlie head of these he founded in 1775 the Danish Literary Society, a body which became influential, and which made the study of Ewald a cultus. But the poet's health had broken ; when he was writing Rolf Krage he was already an inmate of the Consumptive Hospital, and when he seemed to be recovering, his health was shattered again by a night spent in the frosty streets. He embittered his ex- istence by the recklessness of his private life, and finally, through a fall from a horse, he ended by becoming a com- plete invalid. His last ten years were full of acute suffering ; his mother treated him with cruelty, his family with neglect, and but few even of his friends showed any manli- ness or generosity towards him. In 1774 he was placed in the house of an inspector of fisherics at Ruugsted, where Anna Hedevig Jacobsen, the daugliter of the house, tended*~~

~~*the wasted poet with infinite tenderness and skill. He stayed in this house for three years, and wrote there some of his finest later lyrics. Meanwhile he had fallen deeply in love with the charming solace of his sufferings,*~~

~~*and won her consent to a marriage. This step, however, was pre- vented by his family, who roughly removed him to their own keeping near Kronborg. Here lhe was treated so in- famously that he insisted on being taken back to Copen- hagen in 1777, where he found an older, but no less tender nurse, in Madame Schouw. Here he wrote Liskerne, with his imagination full of the familiar shore at Hornbek, near Rungsted. In 1780 he was a little better, and managed to be present at the theatre at the first performance of his poem. But this excitement destroyed him, and after months of extreme agony, he died on the 17th of March 1781, and was carried to the grave by a large assembly of his admirers, since he was now just recognized by the public for the first time as the greatest national poet. Amoug his papers were found fragments of threc dramas, two on old Scandinavian subjects, entitled Yrode and Helyo, and the third a tragedy on the story of Hamlet, which he meant to treat in a way wholly distinct from Shakespeare's.*~~

~~*Ewald belongs to the race of poetical reformers who ap- peared in all countries of Europe at the end of last century ; but it is interesting to observe that in point of time he pre- ceded all of them. He was born six years earlier than Goethe and Alfieri, sixteen years before Schiller, nine years before André Chénier, and twenty-seven years earlier than Wordsworth, but he did for Denmark what each of these poets did for hisown country. Ewald found Danish litera- ture given over to tastcless rhetoric, and without art or vigour. He introduced vivacity of style, freshness and brevity of form, and an imaginative study of nature which was then unprecedented. But perhaps his greatest claim to notice is the fact that he was the first person to call the attention of the Scandinavian peoples to the treasuries of their ancient history and mythology, and to suggest the use of these in imaginative writing. With a colouring more dis- tinctly modern than that of Collins and Gray, his lyrics yet resemble the odes of these his English contemporaries more closely than those of any Continental poet; from another point of view his ballads remind us of those of Schiller, which they preceded. I1Lis dramas, which had an immense influence on the Danish stage, are now chiefly of antiquarian interest, with the exception of ' The Fishers," a work that must always live asa great national poem. In personal character and in fate Ewald seems to have been not unlike Heinrich Heine.*~~

~~*The first collected edition of Ewald's works began to appear in his life-time. It isin four volumes, 1780-1784. They have con- stantly been reprinted, but the standard edition is that by Lieben- berg, in 8 vols., 1850-1855. CH, AY. Gay*~~

~~*EWING, ALEXANDER (1814-1873), a clergyman of the Scotch Episcopal Church, bishop of Argyll and the Isles, was descended from an old Highland family, and was born in Aberdecn 25th March 1814. After spending two sessions at the university of that city, where he manifested a special bent towards the study of natural history, he studied for a time at a private school in Chelsea, and in 1831 he attended the classes of chemistry, natural philosophy, and natural history in the university of Edinburgh. His uncertain health, however, compelled him for a time to suspend all systematic study. 'The property inherited fron his father rendered it unnecessary for him to adopt a profession from pecuniary considera- tions, and his delicate health counselled at least delay in taking such a step. Accordingly, for some time after his marriage be occupied himself chicfly in the cultiva- tion of his literary and artistic tastes, residing at first in the north of Scotland, and in October 1838 journeying to Italy,*~~

~~*where he remained till April1841. As early as 1836, how- ever, he had begun to look to the church as a profession; and in October 1838 he was admitted to deacon's orders with the object of pledging himself to his future profession before leaving Scotland,—the Episcopalian Church being preferred by him to the Presbyterian, chiefly on account of its comprehensive statements regarding the subject of human redemption. Soon after his return from Italy he was requested to take the charge of the Episcopal congrega- tion at Forres, and on accepting it he was ordained a pres- byter in the autumn of 1841. He remained at Forres till 1846, when he was elected first bishop of the newly restored diocese of Argyll and the Isles, the duties of which position he discharged till his death, 22d May 1873. In 1851 he received the degree of D.C.L. from the university of Oxford.*~~

~~*Though the work accomplished by Ewing was necessarily modified and circumscribed by the fact that throughout his whole life he was fettered by a delicate bodily con- stitution, he yet battled with the vices and religious per- plexities and difficulties of his time in a spirit of buoyant cheerfulness. _ Perhaps his strength lay chiefly in the charm of his personal manner, in his fine tact, and his catho- lic sympathies; and these gradually secured him, not only the admiration and love of the people and clergy of his diocese, but a prominent position among the ecclesiastics of his own time, both in Scotland and England. In all theological discussions he contended for the exercise of a wide tolerance and charity, shrinking from condemning with ecclesiastical censure even opinions which he feared might be fraught with evil and danger to the church. He did not, indeed, attach much importance to mere ecclesiastical authority and organization, and was more solicitous about the inward than the outward unity of Christianity. His own theological position resembled very closely that of Thomas Erskine of Linlathen, and Frederick Denison Maurice; but his relation to.these theologians was rather that of a friendly sympathizer than a disciple, for his opinions were the fruit of his own meditation, and were coloured by his own idiosyncracy, and their perspective was determined, by his individual stand-point. Unlike theirs, his teaching was never presented in the form of a complete and elaborate theological treatise, and its purport is only to be gathered from fragmentary publications,—letters to the newspapers, pamphlets, special sermons, essays contributed to the series of Present Day Papers, of which he was the editor, and a volume of sermons entitled Revelation considered as Light, which he only lived to see through the press. The title of this volume nay be taken as indicating the characteristic feature of his theology. He dwelt specially upon the illuminating power of Christianity as revealing the father- hood of God, and thus "rolling back the clouds of human sin and sorrow," so as even ultimately to "exhaust hell of its darkness." To him each attribute of God was equally light, and therefore he did not believe that any compromise had ever been effected between them. Christ was the supreme manifestation of that light, and the Bible was but the medium of its revelation, the means for enabling it to stream in upon the soul from sources beyond the mere letter of the truths which the written word contained. One of the chief of these external sources of light, specially wel- comed by Ewing, was science, to the discoveries of*~~

~~*which he looked forward as destined to lead to the manifestation of other and higher aspects of Christianity than were yet fully realized.*~~

~~*Besides his strictly theological writings, Ewing is the author of the Cathedral or Abbey Church of Iona, 1865, the first part of which contains drawings and descriptive letterpress of the ruins by Messrs Bucklers, architects, Oxford, and the second a history of the early Celtic church and of the mission of St Columba. Sce Afemoir of Alexander Ewing, D.C.L., by A. J. Ross, B.D., 1877.*~~

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~~*EXAMINATIONS. Examinations have lately come very widely into use, and call for consideration at once as educational appliances and as tests of proficiency. Some- thing answering to examinations must enter into all effec- tual instruction; for in order that the pupil may gain solid advantage it is not encugh that what he ought to know should be put before him — as by giving him a book, or by making him listen to lectures — but we must also see that he gets hold of it and understands it aright; this is the func- tion of examinations as appliances for education. They have, however, another use, that of tests or instruments for selection, and this purpose may clash with the educa- tional purpose. But though the examiners may have one purpose primarily in view, and may lay down their scheme with especial reference to it, we must bear in mind that the examination must act in both ways at once. Some sort of advantage must attend on success, or else candidates will not work for it; and, on the other hand, though an ex- amination may only be intended to sift out the ablest, and pains may be taken to avoid giving any advantage to a particular sort of instruction, still it will be found that some particular course is most productive of marks, and this will come into favour.*~~

~~*The few notices which we find of examinations in old times relate to tests of qualification for professions or crafts. We gather from notices of contests between the universities and the medical corporations in London that students had to pass an examination, after going through their ap- prenticeship, before being allowed to practise. But we never find that an examination was the sole test; it was always attached to a prescribed course of study and service. The foundation deeds of old endowed schools*~~

~~*sometimes contain a provision for an examination; the object of this seems to have been rather to ascertain that the teaching was satisfactory than to classify the boys, though sometimes prizes and emoluments were awarded by the examiners.*~~

~~*University examinations are found to take their origin from the "disputations" which appear very early in the history of universities. Dialectical discussion had entered largely into the higher education in classical times, and when the university of Bologna was incorporated as a school of law by the emperor Frederick I. in 1158, disputations soon came into use as exercises for degrees. 'The university of Paris, which was founded soon after, and which was a school of theology and of arts, adopted the same course ; and the forms of these exercises for degrees have survived to the present time in Germany, and did not disappear in England until 1860.*~~

~~*A student who aimed at a degree, which formerly only the more distinguished did, acted three times as opponent to other candidates, and was in time admitted to keep his " Act." This performance began by his reading a Latin thesis, in which he maintained some position in disputation against a doctor in the faculty, as well as the above- named opponents, and, in fact, against all comers. The debate was carried on in syllogistic form; the presiding doctor eventually summed up the controversy, and usually passed a compliment on the disputant, which was the earliest form of university honours.*~~

~~*Academical degrees, in their origin, implied a title to teach, as is seen in the names of Doctor and Master. The notion of a university degree as a criterion of general cultivation is comparatively recent: the B.A. or first degree, which is now so important, was not known in the earliest times, and is not even now granted in the German universities, The disputations took wonderful hold of the popular mind in the Middle Ages. It may be supposed that students looked more to points that gave an opening for attack, or that might be ingeniously defended, than tothe truth of the matter; and as the question would*~~

~~be settled by an appeal to the Bible or Aristotle, a habit of looking to authority was engendered. We may catch sight of analogous evils in the examination system ; for under this the points that are most likely to yield questions are the most studied. The two plans are only different ways in which the student may make a display of the powers or the knowledge he has acquired. We may observe that disputa- tions bring out "powers," such as ease of expression in Latin, quickness in logical fence, and fertility of resource, more thoroughly than they do actual knowledge; they are better adapted for " Arts" than for sciences.~~

~~Each meinber of the "faculty" had a right of putting questions to the candidate for admission into it in addition to that of formally opposing him in his " Act," and this was freely exercised. This was the germ of the examination, which has since developed itself in England, and displaced the disputation. The transition from disputations to ex- aminations took place in England during the 18th century, and it can be clearly traced at Cambridge, where the com- petitive system first attracted uotice, from the éclat attaching to the "tripos list " and the senior wranglership. The name "'tripos" has given rise to various strange guesses; the facts are as follows. For the appointment of some univer- sity officers, and for settling precedency, a list of those who took their B.A. degree was drawn out in order of priority of admission. This rule of priority was originally deter- mined by favour ; it was a piece of patronage belonging to the "moderators," who presided at the acts, and the proctors ; afterwards it was settled according to the perform- ances of the candidates at the acts, and eventually by the results of an examination in mathematics and natural philosophy. The day when these bachelors wereinaugurated was called the " tripos" day, because on that occasion one of the old bachelors was appointed to take his place on a stool, and to dispute with the new bachelors. It was his business to make sport by a kind of mock disputation, and he was allowed much licence in his remarks. HIe was called "the bachelor of the stool" or "'tripos," and the day was called "the tripos day." The list of names was called the tripos list, and it is probably owing to this need that there was for an order of seniority that the Cambridge tripos list came to be arranged in order of merit.~~

~~*The subjects of discussion were originally taken chiefly from Aristotle ; but soon after the publication of Newton's Principia it became usual to take one at least of the three questions which the candidate had to maintain from that work ; a second was frequently taken from Newton's Optics, and a third from ethical philosophy. The authorities, we find, endeavoured in vain to prevent ethics from being thrust aside, and to maintain something like respectability in the Latin, Interest was concentrated on the mathemati- cal subjects, three-fourths of them belonging to what we should call mathematical physics. These subjects could not be dealt with thoroughly ina disputation, and therefore the moderators adopted the plan of giving out questions which were answered in English. This eventually led to printed papers of questions being given, and in 1838 all vestige of the "Act" for the B.A. degree disappeared, although it was retained for a time in divinity, law, and medicine.*~~

~~*The history of the tripos serves to bring into relief different views as to the end which an examination is meant to serve. Originally it was intended to guide men so that they might learn what was thought best for them, and in the best way; this was the educational view. But colleges had fellowships to dispose of, and the tripos list furnished a ready gauge of merit for the purpose. This made it incumbent on the moderators to exercise rigorous ini- partiality ; and great pains were taken to secure fairness and to judge rightly. A list in order of merit would hardly*~~

~~*have approved itself to public opinion in the way the tripos list did, but for the fact that the examination was almost entirely on one subject, and that a subject which admits of questions being set of every shade of difficulty, and for which there is a definite right and wrong. If several sub- jects had been combined, or if, as was the case at Oxford, the ethical element had been allowed to preponderate, the results could not have been so accurately weighed, there would have been room for difference of opinion, and the only safe course would have been to distribute the names alphabetically in several classes, or in a few classes containing wide brackets, which is nearly the same thing.*~~

~~*The most important change in an educational direction was effected by the influence of Dr Whewell in 1848. He introduced a compulsory examination of adequate length in the elementary subjects, especially elementary natural philosophy; this checked the practice of reading "scraps" of the higher subjects. The old educational party aimed at turning out men in the most effective condition for the ordinary struggles of life, while a later party sought to turn out mathematicians to supply the demands of the scientific world. In the old times the notion was that the senior wrangler would go to the bar, or stay at Cambridge and follow an acadeinical career ; now his destination is very commonly a professorship in Scotland or Ireland, or in the colonies. Hence the course at Cambridge has been made to include a technically scientific as well as an educational training; and it has been thereby so much extended that the amount to be carried into the tripos is excessive. As the whole cannot be read in the three years allotted, the tripos no longer affordsa fair field for all those who collect together as freshmen, as it did forty years ago. A very high place can hardly be hoped for now unless much ground has been got over before admission to the university. This point has attracted notice, and changes are about to be made (1878).*~~

~~*Before considering other methods, it will be well to take a general view of the action of examinations, First, it may be observed that the employment of examinations rapidly spreads. An examination at a school may at first be confined to a few subjects; it is then found that the rest are neglected, and however ill suited they are for examination, they must be brought in somehow. Again, if certain boys or classes are being prepared for an examin- ation, the others think that they may take their ease, because they are not going to be examined, and the thoughts and interests of the teachers will commonly turn to those who have to prepare for this ordeal. Moreover, if some professions are guarded by an examination, those which are. not' so will become the resort of the dunces. Hence wlhien examinations are once started they spread in all direc- tions.*~~

~~*It is found that some branches of study are better suited for examination than others; and something more must be said as to the fitness of different classes of subjects for this purpose. Certain studies endow the pupil with the faculty of doiwg something he could not do before, such as*~~

~~*that of translating foreign languages, or of solving mathe- matical problems ; and there are others, like history, which though they may add greatly to the wealth of the man's mind, yield no such definite faculty or technical dexterity. We can test the possession of the first sort of acquirement directly, by calling on the student to put in practice the powers he is expected to have acquired. But with respect to the latter we can only ascertain that he recollects some portions of what he has prepared. By choosing these por- tions judiciously, we can tell whether the student has care- fully studied the subject, and linked the various parts of it together, but we cannot make sure of the permanency of this knowledge. Young men used to examination will pick up*~~

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~~*just the information suited for their examination in a very short time, from an analysis or tutor's note book, and forget much in a few days. This power of "getting up" and "carrying" is not without practical value. It is the power which enables a lawyer to master a mass of details, and we may allow credit for this, for it shows a good analytical memory; but it must be observed that what is thus rewarded is not so much a knowledge of the special branch of study asa power of acquiring, which very probably might be applied to one subject as well as another.*~~

~~*It requires great experience and judgment in an examiner to deal with subjects like history and literature. HIe must have an eye for the cardinal points, and must know how a student ought to hold things together in his mind. If he yield to the temptation which seems to beset examiners of picking out "things not generally known," and minute details which a wise man is content to leave to be looked up when he wants them, then a kind of artificial knowledge, solely for usc in examinations, will be engendered. In this class of subjects the profit obtained by the student is not proportionate to his recollection of what he has learned, and yet it is this recollection only which can be accurately measured. A student may have got good from his reading, and yet be able to do little even in a paper that is well set; because for an examination the subject must not only be read, it must be " got up."*~~

~~*The studies, on the other hand, which enable one to "do" something supply a power that is alwaysat hand. A classical scholar can at any moment translate a passage. This difference is very important. ' Information subjects " burden the memory and give rise to " cram" more than the others; besides, a faculty cannot be lost in a few months and information may. The more, therefore, that a competitive examination can be made to turn on " faculty subjects" the better. Information subjects can be dealt with more satisfactorily when competitions, which should be confined to an early age, are over, and the student is fitting himself for the work of life. He will read them most profitably when he feels that he wants the information, not for display, but for practical use.*~~

~~*Examinations, of course, tell us little directly about moral qualities ; industry, indeed, they reward, but the work pro- duced may have been done under the strong incentive of eagerness for success, or under compulsion, or in the absence of temptation, and under other circumstances the candidate's zeal may flag. Energy and tastes go far to make a man what he is, and of these examinations tell us nothing. A course of examinations tells something more as to steadiness of purpose and growth of mind than a single one; and a person who follows up an unusual kind of study—such as till lately natural science was—has probably a genuine taste for it.*~~

~~*It makes all the difference to the teacher whether the examination is subordinate to the teaching, or the teaching to the examination. In the first case he is really the educator—he lays down the course he thinks best. In the second he carries out a course which may leave him no option; and even if it embrace alternative subjects, these must often be chosen for the marks they will bring in the time allowed rather than for the good they will do the pupil. On the other hand, if a teacher's work is not sub- ject to some external test, he may get careless, and neglect to keep himself abreast of the progress of science and of the art of teaching. Of course no public advantages could be granted to a certificate given to candidates by their own teacher, when his interest lay in getting them through. If he were independent, like an authorized public teacher, he might be trusted, but he would then be a perma- nent examiner, and his*~~

~~*style would soon be 'understood. There must, however, be some correspondence between*~~

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~~*the teaching and the examination, especially on subjects which can be treated in different ways. If a professor, for example, occupy himself with the textual criticism of a book, and the examiner ask no question on this, students will neglect the lecture. Hence, the public teacher should be in communication with the examiner, or form one of a body of examiners.*~~

~~*In Germany the difficulty is solved in this way. At the " abiturient " examination the teachers in a gymnasium propose two questions in each subject ; of these the Govern- ment inspector chooses one, and this the candidates who are leaving for the university answer on paper. The errors in the answers are marked by the masters, and the papers so marked are considered by the inspector, who, along with the school authorities, and with some reference to the pupil's work in school, decides on his fitness for leaving the gymnasium.*~~

~~*The two functions of testing acquirements and of direct- ing and stimulating instruction do not act always along the same lines, and the examiner and teacher may therefore pull different ways. If the examiner wants to pick out the sharpest lad in a school he will give great weight to any- thing that shows brilliancy. Excellence, too, in any one de- partment is a far better sign of power than mediocrity in many. But the teacher does not want the clever boy to rely on his facility in Latin verses or to give himself up to his favourite study, and will make the examination turn on the general school work. He will set questions in the parts of the subjects which involve drudgery, in order to enforce attention to them. Propositions in Euclid and questions on elementary grammar may have no effect in dis- criminating between two clever boys; yet these questions must be set if Euclid and grammar are to be learnt.*~~

~~*Again, an examiner may only want to see that the can- didate has a certain knowledge, namely, that which is required in the situation in prospect. He may want to see, for instance, that arithmetical questions can be worked correctly ; if this can be done he may not care how the*~~

~~*know- ledge was got,—all he wants being the fact that it is there. But a boy may be taught to do sums by the old mechani- cal rules, and this kills the reason instead of developing it. The educator is teaching the boy by means of Euclid, arithmetic, and the rest, rather than teaching him Euclid and arithmetic for their value as possessions. He will therefore frame his paper so as to show that the boy has gone through the processes of study which he wants to en- courage ; his questions will involve principles. His paper may not gauge powers of computation so well as one con- taininga number of intricate sums to be done in a short time, but it shows whether the boy in learning arithmetic has used his brains.*~~

~~*Examinations are effective in three principal ways as regards education, First, they act as stimulants, partly by holding out the prospect of advantages of some sort, and partly by appealing to the combative spirit in human nature and the desire to excel, Stimulants are valuable in our pharmacopeeia, though liable to be used too freely. Youths who might sink into inertness are often roused to vigour by seeing a definite object to work for, or by finding themselves engaged in a contest. On the other hand, if the idea of gain is presented to young people too early, it may over-ride all other motives, such as duty and regard for authority and desire to learn. To those who have been habituated to examinations, it seems useless to work for anything in which they are not going to be examined, and the examinations will not act as a stimulus unless some- thing is to be got by them. Hence competitive examina- tions should not be often repeated ; a single comprehensive one at the end of a long course may do good, but it must not be kept always immediately in view. The pupil*~~

~~*should not himself study examination papers, or speculate on the most profitable course, but should trust to his tutor, who will tell him that the best way to get marks is to learn honestly, as if for learning's sake alone. The stimu- lating effect of examinations leading to gain acts on parents and on schoolmasters. It leads parents to exert themselves to procure, not the best education for their sons they can, but the most direct preparation for competitions. This fosters low notions of education: people overlook*~~

~~*the value of developed faculties and good mental labits, and seem to think that if there were no examinations their sons would want no schooling. Often it is of great importance for a youth to pass an examination when there is no time for him to get genuine knowledge; this knowledge must then be simulated by a process called "cram," which means that the "portative memory," or carrying power, must serve as a make-shift for all other faculties, School- masters find a zest given to their work by looking to the places their pupils may gain, but the course which will earn the best placc is not always that which will be the best for the youth in the end ; and then the master is pulled in the wrong direction by the eagerness of the boy or his parents, and sometimes of his own subordinates, all of whom look first to success. Masters, let it be said, for the most part resist nobly, and aim at doing real good ; but the pres- sure. pnt on them adds to the wear and tear of their work.*~~

~~*Secondly, examinations serve as guides. A youth may seem to be listless only because his energies have not been turned into a definite channel; when he is shown his work, and is started in the way to do it, he becomes quite another being. Besides, a good examination shows whiat is meant by knowing a subject. The pupil or even a teacher by looking over a thoughtfully drawn up paper of questions gets a higher standard of knowledge; he sees the way of dealing with the subject secundum artem as opposed to any slipshod easy-going way of handling it. On the other hand, examination papers which are so meagre that the pupil finds no call on him for intelligence, or in which he can pass by doing a very small portion of the paper, have a most injurious effect. They give the pupil a low view of know- ledge, and cripple the teacher, because the pupil is confident of passing with what he thinks he can learn in a week or two before the examination.*~~

~~*'Thirdly, examinations oblige a person to be able to pro- duce lis knowledge, and encourage him to bring it out in a terse and lucid style. They give no credit to loose or floating knowledge. Notions that are in solution are not available ; they must be crystallized in definite form before au examiner will accept them. Great difference is also made between an answer which is perfect and one which is not ; and this exerts a good influence, for onc of the com- monest defects of loosely trained*~~

~~*minds is that they are very deficient in exactitude, and do not appreciate the enormous difference between going " somewhere near" the mark and hitting the precise point.*~~

~~*But examinations, even when well conducted, have ill as well as good effects. They destroy spontaneity. Nine young people out of ten may quite rightly be made to move in a good "regulation groove," but the tenth would be better for having room to expatiate. The candidate who is getting up his books is busy about learning, not in think- ing. If independent thoughts suggest themselves he puts them aside ; his business is with his "books," for his own thoughts cannot be set. This tendency may be obviated by allowing scope in the answers for some discursiveness (but this has its evils also) or by introducing essays, but a man's mind no doubt becomes " examination bound" if he is subjected to repeated definite mechanical examinations. He is kept in a state of pupilage, and only reads to recollect when he is of an age to reflect, to examine, and to judge.*~~

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~~*This leads to the question ofage. Exanunations, though good for boys, are bad for men. Those which: deal with general education should not be continued beyond the age of 22. Professional examinations, or examinations in the highest parts of science, intended for those who mean to give their lives to study, must come later, but should be as little competitive as possible. By a "' competitive" ex- amination is meant one in which a candidate is depressed or excluded by the superiority of another.*~~

~~*Another point is the strain on the mind produced by competition. This strain is much greater, as has been said above, when many "information subjects" have to be carried in the head at once, than when the pupil has only to exercise in his examination a power which he keeps about him; because, in the former case, he is constantly harassed by the fear that he is dropping something. It is bad for a student when he is interested in his chemistry to feel a panic about his English literature. Nothing wears out the mind so much as being pulled many ways at once, especially if this state of distraction is prolonged. Yearly trials, for instance, for some*~~

~~*appointment, a new subject being now and then added to increase the candidates' weight of metal, so habituate the mind to an artificial stimulus that pupils become incapable of studying without it. They can feel no interest in a subject if it is not to be set in an examination; and in time their power of attention is weakened, and their minds become like india-rubber bands which have been too long on the stretch. On the other hand, young people may be expected to be equal to one great effort or perhaps to two. Such occasions may call out some heroism or self-denial, and these qualities are much needed, But for this purpose the teacher should regard the examination with respect, and teach his pupils to respect it,—he must not help them to outwit the examiners. In this view it is well that the teachers shonld have some influence in framing or altering the examina- tion scheme. 'They will then regard it asin part their own. Moreover, the pupil should have the examination in view at the end of a long vista of study ; the preparation for it should not be hurried. The feeling of being short of time adds to worry, and prevents good work.*~~

~~*There are always some students of an anxious disposition who will over-fag themselves at the approach of an examinn- tion. Thisis more frequently the effect of over-worry than of over-work. It will usually be found on inquiry that the hours of work per diem have not been excessive, but the evil is that they have had no rest; when not at their books they are letting their minds run on their work, fancying they are forgetting something,—they are haunted by the idea of the examination, and becoine physically un- fit for it. But we must not throw the blame of the mischief that may thus accrue to them on the examinations, Sucli cases do not commonly occur among those who are aiming at the highest places, and are most exposed to the strain of competition ; very often the sufferers are merely pass men, and they are in fact unequal to any call on their nervous energies. The examination is the first call they encounter, and their weakness is shown in that; but they would probably have been in the same condition the first time they were called on to face auy responsibility, such as to make a speech, or preach a sermon, or write an article bya given day. Afteran examination or two this nervous- ness is overcome by the stronger sort. Nodoubt young men have to encounter a severe strain at some examinations, and this should be reduced by lessening the load on the memory at one time. It may be very desirable for*~~

~~*young men to learn something of six or eight subjects, but they should not be examined in all at once. It is also desirable that those who are exposed to strain of any kind should be under the eye of one who knows the laws of mental and*~~

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~~*physical hygiene—who can detect the first symptoms of morbid anxiety, and will have authority enough with the pupil to enforce exercise, proper diet, and mental relaxation. If the mind cannot rest, it must have a change of occupa- tion.*~~

~~*The most important examinations are those which lead to university emoluments, and those by which candidates aie selected for the civil service and the army.*~~

~~*A clever youth, destined for the university, is at present subjected to examinations from the age of 14 to 23 or 24. First he is brought on at a preparatory school, to compete for a scholarship at one of the large schools. The credit of his schoolmaster is involved in his success, and great pains are taken with the candidates, Usually the examiners understand boys, and the papers are set with judgment; but a boy at 14 should be extending the roots of his knowledge, not arranging it for display; and if he be trained in order to have something to show, there is a danger that solidity may be sacrificed to the early production of results. An examiner taking a school unawares, and questioning the boys, would probably detect the cleverest without doing any harm ; but when boys work up to papers, even if they are carefully set, there is a danger of their developing the fatal facility of remembering words with little care for ideas, which belongs to their age. It is said that those who are elected scholars often seem to fall off at first. They have worked under pressure, and the pressure is removed. They most commonly, however, rally for the next contest, which is that for open scholarships at the university. The examinations for these are now almost always in special branches of knowledge,—classics, or mathematics, and natural science. The colleges too often aim at securing, not the youth who is well-educated all round, but one who is likely to obtain a high degree in a school of uni- versity honours. They want men of power; and special distinction is held to be*~~

~~*the best criterion of this. School- masters often grieve over the necessity of having to put a boy apart to be prepared for the classical or mathematical market; but the public looks in the newspapers for notices of scholarships gained, and a school which may do admirable work with the staple of its boys will yet be carped at if wanting in university success. Boys are hawked from college to college till they find one which will give the price, —that is to say, a scholarship of the value which the parent or master thinks the boy ought to fetch. Of these youths many have little taste for things intellectual, but they have hard heads, and a keen desire to get a scholarship, without which their friends will not send them to the university. By diligent work they may get such a place in a class list as can be won without special ability. Some, of course, are of a higher order, and of a perfectly satisfactory description; and others, on the withdrawal of the pressure that was on them at school, or under their tutors, turn idle and disappoint their purchasers.*~~

~~*At Cambridge, unless the students are at Trinity College, the "tripos" brings their examinations to an end, At Trinity College and at Oxford an examination by the college is held for fellowships. There are thus two systems for awarding these,—that of special examinations, and that of being guided by the university honours obtained. It is in favour of the first that it gives two or three chances, aud that, by affording a long period from the first admission to the university, it enables a young man to retrieve himself if his early education has been mismanaged by his friends. In some cases, too, very good work is done in the intervening years, but for this to be the case the candidate must not be anxious about the examinations. Those who profit in this way are those who may reckon pretty certainly on success. Against this special ex- amination it is urged that it retains men in papilage up*~~

~~*to 24 or 25, that with many it is a question whether their chance is worth the investment of the time, and that it gives an advantage to the richer men who can study at leisure, while the poorer must support themselves at schools or by private pupils.*~~

~~*We now come to Government competitive examinations, such as those for the army and civil service. The object of the system was twofold. First of all it was desired to get rid of patronage, with the solicitation and trouble at- tending it, and, secondly, to secure the ablest men which the situations can command. 'The first object, no doubt, is attained, aud is well worth attaining ; with regard to the second, experience seems to show that the system answers quite satisfactorily for the army, and moderately so for the civil service. The reasons of the difference are that the pay in the army is not sufficient to attract those who have no turn for the profession, or who are deficient in the traditional qualities or bearing of the British officer. This examination also is the less distracting of the two, because the number of subjects that may be taken up, both in the case of the ordnance corps and of the line, is limited, and a preponderance is given to those subjects which furnish faculties over those which result in information. If by these examinations we had to pick out 10 men out of 500, the mechanism would be too rough for the purpose ; but if we have to take 50, we get down to the great plateau of mediocrity, where we find a batch of can- didates nearly on a level; and even if the sixtieth man were to be a trifle better than the fiftieth, either of them would be good enough for the purpose.*~~

~~*The English Government encountersa particular difficulty in such examinations, because there is no uniform national system of education as in Prussia, and advantage must not be given to particular schools. This makes it necessary to allow a wide option of subjects, and the result is that candidates will take, not what is best for them to know, but what will bring most "marks" within a given period of study. The tutor has to invest the pupil's time in that study which promises best for his score. This is not satisfactory to the educationalist, but as a fact, if these youths were not getting up their modicum of zoology or electricity, they would probably be doing nothing better. The money value of an Indian appointment attracts many youths of a different class from those who seek for com- missions; these may be wanting in the qualities which are required to command the respect of HIndus, and they may regard their career too narrowly as an investment of brains and labour for which they expect a good return. Physical accomplishments might be allowed to carry some weight, and be required as a qualification.*~~

~~*The next class to be considered are " pass examinations." These are important from the large number of men they affect. By a pass examination we mean one in which the leading object is to ensure a certain standard. It does not follow that some credit may not be obtained by doing well; indeed, for the healthy operation of the examination it is desirable that those who pass should be classified alpha- betically in three or four classes. The objects of a pass examination are to sift out incapacity, and to ascertain that the candidates have gone through a certain process of edu- cation. The pass examinations of universities, both in Enugland and in France, were until lately framed on a wrong principle. It was thought that the examinations should comprise a specimen of every kind of knowledge that an educated man should possess. If the garduate should prove ignorant of any such branch, the university, it was thought, could absolve itself from responsibility by showing that he had known it at onetime. Now, however, we recognize the fact that these scraps of knowledge soon disappear. The portion of chemistry or history which the candidate has*~~

~~*passed in is often only so much "book" learnt almost by heart ; with those who do really well the case is different. The value of these examinations is only that they show that men can apply their minds, and can express themselves passably well. The subjects should be chosen much less for their value as information than for their requiring the exercise of thought. Pass men are apt to reduce all they can to the action of memory; hence subjects should be taken which require something more than memory. To detect " parrot-work," the examiners should be familiar with the text-books from which the subjects are learnt, and therefore such examinations should be in connexion with set courses of teaching. 'Translation of unseen passages, in Latin for instance, should be insisted on, but a diction- ary might be allowed. Questions in geometry should be get in such a way that they cannot be answered by writing out Euclid by heart.*~~

~~*The difficulty of a pass examination depends both on the number of compulsory subjects it contains, and on the standard maintained ineach.*~~

~~*Feeble men can get through an examination in one or two subjects at a time, if the standard be moderate. Thus an examination which can be passed piece-meal, like the Cambridge "' Little-go," is a poor criterion of brains, while an examination embracing many subjects ensures a certain strength of head, but not lasting knowledge of any one thing. When an examina- tion has to be extemporized in order to ascertain whether candidates have heads on their shoulders, it will be sufficient to read over to them once or twice some short narrative or argument, or a correspondence on business matters, and to call on them to give an account of it on paper. This will test sufficiently well many of the qualities which go to make an efficient subordinate.*~~

~~*It remains to say something as to practical methods of examining. Originally examinations were conducted wva voce, and they still are so in part. Examinations in experi- mental philosophy and natural science are valueless without something of the kind. The student must perform experi- ments and explain them, and must identify and describe specimens. Viva voce examination is not well adapted for discriminating between candidates who are nearly equal, because they have not the same questions put to them, and nervousness is a disturbing element. The value of wva voce lies chiefly in detecting shallow knowledge. It convicts an impostor. On paper a candidate may avoid a searching question; in viva voce he has no escape. The objection to its employment is its great expense. It requires very skilled examiners, two of whom ought tosit together ; and the examination should last a quarter of an hour for each man. When the numbers are large this involves a long period of examination and great cost. The German system of giving only one question in each subject for a pass examination, and allowing plenty of time, but requiring a very full and perfect answer, is well suited for fairly pre- pared men, who have only to be roughly classified as "excellent," "good," "fair," and " indifferent." This forces the candidate to study the whole subject carefully, while if a dozen questions are given, as in England, can- didates will speculate on passing witha knowledge of only half the subject. –*~~

~~*Essays may be used in examinations in two ways. Sub- jects of a general nature, like a maxim or topic of the day, may be proposed, in which case*~~

~~*readiness and fertility of ideas are tested, but a kind of superficiality and glibness is engendered ; or the student may be required to write on some subject belonging to his course. 'The classical student, for Instance, might write ona point of Greek history. A dis- sertation written at leisure is an excellent means of judging of qualifications, and may be used for those who are past the proper age for examination.*~~

~~*EXAMINATIONS*~~

~~*In marking a paper the examiner distributes his marks to the questions according to the difficulty or the time they take toanswer. The aggregate of the marks may not coin cide with his impression, and it may be well to keep back one quarter of the marks, to be allotted afterwards, accord- ing to the impression obtained when the papers are read over again, not question by question, but as wholes. It may be well sometimes to use negative marks, as an answer may reveal such ignorance as to show that some of the correct answers were " parrot-work." When different subjects are compared, a little knowledge should go for nothing, and excellence should count for much, It isa good plan to add to the marks got the excess above half the full value assigned to the paper, and then deduct one quarter of the full value, ¢.g., if the full value be 500 and the candidate obtain 400, his score will stand thus :—*~~

~~*400+ 150-125 = 425.*~~

~~*Candidates for honours may be arranged in order of merit, as iscommon at Cambridge, or alphabetically classed, as at Oxford. In the first case brackets should be used, so as to class as equal those who fall within certain limits of uncer- tainty. These limits will be wider where there is room for difference of opinion among the examiners, as in composition or philosophy, than in mathematics. If the candidates whose marks differ by as much as twelve per cent. are bracketed together, we come to something like an alpha- betical arrangement in classes. When the alphabetical system is adopted those who are sure of a first class are freed from anxiety. But many are in suspense about their class, and the difference between being in a first or second class alphabetically arranged is greater than that between being last in the first class or first in the second class, where the lists are in order of merit.*~~

~~*Out of 1000 young men who came to a university with a view to taking a degree, we find from experience that, roughly speaking, the following proportions will hold good: —250 will have both good abilities and the requisite power of will, and will take creditable honours; about 200 more will be comparatively weak in one or other of these qualifications, but may still get a place in an honour school or tripos; the next 150 will be the more vigorous pass men, who will show intelligence in subjects of but moderate difficulty, will enter keenly into the life of the place, and will pass their examinations respectably; 200 more will pass without failure; the 100 that follow will meet with failures more or less frequently; and the remaining 100 will never pass any university examination at all. Some of these last instances may almost be regarded as cases of disease, arising from infirmity of will or the want of the power to fix theattention. Neglect of the early acqui- sition of good mental habits is the cause of many failures. A youth may be rejected once from love of amusement or from underrating the examination, but he does not fail again if he can help it. A second failure shows moral or intellectual incapacity.*~~

~~*On this subject see—" Remarks on State of Education at Cam- bridge," in Dr John Jebb's works, 1774 (here we find the first plan for examining the pass men) ; Peacock, On the Statutes of the Uni- versity of Cambridge, 1840; Whewell, Of a Liberal Education, 1848; Reports of her Majesty's Commissioners on Oxford, 1852, and on Cambridge, 1854 (in the latter see the evidence of Dr Philpott, Prof. Stokes, Dr Merivale, Mr R. Leslie Ellis, and Mr W. Hop- kins); Suggestions on Academical Organization, Mark Pattison, B.D. (referring to Oxford); L. Wiese, German Letters on English Education, translated by L. Schmitz, 1877 ; Education in Oxford : its methods, its aids, and its rewards, James E. Thorold Rogers ; Conflict of Studies, I. Todhunter, F.R.S8., 1878 ; Higher Schools and Universities in Germany, M. Arnold, 1874; On the Action of Ex- aminations, H. Latham, 1877 ; Report to the French Government on Education in England, by M. Demogeot and M. Montucci, 1870 ; Third Report of Royal Commissioners on Scientific Instruction, 1878 ; M. Burrows, Pass and Class, Oxford, 1878; Student's Gutde to*~~

~~*the University of Cambridge, 1874; Twentieth Report of Civil Ser- vice Commissioners, 1876. _PERIODICALS.—Mind, No. 1, 1873, '* Philosophy at Oxford," Mark Pattison, B.D.; Fortnightly Review, June 1875, 'The Examination System at the Universities," A. H. Sayce ; Contemporary Review, April 1876, " Idle Fellow- ships," H. Sidgwick, and November 1877, " The Civil Service Ex- amination Scheme in relation to Sciences and to Languages," Alex. Bain, LL.D.; Nineteenth Century, April 1878, "The Good and Evil of Examination," Canon Barry; Quarterly Journal of Edu- cation, April and July 1872, "On the Leaving Examinations of Prussia," by W. C. Perry; Macmillan's Magazine, June 1877, "On German Schools," W. C. Perry, and March 1878, "German Views of Oxford and Cambridge." (H. LA.)*~~

~~*EXARCH (é€apyos, a chief person or leader), a title that has been conferred at different periods on certain chief officers or governors, both in secular and ecclesiastical matters. Of these, the most important were the exarchs of Ravenna, the first of whom was appointed by Jus- tinian, emperor of the East, as governor of the middle part of Italy, which was made a province of the Eastern empire after Narses had entirely subdued the Goths and their allies in Italy, 552-554 a.p. Ravenna, with the whole exarchate, was conquered by Astolphus, king of the Lombards, in the year 752; but three years later it was taken by Pepin, king of the Franks, who bestowed it on the pope (Stephen III.), from which time Ravenna and its territory remained united to the papal dominions. The exarch of a diocese was anciently the same as primate. This dignity was intermediate between the patriarchal and the metropolitan, the name patriarch being given only to the heads of the more important dioceses. Metropolitans are also sometimes called exarchs, but apparently not in a technical sense. Exarch is used, in the ecclesiastical antiquities of the Eastern Church, for a general or superior over several monasteries, and is also applied to certain ecclesiastics deputed by the patriarch of Constantinople to collect the tribute payable by the church to the Turkish Government. In the modern Greek Church, an exarch is a deputy, or legate a latere, of the patriarch, whose office it is to visit the clergy and churches in the provinces allotted him.*~~

~~EXCAMBION, or Excaancs. Excambion (a word con- nected with a large class of Low Latin and Romance forms, such as cambium, concambium, scambium, from Latin cambire, and Greek xdpPew or kdprrew, to bend, turn, or fold) means in Scotch law the exchange of one heritable subject for another. Its meaning is extended by Lord Stair (Jnst., i. 14, 1) to every case of exchange or barter, the permutatio or innominate contract (Datur res ut vicissim res detur) of the civil law, about which a fierce controversy raged between the Proculian and Sabinian schools, as to whether it was truly a sale or a separate contract. Both schools used to quote the words of Homer, " And thence, too, wine was got by the long- haired Achzans, some bartering it for bronze, and otliers the glistening steel, some hides, and some the cows them- selves, and some again slaves." This Roman contract was not constituted by consent, but by a formal stipulation ; it did not pass the property of movables, if the seller had not a title; and it was liable to be rescinded on proof of great inequality. In each of these features it has been modified by the modern law of most European states. Erskine says (Jnst., iii. 3, 13), "This doctrine (of property not passing apart from title) may be equitable if directed only against the party himself and his heir; but there could be little security in the commerce of movables if it were extended against a singular successor who had bona fide bought the subject from the party after the exchange." In other points, such as the risk of a subject being destroyed, or the remedies on breach of contract, permutation of mov- ables falls under the same rules as sale. The feudal lawyers amused themselves by discussing what name~~

~~should be given to a contract in which the consideration consisted partly of money. They called it sale where major pars in pretio quam in re permutata. In the more limited sense of the exchange of heritable subjects, this contract received from the feudal law some advantages not given to sale. Thus, the burdensome right of the superior called protimesis, or pre-emption, did not apply to ex- cambions, The decuriones, or town councils, of the imperial municipia were allowed to excamb, although they could not sell, the town-lands; and so with regard to church lands, the fundus dotalis, and other subjects partly withdrawn from commerce, excambions, but not sales, were permitted. Sovereigns,~~

~~too, were allowed to excamb parts of the royal domain, although, as may be seen from the Scotch annexation and dissolution statutes of the 16th century, it required special authority to feu or alienate such subjects. The modern Scotch excambion may consist in the exchange of any heritable subjects whatever, ¢.g., a patronage or, what often occurs, a portion of a glebe for servitude. The older form of an excambion was in separate dispositions by each "* copermutant," as Pothier calls him, in favour of the other, or sometimes mutual charters, each party becoming in turn vassal and superior. And according to the Leges Burgorum, c. 55, where lands or houses in burgh were exchanged, the form of delivering sasine consisted in the apertio and clausio of the door, or the passing out and in of the parties respectively, each of whom gave two pennies (dwo nummz) to the bailie. But this early form was soon superseded by one contract of excambion (originally drawn by Gilmour and Nisbet, and preserved in the MS. Style Book of Bain of Pitcarly) con- taining both dispositions, and proceeding generally on the narrative that the parcels of land excambed lie remote from or at least discontiguous to the mansion-house or the principal estate, and, being intersected by the lands of the other party, form a run-rig possession. This contract gives to each party a sufficient narrative of his own title to the lands he is disponing, and it provides, although the law implies this in every express excambion, that on eviction the contract and sasine shall be void and null, and that immediate " recurrency " or regress be given brevi manu to the lands which were excambed by the party evicted. Such real warrandice, as it is called, affects ex- cambed land in the hands of singular successors who have purchased bona fide, and hence it is often provided that notice of any action of eviction shall be given to the excamber or his heirs. This exceptional severity reminds one of the civil law which distinguished between sale, where delivery of possession with warrandice against evic- tion was sufficient performance by the seller, and exchange, where an absolute title of property must be given. Writ- ing, however, is not, by the law of Scotland, essential to an excambion. Chiefly in favour of the class of cottars and small feuars, and for convenience in straightening marches, the law will consider the most informal memoranda, and even a verbal agreement, if supported by the subsequent possession. 'The power to excamb was gradually conferred on entailed proprietors. The Montgomery Act, which was passed in 1770, to facilitate agricultural~~

~~*improvements, per- mitted 50 acres arable and 100 acres not fit for the plough to be excambed. This was enlarged by the Rosebery Act in 1836, under which one-fourth of an entailed estate, not including the mansion-house, home farm, and _ policies, might be excambed, provided the heirs took no higher grassum than £200. 'The power was applied to the whole estate by the Rutherfurd Act of 1848, and the necessary consents of substitute heirs are now regulated by the Entail Amendment Act of 1875.*~~

~~*Hachange, in English law, is defined as the mutual grant of equal interests, the one in consideration of the*~~

~~*784*~~

~~*other. 'The peculiarities of this very ancient common law conveyance or assurance were—(1) equality of estates, not in value or in subject matter, but in legal right of owner- ship ; (2) the use of the word exchange (excambium, e.g., in Domesday book, hanc terram cambiant Hugo, &c.); (3) that, though formal delivery of seisin was not required, possessiou or entry was required to complete the transaction by mak- ing it notorious; (4) that, in the case of incorporeal heredita- ments, and where the lands lay in different counties, a deed was required; (5) an implied condition of re-entry on the lands of him whose title failed (Coke on Littleton, 50 a ; Blackstone by Sweet, ii. p. 323), the liability to re-entry affecting an alienee, but the right to re-enter being per- sonal to the exchanger and his heirs. This condition, how- ever, did not long survive the statute Quia emptores ; and exchanges are now generally effected by mutual cunveyances with the usual covenants for title, which the Act 8 and 9 Vict. c. 106 declares not to imply any condition, whether the word "exchange" be used in the testatwm or not. Ex- chauges are also very frequently made, by order of the in- closure commissioners, under the various Acts of Parliament for the inclosure, exchange, and improvement of lands, from 8 and 9 Vict. c. 118 to $81 and 32 Vict. c. 89 (see Cooke On Inclosures). In these cases, the property taken is simply impressed with the title of the property given in exchange. So also statutory exchanges are made under the Acts for the Sale and Exchange of Charity Estates, the Chari- table Trust Acts, from 16 and 17 Vict. c. 137 to 32 and 33 Vict. c. 110, which now apply to Roman Catholic charities, formerly under 23*~~

~~*and 24 Vict. c. 134. There are also statutes enabling ecclesiastical corporations to ex- change, with the approval of the church estate commis- sioners, Powers of exchange are generally given to trustees under English settlements, and these are exercised by revo- cation of the original uses and appointment of new uses, all ancillary powers being given by implication under 23 and 24 Vict. c. 145 (see Davidson's Precedents in Conveyancing, vols, ii., iii, and v.).*~~

~~*In what may be called international conveyancing, the exchange of territories is accomplished by treaties, of which there is no fixed style. A well-known example is Art. XII. of the Treaty of Nimeguen, 'Les terres en- clavées seront exchangées contre d'autres qui se trouveront plus proches et & la bienséance," &c. The Italian duchies and islands have very frequently been exchanged. Thus, in the Quadruple Alliance of 1720, Philip V. exchanged a reversionary title to Sicily for a reversionary title to Sardinia. The exchange of prisoners in war is often regulated by documents called cartels, which specify a certain agreed on value for each rank of prisoners. The transference of prisoners is often carried out by cartel ships, which, though prolibited from carrying cargo or passengers, are entitled to certain privileges. It was in the 17th century that this practice (which seems to have been unknown to Grotius) superseded the older one of ransom at the end of the war.*~~

~~*See Wheaton's Elements of International Law, Lawrence's edi- tion, p. 590, and App. A. in Robinson's Adm. Rep., vol. iii. The early law of military exchange will be found discussed by Albericus*~~

~~*Gentilis, De Jure Belli, cap. xvi., "De permutationibus et libera- tionibus." (W. O72)*~~

~~*EXCHANGE. The system by which commercial nations discharge their debts to each other has been termed " Ex- change, " or "tlie Exchanges." It has been subject of much study both by merchants and bankers who have to deal with its phenomena in the course of business, and by economists desirous to discover the causes of the phenomena, and to ex- plain the laws or method of their operation. In rude times the people of neighbouring countries brought their staple or surplus produce to common fairs, where one kind of goods*~~

~~*HEXC—EXC*~~

~~*was valued and bartered for another; and the dealers brought a little gold and silver with them to settle the small balances. But this, though a rough type of international trade still, is a wholly different affair from modern com- merce, with its transactors multiplied a millionfold, and con- ducting their transactions far apart in widely distant coun- tries. Money itself does little to obviate the difficulties arising from this multiplicity of crossing and recrossing currents; and whoever, therefore, was the first introducer of the idea of "Exchange" is entitled to a high place in*~~

~~*the commercial annals of the world—whether it was the*~~

~~*stranger mentioned by Isocrates, who came to Athens with some cargoes of corn, and gave an order on a town on the Euxine where money was owing to him, with recourse on an Athenian merchant in the event of the order being dis- honoured; or Cicero, in paying for the studies of his son at Athens by an assignment from a creditor in Rome on his debtor in the Greek city; or the pope, whose lending merchants of Siena and Florence drew upon Henry III, or rather on the prelates and abbots of England, with some English merchants as remitters, for the expenses of depos- ing Manfred, king of Sicily, in which act of deposition Henry was an interested and obligant party—thus avoid- ing in these various cases the difficulty and risk of trans- porting coin. The idea, wherever first exemplified, was too good to be lost. It was early developed into a system in Venice, later in Amsterdam, and is now of world-wide application.*~~

~~*It is well to observe, first, what is exchanged—values of commodities exported and sold from oue place or country to another, debts thereby owing, interest, profits of capital invested abroad, foreign loans and subsidies, freights, bank- ing and other commissions, expenses of foreign residence or travel, and, in short, claims of payment of every kind on one part, having their relative obligations of remittance on the other, and originally denominated, as the contract or the occasion may have been, in the money either of the places from which the claims proceed or of those where they are payable. Secondly, the means must be noticed by which the exchange is effected—pieces of paper, bearing express calculation to secure what is exactly due between debtor and creditor. A bill of exchange*~~

~~*is an order drawn for a specified and definite sum, in favour of a person who is the buyer and becomes the "remitter" of the order, upon a third person, the "drawee," who is indebted for this sum to the drawer, and on presentation of the order becomes the "acceptor." The person or company in whose favour the order is drawn may pass it into other hands, and these, by writing their names on the back, become "indorsers." On much the same model there are "inland " and "foreign" bills of exchange. The whole system of exchange has its foundation in the drawing of the creditor on the debtor; for, as in every country there are both creditors and debtors of other countries, the debtors find it to their advantage to take up the drafts of the creditors in order to avoid direct remittances in cash.*~~

~~*Inland exchange is simpler in character and more easily Inland comprehended than foreign exchange, but in reality presents A the same phenomena and the same sequence of cause and "7"8%*~~

~~*effect as the other, so far as the circumstances of any country allow these to come into operation.*~~

~~*Mr M'Culloch, in the article on " Exchange" in former editions of the present work, gave a familiar exposition of inland exchange, which it would be difficult to improve :—*~~

~~*'© If the debts reciprocally due by London and Glasgow be equal, whether they amount to £100,000, £500,000, or any other sum, they may be discharged without the intervention of money, and the price of bills of exchange will be 'at Par;' that is, a sum of £100 or £1000 in Glasgow will purchase a bill for £100 or £1000 payable in London, and vice versa. But if these cities be not mutually indebted in equal sums, then the price of bills will be*~~

~~*EXCHANGE*~~

~~*increased in the city which has the greatest number of payments to*~~

~~*make, and reduced in that which has the fewest. 1f Glasgow owe London £100,000, whilst the latter only owes the former £90,000, it is clear,*~~

~~*inasmuch as Glasgow has a larger sum to remit to London than London has to remit to Glasgow, that the price of bills on London will rise in Glasgow because of the increased demand, and that the price of bills on Glasgow will fall in London because of the*~~

~~*diminished demand. A larger sum would consequently be required ,*~~

~~*to discharge a debt due by Glasgow to London, and a less sum to discharge an equal debt due by the latter to the former ; or, which is the same thing, the exchange would be in favour of London, and against Glasgow. Bills on London would sell in Glasgow at a premium, and bills on Glasgow would sell in London at a dis- count ; the premium in the one case being equal to the discount in the other.*~~

~~*"On the supposition that the balance of £10,000, due by Glasgow, depresses the exchange on London one per cent., it appears, at first sight, that it will cost Glasgow £101,000 to discharge her debt of £100,000 due to London ; and that, on the other hand, £89,100 would be sufficient to discharge the debt of London to Glasgow. But a very little consideration will serve to show that this would not be the case. Exchange transactions cannot take place between different cities until debtors and creditors of the one reside in the other. And hence, when the exchange became unfavourable to Glasgow, the premium paid by its merchants for bills on London would not go into the pockets of their creditors in the latter, but into those of their neighbours in Glasgow to whom London was in- debted, and from whom the bills were purchased. The loss to Glasgow would, therefore, be limited to the premiwm paid on the balance of £10,000. Thus, supposing that A of Glasgow owes D of London £100,000, and that C of London owes B of Glasgow £90,000, A will pay to B £91,000 for a bill or order on C to pay D £90,000. In this way the £90,000 of London debt at Glasgow would be cleared off,—the premium, which is lost by the debtor to London in Glasgow, being gained by its creditor in the same place. If the business had been transacted in London, C, with £89,100, would have purchased of D a bill for £90,000, payable by A; so that, in this case, the gain would have 'fallen to the share of the debtor C, and the loss to that of the creditor D, both of London. The complexity of real transactions does not affect the principles on which they are founded.*~~

~~*And whatever may be the amount of the debts reciprocally due by different places, the only disadvantage under which any of them could be placed by a fall of the exchange would be the unavoidable one of paying the expense of remitting the balance of debt.*~~

~~*'The expense of transmitting money from one place to another limits the fluctuations in the exchange between them. If 20s. sufficed to cover the expense and risk attending the transmission of £100 from Glasgow to London, it would be indifferent to a mer- chant, in the event of the exchange becoming unfavourable to the former, whether he paid one per cent. premium for a bill on London, or remitted money direct to thelatter. Ifthe premium were less than one per cent., it would be clearly,his interest to make his pay- ments by means of bills rather than by remittances ; and that it could not exceed one per cent. is obvious, for every individual would rather directly remit money than incur an unnecessary expense by purchasing bills on London at a greater premiwm than would suffice to cover the expense of a money remittance. If, owing to the badness of roads, disturbances in the country, or any other cause, the expeuse of remitting money from Glasgow to London were increased, the difference in the rate of exchange between them might also bef proportionally increased. But in every case the extent to which this difference could attain would be limited by, and could not for any considcrable period exceed, the cost of remitting cash.*~~

~~*'* Exchange transactions become more complex when one place, as is often the case, discharges its debts to another by means of bills drawn on a third place. Thus, though London should owe nothing to Glasgow, yet if Glasgow be indebted to London, London to Manchester, and Manchester to Glasgow, the latter may wholly or partially discharge her debt to London by remitting bills on Man- chester. She may wholly discharge it, provided the debt due to her by Manchester exceed or is equal to the debt due by her to London. If, however, it be not equal to the latter, Glasgow will either have to remit money to London to pay the balance ofdebt, or bills on some other place indebted to her. ;*~~

~~*'« Transactions in inland bills of exchange are almost entirely con- ducted by bankers, who charge a certain rate per cent. for their trouble,*~~

~~*and who, by means of their credit and connexions, are able, on all occasions, to supply the demands of their customers. Bills on London drawn in Edinburgh and Glasgow were formerly made payable at forty days' date, which was equivalent to a premium of about 4 per cent.; but, owing to the greater facility of com- munication, this premium is now reduced to twenty days' interest, or to about ¢ per cent. Bills for remitting the revenue from Scot- land are now drawn at thirty days ; previously to 1819 they were drawn at sixty days."*~~

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~~*The cost of remittance from Scotland to London has con- tinued to fallduring the last thirty years. Bills on revenue account are now drawn at eleven days, free of stamp, and bankers' drafts at seven days, or at a charge of 2s. per £100 up to £300, 6s. for all sums between £300 and £600, and 1s. additional for every £100 above £600. On the other hand, the London bankers remit money, paid over their counters to-day, to Scotland and other parts of the kingdom, payable at par to-morrow. To this extent the rate of ex- change is still adverse to Edinburgh and Glasgow, and in favour of London. In like manner the holder of a bill of exchange in Edinburgh or Glasgow upon London finds himself in a somewhat better position than the holder of a billin London upon either of the two Scotch centres, Yet it would be an error to suppose that the balance of trade is against Scotland and in favour of England, The balance of value of commodities exchanged between the two countries is in favour of Scotland, and might be greatly in her favour, and yet the rate of exchange be adverse; so that we are thus early admonished that the imports and exports of goods, though an important, are not, as was long supposed, a decisive element in the rate of exchange. The transmission of the revenue of Scotland (seven or eight millions annually), the rental of owners of land having their chief domicile in the metropolis, and the amount of obligations of Scotch merchants made payable in London under the increasing concentration of monetary business, would be sufficient to counteract the effect of a large balance of trade on the rate of exchange. Hence London bankers, in taking money even in small sums payable at par next day in Edinburgh or Glasgow, are simply taking*~~

~~*before. hand what is already under course of remittance, and re- ducing pro tanto the balances to be remitted from Scotland.*~~

~~*The relations of inland exchange just stated are those of a country where the money is uniform; where the bank- notes of Ireland and Scotland are payable on demand in the common imperial standard of value, as the country bank- notes of England are similarly exchangeable for gold or for Bank of England notes, which latter are orders for the deli- very of so much gold in the issue department ; and where, consequently, all inland bills are drawn in precisely the same money. 'The circumstances are thus highly favourable to an even exchange ; and it may be conclusively held that the nearer the monetary system, whether in separate countries Within themselves, or in nations closely related by com- mercial "and financial transactions one with another, approaches to these conditions, the difficulties and oscilla- tions of exchange, inland and foreign, will be reduced within narrower limits.*~~

~~*The history of inland exchange in the three kingdoms presents abundant proofs of the immediate effect of money of differing values in disordering the exchanges, or, in other words, the uniform payment of their debts one to another. In the early days of Scotch banking, when the natural limit of a free legal issue of notes was less under- stood than it soon became, and a structure of bills of exchange was reared upon this basis, it was found that bullion had to be raised by constant re-discounts in London, and that exchange, in short, 'became imprac- ticable. Even within the same town, given two kinds of money or currency, one of superior value to another, a premium will be immediately established in favour of the money of superior value, and will affect every transac- tion, however small, by calculations of rate of exchange, as was long illustrated by the banco of Hamburg, a strict metallic money of given weight and fineness, in its contact with the worn or degraded coins of various mints in pre- vailing circulation. In 1689, when, by a proclamation of James II., one penny was added to the nominal value of the Irish shilling, £108, 6s, 8d. Irish money became equal*~~

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~~to only £100 of British money in the nominal par of ex- change, between Great Britain and Ireland, or a difference of 84 per cent. against the latter. In the course of another century the monetary system of Ireland and Great Britain had so far become uniform that the bank-notes of both countries were payable on demand in gold, but the dilution of standard proclaimed by James IL. was still in force. In the eight years previous to 1797, the date of the Bank Restriction Act suspending specie payments, the rate of exchange between London and Dublin had ranged from 73 to 9 per cent., being from § below to 3 per cent. above the par of exchange, as determined by the actual value of the British and Irish money. The banks of England and Ireland were now alike free to issue notes without legal liability to pay them in gold on demand ; and in 1803 the Bank of Ire- land had increased its issues from £621,917 to £2,707 ,956, being in the proportion of 1 to 4°3; while the Bank of Eng- land had increased its issues in the same period from £9,181,843 to £16,505,272, or in the proportion only of 1 to 1°8. The rate of exchange was then 17 per cent. against Dublin, being 83 per cent. more than the normal par. But in the seven subsequent years the issues of the Bank of Ireland increased at the rate of 24 per cent., and the issues of the Bank of England at the rate of 5 per cent., while the country bank issues of Ireland were much dimin- ished in amount, and those of England were largely increased. During this period the current rates of ex change became more favourable to Dublin. The inconver- tible paper currency of Ireland had increased, but it had not increased in nearly the same proportion as the same kind of money in England. The manufacturers of Ulster, at once disaffected against the Government and annoyed at the uncertain value of the bank notes, clung to a gold cur- rency ; and while Dublin was under a discount of 8 per cent. in its exchange with London, Belfast was commanding a premium of 3 per cent. against London, and 10 per cent. against Dublin.!**

~~Apart, however, from this element of the differing stand- ards and values of money, which comes more fully into view under the head of "foreign exchange," it is impossible to follow closely the description of inland exchange above quoted from Mr M'Culloch without apprehending many of the principal characteristics of the operation, which, as they are sure to~~

~~*arise in exchange transactions under all cireum- stances, cannot be too soon brought into formal notice ; such as (1) that the rate of exchange is ruled by the supply and demand of bills for the time being; (2) when in any market the demand for bills on a given centre is greater than the supply, the deficiency may be supplemented by bills on other centres having a favourable exchange with the given centre—a resource which, though indirect, receives much extension in the wide theatre of the commercial world under the watchful study of experts in bills; (3) the profit of a premium and the loss of a discount on bills fall within the market where the bill is drawn or sold, the drawee or acceptor having the definite sum on tlie bill to pay in either case ; (4) exchange between one country or one centre and another is never a completed or perfectly adjusted process, but a constant series of transactions, reflecting the varying phases of claims and debts as they mature; and (5) the fluctuation of rates of exchange is effectually limited by the*~~

~~*1 The Bullion Inquiry and Report of 1819 is full of information and discussion as to the effects on exchange of the long breach in our monetary system during the French Revolutionary wars, which will always be highly instructive, but on which it would here be out of date to dwell. The Scotch banks do not appear, during that trying period, to have departed from the rule of paying their notes in gold on demand. The contrary lesson may have been so well impressed on them by the experience of the previous century, and so well explained by the intermediate instructions of Adam Smith, whom, of course, they were the first to read, as to raise them above temptation.*~~

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~~*expense of transmitting money, that is, coin or bullion, — a principle which, though subject to partial exceptions in foreign exchange, isan underlying and potential law of the*~~

~~*whole system. In the study of foreign exchange some embarrassment*~~

~~*sults, and the necessity of realizing in one conception the drawers and buyers of the bills, and the two countries to which their transactions apply. It tends to simplify the matter to remember that what is transacted either in London or Paris expends the whole effect, for purposes of comprehension at least, of the course of exchange between the two cities; and so in other cases. If the debts, the time of settlement of which has come, of London to Paris be greater than the debts of Paris to London, the supply of bills on Paris in London will be less, and the supply of bills on London in Paris will be greater than the demand, which are only different forms of expressing the same relation. There may be a momentary variation in the rate of exchange in the two cities, but as soon as the relation of supply is discovered the variation will disappear. On both fields the same two classes of people, drawers and remitters,'are at work, only the party in stronger force on the one is in weaker force on the other, and at both ends there is the same though converse result. In any one market, there- fore, there is a complete representation of the action of exchange.*~~

~~*To a circle of exchange four persons, as is explained by Mr Mill, are always necessary: A, say of England, has ex- ported English goods to B, say in France; and in order that B may be saved the expense and risk of sending money to A, A draws a bill on B for the sum due, and sells it to his neighbour D in England, in order that he may send it instead of money to C in France, from whom D has imported French goods of exactly equivalent value, and who, on the expiry of days the bill has to run, takes it to his neighbour B, and gets his payment, while in possession of the bill B has his discharge from A. The debt on both sides is thus paid without the transmission of a single ounce of gold or silver.*~~

~~*This is a genuine circle of foreign exchange ; but in the great commerce and diversified creditorship and debtorship of the world the process is frequently of a very complex kind. Not only all the exports and imports, freights, and transit dues round the globe, but nearly all the public and private outlays, which one country expends upon another, are paid by means of foreign bills of exchange. Mr Goschen, in a prac- tical treatise which may be said to bring up the science of exchange to the present time,? examines the various classes of foreign bills, and specifies some*~~

~~*movements of exchange which could hardly be dreamed of save by professional men. For instance, teas shipped from China to New York are generally paid for by a draft of the exporter on a London merchant for account of the American importer. The exporter in China is paid by the price which is given him for his bill on London; and the London jacceptor looks for payment to the importer in New York. In the East Indies those who ship produce to America draw on London and not on New York; and the New Orleans cotton exporter to Russia draws on London instead of on St Petersburg. The explanation of this may be partly that Great Britain exports more in manufactures and silver to China, for example, than she imports of Chinese tea and silk, and thus leaves a balance of trade due to her, which the Chinese pay by transferring their claims on New York to their London creditors, and partly from the greater reputation and custom of the London banking houses than*~~

~~*2 The Theory of Foreign Exchanges, by the Right Hon. G. J. Goschen, M.P., ninth edition, London, Effingham Wilson, 1876.*~~

~~*Foreign*~~

~~*arises from the twofold character of the action and its re-°* –*~~

~~*change.*~~

~~*EXCHANGE 787*~~

~~*those of New York or St Petersburg, though many of these may be no less wealthy than the others, or simply from the greater convenience of a bill on London. In propor- tion, however, as direct trade in mutual import and export of goods is established between two countries, direct ex- change follows. Formerly the New York houses drew, for their shipments of tobacco and other produce to Bremen, on England for German account. But now since German manufactures and products have been making progress in the New World, bills of exchange aie drawn between New York and Bremen, and Rio Janeiro and Hamburg. But the merchants of Bombay and other parts of India, finding few purchasers of bills on Bremen, still draw on Londou for German account. These indirect exchanges inay be re- garded as examples of the common expedient of*~~

~~*utilizing both debts and credits at various distant points in redressing the inequalities of direct exchange; and, also, of the advantage of London, from the greater extent of British commerce and the greater distribution of British exports than those of any other country, as the centre for ultimate adjustments and clearings of this kind. But Mr Goschen has adduced an extensive class of foreign bills still more remarkable. These are bills " technically said to be drawn in blank," which represent no actual indebtedness at the period of drawing, and by which the acceptor does not pay his debt to the drawer, but on the contrary, the drawer incurs a debt to the acceptor. Mr Goschen admits that they approach nearly to the character of accommodation bills in the home trade, might be even worse abused, and consequently require to be discriminated. In many cases such bills have a function of public utility,—as, for example, where the imports of a country do not fall into the same period of the year as its exports, and the bills in payment of them do not meet each other in the ordinary course. In that case, the importers in seeking to buy bills on foreign countries would not find them, and would have no recourse but to remit specie in payment of their purchases abroad. In like manner the exporters of grain, cvtton, and other produce might draw bills for their value, but would find the bills were unsaleable, and would have to order the gold, remitted by the importers a few months before, to be sent back again. In this situation banking-houses draw " in blank" on bankers abroad, selling their drafts to importers at one period of the year and buying the bills of the exporters at another, therewith to refund the bankers abroad by whom their drafts have been honoured. The case implies a raising of capital in anticipation of the produce, but there need be nothing fictitious either in its manner or character, and it may well be believed to be the case of many large producing countries and colonies. In the deal- ings of foreign exchange the small as well as the large bills are embraced. With the piles of single bills for many thousands of pounds sterling, from such countries as China, India, or America, are commingled many bills of small amounts ; while from all parts of Europe they are of a still more miscellaneous character—bills of retail as well as wholesale trade, bills of Swedish or Norwegian shipmasters for freights, of Dutch and Belgian farmers for parcels of eggs and butter, of Germans for toys, and French for odd articles de Paris, on minor agénts,*~~

~~*shopkeepers, milliners, and others, who may not have come in the course of their business within the range of inland exchange.*~~

~~*The developments of foreign exchange are always more or less modified in the course of a generation, and so much seems necessary as an introduction to the essential subject itself, and in particular to the explanation of tlie rate of exchange, how it is determined, and what in a general sense it imports.*~~

~~*Mr M'Culloch, in former editions of this work, treated foreign exchange under three heads :—(1) nominal ex-*~~

~~*change, or the rate of exchange established between two countries on a strict estimate of the respective money, or coins, or currencies, in which the value of their goods are usually denominated and exchanged; (2) real exchange, or the effect of the supply and demand of bills in raising the current rate above, or depressing it below, the mean point or equilibrium —nominal, inasmuch as it is an equal value from which there is constant variation by other elements acting on the rate of exchange, but yet of radical fixity and importance ; and (3) computed exchange, or, in reality, the actual course of exchange as determined day by day from the combined consideration and effects of the other two. While this division was appropriate enough, it may be better here to consider still more in detail the various elements entering into the valuation of foreign bills or, in other words, the rate of foreign exchange. These may be con- veniently embraced under the following heads:—(1) par of exchange ; (2) supply and demand of bills; (3) rate of interest ; (4) cost of specie remittance; to which may be added, what is always implied, (5) correct judgment of the force and duration of the cause or causes affecting the rate of exchange, or its opposite, panic.*~~

~~*1, Without some common medium of value in commercial Par of countries, bills of exchange could not be drawn between one ¢s- and another. The "cash" of China has played no more part °!@28°*~~

~~*in the foreign exchanges than the cowries of Africa; but since a mint has been established in Japan, from which gold pieces are issued under public regulation as to weight and fineness, there may be no difficulty in*~~

~~*ascertaining the mone- tary equivalency, at Yokohama, of any debt due by Japan to England, or vce versa. The nations have thus found a medium of exchange in bullion, in gold or silver, or in both. In countries of the double standard, it has been usual to modify the law by liberty of contract for payment in one of the metals, without which liberty, indeed, it would be as well to have only one standard, since it is certain that the debtor will always choose to pay in the metal that has become relatively cheaper. In countries where silver is the sole standard, the par of silver to gold may be 15 to 1, or 16 to 1, as law or custom may have established; but in foreign exchange the par of silver to gold cannot be fixed at any absolute point by the law of any one country, and in the case of a depreciation, say of silver, even though temporary, by which the market price of silver to gold became 17 to 1, a proportionate addition would be made to the figures of the mint or former customary par, and this new sum become practically the par of exchange between the gold currency of England or California and the silver dollars of Mexico or rupees of India. Thus, having gold and silver to deal with, it is always possible, whatever may be the variety and names of the coins of different countries, to estimate the equivalents of the one to the other. This is a matter simply of weight and assay; and the ratio thus found is the par of exchange between one country and another.*~~

~~*Mr M'Culloch seems to have thought that the par of ex- change should properly include, not only equivalent weight and purity of the precious metals, but their relative cheap- ness or dearness in given places, " Thus," he says, "if, because of the expense of carriage, the value of bullion in Great Britain be 5 per cent. greater than in San Francisco, 100 ounces of pure gold in the latter would not be worth 100 ounces of pure gold in London, but 5 per cent. less ; and the exchange would be at true par when bills for 105 ounces standard bullion, payable in San Fran- cisco, sold in London for 100 ounces." Since this has not been the practice in determining the par of exchange—the 25°30 of Paris, and the old 109 of New York, &c., with London having been based more or less exactly on equal weights of pure gold for pure gold—a question is suggested which the following considerations may help to resolve.*~~

~~*Effect of incon- vertible paper money.*~~

~~The 5 per cent. claimed from San Francisco is fora relative dearness of gold in London, which can only be overcome by carrying the gold from the one place to the other; but it would be illogical to charge in a bill of exchange for a transport of specie which it is the express object and effect of the bill to supersede. The merchant in London would be entitled to sell a bill on San Francisco for a sum equal to 100 ounces of gold, and to include the costs of ex- change, if any; or his debtor in San Francisco might buy a bill on London for a sum sterling equal tv 100 ounces of gold ; and if the course of exchange were such that this bill cost him only 99 ounces, the merchant in London would yet have no reason tocomplain. If neither of these modes of settlement were available, the debtor in San Francisco would have to send 100 ounces of gold to London, in which case there would be no rate of exchange in question.~~

~~But, apart from the less value of bullion in some coun- tries than in others owing to nearness to the mines or other causes, there is a cheapness of the metallic money, as well as the general currency of a country, which operates directly on the rate of exchange, and requires in one form or other the recognition of a different par from that established under other conditions. The standard may be tampered with; the alloy may be increased; the weight of the coins may be diminished and diminished, till, like the Turkish piastre, they, become scarce a shadow of themselves. It is obvious that innovations of this kind compel a revtification of the estimated par of exchange. In other cases coins are legitimately changed ; and these variations, in so far as they supersede or modify coins which entered into the par esti- mate, are bound to have a new rating. A country which sllows its coinage to be much worn, defaced, and generally light in weight, is in the same position as one which has deliberately lowered its standard of value ; for though its light. coins, when sent abroad, which they are not apt to be, count for no more than they weigh, there is the other and more serious effect that they may have been already well weighed at home, and have so raised the prices of the goods of the couutry as to place all dealings in them under a de- lusion as to their real value. One may well believe, how- ever, that this isa form of monetary evil which has now passed away. There will always be some~~

~~*more or less worn and light coins in a metallic circulation, 'and as long as these are limited in number, and circulate in the country of their coinage at the mint price, they do little or no harm. There is a much more convenient process by which to cheapen the money of a country than any form of debasing the coinage, namely, to dispense wholly or almost wholly with metallic money in favour of an inconvertible paper currency.*~~

~~*When a country is impelled to issue paper money not payable on demand in gold or silver, its monetary value slips away from all fixed reckoning. The first effects are so agreeable as uaturally to lead to a larger and a still larger issue, and the agreeable effects are prolonged until the real situation begins to be disclosed, and, finally, de- rangement has spread so widely on all sides that extrica- tion becomes a task of the gravest difficulty. The effects even on the foreign exchanges are for a time somewhat illusive. There being no more need for gold and silver, nearly the whole stock of bullion passes out, and like a new found capital gives ample power of purchase abroad. The importer, finding that there are increasing prices for every commodity in the paper money, goes into his business with new heart and will. The premium, which has early begun to be established on foreign bills, soon becomes so large that the exporter imagines that he can make a fair profit out of the premium on his foreign bill alone, though there may not be a margin of a fraction of one per cent. of profit in the actual trade. Supposing such a result possible*~~

~~*to the exporter, it is clear that he makes his profit entirely out of his neighbour the importer, who has to buy his bill, and consequently to pay the premium. Both cannot be right in their views, and in point of fact both are wrong until they begin to realize that the inconvertible paper dollar, rouble, or florin is not so valuable and has not the same purchasing power as the metallic money, or as the paper notes maintained in a constant practical convertibility. This fact is demonstrated within the country itself by the more or less gradual and uniform, but inevitable, rise of prices of all commodities, and of bullion among others, in this new currency. It is discovered very early in the foreign exchanges, not only since there is likely to be an excess of imports over exports when a*~~

~~*country is in the act of denuding itself of specie, but because the foreigner has to be careful to get the value of his goods or produce as it is known to him in his own money; and any important change in the money of a country, therefore, obtains a sharp valuation abroad. Both at home and abroad it is soon dis- covered that the par of exchange, as formerly established, has passed away, and that a new par has come into operation uuder the pure force of the natural relations of the case, The importer finds no advantage from the advancing prices of what he imports in the domestic markets, since he has to pay more of the domestic money for the foreign bill of exchange by which he discharges the debt for his imports ; and the exporter finds no advantage in the premium on his foreign bill which he sells to the importer, since it only re- places what he has already paid in the increased cost of his commodities and other outlays.*~~

~~*This action of exchange is now so familiar as to require little illustration; but a commonplace example may be given, to render more obvious the result on both sides. A, a merchant in London, at a period when the rate of ex- change between London and Hamburg is at exact par, can sell a hogshead of sugar worth £50 in London to B in Hamburg for £100, or weight for weight in gold of. 100 sovereigns. He exports, draws his bill on B, which he sells for £100, and derives his profit of £50 on the sugar, less expenses of transit, At another period of equal scarcity and dearness of sugar in Hamburg as compared with London, but when the currency of England has been under suspension of specie payment, and has been so much in- creased in quantity that prices of sugar and other commo- dities have doubled in the meanwhile, the hogsliead of sugar now sells in London for £100. A, however, again exports, draws on B for £100, and, the rate of exchange being now 100 per cent. in favour of Hamburg against the currency of England, sells the bill for £200 in London, and makes a profit in the English currency of £100, equal to £50 in undepreciated money—the same profit as he made before, The results to B, all things being equal as sup- posed save the depreciation of the English currency, are also the same in both transactions. The case of a British importer, in corresponding circumstances, would not differ from that of A, the exporter ; because, however unfavourable the nominal exchange might be in the bills by which he paid for his imports from*~~

~~*abroad, he would be repaid by the increased nominal prices obtained for them in the home market.*~~

~~*As long as a change in the par of the money of two countries is not recognized or clearly understood, there may be much miscalculation and irregular profit and loss among the merchants on both sides. On the other hand, as soon as noted and brought under generally acknowledged estimate, it does not interfere, yer se, with the movement of produce or the fair profits of those engaged in foreign trade.*~~

~~*But how is the depreciation of an inconvertible paper currency to be measured? As a convertible paper currency*~~

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~~*only maintains its par with gold.by being always payable on demand in the gold it promises to pay, so an incon- vertible paper currency falls just so much below the par of gold as the difference between the amount of gold it professes to be and the amount of gold it exchanges for in its own market. The price of bullion in an inconvertible paper currency rises like that of other commodities—not, indeed, in its general market value, but in its market price within the sphere of the currency; and the amount of this rise,marks what may be called either a discount on the paper money or a premium on the gold, and this dis- count or premium becomes a measure of the depreciation of the currency. It is by no means a satisfactory standard, for it may vary from day to day, and in this respect be as unlike as possible to a par of exchange between the gold and silver moneys alike of small and great states, which may hold good without variation for any number of years, There may also be restrictions on the sale of bullion, prohi- bition of the export of bullion, and speculative combinations of paper-holders and gold-holders to " corner" each otlier, and the fluctuations may be not only constant but sometimes extreme. But, with all its disadvantages, the relation of gold to the paper money, as it happens to be revealed in tle markets, is the only measure of the depreciation to be had, and the premium on gold has consequently to be reckoned as a necessary component part of the rate of ex- change with other countries.*~~

~~*The history of the last twenty years, though years of abundant production of gold and silver and great material prosperity, has been marked by an extended resort to incon- vertible paper mouey in many parts of the world; and the ex- changes of Russia, Austria, Italy, and many other countries might be referred to for ample proofs of the effect of this monetary expedient on the nominal par, and the extra- ordinary fluctuations to which it gives rise. The 'green- back" money of the United States, a result of the war between North and South, is probably the most familiar, while in some respects also the most instructive example. The par of the American dollar to the pound sterling was originally struck in the rough proportion of $40 equal to £9, which made the quotation at New York $4'44 to the pound, or, as stated on the British side, 54d. to the dollar. But on strict inquiry this did not correspond with the gold, weight for weight, in the dollar and the sovereign, and was in fact 9 per cent. too favourable to the dollar. It thus appeared that to correct the scales $9 had to be thrown in with every hundred, aud adhering to the old par with the tenacity which has been the general commercial practice in such cases, the exchanges were held to be in equilibrium when bills on London stood at $109 for every hundred of the purchase-money, or 9 per cent. nominal premium in favour of England. The par, as more definitely stated, was then in New York $4°85 equal to the pound, or in London 493d. equal to the dollar, and this remained the mean specie point from which all other influences acting on the exchange caused the rate either to rise or to fall, until the period of the civil war, and the issue of paper money, guaranteed by Federal security, but inconvertible. The effect of the new currency on the exchanges was neither immediate nor suddenly great in its proportions. The wide territory and large population of the Northern States were a powerful absorbent. Moreover, as the Government increased its issues the banks withdrew their notes, which had the effect pro tanto of staying the progress of deprecia- tion, But gold was still absolutely necessary in the ports, and a premium on gold, inevitable from the first, increased month by mouth with the increased issue and circulation of "greenbacks." What the nominal par of exchange now was became a sort of arithmetical puzzle; for, taking the exchange of New York on London alone, without respect*~~

~~*to other countries trading with the United States (the money of some of which was undergoing similar deprecia- tion at the same period), the established premium of 9 per cent. in favour of London was met and supplemented by this new premium on gold, and to add the one premium to the other would not be enough, because the dollar itself was now fallen away from its value when the $9 to the hundred had been strictly ascertained and arranged as a corrective of the original rough par of $40 equal to £9. The Governmeut, issuing the new currency that produced this disturbance in the foreign exchanges, had no theory on the subject, and only made some feeble attempts to regulate the sale of bullion. The adjustment was left in the main to the calculation of bankers and merchants on both sides, in presence of the natural causes in operation, and the solu- tion thus attained may be all the more significant. The premium on gold in its exchange at New York with the paper currency was added to the former premium of 9 per cent. in favour of London, and the 9 per cent. itself, marked of old in $9 of bullion value, was increased pro rata by the same premium.! This rule has since regulated the nominal par of exchange between New York and London through wide ranges of fluctuation. The exchange was often as high as 180 during the war, so that the quo- tation must often have been—New York $80 = £1, London 30d.=$1°0. It is no less worthy of remark that, without the actual resumption of specie payment, the " greenback" dollar has been quoted of late in New York and other American cities at the metallic par of 4°85—a rare tliough not unprecedented phenomenon, to be attributed to a severe financial and commercial crisis, followed by four years of lowered prices, steady excess of exports over imports, and accumulation of bullion.*~~

~~*The effect of issues of inconvertible paper money, or the suspension of cash payment of paper currency already in circulation on the par of exchange, is the same as that of a change of the standard of value, a debasement of the coinage, or, where in one of two countries the money is gold, and in the other silver, a depreciation of one metal as compared with the other. When two countries par their gold coins, the object is to arrive at a common term by which value for value will be paid, in equivalent weight and purity of metal, out of the money of each other. When one of them displaces its gold coins by inconvertible paper money, the same object has to be attained, and this is reached, though not so fixedly as in*~~

~~*the par of metallic coins, by the premium which gold commands over the paper money in the sphere of its currency. The former par in such cases may be adhered to as a landmark, and this gold premium may be treated as nominal premium on one side and nominal discount on the other, but it is sub- stantially of the nature of par of exchange, and becomes a necessary integer of the rate of exchange. In the case of countries of one of which gold, and of the other silver, is the standard money, the nominal par is subject to variation from changes in the relative market value of the two metals. If, for example, the relation on which the par proceeded was 15 ounces of silver equal to 1 ounce of gold, and the depreciation of silver becomes such that 17 ounces*~~

~~*1 Mr Goschen, in his book on Foreign Exchanges, gives the follow- ing definition of the process of exchange between New York and London :—"If, before the issue of paper money, the purchaser of a bill on England paid 100 dollars and 9 dollars for it, he would, if the premium on gold had risen to 50 per cent., in the first place pay 150 dollars instead of the 100, and in the second 13% dollars instead of 9 dollars, or halfas much again as what we may call the correcting premium. 'Thus, if the price of bills when gold stood at 150 was 1634, this price would correspond to the price of 109 at the time when there was no premium on gold. 'The price might rise to 165, or fall to 161, according as there was supply or demand, but the mean point would be ascertained by the process which has been described."*~~

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~~*will buy only 1 ounce of gold, the par of exchange between the two couuttries will follow the course of tliat depreciation.*~~

~~*The course of the exchanges of India has been much affected of late years by the depreciation of silver, and so also those of all silver-paying countries. The drawer of a bill sterling on London in Calcutta or Bombay is literally selling gold for silver, and, whatever the more ordinary par may have been, is bound to take into account the market value of silver. In 1876, owing to the large quantity of demonetized German silver thrown upon the market, less directly to a pre-existing cause, namely, the large extent to which silver had been cast out even of the fractional currency of*~~

~~*countries largely committed to incon- vertible paper, and also to exaggerated reports of abundant increase of production in the American mines, silver fell to 47d. an ounce—about the lowest point reached in its rela- tion to gold, and a great reduction from what had long been its par value of 5s. 2d. an ounce. The consequence was that the Indian rate of exchange declined to 1s. 64d. per rupee in six months' sight bills on London, or, in other words, that the rupee, having an accustomed par value of near 2s., was worth only 1s. 63d. sterling, menus say seven months' interest accruing between the date and the maturity of the bill. It is difficult, or rather impossible, as foreign bills are negotiated, to distinguish the respective force of the various causes operating on the rate of exchange. In the case of India nearly all the constituents of exchange are adverse to the value of the rupee, save that of rate of interest, which is higher in Calcutta or Bombay than in London. The Indian drawer of a six months' bill on London would lose more by holding the bill till its maturity than the buyer of the bill who remits it to London for acceptance and discount ; and some middle term must be struck between them, according as the rates of interest in India and England vary. But, on the other hand, India is a country where the imports always exceed the exports, where foreign capital in many forms has been largely invested and has to render its annual tribute, and where the financial relations of the Government of India and the Government of England are such that the latter has to draw periodically a considerable amount of bills on the Indian treasuries; so that, whatever the par of gold and silver might be, the supply of bills on London would always be less than the demand, or, in other words, the Indian creditors have some advantage over the Indian debtors of London in the rate of exchange. Were gold the money of India, the range of the prenlium thus established on the bill on London would be limited by the cost of remitting gold; but silver being the money of India, the action of the premium itself, or rather of the relative indebtedness of which it is the result, is to extend the range of thespecielimit by lessening the demand for silver abroad. The rupee being less valuable than it formerly was, does less work in the Indian circulation and is all the more needed at home; to export it in payment of the adverse balance of trade would be to send it where it is less valuable still. It may thus be concluded that the depreciation of silver has been much the most potent and constant element in the adverse current of Indian exchange. The price of*~~

~~*silver having since 1876 risen to 534d., the rate of six months' bills in London has risen to 1s. 87d. The rate of Indian exchange rises in the export seasons when the supply of foreign bills is increased ; and it rises with the price of silver at all seasons.*~~

~~*In the silver exchange between HHamburg and London the same rule prevailed. In HHamburg silver was money, but in England and other countries which have a gold standard it 1s only merchandise, and a rise or fall in the price of silver affected the value of a bill on HHamburg or a bill drawn on HHamburg in English sovereigns. Where a double*~~

~~*standard exists, as in France, bills between that country and another are drawn in the standard which is common to both. Thus in the direct exchange between Paris and London, the bills are usually or almost wholly gold bills.*~~

~~*2. Were there a common international money, the Supply and de- mand of*~~

~~*supply and demand of bills would be the chief determining cause of a rise or fall in the rate of exchange. Heuce, in distinction from the nominal par, the relation of supply and demand of bills has been called "real exchange." Mr Goschen speaks of it as "the primary element in the value of bills," which, from so practical an authority, may be regarded as indicating that, notwithstanding all the varieties of money, this continues to hold the chief place in the negotiation of bills of exchange, or that, the nominal par being once determined, or a common principle formed for its rectification when the money of a country has de- preciated, it ceases to require the calculation which must always be given to the supply and deniand of bills in the market. As the sum of the bills offered, and the sum ready to be bought, never express the whole of the claims upon, or the whole of the debts due to a country, but only such claims"as have been drawn for, and debts the tine of payment of which las come or is nearly approach- ing, there is always more or less change of the relation of supply and demand, as well as opportunity of judgment as to the probable course of the market, and means of apply- ing correctives if the balance be swaying too much on the one side or the other. If the price of foreign bills be depressed for want of buyers, drawers may hold back a little ; on the other hand, if the demand has raised the price of bills, all who have sums to draw for will be induced to take advantage of the market, and so increase the supply. The buyers are moved in the same way, quickening or delaying their purchase within the limits of their period of remittance, according to their judgment of the probable course of the exchange. But the buyer cannot delay beyond the day when his remittance is due in the foreign country, nor the drawer beyond the ultimate*~~

~~*bills.*~~

~~*dite of drawing, or lis own need of realizing the value of —*~~

~~*his bill; so that, amidst this oscillation, it is always the peremptory business to be done that determines the effect of supply and demand on the rate of exchange. The debtors of a foreign country, finding the supply of bills on that country less than the demand, will be ready to give an addition of price for them, in proportion to the scarcity, within the cost or up to the cost of remitting specie; and the creditors or drawers on a*~~

~~*foreign country will submit in the other extremity to discount on their bills within the cost of sending them to their correspondent or banker's correspondent abroad, with orders to take payment and remit the proceedsin specie. When the course of exchange, as thus pursued from week to week, reveals that the claims immediate and maturing upon any country are greater than the debts due to it, and cannot be discharged through the mechanism of direct and indirect bills of exchange, its balance of debt can only be paid by remittances of bullion or an increased export of goods and produce, or other exportable value.*~~

~~*It is unnecessary to dwell further on the law of supply and demand of bills, which differs little from that of other com- modities, beyond remarking that an inadequate idea would be formed of the efficacy of bills of exchange in liquidating international debts without taking into account au immense banking organization, aided by bill-brokers and dealers in foreign exchange, who have all the main currents of indebtedness under their eyes, and know with the precision of practice how the debts of one centre can be met by its claims upon others, and a stupendous mass of conflicting operations, ordinary and extraordinary, be most economi- cally effected. Fifty or a hundred millions sterling, as in the*~~

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~~*Rate of interest.*~~

~~*EXCHANGE*~~

~~*case of the French indemnity to Germany, can be trans- ferred from Paris to Berlin at a time without material dis- turbance of the more ordinary business of exchange. The British chancellor of the exchequer could transfer three millions and a quarter from London to Washington in pay- ment of the Alabama indemnity before the operation was well known in the principal marts of the two countries. When England is lending ten millions to India, fifteen millions to the Australian colonies, or twenty millions to innumerable enterprises in the United States and Canada, or so many millions to Russia, Turkey, or the River Plate republics—or making several of such loans at nearly about the same time, as has sometimes happened—the effect on the foreign exchanges, though*~~

~~*considerable, is seldoin thought of. A foreign loan is usually taken out—a large part in goods, another part in bills, and the balance most probably in specie. But the effect of a foreign loan on the exchanges is exactly the same as if the borrowing country had exported produce to the lending country equivalent to the amount of the loan, placing it in debt to that amount. The lender has become bound by contract to pay so much to the borrower. The whole weight of a foreign loan, therefore, falls at once to what may be called the adverse exchange of the lending country or the favourable or less unfavourable exchange of the borrowing country. The reverse action comes in half-yearly or yearly rills, when the interest and redemptions of the loan, spread over a series of years, are payable. A foreign loan, if prudently und honourably conceived, may thus, as regards even thie rate of exchange, be advantageous on both sides. The lending country gives a great advantage at once to the borrowing country in its exchange, which may be no evil in itself, and which tlie borrowing country, if the terms of the loan be fulfilled, repays in a period of years, during which its exporting and paying power may be reasonably expected to increase, which may be acommon good. It may be added that foreign loans and investments of capital in foreign countries, badly as many may have been conducted, yet in their product of sound and marketable stocks and shares come to play a generally useful part in the rates of exchange. The value of commercial bills might not be so equable between such centres as London and Paris, or London and New York, without the intervention of stock- exchange securities.*~~

~~*3. It is obvious that the number of days or months a bill has to run before payable imports the question of interest as an element of valuation in the rate of exchange. The usance of foreign bills is extremely various, from short to long, from payable at sight to payable at six months after sight ; and days of grace are allowed by the law or custom of some few countries considerable enough to be taken into count. Where a bill is payable so many days or months after sight the time that must elapse, in the ordinary course of communication, before it can be presented for acceptance, is a further prolongation of the currency of the bill. The buyer takes it with this weight of time upon it, and, whatever the period may be, is entitled to a conces- sion equivalent to the interest of the money which he pays, the converse happening in the case of stocks and shares*~~

~~*on which dividend or interest has accrued at the period of sale, and must be accounted for to the seller in the price. But the important question in foreign bills of exchange 1s what rate of interest is to rule in the transaction, Is it that of the country where the bill is drawn, or the country where it is payable, or a compromise between the two? The drawer, in offering to transfer his bill to a buyer, is wholly in the domain of the rate of interest in his own market, If he sells, he gets the value of the bill in money worth so much interest ; and if he holds the bill till its maturity, or to some period nearer its maturity, he deprives himself of money*~~

~~*tol*~~

~~*for that period worth the same interest. The buyer who, in the event of an exchange, pays down the value of the bill in money would seem to be under the same condition ; but in reality, when closely examined, the relations of the buyer and the seller of a bill of exchange to the rate of interest are different. The buyer has a debt to pay in the country on which the bill is drawn, which debt he is bound to pay now, and for his purpose the bill is all the more valuable the less weight of interest it bears, or, in other words, the less discount it is subject to. Supposing, therefore, the bill is drawn in a country where the rate of interest is 7 per cent. on a country where the rate of interest is 34 per cent., possession of the bill will be more profitable, as regards rate of interest, to the buyer than to the seller. If the seller holds the bill, it bears 100 per cent. more weight of interest than it would bear in the hands of the buyer. If the rates of interest in the two countries be exactly reversed, the bill bears 100 per cent. more of this weight in the hands of the buyer than of the seller. Thus, after the par of the currencies has been established, which, as we have seen, is always practically established, even in the case of an inconvertible paper currency, by the bullion test, and must be regarded as the first condition of all foreign exchange, this question of interest is sufficiently important to modify the action of supply and demand, and of other circumstances operating either to raise the rate of exchange above or depress it below the par of the currencies. It is one of those innumerable commercial relations in which there is an advantage to buyer or seller, but which cannot be realized without mutuality, and which consequently helps them*~~

~~*toa transaction. If the advantage of rate of interest be in favour of the buyer of a bill of ex- change he will be inclined, other elements of valuation con- sidered, to give a somewhat larger price for it than if this were hot in the account; and if the advantage be in favour of the seller he will be less exacting. The whole advantage on either side may not be realized in the actual terms in either case; but it will have had some effect towards a mediation of the prices.*~~

~~*The price of a bill, apart from other elements, is the sum of the bill mus the interest it bears at the rate of dis- count in the country where it is payable. Yet in the practical negotiation this does not hold exact, because the value of the bill to the seller or the buyer is always modi- fied by the relation of the rate of interest where it is pay- able to the rate of interest where it is drawn.*~~

~~*Rate of interest, though in tle aspect it presents to the seller and buyer of a bill thus plain enough, yet comes to play so great a part in the general course of exchange that it is worth while to pursue the subject a little further. Rate of interest regulates the supply and demand of bills, and affects the rate of exchange through that element; where the balance of indebtedness is against a country au advance of the rate of interest tends to restrain imports and to stimulate exports, by which effects the balance of debt is reduced ; aud where the action of trade is not sufficient to overcome the evil, further rises of the rate of interest may be employed to attract imports of foreign capital and specie. In the case we have supposed of two countries, where the rate of interest is 100 per cent. more in the one than the other, this relation of their rates of interest may be the normal relation from the greater abundance or the greater profits of capital in the one than the other, and their exchange may be supposed to be in equilibrium, so. that this normal relation is not disturbed by any changes of rate of interest to correct the supply and demand of bills, or the balance of trade. The effect, as we have seen, of difference of interest was in favour of the price of the bill drawn by the country of high interest on the country of low interest, from the fact that the buyer was moving the bill*~~

~~*Cost of specie remit- tance.*~~

~~out of a market where it bore a weight of 7 per cent. to one where it bore a weight of only 34 per cent. interest. But suppose the balance of indebtedness has become so adverse to the country of low interest that the rate has been increased to 7 per cent. in order to improve the course of exchange, and that the effect has beeu, as must more or less follow, to render the foreign drawer less eager to sell, and the foreign remitter more eager to buy. The remitter or buyer will find the new influence thus introduced operating in the same direction—viz., in favour of the price of the bill; but, on the other hand, the difference of interest has disappeared. Two effects have thus pro- ceeded from the same cause, which neutralize each other so far as they go; and the remitter, instead of buying a bill, may as well, as regards the rate of interest in the two countries, be drawn upon by his foreign creditor. If the rate of interest be further increased to 10 per cent., the drawer may be induced to hold the bill in order to save the 3 per cent. of discount above the rate of interest in his own market, or an investing buyer may intervene, and give such a price for the bill as will allow the seller 15 or 1 per cent. of the profit, and leave 14 or 2 per cent. to himself. In either case the bill would be held till it matured, and relief to that extent be afforded to the ex- change of the country raising its rate of interest. But it is clear that not until the rate were raised 3, 4, or 5 per cent. above the rates of the countries drawing upon it could any effect of this kind be produced. It thus appears that the function of rate of interest in controlling the supply and demand of bills is a strictly limited function; and this limitation will probably be found in all the effects expected from it onthe state of exchange. It may hasten the course of payments due toa country, but it does not lessen the adverse balance of indebtedness, nor can it much retard the pressure of the foreign claims. It may restrain importation of foreign goods, but it may not at the same time increase exportation of domestic goods ; or, if increasing export, it may not diminish import. These are results which will depend on many other causes. It may tend to lower prices, and thus seem to check import, while facilitating export; but, forming in itself an addition to the cost of production and exchange, it may render much outward as well as inward trade less possible. If the rate of interest be carried high enough it may attract much capital from neighbouring countries. Foreign bankers and~~

~~*lenders will buy up bills on the country as the best mode of importing their capital, or may import specie ; and admirable as this service may often be, yet it does not lessen the foreign indebtedness of the country. It only transmutes one form of the adverse balance into another more convenient for the time being ; and in the meanwhile, if the high rate of interest has crippled the productive and exporting resources of the country, little good or a reverse balance of evil may have been done. Hence bullion reserves are either inadequate in the plan of their formation, or they miss their use and efficacy if, when a heavy balance of indebtedness appears in the exchanges, they cannot be trenched upon without large and excited advances of the rate of interest.*~~

~~*4, Nothing is more definite in the system of exchange than what has been more than once stated in the course of these remarks, namely, that the cost of remitting specie forms the limit of variation in the rates of bills. That the buyer of a foreign bill will not give more for it than the cost of remitting specie equal in amount to his foreign debt is an axiom which holds good under all the ordinary conditions. But there are exceptions to the rule where the conditions vary from the ordinary. From the countries of productive gold and silver mines bullion flows abroad as naturally as the corn, cotton, wine, or oil which forms the special merchandise of a country, and it will so flow irrespective*~~

~~*EXCHARGS*~~

~~*of supply and demand of bills, rate of interest, and other causes which have so much sway in rates of exchiange. San Francisco will export gold and silver to London in all states of supply and demand of bills, and when its rate of interest may be double that of the Bank of England, and in the common parlance money is there dearer than in London, though it may be only that the average profits of capital are larger in the one place than in the other. If bullion is needed at New York, and commanding a higher premium on the Federal currency, it will be matter of calculation to the bullion exporter at San Francisco whether to send a consignment to New York or to London, If, since the dis- covery of the Californian mines, a metallic currency had been established throughout the Federal Union, the United States would no doubt have absorbed a proportion of the gold*~~

~~*and silver shipped to Europe ; but this object accom- plished, the export to Europe would have proceeded much as it has been proceeding. In short, from gold and silver producing countries the export of bullion is not a remittance of money, but a transmission of the exportable produce of labour, which but for export would not have been produced. Then, there is the case of exchange between countries of silver standard and countries of gold standard, from either of which remittances of specie cannot be made without exact reference to the market value of the two metals. This will have been already marked in the par of exchange between the gold and the silver country, but it will have introduced a new element into the cost of remit- tance, since the specie remitted will have to be sold into the specie standard of the country to which it is remitted. Silver from India and China, for example, in the circum- stances of recent years, cannot be remitted in payment of an adverse balance of exchange without taking into account a subsequent act of merchandise—namely, what the silver will bring in the gold of Englaud; and this, with silver under a course of depreciation, may be so doubtful that the buyer of a bill on London will rather yield in the rate of exchange, and give some fraction more of a rupee for the pound sterling than run the risk of it. Neither in payment of an adverse balance of debt, nor in transferring capital from one country to another with the view of taking advan- tage of a higher rate of interest, can specie be remitted between gold and silver standard countries free from this contingency. A Hamburg capitalist wishes to profit by a rate of interest two or three per cent. higher in England than at home. He will therefore buy bills on London up to a certain limit of price ; if he has any gold, he will then remit gold rather than exceed this limit for bills ; or he will remit the silver specie of Hamburg subject to its market valuein London. In this case, indeed, the foreign capitalist has more than one act of merchandise to contemplate, for he has to leok to the reverse action when the rate of inte- rest may be higher at home than in England, and when it will be his motive to re-convert his English sovereigns into silver, which in the relative condition of the market value of the two metals may be either favourable or unfavourable. Tf unfavourable, he will buy bills of England on Hamburg, or some other centre with which the exchange is favourable to Hamburg, rather than re-transmit silver at a higher cost than the rate of the bills. It is obvious that all this does not alter the principle that the cost of specie remittance is the limit of rate of exchange*~~

~~on bills, but only that it gives a larger range to the variation of rate, and to the specie limit, between two countries whose money and standard of value are of different metals than would exist between two countries where they were of the same metal. _ In exchange between a gold-paying and a silver-paying country, one of which, say the silver country, has gone largely into an inconvertible paper currency, the case becomes more complicated, and the specie limit to adverse~~

~~BAC HAN Ge 793~~

~~refusing them discount or discounting them under excep- tionally high rates of interest.~~

~~5, An exposition, however brief, of the causes operating Corrcet on the rate of exchange would scarce be complete without judz- including the effect of opinion or estimate, correct or pel oe erroneous, of the probable course of the market ; and there- it. = fore it may be observed that a judgment has to be formed panic. in every new phase of the numerous fluctuations. The seller~~

~~rate on bills recedes, till, if the inconvertibility be so great as to be incapable of valuation, or the Government in its ignorance or alarm has prohibited the export of specie, the limit is wholly lost. A Russian merchant, who has ample silver and paper roubles at command for his purposes, but has a debt to discharge in America, or needs to lift a cargo of cotton at Liverpool or of sugar at Glasgow, and finds that the remittance even of such specie as he may be able to~~

~~produce is illegal, must buy a foreign bill or a banker's draft on London at any price. At this stage the rate of exchange passes out of the domain of principle, or natural action of principle, into that of purely arbitrary considera- tions. When, from much less sutficient causes, general dis- credit passes upon a country, the rate at which its bills or acceptances may be valued is scarcely more reducible to rule. It might even be difficult to define why in the same general circumstances there should be collaterally a higher and lower course of exchange, and the bills drawn or pay- able by one firm should differ in their rate from those drawn or payable by another firm. Itis only by removing abnormal conditions that~~

~~*one arrives at the underlying principle which governs exchange, and determines the suc- cess with which it is conducted.*~~

~~*Accordingly it is in countries where bullion, separated from its necessary export from the mines, has become money, and forms the common standard of value in their international trade, that the limitation of the rate of exchange by the cost of specie remittance is most clearly visible. Between all nations trading on a gold basis there is a well-known and definite point above and below the par of exchange where it becomes profitable to move gold from one to the other, and which marks the extreme range of variation in the price of bills. Thus in the exchange of London with Paris, New York, and Berlin respectively, 25°10, 4°81, and 20°30 mark a point in the price of bills below par when it pays to send gold from London to these centres ; and, on the other hand, 25°30, 4°87, 20°50, a point above par when it becomes profitable to move gold from Paris, New York, or Berlin to London.*~~

~~*When the rate of exchange, touching, under the supply and demand of bills and other elements of valuation, these extreme points on one side or the other, and tending to exceed them, is the result of an actual over-indebtedness, a transmission of bullion is the best and most satisfactory inode of settlement. It directly reduces the balance of debt, and renders the price of bills again more equitable to the traders. All other modes of fencing it off, save an increased export of goods and produce, are more or less illusory. If, in such a juncture, an amount of foreign capital has been invested in bills on the country with the view of holding them to maturity for sake of profit in rate of interest, and now with the view of realizing the value of the bills in gold they should be pressed on the market before maturity for discount, an advance of one per cent. in the rate of dis- count may be sufficient to induce the foreign capitalists to hold the bills till they mature. And another advance of one per cent. in the rate of discount may induce them to reinvest in other bills on the country. But the root of the adverse exchange will not have been removed. It will always appear when the foreign capital thus invested in bills on the country is from any cause withdrawn, and until the over-indebtedness is liquidated by remittances of specie, increased export of produce, or transfers of saleable shares and securities.*~~

If, on the other hand, the rate of exchange has been brought to the specie limit by bills, representing n> actual debt, but drawn and accepted solely for the purpose of moving bullion, as may probably happen, there is no remedy for what may prove an inordinate demand for specie by irregular means but the detection of the bills, and either

of bills finds that within a few days the market has taken an unfavourable turn. If he judges that this has arisen from merely accidental or temporary causes he will be inclined to hold his bills for what he deems their true value; or if, on the contrary, he judges that the causes operating are more deeply seated, and likely to become stronger for a time, he will sell with the least possible delay. Should his judg- ment be justified by the event he will have done what is right for him, if otherwise he will have done what is wrong; but in either case, his abstention or action will have affected the supply and demand of bills in the mean- while. In all the great marts of exchange, and in London probably more than in others, there are frequent wave- currents so to speak, which cannot be rightly interpreted either as the sign of a protracted state of exchange between the points of the compass in which they flow, or of the general foreign indebtedness of the centre upon which they are directed. When New York balances its debts to China and India by bills on London, the bills affect the course of Eastern exchange ; but they lose much of the significance they might otherwise bear when it is considered that New York is in course of compensating London in other direc- tions. These operations come to be understood and sys- tematized by dealers and agents in bills with much accuracy ; but in addition 'to the judgment that may be formed by a thorough analysis of the substance of the various cur- rents of exchange, there is the effect of opinion on external events, which, though of almost daily occurrence in one quarter or another, are wholly of future account, and which impress, not only the connoisseurs of exchange, but the whole body of drawers and remitters, from whom tlhe original impulse on the action of exchange in all cases comes. The examples that might be adduced of the great effect of passing events on exchange are innumerable. In the beginning of 1861, when the disastrous rupture between North and South had occurred, aud war was imminent, the United States had a most favourable balance of trade with England and Europe. Their exports of wheat and flour and cotton in the previous year

~~had at once reached a maximum in quantity and a rise in value. The drawer of a bill on London was in so good a position that he had only to wait for the buyer to get the value of his bill up to the specie point. But so eager were the drawers, in view of the pending outbreak of civil war, to realize what was owing to them abroad, that they threw their bills on the market in an abundance which reduced their price to the other end of the scale. This, of course, had its converse effect at London, and bills on New York were there selling at such a premium that it seemed as if the United States would have to remit bullion to Europe. The volume of bills, however, told its own tale after a while. England had to remit bullion in large quantity to the United States, and then people began to awake to the perception that, in the exchange transactions, the one element most important of all had been left out—namely, the relative indebtedness. It must have been a time of much profit to those on both sides of the Atlantic who knew the actual state of affairs, and of much loss to those who did not know, of whom there can be little doubt that the latter were much the greater number, but the balance of value between the two countrics, as expressed on the face of the bills, had to be rendered ail~~

~~the same. Vee 155~~

~~Favour- able and unfavour- exchange.~~

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~~To take a more recent case. The exchange value of the Russian rouble during the last twelve months of war between Russia and Turkey will amply illustrate what is meant by the prevailing judgment on events in their future aspect, which, while proceeding on a certain amount of reason, yet borders on panic, and may be of the nature of panic. The issue of paper roubles had gone the length of 730 millions before the war, and there was a constantly in- creased remission during the year, counteracted in some measure by conversions into loans bearing interest. On the mobilization of the troops the value of the rouble was 29d. to 30d.; on war being declared it fell to 27d.; when it seemed as if Plevna could not be taken it sank to 224d.; when Plevna fell it rose to 263d.; and when it followed that the conquest of Turkey and an armistice did not end the difficulties, it fell to the lowest point it had touched, 22d,~~

~~*The term " favourable exchange," as commonly used, not only means a state of the exchanges when the debts due to a country abroad are so much greater than what it owes abroad as to affect potentially the demand and supply of bills, and when the money of the country so situated, as expressed in the price of bills, is equal to more of the money of a foreign country than the nominal par—when its bills on abroad, in short, are dull of sale, while the foreign bills on itself are in much demand; it is also applied to all stages, moderate or extreme, of this relation of the foreign exchanges. And so the term " unfavourable," of course, applies to the opposite conditions. If these phrases had ever any reference to the prosperity of the foreign trade of a country, they must have arisen under the sway of " the mercantile system" of the last century, the principle of which was that a balance payable in specie is the cardinal condition of prosperous trade with any foreign country ; or, if introduced under that erroneous theory, they have been prolonged by the usage of bankers and other dealers in foreign exchange, who, having large liabilities entailing bullion payment, naturally consider a state of exchange which is on the eve of bringing specie more favourable than one on the eve of taking it away. This is quite true in the monetary view of the question, and it is true also as to the relative indebtedness for the time being, But itis not true to extremes even ina monetary sense. The condition of a country to which specie was always flowing in and never going out would be a realization of the fate of Midas. The most favourable exchange, therefore, is that where there are only moderate oscillations up or down from the par of exchange.*~~

~~*While the terms "favourable" and " unfavourable" are thus somewhat misleading as regards substantial inter- ests, they are involved in a minor technical complexity, which, though well understood by those in the business, may here be stated. The terms would be strictly applicable inthe sense they are used, were the rate of exchange always quoted in the home money. The certain properly in ex- change transactions is the number of pounds, dollars, francs, or florins a remitter has to pay abroad; the wncertavn is what amount of his own money is equal to this amount of the foreign money. Were the quotation on both sides respectively always made in the home money, the fall or rise of the quotation would always be identifiable with such terms as "favourable " or "unfavourable." Both*~~

~~*drawers ani remitters would be so familiar with their significance as to know what they meant. But this is not the practice, und, with so much variety of currency, could hardly have been the developed practice of exchange. The pound ster- ling of England is the largest monetary unit, and there is always facility of expressing minute shades of difference in the smaller units, more especially when, as in the case of Paris or New York, they have a decimal character. In London, consequently, 'the public'only hear quotations of rate of exchange with such countries as France and the United*~~

~~*~HXCHANSEE*~~

~~*States in the foreign money—London thus giving what is called the certain, and the smaller moneys the variable. On the other hand, not only in the Australian and other British colonies, where the standard of value is the same as in the parent country, but in such large commercial regions as China and India the quotation of rate of exchange on both sides is always expressed in sterling. The Chinese tael of silver is worth so many English pence sterling at Canton; and the rupee is worth so many English pence at Bombay or Calcutta; and in the same terms run the quotations in London. 'The practice may not alter in any iota the true rate of exchange, but it has the result that*~~

~~*-when the rate is quoted in sterling money, as in the Indian,*~~

~~*Chinese, and Australian exchanges, every drop in the quotation is "more favourable" to England, every rise "Jess favourable," and this will hold good whether the*~~

~~*quotations are made in England or in India, China, or*~~

~~*Australia ; whereas, on the other hand, when exchanges are quoted in foreign money—French, German, or American, &c.—every drop in the rate by the same rule is "less favourable," every rise in the rate " more favourable" to England, whether the quotation be made in England or in the foreign countries.*~~

~~*The states of exchange to which the terms " favourable " and 'unfavourable " are thus applied refer wholly to the effect of the demand and supply of bills ; so that, since the fluctuations of exchange are due to various causes, it would be au improvement were the quotation always to include the par of exchange, whether between the gold money of one country and the silver money of another, or between either and inconvertible paper, the depreciation of which has to be determined by the gold or silver premium in the country of its currency. The actual rate above or below par would show the effect due to the supply and demand of bills. When a sudden alteration takes place in foreign exchange, nothing is more difficult than to discover the relative force of the cause or causes to which it is to be ascribed, and yet nothing is more necessary to know than this, whether in the correctives that may be applied or in the lessons to be conveyed to importers and exporters.*~~

~~*The limited meaning to be given to such terms as "favourable" and "unfavourable" exchange probably applies to other statements that may arise legitimately in connexion with this subject. The principle, for instance, that the profit and loss of exchange transactions fall, not between the two countries concerned, but between the foreign creditors and debtors in one or other, is exact within its own range; but it leaves as an open question whether in a country where from a depreciated and depre- ciating currency the rate of foreign exchange is always rising, the general result may not be adverse to its interests in ex- port and import trade. In like manner it would be more than questionable, because "the mercantile theory " was wrong in supposing that a balance of foreign trade in specie, or an excess of export value over import value, was the necessary condition of national prosperity, to posit the opposite doctrine that an excess of imports over exports is the only prosperous condition. The solution of this ques- tion must depend on what may be called the permanent in- debtedness of some countries to others. A country which is under large tribute to foreign capital is assuredly in the right way for itself and for other countries when the value of its exported exceeds that of its imported produce. And so also it may be observed that " rate of interest," if we are correct in our reasoning on that head, may not have the absolute control over the exchanges which was so strongly emphasized for some years after the passing of the Bank Charter Act of*~~

~~*1844, and has since only been modified in practice without any express recognition of the principles involved.*~~

~~*oe Cer NG &*~~

~~*NEGOTIATION OF BILLS OF EXCHANGE. 4*~~

~~*Rates of exchange have undergone much variation of late years from changes of standard—in some cases from gold to silver, and in others from silver to gold—and from the circulation of forced paper currency. The tendency, however, is to greater uniformity. The gold standard of value adopted at Berlin extends to the whole German empire, and the rates of exchange are now calculated in imperial marks and pfennige at Hamburg, Frankfort-on-the-Maine Altona, and other German places, where different moneys formerly were used. The money under the new system is 100 pfennige =1 mark, 20 marks = 1 twenty-mark gold piece (imperial mark) =19s. 6°954 sterling mint par. The mark, which is the unit or in- teger of the system, is a silver coin based on the ratio of 1 to 154 as the relative value of silver and gold. In like manner the kingdom of Italy has extended a uniform exchange; and the rates at Naples Palermo, Messina, Milan, Turin, Florence, Leghorn, and other Italian towns are similar to the rates at Genoa.*~~

~~*Bills of exchange may be made payable on demand (as the 'invariable rule is in the case of cheques), at sight, at a certain speci- fied time after sight or after date, or at usance, which means the customary or usual time for which bills are drawn from a given place, and when the time is doubled it is called dowble usance. No bills are now drawn in London at wsance, and the practice is being*~~

~~*radually cape in other countries. The usance of bills drawn rom France, Holland, and Germany is 30 days' date ; from Spain and Portugal 60 days'; and from Italy 8 months' date; but the currency of bills is regulated more by the classes of business to which they relate than to the usage of any country. The allowance of days of grace is also going out of fashion. Three days are still given on bills drawn upon or payable in the United Kingdom other- wise than at sight, and a similar practice holds in the United States. St Petersburg gives 8 days on sight bills and 10 days on*~~

~~*date bills, Copenhagen 8 days, Christiania 8 days ; but in these and other cases the allowance may not mark so distinctly the day when a bill is legally due as an interval within which certain legal pro- ceedings of the respective countries cannot be instituted. The practice, which was at one period extremely various, has now been reduced within such narrow limits that in exchange transactions in London no account is taken of days of grace.*~~

~~*Bills of exchange in London are bouglit and sold through brokers, who go round the mercantile and banking houses, and discover whether they are buyers or sellers of bills. The negotiations are determined on Tuesdays and Fridays, which correspond with the principal post days in foreign exchange business. In London, as in other great commercial cities, bankers deal largely on the rise and fall of exchanges,—buying bills when they expect a rise, and selling bills when they expect a fall.*~~

~~*Foreign bills are generally drawn in duplicate or triplicate, lest the first should miscarry. When thus drawn in sets, the first is payable only "second and third unpaid," the second * first and third unpaid," and the third "first and second unpaid." Where there is a doubt as to the acceptance, the first may be sent unindorsed to a correspondent of the drawer in the place of payment to have it accepted, and the second sold and put in circulation, bearing the name and address of the party holding the first or accepted bill 'in case of need," that is, in case he may not have obtained accept- ance, and will protect the drawer from having the bill returned through the indorsers. The indorsed second, and the accepted first of exchange, when wafered togethcr, become one pill and are valid.*~~

~~*Exchange, as regards the abundant arithmetic to which it gives rise in its negotiation, may be divided into—(1) Direct, or exchange between two countries wholly based on their rates of exchange, which is so simple as to need no remark ; (2) Cross, or exchange between two countries in which a third country has an interest, as when London, say, has 10,000 frances in Paris which he wishes to move to Hamburg, and has to take account of his own course of exchange to Hamburg as well as the direct between Paris and Hamburg, which is only less simple than direct exchange, inasmuch as it requires two formule instead of one ; and (8)*~~

~~*Indirect or arbitrated, where exchange between two countries is conducted through the medium of a third, or more than one other country, and thus becomes more compound as the sphere of the operation is extended. Itis an arbitrated rate because it has no actual form, and is found only in figures out of the current rates of exchange between more than two countries. The object being to discover how a debt in one place may be most economically paid from another, the question carries along with it not only the difference between remitting and drawing which exists in the simplest direct exchange— the debtor in the one country and the creditor in the other having always the option of the one remitting or the other drawing—but such minutice as whether the rate of exchange given be in the foreign money or in sterling, till it results in the following rules : —*~~

~~*"« For Remittances :— "With a foreign rate, any arbitrated rate is better than the direct rate if it is*~~

~~*greater than the latter; . ; Ped. " With a sterling rate, any arbitrated rate is better than the direct rate, if it is*~~

~~*less than the latter:*~~

~~*195*~~

~~*"Because, in either case, a given sum in sterling will produce a greater sum in foreign money, or a given sum in foreign money will cost a less sum in sterling.*~~

- ~~*For Drafts or Returns :— ?*~~

~~*ie With a foreign rate, any arbitrated rate is better which is Jess than the direct rate ;*~~

~~*"With a sterling rate, any arbitrated rate is better which is greater than the direct rate:*~~

~~*"Because, in either case, a greater sum in sterling will be obtained from a given sum drawn for in foreign money."*~~

~~*Noris this all. Arbitrated rates are calculated for present money ; the actual rates of exchange on which they are calculated have been affected by time and rate of interest. In the rate of direct exchange particularly, with which the arbitrated rate has to be com- pared, this effect has to be estimated, long pills reduced to short and the difference of interest on them discounted from the basis of calculation prima facie. This, in a superficial view, may be counter- poised by drawing speculative bills of long date on a foreign centre, but there are limits to drawing ona place,for purposes external to its ordinary course of exchange, and a large amount of bills thus directed without corresponding remittances might produce an effect on the exchanges which would go far to upset the calculation.*~~

~~*It is obvious that arbitration of exchange, thus burdened at every additional length of the chain by difficulties of estimate, cannot be much extended or become too artificial without the risk of mis- carriage. But the mediation of direct exchange through a third place is of such common and useful practice that it may be desirable to give an example broad enough to illustrate the general method of equation. :*~~

~~*Take London on Paris at 3 months, quoted £.25°55; Paris on Lon- don at 3 months, quoted f.25°10.*~~

~~*The discount for 3 months, in the example to be given, is taken at 1 per cent., or 25 cents., which is deducted from the London rate and added to the Paris rate, to make the two short or cash rates ; thus reducing the former to f.25°30, and raising the latter to £.25°35.*~~

~~*If this variable price were in sterling, as for instance with Madrid, the allowance for interest would have to be reversed, that is, added to the London price, and subtracted from the price abroad.*~~

~~*— – FEXAMPLE. From the following rates of bills in London and Paris it is required to find— 1st.—Whether, having money to transmit from London to Paris, it will be better for me to remit direct bills on Paris, or to order bills in Paris to be drawn upon me in London, at the rate of 4 per cent. per annum. = 2d.—Whether, having money to draw from Paris, it will be better for my cor- respondents there to make me remittances, or*~~

~~*for me to draw upon them, ; 3d.—If I have to make remittances to Paris, whether any indirect rate will answer better than the rates of direct bills. ; 4th.—If I have to obtain returns from Paris, whether any indirect rate will answer better than either of the direct rates.*~~

~~*RATES OF EXCHIANGE.*~~

~~*London, June 17. Paris, June 14. 25°55 ……-Paris at 3:montlis.*~~

~~*12/13 …….—Amsterdam……..2093 13102. ....066e HAMDUTE...0000000-184 TO 5 es. cE taNKiOnt ..----< 20 Cn*~~

~~*29°472 ….00—LEghOrn 2 …..4-+215 loss =100 lire for 85 francs,*~~

~~*MrtTHops OF WORKING THE EQUATIONS. Amsterdam, ae £1? 1 — * 12/14 Florins and Stivers. 100: — * 2°093 Francs. | Francs 2°093 × 12:06 = 25°24 Francs.*~~

~~*Hamburg. £1?*~~

~~*1 — * 13103 Mk. and Se. = 2183 Se. Se. 1660 = Mk. 100 — * 184 Francs. Frances 184 × 2183 + 1600 = 25:10 Francs.*~~

~~*Frankfort. £1? 10 — * 121 Florins. 100 — * 210} Francs. Francs 2103 × 121 + 1000 = 25°42 Francs. Leghorn. £1? 1 — * 29-473 Lire Italiane. 100 — * 85 Francs. Frances 85 × 29°47} + 100 = 25°06 Francs.*~~

~~*CoMPARISON OF THE'ARBITRATED RATES. Prices.*~~

~~*London.*~~

~~*25°30 short, 25°24*~~

~~*25°10) ar*~~

~~*2542 250652*~~

1. ~~*24°35 short.*~~

~~*London, 3 months….*~~

~~*Amsterdam…. Hamburg, Frankfort*~~

~~*1 These rules of arbitrated exchange, accurately given in Tate's Modern Cambisé, and the verbal puzzle of which turns chiefly on whether the rate forming the basis of calculation be foreign or sterling, Jend force to the observation above that the onerate should never be lost inthe other one-sidedly, If distinguished in the practical quotation of exchanges, there seems no reason to take other than one in arbitrated exchange. — ' <*~~

~~*2 The loss at Leghorn is owing to cash premium on forced paper currency, but. as it affects London and Paris equally, docs not disturb the calculation, '*~~

~~*(96*~~

~~*{For Direct PAPER.*~~

~~*it appears from the direct rates between London and Paris at 25°30 and 25°35 ee remit or transfer money from London to Paris, it is better for Paris to draw upon London at 25°35 short, than for London to remit to Paris at 25°30 short, because by the former operation there will be made 5 cents. per pound, or about one-fifth per cent , more than by the latter.*~~

~~*2d.—To have returns from Paris, it is better, by the same 5 cents, for London to draw upon Paris than for Paris to remit to London, because the bills will cost sv much less French money, or produce so much more in sterling.*~~

~~*For InpIrEctT PArer.*~~

~~*1lst.—For remittances to Paris, it appears from the arbitratcd results that bills on Frankfort, bonghtin London at 121 florins per £10 sterling, and sold in Paris at 212 francs per 100 florins, will produce 12 cents. more than direct remittances from London to Paris, or 7 eents. more than is yielded by direct drafts of Paris upon London.*~~

~~2d.—For returns from Paris, it appears from the arbitratcd results that bills on Leghorn, bought in Paris at 85 ccntimes per paper lira ltaliana, and sold in Lon-~~

~~KX C—~~

~~don at paper lira Italiana 29°47} pcr pound sterling, will cost 29 cents. less than direct bills from Paris, and will give 24 cents. more than drafts from London on Paris.~~

~~Such is the manner in which the various exchanges are calculated in order to ascertain which will answer best for a speculation in bills through intermediate places. The contingency of a change of rates has to be considered, and the charges of brokerage and com- mission on the operation have to be deducted from the result, or may be reduced when the operation is done by branches of the same house, or on joint account.~~

~~The elasticity of arbitrated rates of exchange is put to the severest strain when a large subsidy, or monster indemnity, like that of France to Germany, has to be paid by one country to another. In these cases it is necessary to employ extensive banking co-opera- tion, and at centres on which the drafts arc heavy to arrange means for the support of the exchange. i~~

~~PaRs OF EXCHANGE. (Abstracted from Tate's Modern Cambist, 16th edition.)~~

~~London receives from or gives to Amsterdam, 11/19 florins and stivers ……. +. for £1 sterling, Antwerp and Brussels, 25°15 francs ….ss.000. — » #&I1 sterling, Hamburg, Berlin, and German bank places, 204 oieteniine imperial marks and pfennige …ccccccccccsrscceeeeef BU INNA~~

~~PSUS H25;2 251 VAMCSH.,..cteeccetetesstwettts…cscve@teeeeeecssscs 5, col sterling. *Vienna,! 11°50 florins and kreuz. .....0.8 situs — » &1 sterling. *Genoa, and'Italian towns, 29°50 lire and centes…. ,, £1 sterling.~~

~~Lisbon, 53} pence sterling: .....cssccscsseeeess nececeoron + » Il milreis.~~

~~*Madrid, 48 to 50 pence sterling ……..sssccccsssseeees see 4, 1 duro (hard dollar). Gibraltar, 493 pence sterling ……..cssccccscscsscsescccees » J hard dollar. Malta, 49 pence sterIIng ….cccsccccscsisccccesseeces covcsseses yy L PCZZAs*~~

~~**Constantinople, 125 piastres ……..00ccccc*~~

~~*£1 sterling. St Petersburg, 374 pence sterling….. cota*~~

~~*1 silver rouble.*~~

~~*Warsaw, 6°40 silver roubles and cop…….. tesscsscsseree yp L1 sterling. Copenhagen, 9°10 rigsdal and Sk, …….scsscccsssseseess + » &£1 sterling, Christiania, 4663 species and SK…ussccccccssrree 4, L1 sterling, Stockholm,, 18-05 riksdaler …….. eres SaceosoLr sees 4, £1 sterling.*~~

~~*New York, 49} pence sterling …..scccccssecccccsseccccees » 1 gold dollar.*~~

~~*Rio Janeiro, 27 pence sterling …….. pales +. 4, 1 milreis gold. Buenos Ayres, 67 shillings sterling ……..sc00sce0e » 1 onca gold. Calcutta, Bombay, and Rangoon, 23 pence sterling ,, 1 Govt. rupee. Canton,? 784, pence sterling …….. segecsecsssssssesseeee 5, 1 tael sycce silver, Japan, 51 to 52 pence sterling…….. oo sesesee 4, 1 Span. or Mex. dollar,*~~

~~*(R. SO.)*~~

~~*EXCHEQUER, Courr or Excnrquer, Excurquer CuamBer. The name scaccarium, from which the word "exchequer" is derived, was used under the Norman kings of England to signify the treasury. Madox, in his learned History of the Exchequer, exhausts the possible definitions of the word. According to some, it is connected with scaccus er scaccum, a chess-board, and the exchequer of England " was in all probability, called scaccarium because a chequered cloth (figured with squares like a chess-board)*~~

~~*was anciently wont to be laid on the table in the court or place of that name." ""' From the Latin," continues Madox, "cometh the French*~~

~~*eschequier or exchequier, and the English name from the French. Or if any one thinks more likely that the French word was the ancienter, and*~~

~~*the Latin one formed from it, I do not oppose him,—nay, I incline to believe it was so." Another and less probable explanation is, that the original word was statarium, 'from its stability, as it was the firm support of the crown or kingdom." But Madox points out that from the early*~~
~~*——————__44 ss eee*~~

~~*1 Those marked (*) include premium on gold or silver on account of depreciati be panes currency. The mint par of ee is about 10°35. In Genewunatsttier i= ee cities it would be about 25:30. The full metallic par of the Turkish piastre*~~

~~*5 L 5=£1 sterling. Where the quotations in the above table are sterling with sliver money, the price of silver has been taken at 5s. an ounce, and the par of*~~

~~*ex * A * . wine = va bes deduced from lower and higher prices of silver, as compared*~~

~~*2 Foreign merchants trading with*~~

~~*a China usually keep their accounts in dollars*~~

~~*and cents; and the dollar is i i tells OF Canines toe aioe f 4 "i the mint at Hong Kong forms an acceptable |*~~

~~*LA®*~~

~~*times of the Conquest onwards it was always called scaccarium and never statarium.*~~

~~*At the present day, exchequer means two very different aud independent institutions, the historical origin of which is one and the same, It is a court of law—one of the three superior courts at Westminster. Jt is also the treasury. The connexion between the treasury and the court is still kept up im one or two points. The chancellor of the exchequer still takes*~~

~~*his seat in the Exchequer Court on certain formal occasions, and the Exchequer Court (or, as it is now called, the Exchequer Division) is still the appropriate tribunal for cases connected with the revenue.*~~

~~*The Exchequer makes its appearance among English institutions in close connexion with the King's Court (curia regis)—the germ from which so large a portion of the English constitution has sprung. In the language of later times it might be called a committee of that court specially charged with the management of the revenue. The King's Exchequer, says Theodore, "was anciently a member of his court, and was wont to be held in his palace. It was a sort of subaltern court, partly resembling in its model that which was properly called the curia regis, for in it the king's barons and great men who used to be in his palace near his royal person ordinarily presided, but sometimes the king himself; in it the king's chief-justiciar, his chancellor, his treasurer, his constable, his marshal, and his chamberlain performed some part of their several offices." And just as the curia regis was not a pure court of law, so the Exchequer was not merely a financial council but a court of law. Its principal business, says Madox, related to the revenue, and although the justices on circuit*~~

~~*'had cognizance of revenue matters, such matters, as they*~~

~~*arose, were certified or sent into the Exchequer "to which place the affairs of the royal revenue tended as to their centre." Madox divides the business of the Exchequer, during the period between the Conquest and the reign of King Johu, under the head of revenues, causes, non-litigious business, and matters of public policy.*~~

~~*From the reign of Henry III. the Exchequer was recognized as a separate court, the others being the King's Bench and the Common Pleas (@.v.). Mr Stubbs thinks that a separate staff of judges was not assigned to each court until the end of the reign of Henry. The special business of the Exchequer was as before the decision of revenue cases, but from a very early timc, and in spite of repeated prohibitions, the lawyers of the Exchequer com- peted for the ordinary litigious business—the common pleas—of the country. 'They finally succeeded by means of the well-known fiction which allowed one of the litigants to own that he was indebted to the king, and forbade his opponent to traverse the averment.*~~

~~*The organization of the court seems to have been somewhat later in point of time than that of the Common Pleas and the King's Bench. The barons of the Exchequer were not at first recognized as judges. They are not mentioned in the statutes of Nisi Prius (13 Edward I. c, 30, and 14 Edward III. c¢. 16), In the reign of Elizabeth the Exchequer was definitely recognized a court of co-ordinate jurisdiction with the Com- mon Pleas and the King's Bench.*~~

~~*The Exchequer was further distinguished from the two other courts by possessing an equitable as well as a common law jurisdiction. "The Court of Equity," says Blackstone, "is held before the lord treasurer, the chancellor of the ex- chequer, the chief baron, and the three puzsne ones," whereas the common law jurisdiction isexerciséd by tle barons only of the exchequer, and not the treasurer or chancellor. This equity jurisdiction was abolished in 1841, when two addi- tional vice-chancellors were appointed in the Court, of Chancery.*~~

~~*By the Judicature Act of 1873 the Court of Exchequer*~~

~~*EX C—EHEXC*~~

~~*was abolished as a separate court, and its jurisdiction was transferred to the new HIgh Court of Justice. The Ex- chequer still survives, however, as one of the divisions of the HIgh Court, and still retains under its new name its old exclusive jurisdiction.*~~

~~*The Court of Exchequer Chamber was, until the passing of the Act just referred to, the court of appeal from the three courts of common law. Appeals from any one of these were heard before judges of the other two. It was originally intended (by statute 31 Edward IIT. ec. 12) to de- termine causes by writs of error from the common law side of the Court of Exchequer, the judges being the lord chan- cellor, lord treasurer, and the justices of the King's Bench and Common Pleas. A statute of 27 Elizabeth (c. 8) made similar arrangements for writs of error from the King's Bench. The jurisdiction of the Exchequer Chamber is transferred by the Judicature Act to the new Court of Appeal.*~~

~~*The chancellor of the exchequer is the second commis- sioner of the treasury, the first lord being the premier. Occa- sionally both offices are held by the same person. It is the duty of the chancellor to prepare and lay before the House of Commons the " budget " for the year, and therefore he must be a commoner. The chancellor takes his seat in the Court of Exchequer once a year—at the nomination of persons to serve as sheriffs, (E..B.)*~~

~~*EXCISE, a term of obvious Latin derivation, now well- known in public finance, signifying a duty charged on home goods, either in the process of their manufacture or before their sale to the home consumers. This form of taxation implies a commonwealth somewhat advanced in manufac- tures, markets, and general riches; and it interferes so directly with the industry and liberty of the subject that it has seldom been introduced save in some supreme financial exigency, and has as seldom been borne, even after long usage, with less than the ordinary impatience of taxation. Yet excise duties can boast a respectable antiquity, having a distinct parallel in the vectigal rerum venalium (or toll levied on all commodities sold by auction or in public market) of the Romans. But the Roman excise was mild compared with that of modern nations, having never been more than centesima, or one per cent., of the value; and it was much shorter-lived than the modern examples, having been first imposed by Augustus, reduced for a time oue-half by Tiberius, and finally abolished by Caligula, 38 A.D., So that the Roman excise cannot have had a duration of much more than half a century. Its remission must have been deemed a great boon in the marts of Rome, since it was commemorated by the issue of small brass coins with the legend Remissis Centesimis, specimens of which are still to be found in collections.*~~

~~*The history of this branch of revenue in the United Kingdom dates from the period of the civil wars, when the republican Government, following the example of Holland, established, as a means of defraying the heavy expenditure of the time, various duties of excise, which the Royalists when restored to power found too convenient or necessary to be abandoned, notwithstanding their Roundhead origin and general unpopularity. On the contrary, they were destined to be steadily increased both in number and in amount. It is curious that the first commodities*~~

~~selected for excise were those to which this branch of taxa- tion, after great extension, has again in the age of reform and free trade been in a manner permanently reduced, viz., malt liquors, and such kindred beverages as cider, perry, and spruce beer. The other excise duties remaining are chiefly in the form of licences, such as to kill game and to use and carry guns, to séll gold and silver plate, to pursue the business of appraisers or auctioneers, hawkers or pedlars, pawnbrokers, or patent-medicine vendors, to manu-~~

~~facture tobacco or snuff, to deal in sweets or in foreign wines, to make vinegar, to roast malt, or to use a, still in chemistry or otherwise. It may be presumed that the policy of the licence duties is not so much to collect revenue, though in the aggregate they yield a large sum, as to guard the main sources of excise, and to place certain classes of dealers, by registration and an annual payment to the exchequer, under a direct legal responsibility. The excise system of the United Kingdom as now pruned and reformed, however, while still the most prolific of all the sources of revenue, is simple in process, and is contentedly borne as compared with what was the case in the last and the beginning of the present century. The wars with Bonaparte strained the Government resources to the utter-most, and excise duties were multiplied and increased in every practicable form. Bricks, candles, calico prints, glass, hides and skins, leather, paper, salt, soap, and other commodities of home manufacture and consumption were placed, with their respective industries, under excise sur- veillance and fine. When the duties could no longer be increased in number, they were raised in rate. The duty on British spirits, which had begun at a few pence per gallon in 1660, rose step by step to 11s. 84d. per gallon in 1820; and the duty on salt was augmented to three or fourfold its value.~~

~~The old unpopularity of excise, though now somewhat out of date, must have had real enough grounds. It breaks out in all our literature, from songs and pasquinades to grave political essays and legal commentaries. Black- stone, in quoting the declaration of parliament in 1649 that " excise is the most easy and indifferent levy that can be laid upon the people," adds on his own authority that " from its first original to the~~

~~*present time its very name has been odious to the people of England" (book i. cap. 8, tenth edition, 1786); while the definition of " excise " gravely inserted by Dr Johnson in the Dictionary, at the imminent risk of subjecting the eminent author to a prose- cution for libel—viz., "a hateful tax levied upon commo- dities, and adjudged not by the common judges of property, but wretches hired by those to whom excise is paid "—can hardly be ever forgotten. The levy of excise has more than the disagreeableness of other direct taxation, and though not more inquisitorial than income tax, establishes an espionage and control over premises and processes of manufacture which are much more offensive as well as some- times injurious. The caustic feeling of last century points directly enough to much rough and arbitrary administration, which it was possible gradually to correct and mitigate.*~~

~~*But what may be deemed the permanent defect of excise is that it is apt to increase the cost of conimodities to consumers far more than the amount of duty levied for the revenue. This has been found on the abolition of excise, whether on bricks, calicoes, leather, paper, or other articles of manufacture. The cheapening effect might not be very immediate or apparent, because the duty when abolished might bear only a very fractional proportiou to the natural value of the goods; but under the greater freedom of production have arisen more invention, more skilful and varied appliances, and consequently more economy to con- sumers, and more expansion of the several industries, than could have been attained under the fiscal restrictions. The inexpediency, even for revenue purposes, of fining and fetteriug a great number of the most useful and necessary home industries by this kind of impost would seem tu be abundantly demonstrated by the fact that the excise revenue of the United Kingdom, while being reduced always within narrower compass, has not suffered eventually in its actual produce to the state. The revenue from excise has never been greater, or much greater, than it is at present.*~~

~~*| The gross receipts from excise in 1820 were £27,955,810.*~~

~~*798 ExXC—EHEXC*~~

~~*In the year ended 31st March 1866, when the larger number of the duties had been abolished, the net revenue from excise was £18,332,868; and in*~~

~~*the year ended same date 1877, when excise for some years had been almost wholly confined to British spirits and malt liquors, the net revenue was £27,681,523. The following are the general items of the excise revenue in the latter year :—*~~

~~*CHICOrY ce eeesee ce ceeeeeeeeeeeueeeeeeneeeeeeneeeeeeS £2,942 ILMOGEEE) oApseosesopsoneadsondsonodecuoodondos ned 8,548,557 INVGALLE. Speton.oneteeoco »apBBencs ceebroenaccocuceapede 8,040,378 Railways ……cceeseeseeeeersceneeeesenseseesees 728,718 Spirits, home made……s…sseeseeeeeees 14,873,165 Sugar, used in brewing …….. .eeeeeeeeeee 487,763*~~

~~*OM: sce Rpcieees £27,681,523*~~

~~*So large a revenue from so few sources indicates high duties, and the excise on spirits in particular has been maintained during many years at a rate that would have astonished the people of last century, and yet without any of the evils incident to heavy fiscal exaction, There is a check, which has been often exemplified, to the increase of the rate of excise in the encouragement it gives to illicit manufacture, and the consequent defeat of its object, viz., increase of revenue. The high rates of 11s. 84d. per gallon in England, 6s. 2d. in Scotland, and 5s. 7d. in Ireland, to which the excise on home-made spirits was increased at the close of the great wars, gave rise to so much evasion that "more than one-half of the spirits actually consumed in Scotland and Ireland," as we learn from an official source, "were supplied by the smuggler." The duties were reduced to 7s. per gallon in England, and to 2s. 44d. in both the other countries. 'The result of these changes was a most surprising increase of legally made spirits. In 1820 the quantity made in the United Kingdom, and retained for home consumption, was 9,600,000 gallons. In 1826 "—two years after the change of duties—" it was 18,200,000" (First Report of Commissioners of Inland Revenue, 1857). At subsequent periods, when the duties were again moderately increased, it was found that there was a sharp limit to the process, and that the excise on spirits could not be advanced much beyond 3s. 4d. in Scotland and Ireland without a revival of the old evils and a decline of revenue; while in England more than 7s. encouraged adulteration, and much higher prices than were justified by*~~

~~*the duty and other trade charges. Later experience shows that this check is elastic. Since 1860 the excise on home-made spirits has been 10s. per gallon uniformly in the three kingdoms, and yet in no previous period have there been fewer complaints of smuggling or illicit distillation. This result is ascribable to various causes. The increase of employment, higher wages for legitimate labour, the opening of all parts of the country by means of communication, the greater sway of the law, and the greater influence of habits of order, must have dis- couraged the dark though tempting business of smuggling quite as much or more than the enormously high excise encouraged it. The excise service itself has also been much improved, and by simple mechanical provisions in the dis- tilleries much less supervision of officers is requisite, with greater security against fraud than in former times. The exemption from duty of methylated spirit, used extensively in " French polishing" and many other arts, has likewise had a beneficial effect in stamping out illicit distillation. The spirit of wine, or pure alcohol of the druggists, how- ever, is still almost necessarily subject to duty, though it were certainly desirable that in tinctures and other medicaments incapable of being abused as potable liquors, it should be free of tax. But permission to prepare tinctures in bond, in quantities of not less than nine gallons, has not as yet been taken advantage of to anyextent. In the export of spirit of wine a rebate of duty is allowed,*~~

~~*The duty on malt, like that on spirits, has also for some years been uniform in the United Kingdom, at the rate of 2s, 74d. per bushel, with a further duty on brewers of 12s. 6d. for every 124 quarters mashed, or, what is held equivalent, every 50 barrels of 36 gallons brewed, The duty on each gallon of ale is thus barely one and seven- eighths of a penny—a very lenient excise compared with the 10s. per gallon on spirits. It might be supposed that when the duty on spirits in Scotland and Ireland was made as high as in England, a certain equality should have been established in the incidence of taxation on the liquors most generally used in the several countries. But the legislature has favoured the milder fermented liquors with the view of promoting temperance in all parts of the kingdom, irrespec- tive of taste, habit, or climate. HOw far this good intention has been realized is a question aside from these explana- tory remarks on excise. It has only to be observed that while the consumption*~~

~~of brewed liquors has been increas- ing in Scotland, the consumption of distilled spirits in England has been increasing in a still greater proportion. The following are the official returns of spirits and malt charged with duty in the three kingdoms in 1867 and 1876 :—~~

~~Ireland.~~

~~England. Scotland.~~

~~1867. 1876.~~

~~9,170,561|13,368,096| 7,144,144 | 9,193,608 | 6,377,648 | 8,156,743~~
~~48,608,570.54,161,922| 2,881,501 | 3,021,891 | 2,499,366 | 3,342,869~~

~~.| Spirits at proof, Gallons… Malt, bushels……~~

~~The abolition of many of the old excise duties, and con- sequent simplification of the department, prepared the way for an administrative reform, by which the three revenue branches of excise, stamps, and taxes were placed under the superintendence of one board of commissioners, and included in the general description of inland revenue. This was accomplished in 1848, and the board of excise left its old head quarters in Gresham House and was merged in the new body in Somerset House, by which the collection and management of the whole inland revenue has since been directed. The provisions for the consolidation and guidance of the board of inland revenue are embodied in the Act 12 Vict. cap. 1. The numerous statutes of excise, well annotated, have been collected and published under the authority of the commissioners of inland revenue, in one volume (1873). (R. SO.)~~

~~EXCOMMUNICATION, the highest ecclesiastical cen- sure, is the judicial exclusion of a baptized person from the fellowship of the visible church of Christ. As part of the discipline of the church it is based on the precept of Christ (Mat. xvi. 19, xviii, 15-18 ; John xx. 23), and on apostolic example (1 Cor. v. 5; 1 Tim. i. 20, é&ec.). These and the other texts, however, bearing, or supposed to bear, on the subject of excommunication, have not by any means been uniformly interpreted; and the usages ostensibly based on them have differed accordingly. The~~

~~*praxis of Chris- tian discipline, moreover, has never been wholly inde- pendent of Jewish and pagan influences; and its variations cannot be adequately explained unless account be taken of several non-Christian analogues of excommunication. Among other pagan analogues may be mentioned the Greek xepviBwv «ipyerfar (Demos. 505, 14), with its consequences (Aisch., Choeph. 283 ; Hum. 625 £.; Soph., Hd. Tyr. 236 ff.) ; the Roman esecratio and diris devotio; the awful power which the Druids claimed of excluding from the sacrifices (Ces., B. G., vi. 13). But more influential than any of these has been the ancient Jewish practice. The word used in the New Testament to describe an ex- communicated person, dvdBepna (1 Cor. xvi. 22 Gal… 8 9; Rom. ix. 3), is the constant LXX. rendering of the Hebrew D7 (see ANATHEMA). This word (herem), in its*~~

~~*EX C OMarUNIT CATT OR*~~

~~*primary signification means simply any person or thing separated or set apart, a meaning which is still seen in the familiar Arabic word " harem." The connexion in thought between the notions separation from common use, dedica- tion to God, and devotion to destruction is not very obscure, and it soon established itself in the Hebrew mind. In Ley. xxvil. 21, 28, 29, we read that no "devoted" person or thing was to be sold or redeemed; "none which shall be 'devoted' from among men shall be redeemed, but shall surely be put to death." The Hebrew mohoram (devoted) was precisely in the same position as the Latin zmpius or sacer (Mommsen, ém. Alt., ii. 50 ff.). In Num. xxi. 2, 3, Deut. ii. 34, iii. 6, vil. 2, we find whole cities or nations thus ' banned," "excommuuicated," or devoted to destruc- tion. We occasionally read of Israelites as well as of aliens falling under this ban (e.g., in Judg. xxi. 5, 11); indeed, the extreme penalty of being "cut off," which is attached to so many sins, appears to have been carried into effect by the congregation only after the D2 had been duly pronounced by the competent authority (Ex. xxii. 19 [20]; Deut. xiii, 7-18 [6-17]; cf Ewald, Alterth., pp. 101, 420). If in this 930 we already find the analogue of the major excomniunication (called anathema) of the medieval church, we may perhaps look for the analogue of the minor in that temporary separation or seclusion (niddah) which was pre- scribed for ceremonial uncleanness. Scripture furnishes no*~~

~~*distinct trace of the use of the deadly anathema in post- exile times; it is probable, however, that the right of sentencing by a O27 to capital punishment remained with the Jewish ecclesiastico-civil authorities to a very late period (Ezra vii. 25, 26). In Ezra x. 8, it ought to be observed, we read of an excommunication of a milder kind; its effect was that all the substance of the offender was "' forfeited" (7.e, laid under a herem), but he himself merely " separated" from the congregation.*~~

~~*The Talmud recognizes two kinds of excommunication, a minor and a major, called respectively niddui and herem. The niddui (from niddah, to drive away) could be pro- nounced at any time by any competent individual (cwm periculo, of course); its validity continued for thirty days, during which period the subject of it was expected to go into mourning, absent himself from the synagogue, and separate himself from all his fellows by a distance of not less than four ells. HIe was not excluded from the temple, but if he visited it he was required to enter by a separate door. If at the end of thirty days he showed impenitence or con- tumacy, the niddui might be renewed once and again ; and finally, in certain circumstances, the herem might be pro- nounced, A valid herem, which could only be pronounced by a court of not less than ten judges, had the effect of excluding from the temple as well as from the synagogue, and from all association with the faithful. Some writers have asserted that there was a still more terrible, because irrevocable, sentence called the shammatta; but the pre- ponderance of evidence is against this statement. (See Buxtorf's Lexicon, p. 2466; and Selden, De Jure Nat. et Gen., iv. 9.) Among modern instances of expulsion from the Jewish communion, that of Spinoza (16th July 1656) for contempt of the law has became famous. The text of the curse pronounced upon the culprit, which is simular to that given by Selden (as above, iv. 7), may be taken as a fair specimen of the formule then in use. The HIxemplar HIumane Vite of Uriel d'Acosta may also be referred to.*~~

~~*As an authority upon Jewish usages the Talmud does not go nearly so far back as to the beginning of the first Christian century. It is to the New Testament alone that we must look for any little information that can be had on the contemporary practice of the Jewish courts. The sentence of exclusion from the synagogue is plainly*~~

~~*indicated in Luke vi. 22, John ix. 22, xii. 42, and the more |*~~

~~*799*~~

~~*severe sentence seems to be hinted at in John xvi. 2. The question as to the period at which the Jewish synedrium ceased to have the power of giving full effect to the herem spoken of in Leviticus, has been much disputed. The Talmud itself says that the judgment of capital causes was taken away from Israel forty years before the destruction of the temple, But the point whether the synedrium which tried Jesus Christ could lawfully claim that power is still unsettled.*~~

~~*It has been already said that the use of excommunication as a part of Christian discipline, is based on the precept of Christ and on the apostolic practice, The general principles which ought to be observed can be easily gathered from the New Testament writings ; but the church appears to have been left, for most of the practical details, to the guidance of reason and experience. Mat. xviii. 17 leaves unsolved many questions which cannot fail to arise as to the occa- sion, nature, and effects of excommunication. Tit. iii. 10, which enjoins the "rejection" (comp. 1 Tim. iv. 7) of a " heretic " after two '" admonitions," can hardly be called more explicit. The locus classicus is 1 Cor. v. taken in connexion with 1 Tim. i. 20. In the former passage, mucli importance has been attached to the apparent distinction between the aipew éx pécov in vs. 2, 13, and the zapadotvar 76 Sarava in v. 5, the former being (it is alleged) within the competency of the congregation, and the latter a purely apostolic function. The dvafena, or " delivering over to Satan for the destruction of the flesh," has been the subject of much dispute (see Bingham, Antig., xvi. 2,15). The language may safely be assumed to have been borrowed from an older formula. Plainly it was intended as thie highest censure, to be pronounced only on grave offenders. It is also manifest that it was not irrevocable, and that it was in every case meant to have a salutary disciplinary effect upon the soul.*~~

~~*The writings of the church fathers give sufficient evi- dence that two degrees of excommunication, the adopirpds and the ddopiopos zravreAys, as they were generally called, were in use during, or at least soon after, the apostolic age. The former, which involved exclusion from*~~

~~*participation in the eucharistic service and from the eucharist itself, though not from the so-called '* service of the catechumens," was the usual punishment of comparatively light offences; the latter, which was the penalty for graver scandals, involved "exclusion from all church privileges,"—a vague expres- sion which has sometimes been interpreted as meaning total exclusion from the very precincts of the church building (inter hiemantes orare), aud from the favour of God (Bingham, xvi. 2, 16). For some sins, such as adultery, the sentence of excommunication was in the 2d century regarded as wayreAys in the sense of being irrevocable. Difference of opinion as to the absolutely '"irremissible " character of mortal sins led to the important controversy associated with the names of Zephyrinus, Tertullian, Cal- listus, Hippolytus, Cyprian, and Novatian, in which the stricter and more montanistic party held that for those who had been guilty of such sins as theft, fraud, denial of the faith, there should be no restoration to church fellow- ship even in the hour of death. On this point the provincial synods of Illiberis (Elvira) in 305 and of Ancyra in 315 subsequently came to conflicting decisions. But the excommunication was on all hauds regarded as being "medicinal" in its character. It is noteworthy that the word dévdGena had fallen into disuse about the beginning of the 4th century, and that, throughout the same period, no instance of the judicial use of the phrase rapadotva 76 Saravé can be found.*~~

~~*A new chapter in the history of church censure may be said to have begun with the publication of those imperial edicts against heresy, the first of which, De summa trintt tte et fide*~~

~~*800*~~

~~*catholica, dates from 380. Till then exclusion from church privileges had been a spiritual discipline merely ; thencefor- ward it was to expose a man to serious temporal risks. Excommunication still continued to be occasionally used in the spirit of genuine Christian fidelity, as by Ambrose in the case of Theodosius himself (390); but the temptation to wield it as an instrument of secular tyranny too often proved to be irresistible. In the formula used by Synesius (410), which is to be found in Bingham and in most other works of reference, we already find the*~~

~~*attention of magis- trates specially called to the censured person. The history of the next thousand years shows that the magistrates were seldom slow to respond to the appeal. Even the hastiest survey of that long and interesting period enables the student to notice a marked development in the theory and practice of excommunication. One or two points may be specially noted. (1.) While it had been held as an un- doubted principle by the ancient church that this sentence could only be passed on living individuals, whose fault had been distinctly stated and fully proved, we find the medieval church on the one hand sanctioning the practice of excommunication of the dead (Morinus, De Penit., x., c. 9), and, on the other hand, by means of the papal inter- dict, excluding whole counties and kingdoms at once from every church privilege. The earliest well-authenticated instance of such au interdict is that which was passed (998) by Pope Gregory V. on France, in consequence of the contumacy of King Robert the Wise. Other instances are those laid respectively on Germany in 1102 by Gregory VII. (Hildebrand), on England in 1208 by Innocent IIL, on Rome itself in 1155 by Adrian IV. (2.) While in the ancient church the language used in excommunicating had been carefully measured, we find an amazing recklessness in the phraseology employed by the medizeval clergy. The curse of Ernulphus or Arnulphus of Rochester (cir. 1100), which has been made familiar to most students of English literature, is a very fair specimen of that class of composi- tion. With it may be compared the formula transcribed by Dr Burton in his History of Scotland (iii. 317 ff.). To the spoken word was added the language of symbol. By means of lighted candles violently dashed to the ground aud extin- guished the faithful were graphically taught the meaning of the greater excommunication,—though in a somewhat mis- leading way, for it is a fundamental principle of the cauon law that disciplina est excommunicatio, non eradtcatio. The first instance, however, of excommunication by "bell, book, and candle" is comparatively late (cir. 1190).~~*

~~*At the Reformation the necessity for church discipline did not cease to be recognized ; but the administration of it in many Reformed churches passed through a period of some confusion. Insome instances the old episcopal power passed more or less into the hands of the civil magistrate (a state of matters which was highly approved by Erastus and his*~~

~~followers), in other cases it was conceded to the presbyterial courts. In the Anglican Church the bishops (subject to appeal to the sovereign) have the right of ex- communicating, and their sentence, if sustained, may in certain cases carry with it civil consequences.~~

~~In the law of England sentence of excommunication, upon being properly certified by the bishop, was followed by the writ de excommunicato capiendo for the arrest of the offender. The statute 5 Eliz. c. 23 provided for the better execution of this writ. By the 53 Geo. III. c. 127 (which does not, however, extend to Ireland) it was enacted that 'excommunication, together with all proceedings following thereupon, shall in all cases, save those hereafter to be specified, be discontinued." Disobedience to or contempt of the ecclesiastical courts is to be punished by a new writ de contumace capiendo, to follow on the certificate of the judge that the defender is contumacious and in contempt.~~

~~; nx Lr=f oh~~

~~Sect. 2 provides that nothing shall prevent "any ecclesi- astical court from pronouncing or declaring persons to be excommunicate on definite sentences pronounced as spiritual censures for offences of ecclesiastical cognizance." No persons so excommunicated shall incur any civil penalty or incapacity whatever, save such sentence of imprisonment, not exceeding six months, as the court shall direct and certify to the Queen. in Chancery.~~

~~In Scotland, three degrees of church censure are recog- nized—admonition, suspension from sealing ordinances (which may be called temporary excommunication), and exconmmunication properly so called. Intimation of the last- named censure is occasionally (but very rarely) given by authority of a presbytery in a public and solemn manner, according to the following formula :—" Whereas thou N. hast been by sufficient proof convicted of (here mention the sin) and after due admonition and prayer remainest obstinate without any evidence or sign of true repentance : Therefore in the name of the Lord Jesus Christ, and before this congregation, I pronounce and declare thee N. excom- municated, shut out from the communion of the faithful, debar thee from privileges, and deliver thee unto Satan for the destruction of thy flesh,~~

~~*that thy spirit may be saved in the day of the Lord Jesus." This is called the greater excommunication. The congregation are thereafter warned to shun all unnecessary converse with the excommunicate. (See Form of Process, c. 8.) Formerly excommunicated persons were deprived of feudal rights in Scotland; but in 1690 all Acts enjoining civil pains upon sentences of excommunication were finally repealed (Burton's History, vii. 435). (J. 8. BL.)*~~

~~*EXECUTORS anp ADMINISTRATORS, in the law of England, are those on whom the personal property of a deceased person devolves, according as he has or has not left a will. If a man dies and leaves a will, the person or persons named therein to carry out his intentions are his executors, and their title to the personality vests at the moment of the testator's death. If there is no will, the right of administering the personal estate of the deceased ig granted, according to certain rules, by the court of probate to persons who are called administrators. When the will contains no nomination of executors, administra- tion is said to be granted ' with the will annexed." The title of the administrator vests at the date of the letters of administration. As to the appointment of executors and administrators before the establishment of the Court of Probate, see articles Witt and Inrestacy. The executors or administrators when appointed become the legal personal representatives of the deceased. As to powers and duties administrators stand in the same position as executors.*~~

~~*It is the duty of an executor—(1) to bury the deceased in a manner suitable to the estate he leaves behind him; extravagant expenses will not be allowed, but the payment of legitimate funeral expenses " takes precedence of any debt or duty whatsoever ;" (2) to obtain probate of the will (or letters of administration) within six months after the death. (3) He must make an inventory of the personal estate of the deceased, whether in possession or outstand- ing, and this inventory. he is to deliver to the court on oath. He is to collect all the goods so inventoried and to commence actions which may be necessary to recover those which are outstanding. The executor is responsible to creditors for the whole of such estate, whether in possession or in action. (4) He must pay the debts of the deceased according to their several degrees of priority. An executor can, how- ever, pay any debt due to himself by retaining it out of the fund*~~

~~*before the other creditors are paid, except in the case of an executor de son tort. And a creditor only gains a preference for himself over others of the same class by taking action and obtaining judgment for his debt. If the*~~

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~~*estate is exhausted by due and proper payments before all the debts are cleared off, the unsatisfied creditors cannot re- cover. (5) After the debts come the legacies, which must be paid as far as the estate will extend. An exccutor cannot exercise a preference in the payment of his own legacy. (6) The residue of the estate must be paid to the person named in the willas residuary legatee. If there is no will or no residuary legatee named, the residue falls to be distributed among the next of kin, under the statute of distributions (see InTestacy). It was held at one time that in default of a residuary legatee the residue fell to the executor himself, but now nothing less than the expressed intention of the testator can give it to him.*~~

~~*An executor de son tort (of his own wrong) is one who in- termeddles with the estate of a deceased without authority. HIe thereby makes himself liable to all the trouble of an executorship without any of its profits.*~~

~~*If an executor is under age or abroad when he is appointed, temporary administration durante minore ctate, or durante absentia, may be granted to another.*~~

~~*An executor of an executor becomes the executor of the first testator. If, however, an executor dies intestate before completing the administration of the estate, an adminis- trator de bonis non must be appointed. This is also the case where an administrator dies before the administration is complete. (gE. R.)*~~

~~*EXELMANS, Reny Josepu Istpore (1775-1852), a distinguished French general, was born at Bar-le-Duc, November 13,1775. HIe volunteered into the 3d battalion of the Meuse in 1791, became lieutenant in 1797, and in 1798 was attached as aide-de-camp to General Eblé. In his first campaign in Italy he greatly distinguished himself ; and in April 1799 he was rewarded for his services by the grade of captain in the 16th regiment of*~~

~~dragoons. In the same year he took part with honour in several battles connected with the conquest of Naples, and was pro- moted to the rank of major; and'in 1801 he became aid: de-camp to General Murat. He was named chief of a squadron in 1803, and he accompanied Murat in the Austrian, Prussian, and Polish campaigns of 1805, 1806, and 1807. At the passage of the Danube, and in the battle of Wertingen, he specially distinguished himself; he was made colonel of the lst regiment of chasseurs for the valour which he displayed at Austerlitz; and after the battle of Eylau in 1807 he obtained the rank of brigadier- general. In 1808 he accompanied Murat to Spain, but was there made prisoner and conveyed to England. On regaining his liberty in 1811 he went to Naples, where King Murat appointed him grand master of horse; but when Murat became estranged from Napoleon, Exelmans left his court and joined the French army. Napoleon was then entering on his Russian campaign, and gave him wel- come and immediate employment as a general of division. He was present at the battle of Moscow, and in the famous retreat from that city his steadfast courage was conspicu- ously manifested on several occasions. In 1813 he received, for services in the campaign of Saxony, the decoration of the Legion of Honour ; and in 1814 he reaped additional glory by his intrepidity and skill in the campaign of France. When the Bourbons were restored in 1815 he retained his position in the army, but this did not prevent Napoleon on nis return from Elba from intrusting him with the command of the 2d army corps. After the second Restoration he was proscribed, and lived in Belgium, and subsequently in Nassau, till 1819, when he was recalled to France. In the following year he was appointed to an inspector-general- ship of cavalry; and after the July revolution of 1830 he received from Louis Philippe the grand cross of the Legion of Honour, and was created a peer of France. In the House of Peers he denounced the execution of Marslial Ney~~

~~as an "abominable assassination." At the revolution of 1848 Exelmans was one of the adherents of Louis Napoleon ; and in 1851 he was, in recognition of his long and brilliant military career, raised to the dignity of a marshal of France. His death, 10th July 1852, was the result of a fall from his horse.~~

~~*EXETER, the chief town of Devonshire, in England, a city which is a county in itself, and a municipal and parlia- mentary borough, stands on the Exe, about ten miles north- west of the mouth of the river, where it opens to the English Channel, The distance of Exeter from London is 194 miles. The ancient city (round which suburbs have extended) occupies a broad ridge of land, which rises steeply from the left bank of the Exe. At the head of the ridge is the castle, on the site of a great British earthwork, This was the stronghold of Caer Isc (so named from the river Isc or Exe, meaning water); and the British town became the Jsca Damnoniorum of the Romans, just as Isca Silurum was the Roman name of Caerleon on the Usk, in South Wales. Roman coins, tesselated pave- ments, pottery, and sepulchral urns have been found from time to time, proving that the station was one of import- ance. It was one of the few cities in Britain which were not deserted at the time of the Saxon Conquest; and when Athelstan came westward about 926, he found Exanceaster, the "chester" or fortified town on the Exe, as the Saxons called it, occupied by Britons and Saxons equo jure. The ground plan of the city indicates its*~~

~~*Plan of Exeter.*~~

~~*Romano-British origin, since the principal streets cross each other nearly in the centre. The main or HIgh Street is, in fact, a portion of the Roman road which extended from the eastern border of the county tothe Tamar. Exeter was more than once attacked by the Northmen; but the walls which had been constructed by Athelstan greatly protected the "burgh;" and in 1050 the episcopal see of Devon- shire, which had been founded at Crediton about 910, was removed, for greater security, to Exeter. The position of Exeter, and its importance as the prin- cipal city of the western peninsula, have affected the whole course of its history, and led to its numerous sieges. In 1068 the Conqueror appeared before- a nae, beleaguered it VII. — 101*~~

~~*802*~~

~~*for eighteen days, and then received the submission of its citizens: HIe afterwards founded the castle, known as « Rougemont," from the red colour of the rock on which it stands. The castle was held for Matilda in 1137 by Baldwin de Redvers, earl of Devon; and King Stephen took it*~~

~~*after a siege of three months. Exeter was Lancas- trian, and in 1469 held out successfully against Sir William Courtenay and the Yorkists. In 1497 it was besieged by Perkin Warbeck, and in 1549 for thirty-five days by the men of Devon and Cornwall, who rose in defence of the "old religion." The city was taken and retaken during the civil war; and the queen gave birth there to the Princess Henrietta, afterwards duchess of Orleans. After that period the most noticeable event is the entry of the prince of Orange (William HL) in November 1688. His " declaration" was then read by Burnet in the cathedral.*~~

~~*The High Street of Exeter and its continuation, called Fore Street, are narrow, but very picturesque, with many old houses of the 16th and 17th centuries. There is a tangle of lesser streets within the walls, the line of which may be traced. All the gates have been destroyed. The suburbs, which have greatly extended since the beginning of the present century, contain many good streets, terraces, and detached villas. The surrounding country is not only rich and fertile, but is of great beauty. Extensive views are commanded in the direction of Haldon, a stretch of high moorland which may be regarded as an outlier of Dartmoor. The lofty mound of the castle has been laid out as a promenade, with fine trees and broad walks. The city is the centre of the system of western railways. London may 'be reached either by the Great Western (Bristol and Exeter) line, or by the South-Western, passing by Salisbury and Basingstoke. The distance in both cases is about the same. The North Devon railway runs from Exeter by Crediton to Barnstaple and Ilfracombe; and the South Devon by Teignmouth and Totness to Plymouth, and thence into Cornwall. There is alsoa line to Plymouth belonging to the South-Western Company, which passes inland by Lidford and Tavistock.*~~

~~*The population of Exeter in 1871 was 34,650 within the municipal limits. The parliamentary borough contained 44,226 persons. The city, of which . the earliest recorded charter was granted by Henry I., has returned two members of parliament since the | reign of Edward I. Itis situated in § RAG 3} the parliamentary division of East WE =a. Devon. Assizes for the county of YSeeaego7 Devon are held twice in the year at: Exeter, in the assize hall within the castle. The most important buildings in the city are*~~

~~*the cathedral, the guildhall, and the Albert Memorial museum; and the remains of the castle are also of interest,*~~

~~*The cathedral, although not one of the largest in England, is inferior to none in the great beauty of its architecture and in the richness of its details. With the exception of the Norman transeptal towers, the general character is Decorated, ranging from about 1280 to 1369. On the exterior the great peculiarities are the towers mentioned above, and the west front, which is of later date than the rest of the church (probably 1369-1394), and is adorned with statues. Transeptal towers occur elsewhere in England only in the collegiate church of Ottery, in Devon- shire, where the cathedral served as a model. Within, the points to be specially noted are—the long unbroken roof, extending 'throughout nave and choir (there is no central tower or lantern) ; the beautiful sculpture of bosses and ee the minstrel's gallery, projecting from the north*~~

~~*ruorium of the nave; and the remarkable manner in which*~~

~~*Corporation Seal.*~~

~~*EXETER*~~

~~*the several parts of the church are made to correspond. The window tracery is much varied; but each window answers to that on the opposite side of nave or choir ; pier answers to pier, aisle to aisle, and chapel to chapel, while the transeptal towers complete the balance of parts. A complete restoration of the cathedral, under Sir G. G. Scott, was began in 1870 and completed in 1877. The new stall work, the reredos, the choir pavement, of tiles, rich marbles, and porphyries, the stained glass, chiefly by Clayton and Bell, and the sculptured pulpits in choir and nave are of the highest merit. The ancient episcopal throne, a sheaf of tabernacle work in wood, erected by : Bishop Stapledon about 1320, has been cleaned and renovated ; and the organ, of which the pipes are of very nearly pure tin, has been rearranged. The |}q*~~

~~*most interesting monuments are those | of bishops of the 12th and 13th cen- | turies, in the choir and lady chapel. | Some important MSS., including the*~~

~~*famous book of Saxon poetry given by Leofric to his cathedral, are preserved in the chapter house. The united sees —— of Devonshire and Cornwall were fixed At™s of Bishopric.*~~

~~*at Exeter from the installation there of Leofric (1050) by the Confessor, until the re-erection of the Cornish see in 1876.*~~

~~*The Guildhall in the High Street is a picturesque Elizabethan building, which contains some interesting por- traits. Among them are a full-length of General Monk, duke of Albemarle, born in Devon (engraved in Lodge), and a full length (given by Charles II.), of the Princess Henrietta. Both are by Sir Peter Lely. The Albert Memorial Museum in Queen Street was designed by Hayward of Exeter (1865). Devonshire materials have been chiefly used in its construction, 'The building, which is of considerable size, contains a school of art, an excellent free library, a reading room, and a museum of natural his- tory and antiquities. There isa good collection of local birds, and some remarkable pottery and bronze relics ex- tracted from barrows near Honiton or found in various parts of Devonshire. Of the Castle the chief architectural remain is a portion of a gateway tower which may be late Norman. Huge dykes and trenches of the British period exist in an adjoining garden. The parish churches of Exeter are of small importance, but the modern church of St Michael: (1860) deserves notice. It is sufficient to men- tion the Devon and Exeter Institution, founded in 1813, which contains a large and valuable library ; the diocesan training college and school ; and the graminar school, which dates from the reign of Henry VIII. There are two market houses in the city; many hospitals, and many charitable institutions.*~~

~~*Exeter has few manufactures; and Devonshire or Honiton lace, for which it is celebrated, is made quite as much in the villages of the south coast as in and around Exeter itself, although it is chiefly brought to the city. for sale. There is a considerable trade of a miscellaneous de- scription. Hides from South America, wines from Portugal and Spain, fruits and valonia from the Mediterranean, and coal from the northern counties and Wales are imported. Leather, paper, corn, and cider are sent to London and other parts of the country, The woollen trade has quite passed away from Exeter, although it was at one time so considerable that it was only*~~

~~exceeded by that of Leeds, and the value of exported goods in 1768 exceeded half a million annually. The Ship Canal, from Exeter to Topsham, in the estuary of the Exe, greatly assisted this commerce. It was begun in 1564, enlarged in 1675, and again in 1827. Vessels of 300 tons can come up to the quay at Exeter; those of greater burden remain at~~

~~Topsham ; and those of the largest size lie at Exmouth, at the outfall of the river.~~

~~Bibliography.—Of older histories the most important is Izacke's Antiquities of Exeter, 1681. The best later authorities are The History of the City of Exeter, by the Rev. G. Oliver, 1861; Lives of the Bishops of Exeter and History of the Cathedral, by the Rev. G. Oliver, 1861; Archdeacon Freeman's History of Exeter Cathedral, 1874; and Murray's Handbook for the Southern Cathedrals of England (Exeter),—see edition of 1876. (R, J. K.)~~

~~EXHIBITIONS. National and International Exhibi- tions may be ranked among the most remarkable features in the industrial records of the world, and have taken their place as prominent instruments of civilization, for by their means the diffusion of knowledge has been advanced and extended in the most wonderful manner.~~

~~It is to the Society of Arts that the credit is due of having originated national exhibitions. So far back as the year 1761 that body offered prizes for agricultural and other machines, and had an exhibition of these in its apart- ments. Jn 1798 France began a series of national exposi- tions under the direction of Napoleon. The exhibitors at first numbered only 110, and a jury of nine was appointed to decide upon their merits. A gold medal was offered to the manufacturer who should deal the heaviest blow to English trade. The secoud exposition took place in 1801, and was so successful that the third was fixed to take place in 1802. Expositions were subsequently held in 1806, 1819, 1828, 1827, 1834, 1839, 1844, and in 1849, in which year there were 4494 exhibitors. This last was the conclusion of the purely national displays in France before the great London international exhibition of 1851. So exclusive were the French at~~

~~*that time that a proposal made for the representation of foreign products in 1849 was deemed by the minister of commerce to have emanated from the enemies of French industry.*~~

~~*In 1820 a series of exhibitions were opened in various cities of Austria, and national exhibitions were held at Vienna in 1835, 1839, and 1845, which last had 1865 ex- hibitors. In Germany there were national exhibitions at Berlin in 1822 and 1827, and in 1844 one with 3060 ex- hibitors. National exhibitions were held in Saxony be- tween 1824 and 1845, in which last year there were 6013 exhibitors. Between 1837 and 1848 exhibitions were held at Lausanne, Berne, St Gall, and Zurich in Switzerland; between 1835 and 1850 at Brussels and Ghent in Belgium; between 1823 and 1844 at Stockholm in Sweden; between 1829 and 1849 at St Petersburg, Moscow, and Warsaw in Russia; between 1844 and 1849 at Lisbon in Portugal; between 1829 and 1855 in the kingdom of Sardinia; be- tween 1827 and 1850 at Madrid; between 1828 and 1844 at New York and Washington in the United States.*~~

~~*In the United Kingdom industrial displays had to fight their way against much apathy and prejudice. In 1828 an exhibition was formed in London under the patronage of George IV., which dragged out an unfortunate existence till 1833, when it was consigned to oblivion as an unsuccessful bazaar. In Ireland exhibitions of native industry were held triennially in the rooms of the Royal Dublin Society, commencing in 1829. In 1845, however, an exhibition of manufactures held in Covent Garden, London, proved a great success; and in 1849 an exposition of industry was held at Birmingham, which was the most complete of any held till that time in the country.*~~

~~*After various proposals made by the Society of Arts be- tween 1846 and 1849, it was held that the great object of an international exhibition of industry was more likely to be carried out than hitherto, and at last a royal commission was issued to take steps for an industrial exhibition to be held in 1851. The commissioners received a site of up- wards of 18 acres in Hyde Park, and erected the building known as the " Crystal Palace," from the designs of Mr*~~

~~*(afterwards Sir) Joseph Paxton. Its general plan was a parallelogram 1848 feet long by 408 feet wide. There was also a projection on the north side 936 feet long, the whole covering a space of 1,000,000 square feet. The exhibition had four great departments,—raw material, machinery, manufactures, fine arts,—which were subdivided into 30 classes ; and this arrangement has been usually followed in the great exhibitions_since held. In allocating the space for the display of objects one-half was given to England and the colonies, the other half to foreign countries. The estimated value of the articles exhibited, excluding the famous Koh-i-noor diamond, was £1,781,929. This exhi- bition was opened on 1st May by Queen Victoria in person, and was closed on 11th October following, and the receipts exceeded the expenditure by a sum of £213,305. The building was afterwards removed to Sydenham, where it forms the main part of the present " Crystal Palace."*~~

~~*The success of the Great Exhibition of 1851 encouraged the repetition of similar displays all over the world, a list of which will be found in the table given below.*~~

~~*In 1855 the great Paris international exhibition was held, which was opened by the emperor of the French on 17th May. The buildings for this exhibition were of various kinds. There were the palais d'industrie, the palais des beaux arts, and the panorama; erections were afterwards added for agricultural implements, carriages, minor articles, &c. The main building, which was of. stone, brick, and glass, was only 800 feet long by 350 feet wide. This exposition brought together an assemblage of objects in the industrial and fine arts such as had never been seen before. The distinguishing feature of the palais d'industrie was its collection of the works of living artists, while the London exhibition of 1851 was principally a display of manufactured goods. The exposition was closed on the 15th November, when the distribution of medals to about 12,000 exhibitors took place.*~~

~~*In 1862 the second great English international exhibition was held in London in an immense brick erection adjoin- ing the gardens of the Horticultural Society at South Kensington. The building consisted of two vast domes of glass, 250 feet high and 60 feet in diameter, larger than the*~~

~~*dome of St Peter's, connected by a nave 800 feet long, 100 feet high, and 83 feet wide, with a closed roof lighted by a range of windows after the manner of the clerestory of a Gothic cathedral. The domes opened laterally into spacious transepts, and the nave into a wide central avenue and interminable side aisles and galleries roofed with glass. These apartments occupied 16 acres, but in addition there were two annexes which covered 74 acres. The ceremonial with which this exhibition was inaugurated on Ist May was the most imposing public pageant which had been seen in Britain for many years. The number of exhibitors in the industrial division was 26,348, besides 2305 in art, making in all 28,653. The fine art collection was very extensive, comprising 901 pieces of sculpture, 1275 engrav- ings, 983 architectural designs, and no less than 3370 paintings. The classification of the objects was based upon that of 1851, and embraced 36 divisions, in addition to those of the fine arts.*~~

~~*In April 1867 a great international exposition universelle was opened in Paris in an immense oval building erected in the Champ de Mars. It was arranged in twelve concen- tric aisles, with a small open central garden. It covered no less than 37 acres, and the total number of exhibitors was 42,000. It was intended to bring into notice all the resources which industry can create for satisfying the re- quirements of mankind, and it was divided primarily into groups corresponding with the leading wants of the human family. A great feature was the display of actual examples of the styles of domestic and palatial architecture of most*~~

~~*countries, even the tents of some of the nomad tribes, such as the Kirghis Tartars, Samoyeds, Bedouin Arabs, &c., being exhibited. In addition, all kinds of civil and mili- tary erections of general importance were represented.*~~

~~*In May 1878 an international exhibition was opened in the Imperial Park at Vienna. The building in which it was held was of enormous size, covering about 40 acres. The principal part of the edifice was a grand nave nearly 1000 yards long, in the midst of which rose a vast rotunda or dome of great height. In this part of the building objects of a trophy character were exhibited, and presented a coup d'ceil of surpassing*~~

~~*grandeur. An immense number of prizes and diplomas were distributed, and the awards were shared by almost every nation in the world. This exhibition was closed in November 1873. It was not a success financially, there being a considerable deficit in the receipts. The building has been converted into a national museum.*~~

~~*In 1876, after five years of preparation, the great inter- national exhibition of America was opened in Fairmount Park, Philadelphia, on the 10th of May, being the centennial anniversary of the declaration of independence. The main building was in the form of a parallelogram extending east and west, 1880 feet in length and 464 feet in width. Its central span, in which was situated the grand avenue, was 1832 feet long by 120 feet wide, being the longest of such a width ever introduced into an exhibition building. The greater portion of the structure was one story high, the in- terior height being 70 feet. In the centre were four square towers 120 feet high. The frame work was of iron, filled in with glass and wood; it covered 20·02 acres. With the other buildings attached to the exhibition, a total space of 60 acres were covered. Besides the main building there were the machinery hall, the horticultural hall (built in a Moorish style), the agricultural hall, the memorial hall or art gallery, the Government building, covering about 2 acres, in which werc illustrated the functions of the Government in time of peace and its resources as a war power. Besides these there were the women's pavilion, the judges' hall, and a great many smaller erections, including a Swedish schoolhouse, a timber-framed house somewhat in the style of the 16th century, which formed the head-quarters of the British commission. A structure having the homely designation of "' department of public comfort " was used as a place of rest and convenience. The total number of buildings within the inclosure was over 160, and their cost was £1,600,000. The number of cxhibitors was 60,000, derived from 37 nations. The promenades in the main building were 25 miles in length.*~~

~~*In England, after the great displays of 1851 and 1862 a feeling began to gain ground that as the activity and in- genuity of manufacturers and designers were constantly directed to fresh efforts, universal expositions would attain such gigantic proportions as to become quite unmanageable. A resolution was therefore come to by the British commis- sioners, as*~~

~~trustees of the fund derived from the proceeds of the great exhibition of 1851, that the objects suitable for ex- hibition should be divided into groups, and that exhibitions of selections from these groups should be held at more fre- quent intervals. A plan was then arranged for a series of exhibitions of the fine arts, recent scientific inventions and discoveries, and two or three branches only of manufactures, providing at the same time for the representation of each~~

~~Acres Exhibitors. sonconeotel Solenssepersssreeren Al 17,000 Paristo files nee senses… ecceeree 244 21,779 Londontot US62h….). sce 234 28,653 Paristof slS67e.2 ...seeetee en: 37 | 50,226 Vienna of 1873 …….0.0000 40 | 42,584 Philadelphia of 1876 ……. 60 60,000~~

~~EX HTB Ieee~~

~~distinct manufacture once in ten years. Exhibitions were accordingly held in 1871, 1872, 1873, and 1874, but at last it was found that they lost the attractiveness of novelty, and failed to draw the multitude of sight-seers who flocked to the great exhibitions of 1851 and 1862.~~

~~Notwithstanding these views of the British commissioners, an Exposition Universelle on a great scale was opeued in Paris on lst May 1878 by the President, Marshal MacMahon. It is expected to unite the civilized world, as the sciences are represented as well as the arts. The building, or Industrial Palace, is an enormous erection in the Champ de Mars, consisting of a series of rectangular galleries in which each country has been allotted a division more or less important. Besides the main building, there are about a dozen annewes without the enceinte of the palace. Immiediately across the Seine there is a second palace situated in the Trocadero (so named from a Spanish fort in the harbour of Cadiz, captured in 1823), amidst ornamental gardens with cas- cades. 'This is devoted to the fine arts and music, and is to remain a permanent monument of the exhibition. It contains a music gallery even larger than the Albert Hall, London. The space occupied by the exhibition is about 140 English acres; and the total expense has been an- nounced by the minister of commerce as about £1,800,000 sterling.~~

~~*An international exhibition is proposed to be held in 1879 at Melbourne, a city which in 1851 was a town of but 20,000 inhabitants.*~~

~~*Of the London Great Exhibition of 1851 an official cata- logue was published the same year in 4 vols, 8vo, and in 1852 a volume of reports by the juries on the subjects in the 30 classes into which the exhibition was divided, in royal 8vo, A sumptuous edition of this catalogue on large paper was printed, of which copies were presentcd to dis- tinguished personages and public libraries, Of the exlu- bition of 1862 an illustrated catalogue was printed by the commissioners the same year in 4 vols. 8vo. Of the Paris exposition held in 1855 there was an official catalogue published the same year; and a Rapport sur Hxposition Universelle (also published) was presented by Prince Napoleon to the emperor in 1857. Of the exposition of 1867 there was published in London the same ycar a translation from the proof-sheets of the French official cata- logue. Of the Vienna cxhibition of 1873 there was an official illustrated general catalogue, with a large number of reports of the juries, &c. Of the Philadelphia exhibition there was an official catalogue printed in four languages— English, French, German, and Spanish; aseries of reports and awards under the different groups into which the ex- hibition was divided is now being published. Besides the general catalogues of the great international exhibitions, there have been published an immense number of catalogues of the exhibits of the different countries at each, which are to be found available for reference in the South Ken- sington and other industrial museums. Various beautifully illustrated books, representing the works of art exhibited, have been published both in London and Paris; and onc, Etudes sur U Exposition de 1878, intended to be a complete record of the progress made in all the arts up to the present date, is about to be issued under the direction of E. Lacroix.*~~

~~*The following table shows the statistics of the first six great international exhibitions :—*~~

~~*Cost. Days open. Receipts. Number of Visitors. £2925794 144 £506,100 6,089,195*~~

~~*1,000,000 200 128,099 5,162,330*~~

~~460,000 171 408,530 6,211,103 800,000 217 420,735 10,200,000 2,200,000 186 206,470 7,254,687 1,600,000 159 762,744 9,910,966~~

~~es pe~~

~~The following table shows the minor exhibitions which have been held in various parts of the world from 1852 to the present time (1878) :—~~

~~Exhibition of Ivish arts and manufactures, c Do. do. with those of other countrics. Industrial exhibition, which cost £200,000. Native industry. Do, do. Industrial arts. German industry. Norwegian arts and manufactures, Belgian arts. Edinburgh Exhibition of Art Manufacture Association. Manchester……| Art treasures exhibition. .-| Swiss arts and manufactures; 2050 exhibitors. Italian industry. Amcrican industry. -| Exhibition, with 296 exhibitors. Products of 12 northern departments of France. National exhibition, with 947 exhibitors.~~

~~" 1860 St Petersburg…... Russian products. T8601 Blononee……..0+. Fine art in Tuscany and Italian silk goods. » | Haarlem……1 Dutch industries. Py IBTUSSETS 0:50 ovceesene Exhibition of articles of common usc. Trataut Exhibition preliminary to London great exhibi 6 Viletoria; …….-. — ; tion of 1862. y 1863 | Constantinoplc….| Turkish producc, and foreign machinery. 1864 | Amsterdain ……..) Dutch produce, art, and industry. a Bayonne . .| Industrics connected with corn and wine. 7 RWRDIE RG cceesecess cores Local art and industry. a @alemtta:.s:..1UDI. ..cccc occ. Arts and manufactures, attracted 900,000 visitors. " Cologne…... soveeeeel Agriculture and horticulture. ' Boulogne peccnescdens International fishery exhibition. nF Sierra Leoue…….. Industrial exhibition. . Oporto sevecseeccees Arts, manufactures, and agriculture; 3911 cx- iaciaae 3 hibitors. " { pee anit Colonial produce, Fr Birmingham ……. Metals and tradcs. on Vienna ……4, Working men's industrial exhibition. rs London Bseecsseestes Do. do. rf Stettin ……. sess) Exhibition of industry, with 1451 exhibitors, a Philadelphia ……. Amcrican produce. 1866 Sear epcoononce Scandinavian industrics. " { Ten taw produce, with 2590 exhibitors. Melboune { Intercolonial exhibition, rich in specimens of ue igs minerals. " .| Working men's exhibition. 1867 | Fishery exhibition. '9 .—| Industries of N.W. provinces of India, 1868 .| International maritime exhibition.~~

~~*Products of Chili.*~~

~~*South London industrial classes exhibition.*~~

~~*§] Netherland Society of Manufacturers; rich in objects of domestic economy.*~~

~~*1870 | Berlin……) Exhibition of drawing implements, 5 Turin ……e+.s000004/ Italian products, = St Pctersburg……] Russian industrial exhibition. ” Gujerat .| Indian cotton. ” Sydney. Intercolonial exhibition, with 2914 exhibitors. ” London Workmen’s international exhibition, 1871 Do. First annual international exhibition at South . Kensington. Pr MOV ate ereeee as sooveeee| Exhibition of sclected branches of industry, ” Naples sseesee{ International maritime exhibition. 1872 | London…… .| Second annual international exhibition. Fs DIIIBIING ccetseescceeee frish native produce and fine arts. ” Copenhagen …..,..| Scandinavian art and industry; 4000 exhibitors. * LYONS wesescceeeeee ; aeeaeeres industrial products, aud works of Exhibition on celebration of sccond centenary ” Moscow ……00. * of Peter the Great, illustrative of the pro gres§ of Russia in manufactures. ” IBOMOER scoceecsssseny Products of South America. Dis” | WONTON. ercsccs cess Third annual international exhibition, ” Doz seienss sce Fourth and last annual international exhibition 1s74£ | Aberdcen……! Exhibition of fungi; 7000 specimens shown. ay DEUSSCIST res.scsscee Industrial art. USCS |! TAUB Risscceresccce sarees Agricultural machines and implements. 1876 TOMWON ie cccrssscns 2s Exhibition of needlework in Albert Ifall. ; Do { Exhibition of bees, their produce, hives, and ; Need bee furniture, in Alexandra palace. cf) BRIS... oscesesevevecen Applications of electricity. Thurso { Exhibition of art and industry, and local anti- 99 ff REAR OU cc ec ewes veces quitics. ” IBUTISSO]Stoeseicecesssee: Exhibition of life-saving and hygicnic apparatus.~~

~~*Exhibition of silks, bronzes, casqucs, wearing- apparel, &c., being the fifth of a series since*~~

~~*1872.*~~

~~*1877 MEG INWON ce nceencceeee Loan collection of scientific apparatus, D { Caxton exhibition, illustrative of the art of o] Oem Vecsacacneses Faas printing. , . Do. (| Westminster and Pimlico working classes in- uw a oes dustrial exhibition. — Cape Town …... { Tale one exhivition of manufactures of all a Tm binree cs… .seese International dairy exhibition, " Ghent …| Exhibition of Industrial Art. 1878 | Ballarat International exhibition. (J. SM.)*~~

~~*EXMOUTH, a market-town and watering-place in the county of Devon, England, is situated at the mouth of the Ex, 10 miles E.S.E. of Exeter. It was the first*~~

~~*watering-place on the coast of Devon, and is frequented, not only for bathing, but also as a winter residence by those suffering under pulmonary diseases, as it is cele- brated for the mildness of its climate, and is well sheltered from the N.E. and S.E. winds by some high hills which rise almost close behind it. The old town, originally only a fishing village, has been altered and improved by new buildings. It lies along the base of the Beacon hill. The new town is built along the slopes of the hill and consists of terraces and detached houses. The sides'and walks in the neighbourhood are remarkably beautiful, and the hill commands one of the finest views in the south of England. Exmouth possesses a handsome church, and has assembly rooms, baths, libraries, and other essentials of a fashionable watering-place. Its sea wall, which is 1800 feet long and 22 feet high, affords an admirable promenade. Near the town is a natural harbour, called the Bight. The population of Exmouth in 1871 was 5614.*~~

~~*Exmouth was early a place of importance, and in 1347 contributed 10 vessels to the fleet sent to attack Calais. It at one time possessed a fort or "'castelet," designed to cominand the estuary of the Ex. This fort, which was garrisoned for the king during the civil war, was blockaded and captured by Colonel Shapcoate, iu 1646.*~~

~~*EXMOUTH, Epwarp PEttew, Viscount (1757-1833), an English admiral, was descended from a family which came originally from Normandy, but had for many cen- turies been settled in the west of Cornwall. He was*~~

born at Dover, April 19, 1757. At the age of thirteen he entered the navy, and even then his smartness and activity, his feats of daring, and his spirit of resolute independence awakened remark, and pointed him out as one specially fitted to distinguish himself in his profession. IIe had, however, no opportunity of active service till 1776, when, at the battle of Lake Champlain, his gallantry, promptitude, and skill, not only saved the ‘“‘ Carleton ””—whose command had devolved upon him during the progress of the battle— from eminent danger, but enabled her to take a prominent part in sinking two of the enemy’s ships. For his services on this occasion he obtained a lieutenant’s commission, and the command of the schooner in which he had so bravely done his duty. The following year, in command of a brigade of seamen, he shared in the hardships and perils of the American campaign of General Burgoyne In 1782, in command of the “Pelican,” he attacked three French privateers inside the Isle of Bass, and compelled them to run themselves on shore—a feat for which he was rewarded by the rank of post-captain. On the outbreak of the French war in 1793, he was appointed to the “Nymphe,” a frigate of 36 guns; and, notwithstanding that for the sake of expedition she was manned chiefly by Cornish miners, he captured, after a desperate conflict, the French frigate “La Cléopatre,” a vessel of superior size to his own and better armed. For this act he obtained the honour of knighthood. In 1794 he received the command of the “ Arcthusa,” and in a fight with the French fleet off the Isle of Bass he compelled the “ Pomona” to surrender. The same year the western squadron was increased and its command divided, the second squadron being given to Sir Edward Pellew, While in command of this squadron he, on several occasions, performed acts of great personal daring ; and for his bravery in boarding the wrecked transport “Dutton,” and his promptitude and resolution in adopting measures so as to save the lives of allon board, he was in 1796 created a baronet. In 1798 he joined the channel fleet, and in command of the ‘ Imp¢- tueux,” tock part in several actions with great distinction. In 1802 Sir Edward Pellew was elected member of parlia- ment for Dunstable, and during the time that he sat in the Commons he was a strenuous supporter of Pitt. In

~~*1804 he was made rear-admiral of the blue, and appointed commander-in-chief in India, where, by his vigilance and rapidity of movement, he entirely cleared the seas of French cruisers, and secured complete protection to English commerce. He returned to England in 1809, and in 1810 was appointed commander-in-chief in the North Sea, and in 1811 commander-in-chief in the Mediterranean. In 1814 he was created Baron Exmouth of Canonteign, and in the following year was made K.C.B., and a little later G.C.B. When the dey of Algiers, in 1816, violated the treaty for the abolition of slavery, Exmouth was directed to attack the town. Accordingly, on the 26th August, he engaged the Algerine battery and fleet, and after a severe action of nine hours' duration, he set on fire the arsenal and every vessel of the enemy's fleet, and shattered her sea defences into ruins. At the close of the action the dey apologized for his conduct, and agreed to a renewal of the treaty, at the same time delivering up 1800 persons of various nations who had been Algerine slaves. For this splendid victory Exmouth was advanced to the dignity of Viscount. Shortly before his death, which took place 23d January 1833, he was made vice-admiral. A Life of Exmouth, by Edward Osler,. was published in 1835.*~~

~~*EXODUS. See PENTATEUCH,*~~

~~*EXORCISM, the act of expelling evil spirits from persons or places by means of certain adjurations and cere- monies, appears in the present custom or past history of almost every nation of the world. Its importance is greatest among barbarous peoples, whose belief in attacks of demons furnishes them with a general theory to account for misfortunes, mysterious events, and especially all diseases of body or mind, so that the exorcists, who are usually priests or sorcerers, become in fact the recognized order of physicians (see article Demononoey), From among the numerous accounts of modes of exorcism among rude tribes may be instanced that among the Dakota Indians, where the medicine-man summoned to cure a sick person chants " hi-le-li-lah!" to the accompaniment of a gourd rattle, and sucks at the part affected till the possess- ing spirit is supposed to come out and take flight, when men in waiting at the tent-door fire guns at it (Schoolcraft, Indian Tribes of North America, part i. p. 250, part ii. p. 199); and that of the Zulus,*~~

~~among whom the ghosts of the dead who enter men's bodies and cause disease are got rid of by the sacrifice of cattle, with expostulations, such as, "I say, cease; leave off making me ill" (Callaway, Religious System of the Amazulu, p. 157). In the most ancient known civilizations we find records of exorcism. An Egyptian tablet records the possession of a princess of the land of Bakhten by a demon, and the exorcism of this spirit by the god Khonsu, who was sent thither in his ark and cured her at once, the spirit saying, " Thou hast come in peace, great god, driver away of possessors. I am thy slave, I will go to the place whence I came" (Birch, in Records of the Past, vol. iv. p. 53). Among the formulas in ancient Babylonian exorcism are such as these :—" May the noxious spirit of the neck, the noxious wind, from the man himself and the clothing of the body be driven forth!" "From the burning spirit of the entrails, which devours the man, may the king of heaven preserve!" (Sayce, in Records of the Past, vol. i. p. 131). In Grecce men of no less distinction than Epicurus and Aischines were the sons of women who lived by the exorcist's art; and both were bitterly reproached, the one by the Stoics, and the other by Demosthenes (De Cor.), for having assisted their parents in these practices. This power was in some instances considered as a divine gift; in others it was thought to be acquired by investigations into the nature of demons and the qualities of natural productions, as herbs, stones, &c., and by the use of certain forms of adjurations and ceremonies.~~

~~EXxXO—EXP~~

~~The power of expelling demons Josephus places among the endowments of Solomon, and relates that he left behind him the manner of using exorcisms by which they drive away demons. (For the pretended fragments of these books see Fabricius, Cod. Pseud. Vet. Test., p. 1054.) He relates that he had seen a rman named Eleazar releasing people that were demoniacal, in the presence of Vespasian, his sons, captains, and soldiers, by means of a certain root set in a ring, on the application of which to the nose of the patient, the devil was expelled through his nostrils. (See Antig. viii. 2, § 5; and De Bell. Jud. vii. 6, § 3.) The profession of exorcist was not uncommon among the Jews; and the epithet applied to such persons (aepiepxopéver ; Vulg., de circumeuntibus~~

~~*Judcis) perhaps indicates that they were travelling mountebanks. The passages of the New Testament which refer to the exorcism of demons from epileptic, insane, and other diseased persons are too numerous and well known to require particular reference. The prominence of exorcism in the early ages of the Christian church appears from its frequent mention in tlie writings of the fathers, and by the 3d century there seems to have been an order of exorcists (see Bingham, Antiquities of the Christian Church). The ancient rite of exorcism in connexion with baptism is still retained in the Roman ritual, as is also a form of service for the exorcising of possessed persons. The exorcist signs the possessed person with the figure of the cross, desires him to kneel, and sprinkles him with holy water; after which the exorcist asks the devil his name, and abjures him by the holy mysteries of the Christian religion not to afflict the persou possessed any more. Then, laying his right hand on the demoniac's head, he repeats the form of exorcism as follows: "I exorcise thee, unclean spirit, in the name of Jesus Christ; tremble, O Satan, thou enemy of the faith, thou foe of mankind, who hast brought death into the world, who has deprived men of life, and hast rebelled against justice, thou seducer of mankind, thou root of evil, thou source of avarice, discord, and envy." Houses and other places supposed to be haunted by unclean spirits are likewise to be exorcised with similar ceremonies.*~~

~~*EXPIATION or ATONEMENT, Day or (0830 DY,*~~

~~*Huepa é&Aacpod), called in the Mishna simply "the Day," the only fast enjoined by the Mosaic legislation, occurred annually on the tenth day of the 7th month (Tisri). The laws for its observance are given in Lev. xvi. 1-34, xxili. 27-32, and Numb. xxix. 7-11. The high priest was to enter the Most Holy Place according to a minutely de- tailed ritual, and so "make an atonement for" (19) the sanctuary, the tabernacle, the altar, the priests, and all the people. From the one evening to the other the people were enjoined, under the severest penalties, to "afflict their souls," and observe a " perfect sabbath." — EXPLOSIVES. It lies beyond the object of this article to attempt an estimate of the influence, direct or indirect, upon modern civilization of the introduction of explosive agents for the purposes of war. Some eminent authors have gone so far as to consider the invention of gunpowder as next in importance, in its ultimate effects,*~~

~~*to those of printing and the application of steam power. HOwever this may be, it is well to remember that explosive sub- stances are now of immense utility in the arts of peace; indeed, it is not too much to say that without their aid many of the great engineering enterprises of the present day would either be impossible, or else have to be carried out at a vast additional expenditure of time and labour.*~~

~~*The germ of all the knowledge of explosive reaction we possess undoubtedly lay in the probably accidental dis- covery, many ages ago, of the deflagrating properties of the natural substance uitre or saltpetre (KNO,), when in con- act with incandescent charcoal. To trace the consequences*~~

~~*of that discovery, very gradual as they have been, and intimately bound up with the progress of chemical and mechanical science, belongs rather to an article on gun- powder; but the fact may be briefly referred to in connexion with the second great epoch in the history of explosive substances. By distilling nitre with oil of vitriol, the alchemists obtained a corrosive fluid which they called. aquafortis, now known as nitric acid (HNO,), which parts with its oxygen even more readily than saltpetre; so that if the strongest nitric acid be poured upon finely powdered charcoal, the latter takes fire at the ordinary temperature. Somewhat less than half a century back, it was discovered by some French chemists that upon treating various organic substances, such as starch, the sugars, cotton fabrics, and even paper, with concentrated nitric acid under proper precautions, the chemical constitution of the substances underwent a great change, and they became endowed with violently explosive properties, while remain- ing for the most part unaltered in external characteristics. To this discevery we owe a distinct class of explosive compounds, the most powerful for practical purposes as yet known; their general formation and properties will be noticed in due course,*~~

~~*We will now proceed to examine into those principles of constitution and action which are more or less common to all explosive substances.*~~

~~*As the term is often rather loosely employed, " explosion" may for our purpose be defined as the sudden or extremely rapid conversion of a solid or liquid body of small bulk into gas or vapour, occupying very many times the volume of the original substance, and, in addition, highly expanded by the heat generated during the transformation. This*~~

~~*ingredients, and which can be again separated more or less Explo- completely by mechanical means, not involving chemical sive mix- These ingredients do not, as a rule, possess tures.*~~

~~*action. explosive properties in their separate condition. There are, however, explosives which might almost be classed in both categories; for example, pieric powder is composed of ammonium picrate and saltpetre, the former of which contains an explosive molecule, but is mixed with the latter to supply additional oxygen, and thus increase the force.*~~

~~*If a substance that will burn freely in air, combining gradually with the oxygen of the atmosphere, be ignited in pure oxygen gas, the combustion will be much more rapid, and the amount of heat generated greater, at the ordinary atmospheric pressure. If it be possible to burn the sub- stance in a very condensed atmosphere of oxygen, we can readily imagine the combustion being very greatly accelerated, and therefore increased in violence ; this is what is ordinarily effected by an explosive "mixture." A combustible body and a supporter of combustion are brought into extremely close contact with one another, by means of intimate mechanical mixture ; also, the sup- porter of combustion, or oxidizing agent, is present in a very concentrated form, constituting what may be termed a magazine of condensed oxygen, solid or liquid. In the case of the explosion of a definite chemical compound, the change may be considered as the resolution of a complex body into simpler forms; this is not, however, always the case when a mechanical mixture is concerned: gunpowder, for example, may be said to contain two elementary sub- stances, carbon and sulphur, not in chemical union.*~~

~~*The chief explosive mixtures may be subdivided into "nitrate mixtures," and " chlorate mixtures."*~~

~~*In the nitrates, the oxygen is held in combination with Nitrate sufficient force to need a powerful disturbing cause to mix- separate it, so that mixtures made from nitrates do not tures. explode very readily, and their action is comparatively gradual; they are not sensitive to friction or percussion, and hence are tolerably safe. Any of the nitrates will form explosive mixtures with combustible substances, but nitrate of potash (KNO,) is the only one practically em- ployed. The nitrate of soda, called "cubical" or Chili saltpetre, has been used, but absorbs moisture from the air so readily as to give very inferior results. Gunpowder may be taken as the representative of the nitrate explosive mixtures. Picric powder, above referred to, has been pro- posed by Abel for use asa bursting charge for shells, as*~~

~~*sudden or very rapid expansion of volume is attended by*~~

~~*an exhibition of force, more or less violent according to*~~

~~*the constitution of the original substance and the circum-*~~

~~*stances of explosion. Any substance capable of undergoing*~~

~~*such a change upon the application of heat, or other dis- turbing cause, is called "explosive."*~~

~~*Consti- The explosive substances that are practically the most*~~

~~*tution of important essentially contain carbon, oxygen, and nitrogen,*~~

~~*a the last always existing in a state of feeble combination with*~~

~~*"the whole or part of the oxygen, and thus creating that con-*~~

~~*dition of unstable chemical equilibrium which is necessary.*~~

~~*When explosion takes place, the nitrogen parts with its*~~

~~*oxygen to the carbon, for which if has a great affinity,*~~

~~*forming carbonic acid (CO,) and carbonic oxide (CO)*~~

~~*gases, the combination being accompanied with great generation of heat, and the nitrogen gas is set free. In most explosives there is also hydrogen accompanying the carbon, and by its combustion producing an extremely high temperature ; it combines with part of the oxygen to*~~

~~*being more powerful than a corresponding charge of gun- powder, equally safe as regards friction or percussion, and less hygroscopic ; it consists of two parts ammonium picrate, and three parts saltpetre, incorporated, pressed, and finished very much as ordinary gunpowder.*~~

~~*The chlorates part with their oxygen far more readily Chlorate than the nitrates, the strong affinities of chlorine for the mix- metals coming into play, and consequently chlorate mixtures tures.*~~

~~*form water in the form of greatly expanded vapour. Other subordinate elements are often present; in gunpowder, for instance, the potassium binds the nitrogen and oxygen*~~

~~*loosely together in the state of saltpetre, and there is sulphur, a second combustible, whose oxidation evolves greater heat than that of carbon. When chlorate of potash is present, the chlorine plays the part of the nitrogen, and is set free in the gaseous state. Two very unstable and practically useless explosive substances, the so-called chloride and iodide of nitrogen, contain neither carbon nor oxygen; but their great violence is equally caused by the feeble affinities of nitrogen for other elements, large volumes of gaseous matter being suddenly disengaged from a very small quan- tity of a liquid and solid body respectively.*~~

~~*Explosives may be conveniently divided into two distinct classes,—(1) explosive mixtures, and (2) explosive*~~

~~*are very sensitive to friction and percussion, and explode with great violence ; chlorate of potash (KCIO.) is the only one used. Very many*~~

~~chlorate mixtures have been made, some of which are employed in fireworks. ‘“ White gun- powder” is a mixture of two parts chlorate of potash, one of yellow prussiate of potash, and one of sugar; it is exploded very easily by friction or percussion. The most important chlorate mixtures are those used for igniting other explosives, such as the composition for friction tubes for firing cannon, percussion cap composition, and percussion fuzes for busting shells on impact; it is sometirnes mixed with sulphur, as a combustible, and sometimes with black sulphide of antimony, which gives a longer flame.~~

~~In an explosive “compound,” the elements are all in Explc- chemical combination, presenting a definite explosive sive coms “molecule,” which contains, so to speak, both the com- Pounds.~~

~~compounds. ‘ . The first class consists of those explosive substances which are merely intimate mechanical mixtures of certain~~

~~Nitro- substitu- tion pro- ducts.~~

~~Picric acid.~~

~~Ful- minates.~~

~~808~~

~~bustible and the supporter of combustion, in the closest possible union; we can therefore understand its action being much more sudden and violent than that of the most intimate mechanical mixture.~~

~~The chief explosive compounds are formed from some organic substance containing carbon, hydrogen, and oxygen, by introducing into it, through the action of concentrated nitric acid, a certain portion of nitric peroxide (NO,), in substitution for an equivalent amount of hydrogen. A new compound, differing outwardly very little, if at all, from the original substance, is thus formed, but in a very un- stable state of chemical equilibrium, because of the feeble union of the nitrogen and oxygen in the NO, molecule. A slight disturbing cause brings into play the stronger affinity of the carbon and hydrogen for the large store of oxygen~~

~~contained in the new compound. Gun-cotton and nitro-glyccrin are the leading members of this group, being produced in a precisely similar manner, by the substi- tution of three molecules of NO, for three atoms of hydro- gen (II). As those explosives will be elsewhere described in detail, we give the formation, as a representative member cf the group, of nitro-phenol, or picric acid, by treating phenol, or carbvlic acid, with a mixture of nitric and sul- phuric acids, the latter being required to absorb the water, and preserve the full strength of the nitric acid :—~~

~~C,H,O + 3HNO, = C,H,(NO,),0 + 3H,0.~~

~~Carbolic acid. Nitric acid. Picric acid. Water.~~

~~The formula of the product may be empirically written C,H,N,0,; it is, like gun-cotton and nitro-glycerin, a tri-mtro substitution product. Only the picrates, cr salts of picric acid formed with potassium or ammonium, are used in practice, as possessing more force than the uncom- bined acid. From starch can be obtained, in a strictly analogous manner, au explosive called xylotdine, which is a bi-nitro product, two molecules of nitric peroxide being substituted for two atoms of hydrogen. In the case of nitro-mannite, au explosive made from mannite, one of the sugars, a8 many as six molecules of the NO, are inserted. The number of nitro-substitution products is very great, many of them being more or less violently explosive.~~

~~The fulminates are among the most violent of all explosive compounds, their chemical stability being very small. Sud- den in action, their effect is great locally ; thus they are well adapted to the purpose, for which alone they are practically used, of igniting, or upsetting the equilibrium of, other explosives,~~

~~Fulminate of mercury is produced by adding alcohol (C,H,O), under careful precautions, to a solution of mercury in nitric acid; a grey crystalline precipitate is obtaincd, very heavy (sp. gr. 4°4), and so sensitive to friction or per- cussion that it is kept in the wet state. The results of analysis show one atom of mercury, and two each of car- bon, nitrogen, and oxygen, so that the formula may be empirically written HgC,N,O,, or perhaps more correctly Hg0O.C,N,O; the chemical factor C,N,O is called~~

~~*faulminic acid, but has never been produced separately. Opinions differ as to the precise "rational" formule of the ful- minates, some chemists considering their process of forma- tion to be similar to that of the nitro-substitution products. It will be observed that two atoms of nitrogen take the place of hydrogen, being the ratio of combining propor- tions of those elements. The products of combustion are carbonic oxide, nitrogen, and metallic mercury, and the violence of action is due to the sudden evolution of a volume of gas and vapour very large in comparison with that of the substance, its density being so great. This fulminate enters into the composition used for percussion caps and electric fuzes; its practical value has of late years been immensely increased by the discovery of its power,*~~

~~*even in very small quantities, to produce the almost in- stantaneous decomposition of several explosive substances.*~~

~~*Fulminate of silver is prepared in a similar manner, but, being far more sensitive, is of little practical value; it is employed, in very minute quantities, in making such toys as detonating crackers.*~~

~~*The difficulties in the way of estimating, with any accuracy, the force of explosive substances are very great, especially as no definite standard of comparison can be laid down. HOwever, by mcans of theoretical considerations, conibined with the results of actual experiment, a tolerably fair approximation may be arrived at.*~~

~~*When an explosive substance is exploded in a closed vessel sufficiently strong to resist rupture, the tension attains its maximum value in an extremely short space of time and gradually decreases from the heat being conducted away by the metal envelope, and dispersed by radiation. It has, however, been demonstrated that, at the moment of maximum tension, the loss of pressure due to the commu- nication of heat to the vessel, if the latter be filled with the explosive, is less than one per cent. The products of com- bustion, after cooling down, can easily be determined by analysis, and are then either (a) wholly gaseous, as for chloride or iodide of nitrogen; (6) gaseous and liquid, in the case of gun-cotton and nitro-*~~

~~*glycerin; or © gaseous and solid, as with gunpowder. It is certain that, at the moment of explosion, the products of the more violent explosive compounds are wholly ina state of gas or vapour, but we should arrive at incorrect results by making the same assumption in the case of a mechanical mixture like gunpowder. 'Tle experiments of Noble and Abel on " Fired Gunpowder " (Phil. Trans. Roy. Soc., 1874), which are the most complete ever undertaken, show that the ultimately solid residue is, at the moment of explosion, in a liquid state, and most probably in a very finely divided condition; moreover, that, at that instant, it occupies a space the ratio of which is about '6 that of the original volume, sup-posing the substance to fill the vessel in which it is exploded.*~~

~~*Provided the laws concerned can be supposed to hold good at such high temperatures, we may assume for the gascous products of combustion the well-known equaticn of the elasticity and dilatibility of permanent gases—*~~

~~*pu=Rt (1), where R is a constant, and ¢ reckoned from absolute zero (— 273°C). Forthe sake of convenience, we will consider that a unit of weight of the explosive substance occupies a unit of volume, and, if P be maximum tension developed by the explosion, we have*~~

~~*Pt pj—Rt (2),*~~

~~*where T is the temperature of explosion, and p the ratio of the volume of the non-gaseous products, taken as constant; we have also the relation*~~

~~*Lo (1 — p)=R.273, ° (3),*~~

~~*when the vessel is cooled down to 0° C; therefore, elimi- nating R between (2) and (3), we get*~~

~~*(4).*~~

~~*But permanent gases under the pressure p, in atmospheres, at a volume (1 — p), will occupy a space p, (1 — p), if allowed to expand to the normal pressure of 760 mm.; calling this*~~

~~*expanded volume V, VT*~~

~~P=——_____ , : 273 (1—p) (5) The large amount of aqueous vapour produced by the explosion of some compounds must be added to the valuc of V, its volume being calculated on the supposition that it cal remain uucondensed at the temperature of 0° C.~~

~~Maxi- mum ten- sion in closed vessel.~~

~~LESaPLost yas~~

~~We have no certain means of directly estimating the temperature of explosion, but if it be assumed, as is usually done, to be the temperature the total products of combus- tion would attain to if the whole amount of heat generated by the explosion were applied to raise them, under con- stant volume, from absolute zero, we have the relation~~

~~H=Te,~~

~~in which H represents the number of units of heat generated, and c the specific heat under constant volume of the united products, gaseous or otherwise. The quan- tity of heat can be obtained by experiment, and this, divided by the specific heat, will give the temperature. The chief sources of error lie in the assumption that the specific heat remains constant throughout the great range of tem-~~

~~to oxidize completely all the carbon of the gun-cotton, cannot penetrate between the fibres and accelerate the com- bustion, but burns with a bright flame away from the surface of the twisted cotton; when the yarn is yet more compressed by any means, the temperature is not kept up to the height necessary for the combustion of the carbonic oxide, so that it escapes unconsumed, abstracting heat, and yet more retarding the rate of burning. For the Same reason, pulped and compressed gun-cotton burns comparatively slowly in air, even when dry; in the wet state, it merely smoulders away, as the portions in contact with the fire successively become dried. Yet this same wet compressed gun-cotton can be so used as to constitute one of the most powerful explosives known.~~

~~*It is well known that*~~

~~*gunpowder behaves differently rxternal*~~

~~*perature in question, and in the additional quautities of heat disengaged by secondary reactions, The value of T thus found probably will therefore be higher than the real*~~

~~*when fired in the open air and under strong confinement ; condi- not only the rate of burning, but even, to a certain tions of*~~

~~*extent, the products of combustion are altered. We have oe*~~

~~*Explo- Having regard to the above reasoning, it may be generally | cotton: but, when confined in a strong envelope, the sive concluded that the amount of force exerted by an explosive | whole of the inflamed gas, being unable to escape out- force. substance depends upon—(1) the volume of gas or vapour | wards, is forced into the interstices under immense produced by the transformation, compared with that of | pressure, and the decomposition greatly accelerated. The the original substance ; and (2) the temperature of explosion, | amount of confinement or restraint needed by any explosive which determines the extent to which the gases are ex- | depends, however, upon the nature of the substance and panded, or their tension increased ; or, in other words, the | the mode of exploding it, becoming very much less as the explosive force is directly proportional to the heat of transformation is more rapid, until it may be said to reach combustion, and the volume of gas and vapour calculated | the vanishing point. For example, the very violent ex- at 0° C. and 7-60 mm. pressure, and enversely proportional | plosive chloride of nitrogen is usually surrounded, when to the specific heat of the mixed products. exploded, with a thin film of water; Abel states that if It has been supposed by Berthelot and others that the | this film, not exceeding ,/55 inch in thickness, be volume of gas 'produced may possibly be still further in- | removed, the explosive effect is much lessened. Nitro- creased by the partial or total "dissociation" of the glycerin, again, when detonated by a fulminate, is sufficiently. compound gases, at the high temperatures concerned ; for | confined by the surrounding atraosphere. By the same example, that the carbonic acid (CO,) may be decomposed | means, gun-*~~

~~cotton may be exploded unconfined, if com- into carbonic oxide (CO) and oxygen, or the aqueous | pressed, the mechanical cohesion affording sufficient restraint. vapour into oxygen and hydrogen. However, Noble and | In the case of wet compressed gun-cotton, which can be Abel demonstrate that, in the former instance, the loss of | detonated with even fuller effect than dry, the mechanical temperature, consequent upon the absorption of heat by | resistance is greater, the air-spaces being filled with the decomposition, would more than compensate for the | incompressible fluid. increase of volume by dissociation. It must also be The manner in which tho explosion is brought about Mode of remembered that, if the temperature be extremely high, | has a most important bearing upon the effect produced, explod- so also is the pressure under which dissociation must take | This may be done by the direct application of an ignited "5 place. We may therefore consider that it has no sensible | or heated body, by the use of an electric current to heat influence upon the explosive force. a fine platinum wire, or by means of percussion, con- Explo- It is most important to distinguish between explosive | cussion, or friction, converting mechanical energy into heat. sive force and explosive effect, the latter in great measure | A small quantity of a subsidiary explosive, such as @ com- eflect. depending upon the rapidity with which the metamor- position sensitive to friction or percussion, is often em- phosis takes place, while the same amount of force may | ployed, for the sake of convenience, to ignite the main be exerted suddenly or gradually. We may, therefore, | charge, the combustion spreading through the mass with consider that the explosive effect varies directly as the | more or less rapidity, according to the nature of the volume of gas preduced and the temperature of explosion, | substance. = ——_ and inversely as the time required for the transformation. Although subsidiary or Initiatory explosives were at Detona- But the time, and, to a certain extent, the products and | first used merely to generate sufficient heat to ignite the tion. temperature, will vary with—(a.) the physical state of the | charge, and are often still so employed, they have of explosive substance; (6.) the external conditions under | late years received an application of far wider importance. which it is fired; (c.) the mode of firing or exploding. Mr Alfred N obel, a Swedish engineer, while endeavour- Physical The physical or mechanical state of the explosive sub- | ing to employ nitro-glycerin for practical~~

~~purposes, found state of stance has a most important bearing upon the effect | considerable difficulty in exploding it with certainty ; explo- obtained from it, To prove this, it is only necessary to | he at length, in 1864, by using a large percussion cap,~~

~~sives,~~

~~temperature.~~

~~point to the very different results given by gunpowders mate with the same proportions of the three ingredients, but varying in density, and in shape and size of grails or pieces. Guu-cottou is even more affected by variations in mechanical condition. In the form of loose wool, it burns so rapidly that gunpowder in contact with it is not inflamed; plaited or twisted tightly, its rate of combustion iu air is greatly modified. This is due to the fact that the inflammable carbonic oxide, which is evolved by the~~

~~decomposition from the want of sufficient stored-up oxygen |~~

~~discussed the effect of tightly plaiting or compressing gun-~~

~~charged with fulminate of mercury, obtained an explosion of great violence. This result led to the discovery that many explosive substances, when exploded by means of a small quantity of a suitable initiatory explosive, produce an affect far exceeding anything than can be attri- buted to the ordinary combustion, however rapid, of the body in question; in fact, the whole mass of the explosive is converted into gas with such suddenuess that it may, practically, be considered instantaneous; this sudden trans- formation is termed "detonation." Of the substances VIL. —102~~

~~810~~

~~capable of producing such action, fulminate of mercury is the most important.~~

~~Some explosives appear always to detonate, in whatever mauner they may be exploded, such as chloride and iodide of uitrogen ; the explosive effect~~

~~*is therefore much greater than that of a slower explosive substance, although their explosive force may be less, Again, other substances, such as gun-cotton and nitro-glycerin, are detonated or not accord- ing to the mode of explosion. Indeed, Abel has proved that most explosives, including gunpowder, can be de- tonated, provided the proper initiatory charge be employed. Roux and Sarrau (Comptes Rendus, 1874) have divided*~~

~~*sidered by some authorities that, in the instance cited, the fulminate of mercury communicates a vibration to which the gun-cotton molecule is sensitive, and which overthrows its equilibrium ; it is not sensitive to the vibrations caused by the nitro-glycerin, which only tears and scatters it mechanically. Although the action of detonation has been spoken of as instantaneous, and may practically be so con- sidered, yet a certain infinitesimal duration of time is required for the metamorphosis ; different substances possess, doubtless, different rates of detonation, for we can scarcely conceive of a mechanical mixture, such as gunpowder, being so sensitive to the action of the detonating impulse as a*~~

~~*two explosions into two classes or orders,—'detonations" or | definite chemical compound, and the rate even varies orders explosions of the first order, and "simple explosions" of | slightly, for the same explosive, with its physical state. Cee the second order. They made a series of experiments | It has been shown, by means of Captain A. Noble's * with the object cf determining the comparative values of | chronoscope, that compressed gun-cotton, when dry, is various explosive substances, detonated, and exploded in } detonated at a velocity of from 17,000 to 18,000 feet a the ordinary manner; the method employed was to ascer- | second, or about 200 miles a minute; by using a small tain the quantity of each just sufficient to produce rupture primer of dry gun-cotton, the same substance in the wet in small spherical shells of equal strength. The following | state may be detonated at the increased rate of from 18,000 table gives the comparative results for the three most im- | to 21,000 feet a second, or about 240 miles a minute. portant explosive substances :— The following results are taken from experiments on aa, detonation and its*~~

~~applications, carried out by F. A. Abel, dalla C.B., F.B.S. :— Second Order. | First Order, | — I. Illustrating some of the conditions which promote the detona- (Chauny somytd le? omanansennoseccooseen: Pesce 1°00 4°34 tion of an explosive substance—(a) Quality of the initial detonation ; Gun-cotton or nitro-cellulose…... 3‘00 6°46 (b) Resistance to mechanical dispersion offered by the mass of the INitro-Glycemmn … 7..222) cagemensse sss 4°80 10°13 substance to be detonated.~~

~~Se a eee 1. A fuze containing rather more than 1 oz. gunpowder, strongly~~

~~These experiments, although valuable, cannot be con: | confined, exploded in contact with a mass of compressed gun-cotton, sidered as affording a precise method of comparison; the only inflames it, although the explosion of the fuze is apparently results would be affected, inter alia, by the impossibility of a saatp one, }~~

~~a owen caer eae Pe y 2, Forty-five grains of fulminate of mercury, exploded unconfined ensuting that the shells were all of the same strength, a | on the surface of a piece of compressed gun-cotton, only inflames point of great importance, considering the very small | or disperses it. ay ; weights of each explosive used ; also the rate of combustion, a ae ia cone : eee fahaigate of ae, strongly and therefore the explosive effect, of gunpowder is materially | SY't. detondtes it BE en atts ey coun ee~~

- ~~. Cir . r] ¢ ce Ye affected by its mechanical condition, so that different 4, Au equal quantity of fulminate, similarly confined, does not powders would give a varying standard of comparison, | detonate uncompressed gun-cotton in which it is imbedded, but HOwever, they afford fair evidence that, when detonated, ae and Cae ip it. 1s amen: _ eun-cotton has about six times, and pure nitro-glycerin | g Jimi grains compressed gun-cotton, detonated in proximity to = : : ynamite, detonates the lattcr. about ten times the local explosive effect of gunpowder | "6. 3 oz. of dynamite, and very much larger quantities, detonated simply ignited in the ordinary manner ; nitro-glycerin is | in contact with compressed gun-cotton only disperses it.~~

~~; ; i a, ie 4~~

~~usually employed in the form of dynamite, mixed with iL) Peo anatan. some inert absorbent substance, so that its power is pro- ; : ; ; ;~~

~~= nate saad anced 7. Detonation being established at one extremity of a continuous~~

~~a ahead | ee alae oe. row of distinct masses of compressed gun-cotton, or dynamite, Theory The rationale of detonation is not yet understood. If the | travels the whole length thereof. Stretching insulating wires across of de- transformation were due merely to the mechanical energy of | the row of discs, at intervals of six feet, their rupture by the tonation. the particles of gas, liberated from the initiatory charge at aoe eres Ske Apt evi of ole i, ohrone~~

~~= ee mendous velocity, being converted into heat by : impact 8. A row of gun-cotton discs, of any length, placed 0°5 inch apart,~~

~~against the mass of the explosive substance, then it would | can all be detonated from one end. :~~

~~follow that the most powerful explosive would be the best 9. Discs of compressed gun-cotton, weighing about 8 oz. each,~~

~~detonating agent; this is, however, by no means the case, being placed 6 inches apart, the Eoenaiiee of the central disc only~~

~~: ‘ p blows away or breaks up the neighbouring masses. for a few grains of fulminate of saat ea metal tube 10. About 2 oz. compressed gun-cotton being inserted into one will detonate gun-cotton, whereas nitro-glycerin, although | extremity of a wrought-iron tube 5 feet long, its detonation is trans-~~

~~possessed of more explosive force, will not do so unless used in large quantities. The fact of its being possible to detonate wet gun-cotton is also a proof that the action cannot be due to heat alone. It would rather seem to be what Professor Bloxam terms “sympathetic” explosion; the experiments of Abel, as well as those of Champion and Pellet in France, appear to indicate a vibratory action of the detonating agent upon the~~

~~*ultimate particles of the substance to be exploded. An explosive molecule is most unstable, certain very delicately balanced forces preserving the chemical and physical equilibrium of the compound. If these forces be rapidly overthrown in succession, we*~~

~~*mitted to a dise of compressed gun-cotton inserted into the other extremity of the tube.*~~

~~*III. Applications of Detonation.*~~

~~*11. A wrought iron rail can be destroyed by detonating 8 oz. of compressed gun-cotton placed unconfined upon the rail.*~~

~~*12. A piece of wet gun-cotton, quite uninflammable, removed from a fire and detonated upon a block of granite, using a small primer of dry gun-cotton, shatters the block.*~~

~~*13. A stockade can be destroyed by means of a flat charge built up of wet gun-cotton slabs, — detonation being established by means of a small portion of the charge in a dry state.*~~

~~*14. A submerged charge of wet gun-cotton, open on all sides to the water, and merely confined around the dry initiative charge, or primer, by means of a net, can be detonated.*~~

~~*have explosion; but when, by a blow of a certain kind, they are instantaneously destroyed, the result is detonation. Just as a glass globe may withstand a strong blow, but be shattered by the vibration of a particular note, so it is con-*~~

~~*Many attempts have been made, especially by foreign we*~~

~~*chemists and physicists, to arrive at an exact determination expo- of the comparative force of explosive substances. The sives.*~~

~~*Products of com- bustion allowed to ex- pend.*~~

~~*EXPLOSIVES*~~

~~*ineans adopted may be summed up under the two headings of (1) experiment alone, and (2) calculation and experiment combined. In the first category may be placed the cexperi- ments of Roux and Sarrau, already noticed. By the second method, Berthelot (force de la Poudre et Matiéres Fxplosives, 1872) calculates the volume of gases which would be produced, and having ascertained the quantity of heat generated by the explosion, considers that their pro- duct affords a term of comparison according fairly well with the results of experiment. Sarrau (Lifets de la poudre et des substances explosive, 1874), from a train of reasoning somewhat similar to that here followed, arrives at the con- clusion that the explosive force is nearly proportional to the product of the heat of combustion by the weight of perma- nent gases produced; he obtains both these data by experimeuts carried out at the Dépdt central des Manufac- tures de l'Etat. The following table shows the results of the two methods :—*~~

~~*Relative Force. Explosive Substance. Sarrau, Berthelot. Gunpowder ……. Bee: 1:00 CE CORO ss oss sis casscesoeasescesss ons 3°06 PUNO ERCETIN «py cccescons ese TEMOVENUS OL WOUESN .0.., wcasscaesses civ er- 1-98 Picrate of potash and saltpetre …... 1°49 Picrate and chlorate of potasli …... 1°82 Chiloride of niinegetios….. cic… +26. 1:08*~~

~~*The plan pursued by Sarrau appears the more reliable of the two, in that he obtains by experiment the quantity of permanent gases evolved; the relative proportions he gives agree fairly well with those experimentally determined by him, in conjunction with Roux, for simple explosion. With reference to Berthelot's figures, it is a well known fact that nitro-glycerin, when not detonated, is very un- certain in its action, so that in all probability it would never give its full thoeretic force; Sarrau seems nearer its correct value. On the other hand, chlorine gas, liberated by the explosion of chlorate of potash and chloride of nitrogen, is very heavy, so that considerable variation may arise from estimating it by weight instead of volume. The mean of the results given by five descrip- tions of gunpowder was adopted by Sarrau as his standard, and he estimates the pressure at about 5290 atmospheres, Noble and Abel have proved these figures to be consider- ably too low; and we shall, in all probability, be not*~~

~~*far wrong if we multiply each of the ratios given in Sarrau's table by 6000, in order roughly to show the pressure, in atmospheres, of equal weights of each of the substances in question exploded in about its own volume, but not detonated.*~~

~~*We have considered the tension developed in a close vessel of constant volume. Let us now investigate the case of the products of combustion being allowed to expand in a vessel impervious to heat, it having been conclusively proved that with large charges the loss of heat by communication to the metal of a gun is relatively very small, and may practically be neglected. If V, P, and T be respectively the initial volume occupied by the substance, the maximum pressure, and the temperature of explosion, we shall deduce expressions for the pressure and temperature corresponding to any volume v, and the work done by the expansion of the permanent gases in the spacev—V. It will simplify the calculation if we suppose that the gravimetric density of the substance is unity, that it fills the volume in which it is exploded, and that the charge is burnt before it commences to do work, either upon a projectile or otherwise; even with gunpowder the correction due to this last assumption is not great, and the action of the more violent explosives*~~

~~*S11*~~

~~*may practically be considered instantaneous, especially when detonated. It has already been stated that, with most explosives, there is an ultimately solid or liquid residue, the products not being wholly gaseous ; with gun-powder this residue is very considerable.*~~

~~*As before, let _p be the ratio of the volume of the non-gaseous products at the instant of explosion ; then the original volume of gas and vapour will be V(1—p), and the expanded volume v— Pvs for the sake of brevity these corrections will be made at the end of the calculations. — As already stated, for gunpowder the value of p is about °6 ; it is relatively inconsiderable for the more violent explosive compounds.*~~

~~*Starting with the fundamental relation for permanent gascs,*~~

~~*Uae 2 ee (), if we suppose the pressure to remain constant while the volume varies by au infinitesimal amount dv, the temperature will undergo a corresponding variation ne Cy. pav amount of heat oe, Cp being the specific heat for constant pres-*~~

~~*, and the gases gain or lose an*~~

~~*sure ; similarly, if the volume be supposed to remain constant, while the pressure varies by dp, we have a gain or loss of heat Cy.vdp R ? when both pressure and volume vary simultaneously, the gain or loss of heat is*~~

~~*cy being the specific heat for constant volume; consequently,*~~

~~*+ (ep.-pdv +cy.vdp)=dh and differentiating (1),*~~

~~*(2);*~~

~~*pdv+vdp=Rdt .*~~

~~*Eliminating vdp between thesc equations, we get*~~

~~*cp—c — -pdvt+cy.dt=dh .*~~

~~*(3).*~~

~~*(4).*~~

~~*Again, if c' be the specific heat of the solid residue, assumed to be constant, and o the ratio of its weight to that of the gas and vapour, it is evident that the residue will part with an amount of heat, c'.dt, during an instant of the expansion while the temperature is lowered*~~

~~*| by an amount dé; but, by our hypothesis, the heat given off by*~~

~~*the residue is acquired by the gascs; therefore, dh=—oe'.dt..' . (5);*~~

~~*and (4) becomes, for the expansion from V to v,*~~

~~*t _ v —cotoe) f. ant f DOO wee are T Vv*~~

~~*Substituting for p its value derived_from (1), dividing both sides by é, and integrating, we have*~~

~~*‘3 T bee (£26 = eg (DYE*~~

~~*—(6).*~~

~~*» (7); whence Gpieabe) t=T.(L)otoe . — Wee v*~~

~~*making the correction for the volume of the solid or liquid residue Vv Y Cp—Cv = VP) oy + oe’. (9). tel { v—pv J ‘ “In a precisely similar manner, or more briefly by remembering*~~

~~*that PV=RT, we find Cp+oc’ =p SVO=P)) cefoc’. . p=P { v——oV*~~

~~*(10).*~~

~~*v But the definite integral / pdv, represents the work done by the work js done by expansion of tlie gas and vapour from the volume V to any volume the ex- v, aud from cquation (6), pansion.*~~

~~*v R oc’) f fen e dt Vv ae*~~

~~*h , Integrating, and remembering that cp — C= Fs where J is Joule’s*~~

~~*(11).*~~

~~*mechanical equivalent of heat, we get W=J(co+ae){T—¢} or the work done is directly proportional to the loss of temperature*~~

~~*during the expansion. Substituting the value above found for ¢, we have*~~

~~*Cp—Cv*~~

~~*Wastin ov) | 1— (OEP evar |.*~~

~~*but T(cy+oc’)=H, the whole amount of heat generated by the explosion, so that we have the expression,*~~

~~*(12);*~~

~~*« (3);*~~

~~*812*~~

~~*Cp—Cv : west i (WA=P) eae \ (4). (v—pV This expression for the work done is of considerable practical value in the case of gunpowder, or any explosive which can be used as a propelling agent with heavy guns. Knowing the length and diameter of the bore, we can calculate the total maximum work due to a given weight of charge in expanding to that volume. This maximum is of course not attained in practice, and it is there- fore necessary to multiply it by a ratio, or factor, dependent on the nature of the gun and projectile, the powder used, mode of ignition, &c. However, by making use of the results of actual experiment, this "factor of effect," or percentage of work realized, can be determined with much accuracy. Its value is greatest for very large guns, being 93 per cent. for the 38-ton gun, and becoming as low as about 50 per cent. in the case of the little 7-pr. mountain gun of 150 Ib. weight ; the difference is chiefly due to the loss of heat by communication to the metal of the gun. (See Noble and Abel on " Fired Gunpowder.") Initial We can approximate to the "muzzle velocity," or the velocity. velocity at which the projectile leaves the bore, by substituting the value of W, found for the particular gun, in the ordinary*~~

~~*2*~~

~~*equation of work, wae where V is the velocity, and w the weight of the projectile ; we thence obtain*~~

~~*= ,/% '*~~

~~*Vv wy EE.*~~

~~*If W, the maximum work due to the expansion of the gaseous products in the volume of the bore, be multiplied by the factor of effect 7, for the nature of gun and powder used, the result will be very nearly the mean observed velocity.*~~

~~*sraphi- The mathematical expression for the work done by an — explosive substance in expanding from V to », or Ji pdr,*~~

~~*of work. evidently denotes the area of a plane curve ; the work may*~~

~~*therefore be graphically represented by the area enclosed by a curve, having for its ordinates the pressures in foot-tons, or atmospheres, and for abscissz the corresponding volumes or spaces occupied by the gases.*~~

~~*Total If, in equation (14), we take the limits between V and*~~

~~*theoretic infinity, we arrive at a very simple expression for the total*~~

~~*work. theoretic work due to the indefinite expansion of a given weight of any explosive substance, v becoming indefinitely great compared to the original volume V, and we have*~~

~~*W=JH,. (15),*~~

~~*which may be called the " potential energy " of the ex- plosive, being the product of the total quantity of heat generated by the explosion and the mechanical equivalent of heat. This conclusion, within the assumptions made, is in strict accordance with the principle of the mutual convertibility of energy and heat.*~~

~~*The following table shows the potential energy, in foot-tons, calculated from the heat of combustion for each explosive, determined by Roux and Sarrau, in the experi- ments already referred to; that for gunpowder is the*~~

~~*mean given by five kinds. Potential Energy*~~

~~*Explosive Substance, per Ib. Foot-tons. GUN POWER. PEE CUO Diss cuheniccies Soest a alsannaseiaurens 716 INE Oe PRD son's ccs sancctaeniucduedens sae 1139 Bicret i oma cn28 sapsc ts caste: cane ceases 536 Picrate of potash and saltpetre……. 615 Picrate and chlorate of potash……. 781 Chloride of nitrogen……. 216*~~

~~*The above figures naturally direct our attention to the small amount of work stored up in even the most violent explosive substance, compared*~~

~~with the potential energy of 1 Ib. of coal, which is about 4980 foot-tons. Noble and~~

~~EXP EOSTVeee~~

~~Abel point out that this great difference is not alone due to the fact that the coal draws its oxygen from the air, but also because the explosive has to expend a considerable amount of work in converting its condensed magazine of oxygen into gas, before it can combine with the carbon; further, with reference to the economic value of the work done, that the oxygen used by the coal costs nothing, whereas much expense is incurred in condensing the oxygen into the explosive substance.~~

~~The practical value of any explosive must depend greatly Practical upon the object tobe attained. It is essential to distinguish value of between explosive force and effect; the more sudden the 2 &- action the more local will be the effect produced, and hence P!°"* the very violent explosive substances are useless as propel- ling agents for heavy guns or small arms, since they would destroy the weapon before overcoming the inertia of thie projectile. It is true that gun-cotton, prepared in various forms, and mixed with other substances to moderate its action, as well as a similar compound made from saw-dust, an inferior form of cellulose, are sometimes used with small arms; but, in addition to a want of uniformity in action, the strain caused by such substances would be far too great in the large charges needed for heavy guns. Again, there are cases, even in mining or blasting operations, for instance, when it is desired to displace large masses of earth or soft rock, in which a comparatively slow explosive, such as guupowder, would give better results than gun-cotton or dynamite. HOwever, speaking generally, gunpowder in some one of its forms is far the most valuable as a pro- pelling agent, while, for destructive purposes, the last- named substances are much more effective, especially when detonated.~~

~~Law.—In 1860 an Act was passed " to amend the law concerning Law re- the making, keeping, and carriage of gunpowder and compositions of lating to an explosive nature, and concerning the manufacture and use of fire- explo- . works " (23 and 24 Vict. c. 189), whereby previous Acts on the same sives. subject were repealed, and minute and stringent~~

~~*regulations intro- duced. Gunpowder may only be mannfactured in mills, lawfully used at the cominencement of the Act, or duly licensed as in this Act provided ; other explosive compositions require a licence, and the precautionary rules as to quantity, distance from dwelling houses, &c., are set forth in minute detail. No person may sell fireworks without a licence, or to persons apparently under 16 years of age; and throwing fireworks on the streets was made punishable by a penalty not exceeding £5. Other regulations deal with car- riage by land and sea, search-warrants, inspections of mills, &c. Amending Acts were passed in 1861 and 1862.*~~

~~*In 1875 was passed the " Explosives Act " (88 Vict. c. 17), which repeals the former Acts, and deals with the whole subject in a more comprehensive manner. " Explosives" are thus defined : —(1) Gun-powder, nitro-glycerin, dynamite, gun-cotton, blasting powders, fulminate of mercury or of other metals, coloured fircs, and every other substance, whether similar to those above mentioned or not, used or manufactured with a view to produce a practical effect by explosion or a pyrotechnic effect, and including (2) fog-signals, fireworks, fuzes, rockets, percussion caps, detonators, cartridges, ammunition of all descriptions, and every adaptation or preparation of an explosive as above defined. Part i. deals with gunpowder; part ii. with nitro-glycerin and other explo- Sives ; part ili. with inspection, accidents, search, &c.; part iv. with various supplementary provisions. In addition to the licence required for manufacturing gunpowder, it is provided that gun- powder shall not be kept in any place except (1) a licensed factory, (2) a licensed magazine or store, or (3) premises registered for keeping gunpowder. Private persons may keep gunpowdcr for their own use to the amount of thirty pounds. Rules for the proper keeping of gunpowder on such registered premises are prescribed. The Act contains 122 sections, and applies to Scotland and Ireland as well as England. It was based on the report of a Committee of the House of Commons. Public opinion had been greatly excited on the sub- ject by the terrible explosion on the Regent's Canal in 1874.*~~

~~*Petroleum is governed by the Petroleum Act 1871—an annual*~~

~~*Act, which has been included every year in the Expiring Acts Con- tinuance Bill. ‘ In 1877 the ‘Fisheries (Dynamite) Act” was passed, whereby any person who uses dynamite or other explosive substance to catch or destroy fish in a public fishery, shall be liable, on summary con- Viction, to a fine not exceeding £20, or imprisonment for a term of not more than two months.*~~

~~*SEE EE ———EEEEE*~~

~~*a*~~

~~*KX T—EX T*~~

~~*Bibliography.—See, on the general subject, the following works: — OCount de St Robert, Traité de Thermodynamique, Turin, 1865 ; Berthelot, “ Recherches de Thermochimie,” Annales de Physique et de Chimie, tome vi.; Berthelot, Sur la Foree de la Poudre et les Matiéres Explosives, 1872 ; Roux and Sarrau, “ Experiments on Ex- plosives,” Comptes Rendus, tome lxxvii. 1874; Bunsen and Schis- Kotf ’s “* Researches on Fired Gunpowder,” Poggendorff’s Annalen, vol. cii.; Sarrau, Recherches théoriques sur les effets de la poudre, et des substances explosives, 1874; Noble and Abel, Rescarehes on Explosives— Fired Gunpowder, 1875 ; Recent investigations and ap- plications of explosive agents, F. A. Abel, F.R.S., 1871; “Con- tributions to the histcry of Explosive Agents,” F. A. Abel, F.R.S. (Proe. Roy. Soe., No. 150, 1874); Chemistry Inorganie and Organie, C. L. Bloxam (articles on Gunpowder, Gun-Cotton, &c.), London, 1875; “ Vibratory motions produced by Detonants,” Champion and Pellet (Comptes Rendus, vol. lxxv.); Notes on certain Explo- sive Agents, Walter N. Hill, 8.B. Chemist, U.S. Torpedo Service, Boston, 1875. The bibliography of explosives is chiefly contained in memoirs scattered throughout proceedings of various learned societies. (W. H. W.)*~~

~~*EXTRADITION. When a person who has committed an offence in one country escapes to another, what is the duty of the latter with regard to him? Should the country of refuge try him in its own courts according to its own laws, or deliver him up to the country whose laws he has broken? To the general question international law gives no certain answer. Some*~~

~~*jurists, Grotius among them, incline to hold that a state is bound to give up fugi- tive criminals, but the majority appear to deny the obliga- tion as a matter of right, and prefer to put it on the ground of comity. And the universal practice of nations is to sur- render criminals only in consequence of some special treaty with the country which demands them.*~~

~~*There are two practical difficulties about extradition which have probably prevented the growth of any uniform rule on the subject. Oue is the variation in the definitions of crime adopted by different countries. The second is the possibility of the process of extradition being employed to get hold of a person who is wanted by his country, not really for a criminal, but for a political offence. In modern states, and more particularly in England, offences of a political character have always been carefully excluded from the operation of the law of extradition.*~~

~~*Extradition, as stated above, has for the most part been regulated by special treaties. A full list of the extradition treaties between the principal civilized countries will be found in Phillimore's Jnternational Law, vol.i.c. 21. Just before the passing of the Extradition Act of 1870, England had only two treaties subsisting—one with France, another with the United States. Both were confirmed by Acts of Parliament. The 'Extradition Act 1870" enacts that "where an arrangement has been made with any foreign state, with respect to the surrender to such state of any fugitive criminals, Her Majesty may, by Order in Council, direct that this Act shall apply in the case of such foreign state," subject to any lunitations, conditions, or restrictions that may be thought expedient. Itis expressly provided—*~~

~~*1. That a fugitive criminal shall not be surrendered for a political offence, or if he prove that his surrender has in fact been required with a view of trying him for a political offence.*~~

~~*2. Provision must be made that a surrendered criminal shall not be tried for any but the extradition crime.*~~

~~*3. Criminals accused or convicted of offences in England shall not be surrendered in extradition until they are discharged.*~~

~~*4, There must -be an interval of 15 days betwcen the committal to prison and the surrender.*~~

~~*An Order in Council under the Act must be in conformity with its provisions, and must provide for the determination of the arrangement after not more than a year's notice.*~~

~~*When the Act applies, a fugitive criminal of a foreign state is liable to surrender. A requisition for that purpose must be addressed to a secretary of state by some person recognized as a diplomatic representative of the foreign state. The secretary of state, unless he thinks the offence*~~

~~*813*~~

~~*is one of a political character, may inform a police magis- trate of the requisition, and require him to issue his warrant for the apprehension of the criminal. The police magistrate, when the criminal is brought before him, shall receive any evidence tending to show that the offence is political, or is not all extradition crime. If the evidence is such as would justify a committal for trial in England, or would prove that the prisoner has been convicted, the magistrate com- mits him to prison, and after fifteen days' interval, or if a habeus corpus is issued after the decision of the court, the secretary of state may by his warrant deliver him over to the representatives of the foreign country. If the prisoner is not removed within two months he must be discharged. The Actjapplies, with certain modifications, to all British possessions.*~~

~~*"Fugitive criminal" means any person accused or con- victed of an extradition crime committed within the jurisdiction of any foreign state, who is in, or is suspected of being in, any portion of Her Majesty's dominions. The following is a list of extradition crimes, to be construed according to the law existing in England :—*~~

~~*Murder and attempt and conspiring to murder; manslaughter ; counterfeiting or altering money, and uttering ; forgery, counter- feiting, and altering what is forged, &c.; embezzlement and larceny; obtaining money and goods by false pretences ; bankruptcy crime : fraud by bailee, banker, agent, &c.; rape ; abduction ; child- stealing ; burglary and*~~

~~*housebreaking ; arson ; robbery with vio- lence ; threats by letter or otherwise, with intent to extort ; piracy by law of nations ; sinking or destroying a vessel at sea, or attempting or conspiring to do so ; assaults on board ship on the high seas, with intent to destroy life or to do grievous bodily harm ; revolt or conspiracy to revolt by two or more persons on board a ship on the high seas against the authority of the master. The Extradition Act of 1873 adds the following :—Kidnapping and false imprison- ment ; perjury and subornation of perjury ; and indictable offences, not previously named, under the Larceny and other Criminal Acts of 1861 (24 and 25 Vict. c. 96, 97, 98, 99, 100, 101).*~~

~~*The countries with which England has entered into ex- tradition treaties are the following :—Austria, 3d December 1873; Belgium, 30th May 1876; Brazil, 13th November 1872; Denmark, 31st March 1873 ; France, 13th February 1843; Germany, 14th May 1872; Hayti, 7th December 1874 ; Honduras, 6th January 1874; Italy, 5th February and 7th May 1873; Netherlands, 10th June 1874; Sweden and Norway, 26th June 1873; Switzerland, 31st March 1874; United States, 9th August 1842 (Abdy's edition of Kent's International Law, Cambridge, 1878). The treaties with France and the United States, it will be noticed, are those which were in force before the English Extradition Acts. Difficulties have arisen between this country and the United States as to the effect of the Extradition Act on the subsisting treaty. In 1875 the English Government protested against the trial for a second offence of a criminal who had been surrendered to the United States. The United States Government maintained that the principle of the English Extradition Act (that the surrendered criminal shall net be tried for any offeuce committed prior to his surrender other than the extradition crime) did not apply to the treaty of 1842, that this treaty could not be newly construed at the will of one of the parties, and that the claim of the English Government made it impossible for the United States to ask or grant extradition under it. The English Government have in the meantime surrendered three fugitive criminals without insisting on their claim. A royal commission on the Extradition Acts is now sitting (1878).*~~

~~*See A Treatise on the Law of Extradition, by Edward Clark, barrister-at-law, 2d edition, London, 1874. (HE. R.)*~~

~~*EXTREME UNCTION, one of the seven sacraments of the Romish Church, now to be administered only after those of penance and the Eucharist to persons who are sup- posed to be at the point of death. Among the Orientals oil has Jong been employed as a cure for various dis-*~~

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~~*orders, as well as for the purpose of promoting the general health of the body. According to the narrative of Mark, it was employed by the disciples of Jesus apparently for the purpose of effecting miraculous enres (Mark vi. 13). The apostle James also exhorts Christians to make use of it, accompanied with prayer, in the case of sick persoils. elders of the church; and let them pray over him, anoint- ing him with oil in the name of the Lord; and the prayer of faith shall save the sick, and the Lord shall raise him up; and if he have committed sins, they shall be forgiven him" (James v. 14, 15). Unction is not referred to by any of the fathers as a sacrament, but Origen, in his second homily on Lev. iv., implies that in his time it was conjoined with the imposition of hands in the restoration of the lapsed; and Irenezeus (i. 21, 5) states that among some of the Gnostics it was common to anoint the dying witha mixture of oil or opobalsam and water, to render their souls invisible to their spiritual enemies in the other world, and proof against their machinations. There is evidence that among the Christians of the 4th century a superstitious efficacy was ascribed to tle use of oil in cases of sickness, and instances are recorded in which the oil used in the lamps of the churches was stolen in order to be applied in sickness, or to ward off attacks of disease. The first proof of the use of the rite in the Roman Church is contained in a letter of Innocent I. to Decentius, bishop of Eugubium (Gubbio), in the year 416, in which he speaks of it as "a kind of sacrament;" but he adds that after the oil has been blessed by the bishop, it may be used, not merely by the bishops and priests, but by Christians generally, From the 8th century the rite is often mentioned in the acts of the councils, and has been the occasion of a considerable amount of discus- sion and difference of opinion, at least in regard to details. In 850 it was declared by the synod of Regiaticinum (Pavia) to be a sacrament by which sins were forgiven, and conse- quently bodily health restored, but its chief purpose*~~

~~*was represented to be the restoration of the sick person. In the 12th century the question whether the rite could be repeated was raised, and began to be answered in the negative; and an attempt was made by some to obtain a decision that the person to whom it had been adminis- tered should not afterwards touch the earth with his bare feet, nor indulge in any of the pleasures of the flesh ; and although these proposals were not carried, the general re- sult of the discussions was to deepen the impression that it was a rite of unusual solemnity, to which recourse should not be had except in cases of great necessity. About this time the rite came to be known as sacramentum exeuntium or extrema unctio. By Peter the Lombard it was placed fifth in the list of the seven sacraments, and its spiritual significance was further developed by the scholastic theologians, especially by Thomas Aquinas. According to him, its principal end was the removal of the spiritual weakness resulting from the sins of the past life, and the healing of the body was only its secondary end; but among other theologians of his time discussions as to the purpose of the rite were the cause of considerable difference of opinion. It was, however, regarded by most as having only a relative necessity, its omission not entailing any positive spiritual evil. According to the decrees of the Council of Trent, it confers the pardon of any faults that may previously have been unexpiated, and it removes the remains of sin; it relieves and strengthens the soul, and enables it better to bear up under pain, and more suc- cessfully to withstand the assaults of the devil—bodily ease and health following so far as these are advan- tageous to the soul's welfare. As to its repetition the council contented itself with declaring that it might be repeated in cases of similar peril. According to the*~~

~~*"Ts any sick among you, let him call for the |*~~

~~*EYC—EHEYC*~~

~~*Romish catechism, two ends are obtained by its obsery- ance,—Ist, the pardon of venial sins, it not possessing the highest efficacy in regard to mortal sins ; 2d, the removal of the spiritual infirmity resulting from sin, and of all the other remains of sin. For the observance of the rite the Romish Church appeals to the authority of Christ, as im- plied in Mark vi.*~~

~~13, and to the authority of the apostles, as implied in James v. 14, 15. The Council of Trent has decreed extreme unction to be a sacrament, and declares that " whosoever shall affirm that extreme unction is not truly and properly a sacrament, instituted by Christ our Lord, and published by the blessed apostle James, but only a ceremony received from the fathers, ora human invention, is to be accursed." And it denounces a similar anathema against all who "shall affirm that the sacred unction of the sick does not confer grace, nor forgive sin, nor relieve the sick, but that its power has ceased, as if the gift of healing existed only in past ages." The ceremony is performed in the following way. When a person's recovery is despaired of, his eyes, ears, nostrils, mouth, hands, feet, and reins are succes- sively anointed with the sacred oil by the priest. At each anointing the priest says, "By this holy unction, and through HIs great mercy, Almighty God forgive thee whatever sins thou hast committed by sight" (or smell, hearing, touch, &c.). The oil used in extreme unction is supposed to represent the grace of God poured down into the soul, and conferring pardon and spiritual strength. It is blessed by the bishop on Maundy Thursday, and delivered to the parochial clergy to be used by them throughout the year. IJf any oil is left after the expiry of the year it is burned, and if the supply threateus to become exhausted, other oil may be added to that which has been consecrated, but only a small propor- tion of new oil is permitted. In the Greek church the rite is called "EvxéAawov, or "Aytov éAavov. The oil is not con- secrated by the bishop, but is taken out of the sanctuary lamps as required and blessed by seven priests, or, if that number cannot be gathered together, by not less than three. The rite is administered in diseases of all kinds; and such sick persons as are able are expected to visit the church, especially on Maundy Thursday, to experience its bodily and spiritual blessings. Only in extreme cases does the anointing take place in the sick chamber. _~~

~~- EYCK, Van, the name of a family of painters in whose works the rise and mature development of art in western Flanders are represented. Though bred in the valley of the Meuse, they finally established their professional domi- cile in Ghent and in Bruges; and there, by skill and inven- tive genius, they changed the traditional habits of the earlier schools, remodelled the primitive forms of Flemish design, and~~

~~*introduced a complete revolution into the technical methods of execution familiar to their countrymen.*~~

~~*1. Hupert Van Eyck was the oldest and most remark- able of this race of artists. The date of his birth and the records of his progress are lost amidst the ruins of the earlier civilization of the valley of the Meuse. He was born about 1366, at Maeseyck, under the shelter or protection of a Benedictine convent, in which art and letters had been cultivated from the beginning of the 8th century. But after a long series of wars,—when the country became in- secure, and the schools which had flourished in the towns decayed,—he wandered to Flanders, and there for the first time gained a name. As court painter to the hereditary prince of Burgundy, and as client to one of the richest of the Ghent patricians, Hubert is celebrated. Here, in middle age, between 1410 and 1420, he signalized himself as the inventor of a new method of painting. Here he lived in the pay of Philip of Charolais till 1421. Here he painted pictures for the corporation, whose chief magistrates honoured him witha state visit in 1424, His principal masterpiece, and the only picture that can be traced to his*~~

~~*mY CK*~~

~~*hand, the Worship of the Lamb, commissioned by Jodocus Vijdts, lord of Pamele, is the noblest creation of the Flemish school, a piece of which we possess all the parts dispersed from St Bavon in Ghent to the galleries of Brussels and Berlin,—one upon which Hubert laboured till he died, leaving it to be completed by his brother. Almost unique as an illustration of contemporary feeling for Chris- tian art, this great composition can only be matched by the Fount of Salvation, in the museum of Madrid, It repre- sents, on numerous panels, Christ on the judgment seat, with the Virgin and St John the Baptist at His sides, hearing the songs of angels, and contemplated by Adam and Eve, and, beneath him, the Lamb shedding His blood in the presence of angels, apostles, prophets, martyrs, knights, and hermits. On the outer sides of the panels are the Virgin and the angel annunciate, the sibyls and prophets who foretold the coming of the Lord, and the donors in prayer at the feet of the Baptist and Evangelist. After this great work was finished it was placed, in 1432, on*~~

~~*an altar in St Bavon of Ghent, with an inscription on the framework describing Hubert as " maior quo nemo reper- tus," and setting forth, in colours as imperishable as the picture itself, that Hubert began and John afterwards brought it to perfection. John Van Eyck certainly wished to guard against an error which ill-informed posterity showed itself but too prone to foster, the error that he alone had composed and carried out an altarpiece executed jointly by Hubert and himself. His contemporaries may be credited with full knowledge of the truth in this respect, and the facts were equally well known to the duke of Surgundy or the chiefs of the corporation of Bruges, who visited the painter's house in state in 1432, and the members of the chamber of rhetoric at Ghent, who reproduced the Agnus Dei as a tableau vivant in 1456. Yet a later generation of Flemings forgot the claims of Hubert, and gave the honours that were his due to his brother Joln exclusively.*~~

~~*The solemn grandeur of church art in the 15th century never found, out of Italy, a nobler exponent than HLubert Van Eyck. His representation of Christ as the judge, between the Virgin and St John, affords a fine display of realistic truth, combined with pure drawing and gorgeous colour, and a happy union of earnestness and simplicity with the deepest religious feeling. In contrast with earlier productions of the Flemish school, it shows a singular depth of tone and great richness of detail. Finished with sur- prising skill, it is executed with the new oil medinm, of which Hubert shared the invention with his brother, but of which no rival artists at the time possessed the sccret,—a medium which consists of subtle mixtures of oil and varnish applied to the moistening of pigments after a fashion, only kept secret for a time from guildsmen of ncighbouring cities, but unrevealed to the Italians till near the close of the 15th century. When Hubert died on the 18th September 1426, he was buried in the chapel on the altar of which his masterpiece was placed. According to a tradition as old as tlie 16th century, his arm was preserved as a relic in a casket above the portal of St Bavon of Ghent. During a life of much apparent activity and surprising successes, he taught the elements of his art to his brother John, who survived him.*~~

~~*2. Jon Van Eycx. The date of his birth is not more accurately known than that of his elder brother, but he was born much later than Hubert, who*~~

~~took charge of him and made him his "disciple." Under this tuition John learnt to draw and paint, and mastered the properties of colours from Pliny. Later on, Hnbert admitted him into partnership, and both were made court painters to Philip of Charolais. After the breaking up of the prince's house- hold in 1421, John became his own master, left the~~

~~workshop of Hubert, and took an engagement as painter to John of Bavaria, at that time resident at the Hague as count of Holland. From the Hague he returned in 1424 to take service with Philip, now duke of Burgundy, at a salary of 100 livres per annum, and from that time till his death John Van Eyck remained the faithful servant of his prince, who never treated him otherwise than graciously. He was frequentlyjemployed in missions of trust; and following the fortunes of a chief who was always in the saddle, he appears for a time to have been. in ceaseless motion, receiving extra pay for secret services at Leyden, drawing his salary at Bruges, yet settled in a fixed abode at Lille. In 1528 he joined the embassy sent by Philip the Good to Lisbon to beg the hand of Isabella of Portugal. His portrait of the bride fixed the duke's choice. After his return he settled finally at Bruges, where he married, and his wife bore him a daughter, known in after years as a nun in the convent of Maeseyck. At the christening of this child the duke was sponsor, and this was but one of mauy distinctions by which Philip the Good rewarded his painter's merits, Numerous altarpieces and portraits now give proof of Van Eyck's extensive practice. As finished works of art and models of conscientious labour they are~~

~~'all worthy of the name they bear, though not of equal~~

~~excellence, none being better than those which were com- pleted about 1432. Of an earlier period, a Consecration of Thomas & Becket has been preserved, and may now be seen at Chatsworth, bearing the date of 1421; no doubt this picture would give a fair representation of Van Eyck's talents at the moment when he started as an independent master, but that time and accidents of omission and com- mission have altered its state to such an extent that no con- clusive opinion can be formed respecting it. The panels of the Worship of the Lamb were completed nine years later.~~

~~They show that John Van Eyck was quite able to work in the spirit of his brother. He had not only the lines of Hubert's compositions to guide him, he had also those parts to look at and to study which Hubert had finished. He continued the work with almost as much vigour as his master. His own experience had been increased by travel, and he had seen the finest varieties of landscape in Portugal and the Spanish provinces. This enabled him to transfer to his pictures the charming scenery of lands more sunny than those of Flanders, and this he did with accuracy and not without poetic feeling. We may ascribe much of the success which attended his efforts to complete the altarpiece of Ghent to the cleverness with which he repro- duced the varied aspect of changing scenery, reminiscent here of the orange groves of Cintra, there of the bluffs and crags of his native valley. In all these backgrounds, though we miss the scientific rules of perspective with which the Van Eycks were not familiar, we find such delicate perceptions of gradations in tone, such atmosphere, yet such minuteness and perfection of finish, that our admiration never flags. Nor is the colour less brilliant or the touch less firm than in Hubert's panels. John only differsfrom his brother in being less masculine and less sternly religious. He excels in two splendid likenesses of Jodocus Vijdts and his wife Catherine Burluuts. The same vigorous style and coloured key of harmony charac- terizes the small Virgin and Child of 1432 at Ince, and the Madonna, probably of the same date, at the Louvre, executed for Rollin, chancellor of Burgundy. Contemporary with these, the male portraits in the National Gallery, and the Man with the Pinks, in the Berlin Museum (1432-4), show no relaxation of power; but later creations display no further progress, unless we accept as progress a more searcli- ing delicacy of finish, counterbalanced by an excessive soft- ness of rounding in flesh contours. An unfaltering minute- ness of hand and great tenderness of treatment may be~~

~~found, combined with angularity of drapery, and some awkwardness of attitude, in a full length portrait couple at the National Gallery (1434), in which a rare insight into the detail of animal nature is revealed in a study of a terrier dog. A Madonna with Saints, at Dresden, equally soft and minute, charms us by the mastery with which an arcli- tectural~~

~~*background is put in. The bold and energetic striving of earlier days, the strong bright tone, are not equalled by the soft blending and tender tints of the later ones. Sometimes a crude ruddiness in flesh strikes us asa growing defect, an instance of which is the picture in the museum of Bruges, in which Canon Van der Paelen is represented kneeling before the Virgin under the protection of St George (1434). From first to last Van Eyck retains his ability in portrait. Fine specimens are the two male*~~

~~*KEY HE—EY*~~

~~*likenesses in the gallery of Vienna (1436), and a female, the master's wife, in the gallery of Bruges (1439). His death in 1440-41 at Bruges is authentically recorded, He was buried in St Donat. Like many great artists he formed but few pupils. Hubert's disciple, Jodocus of Ghent, hardly does honour to his master's teaching, and only acquires importance after he has thrown off some of the peculiarities of Flemish teaching. Petrus Cristus, who was taught by Jolin, remains immeasurably behind him in every thing that relates to art. But if the personal influence of the Van Eycks was small, that of their works was immense, and it is not too much to say that their example, taken in conjunction with that of Van der Weyden, determined the current and practice of painting throughout the whole of Europe north of the Alps for nearly a century. (J. 4. c.)*~~

~~*EYE*~~

~~*HE sense of vision is excited by the influence of light*~~

~~*on the retina, the special terminal organ connected*~~

~~*with the optic nerve. By excitation of the retina, a change is induced in the optic nerve fibres, and is conveyed by these to the brain, the result being a luminous perception, or what we call a sensation of light or colour. If light were to act uniformly over the retina, there would be no image of the source of the light formed on that structure, and consequently there would be only a general conscious- ness of light, without reference to any particular object. One of the first conditions, therefore, of vision for useful purposes is the formation of an image on the retina. To effect this, just as in a photographic camera, refractive*~~

~~*structures must be placed in front of the retina which will so bend luminous rays as to bring them to a focus on the retina, and thus produce an image. Throughout the animal kingdom, various arrangements are found for this purpose ; but they may be all referred to three types, namely—(1) eye-specks or eye-dots, met with in Meduse, Annelide, &c.; (2) the compound eye, as found in insects and crustaceans; and (3) the simple eye, common to all vertebrates. The eye- specks may be regarded simply as expansions of optic nerve filaments, covered by a transparent membrane, but having no refractive media, so that the creature would have the consciousness of light only, or a simple luminous impression, by which it raight distinguish light from darkness. The compound eye (an account of which, as met with in the com- mon lobster, will be found under Crusracua, vol. vi. p. 637) consists essentially of a series of transparent cone-like bodies, arranged in a radiate manner against the inner sur- face of the cornea, with which their bases are united, while their apices are connected with the ends of the optic filaments. As each cone is separated from its neighbours, it admits only a ray of light parallel with its axis, and its apex represents only a portion of the image, which must be made up, like a mosaic-work, of as many parts as there are cones in the eye. When the cones are of considerable length, it is evident, from their form and direction, their apices being directed inwards, thut the oblique rays emanat- iug from a luminous surface will be cut off, and that only those rays proceeding along the axis of the cone will pro- duce an effect. Thus distinctness or sharpness of definition will be secured. The size of the visual field will depend on the form of the eye, the outermost cones marking its limits. Consequently the size of the visual field will depend onthe size of the segment of the sphere forming its surface. The eyes of many insects have a field of about half a sphere, so that the creature will see objects before and behind it as well*~~

~~*as those at the side. On the other hand, in many the eyes |*~~

~~*have scarcely any convexity, so that they must have a nitrow field of vision.*~~

~~*A description of the sintple eye will be found in the article ANATOMY, vol. i. p. 885 sg. Optically, it consists of a series of refractive media placed*~~

~~*in front of the retina by which rays emanating from an external object are brought to a focus on that structure. In this article, we shall con- sider (1) the physical causes of vision; (2) the optical arrangements of the eye; (3) the specific influence of light on the retina; (4) sensations of colour; (5) the movements of the eyes in vision; and (6) the psychical relations of luminous impressions.*~~

~~*1. PuysitcaL Causes oF VISION.*~~

~~*A luminous sensation may be excited by various modes of irritation of the retina or of the optic nerve. Pressure, cutting, or electrical shocks may act as stimuli, but the normal excitation is the influence of light on the retina. From a physical point of view, light is a mode of movement occurring in a medium, termed the ether, which pervades all space; but the physiologist studies the operation of these movements on the sentient organism as resulting in consciousness of the particular kind which we term a luminous impression. Outside of the body, such move- ments have been studied with great accuracy; but the physiological effects depend upon such complex conditions as to make it impossible to state them in the same precise way. Thus, when we look at the spectrum, we are conscious of the sensations of red and violet, referable to its two extremities: the physicist states that red is pro- duced by 392 billions of impulses on the retina per second, and that violet corresponds to 757 billions per second; but he has arrived at this information by inductive reasoning, from many facts which have not at present any physiological explanation, We cannot at present trace any connexion, as cause arid effect, between 392 billions of impulses on the retina per second and a sensation of red. Below the red and above the violet ends of the spectrum there are vibrations which do not excite luminous sensations. In the first case, belowthe red, the effect as a sensation is heat; and above the violet the result is that of chemical activity. Thus the method of dispersion of light, as is followed in passing a ray through a prism, enables us to recognize these general facts:—(1) rays below the red excite thermal impressions ; (2) from the lower red up to the middle of the violet, the thermal rays become gradually weaker until they have no effect ; (3) from the lower red to the extreme violet, they cause luminous impressions, which reach their greatest intensity in the yellow; and (4) from about the end of the yellow to far beyond the*~~

~~extreme violet, the rays have gradually a less and less luminous effect, but they i have the power of exciting such chemical changes as are~~

~~> =7>~~

~~EYE~~

~~produced in photography. In general terms, therefore, the lower end of the spectrum may be called thermal, the middle luminous, aud the upper actinic or chemical ; but the three merge into and overlap one another. It may be observed that the number of vibrations in the extreme violet is not double that of the low red, so that the sensibility of the eye to vibrations of light does not range through an octave. The ultra-violet rays may act on the retina in certain condi- tious, as when they are reflected by a solution of sulphate of quinine, constituting the phenomenon of fluorescence.~~

~~2. OpticAL ARRANGEMENTS OF THE EvE,~~

~~(1.) General. Wheu light traverses any homogeneous transparent medium, such as the air, it passes on in a straight course with a certain velocity; but if it meet with any other transparent body of a different density, part of it is reflected or returned to the first medium, whilst the remainder is propagated through the second medium in a different direction and with a different velocity. Thus we may account for the phenomena of reflection and of refraction, for which see the article Licnt. Let a 8, in fig. 1, be a plane surface of some transparent sub- stance, say a sheet of glass; a ray, c d, per- pendicular to the sur- face, will pass througi without refraction; but an oblique ray, ¢ f, will be sent in the direction eh. If the ray e A had passed from a dense into a rarer medium, then the direction would have beene g. It might also be shown that the sine of the angle of incidence always bears a certain ratio to the s¢nze of the angle of refraction; this ratio is termed the index of refraction. Thus, if aray pass from air into water, the sine of the angle of incidence will have to the sine of the angle of the refraction the ratio of 4: 3, or 4. é~~

~~Before a ray of light can reach the retina, it must pass through a number of transparent and refractive surfaces. The eye is a nearly spherical organ, formed of transparent parts situated behind each other, and~~

~~surrounded by various membranous structures, tlie anterior part of which is also transparent. The transparent parts are—(1) the cornea; (2) the aqueous humour, found in the anterior chamber of the eye; (3) the crystalline lens, formed by a transparent convex body, the anterior surface of which is less convex than the posterior; and (4) the wtreous humour, filling the posterior chamber of the eye. The ray must therefore traverse the cornea, aqueous humour, lens, aud vitreous humour. As the two surfaces of the cornea are parallel, the rays practically suffer no deviation in passing through that structure, but they are bent or re-fracted during their transmission through the other media.~~

~~From the optical point of view, the eye may be regarded as a dioptric system consisting of various refractive media. In such a system, as shown by Gauss, there are six cardinal points, which have a certain relation to each other. These ure—~~

~~Two focal points: every ray passing through the first focal point becomes, after its refraction, parallel to the axis, and every ray which before refraction is parallel! to the axis passes after its refraction to the sccond focal point; (2) Two principal points: every ray which passes through the first point before refraction passes after refrac- tion through the second, and every ray which passes through any point of a plane elevated on a perpendicular axis from the first principal point (the first principal plane) passes through the corre- sponding point of an analogous plane raised upon the axis at the second principal point (the sccond principal plane); and (3) Two~~

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~~g~~

~~ee Fic. 1.—Refraction of Light.~~

~~nodal points, which correspond to the optical centres of the two principal planes just alluded to. The distance of the first principal point froin the first focal point is called the anterior focal length, aud the term posterior focal length is applied to the distance of the posterior focal point from the second principal point. Listing has given the following measurements in~~

~~*millimetres from the centre of the cornea for the cardinal points in an ideal eye :— Anterior focal point…... 12°8326. Posterior focal point…... 22°6470. First principal point…... ‘ Second principal point… 25724.*~~

~~*First nodal point……...0. Second nodal point……... °7°6398. Anterior focal length….. 15-0072. Posterior focal lengtl…. 20°0746.*~~

~~*A view of such an ideal eye is shown in fig. 2.*~~

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~~*I*~~

~~*te} ——-*~~

~~*Fic. 2.—Transverse section of an Ideal or Schematique Eye.*~~

~~*A, Summit of cornea; SC, Sclerotic; 8, Schlemm’s canal; CH, Choroid; I, Iris; M, Ciliary muscle; R, Retina; N, Optic nerve; HA, Aqucous humour; L, Crystalline lens, the anterior of the double lines on its face showing its form during accommodation; HV, Vitreous humour; DN, Internal rectus muscle; DE, External rectus; YY’, Principal optical axis; gq, Visual axis, making an angle of 5° with the optical axis; C, Centre of the ocular globe. The cardinal points of Listing :—H Ha, principal points; K,K», nodal points; F,F2, principal focal points. The dioptric constants according to Giraud-Teulon :—H, Principal points united; giz, principal foci during the repose of accommodation; ‘1$’2, principal foci during the maximum of accommodation; O, fused nodal points.*~~

~~*The remaining measurements of such an eye are as follows:—*~~

~~*Radii of curvature. Of anterior face of cornea= 8 millimetres.*~~

~~*Of anterior face of lens =10 a*~~

~~*Of posterior face of lens = 6 ‘3 Indices of Refraction.*~~

~~*Aqueous humour……. 198 =1°3379*~~

~~*Crystalline lens …….0.+. 38 = 1°4545*~~

~~*Vitreous humour……. 193 =1°3379*~~

~~*The optical constants of the human eye may be still further simplified by assuming that the two 'principal points and the two nodal points respectively are identical. Thus we may construct a reduced eye, in which the princi- pal point is 2°3448 mm. behind the cornea, and the nodal point is 74969 mm., having an anterior focal length of 15 mm. and a posterior focallength of 20mm. The refracting surface, or lens, has a radius of 5 mm., and is 3 mm. behind the cornea; and the index of refraction is that of the aqueous humour, or 4,93.*~~

~~*(2.) The Formation of an Image on the Retina.—This may be well illustrated with the aid of an ordinary photo- graphic camera. If properly focussed, an inverted image will be seen on the glass plate at the back of the camera. It may also be observed by bringing the eye-ball of a rabbit*~~

~~*a A Z*~~

~~*b B Fic, 3.—Inversion by action of a Lens.*~~

~~*near a candle flame. 'The action of a lens in forming an*~~

~~*inverted imageis illustrated by fig. 3, where the pencil ofrays*~~

~~*proceeding from a is brought to a focus at a', and those*~~

~~*from 6 at 6', consequently the image of a 6 is inverted as at*~~

~~*b'a'. The three characteristic features of the retinal imago VIL — 103*~~

~~*818*~~

~~*are—(1) it is reversed ; (2) it is sharp and well defined if it be accurately focussed on the retina; and (3) its size depends on the visual angle. If we look at a distant object, say a star, the rays reaching the eye are parallel, and in passing through the refractive media, they are focussed at the posterior focal point,—that is, on the retina. A line from the luminous*~~

~~*point on the retina passing through the nodal point is called the line of direction. If the luminous object be not nearer than, say, 60 yards, the image is still brought to a focus on the retina without any effort on the part of the eye. Within this distance, sup- posing the condition of the eye to be the same as in look- ing at a star, the image would be formed somewhat behind the posterior focal point, and the effect would be an indis- tinct impression on the retina. To obviate this, for near distances, accommodation, so as to adapt the eye, is effected by a mechanism to be afterwards described.*~~

~~*When rays, reflected from an object or coming from a luminous point, are not brought to an accurate focus on the retina, the image is not distinct in consequence of the formation of what are called circles of diffusion, the pro- duction of which will be rendered evident by fig. 4. From*~~

~~*Fria. 4,—Formation of Circles of Diffusion.*~~

~~*the point A luminous rays enter the eye in the form of a cone, the kind of which will depend onthe pupil. Thus it may be circular, or oval, or even triangular. If the pencil is focussed in front of the retina, as at d, or behind it as at J, or, in other words, if the retina, in place of being at F, be in the positions G or H, there will be a luminous circle or a luminous triangular space, and many elements of the retina will be affected. The size of these diffusion circles depends on the distance from the retina of the point where the rays are focussed: the greater the distance, the more extended will be the diffusion circle. Its size will also be affected by the greater or less diameter of the pupil. Circles of diffusion may be readily studied by the following experiment, usually called the experiment of Scheiner :—*~~

~~*"2s sy*~~

~~*Fria, 5.—Diagram illustrating the experiment of Scheiner.*~~

~~*_ Let C be a lens, and DEF be screens placed behind it; hold in front of the lens a card perforated by two holes A and B, and allow rays from a luminous point a to pass through these holes; the es o on the screen E will be exact focus of the rays emanatin*~~

~~rom ; if were removed farther from the lens, the focus ceed be on F, and if it were brought near to C, the focus would then be on D. The screens F and D show two images of the point a. If, then, we close the upper opening in A B, the upper image m on F, and the lower image » on D, disappear. Suppose now that the retina be substituted for the screens D and F, the contrary will take place, in consequence of the reversal of the retinal image.~~

~~If the eye be placed at 0, only one image will be seen; but if it be .~~

~~placed either in the plane of F or D, then two images will be seen, are ™ m, Or 2; consequently in either of these planes there will be circles of diffusion and indistinctness, and only in the plane E will there be sharp definition of the image.~~

~~EYE~~

~~To understand the formation of an image on the retina, suppose a line drawn from each of its two extremities to the nodal point and continued onwards to the retina, as in fig. 6, where the visual angle is x It is evident that its size will depend on the size of the object and the distance of the object from the eye. Thus, also, objects of different sizes, c, d, ¢, in fig. 6, may be in- cluded in the same visual angle, as they are at different dis- tances from the eye. The size of the retinal image may obviously be calculated if we know the size of the object, its distance from the nodal point o, and the distance of the nodal point from the pos- terior focus. Let A be the size of the object, B its dis- tance from the nodal point, and C the distance of o from the retina, or 15 mm. ; then the size of the retinal image~~

~~_At+15~~

~~=~~

~~tinct points may be observed is 60 seconds; below this, the two sensations fuse into one; and the size of the retinal image corresponding to this angle is '004 mm., nearly the diameter of a single retinal rod or cone. Two objects, therefore, included in a visual angle of less than 60 seconds,~~

~~*appear as one point. A small visual angle is in most eyes a condition of sharpness of definition. With a large angle, objects appear less sharply marked. Acuteness is deter- mined by a few retinal elements, or even only one, being affected. A very minute image, if thrown on a single retinal element, is appareutly sufficient to excite it. Thus it is possible to see a brilliant point in au angle even so small as 4+ of a second, and a sharp eye can see a body the =5th of a line in diameter, that is, about the g45th part of an inch.*~~

~~*(3.) The Optical Defects of the Eye.—As an optical instrument, the eye is defective ; but from habit, and want of attention, its defects are not appreciated, and con- sequently they have little or no influence on our sensations. These defects are chiefly of two kinds—(1) those due to the curvature of the refractive surfaces, and (2) those due to the dispersion of light by the refractive media.*~~

~~*(a) Aberration of Sphericity.—Suppose, as in fig. 7, MAK to bea refractive sur- 2% face ou which parallel rays from L to§ im- pinge, it will be seen that those rays passing near the cir- cumference are g brought to a focus at F', and those passing near the centre at F?,—intermediate rays being focussed at N. Thus on the portion of the axis between F' and F? there will be a series of focal points, and the effect will be a blurred and beut image. In the eye this defect is to a large extent corrected by the following arrange- ments :—(1) the iris cuts off the outer and more strongly refracted rays; (2) the curvature of the cornea is more ellipsoidal than spherical, and consequently those farthest from the axis are least deviated ; (3) the anterior and pos- terior curvatures of the lens are such that the one corrects,*~~

~~*Fic, 6.—The Visual Angle.*~~

~~*The smallest visual angle in which two dis-*~~

~~*Fic. 7.—Spherical Aberration.*~~

~~*KEY E*~~

~~*to a certain extent, the action of the other; and (4) the structure of the lens is such that its power of refraction diminishes from the centre to the circumference, and conse- quently the rays farthest from the axis are less refracted.*~~

~~*(b) Astigmatism.—Another defect of the eye is due to different meridians having different degrees of curvature. This defect is known as astigmatism. It may be thus de- tected. Draw on a sheet of white paper a vertical and a horizontal line with ink, crossing at a right angle; at the point of distinct vision, it will be found impossible to see the lines with equal distinctness at the same time: to see the horizontal line distinctly the paper must be brought near the eye, and removed from it to see the verti- cal. In the cornea the vertical meridian has a shorter radius of curvature, and is consequently more refractive than the horizontal. The meridians of the lens may also vary ; but, as a rule, the asymmetry of the cornea is greater than that of the lens. The optical explanation of the defect will be understood with the aid of fig. 8,*~~

~~*(~· ea tee st*~~

~~*Fra, 8,—Diagram illustrating Astigmatism.*~~

~~*Thus, suppose the vertical meridian C A D to be more strongly curved than the horizontal F A E, the rays which fall on C A D will be brought to a focus G, and those fall- ing on F AE at B. If we divide the pencil of rays at suc- cessive points, G, H, I, K, B, by a section perpendicular to A B, the various forms it would present at these points are seen in the figures underneath, so that if the eye were placed at G, it would see a horizental line a a'; if at H, an ellipse with the long axis a a' parallel to A B; if at I, a circle ; if at K, an ellipse, with the long axis, 0 ¢, at right angles to A B; and if at B, a vertical line bc. The degree of astigmatism is ascertained by measuring the difference of refraction in the two chief meridians; and the defect is corrected by the use of cylindrical glasses, the curvature of which, added to that of the minimum meridian, makes its focal length equal to that of the maximum meridian. ; (c) Aberration of Refrangibility —When a ray of white light traverses on a lens, the different rays composing it, being unequally refrangible, are dispersed : the violet rays (see fig. 9), the most refrangible, are brought to a focus at*~~

~~*Fic. 9,—Diagram illustrating the Dispersion of Light by a Lens.*~~

~~*e, and the red rays, less refrangible, at d. Ifa screen were placed at e, a series of concentric coloured circles would be formed, the central being of a violet, and the circumference of ared colour. The reverse effect would be produced if*~~

~~*the screen were placed at d, Imagine the retina in place . of the screen in the two positions, the sensational effects would be those just mentioned. Under ordinary circum- stances, the error of refrangibility due to the optical con- struction of the eye is not observed, as for vision at near distances the interval between the focal point of the red and violet rays is very small. If, however, we look at a candle flame through a bit of cobalt blue glass, which trans- — mits only the red and blue rays, the flame may appear violet surrounded by blue, or blue surrounded by violet, according as we have accommodated the eye for different distances. Red surfaces always appear nearer than violet surfaces situated in the same plane, because the eye has to be accommodated more for the red than for the violet, and consequently we imagine them to be nearer. Again, if we contemplate red letters or designs on a violet ground the eye soon becomes fatigued, and the designs may appear to move.*~~

~~*(d) Defects due to Opacities, &c., in the Transparent Media.—When small opaque particles exist in the transparent media, they may cast their shadow on the retina so as to give rise to images which are projected outwards by the mind into space, and thus appear to exist outside of the body. Such phenomena are termed entoptic. They may be of two kinds :—(1) eatra-retinal, that is, due to opaque or semi- transparent bodies in any of the refractive structures anterior to the retina, and presenting the appearance of drops, striz, lines, twisted bodies, forms of grotesque shape, or minute black dots dancing before the eye; and (2) intra-retinal, due to opacities, &c., in the layers of the retina, in front of Jacob's membrane. The intra-retinal may be prodaced in a normal eye in various ways. (1) Throw a strong beam of light on the edge of the sclerotic, and a curious branched figure will be seen, which is an image of the retinal vessels. The*~~

~~*construction of these images, usually called Purkinje's figures, will be understood from fig. 10. Thus, in the figure to the left, the rays passing*~~

~~*BJA*~~

~~*Fic, 10.—Purkinje's Figures.*~~

~~*In the eye to the right the illumination is through the sclerotic, and in the one to the left through the cornea. through the sclerotic at b," in the direction 6"c, will throw a shadow of a vessel at c on the retina at 0', and this will appear as a dark line at B. If the light move from b" to a', the retinal shadow will move from 0' to a', and the line in the field of vision will pass from B to A. It may be shown that the distance ¢ b' corresponds to the distance of the retinal vessels from the layer of rods and cones (see Anatomy, vol. i. p. 888), If the light enter the cornea, as in the figure to the right, and if the light be moved, the image will be displaced in the same direction as the light, if the movement does not extend beyond the middle of the cornea, but in the opposite direction to the light when the latter is moved up and down. Thus, if a be moved to a', d will be moved to d', the shadow on the retina from ¢ to c', and the image d to db'. If, on the other hand, a be*~~

~~*820*~~

~~*moved above the plane of the paper, d will move below, consequently ¢ will move above, and 0' will appear to sink, (2) The retinal vessels may also be seen by looking at a stroug light through a minute aperture, in front of which a rapid to and fro movement is made. Such experiments prove that the sensitive part of the retina is its deepest and most external layer (Jacob's membrane).*~~

~~*(4.) Accommodation, or the Mechanism of Adjustment for Different Distances.—When a camera is placed in front of an object, it is necessary to focus accurately in order to obtain a clear and distinct image on the sensitive plate. This may be done by moving either the lens or the sensitive plate backwards or forwards so as to have the posterior focal point of the lens corresponding with the sensitive plate. For similar reasons, a mechanism of adjustment, or accom- modation for different distances, is*~~

~~*necessary in the human eye. In the norma] eye, any number of parallel rays, com- ing from a great distance, are focussed on the retina. Such an eye is termed emmetropic (fig. 11, A). Another form of eye (B) may be such that parallel rays are brought A to a focus in front of the retina, This form of eye is myopic or short-sighted, & inasmuch as, for distinct vision, the object must be brought near the eye, so as to catch the divergent rays, which are then focussed on the retina. A third form is seen in C, where the focal point, for ordinary dis- tances, is behind the re- tina, and consequently the object must be held far off, so as to allow only the less divergent or parallel rays to reach the eye. This kind of eye is called hyper- metroyne, or far-sighted. For ordinary distances, at which objects must be seen distinctly in every-day life, the fault of the myopic eye may be corrected by the use of concave and of the hyper- metropic by convex glasses. In the first case, the concave glass will remove the posterior focal point a little farther back, and in the second the convex glass will bring it farther forwards; in both cases, however, the glasses may be so adjusted, both as regards refractive index and radius of curvature, as to bring the rays to a focus on the retina, and consequently secure distinct vision.*~~

~~*From any point 65 metres distant, rays may be regarded as almost parallel, and the point will be seen without any effort of accommodation. This point, either at this distance or in infinity, is called the punctum remotum, or the most distant point seen without accommodation. In the myopic eye it is much nearer, and for the hypermetropic there is really no such point, and accommodation is always necessary, Ifan object were brought too close to the eye for the refrac- tive media to focus it on the retina, circles of diffusion would be formed, with the result of causing indistinctness of vision, unless the eye possessed some power of adapting itself to different distances. That the eye has some such power of accommodation is proved by the fact that, if we attempt to look through the meshes of a net at a distant object, we cannot see both the meshes and the object with equal distinctness at the same time. Again, if we look con- tinuously at very near objects, the eye speedily becomes fatigued. Beyond a distance of 65 metres, no accommoda-*~~

~~*Fig. 11. A, Emmetropic or normal eye; B, Myopic or short-sighted eye; C, Hypermetropic or long-sighted eye.*~~

~~*EY &*~~

~~*must be adapted to the diminished distance until we reach a point near the eye which may be regarded as the limit of visibility for near objects. This point, called the punctum prowmum, is usually 12 centimetres (or about 4 inches) from the eye. The range of accommodation is thus from the punctum remotum to the punctum proximum.*~~

~~*The mechanism of accommodation has been much dis- puted, but there can be no doubt it is chiefly effected by a change in the curvature of the anterior surface of the crys- talline lens. If we hold a lighted candle in front anda little to the side of an eye to be examined, three reflections may be seen in the eye, as represented in fig. 12. The first, a, is erect, large, and bright, from the anterior surface of the cornea; the second, 0, also erect, but dim, from the anterior surface of the crystalline lens; and the third, c, inverted, and very dim, from the posterior surface of the lens, or perhaps the concave surface of the vit- reous humour to which the convex sur- face of the lens is adapted. Suppose the Fie. 12.—Reflected three images to be in the position shown in 1™48°s in the Bye. the figure for distant vision, it will be found that the middle image b moves towards a, on looking at a near object. The change is due to an alteration of the curvature of the lens, as shown in fig. 13. The changes occurring during accom-*~~

~~*Fic. 13.—Mechanism cf Accommodation.*~~

~~*A, The lens during accommodation, showing its anterior surface advanced; B, The lens as for distant vision; C, Position of the ciliary muscle. modation are:—(1) the curvature of the anterior surface of the crystalline lens increases, and may pass from 10 to 6 mm. ; (2) the pupil contracts; and (3) the intraocular pressure increases in the posterior part of the eye. An ex- planation of the increased curvature of the anterior surface of the lens during accommodation has been thus given by Helmholtz. In the normal condition, that is, for the emmetropic eye, the crystalline lens is flattened anteriorly by the pressure of the auterior layer of the capsule; during accommodation, the radiating fibres of the ciliary muscle pull the ciliary processes forward, thus relieving the tension of the*~~

~~anterior layer of the capsule, and the lens at once bulges forward by its elasticity. The exact mechanism of~~

~~the ciliary muscle is still not clearly understood. Helmholtz has succeeded in measuring with great accu- racy the sizes of these reflected images by means of an in- strument termed an ophthalmometer, the construction of which is based on the following optical principles. When a luminous ray traverses a plate of glass having parallel sides, if it fall perpendicular to the plane of the plate, it will pass through without deviation; but if it fall obliquely on the plate (as shown in the left hand diagram in fig. 14) it under- goes a lateral deviation, but in a direction parallel to that of the incident ray, so that to an eye placed behind the glass plate, at the lower A, the luminous point, upper A, would be in the direction of the prolonged emergent ray, and thus there would be an apparent lateral displacement~~

~~tion is necessary ; but within it, the condition of the eye | of the point, the amount of which would increase with the~~

~~EYE~~

~~obliquity of the incident ray. If, instead of one plate, we take two plates of equal thickness, one placed above the other, two images will be seen, and by turning the one plate with reference tv the other, each image may be displaced a little to one side. The instrument consists of a small tele- scope (fig. 14) T, the axis of which coincides with the plane separating the two glass plates CC and BB. When we look at an object X Y, and turn the plates till we see two objects ay, xy touch- ing each other, the size of the image X Y will be equal to the distance the one object is displaced to the one side and the other object to the other side. Having thus measured the size of the reflection, it is not difficult, if we know the size of the object reflecting the light and its distance from the eye, to calculate the radius of the curved surface, (See Woinow's Ophthalmometrie, St Petersburg, 1871, and an account given in Appendix to M'Kendrick's Outlines of Physiology, 1878.) The general result is that, in accommo- dation for near objects, the middle reflected image becomes smaller, and the radius of curvature of the anterior surface of the lens becomes shorter. Fra. or 7 eect~~

~~*5.) Absorption and Reflection of view of the Ophthalmo- eae Rays from the Eye— ™eter of HIelmholtz. When light enters the eye, it is partly absorbed by the black pigment of the choroid and partly reflected. The reflected rays are returned through the pupil, not only follow- ing the same direction as the rays entering the eye, but uniting to form an image at the same point in space as the luminous object. The pupil of an eye appears black to an observer, because the eye of the observer does uot receive any of those reflected rays, If, however, we strongly illuminate the retina, and hold a lens in front of the eye, so as to bring the reflected rays to a focus nearer the eye, then a virtual and erect, or a real and reversed, image of the retina will be seen. Such is the principle of the ophthal- moscope, invented by HIelmholtz in 1851. Eyes deficient in pigment, as in albinos, appear luminous, reflecting light of a red or pink colour; but if we place in front of such an eye a card perforated by a round hole of the diameter of the pupil, the hole will appear quite dark, like the pupil of an ordinary eye. In many animals a portion of the fundus of th2 eyeball has no pigment, and presents an iridescent appearance. This is called a tapetum. It probably renders the eye more sensitive to light of feeble intensity.*~~

~~*(6.) Functions of the Iris. —Theirisconstitutesa diaphragm which regulates the amount of light entering the eyeball. The aperture in the centre, the pupil, may be dilated by contraction of a system of radiating fibres of involuntary muscle, or contracted by the action of another system of fibres, forming a sphincter, at the margin of the pupil. The radiating fibres are controlled by the sympathetic, while those of the circular set are excited by the third cranial herve. 'The variations in diameter of the pupil are deter- mined by the greater or less intensity of the light acting on the retina. A strong light causes contraction of the pupil; with light of less intensity, the pupil will dilate. In the human being, a strong light acting on one eye will often cause contraction ofthe pupil, not only in the eye affected, but in the other eye. These facts indicate that the phenomenon is of the nature of a reflex action, in which the fibres of the*~~

~~*optic nerve act as sensory conductors toa centre in the encephalon, whence influences emanate which affect the pupil, It has been ascertained that if the fibres of the optic nerve be affected in any way, contraction of the pupil follows. The centre is probably in the anterior pair of the corpora quadrigemina, as destruction of these bodies causes immobility of the pupil. On the other hand, the dilating fibres are derived from the sympathetic; and it has been shown that they come from the lower part of the cervical, and upper part of the dorsal, region of the cord. But the iris seems to be directly susceptible to the action of light. Thus, as was first pointed out by Brown-Séquard, the pupil of the eye of a dead animal will contract if exposed to light for several hours, whereas, if the eye on the opposite side be covered, its pupil will remain widely dilated, as at the monient of death.*~~

~~*The pupil contracts under the influence—(1) of an in- creased intensity of light ; (2) of the effort of accommodation for near objects; (3) of a strong convergence of the two eyes; and (4) of such active substances as nicotine, morphia, and physostigmine; and it ddlates under the influence—(1) of a diminished intensity of light; (2) of vision of distant objects ; (3) of a strong excitation of any sensory nerve ; (4) of dyspnoea ; and (5) of such substances as atropine and hyoscyamine. The chief function of the iris is to so moderate the amount of light entering the eye as to secure sharpness of definition of the retinal image. This it accomplishes by (1) diminishing the amount of light reflected from near objects, by cutting off the more divergent rays and admitting only those approaching a parallel direc- tion, which, in a normal eye, are focussed on the retina 3 and (2) preventing the error of spherical aberration by cutting off divergent rays which would otherwise impinge near the margins of the lens, and would thus be brought to a focus in front of the retina,*~~

~~*3. Sprciric INFLUENCE oF Lian? oN THE RETINA.*~~

~~*The retina is the terminal organ of vision, and all the parts in front of it are merely optical arrangements for securing that an image will be accurately focussed upon it. The natural stimulus of the retina is light. It is often said that it may be excited by mechanical and electrical stimuli; but such an observation really applies to the stimulation of the fibres of*~~

~~*the optic nerve. It is well known that such stimuli applied to the optic nerve behind the eye produce always a luminous impression ; but there is no proof that the retina, strictly speaking, is similarly affected. Pressure or electrical currents may act on the eyeball, but in doing so they not only affect the retina, con- sisting of its various layers and of Jacob's membrane, but also the fibres of the optic nerve. It is probable that the retina, by which is meant all the layers except those on its surface formed by the fibres of the optic nerve, is affected only by its specific kind of stimulus, light. This stimulus so ff aects the terminal apparatus as to set up actions which in turn stimulate the optic fibres. The next question naturally is——What is the specific action of light on the retina? Professors Holmgren of Upsala individually, and Dewar and M'Kendrick conjointly, have shown that when light falls on the retina it excites a variation of the natural electrical current obtained from the eye by placing it on the cushions of a sensitive galvanometer. The general effect was that the impact of light caused an increase in the natural electrical current,—during the continuance of light, the current diminished slowly, and fell in amount even below what it was before the impact,—and that the with- drawal of light was followed by a rebound, or second increase, after which the current fell in strength, as if the eye suffered from fatigue.*~~

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~~*It was also observed in this research that the amount of electrical variation produced by light of various intensities corresponded pretty closely to the results expressed by Fechner's law, which regulates the relation between the stimulus and the sensational effect in sensory impressions. This law is, that the sensational effect does not increase proportionally to the stimulus, but as the logarithm of the stimulus. Thus, supposing the stimulus to be 10, 100, or 1000 times increased, the sensational effect will not be 10, 100, or 1000 times, but only 1, 2, and 3 times greater. This law, then, applies to the phenomena happening in the terminal organ, and not, as generally supposed, exclusively to those occurring in the brain.*~~

~~*Such electrical phenomena probably result either from thermal or chemical changes in the retina. Recent researches of Boll and Kiihne*~~

~~*have shown that light pro- duces chemical changes in the retina. If an animal be killed in the dark, andif its retina be exposed only to yellow rays, the retina has a peculiar purple colour, which is at once destroyed by exposure to ordinary light. The purple matter apparently is decomposed by light. Kiihne has also shown that an image may actually be jived on the retina by plung- ing it into a solution of alum immediately after death. Thus it would appear that light affects the purple-matter of the retina, and the result of this chemical change is to stimulate the optic filaments ; if the action be arrested, we may have a picture on the retina, but if it be not arrested, the picture is evanescent ; the purple-matter is used up, and new matter of a similar kind is formed to take its place. The retina might, therefore, be compared to a sensitive plate having the sensitive matter quickly removed and re- placed by chemical changes; and it is probable that the electrical expression of these changes is what has been above described.*~~

~~*(a) Phosgenes.—Luminous impressions may also be pro- duced by pressure on the eyeball. Such impressions, termed phosgenes, usually appear as a luminous centre surrounded by coloured or dark rings. Sometimes they seem to be small bright scintillations of various forms. Similar appearances may be observed at the moments of opening or of closing a strong electrical current transmitted through the eyeball.*~~

~~*(b) The Retina's Proper Light.—The visual field, even when the eyelids are closed in a dark room, is not absolutely dark. 'There is a sensation of faint luminosity which may at one moment be brighter than at another. This is often termed the proper light of the retina, and it indicates a certain condition of molecular activity, even in darkness.*~~

~~*(c) The Excitability of the Retina.—The retina is not equally excitable in all its parts. At the entrance of the optic nerve, as was shown by Mariotte in 1668, there is no sensibility to light. HIence, this part of the retina is called*~~

~~*the blind spot. If weshut the left eye, fix the right eye on the cross seen in fig. 15, and move the book towards and tion will be found when the*~~

~~*round spot disappears, that*~~

~~*the entrance of the optic Fic. 15.—Diagram for the study nerve. There is also com- ot ip POM SRE*~~

~~*of the optic papilla is about 1°8 min., giving an angle of 6 degrees; this angle determines the apparent size of the cause a human figure to disappear at a distance of two metres (Beaunis).*~~

~~*sensitive to light, and it is chiefly employed in direct vision. Thus, if we fix the eye on a word in the centre of this line,*~~

~~*away from the eye, a posi-*~~

~~*is when its image falls on .*~~

~~*plete insensibility to colours at that spot. The diameter*~~

~~*blind spot in the visual field, and it is sufficiently large to The yellow spot in the centre of the retina is the most*~~

~~*EY i*~~

~~*it is distinctly and sharply seen, but the words towards each end of the line are vague. If we wish to see each word distinctly, we "run the eye " along the line,—that is, we bring each successive word on the yellow spot. This spot has a horizontal diameter of 2 mm., and a vertical diameter of '8 mm.; and it corresponds in the visual field to an angle of from 2 to 4 degrees. It is believed that the fossa in the spot, where there are almost no retinal elements except Jacob's membrane, consisting here entirely of cones (2000 in number), is the area of most acute sensibility. This fossa has a diameter of only '2 mm., which makes the angle ten times smaller. Thus the field of distinct vision is extremely limited, and at the same moment we see only a very small portion of the visual field. Images of external objects are brought successively on this minute sensitive area, and the different sensations seem to be fused together, so that we are conscious of the object as a whole.*~~

~~*Towards the anterior margin of the retina sensitiveness to light becomes diminished; but the diminution is not uniform, and it varies in different*~~

~~*persons.*~~

~~*(d) Duration and Persistence of Retinal Impressions.— To excite the retina, a feeble stimulus must act for a certain time ; when the retina is excited, the impression lasts after the cessation of the stimulus; but if the stimulus be strong, it may be of very short duration. Thus the dura- tion of an electrical spark is extremely short, but the impression on the retina is so powerful, and remains so long, as to make the spark visible. If we rotate a disc having white and black sectors we see continuous dark bands. Even if we paint on the face of the disc a single large round red spot, and rotate rapidly, a continuous red band may be observed. Here the impressions of red on the same area of retina succeed each other so rapidly that before one disappears another is superadded, the result being a fusion of the successive impressions into one continuous sensation. This phenomenon is called the persistence of retinal impressions. It has been ascertained that an im- pression lasts on the retina from 4 to 35 of a second. If we look steadily at a bright light for a few seconds and then quickly close the eyes or gaze into a dark room, a luminous image of the light will be visible for a short time. Such an appearance is called a positive accidental image, or a consecutive image, It may also be observed in this ex- periment that the intensity of the retinal excitation is not uniform. It increases quickly at its commencement, and after it has reached a maximum it slowly declines. Many familiar toys, such as the thaumatrope, or wheel of life, stroboscopic discs, and the phenakistoscope, produce curious effects due to persistence of retinal impressions.*~~

~~*(e) The Phenomena of Irradiation.—If we look at fig. 16, the white square in the black field appears to be larger than the black square in the white field, although both are of precisely the same size. This is due to zvradiation, a phenomenonexplained by Helmholtz, by stat- ing that the borders of clear surfaces advance in the visual field and encroach on obscure surfaces. Probably, even with the most exact accommodation, diffusion images form round the image of awhite surface on a black ground, forming a kind of pen- umbra, thus causing it to appear larger than it really is.*~~

~~*(f) Intensity of Light required to excite the Retina.—Light must have a certain intensity to produce a luminous impres- sion. It is impossible to fix the minimum intensity*~~

~~*A B*~~

~~*Fic. 16,—Illustrating the effect of irradiation.*~~

~~*necessary, as the effect will depend, not only on the inten- sity of the stimulus, but on the degree of retinal excitability at the time. Thus, after the retina has been for some time in the dark, its excitability is increased ; on the other hand, it is much diminished by fatigue. Aubert has stated that the minimum intensity is about 300 times less than that of the full moon. The sensibility of the eye to light is measured by photometers, instruments which will be de- scribed under the article Lieut.*~~

~~*(9) Consecutive Retinal Images.—Images which persist on the retina are either positive or negative. They are termed positive when the bright and obscure parts of the image are the same as the bright and obscure parts of the object; and negative, when the bright parts of the object are dark in the image, and vice versa. Positive images are strong and sharply marked when an intense light has acted for not less than $ of a second. If the excitation be continued much longer, a negative and not a positive image will be seen. If, when the positive image is still visible, we look on a very brilliantly illuminated surface, a nega- tive image appears. Negative images are seen with greatest intensity after a strong light has acted for a con- siderable time. These phenomena may be best studied when the retina is very excitable, as in the morning after a sound sleep. On awakening, if we look steadily for an instant at the window and then close the eyes, a positive image of the window will appear; if we then gaze fixedly at the window for one or two minutes, close the eyes two or three times, and then look ata dark part of the room, a negative image will be seen floating before us. The positive image is due to excitation of the retina, and the negative to fatigue. If we fatigue a small area of the retina with white light, and then allow a less intense light to fall on it, the fatigued area responds feebly, and conse- quently the object, such as the*~~

~~*window pane, appears to be dark. Many curious experiments may be made to illustrate the laws of consecutive images. Thus, if we look at a black figure on a white ground for, say, one minute, and then gaze into a dark part of the room, a gigantic white figure, of corresponding shape, may make its appearance. A white figure ou a black ground will produce a black image, a green figure will produce a red, and a red a green,—the reproduced colour being always complementary to that of the figure,*~~

~~*4, SENSATIONS or CoLouR.*~~

~~*(1.) General Statement.—Colour isa special sensation ex- cited by the action on the retina of rays of light of a definite wave length. Thus we have a sensation of red when a certain number of waves of light impinge on the retina in a unit of time, and with about twice the number of waves in the same time the sensation will not be of red but of violet. When we examine a spectrum, we see a series of colours merging by insensible gradations the one into the other, thus :—red, orange, yellow, green, blue, and violet. These are termed simple colours, If two or more coloured rays of the spectrum act simultaneously on the same spot of the retima, they may give rise to sensations of mized colours. These mixed colours are of two kinds :—(1) those which do not correspond to any colour in the spectrum,*~~

~~*'such as purple and white, and (2) those which do exist in*~~

~~*the spectrum. White may be produced by a mixture of two simple colours, which are then said to be complementary. Thus, red and greenish-blue, orange and cyanic-blue, yellow and indigo-blue, and greenish-yellow and violet all produce white. Purple is produced by a mixture of red and violet, or red and bluish-violet. When white light falls on a sur- face, the surface may absorb all the rays except the red. If the red rays are alone reflected, then the object will be*~~

~~*red; if the green rays are reflected, then the object will appear to be green. Again, if we look through red glass, all the rays are absorbed except red, and consequently the world beyond appears to be red. So with regard to the other transparent coloured media, The following table b y HIelmholtz shows the compound colours produced by mixing other colours :—*~~

~~*Violet Indigo- Cyanie- Greenish- Green Yellowish- Yellow*~~

~~*blue blue blue green Red | Purple Deep- White- White Whitish- Golden Orange c rose rose yellow yellow Orange Deep- White White Whitish- Yellow Yellow*~~

~~*rose rose yellow Yellow White White Whitish- Whitish- Yellowish- ; rose green green green Yellowish-| White Green Green Green green*~~

~~*Green Blue Water- Greenish-*~~

~~*blue blue Greenish- | Water- Water-*~~

~~*blue | blue blue Cyanie Indigo- blue blue*~~

~~*This table shows that if we mix two simple colours, not so far separated in the spectrum as the complementary colours, the mixed rR colour contains more Re white as the interval between the colours employed is greater, and that if we mix two colours further b distant in the Spec- Fia. 17.— Form of double slit for the partial trum than the com- superposition of two spectra, plementary colours, the mixture is whiter as the interval is smaller. By mixing more than two simple colours, no new colours are produced, but only different shades of colour.*~~

~~*(2.) Modes of Mixing Colour — Sensations.— Various methods have been adopted for study- © ing the effect of mixing colours.*~~

~~*(a) By Super- posing two Spectra (HIelmholtz and Clerk Maxwell).— This may be done in a simple way by having a slit in the form of the letter V (see fig. 17), of which the Ca two portions ab and be form a right angle ; be- hind this slit is placed fil a vertical prism, and two #4 spectra are obtained, as f seen in fig. 18, in which*~~

~~*Fic. 18,— Diagram of double spectrum partially superposed.*~~

~~*b fea is the spectrum of '*~~

~~*of the slit a b, and ce fd uf a*~~

~~*that of the slit dc, the ~-B9.—_____ Eo e*~~

~~*coloured spectra are con- : tained in the triangle Fia. 19.—Diagram showing Lambert's gef, and, by arran ge- method of mixing sensations of colour. ment, the effects of mixture of any two simple colours may be observed.*~~

~~*(b) By Lambert's Method of Reflection.—Place a red wafer on 0, in fig. 19, and a blue wafer on d, and so angle a small glass plate a as to transmit to the eye a reflection of the blue wafer on d in the same line as the rays transmitted from the red wafer on 0. 'The sensation will be that of purple ; and by using wafers of different colours, many experiments may thus be performed.*~~

~~*(c) By the Use of Rotating Discs which quickly super- pose on the same Area of Retina different Impressions of Colowr.—Such discs may be constructed of cardboard, on which coloured sectors are painted, as shown in fig. 20, representing diagrammatically the arrangement of Sir Isaac*~~

~~*824*~~

~~*Newton. The angles of the sectors were thus given by lim :— eee 60° 45°5/ Green .,.....60° 45°65' Orange…...+s 34° 10°5' BIG ssssocssves 54° 41' Yellow…..... 54° 41' Indigo…....34° 10°5' b fic) Cl ebaceenuacoocucobead: 60° 45°5'*~~

~~*With sectors of such a size, whete will be produced on rotating the disc rapidly. This method has been carried out with great efficiency by the colour-top of Clerk Maxwell. It is simply a flat top, on the surface of which discs of various colours may be placed. Dancer has*~~

~~*Blue*~~

~~*added to it a method by Orange which, even while the top is rotating rapidly, Red*~~

~~*and the sensation of a mixed volour is strongly perceived, the eye may be able to see the semple colours of which it is composed. This is done by placing on the handle of the top, a short distance above the coloured surface, a thin black disc, perforated by holes of various size and pattern, and weighted a little on one side. This disc vibrates to and fro rapidly, and breaks the continuity of the colour-impression; aud thus the consti- tuent colours are readily seen.*~~

~~*(3.) Physiological Characters of Colowrs.—All colours have three special characters :—(1) Z"one, depending on the number of vibrations per second ; (2) Zntensity, depending on the extent or amplitude of the vibrations, and passing from the most sombre to the most brilliant shades; and (3) Saturation, which depends on the amount of white the colour contains; thus, it is saturated when there is no white, as in the pure colours of the spectrum, and there may bean infinite number of degrees of saturation from the pure colour to white.*~~

~~*(4.) The Geometric Representation of Colours,—Colours may be arranged in a linear series, as in the solar spectrum. Each point of the line corresponds to a de- terminate impression of colour ; the line is not a straight line, as regards luminous effect, but is better re- presented by a curve, passing from the re to the violet. Thiscurve might be represented as a circle in the circumference of which the various colours might be placed, in which case the complementary colours would be at the extremities of the same diameter. Newton arranged the colours in the form of a triangle, as shown in fig. 21. If we place three of the spectral colours at three angles, thus,—green, violet, and red,—the sides of the triangle include the intermediate colours of the spectrum, except purple.*~~

~~*The point S corresponds to white, consequently, from the inter- section of the lines which join the complementary colours, the straight lines from green to S, RS, and V 8S, represent the amount of green, red, and violet necessary to form white ; the same holds good for the complementary colours ; for example, for blue and red, the line S B=the amount of blue, and the line S R=the amount of red required to form white. Again, any point, say M, on the surface of the triangle, will represent a mixed colour, the composition of*~~

~~*which may be obtained by mixing the three fundamental colours in the proportions represented by the length of the lines M to green,*~~

~~*Fic, 20.—Diagram of the Colour Disc of Sir Isaac Newton.*~~

~~*Violet*~~

~~*Purple*~~

~~*Fic. 21.—Geometrical representation of the relatious of colours as shown by Newton.*~~

~~*EYE*~~

~~*MV, and MR. But the line V M passes on to the yellow Y; we may then replace the red and green by the yellow, in the pro- portion of the length of the line M Y, and mix it with violet in the proportion of S V. The same colonr would also be formed by mixing the amount M Y of yellow with MS of white, or by the amount R M of red with the amount M D of greenish blue.*~~

~~*(5.) The Theory of Colowr-Perception.—The theory generally accepted ae a oa B vO was first proposed by Thomas Young and afterwards re- vived by Helmholtz.*~~

~~*It is based on the as-*~~

~~*sumption that three*~~

~~*kinds of nerve fibres*~~

~~*exist in the retina,*~~

~~*the excitation of*~~

~~*which give respec-*~~

~~*tively sensations of 2*~~

~~*red, green, and vio-*~~

~~*let. These may be*~~

~~*regarded as funda-*~~

~~*mental sensations.*~~

~~*Homogeneous light*~~

~~*excites all three, g*~~

~~*but with different*~~

~~*intensities according*~~

~~*to the length of the*~~

~~*wave. Thus long*~~

~~*waves will excite*~~

~~*most strongly fibres sensitive to red, medium waves those*~~

~~*sensitive to green, and short waves those sensitive to violet.*~~

~~*Fig. 22 shows graphically the irritability of the three sets*~~

~~*of fibres. Helmholtz thus applies the theory :—*~~

~~*"* 1, Red excites strongly the fibres sensitive to red and feebly the other two—sensation : Red,*~~

~~*2. Yellow excites moderately the fibres sensitive to red and green,*~~

~~*feebly the violet—sensation : Yellow.*~~

~~*. Green exeites strongly the green, feebly the other two—sensa- tion : Green.*~~

~~. Blue excites moderately the fibres sensitive to green and violet, and feebly the red—sensation: Blue.~~

~~. Violet exeites strongly the fibres sensitive to violet, and feebly the other two—sensation : Violet.~~

~~. When the excitation is nearly equal for the three kinds of fibres, then the sensation is White."~~

~~This theory explains some of the phenomena of what is called colowr blindness or Daltonism. All individuals appear to have some kind of colour-sensation; in some, however, there may be no sensation for particular colours. The most common defect is insensibility to red (Daltonism properly so called), The spectrum to such an eye is deficient in red, and the scnsation corresponding to all compound colours containing red is that of the complemen- tary colour only. Thus, white is bluish-green, and intense red appears green, so that red poppies in a green cornfield do not appear of a different hue from the green by which they are surrounded. If we suppose in such cases an absence or paralysis of the red-fibres, the phenomena are accounted for. Blindness to green and violet are rare.~~

~~Young's theory also explains the appearance ef the conse- cutive coloured images already referred to.~~

~~Kr © , G B Vv~~

~~Fig, 22.—Diagram showing the irritability of the three kinds of retinal elements. 1. Red; 2. Green; 3. Violet. R, O, Y, G, B, V, initial letters of colours.~~

~~a ot Fe &~~

~~Suppose, for example, that we look at a red object for a con: siderable time; the retinal elements sensitive to red beeome fa- tigued. Then (1) if the eye be kept in darkness, the fibres affected by red being fatigued do not act so as to give a sensation of red ; those of green and of violet have been less excited, and this excita- tion is suffieient to give the sensation of~~

~~*pale greenish blue ; (2) if the eye be fixed on a white surface, the red fibres, being fatigued, are not excited by the red rays contained in the white light; on the contrary, the green and violet fibres are strongly excited, and the consequence is that we have an intense complementary image ; (3) if we look at a bluish-green surface, the complementary of red, the effect will be to excite still more strongly the green and violet fibres, and consequently to have a still more intense complementary*~~

~~*image ; (4) if we regard a red surface, the primitive colour, the red fibres are little affected in consequence of being fatigued, the green and violet fibres will be only feebly excited, and therefore only a very feeble complementary image will be seen; and, (5) if we look at a surface of a different colouraltogether, this colour may combine with that of the consecutive image, and produce a mixed colour ; thus, on a yellow surface, we will see an image of an orange colour.*~~

~~*(6.) The Contrast of Colowrs.—If we look at a small white, grey, or black object on a coloured ground, the object appears to have the colour complementary to the ground. Thus a circle of grey paper on a ved ground appears to be of a greenish-blue colour, whilst on a blue ground it will appear pink. This effect is heightened if we place over the paper a thin sheet of tissue paper; but it disappears at once if we place a black ring or border round the grey paper. Again, if we place two complementary colours side by side, both appear to be increased in intensity. Various theories have been advanced to explain these facts. Helmholtz is of opinion that the phenomena consist more in modifications in judgment than in modifications of sensa- tion ; Plateau, on the other hand, attempts to explain them by the theory of consecutive images.*~~

~~*5. THe MoveMENTs OF THE Eye.*~~

~~*(1.) General Statement.—The globe of the eye has a centre of rotation, which is not exactly in the centre of the optic axis, but a little behind it. On this centre it may move round axes of rotation, of which there are three,—an antero- posterior, a vertical, and a transverse. In normal*~~

~~vision, the two eyes are always placed in such a manner as to be fixed on one point, called the fixed point or the point of regard. A line passing from the centre of rotation to the point of regard is called the line of regard. The two lines of regard form an angle at the point of regard, and the base is formed by a line passing from the one centre of rotation to the other. A plane passing through both lines of regard is called the plane of regard. With these definitions, we can now describe the movements of the eyeball, which are of three kinds, (1) First position.—The head is erect, and the line of regard is directed towards the distant horizon. (2) Second position.—This indi- cates all the move- inf) ments round the ~ transverse and _ hori- zontal axes. When theeye rotates round the first, the line of regard is displaced above or below, and makes with a line indicating its former position an angle termed by Helmholtz the angle of vertical displacement, or the ascensional angle; and when it rotates round the vertical axis, the line of re- gardis displaced from side to side, forming with the median plane of the eye an angle called the angle of lateral displacement. (3) Third order of positions.—This includes all those which the globe may assume in performing a rotatory movement along with lateral or vertical displacements. This movement of rota-~~

~~tion is measured by the angle which the plane of regard~~

~~bl sufo~~

~~r. A rihf r\ int~~

~~Fic, 23.—Diagram of the attachments of the muscles of the eye and of their axes of rota- tion, the latter being shown by dotted lines, (Fick.)~~

~~The axis of rotation of the rectus internus and externus being vertical, that is, perpendicular to the plane of the paper, cannot be shown,~~

~~makes with the transverse plane, an angle termed the angle of rotation or of torsion.~~

~~*The two eyes move together as a system, so that we direct the two lines of regard to the same point in space.*~~

~~*The eyeball is moved by six muscles, which are described in the article ANaTomy, vol. i., p. 891. The relative attach- ments and the axes of rotation are shown in fig. 23. The following table, given by Beaunis, summarizes their action :—*~~

~~*Direction of Line of Regard.*~~

~~*Number of Muscle 7. nog a le Muscles acting. Internal rectus. External rectus. Superior rectus. Inferior oblique. Inferior rectus. Superior oblique. Internal rectus, | Superior rectus. Inferior oblique. {inferior rectus.*~~

~~*Upwards*~~

~~*Downwards {*~~

~~*Inferior rectus. Superior oblique. External rectus, | Sipetor rectus. Inferior oblique.*~~

~~*External rectus. | Interie rectus. Superior oblique.*~~

~~*Outwards and downwards ……..*~~

~~*The term visual field is given to the area intercepted by the extreme visual lines which pass through the centre of the pupil, the amount of dilatation of which determines its size. It follows the movements of the eye, and is displaced with it. Each point in the visual field has a corresponding point on the retina, but the portion, as already explained, which secures our attention is that falling on the yellow spot. "G.) Simple Vision with Two Eyes.—When we look at an object with both eyes, having the optic axes parallel, its image falls upon the two yellow spots, and it is seen as one object. If, how- ever, we displace one eyeball by pressing it with the finger, then the image in the _,, displaced eye does not fall on the yellow * ,*~~

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~~~

~~*orem ey,*~~

~~*~·,*~~

~~*A spot, and we see two objects, oneof them {0>t ~· being less distinct than the other. It is a not necessary, however, in order to see a single object with two eyes that the two images fall on the two yellow spots; an object is always single if its image fall on corresponding points in the two eyes. Thus, in the experiment above described, after having seen two images by displacing one eyeball, we may be able*~~

~~*Fic, 24, — Diagram to illustrate the physiological rela- tions of the two retine.*~~

~~*again to see only one image by pressing on the other fi eyeball. There are then cor- i responding points in the two retinze, so that if they were superposed the two yellow spots would coincide; the upper and lower parts of the left retina would touch the upper and lower parts of the right retina; the nasal side of the left retina would correspond to the temporal side of the right retina, and*~~

~~*the reverse would also hold ? 8 good. The relation of the 3 _ 7 two retinz to each other in + 3 6*~~

~~*S 6*~~

~~*the field of vision may be — 4 5 illustrated by the diagram Fic. 25. — Diagram to illustrate phe- in fig. 24. When an image mena of double vision. (Miiller.) falls on non-corresponding points of the retina, it is seen double.*~~

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~~*Thus. as in fig 25, suppose two eyes looking ata single object, placed at a. b. orc. If the image of the point 0 fall in one eye on 6 and in the other on 7, the point 6 of the one re- tina being correspondent with the point 6 of*~~

~~*the other retina, the distance of the two images seen will be equal to the distance between 6 and 7. Again, if images of @ fall on 5 and 5, it will be seen single. Further, if the image of b fall on the left eye at 6 and on the right at 4, as these two points do not correspond, it will appear double. And so with regard to the other retinal points indicated by the numbers.*~~

~~*The phenomena may also be studied with the aid of fig. 26. Any object at a", or at b", or at c", will be seen simply by the two eyes A and B, as the images fall on corresponding points in the retine, namely, aa', bb', and cc'. It will be readily seen that, if the eye B were displaced, the images would not fall on corresponding points, and consequently two would be seen.*~~

~~*Fic. 26.—Diagram to illustrate the theory of corresponding retinal points. (Miiller.)*~~

~~*The name horopter has been given to a line connecting those points in the C visual field which form their image on corre- A sponding points of the retina. 'The older phy- siologists first gave this name to "a straight line or plane, passing through the point of convergence of the axes of the eyes or the point to which the eyes are directed ;" but Vieth and Miiller showed that it cannot be a straight © c line or plane, but must Fic, 27.—Diagram to illustrate the simple have a circular form. horopter.*~~

~~*Thus if the points a, 8, c in fig. 26 correspond to the points GU, c', the angles 4 and 1 in the one eye must correspond to the angles 4 and 1 in the other. Then a b being equal to a b', the angle 1 in eye A equal to angle lin eye B, the angles 1' and 1' will be equal. Since the angles 2 and 2 are equal, the angles 3 and 3 must also be equal. In the same way, the angle 5 is equal to angle 3, For b c==b'c', and angle 4 = angle 4. Thus the angles 3, 8, and 5 are equal, and a" 6" ¢" can- not lie in a straight line, for it is the pro- perty of a circle only that angles erected on the same chord, and reach ing the periphery have at the periphery equal angles. (Muller's Phy- siology, vol. ii. p. 1195.) A line joining a", ", and ¢" is therefore the simple horopter, and its form is illustrated by fig. 27. It 1s a circle, of which the chord is formed by the distance between the points of decussation of the rays of light in the eye (K ACK in fig 27). Its size is deter- mined by the position of the two eyes, and the point toward which*~~

~~their axes converge. This is illustrated by fig. 28. Thus ifa b be the distance of the eyes from each other, the circle ¢ is the horopter for the object marked 1, the circle d fo: 2, and the circle ¢ for 3.~~

~~An object which is not found in the horopter, or, in~~

~~Fic. 28.—Diagram illustrating the simple horopter of objects at different distances from the eyes.~~

~~EY &~~

~~other words, does not form an -mage on corresponding points of the retinze, is seen double. When the eyeballs are so acted upon by their muscles as to secure images on non corresponding points, and consequently double vision, the condition is termed strabismus, or squinting, of which there are several varieties treated of in works on ophthalmic surgery. It is important to observe that in the fusion of double images we must assume, not only the correctness of the theory of corresponding points of the retina, but also that there are corresponding points in the brain, at the central ends of the optic fibres. Such fusion of images may occur without consciousness,—at all events it is possible to imagine that the cerebral effect (except as regards consciousness) would be the same when a single object was placed before the two eyes, in the proper position, whether the individual were conscious or not. On the other hand, as we are habitually conscious of a single image, there is a psychical tendency to fuse double images when they are not too dissimilar.~~

~~(3.) Binocular Perception of Colowr.—This may be studied as follows. Take two No. 3 eye-pieces of a Hartnack's microscope, or two eye-pieces of the same optical value from any microscope, placee on in front of each eye, direct them to a clear window in daylight, keep them parallel, and two luminous fields will be seen, one corresponding to each eye. Then converge the two eye- pieces, until the two luminous circles cross, and the central part, like a bi-convex lens, will appear clear and bright, while the outer segments will be much less intense, and may appear even of a dim grey colour. Here, evidently, the sensation is due to a fusion of impressions in the brain. With a similar arrangement, blue light may be~~

~~*admitted by the one eye-piece and red by the other, and on the con-vergence of the two, a resultant colour, purple, will be observed. This may be termed the binocular vision of colours. It is remarkable that by a mental effort this sensation of a compound colour may be decomposed into its constituents, so that one eye will again see blue and the other red.*~~

~~*6. Tur PsycHicAL RELATIONS OF VISUAL PERCEPTIONS.*~~

~~*(1.) General Characters of Visual Perceptions.—All visual perceptions, if they last for a sufficient length of time, appear to be external to ourselves, erect, localized in a position in space, and more or less continuous.*~~

~~*(a) Viswal Sensations are referred to the Exterior.—This appears to be due, to a large extent, to habit. Those who have been born blind, on obtaining eye-sight by an opera- tion, have imagined objects to be in close proximity to the eye, and have not had the distinct sense of exteriority which most individuals possess, Slowly, and by a process of education, in which the sense of touch played an impor- tant part, they gained the knowledge of the external rela·· tions of objects. Again, phosgenes, when first produced, appear to be in the eye, but when conscious of them, by an effort of imagination, we may transport them into space, although they never appear very far off.*~~

~~*(6) Visual Sensations are referred to Erect Oljects.—Although the images of objects are inverted on the retina we see them erect. The explanation of the effect is that we are conscious not of the image on the retina, but of the luminous object from which the rays proceed, and wa refer the sensation in the direction of these rays. Again, in running the eye over the object, say a tall pole, from base to apex, we are not conscious of the different images on the retina, but of the muscular movements necessary to bring the parts successively on the yellow spot.*~~

~~*(c) Visual Sensations are referred toa Position in Space.—The localization of a luminous point in space can only be*~~

~~*EY EH*~~

~~determined by observing its relations to other luminous points with a given position of the head and of the eye. Vor example, in a perfectly dark room, if we look at a single luminous point, we cannot fix its exact position in space, but we may get some information of a vague char- acter by moving the head or the eye. If, however, a second luminous point appears in the darkness, we can tell whether it is nearer or farther distant, above or below the first. So with regard to other luminous points we observe their reciprocal relations, and thus we localize a number of visual impressions, There are three principal directions in space—(1) the transverse (breadth), the vertical (height), and the sagittal (depth). Luiminous points may be localized either in the transverse or vertical directions. Here we have to do simply with localization on a surface. A num- ber of points may be observed simultaneously (as when the eye is fixed) or successively (as when the eye moves). If the movement of the eye be made rapidly, the series of im- pressions from different points may be fused together, and we are conscious of a line, the direction of which is indicated chiefly by the muscular sensations felt in following it. The case is different as regards points in the sagittal direction. We see only a single point of this line at a time; it may be a transverse series of retinal elements A, B, and each of these formed by a number of smaller elements 1, 2, 3, 4 situated in the axis of each principal element; it may be, on the other hand, the transverse line a 0 situated~~

~~in space and formed by a series of points in juxtaposi- tion. Each of these points will impress a retinal ele- A* ment, and the result will be ° the perception of a transverse line; but this will not be the same for the points c,d, e, f,g, situated in space in a linear series, in the sagittal direc- tion; only one of those points ¢ will impress the corre- sponding retinal element, and we can see only one point at a time in the line cy. By accommodating successively, however, for the various points at different and considerable distances along the line cg, we may excite retinal elements in rapid succession. Thus, partly by the fusion of the successive impressions on the retina, and partly from the muscular sensations caused by repeated accommodations and possibly of ocular movements, we obtain a notion of depth in space, even with the use of only one eye. It is, however, one of the chief effects of binocular vision to give precision to the notion of space in the sagittal direc- tion.~~

~~*(d) Visual Sensations are continuous.—Suppose the image of a luminous line falls on the retina, it will appear as a line although it is placed on perhaps 200 cones or rods, each of which may be separately excited, so as to cause a distinct sensation. Again, on the same principle, the im- pression of a superficial surface may be regarded as a kind of mosaic, made up of individual portions corresponding to the rods or cones on which the image of the surface falls. But in both cases, the sensation is continuous, so that we see a line or a surface. The individual images are fused together.*~~

~~*(2.) Motions derived from Visual Perceptions.—When we look at any object, we judge of its size, the direction of its surfaces (unless it be a point), its distance from the eye, its apparent movement or fixedness, and its appearance of solidity.*~~

~~*(2) Apparent Size.—This, so far as regards a compara- tively small object, depeuds on the size of the retinal*~~

~~*~ wos © we*~~

~~*B*~~

~~*Qh omer*~~

~~*e e ° e*~~

~~*:*~~

~~*oe @ oe #8 eee 8 e e e . eee.*~~

~~*e e e es e °*~~

~~*Fic. 29.—Diagram illustrating the localization of visual perceptions.*~~

~~*827*~~

~~*image, as determined by the visual augle. With a very large object, there is an appreciation of size from the mus- cular sensations derived from the movements of the eyeball, as we "range"*~~

~~*the eye over it. It is o eee bd*~~

~~*: C difficult to appreciate ’ : — the distan ce separating Fra. ee beac nt illusions two points between which there are other points, as contrasted with an apparently similar distance without intermediate points. For example, the distance A to B appears to be greater than from B to OC, in fig. 30.*~~

~~*(6) Direction.—As the retina is a curved surface, a long straight line, especially when seen from a distance, appears curved. In fig. 31 a curious illusion of direction, first shown by Zoell- ner, is depicted. If these lines be looked at some- what obliquely, say from one corner, they will appear to con- verge or diverge, and the oblique lines, on each side of the ver- tical lines, will appear not to be exactly opposite each other. But the vertical lines are parallel, and the oblique lines i pide. are continuous £!¢- 31— Zoellner’s figure showing an illusion of*~~

~~*direction. across them. The effect is evidently due to an error of judgment, as it may be controlled by an intense effort, when the lines will be seen as they really are.*~~

~~*(c) Apparent Distance.—We judge of distance, as regards large objects at a great distance from the eye—(1) from their apparent size, which depends on the dimensions of the visual angle, and (2) from the interposition of other objects between the eye and the distant object. Thus, at sea, we cannot form, without great experience, an accurate estimate of how many miles we are off the coast, and all know how difficult it is to estimate accurately the width of a river. But if objects be interposed between the eye and the distant object, say a few vessels at different distances at sea, or a boat in the river, then we have certain materials on which to form a judgment, the accuracy of which, however, even with these aids, will depend on experience, When we look at a near object, we judge of its distance chiefly by the sense of effort put forth in bring- ing the two lines of regard to converge upon it.*~~

~~*(d) The Movement of a Body.—If the eye be fixed, we Judge of movement by suecessive portions of the retina being affected, and possibly also, by a feeling of an absence of muscular contractions neces- sary to move the*~~

~~eye-balls. When the eye moves, so as to "follow" the object, there is a sense of muscular effort, which is increased when, in additio? we require to move the head.~~

~~(e) The Apparent Solidity of an Object.—If we look at an object, say a cube, first with the right eye and then with the left, it will be found that the two images of the object are somewhat different, as in fig. 32. If, then, by means of a stereoscope, or by holding~~

~~vy;~~

~~SI~~

~~Fia. 32.—Illustrating stereo. scopic vision.~~

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~~a card between the two eyes, and causing a slight con- vergence of the eyes, the two images are brought upon corresponding points of the two retine, the image will at once be seen in relief.~~

~~Consult regarding the physiology of the eye, as the most com- plete treatise on the subject, Helmholtz's Optique Physiologique, 1867; one of the best of the older treatises is Mackenzie On the Lye and Vision, 1841 ; in the first-mentioned treatise, a full list is~~

~~EZEKIEL (8p!) ie, O€ PIM, God will strengthen, or OX pil), God will prevail; "IeCexuyA; Lzechiel) was the son of Buzia priest, probably of the line of Zadok, who appears to have lived in Jerusalem, and to have held a position of some prominence there. According to an ancient and not impossible interpretation of his own words (chap. i. 1), Ezekiel was born in 624 B.c. 'This interpretation is at least preferable to that which reckons "the thirtieth year" from a hypothetical era of Nabopolassar; but it is not free from all objection, and if it fail us we have no data for precisely determining the prophet's age. Notwithstanding the expression made use of by Josephus (ats dv, Ant., x. 7, 3) we may reasonably assume, however, that he had at least attained to early manhood, and already had read and observed much, when, along with King Jehoiachin and many other~~

~~*prisoners of the better class (2 Kings xxiv. 12-16; Jer. xxix. 1) he was carried into exile by Nebuchadnezzar in 599 zB.c. With others of his com- patriots he was settled at a place called Tel-Abib ("Corn- hill"), on the banks of the river Chebar, by which most probably the Nahr-Malcha or "Grand" Canal of Nebuchadnezzar is meant, though some still think of the Chaboras (modern Khabur), an affluent of the Euphrates more to the north.1 We are left almost wholly to precarious iufereuce and conjecture for all further de- tails of his history. We learn incidentally, indeed, from his writings that he was a married man living in a house of his own, and that his wife died in the ninth year of his exile. But of the nature of his ordinary employments, if he had any, we are not informed. HIs life, as a priest whose heart was thoroughly absorbed in priestly work, could hardly fail to be tinged with sadness, condemned as it was to be spent in an " unclean land" far away from " the inheritance of the Lord." HIe seems to have been of a brooding temperament, and to have passed much of his time in silence and solitude. A recent writer (in the Studien uw. Kritiken for 1877) has ingeniously sug- gested and endeavoured to show that he was an invalid, suffering much from some chronic nervous malady. In the fifth year of his exile (594 B.c.) he had a remarkable vision, of which he has given a very full description in the opening chapters of his book. On this occasion he was divinely called to the prophetic office. Thenceforward, for a period of at least 22 years, both orally and in writing, he continued to discharge prophetic functions at frequent if somewhat irregular intervals ; and whatever may have been the force and bitterness of the opposition he originally had to face, he ultimately, as a "' watchman " and acknowledged leader of public opinion, caine to exercise an incalculably powerful influence in keeping alive the Jewish national feeling, and also in quickening and purifying the religious hopes and aspirations of his time. The last date mentioned in his writings is the 27th year of his exile (572 B.c.). Tt is not probable that he lived long after that time. Nothing authentic, however, has been handed down to us as to the time, place, or manner of his death. Several unimportant*~~

~~*1 Bleek (ini. § 221, note) is probably wrong in identifying both 'V5 and Chaboras with the WAM of 2 Kings xvii. 6, which is most*~~

~~probably the Khabur, a tributary of the Tigris (Delitzsch, Jesaja, -p. 16, note). ,~~

~~HEZE—EZE~~

~~given at the end of each section of all the more important works and monographs bearing on the physiology and optical arrange- ments of the eye, up to 1867. A very valuable bibliographical account is one recently published by J. Plateau, entitled Biblio- graphis analytique des principaux phénoménes subjective de la Vision depuis les temps aneiensjusqw a la fin du XVILIe sitele, swivie d'une bibliographie simple pour la partie écoulée du siécle aetuel: extrait du tome xlit. des Mémoires de UV Aeadémie royale des sciences, des lettres, et des beaux-arts de Belgique, 1877. (J. G. M.)~~

~~traditions may be found in the work of the Pseudo- Kpiphanius, De vit. c mort. proph., in the Itinerary of Benjamin of Tudela, and elsewhere.~~

~~In the present Massoretic canon the book of Ezekiel stands third in order among those of the so-called Nebi'tm Aharénim (latter prophets), being preceded by those of Isaiah and Jeremiah, and followed by that of the twelve minor prophets. In the list of canonical books given in the Talmud (Baba bathra, 14, 2) it is the second of the four, being followed by "Isaiah" and "the twelve." Its arrangement is unusually simple, the chronological cor- responding for the most part with the natural order. Its three divisions date respectively from before, during, and after the siege of Jerusalem.~~

~~1. The first 24 chapters carry the reader from the time of the prophet's consecration down to the beginning of the siege of Jerusalem, 7.c., from 594 to 590 B.c. They are made up of some 29 distinct oracles, all of which, with the trifling exception of xxi. 33-37 [28-32], have direct reference to the religious and political condition of Ezekiel's cornpatriots in Babylonia and in Palestine. First in order stands the famous "chariot" (comp. 1 Ch. xxviii. 18) vision, which has been so variously estimated, both from thezsthetic and from the theological point of view, by different critics. Rightly interpreted, as a mere description, it cannot justly be called vague or obscure, and it is hard to account for the strange stories told of~~

~~*the difficulties felt by the Jews in expounding it. The prophet sees in a storm-cloud coming out of the north a group of four living creatures (cherubs), each with four wings and four different faces, Together they are borne upon four wheels which are full of eyes. Resting upon their heads is a firmament, supporting a sapphire throne, whereon is seated a man-like figure, which is almost hidden in a blaze of light. Hereupon Ezekiel receives and eats the bitter-sweet roll in which are written "lamentations and mourning and woe;" he is now ready to go forth to his fellow-countrymen fearlessly declaring the truth as it is revealed to him, however unwelcome it may be. The recorded oracles that follow belong to the fifth, sixth, seventh, and ninth years of his exile. They can be understood only when viewed in connexion with the general history of that period. Soon after his accession to the throne, Zedekiah, the uncle and successor of Jehoiachin, had begun to intrigue against his suzerain the king of Babylon, and had entered into secret relations with the king of Egypt. Ezekiel, like his older contemporary Jere- miah, had insight and sagacity enough to see the unwisdom of sucha policy. By various symbolical actions (iv. 1-8; iv. 9-17; v. 1-4; vi. 11; xii, 1-16; xxi. 116), and aiso by unequivocal words, he repeatedly declared the certainty of the doom that was impending over Jerusalem, Judah, and all the mountains of Israel ; he insisted on the uselessness of any struggle against Babylon, and distinctly predicted Zedekiah's captivity, blindness, and death. In language of the severest invective he rebuked the sins and idolatries, worse than those of Sodom, which had brought this inevi- table ruin upon the land and people of the Lord; at the same time he held forth the hope of ultimate restoration and final happiness for both Judah and Ephraim at the end of "forty years," under the guidance of the coming prince*~~

~~*EZEKIEL*~~

~~*"whose right it is" (chaps. xi. 14-21; xvii, 22-24; xx, 40-44 ; xxi. 32 [27]).*~~

~~*2. The eight chapters which follow (xxv.-xxxii.) belong to the period which elapsed between the beginning of the siege and the announcement of the capture of Jerusalem ; xxix, 17-21 is an exception, belonging to the 27th year of the prophet's exile, and perhaps also chap. xxv., which has no date. During this period the pro- phet had no word to speak*~~

~~*concerning Judah and Israel. In these chapters the divine woe is pronounced against the seven neighbouring nations which had shown most hos- tility to Judah and Israel, namely, Ammon, Moab, Edom, Philistia, Tyre, Sidon, and Egypt. The oracles relating to Tyre and Egypt are of great length. The others are com- paratively brief. With regard to Tyre its capture aud ruin by Nebuchadnezzar are peel ; and it is predicted that within a very short time Egypt shall be desolate forty years. The addition (xxix. 17-21) made seventeen years afterwards is apparently due to the fact that the earlier prediction regarding Tyre (xxvi. 7-14) had not been literally fulfilled. 'This section contains several passages that are specially interesting from a literary point of view. The description of the great merchant city in chap. xxvii. is noticeable for the richness of its details, and also for the vigour with which the comparison to a ship is carried out in ver. 5-9, 26-36. Striking also is the dirge (chap. xxviii. 12-19) upon the king: "Thou deftly made signet-ring, full of wisdom, and perfect in beauty— thou hast been in Eden, the garden of God 3 every pre- cious stone was thy covering, the sardius, the topaz, and the diamond. ... Beside the overshadowing cherub did I place thee ; thou wast upon the holy mountain of God ; thou walkedst up and down in the midst of stones of fire. Thou wast perfect in thy ways from the day that thou wast created, till iniquity was found in thee. By the multitude of thy merchandise they have filled the midst of thee with violence, and thou hast sinned; therefore I will cast thee as profane out of the mountain of God, and the overshadow- ing cherub shall destroy thee from the midst of the stones of fire." As Tyre had been likened toa ship, so is Egypt with great minuteness of detail likened to a cedar in chap. xxxi. In chap. xxxii. follows a corresponding dirge, in which the assembled nations are represented as mourning women singing their lament over Egypt's grave.*~~

~~*3. The remainder of the book (xxxiii.—xlviii.) dates from after the fall of Jerusalem. In chap, xxxiii. we read how the prophet's dumbness was taken away in the twelfth (more probably the eleventh?) year of his exile, on the day when tidings were brought of the ruin of the city. There- upon chap. xxxiv. opens with a brief retrospect, in which the former avarice, idleness, and cruelty of Israel's shepherds which have led to such disaster are exposed and rebuked. But the future—the immediate and the distant —chiefly ocenpies the prophet's mind. HIe tells of a coming shepherd,*~~

~~*"David," under whose rule great and uninterrupted pros- perity is to be secured, Edom is to be finally destroyed, but the twelve tribes are to be resuscitated and gathered together in their own land once more. A final battle has yet to be fought with Gog from the land of Magog, who shall come up against the chosen people with a great army, but only to be utterly destroyed, that Israel may thence- forward dwell in safety, wholly secure from eny possible repetition of former calamities. Then follow in detail the final arrangements of the reorganized theocracy. The new*~~

~~*1 The language of xxiv. 27, taken along with that of xxxiii. 22, has led many to the conclusion that Ezekiel was literally dumb during this period, and that the oracles belonging to it must necessarily have been written, not spoken. But xxix. 21, dating from a much later period, requires to be also considered in this counexion. He may possibly*~~

~~*have been speechless on certain subjects only. * So the Peshito and a few of the MSS. See Ewald, Hitzig, Bleek.*~~

~~*temple, its dimensions, construction, furniture, are described; new laws as to sacrifice and festival are given for the priests, prince, and people of the new commonwealth. Directions are given for the equitable partition of the Holy Land among the twelve tribes, and for the building of the new city, which is to be called by the new name Jahveh Shammah, "the Lord is there." In all these regulations a general formal resemblance to the Pentateuchal legislation is abundantly manifest ; but the differences of detail are no less striking. The following may be mentioned among others. Ezekiel's temple is larger, but simpler, than that of Solomon. The distinction between the Holy and the Most Holy Place is much less marked. Both ark and high-priest are passed over in silence. The priesthood is specifically Zadokite. The "prince" has priestly functions assigned him. The morning burnt-offering is brought into special prominence; of the great, festivals, the passover and the feast of tabernacles alone are noticed. The feast of pentecost is omitted, nor is any mention made of the great day of atonement, but an observance unknown in the Pen- tateuch, on the Ist and 7th of the first month, is proposed instead,*~~

~~*The genuineness of the book of Ezekiel has seldom been questioned. Some perplexity has been caused by the state- ment in the Talmud (Baba bathra 15, 1) that the men of the great synagogue "wrote" Ezekiel. — This obscure expression, by which most probably mere editing was meant, has been deprived of some of its importance by Kuenen's demonstration of the unhistorical character of the entire tradition regarding the great synagogue, To- wards the close of last century some doubts were ex- pressed by Oeder, Vogel, and an anonymous English writer in the Monthly Magazine (1798), with regard to the genuineness of the last nine chapters, which were supposed rather to be of a Samaritan origin, and by Corodi with respect also to chaps. xxxviii. and xxxix.; but these doubts were unanimously set aside by the not too conservative critics of that period. Zunz (Gottesdienstliche Vortrdge, 1832 ; also Gesammelte Schriften, i. 217 f., 1875) was the first to impugn the genuineness of the entire work, his thesis, in its most recent form, being that no such prophet as Ezekiel ever existed, and that the present work bearing that fictitious name was written somewhere between tlie years 440 and 400 n.c. His arguments are partly of the a priort kind, such as that the special predictions con- tained in it (xvii. 16, xxiv. 2, 16, &c.) are inconsistent with the genuineness of the book, and that it is inconceiv- able that in 570 B.c. any prophet could ever have thou ght of suggesting a new division of the Holy Land, or of drafting a new law-book, or of sketching the plans of a new temple and city. He argues further from the silence of other scriptures, particularly of Jeremiah and of the book of Ezra, with regard to Ezekiel; from certain allusions in the book itself, sucli as those to Daniel, to the wine of Halybon, &c. ; also from its grammatical and linguistic peculiarities, There is still practical unanimity, nevertheless, among critics of all schools in the opinion that the stamp of Ezekiel's in- dividuality is unmistakably and even obtrusively visible in every page of the book that bears his name. Keil and Kuenen agree in holding him to have been its author, and its editor as well. He is believed indeed not to have reduced it to its present form till near the close of his life ; and many have embraced the opinion of Ewald, that the earher dates have in some cases been incorrectly given by him. The text, it ought to be remembered, however, has reached us in a somewhat impure state.*~~

~~*The question principally discussed in recent years, and likely to be discussed for some time to come, in connexion with Ezekiel's name is not whether he wrote less than tradition has assigned to him, but rather whether he may*~~

~~*830*~~

~~*not possibly have written more. In connexion with his theory of the late origin of the priestly legislation in the Pentateuch, Graf, in 1866, arguing from admitted simi- larities of style, gave it out as his belief that Ezekiel was the author of certain chapters of Leviticus (xviii.—xxiiL, xxv., xxvi.). This view, which in substance has subse- quently been adopted by Colenso and a few others, is inanifestly one which does not admit of anything like demonstration. On the other hand, the larger and more interesting inquiry as to the relative priority of the Levitical and Deuteronomic legislations does not fall to be discussed in this place (see PENTATEUCH).*~~

~~*It remains that something should be said of Ezekiel's place as an author and as a religious teacher. His work may be judged from the purely literary point of view more fairly perhaps than that of any of the earlier prophets,—for, unlike them, he was a writer much more than he was a preacher. His oracles were sometimes written before they were spoken; sometimes he wrote what he had no intention of speaking at all. He may he called one of the first sopherim or scribes, if we use that word in its higher sense as denoting " bookmen," and not mere readers or copyists. As a leader of public opinion, he handled a variety of sub- jects in a corresponding variety of styles, but always with a manner entirely his own. His prose is invariably simple and unaffected; if there be any obscurity at all, it is really caused by his excessive desire to make it impossible for his reader to misunderstand him. His poetry has suffered much at the hands of translators, and the student who is wholly dependent on our Authorized Version will be often at a loss to understand the comparisons to Aéschylus, Dante, or Milton which have occasionally been suggested. More than that of any other prophet, it has been subjected to the extremes of exaggerated praise and undue depreciation by its critics. The sympathetic modern reader, however, will be able to find*~~

~~*in it a sublimity, a tenderness, a beauty, a melody, wholly peculiar to itself. Chapter xix., which even Schrader pronounces " masterly," may be specially referred to; also chapters xxviii. and xxxil.*~~

~~*As a religious teacher, it is natural to compare Ezekiel with Jeremiah, his older contemporary, on the one hand, and with his immediate successor, the author of Isa. xl.—lxvi., on the other. It has frequently been said (most strongly perhaps by Duhm) that the contrast is very great, and very much to the disadvantage of Ezekiel. The three men, nevertheless, have much that is common to them all. If Ezekiel sometimes (and especially in his closing chapters) shows a preponderating externalism, a tendency to delight in the fulness and minuteuess of his ceremonial details, it must not be forgotten that Jeremiah too looked forward to a restored sanctuary and a reorganized priesthood as essen- tial elements in the perfected theocracy of the future. And if the "Great Unnamed" be justly regarded as one of the loftiest and purest exponents of the spiritual religion of coming days, we must at the same time remember that Ezekiel too had bidden men seek above all things that city, open only to the pure in heart, of which the glory is that 'the Lord is there."*~~

~~*Ezekiel is nowhere mentioned by name in the New Testament, and the direct traces of his writings there, apart from those in the Apocalypse, are comparatively few. Matt. vu. 24-27 compared with Ezek. xiii 10-13, and John x. 16 compared with Ezek. xxxiv, 22, 23, may be referred to Both directly, however, and also through the writer of the Apocalypse, his influence upon Christian thought, and especially upon Christian eschatology, has been con- siderable.*~~

~~*Litcraturc.—For the ancient, medieval, and earlier modern com- mentaries, see Carpzow and other works of introduction. The most Important works of recent date are those of Ewald, Die*~~

~~*| 1500 of his fellow-countrymen.*~~

~~*EZH—EZR*~~

~~*Propheten des alien Bundes, vol. ii. 2nd. ed., 1868, Engl. tr. 1877; Havernick, Commentar ti. d. Proph. Ezechiel, 1843; Hitzig, D. Proph.*~~

~~*Hzechiel, 1847 ; Fairbairn, Laposition of the Book of Ezekiel, 1851; Kliefoth, D. Buch EIIzechiels, 1865; IIengstenberg, D, Weissagungen d. Pr. Ezechiels, 1867 ; Keil, D. Proph. Ezechiel, 1868 ; The Speaker's Commentary, vol. vi., 1876. See also Ewald's G@e- schichte d. V. Isr., iv. 18 ff.; Kuenen, Godsdienst van Isracl, vol. ii, and Profeten en Profetie, 1875, Eng. tr. 1877; Schrader's article "Ezekiel"" in Schenkel's Bibel-Lexicon; Duhm, Die Theologie der Propheten, 1875. On the critical questions see Zunz, Gottesdienstliche Vortrige, p. 157-299, and Gesammelte Schrif- ten, 1875; Graf, D. geschichtliche Biicher des A. B. 1866 ; Kuenen, in Theol. Tijdschrift for Sept. 1870; Colenso, The Pentateuch and Book of Joshua critically examined, part vi., 1872; Klostermann on "Ezekiel" in the Studien wu. Kritiken for 1877. The English reader may be referred to The IIoly Bible with various renderings and readings, London, 1876. Bunsen's Bibelwerk will also be found useful by the ordinary reader of German. (J. 8. BL.)*~~

~~*EZRA (S71¥ 7.e, help; "Eodpas; ZIIsdras), the famous scribe, was a priest of the line of Zadok. According to the genealogy given in Ezra vii. 1-5, his father's name was Seraiah. If we identify this Seraiah with the person men- tioned in Ezra ii. 2, Neh. xii. 1, then the Ezra who is the subject of the present article may well be identified, as has been done by Michaelis and others, with the Ezra named in the last-quoted texts ; and in this case he must have been a very old man even at the beginning of that public work with which his name is chiefly associated. But a careful comparison of the genealogy in 1 Ch. vi. 4-15 with that in Ezra vii. leads rather to the conclusion that the latter has most probably been abridged, so far as the more immediate and Jess eminent ancestors of our Ezra are concerned. They are omitted probably because, though closely con- nected with Joshua, the son of Josadak, they did not avail themselves of the permission, granted by Cyrus, to return to Jerusalem in 5386. They do not seem on that account, however, to have lost much, if any, of the social influence to which their high rank in the priesthood entitled them. Josephus tells us, somewhat mysteriously, that Ezra himself was high-priest of the Jews who were left in Babylon. Be this as it may, we know that when he first appears in history, in the seventh year of Artaxerxes Longimanus (458 B.c.), he is already a man of great learning, zeal, and authority, enjoying the confidence, not only of his own compatriots, but*~~

~~*also of the Persian king. It is to be regretted that we should so imperfectly know what was the true condition of the Jews in Babylon during the years that immediately followed the close of the " exile." We have various indications, however, that many of them devoted themselves to the study of the written law, kept up friendly intercourse with their compatriots in Jerusalem, regularly sent free-will offerings to the temple there (Philo, Ad Caium, 1013), and made occasional pilgrimages thither (Zech. vi.9). In Judea, on the other hand, the fifty-eight years between 516 and 458, which are passed over in silence in the history, do not seem to have been more prosperous than the twenty preceding years of which the record has been preserved. Whether influenced by un- favourable reports of the condition of affairs at Jeru- salem, or proceeding upon knowledge personally obtained in some previous visit, Ezra, who had "been directing his heart to seek the law of the Lord, and to do it, and to teach in Israel statutes and judgments," asked and re- ceived in the above-mentioned year the royal authority to make an official visit to Judea. From the terms of his com- mission, which are given in Ezra vii. 12-26, we learn that very considerable powers and privileges were at that time conferred upon him. On the first day of the first month of the Jewish year he set out on his westward journey, carrying with him many valuable offerings, and accompanied by some The first considerable halt was made at "the river of Ahava," a locality which has not been identified as yet (it is called Theras in 1 Esdras*~~

~~*EZRA*~~

~~*viii. 41)!, and here it was found that no Levites had joined the expedition. A message was accordingly sent to a place (now unknown) called Casiphia, where a large colony of them had settled, inviting their assistance. A considerable number of Levites were thus induced to join the party. A fast was thereafter appointed, the sacred treasures were solemnly entrusted to the keeping of twelve priests and twelve Levites (see Bertheau on Ezra viii. 24), and, deliber- ately dispensing with the usual military escort, the caravan set out on the twelfth day of the first month, arriving in Jerusalem on the first of the fifth. Here, in the course of the investigation which he had been commissioned to make, Ezra very soon found a field for his reforming acti- vities. He learned that the population*~~

~~*generally, priests, Levites, and rulers not excepted, had been intermarrying with the surrounding peoples to an extent which seemed to threaten the subversion of the true religion, and the obliteration of the Jewish nationality. The unex- pected discovery filled him with amazement and shame. Soon a large number of the inhabitants came to him, and, with Shechaniah for spokesman, assured him that the people at large were willing to dismiss their foreign wives with their children, if only he would take in hand the direction of the matter. With all convenient speed a solemn assembly of all Judah and Jerusalem was then convened, at which, after Ezra had pointed out to the people their transgressions, it was agreed, with only a few dissentient voices (Ezra x. 15, where for " were employed in" read "stood up against "), toappoint a committee to inquire into and decide on all the cases of mixed marriage. This committees had finished its work by the beginning of the following year, when a complete list was drawn up of those who had "taken strange wives" and now pledged them- selves to putthem away. Thus far the Scripture narrative has carried us; but at this point, after detailing the events of precisely one year of Ezra's public life, it abruptly breaks off; nor do we read of him again for the next thirteen years. Modern writers are by no means at one in the conjectures they make as to what occurred during the interval. Ewald thinks that he remained in Jerusalem during all the intervening time ; others (such as Kuenen) are of the opinion that he very soon left the city, and that during his absence occurred those relapses and disasters which were the occasion of his subsequent activities, and also of those of Nehemiah Hitzig thinks that le never re-appeared at all, and corrects Nehemiah accordingly. Ac- cording to the existing text, in the twentieth (twenty-first ?) year of Artaxerxes, on the first day of the seventh month, we find him "in the open space that was before the water- gate," solemnly reading, by public request, in the hearing of all the people, the " book of the law of Moses." One of the immediate effects of this fresh publication of the Mosaic law was that straightway the feast of tabernacles was observed as it had not been "since the days of Joshua the son of Nun;" and very soon afterwards a solemn fast was proclaimed, during which a written covenant was drawn up and confirmed by all the people, with Nehemiah at their head, by which they became bound "to walk in God's law which was given by Moses the servant of God," special prominence being given to the*~~

~~*following points,—separation from the people of the land, strict observance of the Sabbath day and the sabbatic year, punctual payment of the third part of a shekel for the service of the temple, of the first fruits for the priests, and of the tithes for the Levites. And now, once more, after a second period of public activity, which in this case seems to have lasted for*~~

~~*1 Hit, anciently called Thi or Thi-da-Kira, " the well-known spot where caravans make their plunge into the desert,"' has been suggested. Stanley, Lectures on Jewish Church, iii. 116. See p. 670 of the pre- sent volume (art. EUPHRATES).*~~

~~*little more than a month, the name of Ezra abruptly disappears from the Scripture narrative. We have no authentic information from any source as to the events of his subsequent life, or as to the time, place, and manner of his death. According to Josephus, "he died an old man, and was buried in a magnificent manner at Jerusalem ;" but several palpable blunders with reference to Ezra in other parts of this historian's narrative warn us to be cautious in receiving this statement. Other traditions relate that he died in Babylon, or at Zamzumu on the Tigris, while on a journey from Jerusalem to Susa. Ac- cording to the best texts of the Apocryphal work known to English readers as 2 Esdras, he did not die at all, but was translated (xiv. 49).*~~

~~*Tradition is somewhat inconsistent with itself also in the account it gives of Ezra's relation to the Pentateuch. At one time it speaks of him asa mere copyist or transcriber ; at another time it speaks of him as a voluminous author, o prophet, an independent legislator. Modern criticism in like manner has not as yet reached a unanimous finding on the position occupied by him with reference to previous oral and written enactments. While Ewald, on the one hand, maintains that the last editor of the Pentateuch lived when the kingdom of Judah was still standing, Graf and Kuenen, on the other hand, assign to Ezra a very large share in the production of that law-book as we now have it. Between the two extremes there is room for an inter- mediate view, akin to that of ecclesiastical tradition, which, without determining the extent of Ezra's work, admits*~~

~~*that, having before him an earlier work, he added and perhaps also altered some things in an editorial capacity.*~~

~~*It cannot be doubted that Ezra was successful in at least giving to the law as written a prominence and an influence which it had never before possessed. Under him it became the exclusive rule of public and private life in a way that had never before been known. 'The rise of the order of "scribes," that is, of those whose business it was to know the law, to interpret it, and "make a hedge" round it, can be traced directly to him. If he thus was in a sense the founder of that pharisaism which in later ages degenerated into the well-known forms which were so abhorrent to Christ and to the spirit of Christianity, it ought to be remembered, on the other hand, that the synagogue services,—those assemblies throughout the towns and villages of the land in which the written word was weekly read and expounded with praise and prayer,—are most probably to be traced to his influence. The synagogue worship passed directly over from Judaism into the Christian church; and in this way Ezra, so far as he originated it, has exercised an incalcul- able influence on the religious culture of the race.*~~

~~*For much valuable information on the life and times of Ezra, and also for references to the older authorities, the histories of Israel by Ewald, HItzig, Jost, Herzfeld, Graetz, and Kuenen may*~~

~~*be consulted. See also Stanley's Lectures on the History of the Jewish Church, vol. iii. (J. 5. BL.)*~~

~~*EZRA anp NEHEMIAH, Books or. The two canoni- cal books entitled Ezra and Nehemiah in our English Bibles correspond to the 1 and 2 Esdras of the Vulgate, to the 2 Esdras and Nehemiah of the LXX., and to the Ezra and Nehemiah of the Massoretic text. Though for many centuries they have thus been treated as separate compositions, we have abundant evidence that they were anciently regarded as forming but one book. Thus, Origen (Euseb., H. £., vi. 25), expressly enumerating the twenty- two books of the old covenant as acknowledged by the Jews and accepted by the Christian church, gives as one of them "Eodpas mp&ros kal devrepos ev evi Epa. Melito of Sardis (Euseb., H. £., iv. 26) in like*~~

~~manner mentions the book of Esdras only. So also the Talmud (in Baba buthra, 14, 2), nor can it be supposed that Josephus in his enumera-~~

~~tion (C. Ap, i. 8) reckoned Nehemiah as apart from Ezra. Some of the oldest copies of the LXX. make no division between 2 Esdras and Nehemiah; and that the Massoretes themselves recognized no real separation is shown by their epicrisis on Nehemiah.~~

~~If the external evidence for the unity of the book of Ezra- Nehemiah is strong, the internal evidence is decisive. As the result ef long-continued careful examination, modern criticism, with practical unanimity (Hivernick and Keil are hardly exceptions), has reached the conclusion that Ezra and Nehemiah, so far from being separate compositions, together constitute but a section of a larger historical work, the origin, authorship, and plan of which have already been discussed in the article CHRONICLES, to which the reader is referred. Comparatively little remains to be said here on the special questions that arise in connexion with the Ezra- Nehemiah portion of the work.~~

~~Contents.—Resuming the abrupuly broken off narrative of Chronicles, the first six chapters of Ezra relate how, in the first year of Cyrus king of Persia (537-6), Zerubbabel (called Sheshbazzar in chap. i.), along with Joshua and some 50,000 others who are enumerated accord- ing to their families, returned to Jerusalem, set up the altar of burnt-offering there, and in face of many difficulties and discouragements succeeded in rebuilding the temple, which was finally dedicated in the sixth year of Darius Hystaspis (516). An interval of fifty-eight years is then passed over in silence, The next chapters (Ezra vii.-x.) tell of Ezra's mission to Jerusalem in 458, and the dissolution of the heathen marriages there, the one result of a period of eight months' activity. Another blank of thirteen years occurs in the history. Then we read (Neh. i I-vii. 73a) of Nehemiah's expedition to Jerusalem, of the difficulties he encountered on his arrival there (445-4), and how, notwithstanding all the opposition of the Samaritans, the building of the walls was successfully completed in fifty-two days. 'The list of those who had returned under Zerubbabel is given asin Ezra, chap. ii, The narrative then goes on to relate (Neh. vii.~~

~~*73b-x. 39) how in the same year the law of Moses was anew promulgated by Ezra, being solemnly read by him in the presence of a national assembly ; how the feast of the tabernacles was then observed with a strictness that had been unknown since the days of Joshua the son of Nun ; and how a written covenant was drawn up and signed by which the people pledged themselves to observe the whole law. After some genealogies and other lists have been given (Neh. xi—xii. 26), we next have an avcount of the ceremonial which took place at the dedication of the walls (440) ; also further particulars of arrangements for due support of the temple-worship, and of steps taken for the exclusion of aliens from the congregation of Israel. Finally, after an interval of not less than twelve years, we read of a second visit of Nehemiah to Jerusalem (probably in 432). This visit was the occasion of renewed efforts to- wards religious and social reformation. Special mention is made of a collision with Eliashib the high-priest, and also with Joiada his son, which resulted in the expulsion of the latter.*~~

~~*Authorship.—The abstract given above shows very clearly that Ezra-Nehemiah cannot claim to bea continuous chronicle of all the important events of the 110 years of Jewish history over which it extends. Indeed, of the 110 years only some twenty are referred to at all This want of continuity cannot be attributed to lack of materials ; but rather to the specific purpose by which the author was guided in the selection of his facts. That purpose mani- festly was to give an account of the progress of the restored theocracy in Judah and J erusalem, particularly in what re-lated to the temple, and to the share of the priests and Levites in the temple-worship. The striking literary peculiarities which are here displayed in all that is not*~~

~~*merely copied from earlier documents, and even in the manner in which these documents themselves are handled, all indicate one and the same author for Chronicles and for Ezra-Nehemiah.*~~

~~*Sources.—It lies open to the most superficial observation that the work of the Chronicler is a compilation derived from many sources, The authorities for this portion of it may be classified as follows : (1) Statistics*~~

~~*derived from official records. The list contained in Ezra ii., and repeated with some variations in Neh. vii., may be taken as a specimen. It was already old in Nehemiah's day (Neh. vil. 5). The author mentions also a book of chronicles (dibré hajjdmim, Neh. xii. 23), from which the information in Neh. xii. 1-26 was derived. Neh. xi. 83-36 and 1 Ch. ix. 3-33 are also probably drawn from a common source of an Official character. (2) A history of the building of the temple and of the obstacles that had to be overcome, written in Chaldee. This history seems to have furnished the section Ezra v. l-vi. 18, and also to have been the source of the document given in Ezra iv. 8-23, (3) Ezra's personal memoirs. These have been directly transcribed in Ezra vii. 27-ix. 15; and they have been drawn upon for Ezra vii. 1-11, for chap. x., and also for Neh. vii. 730-x. (4) Nehemiah's personal memoirs. These have been ex- tracted from in Neh. i. 1-vii. 5, xi. 1, 2, xii. 31-42, xill. 4-30, and they have been combined with those of Ezra in Neh. vii. 730-x.*~~

~~*Date,—TIn the article Curonicrzs it has been shown that the genealogies there given (1 Ch. iii. 19 sg.), when fairly interpreted, must be taken as reckoning the descendants of Zerubbabel to six generations, thus bringing the history down to near the close of the Persian monarchy. 'In Ezra- Nehemiah all the indications of date which are given go to support the same conclusion. Neh. xii, 11, 22 brings the list of high-priests down to Jaddua, the contemporary of Alexander the Great. In verse 22 there is a reference, more- over, to Darius Codomannus, the opponent of Alexander. The kings of Persia are throughout alluded to in a manner which is fitted to suggest that the Persian empire had already passed away. Ezra and Nehemiah themselves are occasionally spoken of, not as contemporaries, but as vanished heroes of the venerable past (see, for example, Neh. xii. 26, 47). But the same data which forbid us to fix a date for Ezra-Nehemiah earlier than 350 B.c., manifestly also forbid the conclusion of Spinoza (Z'ract. Theol. Polit., x. 28) who placed the work later than the Maccabees.*~~

~~*Credability.—The doubts raised by Graf and others with reference to the historical value of the earlier portion of the work of the Chronicler do not extend to the Ezra-Nehemiah section, There is general concurrence in the conviction that the sources he had access to fully guarantee the*~~

~~trustworthiness of his narrative. A question has, indeed, been raised as to the measure of sagacity he has shown in his employment of some of the materials he had at his dis- posal, Bertheau and others believing (in opposition to Ewald) that he has inappropriately introduced into the narrative of Ezra iv. certain documents which really refer to the later period of Nehemiah.~~

~~The text of Ezra-Nehemiah has reached us in a somewhat impure state. Great caution requires to be exercised, especially as regards the numerals and proper names. Some help may be got from the LXX. translator, who has been faithfully literal 'almost to unintelligibility."~~

~~Literature.—In addition to the works referred to under Curo- NICLES, the following may be consulted :—Zunz, Gottesdienstliche Vortrdge (1832) p. 18 sg.; Bertheau's admirable commentary in the Exegctisches Handbuch (1862) ; his article *' Chronik " in Schenkel's Bibel-Lexicon ; Dillmann on " Chronik " in Herzog's Real-Encyclo- pidie ; Nagelsbach on " Ezra" in the same work; Keil, Commentar (Engl. tr. 1873); Schultz, in Lange's Bibelwerk (1876; Eng. tr. 1877); Rawlinson in the Speaker's Commentary, vol. iii. (J. 8. BL.)~~

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~~i~~

~~in was the sixth letter of the primitive Greek alphabet.~~

~~It represented the sound of our W, 2. a soft labial. But that sound was unpleasant to the Greek ear, and it began to fall out of use at an early time in all parts of Hellas ; it disappeared most completely in the Ionic and in the cognate Attic dialect; it survived longer in the ASolic and the Doric, and it is not improbable that the symbol F may have been written in these dialects after the sound it represented had perished. The grammarians in dealing with this extinct letter gave it the name "digamma" from the shape of the symbol, z.e., a gamma (I) with a second horizontal stroke, and they added the name " Aolic" from a mistaken impression that it lingered longer in that dialect than in the Doric. It was from the Doric of Cuma, as has been already said (see ALPHABET), that~~

~~*the Latins derived the symbols of their alphabet, and F with the others. But though the Latin language contained the sound w, it did not seem necessary to have a special symbol to distinguish it from the vowel w ; and F was used to express quite a different sound, one which the Greek did not possess. This was probably the same sound which the letter still denotes with us—the hard labio-dental (to which V is the corresponding soft sound) produced by pressing the upper teeth on the lower lip, and then letting the breath escape laterally or through the interstices of theteeth—very much, as Quintilian says in his amusing description of the Latin sound (xii. 10, 29), which "pane non humana voce, vel omnino non voce, potius inter discrimina dentium efflandaest." It was quite distinct from ph—a distinction which we have sacrificed ; ph was a p followed by a slight breath, not quite so strong as in "'upheave," but very similar; and it expressed in Latin the sound of the Greek ¢. The Greeks found the Latin fa difficult sound—much as the Germans find the English ¢h—and we find Cicero laughing at a Greek witness because le could not pronounce the first letter of "Fun- danius," which he doubtless called " P-hundanius." The emperor Claudius has the credit of endeavouring to improve the Roman system of spelling by filling up of some of the defects of the alphabet. Thus, he proposed to use an inverted F (1) to denote the corresponding soft consonant (V) which, as we have said above, had no special symbol in the Roman alphabet. Thus in inscriptions of his reign we find HOMIMUS, IOMI, &. But this improvement did not long survive its author.*~~

~~*FABER, Basin (1520-1576), a German schoolmaster and theologian, was born at Sorau in Lower Lusatia in 1520. After studying at the university of Wittenberg, which at that time was under the direction of Melanchthon, he chose the profession of a schoolmaster, and became rector of the school at Nordhausen, whence he went successively to Tennstidt, Magdeburg, and Quedlinburg. His religious opinions led to his being removed from his office in the last-named place in 1570, but a short time afterwards he received and accepted an invitation to become master of the Raths-gymnasium at Erfurt, where he continued till his death in 1576. Faber was a strong Lutheran, and translated the first 25 chapters of Luther's commentary on Genesis, and in various other ways zealously endeavoured to promote the spread of Lutheran opinions. He was a*~~

~~*contributor to the first four of the Magdeburg Centuries. He is, however, best known by his Thesaurus Eruditionis Scholastice, a work which for many years retained a high place in Germany as a scholastic manual. It was origin- ally published in 1571, and the last edition, edited and improved by Leich, appeared in 1749.*~~

~~*FABER, Cxcm1a Boat von (1797-1877), the great woman-novelist of Spain, better known by her masculine pseudonym of Fernan Caballero, was born at Morges, Canton de Vaud, in 1797, her parents being then on a tour through Switzerland. Her father, Johann Nikolas Bohl von Faber, the son of a Hamburg merchant, had removed early in life to Cadiz, prospered in business, professed the Catholic faith, and married Dofia Francisca de Larrea, a member of the Spanish aristocracy. Cecilia received a con- siderable part of her education in Germany at Gorslow near Schwerin, where her father had an estate; and here, besides other accomplishments, including a complete mastery of German and Spanish, she acquired a competent knowledge of Latin, English, French, and Italian. In 1813 she returned to Cadiz, and in the following year became the wife of Captain Planells, whom she accompanied to America, where she seems to have spent some years of married life. Not long after the death of her first husband, she was married to the Marques de Arco Hermoso, and in virtue of her exalted station frequently attended the court of Madrid, where she was much admired for her beauty, vivacity, and wit. In 1837, having, by the death of the marquis (1835), been again left a widow, she gave her hand to Sefior de Arrom, a member of the bar. This union appears to have been productive of little happiness, and when her husband accepted an appointment as Spanish consul abroad, she decided to remain alone in Seville, It is to the trials and disappointments that came upon her in the later ycars of her life that the world is indebted for the fascinating works of this distinguished writer, who seems to have been driven to authorship less by any imperious literary instinct than by the necessity she felt for some anodyne against sorrow. Rarely does it happen that literary genius such as she possessed lies dormant for so long a time, unguessed by the world, hardly suspected even by its owner. As early as 1828, indeed, if not earlier, she had committed to writ- ing, in the form of a novel, a tale of peasant life, which she had heard prosaically told under the olive trees at the village of Dos Hermanas, in the*~~

~~neighbourhood of Seville, but singularly enough, she had preferred to make use of the German language, and does not appear to have contemplated publication. Although Washington Irving, in the course of one of his visits to Spain, had seen and praised the manuscript, and had encouraged the writer to cultivate literature, and especially Spanish literature, as a serious pursuit, it was not till many years afterwards that this first effort, La Familia de Alvareda, was presented to the public ; nor was it till after her fiftieth year had been passed that she appeared as an author at all, and even then only under au assumed name. Her first, andsin some respects her best, publication, Za Gaviota (The Sea-Gull), was originally printed in short daily instalments in the pages of a Madrid newspaper in 1849. It met with high appreciation in the capital, and was accordingly followed at brief intervals by Elia, Clemencia, La Familia de Alvareda, Una en Otra, Simon Verde, and other Cuadros de costumbres populares (pictures of popular life). Slowly but surely the works of the new writer found their way all over the peninsula, and gradually were translated into French and German, until within ten years she had achieved a European repu- tation. A collected edition of her works in 13 volumes was issued from the royal printing press at Madrid in 1859, and about the same time she received an appoint- ment as governess to the royal children. From 1863 to 1868 she occupied rooms in the palace of the Alcazar,—~~

~~the Hampton Court of Seville. At the revolution of 1868 | had given up the Calvinistic views of his youth, and~~

~~she removed to private apartments in the Calle de Burgos; and though with advancing years her pen became less busy, she continued with unimpaired faculties to take a keen and kindly, if somewhat needlessly anxious, interest in the important events that were revolutionizing the institutions of her country. Among the numerous schemes of beneficence that busied her, especially in later life, was the promotion of a society for~~

~~the prevention of cruelty to animals. She was engaged iu correcting for the press the last sheets of a compilation of stories, nursery-rhymes, &c., for the use of children (Cuentos, Oraciones, Adivinas, y Refranes populares é@ infantiles) when she died in her eightieth year, on April 7, 1877.~~

~~Her works, though numbering about fifty in all, are none of them very large, and she cannot be called a volu- minous writer. They all belong to one comparatively brief period of her long and chequered life; and, if classified at all, can be so only by the application of some comparatively artificial criterion. Some deal principally with the features of Andalusian life as it exists among the labourers and peasants ; some delineate the higher phases of society ; and in others " the interest lies, not in the characters of the persons and the description of scenery and manners, but in the selection of incidents which are intended to point a nioral or adorn a proverb." Whiieall are marked by deep and tender sympathy with nature, by subtle and unerring delineation of character, by a quaint humour that is never far removed from pathos, and by an exquisite power of expression, it may safely be said that, as " George Sand " is most delightful when she lovingly depicts the quiet scenes of Berri, the home of her youth, so Fernan Caballero excels in her descriptions of the peasant life of Andalucia. Foreign critics complain not unnaturally of the bitter ultramontane prejudice and the exaggerated Lspaitolismo which are so needlessly paraded in almost all her works ; yet even this peculiarity, as imparting to these productions of undoubted genius a unique couleur locale, may fairly enough be held to enhance rather than diminish their value in the eyes of the dispassionate student of the infinitely varied phases of human thought and feeling.~~

~~Besides those already noted, the following stories may be men- tioned :—Cuentos y Poestas populares Andaluces, Un Verano en Bornos, Cosa eunrplida solo en la otra vida, La Estrella de Vandalia, Pobre Dolores, &c. Her principal works may be found in the Coleccion de Autcres Espuiioles, published by Brockhaus, Leipsic. Most of them have been translated into French. La Gaviota and Elia have been translated into English,—the former by the Honourable Augusta Bethell (1867); La Familia de Alvareda, under the title of The Castle and the Cottage in~~

~~*Spain, by Lady Wallace, appeared in 1861, and a second translation, by the Vis- count Pollington, was published in 1872. An appreciative and able estimate of Fernan Caballero, with a full analysis of several of her best known works, appeared in the Edinburgh Review, July 1861.*~~

~~*FABER, Freperick Witii1AM (1814-1863), a famous hymn writer and theologian, the son of Thomas Henry Faber, secretary to Dr Barrington, bishop of Durham, was born ou the 28th of June 1814, at Calverley, Yorkshire, of which place his grandfather, Thomas Faber, was vicar. He attended the grammar school of Bishop Auckland for a short time, but a large portion of his boyhood was spent in Westmoreland; and the lake scenery left an indelible impression on his imagination. He afterwards went to Harrow, where he remained until he became a student of Balliol College, Oxford, in 1833. About the beginning of 1835 he began to reside at University College, in consequence of obtaining a scholarship there; and in 1336 he gained the Newdigate prize for a poem on the "The Knights of St John," which elicited special praise from Keble. Among his college friends were Dean Stanley and Sir Roundell Palmer. In January 1837 he was elected fellow of University College. Meanwhile he*~~

~~*had become an enthusiastic admirer and follower of John Henry Newman. In 1841 a travelling tutorship took him to the Continent; and, on his return, a book appeared called Sights and Thoughts in Foreign Churches and among Foreign Peoples, which he dedicated to his dear friend the poet Wordsworth. The journal of his travels is beauti- fully written, and reveals an intense love of nature, and an almost southern susceptibility to her charms. There is none of the interjectional piety which so often disfigures books of travel written by religious men. He accepted the rectory of Elton in Huntingdonshire, but soon after pro- ceeded again to the Continent, with the intention of study- ing the metho\s followed by the Roman Catholic Church. Returning to ilton, he devoted himself, with great earnest- ness, to the work of his parish, although the two years he spent there were marked by severe mental struggles, which issued in his conversion to the Roman faith in November 1845, On leaving Elton his parishioners sobbed out—'"' God bless you, Mr Faber, wherever you go" (Life, p. 238). He founded a religious community at Birmingham, called Wilfridians, after the name Wilfred, which Faber assumed. The community was ultimately merged in the oratory of St Philip Neri, of which Father Newman was the head; and in 1849 a branch of the oratory—subsequently considered independent—was estab- lished in London, first in King William Street, and after- wards at Brompton, over which Father Faber presided till his death on the 26th of September 1863. In spite of his weak health, an almost incredib' amount of work was crowded into those years. He published a number of theo- logical works, and edited the Oratorzan Lives of the Sadnts. He was an eloquent preacher, a brilliant talker, and had an unsurpassed power of gaining the love of all with whom he came in contact. It is mainly as a hymn writer, how- ever, that he will be known in the future. There is a sweet saintliness, and at the same time a grandeur of thought and a simplicity of poetical expression in Faber's hymns, which we fail to find in much of the Protestant hymnoiogy. Among the finest are—" The Greatness of God," "The Will of God," "The Eternal Father,' "The God of my Childhood," " Jesus is God," ' The Pilgrims of the Night," 'The Land beyond the Sea," " Sweet Saviour! bless us ere we go," "J was wandering and weary," and "The Shadow of the Rock." The hymns are largely used in Protestant collections.*~~

~~The only complete edition of Faber's Hymns is tle one published by Richardson and Son in 1861, of which a second issue appeared in 1871. In addition to hymns, pamphlets, letters, and translations, he published the following works :—Sighis and Thoughts in Foreign Churehes and among Foreign Peoples, All for Jesus, The Precious Blood, Bethlehem, The Blessed Saerament, The Creator and the Creature, Growth in Holiness, Spiritual Conferenees, The Foot of the Cross, Ethel's Book, Sir Laneelot, Poems, An Essay on Canonization and Beatification, Characteristies of the Lives ef the Saints, and Catholic Home Missions. Notes on Deetrinal and Spiritual Subjects were edited by Father Bowden, and issued after Faber's death. See his Life and Letters, by Fathcr Bowden, and A Brief Sketch of the Karly Life of the late F. W. Faber, D.D., by his only surviving brother.~~

~~FABER, Grorcr Srantey (1773-1854), an English clergyman, son of Thomas Faber, vicar of Calverley, York- shire, was born October 25, 1773. He entered University College, Oxford, in 1789, graduated B.A. in 1792, and in 1794 was elected fellow and tutor of Lincoln College. He received his M.A. degree in 1796, and his B.D. degree in 1803. In 1801 he was appointed to the office of proctor, and the same year he delivered the Bampton lecture, which he afterwards published under the title of Hore Mosaice. He was at this time one of the foremost preachers of the university, and his earnestness and eloquence secured for his discourses an interested and eager audience. In his~~

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~~preaching he gave considerable prominence to the doctrines usually known as evangelical, but he endeavoured to avoid as much as possible the technicalities of a system, and to give all that he spoke a directly practical bearing. Marrying in 1803, he lost his fellowship, and for two years he acted as curate to his father. In 1805 he became vicar of Stockton-on-Tees, and three years later of Redmarshall, both in the county of Durham. In 1811 he obtained the rectory of Long Newton, in 1831 was made a prebendary of Salisbury Cathedral, and the following year received the mastership of Sherborn Hospital, where he died in the~~

~~*master's residence on 27th January 1854. Faber wrote over forty volumes treating more or less directly of theo- logical subjects, and chiefly of those which are of a polemi- cal nature. They manifest great and varied erudition, and considerable acuteness within a certain limited sphere ; but his abilities are frequently misapplied in vain endeavours to establish baseless theories, and in minute discussions regard- ing subjects of no general or lasting importance.*~~

~~*Among his principal works are Mysteries of the Cabiri, or the Great Gods of Phenicia, 2 vols., 1803 ; Origin of Pagan Idolatry, 3 vols., 1816; Diéficulties of Romanism, 1826; Apostolicity of Trinitarianism, 2 vols., 1882; Election, 1842; Papal Infallibility, 1851; and the Sacred Calendar of Prophecy, 3 vols., 1828. The last is his most popular work, and has passed through several editions.*~~

~~*FABER, or LerEvre, Jacosus (c. 1450-1536), surnamed Stapulensis, an eminent pioneer of the Protestant move- ment in France, was born of humble parentage at Etaples in Picardy about 1450, and received his higher education at the university of Paris. After having graduated, and for some time made use of the privilege of teaching which the degree of magister at that time actually conferred, he went to Italy for the prosecution of his favourite classical studies. On his return to Paris he became professor in the college of Cardinal Lemoine, and at the same time he began the publication, with introductions, commentaries, or translations, of various famous works, including the Physics, Metaphysics, and Ethics of Aristotle. In 1507 he commenced residence within the Benedictine Abbey of St Germain des Prés near Paris, of which his friend Brigonnet had become superior; and here he began to give himself to biblical studies. The: first fruit of his labours was the Quintuplex Psalterium; Gallicum, Romanum, Hebraicum, Vetus, Conciliatum (Parisiis, Hen. Stephani, 1509). This was followed in 1512 by S. Pauli Epistole XIV. ex vulgata Hditione, adjectu intelligentia ex Groeco cum com- mentariis, a work characterized by great intelligence and independence of judgment. His De Maria Magdalena et triduo Christi disceptatio, published in 1517, provoked a violent controversy, and was ultimately condemned by the Sorbonne in 1521. In 1523 he removed to Meaux as vicar to his friend Brigonnet, who had recently been*~~

~~*advanced to that bishopric; and in the same year he published his new French translation of the New Testa- ment, also Les Epistres et Evangiles pour les LH. dimanches de Van & usage du diocése de Meaux. In his prefaces and notes to both these works he had expressly declared his conviction that the Bible is the only rule by which doctrines are to be tried, and also that justification is by faith alone. These utterances excited much hostility, but the power- ful protection of the king (Francis I.) and of the Princess Margaret shielded him from any serious consequences. After the battle of Pavia (25th February 1825), Francis being at the time in captivity, Faber was formally con- demned, and his works were vigorously suppressed by a commission of the parliament; these proceedings, how- ever, were at once quashed on the return of the king some months afterwards. In 1526 Faber became librarian in the royal palace at Blois ; and two years afterwards his translation of the Pentateuch appeared. In 1530 he com- pleted his translation of the Bible, which at once took a*~~

~~*high place, has often been reprinted, and has indeed been the basis of all subsequent French versions, both Roman Catholic and Protestant. In 1531 he was induced by Margaret (who had become queen of Navarre) to take refuge at Nérac from the storm of persecution which had broken out with fresh violence; and here he spent the closing years of his life in comparative quietude. His death took place in 1536.*~~

~~*See Graf in Zetischr. f. histor. Theol., 1852, and in Herzog's Tteal-Encyclopidie. A full list of Faber's very numerous writings is given in the Biographie Géneral (s.v. Lefevre d'Etaples).*~~

~~*FABER, or Lerévre, Joann (1478-1541), surnamed from the title of one of his works Malleus Heereticorum, was the son of a smith named Heigerlin, and was born at Leutkirch in Swabia in 1478. At an early age he joined the Dominicans, and he afterwards studied theology at Freiburg in Breisgau, where he received the degrees of M.A. and doctor of canon law. His reputation for ability and learning soon led to his being appointed vicar of Lindau and Leutkirch, and shortly afterwards canon in the cathedral church of Basel. In 1518 the bishop of Con- stance named him one of his vicar generals, and Pope Leo X. appointed him to be papal*~~

~~*protonotary. At this time Faber was on a friendly footing with the principal German Reformers, and sympathized generally with their opinions. Of the many evil customs with which the church had become infected he was well aware, and he was so energetic in opposing the practice of indulgences in his diocese that he was looked upon with suspicion at Rome. He also de- fended Luther against the attacks of his opponent Eck, although he admitted that many of Luther's views were too far in advance of the times. In 1521, however, Faber made a journey to Rome, which seems to have wrought almost an immediate and complete change in his manner of regarding the efforts of the Reformers, for as soon as he returned he began strenuously to oppose them both by speech and writing. In 1523 he appeared as an opponent of Zwingli in a disputation at Zurich, and the same year he published his tractate against Luther entitled Malleus Hereticorum., From this time his chief efforts were devoted either to win back the Reformers to the church of Rome, or to get that church to adopt such measures as would best tend to nullify their influence with the people. Among other means employed by him was the establishment of a boarding-house for poor theologians, in order to train a class of preachers fitted by their peculiar qualifications to rival the Reformed preachers in popular esteem. In 1526 Faber became court preacher to the emperor Ferdinand, and in 1527 and 1528 was sent by him as ambassador to Spain and England. He was chosen bishop of Vienna in 1531, and died there 12th June 1541. Most of his works were directed against the doctrines of Protestantism. They were collected and published in 3 vols., Cologne, 1537, 1539, and 1541,*~~

~~*FABIAN GENS, Tue, was said by the genealogists to have been descended from Hercules and a daughter of the Arcadian Evander. Niebuhr's supposition of the Sabine origin of the clan has been held to be inconsistent with the tradition regarding the pre-Sabine institution of the Luper- calia, the yearly festival inaugurated at the sacrifice which Romulus and Remus offered in the Lupercal after the death of Amulius, and at which, according to the legend, they agreed to distinguish their respective adherents by thenames Quinctilii and Fabii. The two colleges of the Luperci re- tained these designations long after tlle members of the two clans ceased to exercise exclusive control over the sacra. The chief family names of the Fabian gens or clan, during the commonwealth, were*~~

~~*Vibulanus, Ambustus, Maximus, Buteo, Pictor, Dorso, Labeo; and Verrucosus, Rullianus, Gurges, Eburnus, /Emilianns, Allobrogicus, may be enu- merated among their agnomina. Vibulanus" and the two*~~

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~~*following names belonged, lhowever, to the same family at different epochs, Q. Fabius Vibulanus, who was consul in 412 B.c., having been the first to assume the cognomen of Ambustus; while Rullianus, according to some accounts, changed the latter into Maximus, in 312 B.c. —his full name thus being Q. Fabius Maximus Rullianus. Of the Vibulani, first noticed about the year 486 z.c., the most dis- tinguished were the three brothers, Quintus, Keeso, and Marcus, one or other of whom filled one of the two consul- ships from that date to 479. In that year the Fabii—to*~~

~~*the number, it is said, of 306 patricians, exclusive of their*~~

~~*numerous dependents—emigrated from Rome under the*~~

~~*leadership of Keeso, who had just been consul for the third*~~

~~*time, and settled on the banks of the Cremera, a few miles above Rome. Some accounts have attributed that secession to the opposition which the Fabian support of the plebs had aroused among the old patrician families. For two*~~

~~*years the exiles or seceders continued to be the city's chief defence against the Veientes, until at last they were sur- The only sur- vivor of the gens was the son of Marcus, who had been left behind at Rome, and who thus became the ancestor of the succeeding Fabii. IIe was consul in 467 B.c., and a member of the second decemvirate in 450. When the Gauls cap- tured Rome in 390 the pontifex maximus was a Fabius The most famous of this line—z.e., supposing Rullianus to have been the first Maximus—was the father of*~~

~~*prised by the latter, and cut off to a man.*~~

~~*Ambustus. Rullianus. He was thrice consul, and was dictator in 351 B.C. of the 5tli century of Rome," was master of the horse in 365*~~

~~*B.c. to Papirius Cursor, by whom he was degraded for*~~

~~*having fought and beaten the Samnites contrary to orders.*~~

~~*In 296, when consul for the sixth time, he defeated, at the great battle of Sentinum, the combined forces of the Etrurians, Umbrians, Samnites, and Gauls, But the greatest Roman who bore the name of Fabius—one of the most illustrious Romans of the republic—was Q. Fabius Maxi-*~~

~~*mus Verrucosus (see below). Of the later Fabii, Q. Fabius Maximus Aumilianus and Q. Fabius Maximus Allobrogicus were among the most distinguished. The former, a Fabius only by adoption, served in the last Macedonian war, 168 B.C., and was consul in Spain 145 3B.c., when he conquered Viriathus. He was the pupil and the patron of the historian Polybius. The Fabius named Allobrogicus (after his victory over the Allobroges and their ally Bituitus, king of the Arverni) was consul in 121 3.c. The Fabian name is occasionally met with as late as the 2d century a.p.*~~

~~*Perhaps the most complete work on this family is the Disputatio de Gente Fabia, by G. N. Du Rieu, Leyden, 1856, where may also be found a list of previous writers on the same subject.*~~

~~*FABIUS MAXIMUS VERRUCOSUS, Quintus, also named Cunctator and Ovicula, was one of the most dis- tinguished Romans of the republic, —the incarnation of all that a Roman meant by patriotism. It appears that he served his first consulship in Liguria, 233 B.c., that he was censor in 230, and consul for the second time in 228. In 218 he was sent to Carthage to inquire whether that state approved of Hannibal's conduct in attacking Saguntum. The answer proved unsatisfactory; and Fabius, assuming the haughty dignity of a Roman senator, and folding up his cloak so as to form a cavity, thus addressed the nobles of Carthage : ' Hic vobis bellum et pacem portamus ; utrum placet sumite." Being answered that he might give which he pleased, he indignantly exclaimed, "Then I give you war;" and the deputies returned to Rome to state the result of*~~

~~their mission. The disastrous campaign on the Trebia, and the defeat on the banks of the Thrasymene Lake, warned the Romans that their successful resistance to Hannibal, and even their existence, depended on the wisdom of the general to whom they entrusted their troops.~~

~~His son, Rullianus, called by Arnold the " Talbot~~

~~FAB—FAB~~

~~So Fabius was named dictator in 217, and began his tactics of "masterly inactivity." Manceuvring among the hills, where Hannibal's horse were useless, he cut off luis supplies, harassed him incessantly, did everything except fight. His steady adherence to this plan, in spite of all the mis-conceptions which his caution had aroused at Rome, evinced the moral strength of the man. He was suspected of an ambition for the prolongation of his command. Hannibal was one of the few men in Italy who understood him. Even Minucius, the master of the horse, ridiculed the pro- ceedings of Fabius; and he seized the opportunity of the latter's absence at Rome to attack the enemy, and win a victory. This tended only more strongly to confinn the opponents of Fabius in their opinion, and the command was divided between Minucius and Fabius. The result was exactly such as might have been anticipated. Minucius engaged in battle with Hannibal, and his army was on the verge of ruin when the opportune arrival of Fabius changed the aspect of affairs. Minucius seems to have had the moral courage to confess his folly, and cheerfully to submit to the orders of Fabius. Fabius having retired at the end of the legal time of six months, the conduct of the war was entrusted to Aumilius, who followed tlie ex-dictator's plan, and Varro, who did not. 'You must beware of Varro, as well as of Hannibal," said Fabius; and the warning was followed by the disaster of Canna. Fabius might have accused him; but it is narrated that the mag- nanimous Roman thanked his rival "because he had not despaired of the republic." After the defeat at Cannex (216 B.c.) he was appointed to the command of the armics with. Marcellus, " the sword," as Fabius himself was " the shield," of the republic. He laid siege to the important city of Capua; and when Hannibal marched towards Rome, threatening the city itself, Fabius remained firmly at his post. In 214 B.c. when consul for the fourth time,~~

~~*he captured Casilinum in Samnium. In his fifth consul- ship, 209, he took the city of Tarentum; and when it was proposed, towards the conclusion of the war, that Scipio should pass into Africa, Fabius was decidedly op- posed to the scheme. He did not: live to witness the final success of Scipio, having died at an advanced age, 203 B.c. In the previously named year he became prin- ceps senatus, a dignity almost hereditary in the family of the Fabii Maximi.*~~

~~*FABIUS PICTOR, Quintus, the father of Roman history, was the grandson of the Fabius who, surnamed Pictor for his artistic skill, bequeathed that name to a family of the Fabian gens. In the interval between the first and second Punic wars we find hin: taking an active part in the subjugation of the Gauls in the north of Italy (225 z.c.) ; and after the battle of Cannz (216), he was employed by the Romans to proceed to Delphi in order to consult the oracle of Apollo. The rude muse of Nevius had already celebrated in verse the glory acquired by the Roman arms in the first Punic war, and Ennius had clothed the annals of his adopted country in the language of poetry. But till the time of Fabius Pictor, no one had appeared to chronicle in simple prose the ses geste of Romeand the Romans. The: historian's materials consisted of the Annales Maaimt, Com- mentarit Consulares, and similar records (see Fasti) of names, feasts, battles, prodigies, and the like, together with such chronicles as every great Roman family preserved of its own deeds ; as also—what furnished the most valu- able part of his work—his own experiences in the second Punic war. His Annals, as they were called, existed in the time of Pliny the Elder, but are now known only from a few fragments and allusions. According to Dionysius, they contained a description of the battle of Thrasymene, and Niebuhr even conjectures that Dion Cassius derived his knowledge of Roman constitutional history from Pictor's*~~

~~*work. It seems certain, however, that Fabius wrote his Annals in Greek. Polybius expressly asserts this to be the fact ; and Cicero's allusion to the Latin prose writer who lived between the time of Cato and that of Piso probably refers to Sergius Fabius Pictor.*~~

~~*See C. T. Crutwell's History of Roman Lnterature, London, 1877, Du Rieu's Disputatio, and especially Wagner's History of Roman Literature, 1873, translated from Teuffel's Geschichte, 1870.*~~

~~*FABLE. With certain restrictions, the necessity of which will be shown in the course of the article, we may accept the definition which Dr Johnson proposes in his life of Gay: — "A fable or apologue seems to be, in its genuine state, a narrative in which beings irrational, and sometimes inani- mate (arbores loquuntur, non tantum Jere), are, for the pur- pose of moral instruction, feigned to act and speak with human interests and passions." Before tracing the history of the fable we may compare it with its nearest congeners in literature, the myth, the allegory, and the parable. The myth, whether, as is most commonly the case, it has its origin in some physical phenomenon, or can be traced to mistaken metaphor or distorted history, or is merely a play of the imagination, is always the unconscious product of the race, never like the fable invented expressly for a moral or didactic purpose. A closer analogy to the fable is to be found in the literary myth, the artificial product of a later age, such, for instance, as the Aurat of the Iliad, the Hesiodic legend of Pandora, or the story of Er in the Re- public of Plato. Yet these allegorical myths are clearly distinguished from the fable, inasmuch as the story and the moral are intermingled throughout. Between the parable and the fable there is no clear line of distinction. Arch- bishop Trench insists on two essential differences,—first, that the parable teaches spiritual truths, whereas the fable never lifts itself above the earth, and secondly, that the parable never transgresses the actual order of nature. But, though the parables of the New Testament may well be set in a class by themselves, a comparative study of religious writings will show that the parable is one of the commonest forms of religious teaching, and that no hard or fast line can be drawn between moral and spiritual truths. The second difference we should regard as accidental, and it is nwt altogether borne out by facts.*~~

~~*Most writers on the history of the fable are content to trace its origin to Ausop or the Panca Tantra of the mythi- cal Vishnu Sarman, and these are doubtless the oldest col- lectious which have been preserved in writing ; but though We possess no earlier record, we may, from its wide diffusion, regard it as a natural growth of the imagination, and one of the*~~

most primitive fornis of literature. It springs from the universal need of men to express their thoughts by con- crete images and emblems, and thus is strictly parallel to the use of metaphor in language. Even now fables are made every day, and a quick-witted race like the Arabs will invent fables at every turn as the readiest form of argument. To take a familiar illustration, the wise saws and modern instances of Sam Weller would only need a slight expansion to form a very respectable book of fables. Our most fainiliar proverbs are often fables in miniature.

With the fable, as we know it, the moral is indispensable. As La Fontaine puts it, an apologue is composed of two parts, one of which may be called the body, the other the soul. The body is the fable, the soul the morality. But if we revert to the earliest type we shall find that is no longer the case. In the primitive beast-fable, which is the direct progenitor of the Atsopian fable, the story is told simply for its own sake, and is as innocent of any moral as our fairy tales of Little Red Ridinghood and Jack and the Beanstalk. Thus, in a legend of the Flathead Indians, the Little Wolf found in cloud-land his grandsires the Spiders with their grizzled hair and long crooked nails,

and they spun balls of thread to Jet him down to earth ; when he came down and found his wife the Speckled Duck, whom the Old Wolf had taken from him, she fled in con- fusiov, and this is why she lives and dives alone to this very day. Such animal myths are as common in the New World as in the Old, and abound from Finland and Kamtchatka to the Hottentots and Australasians. From the story invented, as the one above quoted, to ac- count for some peculiarity of the animal world, or told as a pure exercise of the imagination, just as a sailor spins a yarn about the sea-serpent, to the moral apologue the transi- tion is easy; and that it has been effected by savages un- aided by the example of higher races seems sufficiently proved by the tales quoted by E. B. Tylor (Primitive Culture, vol. i. p. 411). From the beast-fables of savages we come next to the Oriental apologues which are still extant in their original form. The East, the land of myth and legend, is the natural home of the fable, and Hindustan was the birth-place, i€ not of the original, of these tales, at

~~least of the oldest shape in which they still exist, The Panca Tantra, or fables of the Brahma Vishnu Sarman, have been translated into almost every language and adapted by most modern fabulists. The Kalila wa Damna (names of two jackals), or fables of Bidpai, is an Arab version made about 760 a.p. From the Hebrew version of Rabbi Joel, John of Capua produced a Latin translation about tlie end of the 15th century, whence all later imita- tions are derived. (See Monier Williams, Jndian Wisdom, p- 508.) The Litopadesa, or " friendly instruction," is a modernized form of the same work, and of it there are three translations into English by Dr Charles Wilkins, Sir William Jones, and Professor F. Johnson. The Hitopadesa is a complete chaplet of fables loosely strung together, but con- nected so as to form something of a continuous story, with moral reflections freely interspersed, purporting to be written for the instruction of some dissolute young princes. Thus, in the first fable a flock of pigeons see the grains of rice which a fowler has scattered, and are about to descend on them, when the king of the pigeons warns them by telling the fable of a traveller who being greedy of a bracelet was devoured by a tiger. They neglect his warning and are caught in the net, but are afterwards delivered by the king of the mice, who tells the story of the Deer, the Jackal, and the Crow, to show that no real friendship can exist between the strong and the weak, the beast of prey and his quarry, and so on to the end of the volume, Another book of Eastern fables is well worthy of notice, Buddhaghosha's Parables, a commentary on the Dhammapada, or Buddha's Paths of Virtue. The original is in Pali, but an English translation of the Burmese version has been made by Captain T. Rogers, R.E. As the work is little known we may venture to extract a single gem. A young mother, disconsolate for the death of her first-born son, carries the dead body of her child from house to house seeking medicine to restore it. At last she is sent to Para Takem, the lord and master of the Buddhists, who promises to help her, but she must herself fetch the medicine, which is some mustard seed taken from a house where no son, husband, parent, or slave has died. Gladly the girl speeds on her errand, carrying the dead body of her son on her hip. By degrees she is taught that she is not the only mourner. In the whole of the Savetthi country everywhere children are dying, parents are dying. She leaves her dead son and returns to Para Takem, having learnt the first and last commandment of the Buddhist creed.~~

~~*From Hindustan the Sanskrit fables passed to China, Thibet, and Persia; and they must have reached Greece at an early age, for many of the fables which passed under the name of AMsop are identical with those of the East. Aisop to us is little more than a name, though, if we may trust*~~

~~*a passing notice in Herodotus (ii. 134), he must have lived in the 6th century B.c. Probably his fables were never written down, though several are ascribed to him by Xenophon, Aristotle, Plutarch, and other Greek writers, and Plato represents Socrates as beguiling his last days by versifying such as he remembered. Aristophanes alludes to them as merry tales, and Plato, while excluding the poets from his ideal republic, admits Aisop as a moral teacher. Of the various versions of sop's Fables, by far the most trastworthy is that of Babrius or Babrias, a Greek of the Ist century A.D., who rendered them in choliambic verse. These, which were long known in fragments only, were recovered in a MS. found by M. Minas in a monastery on Mount Athos in 1842, and have been edited by Sir G. C. Lewis.! An inferior version of the same in Latin iambics was made by Pheedrus, a slave of Thracian origin, brought to Rome in the time of Augustus, and manumitted by him, who tells us that he published in senarian verse the rude materials produced by Alsop ; but the numerous allusions to contem- porary events, as, for example, that to Sejanus in the Frogs and the Sun, which brought upon the author disgrace and imprisonment, show that many of them are original or free adaptations. For some time scholars doubted as to the genuineness of Phsedrus's fables, but their doubts have been lately dispelled by a closer examination of the MSS. and by the discovery of two verses of a fable on a tomb at Apulum in Dacia. Pheedrus's style is simple, clear, and brief, but dry and unpoetical; and, as Lessing has pointed out, he often falls into absurdities when he deserts his original. For instance, in Alsop the dog with the meat in his mouth sees his reflexion in the water as he passes over a bridge; Phedrus makes him see it as he swims across the river.*~~

~~*To sum up the characteristics of the Asopian fable, it is artless, simple,and transparent. It affects no graces of style, and we hardly need the moral with which each concludes, 5 pdOos Syrot drt, x. tr. X. The moral*~~

~~*inculcated is that of wordly wisdom and reasonable self-interest. Ausop is no maker of phrases, but an orator who wishes to gain some point or induce some course of action. It is the Aisopian type that Aristotle has in view when he treats of the fable as a branch of rhetoric, not of poetry.*~~

~~*If we consider their striking gift of narrative and their love of moralizing, it is strange that the Romans should have produced no body of national fables. But, with the doubtful exception of Phedrus, we possess nothing but solitary fables, such as the famous apologue of Menenius Agrippa to the Plebs, and the exquisite Town Mouse and Country Mouse of Horace's Satires.*~~

~~*The fables of the rhetorician Aphthonius in Greek prose, and those in Latin elegiac verse attributed to Avianus or Avienus, make, in the history of the apologue, a sort of link between the classical and the dark ages. In that overflow- ing chaos which constitutes the literature of the Middle Ages, the fable reappears in several aspects. In a Latin dress, sometimes in prose, sometimes in regular verse, and sometimes in rhymed stanzas, it contributed, with other kinds of narratives, to make up.the huge mass of stories which has been bequeathed to us by the monastic libraries. These served more uses than one, They were always easier reading, and were often held to be safer and more instructive reading also, than the difficult and slippery classics, for those monks who cared for reading at all, and were not learned enough for any pursuit deserving the name of study. For those who were a little more active- minded, they aided the Gesta Romanorum and other collec-*~~

~~*1M. Minas professed to have discovered under the same circum- stances another collection of ninety-four fables by Babrius. This second part was accepted by Sir G. C. Lewis, but J. Conington has*~~

~~*conclusively proved that it is spurious, and probably a forgery. See article BABRIUS.*~~

~~*FABLE*~~

~~*tions of fabliaux or short novels, in suggesting illustrations available for popular preaching. Among those medieval fables in Latin, very little of*~~

~~*originality is to be detected, The writers contented themselves with working up the old fables into new shapes, with rendering from prose into verse, or from verse into prose,—a species of attempts which had its merits in such hands as those of Babrius or Pheedrus, but from which no fruit could be expected to be gathered in the convents. The few monks who could have performed such a task well aimed wisely at something higher. It might be enough to name, among the monkish fabulists, Vincent of Beauvais, a Dominican of the 12th century, in whose Speculum Doctrinale are a good many prose fables, more than half of them from Phedrus. About the end of the same century, too, a considerable number of fables, some of which have been printed, were compiled by an English Cistercian monk, Odo de Cerinton. Nor was this the only collection that arose in England.*~~

~~*As the modern languages became by degrees applicable to literary use, fables began to appear in them. A good many still exist in Norman-French, of which may be noted the fables called those of Ysopet, and those composed by Marie de France, the authoress of the well-known fabliaux. Later, also, they were not wanting, though not numerons, in our own tongue. Chaucer has given us one, in his Nonne Preste's Tale, which is an expansion of the fable "Don Coc et don Werpil" of Marie of France ; another is Lidgate's tale of The Churl and the Bird. But the course of the short and isolated fables through the Middle Ages is not here worth prosecuting.*~~

~~*Several of Odo's tales, like Chaucer's story, can be ultimately traced to a work, or series of works, for the sake of which chiefly the medizval history of the apologue is interesting—the History of Reynard the Fox. This great beast-epic has been referred by Grimm as far back as the 10th century, and is known to us in three forms, each having independent episodes, but all woven upon a common basis. The Latin form is probably the earliest, and the poem Reinardus et Ysengrinus dates from the 10th or 11th century. Next come the German versions. The most ancient, that of a minnesinger Heinrich der Gl*chesaere (probably a Swabian), was analysed and edited by Grimm in 1840. In 1498 appeared Reynke de Voss, almost a literal version in Low Saxon of the Flemish poeni of the 12th century, Reinaert de Vos. Hence the well-known version of Goethe into*~~

~~*modern German hexameters was taken. It was written in 1793, during the siege of Mainz, and the philosophic poet sought, in the study of animal nature and passions, to divert his thoughts from the bloody scenes of the Reign of Terror. The poem has been well named "an unholy world bible." In it the fEsopian fable received a development which was in several respects quite original. We have here no short and un- connected stories. Materials, partly borrowed from older apologues, but in a much greater proportion new, are work- ed up into one long and systematic tale, so as to form what has been quaintly called an animal-romance. The moral, so prominent in the fable proper, shrinks so far into the background, that the work might be considered as a mere allegory. Indeed, while the suspicions of its having con- tained personal satires has been convincingly set aside, some writers deny even the design to represent human conduct at all; and we can scarcely get nearer to its signification than by regarding it as being, in a general way, what Carlyle has called "a parody of human life." It represents a contest maintained successfully, by selfish craft and audacity, against enemies of all sorts, in a half-barbarous and ill-organized society, With his weakest foes, like Chaunteclere the Cock, Reynard uses brute-force; over the weak who are protected, like Kiward the Hare and*~~

~~*FABLE*~~

~~*Belin the Ram, he is victorious by uniting violence with cunning; Bruin, the dull, strong, formidable Bear, is humbled by having greater power than his own enlisted against him; and the most dangerous of all the fox's enemies, Isengrim, the obstinate, greedy, and implacable Wolf, after being baffled by repeated strokes of malicious ingenuity, forces Reynard to a single combat, but even thus is not a match for his dexterous adversary. The knavish fox has allies worthy of him in Grimbart the watchful badger, and in his own aunt Dame Rukenawe, the learned She-ape; and he plays at his pleasure on the simple credulity of the Lion-King, the image of an im- potent feudal sovereign, The characters of these and other brutes are kept up with a rude kind of consistency, which gives them great liveliness; many of the incidents are devised with much force of humour; and the sly hits at: the weak points of medizval polity and manners and religion are incessant and palpable.*~~

~~*It is needless, as has already been said, to attempt tracing the appearance which fables, or incidents borrowed from them, make so frequently as incidental ornaments in the older literature of our own country and others. Nor is there here fit occasion for dwelling minutely on the culti- vation of the apologue in modern times, as a special form of poetical composition. It has appeared in every modern nation of Europe, but has nowhere become very important, and has hardly ever exhibited much originality either of spirit or of manner. In our own language, Prior indicated the possession of much aptitude for it; but neither the fables of Moore, nor even the much more lively ones of Gay, possess any distinguished merit. To Dryden's spirited remodellings of old poems, romances, and fabliaux, the name of fables, which he was pleased to give them, is quite inapplicable. In German, Hagedorn and Gellert are quite forgotten ; and even Lessing's fables are read by few but schoolboys. In Spanish, Yriarte's fables on literary subjects are sprightly and graceful. A spirited version of the best appeared in Blackwood's Magazine, 1839. Among Italians Pignotti is famous for versatility and command of rhythm, as amongst Russians is Kriloff for his keen satire on Russian society. He has been translated into English by Mr Ralston.*~~

~~*France alone in modern times has attained any pre- eminence in the fable, and this distinction is almost entirely owing to one author. Marie de France in the 13th cen- tury, Gilles Corrozet, Guillaume Haudent, and Guillaume Gueroult in the 16th, are now studied only as the precursors of La Fontaine, from whom he may have borrowed a stray hint or the outline of a story. The unique character of his work has given a new word to the French language: other writers of fables are called fabulistes, La Fontaine is named le fablier, Referring for fuller details to the article Tua FoNTAINE, we must content ourselves here with briefly indicating his chief characteristics. He is a true poet; his verse is exquisitely modulated ; his love of nature often reminds us of Virgil, as does his tenderness and pathos (see, for instance, The Two Pigeons and Death and the Woodentter). He is full of sly fun and delicate humour ; like Horace he satirizes without wounding, and " plays around the heart." Lastly, he is a keen observer of men. The whole society of the 17th century, its greatness and its foibles, its luxury and its squalor, from Le grand monarque to the poor manant, from his majesty the lion to the courtier of au ape, is*~~

~~*painted to the life. To borrow his own phrase, La Fontaine's fables are "' une ample comédie 4 cent actes divers," –*~~

~~*The fables of Lessing represent the reaction against the French school of fabulists. " With La Fontaine himself," says Lessing, "I have no quarrel, but against the imitators of La Fontaine I enter my protest." HIs attentions was*~~

~~*839*~~

~~*first called to the fable by Gellert's popular work published in 1746. Gellert's fables were closely modelled after La Fontaine's, and were a vehicle for lively railings against the fair sex, and hits at contemporary follies. Lessing's early essays were in the same style, but his subsequent study of the history and theory of the fable led him to discard his former model as a perversion of later times, and the " Fabeln," published in 1759, are the outcome of his riper views. lLessing's fables, like all that he wrote, display his vigorous common sense. IIe has, it is true, little of La Fontaine's curiosa felicitas, his sly humour and lightness of touch; and Frenchmen would say that his criticism of La Fontaine is an illustration of the fable of the sour grapes. On the other liand he has the rare power of looking at both sides of a moral problem; he holds a brief for the stupid and the feeble, the ass and the lamb; and in spite of his formal protest against poetical ornament, there is in not a fow of his fables a vein of true poetry, as in the Sheep (ii. 13) and Jupiter and the Sheep (ii. 18). But the value of the work is infinitely enhanced by the monograph on the essence of the fable which appeared at the same time, and as an illustration of which the fables were written. Much of the essay is taken up with the refutation of the theories of contemporary fabulists, De la Motte, Richer, Breittinger, Batteux, who only survive in Lessing's pages like the fly in amber. Passing over this negative criticism we may briefly state the results of Lessing's investigation. According to Lessing the ideal fable is that of Alsop. All the elabora- tions and refinements of later authors, from Phedrus to La Fontaine, are perversions of this original, The fable is essentially a moral precept illustrated by a single example, and it is the lesson thus enforced which gives to the fable its unity and makes it a work of art. The illustration must be either an actual occurrence or represented*~~

~~*as such, because a fictitious case invented ad hoc can appeal but feebly to the reader's judgment. Lastly, the fable requires a story or connected chain of events. A single fact will not make a fable, but is only an emblem. We thus arrive at the following definition :—" A fable is a relation of a series of changes which together form a whole. The unity of the fable consists herein, that all the parts lead up to an end, the end for which the fable was invented being the moral precept."*~~

~~*We may notice in passing a problem in connexion with the fable which had long been debated, but never satisfac- torily resolved till Lessing took it in hand,—Wby should animals have been almost universally chosen as the chief dramatis persone ? The reason, according to Lessing, is that animals have distinct characters which are known and recognized by all. The fabulist who writes of Britannicus and Nero appeals to the few who know Roman history. The Wolf and the Lamb comes home to every one whether learned or simple. But, besides this, human synipathies obscure the moral judgment; hence it follows that the fable, unlike the drama and the epos, should abstain from all that is likely to arouse our prejudices or our passions. In this respect the Wolf and the Lamb of A'sop is a more perfect fable than the Rich Man and the Poor Man's Ewe Lamb of Nathan.*~~

~~*Lessing's analysis and definition of the fable, though he seems himself unconscious of the scope of his argument, is in truth its death-warrant. The beast-fable arose in a primitive age when men firmly believed that beasts could talk and reason, that any wolf they met might be a were-wolf, that a peacock might be a Pythagoras in disguise, and an Ox or even a cat a being worthy of their worship. To this succeeded the second age of the fable, which belongs to the same stage of culture as the Hebrew proverbs and the gnomic poets of Greece. That honesty is the best policy, that death is common to all, seemed to the men of*~~

~~*that day profound truths wortliy to be embalmed in verse or set off by the aid of story or anecdote. Last comes an age of high literary culture which tolerates the trite morals and hackneyed tales for the sake of the exquisite setting, and is amused at the wit which introduces topics and characters*~~

~~*of the day under the transparent veil of animal life. Such an artificial product can be nothing more than the fashion of aday, and must, like pastoral poetry, die a natural death. A serious moralist would hardly chose that form to inculcate, like Mandeville in his Fable of the Bees, a new doctrine in morals, for the moral of the fable must be such that lie who runs may read. A true poet will not care to masquerade as a moral teacher, or show his wit by refurbishing some old-world maxim. (F. 8.)*~~

~~*FABRE D'EGLANTINE, Purr Francois NAZAIRE (1755-1794), a French dramatist and revolutionist, was born at Carcassonne, December 28, 1755. HIs real name was simple Fabre, the "d'Eglantine" being an addition which he adopted in commemoration of his receiving the golden eglantine of Clemence Isaure from the academy of the floral games at Toulouse. After travelling through the provinces as an actor, he came to Paris when about thirty years of age with the intention of continuing the same career, but being ignored by the critics he ventured to take his revenge by a comedy entitled Les gens des Lettres ou le Provincial & Paris, and in spite of its failure continued to bring piece after piece on the boards. Shortly after the outbreak of the revolutionary movement he entered the political arena, was chosen by Danton as his private secre-tary, aud obtained from the electors of Paris a place in the National Convention. HE distinguished himself by the extravagance of his speeches and measures, voting for the king's death, supporting the mazxdmem and the law of the suspected, and giving distorted evidence against the Girondins. On the abolition of the Gregorian calendar he was one of the most active members of the committee en- trusted with the formation of the republican substitute, and to him was due a large part of the new nomenclature, witli its poetic Prairial and Ploreal, its prosaic Primidi and Duodi, and its absurd substitution of the names of trees and beasts and implements for those of saints and heroes. The report which he made on the subject on 24th October is not with- out scientific'value. On January 12, 1794 he was arrested by order of the committee of public safety on a charge of malversation and forgery in connexion with the affairs of the Compagnie des Indes. During his trial he displayed the greatest apparent nonchalance, sitting in an arm chair, looking out dreamily at tlie rain, and singing his own well- known song of J7 pleut, il pleut, bergére, rentre*~~

~~*tes blancs moutons. On his way to the scaffold he distributed his manuscript poems to the people.*~~

~~*Fabre d'Kglantine left behind him seventeen plays and a number of miscellaneous productions. One only of the plays, Le Phalinthe de Moliére, still preserves its reputation as a good specimen of the second class. It professes to be a continuation of Moliére's Le Misanthrope, but the hero of the piece is of a different character from the nominal proto-type—an impersonation, indeed, of pure and simple egotism. On its publication the play was introduced by a preface, in which the author mercilessly satirizes the Optimiste of his rival Collin d'Harleville, whose Chateaux en Espagne lad gained the applause which D'Eglantine's Présomptueux had failed to win, A postliumous play, Les Précepteurs, steeped With the doctrines of Rousseau's Lmile, was performed on 17th September 1794, and met with an enthusiastic recep- tion, The author's Wuvres mélées et posthumes were pub- lished at Paris 1802, 2 vols. –*~~

~~*See Albert Maurin, Galerie hist de la Révolution Srancaise, tome*~~

~~*li.; Jules Janin, Hist. de la Litt. dram., Chénier, Tableau de la Litt. francaise.*~~

~~*FAB—FAB*~~

~~*FABRETTI, RaryaAet (1618-1700), a celebrated Italian antiquary, was born in 1618, at Urbino in Umbria. A younger son, and destined to the pursuit of the law, he studied first at Cagli, and afterwards in his native city, where he took the degree of doctor at the age of eighteen years. While in Rome, preparing for practice at the bar, he early attracted the notice of Cardinal Lorenzo Imperiali, who employed him on important and difficult political affairs in Spain. He was named successively treasurer and auditor of the papal legation in that country, where he remained thirteen years. During all this time, however, his favourite classical and antiquarian studies were not neglected; and returning to Rome with the legate, Bonelli, who had been made cardinal, he was able on the journey to make impor- tant observations of the relics and monuments of Spain, France, and Italy, and to converse with the many eminent scholars of those countries who afterwards corresponded with*~~

~~*him. At Rome he was appointed judge of appellation of the Capitol, which post he left to be, under the legate, Cardinal Cerri, auditor of the legation at his native city, Urbino. After three years he returned to Rome, on the in- vitation of Cardinal Carpegna, vicar of Innocent XI., a great lover of antiquities and learning, and now found that ful- ness of leisure which enabled him to carry on those studies and produce those works which have made him famous. HIe examined with minute care the monuments and inscrip- tions of the Campagna. In his solitary expeditions he always rode a horse which his friends nicknamed Marco Polo, after the celebrated Venetian traveller, saying that it could discover lalf-hidden monuments by smelling only, and thus frequently led its master to notice what he would otherwise have passed by. Fabretti was delighted with the name, and used it himself in a letter on the study of antiquity, still in manuscript. By Innocent XII. Fabretti was made keeper of the archives of the castle St Angelo, a charge of great responsibility and trust, which he retained till his death.*~~

~~*HIs work De Aquis et Aque-ductibus veteris Rome, 1680, three dissertatious which cleared up a number of obscurities as to the topography of ancient Latium, is inserted in Greevius's Thesaurus, iv. 1677. HIs interpretation in this work of certuin passages iu Livy and other classical authors involved him in a dispute with Gronovius, which bore a strong resemblance to that between Milton and Salmasius, Gronovius addressing Fabretti as aber usticus, and the latter, in reply, speaking of Grunnowius and his*~~

~~*ecvelate In this controversy Fabretti used the pseudo- nym Jasitheus, which he afterwards took as his pastoral name in the Academy of the Arcadians. HIs other works, De Columna Trajant Syntagma, Rome, 1683, and Jnserip- tionum Antiquarum Lxplicatio, Rome, 1699, throw much light on Roman antiquity, especially with the aid of the principle which he himself employed of making one monument interpret another. In the former of these works is also to be found his explication of a bas-relief, with inscriptions, now in the Capitol at Rome, representing the war and taking of Troy, known as the Iliac table. Letters and other shorter works of Fabretti are to be found iu some miscellaneous publications of the time, as the Jour- nal des Savants. HIe died at Roime, January 1700. HIs*~~

~~*collection of inscriptions aud monuments was purchased from his relatives by Cardinal Stoppaui, and placed in the ducal palace at Urbino, where they may still be seen.*~~

~~*Crescimbeni, Le Vite degli Arcadi illustri; Fabroni, Vite Llal- orwm, vi. 174; Niceron, iv. 372.*~~

~~*FABRIANO, a town of central Italy, province of Ancona, is situated at the foot of the Apenniues, and on the railway from Ancona to Rome, 35 miles S.W. of Ancona. It has paper and parchment works, tanneries, and powder ills. Among its principal buildings are the cathedral, several*~~

~~*churches with pictures by the Fabriano school of artists, the town hall, which contains ancient inscriptions, and the museum of the Count of Rossenti, where may be seen a very fine collection of objects in ivory. Fabriano is the birth-place of the painter Gentile da Fabriano. The population of the town proper in 1870 was 6071, or including the outskirts, 7612.*~~

~~*FABRIANO, GeEnTILE DA, an Italian painter, was born at Fabriano about 1370. HIe is said to have been a pupil of Allegretto di Nuzio, but there is every probability that he received most of his early instruction from Fra Giovanni, sur- named Angelico, to whose manner his bears in some respects a close similarity. About 1411 he went to Venice, where by order of the doge and senate he was engaged to adorn the great hall of the ducal palace with frescoes from the life of Barbarossa, HIe executed this work so entirely to the satisfaction of his employers that they granted him a pension for life, and accorded him the privilege of wearing the habit of a Venetian noble. About 1422 he went to Florence, where in 1423 he painted an Adoration of the Kings for the church of Santa Trinita, which is pre- served in the Florence gallery of paintings, and is con- sidered his best work now extant. 'To the same period belongs a Madonna and Child which is now in the Berlin Museum. Fabriano had by this time attained a wide re- putation, and was engaged to paint pictures for various churches, more particularly Siena, Perugia, Gubbio, and Fabriano, About 1426 he was called to Rome by Martin V. to adorn the church of St John Lateran*~~

~~*with frescoes from the life of John the Baptist. He also executed a portrait of the pope attended by ten cardinals, and in the church of St Francesco Romano a painting of the Virgin and Child attended by St Benedict and St Joseph, which was much esteemed by Michelangelo, but is no longer in existence. Fabriano died about 1459. Michelangelo said of him that his works resembled his surname Gentile, noble or refined. They are full of a quiet aud serene joyousness, and he has a naive and innocent delight in splendour and in gold ornaments, with which, however, his pictures are not overloaded.*~~

~~*FABRICIUS, Carus Luscrnus, a Roman general and consul, was perhaps the first member of the Fabricia gens who settled in Rome. He makes his earliest appearance in history as one of the ambassadors sent to the Tarentines to dissuade them from making war on the Romans, Elected consul in 282 3.c., he in the same year defeated the Boii aud the Etruscans. When in the following year the Romans were defeated by Pyrrhus, Fabricius was sent to treat for the ransom and exchange of the prisoners, and Pyrrhus endeavoured unsuccessfully to bribe him with large offers to enter his service. In 278 Fabricius was elected consul for the second time, and was successful in negotiat- ing terms of peace with Pyrrhus, who sailed away to Italy. Fabricius afterwards gained a series of victories over the Samnites, the Lucanians, and the Bruttii, and on his return to Rome received the honour of a triumph. Notwithstand- ing the offices he had filled he died poor, and provision had to be made for his daughter out of the funds of the state. In honour of his military achievements and his incorrup- tible integrity, the senate also decreed that he and his descendants should have a burial place inside the city.*~~

~~*FABRICIUS, George (1516-1571), poet, historian, and archeologist, was born at Chemnitz in Upper Saxony, on the 24th April 1516. He completed his studies at Frei- berg and Leipsic. Travelling into Italy with one of his pupils, he made an exhaustive study of the antiquities of Rome, The result was the second work named below, in which the correspondence between every discoverable relic of the old city and the references and descriptions which lay scattered throughout ancient literature was*~~

~~*formance.*~~

~~traced with the minutest detail. Even learned Germans suspected that the work was in reality an ancient per- Having returned to Germany in 1553, he was appointed director of the college of Meissen, where he died on the 13th July 1571. In his sacred poems, which obtained for him considerable distinction, he affected tv avoid every word with the slightest savour of paganism ; and he blamed the poets for their allusions to pagan divinities.~~

~~The following list includes the principal works which he pub- lished, either as author or as editor :—(1) Zerentii Afri Comedic~~

~~sex cum castigatione duplict Joannis Rivii et G. Fabrictt, Strasburg,~~

~~1548, 8vo; (2) Roma, sive Liber utilissimus de veterts Rone situ, regionibus, viis, templis, aliisque wdifietis, Basel, 1550, 8vo; (3) Virgilit Opera eum commentariis Servii et T. C. Donati, Basel, 1551, fol. ; (4) Virgiléi Opera a Fabricio castigata, Leipsic, 1551, 1591, 8vo ; (5) Poématum sacrorum libri quindecim, Basel, 1560, 16mo; (6) Poématum veterum ecclesiasticorum opera Christiana et operum reliquice ae fragmenta, 1562, 4to ; (7) De Re Pottica libri septem, 1566, 8vo; (8) Rerum Misnicarum libri septem, 1569, 4to; (9) Originum illustrissime stirpis Saxonice libri septem, 1597, fol.; (10) Rerum Germania magne et Saxonicee universe memorabilium volumina duo, Leipsic, 1609, fol. A life of George Fabricius was published in 1839, at Leipsic, by Professor C. G. Baumgarten Cru- sius. In 1845 the same biographer issued an edition of Fabricius's Epistole ad Wolf. Meucrum et alios equales, prefixed to which there is also a short sketch De Vita Ge. Fabricii et de gente Fabriciorwm.~~

~~FABRICIUS, Hieronymus (1537-1619), a celebrated Italian anatomist and surgeon, was surnamed Acquapen- dente from the episcopal city of that name, where he was born in 1537, At Padua, after a course of philos »phy, he studied medicine under Fallopius, whose successor as teacher of anatomy and surgery he became in 1562. From the senators of Venice he received numerous honours, and an anatomical theatre was built by them for his acconnuoda- tion. He died May 21, 1619.~~

~~*The collective works of Fabricius were printed by Bohn under the title of Opera omnia Anatomica ct Physiologica, Leipsic, 1687. The Leyden edition, published by Albinus in 1738, folio, is preferred to that of Bohn, as containing a life of the author and the prefaces of his treatises. See ANATOMY, vol. i., p. 809, and SuRGERY.*~~

~~*FABRICIUS, Joannes Atpertus (1668-1736), one of the most learned, laborious, and useful of bibliographers, was born at Leipsic, November 11, 1668. His father, Werner Fabricius, director of music in the church of St Paul at Leipsic, was the author of several works, particu- larly Delicice Harmonic, published in 1657. Joannes Albertus himself commenced his studies under his father, who on his deathbed recommended him to the care of Valentine Alberti. He studied under Weuceslas Bull and J, S. Herrichen, and afterwards at Quedlinburg under Samuel Schmidt. It was in Schmidt's library, as he afterwards said, that he found the two works, Barthuiss's Adversaria and Morhoff's Polyhistor, which suggested to him the idea of his Bibliothece, the kind of work for which he stands pre-eminent among scholars. Having returned to Leipsic in 1686, he was the same year admitted bachelor in philosophy; and in the begin- ning of 1688 he took the degree of master in the same faculty, shortly after which he published his first work, Seriptorum recentium decas, an attack on ten writers of the day, Thomasius among them. His Decas Decadum, sive plagiarorum et pseudonymorum centuria, published in the following year, is the only one of his works to which le signs the name Faber. He then applied himself to the study of medicine, which, however, he relinquished for that of theology; and having gone to Hamburg in 1693, he proposed to travel abroad, when the unexpected tidings that the expense of his education had absorbed his whole patri- mony, and even left him in debt to his trustee, forced him to abandon his project. He therefore remained at Ham- burg, where J. F. Mayer employed him in the capacity of librarian. In 1696 he accompanied his patron to Sweden ;*~~

~~*and, on his return to Hamburg, not long afterwards, he com- peted for the chair of logic and philosophy. The suffrages being equally divided*~~

~~*between Fabricius and Sebastian Edzardi, one of his opponents, the appointment was decided by lot in favour of Edzardi ; but in 1699 Fabricius suc- ceeded Vincent Placcius in the chair of rhetoric and ethics, after which he took the degree of doctor in theology at Kiel. In 1701 J. F. Mayer, who had established himself at Greifswald, caused the chair of theology in that city to be offered to Fabricius; but he refused it on account of his health. But in 1708 he accepted the professorship of theology, logic, and metaphysics, and was preparing to enter on his new office, when the senate of Hamburg in- duced him to remain, by adding to his professorship the office of rector of the school of St John, then held by his father-in-law Schultz. Schultz died in 1709, but Fabricius retained the rectorship two years longer. Jn 1719 the land- grave of Hesse-Cassel made him so advantageous an offer that he was on the point of accepting it; but this time also the magistrates, by a seasonable increase of salary, prevailed on him to remain with them. An attempt was subse- quently made to draw him to Wittenberg ; but he refused to listen to the proposals made to him, and remained at Hamburg, where he died April 30, 1736.*~~

~~*Niceron and Reimar give a list of 128 books by Fabricius, but very many of them were only works which he had edited. One of the most famed and laborious of his works is the Bibliotheca Latina, sive notitia auetorum veterum Latinorum quorumeunque scripta ad nos pervenerunt, Hamburg, 1697, 8vo, a work which was republished in an improved and amended form by J. A. Ernesti, Leipsic, 1773, in three vols. 8vo. The divisions of the compilation are—the writers to the age of Tiberius; thence to that of the Antonines ; and thirdly, to the decay of the language ; while a fourth gives fragments from old authors, and chapters on early Christian literature. His chef dceuvre is the Bibliotheca Greea, sive notitia seriptorum veterum Groeecorum quorumeunque monumenta integra aut frag- menta edita extant, tum plerorumque e manuscript. ae deperditis, Hamburg, 1705-1728, in 14 vols. 4to, a work which has jnstly been denominated maximus antique ecruditionis thesaurus. It was re-arranged by Harles, at Hamburg, in 1790. Its divisions are marked off by Homer, Plato, Christ, Constantine, and the capture of Constantinople in 1453, while a sixth section is devoted to eanon law, jurisprudence, and medicine. Of his remaining works we may mention—Bibliotheca Antiquaria, sive introductio in notitiam seriptorum qui antiquitates*~~

~~*Hebraicas, Grecas, Romanas, et Christianas seriptis illustrarunt, 1713 and 1726, 4to; Centifoliwm Lutheranum, sive notitia literaria seriptorum omnis generis de B. D. Luthero, 1728 and 1780, 8vo ; as also Salutaris lux evangelii toti orbi per divinam gratiam ecxoriens, sive notitia historico-chronologica, litteraria, ae geographica propagatorwm per orbem totum Christiano- rum saerorum, 1731, 4to; and Hydro-theology, in German, 1734, 4to. Among the principal works edited by Fabricius may be named Joannis Mabillontt iter Germanieum, et Joannis Launoit de Scholis eclebribus a Carolo Magno ect post Carolum Magnum in occidente instauratis liber, 1717, 8vo.*~~

~~*The details of the life of Fabricius are to be found in De Vita et Scriptis J. A. Fabrieit Commentarius, by his son-in-law, H. S. Reimar, published at Hamburg, 1757. This is the work whence Niceron, Chauffepié, and other writers on the subjeet have borrowed their materials. Niceron's work is entitled AMenwires pour servir a Uhistotre des hommes illustres dans la republique des lettres, avee wn catalogue raisonné de leurs owvrages, Paris, 1729-1745.*~~

~~*FABRICIUS, Jonann Curistran (1745-1808), one of the chief founders of scientific entomology, was born at Tondern in Schleswig, January 7, 1745. HIs father was a physician of enlightened views, who encouraged his son's inclination to study the natural sciences, and, after educating him at Altona and Copenhagen, sent him to Upsala, where, | Some time after this he was chosen to preach a disconrse in attending the lectures of the great Linnzeus, his future des- | the pontifical chapel before Benedict XIV., and made such tiny, as he himself says, appears to have been laid. Of his | a favourable impression that the pontiff settled on him an career, apart from entomology, it may be briefly recorded | annuity left by the Countess Rospigliosi to young men who that he devoted his attention professionally to political | had taken a degree in law. With the possession of this economy, and, after lecturing on that subject in 1769, was | annuity Fabroni was able to devote his whiole time to study. appointed a few years later professor of natural history, | Besides his other literary labours, he commenced at Pisa in economy, and finance at Kiel, in which capacity he wrote | 1771 a literary journal, which he continued till 1796. various works, chiefly referring to Denmark, and of no | About 1772 he made a*~~

~~journey to Paris, where he formed special interest. He also published a few other works on | the acquaintance of Condoreet, Diderot, D'Alembert,~~

~~general and natural history, botany, and travel (of which the Reise nach Norwegen, 1779, deserves separate mention),— for, although his professional stipend was small, he extended his personal researches into every town in northern and central Europe where a natural history museum was to be found. In 1771 he married the daughter of Counsellor Ambrosius of Flensborg, by whom he had two sons and one daughter; and he died on 3d March 1808.~~

~~It is, however, purely as an entomologist that the memory of Fabricius survives, aided perhaps im this country by the fact that he visited Great Britain many times after 1767, exhibiting a marked partiality for English naturalists, amongst whom were Solander, Sir Joseph Banks, Drury, Hunter, Francillon, Pennant, and Greville. Sir Joseph Banks's specimens, indeed, formerly in the col- lection of the Linnean Society, and now separately trea- sured in the British Museum, still retain the labels written by Fabricius, and are often consulted by entomologists as evidence of his views. For many years his great scientific reputation rested upon the system of classification, which (it can scarcely be said in opposition to that of his revered master Linneeus) he founded upon the structure of the month-organs, instead of the wings. No scheme, however, based upon solitary characters suffices any longer for the comprehension of the vast number of forms now known to science; and, although the value of the cibarian organs is still fully recognized, the system exclusively founded on them has long since passed into disuse. But the name of Fabricius is indelibly stamped upon the science, as he had a keen eye for specific differences, and possessed the art of describing in a marvellously terse and accurate manner ; and, from his being recognized as a master, added to the opportunities afforded during his many journeys to European capitals, great numbers of insects passed through his hands for description and arrangement according to his system, at a time when almost everything was new, owing to paucity of workers.~~

~~A complete list of his entomological publications (31) will be found in Hagen's Bibliotheca Entomologiw; the following are the chief :—~~

~~*Systema Entomologie, 1775; Genera Insectorum, 1776 ; Philosophia Entomologica, 1778 ; Species insectorwm, 1781; Man- tissa. Insectorum, 1787 ; Entomologia Systematica, 1792-1794, with a supplement, 1798; Systema LEleutheratorum (1801), Rhyn- gotorum (1808), Prezatorwm (1804), and Andtliatorum (1805). Full particulars of his life will be found, with a portrait, in the Transactions of the Entomological Society of London, vol. iv. (1845), pp. i-xvi., where his autobiography is translated from the Danish by the Rev. F. W. Hope, then president of the society. There is also a good account by Professor Westwood, in the article Insecta," British Cyclopedia, p. 881. Baron Walckenaer's verbose life in the Biographie Universelle, like Latreille's " Notice Biographique "*~~

~~*in the Annales du Muséwm d'Histoire Naturelle, ii. 393 (1808), contains important errors.*~~

~~*FABRONI, Anceto (1732-1803), a celebrated Italian biographer, was born at Morradi, Tuscany, 25th September 1732. After studying at Faenza under the grammarian Girolamo Ferri, he entered the Roman college founded for the education of young Tuscans. On the conclusion of his three years' curriculum, he resolved, being determined to at- tain to literary distinction, to continue his stay in Rome, and having been introduced to the celebrated Jausenist Bottari, received from him the canonry of 8. Teresa in Trastevere.*~~

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~~*Rousseau, and most of the other eminent Frenchmen of that age. He also spent four months in London. He died at Pisa 22d September 1803.*~~

~~*The following are his principal works :— Vite Italorum doctrina excellentium qui seeculis XVII. et XVII. Jloruerunt, Pisa, 1778—1799, 1804-1805, 20 vols. 8vo (the last two vols. were published posthumously, and contain a life of the author) ; Laurentit Medieci Magnifier Vita, Pisa, 1784, 2 vols. 8vo; Leonis X. pontificis maximt Vita, Pisa, 1797; and Elogi dt Dante Alighieri, di Angelo Poliziano, di Lodovico Ariosto, e di Torg. Tasso, Parma, 1800.*~~

~~*FABROT, Cuartes Annipat (1580-1659), a French jurisconsult, was born at Aix in Provence, 15th September 1580. At an early age he made great progress in the ancient languages and in the civil and the canon law; and in 1602 he received the degree of doctor of law, and was made avocat to the parlement of Aix. In 1609 he obtained a professorship in the university of his native town. He is best known by his translation of the Basilica, which may be said to have formed the code of the Eastern empire till its destruction. This work was published at Paris in 1647 in 7 vols. fol., and obtained for its author a considerable pension from the chancellor Seguier, to whom it was dedi- cated. Fabrot likewise rendered great service to the science of jurisprudence by his edition of Cujas, which comprised several treatises of that great jurist previously unpublished. He also edited the works of several Byzantine historians, and is besides the author of various antiquarian and legal treatises. He died at Paris 16th January 1659.*~~

~~*FABYAN, Rosert, an English chronicler, sprung from an Essex family, is said by Bishop Tanner to have been born in London about the middle of the 15th century. Even the date of his death, 1512, is an inference from that upon which his will was proved, namely, 12th July 1513. The records of the Draper's Company, of which he wasa member, might have settled these and other chronological doubts ; but in consequence of the destruction of the company's hall by fire, there are no memoranda of a date earlier than 1602. All the ascertained details of his life are given in the bio- graphical preface to Sir Henry Ellis's admirable edition of Fabyan's Chronicles. From this source we learn that Fabyan was alderman for the ward of Farringdon-Without, and that in 1493 he was appointed to the office of sheriff. In 1502, though he is believed on good grounds to have been very rich, he resigned the former office on the plea of poverty, not wishing probably to be elected to the ex- pensive position of Lord Mayor, as he had a very numerous family. Fabyan's Chronicle extends from the time when "Brute entryd firste the Ile of Albion" to the year 1485. In subsequent editions it was continued by unknown authors to the year 1559. There have been five editions of the work,—the first printed in 1516 by Pynson, the second by Rastell in 1533, the third by Reynes in 1542, the fourth by Kyngeston in 1559, The fifth, in the pre- paration of which all the previous editions were compared, was published*~~

~~by Sir HHenry Ellis in 1811. For its ex- posure of ecclesiastical abuses, Wolsey, it is said, ordered many copies of the first edition to be burnt,— hence iis scarcity. The second edition was not published until after the cardinal's death. A great merit of the work consists in its details of city government and ceremonial. Wharton, indeed, observes that, in the eyes of the chronicler, a lord mayor of London seemed to be as august a personage as a king of England, and a city company's dinner as important an event as an English victory in France or a constitutional struggle at home. Ellis, it nay be added, suggests that the part of the history which may have excited the hostility of Wolsey was an abstract of the Commons Bill, 11th year of HHenry IV., for the resumption of ecclesiastical property. But the story of the suppression of the first edition ap- pears to rest on the uncorroborated assertion of Bayle. In col. 256, vol. i. of Anthony & Wood's Athenee O.contenses~~

~~843~~

~~(Bliss's edition, 4 vols., 1813-1820) there is an entry to the effect that Fabyan was "born in London, bred in grammaticals and something in logicalls in this university." In this account it is stated that Fabyan died in February~~

~~1511.~~

~~FACCIOLATI, Jacovo (1682-1769), was born at Torig- gia, in the province of Padua, in 1682. HHe owed his admission to the seminary of Padua to Cardinal Barberigo, who had formed a high opinion of the boy's talents. As professor of logis, and regent of the schools, Facciolati was the ornament of the Paduan university during a period of forty-five years. HHe published improved editions of several philological works, such as the Vhesaurus Ciceronianus of Nizolius, and the polyglot vocabulary known under the name of Calepino. The latter work, in which he was assisted by his pupil Forcellini, he completed in four years —1715 to 1719. It was written in seven languages, aud suggested to the editor the idea of his opus magnum, the Totius Latinitatis Lexicon, 4 vols. fol., Padua, 1771. In the compilation of this work the chief burden seems to have been borne by Facciolati's pupil Forcellini, to whom, however, the lexicographer allows a very scanty measure of justice, though the work occupied thirty years of~~

~~his life. Perhaps the best testimony to the learning and industry of the compiler is the well-known observation that the whole body of Latinity, if it were to perish, might be restored from this lexicon. Facciolati's mastery of Latin style, as displayed in his epistles, has been very much admired for its purity and grace. In or about 1739 Facciolati under- took the continuation of Papadopoli's history of the university of Padua, carrying it on to his own day. Facciolati was known over all Europe as one of the most enlightened and zealous teachers of the time; and among the many flattering invitations which he received, but always declined, was oue from the king of Portugal, to accept the directorship of a college at Lisbon for the young nobility. IIe died in 1769. IIis history of the university was published in 1757, under the name Fasti Gymnasii Patavint. In 1808 a volume containing nine of his Lpistles, never before published, was issued at Padua.~~

~~FACTORS, in mercantile law, are agents entrusted with goods for the purpose of sale. The general rule as to sales at common law is that no person but the true owner can give a title to a purchaser. If, therefore, a factor or any similar kind of agent, being in possession of goods belong- ing to his principal, dealt with them in any unauthorized way, the persons dealing with him acquired no right as against the real owner. The inconvenience and injustice of this rule are apparent, A merchant bona fide buying goods from a person who was in possession of them, and had what among mercantile men are called the documents of title, was liable to have his rights defeated by the ap- pearance of the real owner, who repudiated the transaction and recovered the goods, Oran agent might pledge the goods entrusted to him for advances made to him in good faith on that security, and the unfortunate lender might find that the goods belonged to a principal, and that he had no security for his loan. It thus became necessary in such cases to inquire into the real ownership of the goods and the nature of the agent's authority,—an intolerable necessity iu trade. Accordingly the Factors Acts were passed for the protection of such transactions,~~

~~The 4 Geo. LV. c. 83 was an Act for the " better protec- tion of the property of merchauts and others who may hereafter enter into contracts or agreements in relation to goods, wares, and merchandise entrusted to~~

~~factors or agents." It was followed by the 6 Geo. IV. c. 94, the principal Factors Act, the second section of which enacts that "persons entrusted with, and in possession of, any bill of lading, Indian warrant, dock warrant, warehouse keeper's~~

~~certificate, warrant or order for the delivery of goods, shall be deemed and taken to be the true owner of the goods, so far as to give validity to sales made by them to buyers," without notice of the fact that they are not the real owners. When a factor pledges goods deposited with him as security for an antecedent debt, the pledger shall acquire no further interest in the goods than was possessed by the factor himself. By section 4, contracts made with agents for the purchase of goods consigned to them shall be held binding upon the owners notwithstanding that the purchaser had notice that the veudors were only agents: provided such contracts be made in the usual course of business, and that the purchaser had not notice that the agent had no authority to sell.~~

~~By the Amendment Act, 5 and 6 Vict. c. 39 (which re- cites that much litigation had arisen on the construction of the former statute, and that it is necessary to explain and ex- tend the provisions thereof), it is enacted "that any agent who shall thereafter be entrusted with the possession of goods, or of the documents of title to goods, shall be deemed and taken to be owner of such goods and documents, so far as to give validity to any contract or agreement by way of pledge, lien, or security bona fide made to any person with such agent, aswell for any original loan, advance, or payment, made on the security of such goods or documents, as also for any further or continuing advance." And such contracts shall be binding on the owner notwithstanding notice of the agency. Dona fide deposits in exchange are protected, a.e., Where an agent pledges goods consigned to him in ex- change for other goods on which the person delivering them up had at the time a valid lien. In all cases the transac- tion must be bona fide, and without notice that the agent is acting beyond his authority or in bad faith as regards his principal.~~

~~"These Acts," says Mr Benjamin in his treatise on The Sale of Personal Property, "apply solely to persons en- trusted as factors or commission~~

~~*merchants, not to persons to whose employment a power of sale is not ordinarily added, as a wharfinger, who receives goods usually without a power to sell. The statute is limited in its scope to mercantile trans- actions, to dealings in goods and merchandise, and does not embrace sales of furniture or goods in possession of a tenant or bailee for him." And the courts of law have un- fortunately felt themselves constrained to put a very narrow interpretation on the scope of the Acts. The most remark- able case was that of Fuentes v. Montes (Law Leports, 3 Common Pleas, 268). Here the plaintiffs, wine merchants in Spain, had consigned some casks of sherry to a London factor for sale, but afterwards revoked his authority. He, while in possession of the wine, but after the revocation, pledged it as security for advances made by the defend- ant, who acted in good faith, and in entire ignorance of the revocation, The court held that the words "entrusted with and in possession of" referred to the time of the pledge only, and that the factor was not so entrusted at the time of the pledge. This decision, which unsettled the confidence of merchants in dealing with apparent owners of goods, and a general uncertainty as to the true construction of the enactments, led to the passing of the last Factors Act (40 and 41 Vict. c. 39), The second section overrules the de- cision in Fuentes v. Montes, by providing that a revocation of authority shall not affect the right of persons purchasing from factors without notice of such revocation. Then the Act goes on to provide for:other cases of apparent owner- ship in which the same hardships had arisen which the Factors Acts were intended to meet. Thus, where goods have been sold, and the vendor has b2en permitted to retain possession of the documents of title, any sale by him or his agent will be as valid and effectual as if he or his agent were a person entrusted with, or in possession of, the goods under*~~

~~*FAC—FAC*~~

~~*the Factors Acts. A case recently decided (Johnson v. the. Credit Lyonnais Company) will illustrate the purpose of this enactment. A, a tobacco broker, had 50 hogsheads of tobacco lying in dock for which warrants were issued to him. He sold it to B, who paid for it, but left the warrarts in A's hands, and took no steps to have any change made in the books cf the dock company as to the ownership. In the meantime A obtained advances*~~

~~*on the tobacco from C and D, handing over to them the dock warrants. It was held that these transactions were not protected as against B; under the new Act such transactions are pro- tected. The fourth section deals with cases in which goods have been sold, and the vendee has got possession of the documents of title, although some lien or other right remains tothe vendor. Dealings with the vendee in respect of the goods, and in ignorance of the vendor's right, are protected. The fifth section protects bona fide transfers of documents of title for a previous vendor's lien or right of stoppage in transitu. (gz. RB.)*~~

~~*FACTORY ACTS. The long series of Factory Acts, cul- minating in the home secretary's bill of the present session (1878), constitutes one of the most important chapters in the history of modern English legislation. The Acts assert the right of the state to control the industrial organizations which depend upon the labour of women and children, As yet the freedom of the adult male labourer has been held sacred from the interference of the legislature, but it is necessarily involved, to some extent, in the protection exercised over persons whose co-operation is necessary to his work. The gradual rise of the important principle that, in the interests of the moral and physical well-being of the community, the labour of women and children should be restricted by law within reasonable limits may be seen by a glance at the Factory Bills introduced in parliament since the beginning of the century.*~~

~~*In 1802 an Act was passed " for the Preservation of the HIealth and Morals of Apprentices and others employed in Cotton and other Mills, and Cotton and other Factories." The immediate cause of passing this bill was the fearful spread throughout the factory district of Manchester of epidemic disease, which made dreadful havoc among the youthful labouring population on account of their scanty mode of living and pecnliar way of working.' Pauper children from the agricultural districts of the south were sent to the northern counties to work in the factories which sprang up there in consequence of their superior supply of water-power. Their long hours of labour, the wretched accommodation provided for them, and the over-crowding of workmen in mills and factories, caused the alarming epidemic fevers of those times and districts. The Act of 1802 subjected alk mills employing three or more apprentices, or*~~

~~*twenty other persons, to the rules and regulations of the Act. The walls were to be washed with quicklime and water; a sufficient number of windows was to be provided; the apprentices were always to have two suits of clothing, one to be new every year. The most important regulation, however, was that which fixed the hours of work at twelve per day, and prohibited work altogether from 9 o'clock at night to 6 in the morning. This Act, being intended to meet the evils of the apprentice system, did not extend to factories where children residing in the neighbourhood were employed. The use of steam-power had meanwhile caused the growth of factories in populous town districts. In 1819 an Act was passed for the regulation of cotton mills : children were not to be admitted before the age of nine, and between that age and sixteen were restricted to twelve hours a day, exclusive of an hour and a half for meal-time. eee ee a*~~

~~*1 Von Plener, English Factory Legislation, p. il.*~~

~~*FAC ror Y ACTS*~~

~~*In 1825 Sir John Cam Hobhouse's Bill was passed, which established a partial holiday on Saturday, and provided penalties for offences against the Act. An amending Act was passed (10 Geo. IV. c. 51), and in 1831 (by the 1 and 2 Will. IV. c. 39) night work in the cotton factories was prohibited for persons between nine and twenty-one years of age ; the working day for persons under eighteen was to be twelve hours, and on Saturdays nine. This was the time of the great political movement which brought about the Reform Act of 1832, and the factory question entered into and to some extent complicated the purely political issues. In the wool districts the unions of the working men clamoured for a restriction of non-adult labour in factories to ten hours a day, and their demand was supported by the Conservative and couutry party, out of opposition to the manufacturers, who were for the most part keen supporters of the Reform Bill. The wool factories had not been touched by the recent legislation, and the sufferings of the over-worked children appealed powerfully to the imagina- tion of the public. After much discussion in committees and commissions, the Act of 1833 (3 and 4 Will. IV. c. 103) was passed. Night work (between 8.30 p.m. and 5.30 a.m.) was prohibited to persons under eighteen in cotton, wool, worsted, hemp, flax, tow, and linen spinneries*~~

~~*and weaving mills; children from nine to thirteen were not allowed to work more than 48 hours a week; and young persons from thirteen to eighteen were restricted to 68 hours aweek. Jn silk factories children might be admitted under nine, and children under thirteen were to be allowed ten hours a day. Provision was also made for school attendance and for the appointment of factory inspectors to watch over the working of the law. The manufacturers, dreading the economical results of thelossof children's labour, subsequently induced the Government to propose that chil- dren over eleven should be allowed to work the full time of 69 hours a week, but in the face of the agitation for greater restrictions this amendment was not persisted in.!*~~

~~*The extension of the Factory Acts to unprotected industries now engaged the attention of philanthropists. A Mining Act (5 and 6 Vict. c. 99) was passed, which pro- hibited under-ground work to children under ten and women. In 1844 the Factory Act, 7 Vict. c. 15, was passed. Children from eight to thirteen might be employed in textile industries for not more than six hours and a half per day, but in factories where " young persons" restricted to ten hours a day were employed, children might also be employed for ten hours a day on alternate days. Children so employed had to attend school during the "half time." Adult women were brought under the same rules as "young persons." Lord Ashley's? Printworks Act followed in 1845, A Ten HOurs Bill was at last carried in 1847 (10 Vict. c. 29), Women and young persons were restricted to ten hours a day, and the legal working day was fixed from 5.30 a.m. to 8.80 p.m. By employing protected persons in relays, manufacturers were enabled to keep their works going during the whole of the legal day; and to meet this evasion, as it was deemed to be, of the factory legisla- tion a uniform working day was fixed, 13 and 14 Vict. c. 54. Young persons and women were allowed to work only between 6 a.m. and 6 p.m.—an hour and a half being allowed for meal-time. No protected person was to work on Saturday after 2 p.m. By the 16 and 17 Vict. c. 104,*~~

~~*1 One of the consequences of the restrictions imposed on the employ- ment of children was the increased use of machinery as a substitute. {n 1835 (before the Factory Act), there were 56,455 children employed in 3164 factories; in 1838 (under the Factory Act), 29,283 children were*~~

~~*employed in 4217 factories.—Von Plener's English Factory Legislation, p. 22.*~~

- ~~*Afterwards earl of Shaftesbury, whose name, more than any other, is entitled to be associated for ever with the English factory legislation.*~~

~~*845*~~

~~*children were limited toa legal day beginning at 6 a.m, and ending at 6 p.m. Bleaching and dyeing works were subjected to similar restrictions by Acts passed in 1860 and 1862, calendering and finishing works in 1863 and 1864. Lace factories were placed under the regulations of the Factories Acts by 24 and 25 Vict.c.117. Night work in bakehouses was prehibited to young persons under eighteen, by 26 and 27 Vict. c. 40. After the report of a commission, a new Factory Acts Extension Act was passed (27 and 28 Vict. c. 48), which brought manufactories of earthenware, per-cussion caps, lucifer matches, and cartridges, paper-staining, and fustian-cutting within the scope of the factory legisla- tion. In 1867 a distinction was drawn in legislation between factories and workshops. The Factory Acts Ex- tension Act of that year applied to all furnaces, iron and copper works, machine manufactories, metal and gntta- percha iactories, paper-mills, glass-works, printing offices, and bookbinders' shops, and to all establishments in which over 50 persons are employed for a period of a hundred days. Special modifications, however, were introduced to suit the requirements of the different trades. In the same year the Workshop Regulation Act was passed, for small trades and handicrafts, fixing the working day for children at 6 a.m. to8 p.m., and for young persons and women from 5a.m.to9p.m. Printing, bleaching, and dyeing works were brought under the general law by the Factory and Workshop Act 1870. Iu 1871 another Act with the same title was passed, which, ¢nter alza, subjected Government factories to the general Jaw. The Factory Act of 1874, the last of the series, raiscd the minimum of age in children to ten.*~~

~~*3y these various enactments the state las emphatically taken under its protection the whole class of children and young persons employed in manufacturing industries. It has doue this in the name of the moral and physical health of the community. The slow but steady advance of the principle of interference may be traced in the titles of the successive*~~

statutes. It is needless here to discuss the wisdom of the policy, which has now received en blec the stamp of legislative approval. The substantive law of the Factories Acts has been re-enacted in a measure laid before parliament in the present session, whici has already (May 1878) passed both Houses. In the debates in the Commons the only question of priuciple seriously raised was whether the freedom of adult women ought to be curtailed by legisla- tive interference. Mr Fawcett's motion in the negative was rejected by a large majority.

The following outline will give some idea of the scope of the law relating to factories and workshops consolidated by the new measure :—

Part I. contains the general law relating to factories and work- shops, under the following heads—(1) Sanitary Provisions; (2) Safety; (3) Employment and meal hours; (4) Holidays; (5) Edu- cation ; (6) Certificates of fitness for employment; (7) Accidents.

(1.) Under the first head, the buildings must be kept in a clean state, and free from efiluvia arising from any drain, privy, or other nuisance.

(2.) The second contains provisions for the fencing of dangerous machinery, and restrictions on the employment of children and young persons in cleaning, &c., machinery in motion.

(3.) A child, young person, or woman shall not be employed except during the period of cinployment fixed as follows:—

(a.) In textile factories.—For young persons and women, the period shall be from 6 a.m. to 6 p.m. or 7 a.m. to 7 p.m.; on Saturday, from 6 a.m. till 1 p.m. for manufacturing processes, and 1.80 for all employment, if one hour is allowed for meals ; otherwise at 12.30 and 1. Or if the work begins at 7 a.m., it shall end on Saturdays at 1.30 and 2 p.m. respectively. For meal times two hours at least on week days, and on Saturdays half an hour, must be allowed. Continuous employment without a Tea time of at least half an hour not to exceed four hours and a ialf,

For children. Employment to be for half time only (in morning or afternoon sets, or alternate days). The woik-day is the same as

~~above. A child must not be employed for cwo suecessive periods of seven days in the same set, whether morning or afternoon, nor on two successive Saturdays, nor on Saturday in any week if he has already on one day been employed more than five hours and a half. Nor shall a child be employed on two suecessive days, nor on the same day in two suecessive weeks.~~

~~(b.) In non-textile faetories.—Por young persons and women. Period of employment same as before, euding at 2 p.m. on Satur- days ; meal times not less than an hour and a half, on Saturday half an hour ; continuous employment without a meal not to exceed 5 hours ; these regulations also apply to young persons in workshops.~~

~~For children. WUalf time arrangements generally the same as before, continuous employment without a meal not to exceed 5 hours.~~

~~Women in workshops are subjeet to the same regulations as young persons, if young persons or children are employed; if not, the period of employment for a woman in a workshop shall be from 6 a.m. to 9 p.m. (on Saturday 4 p.m.). Absent time for meals, &c., must be allowed to the extent of four hours and a half (Saturdays two hours and a half).~~

~~The employment of young persons or children at home, when the work is the same as in a factory or workshop, but no machine power is used, is also regulated,—the day being fixed at 6 a.m. to 9 p.m.; for children, 6 a.m.tol p.m., or1 p.m. to 8. Meal tiines in factories or workshops must be simultaneous, and employment during such meal times is forbidden. The oceupier of a factory or workshop must issue a notice of the times of employment, &c. No children under 10 shall be employed.~~

~~(4.) The following holidays shall be allowed to all protected persons :—Christmas day, Good Friday (or the next public holiday), and eight half-holidays, two of which may be eommuted for one entire holiday.~~

~~(5.) Oceupiers must obtain a weekly certificate of school attend- anee for every child in their employment.~~

~~*(6.) Medical certificates of fitness for employment are required in the case of children and young persons under 16. Whena child becomes a young person a fresh certificate is necessary.*~~

~~*(7.) Notice of accidents, causing loss of life or bodily injury, must be sent to the inspector and certifying surgeon of the district.*~~

~~*Part I]. containsspecial provisions for particular classes of factories and workshops, such as bake-houses, print-works, bleaching and dyeing works. The third schedule to the Act contains a list of special exceptions too numerous to be given in detail.*~~

~~*Part III. provides for the administration of the law. Two classes of officers are to be appointed by the secretary of state, viz., (1) inspectors, charged with the duty of inspecting and examining factories and workshops at all reasonable times, and of exercising such other powers as nay be necessary to the carrying out of the Act; and (2) certifying surgeons to grant certificates of fitness under the Act. Numerous other sections relate to penalties and legal proceedings.*~~

~~*Part IV. defines the principal terms used in the Act. Child means a person under fourteen years of age ; a " young person" is between fourteen aud eighteen; "a woman" means a woman over eighteen. Other sections apply the Act to Scotland and Ireland, with a temporary saving for the employment of children under 10 and clildren over thirteen (lawfully employed at the time of the passing of the Act). Previous enactments are re- pealed. (E. R.)*~~

~~*FACULTY, in law, is a dispensation or licence to do that which is not permitted by the common law. The word in this sense is used only in ecclesiastical law. Thus, any alteration or enlargement of a church requires a licence or faculty from the ordinary. The faculty court belonging to the archbishopric of Canterbury is presided over by the Master of the Faculties, who has power "to grant dispensa- tions, as to marry, to eat flesh on days prohibited, to hold two or more benefices incompatible," &c. (Burn's Lcclesi- astical Law).*~~

~~*In universities aud other learned bodies faculty means the association of professors or practitioners of some special branch of learning or skill. Thus, in the Scotch universities we have the usual faculties of arts, medicine, divinity, and law. Again, the society of advocates of the court of session, and local bodies of legal practitioners, are described as faculties. The word, in this sense, has fallen into disuse in England.*~~

~~*FAENZA, a city of Italy, at the head of a circondario in the province of Ravenna, situated in a fertile plain about 20 miles 8.W. of Ravenna, at the junction of the Zanelli canal with the Lamone (the ancient Anemo), and on the railway*~~

~~*polemic, mainly directed against the Jesuits.*~~

~~*FAC—FAH*~~

~~*between Bologua and Ancona. It is regularly built, sur- rounded by wails, and defended by a citadel. Around the market-place (a spacious square in the centre of the town with a fine marble fountain) are arranged the cathedral (St Constantius), the town-hall, the theatre, and many hand-some residences. The town-hall or palazzo communale was formerly the palace of the Manfredi family, and is famous as the scene of the assassination of Galeotto Manfredi by his wife, which has been dramatized by Monti. Several of the churches in the town possess valuable paintings, among which are a few by Girolamo da Treviso. A college, a school of painting, a hospital, and two orphan asylums are among the public buildings of importance. The majolica ware, which takes its French name of " fayence" froin the town, still continues to be manufactured, though not to such an extent as formerly ; and there are also paper-mills and factories for spinning and weaving silk. A considerable trade is carried on by the canal which was opened in 1782 by Signor Zanelli, to unite the Lamone with the Po di Primaro at Sant' Alberto. About 24 miles from the town there are thermal and saline springs, fron1 the latter of which salt is extensively manufactured. The same product is also obtained from the cinericious tufa on the banks of the Lamone, and between tle Lamone and Sentria runs an abundant vein of sulphur. The population of the town in 1871 was 36,299. '*~~

~~*Faenza is identified with the Faventia which is noted in history as the place where Carbo and Norbanus were defeated with great loss by Metellus, the general of Sulla, in 82 B.c. In the time of Pliny it was celebrated jfor the whiteness of its linen. It was greatly favoured by the emperor Constantine, and during the Middle Ages it continued to be a place of some importanee. Dante men- tions it as the seat of the powerful family of the Pagani. In 1241 it was eaptured by Frederick II. after a protracted siege, and not long after the Bolognese obtained temporary possession. A period of independence followed, till the Manfreds, who settled in the eity about 1286, established their supremacy. In 1376 the town was pillaged by the notorious Sir John Hawkwood of Essex (the Giovanni Aeuto of the Italian chronicles), who served under Gregory XI. 'The Manfredi power eame to an end in 1500, and in 1509 Pope Julius II. seeured Faenza against the Venetians by the battle of Ghiara d'Adda. It eontinued subject to the echureh till the unification of Italy. At a little distance is the seene of the first battle between the pontifical forees and the French in 1797. he town elaims the honour of being the birth place of Torricelli, and has erected a statue to his memory.*~~

~~*FASULE. Sce FIEsoLe.*~~

~~*FAHLCRANTZ, Curistian Ertx (1790-1866), a Swedish author, was born at Stora Tuna in Sweden on the 30th of August 1790. The family to which he belonged was a gifted one, aud of his brothers, two, Carl Johan the landscape-painter, and Axel Magnus the sculptor, became hardly less distinguished than himself. In 1804 he entered on his career as a student; in 1821 he became tutor in Arabic, and in 1825 professor of the Oriental languages at the uni- versity of Upsala. In 1828 he entered the church, but earlier than this, in 1825, he published his polemical and satirical poem of Noah's Ark, which enjoyed an immense success. In 1826 appeared a second part of Noah's Art, together with various pieces, original and translated. In 1835 Fahlerantz brought out his epic of Ansgarius, which grew as time went on, and finally consisted, in 1846, of 14 books. In 1842 he was made a member of the Swedish Academy, and in 1843 entered into a furious controversy with the famous novelist, Alinqvist, against whose writings he published a thick volume in 1845-46. In 1849 he was made bishop of Vesteras, and his next literary work was*~~

~~*an archeological study on the beautiful ancient cathedral of his diocese. In the course of the years 1858-61 appeared the six volumes of his Rome as at was and is, a theological In 1863 he began to collect and issue his complete works, a task which was still unfinished when he died on the 6th of August*~~

~~¥~~

~~*FAII—FAT*~~

~~*1866, a few liours after conducting service in Vesteris Cathedral.*~~

~~*Of the writings of no Swedish author so much as of those of Fahlerantz can it be said facit indignatio versus. IIe writes ill, except at a white heat of scorn or anger. IIis early humoristic poem, Noah's Ark, was once extremely popular; it was a satire upon the literary life of 1820, under the form of a parody of the world before the flood. It is still readable, which is more than can be said of Ansgarius, a very tedious production. Fahlcrantz will live, if he live at all, by the point and venom of his wit.*~~

~~*FAIIRENIIEIT, Gasrien Danten (1686-1736), well known for the improvements made by him in the constrne- tion of the thermometer and barometer, was born at Dantzic, May 14, 1686. IIe early relinquished trade for the study of natural philosophy; and, after having travelled in Germauy and England, he settled in Holland, where Gravesande and other men of science were his teachers and friends. In 1714 he conceived the idea of substituting mercury for spirits of wine in the construction of thermo- meters. IIe took as the zero of his thermometric scale the lowest temperature observed by him at Dantziec during the winter of 1709, which he found was that produced by mix- ing equal quantities of snow and sal-ammoniac. The space between this point and that to which the mercury rose at the temperature of boiling water he divided into 212 parts, At the time of his death, which took place on September 16, 1736, Fahrenheit was engaged in the contrivance of a machine for draining inundated land. See TuermomETER and MrTEoro.oey.*~~

~~*FAIR. A fair is defined as a "greater species of market recurring at more distant intervals;" both have been distinguished by Lord Coke from "*~~

~~*mart," which he con- siders as a greater species of fair; and all three may com- prehensively be described as customary or legalized public places for tlie sale of commodities (including labour). Thus, in England, no fair can be held without a grant from the sovereign, or prescription which presupposes such grant. In France, the establishment and abolition of fairs — with the exceptiou of cattle markets and the markets of the metropolis — are generally left to the discretion of the departmental prefects. The most commonly accepted deri- vation of the word fair is from feriw, a name which the church borrowed from Roman custom and applied to her own festivals. A fair was generally held during the period of asaint's feast, and in the preeinets of his church or abbey — the time and the place of the chief popular assemblages ; but in England this desecration of church and churchyard was first forbidden by the statutes of Henry III. and Edward II. Most of the famous fairs of medieval England and Europe, with their tolls or other revenues, and, within certain limits of time and place, their monopoly of trade, were grants from the sovereign to abbots, bishops, and other ecclesiastical dignitaries. Their "holy day" associa- tions are preserved in the German word for fairs, messen ; as also in the kirmiss, "church mass," of the people of Brittany. So very intimate was the connexion between thie fair and the feast of the saint that the former has very commonly been regarded as an off-shoot or development of the latter. Nevertheless, there are grounds for tle supposi- tion that fairs were already existing national institutions, long before the church turned or was privileged to turn them to her own profit. The first charter of the great fair of Stourbridge, near Cambridge, was granted by King John, for the maintenance of a leper hospital; but the origin of the fair itself is ascribed to Carausius, the rebel emperor of Britain, 207 a.p. At all events, it may be seen from the data given in Mr Herbert Spencer's Descriptive Socvology that the country had then arrived at the stage of develop- ment where fairs might lave been recognized as a necessity.*~~

~~*S47*~~

~~*The Romans also appear to have elaborated a market-law similar to that in force throughout medieval Europe — thongh it must be observed that the Roman xundinw, which some have regarded as fairs, were weekly*~~

~~*markets. It has also been supposed that the ancient fairs of Lyons were a special privilege granted by the Roman conquerors; and Sidonius Apollinaris, 427 a.p., alludes to the fairs of the district afterwards known as the county of Champagne, as if they were then familiarly known institutions. Fairs, in a word, would not only have arisen naturally, wherever the means of communication between individual centres of production and consumption were felt to be inadequate to the demand for an interchange of commodities ; but, from their very nature, they might be expected to show some essential resemblances, even in points of legislation, and where no international transmission of custoin could have been possible. Thus, the fair courts of pre-Spanish Mexico corresponded very closely to those under whose supervision the Beaucaire fair is conducted in the present day. They resembled our own courts of piepowder. The Spaniards, when first they saw the Mexican fairs, were reminded of thie like institutions in Salamanca and Granada. The great fair or market at the city of Mexico is said to have been attended by about 40,000 or 50,000 persons, and is thus described by Prescott :—*~~

~~*'* Officers patrolled the square, whose business it was to keep the peace, to collect the dues imposed on the various kinds of merehan- dise, to see that no false measures or fraud of any kind were used, and to bring offenders at once to justice. A court of twelve judges sat in one part of the tianguez clothed with those ample and summary powers which, in despotic countries, are often delegated even to petty tribunals. The extreme severity with which they*~~

~~*exereised those powers, in more than one instanee, proves that they were not a dead letter."*~~

~~*But notwithstanding the great antiquity of fairs, their charters are comparatively modern—the oldest known being that of St Denys, Paris, which Dagobert, king of the Franks, granted (642 a.p.) to the monks of the place "for the glory of God, and the honour of St Denys at his festival." The first recorded grant in England appears to be that of William the Conqueror to the bishop of Winchester, for leave to hold an annual "free fair" at St Giles's hill. The monk who had been the king's jester received his charter of Bartholemew fair, Smithfield, in the year*~~

~~1133. And in 1248 Henry ITI. granted a like privilege to the abbot of Westminster, in honour of the " translation " of Edward the Confessor. Sometimes fairs were granted to towns as a means for enabling them to recover from the effects of war and other disasters. Thus, Edward IIL granted a "free fair " to the town of Burnley in Rutland, just as, in subsequent times, Charles VII. favoured Bordeaux, after the English wars, and Louis XIV. gave fair charters to the towns of Dieppe and Toulon, The importance attached to these old fairs may be understood from the inducements which, in the 14th century, Charles IV. held out to traders visiting the great fair of Frankfort-on-the-Maine. The charter declared that both during the continuance of the fair, and for eighteen days before and after it, merchants would be exempt from imperial taxation, from arrest for debt, or civil process of any sort, except such as might arise from the transactious of the market itself and within its precincts. Philip of Valois's regulations for the fairs of Troyes in Champagne might not only be accepted as a fair type of all subsequent fair-legislation of the kingdom, but even of the English and German laws on the subject. The fair had its staff of notaries for the attestation of bargains, its court of justice, its police officers, its sergeants for the execution of the market judges' decrees, and its visitors— of whom we may mention the prud' hommes,—whose duty it was to examine the quality of goods exposed for sale, and to confiscate those found unfit for consumption. 'The con-~~

~~fiscation required the consent of five or six representatives of the merchant community at the fair. The eifect of these great "free fairs" of England and tlie Continent on the development of society was indeed great. They helped to familiarize the western and northern countries with the banking and financial systems of the Lombards and Florentines, who resorted to them under the protection of the sovereign's 'firm peace," and the ghostly terrors of the pope. 'They usually became the seat of foreign agencies. In the names of her streets Provins preserved the memory of her 12th century intercourse with the agents and mer- chants of Germany and the Low, Countries, and long before that time the Syrian traders at St Denys had established their powerful association in Paris. Like the church on the religious side, the free fairs on the commercial side evoked~~

~~*and cherished the international spirit. And during long ages, when commercial " protection" was regarded as indispensable to a nation's wealth, and the merchant was compelled to "fight his way through a wilderness of taxes," they were the sole and, so far as they went, the complete substitute for our modern free trade.*~~

~~*Their privileges, however, were, from tleir very nature, destined to grow more oppressive and intolerable the more the towns were multiplied and the means of communication*~~

~~*increased, The people of London were compelled to close }*~~

~~*their shops during the days when the abbot of Westminster's fair was open. Buta more curious and complete instance of such an ecclesiastical monopoly was that of the St Giles's fair, at first granted for the customary three days, which were increased by Henry III. to sixteen. The bishop of Winchester was, as we have seen, the lord of this fair. On tlie eve of St Giles's feast the magistrates of Winchester surrendered the keys of the city gates to the bishop, who then appointed his own mayor, bailiff, and coroner, to hold office until the close of the fair, During the same period, Winchester and Southampton also—though it was then a thriving trading town—were forbidden to transact their ordinary commercial business, except within the bishop's fair, or with his special permission. The bishop's officers were posted along the highways, with power to forfeit to his lordship all goods bought and sold within seven miles of the fair—in whose centre stood "the pavilion," or bishop's court. It is clear, from the curious record of the Establishment and Hapenses of the Household of Percy, fifth earl of Northumberland, that fairs were the chief centres of country traffic even as late as the 16th century. They began to decline rapidly after 1759, when good roads had been constructed and canal communication established between Liverpool and the towns of Yorkshire, Cheshire, and Lancashire. In the great towus their extinction was hastened in consequence of their evil effects on public morals, All the London fairs were abolished as public nuisances before 1855,—the last year of the ever famous fair of St Bartholomew; and the fairs of Paris were swept away in tlie storm of the Revolution.*~~

~~English Fairs and Markets.—FYor the general reasons apparent from the preceding sketch, fairs in England, as in France and Germany, have very largely given way to markets for specialities. Even the live-stock market of the metropolis is being superseded by the dead-meat market, a change which has been encouraged by recent legislation on cattle disease, the movements of home stock, and tlie importation of foreign animals. Agricnltural markets are also disappearing before the 'agencies " and the corn exchanges in the principal towns, Still there are some considerable fairs yet remaining. Of the English fairs for live stock, those of Weyhill in Hampshire (October 10), St Faith's, near Norwich (October 17), as also several held at Devizes, Wiltshire, are among the largest in the kingdom. The first named stands next to none for its dis-~~

~~play of sheep ; "whilst the second is the principal resort of the Scotch drovers and cattle-dealets, and supplies a large proportion of the fat stock required for the London market. Horncastle, Lincolnshire, is the largest horse fair in the kingdom, and is regularly visited by American and Continental dealers. The other leading horse fairs in England are Howden in Yorkshire (well known for its hunters), and Woolbridge (on Lady Day) for Suffolk horses. Exeter December fair has a large display of cattle, horses, and most kinds of commodities. Large numbers of Scotch cattle are also brought to the fairs of Market Harborough, Carlisle, and Ormskirk. Ipswich has a fair for lambs on Ist of August, and for butter and cheese on Ist of Septem- ber. Gloucester fair is also famous for the last-named commodity, The guild or jubilee held at Preston, Lanca- shire, every twentieth year, occurred last in 1862. Falkirk fair, or tryst, for cattle and sheep, is one of the largest in Scotland ; and Ballinasloe, Galway, holds a like position among Irish fairs. The Ballinasloe cattle are usually fed for a year in Leinster before they are considered fit for the Dublin or Liverpool markets. In 1790 there were 61,931 sheep and 8632 horned cattle exhibited at the fair, and for 1867 the returns, in the foregoing order, were 73,364 and~~

~~23,734,~~

~~French Fatrs.—The most important is that of Beaucaire, ance among the first in Europe. Its position on the Rhone (14 miles east of Nismes), and~~

~~its connexion with the canals, still enable it to maintain a high rank among the Continen- tal markets. It lasts from the 22d to the 28th July, and is visited by about 60,000 persons, from all parts of the Continent between Spain and the Levant; articles of all descriptions are sold at it. It is a rule that all bills due at this fair must be presented on the 27th and protested, if necessary, on the 28th.~~

~~German Fairs.—First, thongh no longer of world-wide importance, are those of Frankfort-on-the-Maine, Frank fort- on-the-Oder, and Leipsic. Those of Frankfort-on-the-Maine begin on Easter Tuesday and on the nearest Monday to September 8 respectively, and their legal duration is three weeks, though the limit is regularly extended. The fairs of the second-named city are Reminiscere, February or March; St Margaret, July; St Martin, November. Or- dinarily they last fifteen days, which is double the legal term. The greatest of the German fairs are those of Leipsic, whose display of books is famous all over the world. Its three fairs are dated January 1, Easter, Michaelmas. The Easter one is the book fair, which is attended by all the principal booksellers of Germany, and by many more from the adjoining countries. Most German publishers have agents at Leipsic. As many as 5000 new publications have been entered ina single Leipsic catalogue. As in the other instances given, the Leipsic fairs last for three weeks, or nearly thrice their allotted duration, Here no days of grace are allowed, and the holder of a bill must demand payment when due, and protest, if necessary, on the same day, otherwise he cannot proceed against either drawer or endorser.~~

~~Russian Fuirs.—These are very numerous, the chief being those of Nijni Novgorod, of Irbit in Perm, Kharkoff (January and Augnst), Poltava (August and February), Koreunais in Koursk, Ourloupinsknia in the Don Cossack country, Krolevetz in Tchernigoff, and a third fair held at Poltava on the feast of the Ascension. It is calculated that in 1851 the aggregate value of goods sold at the above named fairs amounted to nearly 120,000,000 silver roubles. The chief fair of Novgorod is attended by 100,000 to 130,000 persons from all parts of Asia and of eastern Europe. Thirty years ago the fair of Kiatcha, on the Russo- Chinese frontier, yielded one million sterling in revenue ; but in 1867, according to Mr Lumley, secretary to the~~

English embassy at St Petersburg, the sum had fallen by one half. This was in consequence of the opening of new communications, and the abolition of the Kiatcha monopoly.

Turkish Fatrs.—Of these there are a very considerable number, and the vast bulk of the internal commerce of the country is transacted at them. Among the most note- worthy are the fairs of Usundji, in Roumelia, on a tributary of the Maritza, 40 miles from Adrianople ; Janina in Albania ; Strouga, on the lake of Orida 3 Novi-Bazaar in Upper Moesia ; Islioni in Thrace; N icopoli and Prelip in Macedonia; Eski-djouma in Bulgaria ; and Zeitoun and Pharsalia in Thessaly. There is a large show of western manufactures at the Usundji fair.

Indian Fairs.—The largest of these, and perhaps the largest in Asia, is that of Hurdwar, on the upper course of the Ganges. The visitors to this holy fair number from 200,000 to 300,000 ; but every twelfth year there occurs a special pilgrimage to the sacred river, when the numbers may amount to a million or upwards. Those who go solely for purposes of trade are Nepaulese, Mongolians, Thibetans, Central Asiatics, and Mahometan pedlars from the Punjab, Scinde, and the border states. Persian shawls and carpets, Indian silks, Cashmere shawls, cottons (Indian and English), preserved fruits, spices, drugs, &c., together with immense numbers of cattle, horses, sheep, and camels, are brought to this famous fair.

American Fairs.—The word fair, as now used in the United States, appears to have completely lost its Old World meaning. It seems to be exclusively applied to industrial exhibitions, and to what we in England would call fancy bazaars. Thus, during the civil war, large sums were collected at the "sanitary fairs," for the benefit of the sick and wounded. To the first-named class belong the State and county fairs, as they are called. Among the first and best known of these was the "New York World's Fair," opened in 1853 by a company formed in 1851. Since 1829 the " American Institute" held annual "fairs" for the encouragement of the agricultural and manufacturing arts. The chief centres of these

~~*"fairs," or exhibitions, appear to be Cincinnati, Baltimore, Boston, San Francisco, and Buffalo.*~~

~~*Law of Fairs.—As no market or fair can be held in England without a royal charter, or right of prescription, so any person establishing a fair without such sanction is liable to be sued, under a writ of Quo warranto, by any one to whose property the said market may be injurious. Nor can a fair or market be legally held beyond the time specified in the grant; and by 5 Edward II]. ¢. 5 a mer- chant selling goods after the legal expiry of the fair forfeited double their value. To be valid, a sale must take place in ' market-overt " (open market) ; 'it will not be binding if it carries with it a pre- sumption of fraudulence." These regulations satisfied, the sale "transfers a complete property in the thing sold to the vendee ; so that however injurious or illegal the title of the vendor may be, yet the vendee's is good against all men except the king." (In Scotch law, the claims of the real owner would still remain valid.) However, by 21 Henry VIII. c. 2 it was enacted that, "if any felon rob or take away money, goods, or chattels, and be indicted and found guilty, or otherwise attainted upon evidence given by the owner or party robbed, or by any other by their pro- eurement, the owner or party robbed shall be restored to his money, goods, or chattels," but only those goods were restored which were specified in the indictment, nor could the owner recover from a bona fide purchaser in market-overt, who had sold the goods before eouviction. For obvious reasons the rules of market overt were made particularly stringent in the case of horses. Thus, by 2 Philip and Mary c. 7 and 81 Eliz. e. 12, no sale of a horse was Icgal which had not satisfied the following conditions :—Public exposure of the animal for at least an hour between sunrise and sunset ; identification of the vendor by the market officer, or guarantee for his honesty by " one sufficient and credible person ;' entry of these particulars, together with a description of the animal, and a statement of the price paid for it, in the market officer's book. Even if his rights should have been violated in spite of all these precautions, the lawful owner could recover, if he claimed within six months, produced witnesses, and tendered the price paid to the vendor. Tolls were not a "necessary incident" of a fair—t.c., they were illegal unless specially granted in the patent,*~~

~~*or recognized by custom. As a rule, they were paid only by the vendee, and to the market clerk, whose record of the payment was an attestation to the genuineness of the purchase. By 2 and 3 Philip and Mary ec. 7 every lord of a fair entitled to éxact tolls was bound to appoint a clerk to collect and enter them. It was also this functionary's business to test measures and weights. Tolls, again, are sometimes held to include "stallage" and '* picage,"' which mean respectively the price for permission to erect stalls and to dig holes for posts in the market grounds. But toll proper belongsto the lord of the market, whereas the other two are usually regarded as the property of the lord of the soil. The law also provided that stallage might be levied on any house situated in the vicinity of a market, and kept open for business during the legal term of the said market. Among recent statutes, one of the chief is the Markets and Fairs Clauses Act (10 Vict. e. 14), the chief purpose of which is to consolidate previous measures. By the Act no proprietors of a new market are permitted to let stallages, take tolls, or in any way open their grounds for business, until two justices of the peace have certificd to the completion of the fair or market. After the opening of the place for public use, no person other than a licensed hawker shall sell anywhere within the borough, his own house or shop excepted, any articles in respect of which tolls are legally exigible in the market. A breach of this provision entails a penalty of forty shillings. Vendors of unwhole- some meat are liable to a penalty of £5 for each offence; and the 'inspectors of provisions" have full liberty to seize the goods and institute proceedings against the owners. They may also enter "at all times of the day, with or without assistance," the slaughter-house which the undertaker of the market may, by the special Act, have been empowered to construct. For general sanitary reasons, persons are prohibited from killing animals anywhere except in these slaughter-houses. Again, by 36 and 87 Vict. c. 37, times of holding fairs are determined by the secretary of state ; while 34 Vict. c. 12 empowers him to abolish any fair on the representation of the magistrate and with the consent of the owner. The preamble of the Act states that many fairs held in England and Wales are both unnecessary and productive of " grievous immorality."*~~

~~*The Fair Courts.—The Piepowder Courts, the lowest but most expeditious courts of justice in the kingdom, as Chitty calls them, were very ancient.*~~

~~*The Conqueror's law De Emportis shows their pre-existence in Normandy. Their name was derived from pied puldreux, Norman for pedlar.1 The lord of the fair or his repre- sentative was the presiding judge, and usually he was assisted by a jury of traders chosen on the spot. Their jurisdiction was limited by the legal time and precincts of the fair, and to disputes about con- tracts, "slander of wares," attestations, the preservation of order, &c.*~~

~~*Authorities.—See Herbert Spencer's Descriptive Soetology, 1878, especially the columns and paragraphs on 'Distribution ;' Pres- cott's History of Mexico, for descriptions of fairs under the .A\ztecs ; Giles Jacob's Law Dictionary, London, 1809; Joseph Chitty's Treatise on the Law of Commerce and Manufactures (vol. ii. chap. 9), London, 1824; Holinshed's and Grafton's Chronteles, for lists, &c., of English fairs ; Meyer's Das Grosse Conversations Lexicon, 1852, under '* Messen;" article " Foire" in Larousse's Dictionnaire Universelle du XIXe. Sieele, Paris, 1866-1874, and its references to past authorities ; and especially, the second volume, commercial series, of the Zneyelo- pédie Méthodique, Paris, 1788; M'Culloch's Dictionary of Com- merce, 1869-1871 ; Wharton's History of English Poetry, pp. 185, 186, of edition of 1870, London, Murray & Son, for a description of the Winchester Fair, &c.; a note by Professor Henry Morley in p. 498, vol. vii. Notes and Queries, second series ; the same author's unique History of the Fair of St Barthélomew, London, 1859 : Wharton's Law Lexicon, Will's edition, London, 1876; and also, for some effects of recent legislation, as regards meat and fat stock markets, the dcbates in the House of Lords, Feb. 12 and March 5, 1878. (J. MA.)*~~

~~*FAIRBAIRN, Sir Witt1am, Baronet (1789-1874), a distinguished mechanical engineer, was born at Kelso, Roxburghshire, February 19, 1789. His father, who occupied the humble position of farm bailiff, possessed a large measure of the untiring energy and practical skill which were so conspicuously manifested in the son, but on account of adverse circumstances the family were often re- duced to very hard straits ; and as they frequently required to change their place of residence, the education which the children received was somewhat fragmentary. At the age of ten, however, young Fairbairn had "mastered the rules of arithmetic as far as*~~

~~practice and the rule of three," and had acquired a taste for reading by a perusal of the selections from English authors in Scott and Barrow's col-~~

~~1Skene has shown the indentity in Scotch borough law between '*marchand travelland" and "pied puldreux," or " dusty fute." H. — 107~~

~~lections. He afterwards received additional instruction in reading, writing, and accounts, and obtained from his uncle, who was a parish schoolmaster, some knowledge of mensura- tion; but "the want of a good grammatical course, and a slight knowledge of the classics," was a frequent subject of regret to himin his subsequent life. Other circumstances worthy of notice connected with his earlier years were his fondness for athletic exercises, which often tempted him to the performance of daring feats in climbing, and the early development of his mechanical genius, which first displayed itself in the construction of a waggon to save him- self the trouble and fatigue of carrying his infant brother on his back. It is somewhat remarkable that the other efforts of his mechanical genius in boyhood had reference chiefly to ships and mills, with the construction of both of which his name was subsequently so largely associated. In 1803 it was found necessary that Fairbairn should contri- bute something to the very straitened family income, and he obtained work at three shillings a week as a mason's labourer on the Rennie bridge at Kelso; but a serious accident which happened to him a few days after beginning this employment not only deprived the family of the small help of his earnings, but, by the expense it entailed, con- tributed to bring them almost to the brink of starvation. His father having, however, shortly after this obtained the situation of steward on a farm connected with Percy Main Colliery near North Shields, William obtained employment as a carter in connexion with the colliery. Here, on account of his "Scotch accent and different manner, he became the mark of every species of annoyance," and had to take part in no less than seventeen pugilistic encounters before he was 'able to attain a position calculated to en- sure respect." In March 1804 an immense change for the better occurred in his surroundings and prospects, by lis being bound an apprentice toa millwright at Percy Mains. He now commenced a~~

~~*systematic course of self-improvement, assigning each day of the week toa particular subject of study, and devoting also a fixed amount of his time to recreation and amusement. Besides obtaining by unaided application a pretty complete knowledge of practical niathematics he contrived to go through an extensive course of general reading; and an attachment he formed to a young girl, whom he afterwards married, by leading him to begin letter writing, was his first stimulus to the practice of literary composition. It was at Perey Mains also that le made the acquaintance of George Stephenson, who then had charge of an engine ata neighbouring colliery, and the friendship 'thus begun lasted through life.*~~

~~*For some years subsequent tothe expiry of his term of apprenticeship, Fairbairn, who, with all his forethought and persevering diligence, had still in his composition a strong love of adventure and a spice of recklessness, lived a some- what roving life, seldom remaining long in one place and often reduced to very hard straits before he got a job. But soon after his marriage he began seriously to set himself to the attainment of the object he had long contemplated, his emancipation from daily labour; and in November, 1817 he entered into partnership with a shopmate of the name of Lillie, with whose aid he hired an old shed in High Street, Manchester, where he set up a lathe, and began business. His first order was to renew the shaftwork of an extensive cotton mill, which with great diligence he accomplished within the specified time, and not only satis- factorily, but with the substitution of improvements which virtually amounted to a revolution of the whole system of mill construction. Such a successful performance of their first contract immediately secured to the new firm a great reputation, and orders pressed in inuch faster than they were able with their limited capital to execute them. Their fame soon extended beyond Manchester, and in 1824*~~

~~*Fairbairn was engaged to plan and execute a new arrange- ment of the water-power of Catrine cotton works, Ayrshire, where, aud at Deanston, Perthshire, he introduced a system of water-wheel construction whose hydraulic power has never been surpassed. In the summer of 1824 he also effected similar improvements in a mill at Zurich, Switzer- land. In 1832 Fairbairn dissolved partnership with Lillie, retaining the works in Canal Street to which they had previously removed. In 1830 he had been*~~

~~employed by the Forth and Clyde Canal Company to make experiments with the view of determining whether it were possible to construct steamers capable of traversing the canal ata speed which would enable the canal interest to compete success- fully with that of the railway; and the results of his investigation were published by him in 1831, under the title Remarks on Canal Navigation. His plan of using iron boats proved inadequate to overcome the diffi- culties of his problem, but it first suggested the construc- tion of iron vessels; and in the development of the use of this material both in the case of merchant vessels and men-of-war the chief merit must be assigned to Fair- bairn. In this way also he was led to pursue those ex- periments in regard to the strength of iron, according to its combination with other substances, and to various methods of preparation and construction, which have given him a place in this branch of mechanical engineering altogether pre-eminent. In 1835 Fairbairn established, in connexion with his Manchester business, a ship-building yard at Mill- wall, London, where he constructed several hundred vessels, including many for the royal navy; but he ultimately found it impossible with his other engagements to superintend the work in such a satisfactory manuer as to make it pay, and at the end of 14 years he disposed of the concern at a great loss. In 1837 he was employed by the sultan of Turkey with the view of assisting in the introduction of the me- chanical arts into that country, and after his return home his services were rewarded by a decoration. For several years Fairbairn was engaged, in conjunction with Eaton Hodgkinson, in making experiments on the strength and other properties of iron, and in 1845 he was consulted by Robert Stephenson in reference to the best method of constructing the tubular bridge which the latter designed for carrying the railway across the Conway and Menai Straits. Although the share Fairbairn had in the under- taking has been the subject of some dispute, there can be no doubt that he was guided in his experiments chiefly by his own independent judgment, and that he was the in- ventor of the rectangular self-supporting tube which was the essential feature of the construction. For this inven- tion he, with the concurrence of Stephenson, took out a patent, and he afterwards constructed more than a thousand bridges on the same principle. In reference to his con- nexion with the invention, he published a volume entitled An Account of the Construction of the Britannia and Conway Tubular Bridges, &c., 1849. In 1849 he was invited by the king of~~

~~*Prussia to submit designs for the construction of a bridge across the Rhine, but after various negotiations, another design, by a Prussian engineer, which was a modification of Fairbairn's, was adopted. Another matter which engaged much of Fairbairn's atten- tion was steam boilers, in the construction of which he effected many improvements. He is also the inventor of the tubular crane, and took out several patents for the con- struction and arrangement of steam machines. In 1851 he greatly aided, by his fertility and readiness of inven- tion, in an investigation carried on at his works by Mr*~~

~~*Joule and Sir William Thomson in reference to the proper-*~~

~~*ties of the materials of the earth's surface; and from 1861 to 1865 he was employed to guide the experiments of the Government committee appointed to inquire into the ' appli-*~~

~~*FAI—FAT*~~

~~*cation of iron to defensive purposes." The results of experiments were published in the proceedings of the com- mittee. Fairbairn was a member of many learned societies, both British and foreign. In 1860 he received the degree of LL.D. from the university of Edinburgh, and in 1862 that of D.C.L. from the university of Cambridge. He declined the honour of knighthood in 1861, but accepted a baronetcy in 1869. He died at Moor Park, Surrey, August 18, 1874. Perhaps no one ever made more use than Fairbairn of the time at his disposal, for amid all the cares of business he not only found leisure for varied scientific investigation, but inanaged to obtain a wide acquaintance with general litera- ture, to conduct an extensive correspondence on a great variety of subjects, and also to participate largely in the delights of social intercourse. In private his unassuming but dignified simplicity, his thorough honour, and his geniality and kindness secured him general esteem. The results he achieved in mechanical science were due chiefly to minute, patient, and sagacious observation and experi- ment. It was his habit to aid himself in his investigations by committing his ideas to writing, and, when his opinions on any subject were matured, to communicate them to the world either in a published volume, or by a paper read be- fore some learned institution. By his extensive acquaint- ance with English authors, and his*~~

~~*early and patient prac- tice of composition, he acquired the possession of a clear, simple, and nervous style, and his writings are in this re- spect worthy to be regarded as models in their own species of literature.*~~

~~*Among his principal writings, besides those already mentioned, may be named On the Application of Cast and Wrought Iron to Build- ing Purposes, 1856 ; Iron, its History, Properties, and Processes of Manufacture (reprinted from the eighth edition of the Encyclopedia Britannica), 1861; Treatises on Mills and Millwork, part i., 1861, part ii., 1863 ; Treatise on Iron Shipbuilding, 1865 ; and An Experi- mental Enquiry into the Strength, Elasticity, Ductility, and other Properties of Steel, 1869. These have all passed through several editions, His papers read before learned societies are too numerous to be mentioned. The Life of Sir William Fairbairn, partly written by himself, and edited and completed by William Pole, F.R.S., was published in 1877, and a popular edition of this work appeared in 1878.*~~

~~*FAIRFAX, Epwarn (? 1580-1632), the most poetical of all the translators of Tasso, was a native of Yorkshire, second son of Sir Thomas Fairfax of Denton. As Roger Dodsworth, the antiquary—a contemporary of Fairfax — styles him the " natural" son of Sir Thomas, it has been assumed that the poet was illegitimate, but it is certain that in the time of Queen Elizabeth the term "natural" was often used to signify true or legitimate, t.e., the father's own son. We may therefore conclude with Douglas in his Peerage that Edward was the lawful son of Sir Thomas Fairfax, by Dorothy his wife, daughter of George Gale of Ascham Grange. The date of his birth has not been ascertained. He is said to have been only about twenty years of age when he published his translation of the Gerusalemme Inberata. This is very doubtful, but it would place his birth about the year 1580. He seems early to have preferred a life of study and retirement to the military service in which his brothers were distinguished. Having married, he lived at Fuystone, a place situated between the paternal seat of Denton and the forest of Knaresborough, and there his time was spent in his literary pursuits, and in the education of his children and those of his elder brother, Sir Thomas Fairfax, afterwards baron of Cameron. His famous trans- lation appeared in 1600, —G@od/rey of Bulloigne, or the Recoverie of Lerusalem, done into*~~

~~*English heroicall Verse by Hidw. Fairefax, Gent. Never did any mere translation re- ceive such enthusiastic and continued approbation as this work by Fairfax. In the same year in which it was pub- lished extracts from it were printed in Lngland's Parnassus. Edward Phillips, the nephew of Milton, in his*~~

~~*his | Theatrum Poetarum, a work in which, as Warton says,*~~

~~*may be discovered many traces of Milton's hand, warmly eulogized the translation, Waller said he was indebted to it for the harmony of his numbers. Dryden places the translator almost on a parity with Spenser (whom undoubt- edly Fairfax imitated), and Collins has beautifully asso- ciated him with his great original, Tasso :— "How have I sat, when piped the pensive wind,*~~

~~*To hear his harp by British Fairfax strung !*~~

~~*Prevailing poet, whose undoubting mind*~~

~~*Believed the magie wonders which he sung !"}*~~

~~*In more recent times we find Campbell pronouncing Fairfax's work one of the glories of the reign of Elizabeth, to whom it was dedicated. Hallam, more critical, said the translation did not represent the grace of its original, and deviated too much from its sense, yet was by no means de- ficient in spirit or vigour. The poetical spirit of the work is indeed its life blood and preservation. Hoole and Hunt may give a more literal version, but Fairfax alone seizes upon the poetical and chivalrous character of the poem.*~~

~~*8 Denham says of Fanshawe's rendering of the Pastor Lido :—*~~

~~*'*They but preserve the ashes, he the flame, True to its sense, but truer to its fame." And in this way he carries along with him the interest and admiration of the reader. The sweetness and melody of many passages are scarcely excelled even by Spenser. Fairfax made no other appeal tu the*~~

~~*public. He wrote however, a series of eclogues, ten in number, one of which, the fourth, was published by permission of the family, in Mrs Cooper's fuses' Library (1737). He wrote also a Discourse on Witchcraft, as it was acted in the Family of Mr Lidward Fairfax of Fuystone in the county of York in 1621, which was edited from the original copy by Mr Monckton Milnes (now Lord Houghton) in the Afiscellanies of the Philobiblon Society, 1858-9. Fairfax was a firm believer in witchcraft. He fancied that some of his children had been bewitched, and he had the poor wretches whom he accused brought to trial, but without obtaining a conviction. Such "follies of the wise" are painful to contemplate. Fairfax, however, only shared in the common superstition of the age, and it is at once a memorable and melancholy fact that Sir Matthew Hale, the most upright and able of lawyers, condemned two women to the stake on a charge of witchcraft. Fairfax described himself as "neither a fan- tastic Puritan nor superstitious Papist ; but so settled in conscience as to have the sure ground of God's word to warrant all he believed, and the commendable ordinances of the English Church to approve all he practised." And he adds, "I live a faithful Christian and an obedient subject, and so teach my family." His descendants have not deemed it necessary to publish his writings on theological subjects and the keen controversies of the times. His fame is secure, grafted on the stem of Tasso, and flourishing in perennial beauty and vigour. Fairfax was living in 1631, and is supposed to have died soon afterwards, about , (R. CA.*~~

~~*FAIRFAX, Tuomas, toHrrp Lorn, better known as & Thomas Fairfax, the eminent Parliamentary general and commander-in-chief during the civil wars, was the eldest son of Sir Ferdinando (afterwards Lord) Fairfax by Mary, daughter of Lord Sheffield, president of the North, and was born at Denton, on the banks of the Wharfe, near Otley, Yorkshire, on the 17th of January 1611-12. He studied*~~

~~*1 Ode on Popular Superstitions. Sir Walter Scott conceived that the lines applied to Fairfax (Demonology, Letter viii.), and Thomas Campbell seems to have entertained the same opinion (Specimens of the Poets), — also Charles Knight and others. A careful perusal of the stanza, how- ever, will show that Collins intended the honour for Tasso, not for his*~~

~~translator. Both, indeed, may be said to have " believed the magic wonders which they sung."~~

~~at St John's College, Cambridge, about four years (1626-30), and then proceeded to Holland to serve asa volunteer with the English army in the Low Countries under Lord Vere of Tilbury. This connexion led to one still closer ; in the summer of 1637 Fairfax married Anne, daughter of Lord Vere, a lady of spirit, whom Mr Carlyle characterizes as "a Vere of the fighting Veres and given to Presbyterianism." The Fairfaxes, though serving at first under Charles J., were opposed to the arbitrary prerogative of the crown, and Sir Thomas (he had been knighted by Charles in 1640) declared that " his judgment was for the parliament as the king and kingdom's great and safest council." When Charles en- deavoured to raise a guard for his own person at York, in- tending it, as the event afterwards proved, to form the nucleus of an army, Fairfax was employed to present a petition to his sovereign, entreating him to hearken to the voice of his parliament, and to discontinue the raising of troops. 'Phis was at a great meeting of the freeholders and farmers of Yorkshire convened by the king on Heyworth Moor near York. Charles evaded receiving the petition, pressing his horse forward, but Fairfax followed him and placed the petition on the pommel of the king's saddle. The incident is typical of the times and of the actors in the scene. War broke out, Lord Fairfax was appointed general of the Parliamentary forces in the north, and his son Sir Thomas, was made general of the horse under him. Both father and son distinguished themselves in the campaigns in Yorkshire. At first the Parliamentary troops were not successful. The Cavalier spirit of honour and high-bred loyalty was too much, as Cromwell said, for poor tapsters and town-apprentice people. There was little hope of suc- cess until men of strong religious feelings could be brought into the field against them, and this was effected by Oliver and his Ironsides, his invulnerable troop of disciplined horsemen. In the beginning of 1644 the Scottish army under the command of the earl of Leven joined the Parliamentary forces, and after some minor engagements, commenced the siege of York, then invested by the marquis of Newcastle. York was considered the second town of England, and upon~~

~~its preservation Charles believed that the safety of his crown mainly depended. There were several assaults and sallies, but news having arrived that Prince Rupert was marching to raise the siege with 20,000 men, the besieging generals, Leven, Fairfax, and Manchester, resolved to draw off their troops, and en- camp on the moor seven miles west of York. On the 2nd of July 1644, was fought the important battle of Marston Moor, which virtually decided the fate of the war. The gallantry of the troopers led by the old earl of Leven, Manchester, and Fairfax was conspicuous.! Fairfax was severely wounded, and he lost a brother in the action. The victory was so decisive that the marquis of Newcastle fled the kingdom, and the Royalists abandoned all hopeof retriev- ing their affairs. The city of York was taken, and nearly the whole north submitted to the parliament.~~

~~In the south and west of England, however, the Royalist cause was still active. The war had lasted two years, and the nation began to complain of the contributions that were exacted and the excesses that were committed by the mili-~~

~~1 Cromwell, in the letter to his brother-in-law, assumes the whole credit of the defeat of the Royalist right, certainly at the expense both of truth and honour. He says: " The left wing which 1 commanded, being our own horse, saving a few Scots in our rear, beat all the Prince's horse. God made them as stubble to our swords." Now the few Scots consisted of 1920 men out of 4200, and Cromwell's asser- tion that they were in the rear is contradicted by every other eye- witness who mentions them. Principal Bailie, who received a long account of the battle from his namesake, and had other sources of in- formation now lost, says that David Leslie (Leven) in all places that day was Cromwell's leader. — Markham's Life of Fairfax. Mr Carlyle does not take up this disputed point,~~

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~~tary. Dissatisfaction was expressed with the military com- manders, Essex and Manchester, and as a preliminary step to reform, the self-denying ordinance was passed. This Act took from all members of parliament their commands in the army or their civil employments, The earl of Essex was~~

~~*removed from the supreme command, and Sir Thomas Fairfax appointed his successor. Cromwell, as a member of the HOuse of Commons, was excluded by the ordinance, but he was too important to be dispensed with; he was made lieutenant-general under Fairfax. The army was new modelled, incompetent officers were dismissed, and the regiments completed by more select levies. The hostile armies met on the 14th of June 1645, at Naseby in North- amptonshire, aud a decisive battle took place, which ended in the total discomfiture of the Royalists. The king him- self was in the field. "At Naseby," says Carlyle, "Charles fought his last battle—dashed fiercely against the new model army which he had despised till then—and saw him- self shivered utterly to ruin'—partly through the fiery rashness of Prince Rupert, but mainly through the able generalship of Fairfax and Cromwell. The king fled to Wales. Fairfax besieged Leicester, and was successful at Taunton, Bridgewater, and Bristol. The whole west was soon reduced to obedience. The king had returned from Wales and established himself at Oxford, where there was a strong garrison, but danger was too apparent ; the vacillat- ing monarch withdrew secretly, and proceeded to Newark to throw hiniself into the arms of the Scots. Oxford capitulated ; and by the end of September Charles had neither army nor garrison in England.*~~

~~*Fairfax arrived in London on the 12th of November 1645. In his progress towards the capital he was accom- panied by applauding crowds. Complimentary speeches and thanks were presented to him by both houses of parlia- ment, along with a jewel of great value set with diamonds, anda sum of money. Charles was delivered up to the commissioners of parliament by the Scots in January 1646. HIe had voluntarily surrendered himself to the Scots army, and they negotiated with the parliamentary leaders in his favour. 'here was a debt of £600,000, arrears of pay, owing to the Scots, but they agreed to take £400,000, one half of which was to be paid before the army left England. The bargain was concluded some months before there was any stipulation to deliver up the king, but probably, as HIallam remarks, the parliament would never have actually paid the money on any other consideration than the delivering of the king's person.2 The transaction was naturally seized upon by the Royalists and the Cavalier wits, and poets, as a subject of obloquy and reproach to the Scots commissioners, and, by implication,*~~

~~*to the whole Scottish nation. It is not yet forgotten. Such _ political libels are not of that class which the poet says are "born to die." They become the shibboleths of a party, and descend from generation to generation.*~~

~~*Charles was delivered up to the commissioners of parlia- meut on the 30th January 1646-7. Fairfax, who preceded the king, having met him beyond Nottingham, dismounted from his horse, kissed the royal hand, and having resumed his seat, discoursed with the unfortunate prince during the journey to Holdenby. 'The general," said Charles, 'is a man of honour, and keeps his word which he had pledged to me." His chivalrous courtesy is of a piece with his whole character.*~~

~~*The agitation in the army now became formidable, and threatened anarchy. The Independents were too powerful for both parliament and Presbyterians. Fairfax resolved to*~~

~~*2 Major-General Skippon carried up the cash, £200,000, to Newcastle successfully in a proper number of waggons ; got it all counted there, bags of £100, chests of £1000 (5-19th January 1646- 7), after which the Scots marched peaceably away.—Carlyle.*~~

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~~*resign his commission as commander-in-chief, but he was persuaded to retain it, and was passive, if not co-operating, in all the proceedings of the army which had for their object to destroy the power of parliament. Lord Fer- dinando Fairfax died in the spring of 1647, and Sir Thomas succeeded to his title and to luis office as governor of Hull. A second civil war broke out in the summer of 1648; a Scots army of 40,000 was raised to deliver the king from the " sectaries ;" there were tumults in England and in Wales. Fairfax displayed the greatest activity in putting down these insurrections, and took Colchester, whither the royalist army had betaken themselves. It was at this time, when the commander-in-chief was besieging Colchester, that Milton addressed to him the sonnet :— '* Fairfax, whose name in arms through Europe rings, Filling each month with envy or with praise."*~~

~~*The poet eulogizes the brave soldier for " firm unshaken virtue," but he hesitated to go along with the army and In- dependents in the trial of the king. IIe was placed at the head of the judges before whom Charles was arraigned, but he refused to act. In calling over the court, when the crier pronounced 'the name of Fairfax, a lady in the gallery called out "that the Lord Fairfax was not there in person, that he would never sit among them, and that they did him wrong to name him as a commissioner." This was Lady Fairfax, who could not forbear, as Whitelock says, to exclaim aloud against the proceedings of the IIigh Conrt of Justice. The decision of the court was a grievous error. " When living, Charles was a bafiled tyrant," as Lord John Russell has remarked; "when dead he became a royal martyr." In June 1650, after the Scots had declared for Charles IT., the council of state resolved to send an arniy to Scotland in order to prevent an invasion of England. Fairfax declined to act against the Presbyterian Scots, and resigned his com- mission. Cromwell was appointed his successor, "captain- general and commander-in-chief of all the forces raised or to be raised by authority of parliament within the common- wealth of England." Fairfax received a pension of £5000 a year, and is no more heard of till after the death of the triumphant Protector.*~~

~~*When Monk invited him to assist in the operations about to be undertaken against Lambert's army he promptly obeyed the call, and in December 1659 appeared at the lead of a body of Yorkshire gentlemen ; and such was the influence of Fairfax's name and reputation that the Irish brigade, consisting of 1200 horse, quitted Lambert's colours and joined him. This was speedily followed by the breaking up of all Lambert's forces, and that day secured the restoration of the monarchy. A "free" parliament was called ; Fairfax was elected member for Yorkshire, and was put at the head of the commission appointed by the IIouse of Commons to wait upon Charles If. at the IIague and urge his speedy return. Of course the 'merry monarch, scandalous and poor," was glad to obey the summons, and Fairfax provided the horse on which Charles rode at his coronation. 'The remaining eleven years of the life of Lord Fairfax were spent in retirement at his seat in Yorkshire. IIe must, like Milton, have been sorely grieved and shocked by the scenes'that followed—the brutal indignities offered to the remains of his companions in arms, Cromwell and Ireton,*~~

~~the sacrifice of Sir Harry Vane, the neglect or desecration of all that was great, noble, or graceful in England, and the flood of immorality which, flowing from Whitehall, sapped the foundations of the national strength and honour. Lord Fairfax died at Nunappleton on the 12th of November 1671. The integrity of Fairfax has never been doubted. No one has ever attempted to charge mean- ness or corruption on the Parliamentary general. But he was great only in the field, and had apparently none of the qualities of a statesman. He is placed at great disadvan-~~

~~| in the army.~~

~~tage, however, by being both in war and in peace over-~~

~~shadowed by his associate Cromwell : 'And under him~~

~~His genius was rebuked, as, it is said, Mark Antony's was by Cesar."~~

~~Lord Fairfax had a taste for literature. He translated some of the Psalms, and wrote poems on solitude, the Chris- tian warfare, the shortness of life, &c., none of which are above mediocrity. During the last year or two of his life he wrote two Jfemorials which have been published—— one on the northern actions in which he was engaged in 1642-44, and the other on some points during his command At York and at Oxford he endeavoured to save the libraries from pillage, and he enriched the Bodleian with some valuable MSS. His correspondence was pub- lished in 1848-9 in four volumes, and a life of him by Clements R. Markham in 1870. (R. CA.)~~

~~FAIRFIELD, a town and port of entry of Fairfield co., Connecticut, is situated near Long Tsland Sound, and on the New York and New Haven railroad, 22 miles 8.W. of New Haven. It consists chiefly of one spacious street of new and handsome buildings. The beautiful scenery and fine sea air of the neighbourhood attract to the town a consider- able number of summer visitors, but its presperity depends chiefly on its shipping trade. About one and a half miles south-east from the town is Black Rock, one of the finest harbours of the state. Fairfield was settled in 1659. In 1779 it was burned by the British under Governor Tryon. The population in 1870~~

~~*numbered 5645, but since then a portion of the town, containing more than a fourth of the inhabitants, has been annexed to Bridgeport.*~~

~~*FAIRHOLT, Frepericx Witi1am (1813-1866), a most industrious antiquary, draughtsman, and editor of our older literature, was born in London in the year 1813, His father, who was of a German family (the name was originally Fahrholz), was a tobacco manufacturer, and for smoe years Fairholt himself was employed in the. business. He had, however, other aims. Jor a time he was a draw- ing-master, afterwards a sceue-painter. Some pen and ink copies made by him of figures from Hogarth's plates led to his being employed by Charles Knight on several of that gentleman's illustrated publications. His first published literary work was a contribution to Hone's Year-Book in 1831. His life seems to have been one of almost uninter- rupted quiet labour, carried on until within a few days of death. Several works on civic pageantry and some collec- tions of ancient unpublished songs and dialogues were edited by him for the Percy Society in 1842. In 1844 he was elected fellow of the Society of Antiquaries. An edition of the dramatic works of Lilly was published by him in 1853. His principal independent works are Tobacco, ats History and Association, 1859; Up the Nile and Home Again, 1862; many articles and serials contributed to the Art Journal, some of which were afterwards separately published, as Costewme in England, 1846; Dictionary of Terms in Art, 1854. These works are illustrated by numerous cuts, drawn on the wood by his own hand, His pencil was also employed in illustrating Evan's Coins of the Ancient Britons, Madden's Jewish Coinage, Halliwell's folio Shakespeare, Roach Smith's Lichborough, the Miscellanea Graphica of Lord Londesborough, and many other works. Mr Fairholt was entirely a Londoner; boru in London, and never out of sight of St Paul's for the first twenty-two years of his life, he ever loved a paved street better than a green lane. His later years were much troubled by discase which, though temporarily alleviated by a voyage to Egypt and Nubia with the present Lord Londesborough, terminated in consumption. He died April 3, 1866. His books relating to Shakespeare were be- queathed to the library at Stratford-on-Avon ; those on civic*~~

~~*Antiquaries; his old prints and works on costume to the British Museum.*~~

~~*FAIRIES (Fr., fée, faerie; Prov., fada,; Sp., hada ; Ital., fata; Med. Lat., fatare, to enchant, from Latin fatum, fate, destiny). In early times, when so much of the energy of man was not, as now, applied to practice, it seems to have found a natural outlet in the imagination, Of all the minor creations of mythology, the fairies are the most beau- tifnl, the most numerous, the most memorable in litera- ture. Like all organic growths, whether of nature or of the fancy, they are not the immediate product of one country*~~

~~*or of one time; they have a pedigree, and the question of .*~~

~~*their ancestry and affiliation is one of wide bearing and weighty side-issues. But mixture and connexion of races have in this, as in many other cases, so changed the original folk-prodnet that it is difficult to disengage and separate the different strains that have gone to the making or moulding of tlic result as we have it. Certain points, liow- ever, in the course and development of the superstition can be definitely placed.*~~

~~*The character of the religion by the people of Gaul was undoubtedly much changed by the Roman occupation, but, in inscriptions and legends, traces are to be found of what the primitive belief was, which faintly shadow out that primitive belief, and it is here that we first find traccs of one of the various classes of beings which have in later times received the general name of fairies. Votive inscrip- tions to supernatural beings, corresponding to the nymphs and fauns of classic mythology, have been found on Gaulish and German soil repeatedly. A passage in Pomponius Mela (De Situ Orbis, bk. iii. c. 6) points distinctly to a belief of the Bretons in certain beings having many characteristics of the fairies.*~~

~~*'Sena being situate in the British sea against the country of the Osismyes is renowned with the oracle of the god of the Galles, whose. vowesses in number nine, are hallowed to continual virginitie. They call them Gallicens, and are of opinion that, through the singular wisdom wherewith they are indued, they raise the seas and winds with their charms, and transform themselves into what beastes they will, and heale such diseases as to others are incurable, and knowe things to come and*~~

prophesy of them, but not unto any other than such as sayle thither for the nonce, and

come of set purpose to demaund counsell of them." —Golding's translation, p. 78.

The similarity of these beings to the fays that play so important a part in medizval romances is remarkable. A passage in the romance of Lancelot du Lac is so directly descriptive that it may be quoted:—

"En cellui temps estoient appellees fées toutes celles qui sentermet- toient den-chantements et de charmes, et moult en estoit pour lors principallement en la Grande Bretagne, et scavoient la force et la vertue des parolles, des pierres, et des herbes, parquoy elles estoient tenue en jeunesse et en beaulte et en grandes richesses comment elles divisoient. Et ce fut estably au temps de Merlin le prophete.— lid. 15338, p. v.

'These fays preside at the birth and influence the destiny of men, taking individuals under their special protection. They take lovers from among mien, and are often described as of delicate, unearthly, ravishing beauty. The cnjoynient of their charms is, however, generally qualificd by some re- striction or compact, the breaking of which is the cause of calamity to the lover and all his race, as in the notable tale of Melusine. This fay by enchantment built the castle of Lusignan for her husband. It was her nature to take, every week, the form of a serpent from the waist below. The hebdomadal transformation being once, contrary to compact, witnessed by her husband, she left him with much wailing, and was said to return and give warning by her appearance and great shrieks whenever one of the race of Lusignan was about to die. At the birth of Ogier le Dannois six fairies attend, five of whom give good gifts, which the sixth over-

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pageantry (between 200 and 300 volumes) to the Society of | rides with a restriction.

~~*Gervaise of Tilbury, writing early in the 13th century, has, in his Otia Jmperialia, a chapter De lamais et nocturnis larvis, where he gives it out, as proved by individuals beyond all exception, that men have been lovers of beings of this kind whom they call Fadas, and who did, in case of infidelity or infringement of secrecy, in- flict terrible punishment—the loss of goods and even of life. There seems little in the characteristics of these fairies of romance to distinguish them from human beings, except their supernatural knowledge and power. They are not often represented as diminutive in stature, and seem to be subject to such human passions as love, jealousy, envy, and revenge. To this class belong tile fairies of Boiardo, Ariosto, and Spenser.*~~

~~*The etymology traced at the beginning of this article is that generally given, but it is by no means universally accepted. Some fanciful theories that prevailed at the be- ginning of the century, as, for instance, that adopted by Sir W. Scott in his Hssay on the Fairy Superstition, which con- nects the word fairy with the Persian peri, are now generally rejected. M. Walckenaer believed the word to be purely Celtic (see his Letters sur les Contes des Fées, Paris, 1836). Apart, bowever, from the question of the origin and varying intention of the term, the kind of beings first signified by it can be fairly connected with creatures of the Greek and Roman mythology.*~~

~~*The Gauls had no doubt a populous pantheon, The peasants seem to have offered worship to, and peopled the old hills, trees, rocks, streams, and springs with, beings similar to the nymphs and fauns of antiquity. And each little lozality seems to have had its protecting deities, female, and generally three in number. The coming of Christianity only changed slightly the way of regarding these creatures—did not by any means overcome the superstition. It is most likely to the similarity in character and func- tion of these local deities to the Parez or Fates of antiquity that we owe the name generally given to all the different beings, a great part of whose functions it was to preside at the birth and rule the destiny of man. It seems probable that among the people generation after generation of nurses changed these topical divinities into those fairies, the tales of which Perrault and his successors made so popular. The fairy tales in the Pracevoli Notte of Straparola (1550-54) and the Pentamerone of Basile*~~

~~*(1672) are also, no doubt, the results of genuine tradition. By this time, however, the inflnence of Eastern stories had been brought by travellers and crusaders to bear upon the traditions of the West, as well as that of the superstition next to be mentioned. To the elves and dnergar of the northern mythology we must go for the origin of those little creatures that dance in the woods and meadows. The elves are divided into two classes, the light and the dark. It is related in the prose Edda that the gods reflected how the duergar animated the clay below the earth like maggots in flesh; and certainly, under different names, as brownic, cluricaunc, kobbold, nisse, lutin, hobgoblin, beings of this kind, whether of the hill or wood, of the rock or stream, or of the household, have played a great part in the life of the peasantry of many countries. They are represented as of very various characteristics and propensities. Their appearance and power is sometimes propitions, at other times baleful. "He that looks on them shall dic," says Falstaff, and hides his face accordingly. Perhaps the leading features of their character with relation to man is a desire for fair human children, which, substi- tuting abortive creatures, they practise many tricks to obtain. They are often represented as animated by a spirit of malicious mockery towards men, which is not, however, altogether malignant. In connexion with their fabled abode underground, it is to be noted that Chaucer makes Pluto and Proserpina king and queen of faery.*~~

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~~*Besides scattered allusions, we owe to this superstition many fair products of our poetry. Works of Drayton, Ben Johnson, Fletcher, Randolph, and Herrick will at once suggest themselves. Its influence is of course very marked in the youthful works of Milton. Of the Midsummer Night's Dream, that perfect rose among all these flowers of fancy, it is unnecessary to speak, even were it possible to do so adequately.*~~

~~*For an elaborate account of fairies in general, see Keightley's Fairy Mythology, where the legends of different countries are col- lected. iid (W. HE.)*~~

~~*FAITHORNE, WILLIAM, a painter and engraver, was born in London, at what date is uncertain, but most: pro- bably either in 1626 or 1627. He was apprenticed to Robert Peake, a painter and printseller, who reccived*~~

~~the honour of knighthood from Charles I. On the ontbreak of the civil war he accompanied his master into the king's service, and being made prisoner at Basinghouse, he was confined for some time to Aldersgate, where, however, he was permitted to follow his profession of engraver, and among other portraits did a small one of the first Villiers, duke of Buckingham. At the earnest solicitation of his friends he very soon regained his liberty, but only on con- dition of retiring to France. There he was so fortunate as to receive instructions from Robert Nanteuil, by which lis style was greatly benefited. He was permitted to return to England about 1650, and took up a shop near Temple Bir, where, besides his work as an engraver, he carried on a large business as a printseller. In 1680 he gave up his shop and retired to a house in Blackfriars, occupying himself chiefly in painting portraits from the life in crayons, although still occasionally engaged in engraving. He died of a lingering consumption, May 13, 1691 ; and it is said that his life was shortened by the misfortunes, dissipation, and early death of his son William. Faithorne is especially famous as a portrait engraver, and among those on whom he exercised his art were a large number of eminent persons, including Sir Henry Spelman, Oliver Cromwell, Henry Somersct, the marquis of Worcester, John Milton, Queen Catherine, Prince Rupert, Cardinal Richelieu, Sir Thomas Fairfax, Thomas Hobbes, Richard Hooker, Robert second earl of Essex, and Charles I. All his works are remarkable for their combination of freedom and strength with softness and delicacy, and his crayon paintings unite to these the addi- tional quality of clear and brilliant colouring. Faithorne is the author of a work on engraving, which was published in 1622.~~

~~FAITHORNE, Wirxi1am (1656-1686), a mezzotinto en- graver, son of the former, was born in 1656. He had the advantage of his father's instructions, and devoting his attention chiefly to mezzotinto, at an early age gave promise of attaining great excellence, but became idle and dissi- pated, and it is said involved his father in money difficulties. Among persons of note whose portraits he engraved are Charles II., Mary princess of Orange, Queen Anne when princess of Denmark, and Charles XII. of Sweden. He died in 1686.~~

~~*The best account of the Faithornes is that contained in Walpole's Ancedotes of Painting. A life of Faithorne the elder is preserved in the British Museum among the papers of Mr Bayford, librarian to Lord Oxford, and an intimate friend of Faithorne.*~~

~~*FAIZABAD, a division or commissionership of Oudh in British India, now under the jurisdiction of the lieutenant- governor of the North-Western Provinces. It lies in 26°—28° 30' N. lat. and 81° 5'-83° 15' E. long., and comprises the three districts of FaizAbad, Gonddé, and Bharaich. It is bounded on the N. by the independent state of Nepal, on the E. by Gorakhpur district, on the S. by Azimgarh and Sultan- pur, and on the W. by Bara Banki, Sit4pur, and Kheri. Population, according to the census of 1868—Hindus,*~~

~~*3,028,502; Mahometans and others, 350,760; total, 3,379,262, of whom 1,747,411 were males and 1,631,851 females. Number of villages or townships, 8452. Area, 7671 square miles.*~~

~~*FarzApAD, a district of British India in Oudh, under thie lieutenant-governor of the North-Western Provinces, in 26°-27° N. lat. and 81°-82° E. long., is bounded on the N. and E. by the Gogra river, on the S. by Azimgarh district, and on the W. by the Gumti river. The area, according to the latest estimate in 1877, is 1649 square miles, and the population 1,024,092 souls. Faizibid forms a very historical district, lying between the two great rivers of Oudh, and is interesting alike for its calamities and its ruins, Ajodlty4, the capital of the ancient kingdom of Oudh, which plays so conspicuous a part in the Sanskrit epics, lies in its northern angle, close to the present city of Faizibad. In more modern times the district was the centre of the nawéb vizir's influence, and contained his capital until the removal of his court to Lucknow in 1775. In 1857 it be- came the scene of the disaster described below. Since the mutiny, the district has settled down into a peaceful part of the British empire, with an increasing population, It is penetrated throughout its length from north to south by the Oudh and Rohilkhand railway, and does an import- ant trade with the great cities of the north-west. The growth of its population has been the more marked, owing to the previous desertion and decay in the last*~~

~~*century on the transfer of tle naw4b's court to Lucknow. The popmla-tion, classified according to religion, is—Hindus, 922,360, Mahometans, 100,410, Christians, 1322, of whom 1267 represent the European soldiers; total, 1,024,092; the density of population averaging 621 per square mile. The five largest towns, containing upwards of 5000 inhabi-tants, are—Faizabad, population, 37,804 ; Tanda, 13,5438; Ajodhya, 9949 ; Jalalpur, 6275 ; and Sajauli, 5614. The railway stations are the following :—Malipur, Akbarpur, Kanurpur, Gosdinganj, Tandauli, Belarghat, Darsinagar, Ajodhya, Faizabad, and Sajauli. The estimated cultivated area in 1875 was 628,690 acres, of which rice was returned as occupying 162,562 ; wheat, 162,895 ; other food grains, 248,837 ; oil-seeds, 6888; sugar, 27,800; cotton, 492 ; opium, 4982 ; indigo, 6900 ; fibres, 202; tobacco, 3957; and vegetables, 3522. The total value of the trade of Faizabad in 1874—75 was exports £425,115, and imports £122,511, the chief articles of export being food grains, oil-seeds, country cloth, and silk, and cotton; and of im- ports, sugar, spices, European piece goods, &c. The revenue of the district in 1874-75 was £151,856, of which £133,243, or 85 per cent., was derived from the land-tax. The machinery for protecting person and property consisted of 15 magisterial and 15 civil and revenue courts. The regular police force consisted of 552 officers and men, maintained at a cost of £8363 out of the imperial revenue ; a town and cantonment police numbering 237, and costing £1402 from local sources ; and a village police numbering 2277 men, maintained by the villagers or landholders at a cost of £5524, The average daily number of prisoners in jail in 1875 was 791, or one to every 1294 of the popula- tion. The schools in the same year numbered 98, attended by 4461 pupils. Four charitable dispensaries afforded medical aid to 13,463 patients ; and a poorhouse furnished assistance to 6752 paupers in the shape of food, clothing, and shelter.*~~

~~*Farz4Bdp, the chief town and administrative head- quarters of the district of the same name, situated on the right or south bank of the Gogra, in 26° 47' N. lat, and 82° 15' E. long. Adjacent to Faiz4bad on the E., and now forming a suburb of the town, is Ajodhyd, the ancient capital of King Daswratha, the father of Rama, the hero of the Ramayana. Of this ancient city, said to have covered*~~

~~an area of 48 kos, now hardly a trace remains. The modern Ajodhya contains several Jain and Hindu teraples. The city of Faizibid was founded about 1730 by Sa'adat Ali Khan the first nawab vizier of Oudh, who made it his capital. The place rapidly grew in importance until 1775, wlien the court of Oudh was removed to Lucknow. It then rapidly decayed, all the leading merchants, bankers, &c., abandoning the place. In 1839, Butter estimated its population at 100,000 but fast diminishing, owing to the exactions and oppressions by the native officials of the nawab's Government. At the time of the census in 1869 Faiz4bad contained only 37,804 inhabitants ; but it is now again advancing in prosperity, and is rapidly becoming an emporium of trade. At the time of the annexation of Oudh in 1856 Faiza4bid was made, and still continues to be, a | large military station. On the outbreak of the mutiny in |~~

~~1857, the cantonment contained two regiments of infantry, a squadron of cavalry, and a light field battery of artillery — all natives. Owing to their threatening demeanour after the Meerut massacre, many of the European ladies and children were sheltered by one of the great landholders of Oudh, and others were sent forward to less disturbed parts of the country. The troops rose, as was anticipated, and although they at first permitted their officers to take boats and proceed towards Dinapur, a message was afterwards sent to a rebel force lower down the river to intercept the fugitives. Of four boats, one succeeded in reaching Dinapur safely, having passed the rebels unnoticed. Of the occu- pants of the other three boats, one person alone escaped. Faizabad is now a station for European as well as fur native troops. FAKIR. See Dervish, vol. vii., p. 113.~~

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~~*When insertion throughout the text is desired, the Plates to be placed opposite the following pages :—*~~

~~*Plate I. page 215 |*~~

~~*Plate V. page 318*~~

~~*Plate IX. page 680*~~

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The articles FISHERIES and FRANCE (PART Iv., FRENCH LITERATURE) are Entered according to Act

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FAL—-FAL

ALABA, a town of West Africa, about 190 miles N.W. of Freetown in Sierra Leone, at the foot of the Kon- kodugor, and on the Fala river, a tributary of the Little Scar- cies, It was founded by the Sulimas, who revolted from the Mahometan Foulas, and its warlike inhabitants soon attained supremacy over the neighbouring villages and country. The defences consist of a lofty stockade, and a moat about 20 feet deep and as many in breadth. From a distance the town appeurs like a grove of silk-cotton trees, and only at intervals are the brown roofs seen peering through the foliage. Major Laing about 1825 estimated the number of huts at about 4000. They are arranged in clusters round squares or court-yards, and though only built of clay are neat and even elegant. Winwood Reade, who was detained in the town during his Niger journey in 1869, has given a

graphic description of life in Falaba in his African Sketch oor vol. ii, 1873. See also Laing, Zravels in W. Africa,

825.

FALAISE, a town of France, the capital of an arron- dissement in the department of Calvados, is situated on the right bank of the Ante, 21 miles S. by E. of Caen. It was formerly a place of some strength, and is still surrounded by old walls. The principal object of in- terest is the castle, now partly in ruins, but formerly the seat of the dukes of Normandy, and the birthplace of William the Conqueror. Near the castle, inthe Place de la Trinité, is an equestrian statue in bronze of William the Conqueror, by Louis Rodel. Falaise has two large and populous suburbs, one of which, Guibray, rivals in size and importance the town itself, and is celebrated for its annual fair, which lasts from 10th to 25th August. The town contains a town-hall, a hospital, a theatre, several ancient churches, and a public library. The manufactures are chiefly cotton goods, hosiery, leather, and paper. The population in 1872 was 7749,

_ FALASHAS (i.¢., Exiles), the degenerate Jews of Abys- sinia, found in considerable numbers in the provinces west of Takazze, namely, Semien, Wogara, Armatshoho, Walkait, Tchelga, Dembea, Tenkel, Dagusa, Alafa, Kunsula, Aschafer, Agarv-Meder, and Quara. It is doubtful whether they are to be ethnologically identified with the seed of Abraham, or regarded, like the Khazars of the 8th century, as, for the most part, mere proselytes to Judaism. As to the date

when the race or the religion was introduced there is no authentic information,—one account carrying it back to the days of Solomon and his hypothetical son Menelek by the queen of Sheba, another to the time of the Babylonian captivity, and a third only to the Ist century of the Chris- tian era. That one or other of the earlier dates is probably correct may be gathered from the fact that the Falashas know nothing of either the Babylonian or Jerusalem Tal- mud, make no use of the tephilin, and observe neither the feast of Purim nor the dedication of the temple. They pos- sess —not in Hebrew, of which they are altogether ignorant, but in Ethiopic (or Geez)——the canonical aud apocryphal books of the Old Testament; a volume of extracts from the Pentateuch, with comments given to Moses by

God on Mount Sinai ; the Te-e-sa-sa Sanbat, or laws of the Sabbath ; the Ardit, a book of secrets revealed to twelve saints, which is used as a charm against disease; lives of Abraham, Moses, &c.; and a translation of Josephus called Sana Aibud.

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the passover, the harvest feast, the Baala MazAlat or feast of tabernacles (during which, however, no booths are built), the day of covenant or assembly, and Abraham's day. It is believed that after death the soul remains in a place of

darkness till the third day, when the first taskar or sacrifice |,

for the dead is offered ; prayers are read in the mesgeed for the repose of the departed, and for seven days a formal lament takes place every morning in his house. No coffins are used, and a stone vault is built over the corpse so that it may not come into direct contact with the earth. The Falashas are an industrious people, living for the most part in villages of their own, or, if they settle in a Christian or Mahometan town, occupying a separate quarter. ~~They en~~ gage in agriculture, manufacture pottery, iron ware, and cloth, and are specially sought after for their skill in niason- work. 'Their numbers are variously estimated at from 80,000 to 200,000.

See Nott and Gliddon, Types of Mankind, 1868; Flad, Zwolf Jahre in Abyssinia, Basel, 1869, and his Falashes of Abyssinia, translated from the German by S. P. Goodhart, London, 1869.

FALCON (Latin, Falco;! French, Faucon ; Teutonic, Falk or Valken), a word now restricted to the high-couraged and long-winged Birds-of-Prey which take their quarry as it moves ; but formerly it had a very different meaning, being by the naturalists of the last and even of the present century extended to a great number of birds comprised in the genus Falco of Linnzeus and writers of his day,? while, on the other hand, by falconers, it was, and still is, techni- cally limited to the female of the birds employed by them in their vocation (see Fanconry), whether " long-winged " and therefore "noble," or " short-winged " and " ignoble."

According to modern usage, the majority of the Falcons, in the sense first given, may be separated into Jive very dis- tinct groups :—(1) the Falcons pure and simple (Falco proper) ; (2) the large northern Falcons (Hierofalco, Cuvier) ; (3) the “Desert Falcons” (Gennea, Kaup); (4) the Merlins (salon, Kaup); and (5) the Hobbies (Hypotriorchis, Boie), The precise order in which these should be ranked need not concern us here, but it must be mentioned that a sixth group, the Kestrels (Tinnunculus, Vieillot) is often added to them. This, however, appears to have been justi- fiably reckoned a distinct genus, and its consideration may for the present be deferred.

The typical Falcon is by common consent allowed to be that almost cosmopolitan species to which unfortunately the English epithet “peregrine” (.e., strange or wandering) has been attached. It is the Falco peregrinus of Tunstall (1771) and of most recent ornithologists, though some? prefer the specific name communis applied by J. F. Gmelin a few years later (1788) toa bird which, if his diagnosis be correct, could not have been a true Falcon at all, since it had yellow irides—-a colour never met with in the eyes of any bird now called by naturalists a “Falcon.” This species inhabits suitable localities throughout the greater part of the globe, though examples from North America have by some received specific recognition as F. anatum—

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- Unknown to classical writers the earliest use of this word igs said to be by Servius Honoratus (circa 390-480 a. D.) in his notes on din. lib. x. vers. 145. It seems possibly to be the Latinized form of the Teutonic Falk, though falx is commonly accounted its root.

- The nomenclature of nearly all the older writers on this point is extremely confused, and the attempt to unravel it would hardly repay the trouble, and would undoubtedly occupy more space than could here be allowed. What many of them, even so lately as Pennant’s time, termed the “Gentle Falcon” is certainly the bird we now call the Gos-Hawk (7.¢., @oose-Hawk), which name itself may have been transferred to the Astur palumbarius of modern ornithologists, from one of the long-winged Birds-of-Prey.

3 Among them Mr Sharpe, who, in his recent Catalogue of the Birds tn the British Museum, lias besides rejected much of the evidence that the experience of those who haye devoted years of study to the Falcons has supplied,

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the “ Duck-Hawk,” and those from Australia have been described as distinct under the name of F. melanogenys. Here, as in so many other cases, it is almost impossible to decide as to which forms should, and which should not, be accounted merely local races. In size not sur- passing a Raven, this Falcon (fig, 1) is perhaps the most powerful Bird-of-Prey for its bulk that flies, and its courage is not less than its power. It is the species, in Europe, most commonly trained for the sport of hawk- ing (see Fatconry). Volumes have been written upon it, and to attempt a complete account of it is, within the limits now available, impossible. The plumage of the adult

Fic. 1.—Peregrine Falcon.

is generally blackish-blue above, and white, with a more or less deep cream-coloured tinge, beneath—the lower parts, except the chin and throat, being barred transversely with black, while a black patch extends from the bill to the ear-coverts, and descends on either side beneath

the mandible. The young have the upper parts deep blackish-brown, and the lower white, more or less strongly tinged with ochraceous-brown, and striped longitudinally with blackish-brown. From Port Kennedy, the most northern part of the American continent, to Tasmania, and from the shores of the Sea of Ochotsk to Mendoza in the Argentine territory, there is scarcely a country in which this Falcon has not been found. Specimens have been re- ceived from the Cape of Good Hope, and it is only a ques- tion of the technical differentiation of species, whether it does not extend to Cape Horn. Fearless as it is, and adapt- ing itself to almost every circumstance, it will form its eyry equally on the sea-washed cliffs, the craggy mountains, or (though more rarely) the drier spots of a marsh in the northern hemisphere, as on trees (says Schlegel) in the forests of Java, or the waterless ravines of

Australia. In the United Kingdom it was formerly very common, and hardly a high rock from the Shetlands to the Isle of Wight but had a pair as its tenants. But the British gamekeeper has long held the mistaken faith that it is his worst foe, and the number of pairs which are now allowed to rear their brood unmolested in these islands must be small indeed, Yet its utility to the game-preserver, by destroying every one of his most precious wards that shews any sign of infirmity, can hardly be questioned by reason, and no one has more earnestly urged its claims to protection than Mr G. E. Free- man (falconry, e., p. 10).4 Nearly allied to this Falcon

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aid as not to be inferred, however, as many writers have done, that Falcons habitually prey upon birds in which disease has made any

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known. about them, their position must remain doubt- ful. ,

We have then a small but very beautiful group—the Merlins! (salon of some writers, Lithofalco of others). The

are several species of which it is impossible here to treat. at length, such as 7’. barbarus of Mauritania, /. minor of South Africa, the Asiatic 7. babylonicus, F. peregrinator of India—the Shaheen, and perhaps F, cassini of South America, with some others. .

Next to the typical Falcons comes a group known as the | “great northern” Falcons (Hierofalco).’ Of these the most re- markable is the Gyrfalcon (7. g yrfalco), whose home is in the Scandinavian mountains, though the young are yearly visi- tants to the plains of Holland and Germany. In plumage it very much resembles F. peregrinus, but its flanks have generally a bluer tinge, and its superiority in size is at once manifest. Nearly allied to it is the Teelander (F. islandus), which externally differs in its paler colouring, and in almost entirely wanting the black mandibular patch. Its propor- tions, however, differ a good deal, its body being elongated. Its country is shown by its name, but it also inhabits South Greenland, and not unfrequently makes its way to the British Islands. Very close to this comes the Greenland

Falcon (F. candicans), a native of North Greenland, and perhaps of other countries within the Arctic circle. Like the last, the Greenland Falcon from time to time occurs in the United Kingdom, but it is always to be distinguished by wearing a plumage in which at every age the prevailing colour is pure white. In N orth-Eastern America these birds are replaced by a kindred form (F. labradorus) first detected by Audubon, and lately recognized by Mr Dresser (Orn. Miscell., 1. p. 135). It is at once distinguished by its very dark colouring, the lower parts being occasionally almost as deeply tinted at all ages as the upper.

All the birds hitherto named possess one character in common. The darker markings of their plumage are longi- tudinal before the first real moult takes place, and for ever afterwards are transverse. In other words, when young the markings are in form of stripes, when old in form of bars. ‘The variation of tint is very great, especially in 7. pere- grinus; but the experience of falconers, whose business it is to keep their birds in the very highest condition, shews that a Falcon of either of these groups if light-coloured in youth is light coloured when adult, aud if dark when young ‘5 also dark when old—age, after the first moult, making no difference in the complexion of the bird. The next group is that of the so-called “ Desert-Falcons ” (Gennea), wherein the difference just indicated does not obtain, for long as the bird may live and often as it may moult, the original style of markings never gives way to any other. Foremost among these are to be considered the Lanner and the Saker (commonly termed /*. lanarius and J’. sacer), both well known in the palmy days of Falconry, but only within the last forty years or so readmitted to full recogni- tion. Both of these birds belong properly to South-eastern Europe, North Africa, and South-western Asia. They are, for their bulk, less powerful than the members of the pre- ceding group, and though they may be trained to high flights are naturally captors of humbler game. The precise number of species belonging here is very doubtful, but among the many candidates for recognition are especially to be named the Lugger (7. jugger) of India, and the Prairie Faleon (F. mewxicanus) of the western plains of North America.

The systematist finds it hard to decide in what group he should place two somewhat large Australian species (7. hypoleucus and I. subniger), both of which are rare in collections—the latter especially; and, until more is

Fic. 2.—Merlin. | European Merlin (/. «salon) is perhaps the holdest of the

Accipitres, not hesitating to attack birds of twice its own size, and even on occasion threatening human beings. Yet it readily becomes tame, if not affectionate, when reclaimed, and its ordinary prey consists of the smaller Passeres. Its “ pinion of glossy blue ” has become almost proverbial, and a deep ruddy blush suffuses its lower parts; but these are characteristic only of the male—the female maintaining very nearly the sober brown plumage she wore when as a nestling she left her lowly cradle in the heather. Very close to this bird comes the Pigeon-Hawk (F. columbarius) of North America—so close, indeed, that none but an ex- pert ornithologist can detect the difference. The Turumti of Anglo-Indians (7. chicquera), and its representative from Southern Africa (/’. rujicollts), also belong to this group, but they are considerably larger than either of the former.

Lastly, we have the Hobbies (Hypotriorchis) comprising a greater number of forms—though how many seems to be

Fia, 3.—Hobby.

doubtful. They are in life at once recognizable by their bold upstanding position, and at any time by their long wings. The type of this group is the English Hobby (/. subbuteo), a bird of great power of flight, chiefly used in ee a al re a ag ra

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serious progress. Such birds meet their fate from the less noble Accipitres, or predatory animals of many kinds. But when a bird is first affected by any disorder, its power of taking care of itself is at once impaired, and hence in the majority of cases it may become an easy victim under circumstances which would enable a perfectly sound

bird to escape from the attack even of a Falcon. 1 French, Emérillon ; Icelandic, Smirill.

coveries he and Captain Cautley received in 1837 the Wollaston medal in duplicate from the Geological Society of London. In 1834 Falconer was appointed to inquire into the fitness of India for the growth of the tea-plant, and it was on his recommendation that it was introduced into that country. He also made large natural history collec- tions, not only of the productions of the country round Saharunpoor, but also of the valley of Kashmir and the countries to the north of it, exploring at the same time the glacier on the southern flank of the Muztagh range, and the great glaciers of Arindoh and of the Braldoh valley. He was compelled by illness to leave India in 1842, and during his stay in England, besides reading various papers on his discoveries before several learned societies, he occu- pied himself with the classification and arrangement of the Indian fossils presented to the British Museum and East India House, chiefly by himself and Captain Cautley. In 1848 he was appointed superintendent of the Calcutta botanical garden, and professor of botany in the medical college ; and on entering on his duties he was at once em- ployed by the Indian Government and the Agricultural and Horticultural Society as their adviser on all matters con- nected with the vegetable products of India. Being com- pelled by the state of his health to leave India in 1855, he spent the remainder of his life chiefly in examining fossil species in England and the Continent corresponding to those which he had discovered in India. In the course of his researches he became interested in the question of the antiquity of the human race, and actually commenced a work on " Primeval Man," which, however, he was not spared to finish, He died 31st J anuary 1865. He wasa member of many learned societies, both British and foreign. Shortly after his death a committee was formed for the promotion of a "Falconer Memorial." This took the shape of a marble bust, which was placed in the rooms of the Royal Society of London, and of a Falconer scholarship of the annual value of £100, open for competition to graduates in science or medicine of the university of Edin- burgh.

Dr Falconer's botanical notes, with 450 coloured drawings of Kashmir and Indian plants, have been deposited in ihe library at Kew, and his Paleontological Memoirs and Notes, comprising all – his papers read before learned societies, have been edited, with a biographical sketch, by Charles Murchison, M.D., London, 1868,

FALCONER, Witt1am, our greatest naval poet,— Charles Dibdin taking rank as second,—was born in Kdinburgh, February 11, 1732. His father was a wig-maker, and carried on business in one of the sinall shops with wooden fronts at the Netherbow Port, an antique castellated struc- ture which remained till 1764, dividing High Street from the Canongate. The old man, who is described as a sort of humorist, was unfortunate. Of his three children two were deaf and dumb ; he became bankrupt, then tried busi- nésS as a grocer, and finally died in extreme poverty. William, the son, having received a scanty education, was put to sea. He served on board a Leith merchant vessel, and in his eighteenth year was fortunate enough to obtain the appointment of second mate of the « Britannia," a vessel employed in the Levant trade, and sailed from Alexandria for Venice. The " Britannia" was overtaken by a dreadful storm off Cape Colonna and was wrecked, only three of the crew being saved. Falconer was happily one of the three, and the incidents of the voyage and its disastrous termination formed the subject of his poem of 1834 he published a description of the geological character | The Shipwreck. "In all Attica," says Byron, "if we ex- of the neighbouring Sewalik hills, in the Tertiary strata of cept Athens itself and Marathon, there is no scene more in- which he discovered bones of crocodiles, tortoises, and other teresting than Cape Colonna. To the antiquary and artist, fossil remains ; and subsequently, along with other conjoint | sixteen columns are an inexhaustible source of observation labourers, he brought to light a sub-tropical fossil fauna of | and design; to the philosopher the supposed scene of unexampled extent and richness, For these valuable dis- | Plato's conversations will not be unwelcome 3 and the

the capture of insects, which form its ordinary food. It is a summer visitant to most parts of Europe, including these islands, and is most wantonly and needlessly destroyed by gamekeepers. A second European species of the group is the beautiful 7. eleonore, which hardly comes further north than the countries bordering the Mediterranean, and, though in some places abundant, is an extremely local bird. The largest species of this section seems to be the N eotropical 1. Jemoralis, for F'. diroleucus though often ranked here is now supposed to belong to the group of typical Falcons. (A. N.)

FALCONE, Antretio (1600-1665), a battle-painter, was the son of a tradesman, and was born in N aples. He showed his artistic tendency at an early age, received some instruction from a relative, and then studied under Ribera (Lo Spagnoletto), of whom he ranks as the most eminent pupil. Besides battle-pictures, large and small, taken from biblical as well as secular history, he painted various reli- gious subjects, which, however, count for little in his general reputation. He became, as a battle-painter, almost ‘as celebrated as Borgognone (Courtois), and was named “T’Oracolo delle Battaglie.” His works have animation, variety, truth to nature, and careful colour. Falcone was bold, generous, used to arms, and an excellent fencer. In the insurrection of Masaniello (1647) he resolved to be bloodily avenged for the death, at the hands of two Spaniards, of a nephew, and of a pupil in the school of art which he had established in Naples. He and many of his scholars, including Salvator Rosa and Carlo Coppola, formed an armed band named the Compagnia della Morte. They scoured the streets by day, exulting in slaughter ; at night they were painters again, and handled the brush with im- petuous zeal. Peace being restored, they had to decamp. Faleone and Rosa made off to Rome; here Borgognone noticed the works of Falcone, and became his friend, and a French gentleman induced him to go to France, where Louis XIV. became one of his patrons. Ultimately Colbert obtained permission for the painter to return to N. aples, and there he died in 1665. Two of his battle-pieces are to be seen in the Louvre and in the N aples museum ; he painted a portrait of Masaniello, and engraved a few plates. Among his principal scholars, besides Rosa and Coppola (whose works are sometimes ascribed to Falcone himself), were Domenico Gargiuolo named Micco Spadaro, Paolo Porpora, and Andrea di Lione.

FALCONER, Hucu (1808-1865), a distinguished paleontologist and botanist, descended from an old Scotch family, was born at Forres, 29th February 1808. In 1896 he graduated as M.A. at Aberdeen, where he began to manifest a decided taste for the study of natural history and botany. He afterwards studied medicine in the uni- versity of Edinburgh, taking the degree of M.D. in 1829. Proceeding to India in 1830 as assistant-surgeon on the Bengal establishinent of the East India Company, he made on his arrival an examination of the fossil bones from Ava in the possession of the Asiatic Society of Bengal, and a description of the collection which he published

immediately gave him a recognized position among the scientists of India, In 1831 he was appointed to the army station at Meerut, in the north-western provinces, and in 1832 he succeeded his friend Dr Royle as superintendent of the botanic garden of Saharunpoor. He was thus placed ina district particularly rich in paleontological remains, the existence of which were, however, then unknown ; and he immediately set to work to Investigate both its natural history and geology. In

traveller will be struck with the beauty of the prospect over Sisles that crown the A%gean deep.’ But for au English- man Colonna has yet an additional interest, as the actual spot of Falconer’s Shipwreck. Pallas and Plato are forgotten in the recollection of Falconer and Campbell— ‘¢¢ Here in the dead of night, by Lonna’s steep, The seaman’s cry was heard along the deep.’ ’ After the wreck of the “ Britannia” and his return to England, Falconer, in his nineteenth year, appeared as a poet. He printed at Edinburgh an elegy on Frederick, prince of Wales,—a puerile inflated performance,—and afterwards contributed short pieces to the Gentleman’s Magazine. Some of these descriptive and lyrical effusions possess merit. The fine naval song of The Storm (‘“Cease, rude Boreas”), reputed to be by George Alexander Stevens, the dramatic writer and lecturer, has been ascribed to Falconer, but apparently on no authority. It is foreign to his usual style. Had he been the author he would assuredly lave claimed it. Falconer continued in the merchant service until the spring of 1762, when he gained the patronage of Edward, duke of York, by dedicating to him his poem of The Shipwreck, which appeared in May of that year, «‘ printed for the author.” The duke advised lim to enter the royal navy, and before the end of summer the poet-sailor was rated as a midshipman on board the “ Royal George.” But as this ship was paid off at the peace of 1763, and as Falconcr’s period of service had been too short to enable lim to obtain the commission of lieutenant, he was advised to exchange the military for the civil department of the navy, aud in the course of the same year, he received an appointment as purser of the “ Glory ” frigate, a situation which he held until that vessel was laid up on ordinary at Chatham. In 1764 he published a new edition of The Shipwreck, corrected and enlarged, and printed, not for the author, as in the former instance, but for Andrew Millar, the publisher of Hume and

Robertson, and whom Johnson called the Meecenas of the age. About nine hundred lines were added to this new edition of the poem, including what may be termed its character-painting and elaborated description and episodes. In the same year, 1764, Falconer published a political satire, a virulent rhyming tirade against Wilkes and Churchill, entitled The Demagogue ; and in 1769 appeared his Universal Marine Dictionary, an elaborate and valuable work. While engaged on this dictionary, Mr Murray, a bookseller in Fleet Street, father of Byron's munificent publisher and correspondent, wished him to join him as a partner in business. The poet declined the offer, probably because his dictionary was then near completion, and he might reasonably anticipate from its publication some favourable naval appointment. He did receive this reward; he was appointed purser of the " Aurora" frigate, which had been commissioned to carry out to India certain supervisors or superintendents of the East India Company. Besides his nomination as purser, Falconer was promised the post of private secretary to the commissioners. Before sailing he published a third edition of his Shipwreck, which had again undergone "correction," but not improvement. Mr Stanier Clarke conceived that the poet, in his agitation and joy on being appointed to the " Aurora," had neglected this edition, and left the last alterations to his friend Mallet; but Mallet had then been more than four years in his grave, and Falconer, in the "advertisement" which he prefixed to the volume, and which is dated from Somerset House, October 1, 1769, said he had been encouraged by the favourable reception the poem had met with to give it "a strict and thorough revision." The day after this announcement the poet sailed in the "Aurora" from Spithead. The vessel arrived safely at the Cape of Good Hope, and having passed a fort- night there, left on the 27th of December. She was never

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more heard of, having, as is supposed, foundered at sea. The captain was a stranger to the navigation, and had obstinately persisted in proceeding by the Mozambique Channel instead of stretching as usual into the Indian Ocean south of Madagascar. Every commander ofa vessel, as Fielding has remarked, claims absolute dominion in his little wooden world, and in too many instances shows the dangerous consequences of absolute power.

Thus miserably perished William Falconer in the thirty- seventh year of hisage. His fame rests on his poem of Zhe Shipwreck, and rests securely. In that work he did not aspire to produce a great effect by a few bold touches, or the rapid and masterly grouping of appalling or horrible circumstances. He labours in detail, bringing before us the events as they arise, and conducting us with an interest constantly increasing towards the catastrophe. Such a tremendous picture of shipwreck as that which Byron has, in wild sportiveness, thrown out in Don Juan, immeasur- ably transcends the powers of Falconer, and, indeed, stands alone in its terrible sublimity ; but, on the other hand, the naval poet, by the truth and reality of his descriptions, ultimately impresses the mind of the reader, if not with such vivid force, perhaps with even more enduring effect. Some of the classic invocations to the shores of Greece, and some descriptive passages, are a little tawdry, but the grand incidents of the poem are never forgotten. The personification of the ship in its last struggles is sublime as well as affecting, and the reader's anxiety and sym- pathy with the principal characters and the hapless crew never slumber. Nor are the technical expressions and directions a drawback to the general reader. They are explained in footnotes, and give a truth and reality to the narrative; and they do not occur in the more impassioned scenes. ; (R. CA.)

FALCONET, Etrennt Mavrice (1716-1791), a French sculptor, was born at Paris in 1716. His parents were poor, and he was at first apprenticed to a carpenter, but some of his clay-figures, with the making of which he occu- pied his leisure hours, having attracted the notice of Lemoine, that sculptor made him his pupil. While dili- gently prosecuting his profession he found time to study Greek and Latin, and also wrote several brochures on art, in which many names both ancient and modern of great reputation are treated in a remarkably disparaging way. His artistic productions are characterized by the same defects as his writings, for though manifesting considerable cleverness and some power of imagination, they display in many cascs a false and fantastic taste, the result most pro- bably of an excessive striving after originality. One of his most successful statues was one of Milo of Crotona, which secured his admission to the membership of the Academy of Fine Arts. Many of his works, being placed in churches, were destroyed at the time of the French Revolution. At the invitation of the empress Catherine he went to St Petersburg, where he executed a colossal statue of

Peter the Great in bronze. On his return to Paris in 1788 he became director of the French Academy of Paint- ing. He died 4th January 1791.

Among his writings are Réfcaions sur la sculpture (Par. 1768), and Observations sur la statue de Mare Auréle (Par. tego The

whole were collected under the title of Guvres littératres (6 vols., Lausanne, 1781-82; 8 vols., Paris, 1787).

FALCONRY, the art of employing falcons and hawks in the chase,—a sport the practice of which is usually termed hawking. Falconry was for many ages of the Old World's history one of the principal sports. Probably it may be considered as having been always as purely a sport as it is at the present day; for even in the rudext times man must have been possessed of means and appli- ances for the capture of wild birds and beasts more

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effectual than the agency of hawks, notwithstanding the high state of efficiency to which, as we may still see, well- trained hawks may be brought. The antiquity of falconry 1s very great. It seems impossible to fix the exact period of its first appearance. f it was practised in Asia at a very remote period, for which we have the concurrent testimony of various Chinese and Japanese works, some of the latter being most quaintly and yet spiritedly illustrated. It appears to have been known in China some 2000 years B.c., and the records of a King Wen Wang, who reigned over a province of that country 689 B.c., prove that the art was at that time in very high favour. In Japan it appears to have been known at least 600 years B.c., and probably at an equally early date in India, Arabia, Persia, and Syria. Sir A. H. Layard, as we learn from his work on Nineveh and Babylon, considers that in a bas-relief found by him in the ruins of Khorsabad "there appeared to be a falconer bearing a hawk on his wrist," from which it would appear to have been known there some 1700 years B.c. In all the above-mentioned countries of Asia it is practised at the present day.

Little is known of the early history of falconry in Africa, but from very ancient Egyptian carvings and draw- ings it seems to have been known there many ages ago. It was probably also in vogue in the countries of

Morocco, Oran, Algiers, Tunis, and Egypt, at the same time as in Europe. The older writers on falconry, English and Con- tinental, often mention Barbary and Tunisian falcons. It is still practised in Africa; the present writer has visited two hawking establishments in Egypt.

Perhaps the oldest records of falconry in Europe are supplied by the writings of Pliny, Aristotle, and Martial. Although their notices of the sport are slight and some- what vague, yet they are quite sufficient to show clearly that it was practised in their days—between the years 384 B.c.and 40 A.D. It was probably introduced into England from the Continent about 860 a.D., and from that time down to the middle of the 17th century falconry was followed with an ardour that perhaps no sport in our country has ever called forth, not even our grand national sport of fox-hunting. Stringent laws and enactments, notably in the reigns of William the Conqueror, Edward IIL, Henry VIII, and Elizabeth, were passed from time to time in its interest. Falcons and hawks were allotted to degrees aud orders of men according to rank and station,—for instance, to royalty the jerfalcons, to an earl the peregrine, to a yeoman the goshawk, to a priest the sparrow-hawk, and to a knave or servant the useless kestrel. The writings of Shakespeare furnish ample testi- mony to the high and universal estimation in which it was held in his days. About the middle of the 17th century falconry began to decline in England, to revive somewhat at the Restoration. It never, however, completely recovered its former favour, a variety of causes operating against it, such as enclosure of waste lands, agricultural improvements, and the introduction of fire-arms into the sporting field, till it fell, as a national sport, almost into oblivion. Yet it has never been even temporarily extinct, and it is still very sucessfully practised at the present day.

In Europe the game or “quarry” at which hawks are flown consists of grouse (confined to the British Isles), black- game, pheasants, partridges, quails, landrails, ducks, teal, woodcocks, snipes, herons, rooks, crows, gulls, magpies, jays, blackbirds, thrushes, larks, hares, and rabbits. In former days geese, cranes, kites, ravens, and bustards were also flown at. Old German works make much mention of the use of the Iceland falcon for taking the great bustard, a flight scarcely alluded to by English writers. In

Asia the list of quarry is longer, and, in addition to all the fore- going, or their Asiatic representatives, various kinds of

There appears to be little doubt that

bustards, sand grouse, storks, ibises, spoonbills, pea-fow], jungle-fowl, kites, vultures, and gazelles are captured by trained hawks. In Mongolia and Chinese Tartary, and among the nomad tribes of Central Asia, the sport still flourishes; and though some late accounts are not satis- factory either to the falconer or the naturalist, yet they leave no doubt that a species of eagle is still trained in those regions to take large game, as antelopes and wolves. Mr Atkinson, in his account of his travels in the country of the Amoor, makes particular mention of the sport, as does also Mr Shaw in his work on Yarkand ; and in a letter from the Yarkand embassy, under Mr Forsyth, C.B., dated Camp near Yarkand, Nov. 27, 1873, the following passage occurs :—‘ Hawking appears also to be a favourite amuse- ment, the golden eagle taking the place of the falcon or hawk. This novel sport seemed very successful.” It is questionable whether the bird here spoken of is the golden eagle. In Africa gazelles are taken, and also partridges and wildfowl.

The hawks used in England at the present time are the three great northern falcons, viz., the Greenland, Iceland, and Norway falcons, the peregrine falcon, the hobby, the merlin, the goshawk, and the sparrow-hawk. In former days the saker, the lanner, and the Barbary or Tunisian falcon were also employed. (See Faxcon.)

Of the foregoing the easiest to keep, most efficient in the field, and most suitable for general use at the present day are the peregrine falcon and the goshawk.

In all hawks, the female is larger and more powerful than the male.

Hawks are divided by falconers all over the world into two great classes. The first class comprises “ falcons,” “long-winged hawks,” or “ hawks of the lure,” distinguished by Eastern falconers as “‘dark-eyed hawks.” In thiese the wings are pointed, the second feather in the wing is the longest, and the irides are dark-brown. Merlins must, however, be excepted; and here it would seem that the Eastern distinction is the best, for though

merlins are much more falcons than they are hawks, they differ from falcons in having the third feather in the wing the longest, while they are certainly ‘“ dark-eyed hawks.”

The second class is that of “hawks,” “short-winged hawks,” or ‘hawks of the fist,” called by Eastern falconers ‘“‘yellow (or rose) eyed hawks.” In these the wings are rounded, the fourth feather is the longest in the wing, and the irides are yellow, orange, or deep-orange.

The following glossary of the principal terms used in falconry may, with the accompanying woodcut, assist the reader in perusing this notice of the practice of the art. Useless or obsolete terms are omitted :—

Bate.—A hawk is said to ‘‘ bate”’ when she flutters off from the fist, perch, or block, whether from wilduess, or for exercise, or in the attempt to chase.

Bewits.—-Straps of leather by which the bells are fastened to a hawk’s legs.

Bind.—A hawk is said to ‘‘bind” when she seizes a bird in the air and clings to it. This term is properly only applied to the seizure of large quarry, taken at a height in the air.

Block.—The conical piece of wood, of the form of an inverted flowerpot, used for hawks to sit upon; for a peregrine it should be about 10 to 12 inches high, 5 to 6 in diameter at top, and 8 to 9 in diameter at base.

Brail.—A thong of soft leather used to secure, when desirable, the wing ofahawk. It has a slit toadmit the pinion joint, and the ends are tied together.

Cadge.—The wooden frame on which hawks, when numerous, are carried to the field.

Cadger.—The person who carries the cadge.

Calling of.—Luring a hawk (see Lure) from the hand of an assist- ant at a distance for training or exercise is called ‘calling off.”

Carry.—A hawk is said to ‘‘carry” when she flies away with the quarry on the approach of the falconer.

ail ON, lea which may be used for flying together are called a Cast.

Casting.—The oblong or egg-shaped ball, consisting of feathers, bones, &c., which all hawks (and insectivorous birds) throw up after the nutritious part of their food has been digested.

Cere.—The naked wax-like skin above the beak.

Cheek.—A hawk is said to fly at ‘‘check” when she flies at a bird other than the intended object of pursuit,—for instance, if a hawk slipped at a heron goes off at a rook, she flies at check.

Clutehing.—Taking the quarry in the feet as the short-winged hawks do. Falcons occasionally ‘‘ clutch.”

Come to.—A hawk is said to ‘‘come to” when she begins to get tame

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HALF. NATURAL. SIZE

Implements used in Falconry.

1. Hood; 2. Back view of hood, showing braces a, a, b, b; by drawing the braces 6, b, the hood, now open, is closed; 3. Rufter hood; 4. Imping-needle; 5. Jess; dis the space for the hawk’s leg; the point and slit a, a are brought round

the leg, and passed through slit 6, after which the point c and slit c, and also |

the whole remaining length of jess are pulled through slits a and 6; cis the slit to which the upper ring of swivel is attached; 6. Hawk’s leg with bell a, bewit 5, jess c; 7. Jesses, swivel, and leash; 8. Portion of first wing-feather of male peregrine faleon, “ tiereel,” half natural size in process of imping; a, the living hawk’s feather; 6, piece supplied from another tiercel, with the

imping needle ¢ pushed half its length into it and ready to be pushed home into the living bird's feather.

Coping. —Cutting the beak or talons of a hawk is called "coping."

ee ee Hewks are said to ''crab" when they seize one another

ghting.

Creanee.—A long line or string.

Crop, to put away.—A hawk is said to '' put away her crov " when the food passes out of the crop into the stomach.

Deck feathers.—The two centre tail-feathers.

———* hawk which has been brought up from the nest is an

eyas.""

Eyry.—The nest of a hawk.

Foot.—A hawk is said to 'foot' well or to be a ''good footer " when she js successful in killing, Many hawks are very fine flyers without being '' good footers,"

Frouwnce.—A disease in the mouth and throat of hawks.

Get in.—To go up to a hawk when she has killed her quarry fs to

'get in."

Hack.—The state of partial liberty in which young hawks must always at first be kept—loose to fly about where they like, but aged fed early in the morning and again in the day, to

2 them from seeking food for themselves as long as pos- sible.

Taggard,—A wild-caught hawk in the adult plumage.

Hood.—The cap of leather used for the purpose of blindfolding the hawk. (See woodcut.)

Hoodshy.—A hawk is said to be ‘‘ hoodshy ” when she is afraid of, or resists, having her hood put on.

Imping.—The process of mending broken feathers is called ““imping.” (See 8 in cut.)

Imping needle.—A piece.of tough soft iron wire from about 14 to 24 inches long, rough filed so as to be three-sided and taper- ing from the middle to the ends. (See 4 in cut.)

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7 Site Sia hawk moultedin confinement is said to be “ inter-

mewed.”

Jesses. — Strips of light but very tough leather, some 6 to 8 inches long, which always remain on a hawk’s legs—one on each leg. (See cut.)

Leash.—A strong leathern thong, some 24 or 3 feet long, with a knot or button at one end. (See 7 in cut.)

Lure.—The instrument used for calling long-winged hawks,—a dead pigeon, or an artificial lure made of leather and feathers or wings of birds, tied to a string.

Man a hawk.—To tame a hawk and accustom her to strangers.

Manile.—A hawk is said to ‘‘ mantle” when she stretches out a leg and a wing simultaneously, a common action of hawks when at ease ; also when she spreads out her wings and feathers to hide any quarry or food she may have seized from another hawk, or from man. In the last case it is a fault.

Make hawk.—A hawk is called a “make hawk” when, as a thoroughly trained and steady hawk, she is flown with young ones to teach them their work.

Mew.—A hawk is said to ‘‘ mew” when she moults. The place where a hawk was kept to moult was in olden times called her ‘“‘mew.” Buildings where establishments of hawks were kept were called ‘‘ mews ”—an_ appellation which in many cases they have retained to this day,

Pannel.—The stomach of a hawk, corresponding with the gizzard of a fowl, is called her pannel. In it the casting is formed.

Passage.—The line herons take over a tract of country on their way to and from the heronry when procuring food in the breeding season is called a ‘‘ passage.”

Passage hawks.—Are hawks captured when on their passage or mi- gration. This passage takes place twice a year, in spring and autumn.

Pelt.—The dead body of any quarry the hawk has killed.

Pitch.—The height to which a hawk, when waiting for game to be flushed, rises in the air is ealled her ‘‘ pitch.”

Plume.—A hawk is said to “ plume ” a bird when she pulls off the feathers.

Point.—A hawk ‘* makes her point’ when she rises in the air in a peculiar manner over the spot where quarry has saved itself from capture by dashing into a hedge, or has otherwise secreted itself.

Pull through the hood.—A hawk is said to pull through the hood when she eats with it on.

Put in.—A bird is said to ‘‘ put in” when it saves itself from the hawk by dashing into covert or other place of security.

Quarry.—The bird or beast flown at.

Rake out-—A hawk is said to ‘‘rake out” when she flies, while ‘waiting on” (sce Wait on), too far and wide from her master.

Red hawk.—Hawks of the first year, in the young plumage, are called ‘‘ red hawks.”

Ringing.—A bird is said to ‘‘ring” when it rises spirally in the air.

Rufter hood.—An easy fitting hood, not, however, convenient for hooding and unhooding—used only for hawks when first eap- tured (see 3 in cut).

Seeling.—Closing the eyes by a fine thread drawn through the lid of each eye, the threads being then twisted together above the head,—a practice long disused in England.

Serving a hawk.— Driving out quarry which has taken refuge, or has ‘‘ put in.”

Take the air.—A bird is said to ‘take the air”? when it sceks to escape by trying to rise higher than the falcon.

Tiereel. _—The male of various falcons, particularly of the peregrine, is called a “ tiercel;” the term is also applied to the male of the goshawk.

Trussing.—A hawk is said to ‘‘ truss” a bird when slie catches it in the air, and comes to the ground with it in her talons: this term is not applied to large quarry. (See Bind.)

Varvels.—Small rings, generally of silver, fastened to the end of the jesses —not much used now.

Wait on.—A hawk is said to “ wait on” master waiting till game is sprung.

Weathering.—Hawks are ‘* weathered ” by being placed unhooded in the open air. This term is applied to passage hawks which are.not sufficiently reclaimed to be left out by themselves un- hooded on blocks, —they are ‘‘ weathered ” by being put out for ‘an hour or two uuder the falconer’s eye. :

Yarak.—An Eastern term, generally applied to short-winged hawks, When a hawk is keen. and in hunting condition, she is said to be ‘‘ in yarak.”

The training of hawks affords much scope for judgment, experience, and skill on the part of the falconer, who must carefully observe the temper and disposition as well as the constitution of each bird ; and various practices are re- sorted to which cannot be here described. It is through

when she flies above her

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the appetite principally that hawks, like most wild animals, are tamed; but to fit them for use in the field much patience, gentleness, and care must be used. Slovenly taming necessitates starving, and low condition and weak- ness are the result. The aim of the falconer must be to have his hawks always keen, and the appetite when they are brought into the field should be such as would in- duce the bird in a state of nature to put forth its full powers to obtain its food, with, as near as possible, a cor- responding condition as to flesh. The following is an out- line of the process of training hawks, beginning with the management of a wild-caught peregrine falcon, When first taken, a rufter hood should be put on her head, and she must be furnished with jesses, swivel, leash, and bell. A thick glove or rather gauntlet must be worn on the left hand (Eastern falconers always carry a hawk on the right), and she must be carried about as much as possible, late into the night, every day, being constantly stroked with a bird's wing or feather, very lightly at first. At night she should be tied to a perch in aroom with the window darkened, so that no light can enter in the morning. The perch should be a padded pole placed across the room, about four and a half feet from the ground, with a canvas screen underneath. She will easily be induced to feed in most cases by draw- ing a piece of beefsteak over her feet, brushing her legs at the time with a wing, and now and then, as she snaps, slipping a rnorsel into her mouth. Care must be taken to make a peculiar sound with the lips or tongue, or to use a low whistle as she is in the act of swallowing; she will very soon learn to associate this sound with feeding, and it will be found that directly she hears it, she will gripe with her talons, and bend down to feel for food. When the falconer perceives this and other signs of lier " coming to," that she no longer starts at the voice or touch, and steps quietly up from the perch when the hand is placed under her feet, it will be time to change her rufter hood for the ordinary hood. This latter should be very carefully chosen,—-an easy fitting one, in which the braces draw closely and yet easily and without jerking. An old one previously worn is to be recommended. The hawk should be taken into a very dark room,—one absolutely dark is best,—and the change should be made if possible in total darkness. After this she must be brought to feed

with her hood off; at first she must be fed every day ina darkened room, a gleam of light being admitted. The first day, the hawk having seized the food, and begun to pull at it freely, the hood must be gently slipped off, and after she has eaten a moderate quan- tity, it must be replaced as slowly and gently as possible, and she should be allowed to finish her meal through the hood. Next day the hood may be twice removed, and so on; day by day the practice should be continued, and more light gradually admitted, until the hawk will feed freely in broad daylight, and suffer the hood to be taken off and replaced without opposition. Next she must be accus- tomed to see and feed in the presence of strangers and dogs, &c. A good plan is to carry her in the streets of a town at night, at first where the gaslight is not strong, and

where persons passing by are few, unhooding and hooding |

her from time to time, but not letting her get frightened. Up to this time she should be fed on lean beefsteak with no castings, but as soon as she is tolerably tame and sub- mits well to the hood, she must occasionally be fed with pigeons and other birds. This should be done not later than 3 or 4 p.M., and when she is placed on her perch for the night in the dark room, she must be unhooded and left so, of course being carefully tied up. The falconer should enter the room about 7 or 8 a.m. next day. admitting as little light as possible, or using a candle. observe if she has thrown her casting ; if so, he will at once take her to the fist giving her a bite of food, and re-hood

He should first |

her. If her casting is not thrown it is better for him to retire, leaving the room quite dark, and come in again later. She must now be taught to know the voice,—the shout that is used to call her in the field,—and to jump to the fist for food, the voice being used every time she is fed. When she comes freely to the fist she must be made ac- quainted with the lure. Kneeling down with the hawk on his fist, and gently unhooding her, the falconer casts out a lure, which may be either a dead pigeon or an artificial lure garnished with beefsteak tied to a string, to a distance of a couple or three feet in front of her. When she jumps down to it, she should be suffered to eat a little on it—the voice being used—the while receiving morsels from the falconer’s hand; and before her meal is finished she must be taken off to the hand, being induced to forsake the lure for the hand by a tempting piece

of meat. This treatment will help to check her inclination hereafter to carry her quarry. This lesson is to be continued till the falcon feeds very boldly on the lure on the ground, in the falconer's presence—till she will suffer him to walk round her while she is feeding. All this time she will have been held by the leash only, but in the next step a strong but light creance must be made fast to the leash, and an assistant holding the hawk should unhood her, as the falconer, stand- ing at a distance of 5 to 10 yards, calls her by shouting and casting out the lure. Gradually day after day the dis- tance is increased, till the hawk will come 30 yards or so without hesitation ; then she may be trusted to fly to the lure at liberty, and by degrees from any distance, say 1000 yards. This accomplished, she should learn to stoop at the lure. Instead of allowing the hawk to seize upon it as she comes up, the falconer should snatch the lure away and let her pass by, and immediately put it out that she may readily seize it when she turns round to look for it. This should be done at first only once, and then progressively until she will stoop backwards and forwards at the lure as often as desired. Next she should be entered at her quarry. Should she be intended for rooks or herons, two or tliree of these birds should be procured. One should be given her from the hand, then one should be released close to her, aud a third at a considerable distance. If she take these keenly, she may be flown at a wild bird. Care must, how- ever, be taken to let her have every possible advantage in her first flights,— wind and weather, and the position of the quarry with regard to the surrounding country, must be considered.

Young hawks, on being received by the falconer before they can fly, must be put into a sheltered place, such as an outhouse or shed. The basket or hamper should be filled with straw. A hamper is best, with the lid so placed as to form a platform for the young hawks to come out upon to feed. This should be fastened to a beam or prop a few feet from the ground. The young hawks must be most plentifully fed on the best fresh food obtainable—- good beef- steak and fresh-killed birds; the falconer when feeding them should use his voice as in luring. As they grow old enough they will come out, and perch about the roof of their shed, by degrees extending their flights to neigh- bouring buildings or trees, never failing to come at feeding time to the place where they are fed. Soon they will be continually ou the wing, playing or fighting with one an- other, and later the falconer will observe them chasing other birds, as pigeons and rooks, which may be

passing by. As soon as one fails to come for a meal, it must be at once caught with a bow net ora snare the first time it comes back, or it will be Jost. It must be borne in mind that the longer hawks can be left at hack the better they are likely to be for use in the field,—those hawks being always the best which have preyed a few times for themselves before being caught. Of course there is great risk of losing

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hawks when they begin to prey for themselves. When a hawk is so caught, she is said to be ‘‘taken up” from hack. She will uot require a rufter hood, but a good deal of the management described for the passage falcon will be necessary. She must be carefully tamed and broken to the hood in the same manner, and so taught to know the | lure; but, as might be expected, very much less difficulty will be experienced. As soon as the eyas knows the lure sufficiently well to come to it sharp and straight from a dis- tance, she must be taught to “wait on.” This is effected by letting the hawk loose in an open place, such as a down. It will be found that she will circle round the faleoner looking for the lure she has been accustomed to | see,—perhaps mount a little in the air, and advantage must be taken of a favourable moment when the hawk is at a | little height, her head being turned in towards the falconer, to let go a pigeon which she can easily catch. When the hawk has taken two or three pigeons in this way, and mounts immediately in expectation, in short, begins to wait on, she should see no more pigeons, but be tried at game as soon as possible. Young peregrines should be flown at grouse first in preference to partridges, not only because the season commences earlier, but because, grouse being the heavier birds, they are not so much tempted to “carry” as with partridges.

The training of the great northern falcons, as well as that of merlins and hobbies, is conducted much on the above principles, but the jerfalcons will seldom wait on well, and merlins will not do it at all.

The training of short-winged hawks is a simpler pro- cess. They must, like falcons, be provided with jesses, swivel, leash, and bell. In these hawks a bell is some- times fastened to the tail. Sparrow-hawks can, however, scarcely carry a bell big enough to be of any service. The hood is seldom used for short-winged hawks,—never in the field. They must be made as

tame as possible by carriage on the fist and the society of man, and taught to come to the fist freely when required—at first to jump to it ina room, and then out of doors. Whenthe goshawk comes freely and without hesitation from short distances, she ought to be called from long distances from the hand of an as- sistant, but not oftener than twice in each meal, until she will come at least 1000 yards, on each occasion being well rewarded with some food she likes very much, as a fresh- killed bird, warm. When she does this freely, and endures the presence of strangers, dogs, &c., a few bagged rabbits should be given to her, and she will be ready to take the fied. Some accustom the goshawk to the use of the lure, for the purpose of taking her if she will not come to the fist in the field when she has taken stand in a tree after being baulked of her quarry, but it ought not to be necessary to use it.

Falcons or Jong-winged hawks are either " flown out of the hood," ¢.e., unhooded and slipped when the quarry is in sight, or they are made to " wait on" till game is flushed. Herons and rooks are always taken by the former method. Passage hawks are generally employed for flying at these birds, though we have known some good eyases quite equal to the work. For heron-hawking a well-stocked heronry is in the first place necessary. Next an open country which can be ridden over—over which herons are in the constant habit of passing to and from their her- onry on their fishing excursions, or making their " pas- | sage." A heron found at his feeding place at a brook or pond affords no sport whatever. If there be little water any peregrine falcon that will go straight at him will seize him soon after he rises. It is sometimes advisable to fly a young falcon at a heron so found, but it should not be repeated.

If there be much water the heron will neither show sport nor be captured. It is quite a different affair when he |

is sighted winging his way at a height in the air over an open tract of country free from water. Though he has no chance whatever of competing with a falcon in straight- forward flight, the heron has large concave wings, a very light body proportionately, and air-cells in his bones, and can rise with astonishing rapidity, more perpendicularly, or, in other words, in smaller rings, than the falcon can, with very little effort. As soon as he sees

the approach of tlie falcon, which he usually does almost directly she is cast off, he makes play for the upper regions. Then the falcon commences to climb too to get above him, but in a very different style. She makes very large circles or rings, travelling at a high rate of speed, due to her strength and weight and power of flying, till she rises above the heron. Then she makes her attack by stooping with great force at the quarry, sometimes falling so far below it as the blow is evaded that she cannot spring up to the proper pitch for the next stoop, and has to make another ring to regain her lost command over the heron, which is ever rising, and so on,—the " field" meanwhile galloping down wind in the direction the flight is taking till she seizes the heron aloft, "binds" to him, and both come down together. Absurd stories have been told and pictures drawn of the heron re- ceiving the falcon on its beak in the air. It is, however, well known to all practical falconers that the heron has no power or inclination to fight with a falcon in the air ; so long as he is flying he seeks safety solely from his wings. When on the ground, however, should the falcon be de- ficient in skill or strength, or have been mutilated by the coping of her beak and talons, as was sometimes formerly done in Holland with a view to saving tlie heron's life, the heron may use his dagger-like bill with dangerous effect, though it is very rare for a falcon to be injured. It is never safe to fly the goshawk at a heron of any description. Short-winged hawks do not immediately kill their quarry as falcons do, nor do they seem to know where the life lies, and seldom shift their hold once taken even to defend themselves; and they are therefore easilystabbed by a heron. Rooks are flown in the same manner as herons, but the flight is generally inferior. Although rooks fly very well, they seek shelter in trees as soon as possible.

For game-hawking eyases are generally used, though undoubtedly passage or wild-caught hawks are to be pre- ferred. The best game hawks we have seen have been passage hawks, but there are difficulties attending the use of them. It may perhaps be fairly said that it is easy to make all passage hawks "wait on" in grand style, but until they have got over a season or two they are very liable to be lost. Among the advan- tages attending the use of eyases are the following :—they are easier to obtain and to train and keep; they also moult far better and quicker than passage hawks, while if lost in the field, they will often go home by themselves, or remain about the spot where they were liberated. Experi- ence, and, we must add, some good

fortune also, are requisite to make eyases good for waiting on for game. Slight mis- takes on the part of the falconer, false points from dogs, or bad luck in serving, will cause a young hawk to acquire bad habits, such as sitting down on the ground, taking stand in a tree, raking out wide, skimming the ground, or lazily flying about at no height. A good game hawk in proper flying order goes up at once to a good pitch in the air— the higher she flies the better—and follows her master from field to field, always ready for a stoop when the quarry is sprung. Hawks that have been successfully broken and judiciously worked become wonderfully clever, and soon learn to regulate their flight by the movements of their master. Eyases were not held in esteem by the old fal- coners, and it is evident from their writings that these hawks have been very much better understood and man-

aged in the nineteenth ceutury than in the Middle Ages. It is probable that the old falconers procured their passage and wild-caught hawks with such facility, having at the same time more scope for their use in days when quarry was more abundant and there was more waste land than we have now, that they did not find it necessary to trouble themselves about eyases. We here quote a few lines from one of the best of the old writers, which may be taken as giving a fair account of the estimation in which eyases were generally held, and from which it is evident that the old falconers did not understand flying hawks at hack. Simon Latham, writing in 1633, says of eyases :—

They will be verie easily brought to familiaritie with the man, not in the house only, but also abroad, hooded or unhooded ; nay, many of them will be more gentle and quiet when cunhooded than when hooded, for if a man doe but stirre or speake in their hearing, they will crie and bate as though they did desire to see the man. Likewise some of them being unhooded, when they see the man will cowre and crie, shewing thereby their exceeding fondness and fawning love towards him. . . .

0 oe These kind of hawks be all (for the most part) taken out of the nest while verie young, even in the downe, from whence they are put into a close house, whereas they be alwaies fed and familiarly brought up by the man, untill they bce able to flie, when as the summer approaching verie suddenly they are continued and trained up in the same, the weather being alwaies warm and temperate ; thus they are still inured to familiaritie with the man, not knowing from whence besides to fetch their relief or sustenance.

When the summer is ended they bee commonly put up into a house again, or else kept in some warm place, for they cannot endure the cold wind to blow upon them. .... But leaving to speak of these kind of scratching hawks that I never did love should come too neere my fingers, and to return unto the faire conditioned haggard faulcon. ... .« :

The author here describes with accuracy the condition of unhacked eyases, which no modern falconer would trouble himself to keep. Many of our falconers in this century have had eyases which have killed grouse, ducks, and other quarry in a style almost equalling that of passage hawks. Rooks also have been most suc- cessfully flown, and some herons on passage have been taken by eyases. No sport is to be had at game without hawks that wait on well. Moors, downs, open country where the hedges are low and weak, are best suited to game hawking. Pointers or setters may be used to find game, or the hawk may be let go on coming to the ground where game is known to lie, and suffered, if an experienced one, to “ wait on” till game is flushed. However, the best plan with most hawks, young ones especially, is to use a dog, and to let the hawk go when the dog points, and to flush the birds as soon as the hawk is at her pitch. It is not by any means necessary that the hawk should be near the birds when they rise, provided she is at a good heighit, and that she is watching; she will come at once with a rush out of the air at great speed, and either cut one down with the stoop, or the bird will save itself by putting in, when every exertion must be made, especially if the hawk be young and inexperienced, to “serve” her as soon as possible by driving out the bird again while she waits over- head. If this be successfully done she is nearly certain to kill it at the second flight. Perhaps falcons are best for grouse and tiercels for partridges.

Magpies afford much sport. Only tiercels should be used for hunting magpies. A field is necessary—at the very least 4 or 5 runners to beat the magpie out, and per- haps the presence of a horseman is an advantage. Of course in open flight a magpie would be almost immediately caught by a tiercel peregrine, and there would be no sport, but the magpie makes up for his want of power of wing by his cunning and shiftiness ; and he is, moreover, never to be found except where he has shelter under his lee for security from a passing peregrine. Once ina hedge or tree he is perfectly safe from the wild falcon, but the case is otherwise when the falconer approaches with his trained

tiercel, perhaps a cast of tiercels, waiting on in the air, with some active runners in his field. Then driven from hedge to hedge, from one kind of shelter to another, stooped at every instant when he shows himself ever so little away from cover by the watchful tiercels overhead, his egg-stealing days are brought to an end by a fatal stroke—sometimes not before the field are pretty well exhausted with running and shouting. ‘The magpie always manceuvres towards some thick wood, from which it is the aim of the field to cut him off. At first hawks must be flown in easy country, but when they understand their work well they will kill magpies in every enclosed country, —with a smart active ficld a magpie nay eve be pushed through a small wood. Magpie hawking affords excellent exercise, not only for those who run to serve the hawks, but for the hawks also ; they get a great deal of fiying, and learn to hunt in com- pany with men,—ary number of people may be present. Blackbirds may be hunted with tiercels in the same way. Woodcocks afford capital sport where the county is toler- ably open. It will generally be found that after a hawk has made one stoop at a woodcock, the cock will at first try to escape by taking the air, and will show a very fine flight. When beaten in the air it will try to get back to covert again, but when once a hawk has outflown a woodcock, he is pretty sure to kill it. Hawks seem to pursue wood- cocks with great keenness; something in the flight of the cock tempts them to exertion. The laziest and most useless hawks—hawks that will scarcely follow a slow pigeon—will do their best at woodcock, and will very soon, if the sport is continued, be improved in their style of flying. Snipes may be killed by first-class tiercels in

favourable localities. Wild ducks and teal are only to be flown at when they can be found in small pools or brooks at a distance from much water,—where the fowl can be suddenly flushed by men or dogs while the falcon is flying at her pitch overhead. For ducks, falcons should be used ; tiercels will kill teal well.

The merlin is used for flying at larks, and there does not seem to be any other use to which this pretty little falcon may fairly be put. It is very active, but far from being, as some authors have stated, the swiftest of all hawks. Its flight is greatly inferior in speed and power to that of the peregrine. Perhaps its diminutive size, causing it to be soon lost to view, and a limited acquaintance with the flight of the wild peregrine falcon, have led to the mistake.

The hobby is far swifter than the merlin, but cannot be said to be efficient in the field; it may be trained to wait on beautifully, and will sometimes take larks ; it is very much given to the fault of “ carrying,”

The three great northern falcons are not easy to procure in proper condition for training, They are very difficult to break to the hood and to manage in the field. They are flown, like the peregrine, at herons and rooks, and in former days were used for kites and hares. Their style of flight is magnificent; they are considerably swifter than the pere- grine, and are most deadly “footers.” They seem, however, to lack somewhat of the spirit and dash of the peregrine.

For the short-winged hawks an open country is not re- quired; indeed they may be flown in a wood. Goshawks are flown at hares, rabbits, pheasants, partridges, and wild- fowl. Only very strong females are able to take hares; rab- bits are easy quarry for any female goshawk, and a little too strong for the male. A good female goshawk may kill from 10 to 15 rabbits in a day, or more. For pheasants the male is to be preferred, certainly for partridges ; either sex will take ducks and teal, but the falconer must get close to them before they are flushed, or the goshawk will stand a poor chance of killing. Rabbit hawking may be practised by ferreting, and flying the hawk as the rabbits bolt, but care must be taken or the hawk will kill the ferret. Where rabbits sit out on grass or in turnip ficlds, a goshawk may

be used with success, even in a wood when the holes are not too near. From various causes it is impossible, or nearly so, to have goshawks in England in the perfection to which they are brought in the East. In India, for instance, there is a far greater variety of quarry suited to them, and wild birds are much more approachable ; moreover, there are advantages for training which we do not possess in England. Unmolested,—and scarcely noticed except per- haps by others of his calling or tastes,—the Eastern falconer carries his hawk by day and night in the crowded bazaars, till the bird becomes perfectly indifferent to men, horses, dogs, carriages, and, in short, becomes as tame as the domestic animals.

The management of sparrow-hawks is much the same as that of goshawks, but they arc far more delicate than the latter. They are flown in England at blackbirds, thrushes, and other small birds ; good ones will take partridges well till the birds get too wild and strong with the advancing season. In the East large numbers of quails are taken with sparrow-hawks.

It is of course important that hawks from which work in the field is expected should be kept in the highest health, and they must be carefully fed; no bad or tainted meat must on any account be given to them,—at any rate to hawks of the species now used in England. Peregrines and the great northern falcons are best kept on beefsteak, with a frequent change in the shape of fresh-killed pigeons and other birds. The smaller falcons, the merlin and the hobby, require a great number of small birds to keep them in good health for any length of time. Goshawks should be fed like peregrines, but rats and rabbits are very good as change of food for them. The sparrow-hawk, like the small falcons, requires small birds. All hawks require castings frequently. It is true that hawks will exist, and often appear to thrive, on good food without castings, but the seeds of probable injury to their health are being sown the whole time they are so kept. If there is difficulty in procuring birds, and it is more convenient to feed the hawks on beefsteak, they should frequently get the wings and heads and necks of game and poultry. In addition to the castings which they swallow, tearing these is good exercise for them, and biting the bones prevents the beaks from overgrowing. Most hawks, peregrines especially, require the bath. The

end of a cask, sawn off to give a depth of about 6 inches, makes a very good bath. Peregrines which are used for waiting on require a bath at least twice a week. If this be neglected, they will not wait long before going off in search of water to bathe, however hungry they may be.

The most agreeable and the best way, where practicable, of keeping hawks is to have them on blocks on the lawn. Each hawk's block should stand in a circular bed of sand —about 8 feet in diameter; this will be found very convenient for keeping them clean. Goshawks are generally placed on bow perches, which ought not to be more than 8 or 9 inches high at the highest part of the arc. It will be several months before passage or wild-caught falcons can be kept out of doors; they must be fastened to a perch in a darkened room, hooded, but by degrees as they get thoroughly tame may be brought to sit on the lawn. In England (especially in the south) peregrines, the northern falcons, and goshawks may be kept out of doors all day and night in a sheltered situation. In very wild boisterous weather, or in snow or sharp frost, it will be ad- visable to move them to the shelter of a shed, the floor of which should be laid with sand toa depth of 3 or 4 inches. Merlins and hobbies are too tender to be kept much out of doors. An eastern aspect is to be preferred,—all birds en- joy the morning sun, and it is very beneficial to them. The more hawks confined to blocks out of doors see of per- sons, dogs, horses, &c., moving about the better, but of

course only when there is no danger of their being fright- ened or molested, or of food being given to them by strangers. 'Those who have only seen wretched ill-fed hawks in cages as in zoological gardens or menageries, pining for exercise, with battered plumage, torn shoulders, and bleeding ceres, from dashing against their prison bars, and overgrown beaks from never getting bones to break, can have little idea of the beautiful and striking-looking birds to be seen pluming their feathers and stretching their wings at their ease at their blocks on the falconer's lawn, watching with their large bright keen eyes everything that moves in the sky, and everywhere else within the limits of their view. Contrary to the prevailing notion, hawks show a good deal of attachment when they have been pro- perly handled. Itis true that by hunger they are ina great measure tamed and

controlled, and the same may be said of all undomesticated and many domesticated animals. And instinct prompts all wild creatures when away from man's control to return to their former shyness, but hawks certainly retain their tameness for a long time, and their memory is remarkably retentive. Wild-caught hawks have been re-taken, either by their coming to the lure or upon quarry, from 2 to 7 days after they had been lost, and eyases after 3 weeks. As one instance of retentive- ness of memory displayed by hawks we may mention thie case of a wild-caught falcon which was re-captured after being at liberty more than 3 years, still bearing the jesses which were cut short close to the leg at the time she was released; in five days she was flying at the lure again at liberty, and was found to retain the peculiar ways and habits she was observed to have in her former existence as a trained hawk. It is useless to bring a hawk into the field unless she has a keen appetite; if she has not, she will neither hunt effectually nor follow her master. Even wild-caught falcons, however, may sometimes be seen so attached to their owner that, when sitting on their blocks on a lawn with food in their crops, they will on his coming out of the house bate hard to get to him, till he either go up to them and allow them to jump up to his hand or withdraw from their sight. Goshawks are also known to evince attachment to their owner. Another prevailing error regarding hawks is that they are supposed to be lazy birds, requiring the stimulus of hunger to stir them to action. The reverse is the truth ; they are birds of very active habits, and exceedingly restless, and the notion of their being lazy lias been propagated by those who have seen little or no- thing of hawks in their wild state. The wild falcon requires an immense deal of exercise, and to be in wind, to exert the speed and power of flight necessary to capture her prey when hungry; and to this end instinct prompts her to spend hours daily on the wing, soaring and playing about in the air in all weathers, often chasing birds merely for play or exercise, Sometimes she takes a siesta when much gorged, but unless she fills her crop late in the evening she is soon moving again—before half her crop is put over. Goshawks and sparrowhawks, too, habitually soar in the air at about 9 or 10 a.m., and remain aloft a considerable time, but these birds are not of such active habits as the falcons. 'The frequent bating of thoroughly tame hawks from their blocks, even when not hungry or frightened, proves their restlessness and impatience of repose. So does the wretched condition of the caged falcon (before alluded to), while the really lazy buzzards and kites, which

do not in a wild state depend on activity or power of wing for their sustenauce, maintain themselves in confinement, if properly fed, for years in good case and plumage. Such being the habits of the falcon in a state of nature, the faleoner should endeavour to give the hawks under his care as much flying as possible, and he should avoid the very common mistake of keeping too many hawks, In this

case a favoured few are sure to get all the work, and the others, possibly equally good if they had fair play, are spoiled for want of exercise. ;

The larger hawks may be kept in health and working order for several years —I15 or 20—barring accidents. The writer has known peregrines, shaheens, and goshawks to reach ages between 15 and 20 years. Goshawks, however, never fly well after 4 or 5 seasons, when they will no longer take difficult quarry ; they may be used at rabbits as long as they live. Shaheens may be seen in the East at an advanced age, killing wild-fowl beautifully. The shaheen isa falcon of the peregrine type, which does not travel, like the peregrine, all over the world. It appears that the jerfalcous also may be worked to a good age. Old Simon Latham tells us of these birds, —‘‘I myself have known one of them an excellent Hearnor, and to continue her good- nesse very near twentie yeeres, or full out that time.”

It is hardly likely that falconry will ever recover such a position as to be reckoned once more among the national sports of England. Yet in these days of breech-loading and battue shooting, when even a well-broken retriever is a rarity, from want of time to see him work or to give him fair play, there are still some sportsmen who are, to quote the words of the authors of our best modern book on fal- conry, in the dedication of their work, “those who love sport for its own sake, and in the pursuit of it are willing to tread in the footsteps of their forefathers.”

The work just quoted is Falconry in the British Isles, by Salvin and Brodrick. A work to which we are very largely indebted for information regarding the past history of falconry and its practice in foreign countries is Schlegel’s Traité de Faueonnerie. This magnificent book, in the words of a very able writer in the Quarterly Review for July 1875, ‘is a worthy

monument of the noble art it describes ; the extent and minuteness of the learned author's anti- quarian resources are only equalled by his practical knowledge of the details of modern usage, and the result is such as may be ex- pected from such a combination." It contains a very large list of works on falconry in languages of all the principal countries of the Old World. Other modern works are Practical Faleonry, by the Rev. G. E. Freeman, an excellent little book; Falconry, its Claims, History, and Practice, by Freeman and Salvin; Observations on Hawking, by Sir J. 8S. Sebright, Bart.; and a pamphlet entitled Notes on the Falconidee used in India in Faleonry, by Lieutenant- Colonel Delmé Radcliffe. Perhaps the most useful of the old works are The Booke of Faulconrie or Hawking, by George Turber- ville, 1575, and The Faulcon's Lure and Cure, by Simon Latham, 1633. (E. D. R.)

FALERITI, an ancient and powerful city of Etruria, the capital of the Falisci, who occupied the region between Soracte and Monte Cimino, The affinity of the Falisci with the Etrurians is both asserted and denied ; in his- toric times Falerii at least appears as a city of Etrurian sympathies, and it probably belonged to the Etrurian League. It supported the people of Veii against the Romans, and used its utmost efforts to rouse the other Etrurians against the common foe. After the reduction of Veii the Faliscans saw themselves exposed to the fury of the Roman arms, and after a siege from Camillus they were obliged to surrender their city. The episode of the traitor schoolmaster and the generosity of the Roman commander need only be mentioned to be generally remembered. From this time Falerii continued sometimes at peace, sometimes at war with Rome, till on the conclusion of the first Punic war it rose in open rebellion; after a short resistance it was taken and destroyed, and its inhabitants were forced to select a site for a new city in a less inaccessible and defen- sible position. The Falerii thus founded was enrolled in the Horatian tribe, and under the triumvirs received a mili- tary colony. The old city continued, probably from its re- ligious associations, to retain a small population, and this in all likelihood explains the fact that Strabo speaks of two towns, one Falerii and the other Faliseum. Ovid in his Amores relates how he ascended by a toilsome path to the

temple of the Faliscan Juno, a goddess, who, according to inscriptions, bore the title of Quuris (or “of the spear”), and, if we may trust the tradition, had young girls immolatcd on her altar. In the Middle Ages the inhabitants of the Roman town, invited by the impregnable position of the earlier site, returned and built the town now known as Civita Castellana. The ruins they left behind them are now occupied by the small hamlet of Santa Maria di Falleri. They consist mainly of the city walls, which stand from 35 to 55 feet high, and are of excellent architecture and strengthened by square towers. Within the ancient area are the remains of a convent in the Lombard style, and we learn from a bull of Benedict IX. that the town continued

a separate see from Castellana till 1032.

Excavations made at Santa Maria di Falleri by Angelo Jannoni Sebastiani are reported in the Annales dell Inst. di Cor. Arch. di Roma, 1860, and the Bullettino 1864, see also Noel Desverger’s L’Etrurie, 1862-64.

FALERNUS AGER, the name of a district in the northern part of Campania. The term has sometimes a wide and sometimes a restricted signification, being used with reference to the whole of the fertile plain between the Massican (now Mandragone) hills and the river Vul- turnus, but more commonly as denoting that portion of the plain lying at the foot of the Massican hills between the rivers Vulturnus and Savo, and celebrated for its wines. In the time of Horace these were reputed to be the best of all Italy, but in the time of Pliny their reputation had begun to decline, and they were supplanted in general estimation by those produced in the adjoining Ager Statanus. Before it passed into the hands of the Romans, in 340 B.o., the whole district formed part of the Capuan territory. In 217 B.o. it was desolated by the Carthaginian general Maharbal.

FALIERO, Marino (1274-1355), doge of Venice, was born in 1274, In 1346 he commanded the Venetian forces at the siege of Zara, where, being attacked by Louis the Great of Hungary with a force of 80,000 men, he totally defeated them, inflicting a loss of 8000, and compelling him to abandon all further attempts to raise the siege, which was concluded shortly afterwards by the surrender of the defenders at discretion. As commander of the Venetian fleet he also gained several victories and captured Capo d’‘Istria. He was elected doge 11th September 1354. His reign was short,

and it had both a disastrous commence- ment and a tragic close. Very soon after his election the Venetian fleet was captured by the Genoese, and hardly had he concluded a four months' truce with Genoa, when a very trivial incident occurred which resulted in his arrest and execution. It would appear that, though an able general and prudent statesman, Faliero possessed a temper so choleric that when he was provoked reason for a time almost forsook him. On the occasion of the usual court feast on Shrove Thursday, a young nobleman named Michele Steno, perhaps excited by wine, took some liber- ties with one of the maids of honour, and the doge on that account caused him to be ignominiously expelled from the hall. Provoked at such a public affront Steno went to the hall of audience and wrote on the doge's chair the following words—Marini Falieri dalla bella moglie, altri la gode ed egli la mantiene (Marino Faliero, the husband of the beautiful wife ; others kiss her, he keeps her). The author of the insult was soon discovered and arrested, but the council sentencing him only to two months' imprisonment, the doge resolved to have adequate revenge, and with this view formed a conspiracy to seize all the nobles and lead- ing citizens, and to make himself despot of Venice. The plot being, however, discovered a short time before the day fixed on, the doge and principal conspirators were arrested, and were executed on the 17th April 1355.

FAL—FAL

The reign of Faliero has formed the subject of tragedies by Lord Byron, by Delavigne, and by Albert Lindner; and Hoffman has employed it to furnish materials for a romance. It also forms the subject of the libretto of one of Donizetti's operas. Byron has added to his tragedy a good many notes on the character of Faliero, and on the incidents of his reign, together with an English translation—made by F. Cohen—of the old Chronicle of Marino Faliero. The circumstances of Faliero's plot are related in one of the letters of Petrarch, who was his contemporary and friend.

FALK, Jowann Dantet (1768-1826), a German author and philanthropist, was born at Dantzic, 20th October 1768. His parents, who were in poor circumstances, gave him only a scanty education, and strongly opposed his desire to enter one of the learned professions; but notwithstanding their discouragement he managed not only to make himself acquainted with the

best German writers but also to learn French and English. After attending for some time thie gymnasium of lis native town, he entered the university of Halle with the view of studying theology, but preferring, on second thouglits, a non-professional life, he gave up his theological studies and went to live at Weimar. There he published a volume of satires which procured him the notice and friendship of Wieland, and admission into the literary circles of the city. On the invasion of Germany by the French, Falk joined the army, and so distinguished himself at the battle of Jena that the duke of Weimar created him a counsellor of legation. In 1813 he succeeded in establishing a society for friends in necessity, and about the same time he founded an institute for the eare and education of neglected and orphan children, which in 1829 was changed into a free public school. The first literary efforts of Falk took the form chiefly of satirical poetry, and gave promise of greater future excellence than was ever completely fulfilled, for as his later pieces were directed more against individuals than the general vices and defects of society, they gradually degenerated in quality. In 1804 he published a comedy entitled Amphitryon, which met with some success, and a tragedy entitled Prometheus, which, although in many places deficient in rhythm and melody, and in form more philo- sophical than dramatic, yet contains many fine thoughts expressed in language truly poetical. From 1797 to 1803 he published a kind of satirical alinanac entitled Z'aschen- buch fiir Freunde des Scherzes und der Satire. In this publication he wrote a description of the hospitals of Berlin under the satirical title of Denkwiirdigkeiten der Berliner Charité auf das Jahr 1797, which led to the appointment of a committee to inquire into their management, and finally to their reform. In 1806 Falk founded a critical journal under the title of Hlystum und Tartarus. He also contri- buted largely to contemporary journals. He enjoyed the acquaintance and intimate friendship of Goethe, and his account of their intercourse was published after the death of both under the title Goethe aus ndiherm persdnlichen Umgange dargestelit, Leipsic, 1832. Fall died 14th February 1826.

See Johannes Falks Erinnerungsblitter aus Briefen und Tage-

biichern, gesammeli von dessen Tochter Rosalie Falk, Weimar, 1868.

FALKE, JoHann Friepricu Gorrie (1823-1876), a German historian, was born at Ratzeburg, 20th April 1823. He entered the university of Erlangen in 1843, and soon thereafter began to devote his attention to the history of tlle German language and literature. In 1848 he went in the capacity of tutor to Munich, where he remained five years, and diligently availed himself of the use of the Government library for the purpose of prosecuting his historical studies. In 1855 he was appointed secretary of the German museum at Nuremberg, and in 1859 keeper of the manuscripts. With the aid of the manuscript collections in the museum he now turned his attention chiefly to politi- eal history, and, along with his brother Jacob, who is still

(1878) living, and Johann Miiller, established an historical journal under the name of Zeitschrift fiir deutsche Cultur- geschichte (4 vols., 1855-59). ‘To this journal he contri- buted a history of German taxation and commerce. On the latter subject he published separately Geschichte des deutschen ITandels (2 vols., Leipsic, 1859), and Die Hansa als deutsche See-und Handelsmacht (Berlin, 1826). In 1862 he was appointed secretary of the state archives at Dresden, and a little later keeper. He there began the study of Saxon history, still devoting his attention chiefly to the history of commerce and economy. In 1866 he published, at Leipsic, Dre Geschichte des Kurfiirsten August von Sachsen in volkswirthschaftlicher Beztehung, and in 1869 Geschichte des deutschen Zollwesens. He died at Dresden, Ist March 1876.

FALKIRK, a municipal and parliamentary burgh and market-town of Scotland, in the county of Stirling, 254 miles W. by N. from Edinburgh by rail, is situated on a declivity which overlooks the expanse of fertile country called the Curse of Falkirk. The town consists of one wide street, with a number of narrow streets and lanes branching off from or running parallel to it. The houses are generally lofty and well built. The parish church, erected in 1811, has a fine steeple 130 feet high. There are also places of worship for the Free Church, United Presbyterians, Inde- pendents, and Roman Catholics. Continuous lines of houses connect Falkirk with the villages of Grahamston and Bainsford, and extend thence to Carron, which lies about two miles N. of the town, and is celebrated for its iron-works.

Though Falkirk is not itself a manufacturing town, yet in the neighbourhood there are extensive works of various kinds. In addition to the Carron iron-works there is the Falkirk foundry at Bainsford, and several large collieries, distilleries, flour-mills, &. The three trysts or cattle fairs held at Falkirk annually, on the 2d Tuesday and Wednesday of August, the 2d Monday and Tuesday of September, and the 2d Monday, Tuesday, and Wednes- day of October, are the largest in Scotland,—the last being the largest of the three. Population of parlianientary burgh in 1871, 9547; of burgh and suburbs, 11,312.

Falkirk is a town of considerable antiquity, aud appears to have heen a place of some note in the early part of the lith century. Its original name was Eglishbreckk, which signifies the ‘‘ speckled church,” in allusion, it is supposed, to the colour of the stones, and translated by Buchanan variwm sacellum. In the valley between Falkirk and the Carron a battle was fought on the 22d July 1298, between the Scotch under Wallace and the English under Edward I., in which the former were defeated, and two of their chieftains, Sir John Graham and Sir John Stewart, slain. Their graves are still pointed out in the churchyard : that of Graham has a monu- ment with an inscription whieh has been several times renewed. On a moor a little to the S.W..of the town a battle was fought on 17th January 1746, between the royal forces and those of the Pretender, in which the rebels were vietorious. On this occasion fell Sir Robert Monro of Foulis, and his brother Dr Monro, whose monument is to be seen in the churchyard. In the vicinity traces of the Roman wall are still visible. Falkirk was made a burgh of barony in 1600, and in 1646 a burgh of regality. In1715, by the forfeiture of the earl of Linlithgow, its superiority was vested in the crown, butit did not become a municipal burgh till the passing of the Reform Act of 1832, when it also obtained the privilege, in conjunction with Airdrie, Lanark, Hamilton, and Linlithgow, of returning a member to parliament.

FALKLAND, a royal burgh of Scotland, county of Fife, is situated at the N. foot of the East Lomond Hill, 22 miles N.N.W. of Edinburgh. It consists of a single street with some cross lanes, the houses being in many cases thatched and of an antique and primitive appearance. The inhabitants are engaged chiefly in weaving and flax- spinning. Falkland is noted for its royal palace, originally a stronghold of the Macduffs, earls of Fife, but

forfeited to the crown in 1424. The palace was greatly enlarged and improved by James V., who died there in 1542, and was slso the favourite residence of James VI., on account of the

fine park and the abundance of deer. The east side of the building was accidentally burnt in the reign of Charles II, and the park was rnined during the time of Cromwell, when the fine oaks were cut down in order to build a fort at Perth. In one of the dungeons David, duke of Rothesay, eldest son of Robert IIL, was starved to death by the duke of Albany (the king's brother) and the earl of Douglas in 1402. In 1715 the famous Rob Roy gar- risoned the palace, and laid the burgh and vicinity under contribution. The palace till recently was allowed to fall into decay, but what remained of it has been renovated, and is now occupied as a dwelling house. The western front has two round towers, similar to those at Holyrood, and the southward range of buildings is ornamented with niches and statues, which impart to it a close resemblance to the Perpendicular style of the semi-ecclesiastical architecture of England. Falkland was constituted a royal burgh by James IL in 1458, and its charter was renewed by James VL in 1595. Population of the burgh, 1144 ; of the burgh and suburbs, 1283.

FALKLAND, Viscount. See Cary, Luctus.

ing to Britain, and lying about 250 miles E. of the nearest pot in the mainland of South America, between the parallels of 51° and 52° 45' S. and the meridians of 57° 20' and 61° 46' W. Theislands are about 200 in number,

but only two are of considerable size; the largest of these, . East Falkland, is 95 miles in extreme length, with an-

average width of 40 miles, and the smaller, West Falkland, is 80 miles long, and about 25 miles wide. The area of East Falkland is about 3000 square miles, and that of West Falkland 2000. Most of the others are mere islets, the largest 16 miles long by 8 miles wide. The two principal islands are separated by Falkland Sound, a narrow strait

from 18 to 24 miles in width, running nearly due north |

and south (magnetic). The coast-line of both islands is

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Map of the Falkland Islands.

deeply indented, and many of the bays and inlets form secure aud well-protected harbours. East Falkland is almost bisected by two deep fiords, Choiseul and Brenton Sounds, which leave the northern and southern portions connected only by an isthmus a mile and a half wide. The northern portion is hilly, and is crossed by a rugged range, the Wickham Heights, running east and west, and rising in some places to a height of nearly 2000 feet. The remainder of the island consists chiefly of low undulating ground, a mixture of pasture and morass, with many shallow freshwater tarns, and small streams running in all the valleys. The general appearance of the country is tame and uninteresting, not unlike one of the outer Hebrides. The general colouring is dark brownish-green, relieved along the strike of the hills by veins of white quartzite denuded by the wearing away of softer rocks on both sides, and left projecting on the mountain slopes like

dilapidated stone dykes. Two fine inlets, Berkeley Sound and Port William, run far into the land at the north- eastern extremity of the island. Tort Louis, until lately the seat of government, is at the head of Berkeley Sound, but the anchorage there having been found rather too ex- posed, about the year 1844 a town was laid out, and the necessary public buildings were erected on Stanley Harbour, an admirably sheltered recess within Port William.

Above Stanley Harbour the land slopes up for a hundred feet or so to a low ridge, beyond which what is called there the “camp” (campo) extends nearly level for many miles, The little town of Stanley is built along the shore of the harbour and stretches a short way up the slope; it has a population of 600 or 700 inhabitants. The houses are mostly square, whitewashed, and grey-slated, much like those of one of the newer small towns in the West High- lands of Scotland. The Government house puts one in mind of a Shetland or Orkney manse, stone-built, slated, and grey, without the least shelter. The Government barrack, occupied by an officer and a company of marines,

| is a rather imposing structure in the middle of the town, FALKLAND ISLANDS (French, AJalowznes ; Spanish, | Malvinas), a group of islands in the South Atlantic, belong- |

and there is a neat little Episcopal church. Many of the houses belonging to the agents of the Falkland Islands Company, and to the representatives of several private firms, have very pretty greenhouses attached to them, the gay groups of fuchsias and pelargoniums of all the best home varieties contrasting pleasantly with the barrenness without.

In 1845 Mr S. Lafone, a wealthy cattle and hide mer- chant on the river Plate, obtained from Government a grant of the southern portion of the island, a peninsula 600,000 acres in extent, and possession of all the wild cattle on the island for a period of six years, for a payment of £10,000 down, and £20,000 in ten years from January 1, 1852. In 1851 Mr Lafone’s interest in Lafonea, as the peninsula has since been called, was purchased for £30,000 by a company chartered in London for the purpose of turn- ing the islands to more account.

The headquarters of the Falkland Island Company are now at Stanley, where their colonial manager resides, while their grazing and boiling-down operations are carried out in different parts of the islands. The development of the undertaking has necessitated the establishment of stores

| and workshops at Stanley, and now ships can be repaired

and provided in every way, much better and more cheaply there than at any of the South American ports,—a matter of much importance, seeing that a greater amount of injury is done annually to shipping passing near Cape Horn by severe weather than in any other locality in the world,

| The average number of vessels entering Stanley Harbour in

the year is about 50, with an aggregate tonnage of 20,000 tons. Of this number about one-fourth arrive in distress and are repaired at Stanley. Next to Stanley the most im- portant place on East Falkland is Port Darwin on Choiseul Sound,—a station of the Falkland Island Company, a village chiefly of Scottish shepherds with a little iron church with schoolhouse attached, and a Presbyterian clergyman and a competent schoolmaster. West Falk- land is more hilly near the east island; the principal moun- tain range, the Hornby Hills, runs north and south parallel with Falkland Sound. Mount Maria, at the back of Port Howard, is 2270 feet high. In 1867 there were no settlers on the west island, and Government issued a proclamation offering leases of grazing stations on very moderate terms. In 1868 all the available land was occupied, producing an annual revenue of about £1350. Some good houses have lately been built at Port Stephens, Mr Dean’s station on West Falkland.

The Falkland Islands were first seen by Davis in the year 1592, and Sir Richard Hawkins sailed along their

north shore in 1594, In 1598 Séebald de Wert, a Dutch- man, Visited them, and called them the Sebald Islands, a name which they still bear on some of the Dutch maps. Captain Strong sailed through between the two principal islands in 1690, and called the passage Falkland Sound, and from this the group afterwards took its English name. In 1763 the islands were taken possession of by the French, who established a colony at Port Louis on Berkeley Sound; they were, however, expelled by the Spaniards in 1767 or 1768. In 1761 Commodore Byron took possession on the part of England on the ground of prior discovery, and his doing so was nearly the cause of a war between England and Spain, both countries having armed fleets to contest the barren sovereignty. In 1771, however, Spain yielded the islands

to Great Britain by convention. As they had not been actually colonized by England, the republic of Buenos Ayres claimed the group in 1820, and formed a settlement at Port Louis which promised to be fairly successful, but owing to some misunderstanding with the Americans it was destroyed by the latter in 1831. After all these vicissitudes the British flag was once more hoisted at Port Louis in 1833, and since that time the Falkland Islands have becn a regular British colony under a governor, and the seat of a colonial bishopric. The population of the Falkland Islands is at present about 1250, by far the greater number being English and Scottish, with a few Buenos-Ayrean Gauchos. The number of children on the school-roll in 1876 was 127. The exports now consist almost entirely of wood and tallow, with a few hides. The rearing of cattle is rapidly giving place to sheep-farming, which is found to pay better. There are now upwards of 200,000 sheep on the islands, and they yield heavy fleeces of wool of fine quality. In 1876 the value of exports amounted to £37,121, of which wool sales account for £25,453. A process adopted a few years ago by the Falkland Island Company of boiling down the carcases of sheep for tallow is likely to prove successful, and to add another valuable export, The trade in sealskins, which was at one time of great value, is now almost at an end, and there is also a vreat falling off in the export of oil, the whales and seals which were at one time very numerous, particularly about West Falkland, having almost entirely left the coasts.

The Falkland Islands correspond very nearly in latitude in the southern hemisphere with Middlesex in the northern, but the conditions of climate are singularly different. The temperature is very equable, the average of the two mid- summer months being about 47° Fahr., and that of the two midwinter months 37° Fahr. The sky is almost constantly overcast, and rain falls, mostly in a drizzle and in frequent showers, on about 250 days in the year. The rainfall is not great, only about 20 inches, but the mean humidity for the year is 80, saturation being 100. Owing to the absence of sunshine and summer heat, and the constant fog aud rain, wheat will not ripen, barley and oats can scarcely be said to do so, and the common English vegetables will not pro duce seed in the gardens. Still the inhabitants seem to get accustomed to their moist, chilly surroundings, and the colony is remarkably healthy.

The Falkland Islands form essentially a part of Patagonia, with which they are connected by an elevated submarine plateau, and their flora is much the same as that of Antarctic South America. The trees which form dense forest and scrub in southern Patagonia and in Fuegia are absent, and one of the largest plants on the islands is a gigantic woolly ragweed (Senecio candicans) which attains in some places a height of three to four feet. A half-shrubby veronica (V. decussata) is found locally on the west island. The greater part of the "camp" is formed of peat, which in some places is of great age and depth, and at the bottom of the bed very dense and bituminous. The peat is different in its character

just as they would in little rifts in rocks.

from that of the north of Europe: cellular plants enter but little into its composition, and it is formed almost entirely of the roots and stems of Empetrum rubrum, a variety of the common crowberry of the Scottish hills with red berries, called by the Falklanders the "'diddle-dee" berry; of Myrtus nummularia, a little creeping myrtle whose leaves are used by the shepherds as a substitute for tea; of Caltha appendiculata, a dwarf species of marsh-marigold ; and of some sedges and sedge-like plants, such as Astelia pumila, Gaimardia australis, and Bostkova grandiflora. There is an intention of establishing a work in Stanley for converting the peat into patent compressed fuel.

Two vegetable productions of the Falklands, the ' balsam bog" and the "tussock grass," have been objects of curi- osity and interest ever since the first accounts of the islands reached us. In many places the low grounds look at a little distance as if they were scattered over with large grey boulders, three or four to six or eight feet across. To heighten the illusion many of these blocks are covered with lichens, and bands of grass grow in soil collected in crevices, These boulder- like masses are single plants of Bolaw glebaria, an umbelli- ferous plant. The lumps of balsam-bog are quite hard and nearly smooth, and only when looked at closely are they seen to be covered with small hexagonal markings like the calices of a weathered piece of coral. These are the circlets of leaves and the leaf-buds terminating a multitude of stems which have gone on growing with extreme

slowness and branching dichotomously for an unknown length of time, possibly for centuries, ever since the plant started as a single shoot froma seed. The growth is so slow, and the condensa- tion from constant branching is so great, that the block becomes as hard as the boulder which it so much resembles, and it is difficult to cut a shaving from the surface with a sharp knife. Under the unfrequent condition of a warm day with the sun shining, a pleasant aromatic odour may be perceived where the plants abound, and a pale yellow astringent gum exudes from the surface, which is used by the shepherds asa vulnerary, The “tussock grass,” Dactylis caspitosa, is a wonderfn] and most valuable natural produc- tion, which, owing to the introduction of stock into the islands, will probably ere long become extinct. It is a reed-like grass, which grows in dense tufts from six to ten feet high from stool-like root-crowns. The leaves and stems are most excellent fodder, and are extremely attract- ive to cattle, but the lower parts of the stems and the crowns of the roots have a sweet nutty flavour which makes them irresistible, and cattle and pigs, and all creatures herbivorous and omnivorous, crop the tussocks to the ground, when the rain getting into the crowns rots the roots. The work of extermination has proceeded rapidly, and now the tussock grass is confined to patches in a narrow border round the shore and to some of the outlying islands. The land fauna of the Falklands is very scanty. A large wolf-like fox, which seems to be indigenous, was common some years ago, but is now nearly exterminated. Some herds of cattle and horses run wild; but these were of course introduced, as were also the wild hogs, the nume- rous rabbits, and the mnch less numerous hares. Land- birds are few in number, and are mostly strays from Fuegia. Sea-birds are very abundant, and, probably from the islands having been comparatively lately peopled, they are singularly tame. Several species of wild geese, some of them very good eating, fly about in large flocks, and are so fearless that the boys bring them down at will by en- tangling their wings with a form of the “bolas” made with a pair of the knuckle-bones of an ox.

The Falkland Islands consist entirely, so far as we know at present, of the older palaozoic rocks, Lower Devonian or Upper Silurian, slightly metamorphosed: and a good deal

crumpled and distorted, in the low grounds clay slate and soft sandstone, and on the ridges hardened sandstone pass- ing into the conspicuous white quartzites. There do not seem to be any minerals of value, and the rocks are not such as to indicate any probability of their discovery. Galena is found in small quantity, and in some places it contains a large percentage of silver. The dark bituminous layers of clay slate, which occur intercalated among thie quartzites, have led, here as elsewhere, to the hope of com- ing upon a seain of coal, but it is entirely contrary to experience that coal of any value should be found in rocks of that age.

Most of the valleys in the Falklands are occupied by pale glistening masses which ata little distance have very much the look of some of the smaller Swiss glaciers. Examined a little more closely these are found to be vast accumula- tions of blocks of quartzite, irregular in form, but having a tendency to a rude diamond shape, from two to eight or ten or twenty feet in length, and half as much in width, and of a thickness corresponding with that of the quartzite ridges on the hills above, The blocks are angular, like the frag- ments in a breccia, and rest irregularly one upon the other, supported in all positions by the angles and edges of those beneath, The whole mass looks as if it were, and no doubt it is, slowly sliding down the valley to the sea. These “stone rivers” are looked upon with great wonder by the shifting population of the Falklands, and they are shown to visitors with many strange speculations as to their mode of formation. Their origin is not far to seek. The hard beds of quartzite are denuded by the disintegration of the softer layers. Their support being removed they break away in the direction of natural joints, and the fragments fall down the slope upon the vegetable soil. This soil is spongy, and, undergoing alternate contraction and expansion from being alternately comparatively dry and saturated with moisture, allows the heavy blocks to slip down by their own weight into the valley, where they become piled up, the valley stream afterwards removing the soil from among and over them, They certainly present a very striking phenomenon.

See Pernetz, Journal historique @une voyage faite aux tles Ma- lowines en 1763 et 1764, Berlin, 1767 ; S. Johnson, Thoughts on the late Transactions respecting Falkland’s Islands, 1771 ; T. Falkner, Deseription of Patagonia and the Falkland Islands, 1774; B. Pen- rose, Account of the last Expedition

to Port Egmont in the Falkland Islands, 1775 ; Observations on the foreible occupation of Malvinas by the British Government in 1838, Buenos Ayres, 1833; Reela- macton del Gobierno de las provincias Unidas de la Plata contra el de S. M. Britaniea sobre la soverania y possesion de las Islas Mal-vinas, London, 1841; Fitzroy, Narrative of the surveying voyage of H.M.S. Adventure and Beagle, 1839; Darwin, Voyage of a Naturalist round the World, 1845; S. B. Sullivan, Deseription of the Falkland Islands, 1849 ; W. Hadfield, Brazil, the Falkland Islands, &c., 1854; W. Parker Snow, Two years' erwise off the Tierra del Fuego, the Falkland Islands, &c., 1857; Sir Wyville Thomson, Voyage of the Challenger, 1877. (CA Wa)

FALLMERAYER, Jaxos Puruipp (1791-1861), a German traveller and historical investigator, best known for his opinions in regard to the ethnology of the modern Greeks, was born, the son of a poor peasant, at Tschdtsch, near Brixen in Tyrol, 10th December 1791. In 1809 he absconded from the cathedral school at Brixen and repaired to Salzburg, where he studied theology, the Semitic languages, and history. At the university of Landshut, to which he next removed, he at first applied himself to juris- prudence, but soon again devoted his exclusive attention to history and philology. During the Napoleonic wars the still youthful student forsook his books, joined the Bavarian in- fantry in 1813, took part in a battle near Hanau, and accom- panied his regiment to France. Receiving his discharge in 1818, he was successively engaged as teacher and professor in the gymnasium at Augsburg, and in the pro-gymnasium and lyceum at Landshut. The three years from 1831 to 1834 he

_congress at Frankfort-on-the-Maine.

spent in travel, along with the Russian Count Ostermann Tolstoi, visiting Egypt, Palestine, Syria, Cyprus, Rhodes, Constantinople, Greece, and Naples. On his return he was elected in 1835 a member of the Royal Bavarian Academy of Sciences, but he soon after left the country again on account of political troubles, and spent the greater part of the next four years with Count Tolstoi at Geneva. Con- stantinople, Trapezunt, Athos, Macedonia, Thessaly, and Greece were visited by him during 1840-41; and after some years' residence in Munich he returned in 1847 to the East, and

travelled through parts of Palestine, Syria, and Asia Minor. The political changes in Bavaria invited him home in 1848, and he was appointed professor of history in the Munich university, and made a member of the national He there joined the left or opposition party, and in the following year he accom-

panied the rump-parliament to Stuttgart, a course of action

which naturally led to his expulsion from his professorate. During the winter of 1849-50 he was obliged to live in Switzerland to escape arrest, but the amnesty of April 1850 enabled him to.return to Munich. He died April 26, 1861. His contributions to the history of Greece in the Middle Ages are of great value; and though his theory that the Greeks of the present day are almost pure Slavonians, with hardly a drop of true Greek blood in their veins, has not been accepted in toto by other investigators, it has served to modify the opinions of even his greatest opponents. A criticism of his views will be found in Hopf's Geschichte Griechenlands (reprinted from Ersch and Grubei's Encye.), and in Finlay's Wistory of Greece in the Middle Ages.

His works are—Ceschichte des Kaiserthums Trapezunt, Munich, 1827 ; Geschichte der Halbinsel Morea im Mittclalter, Stuttgart, 1830-1836 ; Ueber die Entstehung der Neugricchen, Stuttgart, 1835 ; '* Originalfragmente, Chroniken, u. s. w., zur Geschichte des K. Trapezunts," Munich, 1843, in Abhandl. der. hist. Classe der K. Bayerisech Akad. v. Wiss.; Fragmente aus dem Orient, Stuttgart, 1845 ; Denksehrift iiber Golgotha und das heilige Grab, Munich, 1852, and Das Todte Meer, 1853—both of which had appcared in the Abhandlungen of the Academy ; Das Albanesische Element in Griechenland, III. parts, in the Abhandl. for 1860-1866. After his death there appeared at Leipsic in 1861, under the editorship of A. Thomas, three volumes of Gesammelte Werke, containing Neuen Fragmente aus dem Orient, Kritische Versuche, and Studien und Erinnerungen aus meinem Leben. A sketch of his life will also be found in L, Steub, Herbsttage in Tyrol, Munich, 1867.

FALLOPIUS, or Fattopio, GaBriEnio (1523-1562), one of the greatest anatomists of his time, was a native of Modena. He studied medicine at Ferrara, and, after a European tour, became teacher of anatomy in that city.

He thence removed to Pisa, and from Pisa, at the instance of Cosmo I. grand-duke of Tuscany, to Padua, where, besides the chairs of anatomy and surgery and of botany, he held the office of superintendent of the new botanical garden. He died October 9, 1562. Only one treatise by Fallopius appeared during his lifetime, namely the Observa- tiones Anatomicee, Venice, 1561. His collective works, Opera genuina omnia, were published at Venice in 1584. For an account of the services which Fallopius rendered to anatomical science, see ANATOMY, vol. i. p. 809.

- FALL RIVER, a city of the UnitedStates, Massachusetts, is situated on Mount Hope Bay, the north-east arm of Narraganset Bay, 46 miles S. of Boston. The Fall river, which here joins the Taunton, has a descent of 130 feet in less than half a mile, and its great water-power was at an early period of much advautage for the development of the manufactures of the town, but most of the mills are now driven by steam. The town is well built, and many of the streets are finely adorned with trees, The harbour on Taunton river is safe and easy of access, and has depth of water sufficient for the largest ships. Fall River has a

Jarge coasting trade, and is engaged in the whale and other

fisheries. The total value of foreign and domestic imports for the year ending June 30, 1877, was $12,358, and of exports $4795. The principal industry is the manufacture of cotton goods, especially print cloths, but there are also woollen factories, bleaching works, foundries, a shipbuild- ing yard, and planing mills. In the neighbourhood there are valuable granite quarries. Fall River is the terminus of the line of steamers in the route from New York to Boston. It was incorporated as a town in 1803, and re- ceived a city charter in 1854; and in 1862 Fall River, Newport county, with 3377 inhabitants, was added to it. The population in 1850 was 11,522, and in 1870 26,766.

FALMOUTH, a municipal and parliamentary borough and market-town of England, county of Cornwall, on the south side of Falmouth Harbour, 15 miles N.N.E. of Lizard Point, and 267 miles W.S.W. of London, The town con- sists chiefly of a long and narrow street extending along the shore. The

prineipal public buildings are the hall of the Cornwall Polytechnic Society, the mechanics institute, the town-hall, and the market-house. In the early part of the 17th century Falmouth consisted only of a few fisher- men's huts, but soon after this Sir Johu Killigrew, having obtained the permission of James l., coustructed a new quay and laid the foundation of the present town. Its sub- sequent prosperity was a consequence of the excellence of its harbour, and its proximity to Land's End. For about 150 years it was the port from which the mail packets for the Mediterranean, Spain, the West Indies, and South America were despatched; and though these steamers now start from other ports it maintaius steam communication with London, Liverpool, Dublin, Penzance, Plymouth, and Southampton. The harbour is one of the best refuges for shipping in England, _ Its entrance between St Anthony's Head on the E. and Pendennis Castle on the W. is about a mile in width, and it thence stretches inland about five and a half miles. It has depth of water and excellent anchorage for the largest ships, and vessels of considerable burden can discharge their cargoes at the quay. In 1876 the number that entered the port was 803, with a tonnage of 118,617; the number that cleared 384, tonnage 26,522. The total value of imports was £240,474, and of exports £5261. The exports include copper, tin, tin- plates, woollen goods, and fish, Falmouth along with Penryn returns two members to parliament. The popula- tion of the municipal borough in 1871 was 5294.

FALSE POINT, a land-locked harbour in the Cuttack district of Orissa, situated in 20° 20' N. lat. and 86° 47' E. long., and reported by the famine commissioners in 1867 to be the best harbour on the coast of India from the Hugl{ to Bombay. It derives its name from the circum- stance that vessels proceeding up the Bay of Bengal fre- quently mistook it for Point Palmyras, a degree further north. The anchorage is safe, roomy, and completely land-locked. The capabilities of False Point as a harbour remained long unknown, and it was only in 1860 that the port was opened. It was rapidly developed, owing to the construc- tion of the Orissa canals. Two navigable channels lead in- land across the Mahdnadi delta, and connect the port with Cuttack city. The trade of False Point is chiefly with other Indian harbours, but a large export trade in rice and oil-seeds has sprung up with Mauritius, the French colonies, and France, False Point is now a regular port of call for Anglo-Indian coasting steamers. Its capabilities were first appreciated during the Orissa famine of 1866, when it afforded almost the only means

by which supplies of rice could be thrown into the province. Between 1863-64 and 1874-75 the value of the export and import trade of False Point has increased from £51,921 to £261,212, or upwards of five times, and the nuraber of vessels visiting the port from 16 to 110. A lighthouse is situated a little

and most celebrated in Europe.

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to the south of the anchorage, on the point which screens it from the southern monsoon, in 20° 19’ 52” lat. and 86° 46’ 57” KE. long.

FALSTER, an island in the Baltic, belonging to Den-

mark. It is richly wooded and well cultivated, and is very

fertile, especially in fruits. Area, 180 square wiles; popu- lation (1870), 27,763. See DENMARK.

FALUN, or FAHLUN, a town of Sweden, capital of a laen of the same name, which, however, is also called Dalarna or Dalecarlia, is situated in a bare and rocky country near the W. shore of Lake Runn, 73 miles W. of Gefle. The town is built chiefly of timber, and the inhabitants are mostly engaged in mining and smelting. West of the town are the celebrated Falun copper mines, the oldest They are known to have been in existence 600 years ago, but probably their origin is some centuries earlier. Since the 17th century their pro- duce has been gradually decreasing, and while in 1650 they produced nearly 3300 tons the total output in 1874 was only a little over 490 tous. In the town are museums of mineralogy and geology, a school of practical mining, a model room, and a large scientific library. The fuines arising from the copper-smelting works destroy vegetation in the vicinity of the town, but so far from being injurious to human life, they seem often to have acted as a preventa- tive against cholera and other epidemic diseases, Connected with the copper works there are shot, sulphur, vitriol, and Indian red factories. The population of Falun in 1875 was 6694.
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FAMAGOSTA. See Cyprus.

FAMILY. Family is a word of which the etymology but partially illustrates the meaning. The Roman familia, derived from the Oscan famel (servus), originally signified the servile property, the thralls, of a master. Next, the term denoted other domestic property, in things as well as in persons. Thus, in the fifth of the laws of the Twelve Tables the rules are laid down :—SI. INTESTATO, MORITUR. cur. SUUS. HERES. NEC. SIT. ADGNATUS. PROXIMUS. FAMILIAM. HIABETO, and SI. AGNATUS. NEC. ESCIT. GENTILIS. FAMILIAM. NANCITOR; that is, if a man die intestate, leaving no natural heir, who had been under his potestas, the nearest agnate, or relative tracing his connexion with the deceased exclusively through males, is to inherit the famslia, or family fortune of every sort. Failing an agnate, a member of the gens of the dead man is to inherit. In a third sense, the Roman word familia was applied to all the persons who could prove themselves to be descended from the same an- cestor, and thus the word almost corresponded to our own use of it in the widest meaning, as when we say that a person is “of a good family” (Ulpian, Dig., 50, 16, 195, Leaving for a while the Roman terms, to which it will be necessary to return, we may provisionally define “family,” in the modern sense, as the small community formed by the union of one man with one woman, and by the increase of children born to them. These in modern times, and in most European countries, constitute the household, and it has been almost universally supposed that little natural associations of this sort are the germ-cell of early society. The history with which, from childhood, we are best acquainted shows us the growth of the Jewish nation from the one household of Abraham. It is true that his patriarchal family differed from the modern family in one respect. It was polygamous, but, as female chastity was one of the conditions of the patriarchal family, and as descent through males was therefore recognized as certain, the plurality of wives makes no real difference to the argu- ment. In the same way the earliest formal records of Indian, Greek, and Roman society show us the family firmly established, and generally regarded as the most primitive of human associations. Thus, Aristotle derives

the first household (oixéa zpaéry) from the combination of man's possession of property—in the slave or in domesti- cated animals—with man's relation to woman, and he quotes Hesiod: oixov pev mpéricra yuvaixa, Te Botv 7 apornpa (Politics, 1, 2, 5). The village, again, with him is a colony or offshoot of the household, and monarchical govern- ment in states is derived from the monarchy of the eldest male member of the family. Now, though certain ancient terms, introduced by Aristotle in the chapters to which we refer, might have led him to imagine, as we shall see, a very different origin of society, his theory is, ou the face of it, natural and plausible, and it has been almost universally accepted, The beginning of society, it has been said a thou- sand times, is the family, a natural association of kindred by blood, composed of father, mother, and their descendants. In this family, the father is absolute master of his wife, his children, and the goods of the little community ; at his death, his eldest son succeeds him; and in course of time this association of kindred, by natural increase and by adoption, develops into the clan, gens, or yévos. As generations multiply, the more distant relations split off into other clans, and these clans, which have not lost the seuse of primitive kinship, unite once more into tribes, The tribes again, as civilization advances, acknowledge them- selves to be subjects of a king, in whose veins the blood of the original family runs purest. This, or something like this, is the common theory of the growth of society.

On the other side, the following facts are to be noticed :— (1) In many barbarous communities the family, in our sense of the word, does not exist. (2) The traditions of civilized races report a similar state of things in their early experience. (3) The domestic institutions of savages, and traces of the same manners among cultivated races, point to an age when the family was not constituted in the modern way. (4) The larger tribal associations of savages were clearly not developed out of the monogamous or patriarchal family. (5) The larger tribal associations of Greece, Rome, and India bear marks of having been evolved out of the tribal associations of savages. If these points can be proved, the family is not the earliest, but one of the latest conquests of civilization. We shall consider these points in order.

1. At whatever epoch civilized travellers have visited peoples of less cultivation, they have noted, with uncon- cealed surprise, not the family, but promiscuity and poly- andry. They have found inen and women living together in what seemed unregulated community, or they have found that the woman had several husbands, and often that these husbands were brothers. They have alleged that the woman, not the man, was really head of the household, that kinship was traced through the female line, on account of the certainty of that sort of genealogy, and consequently that a man's children belonged, not to his own family, but to that of the wife, in whose affections he had only a limited or transitory share. Jt may be presumed, with some con- fidence, that these customs, observed in lands and ages widely apart, cannot have grown out of the monogamous or patriarchal family as we know it. The limitless area in which such practices have been usual may be gathered from a few examples. Thus Herodotus says of the Agathyrsi, a Scythian people (iv. 104): "They have their women in common, that they may all be brothers of each other." The Nasamones (iv. 172) have similar customs; of the Massagetze (i, 216) it is said that each marries a wife, TavTyGL dé émikouwa xXpéwvrat. Aristotle alludes to similar promiscuity among the Libyans (Pol., ii. 3, 9); they have their women in common, and distribute the children by their likeness to the men. Diodorus Siculus reports the Same manners among the Troglodytes and the Ichthyo- phagi on the coast of the Red Sea. The Anseis by the

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Libyan lake Tritonis, though they seem to have set store on the chastity of unmarried women, are said by Herodotus to have lived like cattle, with no permanent cohabita- tion (iv. 180). These are examples of reported promis- cuity in ancient times. Though the observers may have overlooked, and probably did overlook, some regulations, yet it is plain that in the societies spoken of the mono- gamous or patriarchal family cannot have existed, and so cannot have been the germ of such wider tribal associations as were then established. Turning to modern savages, we find the custom of lending wives, as an act of friendliness and hospitality, very common. This may be no more than mere profligacy, in a society where male kin is recog- nized ; but the marriage custom of Thibet, which assigns to a woman several brothers as joint husbands, cannot be thus explained. This amazing practice

is the rule of life “among thirty millions of respectable people” (Wilson, Adode of Snow). As to the area over which some form of polyandry extends, the reader may consult Mr M‘Lennan’s Primitive Marriage (Edinburgh, 1865, p. 178, 183), where it is traced “to points half round the globe.” Czesar describes something like it among the inhabitants of Britain (De Bello Gallico, lib. v. c. 14): “Ten or twelve men have wives in common, and chiefly brothers share with brothers, and father with children.” According to a fragment of Polybius, the same fraternal arrangement wasnot unknown among the Spartans.

Among the Nairs of Malabar, a woman has several husbands, but these are not brothers (Asiatic Lesearches, vol. v. p. 13; Hamilton’s Account of East Indies, vol. i. p. 308 ; Buchanan’s Journey, vol. ii. p. 411). Among the Nairs the woman lives with her mother or brothers, or in other cases has a house of her own, where she receives her husbands. “No Nair knows his father, and every man looks upon his sister’s children as his heirs” (Buchanan, li, 412). Some other examples of very loose relations between the sexes will be found in Mr Herbert Spencer’s Principles of Sociology, vol. i. chap. 5, 6. But, to be brief, we strike on instances as soon as we look below the surface of civilization. Thus, in the Marquesas Islands, Mr Melville (Narrative of a Four Months’ Residence, 1846, Dp. 212) describes polyandry, and asks, with some naiveté, “ Where else could such a practice exist even for a single day?” He would have found the practice among the Tsonnotouan Iroquois. “La polygamie qui n’est pas perinise aux homunes, l’est pourtant aux femmes” (Lafitau, Moers des Sawages Américains, vol. i. p. 555, 1726). If we are to maintain, as it was usual to declere, that “it is difficult to say of what races of men it is not allowable to lay down that the society in which they are united was originally organized on the patriarchal model,” we must believe that some strange necessity, or some monstrous profligacy destroyed the patriarchal model among the people whose manners we have been studying.

2. If we can trust the traditions of Indo-European and other polite peoples, they too once lived in a stage which can hardly be discerned from promiscuity, and they too allotted many husbands to one wife. Beginning with Greece, We find the legend in Suidas (p. 3102), that the women of Attica abandoned themselves to unchecked vice, and that the male

parentage of children could not be ascertained. According to the story of Varro (Augustine, De Civ. Dei, 1. xvul. ¢. 9), it was Cecrops, the serpent-king, who first in- stituted marriage, just as the Australian natives credit the lizard with the discovery: The Hindoos give it to Svetaketu, before whose date “women were unconfined,

(Muir, a The Egyptians attri- buted the origin of marriage to the rule of Menes 3 the

FAMILY

As to polyandry, among Aryans of |

Chinese, to Fohi. India, a famous passage in the Jlahubharata tells how the five brothers Pandava “married the fair Draaupadi with eyes of lotus blue.” The whole legend of these princes is so marked with the stamp of polyandrous institutions that the very terminology of polyandry, the system of nomen- clature called “ classificatory,” is retained. Grand-uncles, in this episode of the Mahabharata, as among the Red Indians, are called grandfathers, and uncles fathers.

If, then, the Aryan race was not originally organized like the polyandrous Thibetans, the legends which declare these facts are at least singular examples of “ undesigned coincidence.” Before coming to that conclusion, it is now necessary to examine certain symbolic customs, certain laws of inheritance and of prohibited degrees, and so to de- termine whether the looser relations of savages may not have been the material out of which the modern family was gradually fashioned. ‘This can scarcely be called a new, though it has never been a popular opinion. Mr Millar, professor of law in the university of Glasgow, expressed it distinctly in his Origin of the Distinction of Ranks, p. 47 (4th edition, Edinburgh, 1806).

3. If the practices which make kindred through males difficult or impossible to recognize were ever universally prevalent, they will have left vestiges of their existence in the custom of tracing descent through females. Again, where that custom is met with, though marriage has become fixed, and where women are mistresses of the household and heads of the family, it is not easy to give any other explanation of these facts than this, that they are

survivals from a time when the union of the sexes was vague and temporary. Where, then, do we meet with examples of kindred traced through the female line? Kindred through women is recognized in Australia (with exceptions among certain tribes), in the Marianne Islands, in Fiji, Tonga, and some other isles of the Pacific, and in the Carolina Islands. Among the Kars of the Golden Chersonese, the tribes are divided into Sgans, who recognize male descent, and Pwos, who reckon by the mother's side. The natives of the province of Keang-se "are celebrated among tlie natives of the other Chinese provinces for the mode or form used by them in address, which is Laon eaon," para- phrastically translated (Morgan, Systems of Consanguinity and Affinity of the Human Family, p. 452), "Oh, you old fellow, brother mine by some of the ramifications of female relationship!" To select some more modern instances from M. Giraud Teulon's collections (Origine de la Famille, Geneva, 1874, p. 15), the Singhalese, the Nairs of Malabar, the Kocchs, an Indian tribe, and the Zaporogue Cossacks, with the red men of North America as a rule, and the Indians of British Guinea, to whom we may add many African tribes (Bowditch, Mission to Ashantee, p. 185, London, 1873; Munzinger, Ost-Afrikanische Studien, 1864), count kindred by the mother's side. Another collection of examples will be found in Mr M'Lennan's Primitive Marriage. Strabo reports that among the Iberians women were heads of families (i. 214, 319; iii 165), and Cordier (Anciennes coutumes de Barége) shows that among the Basques women inherited property to the exclusion of males as late as the eighteenth century. The legislation of the Revolution changed all this, but a popular song still testifies to the annoyance of les héritiéres. This ancient custom thus fulfils the proverb, "Tout finit par des chan- sons" (Giraud Teulon, La Mere chez certains peuples de VAntiquité, Paris, 1867, p. 42). Among ancient peoples there are very many more or less distinct vestiges of female kinship, Herodotus, it is true, says of the Lycians Glia); "This custom they have to themselves, and herein agree with no other men, in that they name themselves by the mother's side and not by the father's, And if one ask

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another who he is, he will recount his maternal descent, and reckon up his mother's maternal ancestors." Now, so far from this mode of deducing

descent being peculiar to the Lycians, it was in vogue among the Locrians (Polybius, 12, v., and Excerpta Hist. Gree, Frag., Rome, 1827, p. 384). In the bilingual Etruscan inscriptions, according to M. Giraud Teulon (Origine de la Famille, p. 21), to whom we owe many of these citations, "'the Etruscan text con- tains only the name of the mother of the dead, while the Latin text gives that of the father." Certain Egyptian mortuary inscriptions give the name of the mother, while the accompanying Greek text gives that of the father. A stele found in the ruins of the temple at Napata by Mariette Bey (Revue Archéologique, May 1873) shows us a monarch justifying his claim to the throne by enumerating the women of his maternal ancestry. Future historians will no doubt explain the apparent coexistence of two systems of kindred in Egypt. Meanwhile it is noteworthy that Herodotus ue 35) declares that daughters were compelled by law to main- tain their parents, while sons were free to do as they pleased. This report has been curiously confirmed by the legal documents of certain private Egyptian families, lately deciphered by M. Revillout. We se¢ the woman mistress of the household, and owner of the property.

Many other ancient examples are published by the Baron d'Eckstein (Revue Archéologique, 1858), but M. d'Ecksteiu's speculations about race need not be accepted. Millar (op. cit., p. 48) quotes some survivals of the custom of tracing pedigree and deriving condition through women : "Tf any one be born of a Campanian father, and a mother Puteolan, he is a Campanian citizen, unless, by some particular custon (privilegio aliquo), his maternal descent is to be reckoned." Among places where this local custom ruled, Delphi is mentioned. 'The great collections of the facts known about the ancient position of women as heads of the family is Bachofen's Das Mutterrecht, in which somewhat crude speculations about religion are introduced. The most classical example of a tradition of gynzecocracy is that often-quoted tale of Varro's preserved by St Augustine (De Crvitate Dei, lib. xiii. c. 9). In the time of Cecrops, the serpent-king, a dispute arose between Pallas and Poseidon, which was settled by the votes of the Athenians. In these days women possessed the franchise, aud a woman's vote turned the scale in favour of Pallas. To appease Poseidon, the Athenian men resolved that women should no more be admitted to the assemblies, nor should children take their names from the mother's family. In this tradition survives a memory of the Red Indian and Australian practice,

which makes the child belong to the mother’s clan, and also a memory of the political rights, so to speak, which women enjoyed among the ancient Britons, among the Iroquois of Lafitau’s time, and which take the shape of a considerable share in the despotism of African races. It may be said that if women bave ever enjoyed these privileges it is odd that among the least cultivated peoples, such as the Australians, they are treated as slaves. The reply is—if the Australians were a people of barbaric wealth, like many African nations, and if the cer- tainty of succession to the “royal stool” and the royal treasures were a matter of the utmost moment to the state, it is not improbable that the ancient custom of female kinship would have given, among them too, dignity, 1mport- ance, and power to women. ‘Thus we know from several sources that

From the nobility of the mother Should always be the right to the sovereignty

among the Celts in Scotland (M‘Lennan, Primitive Marriage, 1865, p. 86, quoting Nennius; the Anglo- Saxon Chronicle, Rolls series, p. 1). Even in the Mahab- harata there is a vestige of this system. Vasouki, the

Naga (serpent) king, wished to have an heir. Instead of marrying, he found a partner for his sister Djaratkarou. The sister’s son succeeded. Compare Bowditch’s Ashantee (p. 185), “Their extraordinary rule of succession excludes all children but those of a sister, and is founded on the argument that, if the wives of the brothers are faithless, the blood of the family is entirely lost in the offspring, but, should the daughters deceive their husbands, it is still pre- served.” In leaving this part of the subject we may ask, from what considerations, except those indicated by Bowditch, could the rule of inheritance by the mother’s side have been derived ?

4, It has been shown that the actual practices of many barbarous races make the existence of the patriarchal, and still more of the monogamous family impossible, and that the traditions of the races called Aryan, with many frag- ments of their customs, testify to a similar state of things in the past experiences of nations now organized on the basis of the family. We must now ask—(1) Of what nature are the wider tribal associations of savages?

(2) How did they come into existence? (3) Are there any vestiges of similar and similarly formed associations among peoples which now possess strict marriage and kinship through males? We find that the Australian black fellows and the red men of North America are grouped in local tribes, which generally are named from the lands they occupy. Thus, the Onondaga are people of the hills, the Mohawks people of the flint, the Senecas people of the great hills, the Oneidas people of the granite, and so forth (Morgan, League of the Iroquois, 1851). In Australia the tribes take the names of districts, as Ballarat, Wandyalloch, and Moreton Bay. Within these local tribes there are smaller associations, variously called “clans,” ‘ families,” “ septs,” “tribes,” by travellers. They are, as a rule, governed on this principle in Australia :—“ All the children take after the clan of their mother, and no man can marry a woman of the same clan, although the parties be born of parents in no way related, according to our ideas” (G. S. Lang, Aboriginals of Australia, Melbourne, 1865, p. 10; Gray’s Journals, &c., ii. 227). These smaller associations which may not intermarry are named after some animal, vegetable, or other natural object. A member of the Kangaroo associations may not slay or eat the kangaroo, which he holds in honour, and a Paddymelon must abstain from paddymelon. The obvious result of this scheme of prohibited marriage is to make every local tribe contain much the same assortment of smaller communities. Look- ing at North America, we find the local tribe of Senecas to be composed of sets of persons called by the name of – Wolf, Bear, Turtle, Beaver, Deer, Snipe, Heron, Hawk, and many of the same names prevail among Cayugas, Oneidas, Mohawks, and the rest. Just as in Australia, ne man may marry a woman of the same name, though she may have been born hundreds of miles away, and may be no sort of relation in our sense of the word. As in Australia, the animal or plant from which each associa- tion takes its name is sacred; in America it is called tlie totem. The oldest Iroquois totems seem, from many legend- ary and political proofs, to have been Wolf, Bear, and Turtle (Morgan, Ancient Society, 1877, p. 70; see also M‘Lennan, Fortnightly Review, 1869-1870). Turning to Africa (Bowditch’s Mission to Ashantee, p. 181), we read of similar institutions. Livingstone reports similar facts among the Bechwanas, Falkner among the Patagonians, Brooke among the Sea Dyaks, and Garcilasso de la Vega among the lower races of Peru.

y po en features of these associations and groups

. are, for our present purpose—(1) Their in- dubitable growth out of female kinship, and the rule which prohibits marriage between persons who are of the same

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name, and own descent from the same plant, animal, or thing ; (2) their existence as stocks of different blood in the same local tribe; and (3) their acknowledgment of kin- ship with, and of the duty to support in war, or to revenge, other members of the same name. (On this point, see Morgan, Ancient Society, p. 78. Compare also Ancient Society, p. 175, as to the Louchoux or Kutchin of the Tukon River: “A man does not marry into his own class;

. . . the children belong to the grade of the mother; . . » . members of the same grade in the different tribes do not war with each other.”) For convenience of nomen- clature, we shall call all such associations totem-kin. The word totem points to the peculiarity of supposed descent from some natural object which gives the name, and “kin” is more convenient than “group” or “‘clan,” because the same totem and the same name cover many scattered groups.

5. The question now rises, Do we meet siinilar associa- tions among civilised peoples who now possess the family? First we find Mr Hart of Canton saying (Ancient Society, pp. 364, 365) : “In some parts of the country large villages are to be met with, in each of which there exists but one family name; thus in one district will be found, say, three villages, each containing two or three thousand people, the one of the Horse, the second of the Sheep, and the third of the Ox family name. .... Just as among the North American Indians husband and wife are always of different families,—that is, of different surnames. Custom and law alike prohibit marriage on the part of people having the same family surname. The children are of the father’s family,—that is, they take his surname.” (Com- pare Narrative of Two Mahometan Travellers, Pinkerton, vol. vii.) The Arabian travellers had the same law at home, prohibiting marriage between people of the same family name.

Looking at India we find in the Jnstetutes of Menu (iii. 5) that a man of the twice-born classes may not marry “a woman descended from his paternal or maternal ancestors within the sixth degree, nor [in words believed to be a comment on the original] one who is known by her family name to be of the same primitive stock with his father.” No one, that is to say, may marry within the ghotra, just as no Red Indian may marry within the limits fixed by the totem. If the ghotra was counted, or if the Chinese family name ran, on the female side, Chinese and Brahmans would be exactly in the position of Australian blacks, as far as prohibited degrees are concerned. Mr Cunningham (Digest of Hindu Law, Madras, 1877) says that the old rule about the ghotra is falling into disuse, and that local custom in many places permits it to be dis- obeyed. Now, just as observers in India note this change of practice, so observers among the Red Indians and Australians note another change of practice. Kindred among these peoples is very gradually beginning to be reckoned by the male line; children are being counted on 86 some tribes in the clan of the father (Morgan, p- 90).

Leaving India, and turning to Greece and Rome, we find the local tribe and, subordinate to the tribe, two forms of associitions called the yévos and gens, which are prominent in early history and gradually die out. Thus, though in the Twelve Tables, as we have seen, the members of the gens succeed to the property of an intestate, yet in the 2d century Gaius declares (Jnst., iii. 17) that all Gentile law had fallen into desuetude. The gens, then, was, as its very name implies, a form of kindred, but old and hastening to decay. The members of a gens, according to Cicero, had a common name, were born of free parents, and were those who capite non sunt deminuti. Festus adds that members of a gens are ex eodem genere ortt.

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Tt must be noticed that, though the members of a gens were of no recognizable kin to each other in one sense, yet they showed a certain solidarite—putting on mourning when one of the kin was in disgrace (Livy, vi. 20), sharing common religious rights peculiar to themselves, and at one time having a right to inherit property. All these things point to consciousness of distant blood-relatiouship. Still one feature of the ghotra seems absent. Itis hardly proved that there was a time when Romans might

not marry within the gens. Indications of the past existence of the rule are found in the fact that Roman genealogies do not, as it is said, show us examples of marriages between persons of the same gens. More to the point is Plutarcli's statement (Iepi airiwy "Pwpaixay), "In times past it was unlawful for Romans to marry women of their own kin (cvyyevidas); . . . . nay, they did not wed ladies in any degree connected with them by blood, just as now they do not take sisters or aunts, and it was long before they ventured to take cousins to wife." It seems then that, just as in the case of the contemporary ghotra of the Hindus, an ancient and wide prohibition to marry in the gens was thrown off by the Romans. Here it must be noted that the ghotra of the Hindu law of inheritance is not identical with the ghotra in which marriage is pro- hibited by custom. It is rather a body composed of all the cognates within certain large limitations.

In the example of the Greek yévos we again find the common name a patronymic, generally thought to be derived from a hero. We find that all who bore the name shared certain religious rights, and before Solon's date were co-heirs to property, and took up the bluod feud if one of the yévos were slain. Yet the yevvytot are often defined as xot akin in blood, so entirely did the old sense of relationship dwindle, in Greece as in Rome. The lexico- graphers supposed that the yevy were constituted by legis- Jative enactment, vow rive exovres Kowwviav. (See Meier, De Gentibus Atticis; Philippi, Der Areopag und die Epheten, Berlin, 1874, p. 68; Schoemann, Griechische Alterthiimer, Berlin, 1861, vol. i. p. 329, with Schoemann's theory of the growth of the yévos; F. Haase, Die Athenische Stamm- verfassung ; also Grote's History of Greece, iii. 53.) Now, hard as it is to ascertain the exact nature of the yévos, and of its relation to the tribe, it seems, on the whole, more analogous to the totem-kin than to the caste or joint family of the modern Hindus. (See Sir Henry Maine, "South Slavonians and Rajpoots," Wineteenth Century, December, 1877.) A common name, co-heirship, the duty of avenging a member, all point to the idea of kinship. As to exogamy, a Greek could certainly marry in his own yévos, for the common name went by the father's side, and a Greek might marry his father's though not his mother's daughter. It has been argued that the prohibition to marry a uterine sister, though kinship in historic Greece went by the male line, indicates a past when the maternal tie was more strict,—when, in fact, a man who married his uterine sister married within

the yévos, and a man who took his half-sister by the father's side married outside the yévos. Here it may be observed that Aristotle (Pol., 1, 2, 5, 6) gives as very ancient synonyms of yevvjrac the terms dpoyadanres (nourished on the same milk), Spootrver (eating from the same vessel), uoxdémvor (warmed by the same fire). These terms speak of a time when motherhood or fosterage, when community of shelter, not blood kinship, were the bonds that kept members of the same kin together. The words may be compared with Gaelic teadhloch and coediche, "Gaelic names for family, signifying, the first, having a common residence, the second those who eat together v (M'Lennan, Prim. Mar., p. 154).

It has been usual, almost universal, to explain the Greek yévos and Roman gens by simply saying, like Mr Freeman

(Comparative Politics, Macmillan, 1873, p. Wi); "the family grew into the clan, the clan grew into the trike." Mr Freeman says we can trace this process best " among men of our own blood." But when we examine the early associations of the English (Kemble's Saxons in England, vol. i. p. 458), we find, just as in America, just as in Australia, groups of kindred of the same name,—take Billing, by way of example,—scattered from north to south through all the local tribes. We have seen how this happens in America and Australia, we have seen that there the family, in Mr Freeman's sense, does not grow into the clan. Did it do so in Attica and Italy, and, if so, how did a tribe, which was ex hypothesi but a swollen clan, contain so many stocks which claimed distinct origin and distinct mythical ancestors? How did these stocks come to be scattered through local tribes, not grouped in one? The growth of savage tribes is not a development of the family; tribes singularly like those of savages are found in early civilizations. Had the two kinds of kindred different origins?

There remains a point to notice. The thoroughly savage totem-kindreds revere the animal, plant, or other object from which they take their name and claim descent, and they use it as a badge. For Greek and Roman survivals of this usage see Plutarch, Theseus ; M'Lennan, ''The wor- ship of plants and animals," in the Fortnightly Review, 1869, 1870; and the Antiquities of Heraldry, by W. 8. Ellis, 1869. If the ordinary theory, that the

tribe and clan are overgrown families, be rejected, the converse theory may be stated thus :—The totem-kindreds of savages grow up through exogamy and female kin. The change to male kinship (a change which is demonstrably taking place in America and Australia) produced something like the Chinese circle of relationship. The substitution of the name of a fictitious ancestor for that of the sacred plant, animal, or natural object produced a circle of affinity like the Hindu ghotra of customary religion.!_ The decay of the prohibition to marry within the kin united by the family name, like the growing laxity of rule in the ghotra, pro- duced something like the Greek yévos and the Roman gens. Nothing remained but joint religious rites, a common place of burial, a common name, a vague feeling of connexion, traditions of the prohibition to marry within the gens, the duty of taking up the blood-feud, and vestiges of the joint- heirship. In process of time the intenser affections of the family caused the old gentile ties to disappear, and gentile law became anempty memory.

It has been shown that arrangements ruder than the modern family exist among contemporary savages, and have existed among ancient peoples. It has been shown that these rude institutions produce large associations of men, tribes and totem-kindred, among savages, and that, by a series of changes, every one of which is exemplified in experience, the Greek and Roman gentes, the units of early political society, may have been developed out of barbarous groups. There are next certain customs to be examined, which tend, as far as they go, to show that civilized society passed through savage stages. The chief of these customs are the ceremony of capture and bridal etiquette. As to the ceremony of capture it is superfluous to say much, as the subject has been handled, with complete originality and copious illustrations, in M‘Lennan’s Primitive Marriage. The classic example of the ceremony of capture is thus stated by C. O. Miiller, (Hestory and Antiquities of the Doric Race, English translation, Oxford, 1830, vol. ii, p. 298): “ Two

things were requisite as an introduction and preparation to

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1 We have examples in Zulu-land of the declining belief in animal ancestry (Callaway’s Religion of the Amagulu), and in Greek history we have

frequent instances of the fictitious adoption of eponymous heroic ancestors.

marriage at Sparta: first, betrothing on the part of the father ; secondly, the seizure of the bride. The latter was clearly an ancient national custom." Miiller then describes the clandestine intercourse, which lasted for some time, be- fore the man " brought his bride, and frequently hcr mother, into his house." The intercourse of bride and groom among the Iroquois of Lafitau's time was likewise clandestine. the practice in Crete Miiller quotes Strabo, x. 482, p. A similar custom prevailed in Rome (Apuleius, De As. Aur. iv.; Festus, s. v. " Rapi"), and was supposed to be derived from the time of the rape of the Sabines. Mr M'Lennan finds the practice necessary to the constitution of the relations of husband and wife among the Calmucks, the Tunguzians, the Khonds, the Fuegians, the Welsh, the Arabs, the Irish, and various other races. He explains its existence by the institutions of exogamy (@¢, the rule prohibiting marriage between people of the same blood), and by the prevalence of hostility between the tribes of rude times. Suppose the rule to exist that a man may not marry a woman of his own community, and suppose that, by an exhaustive division, all other communities without exception are hostile, he must steal a wife if he is to- marry at all. The fiction of capture, as men grow more polite, will endure as part of the marriage ceremony when the need of the reality is passed. It is to be noticed that the theft of the woman is, in the fictitious capture, generally the work of more than one man, as it well might be, if the early marriages were polyandrous. If it be granted that the pro- hibition to marry within the community is as early as it is widely prevalent, this explanation of the form of capture will seem sufficient. The origin of the early prohibition will be discussed later. Thus, on the evidence of a sport- ive feature in the marriage ceremony of civilized peoples, a vestige is revealed of customs connected witha very early form of the family.

A strange piece of barbarous etiquette may hint that the kindred of the bride and groom were once hostile groups. The daughter-in-law, among many races, is forbidden to speak to her father-in-law; the mother-in-law must hide when she sees her son-in-law. The wives treat their hus- bands with what may be a survival of hostility, and never name them by their names.

Examples are collected in Sir John Lubbock's Origin of Civilization, pp? 1a, 12) The practices are found amcng races on the border of the Polar Sea, in the Rocky Mountains, in Southern Africa, among the Caribs, Mongols, and Calmucks, in China, in Siberia, and in Australia. To these instances adduced by Sir John Lubbock we may add Bulgaria (Dozon, Chants Populatres Bulgares).

Herodotus says (i. 146) that the wives of the early Tonians would not call their husbands by their names nor sit at meat with them, and instructed their daughters to practise the same reserve. The reason assigned is that the women were originally Carians, whose parents the Jonians had slain. It may be allowed that this world-wide practice, too, testifies to a time when men married out of their own group, and all groups were hostile each to the other. Perhaps the English local custom, which forbids the parents of bride and bridegroom to be present at the marriage ceremony, holds the same antiquity.

We have now to note the widespread existence of a system of nomenclature, which can hardly have arisen in times when the monogamous family was the unit of society. Mr Lewis Morgan of New York was the discoverer of a custom very important in its bearing on the history of society. In about two-thirds of the globe persons in addressing a kinsman do not discriminate between grades of relationship. All these grades are merged in large cate-gories. Thus, in what Mr Morgan calls the " Malayan system," "all consanguinei, near or far, fall within one of

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these relationships—grand-parent, parent, brother, sister, child, and grandchild." No other blood-relationships are re- cognized (Ancient Society, p, 385). This at once reminds us of the Platonic Republic. '' We devised means that no one should ever be able to know his own child, but that all should imagine themselves to be of one family, and should regard as brothers and sisters those who were within a certain limit of age; and those who were of an elder generation they were to regard as parents and grand-parents, and those who were of a younger generation as children and grand-

children (Zimeeus, 18, Jowett's translation, first edition, vol. ii, 1871). This system prevails in the Polynesian groups, and in New Zealand. Next comes what.Mr Morgan chooses to call the Turanian system. "It was universal among the North American aborigines," whom Mr Morgan styles Ganowanians. "Traces of it have been found in parts of Africa" (Ancient Society, p. 386), and "it still prevails in South India among the Hindus, who speak the Dravidian language," and also in North India, among other Hindus. The system, as Mr Morgan says, "is simply stupendous." It is not exactly the same among all his miscellaneous " Turaniuns," but, on the whole, assumes the following shapes. Suppose the speaker to be a male, he will style his nephew and niece in the male line, his brother's children, "son" and "daughter," and his grand-nephews and grand-nieces in the male line, " grandson" and " grand- daughter." Here the Turanian and the Malayan systems agree. But change the sex ; let the male speaker address his nephews and nieces in the female line,—the children of his sister,—he salutes them as " nephew " and " niece," and they hail him as "uncle." Now, in the Malay system, nephews and nieces on both sides, brother's children or sisters, are alike named "children" of the uncle. If the speaker be a female, using the Turanian style, these terms are reversed. Her sister's sons and daughters are saluted by her as "son" and daughter," her brother's children she calls "nephew" and "niece." Yet the children of the persons thus styled "'nephew" and "niece" are not recog- nized in conversation as "grand-nephew" and " grand- niece," but as " grandson" and " grand-daughter." It is impossible here to do more than indicate these features of the classificatory nomenclature, from which the others may be inferred. The reader is referred for particulars to Mr Morgan's great work, Systems of Consanguinity and A finity of the Human Race (Washington, 1871). :

The existence of the classificatory system is not an entirely novel discovery. Nicolaus Damascenus, one of the inquirers into early society, who lived in the first century of our era, noticed this mode of address among the Galactophagi. Lafitau found itamong the Iroquois. To Mr Morgan's perception of the importance of the facts, and to his energetic collection of reports, we owe our knowledge of the wide prevalence of the system. From an examination of the degrees of kindred which seem to be indicated by the '' Malayan" and "Turanian" modes of address, Mr Morgan has worked out a theory of the evolution of the modern family. A brief comparison of this

with other modern theories will close our account of the family. The main points of the theory are shortly stated in Systems of Con- sanguinity, &c., pp. 487, 493, and in Ancient Society, p. 384. From the latter work we quote the following description of the five different and successive forms of the family :—

“I. The Consanguine Family. 1+ was founded upon the inter- marriage of brothers and sisters, own and collateral, in a group.

“Il. The Punaluan Family. Yt was founded upon the inter- marriage of several sisters, own and collateral, with each others’ husbands, in a group, —the joint husbands not being necessarily kinsmen of each other; also, on the intermarriage of several brothers, own and collateral, with each others’ wives in a group,— these wives not being necessarily of kin to each other, although

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often the case in both instances (sic). In each case the group of men were conjointly married to the group of women.

“IIL. The Syndyasmian or Pairing Family. lt was founded upon marriage between single pairs, but without an exclusive cohabita- tion. The marriage continued during the pleasure of the parties.

“TV, The Patriarchal Family. It was founded upon the marriage of one man with several wives, followed in general by the seclusion of the wives.

“V. The Monogamian Family. It was founded upon marriage between single pairs with an exclusive cohabitation.

“‘Three of these forms, namely, the first, second, and fifth, were radical, because they were sufficently general and influential to create three distinct systems of consanguinity, all of which still exist in living forms. Conversely, these systems are sufficient of themselves to prove the antecedent existence of the forms of the family and of marriage with which they severally stand con- nected.”

Mr Morgan makes the systems of nomenclature proofs of the existence of the Consanguine and Punaluan families. Unhappily, there is no other proof, and the same systems have been explained ona very different principle(M‘Lennan, Studies in Ancient History, p. 372-407). Looking at facts, we find the Consanguine family nowhere, and cannot easily imagine how early groups abstained from infringing on each other, and created a systematic marriage of brothers and sisters. St Augustine, however (De Civ. Dei, xv. 16), and Archinus in his Thessalica (Odyssey, xi. 7, scholia B, Q) agree more or less with Mr Morgan. Next, how did the consanguine family change into the Punaluan? Mr Morgan says (Ancient Society, pp. 424, 428) brothers ceased to marry their sisters, because “the evils of it could not for ever escape human observation.” Thus the Punaluan family was hit upon, and “created a distinct system of consanguinity” (Ancient Society, p. 384), the Turanian. Again, “marriages in Punaluan groups explain the rela- tionships in the system.” But (p. 286) Mr Morgan pro- vides himsclf with another explanation, “the Turanian system owes its origin to marriage in the group and to the gentile organization.” He calls exogamy ‘‘the gentile organization,” though, in point of fact, the only gentes we know, the Roman gentes, show scarcely a trace of exogamy. Again, “the change of relationships which resulted from substituting Punaluan in the place of Consanguine marriage turns the Malayan into the Turanian system” (p. 442, see too p. 387). In the same page (442) Mr Morgan attri- butes the change to the “ gentile organization,” and, still in the same page, uses both factors in his working out of the problem. Now, if the Punaluan marriage is a sufficient ex- planation, we do not need the “gentile organization.” Both, in Mr Morgan’s opinion, were efforts of conscious moral reform. In Systems of Consanguinity (p. 490) the gentile organization (there called tribal), that is, exogamy, is said to have been “designed to work out a reformation in the intermarriage of brothers and sisters.” But the Punaluan marriage had done that, otherwise it would not have produced (as Mr Morgan says it did) the change from the Malayan to the Turanian system, the difference in

the two systems, as exemplified in Seneca and Tamil, being |

‘in the relationships which depended on the intermarriage or non-intermarriage of brothers and sisters” (Anceent Society, p. 442). Yet the Punaluan family, though itself a reform in morals and in “breeding,” “did

not furnish adequate motives to reform the Malay system," which, as we have seen, it did reform (p. 388), The Punaluan family, it is suspected, " frequently involved own brothers and sisters" (p. 427) ; had it not been so, there would have been no need of a fresh moral reformation,—" the gentile organization." Yet even in the Punaluan family (Ancient Society, p. 488) "brothers ceased to marry their own sisters." What, then, did the "gentile organization " do for men? As they had already ceased to marry their own sisters, and as, under the gentile organization, they were

still able to marry their half-sisters, the reformatory "in- | chap. XVil.),

genuity " of the inventors of the organizations was at once superfluous and useless. It is impossible to understand the Punaluan system. Its existence is inferred from a system of nomenclature which it does (and does not) produce ; it admits (and excludes) own brothers and sisters. Mr Morgan has intended, apparently, to represent the Puna- luan marriage as a long transition to the definite custon1 of exogamy, but it will be seen that his language is not very clear nor his positions assured. He does not adduce sufficient proof that the Punaluan family ever existed as an institution, even in Hawaii. 'There is, if possible, a greater absence of historical testimony to the existence of the Consanguine family. It is difficult to believe that exogamy was a conscious moral and social reforma- tion, because, ex hypothesi, the savages had no moral data, nothing to cause disgust at relations which seem revolt- ing tous. It is as improbable that they discovered the supposed physical evils of breeding in and in. That dis- covery could only have been made after a long experience, and in the Consanguine family that experience was impos- sible. Thus, setting moral reform aside as inconceivable, we cannot understand how the Consanguine families ever broke up. Mr Morgan's ingenious speculations as to a tran- sitional step towards the gens (as he calls what we style the totem-kindred), supposed to be found in the " classes" and marriage laws of the Kamilaroi, are vitiated by the weakness and contradictory nature of the evidence (see Pritchard, vol. ii. p. 492; Lang's Queensland, Appendix ; Proceedings of American Academy of Arts, &c., vol. vill. 412; Nature, October 29, 1874). Further, though Mr Morgan calls the Australian " gentile organization" " in-

cipient," he admits (Ancient Society, p. 374) that the Nar- rinyeri have totem groups, in which "the children are of the clan of the father.' Far from being "incipient," the gens of the Narrinyeri is on the footing of the ghotra of Hindu custom. Lastly, though Mr Morgan frequently declares that the Polynesians have not the gens (for he thinks them not sufficiently advanced), Mr Gill has shown that unmistakable traces of the totem survive in Poly- nesian mythology.

There is the less necessity to believe, with Mr Morgan, in the Punaluan and Consanguine families, because the evidence on which he relies, the evidence of the classi- ficatory system, has heen explained on a different theory by Mr M'Lennan (Studies in Ancient History, loc. ctt.), whose mode of conceiving the evolution of the family is, briefly stated, this. Primitive man was, as geology reveals him, gregarious. We have no sort of evideuce as to his truly primitive manners, for all existing savages have had many ages of experience and, as it were, of education. It can hardly be supposed, however, that the earliest men had instinct against marriage with near kin. Their earliest associations would be based on the sentiment of kindred, not yet brought into explicit consciousness, and on community of residence. They would be named by the name of their group. The blood relation of the mother to the child would be the first they perceived. As time went on they could reason out other relationships through women, but male kinship would remain, though not unknown as a fact, unrecognized in custom, because, if harmony was to exist within the group, it could only be secured "through indifference and promiscuity," which made certainty of male parentage impossible. Now let it be sup- posed, as a vast body of evidence leads us to suppose, that female children were slaughtered as bouches inutiles. The result would be a scarcity of women within the group. To secure wives men would be obliged to steal them from other groups, which were, ea hypothesz, hostile. This is almost the state of things known to Montaigne (Cotton's translation, "where the servile condition of women is

looked upon with such contempt that they kill all the native females and buy wives from their neighbours." Now, in each group, by the system of capture, are members of alien groups, namely, the women and their

children, who, as we lave seen, are recognized as connexions of the mothers, not the fathers. Let these practices be formed into customary law, refuse a man permission to marry a woman of his own stock-name (marked by the totem), and you have exogamy, or what Mr Morgan calls “the gentile organization.” Within the groups are several families of the earliest type, the female and her offspring. Next, conceive of the sets of mother’s sons, as feeling a stronger bond of union between themselves and the other members of the group, and as living with their mother. They cannot marry their sisters (who are of the same name and totem as themselves), but they regard their sisters’ children as their heirs. To their own putative children, they can only mnake presents enter vivos, and the sisters are wedded each to a set of men in the manner of the Nairs. But, as pro- perty was amassed, the brothers would prefer to keep their property in the hands of their putative children, and “ there would be a disposition in favour of a system of marriage which would allow of the property passing to tlie brother’s own children” (Prim. Mar., 242). This form of marriage would be the one prevailing in Thibet. The elder brother, the first to marry, would have some of the attributes of the paterfamilias. Thus the idea of fatherhood attained some- thing like maturity. Chiefs, moreover, would secure one or more wives to themselves, and their example imitated would produce monandry. The old state of things would leave its trace in the levirate, the duty of “raising up seed toa brother.” Even before these changes, the custom of marrying out of the group would have introduced so inany strangers of various names and totems, that the members of a local tribe conld intermarry with one another and yet not violate the law of exogamy. Sucli a local tribe, flushed with success in war, might refuse to marry beyond its limits, and become, so to say, a caste divided into ghotras, Let this caste feign itself to be descended from a common ancestor (a process of which Sir John Lubbock gives many examples), and you have a caste believed to be of common blood, yet refusing to marry outside the blood,—that is, an endogamous tribe. Within this tribe (as it were by a reac- tion from the old kinship through females) grows kinship through males only, the agnatic system of Rome. The wife and children are the husband’s property; agnates only can be a man’s heirs and, failing these, gentiles, —1.e,, members of the kin still denoted by the common name.

Many criticisms have been made, especially by Sir John Lubbock and Mr Herbert Spencer (Origin of Civilization, third edition ; Principles of Sociology, vol. i.), on the scheme here too briefly sketched. Sir John Lubbock holds that exogamy springs from marriage by capture (by which alone a member of a group could get a wife to himself), rather than marriage by capture from exogamy, Mr Spencer advocates the action of various “ conspiring causes,” “the stealing of a wife might become the required proof uf fitness to have one” (op. cit., pp. 652, 653). The origin of exogamy lies so far behind us in the past that it nay remain for ever obscure. It is probable that every variety of union of the sexes has existed, while it seems possible that a few have been passed through, as necessary stages, by all advancing races. In this notice we have said little of the custom by which a man is a member of several clubs of men, each with one wife in common.

No hard and fast theory is likely to be accepted as more than provisional in the present state of knowledge, when

science has only for a few years been busily occupied in this investigation. (Ande)

FAM—FAM

FAMINES. War, pestilence, and famine are regarded by many as the natural enemies of the human race; but in truth these are all more or less associated with the circnm- stances of civilization. In the highest state of civilized society there ought to be no war; there need be no pesti- lence; and famine alone would stand as being beyond the range of human prevention—subject to some conditions to be afterwards spoken of. The advancement in the social scale to a state of dependence upon cereal crops, while the facilities of intercommunication between different countries, or even parts of the same country, remained imperfect, led almost necessarily to the periodical recurrence of scarcity. Cereal crops are especially dependent upon conditions of climate for their regular production; and here at least are circumstances beyond human control.

In a matter of such practical importance as the failure of the regular supply of the food of the people, it is not desirable to rely upon merely theoretical

surmises ; nor is it necessary todo so. A table has recently been prepared! of over 350 famines which have occurred in the history of the world, beginning with those spoken of in the Scriptures as having been in Palestine and in the neighbouring nations in the time of Abraham (Gen. xii. 10), and again in the time of Isaac (Gen. xxvi. 1) ; passing on to the seven years' famine in Egypt down through those which afflicted ancient Rome; enumerating in their order those which have visited the three divisions of the United Kingdom (by far the most numerous in the table—the records being more avail- able), as also those devastating Europe in the Middle Ages ; reviewing in special detail the 34 famines which have visited India, including, as the first recorded of this group, that of 1769-70 (above 20 have been on a large scale); and concluding with that terrible calamity which is now ravaging the populations in North China. It is not pretended that this table is entirely exhaustive. It is known that many famines have occurred in the Chinese empire of which no details have been found available; and it is supposed that many have desolated Persia and other portions of Asia of which exact particulars are not avail- able. But as this is believed to be the only existing table of the kind, and as great pains have been taken to make it complete, it may for our present purpose be regarded at least as representative. We proceed then toan analysis of it, in view of ascertaining what have been the causes of famines,—a point of the first importance when we come to @ consideration of the problem whieh will naturally force itself into prominence—can anything be done to avert these national calamities ?

The analysis discloses the following causes, or we may perhaps more accurately say attributed causes—for in this matter we have to follow the authority of the original chronicle, or of such records as have reached us :—l, rain i 2, frost ; 3, drought ; 4, other meteorological phenomena ; 5, insects and vermin; 6, war; 7, defective agriculture ; 8, defective transport; 9, legislative interference ; 10, cur- rency restrictions; 11, speculation; 12, misapplication of grain. These causes are named, as far as may be, in the order of their importance. It is immediately noticeable that they form themselves into the two distinct groups of natural and artificial causes.

We proceed to consider the first group—natural causes of famines,

1, Rain.—By excess of rain floods are produced, the soil becomes saturated, and decomposition of the seed is occa- sioned. In hilly countries the seed is not unfrequently washed entirely out of the ground, and so is destroyed. This cause of famine applies in a marked manner to eee ie ae co

1 See Statistical Journal, vol. xli., paper by Mr Cornelius Walford, B.LA., F.SS., &c., ‘On the Famines of the World, past and present.”

tropical countries, where the rains are so much of the nature of torrents that the evil presents itself in a magni- fied degree. Improved cultivation of the land, embracing good drainage, is providing the most effective remedy. Other forms of damage to grain crops result from rain, as where it occurs in undue quantities during the harvest season, and the crops are destroyed before they can be safely stored. This has constantly happened in the northern portions of our own kingdom, and in parts of continental Europe. Inundations from the sea, from rivers, from inland lakes, fall within this category, and great mischief has resulted from these in many parts of the world. White, in his Vatural History of Selborne, gives scientific reasons why much-flooded lands remain infertile—the bene- ficial action of the earth-worms is thereby retarded.

9. Frost.—In temperate regions frost is a deadly enemy to vegetation in several forms, In the case of grain cultiva- tion it may, by setting in early, prevent the efficient mani- pulation of the soil and the sowing of the autumn seed. Or by being protracted beyond the early months of the year, it will prevent spring sowing, and even seriously injure the young crops. Combined with rain it will frequently destroy the vitality of the seed while yet in the ground. In the northern part of our island it not unfrequently destroys the grain before it is fully harvested. Efficient drainage of the soil is almost as effective against the ravages of frost as against the damage from rain. Many famines in Great Britain have been shown to be directly the result of frost. In France, and other wine and olive producing countries, the damage occasioned by frost is immense. Such damage, as well as that occasioned by floods, is there a recognized branch of insurance business.

3. Drought.—In all climates of a tropical character drought plays an important part in retarding the develop- ment of vegetation. When combined with moisture, solar heat affords the most certain means of securing luxuriance ; without the moisture there is absolute sterility. The early Bible records refer to the rising of the waters of the Nile as the event upon which the fertility of Egypt depends. About 1060 the overflowing of this great river failed for seven successive years, occasioning one of the greatest famines of history. Two provinces were wholly depopulated ; and in another half the inhabitants perished. Even in tem- perate climates long-continued drought is very disastrous.

4, Other Meteorological Phenomena.— Under this general designation has to be included several causes more or less directly or remotely contributing to famines. (a) Comets. —The appearance of these has often coincided with periods of drought; they are also frequently associated with ex- cessive heat. But heat, except in so far as it may super- induce drought, is not detrimental to the grain crops ; while, in relation to fruit crops, and more especially that of the vine, not only is the quality of the produce greatly enhanced, but frequently its quantity also. The sale of some of the comet-claret of 1811 recently at £12, 10s. per bottle in Paris is some evidence of the quality. (6) Earthquakes.—These would seem to have but little in- fluence in producing famine, except in the immediate locality of their devastations. Where, however, they have produced irruptions of the sea or inland waters, which has not unfrequently been the case, the damage has been extensive. (c) Hurricanes and Storms.—These frequently produce widespread injury in the localities they visit. They also lead to irruptions of the sea, and to the overflow of rivers; but as a rule these occur at periods of the year when the grain and other crops are not sufficiently advanced to sustain serious damage by shaking or otherwise, or have been harvested. (d) Hazl-storms.—These are usually local in their effects—rarely extending beyond 60 miles in their greatest length and some 6 miles in width, and are

generally confined to much smaller limits. They are most destructive to grain and fruit produce of all kind when they occur in severe form, and in the summer and autumn months—when they are most prevalent. The damage these occasion has long been the subject of insurance alike in

England and other parts of Europe. In France hail-storms are of great frequency, and also of great severity.

5. Insects, Vermin, dc.—Insect plagues appear to have afflicted mankind from a very early period. Thus flies and locusts were among the plagues of Egypt, and concerning the latter we read (Ex. x. 14, 15): “ Very grievous were they; before them there were no such locusts as they, neither after them shall be such. For they covered the face of the whole earth, so that the land was darkened ; and they did eat every herb of the land, and all the fruit of the trees which the hail had left; and there remained not any green in the trees, or in the herbs of the field, through all the land of Egypt.” The present writer travelled in 1874 through districts in the Western States of America devastated very much in the manner thus described. The famine now raging in North China began in one district at least by a visitation of locusts. In India such visitations have occurred several times. England has been visited on various occasions by plagues of insects, especially in 476 and again in 872. As to vermin, such as rats, mice, &c., destroying the crops, there are but few instances on record. In 1581 there was a plague of mice in Essex, and in 1812-13 a plague of rats in the Madras presidency, which in part occasioned the famine of that year.

We now turn to the artificial causes of famines, some of which hardly admit of being dealt with in the same detail.

6. War.—Warfare has a tendency to create famine in one or other of several forms. It too frequently retards cultivation, either by its direct operation, or indirectly by calling the agricultural classes to arms. By its agency, too, the crops ef whole districts are either designedly destroyed or ruinously devastated. Famines in particular towns or localities are often occasioned by the establish- ment of blockades, or through supplies being otherwise intercepted or cut off. A large quantity of grain, too, is probably damaged every year by being kept in military stores in various parts of Europe; in the event of famine, however, these stores may become of immense value.

7, Defective Agriculture.—This may result from one of several causes, as ignorance, indifference, or unsuitability of climate or location. Where the produce of the soil but barely meets the current requirements of the inhabitants, st is clear that either the failure of one season’s erops, or the

sudden influx of any great number of strangers, may produce at least temporary famine. See Macaulay's Lg- land, vol. i. chap. 3, or Wade's British History chrono- logically arranged, under date 1549 to 1553, &e.

8, Defective Transport.—This may arise from such causes as bad roads or want of roads, absence of canals or want of shipping, or from wilful obstruction. In our own country we had the advantage of the great Roman roads from a very early period; but still for cross country purposes the roads remained very bad, or, indeed, did not exist, until comparatively recent times. In 1285 an Act was passed for widening the highways from one market town to another; "but this was intended rather to pre- vent robbery than to facilitate travelling" (Wade). In consequence of the bad state of the roads it has fre- quently happened that there was a famine prevailing in one part of the kingdom, with a superabundance of food in another. The introduction of canals, and subsequently of railroads, removed all possible difficulty in_ the United Kingdom. In India at the present moment the chief diffi- culty in connexion with the famines is the want of the means of transport.

9. Legislative Interference.—It does not appear altogether certain whether legislative interference with respect to the import or export of grain originated in relation to the pre- vention of famines, or in the desire to advance agriculture or to keep down prices within the limits at one time pre- scribed by law. Probably all these causes contributed to the building up of the system of the Corn Laws, which were only repealed, at the indignant demand of the nation, as recently as 1846. It is clear that all legislative inter- ference must be designed to interfere with the natural course of supply and demand; and to that extent it 1s dangerous. There is no doubt that the Corn Laws were often called into play to prevent exportation of grain; while they only admitted of its importation when prices reached or exceeded certain predetermined limits. It was the Irish famine of 1845-6 which at least hastened their final repeal. ;

10. Currency Restrictions.—Under this head is maiuly included the consideration of debasing the coin, and so lessening its purchasing power. But for very direct testi- tony on more than one occasion we should hardly have in- cluded this among the causes of famine. Thus Penkethman (who may be regarded as a high authority) says, under date 1124, “By means of changing the coine all things became very deere, whereof an extreame famine did arise, and afflict the multitude of the people unto death.” Other instances, as in 1248, 1390, and 1586, are more particu- larly set out in the table of famines already referred to.

11. Speculation.—Under this head has chiefly to be considered that class of dealings known as “ forestalling,” “ingrossing,” and trafficking by “‘regratours.” Offences of this character were prohibited by statute in 1552 (5 and 6 Edward VI. c. 14), and it is seen that much importance was attached to them. Then there was the Act of 1555 (2 and 3 Philip and Mary, e. 15), “An Act that purveyors shall not take victuals within 5 miles of Cambridge and Oxford,” on account of the poor estate of the multitude of scholars “ having very bare and small sustentation.” A further inquiry into the legislative measures taken in this direction would show how little removed from famine con- ditions were the people of England even at a compara- tively recent period.

12. Misapplication of Grain.—Under this head is mainly to be noted the excessive use of grain in brewing and distilling, and by burning, whether wilfully or by misad- venture. The laws regarding the burning of grain ricks were long and properly very severe, the punishment being capital until within a comparativly recent date. Under date 1315 we find it recorded that the Londoners, “considering that wheat was much consumed by the convert- ing thereof into mault, ordained that from thence it was to be made of other grains.” This order was afterwards ex- tended by the king(Edward IT.) through the whole kingdom. Tn later times distilling from grain has been prohibited.

It is clear from what has thus been said that the specific causes of famines which are denominated artificial have nearly all passed away, so far as Britain is concerned ; but some of them still assert their force, especially in the East. As to India, the constantly recurring famines in the various

provinces have caused great commiseration in England, and much anxiety and cost to the Government,—that of 1874 costing £6,500,000, that of 1877 nearly £10,000,000, —and have naturally drawn attention to the fact that the Indian empire, as a whole, produces year by year sufficient food for its aggregate population. The food supply fails at certain points; and there are no adequate means of transportation between the suffering provinces and others

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1 Edward I. ‘‘ caused the wooll and leather to be stayed in England, and there followed great dearth of corne and wine.” —Penkethman.

FAMIWNES

which have abundance. Hence millions starve ; and hence, in the meantime, has arisen a fierce controversy between those who are in favour of canals, and water carriage gene- rally, and the military authorities, who regard railways as of the first necessity—funds not being iminediately forth-coming for both purposes.

There are other facts regarding the famines of India which require to be known, as they are contrary to the general belief. Thus Mr F. C. Danvers says, in his able fteport on the Famines of India (1878) :-—

‘*Famines in India have arisen from several different causes, but the most general cause has not been the failure of the usual rains. Distress has also, however, been caused by hostile invasion, by swarms of rats and locusts, by storms and floods, and not unfre- quently by the immigration of the starving people from distant parts into districts otherwise well provided with food supplies, and occasionally by excessive exports of grain into famine-stricken districts, or by combinations of two or more of the above-mentioned circumstances,”

Another point may be mentioned, which bears, not only upon the famines of India, but upon those of other countries where they are occasioned by deficiency of rain, or by too much rain, viz., the effect produced on the average rainfall by denuding a country of its growing timber. There can be

uo doubt that the rainfall in England has been much lessened by the continuous destruction of our forests and even of our hedgerows. In India the cutting down of timber for the purpose of supplying fuel to the locomotive engines on the railways has already produced noticeable effects. The authorities are happily alive to the fact, and remedial measures are already being taken. But other results are produced by the same cause. ‘The testimony of the French forest department in the Hautes and Basses Alpes is strong, and reaches the practical ques- tion of floods and the damage they occasion. “So great indeed were the devastations from which these alpine districts suffered through the denudation of the mountain sides, and the consequent formation of torrents, that inter- vention of the most prompt description became necessary to prevent the destruction, not only of the grazing grounds themselves, but of the rich valleys below them.” The re-planting of these mountains had been going on for some time. ‘Already the beneficial effect of what has been done is felt in the diminution of the violence of the torrents. .«.. During the present summer (1875), when so much mischief has been done in the south of France by inundations, the Durance, which rises in the mountains east of Avignon, and which, on former occasions, has been the worst and most dangerous of all the rivers in the south of France, on account of the inundations it has caused, has searcely been heard of ; and it is around the head waters of this river that the chief plantation works have, during the last ten years, been carried on.”?

In connexion with famines the “sun-spot” theory of rain- fall has of late engaged much attention. The basis of this theory is that all the phenomena connected with the sun ebb and flow once in eleven years, and that from the rela- tion of the earth to the sun these. maximum and minimum periods regulate terrestrial phenomena. The sun’s energy “‘ gives us onr meteorology by falling at different times upon different points of the aerial and aqueous envelopes of our planet, thereby producing ocean and air currents; while, by acting upon the various forms of water which exist in those envelopes, it is the fruitful parent of rain, and cloud, and mist. Nordoesit stop here. It affects in a more mysteri~ ous way the electricity in the atmosphere, and the magnet- ism of the globe itself.” So far, however, as the tables

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2 See Proceedings of the Forest Conference held at Simla (India), October 1875.

- “Sun-Spots and Famines,” by J. Norman Lockyer and W. W. Hunter, in Nineteenth Century, Nov. 1877, p. 583.

illustrating the theory admit of comparison with the list of famines already referred to—and the tables extend to the rainfall (as indicated by floods), to frosts, to drought, and to other meteorological phenomena—there is no present evidence that such a theory can be up- held, even when applied to the famines of India only ; and apparently still less when extended to those of the whole world. As to Mr Jeula’s tables of shipwrecks, which appear to follow the eleven years’ theory, and to which the doctrine of recurrent storms, induced by the meteorological influences already named, has been applied—the explana- tion may be traced to other influences, such as mercantile depression, &ec.

In remains to be added that to the direct influence of famines we owe our Poor Laws—that national system of insurance against starvation. ‘“ In the 29th yeare of Queen Elizabeth, about January [1586], Her Majesty observing the general Dearthe of Corne, and other victual, groune partly through the unseasonablenesse of the year then passed, and partly through the uncharitable greediness of the Corne-Masters, but especially through the unlawful and over much transporting of graine in forreine parts ; by the advice of Her most Hon. Privy Council, published a Pro- clamation, and a Booke of Orders to be taken by justices for reliefe of the Poore; notwithstanding all which the ex- cessive prices of grain still encreased : so that wheate was sold at London for 8s. the Bushel, and in some other parts of the Realme above that price.’—-Penkethman. To the famine in India in 1781-3 was due the institution of the Monegar Choultry, or the Indian equivalent to the British Pocr Law; while in connexion with the Indian famine of 1790—2 was introduced the system of Government relief works, so extensively adopted at the time of the Trish famine of 1846-7 and the Lancashire cotton famine of 1861-5. The first recorded importation of grain into Great Britain took place during the great famine of 1258, when “fifty of shiploads of wheat, barley, and bread were procured from Germany ”—

hence the first incident which, at a later date, gave rise to our Corn Laws ; and in many other ways famines have left their mark upon our history and our in- stitutions. (c. w.)

FAN (Latin, vannus; French, éventarl), a light imple- ment used for giving motion to the air. Ventilabrum and flabellum are names under which ecclesiastical fans are mentioned in old inventories. Fans for cooling the face have been in use in hot climates from remote ages. A bas-relief in the British Museum represents Sennacherib with female figures carrying feather fans. They were attri- butes of royalty along with horse-hair fiy-flappers and umbrellas. Examples may be seen in plates of the Egyp- tian sculptures at Thebes and other places, and also in the ruins of Persepolis. In the museum of Boulak, near Cairo, a wooden fan handle showing holes for feathers is still preserved. It is from the tomb of Amen-hotep, of the 18th dynasty, 17th century B.c. In India fans were also attributes of men in authority, and sometimes sacred emblems. A heartshaped fan, with an ivory handle, of unknown age, and held in great veneration by the Hindus, was given to the prince of Wales. Large punkahs or screens, moved by a servant who does nothing else, are in common use by Europeans in India at this day.

Fans were used in the early Middle Ages to keep flies from the sacred elements during the celebrations of the

Christian mysteries. Sometimes they were round, with bells attached—of silver, or silver gilt. Notices of such fans in the ancient records of St Paul’s, London, Salisbury cathedral, and many other churches, exist still. For these purposes they are no longer used in the Western church, though they are retained in some Oriental rites. The large feather fans, however, are still carried in the state processions

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of the supreme pontiff in Rome, though not used during the celebration of the mass. The fan of Queen Theodolinda (7th century) is still preserved in the treasury of the cathedral of Monza. Fans made part of the bridal outfit, or mundus muliebris, of ancient Roman ladies.

Folding fans had their origin in Japan, and were imported thence to China. They were in the shape still used—a segment of a circle of paper pasted on a light radiating frame-work of bamboo, and variously decorated, some in colours, others of white paper on which verses or sentences are written. It is a compliment in China to in- vite a friend or distinguished guest to write some sentiment on your fan as a memento of any special occasion, and this practice has continued. A fan that has some celebrity in France was presented by the Chinese ambassador to the Comtesse de Clauzel at the coronation of Napoleon J. in 1804. When a site was given in 1635, on an artificial island, for the settlement of Portuguese merchants in Nippo in Japan, the space was laid out in the form of a fan as emblematic of an object agreeable for general use. Men and women of every rank both in China and Japan carry fans, even artisans using them with one hand while work- ing with the other. In China they are often made of carved ivory, the sticks being plates very thin and sometimes carved on both sides, the intervals between the carved parts pierced with astonishing delicacy, and the plates held to- gether by a ribbon. The Japanese make the two outer guards of the stick, which cover the others, occasionally of beaten iron, extremely thin and light, damascened with gold and other metals.

Fans were used by Portuguese ladies in the 14th century, and were well known in England before the close of the reign of Richard I]. In France the inventory of Charles V. at the end of the 14th century mentions a folding ivory fan. They were brought into general use in that country by Catherine de’ Medici, probably from Italy, then in ad- vance of other countries in all matters of personal luxury. The court ladies of Henry VIII.’s reign in England were used to handling fans, A lady in the Dance of Death by Holbein holds a fan. Queen Elizabeth is painted with a round feather fan in her portrait at Gorllambury ; and as many as twenty-seven are enumerated in her inventory (1606). Coryat, an English traveller, in 1608 describes them as common in Italy. They also became of general use from that time in Spain. In Italy, France, and Spain fans had special conventional uses, and various actions in handling them grew into a code of signals, by which ladies were supposed to convey hints or signals to admirers or to rivals in society. A paper in the Spectator humorously proposes to establish a regular drill for these purposes.

The chief seat of the European manufacture of fans during the 17th century was Paris, where the sticks or frames, whether of wood or ivory, were made, and the deco- rations painted on mounts of very carefully prepared vellum (called latterly chicken skin, but not correctly),—a material stronger and tougher than paper, which breaks at the folds. Paris makers exported fans unpainted to Madrid and other Spanish cities, where they were decorated by native artists. Many were exported complete ; of old fans called Spanish a great number were in fact made in France. Louis XIV. issued edicts at various times to regulate the manufacture. Besides fans mounted with parchment, Dutch fans of ivory were imported into Paris, and decorated by the heraldic painters in the process called “ Vernis Martin,” after a famous carriage painter and inventor of colourless lac varnish. Fans of this kind belonging to the Queen and to the late baroness de Rothschild were ex- hibited in 1870 at Kensington. A fan of the date of 1660, representing sacred subjects, is attributed to Philippe de Champagne, another to Peter Oliver in England in the

17th century. Cano de Arevalo, a Spanish painter of the 17th century devoted himself to fan painting. Some harsh expressions of Queen Christina to the young ladies of the French court are said to have caused an increased ostenta- tion in the splendour of their fans, which were set with jewels and mounted in gold. Rosalba Carriera was the name of a fan painter of celebrity in the 17th century. Lebrun and Romanelli were much employed during the same period. Klingstet, a Dutch artist, enjoyed a consider- able reputation for his fans from the latter part of the 17th and the first thirty years of the 18th century.

The revocation of the edict of Nantes drove many fan- makers out of France to Holland and England. ‘The trade in England was well established under the Stuart sovereigns. Petitions were addressed by the fan-makers to Charles IT. against the importation of fans from India, and a duty was levied upon such fans in consequence. This importation of Indian fans, according to Savary, extended also to France. During the reign of Louis XV. carved Indian and China fans displaced to some extent those formerly

imported from Italy, which had been painted on swanskin parchment pre- pared with various perfumes.

During the 18th century all the luxurious ornamenta- tion of the day was bestowed on fans as far as they could dis- play it. The sticks were made of mother-of-pearl or ivory, carved with extraordinary skill in France, Italy, England, and other countries. They were painted from designs of Boucher, Watteau, Lancret, and other “ genre ” painters, Hébert, Rau, Chevalier, Jean Boquet, Mad. Verité, are known as fan painters, These fashions were followed in most countries of Europe, with certain national differences. Taffeta and silk, as well as fine parchment, were used for the mounts. Little circles of glass were let into the stick to be looked through, and small telescopic glasses were sometimes contrived at the pivot of the stick. They were occasionally mounted with the finest point lace. An in- teresting fan (belonging to Madaine de Thiac in Frauce), the work of Le Flamand, was presented by the munici- pality of Dieppe to Marie Antoinette on the birth of her son the dauphin. Fron the time of the Revolution the old luxury expended on fans died out. Fine examples ceased to be exported to England and other countries. The painting on them represented scenes or personages con- nected with political events. At a later period fan mounts were often prints coloured by hand. The events of the day mark the date of many examples found in modern collec- tions. Amongst the fanmakers of the present time the names of Alexandre, Duvelleroy, Fayet, Vanier, may be mentioned as well known in Paris. The sticks are chiefly made in the department of Oise, at Le Déluge, Crévecceur, Méry, Ste Genevidve, and other villages, where whole families are engaged in preparing them ; ivory sticks are carved at Dieppe. Water-colour painters of distinction often design and paint the mounts, the best designs being figure sub- jects. A great impulse has been given to the manufacture and painting of fans in England since the exhibition which took place at South Kensington in 1870, Other exhibitions have since been held, and competitive prizes offered, one of which was gained by the Princess Louise, Modern collections of fans take their date from the emi- gration of many noble families from France at the time of the Revolution. Such objects were given as souvenirs, and occasionally sold by families in straitened circum- stances, A large number of fans of all sorts, principally ae er the mrs sale Freuch, English, German,

lan, Spanish, &c., have b South Kensington Niegéune. Sh ee

Regarding the different parts of folding fans it may be well to state that the sticks are called in French brins, the two outer guards panaches, and the mount Jewlle. (5, H. a)

FANO, a city of Italy in the province of Urbino-e- Pasaro, is situated in a rich and fertile plain on the shores of the Adriatic, at the mouth of the Metauro, 7 miles S.E. of Pesaro. The town is clean and well built, and is inclosed by old walls, with a lofty bastioned front towards the sea. Its cathedral is an unimposing structure, but some of the churches are fine buildings, richly adorned with marbles and frescoes, and containing several master- pieces of the great Italian painters. In the church of S. Francesco are the splendid tombs of tlie Malatestas. Fano has a Jesuit college, several monastic edifices, a gymnasium, a public library, and a large and finely adorned theatre. The harbour is so choked up with sand as to be accessible only to vessels of the smallest size. Some silk manufactures and a small trade in corn and oil are carried on, and the town is much resorted to for sea-bathing. The population in 1871 was 6439.

Fano occupies the site of the ancient Fanum Fortune, so named from the temple of Fortune there. It afterwards took the name of Colonia Julia Fanestris, from a colony of veterans established by Augustus ; and a triumphal arch of white marble erected in honour of that emperor still forms one of the gates of the city. Though the town was within the duchy of Urbino it did not belong to the dukes, but was successively held by the Malatesta and the Sforza families, till in 1458 Pius II. incorporated it with the States of the Church. Fano is the birthplace of Clement VIII. It was there that the first printing press with movable Arabic types was established, in 1514, at the expense of Pope Julius II.

FANSHAWE, Sir Ricnarp (1608-1666), poet and statesman, was the youngest son and tenth child of Sir Henry Fanshawe, remembrancer of the exchequer under James I. He was born early in June 1608, at Wareham Park, Hertfordshire. At the age of seven he lost his father, and was soon placed by his mother under the care of the famous schoolmaster, Thomas Farnabie. In Novem- ber 1623 he was admitted fellow commoner of Jesus College, Cambridge, under Dr Beale. In January 1626 he entered the Middle Temple, but his mother dying soon after, and the study of the law being distasteful to him, he travelled in France and Spain, learning the languages of those countries, and observing the customs of the people, On his return, in 1635, he was appointed secretary to the English embassy at Madrid under Lord Aston, and was

‘resident there until Sir Arthur Hopton’s appointment in

1638. Assoon as the civil war broke out he very pro- minently joined the Royalist party, being at this time on terms of somewhat affectionate intimacy with Charles I. In 1644, being with the court at Oxford, he had the degree of D.C.L. conferred upon him, and the same year he was appointed secretary at war to the prince of Wales, with whom he set out for the western counties, Scilly, and then Jersey. It was during this stormy period that Fan- shawe first appeared as a poet: in 1647 he published his translation of the Pastor Fido of Guarini, the remaining copies of which he re-issued in 1648 with the addition of a number of other poems, original and translated. In 1648 his attention was again directed to public affairs by his appointment as treasurer to the navy under Prince Rupert, which he held till the latter was forced, in 1650, to escape to the West Indies. Fanshawe then proceeded to Paris, where he was created baronet, and sent to Madrid as envoy extraordinary. He was, however, immediately afterwards sent for to Scotland, but was captured on the way at the

battle of Worcester in 1651. He was sent to London, and

kept in such close confinement that his health broke down ; but Cromwell, finding that he was really dangerously ill, allowed him to choose a place of residence, with the proviso that he was not to stir from it more than 5 miles. It was during his captivity that he published, in 1652, his Selected Parts of

Horace, Prince of Lyricks, a very graceful work, in which he keeps as close as possible to the metrical form of the Odes. He chose to retire to Tankerley Park, in

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1 and afterwards wrote them out in a fuller form. Under the encouragement of Mr Dance, he wrote to Sir H. Davy, enclosing these notes. and favourable.” bookbinder till 1st March 1813, when, at the recommenda- tion of Sir H. Davy, he was appointed assistant in the labo-

Yorkshire, the seat of Lord Strafford, and gave himself up entirely to literature. In 1654 he completed translations wf two of the comedies of the Spanish poet Antonio de Mendoza, which were published after his death, in 1671, under the title of Querer per solo querer: to Love only for Love’s Sake, and Fiestas de Aranjuez. But the great labour of his retirement was the translation of the national epic of the Portuguese poet Camoeus. This version of the Lusiad was printed in folio in 1655, with very fine engravings. It is in ottava rima, and there is prefixed to it a translation of the long Latin poem entitled Furor Petroniensis, which forms an episode in the Satyricon. Moreover, in 1658 Fanshawe published a Latin version of the Faithful Shepherdess of Fletcher, and a letter dedicating the unprinted translations of Mendoza’s plays to the queen of Sweden, In February 1659 he broke through his bail, and joined Charles I. at Breda ; he was enthusiastically received and loaded with promises. But when the Restora- tion was complete he did not, to his great disappointment, find himself made secretary of state. In 1661 he repre- sented the university of Cambridge in parliament, and was presently sent out to Portugal as envoy extraordinary ; le was shortly after appointed ambassador to the same court, and negotiated the marriage between Charles IL and the Infanta. At the end of the year he returned to England,

‘only to be sent out as ambassador to Lisbon again in 1662. In 1663 he was recalled to be sworn one of his majesty’s | In the beginning of 1644 he was sent as

privy council. ambassador to Philip IV. of Spain, and arrived at Cadiz in February of that year, to receive such an ovation as no English envoy had

ever before enjoyed. During the whole of 1665 he was engaged in_very delicate diplomatic relations between England, Portugal, and Spain; and in January 1666 he travelled to Lisbon in the endeavour to bring about a peace between the last-men- tioned powers, But he had scarcely returned to Madrid when he was somewhat peremptorily recalled to England. It is not known whether this affected his health, but at all events he fell ill at Madrid, and died there, after a short illness, on the 26th of June 1666. His widow, Lady

Fanshawe, drew up a charming memoir of her husband, | which was first printed in 1829. To this circumstance and. } to his public position we owe the fact that of no poet of | his age do we possess more copious materials for biography |

than of Fanshawe. He was a very tall courtly man, with short curling brown hair, and fine eyes. As an original poet we have very little means of judging his merit: a fine “Ode upon occasion of his Majesty’s Proclamation in 1630,” and some rough, but richly-coloured sonnets, are the best of his own verses which have come down to us. But asa translator he is one of the illustrious figures in our litera-

ture, whether Italian, Latin, Portuguese, or Spanish | His Pastor Fido and his | | conducting wire rotate on its own axis, and in April 1821

attracts his versatile muse. Lusiad have never been surpassed by later scholars. As a verse-writer his chief fault is ruggedness; his active life gave him but scant opportunity for revision, His letters were edited in 1724 and since, but no collected edition of his works has ever been issued.

FARADAY, Micsart, chemist, electrician, and philo- sopher, was born at Newington, Surrey, 22d September 1791, and died at Hampton Court, 25th August 1867, His parents had migrated from Yorkshire to London, where his father worked as a blacksmith, Faraday himself became apprenticed to Mr Riebau, a bookbinder. The letters written to his friend Benjamin Abbott at this time give a lucid account of his aims in life, and of his methods of self-culture, when his mind was beginning to turn to the experimental study of nature. In 1812 Mr Dance, a customer of his master, took him to hear four lectures by Sir Humphry Davy. Faraday took notes of these lectures,

“The reply was immediate, kind, He continued to work as a journeyman

ratory of the Royal Institution of Great Britain. He was appointed director of the laboratory 7th February 1825; and in 1833 he was appointed Fullerian professor of chemistry in the Institution for life, without the obligation to deliver lectures. He thus remained in the Institution for 54 years. He accompanied Sir H. Davy in a tour through France, Italy, Switzerland, Tyrol, Geneva, &c., from October 13, 1813, to April 23, 1815.

Faraday’s earliest chemical work was in the paths opened by Davy, to whom he acted as assistant. He made a special study of chlorine, and discovered two new chlo- rides of carbon. He also made the first rough experiments on the diffusion of gases, a phenomenon first pointed out by Dalton, the physical importance of which has been more fully brought to light by Graham and Loschmidt. He succeeded in liquefying several gases; he investigated the alloys of steel, and produced several new kinds of glass intended for optical purposes. A specimen of one of these heavy glasses afterwards became historically important as the substance in which Faraday detected the rotation of the plane of polarization of light when the glass was placed in the magnetic field, and also as the substance which was first repelled by the poles of the magnet. He also endeavoured with some success to make the general methods of chemistry, as distinguished from its results, the subject of special study and of popular expusitiun. See his work on Chemical Manipulation.

But Faraday’s chemical work, however important in itself, was soon completely overshadowed by his electrical discoveries. ‘The first experiment which he has recorded was the construction of a voltaic pile with seven halfpence, seven disks of sheet zinc, and six pieces of paper moistened with salt water. With this pile he decomposed sul- phate of magnesia (first letter to Abbott, July 12, 1812). Henceforward, whatever other subjects might from tinie to time claim his attention, it was from among electrical phenomena tliat he selected those problems to which he applied the full force of his mind, and which he kept per- sistently in view, even when year after year his attempts to solve them had been baffled.

His first notable discovery was the production of the con- tinuous rotation of magnets and of wires conducting the electric current round each other. _ The consequences de- ducible from the great discovery of Orsted (21st July 1820) were still in 1821 apprehended in a somewhat confused manner even by the foremost men of science. Dr Wollaston indeed had formed the expectation that he could make the

he came with Sir H. Davy to the laboratory of the Royal Tnstitution to make an experiment. Faraday was not there at the time, but coming in afterwards he heard the conversa- tion on the expected rotation of the wire. ,

In July, August, and September of that year Faraday, at the request of Mr Phillips, the editor of the Annals of Philo- sophy, wrote for that journal an historical sketch of electro- magnetism, and he repeated almost all the experiments he described. ‘This led him in the beginning of September to discover the method of producing the continuous relation of the wire round the magnet, and of the magnet round the wire. He did not succeed in making the wire or the magnet revolve on its own axis. This first success of Faraday in electromagnetic research became the occa- sion of the most painful, though unfounded, imputations against his honour, Into these we shall not enter, re-

ferring the reader to the Life of Faraday, by Dr Bence Jones.

We may remark, however, that although the fact of the tangential force between an_ electric current and a magnetic pole was clearly stated by Orsted, and clearly apprehended by Ampére, Wollaston, and others, the realization of the continuous rotation of the wire and the magnet round each other was a scientific puzzle requiring no mean ingenuity for its original solution. or on the one hand the electric current always forms a closed circuit, and on the other the two poles of the magnet have equal but opposite properties, and are inseparably connected, so that whatever tendency there is for one pole to circulate round the current in one direction is opposed by the equal tendency of the other pole to go round the other way, and thus the one pole can neither drag the other round and round the wire nor yet leave it behind. The thing cannot be done unless we adopt in

some form Faraday’s ingenious solution, by causing the current, in some part of its course, to divide into two chaunels, one on each side of the magnet, in such a way that during the revolution of the magnet the current is transferred from the channel in front of the magnet to the channel behind it, so that the middle of the magnet can pass across the current without stopping it, just as Cyrus caused his army to pass dryshod over the Gyndes by divert- ing the river into a channel cut for it in his rear.

We must now go on to the crowning discovery of the in- duction of electric currents,

In December 1824 he had attempted to obtain an electric current by means of a magnet, and on three occasions he had made elaborate but unsuccessful attempts to produce a current in one wire by means of a current in another wire or by a magnet, He still persevered, and on the 29th August 1831 he obtained the first evidence that an electric current can induce another in a different circuit. On September 23 he writes to his friend R. Phillips—* I am busy just now again on electromagnetism, and think I have got hold of a good thing, but can’t say. It may bea weed instead of a fish that, after all my labour, I may at last pull up.” This was his first successful experiment. In nine more days of experimenting he had arrived at the results described in his first series of “¢ Experimental Researches” read to the Royal Society, November 24, 1841.

By the intense application of his mind he had brought the new idea, in less than three months from its first develop- ment, to a state of perfect maturity. The magnitude and originality of Faraday’s achievement may be estimated by tracing the subsequent history of his discovery. As might be expected, it was at once made the subject of investiga- tion by the whole scientific world, but some of the most experienced physicists were unable to avoid mistakes in stating, in what they conceived to be more scientific language than Faraday’s, the phenomena before them. Up to the present time the mathematicians who have rejected Faraday’s method of stating his law as unworthy of the precision of their science have never succeeded in devising any essentially different formula which shall fully express the phenomena without introducing hypotheses about the mutual action of things which

have no physical existence, such as elements of currents which flow out of nothing, then along a wire, and finally sink into nothing again.

After nearly half a century of labour of this kind, we may say that, though the practical applications of Faraday's discovery have increased and are increasing in number and value every year, ho exception to the statement of these laws as given by Faraday has been discovered, no new law has been added to them, and Faraday's original statement remains to this day the only one which asserts no more than can be verified by experiment, and the only one by which

the theory of the phenomena can be expressed in a manner |

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which is exactly and numerically accurate, and at the same time within the range of elementary methods of exposition.

During his first period of discovery, besides the induc- tion of electric currents, Faraday established the identity of the electrification produced in different ways; the law of the definite electrolytic action of the current; and the fact, upon which he laid great stress, that every unit of positive electrification is related in a definite manner to a unit of negative electrification, so that it is impossible to produce what Faraday called "an absolute charge of elec- tricity" of one kind not related to an equal charge of the opposite kind.

He also discovered the difference of the capacities of different substances for taking part in electric induction, a fact which has only in recent years been admitted by con- tinental electricians. It appears, however, from hitherto unpublished papers that Henry Cavendish had before 1773 not only discovered that glass, wax, rosin, and shellac have higher specific inductive capacities than air, but had actu- ally determined the numerical ratios of these capacities, This, of course, was unknown both to Faraday and to all other electricians of his time.

The first period of Faraday's electrical discoveries lasted ten years. In 1841 he found that he required rest, and it was not till 1845 that he entered on his

second great period of research, in which he discovered the effect of magnet- ism on polarized light, and the phenomena of diamagnetism.

Faraday had for a long time kept in view the possibility of using a ray of polarized light as a means of investigating the condition of transparent bodies when acted on by elec- tric and magnetic forces. Dr Bence Jones (Life of Fara- day, vol. i. p. 362) gives the following note from his laboratory book, 10th September 1822 :—

“Polarized a ray of lamp-light by reflexion, and endeavoured to ascertain whether any depolarizing action (was) exerted on it by water placed between the poles of a voltaic battery in a glass cistern; one Wollaston’s trough used; the fluids decomposed were pure water, weak solution of sulphate of soda, and strong sulphuric acid ; none of them had any effect on the polarized light, either when out of or in the voltaic circuit, so that no particular arrange- ment of particles could be ascertained in this way.”

Eleven years afterwards we find another entry in his notebook on 2d May 1833 (Life, by Dr Bence Jones, vol. il. p. 29). He then tried, not only the effect of a steady current, but the effect on making and breaking contact.

**T do not think, therefore, that decomposing solutions or sub- stances will be found to have (as a consequence of decomposition or arrangement for the time) any effect on the polarized ray. Should now try non-decomposing bodies, as solid nitre, nitrate of silver, borax, glass, &c., whilst solid, to see if any internal state induced, which by decomposition is destroyed, 7.e., whether, when they can- not decompose, any state of electrical tension is present. My borate of glass good, and common electricity better than voltaic.”

On May 6 he makes further experiments, and con- cludes—“ Hence I see no reason to expect that any kind of structure or tension can be rendered evident, either in decomposing or non-decomposing bodies, in insulating or conducting states.”

Experiments similar to the last-mentioned have recently been made by Dr Kerr of Glasgow, who considers that he has obtained distinct evidence of action on a ray of polarized light when the electric force is perpendicular to

the ray and inclined 45° to the plane of polarization. Many physicists, however, have found themselves unable to obtain Dr Kerr’s result.

At last, in 1845, Faraday attacked the old problem, but this time with complete success. Before we describe this result we may mention that in 1862 he made the relation between magnetism and light the subject of his very last experimental work. He endeavoured, but in vain, to de- tect any change in the lines of the spectrum of a flame when the flame was acted on by a powerful magnet.

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occasions, he was forced out of the region of science into that of controversy, he stated the facts, and let them make their own way. He was entirely free from pride and un- due self-assertion. always thankfully accepted a correction, and made use of every expedient, however humble, which would make his work more effective in every detail. found his memory failing and his mental powers declining, he gave up, without ostentation or complaint, whatever parts of his work he could no longer carry on according to his own standard of efficiency. able to apply his mind to science, he remained content and happy in the exercise of those kindly feelings and warm

This long series of researches is an instance of his persist- ence. His energy is shown in the way in which he followed up his discovery in the single instance in which he was successful. The first evidence which he obtained of the rotation of the plane of polarization of light under the action of magnetism was on the 13th September 1845, the transparent substance being his own heavy glass.

He began to work on August 30, 1845, on polarized light passing through electrolytes. After three days he worked with common electricity, trying glass, heavy optical glass, quartz, Iceland spar, all without effect, as on former trials. On September 13 he worked with lines of magnetic force. Air, flint, glass, rock-crystal, calcareous spar, were examined but without effect.

‘Heavy glass was experimented with. It gave no effects when the same magnetic poles or the contrary poles were on opposite sides (as respeets the

course of the polarized ray), nor when the same poles were on the same side either with the eonstant or intermitting eurrent. But when contrary magnetie poles were on the same side there was an effect produeed on the polarized ray, and thus magnetic foree and light were proved to have relations to each other. This fact will most likely prove exceedingly fertile, and of great value in the investigation of the eonditions of natural foree."

He immediately goes on to examine other substances, but with "no effect," and he ends by saying, "Have got enough for to-day." On September 18 he "does an excellent day's work." During September he had four days of work, and in October six, and on 6th November he sent in to the Royal Society the nineteenth series of his " Experimental Researches," in which the whole conditions of the pheno- mena are fully specified. The negative rotation in ferro- magnetic media is the only fact of importance which re- mained to be discovered afterwards (by Verdet in 1856).

But his work for the year was not yet over. On November 3 a new horseshoe magnet came home, and Varaday immediately began to experiment on the action in the polarized ray through gases, but with no effect. The following day he repeated an experiment which had given no result on October 6. A bar of heavy glass was sus- pended by silk between the poles of the uew magnet. '¢ When it was arranged, and had come to rest, I found I could affect it by the magnetic forces and give it position." By the 6th December he had sent in to the Royal Society the twentieth, and on 24th December the twenty-first, series of his " Researches," in which the properties of diamagnetic bodies are fully described. Thus these two great dis- coveries were elaborated, like his earlier one, in about three months.

The discovery of the magnetic rotation of the plane of polarized light, though it did not lead to such important practical applications as some of Faraday's earlier dis- coveries, has been of the highest value to science, as furnish- ing complete dynamical evidence that wherever magnetic force exists there is matter, small portions of which are rotating about axes parallel to the direction of that force.

We have given a few examples of the concentration of his efforts in seeking to identify the apparently different forces of nature, of his far-sightedness in selecting subjects for investigation, of his persistence in the pursuit of what

he set before him, of his energy in working out the results of his discoveries, and of the accuracy and completeness with which he made his final statement of the laws of the phenomenon.

These characteristics of his scientific spirit lic on the sur- face of his work, and are manifest to all who read his writings. But there was another side of his character, to the cultivation of which he paid at least as much attention, and which was reserved for his friends, his family, and his church. His letters and his conversation were always full of whatever could awaken a healthy interest, and free from anything that might rouse ill-feeling, When, on rare

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During the growth of his powers he

When at length he

When he was no longer

affections which he had cultivated no less carefully than his scientific powers.

The parents of Faraday belonged to the very small and isolated Christian sect which is commonly called after Robert Sandeman. Faraday himself attended the meetings from childhood; at the age of thirty he made public pro- fession of his faith, and during two different periods he dis- charged the office of elder. His opinion with respect to the relation between his science and his religion is expressed in a lecture on mental education delivered in 1854, and printed at the end of lis Lesearches im Chemistry and Physics.

‘‘ Before entering upon the subject, I must make one distinetion whieh, however it may appear to others, is to me of the utmost importance. High as man is placed above the ereatures around him, there is a higher and far more exalted position within his view ; and the ways are infinite in which he oeeupies his thoughts about the fears, or hopes, or expectations of a future life. I believe that the truth of that future eannot be brought to his

knowledge by any exertion of his mental powers, however exalted they may be ; that it is made known to him by other teaching than his own, and ig reeeived through simple belief of the testimony given. Lect no one suppose for an instant that the self-edueation I am about to eommend, in respeet of the things of this life, extends to any eon- siderations of the hope set before us, as if man by reasoning eould find out God. It would be improper here to enter upon this sub- ject farther than to claim an absolute distinction between religious and ordinary belief. I shall be reproaehed with the weakness of refusing to apply those mental operations whieh I think good in respeet of high things to the very highest. I am eontent to bear the reproach. Yet even in earthly matters I believe that 'the in- visible things of Him from the ereation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead'; and I have never seen anything ineompatible between those things of man whieh can be known by the spirit of man which is within him and those higher things eon- eerning his future, whieh he eannot know by that spirit."

Faraday gives the following note as to this lecture :-—

'* These observations were delivered as a leeture before His Royal Highness the Prince Consort and the members of the Royal Insti- tution on the 6thof May 1854. They are so immediately eonneeted in their nature and origin with my own experimental life, con- sidered either as eause or consequence, that I have thought the elose of this volume not an unfit place for their reproduetion."

As Dr Bence Jones concludes—

" His standard of duty was supernatural. It was not founded on any intuitive ideas of right and wrong, nor was it fashioned upon any outward experiences of time and place, but it was formed entirely on what he held to be the revelation of the will of God in the written word, and throughout all his life his faith led him to aet up to the very letter of it."

Published Works.—Chemical Manipulation, being Instructions to Students in Chemistry, 1 vol., John Murray, Ist edition 1827, 2d 1830, 3d 1842; Experimental Researches in Electricity, vols. i. and ii., Richard and John Edward Taylor, vols. i. and ii., 1844 and 1847 ; vol. iii., 1844; vol. iii,

Richard Taylor and William Francis, 1855 ; Experimental Researches in Chemistry and Physics, Taylor and Franeis, 1859 ; Lectures on the Chemical History of a Candle (edited by W. Crookes), Griffin, Bohn, and Co., 1861; On the Various Forces in Nature (edited by W. Crookes), Chatto and Windus (no date).

Biographies.—Faraday as a Discoverer, by John Tyndall, Long- mans, Ist edition 1868, 2d edition 1870: The Life and Letters of Faraday, by Dr Benee Jones, seeretary of the Royal Institution, in 2 vols., Longmans, 1870; Afichael Faraday, by J. H. Gladstone, Ph. D., F.R.S., Macmillan, 1872. (le, (Chalhig))

FARCE. See Drama.

FAREHAM, a market-town of England, county of Hants, situated at the N.W. extremity of Portsmouth harbour, 73 miles by road and 84 by the South-Western Railway from London. The town consists chiefly of one wide street, and during the summer months is much resorted to for sea-bathing. It has a handsome assembly-room and other con- veniences requisite for such places. The principal indus- tries are the manufacture of sackings, ropes, coarse earthen- ware, terra-cotta, tobacco pipes, and leather. Fareham has a considerable trade in corn, timber, and coal. The popu- lation in 1871 was 7023.

FAREL, Guiniaume (1489-1565), a celebrated French Reformer, was born near Gap in Dauphiny in 1489. He

was of noble descent, and it was the wish of his parents | | by Calvin in all important matters.

that he should adopt the military profession, but tlie pur- suit of knowledge proved so attractive to him that he char- acteristically determined to have his own way, and succeeded in obtaining permission to enter the university of Paris. Here he became the intimate friend of Jacobus Faber (Stapulensis), from whom in all probability he imbibed his first doubts regarding many of the usages and customs of the Roman Catholic Church. Through the

introduction of Faber he was appointed professor to the college of Cardinal Lemoine, but not long afterwards, on the invita- tion of Bishop Brigonnet, he went to Meaux to assist Faber and others in preaching the doctrine of the Refor- mation. He was, however, compelled to leave France by the outbreak of the persecution of 1523, and went to Basel, where, in 1524, he defended the Reformation doc- trines in a public disputation with great ability, but with such acrimonious keenness that Erasmus sided with the opponents of the Reformation in requiring his expulsion from the city. From Basel he went to Strasburg, and thence, on the invitation of the duke of Wiirtemberg, to Montbéliard, where he preached for a time with great suc- cess ; but since, as usual, he forgot to temper his zeal with discretion, he was compelled to leave the town in the spring of 1525. He shortly afterwards began his Reformation crusade at Aigle in Switzerland, and notwithstanding the strenuous opposition of the monks, he, in 1528, obtained permission from the authorities to preach in any place within the canton of Bern. He also extended his itiner- acies to the cantons of Neufchatel and Vaud, and although often seriously maltreated by the mobs whom he provoked

by his violent invectives, continued his crusade in these }

districts with unabated zeal till 1531, when increasing manifestations of hostility rendered it imperative that he should seek another sphere for his labours. In that year, accordingly, he paid a short visit to the Waldenses, after which he went to Geneva, where he began to hold meetings of the Reformers in his private house. On this account he was summoned to appear before the bishop’s vicar, and after being frequently insulted and threatened, during the progress of his trial, by the monks and canons, who drowned his defence by their clamour, he was rudely and violently pushed out of the court, and was commanded to leave the town within three hours. Escaping with great difficulty from the fury of his opponents, he went by sea to Orbe. In 1533, however, he returned to Geneva under the protection of the Government of Bern, and so successful were his sermons and_ his public disputations that in

August 1535 the town renounced the authority of the pope, |

and the simple worship of the Reformation was instituted in the churches. About this time Calvin visited Geneva and Farel—whose superabounding zeal seems to have exer- cised a kind of spell over the calmer spirit of the great theologian—prevailed on him to give up all thoughts of a life of quiet study, and to devote himself to the cause of the Reformation in Geneva, Leaving Geneva to

‘ between him and Calvin.

FAR—FAR

the eare of Calvin, Farel returned to his work of itinerant preaching, chiefly in Neufchatel, where, although the violent hostility of the priests and women showed no signs of diminution, he attracted large audiences, and gained a considerable number of adherents. At intervals he visited Geneva, over whose ecclesiastical affairs he seenis to have exercised a kind of supervision; but the strictness of his doctrines and discipline gradually provoked the opposition of many of the inhabitants, and in 1538 he and Calvin were banished from the town. Farel went to Strasburg, and afterwards, in 1542, to Metz, where he laboured with

| his usual energy and want of discretion, and with the

usual mingled results. In 1541 Calvin was permitted to return to Geneva, and although Farel visited the town only at long intervals, he seems to have been consulted When the trial of Servetus was in progress Farel was earnestly entreated by Calvin to be present before the case was finally de- cided, but he did not arrive until after the sentence of condemnation had been passed. He, however, accom- panied the unhappy man to the place of execution, and continued until the last moment his exhortations to him to renouuce his errors. About 1558 Farel married a young girl, and the marriage was the occasion of a quarrel Farel continued his labours with unabated zeal and vigour till 1565. In that year he visited Metz, where he had an euthusiastic reception, and preached with alk his old fire and eloquence; but

after returning to.the house where he was residing, he | was overpowered by exhaustion, from which he never | rallied, dying on the 13th September.

Farel wrote a con- siderable number of works, but as these were all thrown

off in haste, and merely for a temporary purpose, it is

scarcely fair to make them the criterion by which to esti- mate his powers as a thinker or theologian. His nature

| was, however, rather practical than meditative, the most remarkable features of his character being his dauntlessness

and his untiring energy and zeal, in which respects he is perhaps to be ranked second to none of the Reformers with tle exception of Luther, if he is to be considered second even to him. He possessed all but the greatest qualities of an orator, a sonorous and tuneful voice, appropriate gesture, fluency of language, and passionate earnestness. But although seldom failing to awaken the attention and interest of his large audiences, he often, by imprudent torrents of denunciation aroused against his doctrines un- necessary opposition; and it would be difficult to determiue

| whether, on the whole, the cause of the Reformation gained

or: lost by his advocacy. A monument to Farel was un- veiled at Neufchatel on the 4th of May k876.

See Ancillon, Vie de Gutllawme Farel, Amster. 1691 ; Kirchhofer, Das Leben Wilhelm Farel's, 2 vols., Zurich, 1831-33 ; Schmidt,

| Etudes sur Farel, Stras. 1834; and Schmidt, Wilhelm Farel and

Peter Viret, Elberfeld, 1860. FARIA Y SOUSA, Manor DE (1590-1649), a Spanish

and Portuguese historian and poet, was born of an ancient Portuguese family, probably at Pombiero, attended for

| several years at the university of Braga, and when about

fourteen entered the service of the bishop of Oporto. With the exception of about four years (1630-1634), during which he held the post of ambassador

to the papal court, the greater part of his later life was spent at Madrid, and there he died, after long-continued sufferings, on 3d June 1649. He was a laborious, peaceful man; and a

| happy marriage with Catharina Machado, the Albania of

his poems, enabled him to lead a studious domestic life, dividing his cares and affections between his children and his books. His first important work, an Epitome de las historias Portuguezas, Madrid, 1628, was favourably received ; but some passages in his enormous Commentary

on the Lusiad (2 vols., Madrid, 1839) excited the suspicion | Godlandd, where it receives the waters of the Jamuna or

of the inquisitors, caused his temporary incarceration, and led to the permanent loss of his official salary. In spite of the enthusiasm which is said to have prescribed to him the daily task of twelve folio pages, death overtook him before he had completed his greatest enterprise—a history of the Portuguese in all parts of the world. Several portions of the work appeared at Lisbon posthumously, under the editorship of Captain Faria y Sousa:—Huropa Portugueza, 1667, 3 vols. ; Asia Portugueza, 1666, 1674, and 1675, 3 vols.; Africa Portugueza, 1681. As a poet Faria y Sousa was nearly as prolific; but his poems are vitiated by the prevailing Gongorism of his time. They were for the most part collected in the Fuente de Aganipe, of which four volumes were published at Madrid in 1644-46. A series of ‘‘ Moral Dialogues,” as the author intended to have called them, obtained from the publisher the fantastic title of the “Brilliant Nights ”—Voches Claras, Primera Parte,

1624.

FARIDKOT, a feudatory state of North-Western India, under the political superintendency of the government of the Punjab, situated between 30° 40’ and 30° 56’N. lat., and between 74° 22’ and 75° 9’ E. long, It is bounded on

the W. and N.E. by the British district of Firozpur, and on the S. by Nabha State. Area, 600 square miles ; estimated population, 68,000; estimated revenue, £30,000. The raja's military force consists of 200 cavalry, 600 infantry and police, and 3 field guns, During the Sikh wars in 1845 the chief exerted himelf in the English cause, and was rewarded with the title of Raj& and an in- crease of territory. In the mutiny of 1857, too, he did good service by guarding the Sutlej ferries, and in attack- ing a notorious rebel, whose stronghold he destroyed.

FARIDPUR, or FurreEppore, a district of British India, in the Dacca division of Bengal, lies in 22° 47' 53" —23° 54' 55" N. lat., and in 89° 21' 50"—90° 16' 0" E. long. It is bounded on the N. and E. by the Ganges or Padma river, separating it from Pubna and Dacca districts; on the W. by the Chandn4 and Madhumati rivers, separating it from Jessor; and on the §S, by Bikarganj. The general aspect of the district is flat, tame, and uninteresting, although in the northern tract the land is comparatively high, with a light sandy soil, covered with water during the rainy season, but dry during the cold aud hot weather. From the town of Faridpur the ground slopes, until in the south, on the con- fines of Békarganj, it becomes one immense swamp, never entirely dry. During the height of the inundations the whole district. may be said to be under water. The villages are built on artificially raised sites, or the high banks of the deltaic streams, Along many of the larger rivers the line of hamlets is unbroken for miles together, so that it is difficult to say where one ends and another begins. The huts, however, except in markets and bazaars, are seldom close together, but are scattered amidst small garden plots, and groves of mango, date, and betel-nut trees, The platns between the villages are almost invariably more or less depressed towards the centre, where usually a marsh, or lake, or deep lagoon is found. These marshes, how- ever, are gradually filling up by the silt deposited from the rivers ; in the north of the district there now only remain two or three large swamps, and in them the process may be seen guing on. The climate of Farfdpur is damp, like that of the other districts of Eastern Bengal; the average annual rainfall is 85°42 inches, and the average mean temperature 76°9° F.

The principal rivers of Faridpur are the Ganges, the Arial Khan, and the Madhumati. The Ganges, or Padmé as it is locally called, touches the

extreme north-west corner of the district, flows along its northern boundary as far as

of the district.

main stream of the Brahmaputra, and whence the united stream turns southwards and forms the eastern boundary At the confluence of the two great rivers, the current is so strong, and the eddies and whirlpools so numerous, that the most powerful river steamers proceeding up stream during the flood season are often unable to make headway, and have to lie for days at Godlanda point until the river subsides. The Padmé is navigable by the largest cargo boats and river steamers throughout the year, its channel being estimated at an average of 1600 yards. The Arial Khan is the principal branch of the Padma. It takes off from the right bank of the parent stream a few miles

‘below Faridpur town, and runs a south-easterly and

southerly course till it leaves the district and flows into Bakarganj. The river is navigable by large cargo boats throughout the year, and has an average breadth during the rainy season of 1600 yards. The third great water channel is the Madhumati (a continuation of the Garai branch of the Padma), which forms the western boundary of the dis- trict. These rivers, but particularly the Padmé, are subject to constant alluvial changes on a large scale, and to re- peated alterations in their course.

Rice, the great crop of the district, is divided into four distinct species, each with many minor varieties These are—the aman or winter rice, which forms the prin- cipal harvest, and is the great staple of export; the dus or autumn rice ; and the spring boro and réda rice, both grown in swamps and deep water, and forming the common food

_of the people. The other cereal crops are wheat, barley, oats,

and Indian corn; pulses, oilseeds, vegetables, fibres, sugar cane, date palms, indigo, safflower, betel-leaf, comprise the remaining important agricultural products. The area of the district, prior to recent changes of boundary, was 1506 square miles, of which 1143 were returned in 1871 as under

cultivation, 133 as uncultivated but capable of till- age, and 230 as uncultivable. More than one-half of the whole cultivated area is under rice. The only natural calamity to which the district is subject to any serious ex-tent arises from floods, which occasionally cause a general destruction of the crops. The three principal lines of road in Farfdpur are the Calcutta and Jessor imperial road, 19 miles in length ; Faridpur and Kalinagar road, 16 miles ; Faridpur and Télma road, 10 miles. The Eastern Bengal Railway runs for 22 miles from west to east through the north of the district, having its terminus at Godlanda, at the junction of the Padma and Jamuna rivers.

The census of 1872 showed a population of 1,012,589, 497,854 males and 514,735 females, inhabiting 2307 villages and 157,518 houses. The Mahometans number 588,299, or 58°1 per cent. of the whole; the Hindus, 420,988, or 41°6 per cent. ; Christians, 463 ; and ‘‘others,” 2839. The material condition of the population has considerably improved of late years, owing to the increase of tillage and the general rise in prices of agricultural products. Two towns contain a population exceeding 5000, viz. —(1) Faridpur, the chief town and administrative headquarters of the district : population in 1872, 8598; municipal revenue, £319, 3s. 7d. ; expenditure, £213, 19s. 2d. ; and (2) Sayyidpur : population, 6324 ; municipal revenue, £91, 4s. 9d. ; expenditure, £136, 3s. 2d. The other towns or villages of importance as places of trade are—Bhanga, on the Kumar ; Gopalganj, on the Madhumati; Bodlmari, on the Barasia ; Madhukhali and Betangd, on the Chandn4; Kanaipur, on the Kumar; and Goalanda, on the Padma,

The district has rapidly advanced in prosperity under British administration, especially of late years. In 1844-45 the total net revenue amounted to £9616, and the cxpenditure to £6004; in 1870-71 the net revenue was £58,868, and the expenditure £25,013. The land revenue, which in 1850 amounted to £3803 paid by 448 proprietors, had increased in 1870-71 to £27,263, derived from 3126 proprietors. The regular police force consisted in 1871 of 341 officers and men, costing £6425. A small municipal force of 20 men is kept up in the municipal towns of Faridpur and Sayyidpur. The rural police consisted in 1871 of 2026 men, and cost £7658, contributed by the landholders and villages. The schools in 1872-78 numbered 176, with 6497 pupils.

FARINA, or Porto Farina, a town of the regency of Tunis, at the mouth of the Madjerda (the ancient Bagradas), about 15 miles E. of Bizerta or Binzert. It lies in a very fruitiful district, and was at one time the naval arsenal of Tunis; but its harbour has become very shallow, in all probability by the elevation of the coast, and its importance has consequently declined. The ruins on the west side of the river are identified with the ancient Utica. Quicksilver is obtained from the neighbouring pro- montory. Population about 9000. ;

FARINATO, Paoto (1522-1606), a painter and archi- tect, was a native of Verona. He is sometimes named Farinato degli Uberti, as he came from the ancient Floren- tine stock to which the Ghibelline leader Farinata degli Uberti, celebrated in Dante's Commedia, belonged. He flourished at the same time that the art of Verona obtained its greatest lustre in the works of Paolo Cagliari (Paul Veronese), succeeded by other members of the Cagliari family, of whom most or all were outlived by Farinato. He was instructed by Niccold Giolfino, and probably by Antonio Badile and Brusasorci. Proceeding to Venice, he formed his style partly on Titian and Giorgione, though he was never conspicuous as a colourist, and in form he learned more from the works of Giulio Romano. His nude figures show knowledge of the antique ; he affected a bronzed tone in the complexions, harmonizing with the general gravity of his colour, which is more laudable in fresco than in oil-painting. Vasari praised his thronged compositions and merit of draughtsmanship. His works are to be found, not only in Venice and principally in Verona, but also in Mantua, Padua, and other towns belonging or adjacent to the Venetian territory. He was a prosperous and light-hearted man, and continually pro- gressed in his art, passing from a comparatively dry manner into a larger and bolder one, with much attraction of drapery and of landscape. The Miracle of the Loaves and Fishes, painted in the church of 8. Giorgio in Verona, is accounted his masterpiece; it was executed at the advanced age of seventy-nine, and is of course replete with ficures, comprising those of the painter's own family. A saloon was painted by him in 8. Maria in Organo, in the same city, with the subjects of Michael

expelling Lucifer, and the Massacre of the Innocents; in Piacenza is a St Sixtus ; in the Berlin gallery a Presentation in the Temple ; and in the communal gallery of Verona one of his prime works, the Marriage of St Catherine. Farinato executed some sculptures, and various etchings of sacred and mytho- logic subjects; his works of all kinds were much in request, including the wax models which he wrought as studies for his painted figures. He is said to have died at the same hour as his wife. His sun Orazio was also a painter of merit.

FARINELLI (1705-1782), whose real name was Carto Broscul, one of the most extraordinary singers that ever lived, was born January 24, 1705, at Naples (Burney), or according to Sacchi, his biographer, at Andria. Having been prepared for the career of a sopranist, he soon acquired a voice the beauty of which has never been sur- passed, under the instruction of the celebrated Porpora. He became famous, while yet a boy, throughout southern Italy, where he was usually called a ragazzo ; and in 1722

Rome, where he created the greatest astonishment by vying with a celebrated German trumpet-player in holding and swelling a note of prodigious length and power. In 1724 he appeared at Vienna, and at Venice in the following year, and returned to Naples shortly afterwards. He sang at Milan in 1726, and in 1727 at Bologna, where he met for the first time the great artist, Bernacchi, to whose instruction he was indebted for some of his subsequent improvement After revisiting Vienna, Farinelli, with ever-increasing suc-

cess and fame, appeared in nearly all the great cities of Italy ; and he returned a third time to Vienna in 1731. Here he received from Charles VI. a piece of sound criti- cism and kindly advice, which led him to acquire a pathos in his singing which he had not till then possessed, hav- ing hitherto always adhered to the florid, bravura style, peculiar to the school of Porpora. After making another tour of the Italian cities he came to London in 1734, arriving here in time to lend his powerful support to the faction which had just set up an opposition to Handel ; but not even his aid could make the undertaking successful, though he was assisted by Porpora and the celebrated Senesino. Having spent three years in England, Fari- nelli,

loaded with presents, set out for Spain, staying a few months by the way in France, where he sang before Louis XV., and was rewarded with a handsome snuff-box containing the king's portrait set in diamonds, and 500 louis d'or. In Spain, where he had only meant to stay a few months, he ended by passing nearly twenty-five years. His voice, used by the queen to cure Philip V. of his melancholy madness, acquired for him, through the success of the treatment, an influence with that prince which gave him eventually the power, if not the name, of prime minister. This power he was wise and modest enough to use dis- creetly; and he always conciliated the enemies whom his favour raised up against him. He had, however, to pay for his position a price which to every artist must seem too heavy,—that of singing night after night to the king the same six songs, and never anything else. Under Ferdinand VI. he held the same place, and was decorated with the cross of Calatrava. He utilized his ascendeucy over this king by persuading him to establish an Italian opera. While at Madrid he heard of the death of Bernacchi, of whom he speaks in terms of affection and esteem in an extant letter addressed to the Padre Martini. Returning to Bologna, Farinelli speut the remainder of his days there in a melancholy splendour, and died July 15, 1782, aged 77. His voice was of large compass, possessing seven or eight notes more than those of ordinary singers, and was sonorous, equal, and clear; and he also possessed a great knowledge of music.

FARINI, Lutc1 Carto (1812-1866), an Italian physician, statesman, and historian, was born at Russi in Ravenna, 22d October 1812, After completing a brilliant university course at Bologna, he practised as a physician at Ravenna and at Russi. By his successful treatment of various diseases, and his communications to the Bolognese Bollet- tino delle scienze mediche and other scientific journals, he soon acquired a considerable reputation, but in 1843 his political opinions brought him under the suspicion of the police, and caused his expulsion from the Papal States. He then resided successively at Marseilles, Paris, Florence, and Turin, taking advantage of the facilt- ties afforded him in each place to perfect his medical skill ; but by the amnesty granted by Pius 1X. on the 16th July 1846 he was permitted to return to the States, and he received soon afterwards the professorship of clinical sur- gery at Osimo. In 1845 he

published a pamphlet on the cultivation of rice in Italy. In 1847 he was induced to take advantage of an opportunity which then presented itself of

a : , | entering political life, and became under secretary of state he made his début in “Eomene,”’ written by his master, at ee og . ry >

holding office, however, for little more than a month, since, along with his colleagues, he disapproved of the policy of the pope in siding with Austria against the Italian states. Elected in 1848 member of the reformed parliament for Faenza, he was named director general of health and prisons, but refusing to adhere to the proclamation of a republic, he resigned the office in February 1849, and passed into Tuscany. When the French army entered Rome in the following July he resumed his office, but the triumvirate of

| cardinals who governed in the name of the pope having

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compelled him, soon after his return, to go again into exile, he took up his residence at Turin, where he published a satirical paper Za Frusta, contributed to the Risorgumento, and wrote the first part of his chief historical work Storia dello stato Romano dal anno 1815 al 1850, which he pub- lished in 1850. In the same year he was named by the Sardinian Government member of the upper council of health; and in 1851 he was appointed minister of public instruction, an office which he held till May 1852. Asa member of the Sardinian parliament, and as proprietor and

editor of a political journal, 72 Piemonte, Farini was one of the most influential supporters of the policy of Cavour, and in 1859 he was sent by the latter on a political mission to Parma and Modena. On tlhe flight of the duke of Modena in June 1859, Farini was entrusted with the pro- visional government of the town, in which capacity he negotiated the annexation of the duchy to Piedmont. The same year saw the publication of the second volume of his Storia. In June 1860 he was named by Cavour minister of the interior, but resigned the office on the death of Cavour in June of the following year. On the 8th December 1862 he succeeded Rattazzi as president of the cabinet, in which office he endeavoured to carry out the

policy inaugurated by Cavour. Over-exertion, however, brought on softening of the brain, which compelled him to resign his office 24th March 1863, and ultimately resulted in his death at Quarto, near Genoa, lst August 1866. His remains, originally buried at Turin, were in 1878 removed to his native town of Russi, and monuments to his memory have been erected both there and at Ravenna.

Several letters addressed by Farini to Mr Gladstone and Lord John Russell, on the affairs of Italy, were reprinted in the appendix to a Mémoire sur les Affaires d' Italie, 1859, and a collection of his political correspondence was published at Parisin 1860, under the

title Lettres sur les Affaires d'Italie. His historical work was 'translated into English, the first part by Mr Gladstone, and the second by a lady under his superintendence. A French translation of the work appeared in 1862. See Ettori Parri, Luigi Carlo Farini: Commemorazione, Rome, 1878.

FARMER, Hveu (1714-1787), an English theologian, was born in the neighbourhood of Shrewsbury in 1714. About 1730 he entered the theological academy at North- ampton taught by Dr Doddridge, and on completing his studies he was appointed to a charge at Walthamstow in Essex, officiating at the same time as chaplain to a wealthy gentleman in the neighbourhood in whose house he lived. He soon, however, resigned his chaplaincy, and took up his residence in the house of another member of his congrega- tion, where he continued to live till his removal to London in 1761, on his acceptance of an invitation to become the afternoon preacher at Salter's Hall. There he was also soon afterwards appointed one of the Tuesday lecturers. He died 5th February 1787.

His first work of importance was published in 1761, under the title of An Inquiry into the Nature and Design of our Lord's Tempta- tion in the Wilderness, and was designed to prove that the tempta- tion of Jesus took place only in vision, and was a prefiguration of his future life and ministry. In 1771 appeared his Dissertation on Miraeles, designed to show that they are Arguments of a Divine Interposition, and absolute Proofs of the Mission and Doctrine of a Prophet. 1n1775 he published an Essay on the Demoniacs of the New Testament, and in 1783 a treatise entitled The General Pre-

valence of the Worship of Human Spirits ia the Ancient Heathen Nations asserted and proved. See Memoirs of Hugh Farmer, edited

by Michael Dodson, 1804. ©

FARMER, Ricuarp, (1735-1797), the Shakespearian cominentator, was born at Leicester in 1735. He was educated first at the free grammar school of his native town, and afterwards at Emmanuel College, Cambridge, of which in 1760 he became classical tutor, and in 1775 master, in succession to Dr Richardson, the biographer of | the English bishops. In the latter year also he was | appointed vice-chancellor, and three years afterwards chief

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librarian of the university. In 1780 he was appointed to a prebendal stall in Lichfield, and in about two years more to one at Canterbury ; but the second office he exchanged in 1788 for that of a canon residentiary of St Paul's. Cam- bridge, where he usually resided, was indebted to him for improvements in lighting, paving, and watching ; but per- haps London and the nation have less reason to be grateful for his zealous advocacy of the custom of erecting monu- ments to departed worthies in St Paul's. In 1765 he issued a prospectus for a history of the town of Leicester; but this work, based on materials collected by Thomas Staveley, he never even began; it was finished by the learned printer John Nichols. In the year after the publi- cation of his Leicester "' proposal" he gave to the world his famous Essay on the learning of Shakespeare, in which he proved that the bard's acquaintance with ancient and modern Continental literature was exclusively derived from transla- tions, of which he copied even the blunders. "Shakespeare," he said, " wanted not the stilts of language to raise him above all other men." 'He came out of nature's hand, like Pallas out of Jove's head, at full growth and mature." 'One might," he said—by way of ridiculing the Shakespearian criticism of the day—' with equal wisdom, study the Talmud for an exposition of Ziistram Shandy." For wealth of information, terseness of language, and force of demonstration, the essay is unsurpassed by any work of the kind. It fully justifies the author's description of himself in the preface to the second edition, ''I may consider myself as the pioneer of the commentators ;] have removed a deal of learned rubbish, and pointed out to them Shake- speare's track in the ever

pleasant paths of nature.” Farmer died at Cambridge on the 8th September 1797. He was, it appears, twice offered a bishopric by Pitt, but declined the preferment. From all that is known of him it may be inferred that Farmer’s habits of life were scarcely com- patible with episcopal reserve and dignity. He has been described as being more of a boon companion than a clergy-man; and for a clergyman, he was too intimate with the play-house, on Shakespearian occasions especially.

For details of Farmer’s life sce the Literary Anecdotes, &c., of John Nichols.

FARNABIE, or Farnapy, Tuomas (1575-1647), grammarian, classical commentator, and one of the most noted schoolmasters of his day, was a native of London. He was the son of a carpenter; his grandfather, it is said, had been mayor of Truro, and his grandfather an Italian musician. Between 1590 and 1595 he appears successively as a student of Merton, a pupil in a Jesuit college in Spain, and a follower of Drake and Hawkins during their expedi- tion in the last-named year. After some inilitary service in the Low Countries, “ he made shift,” says Wood, “ to be set on shore in the western part of England; where, after some wandering to and fro under the name of Tho. Bainrafe, the anagram of his surname, he settled at Martock, in Somersetshire, and taught the grammar school there for some time with good success. After he had gotten some feathers at Martock, he took his flight to London,” and opened aschool in Goldsmith’s Rents, Cripplegate. From this school, which contained as many as 300 pupils, there issued, says the same authority, ‘more churchmen and statesmen than from any school taught by one man in England.” In the course of his London career “he was made master of arts of Cambridge, and soon afterwards incor- porated at Oxon.” Such was his pecuniary success in the metropolis that he was enabled to buy an estate at Otford near Sevenoaks, Kent, to which he retired from London in the year 1636, still, however, carrying on his profession of schoolmaster, his pupils, it appears, being all, or nearly all, boarders—the sons of noblemen and gentlemen. In course

of time he increased his property at Otford, and bought

another estate near Horsham in Sussex. In politics he was a Royalist ; and it was in consequence of his suspected par- ticipation in the rising near Tunbridge, 1643, that the par- liament discussed a proposal for his banishment to America, and eventually imprisoned him in Ely House, Holborn. He died in June 1647. ‘These details of his life were derived, by Anthony & Wood, from Francis, Farnabie’s son by bis second wife, who was the daughter of Dr Howson, bishop of Durham. His works chiefly consisted of annu- tated editions of Juvenal, Persius, Seneca, Martial, Lucan, Virgil, Ovid, and Terence. His Systema Grammaticum was published in London in 1641. On 6th April 1632 Farnabie was presented with a royal patent granting him, for the space of twenty-one years, the sole right of printing and publishing certain of his works.

FARNESE, the name of a noble Italian house, to which belonged Pope Paul ITI., the celebrated Elizabeth, wife of Philip V. of Spain, and a long line of princes of Parma, including the great governor of the Netherlands. The first member of the family known in history was Ranuccio Farnese, a successful general of the church, who held the papal fiefs of Farnese and Montalto in the 13th century. Several of his decendants also fought with distinction in the armies of the Holy See, and others allied themselves with Florence, Venice, Siena, and other states, among whom may be mentioned Pietro Farnese, who led the Florentines to victory over Pisa in the middle of the 14th century. The historical importance of the Farnesi dates, however, from the accession of Alessandro Farnese to the papal throne as Paul III. Through his unblushing nepotism the dignity and domains of the family were greatly enlarged. For its aggrandisement the fiefs of Parma and Piacenza, Castro, and Camerino were alienated from the papacy; the marquisate of Novara was obtained from Charles V.; and marriages were arranged which allied it with the royal houses of Spain and France.

PrerLvuicr Farnese (1493-1547), born in 1493, was the natural son of Pope Paul III., who appointed him gon- faloniere, or captain-general of the armies of the church, created him sovereign duke of Parma and Piacenza, and obtained for him the much coveted dignity of patrician of Venice. His character was shamelessly vicious and tyrannical. He deprived his nobles of their most dearly cherished privileges, forbade them to maintain armed re- tainers, and forced them, on pain of confiscation, to leave their estates and

reside in the towns. His cruelty appeared in his ruthless massacre of the people of Perugia, who had revolted against his father; and his uncontrollable passion in the outrage he committed against the bishop of Fano. At length a conspiracy against him was formed among his own subjects, assisted by Ferrante Gonzago, the imperial governor of Milan, and he was assassinated in his palace. His body was flung from the window, and dragged by the mob in triumph through the streets, Sep- tember 10, 1547. (See Affo, Vita Pierluigi Farnese.)

Pierluigi had several children, for all of whom Paul made a careful and generous provision. The eldest, Ales- sandro Farnese (1519-1589), was, while a mere child created bishop of Parma by Clement VIl., and he wae only fourteen when his grandfather, Paul III., appointed him cardinal, He was a man of learning, and of artistic tastes. It was he who completed the Farnese palace. He ee spinel the diplomatic ability which appeared

ural to his family, as papal envoy to Germany, France and the Low Countries. Orazio, the third son of Bienbetigts Paul created duke of Castro, and married to Diana. n tural daughter of H ; lesilliits

g enry II. of France. His fourth son, Ranuccio 2 made a gesinal when fourteen years of age. ;

TTAVIO FARNE 20- : P ss ec ee 0-86), the second son and suc- g), orm in 1520, The marquisate of

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Novara was obtained for him as an imperial fief by his grandfather Paul III., in pursuance of whose policy he was . married at twelve years of age to Margaret of Austria (see MARGARET OF PaRMmA), daughter of Charles V., and widow of the debauched Alessandro de’ Medici. She was then twenty, and not unnaturally looked with dislike upon the boy bridegroom to whom she was compelled to unite herself. For several years she refused to live with him; but after his return, wounded, from the expedition into Barbary, in which he had fought bravely under her father, her aversion

seems to have entirely disappeared. But a life of activity and indepeudence was best suited to her character, and in 1559 she again separated from him, being appointed governor of the Netherlands, which she rnled with mascu- line resolution for eight years. Besides taking part in the expedition to Barbary, Ottavio also fought for Charles, at the head of the Italian auxiliaries, against the Protestants of Germany. He was twenty-seven when, by the murder of his father, he became duke of Parma. Piacenza was held by the imperialist troops which had seized it; and the means to be used for its recovery became the subject of a quarrel be- tween the pope and Ottavio, who wassupported by his brother Cardinal Alessandro. In consequence, Paul commanded the governor of Parma, Camillo Orsino, to refuse admittance to his grandson. Ottavio retaliated byan unsuccessful attack upon Parma, and even appealed to his enemy the emperor for assistance. The death of Paul, hastened by vexation at this unnatural rebellion, quickly followed ; and Julius III, under the influence of the two cardinals Farnese, restored Parma to Ottavio. His quarrel with the emperor, however, was not atan end; and in 1551, having formed an alliance with Henry II. of France, he was driven from his fiefs by the imperial party. But it was not long before the influence of his wife obtained his restoration. The rest of his life was spent peacefully at home, and the moderation of his government earned for him the affection of his people. He died in 1586, and was succeeded by his son, Alessandro Farnese, the great servant of Philip II., noticed separately below.

Ranuccio Farnese (1569-1622), born in 1569, was the son of the famous Alessandro Farnese, prince of Parma, under whom he served for some time in the Low Countries. His gloomy pride and his avarice rendered him unpopular, and his suspicious temper led him into several acts of atrocious cruelty. On the birth of a legitimate heir, he placed his bastard son, whom he had formerly intended to make his successor, in strict confinement, in which the young man soon died; and on the charge of being impli- cated in a conspiracy, in the real existence of which few believed, he beheaded several of his nobles, confiscated their estates, and hanged numbers of their retainers. He had, however, some taste for art ; and he built a fine theatre at Parma on the model of the ancient Roman theatres. He died in 1622. His son Odoardo (1612-46) fought in alliance with France against Spain. His failure to pay the interest of the money he had borrowed at Rome, and the

desire of the pope to obtain the duchy of Castro for his relatives, the Barberini, gave rise to a war with Urban VIII. Odoardo's successor, Ranuccio, was also engaged in war with the Holy See; and, during his reign, Innocent, taking advantage of his weakness, and using as pretext the murder of the bishop of Castro, razed that town.

In 1731 the male line of Farnese became extinct by the death of Antonio Farnese. But Antonio's daughter, Eliza- beth Farnese (noticed below), was the queen of Philip V. of Spain, and through her efforts her sons succeeded to the Farnese fiefs, the duchy of Castro being secured to Don Philippo by the treaty of Aix-la-Chapelle (1748), and the rest falling to the share of Don Carlos (at that time king of Naples and Sicily, afterwards king of Spain),

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together with the splendid family property in Rome—the Palazzo Farnese and the Farnese gardens. A large part of the Farnese art collection—iucluding the Hercules, the Bull, and the Flora—was removed to the museum at Naples. The Neapolitan court resided in the Farnese palace for many years. In 1861 the Farnese gardens, which belonged to the pope, and had been held in fee by the king of Naples, were bought by Napoleon III. from Francis Il. for 250,000 francs, aud they now belong to the Italian Government, which bought them in 1870 for 650,000 francs. See RoME. :

FARNESE, Atexanver, Pope Paul III. See Pavt III.

FARNESE, Auexanper (1546-1592), prince of Parma, the famous governor of tle Low Countries, was born most probably about 1546. He was the son of Ottavio Farnese, prince of Parma, and the celebrated Margaret of Austria, natural daughter of Charles V. His boyhood he spent at Alcala and Madrid, having as companions his ill-fated cousin Don Carlos and his uncle Don John of Austria, who were both about the same age as him- self. His chief delight was in martial exercises, and his passionate ambition was for warlike glory. At eleven years of age he earnestly begged leave to join the expedition which fought at St Quentin, and wept bitterly when his request was refused. He had, indeed, a love for fighting for its own sake. During the wearisome inac- tivity of his residence at Brussels with his mother, whose abilities and masculine force of character had led to her appointment as

governor of the Low Countries, it was his nightly amusement to saunter in disguise through the streets and challenge any cavalier of martial appearance whom he met. As a young man he was extremely un- popular among the Netherlanders; men said that he was nothing but a coxcomb and a bravo. He treated even the nobility with the most insolent arrogance. When he honoured them with an invitation to dinner, he sat for the most part silent at the head of the table, and placed his guests below the salt. During his stay at Brussels, on the 18th November 1565, his marriage with that wonderful paragon of propriety, Donna Maria of Portugal, was cele- brated with great splendour and at prodigious expense.

At length, after years of impatient waiting, his passion- ate longing for military glory could no longer be repressed, and in 1571 he gained his first laurels by brilliant personal bravery in the battle of Lepanto. It was seven years before he had an opportunity of proving his splendid ability as a general. In the end of 1577 he was placed in command of the reinforcements sent to Don John, and it was mainly his prompt decision at a critical moment which secured the victory of Gemblours (1578). His abilities were now recognized by his master Philip II., and on the death of Don John, he was appointed governor of the Netherlands.

This position, beset on every hand with difficulties up- parently insuperable, was exactly that which afforded the best opportunity for the display of his remarkable talents and character. He gave his whole heart to his work, never questioning the justice of the cause. Birth and education had endowed him with the soul of a prince, with its virtues and its faults; and it probably never occurred to him to doubt that the world was created as a field for the ambition of princes, or to imagine that the plain Nether- land burghers, who certainly did not display a very satis- factory capacity for ruling themselves in the crisis of national danger, were, with all their failings, really fight- ing for a noble cause. To him they were self-willed rebels and heretics. In military ability Alexander Farnese was not surpassed, if equalled, by any of his contemporaries. He possessed in a very high degree the power of command ;

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perfect obedience. A consummate master of strategy, fertile in resource, prompt and vigorous in action, partly by the power of his genius and partly by the contagion of his dauntless courage, he performed the greatest achievements

with the slenderest means. His coolness in danger amounted Once, while dining within range of the enemy, a shot scattered the brains of one of his companions on the table, but he ordered a new cloth to be laid, and would not give the enemy the satisfaction of interfering with his arrangements. His skill in diplomacy was second only to his generalship, but it was a diplomacy without scruple, and his dissimulation was remarkable even in that age. Yet though jealousy preferred numerous charges against him, there is no reason to doubt his fidelity to his ungrateful master.

He found the Netherlands distracted by petty jealousies and party quarrels, and to take advantage of these all his skill in diplomacy and in the art of delicate bribery was exerted to the utmost. In the magistracies of many of the towns he created a party favourable to the king, and the Walloon provinces were induced to return to their allegiance, But he was unable to prevent the Union of Utrecht, which was formed in 1579 by the genius of William the Silent. For five years he waged equal war with that great prince, his chief exploits being the taking of Maestricht and Oudenarde. In 1584 William was assassinated. The oppor- tunity was not lost by Farnese. He offered most favour- able terms (except as regarded the matter of religion), and gained over Ghent and several other important towns. But the great town of Antwerp remained faithful to the union, and against it all his energies were now directed. The history of this siege may be taken as best displaying all the many and varied qualities of a great general whicli Alexander Farnese possessed. Antwerp enjoyed a natural means of defence, of which William of Orange had resolved to take advantage, and which would have enabled it to bid defiance even to the genius of Farnese. It was possible by breaking down the dykes to flood the country to the very city gates. Sainte Aldegonde, the governor, persuaded the magistracy to adopt this plan ; but the butchers and others, whose private interests were threatened, offered a violent resistance, and the magistrates yielded in fear of riots. Another chance was afforded Antwerp, and the magistrates were again to blame, with far less excuse, Even after the siege commenced,

numerous ships continued to bring grain into the city, which might easily have been stored with sup- plies for a very long period; but the magistrates fixed a minimum price, and decreed that no corn should be sold to merchants for storing in granaries, thus completely stop- ping the invaluable traffic. They did not for a monient believe that Farnese would be able to overcome the many difficulties of the task, and build a bridge across the Scheldt. But his engineering skill soon showed itself equal to the achievement ; and it was now in his power to starve the town. Yet a third chance was allowed to Antwerp. The ingenious fireships of Gianibelli were launched against the bridge; a breach was effected; a thousand Spanish soldiers were destroyed ; Farnese him- self was wounded and lay senseless for some time ; his army was overwhelmed with panic. The ships of the Netherlands might have brought their cargoes of corn into the town, and a fatal blow might have been struck against the Spaniards, But, through gross incompetence, the Netherlanders only learned their success too late. The moment he recovered consciousness, Farnese had set about repairing the bridge, inspiring his panic-stricken followers with his own undaunted resolution and energy, and careful precautions were taken against the recurrence of such a disaster. The only hope of Antwerp was to break down

his ill-fed, ill-clad, unpaid soldiers rendered him the most | the dykes, and, taking advantage of Farnese’s absence,

Sainte Aldegonde collected for the work a strong and resolute force. slippery dykes, and the work was going slowly forward, while the Spaniards were beginning to give way, when Farnese himself appeared on the scene, and by his own ex- ploits, and the inspiration of his presence, entirely changed the fortunes of the day. The Netherlanders fought resolutely for their homes and liberties, but at last were forced to retreat, leaving the breach unmade. Antwerp was soon obliged by famine to capitulate ; Farnese, who was ignorant of the extremity of their distress, allowing a com- plete and universal amnesty, and only requiring that all Protestants should leave the city within two years. There was one noteworthy condition, cunningly worded and worthy of Italian diplomacy : it was provided that during the two years allowed the Protestants should not

offer “any offence” to the ancient religion. The Catholic magistrates whom Farnese had appointed, and the Spanish garrison which held the citadel he had rebuilt, were, of course, the sole judges of what constituted such an offence.

The year 1586 he employed in taking steps to obtain the command of the Meuse and Rhine. Grave, Gelders, and Deventer he gained by bribery and intrigue, and Neuss, by assault. In this year negotiations were opened with Elizabeth, who had sent an army under Leicester into the Low Countries. These negotiations are the most strik- ing illustration of Parma’s principles of diplomacy. So perfect was his apparent frankness that even Elizabeth and Burleigh, who were well accustonied to double-dealing, ap- pear to have been completely deceived. From the first Farnese had been told by his master that the negotiations were to lead to nothing; and at the very moment when he had just received orders to invade England, he was assuring the queen that “really and truly ” nothing was in- teuded against her majesty or her kingdom.

As time went on, Parma’s position grew more and more difficult. His soldiers died in hundreds from cold, hunger, and disease; money was’doled out to him with the most niggardly hand ; and it required all his influence to keep down mutiny. He was constantly harassed by Philip’s coniniands to attempt the impossible. He had prepared a fleet of transport boats, and the king issued repeated orders that he should with these invade England, though every port was blockaded by the ships of Holland and Zealand, Once, goaded to rashness, he made a mad attempt to break through the line, but the odds were too great, and he was repulsed with heavy loss. Even after the failure of the Armada, Philip still thought that Farnese with his unarmed boats should do that which the huge warships had failed to accomplish.

In 1590 the condition of the Spanish troops had become intolerable. Farnese could no longer support them from his private resources; his very jewels were pledged, and the supplies from the king did not increase in regularity oramount. A mutiny broke out, but was speedily sup- pressed. Under these difficulties, Farnese was commanded to leave the work of years, and raise the siege of Paris, which was surrounded by Henry of Navarre. He left the

Netherlands on the 3d August 1590 with 15,000 troops. At Meaux he swore publicly in the cathedral that he had come, not to conquer France, but only to assist the Catholic cause. By the most splendid strategy he outwitted Heury, and relieved Paris; but his troops being insufii- oa a aol picket immediately to return to

Aue in. Pg on the march many stragglers a ee were killed by the peasantry, and leaving

positions he had taken to be recaptured by Henry.

Again, in 1591, in the very midst of a de test with the genius of Prince Maurice, sorel

will, Farnese was obliged to give up the engro Pitot

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A fierce hand-to-hand fight ensued on the |

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and march to relieve Rouen. Henry at once cautiously’ raised the siege. Ina subsequent engagement Farnese was wounded by a musket-ball in the arm. Yet he defied pain and fever, refused to take the necessary rest, and was

| carried in his couch to the field. At length Henry seemed

to have shut in the Spanish ariay safely in the land of Caux, but Farnese found means to escape across the Seine. He spent a few days in Paris, and then visited Spa to drink the waters.

All his splendid services had not gained for him the con- fidence of Philip. His enemies persuaded the king that he was only striving to conquer the Netherlands that he might obtain the sovereignty for himself. Philip’s first

characteristic step was to dispatch a letter expressing com- plete confidence and tender affection; Farnese was then politely requested to return home to aid his majesty with his advice. But at the same time the marquis of Cerralbo was sent to the Netherlands to share his work with the Mansfelds, and with orders to seud him home by force, if he refused to obey the king's deceitful command. But all trouble was spared the grateful monarch. In the autumn of 1592 Alexander Farnese prepared to invade France for the third time. His robust constitution ruined by the prodigious labours he had performed, gouty, drop- sical, fevered with his wounds, he was lifted into his saddle every day till the very morning of his death, On the 3d December 1592, in the town of Arras, he fainted while undressing for bed, and in a few hours was dead. He was ouly forty-six years of age. By his own com- mand he was laid out in the garb of a Capuchin friar. His services were rewarded by a pompous funeral at Brussels, at which his Italian aud Spanish veterans fought together for the first place among the mourners, and his statue was placed in the Capitol at Rome. He was buried in the church of his own capital of Parma.

See Strada, the historiographer of the Farnese family; Motley, Dutch Republic and United Netherlands ; Gachard, Correspondence de Philippe II.

FARNESE, Eizapetu (1692-1766), queen of Spain, born on the 25th October 1692, was the only daughter of Odoardo II., prince of Parma. Her mother educated her in strict seclusion, but seclusion altogether failed to tame her imperious and ambitious temper. At the age of twenty-one (1714) she was married by proxy at Parma to Philip V. of Spain, The marriage was arrauged by the Ttalian cardinal Alberoni, with the concurrence, it is said, of the king's mistress, the Princess Orsino. On her arrival at the borders of Spain Elizabeth was met by the princess; but she received her rival sternly, and, perhaps in, accord- ance with a plan previously concerted with the king, at once ordered her to be removed from her presence and from Spain. Over the weak king Elizabeth quickly obtained com- plete influence. This influence was exerted altogether in support of the policy of her countryman Alberoni, one chief aim of which was to recover the ancient Italian possessions of Spain, and which actually resulted in the seizure of Sardinia and Sicily. So vigorously did she enter into this policy that, when the French forces advanced to the Pyrenees, she placed herself at the head of

one division of the Spanish army. But Elizabeth's ambition was grievously disappointed. 'The Triple Alliance thwarted her plans, and at length in 1720 the allies made the banishment of Alberoni a condition of peace. Sicily also had to be evacuated. And finally, all her entreaties failed to pre- vent the abdication of Philip, who in 1724 gave up the throne tv his heir, and retired to the palace of La Granja. Seven months later, however, the death of the young king recalled him to the throne. In 1736 Elizabeth had the satisfaction of seeing her favourite scheme realized in the accession of her son Don Carlos (afterwards Charles VI.)

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to the throne of the Two Sicilies and his recognition by the Powers in the Treaty of Vienna. Elizabeth survived her husband twenty years, dying in 1766.

See Puiip V. of Spain; Spain ; Mémoires pour servira Vhistotre @Espagne sous le regne de Philippe V., by the Marquis de St Philippe, translated by Maudave, Paris, 1756 ; Memoirs of Elizabeth Furnese, London, 1746.

FARNHAM, a market-town of England, county of Surrey, near the left bank of the Wey, 10 miles W.S.W. of Guildford, and 40 miles from London by rail. It is built on the southern slope of a hill rising about 700 feet above the level of the sea, and consists principally of two main streets, with a market-place at their intersection. Itis well supplied with water from springs in the neighbouring hills, conveyed by pipes to a large reservuir in the town. Farnham was formerly noted for its cloth manufacture, which is now quite extinct. It is chiefly celebrated for the hops of a very superior quality cultivated in the vicinity. The parish church is a spacious edifice in the later Gothic style, and was formerly a chapel of ease to Waverley Abbey (founded in 1128), of which some remains still exist in the vicinity. A fine new town-hall, in the Italian style of architecture, was erected in 1866. Population (1871) 4461.

Farnham was early a place of importance, and sent two members to parliament from 4th Edward II. to 38th Henry VI. Farnham Castle, on a hill

north of the town, now the seat of the bishop of Winchester, was first built by Henry de Blois, bishop of Winchester, and brother of King Stephen ; but it was razed by Henry 111. It was rebuilt and garrisoned for Charles I. by Denham, from whom it was taken in 1642 by Sir W. Waller ; and having been dismantled, it was restored by Dr Morley, bishop of Winchester. Cobbett was born in the parish of Farnham, and his remains are interred near the main entrance of the church.

FARO, a city and seaport of Portugal, chief town of the province of Algarve, is situated on the Rio Fermoso near its mouth, 20 miles W. by 8. of Tavira. It is surrounded by walls, and contains a cathedral, a military hospital, a custom- house, an arsenal, and several convents and charitable estab- lishments. At the eastern end of the town is an old castle surrounded by Moorish fortifications. The harbour is small, but it has a good roadstead. The exports are figs, raisins, almonds, dates, oranges, lemons, wines, cork, sumach, baskets, and anchovies, Faro was burned by the English in 1596, and was partly destroyed by an earth- quake in 1755. The population is about 8000.

FAROE ISLANDS, or Feroz Istanps (Danish, Fdré- erne), a group in the North Sea belonging to Denmark. They are situated between Iceland and the Shetland Islands, about 200 miles N.W. of the latter, between 61° 20’ and 62° 25’ N. lat., and between 6° 16’ and 7° 40’ W. long. The total area of the group is 510 square miles, and that of the seventeen inhabited islands 490. The population in 1850 amounted to 9150, in 1860 to 8923, and in 1874 to 10,500. The principal islands are Strémé with 2400 inhabitants, Osterd 2067, Siideré 1387, Vaago 702, Sandé 618, and Bordd 358. They consist throughout of rocks and hills, separated from each other by narrow valleys or ravines; but though the hills rise abruptly, there are often on their summits, or at different stages of their ascent, piains of considerable magnitude. They everywhere present to the sea perpendicular cliffs, broken into a thousand fantastic forms, affording at every turn, to those who sail along the coast, the most picturesque and varied scenery. The highest peaks are Slattaretind in Osterd, and Skelling- fjeld, Skalingfield, or Ben Scarling in Strémé, which, ac- cording to barometric measurement, rise respectively to about 2890 and 2506 feet above the sea. The rocks are generally trap, and exhibit little variety of compositicn, though they present some striking

geological phenomena. The zeolites and chalcedonies of the Faroes have long sup- plied the best specimens to the cabinets of Europe. Turf is abundant. Coal is found in Siideré and some of

the other islands in sufficient quantity to make it a matter of exploitation. In 1872 an expedition was sent out by the United Steamship Company (forenede Dampskibselskab) to investigate the geology of the coal-fields, and in 1876 works were commenced at Trangisvaag and Frodebo.

The climate is foggy, and violent storms are frequent at all seasons. July and August are the only true sum- mer months, but the winters are not very severe. It seldom

| freezes for more than one month, and the harbours are

rarely ice-bound. The only grain crop is barley; and on account of the uncertainty of the weather, it is frequently reaped in a half ripe condition. Agriculture is in a very backward state, the infield or cultivated land being calcu- lated to be to the outfield or uncultivated in the propor- tion of one to sixty. As the plough is ill suited to the rugged and uneven surface of the land, the ground is usually turned up with the spade, care being taken not to destroy the roots of the grass. Horses and cows are few in number, and the latter give very little milk, in con- sequence probably of the very coarse hay upon which they are fed. Sheep form the chief riches of the islanders ; some individuals having flocks of from three to five hundred, and the total number in the islands being about 80,000. They are never housed either in summer or winter, and in severe seasons they suffer considerably. The wool is gene- rally coarse, and is torn off the animals in so rough a manner as often to lacerate the skin. The northern hare (Lepus alpinus) is pretty abundant in Strémé and Osterd, having been introduced into the islands about 1840-50. Besides the ordinary Norway rat there still exist some few representatives of the older black rat (M/us rattus), and, according to popular accounts, a third species not yet scientifically identified. The catching of the numerous sea birds which build their nests upon the face of the cliffs forms an important source of subsistence to the inhabitants. Sometimes the fowler is let down from the top of the cliff; at other times he

climbs the rocks, or, where that is pos- sible, is pushed upwards by poles made for the purpose. The puffin (Alca arctica) is the commonest species, and the eider duck is frequently shot for food. The cod fishery is especially important,—the dried fish being exported to Spain and France, the swim-bladders made into gelatine, and the ovaries prepared for the anchovy fisher of the Medi- terranean. Several Salmonide are found in the streams and lakes,—among them the charr (Salmo salvelinus), which occurs in Upper Bavaria and Scotland. According to Morch, there are 13 species of land and fresh-water mollusks, but not one of them is peculiar to the islands.

The trade of the Faroe Islands was for some time a monopoly in the hands of a mercantile house at Copen- hagen, and this monopoly was afterwards assumed by the Danish Government, but by the law of March 21, 1855, all restrictions were removed. Hosiery, tallow, dried and salt fish, train-oil, feathers, skins, and butter are the chief exports. Thorshavn, the chief town of the islands, is situated on the §.E. side of Stronio, upon a narrow tongue of land, having creeks on each side, where ships may be safely moored. Its population is only between 500 and 600 ; but it is the seat of the chief Government and eccle- siastical officials, and has a castle, a hospital, and a library. The houses are built of wood and roofed with birch bark covered with turf, the greenness of which makes it impos- sible at a very short distance to distinguish the place from the surrounding fields. The character of the people is generally marked by great simplicity of manners, kind- ness, and hospitality. They are well fed and clothed, and seem to be kindly treated by the Danish Government. The average duration of life, as stated by Dr Panum, is 442 years, while in Denmark it is only 36.

The Faroe Islands were, it would appear, first colonized

by a certain Grim Kamban in the time of Harold Haar- |

fager ; and Christianity was introduced by Sigmund Bres- terson at the command of Olaf Tryggvason. They are said to derive their present name from the number of sheep (faar); in the Middle Ages they were known by the name of Fries- land, which was corrupted by the Arabian geographers into Reslanda. English adventurers gave great trouble to the inhabitants in

the 16th century, and the name of Magnus Heiresen, a native of Stromé, who was sent by Frederick IT. to clear the seas, is still celebrated in many a song and story. There was formerly a bishopric at Kirkebo, but it was abolished at the introduction of Protestantism by Christian III., and the islands are now ecclesiastically

dependent on the bishopric of Zealand. The kingdom of | again attractive, but like all continuations (that of Don

Denmark retained possession of the Faroes at the peace of Kiel in 1815, though they had originally belonged to Norway. ‘The language of the people is a remnant of the Old Norse, but that of the courts, churches, and schools is the modern Danish. The statement that there is no native literature is a mistake: not to speak of the famous ’wrey- inga Saga, which was published by Rufn and Mohnike at Copenhagen in 1833, the botanist H. C. Lyngbye, who visited the islands for the study of their Algz, brought back and published in 1822 a number of the popular songs about Sigurd, and a new treatment of the same theme appeared at Paderborn in 1877.

Literature.—Lucas Jacobson Debes, Feroa Reserata, Copenhagen, 1673 (English translation by Slerpin, London, 1675, German by Mengel, Copenhagen, 1757); ‘Torfeus, Comm. hist. de rebus gestts Feereyensium, ibid. 1695 ; Landt, Beskrivelse over Faréerne, 1800, and Deseriptions of the Feroe Islands, London, 1810 ; An account of their geology and mineralogy, by Sir G. 8. Mackenzie and Thomas Allen, in the Trans. of the Roy. Soe. of Edinburgh, vol. vii.; Pauly, Topog. von Dénnemarck einschliesslich Islands und der Féréer, Altona, 1828; Forchhammer in The Transactions of the Danish Royal Society; R, Chambers, Faro Islands and Jeeland, 1856 ; K. Maurer, “Die Farder” in Westermann’s Jl/ust. Monatsheften, Brunswick, 1862; A. J. Symington, Pen and Pencil Sketches of Faroe and Iceland, London, 1862; Tennant in Journal of Seottish Meteorol. Soc., 1871; Willemoes Siihm in Nature, 1872; G. A. Richter, ‘‘Die Faroer und Thorshavn,” in Aus Allen Welttheilen, 1874; Sjurthar Kraeth, Die firdisehen Lieder van Sigurd zwm erstenmal mit Einleit. &c., Paderborn, 1877.

FARQUHAR, Georcs (1678-1707), a dramatist of the last century, the successor in comedy of Wycherley and Con- greve, was the son of a

clergyman, and was born in London- derry, Ireland, in the year 1678. In his sixteenth year he was sent to Trinity College, Dublin, under the patronage of the bishop of Dromore. He was entered as a sizer or servitor, a class of poor scholars, who were compelled to wear a peculiar dress and perform menial offices. These are no longer exacted from their successors, but Goldsmith sixty years after the date of Farquhar's admission, had to submit to the humiliations incident to the position of a sizer—to sweep part of the college courts, to carry up the fellows' dinner to table, and to wait in the hall till the fellows had dined. It certainly iniplied a contradiction. as Goldsmith observed, for men to be "at once learning the liberal arts, and at the same time treated as slaves," and neither in the case of Farquhar nor of Goldsmith was the system attended with favourable results. The former soon broke away from his studies, and appeared as an actor on the Dublin stage. He had the advantage of a good person,

though with a weak voice, but was timid and sensitive, and |

an accident which happened to him when he had only been about a twelvemonth on the boards made him resolve to quit the profession. When performing the part of Guyomar in Dryden's Indian Emperor he had omitted to exchange his sword for a foil, and in a fencing scene wounded a brother performer so severely that his life was despaired of. The sufferer recovered, but Farquhar would never again return to the stage. The earl of Orrery gave him a lieutenancy in his regiment then in Ireland, and as

a soldier Farquhar is.said to have given proofs of his courage and conduct, though none are recorded. We have two letters written by him in Holland in 1700, but in these he says nothing of military service. While yet a minor he appeared as a dramatist. His comedy of Love and a Bottle was performed at Drury Lane in 1698, and its success far exceeded his expectations. His next comedy, 7'he Constant Couple (1700), was still more favourably received. Wilks, a popular comedian and a special friend of Farquhar's (they had been associates in Dublin), by his performance of the part of Sir Harry Wildair contributed very much to the success of the play. 'He made the part," says Farquhar. In the following year the dramatist brought out a sequel to it, entitled Sir Harry Wildair, Wilks's acting was

Quixote excepted) the second part was much inferior to the first. Leigh Hunt has stated that Mrs Oldfield, like Wilks, performed to admiration in this piece, but Mrs Oldfield was not the original heroine (Lady Lurewell). The part was acted by Mrs Verbruggen. Mrs Oldfield performed in the two last and best of Farquhar's seven comedies, and is said to have taken to the stage by his advice. She was the theatrical idol—the Mrs Jordan—of her day. Her exqui- site acting and lady-like carriage were the delight of her contemporaries, and her beauty, her vanity, and her gener- osity found innumerable eulogists—

"Engaging Oldfield, who, with grace and ease, Could join the arts to ruin and to please."'*

In 1702 Farquhar published a trifling volume of Afescel- lanies—poems, letters, and a discourse on comedy. The poems are below mediocrity, and the letters are written in that overstrained style of gallantry and smartness which was then fashionable and considered witty. In one letter he gives a lady a picture of himself "drawn from the life." His mind, he says, was generally dressed, like his person, in black; he was taken for an easy-natured man by his own sex, and an ill-natured clown by the ladies ; strangers had a worse opinion of him than he deserved, but this was recompensed by the opinion of his acquaintance, which was above his desert. Self-portraiture is seldom faithful, but we may conclude from Farquhar's outline, that the young dramatist was somewhat grave and reserved, and wanted address for general society. He was liveliest with the pen 'n his hand. The discourse on comedy is more worthy of the author than his poems or letters. In it he defends the English disregard of the dramatic unities. "The rules of English comedy," he says, " don't lie in the compass of Aristotle or his followers, but in the pit, box, and galleries." In 1703 Farquhar had another comedy on the stage—The Inconstant, or the way to win him—the hint of which he says, he took from Fletcher's Wid G'oose Chase, but was charged with spoiling the original. The poetry of Fletcher certainly evaporates when its scenes are transmuted into the prose dialogue of Farquhar.

About this time the dramatist was betrayed into what was perhaps the greatest blunder of his life. A lady conceived a violent passion for him, and,

though penni- less like himself, contrived to circulate a report that she was possessed of a large fortune. Farquhar snapped at the gilded bait. He married the lady, and found too late that he had been deceived. It is related, however, that he had the magnanimity to pardon a deception which must ee ae

1 Pope—Sober Advice from Horace. It was to this fascinating actress that the satirist alluded as the lady who detested being buried in woollen, and said to her attendant—

“¢ One would not sure be frightful when one’s dead— And—Betty—give this cheek a little red.”

She was only forty-seven when she died, leaving all the court and halt the town in tears.

FA R—

have appeared a compliment to his genius, and in truth there was something to forgive on his own part for having been so readily entrapped contrary to all the rules of love andthedrama. Increased exertion, however, was necessary, and in 1704 he produced he Stage Coach, a piece adapted from the French by Farquhar in conjunction with Anthony Motteux, a clever, reckless playwright and essayist, and re- markable as having, though a Frenchman, given the world the best English translation of Don Quixote. Three more comedies proceeded from Farquhar before his career was sadly closed at the age of thirty. Zhe Twin Rivals was brought out in 1705, The Recruiting Officer in 1706, and The Beaux Stratagem in 1707. The last two are vastly superior to Farquhar’s other plays, and are the works by which he is now remembered. To relieve the poor dramatist from his difficulties, increased by his ill-starred marriage, the duke of Ormond is said to have advised him to sell his commission in the army and pay his debts, his grace promising at the same time to give him a captaincy in his own regiment. Fatquhar sold his commission, but the duke either forgot or was unable to fulfil his promise. Farquhar’s earliest biographer ascribes the unfortunate counsel to a “certain great courtier,” who made solemn assurance which he forgot to keep. The Beaux Stratagem was written in six weeks, while death was impending over its author. Before he had finished the second act he

knew that he was stricken with a mortal illness, but it was necessary to persevere and to be “ consumedly lively” to the end, He had received in advance £30 for the copy- right from Lintot the bookseller. The play was brought on the stage March 8, and Farquhar lived to have his third night, and an extra benefit on the 29th of April, on which day he is said to have died. He left his two children to the care of his friend Wilks :—“ Dear Bob, I have nothing to leave thee to perpetuate my memory but two helpless girls. Look upon them sometimes and think of him that was to the last moment of his life thine, Georce Farquuar.” Wilks obtained a benefit at the theatre for the dramatist’s widow, and the daughters had a pension of £30 a year, which one of them was in receipt of so late as 1764. The plots of Farquhar’s comedies are skilfully conducted and evolved ; his situations are well chosen (in these his friend Wilks’s advice would be useful), and his dialogues are full of life and spirit. ‘To the polished wit and brilliancy of Congreve he has no pretension. His scenes are light and sketchy, and his characters altogether on a lower level than Congreve’s, but they were quite equal to them in stage effect. Sergeant Kite, Scrub, Archer, and Boniface are distinct original characters which long charmed on the stage, while the incidents with which they are mixed up—the un- expected encounters, adventures, artifices, and disguises— are irresistibly comic and attractive in representation. Pope considered Farquhar a mere farce writer, while Goldsmith (who evidently adopted him as a model) preferred him to Congreve. On the stage, with good actors, he might be so preferred, but never in the library. He had the advantage of being less designedly and elaborately licentious than Congreve. Love intrigues then formed the chief business of the comic drama; and in the management of them the homely domestic virtues that form the happiness and cement of society were disregarded or made the subject of ridicule. It is true that the world of comedy was, as argued by Charles Lamb, an artificial world, never perhaps regarded as real or as supplying patterns of morals or manners, but the effect of such representations was to lower and corrupt the national taste, while the fact that no pursuit was then so profitable to an author as writing for the stage was also injurious to our imaginative literature. On this moral view of the question, the reasoning of Macaulay and the eloquent objurgation of Thackeray are un-

answerable.! The artificial comedy, or comedy of manners, as seen in the beginning of the last century, is now "‘ quite extinct on our stage," as Leigh Hunt has observed; but Hunt is surely in error in dating the decline of English comedy from the time of Farquhar. ‘To say nothing of Goidsmith’s two plays, Sheridan’s Fzvals and School for Scandal show no declension in brilliancy of dialogue, wit, or vivacity, and some of the plays of Cumberland and the Colmans evince high dramatic talent. (R. CA.)
FARRAGUT, Davin Gutascoz (1801-1870), first admiral of the United States navy, was the son of Major George Farragut, a Catalan by descent, a Minorquin by birth, who had emigrated to America in 1776, and, after the peace, had married a lady of Scotch family and settled near Knoxville, in Tennessee ; there Farragut was born on the 5th July 1801. At the early age of nine he entered the navy, under the protection of his name-father, Captain David Porter, with whom heserved inthe "Essex" during her cruise in the Atlantic in 1812, and afterwards in the Pacific, until her capture by the "Phoebe," in Valparaiso Bay, on the 28th March 1814. He afterwards served on board the " Washington," 74, carrying the broad pennant of Com- modore Chauncey in the Mediterranean, and pursued his professional and other studies under the instruction of the chaplain, Mr Folsom, with whom he contracted a life-long friendship. Folsom was appointed from the ‘"‘ Washington " as U.S. consul at Tunis, and obtained leave for his pupil to pay him a lengthened visit, in the course of which he acquired a familiar knowledge of Arabic and Turkish. Farragut is said, in his later years, to have spoken fluently all the principal European languages ; this is probably an exaggeration, but with an hereditary knowledge of Spanish, he may have picked up some French and Italian at this time; until the very end of his career, it was his only visit to European waters. In 1825 he was promoted to the rank of lieutenant, whilst serving in the navy yard at Norfolk, where he continued till 1832; he then served for a com- mission on the coast of Brazil, and was again appointed to the yard at Norfolk. It is needless to trace the ordinary routine of his service step by step. ‘The officers of the U.S. navy have one great advantage which is wanting to our own; when on shore they are not necessarily parted from the service, but are employed in their several ranks in the different dockyards, escaping thus not only the private grievance and pecuniary difficulties of a very narrow half- pay, but also, what from a public point of view is much more important, the loss of professional aptitude, and of that skill which comes from unceasing

practice. On the 8th September 1841 Farragut was promoted to the rank of commander, and on the 14th September 1855 to that of captain. At this time he was in charge of the navy yard, Mare Island, California, from which post he was recalled in 1858, and appointed to the “ Brooklyn ” frigate, the command of which he held for the next two years. When the war of secession broke out in 1861, he was “ waiting orders” at Norfolk. By birth and marriage he was a Southerner, and the citizens of Norfolk counted on his throwing in his lot with them ; but professional pride, and affection for the flag under which he had served for more than fifty years, held him true to his allegiance: he passionately rejected the proposals of his fellow townsmen, and as it was more than hinted to him that his longer stay in Norfolk might be dangerous, he hastily quitted that place, and offered his services to the Government at Wash- ington. These were at once accepted ; he was requested

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1 See Macaulay’s essay on the Comic Dramatists of the Reformation, and Thackeray’s English Humorists. In 1840 Leigh Hunt published biographical and critical notices of Wycherley, Congreve, Vanbrugh, and Farquhar, prefixed to an edition of their dramatic works—a valuable addition to our dramatic literature,

to sit on the Naval Retiring Board,—a board then specially constituted for clearing the navy of unfit or disloyal officers, —and a few months later was appointed to the command of the “ Western Gulf Blockading Squadron,” with the rank of flag-officer, and ordered to proceed forthwith, in the “ Hartford,” to the Gulf of Mexico, to collect such vessels as could be spared from the blockade, to proceed up the Mississippi, to reduce the defences which guarded the ap- proaches to New Orleans, and to take and hold thecity. All this Farragut executed to the letter, with a skill and caution that won for him the love of his followers, and with a dash and bolduess that won for him the admiration of the public, and the popular name of “Old Salamander.” The pas- sage of the Mississippi was forced on the 24th April

1862, and New Orleans surrendered on the 26th; this was immediately followed by the operations against Vicksburg, from which, however, Farragut was compelled to withdraw, having relearnt the old lesson that against heavy earth- works, crowning hills of sufficieut height, a purely naval attack is unavailing ; it was not till the following summer, and after a long siege, that Vicksburg surrendered to a land force under General Grant. During this time the service on the Mississippi continued both difficult and irksome ; nor until the river was cleared could Farragut seriously plan operations against Mobile, a port to which the fall of New Orleans had given increased import- ance. ven then he was long delayed by the want of monitors with which to oppose the ironclad vessels of the enemy. It was the end of July 1864 before he was joined by these monitors; and on the 5th August, undismayed by the loss of his leading ship, the monitor ‘‘ Tecumseh,” sunk by a torpedo, he forced the passage into the bay, destroyed or captured the enemy’s ships, including the ram ‘ Ten- nessee,” bearing Admiral Buchanan’s flag, and tvok posses- sion of the forts. The town was nat occupied till the following April, but with the loss of its harbour it ceased to have any political or strategical importance. With this Farragut’s active service came to an end; for though in September 1864 he was offered the command of the force intended for the reduction of Wilmington, the state of his health, after the labours and anxieties of the past three years, in a trying climate, compelled him to decline it and to ask to be recalled. He accordingly returned to New York in December, and was received with the wildest dis- play of popular enthusiasm. It was then that the Govern- ment instituted the rank of vice-admiral, previously unknown in the American service. Farragut was promoted to it, and in July 1866 was further promoted to the rank ofadmiral. In 1867, with his flag flying in the “ Franklin,” he visited Europe. The appointment was an honourable dis- tinction without political or naval import: the “ Franklin” was, to all intents, for the time being, a yacht at Farragut’s disposal; and her arrival in the different ports was the signal for international courtesies, entertainments, and social gaiety. She returned to America in 1868, and Farragut retired into private life. Two years later, on the a eee A, he died at Portsmouth, New Hampshire. o biogra of Farragut, at all fitti i i yet appear: the only ae that can feat Bae ae Career of Vice- Admiral Farragut, by the Rev. P. C. Headley (1865) notwithstanding its claim to be based on personal information, is a badly written boys’ story-book, overloaded with childish and “tial levant matter, ,

A better account of his more distinguished services is to be found in Putnam’s Rebellion Record (1864-68) or Boynton’s History of the Navy during the Rebellion (1867), Gude. TE) 1EADLAKEADAD Ponvcoxnie di of ri Se a, sta division, and under the jurisdiction of 5 ant-governor of the North-Western Provinces lies between 26° 45’ 45” and 27° 49’ 45″ N. lat., and 7 Q yao mr‘80″ 6’°0‘“R, lene. Te is boa : N. b BWGRAh aud sans o , ounded on the y Jabaénpur, E. by Harduf, 8. by

Cawnpur and Etdwah, and W. by Mainpurf and Etah. The district is a flat alluvial plain in the middle dud, The principal rivers are—the Ganges, which has a course of 87 miles either bordering on or passing through the district, but is not at all times navigable by large boats throughout its entire course ; the Budh Ganga, which enters the district in its north-west corner, and falls into the Ganges opposite the town of Farrakhabdad, after a course of 45 miles; the Kali-nadi (84 miles), and the Isan-nadi (42 miles), both tributaries of the Ganges ; and the Arind-nadi, which, after a course of 20 miles in the south of the district, passes into Cawnpur. The census of 1872 returned the population at 499,722 males and 419,026 females,—total, 918,748, of whom 816,733 were Hindus, 101,538 Ma- hometans, and 477 Christians. The area of the district is 1744 square miles, of which 1021 are returned as under cultivation, and 264 as cultivable, but not actually under tillage, The principal products are rice, wheat, barley, millets, pulses, cotton, sugar-cane, potatoes, d&c. The grain crops, however, are insufficient for local wants, and grain is largely imported from Oudh and Rohilkhand. The district is, therefore, liable to famine, and it has been severely visited by this calamity five times during the present century—in 1803-4, 1815-16, 1825-26, 1837-38, and in 1868-69.

The civil station and principal town is Farrakhabad, situated on the right or west bank of the Ganges in 27° 24’ N. lat. and 79° 40’ E. long.; population, 65,441, The other towns are—Fathigarh (Futtehguhr or Futtygur), civil and military station on the Ganges, 3 miles east of Farrakh4b4d, population 13,439; Kanauj, on the right bank of the Kdah-nadi, 17,903; Kaimganj, 10,323; Shamsab4d, 8710; Allahganj, 6246; Chibramau, 5444. Kanauj is of great archeological interest as being the ancient Hindu capital of this part of

India. The ruins of the ancient town cover an area of 5 square miles. The only municipality in the district ig that of Far- rakhébad-cum-Fathigarh, with a population of 78,880; municipal revenue in 1875, £8177, 10s.; expenditure, £766, 6s. The total revenue of «the district in 1876 was £197,229; the expenditure on civil administration, £43,755. The regular police force consisted of 943 officers and men, maintained at a cost of £10,279, For the education of the people there were 320 Government and aided schools in the district, attended by 7507 pupils, and receiving state aid to the extent of £3416. For medical relief four charitable dispensaries are maintained, at which 789 indoor and 19,732 outdoor patients were treated in 1875, Farrakhabdd is one of the healthiest districts in the dadb, but fevers are prevalent during August and September. The average annual mean temperature is almost 80°; the average annual rainfall, 29°4 inches.

Of the tract comprising the present district, the portion lying north of the Kali-nadi was included within the jagir or fief of the Rohilla naw4b of Farrakhdbad, while the country to the south of the river formed part of the terri- tories of the vizir of Oudh. During the wars of the middle of the last century, the district frequently changed hands, at one time being held by the Rohillas, and at another by the nawdb vizir. In 1774, however, the latter, with the assistance of the English, completely defeated the Rohillas ; and Farrakhabad, together with the whole of Rohilkhand, passed into his hands, and remained with him till 1801, when it was ceded to the East India Company. In 1804 the Marhattas, under Holkar, ravaged this tract, but were utterly routed by Lord Lake at the town of Farrakhabad. During the mutiny Farrakh4bad shared the fate of other districts, and passed entirely out of our hands for a time. The native troops, who had for some time previously

| evinced a seditious spirit, finally broke into rebellion on the

18th June 1857, and placed the titular nawdb of Farrakhab4d on the throne. The English military residents took shelter in the fort, which they held until the 4th July, when, the fort being undermined, they endeavoured to escape by the river. One boat succeeded in reaching Cawnpur, but only to fall into the hands of the Nana. Its occupants were made prisoners, and perished in the massacre of the 10th July. The other boat was stopped on its progress

down the river, and all those in it were cap- tured or killed, except four who escaped. The prisoners were conveyed back to Fathigarh, and murdered there by the nawab on the 19th July. The rebels were defeated in several engagements, and on the 3d January 1858 the English troops recaptured Fathigarh fort; but it was not till May that order was thoroughly re-established. Since then nothing has occurred to disturb the peace of the district. FARRANT, Ricuarp, composer of English church music, flourished during the 16th century. Very little is known about him. Fétis gives 1530 as the date of his birth, but on what authority does not appear. He became a gentleman of the Chapel Royal in the reign of Edward VL, but resigned his post in 1564 on being appointed master of the children of St George's Chapel, Windsor. In this capacity he presented a play before the queen at Shrovetide 1568, and again at Christmas of the same year, receiving on each occasion the sum of £6, 13s. 4d. In November 1569 he was reinstated as gentleman of the Chapel Royal. Itis stated by Hawkins (History of Music, vol. iii. 279) that Farrant was also one of the clerks and organists of St George's Chapel, Windsor, and that he retained these posts till his death. Many of his composi- tions are printed in the collections of Barnard and Boyce. Among the most admired of them are a service in G minor, and the anthems " Call to remembrance " and " Hide not thou thy face." It is doubtful whether Farrant is entitled to the credit of the authorship of the beautiful anthem "Lord, for thy tender mercies' sake." No copy of the music under his nanie appeared in print till 1800, although it had been earlier attributed to him. Some writers have uamed John Hilton, and others Thomas Tallis, as the com- poser, From entries in the Old Check Book of the Chapel Royal (recently edited for the Camden Society by Dr Rimbault) it appears that Farrant died, not in 1585, as Hawkins states, but on November 30, 1580 or 1581. FARS, or FaRsisTaN, a province of Persia, extending along the Persian Gulf, and conterminous with Khusistan, Irak,and Kirman. Like the provinces to the N. andS., it is divided in three parallel districts,—the Dushtistan Germ- sir or hot country, the Tengsir or land of the passes, and the Sirhud or cold country. Its mountain ranges run parallel with the coast-line, and inclose a great number of valleys, both longitudinal and transverse. In some of these are considerable lakes, as, for example, the lake of Shiraz, and the salt lake Bakhtagan, which is about 75 miles long, and receives the waters of the Polwar or Kur. Of the rivers which flow into the Persian Gulf the most important are the Prestaf in the 8.

and the Sefid Rud in the N., The coast is for the most part steep and inaccessible, but there are harbours at Bushire, Bender Kongun, and Bender Ka- khil. As the cultivation of the Dushtistan region depends. entirely on the periodical rains, years of abundance alternate with years of dearth. Inland among the moun- tains there is a great deal of excellent pasture land, but most of it lies quite unemployed by the thinly scattered population. Grain of various kinds, dates, tobacco, cotton, and hemp are all grown to some extent, and are usually of excellent quality ; wine is manufactured, and the silk-worm reared ; aud a certain amount of attention is given to the weaving of cottons, silks, woollens, and camel-hair fabrics. An account of the exports will be

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found under Busurre, vol. iv. Shiraz is the capital, and Firusabad, Darabjird, and Bebahan are towns of some importance. Most of the villages are mere collections of mud-built huts, and present a very poverty-stricken appearance, in striking contrast to the splendour of the ancient cities of Shakpur, Pasargadze, and Persepolis, which lie within the province. No satisfactory estimate of the population can be given.

FASANO, a town of Italy, in the circondario and pro- vince of Bari, 32 miles S. of Bari, and a little to the W. of the railway to Brindisi. It stands in a rich olive district, and has a good trade in the produce. During summer the plague of flies is such that the inhabitants retire to a hill in the neighbourhood, called La Selva, where there is already a considerable suburb growing up. The ancient Egnatia, stood in this vicinity. Population 14,800.

FASTI, plural of the adjective fastus, but more com— monly used as a substantive, is derived, according to Varro, from fas, meaning what is binding, or allowable, by divine

law, as opposed to jus, or human law. asti dies thus came

to mean the days on which law business might be transacted (see Ovid, Fasti, i. 48) sine piaculo, thus corresponding to our own “lawful days.” Originally the fasti were a kind of official year-book, or almanac, with dates

and directions for religious ceremonies, court-days, market-days, divisions of the month, and the like. Festus Pompeius calls them tottus anni descriptio. In later times they meant state records in general. The fasti, again, were of two distinct kinds—salendaria, or fasti kalendares, sub-divided into urbani and rustic, and next, faste magzstrales, or historic. Until 314 B.c. the lore of the kalendaria remained the exclusive and lucrative monopoly of the priesthood; but in that year Cn. Flavius, a pontifical secretary, introduced the custom of publishing in the forum tables containing the requisite information, besides brief re- ferences to victories, triumphs, prodigies, &c. These tables were also called fasti. Ovid's Fast: have been well described as "a poetical year-book" illustrating the fasti published by Julius Cesar when he remodelled the Roman year. In the tables of Flavius, the letters F., N., N.P., F.P., Q. Rex C.F., C., EN., stood for fastus, nefastus, nefastus priore (in the first half of the day), fastus priore, quando rex sacrorum comitiavit fastus, comitialis, and ntercisus. The dies intercisi were partly fasti and partly nefast. Upon the cultivators fewer feasts, sacrifices, ceremonies, and holidays were enjoined than on the inhabitants of cities ; and the rustic fasti coutained little more than the ceremonies of the kalends, nones, and ides, the fairs, signs of zodiac, increase and decrease of the days, the tutelary gods of each month, and certain directions for rustic labours to be performed each month. The fasti magistrales were concerned with the several feasts, and everything relating to the gods, religion, and the magistrates; to the emperors, their birthdays, offices, days consecrated to them, with feasts and ceremonies established in their honour, or for their prosperity. They came to be denominated magni, by way of distinction from the bare kalendar, or fast kalendares. Of this class, the fast? consulares, for example, were a chronicle or register of time, in which the several years were denoted by the respective consuls, with the principal events which happened during their consulates. A famous specimen of the same class are the fastz Capi- tolint, so called because they were deposited in the Capitol by Alexander Farnese, after their excavation from the Roman forum in 1547. They are chiefly a nominal list of statesmen, victories, triumphs, &c., from the expulsion of the kings to the death of Augustus. A considerable num- ber of fasti of the first class have also been discovered ; but none of them appear to be older than the time of Augustus. The Preenestine calendar, discovered in 1770, contains the

months of January, March, April, and December, and a portion of February. The tablets give an account of festivals, as also of the triumphs of Augustus and Tiberius. But some kinds of fasti included under the second gene- ral head were, from the very beginning, written for pub- lication. The Annales Pontificum—different from the kalendaria properly so called—were " annually exhibited in public on a white table, on which the memorable events of the year, with special mention of the prodigies, were set down in the briefest possible manner. Any one was allowed to copy them" (Teuffel's History). Like the pon- tifices, the augurs also had their books, libra augurales. In fact, all the state offices had their fasti corresponding in character to the consular fasti named above.

For details of fasti and their discovery, see the great work of Foggini, published at Rome in 1779. Watt's Bibliotheca Britannica contains a long list of references to authorities on the subject. See also Cruttwell's History of Roman Literature, 1877. An admirable summary on fasti, with numerous bibliographical references, is given in Teuffel's Geschichte des Rémischen Literatur, 1870,—trans- lated by Wagner under the title of A History of Roman Litera- ture, 1873.

FASTING (vyorevev, jejunare) is most accurately defined as a withholding of meat, drink, and all natural food from the body for a determined period. So it is defined by the Church of England, in the 16th homily, on the authority of the Council of Chalcedon! and of the primitive church generally. In a looser sense the word is employed to denote abstinence from certain kinds of food merely ; and this meaning, which in ordinary usage is probably the more prevalent, seems also to be at least tolerated by the Church of England when it speaks of 'fast or abstinence days," as if fasting and abstinence were synonymous? More vaguely still, the word is occasionally used as an equivalent for moral self-restraint generally. This secondary and metaphorical seuse (vyorevew kaxéTyros) occurs in one of the fragments of Empedocles.

For the physiological aspects of the subject the reader may consult the article Drzrerics (vol. vii. p. 211, 212).

Fasting is of special interest when considered as a disci- –

pline voluntarily submitted to for moral and religious ends. As such it is very widely diffused. Its modes and motives vary considerably according to climate, race, civilization, and other circumstances ; but it would be difficult to name any religious system of any description in which it is wholly unrecognized. The origin of the practice is very obscure. Mr Herbert Spencer has collected, from the accounts we have of various savage tribes in widely separ-

1 “The Fathers assembled there . . . decreed in that council that every person, as well in his private as public fast, should continue all the day without meat and drink, till after the evening prayer. And whosoever did eat or drink before the evening prayer was ended should be accounted and reputed not to consider the purity of his fast. This canon teacheth so evidently how fasting was used in the primitive church as by words it cannot be more plainly expressed.” Of Good Works: and first, of Fasting.

2 As indeed they are, etymologically ; but, prior to the Reformation, a conventional distinction between abstinentia and jejunium naturale had long been recognized. “Exceptio eduliorum quorundam portionale jejunium est” (Tertullian).

3 Confucianism ought perhaps to be named as one. Zoroastrianism is frequently given as another, but hardly correctly. In the Liber Sad-der indeed (Porta xxv.) we read, ‘‘ Cavendum est tibi a jejunio ; nam a mane ad vesperam nihil comedere non est bonum in religione nostra ;” but according to the Pare de Chinon (Lyons, 1671) the Parsee religion enjoins, upon the priesthood at least, no fewerthan five yearly can See Hyde, Veterum Persarum Religio, p. 449, 548 (ed.

4 During the Middle Ages the prevalent notion was that it had its origin in paradise. The germ at least of this idea is to be found in Tertullian, who says: ‘‘ Acceperat Adam a Deo legem non gustandi de arbore agnitionis boni et mali, moriturus si gustasset ; verum et ipse tunc in psychicum reversus .. . facilius ventri quam Deo cessit, pabulo potius quam precepto

annuit, salutem gula vendidit, mandu- cavit denique et periit, salvus alioquin si uni arbuscula jejunare maluisset?’ (De Jejuntis, c. 3),

ated parts of the globe, a considerable body of evidence tending to suggest that it may have arisen out of the custom of providing refreshments for the dead, either by actually feeding the corpse, or by leaving eatables and drinkables for its use. ‘Ihe offerings to the dead are often made in so lavish a manner as necessarily to involve the survivors in temporary starvation, and it 1s no uncommon thing for a man to ruin himself by a funeral feast. It is suggested that the fasting which was at first the natural and inevitable result of such sacrifice on behalf of the dead may eventually have come to be regarded as an indispens- able concomitant of all sacrifice, and so have survived as a well-established usage long after the original cause had ceased to operate.® It is not pretended that this explana- tion is sufficient to account satisfactorily for all the known cases of primitive fasting; indeed its extreme precarious- ness at ouce becomes evident when it is remembered that, now at least, it is usual for religious fasts to precede rather than to follow sacrificial and funeral feasts, if observed at all in connection with these. Mr Spencer himself (p. 284) admits that “probably the practice arises In more ways than one,” and proceeds to supplement the theory already given by another—that adopted by Mr E. B. Tylor—to the effect that it originated in the desire of the primitive mau to bring on at will certain abnormal nervous conditions favourable to the seeing of those visions and the dreaming of those dreams which are supposed to give the soul direct access to the objective realities of the spiritual world.® Probably, if we leave out of sight the very numerous and obvious cases in which fasting, originally the natural reflex result of grief, fear, or other strong emotion, has come to be the usual conventional symbol of these, we shall find that the practice is generally resorted to, either as a means of somehow exalting the higher faculties at the expense of the lower, or as an act of homage to some object of wor- ship. The axiom of the Amazulu that “ the continually stuffed body cannot see secret things” meets even now with pretty general acceptance ; and if the notion that it is precisely the food which the worshipper foregoes that makes the deity more vigorous to do battle for his human friend be confined only to a few scattered tribes of savages, the

general proposition that “fasting is a work of reverence toward God” may be said to be an article of the Catholic faith.’

Although fasting as a religious rite is to be met with almost everywhere, there are comparatively few religions, and those only of the more developed kind, which appoint definite public fasts, and make them binding at fixed seasons upon all the faithful. Brahmanism, for example, does not appear to enforce any stated fast upon the laity.® Among the ancient Egyptians fasting seems to have been associated with many religious festivals, notably with that of Isis (Herod. ii. 40), but it does not appear that, so far as the common people were concerned, the observance of these festivals (which were purely local) was compulsory. The vynoreia on the third day of the Thesmophoria at Atheus was observed only by the women attending the festival (who were permitted to eat cakes made of sesame and honey). It is doubtful whether the fast mentioned by

5 Principles of Sociology, i. p. 170, 284, 285. Compare the passage in the appendix from Hanusch, Slavischer Mythus, p. 408.

6 Spencer, Prin. of Sociology, i. 256, &c.; E. B. Tylor, Primitive Culture, i. 277, 402 ; ii. 372, &c.

7 Hooker, #. P., v. 72. In the Westminster Assembly’s Larger Catechism fasting is mentioned among the duties required by the second commandment.

8 The Brahmans themselves on the eleventh day after the full moon and the eleventh day after the new ‘‘ abstain for sixty hours from every kind of sustenance ;” and some have a special fast every Monday in November. See Picart, The Religion and Manners of the Bra-

| mins,

Livy (xxxvi. 37) was intended to be general or sacerdotal merely,

Jewish Fasts.—While remarkable for the cheerful, non- ascetic character of their worship, the Jews were no less distinguished from all the nations of antiquity by their annual solemn fast appointed to be observed on the 10th day of the 7th month (Tisri), the penalty of disobedience being death. The rules, as laid down in Lev. xvi. 29-34, xxili. 27-32, and Numb. xxix. 7-11, include a special in- junction of strict abstinence ("ye shall afflict your souls") from evening to evening. This fast was intimately asso- ciated with the chief feast of the year. Before that feast could be entered upon, the sins of the people had to be confessed and (sacramentally) expiated. The fast was a suitable concomitant of that contrition which befitted the occasion. The practice of stated fasting was not in any other case enjoined by the law; and it is generally understood to have been forbidden on Sabbath? At the same time, private and occasional fasting, being regarded as a natural and legitimate instinct, was regulated rather than repressed. The only other provision about fasting in the Pentateuch is of a regulative nature, Numb. xxx. 14 (13), to the effect that a vow made by a woman "to afflict the soul" may in certain circumstances be cancelled by her hus- band.

The history of Israel from Moses to Ezra furnishes a large number of instances in which the fasting instinct was obeyed both publicly and privately, locally and nationally, under the influence of sorrow, or fear, or passionate desire. See, for example, Judg. xx. 26; 1 Sam: vii. 6 (where the national fast was conjoined with the ceremony of pouring out water before the Lord); Jer. xxxvi. 6, 9; and 2 Sam. x11 16.3 Sometimes the observance of such fasts extended over a considerable period of time, during which, of course, the stricter jejunium was conjoined with abstinentia (Dan. x. 2). Sometimes they lasted only for a day. In Jonah iii. 6, 7, we have an illustrativeexample of the rigour with which a strict fast might be observed ; and such passages as Joel ii, aud Isa. lviii. 5 enable us to picture with some vividness the outward accompaniments of a Jewish fast day before the exile.

During the exile many occasional fasts were doubtless observed by the scattered communities, in sorrowful commemoration of the various sad events which had issued in the downfall of the kingdom of Judah. Of these, four appear to have passed into general use—the fasts of the 10th, 4th, 5th, and 7th months—commemorating the beginning of the siege of Jerusalem,

the capture of the city, the destruction of the temple, the assassination of Gedaliah. As time rolled on they became invested with increasing sanctity ; and though the prophet Zechariah, when con- sulted about them at the close of the exile (Zech. viii. 19), had by no means encouraged the observance of them, the rebuilding of the temple does not appear to have been considered an achievement of sufficient importance to warrant their discontinuance. It is worthy of remark that

- WD} is here to be taken as substantially equivalent to ‘‘ desire,” ** appetite.”

- See Judith viii. 6. ‘*And yet it may be a question whether they (the Jews) did not always fast upon Sabbath,” says Hooker (#. P., v. 72,7), who gives a curious array of evidence pointing in this direction. He even makes use of Neh. viii. 9-12, which might be thought to tell the other way. Justinian’s phrase ‘‘Sabbata Judzorum a Mose in omne evum jejunio dicata” (1. xxxvi. c. 2; comp. Suetonius in Octav. c. 76) may be accounted for by the fact that the day of atone- nent is called Sabbat Sabbatén (“a perfect Sabbath’).

° There is, as Graf (Gesch. Biicher des A. T., p. 41) has pointed out, no direct evidence that the fast on the 10th of the 7th month was ever observed before the exile. But the inference which he draws from this silence of the historical books is manifestly a precarious one at best. Bleek calls Lev. xvi. ‘‘ein dentliehes Beispiel Mosaischer Abfassung ” (Hinlzitung, p. 31, ed. 1878). .

Ezekiel’s prophetic legislation contains no reference to any fast day ; the book of Esther (ix. 31), on the other hand, records the institution of a new fast on the 13th of the 12th month.

In the post-exile period private fasting was much practised by the pious, and encouraged by the religious sentiment of the time (see Judith vii. 6; Tob. xii. 8, and context; Sirach xxxiv. 26; Luke ii. 37, and xviii. 12). The last reference contains an allusion to tle weekly fasts which were observed on the 2d and 5th days of each week, in commemoration, it was said, of the

ascent and descent of Moses at Sinai. The real origin of these fasts and the date of their introduction are alike uncertain; it is mani- fest, however, that the observance of them was voluntary, and never made a matter of universal obligation. It is probable that the Sadducees, if not also the Essenes, wholly neglected them. The second book (Seder Moed) of the Mishna contains two tractates bearing upon the subject of fasting. One (Yoma, ‘the day”) deals exclusively with the rites which were to be observed on the great day of expiation or atonement; the other (Zaanith, “fast ”) is devoted to the other fasts, and deals especially with the manner in which occasional fasting is to be gone about if no rain shall have fallen on or before the 17th day of Marcheschwan. It is enacted that in such a case the rabbis shall begin with a light fast of three days (Monday, Thursday, Monday), ¢.e.; a fast during which it is lawful to work, and also to wash and anoint the person. Then, in the event of a continued drought, fasts of increasing intensity are ordered ; and as a last resort the ark is to be brought into the street and sprinkled with ashes, the heads of the Nasi and Ab-beth-din being at the same time similarly sprinkled.* Inno case was any fast to be allowed to interfere with new-moon or other fixed festival. Another institution treated with considerable fulness in the treatise Taanith is that of the qnyp ‘wy (virt stationcs), who are represented as having been laymen severally representing the twenty-four classes or families into which the whole commonwealth of the laity was divided. They used to attend the temple in rotation, and be present at the sacrifices; and as this duty fell to each in his turn, the men of the class or family which he represented were expected in their several cities and places of abode to engage themselves in religious exercises, and especially in fasting. The suggestion will readily occur that here may be the origin of the Christian stationes. But neither Tertullian nor any other of the fathers seem to have been aware of the existence of any such institution among the Jews; and very probably the story about it may have been a comparatively late invention. It onght to be borne in mind that the Aramaic portion of the Megillath Taanith (a document considerably older than the treatises in the Mishna) gives a catalogue only of the days on which fast- ing was forbidden, The Hebrew part (commented on by Maimonides) in which numerous fasts are recommended is of considerably later date. See Reland, Antig. Hebr., p. iv. c. 10; Derenbourg, /7ist. de Palestine, p. 439.

Practice of the Early Christian Church.—Jesus himself did not inculcate asceticism in His teaching, and the absence of that distinctive element from His practice was sometimes a subject of hostile remark (Matt. xi. 19). We read, indeed, that on one occasion He fasted forty days and forty nights; but the expression, which is am obscure one, possibly means nothing more than that He endured the privations ordinarily involved in a stay in the wilderness. While we have no reason to doubt that He observed the one great national fast prescribed in the written law of

4 The allusion to the ark warns us to be cautious in assuming the laws of the Mishna to have been ever in force,

Moses, we have express notice that neither He nor His disciples were in the habit of observing the other fasts which custom and tradition had established. See Mark ii. 18, where the correct reading appears to be—“ The disciples of John, and the Pharisees, were fasting” (some customary fast). He never formally forbade fasting, but neither did He ever enjoin it. He assumed that, in certain circumstances of sorrow ard need, the fasting instinct would sometimes be felt by the community and the individual ; what He was chiefly concerned about was to warn His followers against the mistaken aims which His contempor- aries were so apt to contemplate in their fasting (Matt. vi 16-18). In one passage, indeed, He has been understood as practically commanding resort to the practice in certain circumstances. It ought to be noted, however, that Matt. xvii. 21-is probably spurious ; and that in Mark ix. 29 the words “and fasting” ate omitted by Westcott and Hort as well as by Tischendorf on the evidence of the Cod. Sinaiticus (first hand) and Cod. Vaticanus.!_ The refer- ence to “the fast” in Acts xxvii. 9 has generally been held to indicate that the apostles continued to observe the yearly Jewish fast. But this inference is by no means a necessary one. According to Acts xiii. 2, 3, xiv. 23, they conjoined fasting with prayer at ordinations, and doubtless also on some other solemn occasions; but at the same time the liberty of the Christian ‘in respect of an holiday, or of the new moon, or of the Sabbath” was strongly insisted on, by one of them at least, who declared that meat whether taken or abstained from commendeth not to God (Col. ii. 16-23; 1 Cor. viii, 8; Rom xiv, 14-22;

1 Tim. iv. 3-5). The fast- ings to which the apostle Paul alludes in 2 Cor. vi. 5, xi. 27, were rather of the nature of inevitable hardships cheerfully endured in the discharge of his sacred calling. The words which appear to encourage fasting in 1 Cor. vil. 5 are absent from all the oldest manuscripts aud are now omitted by all critics ;2 and on the whole the precept and practice of the New Testament, while recognizing the propriety of occasional and extraordinary fasts, seem to be decidedly hostile to the imposition of any of a stated, obligatory, and general kind, ;

The usage of the Christian church during the earlier centuries was in this, as in so many other miatters, influenced by traditional Jewish feeling, and by the force of old habit, quite as much as by any direct apostolic authority or supposed divine command. Habitual tem- perance was of course in all cases regarded as an absolute duty; and “the bridegroom” being absent, the present life was regarded as being in a sense one continual “ fast.” Fasting in the stricter sense was not unknown; but it is certain that it did not at first occupy nearly so prominent a place in Christian ritual as that to which it afterwards attained. ‘There are early traces of the customary observ- ance of the Wednesday and Friday fasts—the dives statio- num (Clem. Alex., Strom, vii. 877), and also of a “quadragesimal ” fast before Easter. But the very passage which proves the early origin of “ quadragesima,” conclu- sively shows how uncertain it was in its character, and how unlike the Catholic “ Lent.” Irenzeus, quoted by Eusebius (v. 24), informs us with reference to the customary yearly celebration of the mystery of the resurrection of our Lord, that disputes prevailed not only with respect to the day, but also with respect to the manner of fasting in connexion with it. “ For some think that they ought to fast only one day, some two, some more days; some compute their day as

1 The idea, however, is found in the Clementine Homilies, ix. 9. Compare Tertullian De Jejuniis, c.8. “ Docuit etiam adversus diriora demonia jejuniis preliandum.”

PY On the manuscript evidence the words ‘* I was fasting,” in Acts x.

, must also be regarded as doubtful. They are rejected by Lach- mann, Tregelles, and Tischendorf, J ; ”

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consisting of forty hours night and day ; and this diversity. existing among those that observe it is not a matter that has just sprung up in our times, but long ago among those before us." It was not pretended that the apostles had legislated on the matter, but the general and natural feel- ing that the anniversaries of tlie crucifixion and the resur- rection of Christ ought to be celebrated by Christians took expression in a variety of ways according to the differing tastes of individuals. No other stated fasts, besides those already mentioned, can be adduced from the time before Treneus; but there was also a tendency—not unnatural in itself, and already sanctioned by Jewish practice—to fast by way of preparation for any season of peculiar privilege

Thus, according to Justin Martyr (Apol., ii. 93), catechumens were accustomed to fast before baptism, and the church fasted with them. To the same feeling the quadragesimal fast which (as already stated) preceded the joyful feast of the resurrection, is to be, in part at least, attributed. As early as the time of Tertullian it was also usual for com- municants to prepare themselves by fasting for receiving the eucharist. But that Christian fasts had not yet attained to the exaggerated importance which they afterwards assumed is strikingly shown in the well-known Shepherd of Hermas (lib. iii. sim. v.), where it is declared that " with merely outward fasting nothing is done for true virtue ;" the believer is exhorted chiefly to abstain from evil and seek to cleanse himself from feelings of covetousness, and impurity, and revenge : "on the day that thou fastest con- tent thyself with bread, vegetables, and water, and thank God for these. But reckon up on this day what thy meal would otherwise have cost thee, and give the amount that it comes to to some poor widow or orphan, or to the poor." The right of bishops to ordain special fasts, 'ex aliqua sol- licitudinis ecclesiasticee causa" (Tertullian), was also re- cognized,

Later Practice of the Church.—According to an expres- sion preserved by Eusebius (ZZ. #., v. 18), Montanus was the first to give laws (to the church) on fasting. Such language, though rhetorical in form, is substantially correct. The treatise of Tertullian,—Concerning Fasting: against the Carnal; —written as it was under Montanistic influence, is doubly interesting, first

as showing how free the practice of the church down to that time had been, and then as foreshadowing the burdensome legislation which was destined to succeed. In that treatise (c. 15) he approves indeed of the church practice of not fasting on Saturdays aud Sundays (as elsewhere, De Corona, c. 3, he had ex- pressed his concurrence in the other practice of observing the entire period between Easter and Pentecost as a season of joy); but otherwise he evinces great dissatisfaction with the indifference of the church as to the number, duration, and severity of her fasts. The church thus came to be more and more involved in discussions as to the number of days to be observed, especially in " Lent," as fast days; as to the hour at which a fast ought to terminate (whether at the 3d or at the 9th hour), as to the rigour with which each fast ought to be observed (whether by abstinence from flesh merely, abstinentia, or by abstinence from lacticinia, xerophagia, or by literal jejunum), and as to the penalties by which the laws of fasting ought to be enforced. Almost a century, however, elapsed between the composition of the treatise of Tertullian (cir, 212) and the first recorded instances of ecclesiastical legislation on the subject. These while far from indicating that the church

3 Quinam isti (adversarii) sint, semel nominabo: exteriores ef interiores botuli psychicorum. .. Arguunt nos quod jejunia propria custodiamus, quod stationes plerumque in vesperam producamus, quod etiam zerophagias observemus, siccantes cibum ab omni carne et omni jurulentia et uvidioribus quibusque pomis, nee quid vinositatis vel edamus vel potemus ; lavacri quoque abstinentiam congruentem arido victui.

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had attained unanimity on the points at issue, show progress in the direction of the later practice of catholicism. About the year 306 the synod of Illiberis in its 26th canon decided in favour of the observance of the Saturday fast.? The council of Ancyra in 314, on the other hand, found it necessary to legislate in a somewhat different direction,— by its 14th canon enjoining its priests and clerks at least to taste meat at the love feasts.2 The synod of Laodicea framed several rules with regard to the observance of "Lent," such as that "during [ent the bread shall not be offered except on Saturday and Sunday" (can. 49), that "'the fast shall not be relaxed on the Thursday of

the last week of Lent, thus dishonouring the whole season; but the fast shall be kept throughout the whole period" (can. 50), that "during the fast no feasts of the martyrs shall be celebrated" (can. 51), and that "no wedding or birthday feasts shall be celebrated during Lent" (can. 52). The synod of Hippo (393 a.p.) enacted that the sacrament of the altar should always be taken fasting, except on the Thursday before Easter. Protests in favour of freedom were occasionally raised, not always in a very wise manner, or on very wise gronnds, by various individuals such as Eustathius of Sebaste (c. 350), Aerius of Pontus (c. 375), and Jovinian, a Roman monk (c. 388). Of the Eustathians, for example (whose connection with Eustathius can hardly be doubted), the complaint was made that "they fast on Sundays, but eat on the fast-days of the church." They were condemned by the synod of Gangra in Paphlagonia (ctr. 860) in the following canons :—Can. 19, "If any one fast on Sunday, let him be anathema."? Can. 20, "If any one do not keep the fasts universally commanded and observed by the whole church, let him be anathema." Jovinian was very moderate. He "did not allow himself to be hurried on by an inconsiderate zeal to condemn fasting, the life of celibacy, monachism, considered purely in themselves. ,.,. He merely sought to shqw that men were wrong in recommending so highly and indis- criminately the life of celibacy and fasting, though he was ready to admit that both under certain circumstances might be good and useful" (Neander). He was nevertheless condemned (390) both by Pope Siricius at a synod in Rome, and by Ambrose at another in Milan. The views of Aerius, according to the representations of his bitter apponent Epiphanius (er. 75, " Adv. Aerium"), seem on this head at least, though unpopular, tq have heey. charac- terized by great wisdom and sobriety, He did not condemn fasting altogether, but thought that it ought to be resorted to in the spirit of gospel freedom according as each occasion should arise. He found fault with the church for having substituted for Christian liberty a yoke of Jewish bondage.*

Towards the beginning of the 5th- century we find Socrates (439) enumerating (H. Z,, v. 22) a long catalogue of the different fasting practices of the church. The Romans fasted three weeks continuously before Easter

1 The language of the canon is anibiguous ; but this interpretation seems to be preferable, especially in view of canon 23, which enacts that, Jejunll

superpasitiones are to be ohserved in all months except July and August. See Hefele, Councils, i. 148 (Engl. trs.). a

- Compare the 52d [51st] of the Apostolical canons. “If any bishop or preshyter ar deacon, or indeed any one of the sacerdotal catalogue, abstains from flesh and wine, not for his own exercise but out of hatred of the things, forgetting that all things were very good . . . either let him reform, or let him be deprived and be cast out of the church. Sa also a layman.” ‘To this particular canon Hefele is disposed to assign a very early date. 3 a 3 Compare canon 64 of the (supposed) fourth synod of Carthage ;

Hewho fasts on Sunday ig not accounted a Catholic ” (Hefele, ii. 415).

4 Priscillian, whose widespread heresy evoked from the synod of Saragossa (418) the canon, “No one shall fast on Sunday, nor may any one absent himself from church during Lent and hold a fes- tival of his own,” appears, on the question of fasting, not to have dif-

ae the Encratites and yarious other sects of Manichean tendency C :

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(Saturdays and Sundays excepted). In Illyria, Achaia, and Alexandria the quadragesimal fast lasted six weeks. Others (the Constantinopolitans) began their fasts seven weeks before Easter, but fasted only on alternate weeks, five days at a time. Corresponding differences as to the manner of abstinence occurred. Some abstained from all living creatures; others ate fish; others fish and fowl. Some abstained from eggs and fruit; some confined them- selves to bread ; some would not take even that. Some fasted till three in the afternoon, and then took whatever they pleased. ‘ Other nations,” adds the historian, “observe other customs in their fasts, and that for various reasons. And since no one can show any written rule about this, it is plain the apostles left this matter free to every one’s liberty and choice, that no ong should be com- pelled te do a good thing out of necessity and fear.” When Leo the Great became pope in 440, a period of more rigid uniformity began. The imperial authority of Valentinian helped to bring the whole West at least into submission to the see of Rome; and

ecclesiastical enact- ments had, more than formerly, the support of the civil power. Though the introduction of the four Ember seasons was not entirely due to him, as has sometimes been asserted, it is certain that their widespread observance was due to his influence, and to that of his successors, especially of Gregory the Great. The tendency to increased rigour may be discerned in the 2d canon of the synod of Orleans (541), which declares that every Christian is bound to observe the fast of Lent, and, in case of failure to do so, is to be punished qccording to the laws of the church by his spiritual superior ; in the 9th canon of the synod of Toledo (653), which declares the eating of flesh during Lent to be a mortal sin; in Charlemagne's Jaw for the newly con- quered Saxony, which attaches the penalty of death to wanton disregard of the holy season. Baronius mentions that in the 11th century those who ate flesh during Lent were liable to have their teeth knocked out, But it ought to be remembered that this severity of the law early began to be tempered by the power to grant dispensations. The so- called Butter Towers (Tours de beurre) of Rouen, 1485— 1507, Bourges, and other cities, are said to have been built with money raised by sale of dispensations to eat lacticinia on fast days.

It is probable that the apparent severity of the medieval Latin Church on this subject was largely due to the real strictness of the Greek Church, which, under the patriarch Photius in 864, had taken what was virtually a new departure in its fasting praxis. The rigour of the fasts of the modern Greek Church is well known; and it can on the whole be traged back to that comparatively early date. Of the nine fundamental laws of that church (évéa mapgyyéehpara ths éxxAyotas) two are concerned with fast- ing. 'Besides fasts of an occasional and extraordinary nature, the following are recognized as of stated and universal obligation :—(1) The Wednesday and Friday fasts thrqughout the year (with the exception of the period between Christmas and Epiphany, the Easter week, the week after Whitsunday, the third week after Epiphany) ; (2) The great yearly fasts, viz. that of Lent, lasting 48 days, from the Monday of Sexagesima to Easter eve; that of Advent, 39 days, from November 15th to Christmas eve ; that of the Theotokos (vyareca ris Oeordxov), from August Ist to August 15th ; that of the Holy Apostles, lasting a variable number of days from the Monday after Trinity; (3) The minor yearly fasts before Epiphany, before Whitsunday, before

5 Cap. iii. pro partib. Saxonie : ‘‘Si quis sanctum quadragesimale jejunium pro despectu Christianitatis contempserit et carnem comederit, morte moriatur. Sed tamen consideretur a sacerdote ne forte causa necessitatis hoc cuilibet proveniat, ut carnem comedat.” See Augusti, Christliche Archiologie, x, p. 374,

the feasts of the transfiguration, the invention of the cross, the beheading of John the Baptist. During even the least rigid of these the use of flesh and lacticinia is strictly forbidden ; fish, oil, and wine are occasionally conceded, but not before two o’clock in the afternoon. The practice of the Coptic church is almost identical with this. A week before the Great Fast (Lent), a fast of three days 1s observed in commemoration of that of the Ninevites, raentioned in the book of Jonah. Some of the Copts are said to observe it by total abstinence during the whole period. The Great Fast continues fifty-five days ; nothing is eaten except bread and vegetables, and that only in the afternoon, when church prayers are over. The Fast of the Nativity lasts for twenty-eight days before Christmas; that of the Apostles for a variable number of days from the Feast of the Ascension; and that of the Virgin for fifteen days before the Assumption. All Wednesdays and Fridays are also fast days except those that occur in the period between Easter and Whitsunday. The Armenians are equally strict; but (adds Rycaut) “the times seem so con- fused and without rule that they can scarce be recounted, unless by those who live amongst them, and strictly observe them, it being the chief care of the priest, whose learning principally consists in knowing the appointed times of fasting and feasting, the which they never omit on Sun- days to publish unto the people.”?

At the council of Trent no more than a passing allusion was made to the subject of fasting. The faithful were simply enjoined to submit themselves to church authority on the subject ; and the clergy were exhorted to urge their flocks to the observance of frequent jejunia, as conducive to the martification of the flesh, and as assuredly securing the divine favour. Bellarmine (De jejunio) distinguishes jejunium spirituale (abstinentia a vitiis), jejunium morale (parsimonia et temperantia cibi et potus), jejunium naturale (abstinentia ab omni prorsus cibo et potu, quacunque ratione

sumpto), and jejunium ecclesiasticum. The last he defines simply as an abstinence from food in conformity with the rule of the church. It may be either voluntary or compulsory ; and compulsory either because of a vow or because of a command. But the definition given by Alexander Halensis, which is much fuller, still retains its authority :—“Jejunium est abstinentia a cibo et potu secundum formam ecclesia, intuitu satisfaciendi pro peccato et acquirendi vitam eternam.” It was to this last clause that the Reformers most seriously objected. They did not deny that fasting might be a good thing, nor did they maintain that the church or the authority might not ordain fasts, though they deprecated the imposition of needless bur- dens on the couscience. What they protested against was the theory of the opus operatum et meritorium as applied to fasting. As matter of fact, the Reformed churches in no case gave up the custom of observing fast days, though by some churches the number of such days was greatly reduced. In many parts of Germany, the seasons of Lent and Advent are still marked by the use of emblems of mourning in the churches, by the frequency of certain phrases (Kyrie eleison, Agnus Dei) and the absence of others (Hallelujah, Gloria in excelsis) in the liturgical services, by abstinence from some of the usual social festivities, and by the non-celebration of marriages. And occasional fasts are more or less familiar. The Church of England has retained a considerable list of fasts ; though Hooker (Z. P., v. 72) had to contend with some who, while approving of fastings undertaken “ of men’s own free and voluntary accord as their particular devotion doth move them thereunto,” yct “yearly or weekly fasts such

1 See Fink’s article “ Fasten” in Ersch and Gruber’s Encyclopddie ;

a . odern Egyptians ; and Rycaut, Present State of the Armenian hurch.

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as ours in the Church of England they allow no further than as the temporal state of the land doth require the same for the maintenance of seafaring men and preservation of cattle; because the decay of the one and the waste of the other could not well be prevented but by a politic order appointing some such usual change of diet as ours is.”

Tn the practice of modern Catholicism the following are recognized as fasting days, that is to say, days on which one meal only, and that not of flesh, may be taken in the course of twenty-four hours :—The forty days of Lent (Sundays excepted), all the Ember days, the Wednesdays and Fridays in Advent, and the vigils of certain feasts, namely, those of Whitsuntide, of St Peter and St Paul, of the Assumption of the Blessed Virgin Mary, of All Saints, and of Christmas day. The following are simply days of abstinence, that is to say, days on which flesh at all events must not be eaten :— The Sundays in Lent, the three Rogation days, the feast of St Mark(unless it falls in Easter week), and all Fridays which are not days of fasting. In the English Church, the “days of fasting or abstinence” are the forty days of Lent, the Ember days, the Rogation days, and all the Fridays in the year, except Christmas day. The evens or vigils before Christmas, the Purification of the Blessed Virgin Mary, the Annunciation of the Blessed Virgin Mary, Easter day, Ascension day, Pentecost, St Matthias, the Nativity of St John Baptist, St Peter, St James, St Bartholomew, St Mat- thew, St Simon and St Jude, St Andrew, St Thomas, aud All Saints are also recognized as “fast days.” By the 64th canon it is enacted that ‘‘every parson, vicar, or curate, shall in his several charge declare to the people every Sunday at the time appointed in the communion- book [which is, after the Nicene creed has been repeated] whether there be any holy-days or fast-days the week following.” The 72d canon ordains that ‘no minister or ministers shall, without licence and direction of the bishop under hand and seal, appoint or keep any solemn fasts, either publicly or in any private houses, other than such as by law are or by public authority shall be appointed, nor shall be wittingly present at any of them under pain of suspen- sion for the first fault, of excommunication for the second, and of deposition from the ministry for the third.” While strongly discouraging the arbitrary multiplication of public or private fasts, the English Church seems to leave to the discretion of the individual conscience every question as to the manner in which the fasts she formally enjoins are to be observed. In this connexion the homily Of Fasting may be again referred to. By a statute of the reign of Queen Elizabeth it was enacted that none should eat flesh on “ fish days” (the Wednesdays, Fridays, and Saturdays throughout the year) without a licence, under a penalty. In the Scottish Presbyterian churches days of “fasting, humilia- tion, and prayer” are observed by ecclesiastical appoint ment in each parish once or twice every year on some day of the

week preceding the Sunday fixed for the adminis- tration of the sacrament of the Lord’s Supper. In some of the New England States, it has been usual for the gov- ernor to appoint by proclamation at some time in spring a day of fasting, when religious services are conducted in the churches. National fasts have more than once been observed on special occasions both in this country and in the United States of America.

On the subject of fasting the views of Aerius are to a large extent shared by modern Protestant moralists. Rothe, for exainple, who on this point may be regarded as a representative thinker, rejects the idea that fasting is a thing meritorious in itself, and is very doubtful of its value even as an aid to devotional feeling. Of course when bodily health and other circumstances re- quire it, it becomes a duty; and as a means of self discipline it may be used with due regard to the claims

of other duties, and to the fitness of things. In this last aspect, however, habitnal temperance will generally be found to be much more beneficial than occasional fasting. It is extremely questionable, in particular, whether fasting be so efficient as it is sometimes supposed to be in pro- tecting against temptation to fleshlysin. The practice has a well ascertained tendency to excite the imagination ; and in so far as it disturbs that healthy and well-balanced interaction of body and mind which is the best or at least the normal condition for the practice of virtue, it is to be deprecated rather than encouraged (Z’heologische Lthik, sec.

873-875).

us Fasts.—Among the Mahometans, the month Ramadan, in which the first part of the Koran is said to have been received, is by command of the prophet observed as a fast with extraordinary rigour. No food or drink of any kind is permitted to be taken from daybreak until the appearance of the stars at nightfall, Extending as it does over the whole “month of raging heat,” such a fast mani- festly involves considerable self-denial ; and it is absolutely binding upon all the faithful whether at home or abroad. Should its observance at the appointed time be interfered with by sickness or any other cause, the fast must be kept as soon afterwards as possible, for a like

number of days. It is the only one which Mahometanism enjoins ; but the doctors of the law recommend a considerable number of voluntary fasts, as for example on the tenth day of the month Moharram. This day, called the “ Yom Ashoora,” is held sacred on many accounts :—“‘‘ because it is believed to be the day on which the first meeting of Adam and Eve took place after they were cast out of paradise ; and that on which Noah went out from the ark ; also because several other great events are said to have happened on this day ; and because the ancient Arabs, before the time of the prophet, observed it by fasting. But what, in the opinion of most modern Moslems, and especially the Persians, con- fers the greatest sanctity on the day of Ashoora is the fact of its being that on which El-Hoseyn, the prophet’s grand- son, was slain a martyr at the battle of the plain of Kar- bala.” It is the practice of many Moslems to fast on this day, and some do so on the preceding day also. Mahomet himself called fasting the “ gate of religion,” and forbade it only on the two great festivals, namely, on. that which immediately follows Ramadan and on that which succeeds the pilgrimage. See Lane, Modern Lgyptians, chaps. il., XXIV. (J. 8. BL.)

FASTING, Craus (1746-1791), a Danish poet, was born at Bergen in Norway on the 29th of October 1746. In 1762 he came to reside in Copenhagen. He very early took an active part in letters, and was among the foremost champions of the romantic revival against French taste and the overpowering affectation of Klopstock, then personally reigning in the Danish capital. Fasting edited a brilliant esthetic journal, the Kritiske Tilskuer, or Critical Observer, and in 1772 he formed in Copenhagen the Norwegian Society, a sort of literary club, which included among its members all the best young talent of the time. Soon after this, however, he returned to his native town, and from 1778 to 1781 edited there a journal entitled Provinzcalblade, or Provincial Pages, in which he published most of his poems. In 1783 he was made a member of the municipal council of Bergen, and there he died in 1791. His works were first edited in 1837, when they were issued in one volume, with a biographical study by Lyder Sagen.

FATES, in Latin mythology, a name given to certain beings who, by euphemism similar to that which gave to the Greek ERINYEs (q.v.) the name of Eumenides, were also known as Parce, or the Merciful. Originally

the one Fatum, or spoken word of Jupiter, answered precisely to the single Aisa, the spoken word of Zeus, in the mythology of the

Greeks. The conversion of one Fate into three had refer- ence to the distinction of time into the past, present, and future; and thus the Fates answer to the Teutonic Norns or Weird Sisters.

FATHERS OF THE CHURCH. Ecclesiastically the

word “ father” is used in a variety of secondary significa- tions. applied to priests (Judg. xvii. 10, xvii. 19), and to pro-

In the Old Testament even, we find the name

phets (2 Kings ii. 12, vi. 21, xiii. 14), as well as to kings (2 Kings v. 13); and in the days of later Judaism there was a definite office which was known as that of the Father of the Synagogue.! In the Christian church almost every kind of spiritual relationship in which age or authority was in any way implied came to be expressed by some word denoting paternity. Thus we find such names as abba, papa, pater, bestowed occasionally upon godfathers, con- fessors, instructors, and almost invariably upon bishops and heads of monasteries The decrees of the council of Nice are often referred to as those of the 318 fathers. The expression “ church fathers” (patres ecclesiastici), however, has come to be used in a comparatively definite and restricted sense, as denoting in the aggregate those teachers of the ancient church who, from the close of the apostolic age onwards, either orally or in writing expounded and de- fended the orthodox faith, and came to be acknowledged, either by tacit consent or by express declaration of the church, as duly qualified exponents of her doctrines. The title of father is generally held to imply soundness of doc- trine, holiness of life, the approval of the church, and un- doubted antiquity (Perrone), The word itself is fitted to suggest the idea of age, and also some such notion as that which is expressed in 1 Cor. iv. 15.

The patristic period of the church’s history is generally held to begin with the close of the apostolic age ; but his- torians are not agreed as to the date

at which it may be said to have closed. Some Roman Catholic writers speak of Bernard, who died in 1153, as having been the “ last of the fathers,” while Greek patristic is often brought down so far as to the council of Florence. But it is usual to speak of the scholastic period as having begun with Anselm ; and there seems to be no good reason for removing Bernard from the list of the schoolmen. As no very important author either in Latin or in Greek can be assigned to the centuries immediately preceding Anselm, it may therefore be said, roughly speaking, that the patristic period practi-eally closed for the Eastern Church with Joannes Damascenus, and for the Western with Gregory the Great.

The patristic canon has never been quite definitely fixed, and no precise line of demarcation can be drawn between those ancient teachers of Christianity who are and those who are not entitled to be reckoned “fathers.” The name is often bestowed on some whose title when viewed from the standpoint of rigid orthodoxy cannot but be regarded as somewhat doubtful. While Arius and Eusebius of Nico- media have obviously no title to be called “ fathers,” it has not been thought necessary to withhold the honourable appellation from Origen or Tertullian.? The authors usually named as fathers may be arranged according to chronology into three groups, called respectively the apostolic, the primitive, and the post-Nicene. The apostolic fathers, that is to say, the fathers who were to some extent contemporary with the apostles, are Clement of Rome, Ignatius, Polycarp, the author of the Shepherd of Hermas, and the author of the Epistle of Barnabas (see Apostotic Farners). The chief primitive or ante-Nicene fathers are Irenzus, Justin

1 See the rescript of Constantine (in the Codex Theodosianus) referred. to and discussed by Vitringa, De Syn. Vet. lib. ii. ¢. 5. 2 See Perrone, Loci Theologici, p. ii. sect. ii. cap. ii., De sanctis patribus. IX. — 7

Martyr, Origen, Clement of Alexandria, Cyprian, Tertullian, Gregory Thaumaturgus. Among the post-Nicene fathers may be mentioned Ambrose, Athanasius, Augustine, Basil, Chrysostom, Cyril of Jerusalem, Cyril of Alexandria, Epiphanius, Gregory of Nazianzum, Gregory of Nyssa, Gregory the Great, Hilary, Jerome, and Leo. A distinction is usually recognized between the patres and those who were merely scriptores

ecclesiastici, and it is to the latter cate- gory that such writers as Eusebius and Socrates the his- torians most properly belong. The Eastern and the West- ern Church have each four authors of note whom they recognize as fathers par eacellence. Those of the Eastern are Athanasius, Basil, Chrysostom, and Gregory of Nazi- anzum. ‘Those of the Western are Jerome, Ambrose, Augustine, and Gregory,—the fathers respectively of her monastic system, of her sacerdotal authority, of her scientific theology, and of her popular religion (Milman, Latin Christianity, b. ii. c. 4).

The study of the fathers has sometimes been regarded as constituting a distinct discipline called patrology or patristic, which, however, practically resolves itself into the church history of the first six centuries. For information on the individual fathers and on the influence they exerted upon one another and upon the thought and life of the church the reader is referred to the various articles, biogra- phical, archeological, and historical, relating to that period.

The much-disputed question as to the authority of the fathers resolves itself into the more general one as to the place of tradition considered as a source of dogma and a rule of life apart from the scriptures (see vol. v. p. 759). There seems to be no sufficient evidence for the statement made by Turrettin and others to the effect that some Catholic writers set the writings of the fathers individually on a level with the canonical scriptures ; and it is certainly an exaggeration to say that Cardinal Cajetan regarded them as having no authority at all! The Tridentine doctrine is that no one is entitled to interpret scripture in a sense con- trary to the interpretations of holy mvuther church or to the unanimous consent of the fathers.2 Roman Catholic writers accordingly as a rule attach comparatively little weight to the peculiarities of individual fathers, and hold themselves committed to nothing that is not established by what they consider to be unanimous and unvarying tradition. They distinguish, moreover, between the func- tion of the fathers as witnesses and their function as instructors. As witnesses to the tradition and teaching of the church, they give testimony which is binding on the Catholic conscience ; as independent teachers, they are en- titled to be listened to with deference and respect, but their interpretations and arguments are to be freely accepted or as freely rejected according to their merits. Protestant writers, while fully admitting the merits, literary and

other, of many of the fathers, usually dwell much upon the admitted fact of their fallibility, and strive to show that the attempt to establish an unambiguous tradition by their means is in very many cases much more illusory than Catholic writers are disposed to allow. They do not, how- ever, deny that on many important points there is such a thing as a consensus patrum ; but this they regard as hav- ing at best no other authority than what is merely human and ecclesiastical, the Bible alone being the supreme rule of faith and life. The fundamental Protestant antithesis to the Tridentine doctrine according to which the canonical books and the traditions preserved by the church are to be

} Turrettin, loc. ii. qu. 21. Mohler, Symdolik, sec. 42.

- Cone. Trid., sess, iv. Compare th ; A a Mei premmed by Ps Vv,

: me ohler, ué sup.; Perrone, ut SUD. ernnitz, Examen Concilii Tridentini, De traditionib i us; Daille. De usu patrum; Berbeyrac, De la Morale des Péres, and others, “

is very clearly expressed in the sixth Article of the Church of England which declares that “ Holy Scripture containeth all things necessary to salvation; so that whatsoever is not read therein nor may be proved thereby is not to be required of any man that it should be believed as an article of faith, or be thought requisite or necessary to salvation.”

The first writer in patrology may be said to have been Jerome, himself one of the greatest of the fathers. His work, De Viris Illustribus, sive Catalogus scriptorwm ccclesiasticorum, was reprinted, along with the similar works of Gennadius of Marseilles, Isidore of Seville, and Ildefonso of Toledo, by Fabricius in his Bibliotheca Ecelestastica (1718). Among modern writers on this subject Mohler (Patrologie, 1842), Alzog (Grundriss der Patrologic, 1866), Engelhardt (Liticrarische Leitfaden zw Vorlcsungen iiber dic Pat- risttk, 1823), and J. KE. L, Danz (Initia doctrine patristice, 1839) may be referred to. See also Cave’s Apostolici (1677) and Ecclesi- astici (1683), Ittigii Tractatus de Bibl. Patr. (Lips. 1707), and Dowling’s Notitia

Scriptorum SS. Patrum (Oxon. 1839). The most important collective editions of the fathers are the Latin Magna

| Bibliotheca Vetcrum Patrum of De la Bigne (Paris, 1575), of which

the Maxima Bibliotheca (Lyons, 1677) is an improved reprint, and the exhaustive Patrologia cursus conupictus of Migne, in which the collection of Latin authors, brought down to the time of Innocent III., occupies 221 volumes (Paris, 1844-1855), while the Greek division, extending to the council of Florence, is completed in 166 vols. (Paris, 1857-1866). (J. 8. BL.)

FATHIPUR, or Futtenpoor, a district of British India in the Allahabad division, under the jurisdiction of the lieutenant-governor of the North-Western Provinces, lies between 25° 26’ 15” and 26° 13’ 0” N. lat., and 80° 19’ 0” and 81° 25’ 0” E. long. It is bounded on the N. by Rai Bareli and Sult4npur, E. by Allahabad, S. by Hamirpur and Bandé, and W. by Cawnpur. Fathipur district is situated in the extreme south-eastern corner of the dudb or tract of the country between the Ganges and the Jumna, which respectively mark its northern and southern boundary. The whole district consists of an alluvial plain formed by the deposits of the two great rivers. The central part is almost perfectly level, and consists of higlily cultivated land, in- terspersed with tracts impregnated with saltpetre (usar) and jungle. A ridge of higher land, forming the watershed of the district, runs along it from east to west at an average distance of about five miles from the Ganges. Fathipur therefore consists of two inclined planes, the one five miles broad, sloping down rapidly to the Ganges, and the other, from fifteen to twenty miles broad, falling gradually to the Jumua. The country near the banks of the two rivers is cut up into ravines and zalds running in all directions, and is almost entirely uncultivable. Besides the Ganges and Jumna, the only rivers of importance are the Péndu, a tributary of the Ganges, and the Rind and Nun, which both fall into the Jumna. The census of 1872 returned the population of Fathipur at 663,877, of whom 593,256 were Hindus, 70,554 Maliometans, and 5 Christians. The area of the district is 1586 square miles, of which 871 are returned as cultivated, and 172 as cultivable. Two harvests are gathered during the year, the kharif or autumn crop, consist- ing chiefly of rice, jodr, and bdjrd, and the ravi or spring crop,

consisting principally of wheat, barley, gram, oats, pease, &c. The principal lines of road are the grand trunk road, which runs through the whole length of the district from east to west, the Mughal road to Khajwaé, and the Banda road. The East Indian railway runs through the district parallel to the grand trunk roads, having stations at Khaga, Barhampur, Fathipur, Malwa, and Mohar.

The civil station and principal town is Fathipur, situated on the grand trunk road in 25° 57’ N. lat. and 80° 54’ E. long.; population 19,879. It is also constituted a muni- cipality, the municipal income in 1875 amounting to £1314, and the expenditure to £1196. The town carries on a considerable trade in grain, hides, grease, and soap. The other important trading towns are—Binki, the largest grain and cattle mart in the district; Khajwa, noted for its brass and copper work; Korah, with a trade in metal

work, whips, and skins; Nar4yani, with a large market for grain and local produce. The revenue of the district in 1876 was £165,409 ; the expenditure on civil administration, £54,404. The force for the protection of person and pro- perty in 1875 consisted of 522 regular police, costing £6732, and 1898 village watchmen, costing £6898. The schools in the district numbered 260 in 1875, attended by 6416 pupils, and costing £2662. The Fathipur charitable dis- pensary afforded medical relief in 1875 to 410 indoor and 4863 outdoor patients. The climate is more humid than in the other districts of the dudb, and although fevers are common, it is not considered an unhealthy district. ‘The average annual rainfall is 35°7 inches.

The tract in which this district is comprised was con- quered in 1194 by the Pathans; but subsequently, after a desperate resistance, it was wrested from them by the Mughals. In the 18th century it formed a part of the subah of Korah, and was under the government of the vizir of Oudh. In 1765, by a treaty between the East India Company and the nawdb, Korah was made over to the Delhi emperor, who retained it till 1772, when it was again restored to the uawdb vizir’s dominions. Finally, in 1801, the naw4b, by treaty, reconveyed it to the company in commutation of the amount which he had stipulated to pay in return for the defence of his country. In June 1857, the district rose in rebellion, and the usual murders of Europeans took

place. Order was established after the fall of Lucknow, on the return of Lord Clyde's army to Cawnpur.

FATHIPUR SIKRI, a town in the Agra district in the North-Western Provinces of India, on the road from Agra to Jaipur, situated in 27° 58' N. lat. and 75° 5' E, long. It is a ruined city, and is interesting only from an arche- ological point of view. It was founded by Akbar about 1570, as athankoffering for the birth of a son, Selim, afterwards the emperor Jahangir, obtained through the intercession of a famous Mahometan saint. The principal building is the great mosque, which is said by Fergusson to be hardly surpassed by any in India. "It measures 550 feet east and west by 470 feet north and south, over all. The mosque itself, 250 feet by 80 feet, is crowned by three domes. In its courtyard, which measures 350 feet by 440 feet, stand two tombs. One is that of Selim Chisti [the holy man above mentioned], built of white marble, and the windows with pierced tracery of the most exquisite geome- trical patterns. It possesses besides a deep cornice of marble, supported by brackets of the most elaborate design. The other tomb, that of Naw4b Islam Khan, is soberer and in excellent taste, but quite eclipsed by its surroundings. Even these parts, however, are surpassed in magnificence by the southern gateway. As it stands on a rising ground, when looked at from below, its appearance is noble beyond that of any portal attached to any mosque in India, per- haps in the whole world." Fathipur Sikri was a favourite residence of Akbar throughout his reign, and his palace was one of great magnificence. After Akbar's death, Fathipur Sikri was deserted, within 50 years of its foundation. The buildings are situated within a walled inclosure about seven miles in circumference. They are now all more or less in ruins. The town at present contains 8513 inhabitants.

FATIMAH (606-632), the daughter of Mahomet by his wife Khadijah, and one of the four women whom the prophet regarded as perfect, was born at Mecca in 606. At the age of fifteen she was married to Ali, of whom she was the only wife. The Arabian dynasty named Fatimites, which from 909 to 1171 ruled over Egypt and the northern part of Africa, and latterly over Syria and Palestine, claimed to be descended from Fatimah. The religious tenets of their adherents differed considerably from those of

ol the orthodox Mahometans, and latterly they sought to give to the Koran an allegorical interpretation so as to avoid obedience to its literal precepts. See MAHOMET.

FATTORE, It. See Penni.

FAUCHER, Leon (1803-1854), a French statesman and political economist, was of Jewish extraction, and was born at Limoges 8th September 1803. His parents afterwards removed to Toulouse, and he found the means of supporting himself by the execution of designs for embroidery while attending the college of that place. From Toulouse he went to Paris, where for a short period he followed the pro- fession of private tutor ; but on the outbreak of the revolu- tion of 1830 he became immersed in the political struggles of the time and a contributor to the political journals. In 1833 and 1834 he was editor of the Constitutionnel, after which he joined the staff of the Courter, and in 1839 be- came itseditor. In politics he belonged to the party known as the dynastic left, and he was frequently consulted by the Thiers ministry of 1840. In 1842 the Courier changed hands, and on its new proprietors wishing slightly to modify its principles, Faucher resigned the editorship, and from that time devoted his attention almost exclusively to ques- tions of political economy. In 1843 he visited England with the view of studying the social aspects of that country, and in October of the same year he began a series of articles in the Revue des Deux Mondes, recording the impressions made by his visit. These papers, though not altogether free from the defects incident to the imperfect knowledge of a foreigner, are characterized not less by shrewdness of obser- vation than by able statement and illustration of economical principles, and form an important contribution towards the solution of the great social questions of the time. Shortly after this he became one of the editors of the Journal des Economists, to the pages of which he contributed several valu- able papers, more especially on the tariff of customs. He also took a prominent part in the organization of the French association on the model of the free-trade league of England, but on account of the extreme opinions of the majority of its members he soon resigned his connexion with it. In 1846, chiefly on account of his advocacy of free-trade doc- trines, he was elected member of the chamber of deputies for Rheims, and in the chamber he took a leading part in the discussion of all economical and financial questions. After the

revolution of 1848 he became a member of the new assembly for the department of Marne, and in December of the same year he was named minister of public works, and a little later minister of the interior; but he was compelled through the opposition manifested to his measures by the extreme republicans to resign his office 14th May 1849. On 10th April 1851 he again accepted the same office from Louis Napoleon, then president of the republic, but when Napoleon resolved to appeal to universal suffrage Faucher again resigned ; and after the coup d'état he also refused to become a member of the constitutional commission insti- tuted by the emperor. The occurrence of an affection of the throat which gradually assumed an alarming form in- duced him to pass the summer of 1854 in different parts of the Pyrenees. He had resolved to remain in Italy over the winter, but in November business affairs called him to Paris, and on his way back to Italy he was seized at Marseilles by typhoid fever, and died 14th December. During his whole political career Faucher maintained his probity unsullied, and in very difficult circumstances held with unswerving steadfastness to the path pointed out to him by convictions which were formed solely by a scientific study of political problems and an unprejudiced regard for the welfare of the human race. His economical writings are characterized by clearness of statement, fulness of in- formation, incisiveness of reasoning, and firm grasp of prin- ciples. In relation to the cause of free trade in France he

occupies, more than any other Frenchman, a position analo- gous to that occupied by Cobden in relation to the same cause in England ; and perhaps both by his writings and by his former relations with Napoleon he had no small share, though an indirect and posthumous one, in bringing about the commercial treaty which through the intervention of Cobden was effected between the two countries in 1860.

The principal writings of Faucher were contributed to the Revue des Dewx Mondes, and were published posthumously in 2 vols. under the title Mélanges d'économie politique et de finance, 1856. Among his other writings the principal are Recherches sur Lor et sur Vargent, considérés comme étalons de la valeur, 1848, and Etudes sur U Angleterre, 2 vols.,

1845. The former work and a portion of the latter have been translated into English. A short biography of Faucher, by Léonce de Lavergne, is contained in the Hevue des Deux Mondes for January 1855.

FAUCHET, Cravpz (1530-1601), French historian and antiquary, was born at Paris in 1530. Of his early life few particnlars are known. He applied himself to the study of the early French chroniclers, and proposed to publish ex- tracts which would throw light on the first periods of the monarchy. During the civil wars he lost a large part of his books and manuscripts in a riot, and was compelled to leave Paris. He then settled at Marseilles. Attaching himself afterwards to Cardinal de Tournon, he accompanied him in 1554 to Italy, whence he was several times sent on embassies to the king, with reports on the siege of Siena. His services at length procured him the post of president of the chambre des monnaies, and thus enabled him to re- sume his literary studies. Having “become embarrassed with debt, he found it necessary, at the age of seventy, to sell his office ; but the king, amused with an epigram, gave him a pension, with the title of historiographer of France. Fauchet has the reputation of an impartial and scrupulously accurate writer; and in his works are to be found import- ant facts not easily accessible elsewhere. He was, however, entirely uncritical, and his style is singularly inelegant. His principal works treat of Gaulish and French antiquities, of the dignities and magistrates of France, of the origin of the French language and poetry, of the liberties of the Gallican church, &c. A collected edition was published in 1610. Fauchet took part in a translation of the Annals of Tacitus, whicli appeared in 1582. He died at Paris about the close of 1601.

FAUCHET, Craupe (1744-1793), the Abbé Fauchet, a French constitutional bishop, and a noted actor in the Revolution, was born at Dornes, in the department of Niévre, September 22,1774, He devoted himself to the service of the church, passed through the usual course of studies, and was rapidly promoted. Before he was thirty years of age he made his mark as an orator in a panegyric of St Louis, delivered before the French Academy. For some time he was engaged as tutor to the children of the marquis of Choiseul, a brother of the famous minister of Louis XVI. ; and he was afterwards nominated grand-vicar of the archbishop of Bourges, preacher to the king, and abbé of Montfort-Lacarre in Brittany, The influence of the

new philosophy was clearly seen in his discourses, and the political tone of his sermon, Discowrs sur les meeurs rurales, at the festival of La Rosiere at Surénes, especially exposed him to censure. As he was proof against remonstrance, he was deprived of his office as preacher to the king. This occurred in 1788; and when in the following year the Revolution broke out, Abbé Fauchet was ready to fight . the foremost in the great cause. His speeches fired ee res ener and the sections of Paris, and on Be ree aa e – July he was one of those who led se = = a et on the Bastille, displaying, it is ee Cite. Hes ate, but oe Se ar Pies a © was elected a member of the

e of Faris, figured in the clubs, blessed the tricolor

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flag for the National Guard, and by all means helped for- ward with a passionate zeal the revolutionary movement. He contributed to the reorganization of the church by his Discours sur la religion nationale; and in May 1791 he was appointed constitutional bishop of Calvados, During the same period he had delivered three discourses on liberty, a discourse on the harmony of religion and liberty, the funeral oration of the Abbé de l'Epée, and an Eloge eivique of Franklin. The last of these was spoken in the rotunda of the corn-market in the course of the festivities of the federation in July 1790. Im these pieces the swift progress of the Revolution was reflected im a growing in- tensity of sympathy and enthusiasm on the part of the orator ; and hostility to the church carried him well nigh to a denial of the faith of which he was a minister. In the winter of 1790-91 Fauchet organized, in the precincts of the Palais Royal, his 'Cercle Social," with regenerative in- tent, to be carried out chiefly by means of fluent oratory. He presided in the meetings under the self-assumed title of " Procureur général de la Vérité." Condorcet was one of his coadjutors, and 'ten thousand persons of respectability " flocked to hear them,—a noisy and phantasmal affair, which came toa speedy end. In 1791 Fauchet was elected deputy to the legislative assembly, and afterwards to the conven- tion He wrote in favour of an agrarian law, voted against payment of priests who refused the oath to the constitution, and was oue of the first to submit to the decree for sup- pression of ecclesiastical costume. The excesses of the Jacobins, however, alarmed him, and he began to incline towards the

Girondists. On the trial of the king he spoke earnestly and courageously against the proposal to put him to death, and voted for the appeal to the people, imprison- ment, and banishment. The execution of the king drove him still nearer to the party of the Girondists, and thus made him an object of the wrath of the Mountain. His name was one of those included in the proscription list, but he continued to act as secretary of the assembly till May 31, 1793, when the decree of accusation against the Girondists was passed. On the 18th July he was accused, not only as a Girondist, but also, and without ground, as an accomplice of Charlotte Corday, the murderer of Marat. He was sent to the Conciergerie, was condemned with the Girondist deputies by the revolutionary tribunal on October 30, and with them executed on the 31st.

FAUJAS DE SAINT-FOND, Bartutiemr (1741- 1819), French geologist and traveller, was born at Montéli- mart, May 17, 1741. He was educated at the Jesuits' College at Lyons; and, showing in his boyhood much poetic sensibility and a propensity to versifying, he received from some of his worldly-wise elders the earnest warning,—If you would succeed, don't make verses. He appears to have submitted to this counsel; for he went to Grenoble and applied himself to the study of law, and was admitted advocate to the parliament. He rose to be president of the seneschal's court (1765), a post which he honourably filled, but the duties of which became before long intolerably irk- some, for his feeling for nature was not extinguished, and his favourite relaxation was found in visits to the Alps. His final bent, however, was not to the poetic but to the scientific interpretation of nature. In his frequent Alpine rambles he was amassing observations and facts, the full value of which could only be known at a later time. Geology was in its infancy, had scarcely even a name, when Faujas began his studies of the forms, structure, composi- tion, and superposition of rocks, nor was it possible for him to divine how vast the science that was to arise upon the foundation of the facts of which he was so keen and so diligent an observer. In 1776 he put himself in communi- cation with Buffon, who was not slow to perceive that the humble labours of Faujas would be of great service to him

in his larger and more imaginative sphere of work. Invited by.Baffon to Paris, he quitted the law, and was appointed by Louis XVI. assistant naturalist to the museum, to which office was added some years later (1785, 1788) that of royal commissioner for mines. In 1775 he had dis- covered in the Velay arich mine of pozzuolana, which he opened, and which was largely worked by the Government. One of the most important of his works was the Recherches sur les volcans éteints du Vivarais et du Velay, which appeared in 1778. In this work, rich in facts and observa- tions, he developed his theory of the origin of volcanoes. In his capacity of commissioner for mines Faujas travelled in almost all the countries of Europe, everywhere devoting his chief attention to the surface of the globe, and the nature and constituents of the rocks composing it. Itwas he who first called attention to the basaltic formation of the cave of Fingal (Staffa), He sustained heavy losses during the early years of the Revolution, but for these he was in Lie indemnified by a grant made by the council of five hundred, Having been nominated in 1793 professor at the Jardin des Plantes, he held this post till he was nearly eighty years of age, retiring in 1818 to his estate in Dauphiné. Faujas took a warm interest in the balloon experiments of the brothers Moutgolfier, and published a very complete Description des expériences de la machine aerostatique de MM. Montgolfier, &c. (1783, 1784). He contributed many scientific memoirs to the Annales and the Mémoires of the museum of natural history. Among his separate works, in addition to those already named are—Aistoire naturelle de la province du Dauphiné (1781, 1782) ; Minéralogie des Voleans (1784); Voyage en Angleterre, en Hcosse, et aux Iles Hébrides (1797) ; and Essai de géologie (1803-1809). Faujas died at his estate of Saint-Fond in Dauphiné, July I, 13.9.

FAUN. In Latin mythology, this name denoted a class of rural deities, who fostered the productive powers of the earth and of animals, aud had their dwelling in woods and groves, where they sported with the nymphs. In the later traditions of the people, Faunus was said to have succeeded Picus and Saturnus as king of the Laurentes; but these names may, like many others in the mythology of Italy, be referred to processes or phenoniena in the natural world, Saturnus or Seviternus being the god of the seed time and the harvest, and Picus the deity who cleaves the trees of the forest with the stroke of the lightning or the fury of the storm. There is much likeness

between the charac- teristics of Faunus and those of the Greek Pan, and the two names may have a common origin, although the Latin Faunus has been regarded as an euphemistic name (from the root of the verb faveo) applied to deities whose anger was dreaded. As revealing the secrets of the future, whether by dreams or by strange sounds, the male Faunus and the female Fauna or Faula were known as fatuus and fatua, from the verb farz, to speak, which reappears in the Latin Fatum. In honour of these rural gods the festival of the Faunalia was celebrated yearly in December.

FAURIEL, Cuarizes CraupE (1772-1844), a distin- guished French historian, philologist, and critic, was born at St Etienne, 21st October 1772. His parents belonged to the artisan class, but their circumstances were such as to enable them to afford him a good education at Tournon and Lyons. Though from his earliest years preferring a life of study and retirement, Fauriel could not at first altogether escape the claims of the restless times in which he lived, and in 1793 he became sub-lieutenant in the fourth battalion of light infantry then in garrison at Perpignan. He would appear to have resigned this appointment within a year, but it is certain in any case that he was for some time secretary to General Dugommier, and that he also served under Latour d'Auvergne. In 1794, however, he

st) had returned to St Etienne, where, but only for a short period, he filled a municipal office ; and from 1799 to Lind he devoted himself to strenuous study, more especially of the literature and history, both ancient and modern, of Greece and Italy. Having paid a visit to Paris in 1799, he was introduced to Fouché, minister of police, who immediately conceived for him a strong liking, and induced him to be- come his private secretary. The duties of this office Fauriel discharged both to the satisfaction of Fouché and with such courtesy and kindness as to secure many lasting friendships ; but he must have found it scarcely congenial ; and as he continued to unite with the labour it entailed upon him the same continuous application to study as formerly, he found it necessary in 1801 to recruit his health by foreign travel. In resigning his office in the following year, he was therefore actuated doubtless as much by these considerations as by the ostensible excuse that he had scruples in serving longer under Napoleon, when the latter, in violation of strict republican principles, became consul for life.

Some articles which Fauriel in 1800 published in the Decade on a work of Madame de Staél were the means of ripening his slight acquaintance with that distinguished authoress into intimate friendship—a friendship which in its intellectual relations had considerable influence on her future career. Through her he was shortly afterwards in- troduced into the literary society of Auteuil, Neither in the literary history of his time nor in that particular circle can Fauriel be called the most prominent figure, but his position would not have been so unique in relation to either had it been more obtrusive. By nature strongly sympa- thetic, gifted also with a finely balanced judgment which was informed and cultivated to a high degree of perfection by an almost unexampled erudition, and so intensely in- terested in all that related to literature and history as to be almost forgetful of self and devoid of the love of fame, he soon became the confidant and almost the literary mentor of the most distinguished of his contemporaries, whom he benefited, not only by his contagious enthusiasm and suggestive criticism, but by placing at their dis- posal tle results of his own laborious researches. Those who enjoyed his closest intimacy were the physiologist Cabanis and the Italian poet Manzoni, and perhaps after these, the historians Guizot and Thierry, the latter of whom in his preface to his Etudes historiques speaks of him as the friend and sure and faithful counsellor, whose judgment was his rule in doubt, and whose sympathy with his labours his greatest incentive to progress. During his connexion with Auteuil the attention of Fauriel was naturally turned to philosophy, and from the letter which Cabanis addressed to him on final causes it would appear tbat he must be nained the precursor of that school of philosophy in France which recognizes Cousin as its head—that he was the first to direct attention to the importance of study- ing philosophy in its historical relations, and to advocate what is known as eclecticism. His great merit indeed is in emphasizing the necessity of studying, not only the philo- sophy, but the general literature and civilization of modern times in their primitive sources ; although it must be ad- mitted that his preference for early and uncultured forms of literature has in it something of exaggeration. For some years he was engaged on a history of Stoicism, but perhaps more on account of his attention having been acci- dentally directed to the subject by others than from any special interest in philosophy, and at any rate the work was never completed, all the papers connected with it having accidentally perished in 1814. He also occupied himself at the same time

with the study of Arabic, Sanskrit, and the old French dialects, but all with a special reference to his historical researches. The chief task he had set before

him was an inquiry into the origin of modern civilization,

the wide range of his preliminary studies being accounted |

for by the fact that they were of the nature of soundings taken with a view to discover with some approximation to certainty where the treasure he was in search of was con- cealed; and it was because he became convinced that the object of his quest was to be found in southern Gaul that his studies gradually came to have a bearing more or less direct on the elucidation of the early history of that country. His opinions on subjects which had an incidental relation to his chief purpose were occasionally contributed to peri- odicals ; and as a kind of interlude to his severer studies he published in 1810 a translation of the Parthenats oder die Alpenreise of the Danish poet Baggesen, with a preface on the various kinds of poetry; in 1823 translations of two tragedies of his friend Manzoni, with a preface Sur la théorie de art dramatique; and in 1824 his translation of the popular songs of modern Greece, with a Discowrs pre- liminatire on popular poetry, in which he claims for that species of literature a preference in some respects over the most cultivated and artistic productions on account of its freshness and its intimate connexion with nature and reality, and algo as tlie best key to the comprehension of a nation’s history inasmuch as it is the spontaneous expression and outflow of its peculiar genius and of its deepest experiences. After the revolution of 1830 the Government was per- suaded by his friends to establish expressly for Fauriel a chair of foreign literature. In 1836 he was elected a member of the Academy of Inscriptions and Belles Lettres, and in the same year he published in four volumes L’ Histovre dela Gaule méridionale sous la domination des conquérants Germains—the second portion of a work which, when com- pleted, was to have consisted of three parts, the first on southern Gaul under the Roman dominion, and the third and most important embracing the period from the dis- memberment of the empire of Charlemagne to the end of the 13th century, and including the brilliant though premature spring-time of early literature and culture which

for a short period relieved the sterile winter that had so long overshadowed the intellect of Europe. In 1837 Fauriel published, along with an introduction, a translation of the Provencal poem on the war of the Albigenses, and in 1839 he became a member of the com- mission of the Histoire littéraire de la France, to which work he contributed a number of articles on the writers of the 13th century. He died 15th July 1844. After his death appeared, in 1846, Histoire de la littérature provencale, which formed his course of professorial lectures for 1831-32, and may be regarded as a portion of the third part of the great work which he had sketched out on the history of southern Gaul. In these lectures he sought to prove that from the embers of the civilization of Greece and Rome, which, by a peculiar combination of circumstances, had been transferred not wholly quenched to the foreign soil of Provenge, was lighted the spark which originated the greater part of the romances of chivalry (that is, not only those of the cycle of Charlemagne, but of the cycle of the Round Table), and thus kindled the civilization of uiodern Europe. Various opinions have been formed as to the amount of truth in this theory, and it must at least be admitted that Fauricl has been somewhat hampered and biased in his inquiry by preconceived conclusions; but in any case he must be allowed the merit of having first fully or the importance of the epoch of which he treats, =

of our times who has put in circulation the greatest number of new ideas, can scarcely, however, be accepted, even when we remember his indirect influence on the contemporary writers of France; but none was more than he en rapport with the spirit of the 19th century, or has done a more im- portant work in reference to those problems which are strictly literary or historical. The professorial lectures of Fauriel for 1833-34 were published in 1854, under the title of Dante et les origines de la langue et de la littérature ttaliennes ; and among his miscellaneous writings the most important are his examination of the Systéme de M. Ray- nouard sur Vorigine des langues romanes, contributed to the Bibliotheque de U Ecole des Chartes, and his lives of Dante and Lope de Vega in the Revue des Deux Mondes for Octo- ber 1834 and September 1839 respectively.

The best and fullest account of Fauriel is that by Sainte-Beuve in his Portraits Contemporains, vol. iv. See also the review of Fauriel's work on Provengal literature by H. Fortoul in the Revue

des Deux Mondes for May 1846, and the short notice of his work on Dante by Renan in the Revue des Deux Mondes for December 1855.

FAUST, or Fust, printer. See Fusr.

FAUSTINA, Anni, wife of Marcus Aurelius, was the daughter of Antoninus Pius and the empress Annia Galeria Faustina Augusta. Her husband, whose original name was Marcus Annius Verus, was the son of her maternal uncle Annius Verus ; and both, through their grandfather Annius Verus, consul for the third time in 126 a.D., traced their descent from Numa Pompilius. Besides Commodus, Faustina had six children whose names are known,—viz., Annius Verus, Annia Lucilla Augusta, Vibia Aurelia, Sabina, Domitia Faustina, Fadilla; but she is supposed to have had eleven. Faustina was either one of the most profligate or most maligned of women. Wieland appears to be almost her only apologist in modern times; and in her own day (if we accept the testimony of contemporary historians) the only man who believed in her virtue and goodness was her great and wise husband,—whose testimony, it has been urged, ought to be deemed sufficient to out-weigh the gossip of Dion Cassius. On the other hand, it might be contended that the emperor was just as likely to misjudge the character of his wife as of his son Com- modus, the buffoon of the imperial purple. The empress's impunity amid her alleged vices, and the emperor's patron- age of her supposed paramours, have even been deemed unfavourable to the reputation for judgment and sincerity of one of the noblest men of antiquity. Faustina died in 175, at Halala, near Mount Taurus, in Cappadocia, whither she had accompanied Marcus in his expedition against the rebel Avidius Cassius, commander-in-chief of the imperial armies in Asia. Aurelius, in memory of his wife, raised the obscure village to the rank of a city, with the name of Faustinopolis. In her honour, too, le founded charitable schools for orphan girls—which were similar to those that Antoninus had established in memory of his own wife, the elder Faustina. The title Mater Castrorum first appeared on the coins of the younger Faustina. Pudicitia is another legend commemorative of this supposed incarnation of im- modesty. Marcus

Aurelius placed his wifc's statue in the temple of Venus, and Faustina was numbered among the guardian deities of Rome.

FAUSTUS. Although probably the name of an actual historical personage, Faustus or Faust is principally intcr- esting as an ideal figure of a twofold and in some respects antithetical type,—on the one hand the deliberate choice of evil, on the other an unsatisfied aspiration towards the highest good. The development of the latter conception from the former—of Goethe's Faust from the medieval Faustus—is an interesting study in itself, and affords a curious example of the accretions and modifications inci- dental to popular myths. The Faustus of tradition arose from the fusion of two more primitive conceptions,—that

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ef a compact with the evil one, of which the Theophilus of eeclesiastical legend supplies the typical example, and that of the subjugation of the infernal powers by intellec- tual pre-eminence, as in the cases of Virgil, Pope Sylvester, and Michael Scott. Early in the sixteenth century the two currents of tradition united in the person of an adventurer calling himself Faustus the Younger, from which it may be inferred that the name had already become typical. The existence of an elder Faustus cannot, however, be proved ; nor can he, as sometimes suggested, be identified with Gutenberg's coadjutor, the printer Fust. A conjuring book bearing his name (Dr Faust's Dreifacher Héllenzwang) exists in several MSS. dated early in the sixteenth century, and has been published in the magical collections of Scheible

and Horst. It nevertheless appears from the style to be at least a century later. The younger Faust's own existence has been disputed, but apparently on no good grounds. He is mentioned as a contemporary by Trithemius (1507), Mutianus Rufus (1513), Begardi (1539), and Gast (1548), Trithemius denounces him as a charlatan, who purposely shunned him for fear of exposure. Rufus and Gast claim to have been actually in his company. The former enter- tains the same opinion of him as Trithemius; the latter considers that a learned dog and horse which accompanied him were probably devils. The same judicious author vouches for his having been carried away by the demon in or about the year 1525. This catastrophe

is also nrentioned in an inscription on a picture still extant in Auerbach's cellar at Leipsic, bearing that date, and depicting the feats familiar to Goethe's readers. Further particulars are given by Wier in his well known work De preestigiis demonum, and in Manlius's Locorum communium collectanea (1562), in a passage often erroneously attributed to Melanchthon, whose conversation Manlius is not reporting on this occa- sion. According to him, Faustus was born at Knittlingen in Wiirtemberg (the popular legend says Rohda in Saxony, and other places are also mentioned), and educated at the university of Cracow. However unworthy of such a distinction, he had evidently by this time become a popular hero, around whom the floating accumulations of legend respecting such national wizards as the Bohemian Zyto, the English Friars Bacon and Rush, and the Polish Twardowski were gradually tending to group themselves, These ultimately took shape in the standard version of Faustus's life, published at Frankfort by Johannes Spiess in 1587. This remarkable book, the work of an anonymous scholar acquainted with Latin, first mentions Mephisto- philes as the name of Faustus's familiar spirit, introduces uew elements suggested by the compiler's animosity to Ronie, and gives especial prominence to the traditions which represent Faustus in connexion with classical mythology. The effect is to exalt his importance asa type by exhibiting lim as in some sort a representative of free thought and free learning, thus paving the way for Goethe's more pro- found interpretation of his alleged compact with the fiend. 'The more obvious tragic aspects of the situation were magnificently brought out by Marlowe, whose tragedy of Faustus, founded on an English translation of the Ger- man narrative, is thought to have appeared as early as 1589. Marlowe's play contains some of the finest dramatic poetry in our language, and he dwells with especial delight on Faustus's evocation of Helen, which by education and sympathy he was peculiarly qualified to apprehend. It was inevitable, however, that he should be principally studious of dramatic effect ; and the perception of the full significance of this episode, as well as of the story generally, was reserved for a more reflective age. A more homely moral was drawn by Faustus's next biographer, Johann

Wiedemann, who (1599) rewrote the narrative from an edify- ing point of view, interspersing copious historical parallels |

and theological disquisitions,—which latter, indeed, are not wanting inthe earlier version,—and omitting what hedeemed unsuitable for pious ears. His pedantic labours, subse- quently revised in the same spirit by Pfitzer (1664), unfor- tunately led to the almost total disappearance of the older narrative, except in the abridged form of a chap book, in which it has survived nearly to our own times, and has even been reprinted in America. Another development of the myth was now at hand—the dramatic. It formed the theme of Justi Placidit infelix prudentia, a play in Latin verse published at Leipsic in 1598. By 1618, as appears from Ayrer's Opus Theatricum, a, play on the subject was a stock piece on the boards of the German puppet-theatre. Heine thinks that it was introduced by the English itinerant players who traversed Germany at the time,—a supposition confirmed by Lessing's previous indication of an English element in the text. These marionette pieces long main- tained themselves as a popular entertainment. Zedler mentions them as still frequently performed in 1735; Heine saw the story of Faustus thus represented as late as 1826. It was not committed to writing, and was partly extemporized for the occasion. Restorations have nevertheless been given by Scheible (1847), Hamm (1850), and Engel (1872). Such representations undoubtedly served to keep the legend alive until it met with critics and poets able to discern its significance in the persons of Lessing and Goethe. The original draft of the latter's Faust, as pointed out by Heine, is almost eutirely based upon the puppet representation. Lessing's interest in Faust is believed to have been awakened by a performance of the old play at Berlin in 1753. He took up the subject shortly afterwards, and, according to his own statement, at different periods of his life sketched out the ground plan of two versions,—the first on the lines of the original legend, the second without any supernatural element. Both are said, on his own authority, to have been nearly completed in December 1775, but were probably lost in the following year, along with a trunk containing other MSS. An anonymous Faust ap- peared in 1775 at Munich, and has recently been re- published as Lessing's, which it certainly is not. The con- ception of Goethe's Fuust was formed as early as 1770, and, according to the contemporary testimony of Merck, the composition had made great progress as early as 1775. The first part, notwithstanding, was not completed until 1807, nor the second until

1831. The analysis of this won- derful work will fall more appropriately under the heading GortHE (q.v.). It need only be remarked here that, while Goethe has finally achieved the transformation of Faustus from a vulgar conjuror into a personification of humanity in one of its most interesting phases, the result, in the first part, is still inadequate to the power of the machinery aud the dignity of the situation, As Charles Lamb tersely ex- pressed it, “What has Margaret to do with Faust?” The much abused and under-rated second part may be regarded as an endeavour to remedy this defect, which might have fully succeeded but for the taste for allegory which had become a mania with Goethe in his later years. The Helena episode is nevertheless a masterpiece, and the fifth act presents the quintessence of Goethe’s wisdom with the authority of a last testament :— ‘Ja, diesem Sinne bin ieh ganz ergeben: Das ist der Weisheit letzter Sehluss !”

Among later attempts at a literary treatment of the Faust legend may be mentioned Klinger’s romance, trans- lated into English by Borrow, and chiefly remarkable for the introduction of the Borgia family; Klingemann’s un- wittingly burlesque tragedy, “the hero of which is not the old Faust driven desperate by the uncertainty of human knowledge, but plain John Faust the printer, driven desperate by an ambitious temper and a total deficiency of

cash” (Carlyle) ; Heine’s ingenious and highly dramatic ballet (Der Doktor Faust, ein Tanzpoem); and Lenau’s poem, partly epic and partly dramatic, not deficient in isolated beauties, but a mere repetition of Goethe in all essential respects. Goethe’s example, as well as the gene- rally subjective character of modern poetry, has led to the creation of a number of ideal figures impersonating some particular thought or principle, and betraying more or less affinity to their original. Such are the Manfred of Byron, the Paracelsus of Browning, the Balder of Dobell, the Spiridion of George Sand, the Konrad Wallenrod of Mickiewicz, last and not least remarkable the Brand of the Norwegian poet Ibsen. The affinity between the typical figures of Faustus and Tannhiuser is very powerfully in- dicated in the last

poem of the lyrical collection entitled Der neue Tannhdéuser, by Eduard Grisebach (1871).

The best works on the history of the Faustus legend are—Rist- elhuber, Faust dans Uhistoire ot dans la légende (Paris, 1863) ; Diintzer, Die Sage von Dr Johann Faustus (Stuttgart, 1846) ; the article by W. Sommer in Ersch and Gritber's Encyclopedia, and that in Meyer's Conversations Lexicon. For its bibliography see Peter, Die Literatur der Faustsage (3d edit, Leipsic, 1857), and the 'Bibliotheca Faustiana" in the first part of Engel's Deutsche Puppenkoméidien (1872). The earliest extant edition of the English version of the German legend, from which it departs in several respects, bears date 1592, but the work had been published pre- viously. It is reprinted in the third volume of Thoms's Zarly English Prose Romances (1827). (R. G.)

FAVARA, a town of Sicily, in the province of Girgenti, is situated 5 miles E.S.E. of Girgenti in a mountainous dis- trict near the Hypas, a tributary of the Acragas. It possesses a beautiful old chateau of the Charamonti family, built in the 14th century. In the neighbourhood of Favara there are large sulphur mines, marble quarries, and deposits of bitumen; and it has also a considerable trade in grain and fruits, The population in 1871 was 15,197.

FAVART, OsaRLES SIMON (1710-1792), French dramatist, was born at Paris, November 13, 1710, "Fle was the son of a noted pastry-cook, a man of some parts who in his leisure hours amused himself with making verses. The son was educated at the college of Louis-le-Grand, and after his father's death carried on the business for a time for the sake of his mother. His first success in literature was a poem entitled La France délwrée par la Pucelle d'Orléans, which obtained the prize of the Académie des Jeux Floraux. After the production of his first vaudeville, Les Deux Jumelles, circumstances enabled him to relinquish his business and devote himself entirely to the drama. He provided many pieces anonymously for the lesser theatres, and first put his name to La Chercheuse d' Esprit, which was produced in 1741. Aniong his most successful works were Annette et Lublin, Le Cog du Village (1743), Ninette @ la Cour (1755), Les Trots Sultanes (1761), and L' Anglais a Bordeaux (1763). Favart became director of the Opéra Comique; and in 1745 he married Mademoiselle Duronceray, a

beautiful young singer and actress who had made a successful début the year before. By their united talents and labours the Opéra Comique rose to such a height of success that the jealousy of rival theatres was aroused, and through their influence the house was suppressed the same year. Favart thus left without re- sources accepted the proposal of Marshal Saxe, and under- took the direction of a troupe of comedians which was to accompany his army into Flanders. It was part of his duty to compose from time to time iinpromptu verses on the events of the campaign, amusing and stimulating the spirits of the men. So popular were Favart and his troop that “the enemy” became desirous of sharing his services, and permission was given to gratify them, battles and comedies thus curiously alternating with each other. But in the midst of his success a heavy blow fell upon him. The marshal had looked with evil eyes upon Favart’s young

wife, and attempted to seduce her. To escape him the wife fled to Paris, and the wrath of the foiled adulterer fell upon the husband. A lettre de cachet was issued against him, and he only saved himself by flight and concealment in a cave. Madame Favart meanwhile had been distinguishing herself at the Comédie Italien ; but as she still rejected the brutal advances of the marshal, she was suddenly arrested and confined in a provincial convent, where she was treated as a prisoner of state. After an imprisonment of more than a year her fortitude gave way, and, yielding to the will of her pursuer, she was at length liberated. After the marshal’s death in 1750, Favart returned to Paris, and re- sumed his pursuits as a dramatist. It was at this time that the Abbé de Voisenon became intimately associated with him and took part in his labours, though to what extent is uncertain. Madame Favart, after a long and pain- ful illness, died at Paris, April 22,1772. She is remem- bered as a bold reformer of stage costumes, breaking with the custom of dressing all the dramatis persone in court or showy style, and introducing the use of costumes appropri- ate to the various characters. She had remarkable powers of mimicry, especially of the speech and accent of foreigners. She assisted her husband in some of his best productions. He felt her loss deeply, survived her twenty years, becom- ing nearly blind in his last days, and died at Paris, May 12, 1792. His works have been several times republished. In 1809 appeared his A/émoires et

Correspondance littéraire, dramatique, et anecdotique, which furnish valuable informa- tion on the state of the literary and theatrical worlds in the 18th century. This work, in 3 vols. 8vo, was edited by his grandson A. P. C. Favart and H, F. Dumolard.

FAVERSHAM, or FEVERSHAM, a muuicipal borough and market-town of England, county of Kent, is situated 10 miles W.N.W. of Canterbury, and 47 E.S.E. of London by rail, The town consists of four principal streets, form- ing an irregular cross, in the centre of which are the town- hall and marketplace. The parish church is a spacious cruciform structure, surmounted by a tower and spire; both its exterior and its interior have lately undergone restorations. Faversham has a free grammar school, a national school, a theatre, and assembly-roonis. Faversham Creek, which communicates with East Swale, is navigable up to the town for vessels of 150 tons. The shipping trade is pretty extensive, chiefly in coal, timber, and agricul- tural produce. The oyster fisheries are the principal industry, but brewing, brickmaking, and the manufacture of Roman cement are carried on, and there are several large powder mills in the vicinity of the town.

Faversham is very ancient, and on account of its situation directly opposite the south-cast extremity of the Isle of Sheppey early rose into consideration, In 812 it was styled “the king’s little town of Fefresham,” and in 930 it was the meeting place of a witan or national council. King Stephen and Queen Maud founded here, in 1147, a Cluniac Abbey, and both they and their son, Eustace count of Boulogne, were buried within its walls. It was to Faver- sham that the boatmen conveyed James II. after preventing his escape in a small vessel lying at Shellness, The population in 1871 was 7198

FAVORINUS, ®aBepivos, acelebrated sophist, flourished during the reign of Hadrian. A Gaul by birth, he was a native of Arles, but at an early age began his life-long travels through Greece, Italy, and the East. He may have acquired some kuowledge of Latin and Greek even before he left Gaul, for Arles was within a short distance of the Phocian colony of Marseilles—that ‘‘Athens of the West” which Varro calls “trilinguis,” and which, according to Strabo, had taught the Gauls to become Philhellenes. His extensive knowledge, combined with great oratorical

owers, raised him to eminence both in Athens and Rome. With Plutarch, who dedicated to him his treatise rept rod mpérov wvxpot, with Herodes Atticus, to whom he bequeathed his library at Rome, with Demetrius of Alcxan-

dria, Cornelius Fronto, and Aulus Gellius, with Hadrian himself, he lived on intimate terms. His good humour appears to have been as inexhaustible as his wit, though in his later years he condescended to violent abuse of his rival Polemon, who divided with him the sutfirages of Asia, the Smyrniote faction pronouncing Polemon to be the greater rhetorician of the two, while that of Ephesus declared for Favorinus. It was Favorinus who, on being silenced by Hadrian in an argument in which the sophist might easily have refuted his adversary, made the subsequent explana- tion to his friend that it was foolish to criticize the logic of the master of thirty legions. It was one of his sarcastic boasts that though he had offended Hadrian he still con- tinued to live. When the servile Athenians, feigning to share the emperor's displeasure with the sophist, pulled down a statue which they had erected to the latter, Favorinus remarked that if Socrates also had only had a statue at Athens, he might have been spared the hemlock. Of the very numerous works of Favorinus, we possess only a few fragments preserved by Aulus Gellius, Diogencs Laertius, Philostratus, and Suidas, the second of whom borrows from his IavroSari 'Ioropia. His Tvppavesor Tpdéaot, in ten books, mentioned by Philostratus in his Lives of the Sophists, i. 8, § 4, appears to have been his chief work.

The most modern sources of information regarding the life and work of Favorinus are Fragmenta Philosophorum Greeorum, col- lected and annotated by F. W. A. Mullach, Paris, 1857 and 1860.

See also J. F. Gregor's Commentatio de Favorino, 1755, and Forsmann's Dissertatio de Favorine, 1789.

FAWKES, Francis (1721-1777), a poet and translator, was a native of Yorkshire, and was born in the year 1721. After studying at Jesus College, Cambridge, where he graduated M.A., he entered into holy orders, and was suc- cessively curate of Bramham, curate of Croydon, vicar of Orpington,

and rector of Hayes, and finally was made one of the chaplains to the princess of Wales. He published Bramham Park, a Poem, in 1745 ; a volume of poems and translations in 1761; and Partridge Shooting, a Poem, in 1767. His translations of the minor Greek poets— Auacreon, Sappho, Bion and Moschus, Muszus, Theocritus, and Apollonius—acquired for him considerable fame, but it may be safely predicted that when they are forgotten Fawkes will be remembered for his fine song, Dear Tom, this brown jug, that now foams with mild ale. He also edited a Family Bible with notes. He died on the 26th August 1777.

FAWKES, Guy (1570-1606), the most notorious of the Gunpowder Plot conspirators, was born at York, of a gentle family, in the year 1570. His grandfather and father were notaries and proctors of the ecclesiastical courts of York, the former being registrar of the exchequer court of the province, the latter an advocate of the consistory court of the cathedral. It is believed that the family was connected with the ancient house of the Fawkeses of Farnley in York- shire, but the evidence of such connexion does not amount to proof. Guy was educated at the free school at the “ Horsefayre,” just outside the city of York, and had for schoolfellows Thomas Morton, afterwards bishop of Durham, and Thomas, grandson of Sir John Cheke. The school was under the superintendence of the dean and chap- ter, and this, aud the fact of his immediate ancestors being employed in the ecclesiastical courts, would have led us to conclude that Fawkes was brought up in conformity to the established church. But we have more direct evidence of this, for the names, both of his parents and of his grand-mother, occur several times in the list of communicants of the parish of St Michael-le-Belfrey in which they lived. Perhaps the most determinant event in Fawkes’s life happeued when he was quite young. His father diced when

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he was about eight years old, and before he came of age his mother married again. Her second husband was one Dionis Baynbridge, scttled at Scotton near Knaresborough. Baynbridge was connected with several Roman Catholic families. Several families, steadfast in the old faith, were settled near Scotton,—among them, that of Sir William Ingilby of Ripley, whose sister was mother of the Robert, Thomas, and John Winter with whom, later

in life, Fawkes was brought into such close contact. For some years he lived under the roof of his stepfather, who, we have every reason to believe, was a Roman Catholic. Guy was the only son and, as there was no will, the sole heir of lus father. He said in confession, ‘‘ My father left me but small living, which I spent.” There is, in fact, evidence that when he came of age he sold the little land left him, and soon after, as it appears, enlisted as a soldier of fortune in the army of Flanders, and is said to have been present at the taking of Calais by the Archduke Albert in 1598. He was sent by Sir William Stanley and the Jesuits in Flanders to join Christopher Wright in a mission to the king of Spain im- mediately after the death of Elizabeth. Early in 1604 he was again in Flanders and with Stanley.

The Catholics in England had hoped much from the accession of James I. To facilitate his passage to the throne, he had given great cause for such hopes, promising that the fines against recusants should not be exacted, and bestow- ing honours upon several Roman Catholic gentlemen. Therefore, when, after James was securely seated on the throne, the severe laws of Elizabeth against priests and re- cusants were again put into execution, many Roman Catholic gentlemen experienced feelings of deep resentment. Robert Catesby, a man steeped in plots, conspiracies, and secret embassies, but a gentleman of great personal power and fascination, conceived a plan for the remedy of all this. His parents had suffered much for their religion, and he himself had been an incessant plotter among the discon- tented Catholics of the later years of Elizabeth’s reign, and for joining in Essex’s rebellion had been heavily fined. But there is no reason to believe that he, or indeed any of the conspirators, were actuated by selfish motives or feelings of revenge in assenting to that scheme for the carrying out of which they dared and suffered so much. Catesby’s own words probably express best the way in which they re- garded the matter. ‘The nature of the disease,” he said, “ requires so sharp a remedy.” It should also be remem- bered that the plot was conceived and entered upou before the more severe execution of the laws against recusants. Catesby’s plan was to blow up king, lords, and commons in the Parliament House with gunpowder. Early in 1604 he wrote to his cousin Thomas Winter desiring him to come to London. Winter, after some hesitation, having con- sented, found Catesby at Lambeth with John Wright. All three were old plotters and companions in plots and con- spiracies. Catesby now broached his new scheme to Winter,

who at first wondered at the strangeness of the conception and doubted of success, but finally gave his consent to it or to anything that Catesby should decide to enter upon. Wishing, however, to leave no quiet way untried to obtain their end, it was decided that Winter should go over to Flanders, to mcet Velasco, the coustable of Castile, who was coming to England to negotiate the peace with Spain. Winter was to inform the constable of the state of the Catholics in England, and to entreat him to solicit the king that the penal laws against them might be recalled. Catesby named Fawkes as a likely man in case this quiet way failed. Winter saw the constable at Bergen, and giv- ing up the hope that much would be done by his means, sought out Fawkes, whom he found with Stanley at Ostend. Representing to him that something was in hand to be done in England, they passed together from Gravelines to

Greenwich, April 22, 1604, and at once went to Catesby. At a meeting soon after they were joined by Thomas Percy, another zealous Romanist, a relative of the earl of Northumberland, and one of the king's pensioners. The plot was propounded and approved of ; all took a solemn oath of secrecy and perseverance, and afterwards received the sacrament from Gerard, a Jesuit, who was in another room. In May a house adjoining the Parliament House was hired in Percy's name, from the cellars of which the conspirators proposed to work a mine. Having, however, with great labour worked about half-way through the nine feet of stone which composed the wall, they discovered that a vault, immediately under the House of Lords, was to let, and as this exactly suited their purpose, it was at once en- gaged by Fawkes, who, being little known in England, passed as Percy's servant, and took the name of Johnson. Barrels of gunpowder which had been stored in a house at Lambeth were brought over in the night, large stones and bars of iron were placed upon them, and the whole covered with billets of wood, so that no suspicion might be excited in case it was found necessary to admita stranger. All was prepared about May 1605. The plan of the plot was that after the blow had been given, as most probably the prince of Wales would attend and perish with the king, the duke (Charles) was to be scized

and carried into the country if possible ; or otherwise possession was to be obtained of the person of the Princess Elizabeth, who was then at Combe Abbey in Warwickshire, and a rising was to be prepared among the Catholics of the midland counties. Fawkes was to fire the train, and then to get over as quickly as possible into Flanders in a ship prepared for his passage. After being several times prorogued, parliament was to meet on the 5th of November.

During the progress of the preparations many other gentlemen, Robert Winter, Christopher Wright, Keyes, Rookwood, Sir Everard Digby, and Francis Tresham, had been sworn in by Catesby to assist with labour or money. In the interval between the completion of the pre- parations and the opening of parliament, Fawkes was sent into Flanders to acquaint Stanley and Owen the Jesuit with the plot, and to secure their co-operation after the event of the explosion. A great cause of disagreement among the conspirators was the fact that the Catholic lords and members of parliament would be destroyed in a common catastrophe with those whom the plot was specially intended to strike. That the Catholics should somehow be warned there was general agreement, but not as to the method in which the warning should be given. This dis- agreement no doubt caused the failure of the whole trans- action. Ten days before the opening of parliament, Lord Monteagle, a Catholic and a friend of several of the con. spirators, received an anonymous letter giving him a warn- ing, couched in ambiguous terms, not to attend the opening, for “they shall receyve a terrible blowe this parleament.” It is not known who wrote the letter. Tresham was, and is, generally suspected ; but when Catesby accused him of it, he vehemently and with oaths denied all knowledge of the matter. Something in the character of the letter and of the attendant circumstances seems to render it probable

that the whole thing was prepared beforehand to quash |

the plot, but in such a manner that the Government should not be fully alive to the danger until the conspirators had had time to escape. It has also been suggested that the whole plot itself was got up by Cecil, and was nothing but a state trick. However, Monteagle at once took this letter to Salisbury, who communicated it to the king, directly his Majesty returned from

Royston, where he had been hunt- ing, and it seems to have been at once decided that every

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others that all was known, and passionately desired them to make good their escape to foreign lands. They, how- ever, determined to await further events, and Fawkes especially stuck to his post in the vault with that coolness of courage which seems to have been one of his chief char- acteristics.

The Lord Chamberlain, on the 4th November, going over the Parliament House to see that all was prepared for the morrow, visited the vault, and there saw this “ very tall and desperate fellow,” who, together with the large quantity of fuel, exciting suspicions which he communicated to the king, it was decided that a more strict search should be made. Sir Thomas Knevet, a Westminster magistrate, was ordered to direct this search, and going down to the house suddenly, just before midnight, he came upon Fawkes just stepping out of the door. The 36 barrels of powder were discovered; Fawkes was seized, bound with his own garters, and searched. Upon him were found a watch, a tinder box, and some touchwood. He at once avowed his purpose, and said that if he had been within the house when taken he would have blown up house, takers, himself, and all. He was taken to Whitehall and examined before the king. Answering all questions with careless sarcastic indifference, he would say nothing to implicate his confederates. The other conspirators fled into the country to Dunchurch, where a meeting of the Catholic gentry had been convened under pretence of a hunting party. In the hue and cry which followed, all were either killed or taken, Fawkes and the others were repeatedly examined, and torture was, no doubt, in his case used to break the wonderful will and nerve of the man. On 27th January 1606 the trial took place. All were condemned to be drawn, hanged, and quartered. On Thursday the 30th, Digby, R. Winter, Grant, and Bates (Catesby’s servant) suffered in St Paul’s churchyard ; the next day, T. Winter, Rookwood, Keyes, and Fawkes, at Westniinster. So all yet alive who, from belief in the cause or from love of Catesby, had joined his outrageous plot ascended the scaffold, Fawkes last; ‘his body being weak with torture and sickness, he was scarce able to go up the ladder.” He

“made no long speech, but after a sort seeming sorry for his offence, asked a kind of forgiveness of the king and the state for his bloody intent,” and so died.

Jesuit evidence describes Fawkes as a man “of great piety, of exemplary temperance, of mild and cheerful demeanour, an enemy of broils and disputes, a faithful friend,” and asserts that his society was sought by all the most distinguished in the archduke’s camp for nobility and virtue. There seems to be no doubt that he had qualities which under a different rule would have carried him to honour instead of to ignominy. There is something in the whole character of his actions and undertakings in this plot which seems to imply absolute self-renunciation for the cause believed to be just. But nothing could possibly have been more disastrous to the interest of the Catholics of England. The stringency of the laws against recusants was greatly increased, and their observance more severely exacted. The 5th November was ordered to be kept asa day of thanksgiving for ever, by an Act which was not re- pealed for over two centuries. The festivities which were long commen on what is called Guy Fawkes’s day are now perhaps dying out. The custom was to dress up an absurd figure in rags with a tall cap and a lantern, to parade with this through the streets singing rhymes, and finally at night to burn the effigy. This holocaust was in some places an important annual ceremony, presided over by the local officials.

The question as to the part taken by the Jesuits in the

oat should be taken. Winter received warning that | Gunpowder Plot has been a much debated one. There all was discovered. Tresham also warned Catesby and the | seems to be no doubt that Garnet, the superior of the

order in England, had a guilty knowledge of the plot, if, He was tried and >

he did not even actively encourage it. condemned March 28 and executed May 3, 1606.

Many valuable letters and memorials connected with this plot are preserved in the Public Record Office. The anonymous letter to Lord Monteagle and

the reports of Fawkes's various examinations are there, as well as the reports of the examinations of Winter and other conspirators, supposed conspirators, suspected persons, and persons in any way connected with them. These were some years ago collected and bound in a volume called the Gunpowder Plot Book. They are not, however, separately calendared in the pub- lished series of calendars, but are noticed chronologically with the other papers. Cecil and others to Sir C. Cornwallis about the plot, from the Cotton Library. See Fawkeses of York in the Sixteenth Century, and Jardine's Narrative of the Gunpowder Plot.

FAXARDO. See SAsvEDRA.

FAY, Ayprds (1786-1864), Hungarian poet and author, born 30th May 1786, at Kohany in the county of Zemplin, was educated for the legal profession at the Protestant college of Sdrospatak. Being, however, sub- sequently obliged to abandon the law as a vocation, on account of ill-health, he devoted himself to literary pur- suits, and became one of the best writers of Hungarian narrative prose. His AMesék (Fables), the first edition of which appeared at Vienna in 1820, evinced his powers of satire and invention, and won him the well-merited ap- plause of his countrymen. These fables, which, on account

of their originality and simplicity, have caused Fay to be |

regarded as the Hungarian Aisop, were translated into German by Petz, Raab, 1825, and partly into English by E. D. Butler, Hungarian Poems and Fables, Loudon, 1877. Fay wrote also numerous poems, the chief of wltch are to be found in the collections Bokréta (Nosegay), Pesth, 1807, and Fris Bokréta (Fresh Nosegay), Pesth, 1818. He also composed several plays and romances and numerous tales, busying himself through the whole of his career with every kind of literary work. In the year 1835 Fay was elected representative for the county of Pesth, in the Hungarian diet, where he became for a time the leader of the opposi- tion party; and, though afterwards eclipsed by Kossuth, he still continued to distinguish himself both by his liberal sentiments and by his unremitting efforts for the material internal progress of the nation. It is to him that the Pesth Savings Bank owes its origin, and he was one of the chief founders of the Hungarian National Theatre. He died on the 26th July 1864. His earlier works were

published in a collective form at Pesth, 1843-44, 8 vols. The most noteworthy of his later works is a humorous novel entitled Jévor orvos és Bakator Ambrus szolgdia (Jdvor the Doctor and his servant Ambrose Bakator), Pesth, 1855, 2 vols. FAYAL. See Azorgs, vol. iii. p. 172. FAYETTEVILLE, a town of the United States, capital of Cumberland co., North Carolina, is situated on Cape Fear River, 100 miles N.W. of Wilmington. It has cotton manufactures, and, on account of the large pine forests in its neighbourhood, a considerable trade in timber, tar, and turpentine. It was settled in 1762, received its present name in 1784, was partly destroyed by fire in 1831, and was taken by the Union army in March 1865. Popu- lation in 1870, 4660, of whom 2318 were coloured. FAYOUM, or Fetyoom. See Eeypt, vol. vii. p. 744. FEA, Carto (1753-1834), an Italian archzologist, was born at Pigna in Piedmont, 2d February 1753. At an early age he went to Rome, where he prosecuted his studies with a view to the legal profession, under the superintendence of his uncle, who was a distinguished ecclesiastic. He received the degree of doctor of laws from the university of La Sapienza, and for some time practised as an advocate; but archeology gradually came to occupy his chief attention, and with the view of obtaining better opportunities for his antiquarian researches he in 1798

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Winwood’s Memorials contain valuable letters from |

, researches carried on

took orders. As a member of the Archxological Society of Rome, Fea gave considerable aid to the antiquarian under its auspices. He was also librarian to Prince Chigi. He died at Romie, 18th March

1834,

Fea revised, with the addition of notes, an Italian translation of Winckelmann’s Geschichte der Kunst, and also added notes to some of Bianconi’s works. Among his own works the principal are— Miseellanea

filologica, critica, e antiquaria; Lintegreta del Panteon rivendicata a M. Agrippa; Frammenti di fasti consolari; Iscrizioni di monumenti pubblici; and Descrizione di Roma.

FEARNE, Cuarvzs (1749-1794), an eminent writer on law, son of Charles Fearne, judge-advocate of the Admiralty, was born in London in 1749, and was educated at West- minster School. He adopted the legal profession, but, though well fitted by his talents to succeed as a barrister, he neglected his business and devoted most of his attention and his patrimony to the prosecution of scientific experi- ments, with the vain hope of achieving discoveries which would reward him for his pains and expense. He died in 1794, leaving his widow and family in necessitous circum- stances. His Essay on the Learning of Contingent Re- mainders and Executory Devices, the work which has made his reputation as a legal authority, was called forth by a decision of Lord Mansfield in the case of Perrin v. Blake, and had the effect of reversing that decision. The 10th edition of this essay (1844) contains the notes added by Charles Butler to the 6th edition, with additions by Charles W. Smith. A volume entitled Fearne's Posthumous Works was published by subscription in 1797 for the benefit of his widow.

FEASTS. See FESTIVALS.

FEATHERS. The scientific definition of the various parts of a feather will be found in the article Brrp (vol. iil. p. 727). Here cognizance is taken of the purposes only to which feathers are applied either for use or ornament. These applications are numerous and varied, arising as they do in some cases from the physical properties of the quill, and again from the structure and elasticity of the vane ; while for ornamentation, sometimes beauty of form and oftener brilliancy of colour are the qualities which commend different feathers for use. The chief purposes for which feathers become commercially valuable may be compre- hended under four divisions :—lst, bed and upholstery feathers; 2d, quills for writing; 3d, ornamental feathers ; and 4th, miscellaneous uses of feathers.

Bed and Upholstery Feathers.—The qualities which render feathers available for stuffing beds, cushions, &c., are lightness, elasticity, freedom from matting, and softness. These are combined in the most satisfactory degree in the feathers of the goose and of several other allied aquatic birds,

whose bodies are protected with a warm downy cover- ing. Goose feathers and down, when plucked in spring from the living bird, are most esteemed, being at once more elastic, cleaner, and less liable to taint than those obtained from the bodies of killed geese. The down of the eider duck, Anas mollissima, is esteemed above all other substances for lightness, softness, and elasticity ; but it has some tendency to mat, and is consequently more used for quilts and in articles of clothing than unmixed for stuffing beds. The feathers of swans, ducks, and of the common domestic fowl are also largely employed for beds ; but in the case of the latter bird, which is of course non-aquatic, the feathers are harsher and less downy than are those of the natatorial birds generally. Feathers which possess strong or stiff shafts cannot without some preliminary preparation be used for stuffing purposes, as the stiff points they present would not only be highly uncomfortable, but would also pierce and cause the escape of the feathers from any covering in which they might be inclosed. The barbs are therefore stripped or cut from these feathers, and

when so prepared they, in common with soft feathers and downs, undergo a careful process of drying and cleaning, without which they would acquire an offensive smell, readily attract damp, and become a refuge for vermin. The dry- ing is generally done in highly heated apartments or stoves, and subsequently the feathers are smartly beaten with a stick, and shaken in a sieve to separate all dust and small debris. Bed feathers come to the British market most largely from Germany; in Russia geese are kept almost exclusively on account of their feathers and quills; and from that country as well as France large quantities of goose and other upholstery feathers are obtained. The fine down of the eider duck obtained from high latitudes, as already mentioned, is principally consumed in bed quilts and for down-quilted articles of ladies’ attire.

Quills for Writing.—The earliest period at which the use of quill feathers for writing purposes is recorded is the 6th century ; and from that time till the introduction of steel pens in the early part of the present century they formed the principal writing implements of civilized com- munities. It has always been from the goose that quills have been chiefly obtained, although

the swan, crow, eagle, owl, hawk, and turkey all have more or less been laid under contribution. Swan quills, indeed, are better and more costly than are those from the goose, and for fine lines crow quills have been much employed. It is only the five outer wing feathers of the goose that are useful for writing, and of these the second and third are the best, while left-wing quills are also generally more esteemed than those of the right wing, from the fact that they curve outward and away from the writer using them. Quills obtained in spring, by plucking or otherwise, from living birds are by far the best, those taken from dead geese, more especially if fattened, being comparatively worthless. To take away the natural greasiness, to remove the superficial and in- ternal pellicles of skin, and to give the necessary quali- ties of hardness and elasticity, quills require to undergo some processes of preparation, The essential operation consists in heating the quills, generally in a fine sand-bath, to from 130° to 180° Fahr. according to circumstances, and scraping them under pressure while still soft from heat, whereby the outer skin is removed and the inner shrivelled up. If the heating has been properly effected, the quills are found on cooling to have become hard, elastic, and some- what brittle. While the quills are soft and hot, lozenge-shaped patterns, ornamental designs, and names are easily and permanently impressed on them by pressure with suit- able instruments or designs in metal stamps.

Ornamental Feathers—Feathers do not appear to have been much used, in Europe at least, for ornamental pur- poses till the close of the 13th century, They are found in the conical caps worn in England during the reigns of Edward IIt. and Richard II.; but not till the period of Henry V. did they take their place as a part of military costume. Towards the close of the 15th century the fashion of wearing feathers in both civil and military life was carried to an almost ludicrous excess. In the time of Henry VII. they first appeared in the bonnets of ladies ; and during Elizabeth’s reign feathers began to occupy an important place as head-dress ornaments of women. From that time down to the present, feathers of endless variety ees = to be leading articles of ornamentation in —_ a mee but, except for military plumes, they adie Reson a to be worn in ordinary male costume. eens ie ie ay 1t 1s scarcely too much to say that all

all birds are, in one way or other, turned to ac-

count by ladies for the purpose of ersonal ornament Ostrich feathers, however hold zs ~ BM cabs i ? , as they have always held, olin ae position among ornamental feathers; and the is the only bird which may be said to be reared

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_exclusively for the sake of its feathers.

Ostrich farming is now recognized as one of the established industries of South Africa. On these farms the birds are hatched by artificial incubation from eggs which are valued at £5 each. The birds are estimated to be worth about £30 apiece, a fine full-grown male being valued as high as £75. The birds begin to yield feathers when about a year old, and continue to an advanced age to produce two crops of plumes annually of a present yearly average value of £15. The feathers are generally plucked from the living animal —a process which does not appear to cause any great in-convenience. In the male bird, the long feathers of the rump and wings are white, and the short feathers of the body are jet black; while the rump and wing feathers of the female are white tinged with a dusky grey, the general body colour being the latter hue. The feathers of the male are consequently much more valuable than those of the female, and they are separately classified in com- merce. The art of the plumassier embraces the cleaning, bleaching, dying, curling, and making up of ostrich and other plumes and feathers. White feathers are simply washed in bundles in hot soapy water, run through pure warm water, exposed to sulphurous fumes for bleaching, thereafter blued with indigo solution, rinsed in pure cold water, and hung up to dry. When dry the shafts are pared or scraped down to give the feathers greater flexibility, and the barbs are curled by drawing them singly over the face of a blunt knife or by the cautious application of a heated iron. Dull-coloured feathers are usually dyed black with logwood and sulphate or acetate of iron. Feathers which are dyed light colours are first bleached by exposure in thie open air, and the dyes employed are the same as those for other animal substances. Much ingenuity is displayed in the making up of plumes, with the general result of producing the appearance of full, rich, and long feathers from inferior varieties and from scraps and fragments of

ostrich feathers ; and so dexterously can factitious plumes be prepared that only an experienced person is able to detect the fabrication.

To enumerate all the feathers used for ornamental pur- poses would be practically to give a complete list of all known and obtainable birds; but there are a few in addition to those of the ostrich which form steady articles of com- mercial demand. Among these are the feathers of the South ° American ostrich, Rhea americana, the marabout feathers of India obtained from Leptoptilos argala and L. javaniea, the feathers of the various species of birds of paradise, and of numerous species of humming-birds. Swan-down and the skins of various penguins and grebes and of the alba-tross'are used, like fur, for muffs and collarettes.

The Chinese excel in the preparation of artificial flowers and other ornaments from bright natural-coloured or dyed feathers; and the French also skilfully work fragments of feathers into bouquets of artificial flowers, imitation butterflies, &c.

Miscellaneous Applications of Feathers. —Quills of various sizes are extensively employed as holders for the sable and camel hair brushes used by artists, &c. Feather brushes and dusters are made from the wing-feathers of the domes- tic fowl and other birds; those of a superior quality, under the name of vulture dusters, being really made of American ostrich feathers. A minor application of feathers is found in the dressing of artificial fly-hooks for fishing. As steel pens came into general use it became an object of considerable importance to find applications for the supplanted goose-quills ; and in this quest no one was more deeply interested than M. Bardin, of Joinville le Pont near Paris, whose establishment sent out about 20,000,000 quills annually—the product of 2,000,000 geese. M. Bardin competed with the steel-pen makers by cutting several pens of the shape of metallic pens from each quill,

but more largely he devoted himself to the preparation of quill tooth-picks. The cutting up of the feathers in this way leaves the shaft and barbs unused, and thiese he utilized in various ingenious ways, the principal products being a kind of mat into which the barbs are woven, the shafts yielding a

fibrous substance not unlike hogs' bristles, from which useful brushes are fabricated. (3. PA.)

FEBRUARY, the second month of the year. In or- dinary years it contains 28 days ; but in bissextile or leap year, by the addition of the intercalary day, it consists of 29 days. This month was not in the Romulian calendar. In the reign of Nuina two inonths were added to the year, namely, January at the beginning, and February at the end; and this arrangement was continued until 452 B.c., when the decemvirs placed February after January. The ancient name of Februarius was derived from the verb februare, to purify, or from Februa, the Roman festival of general expiation and lustration, which was celebrated during the latter part of this month. In February also the Lupercalia were held, and women were purified by thie priests of Pan Lyceus at that festival. The most gene- rally noted days of February are the following :—the 2d, Candlemas Day, one of the fixed quarter days used in Scot- land; the 14th, St Valentine's Day; and the 24th, St Matthias. The church festival of St Matthias was formerly observed on the 25th of February in bissextile years, but it is now invariably celebrated on the 24th.

FECAMP, a seaport-town of France, department of Seine-Inférieure, is situated on the English Channel, at the mouth of the small river Fécamp, 23 miles N.N.E. of Havre. The town consists almost entirely of one street, which is upwards of two miles in length. It occupies the bottom and sides of a narrow valley, opening out towards the sea between two high cliffs, on one of which stands a lighthouse. Its port, though small, is one of the best on the Channel, and has been greatly improved by the con- struction of an inner port with a fine quay. It carries on a considerable trade in Baltic and colonial produce, and in brandy and salt, and sends out vessels to the whale, cod, mackerel, and herring fisheries. In 1875 there entered the port 167 vessels, with a total tonnage of 26,321. The river affords abundant water-power for numerous cotton, oil, and other mills. Fécamp has also sugar refineries, tanneries, forges, and building docks, and manufactures of hardware, candles, and soda. The church is a large and handsome edifice; and the other principal buildings arc the sea-bathing establishment, the theatre, the hospital, and the Institute for Poor Sisters. The Latin name of Fécamp was Fiscarium or Fiscanium ; and the town owes its origin to a nunnery which was founded in 664, destroyed by the Normans in 841, and

rebuilt for a Benedictine abbey by Richard L., duke of Normandy, in 998. The population in 1872 was 12,651.

FECKENHAM, or Fecxnam, JouN DE, the last abbot of Westminster, was born of poor parents in Feckenham Forest in Worcestershire. The family name was Howman,; and it is noted by Fuller (Worthies of England) that the abbot was the last clergyman who was “locally sur- named.” He was of good parts and fond of learning ; and, after receiving instruction from the parish priest, he was sent to the Benedictine monastery of Evesham, whence, at about the age of eighteen, he passed to Gloucester College, Oxford. He afterwards returned to Evcsham, and there remained till the dissolution of the monastery in 1536, when he received a pension of a hundred florins. Resum- ing his studies at Oxford, he took in 1539 his degree of B.D. He was successively chaplain to Bell, bishop of Worcester, and to Bonner, bishop of London. When the latter was deprived of his see (1549), Feckenham was com- mitted to the Tower. His learning and eloquence, how-

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ever, made him so weighty an advocate that he was tem- porarily liberated (‘borrowed from the Tower,” he says in old English phrase) for the purpose of holding discussions on the points in dispute between Romanists and Protestants. Among these disputations were four with Hooper, bishop of Worcester. Remanded to the Tower, he was released at the accession of Queen Mary and became her chaplain. In rapid succession he was appointed chaplain to Bishop Bonner and prebendary and dean of St Paul’s. He was sent to Lady Jane Grey two days before her execution to commune with her, and “ to reduce her,” says Tox, “from the doctrine of Christ to Queen Mary’s religion ;” and two months later he was one of the disputants at Oxford against Cranmer, at the martyrdom of Ridley and Latimer. He showed, however, no eagerness of hostility to the martyrs ; and indeed throughout Queen Mary’s reign he distinguished himself by generous endeavours in behalf of the persecuted reformers. He also pleaded earnestly for the release of the Lady Elizabeth, thereby offending the queen. In May 1556 the degree of D.D. was conferred upon him by the university of

Oxford; and in September following he was made abbot of Westminster, fourteen Benedictine monks being placed under him. Queen Elizabeth on her accession (1558) sent for the abbot and offered him, it is said, the archbishopric of Canterbury, but he could not conform to the new faith. He sat in her first parliament, and was the last mitred abbot that was seen in parliament. His influ- ence there was steadfastly directed against all movements of reformation. In 1560 he was sent to the Tower, and, with intervals of freedom, remained in confinement more or less strict for the rest of his life. He died in Wisbeach Castle, in the Isle of Ely, in 1585. Among the few pieces published by Feckenham are the Conference-Dialogue held between the Lady Jane Grey and himself, and several funeral orations or sermons.

FEDCHENKO, Auexis Pavtowitcn (1844-1873), a Russian naturalist and traveller, well known for his explo- rations in Central Asia. He was born at Irkutsk, in Siberia, on 7th February 1844 ; and, after attending the gymnasium of his native town, proceeded to the university of Moscow, for the study more especially of zoology and geology. In 1868 he travelled through Turkestan, the district of the lower Sir-Darya, and Samarcand ; and shortly after his return he set out for Khokand, where he visited a large portion of territory till then unknown. Soon after his re- turn to Europe he perished on Mount Blane while engaged in an exploring tour in Switzerland, 15th September 1873.

Accounts of the explorations and discoveries of Fedchenko have been published by the Russian Government,—his Journeys in Turkestan in 1874, In the Khanat of Khokand in 1875, and

Botanical Discoverics in 1876. See Petermann’s Mittheilungen,

1872-74.

FEDERAL GOVERNMENT. A federal union of sovereign states for mutual aid, and the promotion of inter- ests common to all, is a procedure so consistent with self- interest that examples of it can be adduced from very early times. Had a federal union of Hellenic states been effected at the close of the Persian war, results would have been achieved which were vainly aimed at subsequently,—as by Athens herself, after the capture of

Olynthus by Philip of Macedon. The effort to effect a union of states for the common good then failed; but at length, in the century following the death of Alexander, the Aitolian and Achzan confederacies were formed, and a spirit of unity was inspired which, if less tardily manifested, might have long perpetuated Hellenic freedom. For the first time a federa- tive spirit contended effectively with the isolation which had so long animated the policy of the ancient world.

Aristotle collected the constitutions of 150 governments of the time of Alexander, including many cities bounded

by their own walls, and, like the medizval republics of Italy, standing for centuries almost within sight of each other without a thought of union except by conquest of the weaker by the stronger. The Panhellenic festivals long served to perpetuate a fraternal pride in the community of Hellenic blood, but they begot no results of sustained political unity. But when Macedonian ambition raised up @ military empire on their own frontier stronger and far unore dangerous than that of Persia, the statesmen of Greece learned the necessity of confederation for the safety of their autonomous governments. Of the unions which followed, the two most celebrated were the A®tolian league and the confederacy of Acheans. The constitution of the /Etolian league, though democratic, included an aristocratic or privileged class. It was a league of districts rather than of cities, with chiefs of the hill tribes and leading citizens attending the annual assemblies at Thermus, and might not inaptly be compared to the Swiss confederacy of city and forest cantons. The Spartans alone compared with the A‘tolians in their prolonged maintenance of the power of independent action and self-government. :

The Achzan league differed from that of the Aitolians in being one of cities. Grote speaks of it as never attain-

ing to anything better than a feebleand puny life. But it gave good evidence of the benefits of federation. From

remote times twelve towns had acknowledged confederate rights and obligations; in 275 Bc. other cities joined; and the importance of the confederacy continued to increase till 251 B.c., when Aratus became strategus, and brought his native Sicyon into the union. Upwards of seventy cities, while still controlling their own local affairs, were by this means associated under one federal government. The federal capital was at AZgium, and each city sent deputies annually thither till 194 B.c., when Philopcemen introduced the system of meeting by rotation in the principal cities, a procedure originating in jealousy, and the inevitable source of weakness.

Among the later European confederations the Swiss republic attracts most attention. As now constituted it consists of twenty-two sovereign states or cantons. The government is vested in two legislative chambers, a senate or council of state, and a national council, constituting unitedly the federal assembly. The executive council of seven members elects the president and vice-president for a term of three years. Before the French Revolution the German empire was a complex confederation, with the states divided into electoral colleges, consisting—(1) of the ecclesiastical electors and of the secular electors, including the king of Bohemia; (2) of the spiritual and temporal princes of the empire next in rank to the electors; and (3) of the free imperial cities. The emperor was elected by the first college alone. This imposing con- federation came to an end by the conquests of Napoleon ; and the Confederation of the Rhine was established in 1806 with the French emperor as protector. But its principles were violated by its so-called protector, and in 1815 the Germanic confederation was established by the Congress of Vienna, which in its turn has been displaced by the present German empire. This, in its new organization, has conferred on Germany the long-coveted unity and co- herence the lack of which had been a source of weakness. The constitution dates, in its latest form, from the treaties entered into at Versailles in 1871. organized with the king of Prussia as president, under the hereditary title of emperor of Germany. Delegates of the various confederated Governments form the Bundesrath ; the Reichstag, : the people 3 and the two assemblies constitute the federal parliament. This body has power to legislate for the whole empire in reference to all matters connected with the army,

A federation was then |

navy, postal service, customs, coinage, é&c., all political laws affecting citizens, and all general questions of commerce, navigation, passports, &c. The emperor represents the confederacy in all international relations, with the chan- cellor as first minister of the empire, and has power, with consent of the Bundesrath, to declare war in name of the empire.

The United States of America more nearly resembles the Swiss confederacy, though retaining marks of its English origin. The original thirteen States were colonies wholly independent of each other. By the Articles of Confedera- tion and Perpetual Union between the United States of America, drawn up by Congress in 1777, the States bound themselves in a league of common defence; a conimon citizenship was recognized for the whole union; but each State reserved its sovereignty along with every power not expressly delegated to Congress, and the jealousy in regard to State's rights has never been entirely laid aside. The theory of the confederacy is that of a federal republic formed by the voluntary union of sovereign States. The powers of the central government are determined by a written constitution, and are intrusted to three distinct authorities—executive, legislative, and judicial. The president, elected for a term of four years by electors chosen for that purpose by each State, is the representative head of the republic. The vice-president, ex officio president of the senate, assumes the presidency in case of resignation or death. Legislative power is vested in the Senate, com- posed of two members elected by each state for a terin of six years ; and in the Congress, consisting of representatives in numbers proportionate to the population of each State, holding their seats for two years. The supreme judicial authority, which forms the final court of appeal on all con- stitutional as well as legal questions, consists of a chief justice and eight judges, appointed for life by the president, subject to confirmation by the senate.

The essential principle involved in confederation is that it is a union of sovereign states. With a view to the com- mon interests of all, they agree to abrogate certain functions of sovereignty in their separate capacity, in order that these shall be jointly exercised for the common good by the body

which they concurrently vest with such sovereign functions ; but all other sovereign rights are reserved. This differs essentially from the incorporation of two or more states into a united commonwealth, as in the union of England and Scotland. The new empire of Germany illustrates the former, the new kingdom of Italy the latter. In view of the sovereign rights reserved by the several members of a federal union of states, each may be presumed to have the right to withdraw from the confed- eration. State rights, including that of secession, were strongly asserted during the civil wars between the north- ern and southern States of America; but the result has naturally been to subordinate the will of individual States to the higher interests of the confederacy as a whole. The written constitution of the United States is subject to amendment at any time, by consent of two-thirds of both representative bodies ; or by a convention specially called by the legislatures of two-thirds of the several States for: the purpose.

The extension of responsible constitutional government by Great Britain to her chief colonies, under a governor or viceregal representative of the crown, has been followed in British North America by the union of the Canadian,

_ maritime, and Pacific provinces under a federal govern- ment,—with a senate, the members of which are nominated or popular assembly, is directly chosen by |

by the crown, and a house of commons elected by the different provinces according to their relative population. The governor-general is appointed by the crown for a term

| of seven years, and represents the sovereign in all matters

of federal government. The lieutenant-governors of the provinces are nominated by him; and all local legislation is carried on by the provincial parliaments. The remark- able confederation of the Dominion of Canada whicli has thus originated presents the unique feature of a federal union of provinces practically exercising sovereign rights in relation to all local self-government, and sustaining a constitutional autonomy, while cherishing the

colonial relationship to Great Britain. History has no parallel to this novel fact of a free people, the occupants of vast re- gions stretching from the Atlautic to the Pacific, enjoying all constitutional rights, electing their own parliaments, organizing an armed militia, controlling customs, emigra- tion, and all else that pertains to independent self- government, while they continue to cherish the tie which binds them to the mother country, and to render a loyal homage to the representative of the crown. The harmonious relations resulting from this application of the system of federal governmeut to the British American provinces has suggested the extension of the same principle to the colonies of South Africa, and may be regarded as the basis of a colonial system by means of which the vast colonial dependencies of Great Britain may perpetuate their relations with the mother country, while enjoying all the blessings of its well-regulated freedom, or may be trained to emulate its example as independent states. _(D. w.)

FEDERICI, Camritito (1749-1802), Italian dramatist and actor, was born at Garessio, a small town in Piedmont, April 9, 1749. His real name was Giovanni Battista Viassolo, and that by which he is now known and which he transmitted to his children was taken from the title of one of his first pieces, Camillo e Federico. He was educated at Turin, and showed at an early age a great fondness for literature and especially for the theatre. The praises bestowed on his early attempts determined his choice of a career, and he obtained engagements with several companies both as writer and actor. He made a happy marriage in 1777, and soon after left the stage and devoted himself en- tirely to composition. He settled at Padua, and the repu- tation of his numerous comedies rapidly spread in Italy, aud for a time seemed to eclipse that of his predecessors. Most of his pieces were of the melodramatic class, and he too often resorted to the same means of exciting interest and curiosity. He caught, however, soniething of the new spirit which was manifesting itself in German dramatic literature in the works of Schiller, Iffland, and Kotzebue, and the moral tone of his plays is generally healthy. For- tune did not smile upon him; but he found a helpful friend in a wealthy merchant of Padua, Francis Barisan, for whose private theatre he wrote many pieces. He was attacked in 1791 with a dangerous malady which disabled him for several years; and he had the misfortune to see his works, in the absence of any copyright law, published by others without his permission, At length, in 1802, he undertook to prepare a collected edition;

but of this four volumes only were completed when he was again attacked with illness, and died at Padua (December 23). The publication of his works was completed in 14 volumes in 1816. Another edition in 26 volumes was published at Plorence in 1826-27. A biographical memoir of Federici by Neymar appeared at Venice in 1838.

FEE (feodum), in English law, signifies an estate of in- heritance (7.¢., an estate descendable to the heirs of the grantee so long as there are any in existence), as opposed to – an cstate for life. Ina more primary sense it means an

estate by tenure (land holden of a lord) as opposed to land |

owned allodially. See Digby's History of the Law of Real Property, p. 50, and the article Esrars,

FEHMIC COURTS (Frnmerricuts or VEHMGERICHTE), celebrated secret tribunals which flourished in Germany

from the end of the 12th century to the middle of the 16th, and which, from the extent of their organization and the mystery which surrounded their proceedings, inspired a feeling of dread in all who came within their jurisdiction. Their origin is uncertain. The traditional account is that they were instituted by Charlemagne and Pope Leo III. to prevent the Saxons from relapsing into paganism. It is more probable that they arose from the relics of the ancient Teutonic free courts. Their immediate cause, however, is to be found in the utter lawlessness and disregard of authority then prevailing in Germany, which obliged the weak and the peace-loving to band them- selves together as protection against the outrages of the princes and nobles. The birthplace of the Fel:mic courts was Westphalia, where they appeared shortly after the de- position of Henry the Lion in 1179. The duchy was in consequence of this event annexed to the archbishopric of Cologne, and the archbishops appear to have had a good deal to do with the origination of the courts. Fehmic courts subsequently made their way into most other parts of Germany, but the institution never seems to have suc- ceeded in gaining a firm footing outside the limits of Westphalia, or the Red

Land, as it was called. Within this district, however, which included nearly the entire country between the Rhine and the Weser, they soon ac- quired an immense power, which was at first used only in a beneficial and upright manner, supplying a means of re- dress at a time wheu the public administration of justice was in abeyance. But in the end, as might have been an- ticipated, the secrecy of their proceedings and the arbitrary nature of their rules converted them into an instrument of tyranny in the hands of the very persons whose lawless deeds they were designed to suppress. The emperors them- selves, who had at first encouraged the Fehmic courts, finding them a useful means of keeping their feudal de- pendants in check, were unable directly to resist their en- croachments ; and it was only with the restoration of public order and the establishment of a regular judicature that the influence of the Fehmgerichte gradually waned. The last regular court is said to have been held at Celle, in Hanover, in 1568; but there are traces of the institu- tion at a much later date; and in the present century even, a relic of the once famous Fehmgerichte was to be found in Westphalia in the form of a society for the sup- pression of vice. It was abolished by order of Jerome Bonaparte in 1811.

It was necessary that a candidate for initiation into the Fehm should be born in wedlock, that he should be a Christian, and neither excommunicated nor outlawed, and that he should not be a party to any process before a Febmic court. Originally only natives of Westphalia were admitted. At initiation the candidate took a solemn oath to support with his whole powers the Holy Fehm, to conceal its proceedings “from wife and child, father and mother, sister and brother, fire and wind, from all that the sun shines on and the rain wets, and from every being between heaven and earth,” and to bring before the tribunal every- thing within his knowledge that fell under its jurisdiction. He was then initiated into the signs by which the members recognized each other, and was presented with a rope and a knife, upon which were engraved the mystic letters 8.S.G.G., whose signification is still involved in doubt, but which are supposed to mean Strick, Stein, Gras, Grein. The emperor was the nominal head of the Fehmic courts. Under him the supreme president was the archbishop of Cologne as duke of Westphalia. The whole country over which the jurisdiction of the Fehmic courts extended was divided iuto districts, in each of which there was at

least one court, presided over by a judge called a Freigraf, or free count. Along with him sat an indefinite number of

assessors, but never less than seven, called Freischéffen, or Freischéppen, in Latin scabint. These Freischoffen had the duty of bringing complaints before the courts, and of carry- ing into execution the sentences which were pronounced. There were two distinct sorts of Fehmic courts,—one which held its sittings openly, and another whose proceedings were conducted in secret. ‘The open court, in onc of its branches, exercised a jurisdiction in civil suits and over offences of a trifling description, in which cases it was unnccessary that either plaintiff or defcndant should be a member of the Fehm. The other branch of the open court took cognisance of all crimes of an ordinary nature. The accuser was always one of the Freischoffen. The accused was cited by nailing the summons during night to the door of his house, or, if it was not known where he lived, by fixing four copies upon a post at cross roads near his supposed abode. If the accuscd appeared, the accuser stated the case, and the investigation proceeded by the examination of witnesses as in an ordinary court of law. The judgment was put into execution on the spot if that was possible. The secret court, from whose procedure the whole institution has acquired its evil character, was closed to all but the initiated ; any one not a member on being discovered was instantly put to death, and the members present were bound under the same penalty not to disclose what took place. Crimes of a serious nature, and especially those that were deemed unfit for ordinary judicial investigation—such as heresy and witchcraft—fell within its jurisdiction, as also did appeals by persons condemned in the open courts, and likewise the cases before those tribunals in which the accused had not appeared. The accused if a member could clear himself by his own oath, unless he had revealed the secrets of the Fehm. If lie were one of the uninitiated it was necessary for him to bring forward witnesses to his innocence from among the initiated, whose number varied according to the number on the side of the accuser, but twenty-one in favour of innocence necessarily secured an acquittal. The only punishment which the secret court could inflict was death. If the accused appeared, the sentence was carried into execution at once; if he did not appear, it was quickly made known to the whole body, and the

Freischiffe who was the first to mcet the condemned was bound to put him to death. A knife with the cabalistic letters was left beside the corpse to show that the deed was not a murder.

See Wigand, Das Fehmgericht Westphalens, 1825, and Usener Die Frei und Heimlichen Geriehte Westphalens, 1832 ; also Scott's Anne of Geierstein, introduction and chap. xx. (8G dig 195 184)

FEITAMA, Sysranp (1694-1758), a Dutch author, was born at Amsterdam, December 10, 1694. He was origin- ally intended for the ministry, but eventually adopted a commercial career. In middle life, having made a sufficient fortune, he retired from business, and dedicated his remaining years to literature, and to a circle of friends that included all the most eminent of his younger con- temporaries. In 1733 he published his translation of Télémaque, to which he had given twenty years of revision. In 1735 appeared two volumes of his Stage Poems, original dramas for reading rather than acting. In 1743 was issued the first draft of his translation of the Henriade, in perfect- ing which he spent nearly a quarter of a century. Three volumes of his Posthumous Poems appeared in 1764. He died at Amsterdam on the 3d of June 1758. The influ- ence of Feitama over Dutch literature was very exten- sive and very pernicious. He was a cold and rhetorical versifier, a learned trifler, and hopelessly wedded to the French tradition. His two great translations, which are indeed admirably performed from his own ' standpoint,

have long outlived their immen eee se | century. popularity in the last

of melancholy and despair.

FEITH, Ruuyvis (17 53-1824), a Dutch poet, was of aristocratic extraction, and was born at Zwolle, the capital of the province Overijssel, on the 7th of February wesc), It has been said with truth that his whole life was a model of social, personal, and literary good fortune; there has never lived a poet who enjoyed more unbroken prosperity. This is the more noticeable, because of all the important writers of Holland he is the one whose works are most full He was educated at the uni- versities of Harderwijk and Leyden, and took his degree at the latterin 1770. In1772 he settled at his birthplace, and married. In1780,in his twenty-seventh year, he became bur-

gomaster of Zwolle, a post which he held for the remainder of his life. He built a luxurious villa, which he named Boschwijk, in the outskirts of the town, aud here he lived in the greatest comfort. His first important production was Julia, in 1783, a novel written in emulation of Werther, and positively steeped in Weltschmerz and despair. This was followed in 1784 by the tragedy of Z'harsa, the first of his dramatic poems. The next year was one of great mark in Feith's career : he published Ferdinand and Constantia, another Werther novel, and The Patriots, a tragedy. Both were very successful, and his poems were publicly crowned at Leyden. He was now the most popu- lar poet in Holland, and this fact, combined with his burn- ing patriotism, drew upon him the hatred of Bilderdijk. Other writers attacked his morbid melancholy, and in 1786 the critic Baron van Perponcher made a trenchant assault on him in a work on sentimentality. He was accordingly silent for some time, but in 1791 he printed a tragedy of Lady Johanna Gray ; and in 1792 there appeared a por- tentous didactic poem, Zhe Grave, in four cantos, which belongs to the most tearful school of churelryard poetry. In 1793 and in 1795 he produced his tragedies of Ines de Castro and Mucius Cordus, the first taken from an episode in the Lusiad, the second composed in honour of the Batavian republic. From 1796 to 1814 appeared five volumes of Odes and Miscellaneous Poems. In 1802 he published another didactic poem, Old Age, in six cantos, and in 1804 Poems for Public Worship. He died on the 6thof February 1824. The next year a statue of the poet, the work of Gabriel, was erected in Zwolle, and an edition of his poetical works issued in thirteen volumes. As one of the most prominent members of the revival of Dutch letters, and as a fluent and careful verse-writer, Feith will always be honourably remembered. His own age accounted him one of the greatest of poets, but posterity has refused to endorse this judgment. His romantic ivspiration was borrowed from Germany, and he did not hesitate to imitate Goethe, Wieland, and Novalis. It must be recollected, however, that these men were his immediate contemporaries, and that he showed great alacrity and acumen in perceiving the modern direction of their genius.

FEJER, Gorey (1766-1851), one of the most indefati- gable Hungarian authors of the last generation, was boru on the 23d April 1766, at Keszthely, in the county of Zala. After finishing his scholastic course at the gymnasium he went to Pesth, where he attended the philosophical lectures

at the university. From 1785 to 1790 he studied theology at Pressburg, after which he was engaged for some time as a private family tutor. From 1802 to 1804 he taught dogmatic theology at Stuhlweissenburg, where he for many years officiated as priest; and in 1808 he obtained a theo- logical professorship at Pesth university. (1818) he became chief director of the educational circle of Raab, and in 1824 was appointed librarian to the university of Pesth. Fejér was the most prolific of Hungarian authozs,—his works, which are nearly all written either im Latin or Hungarian, exceeding 180 in number. They treat

Ten years later

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of numerous subjects, and are of various sizes, from mere pamphlets to several volumes. His most important work, Codex diplomaticus Hungarie ecclesiasticus ac cwilis, pub- lished from 1829 to 1844, in eleven so-called tomes, really exceeds forty volumes. It consists of old documents and charters from 104 a.p. to the end of 1439, and forms an extraordinary monument of patient industry. This work and many others relating to Hungarian national history have placed Fejér in the foremost rank of Hungarian historians, He died on the 2d July 1851. His latest works were A Kunok eredete (The Origin of the Huns), and A politikai forradalmak okai (The Causes of Political Revolutions), both published in 1850. The latter produc- tion, on account of its liberal tendencies, was suppressed by the Austrian Government.

See Magyar Irth: Eletrajz-qyijtemény, Pesth, 1856, and A magyar nemzett trodalomtirténet vdzlata, Pesth, 1861.

FELDKIRCH, the chief town of the Vorarlberg district of Tyrol in Austria, is situated at the junction of the valley of the Ill with the valley of the Rhine, about 64 iniles above the confluence of the two rivers. The position is one of much natural beauty and also of great military strength ; and the town has consequently been of far more importance than is indicated by itssize. It is the seat of a number of administrative offices, the residence of a

bishop, and the centre of a considerable transit trade. Among its own industries are cotton-spinning, weaving, bell-founding, copper-smithery, engineering, coopering, and the manufac- ture of Kirschwasser. The principal buildings are the parish church (which dates from 1487 and possesses a Descent from the Cross assigned to Holbein), a Capuchin monastery and church, a Jesuit seminary (the Stella Matutina, or Morning Star), a charity hospital with bathing establish- ment attached, and the Kurhaus with its park. To the east of the town lie the ruins of the castle of Schattenburg, and about a mile to the south begins the territory of the prince of Lichtenstein. Feldkirch, or rather Schattenburg, was at one time the seat of the counts of Montfort, but in 1377 it was sold by Count Rudolph VII. to the dukes of Austria. In 1799 the Feldkirch pass was the scene of an indecisive conflict between the Austrians under Hotze and Jellalich and the French under Oudinot and Massena; and in 1805 the Austrian forces under Wolfskehl were obliged to capitu- late in the neighbourhood. ‘The population, almost ex- clusively Catholic, numbered 2868 in 1869.

FELEGYHAZA, chief town of the former district of Little Cumania, in Hungary, about 66 miles S.E of Pesth, 46° 41’ N. lat., 19° 52’ E. long., is advantageously situated on the railroad between Pesth and Szegedin. Amongst the principal edifices are a fine town-hall, a Roman Catholic gymnasium, and a large parish church. The surrounding country is covered with vineyards, fruit-gardens, and tobacco and corn fields, which are the principal source of employ- ment to the inhabitants; but the town itself is chiefly noted for its great cattle-market. Numerous ancient Roman urns and other relics have been dug up in the vicinity of the town. In the 17th century Félegyhéza was com- pletely destroyed by the Turks, nor was it recolonized and rebuilt till 1743. The population, by the latest census (December 31, 1869), amounted to 21,313, chiefly Roman Catholics and by nationality Magyars.

FELIBIEN, Anprit (1619-1695), Sieur des Avaux et de Javercy, French architect and historiographer, was born at Chartres in May 1619. At the age of fourteen he went to Paris to continue his studies; and in 1647 he was sent to Rome in the capacity of secretary of embassy to the Marquis de Marueil. His residence at Rome he turned to good account by diligent study of its

ancient monuments, by examination of the literary treasures of its libraries, and by cultivating the acquaintance of men eminent in literature

and in art. Amongst these especially to be noted was Nicholas Poussin, whose friendship and counsels were of great value to him. On his return to France he married, and was ultimately induced, in the hope of employment and honours, to settle at Paris. Colbert, the great minister, re- cognized. his abilities ; and he was one of the first members (1663) of the Academy of Inscriptions. Three years later Colbert procured him the appointment of historiographer to the king. In 1671 he was named secretary to the newly founded Academy of Architecture, and in 1673 keeper of the cabinet of antiques in the palace of Brion. To these offices was afterwards added by Louvois that of deputy controller-general of roads and bridges. Félibien found time in the midst of his official duties for study and re- search, and produced many literary works, Among these the best and the most generally known is the Entretiens sur les utes et sur les owvrages des plus excellents peintres anciens et modernes, which appeared in successive livraisons, the first in 1666, and the fifth in 1688. It was republished with several additions at Amsterdam in 1706, and again at Trévoux in 1725. Félibien wrote also Origine de la Peinture (1660), Prineipes de Varchitecture, de la sculpture, de la peinture, &c. (1676-90), and descriptions of Ver- sailles, of La Trappe, and of the pictures and statues of the royal residences. He edited the Conférences of the Academy of Painting, and translated the Castle of the Soul from the Spanish of St Theresa, the Life of Pius V. from the Italian, &c. His personal character com- manded the highest esteem, agreeing with the motto which he adopted—Bene facere et vera dicere. He died at Paris, June 11, 1695.

FELIBIEN, Dom Micuen (1666-1719), French his- torian, was a son of André, and was born at Chartres, Sep- tember 14, 1666. After studying at the Collége des Bons- Enfants at Paris, he entered, at the age of sixteen, the Benedictine congregation of St Maur. He devoted himself to a studious life, and produced in 1706 the learned Histoire de VAbbaye royale de Saint-Denis en France. Drawn from original sources, and illustrated with engravings, it at once attracted attention, and made him a reputa- tion as a scholar. He was soon after selected by Bignon, provost of the merchants of Paris, to write a history of that city, and notwithstanding his broken health he undertook the task. In 1713 he put forth his Projet d'une histoire de la vile de Paris, which was approved by Louis XIV. He steadily continued his labours for six years longer, but did not live to finish the work. He died at St Germain des Prés, September 25, 1719. His History of Paris, which was far advanced, was completed by Lobineau assisted by De Varigny, former secretary to Félibien, and was published in 5 vols. fol. in 1725 (not 1755, as stated by most of the authorities). Dom Michel was the author of several other works of less importance.

FELIX, the name of several popes.

Feurx I, a Roman by birth, succeeded Dionysius in the papal chair in December 269. Regarding his pontificate there is little authentic information, but he is said to have given ecclesiastical sanction to the yearly celebration of the mass over the graves of the martyrs, a custom, however, which had been previously in existence; and the law regarding the consecration of churches is also ascribed to him. On account, it is said, of his having strongly supported the Christians during the persecutions under Aurelius, he was enrolled among the martyrs, his day being the 20th of May. He died in 274. A fragment of a letter to Maximus, bishop of Alexandria, in support of tho doctrines of the Trinity and Incarnation against the argu- ments of Paul of Samosata, was in all probability written by Felix, but other three letters ascribed to him are certainly ungenuine.

Fetrx II. (2), pope or antipope, was in 356 raised from the archdeaconate of Rome to the papal chair, when Tiberius was banished by the emperor Constantius for refusing to subscribe the sentence of condemnation against Athanasius. His election was contrary to the wishes both of the clergy and of the people, and the consecration ceremony was performed by certain prelates belonging to the court. In 357 Constantius, at the urgent request of an influential deputation of Roman ladies, agreed to the release of Tiberius on condition that he signed the semi-Arian creed. Constantius also issued an edict to the effect that the two bishops should rule conjointly, but Tiberius, on his entrance into Rome in the following year, was received by all classes with so much enthusiasm that Felix found it necessary to retire at once from Rome. Regarding the remainder of his life little is known, and the accounts handed down are con- tradictory, but he appears to have spent the most of it in retirement at his estate near Porto. He died in 365, and, on what grounds it is impossible to determine, was enrolled amongst the number of martyrs, his day being the 22d of July. In the reign of Gregory XIII. the claims of Felix to rank among the popes was discussed, and in order to dis- cover whether any miraculous help was to be found to aid in the decision of the question his sarcophagus was opened, when it is said the words “Pope and Martyr” were found inscribed on his body; but this supernatural testi- mony is in contradiction to the earlier authorities of the church.

Feurx III, (or IL.) was descended from one of the most influential families of Rome, and succeeded Simplicius in the papal chair 2d March 483. His first act was to repu- diate the Henoticon, a deed of union, originating, it is supposed, with Acacius, patriarch of Constantinople, and published by the emperor Zeno with the view of allaying the strife between the Monophysites and their opponents in the Eastern church. He also addressed a letter of remon- strance to Acacius; but the latter proved refractory, and sentence of deposition was passed against him. As Acacius, however, had the support of the emperor, a schism (the first on record) arose between the Eastern and Western churches, which lasted for 34 years. Felix died in 492.

Fexix IV, (or IIT.), a native of Beneventum, was, on the death of John in 526, raised to the papal chair by the emperor Theodoric in opposition to the wishes of the clergy and people. His election was followed by: serious riots, which were only quieted by the explanation of Theodoric that he had

merely interposed his authority on account of the strifes of the ecclesiastical factions, and by his promise that in future the election should be vested in the clergy and people, although the confirmation of the emperor should also be required to render it valid, Felix, after an un- eventful pontificate of four years, died in September 530.

Fenix V. (or IV). See Amavevs VIII. ae

FELIX, of Urgel. See Anoprian Controversy.

FELIX, of Valois (1127-1212), one of the founders of the monastic order of Trinitarians or Redemptionists, was born in the district of Valois, France, 19th Apuly 1.27. nee pa ie reached manhood he became a hermit in

ol Galeresse, where he remained till his sixty-first

year, when his disciple Jean de Matha suggested to him the.

idea of establishing an order of monks who should devote or lives to the redemption of Christian captives from the fa er With this view they arrived at Rome about me : _1197, and obtained the sanction of the pope for

® establishment of the new order. On their return to

France they founded t : ae, a Debs hate ie ca he monastery of Cerfroi in Picardy,

Jean de Matha superi

his monks were also called St Mathurins. Felix died at Cerfroi 4th November 1212, aud was canonized.

FELIX, Antonius, a Roman procurator of Judea, Samaria, Galilee, and Persea, entered upon his office in the 11th or 12th year of the emperor Claudius. Both he and his brother Pallas were originally slaves, and, it is said, owed their freedom to Antonia, wife of the emperor, on which account it is probable that Felix received the surname Antonius. By some writers he is also called Claudius, Felix was cruel and licentious, and his accessibility to bribes led to a great increase of crime in Judea under his govern- ment.

The apostle Paul, after being apprehended in Jeru- salem, was sent to be judged before Felix at Czesarea, and so reasoned before him of righteousness, temperance, and judgment to come that Felix trembled. He nevertheless retained Paul in custody for two years, hoping that a bribe would be offered to secure his liberty, but at the end of this time Felix was succeeded in the government by Festus, and in order to gratify the Jewish people left Paul bound. On returning to Rome Felix was accused of having taken advantage of a dispute between the Jews and Syrians of Ceesarea to slay and plunder the inhabitants, but through the intercession of his brother Pallas, who had great influence with the emperor Nero, .he escaped unpunished.

FELIX, Minuctus. See Minvetus Ferix, —

FELL, Joun (1625-86), bishop of Oxford, was the son of Dr Samuel Fell, dean of Christ Church, and was born at Longworth, in Berkshire, June 23, 1625. He passed from the free school of Thame to Christ Church College at the age of eleven, took his degree of B.A. in 1640, and three years later that of M.A. He served in the royal garrison of Oxford, and attained the rank of ensign. He afterwards took holy orders; and being ejected by the parliamentary visitors from his student's place, he lived in retirement at Oxford during the Commonwealth, privately keeping up the services of the Church of England, and administering the sacraments to many Royalists. At the Restoration he was made in rapid succession prebendary of Chichester, canon and dean of Christ Church. He had already obtained his degree of D.D., and was also chaplain to the king. In 1666 he was appointed vice-chancellor of

| the university, and he filled this post for several successive

years. Dr Fell set himself diligently to reform his college, to clear it of all remains of what he regarded as Puritan "hypocrisy and nonsense," to promote learning of all kinds, and to re-establish strict discipline. He did much for the improvement of the university press, therein carrying out the designs of Archbishop Laud, He zealously maintained the privileges of the university, and in so doing made him- self unpopular with the townsmen. He also distinguished himself as a benefactor to the college by making and pro- moting many important additions to its buildings. Having shown

himself a good scholar, and an earnest upholder of the Church of England, he was nominated in 1676 bishop of Oxford. He was allowed, however, still to hold his deanery of Christ Church tz commendam. Fell, as a good Aristotelian, was alarmed at the institution and inno- vations of the Royal Society, and encouraged Stubbe to write against it, making very grave charges against its members. Among his numerous publications were a Life of Dr Henry Hammond (1660), a Latin translation of Wood's History and Antiquities of the University of Oxford (1674), and a critical edition of the Greek Testament with many various readings (1675). This edition was twice re- printed at Leipsic, and at Oxford in 1703. It was followed in 1707 by the more important edition of Mill. When he had held the see of Oxford for ten years, Fell's health failed him, and anxiety about the changes attempted in the church by James IT. hastened his end. He died at Oxford, July 10, 1686, and his remains were interred in the cathedral.

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FELLATAUS, or Foutans. See Arrica, vol. i. p. 263.

FELLENBERG, Puitirp Emanvet von (1771-1844), educationist, was born 27th June 1771 at Bern, in Switzer- land. His father was of patrician family, and a man of importance in his canton, and his mother was a grand-daughter of the Dutch admiral Van Tromp. From his mother and from Pfeffel, the blind poet of Colmar, he received a better education than falls to the lot of most boys, while the intimacy of his father with Pestalozzi gave to his mind that bent which it afterwards followed. In 1790 he entered the university of Tiibingen, where he dis- tinguished himself by his rapid progress in legal studies. On account of his health he afterwards undertook a walking tour in Switzerland and the adjoining portions of France, Swabia, and Tyrol, visiting the hamlets and farm-houses, mingling in the labours and occupations of the peasants and inechanics, and partaking of their rude fare and lodg- ing. After the downfall of Robespierre, he went to Paris and remained there long enough to be assured of the storm impending over his native country. This he did his best to avert, but his warnings were disregarded, and Switzer- land was lost before any efficient means could be taken for its safety. Fellenberg, who had hastily raised a levy en masse, Was proscribed ; a price was set upon his head, and he was compelled to fly into

Germany. Shortly afterwards, however, he was recalled by his countrymen, and sent ona mission to Paris to remonstrate against the rapacity and cruelty of the agents of the French republic. But in this and other diplomatic offices which he held fora short time, he was witness to so much corruption and intrigue that his mind revolted from the idea of a political life, and he returned home with the intention of devoting himself wholly to the education of the young. With this resolution he purchased in 1799 the estate of Hofwyl, uear Bern, in- tending to make agriculture the basis of a new system which he had projected, for elevating the lower and rightly training the higher orders of the state, and welding them together in a closer union than had hitherto been deemed attainable. For some time he carried on his labours in conjunction with Pestalozzi, but incompatibility of disposi- tion soon induced them to separate. The scheme of Fel- lenberg at first excited a large amount of ridicule, but gradually it began to attract the notice of foreign countries ; and pupils, some of them of the highest rank, began to flock to him from every country in Europe, both for the pur- pose of studying agriculture and to profit by the high moral traming which he associated with his educational system. For forty-five years Fellenberg, assisted by his wife, con- tinued his educational labours, and latterly raised his institution to the highest point of prosperity and usefulness. He died 21st November 1844,

See Hamm, Fellenberg's Leben und Wirken, Bern, 1845; and Schém, Der Stifter von Hofwyl, Leben und Wirken Fellenberg's.

FELLER, Francois Xavier DE (1735-1802), a Belgian author, was born at Brussels 18th August 1735. In 1752 he entered a school of the Jesuits at Rheims, where he manifested a great aptitude for mathematics and physical science. He commenced his noviciate two years after- wards, and in testimony of his admiration for the apostle of India added Xavier to his surname. On the expiry of his noviciate he became professor at Luxembourg, and after- wards at Liége. In 1764 he was appointed to the professorship of theology at Tyrnau in Hungary, but in 1771 he returned to Belgium and continued to discharge his professorial duties at Liége till the suppression of the Jesuits in 1773. The remainder of his life he devoted to study, travel, and literature. On the invasion of Belgium by the French in

1794 he went to Paderborn, and remained there two years, after which he took up his residence at Ratisbon, where he died 23d May 1802,

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Feller's works exceed 120 volumes. In 1773 he published, under the assumed name Flexier de Reval (an anagram of Xavier do Feller), his Catéchisme philosophique; and his principal work, Dictionnaire historique et littéraire (published in 1781 at Liége in 8 volumes, and afterwards several times reprinted and continued down to 1848) appeared under the same name. Among his other works the most important are Cours de morale chrétienne et de littéra- ture religicuse and his Coup d'wil sur congrés @' Ems. The Journal historique et littéraire, published at Luxembourg and Liége from | to 1794 in 70 volumes, was edited and in great part written by

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FELLOWS, Sir Cuartzs (1799-1860), a distinguished traveller and antiquary, was born in 1799 at Nottingham, where the family had held an ancestral estate for a con- siderable time. While only fourteen he drew sketches to illustrate a trip to the ruins of Newstead Abbey, which afterwards appeared on the title page of Moore's Life of Lord Byron. In early youth he travelled through a great part of Britain, and in 1820 settled in London, where he proved an active member of the British Association for the advancement of science. In 1827 he distinguished himself as a traveller in Switzerland, and discovered the modern route to the top of Mont Blanc. After the death of his mother in 1832, he gave full scope to his natural bent, and passed the greater portion of each of the next ten years in Italy or Greece, or on the shores of the Levant. The numerous sketches he executed were largely used by Mr Murray in illustrating Childe Harold. In 1838 Fellows, induced by his passion for natural beauty and his preference of a simple peasant life to an artificial civilization, started for Asia Minor, where Smyrna was the centre of his travels, His explorations of parts of the interior and south led him to districts practically unknown to Europeans, and he thus discovered ruins of a number of ancient cities which existed earlier than 300 Bc. He entered Lycia and ex- plored the Xanthus from the mouth at Patara upwards. Nine miles from Patara, he discovered the ruins of Xanthus, the ancient capital of Lycia, finely situated on hills, and

abounding in magnificent remains. About fifteen miles further up he came upon the ruins of Tlos. After taking sketches of the most interesting objects and copying a num- ber of inscriptions, he returned to Smyrna through Caria and Lydia. Actuated by enlightened zeal, he soon brought his discoveries before European men of letters; and the publica- tion of A Journal written during an Excursion in Asta Minor (London, 1839) roused such strong interest in England that Lord Palmerston, at the request of the British Museum authorities, asked the English consul at Constantinople to get leave from the sultan to ship a number of the Lycian works of art. Late in 1839 Fellows, under the auspices of the British Museum, again set out for Lycia, accompanied by George Scharf, who assisted him materially in sketching. This second visit issued in the discovery of thirteen ancient cities, all enriched by works of art ; and in 1841 appeared An Account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor. A third visit was made late in 1841, after Fellows had obtained the “ firman ” by personal application at Constantinople; and he and his party had the pleasure of pitching their tents under the town of Xanthus on the 30th of December. They shipped a number of works of art for England, and in the fourth and most famous expedition (1844) twenty-seven cases of marbles were despatched for the British Museum, where they are now to be seen in the Lycian Saloon. The most noteworthy places on which the labours of Fellows cast a flood of light are Xanthus, Pinara, Patara, Tlos, Myra, and Olympus. The theatres in Lycian towns show the influ- ence of the Greek drama among the so-called “ barbarians” ; and Lycian sculpture and architecture almost rival the Greek masterpieces, The arched tombs, one of which is in the British Museum, are compared by Fellows to Gothic architecture, These tombs are very common in Lycia. At

Pinara, he says, “ rises a singular round rocky cliff literally specked all over with tombs.” For further information about Lycia compare with the works of Fellows Leake’s Asia Minor, the Travels in Lycia of Spratt and Forbes, and Description de [Asie Mineure by Texier. Papers on the Lycian language by Mr Daniel Sharpe are appended to the works of Fellows. In 1844 Fellows presented to the British Museum his portfolios, accounts of his expedi- tions, and specimens of natural history illustrative of Lycia. In 1845

he received the order of knighthood “as an acknowledgment of his services in the removal of the Xanthian antiquities to this country.” Fellows was twice married. He died in 1860.

In addition to the works above mentioned, Fellows published the following —The Xanthian Marbles ; their Acquisition and Trans- mission to England, 1843 ; An Account of the Ionic Trophy Monu- ment exeavated at Xanthus, 1848; a cheap edition of his two Journals, entitled Travels and Researches in Asia Minor, parti- cularly in the Provinec of Lycia, 1852; and Coins of Ancient Lycia before the Reign of Alexander ; with an Essay on the Relative Dates of the Lycian Monuments in the British Muscum, 1855.

FELO DE SE is one who commits murder upon himself. The technical conditions of murder apply to this crime; ¢.g., “if one commits any unlawful malicious act, the consequence of which is his own death, as if attempting to kill another he runs upon his antagonist’s sword, or shooting at another the gun bursts and kills himself,” he is a felo de se. The horror inspired by this crime led to the revolting punishment of an “ ignominious burial on the highway, with a stake driven through the body.” This was abolished by 4 Geo, IV. c. 52, which ordered the burial of the body of a person found to be jelo de se within 24 hours after the coroner’s inquest, between the hours of 9 and 12 at night, and without Christian rites of sepulture, See SUICIDE.

FELONY. In English law crimes are divided into felonies and misdemeanours, The difference between them dves not depend on their gravity as offences, nor on the amount of punishment attached to them,—it is purely his- torical. Felonies are those crimes which at common law brought with them after conviction forfeiture of goods. Since the Felony Act, noticed below, this is no longer an existing ground of distinction. Legal writers have sought to throw light on the nature of felony by examining the etymology of the word. One derivation suggested is from the Greek 7A0s, an impostor. Others connect it with the Latin verb fallo. Coke says it is crimen animo felleo per- petratum (a crime cominitted with malicious or evil intent). Spelman connects it with the word fee, signifying fief or feud; and felony in this way would be equivalent to pretvum feudi, an act for which a man lost or gave up his fee (see Stephen’s Blackstone, vol. iv. p. 7).

And it appears that acts involving forfeiture were styled felonies in feudal law, although they had nothing of a criminal character about them. A breach of duty on the part of the vassal, neglect of service, delay in seeking investiture, and the like were felonies. Injuries by the lord against the vassal were also felonies. In course of time felonies came to mean capital crimes, although there were a few felonies not punishable by death, and a few capital crimes which were not regarded as felonies. It became a principle of law that when a crime was declared by statute to be a felony, the punishment of death with forfeiture of land and goods necessarily attached (Blackstone's Commentaries, iv. 94). Blackstone accordingly makes felony include all capital crimes below treason. "Every person convicted of any felony for which no punishment is specially provided a. = ee oe for the time being is liable upon con- period not cecal ti ae 10 Bova sonuesae for wed a ition dard io years, or to be imprisoned with

abour and solitary confinement for

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any term not exceeding two years, and if a male to be once, twice, or thrice publicly or privately whipped in addition to such imprisonment" (Stephen's Digest of the Criminal Law, art. 18). The only practical distinction between felony and misdemeanour is that for the former arrests may be made by private persons acting without judicial authority. The Felony Act, 1870, abolished forfeitures for felony. FELT is a fabric which results from the matting and intimate adhesion of fibrous materials among themselves, and is not, like ordinary cloth, produced by any spinning and weaving processes. lj ordinary textile fibres possess sufficient adhesive tendency to enable them to be handled for spinning ; but it is only in certain animal fibres that the peculiarity is so marked as to fit them for felting, The property results chiefly from the serrated or jagged structure of wool and hair, and efficient felting is also pro- moted by the crimped or wavy form which some fibres naturally assume. These properties are best developed in the short " carding " wool of such sheep as the merino and Saxony breeds, long "combing" wools possessing them in a less degree. Unwashed wool, being coated with the natural grease, does not felt. The hair of other

animals, as of the rabbit, hare, coypu, vicugna, musquash, and ox, is employed for making felt of various kinds and for different purposes. Felt has been made and used from the most remote antiquity, and indeed, considering the simplicity of the material and the readiness with which wool felts, it is quite probable that it was known before woven fabrics. From time immemorial it has been employed for clothing and tent covers by the tribes of Central Asia, and to the present day it remains in extensive use among the Circassian, Armenian, and Tartar tribes, It is mentioned by Xenophon and Pliny, and Marco Polo describes its manufacture and applications in Central Asia. Felting results from combined pressure and moisture, and is favoured by heat. Ordinary broad-cloth and _ all "'fulled" woollen textures are partly felted, the fulling process having for its object a partial felting of the previously woven material; and the shrinking of woollen garments after washing, with which all are familiar, results from a felting by which the fibres draw closer together, the cloth gaining in thickness and solidity what it loses in superficial extent. The applications of felt are numerous, a certain range of qualities being used for clothing, domes- tic, and upholstery purposes, while other and generally rougher felts are employed for mechanical appliances. The manufacture of felt hats constitutes its most extensive application, for which see the article Har. Its manu- facture in the form of carpets, drugget, table covers, and articles of clothing is also important and extensive. The felt for these purposes is made chiefly from wool, which is, after washing, first carded out into exceedingly fine uniform gossamer-like laps. These laps, of the length and breadth of the web to be made, are superimposed on each other in numbers corresponding to the thickness desired in the finished article. The superficial stratum is usually of finer texture than the body, and the mass when ready for felting has the appearance of a huge sheet of cotton wadding. In this state the compound lap is passed between a series of opposite pressing rollers partly immersed in water, some of which are solid and heavy and others hollow and heated internally by steam. In its progress the lap is not only squeezed between the rollers, but an oscillating motion being given to the upper series, it is at the same time sub- mitted to a rubbing action, the result being that it issues a dense compact sheet of felt of uniform thickness. Felt so made is subsequently dyed, printed, and otherwise finished by the ordinary processes applicable to woven tissues. A patent has recently been secured for a carpet made of uniform strips of felt set on edge and tightly laced.

especially the subterranean remains, and thence to Pozzuoli, where he painted from the decorations of antique crypts or “grotte.” The style of fanciful arabesque which he formed for himself from these studies gained the name of “ grottesche,” whence comes “ grotesque ;” not, indeed, that Morto was the first painter of arabesque in the Italian Renaissance, for art of this kind had, apart from his influ- ence, been fully developed, both in painting and in sculp- ture, towards 1480, but he may have powerfully aided its diffusion southwards. His works were received with much favour in Rome. He afterwards went to Florence, and painted some fine grotesques in the Palazzo Pubblico. Re- turning to Venice towards 1505, he assisted Giorgione in painting the Fondaco dei Tedeschi, and seems to have remained with him till 1511. If we may trust Ridolfi, Morto eloped with the mistress of Giorgione, whose grief at this transaction brought him to the grave ; the allegation, however, is hardly reconcilable with other accounts. It may have been after 1511 that Morto returned to his native Feltre, then in a very ruinous condition from the ravages of warin 1509. There he executed various works, including some frescoes, still partly extant, and considered to be almost worthy of the hand of Raphael, in the loggia beside San Stefano. Towards the age of forty-five Morto, unquiet and dissatisfied, abandoned painting and took to soldiering in the service of the Venetian republic. He was made captain of a troop of two hundred men ; and, fight- ing valorously, he died at Zara in Dalmatia, in 1519, or perhaps somewhat later. One of his pictures is in the Berlin Museum, an allegorical subject of Peace and War. Andrea di Cosimo was his pupil and assistant as a decora- tive painter.

FENCING is the proper use of a small-sword or foil. The small-sword is a light court-dress sword, made to taper gradually from the hilt to the point, and of a size regulated by the judgment of the wearer, if he understand the use of the weapon. The foil with which the art of fencing is practised is a small quadrangular blade, about the length of a small-sword, and mounted in nearly the same manner ; but, for the convenience of the exercise, it is made lighter, blunted, and covered with leather at the point, to prevent accidents in practice.

The first weapon in use among mankind, whether for offensive or defensive purposes, appears to have been the sword. The most ancient records make frequent mention of it. The early swords were probably made of wood, like those used by the natives of Mexico when first visited by the Spaniards; but after the discovery of metals, bronze swords were introduced, of which kind many have at dif- ferent times been found. As soon, however, as the art of tempering steel had been discovered, that metal super- seded all other substances in the fabrication of arms ; ter is it probable that any change in this respect will take place, or that any further improvement is attainable. The form of sword, however, has varied at different times and in different countries. Those used by the Roman legions were short and strong, with a blade seldom exceeding nineteen inches in length, but two-edged, and calculated both for the cut and thethrust. The British swords, called spathe, were large, long, and heavy; and the Saxon and the Norman partook of the same character. The ancient practice of the weapon was probably carried to its greatest perfection amongst the Romans, whose partiality for gladiatorial exhibitions formed a remarkable feature of their character. The various and complicated methods of combat in which that people took delight are either alluded to or described by most of their writers, particularly by Livy, Juvenal, Seneca, and Suetonius,

The history of the modern small-sword or rapier is in- volved in some obscurity. The latter term, though now

through the centre. Such a carpet is. the same on both sides, and for it great durability, thickness, softness, and elasticity are claimed. Among the leading mechanical ap- plications of felt may be enumerated the covering of steam boilers and cylinders, the lining of damp walls, steam- packing, non-conductors for kilns and refrigerators, filters, polishing wheels, lining between the planking and metal sheathing of ships, printers’ blankets, and the covering of roofs. In the coarser qualities of felt cow-hair is the leading ingredient, and waterproof felting for roofs, &c., is impreg- nated with artificial asphalt and like substances. This manufacture was originally introduced by Croggon and Co. of London under a patent of Dr Ritchie of Belfast; but the “roofing felt” now made is a misnomer, seeing it is a bituminous compound simply lield together by waste flax and other vegetable fibres.

FELTHAM, Owen, a moral writer, whose essays were extremely popular during the 17th century. He is believed to have been the son of Thomas Feltham or Felltham of Mutford in Suffolk, and he was probably born about 1609. He was secretary to the earl of Thomond, under whose roof he wrote, when a youth of eighteen, a volume of one hundred fiesolves, Divine, Moral, and Political, short and pithy essays, of which two editions saw the light in 1628. Of this book, which the author constantly augmented, eleven editions were printed before 1700 and several since. To later issues of the Resolves Feltham appended Lusoria, a collection of forty poems. Hardly anything is known of his life, except that Randolph addressed a poem of compli- ment to him, and became his friend, and that Feltham attacked Ben Jonson in an ode shortly before the aged poet's death, but contributed a flattering elegy to the Jonsonus Virbius in 1638. arly in life Feltham visited Flanders, and published his observations in 1652 under the title of A Brief Character of the Low Countries. He was a Royalist and a strict high-churchman. It is supposed that he died soon after 1677. Hallam, with excessive severity, has stigmatized Feltham as one of our worst writers. He has not, indeed, the elegance of Bacon, whom he emulated, and he is often obscure and affected after the fashion of his time; but his copious imagery and genuine penetration give his reflections a charm to those who have leisure to peruse them. To the middle classes of the 17th century he seemed a heaven-sent philosopher and guide, and was ouly less popular than Quarles the emblematist.

An edition published at London in 1806 contains an account of the life and writings of Feltham by James Cumming.

FELTRE, the ancient Feltria, a town of northern Italy, in the province of Belluno, and 16 miles S.W. of the town of that name. It stands on a hill at the foot of the Alps near the Piave, and is partially fortified. It possesses a beautiful town-hall with facades said to be by Palladio, a cathedral, numerous churches, an episcopal gymnasium, a diocesan school, and an orphan asylum. It has some trade in corn, wine, and oil, and manufactures of silk twist, wax, and leather. A money-lending establishment founded there in the 15th century still exists, and is said to be the oldest in Europe. Of the old castle, which was frequently besieged in the Venetian wars of the

14th and 15th centuries, little now remains but a Square tower. The population of Feltre in 1871 was 4852, and including the suburbs 6570.

FELTRE, Morro pa, a painter of the Venetian school, who worked at the close of the 15th century and beginning of the 16th. His real name appears to have been Pietro Luzzo ; he is also known by the name Zarato or Zarotto, apparently from the place of lis death – whether he was termed Morto (dead) from his joyless temperament is a

disputed point. He may probably have studied painting first in Venice, but under what master is uncertain. At an early age he went to Rome, and investigated the ancient,

considered as synonymous with the former, probably denotes a long, ordinary, old-fashioned cutting sword. But by a rapier is now always meant a sword for the thrust, in contradistinction to one adapted for cutting. The small: sword or rapier is undoubtedly very ancient, although there is reason to believe that it was not brought into general use until armour for protecting the body began' to go out of fashion. Since that time the art of fencing has always been considered as a gentlemanly accomplishment, and in many parts of the Continent it is cultivated with the greatest zeal and assiduity. Some have maintained that the weapon was not used in England before the reign of Elizabeth ; and Darcie (Annals of Elizabeth) informs us that one Rowland York, who appears to have betrayed Deventer to the Spaniards in the year 1587, was the first who brought into England " that wicked, pernicious fashion to fight in the fields in duels with a rapier called a tucke only for the thrust." Stowe also mentions that long tucks and long rapiers began about the twelfth or thirteenth year of Elizabeth, and that 'he was held the greatest gallant that had the deepest ruffe and largest rapier. The offence," he adds, "to the eye of the one, and the hurt unto the life of the subject that came by the other, caused her Majesty to make proclamation against them both, and to place selected grave citizens at every gate to cut the ruffes and break the rapiers' points of all passengers that exceeded a yard in length of their rapiers, and a nayle of a yard in depth of their ruffes."?

But at whatever time the small-sword came into use in this country, it is not surprising that, when once intro- duced, it should have. been cultivated as the most equi- table instrument of duelling. Before this period meetings for the purpose of single combat were utterly revolting to all notions of fairness. No regard was paid to equality of arms or numbers; advantages, however unfair, were seized whenever an opportunity offered; and the ferocious passions, instead of being curbed, had fuller scope given for their gratification. “The duellist of former times,” says Sir Walter Scott, in a note to The Lady of the Lake, “ did not always stand upon those punctilios respecting equality of arms which are now judged essential to fair combat. It is true that in formal combats in the lists, parties were, by the judges of the field, put as nearly as possible in the same circumstances. But in private duels it was often otherwise.” The practice of deciding duels with the sword may be con- sidered as now extinct in England. When the rapier was looked upon as an indispensable part of a gentleman’s dress, the facility of immediate rencounter which it offered gave oc- casion to frequent and dangerous brawls, by which the public tranquility was disturbed, and the lives of peaceable citizens sometimes sacrificed. Since arms have ceased to be worn, such an objection can no longer be urged against the art of defence; and it may perhaps be questioned whether it ever had much weight.

The practice of the foil is here considered as applied to the most laudable purposes, namely, the enjoyment of salu- tary recreation and the acquisition of a graceful and un- constrained deportment. The beneficial effects of moderate fencing to persons of weak constitutions, or of studious and sedentary habits, have been attested by medical practi. tioners of the first eminence. ‘To the public speaker, the practice of the fencing-room has been found to impart an ease and freedom of gesture attainable by no other exer- cise. For while the use of the foil and the broadsword

lin The Two Angry Women of Abingdon, acomedy printed in 1599, we find the following pathetic complaint: “Sword and buckler fights begin to grow out of use. Iam sorry for it; I shall never see good manhood again. If it be once gone, this poking fight of rapier and dagger will come up; then a tallman, and a good sword-and-buckler man, will be spitted like a cat or a rabbit.”

diffuses ease, elegance, and grace all over the body, and im- parts to the look and gesture an appearance of intellectual vigour, it teaches invaluable lessons of patience and self- command, and contributes to discipline the temper. “ Per- haps there is no exercise whatever,” says Mr Roland (Theory and Practice of Fencing), “ more calculated for these purposes (developing and cultivating bodily strength and activity) than fencing. Riding, walking, sparring, wrestling, running, and pitching the bar are all of them certainly highly beneficial ; but, beyond all question, there is no single exercise whicli combines so many advantages as fencing. By it the muscles of every part of the body are brought into play ; it expands the chest, and occasions an equal distribution of the blood and other circulating fluids through the whole system. More than one case has fallen under the author’s own observation, in which affections of the lungs, and a tendency to consumption, have been entirely removed by occasional practice with the foil.”

We now proceed to give such definitions as appear to be requisite for conveying a general idea of the science of fencing, referring the reader for the necessary details to the numerous manuals published on the subject.

Attacks and Parades.—After the first positions have been acquired, the modes of attack come to be considered. Attacks are made in three ways :—first, by a quick thrust proceeding merely from the wrist, the arm at the same time being elevated and advanced, with the point directed towards the adversary’s breast ; secondly, by what is téechni- cally called an extension ; and lastly, by longeing and re- covering. The parades, in which consists the defensive part of the art, naturally follow the attack. A parade is a defence of the body, made by an opposition of one’s blade to that of an adversary, in such a situation as upon his attack to prevent the point of his sword hitting. The parades are eight in number, Viz, six simple, called quarte, tierce, circle, octave, prime, quinte, and two round or counter parades in quarte and tierce.

Thrusts, &c.—The next division of the subject includes straight thrusts, simple disengagements, and bindings of the blade. A straight thrust is used as an attack, when an antagonist, from his position on guard, leaves

sufficient opening to enable him to be touched upon that side of the body on which blades are joined. When such an oppor- tunity offers, the wrist must be suddenly raised, so as to bring the “forte ” of one’s sword to the “foible” of the adversary’s ; after which longe immediately on the same line to his breast, observing, however, to preserve a correct opposition. In fencing, “opposition” signifies the art of covering the bodyat the time of delivering a thrust, on that side where the foils happen to cross, in order to prevent an antagonist exchang- ing hits. The disengagement is made either as an attack, or as a return after defending one’s self from a thrust, and is executed both under and over the wrist or foils. A dis- engagement over the arm may be parried with tierce or prime, and, if made low, by the parade of circle; from the position of octave by quarte or, if the thrust be delivered low, by circle; from the position of quinte by prime as the readiest defence, but quarte and tierce are also correct parades against this thrust. There are three different ways of binding the blade. Of these, “ flanconnade” is the principal, as it is sometimes a safe attack when any other mode would be attended with considerable danger; it is also made as a “riposte.” The attack of flanconnade is commenced when the blades are joined in quarte, and it is parried either by octave or quinte, or by the parade of quarte. The return over the arm, after the parade of circle, is parried by prime or tierce, or by changing quickly to the counter in quarte. The return over the arm, after the parade of prime, is parried by prime or tierce, or, if made at a considerable distance, by the counter in quarte. ‘

Feints.—In fencing there are a great variety of feints, which it is not easy to describe intelligibly without figures. A feint is an intentional movement made to deceive an adversary. All thrusts, therefore, may, strictly speaking, come under the definition of feints, as the fencer’s object, in all his attacks, is to deceive his antagonist. For the sake of convenience, however, straight thrusts and simple disengagements have been arranged under a separate head. In executing the feint called one two, inside of the arm, supposing the adversary’s body to be covered in quarte, the parade of tierce is deceived; commencing from the outside, that of quarte is deceived ; from the position of the circle the octave, and from that of the octave the circle is deceived.

This feint, if made inside the arm, is parried by the parade of quarte, or by the counter in tierce, made upon an opponent's second disengagement ; upon the outside of the arm, by tierce, prime, or the counter in quarte ; and from the position of the octave, by octave or quinte. The feint one two is likewise made as a return after the parade of quarte or tierce, or sometimes after that of circle or octave. The cut and disengage is a species of one two, in making which from the position of quarte an adversary's parade of tierce is deceived, and from the position of tierce his parade of quarte. Cut and disengage, if made inside of the arm, is parried by quarte, or the counter in tierce ; if outside, by tierce or counter in quarte. eint seconde is another feint very nearly resembling one two, and is generally made as a return after the parades of tierce, prime, or quinte. In this feint the octave or quinte is deceived; and it is parried by tierce, prime, or quarte, the two former being the readiest where quinte is the parade deceived, but if the feint has been answered with octave, the thrnst must then be parried with quarte. The feint ane two three is made on either side of the blade, upon precisely the same principles as one two,—the only difference between them consisting in making one disengagement more in the latter than in the former movement. The cut and one two is a species of one two three. These feints, if made over the arm, are parried with the simple parade of tierce; if on the inside, with simple quarte. The other feints are— doubling, which, mutatis mutandis, is executed upon pre- cisely the same principles ; one two and deceive the circle, executed from the inside position of quarte; one two and decewe the counter, which may be made from either side of the blade, but most frequently commences from the position of tierce; feint flanconnade, which can be commenced only from the engagement of quarte; feint seconde and deceive quarte, which is always commenced from the outside engagement, whether made as an attack or a return ; feint seconde and deceive tierce, which differs from the preceding only in the last disengagement ; one two and deceive quarte from the position of the circle, when the first disengagement is made over the adversary's wrist towards the body under the arm, and the second over the wrist to- wards the inside of the body ; and doubling on both sides of the arm, which is too complicated a feint to be frequently used in actual fencing, because it is difficult to follow the adversary's sword with certainty through many different parades, and there is much danger of "time thrusts " upon feints which consist of so many disengagements.

Time thrusts are so called because the success of these movements depends entirely upon their being executed at the exact moment of time employed by the adversary in planning or in executing his attack ; and, when made cor- rectly, they are by far the most scientific movements in fencing. There are two sort of time thrusts, in the execu- tion of one of which it is necessary that the blades should cross each other, but for the completion of the other it is not absolutely necessary that the blades should even meet. Those time thrusts in the execution of which the blades

cross are more scientific, and expose the fencer less to ex- changed hits. There are two time thrusts 2 opposition— one the dime over the arm, and the other the time in octave. The former is applicable to all thrusts, however simple or complex the feint may be, provided the longe is made upon the outside; whereas all longes directed to the inside of the body, or under the arm, are exposed to the time in octave ; and thus almost every thrust made in fencing affords an opportunity for one or other of these two move- ments. Those time thrusts in which the opposition is pot essential are made upon incorrect movements of the adver- sary, when he exposes himself by the wideness of his attacks, or by quitting the blade in a dangerous position, or by making too many disengagements in his feints, or by giving a variety of openings which the judgment of the fencer must determine how he is to take advantage of. Thisthrust is practised almost entirely upon irregular attacks, and requires great caution to be observed. It has been already stated that time thrusts in opposition, when correctly made upon good attacks, are perhaps the finest movements in fencing ; but young fencers should nevertheless attempt them very seldom, from the danger of misjudging the attack, and thus exposing themselves to the certainty of being hit. And the time out of opposition is attended with still greater hazard, as its success depends rather upon the wideness and irregularity of an adversary’s movements than on the security of one’s own situation afforded by the oppo- sition in the former species of time thrust.

When fencing was comparatively little known, it was thought necessary that there should be some intermediate practice for the pupil between the lesson of the master and his making the assault ; for which purpose, it appears, he was: taught to longe, at a proper distance, at the wall. This was called by the French ¢zver aw mur, and was considered as useful for planting the learner

well upon his legs, accus- toming him to measure distance correctly, and causing his motions, in making his extension and longe, to follow one another in the proper succession. But as the art became better understood, observation induced masters to place pupils together for their mutual advantage, the one to attack hy simple disengagements, the other to parry by quarte and tierce alternatcly ; and this practice, from its origin, was long called tier au mur. It is now, however, generally known as quarte ond tierce, and, in its improved state, is not merely intended as an exercise for the scholar, but also as a graceful display of the principal motions of fencing; for which reason it should be invariably practised before commencing the assault, and in fencing before com- pany it is never dispensed with. Quarte and tierce appears very simple in its execution, yet it is exceedingly useful to fencers in all stages of their progress, and difficult to acquire with such correctness that all its movements shall take place in their proper succession, and be made with the grace and precision characteristic of a good fencer. The counters is also a practice of importance to young fencers.

In the language of the fencing-room, making the assaule and playing loose are synonymous, signifying the practice of attack and defence, or, in other words, a just application of the lessons received, which, in fact, ought to be done as correctly as if with sword in hand. Jn the assault, the mere inovements should be almost mechanical; for the mind being wholly employed in discovering and counteract- ing the designs of the adversary, as well as in concealing its own, the hand should, on the proper opportunity being given, instantly execute that which the mind conceives without any consideration of the manner in which the par- ticular motion is to be made,

The rules to be observed are few and distinct. The first thing which the attention of a young fencer should naturally be directed to is the most secure manner in

which he can come into the position of the guard, when opposed to an adversary ready to take every advantage of his inexperience. Whilst advancing into distance, it is also an object of importance to have one side of the body secured by the position, particularly that side to which the antagonist’s blade is opposed ; so that, if he commence an attack during this

movement, he must quit the blade in order to direct his thrust or feint at any opening afforded him by the position of his opponent ; and the opportunities of attack being few, his designs will thus be the more easily discovered. In short, the commanding an opponent's blade almost obliges him to effect some change in the relative situations of the contending parties, before he advances into distance ; and as the necessity of such previous move- ment must be foreseen, any attempt of this kind is favour- able for making an attack on him. And, generally, whilst standing in the position of the guard, it is an advantage to have one side of the body covered, and to command the foible of the adversary's blade. Straight thrusts and simple disengagements, executed with quickness and vigour, should frequently be attempted, even though they

do not succeed in hitting; and this should be particularly

attended to in fencing with a stranger. Quick simple thrusts are almost the only certain way of ascertaining his fivourite parades, and consequently of knowing by what feints to attack him with a probability of success. The suddenness and rapidity of the attack will inevitably extort from him the secret of his favourite defence.

Many masters of the old school, and some, too, of the present day, have treated disarming as of importance in the art; but from its inutility, not to mention danger, in the field, it is now considered incompatible with good fencing, and indeed no better than a trick. The only advantage of disarming is that of annoying the person disarmed ; for, sword in hand, it is rendered nuga- tory by the use of a sword-knot, with which, it may be presumed, every person at all acquainted with the weapon will take especial care to fasten it to his wrist in a serious affair. As the manceuvre may therefore be defeated by the most ordinary precaution, attempting it can serve no other purpose than to cause heavy and unpleasant play ; whilst the strength it requires for its execution is a drawback, and affords an adversary favourable moments of attack during the time an attempt is being made to bind his blade.

As far back as 1692 a very curious book on the subject of fencing was published by Sir William Hope; it is now very scarce. In 1780 a Lieutenant M'Arthur published a work on fencing, which he dedicated to the duke of

Argyll. Several modern works of merit have appeared on this subject ; one of the most, valuable and complete is Roland's Treatise on the Theory. and Practice of the Art of Fencing.

FENELON, Bertranp pe Sarienac (?—1589), Mar- quis de La Mothe, a French diplomatist who was ambas- sador to England during the reign of Elizabeth. At the request of Charles IX. he endeavoured to excuse to Elizabeth the massacre of St Bartholomew as a necessity caused by a plot which had been laid against the life of the king of France. For some time after the death of Charles IX. Fénelon was continued in his office, but he was recalled in 1575 when Catherine de' Medici wished to bring about a marriage between Elizabeth and the duke of Alengon, and thought that another ambassador would have a better chance of success in the negotiation. In 1582 Fénelon again arrived in England, charged with a private commission from the king of France, chiefly with the view of obtaining the liberation of Mary queen of Scots on the promise of a French alliance; but Elizabeth saw reason to doubt the king's sincerity, and Fénelon had to

oe England without gaining his purpose. He died in

Fénelon is the author of a number of writings, among which those of general importance are A/émotres touchant V Angleterre et la Suisse, ow Sommaire de la négociation faite en Angleterre, Van 1571 (containing a number of the letters of Charles and his mother, relating to Queen Elizabeth, Queen Mary, and the Bartholomew massacre), published in the Afémozres of Castelnau, Paris, 1659 ; Négociations de La Mothe Fénelonet de Michel, sieur de Mauvissiére, en Angleterre; and Dépéehes de M, de La Mothe Fénelon, Instructions au sieur de La Mauvissiere, both contained in the edition of Castel- naws Mémoires, published at Brussels in 1731. The correspondence of Fénelon was published at Paris in 1888-41, in 7 vols. 8vo.

FENELON, Francois DE SALIGNAc DE LAMOTHE (1651-1715), archbishop of Cambray, and one of the most celebrated names in the intellectual and ecclesiastical history of France in the 17th century, was

born at the Chateau de Fénelon in Périgord, August 6, 1651. The family of Salignac or Salagnac, to which he belonged, had been ennobled from the middle of the 15th century, and pro- duced already many distinguished names. The father of the future archbishop was Count Pons de Salignac, of whose second marriage, contracted in mature years, Frangois was the only child. From his birth he was of a delicate and sensitive temperament; and, greatly beloved by his old father, he was educated at home till he was twelve years of age. He received, according to one of his biographers, “a simple Christian education devoid of anything remarkable.” But he must have been lucky in his tutor or of rare aptitude for learning, for he seems then to have laid the foundation of his admirable scholarship and love of letters. After a short time at the college of Cahors, he went to Paris to complete his studies under the Jesuits at the Collége du Plessis, There his great gifts soon drew to him distinction, and, like his rival Bossuet, he ventured to preach to an ad- miring audience at the age of fifteen. His father seems to have died before this time, and his uncle, the Marquis de

drew his charge from what might have proved injurious seductions, and placed him in the seminary of St Sulpice under the saintly Trouson. His uncle was himself a re- markable man. Distinguished as a soldier and a statesman, he became no less distinguished for his piety and moral heroism, In conjunction with M. Olier, the founder of St Sulpice, he inaugurated and became the first president of an association for the suppression of duelling. The association was composed only of men whose valour was unimpeachable, and whose oath binding them to refuse any challenge or take part in any duel could not therefore be mistaken. The Marquis de Fénelon and his daughter, who became Madame de Montmorenci Laval, wife of the Marquis de Montmorenci Laval, both exercised a decisive and happy influence over the young Fénelon. Many of his early letters are addressed to. his cousin, whom he looked upon as a sister—the only one he had ever known. But the head of St Sulpice, M. Trouson, shared with these relatives the task of his higher education, and no one, both now and afterwards, enjoyed so much of his confidence. “ Great as is my freedom and openheartedness with you,” the young student writes to his uncle after being placed at the seminary, “I must confess without any fear of making you jealous that 1 am still more unreserved with M. Trouson; if you could hear our conversation and the ease with which I lay bare my heart to him,

and with which he teaches me to know God, you would not know your pupil, and you would see that God has very marvellously helped on the work which you began.”

Fénelon’s first aspirations were towards a missionary life. The congregation at St Sulpice had established a missionary society at Canada which many of its pupils had joined, and he wished to follow their steps; and when this project failed he still more earnestly desired to undertake a mission to Greece. In one of his letters, dated October 9, 1679, he draws a glowing sketch of his desire to visit “ the

Fénelon, who had assumed the care of his education, with-

glorious scenes,” redolent of the spirit of antiquity, which he liad so often pictured in imagination, and “ to seek out the Areopagus whence St Paul proclaimed the unknown God to heathen sages.” But his delicate health, and the dissuasion of another uncle, the bishop of Sarlat, interfered with his missionary longings. He was induced to remain at home and accept the office of superior of the community of Nouvelles Catholiques, a community founded for the pro- tection and instruction of women converted from Protes- tantism. He spent ten years (1675-85) of quiet and successful labour in connexion – with this institution, became intimately associated with a select circle, at the head of which was the Duc de Beauvilliers, began his career as an author, and otherwise laid the foundation of lus remarkable influence. It was at the request of the Duchesse de Beauvilliers that he is said to have written his first work, De ? Education des Filles, which long maintained its reputation among the higher families of France, and may still be consulted with advantage. It contains many admirable precepts. ‘T’o this same period belong a Refuta- tron of Malebranche’s Treatise of Nature and Grace, in which he was assisted with marginal notes by Bossuet, and a

treatise on the Afinistry of Pastors, in which he set forth the blessing of a divine order appointed in uninterrupted succession from the apostles to guard men from error, seeing that all experience proves how unable ordinary men are “to decide for themselves as to the details of dogmas.” This treatise had a polemical aim against the Protestants, but was at the same time written with great moderation and fairness,

In 1685 Louis XIV. carried out his infamous policy of expelling the Protestants from France by the revocation of the edict of Nantes. Great disturbance arose in con- sequence in the districts of Poitou and Saintonge. It was necessary, by firm yet gentle means, to do something to allay the violent irritation which had been caused. On the recommendation of Bossuet, Fénelon was chosen as the head of a mission for this purpose. He made two conditions, —that all troops should be withdrawn from the provinces, and that he should be allowed to choose his fellow workers. The result was that his nlission was attended with consider- able success, although he himself complains more than a year afterwards, “Our converts get on very slowly ;—it is no easy matter to change the opinions of a whole people.” On his return to Paris he had several interviews with the king to report the result of bis labours, and afterwards resumed in comparative privacy his old duties among the Nouvelles Catholiques. M. de Harlay, the well-known brilliant but profligate archbishop of Paris, who had first advanced lim to this position, withdrew his favour from him when he saw he could make no use of him. “Itseems, M. lAbbé, that you wish to be forgotten, and you shall be,” was his bitter speech on one occasion; and he so far suc- ceeded as to prevent Fénelon’s appointment to the see of Poitiers which had been contemplated by the king.

Suddenly he was called to the responsible position of preceptor of the dauphin’s son, the young duke of Bur- gundy. This was the work especially of his friend the Duc de Beauvilliers, who in 1689 was appointed governor of the royal grandson, But other friends warmly rejoiced in Fénelon’s advancement, and amongst these Bossuet wrote to Madame de Montmoreuci Laval congratulating her. ““We shall not lose the Abbé Fénelon,” he says ; “ you will be able to enjoy him, and, provincial ag I am, I shall escape from time to time to embrace him.” It is interesting to notice

this renewed trace of hearty friendship between these two illustrious men, considering the unhappy relations which afterwards arose between them.

No man probably was ever better fitted than Fénelon for the difficult position which he now assumed, and to which

he mainly devoted himself during the next six years (1689- 95). He was a born teacher in the highest sense,—gifted with the most charming qualities of patience, sweetness of temper, tact, and address, yet inflexible in principle, and severe and unbending in his methods of training. He had the manners of a grand seigneur, with all the intellectual refinements of an accomplished churchman. Saint Simon in his Mémoires (t. xxii. p. 135) has left a portrait of him about this time which has been often quoted, and from which we extract only a few sentences. ‘‘ He was a tall thin man, well made, pale, with a large nose, eyes whence fire and talent streamed like a torrent, and a physiog- nomy the like of which I have never seen in any other man, and which ouce seen one could never forget. It combined everything, and the greatest contradictions produced no want of harmony. It united seriousness and gaiety, gravity and courtesy—the prevailing characteristic, as in everything about him, being refinement, intellect, graceful- ness, modesty, and above all zodlesse. It was difficult to take one’s eyes off him. All his portraits are speaking, and yet none of them have caught the exquisite harmony which struck one in the original, or the exceeding delicacy of every feature. His manner altogether corresponded to his appearance; his perfect ease was infectious to others, and his conversation was stamped with the grace and good taste which are only acquired by habitual intercourse with the best society and the great world.” He had need of all his brilliant and solid qualities in the task which he had under- taken. The young duke of Burgundy, as the same writer remarks, ‘‘ was born with a 2atuel which made one tremble. He was so passionate that he would break the clocks which summoned him to some unwelcome duty, and fly into the wildest rage with the rain whicli hindered some pleasure.” He was withal warm-hearted and clever,—in fact, “ danger- ously quick in penetrating both things and people.” Fénelon had full scope for the exercise of his marvellons educational art, and the result was a success far beyond

what is usual in such cases. – The impetuous but affection- ate and bright child grew under his charge into an earnest, well-disciplined, and promising, if somewhat over-scrupu- lous and timid youth, whose life if spared might have brought blessing to France. Fénelon carefully planned all the details of his education, and has embodied in his well- known 7’élémaque and other writings the principles on which he based it. It was his aim to train the young prince not merely in habits of self-control, to direct his scholarly acquirements and religious convictions, but, moreover, to awaken in him true and large political instincts fitted to qualify him for his ligh position. Fénelon himself, while an aristocrat both by birth and feeling, and strongly favour- able to the maintenance of these class distinctions which were especially marked in France in the 17th century, was at the same time essentially liberal in his recognition of the radical equality of all men, and the moral regards which should regulate the relation of classes to oneanother. His ideal was that of a limited monarchy, surrounded by national institutions, each having its due place and func- tion in the body politic, and representing in due degree public opinion. A written constitution, one sovereign law for all, universal education provided by the state, the recip- rocal independence of the temporal and spiritual powers, detestation of war, free industry in agriculture and trade, a people growing in intelligence and self-dependence round the throne and under the guidance of the church,—such were the broad principles which he sought to instil into his pupil, and so to make him, in his own language, ‘‘a philosophic king,” “a new Saint Louis.” The task was a noble one, and it was pursued with all the fascina- tion, patience, and quiet earnestness which distinguished him,

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But a train of circumstances was preparing, destined to impair and finally to overthrow his influence at court, and to banish him from all intercourse with his royal pupil. We can only very briefly indicate the causes which led to this result. A system of religious mysticism known as Quietism had been set afloat towards the end of the 17th century by a Spanish priest of the name of Molinos. The system was espoused in France amongst others

especially by Madame Guyon, a remarkable woman devoted to the cause of religion, but of an erratic and restless temperament. Her writings on the subject attracted wide attention, and speedily called forth ecclesiastical condemnation. The archbishop of Paris took up a position of violent hostility towards her; the severe and methodical character of the king was greatly offended by her excesses; and Bossuet was by and by drawn into the circle of her vehement opponents. Strangely it was by Fénelon's advice that the subject was first brought under Bossuet's notice. Attracted by Madame Guyon's genuine enthusiasm, and no doubt finding some- thing in her view of disinterested mysticism which appealed to his own religious temperament, he recommended her to place her writings in the hands of the bishop of Meaux, and to abide by his decision. Many conferences were held on the subject, in which Fénelon at first took no 'part, and during the progress of which he held friendly communication with his old friend, and in fact supplied Bossuet, who professed his ignorance of the mystical writers, with extracts from the fathers and others bearing onthe controversy. Therelation of the two friendscontinued apparently cordial; the atmosphere of the court had not yet changed towards him, for it was at this very time, in the beginning of 1695, that the king nominated Fénelon for the archbishopric of Cambray; but gradually out of this miserable business there sprung up a host of embittered feelings. After his appointment as archbishop, Fénelon had joined in the conferences at Issy which finally condemned Madame Guyon's doctrines. He scrupled, however, to subscribe her condemnation ; he scrupled also to express approval of a publication of Bossuet attacking these doctrines; and in vindication of his own position and principles he published his Masimes des Saints sur la vie intérieure. The result was to kindle into greater fury the storm of controversy, to provoke the jealous and violent animosity of Bossuet, and to fan the suspicions with which the king had always more or less regarded him into such a vehement outbreak as to lead to his permanent banishment from court, and his condemnation at Rome (1699). He sub- mitted himself to the pontifical decision. But this did not save him either from the continued anger of Bossuet or from the displeasure of the monarch, which were further excited by the publication, through the treachery of a secretary, of his T'élémaque, under the allegorical disguise of which Louis and his courtiers recognized a satire against the absolutist principles of the French Government.

Fénelon himself disclaimed any suchintention. ‘He had,” he said, “introduced all the virtues necessary for a good government, and the faults to which sovereign power is liable, but none were drawn with the slightest approach to any personality or portraiture. The more the book is examined, the more it will be seen that it only expressed principles fully, without attempting to draw any finished character. My only object was to amuse the duke of Bur- gundy with a tale of adventure, and to instruct him at the same time, without ever thinking of giving the work to the public ” (Corresp., t. iii. p. 247). ie fee eet “ eee life was spent in his diocese abounded in Prot ti a piety and charity. Cambray ‘won by his Laltevtion af = Sa et hon ee a – and evangelical simplicity. It was,

, @ great thoroughfare for the armies of the time,

to the necessities of which, and especially of the sick and wounded, he personally ministered. His own palace was sometimes crowded with invalided officers, who remained his guests for months. He became in consequence endeared to the army and the people. Mingling familiarly with the poorest peasants under his spiritual charge, dis- pensing with liberality, yet without ostentation, the duties of Christian hospitality, carrying on an extensive corre- spondence with the clergy and some of his old friends at court, he became more honoured in his retirement even than he had been in Paris. “In everything,” says Saint Simon, “ he was a true bishop, in everything a grand seigneur, in everything, too, the author of 7élémaque.” A curious pic- ture is preserved of these later years of Fénelon by a Scotch- man of the name of Andrew Ramsay, who had wandered over Holland and Germany in search of something more satisfying than the sectarianism of his native country, or the deism which seemed to him for a time the only alterna- tive. Won by the spiritual beauty of Fénelon’s character, and the elevation of his teaching, he embraced the Catholic faith, spent much of his time at Cambray, and wrote the first life ever published of his teacher and friend. The last years of the good archbishop’s life were saddened by the loss of most of his friends. ‘‘Our best friends,” he said, on hearing of the death of the Duc de Beauvilliers in 1714, “are the source of our greatest sorrow and bitter- ness.” And again he wrote to a remaining friend, “I only

live in friendship now, and friendship will be the cause of my death.” He died on the 17th January Les

Fénelon is chiefly remembered for the beauty of his character, his tender and mystic devotion, and the charm of his style as a writer. He is not great as a thinker, nor can the substance of his writings be said to have a permanent value. But there is the same subtle delicacy, sensibility, and tenderness and purity of expression in his style as in his character. An exquisite highly-toned and noble genius pervade the one and the other. As a man he is one of the greatest figures in a great time. As a writer he has been placed in prose on the same level with Racine in poetry. In both there is the same full harmony and clearness, the same combination of natural grace with per- fect art.

In addition to the works of Fénelon already noticed, the following deserve to be mentioned :—The Dialogues des Morts, composés pour UV Education d’un Prince, 1712; Diologues sur V Eloquence, &c., 1718 ; Lettres sur divers sujets concernant la religion ct la méta- physique, 1718; Traité d Existence de Dieu, ke., 1713. There are many collected editions of his works. That of Leclere (Paris, 1827-1830), 38 small vols., is the:latest. An excellent life of Fénelon

has recently appeared in English (1877) by the same author as the Life of Bossuct mentioned under that article. Gln 4!)

FENIANS. Ireland appears to have been the theatre of a great ethnic struggle in the first century of the Christian era, in which certain tribes, known to the Romans as Scots, reduced ‘the other inhabitants to sub- jection. The servile clans are called in Irish story Aithech Tuatha, rent- paying tribes, though one of them settled near the river Liffey is specially mentioned as the T’uath Aithechta, & name believed to have been the origin of the Latinized tribe-name Aftticottz. According to Irish tradi- tion Scotic power appears to have been fully established in the reign of a king called Tuathal, the Legitimate, who was slain about 160 a.p. Between this prehistoric king’s reign and the mission of St Patrick, an interval of about 300 years, was the period of the invasions of Roman Britain by the Picts and Scots, which, though not strictly within the historic period of Irish

history, touches upon it. so closely that many traditions of the time have come down to us intermingled with a rich and increasing growth of

| legend embodied in verse and prose tales, known to the

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FENIANS

Irish speaking peasantry as Sgeulta fiannuigheachta, stories of the Fians or Fennians. The word Franna is glossed in an Irish MS. by fecnneda, champions, that is, of the king of Eure. Instead of Pian, Fianna, we have also the words in the oblique case feinn, fernne, from whence has come the English form Fenian. The stories are sometimes also called Ossianic, from a corrupt form of the name of a Fenian poet and warrior named Oésin, the Ossian of Mac- pherson; but though properly applicable to poems, the term cannot be applied to prose tales.

According to popular tradition the Mians, or Fenians, were mercenary tribes acting as a permanent military force for the support of the Ard Rig, or king of Hire. They are supposed to have been instituted by a prehistoric king, Fiachadh, the father of the above-named Z'uathal, or his brother according to another account, and to have enjoyed great power for about 150 years, until, some of them having taken part with the king of Leinster against the king of Hire, they nearly annihilated each other in the battle of Gabhra, which is perhaps only another way of saying that the king, jealous of their power, broke up the organization. The term "an continued, however, to be sometimes applied by the poets to the Amos, or mercenary troops, which the provincial kings, as well as the king of Hire, kept about them. In later times poets even used it in the general sense of soldiers, hence the use of such expressions as " Fians of Alba," " Fians of Breatan," &c. As the Irish princes had an opportunity of learning something of the Roman military system in Britain,—Tacitus (Agr., xxiv.) mentions that one was in the camp of Agricola,—there is nothing improbable in the Scotic or Milesian kings imitating it so far as to assign constant military duty to certain clans. One of the glosses on the word Fianna explains it as Jineadha, because it was in Fines, septs, they were formed. The Leinster and Meath Fenians, consisting of the Clanna Baiscné, from a stemfather Basené, are said to have been

Damnonians of the subjugated tribes of the Gazleoin settled in Meath and East Leinster, one of which was the Zuath Aithechta above mentioned. The Gazlevins figure in the Téin bo Cuailnge, a celebrated tale of the older or Heroic cycle of Irish romance, as the Leinster contingent of Addill, the husband of Queen Medd, the heroine of the tale. The Connaught Fenians, the Clanna Morna, so called from a stemfather Morn, were also a servile tribe, the Twath Domnann, settled in Erris in the west of Mayo. Ferdiad son of Daman, whose combat with Czichulaind forms the finest episode of the Tdin bo Cuailnge, was of this tribe. The Clanna Degaid or Munster Fenians were also pro- bably one of the subjugated tribes. Curod son of Dare, a celebrated hero of the older or Heroic period, seems to have been of this race. It is worthy of note that Ulster, whose warriors of the Craebh Ruaid or Red Branch are the most prominent figures in the Heroic period, had no Fenians, The genealogists of later times, desirous of making every warrior, poet, and saint a Milesian, provided elaborate Milesian pedigrees for the Clanna Baiscné, to which belonged the chief hero of the Fenian period, Deime, sur- named Finn, or Find, son of Cumall son of Trenmor ,; Find's sons Oisin and Fergus Finnbheoil, Oscar son of Oisin, Caoilté son of Ronan, and many others. His great rival Aedh, called Goll (the one-eyed) Mac Morna, Conan Mac Morna grandson of Goll, and the other warriors of the Clanna Morna or Connaught Fenians, continued to be regarded as Firbolgs,

The Irish MSS. contain no account of the organization or distribution of the Fenians, except what can be gathered from incidental references ; but Dr Keating, who appears to have had access to many MSS. since lost, and who may be trusted to tell only what he found in them, gives in his History of Ireland a curious legendary account to which

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the reader is referred. It was this account which suggested calling the members of an organization that was formed a few years ago among the Irish in the United States of America for promoting and assisting revolutionary move- ments in Ireland, and which attained much notoriety, Fenians (see IneLAND). The founder of the modern Fenians, John

O‘Mahony, was alse the author of a transla- tion of Keating’s History, which he published in New York in the year 1857.

‘ Conn of the Hundred Battles, Art the son of Conn, Cormac son of Art, and Cairbre son of Cormac, the chief kings of the Fenian period, /ixd son of Cumall, and his son Oisin, and some others of the chief heroes, are doubt- less real personages. But even in the oldest manuscripts they are so mixed up with mythological beings that it is impossible to sift fact from fiction. Thus in the Leabhar na h-Urdhri, the oldest existing MS. written wholly in Irish, sometime before the year 1106, there is a story concerning a certain king Mongan the subject of many legends, who is supposed to have flourished at the end of the sixth and beginning of the seventh century, which makes him out to be no other than the celebrated Find son of Cumall him- self. The Fenian stories are merely Celtic myths in a new dress, clothing a few misty forms of real life, about whom we know almost nothing. As has been stated in the article Cettic LiTeRatURE, the personages of the Heroic period, Cvichulaind, Fergus son of Rog, Conal Cernach, Laegaire Buadach, Catbad the Druid, Queen Medd, Ferdiad son of Daman, &c., are never associated in any genuine tale with those of the Fennian or Fenian period, such as Find son of Cumall, Oisin, Oscar, Diarmait, Caoilté Mac Ronain, Goll Mac Morna, &c.

The recitation of Fennian stories in the halls of kings and chieftains, and in popular assemblies by the Fulz, was usual in the 12th century, as we learn from a poem on the triennial Aonech, or fair of Carman, now Wexford, in the Book of Leinster, a manuscript of that time. This manu- script also contains poems attributed to Find himself, and to his son Oisin, and most of the poems and prose tales coming under the head Fennian, or Fenian, and now or re- cently current among the Irish-speaking peasantry, are also to be found in MSS. at least 300 years old.

As might be expected from the common origin of the Irish and Gaelic population of Scotland, and the close in- tellectual association between them for centuries, owing to the literary language of both being the same, and to the additional circumstance that the Irish poets, harpers, and leeches looked upon Celtic Scotland quite as much within their domain as any part of Ireland, Fennian poems and tales were as well known in the former as in

the latter. The written stories when old are in the literary language, that is Irish, and do not differ from those found in similar MSS. in Ireland. The current stories are of course in the Gaelic dialect of Scotland, which has gradually supplanted Irish as the literary language since the literary separation of Ireland and Scotland, caused by the Reformation and the decay of the Irish language in Ireland itself. It was such stories, written in the literary language or Irish, and others still current among the Gaelic-speaking population of the Highlands, that suggested to James Macpherson thesubjects of his poems of Ossian, and supplied him with a considerable part of the materials, In using these materials he mingled the events and the actors of the two perfectly distinct periods of story, that of Crichulaind, or the Heroic period, and that of Find, or the Fennian period. Macpherson was not, however, the first who was guilty of this ana- chronism ; in the Book of the Dean of Lismore, tran- scribed in the first half of the 16th century, there is a sort of mosaic poeni made up apparently of fragments of totally different stories belonging to both periods, and having lines

interpolated to link the fragments! It is a rude example of what Macpherson did so well 200 years after. The first part appears to be a fragment of a version of the Sezrgligz Conculaind, or Sick Bed of Crichulaind, into which are introduced references to the /ians; then follows a frag- ment concerning the death of Conlaech son of Cuchulaind ; this is followed by a fragment about the battle of Cruca, in which Cumall, son of Z'renmor and father of Find, was slain by Goll son of Aforn.

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Islay's Leabhar na Feinne, and his Popular Tales of the West Highlands; Transactions of the Ossianiac Society. See also Biblio-

graphy of Cettic LITERATURE, vol. v. p. 327. (Werke) FENNEL (Feniculum), a genus of umbelliferous plants,

having umbels compound, and without involucres; petals yellow, entire, roundish, and incurved at the tip ; and fruit 1. laterally compressed cremocarp, with achene 5-ridged, a large, single vitta under each furrow, and albumen plano- convex. (See Borany, vol. iv. p. 150, fig. 292; and p. 151, fig. 299.) Common Fennel, F. vulgare, Gartn. (Anethum Feeniculum, L.), to which the other forms of fennel are generally referred, is a perennial from 2 to 3 or, when cultivated, 4 feet in height, having leaves three or four times pinnate, with numerous linear or awl-shaped segments, and umbels glaucous, and of about 15 or 20 rays. The plant appears to be of South European origin, but is now met with in various parts of Britain and the rest of

temperate Europe, and in the west of Asia. The fruits.

have an aromatic taste and odour, and are used for the pre- paration of oil of fennel and fennel water, valued for their stimulant and carminative properties. The fruits and edible shoots of fennel were eaten by the ancient Romans. The fennel seeds of commerce are of several sorts. Sweet or Roman Fennel seeds are the produce of a tall perennial plant, with umbels of 25-30 rays, which is cultivated near Nismes in the south of France; they are elliptical and arched in form, about 2 inch long and a quarter as broad, and are smooth externally, and of a colour approaching a pale green. Shorter and straighter fruits are obtained from the annual variety of J’. vulgare known as F. Panmorium (Panmuhuri) or Indian Fennel, and are employed in India in curries, and for medicinal purposes. Other kinds are the German or Saxon fruits, brownish-green in colour, and between + and 1 inch in length, and the broader but smaller fruits of the Wild or Bitter Fennel of the south of France. A variety of fennel, F. dulce, having the stem compressed at the base, and the umbel 6-8 rayed, is grown in kitchen-gardens for the sake of its leaves. Giant Fennel is the name applied to the plant Ferula communis, common in Sicily, where the pith of the stem is used as tinder. Hog’s or Sow Fennel is the species Peucedanum officinale. FENTON, Exiszan (1683-1730), an English poet, was born at Shelton near Newcastle-under-Lyme, Staffordshire, 20th May 1683. He entered Jesus College, Cambridge, with the view of studying for the church, but afterwards declined to take orders, and on leaving the university he accompanied the earl of Orrery to Flanders in the capacity of private secretary. On the return of the earl to

Eng- land in 1705, Fenton became assistant in a school at Headley in Surrey, and was soon afterwards appointed master of the free grammar-school at Sevenoaks in Kent. In 1710 he was induced by the promise of a political ap- pointment from Lord Bolingbroke to resign his mastership, but a change in the Government led to the disappointment

1 The Dean of Lismore's Book, ed. b ' j f , ed. by Rev. T. M'Lauchlan and W. F. Skene, Edinburgh, 1862, p. 88 (translation), 64 (text).

of his hopes. He was, however, not long afterwards appointed tutor to Lord Broghill, only son of the earl of Orrery; and when this engagement expired, he was, on the recommendation of Pope, employed to give private literary instructions to Mr Craggs, secretary of state. His next engagement was with Pope himself, whom he assisted in translating the Odyssey. The first, fourth, nineteenth, and twentieth books are ascribed to Fenton. In 1717 he published a volume of Miscellaneous Poems, and in 1723 his tragedy of Marianne was brought out, and was performed with such success that the author's profits are said to have amounted to nearly a thousand pounds. The poetical merit of this tragedy is considerable; but the diction is too figurative and ornate for a dramatic composition, and accordingly it has not retained its place on the stage. In 1727 Fenton superintended a new edition of Milton's Poems, to which he prefixed a life, and in 1729 he pub- lished a splendid edition of Waller, with notes. During the latter part of his life he was employed by Lady Trumbull, first as tutor to her son, and afterwards as auditor of her accounts. He died at East Hampstead, Berkshire, on the 13th of July 1730, and was interred in the parish church, where his tomb has inscribed ou it an epitaph written by Pope.

Sce Johnson's Lives of the Poets ; Boyle's edition of Pope; and The Gentleman's Magazine, 1xi., lxiv.

FENTON, Sir Georrrey, a writer and statesinan during the reigns of Elizabeth and James I., the brother of Edward Fenton the navigator, who accompanied Sir Martin Frobisher in his expeditions, and was afterwards sent out independently to endeavour to discover a north-west passage. In the capacity of queen's counsellor Sir Geoffrey served for twenty-seven

years in Ireland, where his conduct appears to have given great satisfaction to his royal mistress, not- withstanding that he took every opportunity of impressing on her mind the strong conviction he entertained that the safety and glory of her government in that island de- pended on her subjects enjoying the protection of equal laws. He died at Dublin, October 19, 1606.

Fenton is best known for his translation of the History of the Wars of Italy by Guicciardini, which he dedicated to Elizabeth. Of his other translations the principal are Certain Tragical Dis- courses written out of French and Latin, 1567, and Golden Epistles, containing a variety of Discourses, both Moral, Philosophical, and Divine, gathered as well out of the remainder of Guevara's works as other authors, Latin, French, and Italian, 1577. The Familiar Epistles of Guevara had been published in English by Edward

Fellowes in 1574; Feuton's collection consists of pieces not con- tained in that publication.

FENUGREEK (Trigonella), a genus of leguminous herbs very similar in habit and in most of their characters to the species of the genus Medicago. The leaves are formed of three obovate leaflets, the middle one of which is stalk ed; the flowers are solitary or in clusters of two or three, and have a campanulate, 5-cleft calyx; and the pods are many- seeded, cylindrical or flattened, and straight or only slightly curved. The fenugreeks or trigonels are widely diffused over the south of Europe, West and Central Asia, and the north of Africa, and are represented also by several species in Australia. Common Fenugreek, 7. Ftenum-graecum, so called from the name given to it by the ancients, who used it as fodder for cattle, is indigenous to the Mediterranean region, and is cultivated to some extent in Thuringia, Moravia, and other parts of Europe, and in Morocco, and largely in Egypt and in India. It bears a sickle-shaped pod, containing from 10 to 20 seeds, from which 6 per cent. of a fetid, fatty, and bitter oil can be extracted by ether. In India the fresh plant is employed as an esculent, The seed is an ingredient in curry powders, and is used for flavouring cattle foods. It was formerly much esteemed as a medicine, and is still in repute in veterinary practice. —

rE O—

FEOFFMENT, in English law, was the form of granting or conveying a freehold or fee. One of its essential ele- ments was livery of seisin (delivery of possession), which consisted in formally giving to the feotfee on the land a clod or turf, or a growing twig, as a symbol of the transfer of the Jand. This was called livery a deed. Livery in law was inade not on but in sight of this land, the feoffer saying to the feoffee, “I give you that land; enter and take possession.” By the 8 and 9 Vict. c. 106 feoffments were rendered unnecessary and superfluous. All corporeal hereditanients were by that Act declared to be iz grant as well as livery, 1.¢., they could be granted by deed without livery. And feoffments were in general required to be evidenced by deed.

FERDINAND. The name of Ferdinand (the Italian Ferdinando or Ferrante, Spanish Fernando or Hernando, Arabian Yerdeland), which is supposed to be of Gothic origin and to be allied to the German verdienend (meri- torious), has been borne by a considerable number of European sovereigns, the more important of whom are noticed below in the following order— first, the emperors, and then the kings of Naples, Portugal, and Spain, the grand-dukes of Tuscany, and the duke of Brunswick.

FERDINANDT, (1503-1564), emperor, was the son of Philip of Austria and Joanna daughter of Ferdinand and Isabella of Spain, and was born at Alcala in Spain 10th March 1503. In 1521 he married princess Anna of Hungary, and on the death in 1526 of her only brother the boy-king Louis of Bohemia and Hungury he was elected king of Boheniia, but in Hungary his claims were opposed by John Zapulya, palatine of Transylvania. Zapolya suf- fered a severe defeat froin the imperial troops near Tokay; but after receiving the aid of the Turks he managed to carry on the struggle with varying success until 1538, when the exhausted resources of both rival parties led to a compromise, by which it was agreed that a half of the kingdom should be assigned to each, and that on the death of John the half over which he ruled should revert to Ferdinand. But ou the death of John in 1540 the Turks supported the cause of his infant son John Sigismund, and in 1547 Ferdinand was compelled to purchase peace at the price of a yearly tribute. The war was again renewed in 1552, and at its termination the Turks were allowed to retain possession of a part of Hungary in trust for Sigismund. In 1521 Ferdinand had been chosen president of the council of

regeucy appoiuted to govern Germany during the absence in Spain of his brother the emperor Charles V., and in 1531 he was, through the influence of his brother, elected king of the Romans, in which capacity he acted the part of mediator between the emperor and the German princes, and in 1552 negotiated a treaty between him and the elector Maurice of Saxony. On the abdication of Charles in 1556 Ferdinand was elected emperor. Pope Paul IV. refused ecclesiastical recognition to the election on the ground that it was made without the consent of the papal see, but happily Paul died before the dispute had time to lead to serious consequences, and his successor Pius IV. avoided an open rupture by recognizing its validity on condition that Ferdinand should not observe the treaty of Augsburg. Ferdinand during his short reign showed himself an able, just, and enlightened ruler. He reor- ganized the aulic council, effected a reform in the mone- tary system of Germany, and exerted himself to bring about a reconciliation between his Protestant and Roman Catholic subjects. ‘To effect this he endeavoured on the one hand to obtain from the pope various concessions to the Protestants, among others permission for the laity to use the cup at the communion, and liberty of marriage for the priests ; and on the other hand he sought to persuade the Protestants to send deputies to the council of Trent ;

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but his death, 25th July 1564, prevented these negotiations having a satisfactory termination. See Bucholtz, Geschichte der Regierung Ferdinands J., 9 vols., Vienna, 1831-38. FERDINAND IL (1578-1637), emperor, was the grand- son of the preceding and the son of Charles duke of Styria aud of Mary of Bavaria, aud was born at Gratz, 9th July 1578. He was educated by the Jesuits, and having imbibed strong auti-Protestant sentiments is said to have taken a solemn vow before the altar that, on receiving the imperial crown, promised him by his cousin Matthias If., he would at whatever cost re-establish the Roman Catholic religion throughout all his states. In 1618 Matthias abdicated the thrones of Bohemia and Hungary in his favour, and on the death of Matthias in 1619 he laid claim to the imperial crown. His keen Roman Catholic sympathies, allied to a character gloomy, fanatical, and cruel, had already led him to disregard the guarantees of toleration by which his election to the thrones of Bohemia and Hungary had been acceded to; and on that account the Bohemians,

shortly after the death of Matthias, rose in revolt, and under the leadership of Count Thurn besieged him in Vienna, until the arrival of an army under General Bouquoi forced them to retreat, and enabled him to pro- ceed to Frankfort to receive the imperial crown. The Bohemians, notwithstanding their defeat, chose as their king the elector-palatine Frederick V., son of James I. of Scotland, and with the assistance of Bethlen Gabor, prince of Transylvania, who revolted against Ferdinaud in Hun- gary, virtually inaugurated the long struggle for religious liberty known as the Thirty Years' War. Jerdinand, how- ever, with the support of the Catholic league and the alliance of John George L., elector of Saxony, was able completely to subdue them after a short campaign, and having totally defeated them near Prague, November 8, 1620, he deprived them of their constitutional rights, banished the leading Protestant families, expelled the Re- formed preachers and recalled the Jesuits, and by cruel persecutions totally quelled every manifestation of Protes- tant belief. But in Hungary he was not so successful as to enable him to put such extreme measures into execution; on the contrary, he thought it prudent to conclude a peace on the 31st December 1621, by which he agreed to cede one half of the country to Bethlen Gabor, and to grant religious toleration to the other half. In Germany fortune was for a time more favourable to the Roman Catholic cause; several of the German princes had entered into a league with Christian IV. of Denmark, but that monarch was defeated by Ferdinand's general, Wallenstein, and a peace between him and Ferdinand was concluded in 1629. Taking advantage of his opportunity, Ferdinand in the same year passed the famous Edict of Restitution, which enforced the restoration of all German ecclesiastical pro- perty that had passed into other hands since the treaty of Passau in 1552. The full execution of the edict was, how- ever, prevented,—partly by the unwillingness of the Roman Catholic princes to give up the property of which they had becomed possessed, partly by the intrigues of Cardinal Richelieu, who was jealous of the increasing influence of the emperor, but principally through the arrival of Gustavus Adolphus. Uniting with the Protestant princes of Germany, Gustavus inflicted a succession of defeats on Ferdinand, who, having at the urgent representations of the Catholic princes dismissed Wallenstein from the command of the imperial army, possessed no general at all adequate to cope with the genius and energy of the king of Sweden. Gustavus was subsequently joined by the elector of Saxony, and fortune failed to smile on

the arms of Ferdinand even after the recall of Wallenstein, who was defeated at the battle of Liitzen, 16th November 1632. The victory was dearly bought by the death of the king of Sweden,

but Wallenstein took little advantage of tlie great loss thus sustained by the Protestant cause; and the emperor, learning that he finally meditated treachery, caused him to be assassinated, February 25, 1634. In the same year the imperial army was successful at the battle of Nordlingen, and after this victory tle elector of Saxony separated himself from the Swedish alliance aud made peace with Ferdinand; but the Swedes continuing the struggle with great determination, and being afterwards joined by France, Ferdinand, when he died on the 15th February 1637, was uncomforted by the hope of any uear fulfilment of the purpose expressed in his oath, aud attempted by such ruthless persecutions aud at such an expense of treasure and of human life.

See Khevenhiiller, Annales Ferdinandi II.; the various histories of the Thirty Years' War; Ranke, Die Rém. Pépste, vol. ii.; and

Hurter, Geschichte Ferdinands II. This last is written from a Roman Catholic standpoint.

FERDINAND III. (1608-1657), emperor, the son of the preceding, was born at Gratz, 11th July 1608 He became king of Bohemia in 1625, king of Hungary in 1627, king of the Romans in 1636, and succeeded his father as emperor in 1637. Milder in disposition, less fanatical in his opinions, and somewhat dispirited on account of the repeated defeats inflicted on the German arms by Duke Bernhard and General Baner, he was at an early period of his reign strongly desirous of obtaining peace even at the cost of liberal concessions to the Protestants ; but the determination of France and Sweden to humiliate the imperial power prevented negotiations being entered into until 1643. Between that date and 1648 fruitless conferences continued to be held, the war meanwhile raging intermittently and with somewhat spent fury. In 1647, however, Ferdinand had guaranteed religious toleration to Hungary, and finally, on October 24, 1648, the Peace of Westphalia was signed, by which was brought to a close a war that, besides

the evils inflicted by it on other countries, had desolated the whole of Germany, paralysed its trade, and destroyed more than half its population. By this treaty religious liberty was secured to Germany, although not to Bohemia; France obtained part of Alsace and Lorraine, and the son of Frederick V. got the Upper Palatinate ; while Sweden obtained Western Pomerania, and became a member of the German diet. The unity of Germany was at the same timc so broken up by concessions granted to the independent princes that with the death of Ferdinand JJI. the German kingdom may be said to have ceased to exist, until re-established by William I. after the Franco-Prussian war. During the peace negotiations of Westphalia, Ferdinand IV., eldest son of Ferdinand IIL., was chosen king of the Romans, but he died in 1654, Ferdinand ITI. dicd, April 2, 1657, shortly after concluding a treaty with the Poles against Sweden. See Koch, Geschichte des Deutschen Reichs unter Ferdinand III., 1865.

FERDINAND I. (1793-1875), emperor of Austria, the eldest son of the emperor Francis I. by his second wife Maria Theresa, daughter of Charles VI., was born in Vienna, April 19, 1793. He inherited a constitution so weak as to unfit him for the duties of his station, but his amiable and benevolent disposition secured him general respect, and acquired for him the surname of the Good. On the 2d February 1831 he married Princess Anne Caroline, third daughter of Victor Emmanuel of Sardinia, but the marriage was without issue. He was crowned nominal sovereign of Hungary under the title of Ferdinand V. in 1830, succeeded his father as emperor of Austria on the 2d March 1835, and received the crown of Bohemia in 1836, and that of Lombardy in 1839. During his whole

~~reign the government of Austria was virtually in the hands of Prince Metternich, who continued the conserva~~

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tive policy of Francis I. The revolution of the 13th March 1848 compelled Metternich to resign office, and, the constitution not meeting with the approval of the revolutionists, Ferdinand fied to Innsbruck. At the urgent request of all parties he shortly afterwards returned to Vienna, but on a renewal of the outbreak he left the capital for Olmiitz in Moravia, where, feeling himself unfit to cope with the difficulties of government, he was

persuaded to abdicate in favour of his nephew Francis Joseph, 2d December 1848. He spent the remainder of his life in retirement, chiefly at Prague in Bohemia, where he died 29th June 1875.

FERDINAND I. (1423-1494), king of Naples, the illegitimate son of Alphonso V. of Aragon and I. of Sicily and Naples, was born in 1423. In accordance with his father's will, he succeeded him on the throne of Naples in 1458, but Pope Calixtus JIL having refused to recognize him, John of Anjou, desirous to turn to advantage the opportunity of regaining the throue of his ancestors, invaded the country, and inflicted on him a severe defeat, July 7, 1460. Ferdinand fled to Naples accompanied by only twenty cavaliers, but having by certain concessions obtained recognition from Pius II., who about this time succeeded Calixtus on the papal throne, he received through him the aid of the Albanian chief Scanderbeg, and defeated Johu of Anjou at Troja with great loss, August 18, 1462.

In 1480 the Turks captured Otranto from Ferdinand, and

niassacred the majority of the inhabitants, but in the follow- ing year it was retaken. The only other event of import- ance during his reign was an abortive attempt at revolt ou the part of the nobles in 1485, many of whom, notwithstand- ing that he promised them a general amnesty, were after- wards treacherously murdered by his commands. On account of lis refusing to pay to Innocent VIII. the census- tax promised by him to Pius IL., he was in 1489 excommuni- cated, but he subsequently gained the favour of Alexander VI. He died 25th January 1494, while Charles VIII. of France was preparing to invade his dominions. Though cruel in the infliction of punishment, and ready without scruple to break his promises when it suited him. Ferdi- nand generally dealt out to his subjects even-handed justice, favoured the spread of kuowledge, aud greatly increased the industrial and commercial prosperity of his kingdom. FERDINAND IL, king of Naples, grandson of the pre- ceding, and son of Alphonso IJ., was born probably in 1468. Alphonso finding his tenure of the throne uncertain on ac- count of the general dissatisfaction of his subjects, abdicated in his son's favour in 1495, but notwithstanding this the treason of a party in Naples rendered it impossible to defend the city against the approach of Charles VIIL Ferdinand fled to Ischia; but when the French left Naples, the Neapolitans,

irritated by their conduct during the occu- pation of the city, recalled him; and with the aid of the great general of Ferdinand V. of Spain, Gonzalo de Cordova, he was able completely to rid his state of its invaders shortly before his death on the 7th October 1496. FERDINAND III. of Naples. See Ferpinanp V. of Spain. . “PERDIN AND IV. (1751-1825) of Naples, iIT. of Sicily, and I. of the Two Sicilies, third son of Don Carlos, king of Naples (afterwards Charles ITIL of Spain), was born in Naples, January 12, 1751. When his father ascended the Spanisli throne in 1759, Ferdinand, in accordance with the treaties which forbade the union of the two crowns, succeeded him on the throne of Naples, under a regency of which Ber- nardo Tanucci was the chief. On account of the ambitious purposes of Tanucci, who wished to retain the government of the kingdom as much as possible in his own hands, the education of the young king was very much neglected, while no restraint was put upon his love. of pleasure, or

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his excessive preference for athletic exercises and outdoor sports. His minority ended on the 12th January 1767, and in 1768 he married Maria Caroline, daughter of the empress Maria Theresa. According to the marriage con- tract the queen after the birth of her first son was to have a voice in the councils of state; and she was not backward to make use of this opportunity of political influence. Beautiful, clever, and ambitious, and inheriting many of the masculine characteristics of her mother, she soon ousted Tanucci both from the favour of the king and from all but nominal authority in the state; and when he systematically attempted to frustrate her purposes, he was finally in 1777 dismissed from his office. The Englishman Sir John Acton was shortly after this appointed admiral of the Neapolitan fleet, and succeeded so completely in winning the favour of both queen and court, that he was speedily promoted to be minister of war, and then of foreign affairs. Under his in- fluence Spain lost her ascendency in Neapolitan politics, and an intimate connexion was formed with Austriaand England. In 1793 Ferdinand joined the coalition against France, and although he made peace with France in 1796, he took advan- tage of the absence of Napoleon in Egypt to renew the war in 1793. His army occupied Rome for a short time, but after the defeat of some of its divisions by the French, Ferdinand without attempting to defend Naples, to which he had

fled panic-stricken, escaped on board the English fleet under Admiral Nelson, and went to Palermo; and the French, entering the city after a furious but undisciplined resistance by the lazzaroni, established with the aid of the citizens and nobles the “ Parthenopean Republic.” When, six weeks after this, the defeat of their arms in the north of Italy compelled the French to abandon Naples, Ferdinand was restored by a Calabrian army under Cardinal Ruffo; and with the connivance of Admiral Nelson a reign of terror was inaugurated, which continued until the success of the French arms in 1801 induced Ferdinand to sign a treaty whereby, besides other concessions, he promised to grant an amnesty to political offenders, and also agreed to permit French troopsto occupy his territories. But whenwar broke out between France and Austria in 1805, he thought the opportunity favourable for throwing off the French domination, and prompted by Caroline permitted 13,000 Russian and English troops to land at Naples. Scarcely had he done so, when the vietory of Austerlitz enabled Napoleon to despatch an army against him. Ferdi- nand with his usual precipitation fled from his capital,

leaving Caroline to negotiate terms with the eneniy, but as |

Napoleon refused all further compromise with the house of Bourbon she was compelled to follow her husband into Sicily. On March 30, 1806, Joseph Bonaparte was proclaimed king of Naples and Sicily; but Ferdinand with the aid of England continued to reign over the latter kinglom. After the dethronement in 1815 of Murat, who had succeeded Joseph Bonaparte as king of Naples in 1808, Ferdinand was recalled to his capital, and on December 12, 1816, he united his two states into one, and assumed the title of king of the Two Sicilies. As a condition of his recall he had sworn to grant a constitution, but no sooner did he find himself secure from external interference than he abolished it ; and although a revolution compelled him again in 1820 to give to it a nominal assent, he was shortly afterwards able, with the help of an Austrian army, to break his promises with

impunity, and by means of an elaborate system of espionage | and the unscrupulous arrest and punishment of all suspected |

persons to re-establish his despotism in a more vigorous form than ever. He died 4th J anuary 1825,

See Botta, Storia d’Italia dal 1789 al 1814; Coletta, Storia del reame di Napoli dal 1734 sino al 1825, 2 vols., 1834, English

translation, 1858; Sketch of Popular Tumults, 1837 – Ths dw Général Pepe, 1847, , 1837; and Aémoires

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FERDINAND IL (1810-1859), king of the Two Sicilies, grandson of the preceding, and son of Francis I., was born at Palermo, January 12, 1810. On succeeding his father in 1830, he published an edict in which he promised to “give his most anxious attention to the impartial administration of justice,” to reform the finances, and to “use every effort to heal the wounds which had afflicted the kingdom for so many years ;” but these promises seem to have been meant only to lull discontent to sleep, for while the existing burden of taxation was only slightly lightened, corruption began gradually to invade all departments of the administration, and an absolutism was finally established harsher than that of all his predecessors, and supported by even more extensive and arbitrary arrests. Ferdinand, was naturally shrewd, but badly educated, grossly superstitious, and possessed of inordinate self-esteem. Though he kept the machinery of his kingdom in a high state of efficiency, he made little account of the wishes or welfare of his subjects, and did not deem it of much importance to be on good terms either with them or with foreign states. In 1832 he married Christina, daughter of Victor Emmanuel, and shortly after her death in 1836 he took fora second wife Maria Theresa, daughter of Archduke Charles of Austria. After his Austrian alliance the bonds of despotism were more closely tightened, and the increasing discontent of his subjects was manifested by abortive attempts at insurrection in 1837, 1841, 1844, and 1847, and in 1848 by a general rising in Sicily, on account of which the king judged it pru- dent to promise a constitution. A dispute, however, arose as to the nature of the oath which should be taken by the members of the chamber of deputies, and as neither the king nor the deputies would yield, serious disturbances began to occur in the streets of Naples; and the king, making these the excuse for withdrawing his promise, on the 13th March 1849 dissolved the national parliament. The efforts at revolt were renewed in Sicily, but were speedily quelled, chiefly by the bombardment of the

principal cities of the state, an expedient which won for Ferdinand the epithet

| of “ Bomba.” During the last years of his reign espionage

and arbitrary arrests prevented all serious manifestations of insubordination among his subjects, In 1851 the poli- tical prisoners of Naples were calculated by Mr Gladstone to number 13,000, and so great was the scandal created by the rule of terror which prevailed that in 1856 France and England, though vainly, made diplomatic representations to indnce a mitigation of its rigour and the proclamation of ageneralamnesty, An attempt was made to assassinate Ferdinand in 1857. He died May 22, 1859,

See Correspondence respeeting the Affairs of Naples and Sicily,

1848-49, presented to both Houses of Parliament by command of Her Majesty, 4th May 1849; Two Letters to the Earl of Aberdeen, by

| Right Hon, W. E, Gladstone, Ist. ed. 1851 (an edition published in

1852, and the subsequent editions, contain an Examination of the Official Reply of the Neapolitan Government) ; supplementary chap- ter to the English translation of Coletta’s History of Naples ; and Dawburn, Naples and King Ferdinand, 1858.

FERDINAND I. of Portugal (1345-1383), sometimes referred to as el Gentil (the Gentleman), son of Pedro I. of Portugal (who is not to be confounded with his Castilian contemporary Pedro the Cruel), succeeded his father in 1367. On the death of Pedro of Castile in 1369, Ferdinand, as great-grandson of Sancho IV. by the female line, laid claim to the vacant throne, for which the kings of Aragon and Navarre, and afterwards the duke of Lancaster (married in 1370 to Constance, the eldest daughter of Pedro), also became competitors. Meanwhile Henry of Trastamara, the brother (illegitimate) and conqueror of Pedro, had assumed the crown and taken the field. After one or two indecisive campaigns, all parties were ready to accept the mediation of Pope Gregory XI. The conditions of the treaty, ratified in 1371, included a marriage between

Ferdinand and Leonora of Castile. But before the union could take place the former had suddenly become passion- ately attached to Leonora Tellez, the wife of one of his own courtiers, and having procured a dissolution of her previous marriage, he lost no time in making her his queen. This strange conduct, although it raised a serious insurrection in Portugal, did not at once result in a war with Henry ; but the outward concord was soon disturbed by the intrigues of the duke of Lancaster, who prevailed on Ferdinand to enter into a secret treaty for the expulsion of Henry from his throne, The war which followed was unsuccessful ; and peace was again made in 1373, On the death of Henry in 1379, the duke of Lancaster once more put forward his claims, and again found an ally in Portugal ; but, according to the Continental annalists, the English proved as offensive to their companions in arms as to their enemies in the field; and Ferdinand made a peace for himself at Badajoz in 1382, it being stipulated that Beatrix, the heiress of Ferdinand, should marry King John of Castile, and thus secure the ultimate union of the crowns. On the death of – Ferdinand at Lisbon in the following year (22d October 1383), leaving no male issue, the direct Burgundian line, which had been in possession of the throne since the days of Count Henry (about 1112), became extinct, The stipu- lations of the treaty of Badajoz were set aside, and John, grand-master of the order of Aviz, Ferdinand's illegitimate brother, was proclaimed, This led to a war whic lasted for several years.

FERDINAND I. of Aragon and Sicily (1379-1416), surnamed the Just, the younger son of John I. of Castile and Leonora of Aragon, was born in 1379. On the death of his elder brother Henry III. in 1406, he refused the crown of Castile which the nobles liad offered, but in accordance with his brother's will undertook the office of regent during the minority of his nephew John II. Iu this capacity he distinguished himself by his pru- dent administration of home affairs, and by his victories over the Moors by land and sea. He took the title de Antequera on the surrender of that fortress after a siege of five months (1410). On the death of his maternal uncle, King Martin of Aragon and Sicily, his claims to the throne, though not derived from the usugl laws of descent, were taken up and keenly pressed by a powerful party in the state. The question of the succession was ultimately re- ferred

to a committee of nine judges equally representing Catalonia, Valencia, and Aragon; and the result was his election by a majority (1412). After he had defeated, at Balaguer, Count Jayme of Urgel, the last and most for- midable of his rivals, he was formally crowned at Saragossa in 1414.

From the year 1378 Europe had been scandalized by the spectacle of the papal schism; and since 1410 three rival popes had been claiming the obedience of the faithful. At the council of Constance in 1414, Ferdinand of, Aragon was a prominent supporter of the Spaniard, Benedict XIITL. (Peter de Luna), who had been deposed at Pisa in 1408. The deposition of John XXIII, and the abdication of Gregory XII. in 1415, having paved the way for peace, Ferdinand consented to be present at the meeting of Sigis- mund with the ambassadors of France, Castile, and Na- varre in Perpignan; and after long temporizing he ulti- mately agreed, for the sake of the unity of the church, to withdraw his obedience from Luna. He died in the following year at Ygualada (2d April 1416), and was

succeeded by his son Alphonso V., the conqneror of Naples.

See Zurita, Anales de la Corona de Aragon, xi., xii.: Mariana, —

Hist: Gen. xix. 15—xx. 8.

FERDINAND II. of Aragon and Sicily. See FE – NAND Y. of Castile. A — _ eae

FERDINAND I. (cir. 1000-1065), surnamed the Great, –

first sovereign of independent Castile, was the second son of Sancho IIT. (el Mayor) of Navarre, who about 1026 compelled Bermudo III. of Leon, the last direct descendant of Pelayo in the male line, to surrender his rights over Castile, and also to give his sister Sancha in marriage to Ferdinand, then regent of that province. Sancho, towards the close of his energetic life, divided his extensive doniinions among his four sons, Castile being the portion allotted to the second (1035), Bermudo of Leon, shortly after Sancho’s death, souglit to recover his lost possessions, but was defeated and slain in the attempt at Lantada near Rio Carrion (1038). Ferdinand, now king of Leon as well as of Castile, ky a conciliatory yet firm policy, soon

esta- blished his authority over his conquered subjects; and when in 1053 his dominions were invaded by his brother Garcia III. of Navarre, the attack issued in the death of the latter on the hattlefield of Atapuerca near Burgos, and the annexation of a large portion of his dominions, At an early period of his reign Ferdinand began to direct his arms against the Moors; and by a series of successful campaigns he extended the Christian frontier from the Douro to the Mondego, and reduced to vassalage the emirs of Toledo, Saragossa, and Seville. Even the Arab chronicles mention his victories from Badajoz in Estremadura to Albarracin in Aragon (Gayangos, J/ohammedan Dynasties in Spain, vol. ii). He had set out on an expedition against Valencia when he was seized with a mortal illness which compelled him to retire to his capital (Leon), where, after having divided his dominions among his three sons, he died on the 27th of December 1065, Ferdinand appears to have laid claim to the title of ‘femperor” of Spain; and Mariana alleges that at a council held at Florence in 1055 the emperor Henry III. lodged a formal complaint against this infringement of his rights of suzerainty, that this complaint was sustained by Pope Victor IL, but that at a conference afterwards held at Toulouse a decision favourable to Ferdinand’s imperial rights, so far as they related to the territories which had been conquered from the Moors, was given, chiefly in con- sequence of the representations made by the famous Cid, Ruy Diaz de Bivar. Though this statement can only be received with reserve, it is certain that both in virtue of the ascendency he won for himself in Christian Spain, and also in virtue of his very considerable successes over the Moors, Ferdinand I. is fully entitled to the rank which tradition has assigned to him among the greater Spanish sovereigns,

See Mariana’s Historia General de Espafia, UX, i,-vi.

FERDINAND IL (1136-1188), younger son of Alphonso VIIT. (el Emperador), became king of Leon on the death of his father in 1157, The history of his reign of thirty- one years is obscure, A dispute that arose between him and some of lis powerful nobles gave his brother Sancho III. of Castile a pretext for invading his territory (1158), but the timely submission of Ferdinand averted serious disaster. The death of Sancho shortly afterwards led to a military occupation of Castile by Ferdinand, professedly in the interests of his nephew Alphonso III.; and this occupa-

tion lasted till the marriage of Alphonso to Leonora, daughter of Henry II. of England, in 1170, Meanwhile Ferdinand, having repudiated his wife Dofia Urraca, had become involved in a war with his father-in-law Alphonso I. of Portugal, which resulted in the defeat and capture of the latter at Badajoz in 1169. The later years of the reign of Ferdinand II. were distinguished by sundry successes over the Moors, especially by a brilliant victory at Santarem (cx. 1181); and also by the incorporation of the great

military order of Alcantara, which received its first regular charter from Pope Alexander III. in 1177.

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Benavente (Leon) in 1188, and was succeeded by his son Alphonso IDS

Mariana, Hist. Gen. de Espatia, XI. v., viil., xiil.,xvi.; Gayangos, Mohammedan Dynasties, ii. 522.

FERDINAND IIL. (1200-1252), usually known as Saint Ferdinand, was the son of Alphonso IX. of Leon, and of Berenguela, sister of Henry I. of Castile. On the death of Henry without issue in 1217, the just title of Blanche, the elder of the surviving sisters, was set aside and Berenguela procured the proclamation of Ferdinand. He rapidly secured the homage of the towns and the submission of the nobles, especially of the brothers Alvaro and Fer- nando de Lara. On the death of his father in 1230 he ultimately, though not without dispute, became king of Leon as well as of Castile, thus finally uniting the two kingdoms under one crown. Following up the advantage which had been gained for the Christian arms by his father and the allied kings in the great battle at Las Navas de Tolosa in 1212, he devoted all his energies to the prosecu- tion of the Moorish war. Among his conquests may be mentioned those of Ubeda in 1234, of Cordova in 1236, of Jaen in 1245, and of Seville in 1248. He was planning an invasion of Africa when he died at Seville on the 30th of May 1252, leaving his kingdom to his eldest son Alphonso X. (Alonso el Sabio),

Though not canonized till centuries afterwards (by Clement X. in 1671), he came to be popularly known as el Santo from a very early period. Distinguished though he was for great military talent, he was still more remarkable for his religious zeal. Like his younger cousin Saint Louis of France, he was supremely a champion of the Catholic faith. It was not on the field of battle alone that his ardour was displayed. His Spanish panegyrists never fail to relate how it was his wont to assist in carrying wood for burning the followers of the Albigensian heresy, and how sometimes with his own royal hands he applied the torch to the pile! While as a crusader he is hardly eclipsed by Louis, he contrasts very favourably with him as a sincere friend of learning. He was the original founder (1243) of the university of Salamanca, which his son and successor did so much to foster and encourage. He it was also who caused to be translated into the vulgar tongue the /uero Juzgo (Forum Judicum) or code of Visigothic laws, which as collected and translated at his instance has the double interest of being one of the oldest extant specimens of Castilian prose, and also of being the foundation of Las Stete Partidas, the code for Christian Spain, which was finally drawn up by Alphonso the Wise.

His body now lies in the Capilla Real of Seville Cathedral, where it is exhibited as a relic on certain annual occasions (in May, August, and November). THis day in the Spanish calendar is May 30.

See Mariana, Hist. Gen., XII. vii.—XIII. viii; and compare Conde, Dominacton de los Arabes en Espaita, IV. iii.-vi.

FERDINAND IV. (1285-1312), sometimes called el Emplazado, i.e, Cited or Summoned, succeeded his father Sancho IV. on the throne of Castile and Leon in 1295. The years of his minority were disturbed by a Series of civil wars caused by the pretensions of his cousins Don Juan and Don Alonso de la Cerda to the crown, by the disputes of the Haros, Laras, and other nobles about their privileges, by the restlessness of the municipalities, and by the ambition of the neighbouring kings of Portugal,

Aragon, and Granada. The queen-mother, Maria de Cs“ ee

1 Thus Calderon, in his Awto Historial Alegorico entitled El Santo Rey Don Fernando (Madrid, 1690), introduces Ferdinand as de- claring to St

Dominic his firm determination to apply the cautery which alone can cure the cancer of heresy. He is ready to have his

Own arm destroyed should it fail him in this duty. Compare Mariana, Hist. Gen., XII. xi.

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Molina, on each new outbreak succeeded in procuring peace by diplomatic tact and judicious compromise. Secure at last in possession of his throne, Ferdinand was free to pursue the traditional policy of war against the Moors ; and in carrying it out he was aided by pecuniary grants both from his own nobles and also from the pope (Clement V.), as well as by the spoils of the Templars on the extinction of that orderin 1310. THis chief exploit, as recorded by the historians, both Spanish and Arab, was the expedition against Algeciras (1309), which, while unsuccessful in its main object, resulted in the surrender of Gibraltar and the cession of other strongholds (Gayangos, ii. 348; Conde, IV. xiv). In the course of a subsequent campaign he died sud- denly at Jaen, September 7, 1312. According to Mariana, he had on the 8th of August preceding condemned to death without lawful trial two brothers of the name of Carvajal. These protesting their innocence had summoned him to meet them within thirty days at the bar of God; hence his surname. He was succeeded by his infant son Alphonso XI. (See Mariana, XV. i—xi.

FERDINAND V. of Castile, IIT. of Naples, IT. of Aragon aud Sicily, surnamed e/ Catolico (1452-1516), the younger son of John IL. of Navarre and Aragon by his second wife Juana Henriquez of Castile, was born at Sos in Aragon on the 10th of March 1452. On the death of his elder brother Carlos in 1461, he was recognized by the Aragonese as heir-apparent to the crown, but the Catalans, rendered indignant by the cruelty and perfidy with which Carlos had been treated, refused to recognize any further claim on their allegiance, and rose in rebellion against King John. Fer- dinand accompanied his father in the campaigns which followed, and gave early promise of distinction. In 1466 his father formally associated him with himself in the government of Aragon, and in 1458 declared him king of Sicily. In October 1469 he was married at Valladolid, in circumstances of unusual secrecy, to Isabella, sister of Henry IV. of Castile, and heiress to

that throne. On the death of Henry IV. in 1474, Ferdinand and Isabella were recognized by the nobles in the junta of Segovia as joint-sovereigns of Castile; but a powerful party, including the marquis of Villena, the grand-master of Calatrava, the archbishop of Toledo, and numerous other notables, as well as some of the burghs, declared in favour of Juana “la Beltraneja” (ze., daughter of Beltran), whom Heury had shortly before his death recognized as his own child, and by his will desig- nated as his successor. Juana had also the support of Alphonso V. of Portugal (to whom she was betrothed in 1470) and of Louis XI. of France. The result was a civil war which continued with varying fortunes until victory finally declared for the Catholic sovereigns, and the peace of Lisbon was signed in 1479. In the same year, a few months previously, Ferdinand had succeeded his father on the throne of Aragon, though not on that of Navarre, which went to his sister Leonora de Foix. The union of Castile and Aragon, together with the prosperous termination of the civil war, gave the Catholic sovereigns leisure and opportunity for the development of a vigorous domestic policy. On their accession they had found themselves face to face with an almost anarchical condition of affairs : bitter feuds were raging in Andalucia between the great houses of Cadiz and Medina Sidonia; Galicia and other provinces were rent with hostile factions; robbery and outrage were paralysing commerce and agriculture throughout the king- dom. One of their earliest measures for restoring the much- needed order was the reorganization and development (1476) of the ancient hermandad (brotherhood), a league which had been originally formed by some of the cities for mntual protection against the aggression of the nobles and of the crown, and which had already more than once, by means of its ‘‘cortes extraordinary,” made its power to be felt.

It was now augmented and mobilized as a body of military police for the detection and repression of all crimes against person or property committed on the highways or in the open country. For these ends it proved very useful; and also for another purpose, which is believed to have been aimed at in its constitution, that of checking the arrogance and rapacity of the

feudal aristocracy, The next step for the avowed purpose of securing orderly government was the institution of the famous Inquisition as a tribunal for the repression of heresy (and, as some historians do not hesitate to add, for the extortion of money). ‘The necessary bull was obtained from Sixtus IV. in 1478; the court was institutetl at Seville in 1480, where the first auto de fe took place in the following year. The arrangement was ex- tended to Aragon in 1483, Torquemada being appointed first inquisitor-general. Among other measures taken by Ferdinand and Isabella for the consolidation of their power were the assumption of the grand-masterships of the three great military orders of knighthood, and the vindica- tion from papal usurpation of their ancient rights of eccle- siastical patronage. One result of their firm and on the whole wise policy was that between the years 1477 and 1482 the revenue of the country had been augmented nearly six-fold, and that in 1481 they were free to resume the long-suspended war against the Moors. From the capture of Alhama to the fall of Granada in 1492 (Ist January), the Christian arms had met with a series of un-interrupted successes which resulted in the final extinction of the Mahometan power in Spain,—the Moors, liowever, being permitted the enjoyment of certain stipulated privi- leges, that of the free exercise of their religion being one. In March 1492 the edict for the expulsion of the Jews was signed at Granada, and it was on the 3d of August in the same year that Columbus sailed from Palos in Andalucia, landing on the island of San Salvador on the 12th of October. In 1493 Ferdinand began to look abroad and take a practical interest in European affairs. By the treaty of Senlis he secured from Charles VII[. the restoration of Roussillon (now the department of Pyrénées Orientales) and of Cerdagne (now part of Catalonia), which had been mort- gaged by John If. of Aragon to Louis XI. In 1494 Charles VITI. having undertaken his great Italian expedi- tion, Ferdinand entered into an alliance with the emperor, the pope, and the states of Milan and Venice, and thus gained a footing in Italy for the Spanish troops which, under Gonsalvo de Cordova, succeeded in expelling Charles

from Naples in 1496, By the peace of 1498, however, the |

throne of that kingdom was left in possession of Frederick. In 1499 the liberty of worship which had been guaranteed to the Moors of Granada was treacherously withdrawn ; serious risings in the Alpujarras (Sierra Nevada)

were the consequence (1501); a decree was issued in 1502 offering to the conquered insurrectionists the alternatives of baptism or exile ; and, the latter being usually chosen, Spain had to suffer a second time the loss of many of her most useful subjects. The Neapolitan war again broke out in 1500, and an alliance was formed between Ferdinand and Louis XII. on the basis of a partition of their conquests. This pact was broken by Ferdinand, who by the battles of Cerignola and Garigliano became sovereign of Naples (Ferdinand IIL) in 1504. The death of Isabella took place on November 23d of the same year; and in accord. ance with her will Ferdinand immediately caused his daughter Juana to be proclaimed queen and himself regent. Philip archduke of Austria, the husband of Juana, having disputed the rights of his father-in-law and threatened an appeal to arms, the latter in disgust, with the view of again separating the crowns of Aragon and Castile, entered into negotiations with Louis XII, married Ger- maine de Foix, the niece of Louis (1505), and shortly after-

wards resigned the regency of Castile. On the death of Philip in 1506 he resumed the administration, though not with- out. opposition, and retained it till his death. In 1508 he joined the league of Cambray for the partition of Venice, and thus without any trouble became master of five important Neapolitan cities. In the following year (1509) the African expedition of Cardinal Ximenez was undertaken, which resulted in the conquest of Oran. In 1511 Fer. dinand joined Venice and Pope Julius II. ina “holy league” for the expulsion of the French from Italy. This gave a pretext for invading Navarre, which had entered into alliance with France, and been laid under papal interdict in consequence. Aided by his son-in-law Henry VIII. of England, who sent a squadron under the marquis of Dorset to co-operate in the descent on Guienne, Ferdinand became master of Navarre in 1513; and on the 15th of June 1515, by a solemn act in cortes held at Burgos, he incorporated it with the kingdom of Castile. He died at Madrigalejo (Estremadura) early in the following year, 23d January 1516. It is said that his death was accelerated by a potion which in his desire for posterity he had taken in order to reinvigorate his exhausted constitution. He was succeeded by his grandson Charles I. of Spain, more generally known by his European title as the emperor Charles V.

Though by no means a great general, Ferdinand possessed undoubted military capacity; though not a great statesman, he had abundant political skill. The largeness of his ainbition was somewhat incongruously associated with a narrowness of view which showed itself very unfortunately for Spain in many instances, particularly in his treatment of the Moors and Jews, and witli a smallness of nature which suffcred him to treat with neglect his most faithful servants and greatest benefactors, such as Columbus, Navarro, and Ximenez himself. Yet his name is inseparably associated with the most splendid of all periods in the annals of Spain, It was under his guidance that the king- dom was consolidated and grew into its position of highest prosperity and greatest influence as a Europcan power. And this must be admitted even when it is remembered that few sovereigns have been associated with such consorts as Isabella was, or surrounded by a band of men so distin- guished as were Mendoza, Talavera, Ximenez, Gonsalvo de Cordova, and Pedro Navarro.

See Zurita, Anales, tom. v. and vi.; Mariana, Hist. Gen., xxili.—xxx, ; and Prescott's brilliant History of the Reign of Ferdinand and Isabella.

FERDINAND VI. (1713-1759), king of Spain, some- times called the Sage, the younger son of Philip V. and Maria Louisa of Savoy, was born at Madrid, September 23, 1713. On the death of his elder brother Louis in 1725, Fer- dinand was proclaimed prince of the Asturias 3 and in 1729 he was betrothed to Barbara, daughter of John V. of Portugal. He succeeded his father on July 9,1746. Since 1739 Spain had been involved in protracted war, first with England in consequence of disputes relative to British interests in the West Indies, and afterwards, since 1740, with Austria on the accession of Maria Theresa. It was Ferdinand's first endeavour on coming to the throne to secure peace for his exhausted country, and one of the earliest acts of his govern- ment was to order the withdrawal of the Spanish troops from Italy (August 1746). Soon afterwards negotiations were opened for peace with England; and these, though frequently interrupted, ultimately resulted in the treaty of Aix-la-Chapelle, which terminated the war of the Austrian succession, thus restoring peace to Europe (October 1748). Weak in health and despondent in temperament, Ferdinand had no inclination thenceforward to take an active part in European affairs, and the

management of the public busi- ness he abandoned almost entirely to his ministers Ensenada,

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Carvajal, and Wall. These, however, always found it necessary to take into their counsels the queen, to whom Ferdinand was much attached, the royal confessor Rabago, and the singer Farinelli, whose musical powers had given him extraordinary influence. During this reign the condition of Spanish finance was much improved ; agricul- ture, commerce, and the arts were encouraged; bya con- cordat with Pope Benedict XIV., in 1753, many abuses of ecclesiastical patronage were reformed ; nor were the affairs of the army and navy neglected. On the outbreak of the Seven Years' War in 1756, Spain steadfastly maintained a strict neutrality, notwithstanding the repeated efforts both of France and of England to secure her intervention, the former offering Minorca and the latter Gibraltar as the price of her assistance. On the death of his consort in 1758, Ferdinand fell into a profound melancholy, which issued in a confirmed insanity, under which he died at Villaviciosa on the 10th of August 1759. Leaving no issue, he was suc- ceeded, in terms of the treaty of Aix-la-Chapelle, by his half-brother Charles III. Though he was in no sense an able sovereign, and was remarkable for nothing unless for a pacific and kindly disposition, his reign was an exceptionally prosperous one for Spain, and critics generally concur in the observation of Coxe that, "since the elevation of the house of Bourbon to the throne of Spain, no period occurs in which the interests and independence of the kingdom were so well and so consistently supported as during the reign of Ferdinand VI."

See Coxe, Memoirs of the Kings of Spain of the House of Bourbon, chaps. 48-58,

FERDINAND VII. (1784-1833), king of Spain, the eldest son of Charles IV, and of Maria Louisa of Parma, was born at San Ildefonso, October 14, 1784, and became prince of the Asturias on the accession of his father in

1788. The year of his birth had also been the year of Godoy's arrival at court (see Atcupra) ; and the sinister influences of the royal favourite soon began to manifest themselves there. Ferdinand from a very early age learned to dislike Godoy, and he found many to sympathize with him in his not un- natural aversion. In 1802 he was married to Maria Antonietta, daughter of the king of Naples, and she, along with his former tutor Escoiquiz, the dukes of San Carlos, del Infantado, and others, fostered in him the spirit of re- sistance to the ascendency of "the Prince of the Peace." Soon after her death in 1806 (attributed by him, though without sufficient evidence, to foul play), and the forcible removal of Escoiquiz, the court became openly divided into two hostile factions ; but though Godoy had the entire confidence of the king and queen, Ferdinand had the almost undivided sympathies of the people. On the 30th of October 1807, he was suddenly laid under arrest on a charge of conspiracy against the crown and life of his father 3 but no documentary evidence against him could be produced, except a draft memorial, apparently intended for presenta- tion to the king, in which the conduct of Godoy was bitterly complained of, and a letter to Napoleon appealing for pro- tection, and expressing a desire to enter into a matrimonial connexion with the Bonaparte family. When it was found that the French ambassador had been cognisant of these in- trigues, the matter was hushed up and Ferdinand pardoned ; but meanwhile the rapid movement of events, political and military, had begun to make Godoy's position an extremely precarious one. Ostensibly following out the terms of the agreement at Fontainebleau of October 27, 1807, N apoleon had not only invaded Portugal, but had also begun to pour troops into Spain (December 1807). The Spanish people Were beginning to show signs of restiveness, and, dreading an outbreak, Godoy had advised the withdrawal of the

Ing and queen to Seville with a view to the possible necessity for a further flight to Mexico. But before this

project could be carried out the revolutionary rising at Aranjuez had taken place (March 17-18, 1808), which re- sulted in the forced abdication of Charles, the final over- throw of Godoy, and the enthusiastic proclamation of Ferdinand as king (19th March). This last proceeding had been no part of Napoleon's plan; and Madrid was occupied four days afterwards by the

French troops under Murat. By the representations of the latter, both Charles and Ferdinand were induced to seek a personal interview with Napoleon at Bayonne, and submit to his arbitration their rival claims. The result was the treaty of Bayonne between Charles and Napoleon (5th May 1808), by which the former finally renounced the Spanish throne. Next day Ferdinand also was compelled to give up his claims ; it was declared that the Bourbons had ceased to reign in Spain; and shortly afterwards Joseph Bonaparte was pro- claimed king. Ferdinand was now interned at Valencay (Indre), where he remained during the whole of the Spanish war of independence, receiving from Napoleon an annual allowance of 600,000 francs. ‘The letters he wrote to Napoleon from his captivity were certainly far from indi- cating patriotism: most people will doubt whether they were consistent with any self-respect. He had nothing but com- pliments to offer on the accession of Joseph; he assured his master of his ardent prayers for his prosperity, and of his most respectful and absolute attachment to his august person; he wrote to public men to say, “‘ My highest desire is to prove myself to be the emperor’s adopted son, by my entire submission and obedience to his wishes and desires.”

The decisive victory of Wellington at Vittoria (21st June 1813), followed up by the invasion of France, induced Napoleon to treat with his captive on terms more nearly approaching those of equality (November 1813), and ulti- mately the title of Ferdindnd and his dynasty to the throne of Spain was recognized on his agreeing to sign a convention in which it was undertaken on his part to expel the English from the Peninsula, to pardon all those who had given their obedience to Joseph Bonaparte, and to restore the harmoni- ous relations of the two kingdoms as these had subsisted prior to 1792. On his return to Spain in March 1814, the cortes declined to recognize him until he should have sworn to the constitution which had been promulgated at Cadiz in 1812 ; but, listening to the counsels of the “servile ” party, he first evaded and afterwards rejected this demand. On the 4th of May he, by the decree of Valencia, annulled the constitution of 1812 and all enactments made by the cortes in his absence ; on the 30th of the same month he issued his decree of proscription and perpetual exile against the afrancesados or those who had given obedience to Joseph Bonaparte ; on the 21st of July he re-established the In- quisition, with all the powers it had possessed under Torquemada, and began a hot crusade against

“liberalism” or “‘constitutionalism,” in which no weapon of confiscation, or imprisonment, or banishment, or execution, which despotism could wield was left unemployed. This policy of the absolutist “ camarilla” was for some time interrupted by a revolutionary party headed by Quiroga and Riego at Cabezas de San Juan near Cadiz, which, on the Ist of January 1820, caused the constitution of 1812 to be again pro- claimed. The insurrection gaining daily in strength, the king was compelled to make concession after concession, until at length on the 9th of March he solemnly professed his entire acceptance of the popular constitution, abolished the Inquisition, banished the Jesuits, and restored the free- dom of the press. The cortes reassembled, and the citizens who had been banished reappeared. But very soon the king began to show how insincere his submission had been. Sometimes secretly, sometimes openly, he did all in his power to encourage the opposition, until at last, in July

1822, the royal guard broke out into open revolt with cries for “the absolute king.” For the time they were repressed by the constitutionalists ; but meanwhile the state of the Peninsula had attracted the attention of the Holy Alliance, and at the congress of Verona (August 25 to December 14, 1822) it was agreed to send a French army into Spain, “to deliver Ferdinand from slavery.” Madrid was entered on May 23, 1823; the cortes withdrew to Seville, where Ferdinand was declared incapable of governing, and a regency was appointed (11th June). Driven by the i- vaders to Cadiz, and there compelled tosurrender, the cortes yielded up their authority into the hands of F erdinand, who in his turn promised a general amnesty to all who had been concerned in the revolutionary proceedings. This promise he broke the very next day, annulling every act of his government since 7th March 1820. Another period of proscriptions, banishments, and fusillades now set in. Enactments of the most tyrannical description were un- scrupulously made with the avowed purpose of stamping out the last spark of constitutionalism.! Numbers were put to death for the most trivial offences, and it has been estimated that some 20,000 families were compelled to leave their country. Louis XVIII. offered counsels of moderation; he reminded Ferdinand that ‘Christian princes ought not to rule by means of proscriptions,” and that “a blind despotism, far from

consolidating the power of sovereigns, weakens it ;” but his remonstrances were in vain, His successor Charles X. used similar language ; but Fer- dinand’s reply was that he was not able to control the reactionary party which had restored him to power. Dur- ing the later years of his life he took little or no interest in public affairs; and the absolutists began to turn their attention to the question of the succession. A scheme was matured for inducing the king to abdicate in favour of his brother Don Carlos; but on the death of his third wife Maria Amalia of Saxony in May 1829 without issue, Fer- dinand filled the “ apostolicals ” with consternation and the liberals with new hope by contracting a fourth marriage with Maria Cristina of Naples (December 1829). In March 1830 the king decreed the abrogation of the Salic law,—a measure which excited the Carlists first to intrigue and afterwards to open insurrection on the birth of a daughter in October. In 1832 Ferdinand was seized with a threatening illness, and wavered from his formerly ex- pressed will with regard to the succession ; but ultimately, in June 1833, his daughter (Isabella II.) was declared his successor, Cristina was nominated as regent, and Don Carlos with many of his followers was ordered to leave the kingdom. The death of Ferdinand at Madrid, September 29, 1833, was the signal for the outbreak of a long and bloody civil war,

Ferdinand’s selfishness, hypocrisy, mendacity, incapacity to understand even the idea of patriotism, have sometimes suggested a comparison with Charles I. of England. But such a comparison is unjust to Charles. Ferdinand was a Spanish Bourbon, and in him the characteristic qualities of that house reached their final perfection—“imbecility, dissoluteness, ferocity, mutual hate, intellect never reach- ing higher than cunning, with a religion that was the fetichism of a savage rather than the creed of a rational being.” 2 His reign was a disastrous one for Spain. Its results may be summed up as follows :—loss of her American possessions —New Granada, New Spain (Mexico), Rio de la oe ie Venezuela, Guatemala, and Peru 3 hopeless

embarrassment ; thousands of her best citizens put ee en ama

} Thus the decree abolishin i g popular election of the ayuntamientos sail October 1824) was expressly made “con el fin de que desman para siempre

del suelo Espaiiol hasta la mas remota idea de que la soberania reside en otro que en mi real persona," 2 Crowe, History of France, iv. 151, ,

to death for political opinions ; myriads banished ; and a quarter of a million slain in unnecessary wars.

FERDINAND L. and IL., grand-dukes of Tuscany. See MEDICcI.

FERDINAND III. (1769-1824), grand-duke of Tus- cany, and archduke of Austria, second son of the emperor Leopold II, was born on the 6th May 1769. On his father becoming emperor in 1790, he succeeded him as grand-duke of Tuscany. [ferdinand was the first sovereign to enter into diplomatic relations with the French republic ; and although afterwards compelled by England and Russia to join the coalition against France, he concluded peace with that power in 1795, and by observing a strict neutrality saved his dominions from – invasion by Napoleon till 1799, when he was com- pelled to vacate his throue, and a provisional republican government was established at Florence. Shortly after- wards the French arms suffered severe reverses in Italy, and Ferdinand was restored to his territories, but in 180] Tuscany was converted into the kingdom of Etruria, and he was again compelled to return to Vienna. In lieu of the sovereignty of Tuscany, he obtained in 1802 the elec- torship of Salzburg, which he exchanged in 1805 for that of Wiirzburg. In 1806 he was admitted as grand-duke of Wiirzburg to the confederation of the Rhine. He was re- stored to the throne of Tuscany after the abdication of Napoleon in 1814, but had again to vacate it for a short time in 1815, when Murat proclaimed war against Austria. The final overthrow of the French supremacy at the battle of Waterloo secured him, however, in the undisturbed possession of his kingdom during the remainder of his life. The mild and righteous rule of Ferdinand, his solicitude for the welfare of his subjects, his enlightened patronage of art and science, his encouragement of commerce, and his sympathy with freedom render him an honourable and striking exception to the generality of Italian princes. He died on the 18th of June 1824.

FERDINAND (1721-1792), duke of Brunswick, a famous Prussian general, the fourth son of Duke Ferdi- nand Albert of Brunswick, was born at

Brunswick, I1th January 172]. He was educated for the military profession, and having entered the Prussian service, com- manded a regiment in the first and second Silesian wars. On the outbreak of the Seven Years' War he was appointed to the command of a division, and he greatly contributed to the victory of Prague in 1757. He shortly afterwards received from George II. of England the supreme command of the allied forces, and for five years, by his energy, rapidity of movement, and masterly strategy, succeeded, notwithstanding the fewness of his troops and tlieir very mixed and heterogeneous composition, in holding at bay both the large imperial army and several French armies much better organized and officered than his own. On the Ist of August 1759 he gained a brilliant victory over Marshal Contades at Minden. In 1766 an estrangement occurred between Ferdinand and Frederick the Great, in consequence of which he retired from the military profession, and passed the remainder of his life at his castle cf Veschelde, where he occupied himself in building and other improvements, and became a patron of learning and art, and a great benefactor of the poor. He died 3d July 1792.

See Knesebeck, Ferdinand Herzog von Braunschweig und Liine- burg, wahrend des Sicbenjahrigen Kriegs, 2 vols., Hanover, 1857-58 5 Von Westphalen, Geschichte der Feldziige des Herzogs Ferdinands von Braunschweig-Liineburg, 5 vols., Berlin, 1859-72; and Carlyle's History of Frederick the Great.

FERENTINO, the ancient Ferentinum, a town of central Italy, in the province of Rome, is situated on the Neapolitan

railway about 45 miles S.E. of Rome. Itlies on the side of a hill rising immediately to the left of the Via Latina. It.

possesses mineral springs, a cathedral, and some interesting remains of the ancient Ferentinum. These consist chiefly of the old walls built somewhat in the cyclopean style, a kind of citadel on the top of the hill, on which the cathedral now stands, and various other portions of old Roman buildings containing numerous inscriptions. The ancient Ferentinum at one time belonged to the Volsci, but soon after the defeat of that people by the

Romans in 413 B.c. it was made over with the adjoining territory to the Hernici. It was taken by the Romans in 361 B.c., but so leniently dealt with that, when the Hernici rebelled for the third and last time, Ferentinum was one of the three Hernician cities that refused to join the revolt. In con- ’ sideration of this the inhabitants were allowed to retain their own laws, which they preferred to the Roman code ; but after the social war they accepted the franchise. The population in 1871 was 8360.

FERENTO, the remains of a city of Etruria whose ancient name was Ferentinum. They are sitnated on the northern slope of the Ciminian hills, about 5 miles from Viterbo, and the same distance from the banks of the Tiber. The ancient city was the birthplace of the emperor Otho, and possessed a very old and splendid temple of Fortune. In the 11th century the city was destroyed by the inhabit- ants of Viterbo, and it is now uninhabited. Various por- tions of its walls and gates are still extant, but the prin- cipal building of which the remains still exist is a theatre of very peculiar construction.

FERGHANA, now a province of Russian Turkestan, is the valley containing the head waters of the Sir Darya or Jaxartes (one of the two great feeders of Lake Aral), and lies among the western ranges of the Thian Shan mountains, which inclose it on every side except at its west extremity, where the river emerges, passing Klojend, into the plains of western Turkestan. It is of oval form, and extends approxi- mately from 70° to 74° E. long, and from a little below 40° to 42° N. lat, having on the N. the monntains which separate it from the valleys of the Chirchik and the Talas, and on the 8. the comparatively unbroken chain which divides it from the mountain state of Karategin, and further east from the long highland strath or steppe of the Alai.

There is only one road into Ferghana practicable for wheeled vehicles, viz., that from Khojend. The road from Bokhara to Kashgar enters the valley at the same place, and passing along its entire length crosses the southern border range by the Terek pass. This road, which passes through the chief towns of the province, was before our era perhaps the most important route of the active trade between China and the West, and has ever since been

much frequented for geueral purposes, The direct road from Boklara to Kuldja

also runs through Ferghana, but the longer and easier route.

by Tashkend is usually preferred. Roads to Badakhshan and the south cross the Alai range by passes 12,000 to 14,000 feet high,

The Sir Darya rises in the south-east corner of the valley, but only takes that name after joining the Naryn, a much longer and more considerable stream, having first given off several large canals for irrigation. Its affluents from the north are few and unimportant; about one-third of the valley lies to the north of the Sir, where, except in the rich districts round and to the eastof Namanghdn, the land is usually poor, hilly, and ill-watered. On the south, however, along the foot of the hills, a rich belt of cultivation 10 to 27 miles wide extends with few interruptions for about 160 miles. For luxuriant beauty this region is unequalled in Central Asia, and its wealth, being the combined result of climate, svil, i abundant water, miglit be developed indefinitely. The

anks of the Sir (like those of the N aryn) are almost every- Where sandy and sterile, for its waters are scarcely used for irrigation except near its source, and countless streams flow-

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ing from the southern mountains are absorbed by irrigation before reaching it. These mountains fall gradually towards the valley (whose greatest width is about 65 miles) ina succession of minor parallel ranges, inclosing terraces or valleys, each usually with its village, and cultivated up to over 4000 feet. These valleys are of easy slope; the trans- verse valleys through which the streams force their way to the plain are shorter, steeper, and less capable of cultivation. Rich alpine pastures occur at the heads of the valleys; the barren tracts in the plain are used for winter grazing.

Agricultural Produce, &c.—All the products of the valley (which is 1200 to 1500 feet above sea-level) are cultivated up to 3000 or 4000 feet. Grapes, indeed, ripen at 5800 feet, and barley at 8500. Produce is classed for

taxation under three heads—field produce, garden produce, and fruit- trees. Aniong the first are wheat, barley, rice, pulses, maize, sorghuni, and millet; among the second, melons, water melons, pumpkins, pease and beans, onions, garlic, carrots, red-pepper, madder and other dye plants, cotton, tobazco, flax, and oil-seeds. Among the fruits are excellent grapes, apples, pears, plums, peaches, almonds, mulberries, figs, and pomegranates,

Climate.—The clitaate generally is healthier and more equable than that of Russian Turkestan. The winters are milder, and in summer, though the heat is oppressive, the nights are cool. Little rain falls except in the mountains. The sky is sometimes darkened by a dry mist of fine dust, to which, in great measure, Richthofen attributes in other parts of Asia the formation of vast deposits of loess (see vol, v. p. 632).

Lowns.—The principal towns, which nearly all lie in the fertile belt above described, are—hokand, the late capital of the khanate, with a population of 50,000 to 70,000 ; Namanghan, the only important place north of the Sir Darya, 20,000; Andijau, the capital in Baber's time, 20,000; and Marghilan, the chief seat of the silk manufac- ture, 30,000. Ush, with Usgand, Gulsha, and other smaller places in the bill district to the south-east, is frequented by the Kirghiz, who cultivate their barley and wheat in the neighbourhood. Usgand appears, from its architec- tural remains of the 12th century, to have been a place of considerable extent. Kassan, in the north, is a very ancient Tajik town.

Population.—The population of Ferghana, which for Central Asia is a thickly-peopled region, is about 900,000, of which perhaps two-thirds are settled and the remainder nomad, The settled population consists chiefly of Tajiks and Uzbegs ; the former, the early Aryan inhabitants, are found in greatest purity in the lower mountain valleys; those in the chief towns and central districts, who are known as Sarts, show a large infusion of Uzbeg and other Turki blood. 'The Uzbegs, who predominate in numbers, are here much more modified by the Tajik element than they are in Bokhara. Being the dominant race, their name is assunted by the various other Turk and Tatar elements, which in successive waves have swept over or occupied this region for more than 2000 years." There are also settlements of Kashgaris, who have fled from Chinese oppression. The nomads are mainly Kipchaks

and Kara Kirghiz or Buruts; the former, the braver and more capable race, is indeed only half nomadic, occupying chiefly the northern and eastern districts of the valley. The others have their summer quarters in the surrounding mountains and high plateaus, chiefly in the Alaiand Pamir, and winter in the valley, where they eke outa livelihood by cultivating patches of barley, wheat, and lucerne, thus becoming amen- able to taxation and control. They are poorer than the settled population, who are usually well-to-do. The towns- people especially are fond of good living and sociable, and being, like the Sarts everywhere, keen traders, drive good

bargains with the simpler nomads. They are Sunni Mahometans; their language the classic Chaghatai Turkish, slightly influenced, M. Vambéry says, by the harsher dialect of the tribes to the north-east.

History.—Ferghana was not protected by its mountain barriers from the vicissitudes which befell its neighbours. Overrun by the Arabs in 719, and subject to the Samanides in the 9th and 10th centuries, it formed part, .success- ively, of the conquests of the Kara Kitai, of Jenghiz Khan, and of Timur, whose descendant Baber was expelled in 1513 by the Uzbegs, After a long period of disintegration the khanate was reconsolidated about 1770 by Narbuta Bai, a reputed descendant of Baber, and until 1853, when the last series of Russian aggressions began, the dominions of his successors, the khans of Khokand, extended far beyond the valley of Ferghana to the north and north-west. Their influence, everywhere considerable, was most actively exerted in Kashgar, probably from com-

mercial reasons, the Chinese. allowing them to maintain.

agents there to supervise the Khokandi traders and collect dues. ‘The encroachments of Russia were made easier by the continual jealousy between Khokand and Bokhara, and by dissensions between the nomad and settled populations. The late ruler, Khudayar Khan, though more than once driven out by his oppressed subjects, always kept on good terms with the advancing Russians, who in 1874 sent a mission to Khokand. They found Khudayar setting out to suppress a Kirghiz rising, and, as the disturbances in- creased, persuaded him to retire with them and to place his country at the disposal of the czar. They then ostensibly adopted his son Nasr-ed-din, appropriating, at the same time, all the country north of the Sir Their conduct, however, soon fanned the existing irritation intoa religious war against the Russians, whose position for a time was critical, aud the movement was only crushed, and the pro- vince annexed, after great destruction of life and property.

Trade.—There are no trustworthy statistics of the trade of Fer- ghana. Russian produce is probably imported to the value of 2,600,000 rubles (about £370,000), chiefly cotton, woollen, and leather manufactures, yarn, and hardware.

Most of the tea comes ostensibly from Russia ; but a great deal of Indian toa is smuggledin. The chief exports are silk and cotton. Raw silk, value about Rs.637,000,! raw cotton, Rs.930,000, and cotton manufactures and yarn,

Rs.330,000, go to Tashkend, the principal mart of Russian Turkestan. Among minor exports are timber, flax, wool, salt, and fruits fresh and dried. There is also a good deal of trade with Bokhara and with Kashgar. Manufac- tures are little developed: coarse cotton stuffs are made in large quantities for home use and export ; also some woollens, hardware, and pottery of a certain merit. There are paper-mills at Khokand and at Charku, which supply nearly all Central Asia; the manu- facture resembles the Chinese, one of the few remaining traces of a former extensive intercourse. Gun factories of a rude order exist at Khokand and Andijan.

There is considerable mineral wealth. Naphtha,rock-salt, and gyp- sum are extensively worked ; iron-ore, argentiferous lead, coal, and sulphur have been found, and gold in the head-streams of the Sir.

evenue.—The revenue (under the late system, which the Russians have in the main adopted) has been about £360,000,?—the chief items being the khardj, or land tax, paid in grain, £202,000; the tanapna, on garden produce and fruit trees, £67,000; and the zakdt (one-fortieth part), on the cattle of the nomads, on exports and im- ports, on trade licences, &c.

_Administration.—The Russians have divided Ferghana into seven districts, viz., Khokand, Marghilan, Andijan, Ush, Uchmian or Wadil, Namanghan, and Chust. The administrative centre is re- moved from Khokand to Marghilan, as the nomads are more easily cap eae from that quarter. Justice is administered in civil cases

y the shariat, or Mahometan code, a Russian procureur being present ; in criminal cases by the Russian code. The affairs of the nomads are managed by their own elders, who are obliged to adopt any new regulations Imposed by the Government. ‘

1 The total production is esti ; ta! timated by Petrofski, agent to th Russian ministry of finance at 10 : 8 of al value 2 to 3 millions of rubles. te 20 ? It was estimated in 1877 at £272,000, showing ? 5

had not then recovered from the effects of the war of Cn i

annexation.

Ferghana is mentioned by Chinese writers of the Han dynasty (from 200 B.c.); by Hiouen-thsang, the Buddhist pilgrim, in the 7th century; by various Arab writers between the 10th and 18th (see D'Herbelot and the Oriental Geography) ; in the accounts of the wars of Timur in the 14th century (see Deguignes's Histoire des Huns, &c)., of his son Shah-rukh's mission to China (1419), and of the Chinese mission to him; in the emperor Baber's Memoirs and Mirza Haidar's Tarikhi-Rashidi in the 16th century (see Dr Bellew's " History of Kashgar" in Forsyth's Report of the Mission to Yarkand) ; in the great Chinese Geography of the 18th century, translated by Klaproth (Magasin Asiatique). See also Notices of the Medieval Geography and History of Central and Western Asia, by E. Bretschneider, M.D.

Modern authorities are—Schuyler's Turkestan ; Fedchenko's Travels in Turkestan (Russian) 1875; Terentief, Russia and Eng- land contending for the Markets of Central Asia (Russian), 1876 ; History of Khokand, by Sodhi Hukin Singh of the Punjab Secretariat, edited by Major C. E. Bates; " Journey to the W. Portion of the Thian Shan Range," &c., by N. Severtsof, translated by R. Michell, Rk. G. S. Journal, 1870; communications of Ujfalvy in Bul. de la Soc. Géog. de Parts, 1877-78; " Das Gebiet Ferghana, das frithere Chanat Chokand," from the Jtussisehe Revue, by A. Kuhn. (C. T.)

FERGUSON, Apam (1723-1816), a distinguished philosopher and historian, was born, June 20, 1723, at Logierait, Perthshire, of which parish his father was min- ister. He received the rudiments of his education at the village school of his native parish, after which he was re- moved to Perth grammar-school, where he made remarkable progress in classical literature. Towards the end of 1738 he entered the university of St Andrews, where le took the degree of M.A. on 4th May 1742. In November of the same year he entered the divinity hall, and in 1745, although he had studied divinity only one half of the usual period, he was allowed by the General Assembly to be ordained by the presbytery of Dunkeld, on the represen- tation that he had been selected as the fittest person, from his knowledge of the Gaelic language, to fill the office of chaplain to the 42d regiment, under the

command of Lord John Murray. When this regiment was at the battle of Foutenoy, Ferguson went into action at the head of the attacking column with a drawn broadsword in his hand, and could with difficulty be persuaded to retire to the rear. He continued attached to the regiment till 1754, after which he resolved to devote himself to literary pursuits. About the beginning of 1757, on the resignation of David Huine, he was elected librarian and clerk to the Faculty of Advocates, but these offices he relinquished in about a year on becoming tutor to Lord Bute. In 1757 he rendered himself conspicuous by the interest he took in the success of the tragedy of Douglas, written by his friend Home, and by a pamphlet, Zhe Morality of Stage Plays servously considered, which he published in its defence.

In 1759 Ferguson succeeded Dr John Stewart as profes- sor of natural philosophy in the university of Edinburgh. In 1764 he was transferred to the chair of moral philosophy, and within little more than a year after he published his Essay on the History of Civil Society, which was received with much approbation, and was translated into several European languages. Soon afterwards he began to col- lect materials for a history of the Roman commonwealth. Whilst thus engaged, he was solicited by the guardians of Charles, earl of Chesterfield, to superintend that young nobleman's education, which had been much neglected. He joined his young charge at Geneva in May 1774, and re- mained with him forabout a year. In his absence he had very nearly been deprived of his office in the university, the town-council having, as patrons, proposed to declare the chair vacant. In 1776 Ferguson published a pamphlet on the American revolution in opposition to Dr Price's " Ob- servations on the nature of civil liberty," in which he sympathized with the views of the British legislature. When tke Government resolved to send out commissioners to quiet the disorders in the colonies, he was appointed

| secretary. They failed to accomplish the object of their

mission, but the Government obtained through them fuller information regarding the state and temper of tlhe Ameri- cans than they had previously possessed.

In 1780 Ferguson had a paralytic attack, which was one of the most remarkable on record, for, by an abstemious diet, he continued to enjoy almost uninterrupted good health for more than thirty years, while his mental powers were not impaired. In 1783 his great work, the LHestory of the Progress and Termination of the Roman Republic, appeared in 3 vols. 4to; it was very popular, and went through several editions. In it Ferguson gives, in a connected and elegant form, a narration of the great facts of Roman his- tory for a period of five hundred years. He was led to un- dertake this work from a conviction that the history of that remarkable people during the period of their greatness was a practical illustration of those ethical and political doc- trines which were the object of his peculiar study,

No longer able to undergo the fatigue of public teaching, Ferguson in 1785 resigned his chair in the university, in which he was succeeded by Dugald Stewart, then professor of mathematics, He now proceeded to revise his academic lectures, and in 1792 they were published under the title of Principles of Moral and Political Science.

In his ethical system Ferguson treats man thronghout as a social being, and illustrates his doctrines by political examples. As a believer in the progression of the human race, he placed the principle of moral approbation in the attainment of perfection. His speculations have been carefully criticized by Cousin, who thus expresses himself with reference to this theory :—“ We find in his method the wisdom and circumspection of the Scottish school, with something more masculine and decisive in the results, The prin- ciple of perfection is a new one, at once more rational and compre- hensive than benevolence and sympathy, which in our view places Ferguson as a moralist above all his predecessors.” By this prin- ciple Ferguson endeavours to reconcile all moral systems. With Hobbes and Hume he admits the power of self-interest or utility, and makes it enter into morals as the law of self-preservation. Hut- cheson’s theory of universal benevolence and Smith’s idea of sym- pathy he combines under the law of society. But, as these laws are the means rather than the end of human destiny, they are subordi- nate to a supreme end, and this supreme end is perfection. In the political part of his system Ferguson follows

Montesquieu, and pleads the cause of well-regulated liberty and free government, ;

When in his seventieth year, Ferguson, intending to prepare a new edition of his Roman history, resolved to visit Italy. He visited some of the principal cities of Europe, and passed part of the winter of 1793 at Rome. He was generally well received, and was elected a member of the Academy of Sciences of Berlin, of the Etruscan Society of Antiquaries at Cortona, and of the Arcadia at Rome. From 1795 he resided successively at the old castle of Neidpath near Peebles, at Hallyards on Manor water, and at St Andrews, where he died February 22, 1816, lag a works above mentioned, Ferguson is the author of ee ee aed pe Fa Philosophy, Edinburgh, 1766 ;

, phy, 1769, 1773, 1785, translated and | oonaomaaeci elie foreign universities ; and a few minor he Rel Sy of Bisipa vesen.? Smy 8 Tren. of eo', James (1710-1776), an eminent . aD = aa was born near Keith in Banft- Th fist le , of parents in very humble circumstances. a. — to read by overhearing his father teach his is er, and with the help of an old woman was ee it al in his autobiography, sf to read tolerably well 7 s : er thought of teaching him." A fter receiving oan – oo In reading from his father, who also a 0 in he was sent for three months to the ihc 3 ~ at — His taste for mechanics was ens, ase ot e entally awakened on seeing his father) ae ag Ec raise a part of the roof of his ar — ion o mes strength which at first is a am as well as wonder." On discovering

§ wonder was effected, he began experiments

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with the view of improving on the simple lever his father had made use of ; and although he soon learned that all his inventions had been anticipated, he was so well pleased to find his principles confirmed that his passion for the study of mechanics was increased rather than diminished. As soon as his age permitted he was sent to a neighbouring farm to keep sheep, where in the day time he amused him- self by making models of mills and other machines, and at night in studying the stars. Afterwards, as a servant with a miller, and then with a doctor, he met with hardships which rendered his constitution feeble through life. Being compelled by his weak health to

return home, he there amused himself with making a wooden clock. When slightly recovered he showed this and some other inventions to a neighbouring gentleman, who engaged him to clean his clocks, and also desired him to make his house his home. He there, at the suggestion of a lady visitor, commenced to draw patterns for needle work, and his success in this art led him to think of becoming a painter. Through the assistance of the same lady he was at length sent to Edin- burgh, where, having obtained some instruction in drawing, he began to take portraits in miniature, by which means, while engaged in his scientific studies, he supported himself and his family for many years. On account of the success of his Astronomical Rotula, he determined, in 1743, to leave Edinburgh for London, where he published some curious astronomical tables and calculations, and afterwards gave public lectures on experimental philosophy. These he re- peated in most of the principal towns in England. His deep interest in his subject, his clear explanations, his ingeniously constructed diagrams, and his mechanical apparatus rendered him one of the most successful of popular lecturers on scientific subjects. It is, however, as the inventor and improver of astronomical and other scientific apparatus, and as a striking instance of self-edu- cation, that, he claims a place among the most remarkable men of science of his country. His manners were unaffected and courteous, and his life simple, studious, and irreproach- able. In 1763 he was elected a fellow of the Royal Society, and in 1770 a member of the American Philosophical Society. During the latter years of his life he was in receipt of a pension of £50 from the privy purse. He died in London 17th November 1776.

Fergusen’s principal publications are Astronomical Tables, 1763; Lectures on Select Subjects (1st ed. 1761, edited by Sir David Brewster in 1805); Astronomy explained upon Sir Isaac Newton’s Principles (1756, edited by Sir David Brewster in 1811); and Select Mechanical Exercises, with a Short Account of the Life of the Author, written by himself (1773). “This autobiography is included in an Katended Life by KH, Henderson, LL.D (1st ed. 1867, 2d 1870), which also contains a full description of Ferguson’s principal inventions, accompanied with illustrations. See also The Story of the Peasant- Boy Philosopher, by Henry Mayhew (1857).

FERGUSSON, Roserr (1750-1774), one of the minor poets of Scotland, owes his chief fame to the fact that he was, in a very special sense, the precursor of Burns. He was the youngest of three sons of William Fergusson, a man of superior intelligence, who removed from Aberdeen to Edinburgh in 1746, and there ultimately found employ- ment with the British Linen Company as accountant. Robert was born 17th October 1750, and grew up a delicate youth, with a nervous susceptibility which increased with years, and unfitted him for the prosaic duties of daily life. His health did not admit of his being sent to school till his sixth year; but both there and at the university of St Andrews he manifested great quickness, though accompanied by an impulsive fickleness not unfrequently characteristic of the poetical temperament. Among his fellow students he was distinguished for his vivacity and humour. His conversation was singularly fascinating, his powers of mimicry were great, and he sang Scottish songs with fine effect. In one of his frolics he undertook

for a wager to play the part of a ballad singer; and, in suitable disguise, furnished with a large bundle of ballads, he disposed of the whole, while he attracted the crowd by his spirited rendering of popular songs. Hence, both at college and in subsequent years, his company was sought after ; and in an age when the convivial habits of society were under little restraint, he was exposed to temptations in all respects prejudicial to him. His father died while he was still at college; but a bursary which he held enabled him to complete lis four years of study, The loss of his father was nevertheless an irreparable one at the most critical stage of life. His studies appear to have been subsequently pursued in a desultory fashion. He abandoned all thought of the clerical profession, for which he had been preparing, and returned to his widowed mother without any definite plan or prospect for life. While still at college he had made more than one attempt at dramatic composition, and wrote two acts of a tragedy, of which the hero of Scottish romance, Sir William Wallace, was the central figure. But in the desultory efforts of his erratic muse there is no indication of dramatic power. The sprightly gaiety which made him so covetable a companion inspired his best poems, which are more noticeable for their graphic humour than for tenderness or depth of feeling.

After a brief sojourn with a maternal uncle at Aberdeen, Fergusson returned to Edinburgh, and ere long obtained employment as copying clerk in a lawyer's office. In tliis humble occupation he passed the remainder of his brief life, relieving the irksome drudgery by poetical composition, aud by evenings passed in the convivial gatherings which then formed a peculiar feature of the social life of Edinburgh. He was a member of one of its most noted clubs, celebrated by him in his poem of Auld Reekie. "The Knights of the Cape," as. they dubbed themselves, were wont to assemble at a tavern in Craig's Close, in the vicinity of the Cross; each member had a name and character assigned to him, which he was required to maintain at all gatherings of the order. David Herd, the editor of what Scott styled the first classic edition of Scottish song, was sovereign of the Cape when Fergusson was dubbed a knight of the order, with the title of Sir Precentor in allusion to his fine voice. Alexander Runciman, the historical painter, his pupil Jacob More, and Sir Henry Raeburn were all mem- bers. The old minute books of the club abound with pencilled sketches by them, one of the most interesting of which, ascribed to Runciinan's pencil, is a sketch of Fergus- son in his character of Sir Precentor.

In the case of Fergusson, as in that of Burns, critical censors have been too apt to ascribe to them excesses of a wholly exceptional nature; whereas tliey only conformed to the habits of society at a time when clergymen, judges, and men of all ranks habitually frequented the tavern, and sought intellectual as well as social pleasures in convivial clubs. In such assemblies Fergusson appears to have been the life of the company. In a letter addressed to Burns, Mr Peter Stuart, then editor of the Morning Post, refers to Fergusson ashis " inestimable friend," and bears testimony to the fascinating social attractions of his society. "There was," he says, "such a richness of conversation, such a plenitude of fancy. . . . His manner was so felicitous, that ae oe! person around him, and infused into i Aha E e young and old the spirit and animation Pe rials ot 's own mind." In person he is described pe a oe orien figure, his forehead high, his and Meee " isc apo pio effemi vate Oe ean : "te extreme pallor, but kindled into life by 1on of his large black eyes, whenever he became interested in the conversation. His lict ir wa worn unpowdered, with long way} a Me ee head, and tied into a ee behind: asl side of the

ind with a black silk riband.

FERGUSSON

From time to time Fergusson contributed to Ruddiman's Weekly Magazine grave and humorous pieces, both in English and in the Scottish dialect; but in 1773, when he was in his twenty-fourth year, his poems were collected and published in a volume. The event is not without its signifi- cance in English literature. Robert Burns was then in his fifteenth year. The volume ere long came under his notice, and the generous poet made no stinted acknowledgment of all that he owed to his predecessor. But ere such appre- ciative recognition could be rendered, its unhappy author had died in a maniac's cell. A fall, by which his head was severely injured, greatly aggravated symptoms of mental aberration, from which he had seemed to be recovering; and after about two months' confinement in the old Darien House,—then the only public asylum in Edinburgh,—the poet died on the 16th October 1774, within one day of completing his twenty-fourth year.

The influence of Fergusson's writings on the Ayrshire poet is undoubted. He is thus apostrophized by Burns :— ** Oh, thou my elder brother in misfortune,

By far my elder brother in the muses,

With tears I pity thy unhappy fate !" His Leith Races unquestionably supplied the model for the Holy Fair, Not only is the stanza the same, but the Mirth who plays the part of conductor to Fergusson, and the Fun who renders a like service to Burns, are manifestly conceived on the same model, and even in part in thesameterms, The mutual complaint of Plainstanes and Causey probably suggested The brigs of Ayr; On seeing a Butterfly in the Street has reflections in it which strikingly correspond with T'o a Mouse, one of the most exquisite of all Burns's minor poems; nor will a comparison of The Farmer's Ingle of the elder poet with Zhe Cottar's Saturday Night admit of doubt as to the influence of the city-bred poet's muse on that exquisite picturing of homely peasant life. But the Ayrshire poet was himself the first to render a generous tribute to the merits of Fergusson. On his visit to Edin- burgh in 1787 he sought out, not without difficulty, the name- less grave mound of the poet, and forthwith petitioned

the authorities of the Canongate burying ground for permission to erect the memorial stone which still enables the visitor to identify the poet's grave. The inscription on the stone is as follows :—

- Here lies Robert Fergusson, Poet. Born September 5th 1751—Died 16th October 1774. No sculptured marble here, nor pompous lay, 'No storied urn, nor animated bust ;' This simple stone directs pale Scotia's way

To pour her sorrows o'er her poet's dust."

On the reverse of the stone is this record of its origin:— "By special grant of the managers to Robert Burns, who erected this stone, this burial-place is to remain for ever sacred to the memory of Robert Fergusson." The simple stone has since been rescued from decay, and inserted in a monumental structure of a more ornate character. The date assigned as that of his birth differs, as will be seen, from the one given above, which rests on the authority of his younger sister, Margaret, the wife of Mr Alexander Duval, purser in the royal navy. According to lier state- ment, the birthday of the poet's elder sister Barbara had been assigned by mistake to him.

The first edition of Fergusson's poems was published by Ruddiman, at Edinburgh, in 1773, and a supplement, containing additional poems, in 1779, A second edition appeared in 1785, and another in 1807, with a biographical sketch by Alexander Peterkin. A life of Fergusson is included in Dr David Irving's Lives of the Scottish Poets ; and the chief points in various biographical sketches are embodied in Dr Robert Chambers's article in his Lives of [0lustrious and Distinguished Scotsmen. (D. WS

FERGUSSON, Srr Witriam (1808-1877), Baronet, an eminent surgeon, the son of James Fergusson of Lochmaben, Dumfriesshire, was born at Prestonpans, East

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Lothian, 20th March 1808. After receiving his early edu- cation at Lochmaben and the High School of Edinburgh, he entered the university of

Edinburgh with the view of studying law, but soon afterwards abandoned his inten-

tion, and became a pupil of Robert Knox the celebrated —

anatomist. At the age of twenty he became a licentiate of the College of Surgeons, and he was elected a fellow in the following year. ‘The ingenious fittings of a dissecting case

haviug attracted the attention of Knox, the latter engaged him as his demonstrator. While occupied in teaching anatomy he devoted his chief attention, under the direc- tion of Knox, to the improvement of his surgical skill. In 1831 he became an extramural lecturer on surgery, and in 1836 he succeeded Liston as surgeon to the Royal Infirmary, In 1840 he was appointed professor of surgery in King’s College, London, and surgeon to King’s College Hospital. At first he acquired a practice in London only slowly, but after the deaths of the two Coopers and of Liston he soon held an unrivalled position in his own de- partment, In 1849 he was appointed surgeon-in-ordinary to the Prince Consort, in 1855 surgeon-extraordinary to the Queen, and in 1806 sergeant-surgeon to the Queen. He was a fellow of the Royal Societies of Edinburgh and London, and of various medical societies. In 1865 he was created a baronet. He died at his Scottish residence in Peebles- shire, February 10, 1877. As a surgeon Fergusson’s greatest merit is that of having introduced the practice of “conservative surgery,” in many cases of diseased joints which before his time were treated by amputation. He mide his diagnosis with almost intuitive certainty; and as an operator he was characterized by self-possession in the most critical circumstances, minute attention to details, and great refinement of touch, and relied more on his mechanical dexterity than on complicated instruments. Sir William Fergusson is the author of The Progress of Anatomy and Surgery in the Nineteenth Century (1867), and of a work on Practical Surgery (1st ed. 1842) which has a high repu- tation as a text-book.

FERID-EDDIN-ATHAR (1119-1229), or Fanrrp Uppin Arrar, a Persian poet and mystic, was born at Kedken, near Nishapur, 513 a.m. (1119 a.p.), and was put to death 627 a.m. (1229 a.p.), thus having reached the age of 110 years, His real name was Muhammed ben Ibrahim, and Ferid Eddin

was simply an honourable title equivalent to Pearl of Religion. He followed for a time his father's profession of druggist or perfumer, and hence the name of Athar or Attar, which he afterwards employed as his poetical designation, According to the account of Doulat Shah, his interest in the great mystery of the higher life of man was awakened in the following way. One day a wandering fakir gazed sadly into his shop, and, when ordered to be gone, replied: "It is nothing for me to go; but I grieve for thee, O druggist, for how wilt thou be able to think of death, and leave all these goods of thine behind thee?" The word was in season : and Muhammed ben Ibrahim the druggist soon gave up his shop and began to study the mystic theosophy of the Sufis under Sheikh Rekenuddin. So thoroughly did he enter into the spirit of that religion that he was before long recognized as one of its principal represen- tatives, He visited Mecca, and on his return was invested with the Sufi mantle by Sheikh Majduddin of Baghdad. The greater portion of his life was spent in the town of Shadyakh, but he is not unfrequently named Nishapuri, after the city of his boyhood and youth. The story of his death is a strange one. Captured by a soldier of Jenghiz Khan, he was about to be sold for a thousand dirhems, when he advised his captor to keep him, as doubt- less a larger offer would yet be made; but when the

second bidder said he would give a bag of horse fodder for the old mian, he asserted that he was worth no more, and had better be sold. The soldier, irritated at the loss of the first offer, immediately slew him. A noble tomb was erected over his grave at Shadyakh, and the spot acquired a reputation for sanctity. Ferid Eddin was a voluminous writer, and has left no fewer than 120,000 couplets of

| poetry, though in his later years he carried his asceticism so which he had constructed by his own mechanical skill |

far as to deny himself the pleasures of poetical composition. His most famous work is the Mantie Uttair, or language of birds, an allegorical poem containing a complete survey of the life and doctrine of the Sufis. It is extremely popular among Mahometans both of the Sunnite and Shiite sects, and the manuscript copies are consequently very numerous. The birds, according to the poet, were tired of a republican constitution, and Jonged

for a king. As the lapwing, having guided Solomon through the desert, best knew what a king should be, he was asked whom they should choose. The Simorg in the Caucasus, was his reply. But the way to the Caucasus was long and dangerous, and most of the birds excused themselves from the enterprise. A few, however, set out ; but by the time they reached the great king's court, their number was reduced to thirty. The thirty birds (st morg) wing-weary and hunger-stricken, at length gained access to their chosen monarch the Simorg ; but only to find that they strangely lost their identity in his presence—that they are he, and he is they. In such strange fashion does the poet image forth the search of the human soul after absorption into the divine.

The text of the Mantie Uttair was published by Garcin de Tassy in 1857; a summary of its contents by the same Orientalist appeared in the Revue Contemporaine, t. xxiv., and was reprinted as La poésie philosophique et religieuse chez les Persans, 1856; and this was suc- ceeded by a complete translation in 1860, Among Ferid-Eddin's other works may be mentioned his Pend Namceh, or Book of Reflection, of which a translation by Silvestre de Sacy appeared in Les mines de Ul' Orient, vol. ii.; Bulbul Nameh, or Book of the Nightingale; Wasalet Nameh, or Book of Conjunctions; Khusru va Gul, the King and the Rose; and Tezkiret al Aulia. See Sir Gore Ouseley, Biographical Notices of Fersian Poets, 1846; Von Hammer Purgstall, Geschiehte der schinen Redckiinste Persiens, p. 140; The Oriental Collections, vol. ii., 1798; Palmer, History of Sufiism.

FERISHTA, Monammep KastM, a celebrated Persian historian, was born about 1570, at Astrabad, on the shores of the Caspian Sea. While he was still a child his father was summoned away from hisnative country into Hindustan, where he held high office in the Deccan; and by his in- fluence the young Ferishta received court promotion. In 1589 Ferishta removed to Bejapore, where he spent the remainder of his life under the immediate protection of the Shah Ibrahim AdilIL, who engaged him to write a history of India. At the court of this monarch he died about 1611. In the introduction to his work a résumé is given of the history of Hindustan prior to the times of the Mahometan conquest, and also of the victorious progress of the Arabs through the East. The first ten books are each occupied with a history of the kings of one of thie provinces; the eleventh book gives an

account of the Mussulmans of Malabar; the twelfth a history of the Mussulman saints of India; and the conclusion treats of the geography and climate of India. Ferishta is reputed one of the most trustworthy of the Oriental historians, and his work still maintains a high place as an authority. Several portions of it have been translated into English; but the best as well as the most complete translation is that published by General Briggs under the title of The History of the Rise of the Mahometan Power in India (London, 1829, 4 vols. 8vo). Several additions have been made by Briggs to the original work of Ferishta, but he has omitted the whole of the twelfth book, and various other passages which had been omitted in the copy from which he translated.

FERMANAGH, an inland county in the province of Ulster, Ireland, extending from 54° 7’ to 54° 40’ N. lat., and from 7° 1’ to 8° 5’ W. long., is bounded on the N.W. by Donegal, on the N.E. by Tyrone, on the E. by Mona- ghan, and on the 8.W. by Cavan and Leitrim. Its greatest length N.W. and §.E. is 45 miles; its greatest breadth N.E. and §.W. is 29 miles, The area extends to 457,369 statute acres, or 714} square miles, of which 106,530 acres are under tillage, 243,251 in pasture, 5909 in plantations, 55,248 in waste, bog, mountain, &e., and 46,431 under water. The county is divided into eight baronies: viz., Clanawley, Clankelly, Coole, Knockninny, Lurg, Magheraboy, Magherastephana, and Tirkennedy; and these are subdivided into 23 parishes, and 2183 townlands.

The chicf town in Fermanagh is Enniskillen, popula- tion (1871) 5836. The only other towns of any importance are—Lisnaskea (857), Irvinestown, formerly Lowtherstown (787), Maguire’s Bridge (685), Tempo (460), Newtown- butler (418), Brookborough (390), Rosslea (371), Ederney (332), Belleek (327), Derrygonnelly (302), Kesh (296), in all of which fairs are held and post-offices established. The Irish North-Western division of the Great Northern Railway passes through the most populous portion of the county, one branch connecting Enniskillen with Clones, another connecting Enniskillen with Londonderry, va Omagh, and a third connecting Enniskillen with Bundoran.

Physical Features.—Fermanagh is situated mostly in the basin of the Erne, which divides the county into two nearly equal sections. It presents a hilly, and in many parts a somewhat sterile appearance, though in the main, and especially in the neighbourhood of Lough Erne, it is picturesque and attractive. The climate though moist is healthy, and the people generally are tall and robust. The chief mountaius are Cuilcagh (partly in Leitrim and Cavan) 2188 feet high, Belmore 1312 feet, Glenkeel 1223, North Shean 1135, Tappahan 1110, Carnmore 1034. Tossett or Toppid and Turaw mountains command extensive prospects, and form striking features in the scenery of the county. But the most distinguishing feature of Fermanagh consists in the great extent of its surface being occupied by the Upper and Lower Loughs Erne, which stretch for 45 miles from S.E. to N.W. These lakes are formed by the expan- sion of the river Erne, which enters the county from Cavan at Wattle Bridge, and spreads out its waters in the Upper Lough, broken by innumerable islets. Contracting itself again, the river flows in a meandering course to the town of Enniskillen, where it expands itself once more in the Lower Lough, which extends in a N.W. direction for about 20 miles, till the river again issues from it a mile above Belleck. Of the two loughs the lower and larger one is most famed for its picturesque scenery. Both are dotted with many islands, the number of which has been stated as high as 199. The largest islands are Boa (or "' Cow"), Ennismacsaint, Devenish, Eagle, Innisnakill Gully, Cor, Ferney, Herring, Innismore, and Bellisle. It is navigable throughout, during the winter season, a small steamer plying between Enniskillen and Belleek. The other lakes next in size are Loughs Melvin and Macnean on the border of Leitrim, and draining into the Drowes river. The chief river isthe Erne, which, rising in Cavan, passes through Belturbet, Lough Erne, and Belleek on its way to the Atlantic, into which it descends at Bally- shannon. At Belleek it forms a considerable waterfall, well known to sportsmen for its good salmon-fishing. There are several mineral springs in the county, some of them chalybeate, others sulphureous. At Belcoo, near Ennis- killen, there is a famous well called Daragh Phadric, held no ra by the peasantry for its cure of paralytic and ae ae at miles N.W. of the same town, at

aughton," are natural caves of con-

siderable size. The geological formation of the county may be described as consisting mainly of secondary lime- stone and yellow sandstone. In the former organic remains are plentiful, some fine specimens of encrinites being easily obtainable. A brown marble excavated at Florence Court is beautifully veined, and susceptible of a splendid polish, Grey marble has been found in the parish of Killasher, Iron and coal have also been traced in various places, but only in small quantities. The best iron ore mine is at Belleek.

Industries—Agriculture, &c.—With the exception of the pottery works at Belleek, Fermanagh cannot boast of any distinguishing manufactures. It is chiefly an agricultural county. Of the arable land about the one-half is devoted to pasturage. Oats and potatoes are the crops most extensively cultivated. The next in order are flax, turnips, wheat, barley, rye, beans, and pease, The following table shows the number of acres under the different crops during the years 1874 and 1877 :—

;|3 Other

§ | £4 | Green | Total. a Crops,

s

Potatoes.

54,566 | 24,487 | 16,811 | 2526 | 3330 | 629 | 183 | 27 | 1936 | 104,345

107,323

§3,691 | 25,512 | 17,285 | 4183 | 3844 | 333 | 252 | 92 | 2131

The live stock (horses, cows, sheep, &c.) in the county was valued in the census of 1871 at £839,899, but this estimate was on the basis of the values fixed by the census commissioners of 1841, and is therefore much below the actual present worth, which is probably £1,500,000. From statistics prepared specially for Thom’s Almanac for 1877, it is estimated at £1,354,379. The number of live stock in Fermanagh given in the registrar-general’s annual re- turns during the years 1874 and 1877 is as follows :—

=| e Bes al wv

g sHI2S2\3es| & ls Swe eS SeietSs| o ° of nv! & B52 |S egl¥ Fel © = Sa/ 81, lee her8| g | £5 EAl aq | ES lSsselss6] BS | SO Ss ec lORFIO£L S| S & B co) a= a

1874 | 6781 | 4196 | 25,556) 14,965) 15,813] 43,548) 99,882) 13,718] 17,304) 3818 | 313,228

1877 | 7373 | 4189 | 23,918) 14,708

The county in 1873 was divided among 707 proprictors, of whom 130 owned less thun one acre each, or 19 per cent.,—the proportion for all Ulster being 48 per cent. The average extent of each holding was 586 acres, that of Ulster being 239 acres. The total annual rental of the land amounted to £234,634, or 11s. 54d. per acre—that of Ulster 15s. 8d. More than half the whole county was in possession of ten proprietors, namely,—Marquis of Ely, Ely Lodge, 34,879 acres; Earl of Erne, Crom Castle, 31,389; Earl of Enniskillen, Florence Court, 29,635; Sir V. H. Brooke, Bart., Colebrook Park, 27,994; Mervyn Archdall, Castle Archdall, 27,410; John Madden, Roselea Manor, 14,074; J. G. Irvine, Killadeas, 11,388; J. G. Porter's representatives, 11,015; Church Temporalities Commis- sioners, 10,357; and Hugh de Fellenberg Montgomery,

7996,

Education, éc.—According to the census of 1871, the number of persons in the county over five years of age who could read and write was 41,226; 18,349 could read but could not write, and 22,758 could neither read nor write. There were 10 persons who spoke Irish only, and 349 who spoke both Irish and English. There were two superior schools, having a total of 94 pupils in attendance, all Protestants. On the 31st December 1876 there were on the rolls of the national schools 16,640 pupils, of whom 9720 were Roman Catholics, 6321 Protestant Episcopalians, 278 Presbyterians, and 321 of other persuasions. At the

same date at the Enniskillen model school there were 339 pupils on the rolls, of whom 229 were Protestant Episco- palians, 33 Presbyterians, 18 Roman Catholics, and 59 of other persuasions. In Fermanagh there are neither reforma- tory nor industrial schools.

Administration, &c.—Fermanagh returns three members to parliament—two for the county, and one forthe borough of Enniskillen. The assizes are held at Enniskillen, quarter sessions at Enniskillen and Newtownbutler, aud petty sessions at eleven places throughout the county. Fer- managh is within the Belfast military district. The barrack stations are at Enniskillen and Belleek. LEcclesiastically it belongs for the most part to the diocese of Clogher. ‘The county jail and the county infirmary are at Enniskillen ; but the district lunatic asylum is at Omagh (in Tyrone), serving for the two counties, Fermanagh and Tyrone. The poor law union workhouses for the county are at Enniskillen, Irvinestown, and Lisnaskea.

Population.—The population of Fermanagh steadily in- creased up till the year 1841. The famine and subse- quent emigration intervening between that year and the next parliamentary census (1851), the population showed a decrease at the latter date of about 25 per cent., and since 1851 the decrease has continued. The exact decrease during the 30 years 1841 to 1871 is 40°69 per cent. In 1841 the population was 156,481; in 1851,7116,047; in 1861, 105,768 ; in 1871, 92;794; and on the 3lst December 1876 it was estimated at 91,188. From the lst May 1851 to 3dlst December 1876, the total number of emigrants from Fermanagh was 34,776, or an average of 1337 per annum. In 1871 55 per cent. of the population were re- turned as Catholics.

History and Antiquities.—According to Ptolemy, the aborigenes of this county were the Hrdinz. By the ancient Irish it was called eor-magh-Eanagh, or the “ country of the lakes” (lit. “the mountain-valley marsh district ”); and also Magh-wire, or ‘the country of the waters.” It was divided into two large portions—the one called Targoll, the other Rosgoll. The latter was occupied by the Guarii, the ancestors of the MacGuires or Maguires, a name still very common in the district. This tribe or family was so influ- ential that for centuries the county was called after them Maguire’s Country, and one of the towns still existing bears their name, Maguire’s

Bridge. Fermanagh was one of the six counties which reverted to the crown at the time of the flight of the earls of Tyrone and Tyrconnell, and which were included in the well known scheme of colonization of James I, the Plantation of Ulster. Among the principal Scotch and English settlers at the period of the Plantation were Sir Stephen Butler, Sir Wm. Cole, John Archdall, and Sir Gerard Lowther, from whom some of the towns and villages in the county derived their names, and whose descendants form the leading gentry to the present day. During the revolution of 1688 Fermanagh rendered signal service to the cause of William III. by the gallant stand which its yeomen made against the Irish army, and their descendants possess so much of the military spirit of their forefathers as to make the title " Fermanagh men" still synonymous with bravery and loyalty to the constitu- tion, In the year 1689 battles were fought between be IIL.'s army and the Irish under Macarthy (for a IL) at Lisnaskea (26th J uly) and Newtownbutler (30th J uly). The chief place of interest to the antiquary E Devenish Isle in Lough Erne, about 24 miles N.W. from i It contains about 80 acres of very fertile pas- ure land, and has long been celebrated for its romantic oo and ecclesiastical ruins. Near the remains of the a bey of St Mary, founded in the 6th century by St

aserian (called also Molaisse or Molush), is one of the best *pecimens of [reland's round towers. It is 82 feet high and

49 in circumference, with an ingeniously constructed conical roof. About half a century ago it was carefully repaired, and is now in excellent preservation. Pursuant to "'The Irish Church Act, 1869," both the round tower and the abbey have been vested in the secretary of the commissioners of public works in Ireland to be preserved as national monuments. In various places throughout the county may be seen the ruins of several ancient castles, Danish raths, and tumuli, in which last have been found at times urns and stone coffins. At Wattlebridge, near Newtownbutler, are the remains of a Druidical temple. (w. E. Cc.)

FERMAT, Pierre pe (1601-1665), a famous mathe- matician, was born at Beaumont-de-Lomagne near Mont- auban. While still young he, along with Pascal, made some discoveries in regard to the properties of numbers, on

which he afterwards built his method of calculating probabilities. He discovered a simpler method of quadrating parabolas than that of Archimedes, and a method of finding the great- est and smallest ordinates of crooked lines analogous to that of the then unknown differential calculus, His method of maxima and minima brought him into. conflict with Descartes, but the dispute was due chiefly to a want of explicitness in the statement of Fermat. Fermat was for some time councillor for the parliament of Toulouse, and in the discharge of the duties of that office he was distinguished both for legal knowledge and for strict integrity of conduct. Though the sciences were the principal objects of his private studies, he was also an accomplished general scholar and an excellent linguist. He died at Toulonse in 1665. He left a son, Samuel de Fermat, who was a man of some learning, and published translations of several Greek authors.

The Opera Mathematica of Fermat were published at Toulouse, in 2 vols. folio, 1670 and 1679; they have now become very scarce. The first contains the ‘‘ Arithmetic of Diophantus,’ with notes and additions. The second includes a ‘* Method for the Quadrature of Parabolas,” and a treatise ‘‘ onMaxima and Minima, on Tangents, and on Centres of Gravity,” containing the same solutions of a variety of problems as were afterwards incorporated into the more ex- tensive method of fluxions by Newton and Leibnitz, In the same volume are treatises on ‘‘ Geometric Loci, or Spherical Tangencies,” and on the ‘Rectification of Curves,” besides a restoration of *“Apollonius’s Plane Loci,” together with the author’s correspondence addressed to Descartes, Pascal, Roberval, Huygens, and others.

FERMENTATION, a chemical term, which, in accord- ance with its derivation from fervere (to boil), was originally applied indiscriminately to all chemical changes involving the effervescence of a liquid, but which, in its modern accept- ation, has in itself nothing at all to do with effervescence, being used to designate a peculiar class of metamorphoses which certain complex organic materials are liable to, and of which the well-known change which grape juice under- goes when it “ferments ” into wine, the souring of wine or milk, and the putrefaction of animal or vegetable matter may be cited as familiar examples.

What in all these and similar processes strikes the ordinary observer as something particularly characteristic is their spontaneity: sweet milk turns sour, grape juice passes into wine, wine into vinegar, vinegar into a foul insipid flnid—without the application or addition from without of any agent or reagent; but the “spontaneity ” in the eyes of the chemical investigator does not go far. All chemical reactions are spontaneous; and wherever a case occurs of two things acting upon each other, it makes no difference whether one of them be added, say, to the solution of the other from a bottle, or whether it were present in the liquid from the first. What caused chemists to group together fermentative changes as a class of phenomena different from ordinary reactions was the fact that wherever they succeeded in reducing the phenomena to a degree of simplicity sufficient for translating the respective reaction into an equation, this equation, though perfectly correct in

the sense of chemical arithmetic, appeared to assert some- thing which ran contrary to the known chemical tendencies of the substances concerned. ‘To explain this by an example, let us take the case of the souring of milk, a fer- mentation which, when stripped of what, from the purely chemical standpoint, would appear unessential, involves only one reaction, which consists in this, that the milk sugar of the milk, by a mere rearrangement of its ultimate in- gredients, passes into lactic acid, according to the equation Cuca Ladie act

Now, this in itself is nothing exceptional. A solution of cyanate of ammonia (NCOH.NH;,) is no sooner prepared than it passes into one of urea CO(NH.). ; cyanic acid, (NCHO) when left to itself, soon passes into cyamelide, just as the milk sugar of the milk passes into lactic acid. But there is this great difference, that this latter change cannot be realized, under any known set of conditions, in a solu- tion of pure milk sugar in pure water. And so it is in all other analogous cases. But this comes to the same as say- ing that fermentations, as a class of chemical reactions, are characteristically non-spontaneous, and consequently must be caused by reagents, although these reagents have no place in the mere balance-sheet of the reaction. In fact, experi- ence shows that no fermentable chemical

species will ferment except in presence of water, and unless it be kept by means of that water in direct contact with some specific “ferment,” which, although it contributes nothing to the substance of the products which figure in the equation, nevertheless in- duces the reaction “by its presence,” as the phrase goes. The presence alone, of course, will not do. It is simply inconceivable that a reagent should act chemically unless it were itself in a state of chemical change, although this change may be (and with some ferments probably is) a cycle of changes which always brings back the reagent to its original condition.

Of all the multitude of chemical processes which fall under our heading, vinous fermentation is the one which is by far the best known and most satisfactorily explained ; and it is scarcely an exaggeration to say that the present science of the whole subject has been evolved from the study of that particular case. Hence the best course that we can adopt in this article is to begin with a popular exposition of the growth of our knowledge of vinous fermentation, which may familiarize even the general reader with the main points of the whole subject, and then to append a short epitome of the facts concerning the more important of the different fermentative changes.

Vinous fermentation means that peculiar change which all native sacchariferous juices are liable to undergo when left to themselves at the ordinary temperature, aud which results in the formation of some kind of “wine.” The general course of the phenomena being the same in all cases, we shall assume in what follows that it is grape juice we have to deal with. Such juice, as is well known, when recently prepared, forms an intensely sweet yellowish liquid, which, if it is not so by nature, may be rendered perfectly limpid and transpareut by filtration through bibulous paper. Grape juice when left to itself, after having been thus clarified, may remain unchanged for an indefinite time, but when mixed with ever so little of unfiltered juice, it is sure sooner or later to undergo a change, which manifests itself ies appearance of a turbidity in the liquid. This tur- _ ‘i s pa two causes, namely, (1) the evolution of Goel eed or the formation within the liquid of a Garay Kops in i » which, through the gas-evolution, is aee00H aud Wit bay, partly thrown up to the surface

? 1s known by the name of “veast.” The am from an almost imperceptible beginning, gradually evelops into a more and more vivid effervescence (which

not unfrequently assumes the character of a violent ebulli- tion), the yeast at the same time becoming more and more abundant; and when a sufficient quantity of “must” is oper- ated on, the temperature of the fermenting mass soon rises perceptibly beyond that of the surrounding air. Sooner or later of course the reaction reaches a climax, from which onwards it gradually loses in intensity until at last it dies out. ‘The yeast then settles down asa slimy deposit, above which there is left a clear yellow liquid, which, instead of the originally sweet, now has a “ vinous” taste, and is en- dowed with that well-known physiological action character- istic of “fermented liquors.” Chemically the change in the nature of the liquid consists substantially in this, that the sugar has mostly or perhaps wholly disappeared, and given place to a corresponding percentage of a volatile in- flammable liquid called alcohol. To any one who has a real knowledge of these facts it must necessarily suggest itself as a highly probable hypothesis that it is the destroyed sugar which has furnished the ingredients for the formation of the carbonic acid and of the alcohol, while most persons will be inclined to look upon the yeast as a bye product formed from the secondary constituents of the juices.

This view, which is endorsed substantially by our present knowledge of the matter, one is inclined to think should have forced itself even at the earliest times upon the minds all who reasoned on the process as a material meta- morphosis. But although now-a-days everybody looks almost instinctively upon chemical reactions as nothing more than rearrangements of the ultimate ingredients of the bodies concerned, which ingredients in themselves are, as a matter of course, assumed to be uncreatable and inde- structible, we must not forget that this notion dates back only to the time of Boyle, and that is not much longer than air, and gases generally, have been recognized as species of weighable matter. Hence for many centuries the carbonic acid was not recoguized even by chemists as forming a fac- tor in the chemical reaction; it was known only as an effervescence, a

phenomenon pure and simple, not as a sub- stance. Van Helmont (born in 1577) was the first to show that the gas which rises from fermenting “must” is dif ferent from air, and identical with the gas sylvestre formed in the combustion of charcoal and in the calcination of lime- stone. Long before Van Helmont’s time, the “alcohol” had been recognized as a definite kind of matter. The art of concentrating the intoxicating principle of wine by dis- tillation, in fact, was known and practised industrially in the 8th century ; and nobody could practise this art with- out finding out thata spirit can be strengthened by repeated distillations, with elimination of water. But it was only about the 13th century that chemists learned to remove all the water from spirits of wine, and thus to prepare “absolute,” that is, pure alcohol.

Ordinary cane sugar and honey were known to the ancients; and chemists from the earliest times took it for granted that these two substances and the sweet principles in fruit juices must be closely related to one another. It is also an old experience that cane sugar or honey when added to grape juice ferments with the sugar originally present in the latter. But the idea that the differences be- tween the several kinds of sugar are owing to the existence of a number of distinct chemical species is comparatively new, and it is only in the course of the present century that the problem of isolating these several species has been satisfactorily solved.

But to return to our proposition ; plausible as it is as an hypothesis, to be able to test even its potential correct: ness, we must know the weights of alcohol and carbonic acid produced in the fermentation of a given weight of sugar, and know also the quantitative elementary compositions of the three substances. Lavoisier was the first to make ex-

periments for supplying these data, which, in fact, could not reasonably have been attempted by anybody before him, as it is he to whom we owe our knowledge of the qualitative elementary composition of the substances con- cerned, and indeed of organic substances generally.

Before giving his numbers, it may be stated that he re- garded acetic acid (a small quantity of which is present in most wines) as, like aleohol and carbonic acid, a constant product of vinous fermentation. According to Lavoisier, 95°9 parts of cane sugar in fermenting yield

PCO I ov ccc ei sssecccettessvec’s aoe (GTASOMITOMACTUNS. occ ccsccs ccs ssersscnesnss 35°38 Again 0 ee Ros ONe RES 2°5

95°d

And according to his elementary analysis of these sub- stances, the proportions by weight are—

Carbon. Hydrogen. Oxygen, In 35°83 of carbonic acid …. 9°9 nil 25°4 mes7 7 of aleohol …..... 16°7 9°6 81°4 In 2°5 of acetic acid …..... 0°6 0:2 17

Gay Sa 9°8 58°5 ies Soi supar …..... 26°8 77 61°4

From these numbers Lavoisier concluded (and he was quite justified in doing so, considering the imperfections of his methods of analysis) that sugar in fermenting simply breaks up into these three substances, without any access of matter from without. But if he thus managed to arrive at what we now know to be a substantially correct conclusion, this can be credited to him (if at all) only as a happy stroke of divinatory genius, as his numbers are all of them mon- strously incorrect, the errors going far beyond what even, with his necessarily imperfect method, could be tolerated as “observational errors.” Lavoisier’s numbers were sub- sequently corrected by Gay-Lussac according to his own analyses of sugar, alcohol, and carbonic acid. His results, which have remained unimpugned to the present day, may be stated, with substantial correctness, to have been as follows :—

In vinous fermentation very nearly one-third of the carbon goes off as carbonic acid, while the rest passes into the al- cohol; and reducing to 1, 2, and 3 parts of carbon, we have

Carbon. Hydrogen. Oxygen. Sum.

n carbonic acid ……. i mil 2.667) — 3.667,

MMVALCOROl …2.000+..0.0e 2 + 05 + 1:°333 = 3:833 DOUTEISE: secisnis. «++ 3 0°5 AG es

Found in cane sugar… 3 0°458 3°667 = 7:°125

The agreement being by no means satisfactory, Gay- Lussac suspected that his analyses of sugar were infected with unobserved errors, and he corrected his figures so as to make them agree with those given above opposite to “Suis.” These values, when measured by the customary units (namely C for twelve parts of carbon, H for one part of hydrogen, O for sixteen parts of oxygen), assign to sugar the very simple formula C,H,O, leading to an equally simple equation for the reaction, which is :—

. 6x(CH,0) = C,H,,0, = 2C,H,O + 2C0,; %.€., 180 of sugar gives 2× 46 of aleohol +2 × 44 of carbonic acid g eer 23 3? 2 3 + 22 33 3?

This equation is still looked upon as substantially correct, though not in Gay-Lussae’s sense. It is so, if by sugar we understand either of the two kinds of “glucose” which form the bulk of the sweetening principles in fruit juices, and which are composed according to the formula C,H,,0,. Cane Sugar, as Dumas and Boullay showed, really has the com- Position following from Gay-Lussac’s analysis, which, as 18 easily seen, corresponds to the formula Cy.H 901, = 2C;H,,0, — H,0, where H,O means the elements of 18 parts of water ; and these 18 parts of water, as Dumas and Boullay showed, actually are taken up in the fermentation of C,,H,.0,, = 324 parts of cane sugar,

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Gay-Lussac’s equation being, as we said, only substan- tially correct, we must now state the qualifications implied. Schmidt of Dorpat found in 1847 that vinous fermentation always results in the formation of small quantities of suc- cinic acid. Guerin Vary showed, by quantitative experi- ments, that in the fermentation of glucose the alcohol and carbonic acid produced

account only for about 96:3 per cent. of the glucose. And the present writer happens to know that a certain German apothecary made the interesting discovery that wines, beside the unfermented remnant of glucose that may be left, may contain an unfermentable sweet principle which he recognized as glycerine. These observations, however, were little heeded until Pasteur, in a now classical memoir, proved that glycerine and succinic acid are constant products of normal vinous fermentation, the correct balance sheet of the reaction, according to him, being as follows :—190 parts of cane sugar, in fermenting, pass into 105:4 parts of glucose, which then break up, yielding (approximately) of

EN IGA) Li Se a a ee eae RE SE 511 @arbomicgaeid… ....

SUN, cae ERR snes 105°4

But even this is not quite an exhaustive statement, a small portion of the sugar always passing into the form of higher alcohols (“ fusel-oil”) and compound ethers.

Vinous fermentation, then, isa far more complex reaction than Gay-Lussac imagined ; but it still remains true that all the products formed are derived from the dissociation of the sugar. What is it that brings about this singular de- composition? We call it a singular reaction, because it is one which sugar has never been seen to undergo when sub- jected by itself or as an aqueous solution to the action of heat or electricity or any ordinary reagent. And we have theoretical grounds for presuming that the reaction is not likely ever to be realized by some “reagent” that has not yet been tried. According to many experiences, an arithmetically possible reaction is the more likely to be realized the greater.the heat evolution which, supposing it were realized, it would involve. Now, the reaction formu- lated in Gay-Lussac’s equation C,H,,0,= 2CO, + 2C,H,0, as Professor, Dewar pointed out some years ago, supposing dry sugar could be made thus to split np, would yield only an insignificant amount of heat, if any. Actual fermentation does involve a liberation of heat, as we know, but the quan- tity of heat per unit weight of sugar destroyed, according to Dewar’s experiments, amounts ouly to about 83 heat-units, which can be accounted for as being produced by the hydra- tion of the alcohol formed, and, at any rate, is too small to characterize the decomposition of sugar into carbonic acid and alcohol as

being at all of itself a probable reaction. Even the somewhat higher result previously arrived at by Dubrunfaut, namely, 135 heat-units per unit of sugar, can- not affect this conclusion. Before going further let us take an exact survey, from the chemical standpoint, of the con- ditions which are known to favour or impede the actual process.

(1.) Pure solutions of cane sugar or glucose do not ferment undcr any circumstances.

(2.) Many kinds of impure sugar solutions, such as grape juice, brewers' wort, &c., do ferment. The range of temperatures most favourable to this process lies between about 20° and 24° C. (or 68° and 75° F.). But even grape juice does not ferment at temperatures lying too close to the freezing-point, nor does it ferment at tempera- tures exceeding a certain limit, which liesat about 60° C. (140° F.). The most lively fermentation comes to a stop when the liquid is boiled, and, after cooling, it takes a longer or shorter time before it resumes.

(3.) Grape juice which has been strengthened by evaporation or addition of sugar from without, does not ferment, when the ratio of water to sugar falls below a certain limit-valne.

(4.) Fermentation is impeded and may be entirely stopped by addition of alcohol. Hence the wines produced from the rich juices of southern grapes always contain unfermented sugar.

(5.) Fermentation may be stopped more or less completely by addition to the liquid of even small quantities of certain reagents called antiseptics. Of these corrosive sublimate (and many other heavy metallic salts), sulphuric acid, sulphurous acid, bisulphide of carbon, and carbolic acid may be mentioned as examples.

(6.) Perfectly pure grape juice does not ferment, unless the pro- cess has been started by at least temporary contact with ordinary air. This cardinal fact was discovered by Gay-Lussac in a now classical series of experiments. He caused clean grapes to ascend through the mercury of a large barometer

into the Toricellian vacuum, where he crushed them by means of the mercurial column. The juice thus produced and preserved remained unchanged; but the addition to it of ever so small an air-bell (as a rule) induced fermentation, which, when once started, was always found to take care of itself. . ;

(7.) Ordinary vinous fermentation always involves the formation of yeast. This is the most important of positive facts made out.

(8.) The rate at which a fermentation progresses is (in a limited sense) determined by the quantity of yeast present within the liquid. – (9.) Spontaneous fermentation of grape juice is always slow in beginning ; addition of yeast from without starts it immediately.

From these facts it is legitimate to conclude that it is the yeast or some constituent of the yeast which somehow or other causes the sugar to break up into alcohol, carbonic acid, glycerine, and succinic acid. But what is the rationale of the action? Chemically speaking, it would ap- pear to be vain to attempt an answer without first knowing what yeast is made of in the chemical sense. Unfortu- nately the present state of our knowledge on this point is very unsatisfactory. All we know is that yeast is a highly complex mixture of chemical substances which may be arranged under the four heads of—(1) fats (forming about 2 per cent. of the whole); (2) cellulose (about 18 per cent.) ; (3) nitrogenous substances more or less closely allied to white of egg, some of them soluble, some insoluble in water (about 60 per cent.); (4) incombustible salts, which, when the yeast is burned, remain as “ash” (about 7 per cent.), According to Mitscherlich’s analysis, yeast-ash cousists mainly of phosphoric acid (54 to 59 per cent.), united with potash (28 to 40 per cent.), magnesia (6 to 8 per cent.), and lime (1 to 4 per cent.). That such a complex mixture should act, chemically, as a whole cannot reasonably be assumed ; chemists, accordingly, have always been unani- mous in thinking that it is some one constituent or set of constituents of the yeast which constitutes the characteristic reagent in vinous fermentation; but none of them has suc- ceeded in isolating that reagent. The only clue in this respect which we have is an important discovery of Mitscherlich’s, who showed that an aqueonsextract of yeast, although capable of converting cane-sugar into glucose, does not induce fermentation in the glucose

formed, whence it at once follows that the ferment must be sougnot for amongst the insoluble portion of the yeast. |

Their nou-success in isolating the vinous ferment did not prevent chemists from speculating on its mode of action. Berzelius gave it as his opinion (which was adopted by Mitscherlich and others of the leading chemists) that the action was a purely “catalytic” one. What he meant by this is best explained by an example. Peroxide of hydro- gen (a compound of the elements of water and oxygen) is perfectly stable at ordinary temperatures. Add to it a mere speck of platinum black (a peculiar form of finely divided platinum), and it at once breaks up into water and oxygen, the platinum which caused the decomposition remaining unchanged. In an exactly similar manner = is pone acted upon the sugar, and caused a evel ae me we a and a acid. The merit on Bpapent y reduced the explanation

y complex to that of an undoubtedly simpler phenomenon. But unfortunately neither Berzelius nor any of his followers succeeded in proving the objective existence

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of the analogy by experimental evidence. Hence Berzeliug’s theory really amounted to no more than showing that vinous fermentation and the “catalytic” reactions of inorganic chemistry were both unexplained phenomena.

Something far ore worthy of the name of a theory had been offered 200 years before by Stahl. The originator of the phlogiston theory justly divined that vinous fermenta- tion and putrefaction are phenomena of the same order, and, starting from the well-known infectious nature of the latter, explained both as disturbances in the “molecules” of the fermenting body, brought about by a pre-existing mole- cular motion. ‘“ Ein Korper der in der Faulung begriffen ist bringet in einem anderen von der Faulung annoch befreiten selir leichtlich die Verderbung zu Wege, ja es kann ein solcher, bereits in innerer Bewegung begriffener Korper einen anderen annoch ruhigen, jedoch zu sothaner Bewe- gung geneigten sehr leicht in eine solche innere Bewegung hineiureissen.” ;

These ideas of Stahl’s, at the time of Berzelius’s catalytic

theory, had long been forgotten, and they remained lost to science until they were revived and brought into a more definite form by Justus Liebig, who, in a powerful and com- prehensive memoir on fermentative clianges, which he pub- lished in 1848, used them as the basis of a new theory of these phenomena, which justly attracted universal attention, as it—or rather the wonderfully lucid memoir which embodied it—exhibited the subject in a clearer light than anything else that had been said or written on it before. With Liebig as with Stahl, all “ fermentations” and “ putrefactious” are analogous phenomena. Putrefactions are owing mainly. to the inherent instability of the albuminoid constituents of the respective substances in presence of water. So unstable are these albuminoids that even al incipient oxidation (see Gay-Lussac’s experiment) may suffice to disturb their chemical equilibrium to such an extent as to cause the whole of the atoms of the mass to gradually rearrange themselves into new products of lesser complexity and consequently higher stability. The decom- position when once started, readily propagates itself through the whole mass, aided as it is by the inhereut tendency of ° the molecule to pass into more highly stable forms, just as a stone which rolls down a hill and strikes other stones on its way causes thei to roll down likewise. This isso clear and plausible as almost to command assent. It is less easy to agree with Liebig when he tries to explain fermentation, when he says, for instance, that the sugar in grape juice, although not naturally gravitating towards a rearrangement as alcohol plus carbonic acid, is nevertheless caused to undergo this change by its immediate contact with the albuminoids of the juice or yeast, which are in a state of atomic commotion; and it is still less easy to see how such an atomic revolution could progress from sugar to sugar, as he says it may. That the nitrogenous matters of the juice, in all ordinary cases of vinous fermentation, assume the form of yeast, is, according to Liebig, a purely accidental phenomenon, and, if yeast is so characteristically powerful as a ferment, it is so only through its consisting largely of exceptionally unstable albuminoid substances. _ Liebig’s ideas, more perhaps through the brilliancy of his mode of exposition than the force of his arguments, took firm hold of the scientific mind of the time ; amongst chemists at least the general impression was, and it prevailed for a considerable time, that Liebig’s theory in a satisfac- tory manner summed up the whole of the

empirical know- ledge of the subject—although it totally ignored at least one most important feature in the phenomena which had been brought out and firmly established by Schwann and Cagniard-Latour.

In 1680 a Dutch philosopher, Leuwenhoek, fell upon

examining yeast under the microscope, and found it to comes

sist of minute globular or ovoid particles. Microscopes in his time were very imperfect or he would have made a great discovery. Schwann and Cagniard-Latour, who (about 1838, and independently of each other) resumed the old Dutchman's inquiry, used the better instruments of their time, and discovered that Leuwenhock's globules are membranous bags, which exhibit all the morphologic char- acteristics of vegetable cells, and, like these, when brought under the proper conditions, increase and multiply in the biologic sense. Taking this together with the long known fact that in vinous fermentation the yeast increases as the process progresses, they naturally concluded that yeast is a species of plant, and that it is the life of that plant which somehow or other causes the chemical change. It is the special merit of Schwann to have adduced powerful experi- mental evidence in favour of this view. In his case, the observations on yeast were incidental only to a more com- prehensive investigation, the original aim of which had been to solve the great question of spontaneous generation. Pro- cesses of putrefaction having long been known to be invari- ably accompanied by the formation of vibriones and other microscopic organisms endowed with voluntary motion, he prepared infusions of flesh and other putrescible matters in glass flasks, and, after having hermetically closed these, ex- them for a time to the heat of boiling water, so as to

estroy every trace of living germs that might be present. The contents, when preserved in that condition for ever so long, showed no sign of putrefaction or of life of any kind. But when exposed to the air they did putrefy, and soon swarmed with living organisms of various kinds. Obvi- ously it was the air which caused this two-fold change. Bat then the air which had been shut-up with the infusions did not act. This, however, might have been owing to an absorption of the oxygen by the juices. Schwann therefore, in

another set of experiments, allowed the boiled (and con- sequently germless) infusions to communicate freely with the atmosphere, insuch a manner, however, that no particle of air could enter the flasks without having first passed through a red-hot glass tube, and thus been freed from any germs that might float about in it. In this case the air had fair play in a chemical sense, but yet, not only did no life of any kind make its appearance, but even the chemical changes failed to set in. Exactly similar results were ob- tained by Schwann in experiments with grape juice, whether previously mixed or not with yeast. Gay-Lussac's famous experiment failed when the air-bell, before being admitted to the juice, had been heated, and thus freed from living germs. In a few of these experiments, it is true, the re- sults were contradictory to the general evidence afforded by the rest of the work. But Schwann had no doubt in his mind about the close analogy between vinous fermentation and putrefaction ; and as the putrefaction experiments had all given one and the same answer, he explained these ano- malies as having been caused by unobserved slips in the respective experiments, and did not admit them to invali- date his general proposition that both putrefaction and fer- mentation are inseparably connected with characteristic biologic phenomena ;—the less so, as his experimeuts on the action of certain antiseptics had shown that what is an

antiseptic" to a fermentative change is a poison to the Organisms characteristic of the case. Thus, for instance, he found that white arsenic! and corrosive sublimate, being Poisonous to both plants aud animals, stop both putrefac- tion and fermentation ; while extract of nux vomica, being destructive of animal but not of vegetable life, prevents putrefaction, but does not interfere with vinous fermenta- tion, The mechanism of the latter process he imagined to

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1 F —— to Schutzenberger, who, however, does not quote his rity, arsenious acid does not impede vinous fermentation.

consist probably in this, that tlie “ sugar-fungus” (the yeast) lives at the expense of the nitrogenous matters and of the sugar of the juice, and that those of the elements of these substances which the plant does not assimilate are elimi- nated chiefly as alcohol. This special theory of Schwann’s, as the reader is aware, is not quite correct, but it does not affect his general views on the phenomenon, which were fully confirmed by subsequent investigators. Amongst these we may mention Helmholtz, who showed that oxygen evolved by electrolysis from water does not, like air, induce vinous fermentation. The same observer showed that boiled grape juice, when tied up in a bladder, does not ferment, even when suspended within a tub full of fermenting juice. The evidence afforded by this experiment was considerably strengthened by Mitscherlich, who proved that even a septum of filter paper effectually stops the propagation of the reac- tion. More striking still isan experiment which was made, many years later, by H. Hoffmann. He took a test-tube full of sugar water, and by a plug of cotton wool inserted within it divided the liquid into two parts. To the upper part he added yeast, which of course induced fermentation there ; but the change did not propagate itself through the cotton wool to the lower portion. ‘The same material had done good service some years before in the hands of Schroder and Dusch, who proved in 1854, by a most extensive series of experiments, that the something in air which enables it to start fermentative changes in boiled infusions of meat or malt, in grape juice, &c., can be effectually removed by fil- tration of the air through cotton woul. It is true the “&c.” here does not include milk, which they found to turn sour in filtered as well as in ordinary air, but this exception was subsequently explained away by Pasteur, who found that germs immersed in alkaline liquids may survive tempera- tures considerably higher than 100° C,

A number of other important researches, which led to substantially similar results, must be passed over here, and may be, because what we have quoted has never been dis- proved, and is consequently quite sufficient to show that, in the case of vinous fermentation and putrefaction at any rate, those atomic motions, which, according to Liebig, cause the disintegration of the fermenting substances,—if the notion is to be maintained at all,—- cannot be admitted to have an existence outside the living bodies of certain organisms characteristi¢ of the respective changes. To any unpre- judiced

person this would appear to be sound logic; but Liebig did not see it, and for a long time he had the majority of chemists at least on his side. No reasonable person could have denied the irresistible force of the argu- ments of Schwann and his followers; but these chemists somehow or other managed to ignore the facts, until Pasteur, by means of a most thorougli and extensive experi- mental research (of which the principal portions were published from 1857 to 1861), simply forced the attention of everybody to the physiological side of the subject, and, by absolutely unimpeachable evidence, proved that Schwann's views are substantially correct. Of this investigation it is impossible to speak otherwise than in terms of the highest admiration. Even the purely critical portion of Pasteur's work would be enough to immortalize hisname He did the whole of the work of Schwann and the rest of his pre- decessors over again, modifying and perfecting the experi- mental methods, so as to silence any objection or doubt that might possibly be raised, repeating and multiplying his experiments until every proposition was firmly esta- blished. But his work was synthetical as well as analyti- cal. Some of his discoveries will be noticed below ; suffice it here to mention one of the general results which he arrived at. Vinous fermentation is only one of a number of fermen- tative changes to which sugar is liable. The same substance | sugar, which, when placed under certain conditions, breaks

up into alcohol and carbonic acid, under certain other sets of conditions ferments into lactic acid, or through lactic into butyric acid, or into gum plus mannite. This has long been known. What Pasteur showed is that each of these changes is the exclusive function of a certain species (or at least genus) of organism. What the yeast plant is for vinous a certain other organism is for lactic, a third for mannitic, a fourth for butyric fermentation. No two of these species, even if they belong to the same genus, will ever pass into each other. Pasteur arrived at this great generalization by means of his invention of an ingenious method for cultivating pure growths of the several species, so that each of them could be examined separately for its chemi- cal functions. To explain the method, let us suppose we wanted an unmixed growth of the species of yeast-plant called Saccharomyces cerevisie. The first step of course is ta procure a specimen of yeast which,

when examined under the microscope, proves a fair approximation to what is wanted. This being done, we place a quantity of brewers'

wort in a flask provided with two necks, one long and very |

narrow and bent like a gas-evolution tube, the other short and wide like the tubulus of a retort. We boil the wort in the flask to kill the germs, and during the boiling close first the tubulus by means of a (germless) glass stopper, then the narrow tube by means of a previously ignited plug of asbestos. We now allow the flask to cool down slowly, and by exposing it for several days to the proper

temperature make sure that there is no potential life in—

our medium. We then, by means of a thin platinum wire, introduce a speck of the yeast through the tubulus, which, of course, is stopped up again without delay. We then place the flask ina chamber kept at the particular tempera-

ture which is most favourable to the development of |

saccharomyces." The saccharomyces-cells, being in the majority and enjoying a position of advantage, will multiply at a greater rate than the foreign cells, of which many in fact will go to the wall, so that what we ultimately obtain is a closer approximation to pure saccharomyces than the speck of yeast which we used as seed, and which, in general, was already a little better (in all probability) than the bulk of the yeast it came from. Of the relatively pure yeast we now again take a speck and sow it in a fresh supply of germless wort, and so on until the foreign cells can be assumed to be " Darwinized" out of existence. This method of Pasteur's, apart from its scientific value, is of the greatess practical importance; supposing it to be carried out ou a large scale—which, in fact, has been done with some measure of success—it will enable the brewer to grow and use pure saccharomyces, and thus ta avoid all the many ' diseaseg" which beer, as brewed with ordinary yeast, is liable ta.

After Pasteur's researches it became impassible not to admit that those fermentative changes which he investi- gates are, at least in a practical

sense, physiological and not purely chemical phenomena ; but there appears to be no necessity for assuming, as many do, that it is the life of those minute organisms, qua life, which directly causes the phenomena. Jt seems far more rational and philosopliic to adopt the view taken by Berthelot and Hoppe-Seyler, who go no further than to admit that those living organisms are the only known sources for the ferments proper, which in themselves are chemical substances pure and simple.

Proceeding now to give a short account of the different fermentative changes, we begin with those that are proved to be functions of purely chemical reagents.

A. Fermentations proved to be purely chemical reactions.

These are conveniently arranged according to the respective cata- lytic agents.

1. Aetds.—Many organie substances, when boiled with water and a small quantity of sulphuric, muriatic, or other strong mineral

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acid, undergo hydration and decomposition, or other chemical trans. mutation, the acid remaining ultimately in its original condition. Thus, under the circumstances named,—

(1.) Cane sugar is ‘‘inverted,” 7.e., converted into dextrose and levulose, thus :

Oy2H.00;, + H,O CeH 120g + CeHy.0,.

(2.) The same equation applies to the case of milk sugar, one of the products C,H,,0, in this case being a peculiar substance called ** galactose.”

a! Starch passes into dextrine (a kind of gum) and dextrose, thus: CoH On + 3H,0 CoH 0; + 8CgH1.0¢ Starch. Water. Dextrine. Dextrose.

(4.) Salicine (a bitter principle in willow bark) breaks up into glucose and ‘‘saligenine,” thus :

Cy3H),0, + H,O CgH}.0g + C/H,0, Salicine. Giucose. Saligenine,

Many other ‘‘ glucosides” (native substances containing potential glucose) behave in a similar manner. The exact mechanism of these reactions is scarcely understood ; pending exact investigations, they may be explained, according to Lyon Playfair, by a tendency of the acid to combine with the elements of one of the products, which tendency, althongh sufficient to sever these elements from the rest, is defeated ultimately by the stability of the compound formed by their union with one another.

2. Diastase is a peculiar substance which is formed in the ger- mination of grain (in malting), and which has the power of convert- ing many times its weight of starch into dextrine and dextrose when madc to act on it in the presence of water at about 66° C, Diastase has not yet been isolated in the pure state. In the process referred to it is changed ; but it is not known into what,

8. Emulsineis a constituent of almonds (both of bitter and sweet),

| which is known chiefly for its power of deconiposing amygdaline

| above fermentative change.

(a crystalline substance contained in bitter almonds, and extractable therefrom by alcohol), with formation of bitter-almond oil and glucose, thus:

CopHeyNO, + 2H,O = 2C,H,.0, + C,H,O.NCH

Amygdaliné. Glucose. Volatile oil,

The oil, as the formula shows, is a (loose) compound of prussic acid, NCH, and benzaldehyde, C,H,O. The common idea that bitter almonds contain prussic acid is erroneous ; that acid, like the benzaldehyde, is present only potentially, viz., as amygdaline, which, when the almond meal is treated with water, undergoes the Many other glucosides are decomposed by emulsine, as they are by dilute acids. It may be said, in pass- ing, that the acrid volatile oil contained in table-mustard is not found ready formed in

the mustard seed, but is produced from a constituent of the seed by a fermentative action closely analogous to that we have just been explaining.

4. Soluble Yeast Ferment.—It has already been stated that an aqueous extract of yeast, though devoid of the power of inducing vinous fermentation, converts cane sugar into dextrose and levulose, The ferment, as Berthelot showed, can be precipitated from the liquid, in an impure state, by addition of alcohol,

5. Pepsine.—Stomach digestion (in man and animals nearly re- lated to man) consists mainly in this that the gastric jnice dis- solves the albuminoids of the food, as hydrochlorates of peptones, the only form, it seems, in which they can be assimilated by the system. The juice owes this power to the presence in it of small percentages of two things, namely, of free hydrochloric acid and of ‘* pepsine,’’ both of which are continuously produced by the mucous membrane. Real pepsine has never been seen; but an impure substance, possessing the specific properties of the ferment, can be extracted from the mucous membrane of the stomach by a laborious process which we have no space to describe, Highly dilute hydrochloric acid alone dissolves ¢ertain albuminoids, but it does not convert them into peptones ; it acquires this property by the addition to it of a small quantity of the preparation named. It is as well to state in passing, that the so-called pepsine of the pharmaceutist is only a very poor apology for even the pepsine of the physiological chemist.

6. Panereatine.—What pepsine is to the gastric juice pancreatine is to the secretion of the pancreas gland, whose function it is to digest the starchy and fatty portions of the food. This ‘‘ pancrea- tine’’ seems to include three ferments, namely, a kind of diastase (see above), a ferment similar in its functions to pepsine, and a fer- ment which has the power of converting fats into fatty acids and glycerine. None of these has been isolated.

7. Erythrozume.—This is a peculiar ferment which Edward Schunck, in 1854, extracted from madder-root, and which was found by him to possess the power of inducing vinous fermentation in solutions of sugar,—a most important discovery, which ought to be further investigated.

Wote.—AHl these ferments, the acids of course excepted, lose their

efficacy at temperatures near 100° C. in presence of water. In the dry state they may survive boiling heat.

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B. Fermentations which are known only as Physiological Processcs.

1 Vinous Fermentation.—This case having: already been con- sidered, we confine ourselves here to a few additions and qualifica- tions. Vinous fermentation, as we see it going on in the brewers' vats and in the wine-producers' casks, is a function of Saccha- romyces, a genus of fungi, consisting of minute cells, which sometimes are isolated from one another, sometimes grouped to- gether in a variety of forms, but never united into an organized tissue. 'There is a variety of species, of which 8. cerevisice (the main constituent of ordinary yeast, as produced in the high fermen- tation of beer) is the most important. It consists of cells of about thr millimetre diameter. According to Pasteur, saccharomyces thrives best when immersed in grape juice or wort, or similar liquids. It multiplies only by budding, never by sporification. In pure sugar-water it lives, so to say, at its own expense, and gradually becomes exhausted ; but on addition of phosphates (yeast-ash works best) and ammonia salt to the sugar, the plant thrives as well almost as in native sugar juices. When saccharomyces is not fully immersed in the liquor, and otherwise constrained to live undcr abnormal conditions, it passes into "aerobiotic" forms which are similar to mucors and mucedos (mould plants), and which, like these, live on atmospheric oxygen. But these abnormal forms, when re- immersed in wort, &c., always rclapse into the non-aerobiotic form of saccharomyces. Real mucedos, &c., for instance Mycoderma vini and cerevisie, which by nature are aerobiotic, when immersed in wort or grape juice, aud thus placed in what to them is an abnormal condition, assume non-aerobiotic forms, and produce vinous fermenta- tion, but (coutrary to what was formerly assumed by Pasteur himself) they are never converted into saccharomyces, and their fermentative

ower soon comes to an end, unless they are occasionally revived i re-exposure to the atmosphere.

The power of inducing vinous fermentation, however, is by no means confined to microscopic organisms. It has long been known, from the experiments of Débereiner and others, that sweet fruit, when kept within an inert atmosphere devoid of free oxygen, evolves carbonic acid with formation of alcohol, and it has been proved by Pasteur that this fermentation, which may extend toa considerable portion of the sugar present, is not accompanied by the development of any microscopic species. Closely related to this fact is the well-established experience that large quantities of sugar may be made to ferment by means of yeast without the latter multiplying to any noteworthy extent. On the other hand, large growths of yeast may be obtained (and as a matter of fact are obtained every day by the makers of German barm) without pro- ducing much alcohol. Oskar Brefeld, by means of a peculiar arti- fice, succeeded in growing saccharomyces in brewers' wort, without producing a trace of alcohol. From these experiences we must conclude that vinous fermentation, far from being the characteristic life-function of healthy saccharomyces, is dependent on a certain pathologic condition of "'non-photobiotic'' plant-cells (é.e., cells which habitually live in darkness) generally, which is brought about by immersing them in sacchariferous fluids and shutting them out from the oxygen-gas, which they need for their healthy development. Hence, even in the ordinary cases of fermentation, the normal life of the yeast-plant on the one hand, and the dis- Sociation of the sugar on the other, are not only not necessarily re- lated, but, in the individual cell, positively exclude each other. Tn any iven mass of yeast, healthy cells and diseased cells are in general mixed up together, and thus, in practice, the two pheno- mena come to be accidental concomitants. But this brings us back almost Precisely to the later views of Liebig, as set forth in his last memoir on the subject.

In regard to the genesis of the yeast plant little is known. According to Pasteur's experiments and observations the yeast which forms Spontaneously in grape juice is derived chiefly from certain germs which abound about harvest time on the grapes, and a wore on the grape-stalks. These germs are largely diffused eo eae atmosphere of breweries, wine cellars, and labora- teri ére fermentation experiments are carried on, but they are

y any means widely diffused through the atmosphere generally.

2. Lactic Fermentation. —Milk when left to itselfin warm weather, me knows, soon turns sour, the main feature in the

muical Process being the transmutation of the milk sugar into lactic acid, as expressed by the equation

C,.H..0,,.H = (Hydrated Mik =. p03 605, The milk sugar, before assuming the form of lactic acid, probably pases through the condition of glucose. At any rate, ordinary a when dissolved in milk, ferments into lactic acid along with

- milk sugar originally present. But in this case, if the total

’ Centage of sugar gocs beyond a certain limit, the reaction comes ae aS soon as the acidity of the liquid has attained a certain of ae Addition of chalk or carbonate of soda, 7.¢., conversion Aig 4 acid into a neutral lactate, then revives the process. with a Httl Juvert-sugar (as produced by boiling cane sugar water € vitriol), when mixed with excess of chalk and some

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putrid cheese, and kept at 30°-85° C., soon ferments, with formation of large quantities of lactate of lime(Bensch). Laetic fermentation, according to Pasteur, is caused by the development in the mass of a Microscopic fungus, consisting of cylindrical cells which are far smaller than those of saccharomyces.. We are not aware that this ‘lactic ferment” has ever been seen in ordinary sour milk; in Bensch’s proeessit is produced largely as a greyish deposit on the chalk, from which pure growths of thie fungus may be obtained by Pasteur’s method (sce above). The lactic ferment, to the annoyance of brewers, frequently occurs in ordinary yeast as an impurity.

There is no doubt that that fungus which Pasteur calls the lactic ferment is capable of inducing lactic fermentation ; but it does not by any means follow that it is the thing which actually causes the souring of milk under ordinary circumstances. On the con- trary, from a remarkable set of experiments made by Lister in 1873, this appears not to be the case.

According to him, milk can be completely purged of germs by exposing it (within a germ- less flask) to the temperature of boiling water for some hours, and, when protected against atmospheric germs by a slightly carbolized stopper of cotton wool, keeps sweet for an indefinite time. Specimens of such germless milk, when exposed to the atmosphere of his study, were found by Lister to undergo a variety of fermentative changes, accompanied sometimes by the development of an acid reaction, but none of them set into sour milk. A specimen of ordinary unboiled dairy milk when kept in the same room did get sour as usual, and, when examined under the miscroscope, was found to contain, not Pasteur's fungus, but a kind of motionless bacterium which Lister calls B. lactis, because the introduction of it (or rather of a trace of the sour milk containing it) into the germless milk determined normal lactic fermentation, the Bacterium lactis multiplying at the same time. The same bacterium, when made to pass successively through germless urine and other germless organic liquids, underwent a series of metamorphoses, but, when ultimately put back into milk, caused normal lactic fermentation. The germs of this bacterium must be assumed to abound in the atmosphere of cows' stables and dairies, although they do not seem to be abundantly diffused through the atmosphere generally.

3. Viscous Fermentation is a peculiar change which has long been known to occasionally accompany vinous fermentation, and which manifests itself in this that the wine becomes thick and viscous, so that, when poured from one vessel into another, it draws iuto long threads. This property is causcd by the presence of a kind of gum (of the composition C,,H,,0,9) which is invariably accompanied by mannite, a sweet crystalline substance of the composition C.H 405, (z.¢.containing the elements of glucose, CgH,,0,+ those of hydrogen, H,). The exact nature of the reaction is not established; in fact, we do not know whether it is one reaction or a set of reactions going on simultaneously. According to the usually adopted equation, 100 parts of cane sugar should yield 51 of mannite, 45:5 of gum, and 6 of carbonicacid. According to Péligot (supported by Pasteur) the ''viscous ferment" is a fungus consisting of very minute spherical cells (of 0:001 to 0°0014 millimetre diameter).

4. Butyric Fermentation.—In the lactic fermentation of glucose, as induced by milk or cheese in the presence of chalk, the lactate of lime is no sooner formed than it undergoes itself a further change, which, chemically, is represcuted approximately by the equation

2C,H,0, Cit. + SO. +. au.

Lactic acid. Butyric acid. Carbonic acid. Hydrogen gas.

The temperature most favourable to the change lies near 40° C. A number of similar changes (of other organic acids than lactic) are known, but they are passed over here, being of a more purely scientific interest. According to Pasteur, butyric fermentation is caused by the development in the mass of a special kind of vibrio, a worm-shaped animalcule, eonsisting of a number of longitudinal cells, each about 0°002 millimetre thick, and from 0°002 to 0°02 mm. long. Butyric fermentation, strictly speaking, is only one of a large genus of changes customarily summed up under the generic name of putrefaction. ‘ a

5. Putrefaction.—The scientific meaning of this term coincides pretty much with its popular aceeptation, except that it must be understood to be exclusiveof all cases of oxidation. In olden times it was assuined that organized matter (the tissues of plants and animals, blood corpuscles, &c.) could hold together even chemically only as long as supported by the vital force. But this is a long exploded notion. In absolute absence of water, or at very low temperatures, dead organized matter remains chemically (and even structurally) unchanged. In support of thisassertion we need only refer to that well known casc of the mammoth of the Siberian cave, which was found sweet and fresh thousands of years after the extinction of life. And since the time of Appert (who discovered the now so ex- tensively used process of preserving meats in sealed-up tins) we know that prolonged exposure to boiling heat and subscquent absolute exclusion of air prevent putrefaction, even in presence of liquid water and at the ordinary temperature, as long as the air remains excluded. Chemically speaking, ordinary putrefaction is a most complex phenomenon, always involving the simultaneous on-going

of a multiplicity of chemical reactions. A comparatively simple ease is the putrefaction of urine, which substantially eonsists In this that the urea, by assimilating water, passes into carbonate of ammonia, just as it does when heated by itself with pure water to high temperatures. In the case of animal tissues, which, broadly speaking, may be said to consist of fats and albuminoids, the latter always give way first. Their decomposition 1s a most complex set of successive reactions,—leueine, tyrosine, fatty acids, and many other things appearing as primary produets, ammonia, compound ammonias, sulphuretted hydrogen, hydrogen, and nitrogen as second- ary ones. Less rapidly, but none the less constantly, the fats are changed, being decomposed, in the first instanee, into fatty acids and glycerine, whieh latter undergoes further transmutations, while the former survive for a considerable time. The ‘‘adipocere” which is so well known as one of the constant ultimate products of the decay of dead bodies that have been kept from the air, and which consists of palmitate and stearate of lime (Hoppe-Seyler), well illustrates the high stability of fatty acids. Regarding the causes of putrefaction, we can scarcely do more than refer to what we have quoted from the researches of Schwann and his followers. From these researches two things are clear, namely, (1) that putrefaction is not pos- sible under conditions precluding the development of life, or, in other words, that there is no putrefaction where there is not at least potential life ; and (2) that in 999 out of a thousand cases this potential life assumes the actual form of bacteria and vibriones.* Putrefactions going on in presence of air are always accompanied by processes of oxidation, the effects of which are difficult to dif- ferentiate absolutely from those of putrefaction pure and simple.

C. Cases of Oxidation.

1. Acetous Fermentation is the best known of these. Every- body knows that weak fermented liquors, when exposed to the air, soon turn sour and ultimately become vinegar. The chemical re- action involved consists of two stages. In the first the alcohol in the liquor absorbs oxygen from the air, with formation of alde- hyde and water, according to the equation

CaO = “O° =” CW,0 = EEO. Alcohol. Aldehyde. Water. This aldehyde, however, in ordinary aeetous fermentation never actually appears, being at once oxidized by the direct action of the air into acetic acid, thus : C,H,0 + O = Aldehyde. These two reactions can be realized in all their chemical simpli- city, not, it is true, by oxygen-gas pure and simple, but easily by oxygen as condensed on platinum-black ; and as the deoxi- dized platinum-black readily reabsorbs oxygen from the air, a smal] quantity of this reagent suffices to oxidize large quantities of alcohol into acetic acid by means of atmospheric oxygen. Upon

C,H,0,

Acetic acid.

this observation of Dobereiner’s Schiitzenbach based a rapid and ,

practical method of vinegar-making, which consists in this, that the dilute alcohol is made to trickle through a tower of beech-wood shavings, packed into a tall barrel, constructed so as to draw in an ascending current of air. When a temperature of 20° C. is main- tained in the room, and the spirit introduced having a temperature of 26°, the temperature within the barrel is found to rise to 38°-40°, the heat being produced by the rapid oxidation of the aleohol into acetic acid. What, in the old method of vinegar-making, required weeks or months is thus accomplished in a day or even less. It is difficult to avoid the conclusion that in Schiitzenbach’s process the wood-shavings, besides serving to spread the alcohol over an immense surface, act exactly as the platinum-black does in Dober- einer’s experiment, condensing oxygen in their pores in order to hand it over to the alcohol. And, supposing this theory to be correct, the old process, which consists in exposing the wine to the air in half-filled tubs or casks, would appear to rest on the same principle,—the wood of the cask acting as the shavings do in Schiitzenbach’s process, only far more slowly. But then itis an old experience of vinegar-makers that the old processat least always involves the formation of two organized products, namely, that of a kind of mould which appears on the surface asa membrane, and goes by the name of ‘‘flowers of vinegar,” and that of a mucilaginous mass within the liquid, called ‘‘mother of vinegar ;” and it has always been admitted that the presence of these substances ma- terially accelerates the process of

oxidation. This, however, is no eontradiction to the theory ; it would only prove that the mould- membrane and the mucilaginous mass are more effective carriers of

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Baeteria are microseopie organisms, eomposed of two elongated eells united end to end, possessed of varied powers of motion, and almost without exception ‘rather in themselves reproduetive organs” (Lister) than beings possessed of powers of reproduction. The vibriones are seemingly nothing more than polymerized baeteria with intensified powers of locomotion. With regard to their position in the world of

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oxygen than the wood of the tub. Besides, in Schiitzenbach’s pro- cess, the shavings, aceording to experienee, work the better the freer they are of from organized deposits. Henee, one might say, with Liebig, that the effieacy of these substances is a function only of their physieal and chemieal condition, the presence of life in the mould plant being purely accidental and immaterial to the process, Aceording to Pasteur this view is a mistake. With hin it is the membranous mould on the surface of the fermenting liquid which hands the oxygen to the alcohol, and it does so only when it consists of living specimens of a certain species of mould-plant which he calls Myeoderma aceti. Other moulds or dead Mycoderma aceti do not work. Mother of vinegar, aecording to Pasteur, is the ‘‘non-aero- biotic’’ form of the mycoderma. Only the aerobiotic form acts, To keep it alive we must take care that the liquid contains the phos- phates and the albuminoids or ammonia, which it needs as food, But, if it is to produce vinegar, it must not be fed too liberally, beeause, when in a vigorous state of health, it oxidizes the alcohol into carbonic acid and water. If the oxidation is to stop at acetic acid, the mycoderma must be in a peculiar abnormal condition, which may be ensured by the presence in the liquid of a certain limit pereentage of

alcohol. In the case of Schiitzenbach's process, Pasteur maintains (in spite of apparently contrary experience) that it is the very same Mycoderma aceti which enables the wood shavings to act. One of his arguments is the acknowledged fact that Schiitzen- bach's towers require to be started with ordinary vinegar although they ean be worked with distilled spirits. A more powerful argu- ment he derives from the following experiment. A very slow current of dilute alcohol was caused to triekle down a long string suspended in a room kept at the most favourable temperature to acetous fermentation. The alcohol failed to assume an acid reaction. But the slightest coating of Mycoderma aceti attached to the string caused it to act exactly as the shavings do in the Schiitzenbach casks. After all, however, it is a little difficult to believe that the many pounds of aleohol whieh, in the course of a day, pass through a Schiitzenbach tower and come out below as acetic aeid, have all been under the direct influence of the few grains of Myeoderma aceli which a microscopist might hunt up amongst the wood shavings. lt appears far more rational to assume that the mycoderma acts only indirectly, perhaps by converting a small portion of the alcohol into aldehyde, whieh diffuses itself through the whole mass of the alcohol, and, through its inherent attraction for oxygen atoms, which is assisted by a similar tendency in the porous wood, reduces the stability in a far larger number of oxygen molecules than it needs itself, to such an extent that these so to say half-liberated oxygen atoms become available for the oxidation of alcohol, the more readily as the reaction itself involves a considerable liberation of energy.

2. Eremacausis.—Animal and vegetable matters, besides being liable to putrefy, are known, on exposure to air and water, to undergo a slow process of oxidation whieh ultimately converts them into products of simpler atomic constitution. Speaking quite generally, the proeess, in the case of wood and vegetable tissues generally, cou- sists in this, that the hydrogen is eliminated more and more com- pletely—most of it in the form of water, a small portion in the form of marsh gas (CH,), the rest of the carbon passing gradually into substances more and more closely allied to charcoal. In the caseof albuminoids eremacausis is always preceded and accompanied by putrefaction,—the most gencral effect of the former being that the aimonia produced by the latter is turned into nitrogen and water, cr, in the presence of basic substances, such as lime, carbonate of lime, carbonates of alkalies,

&c., is oxidized into nitrites and nitrates successively. This process of ‘‘nitrification” is going on in all porous soils and waters contaminated with nitrogenous organic matter, and, under favourable cireumstances, progresses at a great rate. Whew sewage is filtered through a bed of porous soil, the drainage waters are generally found almost free from ammonia, the whole of the nitrogen having been oxidized into nitrites and nitrates. Accord- ing to recent researehes by Schlosing and Miintz (which were con- firmed by Warrington) nitrification, like acetous fermentation, 1s determined by the presence in the soil of organized ferments, the chief arguments being that a purely inorganic soil does not act, at secondly, that nitrification in a soil is stopped, or at least very effectually checked, by antiseptic vapours such as those of bisul- phide of carbon, chloroform, and carbolic acid, (W. D.)

FERMO, the ancient Pirmum Picenum, an archiepisco- pal city of central Italy, and the chief town of a circle in the province of Ascoli Piceno, 34 miles 8. by E. of Ancona. From its situation on a rocky height it commands a splet- did prospect of the surrounding country, including a fine view of the Adriatic Sea, It is surrounded by old walls, and besides the cathedral possesses numerous churches and convents, a university, and two fine collections of statuary and paintings. The ruins of the ancient Roman town, which was destroyed in the 5th century, are still to be seem

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Lactantius and Galeazzo Sforza were born in Fermo. The port, Porto di Fermo, is situated on the Adriatic, about four miles from the town. The harbour is small, but there is some trade in corn, silk, and woollens. The population of Fermo in 1871 was 7002.

FERMOY, a market-town of Ireland, in the East Riding of the county of Cork, is about 21 miles distant from Cork, and about 130 miles from Dublin, and is connected with both these cities by the Fermoy branch of the Great Southern and Western Railway. It is situated on the river Black- water, which divides the town into two parts, the larger of which is on tle southern bank, and there the trade of the

town, which is chiefly in flour and agricultural produce, is |

mainly carried on. A stone bridge of 13 arches which formerly spanned the river, and which had been erected in 1689, was in the year 1866 removed, and replaced by one of strong cut stone. The town, which strikes the visitor as being exceedingly neat and clean, has several good streets, and some noteworthy buildings. Of the latter, the most prominent are the military barracks on the north bank of the river, capable of accommodating 3000 men, the Protestant Episcopal church, the Roman Catholic cathedral, St Colman's Roman Catholic college, the convents, and the court-house. Quarter sessions are held in the town, and the muncipal affairs are managed by fifteen com-

inissioners, who meet every alternate Wednesday. The

market day is Saturday. The population in 1871 numbered 7388, 78 per cent. being Roman Catholics.

FERNAN CABALLERO. See Faser, Bout von.

CECILIA |

FERNANDEZ, Atvaro, one of the numerous band of |

Portuguese explorers who, in the earlier part of the 15th century, took part in the search for a sea-passage into the Indian Ocean, was born about the year 1420, and seems to have been brought up as page or esquire to Prince Enrique of Portugal. He was related to Joam Gonsalvez, discoverer of Madeira and governor of Funchal. While still a com- paratively young man, he was commissioned to prosecute the exploration of the African coast. After visiting the mouth of the Senegal and landing on the island of Gorée, he suc- ceeded in reaching Cape de Matos or Mastos, the most southerly point that had ever been attained (1446). Soon afterwards he took command of a second expedition, in which the utmost limit reached was Rio Tabite, a little to the south of Rio Grande. TIIl health thereafter compelled his return to Portugal, where he was welcomed at court as a distinguished discoverer. See Azurara, Historia de la Con- we Guine, and Joam de Barros, Asia, dec. i. lib. i. e.

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FERNANDEZ, Drxco, a Spanish adventurer and his- torian of the 16th century. He was originally educated for the church, but about 1545 he embarked for Peru, where he served in the royal army under Alonzo de Alvarado. Mendosa, marquis of Cafiete, who succeeded Alvarado as ‘iceroy, bestowed on Fernandez the office of chronicler of

cru; and in this capacity he wrote a narrative of the in- Surrection of Giron, of the rebellion of Gonzalo Pizarro, and of the administration of Gasca. The whole work, under the title Historia del Peru, was published at Seville in 1571. It is Written in a clear and intelligible style, and with more art than is usual in the compositions of the time. It gives Copious details, and, as he had access to the correspondence and official documents of the royalist leaders, it is, although necessarily possessing a royalist bias, the fullest and most authentic record existing of the events it relates. A notice of the work will be found in Prescott’s History of the Con- quest of Peru, he aa DEZ, Joam, a Portuguese traveller, also of the 2th century. arly in life he had been taken captive ly pirates of Barbary, ” While amongst them he acquired a

knowledge of Arabic, and had his curiosity stimulated with regard to the geography of the African continent. On re: gaining his freedom he joined an exploring expedition, and got himself landedat the mouth of the Ouro river (lat. 23°N. yy where, exposed to considerable hardship and danger, he spent seven months of a nomadic life with some of the native tribes, and acquired a considerable amount of infor- mation about the geography of the interior (1445), Two years afterwards he explored the territory in the neighbour- hood of Cape Blanco. He deserves some notice as having been the earliest of modern African explorers. The narra- tive of his adventures, which is said by those who have seen it to resemble that of Mungo Park, is to be found in Azurara's Conquista de Guine.

FERNANDEZ, Juan, a Spanish navigator and dis- coverer, While navigating the coasts of South America it occurred to him that the south winds that almost constantly prevailed near the shore, and retarded the voyages between Peru and Chili, might not exist further out at sea. His idea proved to be correct, and by the help of the trade winds and some currents at a distance from the coast he made a voyage with so great rapidity that he was apprehended on achargeof sorcery. His inquisitors, however, accepted, with a readiness far from common, his natural explanation of the seeming marvel, and he was set at liberty. During one of his voyages in 1563 Fernandez discovered the two islands which now bear hisname, He was so enchanted with their beauty and fertility that he solicited the concession of them from the Spanish Government. It was granted in 1572, but a colony which he endeavoured to establish at the largest of them soon broke up, leaving behind them a number of goats, the progeny of which still continue on the islands, In 1574 Fernandez discovered the islands of St

| Felix and St Ambrose, and his companions who survived him

affirmed that during a voyage in 1576 in the southern ocean he came in sight of a continent, which must have been either Australia or New Zealand if the discovery is to be accepted as a fact, but more probably it was either a delusion or an invention of his followers. See Alexander Dalrymple, An Historical Collection of the several Voyages and Discoveries in the South Pacwfic Ocean, London, 1769-71.

FERNANDEZ, Juan, a Spanish sailor and adventurer. In 1531 he joined the army of the celebrated Francesco Pizarro, conqueror of Peru, with a small force, but in 1533 he passed into the service of his rival Pedro de Alvarado. When the latter, however, agreed for a sum of money to cede his claims on Peru and make over his navy to Pizarro and Almagro, Fernandez necessarily returned to the service of Pizarro, who not only granted him pardon, but gave him the command of the ship. In 1538 he accompanied Antonio de Sedefio on an expedition despatched by the Spanish Government against the island of Trinidad. Instead, however, of attempting to fulfil the purpose of the expedition, they were tempted by rumours of the existence of gold to disembark on the mainland, where, after endur- ing great privations and hardships, both leaders died in the winter after they set out, without finding the object of their quest. The survivors, under four different leaders, and decimated by hunger, fatigue, and continual combats with the natives, managed to find their way to the Spanish settle- ments.

FERNANDO DE NORONHA, a group of islands in the South Atlantic, about 194 miles N.E. of Cape St Roque, South Aimerica, 3° 50’S, lat., 32° 25’ W. long. The largest of them is about 20 miles in circumference, its surface is rugged, and it contains a number of rocky hills from 500 to 700 feet high, and a mountainous peak towering to the height of about 1000 feet. The island is covered with wood, but on account of the irregular occurrence of rain, it contains scarcely any other vegetation. It has several har-

bours defended by forts, and serves as a place of banish- ment for criminals from Brazil. The next largest island of the group is about a mile in circumference, and the others are small barren rocks. The convict village numbers about 1000 inhabitants, and consists of a square formed by the governor’s residence, a chapel, the prison, workshop, and Government stores, and three or four streets radiating up- wards, and composed of wattle-built huts. About 1000 additional convicts are employed in cultivating the planta- tions in different parts of the island. The island:is occupied by about 150 soldiers and 6 officers under a governor. Stores,

convicts, and mails are carried by steamer twice a month to and from Pernambuco.

See "' Visit to Fernando Noronha" by Alexander Rattray, M.D., R.N., in Journal of the Royal Geographical Society for 1872. –

FERNANDO PO, or FeRNnao vo Pao, an island on the W. coast of Africa, lying in the Bight of Biafra, about 20 miles from the mainland, in 3° 12' N. lat. and 3° 48' E. long. It isabout 44 miles in length from N.N.E. toS.8. W.., and about 20 in breadth. The coasts are steep and rocky, and the interior is mountainous. A ridge of mountains to- wards the centre of the island rises to the height of 8000 feet, and is terminated at each extremity by a peaked mountain,—the northern one (Ste Isabelle) attaining a height of 10,700 feet. The southern extremity of the island is also intersected by several steep mountains, varying from 1000 to 3000 feet. 'These mountains are covered, most of them to their summits, as are the intervening valleys, with dense forests of shrubs and lofty trees of luxuriant growth: The rocks are of volcanic origin ; and the soil is rich and fertile, producing rice, sugar-cane, cotton, tobacco, yams, and palms. Antelopes, monkeys, sheep, goats, fowls, turtle, and fish are abundant. The climate is salubrious, though the rainy season lasts from May to December, and is succeeded by a season of dense fogs. The principal harbour, Port Clarence on the northern shore, is frequented by English vessels, especially for palm-oil. This island was discovered in 1471 by a Portuguese navigator, whose name it bears. It was taken possession of by Spain in 1778, but was abandoned in 1782. The English formed a settle- ment on the island in 1827, and made use of it as a harbour for the ships of war sent to watch the slave traffic, but they relinquished it in 1834; the Spaniards resumed possession of it in 1844, and changed its name to Puerto de Isabel. The population is about 15,000, and is composed partly of half-breed Protuguese, negroes formerly freed by the British, a few Europeans, and the native inhabitants called Edeeyahs or Bobies, who are in the proportion of ten to one of all the others, and whose jealous hostility perhaps,as much as the reputed insalubrity of the climate, has prevented the colonization of the island by Europeans. The Baptist missionaries who settled on the island during its occupation by the British were expelled by the Spaniards in 1858. See Benedetti, "Les files espagnoles du golfe de Guinée," in Bull. de la Soc. de Géogr., 1869.

FERNEL, Jean Francots (1497-1558), a distinguished French physician, was born at Clermont in 1497. After receiving his early education at his native town, he entered the college of Sainte-Barbe, Paris, where he so distinguished himself in mathematics, philosophy, and languages, that not long after obtaining his M.A. degree he was offered a professorship in the college. This offer he, however, oo. choosing in preference to become a physician.

e received his doctor's degree in 1530, and was named professor of medicine in 1534. His extraordinary general a ae 'a skill and success with which he sought to

e study of the old Greek physicians, gained for him a great reputation, and ultimately the office of physician: to the court. He practised with very great success, and at his

death in 1558 left behind him an immense fortune.

His principal works are Monalospherium, sive Astrolabii genus, generalis Horarii Struetura et Usus; De Abditis Rerum Causis ; 'Medicina ad Henricum II.; and Consiliorwm Medicinaliwm Liber, All of them have been several times reprinted.

FERNOW, Karu Lupwie (1763-1808), German art- critic and archeologist, was born in Pomerania, November 19, 1763. His father was a servant in the household of the lord of Blumenhagen. At the age of twelve he became clerk to a notary, and was afterwards apprenticed to a druggist. While serving his time he had the misfortune accidentally to shoot a young man who came to visit him; and although through the intercession of his master he escaped prosecution, the untoward event weighed heavily on his mind, and led him at the close of his apprenticeship to quit his native place. He obtained a situation at Liibeck, where he had leisure to cultivate his natural taste for draw- ing and poetry. Having formed an acquaintance with the painter Carstens, whose influence was an important stimulus and help to him, he renounced his trade of druggist, and set up as portrait-painter and drawing-master. At Ludwigs- lust he fell in love with a young girl, and

followed her to Weimar; but failing in his suit, he went next to Jena. There he was introduced to Professor Reinhold, and in his house inet the Danish poet Baggesen. The latter invited him to accompany him to Switzerland and Italy, a proposal which he eagerly accepted (1794) for the sake of the opportunity of furthering lis studies in the fine arts. On Baggesen's return to Denmark, Fernow, assisted by some of his friends, visited Rome and made some stay there. He now renewed his intercourse with Carstens, who had settled at Rome, and applied himself to the study of the history aud theory of the fine arts and of the Italian language and literature. Making rapid progress, he was soon qualified to give a course of lectures on archeology, which was attended by the principal artists then at Rome. Having married a Roman lady, he returned in 1802 to Germany, and was appointed in the following year professor extraordinary of Italian literature at Jena. In 1804 he accepted the post of librarian to Amelia, duchess-dowager of Weimar, which gave him the leisure he desired for the purpose of turning to accouut the literary and archeological researches in which he had engaged at Rome. His most valuable work, the Rémische Studien, appeared in 3 vols., 1806-1808. Among his other works are—Das Leben des Kiinstlers Carstens (1806), Ariosto's Lebenslauf (1809), and Francesco Petrarca (1818). Fernow died at Weimar, December 4, 1808. A memoir of his life by Johanna Schopenhauer, mother of the philosopher, Arthur Schopenhauer, appeared in 1810, and a complete edition of his works in 1829.

FERNS, a large group of cryptogamic plants forming in a wide sense a very naturally limited group. In the article Brotoey (vol. iii. p. 694) it has been shown that the sub- kingdom Cormophyta includes three well-marked series, Bryophyta, Pteridophyta, Phanerogame. Of the second of these, Ferns, in the most restricted acceptation of the word, are the most conspicuous representatives. It will be con- venient, however, to give some account under the present head, not merely of ferns proper, but also of the other sinaller groups, closely related to ferns and often spoken of in familiar language as Fern-allies, which are included in the Pteridophyta.

The life-history of all these is divisible into two distinct stages or generations, in which not only are the external morphological cliaracters extremely different, but the pliy- siological functions are also sharply

contrasted. These stages have been termed in the article already referred to the sporophore and the oophore.

The vigorous vegetative forms which are what are familiarly understood when ferns are spoken of are only one phase of their complete life-cycle. They are the sporophores;

and the reproductive bodies they bear (spores) germinate without any process of fertilization, and are therefore not to be compared with seeds, The same thing is equally true of the other members of the series Pteridophyta, viz., horse tails, club mosses, selaginellas, &c. :

A spore on germination produces a structure which, com- pared with its immediate parent, is relatively very small, and bears no resemblance to it in form or texture. It is called the prothallium ; it is green and membranous, and attached to the surface of the ground by root hairs in ferns and horse tails; in adder’’s tongues and club mosses it is tuberous and subterranean, while in Rhizocarpee and Selaginella it always remains more or less included within the cavity of the parent spore. The function of the pro- thallium is entirely reproductive; it develops sexual organs of two kinds, archegonia and antheridia, either upon the same or different prothallia. Hence, in contradistinc- tion to the sporophore—the function of which in this group of plants is purely vegetative—the prothallial generation is termed the oophore.

History.—The older botanists, starting from the study of flowering plants, endeavoured to recognize in all other cases the same characteristic points of structure. They did not doubt therefore, arguing from analogy, that ferns were pro- vided with true seeds. Gerarde (1597), remarking the appear- ance of young plants of Nephrodiwwm dilatatum in the neigh- bourhood of old ones, attributed this to the dissemination of seeds, “for I believe all plants have seeds in themselves to produce their kindes.” No one, however, at this time could say anything definite about the “seeds” of ferns, and they came to be regarded as highly mysterious. It was supposed that they were of an invisible sort, and by a trans- ference of properties it came to be believed that the possessor of fern seed would be invisible too. Shakespeare makes

Chamberlaine say, ‘‘We have the receit of fern-seed, we walke invisible.” Ray ridicules Tragus for spreading linen cloths upon the ground to catch the seed of ferns on the eve of midsummer night, when, as Ray properly observed, it would be indeed astonishing if any fell, sceing that it is not mature till the autumn.

Columna in 1648 compared the fern frond to butcher’s broom, and identified the fructification in the one case with the flowers in the other. Czxsius came to his help, and, having examined the sori of a polypody, “telescopii adjumento,” detected what he supposed to be seeds, but which were probably only the spore cases. W. Cole appears to have been the first to microscopically observe the spores themselves (1669), and Ray himself described the hygro- Scopic movements of the spore-cases which assist the disper- sion of the spores. Morison (1715) seems to have been the first to put the matter to the test of actual experience. He sowed the spores of hart’s tongue, and in due course, with- out, however, distinguishing clearly the two stages, raised plants from them. ‘This important observation fell com- pletely into oblivion, and when in 1789 Dr Lindsay, a Scotch physician settled in J amaica, responded to a request of Sir Joseph Banks for fern plants from that island by sug- gesting that spores would be much more convenient to send, the latter was quite unprepared for the suggestion, which he treated as a great discovery. Dr Lindsay accordingly Wrote a paper on the subject (which was published in the

mnean Transactions a few years afterwards), in which he figured the prothallial stages of Polypodium lycopodioides. The spores of ferns were still, however, regarded as equi- valent to seeds, i.c., as the result of a process of fertilization age to that which precedes the development of seeds in “owering plants, A variety of attempts were made to see i hairs or glands upon the young fronds, &c., something : at would do duty for an anther. As late as 1832 De Candolle maintained the analogy of the prothallium to a ,

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cotyledon. In 1844 Nageli discovered the antherozoids, motile bodies which are set free from the antheridium, and which perform in ferns the function

of pollen grains, All previous observers had tried to find fertilizing bodies on the vegetative generation, the sporophore, which pro- duces only spores. In 1844 the final step was reached when Suminski found upon the prothallia the archegonia, flask- shaped bodies containing a central cell (oosphere) which, when fertilized by the antherozoids, develops into a spore- bearing plant similar to that from which the cycle started. In 1850 Mettenius discovered the details of the reproduc- tion in Jsoetes. Since that time the researches upon ths Pteridophyta have been very numerous, and are to be found quoted in Sachs's Lehrbuch.

The whole group of the Pteridophyta may be classified as follows :—

PTrERIDOPHYTA.—Cormophyta with two distinct stages in the life-cycle. Sporophore with high vegetative differentiation. Oophore inconspicuous and destitute of vascular tissne.

Class I. Filicine.—Leaves highly developed. Sporangia nume-

rous on the fertile leaves.

Sub-Class 1. Filiccs.—Leaves without stipular appendages. Sporangia epidermal, containing spores of one kind de- veloped in each from a single primary mother-cell.

Sub-Class 2. Stipulate.—Leaves with stipule-like append- ages. Sporangia containing spores of one kind developed in each from many endogenous primary mother-cells.

Sub-Class 3. Rhizocarpece.—Spores of two kinds.

Class II. Equisctine.—Leaves rudimentary. Sporangia 5-10 on

the fertile leaves.

Class I1I. Lycopodine.—Leaves small (except Jsoctes), simple.

Sporangia solitary.

Sub-Class 1. Lycopodiaceaw.—Spores of one kind.

Sub-Class 2. Ligulate.—Spores of two kinds.

I. Frucinz.—l. The Jilices or ferns proper deserve consideration at greater length, both on account of their numerical preponderance over the other groups, and the popular favour which deservedly attaches to their great beauty and variety of form.

Commencing with the vegetative generation or sporophore, the following remarks briefly touch upon the most essential points in their organization.

In general habit, although with a certain characteristic ap- pearance which, to the experienced eye, is an almost unfail- ing distinctive character, ferns are as various in stature and aspect asflowering plants, One genus, Ceratopteris,isremark- able for its aquatic habit. The terrestrial forms vary from the HH ymenophyllacee, which have the small size and delicate texture of mosses, to the larger forms which attain the size of shrubs, while some belonging to the tropics and the southern hemisphere have a palm-like habit, and are called tree-ferns, Cyathea medullaris reaches 80 feet in New Zealand, and Alsophila australis even greater heights in Australia, The stem creeps on or beneath the surface of the ground as in the common bracken, or climbs up rocks and the trunks of trees (Davallia canariensis). In the latter case it is usually densely coated with im- bricated membranous scales. In stems of this type the internodes or spaces between the insertion of successive leaves (fronds) is consider- able, and the growing point is often Fie. 1,—Stem of the Male far in advance of the youngest frond, Fem {Nenhrodium | lie. In a large number of herbaceous responding to the detached ferns, of which the common male yey pce ie and lady ferns are good examples, vascular bundles. the stem is short and erect or slightly inclined (fig. 1). The fronds are developed spirally, and in close contiguity without obvious internodes; they form, viewed from above,

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a large rosette with the growing point in the centre. Between the ordinary herbaceous ferns with short erect stems and the tree-ferns there is no hard and sharp line of demarcation. Most of the ferns of decidedly arborescent habit belong to the sub-order Cyatheaceew, which has a sporangium and receptacle a little different from that of the typical Polypodiacew, but in many of the genera of Poly- podiacee, especially Dicksonia, there are species that assume a more or less decidedly arborescent habit. Nearly all Filices are perennial, but we have an instance of annual duration in Gymnogramme leptophylla.

Growing Point.—The apex of the stem, whatever the dimensions of the mature plant, is always occupied by a single apical cell, and the whole growth is entirely depend- ent upon the repeated segmentation of this cell. In form it is either wedge-shaped with a transverse section like that of a bi-convex lens, or it has the form of a three-sided pyramid with a convex base forming the outerface. In the former case the segments are produced from the cell alter- nately right and left, and the stem, whicli is gradually built up by the repeated subdivision of the segments so formed, is always distinctly bilateral, and produces its fronds in two rectilinear series. In the latter case the segments are derived in spiral succession from the three interior faces of the apical cell, and the leaves, which are developed from the masses of tissue to which these segments give rise, are

gradually displaced from the simple triseriate arrangement

due to the segmentation of the apical cell into more com- plicated forms of phyllotaxis.

Branching is effected by the partition of the growing point; the single stem therefore bifurcates. This scarcely ever happens in ferns with erect stems, such as Vephrodium Filix-mas, or in tree-ferns. New shoots are, however, some- times formed from the bases of the leaf-stalks, just as in some species they are normally produced from the fronds themselves. When the terminal point is injured, lateral shoots are often formed in this way. A specimen of Dick- sonia antarctica has been described with as many as twenty- nine crowns, due doubtless to such a cause,

Structure of the Stem.—The repeated subdivision of the cells of the growing point gives rise to a mass of tissue, at first uniform in character, but which is subsequently differentiated. Particular tracts of cells are modified in the process of growth to form the fibro-vascular bundles. These are more or less flattened plates irregularly elliptical in transverse section. As in all the Pteridophyta they are closed, and incapable, when once formed, of further increase indiameter. They consist of a mass of “xylem” surrounded by “phloem.” The xylem consists, in addition to a few spiral vessels at the foci of the elliptical tranverse section, of scalariform vessels—cells of comparatively large diameter, with oblique ends, and with their walls intermittently thickened by transverse projecting ridges (fig. 2). Amongst the vessels are oblong cells containing starch in winter (wood-parenchyma). The phloem contains sieve-tubes, and ex- ternal to these thick-walled bast fibres. The whole fibro- vascular bundle is bounded first by one or two Jayers of oblong starch-containing cells (phlocm-sheath), and external to these by a single Jayer of narrower cells, often thickened externally and darker in colour—the vascular bundle sheath. In very slender stems the fibro-vascular bundles form a central axis (Zymenophyllacee), but when the stems attain any size they are arranged in an anastoniosing cylindrical net- work (fig. 3), in which a mesh corresponds to the base of a frond. This cylinderseparates the remaining or fundamental tissues of the stem into two portions, an internal central medulla and an external cortex. This is shown in fig. 4; the dark lines, however, do not belong to the bundles which correspond to the light spaces enclosed by them 3 the dark lines themselves consist of a mass of thickened elongated

cells termed ‘‘sclerenchyma,” which form protecting sheaths to the fascicular tissue. The medulla and cortex are in the main formed of parenchymatous tissue, often loaded

Fic. 2.—Scalariform vessels.

F1a, 3.—Fibro-vuscular network from the stem of the Mase Fern (Nephrodium Filix-mas). ‘The spaces contained by the meshes correspond

to the attach- ments of the bases of the lcaves. ;

Fic. 4.—Transverse section of the stem of a Tree-Fern (Cyathea). m, medullary ground-tissue; p, cortical ground-tissue, ¢, hypodermal sclerenchyma,; 1, fibro-vascular bundles, with sheathing sclerenchyma (/).

with starch. In Cyathea medullaris this starchy pith was used by the Maoris as an article of food. The medulla is not, however, entirely parenchymatous; it is usually per- meated by a number of anastomosing filiform bundles (usually also invested with a sclerenchymatous sheath), which eventually pass into the leaves through the meshes in the fibro-vascular cylinder. The greater part of the fibro- vascular tissue of the leaves is, however, continuous with the lower portion of the margins of the meshes, which runs out into bundles arranged round the outer circumference of the leaf stalk, and surrounding therefore the bundles which pass through the meshes from the medulla of the stem. In some cases, however, these medullary bundles contract an adhesion to the margins of the meshes as they pass through them. The surface of the stem, and also of the leaf-stalks, is usually strengthened by the sclerenchymatous develop- ment of the superficial portions of the fundamental tissue. This coats the surface with a layer which would be imper- vious to air were it not interrupted by spaces filled with soft parenchyma, by which the internal tissues of the stem are brought into relation with the atmosphere. In Pterts aquilina, the rhizome or horizontal subterranean stem is marked laterally by two lines where the colourless cortical parenchyma is not covered in, and in many tree-ferns the bases of the petioles have their sclerenchymatous invest- ment perforated by pits filled in the living plant by a soft- celled tissue which speedily becomes pulverulent.

The roots of ferns are always slender and wiry. They are continually formed during the growth of the stem in acropetal succession. In tree-ferns they consequently ac: cumulate on the lower portion as they grow downward, giving it a large apparent diameter. In creeping species they at once attach themselves. They are cylindrical in all cases, scarcely exceeding one-eighth of an inch in diameter, dark-brown approaching black in colour, and clothed with root-hairs,

In ferns the occurrence of a special form of “trichomes” is noticeable in the flat multicellular membranous scales, to which the name of “‘paleze” is given, They are found in the greatest abundance on the stem and lower part of the stipes, but they often extend to the rachides of the frond, and sometimes to the foliar surfaces, especially in young fronds. There is no definite correlation in the character of these paleze with other points of structure. The most character- istic are the long thread-like bright-brown palee of Eudicksonia, which are so abundant that those of Dicksonia Culcita are exported in quantity from Madeira to stuff

cushions and mattresses ; and the clathrate flat palez, dull brown in colour and permeated by a distinct Jattice-work of thicker cells, which occur in Vettarva, Antrophywm, and some species of Aspleniwm. By their abundance, position, size, shape, and texture, the palew often furnish great help in characterizing species.

Stipes.—Although generally distinguished by this spe- cial name, the stipes is simply the petiole of the leaf. It is very rare to find a fern in which the blade of the leaf does not possess a distinct stalk. In about two-thirds of the Felices, including not only those with erect, but many with creeping stems, the stipes is con- tinzous with the stem, without any articulation at the point of junction; and when the old fronds die, they do not become disjointed, after the fashion of the leaves of a deciduous tree. In about one-third of the F2lzces, on the contrary, there is a distinct joint at the point of junction between the stipes and the stem, and when tlie fronds fade, they fall away from the stem spontaneously, leaving a clean scar, In the classification proposed by John Smith, the Polypodiacee are subdivided by this character. The ferns in which the leaf-stalk is continuous with the stem, as in Asplenium, Nephrodiwm, and Pteris, he calls Desmobrya. Those in which the old fronds become disarticulated at the base, as in Oleandra, Platycertum, and Polypodium vulgare, he calls Hremobrya ; and he states, as the result of his experience as curator for 40 years of the Kew collection, that the Desmobrya may be more easily reproduced from spores, but that the Hremobrya show greater tenacity of life, and that in the importation of ferns from abroad the Eremobrya generally arrive in good condition, whilst

the Desmobrya, especially such as have siender stems, often perish in the journey.

Fronds.—In Filices we get a more varied range of leaf- form than in any other order in the vegetable kingdom, and some of the most beautiful and complicated types that exist. In size the fronds vary from under an inch, as in some of the minute //ymenophylle, to a length and breadth of from ten to twenty feet in the great Cyatheas and Dicksonias. To take examples of the leading types from amongst familiar British species, we have simple fronds in Scolopendrium vulgare, simply pinnate fronds in Asplenium Prichomanes andLomaria Spicant, bipinnate in Nephrodiwm montanum and Polypodium Phegopteris, tripinnate or tripinnatifid in Cystopteris fragilis and Polypodium Dryopteris,and decompoundin A splenium Adiantum-nigrum and Pieris aquilina, The primary divisions of a compound frond are called pine, the secondary divisions pinnules. In a deltoid frond, as in Cystopteris montana or Pteris pal- mata, the pinne grow regularly smaller from the lower to the upper, and the Jower pinne have the pinnules of the under side exaggerated. A decrescent frond, asin Mephrodium conterminum or Asplemium Trichomanes, has the pinnz largest at the centre of the frond, and gradually smaller both. towards its top and bottom. There is no regular relation between the frond and its fructification. Species with fronds similar in texture, cutting, and veining are often found, when the fructification is examined, to stand widely apart in systematic position, The growth of the fronds is very slow. The whole of the fronds of a rosette of Nephrodium Filiz-mas have been in course of formation two years before the lamina begins to unroll. The develop- ment 1s basifugal, and often the fronds continue growing at the top a long time after they are fully unfolded and eng fructification at the base. This may be seen in G popleyltuin sericeum and Gymnogramme elongata; in ” the leaf-stalk resembles a twining stem, growing a Tu many cases the fronds are of two kinds, Ps at me rom the first In a conspicuously different man-

*t, one kind remaining permanently barren, and the other

alone producing fructification. We have instances of this in Lomaria Spicant and Cryptogramme crispa, and di- morphism is shown still more

couspicuously in Platycerium, in which the barren fronds are uncut and spread out flat over the surface on which the plant grows, and the fertile ones are much larger, and stand erect, and are forked, from which it takes its common name of elk's-horn fern. 'There is another striking instance of dimorphism in the section Drynaria of the genus Polypodiuwm, in which the barren frouds are brown in colour, rigid in texture, small in size, and lobed like the leaf of the common oak, and the fertile ones are several feet long, with elongated segments like those of Polypodium vulgare. Insome ferns the fronds have a habit of taking root at the tip, and thus producing new plants. This is well shown in the walking-leaf of North America (Scolopendrium rhizophyllum), and amongst tropi- cal ferns in Asplentum rhizophorum and Acrostichum flagelliferum. Some species develop copious adventitious buds, from which the plant may be reproduced, sometimes scattered over the surface of the frond, asin Asplenium viviparum and A. bulbiferum, sometimes in the axils of the pinne, as in Asplentum proliferum and Nephrodium cicutarium.

Venation.—In the arrangement of the veins of the fronds of Filices there is an extraordinary amount of variety. The different types, and the extent to which they prevail, and the use that may be made in the systematic arrangement of ferns of the characters they furnish, were carefully worked out by Presl and John Smith. The two principal leading types are veins that, after once branching, do not again unite, and veins that, on the contrary, after branching, join one another so as to inclose areole like the meshes of a net. Ferns that exhibit the first plan are said to be free-veined ; the other kind are said to have anasto- mosing venation. 'The free-veined ferns form far more than half of the order. In the whole frond or its ultimate divi- sions there may be a midrib alone, as in Monogramme graminea or Hymenophyllum tunbridgense ; or the veining may be simply pinnate, that is to say, a midrib with a series of parallel simple branches on each side, as in Nephrodium patens or N. prolixum ; or there may be a re- gular midrib from the base to the top of the frond or seg- ment, with the side-branches branched again, a very com- mon type shown in Pterts aquilina and Nephrodium Filix- mas, or there may be no regular midrib, but the veins arranged like the rays of a fan, as in Advantum Capillus- Veneris and Asplenium cuneatum. Whether the veins are produced to the margin, or end abruptly without reaching it, as is common in the free-veined, and still more

so in the net-veined species of Polypodium, is a point to be noted. Of anastomosing venation the following are the principal types :—

1. Where the veins are free nearly to the edge, but con- nected by an arch just within it, as in the section Z'ham-~ nopteris of Asplenium and Olfersia of Acrostichum.

2. Where the veins are arranged in parallel pinnate groups, and the opposite veins of contignous groups join at the tip, as in the section Zunephrodium of Nephrodium and Goniopteris of Polypodium.

3. Where tlie veins of contiguous segments are copiously pinnate and free, but the midribs are connected by a single arch and the base, as in the section Campteria of Pteris and Pleocnemia of Polypodium. .

4, Where the veins unite in regular hexagonal meshes the sori borne at the tip of a single central vein which these inclose, as in the section Goniophlebium of Poly- podium.

5. Where distinct main veins run from the midrib to the edge of a frond or its divisions, and these are connected by a series of parallel arches, from the upper side of which

several free veins arise, bearing sori at their tips, as in the section Campyloneuron of Polypodium.

6. Where distinct main veins run from the midrib to the edge of a frond or its divisions, with copious small irregular areole between them, as in the section Pleuwridiwm of Poly- podium and Gymnopteris of Acrostichum.

7. Where the whole space between midrib and margin is filled up with copious small irregular areolz, as in the section Phymatodes of Polypodium and Chrysodium of Acrostichum.

Many of the large genera, as characterized by the shape and position of the sori, contain groups which show several of these different plans of veining ;

Polypodiwm and Acrostichum show them nearly all. One school of system- atists, represented in England by J. Smith and Moore, regard a decided difference in veining as a character ini- portant enough in itself to mark a genus ; and if this plan be followed the number of genera is enormously increased. Our estimate of 50 for the genera of Polypodiacee is a large one, if genera founded upon fructification be under- stood; but Moore, using venation in addition, reckons the genera at 143, and John Smith at 194. From this different scale upon which genera have been planned arises the large number of different generic names which have often been used for the same plants, so that the synonymy of ferns has become extremely complicated.

The sporangia of ferns are morphologically trichomes or modified hairs. They originate from epidermal cells, and in tle mature state consist of stalked capsules, the walls of which are one cell thick, A ring of cells differently placed in different genera is called the annulus, and by its unequal contraction in drying effects the disruption of the capsule and the dispersion of the spores (fig. 5). In some genera

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Fig. 6. Fic. 5.—Mature sporangium of the Male Fern (Nephrodium Filiz- mas). p, stalk ; a, annulus; s, spores discharged from ruptured cavity. . ; 0 7 of pict eri of on section Goniophlebium, bearing sori on its back. . 7.— Sorus of Aspidium trifoliatum. ‘The annulate sporangi an orbicular indusium attached by its centre. seni wngri ie’n|

the same object is effected by a group of cells instead of a ring. The separate clusters, of few or many individual sporangia, are called sori (fig. 6), and the membranous excrescence of the epidermis which covers a sorus is called an indusium or involucre (fig. 7).

The orders of /ilices are founded upon differences in the structure of the individual sporangium. Genera of the same order depend upon differences in the shape and posi- tion of the sori and shape and position of the indusium. In a few genera, such as Osmunda, Anemia, and Schizea, the parenchyma of the lamina is entirely absorbed in the fertile parts of the frond, and the sporangia form distinct panicles or spikes. In Acrostichum

the sporangia cover the whole of the under surface of the frond, both veins and inter- spaces. In many genera, such as Preris, Vittaria, and Lind- saya, the sori run in a line along the very edge of the frond,

connecting the tips of numerous veiulets. In Blechnum they form a similar line close to the midrib. The commonest type of all is when they form round dots on the veins of the back of the frond, asin Polypodium, Aspidium, Woodsia, and Cyathea. A type only less common than the last is where they run in lines along the veins of the back of the frond, as in Asplenium, Scolopendrium, and Gymnogramme, In Lygodium the sporangia form spikes on the edge of the leafy segments, each sporangium inclosed in a little pocket. In Dicksonia, Hymenophyllum, and Trichomanes, the sori form round clusters at the tip of a vein on the edge of the lamina. Characters taken from the indusium separate the genera of Polypodiacee into four tolerably well-marked groups. In a large series of genera, including Polypodiwm with not less than 400 species, Acrostichum, and Gymno- gramme, there is no indusium at all. In another series, including Pteris, Pellea, Cheilanthes, and Hypolepis, there is what is called a spurious indusium, which consists simply of the edge of the frond modified in texture and more or less completely recurved, so as to protect the sorus in an early stage. ‘The true indusia are distinct scales, and are of two kinds,—those called inferior, which originate beneath the sorus, and may be distinctly cup-shaped, as in Woodsia and Cyathea, or may be one-sided, as in Cystopteris and Davallia ; and those called superior, as in Vephrodiwm and Aspidium, which are extended over the sorus. As has been already indicated, all the genera of Polypodiacew, which include in the aggregate not less than 2000 species, agree with one another in the structure of the sporangia, so that the great majority of existing forms of ices are very closely allied. The classification of ferns is based at present upon characters entirely drawn from the sporophore generation, and takes no account of the oophore. It is un- doubtedly to a great extent artificial, but until the develop- ment of the prothallium has been carefully worked out in all the different orders, no more satisfactory or more natural arrangement than the following appears attainable.

1. Gleicheniacece.—Sporangia sessile, splitting vertically, furnished with a complete horizontal ring. Sori composed of very few spo- rangia ; receptacle not elevated. Fronds with very distinct dicho- tomous branching. Genera 2; species 30.

2. Hymenophyllacece.—Sporangia sessile, splitting vertically, fur- nished with a complete horizontal ring. Sori composed of numerous sporangia, inserted on a long filiform receptacle. Fronds of filmy texture, with pinnate branching. Genera 2; species 150-200.

3. Cyatheacee.—Sporangia nearly sessile, splitting transversely, furnished with a usually incomplete nearly vertical but rather oblique ring. Receptacle prominent, barrel-shaped. Tree-ferns. Genera 3; species 150.

4, Polypodiacece.—Sporangia stalked, splitting transversely, fur- nished with a usually incomplete vertical ring. Receptacle not prominent. Genera 50 ; species 2000.

5. Osmundacee.—Sporangia stalked, splitting vertically, furnished with only a faint horizontal bar instead of a ring. Genera 2; species 10-12.

6. Schizceaceee.—Sporangia sessile, splitting vertically, crowned by a complete small annular horizontal ring. Genera 5; species

60.

The oophore, or sexual generation of ferns, not having been studied to any great extent from the comparative point of view, can only be described in general terms. It is a membranous structure furnished with root hairs, and the cells of which contain chlorophyll; it is therefore capable of obtaining its nourishment independently, and in many respects has a striking resemblance to the simpler Hepatice. When the spores (for example) of any Polypodiaceous fern are sown, the outer covering bursts, and the inner coat pro- trudes as a filament, which soon divides and continues to grow into a short row of cells. Cell division next begins to take place laterally as well as longitudinally, and a small cellular plate is formed (fig. 8), which gradually attains & kidney-shaped outline, the growing point being situate in the

notch. From the under side are developed the root hairs, antheridia and archegonia.

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~The antheridium is morphologically a trichome, and is an

outgrowth of a superficial cell. The wall when mature consists of a single layer of cells, inclosing a central cell, from which the antherozoids are developed in separate mother cells. The antheridiuni eventually bursts owing to the absorption of water, and the spirally-twisted motile ciliated antherozoids (fig. 9) are set free (fig. 10).

Fig. 9. Fig. 11.

Fic. 8.—Germinating spore (s) of Pteris longifolia, producing a cellular prothal- lium (p) with a root-hair ®. .~-

Fig. 9.—Antherozoid of Asplenium septentrionale,

Fie, 10.—Antheridia from the prothallium of Pieris aquilina. a, antheridium unopened; 6, one discharging cells, each of which contains an antherozoid; c, empty antheridium.

Fig, 11—Archegonium of Asplenium septentrionale. a, canal; ¢, oosphere, with nucleus (e). . ;

The archegonia are produced ona cellular cushion imme- diately behind the notch. They are developed by repeated divisions from a superficial cell, and, when mature, each is a bottle-shaped structure (fig. 11), the rounded base of which is buried in the prothallium, and contains a central cell, the oosphere. The canal of the neck is at first filled by a cell, which eventually deliquesces, and leaves the passage open for the access of the antherozoids to the oosphere, which, after fertilization by blending with them, becomes the oospore. The oospore first divides by @ division-wall oblique to the prothallium, and then divides again so as to form four cells. Two of these give rise to a mass of tissue which remains in contact with the pro- thallium, and is called the foot. Of the other two, one de- velops into the stem (first

leaf), the other into the root. As soon as the young fern-plant (sporophore) is fairly established (fig. 12) the prothallium (oophore) disappears. Its existence is therefore remark- ably contrasted by its brevity with the oophore stage in the Bryophyta. There are, however, cases in which the conditions of the one group are approached by the other. In Osmunda the prothallia admit of vegetative reproduction by the de- tachment of marginal shoots. In Gymnogramme leptophylla, Goebel has shown that the prothallium Vegetates in a persistent way, com- parable to that of the oophore stage Fre. 12—f, Young Fern-plant emit in iaeeermis very Sees

. y Iving lized archegonium of p, the fora few months, and being entirely Prota/ium (oophore). devoted to the production of spores. Amongst Bryophyta, in Anthoceros the Sporophore exhibits a continued produc- tion of spores, which places it nearly on a level with Gymno- gramme, Farlow has made the remarkable observation that the sporophore may in some cases originate from the

-one pair is developed by lateral

‘the fertile fronds of Ophzoglossacee

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prothallium without the intervention of a sexual process, by a process of budding.

2. The Stipulate include two orders often included among ferns, but differing from them in some very import- ant points. Ophioglossacee include Ophioglossum (adder’s tongues) and Botrychiwm (moon-worts), both widely dis- tributed, and Helminthostachys, which is found froin the Himalayas to Queensland. The leaves as soon as they have attained a certain age bear a fertile branch from the axial side, The sporangia are developed in a manner totally different from those of other Filicine. Instead of being pro- ducts of single epidermal cells their origin resembles that of the pollen-sacs of anthers. The sexual generation (oophore) is tuberous and subterranean.

Marattiacee is a group of ferns including about four genera. ll are essentially tropical, but run more into the south than the north temperate zone. Danea is exclu- sively American, Kaulfussia and Angiopteris Old World, Marattca cosmopolitan. The sporangia are placed on lateral veins of the pinnz, and contain two rows of loculi, each of which corresponds to a single sporangium of Ophioglossum, and produces a number of spores originating from many primary mother-cells. The development of the sporangia in Angiopteris, which differs from other Marat- tvacee in the sporangia not being confluent, is still a desideratum for the determination of its affinities,

3. Rhizocarpee are plants whose affinities have long been obscure, but which are now gradually being seen to be re- lated in many essential points to ferns, though departing from them in other respects. In the growth of the roots, mode of branching, and circinate vernation there is entire agreement, and the fructification, though apparently very different, clearly admits of comparison with the true fern type. For a detailed account of their structure reference must be made to the works referred to below. It will be sufficient here to briefly refer to the fructification. Rhizo- carpee include two orders, Marsilece and Salviniew. The former consists of the two genera Pilularia and Marsilea. The former consists of three species of small creeping plants with filiform leaves, one of which is not uncommon in marshy places in Britain; the fruit (sporocarp) is globular, shortly stalked, and springs from the axils of the leaves. The sporocarp is divided by partitions into from one to four cavities, and each of these bears on its outer wall a projecting ridge to which ‘the sporangia are attached. The species of Marsilea are widely distributed mostly in hot countries; J. macropus is the nardoo of Australia. They all agree in hav- ing leaves and long stalks and two pairs of leaflets arranged cross-wise ;

branching, the other pair by dicho- tomy of the growing point. The sporocarp is variously placed, but always in relation toa leaf. Sachs considers that in both Marsilea and Pilularia the sporocarps are modified leaves bearing the sporangia on their upper sides in definite relation to the fibro-vascular bundles. With re- gard to position he compares them to

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F1¢.13.—Sporocarp (s) of Mar- silea Fabri, discharging a gelatinous cord (p) to which the contents of the compart- ments of the sporocarp are attached; these compart- ments (f) contain both macrosporangia and micro-

In Marsilea the sporocarp is bean *P°T#ngia. shaped, and the sporangia are attached to transverse ridges in small compartments which are torn away in the peculiar dehiscence of the sporocarp (fig. 13).

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The Salviniee include Salvinia and Azolla. Salvinia is a cosmopolitan genus of five or six species of floating plants distributed over the tropical and warm temperate zones. ‘The sporocarps are developed from teeth of the fertile leaves round which in each case a circular wall grows up covering in the tooth on which the sporangia are developed. This arrangement has been compared to the cup-shaped “involucre” of Hymenophylium. The sporangia are in all the genera ‘trichomes, and their mode of development is very similar to that in Poly- podiacee. The central mother-cell divides ultimately into eight spore mother-cells. The further progress, how- ever, of these varies according as microspores or macrospores are to be formed, each of the eight cells dividing into four in the one case, while in the latter only one does so, and only one of the four daughter-cells attains maturity.

The oophore or prothallial generation in Rhzzocarpee is dicecious from the first, the macrospore alone producing archegénia, This, however, only carries to an extreme point a differentiation of which there are indications amongst ferns, In Osmunda all the spores from a sporangium sometimes produce prothallia with antheridia alone. In Rhizocarpee the differentiation is carried back to the spores themselves. The microspores are male (fig. 14) ; in Salvinia there is a rudimentary prothallium which produces antheridia, and in Marsilea and Salvimia there is a last trace of such a structure. The macrospores also develop a prothallium from a portion of their contents, which, however, is always for the most part included in the parent spore, which ruptures to expose the archegonia (fig. 15), and allow of the fertilization of one of them.

Fig. 16. Fig. 18,

Fie. 14.—Microspore of Pilularia globulifer

: mien g ifera burst, and allowing the escape of 1G. 15.—Longitudinal section through the a ¥ J i

pex of a macrospore of Pilularia

globultfera, showing the rudimentary prothalli ith it containing a fertilized oosphere. te ED. Sp SSE ae

Pe section ores rhizome of Equisetum Telmateia, show-

—K, septum between two internodal cavities, h,h; fibro-

ig aS i, air-canai; S, leaf-sheath. eet ee Oe 16. 17.—Union (K) of alternating fibro-vascular bundles (7 lower internode in Equisetum Telmateia, ‘i 1 £ ae

oie Vannes ec om rhizome of Eguisetum Telmateia, gg, fibro-

II. Equisrtin# are plants the habit of which in the asexual stage (sporophore) is very singular. The stems are furrowed and jointed, the joints being hollow and closed at each node by a transverse septum (fig. 16). The leaves are reduced to a whorl of membranous teeth which form a sheath at each node, perforated by the slender branches which also form a verticil. The teeth of each successive node alternate. The fibro-vascular bundles also alternate in each successive internode, since they are arranged in a ring, and correspond to the ridges between the furrows

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which above are continuous into the teeth of a leaf-sheath (fig. 17). Each fibro-vascular bundle contains an air-canal, and another series of air-canals alternate with these and correspond to the furrows (fig. 18). The spore-bearing shoots are usually a good deal different in appearance from the barren stems; they terminate in a kind of cone (fig. 19),

Fig. 19. Fia. 19.—Fructification of Equisetum Telmateia. Fig. 20.—Peltate scale of Equisetum (s), bearing sporangia (é). Fic. 21.—Spore of Equisetum with the four elaters, produced by splitting of the exospore, dry and expanded. Fic. 22.—The same with the elaters damp and coiled up.

composed of closely approximated whorls of modified leaves, which are peltate in form, and bear from 5 to 10 sporangia on their under surface (fig. 20). The spores are furnished with an external coat which splits up into four strips, the hygro- scopic movements of which actively assist their dispersion (figs. 21, 22). The oophore consists of a prothallium, which is curiously lobed and curled, but otherwise differs little from that of ferns.

lil. Lycoropin& (Dichotome, Sachs).—With a con- siderable range of morphological variation the different genera agree in some important points. The leaves are always simple and unbranched, and contain only 4 single fibro-vascular bundle. The branching of stems and roots is always dichotomous, and the dichotomies, with some exceptions, succeed one another in planes at right angles. In their reproductive processes Lycopodiacee and Ingulate are related in the same manner as Filices and Rhizocarpee.

1. Lycopodiacec, besides the club-mosses (Lycopodium), includes three other small genera, Psilotum, T'mesipteris, and Phylloglossum. The first belongs to the warm countries of the new world, and is a singular plant with slender dichotomizing stems, very small leaves, and no trueroots. Phylloglosswm isa minute Australian plant, with a small tuber which produces a rosette of a few long leaves and a stalked spike of sporangia. The species of Lycopodium (fig. 23) attain a more vigorous vegetative development, some almost reaching the size of small shrubs Their stems contain an axial cylinder, formed by the greater or less coalescence of a number of fibro-vascular bundles forming transverse bands in cross-section. These bands are composed of xylem, with wide scalariform vessels and spiral vessels at each end; between the xylem plates are the phloem common to each, and containing sieve-tubes. The whole surface is surrounded by a phloem-sheath and a fibro-

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vascular bundle sheath. The cortical tissue surrounding the axial cylinder is often largely converted into sclerenchyma. The sporangia of Lycopodium make their appearance upon the upper surface of the fertile leaves (fig. 24), and, accord- ing to Sachs, are developed from the sub-epidermal tissue. The spores are only of one kind (fig. 25), and on germina- tion, according to the observations of Fankhauser, produce a subterranean prothallium, resembling that of Ophio- glossacee, and bearing antheridia and archegonia.

2. Ingulate includes two orders markedly different in vegetative characters. In both the leaves are furnished at the base with a small appendage called a ligule, wanting in the Lycopodiaceee.

Selaginellee.—The ramification of Selaginella often pro- duces flat frond-like systems of branches, owing to the

Fig. 23. Fig. 28.

Fic. 23.—Branch of Lycopodium clavatum with sporangiferous spikes. Fic. 24.—Leaf from the spike of Lycopodium, bearing a sporangium.

Fie. 25.—Detached sporangium of a Lycopodium opening to discharge the spores.

Fig. 26.—Detached macro-sporangium of a Se/aginella opening to discharge the four macrospores

G. 27—Contents of macrospore of Selaginella Martensii, showing the young prothallium (p),

16. 28.—Vertical section through the upper part of a macrospore of Selaginella, showing the prothallium with unfertilized archegonia, and an embryo grow- ing downwards into the endosperm,

The

regular suppression of one side of the dichotomies. leaves, which are arranged in four longitudinal rows, are in these cases often unequal, those attached to the under side of the horizontally spreading stem being larger

than those on the upper side. The structure of the stem differs from that of Lycopodium in having no axial cylinder, the fibro- vascular bundles being distinct from one another although transversely expanded like those of Lycopodium. In details of structure they agree with the bundles of ferns. Each is often surrounded by a system of air-cavities. The Toots branch dichotomously. The sporangia of Selaginella are shortly stalked, and are inserted in the axil or even in the base of a leaf ; the fibro-vascular bundle runs beneath it without sending a branch into it.

acrosporangia (fig. 26), containing usually four macro- Spores, occur in the same spike with the microsporangia. For a detailed account of the prothallial stage (oophore) of Selaginella reference may be made to Sach's text-book.

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The female prothallium is more distinctly endogenous than even in Rhizocarpee. It is formed from a portion of the contents of the macrospore (fig. 27), which ruptures partially, exposing the prothallium with its first archegonium. The remaining part of the cavity of the spore becomes filled with a cellular tissue, which may be compared to the endo- sperm of phanerogams. This is not the only point in which the reproduction of Selaginella approaches that of flowering plants. The oospore first divides transversely, in which respect it differs widely from /ilicesand Rhizocarpee. The upper half forms the suspensor, a structure wanting in all other cryptogams, but characteristic of phanerogams. The lower half forms the embryo, which by the elongation of the suspensor is at first carried down into the endosperm (fig. 28), the cells of which it partially absorbs in its further development. The microspores produce the antherozoids, containing, in addition, traces of a rudimentary prothallium.

The Jsoetee consist of the species of the monotypic genus Lsoetes, which, almost always aquatic in habit, are found all over the world. They are all remarkable for the extraor- dinarily slow growth in length and absence of branching in the stem, which consists of a small tuberous body bearing the rosette of leaves without internodes. It has the unique peculiarity amongst the vascular cryptogams of increasing in diameter by additions to the parenchyinatous cortical tissue external to the central fibro-vascular axis.

The sporangia of /scetes are produced at the bases of the leaves, and are unquestionably foliar products ; the outer leaves of the rosette produce only macrosporangia, the inner only microsporangia. The macrospores are entirely filled by the female prothallium, the wall being finally ruptured at the apex, as in Selaginella,

Reference may be made to the article Bronocy for a general view of the relations of the reproductive processes in Pteridophyta to other Cormophyta, and especially phanerogams. See also 4 Tezt- book of Botany, Morphological and Physiological, by J. Sachs (3d edition), translated by A. W. Bennett and W. T. Thiselton Dyer; Lehrbuch der Botanik, von Dr Julius Sachs, vierte Aufiage ; Vergleichende Anatomie der Vegetationsorgane der Phanerogamen und Farne, von Dr A. de Bary ; Synopsis Filicum, by Sir W. J. Hooker and J. G. Baker. (W. T. T. D.—J. G. BA.)

FEROZEPORE. See Frrozpur.

FERRAND, Antone Francois Cuaups, Comte (1751— 1825), statesman and political writer, was born at Paris July 4, 1751, and entered the Parlement de Paris at the early age of eighteen as “ conseiller aux enquétes.” During the Revolution he belonged to the emigrant party, and from 1794 to 1801 led a quiet life at Ratisbon, employing him- self in literary work. In 1814 Ferrand was made minister of state and directeur général des postes. It was he who, as ministre du roi, countersigned the act of sequestration of Napoleon’s property, and who, in introducing a bill for the restoration of the property of emigrants, established a dis- tinction, since become famous, between royalists of “la ligne droite” and those of “la ligne courbe.” At the second restoration, Ferrand became again directeur général des postes. He was also made a peer of France, member of the privy council, grand-officier and secretary of the orders of Saint Michel and Saint Esprit, and in 1816 member of the Academy. In his old age he became blind and enfeebled. He died January 17, 1825.

Besides a large number of political pamphlets, Ferrand is the author of l’Esprit de Vhistotre, ou Lettres dun pire & son fils sur la maniére d éudier V histoire, 1802, which reached seven editions, the last number in 1826 having prefixed to it a biographical sketch of the author by his nephew Hericart de Thury ; Eloge historique de Madame Elisabeth de France, 1814;

Cuvres Dramatiques, 1817; Théorie des révolutions rapprochée des événements qui en ont été Vorigine, le développement, ou la suite, 1817; and Histoire des trois démembrements dela Pologne, pour faire suite al' Histoire de 0 Anar- chie de Pologne par Rulhiére, 1820.

FERRARA, a city of Italy, at the head of a circondario ; -and province of the same name, is situated in a flat alluvial

district at the junction of the Po di Volano with several minor branches of the complex water-system of lower Lombardy. At the times of greatest inundation the river rises about 7 or 8 feet above the level of the castle court, but the statement that it sometimes even reaches above the level of the roofs is an exaggeration, and the city affords an asylum to the people of the surrounding country when the district is under water. The distance from Bologna by rail is about 29 miles, and from Venice 70. As it long occupied an important strategical position as a frontier post of the papal states, Ferrara is strongly fortified by walls, bastions, ditches, and a pentagonal citadel. Within the circuit of its defences, which extend for nearly 5 miles, a large part of the area is unoccupied. In the very centre of the city stands the old ducal castle or palace, surrounded by a moat, and crowned with heavy machicolations and battlements. During the papal period it was the residence of the legate, and it is now the seat of the local authorities. The cathedral of San Paolo is a large building originally dating from the 12th century, but gutted and restored in the 17th. The west front, of which a view is given in Mr Street's Brick and Marble Architecture, is a great screen with "three gables of about equal height covered with arcading, which increases in depth and richness of moulding and shadow to the tup, where there are very fine open arched galleries." Of the other churches it is sufficient to mention S. Francesco, S. Benedetto, S. Domenico, and S. Maria del Vado, which contain paintings by Garofalo, Dosso Dossi, Bonone, and other native artists. The palaces are for the most part of small architectural interest: the Palazzo de' Diamanti owes its name-merely to the facets into which the stones of the front are carved. The theatre is one of the largest in Italy ; and the university, or Studio Publico, has a rich numismatic collection and a library of 100,000 volumes and 1100 MSS., numbering

among its curiosities autographic portions of Ariosto’s Orlando Furioso, letters of Tasso, and the original of Guarini’s Pastor Fido. The house of the first of these poets is still shown in a street which bears his naine; and the hospital of S. Anna is regularly visited as the scene of Tasso’s incarceration. Almost all the interest of the city lies in its past, but it shows signs of revival since the unification of Italy. A large factory for scutching and spinning hemp was established in 1874; there are two foundries and a small establishment for the manufacture of brass instruments . and the preserving of peaches is a fairly important industry. A local bank was founded in 1862 with a nominal capital of £83,000. Besides the university, which is free, the educational establishments comprise an industrial and professional institute, a technical school, a communal gymnasium, a lyceum named after Ariosto, and a gymnasium and lyceum attached to the archi. episcopal seminary. The population in 1871 was 28,509, or, including the suburbs of San Luca and San Giorgio, 33,327. Ferrara possibly owes its existence to the in. vasion of Italy by Attila, and the destruction of Aquilea. It was walled by the exarch of Ravenna in 585, and be- came the seat of a bishop in 657. In the beginning of the 13th century, it passed into the hands of the Este family, which continued to hold it, sometimes under the pope and sometimes as independent lords, till the extinction of the main line by the death of Alphonso II. in 1597, os the latter part of this period Ferrara was the seat – at most cultured of the Ttalian courts, and its Italian rete me ever associated with the history of to 80 dee. eeatt 1s Said to have amounted siti rn o ts ates , 1t was incorporated with the papal sacar in Ttal 7 f eee peut Ginel — republic, and Joan ormed part, first of the Cisalpine

‘ ? . y of the kingdom of Italy; but the

treaty of Vienna restored it to the pope, and granted the Austrians the right of maintaining a garrison. In 1859 it was incorporated in the general kingdom of Italy. . FERRARI GAUDENZIO (1484-1549), a celebrated painter of the Milanese, or more strictly the Piedmontese, school, was born at Valduggia, Piedmont, and learned the elements of painting at Vercelli from Girolamo Giovannone. He next studied in Milan, in the school of Scotto, and some say of Luni; towards 1504 he proceeded to Florence, and

afterwards to Rome. His pictorial style may be considered as derived mainly from the old Milanese school, with a considerable tinge of the influence of Da Vinci, and later on of Raphael ; in his personal manner there was something of the demonstrative and fantastic. The gentler qualities diminished, and the stronger intensified, as he progressed. Ferrari was again in Rome towards the close of Raphael's life, and is believed to have aided him in the works of Terre Borgia. ,By 1524 he was at Varallo in Piedmont, and here, in the chapel of the Sacro Monte, the sanctuary of the Piedmontese pilgrims, he executed his most memor- able work. This is a fresco of the Crucifixion, with a multitude of figures, no less than twenty-six of them being modelled in actual relief, and coloured; on the vaulted ceiling are eighteen lamenting angels, powerful in expres- sion. Other leading examples are-the following. In the Royal Gallery, Turin, a Pieta, an able early work. In the Brera Gallery, Milan, St Katharine miraculously preserved from the Torture of the Wheel, a very characteristic example, hard and forcible in colour, thronged in composi- tion, turbulent in emotion; also several frescoes, chiefly from the church of Santa Maria della Pace, three of them being from the history of Joachim and Anna. In the cathedral of Vercelli, the choir, the Virgin with Angels and Saints under an Orange-Tree. In the refectory of San Paolo, the Last Supper. In the Louvre, St Paul Meditat- ing. In Varallo, convent of the Minorites (1507), a | Presentation inthe Temple, and Christ among the Doctors ; and (after 1510) the History of Christ, in twenty-one sub- jects; also an ancona in .six compartinents, named the Ancona di San Gaudenzio. In Santa Maria di Loreto, near '~Varallo (after 1527), an Adoration. In the church of San | Cristoforo, the transept (in 1532-35), a series of paintings in which Ferrari's scholar Lanini assisted him; by Ferrari himself are the Birth of the Virgin, the Annunciation, the Visitation, the Adoration of the Shepherds and Kings, the Crucifixion, the Assumption of the Virgin, all full of life and decided character, though somewhat mannered? In the church of Saronno, near Milan, the cupola (1535), a Glory of Angels, in which the beauty of the school }of Da Vinci 'alternates with bravura of foreshortenings -in the mode of Correggio. In Milan, Santa Maria delle Grazie (1542), the Scourging of Christ, an Ecce Homo, and a Crucifixion. The Scourging, or else a Last Supper, in the Passione of Milan, is regarded as Ferrari's latest work. He was a very prolific painter, distinguished by 'strong expression, animation and fulness of composition, and abundant invention ; he was

skilful in painting horses, and his decisive rather hard colour is marked by a partiality for shot tints in drapery. In general character, his work appertains more to the 15th than the 16th century. His subjects were always of the sacred order. Ferrari's death took place in Milan, Besides Lanini, already mentioned, Andrea Solario, Giambattista della Cerva, and Fermo Stella were three of his principal scholars. He is represented to us as a good man, attached to his country and his art, jovial and sometimes facetious, but an enemy of scandal. The reputation which he enjoyed soon after his death was very great, but it has not fully stood the test of time.

Lomazzo went so far as to place him seventh among the

seven prime painters of Italy,

FERREIRA, Antonio (1528-1569), Portuguese poet, |

was born' at Lisbon in 1528. He was of a noble family, and completed his education at the university of Coimbra.

Destined for the public service, he applied himself to the | | was employed in his time in rabbit hunting, under the

study of the law; but although he obtained the degree of doctor, and held a high legal office at Lisbon, he was far more deeply interested in literature than in jurisprudence. The poetry of Horace especially fascinated him ; and, resolv-

ing to write in the Portuguese tongue alone, he set before —

him as his special task to give to Portuguese poetry a classi- _ cal purity, precision, and elegance of style. While still at the university he composed most of his Sonnets, in which the influence of Petrarch appears, without, however, his passion or his grace, At the same period he produced his comedy of Sristo, which he is supposed to have afterwards retouched and perfected. His chief dramatic work is the tragedy of Inez de Castro, the first

Portuguese tragedy, and the second in modern European literature, the only one of

earlier date being the Italian tragedy of Sofonisha by |

Trissino, Ferreira's elegies are numerous, but few of them bear the impress of sincerity of feeling. One of the most admired is that on " May" and the return of spring. The Epistles of Ferreira, forming the largest portion of his works, were the first of their kind in Portuguese literature. They were addressed to many illustrious persons during

his residence at court, in the maturity of his powers and | knowledge of the world. Usually didactic and serious

in tone, studious of correctness and classical elegance of form, the poetry of Ferreira lacked the inspiration. of genuine passion and the power to touch the hearts of his countrymen. It never became popular. He was looked up to, however, as an oracle by the critics of his own day, en- joyed the special favour of King John III. and two of his

Successors, and had reason to hope for a long and honourable |

career. But he was carried off suddenly in the prime of life, by the plague which raged in 1569. His Poemas Lusitanos were published in 1598, and a complete collection of his works appeared at Lisbon in 1771.

FERRET (dlustela Suro), an albino variety of weasel, |

regarded by some as the descendant of a wild species originally brought from Africa, and now only known in the domesticated state, and by others, as a variety of the polecat (Mustela putortus), which it closely resembles in size, form, and habits, and with which it is said to inter- breed freely. It differs, however, from the polecat in the colour of its fur, which is usually yellowish-white, and of its eyes which are pinky-red. A more important difference, as bearing on the question of its specific distinctness, lies

in the fact that while the polecat thrives in the severe | climate of northern Europe, the ferret is peculiarly intoler- |

ant of cold, and only survives the English winter by means of the artificial warmth to which, under domestication, it is accustomed. The ferret attains a length of about fourteen Inches, exclusive of the tail, which measures about five Inches. Although exhibiting considerable tameness, it Seems incapable of attachment, and when not properly fed or when otherwise irritated is apt to give painful evidence of its native ferocity. Tempted by the opportunity of the mother’s absence it has been known to attack the child in trevetadle, and having once tasted blood it seems to lose | all its acquired shyness, and will then boldly attack any one interfering With the gratification of its bloodthirsty pro- pensity, It is chiefly employed in destroying rats and other vermin, and in driving rabbits from their burrows into a ee for their reception. For the latter purpose it is ie ally muzzled, to prevent it devouring its prey and there-

&r going to sleep at the bottom of a burrow until roused Y aunger to renewed exertion, The ferret is remark- |

ably prolific, the fem a. | each numbering ae e bringing forth two broods annually,

devour its young occasionally immediately after birth, and in this case it produces another brood soon after, The

| ferret was well known to the Romans, Strabo stating that

it was brought from Africa into Spain, and Pliny that it

name Viverra, of which the English name is probably a

| corruption.

FERRI, Crro (1634-1689), a Roman painter, the chief disciple and successor of Pietro da Cortona. He was born in the Roman territory, studied under Pietro, to whom

he became warmly attached, and, at an age a little past

Six to nine young. It is said to

thirty, completed the painting of the ceilings and other internal decorations begun by his instructor in the Pitti Palace, Florence. He also co-operated in or finished several other works by Pietro, both in Florence and in Rome, approaching near to his style and his particular merits, but with less grace of design and native vigour, and in especial falling short of him in colour. Of his own independent productions, the chief is an extensive series of scriptural frescoes in the church of 8. Maria Maggiore in Bergamo ; also a painting of St Ambrose, the principal altarpiece in

_ the church of St Ambrogio della Massima in Rome. The

paintings of the cupola of St Agnese in the same capital

might rank even higher than these; but this labour

remained uncompleted at the death of Ferri, and was marred by the performances of his successor Corbellini. He executed also a large amount of miscellaneous designs, such as etchings and frontispieces from books; and he was an architect besides. Ferri was appointed to direct the Florentine students in Rome, and Gabbiani was one of his leading pupils. As regards style, Ferri ranks as chief of the so-called Machinists, as opposed to the school founded by Sacchi, and continued by Carlo Maratta. He died in Rome—his end being hastened, as it is said, by mortifica- tion at his recognized inferiority to Bacciccia in colonr. FERRIER, James FREDERICK (1808-1864), metaphysi- cian, was born in Edinburgh on 16th June 1808, His father was a writer to the signet, and his grandfather was an intimate friend of Sir Walter Scott. His mother was sister of Professor John Wilson. In his early youth he lived in the family of the Rev. Dr Duncan, in the manse of Ruthwell, Dumfriesshire, and under Dr Duncan’s tuition he acquired a strong liking for the Latin poets, which remained with him all his days. After attending Edinburgh High School he studied under Dr Burney at Greenwich, and was a student of Edinburgh University in sessions 1825-26 and: 1826-27. He took the B.A..degree at Oxford in 1831. In 1832 he passed as an advocate at Edinburgh. Probably it was his metaphysical tastes which led him’ to Heidelberg in 1834. These tastes were fostered by his intercourse with Sir William Hamilton, which was always most cordial, not- withstanding their wide differences of opinion. Ferrier himself has recorded the warm friendship which subsisted

between himself and Hamilton. “For years together,” he: wrote, ‘scarcely a day passed in which I was not in his company for hours, and never on this earth may I expect’ to live such happy hours again.” His admiration for his uncle, John Wilson, whose daughter he married, was un- bounded, and he had many opportunities of meeting politi- cal and literary celebrities in Wilson’s house. In 1842 he was’ appointed professor of civil history in Edinburgh University. In session 1844-45 he acted as Sir William Hamilton’s substitute in the chair of logic and metaphysics, and in 1845 he was elected professor of moral philosophy and’

_ political econemy at St Andrews. He was twice an unsuc-

cessful candidate for chairs in Edinburgh, for that of moral philosophy on the resignation of Professor Wilson in 1852, and for that of logic and metaphysics in 1856, after Hamil. ton’s death. As a professor Ferrier had immense influence over his students, and was warmly beloved. by them. He.

had an attack of angina pectoris in November 1861, from the effects of which he never recovered. He died on 11th June 1864.

Ferrier made his début as a metaphysician in a series of articles in Blackwood in the years 1838-39, bearing the title “ An Introduction to the Philosophy of Consciousness.” In these articles he condemns previous philosophers for ignoring in their psychological investigations the fact of consciousness, which is the distinctive feature of man, and confining their observation to the so-called “states of the mind.” By doing so, he says, they allowed freedom, will, morality, and all man’s peculiar attributes to crumble away. It is wrong to apply the method of physical re- search to the problems of psychology, for the psychologist must act or create the great phenomenon which he has to observe. Consciousness only comes into manifestation when the man has used the word “I” with full knowledge of what it means. This notion he must originate within himself. Consciousness cannot spring from the states which are its object, for it is in antagonism to them. It originates in the will, which in the act of consciousness puts the “I”

in the place of our sensations. Morality, conscience, and responsibility are necessary results of consciousness.

A number of articles on philosophical subjects intervened between the above and the publication of the Jnstztutes. The “Crisis of Modern Speculation,” contributed in 1841, is a decided advance upon hisearlier articles, and evinces a more correct appreciation of the particular element in thought. He there states the problem of philosophy to be the nature of the connexion between the mind of man and the external universe, and he solves the question, not by giving it a positive answer, but by changing its aspect. The question as formerly put becomes under his hands meaningless, for mind and universe, subject and object, are shown to be not two, but merely moments in one reality. Think the object, and it becomes subject-object. Think the subject, and it becomes subject-object. So that the question really asked is, ‘© What is the connexion between the subjective subject- object and the objective subjective-object?” “ What is the connexion between one thing which thought cannot con- strue as really two?” As results of this mode of stating the question, to which the mere thinking it necessarily leads, perception is removed from the sphere of cause and effect, and the grounds of dogmatic realism and dogmatic idealism are subverted. ‘‘ Berkeley and Idealism” (1842) is a further exposition of absolute idealism, and contains some foreshadowings of the later teaching _ the Instztutes on the subject of “ Agnoiology.”

In an article on the publication of Hamilton’s edition of Reid (1847), which contains a vigorous attack on the philo- sophy of common sense, the perception of matter is pro- nounced to be the ne plus ultra of thought, and Reid, for presuming to analyse it, is declared to be a representationist in fact, although he professed to be an intuitionist. A dis- tinction is made between the “ perception of matter ” and “our apprehension of the perception of matter.” Psycho- logy vainly tries to analyse the former. Metaphysic shows

the latter alone to be analysable, and separates the subjective

element, “our apprehension, ” from the objective element, “the perception of matter,’—not matter per se, but the perception of matter is the existence independent of the individual’s thought. It cannot, however, be independent

of thought. It must belong to some mind, and is therefore the property of the Divine Mind. There, he thinks, is an indestructible foundation for the a priori argument for existence of God.

_ Ferrier's matured philosophical doctrines find expression in the [nstitutes of Metaphysics, Therein he claims to have met the twofold obligation resting on every system of philosophy, that it should be reasoned and true. His

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FRRRIER

| method is that of Spinoza, strict demonstration, or at least | an attempt at it.

All the errors of natural thinking and psychology must fall under one or other of three topics :— Knowing and the Known, Ignorance, and Being. These are all-comprehensive, and are therefore the departments into which philosophy is divided ; for the sole end of philo-

| sophy is to correct the inadvertencies of ordinary thinking.

Hence it must be polemical.

The problems of knowing and the known are treated in the "Epistemology or Theory of Knowing," under a series of twenty-two propositions and counter-propositions. Each proposition contains a philosophic truth, and the correspond- ing counter-proposition expresses the error of ordinary thinking regarding it. The truth that along with whatever any intelligence knows tt must, asthe ground or condition of its knowledge, have some cognizance of itself is the basis of the whole philosophical system; and, variously stated through a series of propositions, it leads to the conclusion that the only independent universe which any mind can think of is the universe in synthesis with some other mind or ego.

The leading contradiction which is corrected in the «' Agnoiology or Theory of Ignorance" is this, that there can be an ignorance of that of which there can be no knowledge. Ignorance is a defect. But there is no defect in

not know- ing what cannot be known by any intelligence, and there- fore there can be an ignorance only of that of which there can be a knowledge, 7.¢, of some-object-plus-some-subject, Ferrier lays special claim to originality for this division of the Jnstitutes.

The “ Ontology or Theory of Being” forms the third and final division of the Jnstitutes. It contains a discussion of the origin of knowledge, in which Ferrier traces all the per- plexities and errors of philosophers to the assumption of the absolute existence of matter. The conclusion arrived at is that the only true real and independent existences are minds-together-with-that-which-they-apprehend, and that the one strictly necessary absolute existence is a supreme aud infinite and everlasting mind in synthesis with all things.

Ferrier’s works are perhaps the best propzdeutic to the study of metaphysics in the English language. He has Berkeley’s charm of style, while he surveys philosophical questions from a more advanced standpoint. His philo- sophic insight was true from the first. Notwithstanding his disavowal of any indebtedness to the German philoso- phers, his writings are imbued with the spirit of Germai metaphysics ; and he has the merit of being the first to question the right of Dr Reid and his school to dominate the thought of Scotland. Others have arisen more potent than he to read the riddle of the great German he admired so much; yet those who seek a knowledge of the philo- sophy of the absolute will do wisely not to neglect the works of Ferrier.

A collected edition of Ferrier’s philosophical works, edited by his son-in-law Sir Alexander Grant, and Professor E. L. Lushington, was published in 1866. This edition contains Ferrier’s earlier con— tributions to Blackwood, a few miscellaneous lectures, the biographies | of Schelling and Hegel contributed to the Zmperial Dictionary of. Universal Biography, some papers supplementary to the Institutes of Metaphysics, and the lectures in Greek philosophy which he de- livered to his class. In 1875 there was brought out a three-volume edition of Ferrier’s philosophical works, including, along with the. above, the Institutes of Mctaphysics, of which two editions had been published in the author’s lifetime one in 1854, and a second im 1856. (D. B.)

FERRIER, Susan EpMoNsTON (1782-1854), Scottish novelist, born in Edinburgh in 1782, was the aunt of the subject of last notice. Her father was James Ferrier, for some years factor to the duke of Argyll, and at one time one of the clerks of the court of session with Sir Walter Scott. Her mother was a Miss Coutts, the beautiful daughter of a Forfarshire farmer. Miss Ferrier's first novel, Marriage,

was begun in concert with a friend, Miss Clavering, grand-daughter of the duke of Argyll; but this lady soon relinquished her share in the work, and dfarriage, com- pleted by Miss Ferrier alone, appeared in 1818, when its authoress was between five and six and thirty. It was followed in 1824 by Zhe Inheritance, a better constructed and more mature work ; and the last and perhaps best of her novels, Destiny, dedicated to Sir Walter Scott (who himself undertook to strike the bargain with the publisher Cadell), appeared in 1831. All these novels were published anonymously ; but, with their clever portraiture of contem- porary Scottish life and manners, and even recognizable caricatures of some social celebrities of the day, they could not fail to become popular north of the Tweed, and many were the conjectures as to their authorship, which was by some attributed to Scott himself. Thus, in the Woctes Ambrosiane (November 1826), the Shepherd mentions Zhe Inheritance, and adds, " which I aye thought was written by Sir Walter, as weel's Marriage, till it spunked out that it was written by a leddy." Scott himself gave Miss Ferrier a very high place indeed among the'novelists of the day. In his diary (March 27, 1826), criticizing a new work which he had been reading, he says, '' The women do this better. Edgeworth, Ferrier, Austen, have all given portraits of real society far superior to anything man, vain man, has produced of the like nature." Another friendly recognition of Miss Ferrier is to be found at the conclusion of his Zales of my Landlord, where Scott calls her his " sister shadow," the still anonymous author of ''the very lively work entitled Marriage."

Lively, indeed, all Miss Ferrier's works are,—written in a clear, brisk English, and with an inexhaustible fund of humour. It is true her books portray the eccentricities, the follies, and foibles of the society in which she lived, carica- turing with terrible exactness its hypocrisy, boastfulness,

greed, affectation, and undue subservience to public opinion. Yet Miss Ferrier wrote less to reform than to amuse. With an honest aversion to these things herself, she wished, not to lecture her readers, but to laugh with them. In this she is less like Miss Edgeworth than Miss Austen. Miss Edgeworth was more of a moralist; her wit is not so in- voluntary, her caricatures not always so good-natured. But Miss Austen and Miss Ferrier were genuine humorists, and with Miss Ferrier especially a keen sense of the ludicrous was always dominant. She could be serious, she could be pathetic, she could even touch some of the finest chords in human nature; but she never interfered with the depths of human wickedness and misery. She liked best to laugh; she turned naturally to the humorous, and her humorous characters are always her best. It was no doubt because she felt this that in the last year of her life she regretted not having devoted her talents more exclusively to the ser- vice of religion, not taking into account then how much good she had involuntarily done, and how much harmless pleasure she had distributed about her; for, if she was not a moralist, neither was she a cynic ; and her wit, even where it is most caustic, is never uncharitable.

Miss Ferrier lived till 1854, more than twenty years after the publication of her last work. The most pleasant Picture that we have of her is in Lockhart's description of ne visit to Scott in May 1831. She was asked there to = P to amuse the dying master of Abbotsford, who, when a ~~ writing Count Robert of Paris, would talk as an lantly as ever. Only sometiines, before he had reached

_ Point in @ narrative, " it would seem as if some internal hae had given way." He would pause, and gaze taal we anxiously round him. 'I noticed," says

ockhart, " the delicacy of Miss Ferrier on such occasions. = sight was bad, and she took care not to use her glasses

en he was speaking ; and she affected to be also troubled

with deafness, and would say, ‘ Well, I am getting as dull as a post; I have not heard a word since you said so-and- so, —being sure to mention a circumstance behind that at which he had really halted. He then took up the thread with his habitual smile of courtesy—as if forgetting his case entirely in tlie consideration of the lady’s infirmity.”

Miss Ferrier died, November 5, 1854, at her house No. 38 Albany Street, Edinburgh. She left among her papers a short unpublished article, entitled “ Recollections of Visits to Ashestiel and Abbotsford.” This is her own very inte- resting account of her long friendship with Sir Walter Scott, from the date of her first visit to him and Lady Scott at Ashestiel, where she went with her father in the autumn of 1811, to her last sad visit to Abbotsford in 1831. It con- tails some impromptu verses written by Scott in her album at Ashestiel.

FERRO, or Hierro.

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FERROL, a seaport town of Spain, province of Corufia, is situated on the northern arm of the bay of Relanzos, 12 miles N.E. of Corufia. The town is divided into three parts, the old, the new, and the “esteiro.” The old town is very irregular, but the new town is a parallelogram of seven streets in width, by nine in length, intersecting each other at right angles. It has two squares, in one of which is a fountain, erected in 1812 in honour of Cosme Churruca, a naval officer killed at Trafalgar. Ferrol is invisible from the sea, and isso strongly fortified that it is considered im- pregnable. Its arsenal is one of the three largest in the kingdom, and along with the wharves and dockyards ex- ceeds 23 acres in extent. The dockyard is divided into a smaller outward and a larger inward portion. Behind the inner dock are the dwellings of the operatives, and in the north angle are the foundries, ropeworks, and magazines. On the dockyard 15 ships of the line can be built at one time. Connected with the arsenal is a school for engineer- ing, and also a marine observatory. The harbour, which is one of the best in Europe, is deep, capacious, and secure; but the entrance, which is a strait about two miles in length, admits at the narrowest part only one ship ata time, and is commanded by forts Palma and San Felipe on opposite sides, The chief industries of the town are rope- making, sail-making, and the

manufacture of leather. It contains two hospitals, three large churches, a monastery, aconsistory, a prison, and a naval barracks with accom-modation for 6000 men. ‘The population in 1860 was

21,120.

Until 1752 Ferrol was a mere fishing village, but in that year Ferdinand VI. began to fit it for becoming an arsenal. In 1799 the English made a fruitless attempt to capture it, but on the 4th November 1805 they defeated the French fleet in front of it and compelled its surrender. On the 27th January 1809 it was through treachery delivered over to the French, but it was vacated by them on the 22d July of the same year. On the 15th July 1823 another

blockade was begun by the French, and it surrendered to them on the 27th August.

FERRY, in the law of England, is the right of carrying by boat across a river or arm of the sea, and of exacting a reasonable toll for such carriage. It belongs, like the right of fair and market, to the class of rights called in English law franchises, Its origin must be by statute, royal grant, or prescription. It is wholly unconnected with the ownership or occupation of land, so that the owner of the ferry need not be proprietor of the soil on either side of the water over which the right is exercised. He is bound to maintain safe and suitable boats ready for the use of the public, and to employ fit persons as ferry- men. Asa correlative of this duty he has a right of action, not only against those who evade or refuse payment of toll when it is due, but against those also who disturb his franchise by setting up a new ferry, so-as to diminish his

See Canary Istanps, vol. iv. p.

T12 custom. In Scotland the law is similar. There ferries are either public or private. Public ferries are uuder the management of the trustees of the roads connected with them, or of the justices of the peace of the county, or are regulated by special Acts of Parliament. Private ferries are those which have been granted by the crown to private individuals. They are acquired either by direct grant or by prescription. A new ferry calculated to affect the

old one injuriously is illegal in Scotland as in England. A neigh- bouring proprietor may make use of his boats to transport himself, his fantily, servants, visitors, and workmen, but he may not carry other persons, even gratuitously. FERSEN, Axex, Count (1755-1810), marshal of the kingdom of Sweden, was born at Stockholm, September 4, 1755. He belonged to an old Livonian family, several members of which had attained distinction during the reigns of Queen Christina, Charles X., and Charles XI. He was educated by his father Count Axel, a senator of Sweden under Gustavus IIL, and afterwards studied at the military academy of Turin. In 1775 he returned to Sweden and entered the army. Four years later he went to France, and was appointed colonel of the royal regiment of Swedes in the service of Louis XVI. At the head of this regiment he served with distinction in the later cam- paigns of the American war, and was aide-de-camp to General Rochambeau at Yorktown. After visiting England and Italy he returned to France, and on the outbreak of the Revolution he showed himself the devoted friend of the royal family. When their flight from Paris was arranged, Count Fersen consented to play the part of coachman in disguise ; and he conducted them to the post of Bondi, whence they were sent on under other care. After the failure of the scheme and the imprisonment of the royal family, he zealously exerted himself to minister in any way possible to their comfort and relief. Compelled to leave France after the execution of the king and queen, he visited Vienna, Dresden, and Berlin, and then returned to Sweden. He was named by the king grand-master of his household, chancellor of the university of Upsala, and marshal of the kingdom. He was soon after sent as pleni- potentiary to the congress of Rastadt. But he was at the same time disliked and suspected by the people ; and when the crown prince, Christian of Augustenburg, suddenly died, in June 1810, suspicions fastened on him and his sister the Countess Piper of having taken part with others in poisoning the prince. At the funeral they were assailed by the crowd ; the marshal sought refuge in a house, but was slain by the mob, and his body exposed in the great square (June 20, 1810). His sister succeeded in making her escape. ‘The complete innocence of Count Fersen and his family was established by a subsequent judicial investi- gation. _ FESCA, Freperic Ernest (1789-1826), violinist and composer of instrumental music, was born February 15, 1789 at Magdeburg, where he received his early musical education from Lohse and Zacharié. He completed his

studies at Leipsic under Eberhard Miiller, and at the early

age of fifteen appeared before the public with several con- certi for the violin, which were received with general applause, and resulted in his being appointed leading violinist of: the Leipsic orchestra. This position he occupied till 1806, when he became concert-master to the duke of Oldenburg. In 1808 he was appointed solo- violinist by King Jerome of Westphalia at Cassel, and there he remained till the end of the French occupation (1814), when he went to Vienna, and soon afterwards to Carlsruhe, having been appointed concert-master to the grand-duke of Baden. His failing health prevented him from enjoying the numerous and well-deserved triumphs he owed to his art, and in 1826 he died of consumption at the early age

of thirty-seven. Asa virtuoso Fesca is amongst the best masters of the German school of violinists, the school sub- sequently of Spohr and of Joachim. Especially as leader of a quartet he is said to have been unrivalled with regard to classic dignity and simplicity of style. Amongst his com- positions, his quartets for stringed instruments and other pieces of chamber music are the most remarkable. His two operas, Cantemira and Omar and Leila, were less successful, lacking dramatic power and originality. He also wrote some sacred compositions, and numerous songs and vocal quartets,

FESCH, Josep (1763-1839), cardinal, archbishop of Lyons, was born at Ajaccio, in Corsica, January 3, 1763, six years before the island was conquered by the French, His father, Francis Fesch, of Basel, was a Swiss officer in the service of Genoa, who had married as his second wifea young widow, the mother of Letizia Bonaparte. Joseph Fesch was thus half-brother to Letizia, and uncle to her son Napoleon Bonaparte. He was educated at the seminary of Aix in Provence, took holy orders, and became arch- deacon and provost of the chapter of Ajaccio, When the French Revolution broke out, and the chapters were sup-

pressed, Fesch protested against the civil constitution of the:

clergy, and laid aside his clerical dress. In 1793 he had

to quit Corsica, followed the Bonapartes to Toulon, and

obtained a post in the army administration. In 1795 he was named commissary of war in the army of Italy, of which his nephew Napoleon Bonaparte became commander- in-chief. After the 18th Brumaire (November 9, 1799) he resumed his ecclesiastical functions, and took part in the negotiations which led up to the concordat of 1801. In the following year he was consecrated archbishop of Lyons, and early in 1803 received a cardinal's hat, Napoleon having been proclaimed emperor, and desiring to be crowned at Paris by the pope, Cardinal Fesch was sent as ambassador to Rome to treat with Pius VII. respecting this project. He was received with much distinction, won the pope's good opinion, and brought the negotiations to a successful issue. On this occasion the cardinal had for his secretary the viscount de Chateaubriand, who had just made himself famous by the publication of his Génie du Chrostianisme, The association, however, was not a happy one. Cardinal

Fesch accompanied Pius VII. to Paris, and took part in all

the ceremonies of the coronation of his uncle. In reward

for his services at Rome he was made grand-almoner of France, grand-cordon of the Legion of Honour, and

senator. In 1806 he was chosen coadjutor and successor of

Dalberg, prince-primate of the confederation of the Rhine,

and arch-chancellor of the empire, and received a large annual subvention. tween Napoleon and the holy see made the cardinal's posi- tion a very difficult one; but he resisted the violent

measures taken by the emperor against the pope; and:

when, in 1809, the emperor desired to have one of his kindred head of the French church, and offered to Fesch the archbishopric of Paris, he declined the offer. He refused even to accept the administration of the diocese, As presi- dent of the national ecclesiastical council held at Paris in 1810, he

boldly put forward views which gave offence to the emperor and lost him his favour. He was sent back to his diocese, and in consequence of his letter to the pope, then at Fontainebleau, he was deprived of his subvention. In 1814 he withdrew to Rome, but returned to France and his see during the Hundred Days. He was created a peer; but never sat in the chamber. After Waterloo he returned to Rome, and there spent the remaining years of his life in the enjoyment of his vast wealth and his accumulated art- treasures. He died at Rome, May 13, 1839. His corre- spondence with Napoleon was published by Du Casse

1855,

The dissensions which continued be-

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» PESSLER, Ienaz Aurnttius (1756-1839), a celebrated Hungarian ecclesiastic, historian, and freemason, was born on the 18th May 1756 at the village of Zurdny in the county of Moson. His mother, who was a pious Roman Catholic, made every effort to secure for him a strict reli- gious education. On the 9th July 1773 he joined the order of Capuchins as a novice, and in the following year he took the monastic vows, assuming the name of Innocen- tius. After living in disagreement with his superiors in different monasteries he was transferred to the Capuchin house at Vienna; and while there, by means of a private letter, he drew the attention of the emperor Joseph II. to the irregularities of the monasteries. The searching in- vestigation which followed raised up against him many implacable enemies. Released from the monastery by an imperial decree, he was in 1784 appointed professor of Oriental languages and hermeneutics in the university of Lemberg. In 1787 he brought out his tragedy of Sidney, which his enemies attacked so violently as pro- fane and revolutionary that they compelled him to resign his office and seek refuge in Silesia. In Breslau he met with a cordial reception from Korn the publisher, and was, moreover, subsequently employed by the prince of Carolath as tutor to his sons. In

1791 Fessler was con- verted to Protestantism, and in 1796 he went to Berlin, where he founded a humanitarian society, and was com- inissioned by the freemasons of that city to assist Fichte in reforming the statutes and ritual of their lodge. He soon after this obtained a Government appointment in con- nexion with the newly-acquired Polish provinces, but in consequence of the battle of Jena (1806) he lost this office, and remained in very needy circuinstances until 1809, when he was summoned to St Petersburg by Alexander L., to fill the post of court councillor, and the professorship of Oriental lan- guages and philosophy at the Alexander-Newski Academy. ‘This office, however, he was soon obliged to resign, owing to his alleged atheistic tendencies, but he was subsequently nominated a member of the legislative commission In 1815 he was deprived of his salary, but it was restored to him in 1817. In November 1819 he was appointed consistorial president of the Protestant communities at Saratov, and subsequently became chief superintendent of the Lutheran communities in St Petersburg. Fessler’s numerous works are all written in German. In recognition of his important services to Hungary as a historian, he was in 1831 elected @ corresponding member of the Hungarian Academy of Sciences. He died at St Petersburg, December 15, 1839, in the 84th year of hisage. His most important works are —Die Geschichten der Ungarn und threr Landsassen, 10 vols, Leipsic, 1815~25 ; Marcus Aurelius, 3 vols., Breslau, 1790-92 (3d edition, 4 vols., 1799) ; Aristides und Themis- fokles, 2 vols,, Berlin, 1792 (3d edition, 1818); Adtila, Kowig der Hunnen, Breslau, 1794; Mathias Corvinus, 2 vols., Breslau, 17 93-94; and Die drei grossen Kénige der Hungarn aus dem Arpadischen Stamme, Breslau, 1808. yee Riickblicke auf seine siebzigjdhrige Pilgerschaft, ’ (2d edition, Leipsic, 1851).

FESTIVALS. A festival or feast! is a day or series of days specially and publicly set apart for religious observ- ances, Whether its occurrence be casual or periodic, whether its ritual be grave or gay, carnal as the orgies of Baal and Astarte or spiritual as the worship of a Puritan Sabbath, it 1s to be regarded as a festival or “ holy day” as long as it is professedly held in the name of religion.

To trace the festivals of the world through all their Variations would be to trace the entire history of human religion and human civilization: Where no

religion is,

ale nk eS = i ——<... . o ip feast,’ 1s simply to keep a festum or festival. The etymo- in a he word is uncertain; but probably it has no connexion with

there cin of course be no feasts; and without civilization any attempt at festival-keeping must necessarily be fitful and comparatively futile. But as religion develops, festivals develop with it, and assume their distinctive character; and an advancing civilization, at least in its earlier stages, will generally be found to increase their number, enrich their ritual, fix more precisely the time and order of their recurrence, and widen the area of their observance,

Some uncivilized tribes, such as the Judngs of Bengal, the Fuegians, and the Andamanese, have been described as having no word for God, no idea of a future state, and con- sequently no religious ceremonies of any kind whatever. But such cases, doubtful at the best, are confessedly exceptional. In the vast majority of instances observed and re- corded, the religiosity of the savage is conspicuous. Even when incapable of higher manifestations, it can at least take the form of reverence for the dead; the grave-heap can become an altar on which offerings of food for the departed may be placed, and where in acts of public and private worship the gifts of survivors may be accompanied with praises and with prayers. That the custom of ghost-pro- pitiation by some sort of sacrifice is even now very widely ditfused among the lower races at least, and that there are also many curious “survivals” of such a habit to be traced among highly civilized modern nations, has been abundantly shown of late by numerous collectors of folk-lore and students of sociology ; and indications of the same pheno- mena can be readily pointed out in the Rig-Veda, the Zend-Avesta, and the Pentateuch, as well as in the known usages of the ancient Egyptians, Greeks, and Romans.2 In many cases the ceremonial observed is of the simplest; but it ever tends to become more elaborate; and above all it calls for repetition, and repetition, too, at regular intervals. Whenever this last demand has made itself felt, a calendar begins to take shape. The simplest calendar is obviously the lunar. “The Naga tribes of Assam celebrate their funeral feasts month by month, laying food and drink on the graves of the

departed.” But it soon comes to be combined with the solar. Thus the Karens, “ while habi- tually making oblations, have also annual feasts for the dead, at which they ask the spirits to eat and drink.” The natives of the Mexican valley in November lay animals, edibles, and flowers on the graves of their dead relatives and friends. The common people in China have a similar custom on the arrival of the winter solstice. The ancient Peruvians had the custom of periodically assembling the embalmed bodies of their dead emperors in the great square of the capital to be feasted in company with the people. The Athenians had their annual Nex’iova or Neuéoera and the Romans their Feralia and Lemuralia. The Egyptians observed their three “festivals of the seasons,” twelve “festivals of the month,” and twelve “ festivals of the half month,” in honour of their dead. The Parsees, too, were re- quired to render their afringans (blessings which were to be recited over a meal to which an angel or the spirit of a deceased person was invited) at each of the six seasons of the year, and also on certain other days.?

In the majority of recorded instances, the religious feel- ing of the savage has been found to express itself in other forms besides that of reverence towards the dead. The oldest literatures of the world, at all events, whether Aryan or Semitic, embody a religion of a much higher type than ancestor worship. The hymns of the Rig-Veda, for example, while not without traces of the other, yet indicate chiefly a worship of the powers of nature, connected with the regular recurrence of the seasons. Thus in iv. 57 we have

- See Spencer, Principles of Sociology, i. 170, 280, 306. 3 Haug, Parsis, 224, 225. IX. — 15

a hymn designed for use at the commencement of the ploughing time ;! and in the Attareya-Brahmana, the earliest treatise on Hindu ceremonial, we already find a complete series of sattras or sacrificial sessions exactly following the course of the solar year. They are divided into two distinct sections, each consisting of six months of thirty days each. The sacrifices are allowed to commence only at certain lucky constellations and in certain months. So, for in- stance, as a rule, no great sacrifice can commence during the sun’s southern progress. The great sacrifices generally take place

in spring, in the months of April and May.? In the Parsee Scriptures? the year is divided into six seasons or gahanbars of two months each, concluding with February, the season at which “great explatory sacrifices were offered for the growth of the whole creation in the last two months of the year.” We have no means of know- ing precisely what were the arrangements of the Phcenician calendar, but it is generally admitted that the worship was solar, the principal festivals taking place in spring and in autumn. Among the most characteristic celebrations of the Egyptians were those which took place at the adavic pds or disappearance of Osiris in October or November, at the search for his remains, and their discovery about the winter solstice, and at the date of his supposed entrance into the

moon at the beginning of spring. The Phrygian festivals |

were also arranged on the theory that the deity was asleep during the winter and awake during the summer; in the autumn they celebrated his retiring to rest, and in spring with mirth and revelry they roused him from his slumbers.* The seasonal character of the Teutonic Ostern, the Celtic Beltein, and the Scandinavian Yule is obvious. Nor was the habit of observing such festivals peculiar to the Aryan or the Semitic race. The Mexicans, who were remarkable for the perfection of their calendar (see vol i. 695), had also an elaborate system of movable and immovable feasts distri- buted over the entire year; the principal festivals, however, in honour of their chiefs gods, Tezcatlipoca, Huitzilopochtli, and Tlaloc, were held in May, June, and December. Still more plainly connected with the revolutions of the seasons was the public worship of the ancient Peruvians, who, besides the ordinary feast at each new moon, observed four solar festivals annually. Of these the most important was the Yntip-Raymi(Sun-feast), which, preceded byathree days’ fast, began with the summer solstice, and lasted for nine days. Its ceremonies have been often described. A similar but less important festival was held at the winter solstice. The Cusqui-Raymi, held after seed-time, as the inaize began to appear, was celebrated with sacrifices and banquets, music and dancing. A fourth great festival, called Citua, held on the first new moon after the autumnal equinox, was preceded by a strict fast and special observances intended for purposes of purification and expiation, after which the festivities lasted until the moon entered her second quarter.

Greek Festivals—Perhaps the annual Attic festival in honour of Erechtheus alluded to in the Jliad (ii. 550) eught to be regarded as an instance of ancestor-worship ; but the seasonal character of the éopr# or new-moon feast in Od., xx. 156, and of the @aAvova or harvest-festival in J/., ix. 533, is generally acknowledged. The older Homeric poems, however, give no such express indications of a fully- developed system of festivals as are to be met with in the

1 ** May the heavens, the waters, the firmament, be kind to us; may ne lord of the field be gracious to us May the oxen (draw) : appily, the men labour happily; may the traces bind happily, wield

e goad happily _ (Wilson's translation, iii, 224).

See Haug's Aitareya-brahmanam of the Rig-Veda; Max Miiller's Cs Srom a German Workshop, i. 115. a aes See Haug, Parsis, 192; Richardson's Dissertation on the oe 1 ge, &¢., of Eastern Nations, p. 184; Morier's Journey through

- Plutarch, De Iside et Osiride;; Macrobius, Saturnalia, i. 21.

FRSTIVALS

so-called "Homeric" hymns, in the Works and Days of Hesiod, in the pages of Herodotus, aud so abundantly in most authors of the subsequent period ; and it is manifest that the calendar of Homer or even of Herodotus must have been a much simpler matter than that of the Taren- tines, for example, came to be, of whom we are told by

| Strabo that their holidays were in excess of their working

days. Each demos of ancient Greece during the historical period had its own local festivals (coprat Sypotikat), often largely attended and splendidly solemnized, the usages of which, though essentially alike, differed very considerably in details. These details have in many cases been wholly lost, and in others have reached us only in a very fragment- ary state. But with regard to the Athenian calendar, the most interesting of all, our means of information are for- tunately very copious. It included some 50 or 60 days

on which all business, and especially the administration of justice, was by order of the magistrates suspended. Among these fcpoynvios were included —in Gamelion (January), the Lencea or wine-press feast in honour of Dionysus; in Anthesterion (February), the Anthesteria, also in honour of Dionysus, lasting three days (Pithoigia, Choes, and Chutroi); the Diasia in honour of Zeus, and the lesser Hleusinia; in Elaphebolion (March), the Pandia of Zeus, the Elaphe bolia of Artemis, and the greater Dionysia ; in Munychion, the Munychia of Artemis as the moon goddess (Mouvyia) and the Delphinia of Apollo; in Thargelion (May), the Thargelia of Apollo and the Plynteria and Callynterna of Athene; in Skirophorion (June), the Diipolia of Zeus and the Skirophoria of Athene; in Hekatombaion hecatombs were offered to Apollo the summer-god, and the Cronta of Cronus and the Panathenea of Athene were held; i Metageitnion, the Metageitnia of Apollo; in Boedromion, the Boedromia of .Apollo the helper,> the Mekusta or Nemeseia (the festival of the dead), and the greater Eleus- inta ; in Pyanepsion, the Pyanepsia of Apollo, the Oseho-

| phoria of Dionysus (probably), the Chalkeva or Athena of

Athene, the Zhesmophoria of Demeter, and the Apaturia; in Maimakterion, the Maimakteria of Zeus; and in Posei- deon (December), the lesser Dionysea.

Of these (for the more important of which reference Is made to the separate articles) some are commemorative of historical events, and one at least may perhaps be regarded as a relic of ancestor-worship ; but the great majority are nature-festivals, associating themselves in the manner that has already been indicated with the phenomena of the seasons, the equinoxes and the solstices.6 In addition to their numerous public festivals, the Greeks held various family celebrations, also called éoprai, in connexion with weddings, births, and similar domestic occurrences. The great national ravyyvpes—Olympian, Pythian, Nemean, and Isthmian—will be found under separate headings.

Roman Festivals.—For the purpose of holding comitia and administering justice, the days of the Roman year were regarded as being either dies fasti or dies nefasti—the dies fasti being the days on which it was lawful for the praetors to administer justice in the public courts, while on the dies nefasti

neither courts of justice nor meetings of comitia were allowed to be held. Some days were fasti during one por tion and nefasti during another; these were called dies intercisi. For the purposes of religion a different division of the year was made; the days were treated as festi or a8 profesti,—the former being consecrated to acts of public worship, such as sacrifices, banquets, and games, while the latter (whether fasti or nefasti) were not specially claimed for religious purposes. The dies festi or feria

5 In this month the anniversaries of the battle of Marathon, and of the downfall of the thirty tyrants, were also publicly celebrated.

6 See Schoemann, Griechische Alterthiimer, ii. 489 sq.; Mommser Heortologie.

publica! were either stative, conceptivee, or imperative. The stativee were such as were observed regularly, each

on a definite day; the conceptivee were observed annually |

on days fixed by the authorities for the time being; the imperative were publicly appointed as occasion called for them. In the Augustan age the feria stativee were very numerous, aS may be seen from what we possess of the Fustt of Ovid. The number was somewhat fluc- tuating. Festivals frequently fell into desuetude or were revived, were increased or diminished, were shortened or prolonged at the will of the emperor, or under the caprice of the popular taste. Thus Augustus restored the Com-

pitalia and Lupercalia ; while Marcus Antoninus in his turn |

found it expedient to diminish the number of holidays.

The following is an enumeration of the stated festivals as given by Ovid and contemporary writers. The first day of January was observed somewhat as is the modern New Year’s Day: clients sent presents to their patrons, slaves to their. masters, friends and relations to one another. On the 9th the Agonalia were held, apparently in honour of Janus. On the 11th the

Carmentalia were kept as a half- holiday, but principally by women; so also on the 15th. On the 13th of February were the Fawnalia, on the 15th the Lupercalia, on the 17th the Quirinalia, on the 18th the Feralia, on the 23d (at one time the last day of the Roman year) the Zerminalia, on the 24th the Regzfugium or Fugalia, and on the 27th the Lguwirta (of Mars). On the Ist of March were the Matronalia, on the 14th a repeti- tion of the Hguiria, on the 15th the festival of Anna Per- enna, on the 17th the Liberalca or Agonalia, and from the 19th to the 23d the Quinquatria (of Minerva). On the 4th of April were the Alegalesia (of Cybele), on the 12th the Cerealia, on the 21st the Palilia, on the 23d the Vinalia, on the 25th the Robigalia, and on the 28th the floralia. The lst of May was the festival of the Lares Preestites ; ou the 9th, 11th, and 13th the Lemuria were celebrated ; on the 12th the Ludi Aartiales, and on the 15th those of Mercury. June 5 was sacred toSemo Sancus; the Vestalia occurred on the 9th, the Matralia on the 11th, and the Quinquatrus Minuscule on the 13th. The Ludi Apolli- nares were on the 5th, and the WVeptunalia on the 23d of July. On the 13th of August were the WVemoralia, in honour of Diana; on the 18th the Consuwalza, on the 19th the Vinalia Rustica, and on the 23d the Vulcanalia. The Ludi Magni, in honour of Jupiter, Juno, and Minerva, began on September 4. The Meditrinalia (new wine) were on the 11th of October, the Fawnalia on the 13th, and the Hguiria on the 15th. The Hpulum Jovis was on 13th November. The December festivals were—on the 5th Faunalia, and towards the close Opalia, Saturnalia, Larentalia.

The calendar as it stood at the Augustan age was known to contain many comparatively recent accessions, brought in under the influence of two “closely allied powers, the foreign priest and the foreign cook” (Mommsen). The Megalesia, for example, had been introduced 204 B.c. The Ludi Apollinares could not be traced further back than 208 B.c. The Floralia and Cerealia had not come in much earlier. Among the oldest feasts were undoubtedly the Lupercalia, in honour of Lupercus, the god of fertility ; the Equiria, in honour of Mars; the Palilia; the great September festival ; and the Saturnalia.

Among the feriz conceptivee were the very ancient feriz Latine, held in honour of J upiter on the Alban Mount, and attended by all the higher magistrates and the whole body of the senate. The time of their celebration

greatly de- pended on the state of affairs at Rome, as the consuls were not allowed to take the field until they had held the Latine, es ee

1 i 7 . . . . # Feri private, such as anniversaries of births, deaths, and the like, ere observed by separate clans, families, or individuals.

which were regarded as days of a sacred truce. The ferize sementive were held in the spring, and the Ambarvalia in autumn, both in honour of Ceres. The Paganalia of each pagus, and the Compitalia of each vicus were also concep- tive. Of feri imperative,—that is to say, festivals appointed by the senate, or magistrates, or higher priests to commemorate some great event or avert some threatened disaster,—the best known is the Novendiale, which used to be celebrated as often as stones fell from heaven (Livy, xxi. 62, xxv. 7, &c.). In addition to all those already mentioned, there occasionally occurred ludi votivi, which were cele- brated in fulfilment of a vow; ludi funebres, sometimes given by private persons; and ludi seculares, to celebrate certain periods marked off in the Etrusco-Roman religion. feasts of the Jews.— By Old Testament writers a festival or feast is generally called either 10 (compare the Arabic Hadj), fron: 439, to rejoice, or TW, from TY, to appoint. The words N3Y and W3P NP) are also occasionally used. In the Talmud the three principal feasts are called pea), after Exod. xxiii 14. Of the Jewish feasts which are usually traced to a pre-Mosaic origin the most important and characteristic was the weekly Sabbath, but special im- portance was also attached from a very early date to the lunar periods. It is probable that other festivals also, of a seasonal character, were observed (see Exod, v. 1). In cominon with most others, tke Mosaic system of annual feasts groups itself readily around the vernal and autumnal equinoxes. In Ley. xxiii., where the list is most fully given, they seem to be arranged with a conscious reference to the sacred number seven (compare Numb. xxviii.). Those belonging to the vernal equinox are three in number; a preparatory day, that of the Passover, leads up to the prin- cipal festival, that of unleavened bread, which again is followed by an after-feast, that of Pentecost (see PASSOVER, PENTECOST). Those of the autumnal equinox are four; a preparatory day on the new moon of the seventh month (the Feast of Trumpets) is followed by a great day of rest, the day of Atonement (which, however, was hardly a festzval in the stricter sense of the word), by the Feast of Taber- nacles, and by a great concluding

day (Lev. xxiii. 36 ; John vii. 37). Ifthe feast of the Passover be excepted, it will be seen that all these celebrations or commemorations asso- ciate themselves more readily with natural than with his- torical events.2, There was also a considerable number of post-Mosaic festivals, of which the principal were that of the Dedication (described in 1 Macc. iv. 52-59; comp. John x. 22) aud that of Purim, the origin of which is given in the book of Esther (ix. 20 sg.). It has probably no connexion with the Persian festival Furdigdn (see EstHEr).® Earlier Christian Festivals—While making it abund- antly manifest that Christ and His disciples observed the appointed Jewish feasts, the New Testament nowhere re- cords the formal institution of any distinctively Christian festival. But we have unambiguous evidence of the actual observance, from a very early period, of the first day of the week as a holy day (John xx. 19, 26; 1 Cor. xvi. 2; Acts xx. 7; Rev. i 10). Pliny in his letter to Trajan describes the Christians of Bithynia as meeting for religious purposes on a set day; that this day was Sunday is put beyond all reasonable doubt by such a passage as that in the Apology of Justin Martyr, where he says that "'on Sunday (rj 10d

2 Inthe " parallel" passages, there is considerable variety in the designation and arrangement of these feasts. While Ex. xii. approxi- mates most closely to Lev. xxiii. and Num. xxviii, Ex. xxiii. has stronger affinities with Dent. xvi. The relations of these passages are largely discussed by Graf, Die Geschichtlichen Biicher des A. T., pp. 34-41, and by other recent critics.

3 On the whole subject of Jewish festivals see Reland, Antig. Webr.; Knobel, Leviticus (c. 23); George, Die Jiidischen Feste ; Hupfeld, De primitiva fest. ap. Hebr. ratione; Ewald, Alierthiimer des Volkes Israel ; Dillmann in Schenkel's Bibel-lewicon, art. " Feste."

féov deyonévy Hyépa) all the Christians living either in the city or the country met together." The Jewish element, in some churches at least, and especially in the East, was strong enough to secure that, along with the des dominica, the seventh day should continue to be kept holy. Thus in the Apostolic Constitutions (ii. 59) we find the Saturday specially mentioned along with the Sunday as a day for the assembling of the church ; inv. 15 itis ordained that there shall beno fasting on Saturday, while in vill, 33 it is

added that both on Saturday and Sunday slaves are to have rest from their labours. The 16th canon of the council of Laodicea almost certainly means that solemn public service was to be held on Saturday as well as on Sunday. In other quarters, however, the tendency to re- gard both days as equally sacred met with considerable re- sistance. The 36th canon of the council of Illiberis, for example, deciding that Saturday should be observed as a fast-day, was doubtless intended to enforce the distinction between Saturday and Sunday. At Milan in Ambrose's time Saturday was observed as a festival ; but Pope Inno- cent is found writing to the bishop of Eugubium to urge that it should be kept as a fast. Ultimately the Christian church came to recognize but one weekly festival.

The numerous yearly festivals of the later Christian church, when historically investigated, can be traced to very small beginnings. Indeed, while it appears to be tolerably certain that Jewish Christians for the most part retained all the festivals which had been instituted under the old dispensation, it is not at all probable that either they or their Gentile brethren recognized any yearly feasts as of distinctively Christian origin or obligation. It can- not be doubted, however, that gradually, in the course of the 2d century, the universal church came to observe the anniversaries of the death and resurrection of Christ —the rdcya ctavpdoipoy and the récxa dvacrdcipov, as they were respectively called (see Easter and Goop Fripay). Not long afterwards Whitsunday also came to be fixed in the usage of Christendom as a great annual festival. Even Origen (in the 8th book Against Celsus) enumerates as Christian festivals the Sunday, the zapa-oxevy, the Passover with the feast of the Resurrection, and Pentecost ; under which latter term, however, he includes the whole period between Easter and Whitsuntide. About Cyprian's time we find individual Christians conimemorat- ing their departed friends, and whole churches commemor-ating their martyrs; in particular, there are traces of a local and partial observance of the feast of the Innocents. Christmas day and Epiphany were among the later intro- ductions, the feast of the Epiphany being somewhat the earlier of the two. Both are alluded to indeed by Clemens Alexandrinus (i. 340), but only in a way which indicates that even in his time the precise date of Christ's birth was unknown, that its anniversary was not usually observed, and that the day of his baptism was kept as a festival only by the followers of Basilides (see Ep1PHANY).

When we come down to the 4th century we find that, among the 50 days between Easter and Pentecost, Ascen- sion day has come intonew prominence. Augustine, for example, enumerates as anniversaries celebrated by the whole church those of Christ's passion, resurrection, and ascension, along with that of the outpouring of the Holy Ghost, while he is silent with regard to Christmas and Epiphany. The general tendency of this and the following centuries was largely to increase the festivals of the church, hac" peice to make them more fixed and uniform. Bee P we yea could be quoted from Chrysostom, oe ee es ine to show that these fathers had not

ibis y =e that comparative freedom with re- iicieios of mee eee pam pu , y as contrasted with Judaism and

the various heathen systems (compare Socrates, //. £., y, 22). But there were many special circumstances which seemed to the leaders of the Church at that time to neces- sitate the permission and even legislative sanction of a large number of new feasts. The innovations of heretics some- times seemed to call for rectification by the institutiou of more orthodox observatices ; in other instances the propen- sity of rude and uneducated converts from paganism to cling to the festal rites of their forefathers proved to be invincible, so that it was seen to be necessary to seek to adapt the old usages to the new worship rather than to abolish them altugether ;} moreover, although the empire had become Christian, it was manifestly expedient that the old holidays should be recognized as much as possible in the new arrangements of the calendar. Constantine soon after his conversion enacted that on the dies dominica there should be uo suits or trials in law; Theodosius the Great added a prohibition of all public shows on that day, and Theodosius the younger exteuded the prohibition to Epi- phany and the anniversaries of martyrdoms, which at that time included the festivals of St Stephen, and of St Peter and St Paul, as also that of the Maccabees. In the 21st canon of the council of Agde (506), besides Easter, Christmas, Epiphany, Ascension, and Pentecost, we find the Nativity of John the Baptist already mentioned as one of the more important festivals on which attendance at church was regarded as obligatory. To these were added, in

the centuries immediately following, the feasts of the Annunciation, the Purification, and the Assumption of the Virgin; as well as those of the Circumcision, of St Michael, and of All Saints.

Festivals were in practice distinguished from ordinary days in the following ways:—all public and judicial business was suspended,? as well as every kind of ganie or amuse- ment which might interfere with. devotion ; the churches were specially decorated; Christians were expected to attend public worship, attired in their best dress ; love feasts were celebrated, and the rich were accustomed to show special kindness to the poor ; fasting was strictly forbidden, and public prayers were said in a standing posture,

Later Practice.—In the present calendar of the Roman Catholic Church the number of feast days is very large. Each is celebrated by an appropriate office, which, accord- ing to its character, is either duplex, semi-duplex, or simplex. A duplex again may be either of the first class or of the second, or a major ora minor. The distinctious of ritual for each of these are given with great minuteness in the general rubrics of the breviary; they turn chiefly on the number of Psalms to be sung and of lessons to be read, on the manner in which the antiphons are to be given, and on similar details. The duplicia of the first class are the Nativity, the Epiphany, Easter with the three preceding and two following days, the Ascension, Whitsunday and the two following days, Corpus Christi, the Nativity of John Baptist, Saints Peter and Paul, the Assumption of the Virgin, All Saints, and, for each church, the feast proper to its patron or title and the feast of its dedication. The duplicia of the second class are the Circumcision, the feast of the Holy Name of Jesus, of the Holy Trinity, and of the Most Precious Blood of Christ, the feasts of the Purification, Annunciation, Visitation, Nativity, and Conception of the Virgin, the Natalitia of the Twelve Apostles, the feasts of the Evangelists, of St Stephen, of the Holy Innocents, of St Joseph and of the Patrocinium of Joseph, of St Lawrence, of the Invention of the Cross, and of the Dedication of

1 As, at a later period (601), Gregory the Great instructed bis Anglo-Saxon issionaries so to Christianize the temples, festivals, &c., of the heathen “ ut duree mentes gradibus vel passibus, non autem saltibus, eleventur.”’

- Manumission, however, was lawful on any day.

St Michael. The Dominice majores of the first class are the first Sunday in Advent, the first in Lent, Passion Sunday, Palm Sunday, Easter Sunday, Dominica in Albis, Whitsunday, and Trinity Sunday ; the Dominica majores of the second class are the second, third, aud fourth in Advent, Septuagesiina, Sexagesima, and Quinquagesima Sundays, and the second, third, and fourth Sundays in Lent.

In the canons and decrees of the council of Trent re- peated allusions are made to the feast days, and their fitness, when properly observed, to promote piety. Those entrusted with the cure of souls are urged to see that the feasts of the church be devoutly and religiously observed, the faithful are enjoined to attend public worship on Sundays and on the greater festivals at least, and parish priests are bidden expound to the people on such days some of the things which have been read in the office for the day. Since the council of Trent, the practice of the church with respect to the prohibition of servile work on holidays has varied considerably in different Catholic countries, and even in the same country at different times. Thus in 1577, in the diocese of Lyons, there were almost 40 annual festi- vals of a compulsory character. By the concordat of 1802 the number of such festivals was for France reduced to four, namely, Christmas day, Ascension day, the Assumption of the Virgin, and All Saints day.

The calendar of the Greek Church is even fuller than that of the Latin, especially as regards the éoprat trav ayav. Thus on the last Sunday in Advent the feast of All Saints of the Old Covenant is celebrated ; while Adam and Eve, Job, Elijah, Isaiah, &c., have separate days. The dis- tinctious of ritual are analogous to those in the Western Church. In the Coptic Church there are seven great festi- vals, Christmas, Epiphany, the Annunciation, Palm Sunday, Easter Sunday, Ascension, and Whitsunday, on all of which the Copts “wear new clotlies (or the best they have), feast, and give alms” (Lane). They also observe, as minor festivals, Maundy Thursday, Holy Saturday, the feast of the Apostles (11th July), and that of the Discovery of the Cross.

In common with most of the churches of the Reforma- tion, the Church of England retained a certain number of feasts besides all Sundays in the year.

They are, besides Monday and Tuesday both in Easter-week and Whitsun-week, as follows :—the Circumcision, the Epiphany, the Conversion of St Paul, the Purification of the Blessed Virgin, St Matthias the Apostle, the Annunciation of the Blessed Virgin, St Mark the Evangelist, St Philip and St James (Apostles), the Ascension, St Barnabas, the Nativity of St John Baptist, St Peter the Apostle, St James the Apostle, St Bartholomew, St Matthew, St Michael and all Angels, St Luke the Evangelist, St Simon and St Jude, All Saints, St Andrew, St Thomas, Christmas, St Stephen, St John the Evangelist, the Holy Innocents. The 13th canon enjoins that all manner of persons within the Church of England shall from henceforth celebrate and keep the Lord s day, commonly called Sunday, and other holy days, according to God's holy will aud pleasure, and the orders of the Church of England prescribed in that behalf, that 18, In hearing the Word of God read and taught, in private and public prayers, in acknowledging their offences to God and amendment of the same, in reconciling themselves charitably to their neighbours where displeasure hath been, in oftentimes receiving the communion of the body and blood of Christ, in visiting of the poor and sick, using all godly and sober conversation. (Compare Hooker, Z. P., v. (e) In the Directory for the Public Worship of God which es up by the Westminster Assembly, and accepted ae a ee of Scotland in 1645, there is an appendix . i. "wea ares that there is no day commanded in Scripture » be Kept holy under the gospel but the Lord's day, which

is the Christian Sabbath; festival days, vulgarly called holy- days, having no warrant in the Word of God, are not to be continued ; nevertheless it is lawful and necessary, upon special emergent occasions, to separate a day or days for public fasting or thanksgiving, as the several eminent and extraordinary dispensations of God's providence shall ad- minister cause and opportunity to his people.

Several attempts have been made at various times in western Europe to reorganize the festival system on some other scheme than the Christian. Thus at the time of the French Revolution, during the period of Robespierre's ascendency, it was proposed to substitute a tenth day (Décadi) for the weekly rest, aud to introduce the following new festivals :

—that of tlhe Supreme Being and of Nature, of the Human Race, of the French People, of the Bene- factors of Mankind, of Freedom and Equality, of the Martyrs of Freedom, of the Republic, of the Freedom of the World, of Patriotism, of Hatred of Tyrants and Traitors, of Truth, of Justice, of Modesty, of Fame and Immortality, of Friendship, of Temperance, of Heroism, of Fidelity, of Unselfishness, of Stoicism, of Love, of Conjugal Fidelity, of Filial Affection, of Childhood, of Youth, of Manhood, of Old Age, of Misfortune, of Agriculture, of Industry, of our Forefathers, of Posterity and Felicity. The proposal, how- ever, was never fully carried out, and soon fell into oblivion.

Mahometan Festivals.—These are chiefly two—the ’Eed es-Sagheer (or minor festival) and the’Eed el-Kebeer (or great festival), sometimes called ’Eed el-Kurban. The former, which lasts for three days, immediately follows the month Ramadan, and is generally the more joyful of the two; the latter begins on the tenth of Zu-l-Heggeh (the last month of the Mahometap year), and lasts for three or four days. Besides these festivals they usually keep holy the first ten days of Moharram (the first month of the year), especially the tenth day, called Yom Ashoora; the birthday of the prophet, on the twelfth day of the third month ; the birth- day of El-Hoseyn, in the fourth month ; the anniversary of the prophet’s miraculous ascension into heaven, in the seventh month ; and one or two other anniversaries (see vol, vii. p. 727). Friday, called the day of El-Gumah (the assembly), is a day of public worship; but it is not usual to abstain from public business on that day except during the time of prayer.

Hindu and Buddhist Festivals—In modern India the leading popular festivals are the Holf, which is held in March or April and lasts for five days, and the Dasahara, which occurs in October (see Hunter’s Statistical Account of Bengal). Although in its origin Buddhism was a deli- berate reaction against all ceremonial, it does not now refuse to observe festivals. By Buddhists in China, for example, three days iu the year are especially observed in honour of the Buddha,—the eighth day of the second month, when he left his home; the eighth day of the fourth month, the anniversary of his birthday; and the eighth of the twelfth, when he attained to perfection and entered Nirvina. In Siam the eighth and fifteenth days of every month are considered holy, and are observed as days for rest and worship, At Trut,

the festival of the close of the year, visiting and play-going are universal. The new year (January) is celebrated for three days; in February is another holiday; in April is a sort of Lent, ushering in the rainy season ; on the last day of June pre- sents are made of cakes of the new rice; in August is the festival of the angel of the river, “whose forgiveness is then asked for every act by which the waters of the Meinam have been rendered impure.” See Bowring’s Stam and Carné’s Travels in Indo-China and the Chinese Empire. Copious details of the elaborate festival-system of the Chinese may be found in Doolittle’s Social Life of the Chinese. (3% 8) BE.)

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FESTUS, Sextus Pomprtus, a Latin grammarian of uncertain date, but who probably flourished in the 2d century of the Christian era. He wrote an epitome of the celebrated work De Verborum Significatione. This was a valuable treatise on many obscure points of grammar, mythology, and antiquities, written by M. Verrius Flaccus, a grammarian who flourished in the reign of Augustus. The abridgment of Festus has been done rather mechani- cally, and without sufficient discrimination. He has also made a few alterations, and inserted some critical remarks of his own, besides omitting altogether such ancient Latin words as had long been obsolete. These he discussed in a separate work now lost, entitled Priscorwm Verborum Labri cum Exemplis. Of Flaccus’s work only a few fragments have come down to us, and of Festus’s epitome only one original copy is known to be in existence, and that in a very imperfect form. After passing through very many vicissitudes, it found a temporary shelter in the Farnese lib- rary at Parma, whence in 1736 it was taken to Naples. At the close of the 8th century Paulus, commonly called Diaco- nus, who happened to possess a copy of Festus’s work, epi- tomized it; but, being an imperfect scholar, he allowed countless errors to creep into his abridgment, although he abstained from making any additions of his own. From this work of his, and the solitary mutilated copy of the original which still survives, some of the most distinguished scholars of modern Europe have attempted to reconstruct the important treatise of Festus. Of the early editions the best is that of Scaliger, published in 1565, and with supplements by Fulvius Orsinus in 1581. By both these editors many of the blanks are filled up by conjecture. But by far the best of existing editions is that of K. O. Miiller,

Leipsic, 1839. Festus gives not only the meaning of every word in his treatise, but also its etymology ; and his work, fragmentary as it is, has thrown considerable light on the language, mythology, and antiquities of ancient Rome.

FETICHISM is a stage of worship, or of the ways of regarding nature (for in simple states of mind religion and philosophy are in great part merged) in which ordinary material objects are regarded as holding, or as being the vehicle of, supernatural powers and influences,—which powers and influences can, it is supposed, be controlled or directed by the person possessing the object so endowed.

Religions have not, as yet, been scientifically classified in anything like a final manner. Even the most rigorous of minds would hardly assert that the time has yet arrived for such a classification. But it is possible, even now, to collect roughly those beliefs which, whether still existing among savages and uneducated people of all classes or traceable only among the records of the past, bear a general resem- blance to each other, and to give a general name marking that resemblance. Such a namewehave in "'fetichism." The word feetico, corresponding to our ' fetich," seems to have been first applied by Portuguese traders on the west coast of Africa to savage objects of worship, which were noticed from their resemblance to the talismans and charms common in Europe, and popular with sailors and travellers above all men.

In Purchas's Pilgrimage (1614) is a chapter translated from a Dutch author relating to the customs and rites of the negroes of Guinea, in which fetessos and fetisseros, or priests, are frequently mentioned. '' When the king will sacrifice to Jetisso, he commands the fetissero to enquire of a tree whereto he ascribeth Divinity, what he will demand ;" and so the author goes on to describe the manner of questioning this remarkable tree. The word fetich was, however, first used in a general sense by a thoughtful scholar of the 18th century, the president Charles de Brosses, who, in his work Du Culte Des Dieux Fétiches, strung a number of facts re- lating to savages on a theory tracing fetichism in Egyptian

and classic mythology and in modern life. Comte, the French philosopher, gave great currency to the term by em- ploying it to characterize what he regarded as a great and necessary stage in the theological development of humanity, —a state “plus ou moins prononcé, mais ordinairement tres durable, de pur fétichism, constamment characterisé par lessor libre et direct de tendance primitive & concevoir tous les corps exterieurs quelconques, naturels ou artificiels; comme animés d’une vie essentiellement analogue a la nétre, avec des simples differences mutuelles d’intensité” (Phdlo- sophie Positive, v. 30). In England, and at present among anthropologists generally, the word bears a far more re stricted meaning than the one here given to it by Comte. It is applied, not to a belief ascribing volition and will to all objects, to all matter, but to a belief in the peculiar power of certain objects, which power may be discovered and tested by experiment, any success, of course, confirming the liypothesis and giving reputation to the chance-chosen object as a great and potent fetich, Sir J. Lubbock defines fetchism “as that stage of religious thought in which man supposes he can force the deities to comply with his desires.” He regards it as the next stage above pure atheism in the religious prugress which passes from it, through totemism and shamanism, into idolatry (Origin of Civilization, 199). Tylor defines it as “the doctrine of spirits embodied in, or attached to, or conveying influence through certain material objects.”

Both natural and artificial objects are used as fetiches, To the savage nothing seems too great to serve his indivi- dual purposes, nothing too insignificant or commonplace to be the centre of his ideas of power and devotion.

Generally upon beginning an expedition the negro of Guinea chooses the first object that presents itself to his eyes upon issuing forth, and vows to worship that as a god if the work in hand prove successful ; if not, it is cast aside as useless or worse. Stones, trees, twigs, pieces of bark, roots, corn, claws of birds, teeth, skins, feathers, human and animal remaius of all kinds —anything that may strike the savage as in any way peculiar—are used in this manner; even whole species of animals, rivers, the sea, the moon, and thesun. Articles of costume, tools, weapons, boats, and other articles of human manufacture are not objected to.

Museums of such of these things as may have accom- panied success in any expedition are kept, and are regarded as sacred places, not to be entered without reverence. Other such objects are the property of private individuals, household gods, and are consulted upon all occasions of importance. If the wishes of the worshipper be nob granted, all a savage's rather powerful vocabulary of abuse is exhausted upon the fetich, It is kicked, stamped upon, dragged through the mud. Change of luck, however, pro- duces apologies, and promises of future regard and worship. Savages who have taken trees as their fetiches, if they are unlucky, cut down trees in revenge. The actions seem rather to be tentatives for the discovery of hidden power than those of any formulated and dogmatic cultus.

In considering the state of mind which all this kind of action implies, wemust remember that not only human beings, not only animate beings, are regarded by savages as possess- ing spirits, but that they attribute spirits to inanimate objects also. The sight of the figures of departed friends and ancestors in dreams gives notice of a world of spirits, but each appearing "in his habit as he lived" seems to imply that garments, weapons, and other objects of human social environment must have spirits also. When a chief dies wives and slaves are slain, weapons broken, garments rent to pieces,—for what reason, but that the warrior should not go naked and alone to the world of spirits? As ® deadly blow sets free the spirits of animate, so fracture and destruction set free the spirits of inanimate objects.

But the belief in the efficacy of peculiar objects upon a person's welfare is not by any means confined to savages. Witchcraft is a form of fetichism, and it can hardly be sald to be dead from among us even now. Others than children may be found who will keep a crooked sixpence, a curious stone, a hard potato, for luck,—prompted by exactly those instincts, wluich, although long superseded in some races, are perhaps the highest the savage possesses. The power of the feticl seems in many cases, however, to be regarded not as superhuman, but as extra-human. . The tendency to believe that what precedes, accompanies, or follows a thing or accident must be somehow causally connected with it is ever prevalent; and to palliate our wonder at the gross super- stitions of the savage we must remember how

many people we have met in the heart of modern civilization who are careful about lucky and unlucky days and numbers. As the fetich becomes more and more endowed with personality and will, so the belief passes imperceptibly into what is called idolatry.

See Brosses, Du Culte des Dieux Fétiches, 1760; Dulaure, Hist. des differens cultes, 1828; Lubbock, Origin of Civilization; Tylor, Primi- tive Culture; Schultze, Der Fetisehismus. (W. HE.)

FETIS, Francois JoszpH (1784-1871), although a fertile composer of almost every kind of music, will be chiefly re- membered as a theoretical and critical writer. He was born at Mons in Belgium, March 25, 1784, and was trained as a musician by his father, who followed the same calling. In 1800 he went to Paris and completed his studies at the conservatoire under such masters as Boieldieu, Rey, and Pradher. After many vicissitudes he was in 1823 ap- pointed professor at the same celebrated institute, and re- mained in the French capital for ten years, till in 1833 he obtained the directorship of the music-school of Brussels, which owes much to his indefatigable zeal, He also was the founder, and, till his death, the conductor of the cele- brated concerts attached to the conservatoire of Brussels. In this important position he exercised a potent influence on musical education and musical taste in Belgium. He also furnished a large quantity of original compositions, from the opera and the oratorio down to the simple chanson. But all these are doomed to oblivion. Although not without traces of scholarship and technical ability, they Show total absence of genius. More important are his writings on music. They are partly historical, such as the Curiosités historiques de la musique, Paris, 1850, and the un- finished Histoire universelle de musique, of which only the first three volumes have appeared (Paris, 1869-1872), partly theoretical. Amongst the latter the Méthode des méthodes de piano (Paris, 1837), written in conjuction with Moscheles, may be named. By far the most important of his works Is the celebrated Biographie universelle des Musiciens, com- menced as early as 1806, but not published till 1834 (in 8 vols,). Although full of mistakes, and marked. by narrow- ness and onesidedness of critical judgment, it is a work of vast and varied information, and as such still unsurpassed. Fétis died at Brussels in 1871. His valuable library was purchased by the Belgian Government and presented to the conservatoire,

FEU, in the law of Scotland, signifies, in its widest sense, any tenure of land by which the relation of superior (or overlord) and vassal is constituted. Of these tenures the feudal system in Scotland has recognized five,—ward (the orginal military tenure, abolished in 1747), feu, blench, inortification, and burgage. The term feu, however, is now a Practice restricted to one of these, feu-holding or feu- ee which is a grant of land, or property connected with = i perpetuity, on condition of the grantee making to pee as annual payment of a substantial nature, a jr for certain contingent payments termed

—the radical right to the whole remaining with

the granter. It is opposed to blench-holding—the only other feudal tenure now made use of in Scotland~—-in which the payment to the superior is merely nominal in amount, é.g., a penny Scots. The feudal system embraces the whole of Scotland except Orkney and Shetland, where remains of the udal right are still to be found. Itis a fundamental principle of the system as developed in Scot- land to permit subinfeudation to an unlimited extent,—that is, every vassal, unless restrained by special agreement, may feu the whole or part of his land to another person, who thereby becomes his sub-vassal; and by the Act of 1874 conditions by superiors prohibiting subinfeudation cannot thereafter be lawfully made. The feu-duty is usually a payment either in money or in kind. Services, however, are still legal if they are not of a military nature ; but they must be paid within the year, as is also the case with blench duties of whatever sort. The casualties now recognized are—relief, the fine payable by an heir on succeeding , composition, that payable by a stranger ; and liferent escheat, the forfeiture to the superior of the annual profits of the land while the vassal is civilly dead for failing to answer for a crime. The vassal, also, if he is two years in arrears in payment of the feu-duty and allows decree of irritancy, as it is called, to pass against him, loses his right absolutely. Casualties were at one time more numerous and more irksome in their incidence than at present, for the law now regards with disfavour all feudal payments not of a fixed periodical nature. Indeed it may be said that casualties no longer exist, for the Conveyancing (Scotland) Act of 1874 has abolished all payments of a contingent nature in new feus, and provides for the com- mutation of those already existing. This Act, while it has preserved the name, has really

destroyed the relation of superior and vassal, as that has been long understood in Scotland. A feu is the usual title upon which land is granted for building purposes in Scotland. Long building leases are not much known; and this has greatly con- tributed to the durable nature and value of Scotch house property.

FEUCHTERSLEBEN, Epvarp, FREIHERR Von (1806- 1849), an Austrian physician, philosopher, and poet, was born at Vienna ou the 29th April 1806. He entered the uni- versity of Vienna in 1825, and obtained his doctor's degree in 1833. In 1845 he became dean of the faculty of medi- cine, and in 1847 was named vice-director of medico-chirur- gical studies. In July 1848 he was appointed under secre- tary of state of the education department, but resigned his office in the same year, and died 3d September 1849.

His principal prose writings are Ueber das Hippokratische erste Buch von der Didtetik, Vienna, 1835; Ueber die Gewissheit und Wirde der Heilkunst, Vienna, 1835; Lehrbuch der drztlichen Secl- enkunde, Vienna, 1835, translated into English under the title Medieal Physiology; and Zur Didtetik der Scele, Vienna, 1838. He obtained some reputation also as a poet. Some of his verses are lyrical, but most are of a didactic character. His collected works —with the exception of those purely medical—edited by the poet Hebbel, were published in 7 vols. at Vienna, 1851-53.

FEUDALISM, FEUDAI. SYSTEM. eodum, feudum, fief, or fee is derived from the German Veh, cattle (Gothic, faihu ; Old High German, jihu ; Old Saxon, fehu ; Anglo- Saxon, feoh) ; in a secondary sense the word came to denote goods, money, property in general. The second syllable has been connected with another root, od, also meaning property,—the whole word denoting property held as a re- ward, or in consideration of special service. Whether this etymology be correct or not, this is the signification which the word acquired in time. "The word feodum is not found earlier than the close of the 9th century. But neither the etymology of the word nor the development of its several meanings can be regarded as certain."[1]

1 Stubbs, Constitutional History, i. 251. '* Le mot apparait pour

social organization based on the ownership of land, and per- sonal relations created by the ownership of land,—a state of things in which public relations are dependent on private relations, where political rights depend on landed rights, and the land is concentrated in the hands of a few. Feudalism in this sense has existed, and perhaps may still exist, in various parts of the world; but the feudal system par excellence is always understood to mean that special form of feudalism which was developed on the soil of Gaul by the conquering Franks. England had a feudalism of its own, developed simultaneously but independently through the operation of similar causes. Just as the insular feudalism had reached its maturity, the continental feudalism was brought over ready-made by the Normans, and superimposed on the basis of the domestic product. Thus our social state exhibits elements derived from both forms of feudalism, in conjunction with fossil relics of still earlier institutions. Both varieties of feudalism may be regarded as transition states, intervening between the rough wild liberty of primitive society based on individualism and the carefully organized liberty of modern society based on the effectual supremacy of the law.

Both forms of feudalism had their roots in the organiza- tion of primitive Germany. A glance at that system is desirable for a thorough comprehension of our subject ; it will help us to realize what feudalism was, if not to discern how it grew up. The leading characteristics of the Teutonic polity were individual liberty and tribal autonomy. Each tribe or canton is theoretically independent, and entitled to manage its own concerns; within the tribe all free heads of houses are politically equal, and entitled to a voice in the affairs of the community. Each free villager has his share of the tribe lands,—his homestead, his propor tion of the arable land, with corresponding rights over the forest and pasture lands. The shares are not necessarily equal, as social distinctions exist, and are fully recognized by the law ; but whether large or small, the shares are held on the like terms of participation in all public duties, chief of which are the obligations of attendance in the communal meetings and inthe host. The shares so held “‘ bore among the northern nations the name of QOdal or Edhel.”} Whether any etymological connexion exists between the words odal and alod ““‘may be questioned, but their signification as applied to land is the same: the alod is the hereditary estate derived from primitive occupation, for which the owner owes no service except the personal obligation to appear in the host

and in the council.”2 As above intimated, political equality was not held incompatible with social inequality ; the population was divided into three classes, rated at different values in the legal tariff. First came the nobilis, eorl, or etheling, the man distinguished by ancestral wealth and reputed purity of blood; next ranked the simple freeman, the ingenuus, Srilingus, or ceorl ; at the bottom of the social scale stood the serf or slave (colonus lazzus, let, servus, theow). An injury done to an eorl or his property would cost the offender twice or three times as much as the same injury done to aceorl ; at an equal distance below the ceorl ranks the slave, but the compensation for injury done to him of course goes to his master. The official magistracy (principes) are selected from the ranks of the nobility ; very distinguished parentage will at times entitle a mere lad to high office, but this is. rare.? Superior birth gives weight la premiére fois dans une charte de Charles le Gros, en 884.” Up to

that date beneficium is used apparently to designate the same thing.—

Guizot, Civil. i : i i aa Siig iv. 41. Cf. Robertson, Scotland under her early

a . . ; Also known as Hube in Germany ; in England and France as mansus, hide, cassata, terra Jamilie, &e.

2 Stubbs, sup., 58. 3 Tacitus, Germ., ch. 13,

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Feudalism in a broad sense may be taken to mean a | and precedence in the national councils ; above all, where a

powerful tribe or confederation of tribes think fit to exalt their dignity by conferring regal honours on their chief, care is taken to select the king from the family of noblest birth. But in critical times the instinct of a free people taught that the claims of birth must give place to more weighty considerations: whoever might be allowed to rule in time of peace, on the field of battle only the man of tried ability could take the lead. Judicial and political business was trausacted in the various national assemblies held at fixed times, ‘“ generally at the new or full moon,” Local questions and matters of police were determined in the meetings of the mark or township

(views, dorff); the higher criminal jurisdiction and questions of a political nature were reserved for the malls or gemotes of the hundred, canton, or tribe (gau, pagus, gens) ; ‘there was no distinction of place ; all were free, all appeared in arms.” The order of business was settled beforehand by the chiefs in com- mittee, a leading elder would open the debate; others followed as the spirit moved them; the people decided as they thought fit. ‘Opposition was expressed by loud shouts, assent by the striking of spears, enthusiastic applause by the clash of spear and shield.”

The analogy of popular meetings in other ages and countries will warrant the belief that under ordinary. circumstances the people would be greatly swayed by the policy of their leaders, but the fact remains that the ultimate appeal was to the people. So with the local judi- cial meetings: the position of the elected princeps is “rather that of president than of judge ;” all the free men sit as hisassessors. ‘‘ Doubtless they both declared the law and weighed the evidence.” The authority of the princeps was in all cases limited: ‘ De minoribus rebus principes consultant ; de majoribus omnes.”® Even the prerogatives of the monarchical chiefs were subject to strict limitations. Their position was one of high honour but not of irresponsible power. The practical influence of the chief, whether exalted to royal dignity or not, depended largely upon the strength of his comitatus, or household retinue. This institution, “one of the strangest but most lasting features” of early Aryan civilization, was an arrangement “ partly private and partly public in its character,” which served to furnish “a sort of supplement to an otherwise imperfect organization.” 7 The cometatus was a voluntary bond of partial vassalage, intended for mutual protection and support, by which a freeman, even a man of noble birth, attached himself toa more powerful lord (Alaford,® princeps). At the table of his lord the free companion, as he was called (comes, gesith), found a comfortable seat; from his lord he received his equipment for war or the chase (heregeatwe, heriot), which reverted to the lord at hisdeath. In return he was bound to espouse the cause of his lord as against all men and by all means. The position of a favoured gesith was one of comfort and social importance; but involving, as it did, the surrender of all freedom of individual action, it probably entailed a certain diminution of political status.® The tie of the comitatus, when coupled with the tenure of land, gives us the germ from which the whole feudal system was developed.’° It has been commonly held, apparently on

the authority of Montesquieu, that the Frankish con- quests in Gaul were effected by independent nobles fighting each with a powerful comitatus at his back ; that the lands

4 Tacitus, Germ., ch. 7. This, however, would hardly apply to the case of a monarchical tribe.

> Stubbs, sup., 29; Tacitus, sup., ch. 11-13.

§ Tacitus, sup. 7 Stubbs, sup., 25.

8 Literally ‘‘ Loaf-giver.”—Kemble.

- Tacitus, swp., 13-14. On the whole subject see Kemble’s Saxons, i. 168 ; Stubbs, sup., 24; Freeman’s Norm. Conquest, i. 92.

10 “Ainsi chez les Germains il y avoit des vassaux, et non pas des fiefs,” Montesq., Esprit des Lois, xxx. iii.

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socouquered were immediately parcelled out by them among their cometes upon terms of military service and special fidelity ; and that the Merwing state from the first was built up on the feudal principle of vassalage.? The sound view appears to be that—as in Britain, so in Gaul—the Germanic tribes came over as “ nations in arms,” “ with their flocks and their herds, their wives and their little ones;” that they brouglit their Germanic social and political organization with them; and that the Merwing kingdom was mainly constructed on that basis—subject to modifications introduced perforce by the circumstances of the conquest. In Britain it is clear that the primitive political institutions were introduced en bloc, and took root ; of the agrarian settlement effected, evidence is lacking dur- ing the first centuries of the new order. When trustworthy data begin to appear feudalism has already made large inroads on primitive alodialism. In Gaul

the chain of evidence is continuous, and it is beyond doubt that under the first dynasty the tenure of land was still mainly alodial ; that all the people were bound to be faithful to the king as @ national duty, and not by virtue of special land ten- ure; that “the gift of an estate by the king involved no defined obligation of service,” all the nation being still bound to military service ; that ‘‘ the only comites were the antrustions, and these few in number ;” and that the supposed larger class of comites, the /ewdes, were in fact tlie whole body of the king’s good subjects, in Anglo-Saxon phrase, his “ hold.”2

If we pass to the close of the 10th century, and take a survey of the social condition of western Europe, we shall find all the principles of the primitive Germanic society inverted, Political organization from being personal has become territorial ; ‘the ideas of individual freedom and political right” have “ become so much bound up with the relations created by the possession of land as to be actually subservient to them.”

Everything belongs either to the king or tle lord. Thus in England the national peace is now the king’s peace ; the state domain—the folkland—is terra regis. The township has become the lord’s manor, the township waste the lord’s waste, the township court the lord’s court. “Land has become the sacramental tie of all public relations; the poor nan depends on the rich, not as his chosen patron, but as the owner of the land that he cultivates, the lord of the court to which he does suit and service, the leader whom he is bound to follow to the host.”3 This dreary re- sult was not acomplished in a day. But the causes began to operate from a very early period. Even if each free im- migrant received his due family portion of land, a much larger allotment would certainly be assigned to the leader, Who might be considered to have contributed most to the Success of the undertaking; whole townships in a depend- ent position might thus be established from the very first. The leaders of the migration of course came armed with all the exceptional powers usually conferred on duces in time of war ; the position of the new comers, as military colonists encamped on the lands of others, led to a prolongation of those powers, Strong government was an absolute necessity ; consequently royalty, previously unknown to the Anglo-

axon tribes, makes its appearance as an immediate con- Sequence of the conquest. Five years after his landing the ce ene me oo ee oe, i, 811, &e. Yet see Montesquieu,

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Py an a, i, 251, citing Waitz, Deutsche Verfassungsgeschichte, am The work of Sohm (Altdeutsche Reichs und Gerichts ing ee g), completes the overthrow of the old theory, by reconstruct- a M very remarkable manner, the old German system in Salian erovingian times." See also Robertson's Scotland, ii. 449.

F) p Fate a " see the proclamation of Henry III. in 1258,

3 Stubbs, sup., 167,

"heretoga." Hengest is raised to kingship. When the re- sistance of the natives was crushed, political wars and wars of succession between the invaders themselves ensued, each struggle adding to the private possessions and political influence of the victorious chief. "Everything, in fact, which disturbs the peaceful order of the village system tends to the aggrandizement of the leading family and its chief.'"4 The new order of things, however, sprang from two great sources, the beneficiary system and the practice of " com- mendation." "On Gallic soil it was specially fostered by the existence of a subject population, which admitted of any amount of extension in the methods of dependence."®

The system of benefices had its origin partly in grants of land made by kings and principes to their comites, kinsmen, and servants, on terms of special fidelity,—analogous to, if not identical with, the bond of the comtatws,—partly in the surrender of alodial estates made by the owners to lay or ecclesiastical potentates, to be received back, and held under them as beneficia. By this arrangement the de- pendant bought the protection of a temporal or spiritual patron. Commendation was a similar arrangement, entered into without reference to land ;° the weaker man placed himself under the personal protection of a superior " without altering his title or divesting himself of his estate: he became a vassal and did homage. The placing of his hands between those of his lord was the typical act by which

the connexion was formed. And the oath of fealty was taken at the same time. The union of the beneficiary tie with that of commendation completed the idea of feudal obligation." Both lord and "man" have a hold on the land; each has his duty to the other,—the one to protect, the other to support. "A third ingredient was supplied by the grants of immunity by which the dwellers on a feudal property were placed under the tribunal of the lord, and the rights which had belonged to the nation or its Chosen head were devolved upon the receiver of a fief.""

The system so formed was of mingled origin. The benefi- cium "is partly of Roman partly of German origin ;" com- mendation might be traced up to the comitatus or the Roman clientship, or possibly to Celtic usages of kindred ancestry.® All these Seiicite the benefice proper, the sur- rendered alod, the personal commendation, the private jurisdiction, find their place in English as well as in French history, but the elements were blended in ditferent propor- tion, and under external conditions of a different character. In England the tie of the comitatus played an important part, and became the basis of the later Anglo-Saxon nobility. On the Continent the comitatus was soon lost in "tlie general mass of vassalage ;"® on the Continent territorial influences became paramount; in England personal and legal infiuences were never extinguished. Both in France and England the process of commendation was fostered by edicts of the central Governnient, requiring, for purposes of police, that all persons of humble station should place themselves under lords.}° "The process by which the machinery of government became feudalized, though rapid,

4 Maine, Village Communities, 148.

5 Stubbs, sup., 252.

6 Stubbs, following Waitz, ii. 262, iv. 210, denies any connexion between the commendation and the beneficiary system of the Frank empire with the primitive comitatus. Roth, Beneficialwesen, 385, regards commendation as ‘‘ placing a man in the relation of comitatus to his lord ;" and he makes the Frank antrustionship a link between the primitive comitatus and later feudalism.

7 Stubbs, sup., 253. 8 Waitz, iv. 199.

9“*In the Frank empire the beneficiary system is unconnected with the comitatus ; in the English they are im the closest connexion.” —Stubbs, 153. In spite of this authority, it seems hard to believe that there was no connexion whatever between the Frank benefices and the comitatus.

0 E.g., Athelstan, Conc. Greatanl.; Schmid, Gesetze, i. 132: Thorpe, i. 200; Baluze, ii. c. 118, cited by Guizot, Civ. France, iv. 68.

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was gradual.” In 843, the date of the great treaty of Verdun, two princes shared the land of France with Charles the Bold, namely, the king of Aquitaine and the duke of Brittany. In 877 Charles was induced to publish a recognition of the hereditary character of benefices. By the end of the century nine-and-twenty provinces, or parts of provinces, had been erected into petty states ; by the year 1000 the list had swelled to fifty-five.”

“The weakness of the Karoling kings gave room tor the speedy development of disruptive tendencies in a territory so extensive and so little consolidated. The duchies and counties of the 8th aud 9th centuries were still official magistracies, the holders of which discharged the functions of imperial judges or generals. Such olficers were of course men whom the kings could trust, in most cases Franks, courtiers or kinsmen, who at an earlier date would have been comites or antrustions, and who were provided for by feudal benefices. The official magistracy had in itself the tendency to become hereditary, and when the benefice was recognized as heritable, the provincial governorship became so too. But the provincial governor had many opportunities ofimproving his position, especially if he could throw himself into the manners aud aspirations of the people he ruled, By marriage or inheritance hemight aceumu- late in his family not only the old alodial estates which, especially on German soil, still continued to subsist, but the traditions aud local loyalties which were connected with the possession of them.? So in a few years the Frank magistrate eould unite in his own person the beneficiary endowment, the imperial deputation, and the headship of the nation over which he presided. And then it was ouly necessary for the central power to be a little weakened, and the

independence of duke or count was limited by his homage and fealty alone, —that is, by obligations that depeuded on conscience alone for fulfilment. It isin Germany that the disruptive tendency most distinctly takes the political form; Saxony and Bavaria assert their national independence under Swabian and Saxon dukes who have identified the interests of their subjects with their own. In France, where the ancient tribal divisions had long been obsolete, and where the existence of the alod involved little or no feeling of loyalty, the process was simpler still ; the provincial rulers aimed at practical rather than political sovereignty ; the people were too weak to have any aspirations at all; the disruption was due more to the abeyance of central attraction than to any eentrifugal force existing in the provinces. But the result was the same ; feudal government, a graduated system of jurisdiction based on land tenure, in which every lord judged, taxed, and commanded the class next below him; in which abject slavery formed the lowest, and irre- sponsible tyranny the highest grade ; in which private war, private coinage, private prisons, took the place of the imperial institutions of government. ""*

This was the social system under which William the Conqueror and his barons had been brought up. English indigenous feudalism had reached its height in 1017, when Cnut "dealt" all England into four earldoms —"tohimself the West Saxons, to Thorkell the East Anglians, to Eadric the Mercians, and to Eric the Northumbriaus."® The four juris- dictions are spoken of as co-ordinate. Such a system, with time, might easily have ripened into continental feudalism. But William had no mind to encourage feudalism as a system of government ; on the contrary, he took care to introduce that which England never before had enjoyed, a real central adininistration, and in that aspect he arrested the growth of feudalism in England. As a system of land tenure it was the only arrangement that he could have con- ceived or understood ; and England was already so exten- sively feudalized in fact that it seemed the merest change of

1 Guizot, Civ. France, ii. 430.

2 See the tables in Guizot, sup., 433, 487.

3 Abundant proof of this position will be found in German history. The rise of the successive families of Saxon dukes and the whole history of Bavaria

under the Saxon emperors furnish illustrations. The Saxon dukes of Bavaria carry out the Bavarian policy in opposition to their near kinsmen on the imperial throne. The growth of the Swabian Welfs into perfect identification with the Saxons whom they governed affords another striking instance. In a less degree, but still to some extent, this was the casein France also; but the Gallic populations had lost before the Karoling period most of their national aspirations; nor did the Frank governors identify themselves at any time with the

people. Hence the great difference in social results between French and German feudalism."

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theory to make all subjects tenants, and the king the uni. versallord and sole alodial owner. The barons were allowed to take up the hereditary jurisdictions already existing on the estates on which they entered ; but the administrative func- tions of the Anglo-Saxon earls were transferred to the king's sheriffs. The barons resisted, but William's strong arm kept them down ; again and again under his two sons the struggle was renewed. 'The English, who might never have struggled against native lords, were roused by the fact that lee lords were strangers as well as oppressors, and the Norman kings realized the certainty that if they would retain the land they must make common cause with the people."® Under Stephen feudalism burst out in all its horrors; fortunately the conflagration burnt itself out, The English rallied again round Henry II.; the great houses of the Conquest successively "suffered forfeiture or extinction ;" the other Normans became Englishmen ; and the legal and constitutional reforms of Henry II., with the help of the nation, "put an end to the evil."

In France the royal authority had been reduced to a shadow. But

'the shadow is still the centre round whieh the complex system, in spite of itself, revolves. 1t is recognized by that system as its solitary safeguard against disruption, and its witness of national identity ; it survives for ages, notwithstanding the attenuation of its vitality, by its ineapacity for mischief. In course of time the system itself loses its original energy, and the central force gradually gathers into itself all the members of the nationality in

detail, thus concentrating all the powers which in earlier struggles they had won from it, and incorporating in itself those very forces which the feudatories had imposed as limitations cn the sovereign power. So its character of feudal suzerainty is exchanged for that of absolute sovereignty. The only checks on the royal power had been the feudatories ; the crown has outlived them, absorbed and assimilated their functions ; but the increase of power is turned, not to the strengthening of the central force, but to the personal interest of its possessor. Actual despotism becomes systematic tyranny, and its logical result is the explosion which is called revolution. The constitutional history of France is thus the sum- mation of the series of feudal development in a logical sequence which is indeed unparalleled in the history of any great state, but which is thoroughly in harmony with the national character, form- ing it and formed by it.”® (J. H. BR.)

Remains of Feudalism in English Land Laws.

Feudalism, although it has ceased to exist as a system of political and social relations, still survives as the basis of the law relating to land, both in England and Scotland. The most elementary con ceptions of real property earry us back to the relations of lord and vassal, and cannot be understood without reference to them. Ownership of land, in the full sense of the phrase, is unknown to the law of England. There is no such thing as absolute property in land, says the chief English writer on that subject ; a man cal only have an estate or interest in land. Every landowner, in the popular sense of the phrase, is, in the eye of the law, a tenant only ; and such is the case with the largest and most unlimited interest known to the law—that of an estate in fee-simple. The owner in fee is the tenant of some one else, who in his turn is the tenant of another, and so on, until the last and only absolute owner is reached, viz., the king, from whom directly or indirectly all lands are held. The spirit of feudalism has, of course, entirely gone out of the system ; ouly the skeleton is left. Between a tenant in fee-simple and his lord there is no eonnexion whatever except Mm legal theory ; in poiut of fact, it is for the most part unknown who the lord of a particular tenant may be. ‘here are, however, new eontingencies, in which the feudal theory may still yield positive results. Such, for instance, is the case of Escugat (q.v.), in which, on the failure of heirs of freeholde13 dying

intestate, the land would go to the next lord, and in the absence of a mesne-lord to the crown. In the ease of Copynoxps (q.2.), the incidents of feudal tenure survive in a more marked degree than in any other class © estates. ‘They sprang from an inferior kind of feudal holding, au remained subject to the custom of the manor to which they be- louged. With the exception of such cases, the feudal obligations and restrictions in which the virtue of the system resided have long disappeared. The establishment of the right of alienation, and ata later time of the testamentary disposition of fee-simple estatcs, the aequisition by collusive processes of the right of breaking entail, at

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- Stubbs, sup., 255-6. 5 Anglo-Saxon Chronicle, in anno, & Stubbs, sup., 168. 1 16. aed 8 Ib., 3-4. |

lastly, the formal abolition in the reign of Charles 11. of the most onerous class of feudal obligations—those relating to chivalry—are the most important steps in this process. These tenures in chivalry, by knight-service, or military tenures, as they were variously called, retained the feudal spirit in its most oppressive form. The rights of wardship and marriage were perhaps the most valuable and the most burdensome of all the rights of the lord. They enabled him to seize the estate of his tenant when he was under age, to exact a fine from him on his coming of age, and to marry him or her to whomsoever he chose. By the 12 Charles Il. c. 24 these tenures, with all their oppressive incidents, were abolished and turned into tenures ‘‘in free and common socage,” 7.¢., the ordinary non-military tenure, feudal like the other in its origin, but not subject to the obligations imposed by the military character of the tenure by knight’s service. The law of real property is, however, still feudal in the sense that its main lines were laid in the times of feudalism. 1ts most general terms are all feudal in their original meaning. The fee (feudum) is the feudal estate descendible to a maw’s heirs. The frecholder is the tenant of an estate worthy of a free man, the smallest in quantity being an estate for his own life. To this day a gift to A.B., without other words,’ means a gift of an estate for life only, because feudal holdings were originally granted to the tenaut for his own life, and in return for his

own services. And feudal conceptions have overrun and transformed large classes of rights, which in their origin were anterior to feu- dalism. Thus the independent rights of commoners were ignored, and their privileges were treated as favours granted to them by some lord.

FEUERBACH, Lupwie Anprzas (1804-1872), fourth son of the eminent jurist (see next article), was born at Landshut in Bavaria on the 28th of July 1804. Like other members of his family, he evinced a religious turn of mind from an early age, and he matriculated at

~~the university of Heidelberg with the intention of study~~

ing divinity. His ardour, however, was soon diverted to metaphysical pursuits; he repaired to Berlin, became an auditor of Hegel, and, in spite of his father's vehe- ment opposition, devoted himself to the career of a teacher of philosophy. The history of his life hencefor- ward is that of his gradual emancipation from the yoke he had thus imposed upon himself. Even his first work, Thoughts on Death and Immortality (1830), exhibits the marked divergence between his mental characteristics and those of the Hegelian school. The conclusion, indeed, is Hegelian, but the author's method is dogmatic ratber than dialectical, his cast of thought mystical, his phraseology original, animated with humour and pathos, and strikingly concrete. His negation of personal immortality rendered him obnoxious to the Government, and frustrated his endeavours to obtain a professorship. His embarrassed manner and awkward delivery debarred him from success as a private tutor and lecturer. After some years of disap- pointment he renounced the attempt to gain a livelihood by philosophy, and married a lady whose scanty dower, derived from a share in a small manufactory, included free apartments in the castle of Bruckberg, and the use of a vegetable garden and shooting in the adjacent woods. In these idyllic cireumstances the philosopher supported his family for nearly a quarter of a century,—learning, as he declared, more from his peasant associates than he had learned at the university. 'Berlin opened my mouth, Bruckberg my eyes." During his early struggles and the period of his betrothal he had produced his History of Modern Philosophy, a series of criticisms of leading thinkers from Bacon to Leibnitz, and his monograph on Pierre Bayle, whom he sets forth as the type of the antithesis between faith and

knowledge. His rupture with Hegelianism was first indicated in his Oritique of Hegel (1839). It was grounded on his growing aversion to mere verbal juggles, and his strengthening conviction that philosophical research must be based upon the investigation of actual phenomena. The enthusiast for metaphysics had ceased to be a

is Unless in a will, in which case the obvious meaning of the testator will be adopted.

metaphysician, and had become the mouthpiece of a reaction the more remarkable from its independence of the contem- poraneous development of physical science. The pheno- mena with which Feuerbach dealt were nevertheless wholly psychological. Those referring to the religious sentiment formed the subject of his next and most celebrated work, The Essence (Wesen) of Christianity (1841). In this famous treatise Feuerbach shows that every article of Christian belief corresponds to some instinct or necessity of man's nature, from which he infers that it is the creation and embodiment of some human wish, hope, or apprehension. The same process of interpretation is applied to natural religion in his essay on that subject (1845), and in his lectures delivered at Heidelberg during the revolutionary troubles of 1848 and 1849. This period of anarchy promised for a moment to bring Feuerbach prominently before the world ; the inglorious collapse of the revolution gave an irrecoverable blow to his influence. Notwithstand- ing his own very reserved attitude, he had become identified in the public mind with the agitators who had made a watchword of his name, and unjustly participated in their discredit. He returned to Bruckberg, and occupied himself partly in scientific research, partly in the composition of his last important work, the Theogony (1857). Days of tribu- lation were now in store for him. Driven from his retreat at Bruckberg by the failure of the manufactory on which he had so Jong depended, too proud to implore aid, and incapable of writing for mere bread, lie would have suffered the extremity of want but for the unsolicited contributions of a few friends, assisted shortly before his death by a public subscription. His intellectual faculties were impaired by successive strokes of paralysis, and he had

ceased to take any active interest in human affairs when he expired on September 13, 1872.

Feuerbach is a remarkable figure in the history of modern thought. As a philosopher, he personifies at once the intellectual bankruptcy of mere verbal metaphysics, and the reaction towards empiricism based on the actual observation of nature and society. He reaches substantially the same conclusions as the modern professor of physical science, but by a different path, and independently re- produces the scientific spirit of Positivism, with a total suppression of its sacerdotal element. As a writer on religion his position is ambiguous. Following up the hint of one of the oldest Greek philosophers, he demonstrates that religious ideas have their counterparts in human nature, and assumes that they must be its product. “ All theology is anthropology.” It does not seem to have struck him that the proposition might equally well be inverted, and might afford scope for a problem as insoluble as that concerning the priority of the owl and the egg. His principal work, however, is rather remarkable for depth and truth of feeling than exactness of reasoning ; it wears indeed a semblance of logical consecutiveness, but consists essentially of a series of aphorisms, enunciated dogmati- cially, somewhat in the manner of Emerson. Ethically, his system has done much good by its lofty views of human nature, and the consecration with which it dignifies the most ordinary passages of human life; and not a little harm by the encouragement which an anthropocentric theory necessarily affords to excessive individual pretensions, and thus indirectly to political and social discontent. Its strongest points are its vigorous grasp of reality, embodi- ment of ideal aspirations in familiar forms, healthy optimism, and recognition of the value of everything human as such. ‘Only in action,” said Feuerbach, ‘‘do we feel ourselves free.” ‘ Let us concentrate ourselves on what is real; and great men will revive, and great actions return.” “Health is more than immortality.” His anta- gonism to the idea of personal immortality is one of his

most distinctive traits, but here as elsewhere he deals with the problem solely from the psychological side. Hence he can neither be classed with materialists nor immaterialists ; and, with all his frank honesty and

uncompromising energy of language, the same duality of attitude characterizes his position throughout. He is from one point of view irreligious, from another deeply religious, logical and mystical, positive and speculative, academically cultured and a man of the people.

Feuerbach's personal character was highly estimable, fully conformed to the philosophic ideal in simplicity, independence, disinterestedness, and fidelity to conviction. His erudition is extensive and accurate. He possessed no brilliant or superficially attractive qualities; his manner was shy and embarrassed, and his literary composition tardy and laborious. His style, nevertheless, is sufficiently clear and even epigrammatic to make him a popular writer in his own country, but hardly in any other. His chief work, though translated by the first of living English prose writers, produced little impression in England. Out of Germany he will be most esteemed by those who have attained his results by other processes, and most memorable as an instance of the empirical spirit of modern physical science asserting itself in the region of abstract speculation, with little assistance from scientific study.

Feuerbach's Essence of Christianity has been translated into the principal European languages ; the English version is by George Eliot. His correspondence has been edited, with a confuscd aud imperfect biography, by Karl Griin (Leipsic, 1874). (R. G.)

FEUEBBACH, Pavut JoHann AnsELM von (1775- 1833), a distinguished writer on criminal law, was born at Jena, November 14, 1775, In his infancy the family removed to Frankfort, and he received his early education at the gymnasium of that town. At the age of seventeen, he went to the university of Jena ; and, his path in life not yet being fixed, his active mind eagerly sought after knowledge in all fields. He familiarized himself with the Greek and Roman classics, especially with the poets; and when the common need compelled him to work for bread as well as for knowledge, his choice fell, under the influence of Reinhold's teaching, on divine philosophy. Limiting his worldly wants to the utmost, he devoted himself heart and soul to the research of truth in its higher fields, and at twenty he had already made his mark as a powerful thinker by various philosophical essays, The influence of these early studies is apparent in the great works on which his special

reputation rests. But his attention was soon concentrated on the subject to which his life was to be devoted, the science of legislation. He now sat at the feet of Schaubert and Hufeland, and the study of natural law and of jurisprudence excited in him a genuine enthusiasm, The early essays of his student years bore the impress of one of those mighty minds by which beneficent revolutions are wrought, and which open new paths to the race. In 1795 he obtained his degree of doctor in philosophy; and published one of his firstlings, as he calls it, an essay on the only possible arguments against the existence and the value of natural law. The same year he married. In 1796 he published a Critique of Natural Law as prepara- tion (Propddeutik) for a Science of Natural Law, This was followed in 1798, by his Anti-Hobbes, a dissertation on the limits of the civil power, and the right of resistance on the part of subjects against their rulers, and his Untersuchungen uber das Verbrechen des Hochverraths. In 1799 he obtained a. of ee of laws, and received permission to ea oo of academical lectures. These attracted many ‘earers, and soon won for him the rank of a master ane a at the same time appeared an important : Pies i established his reputation, the Revision der rrundsitze und Grundbegriffe des peinlichen Rechts, In

‘humane reformation of criminal laws.

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this treatise he first set forth his new theory of punishment, the intimidation theory, which was further developed and applied in the Brbliothek fiir die peinliche Rechtswissen- schaft, a work produced by Feuerbach in conjunction with Grolman and Von Almendingen, and published in 1800-1801, and was systematically and thoroughly expounded in his famous Lehrbuch des gemeinen in Deutschland geltenden peinlichen Eechts (1801), of which the fourteenth edition appeared in 1847. In these works Feuerbach shows him- self not only a great thinker and discoverer of truth, but also a gifted texcher and luminous expositor, capable of giving to principles a scientific form, and investing them with the grace and elegance of the highest literary art. His works were a powerful protest against vindictive punishments, and contributed largely to the subsequent Nor was the ex- ample of his style without influence on later writers on law. In 1801

Feuerbach was appointed professor at tlie univer- sity of Jena; but many offers were made to him, and in the following year he accepted a chair at Kiel. This he held for two years, lecturing on the law of nature, criminal law, the institutes, the pandects, and hermeneutics. But, disappointed at not finding so numerous, sympathizing, or promising an audience as he had expected, he removed in 1804 to the university of Landshut. He was also named aulic councillor, and was commanded by the king, Maxi- milian Joseph, to draw up a project of penal law for Bavaria. His position, however, was rendered painful and annoying by the jealousies and dislike of some of his fellow pro- fessors, who instigated the students to burlesque and ridicule him, and he resigned his chair. He was then called to Munich with the rank of privy referendary in the department of justice, and in 1808 was created privy councillor. Meanwhile appeared his Critique on Klem- schrod's project of criminal law (1804); and the practical reform of penal legislation in Bavaria was begun under his influence in 1806 by the abolition of torture. In 1808 appeared the first volume of his Jferkwiirdige Criminat- fdlle, completed in 1811—a work of deep interest for its application of psychological considerations to cases of crime, and intended to illustrate the inevitable imperfec- tion of human laws in their application to individuals. In his Betrachtungen tiber das Geschworenengericht (1812) Feuerbach declared against trial by jury, maintaining that the verdict of a jury was not adequate legal proof of a crime. Much controversy was aroused on the subject, and the author's view was subsequently to some extent modified. His labours on the penal law being completed, the project was submitted to rigorous examination, and, receiving ultimately the royal sanction, was promulgated in 1813 as the Bavarian penal code. The influence of this code, the embodiment in logical form of Feuerbach's enlightened and humane views, was immense. It was at once adopted as the model and basis for new codes for Wiirtemberg and Saxe-Weimar; it was adopted in its entirety in the grand-duchy of Oldenburg; and it was translated into Swedish by order of the king. Several of the Swiss cantons reformed their codes in con- formity with it. Feuerbach had also undertaken to prepare a civil code for Bavaria, to be founded on the Code Napoléon. This was afterwards set aside, and the Codex Maximilianus adopted as a basis, But the project did not become law. During the war of liberation (1813-1814) Feuerbach showed himself an ardent patriot, and published several political brochures, which, from the writer's position, had almost

the weight of state manifféstoes. One of these is entitled Ueber Deutsche Fretheit und Vertretung Deutscher Volker durch Landstdnde (1814). In 1814 Feuerbach was appointed second president of the court of appeal at Bamberg, and three years later he became first president of

the court of appeal at Anspach. In 1821 he was deputed by the Government to visit France, Belgium, and the Rhine provinces for the purpose of investigating their juridical institutions ; and in 1825 he published, as the fruit of this visit, his treatise Ueber die Gerichtsverfassung und das gerichtliche Verfahren Frankreichs. In his later years he took a deep interest in the fate of Kaspar Hauser, which had excited so much attention in Europe ; and he was the first to publish a critical summary of the ascertained facts, under the title of Kaspar Hauser: ein Beispiel eines

Verbrechens am Seelenleben (1832). Shortly before his death appeared a collection of his Aleine Schriften (1833). Feuerbach, still in the full enjoyment of his intellectual powers, died suddenly at Frankfort, while on his way to the baths of Schwalbach, May 29, 1833. In 1852 was published the Leben und Wirken Ans. von Feuerbachs, 2 vols., consisting of a selection of his letters and journals, with occasional notes by his fourth son Ludwig, the dis- tinguished philosopher (noticed above). (W. L. R. ©.)

FEUTLLETON (a diminutive of fewzllet, the leaf of a book), a kind of supplement attached to the political portion of the French newspaper. Its inventor was Bertin the elder, editor of the Débats. It is not usually printed on aseparate sheet, but merely separated from the political part of the newspaper by a line, and printed in smaller type. It consists chiefly of non-political news and gossip, literature and art criticism, a chronicle of the fashions, and epigrams, charades, and other literary trifles; and its general characteristics are lightness, grace, and sparkle. Some editors make use of the feuilleton as a separate sheet to float their journals into popularity by means of the instalments of an exciting novel. Something resembling the feuilleton is not uncommon in the newspapers of other uations, but none of these imitations possess the peculiar and distinctive excellencies of the French supplement.

FEVER (from ferveo, to burn). This term, which may be defined as a condition of the body characterized by an increase in temperature, is used in medicine with a wide application. Fever is one of the most common accompani- ments of diseases in general, and serves to make the distinction between febrile and non-febrile ailments. In many cases the fever must be regarded as only secondary to, and symptomatic of, the morbid state with which it is found associated. But there is a large class of diseases in which fever is the predominant factor, and which, although differing widely among themselves as to their characters and pathological manifestations, are believed to arise from the introduction into the system of something of the nature of # poison, upon which all the morbid phenomena depend. To such diseases the term primary or specific fevers is applied.

In considering the general subject of fever regard must be had in particular to the two main features of the febrile Process,—viz., the abnormal elevation of temperature, and the changes affecting the tissues of the body in reference thereto, Indeed, the two points are inseparably associated.

The average heat of the body in health ranges between 364° and 99°5° F. It is liable to slight variations from such causes as the ingestion of food, the amount of exercise, and the temperature of the surrounding atmosphere. There be moreover, certain appreciable diurnal variations, the ae temperature being between the hours of 1.30 and ane and the highest between 4 and 9 p.m., with trifling

ations during these periods.

— development and maintenance of heat within the = a leat regarded as depending on the destructive petal 0 he: its poe consequent on the changes ~ erg a oe P i in the processes of nutrition. Oa ant tissue disintegration is exactly

alanced by the introduction of food, while the

uniform normal temperature is maintained by the due ad- justment of the heat thus developed, and the processes of exhalation and cooling which take

place from the emunc- tories of the body, particularly the lungs and skin. In the febrile state this relationship is no longer preserved, the tissue waste being greatly in excess of the food supply, while the so-called law of temperature is in abeyance. In this condition the body wastes rapidly, the loss to the system being chiefly in the form of nitrogen compounds (urea, é&c.), The extent of this loss has been made the subject of research by many authorities, more particularly by Dr Senator, whose general conclusion is that in the early stage of fever a patient excretes about three times as much urea as he would do on the same diet if he were in health—the differ- ence being that in thie latter condition he discharges a quantity of nitrogen equal to that taken in in the form of food, while in the former he wastes the store of nitrogen contained in the albumen of the tissues and blood corpuscles. The amount of fever is estimated by the degree of elevation of the temperature above the normal standard. When it reaches as high a point as 106° F. the term hyperpyrexia (excessive fever) is applied, and is regarded as indicating a condition of danger; while if it exceeds 107° or 108° for any length of time, death almost always results. Occasionally in certain fevers and febrile diseases the temperature may attain the elevation of 110°-112° prior to the fatal issue.

The clinical thermometer now in general use furnishes the physician with the means of estimating accurately the temperature and tracing its fluctuations, while the informa- tion it affords serves in many cases to indicate the particular form of fever, even at an early stage, as weil as to prognos- ticate its probable result.

The leading general symptoms characteristic of the feb- rile state are certain phenomena connected with its onset, accession, and decline, necessarily modified in degree by theeform the fever assumes, and by its attendant compli- cations. The commencement is usually marked by a rigor or shivering, which may only exist as a slight but persistent feeling of chilliness, or, on the other hand, be of a violent character, and, as occasionally happens with children, find expression in the form of well-marked convulsions. Although termed the cold stage of fever, the temperature of the body in this condition is really increased. There are besides various accompanying feelings of illness, such as

ain in the back, headache, sickness, thirst, and great jenna In all cases of febrile complaints it is of im- portance for the physician to note the occurrence of the first rigor, which in general fixes the beginning of the attack. This stage is soon followed by the full development of the febrile condition, the hot stage. The skin now feels hot and dry, and the temperature, always elevated above the normal standard, will often be found to exhibit diurnal variations corresponding to those observed in health,— namely, a rise towards evening, and a fall towards morning. There is in general a relative increase in the rate of the pulse and the number of respirations. The tongue is dry and fur-

-red; the thirst is intense, while the appetite is gone; the

urine is scanty, of high specific gravity, containing a large quantity of solid matter, particularly urea, the excretion of which is, as already stated, remarkably increased in fever ; while, on the other hand, certain of the saline ingredients, such as the chlorides, are often diminished. The bowels are in general constipated, but they may be relaxed, as is often the case in typhoid fever. The nervous system participates in the general disturbance, and sleeplessness, disqnietude, and delirium, more or less violent, are common accompaniments of the febrile state. The waste of the muscles and corresponding loss of strength is very marked, and continues even although considerable quantities of nutriment may be taken.

The decline of the fever takes place either by the occur- rence of a crisis or sudden termination of the symptoms, often accompanied with some discharge from the body, such as profuse perspiration, copious flow of thick urine, and occasionally diarrhoea, or by a more gradual subsidence of the febrile phenomena, or, as it is technically termed, a lysis. On the other hand, death may result either from hyperpyrexia or from gradual exhaustion, the patient often passing into the typhoid state (a condition of extreme pros- tration of the physical powers, with which are associated low delirium and coma, and which is an occasional mode of death in all acute diseases); or the fatal event may occur suddenly from syncope after slight exertion, in which case it is believed to be due to asoftened state of the substance of the heart, one of the known accompaniments of fever.

Certain well-marked types of fever are recognized, these being determined by the clinical history and peculiar char- acter and sequence of the symptoms.

The term continued fever is applied to those forms in which the febrile temperature persists for a more or less definite period, uninterrupted by any distinct intermission till the crisis is reached. To this type belong simple con- tinued fever or febricula, typhus and typhoid fevers, and the eruptive fevers orexanthemata,—viz,, small-pox, measles, and scarlet fever. Relapsing fever is a form of continued fever, the chief characteristic of which is the occurrence in about a week after the crisis of a distinct relapse and repetition of all the symptoms. Occasionally second and third relapses take place.

The term remittent is applied to those forms of fever the course of which is interrupted by a short usually daily diminution of the febrile phenomena, followed by a recur- rence of all the symptoms. Such fevers are chiefly met with in tropical climates, but occasionally continued fevers assume this form, particularly in children. The condition known as hectic fever, which occurs in the course of wast- ing diseases, is markedly remittent in its course.

In intermittent fever or ague there is a distinct periodic subsidence of the symptoms, which, according to its dura- tion, characterizes the variety as quotidian (where the paroxysm recurs in 24 hours), ¢ertcan (in 48 hours), quartan (in 72 hours). Intermittent fevers are most common in the tropics, and are believed to be due to malarial poisoning.

The term malignant is employed to describe forms of fever in which the blood appears to undergo rapid de- teriorating changes, sometimes designated blood-poisoning. Yellow fever may be said to belong to this category and the continued fevers, more especially typhus and the exantlemata, occasionally assume a malignant form from the beginning. The chief forms of fever will be found described in detail under separate headings.

With respect to the treatment of the febrile condition in general, it may be remarked that modern therapeutics have furnished several methods of great

importance and efficacy. It will be sufficient to refer to two of these,—namely, the external application of cold, and the adminis- tration of antipyretic remedies or febrifuges. The former of these methods is accomplished by means of baths in which the fever patient is placed, the water being some- what below the febrile temperature, and gradually cooled down by the addition of cold water till a temperature of from 60°-70° is reached. This process, when continued aw SS time and frequently repeated, has been hich oes ae valuable results in many instances of Ae ieee oth in continued fever and in such

S as acute rheumatism. The relief to the Event is remarkable, the body rapidly parting with its leat, and the effect usually continues for hours. The explanation suggested by Professor Binz is that * in fever

the vessels of the skin are generally much contracted. The cool water acts as a strong stimulant on them, and causes a somewhat stronger contraction to take place, but this is only of short duration. Relaxation for a longer time is the necessary consequence. The hitherto bloodless and dry skin becomes filled and moist, and thus the irradiation of warmth goes on. The cooler the bath the longer it lasts,”

Certain drugs possess the power of reducing the heat of fever, and are now largely employed for this purpose. The most important of these is quinine, which, when administered in large doses (gr. x.~~xxx.), has a marked effect in lowering the febrile temperature, and, if repeated, of keeping it down. It has been supposed that this effect of quinine is due to its action as an antiseptic upon the poison in the blood giving rise to the fever; but there seems a greater degree of pro~~ bability in the view that it acts as an antitriptic by retard- ing those excessive tissue changes with which the develop- ment of heat is undoubtedly connected. This opinion is strengthened by the fact that after the administration of quinine the amount of urea discharged from the body is greatly diminished. It is said that quinine acts best at those periods of the day when the febrile temperature is in- clined to undergo slight remission. Many other substances are used for their antipyretic action, among which may be mentioned digitalis, aconite, salicin, salicilic acid, &e, Alcohol is strongly recommended by some physicians for this purpose, but

while its effect in large doses is no doubt to lower the temperature, its extensive employment in fever is objectionable on many important grounds. (J. 0. A.)

FEYDEAU, Ernest-Ammé (1821-1873), a French author, was born in Paris, March 16, 1821. He began his literary career in 1844, by the publication of a volume of poetry of that mediocre quality which in poetry is fatal. Either the partial failure of this literary effort, or his marriage soon afterwards to a daughter of the economist Blangui, caused him to forsake for a time the vocation of letters, and to devote his ambition to exchange transactions ; but the study of archeology gradnally supplanted his in- terest in speculation, and he was finally confirmed in his original choice of a literary profession by the remarkable success which attended the publiéation, in 1858, of his novel Fanny, a success due chiefly to the cleverness with which it depicted and excused the corrupt manners of a certain portion of French society. Fanny was followed in rapid succession by a series of fictions, in which immorality was gilded with the same alluring glitter, but, wanting the attraction of novelty, they failed to produce such a marked impression as their predecessor; and as their interest depended little on the portrayal of any but the lower traits of character, and chiefly on the description of intrigues, they were read and admired only within a limited circle, Besides his novels Feydeau wrote several plays, none of which, however, attained much popularity ; and he is also the author of Iistoire générale des usages funebres & sépultures des peuples anciens, 3 vols., 1857 -—61 ; Le Secret du Bonheur (sketches of Algerian life), 2 vols. 1864, English translation, 2 vols, 1867; and Z’Allemagne @™ 1871, Paris, 1872, a clever caricature of German life and manners, but characterized in many places by a somewhat blasé tone, and disfigured here and there by bitterness of feeling. He died at Paris, October 28, 1873.

See Sainte-Beuve, Causeries du LIundi, vol. xiv. and Barbey d’Aurevilly, Les ewvres et les hommes au XIXe siécle.

FEZ, one of the chief cities in the empire of Morocco, into which kingdom it was incorporated in the year 1548. Tt ig situated in 34° 6’ 3” N. lat. and 4° 58’ 15m long., being about 197 miles N.E. of Morocco, 100 miles E. from the Atlantic, and 85 miles 8. of the Mediterranean.

The city is beautifully situated on the slopes of a pear- shaped valley, through which flows the Wad-el-Jubar (or

River of Pearls). The stream is fordable throughout, and is an affluent of the Wad-el-Sebu, which it joins about six miles tothe north of the town. The Wad-el-Jubar divides the city into two quarters, the ancient town (Fas-el-bali) on the right bank, and the new (Fas-el-djedid) on the left.

Like many Oriental cities, Fez from a distance is a peculiarly striking looking place, It stretches out between low hills, crowned by the ruins of ancient fortresses; and from the turreted walls stand out in bold relief countless domes, minarets, and flat-roofed houses. The old battle- mented wall, which still surrounds the place, though falling into decay, is yet flanked by strong masonry towers. The surrounding country is well cultivated. In some places the view is marvellous. The whole neighbourhood seems covered with ruined buildings of every sort,—cells of recluses, broken columns, massive stone aqueducts, dome- like tombs, dilapidated forts, and ruined houses. Except on the south side the city is surrounded by hills inter- spersed with groves of orange, pomegranate, and various fruit trees, and large olive gardens.

The interior of the city is far from pleasing; tlie walls are lofty, and the streets are narrow and dirty.! In the old town, where is the chief emporium of trade, there is one long narrow street running the entire length of the town. It is irregularly paved with round pebbles about the size and shape of a cocoa-nut; these worn smooth by the tread of slippered feet are sore stumbling blocks to the few equestrians who chance to ride through the town. Com- pared to its fellows this is a wide street,—that is, it varies from 6 to 9 feet in breadth.

The tradesman usually sits cross-legged in a corner of his shop, with his goods so arranged that he can reach them without moving. As a rule, men of a trade congregate together, using the cellars underneath the shop as working places. No stock of goods is kept on hand; they are only made to order. The houses generally consist of two or three stories, with a trellis-work verandah on the roof. They are lighted with wooden gratings in the

side streets. The windows all look into the courtyards, so that the traveller sees only the glooiny prospect of a lofty blank wall.

In olden times Fez was the great seat of learning in western Africa. Leo Africanus states in his work that

= eas ‘ In a paper published in the Medical Times and Gazette of July 28, 1877, a correspondent (Dr Leared) writes—‘‘ If there is any truth in the influence of sanitary arrangements on the public health, how is it that health is preserved at all in Moorish towns? Take for example this capital. Fez is a town of about 45,000 inhabitants, surrounded by high walls, So narrow are the streets that in many of them it would be im- possible fortwo people to walk abreast. Even the principal streets in which business is conducted are not more than ten feet wide. Owing to the height of the houses, many of which are of three stories, and the practice of covering the street on a level with the first story with reed roofs and often with vines, the rays of the sun never reach the streets except here and there in some more open spots. The consequence of this is that the inhabitants of Fez, hardly ever exposed to the sun, are a comparatively light-comiplexioned race of Moors ; many indeed present a pallid etiolated appearance. The sliops are mere cells placed about four feet from the ground, and in these the owners sit crouched up the whole day waiting for customers. ‘The walls of the houses and shade roofs Spoken of are covered with dust and festooned with cobwebs. The strects are rarely swept, and bad smells are prevalent. It is noteworthy, however, that one never experiences the smell of sewage. The reason is not far to seek. Fez, like other Moorish towns, possesses a system of drains, and an abundant and continuous water supply. Every house of any pretension is provided with a fountain in its own courtyard, by which the drains are constantly flushed. Moreover, there is no com- munication between the streets and the sewers, The surface water finds its way out of the streets by other channels. The closet is usually placed Just Inside the street entrance of the dwelling-houses, and too often iris its presence known by a vile smell. But it is no doubt owing a the abundance of water that the bad effects of sewage fermentation a at severely felt, since the sewers open only into the houses. The rinking water of Fez is procured from a river which flows through the

tow: i j i j i ms and which receives its drainage, The water almost invariably Produces diarrhoea in strangers,”

there were not only 700 mosques, but a large university, numerous tlieological schools, and one of. the finest libraries in the world. Now, however, all that is changed. Dr Leared, who visited the city in 1877, endeavoured in vain to gain access to some small collections of ancient books and manuscripts in connexion with the mosques. The two chief mosques are the Caroubin, which is very large, and is said to contain a glass lustre holding 500 lamps, the spoil of some Christian church, and one named after Edris, the reputed founder of the city. The latter is a place of refuge for criminals, and the former has a special court for women to pray in—a most unusual thing in mosques. The palace gardens are fairly well kept; one of them, a beautifully wooded plot of ground on the banks of the river, contains some magnificent myrtles, rising to a height of 40 feet, with trunks like forest trees, and there are fruit and other trees in great variety. The palace, called Lallah Almina, built as usual of a mixture of clay and lime, is situated about two miles from the town ; the courtyard, which is 100 paces long by 50 wide, is paved with highly glazed and very effectively coloured tiles. This palace is said to have been built by Christian slaves, among whom were many English captives,

As a commercial town Fez is a great depét for the trade of Barbary, where also are collected wares brought from the east and south by caravans. The chief exports are almonds, gums, raisins, dates, caraway seeds, anise seed, citrons, capers, olive oil, honey, tallow, hides, tanned leather, ostrich feathers, lead, some gold, ivory, and gold dust, silken goods (such as bright-coloured scarfs, turbans, and sashes), coarse linen, carpets, and saddlery. The “fez,” or national head-dress of the Turks, is largely made. Until recent times, the city had a monopoly of the manufacture, for it was supposed that the dye which imparts the peculiar dull crimson hue of these skull-caps could not be obtained elsewhere; now, however, they are manufactured both in Franceand in Turkey. The dye is obtained from the juice of a small berry which grows in large quantities in the immediate neighbourhood of the town, and is also ex- tensively used in the tanning of morocco leather, one of the chief articles of export. Some gold work is made, the precious inetal being brought from the interior of Africa by caravans which trade regularly

with Timbuctoo. These start in the spring and autumn, and are usually about 140 days on the journey, of which only 54 are actually spent in marching. The merchants of Fez send by this means to the cities in the interior of Africa various articles of European manufacture and foreign produce, linens, muslins, fine cloths, silks, beads, brass nails, coffee, tea, and sugar, and in return they receive, gums, gold, elephants' tusks, ambergris, ostrich feathers, and slaves.

It is believed that Fez was built in the year 793, by a prince named Edris; and, having soon become a city of much importance, it rose to be the capital of the Mahometan states of western Africa. The Moors considered it the finest city in the world; and it is held in extreme veneration also by all Moslem inhabitants of Africa. Leo Africanus mentions it as one of the most famous resorts of pilgrims in the 16th century, as well as the principal Arabic university in the world. It is filled with tombs of holy men, which impart to it an air of sacredness. In the 10th century, when the road to Mecca was unsafe, pilgrimages were performed to Fez, instead of to the tomb of the prophet. Subsequently its schools of religion, philosophy, and astronomy enjoyed a great reputation in Africa, and also throughout southern Europe, and were attended even by Christians. On the expulsion of the Moors from Spain, refugees of all sorts flocked to Fez, partly on account of the asylum it afforded as a sacred city. These bringing with them some knowledge of arts, sciences, and manufactures,

for a time the city flourished ; but the vices and traditional | conservatism of the Moslem religion prevented permanent improvement, so that it gradually sank to the unknown and unimportant position it now occuples.

During the summer the heat is intense, but in winter the climate is excellent. 'Travellers differ much as to the number of inhabitants) Dr Leared computes them at from 45,000 to 50,000, but without sufficient data. Berbers, Arabs, negroes, and Jews are the principal races dwelling in the city. The Jews suffer great persecutions and many indignities, but many of them contrive to amass money.

The best method of reaching Fez is from Tangier, the total distance being about 160 miles. The road, though a mere bridle path, is quite practicable for camels and horses. There are numerous towns and villages at suitable distances, which afford convenient halting-places for travellers.

Authorities.—Leo Africanus, Barth, Rohlfs, Edmondo de Amicis, Dr Vogel, and Dr Leared. (CCRETING)

FEZZAN (the ancicnt Phazania, or country of the Gara- mantes), a country of the Sahara region of North Africa, forming a “ kaimakamlik” of the Ottoman vilayet of Tri- poli, extends 390 miles N. to 8. from the town of Bonjem,

lat. 30° 40’ N., to Bir Omah, on the route from Murzuk to |

Bornu, in lat. 24° 10’ N.; and 420 miles E. to W. from the Akakus Mountains near Ghat in long. 10° 30’ W. to

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tlre village of Wau-Squair in long. 18° 20’ W. Its ill-

defined limits run from Bonjem, within 50 miles of the |

Mediterranean on the north, south-westward by the Bir- | el-Hassi to the Akakus range east of Ghat, tlience east-_

ward to the Bir Omah south of the village of Tejerri, from that to Wau-Squair or Wau-Namus at its south-eastern corner, and thence northward past Zella to Bonjem, cm- bracing an area of about 156,000 English square miles, or nearly three times the extent of England.

The general form of the country is determined by the ranges of hills called the Jebel-es-Sdda or Black Mountain, and the Haruj-el-Aswad or Black Haruj, which cross it along the parallel of 28° N., forming the northern edge of a broad desert plateau and the water-parting of the Mediterranean drainage slope, and shutting off the northern region from the depressions in which lie the oases of Fezzan proper in the south.

The Jebel-es-Séda is described by M. Duveyrier as an isolated volcanic mass in the midst of a hammada or bare desert plateau of white limestone. Its length E. to W. is about 170 miles. Ata point near the pass by which M. Duveyrier crossed it, a summit reaches a height of 2415

|

| point 24 times within three months.

The southern edge of the plateau behind the Séda descends to the Wadi-e-Shati running east and west; then follows 9 latitudinal belt of about 70 miles in average width, occupied by the sand dunes of Edeyen!' which run across the frontier from the north of the Tuareg plateau in the west, and in the east by Serir, the name applied to districts which differ from the hammada or true plateaus, in being less elevated and everywhere covered with coarse gravel or rounded water-worn stones, in contrast to the sharply broken blocks scattered on the higher tablelands. To this follows south- ward the narrower belt called the Hammada of Murzuk, of

_inconsiderable elevation, marked out on the north side by the Amsak ridge which falls to the Wadi-el-Gharbi and its

continuation the Wadi-e-Sherki at its base, and which

_ descends on the south tothe line of Hofra, or slight depres-

sions in which lie the oasis groups of Murzuk, Zuila, and Wau. Along the northern side of the Wadi-e-Sherki and Wadi-el-Gharbi, about 60 miles N.W. of Murzuk, lie the

| celebrated Trona lakes of Fezzan, which were first described

by Dr Vogel. 'They are situated in a desert of drift sand in which the camels sink up to their bellies ; one of them, the Bahr-el-Daud (Dauda = " worm"), contains the remark- able shrimp noticcd below. In general the surface of Fez zan does not vary greatly in elevation ; its numerous wadis

| do not lie much below the level of the Serir; the height of

Murzuk, for example, is estimated by Rohlfs at 1804 feet, or little below the general level of the hammada in the north.

Climate.—The average temperature of Murzuk was found by Rohlfs to be 70° F., or 6° lower than that of Ghadames on the borders of western Tripoli. This difference he accounts for by the greater winter cold, for the heat of summer is probably greater here than in Tripoli; and his meteorological tables show such low temperatures as 25° F. at suurise on the 20th of December, or 23° F. on the 30th of January, the thermometer having fallen below the freezing As in all the rest of the desert, the climate is a very regular one, and is in general healthy, the dryness of the air in summer making the heat more bearable than on the sea coast, where the moisture of the atmosphere hinders evaporation from the skin. Although Fezzan does not lie within the zone of the tropical rains, and scarcely touches the limit of the

_ winter rains supplied by the Mediterranean, it is visited at _rare intervals by showers from the south. An almost per-

feet; where Rohlfs (Quer durch Afrika, Leipsic, 1874) |

passed over it between Tripoli and Murzuk he found its height to be 2982 feet. The volcanic mass of the Haruj continues the line of the Sdda in a S.E. direction for about

150 miles, and is crossed obliquely by the caravan routes —

from Fezzan to Egypt. Where Von Beurmann crossed

the Haruj on the route from Zella to Murzuk he estimates | The plateau of which these |

its height at 1660 feet. ranges mark the northern edge appears to be a continua- tion of the great desert plateau of Tripoli called the Ham- mada-el-Homra, and to have a general width of about 70 miles ; where it is crossed on the western route over the Sédda it is described as shingly broken table-land, scattered over with large sandstone blocks ; in the neigh- bourhood of the Haruj on the east it presents a series of ridges running in different directions 8 to 12 feet above the intermediate land. The wadis or periodically filled | rain-channels which drain northward from these heights are for the most part tributaries of the Wadi-Um-el-Cheil, | which is called Wadi Bel where it opens on the coast of

the greater Syrtis, and of the Wadi Tamet east of the | former.

‘ fodder for cattle.

petual blue sky overhangs the desert, and the people of Fezzan are so unaccustomed to and so ill-prepared for wet

weather that, as in Tuat and Tidikelt, they pray to be.

spared from rain, They are not dependent upon it, for water is found almost everywhere at small depths, and little trouble is required to draw it from wells worked by men or camels for the purposes of irrigation; the palm groves, indeed, require no artificial watering, since their roots strike deep enough to reach the water-bearing stratum.

Products.—In the oases and cultivated spots of Fezzan there are generally five grain harvests in the year: in the winter months wheat and barley are sown, and in spring, summer, and autumn the various kinds of durra, especially ksob and gafolt. Ksob, first sown in March, is planted and reaped

four times successively, although the last harvest in December does not ripen, so that it is used only as

———— eeeeeeeeeSSSeSSSSSSSSS—Ss

- ““Edeyen ” in Temahag signifies dunes, —Duveyrier.

Serer

FEZZAN

figs, and almonds are the chief fruits, besides the date, which is the great wealth of the land. The number of sorts of date-palm found in the oases is very large: in that of Murzuk alone more than 30 varieties are counted, the most esteemed being named the Tillis, Tuati, and Auregh. In all Fezzan the date is the staple food, not only for men, but for camels, horses, and dogs. Even the stones of the fruit are softened and given to thecattle. The huts of the poorer classes are entirely made of date-palm leaves, and the more substantial habitations consist chiefly of the same material. The produce of the tree is small, 100 full- grown trees yielding only about 40 cwts. of dates, worth about 30s. at Murzuk, and about four times that sum at Tripoli. They may generally be preserved about two ears,] Domestic animals include only tlie camel (in two varieties, the Tebu or Sudan camel and the Arabian, differing very much in size, form, and capabilities), domestic fowls, and pigeons,—for the few horses, perhaps 50 in all Fezzan, and the miserable cattle, sheep, and goats imported, scarcely deserve mention. There are no large carnivora in Fezzan ; even the hyena and jackal are absent. In the uninhabited oases gazelles and antelopes are occasionally found, but they are by no means abundant. Among birds are sparrows, swallows, ravens, falcons, and vultures ; in summer wild pigeons and ducks are numerous, but in winter they seek a warmer climate. There are no remarkable insects or snakes. A species of Artemia or brine shrimp, about a quarter of an inch in length, of a colour resembling the bright hue of the gold fish, is fished for with cotton nets in the Bahr-el-Daud before noticed, and, mixed with dates and kneaded into a paste, which has the taste and smell of salt herring, is considered a luxury by the people of Fezzan. People.—The inhabitants of Fezzan are undoubtedly a mixed people, derived from the surrounding Teda and Bornu on the south, Tuareg of the plateaus on the west, Berbers and

Arabs from the north. In colour the people vary from black to pure white, but the prevailing hne of skin isa Malay-like yellow, the features and woolly hair being negro, The chief languages in use in Fezzan are, first, the Kantiri or Bornu language, which is spoken by little children before they learn Arabic, and, secondly, Arabic Itself. Many understand Targish, the Teda, and Haussa languages. If among sucha mixed people there can be said to be any national language, it is that of Bornu, which is most widely understood and spoken. The people of Sokna, north of the Jebel-es-Séda, have a peculiar Berber dialect which Rohlfs found to be very closely allied to that of Ghadames. The natives of Fezzan are mild and con- ciliatory. As soon as one has passed the frontier of their country there is no more need to fear robbers ; and this is the more remarkable since Tebus, who bear a thievish character in their own country, are very numerous. The men wear a haik or barakan like those of Tripoli, and a fez ; short hose, and a large loose shirt called mansarfa, with red or yellow slippers, complete their toilet. Yet one often sees the large blue or white tobe of Sudan and Bornu, and the litham or shawl-muffler of the Tuareg, wound round the mouth to keep out the blown sand of the desert, The women, who so Jong as they are young have very plump forms, and who are generally small, are more simply dressed, aga tule, in the barakan, wound round their bodies ; they seldom wear shoes, but generally have sandals made of palm leaf. Like the Arab women they load arms and legs with heavy metal ri ngs, which are of silver among the more wealthy; a single one of these rings sometimes weighs a French pound. The hair, thickly. greased with butter, Soon catching the dust, which forms a crust over it, is done up in numberless little plaits round the head, in the same ashion as in Bornu and Haussa. Little children run

about naked until they attain the age of puberty, which comes very early, for mothers of ten or twelve years of age are not uncommon. Morality is at a very low stage, and the Fezzanians live a careless and happy life: every even- ing the sounds of music and dancing are heard.

The greater number live in huts of palm leaves, which are set up in the simplest manner ; sometimes there is a small outer hut, which is plastered outside with mud, and serves a3 a winter dwelling ; the two are then

surrounded by a little palm fence. Towns, like the capital Murzuk, are either built of stone or of lumps of earth, as these may be convenient to the site, but beyond the town wall nothing is to be seen but palm huts.

The houses are generally one-floored, and have one or two rooms ; sometimes there is a little courtyard; all are windowless, and have only a low doorway. Dates, as has been already noticed, form the staple food, and camels' flesh is only eaten in the towns. In Murzuk, on an average, three camels are slaughtered every day, with one sheep and one goat, which serve for the whole population without and within the walls of about 8000.

With regard to the numbers of the population of Fezzan the estimates of various travellers, in the absence of any trustworthy data, are widely different. Hornemann gives 70,000 to 75,000, Richardson only 26,000, Vogel 54,000. Rohlfs, who visited Fezzan at a prosperous period in 1865, believes the number 200,000 to be a moderate estimate ; but Nachtigal, in 1870, thinks the whole population cannot exceed 40,000.

Government.—Fezzan is governed by a kaimakam or lieu tenant-governor, under the governor of the vilayet, province, or regency of Tripoli. At the time of Rohlfs's visit, the twelve mudirates or districts into which it had formerly been divided had been reduced to seven, but the Government was on the point of restoring the twelve districts, and of markiug out their limits more distinctly. These districts are those of Bonjem, Sokna, Shati, Temenhint, Sebha, Wadi Sherki, Wadi Gharbi, Hofra, Sherguia, Zella, Rhodua, and Gatron. All the mudirs are appointed by the kaimakam of Fezzan, and deposed by him, if he should see fit, with- out reference to the mushir of Tripoli. The government is like that of the other Turkish provinces, practically abso- lute—for the will of the katmakam or the mudir is law— although in form constitutional, since a mijelis or council, in most cases only imaginary, is supposed to have a voice in the legislature.

Although the inhabited parts of Fezzan are naturally rich and fertile, the Turkish Government shows little skill in taking advantage of its resources. Under the most favourable' circumstances the direct revenue of the country amounts to about 800,000 piastres, or about £72,000. Besides this, however, the Government receives a large sum from the sale of dates. Round Murzuk alone the number of palin trees belonging to the Government is reckoned by

Rohlfs at a million. The direct receipts serve to salary the officials, including the kaimakam and the troops, who, however, are not very regularly paid. Except it may be a present of slaves or other articles sent by the kaimakam, not a farthing passes to Tripoli or Constantinople. On the contrary, all clothing, arms, even provisions, such as rice, sugar, and coffee for the soldiers, come from Tripoli or Stamboul. At the time of M. Duveyrier's visit the garrison of Murzuk consisted of 250 men of the regular Ottoman army (redif), nearly all natives of Fezzan or negroes. At a later date Rohlfs found a garrison of 500 men.

Trade.—The commercé of Fezzan is unimportant, and has never been great. The country serves as a depot or middle station between Bornu and its surrounding negro states in the south and Tripoli and Egypt in the north, the caravan

routes between these countries. passing through it and centring at Murzuk. In later times the slave trade seems rather to have increased than diminished: the slaves are partly sent on to be sold in Tripoli and Tunis, partly by Aujila towards Egypt. The whole number that pass northward by the main caravan route from Kuka in Bornu is estimated at 10,000 annually.

Towns.—Murzuk, the present capital, lies in the western corner of the Hofra depression, in lat, 25° 55' N. and long, 14° 10' E. It was founded about 1310, One of thie earliest buildings was the kasbah in the west of the town. The Turks have restored it as well as the wall of the town, which forms almost a perfect square. 'The town is cut in two by a wide street, the dendal, with shops on each side, which open at each end to the chief gates. The popula- tion within its walls is estimated by Rohlfs at 3000, excluding the garrison of 500 men; with its extra-mural huts it may have 8000 inhabitants. In its main streets a busy market is held in which provisions, meat, bread, and vegetables are bought; but it is insignificant in com- parison with some of the other markets of the Sahara, such as that of Abuam in Tafilet, There are two Turkish coffee-houses which are busily frequented. Sokna, about midway between Tripoli and Murzuk, situated on a great gravel plain north

of the Soda range, seems to stand next to Murzuk in point of importance. Its population was estimated by Vogel at 2500. The other noteworthy centres of population are—Zuila and Temissa, on the route towards Egypt, E.N.E. of Murzuk ; Germa, or Djerma, a walled place in the Wadi Sherki, 70 miles N.W. of Murzuk, near which was the ancient capital of Garama, which gave its name to the nation of the Garamantes ; Gatron (1000 inhabitants) and Tejerri on the southern route towards Bornu, the latter being the frontier castle round which a village of low mud huts has grown up ; Sebha in its oasis 90 miles N.N.E. of Murzuk ; Fughda on the plateau 8.W. of the Haruj-el-Aswad ; and Zella at the northern base of that range.

History.—The group of oases in the south of the present country of Fezzan represents the ancient Phazania, which has had for its capitals at successive periods Germa or Djerma under the Garamantes, Garama under the Romans, Traghen under the Nestir, Zuila under the conquering Arabs, and Murzuk under the dynasty of Uled Mohammed, under Abd-el-Jelil, and under the Turks. The capital of the Garamantes is found under the name of Djerma-el- Kedima, south of the modern Djerma (N.W. of Murzuk), in a sort of bay formed by the hill edge of Amsik. The capital under the Nestir is represented still by the ruins of the ancient castle of Traghen (40 miles E. of Murzuk). Of the Garama of the Romans there remains now only one well-preserved monument, which isdepictedin M. Duveyrier’s work (Les Touaregs du Nord, Paris, 1864) situated amid ruins to the south of modern Djerma., Zuila, the Arab capital, remains as the chief place of the depression called the Sherguia, east of the Murzuk, through which the most direct Egyptian route leads. Tradition and _his- tory are in accord in representing the most ancient in- habitants of the oases to have been the Berduna, a name under which the Arabs group the negroes of Bornu as well as the Tebu. ‘The oldest dynasty of the Beraduna was that of the Nesiir, originally from the Sudan. Its kings reigned at Traghen, and were long in power before they were conquered and dethroned by an Arab tribe, that of ones who reduced the people of Fezzan to a state of chk During this period of bondage, a sherif of Morocco, a $F, Mlonteser-uld-Mohamined by name, on a pilgrimage

ecca, passed through Fezzan. Yielding to the supplications of the people, on his return from the sacred city, he gathered a force of devotees and set out to

liberate the Fezzanians. He defeated and expelled the Khorman Arabs, and, being elected sultan, founded the dynasty of Uled Mohammed. This dynasty, which reigned for about 550 years, advanced the interests of the country, and gradually extended its borders as far as Sokna in the north. The last of these sultans was killed in the vicinity of Traghen in 1811 by El-Mukkeni, one of the lieutenants of Yousef-Pasha, the last sovereign of the independent Karamanli dynasty of Tripoli. El-Mukkeni now made himself sultan of Fezzan, and became notorious by his slaving expeditions into Nigritia, in which he advanced as far as Borgu, the Bahr-el-ghazal, and Bagirmi. In 1831, after the lieutenant of the Karamanli had reigned for 20 years, Abd-el-Jelil, the celebrated chief of the Uled-Sliman Arabs, usurped the sovereign authority, and held it for ten years, during which time he maintained a contest which kept all Fezzan in a ferment. In 1841, Tripoli having meanwhile been erected into a province of the Ottoman empire, Bakir Bey was sent at the head of a column of troops to subjugate Fezzan. A battle took place at El- Bagla, not far from the sea, in which Abd-el-Jelil was slain, and soon after this Fezzan was made a kaimakamlik of the Ottoman empire.

From 1811 onward there is no doubt about the facts above enumerated. Previous to 1811, the documents preserved by the marabouts of Traghen show that the dynasty of Uled-Mohammed occupied the throne of Fez- zan for many centuries; but the date of its establishment, 1261, is perhaps questionable. M. Duveyrier adduces a number of proofs to show that the Berduna above men- tioned were identical with the Garamantes, so that it becomes almost a matter of certainty that at a very ancient date a negro civilization prevailed over the northern Sahara; and that this was very far advanced for its time is shown by the remains of remarkable hydraulic works, by tombs of distinct character, and by rock sculptures which record the chief facts of their history.

The most notable of the European travellers who have visited Fezzan, aud to whose works the student is referred for more detailed information regarding it, are, taking them in the order of date, as follows :— Hornemann, 1798; Lyon, 1819; Denham, Clapperton, and Oudney, 1822;

Richardson, 1845; Barth, 1850-55; Vogel, 1854; Duveyrier, 1859-1861; Von Beurmann, 1862; Rohlfs, 1865; Nach- tigal, 1870. (K. J.)

FIACRE, St, an anchorite of Irish descent, who was nobly born, but renounced his worldly advantages, and sailed to France to find a solitude where he might devote himself to fasting, prayer, and the practices of charity. On reaching Meaux he addressed himself to St Faro, the bishop of the diocese, who assigned him a dwelling in the forestof Breuil, in the province of Brie. Here Fiacre constructed a cell, and at a little distance from it an asylum for the reception of the strangers and pilgrims whom the fame of his austere life and charitable deeds soon attracted in large numbers. He died about 670, and his day is the 30th of August. He was buried in the oratory constructed by himself; and on account of the miracles reported to be performed at his shrine, it was soon resorted to by pilgrims from all parts of France. The name fiacre was first given to French hackney-coaches because they were used t0 convey pilgrims from Paris to the shrine of this saint, and started from an inn which was known by the sign of St Fiacre. A part of the remains of the saint were in 1566 transferred to the cathedral of Meaux, and in 1637 and 1695 the grand-dukes of Florence obtained other portions of them, but some, it is said, were still left in their old place of sepulture. St Fiacre is patron of the province of Brie, and patron saint of gardeners.

FIARS PRICES, in the law of Scotland, are the averag® prices of each of the different sorts of grain grown in each county, as fixed annually by the sheriff, usually after

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fIB—

the verdict of a jury; and they serve as a rule for ascer- | taining the value of the grain due to feudal superiors, to the clergy or to lay proprietors of teinds, to landlords as a part or the whole of their rents and in all cases where the price of grain has not been fixed by the parties. It is not known when or how the practice of “ striking the fiars,” as itis called, originated. It probably was first used to determine the value of the grain rents and duties payable to the crown. In confirmation of this view it seems that at first the

duty of the sheriff was merely to make a return to the Court of Exchequer of the prices of grain within their counties, the court itself striking the fiars; and from an old case it appears that the fiars. were struck above the true prices, being regarded rather as punishments to force the king's tenants to pay their rents than as the proper equivalent of the grain they had to pay. Co-existent, however, with these fiars, which were termed sheriffs' fiars, there was at an early period another class called commissaries' fiars, by which the values of teinds were regulated. They have been traced back to the Reformation, and were under the management of the commissary or consistorial courts, which then took the place of the bishops and their officials. They have now been long out of use, but they were perhaps of greater antiquity than the sheriffs' fiars, and the model upon which these were instituted, In 1723 the Court of Session passed an Act of Sederunt for the purpose of regulating the pro- cedure in fiars courts, Down to that date the practice of striking the fiars was by no means universal over Scotland; and even in those counties into which it had been introduced, there was, as the preamble of the Act puts it, "a general complaint that the said fiars are struck and given out by the sheriffs without due care and inquiry into the current and just prices." The Act in consequence provided that all sheriffs should summon annually, between the 4th and the 20th of February, a competent number of persons, living in the shire, of experi- ence in the prices of grain within its bounds, and that from these they should choose a jury of fifteen, of whom at least eight were to be heritors; that witnesses and other evidence as to the price of grain grown in the county, especially since the Ist of November preceding until the day of inquiry, weré to be brought before the jury, who might also pro- ceed on "their own proper knowledge"; that the verdict was to be returned and the sentence of the sheriff pro- nounced by the 1st March ; and further, where custom or expediency recommended it, the sheriff was empowered to fix fiars of different values according to the different qualities of the grain. It cannot be said that this Act has remedied all the evils of which it complained. The propriety of some of its provisions has been questioned, and the competency of the court to pass it has been doubted, even by the court itself. Its authority has been entirely disregarded in one county— Haddingtonshire—where the fiars are struck by the sheriff alone, without a jury ; and when this practice was called in question the court declined to interfere, observing that the fiars were better struck in Haddingtonshire than anywhere else. The other

sheriffs have in the main followed the Act, but with much variety of detail, and in many instances on principles the least calculated to reach the true average prices. Thus in some counties the averages are taken on the number of transactions, without regard to the quanti- ia sold. In one case, in 1838, the evidence was so care- aera that the second or inferior barley fiars were a higher than the first. Formerly the price was 8 y the boll, commonly the Linlithgowshire boll ; now the imperial quarter is always used.

he origin of the word fiars is uncertain. Jamieson, in his

ot, says that it comes from the Icelandic fc, wealth; Tson derives it from an old French word fewr, an average ;

others connect it with the Latin forum. On the general subject of fiars prices see Paterson's Historical Account of the Fiars in Scotland, Kdin., 1852; Connell, On Tithes, vol. i. 481; Hunter's Landlord and Tenant, 4th ed., ii. 290.

FIBRES, Textize, in their widest acceptation include all substances capable of being spun, woven, or felted; but there are many materials and preparations which, though they can be and actually are woven, yet do not come within the range of fibres as technically understood. Thus metallic wires, although both spun into ropes and woven into wire-cloth for numerous purposes, are not generally reckoned among textile fibres, nor is horse-hair so re- garded ; it would, however, be difficult to frame a general definition that would not 'nclide such substances, Ex- cluding these, and also leaving out of account fibres used solely as paper-making materials, there yet remain an enor- mous variety of materials more or less used and recognized as textile fibres. It is true that those of any considerable importance are comparatively few; but frequent additions are being made to the list of fibres of general utility ; and improved methods of cultivation and preparation, as well as increased facilities of transport, tend to bring into general use numerous kinds which formerly may have had only local and limited applications. All textile fibres of recog- nized commercial importance will be found noticed in detail under their special headings ; and

it is only proposed here to classify commercial fibres generally, and to note some points of interest common to all;

Fibres of animal origin are few, but of the highest value, while vegetable fibres are of endless variety, and of the most diverse character as to qualities and general utility. Animal fibres may be comprehended under two heads, silk and wool, using the terms in an extended sense. Silk of commerce is obtained from several species of moth or silk- worm; and as wool there may be enumerated that pro- duced by the numerous varieties of sheep, the mohair and cashmere wool obtained from varieties of goat, camels' hair or wool, alpaca, and vicugna wool (see ALPACA, WoOLLEN Manvuracturss, &c.). Several other animal fibres or hairs, and notably rabbit fur, are employed for felting, and the long fine hair of various animals has been occasionally woven into useful fabrics, without becoming recognized com- mercial staples. Animal fibres are closely related to each other in chemical composition, sharing their leading charac- teristics in common with all epidermic products, hair, horn, nails, feathers, &c. They belong to the nitrogenous or albuminoid group of substances, and are in composition in- timately related to albumen, gelatin, and fibrin. They are insoluble in water or alcohol, but solutions of caustic alkalies cause them to swell up, and if boiled in these they dissolve with decomposition and the evolution of ammonia. Into the composition of wool sulphur enters, whereas the nitrogenous constituents of silk, which embrace albumen, gelatin, and a peculiar compound called fibroin, are free from that element. As is well known, these animal fibres yield a peculiar odour, like burning horn or feathers, on being ignited, and they carbonize with some difficulty only on the continued application of heat.

Chemically, vegetable fibres show a similar intimate re- lation to each other, the basis of all being cellulose, a com- pound allied in ultimate composition to the carbohydrates, starch and sugar, but possessing very marked and distinct ive characters, In particular, cellulose exhibits a remark- able indifference or resistance to the action of chemical re- agents which affect allied substances and the bodies with which it is associated in growing plants. It is to this power of resisting change that its value for textile purposes is due, and on the same peculiarity is also based the ordinary

method of separating fibres from other vegetable principles with wltich they are in general associated. Al-

though cellulose is, however, practically unaffected by the ordinary solvents, water, alcohol, ether, benzol, and weak solutions of acids and alkalies even at high temperatures, yet under certain circumstances its physical qualities of

Name of Fibre

1. SEED Harrs— Cotton …....

silk’ Cotton.. Pr (Cetba) .

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ll. Bast Fisres OF DICOTYLEDONOUS PLANTS—

Flax… Hemp .. 6 Sunn Hemp… Jubbulpore Hemp .. Gambo or Ambar ce. ida BIDTess.sccessescss VG ST CIP YES eeccanestosscspescenoosenous JIG EE seaeoccesuadsbsosseepocassson

Nettle Fibre… Hemp N ettle a – = mee Nilgherry Nettle …... Alleghanian Nettle …

China Grass…... Rhea or Ramie ..

Puya..

ites. «

Raub eH Bs a-55 cocoa ces sccavecssscuse secs IDhennostoriG chro: ...)..222…c.2-02e2-IBOGUG Dies scccnttrescecase nesene cscs secs

Bun-ochra …. Mahwal…..... echiciese oe oS UGH] eoReroerareee

INGr Wall Geccdecsces

Sebestena ……..... Ueeetses Lime Tree Bast…….....

Tapa ” Baobab _,, Sterculia ,, WVU STERN 9 oc cS ccee ocaniesecccece ss stece Warang ,, Cuba a

Rameta ,, CHRBOnEEED Chitrang ,, soooseesadd ACC UB ark ..cc20:- cs 02055 eeesd eee IRAE AWG Ol erie orcs crac ceeaseis coe ae ciczceereee

III. Fisrovs BuNDLES oF Mono- COTYLEDONOUS PLANTS—~

Phormium, or New Zealand Flax… EAN TIABEVEM Pocc-s sev cov ccscca ces : Plantain Fibre … BOWSER GP CM ie<.<..c-2ss ccs cosas ess Sisal or Grass Hemp….

SOV CBENBEC ss scscce des 220 Silk Grass.. Pina F ibre .. Vegetable Hortehotr . Vacoua or Screw Pine.. Panama Screw Pine….

Crin eo Tucum.. nectiete Tibisire .. Cabbage Palm. Talipat. ... KG Gallo eece Piassava … Gomuti… Ratan . Coir…

| Eriodendron anfractuosum . — B. heptaphyllun . es LNB, CO EDOUIM. vse ssscsse senses

| Chorisia speciosa ……..

...| Beaumontia gr “andifora..

...| Strophanthus… : .| Calotropts gigantea…

«| Asclepias curassavica .

..| A. volubilis .. é

w..| A. syriaca . SésecniCg ewe d Marsdenia (Sp. ee ee cae een aeceisecte

.| Linum usitatissimum..

...-| Hibiscus cannabinus « wD Peagsormocoocbad .| Sida retusa, and other SPECLCS serene

.| Marsdenia tenacissima . moots

.| Laportea pustulata…. -| Bohmeria nivea…. -| B. rena ane eS -..| B. sanguinea ..

-| B. puya..

-.| Bauhinia vahlit . seeel Be PACEMOSA .eereeeee

-.| Cordia ss ea -| C. angustifolia ..

-| Broussonetia papyr ‘ifera .| Adansonia digitata… -| Sterculta villosa..

-.| Kydia calycina.. ..| Hibiscus elatus .. & +| Lasiosyphon speciosus. nee

—| Sponta Wightit…..... -| Lagetta lintearia…..... -| Pinus sylvestris ….0..+

.| Musa textilis..

-| Sanseviera zeylanica ..

-| Agave sisaliana ..

-| Agave americana, “and other | T species .

..| Bromelia karatas.. exo Stbecie -| Bromelia Pinguin …

-| Pandanus sane at «...| Carludovica palmata… eel RAPA PUPIA esecce scence

-..| Borassus flabelliformis .. «| Cerryota tres <0… .s0sce.sse .| Attalea funifera ..

.| Arenga ‘saccharifera .. Bopctos -| Calamus ae and other : species. :

Source.

Gossypium BDATDAMENSE vrecseceecsecrsesereereee® G. conglomeratum .. G. Se le G, acuminatum.. G. arboreum..

Bombax Ceiba… Eriodendron Saumama…

Ochroma lagopus.

C. Hamiltonii ..

strength and elasticity may be very seriously damaged with- out any appearance of chemical change. Strong solutions of acids and alkalies, especially if aided with heat, act upon cellulose by first swelling up the fibres; this is followed

1] Indias… -| Senegal ….

Cannabis sativa …. Crotalaria juncea.. C. tenutfolia ..

Calotropis gigantea ..

U. heterophylla …....+

e North America. : -. a

-| North Europe, &¢. .....

ee _* 5 | plaa Eire recess esiscnsien core

ae India and ‘China… ae

Corchorus capsularis… C. olitorius.. Sis Abelmoschus tetraphylios 500 A, G8CULENE US. ..00 2000000 aa6 Thespesia lampas.. T. populnea … Urena sinuata…

Tilia europea ..

Holoptelea integrifolia .

Phormium tenaz ..

Musa paradisiaca, and ‘other: species… caged

Tillandsia usneoides..

Chamerops excelsa …. Chamerops humilis…....

Astrocaryum vulgare …... Mauritia flexuosa …c.06 Corypha australis…

Cocos nucifera …

by their complete solution, and ultimately a change of

chemical constitution takes

place, the cellulose being trans- formed into glucose or grape sugar.

Oxydizing agents

1. ae Asia..

.| Java..

| ~.-.| Nepal eae |

-| India …....

s500 Europe … soo -.| South Sea Islands… -| West Africa .. coset ndiar. eotore common | Vii esi8 Indies ..

use Deccan .. eveccacasecee| LEIA. 5 -| West Indies ..

weee.| New Zealand… ache ~~| East Indian Archipelago ren ....~~.| Cordage,

.| India, Ceylon, &. . co .| A strong fibre.

-| Central America….

...| South America …... ..| Philippine Islands .

-.| Central America, &c.

«s| MiSUInIbIUSIC; ..02.2 2.2.6.2…

...| Central Amcrica ….

«..| Madagascar …....-

Aad | KCL cnoesaeoneno.an0casE

..| Algeria… All LEV AV oean

nl Mleay osctsods ...| Australia … oes | LIM esses cise wae a cose| nivalis

-| Java, &e.. ae ...| East Indian ‘Islands.

.| Ceylon, &c…

Locality.

Win SiAnnieni@a secs. c..—seccrecne

---| West Indies ., o—|| India. pocherossponasdcrac —| South ‘America… 4 soo|| Lidia… 5

= Sunda .

West pies ae

; Brazil ..

a Wes eee

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Via etre secec cae centev css ceseoce

weil Westiindies’.. Wm… 001

” India and Australia. India… ecesierets

++] APOCYNUM VENELUM .....e0ee ee South Russia, Siberia, and : 7 ihe nse ” Central Asia .. es rtica dioica… cba (Co TAELS Bepaane i Europe… Se U. cannabina… ese] Siberia… eecsessssets CI GRGENLEHE stereo es ..| South Sea Islands…... a OS FapOTv cece css 5 -| Japan… nda

U.S. America ..

BG paalle ease esas eee eon eee

eos|) B@mpillsts zeareerers ce -| ADE aense cee

3? ”

”

Tropical regions .

West Indies, &c…

|| Native ‘ship ropes. ...| Strips for chair scats; fibres for stuffing. ..| Sec Corr.

Remarks.

See Corton, vol. vi.

Used only for stuffing.

Used only occasionally for stuffing.

‘| See Frax. -| Sce Heap.

Used for cordage as a substitute for hemp.

—| Resembling and used like jute. -| A cordage fibre. —| A valuable fibre, difficult of extraction.

Similar to the above. Prepared like flax, and much used locally.

-| Occasionally tried for textiles and paper.

Used only in their native countries.

Cultivation restricted on account of the sting.

Closely allied fibres. See Ruta,

Sce JUTE.

Used in India like jute, which they resemble.

-| Used like sunn hemp.

Used for coffee bags in British Guiana,

Makes exceedingly tough, useful ropes.

Used for coarse cloth, twine, and nets.

~~| Extensively used for mats, &c. +~~ —| Beaten into native cloth. ---| Cordage and paper making. ++-| Cordage. -| Not strong. -| Like lime bast. -| For cigarette wrappers. -| A very strong and almost colourless bast. -| Like the above. —| Ornamental purposes. ---| Surgical wadding.

.| Sce PHORMIUM.

Ship cordage, &c.

Cordage, brush-making, &c.

.| Cordage. .| Woven into extremely fine textures. ...| Upholstery purposes, like horsc-hair, ..| Leaf strips used for matting, &c.

.| Panama hats from leaf strips.

Used for fine mats, &c.

cad ” ” ..| Substitute for horse hair in stuffing. ..... Fine twine for hammocks. ....| Cordage. ....| Used for hat making. ....| Matting, baskets, &c., from leaf strips. .| From base of leaf stalks, for bruslics, cordage, &¢.

”

again exercise a destructive influence upon cellulose, a fact of great importance in connexion with blea ching operations, | which are all based upon the action of various oxidizing

FI B—FIB

Cellulose is completely dissolved by ammoniacal solution of oxide of copper, and from its solution it may be precipitated chemically unchanged by treatment of the solu-

media.

tion with acids. . The physical condition o. fibrous substances is, however,

for textile purposes, of much more importance than their The length and strength of the fibre, its

chemical purity.

fineness and elasticity, and its colour are all considerations The period at which the fibre- yielding plants are collected, and the various processes through which all the raw materials, with the exception of cotton and other seed hairs, pass to free the fibres, exercise important influences on the strength, elasticity, and original The almost invariable method by which vegetable fibres are freed from associated substances consists in retting or rotting, a process which will be fully

| of the first importance. {

colour of the fibres.

described under Fiax.

In the accompanying table are embraced all the fib-

rous substances of vegetable origin which have hitherto

been employed for textiles and cordage, &c., to any con-

siderable extent. It is compiled from Dr H. Miiller's

"Pflanzenfaser" in Hofmann's Bericht uber die Entwickelung der chemischen Industrie,—a paper to which we owe other

obligations.

The more closely vegetable fibres approximate to a con- dition of absolute purity, the greater becomes the difficulty

—=\ ASE

of distinguishing them from each other by any chemical tests. As, however, more or less incrusting substance ad- heres to all bast fibres in their raw condition, they exhibit

Fie. 2.—Fibre of Wool of Cashmere Goat.

certain reactions by which, in that condition, they can be separately recognized, but such tests are of little practical value. More definite and important results can be obtained

Fic. 3.—Fibre of Alpaca Wool.' by microscopical examination, as certain peculiarities of _ Mmunbute structure are retained by fibres with great persistency, The microscopic distinction of allied fibres is,

however, a difficult task, requirmg much experience and discrimination. Cotton and other seed hairs, which consist of single elongated cells or tubes, are of course easily dis- tinguished from other vegetable fibres which are composed of aggregated cells; and still more marked is the difference

between vegetable fibres and wool and silk respectively. The accompanying woodcuts show the microscopic ap- pearance of wool, silk, cotton, rhea, and flax fibres, magnified in each case 320 diameters. As wool, silk, and vegetable fibres present marked differences of chemical

Fic. 5.—Fibre of Sea-Island American Cotton.

character, they can be readily recognized in any mixed fabric by appropiate tests. Thus aniline dyes, which com- municate strong permanent colours to wool and silk, only produce on vegetable fibres a fugitive, easily washed-out stain. Vegetable fibres in a mixed fabric may be distin-

Fic, 6.—Cleaned Rhea Fibre,

guished by boiling a fragment of the material in a solution containing 10 per cent. of soda, whereby the animal fibres dissolve, leaving the vegetable fibres. By filtration and subsequent purifying of the undissolved remains, the proportion of vegetable fibre may be ascertained, The

Fic. 7.—Fibre of Rough Russian Flax

alkaline filtrate treated with acetate of lead gives a white precipitate for silk and black for wool. The sulphur con- tained in wool, from which silk is free, gives a ready means of distinguishing a mixture of these two fibres. In a solution of plumbate of soda wool becomes black, while silk is quite unaffected. (3. PA.) FIBRIN, or Fiprinz, is a member of the important group of albuminoid or proteinous substances which, embracing albumen, casein, gluten, and other allied compounds, con-

stitute essential principles of animal and of the higher vegetable organisms. The substances are distinguished among themselves more by physical peculiarities and pro- perties than by distinctions of chemical constitution, which, indeed, is so variable as to point to the conclusion that the various principles are not ta be regarded as definite chemical compounds. In a physiological sense fibrin results from the union of two albuminoids which exist separately in the blood, fibrinogen and the fibrinoplastic substance,

‘The hody is most readily obtained by lashing blood-clot with a loose bundle of twigs, when the sub- stance will attach itself to the twigs in a filamentous con- dition. Qn being purified by washing with water, it forms a soft elastic transparent or whitish mass of filaments, which have no tendency tocohere. When permitted to dry in the air it becomes a hard horny mass, with a yellowish or green- ish tinge. Fibrin is quite insoluble in water, but boiled under pressure, or with long continued boiling, it dissolves with a change of its structure. It is unaffected by alcohol or ether, but in presence of dilute acids and weak alkalies itis gradually dissolved, Its average percentage composi- tion is thus stated :—Carbon 52°6, hydrogen 7°6, nitrogen 17-4, oxygen 21°8, sulphur 1°2. The analogous product obtained from muscular tissue is termed syntonin. Vegetable fibrin is that portion of the nitrogenous constituents of cereal grains and similar seeds which is insoluble in alcohol. Fibrin, although a substance of the highest physiological interest, and of the utmost importance as a constituent of food, has hitherto, unlike albumen, casein, and gluten, found no special application as a separate jndustrial product.

FICHTE, Jonann Gorrires (1762-1814), one of the most eminent of modern German metaphysicians, was born at Rammenau in Upper Lusatia on the 19th May 1762. His father, a ribbon-weaver in that village, was of Swedish origin, the first of the Fichte family having been a soldier in the army of Gustavus Adolphus, who was left wounded at Rammenau and settled there. All of the race were dis- tinguished for piety, uprightness, and solidity of character. With these qualities Fichte himself combined a certain impetuosity of temper and impatience which were probably derived from his mother, a woman of somewhat querulous and jealous disposition. At a very early age the boy showed remarkable mental vigour and moral independence. A fortunate accident brought him under the notice of a neighbouring noblenian, Freiherr von Miltitz, and was the means of procuring him a more excellent education than his father’s circumstances would have allowed. By Von Miltitz he was placed under the care of Pastor Krebel at Niederau, who prepared him admirably for higher schoo] instruction. After a short stay at Meissen he was then entered at the celebrated school or seminary at Pforta, near Raumburg. In 1780, after six years residence at Schulpforta, Fichte, whose patron Von Miltitz had unfortunately died, entered the university of Jena as a student of theology.

His means did not permit him to prosecute an uninterrupted course of study ; he supported himself mainly by private teaching, and during the years 1784-1787 acted as tutor in various families of Saxony. In 1787, after an unsuccessful application to the consistory for some pecuniary assistance, such as was frequently given to poor students of theology at the Saxon universities, he seems to have been altogether driven to miscellaneous literary work. A tutorship at Zurich was, however, obtained in the spring of 1788, through his friend Weisse, aud Fichte spent in Switzerland two of the happiest years of his life. He made several valuable acquaintances, among others Lavater and his brother-in-law ‘cnet can i whose daughter, Johanna Maria, he

engaged before leaving Zurich in 1790. Settling at Leipsic, Fichte still found himself without

any fixed means of livelihood, and was again reduced to literary drudgery, writing tales, plays, and reviews for the popular magazines. In the midst of this distracting work occurred the most important event of his life, his introduc- tion to the philosophy of Kant. That Fichte had been already interested in philosophico-theological questions we know, but up to this period his speculations had been but desultory. At Schulpforta he had read with delight Lessing’s Ande-Goeze, and during his Jena student days had occupied himself with the difficult problem of the relation between philosophy and religion. The outcome of his speculations, as exhibited in the fragmentary Aphorzsmen tiber Religion und Deismus (unpublished, date 1790; Werke, i. 1-8), was a species of Spinozistic determinism, regarded, however, as lying altogether outside the boundary of religion. It is remarkable that even for a time should fatalism have been predominant in F ichte’s reasoning, for in character he was throughout opposed to such a view, and, as he has said, “according to the man, so 1s the system of philosophy he adopts.” With such half-formed opinions, Kant’s philosophy was a new revelation. In particular, he seized upon the practical side, in which Kant works out his view of the absolute moral law as the essence of fres intelligence. This doctrine lies at the root of all Fichte’s after

speculations ; in fact, his system is merely the rigidly consistent evolution of the true relation between reason ag practical and reason as cognitive.

Fichte’s Letters of this period sufficiently attest the influence exercised on him by the study of Kant. It effected a revolution in his whole mode of thinking ; and so completely did the Kantian doctrine of the inherent moral worth of man harmonize with his own character, that from this time forward his life becomes one effort to realize and perfect a true philosophy, and to make its principles no mere theoretic axioms, but practical maxims. At first he seems to have thought that the best metbod for accomplishing his object would be to expound Kantianism in a popular, intelligible form. He felt, and rightly, that the reception of Kant’s doctrines was impeded by the clumsy and scholastic phraseology in which they were stated. An abridgment of the Kritik der Urtheilskraft was begun, but was left unfinished.

The circumstances of Fichte’s life had not improved. No opening had presented itself, and it had been arranged in the beginning of 1791 that he should return to Zurich and be married to Johanna Rahn. This plan was overthrown by a commercial disaster which severely affected the fortunes of the Rahn family. Fichte accepted a post as private tutor to the family of a nobleman in Warsaw, and proceeded slowly on foot to that town. The situation proved unsuit- able; the lady, as Kuno Fischer says, “ required greater submission and better French ” than Fichte could yield, and after little more than a fortnight’s stay, Fichte set out for Kénigsberg, drawn thither by the desire to see Kant, is first interview with Kant was disappointing; the coldness and formality of the aged philosopher checked the enthu- siasm of the young disciple, though it did not diminish his adiniration and reverence. He resolved to bring himself before Kant’s notice in a more effective manner by sub- mitting to him some paper in which the principles of the Kantian philosophy should be applied. Such was the origin of the work, written in four weeks, the Versuch ewer Kritik aller Offenbarung (Essay towards a Critique of all Revelation). The problem which Fichte dealt with in this essay was one not yet handled by Kant himself, and the relations of which to the critical philosophy furnished matter for considerable surmise. Indirectly, indeed, Kant had indicated a very definite opinion on theology : from the Critique of Pure Reason it was

clear that for him specula- tive theology must be purely negative, while the Critique of

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Practical Reason as clearly indicated the view that the moral law is the absolute content or substance of any religion. A critical investigation of the notion of revealed religion, an examination of the conditions under which religious belief was possible, was still, therefore, an open problem. Fichte's essay was forwarded by him to Kant, who approved it highly, exteuded to the author a most warm reception, and exerted his influence to procure a publisher for the work. After some delay, consequent on the scruples of thie theological ceusor of Halle, who did not like to see miracles rejected, the book appeared at Easter, 1792. By an over- siglit of the publisher, Fichte's name did not appear on the title page, nor was the preface given, in which the author spoke of himself as a beginner in philosophy. Considering then the principles applied and the results reached, it was not unnatural that outsiders should ascribe the work to Kant himself. The Allgemeine Literatur-Zeitung went so far as to say that no one who had read a line of Kant's immortal writings could fail to recognize the eminent author of this new work. The mistake was soon rectified by Kant himself, who publicly announced the true author, at the same time highly commending the work. By thus fortunate error Fichte's reputation was secured at a stroke, and he soon reaped the benefits of fame.

The Critique of Revelation is deserving of particular notice, since it marks the culminating point of Fichte's Kantian period. The exposition of the conditions under which revealed religion is possible turns upon the absolute requirements of the moral law in human nature. Religion itself is the belief in this moral law as divine, and sucli belief is a practical postulate, necessary in order to add force to the law. It follows that no revealed religion, so far as matter or substance is concerued, can contain anything beyond this law; nor can any fact in the world of experience be recognized by us as supernatural. The supernatural element in religion can only be the divine character of the moral law. Now, the revelation of this divine character of morality is possible only to a being in wliom the lower impulses have been or are successful in overcoming reverence for the law.

In such acase it is con- ceivable that a revelation might be given in order to add strength to the moral law. Religion ultimately then rests upon the practical reason, and expresses some demand or want of the pure ego or human will. In this conclusion we can trace the prominence assigned by Fichte to the practical element, and the tendency to make the require- ments of the ego the ground for all judgment on reality. It was not possible that having reached this point he should not press forward and leave the Kantian position.

Fichte's literary success was coincident with an improve- Ment in the fortunes of the Rahn family, There seemed iow no reason for delaying his marriage, which accordingly took place at Zurich in October 1793. The remainder of the year he spent in retirement at Zurich, slowly perfecting his thoughts on the fundamental probleins left for solution in the Kantian philosophy. During this period also he published anonymously two remarkable political works, 4uriickforderung der Denkfretheit von den Fiirsten Eur- opas, and Beitrdge zur Berichtigung der Urtheile des Publicums uber die franzdsische Revolution. Of these the latter is much the more important. The French Revolution Seemed to many earnest thinkers thie one great outcry of hos times for the liberty of thought and action which ae ee heritage of every human being. Unfortun- a – ype itical condition of Germany was unfavourable ite a. of an unbiassed opinion on the great of in ; " @ principles involved in it were lost sight hil haa a + of spurious maxims on social order dite owly grown up and stiffened Into system, To

attention to the true nature of revolution, to demon-

strate how inextricably the right of liberty is interwoven with the very existence of man as an intelligent agent, to point out the inherent progressiveness of state arrangements, and the consequent necessity of reform or amendment, such are the main objects of the Bevtrdge ; and although, as is often the case with Fichte, the arguments are too formal and the distinctions too wire-drawn, yet the general idea is nobly conceived and carried out. As in the Critique of Revelation so here the rational nature of

man and the con- ditions necessary for its manifestation or realization become the standard for critical judgment.

Towards the close of 1793 Fichte received an invitation to fill the post of extraordinary professor of philosophy at Jena, vacant by the transference of Reinhold to Kiel. This chair, though not in the ordinary faculty, had become, through Reinhold, the most important in the university, aud great deliberation was exercised in selecting his successor. It was desired to secure an able exponent of Kantianism, and none seemed so highly qualified as the author of the Critique of Revelation. Fichte, while accept- ing the call, at first desired to delay entry ou his duties for a year, in order to be more thorouglily prepared ; but as this was deemed inexpedient, he rapidly drew out an introductory outline of his system for the use of his students, and began his lectures in May 1794. His success was instantaneous and complete. ‘The fame of his predecessor was altogether eclipsed ; as Forberg writes, “ Fichte is believed in as Reinhold never was. The students understand him even less than they did his predecessor, but they believe all the more earnestly on that account.” Much of this success was undoubtedly due to Fichte’s rare power as a lecturer. In oral exposition the vigour of thought and moral inten- sity of the man were most of all apparent, while his prac- tical earnestness completely captivated his hearers. He lectured not only on philosophy to his own class, but on general moral subjects to all students of the university. These general addresses, published under the title Vocation of the Scholar (Bestimmung des Gelelirten), were on a subject very dear to Fichte’s heart, the supreme importance of the highest intellectual culture and the duties tacumbent on those who had received it. Their tone is stimulating and lofty.

The years spent at Jena were unusually productive; indeed, the completed Fichtean philosophy is contained in the writings of this period. A general introduction to the system is given in the tractate On the Notion of the Theory of Science (Ueber den Begriff der Wissenschaftslehre, 1794), and the theoretical portion is worked out in the Loundation of the whole Theory of Science (Grundlage der gesammten Wissenschaftslehre, 1794), and Outline of what ts peculiar inthe Theory of Science (Grundriss des Eigenthiim- lichen d. Wissenschaftslehre, 1794). To these were added in 1797 a First and a Second Introduction to the Theory of Science,and an

Essay towards a new Exposition of the Theory of Scrence. The Introductions are masterly expositions. The practical philosophy, which was with Fichte the fundamen- tal, was given in the Grundlage des Naturrechts, 1796, and System der Sittenlehre, 1798. The last is, we think, the most important of all Fichte's works; apart from it, his theoretical philosophy is unintelligible and absurd.

During this period of literary activity Fichte's academic career had been troubled by various storms, the last so violent as to put a close to his professoriate at Jena. The first of them, a complaint against the delivery of his general addresses on Sundays, was easily got over. The second, arising from Fichte's strong desire to suppress the Lands- mannschaften, or student's orders, which were productive of much harm, was more serious. Some misunderstanding caused an outburst of ignorant ill-feeling on the part of the students, who proceeded to such lengths that Fichte was

compelled to obtain leave to reside out of Jena. The third storm, however, was the most violent. In 1798 Fichte, who, with Niethammer, had edited the Phdlosophical Journal since 1795, received from his friend Forberg an essay on the "Development of the Idea of Religion." With much of the essay he entirely agreed, but he thought the exposition in so many ways defective and calculated to create an erroneous impression, that he prefaced it with a short paper On the Grounds of our Belief in a Divine Government of the Universe, in which God is defined as the moral order of the universe, the eternal law of right which is the foundation of all our being. Any other mode of existence must be denied tohim. Against these papers the cry of atheism was raised, and the electoral Government of Saxony suppressed the Journal and confiscated the copies found in their universities, acts imitated by all the German states except Prussia. The duke of Saxe-Weimar, patron of Jena university, was almost ordered to reprove and dismiss the offenders. Fichte's defences (Appellation an das Publicum gegen die Anklage des Atheismus, and Gerichtliche Verantwortung der Herausgeber der phil. Zeitschrift (1799), though masterly, did not make the matter easier for the court of Saxe-Weimar, who strongly wished to let the affair pass quietly, and an unfortunate letter, in which he threatened to resign in case of

reprimand, turned the scale altogether against him. ‘The court arbitrarily accepted his threat as a request to resign, passed censure, and extended to him permission to withdraw from his chair at Jena ; nor would they alter their decision, even though Fichte himself endeavoured to explain away the unfortunate letter.

Berlin was now the only town in Germany open to him. His residence there from 1799 to 1806 was only broken by the delivery of lectures during the summer of 1805 at Erlangen, where he had been named professor. Surrounded by friends, including such men as Schlegel and Schleier-macher, he continued his literary work, perfecting and amending the IWvssenschaftslehre. The most remarkable of the works from this period are—(1) the Bestimmung des Menschen (Vocation of Man, 1800), a book which, for beauty of style, richness of content, and elevation of thought, may be ranked with the Meditations of Descartes ; (2) Der geschlossene Handelsstaat, 1800 (The Exclusive or Isolated Commercial State), a very remarkable treatise, intensely socialist in tone, and bitterly opposed to free-trade and competition, inculcating in fact organized protection ; (3) Sonnenklarer Bericht an das grodssere Publicum tiber die neueste Philosophie, 1801. In 1801 was also written the Darstellung der Wissenschaftslehre, which was not published till after hisdeath. In 1804 a set of lectures on the Wissen- schaftslehre was given at Berlin, the notes of which were pub- lished in the Vachgelassene Werke, vol. ii. In 1804 were also delivered the noble lectures on the Characteristics of the Present Age(Grundziige der gegenwartigen Zeitalters, 1804), containing a most admirable analysis of the Aufklérung, tracing the position such a movement of thought holds in the natural evolution of the general human consciousness, point- ing out its inherent defects, and indicating as the ultimate goal of progress the life of reason in its highest aspect as a belief in the divine order of the universe. The philosophy of history sketched in this work has something of value with much that is fantastic and absurd. In 1805 and 1806 ap- peared the Vature of the Scholar (Wesen des Gelehrten) and the Way to a Blessed Life (Anweisung zum seligen Leben oder Religionslehre), the latter the most important work of this Berlin period. In it the union between the finite self- consciousness and the infinite ego or God is handled in an almost mystical manner. The knowledge and love of

God is the end of life; by this means only can we attain blessedness (Seligkeit), for in God alone have we a perma-

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nent, enduring object of desire. The infinite God is the all; the world of independent objects is the result of re- flection or self-consciousness, by which the infinite unity is broken up. God is thus over and above the distinction of subject and object ; our knowledge is but a reflex or picture of the infinite essence. Being is not thought.

The disasters of Prussia in 1806 drove Fichte from Berlin. He retired first to Stargard, then to Kénigsberg (where he lectured for a time), then to Copenhagen, whence he returned to the capital in August 1807. From this time till his death his only published writings are practical in character; not till after the appearance of the Jachge- lassene Werke was it known in what shape his final specula- tions had keen thrown out. We may here note the order of these posthumous writings as being of importance for tracing the development of Fichte's thought. From the year 1806 we have the remarkable Bericht tiber die Wessen- schaftslehre (Werke, vol. viii.) with its sharp critique of Schel- ling; from 1810 we have the Thatsachen des Bewusstseyns, published in 1817, of which another treatment is given in lectures of 1813 (Wachgel. Werke, voli.). Of the Wissen- schaftslehre we have, in 1812-13, four separate treatments contained in the Wachgel. Werke. As these consist mainly of notes for lectures, couched in uncouth phraseology, they cannot be held to throw much light on Fichte's views, Perhaps the most interesting are the lectures of 1812 on Transcendental Logic (Nach. Werke, i. 106-400).

From 1812 we have notes of two courses on practical philosophy, Rechislehre (Nach. Werke, vol ii.) and Stttenlehre (Z6., vol. iii), A finished work in the same department is the Staatslehre, published in 1820. This gives the Fichtean utopia or state organized on principles of pure reason ; in too many cases the proposals are identical with principles of pure despotism.

During these later years, however, Fichte's energies were mainly occupied with public affairs. In 1807 he drew up an elaborate and minute plan for the

proposed new uni- versity of Berlin. In 1807-1808 he delivered at Berlin, amidst danger and discouragement, his noble addresses to the German people (Reden an die Deutsche Nation). Tven if we think that in these pure reason is sometimes over- shadowed by patriotism, we cannot but recognize the im- mense practical value of what he recommended as the only true foundation for national prosperity.

In 1810 he was elected rector of the new university founded in the previous year. This post he resigned in 1812, mainly on account of the difficulties he experienced in his endeavour to alter and amend the student life of the university.

In 1813 began the great effort of Germany for national independence. Debarred from taking an active part, Fichte made his contribution by way of lectures. The addresses on the idea of a true war (Ueber den Begriff einer wahrhaften Kriegs, forming part of the Staatslehre) contain a very subtle and admirable contrast between the positions of France and Germany in the war.

In the autumn of 1813 the hospitals of Berlin were filled with sick and wounded from the campaign. Among the most devoted in her exertions was Fichte's wife, who, in January 1814, was attacked with a virulent hospital fever. On the day after she was pronounced out of danger Fichte was struck down by the same disease. His constitution, weakened by severe illness in 1808, was unable to withstand the attack. He lingered for some days in an almost un- conscious state, and died on the 27th January 1814.

The philosophy of Fichte, worked out in a series of writings, and falling chronologically into two distinct periods, that of Jena and that of Berlin, seemed in the course of its development to undergo a change so fundamental that many critics have sharply

separated and opposed to one another an earlier and a later phase. The ground of the modification, further, has been sought an

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yar found in quite external influences, principally that of nad Fe pislaapiii, to some extent that of Schleiermacher. But asa rule most of those who have adopted this view have done s0 without the full and patient examination which the matter demands; they have been misled by the difference in tone and style between the earlier and later writings, and have concluded that underlying this was a fundamental difference of philosophic conception. One only, Erdmann, in his Entwicklung d. deuts. Spek. seit Kant, § 29, seems to give full references to justify his opinion, and even he, in his later work, Grundriss der Gesch. der Philos. (ed. 3), § 311, admits that the difference is much less than he had at the first imagined. He certainly retains his former opinion, but mainly on the ground, in itself intelligible and legitimate, that, so far as Fichte's philosophical reputation and influence are concerned, attention may be limited to the earlier doctrines of the Wissen- schaftslehre. This may be so, but it can neither be admitted that Fichte's views underwent radical change, nor that the JV issenschafts- lehre was ever regarded as in itself complete, nor that Fichte was unconscious of the apparent difference between his earlier and later utterances. It is demonstrable by various passages in the works and letters that he never looked upon the Wissenschaftslehre as con- taining the whole system ; it is clear from the chronology of his writings that the modifications supposed to be due to other thinkers were from the first implicit in his theory ; and if one fairly traces the course of thought in the early writings, one can see how hie was inevitably led on to the statement of the later and, at first sight, divergent views. On only one point, the position assigned in the Wissenschaftslehre to the absolute ego, is there any obscurity; but the relative passages are far from decisive, and from the early work, Neue Darstellung der Wissenschafislehre, unquestionably to be in- cluded in the Jena period, one can see that from the outset the doctrine of the absolute ego was held in a form differing only in statement from the later theory.

Fichte's systein is one absolutely refusing to be compressed with intelligibility. We shall here note only three points :—(a) the origin in Kant ; (b) the fundamental principle and method of the Wassenschafislehre ; (c) the connexion with the later writings. The most important works for (a) are the " Review of Ainesidemus," and the Second Introduction to the Wissenschaftslehre ; for (b) the great treatises of the Jena period; for © the Thatsachen des Bewusstseyns of 1810.

(2) The Kantian system had for the first time opened up a truly fruitful line of philosophic speculation, the transcendental con- sideration of knowledge, or the analysis of the conditions under which cognition is possible. To Kant the fundamental condition was given in the synthetical unity of consciousness. The primitive fact under which might be gathered the special conditions of that synthesis which we call cognition was this unity. But by Kant there was no attempt made to show that the said special conditions were necessary from the very nature of consciousness itself. Their necessity was discovered and proved in a manner which might be called empirical, Moreover, while Kant in a quite similar manner pointed out that intwition had special conditions, space and time, he did not show any link of connexion between these and the primitive conditions of pure cognition. Closely connected with this remarkable defect in the Kantian view, —lying, indeed, at the founda- tion of it, was thedoctrine that the matter of cognition is altogether gwen, or thrown into the form of cognition from without. So strongly was this doctrine emphasized by Kant, that he seemed to refer the matter of knowledge to the action upon us of a non-ego or Ding-an-sich, absolutely beyond consciousness. While these hints towards a completely intelligible account of cognition were given by Kant, they were not reduced to system, and from the way in which the elements of cognition were related, could not be so reduced, Only inthe sphere of practical reason, where the intelligible nature prescribed to itself its own laws, was there the possibility of S stematic deduction from a single principle. oan peculiar position in which Kant had left the theory of

guition was assailed from many different sides and by many Mie, act Specially by Schultze (Ainesidemus) and Maimon. To

ie criticisms of the latter, in particular, Fichte owed much, but _ pre activity went far beyond what they supplied to him. To ace “ae work, to demonstrate that all the necessary con- ae x e owledge can be deduced from a single principle, and i. . 4 . expound the complete system of reason, that is the ieee of the WV issenschafislehre. By it the theoretical and of ale shall be shown to coincide; for while the categories a, nant ng whole system of pure thought can be expounded + in se ®, the ground of this principle is scientifically, or Sheet eal i inexplicable, and is made conceivable only in the ba _ 1 apse the ultimate basis for the activity of cogni- Fide -— y k le

will. Even in the practical sphere, however, Ebi lots} at the contradiction, insoluble to cognition, was a ae og Suppressed, and he was thus driven to the higher it muct Le ws, explicitly stated in the later writings, though not,

it must be confessed wi oar Seon : , With th the Wissensch, sccsiiios e precision and scientific clearness of

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(5) What, then, is this single principle, and how does it work itself out into system? To answer this one must bear in mind what Fichte intended by designating all philosophy Wissenschafts- lehre, or theory of science. Philosophy is to him the rethinking of actual cognition, the theory of knowledge, the complete, systematic exposition of the principles which lie at the basis of all reasoned cognition. It traces the necessary acts by which the cognitive consciousness comes to be what it is, both in form and content. Not that it is a natural history, or even a phenomenology of eon- sciousness ; only in the later writings did Fichte adopt even the genetic method of exposition ; it is the complete statement of the pure principles of the understanding in their rational or necessary order. But if complete, this Wissenschaftslehre must be able to deduce the whole organism of cognition from certain fundamental axioms, themsclves unproved and incapable of proof; only thus can we have a system of reason. From these primary axioms the whole body of necessary thoughts must be developed, and, as Socrates would say, the argument itself will indicate the path of the development.

Of such primitive principles, the absolutcly necessary conditions of possible cognition, only three are thinkable,—one perfectly un- conditioned both in form and matter; a second, unconditioned in form but not in matter; a third, unconditioned in matter but not in form. Ofthese, evidently the first must be the fundamental ; to some extent it conditions the other two, though these cannot be deduced froin it or proved by it. The statement of thesc principles forms the introduction to Wissenschaftslehre.

The method which Fichte first adopted for stating these axioms is not calculated to throw full light upon them, and tends to exaggerate the apparent airinessand unsubstantiality of his deduction. They may be

explained thus. The primitive condition of all intelligence is that the ego shall posit, affirm, or be aware of itself, The ego is the ego; such is the first pure act of conscious intelli- gence, that by which alone consciousness can come to be what it is. It is what Fichte called a Deed-act (Thathandlung) ; we cannot be aware of the process,—the ego zs not until it has affirmed itself, —but we are aware of the result, and can see the necessity of the act by which it is brought about. The ego then posits itself as real. What the ego posits is real. But in consciousness there is equally given a primitive act of op-positing, or contra-positing, formally distinct from the act of position, but materially determined, in so faras what is op-posited must be the negative of that which was posited. The non-ego—not, be it noticed, the world as we kuow itis op-posed in consciousness to the ego. The ego is not the non-ego. How this act of op-positing is possible and necessary, only becomes clear in the practical philosophy, and even there the inherent difficulty leads to a higher view. But third, we have now an absolute antithesis to our original thesis. Only the ego is real, but the non-ego is posited in the ego. The contradiction is solved in a higher synthesis, which takes up into itself the two opposites. The ego and non-ego Zimit one another, or determine one another; and, as limitation is negation of part of a divisible quantum, in this third act, the divisible ego is op-posed to a divisible non-ego.

From this point onwards the course proceeds by the method already made clear. We progress by making explicit the oppositions contained in the fundamental synthesis, by uniting these opposites, analysing the new synthesis, and so on, until we reach an ultimate pair. Now, in the synthesis of the third act two principles may be distinguished :—(1) the non-ego determines the ego ; (2) the ego determines the non-ego. As determined the ego is theoretical, as determining itis practical ; ultimately the opposed principles must be united by showing how the ego is both determining and deter- mined.

It is impossible to enter here on the steps by which the theo- retical ego is shown to develop into the complete system of cognitive categories, or to trace the deduction of the processcs (productive imagination, intuition, sensation, understanding, judgment, reason) by which the quite indefinite non-ego comes to assume the appear- ance of definite objects in the forms

of time and space. All this evolution is the necessary consequence of the determination of the ego by the non-ego. But it is clear that the non-ego cannot really determine the ego. There is no reality beyond the ego itself. The contradiction can only be suppressed if the ego itself opposcs to itself the non-ego, places it as an Anstoss or plane on which its own activity breaks and from which it is reflected. Now, this op- positing of the Anstoss is the necessary condition of the practical ego, of the will. If the ego be a striving power, then of necessity a limit must be set by which its striving is manifest. But how can the infinitely active ego posit a limit to its own activity? Here we come to the eruwx of Fichte's system, which is only partly cleared up in the Rechtslehre and Sittenlehre. If the ego be pure activity, free activity, it can only become aware of itsclf by positing some limit. We cannot possibly have any cognition of how such an act is possible. But as it is a free act, the ego cannot be determined toit by anything beyond itself; it cannot be aware of its own frce- dom otherwise than as determined by other free egos. Thus in the Rechtslehre and Sittenlehre, the multiplicity of egos is deduced, and X. — 18

with this deduction the first form of the Wissenschaftslehre appeared to end. ;

(c) But in fact deeper questions remained. We have spoken of the ego as becoming aware of its own freedom, and have shown how the existence of other egos and of a world in which these egos may act are the necessary conditions of consciousness of freedom. But all this is the work of the ego. All that has been expounded follows if the ego comes to consciousness. We have therefore to cousider that the absolute ego, from which spring all the individual egos, 1s not subject to these conditions, but freely determines itself to them. How is this absolute ego to be conceived? As early as 1797 Fichte had begun to see that the ultimate basis of his system was the abso- lute ego, in which isno difference of subject and object ; in 1800 the Bestimmung des Menschen defined this absolute ego as the in- finite moral will of the universe, God, in whom are all the individ- ual egos, from whom they have sprung. It lay in the nature of the thing that more precise utterances should be given on this subject, and these we find in the

Thatsachen des Bewusstscyns and in all the later lectures. God in them is the absolute Life, the absolute One, who becomes conscious of himself by self-diremption into the individ- ual egos. The individual ego is only possible as opposed to a non- ego, to a world of the senses ; thus God, the infinite will, manifests himself in the individual, and the individual has over against him the non-ego or thing. ‘ The individuals do not make part of the being of the one life, but are a pure form of its absolute freedom.” ‘¢ The individual is not conscious of himself, but the Life is conscious of itself in individual form and as an individual.” In order that the Life may act, though it is not necessary that it should act, in- dividualization is necessary. ‘‘Thus,” says Fichte, ‘‘we reach a final conclusion. Knowledge is not mere knowledge of itself, but of being, and of the one being that truly is, viz., God.. . This one possible object of knowledge is never known in its purity, but ever broken into the various forms of knowledge which are and can be shown to be necessary. The demonstration of the necessity of these forms is philosophy or Wissenschaftslehre” (Thats. des. Bewuss., Werke, ii. 685). This ultimate view is expressed throughout the lectures (in the Nachgel. Werkc) in uncouth and mystical language.

It will escape no one (1) how the idea and method of the Wissensehaftslchre prepare the way for the later Hegelian dialectic, and (2) how completely the whole philosophy of Schopenhauer is contained in the later writings of Fichte. It is not to the credit of historians that Schopenhauer’s debt should have been allowed to pass with so little notice.

Fichte’s complete works have heen published by his son, J. H. Fichte; Werke 11 vols. (vols. iviii., 1845-6; ix.—xi. Machgelassene Werke, 1834); also the Leben und Briefwechsel, 2 vols., 1830 (2d ed. 1862). The most complete works on his philosophy are—Busse, Fichie und seine Beziehung zur Gegenwart, 1848-9; Léwe, Die Philosophie Fichte’s, 1862; Noack, Fichte nach seinem Leben, Lehren, und Wirken, 1862; Fischer, Geschichte d. neuern Philosophie, v.,1868-9. See also the histories of post-Kantian philosophy by Erdmann, Fortlage (whose account is remarkably good), Michelet, Bicdermann, and others. Dr William Smith has trans- lated many of the later and more popular writings, and has contributed a very excellent biography of Fichte (Popular Writings of Fichte, with Memoir, new edition 1871); Kroeger has translated the best portions of the Wissenschaftslehre

(Science of Knowledge, Philadelphia, 1868) and the Naturrecht (Science of Rights, 1870). Several other pieces have been translated in the St Louis Journal of Specu- tative Philosophy. (R. AD.)

FICHTELGEBIRGE, a mountain group of Bavaria, Germany, forming the centre from which three extensive mountain ranges proceed,—the Erzgebirge in a N.E., the Frankenwaid in a N.W., and the Bohmerwald in a S.E. direction. The streams to which it gives rise flow towards the four cardinal points,—e.g., the Eger eastward and the Saale northward, both to the Elbe ; tlle Main westward to the Rhine, and the Naab southward to the Danube. The chief points of the mass are the Schneeberg and the Ochsenkopf, the former having a height of 3490, and the latter of 3340 feet. The whole district is pretty thickly populated, and there is great abundance of wood, as well as of iron, vitriol, sulphur, copper, lead, and many kinds of marble. In some of the streams mother-of-pearl is found. The inhabitants are employed chiefly in tlie iron mines, at forges and blast furnaces, and in charcoal burn- ing and the manufacture of blacking from firewood. The Fichtelgebirge are not much visited by strangers, the only important points of interest being Alexandersbad (a delight- fully situated watering-place) and the sandstone labyrinth of Luisenburg. |

FICINO, Marsirio (1433-1 499), was born at Figline, in the upper Arno valley, in the year 1433. His father, a phy- sician of some eminence, settled in Florence, aud attached himself to the person of Cosimo de’ Medici. Here the young Marsilio received his elementary education in gram-

mar and Latin literature at the high school or studio pubblico. While still a boy, he showed promise of rare literary gifts, and distinguished himself by his facility in the acquisition of knowledge. Not only literature, but the physical sciences, as then taught, had a charm for him ; and he is said to have made considerable progress in medicine under the tuition of his father. He was of a tranquil temperament, sensitive to music and poetry, and debarred by weak health from joining in the more active pleasures of his fellow students. When he had attained the. age of eighteen or nineteen years, Cosimo received him into his household, and determined to make use of his rare disposition for scholarship in the development of a long

cherished project. During the session of the council for the union of the Greek and Latin cliurches at Florence in 1439, Cosimo had made acquaintance with Gemistos Plethon, the Neo-Platonic sage of Mistra, whose discourses upon Plato and the Alexandrian mystics so fascinated the learned society of Florence that they named him the second Plato. It had been the dream of this man's whole life to supersede both forms of Christianity by a semi-pagan theosophy deduced from the writings of the later Pytha- goreans and Platonists. When, therefore, he perceived the inipression he had made upon the first citizen of Florence, Gemistos suggested that the capital of modern culture would be a fit place for the resuscitation of the once so famous Academy of Athens. Cosimo took this hint. The second half of the 15th century was destined to be the age of Academies in Italy, and the regnant passion for antiquity satisfied itself with any imitation, however grotesque, of Greek or Roman institutions. In order to found his new Academy upon a firm basis Cosimo resolved, not only to assemble men of letters fer the purpose of Platonic disputation at certain regular intervals, but also to appoint a hierophant and official expositor of Platonic doctrine. He hoped by these means to give a certain stability to his projected institution, and to avoid the superficiality of mere enthusiasm. The plan was good; aud with the rare instinct for character which distinguished him, he made choice of the right man for his purpose Mm the young Marsilio.

Before he had begun to learn Greek, Marsilio entered upon the task of studying and elucidating Plato. It 1s known that at this early period of his life, while he was yet a novice, he wrote voluminous treatises on the great philosopher, which he afterwards, however, gave to the flames. In the year 1459 John Argyropoulos was lecturing on the Greek language and literature at Florence, and Marsilio became his pupil. He was then about twenly-three years of age. Seven years later he felt himself a sufficiently ripe Greek scholar to begin the translation of Plato, by which his name is famous in the history of scholarship, and which is still the best translation of that author Italy can boast. The MSS. on which he worked were supplied by his patron Cosimo de' Medici and by Amerigo Beuci. While the translation was still in progress Ficino from time to time submitted its pages to the scholars, Angelo Poliziano, Cristoforo Landino, Demetrios Chal- chondylas, and others; and since these men were @ members of the Platonic Academy,

there can be no doubt that the discussions raised upon the text and Latin version greatly served to promote the purpose of Cosimo's founda- tion. At last the book appeared in 1482, the expenses of the press being defrayed by the noble Florentine, Filippo Valori. About the same time Marsilio completed and pub- lished his treatise on the Platonic doctrine of immortality (Theologia Platonica de Immortalitate Anime), the work by which his claims to take rank as a philosopher must be estimated. This was shortly followed by the translation of Plotinus into Latin, and by a voluminous commentary, the

former finished in 1486, the latter in 1491, and both pub- lished at the cost of Lorenzo de' Medici just one month atter his death. Asa supplement to these labours in the field of Platonic and Alexandrian philosophy, Marsilio next devoted lis energies tu the translation of Dionysius tlie Areopagite, whose work on the celestial hierarchy, though recognized as spurious by the Neapolitan humanist, Lorenzo Valla, had supreme attraction for the mystic and uncritical intellect of Ficino.

It is not easy to value the services of Marsilio Ficino at their proper worth. Asa philosopher, he can advance no claim to originality, his laborious treatise on Platonic theo- logy being little better than a mass of ill-digested erudition. As a scholar, he failed to recognize the distinctions be- tween different periods of antiquity and various schools of thought. Asan expouent of Plato he suffered from the fatal error of confounding Plato witli the later Platonists. It is true that in this respect he did not differ widely from the mass of his contemporaries. Lorenzo Valla and Angelo Poliziano, almost alone among the scholars of that age, showed a true critical perception. For the rest, it was enough that an author should be ancient to secure their adiniration. The whole of antiquity seemed precious in the eyes of its dis- coverers; and even a thinker so acute as Pico di Mirandola dreamed of the possibility of extracting the essence of philosophical truth by indiscriminate collation of the most divergent doctrines. Ficino was, moreover, a firm believer in planetary influences. He could not separate his philo- sophical from his astrological studies, and caught eagerly at any fragment of

antiquity which seemed to support his cherished delusions, It may here be incidentally mentioned that this superstition brought him into trouble with the Rontan church. In 1489 he was accused of magic before Pope Innocent VIII., and had to secure the good offices of Francesco Soderini, Ermolao Barbaro, and the archbishop Rinaldo Orsini, in order to purge himself of a most perilous imputation. What Ficino achieved of really solid, was his translation. The value of that work cannot be denied; the impulse which it gave to Platonic studies in Italy, and through them to the formation of the new philo- sophy in Europe, is indisputable. Ficino differed from the majority of his contemporaries in this that, while he felt the influence of antiquity no less strongly than they did, he never lost his faith in Christianity, or contaminated his morals by contact with paganism. For him, as for Petrarch, St Augustin was the model of a Christian student, The cardinal point of his doctrine was the identity of religion and philosophy. He held that philosophy consists In the study of trath and wisdom, and that God alone is truth and wisdom,—so that philosophy is but religion, and true religion is genuine philosophy. Religion, indeed, is common to all men, but its pure form is that revealed through Christ ; and the teaching of Christ is sufficient to man 1m all circumstances of life. Yet it cannot be ex- pected that every man should accept the faith without seasoning ; and here Ficino found a place for Platonism. He maintained that the Platonic doctrine was providentially made to harmonize with Christianity, in order that by its Means speculative intellects might be led to Christ. The ie from this point of view to an almost superstitious acoration of Plato was natural 3; and Ficino, we know, bee : the hymns and celebrations with which the Flor- his ay honoured their great master on the day of ioe _ death. Those famous festivals in which ne e’ Medici delighted had indeed a pagan tone

te Spriate to the sentiment of the Renaissance 3 Nor were a the Worshippers of the Athenian sage so true to hristianity as his devoted student. ” Se personal life there is but little to be said. order that he might have leisure for uninterrupted study,

Cosimo de’ Medici gave him a house near 8. Maria N uova in Florence, and a little farm at Montevecchio, not far from the villa of Careggi. Ficino, like

nearly all the scholars of that age in Italy, delighted in country life. At Monte- vecchio he lived conteutedly among his books, in the neigh- bourhood of his two friends, Pico at Querceto, and Poliziano at Fiesole, cheering his solitude by playing on the lute, and corresponding with the most illustrious men of Italy. His letters, extending over the years 1474-1494, have been pub- lished, both separately and in his collected works, From these it may be gathered that nearly every living scholar of note was inclnded in the list of his friends, and that the subjects which interested him were by no means confined to his Platonic studies. As instances of his close intimacy with illustrious Florentine families, it may be mentioned, that he held the young Francesco Guicciardini at the font, and that he helped to cast the horoscope of the Casa Strozzi in the Via Tornabuoni.

At the age of forty Ficino took orders, and was honoured with a canonry of S. Lorenzo. He was henceforth assiduous in the performance of his duties, preaching in his cure of Novoli, and also in the cathedral and the church of the Angeli at Florence. He used to say that no man was better than a good priest, and none worse than a bad one. His life corresponded in all points to his principles. It was the life of a sincere Christian and a real sage,—of one who found the best fruits of philosophy in the practice of the Christian virtues. A more amiable and a more harmless man never lived ; and this was much in that age of discordant passions and lawless licence. In spite of his weak health, he was indefatigably industrious. His tastes were of the simplest ; and while scholars like Filelfo were intent on extracting money from their patrons by flattery and threats, he remained so poor that he owed the publication of all his many works to private munificence. For his old patrons of the house of Medici Ficino always cherished sentiments of the liveliest gratitude. Cosimo he called his second father, saying that Ficino had given him life, but Cosimo new birth,—the one had devoted him to Galen, the other to the divine Plato,—the one was physician of the body, the other of the soul. With Lorenzo he lived ou terms of familiar, affectionate, almost parental intimacy. He had seen the young prince grow up in the palace of the Via Larga, and had helped in the development of his rare intellect, In later years he did not shrink from uttering a word of warning and advice, when he thought that the master of the Florentine republic was too much inclined to yield to pleasure. A characteristic proof of his attacliment to the house of Medici was furnished by a yearly custom which

he practised at his farm at Montevecchio. He used to invite the contadini who had served Cosimo to a ban- quet on the day of Saints Cosimo and Damiano (the patron saints of the Medici), and entertained them with niusie and singing. This affection was amply returned. Cosimo em- ployed almost the last hours of his life in listening to Ficino's reading of a treatise on the highest good; while Lorenzo, in a poem on true happiness, described him as the mirror of the world, the nursling of sacred muses, the har- monizer of wisdom and beauty in complete accord. Ficino died at Florence in 1499.

Besides the works already noticed, Ficino composed a treatise on the Christian religion, which was first given to the world in 1476, a translation into Italian of Dante's De Monarchia, a life of Plato, and numerous essays on ethical and semi-philosophical subjects. Vigour of reason- ing and originality of view were not his characteristics as a writer; nor will the student who has raked these dust heaps of miscellaneous learning and old-fashioned mysticism discover more than a few sentences of genuine enthusiasm aud simple-hearted aspiration to repay his

trouble and reward his patience. Only in familiar letters, prolegomena, and prefaces do we find the man Ficino, and learn to know his thoughts and sentiments unclouded by a mist of citations ; these minor compositions have therefore a certain permanent value, and will continually be studied for the light they throw upon the learned circle gathered round Lorenzo in the golden age of humanism.

The student may be referred for further information to the follow- ing works :—Marsilii Ficint Opera, Basile, 1576 ; Marsilit Ficini Vita, auctore Corsio, ed. Bandini, Pisa, 1771; Lorenzo de' Medici; Pasquale Villari, La Storia di Girolamo Savonarola, Firenze, Le Monnier, 1859 ; Von Reumont, Lorenzo de' Medici, Leipzig, 1874. (J. A. S.)

FICTIONS, in law, or legal fictions, are false averments, the truth of which is not permitted to be called in question. English law as well as Roman law abounds in fictions. Sometimes they are merely the condensed expression of a rule of law,—e.g., the fiction of English law that husband and wife are one person, and the fiction of Roman law that the wife is the daughter of the

husband. Sometimes they must be regarded as reasons invented in order to justify a rule of law according to an implied ethical standard. Of this sort seems to be the fiction or presumption that every one knows the law, which reconciles the rule that igno- rauce is no excuse for crime with the moral common-place that it is unfair to punish a man for violating a law of whose existence he was unaware. Again, some fictions are deliberate falselioods, adopted as true for the purpose of establishing a remedy not otherwise attainable. Of this sort are the numerous fictions of English law by which the different courts obtained jurisdiction in private business, removed inconvenient restrictions in the law relating to land, &e.

What to the scientific jurist is a stumbling-block is to the older writers on English law a beautiful device for re- conciling the strict letter of the law with common sense and justice. Blackstone, in noticing the well-known fiction by which the Court of Queen's Bench established its juris- diction in common pleas (viz., that the defendant was in custody of the marshal of the court), says, "These fictions of law, though at first they may startle the student, he will find upon further consideration to be highly beneficial and useful; especially as this maxim is ever invariably observed, that no fiction shall extend to work an injury ; its proper operation being to prevent a mischief or remedy an incon- venience that might result from the general rule of law. So true it is that in fictione juris semper subsistit cequitas." Austin, on the other hand, while correctly assigning as the cause of many fictions the desire to combine the necessary reform with some show of respect for the abrogated law, makes the following harsh criticism as to others :—" Why the plain meanings which I have now stated should be obscured by the fictions to which I have just adverted I cannot conjecture. A wish on the part of the authors of the fictions to render thie law as wncognoscible as may be is probably the cause which Mr Bentham would assign. I judge not, I confess, so uncharitably; I rather impute such fictions to the sheer imbecility (or, if you will, to the active and sportive fancies) of their grave and venerable authors, than to any deliberate design, good or evil." Bentham, of course, saw in fictions the instrument by which the great object of his abhorrence, judiciary law, was produced, It was the means by which judges usurped the functions of legislators. "A fiction of law," he says, " may be defined ae nee falsehood, having for its object the stealing legis- . eae by and for hands which could not or durst

ot openly claim it, and but for the delusion thus produced could not exercise it.” A partnership, he says, was formed

between the kings and the judges against the interests of the people.

FIC—

Roscoe’s Life of

66

Monarchs found force, lawyers fraud ; thus _ said he had forfeited it.

FIC

was the capital found” (Historical Preface to the second edition of the Fragment on Government).

Sir H. Maine (Ancient Law) supplies the historical element which is always lacking in the explanations of Austin and Bentham. Fictions form one of the agencies by which, in progressive societies, positive law is brought into harmony with public opinion. The others are equity and statutes. Fictions in this sense include, not merely the obvious falsities of the English and Roman systems, but any assumption which conceals a change of law by retaining the old formula after the change has been made. It thus includes both the case law of the English and the Responsa Prudentum of the Romans. “ At a particular stage of social progress they are invaluable expedients for overcoming the rigidity of law; and, indeed, without one of them, the fiction of adoption, which permits the family tie to be artificially created, it is difficult to understand how society would ever have escaped from its swaddling clothes, and taken its first steps towards civilization.”

The bolder remedial fictions of English law have been to a large extent removed by legislation, and one great obstacle to any reconstruction of the legal system has thus been partially removed. Where the real remedy stood in glaring contrast to the nominal rule, it has been openly ratified by statute. In ejectment cases the mysterious sham litigants have disappeared. The bond of entail can be broken without having recourse to the collusive

proceedings of fine and recovery. Fictions have been almost entirely banished from the procedure of the courts. The action for damages on account of seduction, which is still nominally an action by the father for loss of his daughter's services, is perhaps the only fictitious action now remain- ing.

Fictions which appear in the form of principles (like that of the unity of husband and wife) are not so easily dealt with by legislation. To expel them formally from the system would require the re-enactment of vast portions of law. A change in legal modes of speech and thought would be more effective. The legal mind instinctively seizes upon concrete aids to abstract reasoning. Many hard and revolting fictions must have begun their career as metaphors. In some cases the history of the change may still almost be traced. 'The conception that a man-of-war is a floating island, or that an ambassador's house is beyond the territorial limits of the country in which he resides, was originally a figure of speech designed to set a rule of law in a striking light. It is then gravely accepted as true in fact, and other rules of law are deduced from it. Its beginning is to be compared with such phrases as "an Englishman's house is his castle," which have had no legal offshoots, and still remain mere figures of speech.

Constitutional law is of course honeycombed with fictions. Here there is hardly ever anything like direct legislative change, and yet real change is incessant. The rules defin- ing the sovereign power and fixing the authority of its various members are in most points the same as they were at the last revolution,—in many points they have been the same since the beginning of parliamentary government. But they have long ceased to be true in fact ; and it would hardly be too much to say that the entire series of formal ee

1 In the same essay Bentham notices the comparative rarity of fictions in Scotch law. As to fiction in particular, compared with the work done by it in English law, the use made of it by the Scotch is next to nothing. No need have they had of any such clumsy instrument. They have two others ''of their own making, by which things of the same sort have been done with much less trouble. Nobile officium gives them the creative power of legislation ; this and the word desue- tude together the annihilative." And he notices aptly enough that,

while the English lawyers declared that James II. had abdicated the throne (which everybody knew to be false), the Scotch lawyers boldly

propositions called the constitution is merely a series of fictions. The legal attributes of the king, and even of the House of Lords, are fictions. If we could suppose that the effects of the two Reform Acts had been brought about, not by legislation, but by the decisions of law courts and the practice of House of Commons committees—by such assump- tions as that freeholder includes lease-holder, and that ten means twenty—we should have in the legal constitution of the House of Commons the same kind of fictions that we find in the legal statement of the attributes of the crown and the House of Lords. Here, too, fictions have been largely resorted to for the purpose of supporting particular theories, —popular or monarchical,—and such have flourished even more vigorously than purely legal fictions. (&. R.)

FIDEN 4, identified with the modern CasteLito Giv- BILEO, an old and important Latin city on the left bank of the Tiber, about five miles above Rome. It is said by Livy to have owed its origin to the Etruscans ; but his testimony is not supported by any other historian. There is no Latin city which plays so important a part in the annals of regal Rome. According to the tradition of the Roman historians, hostilities first broke out between the two cities in the time of Romulus, and continued with little intermission and various success till 496 B.c., when, being abandoned by its allies, it was forced to yield to the Roman arms. In 438 B.C, the Fidenates revolted and slew the Roman ambassa- dors, but after maintaining for twelve years an unequal contest, their city was taken and plundered, and them- selves sold into slavery. From this time Fidenz almost disappears. In the later period of the republic, and under the empire, it was a small country village, and it is men- tioned by Horace as almost proverbially desolate. In the reign of Tiberius it acquired a dismal notoriety : an extra- ordinary gladiatorial show had attracted vast multitudes from Rome and the surrounding country, and the wooden amphitheatre in which thcy were accommodated fell during the exhibition, and destroyed, it is said, nearly 50,000 persons. No ruins of Fiden now exist.

FIELD, Jonny (1782-1837), one of the most remarkable pianists of his time and of the few composers of British origin whose works have acquired European reputation, was born at Dublin in 1782. He was descended from a musical family, his father being a Violinist, and his grandfather the organist in one of the churches of Dublin. From the latter the boy received his first musical education. When a few years later the family settled in London, Field became the favourite pupil of the celebrated Clementi, whom he accom- panied to Paris, and later, in 1802, on his great concert tour through France, Germany, and Russia. Under the auspices of his master Field appeared in public in most of the great European capitals, especially in St Petersburg, and in that city he remained when Clementi returned to England. During his stay with the great pianist Field had to suffer many privations, owing to Clementi's all but unex- ampled parsimony ; but when the latter left Russia his splendid connexion amongst the highest circles of the capital became Field's inheritance. Fame and wealth were how within his grasp, but owing to his extravagant and dissipated way of life the composer was never free from care ; — to the Same cause his early end must no doubt be attri-

uted. His marriage with a French lady of the name of

Carpentier was anything but happy, and had soon to be |

dissolved. Field made frequent concert tours to the chief

cities of Russia, and in 1820 settled permanently in |

Moscow. In 1831 he came to England for a short time,

and for the next four years led a migratory life in France, |

seo and Italy, exciting the admiration of amateurs 1 ae he appeared in public. In Naples he fell seriously F ' – ay several months in the hospital, till a Russian amily discovered him and brought him back to Moscow.

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There he lingered for several years till his death on J anuary 11, 1837. Field was not a prolific writer, but he has left many works which will not easily be forgotten. His training and the cast of his genius were not of a kind to enable him to excel in the larger forms of instrumental music, and of his seven concerti for the pianoforte few if any are heard in concert-rooms now-a-days. Neither do his quartets for strings and pianoforte hold their own by the side of those of the great masters. Butin the miuor forms of composition he has shown gifts surpassed by few of his contemporaries. Especially his “nocturnes,” a form of music highly de- veloped if not actually created by him, remain all but un- rivalled for their tenderness and dreaminess of conception, combined with a continuous flow of beautiful melody. But their best claim to immortality is the fact that they have been the models of Chopin’s still higher efforts in the same direction. Field’s execution on the pianoforte was nearly allied to the nature of his compositions, beauty and poetical charm of touch being mentioned by contemporaries as one of the chief characteristics of his style. A certain monotony was the almost necessary complement of these qualities. Moscheles, who heard Field in 1831, speaks of his “ enchant- ing legato.” “TI again,” he writes on another occasion, “‘admired his tenderness and elegance and his beautiful touch ; but he wants spirit and accent, light and shade, and intensity of feeling.”

FIELD, Natuay, a dramatist and actor of the time of Elizabeth, was probably born about but not later than 1587. He was the son of the rector of Cripplegate, the Rev. John Field, and early became one of the children of Queen Elizabeth’s chapel, and in 1600 he played one of the princi- pal parts in Ben Jonson’s Cynthia’s Revels, which was acted by children. Next year he played in the Poetaster, in 1607 in Bussy Ambois, and in 1608 in Epicene, on which occa- sion his is the only name among the “children” of 1600 which still remains. In 1612, when he must have been very young, he brought out his first play, the original comedy of A Woman is a Weathercock, in which the inconstancy of woman is made a theme fertile in humour. In 1613 he was engaged with Daborne in writing a play which has not been handed down to us; and soon afterwards we find these two authors, in conjunction with Massinger, praying Henslowe for a small sum of money to free them from im- prisonment. In 1618

Field printed Amends for Ladies, in which he reversed the judgment of his first comedy, and, in the persons of a virtuous maid, wife, and widow, vindicated womankind against himself. It has been supposed that Field had some hand in editing the first folio Shakespeare in 1623 ; he certainly assisted Massinger in that year in com- posing his tragedy of Zhe Fatal Dowry, and the play bears evident traces of his co-operation. In 1639 he reprinted the Amends for Ladies, and in 1641 he was dead. There exists a portrait of Field in Dulwich College. He was the poetic “son” of George Chapman, and the associate of many dramatic poets of that age. His elder brother Theophilus, also a writer of verse, entered the church, and rose to be bishop of Llandaff and afterwards of Hereford. The two unassisted plays of Nathan Field are comedies of contemporary London life, and are mainly written in very smooth and flowing blank verse. They contain one or two lyrics, which, in conjunction which certain passages in The Fatal Dowry, prove Field to have surpassed Massinger in lyrical power, Amends for Ladies is greatly superior to its companion play in animation, plausibility, and humour; but the passages between Scudmore and Bellafront in A Woman zs & Weathercock perhaps display the serious style of Field at its best, His song “Rise, lady mistress, rise,” in Amends for Ladies, is a charming aubade. It is to be regretted that we possess so little of the work of.this bright and sensible writer. His plays have never been collected.

FIELDFARE, Anglo-Saxon Fealo-for (= Fallow-farer),

a large species of Thrush, the Zurdus pilaris of Linuzeus— well known as a regular and common autumnal visitor throughout the British Islands and a great part of Europe, besides Western Asia, and even reaching Northern Africa. It is the Veldjakker and Veld-lyster of the Dutch, the Wachholderdrossel and Kramtsvogel of Germans, _ thie Litorne of the French, and the Cesena of Italians. Thuis bird is of all Thrushes the most gregarious in habit, not only migrating in large bands and keeping in flocks during the winter, but even commonly breeding in society—200 nests or

more having been seen within a very small space. The birch-forests of Norway, Sweden, and Russia are its chief resorts il summer, but it is known also to breed sparingly in some districts of Germany. Though its nest has been many times reported to have been found in Scotland, there is perhaps no record of such an incident that is not open to doubt; and unquestionably the Mistletoe-Thrush (7. viscworis) has been often mistaken for the Fieldfare by indifferent observers. The head, neck, upper part of the back, and the rump are grey; the wings, wing-coverts, and middle of the back are rich hazel-brown; the throat is ochraceous, and the breast reddish-brown—both being streaked or spotted with black, while the belly and lower wing-coverts are white, and the legs and toes very dark brown. The nest and eggs resemble those of the Blackbird (7. merula), but the former is usually built high up in a tree The Fieldfare's call-note is harsh and loud, sounding like chat-t'chat : its song is low, twittering, and poor. It usually arrives in Britain about the middle or end of Octwo- ber, but sometimes earlier, and often remains till the middle of May before departing for its northern breeding-places. In hard weather it throngs to the berry-bearing bushes which then afford it sustenance, but in open winters the flocks spread over the fieldsin search of animal food—worms, slugs, and the larvee of insects, In very severe seasons it will altogether leave the country, and then return for a shorter or longer time as spring approaches. From tle author of Welliam of Palerne to the writers of our own day the Fieldfare has occasionally been noticed by British poets with varying propriety. Thus Chaucer's association of its name with frost is as happy as true, while Scott was more than unlucky in his well-known reference to its " lowly nest" in the Highlands.

Structurally very like the Fieldfare, but differing greatly in many other respects, is the bird known in North America as the ' Robin"—its ruddy breast and familiar habits reminding the early British settlers in the New World of the household favourite of their former homes, This bird, the Turdus migratorius of Linneus, has a wide geographi- cal range, extending from the Atlantic to the Pacific, and from Greenland to Guatemala, and, except at its extreme limits, is almost everywhere a very abundant species.! As its scientific name imports, it is essentially a migrant, and gathers in flocks to pass the winter in the south, though a few remain in New England throughout the year. Yet its social instincts point rather in the direction of man than of its own kind, and it is not known to breed in companies, while

it affects the homesteads, villages, and even the parks and gardens of the large cities, where its fine song, its at- tractive plumage, and its great services as a destroyer of noxious insects, combine to make it justly popular. (A. N.)

FIELDING, Antaony VanpykE Coprzy (1787-1855), commonly called Copley Fielding, an English landscape- painter, became at an early age a pupil of John Varley. He took to the water-colour method of art, and to this he confined himself almost exclusively. In 1810 he became

ilt is recorded as having occurred a few times in Europe and once even in England (Zool., 1877, p. 14); but whether in any case if has been a yoluntary visitor may be regarded as doubtful.

an associate exhibitor in the Water-colour Society, in 1813 a full member, and in 1831 president of that body. He also engaged largely in teaching the art. His death took place at Worthing in March 1855. Fielding was a painter of much elegance, taste, aud accomplishment, without reaching very high in originality of purpose or of style: he painted all sorts of views, including marine subjects in large proportion. Five specimens of his work are to be seen in the water-colour gallery of the South Kensington Museum, of dates ranging from 1829 to 1850. Among the engraved specimens of his art is the Annual of British Landscape Scenery, published in 1839.

FIELDING, Henry (1707-1754). The pedigree of Fielding the novelist will always be remembered by an eloquent passage in one of Gibbon’s essays. ‘‘ Our im- mortal Fielding was of the younger branch of the earls of Denbigh, who drew their origin from the counts of Haps- burg, the lineal descendants of Eltrico, in the 7th century duke of Alsace. Far different have been the fortunes of the English and German divisions of the family of Haps- burg: the former, the knights and sheriffs of Leicestershire, have slowly risen to the dignity of a peerage ; the latter, the emperors of Germany and kings of Spain, have threatened the liberties of the Old, and invaded the treasures of the New World. The successors of Charles V. may disdain their brethren in England ; but the romance of Z’om Jones —that exquisite picture of

humour and manners—will outlive the palace of the Escurial and the imperial eagle of Austria.”

Henry Fielding was born at Sharpham Park, near Glas- tonbury, Somersetshire, on the 22d of April 1707. There ‘was nothing in the circumstances of his birth to foreshow that the descendant of such illustrious ancestors would drift as rapidly as he did into Bohemia. His father, the youngest son of the earl of Desmond, and grandson of the ‘first earl of Denbigh, is said to have distinguished himself as an officer under Marlborough, though the details of his career are not known. Shortly after the battle of Ramillies, he appears settled in England as a country squire, having married the daughter of Sir Henry Gould, a judge of the King’s Bench. As Captain Fielding’s family grew, and his love of profuse hospitality manifested itself, and when, on the death of his first wife, he married a second time, and this marriage also proved fertile, it became apparent that his eldest son, the future novelist, would have little patrimony but his wits. His book education had been conducted so far in the ordinary way ; he had been taught at home by the family chaplain (said to be the original of Parson Trulliber), and in due course was sent to Eton. But he did not proceed to Oxford with his schoolfellows Lyttelton and Pitt, but, probably from the growing needs for economy at home, was despatched to the university of Leyden.

As we know only the barest leading facts about that m- teresting seminal period, the first twenty years, of Fielding’s life, we can hardly venture even a guess at the circumstances which had given such early encouragement to the bent of his genius that he returned from Leyden after two years’ residence there, bringing with him as the chief fruit of his studies a first sketch of a comedy called Don Quixote m England, The most significant incident in the records of his early life is his-friendship with the studious, ambitious, precocious Lyttelton, a friendship which cannot have been withont a powerful influence on an impressionable boy, whose high animal spirits and keen relish for existence did not predispose him to study. In after years the novelist made a point of displaying, with a certain degree of ostel- tation, the solid learning which he then acquired. and with all his rollicking dash and recklessness devoted himself to severe intellectual labour with a

zeal which we never find in those who have spent an idle youth. There is no gemlus

so easily dissipated and diverted from the creation of im. perishable works as that of humour ; and it is

If his father had been able to pay him his nominal allowance of £200 a year when he returned from Leyden, in all likelihood Fielding would have qualified himself for admission to the bar, and the wit which has becume a pos- session for all time would have speut itself for the entertainment of the law-courts. But, as he says himself of his allowance, “anybody might pay it who would ;” and meantime he resolved to put money in his purse by writing for the stage. He submitted his sketch of Don Quixote in England to Booth and Cibber, but both, he tells us, “ dis- suaded him from suffering it to be represented.” He re- wrote it afterwards when his services were in request, and, conceiving the idea of making the Knight stand for a borough, added some election scenes which greatly increased its value as an acting play. Meantime, he set himself with ready versatility to provide a comedy in the manner of Congreve. His first effort, entitled Love in Several Masques, was produced at Drury Lane in F ebruary 1728, and when the author printed it with a dedication to his kins- woman Lady Mary Wortley Montague, he was able to boast that though it succeeded one of the most successful comedies of the time, the Provoked LTusband, and was “contemporary with an entertainment which engrossed the whole talk and admiration of the town,” it had no small measure of success. For ten years from this date F ielding was an established and prolific play-writer, as will be seen from the following catalogue:—The Temple Beau, a comedy, 1730; The Author’s Farce, 1730; The Coffee-House Politician, a comedy, 1730 ; Zom Thumb the Great, a bur- lesque, 1730 ; The Letter Writers, a farce, 1731 ; The Grab Street Opera, a burlesque, 1731; The Lottery, a farce, 173L; The Modern Husband, a comedy, 1732 ; The Covent Garden Tragedy, a burlesque, 1732; The Debauchee, a comedy, 1732; The Mock Doctor (adaptation of Moliare’s Le Médecin malgre lui), 1732; The Miser (adaptation of L’Avare), 1733 ; Deborah, or a Wife for you all, an after- piece, 1733; The Intriguing Chambermaid, a two-act comedy, 1733; Don Quixote in

Fingland, a comedy, 1734 ; An Old Man taught Wisdom, a farce, 1735 ; The Universal Gallant, avomedy, 1735 ; Pasquin, a dramatic satire, 1736 : The Mistorical Register, 1737 ; Eurydice, a faneé, 1737 ; Furydice Hissed, 1737; Tumble-down Dick, an extravaganza, 1737; Miss Lucy in Town, a farce, 1742; The Wedding- Day, a comedy, 1743. And not only did Fielding write Plays; he identified himself so closely with the stage as to become a Imanager. He hada booth at Bartholomew Fair in 1733, in conjunction with Hyppesley the comedian ; and in 1736, he took the Haymarket Theatre, and organized + Company called “The Great Mogul’s Company,” a notable en in the history of the stage, inasmuch as it led to

re Institution of the dramatic censorship. i – of Fielding’s Plays, with the exception, perhaps, of b Captation the Miser, can be said to have “ kept the age”; few even of the students of literature have read them, = those who have read them have dismissed them too astily. The closest students these plays have ever had were

the dramatists of the following generation, whose works, notably those of Sheridan, contain many traces of their assiduity. The tradition about his writing scenes after his return from tavern carousals on the papers in which his tobacco had been wrapt, and his cool reception of Garrick’s desire that he should alter some passage in the Wedding- Day, have helped the impression that they were loose, ill- considered, ill-constructed productions, scribbled off hastily to meet passing demands. ‘There is only a fraction of the truth in this notion. ‘That the plays are not the work of a dull plodder or a mechanician of elaborate ingenuity goes without saying; but, though perhaps rapidly considered and rapidly constructed, they are neither ill-considered nor ill- constructed, and bear testimony to the large and keen intelligence, as well as the overflowing humour and fertile wit of their author. With all Fielding’s high spirits, joyous self-confidence, and disdain of criticism, he was no idler over his work; whatever his hand found to do, writing plays, or newspaper articles, or novels, reading law, or administering justice, he did with all his might. He found in play-writing abundant scope for the exercise of that far- sighted and fertile constructive faculty which gave the world afterwards in Tom Jones one of the most

perfect plots in literature. His plays abound in artfully prepared surprises, and the conclusions are never huddled, confused, and unsatisfactory ; he never lacked the skill to unloose the knots which he had had the ingenuity to tie. It may be taken asa national characteristic, whether in the way of merit or defect must be for others to say, that he wrote for the stage as he found it, and practised its methods as he found them, tronbling himself little with theories of what it and they ought to be If we know anything of the actors and actresses who took part in his plays, it is amus- ing to trace the skill with which he adapted himself to their peculiarities. With regard to his moral tone, it is substantially the same as that which pervades Tom Jones. He had no sympathy whatever with the goodness or goodi- ness of Addison and Steele. His creed is stated in the prologue to the second of his plays, " written by a friend," perhaps the same friend to whom he says he owed the first suggestion of Zom Jones, the friend of his school-days, Lord Lyttelton. Some persons, this prologue runs, "Will argue that the stage

Was meant to improve and not debauch the age.

Pshaw ! to improve ! the stage was first designed

Such as they are to represent mankind." If we desire to draw a distinction between Fielding's moral- ity and that of the Restoration dramatists, we should say that he takes more care that the rakes shall not have the best of it.

Very early in his dramatic career F ielding discovered how mucn of his strength lay in burlesque. The obligations which he professed to owe to Cibber in the preface to his first comedy did not prevent him from turning that versatile writer and his son Theophilus to ridicule very soon after- wards. That Cibber, in the meantime, had offended him by refusing the Temple Beau, which was not acted at Drury Lane, or the Wedding-Day, which was originally intended for Mrs Oldfield and Wilkes, is likely enough ; if so, the Author's Farce, in which a poor play-writer reads a play to the manager and receives his comments upon it, listening all the while to his self-glorification, was an ample revenge. In 7om Thumb, a burlesque on inflated tragedy, in which the taste introduced by Dryden and other tragic dramatists of the Restoration period is parodied with irresistible humour, the satire is of a Jess personal kind, and cau be read now with more

enjoyment. Fielding, with the consciousness of lis aristocratic descent as well as his superior powers, had a large share of Pope’s contempt for

| Grub Street, and was a sort of Ishmael aniong his play-

writing brethren, losing no opportunity of girding at them, and. complaining to the public more than once that they had. conspired to “damn ” his plays. He found, too, anotlier field for his satire in the political corruption of the time. When he returned from Leyden to London, he had solicited the patronage of Sir Robert Walpole, as was the custom of the time, in a copy of verses, but the great minister had paid no heed to them. He was thus left free to indulge his humour. ‘The election scenes in Don Quixote, in which he gave a ludicrous representation of the corrupt arts of politicians and the venality of corporations, had made a hit ; and when Fielding took the Haymarket Theatre, and assembled a company of unemployed actors, he endeavoured to crown this success by a still bolder lampoon on the times. The mock-comedy in Pasquin is an election scene, in which he gratifies at the same time his contempt for the performances of rival playwrights and his hatred of politi- cal dishonesty. When Pasgwiz was followed up by the Historical Register, in which the political transactions for the previous year were freely travestied, the legislature deemed it time to interfere; and after a witty and eloquent protest from the earl of Chesterfield, in which he argued against the measure as an attack upon the property of authors, wit, “too often the only property they have to de- pend on,” a bill was passed to amend the Acts relating to rogues, vagabonds, sturdy beggars, and vagrants, by a pro- vision that every dramatic piece, previous to its representa- tion, should receive the licence of the lord chamberlain. Fielding was thus responsible for the institution of the lord chamberlain’s censorship of the stage.

It is generally an irksome task to read plays which were written to be acted, and intended to owe no small part of their point to the art of the actors, but the task is consider- ably lightened in the case of Fielding’s plays by the light which they throw on his private history. When he began life in London as a youth of twenty, he had access through his friends and relations to the most brilliant society. Whether he took much advantage of this, in spite of

lis dislike to “that swarm of impertinences which compose the common-place chat of the world,” or whether he succumbed at once to the charms of “ low life,” with its frank oddities and eccentricities, which his fashionable friends said acquired complete ascendency over him in his later years, we have no means of knowing; but, according to all tra- ditions, he drew from his own case in the character of Luckless in the Author’s Farce. Luckless is represented as being in a condition which would be pitiable but for the imperturbable cheerfulness and gaiety with which he bears it,—attired as a man of fashion but very much in debt, his door almost battered in by duns, winning the heart of his lodging-house-keeper and staying her just claims by his good-humour aud wit, seldom dining more than once at the same ordinary, and helped occasionally out of desperate pinches by tlie generosity of his friends. The colours of the picture are probably somewhat overcharged, but all are agreed as to its substantial truthfulness. We have the authority of his friend Murphy for saying that to the end of his days Fielding was always hard pressed for money ; neither his impecuniosity nor his cheerfulness ever deserted him. He had a brief interval of abundance and reckless profusion for two or three years after his marriage with Miss Craddock, a Salisbury “ belle,” and heiress of £1500. The exact date of his marriage with this lady, who is said to be the original of Amelia, as a former sweetheart and cousin of his, Miss Sarah Andrews, was of Sophia Western, is not known; it took place some time during his play-writ- ing career, probably in 1737, when he was twenty-nine years of age; but whatever may have been the date of the marriage, the youthful husband very soon spent his wife’s

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in the country, on a small estate which he hd inherited from his mother, and at once set about dazzling and out- braving the squires of the neighbourliood by setting up a mugnificent equipage, dressing a numerous retinue of servants in yellow-plush, and dispensing an open-handed hospitality. From this congenial “ fling” he was soon com. pelled to return to his literary drudgery in London, and, it is conjectured, to domestic troubles such as he has de picted in the household of Captain and Mrs Booth, filled with no high opinion of the intellects and manners of the rural squirearclry, but still unsoured at heart, ready as be- fore to meet all

embarrassments with a cheerful face, and to profess himself a disciple of Democritus rather than Heraclitus.

Tlie institution of the lord chamberlain's censorship, and the consequent dispersion of the Great Mogul's company, was a great discouragement to Fielding's playwriting, just as he had hit upon a new and profitable vein. In 1737 he entered as a student of the Middle Temple, and de voted himself with great energy to the study of the law. As a gap of two years occurs at this period in the series of his literary publications, we may probably set this down as the date of his marriage and his experiment at living in the country. Before he had completed his terms, he again had recourse to literary employment, projecting, in conjunction with a journalist of the name of Ralph, a thrice-a-week jour- nal called the Champion. It is based on the model of the Spectator and the Zatler, but in the first number, in which Fielding gives an account of his contributors—different members of the great family of Vinegar—and his purposes, he announces his intentiun of discussing politics freely as well as literary and social subjects, laying down as his "platform" the reduction of tle army, the ¢bolition of use- less offices, the restoration of triennial parliaments, and the removal of "that grand anti-constitutional first mover, @ prime minister." As the journal went on, these objects did not assume a prominent place; still, the Champion is broader in its scope and more rollicking in its tone than the Spectator, as might have been expected from the less decorous character of its principal writers. In two volumes of it which were republished in 1741, the work of the different contributors is indicated, and we find among Fielding's essays the germs of many of the disquisitions with which he afterwards adorned his novels. In the Champion also he renewed his warfare with Cibber, who had turned upon his witty persecutor and assailed him angrily in his Apology as "a broken wit," who, in his 'haste to get money," did not seruple to "draw the mob after him," by 'raking the channel and_ pelting their superiors." Fielding's temper was disturbed but not over- thrown by this furious onslaught; he retorted merrily by drawing up an account of a trial of the laureate for murder, the murder of his native tongue. At the same time the bitter taunts rankled, and prompted Fielding to many further reprisals. It was significant of Cibber's power of stinging that his enemies could never let him alone.

The next episode in Fielding’s life was a serious attempt to get practice at the bar. He was called to the bar m June 1740, and-we are assured by Murphy that he threw himself earnestly into the work, forswore literature, attended Westminster Hall diligently, went circuit; but briefs did not come in, he could not afford to wait, and was compelled, however reluctantly, to return to his old trade.

Fielding returned to literature, but in a new character. A few months after he was called to the bar Richardson’s novel Pamela was published, and was received with the favour always accorded to whatever is fresh and out of the beaten track. TRichardson’s novels are somewhat tedious reading now, but their simplicity and close adherence to

money. He went, his biographer Murphy tells us, to live | nature were a new revelation to a public surfeited with the

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FIELDING

extravagant improbabilities and fictitious heroic manners of the school of romance of which Parthenissa was tle most illustrious example in English, Pamela at once became a book that everybody had to read. Fielding read it, but with less reverence and admiration than the ladies of the time. A man cannot escape from the prevalent moral teaching of his generation ; his attitude towards it must be either sympathetic or militant. The prosperous evenly conducted printer lad complete sympathy with the worldly ethics of the 18th century ; the idea of writing Pamela had been put into his head by the suggestion that he should write ‘‘a little book of familiar letters on the useful concerns of common life ;” and in his earnestness to pro- mote the cause of religion and virtue he saw nothing absurd in making a young maid-servant resist the improper advances of her master and be sustained in her resistance by a secret hope that he might be driven by his passion into offering her lawful marriage. To Fielding, on the other hand, there was something ludicrous in good conduct which was so closely allied to artfulness, and he was moved to write a parody of Mrs Andrews’s virtue

and distressing humility in the adventures of Joseph Andrews, who “by keeping the excellent pattern of his sister’s virtues before his eyes, was enabled to preserve his purity in the midst of great temptations. Joseph Andrews, published in 1742, was thus in its original conception a parody of Pamela, but the author, though he began it with this intention, and executed his intention with inimitable wit, became aware as he went on that he was introducing a kind of writing as new in its way to English readers as Pamela itself, and when he issued the work he endeavoured in his preface to place it on a higher ground than mere burlesque. There was a wide difference, he said, between the comic and the burlesque,—the burlesque writer striving to exhibit what is moustrous, unnatural, delightfully and surprisingly absurd, while the comic writer confined himself strictly to nature, and was of all writers the last to be excused for deviating from it, because “life everywhere furnishes an accurate observer with the ridiculous.” Distinguishing epic writing into the tragic and the comic, and ‘not scrupling to say” that it might be in prose as well as in verse, Fielding claimed for Joseph Andrews the title of a comic prose epic, The author’s criticism on his own work has never been sur- passed for justness; it is a striking testimony that genius 1s not always unconscious of its own excellence. He was equally correct in describing the novel as being ‘‘ written in the manner of Cervantes,” for in Joseph Andrews there is the same blending of the ludicrous, the admirable, and the pathetic as in the character of the knight of La Mancha. The humble squire, not the knight, was his hero, but he liad at last succeeded in the dream of his youth, introduc- ing Don Quixote into England,

At may be assumed that the most irritating thing to Richardson in Fielding’s parody was the humorous malice of making Pamela endeavour to dissuade her brother from lowering their family by marrying poor Fanny. This wise advice was too nearly in keeping with the prudent character of Mrs B. (or, as Fielding filled out the initial, Mrs Booby); and that a person of low habits should preach a higher, or at least a more spiritual morality than himself, must have been gall and wormwood to the moralist.

i = ee was almost as great a success as Pamela. ing had received £200 for it from Andrew Millar, alter vainly negotiating with another publisher for £25. ~- Sum was not sufficient to allow him to rest on his oars. His next

work, published two months after Joseph Andrews, ” @ pamphlet in defence of “Old Sarah,” the duchess of es Considering that his father had been a ae e with the duke, and that one of his sisters was hed after the duchess, there is no reason to suppose that

Fielding’s eulogy was venal, whatever consideration he may have received for the service. In May of the same year (1742) his last composition for the stage, Miss Lucy in Town, a sequel to an An Old Man Taught Wisdom, was produced at Drury Lane; but the enemy whom he had raised up, the lord chamberlain, prohibited the piece, when it had run successfully for several nights, because one of the characters was supposed to be a satire on a person of quality. Early in the following year he was induced to un- dertake to recast for Garrick his comedy of The Wedding- Day, the third comedy he ever wrote, which had been re- jected years before by a manager, possibly Cibber. The serious illness of his wife prevented him from recasting the play ; produced as it stood, it was a failure. This was the end of Fielding’s connexion with the stage. In 1743 he published three volumes of Miscellanies, the first volume containing poems, essays, and imaginary dialogues, the second being A Journey from this World to the Next, the. third The History of Jonathan Wild the Great. The con- versations between eminent men of the past, which the im- aginary traveller overheard in his journey to the shades, are full of the most delicate satiric humour, and bear testimony also to the vividness of Fielding’s scholarship. Jonathan Wild, in some respects the most powerful of Fielding’s works, is the only one in which tlie satire is dashed with bitterness, The bitterness is not predominant : his irrepres- sible humour has everywhere got the mastery, and risen to the surface ; but the blows aimed at the arts by which men attain fame and fortune are so fierce as to suggest that at no other period in his career had Fielding’s troubles so deep a hold of him. At no other time was he so nearly overmastered by the savage feelings of the disappointed man, who sees his inferiors in ability outstripping him in the race by arts which he will not practise. At no other time, indeed, had Fielding such cause for bitterness in the accumulation of every kind of worry and vexation as in the year 1743. The evils of poverty, which were always present with him, were aggravated by the dangerous illness of his wife, to whom he was passionately attached.

He was so distracted by anxiety for her safety, and remorse at the thought of being to blame for her discomfort, that he could not proceed with the work on which he depended for the support of his family. His own health was far from being good; he suffered from attacks of gout, brought on by his sedentary habits and his excesses. Meantime the enemies whom he had enraged by his satires were swarming round him with endless devices for his annoy- ance. No man ever wrote in more desperate and pitiable circumstances. Yet there is no perceptible diminution in the splendid force of his humour. He shook off his troubles like a giant, and gave no sign of the pain at his heart, save in the fiercer energy of his blows. It may well increase our admiration for the genius shown in Jonathan Weld to know that the author laboured in the face of so deadly a conspiracy to rob his hand of its strength.

In 1743 Mrs Fielding caught a fever, and died, Lady Mary W. Montague says, in her husband's arms. For two years afterwards he published nothing but a preface to his sister's novel, David Simple. Although Sarah Fielding was one of Richardson's favourites, and heard laments from him about her brother's "' continued lowness," she seems to have comforted that low brother in his sorrow, and even lived in the same house with him. It was probably at this time that Fielding received from Lord Lyttelton the assist- ance which he gratefully acknowledges in the dedication of Tom Jones. As that masterpiece is said to have been "the labour of somie years of his life," we may conjecture that it was begun sometime during these otherwise barren years, and that, as Dow Quixote was written in a prison, Zom Jones was written when its author was only saved from

despair and destitution by the tender kindness of two life- long friends. : In 1745 Fielding made a second successful venture In periodical literature. In November of that year, when 'London was agitated by the news of the preparations of the Jacobites for marching across the border, he issued the first number of the Z'rue Patriot, in which he brought all his powers of ridicule and his robust sense to the service of the established Government. He continued the publica- tion of the Z'rue Patriot till the rebellion was

suppressed. More than a year afterwards, in December 1747, he began another periodical, called The Jacobite Journal, the object of which he stated to be “to eradicate those feelings and sentiments which had been already so effectually crushed on the field of Culloden.” In both these ventures he was pro- bably assisted by his staunch friend Lyttelton. One of the reasons he gave for starting them was the lamentable ignorance of the common run of journalists, and the greater accuracy of the information at his command, a taunt and boast for which his rivals retaliated by copious personal abuse, and the accusation that he was in the pay of the Government. If Fielding was in the pay of the Govern- ment, they made but a poor return for his support when it was no longer required. Soon after the discontinuance of the Jacobite Journal, towards the close of 1748, he obtained, again, it is said, through Lyttelton’s assistance, the post of a paid Middlesex magistrate. In one of his earliest comedies Fielding had thrown hearty ridicule on these functionaries, who had brought their office into disrepute by their scandalous venality. It was notorious that they eked out their small fees by selling justice to the highest bidder. When Fielding himself accepted such an office his enemies exulted loudly over the step as a degradation. About the same time he gave them another handle for scurrility by marrying his deceased wife’s maid. This last act, as Lady Mary Montague said, “‘ was not so discreditable to his character as it may sound.” “The maid had few personal charms, but was an excellent creature, devotedly attached to her mistress, and almost broken-hearted for her loss. In the first agonies of his own grief, which approached to frenzy, he found no relief but from weeping along with her, no solace, when a degree calmer, but in talking to her of the angel they mutually regretted. This made her his habitual confidential associate ; and in process of time he began to think he could not give his children a tenderer mother, or secure for himself a more faithful housekeeper and nurse. At least this was what he told his friends, and it is certain that her conduct as his wife confirmed it, and fully justified his good opinion.” Fielding’s enemies did not scruple to say that in his dis- charge of his duties as a justice he was no better than his own Justice Thrasher ; but there was no foundation for the charge,—it was only a personal retort in the coarse manner of the time. We have, on the contrary, in the zeal with which Fielding applied himself to his work, an instance of that earnest side of his character which is perhaps kept too much in the background in Thackeray’s charming lecture on him as a humorist. One of

his favourite themes was the preposterousness of undertaking any work without the requisite knowledge, and he showed by his published charge to a grand jury, by pamphlets on various notorious cases, and by an elaborate inquiry into the causes of crime and the most advisable remedies, that he was himself a diligent

student of the numerous volumes of the law which he ridi—

culed Justice Thrasher for neglecting. He was sufficiently Sensitive to the spiteful calumnies of his literary antagonists to formally deny, in his Journal of a Voyage to Lisbon, that he had been guilty of the corruption with which they charged him, declaring that, ‘on the contrary, by compos- ing iustead of inflaming the quarrels of ‘porters and

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beggars, and by refusing to take a shilling from a man who most undoubtedly would not have had another left, he had reduced an income of about £500 a year, of the dirtiest money upon earth ”—the income of the justice came from fees— to little more than £300, a considerable portion of which remained with his clerk.”

A few months after his appointment to the justiceship, in

February 1749, Fielding published his masterpiece The History of Tom Jones, a Foundling. Here we have the ripe fruits of his life. imagination with abundant suggestions of incident. His long struggle with his pen for a livelihood had given

His varied experience supplied his

elasticity to his style. His mind was full ; the hackwork, which would lave exhausted poorer energies had mobilized his, and made lim perfect master of his resources, Hard minds, like stones, are not enriched by rolling; but Fielding’s mind was of the plastic sort, and went on gaining by its incessant movement. His heart, too, had remained as fresh as his brain. His own life had been far from scrupulously pure, but he could still give the world “a miracle of loveliest womanhood” in Sophia Western. His name had been a

byword and reproach in respectable cireles from his early manhood upwards, but he could still write in deprecation of the cynical philosopliy of Mandeville, and create a pattern English gentleman in Squire All- worthy. One would never imagine from reading om Jones that its author was a man of illustrious family who had treated his titled relations with airy independence, and been left by them to win a livelihood by the exercise of his own wits, unsupported by any of the sinecures which their influence might have placed at his disposal. There was no moralist: of the time whose scorn was so heartily and steadily directed against vice, against profligacy, avarice, hypocrisy, meanness in every shape and size ; he made war without ceasing on all ungenerous emotions. In breaking with convention, he remained faithful to society. It isa curious circumstance that this true soldier in the war of humanity, like his great exemplar Cervantes, should be more often read for the sake of indelicate passages which he wrote in pursuance of fidelity to nature, than for the generous sentiment and wise philosophy with which his work as a whole is penetrated. But even this posthumous injustice he could have foreseen without ill-mature. Judging from Richardson's lament over his rival's continued lowness, aud the anecdote told by Horace Walpole of bis being found " banqueting with a blind man and three Irishmen " when some persons of quality wanted lis services as a police magistrate, one might imagine that Fielding spent his leisure off the bench in gratifying his preference for low company. That he enjoyed the frauk- ness and originality of unconventional associates is likely enougli; but he has shown that he had more profitable employment for his leisure. In the first two years after he took office, he completed his last novel, Amelia. It has always been supposed that, in the relations between the somewhat frail but good-natured Captain Booth and his perfect wife Amelia, Fielding drew in some particulars at least from his own domestic life. Dr Johnson, who refused to read Joseph Andrews, and inferred from Z'om Jones that Fielding was "a blockhead" and "a barren rascal," owned that he was so taken by Amelia as to read it through at@ sitting, and mentions as an evidence of its popularity that it was the only instance he knew of the whole of a first edition being sold in one day. Mr Lawrence has pointed out that this last circumstance was due to the ingenuity of the publisher; still the sale was sufficiently rapid to be a tribute to the popularity of its predecessors from the same pen. A more substantial tribute to the author was the

increasing price paid for his labours ; he received £600 for Zom Jones, and £1000 for

Amelia. Fielding's editor and biographer, Arthur Murphy, professed to see in Amelia signs of a genius falling into decay ; but, as in the case of Dickens, the decay does not lie in matters that affect the intellect. Amelia is inferior to Tom Jones only in so far as its humour is less exuberant ; it ig even richer in happily turned humorous sayings. But the colour of the incidents is more predominantly serious ; the laughing philosopher has not changed his mood, but he takes less strong delight in creating materials for laughter.

As soon as Amelia was off his hands, Fielding bent himself with unflagging energy to a new enterprise. In January 1752 he issued the first number of a new peri- odical, the Covent Garden Journal, "by Sir Alexander Draweansir, Knight, censor of Great Britain." In the first number he proved that his appetite for literary warfare was undiminished, giving fair warning to "scribblers" in general that they must expect no mercy ; and soon after, he began an exchange of personalities with Dr John Hill which Disraeli has thought worthy of a place among his quarrels of authors. Among other writers who accepted Fielding's challenge was Smollett, whose ground of quarrel was probably political, but to him Fielding made no reply. He was never an indiscriminate satirist, either in words or in literature ; he reserved his lash for what he believed to be bad, and not even provocation could make him attack a. man wliose writings he respected.

The Covent Garden Journal was discontinued towards the end of 1752, partly, it may be supposed, in consequence of Fielding's health making him unable to bear the strain. He had long been a sutferer from gout ; he had undermined his naturally robust constitution by hard work and reck- less living; and in 1753 his frame began to exlubit symptoms of dropsy. The narrative of the last painful year of his life is given in his Journal of a Voyage to Lisbon, At a moment when the disease might have been curable, or at least might have been delayed in its ravages, he was kept in town to carry out a scheme for putting down organized gangs of robbers who were setting the law at defiance. He tried the effect of the waters at Bath ; he

experimented on himself with Bishop Berkeley's specific of tar-water; he submitted frequently to the operation of tapping; but the summer of 1754 found him with "the dropsy gaining rather than losing ground, the distance growing still shorter between the tappings." In June he set sail for Lisbon to give himself the cliance of a milder winter; but the precaution was unavailing. He died at Lisbon on the 8th of October 1754, To the last, as his Journal shows, he preserved his cheerfulness and his mental activity. Besides his Jowrnal, he left behind him a fragment of an answer to Lord Bolingbroke's religious und philosophical essays, for which, according to Murphy, he had prepared himself by collecting "long extracts and arguments from the fathers, and the most eminent writers of controversy." "It is a pity," Lady Mary Montague wrote when she heard of his death, " he was not immortal " ; he was "so formed for happiness." wee fe Fielding's life and writings is prefixed to Arthur fein. sy edition of his works ; and short biographies have

en by Sir Walter Scott and William Roscoe. The most

complete biography is Mr F. Lawrence's, a conscientious and thorough piece of work. (W. M.)

FIERI FACIAS, in English law, is a writ of execution after judgment obtained in action of debt or damages. It 1s addressed to the sheriff, and commands him to make 00d the amount out of the goods of the person against whom judgment has been obtained.

FIESCHI, Josera Marte (1790-1836), assassin, the = conspirator in the attempt on the life of Louis

lilippe in J uly 1835, was a native of Murato in Corsica, and was baptized there. December 3, 1790. After follow-

ing his father's occupation, that of a shepherd, he enlisted at the age of eighteen in the Corsican Legion at Naples, and passed with it into the service of Murat, king of Naples. In 1814 he returned to Corsica, and in the following year took part in the fatal expedition of Murat for the recovery of

his crown, Sentence of death was passed on him and his companions, but it was not executed ; and Fieschi once more returned to his native land. In 1816 he was convicted of theft and forgery, and was condemned to imprisonment for ten years. After his release he led for several years a restless miserable life, working only by fits, and eking out his resources by fraud and swindling. He went to Paris after the Revolution of July (1830), and by means of forged papers passed himself off as a victim of the Restoration, and obtained ‘a pension and official employment. He affected a zealous devotion to the Government, entered the police, and displayed much energy in the suppression of disturbances. But meanwhile his house was the scene of violent proceedings, and the neighbourhood was kept in alarm by frequent noises, cries, and pistol-shots in and around it. Facts were brought to light which cost him his friends and his employments. Exasperated by dismissal and the “ingratitude of the Government,” he vowed a terrible vengeance. Ile took lodgings on the Boulevard du Temple, and there, with several infamous confederates, contrived his “infernal machine,” constructed with twenty gun barrels, to be fired simultaneously. In July 1835 the fifth anniversary of the Revolution was to be celebrated. Vague rumours getting afloat of some impending catastrophe, of some horrible attempt on the life of the king, prudential measures were taken. On the 28th, as Louis Philippe was holding a grand review, and was passing along the boulevard accom- panied by his three sons and a numerous staff, a sudden explosion was heard, followed by others, and the pavement was strewed with dead and wounded men. A ball grazed the king’s forehead, and his horse, with those of the duke of Nemours and the prince de Joinville, was shot ; but the king and the princes escaped as if by miracle. Fieschi himself was severely wounded by the discharge of his machine, and vainly attempted to escape. The attentions of the most skilful physicians were lavished upon hin, and his life was saved for the stroke of justice. On his trial he named his accomplices, displayed much bravado, and expected or pretended to expect ultimate pardon. He was condemned to death, and was guillotined, February 19, 1836, making on the scaffold a premeditated theatrical display at the feet of his confessor. Of his accomplices two were executed, one was sentenced to twenty years imprisonment, and one was acquitted. A full account of the trial, Procés de Fiescht, appeared at Paris the same ear. FIESCO [pe’ Frescut], Grovannt Luter (about 1523- 1547), count of Lavagna, Genoese conspirator, was de- scended from a great

historical family which counted among its members Popes Innocent IV. and Adrian V. He was born about 1523, and by the death of his father he became at the age of twenty-three the head of his race and the possessor of considerable estates. He had allied him- self by marriage with the ancient family of Cibo,—his wife Eleanora, then about twenty years of age, being a woman of high spirit, great beauty, and remarkable attainments. To the advantages of youth and wealth Fiesco added those of a fine figure, a handsome countenance, and fascinatin + manners. He was ambitious of power and high place, anil inherited from his ancestors a strong passion of jealousy and hatred against the Doria family, the head of which, Andrea Doria, was then doge of the republic, while his nephew, the young Gianettino Doria, was commander of the galleys. With personal and family hostility was com-

bined the political enmity between the imperial and French (aristocratic and popular) parties,—the Dorias be- longing to the former and being warmly supported by the nobles, while the Fieschi were of the latter and leaned upon the popular class Bent on the overthrow of the doge and his family, Giovanni Luigi made an attempt to secure the support of Francis I. in his enterprise, but in this he did not at first succeed. The negotiations were afterwards renewed through William du Bellay, then French ambassador in Italy, and an understanding was come to that the object of the proposed revolution should be to subject the republic to the king of France. The sanction of the pope, Paul III. was obtained, and the alliance of the duke of Parma and Placentia secured. Associated with Giovanni Luigi in the conspiracy were his brothers Geronimo and Ottobuoni, and his trusted friends Vincenzo Calcagno, De Varese, and Raffaello Sacco. Trvops were levied in the duchy of Parma, and report of these sus- picious preparations was sent to Andrea Doria to put him on his guard. But his regard for the young count forbade him to entertain suspicion, and no precautions were taken. When all was ready, Fiesco invited the Dorias to a banquet at his palace on the first day of January 1547, purposing to assassinate them on their arrival. But the doge declined the invitation, his nephew Gianettino had to leave Genoa for some weeks, and the scheme thus foundered. The next night, however, taking advantage of the unsettled state of the city at the

period of re-election of the doge, Fiesco led out his band (having first by display of affec- tionate attention to Doria thrown him off his guard), seized the arsenal, and attacked the galleys. While passing along a plank from the quay to one of the galleys the leader fell into the sea and was drowned, the darkness and the con- fusion preventing his cries for help being heard. The other conspirators proceeded with their task, and Gianettino was slain. The doge succeeded in making his escape, and after the dispersion of the troops and the flight of the leaders, he returned to Genoa, and was welcomed with extraordinary honours. Eleanora, wife of Fiesco, escaped to Massa, married again, survived her second husband many years, and died at Florence in 1594. The story of this conspiracy has frequently been told both by historians and by poets. Amongst the prose narratives that of Mascardi (Antwerp, 1629) is commended for accuracy of detail, but is wanting in impartiality. Amongst the poems the most noteworthy is the tragedy of Schiller.

_FIESOLE, a small episcopal city of Italy, occupying the site of the ancient Fesule, on the crown of a hill that rises above the Arno, about three miles to the west of Florence. In size it is little more than a village, but its historical in- terest is of considerable scope. The principal building is the cathedral, which was commenced by Bishop Giacomo Bavaro in 1028, and dedicated to San Pietro Romolo, a martyr under Nero. It is a small basilica, consisting of a nave with narrow aisles, a transept, a raised choir, and a crypt noticeable for the uncommon character of its capitals. Among its adornments are an altarpiece and a bust of Bishop Salutati by Mino di Fiesole. The church of St Maria Primerana, with a terra-cotta tabernacle by L. della Robbia, San Allesandro, with its twelve cipollino columns, the Franciscan convent, the episcopal palace, and the town-hall or palazzo del pretorio, dating from the 13th century, are all worthy of notice. The convent probably occupies the site of the old arx or citadel; behind the cathedral there are extensive remains of a large Roman Bee ee in 1809 and Jaid bare in 1872-3 ; and

, auapidated portions of the ancient Etruscan fortifica- tion still stand on the northern brow of the hill. Between the little city and Florence the church of San Domenico di

Fiesole marks the site of the monastery fanious as the |

residence of Fra Angelico (see next article) ; not far from the church is the villa where Walter Savage Landor dwelt many years amid the scenes of Boccaccio's Decameron, and further up the hill is the yet more celebrated Villa Mozzi, the favourite haunt of Lorenzo the Magnificent, The present inhabitants of Fiesole are largely employed in straw plaiting. They number, according to the census of 1871, 3467 in the city, and 13,180 in the commune.

Fesule has a great mythical history, according to which it is the oldest city in the world. Its real origin is unknown, but it was evidently an Etruscan site long before the Roman conquest, It became of some note in the Gallic and Punic wars, and was after- wards selected by Sulla for the settlement of a body of his veterans, Twenty years later these colonists rendered themsclves formidable by the support which they gave to Catiline, and the town was chosen as his headquarters in the struggle against Metellus and Antony. The story of Catiline and his exploits has been developed into an elaborate legend by Malespini and other Fiesolan historians. Catellino, as he is called, wages war against Fiorino, king of Rome; the king is slain, but the Fesulan party is ultimately defeated by Julius Cesar, and anew city, Fiorenza Magna (Florence), is founded by the conqueror, and named in honour of Fiorino. At a later date Fzesule, continues the story, was rebuilt by Attila, and Florence destroyed. From Procopius we know that the little city, while oceu- pied by Witiges and his Goths, did stand a long siege by the forces of Belisarius. According to the common account it was '"'destroyed" by the Florentines in the 11th or 12th century; but the statement is open to question, and the destruction at any rate cannot have been very complete. Among the more eminent natives of Fiesole are Francesco Ferrucci, the great captain, and Francesco Ferrucei, the first sculptor in porphyry.

FIESOLE (1387-1455). Tl Beato Fra Giovanni Angel- ico da Fiesole is the name given to a far-famed painter-friar of the Florentine state in the 15th century, the protagonist, beyond all other men, of pietistic painting. He is often, but not accurately, termed simply '"Fiesole," which is merely the

name of the town, noticed above, where he first took the vows ; more often, Fra Angelico. If we turn his compound designation into English, it runs thus —* the Beatified Friar John the Angelic of Fiesole.” In his life- time he was known no doubt simply as Fra Giovanni, or Friar John ; “the Angelic ” is a laudatory term which got assigned to him at an early date,—we find it in use within thirty years after his death ; and, at some period which is not defined in our authorities, he was beatified by due ecclesiastical process. His surname was Guido: his original Christian name—Giovanni being only his name in religion— is not known. He was born at Vicchio, in the Tuscan province of Mugello, of unknown but seemingly well-to-do parentage, in 1387 (not 1390, as sometimes stated) ; in 1407 he became a novice in the convent of S. Domenico at Fiesole, and in 1408 he took the vows and entered the Dominican order. Whether he had previously been @ painter by profession is not certain, but may be pronounced probable. The painter named Lorenzo Monaco may have contributed to his art-training, and the influence of the Sienese school is discernible in his work. According to Vasari, the first paintings of this artist were in the Certosa of Florence; none such exist there now. His earliest extant performances, in considerable number, marked to some extent by the influence of Masolino, are at Cortona, whither he was sent during his noviciate, and here apparently he spent all the opening years of his monastic life. His first works executed in fresco were probably those, now destroyed, which he painted in the convent of S. Domenico in tls city ; as a fresco-painter, he may have worked under, or as a follower of, Gherardo Starnina.’ From 1418 to 1436 he was back at Fiesole; in 1436 he was transferred to the Dominican convent of §S. Marco in Florence, and in 1438 undertook to paint the altarpiece for the choir, followed by many other works; he may have studied about this time the renowned frescoes in the Brat- cacci chapel in the Florentine church of the Carmine, and also the paiutings of Oreagna. In or about 1445 he was

invited by tne pope to Rome. The pope who reigned from 1431 to 1447 was Eugenius IV., and he it was who in 1445 appointed another Dominican friar, a colleague of Angelico, to be archbishop of Florence. If the story (first told by Vasari) is true—that this appointment was made at the suggestion of Angelico only after the archbishopric had been offered to himself, and by

him declined on the ground of his inaptitude for so elevated and responsible a station— Euigenius, and not (as stated by Vasari) his successor Nicholas V., must have been the pope who sent the invita- tion and made the offer to Fra Giovanni, for Nicholas only succeeded in 1447. The whisle statement lacks authenti- cation, though in itself credible enough. Certain it is that Angelico was staying in Rome in the first half of 1447; and he painted in the Vatican the Cappella del Sacramento, which was afterwards demolished by Paul IIJ. In June 1447 he proceeded to Orvieto, to paint in the Cappella Nuova of the cathedral, with the co-operation of his pupil Benozzo Gozzoli. He afterwards returned to Rome to paint the chapel of Nicholas V. In this capital he died in 1455, and he lies buried in the church of the Minerva.

According to all the accounts which have reached us, few men to whom tlie distinction of beatification has been con- ferred could have deserved it more nobly than Fra Giovanni. He led a holy and self-denying life, shunning all advancement, and was a brother to the poor; no man ever saw lim angered. He painted with unceasing diligence, treating none but sacred subjects: he never retouched or altered his work, probably with a religious feeling that, such as divine providence allowed the thing to come, such it should remain. He was wont to say that he who illustrates the acts of Christ should be with Christ. It is averred that he never handled a brush without fervent prayer, and le wept when he painted a Crucifixion. The Last Judgment and the Annunciation were two of the sub- jects he most frequently treated.

Bearing in mind the details already given as to the dates of Fra Giovanni's sojournings in various localities, the reader will be able to trace approximately the sequence of the works which we now proceed to name as among his most important productions. In Florence, in the con- vent of S. Marco (now converted into a national museum), a series of frescoes, beginning towards 1443. In the first cloister is the Crucifixion, with St Dominick kneeling ; and the same treatment recurs on a wall near the dornutory ; iu the chapterhouse is a third Crucifixion, with the Virgin Swooning, a composition of twenty life-sized figures—the red background, which has a strange and harsh effect, is the misdoing of some restorer; an Annunciation, the figures of about three-fourths of life-size, in a dormitory ; in the adjoining passage, the Virgin Enthroned, with four saints ; on the wall of a cell, the Coronation of the Virgin, with Saints Paul, Thomas Aquinas,

Benedict, Dominick, Francis, and Peter Martyr ; two Dominicans welcoming Jesus, habited as a pilgrim ; an Adoration of the Magi ; the Marys at the Sepulchre. All these works are later than the altarpiece which Angelico painted (as before mentioned) for the choir connected with this convent, and which is now in the academy of Florence; it represents the Virgin with Saints Cosmas and Damian (the patrons of the Medici family), Dominick, Peter, Francis, Mark, John i vangelist, and Stephen : the pediment illustrated the

ives of Cosmas and Damian, but it has long been severed

ney the main Subject. In the Uffizi gallery, an altarpiece, the Virgin (life-sized) enthroned, with the Infant and ae angels. In §, Domenico, Fiesole, a few frescoes, ess fine than those in St Marco ; also an altarpiece in tem-bera of the Virgin and Child between Saints Peter, Thomas mytinas, Dominick, and Peter Martyr, now much destroyed.

© subject which originally formed the predella of this

‘saintly painter.

picture has, since 1860, been in the London Nationai Gallery, and worthily represents there the hand of the The subject is a Glory, Christ with the banner of the Resurrection, and a multitude of saints, including, at the extremities, the saints or beati of the Dominican order ; here are no fewer than 266 figures, or portions of figures, many of them having names in-scribed. This predella was highly lauded by Vasari 5 Strel more highly another picture which used to form an altar- plece in Fiesole, and which now obtains world-wide celebrity in the Louvre—the Coronation of the Virgin, with eight predella subjects of the miracles of St Dominick. For the church of §. Trinita, Florence, Angelico executed a Deposition from the Cross, and for the church of the Angeli a Last Judgment, both now in the Florentine academy ; for 8S. Maria Novella, a Coronation of the Virgin, with a predella in three sections, now in the Uffizi,—this again is one of his masterpieces. In Orvieto cathedral he painted three triangular divisions of the ceiling, portraying respect- ively Christ in a glory of angels, sixteen

saints and prophets, and the virgin and apostles: all these are now much repainted and damaged. In Rome, in the chapel of Nicholas V., the acts of Saints Stephen and Lawrence ; also various figures of saints, and on the ceiling the four evan- gelists. ‘These works of the painter’s advanced age, which have suffered somewhat from restorations, show vigour superior to that of his youth, along with a more adequate treatment of the architectural perspectives. Naturally, there are a number of works currently attributed to Angelico, but not really his; for instance, a St Thomas with the Madonna’s girdle, in the Lateran museum, and a Virgin enthroned in the church of S. Girolamo, Fiesole. It has often been said that he commenced and frequently practised as an illuminator; this is dubious, and a_pre- sumption arises that illuminations executed by Giovanni’s brother Benedetto, also a Dominican, who died in 1448, have been ascribed to the more famous artist. Benedetto may perhaps have assisted Giovanni in the frescoes at S. Marco, but nothing of the kind is distinctly traceable. A folio series of engravings from these paintings was published in Florence in 1852. Along with Gozzoli already men- tioned, Zanobi Strozzi and Gentile da Fabriano are named as pupils of the Beato.

We have spoken of Angelico’s art as “ pietistic”; this is in fact its predominant character. His visages have an air of rapt suavity, devotional fervency, and beaming esoteric consciousness, which is intensely attractive to some minds, and realizes beyond rivalry a particular ideal —that of ecclesiastical saintliness, and detachment from secular fret aud turmoil. It should not be denied that he did not always escape the pitfalls of such a method of treatment, the faces becoming sleek and prim, with a smirk of sexless religiosity which hardly eludes the artificial or even the hypocritical ; on other minds, therefore, and these some of the most masculine and resolute, he produces little genuine iinpression. After allowing for this, Angelico should nevertlieless be accepted beyond cavil as an exalted typical painter according to his own range of conceptions, consonant with his monastic calling, unsullied purity of life, and exceeding devoutness. Exquisite as he is in his special mode of execution, he undoubtedly falls far short, not only of his great naturalist contemporaries such as Masaccio and Lippo Lippi, but even of so distant a precursor as Giotto, in all that pertains to bold or life-like invention of a subject, or the realization of ordinary appearances, ex- pressions, and actions—the facts of nature, as

distinguished from the aspirations or contemplations of the spirit. Technically speaking, he had much finish and harmony of composition and colour, without corresponding mastery of light and shade, and his knowledge of the human frame

was restricted. The brilliancy and fair light scale of his tints is constantly remarkable, combined with a free use of gilding ; this conduces materially to that celestial character which so pre-eminently distinguishes his pictured visions of the divine persons, the hierarchy of heaven, and the glory of the redeemed. (w. M. R.)

FIFE. See FLUTE.

FIFE, a maritime county of Scotland, is situated between 56° 1’ and 56° 27’ N. lat., and 2° 35’ and 3° 40° W. long., and is bounded on the N. by the Firth of Tay, on the E. by the German Ocean, on the S. of the Firth of Forth, aud on the W. by parts of Kinross, Perth, and Clackmannau. Its greatest length from east to west is about 42 miles, and its greatest breadth from north to south about 18 miles; its average length is about 36 miles, and its average breadth 14 miles. The area comprises 513 square miles, or 328,427 imperial acres.

The physical aspect of Fife is redeemed from tameness by the picturesqueness and variety of its maritime scenery. With the exception of the ‘Howe of Fife,” and a portion bordering on the east coast line, its surface is pleasantly un- dulating. A ridge of high ground, commencing with the Lomond Hills, runs in the middle of the county from west to east, advancing to near St Andrews in its northern part, and terminating with Kellie Law in the south. Between the Lomonds and a spur of the Ochils lies tle somewhat ex- tensive plain called the “ Howe of Fife”; and to the south of the Lomonds there is another stretch of low ground run- ning westwards to the south of Kinross, presenting, however, greater variety of surface than the plain on the north side of the Lomonds, and interrupted by Saline Hill, Knock Hill, the Hill of Beath, the Cullalo Hills, and other smaller eminences. Further east the land slopes on all sides from the central range towards the sea, but generally with con- siderable alternations of hill and

dale, the large number of wooded knolls presenting in many places a rather picturesque appearance. The most western part of the northern shore is level and marshy, but asthe Firth of Tay widens the coast becomes bold and rocky until the village of Tayport is reached. Between Tayport and St Andrews there is an almost unbroken and pretty wide expanse of downs, after which the coast line is abruptly elevated, presenting a jagged and precipitous wall of rocks whose ridges here and there run out into the sea. Between Fife-ness and Burntisland low and sandy stretches, bending often so as to form small bays, are separated from each other by a shore more or less rocky, and occasionally rising into steep and lofty cliffs. The southern coast to the west of Burntisland is wooded in many cases to the water's edge, and gradually the characteristics of river scenery become more marked. The highest summits in the county are West Lomond Hill (1713 feet), East Lomond Hill (1471), a Hill (1189), Saline Hill (1178), and Largo Law

The only streams that aspire to the name of rivers are the Eden, which, formed of affluents rising in the Lomonds aud in the country to the north and west of that range, flows north-east by Strathmiglo, Kingskettle, and Cupar, and after a course of about 20 miles falls into St Andrews Bay; and the Leven, which, issuing from Loch Leven in Kinross-shire, flows eastward through a pleasant strath by Leslie, Balgonie, Balfour, and Cameron Bridge, and about 14 miles from its source empties itself into the Firth of Forth at the town of Leven. The presence of mill-dams and manufactories have rendered both the Eden and Leven almost worthless for salmon fishing, but in these rivers, as well as in the other larger streams not polluted by the water of coal-pits, the trout-fishing is excellent. The largest ed an Lindores Loch (about 70 acres), Loch Fitty (about

), Lochgelly (about 50), and Kilconquhar Loch (about 40).

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Several, such as those of Rossie and Lochore, have been drained, and valuable crops are now raised on their beds,

Geology and Minerals.—The rocks of the southern half of Fife—with the exception of a small portion lying to the east of a line drawn between St Andrews on the north and Anstruther on the south, and another narrow portion lying between Limekilns and Kinghorn—belong chiefly to the coal formation of geologists. ‘This formation is, however, interrupted by the trap rocks which extend through the central part of the county from Saline to near St Andrews, and by other masses of trap of igneous origin which penetrate especially into the eastern portion of the coal-field, causing innumerable faults and dykes, and elevating the strata by a succession of steps towards the north. The valley of the Eden and a part of the county between St Andrews and Anstruther is occupied chiefly by the upper strata of the Old Red Sandstone ; and in the north-eastern part of the county there is a continuation of the porphyry formation of the Ochils. The Lomonds and the other larger hills are composed of trap, and are capped with green- stone and amygdaloid.

Fife is the third largest coal-producing county in Scotland, being excelled in this respect by Lanark and Ayr. The earliest record regarding the working of coal in Scotland is a charter granted at the end of the 12th century by the proprietor of Carriden to the monks of Holyrood of one- tenth of his coal-works at Carriden. The coal basin is connected under the Forth with that of Mid-Lothian. It may be roughly divided into the coal-fields of Dunfermline and Wemyss or Dysart. In the Dunfermline district, which includes Halbeath, Lochgelly, and Kelty, the principal house-coals are obtained. At Wemyss and Methil gas-coal of the best quality is largely produced; and out of some seams ink-stands, picture-frames, and various other articles of ornament are manufactured. Coal is also wrought at various places in the north-eastern district of the basin as at Ceres, Radernie, Falfield, and Largoward.! Beds of ironstone, limestone, sandstone, and shale lie in many places contiguous to the coal-beds. Blackband ironstone is worked at Lochgelly and at Oakley, and has also been worked at Denhead near St Andrews. At the two former places there are large smelting furnaces, and vessels are built at Inverkeithing and Kinghorn of home-made iron, Oil shale from the same measure as at Broxburn and West ‘Calder is worked near Burntisland, and at Airdrie near Crail. Limestone is found in nearly all directions in the coal basin; and in the north-eastern part, instead of lying around the outcrop of the coal strata, it occurs at intervals in the midst of

the coal measures, The maritime limestone reaches considerable thickness at Kirkcaldy, and resumes the character of mountain limestone at Charleston. The principal limestone quarries are those at Charleston, those near Burntisland, and others in the parish of Cults near Cupar. Freestone of a superior quality 3 quarried at Strathmiglo, Burntisland, and Dunfermline. Whinstone of great hardness and durability is obtained m nearly every district, and is much used for building pur poses. Lead has been worked in the Lomond Hills, and copper and zinc are also said to have been met with 12 various places. Marl is found, but is not much used for agricultural purposes. The number of persons employed in connexion with the various minerals is upwards 0 6000. Fossiliferous fish have been found in great abund- ance and variety at Dura Den near Cupar, and Brachiopoda and minute ZHntomostraca are met with throughout the maritime limestone.2 The most common vegetable mw

1 Further particulars regarding the Fife coal-field will be found in the article CoaL.

2 A “Catalogue of the Brachiopoda of Fife and the Lothians” is con tained in the Transactions of the Edinburgh Geological Society for 1877,

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pressions met with in the coal strata are Lepidoden- dron and Stigmaria, A complete list of the crystals and other precious stones will be found in a paper by Professor Heddle in Ballingall’s Shores of Fife, but men- tion may be here made of the pyropes found in the trap tufa at Elie, which are sold to jewellers under the name of Elie rubies, and are regarded as the most valuable Scottish gem. In the Shores of Fife will also be found a paper on

the flora of tle county.

Climate.—On account of the hills diminishing gradu- ally in height towards the east, the greater part of thie county is fully exposed to the blasts of east wind from the German Ocean, which in spring often check consider- ably the progress of vegetation, although their damaging effect is somewhat lessened by numerous belts of wood. The rainfall is below the average, and the climate is on the whole mild, the heat in summer and the cold in winter

being modified by proximity to the sea. On the higher ridges, however, the air is often sharp and rigorous; and at an elevation of from 500 to 600 feet the harvests are on an average from tliree to four weeks later than in the valleys and on the low ground near the coast. Snow seldom lies long near the sea, but the hills and higher grounds are sometimes coated for a considerable period, Nutwithstanding the extensive drainage of the lakes and marshes, the valleys are occasionally visited by floating mists and hoar frosts even in summer, and grain and potatoes often suffer considerable damage in July from this cause.

Agriculture.—According to the agricultural statistics for 1877 the total area of arable land was 244,865 imperial acres, of which 88,012 were under corn crops, 47,742 under green crops, 58,075 under rotation grasses, 49,599 permanent pasture, and 1437 fallow. The acreage under woods was 22,008, Fife is especially a grain- producing county, and the system of cultivation is chiefly directed to that end. The acreage under wheat—which was 12,384 in 1877— has, as in other districts of Scotland, decreased considerably within the last twenty years, the difference being, in Fife, added prin- cipally to the acreage under barley. Along the coast the yield of wheat ranges from 32 to 50 bushels per imperial acre, and inland it ranges from 28 to 40, The red variety is now less grown than formerly. Barley, being a less expensive crop than wheat, as well as less trying to the soil, and finding a ready sale, is inereasingly eultivated. The acreage under it was 32,265. The variety most largely grown is chevalier. The return on the richer soils is from 40 to 64 bushels per aere, and inland from 32 to 42. Oats—the acreage of which was 39,818-—are a good erop all over the county, and yield on. the richer soils from 48 to 72 bushels per acre, and inland from 86 to 54. Beans grow exceedingly well on the heavy land, but are not extensively cultivated, the total acreage being only 2147. The acreage under turnips was 29,093. About one half of the turnip break is sown with swedes, and a considerable quantity of turnip seed is also grown in the county. The yield in yellows is often as high as 35 tons per acre, and of swedes 30 tons, but the average yield is about 25 tons for yellows and 18 for swedes. The acreage under potatoes was 17,488, The average yield is from 5 to 8 tons, and on the finer svils the quality cannot be surpassed. No other green crops are cultivated to any extent, Asa six-crop rotation—of oats, potatoes or beans, wheat, turnips, barley, and hay or pasture—is the most common one, the acreage

under rotation grasses 1s nore than usually small, but within late years a seven- shift has been obtaining favour, and since 1870 the acreage under grasses has consequently been increasing. In some districts, 8, 5, and 4 shifts are severally in use. The acreage in permanent pasture 1s considerably below the average, It is chiefly confined to the me grounds, especially those in the eastern district, and is let ——, Troup. Asa large number of cattle are fed on most farms Sees : generally a plentiful supply of farm manure; the extensive

ast line also affords a large quantity of seaware ; and limestone eo are within easy reach in most districts. if : number of cattle in 1877 was 37,305, or an average of about So ies, a oe acres under cultivation as compared with 23°6 for atl ae: 2 number of cows and heifers in milk or in calf was tively ale an – will therefore be apparent both that a eompara- a ee r of stock is reared, and that dairy produce forms indeed . item in the farmer’s returns. On most farms, an. i. 1 the exception of those adjacent to the larger towns, Kee “ohh a number of cows are kept to supply the wants of the ied? 1 and farm servants. As the Board of Trade returns are

P in spring they give considerably less than the full number

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of eattle wintered annually. These are mostly imported from Ire- land, and the county on that aecount is scarcely ever free from foot-and-mouth disease and pleuro-pneumonia. Except a few short- horns and a yet smaller number of polled Angus, the cows are mmostly erosses of a somewhat obscure origin; but a cross between Galloway cows and short-horned bulls has lately been largely intro- duced. The number of horses was 10,155, or an average of more than 4°1 to every 100 acres, as compared with 4:0 for Scotland. Of these 7821 were used solely for agricultural purposes. They are a strong, active, and hardy breed. The majority have a large ad- mixture of Clydesdale blood, and the number of pure Clydesdales is gradually increasing. There isa large number of excellent ponies and of carriage and hunting horses. The number of sheep was 73,665, or an average of abont 30-0 to every 100 acres, as compared with 149°3 for Scotland. Of these 26,375 were under one year old. As, however, the Board of Trade returns are made up at the end of June they give only the minimum number of

sheep in the county, the majority being bought in at the end of autumn for winter feeding. More attention is now paid to the breeding of pigs than formerly, and the old breed has been gradually improved by the introduction of Berkshire boars. The unmber of pigs was 6593, or an average of about 2°7 to every 100 acres as compared with 3°3 for Scotland, The breeding and rearing of poultry does not generally receive mueh attention, but the number of fowls kept on a farm is sometimes considerable.

According to the returns, out of a total of 2244 holdings 565 did not exceed 5 acres, 647 lay between 5 and 50, 224 lay between 50 and 100, and 808 were. above 100, the great majority of which were between 250 and 350, and only 39 above 500. Leases of 19 years are almost universal exeept in the case of the smallest holdings.

According to the owners and heritages return, 1872-73, the land was divided between 10,410 proprietors, holding land the gross annual value of which was £905,577. Of the owners 82°9 per cent. possessed less than one acre, and the average value all over was £2, 19s. 6d. There were 11 proprietors holding upwards of 4000 acres, viz., John Balfour (Balbirnic) 10,590; George Johnston (Lathrisk) 10,005; Earl of Moray (Donibristle) 7463 ; Colonel

Ferguson (Raith) 7135; Licutenant-Colonel Tyndall Bruce (Falk- land House) 7058; Randolph G. KE. Wemyss and trustees of J. H. E. Wemyss (Wemyss Castle) 6925; Earl of Glasgow (Crawford Priory) 5625; Earl of Zetland 5566 ; Sir Coutts Lindsay (Balcarres) 4672; George Clark Cheape (Wellfield) 4230; and John Anstruther Thomson (Charleton) 4034. ;

Fife is perhaps below the average as a game-preserving county. Rabbits, hares, pheasants, and partridges are pretty numerous In some districts; roe deer are occasionally seen ; wild geese, ducks, and teal frequent the lochs; and grouse and blackcock are some- what plentiful on the Lomond moors. The pigeon houses have been estimated at 300. The county is particularly well adapted for fox-hunting, and the Fife fox-hounds are now divided into an eastern and a western pack. =,

Manufactures and Trade.—The staple manufacture is linen. The chief seats of the linen cloth manufacture—which ranges from the coarsest ducks and sackings to the finest damask—are Kirkcaldy and Dunfermline. The largest flax spinning mill is that at Prin- laws near Leslie. The other seats of the linen trade are Auchter- muchty, Caméron Bridge, Cupar, Dura Den, Dysart, Falkland, Freuehie, Guardbridge, Kinghorn, Kingskettle, Ladybank, Leven, Markinch, Newburgh, Springfield, Strathmiglo, Tayport, and East and West Wemyss. There are bleaching greens on the banks of the Eden and Leven, and also at Kirkcaldy, Ceres, and Dunferm- line. According to the census of 1871 the number of persons engaged in the linen manufacture was 17,055, of whom 5742 were males and 11,318 females. In the jute manufacture 29 males and 23 females were employed. Kirkcaldy possesses 6 large floor-cloth manufaetories, besides others for the manufacture of hnoleum. In various towns woollen cloth is manufactured, but only to a small extent. There are fishing-net manufactories at West Wentyss, Kirkcaldy, and Largo. There are breweries and tanneries in the principal towns. The largest distilleries are at Cameron Bridge and Burntisland. Paper is manufactured at Guardbridge, Mark- inch, and Leslie ; earthenware at Kirkcaldy; tobacco at Kirkcaldy and Dunfermline; and oilcake in a few places. Kirkcaldy and Dunfermline possess iron-foundries; and shipbuilding is carried on at Kinghorn, Dysart, Burntisland, Inverkeithing, and Tayport. The principal port is Kirkcaldy; the chief imports are flax and timber, and the chief exports coals and potatoes. The largest salmon fisheries are at Newburgh, but there are others at various parts on the east and south coast. The chief seat of the herring fishing is Anstruther ; and the number of boats in the Anstruther district, which includes all the fishing stations in the county, is nearly 800, with a total value of nearly £100,000. For some years the take of herrings on the Fife coast has been very small, and the majority of the Fife fishermen now prosecute the herring fishing at the northern stations.

Towns and Villages.—The number of towns and villages in Fife is exceptionally great. The south coast especially is very thickly populated, and along its whole extent there is almost a eontinuous line of houses. The large extent af downs on the sea.coast affords great facilities for the Scottish national game of golf. Besides the famous golfing green at St Andrews, there arc others at Cupar, Crail, Elie, Lundinmill, Leven, Innerleven,

Wemyss, and Burnt- island, The number of boroughs is 16, of which three, Auchter- muchty (1082), Falkland (1144), and Newburgh (2182), are royal ; and 13 royal and parliamentary, viz., Anstruther Easter (1289), Anstruther Wester (484), Burntisland (3265), Crail (1112), Cupar (5105), Dunfermline (14,963), Dysart (8919), Inverkcithing (1755), Kilrenny (2539), Kinghorn (1739), Kirkcaldy (12,422), Pittenweem (1760), and St Andrews (6316). Among the other towns and villages the principal along the coast are Limekilns (735), with a small harbour ; Charleston (749), the shipping port of Dunfermline, with an iron-foundry, limeworks, and manufactures of salt ; Aber- dour (622), a favourite watering place; the manufacturing village of East Wemyss (777); West Wemyss (1231), partly mining but chiefly fishing; the mining village of Methil (648); the fishing villages of Buckhaven (2187), Innerleven (358), and St Monance (1648); the watering places of Leven (2501), Largo (521), and Earlsferry and Elie (1032); and on the northern coast the towns of Tayport (2498) and Newport (1507). Inland there are Freuchie (1195), Kingskettle (643), Ladybank (772), Leslie (3768), Milton of Balgonie (396), Pitlessie (401), Springfield (608), and Strathmiglo (1509), all chiefly manufacturing ; Cairneyhill (435), Cardenden (355), Charleston (749), Coalton (442), Coaltewn (343), Cowden- beath (1457), Crossgates (1181), Donibristle (412), Dunshalt (481), Halbeath (800), Largoward (325), Lochgelly (2369), Methilhill (480), Thornton (526), Towuhill (855), Wellwood (678), Windy- gates (420), all principally mining ; aud Ceres (1111), Colinsburgh (351), Fordel (641), Kennoway (835), Kilconquhar (381), Kings- an =e Kirkton of Largo (353), Leuchars (523), Lundinmill

» and Strathkinness (619), with a mixed population—mining, manufacturing, agricultural, or shopkeeping.

Kailways.— Fite 1s crossed from Burutisland to Newport by the North British Railway between Edinburgh and Dundee; and from the main line branches diverge at Thornton to Dunfermline and

FIFE

Kinross, and to Leven and the east of Fife ; at Markinch to Leslie; at Ladybank to Auchtermuchty and Kinross and to Perth; and at Leuchars to St Andrews.

Population.—The total population of the county in 1871 wag 160,735, of whan 75,127 were males and 85,608 females, The population in 1861 was 154,770. In the towns the population in 1871 was 73,929 as compared with 66,516 in 1861, in the villages 47,759 as compared with 41,627, and in the rural districts 39,047 as compared with 46,627.

One member of parliament is returned by the county ; one each by the Kirkcaldy and St Andrews districts of burghs; and Dun. fermline and Inverkeithing are grouped with other boroughs under the Stirling district in returning a fourth.

History and Antiquitics.—A dim conception of the kingdom of Fife at a period regarding which there are scanty written records may he obtained from its somewhat important and interesting archeological remains, Those of greatest antiquity are perhaps two eanoes found more than 60 years ago in the bed of the Tay opposite Lindores ; the relics of the Bos primigenius, an inhabitant of the primeval forest ; and the remains of many of the ancient hill forts— chief of which may be mentioned those at Norman's Law and on the Craig of Clachard, both in the parish of Abdie—constructed at a period in all probability considerably anterior to the Roman invasion. Traces yet exist in several places of the foundations of those circular tent-like dwellings noticed by Julius Cesar in other parts of Britain as identical with those of the Gauls of the continent of Europe. The marks of Roman occupation are now nearly all obliterated by cultivation, but sword blades, spear heads, and hoards of Roman eoins have been found at various places ; and vestiges of a number of Roman buildings were in existence 100 years ago. According to Sir Robert Sibbald, traces of Roman camps were in his life-time visible near Burntisland and Dunfermline ; and slight marks of two yet remain in the parish of Carnock at a place known by the name of the Camp Farm. At Lochore, near a place now occupied by the farm of Chapel, there existed about a century ago the outlines of a permanent Roman station of considerable strength, and occupying a central position on the route between Queensferry and the firth of Tay. 1t was near this fortification that in all proba- bility took place the night attack on the ninth legion, mentioned by Tacitus in the 25th chapter of his Agricola,

The earliest inhabitants of Fife and Strathearn of whom we have any knowledge were of Celtic origin, and were called by the Romans Horesti. It is uncertain when the Romans retired from this district, but they did not occupy it for a length of time sufficient to effect any marked change on the civilization of the natives, who made frequent incursions into the Roman province, and received from their Romanized neighbours the name of Picti, the part of Scotland north of the Forth being known as Pictavia so late as the 8th eentury. The title kingdom ultimately inherited by Fife was doubtless applied in the first instance to the whole of Pictavia; and the continuance of the title to a smaller portion, of which the present Fife forms the eastern half, was due as much to its being the southern part of Pictavia as to its distinct peninsular form, and tothe fact that Pictish kings had their residence within its tern- tories. In any case the title as applied to Fife has the sanction of very ancient usage. In the tract of the Scots of Dalriada there occur the words the “men of Fife in the sovereignty”; and m Wynton’s Chronicle, whose date is 1880, Fife is spoken of as a “kynrick ” or kingdom. The power and influence of the thanes of Fife, and the existence afterwards of royal residences at Dunfermline and Falkland, doubtless aided in continuing the title down to later times. The first trace of the name Fife occurs in the old verses ascribed to St Columba, where, under the form F%/, it is used as the designation of one of the seven provinces into which, according to Beda, the ancient kingdom of Pictavia was divided. As to the exaet loandaries of Fife at this period there is no certain information, but in all probability it comprehended the greater part of the territory between the Forth and the Tay, thus including Monteith, Strathearn, and the shires of Clackmaunanand Kinross, but probably in its south-western part ceding a portion of its present area to the province of Fortreim. Ata later period Fife was divided into the g ‘

1 See paper by W. F. Skene in the Proceedings of the Society of Antiquaries of Scotland, vol. iv.

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Ona mound at Norris Law a complete sct of silver armour was discovered about 1817, but it found its way to

several other hills.

the melting pot before its antiquarian importance was recognized. Several relics found along with it have, however, been preserved,

and they are graven with symbols similar to those of the oldest sculptured stones, one of which yet exists at Lindores, and contains

no Christian figures. The standing stones of Lundin, near Leven,

are, according to the tradition of the district, the burial stones of Danish chiefs who fell in a battle which took place in the immediate Of the sculptured stones erected subsequent to the teaching of St Columba, which are eithcr crueiform or

neighbourhood.

graven with a large cross, there are, besides several fragments at

different places, four standing in a pretty entire condition, viz., at

Docton Kinglassie, at Abereromby, at Sauchope near Crail, and at

Mugdrum near Newburgh. Still more interesting memorials of

the early Christian missionaries are the crosses and other figures graven on the walls of the numcrous caves which exist along the coast from St Andrews to Dysart.} the next archzological relic of importance is the pedestal of the cross of Macduff near Newburgh, erected by the thane of Fife after his escape from the vengeance of the usurper Macbeth.

Monastic foundations were pretty numerous in Fife. On the island of Inchkolm there yet stand the cloister, prison, refectory, and chapter-house of an abbey of the Canons Regular, fonnded in 1213; and the same order possessed priories at Pittenweem (of which there are yet interesting ruins), at St Andrews (founded in 1221), andin the Isle of May (1141). Convents of

the Dominicans existed at Cupar, at St Monans(1369), andSt Andrews(1274). The Benedictines founded Dunfermline Abbey in 1214; and , Lindores Abbey, whieh, from the few architectural details now left, must have been of great elegance, owed its origin to the Tyronenses in 1178. Balmerino Abbey, of which there yet exist the roofless walls of the chapter-house with the cloisters, was founded by the White Cister- cians in 1229. The Franciscans had a monastery at Inverkeithing ; an Observantine convent was founded at St Andrews in 1478; and one of the only two numneries of the Clarisses in Scotland existed at Aberdour. The churches of Crail (1517), Kirkheugh, and St Salvators (1450) were collegiate churches ; St Monaus possesses a fine Gothic church of the Middle Pointed style, built about 1365, and restored in 1828; a fine old Norman church stil] stands at Aberdour ; there are ruins of an old church at Abdie consecrated in 1242 ; and the semicircular apse of an old Norman structure forms part of the present parish church at Leuchars. Further particulars regarding the ecclesiastical antiquities of Fife will be found in the accounts of the different burghs,

Among the old castles not mentioned under the names of burghs the principal are the ruins of Balcomie Castle, near the East Neuk, where stress of weather compelled Mary of Guise to land in 1538; two square towers of an old building near East Wemyss, said to have been the residence of Macduff ; the present castle of Wemyss—a plain building with an old castellated wing—where Queen Mary met her future husband Darnley ; the ruin of Ravenseraig, near Dysart, teferred to in Sir Walter Scott's ballad of '* Rosabelle"; the ruined tower of the old castle of Balwearie, near Kirkcaldy, the birthplace of Sir Michael Scott the astrologer ; the square tower of the old castle of Rosythe, near Inverkeithing, visited by Oliver Cromwell when in Fife ; the castellated mansion of Aberdour, at one time the residence of James, fourth earl of Morton ; the fortress of Lochore, built in the time of Malcolm Canmore ; the old stronghold of Balgonie ; part of the round tower of the old castle of Creich, the Tesidence of the Beatons, and the birthplace of Mary Beaton, one of the "four Maries" of Mary Queen of Scotland; Ballinbreich Castle, in the parish of Flisk, for a long time the residence of the earls of Rothes ; and the ruined castle of Dairsie, where, it is said, Archbishop Spottiswoode wrote his history.

Among the modern residences of the gentry may be mentioned _ House (Col. Ferguson), built by Lord Raith in the 17th cen- ‘UTY, a plain building, finely situated on an clevated plateau ; Balcar- res House (Sir Coutts Lindsay), a baronial structure lately enlarged, with fine terraced gardens in front ; Balcaskie House (Sir Robert oe) with terraced gardens in the French style; Falkland i ouse (Tyndall Bruee), a fine mansion in the Elizabethan style, and eautifully situated at the base of the East Lomond; Donibristle (Earl of Moray), and Dysart House (Earl of Rossyln), both ro- vee. situated close on the sea-shore ; Leslie House (Hon. G.

aldegrave Leslie), at one time one of the largest mansions in Scot- and, but on account of a fire now only a fourth of its original size, containing a gallery with portraits of the successive earls of Rothes and many of their contemporaries ; Largo House, where at one time hes i Patrimony of Sir Andrew Wood; Inchdairnje (Roger

nelair Aytoun), a fine mansion in the Scotch baronial style ;

i if ae notes on the sculptured caves near Dysart, by Miss C. M‘Lagan, . XL. of the Proceedings of the Society of Antiquaries of Scot-

and s d / Os tere 4 : ‘hoe a Sculpturés of Cups and Circles, by Sir James Y.

After the time of the Culdees

Crawford Priory (Earl of Glasgow), a castellated mansion lately greatly enlarged ; and Mount Melville (J. Whyte Melville).

On aecount of its isolated situation, Fife, except at the Reformation and during the times of the Covenanters, has not been prominently connected with the eventful periods of later Scottish history, the only circumstances worthy of inention being the battle of Dalcearrens Field, near Lindores, in which Sir William Wallace, in June 1300, inflicted a heavy defeat on the English; the capture in 1651 of Burntisland by the soldiers of the Commonwealth, who garrisoned the town for several years, and in this way kept a check on the Royalist sympathizers of the “kingdom”; the landing of

the earl of Mar at Elie in 1715 to take part in the Jacobite insurrection : and the arrival shortly afterwards of 4000 of the insurgents with

the view of crossing from Fife in boats to join the southern army. Among the eminent persons connected with Fife may be mentioned Sir David Lindsay of the Mount, Sir Michael Scott the astrologer, the parliamentary general Leslie, Lord Leven, Sir David Wilkie, Adam Smith, Thomas Chalmers, Lord Chancellor Campbell, Mrs Somerville, and the seventh and eighth earls of Elgin.

Sir Robert Sibbald's History of the Sheriffdoms of Fife and Kinross is chiefly of value for the information it eontains regarding the condition of Fife at the period of the writer. Varied information regarding the history and antiquities of the shire will be found in Alex. Campbell's Journey from Edinburgh through Fife- shire, 1805; Rev. A. Small's Roman Antiquities in Fifeshire, 1823; Rev. J. W. Taylor's iitstorical Antiquities of Fife, 1875; and Rev. W. Wood's East Neuk of Fife, 1862. See also Swan's Viers of Fife; the beautifully illustrated Shores of Fife, edited by Wm. Ballingall, 1872; and an interesting article on the " Kingdom of Fife," in Fraser's Magazine for J anuary 1878. (T. F. H.)

FIFTH MONARCHY MEN, a Puritan sect who supported Cromwell's government in the expectation that it was a preparation for the " fifth monarchiy,"— that is, the monarchy which should succeed the Assyrian, the Persian, the Grecian, and the Roman, and during which Christ should reign with his saints on earth for a thousand years. Being disappointed at the delay in the fulfilment of their hopes, they attempted to foment a political agitation against the government of Cromwell, but the arrest of Feake and Powell, two of the most violent of their number, was sufficient for a time to damp their ardour, and they were content to nourish their dreams in secret until after the Restoration, when, on January 6, 1661, fifty of them, headed by a wine-cooper named Venner, made a mad effort to attain possession of London in name of " King Jesus." Most of the fifty were either killed or taken prisoners, and on January 19 and 21 Venner and ten others were executed for high treason. From that time the special doctrines of the sect either died completely out, or became merged in a

milder form of millenarianism similar to that which still exists at the present day.

FIG, the popular name given to plants of the genus Ficus, an extensive group, included in the uatural order Jforacew, and characterized by a remarkable develop- ment of the pear-shaped receptacle, the edge of which curves inwards, so as to form a nearly closed cavity, bear- ing the numerous fertile and sterile flowers mingled on its surface (see Borany, fig. 150). The figs vary greatly in habit,—some being low trailing shrubs, others gigantic trees, among the most striking forms of those tropical forests to which they are chiefly indigenous. They have alternate leaves, and abound in a milky juice, usually acrid, though in a few instances sufficiently mild to be used for allaying thirst. This juice contains caoutchouc in large quantity. .

Fieus Carica, which yieias the well-known figs of commerce, is a bush or small tree, rarely more than 18 or 20 feet high,—with broad, rough, deciduous leaves, very deeply lobed in the cultivated varieties, but in the wild plant sometimes nearly entire. The green, rough branches bear the solitary, nearly sessile receptacles in the axils of the leaves. The male flowers are placed chiefly in the upper part of the cavity, and in most varieties are few in number. As it ripens, the receptacle enlarges greatly, and the numerous single-seeded pericarps become imbedded in it. The fruit of the wild fig never acquires the succulence of the cultivated kinds, The fig seems to be indigenous to Asia Minor and Syria, but now occurs in a

wild state in most of thecountries around the Mediterranean. | as a luxury by: the poor, under the name of “fig-cake,” From the ease with which the nutritious fruit can be pre- | Alcohol is obtained from fermented figs in some southern served, it was probably one of the earliest objects of culti- countries ; anda kind of wine, still made from the ripe fruit, vation, as may be inferred from the frequent allusions to it | was known to the ancients, and mentioned by Pliny under in the Hebrew Scriptures. From a passage in Herodotus | the name of sycetes. Medicinally the fig is employed as a the fig would seem to have been unknown to the Persians gentle laxative, when

eaten abundantly often proving useful in the days of the first Cyrus ; but it must have spread in j in chronic constipation ; it forms a part of the well-known remote ages over all the districts around the /Zgean and | “ confection of senna.” Cut open, the fruit is a popular Levant. The Greeks are said to have received it from | cataplasm for boils and sores, an application as old as the Caria (hence the specific name) ; but the fruit so improved days of Hezekiah. It is recommended as a demulcent in under Hellenic culture that Attic figs became celebrated | disorders of the throat, being given in the form of decoction. throughout the East, and special laws were made to regu- | The milky juice of the stems and leaves is very acrid, and late their exportation. From the contemptuous name given has been used in some countries for raising blisters. The to informers against the violation of those enactments, | wood is porous and of little value; though a piece, satur- cuxopdavrat (odKOV and daivw), our modern word sycophant ated with oil and spread with emery, 1s in France a is traced. ‘The fig was one of the principal articles of sus- | common substitute for a hone.

tenance among the Greeks; the Spartans especially used it The fig is grown for its fresh fruit (eaten as an article of largely at their public tables. From Hellas, at some | dessert) in all the milder parts of Europe, and in the prehistoric period, it was transplanted to Italy and the | United States, with protection in winter, succeeds as far adjacent islands, Pliny enumerates many varieties, and | north as Pennsylvania. In England it is usually trained alludes to those from Ebusus (the modern Ivica) as most against a wall, and sheltered with mats or branches in esteemed by Roman epicures ; while he describes those of | severe frosts, though in some warm places near the home growth as furnishing a large portion of the food of the | southern coast small plantations of standard bushes exist; slaves, particularly those employed in agriculture, by whom | one of the oldest is probably that at Tarring, near Worth- great quantities were eaten sn the fresh state at the periods | ing. The tree is propagated by cuttings or layers ; it of fig-harvest. In Latin myths the plant plays an import- | requires care in pruning, and the immature fruit, formed ant part. Held sacred to Bacchus it was employed in | late in summer, should be removed to strengthen the shoots. religious ceremonies ; and the fig-tree that overshadowed The crop ripens in August and September. The fig was the twin founders of Rome in the wolf’s cave,

as an emblem | introduced into England by Cardinal Pole, from Italy, of the future prosperity of the race, testified to the high | early in the 16th century.

value set upon the fruit by the nations of antiquity. The The Sycamore Fig, Fieus Sycomorus, is a tree of large size, tree is now cultivated in all the Mediterranean countries, | with heart-shaped leaves, which, from their fancied resem- but the larger portion of our supply of figs comes from | blance to those of the mulberry, gave origin to the name Asia Minor, the Spanish Peninsula, and the south of | Svxduopos. From the deep shade cast by its spreading France. Those of Asiatic Turkey are considered the best.' branches, it is a favourite tree in Egypt and Syria, being The varieties are extremely numerous, and the fruit is of | often planted along roads and near houses. It bears a various colours, from deep purple to yellow, or nearly white. | sweet edible fruit, somewhat like that of the common fig, The trees usually bear two crops,—one in the early summer | but produced in racemes on the older boughs. The apex from the buds of the last year, the other in the autumn of the fruit is sometimes removed, or a incision made in from those on the spring growth ; the latter forms the chief | it, to induce earlier ripening. The ancients, after soaking harvest. Many of the immature receptacles drop off from | it in water, preserved it like the common fig. The porous imperfect fertilization, which circumstance has led, from

wood is only fit for fuel. very ancient times, to the practice of capryication. Branches The Sacred Fig, Pippul, or Bo, Ficus religiosa, a large tree of the wild fig in flower are placed over the cultivated

with heart-shaped, long-pointed leaves on slender footstalks, bushes. Certain hymenopterous insects, of the genera

is much grown in southern Asia. The leaves are used for Blastophaga and Sycophaga, which frequent the wild fig,

' : tanning, and afford lac, and some caoutchouc 1s obtained enter the minute orifice of the receptacle, apparently to | from the juice ; but in India it is chiefly planted with a reli- deposit their eggs ; conveying thus the pollen more coin-

; gious object, being regarded as sacred by both Brahmans and pletely to the stigmas, they ensure the fertilization and Buddhists. The former believe that the last avatar of Vishnu consequent ripening of the fruit. By some the nature of

took place beneath its shade. A gigantic bo, described by the process has been questioned, and the better maturation | Emerson Tennent as growing near Anarajapoora, in Ceylon, of the fruit attributed merely to the stimulus given by thie

: c is, if tradition may be trusted, one of the oldest trees 10 puncture of the insect, as in the case of the apple; but the

J the world. It is said to have been a branch of the tree arrangement of the unisexual flowers in the fig renders the | under which Gautama Buddha became endued with his first theory the more probable. In some districts a straw

Cais : divine powers, and has always been held in the greatest or small twig is thrust into the receptacle with a similar

: : veneration. ‘The figs, however, hold as important a place object. When ripe the figs are picked, and spread ont to | in the religious fables of the East as the ash in the myths dry in the sun,—those of better quality being much pulled

of Scandinavia. and extended by hand during the process. ‘Thus prepared, Ficus elastica, the India-rubber Tree, the large, oblong, the fruit is packed closely in barrels, rush baskets, or | glossy leaves, and pink buds of which are so familiar in out wooden boxes, for commerce. The best kind, known as greenhouses, furnishes most of the caoutchouc obtamet elemi, are shipped at Smyrna, where the pulling and pack- from the East Indies. It grows to a large size, and 18

ing of figs form one of the most important industries of the | remarkable for the snake-like roots that extend in contorte’

people. masses around the base of the trunk. The small fruit 18 This fruit still constitutes a large part of the food of the unfit for food. For the Banyan see vol. ill. p. 348. natives of western Asia and southern Europe, both in the The trade in the edible fig is one of long standing, 904

fresh and dried state. A sort of cake made by mashing of considerable importance in the regions devoted to tH? up the inferior kinds serves in parts of the Archipelago as cultivation of the tree. Figs are easily preserved by simply a substitute for bread ; mixed with almonds, a similar pre- drying in the sun, the grape sugar which they contain paration is sold in the streets of our large towns, and eaten | abundance being thus rendered available for their preset™™

tion. Recently the practice of preserving fresh undried figs in tins has been adopted, but the amount used in that form is as yet insignificant compared with the quantities preserved by drying. Of the dried and pressed fruit the import into Great Britain alone averages from six

to seven thousand tons annually, the following being the |

official returns for the five years ended 1876 :—

Cwts. Value. Duty. | 441,847… £931,671… ..0: £38,885 DS ii seis cn B20, BAF» ...a00 e715 a 35,021 YY — i 149, 039…..... 23,685

!) 124/609…..... 252,022…..... 32,749

TRIG. ....—. 168,163…..... “ — 39,925

The greater part (about four-fifths) of these imports comes from Asia Minor, the remainder being produced in various Mediterranean countries. (e)-S,)

FIGARO, a famous dramatic character first introduced on the stage by Beaumarchais in the Barbier de Séville, the Mariage de Figaro, and the Folle Journée. The name is said to be an old Spanish and Italian word for a wigmaker, connected with the verb cigarrar, to rollin paper. Many of the traits of the character are to be found in earlier comic types of the Roman and Italian stage, but as a whole the conception was marked by great originality ; and Figaro soon seized the popular imagination, and became the recognized representative of daring, clever, and nonchalant roguery and intrigue. Almost immediately after its appearance, Mozart chose the Marriage of Figaro as the subject of an opera, and the Barber of Seville was treated first by Parsiello, and afterwards in 1816 by Rossini. In 1826 the name of the witty rogue was taken by a journal which continued till 1833 to be one of the principal Parisian periodicals, numbering among its contributors such men as Jules Janin, Paul Lacroix, Léon Gozlan, Alphonse Karr, Dr Veron, Jules Sandeau, and George Sand. Various abortive attempts were made to restore the Figaro during the next twenty years; and at length in 1854 the efforts of M. Villemessaut were crowned with success. The new journal not only still exists, but has attained unusual popularity.

See Mare Monnier, Les Aieux de Figaro, 1868; H. de Ville- messant, Mémoires d’un Journaliste, 1867.

FIGEAC, a town of France, capital of an arrondissement in the department of Lot, is situated on the right bank of the Selle, 32 miles N.E. of Cahors. It is inclosed by an amphitheatre of wooded and vine-clad hills, but is ill-built, and its streets are narrow ani dirty. Many of the buildings are remarkable for their antique style. It was formerly surrounded by ramparts and ditches, but these were demolished in 1622, though remains of them still exist. Figeac has linen and cotton manufactures, dyeworks, and tanneries, and also a considerable trade in cattle and wine, Among the public edifices worthy of notice are the communal college, the hospital, the

abbey church of St Sauveur, the church of Notre Dame du Puy, and the Chateau de la Baleine, now transformed into a law court, but still retaining its feudal exterior. At the south and West extremities of the town are two obelisks called les aguules, octagonal in form, and upwards of 50 feet in height, which were used in former times as fire beacons to guide travellers by night. Champollion the archzologist was born at Figeac in 1790, and an obelisk has been erected to his memory near the river. The town owes its origin to r, ponedictine abbey founded by Pepin the Short in 755. me was besieged by the Huguenots in 1568 without success,

ut was conquered by them in 1576, and remained one of their chief fortresses till 1622. The population in 1876 was 5660, aa IGUERAS, a frontier town of Spain, in the province of

‘ ona, and 20 miles W.N.W. of the town of that name.

‘88 straggling town, situated in a rich plain of olives

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and rice. It possesses a beautiful parish church, two monasteries, and a hospital. The principal manufactures are leather and paper, and it has some trade with France. The citadel, an irregular pentagonal structure on the principles of Vauban, is considered one of the strongest fortresses in Kurope. It was built by Ferdinand VL, and its situation renders it the key to the frontier. Its cost amounted to £285,000, and it contains accommodation for 16,000 men and 500 horses. ‘The buildings inside the walls are all bomb-proof, and the natural adaptation of its situation has been so taken advantage of that trenches can scarccly be opened on any side, the ground being every- where rocky. In 1794 it was surrendered to the French, but it was retaken in 1795. It was again captured by the French in 1808, and though they were forced to vacate it in 1811, they recaptured it on the 19th August of the same year. Jn 1813 they were again driven out, but it again capitulated to them in 1823. The population of Figueras is about 10,000.

FIJI ISLANDS. The Fiji, or more correctly Viti, archipelago (Fiji being the pronunciation in the eastern part of the group frequented by the Tongans) is one of the most important in the South Pacific. Its nearest neighbours are

the Samoan group 300 miles to the N.E., and the Tongan or Friendly rather nearer to the S.E. Lying between 177° E. and 178° W. long., and between 15° 40’ and 20° S. lat., it is beyond the limits of the perpetual S.E. trades, while not within the range of the N.W. monsoons. From April to November the winds are steady between S.E, and E.N.E., after which the weather becomes un-

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Map of Fiji Islands.

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certain and the winds often northerly. In February and March heavy gales are frequent, and hurricanes sometimes occur, causing scarcity by

destroying the crops. The rain- fall is much greater on the windward than on the lee sides of the islands (108 inches at Levuka), but the mean temperature is much the same, viz., about 80° F, The greatest rise and fall of the tide is six feet. The islands cover an area of some 7400 square miles, or about that of Wales, Excluding the two large islands, they are classed by the natives in three groups, viz., the “Lau” or Windward Islands, mostly small, but many of them very fertile, of which Lakemba is the most important; ‘“ Loma-i-Viti,” or Inner Fiji, z.¢, the islands inclosed between the Lau and the two great islands Viti Levu (Great Viti) and Vanua Levu (Great Land); and the “Ra” or Leeward Islands, a chain of numerous small islands bounding the group to the westward.

Scenery.—There is not much level country, except in the small coral islets, and certain rich tracts along the coasts of the two large islands, especially near the mouths of rivers. Elsewhere hill and valley, peak and precipice, assume the most romantic forms, clothed almost always

156 rid a

wita a beautiful and luxuriant vegetation. The large islands have a considerable extent of undulating country, dry and open on their lee sides ; the peaks rise from 4000 to 5000 feet.

Climate and Diseases.—The climate, especially from November to April, is somewhat enervating to the Eng- lishman, but not unhealthy. Fevers are hardly known. Dysentery, which is very common, and the most serious disease in the islands, is said to have been unknown before the advent of Europeans. Elephantiasis is common, but is curable by removal into higher and better air. It is some- times produced by immoderate use of kava. Influenza 1s at times prevalent and very fatal. Rheumatism 1s common. The natives have a bad skin disease, thoko, affecting also the bones, from which few escape ; but it is said to be avoidable by a sounder hygiene.

Rivers.—Streams and rivers ara abundant,—the latter very large in proportion to the size of the islands, affording a water-way to the rich districts along their banks. These aud the extensive mud flats and deltas at their mouths ate often flooded, by which their fertility is increased, though at a heavy cost to the cultivator.

Geological Formation.—The geological features of the group point to repeated volcanic action at considerable intervals. ‘Che tops of many of the mountains, from Kandavu in the §.W., through Nairai and Koro, to the Ringgold group in the N.E, have distinct craters, but their activity has long ceased. The various decomposing voleanic rocks—tufas, conglomerates, and basalts—mingled with decayed vegetable matter, and abundantly watered, form a very fertile soil, Most of the high peaks on thie larger islands are basaltic, and the rocks generally are igneous, with occasional upheaved coral found sometimes over 1000 feet above the sea; but certain sedimentary rocks observed on Viti Levu seem to imply a nucleus of land of considerable age. Hot springs occur on Viti Levu, on Ngau, at Wainunu and Savu-Savu on Vanua Levu; the last have a temperature of 200°-210° F., and cover an area of half a square mile. Earthquakes are ovcasionally felt. Volcanic activity in the neighbourhood is further shown by the quantities of pumice-stone drifted on to the south coasts of Kandavu and Viti Levu; malachite, antimony, and graphite, gold in small quantities, and specular iron-sand occur.

Islands.—The islands number about 250, of which perhaps 80 are inhabited. Viti Levu, about 80 by 55 miles, is the largest and most important from its fertility and variety of surface, number of large rivers, and population, —which is about one-third of that of the whole group. Vanua Levu, somewhat smaller, about 100 by 25 miles, and less fertile and populous, has good anchorages along its entire south coast. All the others are much smaller. Taviuni, 25 by 5 miles, with a central ridge 2100 feet high and a lake at the top, is fertile, but exceptionally devoid of harbours, Kandavu, 25 miles long and very narrow, well-timbered, with a good harbour, contains a Wesleyan training institution and model village. Fulanga and Kaibara are well-timbered and frequented by canoe- builders. Totoya, Moala, Ngau, Mbengga, Nairai, Koro, are all valuable islands (the last especially fertile), 15 to 30 miles in circumference. The Wilson or Exploring group consists of seven islands of considerable size, well situated for the resort of vessels, with anchorages safe and easily reached, and supplies abundant. The navigation between the islands is in many places intricate, but the dangers can be much lessened by good surveys, careful pilotage, and increased use of steam. There are good anchor- ages inside the barrier reefs; the best

harbours are those a Suva in Viti Levu, Savu-Savu and Mbua or Sandalwood

ays in Vanua Levu, Galoa Bay in Kandavu, and Levuka,

tp AN DS

Vegetation.—The vegetation is mostly of a tropical Indo-

Malayan character,—thick jungle with great trees covered with creepers and epiphytes. The lee sides of the larger islands, however, have grassy plains suitable for grazing, with scattered trees, chiefly Pandanus, and ferns. The flora has also some Australian and New Zealand affinities (resembling in this respect the New Caledonia and new Hebrides groups), shown especially in these western districts by the Pandanus, by certain acacias, epacrids, Casuarine, and Dammara, and by the peculiar habit of other species. At about 2000 feet the vegetation assumes a more mountain type. iahie the many valuable timber trees are the vesi (Afzelia bijuga); the dilo (Calophyllum Inophyllum), the oil from its seeds being much used in the islands, as in India, in the treatment of rheumatism; the dakua (Dammara Vitiensis) allied to the New Zealand kauri; the vaivai (Serianthes Vitiensis), the Casuarma, and others, chiefly conifers, Guttiferee, Myrtacez, and Leguminose. Most of the fruit trees are also valuable as timber. The native cloth (masi) is beaten out from the bark of the paper mulberry (Broussonetia papyrifera), cultivated for the purpose. Several useful fibres are supplied by plants of the Musaceze, Bromelideze, Thymelez, and other orders. Of the palms the cocoa-nut is by far the most important. Dr Seemann discovered a sago-palm known to the uatives by the name of sogu, though they were then ignorant of its use. The yasi or sandalwood is now rarely found, and only in a small district at the western extremity of Vanua Levu. There are various useful drugs, spices, and per- fumes ; and many plants are cultivated for their beauty, to which the natives are keenly alive. Among the plants used as pot-herbs are several ferns, and two or three Solanums, one of which, S. anthropophagorum, allied to our S. nigrum, was one of certain plants always cooked with human flesh, which is said to be otherwise difficult of digestion. The use of the kava root, here called yanggona (facropiper methysticum), from which the well-known national bever- age is made, was introduced, it is said, from Tonga.

Of fruit-trees, besides the cocoa-nut, we can only mention the many varieties of the bread-fruit, of bananas and plantains, of sugar-cane and of Citrus; the wi (Spondias dulcis), the kavika (Hugenia malaccensis), the ivl or Tahitian chestnut (Jnocarpus edulis), the pine-apple, and others recently introduced. Edible roots are especially abundant. The chief staple of life is the yam, the names of several months in the calendar having reference to 11s cultivation and ripening, The Dioscorea alata is the variety chiefly planted ; its roots are sometimes 8 feet long and 100 Ib in weight. The kawai (D. aculeata) is also a vely fine esculent, and there are several wild species. The yaka, which also grows wild, is a papilionaceous creeper (Pachyrhizus angulatus), with roots 6 to 8 feet long and as thick as a man's thigh; it is also much valued for its fibre. The taro or dalo (Colocasia esculenta) is grown in ditches, by streams, or on irrigated ground; and there are other aroideous plants growing wild, with huge edible corms. The natives use no grain or pulse, but make a kind of bread (mandrai) from the above roots, as well as from the banana (which is the best), the bread-fruit, the ivi, the kavika, the arrow-root (Zacca pinnatifida aud T'. sativa), and in times of scarcity the mangrove. This bread is made by burying the materials for months, till the mass is thoroughly fermented and homogeneous, when it is dug up and cooked by baking or steaming. Thissimple process, applicable to such a variety of substances, is a valuable security against famine.

The islands are well suited to sugar, maize, coffee, cotton (which here becomes a perennial several feet high), tobacco manilla, india-rubber, &c.

Fig i

Animals.—Besides the dog and the pig, which (with the domestic fowl) must have been introduced into the Pacific islands in very early ages, the only land Mammalia are a rat and five species of bats. Insects are numerous, but the species few. Of zl species of land birds, iu 7, Mr Wallace says, are characteristic of the Australian region, 9 peculiarly Polynesian, and 15 belong to wide-spread genera. Birds of prey are few; the parrot and pigeon tribes are better represented ; of 15 aquatic species only one is peculiar. Fishes, of an Indo-Malay type, are numerous and varied ; Mollusca, especially marine, and Crustaceze are also very numerous. These three form an important element in the food supply.

Ezxports—Numbers of cocoa-nuts have been planted, and the export of copra (the dried kernel of the nut) is rapidly increasing. The chief exports in 1876 were—copra £41,900, sugar £9036, maize £8465,—which are all on the increase; cotton £11,922, and béche-de-mer £2491, which have decreased ; coir £2727, pearl-shell, and arrow- root. The value of exports from Levuka was £80,890, of imports £112,806. The customs returns were estimated at £15,000; the native land revenue was assessed at £22,000. The revenue of 1878 is estimated at £60,000.

People.—The Fijian character was till lately proverbial for every savage abomination. Cannibalism, if fenced round at one time by religious sanctions, had degenerated to a morbid craving recklessly indulged whenever possible. Shipwrecked or helpless strangers were nearly always killed and eaten. Widows were strangled at the death of their husbands, slaves killed at the death of their masters; victims were slain in numbers at the building of a house or of a canoe, or at the visits of embassies from other tribes. The lives of individuals were always subject to the caprices of the chiefs. In the atmosphere of suspicion and treachery thus engendered few virtues could be devel- oped. Yet the people were always hospitable, open-handed, und remarkably polite. tion the practice of killing their sick or aged relations. They are sensitive, proud, vindictive, boastful, cleanly in their houses, cookery, &c., with good conversational and reasoning powers, much sense of humour, tact, and per- ception of character. Their code of social etiquette is minute and elaborate, and the gradations of rank well-marked, These are—l, chiefs, greater and lesser; 2, priests ; 3, Mata ni Vanua (lit., eyes of the land), em- ployés, messengers, or counsellors ; 4, distinguished war- nors of low birth ; 5, common people ; 6, slaves,

Political Institutions.—The family is the unit of political society. The families are grouped in townships or otherwise (galt) under the lesser chiefs, who again owe allegiance to the Supreme chief of the matanitu or tribe. The chiefs are a real aristocracy, excelling the people in physique, skill, intellect, and acquirements of all sorts; and the reverence felt for them, now gradually diminishing, was very great, and had soinething of a religious character. All thata man had belonged to his chief. On the other hand, the chief’s pro- Perty practically belonged to his people, and they were as ready to giveastotake. In atime of famine, a chief would declare the

contents of the plantations to be common pro- perty. A system of feudal service-tenures (lala) is the in- stitution on which their social and political fabric mainly cee It allowed the chief to call for the labour of any

istrict, and to employ it in planting, house or canoe building, supplying food on the occasion of another chief’s visit, &c.,

‘$ power was often used with much discernment ; thus an unpopular chief would redeem his character by calling for el customary service and rewarding it liberally, or a

istrict would be called on to supply labour or produce as a ee i The privilege might of course be abused by Pe’y or unscrupulous chiefs, though they generally

iso>EANDS

They themselves attribute to affec-

deferred somewhat to public opinion; it has now, with similar customary exactions of cloth, mats, salt, pottery, &c., been reduced within definite limits. An allied custom, solevu, enabled a district in want of any particular article to call on its neighbours to supply it, giving labour or some- thing else in exchange. Although, then, the chief is lord of the svil, the inferior chiefs and individual families have equally distinct rights in it, subject to payment of certain dues; and the idea of permanent alienation of land by pur- chase was never perhaps clearly realized.!_ Another curious custom was that of vasu (lit., nephew), The son of a chief by a woman of rank had almost unlimited rights over the property of his mother’s family, or of her people.

War.—In time of war the chief claimed absolute control over life and property. Warfare was carried on with many courteous formalities, and considerable skill was shown in the fortifications. There were well-defined degrees of de- pendence among the different tribes or districts : the first of these, datz, is an alliance between two nearly equal tribes, but implying a

sort of inferiority on one side, acknowledged by military service ; the second, gali, implies greater sub- jection, and payment of tribute. Thus A, being bati to B, might hold C in qali, in which case C was also reckoned subject to B, or might be protected by B for political purposes,

Religion.—The people are now almost all Christians. Their former creed, which had much in common with the Polynesian, included a belief in a future existence, and in two classes of gods,—the first immortal, of whom N dengei is the greatest, said to exist eternally in the form of a serpent, but troubling himself little with human or other affairs, and the others had usually only a local recognition. The second rank (who, though far above mortals, are sub- ject to their passions, and even to death) comprised the spirits of chiefs, heroes, and other ancestors. The gods en- tered and spoke through their priests, who thus pronounced on the issue of every enterprise, but they were not repre- sented by idols; certain groves and trees were held sacred, and stones which suggest phallic associations. The priest- hood usually was hereditary, and their influence great, and they had generally a good understanding with the chief. The institution of Tabu existed in full force. The mburé or temple was also the council chamber and place of asserm- blage for various purposes.

Customs.—They have various games and amusements, dancing, story-telling, and songs being especially popular. Their poetry has well-defined metres, and a sort of rhyme. Their music is rude, and is said to be always in the major key. The excellence of their pottery favours a good and varied cuisine, and they have great and elaborate feasts ; the preparations are sometimes made months in advance, and enormous waste results from them. Mourning is ex- pressed by fasting, by shaving the head and face, or by cutting off the little finger. This last is sometimes done at the death of a rich man in the hope that his family will reward the compliment ; sometimes it is done vicariously, as when the chief cuts off the little finger of his dependants in regret or in atonement for the death of another. Only the women are tatooed.?

Houses.—The houses, of which the framework is timber and the rest lattice and thatch, are ingeniously constructed, with great taste in ornamentation,

and are well furnished with mats, musquito-curtains, baskets, fans, nets, and cook- ing and other utensils.

Population.—The population forty years ago was about

? Of the 4} million acres in Fiji, 854,956 acres, comprising all the best land, were purchased by whites before the annexation; but all the titles have not yet (1878) been confirmed.

? It will be understood that in the present state of transition some of the curious polity and customs here recorded are becoming obsolete:

200,000, it has since rapidly diminished, owing at first to the evils above described (aggravated probably by con- tact with the vicious European element), and afterwards to that fatal languor which so often accompanies the introduction of civilization, the deaths now outnumbering the births. Before the annexation to Britain (1874) there were about 140,000, but 40,000 fell victims to measles soon after. This diminution might perhaps be combated by the encouragement of their old athletic sports under an enlightened Christianity. The exact ethnological posi- tion of the people is a problem. They occupy the extreme east limits of Papuan territory, but far surpass the pure examples of that race, combining their dark colour, harsh hirsute skin, crisp hair,) and muscular limbs with the handsome features of the brown Polynesian race. They are tall and well-proportioned, the average physical development being much higher than our own. The features are strongly marked, but not unpleasant, the eyes deep set, the beard thick and bushy. The chiefs are fairer, much better looking, and of a less negroid cast of face than the people. This negroid type is especially marked on the west coasts, and still more in the interior of Viti Levu. Many other characteristics of both races are found,—e.g., the quick intellect of the fairer, and the savagery and suspicion of the dark ; they wear a mini- mum of covering, but, unlike the Melanesians, are strictly decent, while they are more moral than the Polynesians. A partial circumcision is practised, which is exceptional with the Melanesians, nor have these usually an elabo- rate political and social system like that of Fiji. The status of the women is also somewhat better,—those of tbe upper class having considerable freedom

and influence. Till taught by the Tongans they were, like other Melanesians, timid sailors. The prevalence of one language (though in several dialects) contrasts with the endless variety among the Melanesians. It is copious, flexible, vigorous,—fundamentally Melanesian, but largely modified in vocabulary and even in structure by the Polynesian. It has been argued from, among other considerations, the number of places with Tongan names, and from certain old Tongan traditions, that the ancestors of that people, in their migration from the west, were, after remaining a long tirae in Fiji, finally expelled thence by the aboriginal and darker race. Fijian traditions, however, point to no such movement, only asserting the greater unity of the race in former times, and placing even the creation of man, the scene of the deluge, and of the building of a tower of Babel, on Fijian soil. At all events the Fijian is a well-established race, and the fusion of the elements which produced it cer- tainly dates from a reimote past.

If less readily amenable to civilizing influences than their neighbours to the eastward, they show greater force of character and ingenuity. Possessing the arts of both races they practise them with greater skill than either. They understand the principle of division of labour and production, and thus of commerce. They are skilful culti- vators, and good boat-builders, the carpenters being an here- ditary caste ; there are also tribes of fishermen and sailors; their mats, baskets, nets, cordage, and other fabrics are substantial and tasteful; their pottery, made—like much of the above—by women, is far superior to any other in the South Seas, but, with many other native manufactures, is being supplanted by European articles.

% ot few islands in the N.E. of the group were first seen y jJasman in 16438. The southernmost of the group, Turtle

Island, was discovered by Cook in 1773. Bligh visi i ¢ 1 J A visited them in 1789, and Captain Wilson of the SSD ution in 1797. In 1827

1 The elaborate mop i i iri i i , A Pp into which the hair is trained (as among cer- tain tribes in East Africa and elsewhere) has led to the Geliet that its

peculiar appearance is due to irrecul i i ee eal er ieee cone. gular aggregations of the follicles,

D’Urville in the “‘ Astrolabe ” surveyed them much more accurately but the first thorough survey was that of the United States ex. ploring expedition in 1840.

Up to this time, owing to the evil reputation of the islanders, European intercourse was very limited. About the year 1804 some escaped convicts from Australia and runaway sailors established themselves around the east part of Viti Levu, and by lending their services to the neighbouring chiefs probably led to their pre- ponderance over the rest of the group. Na Ulivau, chief of the small island of Mbau, established before his death in 1829 a sort of supremacy, which was extended by his brother Tanoa, and byTanoa’s son, the well-known Thakombau, aruler of considerable capacity. In his time, however, difficulties thickened. The Tongans, a Polynesian people 250 miles to the S.E. (see Frirnpiy IsLanps), who had long frequented Fiji (especially for canoe-building, their own islands being deficient in timber), now came in larger numbers, led by an able and ambitious chief, Maafu, who, by adroitly taking part in Fijian quarrels, made himself chiefin tle Windward group, threaten- ing’Thakombau’s supremacy. He was harassed, too, by an arbitrary demand for £9000 from the American Government, for alleged in- juries to their consul. Several chiefs who disputed his authority were crushed by the aid of King George of Tonga, who (1855) had opportunely arrived on a visit; but he afterwards, taking some offence, demanded £12,000 for his services. At last Thakomban, disappointed in the hope that his acceptance (1854) of Christianity would improve his position, offered (1858) the sovereignty to England, with the fee simple of 100,000 acres, on condition of her paying the American claims. Colonel Smythe, R.A., was sent out to report on the question, and decided against annexation, but advised that the British consul should be invested with full magisterial powers over his countrymen, a step which would have averted much subsequent difficulty.

Meanwhile Dr Seemann’s favourable report on the capabilities of the islands, followed by a time of depression in Australia and New Zealand, led to a rapid increase of settlers—from 200 in 1860 to 1800 in 1869. This produced fresh complications, and an increasing dcsire among the

respectable settlers for a competent civil and criminal jurisdiction. Attempts were made at sclf-government, and the sovereignty was again offered, conditionally, to England, and to the United States. Finally, in 1871, a ‘‘ constitutional government” was formed by certain Englishmen under King Thakombau ; but this, after incurring heavy debt, and promoting the welfare of neither whites nor natives, came after three years to a dead lock, and the British Government felt obliged, in the interest of all parties, to accept the unconditional cession now offered. 1t had besides long been thought desirable to possess a station on the route between Australia and Panama ; it was also felt that the Polynesian labour traffic, the abuses in which had caused much indignation, could only be effectually regulated from a point so contiguous to the recruiting field, and where that labour was extensively employed. To this end the governor of Fiji is also ‘‘ High Commissioner for the Western Pacific.” Native laws, customs, and polity have been tenderly handled, and utilized, as far as possible, under the new rule. The chiefs are held responsible for good order, and for payment of the revenue. Certain higher chiefs, called ‘‘ Roko Tuis, ’ receive salaries, with executive and magisterial powers, assisted in the latter function bya large number of native subordinates, “‘ Bulis,” all under the eye of avery few European stipendiary magistrates. The employ- ment of native labour is under strict regulations. The revenue is raised in conformity with native ideas, each district being assessed yearly to furnish certain supplies in kind, which are disposed of by tender. The white settlers at the end of 1876 numbered 1569.

The labours of the Wesleyan missionaries must always have a pto- minent place in any history of Fiji. They came from Tonga m 1835, and naturally settled first in the Windward Islands, where the Tongan element, already familiar to them, preponderated. They perhaps identified themselves too closely with their Tongan friends, whose dissolute, lawless, tyrannical conduct led to much mischief ; but it should not be forgotten that their position was a difficult one ; their services to humanity were certainly great, and it was mainly through their efforts that the heathen abominations 50 recently in full vigour have become a thing of the past. ,

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FILANGIERI, Canto (1783-1867), an Italian general, son of the economist Gaetano Filangieri, was born at Naples in 1783, not long before his father's death. In 1799 he came to France, and, through the influence of the first

consul, was admitted to the prytanée, then the training school for young officers, where he remained for the usual period of two years. Entering the French army, he was promoted to the rank of captain on the field of Austerlitz. He afterwards connected himself with the Neapolitan army, which he accompanied to Spain (1808), where he distinguished himself by a brilliant, though not always considerate, valour. He fought many duels, one with General Franceschi, whom he killed. In 1815 he was created general by Murat, and decorated with the order of the Deux-Siciles, after being severely wounded by the Austrians while reconnoitring on the Tanaro. On the restoration of the Bourbons to the throne of Naples, Filangieri opposed the constitution vf 1820, and showed himself a most decided partisan of absolute power. He, however, incurred the displeasure of Ferdinand I.; but on the accession of Ferdinand II,, he was placed at the head of the artillery and engineers. In 18438 he powerfully helped to check the revolutionary movement, by taking Messina after a terrible bombardment which lasted four days; and six months after, when the armistice imposed by England and France expired, he completed the sub- mission of Sicily, of which he was appointed governor- general with dictatorial powers. As a reward for his ser- vices he received the title of duke of Taormina. He died in 1867.

FILANGIERI, Garrano (1752-1788), au eminent Italian publicist, was born at Naples on the 18th of August 1752. He was the third son of Cesar prince of Arianiello, and through his mother he was connected with the ducal house of Fragnito. Gaetano was from his infancy destined for the profession of arms ; when only seven years of age he received a military appointment, and at fourteen he began actual service. His early years gave no promise cf

future distinction ; he seems originally to have manifested a positive dislike for the classics, while his interest in the exact sciences, it is said, was first awakened at a compara- tively mature age by a trivial circumstance. His brother's tutor had made a mistake in the solution of a mathematical problem; Gaetano had been acute enough to discover and rectify the error. From that day his great intellectual powers began to develop rapidly, and such was his diligence that, at twenty years of age, besides being well grounded in mathematical science, he had acquired a competent know- ledge of Latin and Greck, of ancient and modern history, as well as of the principles of law, and, moreover, had composed a couple of essays, one on '* Educational Reform " and another on the "Morals of Princes." Meanwhile he had quitted the military service, and, yielding to the wishes of his friends rather than to his own inclinations, had entered on the profession of the law. At the bar his knowledge and eloquence soon secured his success, and special circumstances still further helped his advancement. In the year 1774 King Charles III. of Naples, at the — of his minister Tanucci, had issued a much-needed

i lustice. Although this reform had been generally welcomed, et ean the murmurs of the bar. Filangieri now i = t ge of the court, and published a defence of | € royal decree founded npon the most enlarged views (a and equity. The extensive knowledge and matured ju gment displayed in this performance called forth the ian commendation of Tanucci, who encouraged its author aa Course in which he had already acquired So wai _ — Through this influence and that of his oe * archbishop of Palermo he received, in 1777, fe nourable appointments at court; but his residence

neither broke in upon his regular habits of life, nor

Interrupted the course of his studies ; nor did he allow it to interfere with

Scienza della Legislazione, on which he was engaged, and to which, rather than to practice at the bar, he had all along been devoting his chief attention. 'The first and second books, containing respectively an exposition of the rules on which legislation in general ought to proceed, anda discus- sion of political and economic laws in particular, appeared at Naples, 1780. Its

success was great and immediate. Not only in Italy, but throughout Europe at large, the author forthwith took rank with the most celebrated publicists, — with his own countrymen Gravina, Vico, and Beccaria, and with the illustrious Montesquieu. Although in the course of his observations he had found it necessary to puint out many faults committed by hisown Government, so skilfully had he discharged the delicate task of stating obnoxious truths without giving offence to those in power that he was promoted by the king to a commandery in the royal order of Constantine, In 1783 he was married to Caroline von Frendel, an Hungarian lady ; and in order that he might the more fully enjoy domestic happiness, and at the same time have leisure for the composition of his work, on which he became every day more intent, he, with the consent of the king, resigned all his military appointments and _ his offices at court, and retired to a country seat at Cava, some twenty miles from Naples. In the same year he published the third book of his Scienza, relating entirely to the principles of criminal jurisprudence. Even his earlier volumes had not failed to rouse the antipathies of an in-

| terested and influential class; but in this certain sugges-

tions which he had made as to the need for reform in the Roman Catholic Church called forth the censure of the ecclesiastical tribunals, and his book was condemned by the congregation of the Index in 1784. In the following year he nevertheless published three additional volumes, dealing with education and morals, these forming the fourth book of his great work. He was proceeding with the preparation of the remaiming three books, but his health was now considerably impaired, owing to an excess of application, so that composition advanced but slowly; and other interruptions soon followed. In 1787 the new king, Ferdinand [V., summoned him to Naples to assist in the council of finance; and there for a time he was wholly engrossed with this important public business. But severe domestic misfortunes, combined with over-work, soon com- pelled his withdrawal from office once more, He had just finished the first part of his fifth book, in which he treats of the different systems of religion which preceded Christianity, when he died on the 21st of July 1788. Of the second part of the same book he had only made a rude sketch, in which were noted down the principal subjects

_of discussion,—such as the advantages of Christianity, and

nance for the reform of abuses in the administration of |

the composition of the great work, Za |

the dangers of superstition; the inconveniences of not distinguishing the spiritual from the temporal power; the evils of an ignorant, venal, excessively wealthy clergy. He was then to have considered the principles of ecclesi- astical jurisprudence; and a chapter on toleration was to have completed the book. In the sixth book he proposed to treat of the laws relating to property; and in the seventh and last, of those regarding the patria potestas and the government of families. [t is much to be regretted that the author was not spared to complete his great work. Though unfinished, it has exercised considerable influence on the thought and feeling of Europe, particularly in Italy, where, at the time of its publication, the feudal system of legislation was still in full force. In some por- tions, particularly in the chapters on criminal law, it is not even now out of date. Filangieri had also other important works in contemplation when he died. One, of which he had written a short fragment, was to have been entitled Nuova Scienza delle Scienze; another was to have con- tained a system of universal history.

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His great work, La Sctenza della Legislazione, has gone through many editions, and has been translated into most of the languages of Europe. The best Italian edition is perhaps that of Livorno, in 5 vols. 8vo (1807). The Milan edition (1822) contains the Opus- culi scelté and a life by Donato Tommasi. A French translation, by Gallois, appeared in Paris in 7 vols. 8vo (1786-98) ; it was repub- lished in 1822-24, with the addition of the Opuscules and notes by Benjamin Constant. The Science of Legislation was translated into English by Sir R. Clayton (London, 1806).

FILBERT. See Haze.

FILE, a bar of steel having sharp teeth on its surface, and used for abrading or smoothing hard substances. Some uncivilized tribes polish their weapons with such things as rough stones, pieces of shark skin, or fishes' teeth. The operation of filing is recorded in 1 Sam. xii. 21; and, among other facts, the similarity of the name for the filing instrument among various European peoples points to an early practice of the art. A file differs from a rasp (which is chiefly used for working wood, horn, and the like) in having its teeth cut with a chisel whose straight edge extends across its surface, while the teeth of the rasp are formed by solitary indentations of a pointed chisel, According to the form of their teeth, files may be sengle-cut or double-cut ; the former have only one set of parallel ridges (either at right angles or at some other angle with the length); the latter (and more common) have a second set cut at an angle with the first, The double-cut file pre- sents sharp angles to the filed surface, and is better suited for hard metals. Files are also classed according to fine- ness of teeth, being known (in order of increasing fineness) as rough, bastard, second-cut, smooth, and superfine or dead smooth. The shapes of files present almost endless varie- ties. Common forms are—the flat file, of parallelogram section, with uniform breadth and thickness, or tapering, or "bellied"; the four-square file, of square section, some- times with one side "safe," or left smooth; the so-called three-square file, having its cross section an equilateral triangle, the half-rownd file, a segment of a circle, the round or rat-tail file, a circle; these are generally tapered. The float file is like the flat, but single-cut. 'There are many others. Files vary in length from three-quarters of an inch (watchmakers') to two or three feet and upwards (engineers'), The length is reckoned exclusively of the spike or tang which enters the handle. Most files are tapered; the blunt are nearly parallel, with larger section near the middle; a few are parallel. The riflers of sculptors and a few other files are curvilinear in their central line.

Cast-steel is the material chiefly used for files, though the larger and rougher varieties are sometimes made from blister-steel. In manufacture, the blanks are forged from bars that have been tilted or rolled as nearly as possible to the sections required. They are then annealed with great care, and when sufficiently softened are taken out, straight- ened, if necessary, with hand hammers, and then rendered clean and accurate in form by filing or grinding. They are now ready for cutting. In this process, as performed

by hand, the cutter sits before a square stake or anvil, on which the blank, slightly greased, is held (having its tang towards him) by means of two leather straps passed round its ends, and held fast below, one by each foot. He holds in his left hand a short chisel (the edge of which always exceeds the width of the file), placing it on the blank with a slight inclination from him, and beginning near the further end. He strikes the chisel sharply with a hammer, an indentation is thus made, and the steel, slightly thrown up on the side next the tang, forms a ridge. The chisel is then transferred to the uncut surface, and slid from the operator till it reaches the ridge just made ; thus the posi- tion of the next cut is determined ; the chisel is again struck, and so on. (The end part of the file is dealt with

separately.) The workman seeks to give his blows as j

uniformly as possible. Sixty to eighty cuts are made in oue minute. After finishing the first cowrse of cuts, he proceeds, if the file is to be double-cut, to make the second course, the cuts of the latter being generally somewhat finer. Thus the surface is covered with teeth inclined towards the point of the file. If the file is flat and is to be cut on the other side, it is turned over, and a thin plate of pewter placed below it to protect the teeth. Triangular and other files are supported in grooves in lead. In cutting round and half-round files, a straight chisel is applied as tangent to the curve. The round face of a half-round file requires eight, ten, or more courses to complete it.

The file is next hardened. Being first covered with a paste to protect the teeth from the direct action of fire, &e, (e.g., passed through beer-grounds to make it sticky, then through a mixture of common salt with roasted and pounded cow’s hoof), it is heated to an even red heat, and then suddenly cooled by plunging in cold water or brine. It is removed before cooling throughout, that it may be straightened if necessary (which is done by pressure), Then it is cooled in oil, The tang is next submitted to a soften- ing process, and the file, after being wiped, and the teeth brushed clean, is ready for fixing into the handle and for use.

In England files are chiefly made in Sheffield and Warrington, those of the latter place being generally known as Lancashire files. It is remarkable that

while many other operations that appear more difficult than file-cut- ting are now effected by machinery, and while numerous file-cutting machines have been invented, the work con- tinues (in England) to be largely done by hand. This is perhaps partly due to strong opposition on the part of operatives to introduction of machinery, and also to @ foolish prejudice in favour of hand-cut files (inachine-cut files, indeed, are not unfrequently sold as hand-cut), but probably also to the problem of cutting files by machinery being really somewhat difficult. In most of the machines invented for that purpose, the idea has been to construct au iron arm and hand to hold the chisel, and a hammer to strike the blow, and so to imitate, as closely as possible, the manual process. Bernot's machine is an improvement on this. In it the blow is given by pressure of a flat steel spring pressing on the top of a vertical slide, at the lower end of which the chisel is firmly fixed, The slide is acted on by a cam making about one thousand revolutions a minute, and the chisel consequently strikes that number of blows per minute, The vibration is thus lessened. The history of filemaking by machinery in America (where it has been extensively practised) seems to indicate that much of the failure experienced has been due to the fatal defect in the machinery used, of producing extreme regu- larity in the teeth. This gives rise to complaints by artisans about files "running in grooves," " chattering," &c. The grooves produced by the file (if double-cut especially) at the beginning of its movement are deepened as it is moved further. With irregular teeth, on the other hand, such as are found in all hand-made files, the grooves made in the first instance have their sides cut away as the file is advanced. The Nicholson File Company, in Provi- dence, Rhode Island, have used, with large and increasing success, a machine which imitates, to some extent, this irregular result of the hand process, cutting the file so that no two spaces are found exactly alike in the entire length.

The filing of a flat surface perfectly true is the test of a good filer ; and this isno easy matter to the beginner. The piece to be operated upon is generally fixed about the level of the elbow, the operator standing, and, except in the case of small files, grasping the file with both hands, the handle with the right, the further end with the left. The great point is to be able to move the file forward with pressure 1m horizontal straight lines ; from the tendency of the hands to

move in arcs of circles, the heel and point of the file are apt to be alternately raised. This is partially compensated by the bellied form given to many files (which also counter- acts the frequent warping effect of the hardening process, by which one side of a flat file may be rendered concave and useless). In bringing back the file for the next thrust it is nearly lifted off the work. Further, much delicacy aud skill are required in adapting the pressure and velocity, ascertaining if foreign matters or filings remain interposed between the file and the work, &c. Files can be cleaned with a peace of the so-called cotton-card (used in combing cotton wool) nailed to a piece of wood. In draw-filing, which is sometimes resorted to to give a neat finish, the file is drawn sideways to and fro over the work. New files are generally used for a time on brass or cast-iron, and when partially worn they are still available for filing wrought iron and steel.

An interesting application of the sandblast to sharpen- ing the teeth of files has recently been made by M. Tilghmann. (A. B. M.)

FILE-FISH and Triccur-Frsx are names given to fishes of the genus Balistes (and Monacanthus) inhabiting all tropical and subtropical seas. Their body is compressed and not covered with ordinary scales, but with small juxta-posed scutes. Their other principal characteristics consist in the structure of their first dorsal fin (which consists of three spines) and in their peculiar dentition. The first of the three dorsal spines is very strong, roughened in front like a file, and hollowed out behind to receive the second much smaller spine, which, besides, has a projection in front, at its base, fitting into a notch of the first. Thus these two spines can only be raised or depressed simul- taneously, in such a manner that the first cannot be forced down unless the second has been previously depressed. The latter has been compared to a trigger, hence the name of Triggerjish. Also the generic name Balistes and the

Balistes vidua.

Italian name of “Pesce balistra” refer to this structure. Both jaws are armed with eight strong incisor-like and sometimes pointed teeth, by which these fishes are enabled, not only to break off pieces of madrepores and other

corals on which they feed, but also to chisel a hole into the hard shells of Mollusca, in order to extract the soft parts. In this way they destroy an immense number of mollusks, and become most injurious to the pearl-fisheries, The gradual failure of those fisheries in Ceylon has been ascribed to this cause, although evidently other agencies must have been at work at the same time. The Monacanthi are dis- tinguished from the Balistes in having only one dorsal “pine and a velvety covering of the skin. Some 30 different species are known of Balistes, and about 50 of Monacanthus, Two species (B. maculatus and capriscus), — in the Atlantic, sometimes wander to the British

asts,

FILELFO, FRANCESCO (1898-1481), was born in 1398 at Tolentino, in the March of Ancona. When he appeared

upon the scene of human life, Petrarch and the students of Florence had already brought the first act in the recovery of classic culture to conclusion. They had created an eager appetite for the antique, had disinterred many important Roman authors, and had freed Latin scholarship to some extent from the barbarism of the Middle Ages. Filelfo was destined to carry on their work in the field of Latin literature, and to be an important agent in the still unac- complished recovery of Greek culture. His earliest studies in grammar, rhetoric, and the Latin language were con- ducted at Padua, where he acquired so great a reputa- tion for learning that in 1417 he was invited to teach eloquence and moral philosophy at Venice. According to the custom of that age in Italy, it now became his duty to explain the language, and to illustrate the beauties of the principal Latin authors, Cicero and Virgil being considered the chief masters of moral science and of elegant diction. Filelfo made his mark at once in Venice, He was admitted to the society of the first scholars and the most eminent nobles of that city ; and in 1419 he received an appoint- ment from the state, which enabled him to reside as secretary to the consul-general of the Venetians in Con- stantinople. This appointment was not only honourable to Filelfo as a man of trust and general ability, but it also gave him the opportunity of acquiring the most coveted of all possessions at that moment for a scholar—a know-

ledge of the Greek language. Immediately after his arrival in Constantinople, Filelfo placed himself under the tuition of John Chrysoloras, whose name was already well known in Italy as brother of Manuel, the first Greek to profess the literature of his ancestors in Florence. At the recom- mendation of Chrysoloras he was employed in several diplomatic missions by the emperor John Palzologus. Before very long the friendship between Filelfo and his tutor was cemented by the marriage of the former to Theodora, the daughter of John Chrysoloras. He had now acquired a thorough knowledge of the Greek language, and had formed a large collection of Greek manuscripts. There was no reason why he should not return to his native country. Accordingly, in 1427 he accepted an invitation from the republic of Venice, and set gail for Italy, intending to resume his professorial career. From this time forward until the date of his death, Filelfo's history consists of a record of the various towns in which he lectured, the masters whom he served, the books he wrote, the authors he illustrated, the friendships he con- tracted, and the wars he waged with rival scholars. ' He was a man of vast physical energy, of inexhaustible mental activity, of quick passions, and violent appetites ; vain, restless, greedy of gold and pleasure and fame; unable to stay quiet in one place, and perpetually engaged in quarrels with his conzpeers.

When Filelfo arrived at Venice with his family in 1427, he found that the city had almost been emptied by the plague, and that his scholars would be few. He therefore removed to Bologna ; but here also he was met with draw- backs. The city was too much disturbed with political dis- sensions to attend to him ; so Filelfo crossed the Apennines and settled in Florence. At Florence began one of the nost brilliant and eventful periods of his life. During the week he lectured to large audiences of young and old on the principal Greek and Latin authors, and on Sundays he explained Dante to the people inthe Duomo. In addi- tion to these labours of the chair, he found time to trans- late portions of Aristotle, Plutarch, Xenophon, and Lysias from the Greek. Nor was he dead to the claims of society. At first he seems to have lived with the Florentine scholars on tolerably good terms; but his temper was so arrogant that Cosimo de' Medici's friends were not long able to put up with him. Filelfo hereupon broke out into open and: IX, — a1

violent animosity; and when Cosimo was exiled by the Albizzi party in 1433, he urged the signoria of Florence to pronounce upon him the sentence of death. On the return of Cosimo to Florence, Filelfo's position in that city was no longer tenable. His life, he asserted, had been already once attempted by a cut-throat in the pay of the Medici ; and now he readily accepted an invitation from the state of Siena. In Siena, however, he was not destined to remain more than four years. His fame as a professor had grown great in Italy, and he daily received tempting offers from princes and republics. The most alluring of these, made him by the duke of Milan, Filippo Maria Visconti, he decided on accepting ; and in 1440 he was received with honour by his new master in the capital of Lombardy.

Filelfo's life at Milan curiously illustrates the multifarious importance of the scholars of that age in Italy. It was his duty to celebrate his princely patrons in panegyrics and epics, to abuse their enemies in libels and invectives, to salute. them with encomiastic odes on their birthdays, and to com- pose poems on their favourite themes. For their courtiers he wrote epithalamial and funeral orations ; ambassadors and visitors from foreign states he greeted with the rhetorical lucubrations then so much in vogue. The students of the university he taught in daily lectures, passing in review the weightiest and lightest authors of antiquity, and pouring forth a flood of miscellaneous erudition. Not satisfied with these outlets for his mental energy, Filelfo went on translating from the Greek, and prosecuted a paper warfare with his enemies in Florence. He wrote, moreover, politi- cal pamphlets on the great events of Italian history ; and when Constantinople was taken by the Turks, he procured the liberation of his wife's mother by a message addressed in his own name to the sultan. In addition to a fixed stipend of some 700 golden florins yearly, he was continu- ally in receipt of special payments for the orations and. poems he produced; so that, had he been a man of frugal liabits or of moderate economy, he might have amassed a considerable fortune. As it was, he spent his money as fast as he received it, living in a style of splendour ill befitting a simple scholar, and indulging his taste for pleasure in more than questionable amusements. In con- sequence of this prodigality, he was always poor. His letters and his poems abound in impudent demands for money from patrons, some of them couched in language of the lowest adulation, and others savouring of literary brigandage.

During the second year of his Milanese residence Filelfo lost bis first wife, Theodora. He soon married again ; and this time he chose for his bride a young lady of good Lombard family, called Orsina Osnaga. When she died, he took in wedlock for the third time a woman of Lombard birth, Laura Magiolini. To all his three wives, in spite of numerous infidelities, he seems to have been warmly attached; and this is perhaps the best trait in a character otherwise more remarkable for arrogance and heat than for any amiable qualities.

- On the death of Filippo Maria Visconti, Filelfo, after a short hesitation, transferred his allegiance to Francesco Sforza, the new duke of Milan; and iu order to curry favour with this parvenu, he began his pouderous epic, the Sforziad, of which 12,800 lines were written, but which was never published. When Francesco Sforza died, Filelfo turned his thoughts towards Rome. He was now an old man of seventy-seven years, honoured with the friendship of princes, recognized as the most distinguished of Italian humanists, courted by pontiffs, and decorated with the laurel aoa and the order of knighthood by kings. Crossing the : oe tered be 2 through Florence, he reached Rome are * of 1475. The terrible Sixtus IV. now

atican ; and from this pope Filelfo had

_good emoluments.

received an invitation to occupy the chair of rhetoric with At first he was vastly pleased with the city aud court of Rome; but his satisfaction ere long turned to discontent, and he gave vent to lis ill humour in a venemous satire on the pope’s treasurer, Milliardo Cicala. Sixtus himself soon fell under the ban of his displeasure ; and when a year had passed, he left Rome never to return. Filelfo reached Milan to find that his wife had died of the plague in his absence, and was already buried. His own death followed speedily. For some time past he had been desirous of displaying his abilities and adding to his fame in Florence. Years had healed the breach between him and the Medicean family ; and on the occasion of the Paza conspiracy against the life of Lorenzo de’ Medici, he had sent violent letters of abuse to his papal patron Sixtus, denouncing his participation in a plot so dangerous to the

security of Italy. Lorenzo now invited him to profess Greek at Florence, and thither Filelfo journeyed in 1481. But two weeks after his arrival he succumbed to dysentery, and was buried at the age of eighty-three in the church ot the Annunziata. ;

Filelfo deserves commemoration among the greatest humanists of the Italian Renaissance, not for the beauty of his style, not for the elevation of his genius, not for the accuracy of his learning, but for his energy, and for his complete adaptation to the times in which he lived. His erudition was large but ill-digested ; his knowledge of the ancient authors, if extensive, was superficial ; his style was vulgar; he had no brilliancy of imagination, no pungency of epigram, no grandeur of rhetoric. Therefore he has leit nothing to posterity which the world would not very willingly let die. But in his own days he did excellent service to learning by his untiring activity, and by the facility with which he used his stores of knowledge. It was an age of accumulation and preparation, when the world was still amassing and cataloguing the fragments rescued from the wrecks of Greece and Rome. Men had to receive the very rudiments of culture before they could appreciate its niceties. And in this work of collection and instruction Filelfo excelled, passing rapidly from place to place, stirring up the zeal for learning by the passion of his own enthusiastic temperament, and acting as a pioneer for men like Poliziano and Erasmus. All that is worth knowing about Filelfo is contained in Rosmini's admirable Vita di Filelfo, Milan, 1808; but the student may also consult Roscoe's Life of Lorenzo de Medici, Vespasiano's Vite dt Vomini Illustri, and Burckhardt's Italian Renarssance, with profit. (J. A. am

FILIBUSTER, a name first given to the buccaneers, 4 band of piratical adventurers who maintained themselves chiefly in the Caribbean seas during the 17th century (see BuccaNzER). The origin of the term has been explained in two ways,—some deriving it from the English word flyboat, French jlibot, Spanish jlrbote, a name given to a small vessel not exceeding 100 tons, which, on account of its sailing qualities, was much used by pirates, while others make it synonymous with the Dutch ory buder, German freibeuter, English freebooter, the word changing first into fribustéer, and then into French flibustier, Spanish filibustero. Flibustier has passed into the French language and filibustero into the Spanish language as

a general namé for a pirate, and the term jilébuster was revived in America to designate those adventurers who, after the termination of the war between Mexico and the United States, organize expeditions within the United States against the Spanish West Indies.

FILICAIA, Vincenzo pa (1642-1707), sprung from an ancient and noble family of Florence, was born in that aly December 30, 1642. From an incidental notice in one 0 his letters, stating the amount of house rent paid during

his childhood, his parents must have been in easy circum- stances, and the supposition is confirmed by the fact that he enjoyed all the advantages of a ltberal education, first under the Jesuits of Florence, and then in the university of Pisa. At Pisa his mind became stored, not only with the results of patient study in various branches of letters, but with the great historical associations linked with the former glory of the Pisan republic, and with one remarkable institution of which Pisa was the seat. To the tourist who now visits Pisa the banners and embleins of the order of St Stephen are mere matter of curiosity, but they had a serious significance two hundred years ago to the young Tuscan, who knew that these naval crusaders formed the main defence of his country and commerce against the Turkish, Algerine, and Tunisian corsairs. After a five years' residetce in Pisa he returned to Florence, where he married Anna, daughter of the senator and marquis Scipione Capponi, and withdrew to a small villa at Figline, uot far from the city. Abjuring the thought of writing amatory poetry in consequence of the premature death of a young lady to whom he had been attached, he occupied himself chiefly with literary pursuits, above all the com- position of Italian and Latin poetry. His own literary eminence, the opportunities enjoyed by him as a member of the celebrated Academy Della Crusca for making known his critical taste and classical knowledge, and the social relations within the reach of a noble Florentine so closely allied with the great house of Capponi, sufficiently explain the intimate terms on which he stood with such eminent men of letters as Magalotti, Menzini, Gori, and Redi. The last-named, the author of Bacchus in Tuscany, was not only one of the most brilliant poets of his time, aud a safe literary adviser ; he was

the court physician, and his court influence was employed with zeal and effect in his friend's favour. Filicaia's rural seclusion was owing even more to his straitened means than to his rural tastes. If he ceased at length to pine in obscurity, the change was owing not merely to the fact that his poetical genius, fired by the deliverance of Vienna from the Turks in 1683, poured forth the right strains at the right time, but also to the influence of Redi, who not only laid Filicaia's verses before his own sovereign, but had them transmitted with the least possible delay to the foreign princes whose noble deeds they sung, The first recompense came, however, not from those princes, but from Christina, the ex-queen of Sweden, who, from her circle of savans and courtiers at Rome, spon- taneously and generously announced to Filicaia her wish to bear the expense of educating his two sons, enhancing her kindness by the delicate request that it should remain a secret. And now the tide of Filicaia's fortunes turned. The grand-duke of Tuscany, Cosmo IIL, conferred on him an important office, the commissionership of official balloting. He was named governor of Volterra in 1696, where he strenuously exerted himself to raise the tone of public morality. Both there and at Pisa, where he was subse- quently governor in 1700, his popularity was so great that on his removal the inhabitants of both cities petitioned for his recall. He passed the close of his life at Florence ; the grand-duke raised him to the rank of senator, and he died in that city on the 24th of September 1707. He was buried in the family vault in the church of St Peter, and a monument was erected to his memory by his sole Surviving son Scipione Filicaia. In the six celebrated odes Inspired by the great victory of Sobieski, Filicaia took a lyrical flight which has placed him at moments on a level with the greatest Italian poets. They are, however, unequal, like all his poetry, reflecting in some passages the native vigour of his genius and purest inspirations of his tastes, whilst in others they are deformed by the allcctations of the Seicentisti, When thoroughly natural

and spontaneous,—as in the two sonnets " Italia, Italia, o tu cui feo la sorte" and " Dov' é, Italia, il tuo braccio? e a che ti serve;" in the verses " Alla beata' Vergine," " Al divino amore ; " in the sonnet " Sulla fede nelle disgrazie "— the truth and beauty of thought and language recall the verse Of Petrarch. Besides the poems published in the complete Venice edition of

1762, several other pieces appeared for the first time in the small Florence edition brought out by Barbera in 1864.

FILIGREE, formerly written filigrain or filigrane (the Italian jiligrana, Fr. filigrane, Span. jiligrana, Germ. Drahigeflecht), jewel work of a delicate kind made with threads and beads usually of gold and silver. The compound word from the Latin jilum, thread, and granum, grain, is not found in Ducange, and is indeed of modern origin. Though filigree has become a special branch of jewel work in modern times it was anciently part of the ordinary work of the jeweller. Signor Castellani states, in his lecture on "Antique Jewellery," that all the jewel- lery of the Etruscans and Greeks was made by soldering together wires and grains or minute plates of gold rather than by hammering or stamping the precious metals in dies,

The art may be said to consist in curling, twisting, and plaiting fine pliable threads of metal, and uniting them at their points of contact with gold or silver solder and borax, by the help of the blow-pipe. Small grains or beads of the same metals are often set in the eyes of volutes, on the junctions, or at intervals at which they will set off the wire work effectively. The more delicate work is generally protected by framework of stouter wire. Brooches, crosses, earrings, and other personal ornaments of modern filigrec are generally surrounded and subdivided by bands of square or flat metal, giving consistency to the fillmg up, which would not otherwise keep its proper shape.

Probably the oldest existing jewel work is that which has been found by Belzoni, Wilkinson, Mariette, and other Egyptian discoverers in the tombs of Thebes 'and other places. Filigree forms an important feature of the ornamentation. Amongst the jewellery now in the British Museum, and in the Louvre in Paris, are examples of the round plaited gold chains of fine wire, such as are still made by the filigree workers of India, and known as Trichinopoly chains. From some of these are hung smaller chains of finer wire with minute fishes and other pendants fastened to them. Most of the rings found in these collections are whipped with gold wire soldered to the hoop. The Greek and Etruscan filigree of about 3000 years ago is of extraordinary fineness and very perfect execution. A number of earrings and other personal ornaments found in Central Italy are preserved in the

Campana collection of the Louvre and: amongst the gems of the British Museum. Almost all of them are made of filigree work. Some ear- rings are in the form of flowers of geometric design, bordered by one or more rims each made up of minute volutes of gold wire, and this kind of ornament is varied by slight differences in the way of disposing the number or arrange- ment of the volutes. But the feathers and petals of modern Italian filigree are not seen in these ancient designs. In many earrings chains hang from the upper part, and tiny birds, such as doves or peacocks covercd with enamel, are set amongst these hanging ornaments. Other Etruscan earrings are short tubes of gold, half or three-quarters of an inch long by half an inch or less in diameter, with a plate of gold attached to the side, and the whole surface covered with filigree soldered on in minute patterns. Many rings reseinble fishes with the tails in their mouths, made up of thin plates of gold and wire work of the same metal. A beautiful collection of antique examples of Greek

jewellery found in the Chersonese and along the coast of Asia Minor was placed, before the Crimean war, in a museum at Kerteh. Many bracelets and necklaces in that collection are made of twisted wire, some in as many as seven rows of plaiting, with clasps in the shape of heads of animals of beaten work. Others are strings of large beads of gold, with grains of gold, or with volutes and knots of wire soldered over the surfaces. (See the Bosphore Cimmerien, in which will be found careful engravings of these objects.) In the British Museum a sceptre, pro- bably that of a Greek priestess, is covered with plaited and netted gold wire, finished with a sort of Corinthian capital and a boss of green glass.

It is probable that in India and various parts of central Asia filigree has been worked from the most remote period without any change in the designs. Whether the Asiatic jewellers were influenced by the Greeks settled on that continent, or merely trained under traditions held in common with them, it is certain that the Indian filigree workers retain the same patterns as those of the ancient Greeks, and work them in the same way, down to the present day. Wandering workmen are given so much gold, coined or rough, which is weighed, heated in a pan of charcoal, beaten into wire, and then worked

in the courtyard or verandah of the employer’s house according to the designs of the artist, who weighs the complete work on restoring it and is paid at a specified rate for his labour. Very fine grains or beads and spines of gold, scarcely thicker than coarse hair, projecting from plates of gold are methods of ornamentation still used. This work requires the utmost delicacy of hand to execute, and is of extra- ordinary richness of effect. Signor Castellani, the modern Cellini of Italy, who has made the antique filigree work of the Etruscans and Greeks his special study, found it for a long time impossible to revive this particular process of delicate soldering ; but the difficulty has been overcome at last.

Passing to later times we may notice in many collec- tions of medieval jewel work (such as that in the South Kensington Museum) reliquaries, covers for tle gospels, &c., made either in Constantinople from the 6th to the 12th centuries, or in monasteries in Europe, in which Byzantine goldsmiths’ work was studied and imitated. These objects, besides being enriched with precious stones, polished, but not cut into facets, and with enamel, are often decorated with filigree. Large surfaces of gold are sometimes covered with scrolls of filigree soldered on; and corner pieces of the borders of book covers, or the panels of reliquaries, are not unfrequently made up of complicated pieces of plaited work alternating with spaces encrusted with enamel. Byzantine filigree work occasionally has small stones set amongst the curves or knots. Examples of such decoration can be seen in the South Kensington and British Museums.

In the north of Europe the Saxons, Britons, and Celts were from an early period skilful in several kinds of gold- smiths’ work. As early as the middle of the 5th century the brooches and other personal ornaments of the “ Littus Saxonicum” in England were encrusted with enamel, often set in bands of pure gold, and the enamel work varied with borders or centres of filigree.

The Irish filigree work is more thoughtful in design and more varied in pattern than that of any period or country that could be named. It reached its highest perfection, according to Dr Petrie, in the 10th and 11th centuries. < pothey Irish Academy in Dublin contains a number of

quaries and personal jewels, of which filigree is the general and most remarkable ornament. The ‘ Tara” eee Leelee imitated, and the shape and

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designs in which one thread can be traced through curious knots and complications, which, disposed over large sur- faces, balance one another, but always with special varieties and arrangements difficult to trace with the eye. The long thread appears and disappears without breach of con- tinuity, the two ends generally worked into the head and the tail of a serpent or a monster. The reliquary contain- ing the “ Bell of St Patrick” is covered with knotted work in many varieties. A two-handled chalice, called the “ Ardagh cup,” found near Limerick a few years since, has belts, bosses at the junctions of the handles, and the whole lining of the foot ornamented with work of this kind of extraordinary fineness. The late Lord Dunraven (Royal Irish Academy Trans., vol. xxiv.) numbers forty varieties of pattern on this cup alone. Some are the Greek fret with Celtic varieties, spiral trumpet-shaped lines, interlaced bands, knots, and arabesques, all in several varieties,

Much of the medizeval jewel work all over Europe down to the 15th century, on reliquaries, crosses, croziers, and other ecclesiastical goldsmiths’ work, is set off with bosses and borders of filigree, Filigree work in silver was prac- tised by the Moors of Spain during the Middle Ages with great skill, and was introduced by them and established all over the Peninsula, where silver filigree jewellery of delicate and artistic design is still made in considerable quantities. The manufacture spread over the Balearic Islands, and among the populatious that border the Mediterranean. Itis still made all over Italy, and in Albania, the Jonian Islands, and many other parts of Greece. That of the Greeks is sometimes on a large scale, with several thicknesses of wires alternating with larger and smaller bosses and beads, sometimes set with torquoises, &c., and mounted on con- vex plates, making rich ornamental headpieces, belts, and breast ornaments. Filigree silver buttons of wire work and small bosses are worn by the peasants in most of the countries that produce this kind of jewellery. Silver filigree

brooches and buttons are also made in Denmark, Norway, and Sweden. Little chains and pendants are added to much of this northern work. Beautiful specimens have been contributed to the various international exhibitions.

Some very curious filigree work was brought from Abyssinia after the capture of Magdala—arm guards, slippers, cups, &c., some of which are now in the South Kensington Museum. They are made of thin plates of silver, over which the wire work is soldered. The filigree is subdivided by narrow borders of simple pattern, and the intervening spaces are made up of many patterns, sole with grains set at intervals.

Great interest has been felt in the revival of the designs of antique jewellery by Signor Castellani, He collected examples of the peasant jewellery still made in many provinces of Italy on traditionary designs preserved from a remote antiquity. Most of the decoration is in filigree of many varieties. It was in part through the help of workmen in remote villages, who retained the use of various kinds of solders, long forgotten elsewhere, that the fine reproductions of antique gold filigree have been 80 beautifully carried into execution in Italy, and by Italian jewellers in London.

For examples of antique work the student should ex- amine the jewel room of the British Museum, the Campana collection in the Louvre in Paris, and the collection in the South Kensington Museum. The last contains a large an very varied assortment of modern Italian, Spanish, Greek, and other jewellery made for the peasants of various countries. The Celtic work is well represented im the Royal Irish Academy in Dublin. (3. HP.

FILIPPINO. See Lipri. :

FILLAN, Sr. The accounts given by various writers of this saint, in so far as they supply any details, are, “4

in many similar cases, purely legendary and conjectural. That such an ecclesiastic existed, that he was of Irish origin, and that he was venerated in Glendochart and Strathfillan in Perthshire as early as the 8th or 9th century,

may be held as certain. ‘There was an ancient monastery in that district dedicated to St Fillan, which, like most of the religious houses of early times, was afterwards secular- ized. The lay-abbot, who was its superior in the reign of William the Lion, held high rank in the Scottish kingdom. This monastery was restored in the reign of Robert Bruce, and became a cell of the abbey of canons- regular at Inchaffray. The new foundation received a grant from King Robert, in gratitude for the aid which he ‘was supposed to have obtained from a relic of the saint on the eve of the great victory of Bannockburn. Another relic was the saint’s staff or crozier, which became known as the coygerach or quigrich, and was long in the posses- sion of a family of the name of Jore or Dewar, who were its hereditary guardians. They certainly had it in their custody in the year 1428, and their right was formally recognized by King James III. in 1487. The head of the crozier, which is of silver-gilt with a smaller crozier of bronze inclosed within it, is now deposited in the National Museum of the Society of Antiquaries of Scotland. It was secured for them through the exertions of Dr Daniel Wilson, author of the Prehistoric Annals of Scotland. This crozier has attracted much attention among Scottish antiquaries, and its history has been minutely investigated.

On the subject of this article reference may be made to Cosmo Innes’s Sketches of Early Scottish History, pp. 389-394, 623-624; Bishop Forbes’s Kalendars of Scottish Saints, p, 341-346; and specially to the Historical Notices of St Fillan’s Crozier, by the late

eminent antiquary Dr John Stuart, who died while this, his latest work, was passing through the press.

FILLMORE, Mittarp (1800-1874), thirteenth presi- dent of the United States of America. His family was of English stock, and had early settled in New England. Tis father, Nathaniel Fillmore, made in 1795 a clearing within the limits of what is now the town of Summer Thll, Cayuga co., New York, and there the future president was born, January 7, 1800. The father went by the title of “the squire,” and served as a justice in the beginnings of the settlements nearest to him, which were very sparsely occupied. Millard, to the age of fourteeu, could have shared only the simplest rudiments of education, chiefly from his parents, with slight help from a school. At that

age he was apprenticed, for the usual term, to a fuller and clothier, to card wool, and to dye and dress the cloth from the farmers' houses. Two years before the close of his term, he, by a promissory note for thirty dollars, bought the remainder of his time from his master, and entered a retired lawyer's office as a student and helper at the age of nineteen. He, of course, re- ceived and accepted the usual honour extended to young men of his proclivities, to deliver the Fourth of July Oration, before he was twenty-one years of age. In 1820 he made his way to Buffalo,—then only the germ of the Present flourishing city,—and supported himself as a student in another law office by teaching a school and aiding the postmaster. In 1823 he was admitted an attorney in the court of common pleas, Erie co., and then took up legal Practice at Aurora, to which his father had removed. Hard study, temperance, and integrity gave him a good re- putation and moderate success, and he was made an attorney and counsellor of the supreme court of the

pe In 1826 he married Abigail, daughter of the me Lemuel Powers, Returning to Buffalo in 1830 é formed a

: @ a partnership with two lawyers, both after- aden distinguished in public life, and became suc- sul at the bar. From 1828 to 1831 he served as a

representative in the State legislature, coming in as an

anti-mason. In the single term of 1832-4 he was a repre- sentative of his district in the national Congress, as anti- Jackson, or in opposition to the administration. From 1836 to 1842, when he declined further service, he re- presented his district as a member of the Whig party. In Congress he opposed the annexation of Texas as slave territory, was a warm advocate of internal improvements and a protective tariff, supported J. Q. Adams in maintaining the right of offering anti-slavery petitions, advocated the prohibition by Congress of the slave trade between the States, and favoured the exclusion of slavery from the District of Columbia. His speech and tone, however, were moderate on these exciting subjects, and he claimed the right to stand free of pledges, and to adjust his opinions and his course by the development of circum- stances. The Whigs having the ascendency in

Congress during the latter part of his membership, he was made chairman of the House Committee of Ways and Means. Against a stroug opposition he carried an appropriation of 30,000 dollars for Morse's telegraph, and secured important provisions in the new tariff measures of 1842. He found some supporters of his proposed nomination as a candidate for vice-president in the Whig National Convention at Baltimore. In May 1844, being the Whig candidate for the governorship of New York, he was defeated by Silas Wright. In 1847 he was made comptroller of the State of New York, an office of manifold responsibilities and duties, which he resigned on his election, in November 1848, as vice-president of the United States, Zachury Taylor being president. He presided over the senate ably and impar- tially during the seven montlis of exciting debate and agitation on the so-called "Compromise Measures," and Mr Clay's "Omnibus Bill," which, though finally defeated as a whole, substantially succeeded in its general bearing on several matters of intense import to the nation as connected with the subject of slavery.

President Taylor died July 9, 1850, and the next day Fillmore, according to the special provision of the consti- tion, took the oath and acceded to the highest office, being then fifty-one years old. The cabinet which he called around him, contained many distinguished men, as Webster, Corwin, Crittenden, Graham, Hall, and Kennedy. On the death of Webster in 1852, Edward Everett suc- ceeded him as secretary of state, The president sent a force to protect New Mexico in the dispute as to its boundaries with Texas. The critical matter which gave its historic significance to his administration was that chief one of the class of '' compromise" measures, the enactment of the Fugitive Slave Law, to make effective a provision of the constitution for the rendition of " fugitives from labour or service." Being instructed by Crittenden, his attorney-general, that the bill was not inconsistent with the constitutional sanction of the Habeas Corpus, the president signed the bill, and issued a proclamation calling upon Government officials to enforce it. These measures roused the most passionate opposition and animosity, among Whigs as well as anti-slavery men, The attempt to enforce the odious law was restricted by mobs in various free States, and was made, for the most part, wholly ineffectual, the people being resolved to regard it as annulled by the "higher law." The fact that the president had signed and sought to enforce the law, though he might plead for himself constitutional

obligation, and a purpose of patriotic fidelity in the exercise of his best judgment, made a breach between him and his party. But few questioned the sincerity and purity of his intentions, or his own full persuasion that the measures were of vital necessity to pacify the nation. Still, as the result was a sharp and embittered variance among his previous supporters, his administration was regarded as inglorious, if not as a failure.

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In many other matters of high public concern, his official course, as indicated by his appointments, the recommenda- tions in his messages, and the projects which he devised, was characterized by sound discretion, by humanc promptings, and practical wisdom. His advice, however, even on these matters, was not always followed by Congress. That body having approved a plan for the extension of the Capitol, the president, on July 4, 1851, laid the corner-stone of the new edifice, Daniel Webster being the orator of the occasion, In the saine year he interposed promptly and effectively in thwarting the projects of the “ filibusters,” under Lopez, for the invasion of Cuba. Commodore Perry’s expedition to Japan, that of Lieutenant Lynch to Africa, and that of Ringgold to the Chincse Seas, with the exploration of the valley of the Amazon by Herndon and Gibbou, may be referred to as engaging the executive ability and wide-fore- thought of the president. His term closed March 4, 1853. In the preceding autumn he had been an unsuccessful can- didate for nomination for the presidency by the Whig National Convention, and he yielded his place to Franklin Pierce. Three weeks before the close of his term his wife died in Washington, and he quictly returned, with a son anda daughter, to private life in Buffalo. In 1854, he travelled extensively through the southern and western States, and in 1855-6 he visited Europe, moving from place to place in a quiet and unostentatious way, but receiving much courteous attention. He declined the proffered honour of D.C.L, from Oxford. While in Rome he was informed of his nomination for the presidency by the “ Native Amcrican” party, the nominees of the other parties being Buchanan and Fremont. In 1858 he married Mrs Caroline M‘Intosh of Albany, a lady of fortune and culture. Retiring to his home in Buffalo, he enjoyed a studious retirement among his books and friends, taking no public share in political affairs. He took great interest in the Buffalo Historical Society, of which he was the president. His

life closed March 8, 1874, in his seventy- fifth year. All who knew him in any relation accorded in regarding him as an upright and conscientious man, blameless, loving simple ways, and heartily devoted to the

best interests of his country. (G. E. E.)

FILM. See Capittary Action and Oprics. FILMER, Sir Ropert, a writer of the 17th century, remarkable for his singular political theory, which deserves notice on account of the great attention which it excited, was the son of Sir Edward Filmer of East Sutton in Kent. He studied at Trinity College, Cambridge, where he matri- culated in 1604. His death has been fixed at widely different dates, but of these the most probable is 1653. Filmer was already a middle-aged man when the great controversy between the king and the Commons roused him into literary activity. His writings afford an exceedingly curious example of the doctrines held by the most extreme section of the Divine Right party. Filmer's theory is founded upon the statement that the government of a family by the father is the true original and model of all government. In the beginning of the world God gave authority to Adam, who had complete control over his descendants, even as to life and death. From Adam this authority was inherited by Noah; and Filmer quotes as not unlikely the tradition that Noah sailed up the Mediter- ranean and allotted the three continents of the Old World to the rule of his three sons. From Shem, Ham, and Japheth the patriarchs inherited the absolute power which they exercised over their families and servants; and from the patriarchs all kings and governors (whether a single

monarch or a governing assembly) derive their authorit which is therefore absolute, and founded divi 4 right. The difficulty that —_ ch an Ad oe God may unjustly" an "by the secret will of y attain to power which he has not

inherited appeared to Filmer in no way to alter the nature of the power so obtained, for "there is, and always shal] be continued to the end of the world, a natural right of a supreme father over every multitude." The king is per- fectly free from all human control. He cannot be bound by the acts of his predecessors, for which he is not re- sponsible ; nor by his own, for " impossible it is in nature that a man should give a law unto himself"—a law

must be imposed by another than the person bound by it, With regard to the English constitution, he asserted, in his Freeholder's Grand Inquest touching our Sovereign Lord the King and his Parliament (1648), that the Lords only give counsel to the king, the Commons only " perform and consent to the ordinances of parliament," and the king alone is the maker of laws, which proceed purely from his will, It is monstrous that the people should judge or depose their king, for they would then be judges in their own cause. The most complete expression of Filmer's opinions is given in the Patriarcha, which was published in 1680, many years after his death. His position, however, was sufficiently indicated by the works which he published during his lifetime :—the Anarchy of a Limited and Mixed Monarchy (1646), an attack upon a treatise on monarchy by Nicholas Hutton, which maintained that the king's prerogative is not superior to the authority of the houses of parliament; the pamphlet entitled Z'he Power of Kings, and tn particular of the King of England (1648) ; and his Observations upon Mr Hobbes's Leviathan, Mr Milton against Salmasius, and H. Grotius De Jure Beli et Pacis, concerning the Originall of Government (1652), Filmer's theory, owing to the circumstances of the time, obtained a recognition which it is now difficult to understand. Nine years after the publication of the Patriarcha, at the time of the Revolution which banished the Stuarts from the throne, Locke singled out Filmer as the most remark- able of the advocates of Divine Right, and thought it worth while to attack him expressly in the first part of the Treatise on Government, going into all his arguments seriatim, and especially pointing out that even if the first steps of his argument be granted, the rights of the eldest born have been so often set aside that modern kings can claim no such inheritance of authority as he asserted.

FILTER, an arrangement for the separation of impurities from liquids, by passage through porous material. The filtering process is common in nature. The clearness of spring water is due to it; for such watcr generally comes from a considerable depth in the. ground (as appears, ¢g- from its equable temperature throughout the year) ; and having traversed a variety of porous strata, it has under- gone a straining action, producing the beautiful trans- parency we observe. This does not, of course, represent absolute purity, for the liquid retains in solution various substances acquired by contact with the strata through which it has percolated. The operation of filtration 1s

extensively practised in purification of water, on @ large scale for supply of towns and cities (now an important branch of civil engineering), and on a small scale 10° domestic purposes, and for the use of ships on 4 long voyage, &c. It is also a valued method in chemistry and the arts.

The mechanical action of straining, by which all particles larger than the interstices of the porous material are arrested, is one important function of filters, and it used to be commonly represented as their only function. They may act, however, in other ways to purify water. Not to speak of the further mechanical actions of subsidence 02 upper surfaces of particles of the filtering medium, 4” lateral attraction and adhesion of suspended matter (which doubtless occur in some measure), it is an important fact, now well ascertained, that a filter may separate from water

a portion of the matter held in solution. On the other hand, it is often precisely such matter, when of organic origin and putrescent (and minute invisible disease-germs may here be included with the matter in solution), that it is specially desirable to remove from drinking water, as being prolific of mischief when taken into the system. In numerous instances an outbreak of virulent disease, such as typhoid fever, has been clearly traced to water so con- taminated. The danger is the greater that such water may be bright and sparkling, and peculiarly palatable.

That even sand has the power of removing dissolved matter from water was shown by Mr Witt’s valuable experiments at Chelsea, described in 1856. In one of these, ¢.g., water containing 1°42 grains of chloride of sodium per gallon (70,000 grains) was deprived of 22 per cent. of that substance by filtration through a depth of 1 foot 9 inches of sand. The sand had no appreciable action on dissolved organic matter, as charcoal had, but the quantity of such matter originally present was small. It is probable that all finely porous material has such action, more or less. The efficiency of charcoal in this respect, and especially fresh animal charcoal, has been well demon- strated and utilized. The mode of the disappearance of dissolved organic impurities has been a disputed point. Some say they are retained and accumulated in the pores of the charcoal; but the experimental evidence seems to leave little doubt that they are mainly oxidized, so as hardly to

impair the activity of the filter. In fact, the value of a filtering material will be found to depend chiefly on the power it has of bringing oxygen, stored in its fine pores or otherwise provided, into chemical union with the dissolved organic matter and destroying it. At the same time it is obvious that, chiefly by the mechanical action of straining, organic matter may accumulate in a filtering medium, and in course of time, through decomposition, render the water which passes through more impure and less wholesome than In its unfiltered state,

We may remark here that river water and shallow well water, while extensively used for water supply, are in general the most largely polluted. Rivers commonly receive large volumes of sewage, impure surface water from cultivated Jand, and other contamination. The water of shallow wells, especially in large towns, or when near churehyards, stables, cesspools, &c., is often contaminated with organic matter of the worst kind, in large quantity. While rain water, collected from the roofs of houses in butts, no doubt contains organic matter, this hardly bears comparison in amount to the organic impurity in rivers (thus Dr Hassall found it a hundredfold less). Deep spring water, again, is

Impurity through natural filtration. The advantages of a

good lake-supply for large towns has been amply demon-. | top).

strated in these days, notably in the case of Glasgow, Which draws its water from Loch Katrine,

Though the arrangements for water supply of most of our large towns include filtering processes by means of which, as a rule, excellent drinking water is abundantly provided, so that in the opinion of some chemists a domestic filter may be Superiiuous, while it is sometimes a source of harm (owing a lack of proper attention), it is generally thought a wise additional safeguard to employ one of those instruments, In view, more especially, of some of the possible conse- — of epidemics and floods, and the necessity of house- a ase of the water received. In country places, and : arious other circumstances, their use is often quite mie if the laws of health are to be respected. ce’ ie and Egyptians seem to have used water 7 = carty period. These consisted of sandstone or

gazed earthenware, and were of bowl or egg shape, with

sin: ‘ecti : all projections at the top resting on a wooden frame.

freed from much of its organic

The water poured into this vessel filtered through to a vessel below. About the middle of last century, slabs of a lias found in Picardy were used as a filtering agent, being fitted as a false bottom in water cisterns; the water was drawn off through a tap from the space below. A porous filtering stone of Teneriffe was at one time imported largely into England. The “alearrhazas” are filter vessels of porous biscuit stoneware made in Spain.

One of the earliest filters in England was that patented by Mrs Johanna Hempel in 1790. It was a supported basin made of tobacco pipe (or similar) clay and coarse sea, river, drift, or pit sand, and hardened in the fur- nace. In the following year (1791) the ascending prin- ciple was first applied by Mr James Peacock. Water from an upper reservoir was admitted through a pipe to the bottom of a box containing strata of sand, gravel, and a mixture of charcoal and powdered calcareous stone. Passing up through this, it was drawn off by a pipe at the top. The filter was occasionally cleaned with an exhaust- ing and condensing pump, which sucked up water rapidly through the filtering material and then sent it back with force, washing out the dirt.

The construction of filters is a matter on which inventive- ness has been largely exercised. All sorts of porous substances have been called into requisition, as may be seen by a glance at the patent records. Thus, to mention some of these, we have various kinds of stone, sand, gravel, powdered glass, clay, porous sulphur, preparations of iron, charcoal (vegetable and animal), cloth, felt, horsehair, skins, paper, silicated carbon, sponge, wood, woul, cane, capillary threads, and soon. Vegetable charcoal, we may note, was first employed in 1802, animal charcoal in 1818, and solid carbon blocks in 1834,

It is impossible here, and it would be tedious, to give anything like a detailed account of the changes that have been rung on the filtering

principle for domestic filters. In the simplest and most familiar forms, of course, the water passes down by its own gravitation through the filtering medium to a reservoir below. The force of downward pressure has sometimes been augmented by a head of water, sometimes by a force pump, and sometimes by means of air condensed above the water to be passed through the filter. Or the air has been extracted from the vessel con- taining the filtered liquid, thus adding force to the atino- spheric pressure above. The ascending principle has appeared in various applications; and in some cases the water has been caused first to descend and then to ascend through filtering material (a vertical partition, ¢g., being fixed in a vessel so as to reach nearly to the bottom, and layers of sand and vitrified limestone being placed on either side of the lower part ; the water is ponred in on one side of the partition and drawn from the other side near the Lateral filtration has also been tried. Filters have been arranged to act in the cistern, or in connexion with the service pipe between the cistern and the water tap, or independently, and, in the latter case, either having the unfiltered water poured into them, or being placed in a vessel of it, and giving filtered water through a tube. Sometimes a series of separate connected vessels have been employed ; and for very dirty water it is often advantageous to have one system of filtration for the coarser, and.another for the finer impurities. Once more, filters have been ren- dered self-supplying by means of a ball-cock. These are some of the general forms which the filter has taken.

The application of pressure to filters cannot as a rule be pursued very far, for it tends to derange the apparatus and render the filtered liquid muddy. Enlargement of surface is a better means of obtaining rapid filtration. Upward filtration, while it offers some advantages over downward; has not hitherto come very much into use, It is open to

- objection in that the water sent upwards has a tendency to

_ force a passage through certain channels, without being uniformly disseminated in the material ; and the deposit of any filth is excluded from view, and mostly also from smell, instead of being exposed and giving us warning.

In passing now to examine more closely some of the ap- proved forms of domestic filter at present in use, it should be borne in mind that while any of these filters will doubtless purify water both mechanically and chemically, more or less, it is only on condition of their being properly attended to, and the filtering material renovated at intervals depending on its nature and the nature and amount of impurity in the water. The term “ self-cleansing,” applied to some filters, may have a (limited) true sense, but if understood to imply that a filter, let alone, will go on ad infinitum giving pure water, it is quite inapplicable ; solid impurities must accumulate and call for removal. The statement, occasionally made, that a filter is ‘‘ warranted to remove all impurities” from water is absurd and hardly deserves notice. Absolutely pure water is a thing almost unknown ; careful distillation alone will give an approxima- tion to it. Again, the claim that a filter will remove ad/ lime from water is often false ; filtration is capable of re- moving only a small quantity of lime, It must be allowed that sundry points in the process of filtration still remain in some obscurity, and it is matter of regret that the action of some common filtering agents has not been so fully cleared up by scientific experiment as others. Still enough has been ascertained probably to guide to the construction of a filter on rational principles.

In a large proportion of filters, as already indicated, some form or other of carbon is the chief filtering agent. The well-known filters of Lipscombe are cylindrical-shaped covered vessels of glazed earthenware, in which the filtering medium, a mixture of vegetable and animal charcoal, in granular form, is enclosed between two slabs cemented in the case. The upper (glazed earthenware) slab has a central aperture with raised border, and a small perforated basin immediately below it; into this is inserted a sponge to arrest the grosser impurities, which is taken out and cleaned at short intervals. The filtered water passes through the lower (and porous) slab to the reservoir below, which communicates above with the outer air by a narrow tube passing up within to the top of the apparatus, and delivers its water through a tap.

Charcoal in the form of solid finely porous blocks, which can be conveniently brushed and cleaned externally, is now often moulded for filters. The convenient decanter filter, in which the water passes through the

block to a central tube, forms an elegant addition to the sideboard. The annexed figure (1) represents one of these as made by Atkins, who also furnishes earthenware filter vessels having a division across the inside wherein a carbon block is fitted water-tight, which can readily be taken out and cleaned and replaced, or a fresh one sub- stituted. Sometimes the block is fitted ina movable pan. Again, in the filter shown in fig. 2 a double filtration is effected, the

Fic. 1.—Decanter Filter.

water passing first through loose charcoal B, then through a charcoal block C, supported as shown. The block in this case is said to last longer without cleaning. The movable and perforated earthenware plate A, which is

placed above the charcoal (see fig. 3), allows of easy renewal of the latter. The charcoal used in these filters is chiefly

FILTER

of vegetable origin. They are found to remove more or less of organic and inorganic matter dissolved in water,

It may be useful here to call attention to some of the conclu- sions arrived at regarding char- coal in the sixth report of the Royal Commission on Rivers' Pol- lution a short time ago. Fresh animal charcoal has been proved to act powerfully in the removal of organic impurity (considerably more so than vegetable charcoal), , as well as of mineral matter. But, © according to Dr Frankland, its reduction of the hardness ceases ~ in about a fortnight, the removal of organic matter continuing even after six months, though to a much less extent, especially if the filter be much used. It was found neces- 7 sary to renew the charcoal every six F!6. 2.—Filter with double months when used for filtering — the comparatively pure water of the London New River Company, whilst the water of the Thames required te- newal of the charcoal every three months. If this be not done, myriads of minute worms, we are told, are developed in the material passing out with the fil- tered water. Other statements, of scien- tific weight, regarding animal charcoal are more favourable to it, and seem to show that under certain conditions, per- haps imperfectly understood, it may give better results.

In Major Crease’s system, which is adopted in the British army and navy, loose animal charcoal is com- pressed between plates by means of a screw, the amount of compression being determined by the degree of impurity in the water to be filtered. .

The silicated carbon of Mr Dahlke’s filters is obtained by mixing animal or vegetable charcoal with the residue of distillation of Boghead coal. By adding a little clay to the latter product, and saturating the whole with oily matter, it can be moulded, after which it is burnt. In one form of the filter, two carbon blocks are sealed into the interior of earthenware vessel, granulated car- bon being placed between them ; in another, a double action is obtained by placing a carbon block over the entrance toa second carbon medium. These filters have been highly com- mended for their chemical properties, attributed to magnetic oxide of iron present in the medium, We give (fig. 4) a representation of the sili- cated carbon siphon filter with its case. Water may be sucked through Fic. 4.—Silicated Carbon it from a stream directly into the Siphon Filter. mouth, or passed siphon-wise from one vessel into another. These and similar pocket filters of Atkins’s were supplied to the Ashantee expedition.

A very powerful filtering medium was discovered and introduced many years ago by Mr Thomas Spencer. It is called magnetic carbide, and consists of protoxide of iron in chemical combination with carbon. It is obtained by roasting hematite iron-ore with granulated charcoal for twelve to sixteen hours at a dull red heat. Mr Spencer considers the purifying property of the oxide to be due t0 its power of attracting oxygen to its surface, without the latter being acted upon, the oxygen attracted being them

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Fic. 3.—Plate atA in fig. 2.

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changed into ozone, by which the organic matter of the water is consumed. The magnetic carbide is used in

granular form. This filter gained prize medals at the last

London and Paris ex- hibitions, and its effi- ciency was strated by tlie Lancet Sanitary Commission- ers' report on filters in

1867. :

The only other system we shall here notice is that in which spongy iron is used. This substance is me- tallic iron which has been reduced from an oxide without fusion. It is in a spongy or porous state of ex- tremely fine division. Its remarkable purify- ing action on water was discovered by Professor Gustav Bischof of the Andersonian Univer- sity, Glasgow; and ex- periments made with lus filters by the Royal Commissioners already referred to showed that their power both of re- moving organic matter and reducing the hard- hess of water even in- creased during upwards

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C FILTERED WATER.

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REGULATOR,

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Z CMLL, Fig. 5.—Bischof's Spongy Iron Filter.

ofeight months' constant use. The general form of the filter An inner vessel containing the

18 represented in fig. 5.

AIR PIPE

169°

_Spongy iron is supported in a case, which, below, contains | Some prepared sand, a regulator A, and a receptacle C, for

filtered water (with tap, not shown). The unfiltered water B is in this form supplied from a bottle which is inverted into the upper part of the inner vessel (a method familiar to chemists). After passing through the spongy iron, the water ascends through an overflow pipe in the direction of the arrows ; the object of this is to keep the spongy iron, when once wet, constantly under water, as otherwise it is too rapidly oxidized. The object of the prepared sand (which is generally in three layers, viz., pyrolusite at the top, then sand, then gravel) is to separate traces of iron retained in solution, The regulator A consists of a tin tube, cemented in the position shown; it is open at the inner end, which is below the perforated bottom supporting the sand, and closed by a screw cap at its outer end. It has also a small lateral perforation, through which alone the filtered water passes into the reservoir. Should the perforations get choked, the screw cap is removed, and a brush inserted ; on starting at first, too, the cap is un- screwed, that the materials may be well washed out with- out soiling the lower reservoir, With a ball-cock and con- stant supply of water, the inuer vessel is dispensed with.

The nature of the action of the metal on organic matter is rather obscure. Mr Bischof considers there are both reducing and oxidizing agencies constantly at work, and that the oxides of iron, being present in their nascent state, must be very energetic in their action, Probably ferric hydrate, the last product of oxidation, takes an active part in separation of the organic matter, transferring oxygen to it. Again, spongy iron is known to be very energetic in precipitating any lead or copper. Its reduc- tion of the hardness of water presents some difficulty.

This filter, we may add, recently gained the prize medal for general excellence given by the Sanitary Institute of Great Britain, and has been otherwise commended.

The subject of cistern filters (of which there are many varieties) need not detain us long here. The arrangement adopted by Lipscombe, shown in fig. 6, may be taken as an example. The impure water passes through the inlet

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‘into the chamber of the filt ‘plate of porous stone, then

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CHAMBER.

PIPE TO SUPPLY BOILER &c. WITH PURE WATER.

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Fig. 6.—Lipscombe’s Cistern Filter.

er, thence upwards through a

through powdered charcoal

into the pure water reservoir, whence it may be drawn off cold by the pure water tap, or hot and pure from the boiler. IX. — 22

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When tlie filter is in action, the grosser impurities are stopped by the porous stone, while the finer pass into the charcoal and are chemically acted on. Each time the unfiltered water tap is opened to obtain water, unfiltered water enters the inlet and scours out the impurities in the chamber. ‘To clean the filter, once every six months or other period, a plug is drawn up by means of a galvan- ized chain (attached as shown) from the top of the filter and dropped into the inlet. The unfiltered water tap 1s then turned on several minutes, so that the cistern water rushes down through the filter and out of the tap, carry- ing out impurities from the filter. :

In the filtration of water for supply of towns, galleries of masonry are often constructed in the sand and gravel forming the river bed or banks; the water percolates through and enters these tunnels at the bottom and by side channels; it is thence pumped to the town. Genoa, Toulouse, Lyons, and Perth present examples of this system, which is apt to prove rather costly. The system of artificial filter-beds of sand resting on gravel, &ec., is now more generally adopted. It was first introduced into London by Mr Simpson, in 1839, after a study of various works in the north, and especially of the costly experience of Glasgow. For the Chelsea Water Company he had a series of tunnels built of brick without mortar ; these were covered with a layer of fine gravel 2 feet thick, then a 2-feet stratum of fine gravel and coarse sand, and lastly 2 feet of fine sand, or 6 feet in all. The sand was periodically removed to the depth of about half aninch. To the filter bed, covering 1 acre, were attached two reservoirs, slightly higher ; into these river water was pumped, which, after time for subsidence, was admitted to the filter beds through small pipes.

The eight Water Companies of London all use similar beds, increasing in coarseness downwards, of various depth and proportion of materials. A sharp siliceous sand is preferred for the upper bed (the true filtering agent),

and the stratum is seldom made less than 2 or more than 3 feet thick. Sometimes this bed is laid immediately on a bed of small shells.

It is considered that filtration through sand, to be effective, should not proceed more rapidly than 6 inches of descent per hour (in the London beds the rate varies from 2°5 to 10°7 inches), and that there should be about 1} square yards of filtering area for each 1000 gallons per day. The depth of water maintained on filter-beds varies between 1 foot and 7 or 8 feet. The inlet arrangements should be such as to produce little disturbance of the sand in charging; thus the water may be admitted into a long trough from which it gently overflows, or through an inlet pipe carried to the centre of the bed and turned upwards (at Chelsea the water enters through a wall of gravel between two horizontal concentric arches of brickwork with vertical joints). The beds are drained variously, ¢.g., by means of perforated stoneware pipes, or pipes with open joints, sometimes leading into a brick culvert which traverses the bed. A good method of draining is that of Mr Muir, adopted by the New River Company. It con- sists of two courses of bricks laid flat and dry; in the lower, the bricks are placed end to end in series alternating with half-brick spaces which serve as drains leading to a central culvert; in the upper course, the bricks are laid close together, forming a floor, on which a thin layer of fine gravel supports a bed of sand. ee Boge Tounise to be cleaned, at intervals varying

: ek to six or eight, by removal of about half eae sand. The clean sand remaining is loosened ‘oe a ee high to the air some time, then smoothed WR Otay diate ed may be made with several compart-

? Ich may remain in action while others are

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being cleansed. There are various contrivances for washing sand previous to its replacement. Filter beds are some- times arranged to be cleansed by a reverse current sent upwards with force,—an operation which may be aided by stirring the surface sand after the water has come above it, Such a system is practiced, e.g., in the Greenock, Paisley, and Dunkirk water works, At the last-named place, washed coke is among the filtering agents used. (For an account of the works at Dunkirk see Hngineering, vol. xiv, p. 206.) In the

system of M. Maurraz the water is filtered both per ascensum et descensum, the two portions of water, which flow in opposite directions, uniting at the middle, The sand is retained in closed and perforated boxes. This filter also permits of cleansing by reversal of the current. Mr Spencer's carbide system has been applied successfully on a large scale at Wakefield and other places, the carbide layer being combined with others of sand and gravel, With carbide, the total thickness of bed may be considerably reduced.

Filtering is frequently practised by the chemist. And whereas in the ordinary filtration of water above described the purified liquid is the object of the process, while the matter retained is merely to be got rid of and destroyed, the reverse may be the case in the laboratory, the retained matter being sought, while the * filtrate," as it is called, is disregarded. For most laboratory preparations the material used is unsized paper. Swedish filtering paper (which is prepared with very pure spring water) possesses the advantage of filtering very rapidly, and of being singularly free from inorganic matter. Cloth is employed in the case of viscid liquids such as syrup or white of egg; while corro- sive liquids may be filtered through pounded. glass. Asbestos is a valuable filtering material, since, by making it red hot, all organic matter may be destroyed, and acid and alkalies have scarcely any action in it. Being nearly indestructible, it can be repeatedly used. Glass-wool has

also of late years been recommended.

Paper filters, to be placed in a funnel, are sold ready cut of circular shape. The paper is folded twice to the form of a quadrant, and this, when half opened, forms a cone, whose edges meet at an angle of 60°. To facilitate passage of the filtered liquid, small folds are sometimes made in the filter all round. In a filter devised by Bunsen, the neck of the filter is inserted in the caoutchouc stopper of a lower vessel, and through this stopper also passes a tube con- nected with an exhausting apparatus. The production of a partial vacuum below accelerates the filtering process. Sometimes substances have to be filtered under the influence of heat, as they solidify at ordinary temperature. In such cases the funnel may be surrounded by a sleeve containing water, which is heated with a lamp. :

In Robinson’s oil filter, oil is forced up from a cask into and through the filtering apparatus (containing charcoal or other medium) by water entering below from an upper reservoir. Sundry modes of filtration practised in the arts (sugar-refining, &c.) will be referred to elsewhere. In some of them centrifugal force is employed. ,

Circumstances are not uncommon in which it 1s very desirable to remove impurities from air by a process 0 filtration. Cutlers and other grinders use respirators to arrest the small particles which would otherwise find their way into the lungs. For steel particles magnetic gauze 18 an efficient protective. Professor Tyndall’s respirator for firemen consists of an iron cylinder, attached to 4 mask, and containing charcoal, and three layers of cotton wool, one moistened with glycerine ; the ends of the case are of wire gauze. With this respirator it is possible to enter an atmosphere of dense smoke and remain in it over @ quarter of an hour. The disinfecting properties of charcoal have been turned to good account by Dr Stenhouse for purifying

air, the substance being used in the construction of respira- tors, or at the outlet of sewers, &e. An interesting applica- tion of the principle was made in the justice room of the Mansion House, London, in 1854, where offensive smells originating just under one of the windows were effectually removed. ‘There are various devices in existence for purify- ing the air admitted to railway carriages and other inclosed spaces. Thus the air may be passed through wire screens, or through a spray of water, &c. In connexion with biolo- gical research and the germ theory of disease, the removal, by filtration, of minute foreign particles from air is a mat- ter of great moment.

For further information see, among other works, Humber’s Water Supply of Cities and Towns, 1876; Sixth Report of the Royal Commis- sion on Rivers Pollution (published in 1875); Lancet Sanitary Com- missioners Report on Filters, 1867; Wanklyn and Chapman’s Water Analysis; Philosophical Magazine, 4th series, vol. xii. p. 30 (Witt); Proceedings of the Institution of Civil Engineers,

May 1867 (Byrne); Paper by Mr Pearse, on Water Purification, Sanitary and Industrial, to Society of Engineers, March ao) US7 a Paper by M. Bischof, on The Purification of Water, to Society of Arts, April 25, 1878 ; Registrar-General's Returns for 1876, &c.; Chemical News, vols, xxxiii. and xxxiv. (Wanklyn, Hildebrand) ; Dictionaries of Ure, Knight, Tomlinson, Watts, &c. (A. B. M.)

FINALE DELL' EMILIA, a town of Italy, circle of Mirandola, province of Modena, is situated on the right bank of the Panaro, 10 miles from its junction with the Po. It receives its name from its situation on the border line between the duchy of Modena and the States of the Church. It has manufactures of silk and woollen fabrics, and some trade in corn, wine, hemp, and fruits. Finale owes its origin to a castle connected with the monastery of Nonantola, The town was taken by the imperial troops in 1703 on its being abandoned by the French. It was again taken by the French in 1704, and by Prince Eugene in 1706. The population in 1871 was 4456.

FINANCE

N the 13th and 14th centuries, the words finare, finacio, aud financia were employed, priucipally by writers in France, to denote those bargains by which the inde- finite liabilities of ancient tenures were commuted for fixed sums payable to the immediate lord of the tenant. It was at this time that the commutation became general, except when the service of the tenant was of a military or dignified character. Even here, however, a remarkable innovation was made at an early period in English social history, on which we shall comment presently. In course of time the word finance became nearly synonymous with the product of taxation, aud the finances of a country (though the phrase is sometimes used to denote the aggregate revenues of those who are liable to taxation) are understood to be the ways and means by which the expenditure of governmeut, imperial and local, are met. In the present article we shall deal with the history of finance only. Under the head of Taxation, the reader will find an analysis of the economical theory, in accordance with which taxation 1s shown to be innocuous and equitable, or the reverse.

The most ancient forms of finance have always been taxes on produce, Such appear to have been the taxes of ancient Egypt ; such were and still

are the principal taxes of Turkey and Hindustan. Whatever may have been the character of the first agricultural settlement, the development of a central government has always been assisted by a theory that the true lordship of the soil is the property of the state or the ruler, on which the immediate occupant of the soil is dependent, and to which a portion of the produce is due. The conquests of Rome always involved a confiscation of the vanquished nation's land, and the re-grant of a portion of the confiscated estate on what we might call by analogy a base tenure. In the same way, when in the 10th and 11th centuries the Christianized' Teutonic tribes of north- eastern Europe pressed on the heathen Slavs, the victory of the former was always followed by the establishment of @ military and well-endowed church, on which a third of the conquered territory was generally settled, the vanquished race being permitted, though in a state of dependence, to occupy the residue, The settlement of Afigina and Eubeea

y the Athenian lot-holders, to say nothing of more ancient "rcupaneies, was of the same character. Here indeed the State distributed the ownership which it had acquired by its arms among its citizens, though doubtless it claimed military service from them as a garrison, and probably exacted a Tevenue which was similar in its nature to a rent. oun jabosial system of ancient states was, as a rule, ex- = SY simple. The charges of government, were few,

cept in the vast despotisms of Asia and Egypt, and later

on in the great military republics of Carthage and Rome, where the revenues of the king and state were derived from tribute in money or kind from inferior or dependent districts and races. The district of the Aristotelian ideal city (Politics, vii. 10, 11) is to be divided into two portions, one the property of the state, out of the produce of which the charges of the national religion and the costs of the common tables are to be supplied, the other to be held in private ownership. The philosopher does not con- template the necessity of making provision for the ordinary charges of government, The magistrates were unpaid ; the army was a militia, serving atits own charges. When the Lacedzemonians undertook the command of tlie allies in the Peloponnesian war, they had no public revenue. Later on in their history, we are told by Aristotle that the public

exchequer of the Lacedzemonians was ill managed, for most of the land of Laconia belonged to the Spartiats, and they assessed themselves,

The beginning of Athenian finance was a revenue derived from the silver mines in the promontory of Sunium, the ownership of which was, it seems, vested in the state. It was the practice of the Athenian Government to grant a perpetual lease of allotments in these mines, and to exact, moreover, a small percentage on the produce, reserving to itself a right of forfeiture and re-entry if the terms of the lease were infringed, or the produce rents were unpaid. With the proceeds of these mines the Athenians built their first navy, and with this navy they won the victory of Salamis, thus paving the way to their naval supremacy.

The next great source of Athenian revenue was the con- tribution from those protected states which failed to supply a proper naval contingent for the defence of the A‘gean. Most of the Greek cities of Asia Minor and the islands owed their security from the attacks of the Phoenician navy, then dependent on Persia, to the vigorous and effective sea forces of the Athenian republic. It was cheaper for them to commute their contingent for a money payment, and the police of the sea became far more efficient when wielded by a single power, which had every interest in bringing its navy to the highest pitch of serviceableness. The Athenians contrived to economize, and, later on, to increase the contributions of those states whom they pro- tected. Considering that they had fully satisfied the terms of their own bargain if they thrust back the Persian despot, they concluded that they might fairly accumulate a surplus in the public treasury, and even expend a portion of their revenues in embellishing their city, We may be certain that the power which this revenue gave the Athenian republic was the chief cause of that jealous fear which

precipitated the thirty years’ war of the 5th century B.c., and which produced results as disastrous to the progress of mankind as a war of the same duration twenty centuries later did on the rapidly growing civilization of central Europe. So desperate and so penniless were the military rivals of Athens, overwhelming as their land forces were, that they even thought of appropriating the sacred treasures _of Delphi, a proposal, in the 5th century

before Christ, which was as shocking as it would have been in the 12th century after Christ to have suggested that the sacred vessels and shrines of the great churches and monasteries should be coined in order to pay the soldiers of the crusade.

The finance of antiquity derived a revenue from customs. These customs were, at least in Athens, an ad valorem duty of two per cent. as a war measure. Twelve years before the conclusion of the great thirty years' struggle, the Athenians levied a five per cent. ad valorem duty on their subject cities, though this was in substitution for the old contribution on account of the police of the seas. A poll tax was levied on foreign residents, perhaps on slaves; and it appears that, possibly as a measure of police, another poll tax was imposed on the inmates of disreputable houses.

The revenue, therefore, of that Greek state whose his- tory is best known to us was derived from the rent of pub- lic lands, especially the mines, from a composition paid by the allies in lieu of naval service, from very moderate customs duties, and from a few personal taxes. It must not, however, be imagined that the finance of antiquity was successful in the eyes of those who saw how inelastic it was. There is still extant a treatise by a very practical man. Xenophon, in the oldest work on finance, discusses the means by which the Athenian home revenne might be conveniently increased, and, like many other speculative thinkers, suggests projects which would have created far more mischief than they would have remedied. It will be obvious also that by far the most important item in Athenian finance, the contributions from the allies in lieu of personal service, was necessarily precarious, and that when the Athenian empire was finally broken up, the revenue of the state was gone, while the necessity of find- ing ways and means for the public defence was as urgent as ever.

This brings us to another aspect of Athenian finance, viz., the extraordinary taxes on property which the Government levied, and which the contributors paid apparently with the greatest readiness. These were the Ae:rovpyiat, exceptional imposts with a view to defraying certain kinds of public expenditure; and property taxes assessed on a valuation, and graduated according to the means of the contributor.

The principal liturgies, as they are called from the Greek word quoted above (the word is suggestive of the process by which it was finally appropriated in the ecclesiastical vocabulary), were three in number, two religious and one secular. The tendency of a religion, like that of Greece, in which so much nature worship was contained, was to associate many of the acts of life with religious ceremonies, and, as culture progressed, with art. Thus the drama of antiquity arose from the worship of the wine god and the vintage, and the arts of sculpture and painting had originally a similar religious origin. The dramatist who succeeded in securing a representation of his composition had assigned to him a citizen whose wealth was sufficient to defray some of the charges of representation, as the ee at maintenance, aud dresses of the actors. A gd aS yee religious service was the public games. m We ite erable portion of the expenses incurred Ted ied tee ee imposed on wealthy persons. ogo ele oa ie oad the equipment and command

Pp ar, the state supplied the ship, the trierarch

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its stores and tackling, and in some cases provisions and pay. In return the trierarch was captain of the ship, This arrangement is closely analogous to that financial arrangement in England by which, after the Revolution, local regiments were raised, clothed, and officered by wealthy men, who had in return the colonelcy of the regiment, and the right of appointing its subordinate officers.

The liability to these charges, distributed, as it seems, at the discretion of the Government, was a serious charge on the wealthy. Hence, when the state fell on evil days, and reverses had impoverished the Athenian people, persons were allowed to club together in order to supply these public functions. ‘To abandon them would have been to incur the wrath of the gods, or imperil the safety of the state. The modern critics of Greek sentiment are amazed at the fact that only on the very eve of the great crisis in which the fate of Greece was finally determined, the battle of Cheronesa, Athens reluctantly devoted the taxes which

had hitherto been employed for ecclesiastical purposes to

the pressing necessities of the public defence. The theoric fund was that portion of the revenues of the state which was assigned to those sacred purposes, It was distributed nominally among the spectators as the price of tickets for admission. It actually was paid over to the managers of those public buildings in which the ceremony was performed.

If the person on whom the duty of supplementing the charges of the state was imposed conceived that he was unfairly selected, or asserted that his means were inade- quate for the purpose, he was allowed to nameanother citizen to whom he could proffer an exchange of property. In this offer the other was bound to acquiesce, unless he con-

sented to allow himself to be substituted for the individnal

on whom the duty was originally set. In short, the pos- session of property involved serious liabilities in Athens, though it seems that men of substance gloried in the satis- faction of these public charges, and completely conformed themselves to public opinion. For it will be found to be a fundamental law in successful finance that those imposts are always found to be most productive which are most in accord with public opinion, and that in the selection of a system of taxation it is not always possible to adopt that which is most expedient or even most just, but that which can be most readily enforced and is most willingly accorded.

But the most remarkable illustration of Athenian opinion in matters of finance is the regular property tax. In the costly services which have been sketched above, some compensation was afforded to the contributor by the position he occupied. The choragus was the chief official in rank at those religious ceremonies in which the drama was the highest act of worship; the chief of the gymnasts exercised authority over his staff of competitors in the public games, and was even empowered to compel parents to allow their children to take part in the contest. The man of substance on whom the state imposed the duty of equipping, manning, and provisioning a hull was captain of the vessel, and though he was liable to a due perform- ance of his service, and subject to an audit on the ter mination of his year of office, he exercised full authority during his command, and might be, indeed was, rewarde for exceptional diligence and smartness during the period of his office.

The property tax wasa contribution which did not make the tax payer conspicuous, and did not confer on him any distinction. The impost dates from the earliest records of the Athenian constitution. It was graduated, being * heavier percentage in the case of the richer citizens than in that of the middle classes. It passed through several notable changes, always, however, in the same direction, the particulars of which are well given in Boeckh's Pubhe

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Economy of Athens. But the principles of the assessment are very simple, though the process by which the result was finally arrived at is somewhat artificial.

The property of every Athenian citizen was assessed, whether it were movable or immovable, and the amount was entered in a public register. The assessment included the value of slaves, manufactured goods, and raw materials.

A register of the assessment was open for examination, |

and undoubtedly re-valuations were frequent. The state was informed as to the property which each citizen— and indeed every resident alien— possessed, and made this property the basis of direct taxation. It then proceeded to divide all assessments into several schedules, assuming in each schedule a variable quantity, varying from a fifth toa tenth, as the taxable property of the individual. On this sum it levied a fixed rate. Thus, if a very wealthy man possessed an estate valned at 500 talents, 2.¢, nearly £122,000, his taxable wealth was treated as £24,400, and a five per cent. tax, £1220, exacted from him; while the owner of property valued at 25 minwx, 7.e., about £101, 10s., the lowest sum apparently which was liable to property tax, found his property assessed for purposes of taxation at £10, 3s., and his property tax of five per cent. at a little over 10s.

In the budget speech which the great statesman of the Athenian empire delivered before the commencement of the Peloponnesian war, and of which Thucydides gives us the heads, we learn that the revenue of Athens from the contributions cf her allies amounted on an average to 600 talents

(£147,250) a year, and that there was an existing accumulation of treasure in coined silver amounting to a million and a half sterling, besides other immediate resources. It is to be regretted that the historian did not supply us with further particulars as to the finance of his country during the period of her greatest wealth and power. These resources, had Athens merely carried on a defensive Warfare, would, as the statesman justly argued, have rendered the country not only unconquerable, but practi- cally invulnerable.

The high rate of interest, and the general insecurity of Society, excluded the states of ancient Greece from having recourse to regular loans, though not from attempting to meet current exigencies by anticipations of revenue. Occasionally portions of the revenue were assigned to creditors; sometimes the public lands were granted for a term, during which the principal and interest might be repaid. Instances may even be found in which the state issued a currency of tokens, which fulfilled some of the functions of state paper in modern times. Another financial expedient, always followed by the most mischievous consequences, was occasionally adopted, the issue, namely, of a debased currency, But from this fraud Athens always kept herself free, not only inflicting the punishment of death on those who put base money into circulation (the ae. code of Athens having been generally very lenient), a a etn her deepest distress from the temptation bass PP ementing her Tevenues by the temporary issue of in en +. studious was Athens of her reputation ees: pect that, when she was the home of the fine

» Se continued to maintain the clumsy archaic type of

*r coinage, although the arts of die-sinking and coining were carried to perfection in states which were far less scrupulous,

oO, of Rome in the earlier ages of the republic ea a rom a lands of the state, payments in kind 4 — su eg from import and export duties, and = ad — and articles of luxury. Partly as a a e loss of the national domain, partly as digi iowa ing discontent, the state, in the later ages

epublic and the beginning of the empire, undertook

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the maintenance of its poorer citizens, either by gratuitous distributions of corn, or by the sale of food at low fixed prices. Cicero calculates the charge incurred by the revenue in consequence of this expedient at one-fifth of the public expenditure. Augustus increased the charges of maintaining these state paupers till the cost amounted to more than half of what had been the revenue of republican Rome. The emperor Vespasian declared (Suet., Vesp. 16) that the necessities of government in Rome required a sum of £400,000,000 sterling, apparently after the destructive civil war which preceded the elevation of the Flavian family to the throne. But the manner in which the revenue of the Roman empire was collected was even more destructive than the crushing weight of the charge itself.

The collection of taxes in Rome, both under the republic and the early empire, was entrusted to contractors, who purchased by auction the right of levying the tax. The character of the Roman contractor is aptly illustrated by Livy, who narrates the frauds practised by those persons on the Roman treasury during the deepest distresses of the second Punic war, and the violence with which other contractors defended the interests of the order in general, and the convicts in particular, But after the Macedonian war, tlie Roman citizen was relieved from direct taxes, the weight of which fell on the provincials. Associations of wealtliy men were formed, who could give security to the Government, and who, being protected by the Government, could practice what extortion they pleased on the provin- cials. The law, indeed, provided that such persons should be liable to prosecution for corrupt and illegal practices, but the law was far tuo weak to check the malpractices of the officials. It appears that the province was divided into districts, or dioceses, as they are called, a manager being appointed for each district, who was in regular correspond- ence with the chief of the office at Rome. The law recognized the guild of the publicans, who were indeed, by their agency, the centre of the Roman system of finance, and in many emergencies the parties with whom the state negotiated for an advance on the security of its revenues. But, on the other hand, it was said with too much truth that where the tax-gatherer appeared public law and private liberty vanished.

Taxes paid in kind were the tenth of corn and the fifth of fruit. Such taxes were imposed in Sicily, in Africa, in Sardinia, and in Egypt. Spain was treated more generously, partly to compensate for the reputed unproductiveness of its soil, partly in all likelihood from fear of the high-spirited character of its inhabitants. In some cases, the contributor of the tithe had to carry his quota to the nearest port for shipment to Rome. The rest of the empire paid money taxes, partly from an assessment on the value of property, partly by what appears to be a poll tax, but was really an artificial estimate, under which several needy persons might be made to represent a unit, and on the other hand one wealthy person might be treated as many units. The assessment lasted for a definite period, which, in the age of Constantine at least, got the name of the Indiction. In the sense of a tax, this term is as old as Pliny, if indeed it cannot be carried back to the early empire.

The finance of the Roman empire imposed a tax on the profits of trade, which seems to have been collected with great severity, and to have exposed those who were liable to it to strict scrutiny, and to degrading punishments in case of default. Capitation taxes were levied on cattle, on imports and exports, on slaves kept for the purpose of luxury, on auctions (1 per cent.), on sales in the public markets, analogous to the octroi in the French towns, on salt works, on emancipated slaves, and on successions in cases where the inheritance went by devise to strangers.

The Roman empire even anticipated the benevolences of the Plantagenet and Stuart kings of England in the coronary gold, which was first received as a present on the occasion of a triumph, but afterwards exacted as a right on such occurrences as the emperor might choose to proclaim.

The distinction of Roman and provincial was merged in a common servitude under the edict of Caracalla, which conferred the Roman franchise upon all the subjects of the empire. The task of collecting and transmitting the taxes from the provinces to Rome, and subsequently to Constantinople, was imposed on the decurions, the senate of the colonies. These persons exercised what little authority was left to the local magistracy by the centralization and despotism of the empire, and were exempted from

some of the more degrading punishments which were imposed on the mass of the people. But they bought their rank and privileges at a dear rate. They were liable, in case they failed to collect it, to the whole impost which was assessed on the locality whose affairs they administered. To escape from the dignity and responsibility of the decurion's office, without sinking into the condition of an unprotected citizen, was the object of numerous petitions to the emperor. The privilege was occasionally, sometimes lavishly, awarded as a matter of special favour. But the necessities of the public revenue demanded that enough decurions should be left for the purpose of meeting the burden of taxation. Hence, under the financial system of the later empire, the weight of fiscal charges fell with increasing severity on the middle classes, so that at last, when the military system of Rome collapsed, nothing remained to withstand the assaults of the barbarian invaders. One is struck at finding how small are the armies which subverted the Roman empire, and how easily they occupied Gaul, Spain, and northern Italy.

The fiscal and military system of the Roman empue caused the downfall of ancient civilization. The Roman army and the Roman exchequer were developments from a centralized despotism. The army exhausted the free growth of Italy, devoured the population of those most warlike races who were successively allowed to recruit the Roman legions ; and when the subject races, from which new blood could be introduced into the forces, were thoroughly drained, the Government was forced to enlist soldiers from those foreign hordes who were already threatening, and were soon about to overthrow tle empire. Civil society was simultaneously crushed by a prodigious weight of taxation, arbitrarily imposed, and rigorously exacted. Before the final collapse occurred, wide regions, once occupied by opulent and populous cities, were found to be destitute of inhabitants, and released from taxation on the plea that there was no population left from which to collect a revenue. Large tracts of Asia, southern Europe, and northern Africa have never recovered from the desolating effects which were induced on them by the fiscal and military policy of im- perial Rome. A great break occurred in the history of human progress. Social development was thrown back for centuries, and in some particulars has not even yet recovered the ground on which it stood in the first century before our present era, Not a few fragments, too, survive from that Imperial system which was the downfall of ancient civilization, and which will remain an

impediment to modern civilization until they are completely taken out of the societies in which they have been embedded. sae = po of modern finance may be best Bole ai Se fiscal history. Some countries, as a Te expedients in finance long before other 7 ace ie le ppm st them ; others, as France,

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by which a sounder, “fairer and i system might be adopted in pl core 0 rea

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oppressive, and unproductive. But in England only theory and practice have gone on togetler,—not indeed simultaneously, for the English legislature has accepted scientific principles with hesitation and slowness, but pro- gressively, the result being a compromise, which is opeh indeed to serious criticism from the point of view of the economist, but is, under existing circumstances, of easy manipulation to the financier. Into the former of these we do not propose to enter; it will be treated under Taxa. TION; but the latter can be presented from an historical point of view.

English finance is historically connected with the founda- tion and growth of the English exchequer. It is further divisible into two periods,—one in which almost the whole income of the sovereign, acting for the state, was derived from direct taxation; another in which a continually increasing revenue has been obtained from the indirect taxation of consumable articles. The dividing line in these two systems is the civil war of the 17th century ; and it may be affirmed confidently that nothing but the emer- gencies of a great convulsion like that of the parliamentary war could have reconciled the English people to so total a change in the system of taxation as the adoption of the excise was. Formore than a century after the compromise was effected, of which the perpetual or, as it was called at first, the hereditary excise was the outcome, the impost was detested. A generation has hardly passed away since offences against the excise have ceased to command public sympathy, and, despite the severity with which the law treated frauds on the revenue, have been looked on as venial acts, detection

in which was rather thought unlucky than scandalous. We no doubt owe the change in public senti- ment, in accordance with which frauds on the excise are considered criminal, to the happy change in the fiscal policy of the country, under which taxes are imposed for the purposes of revenue only, and are no longer seen to be protective or partial.

The origin of the English exchequer is variously ascribed to William the Norman and his youngest son Henry!. It is certain that the great cadastre of Domesday Book, the terrier of inhabited England, was treated as the register of the exchequer, the authority of which, as a record of the crown's title to lands and services, and of the subjects' tenure, was held in the exchequer court to be conclusive. It is also certain that whatever arrangement may have been made by the first and third Norman kings, the system was suspended during the troubles of Stephen's reign, and. that the exchequer was reconstructed by Henry IT. It appeats, too, that the machinery of the exchequer was perfected by a family of clerical financiers, who held at once high dignities in the church and confidential offices in the state ; that they were, and avowed themselves to be, eager advo- cates of regal rights ; and that they strove to extend, as far as possible, the liabilities and responsibilities of the subject towards the crown. They also found means by which the judicial powers of the crown, the protection which the powers of police wielded by the crown could afford to the subject, and even the validity of contracts were made the machinery for securing a revenue.

The Norman and Plantagenet kings were not only the overlords of all their subjects, and therefore interested i the escheat of their estates by failure of heirs, but by far the largest landholders in the country. The royal estates were managed, at least in the 13thand 14th centuries, just as the estates of the nobles and gentry were. They were superintended by bailiffs, generally of very low social rank, and cultivated by customary and hired labour. – The profits of the estate, as long as this system was coutinue®, were paid into the exchequer by the bailiffs, and after the

king ceased to cultivate land with his own stock and

capital, the collectors of rents succeeded to similar duties | sovereign, was valid for payment, unless

with those of the more ancient bailiffs. The sheriffs collected the customary charges which were imposed on the counties, and the extraordinary _Teceipts of the crown, making audit of their liabilities twice a year, and receiving a quittance when those liabilities were discharged. Care- ful search was made into the estates of deceased tenants of the crown, and the antiquary or genealogist has derived the largest amount of his information as to family and local history from the numerous and exact inguisitiones post mortem which were taken by the proper authorities. As certain offences involved a forfeiture, and as all offences might be condoned by the payment of mulcts, the atten- tion of the royal officials was stimulated to all such cases of misconduct, and except in matters of petty police, adjudicated in the manorial courts, the royal tribunals rapidly superseded private jurisdictions. In England these

private jurisdictions disappear in the middle of the 14th

century ; in Scotland they survived till they were abolished after the insurrection in 1745; in France they existed till the eve of tle Revolution. Nothing has tended so much to develop English nationality, and to consolidate the authority of the crown, as the royal tribunals, workiug through and for the machinery of the exchequer,

As the King’s Bench dealt with pleas of the crown, when the king’s peace was broken, and the exchequer hunted up and punished offences against the revenue, and through both agencies assisted the revenue, so a further source of royal income was derived from the fees levied for the adininistra- tion of justice between subject and subject. There are many forms of conveyance known to those who are curions in legal antiquities. But the court of Common Pleas competed against them, by recognizing a form of conveyance transacted in court, recorded, and thereupon protected by valid evidence of title. ‘Na assurances,” said Clarendon, when, in the full tide of revived loyalty, the cavaliers of the Restoration strove to reverse or make void disadvantageous or forced sales made by themselves during the course of the civil wars, “are equal in validity to titles created by fines,” as these kinds of conveyances were called. ‘‘ There is no precedent of their being

vacated by judgment or Act of Parliament, or otherwise, without the consent of the parties.” So conclusive was this form of conveyance, that when Viscount Purbeck surrendered his title to the king by the process of a fine, the Lords, though they protested against the act, did not venture on demanding that it should be void. This form of con- veyance also supplied a revenue to the crown. The exchequer, in short, was ubiquitous, constantly searching after means by which the finances of the crown could be recruited or enlarged, and sometimeg offering very solid advantages to the subject in return for business of which the law courts, centred in the exchequer, took cognizance.

Besides these revenues, the crown derived an income from the conporations whose charters were granted in lieu of annual payments, and were renewed on further payments. Sometimes the accession of a new sovereign was made the ground for fresh demands on the re-grant of charters, and payment was always expected for the concession of new rights. All these receipts, from whatever sources derived, Were entered in the annual registers, the great rolls of the a ie of documents still preserved, and extending he _. ine from early in the reign of Henry IL. down An eign of William IV., when offices, long obsolete, and ae, , — Sinecures, were abolished. But for nearly ae nturies the financial history of England is con- Ew “i unbroken series of public records, carefully oon a, _ to year, and as carefully audited. And a the exchequer were exactly scheduled, so

Payments were checked, No mere order, even of the

it were counter- signed by some official—originally the treasurer—and therefore duly subjected to a formal examination.

It is reasonable to conclude that arbitrary taxation was, if not unknown, always unconstitutional in England. The strict definition of the crown’s rights in relation to revenue, which Domesday Book defended, and which the exchequer interpreted, naturally suggests that the rights of the subject were equally acknowledged and intelligible. Heuce it was a general opinion, pretty freely expressed when the administration was unpopular, that the king should live within that income, in ordinary times at least,

which had, under good management, been found sufficient for the dignity of the crown aud the good government

‘ of the kingdom. ‘The risk of the crown’s impoverishment, | and the consequent necessity of grants from the subject, made the English people exceedingly hostile to favourites, and Jed parliaments to recommend or even insist on a resumption of grants. The improvidence of Henry III. led to the Barons’ War. The worse improvidence of Henry VI.’s administration, when the crown was in abject penury, was a principal stimulant to the party of the duke of York. The last echo of this discontent was the dissatisfaction felt at the grants made by William III. to the Bentincks and the Keppels, grants which had to be revoked in part, and which were only confirmed in part bythe adroit manner in which the Whigs proposed to extend the same resumption to the estates bestowed on the numerous illegitimate chil- dren of Charles II.

One financial expedient, however, adopted, as is sup- , posed, at the instigation of Becket, and certainly introduced in the middle of the 12th century, had such lasting and peculiar effects on the fiscal and political system of the country that it should be explained. This was the commuta- tion of foreign military service for a fixed money payment.

The policy of Henry II. was to strengthen the revenue, and to make it the instrument of government, Beyond his immediate and obvious interests, the warning which he derived from the straits to which his great rival Louis VII. was constantly reduced was enough to make him eager to secure and perpetuate the means for carrying out his own designs. The expedient on which he hit led to three results, two of which had an overwhelming influence on the medizval history of England and of western Europe, while in the third was contained the solution of the greatest problem with which civilization has had to grapple, which ancient politics failed to grasp, but which is the

great victory of modern politics. The commutation of foreign military service for a fixed money payment was, first, the cause why the Norman settler and the subject Englishman rapidly developed a common sentiment against the royal prerogative ; was, secondly, the origin of that irresistible English army before which, till it was rivalled by the Swiss infantry, no

feudal levy could hold its ground ; and, thirdly, was the unwilling parent of representative government, of parliamentary control, and finally of scientific finance.

The king, under that system of reciprocal obligation between overlord and tenant which is called, somewhat loosely, feudalism, had a right to the military service of such among his subjects as held lands by military tenure. Sometimes, to be sure, as in France and Germany in the 11th and 12th centuries, the suzerain was not in a position to enforce the obligation ; sometinies, as in the kingdom of Jerusalem, the obligation was rendered stringent by the necessity of defence against a common enemy. It would seem that the position of the English king and Norman duke was intermediate to the above. There was no doubt that he could call on his subjects in England to do battle on behalf of interests which were indisputably insular, his

Norman subjects for such interests as were indisputably continental. But it was not quite so clear that an English tenant was bound to defend the transmarine interests of the English king, or that a Norman, a Gascon, or Langue- doc tenant should be constrained to vindicate the English rights of a Norman duke. But there was so much to be said on behalf of the king's claim that a compromise was possible, and it was so much to the advantage of the English monarch that such a compromise should be made, that the bargain known as escuage or scutage was struck between the English king and his barons.

Military service rendered by a military tenant was a tax in kind, In 1158 Henry IL laid claim to the great fief of Toulouse in right of his wife. If this fief could be transmitted through females, his claim, according to the public law of the time, was good. But another family had been in possession for nearly a century, and it was plainly inexpedient to the French king that his dominions should be completely girdled round, from Flanders to the Alps, by the fiefs of the English king, who, by various titles, had inherited or claimed the whole seaboard of France. The recovery, therefore, of the fief of Toulouse was sure to be an arduous task, and in effect Henry did not achieve it. But by bargaining for a money payment instead of personal

service he could supply himself with the most effective means towards the object aimed at. A feudal army was collected slowly, was destitute of solid organization, and was at once disbanded when the time of its service was passed. An enlisted army, paid and commanded by the sovereign, gathered by careful selection, and drilled with all the skill which the age possessed, was a far more efficient instrument of warfare.

The assize of arms under which the militia was enrolled defined the equipment of the national forces as precisely as those of Rome were defined under the so-called consti- tution of Servius. Each social order had its proper arms and place in the army. None but freemen were entitled to serve. But in the king's enlisted army a serf could be enrolled, and rise tu knighthood and even to nobility. During the long wars of Edward III. many such persons of originally ignoble birth became distinguished captains. The royal army became, like the church, the road by which humble merit might be promoted to rank and affluence. Such an army was highly paid, well drilled, rapidly man- ceuvred, and prodigiously effective. Though small, it easily routed hosts many times greater in nuinbers than itself. The chivalry of France went down before the English footmen at Crecy, Poitiers, Agincourt, and Verneuil, as the Persian armies were destroyed at Granicus, Issus, and Arbela, and as the native forces of India were routed at Plassy or Assaye. It is true that these English victories were ultimately barren, because the victors were too few to hold the country which they conquered. But in action, as long as the army was true to its drill and discipline, it was irresistible, and could only be beaten or dislodged in detail. Perhaps it is not too much to say that the tradition of these exploits has had a permanent effect.

'Again, the commutation first adopted in 1158 united the two races, Norman and English, in a common policy. In accordance with the spirit of the time the bargain was a record and a precedent. If it strengthened the king's military power, it weakened his civil power. The feudal a re not be unwilling to undertake a campaign pee te cs ey get plunder or glory, or the solid — ee mpi os and appreciated service. But it et collared — a = ee from which others The military tenant Wetied Xs criti Mone aca

cize the sovereign's policy

n undertaking foreign wars, and to demur to his demands | of giving validity to the grants of the clergy n thei

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crown was the free peasant. In little more than half a century after the bargain which Becket made with the

military tenants of the crown, the whole nation, church-.

men, nobles, burghers, and peasants, were united against John and his mercenaries, forced the Great Charter from him, and despite the anathemas of the most powerful pope which ever sat at Rome, insisted that the Charter should be maintained. The history of no European nation supplies a parallel to the events of 1215. It will be found also that this common purpose influenced the minds of all ranks of Englishmen, till, under the unhappy reign of Henry VI, the feuds of the nobles made havoc of English liberty for a century anda half. But it was during the period of national resistance to the excesses of prerogative,

ae, during the 13th, 14th, and the first half of the 15th

century, that those precedents were created which served the parliamentary opposition of the 17th century to such good purpose.

In the third place, the commutation of personal service was the true cause of parliamentary representation. It is known that the earliest traces of representation are to be found in those elections of county knights who were appointed to assess the contributions for extraordinary necessities which the irregular conucils or assemblies of the earlier Plantagenet kings had conceded. From local or county assessments to a national or general assessment, based on uniform principles, was only a step. At first there was no need that any but the country districts should be dealt with in this fashion. The resources and liabili- ties of the towns were well known, and the king could treat directly with the borough authorities. These rela- tions of the crown to the chartered boroughs is the explanation of those anomalous franchises which charaeter- ised so many of the boroughs before the Reform Act of 1832. At last, in 1265, Simon de Montfort summoned the

representatives of the boroughs as well as the counties, avowedly for the purpose of obtaining their adhesion to his policy, and the precedent was copied thirty years later by Edward I.

How the parliament gradually, through its control over the supply of funds for the extraordinary necessities of the crown, undertook tle cognizance and remedy of abuses, assumed legislative functions, affirmed its own privileges, debated political questions, changed or determined the succession to the crown, extended or narrowed the franchises of the electors, and criticized the royal administration and expenditure, is matter of familiar history. The origin of the English parliament was peculiar, as its place in modern European history was unique, till, at the conelusion of the 18th century, other countries began to imitate the forms and traditions of the English constitution, aud at last a free parliament has become a symbol and condition of constitu- tional government.

It has been stated that finance, during the Plantagenet and Tudor dynasties, consisted mainly in the occasional imposition of direct taxes. The crown made known its necessities, and the parliament declared the amount of sup- ply. Ata period which is not settled, the right or duty of originating supply became vested in the lower chamber. It is probable that this great privilege, to which the House of Commous owes its ascendency, but which was formally conceded ouly in the reign of Charles IT., was partly due to the willingness of the Lords to throw on the lower chamber the odium or dauger of refusing or cutting down the demands of the crown, partly to the original character of parliamentary representation,—the fact, namely, that 1b was called into being for the purpose of assessment. In course of time, the House of Commons assumed the i r Con-

for es : is . : ‘ : ror escuage. His natural ally against the power of the | vocations, a right which they angrily affirmed in the first

PeN AN C

session of the Long Parliament. Here, again, it is probable that the clergy had, at some period which cannot be now defined, attempted to protect themselves against the heavy demands of the king by putting their grants under tlie sanction of the popular chamber.

The direct taxes of the Plantagenet and Tudor times were percentages on the annual value of lands and tenements, property taxes strictly SO called on personal estate, and percentages on ecclesiastical revenues. The first two were granted by the secular, the last by the clerical parliament. Very early in the history of English finance, the district from which the tax was raised was assessed, and the assess- ment was made a permanent valuation. It seems tliat this was even done with the tax on personalty. The town, for instance, from which the tax was collected was set down at a fixed sum, and the sum thus fixed was raised rateably by the local authorities. Hence in the time of James I. the subsidies and fifteenths, as the direct taxes on real and personal property were called, produced less than they did more than three centuries before, though the money of the Stuart sovereign contained only one third of the specie which was coined in pieces bearing the same name in the 13th century, and prices had risen owing to the increasing cheapness with which silver was obtained. It is likely that the motive for maintaining the same assessment was that parliament might exactly understand the amount of the burden, and the extent of the aid given to the king. The taxingrolls in which the amounts levied are set down exist by thousands in the national archives, and might be made the material for illustrating the social condition and opulence of medieval England. Similarly the value of benefices was assessed and remained constant, the tax levied being a percentage on the nominal value as entered on the books of the pope or the king.

The tax levied on the clergy was always a higher per- centage than that imposed on the laity. It was reasonably argued that a tax on tithes wasa lighter burden than a tax on products or annual value, since the tithe-owner had contributed neither in labour nor capital to his share in the produce. Hence Edward I. demanded, in 1296, an Chormous percentage—a third—on the revenues of tlie clergy. The clergy had procured a bull from Boniface VIL, under which they were forbidden to pay taxes to lay persons, That this bull was obtained at their solicita- fon seems manifest, since the crown was in want of money for carrying on war with Philip the Fair, with whom the Pope was at constant feud, and against whom he would be likely to support any enemy. ‘The attitude which dward instantly assumed towards the clergy, the success which attended his policy, and the serious diminution in their privileges and prestige which followed from the expedient so

unluckily adopted, are matters of familiar history. From the time of Edward there are only faint and Occasional signs of that clerical independence which Te exhibited such vigour in earlier times, During the oth century the clergy had ceased to be a separate power vee state, though they exercised a great conservative intivence in the obscure politics of the Lancastrian and Yorkist period, a the king received taxes in kind, especially in that : cae export of English produce. It appears re a eeding was almost confined to England, pro- aa me cause the peace was better kept in England than “a ect – destitution was nearly unknown. Hence it a te “a puta heavy export duty on the produce, or, pale € same Jn effect, to sell it at a much higher — – ™. Was purchased at, by assuming a temporary

poly of the article. Such an expedient was adopted

oy Matin I in 1297, and several times over by Edward . € importance of

English wool to the Flemish

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manufactures was so great, and the trade was so easily manipulated by the English Government, that, from the time of Edward I. till that of Henry VIL, 2.e., during two centuries, the political sympathies of the Flemish were easily secured on the side of England through the agency of commercial intercourse. When Margaret of Burgundy gave a refuge to the Yorkist exiles, and sent forth pretenders to disturb the throne of Henry ‘Tudor, the negotiation of a commercial treaty with Flanders, the Intercursus Magnus, formed an effectual bar to her intrigues.

The direct taxes of the period before us were doled out sparingly and grudgingly. Sometimes, as in the minority of Richard II., they were appropriated, to use a modern phrase, by the hands of a body of commissioners appointed for the purpose. On the occasion referred to, Sir Richard Whittington was one of the persons selected to see that the moneys granted were duly applied to the war with France. It may also be stated that munitions for the defence of Cherbourg, saltpetre and sulphur, were sold to the Govern- ment of this time by Sir William Walworth, well known in history as the slayer of Wat Tyler, the leader of the Kentish insurgents in the

peasants' war. It is almost superfluous to say, that supply was granted on the condition that the grievances were redressed. In the early part of the 15th century, when it was seen that the officials of the court evaded the redress of that which the Commons prayed for and paid for, the practice became general of drawing up petitions in the form of bills, and thus of making the redress of grievances the basis of a legislative act.

It is a common-place with historians to assert that the right of the crown to purveyance, ¢.¢., to provisions and labour, purchased at market rates, or distrained for royal works, was a serious grievance in the Middle Ages. There is no evidence that it was so. The present writer has read many thousands of medizval accounts, and has rarely found that the forced purchases of the crown were treated asa wrong. Sometimes a great courtier, such as was the younger Despencer in the reign of Edward IL, usurped a right which belonged to the crown, and injured the proprietor. But, as a rule, the crown paid its way honestly during the Plantagenet period. It was especially in the reign of the first two Stuarts that the grievance of purveyance was felt. But the discontent was due to the fact that the crown had determined on paying for supplies at the old rates of value which prevailed before the currency was changed and prices had risen. Such a system put on the county, through the justices at quarter sessions, the cost of the difference between nominal and market rates ; and the crown, when the supplies were not forthcoming from the county, purchased on its own account, and forced the county to pay extravagant, perhaps factitious, prices for that which it had failed to purvey. An additional cause of discontent was found in the fact that, though purveyance was claimable only while the king was in the district, the Stuart kings demanded the contribution when the court was in London, or at any rate at some distance from the locality which was charged, and often overcharged for default.

In the 14th century a practice of making voluntary gifts to the crown began. Stories are told of Pole and Whittington having made presents or loans to the king, and of the latter having cancelled the king's debts at a banquet which he gave to his sovereign. In the 15th century the voluntary gifts of rich men were modified into a system of begging, under the name of a benevolence. It is probable that the extreme poverty of the crown during the latter years of Henry VI.'s reign, and the growth of partisan spirit among the

nobles and gentry of this time, may have led to the practice becoming common. At any rate the custom became general during the twenty-five years of

Yorkist ascendency. That it was exceedingly unpopular is |

shown by an Act of Richard IIL's single parliament, in which benevolences were declared illegal. The successors of the usurper pretended to treat this statute as inoperative since it was enacted during an illegal government. Henry VIL. and his successors constantly supplemented their revenues by benevolences. Chancellor Morton's fork, by which parsimonious and expensive opulence were equally invited to aid the king's necessities,—the one out of savings, the other out of expenditure,—is well known. The practice continued down to the eve of the Long Parliament, if indeed it can be said to have ceased, as far as the Royalist party was concerned, before the final collapse of Charles L.'s fortunes at Naseby. It was a commonplace with the courtiers of the day that the king might, if he wished, take the subject's wealth without asking leave. On the other hand, they who refused professed that they were restrained from giving by tlie anathemas of the Great Charter, by which those were denounced who violated any of the provisions which the Great Charter contained, and notably that by which common assent must be accorded to taxation. Anticipations of revenue by loans were common. The foolish project of Henry IIL., which was set on foot in order to secure the throne of Sicily for his second son, more accurately in order to enable the pope to crush the reigning members of the house of Swabia, loaded the king with debt, and, forcing him to consult his nobles as to the means of liquidating his obligations, gave an occasion for Simon de Montfort's abortive political and financial reforms. The long wars of Edward III. compelled him to make loans, and ultimately to repudiate his debts; and we are told that his bankruptcy brought down some of the most opulent financial houses in Florence. Henry VIII., who squandered the enormous treasure which his father had accumulated, and afterwards the great personal estates of the church, and finally its lands,—reputed, and perhaps with reason, to have been, in the wealthiest age of its existence,

one-third of the fertile land in the kingdom,—constantly incurred large debts, from which he was relieved by his cbsequious parliaments. Charles and his son incurred debts which were never paid, and Macaulay does not misstate the case when he says that public debt was not incurred for the first time at the Revolution; what did happen was the satisfaction of the obligation to pay the interest and, if possible, the principal.

One of the financial expedients of the Middle Ages, and indeed of much later times, was a depreciation of the cur- rency by means of issues which, nominally of the same value with an older issue, were intrinsically below it. This is not the place in which one might point out how disastrous and suicidal a policy it is to tamper with the currency, how mischievously the forces of Government are employed when they undertake this kind of fraud, and how enduring are the calamities which result from so great a political crime. Not a little of the stability and progress of Eng- land has been due to the fact that dishonesty on the part of Government in dealing falsely with the currency has been a very rare offence,—has, indeed, been committed only within a short but continuous period. The evil, however, which the action caused to England, even for so short a time, was so great that it reduced this country from the position of a first-rate to that of a third-rate power in Europe for more than a century.

At the close of the 13th century, the pound sterling con- tained what its name imported, a pound weight of silver, of 11:2 fineness,—the penny, which was the commonest coin, containing the 240th part of a pound. Between this period and the first quarter of the 16th century, the penny was reduced to one-third of its ancient weight. But there is

was the practice to pay by weight and not by tale. It is inconceivable that the crown would, for the sake of a temporary gain, have sacrificed the fixed or quit rents, which constituted, after the beginning of the 15th century, the greater part of the revenues raised from crown lands and regalian rights. Besides, the evidence of prices is eon- clusive as to the alternatives that the value of silver must either have quadrupled in the 15th century, or that pay- ments must have been made by weight, for during three- fourths of the 15th century the prices of the necessaries of life are much lower than they are in

the 14th. Durmg the whole of this period, however, the coinage was kept to its customary standard of fineness, and therefore no un- certainty was induced upon pecuniary transactions.

In 1543 Henry VIII. commenced an issue of base coin. At first the alloy was only one-sixth of the silver; but in 1545 a second issue was put into circulation, in which the alloy was one-half, and in 1546 a third issue only contained one-third of silver. Henry died on January 28, 1547. The guardians of his son continued the practice during the first five years of his reign, coining money in 1547 which was only one-third fine, in 1549 of one-half fineness, and in 1551 of only one-fourth fineness. An attempt was made at the conclusion of this reign to issue a coinage of genuine quality, but as the base money continued in eircula- tion, the attempt wasfutile. Mary was anxious to restore the ancient standard, but found it impossible to do so. Elizabeth called in her father's and brother's base money at a low fixed rate, which gave her a considerable profit, and put into circulation money of the old character and quality. This was effected in 1560, so that England suffered from the evils of a base currency for seventeen years. The effect was disastrous in the highest degree, for it impoverished the nation, and for a long time disabled it from filling that place in Europe which it had occupied for centuries before.

Among the sources of the royal reveuue, the ancient customs of tonnage and poundage occupied an incon- siderable place. These were dues levied upon exports and imports, and seem to have been yielded from the earliest times. They are justified on the ground that the sovereign was under the obligation of maintaining the police of the narrow seas. Attempts of a more or less successful kind were made for the purpose of securing this part of the revenue by limiting exports and imports to certain towns, and particularly by fixing the market of exports in particular localities, known as towns of the staple. Thus, for a long time, Calais was by law the sole market of English wool, and the West of England tin was sold at Bodmin and some other Cornish towns. Towards the latter end of the 16th century the growth of foreign trade was rapid and considerable. But the old dues 07 exports and imports, which had been granted to the crown

on the occasion of each accession from the 15th century,

were small.and inelastic. An attempt was therefore made to revise them, and in 1608 Cecil, James T.’s minister, drew up a new book of rates. e. It is well known that these new taxes, for the imposition of which many plausible reasons were alleged, were the commencement of that quarrel between king and parliament which culminated in the civil war. The law courts decided in favour of the crown, and it does not appear that at this time the special scandal of the Stuart government,—th® practice, namely, of displacing such judges as gave deci- sions on points of constitutional law or public justice that were distasteful to the sovereign,—had commenced. _ But, on the other hand, it was seen clearly enough that, if the crown could, at its own discretion, impose what taxes 1 pleased on trade, the checks which parliament might impose

reason to believe, from direct and indirect evidence, that it | on the administration would be annihilated. In point ob

fact, the Book of Rates had very much this effect. Practically there was no parliament between, 1610 and 1621, for the parliament of 1611 was dissolved without passing a bill or making agrant. But in the latter part of this period, owing to the skill and energy of Cranfield, the first of English financiers, the king was relieved from his debts, and put in possession of a revenue which was independent of parliamentary supply under ordinary circumstances. The election of 1621 was simply due to the outbreak of the Thirty Years’ War, and the disastrous condition to which the king’s son-in-law was reduced.

Another expedient by which the crown strove to in- erease its fiscal receipts was the grant of monopolies. It seems that the creation of a trading company, and the accord of special privileges to those who founded a market in those regions which were opened up to trade by the discovery of the Cape passage and the New World, was deemed to be incontestably the province of the crown. The houses of parliament could not have ventured on criticizing the action of a chartered company, much less have pretended to define its privileges. Now the papal see had granted to Spain the whole of the New World, or at least such parts of it as were in any way inviting, and had made a similar grant to Portugal of the district which lay on the road to

India. By the death of Cardinal Henry in 1580, the succession of Portugal passed to Philip II, who thus united under one rule the West and the East. But the Dutch were now engaged in the War of Inde- pendence, and were assisted by the English, though war had not actually broken out between England and Spain. The war came at last, and the Eastern possessions of Spain were obviously the most convenient spot in which the power of Spain might be attacked. There was every reason, then, in according trade privileges to a company which had to contend against the power of Spain, to build forts and factories in which trade could be secured and extended, and to deal discreetly with rivals who were associated with Protestant England by a commou European interest, but were sooner or later to come into collision in Inore distant regions, The massacre of Amkoyna was the beginning of those differences which culminated in the wars with Holland during the protectorate and after the mon- archy was restored. On December 31, 1600, the first East India Company was created by charter. So far was the revenue from being the better for this charter that the queen granted the company an exemption from customs duties for the first four of their voyages.

From the undisputed power of granting charters for the monopoly of foreign trade there was only a step to the grant of monopolies to the home trade, though of course always on the plea that the monopoly was really a control which it was in the public interest to exercise. It is well known that, when these monopolies caused discontent, Elizabeth graciously cancelled them. They were renewed by James, were again the subject of remonstrance, and were abandoned by tha king with so little conciliation that the surrender of the practice gave no great ground for gratitude. The other fiscal expedients which James adopted were the creation of a new title which was conferred by purchase, the sale of peerages, and the rigorous exaction of feudal rights. In the parliament of 1610 an attempt was made to cancel these rights by commuting them for a fixed payinent, which, if the scheme had been accepted, would have taken the form of a quit rent on all estates held on military service by tenants of the crown. But the scheme failed, probably as much from a disinclination on the part _ the parliament to aid the prerogative by granting the

Ing a fixed revenue, as from any dispute over the amount

of the commutation. The whole subject has been ably and |

judiciously treated by Mr Gardiner, whose conscientious and painstaking histories of the earlier Stuart period are of the utmost value to the student of finance aud politics,

Hitherto, the history of English finance has been that of the process by which the Government attempted, with more or less success, to derive a revenue from direct taxa- tion. Cecil and James I. discovered that a fruitful source of increased revenue was to be found in the customs and a new book of rates, and the Commons as clearly saw that in this fiscal expedient lay the whole issue of the debate between parliamentary control and the royal preroga- tive. The struggle began with the accession of Charles. The independence and privileges of parliament, the desire to obtain certain guarantees for that kind of church government which represented the dominant feeling of most Englishmen, were the objects of those who constituted the parliamentary opposition to the court; but the machinery by which these results were to be effected was finance. No one can understand the politics of the first fifteen years of Charles I.’s reign who does not detect that the parliament intended to bring the king to terms by stinting the revenue. The struggle began with the first parliament of Charles. The parliamentary leaders imagined that they had won the victory when they secured the Petition of Right. The king interpreted that concession in another way, and was supported by legal advice in the view which he took. During the long interval between the third and fifth parlia- ments of Charles, the king tried every expedient by which to raise arevenue. Clarendon’s statement that the country was peculiarly prosperous between 1629 and 1640 is undoubtedly correct. But the country determined not to let Charles have his way, and the resistance to his financial expedients was only the prelude to those measures which the Long Parliament at once adopted when it met.

During the period which intervened between the dis- missal of the third and the summons of the fourth parlia- ment, Charles adopted various fiscal expedients in order to fill up the deficiency of his finances. They were all, except the rates levied on imports and exports, forms of direct taxa- tion. Such were the compositions in lieu of knighthood, the annual payments

made by chartered monopolies, the resumption of lands which were said to be encroachments on the royal forests, the fines of the Star Chamber, and in particular the fine of £70,000 imposed on the city of London, and lastly ship-money.

In the earliest times, the maritime towns, and especially the ports in the south-east of England, were liable to be charged with the duty of the national defence at sea. The privileges of the Cinque Ports were connected with this duty of defence, and it appears that the sailors of these ports needed very little persuasion to undertake a duty in which privateering differed little from piracy. Sometimes these irregular forces did good service. The victory of the Cinque Ports over Eustace the Monk in 1216 had even more important results than the battle of Lincoln. The navy of Philip of Valois was annihilated at the battle of Sluys by the same kind of force, and Edward III. was freed from rivalry on sea. In later times the piratical ventures of Hawkins and Drake had royal patronage, and it is said that some of the families who purchased titles from James I.—notably the Riches—had gained their wealth by expe- dients very similar to those which were familiar to the Algerines, and that their expeditions were as equivocal as those of the Mediterranean pirates. Not a few men who had won their wealth as buccaneers spent a calm and respectable old age in England. There was no hardship felt in the demand occasionally made by the crown, that the seaboard towns and counties must defend the realm at sea.

The first writs of ship-money in 1634 were levied on the

maritime counties only. The second and third of 1635 and 1636 were imposed on the inland counties as well, the judges affirming, at first privately, and afterwards, on Hampden’s appeal, by a majority, that the crown could levy the tax at its discretion and without the consent of parliament. Itseems that the tax yielded about £200,000, though it is said that after the judgment in Hampden’s case, the payments were more reluctant and irregular than they were before the judges affirmed the legality of the impost.

ie civil war broke out in the autumn of 1642. The king was better off for soldiers, the parliament better off fur money, and in the end the possession of adequate funds supplied the means by which the single advantage which the king possessed was neutralized. These were afforded by the new forces which Cromwell drilied effectively and paid highly. Not only was London, always in the interest of parliament, richer than all the towns in England put together; not only was the eastern district of England untouched by the war; but Norfolk was by far the most wealthy and populous district in England, as Yorkshire and Lancashire were the poorest and least populous. The resources, therefore, from which the parliament could pro- cure its means were ample and easily obtained,

In 1643 the parliament imposed an excise on beer and ale within all the counties which acknowledged their authority, They also levied a heavy tax on tobacco and wine, and on other articles of consumption. The project was denuunced by the king as an act of unheard-of oppres- sion, but was soon imitated in the royalist district by the parliament which sat at Oxford, though, after it had made this grant, it did not meet again. In 1646 the par- liament abolished the old feuda] dues, turning all tenures into common socage. Itis said that between the outbreak of the civil war and the year 1647 the parliament raised more than forty millions in the counties which they governed. Among other expedients, the Protector in 1656 estaltished a general post office. According to the theory advocated by the crown lawyers at the Restoration, that all acts of the parliament from the date of the rupture with the king in the summer of 1642 were void, the old feudal liabilities were revived with the monarchy, and also, by implication, the royal privilege of purveyance. But as the country had been quit of these liabilities for fourteen years, the revival was felt to be an intolerable burden, and by 12 Charles II, cap. 12 they were extinguished. In common justice this emancipation should have been compensated according to the bargain nearly completed in 1610, which was known as ‘“‘the great contract,” by a land tax specially levied on lands which had hitherto been subject to feudal dues, and such an arrangement was proposed. But the cavalier party, now in the ascendant, contrived by a bare majority to carry a measure by which the king obtained the hereditary excise in lieu of his feudal dues, duties being imposed on beer, cider, perry, mead, spirits, coffee, tea, sherbet, and

chocolate. Parlianient also gave the king the old tonnage and poundage for life.

The excise was an expedient borrowed from the Dutch. In the long War of Independence, the people of Holland were constrained to make great loans, and to pledge their revenues to pay interest on tliese loans. The debt was almost all held in the country, and to meet the charges the Dutch financiers imposed taxes on all articles of consump- tion, whether necessaries or luxuries, on commercial transactions, on births, marriages, and deaths, on succes- rt pe ieee A Dutchman in the 17th century was “i aie Se cradle to the grave, and the expedients of

neiers formed for a long time a series of precedents from which other countries borrowed largely. In effect Holland was the source of modern finance, and

proved how taxation, though apparently of crushing weight, could be easily endured, if it were counterbalanced by industry and thrift. In point of fact, only a few years after the disastrous war with the English Commonwealth (a war waged quite as much for the political reason that the Dutch democracy, always inclined to the House of Orange, which was counected by marriage with the Stuarts, favoured the English exiles, and insulted or even murdered the English envoys, as from motives of commercial rivalry), the state of Holland contrived to reduce the interest on its debt of nearly fourteen millions sterling from five to four per cent. by the threat of paying off the principal. In the same period this state established, for the first time, a genuine sinking fund, by which, principal and interest being paid together, the debt of fourteen millions was to be com- pletely extinguished in twenty-one years. The rate of interest in England at this time was eight per cent.

During the reign of Charles II. the English nation increased greatly in opulence, especially through its foreign trade. But its internal trade and industry suffered severely by the appropriation in 1672 of the goldsmiths’ loans. The goldsmiths of London, who during the civil war had undertaken the office of bankers to the London merchants, and took in money at call, or at short notice on rates of interest, bad lent these deposits to Charles, in

anticrpation of revenue, to the amount of more than a million anda quarter, at eight per cent. At the instigation of the Lord High Treasurer Clifford, the king suspended the payment of interest on this loan, for one year only, as he said. But the obligation was never acknowledged, and in 1701, nearly thirty years after the exchequer was shut up, the bankers' debt was treated as a national debt, on which three per cent, interest was to be paid, but which might be redeemed on the payment of a moiety of the principal. It is the oldest portion of the English public debt. In 1720 it became part of the South Sea stock.

Finance became a science in England at the Revolution. The immediate effect of the deposition of James was an alliance between England, Germany, Spain, and Holland, and a declaration of war against France. The war lasted for rather more than eight years, and was concluded by the peace of Ryswick. Now the founders of the English Revolution were determined that for the future the crown should be dependent for its supplies on the pleasure of parliament, and especially that its foreign policy should be held in check by the control of supply. There was the greater reason for this policy at the moment, for it was quite understood that the expulsion of James implied war with France, and that such a war, carried on as it would be by the vigour and determination of William, must be prolonged and costly. In 1688 the revenue was derived from (1) tonnage and poundage, (2) the hereditary excise granted in lieu of the old feudal incidents, (3) the profits of the post office, (4) the hearth money, a house tax, and (5) the grants made in the parliament of 1685 for eight years, The income derived from these sources has been variously computed at two millions to two and a half millions, and the receipts from the excise and customs were steadily increasing. William was under the impression that this great revenue was vested at once in him by the change of the succession,—a view which was supported by several Whig lawyers, who urged that, as long as the late king lived, these duties were payable, but that they were to be enjoyed by his successor. But the political Whigs thought differently. They determined, and they carried without opposition, that a fixed revenue should be settled on the crown during time of peace, that this revenve should be divided into two portions, one for the household and the civil expenditure, the other for the public defence and other analogous charges. It is true that they must

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have contemplated the immediate contingency of war, and have known that the sum at which they fixed the revenue would be wholly inadequate for the emergencies which would arise; but they were affirming a principle which should be permanent, while the contingency to be dealt with was temporary. It appears that the attitude taken by the parliament gave deep and lasting offence to William, and that the distrust and dislike which marked the relations of crown and parliament during this reign, and prepared the reaction under Anne, had no other origin than the settle- ment of the revenue by the convention parliament.

The parliament further determined, once for all, to affirm a principle, occasionally acted on in past times, and funda- mental to the concession of extraordinary grants, by which all supplies, other than tlie civil list and the hereditary estate of the crown, should be strictly appropriated to the objects for which they were granted. The demands of tlie crown in the Middle Ages were generally for public objects, in which the whole community was reputed to be interested, though sometimes, in accordance with the theory of the age, they were acknowledgments for favours received, petitions granted, or pardons allowed. They were therefore ordinarily granted to the exchequer, and no limit was put on the objects for which they were to be expended. But, as we have stated above, appropriations were made in the minority of Richard IT. and of Henry VI., in the Jast year of James L., and pretty frequently after the Restoration, greatly to the disgust of some among the courtiers, wlio conceived that tle prerogative of the crown was dangerously invaded, if Charles were disabled from diverting parliamentary grants from special objects to those which the king might be pleased to select. But from the Revolution the Appropriation Act has always denounced severe peualties on any minister of state, or head of department, who converts supply voted from one branch of the service into any other direction. The trial of Lord Melville, in 1806, illustrates the manner in which a parliament, otherwise disposed to trust implicitly in the Government, resented the apparent breach of a fundamental principle in English finance.

The settlement of the revenue on William and Mary left the parliament in the possession of a surplus of £800,000, the difference between the grants made to James and the sums actually settled on the crown. But £200,000 of this was immediately remitted by the abolition of the hearth tax or chimney money. The nation had also incurred a debt to the Dutch of £600,000, which was repaid at once. To meet these charges, a sum of rather more than £400,000 was voted, to be raised by monthly instalments, and as a security for borrowing £370,000 at Six per cent. in order to meet immediate requirements. The expedient of anticipating revenue by loans at short dates was very ancient, and is indeed obvious. At first, the Government of the Revolution, feeling its way cautiously, raised loans on short periods, at high rates of interest, and pledged particular taxes for the payment of the principal and interest. These taxes were—new excise duties, 2.¢., taxes on consumption ; a monthly assessment, 7.e., a direct tax on income ; and a quarterly poll tax, which of course Was graduated. A resolution was, moreover, passed by the

ouse of Commons, by which it was proposed to lower the salaries of all offices under the crown to £500 a year maximum, with the exception of certain cases. It took no effect, and was indeed a mere expression of dissatisfaction = 7 Cnormous gains of official statesmen. Nothing a lower political morality during the latter part of ie and the whole of the 18th centuries so much as

ormous perquisites which officials enjoyed. ae a loan was raised on the basis of a tontine. — a lent was familiar to Italian financiers, and was Probably suggested by the life loans of the papal Curia.

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It combined a limited security with the charms of survivor- ship,—a kind of lottery which is very often found to be attractive, unless, as is generally the case, the tontine is employed as a speculation by those who put selected lives into the loan, Tontines have been employed by English financiers as a means for raising money up to the begin- ning of the present century. On this occasion, when a million was advanced on the security of additional excises to be levied on beer and ale, interest was paid to all subscribers at the rate of ten per cent. for seven and a half years, after which date £70,000

per annum was to be divided among the survivors, till the number was reduced to seven, when the annuity of each was to revert to thie public on his decease. In order to stimulate the operation of this loan, persons were allowed to nominate lives at ten per cent. on the capital invested on each life. Although the latter offer was equivalent to selling annuities at less than half their value, the loan was raised with difficulty. But the capital expedient of 1693 was the imposition of the land tax. Willing as the parliament was to extend the area of indirect taxation, it was impossible that landed estates should be allowed to go untaxed, especially as, within half a century, nearly el! taxation had been derived from the contributions of land and property, and, as it was remembered that the emancipation of the military tenancies was effected at the expense of the general public. But the Government did not venture on departing from the old principle under which the subsidies were collected, that of making certain local authorities responsible for the assessment, or rather of relieving them of all virtual responsibility. The tax was fixed at four shillings in the pound on the profits of land and personal estate, the latter being taken at six per cent. But from the very beginning the assessment was unequal. It is said that those districts which were favourable to the principles of the Revolution assessed themselves fully and fairly, but that those in which Jacobite views were in the ascendant greatly understated their liabilities. It appears, too, that the assessment of personal estate was soon lost sight of, or rather merged in an aggregate local charge. In point of fact, no revaluation was made. Hence the estimated rental of agricultural estates remained unaltered, aud the assessment of the towns, which was also taken as a fixed quantity, was imposed on the owners of property, the capital of the towns- folk and traders being merged in the value of the premises. For example, if the assessment of a town was £1000 in 1693, this sum including both items in the land tax, the same assessment was charged whenever the full land tax was imposed. But the inhabitants of the town had the right of redistributing the fixed assessment on the property contained in the town, as the value of individual holdings was increased or diminished by the outlay of the owners, or the depreciation of the premises. The land taxes, therefore, in the county districts became virtually a secured rent payable to the crown; in the towns it became a tax on improvements, though the amount was not considerable enough to discourage improvement. It was Adam Smith’s opinion that in his time there were districts in which the land tax was half

what it professed to be, animpost of four shillings in the pound on rents. Since the great increase in the rent of land, owing to the great improvements which have been made in the art of agriculture, the land tax is nowhere heavy, and in some districts is trivial.

Taxes on the rent of land, cr on its value as property to be rented, constitute a far larger percentage in the budget of foreign countries than they do in England. In the reign of William and Mary it is true that the land tax, where it was fairly assessed, was a very considerable impost, and the country geutlemen easily fell in with the pacific projects of Walpole, when he coupled them with the fact of a reduced

land tax, and a prospect that the tax would be abrogated altogether. But as, owing to the increasing value of land, and the growth of the system of indirect taxation (the principal expedient of English financiers during the 18th and the first half of the 19th century), the land tax became absolutely and relatively a decreasing charge, taxes on the rent of land ceased to be an important element in the national budget. Adam Smith informs us that in Prussia the land tax on secular estates was from 20 to 25 per cent. of the revenue, on ecclesiastical 40 to 45. In some European countries Jands held by a noble tenure were taxed at a slightly higher rate than those held by a base tenure. In France, on the other hand, lands held by a noble tenure and the lands of the clergy were exempt from land tax, while the burden of direct taxation fell exclusively on those held by a base tenure. The inequality of this system, its injury to the revenue, and the still greater wrong which it inflicted on those who were liable to the tax, were constantly commented on by those French writers who made finance their study, and par- ticularly by the Economists, whose peculiar views on the nature of taxation were an exaggeration of what contained a serious and important truth. But the interests which profited by the inequality were too strong for any reform. They were at last sacrificed by a revolution, much of the bitterness and ferocity which accompanied the change having been unquestionably due to the sense of injustice felt at the extreme unfairness of the feudal taille.

The next expedient was that of borrowing money on lotteries. There are instances of state lotteries before the Revolution, One was drawn in 1568, with the object of improving the harbours; another was held in 1612 and subsequent years, for the benefit of the Virginian colonists. But the parliament of 1620 presented these lotteries as a grievance, and they were discontinued by an order in council. In these later lotteries the Government found it impossible to dispose of the tickets except by granting at the same time annuities at exorbitant rates of interest. In course of time, when the English people became more inclined to speculation, lotteries became a profitable means of raising money, though they had such disastrous effects on public morality that they were ultimately discontinued. In the year 1693 loans were raised on the security of stamp duties, now introduced for the first time, and on the tonnage of ships. The charter of the Bank of England was granted at the same time in exchange for a loan of £1,200,000, the security of the loan being generally the assignment of one half the additional excise duties. These duties were now imposed without any limit of time. Hitherto indirect taxes had been granted for fixed periods. The negotiations which led to the foundation of the Bank of England contemplated a permanent debt and a permanent fund from which the interest of the debt was to be paid.

The relations of the Bank of England to the finance of the country are as important as the effects which it had upon trade,—in the early part of its career were far more important, for the private bankers were already fulfilling many of the functions of commercial banking. But the Bank of England was from the first the banker of the Government, managing its revenue,—for which it received on its foundation £4000 a year,—anticipating its revenues, putting its securities into circulation, and assisting its credit at emergencies. It was, in point of fact, from the beginning a grcat department of state, and so obvions ue ue the public Opinion of the time, so dangerous were . pon ers, that provision was taken in the Act by which it

constituted, that if it advanced to the Government any moneys on the credit of the public revenue without the sce of parliament, it should forfeit treble the sum Which it had soadvanced. Moreover, the Bank of England,

by virtue of its financial power, became a great political institution, existing by and for the principles of the Revolution; and to it much more than to the public debt niay be applied the statement of Bolingbroke that, while the taxes necessary for the expenditure of the eight years' war might have been met by taxation within the year, the Government of the Revolution preferred to incur debt, because the holders of the public securities were thereby interested in the maintenance of the new settlement.

A singular tax was imposed in the year 1694, that on inarriages, births, and burials, on bachelors and widowers, These taxes were graduated, rising from four shillings on the burial of the humblest person to £50 in the case of a duke or duchess. The duty on births ranged from two shillings to £30, on marriages from two and sixpence to £50, on bachelors and widowers from a shilling a year to £12, 10s. In the same year taxes were imposed on glass, stone and earthenware, coals and culm. In the next year the currency was reformed, the Government conceiving it expedient that the cost of restoring the clipped and ham- mered money should be borne by the nation.

During the period in which the old money was being called in, and the new coinage struck and issued, the country was in the direst distress. But the fertile genius of Montagu, now chancellor of the exchequer, invented exchequer bills. Long ago, exchequer tallies, 7.e., certi- ficates of indebtedness on the part of the exchequer, had been iu circulation, or at any rate been negotiated. But the first exchequer bills—these did not bear interest—were virtually a Government paper based on the security of the revenue, and intended to be a temporary substitute for the currency, now deficient, but in course of restoration aud extension. They came at a critical time, and supplied an urgent want. Thus they were an immediate success. They helped to sustain mercantile credit, they lightened the burden of pressing charges on the revenue, they supplemented the weakness of the currency, and they thenceforward formed part of the machinery of English finance, The second issue of exchequer bills bore interest at 5d. per cent. per diem, 7.¢., a little over 74 per cent. per annum. These instruments of credit were put into circu- lation in amounts from £5 upwards. Exchequer bills survived a risk which has been fatal to similar instruments, for in 1698 it was discovered that an extensive forgery of them had been perpetrated, for which some few persons were punished, though the greater criminals

escaped. In 1696 the malt tax was first imposed. During the reign of William the whole amount of receipts for revenue was a little over 72 millions, ¢.e., rather more than 53 millions annually. Of this amount, about 344 millions are obtained by indirect taxation, about 213 millions by direct taxation, 21 millions from the post office and the hearth money, and nearly 134 millions remaiued as debt. The expenditure was about 45 millions on the public service, nearly 9 millions on the civil list, and rather more than 18 millions on various objects, includiug repayment of debt.

In forty years, then, the English financiers had found out how elastic and fertile indirect taxation is. We shall see in the course of a century and a half how they used their discovery, and improved on it. Hitherto most of the indirect taxes had been imposed temporarily ; the policy on which the country was about to enter necessitated their perpetual imposition. Thus, for example, the malt tax, having been a temporary tax in the eight years' war, was revived and made a permanent tax at the beginning of the war of the Spanish succession. The principal sources, however, of the extraordinary revenue needed for this war

were customs and excise, land taxes, stamps, and similar

duties, and loans. The amount of debt contracted during the period was a little in excess over that obtained by the

Jand tax, the land tax being less than two-thirds of that obtained by indirect taxation. The form in which the loans were raised was annuities on lives or on terms of years, granted on disadvantageous conditions, lotteries, and the funding of floating debt. The latter operation was mn part undertaken by the Bank of England, which thus con- siderably eularged its capital. The rate of interest was about 6 per cent., and it appears that the form in which the loans were contracted was the best method after all in which the Government could borrow.

A still larger operation was attempted by Harley in 1710. A new company was formed, which was to take the unfunded debt, amounting to more than 19 millions, to receive 6 per cent. on the sum, with £8000 a year for

expenses of management, and in consideration of having performed this financial operation for the Government, was to be invested with the sole privilege of trading to the South Seas. ‘This was the origin of that famous company which ten years afterwards obtained so scandalous a notoriety. In 1715 the aggregate fund was established. Numerous taxes had been made perpetual, and the Act creating this fund directed that the proceeds of these taxes, with the surplus of other revenues, and all other public money, should be brought into the exchequer as a collective quantity. But by this time the whole revenue of the country, with the exception of the annual land and malt taxes, had been pledged to the various loans contracted during the two wars which followed on the Revolution. An attempt was imade to lighten the burden of the debt in another direction of finance, 7.¢., by diminishing the rate of interest.

Shortly after the peace of Utrecht the rate of interest began to fall, and continued to decline till it became pos- sible to make use of the fact for the purpose of effecting a considerable reduction in the annual charge of the debt. An attempt was therefore made in 1717 to obtain a small loan at 4 per cent. The project was permature as yet ; only a trifling sum was subscribed, and at last it became necessary to raise the rate to 5 per cent. But in order to consolidate parliamentary credit, the Government of the day created three new funds in addition to tle aggregate fund of 1715. These are called the South Sea fund, the general fund, and the sinking fund. The aggregate fund was the guarantee under which the Bank of England conseted to accept 5 instead of 6 per cent. on their capital, and to circulate exchequer bills at a very low rate of interest, The South Sea fund was the security afforded by the perpetual duties appropriated to the South Sea Company at the foundation of that corporation, the Interest in this case being reduced also from 6 to 5 per cent. In order to pay off such public creditors as were unwilling to submit to the reduction, the two companies agreed to advance 4} millions at 5 per cent., and certain taxes granted heretofore for terms of years were now made perpetual, under the name of the general fund. By these financial operations a saving of more than £300,000 a year was effected. The sinking fund consisted of the surpluses derived from the several other funds, which were to be employed for the extinction of debt, and for no other purpose whatever. The policy of these arrangements, particularly the latter, was soon approved by a considerable rise in the value

of stocks. Thus, for example, South Sea stock, which was worth 1003 at Ladyday, rose by Michael- mas to 1114. In the same year, too, the first vote of credit was taken, in expectation of a threatened invasion by Charles XII. of Sweden. The vote was indeed strongly resisted, and as tlie majority by which it passed was very slender, Townsend, Walpole, Methuen, and Pulteney were put out of office or resigned. In 1719 the surplus of the three funds referred to above, amounting to over £400,000, Was applied to the reduction of debt.

-whien it should be reduced to 4 percent.

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In 1720 the celebrated South Sea scheme was projected. It gives some colour to the opinion of those who hold that commercia! and financial follies are epidemic, that a scheme far more disastrous in its effects than the South Sea bubble was put into shape the year before in France, when Law floated the Mississippi Company. In the month of November 1719 the nominal valne of tlie stock of the French company was 18,000 millions sterling, a sum which the statists of the age reckoned at 180 times more than all the currencies of Europe put together. Both projects were trading companies, and in both companies the grant of trade privileges was made the occasion for negotiating terms with the public creditor through the agency of the company. The immediate object of the negotiations entered into with the South Sea Company was the reduction of what were called the irredeemable aunuities, created for long terms of years during the wars of William III. and Anne. It is probable that the proposals of the company would have been, to judge from the success with which the conversion of the various stocks in 1710 was effected, financially satis- factory. But unluckily the other great financial corpora- tion, the Bank of England, bid against the South Sea Company, and in this rivalry the latter offered terms, which were finally accepted, under which the company contem- plated the purchase of the whole national debt, to be repre- sented by a total capital of 434 millions, for which they were to receive interest at 5 per cent. The magnitude of the operation, the difficulty sure to arise when attempts were made to obtain bona fide subscriptions for the large amount which would be required in order to complete the bargain, and the reaction certain to ensue

as soon as ever a check was given to the operation, were lost sight of. It was not perhaps so remarkable, when it is mentioned that the very manner of the negotiation between the company and the Government pushed up the price of the original stock much beyond its natural value, a rise which the directors of the company were not slow to take advantage of, and that the stocks of other companies which could offer no exceptional prospects of profit were raised to nearly as absurd a price as that of the South Sea. The directors of the conipany took advantage of the fictitious price which the stock had reached, and created shares at or near the market value of their stock. As the fever of speculation reached its height, the directors exalted the price of their shares, and it seems even contemplated an issue of stock at the price of ten times its nominal amount. By midsummer the advanced prices of all public stocks are said to have reached a market value of 500 millions. Before the books of the company closed on June 22, the directors had negotiated for all the irredeemable debts of the Government. On August 12th they dealt with the redeemable debts, amounting to nearly 144 millions, at the price of 800. When parliament met in December, the price of South Sea stocks had fallen to 200. In the interval, however, the directors declared a dividend of 30 per cent. at Christmas, and pledged themselves to a dividend of 50 per cent. for the next twelve years. This might perhaps have been pos- sible had the subscribers made good their payments, had the directors been able to place all their stock at the nominal prices, and if all their loans were repaid. But the payment would only have been temporary, and both principal and finally interest would have speedily been lost to the shareholders.

The issue to the nation was that the South Sea stock was fixed at nearly 34 millions ; that this was divided into moieties, one half to be the trading stock of the company, the other to be a fund stock on which dividends should be paid ; and that the rate of interest payable by the Govern- ment on the whole should be 5 per cent. till June 2, 1727, Thenation suffered

considerable temporary loss, for the capital of the debt, instead of being reduced, was increased by three millions, and the temporary annuities were

converted into a perpetual stock. But, on the other hand, the state secured a reduc-

tion of interest within six years, and could, if the state of |

the money market proved favourable, reduce their rate of interest at an earlier date, or if the revenue exceeded the expenditure could bring the machinery of the sinking fund into operation. In 1727 three-fifths of the public debt was South Sea stock. In 1724 the rate of interest had fallen so much that the bank, on a revision of its bargain with the Government, agreed to accept 4 per cent. instead of 95 on its uew stock, the old rate of 6 per cent. remaining on its original stock.

In 1726 it was found possible to borrow at 3 per cent., and a small stock was raised at this rate. In 1727 the land tax, which had been at two shillings for five years, was raised to four. Those customs and excise duties which had now been made permanent, and were reckoned on an

average at 30 per cent. of the value of duty-paying and.

excisable articles, now yielded, with the malt tax, about four and a half millions, or twice as much as the land tax at four shillings in the pound. In 1732-3 the land tax was reduced toa shilling in the pound in order to conciliate the landed interest, the salt taxes were reimposed, and the deficiencies of the revenue were made up from the receipts of the sinking fund, which now amounted to more than a million annually, and by which reductions were made from time to time in the public debt to the amount of more than six millions in the twelve years between 1727 and 1739. As Walpole had been designated the father of the sinking fund, his policy was severely, perhaps sincerely, criticized by the opposition. But while it was certain that the ministers could count on a great majority for the financial scheme whicli he proposed, it was not equally certain that he could reckon on support except by reducing the land tax, an iinpost which was sensibly felt by the landowners, and was correspondingly distasteful. The land tax re- mained at two shillings in the pound from 1733 to 1739. In other words, direct taxation remained odious, and indirect taxation became familiar.

In 1737 the rate of interest on public securities was less than 3 per cent., for the 3 per cent. stocks were worth 107 in June. This is at about the middle of that remarkable series of years in which the prices of grain were singularly low, a set of facts which is characteristic also of the fitst half of the 15th century. The cheapness was undoubtedly due in great measure to a succession of abundant harvests, and to the rapid growth of agricultural skill. But it is also to be ascribed in some degree to the increasing dearness of the precious metals, especially silver, and it is likely, for economical reasons which would not be in place to allege here, that a period in which the precious metals are dear will be accompanied by persistently low rates of interest. It is manifest that, at the present time, gold is rapidly increasing in value, and that a low rate of interest has accompanied this fact, as it will in all likelihood continue. The House of Commons resolved, in view of the high prices to which public securities had risen, that the rate of interest on all Government stocks which were redeemable should be reduced to 3 per cent. A bill was brought forward embodying this resolution, and was read twice, but lost in the course of the session. It appears that the plan was frustrated in deference to the monied interest. ‘That it caused some alarm to the holders of redeemable stocks is proved by the fact that, when the three per cents. stood at £105, 3s. 8d., the four per cents. were at £113 only.

There 1s One incident in the history of Walpole’s financial projects which must be referred to. In 1733 this minister brought forward his famous excise scheme. The payment

of customs duties by the importers was obligatory on the landing of such articles as were liable to the tax, or the importer, if he desired delay, was compelled to enter into a bond with sufficient securities for the payment of the impost. The inconveniences of the system were obvious, If the importer were in narrow circumstances, he was fre- quently obliged to realize the value of his goods by immediate sales, when the market price was low already, and was thus deprived of one advantage which is charac- teristic of capital, that it enables the possessor of it to wait for favourable markets. It inflicted the maximum loss on the consumer, to whom the tax was of course transferred, and a minimum advantage to the Government; for of course the

trader's profit was derived from capital advanced for payment of duty, estimated by the time intervening between the importation and the sale. It tended towards limiting competition in foreign products, for the wealthier merchants had nearly a monopoly of sale in articles on which considerable customs duties were charged, owing to the necessity of finding the tax at once. A further assist- ance was given to such merchants by the rule under which the importer who paid his tax promptly was allowed a bonus of 10 per cent. on the amount of the tax. It opened the way for frauds on the revenue, for it encouraged smuggling, and assisted the dishonest exporter of foreign produce in obtaining a fraudulent drawback. It checked the carrying trade, narrowed consumption, and impaired the revenue.

The reform which Walpole contemplated was to extend to foreign products imported into Great Britain that system which was already practised with such articles as were liable to the internal duties of excise, z.¢., to permit the storage of foreign goods in bonded warehouses on the payment of a trifling lauding duty. Thus tobacco—the experiment was to be tried with tobacco and wine at first—was liable to 64d. per pound. Walpole proposed to reduce the tax to 42d., to levy $d. on importation and deposit in the ware-house, the import duty being payable as part of the hereditary excise, but being repaid on exportation, and to delay the payment of the 4d. till such time as the owner of the goods might wish to dispose of it to the dealer for home consumption. In this way Walpole contemplated that a great ease would be afforded to the fair trader, and that frauds on the revenue—an invariable source of loss to the honest merchant—-would be obviated. It is clear that Walpole anticipated that the revenue would gain all from the check to smuggling and factitious drawbacks which it lost in reducing the duty.

It was unfortunate for Walpole's project that he brought it forward at a time when he had, in deference to the clamour of the landed interest, reduced the land tax toa shilling in the pound, and suspended the operation of the sinking fund. It is true that the plan was not wrecked on these issues, though they must have been present to the minds of many among those who resisted it. It was in vain that Walpole most accurately predicted, as the result of his reform, "that it would make London a free port, and by consequence the market of the world." 'The great merchants, who had a

monopoly of importation; the smugglers who, in that age of corruption, found means to make themselves a parliamentary power ; the public, which loathed the excise as an inquisitorial system, begun in the old days of Cromwell's military usurpation, continued in order to sustain the foreign policy which the Government of the Revolution had prosecuted, and extended in order to enrich foreign favourites and to bribe the servants of the state ; and the patriots, as the opposition called themselves, eager to use every chance against Walpole, even when he was in the right, because they had so pertinaciously asserted that he was always in the wrong,—united to defeat the

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project. Walpole's life was threatened in the streets, and, what he feared more, his majority was imperilled in the House. 'The warehousing scheme was abandoned, and not revived till 1803. The elder Pitt, when, being in the ascendant, he could afford to criticize his own conduct, said that he regretted nothing so much as his opposition to Walpole's excise. It is singular that the principal works on commerce and finance which were published before the adoption of the bonded warehouses system pass over Walpole's plan in silence.

The public debt was increased between 1739 and 1748, the date of the peace of Aix-la-Chapelle, by about 28 millions, the interest on this sum being principally provided by duties on spirits, though during the whole period the land tax was put at 4s. In 1750 it was reduced to 3s. But the old customs and excises were continued and increased. In 1731 a duty of 20s, a gallon had been imposed on gin, with a view to checking its use. It is well known that this prohibitory duty led to extensive smuggling, and to illicit distillation on a large scale. Hence in 1743, when the Government was on the look-out for means, it was proposed to repeal the Act of 1731, and impose remunerative duties in the place of the prohibitive tax. The proposal was resisted on grounds of health and morals, but was carried.

Early in 1750 the plan suggested in Walpole's time of reducing the rate of interest on public securities, with the option of receiving the principal, was revived, as the three per cents. had been above par in the autumn of 1746. The amount to be treated in this way was nearly 58 millions, The holders of

the stock were offered 4 per cent. for 1750, 33 till the end of 1757, and 3 afterwards. In the course of the year the terms were, except for about 34 millions, agreed to. In the next year the consolidated stock was first formed by merging nine separate loans into a common 3 per cent. fund, and subsequently other stocks were consolidated in the same manner. The project was not only highly successful, but the new three per cents. rose in June of the same year to 1063. In 1753-4 the land tax was reduced to 2s. In 1755, when the Seven Years' War was imminent, the land tax was raised to 4s., at which sum it continued, except in 1767, 1768, 1769, 1770, 1772, 1773, 1774, 1775, till 1798, when, being made perpetual, the ceremony of its being granted annually was abandoned. During the Seven Years' War and onwards, it became the practice of English financiers to invite loans upon one of three principles. They either offered such a variable sum of three per cent. annuities as represented the difference between the value of this security and the same amount actually lent, as, for example, £120 stock for £100 borrowed ; or a fixed amount of stock for a variable percentage, as £100 stock for (say) £80 lent; or gave £100 stock, and a variable sum in long or life annuities, as (say) £100 stock and 22s. 6d. per cent. per £100 subscribed for ninety-nine years. The loans raised during the Seven Years' War were far in excess of any that had been negotiated before. That, for instance, of 1760 was twelve millions, and the same sum was raised in the next year. When the peace of Paris was signed in February 1763, the nominal capital of the English funded debt was in amount nearly double that which had been incurred up to the treaty of Aix-la-Chapelle.

The loser in the Seven Years' War was France. It was Prostrated, was stripped of its colonies, and wholly im- poverished. No war in the world's history had such im- portant results on the remote future as this has had. From this time France ceased to be a colonizing nation, and England occupied its place, as well as extended the settle- ments which it had already founded. At the beginning af the Seven Years' War, France was the determined rival of

England in the East, and had occupied the south and north of the English plantations in the West. At the conclusion of the Seven Years' War, it had

lost both its colonial centres. By this loss it was also deprived of one among those outlets for discontent which have been so serviceable to the Governments of Western Europe. Emigration does not relieve a country of its population so much as it does of its dissatisfied and disaffected members. The destruc- tion of French colonial enterprise had no little indirect effect on the passions of the Revolution. The supremacy of England in the northern part of the New World led the Protestant inhabitants of Ireland, bowed down and im- poverished by the oppressive revenue laws of England, to emigrate westwards, and so give at home an opportunity for the Irish Catholics to reassert themselves, and for the Americans to strengthen or recruit themselves in the War of Independence. Again, the charges of the Seven Years' War were so great that the British parliament tried to help itself by taxing the colonies; the colonies met this project, after various acts of resistance, by the Declaration of Independence; the war of American independence found an ally in France, which was eager to blot out the memories of the Seven Years' War ; the reaction of repub- lican America on monarchical France aided those theories which developed the French Revolution. On the Revolu- tion followed the Empire ; the Empire induced the reaction of the Holy Alliance ; from this came the western rising of 1830, the general rising of 1848, and ultimately the doctrine of modern European politics, that, namely, of the nationalities,

We are concerned, however, with the financial conse- quences of the Seven Years' War. It was in no slight degree provoked by the hostility of the French and English settlers in America, and it had been carried on at an enormous expense. The result was to secure the ascendency of the English race ou the American continent. It ap- peared to deserve the gratitude and the sacrifices of the colonists. There is little doubt that the inhabitants of the plantations would have recognized these facts, and have responded according to their means to an appeal made to them by the ministry. In an evil hour the ministry attempted to impose taxes on them by the authority of the English parliament. No one, not even the colonists them- selves, doubted that the English parliament could enact laws for the colonies, could regulate their trade, could dictate the course of their industry, and thus as effectually bring them within the financial arrangements of the British empire as though it collected a revenne from them. In fact the colonial system was really a department of finance, though its details were defended

on those mercantile principles which Adam Smith expounded and refuted. The imposition of the Stamp Act was resented on political principles, and was resented successfully. Passed in 1765, it was repealed in 1766, though at the same time the House of Commons passed an Act asserting, in the broadest manner, the right of the English parliament to tax its dependencies. ‘The Americans answered by refusing to consume British goods. Asis well known, the ultimate cause of the revolt of the colonies was the despatch of the East India Company’s tea ships to Boston, the tax on tea imposed on the colonists being nominally retained in order to serve the interests of the company, whose finances were seriously affected at the time, but really in order to affirm the right, on which king, ministry, and parliament insisted, of taxing the colonies through the machinery of the English House of Commons.

From the outbreak of the War of American Independence the land tax was annually granted at 4s. in the pound, though of course on the old assessment. Jt formed the basis on which an annual issue of two millions in exchequer

bills was made. But the residue of the means from which the interest on the annual increment of debt was payable was derived from taxes on consumption and stamps, 2.¢., from indirect sources. The actual debt created during the American war was nearly 97} millions. The sum received from loans was 754 millions, and the annual sum needed. for the interest on this debt was a little over 4 millions. In 1786 Pitt, after inviting the attention of parliament to the magnitude of the debt, and the necessity for reducing it, proposed to revive and make permanent the machinery of a sinking fund. The minister had taken counsel with Dr Price, who for some years previously had been lamenting the downfall of Walpole’s sinking fund, and urging that by borrowing at simple interest great accumulations might be formed at compound interest, and that thereby the debt would be ultimately extinguished. Pitt’s proposal was that the exchequer should pay a million annually in quarterly instalments to six eminent persons, who should invest the sum in the purchase of stock, and that this payment should

have precedence over any other issues of the exchequer, except the interest on the debt. He intended that the interest on this fund should accumulate with the annual receipts, and be calculated that in twenty-eight years the fund, with accumulated interest, would yield an annual surplus of four millions. When this sum was reached, the interest was to be at the disposal of parliament.

An amendment was proposed on Pitt's proposal by Fox, to the effect that when at any future time a loan was pro- posed, say of six millions, the commissioners, if they had sufficient funds at their disposal, might purchase a sixth of the stock. It was accepted by Pitt, and formed the process by which, during the great Continental war, the commissioners of the sinking fund continued to lend their balances and the annual sum which they received from the Government to the state, thus piling up an imaginary obligation of the nation to itself, which seemed to extinguish public debt, but which would certainly be treated as a fiction, as indeed came to be the case, when the great war was over. 'The efficiency of the sinking fund consisted entirely in the extent to which, by requiring an income which should be in excess of expenditure, it necessarily diminished debt. Its delusiveness arose from the fact that the actual funds which it had accumulated were actually invaded under the pressure of war-taxation and expenditure, and that its nominal continuance was accompanied by the creation of a fictitious loan, the process of which was burdened by tlie expenses of an office. Other schemes were adopted subsequently, more or less similar to the old sinking funds, in later times, to which we shall allude presently.

For a short time before 1793, when England began her longest and costliest war, the English funds rose greatly in value, chiefly, it is said, because they were con- ceived to be the safest investment which could be found for those who were flying from the Continent in dread of actual or prospective violence. But immediately on the outbreak of hostilities with France the country was put to the severest straits. In the year 1793 a serious com- mercial panic occurred, accompanied with an unparalleled number of bankruptcies. Loans of enormous amounts were raised as the war went on; the current expenses of Government were met by credits on the bank ; and at last, * oe 27,1797, the Privy Council ordered the Bank of England to

suspend cash payments. For twenty-three sesh afterwards the suspension was continued. bs — << ne additional burdens which were imposed eae es – — on loans and to defray some of the i as. romsind: vl war were raised almost entirely from es consumption, sometimes on production, : property. But in this year Pitt proposed

to levy duties on the succession to real and personal estate, Knowing that his budget would meet with hostile criticism, lie determined to divide his bill, and impose the projected tax on real and personal estate by separate enactments. The tax on personalty was accepted with very little remonstrance, though a few solid objections were urged against the measure. But the country party strongly resented the proposed tax on real estate. They absentei themselves from the House, and nearly left Pitt in a minority. The minister felt that he must give way to them, and postponed his bill for granting duties on realty in succession for three months, thus virtually abandoning the project. The discrepancy, therefore, between the liabilities of real and personal estate, when they become the subject of devise or succession, has never been remedied. It is true that an attempt was made by Lord Lauderdale to suspend the operation of the Act which had been passed, till such time as the anomaly might be rectified. But he was ruled to be out of order, on the ground that no bill after it has been passed can be repealed or modified in the same session. Like many similar Acts, the legacy duty was tentative, and the rates of tax were progressively raised according to the proximity of blood in which the legatee or heir stood to the testator or ancestor. In order to compel the making of wills, and to obviate the risk that persons might avoid a testamentary disposition with a view to escape the legacy duties, exceptional probate duty was imposed on those estates which were administered without a will.

Apart from the manifest inequality of a tax which omitted to charge succession duty upon real estate, especially at a time in which the value of such estate was rapidly rising, objections were alleged against the tax on the ground that it was likely to inflict inconvenience or injury in the case of persons engaged in trade by the com- pulsory exposure of their circumstances, and because it was sure to breed discontent. More subtle was

the objection taken by Lord Lauderdale, and afterwards by Mr Ricardo, ou the ground that it was a tax on capital, and therefore injurious to the development of wealth. The answer to this objection is, however, simple. It is impossible for a Government to tax that which cannot be saved, but must be consumed in order that industry may be continuous. Now that which may be saved is either consumed i superfluities, and therefore may be made the subject of direct or indirect taxation, as the case may be, or is saved and employed as capital, or accumulated as reserve. In other words, not only is it not true that capital should not be taxed, but it is true that nothing but that which is or may be capital can be taxed.

More valid than this objection to legacy duties is that which can be alleged from the fact that, under existing circumstances, it is easy for the wealthy to evade the tax by a donatio inter vivos. The attempt to evade duties or liabilities on successions is a very old practice in England. One of the earliest, after the Great Charter perhaps the earliest, written law in English history, the Statute of Marlebridge, is intended to defeat attempts to evade feudal dues by such donations. There can be no doubt that similar practices prevail at present. Nor can they be pre- vented until voluntary gifts and transfers are registered, published, and rendered traceable at last to the officers of the revenue, who might have powers to visit with penalties in addition to ordinary duties all conveyances and transfers made at such a date previous to the death of the donor as would indicate that the gift could reasonably be interpreted to imply an intention of evading legacy duty. But at the same time it cannot be stated too often that, first, it is not always the best system of taxation which must be adopted, but the best possible system, since communities require t0

be habituated to a new tax; and, next, that any unfairness in the imposition of taxation is sure to suggest evasion. A financier must be just, if he wishes the taxpayer to be honest. There are three offences against the revenue, looked on as very differently culpable, but all stimulated by financial error or injustice. The first is that just alluded to, a gift of property during the life of the donor with a view to evade the legacy duties. This fraud is thought scarcely culpable, though it will be obvious that it is much more easy for

the wealthy to practise it than for those who are in narrow or moderate circumstances. Thesecond is the evasion of the charges imposed on earnings by the so-called property tax, but which is of course no property tax at all, since large masses of property are exempted from its operation, and incomes which are in no sense pro- perty are taxed at the same rate as those which issue from property. The third, now considered as merely vulgar larceny, is smuggling. A generation ago public sympathy was strongly with the smuggler. The change in this opinion is intelligible aud instructive. The greater part of English taxation of an indirect kind was imposed for political purposes, or to serve private interests, up to the time when Sir Robert Peel, nearly forty years ago, began seriously to reform the tariff. In course of time, he and those who succeeded to his policy have adopted and carried out the principles that protection must be abandoned, that finance must not be manipulated in order to suit poli- tical antipathies, and that taxation must be imposed for revenue purposes only. The progress of these principles has extinguished the trade of the smuggler. For a long time even economists argued that the smuggler was the practical critic of a vicious system of finance. It may be predicted with some confidence that, when a just property tax is im- posed instead of an unfair income tax, public opinion will enforce a morality which it does not require at present, and will assist the Government in enforcing that morality by penalties and by compulsory publicity; and that similarly when real estate is made liable to the same duties as are imposed on personalty, the disposition to evade the duties will be checked, and that machinery of Government which detects and chastises fraud will be strengthened and enforced.

The disasters which followed on the outbreak of the great Continental war, the enormous cost at which the war was carried on, and the demand for money in order to meet current charges, produced serious effects on the currency. A considerable exaltation took place in the value of gold, and as gold had become the chief currency of England, its exportation was under the circumstances inevitable. In 1794 the Bank of England possessed in cash and bullion over 8 millions. In February 1797 the stock of treasure had sunk to 14 millions. The Government had overdrawn Its account with the Bank on February 25, 1797, to the amount of nearly 10 millions, and was demanding further advances. It is true that no real alarm was felt for the ultimate solvency of the Bank, but considerable and just alarm was

entertained as to the convertibility of the notes. Hence the Government, on February 27, 1797, ordered the Bank of England to suspend cash payments, and shortly afterwards authorized the issue of notes below five pounds.

In November 1797 Mr Pitt introduced what he called a new and solid system of finance. The scheme was after- Wards explained to consist in a triple assessment, i.¢., a trebling of all the assessed taxes imposed on individuals, with a limitation, however, that such a tax should not exceed the tenth of the taxpayer's income. It was estimated. that this tax would yield 7 millions, but the result was disappointing. From the first it was exceedingly unpopular, It was felt to be unequal, and to press with peculiar severity on those whose avocations constrained them

to contribute to those assessments which the Government im- posed, and perhaps necessarily, without much consideration for those who had to pay them. At the same time the poor escaped the tax, for according to Pitt's budget speech, the assessed taxes were leviable on between 700,000 and 800,000 householders, and yielded £2,700,000, though the contributions of 400,000 of these householders did not amount to more than £150,000.

The triple assessment lasted only a year. It was pro- bably intended only to be preparatory for the income tax, which was imposed in 1798. Indeed, if the expenditure of the war was to be met by any other resource than loans, it was necessary to discover some tax which should reach all classes who could be made to contribute to the necessities of the exchequer. Now it was plain that, had the assessed taxes been ever so productive,—the amount actually received from them was only two-thirds of their estimated yield,—they are more or less optional in character, and could therefore be evaded. The income tax, according to Lord Stanhope, had often been urged on Pitt, and especially by Bishop Watson. It began as a graduated percentage. If the income of the taxpayer was between £60 and £65 a year—it was not imposed on those rated below that sum— the tax was to be a 120th part of the income, and the proportion gradually rose to a 10 per cent. tax on incomes of £200 and upwards. Pitt estimated the produce of the tax at 10 millions; it actually yielded only 7. It was imposed as a war tax, to cease at a declaration of peace. But Pitt immediately pledged it to a loan, and in

1801 3 millions of its annual produce was thus appropriated to irredeemable debt. The remission of the tax then rendered it necessary that new taxes should be imposed, and such was the course actually adopted after the short-lived peace of Amiens.

The income tax was criticized by Lord Holland on grounds very familiar to us in the later times, namely, that it visited incomes “ derived from permanent and disposable capital, those arising from precarious and temporary pos- sessions, and those from labour, talents, and industry at the same rate, and was therefore unjust, unequal, and impolitic.” It was also argued that the term property tax was a misnomer,—that property was often not visited by the tax at all, and that what was not property was mulcted. It was alleged that to require the disclosure of one’s circum- stances was coutrary to the prejudices and customs of Englishmen, was unconstitutional, and a serious injury to commerce and trade, since merchants, it was alleged, would often find it convenient to sacrifice more than a tenth of their income rather than permit the publication of their affairs, and, lastly, that it was a violation of public faith with the stockholder, whose dividends were mulcted, by the intervention of that very Government which was pledged to pay him an irredeemable annuity, of one tenth of his just due. But no objection seems to have been alleged, on the one hand, against the graduated character of the tax, nor, on the other, against the low limit on which the full amount was exacted,

At the remission of the income tax imposts to the amount of 384 millions a year were paid, this sum being double the amount raised in 1793. With the exception of the perpetual land tax, a little over 2 millions, and every year becoming more disproportionate to the rising value of land, almost the whole of this amount was raised on consump- tion, ¢.e., from indirect sources. Rents rose rapidly, under the joint operation of high prices and deficient crops, Profits increased, owing partly to the legitimate growth of manufacturing industry,—for the inventions of Hargreaves, Arkwright, and Watt were beginning to produce their effects,— partly to the enormous expenditure of Government, and to the subsidies and loans which were lavished on the

Continental powers and expended in the purchase of British inanufactures. But the condition of the working classes became deplorable. Mr Porter has proved with minute exactness that the real burden of the long and exhausting Continental war was, as faras England is concerned, mainly sustained by labour.

In 1803 the income tax, under the name of a property tax, was reimposed. The sources of income were dis- tinguished and put into five schedules named A, C.D, E,—being respectively lands, tenements, mines, Bie. ; occupancies or tenancies ; shares, annuities, and dividends ; profits and gains in professions and callings ; and public offices of profit and pensions. On all but the second a tax of a shilling in the pound was levied, but on the second ninepence only in England and sixpence in Scotland. Incomes below £60 a year were exempt from the tax, and, following the analogy in some degree of the first income tax, a reduction of the rate was made in incomes increas- ing by £10 a year up to £150, beginning at three- pence in the pound tax up to elevenpence, the largest remission being made on the largest income. But it will be observed that, as in the first income tax, the quantity payable increased with the income, so in this system the deduction increased with the receipts of the taxpayer, though it ceased at alow amount of income. Furthermore, some consideration was shown to those who had families. Those householders who had more than two children were allowed, on incomes between £60 and £400, a reduction in the rate of 4 per cent. for each child; those between £400 and £1000, 3 per cent; those between £1000 and £5000, 2 per cent; those who had £5000 and upwards, 1 per cent. for each child.

In 1805 25 per cent. was added to the income tax, and in 1807 it was raised to two shillings in the pound on incomes in schedules A, C, D, and E, and to eighteen- pence in England and a shilling in Scotland on the annual rental of tenancies under schedule B. The limit of exemp- tion was lowered to £50, and an abatement of a shilling in the pound was allowed on all incomes between £50 and £150 a year. Labourers and artisans whose earnings were less than thirty shillings. a week were exempted from the tax, but it does not appear that the deductions in the case of children were allowed, as in the Act of 1803. The war income tax was levied up to April 5, 1816, when it expired, and despite the efforts of Castlereagh and others

who urged its continuance, parliament refused to sanction the impost any longer.

The rejection of the income tax as a means of revenue in 1816 necessitated, at the winding up of the costly Con- tinental war, the imposition of indirect taxes upon most processes of production and all of consumption, for the corn laws and customs duties on foreign imports of food exalted indirectly the value of home produce. Industry was checked at its source. Food, the raw material of labour, was rendered scarce, while the farmer, who conceived that the maintenance of the corn laws was his only hope of profit, and the sole power by which he could pay his rent, was mocked by violent fluctuations of prices, and was equally ruined by plenty and by scarcity.

_ The first hint given that the progress of the nation was impossible until its fiscal system was revised, was the formation and presentation of the Merchants' Petition. This remarkable document was drawn up by Mr Tooke, who nas narrated, in the last volume of his History of Prices, the circumstances under which it was composed, signed, and presented to the House of Commons. It was not presented in the House of Lords, for Tooke had oo on committing the document to the hands of Lord a. ieee who had signed the petition

eman, on the ground of his Whig

principles, and the framer of the petition would not give way. The petition was presented to the House of Commons by Mr Baring, afterwards Lord Ashburton, and was debated. The Government, that of Lord Liverpool, expressed its agreement in the principles which the petition avowed,—those, in short, of free trade,—and admitted that these principles were not only abstractedly correct, but ought to be adopted at once if one were making a beginning, but declined to agree to the inference that they could be adopted in a country where trade and commerce were and had been for so long a time based on artificial restrictions, The protected interests, however, signified pretty clearly that they would not allow themselves to be molested. But the Government granted a committee of inquiry on foreign trade, and with this committee commences the movement which six-and-

twenty years later culininated in the practical adoption of free trade principles and in the abolition of the corn laws. Such a result was only a question of time, when Lord Liverpool could say in May 1820 :—“ We have risen to our present greatness under a different system than that of free and unrestricted trade. Some suppose that we have risen in consequence of that system. Others, of whom I am one, believe that we have risen in spite of that system. It is utterly impossible, with our debt and taxation, even if they were but half their amount, that we can suddenly adopt the system of free trade.” Lord Liverpool probably knew that, as Swift had said, “in the arithmetic of the custom-house, two and two do not always make four ;” but he was not alive to the enormous fertility of thatsystem of finance which, substituting low for high duties, with some exceptions, and invariably avoiding such fiscal changes as hinder the progress of industry, leaves the widest opportunities for production, exchange, and consumption. Lord Liverpool added that though he supported the corn law of 1815 as a measure of justice to the agricultural interest, he was of opinion that had the bill not passed at that time, it should not have been passed at all. It may be observed, so much was trade hampered at this time by legislation the primary object of which was to extract a revenue at all costs and hazards, that there were more than 1500 custom-house acts relating to the entry, export, and custody of goods.

The committee of the Commons continued its sittings through three sessions, and presented four reports on the subject of foreign trade, accompanied by abundant evidence. The committee of the Lords sat for two sessions, and presented two reports. The necessity for admitting the principles of free trade was felt and expressed by the com- mittee ; but so much alarm was excited among protected interests, even by the recognition of the abstract propriety of free exchange, that the committee felt it necessary to strongly disclaim any sympathy with sudden change, and to calm frightened imaginations by declaring that the greatest prudence and circumspection must precede any project, and accompany any measure of reform. The first thing, however, which people recognized was that great additional taxation did not add but a very small degree to the income of the exchequer. This was the effect of the financial statement of 1819, which Tooke justly characterizes as the last thoroughly vicious project accepted by the House. In 1823 Mr Vansittart retired from office, and during the next

five years, when Mr Huskisson was at the Board of Trade, great and notable modifications were made in the customs and excise, for taxes amounting in the aggregate to £8,340,000 were remitted, the experiment being attended by a manifest elasticity in the revenue. The enormous aggregate of custom-house statutes was con- solidated into eleven, by the labours of Mr Deacon Hume. Between 1827 and 1841 further reforms, though not on 80

considerable a scale, were made, the most important of

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which was the abandonment of the excise on beer in 1830, and that on printed cottons in 1831. It is an apt illustra- tion of the effect induced by such duties as this, that within a very short time the price of cottons fell below the amount (3}d. a yard) which was levied under the old excise. But, on the whole, little was done for a systematic financial reform during the period which elapsed between the death of Mr Huskisson and the defeat of the Melbourne administration. One change of great importance was made in the adoption of Mr Rowland Hills plan of the penny postage. This scheme involved the immediate sacrifice of revenue to the amount of a million and a quarter, but it gave a considerable impetus to trade, and rendered the discussion of those further fiscal reforms which were effected by Sir Robert Peel easy, perhaps possible.

Sir Robert Peel's ministry was formed in September 1841, and had before it a task of no common magnitnde. For five years the average deficiency of the revenue, according to Sir Stafford Northcote's statement, had averaged a million and a half, the year in which Sir Robert Peel took office having been characterized by the largest deficiency. The cause of this was that the revenue had fallen short of the estimates ; in other words, the financial system of the country was fundamentally vicious. The reforms which Sir Robert Peel immediately determined to bring about were greatly assisted by the information obtained from Mr Joseph Hume's report of 1840, which stated " that the tariff contained 1150 different rates of duty chargeable on imported articles, besides others imposed on all unenu- merated articles ; that there was no principle in the finance of the country, some duties being levied for the sake of revenue, some for that of protection ; that serious detriment to the home consumer ensued from the differential duties in

favour of the colonies; and that of 862 articles chargeable with duty 147 paid no duty at all, while 17 articles sup- plied 94 per cent, of the revenue, 29 others 4 per cent. more, so that 816 articles yielded no more than 2 per cent. of the revenue, though the imposition of the customs duties was a serious hindrance to trade and manufactures.”

In drawing up his budget of 1842, Peel had three ex- pedients before him. One was to adjust the corn laws, so ai to make themapress less heavily on the consuming and manufacturing classes; the second, to reform the tariff ; the third, to obviate the constant deficit in the revenue. The first was undoubtedly the most pressing. The depres- Sion of trade and manufactures in 1842 was so serious, and the remedy in a repeal or great reduction of the taxes on food was so obvious to all rational persons, that the measure was in the highest degree expedient. But Peel could not as yet venture upon it; the mere proposal to levy a foreign fixed duty on corn had more than anything else contributed to the downfall of the Whigs in 1841, and the measure was postponed till it was yielded to famine and agitation by an angry and disappointed faction.

Sir Stafford Northeote, in discussing the fact why the Whigs were the freetraders and the Tories the protectionists mM 1842-46, says he sees no particular reason why this phenomenon should have been exhibited, judging from the antecedents of the two historical parties, and he inclines to believe that the Whigs were discredited in the eyes of their opponents by their associations with the Radical party. But the solution of the question is not far to seek. The reforms of Mr Huskisson applied solely to commerce and manufactures, to colonial interests, and to some local Industries. Most of those who represented such interests were alive to the fact that protection was no longer neces- sary for them, or that it was inexpedient that the consumers ; colonial produce should be exceptionally taxed in order © &lve a subvention to colonial planters and their agents. The majority which supported Peel would have been on the

‘the answer should be in the negative.

whole indifferent to such financial reforms as simply affected manufactures and foreign trade. As consumers, they were benefited by the cheapening of such produce ; as producers themselves, they had wit enough to discern that the general prosperity of thé country improved the market of the agri-culturist. But when it came to be a question whether the artificial prices which the sliding scale was supposed to bestow on farmers and landowners should be abandoned, they were convinced that their interests were being sacrificed ; and though they constantly tried to alarm the public with the bugbear of dependence on foreign supply, they frequently admitted that the struggle on their part was to maintain the existing level of their rents. In the 18th century, especially in its earlier half, the country gentlemen would have had no difficulty in accepting free trade, provided they could escape the land tax, for the produce of the country was on an average in excess of its wants; in the first half of the 19th century, they were firmly convinced that all their interests were bound up in the sliding scale, and it must be admitted that the Ricardian theory of rent, now become popular, gave them certain grave scientific reasons for the belief which they entertained.

The estimates which Sir Robert Peel formed suggested that, if the House would accept his new system of finance, he should be in the possession of a surplus of £1,800,000, The greater part of this sum he proposed to devote to the remission of taxation, the particulars of which may be found in the works of Sir Stafford Northcote, of Mr Tooke, and Mr M‘Culloch. The estimates, partly from some singular oversights of Sir Robert Peel, partly from the fact that the distress of the country was too serious to be cured by trifling remedies, were a failure, for the receipts of the exchequer, notwitlistanding the new taxes which Peel imposed, were two millions less than he anticipated. The process by which the minister sought to put the finances of the country on a sound basis, and to provide a surplus in future years, was the income tax,—an impost which had been decisively rejected in 1816, but was now reimposed for five yearsat 7d.in the pound. The character of this tax of 1842 varied a little from the old tax of 1803, 1805, and 1808. The limit of exemption was fixed at £150 a year, the old schedules were retained, but the farming classes were specially favoured. The rate previously levied on these persons had been three-fourths of the tax imposed on those who are comprised in the other schedules. In 1842 it was made one-half. The income tax was not extended to Ireland, but a

higher tax was put on Irish spirits, and on the whole the Irish and English stamp duties were equalized.

The question has been raised, whether, in case the corn laws had been at once repealed, it would have been necessary to impose the income tax, It is probable that But apart from the difficulties in the way of a measure which would certainly at this time, as it did four years afterwards, have roused the most angry feelings, it may be safely stated that Peel's proper business was to establish a surplus, ard to effect this in the surest way possible. He could not have suc- ceeded in imposing a just property tax, for such a tax would have been nearly as unpopular among his supporters as a repeal of the corn laws. He therefore imposed an income tax, and though the scheme was criticized adversely, both in the Commons and the Lords, it was carried by over- whelming majorities in both Houses, the arguments against the tax being summed up with great precision in the pro- tests of Lords Radnor and Western. The income tax has since always figured in the budget, and it cannot be denied that, whatever objections may be alleged against its equity, it secured the end which Peel had before him, and has

more than once been of great service in supplying the defi- ciencies of revenue due to an increased expenditure.

In 1843 and 1844 a few remissions of customs duties were effected. But the effect of the tariff reforms was now visible. The excess of income over expenditure in the first year was 2 millions, in the second 64 millions. The wheat crop of 1843 was an average, that of 1844 was abundant ; the price was low, and the imports of foreign corn neatly ceased. In consequence, Peel was enabled to bring forward his most considerable measure of tariff re- form, He remitted no less than 34 millions in the customs, and more than a million in the excise. The effect was an increase of income over expenditure of nearly 24 millions. Tn 1846 the remission was three-quarters of a million, but there was again a surplus of 2 millions. In the same year the repeal of the corn laws was effected, and a modification was made in the sngar duties, followed in 1848 by an equalization of these duties. A little later and the Navigation Acts were repealed; and, finally, the last fragment of protection was extinguished in the abolition of the differential duties on foreign timber. The detailed history of these changes is best given in the last three volumes of Mr Tooke's History of Prices, and in the annual

summaries of the Hconomist newspaper, compiled by Mr Newmarch, who was the coadjutor of Mr Tooke in the last three volumes of the history referred to. The process by which the new system of finance was established is de- scribed and illustrated by Sir Stafford Northcote in his Twenty Years of Financial Policy.

The principles of modern English finance are—(1) to impose as high a duty as is consistent with the prosperity of the revenue on such articles of voluntary consumption as may be dispensed with and may be taken in excess;—of these the most notable are alcoholic liquors and tobacco; (2) to abandon taxation on all articles which are used fot manufacture or food, the last tax of the latter kind which has been extinguished being that on sugar; (3) to levy the lowest duties possible, consistent with revenue purposes, on articles of voluntary consumption and wholly innocent use, of which the best type is tea ;—such are the customs and excise, the only trades now under the control of the inland revenue officers being those of the maltster, the brewer, and the distiller; (4) to attempt the collection of as large a revenue as possible at the lowest possible rates on transactions by the mechanism of stamp duties; (5) to simplify the assessed taxes, some of which indeed, as the house duty, are objectionable, and some of which have been perhaps imprudently remitted; and (6) to make use of the income tax as a supplementary means of raising a revenue when the expenditure is notably in excess of the income. Nothing, indeed, is simpler than the function of the chancellor of the exchequer, if he is resolved not to modify the established sources of the revenue or readjust its parts. All that is needed is to impose an additional Income tax, or to remit a portion of that which has been imposed.

It will be seen, however, that the continuity of the present system of British finance depends upon a continuity in the habits of the people. The revenue derived from alcoholic liquors and tobacco amounts annually to about 42 millions. That which is supplied from articles of voluntary consumption, the use of which is wholly innocent, is about fe millions, the principal contribution to this head coming Bie og Purely direct taxation—the land, house, and

e tax on the one hand (the last-named at 3d. in the pound); and stamps, probate, and legacy duties on the other oe equal sums, a little short of 8 millions each. eral

- *4i€ security, then, of the English revenue*

FINANCE

depends on the extent to which the habits of consuming alcoholic liquors and tobacco are permanent. The con- sumption of the former is threatened by a powerful and apparently growing organization and agitation, and it can hardly be doubted that, should those who demand that the control of the traftic in alcoholic liquors ought to be trans- ferred froni the present licensing bodies to a direct popular vote be successful, the dimensions of the trade would be curtailed and the revenue diminished. One cannot other- wise account for the alarm which is felt by those interested in the success of the trade at the activity of their critics, and the process by which the advocates of restraint believe that they can compass their ends. It is possible, also, that in the future the poorer classes, whose consumption is the cause of so large a revenue, may imitate the temperance or moderation of those who are better off, and whose habits are to all appearance in marked contrast to those of their pro- genitors two or three generations ago. Should such a change ensue, it is not easy to determine what would be the direction taken by the financiers of the future; for though there are some obvious sources of taxation, particularly real estate devised or inherited, and property specially so called, yet the receipts from these sources would necessarily be limited, and there is nothing more difficult, as we have attempted to show, than the task of familiarizing a people with a new impost.

We need not be surprised that such a difficulty is felt and must be encountered when the financier attempts new expedients ; for, apart from the natural dissatisfaction with which a new tax is paid, and the resistance which powerful interests may make and have made to such im- posts, such as we have seen to have been successful when Pitt attempted to levy an equal charge on the succession to personal and real estate, a tax may make a serious difference to values, or may interfere fatally with an industry. Thus there can be no doubt that the exemptions with which land is favoured

in the devolution of real estate is a cause why the rate af return to the purchase money of land is so low. Fixed charges will, of course, in the long run make no difference to the rate of interest derived from investments in land, though they would diminish the value to the vendor. .Thus the value of land in France is as high or nearly as high as it is in England, and is much higher in Belgium, though in both countries there is a heavy land tax. But freedom from an accidental tax, a tax which caunot be computed beforehand, is a direct advantage to the vendor, and in the case of land would add to the number of years' purchase at which the land is sold.

The taxes which have been laid on industry and con- suniption, apart from the reckless manner in which they were imposed, were felt far more severely in their first incidence than they were when they became familiar. There is a convenient and suggestive example of the manner in which sucli taxes affect industry in a matter of recent experience. Apart from the question whether Mr Lowe's abortive match tax was in itself a judicious impost,— a question which, it may be affirmed, most persons would answer in the negative,—it became plain, when the pro- posal was made, that two results would follow from its adoption. It would seriously curtail the employment of a very large class of very ill-paid labourers, and thereupon induce great distress on those who were already very poor, and it would ultimately transfer the industry to those countries where no excise is levied on the manufacture. Already, although matches are bulky in proportion to their value, and are conveyed from the place of their origin t0 the market of consumption at very high rates, owing 10 the dangerous character of the goods, the competition of @ place so distant as Jonkiping in Sweden against the English manufacturer is so sharp as to lower materially the profits

of the home producer, and to make it necessary that the manufacture should be carried on by low-priced labour. It is almost certain that, had the scheme of taxing matches been adopted, the supply of these articles would have rapidly been limited to foreign producers, or it would have been necessary to have established, simultaneously with the impost, a really protective duty ou the foreign article.

Manufactures, indeed, unless they are wholly ruined by taxation, or at least confined to domestic supply, can be and are made to accommodate theniselves to circumstances.

The amount of capital employed in supplying the taxed |

commodity diminishes with the demand, competition between capitalists slackens, and in due time the rate of profit in the particular industry reaches its old level. But the process is undoubtedly accompanied by loss to both capitalist and labourer, as well as followed by an enhance- ment of price to the consumer, together with a still more serious depressicn of foreign trade, however fully the duties levied are allowed on export. In illustration of the effect which an erroneous system of finance induces on industry, nothing can be more instructive than the history of the revenue in the few years preceding Peel's adminis- tration of 1841; tle effect of the reform in the tariff which that minister adopted; and the loss which ensued from postponing the full effect of these reforms owing to the hesitation which Peel showed in abvlishing the corn laws, which could have been much better repealed in 1843 than in 1846.

It is said, and has been said for the last century, that it is inexpedient to tax capital. To this we have already given the answer. A Government can tax nothing but capital, actual or potential. For all wealth is of two kinds, The first is that which is absolutely necessary for the con- tinuity of industry, and which cannot be taxed without destroying that industry. There can be no tax on necessary consumption. The second is that which can be saved, which is in part saved, in part consumed unproductively. This product of labour can be and can alone be taxed. The English system of finance attempts to levy taxation on a part of this, either directly on revenue, though it might be levied with advantage on the wealth itself, instead of or concurrently with the revenue derived from the wealth, or indirectly on consumption. Nor does the taxation of capital diminish capital. It merely changes its direction. The tax may be expended unwisely, even mischievously. But it undoubtedly calls labour into activity, and may therefore give wider employment than it would if left in the hands of those who are now mulcted of a portion of what they might have saved or spent. It may even increase capital by increasing economy in expenditure, and

mducing those who are taxed to fill up tlie void in their Own resources which the tax has created. The expenditure of the Dutch in the palmy days of their finance was enormous ; the taxation to which the people submitted was

FINCH (German Fink, Latin Fringilla), a name applied (but almost always in composition—as Bullfinch, Chaffinch, Goldfinch, Hawfinch, &c.) to a great many small birds of the Order Passeres, and now pretty generally accepted as that of @ group or family—the Fringillide of most ornitho- logists, Yet itis one the extent of which must be regarded as being uncertain, Many writers have included in it the Buntings (Emberizide), though these seem to be quite distinct, and the grounds of their separation have been before assigned (cf, Buntina, vol. iv. p. 525), as well as the Larks (Alaudide), the Tanagers (Tanagride), and the Weaver-birds (Ploceide)—the mode in which these

searching to an extent and minuteness which has had no parallel since ; but, notwithstanding the prodigious sacri- fices which the people made, they accumulated capital so rapidly by reason of parsimony, that those who watched the financial condition of the republic made all sorts of guesses as to what could be the reason why enormous taxation was accompanied by a singularly low rate of interest, and at last some persons, absurdly enough, asserted that the taxa- tion was itself the cause of the low rate.

Apart from imperial finance, the wealth of this country is liable to other levies imposed for local purposes. Most local taxation is direct, and imposed on occupation. Some, however, is indirect, and levied on consumption. Again, some local taxation is imposed in satisfaction of a local duty, some in consideration of a local service. Thus the duty on coals consumed within a particular radius from St Paul's cathedral, originally, we are told, imposed in order to meet some of the losses incurred by the great fire of London, is a tax on consumption, analogous to the octroi duties imposed in Continental towns. The county and borough rates imposed for the maintenance of roads and of police, rates levied for the use of gas and water, are pay- ments intended to be the equivalents of public service, and capable, witli greater or less exactness, of being apportioned to the amount

of benefit received by the taxpayer. Of late years some large towns have made use of their local needs for the purpose of creating capital on the security of rates, and of deriving some of the profits of a joint-stock company from the sale of gas and water, with a view to lightening other local burdens of a more general kind. Under proper safeguards, such a form of local finance is beneficial and to be encouraged. It bears a close analogy to the Goverument service of the post office.

Local finance has followed in one particular the precedent supplied it by the central Government, in anticipating its revenue by loans. Most of these loans, however, are terminable, 2.e., provision is made for repayment of principal as well as interest. The amount of these loans is in excess of 100 millions, and is likely to increase. But most of the increased charge is to be put down to the head of remunerative outlay, there being, as we have stated, an increased disposition—inudeed from necessity— ou the part of local authorities to undertake the satisfac- tion of public services, or the supply of public conveniences. The aggregate annual expenditure of the United Kingdom for local and imperial taxation, including loans, is now about 125 millions.

The authorities relied on for this article are principally—for ancient history, Boeckh's Public Economy of Athens, and Dureau de la Malle, Keonomie politique des Romains; and for modern times— Macpherson's Dietionary of Commerce; Grellier's History of the National Debt; Porter's Progress of the Nation; Sir Stafford Northcote's Twenty Years of Financial Policy; The Statutesat Large, in the edition commencing from the first volume printed by Berthollet for Henry VIII. and continued in the same form to the present time ; Hansard's Parliamentary Debates, &c. (J.E.T.R.)

three last differ having in due time to be shewn in these pages. Others have separated from it the Crossbills, under the title of Loxtide, but without due cause (cf. CRossBILL, vol. vi. p. 614), while again some systematists have placed among the Finches the Mouse-birds (Colitde)—an allocation which a very slight study of osteological characters would have proved to be unsound; and a group which has no English name, including probably the genera Panurus (the so-called Bearded Titmouse), Para- doxornis, and,

perhaps, a few others, has also been occasionally referred to the Finches, to all appearance erroneously. The difficulty which at this time presents

itself in regard to the limits of the Mringillide arises from our ignorance of the anatomical features, especially those of the head, possessed by many exotic forms.

Taken as a whole, the Finches, concerning which no reasonable doubt can exist, are not only little birds with a hard bill, adapted in most cases for shelling and eating the various seeds that form the chief portion of their diet when adult, but they appear to be mainly forms which predominate in and are highly characteristic of the Palew- arctic Region ; moreover, though some are found elsewhere on the globe, the existence of but very few in the Notogeean hemisphere can as yet be regarded as certain.

But even with this limitation, the separation of the

undoubted Fringillide! into groups is a difficult task. Were we merely to consider the superficial character of the form of the bill, the genus Zozia (in its modern sense) would be easily divided not only from the other Finches, but from all other birds. The birds of this genus—the Crossbills—when their other characters are taken into account, prove to be intimately allied on the one hand to the Grosbeaks (Pinicola) and on the other through the Redpolls (Ayiothus) to the Linnets (Zinota)—if indeed these two can be properly separated. The Liunets, through the genus Leucosticte, lead to the Mountain-Finches (Monti- fringilla), and the Redpolls through the Siskins (Chryso- mitris) to the Goldfinches (Carduelis) ; and these last again to the Hawfinches, one group of which (Coccothraustes) is apparently not far distant from the Chaffinches (Fringilla proper), and the other (Hesperiphona) seems to be allied to the Greenfinches (Zigurinus). Then there is the group of Serins (Serinus), to which the Canary-bird belongs, that one is in doubt whether to refer to the vicinity of the Greenfinches or that of the Redpolls. The Mountain- Finches (before named) may be regarded as pointing first to the Rock-Sparrows (Petroniu) and then to the true Sparrows (Passer) ; while, returning to the Grosbeaks, we find them passing into many varied forms which regard to space forbids our here

naming, and throwing out a very well marked form—the Bullfinches (Pyrrhula). But our readers must be prepared to take all this as problematical. Some of the modifications of the Family are very gradual, and therefore conclusions founded on them are likely to be correct; others are further apart, and the links which con- nect them, if not altogether missing, can but be surmised. To avoid as much as possible prejudicing the case, we shall therefore take the different groups of Fringillide which it is convenient to consider in this article in an alphabetical arrangement.

The Roturivcues thus present themselves first. Of these the best known to our readers will be the familiar bird (Pyrrhula europea), which hardly needs description. The varied plumage of the cock—his bright red breast and his grey back, set off by his coal-black head and quills—is naturally attractive; while the facility with which he is tamed, with his engaging disposition in confinement, makes him a popular cage-bird,—to say nothing of the fact (which in the opinion of so many adds to his charms) of his readily learning to "' pipe" a tune, or some bars of one, though this perversion of his natural notes is hardly agree- able to the ornithologist. By gardeners the Bullfinch has long been regarded as a deadly enemy, from its undoubted destruction of the buds of fruit-trees m spring-time, though oo the destruction is really so much of a detriment is a he undoubted. Northern and Eastern Europe mas =~ : y a larger form (P. major), which differs in —— wie and nore vivid tints from that which is

nin the British Isles and Western Europe. A very en a } About 200 species of these hay

may really exist. e been described, and perhaps 150

ETN Co

_ French Pinson.

distinct species (P. murina), remarkable for its dull colora- tion, is peculiar to the Azores, and several others are found in Asia from the Himalayas to Japan. Recently a Bull finch (P. cassinz) has been discovered in Alaska, being the first recognition of this genus in the New World.

The Canary-Birp (Serinus canarius) is indigenous to the islands whence it takes its name, as well, apparently, as to the neighbouring groups of the Madeiras and Azores, in all of which it abounds. It seems to have been imported into Europe at least as early as the first half of the 16th ceutury,? and has, as everybody knows, since become the . commonest of cage-birds. The wild stock is of an olive- green, mottled with dark brown, above, and greenish-yellow | beneath. All the bright-hued examples we now see in | captivity have been induced by carefully breeding from | any chance varieties that have shewn themselves ; and not only the colour, but the build and stature of the bird have in this manner been greatly modified. Of late the ingenuity of "the fancy," which might seem to have exhausted itself in the production of topknots, feathered feet, and so forth, has brought about a still further change from the original type. It has been found that by a particular treatment, in which the mixing of large quantities of cayenne-pepper with the food plays an important part, the ordinary " canary yellow " may be intensified so as to verge upon a more or less brilliant flame colour. Birds which have successfully undergone this forcing process, and hence called "hot canaries," command a very high price, for a large propor- tion die under the discipline, though it is said that they svon become exceedingly fond of the exciting condiment. But it is impossible here to treat of this species in its domesticated state. A small library of books has been written on the subject.?

Very nearly resembling the Canary-bird, but smaller in size, is the SERIN (Serinus hortulanus), a species which not long since was very local in Europe, and chiefly known to inhabit the countries bordering on the Mediterranean. It has of late years pushed its way towards the north, and has even been several times taken in England (Yarrell's Brit. Birds, ed. 4, ii. pp. 111-116). A closely allied species (S. canonicus) is peculiar to Palestine.

The CHAFFINCHES next demand our attention, and these are regarded as the type-form of Pringulde. The hand- some and sprightly species (Fringilla ccelebs), which is 80 common throughout the whole of Europe, requires no description. Conspicuous by his variegated plumage, his peculiar call-note® and his glad song, the cock is almost everywhere a favourite. In Algeria our Chaftinch is re- placed by a closely-allied species (F. spodogenia), while in the Atlantic Islands it is represented by two others (/*

tintillon and F'. teydea)—all of which, while possessing the general appearance of the European bird, are clothed in

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2'The earliest published description seems to be that of Gesner in 1555 (Orn., p. 234), but he had not seen the bird, an account of which was communicated to him by Raphael Seiler of Augsburg, under the name of Suckeruwigele.

3 Those most to be commended are perhaps The Canary Book by Robert L. Wallace, Canaries and Cage Birds by W. A. Blackston, and of course Mr Darwin's Animals and Plants under Domestication (vol. i. p. 295). An excellent monograph of the wild bird is that by Dr Carl Bolle (Journ. fiir Orn., 1858, pp. 125-151). b

4 This fanciful trivial name was given by Linneeus on the supposr tion (which later observations do uot entirely confirm) that in Sweden the hens of the species migrated southward in autumn, leaving the cocks to lead a celibate life till spring. Itis certain, however, that 12 some localities the sexes live apart during the winter. » |

5 This call-note, which to many ears sounds like " pink " or " spink, not only gives the bird a name in many parts of Britain, but is also obviously the origin of the German Fink and our Finch. The similar Celtic form Pinc is said to have given rise to the Low Latin Pact, and thence come the Italian Pincione, the Spanish Pinzon, aud the

soberer tints! Another species of true Fringilla is the Brambling (7. montefringilla), which has its home in the birch-forests of northern Europe and Asia, whence it yearly proceeds, often in flocks of thousands, to pass the winter in more southern countries. This bird is still more beautifully coloured than the Chaffinch—especially in summer, when, the brown edges of the feathers being shed, it presents a rich combination of black, white, and orange. Even in winter, however, its diversified plumage is sufficiently striking.

With the exception of the single species of Bulliinch already noticed as occurring in Alaska, all the forms of Finches on which we have dwelt are peculiar to the Palearctic Region. Consideration of some of the remain- ing forms which have been incidentally named is de-

ferred. (A. N.) FINCH, Danie, and Heneacz. See Norrinenam, EARLS OF.

FINCK, Hetnricu, a celebrated German musical com- poser, of whose life little more is known than that lie was of Saxon origin, and that between 1492 and 1506 he was chapelmaster to two successive kings of Poland, at whose court in Warsaw he resided. After this he seems to have retired to Wittenberg in Saxony, where he died. The year of his death, like that of his birth, is uncertain. "His works, mostly part songs and other vocal compositions, show great musical knowledge, and amongst the early masters of the German school he holds a high position. They are found scattered amongst ancient and modern collections of songs and other musical pieces. The library of Zwickau possesses a work containing a collection of fifty-five songs by Finck, printed about the middle of the 16th century,

FINCK, Hermann, the nephew of the subject of last notice, has frequently been mistaken for him. The date of his birth (at Pirna in Saxony) also is uncertain, but it has recently been discovered that in' 1506 he succeeded his uncle in the position of royal chapelmaster to the king of Poland. After 1553 he lived at Wittenberg, and there, in 1555, was published his collection of " wedding songs." His most celebrated work is entitled Practica musica, euempla variorum signorum, proportionum, et canonum, judicium de tonis ac quedam de arte suaviter et artifictose cantandi continens (Wittenberg, 1557). It is of great historie value, but very rare. The Paris library, the Vienna court library, and the Prague library possess a copy each, and there are three or four copies in the royal library at Berlin.

FINDEN, Witt (1787-1852), English line engraver, was born in 1787. He served his apprenticeship to one James Mitan, but appears to have owed far more to the influence of James Heath, whose works he privately and earnestly studied. His first employment on his own account was engraving illustrations for books, and among the Most noteworthy of these early

plates were Smirke's illustrations to Don Quixote. His neat style and smooth finish made hig pictures very attractive and popular, and although he executed several large plates, his chief work throughout his life was book illustration. His younger brother, Edward Finden, worked in conjunction with him, and so much demand arose for their productions that ultimately a company of assistants was engaged, and plates were produced in increasing numbers, their quality as works of art declining as their quantity rose. The largest Plate executed by William Finden was the portrait of King George IV, seated on a sofa, after the painting by Sir

LThic 5 This is especially the case with F, teydea of the Canary Islands,

ie from its dark Colouring and large size forms a kind of parallel 0 the Azorean Pyrrhula murina,

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Thomas Lawrence. For this work he received two thousand guineas, a sum larger than had ever before been paid for an engraved portrait. The demand for this print was for a time so great that proofs were advertised at a price largely in advance of the publication price. But the reputation of the subject, of the painter, and of the engraver have alike declined. Finden's next works on a large seale were the Highlander's Return and tlie Village Festival, after Wilkie's well-known works, the latter now forming part of the national collection, These are esteemed as Finden's happiest works. Later in life he undertook, in co-operation with his brother, aided by their numerous staff, the publication as well as tlie production of various galleries of engravings. 'The first of these, a series of landscape and portrait illustrations to the life and works of Byron, appeared in 1833 and following years, and was a very successful venture. Other attempts of a like kind were less so; and by tlie last, the most costly, and by far the most deserving of success, both for its subjects and the quality of its workmanship, the Gallery of British Art, he lost the fruits of all his former success, Of this Gallery fifteen parts were published between 1838 and 1840. Finden's last undertaking was an engraving on a large seale of Hilton's Crucifixion, which was completed just before his death. The plate was bought by the Art Union for £1470. A few days before his death this industrious engraver joined with a few of his brothers in art in a petition to

the queen for the admission of engravers to the honours of the Royal Academy. He died in London, unmarried, September 20, 1852.

FINE, in law, is a pecuniary penalty inflicted for the less serious offences, Fines are necessarily discretionary as to amount; but a maximum is generally fixed when the penalty is imposed by statute. And it is an old constitu- tional maxim that fines must not be unreasonable. In Magna Charta, c. 111, it is ordained " Liber homo non amercietur pro parvo delicto nisi secundum modum Upsius delicti, et pro magno delicto secundum magnitudinem delictr."

The term is also applied to payments made to the lord of a manor on the alienation of land held according to the custom of the manor, to payments made on the renewal of leases granted by ecclesiastical and other corporations, and to other similar payments.

Fine also denotes a fictitious suit at law, which played the part of a conveyance of landed property. "A fine," says Blackstone, "may be described to be an amicable composi- tion or agreement of a suit, either actual or fictitious, by leave of the king or his justices, whereby the lands in question become or are acknowledged to be the right of one of the parties. In its original it was founded on an actual suit commenced at law for the recovery of the pos- session of land or other hereditaments ; and the possession thus gained by such composition was found to be so sure and effectual that fictitious actions were and continue to be every day commenced for the sake of obtaining the same security." Freehold estates could thus be transferred from one person to another without the formal delivery of pos- session which was generally necessary to a feoffment. This is one of the oldest devices of the law. A statute of 18 Edward I. describes it as the most solemn and satis- factory of securities, and gives a reason for its name—" Qui quidem finis sic vocatur, eo quod finis et consummatio omnium placitorum esse debet, et hac de causa provi- debatur." The action was supposed to be founded on a breach of covenant: the defendant, owning himself in the wrong," makes overtures of compromise, which are author-

- *Hence called cognizor; the other party, the purchaser, is the*

cognizee. : TX. — 25

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ized by the licentra concordandi,; then followed the concord, in-tail could bar his issue by a fine. A statute of Henry or the compromise itself. These, then, were the essential VIII. expressly declares this to be the law. Fines, along parts of the performance, which became efficient as soon as with the «indred fiction of recoveries, were abolished by they were complete ; the formal parts were the nots, or statute 3 and 4 Will IV. c. 74, which substituted a deed abstract of the proceedings, and the foot of the fine, which enrolled in the Court of Chancery. —

recited the final agreement. Fines were said to be of four | Fines are s0 generally associated in legal phraseology kinds, according to the purpose they had in view, as for with recoveries that it may not be inconvenient to describe instance, to convey lands in pursuance of a covenant, to the latter in the present place. A recovery was employed grant reversionary interest only, &c. In addition to the | as a means for evading the strict law of entail, The Formal record of the proceedings, various statutes required | purchaser or alienee brought an action against the tenant: other solemnities to be observed, the great object of which | in-tail, alleging that he had no legal title to the land. The . was to give publicity to the transaction. Thus by statutes tenant-in-tail brought a third person into court, declaring

of Richard ITI. and Henry VII. the fine had to be openly | that he had warrauted his title, and praying that he might

read and proclaimed in court no less than sixteen times. | be ordered to defend the action. This person was called

A statute of Elizabeth required a list of fines to be exposed | the vouchee, and he, after having appeared to defend the in the Court of Common Pleas and at assizes. ‘The reason | action, takes himself out of the way. Judgment for the

for these formalities was the high and important nature of lands is given in favour of the plaintiff ; and judgment to

the conveyance, which, according to the Act of Edward I. | recover lands of equal value from the vouchee was given above mentioned, "precludes not only those which are | to the defendant, the tenant-in-tail. Ina real action, such parties and privies to the fine and their heirs, but all other lands when recovered would have fallen under the settle- ; persons in the world who are of full age, out of prison, of | ment of entail; but in the fictitious recovery the vouchee sound memory, and within the four seas, the day of the | was a man of straw, and nothing was really recovered from

fine levied, unless they put in their claim on the foot of the | him, while the lands of the tenant-in-tail were effectually

fine within a year and a day." This barring by non-claim conveyed to the successful plaintiff. A recovery differed was abolished in the reign of Edward III, but restored | from a fine, as to form, in being an action carried through = with an extension of the time to five years in the reign of | to the end, while a fine was settled by compromise, and Henry VII. The effect of this statute, intentional accord- | as to effect, by barring all reversions and remainders ing to Blackstone, unintended and brought about by | in estates tail, while a fine barred the issue only of the judicial construction according to others, was that a tenant- | tenant. (E. B.)

THE FINE ARTS |

Prelimi- INE ART is the abstract or collective name given to beauty hold in the general scheme of things 1 what are the oe the results of a whole group of human activities; the | relations of these activities and their results to the idea of

activities themselves which constitute the group being | the universe, to the faculties of man, aud to each other! severally called the Five Arts. In antiquity the fine arts | To such inquiries as these, enormous in extent and enormous were not explicitly named, nor even distinctly recognized, | in complexity, a separate place has been given in modetn as a separate class. In other modern languages besides | philosophy under the name Atsthetics. 'It is the province English they are called by the equivalent name of the of esthetics," says Professor Ruskin, "to tell you (if you beautiful arts (belle arte, beaux arts, schéne Kiinste). The | did not know it before) that the taste

and colour of a peach | fine or beautiful arts, then, are those among the arts of | are pleasant, and to ascertain (if it be ascertainable, and man which minister, not to his material necessities or con- | you have any curiosity to know) why they are so." But in veuiences, but to his love of beauty (using the word beauty | a less sarcastic and more extended definition, it would be in its widest sense); or if any art fulfils both these purposes | said that the name ZEsthetics is intended to designate 4 at once, still as fulfilling the latter only is it called a fine | scientific doctrine or account of beauty in nature and att, art. Thus architecture, in so far as it provides shelter and and of the faculties for enjoying and for originating beauty accommodation, is one of the useful or mechanical arts, | which exist in man. Instead, however, of an accepted or and one of the fine arts only in so far as its structures give uniform science, we find on these subjects a multitude of pleasure by the aspect of strength, fitness, harmony and | speculations as conflicting as they are voluminous ; but yet proportion of the masses, by disposition and contrast of | conflicting more in appearance than in reality, because the light and shade, by colour and enrichment, by variety and | source of their contradictions lies less in difference of judg- relation of lines, surfaces, and intervals. ment concerning the facts themselves, than in difference of Conflict- There is no difference of opinion concerning the nature doctrine concerning the abstract order of the universe ID me of fine art and the fine arts as thus generally described, and which those facts find a place, and in consequent diversity qa contra-distinguished from art and the arts mechanical. | of method in arranging and of formula in interpreting the ite the leas acknowledged that the one set of arts exists to satisfy | facts. nature of practical needs, and the other set exists to give delight and Of the principal speculations of ASsTHETICS the reader Flt beauty. satisfy the sense of beauty, while as to an intermediate set | already possesses a synopsis under the proper heading. » of arts which exist for both purposes, it is possible to dis- | Our present task is of a different kind. We shall, indeed, rid tinguish in each case the part which is beautiful or pleasur- | as well as our space admits, endeavour to state what char- able from the part which is mechanical or merely useful. | acters all the fine arts possess in common, and in what But as soon as we inquire further, and seek for more precise | they severally differ from one another, as well as to lay definitions, we find ourselves confronted with a mass of down certain leading facts of their history ; in other words, | 7 lla and discussion as formidable as has

been accumu- | we shall submit (1) a definition of fine art in general, he me pert” of human thought. Granting that | (2) a definition and classification of the fine arts severally; asia annie i which the end is beauty, or beauty (3) some observations on their historical development. But Be airpacic a ae —— next arises, what is | Inso doing, we shall not profess even to state the deeper pro ne of oes the beauty of art differ from blems either of metaphysics or psychology wltich will lie t y ature? and then, what place do the arts of | right and left of our path, still less, as the exponents of any

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one philosophical system, to solve them. We shall simply take account of the facts and phenomena of the several arts as we find them in experience, and sum them up in the language of every day; keeping of necessity in view only the most salient features of the vast provinces of inquiry before us, and leaving particulars to be supplied under the headings of the individual arts. And when, as will some- times happen, we do quote the formulas and refer to the systems of philosophers, it will be, not as adopting any of them for better for worse, but as finding suggestions in all of them by turns; since, though one body of speculative doctrine may be no truer than another, yet each brings forward some aspect and contains some presentment of the truth ; and acomplicated mass of facts, when it is arranged in the order and expressed in the terms of a system, may not be essentially the clearer, but is usually the better marshalled for review.

At the threshold it will be necessary that we should call to mind the terms of our own definition of art in

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of it, we put down the charm of this to judicious fore- thought and calculation, and call it art. Again, it is an established and a just practical maxim of the dramatic art, that the actor who in the moment of performance really and involuntarily surrenders himself to the emotions of his part and situation, though he may rouse the sympathies of the audience by a natural exhibition of feeling, yet is not acting like an artist, and does

not produce as much effect, nor an effect of the same kind, as he does when, master of him- self, he goes through a series of utterances and gestures which he has deliberately conceived and rehearsed before- hand. The task of art is not, in either of the above instances, to create a product outside of or separate from the artist. The material upon which the artist has in these cases to work con- sists of his or her own natural aptitudes; aptitudes, in the one case, of personal charm, which have to be made the most of by appropriate adornment ; aptitudes, in the other case, for mimicry and emotional expression, which have to be made the most of by study and practice. In such

phe general (see Art). According to the popular distinction | instances, it may often be hard to separate the share are: between art and nature, the idea of art only includes | of nature from the share of art in the result—to determine ; uedi- phenomena of which man is the cause—and that, when he | where grace ends and calculation begins, or where ends the ton acts not spontaneously but with calculation, not from | sympathetic power of natural expression, and where begins ~“ impulse but from forethought; while the idea of nature | the properly artistic power of studied and premeditated ex-

includes all phenomena, both in man and in the world outside him, which take place without forethought or studied initiative of his own. This distinction we saw reason to recognize as practically valid. Art, we said accordingly, means every regulated operation or dexterity whereby we pursue ends which we know beforehand; and it means nothing but such operations and dexterities, That which any one does without thinking about it, and without considering what he is doing it for, is not art at all, Hence we shall not allow the title of fine art to natural eloquence, to charm or dignity of manner, to delicacy and tact in social intercourse, and other graces of life and con- duct for which such a title is sometimes claimed, though they really proceed from an unconscious gift or unreflecting habit in those who exhibit them, All these are manifes-

pression. Perhaps no writer has observed the differences or laid down the boundary lines between these adjacent kingdoms of artlessness and art with more acuteness than Schleiermacher. But we have said enough to mark for the present purpose the reality and importance of the distinction. And

having thus secured ourselves against the intrusion among fine arts of those phases of beauty in human act and utterance which justly belong not to art at all but nature, we can enter upon what is our proper business, the delimitation of the separate place and functions of the fine arts among thie rest of the arts and among each other.

I. Or Fine ART IN GENERAL.

When we say of the fine arts as a group that they are Theplea-

activities which minister to the love of beauty in man, it is sures of as if we said, the tailor's art is an activity which ministers i i to his need of clothes; and the inference is, in the one case tially a as in the other, that a separate class of men is to be found commu- in every community devoted to this particular employment. nicable Aud such, practically, we all know to be the case; the gifts a gt

and calling of the artist constitute a separate profession, a sures,

tations of the beautiful, and in witnessing them we ex- perience a pleasure analogous, no doubt, to the pleasures of fine art. Nevertheless, so far as such manifestations are spontaneous, they are not arts, but, as we have called them, graces ; they are due, as Greek theology would have ex- | pressed it, not to the teaching of Athéné but to the gift of the Charites. When the exigencies of a deductive and

ontological system lead a writer like DrRobert Zimmermann, of Vienna, to co-ordinate these spontaneous acts or traits of beautiful and expressive behaviour with the deliberate artistic activities of the race, we feel that he is sacrificing to system a distinction which is essential. That distinction common parlance very justly observes, with its opposition of "art" to "nature," and its phrase of " second nature" for those habits which have become so ingrained as to Seem spontaneous, whether originally the result of disci- pline or not. One of the essential qualities of art is premeditation ; and when Shelley talks of the skylark's profuse strains of wnpremeditated art, he in effect lays emphasis on the fact that it is only by a metaphor that he uses the word art in this case at all ; he calls attention to that which (if the songs of birds are as _istinctive as we suppose) precisely makes the

difference between the skylark's outpourings and_his Own. For example, when we see a person in all whose ordinary movements there is freedom and beauty, we put down the charm of these to inherited and inbred physical aptitudes of which the person has never thought, and call it nature; but when we go on to notice that the

Same person is beautifully and appropriately dressed, since |

we know that it is impossible to dress without thinking

profession of the producers, so to speak, of fine art, while the rest of the community are enjoyers or recipients of the fine art produced. In the most primitive societies, uu- doubtedly, this was not so, and we can go back to an original or rudimentary stage of every fine art at which the separation between a class of producers or performers, and a class of recipients, does not exist. Such an original or rudimentary stage of the dramatic art, for instance, we are accustomed to witness in children, who will occupy them-selves at all moments with mimicry and make-believe for their own satisfaction, and without the least regard to the presence or absence of witnesses. The original or rudi- mentary type of the profession of imitative sculptors or painters is the cave-dweller of the paleolithic age, who, when he rested from his day's hunting, first took up the bone handle of his weapon, and with a flint either carved it into the shape, or on its surface scratched the outlines, of the animals of the chase. The original or rudimentary type of the architect, considered not as a mere builder but as an artist, is the savage who, when his tribe had taken to live in tents or huts instead of caves, first

arranged the skins and timbers of his tent or hut in

one way because it pleased his eye, rather than in some other way which was as good for shelter. The original

Separa- tion of theclass- es who produce and those who re- ceive plea-sures of fine art.

type of the artificer or maker of household implements, considered in the same

ment it with tufts or markings. In none of these cases had the primitive artist any reason for pleasing anybody but himself. Again, the original or rudimentary type of lyric song and dauciug arose when the first reveller clapped hands and stamped or shouted in time, in honour of his god, 'n commemoration of a victory, or in mere obedience to the blind stirring of a rhythmic impulse within him ; and to such a display the presence or absence of witnesses does not signify at all. The original type of the instrumental tausician is the shepherd who first notched a reed and drew sounds from it while his sheep were cropping. The father of all artists in dress and personal adornment was the first wild man who tattooed himself or bedecked himself with shells and plumes. But in both of these last instances, it may be said, the primitive artist surely had the motive of pleasing not himself only, but his mate, or the female whom he desired to be his mate? However that may be, it is clear that what any one can enjoy by himself, whether in the way of musical sounds or personal adornments, or in the way of mimicry, of rhythmical movements, of imitative or ornamental carving and drawing, of the disposition and adornment of dwelling places and utensils—the same things, it is clear, others can also enjoy with him. For these and similar things to give pleasure, it is not essential that others should be by ; but the pleasures they give are essen- tially of a kind in which others can, if they are by, partici- pate.

And so, with the growth of societies, it comes about that one class of persons separate themselves, and become the ministers or producers of this kind of pleasures, while the rest become the persons ministered to, the participators in or recipients of the pleasures. Artists are those members of a society who are so constituted as to feel. more acutely than the rest certain classes of pleasures which all can feel in their degree. By this fact of their constitution they are impelled to devote their active powers to the production of such pleasures, to the making or doing of some of those things which they enjoy so intensely when they are made and done by others. At the same time the artist does not, by assuming these ministering or creative functions, surrender his enjoying or receptive functions. He continues to participate in the pleasures of which he is himself the cause, and remains a

conscious member of his own public. The architect, sculp- tor, painter, are able respectively to stand off from and appreciate the results of their own labours; the singer enjoys the sound of his own voice, and the musician of his own instrument; the poet, according to his temperament, furnishes the most enthusiastic or the most fastidious reader for his own stanzas. Neither, on the other hand, does the person who is a habitual recipient from others of the pleasures of fine art, forfeit the privilege of producing them according to his capabilities, and of becoming, if he has the power, an amateur or occasional artist. Nay, these oppo- site functions of producing and enjoying the fruits of production, of ministering and being ministered to, are much more commonly combined in this than in other de- partments of human exertion. Nearly every one is ready to aoe = he can, of his own higher pleasures, and ait . e his own singer or poet, his own architect, og ae eae Few are ready to be munisters of oe Pause = s, and to be their own tailors, their a wit icins – on = the case of wild game, the killing Lo mee : Mile, og p me possesses an attraction of which ee 4 : evoid), their own cobblers, cooks,

; rest. In spite, however, of such com-

light, was the other savage who first | took it into his head to fashion his club or spear 1n one way rather than in another way as good for killing, and to orna—

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‘ bination or interchange of functions, we may, both practi-

cally and for the purposes of the present discussion, regard the artist as belonging generally to one category and the rest of the world to another. We may separate in our consideration those phenomena which attend the production of fine art, or exercise of the esthetic activities, from those phenomena which attend the enjoyment of fine art, or contemplation of the results of such exercise.

For the rest, of the two parts of which our preliminary Noga; definition consisted, we shall gain most by letting alone the part of one and following

out the other. If we take up the affir- Mstd mative part, in which we said that the fine arts are those jr

: —e : @ fol- which minister to our love of beauty, and if we try to de joyei velop and complete that, we shall have, for one thing, to explain how the love of beauty, in the wide and somewhat loose sense in which we here use the phrase, means a faculty which man possesses for taking keen and permanent delight in the contemplation and the imagination of many kinds of things, including some not strictly to be called bean- tiful, such as grotesqueness, comicality, even ugliness itself, when they are presented in typical forms. For another thing, we shall be very apt to find ourselves arguing in 4 circle, and saying, such and sueh an art is fine because it produces beauty, and such and such a thing is beautiful because it is produced by fine art. But if we take up the negative part of our definition, in which we only said that the fine arts are arts which exist independently of practical necessity or utility, and if we try to follow out this, we shall find that here we have got hold of a character of the fine arts which at once presents instructive aspects and far- reaching consequences. Indeed, the greater part of those other characters, or common properties of whatever kind, which have been recognized by consent as peculiar to the group of fine arts, will appear on examination to be implied in, or deducible from, this one fundamental character.

Let us take first, among such common properties, one The: relating to the frame of mind, or moral attitude, so to cal] sure it, which accompanies the reception as distinguished from aed the production of esthetic pleasure. Tt is an observation tore as old as Aristotle that such pleasures differ from mostas other pleasures of experience in that they are disinterested. %° That is to say, of course not disinterested in the sense in a which that word implies the positive ethical virtue of self- | abnegation, or preferring othersto one's self; but disinterested | in the sense that they are not such as nourish a man's body | |

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nor add to his riches; they are notsuch as can gratify him, wlien he receives them, by the sense of advantage or superi- ority over his fellow creatures; they are not such as one human being can in any sense receive exclusively from the object which bestows them. We have partly learnt as much already in glancing at the origins or rudimentary stages of the several fine arts, when we saw that, whether the primi tive artist meant it or not, his operations were capable at any rate of pleasing others besides himself. To turn to their developed stages, it is evidently characteristic of a beautiful building that its beauty cannot be monopolized, but can be seen and admired by the inhabitants of a whole city and by all visitors for all generations. The same thing is true of a picture or a statue, except in so far as an indivi- dual possessor may choose to keep such a possession to him- self, in which case his pride of monopoly is a sentiment wholly independent of his pleasure in artistic contemplation ; (and as a rule we practically find that the heir or ccllector who takes most pleasure in his treasures of art is also the readiest to make them accessible to others). Similarly, music is composed to be sung or played for the enjoyment of many at a time, and for such enjoyment a hundred years hence as much as to-day. Poetry is written to be read by all readers for ever who care for the ideas and feelings of the poet, and can apprehend the meaning and melody of bis

language. If we consider otlicr pleasures which might seem to be analogous to those of fine art, but to which common consent yet declines to allow that character, we shall see that one reason is, that such pleasures are not in their nature thus disinterested. Thus the senses of smell and taste have pleasures of their own like the senses of sight and hearing, and pleasures neither less poignant nor very much less capable of fine graduation and discrimination than those. Whiy, then, are the experiences of these senses not called beautiful? and why is the title of fine art not claimed, or only claimed in jest, for any skill in arranging and combining them? Whiy are there no arts of savours and perfumes corresponding in rank to the arts of forms, colonrs, and sounds? An answer commonly given is that sight and hearing are intellectual and therefore higher senses, that through them we

have our avenues to all know- ledge and all ideas of things outside us; while taste and smell are unintellectual and therefore lower senses, through which few such impressions find their way to us as help to build up our knowledge and our ideas. To this it may be veplied that music, in its perfect or developed state, the ac- complished fine art, that is, of sounds, deals precisely with those modes and relations of sound, pure sound as apart from words, which least convey knowledge or definite ideas, and can so far at least be called intellectual. The reply is

in the musical art, the same is a menu in the culinary, and that practically it is no Jess possible to serve up a thousand times and to a thousand different companies the same dinner than the same symphony, we must fall back upon that still more fundamental form of the distinction between the esthetic and non-xsthetic bodily senses, upon which the physiological psychologists of the English school lay stress We must say that the pleasures of taste and smell cannot be esthetic pleasures, or pleasures of fine art, because their enjoyment is too closely associated—in the case of taste of inseparably—with the most indispensable and the most strictly personal of utilities, eating and drink- ing. To pass from these lower pleasures to the highest ; con- sider the nature of the delight derived from the contempla- happy enough to be their object, of the signs and manifestations of love, That at least is a beautiful experience ; why is the pleasure which it affords hot an artistic pleasure either? Why, in order to receive an artistic pleasure from human signs and manifestations of this kind, are We compelled to go to the theatre, and see : tblted In favour of a third person, who is not – y their object any more than ourselves? This is so, or one reason, evidently, because of that difference between att and nature on which we have already dwelt. Not to art, but to nature and life, belongs love where it is really felt, with its attendant train of hopes and fears, momentous weagous and contingencies. To art belongs love displayed ae it ‘. not really felt; and in this sphere, along with – 4

personal emotions are absent can the properly

esthetic emotions or pleasures of fine art find place. That in witnessing a dramatic performance, part of the spectator’s enjoyment consists in sympathetically identifying himself with the lover, may be true, but cannot

affect the argument, since at the same time he is well aware that every other spectator present may be similarly engaged with himself.

Thus, from the lowest point of the scale to the highest, This is we may observe that the element of personal advantage or because monopoly in human gratifications seems to exclude them th =: from the kingdom of fine art. The pleasures of fine art Seamer: seem to define themselves as pleasures of delighted con- of utility. templation, but of such contemplation only when it is dis- interested. Now, the negative part of our first definition was that the fine arts were arts having nothing to do with the satisfaction of practical necessities or supply of practical utilities. So far as the necessity of anything implies its necessity to the sustenance or comfort of the individual apart from others, and so far as its utility implies its capa- city of being used by one to the exclusion of others, our new observation, it is evident, does but confirm that first statement ; repeating it as to a part of the ground which it covers, and drawing out a part of its consequences in the moral and social sphere.

Next, let us consider another generally accepted observa- The fine tion concerning the nature of the fine arts, and one, this arts can- time, relating to the disposition and state of mind of the not be artist himself. The observation we mean is this, that while eg for success in other arts it is only necessary to learn their ey pre- rules, and to apply them until practice gives facility, in the cept;this fine arts rules and their application will carry but a little way also is towards success. All that can depend on rules, on know- a. ledge, and on the application of knowledge by practice, the ied artist must indeed acquire, and the acquisition is often very dent of complicated and laborious. But outside of and beyoud suclhi utility. acquisitions, he must trust to what is called genius or imagination, that is, to the spontaneous working together of an incalculably complex group of faculties, reminiscences, preferences, emotions, instincts, in his constitution. Now, if we consider this characteristic of the activities of the artist, we shall see that it is a direct consequence or corollary of the fundamental fact that the art he practises is independent of utility: thus. A useful end is necessarily a determinate and prescribed end. To every end which is determinate and prescribed there must be one road which is the best. Skill in any useful art means knowing practi- cally, by rules and the application of rules, the best

road to the particular ends of that art. Thus the farmer, the engineer, the carpenter, the builder so far as he is not con. cerned with the look of his buildings, the weaver so far as he is not concerned with the designing of the patterns which he weaves, these and the hundred other varieties of crafts- men or artificers in a community, possess each his separate skill, but a skill to which fixed problems are set, and which, if it indulges in new inventions and combinations at all, can indulge them only for the sake of an improved solution of those particular problems and no others. The solution once found, the invention once made, its rules can be written down, or at any rate its practice can be imparted to others, who will apply it in their turn. Whereas no man can write down, in a way that others can act upon in their turn, how Beethoven conquered unknown kingdoms in the world of harmony, and established new laws by the inspired violation of old; or how Rembrandt turned the aspects of spiritual abjectness and physical gloom into pictures as worthy of contemplation as those into which the Italians had for ages turned the aspects of spiritual exaltation and shadowless day. The reason why the operations of the artist thus differ from the operations of the ordinary crafts- man or artificer is that his ends, being ends other than useful, are not determinate nor fixed as theirs are. He has.

large liberty to choose his own problems, and may solve each of them in a thousand different ways according to the prompting of his own ordering or creating instincts. The musical composer has the largest liberty of all. Having learned what is learnable in his art, having mastered the complicated and laborious rules of musical form, having next determined the particular class of the work which he is about to compose, he has then before him the whole inexhaustible world of appropriate successions and combina- tions of emotional sound. He is merely directed and not fettered, in the case of song, cantata, oratorio, or opera, by the sense of the words which he has to set. The poverty or splendour of the result depends absolutely on his pos- sessing or failing to possess powers which can neither be trained in, nor communicated to, any man. And _ this double freedom, alike from practical service and from the representation of definite objects, is what makes music ina certain sense the typical fine art, or art of arts. Archi- tecture shares one half of this freedom. It has not to ;mitate

natural objects; for this service it calls in sculpture to its aid; but architecture is without the other half of freedom altogether. The architect has a sphere of liberty in the disposition of his masses, lines, colours, alternations of light and shadow, of plain and ornamented surface, and the rest; but upon this sphere he can only enter on con- dition that he at the same time fulfils the strict practical task of supplying the required accommodation, and obeys the strict mechanical necessities imposed by the laws of weight, thrust, support, resistance, and other properties of solid matter. In the imitative arts, the sculptor, the painter, the poet, has each in like manner his sphere of necessary facts, rules, and conditions corresponding to the nature of his task, The sculptor must be intimately versed in the facts of the human frame and the rules and condi- tions for its representation in solid form; the painter in a much more extended range of uatural facts and appear- ances, and the rules and conditions for representing them on a plane surface ; the poet's art of words has its own not inconsiderable basis of positive and disciplined acquisi- tion. So far as rules, precepts, measurements, and other communicable laws or secrets can carry the artist, so far also the spectator can account for, analyse, and, so to speak, tabulate the effects of his art. But the essential character of the artist's operation, its very bloom and virtue, lies in those parts of it which fall outside this range of regulation on the one hand and analysis on the other. His merit varies according to the felicity with which he is able, in that region, to exercise his free choice and frame his individual ideal, and according to the tenacity with which he strives to grasp and realize his choice, or to attain perfection according to that ideal. Of the ampli- tude of that freedom, of the complex and unsearchable secrets of that felicity, of the honourableness of that pursuit after perfection, men in general have expressed their con- sciousness when they have called these the fine or beautiful arts; thereby signifying not less their admiration of the nature of the operation than their pleasure in its results. Corresponding, then, to the fact, concerning the ends or purposes of the mechanical and the fine arts respectively, that those exist for use and these independently of use— we get the further fact, concerning the respective modes of their pursuit, that the mechanical arts can be rightly prac- tised by strict adherence to rule and precept, while the fine arts, though they have technical foundations which are matters of rule and precept too, can yet be riglitly practised only by following, in a region outside the reach of rule and precept, the free

prompting of sonie of the finest faculties of the spirit. aa age ge the power and province of mechanical y expanding, it is worth while in this connexion

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to inquire in what way such expansion affects the power Relatiye

and province of fine art. of the world in our age is a movement for thie develop- ment of mechanical inventions and multiplication of me- chanical products.

*to purposes purely useful, and so far as tlieir products do known not profess to offer anything delightful to contemplation, **

this movement in no way concerns our argument. But

there is a vast multitude of products which do profess atin. qualities of pleasantness, and upon which the ornaments dustries

intended to make them pleasurable are bestowed by inachinery, and in speaking of which we are accnstomed to the phrases art-industry, industrial art, art manufactures, and the like. It concerns us to know what relation the fine arts really hold to these. The answer is, that the in- dustry or ingenuity which directs the machine is not fine art at all, since the object of the machine is simply to mul- tiply as easily and as perfectly as possible a definite and pre- scribed impress or pattern, This is equally true whether the machine is a perfectly simple one, like the engraver's press, for producing and multiplying impressions from an en- graved plate, or a highly complex one, like the loom, in which elaborate patterns of carpet or curtain are set for weaving. In both cases there exists behind the mechanical industry an industry which is one of fine art in its degree. In the case of the engraver's press, there exists behind the industry of the printer the art of the engraver, which, if the engraver is also the free inventor of the design, is then a fine art, or if he is but the interpreter of the invention of another, is then in its turn a semi-mechanical appliance in aid of the fine art of the first inventor. In the case of the weaver's loom there is, behind the mechanical industry which directs the loom at its given task, the fine art, or what ought to be the fine art, of the designer who has contrived the pattern.

In the case of the engraving, the mechanical industry of printing only exists for the sake of bringing out and disseminating abroad the fine art em- ployed upon the design. In the case of the carpet or cul- tain, the fine art is only called in to make the product of the useful or mechanical industry of the loom acceptable, since the eye of man is so constituted as to receive pleasure or the reverse of pleasure from whatever it rests upon, and it is to the interest of the manufacturer to have his product so made as to give pleasure if it can. Whether the machine is thus a humble servant to the artist, or the artist a kind of humble purveyor to the machine, the fine art in the result is due to the former alone; and in any case it reaches the recipient at second-hand, having been put in circulation by a medium not artistic but mechanical. So far, then, as the adoption of mechanical agencies causes an increasing number of people to buy the same print, or decorate their apartments with the same hangings, or WF the same pattern, where before each community or section of a community used products according to its individual taste and tradition, so far such adoption tends to reduce the number of first-hand artistic inventions, or total quantity of fine art, in the world. There is no greater mistake than to suppose that the expansion of what are called art- industries is necessarily tantamount to an increase or pro- pagation of fine art; it is only tantamount to an increase or propagation of particular decorations mechanically mul- tiplied; and is a thing desirable or not according as the decorations so multiplied replace something better worse than themselves. , Again, with reference not to the application of mechanical coutrivances but to their invention,—is not, it may be In- quired, the title of artist due to the inventor of some of the astonishingly complex and astonishingly efficient machines of modern times? Does he not spend as much thought,

labour, genius, as any sculptor or musician in perfecting his

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construction according to his ideal, aud is not the construc-

In another age, and thinking according to another Schiller

tion when it is done—so finished, so responsive in all its | system, Schiller, so far from holding thus cheap the king- 2nd the parts, so almost human—is not that worthy of the name | dom of play and show, regarded his sovereignty over that ee of fine art? Nay, we must reply, for the inventor has a kingdom as tlie noblest prerogative of man. Schiller wrote a definite and practical end before lum ; his ideal is not free; his famous Letters on the Asthetic Education of Man in he deserves all credit as the perfector of a particular instru- | order to throw into popular currency, and at the same time ment for a prescribed function, but an artist, a free follower | to modify and follow up iu a particular direction, certain of the fine arts, he is not. systematic doctrines which had lately been launched upon '; fine Lastly, let us consider one common observation more con- the schools by Kant. The spirit of man, said Schiller 3a cerning the nature of the fine arts, though in effect it too | after Kant, is placed between two worlds, the physical world 1dof does but affirm, in a somewhat new light, that negative de- | or world of sense, and the moral world or world of will. /% finition on which we have dwelt so much already. The | Both of these are worlds of constraint or necessity. In fine arts, it is said, are activities which men put forth, not | the sensible world, the spirit of man submits to constraint because they need but because they like. They have the | from without; in the moral world, it imposes constraint activity to spare, and to put it forth in this way pleases | from within. So far as man yields to the importunities of them. Fine art is to mankind what play is to the indivi- | sense, in so far he is bound and passive, the mere subject dual, a free and arbitrary vent for energy which is not | of outward shocks and victim of irrational forces. So far needed to be spent upon tasks concerned with the conserva- | as he asserts himself by the exercise of will, imposing upon tion, perpetuation, or protection of life. To insist on the | sense and outward things the dominion of the moral law superfluous or optional character of the fine arts, to call | within him, in so far he is free and active, the rational them the play or pastime of the human

race as distinguished | lord of nature and not her slave. Corresponding to these from its inevitable and sterner tasks, is obviously only to | two worlds, he has within him two conflicting impulses or reiterate our fundamental distinction between the fine arts | impuisions of his nature, the one driving him towards one and the useful or necessary. But the distinction,as expressed | way of living, the other towards another. The one, or in this particular form, has been interpreted in a great | sense-impulsion, Schiller thinks of as that which enslaves variety of ways, and followed out to an infinity of conclu- | the spirit of man as the victim of matter, the other or moral sions, couclusions regarding both tlie nature of the activities | impulsion as that which enthrones it as the dictator of themselves and the character and value of their results. form. Between the two the conflict at first seems te For instance, starting from this saying that the esthetic | inveterate. The kingdom of brute nature and sense, the glish activities are a kind of play, the English psychology of | sphere of man's subjection and passivity, wages war against dy association goes back to the spontaneous cries and move- | the kingdom of will and morai law, the sphere of his activity ee ments of children, in which their superfluous energies find a | and control, and every conquest of the one is an encroach- m. vent, It then enumerates pleasures of which the human con- | ment upon the other. One of the two, it seems, must win. stitution is capable apart from direct advantage or utility. | The man, it seems, must either be slave or master; he Such are the primitive or organic pleasures of sight and | must either obey the impulsion of matter, and let sense and hearing, and the secondary or derivative pleasures of asso- | outward shocks lay upon him the constraint of nature, or ciation or unconscious reminiscence and inference that soon | he must obey the impulsion of form, and must control and become mixed up with these. Such are also the pleasures | subjugate sense under the constraint of moral reason and derived from following any kind of mimicry, or represen- | the will. Is there, then, no hope of truce between the two tation of things real or like reality. It describes the | kingdoms, no ground where the two contending impulses grouping within the mind of predilections based upon these | can be reconciled? Must a man either abandon law and pleasures ; it shows how the growing organism learns to | give way to sense absolutely, or else absolutely set up law govern its play, or direct its superfluous energies, in | and put down sense? Nay, the answer comes, there is obedience to such predilections, till in mature individuals, |

such a hope ; such a nevtral territory there exists. Between and still more in mature societies, a highly regulated and | the passive kingdom of matter and sense, where man is accomplished group of leisure activities are habitually | compelled to blindly feel and be, and the active kingdom employed in supplying to a not less highly cultivated | of law and reason, where he is compelled sternly to will and group of disinterested sensibilities their appropriate artistic | act, there is a kingdom where both sense and will may pleasures. have their way, and where man may give the rein to all his Again, in the views of an ancient philosopher, Plato, | powers. But this middle kingdom does not lie in the and a modern poet, Schiller, the consideration that the | sphere of practical life and conduct. In practical life and artistic activities are in the nature of play, and the mani- | conduct you cannot yield to both impulsions at once; let festations in which they result independent of realities | yourself go, in that sphere, to the allurements of sense, and and utilities, has led to judginents so differing as the fol- | you cast off law; maintain law, and you mortify sense. i lowing. It is in the sphere of those activities which neither sub- ato,

Plato held that the daily realities of things in ex- perience are not realities indeed, but only far-off shows or reflections of the true realities, that is, of certain ideal or essential forms which can be apprehended as existing by the mind. Holding this, Plato saw in the works of fine art but the reflections of reflections, the shows of shows, and depreciated them according to their degree of remoteness from the ideal, typical, or sense-transcending existences. He sets the arts of medicine, agriculture, shoemaking, and the Test, above the fine arts, inasmuch as they produce something serious or useful (crovdaidy 71). Fine art, he says, produces nothing useful, and makes only semblances (cidoAorotixy), Whereas what mechanical art produces are

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serve any necessity of nature, nor fulfil any moral duty, that the middle kingdom lies where sense and reason can be reconciled. Towards activities of this kind we are driven by a third impulsion of our nature not less essential to it than the other two, the impulsion, as Schiller calls it, of Play. Relatively to real life and conduct, play is a kind of harmless show; it is that which we are free to do or leave undone as we please, and which lies alike

outside the sphere of needs and duties. In play we may do as we like, and no mischief will come of it. In this sphere man may put forth all his powers without risk of conflict, and may invent activities which will give it a complete ideal satisfaction to the contending faculties of sense and will at once, tu the impulses which bid him feel and enjoy the shocks of physical and outward things, aud

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the impulse which bids him master such things, control, and regulate them. In play you may impose upon Matter what Form you choose, and the two will not interfere with one another or clash. The kingdom of Matter and the kingdom of Form thus harmonized, thus reconciled by the activities of play and show, will in other words be the kingdom of the Beautiful. Follow the impulsion of play, and to the beautiful you will find your road; the activities you will find yourself putting forth will be the activities of esthetic creation —you will have discovered or invented the fine arts. ‘ Midway," these are Schiller's own words, " midway between the formidable kingdom of natural forces and the hallowed kingdom of moral laws, the impulse of sesthetic creation builds up a third kingdom unperceived, the gladsome kingdom of play and show, whicrein it emanci- pates man from all compulsion alike of physical and of moral forces." Schiller, the poet and enthusiast, thus making his own application of the Kantian metaphysics, goes on to sct forth how the fine arts, or activities of play and show, are for him the typical, the ideal activities of the race, since in them alone is it possible for man to put forth his whole, that is his ideal self. 'Only when he plays is man really and truly man." "Man ought only to play with the beautiful, and he ought to play with the beautiful only." 'Education in taste and beauty has for its object

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and their results; it will certainly be none for those to whom the Kantian doctrine of metaphysical opposition between the senses and the reason has no meaning, Neither can his particular application of that doctrine, with its terminology of Stoftrieb, Formtrieb, and Spieltrieb, the three impulses, or

impulsions, of Matter, Form, and Play, be considered altogether happy. Nevertheless the theory furnishes us with a suggestive approach to a working definition, and has remained a fruitful one for many minds independently of the metaphysical doctrines upon which it was based. Its great fault is that, though it asserts that man ought only to play with the beautiful, and that he is his best or ideal self only when he does so, yet it does not sufficiently determine what kinds of play are beautiful nor why we are moved to adopt them. It does not sufficiently show low the delights of the eye and spirit in contemplating forms, colours, and movements, of the ear and spirit in apprehending musical and verbal souuds, or of the whole mind at once in following the comprehensive current of images called up by poetry—it does not sufficiently show how delights like these differ from those yielded by other kinds of play or pastime, and betwecn them make up the whole kingdom of artistic pleasures.

The chase, for instance, is a play or pastime whicli gives Ples-

*scope for any amount of premeditated skill; it has sureso pleasures, for those who take part in it, which are in some ™** © degree analogous to the pleasures of the artist ; aud we all a know the claims made on behalf of the noble art of venerie with*

by the knights and woodnien of Walter Scott's romances. thoseof

to train up in the utmost attainable harmony the whole sum of the powers both of sense and spirit." And the rest of Schiller's argument is addressed to show how the activities of artistic creation, once invented, quickly react upon other

departments of human life, how the exercise of the play a e Chase,

impulse prepares men for an existence iu whicli the inevi- table collision of the two other impulses shall be softened or averted more and more. That harmony of the powers which clash so violently in man's primitive nature, having first been found possible in the sphere of the fine arts, re- flects itself, in his judgment, upon the whole composition of man, and attunes him, as an esthetic being, into new capabilities for the condnet of his social existence.

But here we must remember that, though the chase is play to us, who in civilized communities follow it on no plea of g,, necessity, yet to a not remote ancestry it was earnest; in primitive societies hunting dves not belong to the class of optional activities at all, but is among the most pressing of utilitarian needs. And this character of its origin and history might exclude it from the class of fine arts, even if there were not the further fact that the pleasures of the

Merits Our reasons for dwelling on this wide and enthusiastic | sportsman are the only pleasures arising from the chase ; -— formula of Schiller's are both its importance in the history | his exertions afford pain to the victim, and no satisfaction

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of reflection—it produced, indeed, so great an impression

theory of that it may still be called a formula almost classical—and

Schiller, its positive value.

The notion of a sphere of voluntary ac- tivity for the human spirit, in which, under no compulsion of necessity or conscience, we order matters as we like them apart from any practical end, seems at least co-extensive with the widest conception of fine art and the fine arts. It Insists on and brings into the light the essential point of the free, or as we have called it, the optional character of these activities, as distinguished from others to which we are compelled by necessity or duty. It also insists on and brings into the light what is no less essential, the fact that these activities, superfluous as they are from the points of view of necessity and of duty, spring nevertheless from an imperious and a saving instinct of our nature. It does justice to the part which is, or at any rate may be, filled in the world by pleasures which are apart from profit, and by delights for the enjoyment of which men cannot quarrel. It claims the dignity they deserve for those shows and pastimes in which we have found a way to make permanent all the transitory delights of life and nature, to turn our very tears and yearnings, by their artistic utterance, into sources of appeasing joy, to make amends to ourselves for the confusion and imperfection of reality by conceiving and

imaging forth the semblances of things clearer and more complete, since in contriving them we incorporate with the

experiences we have had the better experiences have dreamed of and longed for. —-

Schiller's theory may thus

; be no explanati essential nature and place in the pie

universe of these activities

to any class of recipients but himself ; or at least the plea- sures of the bystanders at a meet or a battue are hardly to be counted as pleasures of artistic contemplation. Again, it may be said that such a theory does not sufficiently exclude from among the fine arts the class of athletic games or sports, not connected with the chase, though these do afford pleasure to multitudes, and most commu- nities, especially our own, are accustomed to devote to them much trained skill and a large portion of thcir leisure activity. Here the difference is, that the event which excites the spec- tator's interest and pleasure at a race or athletic contest is not a wholly unreal or simulated event ; true, it is less real than life, but it is more real than art. The contest has not, indeed, any momentous practical consequences, but it is a contest in which competitors put forth real strength, and one really wins, and others are defeated. Such a con- test, in which the exertions are real and the issue uncertain, we follow with an excitement and an expectancy which are different in kind from the feelings with which we contem- plate any fictitious representation of which the issues are arranged beforehand, For example, let the reader recall the feelings with which he has watched a real fencing bout, and compare them with those with which he watches the simulated fencing bout in Hamlet. The instance is 4 crucial one, because the simulated contest is made infinitely more exciting than such contests in general by the intro duction of the poisoned foil, and by the tremendous con- sequences which we are aware will turn, in the represen- tation, on the issue. Yet because the fencing scene Hamlet 7s a representation, and not real, we find ourselves

athletics,

witching if in a mood wholly different from that in which we watch the most ordinary real fencing-match with vizors aud blunt foils; a mood much more exalted, if the repre- sentation is good, but amid the esthetic emotions of whiclt those other fluctuations of direct, even if trivial, excitement, of participation, approval, disappointment, suspense, eager- ness, find no place. Again, of athletics in general, they are pursuits to a considerable degree definitely utilitarian, hav- ing for their specific end the training and strengthening of the human body. Here, however, our argument touches grouud which is not free from debate ; inasmuch as in some systems the title of fine arts has been consistently claimed, if not for athletics technically so-called, and involving the idea of competition and defeat, at any rate for gymnastics, regarded simply as a display of the physical frame of man cultivated by exercise—as, for instance, it was cultivated by the ancient Greeks—to an ideal perfec- tion of beauty and strength.

Ge al Divesting the view of Schiller, then, of the Kantian

def- metaphysic, and adding to it those provisions on which, in

tio' the course of our argument, we have seen the necessity of laying stress, we might put the matter thus. There are some things which we do because we must ; those are our necessities. There are other thiugs which we do because we ought ; those are our duties. There are other things which we do because we like ; those are our play. Among the various kinds of things done by men only because they like, the fine arts are those of which the results afford to many permanent and disinterested delight, and of which the per- formance, calling for premeditated skill, is capable of regu- lation up to a certain point, but, that point passed, has secrets beyond the reach and a freedom beyond the restraint of rules. We believe that this definition or description, avoiding barren controversy concerning the nature of beauty, will be found both to state the limits of the group of undis- puted fine arts, and to enunciate some of its chief charac- teristics, ——

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II. Or roe Fine Arts SEVERALLY.

Architecture, sculpture, painting, music, and poetry are

*by common consent the five principal or greater fine arts. * It is possible in thought to group these five arts in as ne I many different orders as there are among them different ved. kinds of relation or affinity. One thinker fixes his atten- rts ve 40n upon one kind of relations as the most important, and cel arranges his group accordingly; another upon another; and "Sd. each, when he has done so, is very prone to claim for his arrangement the virtue of being the sole essentially and fundamentally true. For example, we may ascertain one kind of relations between the arts by inquiring which is the simplest or most limited in its effects, which next simplest, which less simple still, which least simple or most complex of them all. This, the relation of progressive complexity or comprehensiveness between the fine arts, is the relation upon which an influential thinker of recent times, Auguste Comte, has fixed his attention, and it yields In his judgment the following order :— Architecture lowest m complexity, because both of the kinds of effects which it produces, and the material conditions and limitations under Which it works: Sculpture next; painting third; then music; and poetry highest, as the most complex or com- prehensive art of all, both in its own special effects and in its resources for ideally calling up the effects of all the other arts, as well as all the phenomena of nature and experiences a ve. A somewhat similar grouping was adopted, though i the consideration of a wholly different set of relations, ie Hegel. Hegel fixed his attention on the varying rela- lons borne by the idea, or spiritual element, to the embodi- ment of the idea, or material element, in each art. Leaving aside that part of his doctrine which concerns, not the*

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phenomena of the arts themselves, but their place in the dialectical world-plan, or scheme of the universe—Hegel said in effect something like this. In certain ages and among certain races, as in Egypt and Assyria, and again in the Gothic age of Europe, mankind has only dim ideas for art to express, ideas insufficiently disengaged and realized, of which the expression cannot be complete or lucid, but only adumbrated and imperfect; the characteristic art of those ages is a symbolic art, with its material element predomi-

nating over and keeping down its spiritual, and such a symbolic art is architecture. In other ages, as in the Greek age, the ideas of men have come to be definite, disengaged, and clear; the characteristic art of such an age will be one in which the spiritual and material elements are in equilibrium, and neither predominates over or keeps down the other, but a perfectly distinct idea is expressed in a per- fectly adequate form; this is the mode of expression called classic, and the classic art is sculpture. In other ages, again, and such are the modern ages of Europe, the idea grows in power and becomes importunate; the spiritual and material elements are no longer in equilibrium, but the spiritual element predominates; the characteristic arts of such an age will be those in which thought, passion, senti- ment, aspiration, emotion, emerge in freedom, dealing with material form as masters, or declining its shackles altogether ; this is the romantic mode of expression, and the romantic arts are painting, music, and poetry. Next let us take another point of view, and turn our atten- tion, with one of the acutest of recent critics of zsthetic systems, Dr Hermann Lotze, to the relative degrees of freedom or independence which the several arts enjoy—their freedom, that is, from the necessity of either imitating given facts of nature or ministering, as part of their task, to given practical uses. In this grouping, instead of the order architecture, sculpture, painting, music, poetry—music will come first, because it has neither to imitate any natural facts nor to serve any practical end ; architecture next, be- cause though it is tied to useful ends and material condi- tions, yet it is free from the task of imitation, and pleases the eye in its degree, by pure form, light and shade, and the rest, as music pleases the ear by pure sound; then, as arts all tied to the task of imitation, sculpture, painting, and poetry, taken in progressive order according to the pro- gressing comprehensiveness of their several resources.

Again, besides the enumeration of the five greater fine arts, which is fixed, and their classification, which is thus unfixed and variable, the thinker on these subjects has to consider the enumeration and classification of the lesser or subordinate fine arts, Whole clusters or families of these occur to the mind at once; such as acting, an art auxiliary to poetry, but quite different in kind; dancing, an art not auxiliary but subordinate to music, from which in kind it differs no less; eloquence in all kinds, so far as it is studied and not merely spontaneous; and among the arts which fashion or

dispose material objects, embroidery and the weaving of patterns, pottery, glassmaking, goldsmith's work and jewellery, joiner's work, gardening, according to the claim of some, and a score of other dexterities and industries which are more than mere dexterities and industries because they add elements of beauty and pleasure to elements of serviceableuess and use. To decide whether any given one of these has a right to the title of fine art, and if so, to which of the greater fine arts it should be thought of as appeuded and subordinate, or between which two of them intermediate, is often no easy task.

The weak point of all classifications of the kind of which we have above given examples is that each is intended to be final, and to serve instead of any other. The truth is, that the relations between the several fine

arts are much too complex for any single classification to

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Place of the lesser or auxili- ary arts

_among

the rest,

No one classifica- tion suffi- cient,

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bear this character. Every classification of the fine arts must necessarily be provisional, according to the particular class of relations which it keepsin view. And for practical purposes it is requisite to bear in mind not one classification but several, Fixing our attention not upon complicated or problematical relations between the various arts, but only upon their simple and und isputed relations, and giving the first place in our consideration to the five greater arts of architecture, sculpture, painting, music, and poetry,

we shall find at least three principal modes in which every fine art either resembles or differs from the rest.

L. The Shaping and the Speaking Arts.—Each art eitlier

classifi- makes something, or does not make anything, that can be cation— geen and handled. 'The arts which make something that

the shap- ing and

can be seen and handled are areliitecture, sculpture, and

speaking painting. In the products or results of all these arts ex-

arts.

ternal matter is in some way or another manually put to- gether, fashioned, or disposed. But music and poetry do not produce any results of this kind. What music produces is something that can be heard, and what poetry produces, is something that can be either heard or read—which last is a kind of ideal hearing, having for its avenue the eye instead of the ear, and for its material, written signs for words instead of the spoken words themselves. Now what the eye sees from any one point of view, it sees all at once; in other words, the parts of anything we see fill or occupy not time but space, and reach us from various points in space ata single simultaneous perception. If we areat the proper distance we see at one glance the whole height and breadth of a house from the ground to the chimneys, the whole of a statue from head to foot, aud in a picture at once the foreground and background, and everything that is within the four corners of the frame. On the other hand, the parts of anything we hear, or, reading, can imagine that we hear, fill or occupy not space but time, and reach us from various points in time through a continuous series of perceptions, or, in the case of reading, of images raised by words in the mind. We have to wait, in music, while one note follows another in a bar, and one bar another in an air, and one air another in a movement ; and in poetry, while one line with its images follows another in a stanza, and one stanza another in a canto, and so on. It is a con- venient form of expressing both aspects of this difference between the two groups of arts, to say that

architecture, sculpture, and painting are arts which give shape to things in space, or more briefly, shaping arts; and music and poe arts which give utterance to things in time, or more

riefly, speaking arts. These simple terms of the shayyng and the speaking arts are not usual in English; but they seem 'appropriate and clear, and we shall adopt them for denoting the distinction we are now considering between the group that work in space, architecture, sculpture, and painting, and the group that work in time, music and poetry. (The distinction is best expressed in the German bildende and redende Kiinste; for which the words manual and vocal, or else formative, or plastic, and rhetorical, are some-times used, not too happily, in English.) This is practically, if not logically, the most substantial and vital distinction upon which a classification of the fine arts can be based. The arts which surround us in space with stationary effects for the eye, as the house we live in, the picture on the walls, the marble figure in the vestibule, are stationary, hold are mt of place in our experience—not a greater a = Leh essentially a different place—from the Geeta eae us with transitory effects in time, effects a we mine for the ear or mind at any ene by Lies ao 2h is awakened by playing and an gustitct g, but lying in abeyance until we bid that {KE 20 aes and passing away when the performance or

ne reading 1s over. Such, indeed, is the practical force of

FINE ARTS

the distinction that in modern usage the expression sine art, or even art, is often used by itself in a sense which tacitly excludes music and poetry, and signifies the group of manual or shaping arts alone.

tion on which we are now dwelling is sharp and absolute, metiate / Buildings, statues, pictures, belong absolutely to sight and Class of space; to time and to hearing, real through the ear, or ideal through the mind in reading, belong absolutely music and poetry. Among the lesser or subordinate arts, how- ever, there are several in which this distinction finds no place, and which produce, in space and time at once, effects midway between tlie stationary or stable, and the transitory or fleeting. Such, first of all, is the dramatic art, in which the actor makes with his actions and

gestures, or several actors make with the combination of their different actions and gestures, a kind of shifting picture, which appeals to the eyes of the witnesses while the sung or spoken words of the drama appeal to their ears; thus making of them

As between any two of the five greater arts, the distine- hie.

arts of notion, ;

spectators and auditors at once, and associating with the pure time-art of words the mixed time-and-space art of bodily movements. As all movement whatsoever is necessarily movement through space, and takes time to happen, so every other fine art which is wholly or in part an art of movement partakes in like manner of this double character. Along with acting thus comes dancing. Dancing, when itis of the mimic character, may itself bea kind of acting, andis, whether apart from or in conjunction with this mimic ele- ment, at any rate an art in which bodily movements obey, accompany, and as it were accentuate in space the time effects of music. Eloquence or oratory in like manner, S0 far as its power depends on studied and premeditated gesture, is also an art which to some extent enforces its primary appeal through the ear in time by a secondary appeal through the eye in space. So much for the first distinction, that between the shaping or space-arts and the speaking or time-arts, with the intermediate and subordinate class of arts which, like acting, dancing, oratory, add to the pure time element a mixed time-and-space element. These can hardly be called shaping arts, because it is his own person, and not anything outside himself, which the actor, the dancer, the orator disposes or adjnsts ; they may perhaps best be called arts of motion, or moving arts. We must postpone further description of the functions of the several fine arts until we have taken account of the second great principle of classification among them, which is as follows —

2. The Imitative and the Non-imitutive Arts. —Each art Seco either represents or imitates something, or does not represent iy or imitate anything, which exists already in nature. f ital the five greater fine arts, those which thus represent objects mndu existing in nature, are sculpture, painting, and poetry. imita Those which do not represent anything so existing area music and architecture. So that on this principle we get@

different grouping from that which we got on the principle last explained. Two space-arts and one time-art now form the imitative group of sculpture, painting, and poetry; while one space-art and one time-art form the non-imitative group of music and architecture. The mixed space-and- time arts of the actor, and of the dancer so far as he or she is also a mimic, belong of course, by their very name am nature, to the imitative class.

Tt was this imitative character of the arts which chiefly ™" But Aristotle had not #"

his mind the idea of imitation or representation (mimésis) 2 was extended so as to denote the expressing, uttering, 0 ae making manifest of anything whatever. Music and dancings sath | by which utterance or expression is given to emotions that may be quite detached from all definite ideas or images,

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are thus for him varieties of imitation. He says, indeed, | is the surest proof of vulgarity in a musician. Neither are most music and dancing, as if he was aware that tlere were | those effects of the great composers in accompanying the exceptions, but he does not indicate what the exceptions verbal descriptions of natural phenomena, which we recog- are; and under the head of imitative music, he distinctly | nize as most appropriate to the phenomena described, reckons some kinds of instrumental music without words. | generally in the nature of real imitations or representations But in our own more precise usage, to imitate is necessarily | of them. The notes of the dove and nightingale in Haydn's to imitate some individual thing, some definite reality of | Creation must be acknowledged to be instances of true experience; and wecan only call those imitative arts which | though highly idealized imitation; but in such other tell us of such things, either by showing us their actual like- | instances of direct, obvious, and suggestive appropriateness ness, as sculpture does in solid form, and as painting does | of the music to the words as even the " Hailstune" chorus by means of lines and colours on a plane surface, or else by | and the "Darkness" chorus of the Jsrael in Eyypt, the calling up ideas or images of them in the mind, as poetry | music in no true sense imitates the phenomena, or shows us and literature do by means of words, It is by a stretch of | how fire mingled with

the hail ran along upon the ground, ordinary usage that we apply the word imitation even to | or how there came over all the land of Egypt thick dark- this last way of representing things ; since words are no true | ness—even a darkness which might be felt. Again, it is likeness of, but only arbitrary signs for, the thing they re- | an acknowledged fact concerning the operation of instru- present. And those arts we cannot call imitative at all | mental music on its hearers, that al! hearers will find them- which by indefinite utterance or expression produce in us | selves in tolerable agreement as to the meaning of any emotions unattended by the recognizable likeness, idea, or | passage so long as they only attempt to describe it in terms image of anything. of vague emotion, and to say, such and such a passage ex- Nimi- Now the emotions of music, when music goes along with | presses, as the case may be, dejection or triumph, effort or ta» words, whether in the shape of actual song, or cven of the | the relaxation of effort, eagerness or languor, suspense or ch ¢- instrumental accompaniment of song, are no doubt in a | fruition, anguish or glee. But theiragreement comes to an

a4 certain sense attended with definite ideas. But the ideas | cud the moment they begin to associute, in their interpreta- ~ then in question are the ideas expressed by the words them- | tion, definite ideas with these vague cmotions; then we selves ; and tlie same ideas would be cunveyed to the mind | find that what suggests in idea to one hearer the vicissitudes equally well by the same words if they were not sung or | of war will suggest to another, or to the same at another time, accompanied, but simply spoken. What the music contri- | the vicissitudes of love, to another those of spiritual yearn- butes is a special element of its own, an element of pure | ing and aspiration, to another, it may be, those of changeful emotion which heightens the effect of the words upon the | travel by forest, champaign, and ocean, to another those of feelings, without in the least helping to elucidate them for | life's practical struggle and ambition. The infinite variety the understanding, Nay, it is well known that a song pro- | of the ideas which may thus be called up in different minds duces its intended effect upon the feelings almost as well | by the same strain of music is proof enough that the music though we fail to catch the words or are ignorant of the | is not like any particular thing. The torrent of entrancing language to which they belong. Thus the view of Aristotle | emotion which it pours along the heart,

emotion latent and cannot be defended on the ground that he was familiar | undivined until the spell of sound begins, that is music's with music only in an elementary form, and principally as | achievement and its secret ; the ideas which may spring up the direct accompaniment of words, and that in his day the | in attendance on the emotion are no more than as the rain- modern development of the art, as au art for building up | bow colours which come and go in the torrent spray. immense constructions of independent sound, glorious and It is perhaps hardly necessary to add, that the latest intricate fabrics of melody and harmony detached from | physiological explanation of the source of music's power words, was a thing neither imagined nor imaginable. That | within us in no way shakes or interferes with this funda- is perfectly true; but the essential character of musical | mental character of the art. According to that explanation, sound is the same in its most elementary as in its most | the charm of musical sounds depends on susceptibilities complicated stage. Its privilege is to give delight, not | which have gone on accumulating in the fibres of the humau by communicating definite ideas, or calling up particular | constitution, by hereditary transmission through uncounted images, but by expressing on the one part, and arousing on | generations, ever since our brute progenitors found favour the other, a unique kind of emotion. 'The emotion caused | with their mates by wooing them (as other brutes are by music may be altogether independent of any ideas con- | known to woo theirs now) with love-cries which in their veyable by words. Or it may serve to intensify and enforce | regulated time and pitch contained the rudimentary elements other emotions arising at the same time in connexion with | of music. If this explanation is true, that does not of the ideas conveyed by words; and a distinguished composer | course mean that the musical utterance of to-day is any and energetic musical reformer of our own day insists that | copy or imitation of those aboriginal love-cries ; only that in the former phase the art is now exhausted, and that only | it is an infinitely complex and remote development of In the latter are new conquests in store for it. But in | faculties which bad in them their earliest exercise. either case the music is the music, and is like nothing else; Aristotle endeavoured to frame a classification of the arts, Defini- _ it 1s no representation or similitude of anything whatsoever. | in their several applications and developments, on two ae 4 i But does not instrumental music really, it may be urged, grounds —the nature of the objects imitated by each, and : fo, S2metimes imitate the

sounds of nature, as the piping of | the means or instruments employed in the imitation. But

abs. birds, the whispering of woods, the moaning of storms, or | in the case of music the first part of this endeavour falls to an he Very explosion of the thunder ; or docs it not at any rate | the ground, because the object imitated has, in truth, no "|. Suggest these things by resemblances so close that they | existence. The means employed by music are successions almost amount to imitation? Occasionally, it is true, | and combinations of vocal or instrumental sounds regulated Music does allow itself these playful excursions into a region | according to the three conditions of time or interval, tone of quasi-imitation or mimicry, It modifies the char- | or pitch (which together make up melody), and harmony, acter of its abstract sounds into something, so to speak, | or the relations of different strains of time and tone co- More concrete, and, instead of sensations which are like | operant but not parallel. Withthese means, music either nothing else, affords us sensations which recognizably re- | creates her independent constructions, or else accompanies, semble those we receive from some of the sounds of nature. | adorns, enforces, the imitative art of speech—but herself But such excursions are hazardous, and to make them often | imitates not ; and may best be defined simply as a speuking

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art, of which the business is to utter and arouse emotion by successions and combinations of regulated sound.

That which music is thus among the speaking or time-arts, architecture is among the shaping or space-arts. As music appeals to our faculties for taking pleasure in non-imitative combinations of transitory sound, so architecture appeals to our faculties for taking pleasure in non-imitative combi- nations of stationary mass. Corresponding to the system of ear-effects or combinations of time, tone, and harmony with works, architecture works with a system of eye-effects or combinations of line, light and shade, colour, proportion, interval, alternation of plane and decorated parts, regularity and variety in regularity, apparent stability, vastness, appropriateness, and the rest. Such pleasures of the eye and ear, depending on abstract relations of sounds in time and sights in space, and not all on concrete imita- tion, are one half of those disinterested pleasures of which we are capable, and which the play-impulse within us finds out and turns to account. Only, the materials of architec- ture are not volatile and intangible like sound, but solid brick, stone, metal, and mortar, and the laws of weight and force according to which these materials have to be combined are much more severe and cramping than the laws of melody and harmony which regulate the combinations of music. The architect is further subject up to a certain point, which the musician is not, to the dictates and pre- cise prescriptions of utility. Hence the effects of architec- ture are necessarily less full of various, rapturous, and un- foreseen enchantment than the effects of music. Yet for those who possess sensibility (which many persons without knowing it completely lack) to the pleasures of the eye and the perfections of shaping art, the architecture of the great ages has yielded combinations which, so far as comparison is permissible between things unlike in their materials, fall no whit short of the achievements of music in those kinds of excellence which are common to them both. Thus in the virtnes of lucidity, of just proportion and organic inter- dependence of the several parts or members, in exquisite subtlety of their mutual relations, and of the transitions from one part or member to another, in consummate purity and consummate finish of individual forms, in the character of one thing growing naturally out of another and every- thing serving to complete the whole—in all these qualities, no musical combination can surpass a typical Doric temple such as the Hecatompedon at Athens. None, again, can surpass the great cathedrals of the Middle Age in the quali-

ties of sublimity, of complexity, in the power both of ex-

pressing and suggesting spiritual aspiration, in the invention of intricate developments and ramifications about a central plan, in the union of greatness and majesty in the main conception with inexhaustible fertility of adornment in de- tail. In fancifulness, in the unexpected, in capricious opulence and far-sought splendour, in filling the mind with mingled enchantments of East and West and South and North, none can surpass a building like St Mark's at Venice, with its blending of Byzantine elements, Italian elements, Gothic elements, each carried to the utmost pitch of elaboration and each enriched with a hundred caprices of orna- ment, but all working together, all in obedience to a law, and 'fall beginning and ending with the Cross." It would be tempting to carry further, and into more particular applications, the parallel between the space-effects of architecture and the time-effects of music. But we must be content with having indicated it here. It is no fanciful similitude, but constitutes, so to speak, the positive aspect a _ affinity between music and architecture, of which we ; -~ gee the negative aspect ouly when we separate 0 arts, as being non-imitative, from the imitative arts of sculpture, painting, and poetry. _ In the case of architecture, however, as in the case of

music, this non-imitative character must not be stated quite without exception or reserve. There have been styles of architecture in which forms suggesting or imitating natural or other phenoména have held a place among the abstract forms proper to the art. Often the mode of such suggestions is rather symbolical to the mind than really imitative to the eye; as when the number and relations of the heavenly planets were imaged in the seven concentric walls of their great temple, and in many other architectural constructions, by that race of astronomers the Babylonians; or as when the shape of the cross was adopted, with innumer- able slight varieties and modifications, for the ground plan of the churches of Christendom. Passing to examples of imitation more properly so-called, it may be true, and was at any rate long believed, that the aisles of Gothic churches had reference to or were inspired by the aspect of the natural forest aisles amid which they rose, and that the upsoaring forest trunks and meeting branches were imaged in their piers and vuultings. In the temple-palaces of Egypt, one of the regular architectural members, the sus. taining

pier, is often systematically wrought in the actual likeness of a conventionalized cluster of lotus stems, with lotus flowers for the capitals. When we come to the fashion, not rare in Greek architecture, of carving this same sustaining member, the column, in complete human likeness, and employing Caryatids, Canephori, Atlases, or the like, to carry the architrave of a building, it then becomes difficult to say whether we have to do with the work of architecture or of sculpture. The case, at any rate, is different from that in which the sculptor is called in to supply surface decoration to the various members of a building, or to fill with the products of his own art spaces in the building specially contrived and left vacant for that purpose. When the imitative feature is in itself an indispensable member of the architectural construction, to architecture rather than sculpture (not that such niceties of appropriation are import- ant) we shall probably do best to assign it. Defining architecture, then (apart from its utility, which for the present we leave out of consideration), as a shaping art, 0 which the function is to arouse emotion by combinations of ordered and decorated mass, we pass from the characteristics of the non-imitative to those of the imitative group of arts.

The second half of the disinterested pleasures of which we are capable, and which the play impulse finds out and turns to account in us, are the pleasures afforded by imitation, that is, by the showing of shows or the telling of stories which bring before us things like what we know in reality. In the consideration of the arts which minister to these pleasures, we cannot do better than follow that Aristotelian division to which we have already alluded, and which describes each art according, first, to the objects it imitates, and secondly, to the means or instruments it employs.

Sculpture, then, may have for its objects of imitation the shapes of whatever things possess length, breadth, and magnitude. For its means or instruments it has solid form, which the sculptor either carves out of a hard substance, as in the case of wood and stone, or models in a yielding substance, as in the case of clay and wax, or casts in & dis- solved or molten substance, as in the case of plaster and of metal in certain uses, or beats, draws, or chases in @ malleable and ductile substance, as in the case of metal m other uses, or stamps from dies or moulds, a method some times used in all soft or fusible materials, 'Thus a statue or statuette may

either be carved straight out of a block of stone or wood, or first modelled in clay or wax, then moulded in plaster or some equivalent material, and then carved in stone or cast in bronze. A gem is wrought 10 stone by cutting and grinding. Figures in jeweller's work

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are wrought by beating aud chasing; a medallion by beat- ing and chasing or else by stamping from a die ; a coin by stamping from adie; and so forth. The process of model- ling (Greek wAdrrevy) in a soft substance being regarded as the typical process of the sculptor, the name plastic art has been given to his operations in general.

In general terms, the task of sculpture is to imitate solid form with solid form. But sculptured form may be either completely or incompletely solid. Sculpture in com- pletely solid form exactly reproduces, whether on the original or on a different scale, the relations or proportions of the object imitated in the three dimensions of length, breadth, and depth or thickness. Sculpture in incompletely solid form reproduces the proportions of the objects with exactness only so far as concerns two of its dimensions, namely those of length and breadth; while the third dimension, that of depth or thickness, it reproduces in a diminished proportion, leaving it to the eye to infer, from the partial degree of projection given to the work, the full

projection of the objectimitated. The former, or completely solid kind of sculpture, is called sculpture in the round; its works stand free, and can be walked round and seen from all points, The latter, or incompletely solid kind of sculpture, is called sculpture in relief; its works do not stand free, but are engaged in or attached to a background, and can only be seen from in front. According, in the latter kind of sculpture, to its degree of projection from the background, a work is said to be in high or in low relief. Sculpture in the round ard sculpture in relief are alike in this, that the properties of objects which they imitate are their outlines, or the boundaries and circumscriptions of their masses, and their light and shade—the lights and shadows, that is, which diversify the curved surfaces of the masses in consequence of their alternations and gradations of projection and recession. But the two kinds of sculpture differ in this. A work of sculpture in the round imitates the whole of the outlines of any given object, and presents to the eye, as the object itself would do, a new outline suc- ceeding the last every moment as you walk round it. Whereas a work of sculpture in relief imitates only one outline of any object ; it takes, so to speak, a section of the object as seen from a particular point, and traces on the background the boundary-line of that particular section ; merely suggesting, by modelling the surface within such boundary according to a regular, but a diminislied, ratio of Projection, the other outlines which the object would present if seen from all sides successively.

As sculpture in the round reproduces the real relations of a Solid object in Space, it follows that the only kind of object which it can reproduce with pleasurable effect must be one not too vast or complicated, one that can afford to be detached and isolated from its surroundings, and of Which all the parts can easily be perceived and apprehended in their organic relations. Further, it will need to be an object interesting enough to mankind in general to make them take delight in seeing it reproduced with all its parts m complete imitation. And again, it must be such that ‘ome considerable part of the interest lies in those particular Properties of outline and light and shade which it is the special function of sculpture to reproduce. Thus a sculp- _ pin in the round, say, of a mountain with oaiabe It, pss d hardly be a sculpture at all; it could vile oy mo “4 and as a model might have value; but les ‘ of fine art it could not have, because the ee. oe ai lack organic definiteness and com- jneieee ge rt ~~ universality of

interest, and of the ‘ivabed ete : possess, a very inconsiderable part odd ieiede Once Upon its properties of outline and light ae viously there is no kind of object in the : at so well unites the required conditions for

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pleasurable imitation in sculpture as the human body. It is at once the most complete of organisms, and the shape of all others the most subtle as well as the most intelligible in its outlines; the most habitually detached in active or stationary freedom; the most interesting to mankind, because its own; the richest in those particular effects, contours and modulations, contrasts, harmonies, and transi- tions of modelled surface and circumscribing line, which it is the prerogative of sculpture to imitate. Accordingly the object of imitation for this art is pre-eminently the body of man orwoman. That it has not been for the sake of repre- senting men and women as such, but for the sake of repre- senting gods in the likeness of men and women, that the human form has been most enthusiastically studied, does not affect this fact in the theory of the art, though it is a consideration of great importance in its history. Besides the human form, sculpture may imitate the forms of those of the lower animals whose physical endowments have something of a kindred perfection, with other natural or artificial objects as may be needed merely by way of acces- sory or symbol. The body must for the purposes of this art be divested of covering, or covered only with such tissues as reveal, translate, or play about without concealing it. Only in lands and ages where climate and social use have given the sculptor the opportunity of studying human forms so draped or undraped has this art attained perfec- tion, or become exemplary and enviable to that of other races,

Relief sculpture is more closely connected with architec- Subjects

ture than the other kind, and indeed is commonly used in proper subordination to it. But if its task is thus somewhat on ; different from that of sculpture in the round, its principal cst objects of imitation are the same. The human body relief. remains the principal theme of the sculptor in relief; but the nature of his art allows, and sometimes compels, him to include other objects in the range of his imitation. As he has not to represent the real depth or projection of things, but only to suggest them according to a ratio which he may fix himself, so he can introduce into the third or depth

dimension, thus arbitrarily reduced, a multitude of objects for which the sculptor in the round, having to ob- serve the real ratio of the three dimensions, has no room. He can place one figure in slightly raised outline emerging from behind the more fully raised outline of another, and by the same system can add to his representation rocks, trees, nay mountains and cities, and birds on the wing.

But the more he uses this liberty, the less will he be truly Relief a sculptor. Solid modelling, and real light and shade, are sculpture

*: * : tends to the special means or instruments of effect which the sculp- ee tor alone among imitative artists enjoys. Single outlines ie and contours, the choice of one particular section and the drawing tracing of its circumscription, are means which the sculptor on the*

- *6 . : one hand enjoys in common with the painter or draughtsman. And indeed, when we consider works executed wholly or in part ,chitec. in very low relief, whether Assyrian battle-pieces and hunt- ture on ing pieces in alabaster or bronze, or the backgrounds carved theother. in bronze, marble, or wood by the Italian sculptors who followed the example set by Ghiberti at the Renaissance, we shall see that the principle of such work is not the prin- ciple of sculpture at all. Its effect depends not at all on qualities of surface-light aud shadow, but exclusively on qualities of contour, as traced by a slight line of shadow on the side away from the light, and a slight line of light on the side next to it. And we may fairly hesitate whether we shall rank the artist who works on this principle, which is properly a graphic rather than a plastic principle, among sculptors or among draughtsmen. The above are cases in which the relief sculptor exercises his liberty in the introduction of other objects besides human figures into his sculptured compositions. But there is*

Defini- tion of sculp- ture,

Nature and methods of paint- ing.

another kind of relief sculpture in which the artist has less choice. That is the kind in which the sculptor is called in to decorate with carved work parts of an architectural con- struction which are not adapted for the introduction of figure subjects, or for their introduction only as features in a scheme of ornament that comprises many other elements. Ty this head belongs most of the carving of capitals, mould- ings, friezes (except the friezes of Greek temples), bands, cornices, and in the Gothic style, of dovrway arches, niches, canopies, pinnacles, brackets, spandrils, and the thousand members and parts of members which that style so exqul- sitely adorned with true or conventionalized imitations of natural forms. This is no doubt a subordinate function of the art; aad it is impossible, as we have seen already, to find a precise line of demarcation between carving, in this decorative use, which is properly sculpture, and that which belongs properly to architecture.

Leaving such discussions, we may content ourselves with the definition of sculpture as a shaping art, of which the business 1s to imitate natural objects, and principally the human body, by reproducing im solid form either their true proportions in all dimensions, or else ther true pro- portions in the two dimensions of length and breadth only, with a diminished proportion in the third dimension of depth or thickness.

In considering bas-relief as a form of sculpture, we have found ourselves approaching the confines of the second of the shaping-imitative arts, the graphic art, or art of paint- ing. Painting, as to its means or instruments of imitation, dispenses with the third dimension altogether. It imitates natural objects by representing them as they are repre- sented on the retina of the eye itself, simply as an assem- blage of lines and colours on a flat surface. The charac- ter and disposition of the lines and colours in painting are determined by two things, the local colours of the ob- jects themselves, and their shapes and positions in space. Painting does not reproduce the third dimension of reality by any third dimension of its own whatever ; but leaves the eye to infer the solidity, the recession and projection,

the nearness and remoteness of objects, by the same per-

spective signs by which it also infers those facts in

nature—namely, by the direction of their several bound-

ary lines, the incidence and distribution of their lights

and shadows, the strength or faintness of their tones of.

colour. Hence this art has an infinitely greater range and freedom than any form of sculpture. Near and far is

all the same to it, and whatever comes into the field of vision can come also into the field of a picture; trees as well as personages, and clouds as well as trees, and stars as

well as clouds; and on earth the remotest mountain snows

as well as the violet of the foreground, and far-off multi-

tudes of people as well as one or two near the eye. What- ever any man has seen, or can imagine himself as seeing, that he can also fix by painting, subject only to one great limitation,—that of the range of brightness which he is able to attain in imitating natural colour illuminated by light. In this particular his art can but correspond according to a greatly diminished ratio with the effects of nature. But excepting this it can do for the eye almost all that nature herself does; or at least all that nature would do if man had only one eye; since the three dimensions of space pro- duce upon our binocular machinery of vision a particular stereoscopic effect of which a picture, with its two dimen- sions only, is incapable. The range of the art being thus almost unbounded, its selections have naturally been dic- ame by the varying interest felt in this or that subject of representation by the societies among whom the art has at various times been practised. As in sculpture, so in painting, man, whether as figuring God, or for the sake of

his own looks and doings, has always held the first place.

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For the painter, the interveution of costume between man and his environment is not a misfortune in the same degree as it is for the sculptor. For him, clothes of whatever fashion or density have their own charm; they serve to diversify the aspect of the world, and to express the charac- ters and stations, if not the physical frames, of his person- ages ; and he is as happy or happier among the brocades of Venice as among the bare limbs of the Spartan palestra, Along with man, there come into painting all animals and vegetation, al] man's furniture and belongings, his dwelling- places, fields, and landscape ; and in modern times also landscape and nature for their own sakes, skies, seas, momntains, and wildernesses apart from man,

Besides the two questions about any art, what objects Thres does it imitate, and by the use of what means or Instru- modes ments, Aristotle proposes (in the case of poetry) the further Me question, which of several possible forms does the imitation nature in any given case assume? We may transfer very nearly in paint. the same inquiry to painting, and may ask, concerning any 18. painter, according to which of three possible systems he works, The three possible systems are (1) that which attends principally to the configuration and relations of natural objects as indicated by their circumscribing lines— this may be called for short the system of line ; (2) that which attends chiefly to their configuration and relations, as indicated by the incidence and distribution of their lights and shadows—this may be called the system of light-and- shade; and (3) that which attends chiefly, not to their configuration at all, but to the distribution, qualities, and relations of colours upon their surface—this is the system of colour. Line, light-and-shade, and colour, these thie kinds of appearances between them make up the whole world of sight. (We do not pause to insist on the fact that line is in truth partly an invention of the mind ; those divisions | between objects which the painter or draughtsman indicates with an outline or dark marking being in nature only in- dicated by the even edge where one colour ends and another | begins.) It is not possible for a painter to imitate natural objects to the eye at all without either defining their masses by outlines, or suggesting them by juxtapositions of light and dark or of local colours. In the complete art of paint- ing, of course, all three methods are employed at once.

But in what is known as outline drawing and outline en-

graving, one of the three methods only is employed, line;

in grisaille pictures, and in shaded drawings and engrav- }

ings, two only, line with light-and-shade ; and in the |

shadowless pictures of the early religious schools, a differ:

ent two only, line with colour. And even in the most .

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accomplished examples of the complete art of painting, as has been justly pointed out by Professor Ruskin, we find that there almost always prevails a predilection for some one of these three parts of painting over the other two Thus among the mature Italians of the Renaissance, Titian is above all things a painter in colour, Michelangelo in line, and Leonardo in light-and-shade.

The value of a pictorial in1itation is by no means neces Com sarily in proportion to its completeness. Many accom a: plished pictures, in which all the resources of line,

colour, not th

and light-and-shade have been used to the uttermost pict‘ the artist’s power for the imitation of all that he could see vale,

in nature, are worthless in comparison with a few faintly- an touched outlines or lightly-laid shadows or tints of another «nits. artist who could see nature better. The fine art of paint tion. ing addresses not merely the eye but the imagination. Unless the painter knows liow to choose and combine the elements of his finished work so that it shall contain 10 every part suggestions and delights over and above the mere imitation, it will fall short, in that which is the essential | charm of fine art, not only of any scrap of a great master’s

handiwork, such as an outline sketch of a child by Rapbael,

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or a colour sketch of a boat or a mackerel by Turner, but even of any scrap of the merest journeyman's handiwork produced by an artistic race, such as the first Japanese drawing for children in which a water-flag and king-fisher, or a spray of peach or almond blossom across the sky, is dashed in with a mere hint of colour, but a hint that tells a whole tale to the imagination. This, however, is an order of considerations belonging rather to particular criti- cism than to general classification.

It remains to consider, for the purposes of our classifica- tion, what are the teclinical varieties of the painter's craft. Since we gave the generic name of painting to all imitation of natural objects by the assemblage of lines, colours, and lights and darks on a single plane, we must include as varieties of painting, not only the ordinary crafts of spread- ing or laying pictures on an opaque surface in fresco, oil, or water-colour, but also the craft of arranging a picture to be seen by the transmission of light through a transparent substance, in glass painting ; the craft of fitting together a inultitude of solid cubes or cyiinders so that their united surface forms a picture to the eye, in mosaic; the craft of spreading vitreous colours in a state of fusion so that they form a picture when hardened, as in enamel ; and even, it would seem, the crafts of tapestry and embroidery, since these also yield to the eye a plane surface figured in imita- tion of nature. As drawing we must also count incised or engraved work of all kinds representing merely the outlines of objects and not their modellings, as for instance the mythological subjects incised upon the brouze mirrors and dressing cases of Etruscan ladies ; while raised work in low relief, in which outlines are plainly marked and modellings neglected, furnishes, as we have seen, a doubtful class be- tween sculpture and painting. In all figures that are first modelled in the solid and then variously coloured, sculp- ture and

painting bear a common part; as for instance when the sculptor Praxiteles handed his finished statue to the painter Nicias to receive its cirewmlitio or tinting. But as the special characteristic of sculpture, the third dimension, is here present, it is to that art and not to painting that we shall still ascribe the resulting work. The system of more or less highly colouring stone statues, that is, of painting sculpture, which the moderns have disused, prevailed alike in the Greek aud Gothic ages; and solid form and local colour have been similarly combined in the productions of pottery in all ages, from those of Corinth and Tanagra down to those of Dresden and Sevres.

With these indications, which the reader can easily follow up for himself, we may leave the art of painting defined in general terms as a shaping art, of which the business is to imitate all kinds of natural objects by repro- ducing on a plane surface the relations of their boundary lines, lights and shadows, or colours, or all three of these appearances together. .

The next and last of the imitative arts is the speaking art of poetry. The transition from sculpture and painting to poetry is, from the point of view not of our present but of our first division among the fine arts, abrupt and abso- lute. It is a transition from space into time, from the sphere of material forms to the sphere of immaterial images. This is not the place for any detailed exposition of the principles of poetry. But for the sake of the due co-ordina- tion of this art in our general scheme, we are bound as briefly as we can to state its functions among the rest. In 80 doing we will again adopt the several heads of descrip- tion with which the reader is already familiar from Aristotle. The objects of poetry's imitation, then, we shall define as everything of which the idea or image can be called up by words, that is, every force and phenomenon of nature, every operation and result of art, every fact of life and history, or every imagination of such a fact, every

thouglhit and feeling of the human spirit, for which mankind in the course of its long evolution has been able to create in speech an explicit and appropriate sign, The means or instruments of poetry's inlitation are these verbal signs or words, arrauged in lines, strophes, or stanzas, so that their

sounds have some of the regulated qualities of music. The three chief modes or forms of the imitation may still be de- fined as they were defined by Aristotle himself. First comes the epic or narrative form, in which the poet speaks alternately for himself and his characters, now describing their situations and feelings in his own words, and anon making each of them speak in the first person for him- self. Second comes the lyric form, in which the poet speaks in his own name exclusively, and gives expression to sentiments which are purely personal. Third comes the dramatic form, in which the poet does not speak for himself at all, but only puts into the mouths of each of his person- ages successively such discourse as he thinks appropriate to the part. The last of these three forms of poetry, the dramatic, calls, if it is merely read, on the imagination of the reader to fill up those circumstances of situation, action, and the rest, which in the first or epic form are supplied by the narrative between the speeches, and for which in the lyric or personal forin there is uo occasion, To avoid mak- ing this call upon the imagination, to bring home its effects in full reality, dramatic poetry has to call in the aid of several subordinate arts, the shaping or space art of the scene-painter, the mixed time aud space arts of the actor and the dancer. Occasionally also, or in the case of opera throughout, dramatic poetry heightens the emotional effect of its words with music. A play or drama is tlius, as per formed upon the theatre, not a poem merely, but a poem accompanied, interpreted, completed, and brought several degrees nearer to reality by a combination of auxiliary effects of the other arts. Besides the narrative, the lyric, and dramatic forms of poetry, the didactic, that is, the teach- ing or expository form, has usually been recognized as a fourth. Aristotle refused so to recognize it, regarding a didactic poem in the light not so much of a poem as of a treatise. But from the Works and Days down to the Loves of the Plants there has been too much literature produced in this form for us to follow Aristotle here. We shall do better to regard didactic poetry as a variety corresponding, among the speaking arts, to architecture aud the other manual arts of which the first purpose is use, but which are capable of accompanying aud adorning use by a pleasurable appeal to the emotions.

We shall hardly make our definition of poetry, con- sidered as an imitative art, too extended if we say that it is a speaking art, of which the business is

to represent by means of verbal signs arranged with musical regularity everything for which verbal signs have been invented.

Neither the varieties of poetical form, however, nor the modes in which the several forms have been mixed up and interchanged—as such mixture and interchange are implied, for instance, by the very title of a group of Mr Browning's poems, the Dramatic Lyrics,—the observation of neither of these things concerns us here so much as the observation of the relations of poetry in general, as an art of represen- tation or imitation, to the other arts of imitation, painting and sculpture.

Verbal signs have been invented for innumerable things which cannot be imitated or represented at all either in solid form or upon a coloured surface. You cannot carve or paiut a sigh, or the feeling which finds utter- ance in a sigh; you can only suggest the idea of the feeling, and that in a somewhat imperfect and uncertain way, by representing the physical aspect of a person in the act of breathing the sigh. Similarly you canuot carve or paint any movement, but only figures or groups in

Defini- tion of poetry.

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which the movement is represented as arrested in some | particular point of time ; nor any abstract idea, but only fae figures or groups in which the abstract idea, as for example otween Telease, captivity, mercy, is illustrated in the concrete shape the three of allegory. The whole field of thought, of propositions, imitative arguments, injunctions, and exhortations, is open to poetry aris. but closed to sculpture and painting. Toetry, by its com- mand over the regions of the understanding, of abstrac- tion, of the movement and succession of things in time, by its power of instantaneously associating one delightful image with another from the remotest regions of the mind, by its names for every shade of feeling and experience, exercises a sovereignty a hundred times more extended than that of either of the two arts of manual imitation. But on the other hand, words do not as a rule bear any sensible resemblance to the things of which they are the signs. There are few things that words do not stand for or cannot call up; but they stand for things, as it

were, only at second hand, and call them up only in idea, and not in actual presentment to

Ana- Jogies and con-

the senses. And just in this lies the strength of painting and sculpture, that though there are countless things which they cannot represent at all, and countless more which they can only represent by suggestion more or less ambiguous, yet there are a few things which they represent more effect- ually and directly than poetry can represent any thing at all. These are, for sculpture, the forms or configurations of things, which that art represents directly to the senses both of sight and touch ; and for painting the forms or configura- tions, colours, and relative positions of things, which the art represents to the sense of sight, directly so far as regards surface appearances, and indirectly so far as regards solidity. For many delicate qualities and differences in these visible relations of things, there are no words at all—the vocabulary of colours, for instance, is in all languages surprisingly scanty and primitive, And those visible qualities for which words exist, the words still call up indistinctly and at second hand. Poetry is almost as powerless to bring before the mind's eye with precision a particular shade of red or blue, as sculpture is to relate a continuous experience, or painting

to enforce an exhortation or embellish an abstract proposi- tion. The wise poet, as has been justly remarked, when he wants to produce a vivid impression of the beauty of a visi- ble thing, does not attempt to catalogue or describe its sta- tionary beauties. In representing the perfections of form

in a bride's slender foot, the speaking art, poetry, would find itself distanced by either of the shaping arts, painting or sculpture; the wise poet calls up the charm of such a foot by describing it not at rest but in motion, and in the feet which a ' Beneath the petticoat, Like little mice, went in and out," leaves us an image which baffles the power of the other arts. Shakespeare, when he wants to make us realize the perfections of Perdita, puts into the mouth of Florizel, not, as a bad poet would have done, a description of her lilies and carnations, and the other charms which a painter could make us realize better, but the praises of her ways and movements ; and with the*

final touch— '¢ When you do dance, I wish you A wave o' the sea, that you might ever do Nothing but that,"

he leaves upon the mind a twofold image of beauty in motion, of which one-half might be the despair of those painters who designed the dancing maidens of the walls of Herculaneum, and the other half the despair of all artists who in modern times have tried to fix upon their canvas the buoyancy and grace of dancing waves.

The difference between the means and capacities of re- presentation proper to the shaping arts of sculpture and painting, and those proper to the speaking art of poetry,

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which we have unsystematically glanced at in the above; were for a long while overlooked or misunderstood. The maxim of Simonides, that poetry was a kind of articulate painting, and painting a kind of mute poetry, was vaguely accepted until the days of Lessing, and first overthrown by the famous treatise of that writer on the Laocoén, Following in the main the lines laid down by Lessing, other writers have worked out the conditions of representation or imitation proper, not only to sculpture and painting as dis-tinguished from poetry, but to sculpture as distinguished from painting, uutil there is perhaps no part of artistic theory so well or so generally understood as this. The chief points, with some of which we have become acquainted already, may really all be condensed under the simple law, that the more direct and complete the imitation effected by any art, the less is the range and number of phenomena which that art can imitate. Thus sculpture in the round imitates its objects much more completely and fully than any other single art, reproducing one whole set of their re- lations which no other art attempts to reproduce at all, namely, their solid relations in space. Precisely for this reason, such sculpture is limited to a narrow class of objects. As we have seen, it must represent human or animal figures ; nothing else has enough of organic beauty and perfection, or enough of universal interest. It must represent such. figures in combinations and with accessories comparatively simple, on pain of puzzling and embarrassing the eye with a complexity and entanglement of masses and lights and

shadows ; and in attitudes comparatively quiet, on pain of violating, or appearing to violate, the conditions of mechani-

cal stability. Being a stationary or space-art, it can only.

represent a single action, which it fixes and perpetuates for ever; and it must therefore choose for that action one as significant and full of interest as is consistent with due observation of the above laws of simplicity and stability. Such actions, and the facial expressions accompanying them, must not be those of sharp crisis or transition, because sudden movement or flitting expression, thus arrested and perpetuated in full and solid imitation by bronze or marble, would be displeasing and not pleasing to the spectator. They must be actions and expressions in some degree settled, collected, and capable of continuance, and in their collected- ness must at the same time suggest to the spectator as much as possible of the circumstances which have led up to them and those which will next ensue. These conditions evi- dently bring within a very narrow range the phenomena with which this art can deal, and explain why, as a matter of fact, by far the greater number of statues represent simply a single figure in repose, with the addition of one or two symbolic or customary attributes. Paint the statue and you bring the imitation to a still further point of completeness by the addition of local colour; but you do not thereby lighten in any degree the restrictions which are inevitably laid upon sculpture so long as it undertakes to reproduce in full the third or solid dimension of bodies. You only begin to lighten its restrictions when you begin to relieve it of that duty. We have traced how sculpture in relief, which is satisfied with only a partial reproduction of the third dimension, is free to introduce a larger range of objects, bringing forward secondary figures and accessories, indicating distant planes, indulging even in some violence and complexity of motion, since limbs attached to a background do not alarm the spectator by any idea of danger or fragility ; though for the due effect of the work, and the pleasurable distinctness and

diversity of its lights and shadows, such complexity must |

not, even in relief, be carried too far. And so by degrees we arrive at painting, in which the third dimension is dis- missed altogether, and nothing is actually reproduced, 12

full or partially, except the effect made by the appearance The conse:

of natural objects upon the retina of the eye.

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quence is that this art can range over distance and multitude, can represent complicated relations between its various | figures and groups of figures, extensive backgrounds, and all _| those subtleties of appearance in natural things which depend upon local colour and incidence of light and shade. These last phenomena of natural things are in our experi- | ence subject to change, in a sense in which the substantial or solid properties of things are not so subject. Colours, shadows, and atmospheric effects are to some extent as-

_ sociated with ideas of transition, mystery, and evanescence. |

Hence painting is able to extend its range to another kind of facts over which sculpture has no power. It can perpet- uate in its imitation, without breach of its true laws, certain classes of facts which are themselves fugitive and transitory, asa smile, the glance of an eye, a gesture of horror or of passion, the waving of the young Achilles' hair "not un- stirred," as the old description has it, by the wind, the toss and gathering of ocean waves, even the flashing of light- ning across the sky. Still, any long or continuous series of changes, actions, or movements is quite beyond the means of this art to represent. Painting remains, in spite of its comparative width of range, tied down to the inevitable conditions of a space-art: that is to say, it has to delight the mind by a harmonious variety in its effects, but by a variety apprehended not through various points of time successively, but from various points in space at the same moment, Lastly, a really ample range is only attained by the art which does not give a full and complete reproduction of any natural fact at all, but represents or brings natural

facts before the mind merely by the images which words convey. The whole world of movement, of continuity, of cause and effect, of the successions, alternations, and interaction of events, characters, and passions, of everything that takes time to happen and time to declare, is open to poetry as it is open to no other art. We speak only of those parts of poetry which may properly be called its imitative or repre- sentative parts, and not of its other parts or applications, in reasoning, in exhortation, in denunciation, and the like. As an imitative or representative art, then, poetry is subject to no limitations except those which spring from the poverty of human language, and from the fact that its means of imi- tation are indirect. Poetry's report of the visible properties of things is from these causes much less full, accurate, _ and efficient than the reproduction or delineation of the same properties by sculpture and painting. And this is the sum of the conditions concerning the respective functions of the three arts of imitation which had been

*5 | overlooked, in theory at least, until the time of Lessing. oat f _ Lo this law, in the form in which we have expressed it, * it may perhaps be objected that the acted drama is at once tio o the most full and complete reproduction of nature which thiaw, We owe to the fine arts, and that at the same time the number of facts over which its imitation ranges is the greatest. The answer is that our law applies to the several arts only in that which we may call their pure or unmixed state. Dramatic poetry is in that state only when it is read or spoken like any other kind of verse. When it is witnessed on the stage, it is in a mixed or impure state; the art of the actor has been called in to give actual re- production to the gestures and utterances of the personages, that of the costumier to their appearances and attire, that of the stage-decorator to their furniture and surroundings, that of the Scene-painter to imitate to the eye the dwelling- places and landscapes among which they move; and only a the combination of all these subordinate arts does the _ GTama gain its character of imitative completeness or reality, _ Throughout the above account of the imitative and non- imitative groups of fine arts, we have so far followed Aristotle as to give the name of imitation to all recognizable*

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representation whatever of realities, By realities we have Things meant not only phenomena as they actually or literally unknown exist, or may have existed in the past. Imitation, as we Shadow- understand it, is not tied to such strict veracity of positive °@ frth 5 : z : Y Of positive by imita-

delineation or report. It includes the representation of tion of things which, though similar to things actually existing, things have themselves never actually existed—the invention aided phenomena, and of relations and combinations among phenomena, derived from those of actual experience, but not identical with them. Such shadowing forth of the unknown

by means of the known is part of the work of that compre- hensive faculty which we call the imagination. But the materials or elements with which the imaginative faculty is

at liberty thus to deal are materials or elements supplied by

real experience. When we find among the ruins of a Greek temple the statue of a beautiful young man at rest, or above

the altar of a Christian church the painting of one transfixed with arrows, we know that the statue is intended to bring

to our minds'no mortal youth, but the god Hermes or Apollo, the transfixed victim no simple captive, but Sebas- tian the holy saint. Atthe same time we none the less know

that the figures in either case have been studied by the artist from living models before his eyes. In like manner, in all the representations alike of sculpture, painting, and poetry, the things and persons represented may bear symbolic meanings and imaginary names and characters ; they may be set in a land of dreams, and grouped in rela-

tions and circumstances upon which the sun of this world

never shone—and such in truth was the purpose to which

the arts were almost universally put until but the other

day ; but it is from real things and persons that their lineaments and characters have been taken in the first instance, in order to be attributed by the imagination to another and more exalted order of existences.

The law which we have last laid down is a law defining Imita-

the relations of sculpture, painting, and poetry, considered tion by

3 : . – + artneces- simply as arts having their foundations at any rate in sania reality, and drawing from the imitation of reality their indi- ieeined spensable elements and materials. It is a law defining the imita- range and character of the elements or materials in nature tion. which each art is best fitted, by its special means and re- sources, to imitate. But we must remember that, even in this fundamental part of its operations, none of these arts proceeds by imitation pure and simple. None of them contents itself with seeking to represent realities, however literally taken, exactly as those realities are. A portrait in sculpture or painting, a landscape in painting, a passage of local description in poetry, may be representations of known things taken literally or for their own sakes, and not for the sake of carrying our thoughts to the unknown; but none of them ought to be, or indeed can possibly be, a re- presentation of all the observed parts and details of such a reality on equal terms and without omissions. Such a re- presentation, were it possible, would be a mechanical inven- tory and not a work of fine art. That only, we know, is fine art which affords keen and permanent delight to con- templation. Such delight the artist can never communicate by the display of a callous and pedantic impartiality in presence of the facts of life and nature. His delineation or report of realities will only strike or impress others in so far as it directs their attention to things by which he has been struck and impressed himself. To excite emotion, he must have felt emotion ; and emotion is only another word for partiality. The constitution which observes and registers every detail of an experience with uniform and equal minuteness is a constitution which has been strongly affected by no part of that experience. Such a constitution will never make an artist. The ulterior imaginative mean- ings and combinations of art being left out of the question, the artist is one who instinctively tends to modify and work

upon every reality before him in conformity with some poignant and sensitive principle of preference or selection in his mind. He instinctively adds something to nature in one direction and takes away something in another, over- looking this kind of fact and insisting on that, suppressing many particulars which he holds irrelevant in order to insist on and bring into prominence others by which he is attracted and arrested. 'To do this is called to idealize, and the faculty by which an artist prefers, selects, and brings into the light one order of facts or aspects in the thing before him rather than the rest, is called the idealizing or ideal faculty. To the definitions of the imitative arts above given, in which we said that their business was to imitate natural facts,—one by solid form, another by line, light- and-shade, and colour, a third by words in regulated com- bination,— to these detinitions, then, we must now add that the imitation of natural fact in question is not an imitation pure and simple, but an idealized imitation, in which the mind acts upon the facts of nature, and sifts and sorts them at its choice, before it represents or puts them on record. This idealizing faculty is also one of that great cluster of faculties or powers within us for mentally making the most of the world we live in, which are commonly associated together under the comprehensive name imagination. Interminable discussion has been spent on the questions,— What is the ideal, and how do we idealize? The answer has been put in the most sensible form by those thinkers (e.g., Vischer and Lotze), who have pointed out that the process of esthetic idealization carried on by the artist is only the higher development of a process carried on in an elementary fashion by all men, from the very nature of their constitution. The physical organs of sense themselves do not retain or put on record all the impressions made upon them. When the nerves of the eye receive a multi- tude of different stimulations at once from different points in space, the sense of eyesight, instead of being aware of all these stimulations singly, only abstracts and retains a total impression of them together. In like manner we are not made aware by the sense of hearing of all the several waves of sound that strike in a momentary succes- sion upon the nerves of the ear; that sense only abstracts and retains a total impression from the combined effect of a

number of such waves. And the office which each sense thus performs singly for its own impressions, the mind per- forms in a higher degree for the impressions of all the senses equally, and for all the other parts of our experience. We are always dismissing or neglecting a great part of our impressions, and abstracting and combining among those which weretain. The ordinary human consciousness works like an artist up to this point ; and when we speak of the ordinary or inartistic man as being impartial in the retention or registry of his daily impressions, we mean, of course, in the retention or registry of his impressions as already thus far abstracted and assorted in consciousness. The artistic man, whose impressions affect him much more strongly, carries much farther these same processes of abstraction and combination among his impressions, and according to the complexion of his feelings imparts a colour from his own mind both to the literal record of his experiences and _ to the imaginary constructions which he builds upon them. ae Tt will further help our understanding of what is meant Gbjective by the ideal in art, if we observe that into the framing of ideals, °Vety ideal there enter two parts or elements. These are, a ipa and an objective part or element—or so we may tee ee eS shan The artist, affected more than a. ne al —_ grows up with certain constitution oe ee h ace a yr ee . i is a dramatic poet – a tn te te =a = ee a ‘ certain types of character and situa- ‘ a sculptor, for certain proportions and a

Nature of the idealiz- ing pro- cess,

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certain habitual carriage and disposition of the limbs; if he is a figure painter, for certain moulds of figure and airs and expressions of countenance ; if a landscape painter, for a certain class of character, configuration, and sentiment in natural scenery. This is the subjective or purely personal part of the artistic ideal. But on the other hand, as an intitator of fact, the artist has to recognize and accept the character of the facts which he finds at any given moment before him. All facts cannot be of the cast which he prefers, and in so far as he undertakes to deal with facts of an opposite cast he must submit to them; he must study them as they actually are, must: abstract, retain, bring into prominence, and carry out their own dominant tendencies. If he cannnot find in them what is most

pleasing to himself, he will still be led by the abstracting and discriminating powers of his observation to discern what is most significant in them, he will emphasize and put on record this, idealizing the facts before him not in his direction but in their own. This, the disengaging and bringing forward of the characteristics actually domin- ant in any object as he finds it, is the second or objective half of the artist's task of idealization. It is this half upon which M. Taine has dwelt almost exclusively, and on the whole with a just insight into the principles of the operation, in his well-known treatise On the Ideal in Art. These two modes of idealization, the subjective and the objective, are not always easy to be reconciled. Though the perfect artist would no doubt be he who should combine the strongest personal instincts of preference with the keenest power of observing characteristics as they are, yet in fact we find few . artists in whom both these elements of the ideal faculty) have been equally developed. To take some familiar instances among painters: Leonardo da Vinci, haunted as he was above all men by a particular human ideal of intel- lectual sweetness and alluring mystery, which perpetually . recurs in the faces of his women and young men, has yet | left us a vast number of exercises which show him as an | indefatigable student of objective characteristics and psycho- . logical expressions of an order the most opposed to this. An older painter of the same period, Sandro Botticelli, is on the other hand as good an example as can be named of an artist who could never escape from the dictation of his own personal ideals, in obedience to which he invested all the creations of his art with nearly the same conformation of brows, lips, cheeks, and chin, nearly the same looks of wistful yearning and dejection. If, again, we desire an example of the opposite principle, of that idealism which idealizes above all things objectively, and disengages the very inmost and individual characters, however unattractive or unseemly, of the thing or person before it, we must turn to the northern schools, and especially to the work of Rembrandt ; though, indeed, that master's profound sense of human sympathy and commiseration, and his predilec- tion for a certain class of light-and-shade effects, throw im this case, too, a veil of distinct personal feeling over his representations, ' Sculpture, painting, and poetry, then, are arts which re- The ™" present things known and real, either for their own sakes — literally, or for the sake of shadowing forth things n0b jerend known but imagined. In either case they represent their partly originals, not indiscriminately as they are, but bettered, com on 20%

pleted, or at the least simplified and enforced to our apprt Ed hensions, partly by the transmuting power of the artist's °

own instincts and partly by his discriminating, selecting, and rejecting power among the facts before him. But before we dismiss these arts, we must remember that imitation is not the whole of their task. Just as music and architecture, we saw, though non-imitative arts in the main, admitted occasional and partial elements of imitation, so sculpture,

painting, and poetry include non-imitative elements in their

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turn. Part of the pleasures of sculpture, and a larger part of those of painting, are independent of the representation of natural facts, and depend only, like the pleasures of architecture, on abstract properties of line, colour, and light- and-shade. In like manner part of the pleasures of poetry are independent of the images which the words in poetry call up, and depend only, like the pleasures of music, ou the melody and emotional suggestiveness of the sounds of those words as they are combined in the line or stanza. It is impossible to distinguish how much of this pleasure which is received by the eye and ear respectively apart from imitation is purely organic pleasure of the senses, and how much is plea- sure derived from the association of particular forms, hues; and sounds with desirable and beneficent qualities. Certain it is that there are figures and combinations of line, and patterns and arrangements of colour, and successions, transi-

tions, and oppositions of sound, which affect our senses with an organic pleasure ; and certain it is no less that there are others which seem to affect them with a similar pleasure from being unconsciously associated in our minds with ex- periences of efficiency, beneficence, or power. The point at which these kindred pleasures merge into one another it does not here concern us to distinguish, if we could. It is sufficient that the effects of architecture and music depend, as we have learned, almost entirely on their appeal to these pleasures ; while the effects of sculpture, painting, and poetry, depending mainly on the pleasures derived from idealized representation of fact, depend on the others also in a secondary but none the less in an indispensable degree. Thus, the outlines, intervals, and shadows of the masses in a work of sculpture are bound to be such as would please the eye, whether the statue or relief represented the figure of anything real in the world ornot. The flow and balance of line, and the distribution of colours and light-and-shade, in a picture are bound to be such as would make an agreeable pattern although they bore no resemblance to natural fact (as, indeed, many subordinate applications of this art, in decorative painting and geometrical and other ornaments, do, we know, give pleasure though they represent nothing). The sound of a line or verse in poetry is bound to be such as would thrill the physical ear in hearing, or the mental ear in reading, with a delightful excitement even though the meaning went for nothing. If the imitative arts are to touch and elevate the emotions, if they are to afford per- manent delight of the due pitch and volume, it is not a more essential law that their imitation should be of the order which we have defined as ideal, than that they should at the same time exhibit these independent effects which they share with the non-imitative group.

Having now sufficiently drawn attention to the effects presented by the several greater fine arts as divided into an imitative and a non-imitative group, and having found that division the most convenient for the 'general discus- Sion of the nature of the several arts, if not the most important for practice, we may now pass to another point of view, and consider very briefly the results which are gained by a third inode of classification.

3. The Serviceable and the Non-Serviceable Arts.—It has been established from the outset that, though the essential distinction of fine art is to minister

not to necessity but to delight, yet among the arts of men there are some which do both these things at once, and add beauty, or the quality which gives us delight, to use, or the quality which satisfies ourneeds. This double character is inseparable, among the five greater arts, from architecture. We build in the first Instance for the sake of necessary shelter and accommoda- tion, _ By and by we find out that the aspect of our con- structions is pleasurable or the reverse. Architecture is the art of building at once as we need and as we like, and @ practical treatise on architecture must treat the beauty

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and the utility of buildings as bound up together, But for our present purpose it has been proper to take into account one half only of the vocation of architecture, the half by which it gives delight, and belongs to that which is the subject of our study, to fine art; and to neglect the other half of its vocation, by which it belongs to what is not the subject of our study, to useful or mechanical art. It is plain, however, that the presence or absence of this foreign element, the element of utility, constitutes a fair ground for a separate classification of the fine arts, If we took the five greater arts only, architecture would on this ground stand alone in one division, as the useful or serviceable fine art; with sculpture, painting, music, and poetry together in the otlier division, as fine arts unasso- ciated with direct use or service. Not that the divisions would, even thus, be quite sharply and absolutely separated. Didactic poetry, we have already acknowledged, is a branch of the poetic art which aims at practice and utility. Again, the hortatory and patriotic kinds of lyric poetry, from the strains of Tyrtzus to those of Arndt or Rouget de Lisle, may fairly be said to belong to a phase of fine art which is directly concerned, if not with practical needs, at any rate with practical duties. So may the strains of music which accompany such poetry. The same practical char- acter, as stimulating and attuning the mind to definite ends and actions, might indeed have been claimed for the greater part of the whole art of music, as that art was practised in antiquity, when each of several prescribed and highly elaborated moods, or modes, of melody were sup- posed to have a known effect upon the courage and moral temper of the hearer. In modern music, of which the elements, much more complex in themselves than those of

ancient music, have the effect of stirring our fibres to moods of rapturous contemplation rather than of action, military strains in march time are the only purely instru- mental variety of the art which may still be said to retain this character. .

To reinforce, however, the serviceable or useful division of fine arts in our present classification, it is not among the greater arts that we must look. We must look among the lesser or auxiliary arts of the manual or shaping group. The potter, the joiner, the weaver, the smith, the goldsmith, the glass-maker, these and a hundred artificers who produce wares primarily for use, produce them in a form or with embellishments that have the secondary virtue of giving pleasure to the user. Much ingenuity has been spent to little purpose in attempting to group and classify these lesser shaping arts under one or other of the greater shap- ing arts, according to the nature of the means employed in each. Thus the potter's art has been classed under sculp- ture, because he moulds in solid form the shapes of his cups, plates, and ewers ; the art of the joiner under that of the architect, because his tables, seats, and cupboards, are fitted and framed together, like the houses they furnish, out of solid materials previously prepared and cut ; and we our- selves had occasion above to class the weaver and embroid- erer, from the point of view of the effects produced by their art, among painters. But the truth is, that each one of these auxiliary handicrafts has its own materials and technical procedure, which cannot, without forcing and con-fusion, be described by the name proper to the materials and technical procedure of any of the greater arts. The only satisfactory classification of these handicrafts is that now before us, according to which we think of them all together in the same group with architecture, not because any one or more of them may be technically allied to that art, but because, like it, they all yield products capable of being at the same time useful and beautiful. Architecture is the art which fits and frames together, of stone, brick, timber, or iron, the abiding and assembling places of

man, all his houses, palaces, temples, workshops, roofed places of meeting and exchange, theatres for spectacle, fortresses of defence, bridges,

aqueducts, and ships for seafaring. The wise architect having fashioned any one of these great constructions at once for service and beauty in the highest degree, the lesser or auxiliary manual arts come in, to fill, furnish, and adorn it with things of service and beauty in a lower degree, each according to its own technical laws and capabilities; some, like pottery, delight- ing the user at once by beauty of form, delicacy of sub- stance, and pleasantness of imitative or non-imitative orna- ment; some, like embroidery, by richness of tissue, and by the same twofold pleasantness of ornament; some, like goldsmith's work, by preciousness of fancy and workman- ship proportionate to the preciousness of the material. To this vast group of workmen, whose work is at the same time useful and fine in its degree, the ancient Greek gave the place which is most just and convenient for thought, when he classed them all together under the name of réxtoves or artificers, and called the builder by the name of dpyiréxrwv, arch-artificer or artificer-in-chief.

Of the manner in which the operation of these auxiliary manual arts has been modified in later times by the increase of mechanical agencies, and of the degree to which the intervention of such agencies, in multiplying one uni- form design upon a vast number of wares, is compatible with the true characters of fine art in the product, we have said enough further back. It is time now to turn to the last section of our inquiry.

III. Or tHe History or THE Fine Arts.

Under this heading it will not be expected, nor will our space allow, that we should do more than touch in the most general terms on some of the great facts and divisions in the history of the several arts. The students of human culture have within the last hundred years concentrated a great deal of attentive thought upon the history of fine art, and have put forth various comprehensive generalizations intended at once to sum up, and to account for, the phases and vicissitudes of that history. The most famous formula of all is that of Hegel, to which we have already alluded. Hegel, we learned, regarded particular arts as being charac- teristic of and appropriate to particular forms of civiliza- tion and particular ages of history. For him, architecture was the symbolic art appropriate to ages of obscure and struggling ideas, and characteristic of the Egyptian and the Asiatic races of

old and of the medizeval age in Europe. Sculpture was the classical art appropriate to ages of lucid and self-possessed ideas, and characteristic of the Greek and Roman period. Painting, music, and poetry were the romantic arts, appropriate to the ages of complicated and overmastering ideas, and characteristic of modern humanity in general. In the working out of these generalizations, Hegel has brought together a great mass of judicious aud striking observations; and that they are generalizations con- taining on the whole a preponderance of truth may be ad- mitted. It has been objected against them, from the philo- sophical point of view, that they too much mix up the definition of what the several arts theoretically are with considerations of what in various historical circumstances they have practically been. From the historical point of Md eee can be taken what seems a more valid objec- bare a pring of Hegel tend too much to concen- hg —- ae a the student upon the one dominant ee aes, oe eristic of any period, and to give him ee proportions and relations of the several

: period,—of the proportions and relations which poetry, say, really } hee awe end ‘i a ore to sculpture among the

: culpture to architecture among the

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Christian nations of the Middle Age. The truth ig, that the historic survey gained over any field of human activity from the height of generalizations so vast in their range and scope as these are, must needs, in the complexity of earthly affairs, be a survey too distant to give much guidance until its omissions are filled up by a great deal of nearer study; and such nearer study is apt to compel the student in the long run to qualify the theories with which he has started until they are in danger of disappearing altogether, Another systematic exponent of the universe, whose Herter, system is very different from that of Hegel, Mr Herbert Spencer Spencer, has brought the great scientific generalization of 4 the our time, the doctrine of Evolution, to bear, not without in- ae teresting results, upon the history of the fine arts and their fn, | development. Mr Herbert Spencer sets forth how the manual group of fine arts, architecture, sculpture, and painting, were in their first rudiments bound up together, and how each of them in the course of history has liber- ated itself from the rest by a gradual process of separa- tion.

These arts did not at first exist in the distinct and developed forms in which we have above described them. There were no statues in the round, and no painted panels or canvasses hung upon the wall. Only the rudiments of sculpture and painting existed, and that only as ornaments applied to architecture, in the shape of tiers of tinted reliefs, representing, in a kind of picture-writing, the exploits of kings upon the walls of their temple-palaces. Gradually sculpture took greater salience and roundness, and tended to disengage itself from the wall, while painting found out how to represent solidity by meaus of its own, and dispensed with the raised surface upon which it was first applied. But the old mixture and union of the three arts, with an undeveloped art of painting and an undeveloped art of sculpture still engaged in or applied to the works of archi- tecture, continued on the whole to prevail through the long cycles of Egyptian and Assyrian history. In the Egyp- tian palace-temple we find a monument at once political and religious, and into this one class of monument we find concentrated all the energies and faculties of all the arti- ficers of the race. With its incised and pictured walls, its half-detached colossi, its open and its colonnaded chambers, the forms of the columns and their capitals recalling the stems and blossoms of the lotus and papyrus, with its architecture everywhere taking on the characters and cover- ing itself with the adornments of immature sculpture and painting—this structure exhibits within its single fabric the origins of the whole subsequent group of shaping arts. From hence it is a long way to the innumerable artistic sur roundings of later Greek and Roman life, the many temples with their detached and their engaged statues, the theatres, the porticoes, the baths, the training schools, with free and separate statues both of gods and men adorning every build- ing and public place, the frescoes upon the walls, the panel- pictures hung in temples and public and private galleries. In the terms of the thevry of evolution, the advance from the early Egyptian to the later Greek stage is an advance from the one to the manifold, from the simple to the complex, from the homogeneous to the heterogeneous, and affords a striking instance of that vast and ceaseless process of differ- entiation and integration which it is the law of all things to undergo. In the Christian monuments of the early Middle Age, again, the arts have gone back to the rudimentary stage, and are similarly attached to and combined with each other. The single monument, the one great birth of art, in that age, is the Gothic church. In this we find the art of applied sculpture exercised in fashions infinitely rich

and various, but entirely in the service and for the adornment of the architecture ; we find painting exercised in fashions more rudimentary still, principally in the forms of coloured imagery in the chancel windows and illuminated minia-

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tures in the pages of missals and service-books. And from this stage again the process of the differentiation of the arts is repeated. It is by a new evolution or unfolding, and by one carried to much farther and more complicated stages than the last had reached, that the arts since the Middle Age have come to the point where we find them to-day; when architecture is applied to a hundred secular uses with not less magnificence, or at least not less desire of magnifi- cence, than that with which it fulfilled its single sacred use of old; with sculpture adorning, or intended to adorn, all our streets and commemorating all our likenesses ; with the subjects of painting extended from religion to all life and nature, until this one art has been divided into the dozen branches of history, landscape, still life, genre, anecdote, and the rest. Such being in brief the successive stages, and such the reiterated processes, of evolution among the shaping arts, the action of the same law can be traced in the growth of the speaking or time arts also. Originally poetry and music, the two great speaking arts, were not separated from each other and from the art of bodily motion, dancing. The father of song, music, and dancing, all three, was that savage of whom we have already spoken, who first clapped hands and leapt and shouted in time at some fes- tival of his tribe. From the clapping, or rudimentary rhythmical noise, has been evolved the whole art of instru- mental music, down to the entrancing complexities of the modern symphony. From the shout, or rudimentary emo- tional utterance, has proceeded by a kindred evolution the whole art of vocal music down to the modern opera or oratorio. From the savage leap, or rudimentary expression of emotion by rhythmical movements of the body, has descended every variety of dancing, from the stately figures of the tragic chorus of the Greeks to the kordax of their comedy or the cancan of modern Paris.

That the theory of evolution serves well to group and to interpret many facts in the history of art we are not dis- posed to deny, though it would be easy

to show that Mr Herbert Spencer's instances and applications are not suffi- cient to sustain all the conclusions that he seems to draw from them. Thus, it is perfectly true that the Egyptian or Assyrian palace wall is an instance of rudinientary painting aud rudimentary sculpture in subservience to architecture. But it is not less true that races who had no architecture at all, but lived in caverns of the earth, exhibit, as we have already had occasion to notice, the rudiments of the other two arts, in a different form, in the carved or incised handles of their weapons. And it is almost certain that, among the nations of Oriental antiquity themselves, the art of decorat- Ing solid walls so as to please the eye with patterns and resentations of natural objects was itself borrowed from the precedent of an older art, which works in easier materials, the art of weaving or tapestry. It would be in the perished textile fabrics of the earliest dwellers in the valley of the Nile and the Euphrates that we should find, if anywhere, the origins of the systems of surface design, whether con- ventional or imitative, which those races afterwards applied to the decoration of their solid constructions. Not in any one exclusive type of primitive artistic activity, but in a score of such types equally, varying according to race, region, and circumstances, shall we find so many germs or nuclei from Which whole families of fine arts have in the course of the world's history differentiated and unfolded themselves. And once at least during that history, a cataclysm of all the pa and Social forces has not only checked the process a ne oo of the fine arts, but from an advanced stage s ee ement has thrown them back again—we speak i y of the manual group—to the primitive stage xe ete are all practised conjointly and in mutual inter- es ence, By Mr Herbert Spencer's application of the

cory of evolution, not Jess than by Hegel's theory of the

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historic periods, attention is called to the fact that Christian Europe, during several centuries of the Middle Age, presents to our study a civilization analogous to the civilization of the old Oriential empires in this respect, that its ruling and characteristic manual art is architecture, to which sculp- ture and painting are, as in the Oriental empires, once more subjugated and attached. It does not of course follow that such periods of fusion or mutual dependence among the arts are periods of bad art. On the contrary, each

stage of the evolution of any art has its own characteristic excellence. There is an excellence of sculpture as a decorative or sub- sidiary art, and that it reached in the Gothic age. There is an excellence of sculpture as an independent art, and that it reached in Greece in the 5th century B.c., and again ap- proached in Tuscany in the 15th century a.p. The arts can be employed in combination, and yet be all severally excel: lent. When music, dancing, acting, and singing were com- bined inthe performance of the Greek chorus, thecombination no doubt presented a relative perfection of each of the four elements analogous to the combined perfection, in the con- temporary Doric temple, of pure architectural form, sculp- tured enrichment of spaces specially contrived for sculpture in the pediments and frieze, and coloured decoration over all. The extreme differentiation of any art from every other art, and of the several branches of one art among themselves, does not by any means tend to the perfection of that art. The process of evolution among the fine arts may go, and, indeed, in the course of history has gone, too far. Thus an artist of our own day is usually either a painter only or a sculptor only; but yet it is acknowledged that the painter who can model a statue, or the sculptor who can paint a picture, is likely to be the more efficient master of both arts; and in the best days of Florentine art the greatest men were generally painters, sculptors, architects, and goldsmiths all at once. In like manner a landscape painter who paints landscape only is apt not to paint it so well as one who paints the figure too; and in recent times the skill of engraving had almost perished from the habit of allotting one part of the work, as skies, to one hand, another part, as figures, to a second, and another part, as landscape, toathird. This kind of continually progressing subdivision of labour, which seems to be the necessary law of industrial processes, is fatal to any skill which demands, as skill in the fine arts, we have seen, demands, the free exercise and direction at every moment of a highly complex cluster both of faculties and sensibilities. Turning to the other group of arts, there are reformers who say that the process of evolution and differentiation has in like manner gone too far with music. Music, as separated from words and actions, say Dr Wagner aud his followers,—independent orchestral and instrumental music,—has reached its utmost development, and its farther advance can only be an advance into the inane; while the music that is still asso- ciated with words, operatic music, has broken itself up into a number of set and separate forms, as aria, scena, recitative, which correspond to no real varieties of

instinctive emo- tional utterance, and in the aimless production of which the art is in danger of paralysing and stultifying itself. This process, they say, must be checked ; music and words must be brought back again into close connexion and mutual dependence; the artificial opera forms must be abolished, and a new and homogeneous musical drama must be created, of which the author shall combine in himself the now differentiated functions of poet, composer, inventor, and director of scenery and stage appliances, so that the entire creation may bear the impress of a single mind.

It is thus evident that the evolution theory furnishes us with some instructive points of view for the history of the fine arts asfor other things, Another key to what is called the philosophy of that history, although one which has been

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M. Taine employed with results perlaps less really luminous than

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they are certainly showy and attractive, is that supplied by a distinguished French writer, M. Taine. M. Taine's philo- sophy, which might perhaps be better called a natural history, of fine art, consists in regarding the fine arts as the necessary result of the general conditions under which they are at any time produced—conditions of race, conditions of climate, conditions of religion, civilization, and manners. Acquaint yourself with these conditions as they existed in any given people at any given period, and you will be able to account for the characters assumed by the arts of that people at that

period and to reason from one to the other, as a botanist can account for the flora of any given locality and can reason from its soil, exposure, and temperature, to the orders of vegetation which it will produce. This method of treating the history of the fine arts, again, is one which can be pursued with profit, in so far as it makes the student realize the connexion of fine art with human culture in general, and teaches him how the arts of any age and country are not an independent or arbitrary phenomenon, but are essentially an outcome, or efflorescence, to use a phrase of Professor Ruskin's, of many deep-seated elements in the civilization which produces them. But it is a method which, rashly used, is very apt to lead to a hasty and one- sided handling both of history and of art. It is easy to fasten on certain obvious relations of fine art to general civilization when you know a few of the facts of both, and to say, the cloudy skies and mongrel industrial population of Amster- dam at such and such a date had their inevitable reflexion in the art of Rembrandt; the wealth and pomp of the full- fleshed burghers and burgesses of Antwerp had theirs in the art of Rubens. But to do this in the precise and conclusive manner of M. Taine's treatises on the philosophy of art always means to ignore a large range of conditions or causes for which no corresponding effect is on the surface apparent, and generally, also, a large number of effects for which appropriate causes cannot easily be discovered either. The truth is, that this particular efflorescence of human culture depends for its character at any given time upon combina- tions of causes which are by no means simple, but generally highly complex, obscure, and nicely balanced. For instance, the student who should try to reason back from the holy and beatified character which prevails in much of the devo- tioual painting of the Italian schools down to the Renais- sance would make a great mistake if he were to conclude, "like art, like life, thoughts, and manners." He would not understand the relation of the art to the general civilization of those days, unless he were to remember that one of the chief functions of the imagination is to make up for the shortcomings of reality, and to supply to contemplation images of that which is most lacking in actual life ; so that the visions at once peaceful and ardent of the religious schools of the Italian cities are to be explained, not by the peace, but rather in great part by the dispeace, of contemporary existence.

Either of the? three modes of generalization to which we have referred might no doubt yield, however, supposing in the student the due gifts of patience and of caution, a working clue to guide him through that immense region of research, the history of the fine arts. But it is hardly pos- sible to pursue to any purpose the history of the two great groups, the shaping group and the speaking group, together. Words are a means of expression which men have generally ne more quickly than any other; and in Greece all

ree divisions of the art of poetry, the narrative, lyric, andl dramatic, had been perfected, and two of them had again goa before sculpture reached maturity, or painting had passed beyond the stage of its early severity. Again, niany

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ne arts flourished humbly if at all—as England in | wuich who shall as yet foretell the issue ? (s.)

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the days of Elizabeth. The history of poetry must thns of necessity bea separate study. And so must the history of music. Music in its independent development is an inven- tion,—whether made, as some think, in response to the special needs of modern souls, or, as others hold, simply like other inventions in the progress of human ingenuity—but at any rate an invention of the last two hundred years.

On the other hand, it is very possibie to take the whole Main of the shaping group of fine arts together, and to pursue penods connectedly the history, throughout the course of civiliza-™ te — tion, of architecture, sculpture, and painting, and of tae ; their mutual relations with one another. Being all arts ing } of manual dexterity, and all occupied in providing for group our delight objects intended for visual contemplation in space, these have a natural and practical affinity. Leaving aside the arts of tlie races of Egypt and the Kast, which, profoundly interesting as they are, have had no direct

effect upon ourselves except in so far as they communi. cated the first hints or germs of inspiration to the ancestors and masters of Western civilization, the Greeks,—leaving those aside, the history of the manual arts of architecture, painting, and sculpture, falls naturally into four great periods or divisions :—(1) the Greek and Roman period, from about 700 B.c. to the final triumph of Christiamity, say 400 B.c.; (2) the Christian period, from the triumph of Christianity to about 1260 a.p. in Italy and about 1460 in northern Europe ; (3) the Renaissance period, from the . above dates till about 1620 a.p; (4) the modern period, from about 1620 to our own day. We have not set down, as is usually done, a specifically Gothic age in art, for this reason. The characteristic of the whole Christian period is | that its dominant art is architecture, chiefly employed in the service of the church, and with the arts of painting and carving only applied subordinately for its enrichment. It makes uo essential difference to this fundamental character that from the 5th to the 12th century the forms of this art were derived in the east of Europe from the Byzantiue branch, and in the west from the branch usually called Romanesque, of the round-arched architecture of the empire; and that by the 13th century a new form of architecture, in which the round arch was replaced by the pointed, and the decorations took another character, lad been invented in France, and from thence spread abroad to Germany, Eng- land, Spain, and last to Italy. The essential difference only begins when the imitative arts, sculpture and painting, begin to develop and detach themselves, to exist and strive after perfection on their own account. 'This happens in Italy with the artificers of the 13th and 14th centuries, with Niccola Pisano and Giotto; and it happens, though the respective arts are still wholly engaged upon ecclesiastical subjects, in connexion with an incipient study of and passion for antique models. From this time and onward, that movement of men's minds which gradually enthroned the images of pagan antiquity beside those of Christian worship as the ideal theme of art, continued until, in the 15th century, it communicated itself to the more pious races of the North, and until in Italy reached its culmine tion in the genius of Michelangelo and of Raphael. The same movement of the arts held on, with its energy & hausted and its inspiration flagging, until, soon after the beginning of the 17th century, the Dutch school of common life appeared and announced the greatest revolution of all. This is a revolution which has its counterpart in literature too, and which proceeds*

from a modern manner of regardiug life totally different from that of either antiquity, the Chms- tian Middle Age, or the Renaissance. By it the fine atts

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and the classical ideal, and launched upon their human, their secular, their democratic, their realistic career, °

FIN—FIN

FINGAL, the name of the chief hero in the English prose epics called the Poems of Ossian, written in the last century by James Macpherson, and based to a certain extent upon poems and prose tales to be found in manuscripts written in Irish—the literary language common to both

- Treland and Gaelic Scotland, or still preserved in memory

by the Celtic-speaking people of both countries. The Minn ua Baiscni, or Find Mac Cumhaill, of those poems and tales was, according to all Irish and Scottish traditions, the Zig, or king—for that word was one of wider application than in modern times—of the Leinster Jans or Fenians (see FenrANs) in the time of the monarch Cormac son of Art ; and he resided at a Dun, or fort, at Almhain, now the Hill of Allen, in the county of Kildare, whence has come the name of Bog of Allen given to the great central bogs of Ireland. Grainné, daughter of Cormac Mae Airt, was betrothed to Jind, but she having eloped with a celebrated warrior of the Lians—Diarmart ua Duibhne— herfather offered him another daughter, A2bhé, distinguished for her wisdom, The elopement of Diarmazt and Grainné and their pursuit by /ind is the subject of one of the most important of the Irish Fenian tales. /%nd's courtship of Ailbhé is also the subject of a curious tale. /nd is said to have been killed in the year 283 a.p., at a place called Ath Brea, on the river Boyne, by a fisherman who thought to distinguish himself thereby. Jind's sons—Lergus Finn- bheotl, or the Eloquent, and Ozsin (the Little Deer)—were poets, and some poems attributed to them still exist. Oscar, the celebrated son of Ovzsin, was killed at the battle of Gabhra, which broke the Fenian organization and power ; but Ovstn and a few others survived that battle, and accord- ing to popular tradition lived down to the time of St Patrick, The Fenian period, though not strictly within the historic period, is

so close upon its threshold, that Find may have been a real personage. Much that is told of himself and of his father, Cumall son of Trenmor, might have happened. None of the poems attributed to ind himself, or his sons Ozsin and Fergus, though some are in a manuscript of the 12th century, belong, at least in their present form, to the supposed time of the poets. But even if we admit that Find and the other Fenians were real personages, they have become, like Art and his son Cormac, the centres of a luxuriant growth of legend, Find himself having grown into a powerful giant.

In taking Find as the hero of his new epic, Macpherson changed his name, apparently for euphony sake, to Fingal, and made him king of a fictitious petty kingdom of Morven, corresponding apparently with the deanery of that name In the medizeval diocese of Argyle. The name Fingal is not, however, of his own coinage. A large number of Irish personal names end in the same letters, eg., an (Abban, Aedan, éc.), nall (Domhnall, Seachnall, &c.), gen, gan (Cellgen, Corrgen, &c.), gus (Fergus, Oingus, Snedgus, &c.), gat or ghal (Fergal, Aedhghal, é&c.). The same stem, by the addition of different suffixes, gives a series of names, eg., Ferbaeth, Fergal, Fergus, &c. The stems are often the names of colours, ¢g., Donngal, Dubhgal, Gormgal, Fingal, brown, black, blue, fair. According to the Annals of the Four Masters, there was an abbot of Lismore in Ireland named Fingal, who died in 741 a.p, The suffix gal has been assumed to mean stranger or foreigner, so that Fingal would be the fair stranger. This is, however, a mere a The meaning of the stems are equally uncertain ; be brown, black, are designations which might be applied eee aed to the person, but what shall we say of blue, or . A person first called Gormgal painted himself blue Mi — att the manner of the ancient Britons. There = na better Justification than mere euphony for the

nge of Finn or find into Fingal. Barbour, in his mice, written in 1375. has the following interesting

passage (Zhe Brus, xix. p. 49, Spalding Club edition) proving the ancient use of the form Fingal :— "He said, 'Methink, Marthokis sone, Richt as Golmakmorn was wone To haf fra Fingal his menyhe, Richt sa all his fra us has he.'"

In transferring his hero Fingal to Morven, Macpherson was also justified, for that district has an old Fenian topography ofitsown. Kirke in his Psalter, published in 1684, actually calls the districts from Morvaren to Glenelg and the Isles the land of the Mian or Fenians. These and the neigh- bouring districts are also intimately associated with the legends of the heroic period of Cuchulaind.

FINI. See Masorrno.

FINIGUERRA, Maso (contraction for Tommaso), a Florentine goldsmith, is distinguished as the inventor of the method of taking impressions from engraved plates. The date of his birth is not ascertained, and conjectures vary from 1400 to 1426. He was one of the best workers in niello, a form of decorative art then very much in vogue in Italy, which, however, in the next century fell into neglect. He is said to have been a pupil of the famous sculptor Lorenzo Ghiberti, and to have assisted him in the execution of the beautiful bronze gates of the baptistery of Florence ; but whether the first or second pair of gates is not stated. Baldinucci makes him a pupil of Masaccio; but it appears probable that he was rather one of those art students who were powerfully influenced by the new style, noble in simplicity, of Masaccio's works, than a personal disciple of the painter. One indisputably genuine work of Finiguerra is still extant, a silver Pax on which is wrought in niello a representation of the Coronation of the Virgin. By some writers it is called an Assumption. It was executed for the church of San Giovanni Battista at Florence, and is still preserved there. It is in height a little more than 4 inches, and in breadth about 3 inches; and within this small space is a composition of more than forty figures, marvellous for accuracy of drawing and minute finish. The date of its completion is fixed by an entry in the city archives, under the year1452. Dmnring the progress of the work the artist, according to the custom, took casts in sulphur from the plate, and also impressions upon damped paper. For these impressions he made use of a smooth roller, which passed over the paper on the plate, and pro- duced impressions that looked like pen drawings. This method was followed by other workers; and thus copper- plate engraving and printing soon became generally prac- tised in Italy. The title of Finiguerra to the discovery was long disputed, especially on the ground that while prints by early German masters were in existence bearing earlier dates than any

Italian engravings, not a single print by Finiguerra could be produced in support of his claim. The question was settled by Zani's discovery in 1797, in the National Cabinet of Paris, of the identical impression taken by the artist himself from the silver Pax of San Giovanni. This print is believed to have been executed as early as 1440. Zani's account of his discovery (see Ottley's History of Engraving, vol. i. pp. 306-312) is a singularly fascinating narrative, breathing an enthusiasm as intense and a joy as devout as those of a Columbus who first sights a long-sought world. The date of Maso's death is not known. Zani places it about 1460, others about 1475.

FINISTERE, or Finisterre, the most western depart- ment of France, forming part of the old province of Bretagne or Brittany, is bounded on the N.W. and 8. by the ocean, and on the E. by the departments of Cotes-du-Nord and Morbihan. Itextendsfrom 47° 44' to 48° 47' N. lat., and from 3° 22' to 4° 50' W. long., being 78 miles in length from north to south by 63 in width, and having an area of 666,705 hectares, or 2574 square miles. Two

lakes occupy about 12 per cent. of the area, the marshes 20 per cent., so that Finland is more abundantly supplied with water than any other country in the world. The land – appears to have been formerly a sea-bed, which was gradually elevated and is still rising at the rate of about 3-4 feet on the Gulf of Bothnia, and 1-9 feet on the Gulf of Finland in a hundred years. The surface consists of primitive rocks, as gneiss, porphyritic and synetic granite, diorite, gabbro, and hyperesthene, and of formations allied to the older metamorphic and the Cambrian. Neither fossils nor coal have been found. Geologists suppose that the land, a low table-land, continuous along its north-westem and southern borders with two low and flat border-ridges, was long ago covered with an immense ice-sheet, which, creeping from Scandinavia, crossed the Gulf of Bothnia, traversed southern Finland in a direction south by east, crossed the Gulf of Finland, and crept further on in the Baltic provinces. 'The numberless striz, the positions and directions of which exclude any suspicion of their having been traced by floating ice, the striation on the islands of the shallow gulfs, together with that of the Onega basin, the Neva valley, and the Baltic provinces, the uninterrupted sheet of

till, ze, of a true unstratified and unwashed morainic deposit covering Finland, the numberless moraines parallel to the glacial striz, and hundreds of other evi- dences seem to settle the existence of such an ice-sheet beyond doubt. As to traces of marine formations, there are none above a level of about 100 or 120 feet; only lacustrine deposits cover the till above this level.

The greater portion of the interior is, as has been said, a vast table-land, averaging in height from 350 to 400 feet, and interspersed will hills of no great elevation. Heights of considerable elevation are found only in the most northerly part, where the highest summit, Haldefjall (Lappish Haldischok), rises to 4124 feet in the north-west on the Norwegian border. Other single mountains reach from 2000 to 3000 feet, and the higher ridges 1000 feet. The land falls towards the south. 'The principal central ridge Maanselk& (z.¢., land-ridge), about 1300 feet high, the watershed between the Arctic Ocean and the Gulf of Bothnia, forms the boundary between Russia and Finland from 68° to 64° N. lat., running thence under the name of Suomen-selka (i.¢., Finland-ridge) towards the south-west as far as the Gulf of Bothnia, 62° N. lat. Several spurs run off from this ridge towards the south, forming watersheds, but rising little above the general level of the table-land. The largest plain lies on the narrow middle part of the Gulf of Bothnia.

By the above-mentioned ridges Finland is divided into five great basins. In the south-eastern basin, besides Lake Ladoga on the border, lies Lake Saima, along with 120 larger and several thousand smaller lakes, discharging by the river Wuoksen into Lake Ladoga; in the middle or southern basin is Lake P&ijane, discharging by the river Kymmene into the Gulf of Finland; in the south-west basin the waters unite near the town of Tammerfors in the little lake Pyh&jarvi, and discharge by the river Kumo into the Bothnian Gulf; in the north-west is the Ulea bast, with an outflow by the rivers Ule&, Kemi, and Tornea into the same gulf; the north basin contains Lake Enare (nearly 1000 square miles), covered with ice for ten months I the year, and sending its waters into the Arctic Oceal. The rivers are full of rapids, and rarely navigable, but serve for floating down large quantities of timber from the extensive woods of the interior, and also furnish motive power for many mills. 'The lakes are united by canals

The climate of Finland is severe, but generally healthy. The mean yearly temperature in the north is 27°5° Fah. ; at eee 38-7°. The average annual rainfall 1s 20 inches.

chains of hills ran nearly parallel from east to west through this department, and divide it into three zones of almost equal extent, conveying the waters in three different direc- tions. North of the Arrez, or more northern of the two chains, the waters of the Douron, Jarleuc, Penzé, and Fleche flow northward to the sea. South of the Noires range, the Odet, Aven, Ioste, and Ells flow southward ; while the region inclosed by the two chains having a declination westward, the waters of the Aulne and the Elorn flow into the Brest roads, The rivers are all small, and none of the hills attain a height of 900 feet. The coasts are generally steep and rocky, and indented with numerous bays and inlets, affording some excellent harbours, the principal being those of Brest, La Forest, Morlaix, Landernau, Quimper, and Douarnenez. The only navigable rivers are the Aulne, Elorn, and Odet. Off the coast lie a number of islands and rocky islets, the principal of which are Ushant and Bas. The climate is temperate, but rather humid; the prevailing winds are the W., 8.W., and N.W. More than a third of the soil is under cultivation, and about an equal proportion is heath or waste land, rather the larger proportion of the remainder being pasturage, and the rest woods and forests. Though so small a portion of the land is under cultiva- tion, the produce of corn is more than sufficient for the population, and might be greatly increased if the primitive agricultural implements and methods still in use were superseded by the introduction of modern improvements. The chief crops are oats, rye, wheat, and barley; flax, hemp, and pulse are also produced. The farm and dairy produce, though plentiful in quantity, is indifferent in quality; but great attention is paid to the breeding and feeding of cattle. In the department there are a large number of orchards and gardens, and vegetables are largely grown for exportation, The fisheries of the coast, parti- cularly the pilchard fishery, employ a great many hands, and render this department an excellent nursery of seamen for the French navy. Finistére is rich in minerals: iron, coal, lead, bismuth, and zinc mines are worked ; and there are quarries of granite, slate, marble, and porphyry. The lead mines of Poullaouen and Huelgoat, which yielded a considerable quantity of silver, have not been worked since 1869. The manufactures are linens, woollens,

sailcloth, ropes, paper, leather, earthenware, soda, soap, candles, sugar, &c. Shipbuilding is carried on at Brest and other seaports. Finistére is divided into the arrondissements of Quimperlé, Brest, Chateaulin, Morlaix, and Quimper, the town of Quimper being the capital of the department. The population of Finistére in 1872 was 642,963, and in 1876 it was 666,106. FINLAND (Finnish Suomi, or Suomenmaa, the Swampy Region, of which Finland—Fen Land—is said to be a Swedish translation), a grand-duchy forming an adminis- trative division or government of Russia, lies between 59° 48' and 70° 6' N. lat, and 20° 29' and 32° 47' E. long. It is bounded on the N. by Norway, on the E. by the govern- ments of Archangel and Olonetz, on the S. by the Gulf of Finland, and on the W. by the Gulf of Bothnia. Its greatest length is 717 miles, greatest breadth 378 miles, the average breadth being about 185 miles; the area is 144,221 square miles. The surface is a labyrinthine mixture of land and water; and the sea-coast, especially in the south and south-west, presents the same succession of fiords and rocky headlands that characterizes the coasts of Norway and Sweden. The fiords of Finland, however, seldom exceed a = miles in extent. The coast is studded with innumer- oe ee rae and rocks called skar; some of these ar i oe of Sveaborg, have been converted into SeBlats aa great strength. The intricate archipelago gtk renters ie and limestone rocks in the Bothnian 6 navigation extremely dangerous. The

FINLAND

Immense forests cover one-half of the area of the country, reaching on the north as far as Lake Enare. They consist chiefly of pine, spruce fir, and birch, the oak growing wild only in the south, where also are found apples, pears, and cherries. Rye is cultivated as far as the Arctic Circle, barley mostly in the north to Lake Enare, oats as far as 65° N. lat., wheat but little and only in the south, buckwheat and flax to 64° N. lat., hemp to 66°, and potatoes every- where. 'The flora includes 1080 phanerogams and 1800 eryptogams. Of wild animals the bear, wolf, fox, ermine, hare, and squirrel are the most common, with the lynx, elk, rein-deer ; and seals in the sea and in Lakes Ladoga and Saima, Among birds, are the woodcock, moorcock, black- cock, white ptarmigan, partridge, swan, goose, duck. Tle fish include the salmon, perch, pike, and other common kinds.

The population in 1875 was 1,912,647, divided among the various provinces as follows :—

« §q. miles, Population. 21300, oP otaars: Ae gene OREM ce eecs ice «cat Se 318,610 PGWO PIO'... 285.66… ee Mego en. ee. ke 238,280 nee ieee Sen.) W95G4 es… ocee ss. 188,845 Sit 10) SOUS eer. Beene 162,836 Mavastehus …....00….— OMS e ers. Beebiocacee: 202,250 Wiewbere…8. ..... 2) 193,584 Spagna ooa 1G, CY 324,232 ae SOREN. .....05….. 8890010

144,221 1,912,647

The yearly increase of the population is at the rate of 1°05 per cent. ; the density is one person to 148°6 acres, The population of the 35 towns was, in 1875, 148,355, or 77 per cent. of the whole. Of the population 98 per cent, belong to the Lutheran Church, somewhat less than 2 per cent. to the Greco-Russian Church, while Roman Catholics and Jews together number only about 1230; in 1870 there were 86 Mahometans. Of the whole population, 85 per cent. are Finns proper 14 per cent. are Swedish-speaking farmers and peasants, chiefly in the governments of Nyland, Abo, and Wasa, on the coasts and islands ; Russians number about 6000, besides the military, mostly in the towns ; Germans 1200, in Helsingfors and Wiborg ; gipsies about 1000 ; and, to the furthest north, Lapps 600. Agriculture occupies about 80 per cent. of the population ; trade, shipping, and manufactures, 7 per cent.; the profes- sions, 1°5 per cent.; military, 1 per cent. The proportion of men to women is 1000 to 1056. The average number of illegitimate births is 7 per cent. The mean duration of life is 37 years, being 35°6 among men and 38-4 among women, The epidemic diseases are typhus, nervous fever, and, in dry summers, diarrhoea. Of the deaths 3 per cent., or 1179 (1874), were violent, Nearly 7000 are whole or half blind. There is some emigration to Russia and the north of Norway, and thence to the United States, chiefly to Michigan. _ The chief occupation is agriculture, for which the soil in the south-west and on the coast of Wasa is best adapted. Modern methods of agriculture are found only in the south, the hoe being the principal implement in the east. The area under cultivation is about 2,000,000 acres,—of which 700,000 are occupied with rye, 300,000 with barley, 240,000 with oats, and 600,000 are fallow.

Sometimes, especially in the north, the night-frosts destroy the crops, and then meal has to be largely imported from Russia. i fre are ten agricultural schools, two of which are of a

igher class, Of the land 35 million acres belong to the in 6 millions to the upper classes, and 50 millions to atlagll Serfdom never existed in the country. Fo f the exports about one-half is timber, though the ests are much thinned by fires, uprooting, and extrava- aie Of the land under wood (64 per cent.) 39 per cent. elongs to the crown, under the superintendence of forest-

2%

| masters, there being one school of forestry. In 1876 there were upwards of 200 saw-mills, the export amounting to 41,536,169 cubic feet—planks, boards, battens, &c., besides 7,432,617 cubic feet of round timber.

Cattle-breeding is successful on account of the many natural meadows, the good pasturage, and abundance of water. Government gives premiums for riding and draught horses, and for improvement in the breeds of horses and cattle. The value of butter and other dairy produce ex- ported in 1875 amounted to nearly £800,000; of horses 250,000, horned cattle 100,000, sheep 900,000, swine 190,000, and rein-deer 60,000 were exported.

The herring fishery is of some importance, while the rivers yield considerable quantities of salmon, and the lakes white-fish (Coregonus albus). The export of fish in 1876 was valued at over £100,000.

Granite, marble, felspar, and quartz are quarried to the north of Lake Ladoga, and porphyry on the island of Hogland, There is also an extensive granite quarry at Pytterlahti near Fredrikshamn. Iron-mining and smelting are important industries. In 1876 68,000 tons of iron ore were raised ; 21 iron-works turned out 26,000 tons of cast-iron. Besides this, 13 refining works turned out 16,000 tons of bar-iron, The iron exports in 1874 amounted to 19,230 tons, and the imports were 47,270 tons, half of which consisted of ore; while in 1876 the iron export amounted to only 12,000, and the import to 31,000 tons. Copper and tin are found, and in Lapland a little gold. Lime is obtained nearly everywhere.

Finland has about 420 manufactories of various kinds, giving employment to about 11,000 workpeople. The principal articles manufactured are metal goods, cotton goods, woollen cloth, paper, candles, soap, tobacco, sugar, brandy, beer, leather. The whole production is valued at £1,480,000.

The value of the whole exports in 1876 amounted to £3,948,200, timber representing about one-half, cattle one- seventh, grain about 1 per cent., iron and steel goods about 7 per cent., woven goods 7 per cent., paper 24 per cent., fish and game nearly 3 per cent., tar 33 per cent., butter, &ce., 21 per cent. The imports were valued at £5,541,710 ; of this 15 per cent. represeuted woven goods, grain 174 per cent., iron and steel 83 per cent., coffee 7 per cent,, sugar 6 per cent., cotton 4} per cent., tobacco 24 per cent., salt 2 per cent., wine and spirits 34 per cent. In 1876 the exports showed an increase in timber, tar, butter, grain, and hides, and a falling off in woollen goods and iron. In the import list a falling off took place in all articles except cotton, petroleum, and coffee. In 1876 the custom-house receipts were £424,603, showing a falling off of about one-tenth as compared with 1875. In the imports Russia holds the first place, Germany being second, Great Britain third, and Norway and Sweden fourth. Russia also comes first in the export list, Great Britain second, and Germany and Norway and Sweden respectively third and fourth. The shipping that entered the various ports numbered 9364 vessels of all kinds, of 1,314,999 registered tons ; 9220 vessels of 1,310,679 tons cleared the ports. The Finnish merchant shipping in 1875 numbered 1900 vessels of more than 184 tons (280,000 tons in all); 125 of these (7103 tons) were steamers, A considerable amount of shipbuilding is carried on on the wesb coast. 3

The total length of the state railways is 524 miles, which, with a private railway of 21 miles, connect the capital Helsingfors with Abo, Hangé, Tammerfors, Tavastehus, Borga, Wiborg, and St Petersburg. The longest canal is that known as the Saima canal, 37 miles long, connecting Lake Saima with the Gulf of Finland ; besides this there are several smaller canals rendering

navigation practicable between several of the lakes. The telegraph, under Russian management, connects nearly all the towns of the country.

The education of Finland is carried on in one university (Helsingfors), 14 lyceums and realschulen, one polytechnic, two industrial, six navigation, one cadet, two superior and eight inferior agricultural, two trade schools, besides two schools for the blind, and four for deaf and dumb. These include both state and private schools. For popular in- struction there are three normal seminaries and 448 primary schools, most of them Finnish, 67 being Swedish, 5 mixed Finnish and Swedish, and 2 Russian. Besides these there seem to be a number of peripatetic teachers who teach many that do not attend school. In 1875 24 publishers issued 154 books, which had a sale of a million and a quarter copies. There are 55 journals of various kinds, one-half being Finnish.

The czar of Russia is grand-duke of Finland, the external affairs of both countries being thesame. So far as internal administration is concerned, Finland is an independent state, The constitution dates from 1772-1789, and is based besides upon the pledge of the czar Alexander I. in 1809 (when Swedish Finland was annexed), renewed by his successors, and upon the decree of the diet of date 1869. The czar decides as to war and peace, and as to treaties, has the right of pardon, appoints the officials of the country, who, however, must be natives, and is the last appeal in Jaw. The government of the country and the administration of justice are carried on by the Imperial Senate for Finland, consisting of eighteen members appointed by the czar, under the presidency of the governor-general of Finland. The particular affairs on which the czar has to decree are laid before him by the state secretary for Finland. The legislative function is exercised by the czar and diet or landtag (Sem), without the consent of which no law can be either ordained or repealed, no new taxes imposed, or soldiers levied. The diet is called together every five years, and consists of the representatives of the nobility, clergy, citizens, and peasantry. The nobility are represented by the heads of the noble families admitted into the House of Nobles ; the other deputies are elected, the bishops being admitted on account of their office. The official language is Swedish. For administrative purposes Finland is divided into eight lans or governments, the names of which are given above. An older division was the districts of

Finland proper, Aland, Sata-Kunta, Nyland, Tavastland, Karelen, Savolaks, Osterbotten, and Lapland. The lans are divided into harads or districts, and these into parishes or communes, of which there are 480, and which have the management of their own internal affairs. The administra- tion of the law lies in the first place with the senate, in the second place with the high courts established in Abo, Nikolaistad, Wasa, and Wiborg, and finally with the district courts in the country and the municipal courts in the towns. The established religion is that of the Evangelical Lutheran Church, under the archbishop of Abo and the bishops of Borga and Kuopio. There is an ecclesiastical assembly or convocation every ten years, with thirty-four clerical and fifty lay representatives. There is complete religious free- dom for other bodies. The Greco-Russian parishes are under the metropolitan in St Petersburg.

The public income of the countryin 1877 was £1, 267,732, and the expenditure £1,267,738, while on January 1, 1878, ue debt was £2,462,470. Besides the national bank of 1 Ohne aa are two private banks, thirty-nine savings' F s ree fire insurance establishments. The mili- ia orce of Finland consists of one battalion of riflemen. a ae cea consists of a markka or silver mark of

venm, equal to about 94d. In 1878 a new gold coin-

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age was issued, consisting of two pieces of 20 and 10 francs or markka respectively. The Finnish mile is equal to 10 versts or 6°64 English miles. of 2 Finnish feet is equal to 1:9483 English yards. The tunland contains 1°219838 acres. tains 374°85 ib avoirdupois, the Finnish ib being equal to 0-93713 tb avoirdupois ; the ton is equal to 4°5395 bushels, the last to 1°86 ton register, the "can" to '57645 imperial

The fathom of 3 ells

The " ship-pound " con-

gallon.

History.—It was probably at end of the 7th or beginning of the 8th century that the Finns took possession of what is now Finland, though it was only when Christianity was in- troduced, about 1157, that they were brought into contact with civilized Europe. They probably found the Lapps in possession of the country. The early Finlanders do not seem to have had any governmental organization, but to have lived in separate communities and villages independent of each other. Their mythology consisted in the deification of the forces of nature, as "'Ukko," the god of the air, "Tapio," god of the forests, " Ahti," the god of water, &. These early Finlanders seem to have been both brave and troublesome to their neighbours, and their repeated attacks on the coast of Sweden drew the attention of the kings of that country. King Eric IX. (St Eric), accompanied by the bishop of Upsala, Henry (an Englishman, it is said), and at the head of a considerable army, invaded the country in 1157, when the people were conquered and baptized. King Eric left Bishop Henry with his priests and some soldiers behind to confirm the conquest and complete the conversion. After a time he was killed, canonized, and as St Henry became the patron saint of Finland. As Sweden had to attend to her own affairs, Finland was gradually reverting to independence and paganism, when in 1209 another bishop and missionary, Thomas (also an Englishman), arrived, and recommenced the work of St Henry. Bishop Thomas nearly succeeded in detaching Finland from Sweden, and forming it into a province subject only to the pope. The famous Birger J arl undertook a crusade in Finland in 1249, compelling the Tavastians, one of the subdivisions of the Finlanders proper, to accept Christianity, and building a castle at Tavastehus. It was Torkel Knutson who conquered and connected the Karehan Finlanders in 1293, and built the strong castle of Wiborg. Almost continuous wars between Russia and Sweden were the result of the conquest of Finland by the latter. In 1323 it was settled that the river Rajajoki should be the boundary between Russia and the Swedish province. After the final conquest of the country by the Swedes, they spread among the Finlanders their civilization, gave them laws, accorded them the same civil rights as belonged to themselves, and introduced agriculture and other beneficial arts. The Reformed religion was introduced into Finland by Gustavus Vasa about 1528, and King John III. raised it to the dignity of a grand-duchy. The country suffered, sometimes deplorably, in most of the wars waged by Sweden, especially with Russia and Denmark. His predecessor having

created an order of nobility,—counts, barons, and nobles, Gustavus Adolphus in the begiuning of the 17th century established the diet of Finland, composed of the four orders of the nobility, clergy, bourgeois, and peasants. Gustavus and his successor did much for Finland by found- ing schools and gymnasia, building churches, encouraging learning, and introducing printing. During the reign of Charles XI. (1692-1696) the country suffered terribly from famine and pestilence ; in the diocese of Abo alone 60,000 persons died in Jess than nine months. Finland has beer visited at different periods since by these scourges; SO late as 1848 whole villages were starved during a dreadful famine. Peter the Great cast an envious eye on Finland and tried to wrest it from Sweden; in 1710 he managed to obtain posses

sion of the towns of Keksholm and Villmanstrand ; and by 1716 all the country was in his power. Meantime the sufferings of the people had been great; thousands perished in the wars of Charles XII. By the peace of Nystad in 1721 the province of Wiborg, the eastern division of Finland, was finally ceded to Russia. But the country had been laid very low by war, pestilence, and famine, though it recovered itself with wonderful rapidity. In 1741 the Swedes made an effort to recover the ceded province, but through wretched management suffered disaster, and were compelled to capitulate in August 1742, ceding by the peace of Abo, next year, the towns of Villmanstrand and Fredrikshamn. Nothing remarkable seems to have occurred till 1788, under Gustavus ITL., who began to reign in 1771, and who gave the Finlanders those fundamental laws by which they are still essentially governed. The country was divided into six governments, a second superior court of justice was founded at Wasa, many new towns were built, commerce flourished, and science and art were encouraged. Latin disappeared as the academic language, and Swedish was adopted. In 1788, however, war again broke out between Sweden and Russia, and was carried on for two years without much glory or gain to either party, the main aim of Gustavus being to recover the lost Finnish province. In 1808, under Gustavus IV., peace was again broken between the two countries, and the war ended by the cession in 1809 of the whole of Finland and the Aland Islands to Russia, which has ever since maintained her supremacy. The

Finlanders themselves fought bravely against Russia, and it is said that bribery had not a little to do with the result. The emperor Alexander I. convoked the diet at Borgo in 1809, when he issued a manifesto undertaking to preserve the religion, laws, and liberties of the country. This pledge has been taken by his successors, and probably Finland is the freest and best governed part of the Russian empire. A senate was created and a governor-general named, The province of Wiborg was reunited to Finland in 1811, and Abo remained the capital of the country till 1821, when the civil and military authorities were removed to Helsingfors, and the university in 1827. The diet, which had not met for 56 years, was convoked by Alexander IT. at Helsingfors in 1863, and has met every five years since. Since 1860 Finland has been allowed the use of a coinage peculiar to itself, Uuder Alexander II. Finland has been on the whole prosperous and progressive. The use of the Finnish tongue is everywhere encouraged, though the upper classes mostly use Swedish, and the study of the Russian ee was made compulsory in all the state schovls in

Ethnology and Language.—The term Finns has a wider application than Finland, being, with its adjective Finnic or Finno-Ugric or Ugro-Finnic, the collective name of the westernmost branch of the great Uralo-Altaic family, dis- persed throughout Finland, Lapland, the Baltic provinces (Esthonia, Livonia, Courland), parts of Russia proper (south of Lake Onega), both banks of middle Volga, Perm, Vologda, West Siberia (between the Ural Mountains and the Venis. sei), and Hungary. It consists of five groups :—(1) the Finns proper ; (2) the Lapps ; (3) the Permian Finns; (4) Volga Finns ; (5) Ugrian Finns. (1) The first group com- prises the Suomi or Suomelaisset, z.¢., Fen-men, who occupy nearly all Finland except a portion on the Gulf of Bothnia, about Wasa, where Swedish is spoken; next, the Karelians, Who extend from Russian Lapland south to the Gulf of Finland and Lake Ladoga, and east to the White Sea and the shores of Lake Onega; thirdly, the Chudic, a Slav term often applied to the whole group, but now restricted to the

eps or northern Chud and the Votic or southern Chud, dwelling in scattered communities round the shores of Lake

given to the world by Dr Elias Lénnrot.

Onega; and lastly, the Baltic Finns, including the Este or Esthonian, occupying the greater part of the southern coast of the Gulf of Finland and the northern half of Livonia, and the Livonian or Krevinian occupying a small corner in the north-west of Courland. (2) The Lapps occupy the extreme uorth-west of Russia, and some parts of northern Sweden and Norway. (3) The Permian Finns comprise the Siryenians, occupying au extensive region between 60° N. lat. and the Arctic circle and 50° E. long. and the Ural Mountains, but mainly in the section of the government of Vologda; the Permian proper, formerly diffused throughout Perm, Viatka, Oufa, &c., now surviving in isolated com- munities mainly about the upper Kama; and the Votyak, occupying a relatively compact territory in Viatka as far north as Glazov on the river Tchepsa. (4) The Volga Finns include the Cheremissian on the left bank of the Volga, from a little west of Kazan to near Nijni-N ovgorod; and the Mordvinian, divided into small communities on both banks of the Volga, about Simbirsk, Samara, Stavropol, and Tambov. (5) The Ugrian Finns include the Voguls, extending from the Ural Mountains east to near the river Obi and south to Tobolsk; the Ostyaks, from the Voguls east to the river Yenissei, between Turuchansk and Yenis- seisk, and from the Arctic circle to 59° N. lat.; and the Magyars of Hungary. These five groups form one lin- guistic family, to which Samoyede is related. The richest and most highly cultivated languages of the family are the Suomi and Magyar. The dialects are all distinctly agglutinative forms of speech, with decided tendencies towards true inflexion, so much so that in many grammati- cal endings the essential difference between agglutination and inflexion becomes obscured. As in other Uralo-Altaic tongues, progressive vowel-harmony forms a characteristic feature of the Finnic group. Rask considered the Finnish language the most sonorous and harmonious of tongues, It is maintained by some that the Finnic languages represent the oldest forms among the Uralo-Altaic groups. There is strong evidence that the Finns, or a closely allied race, must have at one time, probably prehistoric, been spread over a considerable area of central if not of western Europe.

Originally nomads (hunters and fishers), all the Finnic people except the Lapps and Ostyaks have long yielded to the influence of civilization, and

now everywhere lead settled lives as herdsmen, agriculturists, traders, &c. Physically the Finns are a strong, hardy race, of low stature, with almost round head, low forehead, flat features, prominent cheek bones, eyes mostly grey and oblique (inclining inwards), short and flat nose, protruding mouth, thick lips, neck very full and strong, so that the occiput seems flat and almost in a straight line with the nape ; beard weak and sparse, hair no doubt originally black, but, owing to mixture with other races, now brown, red, and even fair; complexion also somewhat brown. The Finns are morally upright, hospitable, faithful, and submissive, with a keen sense of personal freedom and independence, but also somewhat stolid, revengeful, and indolent. Many of these physical and moral characteristics they have in common with the so-called '" Mongolian" race, to which they are no doubt ethnically, if not also linguistically, related.

Literature.—Finland can boast of a varied literature more or less indigenous, the great monument of which is, however, the Kalewala, a sort of epic poem, which, until the present century, existed only in fragments in the memories and on the lips of the peasantry. A collection of these scattered songs was published in 1822 by Dr Zacharias Topelius, but it was not till 1835 that anything like a complete and systematically arranged collection was For years Dr

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Lonnrot wandered from place to place in the most remote districts, living with the peasantry, and taking down from their lips all that they knew of their popular songs. After unwearied diligence he was successful in collecting 12,000 lines. 'These he arranged as methodically as he could into thirty-two runes or cantos, which he published exactly as he heard them sung or chanted. Continuing his researches, Dr Lonnrot published in 1849 a new edition of 22,793 verses, in 50 runes. The importance of this indigenous epic, as it may be fairly styled, was at once recognized iu Europe, and translations were made into Swedish, German, and French. A few specimens have also been translated into English by the late Professor

A. Porter, of Yale College, and published at New York (1863). The best foreign editions are those of Castren in Swedish (1844), Ldéouzon le Duc in French (1845 and 1868), Schiefner in German (1852). The poem has besides given rise to a cou- siderable amount of critical literature, which is worthy of the attention of the comparative mythologist The poem is written in eight-syllabled trochaic verse, and an idea of its style may be obtained from Longfellow's Hzawatha, which is a pretty true imitation of the Finnish epic. Of the merits and importance of the poem Professor Max Mier, than whom there could be no better judge, speaks thus :—'" From the mouths of the aged an epic poem has been collected, equal- ling the Ziad in length and completeness; nay—if we can forget for a moment all that we in our youth learned to call beautiful—not less beautiful. A Finn is not a Greek, and a Wainamoinen was not a Homer. Butif the poet may take his colours from that nature by which he is surrounded, if he may depict the men with whom he lives, Kalewala possesses merits not dissiinilar from those of the J//ad, and will claim its place as the fifth national epic of the world, side by side with the Ionian songs, with the Mahabharata, the Shahndmeh, and the Nibelunge." The Kalewala is concerned entirely with the mythology or folk-lore of the people. In the story there is a certain unity of plot, though the various parts are not perfectly homogeneous, and are evidently the product of different minds at different times, the various songs having evidently received additions in course of time. Indeed, it is probable that the origin of the songs must be sought for in a time when the various branches of the Finns were not so scattered as they are now, certainly before their conversion to Christianity, though in the conclusion there seem to be one or two allusions to Christian subjects. The poem takes its name from the three heroes of Kaleva, the land of plenty and happiness, Wiindméinen, Iimarinen, and LemminMuinen ; it is the struggles of these with Louhi, Hiise, Yofukahainen, and others from Pohjola, a land of the cold north, and from \uonela, the land of death, that are sung. The poem begins with the creation of the world, and after many varied events, ends in the triumph of Wiindméinen and his followers. At the time that Dr Loénnrot collected the Kalewala songs he also collected a considerable quantity of lyric poetry, which he published under the name of Kantele- tar, from the name of the national instrument to which they are sung—antele, a species of her) with five strings. Of recent poets the most popular seems to be Paavo Korrhojnen, a peasant whose productions are characterized by sharp and

biting sarcasm. His songs were published at Helsingfors in 1848. Other modern poets are Marteska, Kettunen, Tlahainen, Oksa The Finns are strong in proverbs, Lonnrot having published a collection of upwards of 7000, with about 2000 charades, while considerable collections of aes and tales have been published. ae ae partes in Finnish was in the middie of a tate A, ae _ probably the Abecedariwm (1543) How Testam ae : ishop of Abo. A translation of the y the same bishop appeared in 1548, at

Stockholm. The whole Bible was not translated into Finnish till 1642. Even during last, but especially during the present century, there has been considerable literary activity in Finland, so that now books in almost every branch of research are found in the language, mainly trans- lations or adaptations. We meet with, during the present ceutury, a considerable number of names of poets and dramatists, no doubt very minor, as also painters, sculptors, and musical composers. At the Paris International Exhibi- tion of 1878 several native Finnish painters and sculptors exhibited works which would do credit to any country; and both in the fine and applied arts Finland occupied a position thoroughly creditable. An important contribution to a history of Finnish literature is Krohn's Suomenkielinen runollisuk$ ruotsinvallan atkana (1862). Finland is won- derfully rich in periodicals of all kinds, the publications of the Finnish Societies of Literature and of Sciences and other learned bodies being specially valuable. 'The Finnish Literary Society has within the last few years published a new edition of the works of the father of Finnish history, Henry Gabriel Porthan (died 1804), A valuable handbook of Finnish history was published at Helsingfors in 1869- 73, by Yrjo Koskinen, and has been translated into both Swedish and German. The author, however, is understood to be really a Swede, whose name is Georg Forsman, the above form being a Finnish translation. Other works on Finnish history have also appeared within the last four or five years. Some important works in Finnish geography have also appeared during the same period. In language we have Lonnrot's great Finnish-Swedish dictionary, now being published by the Finnish Literary Society, In this connexion the student may be glad to know of Dr Donner's Comparative Dictionary of the Finno-Ugric Languages (Helsingfors and Leipsic), in German. In other depart- ments

works of importance have not been infrequent during the present decade ; most of them apparently are in Swedish. A valuable sketch of recent Finnish literature will be found in the Russische Revue (iv. Jahrgang, 4 and 6 Hefte). (3. 3. FINLAY, Georce (1799-1875), the historian of Greece "from its conquest by the Romans to the present time," was born of Scottish parents at Faversham, Kent, on the 21st of December 1799. His father, Major John Finlay, R.E, F.R.S., who had held for some time the post of inspector of the Government powder-mills at Faversham and Waltham Abbey, died when George was still very young (1802) ; but the boy has left on record how his interest in historical studies was awakened at a very early age by the manner in which his mother used to explain the history of England. On the second marriage of his mother, he was sent toa boarding-school near Liverpool, where he spent three years,—not very profitably, according to his own account. Afterwards his education was continued in more favourable circumstances under a private tutor in the house of his uncle, Mr Kirkman Finlay, who at that time sat as member of parliament for the Glasgow district of burghs. While making good progress in his literary education, he at the same time laid up pleasant and life-long memories of the boating, fishing, and pedestrian excursions for which the picturesque shores of the Firth of Clyde offer so many delightful facilities. At one time he had entertained thoughts of entering the army ; but having been dissuaded from this by his friends, he ultimately, at the close of his: university curriculum in arts, made choice of the legal pro- fession. He received his preliminary technical training 12 a writer's office in Glasgow, and, when little over twenty years of age, went to Gottingen to complete his studies 10 Roman law. But before this time he had begun to feel @ deep interest in the contemporary affairs of Greece, and at the Hanoverian university he was wholly unable to with-

draw his attention from the stirring drama which was then being unfolded in the south-eastern corner of Europe. "TI conversed much," he says, "with everybody I met who had visited Greece, read all the works of modern travellers, and associated a great deal with the only Greek who was then studying at Gottingen." In 1823 he resolved to visit the country personally, in order that he might judge for himself of the condition of the people and

the prospects of the war. In November accordingly he arrived in Cephalonia, where he first met Lord Byron, by whom, as well as by Sir Cliarles Napier, the British resident, he was very kindly received. Shortly afterwards he was landed at Pyrgos, aud during the next fourteen months, which were spent partly at Athens and partly at Missolonghi, he greatly improved his knowledge of the language, history, and antiquities of the country. While soon led to form a very unfavourable opinion of the rapacity, selfishness, and incompetency of the Greek leaders, both civil and military, he by no nieans lost his enthusiasm for the cause of Greek independence. A severe attack of fever, however, combined with other circumstances to make a change of scene de- sirable in December 1824. The rest of that winter accordingly and the spring of 1825 were spent in Roine, Naples, and Sicily. After spending a summer at Castle Toward, Argyllshire, he went to Edinburgh, where he attended classes in the university, and passed his examina- tion in civil law with a view to being called to the Scottish bar. His unquenched enthusiasm for Greece, however, made it impossible for him to resist the pressing invitation of his friend Hastings that he should return to that country, and thenceforward, if we except a few brief journeys (one to England in 1826 in order to secure the services of some competent engineers), the remainder of his life was wholly spent in the land of his adoption. He took part in the unsuccessful operations of Lord Cochrane and Sir Richard Church for the relief of Athens in 1827. When independ- ence had been secured in 1829, under the presidency of Capodistrias, he was induced by the prospect of peaceful progress to buy a landed estate in Attica, hoping in this Way to aidin putting the country "into the road that leads to a rapid increase of production, population, aud material umprovement." These hopes were not realized; all his efforts for the introduction of a better system of agriculture ended in failure ; within a very few years he found that he had lost his capital as well as his labour in his generous but ill-rewarded enthusiasm. Only when it had become too plain to him that Greece could be served in no other way, did he form the resolve of giving himself to the literary work which ocenpied, somewhat sadly, all the remainder of his life. "Had the hopes with which I joined the cause of Greece in 1823 been fulfilled, it is not probable that I should have abandoned the active duties of life, and the noble task of labouring to improve the land, for the sterile task of recording its misfortunes." So he writes in 1855. His first publications were The Hellenic Kingdom and the

Greek Nation (London, 1836) ; Hssac sur les principes de banque appliqués d Vétat actuel de la Croce (Athens, 1836) ; and Remarks on the Topography of Oropia and Dacria, with a map (Athens, 1838). The first instalment of his great historical work appeared in 1844 (the 2d edition a 1857) under the title Greece under the Romans: a ow View of the Condition of the Greek Nation from of "' i: us Conquest by the Romans until the Extinction ee € ee Limpire in the Hast. Meanwhile he had K i i Sige himself still further for his task by travel fie as by reading ; he undertook several tours (one in We aa of Karl Ritter) to various quarters of the tolls _ the result of one of them he published a cae n the Sote of the Holy Sepulchre 3 with a plan of erusatem (London, 1847). The Ltistory of the Byzantine

aon and Greek Empires from 716-1453 was completed in 1854, It was speedily followed by the History of Greece under Othoman and Venetian Domination (1856), and by the Mistory of the Greek Revolution (Edinburgh, 1861). In weak health, and conscious of failing energy, he now gave the last years of hi. life to the task of revising, supplement- ing, aud partly rewriting his great work. From 1864 to 1870 he was also correspondent of the Z%mes newspaper, and at various periods he contributed articles to Blackwood's Magazine, the Atheneum, and the Saturday Review. He was a member of several learned societies ; and in 1854 he received from the university of Ediuburgh the honorary degree of LL.D. He died at Athens on the 26th of January 1875. A new edition of his History, "revised throughout, and in part rewritten, with considerable addi- tions, by the author, and edited by the Rev H. F. Tozer, M.A.," with a portrait by Jeens, was issued from the Oxford Clarendon press in 1877. It includes a brief but extremely interesting fragment of an autobiography of the author. As an historian Finlay had the merit, which was also to some extent the advantage, of entering upon a field of research that had been previously wholly ne- glected by English writers, Gibbon alone being a partial exception. He brought to his work many admirable quali- ties; as a student he was laborions, as a scholar he was accurate, as a thinker he was both acute and profound ; and in all that he wrote he was unswerving in his loyalty to the principles of constitutional government and to the cause of liberty and justice. The portion of his work which exteuds from 146 Bc. to 1453 a.p. has been translated into German. ae

FIORENZUOLA, a small town of Italy, in the province of Piacenza, about 13 miles from the city of that name, on the right of the Arda, which is there crossed by a noble bridge. The ancient towers in the piazza, the collegiate church of 8. Fiorenzo with its beautiful carved work, and the old Palazzo Grossi are the principal objects of interest. The town is of no small antiquity, and in the 9th century it was the scene of a sanguinary battle between Berenger of Italy and Rudolph II. of Burgundy. The Scotti, the Visconti, the Pallavicini, and the Farnesi were successively in possession of the fee. In the vicinity are the ruins of the old city of Veleia, which was overthrown by a landslip in the 4th century. Population of the town in 1871, 3295 ; of the commune, 6730.

FIORILLO, Jonann Dominicus (1748-1821), German painter and historian of art, was born at Hamburg, October 13, 1748. He received his first instructions in art at an academy of painting at Baireuth; and in 1761, to continue his studies, he went first to Rome, where for four years he was the pupil of Batoni, and next to Bologna, where he studied under Bigari and Lulli. He distinguished himself sufficiently to attain in 1769 admission to the academy of that city. Returning soon after to Germany, he obtained the appointment of historical painter tothe court of Bruns- wick. In 1781 he removed to Gottingen, occupied himself as a drawing-master, and was named in 1784 keeper of the collection of prints at the university library. He was appointed professor extraordinary in the philosophical faculty in 1799, and ordinary professor in 1813, During this period he had made himself known as a writer by the publication of his Geschichte der zeichnenden Kiinste, in 5 vols. (1798-1808). This was followed in 1815 to 1820 by the Geschichte der zeichnenden Kiinste in Deutschland und den vereinigten Niederlanden, in 4 vols. These works, though not attaining to any high mark of literary excellence, are esteemed for the information collected in them, especially on the subject of art in the later Middle Ages. Fiorillo practised his art almost till his death, kut has left no memorable masterpiece. The most noticeable of his

paintings is perhaps the Surrender of Briseis. Gottingen, September 10, 1821.

FIR, the. name originally given by our Scandinavian forefathers to the Scotch pine (Pinus sylvestris), is at present not unfrequently employed as a general term for the whole of the true Conifers (Abzetine); but, in a more exact sense, it has been transferred to the "spruce" and "silver firs," the genera Abies and Picea of most modern botanists.

The firs are distinguished from the pines and larches by having their needle-like leaves placed singly on the shoots, instead of growing in clusters from a sheath or abortive branch. Their cones are composed of thin, rounded, closely-imbricated scales, furnished in some species with bracts springing from the base. The trees have usually a straight trunk, and a tendency to a conical or pyramidal growth,—throwing out each year a more or Jess regular whorl of branches from the foot of the leading shoot, while the buds of the lateral boughs extend horizontally.

In the Spruce Firs (Abves), the cones are pendent when mature and their scales persistent ; the leaves are arranged all round the shoots, though the lower ones are sometimes directed laterally. In the sub-genus Picea, the Silver Firs, the cones are erect, and their scales drop off when the seed ripens ; the leaves are placed in distinct rows on each side of the shoot. .

The most importaut of the firs, in an economic sense, is the Norway Spruce (Abies excelsa), so well known in British plantations, though rarely attaining there the gigantic height and grandeur of form it often displays in its native woods. Under favourable circumstances of growth it is a lofty tree, with a nearly straight, tapering trunk, throwing

He died at

Fria. 1.—Norway Spruce (Abies excelsa). Male flowers.

out in somewhat irregular whorls its wide-spreading branches, densely clothed with dark, clear green foliage. The boughs and their side-branches, as they increase in length, have a tendency to droop, the lower tier, even in large trees, often sweeping the ground,—a habit that, with the Jagged sprays, and broad, shadowy, wave-like foliage- masses, gives a peculiarly graceful and picturesque aspect Ms the Norway spruce. _ The slender, sharp, slightly curved Caves are scattered thickly around the shoots; the

upper ad tenia Saas the _— and the lower directed side- ways, give 2 sumewhat flattened appearance to thie individual sprays, The elongated, acylated cones grow

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FIR—FIR

chiefly at the ends of the upper branches ; they are purplish at first, but become afterwards green, and eventually light brown ; their scales are slightly toothed at the extremity; they ripen in the autumn, but seldom discharge their seeds until the following spring.

The tree is very widely distributed, growing abundantly on most of the mountain ranges of northern and central Europe; while in Asia it occurs at least as far east as the Lena, and in latitude extends from the Altaic ranges to beyond the Arctic circle. On the Swiss Alps it is one of the most prevalent and striking of the forest trees, its

Fic. 2.—Norway Spruce (Abies excelsa). Cones; scale with seeds. .

dark evergreen foliage often standing out in strong contrast to the snowy ridges and glaciers beyond. In the lower districts of Sweden it is the predominant tree in most of the great forests that spread over so large a portion of that country. In Norway it constitutes a considerable part of the dense woods of the southern dales, flourishing, accord- ing to Schiibeler, on the mountain slopes up to an altitude of from 2800 to 3100 feet, and clothing the shores of some of the fjords to the water's edge ; in the higher regions It is generally mingled with the pine. 'Less abundant on the western side of the fjelds, it again forms woods in Nord- land, extending in the neighbourhood of the coast nearly to the 67th parallel; but it is, in that arctic climate, rarely met with at a greater elevation than 800 feet above the sea, though in Swedish Lapland it is found on the slope of the Sulitelma as high as 1200 feet, its upper limit being everywhere lower than that of the pine. In all the Scandinavian countries it is known as the Gran or Grant. Great tracts of low country along the southern shores of the Baltic and in northern Russia are covered with forests of spruce. It everywhere shows a preference for a moist but well-drained soil, and never attains its full

stature of luxuriance of growth upon arid ground, whether on plait or mountain—a peculiarity that should be remembered by the planter. In a favourable soil and open situation 1 becomes the tallest and one of the stateliest of Europea? trees, rising sometimes to a height of from 150 to 170 feet, the trunk attaining a diameter of from 5 to 6 feet at the base. But when it grows in dense woods, where the lower branches decay and drop off early, only a small head. of foliage remaining at the tapering summit, its stem, though frequently of great height, is rarely more than 1} or 2 feet

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in thickness. Its growth is rapid, the straight leading shoot, in the vigorous period of the tree, often extending 24 or even 3 feet in a single season. In its native habitats it is said to endure for several centuries; but in those countries from which the commercial supply of its timber is chiefly drawn, it attains perfection in from 70 to 90 years, according to soil and situation.

In the most prevalent variety of the Norway spruce the wood is white, apt to be very knotty when the tree has grown in an open place, but, as produced in the close northern forests, often of fine and even grain.

"Christiania," and "' Danzig deal." The larger trees are sawn up into planks and battens, much used for the

purposes of the builder, especially fcr flooring, joists, and | rafters. Where not exposed to the weather, the wood is |

probably as lasting as that of the pine, but, not being so resinous, appears less adapted for out-door uses. Of late years great quantities have been sent from Sweden in a manufactured state, in the form of door and window-frames and ready-prepared flooring, and much of the cheap "' white deal" furniture is made of this wood. The younger and smaller trees are remarkably durable, especially when the bark is allowed to remain on them; and most of the poles imported into Britain for scaffolding, ladders, mining-timber, and similar uses are furnished by this fir. Small masts and spars are often made of it, and are said to be lighter than those of pine. The best poles, according to Monteath, are obtained in Norway from small, slender, drawn-up trees, growing under the shade of the larger ones in the thick

woods, these being freer from knots, and tougher from their slower growth. A variety of the spruce,

abounding in some parts of Norway, produces a red heart-

wood, not easy to distinguish from that of the Norway

Im- mense quantites are imported into Britain from Norway, | Sweden, and Prussia, under the names of " white Norway," |

pine (Scotch fir), and imported with it into England as |

"red deal" or "pine." This kind is sometimes seen in plantations, where it may be recognized by its shorter, darker leaves, and longer cones. The smaller branches and the waste portion of the trunks, left in cutting up the timber, are exported as fire-wood, or used for splitting into matches, an industry that has lately sprung up in Sweden. Recently, the wood of the spruce has been employed in the manu- facture of paper-stuff, being first reduced to a state of fine division, and then deprived of its resin by long boiling in alkaline solutions,—an application that will probably be considerably extended with the wider employment of paper- pulp in the useful arts.

_The resinous products of the Norway spruce, though yielded by the tree in less abundance than those furnished by the pine, are of considerable economic value. In in the bark, forming by its congelation a fine yellow resin, known commercially as "spruce rosin," or "frankincense"; it 18 also procured artificially by cutting off the ends of the lower branches, when it slowly exudes from the extremities. Tn Switzerland and parts of Germany, where it is collected

m some quantity for commerce, a long strip of bark is cut _

out of the tree near the root ; the resin, that slowly accumulates during the summer, is scraped out in the latter part of the season, and the slit enlarged slightly the follow- ng spring to ensure a continuance of the supply. The Process 18 repeated every alternate year, until the tree no longer yields the

resin in abundance, which under favour- able circumstances it will do for twenty years or more.

he quantity obtained from each fir is very variable, depending on the vigour of the tree, and greatly lessens after it has been subjected to the operation for some years. Eventually the tree is destroyed, and the wood rendered Wortliless for timber, and of little value even for fuel. From

Scandinavia a thick turpentine oozes from cracks or fissures |

the product so obtained most of the better sort of "Bure- undy pitch" of the druggists is prepared. The resin collected from the fir is melted and boiled in water, then filtered through a sackcloth bag, and left to congeal in a cask beneath ; nearly half the original amount of resin is obtained iu this purified condition. Its chief employment is for plasters, much used in disorders of the chest and other complaints in which a mild stimulant to the skin is required. It is often applied in conjunction with the spruce-rosin itself and other ingredients. Much of the so- called Burgundy pitch of the shops is, according to Pereira, a compound of common rosin, palm oil, and water. By distillation with water the resin of tle spruce yields oil of turpentine ; but only a comparatively small quantity of that of commerce is obtained from this source, and it is considered inferior to that yielded by the pine and larch. By the peasantry of its native countries the Norway spruce is applied to innumerable purposes of daily life. The bark and young cones afford a tanning material, inferior indeed to oak-bark, and hardly equal to that of the larch, but of value in countries where substances more rich in tanuin are not abundant. In Norway the sprays, like those of the juniper, are scattered over the floors of churches and the sitting-rooms of dwelling-houses, as a fragrant and healthful substitute for carpet or matting. The young shoots are also given to oxen in the long winters of those northern latitudes, when other green fodder is hard to obtain. In times of scarcity the Norse peasant-farmer uses the sweetish inner bark, beaten in a mortar and ground in his primitive mill with oats or barley, to eke out a scanty supply of meal, the mixture yielding a tolerably palatable though somewhat resinous substitute for his ordinary flad-brod. A decoction of the buds in milk or whey is a common household remedy for scurvy ; and the young

shoots or green cones form an essential ingredient in the spruce-beer drank with a similar object, or as an occasional beverage. The well-known "' Danzig-spruce " is prepared by adding a decoction of the buds or cones to the wort or saccharine liquor before fermentation. Similar preparations are in use wherever the spruce fir abounds. The wood is burned for fuel, its heat-giving power being reckoned in Germany about one- fourth less than that of beech. From the wide-spreading roots string and ropes are manufactured in Lapland and Bothnia: the longer ones which run near the surface are selected, split through, and then boiled for some hours in a ley of wood-ashes-and salt, which, dissolving out the resin, loosens the fibres and renders them easily separable, and ready for twisting into cordage. _ Light portable boats are sometimes made of very thin boards of fir, sewn together with cord thus manufactured from the roots of the tree. The Norway spruce seems to have been the " Picea" of Pliny, but is evidently often confused by the Latin writers with their " Abies," the Picea pectinata of modern botanists. From an equally loose application of the word "fir" by our older herbalists, it is difficult to decide upon the date of introduction of this tree into Britain; but it was commonly planted for ornamental purposes in the begin- ning of the 17th century. In places suited to its growth it seems to flourish nearly as well as in the woods of Norway or Switzerland ; but as it needs for its' successful cultivation as a timber tree soils that might be turned to agricultural account, it is not so well adapted for economic

| planting in Britain as the Scotch fir or larch, which come

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to perfection in more bleak and elevated regions, and on comparatively barren ground, though it may perhaps be grown to advantage on some moist hill-sides and mountain hollows. Its great value to the English forester is as a "nurse" for other trees, for which its dense leafage and tapering form render it admirably fitted, as it protects, without overshading, the young saplings, and yields. saleable

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stakes and small poles when cut out. not so well adapted as the larch. Asa picturesque tree, for park and ornamental plantation, it is among the best of

the conifers, its colour and form contrasting yet harmoniz- ing with the olive green and rounded outline of oaks and beeches, or with the red trunk and glaucous foliage of the pine. When young its spreading boughs form good cover for game. 'The fresh branches, with their thick mat of foliage, are useful to the gardener for sheltering wall- fruit in the spring. In a good soil and position the tree sometimes attains an enormous size : one in Studley Park, Yorkshire, was, a few years back, nearly 140 feet in height, and the trunk more than 6 feet in thickness near the ground. The spruce bears the smoke of great cities better than most of the Abzetine ; but in suburban localities after a certain age it soon loses its healthy aspect, and is apt to be affected with blight (Zriosoma), though not so much as the Scotch fir and most of the piues.

The Black Spruce (Abies nigra) is a tree of more formal growth than the preceding. The branches grow at a more acute angle and in more regular whorls than those of the fir of Norway; and, though the lower ones become bent to a horizontal position, they do not droop, so that the tree has a much less elegant appearance. The leaves, which grow very thickly all round the stem, are short, nearly quadrangular, and of a dark greyish green. The cones, produced in great abundance, are short and oval in shape, the scales with rugged indented edges; they are deep purple when young, but become brown as they ripen. The tree abounds throughout New England, Nova Scotia, and all the countries around the St Lawrence, in Canada grow- ing up to 65°,—in all these regions often forming a large part of the dense forests. A variety with lighter foliage and reddish bark is common in Newfoundland and some districts on the mainland adjacent. The trees usually grow very close together, the slender trunks rising to a great height bare of branches ; but they do not attain the size of the Norway spruce, being seldom taller than 60 or 70 feet, with a diameter of 14 or 2 feet atthe base. This species prefers a peaty soil, and often grows luxuriantly in very moist situations. The wood is strong, light, and very elastic, forming an excellent material for small masts and spars, for which purpose the trunks are used in America, and exported largely to England. The sawn timber is inferior to that of A. eacelsa, besides being of a smaller size. In the countries in which it abounds, the log-houses of the settlers are often built of the long straight trunks. The spruce-beer of America is generally made from the young shoots of this tree. The small twigs, tied in bundles, are boiled for some time in water with broken biscuit or roasted grain ; the resulting decoction is then poured into a cask with molasses, or maple sugar, and a little yeast, and left to ferment. It is often made by the settlers and fishermen of the St Lawrence cauntries, being esteemed as a preventive of scurvy. The American "essence of spruce," occasionally used in England for making spruce-beer, is obtained by boiling the shoots and buds and concentrating the decoction. The resinous pro- ducts of the tree are of no great value.

The White Spruce (Adies alba), sometimes met with in English plantations, is a tree of lighter growth than the black spruce, the branches being more widely apart ; the foliage is of a light glaucous green; the small light-brown

cones are more slender and tapering than in A. nigra, and the scales have even edges. It is of comparatively small size, but is of some importance in the wilds of the Canadian dominion, where it is found further north than any other tree, growing up to at least 69°; the slender trunks yield the only useful timber of some of the more desolate

BET –

For hop-poles it is | frequently, mingled with the black spruce and other trees,

The fibrous tough roots, softened by soaking in water, and split, are used by the Indians and voyageurs to sew together the birch-bark covering of their canoes; and a resin that exudes from the bark is employed to varnish over the seams,

The Hemlock Spruce (A. canadensis) is a large tree, abounding in most of the north-eastern parts of America up to Labrador; in Lower Canada, New Brunswick, and Nova Scotia it is often the prevailing tree. The short leaves are flat, those above pressed close to the stem, and the others forming two rows; they are of a rather light green tint above, whitish beneath. The cones are very small, ovate, and pointed. The large branches droop, like those of the Norway spruce, but the sprays are much lighter and more slender, rendering the tree one of the most elegant of the conifers, especially when young. When old, the branches, broken and bent down by the winter snows, give it a ragged but very picturesque aspect. The trunk is frequently three feet thick near the base. The hemlock prefers rather dry and elevated situations, often forming woods on the declivities of mountains. The timber is very much twisted in grain, and liable to warp and split, but is used for making plasterers' laths and for fencing; "shingles" for roofing are sometimes made of it. . The bark, split off in May or June, forms one of the most valuable tanning substances in Canada. The sprays are sometimes used for making spruce-beer and essence of spruce.

The Douglas Spruce (A. Douglasii) is one of the finest trees of the genus, often rising to a height of 200 feet and sometimes considerably more, while the gigantic trunk frequently measures 8 or 10 feet across. The yew-like leaves spread laterally, and are of a deep green tint; the cones are furnished

with tridentate bracts that project far beyond the scales. It forms extensive forests in Van- couver's Island, British Columbia, and Oregon, whence the tinber is exported, being highly prized for its strength, durability, and even grain, though very heavy ; it is of deep yellow colour, abounding in resin, which oozes from the thick bark. It was introduced into Britain soon after its discovery by Douglas, and has been planted in some parts of the kingdom experimentally, but does not appear to flourish well in the climate of England generally, though individual plants may be occasionally seen in good condition in ornamental shrubberies.

Of the Picea group, the Silver Fir (P. pectinata) may be taken as the type,— a lofty tree, rivalling the Norway spruce in size, with large spreading horizontal boughs cutv- ing upward towards the extremities. The flat leaves are arranged in two regular, distinct rows ; they are deep green above, but beneath have two broad white lines, which, a8 the foliage in large trees has a tendency to curl upwards, give it a silvery appearance from below. The large cones stand erect on the branches, are cylindrical in shape, and have long bracts, the curved points of which project beyond the scales. When the tree is young the bark is of a silvery grey, but gets rough with age. This tree appears to have been the true "Abies" of the Latin writers—the "pul | cherrima abies" of Virgil. From early historic times | has been held in high estimation in the south of Europe — being used by the Romans for masts and all purposes for — which timber of great length was required. It is at present — abundant in most of the mountain ranges of southern and central Europe, but is not found in the northern parts of that continent. In Asia it occurs on the Caucasus an Ural, and in some parts of the Altaic chain. Extensiv? woods-of this fir exist on the southern Alps, where the tree = grows up-to nearly 4000 feet ; in the Rhine countries it |

northern regions. In the woods of Canada it occurs | forms great part of the extensive forest of the Hochwald, —

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and occurs in the Black Forest aud in the Vosges; it is plentiful likewise on the Pyrenees and Apennines. The wood is inferior to that of Adves excelsa,

but, being soft and easily worked, is largely employed in the countries to which it is indigenous for all the purposes of carpentry. Articles of furniture are frequently made of it, and it is in

- great esteem for carving and for the construction of stringed

instruments. Deficient in resin, the wood is more perish- able than that of the spruce fir when exposed to the air, though it is said to stand well under water. The bark contains a large amount of a fine, higlily-resinous turpentine, which collects in tumours on the trunk during the heat of summer. In the Alps and Vosges, this resinous semi-fluid is collected by climbing the trees, and pressing out the con- tents of the natural receptacles of the bark into horn or tin vessels held beneath them. After purification by straining, it is sold as "Strasburg turpentine," much used in the preparation of some of the finer varnishes. Burgundy piteh is also prepared from it by a similar process ag that from Abies excelsa, A fine oil of turpentine is distilled from the crude material; the residue forms a coarse rosin. Introduced into Britain in the 17th century, the silver fir has become common there as a planted tree, though, like the Norway spruce, it rarely comes up from seed scattered naturally. There are many fine trees in Scotland; one near Roseneath, figured by Strutt in his Sylva Britan- nica, then measured more than 22 feet round the trunk. In the more southern parts of the island it often reaches a height of 90 feet, and specimens exist considerably above that size ; but the young shoots are apt to be injured in severe winters, and the tree on light soils is also hurt by long droughts, so that it usually presents a ragged appearauce ; though, in the distance, the lofty top and hori-

zontal boughs sometimes stand out in most picturesque |

relief above the rounded summits of the neighbouring trees. The silver fir flourishes in a deep loamy soil, and will grow even upon stiff clay, when well drained—a situa- tion in which few conifers will succeed. On such lands, Where otherwise desirable, it may sometimes be planted with profit. The cones do not ripen till the second year,

The Silver Fir of Canada (P. balsamea), a small tree resembling the last species in foliage, furnishes the " Canada balsam" used in medicine, and

highly valued by the microscopist as a "mounting" medium. It is obtained from natural swellings or receptacles in the bark, like the resin of the common silver fir. The tree abounds in Lower Canada and the adjacent provinces.

Numerous other firs are common in gardens and shrnb- beries, and some furnish valuable products in their native countries ; but they are not yet of sufficient economic or general interest to demand mention here. (C. P.J.)

FIRDOUSE. Abu'l Césim Mansur, who took the nom de pl wme of Firdousi, was a Persian poet of great eminence, and 18 chiefly known to European readers by his magnificent eple poem the Shahnamah, or " Book of Kings," a complete history of Persia in nearly 60,000 verses. He was born at Shadab, a suburb of Tus, about the year 329 of the Hegira (941 a.v.). His father, Maulana Ahmed, son of Maulana Fakhr-ed-din el Firdoust, belonged to the class of Dikkans (the old native country families and landed Proprietors of Persia, who had preserved their influence and status under the Arab rule), and possessed an estate in the neighbourhood of Tus. Firdousi's own education eminently qualified him for the gigantic task which he subsequently undertook, for he was profoundly versed in the Arabic language and literature, and had also: studied deeply the Pehlavi or Old Persian, and was conversant with the aucient historical records which existed in that tongue. A 8 his history is intimately connected with that of the grand €pie which he composed, it will be necessary to say a few

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words concerning the origin of the latter and the nature of the authorities from which it was compiled.

An epic poem, properly so called, is a collection of the ballads and songs, in which the memory of heroic deeds is always preserved in the earlier periods of a people's history, thrown by the rhapsodists into a connected and consecutive form. To become national and to take hold on the people's hearts it must contain nothing but the genuine national legends and traditions, and must have grown spontaneously. Many attempts have been made by poets of different nations to create a national epic, but they have always failed for the lack of the elements above referred to. Homer's Jiéad

and Virgil's dneid are typical specimens of the real and spurious epic,—the former breathing in every line the true spirit of the Hellenic nation, and always rousing thie national euthusiasm and appealing to the national feeling ; the latter never having been regarded by the Latin race with any deeper feeling than that of admiration for its literary merits. The Shahnamah of Firdoust is perhaps the only exception of a poem produced by a single author, and at once taking its place as the national epic of the people. The nature of the work, the materials from which it was composed, and the circumstances under which it was written are, however, in themselves exceptional, and necessarily tended to this result. The grandeur and an- tiquity of the empire and the vicissitudes through which it passed, their long series of wars and the magnificent monuments erected by their ancient sovereigns, could not fail to leave numerous traces in the memory of so imagi- native a people as the Persians,

*As early as the 5th century of the Christian era we find mention made of tliese historical traditions in the work of an Armenian author, Moses of Khorene. During the reign of Naushirwan, the contemporary of Mahomet, and by order of that monarch, an attempt had been made to collect, from various parts of the kingdom, all the popular tales and legends relating to the ancient kings, and the results were deposited in the royal library. Under the last sovereign of the Sussanian dynasty, Yezdegird, the work was resumed, the former collection being revised and greatly added to by the Dihkan Danishwer, assisted by several learned mobeds. His work was entitled the Khodai-nameh, which in the old dialect also meant the "Book of Kings," On the Arab invasion this work was in great dauger of perishing at the hands of the iconoclastic caliph Omar and his generals, but it was fortunately preserved ; and we find it in the 2d century of the Hegira being paraphrased in Arabic by Abdallah ibn el Mokaffa, a learned Persian who had embraced Islam. Other Guebres occupied themselves privately with the collection of these traditions ; and, when a prince of Persian origin, Yakub ibn Leith, founder of the Soffaride dynasty, succeeded in throwing off his allegiance to the caliphate, he at once set about con- tinuing the work of his illustrious predecessors. His ** Book of Kings" was completed in the year 260 of the Hegira, and was freely circulated in Khorassan and Irak. Yakub's family did not continue long in power; but the Samanian princes, descendants of the Sassanians, who suc- ceeded them, applied themselves*

zealously to the same work, and entrusted it to the poet Dakiki himself, a Guebre by religion. Dakiki's labours were brought to a sudden stop by his own assassination, and the fall of the Samanian house happened not long after, and their kingdom passed into the hands of the Ghaznavides. Mahmud ibn Sebuk- tagin, the second of the dynasty (667-1030 a.p.), continued to make himself still more independent of the caliphate than his predecessors, and, though a warrior and a fanatical Moslem, extended a generous patronage to Persian literature and learning, and even developed it at the expense of tlie Arabic institutions. The task of continuing and com-

pleting the collection of the ancient historical traditions of the empire especially attracted him. With the assistance of neighbouring princes and of many of the influential Dihkans, Mahmud collected a vast amount of materials for the work, and after having searched in vain for a man of sufficient learning and ability to edit them faithfully, and having entrusted various episodes for versification to the numerous poets whom he had gathered round lum, he at length made choice of Firdousi. Firdousi had been always strongly attracted by the ancient Pehlavi records, and had begun at an early age to turn them into Persian epic verse. On hearing of the death of the poet Dakiki, he conceived the ambitious design of himself carrying out the work which the latter had only just commenced ; and, although he had not then any introduction to the court, he contrived, thanks to one of his friends, Mohammed Lashkari, to procure a copy of the Dihkan Danishwer's collection, and at the age of thirty-six commenced his great undertaking. Abu Mansour, the governor of Tus, patronized him and encour- aged him by substantial pecuniary support. When Mahmud succeeded to the throne, and evinced such active interest in the work, Firdous{ was naturally attracted to the court of Ghaznin. At first court jealousies and in- trigues prevented Firdousi from being noticed by the sul- tan; but at length one of his friends, Mahek, undertook to present to Mahmud his poetic version of one of the well- known episodes of the legendary history. Hearing that the poet was born at Tus, the sultan made him explain the origin of his native town, and was much struck with the

intimate knowledge of ancient history which he displayed. Being presented to the seven poets who were then engaged on the projected epic, Abu '1 Casim was admitted to their meetings, and on one occasion improvised a verse, at Mahmud's request, in praise of his favourite Ayaz, with such success that the sultan bestowed upon him the name of Firdous{, saying that he had converted his assemblies into paradise (Firdous). During the early days of his sojourn

at court, an incident happened which contributed in no |

small nieasure to the realization of his ambition. Three of the seven poets were drinking in a garden when Firdoust approached, and wishing to get rid of him without rude- ness, they informed him who they were, and told bim that it was their custom to admit none to their society but such as could give proof of poetical talent. To test his acquire- ments they proposed that each should furnish an extem- porary line of verse, his own to be the last, and all three ending in thesamerhyme. Firdousi accepted the challenge, and the three poets having previously agreed upon three rhyming words to which a fourth could not be found in the Persian language, 'Ausari began— Thy beauty eclipses the light of the sun; Farrakhi added—

The rose with thy cheek would comparison shun ; 'Asjadi continued—

Thy glances pierce through the mailed warrior's johsun;'

and Firdous{, without a moment's hesitation, completed the quatrain—

Like the lance of fierce Giv in his fight with Poshun.

The poets asked for an explanation of this allusion, and Firdoust recited to them the battle as described in the Shah- namah, and delighted and astonished them with his learn- ing and eloquence.

Mahmud now definitely selected him for the work of compiling and versifying the ancient legends, and bestowed upon him such marks of his favour and munificence as to elicit from the poet an enthusiastic panegyric, which is in-

1 A sort of cuirass.

serted in the preface of the Shahnamah, and forms a curious contrast to the bitter satire which he subsequently prefixed to the book. 'The sultan ordered his treasurer, Khojah Hasan Meimendi, to pay to Firdousf a thousand gold pieces for every thousand verses ; but the poet preferred allowing the sum to accumulate till the whole was finished, with the object of amassing sufficient capital to construct a dike for his native town of Tus, which suffered greatly from defective irrigation, a project which had been the chief dream of his childhood. Owing to this resolution, and to the jealousy of Hasan Meimendi, who often refused to ad- vance him sufficient for the necessaries of life, Firdousi passed the later portion of his life in great privation, though enjoying the royal favour and widely extended fame. Amongst other princes whose liberal presents enabled hin to combat his pecuniary difficulties, was one Rustem, son of Fakhr ed dauleh, the Deilamite, who sent him a thousand gold pieces in acknowledgment of a copy of the episode of Rustem and Isfendiar which Firdousi had sent him, and promised him a gracions reception if he should ever come to his court. As this prince belonged, like Firdoust, to the Shiah sect, while Mahmud and Meimendi were Sunnites, and as he was also politically opposed to the sultan, Hasan Meimendi did not fail to make the most of this incident, and accused the poet of disloyalty to his sovereign and patron, as well as of heresy. Other enemies and rivals also joined in the attack, and for some time Firdoust's position was very precarious, though his pre-eminent talents and obvious fit- ness for the work prevented him from losing his post. To add to his troubles he had the misfortune to lose his only son at the age of 37.

At length the book was completed, and Firdousi entrusted it to Ay4z, the sultan's favourite, for presentation to him. Mahmud ordered Hasan Meimendi to take the poet as much gold as an elephant could carry, but the jealous treasurer persuaded the monarch that it was too generous a reward, and that an elephant's load of silver would be sufficient. 60,000 silver dirhems were accordingly placed in sacks, and taken to Firdousi by Ayaz at the sultan's com- mand, instead of the 60,000 gold pieces, one for each verse, which had been promised. 'The poet was at that moment in the bath, and seeing the sacks, and believing that they contained the expected gold,

received them with great satis- faction, but finding only silver he complained to Ayaz that he had not executed the sultan's order. Ay4az related what had taken place between Mahmud and Hasan Meimendi, and Firdousi in a rage gave 20 thousand pieces to Ayaz himself, the same amount to the bath-keeper, and paid the rest to a beer seller for a glass of beer (fouka), sending word back to the sultan that it was not to gain money that he had taken so much trouble. On hearing this message, Mahinud at first reproached Hasan with having caused him to break his word, but the wily treasurer succeeded 1 turning his master's anger upon Firdous{ to such an extent that he threatened that on the morrow he would "cast that Carmathian (heretic) under the feet of his elephants." Being apprised by one of the nobles of the court of what had taken place, Firdousi passed the night in great anxiety ; but passing in the morning by the gate that led from his own apartments into the palace, he met the sultau in his private garden, and succeeded by humble apologies in appeasing his wrath. He was, however, far from being appeased himself, and determined at once upon quitting Ghazni. Returning home he tore up the draughts of some thousands of verses which he had composed and threw them I the fire, and repairing to the grand mosque of Ghazam he wrote upon the walls, at the place where the sultan was 10 the habit of praying, the following lines :—

"The auspicious court of Mahmud, king of Zabulistan, is like a sea. What asea! One cannotsee its shore.

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I have dived therein without finding any pearls it is the

fault of my star and not of the sea."

He then gave a sealed paper to Aydz, begging him to hand it to the sultan in a leisure moment after 20 days had elapsed, and set off on his travels with no better equipment than his staff and a dervish's cloak. At the ex- piration of the 20 days Aydz gave the paper to the sultan, who on opening it found the celebrated satire which is now always prefixed to copies of the Shahnamah, and which is perhaps oue of the bitterest and severest pieces of reproach ever penned. Mahmud, in a violent rage, sent after the poet, and promised a large reward for his capture, but he was already in comparative

safety. Firdousi{ directed his steps to Mazenderan, and took refuge with Kabous, prince of Jorjan, who at first received him with great favour, and promised him his continued protection and patronage ; learning, however, the circumstances under which he had left Ghaznin, he feared the resentment of so powerful a sovereign as Mahmud, who he knew already coveted his kingdom, and dismissed the poet with a magnificent present. Firdousi next repaired to Baghdad, where he made the acquaintance of a merchant, who introduced him to the vizier of the caliph, El Cader Billah, by presenting an Arabic poem which the poet had composed in his honour, The vizier gave Firdousi an apartment near himself, and related to the caliph the manner in which he had been treated at Ghaznin. The caliph summoned him into his presence, and was so much pleased with a poem ofa thousand couplets, which Firdoust composed in kis honour, that he at once received him into favour. The fact of his having devoted his life aud talents to chronicling the renown of fire-worshipping Persians was, however, some-what of a crime in the orthodox caliph's eyes; in order, therefore, to recover his prestige, Firdoust composed another poem, of 9000 couplets, on the theme borrowed from the Koran of the loves of Joseph and Potiphar's wife — Vusuf and Zuleikha.. This poem, though rare and little known, is still in existence—the Royal Asiatic Society pos- Sessing a copy. But Mahmud had by this time heard of his asylum at the court of the caliph, and wrote a letter menacing his liege lord, and demanding the surrender of the poet. Firdoust, to avoid further troubles, departed for Ahwaz, a province of the Persian Irak, and dedicated his Yusuf and Zuleikha to the governor of that district. Thence he went to Kohistan, where the governor, Nasir Lek, was his intimate and devoted friend, aud received him with great ceremony upon the frontier. Firdousi confided to him that he contemplated writing a bitter exposition of his shameful treatment at the hands of the sultan of Ghaznin : but Nasir Lek, who was a personal friend of the latter, dissuaded him from his purpose, but himself wrote and Temonstrated with Mahmud. Nasir Lek's message and the urgent representations of Firdoust's friends had the de-sired effect ; and Mahmud not only expressed his intention

his life to the glorification of fire-worshippers and misbelievers. 'The next night, however, having dreamt that he beheld Firdousi in paradise dressed

in the sacred colour, green, and wearing anemerald crown, he reconsidered his determination ; and the poet was henceforth held to be perfectly orthodox. He died in the year 411 of the Hegira (1020 a.D.),aged about eighty, eleven years after the comple- tion of his great work. Mahmud had in the meanwhile des- patched the promised hundred thousand pieces of gold to Firdousi, with a robe of honourand ample apologies for the past. But as the camels bearing the treasure reached one of tle gates of the city, Firdousi's funeral was leaving it by another. His daughter, to whom they brought the sultan's present, refused to receive it ; but, his aged sister remember- ing his anxiety for the construction of the stone enbank- ment for the river of Tus, this work was completed in honour of the poet's memory, and a large caravanserai built with the surplus.

The Shahnamah is based, as we have seen, upon the aucient legends current among the populace of Persia, and collected by the Dihkans, a class of men who had the greatest facilities for this purpose. There is every reason to believe that Firdousi adhered faithfully to these records of antiquity, and that the poem is a perfect storehouse of the

| genuine traditions of the country. Among much that is

marvellous or incongruous, therefore, we may fairly look for the records of real events; and there is no doubt that, studied by the light of modern criticism, the volume will prove of great service and interest to future historians and ethnologists.

The entire poem has been published with a French trans- lation in a magnificent folio edition, at the expeuse of the French Government, by the late learned and indefatigable Jules de Moh]. Thesize and number of the volumes, how- ever, and their great expense, make them difficult of access, while the origina] Persian, though easily procurable, is of course a sealed book to the majority of European readers. To supply this defect, Madame de Mohl has published in a cheap and convenient form the French translation, with her illustrions husband's critical notes and introduction, This will henceforth be the standard work on the subject, containing as it does a résumé of everything that has ever been written on the Shahnamah, or which can elucidate its contents. It is published at the "Imprimerie

Nationale," Paris, under the title of Le Livre des Rois, par Abou l Kasim Firdoust, traduit et commenté par Jules

| Mohl, Membre de 0 Institut, Professeur au Collége de France ;

publié par Mme. Mohl, Paris, 1876-7. (E. H. P.) FIRE. So general is the knowledge of fire and its uses

that it is a question whether we have any authentic in- | Stance on record of a tribe altogether ignorant of them.

A few notices indeed are to be found in the voluminous

literature of travel which would decide the question in

of offering full reparation to the poet, but put his enemy |

Meimendi to death. The change, however, came too late ;

Firdoust, now a broken and decrepit old man, had in the |

meanwhile returned to Tus, and, while wandering through the streets of his native town, heard a child lisping a verse

from his own satire, in which he taunts Mahmud with his slavish birth -—

"" Had Mahmud's father been what he is now A crown of gold had decked this aged brow; Had Mahmud's mother been of gentle blood, In heaps of silver knee-deep had IJ stood." er 80 affected by this proof of universal sympathy vith his misfortunes that he went home, fell sick, and died. ne eed in a garden, but Aboul Casim Gourgani, a el of Tus, refused to read the usual prayers over S tomb, alleging that he was an infidel, and had devoted

the affirmative ; but when they are carefully investigated, their evidence is found to be far from conclusive. The missionary Krapf was told by a slave of a tribe in the southern part of Shoa who lived like monkeys in the bamboo jungles, and were totally ignorant of fire; but no better authority has been found for the statement, and the story, which seems to be current in Eastern Africa, may be nothing else than the propagation of fables about

the Pygmies whom the ancients located around the sources of the Nile. Commodore Wilkes, commander of the United States exploring expedition, says that in Fakaafo or Bow- ditch Island "there was no sign of places for cooking nor any appearance of fire," and that the natives felt evident

alarm at the sparks produced by flint and steel and the

smoke emitted by those with cigars in their mouths. The

| presence of the word a/i, fire, in the Fakaafo vocabulary | supplied by Hales the ethnographer of the expedition,

though it might perhaps be explained as equivalent only to solar light and heat, undoubtedly invalidates the com- modore's supposition ; and the Rev. George Turner, in an account of a missionary voyage in 1859, not ouly repeats the word afi in his list for Fakaafo, but relates the native legend about the origin of fire, and describes some peculiar customs connected with its use. Alvaro de, Saavedra, an old Spanish traveller, informs us that the inhabitants of Los Jardines, an island of the Pacific, showed great fear when they saw fire,—which they did not know before. But that island has not been identified with certainty by modern explorers. It belongs, perhaps, to the Ladrones or Morianas Archipelago, where fire was unknown, says Padre Gobien, "till Magellan, wroth at the pilferings of the inhabitants, burnt one of their villages. When they saw their wooden huts ablaze, their first thought was that fire was a beast which eats up wood. Some of them having approached the fire too near were burnt, and the others kept aloof, fearing to be torn or poisoned by the powerful treath of that terrible animal." To this Freycinet objects that these Ladrone islanders made pottery before the arrival of Euro- peans, that they had words expressing the ideas of flame, fire, oven, coals, roasting, and cooking. Let usadd that in their country numerous graves and ruins have been found, which seem to be remnants of aformer culture. Thus the question remains in uncertainty: though there is nothing impossible in the supposition of the existence of a fireless tribe, it cannot be said that such a tribe has been discovered.

It is useless to inquire in what way man first discovered that fire was subject to his control, and could even be called into being by appropriate means. With the natural pheno- menon and its various aspects he must soon lave become familiar. The volcano lit up the darkness of night and sent its ashes or its lava down into the plains; the lightning or the meteor struck the tree, and the forest was ablaze ; or some less obvious cause produced some less extensive iguition. For a time it is possible that the grand manifes- tations of nature aroused no feelings save awe and terror ; but man is quite as much endowed with curiosity as with reverence or caution, and familiarity must ere long have bred confidence if not contempt. It is by no nieans neces- sary to suppose that the practical discovery of fire was made only at one given spot and in one given way; it is much more probable indeed that different tribes and races obtained the knowledge in a variety of ways. We still find in dif- ferent parts of the world the natives taking advantage of hot springs, naphtha or petroleum wells, and accessible craters. In the island of Tanna, for instance, there is a mountain to the west of Port Resolution which abounds in evidence of its volcanic character—in fissures, steam-jets, hot-springs, &e. The inhabitants, says the Rev. George Turner, have not the slightest apprehension of danger; their settlements are arranged so that their mwrum or public square occupies one of the "hot places of the mountain; and there they lounge and enjoy the subterranean heat. Some of the springs reach the boiling point. Every day women may be seen cooking vegetables in artificial pits which form a series of never failing boiling pots. In some places the men or boys have only to stand on the rocks, spear their

fish, and pitch them behind into the hot springs." Similar |

accounts are given of the Maories in New Zealand, and the Negritos in the New Hebrides.

It has been asserted of many tribes that they would be unable to rekindle their fires if they were all allowed to die out. Travellers in Australia and Tasmania depict the typical native woman bearing always about with her a bur- ning brand, which it is one of her principal duties to pro- tect and foster ; and it has been supposed that it was only ignorance which imposed on her the endless task. This, however, is not so certain ; fur Mr Miklucho Maclay remarks

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of the apuans, whom he has closely studied, that though they know how to produce fire, they prefer to carry it about. It was one of the distinguishing marks of the Samoan noble that his fire was never permitted to go out; and his attendants had a special name from their business of watching it while he slept. In Corea the preservation of the ancestral fire is still regarded as of the first import- ance for the happiness of a family, and tlie same belief has had a very extensive sway in other parts of the world. The methods employed for producing fire vary consider- ably in detail, but are for the most part merely modified applications of concussion or friction. Sir John Lubbock has remarked that the working up of stone into implements must have been followed svoner or later by the discovery of fire; for in the process of chipping sparks were elicited, and in the process of polishing heat was generated. The first or concussion method is still familiar in the flint and steel, which has hardly passed out of use even in the most civilized countries. Its modifications are comparatively few and unimportant. The Alaskans and Aleutians take two pieces of quartz, rub them well with native sulphur, strike them togetlhier till the sulphur catches fire, and then transfer the flame to a heap of dry grass over which a few feathers have been scattered. Instead of two pieces of quartz the Eskimos use a piece of quartz and a piece of iron pyrites. Mr Frederick Boyle saw fire produced by striking broken china violently against a bamboo, and Bastian observed the same process in Burmah, and Wallace in Ternate. In Cochin China two pieces of bamboo are considered sufficient, the silicions character of the outside layer rendering it as good as native flint. The friction methods are more various. One of the simplest is what Mr Tylor calls the stick and groove —'a blunt pointed stick being run along a groove of its own making in a piece of wood lying on the ground." Much, of course, depends on the quality of the woods and the expertness of the manipulator. In Tahiti Mr Darwin saw a native produce fire in a few seconds, but only suc ceeded himself after much labour. The same device was employed in New Zealand, the Sandwich islands, Tonga, Samoa, and the Radack islands. Instead of rubbing the movable stick backwards and forwards other tribes make it rotate rapidly in a round hole in the stationary piece of wood—thus making

what Mr Tylor has happily designated a fire-drill. This device has been observed in Australia, Kamchatka, Sumatra, and the Carvlines, among the Ved- dahs of Ceylon, throughout a great part of Southern Africa, among the Eskimo and Indian tribes of North America, in the West Indies, in Central America, and as far south as the Straits of Magellan. It was also employed by the ancient Mexicans, and Mr Tylor gives a quaint picture of the operation front a Mexican MS.,-—a man half kneeling on the ground is causing the stick to rotate between the palms of his hands. This simple method of rotation seems tu be very generally in use; but various devices have been resorted to for the purpose of diminishing tle labour and hastening the result. The Gaucho of the Pampas takes "an elastic stick about 18 inches long, presses one end to bis breast and the other in a hole in a piece of wood, and then rapidly turns the curved part like a carpenter's centre-bit." In other cases the rotation is effected by means of a cord or thong wound round the drill and pulled alternately by this end and that. In order to steady the drill the Eskimo and others put the upper end in a socket of ivory or bone which they hold firmly in their mouth. A further advance was made by some of the North American Indians, who appear to have applied the principle of the bow-drill ; and the still more ingenious pump-drill was used by the Iroquols Indians. For full descriptions of these instruments and 4 rich variety of details connected with fire-making we must refer the reader to Mr Tylor's valuable chapter in his he

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searches. These methods of producing fire are but rarely used in Europe, and only in connexion with superstitious observances. We read in Wuttke that some time ago the authorities of a Mecklenburg village ordered a "wild fire" to be lit against a murrain amongst the cattle. For two hours the men strove vainly to obtain a spark, but the fault was not to be ascribed to the quality of the wood, or to the dampness of the atmosphere, but to the stub-bornness of an old lady, who, objecting to the superstition, would not put out her night lamp; such a fire, to be efficient, must burn alone, At last the strong-minded female was compelled to give in; fire was obtained,—but of bad quality, for it did not stop the murrain.

It has long been known that the rays of the sun miglit be concentrated by a lens or concave mirror. Aristophanes mentions the burning-leus in The Clouds, and the story of Archimedes using a mirror to fire the ships at Syracuse is familiar to every schoolboy. If Garcilasso de la Vega can be trusted as an authority, the Virgins of the Sun in Peru kindled the sacred fire with a concave cup set in a great bracelet. In China the burning-glass is in common use.

To the inquiry how mankind became possessed of fire, the cosmogonies, those records of pristine speculative thought, do not give any reply which wonld not be found in the relations of travellers and historians.

They say in the Tonga Islands that the god of the earthquakes is likewise the god of fire. At Mangaia it is told that the great Maui went down to hell, where he surprised the secret of making fire by rubbing two pieces of wood together. The Maoris tell the tale differently. Maui had the fire given to him by his old blind grandmother, Mahuika, who drew it from the nails of her hands. Wishing to have a stronger one, he pretended that it had gone out, and so he obtained fire from her great toe. It was so fierce that every thing melted before the glow; even Maui and the grandmother herself were already burning when a deluge, sent from heaven, saved the hero and the perishing world ; but before the waters extinguished all the blaze, Mahuika shut a few sparks into some trees, and thence men draw it now. The Maories have also the legend that thunder is the noise of Tawhaki's footsteps, and that lightnings flash from his armpits. At Western Point, Victoria, the Australians say the good old man Pundyil opened the door of the sun, whose light poured then on earth, and that Karakorok, the good man's good daughter, sceing the earth to be full of serpents, went everywhere destroying serpents ; but before she had killed them all, her staff snapped in two, and while it broke, a flame burst out of it. Here the serpent-killer is a fire-bringer. In the Persian Shahnamah also fire was discovered by a dragon-fighter. Hushenk, the powerful hero, hurled at the monster a prodigous stone, which, evaded by the snake, struck a rock and was splintered byit. 'Light shone from the dark pebble, the heart of the rock flashed out in glory, and fire was seen for the first time in the world." The snake escaped, but the mystery of fire had been revealed.

North American legends narrate how the great buflalo, careering through the plains, makes sparks flit in the night, aud sets the | Tairie ablaze by his hoofs hitting the rocks. We meet the same idea in the Hindu mythology, which conccives thunder to have

en, among many other things, the clatter of the solar horses on eeemon or hard pavement of the sky. The Dakotas claim that

eu ancestor obtained fire from the sparks which a friendly panther struck with its claws, as it scampered upon a stony hill. ja who gave the Quiches fire by shaking his sandals, was, ike the Mexican Quetzelcoatl, represented by a flint stone. Gua- lee the father of the Peruvians, produced the thunder and the he ined hurling stones with his sling. The thunderbolts are clog Hc on Kudai, the great god of the Altaian Tartars, dis- The SI the secret of the stone's edge and the iron's hardness." hea as god of thunder was depicted with a silex in his wit e — protruding from his head. The Lapp Tiermes struck Me lammer upon his own head ; the Scandinavian Thor held

latiet in one hand, a flint in the other. Upon his head a huge mace surrounded by six little ones.

» Where it was rocked in a tub of yellow copper, in a large

, Ukko, the Esthonian god, sends forth lightnings, as he strikeg his stone with his steel. ie e wa

to rock it, but

tee aa the great pike, and fire would have been lost for ever, Sreat rik f f the sun had not come to the rescue. He dragged the pike trom the Water, drew out his entrails, and found there

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the heavenly spark still alive. Hephestus also, the Greek fire god, Prometheus brought

fell from heaven into the sea of Lemnos. to carth the torch he had lighted at the sun's chariot.

Human culture may be said to have begun with fire, of which the uses increased in the same ratio as culture itself. To save the labour expeuded on the initial process of procuring light, or on carrying it about constantly, primitive men hit on the expedient of a fire which should burn night and day in a public building. The Egyptians had one in every temple, the Greeks, Latins, and Persians in all towns and villages. The N atchez, the Mexicans, the Mayas, the Peruvians, had their "national fires" burning upon large pyramids. Of these fires the "eternal lamps " in the synagogues, in the Byzantine and Catholic churches, may beasurvival. The "Regia," Rome's sacred centre, sup- posed to be the abode of Vesta, stood close to a fountain _ it was convenient to draw from the same spot the two great requisites, fire and water. All civil and political interests grouped themselves around the Prytaneion which was at once a temple, a tribunal, a town-hall, and a gossiping re- sort ; all public business and most private affairs were trans- acted by the light and in the warmth of the common fire. No wonder that its flagstones should become sacred. Primi- tive communities consider as holy everything that ensures their existence and promotes their welfare, material things such as fire and water not less than others. Thus the Pry- taneion grew into a religious institution. And if we hear a little more of fire worship than of water worship, it is because fire, being on the whole more difficult to obtain, was esteemed more precious.

We have curious and concordant testimonies that the principal functions of the state itself grew out of the care which was bestowed on the tribal fire. The men who at- tended it in Hellas were called the Prytanes. They had to eat together, and it would have been considered as a bad omen if they had neglected that duty, They were fed at the public expense; and well they might be, for having been, probably, general cooks at the outset, they became, when the city was established, Archontes or magistrates, and even Baszlets, or a combination of the captain, the priest, and the king. Thus the first guardians of the tribal fire were the earliest public servants, who by degrees ap- propriated all important offices, as the state itself developed into a vast aggregation of interests. And when Augustus usurped the Roman empire, he assumed all the powers which a pristine board of flamens, or of

Prytanes, may have possessed. He made himself Pontifer Maximus, and assumed the charge of the public fire ; and on transporting it to his own palace, he had to convert it into public pro- perty. The Hellenic nations, as well as the Aztecs, received ambassadors in their temples of fire, where, as at the natioual hearth, they feasted the foreign guests. The Prytaneion and the state were convertible terms. If by chance the fire in the Roman temple of Vesta was extinguished, all tribunals, all authority, all public or private business, had to stop im- mediately. The connexion between heaven and earth had been broken, and it had to be restored in some way or other,—either by Jove sending down divine lightning on his altars, or by the priests making a new fire by the old sacred method of rubbing two pieces of wood together, or by catching the rays of the sun in a concave mirror. No Greek or Roman army crossed the frontier without carrying an altar where the fire taken from the Prytaneion: burned night and day. When the Greeks sent out colonies the emigrants took with them living coals from the altar of Hestia, and had in their new country a fire lit as a repre- sentative of that burning in the mother country.) Not

? Curiously enough we see the same institution obtaining among the

Damaras of South Africa, where the chiefs, who sway their people with a sort of priestly authority, conmit to their daughters the care

before the three curiz united their fires into one could Rome become powerful; and Athens became a shining light to the world only, we are told, when the twelve tribes of Attica, led by Theseus, brought each its brand to the altar of Athene Polias. All Greece confederated, making Delphi its central hearth; and the islands congregated around Delos, whence the new fire was fetched every year.

According to a not impossible theory, all architecture, public and private, sacred and profane, began with the erec- tion of sacred sheds to protect the sacred fire, which abodes men dared to inhabit only after a length of time. For it must be borne in mind that fire was looked upon as a divinity. We are expressly told that Vesta had no image or statue even in her own temple, the Vestal fire being con- sidered as the very goddess herself. The husbandmen

who ate their repast before the hearth believed, as Ovid relates, that they sat in the presence of the gods themselves. The hearth fire was kept holy, its flame was to remain bright and pure. The minute and irksome prescriptions of the Zend-Avesta carried this feeling to the extreme: it was and it is still a widely spread belief that nothing unclean is to be thrown in the fire, that no indecent actions are to be committed before it. To spit in one's fire would be now considered in many places, in Albania, for example, as an unpardonable offence. 'The Galtchas of Ferghana, according to M. de Ujfalvy, are so reverential that they would not blow out a light lest they should render the flame impure with their breath ; and a similar peculiarity was observed by Wood in Badakshan and by Khanikoff among the Tadjiks of Bokhara.?

In the course of time, the same reasons which made the tribe provide itself with a permanent fire made every family have its hearth. It would even be more accurate to say that the family, as it is called now-a-days, developed itself after the human couple and their children had their own fire-place, and not before. It is likely that at the outset only the higher aristocracy of chieftains, ewmetrsdes or eupatrides, were allowed to have a fire of their own, which was then equivalent to a private or family god. They kept it burning night and day all the year round. As recently as the last generation, fires of such a character were rather numerous in the northern countries,"

These lingering customs take us back to the time when every hearth was an altar. From the national Prytaneion a brand was given to each gens. When gentes grew out of the tribe, and subsequently when families grew out of the gentes, coals from the gentile sacrificial stone were given to every family. These three social organisms, the nation, the gens, the family, one merging into the other, had fire for their common symbol, and esteemed it as even the cause of their existence. The hearth was the very centre of the

of a so-called eternal fire. From its hearth younger scions separating from the parent stock take away a burning brand to their new home. The use of a common Prytaneion, of circular form, like the Roman temple of Vesta, testified to the common origin of the North American Assinais and Maichas. The Mobiles, the Chippeways, the Natchez, had each a corporation of Vestals. If the Natchez let their fire die out, they were bound to renew it from

the Mobiles. The Moquis, Pueblos, and Comanches had also their perpetual fires. The Red-skins discussed important affairs of state at the "council fires," around which each sachem marched three times, turning to it all the sides of his person. "'It wag a saying among our ancestors," said an Iroquois chief in 17538, "that when the fire goes out at Onondoga"—the Delphi of the league—-" we shall no longer be a people."

1 See Bulletin de la Soc. de Géog., Paris, 1878, p. 489; Wood's Journey to Source of Oxus, 1872, p. 177.

The rich Westphalian farmers have still between their habitation gud the stables the so-called Skorestein, where burns a constant fire, f e which they have a superstitious regard. On the banks of the Sieg kd the custom, as recently as the year 1855, to insert a large mass h sn , usually a stump with its roots, in a niche opposite the pot-

anger. The block smouldered slowly, and was intended to last the ae year, from Christmas to Christmas, when its remains were ground to powder and strewn on the fields to insure their fertility.

FIRE

house, as the regia was the sacred centre of Rome and the Roman commonwealth ; around the regia the civic and politic institutions developed themselves, and around the hearth the family grew slowly into shape and power.

As already observed, the Prytaneion was an altar to the genius of the commonwealth, the abode of the nation's heroic ancestors. Its exact counterpart was the gentile hearth, owned by the gens at large and its dependent families. When the gentes broke asunder, every family became possessed likewise of an altar to its particular " Penates" and " Lares," or sacred fathers. These fathers were not mere ancestors, or grandparents, as we hold them now to be, but the constant progenitors ; not only were they believed to have begotten children in a former age, but also to go on begetting them constantly through succeeding generations. Procreators and protectors as well, they were the source of blessing at the same time as the source of ex- istence. Called gods, "theot patrooi, genethlror, engeneis,

sunaimot," they were in fact the gods of the household, but gods of the same kin and blood as their descendants. Na oath was held more sacred than the one which a man swore by his own hearth,—no prayer more readily granted than that which was coupled with a wish for the welfare of the hearth. The hearth had a recognized right of asylum, which is yet in full vigour in many countries. But it was above all the throne of the " paterfamilias," the stronghold of his dominion. The proud saying of the Englishman that his home is his castle is but an attenuated remnant of the feeling which animated the chiefs of the Vedic, the Greek, and the Italian gentes. Such a man was the king absolute over his household ; he wielded the power of life and death over all his subordinates, cattle, slaves, children, wife or wives; he was the priest of his altar, the manager and ex- pounder of all divine things, elevated above the standard of common mortals. He alone in his kingdom could, if need were, make a new fire, not with a vulgar flint and iron, hut by the solemn mode of rubbing together two sacred twigs. In this way all Greek hearths were provided with new fires when the ancient ones had been sullied by the look of the hated Persian invaders. Beside the hearth, the second place, at least, was due to the wife and mother ; and as time went on her influence continued to increase.?

Identity of Fire and Soul in Ancient Belief—The sun, as the source of heat, gives life to earth , and it was natu- ral to suppose that the hearth, "the sun in the house," as the younger Edda calls it, radiated life likewise. There- fore it was made the seat of the Lares and Penates, oF ancestors, a dwelling-place for the deceased, where a stock of souls ready to enter existence by new births was main- tained. 'The famous Roman legend of Servius Tullius, whom Plutarch and other writers report to have been pro- created in the ashes of the hearth by the Lares themselves, is a curious illustration of this belief. A sepulchral picture at Orvieto represents a double phallus protruding trom the flame of a hearth, on which a libation is being poured. The Vedas taught that the hearth-fire was cosubstantial with the cause of generation, Hence care was taken to

preserve the purity of descent in the kin by preserving the

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3 The traveller Pallas was told by the Mongol populations which he visited that a woman might indulge in the vilest abuse and insult, an no one would dare ta touch her, so long as she stood between the bed and the fire-place. In the Vedas we see that the new wife underwent some sort of consecration by walking thrice around the new hearth-place, and stretching her hand into the flaines while she was being sprinkl over with lustral water. In Germany and Slav countries, the bride, as she comes from church and enters her new house, bows to the fire burning on the hearth, walks thrice round it, burns three of her halt, and binds a red string round her body. What is no more done by the mistress is still done to her servants in Germany, who, as they come in, are made to run round the kitchen fire, are touched with 800s and have their bare feet sprinkled with ashes.

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flame of the hearth pure and unmingled with fire taken from another house. On this matter the ancient Persians were particularly punctilious, feeding their fires, and espe- cially their sacred fires, only with certain kinds of wood, re- puted to be cleaner than all others, well dried, and well stript of the bark. Everywhere and in all countries, it was considered a most fatal omen if the fire died out in the hearth, The family whose fire went out had incurred the ire of the Lares, who, if not quickly appeased, would strike the sons With impotence and imbecility. A new fire was to be lit by the friction of two twigs, as to fetch some from aneighbour's would have been considered an adulterous union of hearths, an undue mingling of two families' blood.

Resemblance between Fire-Production and Life-Production. —For a long time, throughout all the world, the ancient naturalists who meditated on the greatest wonder of physi- ology, supposed that the generation of fire by the friction of two woods, one of harder the other of softer substance, was the exact counterpart of human generation. The heat thus evolved in the human organism was held to be of most subtile nature, a flash of the astral light, an intelligent substance, Primary fire impregnated primary water, and the soul was born. Life was compared to a flame, to a torch ; and no comparison is more true. Modern chemistry having proved that animal life is a constant

burning of oxygen, the ancient myth was not far from the truth when it said that Prometheus animated the figure of clay by putting into it aspark of fire. "Know ye," said an Ojib- way prophet, "that the fire in your huts and the life in your bodies are one and the same thing." A torch which was put out by throwing it violently on the ground sym- bolized in ecclesiastical rites excommunication, or the con- demnation of 4 soul to eternal death. In classical mytho- logy, Meleager's life was bound to a log of wood ; when the one was turned to a heap of ashes, the other was to fall dead. "Corpus est terra, anima est ignis," that old piece of philosophy, became inseparable from poetry and language ; and now, as in the days of yore, the soul and the " genius" are always spoken of as if they possessed the nature of flame, and the angels and the peris as if their substances were pure light. According to the pristine physiology, man was likewise a fire, but a fire hidden in clay, diluted in water. If it had not been for water, the flame would have been destroyed by its own force,—it would have blazed up, coruscating violently in dazzling effulgence, and then dying out. In fact, all primitive theories attributed to gaseous water the action which our present science attributes to nitrogen, without which oxidation would go on too rapidly to allow of the formation of oxidizable matter. Hence water was thought to be as necessary as fire itself; hence ancient law forbade the individuals guilty of offences against the commonwealth to have fire and water given them—a Sentence equivalent to death. The mixture of organic fire and organic water in our bodies was compared to that in vegetable matter, which emits much smoke if burned when m green or wet condition. Nay, by pursuing the analysis of combustion in which the classical world had centred all its philosophy, the ashes or mineral detritus which fell on the hearth found their analogue in the flesh, in the bones, I the solid parts of our organism. Thus man was thought to be an alloy of fire, earth, and water in slightly different Proportions, Fire, a constituent part of the divine intelli-

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i ees a It is Interesting

ch) ecgele to note that in Bohemia the country people have the Perth." he against any fire being taken to or taken from Sal ee a ill the babe he forty days old, the Albanians do not away ae » hot even a coal, from the family

fire-place to be given in He os ong as the Japanese had castes, people of the higher ranks de. A except what was cooked in their own home, for fear of nalieere Te, evidently because they thought that fire imparted its © to food, and by means of food to the bodily powers.

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gence, became a soul when it was immersed in organic water; it became the body when it was put into organic clay. The traditions of the Egyptian priesthood, which were current under the name of Hermes Trimegistus, teacli that at the moment of death, " our intelligence, one of God's subtile thoughts, escapes the body's dross, puts on its fiery tunic again, and floats henceforth in space," leaving the soul to await judgment. Men were divided into noble and ignoble, according as the material or the spiritual side of their nature predominated. Thus a frequent distinction in the burials, which may have arisen even in prehistoric times, can be explained. Chiefs and kings, priests and noblemen, possessed all of a divine soul, were burned, flame going forth to flame; but people of the common sort were sunk among the sods, clay going back to clay.?

Cosmie Fire.—The opinions and beliefs which most primitive populations have entertained on the nature of fire in the hearth were applied by them to the great cosmic fire: both were life-givers, one to the family and the other to the universe ; both were parts of the same substance or element. It was taught by Aristotle that Zeus was a name given to the fire of heaven, and by Plato and Euripides that the same Hestia burned in the humblest hut and the highest sky. Ovid went so far as to identify that goddess with the earth itself. According to that doctrine, fire was held to be the very soul of nature, the essence of every thing that had a shape, and even to be the giver of that shape, for philosophers explained that of all elements none but fire having any form by itself could impart it to other things. From Jupiter to the fly, from the wandering star to the tiniest blade of grass, all beings owed existence to the fiery element. This theory, more or less distinctly expressed, obtained among the Aztecs, who invoked in their prayers "fire the most ancient divinity, the father and mother of all gods." Tohil the Quiche, Quetzacoatl the Mexican, Tiermes the Finn, Perkun the Slav, Thor the Scandina- vian, Taranis the Gaul, and many other gods, as stated above,

were represented as having fircstones for heads or for bodies ; one of them was said to have flashed up 10 lightnings as he was dragged along the rocky heavens by some powerful antagonist. Such a god, encased in a shell of flint, fell down from heaven upon earth, according to an Indian legend; the shell broke into sixteen hundred frag- ments, and each of them arose and stood up as a particular god. From such a thunderbolt or meteorite the Dacotas boasted to have originated.

In the Gnostic theory the middle part of the cosmos was taken up by the starry world, emitting the astral light, inferior in sanctity to the mild effulgence of ether above it, but superior in vivifying properties to our common fires. These three conditions of the cosmic fire corresponded to the three component parts of man—mind, soul, and body. Prophets and other great and pious men had minds still refulgent with ethereal rays, which were the thoughts of divinity; while the wicked had souls which had been soaked in a smoky fire, and in stupid people there glim- mered but the weakest possible ray of celestial light.

2So among Algonquins and Ottaways those only of the ,, Great Hare totem," among the Nicaraguans none but the ""caciques, among the Caribs no others than the priestly caste, were entitled to the honour of cremation. The tribes of Upper California were even persuaded that such as were not burned were liable to be transformed into brutes. Among certain popnlations (as, for instance, the Colchians of old, and the Babeens or Chimpseyans of our times) the males had the privilege of the pyre, which was denied to women. The examples illustrating the belief of the soul being a fire are so numerous that it is difficult to choose among them. In Voigtland the souls of unchristened babes are believed to be turned into Wills-of-the-Wisp. The souls of dying men or beasts are said to burn sometimes with a heat so intense that their eyes inflame piles of wood. It is a frequent feat of divine horses in Tartar legends to make the rocks glow and melt as pitch by merely

| looking at them.

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It was not the hottest fire which was supposed to be the most divine. Fierce leat being inimical to organic life, hot fires are said to be hellish ones. Their masters, the demons of drought and sterility, dry up the fountains, scorch the grass, excite pestilence, are the worst fiends to the human race. Pure light was thought to be without any heat at all, and legends tell of '"theophanias," of aureoles, of fiery tongues flickering above the cradles of in- fants predestined to glorious careers. Phallic fire, giving out heat but no light, was often considered as of an inferior nature, and therefore represented by secondary or even by tertiary deities, fauns, satyrs, egipans, and the like.

At the outset the gods and demons alike had some com- mand of fire, but they were distinguishable by the nature of their fire. Among the Scandinavians, Woden was the fire that shines, Thor the lightning, and Loki the fire that burns and shall one day destroy the whole world; Brahma, Indra, Siwa, and Osiris, Horus, Typhon, had similar mean- ings. Zeus, Apollo, and Athene presided over the celestial flame ; Hercules and Dionysus marked the progressive puri- fications of the terrestrial fire. Besides his influence over generation, Hephestus had the command of the subter- ranean fire and of its vast smithies, where earths and stones were fused into metals. It was with a feeling of the most intense awe that the Vedic Aryans contemplated the thunderstorm and the lightning, the fierce struggle in the heavens, the fight between the winds and the clouds, be- tween fire and water, between the fire-god Indra and Vritra the fire-dragon. So, likewise, the Iranians conceived of our world as the field of the great battle between Ormuzd the Increaser, and his twin brother Ahriman the Destroyer.

Healing und Purification by Fire.—The principle of life being a fiery one, it was supposed that all maladies were ouly so many defilements of the pure principle which had been darkened by the demons of night, and that all sick people were demoniacs. The traditions of the Finns assert that lightning, the fiery sword of Ukko, slays the demons of illness. But it was discovered that the exhibition of lightning, as a healing method, was attended with grave drawbacks: it was impossible to insure being able to use it, and when it could be obtained, the cure was worse than the disease, as the patient was killed before the imp who had bedeviled him. It became necessary to have

*recourse to a substitute ; and therefore the healing virtues of the thunderbolt were embodied in the Keraunza or thunder- stones. The "holy stones" of the Anglo-Saxons, or "holed stones," arrow heads, flint celts, and flint knives worked by prehistoric men, were popularly believed to be stones which falling down from heaven possessed heavenly virtues, and were of use in all sorts of disease.**

Sickness having become identified with sin, purification became the first and most esteemed of curative agents and of prophylactics. It needed to be undergone when a dead body had been touched or when women had been delivered. The mother walked with her babe through fires lit on her right band and on her left; the infants, especially the males, were fumigated with great care. Among some populations none could approach mother and child without stepping over abrazier. Fiery ordeals heralded the attain- ment of the age of puberty by both sexes. Ambassadors were refused admittance to the presence of the sovereign until they had traversed a flame which should singe away the foreign devilries which they might carry about them.

tg ae cases the Australian sorcerer applies five to the injured P s of his patients. The Persians kindle fire on the terraces of their ouse where the sick man lies. The Patagonians fire off guns and Se eta and throw burning brands into the air. In Turkestan, sick pone ren ~

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Purification by fire led to the institution of baptism by fire, which in many places was thought vastly superior to baptism by water; and the idea obtained its furthest development in the notion of purgatorial fires, which is not peculiar to one church. Often people lad misgivings about the penance which awaited them in a future state, and reckoned that it would be better for them to undergo it on this side of the grave.?

Periodic Fires.—Because the sun loses its force after noon, and after midsummer daily shortens the length of its circuit, the ancients inferred, and primitive populations still believe, that, as time goes on, tlie energies of fire must necessarily decline. Therefore men set about renewing the fires in the temples and on the hearth on the longest day of summer or at the beginning of the agricultural year. The ceremony was attended with much

rejoicing, banqueting, and many religious rites. Houses were thoroughly cleansed; people bathed, and underwent lustrations and purifications; new clothes were put on; quarrels were made up; debts were paid by the debtor or remitted by the creditor; eri- minals were released by the civil authorities in imitation of the heavenly judges, who were believed to grant on the same day a geueral remission of sins. All things were made new; each man turned over a new page in the book of his existence. Some nations, like the Etruscans in the Old World, and the Peruvians and Mexicans in the New, carried these ideas to a high degree of development, and celebrated with magnificent ceremonies the renewal of the secula, or astronomic periods, which might be shorter or longer than a century. Some details of the festival among the Aztecs have been preserved. Qn the last night of every period (52 years) every fire was extinguished, and men proceeded in solemn procession to some sacred spot, where, with awe and trembling, the priests strove to kindle a new fire by friction. It was as if they had a vague idea that the cosmos, with its sun, moon, and stars, had been wound up like a clock for a definite period of time. And had they failed to raise the vital spark, they would have believed that it was because the great fire was being exti- guished at the central hearth of the world. The Stoics and many other ancient philosophers thought that the world was doomed to final extinction by fire. The Scan- dinavian bards sung the end of the world, how at last the wolf Fenrir would get loose, how the cruel fire of Loki would destroy itself by destroying everything. The Essenes enlarged upon this doctrine, which is also found in the Sibylline books and appears in the Apocrypha (? Esdras xvi. 15).

See Dupuis, Origine de tous les Cultes, 1794 ; Bournouf, Seience des Réligions; Grimm, Deutsche Mythologie, cap. xx., 1835; Adalbert Kuhn, Die Herabkunft des Feuers und des Gottertranks, 1859; Steinthal, Ueber die urspriingliche Form der Sage von Prometheus, 1861; Albert Reville, " Le Mythe de Prométhée," in Revue des Deux Mondes, August 1862; Michel Bréal, Hereule et Cacus, 1863 ; Tylor, Researehes into the Early History of Mankind, chap. %s 1865 ; Bachofen, Die Sage von Tanaquil, 1870 Lubbock, Prehts- toric Times, 3d edition, 1872; Haug, Religion of the Parsis, 1878. (E. RE.)

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Similar practices are still resorted to in mountainous regions of France when illness smites the flocks. In backward districts of Ger- many, when the swine sicken and die, the " wild fire," or "Voth fewer, is kindled, but it would have no virtue if it were kindled by bachelors instead of by imarried men, or with matches and not by the orthodox process of rubbing wood against wood.

2In the hill ranges of Southern India penitents are made to pass through a row of burning huts and are absolved after having passe the seventh. Before seed is sown it is still passed through the fire ul Bavaria; and in Basuto land children underwent recently 4 process, being held over the flame of a lighted altar. The earth was freet | from the demons of sterilty by lighting huge fires, and the fields became fertile as far as the blaze could be seen distinctly, —a practice which still prevails in many places from Norway to Ceutral Anierica.

FIRE

' FIRE is considered in the present article in relation to the destruction by it of life and property. History is full of accounts of the devastation it has caused in the towns and cities of nearly every country of the civilized world. The following list embraces the most memorable of the great fires of which records have been preserved :—

798. 982. 1086.

1212, 1666.

1794.

1834, 1861.

1873. 1137. 1184,

1292.

1507.

1544,

1598.

1612.

1731,

1700. 1612. 1613. 1614. 1644, 1675. 1683, 1694,

1707. 1727. 1738. 1743, 1760. 1770. 1802. 1827, 1854, 1875.

59. 1118. 1137, 1524, 1720.

1784. B

1862.

_ 1871. P

64.

1106. 1577,

1299, 1379.

1405, 1420, 1457, 1491, 1521, 1548, 1634,

GREAT BRITAIN AND IRELAND,

*London, nearly destroyed. greater part of the city burned. all houses and churches from the east to the west gate burued. greater part of the city burned. – **The Great Fire," September 2-6.*

*It began in a wooden house in Pudding Lane, and*burned for three days, consuming the buildings on 436 acres, 400 streets, lanes, &c., 13,200 houses, with St Paul's church, 86 parish churches, 6 chapels, the guild-hall, the royal exchange, the custom-house, many hos- pitals and libraries, 52 companies' halls, and a vast number of other stately edifices, together with three of the city gates, four stone bridges, and the prisons of Newgate, the Fleet, and the Poultry and Wood Street Compters. The fire swept from the*

Tower to Temple church, and from the N.E. gate to Holborn bridge. Six persons were killed. The total loss of property was estimated at the time to be £10,780,500.

London, 630 houses destroyed at Wapping. Loss above £1,000,000. » Houses of Parliament burned, » Tooley Street wharves, &c., burned. Loss esti- mated at £2,000,000. », _ Alexandra palace destroyed. York, totally destroyed. Glastonbury, town and abbey burned. Carlisle, destroyed. Norwich, nearly destroyed ; 718 houses burned, Leith, burned. Twerton, 400 houses and a large number of horses burned; 33 persons killed. Loss, £150,000. nt 600 houses burned. Loss over £200,000. . 300 houses burned. Edinburgh, 'the Great Fire." Cork, greater part burned, and again in 1622. Dorehester, nearly destroyed. Loss, £200,000. Stratford-on-Avon, burned. Beaminster, burned. Again in 1684 and 1781. Northampton, almost totally destroyed. Newmarket, large part of the town burned. Warwick, more than half burned; rebuilt by national con- tribution. Lisburn, burned. Gravesend, destroyed. Wellingborough, 800 houses burned. Crediton, 450 houses destroyed. Portsmouth, dockyard burned.

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Toss, £400,000.

a iS . Loss, £100,000. Liverpool, destructive fire. Loss, £1,000,000. Sheerness, 50 houses and much property destroyed. Gateshead, 50 persons killed. Loss, £1,000,000, Glasgow. Great fire. Loss, £300,000.

FRANCE.

Lyons, burned to ashes. Nero offers to rebuild it.

Nantes, greater part of the city destroyed.

Dijon, burned.

Troyes, nearly destroyed.

Fennes, on fire from December 22 to 29, 850 houses burned. rest. Fire and explosion in dockyard. Loss £1,000,000. Marseilles, destructive fire.

aris. Communist devastations, Property destroyed, £32, 000,000,

CENTRAL AND SouTHERN EUROPE.

Rome burned during 8 days. 10 of the 14 wards of the city were destroyed. Venice, greater part of the city was burned. 1» fire at the arsenal, greater part of the city ruined d by an explosion. Weimar, destructive fire; also in 1424 and 1618.

Memel was in large part destro ed, and again in 1457, 1540 1678, 1854, a +. : :

Bern was destroyed.

Leipsie lost 400 houses.

Dort, cathedral and large part of the town burned.

Dresden was destroyed.

Oviedo, large part of the city destroyed.

K omorn was burned.

Firth was burned -by Austrian Croats.

1680. 1686. 1758. 1762. 1764,

1769.

1784.

1801. 1859. 1808. 1811. 1818. 1842.

1861,

1530. 1541.

1624.

1702. 1728.

1794,

gos

1751. 1759. 1775. 1827.

1790.

1802. 1858. 1865,

1736,

1862,

1752. 1812.

1753. 1798. 1786. 1788. 1812. 1834. 1848. 1850. 1864.

233

Firth was again destroyed. Landau was almost destroyed. Pirna was burned by Prussians, Munich lost 200 houses. Kénigsberg, public buildings, &¢., burned. Loss, £600,000. ne almost destroyed. Rokitzan (Bohemia) was totally destroyed. Loss, £300,000. Brody, 1500 houses destroyed. »» 1000 houses destroyed. Posen, large part of older portion of city burned. Forest fires in Tyrol destroyed 64 villages and hamlets. Salzburg was partly destroyed. Hamburg. A fire raged for 100 hours, May 5-7. ,_ During the fire the city was in a state of anarchy. 4219 buildings, including 2000 dwellings, were destroyed. Onc-fifth of the popula- tion was made homeless, and 100 persons lost their lives. The total

Joss amounted to £7,000,000. After the fire contributions from all Germany came in to help to rebuild the city.

Glarus (Switzerland), 500 houses burned.

260 houses destroyed.

NortTuern Evrors,

Aalborg, almost entirely destroyed. Aarhuus, almost entirely destroyed, and again in 1556. Opsto, nearly destroyed. Christiania was built on the site. Bergen, greater part of the town destroyed. Copenhagen, nearly destroyed. 1650 houses burned, 77 streets. A royal palace with contents burned. 8 50 streets, 1563 houses burned. Stockholm, 1000 houses destroyed. ‘ 250 houses burned. Loss, 2,000,000 crowns. Abo, 200 houses and 15 mills burned. », 780 houses burned, with the university, Carlscrona, 1087 houses, churches, warehouses, &c., de- stroyed. Gothenburg, 178 houses burned. Christiania. Loss estimated at £250,000. Carlstadt (Sweden), everything burned except the bishop’s residence, hospital, and jail. 10 lives lost.

Russia,

St Petersburg, 2000 houses burned. 45 great fire. Loss, £1,000,000. Moseow, 18,000 houses burned.

- The Russians fired the city on September 14 to drive out the army of Napoleon. The fire continucd five days. Nine-tenths of the city ‘was destroyed. Number of houses burned, 30,800. Loss, £30,000,000.

Archangel, 900 houses burned. se 3000 buildings and the cathedral burned. Tobolsk, nearly destroyed. Mitau, nearly destroyed. Riga, partly destroyed. Tula, destructive fire. Orel, large part of the town destroyed. Cracow, large part of the town burned. Novgorod, large amount of property destroyed.

TURKEY.

The following fires have occurred at Constantinople :—

1729. 1745. 1750.

1751. 1756. 1769. 1771.

1778. 1782.

1784.

1791. 1799.

A great fire destroyed 12,000 houses and 7000 people.

A fire lasted five days.

In January 10,000 houses burned; in April property destroyed estimated from £1,000,000 to £3,000,000. Later in the year 10,000 houses were destroyed.

4000. houses were burned. ;

15,000 houses and 100 people destroyed. During the years 1761, 1765, and 1767 great havoc was made by fire.

July 17. A fire raged for twelve hours, extending nearly 1 mile in length. Many of the palaces, some small mosques, and nearly 650 houses were destroyed.

A fire lasting 15 hours consumed 2500 houses and shops.

2000 houses were burned.

August 12. A fire burned three days: 10,000 houses, 50 mosques, and 100 corn mills destroyed ; 100 lives lost. In February 600 houses burned ; in June 7000 more,

August 5.

Between March and July 32,000 houses are said to have been burned, and as many in 1795.

In the suburb of Pera 13,000 houses were burned and many magnificent buildings.

IX. ==. 3°

2354 1816.

1818. 1826.

1848. 1865. 1870.

1797. 17638. 1772.

1796. 1841.

1631. 1789. 1833.

1803. 1808.

1822. 1866.

1872,

1873.

1679.

1760. 1787. 1794. 1872.

1778. 1796. 1838.

1802. 1813,

1820. 1835.

1845.

1845.

1846. 1848.

1849.

1851.

1851, 1850.

1865.

1851, 1851.

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August 16. 12,000 houses and 3000 shops in the finest quarter were destroyed.

August 138. A fire destroyed several thousand houses,

A fire destroyed 6000 houses.

500 houses and 2000 shops destroyed. £3, 000,000.

A great fire destroyed 2800 houses, public buildings, &c. Over 22,000 people were left homeless.

June5, The suburb of Pera, occupied by the foreign popu- lation and native Christians, was swept by a fire which destroyed over 7000 buildings, many of them among the best in the city, including the residence of the foreign legations. Loss estimated at nearly £5,000,000.

Scutart, the town of 3000 houses totally destroyed.

Smyrna, 2600 houses consumed. Loss, £200,000.

5 3000 dwellings burned. 3000 to 4000 shops, &c., consumed. Loss, £4,000,000.

4000 shops, mosques, magazines, &c., burned.

12,000 houses were burned.

Loss estimated at

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INDIA.

Rajmahal. Palace and great part of the town burned. Manilla, vast storehouses were burned. ie 10,000 huts were burned, March 26.

30,000 |

people rendered homeless, and 50 lives lost. Madras, more than 1000 houses burned. Bombay. Loss by fire of £600,000.

CHINA AND JAPAN.

Canton was nearly destroyed by fire. Yokohama, two-thirds of the native town and one-sixth of the foreign settlement destroyed.

Yeddo. A fire occurred in April during a gale of wind, de- stroying buildings covering a space of 6 square miles. 20,000 persons were made homeless.

oF A fire destroyed 10,000 houses. UNITED STATES.

Boston. All the warehouses, 80 dwellings, and the vessels in the dockyards were consumed. Loss, £200,000.

% A fire caused a loss estimated at £100,000.

a A fire consumed 100 buildings, February 20.

Fe 96 buildings were burned. Loss, £42,000.

ae Great fire, November 9-10. By this fire the richest quarter of Boston was destroyed.

The fire commenced at the corner of Summer and Kingston streets. The area burned over was 65 acres. 776 buildings, comprising the largest granite and brick warehouses of the city, filled with mer- chandise, were burned. The loss was about £15,000,000. Before the end of the year 1876 the burned district had been rebuilt more substantially than ever.

Charleston.

oF 300 houses were burned.

5 One-half the city was burned on April 27.

1158 buildings destroyed. Loss, £600,000.

Portsmouth (Maine), 102 buildings destroyed. a 397 buildings destroyed. Savannah, 463 buildings were burned. Loss, £800,000. New York, The great fire of New York began in Mer- chant Street, December 16, and burned 530 buildings in the business part of the city. 1000 mercantile firms lost their places of business. The area burned over was 52 acres. The loss was £3,000,000, A fire in the business part of the city, July 20, destroyed 300 buildings. The loss was ; £1,500,000. 35 persons were killed. Pittsburg. A large part of the city burned, April ll. 20 squares, 1100 buildings destroyed. Loss, £2,000,009. Nantucket was almost destroyed.

Albany. 600 houses burned, August 17. Area burned over 37 acres, one-third of the city. Loss, £600,000. St Louis. 23 steamboats at the wharves, and the whole

or part of 15 blocks of the city burned, May 17. Loss, £600,000. More than three-quarters of the city was burned, May 4. 2500 buildings. Loss, £2, 200,000. ” 500 buildings burned. Loss, £600,000. Philadelphia, 400 buildings burned, July 9. 30 lives lost. Loss, £200,000. ” 50 buildings bummed, February 8. 20 per- Bi 5 sons killed. Loss, £100,000. es ty = of the Capitol and the whole of the his 5 Library were burned.

On May 4-5 a fire destroyed 2500 build-

ings. A number of lives lost. More than three-fourths |

1857. 1859. 1866.

1871.

1862. 1866.

of the city destroyed. Loss upwards of £2,000,000. In Juue another fire burned 500 buildings. Loss estimate at £600,000.

Chicago. A fire destroyed over £100,000. 14 lives lost, a Property destroyed worth £100,000, Sept. 15.

Two fires on August 10 and November 18. Loss, £100,000 each. The greatest fire of modern times.

It began in a barn on the night of the 8th of October and raged until the 10th. The arca burned over was 2124 acres, or 34 sq, miles, of the vcry heart of the city. 250 lives were lost, 98,500 per- sons were made homeless, and 17,430 buildings were consumed. The buildings werc one-third in number and one-half in value oj the buildings of the city. Before the end of 1875 the whole burned district had been rebuilt. The loss was estimated at £39,000,000.

Troy (N.Y.) was nearly destroyed by fire.

Portland. Great fire on July 4. One-ha.. of the city was burned ; 200 acres were ravaged ; 50 buildings were blown up to stop the progress of the fire. Loss, £2,000,000 to £2, 250,000.

33

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1871. October. Forest and prairies fires in Wisconsin and Michigan. 15,000 persons were made homeless; 1000 lives lost. Loss estimated at £600,000.

British NortH AMERICA.

1815. Quebee was injured to the extent of £260,000.

1845. ,, 1650 houses were burned, May 28. One-third of the population made homeless. Loss from £400,000 to £750,000. Another fire, on June 28, consumed 1300 dwellings. 6000 persons were made homeless. 30 streets destroyed. In- surance losses, £60,770.

1866. ,, 2500 houses and 17 churches in French quarter burned.

1825. New Brunswick. A tract of 4,000,000 acres, more than

1837.

1877.

1846.

1850, 1852.

1536. 1861.

1862. 1863.

1752. 1782. 1795. 1805. 1808.

1828. 1843,

100 miles in length, was burned over; it included many towns. 160 persons killed, and 875 head of cattle. 590 buildings burned. Loss about £60,000. Towns of Newcastle, Chatham, and Douglastown destroyed.

St John (New Brunswick). 115 houses burned, January

18, and nearly all the business part of the city. Loss, £1,000,000.

oe Great fire on June 21. The area burned over was 200 acres. 37 streets and squares totally or in part destroyed; 10 miles of streets; 1650 dwellings. 18 lives lost. Total loss, £2,500,000. 'Two-fifths of the city burned.

St John's (Newfoundland) was nearly destroyed, June 9. Two whole streets burned upwards of one mile long. Loss estimated at £1,000, 000.

Montreal. A fire destroyed the finest part of the city on

June 7. 200 houses were burned. }

A A fire on July 9 rendered 10,000 people desti- tute. The space burned was one mile in length by half a mile in width, including 1200 houses. Loss, £1,000,000.

SouTH AMERICA.

Cuzeo was nearly consumed.

Mendoza. A great fire followed an earthquake which had destroyed 10,000 people.

Valparaiso was devastated by fire.

Santiago. Fire in the Jesuit church ; 2000 persons, mostly women and children, perished.

West INDIEs. Pierre (Martinique) had 700 houses burned. Kingston (Jamaica) had 80 houses burned. Loss, £500,000. Montego Bay (Jamaica). Loss by fire of £400,000. St Thomas. 900 warehouses consumed. Loss, £6,000,000. Spanish Town (Trinidad) was totally destroyed. Loss estimated at £1,500,000. Havana lost 350 houses; 2000 persons reduced to poverty. Port Republicain (Hayti). Nearly one-third of the town was burned.

Such great fires as the above are due, first, to the com- bustible contents of buildings and of the materials they are built of, and to radical defects in the method of construc tion, and, secondly, to the want of proper means and appliances for promptly extinguishing fires and perventing the spread of them. Wooden buildings crowded together in narrow crooked streets, insufficient supply or absolute want of water, no fire-engines or only the feeblest machines for pumping water, and no organized or trained and dis- ciplined body of firemen, were the conditions in earlier ime, and in some countries they are the conditions still.

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It is of importance, however, to bear in mind that the loss of property by great fires or couflagrations is really small in proportion to the loss by fires of moderate propor- tions. Thus a very competent authority, Mr Cornelius Walford, gives it as his opinion that great fires, properly so called, "involving the loss of £50,000 and upwards, pro- bably do not account for more than one-fifth of the losses of any uverage year." With the gradual improvement of

the organization for coping with fires, the disproportion of |

conflagrations year by year becomes greater, so that really small but oft-occurring fires are now, in all well-governed communities, the subject which demands the careful atten- tion of authorities. No means at present exist for accur- ately estimating the average annual loss of property by fire throughout the world, as in scarcely any country is an official record of fires and their results kept; and the im- perfect returns of insurance companies are of comparatively little significance, It is estimated that the value of the insured property destroyed by fire all over the world amounts to from thirty to forty millions of pounds sterling aunually. (See INSURANCE.)

In modern times great improvements have been made in the means employed for the prevention and extinction of fires, Broad thoroughfares have taken the place of narrow

crooked streets; incombustible materials, such as brick, |

stone {uatural and artificial), and iron are used, not only for the' exterior, but for the interior of important buildings as far as practicable ; the introduction into cities of an abundant supply of water is common ; the electric fire-alarm telegraph, powerful steam fire-engines, extension ladders, and fire-escapes are among the mechanical appliances now in daily use. The two essential elements of the problem, however, are the fire-resisting character of buildings, and the organizations of trained men who can make the modern appliances effective. The methods of organization and procedure differ in different countries.

Fires are dealt with, first and chiefly, by way of preven- tion; secondly, by prompt measures for extinction when they have begun; and thirdly, by

circumscription or limitation when the fire has obtained such a hold of any building or range that the salvation of the burning property is beyond hope. In concerting preventive measures, a knowledge of the principal causes of fires is of the utmost consequence ; and as bearing on the ordinary causes the following abstract of the results deduced from about 30,000 fires, which occurred in London during the thirty-three years 1833-65, possesses significance. were: —Candles 11:07, children playing 1°59, curtains 9°71, flues 7°80, gas 7°65, lucifers 1:41, smoking tobacco 1°40,

sparks of fire 4-47, spontaneous ignition 0°95, stoves 1°67, |

other known causes 19°40, unknown causes 32°88, There 1s too much reason to suspect that a considerable proportion of fires attributed to no known cause are due to incerdiarism : and were an official 'investigation into the origin of fires instituted, it most probably would result in a great saving of Property, Among preventive measures the fire-proof building of large erections occupies an important place. Much can be done structurally to prevent and to limit fires, although it is now conceded that the thorough fire-proofing of any building is almost impracticable. may be fire proof, but no sooner is it stored with inflam- mable goods or property than it ceases to be invulnerable. It Is of the utmost importance to reduce the danger of fire to 4 Minimum in many public structures, as for example, Public record offices, banks, and great libraries and museums, and in such establishments generally the most complete Precautions are observed. Open fire-places are discouraged, arched floors are provided, the use of exposed wood is, as far as possible, avoided, gas and other lights aré most care- ully arranged, and fire-buckets, hose, and other appliances

The percentages of different causes |

The erection itself |

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| suction and force pumps driven by steam power.

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are in readiness for any emergency, while the premises are constantly patrolled by watchmen. For the prompt extinc- tion of a fire in its incipient stages the water-buckets, hand- pumps, and extincteurs alluded to below are of the utmost value. When such means fail or are wanting, the services of fire brigades and salvage corps, if brought into requisition without loss of time, generally result in a great saving of property ; but when a fire has obtained complete mastery of a building, it is a recognized fact that the most powerful engines, even aided with unlimited supplies of water, are ineffectual, and the efforts of the firemen are directed to confining the conflagration within the limits over which it has secured ahold. To cut off neighbouring properties, the use of gunpowder and other means of breaking connexion

are frequently required.

Fire Extinction.

In coping with fires, water is the great agent employed ; and in towns where the supply of water is abundant, and where especially there is a constant and high pressure in the mains, the task of the firemen is much simplified. In such cases it is frequently only necessary to attach the fire- hose to the plugs, and the pressure in the main pipe is sufficient, without the aid of any engine, to throw the jet over the whole burning mass. But it is only rarely that towns are so favourably situated, and for the equipment of an ordinary fire brigade and fire establishment the follow- ing among other appliances are required.

Hand-Pump and Bucket.—A small hand-pump which can be set into a bucket of water is the most effective means of distributing a small supply of water without waste. If judiciously used it will put out any fire in its earlier stages.

The Portable Chemical Extinguisher (fig. 1), Dick's Patent Extincteur, &c., designed to answer ~ the same purpose as the hand-pump and bucket, are now in extensive use in fac- tories, warehouses, and public buildings. The vessel is a cylindrical tank, holding 7 gallons or upwards of water, and is

carried on the back. Carbonic acid is ||) generated at the moment of using within | i the vessel itself, and from its compres- |) || sibility affords the power which projects |), the liquid. The working pressure varies (/) from 70 to 120 Ib per square inch, accord- } ing to the temperature of the surrounding —— atmosphere ; and the projectile range of Fria. 1.— Portable the jet is from 40 to 50 feet. ‘ Extinguisher.

Hand-worked Engines consist essentially of a pair of single-acting force-pumps mounted on wheels and worked by hand. They vary much in size, weight, and power, and are hauled by men or horses. Those most used in Paris are worked by eight men, and throw a §-inch jet to a height of 100 feet. Each pump is 5 inches in diameter, with 94-inch stroke. A smaller engine that may be carried into buildings by four men is also used. Those of the London fire brigade are worked most effectively by 26 to 30 men ; pumps 6 or 7 inches diameter and 8 inches stroke. Each stroke (with 6-inch pumps) delivers 13 gallons of water. Still larger engines have been used, requiring 40 to 50 men. In the United States these as well as smaller hand-worked engines have given place to steam fire-engines, with pumps of the same size, in all the larger towns. ,

Steam Fire-Engines are essentially a pair of single-acting They are hauled by two horses, or are self-propellers. They weigh, as drawn to fires, from 5000 to 8000 ib. Fig. 2 repre-

CA

| gents the kind that is most in use in the United States.

The diameter of the cylinder in this engine is 72 inches, and that of the pumps 44 inches, with a stroke of 8 inches.

236,

The boilers are tubular, of sufficient capacity to work the pumps 500 strokes per minute. The usual working pres-

FIRE

Chemical Engines are of several forms and sizes. The

size most used consists essentially of two cylindrical copper

sure of steam is 80 to 100 Ib per square inch, The weight | or steel tanks, each holding 80 gallons of water (fig. 3), The charge for each tank is 28 tb bicarbonate of soda and

as drawn to fires is about 8000 fb,

14 Ib sulphuric acid. The soda is dissolved in the water, and the acid is held in a leaden jar within the tank, which is securely closed, At the moment of using the sulphuric acid is mixed with the water, and instantly combining with the soda causes carbonic acid to be given off with a pressure

—

Fic. 3.—Chemical Engine. of as : on the square inch. The tanks are used inde- pany! and charged separately, so that a continuous 300 or water, usually J-inch jet, may be maintained.

eet of Z-inch rubber hose is carried. The whole ap- paratus, charged and carrying three men, weighs about

Fie. 2.—Steam Fire-Engine.

5000 ib, and is drawn by two horses. The hose is rarely carried upon the engine; it is usually on a separate car- riage drawn by one horse. The reel carries about 1000 feet of 34-inch rubber hose. Six hosemen ride on the car riage. The total load is about 3000 b.?

Ladder Carriages carry from 20 to 25 ladders of various lengths (see fig. 4). Two ladders spliced reach 70 feet The carriage fully equipped and carrying 12 men weighs from 7000 to 8000 tb, and is drawn by two horses. The "serial ladder" (so-called) reaches when fully extended a height of 100 feet, and is self-supporting; it is readily moved, when raised. It is made in 8 sections, each being a ladder about 12 feet long, and is put together and

raised in six minutes. It is available as a fire-escape. The total load with its carriage is about 6000 fb.

Electric Fire-Alarm Telegraph.—Time is a most import- ant element in all fires, and the purpose of this telegraph 1s to put it in the power of any one discovering a fire to make known the locality of it to the fire department in the shortest possible time. Throughout the town or city "alarm boxes" are placed, connected by telegraph wire

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1 A combined manual and chemical fire-engine is made by Dick of Glasgow, which consists of an iron tank on wheels, divided into two galvanized compartments, It has two pumps, with vertical motion, connected with the suction pipes, to fill the compartments with water where the chemicals are dissolved, and two pumps to project the chemical liquid from each compartment into the air-chamber, where they combine and generate carbonic acid gas. The gas is held in solu- tion by the water, and is conveyed direct to the fire, upon which it exercises its fire-extinguishing power. The engine can be worked by four or five men, and is capable of throwing 30 gallons of water per minute, containing 250 gallons of carbonic acid gas, a distance of 40 to 90 feet. =

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with the central office and all the stations of the depart- ment. They are small iron boxes about a foot square, numbered in order and placed conspicuously on telegraph poles, or on the side of a building at corners of streets. Inside of each is a simple clock-work, which is set in motion by the pulling of a handle, and which records at

the central office the number of the box. To guard against false alarms the outer door of the box is locked, but keys are kept at hand and are in the possession of all policemen and firemen.

The Automatic Signal Telegraph gives instantaneous notice at the headquarters of the fire department, or at the nearest

engine-house, of the existence of a fire, by the action of the fire itself, and records there the number of the building and the room in which it occurs. The apparatus is very simple, and may be fully relied on. It consists of a small tube, called a thermostat, about 3 inches long, containing a spiral strip of metal, so arranged that the expansion due to a rise of thirty degrees above the ordinary temperature of the room in which it is placed, will close the connexion between the two poles of a battery, and produce an electric current, which, passing through a small iron box containing a clock- work and circuit breaker, called a " transmitter," at once strikes a bell and starts a register at the nearest station of the fire department, which records the number of the build- ing and the roum in which the fire has broken out. The thermostat is placed upon the ceiling of each room at Intervals of 25 feet throughout the building, the trans- mitter in every room that requires a separate signal. The signal is transmitted even when the wires are broken. This

telegraph has been adopted in New York and Boston. _ Theelectric arrangements connected with the fire brigade in the city of Glasgow, which have been devised by Mr R. 8. Symington, telegraph engineer, have been carried out on a scale of much efficiency and perfection. The city is divided into six fire districts, all connected by telegraph with the central principal station. There are also placed throughout the city 80 "electric fire alarm boxes," at the corners of the principal streets, and the occurrence of fire ene through these be instantly telegraphed to the nearest fire station," and at the same time to the " central station." On the arrival of the first detachment, the "box" from which the signal was given is by an ingenious arrangement immediately converted into a "telegraph station " (for the time being), connecting all the stations, and enabling the firemaster to command the whole "staff." The fire- master, as also the principal men, reside on the premises at the central station ; and men and horses are summoned by an electric bell system leading into each man's bedroom. Besides the above arrangements there are placed in many — and extensive establishments throughout the wea is ti 2000 electric thermostats, by which the rising pe reurial column causes a loud gong to sound, at once

awing attention to unoccupied or shut-up premises.

a Nga —The organizations of Paris and Berlin pe "ei and are based upon the idea of small detach- salle iegny < spe machines, and a large number of began: 'p mae Tt mecca that no fire will have got cOnmeiand en the small detachment before it is dis- satisfactory u ne odes The results have been generally Sn Koed y heer the conditions existing in those cities. Héon larger detachments and fewer stations have given

good results, In the principal cities of the United States different conditions have necessitated a proportionately larger force of men and more effective appliances, London.—The metropolitan fire brigade is a force of about 400 men under the control of the Board of Works, but under the immediate command of the " chief officer." The city is divided into a number of districts, each under a "superintendent." Within each district are fire-engine stations properly equipped, each under an " engineer." The force at these stations is the unit of organization. Each engineer has independent telegraphic communication with his superintendent, and he in turn with the chief

officer. 26 steam fire-engines and 86 hand-worked engines are in use. Floating steam fire-engines protect the river front. The chief officer has absolute command at fires.

Paris.—The firemen are a corps, " sapeurs-pompiers," attached to the War Department, but at fires the corps acts under orders from the prefect of police. It is under the immediate command of a colonel, and is divided into 12 companies, the company being the unit of organization. Fire stations, manned by three men and provided with hand- pumps and fire-escapes, are distributed throughout the city. If the three men of a station, with bystanders impressed into the service by the police, are unable to extinguish the fire, men from other stations of the same company are sum- moned. Additional companies are called out by orders from headquarters of the corps. Hand-engines are the main re- liance, but in 1876 five steam fire-engines were in use.

Berlin.—The department is subject to military discipline, and is under the command of a " fire-director " with subor- dinate officers. The city is

divided into four inspection districts, with an officer in charge of each. Each district has numerous fire depéts, according to its needs, and each depét is in charge of a fireman and four men, and is fur- nished with a small hand-engine, a hook and ladder, and a fire-escape. The principal stations are connected by tele- graph.

New York.—The fire department of New York may be taken as the type of the best system now employed in the United States. It is on a military basis, under the control of a board of commissioners appointed by the mayor. The active force is under the immediate command of the " chief of department," and consists of 10 battalions, each of 6 companies, in all about 750 men. Each company, whether engine or ladder company, has its own house, where the men live and tlie apparatus is kept. The whole force is at all times on duty and in the houses, except such small detachments as are on street patrol or at their meals, The horses stand harnessed in their stalls, which are placed im- mediately in the rear of the engine, and are loosened by a

simple mechanical appliance which, simultaneously with | the striking of the alarm, opens the front of the stall; the | horses, trained to move at the sound of the gong, advauce rapidly each to his own place at the pole. They are instantly hitched in, the men spring to their seats, and the carriage is driven at high speed to the "alarm box" from which the alarm was given. To make sure that there will be a working pressure of steam on reaching the fire, the water in the engines, as they stand in the houses, is kept always at boiling point by the circulation of hot water from small stationary boilers, and fire is lighted in the engine the instant it leaves the house. Every effort is made to save even a few seconds of time, so that the interval between sounding the alarm and pumping water on the fire will average three minutes, and rarely exceeds five minutes. The city is divided into 10 battalion districts. The smallest of these represent each an area of about 5000 by 2000 feet, and comprise. the most exposed parts of the city; but most of the districts are from two to three times as large. The signal boxes of the electric fire-alarm telegraph are placed conspicuously in the streets about 400 feet apart in the more crowded portion of the city, and from 1000 to 1200 feet in other portions. There are 540 in all, Alarms given from these

boxes are instantly tele- graphed from the headquarters of the department to each company house in the city. The first alarm calls out two or more companies previously designated; a second and third call out additional force. There are in use 57 steam fire-engines (5 of which are self-propellers), 1 steam fire- boat, 10 chemical engines, and 18 ladder carriages, including 5 "aerial ladders." The men are well-disciplined and skilful firemen.) (a. P. RB.) FIRE-CLAY, FIRE-BRICKS. Fire-clays may be de- fined as native combinations of hydrated silicates of alu- mina, mechanically associated with silica and alumina in various states of subdivision, and sufficiently free from silicates of the alkalies and from iron and lime to resist vitrification at high temperatures; the absence of the

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vitrifiable element is, however, merely a question of degree, as no native clays are wholly free from iron, the alkalies, lime, and the other alkaline earths.

Fire-clay may be looked upon as a special term for the grey clays of the Coal-Measures, interstratified with, and generally in close proximity to, the seams of coal, in beds varying from a few inches to many yards in thickness. They are locally known as " clunches" and " underclays,"

and are supposed to represent the soil that produced the vegetation from which the coal was formed.

The association of coal with the fire-clays of the carboni- ferous formation has localized the manufacture of fire- bricks, and by far the larger proportion are produced in the Coal-Measure districts, especially at Stourbridge, celebrated for producing a, highly refractory brick, Broseley, Benthall, Madeley and Coalbrookdale in the Shropshire coal-field, aud in the Midland, Yorkshire, North and South Wales, Durham,

and the Scotch coal-fields; but in later years the area of fire-brick manufacture has much widened. There has been an extensive production since about 1850 from the Eocene clays, in the neighbourhood of Poole and Wareham in Dorsetshire ; and a more limited supply from the Miocene between Bovey Tracey and Newton Abbot in Devonshire. Still more recently

Cornwall has become the seat of the manufacture, where, as at Calstock, Tregoning Hill near Breage, St Ednor near St Columb, and Lee Moor, fire-bricks of fine quality are made from china-clay refuse and disintegrated granite. Mr Argall of the Tregoning Hill Company states that the locality was one of the ee OT

1The foregoing article is i issi i reprinted by permission of Messrs Little Brown, & Co, Boston, Mass., from Great Fires and Fire. Rztinetion,

by General Alfred P. Rockwell, Boston, 1878.

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first seats of china-clay mining between the years 1730 and 1750, and that in 1862 the present company commenced to make fire-bricks and tiles from the refuse of the clays, taking about two-thirds of silica and one-third of mica, which are mixed together in a pug mill, moulded and burnt in round ovens holding about 16,000 bricks, and that a very superior fire-brick is made from clay direct from the "stopes," containing

SiN Ca ecg esac cn faaeeeaseecu suet 40°00 per cent. PANIMITMINTAS coe siccociess sasve'sncder 37°00 a

Pog NS eee 2°00 s COMM ribs. ete PB ec seeays 9°00 5 WHEHORT, . .. cca. ae eee 12°00

which are employed by founders, smelters, gas companies, &c. The price paid at the works is from 50s. to 55s, per 1000. The source of the materials is decomposed granite, of which Tregoning Hill consists.

The Hingston Down fire-clay deposit, near Calstock, sup- plying tle Calstock fire-brick works, the Phoenix works, and the Tamar works in the same neighbourhood, consists of a range of decomposed granite with an average width of three-quarters of a. mile, running east and west for 3 or 4 miles, extending to an ascertained depth of from 300 to 400 feet, and intersected by mineral lodes. The Calstock Fire-Brick Company (limited), superiutended by Mr C. B. Evate, commenced operations in the year 1870, and manufactured from the decomposed granite fire-bricks of a highly

refractory character, which are delivered free on board at the port of Calstock at from 50s. to 60s. a thousand, weighing about 34 tons. Another source of fire- brick material, scarcely yet developed, is the pockets or depressions occurring in the mountain limestone of North Wales, Derbyshire, and Ireland, containing white refractory clays and sands, the insoluble remnants from the local dissolution of the limestone, intermixed with the débris of the overlying millstone grit. These clays and sands when evenly mingled are sufficiently adhesive to be moulded, and their small contractility and highly refractory character render them pre-eminently suitable for fire-brick manufac- ture. Fire-brick works have already been established on the estate of Captain Cooke of Colomendy Hall, near Mold, and the refractory clays and sands are largely employed for lining furnaces, 3000 tons having been sold for this purpose alone in the year 1877.

The fire-clays of the Coal-Measures vary as regards their refractory character, not only in the different coal-fields, but the individual strata in close alternation often present sudden variations, refractory beds being interstratified with useless strata largely charged with disseminated car- bonate of iron. The grey colour of the Coal-Measure clays is partially due to the presence of this mineral, which, whether disseminated through the mass or otherwise occurring in excess as concretionary nodules, is prejudicial to the clays as a material for fire-bricks. Carbonaceous matter is also present in variable proportions, colouring the clay from a slaty-black to a pale grey, but as this 18 eliminated in the earlier stages of the burning of the bricks, its presence in no way influences their refractory character.

The relative proportion of silica and alumina. whicl some manufacturers have laid undue stress upon as indicat- ing heat-resisting quality is of little moment, as both these constituents, whether occurring in combination as silicates of alumina, or as free alumina and silica, are essentially the refractory elements of all good fire-bricks, being unvitrifiable. per se, excepting when associated with the alkalies, lime, or oxides of iron. The plastic character of refractory clays is also of limited influence on their suitability for fire-brick manufacture; extreme plasticity, which is generally accompanied by excessive contractility and vitrifiability, is prejudicial. As a rule few clays oF

materials used in the manufacture of fire-bricks are insufficiently plastic to prevent their being easily moulded, and in the manufacture by the dry process, or the compres- sion of the brick out of nearly dry pulverized clay, plasticity is not so essential a quality. As regards chemical composi- tion the following analyses indicate its general character, and the variability of the proportion of the constituents of some of the more important fire-clays : —

Coal-Measure Clays.

A. Stourbridge Clay. (Omitting | B. Stourbridge Clay. (Analysis the water.) by Richardson.)

MICA oo ccec esas tecesesestsesMAOIGO) | HILICH os,..... sere reotee . MOO EAMUINIDEA ..ccccervecsssssssssecsscsseses, DOGO | 2.) eine Ta Oxide Of iFON ….....eeeeee 20 | Protoxide of iron occ… 2°04 LIMO ..seseee cesses eeeceeeeecsereeres 140 | Magnesia w.cccecsscsesssesseess, 1:05 SME TESIAY:« .. 000 csuceececsecseceeoseneb PACS,

*C. Glass House Pot Clay, Tintam| D. * Best Clay," Tamworth. Abbey, Stourbridge. (Analysis} (Analysis by A. W. Wills.)*

by A. W. Wills.) Silica: ce. eee 71:40 oS . 73°82 | Alumina…..... esciesiccercccee MOGI Alumina…...

w+ 15°88 | Protoxide of iron… con 0°91

Protoxide of iron. meee corel TIME)... 0°04 Alkalies ,..... see. 090! Alkalies .. 0°82 ere hecsdecsescereecsease-... 6745 | Water ….a.—... 6°06

E. Fire-Brick Clay from New-

F. Fire-Clay from Neweastle. castle, (Analysis by H. Taylor.)

(Excluding the water.)

BHUICR) cies csecesccecee 55°50 | Silica …..... Bepaesoese: (5 BAUIUVTES Gs oscecicae eas 00s Ziel) | PAUMIMINE 285 .0.0.c0.060cc0scesseecssar.. 1°90 Sesquioxide of iron OU | Oxideror ITO ....5…....0..cc00ee. NDOT. ee cciissscs« OiG7 | MA gneBia:.....c.0.0.s6cccccscccccescee 1:00 Magnesia…..... (F029 |) LOTT Sapir aan acne ee nee' = © Alkalies …..... a: 2:68

ee escsietesscsseaceescsssece. LOVES

G. Clay from Glasgow, used for

H. Dinas Fire-Clay, South saggars, glass house pots,

Wales. (Excluding the water.)

—_—_—— ee eeeeeesC

bricks, &e, (Percy's Metal- Silica CEOBCOS Temee sence Glace lurgy.) AIUMING 0. ese sees ee eee cee ces ese ceeee 8-05

SHIGA sersesssecensssesseneee 6616 | With traces of iron,

BOUVOTNIY, oc ceesiccseccessoesessescce 22°54

Protoxide of iron …..0.0…..... 531

NE: (ices sce se sscsssssscecoeee, 1°42

Meee cscicicns sc. sesscscn., 314 J. Fire-Clay Jrom Dowlais. K. Welsh Fire-Clay. (Exclud- _ (Analysis by J. E. Rily.) ing the water.)

, ae cece omOUMON BYEGR! 5. ses. ss000s- less sccesceseosces SOMO

Alumina…....., os 2° Alumina Ss sieuisenieiaselvaeswcacielesssep ps UGIOO

Sesquioxide of iron c OXTde OffIrOM ooo. ssccscecccccsees, IO Bites ess sis sessces ce 5 PAU Ctereetsn sts. s cece. eee 10

Magnesia…

MRICS ooo. ss ccceesecccseecs, 2°02

Organic matter Peiccaieecitisc..s. OF00

Water wo… =f 6°21

Note.—In comparing the percentages of the individual constituents, it must be noticed that some of the analyses exclude the water,

Tertiary Clays of Dorset and Devon used for Fire-Brick Manufacture.

L. White Clay, Branksea Island, | M. Blaek Clay, Branksea Island, Dorset. (Analysis by Professor Dorset. (Analysis by Professor

Way.) Way.) rh Bete ae tonne sce eeessseees CHAD | SHCA so. ceccccccsesscscccsecsesesenescee 72°93 lumina …,... srseeceeeeee. 21°28 | Alumina….....0… COOLDOMHERe ROSS 5. ean

Preece. 196 | Oxides of tron. Ikalies aud alkaline earths «+ 725 | Alkalies and alkaline earths….. 1:78 Sulphate of NERC re vescceccccsscss… 2°92 | N. Beacon Hitt Clay, near Poole. | O. Beacon Hill Clay, near Poole. bs power Bagshot Beds, Lower Bagshot Beds.

1a tetreseseseree 63°00 | Silica …..... 53°52 @uumina givtrtttteceessesecsscsecsseres 33°00 | Alumina ….. 33°68 eg of MON weecscsesenee 100 KAMAE. 5: .0. 5 0:76 PROBA ccs ce sesecsccses,, 2°00 | Magnesia…..... vee O14 OsrHer ORION! ....essectn-c. seco, OS

PMPRWMCSY os ore eos oyce cspnceacee eel. OE

PUMRG GTS oso ec sisiees sassuzeensssesove cena lla

P. Blue Ball Clay, Bovey Tracy,

Devon, Miocene Lignite For- mation,

Silica Beets ee noes Alumina …..... Oxides of iron. Magnesia… Water, &e…...

th © above analyses indicate a preponderance of silica in ; . oal-Measure fire-clays compared with the Tertiary clays —s and Dorset, in which a larger proportion of alumina a . The latter character is accompanied by tenacity – ~ren ah and greater contraction in drying and burn- with lech, when excessive, is counteracted by mingling "it the clay sand and ground burnt clay or skerds.

Contractility.—The contraction in burning (excluding the contraction in drying) of several Coal-Measure fire-clays pressed out of nearly dry pulverized clay was ascertained by the writer to be as follows:—

Fire-clay occurring between the " Penystone Measure" and '' Vigor's" clay, Shropshire coal-measures, near } 1 per cent.

- *Two-foot coal" fire-clay, Shropshire coal-measures… 5*

berley, Bewdley, No. 1

a SO CSOO Oromo moron rT irinericioririr

2

Bewdley Forest fire-clay, from the works of Mr Mob- 3

Do. do. PF 2 once e.. 4 ,, Do. do. BRIO cect tec. cme. noe ts Stourbridge fire-clay, from Messrs Fisher Brothers, 1 "The Hayes," Stourbridge, No. L…....ecccecccseee ees ug Do. do. No: 25… eek ee a; ' Best" fire-clay, from the earl of Dudley's pits near 9 SO. cuties*

The average contraction of the Coal-Measure fire-clays is thus little over two per cent. A brick manufactured from the best Stourbridge clay without admixture of burnt material contracted seven-eighths of an inch in nine inches, but this would probably represent the contraction both in drying and burning. The contraction in burning of the Tertiary fire-clays used for the

manufacture of fire-bricks in Devon and Dorset is much more than that of the Coal Measure clays

Le "ie Se se § Household clay" .... op Us. PUPOMOWATONMGIIY . ooscace. coseceuecece…. es Tlommerinter CNG? o.oo coco occ ccc cec ccc eee ~~ ., ee LL) re ft mes ee as srosccrcuccaareece coeisesneeusecwae lise re ene I, os vascisstnoninamcaenaraiancicweciun DL, scars NMED WAM CII... ocicoe ccs. ccoeeeccccscccccceee. it ae ** Black carbonaceous clay? .....000ceccc0000005 10" 5*

Average contraction a little under 9 per cent.

Contractility of Dorsetshire Clays. Lower Bagshot (Eocene)

Beds.

'White clay" from Messrs Pike's works, { 10 = ae

areal… w2sd,.kcs).., Se P : Md Ce ee ee 1 ae EES eee nn 13) Pik 2a rina aii 13 y, ee ne.) Se ise NG, OMI. 5 5. ES oe ee a ee a Her 55 I acer a Ripe EN NR la a 3 Mottled sandy clay, Lower Bagshot Beds, 1

ide 3 a i rine Gia cectcn seen 2 Clay from Upper Plant Bed, Lower Bagshot 6

Beds, Studland Bay, Dorset….., apts Soonrenredld ?

The clays above enumerated are not exclusively used for fire-brick manufacture, bnt fairly indicate the general character of the Tertiary fire-brick clays, which, compared with the Coal-Measure fire-clays, are characterized by a pre- ponderance of alumina, tenacity of texture, contractility in the kiln, and an absence of iron and the alkalies, &c., which tend to vitrification. Tenacity of texture in a fire-brick material is, however, a mechanical condition, which, ceteris paribus, assists vitrification, a coarse open body being more refractory than a close homogeneous brick of similar chemical composition. A well manufactured brick should be of a pale cream or clear buff colour, uniform throughout its mass, and burnt to the full extent of its contractility.

The chemical changes which take place in the burning consist, first, of the destruction of the disseminated carbonaceous matter, the dehydration of the silicates of alumina, destroying their plastic character, and the decom- position of the disseminated carbonate of protoxide of iron,

converting it into anhydrous sesquioxide, to which the yellow colour of the burnt brick is due ; if the burning is carried to a high state of vitrification the yellow tint is replaced by a dull grey, due to the partial reduction of the sesquioxide of iron and its conversion into silicate of protoxide or minutely disseminated particles of metallic iron; any alkalies present also form vitreous combinations with the silica during the latter stages of the burning. The paleness of colour of a fire-brick is not always a safe indica- tion of the absence of iron, as the presence of a large proportion of carbonaceous matter in the clay tends to bleaching by the reduction of the colouring sesquioxide to a lower oxide preserved asa silicate in a comparatively colourless condition. Again, the presence of lime and the other alkaline earths, which are disadvantageous fluxing elements, will cloak the colouring power of a large per- centage of oxide of iron by the formation of a pale double silicate of lime and iron. This is taken advantage of in the manufacture of buff building bricks by mixing ground chalk with ferruginous clays which would otherwise burn dark red.

A properly burnt brick, uniform in colour throughout its mass, can only be obtained by slow progressive firing; a broken brick that has been too quickly burnt, though pale on the surface, presents a darker central patch and con- centric rings of various shades of colour, due mainly to the different states of oxidation of the iron, and partly to the presence of unconsumed carbonaceous matter; but the chemistry of this colour- variegation is not clearly under- stood.

Durability of Fire-Bricks.—The destruction and wearing out of a fire-brick in its ordinary uses takes place in different ways. First, it may waste by crumbling and shattering ; this occurs only when the brick is unnecessarily porous in texture, or from the presence of extraneous lumps of foreign materials, such as small pebbles and fragments of lime and iron-stone, which the manufacturer endeavours to get rid of by sifting or crushing

*before the clay is moulded. Secondly, the gradual vitrification of the brick under the pressure of the superimposed structure distorts its form, and the semiplastic red-hot or white-hot mass is gradually squeezed out of shape, and has to be periodically replaced in the hotter parts of the furnaces and kilns. However completely a brick has been burnt, bringing its dimensions almost to the limit of contractility, constant exposure to long-continued heat still further reduces its bulk, causing the displacement of the mass of which it forms a part, and necessitating replacement and repairs. Thirdly, there is the gradual fretting away of the exposed brick surface by vitrification, however refractory a brick may be; when it lines flues and furnaces, the fumes and ashes incessantly carried into contact with it bring foreign accessions, which vitrify the exposed portions and form a coating of viscid slag, which eats into the brick surface, creeping down and clogging the flues and fire-holes with a vitreous mass. In the case of blast-furnaces the fretting away of the surface of the fire-brick linings gradually enlarges their capacity, the surface destruction decreasing from the tweers upwards, the faces opposite the impact of the blast being distinctly excavated beyond the outline of the enlarged circum- ference. In one of the furnaces of the Madeley Wood Company, Madeley, Shropshire, " blown in" in 1867 and * blown out" in 1874, the diameter at the base, originally 3 feet, had been enlarged to about 7 feet 6 inches, and at the widest part, a little below the middle, from 12 feet, its original diameter, to 13 feet. In another furnace, after ten years' blast, the original diameter of 4 feet 5 inches at the base had been enlarged to 9 feet 6 inches; at a third of its height from 9 feet 11 inches to 12 feet: and half*

way up, from 11 feet 9 inches to 12 feet 10 inches, the | studies first at Siena and afterwards at Perngia.

destruction of brick-surface gradually decreasing towards the top, where the increase of size was but trifling, This would represent a consumption of brick-surface of from 3 to 4 inches a year at the tweers, and about three-quarters of an inch a year towards the middle of the furnace,

It is beyond the scope of this article to enter into the details of fire-brick manufacture, which in its main features resemble the manufacture of

building bricks, except that fire-bricks are rarely if ever burnt in clamps.

Properly constructed ovens on the "down draft" prin- ciple, with the outlet from the bottom into a tall chimney, are now almost universally employed, as they ensure greater regularity in the burning than in the old form of kiln, with a direct escape from the top, as well as economy in fuel, The consumption of coal varies from 9 to 15 cwt. per 1000 bricks, exclusive of the coal used in the drying stoves,

Coal-Measure fire-clays are often mined in an almost rocky condition, requiring long exposure to the weather to effect their disintegration. The softer clunches or clays are sometimes prepared for the moulder by " weathering," but the more common practice is to grind the fire-clay just as it comes from the pit under heavy "runners" or rollers, effecting a granular texture which is a desirable quality in a refractory brick. It is now becoming a com- mon practice to grind up with the raw clay from one fourth to one-third of its weight of broken burnt sherds or fire-bricks. All waste materials are thus utilized, and the excessively contractile character of highly plastic clays such as those of Dorsetshire is counteracted. Silicious sand is also sonietimes mixed with the more plastic clays to reduce

their contractility.

The ground clay is either brought into a plastic state with water in a pug-mill and moulded by hand, or by brick- moulding machinery generally connected with the pug-mill outlet; or the partially moist ground-clay dust is com- pressed into bricks in iron moulds by steam power, 4 modification of Prosser's well-known process. More shapely bricks are thus produced than by plastic moulding, and their perfectly true flat sides enable a minimum of joint ing materials to be employed—a circumstance of import ance in the stability of fire-brick masonry, as thick fire clay jointing contracts in the firing, tending to shatter the structure.

In addition to the use of fire-clay for the bedding of all fire-brick structures, it forms the materials of gas retorts, crucibles, and every kind of potter's kiln furniture, such as sagegars, cranks, slip kiln bottoms, enamel kiln linings, &. These have been up to within the Jast year or two moulded out of plastic clay, but by processes and machinery recently patented by Mr A.

Maw, saggars, cranks, and every kind of kiln furniture can be moulded out of nearly dry pulverized clay, at a great reduction in cost below that of the plastic process, and the exact regularity of form attained effects a large saving of space in the ovens and kilns. Moreover, the even bearing on each other of the regularly- shaped saggars when piled up in the oven, reduces the " wear and tear" and breakage toa minimum. Frire-bricks vary much in price in the different producing districts,— about 40s. per 1000 may now be looked upon as a minimut, ranging up to 70s. and 80s. further augmented by the cost of carriage to other districts. A thousand fire-bricks weigh from 3} to 4 tons. (a. M.)

FIRENZUOLA, Acnoto (1493-c. 1545), Italian poet and littérateur, was born at Florence, September 28, 1499. The family name was taken from the town of Firenzuol, situated at the foot of the Apennines, its original hom® The grandfather of Agnolo had obtained the citizenship of Florence and transmitted it to his family. Agnolo W2%

destined for the profession of the law, and pursued his There he

became the associate of the notorious Pietro Aretino, whose foul life he was not ashamed to make the model of his own. They met again at Rome, where Firenzuola practised for a time the profession of an advocate, but with little success, It is asserted by all his biographers that while still a young man he assumed the monastic dress at Vallambrosa, and that he afterwards held successively two abbacies. Tira- boschi alone ventures to doubt this account, partly on the ground of Firenzuola's licentiousness, and partly on the ground of absence of evidence; but his arguments are not held to be conclusive. Firenzuola left Rome after the death of Pope Clement VII., and after spending some time at Florence, settled at Prato as abbot of San Salvatore. His writings, of which a collected edition was published in 1548, are partly in prose and partly in verse, and belong to the lighter classes of literature. Among the prose works are—Discorst degli Animalz, imitations of Oriental and Atsopian fables, of which there are two French translations; Dialogo delle Bellezze delle Donne, also translated into French; Ragionamenti Amorosi, a series of short tales in the manner of Boccaccio,

rivalling him in elegance and in licentiousness ; Discacciamento delle Nuove Lettere,

a controversial piece against Trissino's proposal to introduce |

new letters into the Italian alphabet; a free version or adaptation of Z'he Golden Ass of Apuleius, which became a favourite book and passed through many editions 3 and two comedies, J Lucid', an imitation of the Menechmi of Plautus, and La Trinuzia, which in some points resembles the Calandria of Cardinal Bibbiena. His poems are chiefly satirical and burlesque. All his works are esteemed as models of literary excellence, and are cited as authorities in the vocabulary of the Accademia della Crusca. The date of Firenzuola's death is only approximately ascertained. He had been dead several years when the first edition of his writings appeared (1548). His works have been very frequently republished, separately and in collected editions. A convenient reprint of the whole was issued at Florence in 2 vols. in 1848.

FIREWORKS. See Prrorecuny.

FIRMICUS, Marernus Juuius, the name of a Latin writer, and most probably of two, who lived in the reign of Constantine and his successors. About the year 347 one of them composed a work entitled De Erroribus Profanarum Religionum, which he inscribed to Constantius and Constans, the sons of Constantine, and which is still extant. During the life of Constantine a person of the same name as the author of the work on Christianity commenced his eight books on astronomy, which were not completed however till 354 3.c, They were first printed by Aldus Manutius in 1501, and have been reprinted several times since. The work is interfused with Neo- Platonic philosophy, and its spirit is hostile to Christianity. Its diction in some cases resembles that of the Christian work, but it is impossible that two works so contradictory n tone and spirit could have been written by the same person at the same period; and even if it be supposed, contrary to the evidence, that the Christian work was written subsequent to the heathen one, all the contradic- tions between them would not be accounted for.

i Christian work is preserved in a Palatine MS. in the Vatican

uy. It was first printed at Strasburg in 1562, and has been reprinted several times, both separately and along with the writ- ings of Minucius Felix, Cyprian, or Arnobius. The most correct editions are those by Conr. Bursian, Leipsic, 1856, and by ©.

alm, in his Minucius Felix, Vienna, 1867. _ FIROZPUR, or F EROZEPORE, a district of British India in the Lahore division or commissionership under the jurisdiction of the lieutenant-governor of the Punjab, lies between 30° 18 12” and 31° 10’ 36” N. lat, and 74° 5’ and 75° 29’ R. long. It is bounded on the N. by Lahore,

Amritsar, and Kapurthala state, E. by Jalandhar and |

Ludhidna, 8. by Patiala, N abha, and Faridkot states, and W. by Sirs. The surface of the district is level, with the exception of a few sand-hills in the south and south-east. The country consists of two distinct tracts, that liable to annual fertilizing inundations from the Sutlej, known as the bhet, and the rohkz or upland tract. The only river is the Sutlej, which runs along the north-western boundary. The census of 1868 returned the population at 303,489 males and 245,764 females—total 549,253, of whom 68,406 were Hindus, 245,659 Mahometans, 160,487 Hindus, and 74,701 "others." The area of the district is 2740 square miles, or 1,753,250 acres, of which 1 ,243,508 are cultivated, 377,722 cultivable, and 132,020 uncultivable and waste. The principal crops are wheat, barley, millet, gram, pulses, oilseeds, cotton, tobacco, &c. The manufactures are of the humblest kind, consisting chiefly of cotton and wool-weaving, and are confined entirely to the supply of local wants.

The Lahore and Ludhiana road runs for 51 miles through the district, and forms the chief trade route. The chief town and administrative headquarters of the district is Firozpur. The other important towns and seats of com- merce are Mahr4g, population 5681; Dharmkot, 5379 ; Moga, 4844; Muktsar, 4694; and Zira, 3010. The district revenue in 1872-73 amounted to £61,141, of which £49,713 was derived directly from the land. For the pro- tection of person and property there are 12 revenue and civil and 13 magisterial courts, a regular police force of 388 officers and men, a municipal police of 75 men, and a rural constabulary of 542 men. For educational purposes 121 schools, attended by 3487 pupils, are maintained or subsidized by the state, at a cost of £1299. Owing prin- cipally to the dryness of its climate, Firozpur has the reputation of being an exceptionally healthy district. In September and October, however, after the annual rains, the people suffer a good deal from remittent fever. The average annual rainfall is 20°9 inches. British rule was first established at Firozpur in 1835, when on the failure of heirs to the Sikh family who possessed it, a small territory 86 miles in extent became an escheat to the British Government, and the present district has been gradually formed around this nucleus. Firozpur was the scene of operations during the first Sikh war. The Sikhs crossed the Sutlej in December 1845, were defeated successively at Mudki, Firozshah, Aliwdl, and Sobraon; after which they witldrew into their own territory, and peace was concluded at Lahore. At the time of the

mutiny, Firozpur cantonments contained two regiments of native infantry and a regiment of native cavalry, together with the 61st Foot, and two companies of European artillery. One of the native regiments, the 57th, was disarmed; but the other, the 45th, broke into mutiny, and, after an unsuccessful attempt to seize the magazine, which was held by the Europeans, proceeded to join the rebel forces in Delhi. Throughout the mutiny Firozpur remained in the hands of the English. Ps

Firozpur, the civil headquarters of the district of the same name, also a military cantonment, is situated on the old bank of the Sutlej, in 30° 57' N. lat. and 74° 10° E. long. The city contains a population of 20,592, according to the census of 1868, of whom 7181 are Hindus, 11,171 Mahormetans, 1347 Sikhs, and 893 "others." It has been constituted a municipality of the second class; municipal income in 1872-73, £4033; expenditure, £3962 ; rate of taxation per head, 3s. 104d. Firozpur has rapidy advanced in material prosperity of late years, and is now a very important seat of commerce. The main streets of the city are wide and well paved, and the whole is inclosed by a low brick wall. Great-improvements have been made in the surroundings of the city. The cantonment lies two miles to the south of the city, and is connected with it by

a good metalled road. The garrison now consists of one regiment of Britisli infantry, one of native infantry, one battery of field and one of garrison artillery. The arseual to which Firozpur owes its political importance is situated one mile distant from cantonment. Itis by far the largest in the province, and well stored with all munitions of war. The population of Firozpur cantonments and military lines amounted in 1868 to 15,837.

FISCHART (1546-1590), Jonannes, the great German satirist of the 16th century, was born probably at Strasburg (according to some accounts at Mainz), in 1546, and was educated at Worms, in the house of Kaspar Scheid, whom he mentions in the preface to his Eulenspiegel as his 'cousin and preceptor." After taking the degree of Doctor der Rechte at Basel in 1570, he left Germany for a time, and is said to have travelled in Italy, the

Netherlands, France, and England. Having returned to Strasburg, he lived there from 1576 to about 1580 with his brother-in- law the printer, Bernhard Jobin, who became the publisher of most of Fischart's works. In 1581 Fischart became Advocat am Reichskammergericht at Spire, and in 1583 Hohenfelsischer Amtmann at Forbach, near Saarbriick. Here he died in the winter of 1589-90, at age of forty- three. Fischart wrote under various feigned names, such as Mentzer, Menzer, Reznem, Huldrich Elloposkleros, Jesuwalt-Pickhart, Winhold Alkofribas Wiistblutus, and Huldrich Mansehr von Treubach; and it is partly owing to this fact that there is doubt whether some of the works attributed to him are really his. More than 50 satirical works, however, both in prose and verse, remain authentic, among which are—Der Nachtrabe, or Die Nebelkréh (1570), a satire against one Jacob Rabe, who had become a convert to the Catholic Church; Von St Dominici des Prediger- ménchs u. St Francisci Barfiissers artlichem Leben (1571), a poem with the expressive motto "Sie haben Nasen vnd riechens nit," written to defend the Protestants against certain wicked accusations, one of which was that Luther held communion with the devil ; Hulenspeigel Reimensweis (1572); Allerpraktik Grossmutter (1572), after Rabelais's Prognostication Pantagrueline; Fléhatz Weibertratz (1574) ; Affenteuerliche und ungeheuerliche Geschichtschrift vom Leben, Rhaten und Thaten, u. s. w., von Gargantoa u. Pantagruel, also after Rabelais (1575, and again under a modified title 1577); Neue kiinstliche Figuren Biblischer Historien (1576) ; Anmahnung zur christlichen Kinderzucht (1576) ; Das gliick- haft Schiff von Ziirich (1576, repub. 1828 and 1849), a poem commemorating the adventure of a company of Zurich arquebusiers, who sailed from their native town to Stras- burg in one day, and brought, as a proof of this feat, a kettleful of " Hirsebrei," which had been cooked in Zurich, still warm into Strasburg; Podagrammisch Trostbiichlein (1577); Das philosophisch Ehzuchtbiichlein (1578); the celebrated Bienenkorb des heiligen réimischen Immen- schwarms, &c., a modification of the Dutch Bynencorf der roomischer kerke, by Philipp Marnix of St Aldegonde, published in 1579 and again in 1847; Der hetlig Brotkorb, (1580), after Calvin's Trazté des Reliques; Das werhornige Jesuiterhitlein, a rhymed satire against the Jesuits (1580) ; Catalogus Catalogorum perpetuo durabilis (1589). To Fischart also have been attributedfsome " Psalmen und geistliche Lieder" which appeared irfa Strasburg hymn book of 1576. Fischart had studied not only the ancient literatures, but also those of Italy,

France, the Netherlands, and England. He wa a lawyer, a theologian, a satirist, in religion a staunch Protestant, in politics a republican. Above all, he is reputed a master of language, and was in- defatigable with his pen. His satire was levelled merci- lessly at all perversities in the public and private life of his time,—at. astrological superstition, scholastic pedantry, ancestral pride, but especially at the papal dignity and the

lives of the priesthood and the Jesuits. He indulged in the wildest witticisms, the most abandoned caricature ; but all this he did with a serious purpose. Thirty years after Fischart's death his writings, once so popular, were almost entirely forgotten. Recalled to the public attention by Bodmer and Lessing, it is only quite recently thet his works have come to be a subject of investigation, and hig position in German literature to be fully understood, There is a collection of Fischart's works in the royal library at Berlin.

FISHER, Jonny, bishop of Rochester, was born at Beverley in Yorkshire, but the year of his birth is uncertain, some placing it in 1459, others in 1461, and others in 1465. He was educated in the collegiate church of Beverley, and in 1484 he removed to Michael House in Cambridge, of which college he was elected master in the year 1495, Having applied himself to the study of divinity, he took orders ; and becoming eminent as a divine, attracted the notice of Margaret, countess of Richmond, mother of Henry VII, who appointed him her chaplain and confessor. In 1501 he took the degree of doctor im divinity, and the same year was elected chancellor of the university. In the year following the first appointment of the newly-established Margaret professorship in divinity — was conferred upon him; and in 1504 he was consecrated bishop of Rochester. Fisher has been erroneously credited — with the composition of the Assertio Septem Sacramentorum, in which Henry VIII. attacked the heretic Luther, and for which the pope conferred upon his Majesty the title of " Defender of the Faith." Sir Thomas More and Fisher, however, published their respective rejoinders to the Reformer's reply to the king. Hitherto he had retained the friendship and esteem of the king; but from 1527 till his death he was ackuowledged as, next to Sir Thomas More, the most influential man of the

anti-royal or papal party in England, He published a pamphlet against the divorce of Catherine of Aragon, which was widely disseminated on the Continent, and also secretly circulated in England. In | 1533 the parliament found him guilty of misprision of | treason, for concealing certain prophetic speeches of Eliza- beth Barton, a fanatical impostor known as the Holy Maid of Kent, relative to the king's death, and condemned him, — with five others, to suffer loss of goods and imprisonment — during his majesty's pleasure. He was subsequently | released upon payment of a fine of £300. Fisher excused his sileuce on the ground that the nun had told him that she had communicated her prophecies to Henry in person, but he nevertheless refused to express regret for having i? been unwittingly connected with treasonable designs. Asto — the great question of the day, Fisher offered to swear to | the succession in the line of Aune Boleyn's issue, but he | refused to acknowledge either the validity of her marriage | or the king's supremacy. For this refusal he was attainted by the parliament of 1534, and committed to the Tower. | At this juncture Pope Paul III. sent him a cardinal's hat. This kindness, however, only hastened the bishop's ruil. He was beheaded at Tower Hill on the 22d of June 1599. It is impossible to withhold from Fisher, notwithstanding his inflexible enmity to the Reformation, the character of 2 | learned, pious, and honest man. His works attest his learning; his inflexible zeal for his faith, and the readiness with which he died for his creed, plainly prove his honesty _ as well as his piety. His execution was a sad tragedy, | defensible only on the plea of political necessity. For the latest apology for Bishop Fisher, see the Rev. R. W. Watson's History of the English Church, vol. i., 1877.

Fisher was the author of a considerable number of controversial tracts, most of which were collected and printed in one volume folio, — published at Wurtzburg in 1595. A Life of Fisher, by Rev. John Lewis, A.M., was published in 1855, in two volumes. '

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FISHERIES

NDER the heading Sea Fisheries, which form the particular subject of the present article, may be included the various operations engaged in for the capture of the different forms of marine life which, in some manner or other, ministet to the wants or convenience of man. The most important of these fisheries—those only, in fact, to which the title strictly belongs, and which have more or less widely occupied attention from probably the earliest times—are carried on chiefly by hook and line or net, with the object of obtaining fish for the purposes of food; and this main division of the general subject will be here con- sidered.

Although little or nothing is known of the methods of fishing on our coasts in very early times, there can be no doubt that in England, as in all maritime countries, fish has always been eageriy sought after as an easily procurable article of food. The abundance of herrings and mackerel, for instance, on the coasts at regular seasons of the year, could not have failed to attract attention; and Swinden, in his History and Antiquities of Great Yarmouth, expresses his belief that the herring fishery began there soon after the year 495. In Scotland also there is evidence that the herring fishery was systematically carried on from a very early date. Precise records of other fisheries do not go back so far as that of the herring; but there is no reason for believing that cod and kindred fishes were not taken by the hook and line very many centuries ago, and, like the herring, were subjected to some ready mode of curing either with salt or by drying in the open air. In comparatively recent times all the fisheries have been largely developed, and none more so than that known as beam- trawling, a method of fishing which had probably attracted little notice a hundred years ago, but is now the most regularly productive and important on the English coast. Many circumstances have combined to encourage the work- ing of sea fisheries as a national industry. The great extent of coast-line surrounding the British Islands provides ready access to the sea to a numerous population who become familiar from their youth with seafaring pursuits ; and to such occupations large numbers betake themselves with instinctive aptitude, either as fishermen or sailors. In Many cases early associations lead them to devote them- selves to such fisheries as are within reach of their native villages ; in others, they may become alternately sailors and fishermen, shipping for a few months every year on a trad- mug voyage, and returning home in time to take part in the herring or some

other temporary but profitable fishery ; whilst in the case of the deep-sea trawling or cod fishery, they learn to become as good sailors as they are fishermen, for they have often to remain at sea in decked vessels for weeks at a time in all kinds of weather,—they must keep on their fishing ground, and must trust to their knowledge of seamanship to battle with the furious gales to which they may be at any time exposed when thus far away from shelter, Inducements to become fishermen are not wanting to this coast population. Nowhere are the best kinds of sea fish more abundant than in temperate and moderately high latitudes ; and in this respect the British Islands are i advantageously situated, the seas surrounding them ane frequented throughout the year by a variety of fishes ee = request for the market, besides producing count- ne ‘ ‘ 8 of other kinds which only come within reach of

shermen at particular seasons of the year. And great

il 7 ol Cora, Peart, SALMON, Sponcr, and WHALE FISHERIES the Cader is referred to those headings,

as may sometimes be the supply of fish during the continuance of favourable weather, it is rarely that the demand for it is exceeded at the present day; for all the markets of the country are brought within reach by the facilities provided for rapid transport from the fishing ports by the extensive system of coast and inland railways now in operation. Fishermen, therefore, always find a market for their produce; and although it is to be feared that many of them obtain but a small proportion of the price for which their fish is ultimately sold to the consumer, the majority of them are enabled to live more comfortably than formerly, and to save enough to keep their fishing gear in good working order, and in many cases to pay for improved and larger boats.

There is no doubt that the fisheries fluctuate a good deal Fiuctn- from year to year; and it is often the case that they may ation of be good on one part of a coast when they are bad on another. fisheries.

The important herring fishery on the coasts of Scotland is a marked example of this, as must be familiar to all persons _ who have given any attention to the subject. Thus it not unfrequently happens that when the

fishery on the east side is particularly successful, a scarcity occurs on tle west coast, or vice versa. Again, in some years the fish are equally abundant or scarce on both coasts. These fluctua- tions are observed in even small districts of a line of coast, and one part of a season may be good and another bad in the same locality. Precisely the same variations occur on all the coasts of the British Islands, and with all kinds of fishes. Undoubtedly, weather is one of the most important elements in the question of success ; and a generally stormy season has a marked effect in the diminished quantity of fish landed. It tells both in reducing the number of fisher- men at work, and in driving the fish from their usual haunts. It is only quite recently that attention has been directed to the subject of temperature as affecting the movements of certain fishes towards or from the surface of the sea, and this will be further noticed when we speak of the herring fisheries. Apparently trifling circumstances may in some cases materially affect the catch of fish. Thus the sean fishery for pilchards on the coast of Cornwall has fluctuated exceedingly during the last 50 or 60 years for which returns are in existence; but however abundant these fish may be on the coast, the seans cannot catch them unless the shoals come quite close to the land in localities where these nets can be worked. Enormous hauls of pil- chards have been made in particular years, whilst in others the fishermen have waited week after week without a chance of wetting their nets, although the drift-net fishermen at some little distance from the land have been meeting with fair success. The large apparent element of chance in the success of our fisheries cannot be better expressed than by the general hope of the fishermen for " good luck."

=a Great changes have taken place in the fishing trade Transport within the last 20 or 30 years, more especially in that for of fish.

fish sent fresh to the market. Excluding herrings and cod, which to a great extent were consigned to the curer as soon as possible after they were caught, a large proportion of the fish formerly taken on our coasts was disposed of within a short distance of the place where it was landed. A good many turbot and soles were forwarded by light carts or coaches to the nearest railways as these gradually extended in different directions from London; but the people near the coast were, a generation or two ago, the principal consumers of fish, and the supply was compara. tively scanty, for

the fishing boats were small, and there was little inducement to fish on a large scale when the

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markets within reach were so few. All this has been com- pletely changed, and the main agent in the work has been the great extension of railways throughout the length and breath of the land. Next to railways as a means of facili- tating the transit of fish to all the markets, the use of ice Use of for packing the fish has become of great importance, so icein much so in fact that without its employment it would be packing. impossible to carry on the North Sea trawl fishery during summer at the distance from land at which it is generally worked, and where some of the most productive grounds are situated. Its special importance in this fishery will be further noticed when we speak of the general system of beam-trawling ; but we may here mention that without the use of ice a large proportion of the fish now sent long dis- tances by railway would never reach their destination in a condition fit for the table. The idea of using ice in con- nexion with the fish trade was first put into a practicable shape by Mr Samuel Hewett. At the present time about 30,000 tons of ice are imported annually from Norway into Hull, which is only one of the large North Sea trawling stations, for the sole purpose of preserving fish, either on board the fishing smacks or during its transit to market. With the exception of herrings, pilchards, and sprats, a large proportion of the fish now caught on the English coast is put into ice almost as soon as taken out of the water. Much of it is at once so packed on board the trawlers ; it is brought on shore sometimes after several days, and sold in the wholesale markets; it is then re- packed in ice and forwarded to other markets, where it is purchased by the fishmungers, who have a stock of ice at home ready to receive it ; and there it remains, if properly taken care of, till wanted, sufficient only to make an attractive display being laid out at one time for sale. Continu- The question of how long our present large supply of sea ance of fish is likely to continue is one of much interest, and the supp y answer to it depends on whether or not our fisheries are “carried on in such a manner as to cause more destruction of fish life than can be compensated for by the vast repro- ductive powers of

those fishes which escape the nets and hooks of the fishermen. For more than fifty years past the cry has been periodically raised that our fisheries are being ruined. The general complaint has been of the wasteful destruction of spawn and very young fish by beam-trawling and sean nets; and in 1863 the outcry was so loud that a Royal Commission was appointed, uot only to examine this question, but also to inquire into the general condition of all our sea fisheries,—the special objects of inquiry being the state of the supply of fish, and the questions whether the methods of fishing in use involved a wasteful destruction of fish or spawn, and whether existing fishery restrictions operated injuriously on the fisheries. On these points the commissioners, after taking evidence all round the British Islands, were enabled to give avery decided opinion. They reported that the supply of fish generally had largely increased, that the methods of fishing involved no waste of young fish that could be prevented without interfering with the general fisheries, that spawn was not destroyed by the nets, and that all fishery restrictions should be removed except such as were desirable for protecting and — keeping order among the fishermen. The recommenda- tions of the commissioners were embodied in an Act of Parliament known as The Sea Fisheries Act 1868, by Which, with one or two small exceptions relating to herring fishing on the west coast of Scotland, previous Fishery Acts mere repealed, and fresh regulations made having reference to Pee alien a fishing boats, keeping order among drift- a. a ig ci and providing a close time ge aomeider e English Chanuel. The main object of tela Gia " out a convention between the British ce, for the better ordering of the fisheries

in the seas adjoining the two countries. The Act came into force in England on the Ist of February 1869, but cir- cumstances have hitherto prevented any date being fixed for carrying out the convention on the part of the French, Great advantage has undoubtedly been gained by British fishermen from the substitution of the present simple fishery regulations for the numerous Acts previously existing, many of which had long been obsolete ; but the Royal Com. mission, which was issued virtually to inquire into the alleged destruction of fish spawn on the ground by beam- trawlers, would probably have never come into existence had the facts then been known which have since come to light about the spawning habits of most of our

edible fishes, These facts are so important that a short notice of them may be given here.

Fishermen are in the habit of asserting with perfect Invest. confidence that fishes of almost every kind they are accus- gations

tomed to catch have certain grounds which they frequent or .

: : spawas ova. The herring is known to spawn on the ground,—jng

at particular seasons for the purpose of depositing their

at all eveuts the spawn is found there in irregularly shaped lumps adhering to the bottom. It has therefore been con- cluded that all kinds of fishes have the same habits in this respect. Yet no one has been able to speak positively of having ever seen any fish spawn taken from the ground except that of the herring. Various soft and gelatinous substances are brought on shore by the sean nets, and com- monly go by the name of spawn among the inshore fisher- men; but that they are not fish spawn is perfectly well known to any one who has given attention to the variety of curious animal organisms inhabiting the sea.

It was stated by Professors Huxley and Allman in 1867, before the select committee of the House of Com- mons on the Sea Coast Fisheries (Ireland) Bill, as within their personal knowledge, that fish ova had been found floating at the surface of the sea, and that the ova they had met with were in all cases alive, and some of them in an advanced state of development. Reference was at the same time made to the observations then recently recorded by Norwegian naturalists on the spawning habits of the

common cod, leading to the belief that spawning at the'

surface was by no means uncommon with our sea fishes. These investigations have been systematically carried on during the last ten years, under the direction of the Swedish Government, by Professor G. O. Sars of the university of Christiania, and have resulted in some unexpected dis- coveries. The seas in the neighbourhood of the Loffoden Islands on the coast of Norway had long been known to be a great place of resort for cod

during the spawning season; and in 1864 Professor Sars commenced his work there, and by means of a small surface towing net he obtained plenty of the ova of the common cod (Gadus morrhud) floating at the surface; examples in various stages 0 development were procured, the young fish were success

fully hatched out, and the species identified beyond a

doubt. Subsequent observations fully confirmed the accuracy of the conclusions previously arrived at that the cod spawn was not deposited on the ground but floated freely at or near the surface. In 1865 the same observa tions were made on the ova of the haddock (Gadus ceglefinus), and it was satisfactorily proved that they went through all their stages of development while floating at the surface, in precisely the same manner as in the case of the cod. Sars was at first inclined to believe this develop- ment of the ova while floating was peculiar to the members of the Gadide or cod family, in its restricted sense ; but in the summer of 1865 he visited the southern coast 0 Norway during the season for mackerel, and found abundant evidence of the same rule obtaining in that widely distinct

| fish. In the case of the mackerel, the spawning actually

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takes place at the surface; but with the cod family we believe the operation has not been so distinctly observed. The ova, however, are undoubtedly met with at the surface and at a short distance below it. Entirely subversive as these discoveries of Professor Sars are of the popular notions about fish- spawning, it is even more unexpected to find that both he and M. A. W. Malm of Gothenburg have independently ascertained that the ova of that essentially ground-fish the plaice (Pleuronectes platessa) follow the same rule of floating at the surface. Other kinds of float- ing ova were also obtained by Sars, some of which he succeeded in hatching; and he has completely identified the gurnard (Z'rig/a) and the garfish (Bellone), in

addition to those before mentioned. It is evident, then, that the floating of fish ova during the development of the embryo must be taken as the general rule in several large and distinct families of sea fish. Sars has pointed out that the development takes place at the bottom in the case of those fishes especially whose ova are cemented together by a glutinous secretion, or fastened in lumps to foreign bodies, such as Alge, Hydroids, &c. He mentions as examples of this, among others, the herring (Clupea), the capelan (Osmerus), the species of Cottus, Liparis, &c.

It is particularly worthy of notice that, according to these observations of the Norwegian naturalists, all the important kinds of fish taken by our line fishermen and beam-trawlers, and the mackerel among such as are caught by the drift-nets, may be reasonably included among the species whose spawn floats at or near the surface of the sea, and their ova cannot therefore be liable to the slightest injury by any method of fishing which is carried on upon or near the ground. Yor if that be the rule with the spawn of the cod and haddock there can hardly be a doubt about its being so likewise with the ova of ling, coal-fish, whiting, pollack, hake, and that northern species, the tusk, all belonging to the same family. Again, turbot, holibut, brill, soles, plaice, dabs, and flounders are all closely allied, and there can scarcely be a doubt that the same rule applies to all which Sars and Malm have established in the case of the plaice, one of the most typical of this group of fishes. The gurnard family must also be included in this category ; the spawn of the red mullet, we believe, has been observed floating in aquariums; and the dory, from its close affinity to the mackerel, may be expected to follow the same rule. On the other hand, we know that the Spawn of the herring is commonly found at the bottom, although it by no means follows that the parent fish is there when the ova are excluded ; for the full herring is frequently taken in drift nets which are very near the Surface, and these nets are often covered with small lumps of spawn. At the same time the specific gravity of herring spawn is greater than water, and it sinks to the bottom sooner or later if nothing intercepts it. There is no evidence of its ever floating at or near the surface as is the case with that of the cod. In fact, the aggregation of the ova into masses of various sizes, and the glutinous substance in which the ova are enibedded, by Which they are enabled to adhere firmly to anything with Which they may come in contact,

point to their remaining ma fixed position during the process of development. It might have been anticipated that the other members of the

erring family—the pilchard and sprat, for instance—would also have Spawned on the ground, but, so far as we are aware, their ova have never been found there. Indeed, nothing is known of the spawning habits of the sprat, although this little fish has the roe well developed in December or January, when it is found in the greatest abundance on our coast, and comes nearest to the shore. The spawning of the pilchard is a matter of some little interest. The late Mr Jonathan Couch, who probably devoted

more time to the study of the habits of this fish than any other ichthyologist, states! his belief that the pilchard spawned at the surface, and the ova became mixed with a large quantity of tenacious mucus which spread out like a sheet on the water and kept them floating. If this should be confirmed, it will prove that even in the case of agglu- tinated masses of ova, development may naturally take place in them far away from the bottom. There appears to be little doubt that the pilchard spawns far out at sea, as they are on chance occasions taken in spawning condi- tion in the mackerel drift-nets early in the year ; aud when, some months later, the shoals of pilchards approach the land the roe shows no signs of development. These circumstances favour the idea that pilchards are surface Spawners, as believed by Mr Couch.

There are several other kinds of edible fish of whose Spawning habits we have no definite knowledge, but enough has been discovered of the habits of most of the fish which are valuable for the purposes of food, to show ; that there need be no anxiety about their spawn being destroyed by any of the methods of fishing in ordinary use. The only apparent exception to this statement is in the case of the herring, whose spawn it has been alleged has been destroyed by the beam-trawlers. But if the beam-trawlers wish to avoid tearing their nets in pieces, they must work where the ground is smooth; and in the few precise localities where it has been positively ascertained that the herring does spawn, the general character of the bottom is rough. That is the ground specially worked over by the line fisher-men for haddock, cod, turbot, and other fishes, which come there in numbers for the sake of feeding on the herring spawn. ‘There is a popular

idea that all fish spawn is of a Vitality most delicate nature, and quickly loses its vitality if taken of spawn. out of the water for a short time, or at all knocked about.. This is probably true in those cases in which the ova are separated from each other after exclusion, and float freely in the water ; but it is not so with the spawn of the her- ring, or probably of other fish whose ova are embedded in a tenacious mucus. The experiments of Professor Allman and of Dr M'Bain have shown that herring spawn does not readily lose its vitality under rough treatment, and may even be hatched out after having been exposed to most unnatural conditions, Professor Allman states in his Report to the Board of Fisheries at Edinburgh that some stones covered with spawn were taken from the sea by divers on the Ist of March 1862, not far from the Island of May. Some of this spawn was forwarded to him and came into his possession after being kept in only a small quantity of water for two entire days. He says :—

"With the view of determining whether development would proceed in confinement, I placed some of this spawn in a glass jar with sea-water, exposing it in a window looking to the east. The several stages of development were regularly passed through, and on the 15th of March the embryo was fully formed, energetic movements were performed by it in the ovum, and it seemed ready to escape into the surrounding water. On the 16th some of the embryos had actually escaped, and were now about four-tenths of an inch in length, They were of crystalline transparency, and swam about with great activity, and with the remains of the yolk, reduced now to a very small volume, still adhering to them. The specific characters had, of course, not yet become established, and the little fish afforded no further evidence, beyond what we already possessed, to enable us to identify it with the young of the herring."

The young fish lived nearly a month in confinement, but the specific characters were not even then sufficiently per- fected to identify the fish with certainty. There could be no reasonable doubt, however, that the spawn was that of the herring. After some account of other discoveries of spawn, he thus concludes his report :—

"It was shown by these experiments that the vitality of the spawn was in no way injured by detaching it from the spawning

- *History of British Fishes, vol. iv. p. 81 (1865).*

bed, so that if it be returned to the sea before it suffers any pro- longed exposure to the air, development will proceed apparently unchecked. Those specimens, indeed, which underwcut develop- ment in my possession, had not only been removed from the ground, but had been kept for many hours in a scanty supply of water be- fore I received them; and even after they came under my care, they were necessarily placed in conditions very different froin those to which they would have been exposed if they had been allowed to remain in their natural habitat,—and yet, with all these disadvan- tages, development proceeded uninterruptedly." ae

Registra- Registration of Fishing Vessels. —Under the Sea Fisheries Act

tion of 1868, all vessels and boats engaged in fishing for the purpose of sale

vessels, must be registered at the custom-house, and must be marked on the bow with letters denoting the port to which they belong, and their registered number. Thus, Grimsby is represented by the letters G Y, Peterhead by P D, and Galway by G. The fishing boats are divided into three classcs,—the first class including everything of 15 tons and upwards, the second class all boats under 15 tons navigated otherwise than by oars only, that is, sometimes by sails and sometimes by oars, and the third class those with which oars ouly are used. The last class is supposed to include only small boats used for harbour fishing ;? but as there are very few boats in which a sail of some kind is not sometimes hoisted, the customs have a discretionary power to put very small boats into the third class, notwithstanding their occasional use of a sail. The registers for each port are sent to the registrar-general of shipping, and appear in the annual returns published by the Roard of Trade. There is great difficulty, however, in obtaining precise accuracy in the returns for many parts of the coast; new boats sometimes escape registration, and boats which have been lost or broken up some- times remain for a year or so on the list. But, imperfect as these returns undoubtedly are, they are of some value in giving an approximate idea of the number of the fishing craft, and of the average size of those in the first class. It must be remembered, however, that this class includes

boats ranging from 15 tons to 70 or 80 tons. The tendency now is to fish farther from the land than formerly, and to use decked instead of open boats; the result is that there is a steady increase in the first class boats, and a diminution in the number of the smaller ones. The following table gives the total number of fishing boats in England, Scot- land, Ireland, and the Isle of Man on the register for 1876 and 1877, arranged according to their classes :—

Second

First Class. Gliss

Boats.

8,777 7,825 9,888 9,326 2,802 2,817

107

123

Boats. Tonnage.

3,142 3,425 2,782 2,940 393 405 235 254

121,445 137,768 47,748 51,039 9,364 9,861 5,017 5,446

England Scotland Jreland

Isle of Man.

21,574 19,968

183,569 198,668

6,552 6,770

Totals …

We will now proceed to give an account of the several valuable fisheries carried on around the coasts of the British Islands, with some details of the appliances in use, and the mauner in which they are worked.

Encuish ENGLISH FisHERIES.—On the coast of England the FISHER- methods of fishing in general use are more numerous than as in the case of either Scotland or Ireland, the fishing grounds are more extensive, and the total supply of fish obtained is larger and more varied in kiud. The principal modes of fishing are by the beam-trawl, the drift-net, the sean, the stow-net, and lines. Their relative importance varies to some extent, but trawling and drift-net fishing occupy by far the most conspicuous positions, and lines come next in order.

Trawling.—The most characteristic mode of fishing is that known in England as " trawling," or in Scotland as "beam-trawling," and consists in towing, trailing, or trawl- ing a flattened bag-net, often 100 feet long, over the bottom

Trawl- ing,

1 c ne BY a recent order in council all open fishing boats which do not sh beyond three miles from land are exempted from registration.

This practically abolishes the thi i i ah aloes e third class which has hitherto appeared

PFs RLS

[ENGLISH

in such a manner as to catch those fish especially which naturally keep close to or upon the ground. It is very desirable that the name " trawl " should be restricted to this net, presently to be described, as much confusion hag been caused by the practice, general in Scotland (which has misled even such writers as Mr Couch, see Fishes of the British Islands, iv. 105), of applying the name to that very different kind of net which has for centuries past been almost universally known as the "sean," "seine," or "seyne," and may be traced back through the Saxon segne to the Latin sagena, a

sweep-net. In the United States and Canada, the word "trawl" is still more misapplied, being given to what is in England commonly called the long line or bulter.

The beam-trawl may be simply described as a triangular, 'The

fiat, purse-shaped net with the mouth extended by a horizon- beam. tal wooden beam, which is raised a short distance from the ™"!*

ground by meaus of two iron frames or heads, one at each end, the upper part of the mouth being fastened to the beam, and the under portion dragging on the ground as the net is towed over the bottom. The beam of course varies in length according to the size of the net, and depends to some extent also on the length and power of the vessel which has to work it. In the large "smacks," as the trawl-boats have long been called, the beam ranges from 36 to 50 feet in length; and there is rarely anything less than this now used by the deep-sea trawlers. Elm is generally preferred for it, selected if possible from timber grown just of the proper thickness, that the natural strength of the wood may not be lessened by more trimming or chipping than is absolutely necessary. If the required length and thickness cannot be obtained in one piece, two or even three pieces are scarfed together, and the joints secured by iron bands. When the trawl is being hoisted in, the first part of the apparatus taken on board is the large heavy beam, and this is very commonly done when the vessel is rolling and pitching about in a seaway. It is therefore necessary for the sake of safety that the beam should be secured as soon as possible, and in such a position as to be out of the way and at the same time conveniently placed for lowering again when required. All this may be easily effected by having the beam of such a length in proportion to the size of the vessel that when hoisted up, one end of it may come over the taffrail, with the iron head just clear outside, and the fore end in front of one of the shrouds. It then lies on the gunwale of the vessel, and the ends are secured by ropes, the forerigging preventing that end of the beam coming on board, but the iron head passing in between the shrouds. 'The object or use of the beam is to extend the mouth of the net ; but, in order to allow room for the fish to enter, the beam, and with it the back of the net which is laced to it, must be raised a certain distance from the ground. For this purpose the beam is fastened at

each end to the top of an iron frame, shaped somewhat like a0 irregularly formed stirrup, which is fitted to it at right angles by a square socket at the top. By these "heads or irons" the beam is supported at a height of neatly 3 feet from the ground, and, contrary to the popular idea on the subject, never touches the bottom. It could only do so if the trawl were to reach the ground with its bac

undermost, and then the mouth of the net would close and no fish could enter. The lower part of the trawlhead of iron is straight and flat, just like the corresponding part of astirrup. It is called the "shoe," and is the part which slides over the ground as the trawl-beam and following net are towed along. There is a slight variation in the form of the trawl-irons, and one, known as the Barking pattern, from having been adopted at that old trawling station ou the Thames, is shaped exactly like a stirrup ; but generally the irons are preferred with the aft side straight. We

'ys net.

Po its;

TRAWLING. |

now have the long beam supported at each end by a more or less stirrup-shaped iron fitted at right angles. The next thing to be considered is the net. This was previously spoken of as flattened aud purse-shaped. When the net is spread out in the manner it would be when working, the upper part or back has its straight front edge fastened to the beam, but the corresponding lower part or belly is cut away in such a manner that the front margin forms a deep curve extending from the shoe of one trawl-head to the other, the centre of the curve or " bosom," as it is called, being at a considerable distance behind the beam. The usual rule in English trawls is for the distance between the beam and the bosom to be about the same as the length of the beam. In French trawls this distance is generally much less ; but in all cases the beam and back of the net must pass over a considerable space of ground when the trawl is at work before the fish are disturbed by much of the lower margin of the net. This lower edge of the mouth of the trawl is fastened to and protected by the " ground- rope," which is made of an old hawser "rounded" or covered with small rope to keep it from

chafing, and to make it heavier. The ends of the ground-rope are fastened at each side by a few turns round the back of the trawl- heads, just above the shoe, and the rope itself rests on the ground throughout its entire curve. The fish which may be disturbed by it have therefore no chance of escape at etther the sides or back of the net, and as the outlet under the beam is a long way past them, and is steadily moving on, their fate is sooner or later decided by their passing over the ground-rope and finding their way into the funnel- shaped end of the net, from which a sinall valve of netting prevents their return. The ground-rope is the part which directly bears on the ground, and to prevent the possibility of the fish passing under it, the rope should have some Weight in it so as to "bite" well, or press the ground closely. It is, however, always made of old material, so that it may break in case of getting foul of rocks or such other chance obstruction as may be met with on the generally smooth ground where the trawl can only be worked with advantage. If insuch a contingency the rope Were so strong and good as not to break, there would be serious danger of the tow-rope snapping, and then the whole apparatus might be lost ; but the ground-rope giving way enables the net to be cleared and hauled up with pro- bably no more damage to it than the broken rope and perhaps some torn netting. The remaining part of the trawl, extending from the bosom to the extreme end, forms a complete bag gradually diminishing in breadth to within about the last 10 feet, which part is called the "cod or purse," and is closed by a draw-rope or "cod-line" at the extremity when the net is being used. This is the general receptacle for the various fishes which enter the net 5 and when the trawl is hauled up and got on board the vessel, Te is cast off and the fish all fall out on the eck, :

_We must now say a few words about the ingenious con- trivances for preventing the escape of the fish which have entered the purse and reached the farthest extremity of the net. It has been mentioned that the body of the net tapers away to the entrance to the purse. It is at this Point the opening of the pockets are placed; and they are so arranged that the fish having passed into the purse, and then Seeking to escape by returning along its sides, are pretty sure to go into the pockets, which extend for a length of about 15 or 16 feet along the inner side of the body of the het, and there, the more they try to press forward, the More tightly they become packed, as the pockets gradually narrow away to nothing at their upper extremity. These

pockets are not separate parts of the trawl, but are made by merely lacing together the back and belly of the net, |

beginning close to the margin or side nearly on a level with the bosom, and then carried on with slowly increasing breadth downwards as far as the entrance to the purse. At this point the breadth of the net is divided into three nearly equal spaces, the central one being the opening from the main body of the net into the purse, or general receptacle for the fish, which must all pass through it, and those on each side being the mouths of the pockets facing the opposite direction. The central passage has a valve or veil of netting called the " flapper," which only opens when the fish press against it on their way into the purse. To under- stand clearly the facilities offered to the fish to enter the pockets, it is necessary to remember that the trawl, when at work, is towed along, with just sufficient force to expand the net by the resistance of the water. But this resistance directly acts only on the interior of the body of the net between the pockets and then on the purse; it does not at first expand the pockets, but tends rather to flatten them, because they are virtually outside the general cavity of the trawl, and their openings face the further end of it, The water, however, which has expanded the body of the net, then passes through the flapper or valve, and enters the purse, which, being made with a much smaller mesh than the rest of the net, offers so much resistance that it cannot readily escape in that direction ; return currents are consequently fornied along the sides, and those currents open the mouths of the pockets, which, as before mentioned, are facing them; and the fish, in their endeavours to escape, and finding these openings, follow the course of the pockets until they can go no farther. The whole of the net is therefore well expanded, but it is so by the pressure of the water in one direction through the middle, and in the opposite direction at the sides or pockets,

The meshes of an ordinary deep-sea trawl vary in size Meshes,

in different parts of the net, diminishing from 4 inches square near the mouth to 14 inches in the cod or purse. The under part of the net, being

exposed to more wear and chafing than the upper, is usually made with rather stouter twine ; and the purse, being especially liable to injury from being dragged over the ground with a weight of fish and perhaps stones in it, has some protection provided by layers of old netting called " rubbing pieces " laced to its under surface. The French fishermen fre- quently fasten a stout hide to this part of their trawls with the same object.

A deep-sea trawl, such as has now been described, is therefore an immense bag-net, the largest size being about 50 feet wide at the mouth and about 100 feet long. Many of these nets are much smaller, some of them not having the beam more than 36 feet or even less, and the net reduced in proportion ; but there has been a great increase in the size of the trawl-vessels in recent years, and at the same time there has been an enlargement of the nets, although not quite in the same ratio. The trawl is towed over the ground by the trawl-warp, generally a 6-inch rope 150 fathoms long, and made up of two lengths of 75 fathoms each spliced together; one end of this warp is shackled to two other pieces each 15 fathoms long, and called the "spans or bridles," which lead one to each end of the beam, and are shackled to swivel-bolts in front of the iron heads so as to give a fair pull on the whole apparatus.

*The great development of the trawl fishery in recent-Size ot years has led to a vast improvement in the kind of fishing trawl vessels employed in it. Fifty years ago the only deep-sea Y**¢!s.*

trawlers were in the west of England, and from Barking on the Thames. They were not nearly the tonnage of many of the vessels now used in the North Sea, but were stout, heavy, seagoing craft of their size, and capable of standing almost any description of weather ; and, although comfortable, they were certainly not very fast. At that

Barking.

date, however, the fish went into consumption at once, instead of being sent one or two hundred miles before it reached the consumer. The increased demand for fish of late years has led to the building of trawlers of the best

description, as remarkable for their fast sailing as for other improved qualities. There is racing home now from the fishing grounds to catch the first of the market, and every- thing is done as quickly as possible to ensure quick dis- tribution and delivery all over the country. The cost of the vessels has of course largely increased, not only from their greater size, but also because of the much higher price now paid for everything used in their construction. In 1862 a new trawl vessel, and what was at that time considered one of the larger class, could be built and fitted out ready for sea for £700 or £800 ; but it costs from £1200 to £1300 to turn out one of the vessels now com- monly used in the North Sea fishery. This includes a supply of everything necessary for fishing, costing about £70 or £80. A proper fit-out consists of a double set of almost every part of the gear, so as to provide against accidents, and generally to save the time which would be lost if the trawler were obliged to return to port before he had done a fair quantity of work. A trawl-net will perhaps last from two to four months, according to the nature of the ground worked upon; but during that time parts of it will have to be renewed. The back of the net, being exposed to the least wear, lasts the longest ; the under part will generally require renewing twice, and the cod or purse five or six times, before the net is finally con- demned. The additional size now given to the trawl- vessels has led to an alteration in the manner in which they are rigged. 'The term "smack" has been for a long time applied to those trading and fishing craft which were cutter rigged, and until quite recent years all the trawlers were known as trawl-smacks. It was a convenient rig; the single mast was stepped well forward so as to allow of a large aud powerful mainsail, at the same time giving pleuty of free space on deck for getting in the net, and stowing it and the long trawl-beam on the top of the bulwark when not at work. But when the size of the vessels was increased to 70 or 80 tons, it was found that the mainsail, enlarged in proportion, wanted a good deal more looking after in bad weather than was convenient, and the heavier main-boom caused a great deal of straining. More hands became necessary on this account than were required for ordinary fishing purposes, and the increased expenses interfered with profitable working. The new trawl-boats were therefore built of greater length, so as to provide room for a small second mast or mizen on which a gaff-sail could be carried, and thus something could be taken off the large mainsail. The result has been very satisfactory ; just as much sail is carried as before, but it is not so lofty, and being divided into smaller

pieces, it can be handled with greater ease and safety. As a gaff-sail is carried on the mizen, the rig is that of a ketch; had a lug-sail been used instead of a gaff-sail, the vessel would have been what is called "dandy-rigged." The increased length of the vessel in proportion to her size gives many advantages. Space is provided for packing away a considerable quantity of ice, which is a very necessary article in the present mode of working the North Sea trawl fishery; the produce of many fishing days can be properly stowed away and preserved in good condition, and the crew have more roomy and comfortable accommodation,—a point of importance, since at certain seasons they remain at sea for several weeks at a time.

ss Barking " the sails is a regular practice with the traw- lers, as it is with most other fishermen in England and Scotland, _ The process consists in mopping them over with a. composition of a solution of oak-bark, tar, grease, and

ochre, which acts as a good preservative of the canvas, This is done once in six or eight weeks, and a suitable place is kept for the purpose at all the important fishing | stations. | Working the beam-trawl requires some little skill which wo, can only be acquired by experience at sea. A knowledge the | of the ground and of the direction and times of the tide igh essential ; for the trawl is towed with the stream, a little | faster than it is running, so that there may be just sufficient) resistance from the water to expand the net. If it were — towed too fast, the pressure of the water against the long | transverse beam would tend to lift it from the ground, and — then the fish would not enter the net. This important point is regulated by a nice adjustment of the length of tow-rope to the force of the wind and state of the sea; and experience enables the fisherman to tell, by pressing the hand firmly on the warp between the vessel and the water, whether or not the trawl is working steadily over the ground. Lowering the trawl to the bottom is also a matter requiring great care, so that it may reach the ground with the beam above the iron heads and the ground-rope in its proper position below. This can only be managed by first getting the whole apparatus in a proper position at the surface, and then keeping the vessel slowly moving through the water whilst the lowering takes place. If, as sometimes happens in spite of all precautions, the net and beam should twist round while being lowered, and the apparatus should reach the bottom with its back

downwards, then the beam would be on the ground and the iron supports above, the mouth of the net would close, and no good could | be done with it. The only thing for the fishermen todo | under such circumstances is to haul up the trawl and shoot t it again. The popular idea that the beam is always drag- ging on the ground is therefore a mistaken one. The trawl is shot at the beginning of the tide, so that it may be towed for five or six hours, and during that time it will probably pass over from fifteen to twenty miles of ground. As trawlers when engaged in fishing are practically anchored | by their trawls, they cannot readily get out of the way of vessels meeting them, and the law admits this view of the case by obliging them at night to carry a single mast-head light as an anchor light, instead of the regulation red and — green side-lights for vessels under sail.

When the tide has finished, or the smack has reached the end of its fishing ground, the trawl is hauled up by a winch or capstan. This seldom takes less than three-quarters of an hour in fine weather, and two or three hours if it be rough. The beam is got alongside, and hoisted up and secured; then the net is gathered in, the cod or end of the bag being hoisted in by a tackle, and the cod-rope closing the end being cast off, the whole catch of fish falls out on deck. The fish are immediately sorted and packed away, and the fishermen prepare for another haul, according to the state of the wind and tide.'

Trawl-fish are separated for market purposes into two! great classes, known respectively as "prime" and " offal." | Prime includes turbot, brill, soles, dories, and red mullet, the last being caught in large numbers in summet, especially by the Brixham trawlers. Offal is the name | given to 'plaice, haddocks, whiting, and other kinds of | inferior fishes which are caught in great abundance, and usually sell at a low price. The term " offal" was applied | to these fish at a time when railways had not come into | existence, and purchasers frequently could not be found for the quantity of fish the trawlers would bring to market m one day. This was especially the case with plaice ane | haddocks when the newly discovered fishing grounds 10 | insincere 2 cae: 45 ae

1 Fuller details of the mode 'of working the beam-trawl will be | found in Deep Sea Fishing and Fishing Boats, London, 1874. |

ii

TRAWLING. | FISHERIE S 249

| the North Sea were first worked. A good deal of fish was | fishery ea have come to an =a sea cae reek It has, how- hrown over- | Ver, never been so prosperous as during the last few years. Ever

bie es cas ceght, – = aa ae cage: |= a oo or mo Lo see in the pee of the fish.

oard agal p ‘ Ing; tne actual condition of the fishery is generally understood,

orders not to bring ashore more than were likely to be sold | and the savings of the fishermen and many of the eaiiced. of

whilst fresh. Even in comparatively recent years trawled | the place are invested in it year after year. The trawlers do not

haddocks were of little value, until the practice of smoking work for weekly wages, but on the share principle, and the master

é is generally owner or part-owner of the vessel. It is consequent] them, as had long been done in Scotland, was adopted at the interest of every one on board to do his best to nike a md

Hull, Grimsby, and other places; and now not a haddock | cessful fishing, and the fact of the owner being in command insures is thrown away if it is in good condition when landed. It | due attention to economy in working, so that, whilst no necessary may be mentioned that round-fish, such as haddock and | expense is spared in keeping the sails and gear im proper order,

ie : . everything is made to last as long as possible. whiting, always suffer more or less in appearance when Brixham has been long considered the “‘mother-port ” of the

caught by the trawl, as they are liable to be knocked about trawlers, the place where the system of beam-trawling originated ; by the crowd of fish in

the small end of the net, especially | but although Barking, once famous as a fishing station, disputes _ _when the trawl is being hauled up. They do not therefore | the honour with her, there is no doubt that Brixham me, have led

ie ’ F the way in developing this particular method of fishing to its _ fetch a good price in the wholesale market, whilst haddock present large proportions. More than forty years ago some of

*and whiting caught by the hook are always in demand, and the Brixham vessels went to Ramsgate and fished the grounds at it need hardly be mentioned that the Scotch haddock, so | that end of the Channel. Others joined them and permanently long famous for their excellence, both fresh and cured, are | settled there, and now there are upwards of 160 sea-going trawlers 1 Reh iih hook and line belonging to the port. Ten years later Hull was colonized from al Caug : Brixham and Ramsgate, and Grimsby from Hull at a subsequent Ti ling The trawling stations in the west of England are Plymouth, and period ; whilst as early as 1818, Brixham smacks and fishermen stims. Brixham in Torbay, and this method of fishing has been carried on passed over to Dublin to commence deep-sea trawling in Irish _ from both places for probably upwards of 100 years, although the | waters. The important rise of Hull as a trawling station dates from Hull, __ date of its commencement has been by no means accurately ascer- | 1845, soon after the discovery of the famous Silver Pit, at the south * tained. It is certain, however, that at the beginning of the present | end of the Dogger Bank. Before that time the number of N orth century the trawlers were comparatively few, and not half the size | Sea trawlers was very small; they were only of about half the size Pl of those now at work. Plymouth does not appear to have progressed | of most of the smacks at present ; and not enough was known of inh, so steadily in later years as Brixham, and this may be partly caused | the fishing grounds to tempt the fishermen so far from land in by the more frequent interruptions from bad weather at the western vessels of such little power. For a long time, however, the line _ port. The south-westerly gales so common in winter are felt in all fishery for cod and haddock had been carried on in the neighbour- __ their violence on the fishing ground of Plymouth, and the heavy | hood of the Dogger, but in vessels specially constructed for the sea accompanying them sometimes puts a stop to fishing for two or | purpose. The Great Silver Pit, so called to*

distinguish it from a | three days at a time. The custom also at Plymouth of only fishing | smaller Silver Pit much nearer the land, was first worked over durin g during the day and returning to harbour every evening must | a very severe winter, —we bclieve, in 1843. Two fishing grounds | materially diminish the chances of the fishing being very profitable, | called the Well Bank and Botany Gut had been explored and dis- Bri

md for some few years past the number of trawl vessels has not | covered to be very productive; and between them and the Dogger, um. averaged more than about 60. At Brixham, where trawling is be- | and bearing true east from Flamborough Head, the Admiralty chart | lieved to have originated, and fishing has always been the chief | showed a bed of deeper soundings, ranging in some parts from industry, much more enterprise is shown. The trawlers there go | 30 to 40 fathoms, and the whole extending for about sixty miles _ to seaon Monday morning and remain at work till the next morn- | east and west, and from six to ten miles in breadth. The pateh ing, when they return and land their fish. After an hour or so | was inarked 'Outer Silver Pit," and on trying it with the trawl, in they again go off, and fish day and night till the next morning, and | the deeper parts at the western end and near the middle, soles were | 80 on every day till Saturday comes, when, having landed their fish, | found during that very eold season in almost incredible numbers ; _ they come to anchor, get their sails down, and spend the rest of | the nets were hauled up bristling with fish trying to escape through the day in mending their nets and putting everything in order for | the meshes, and such enormous catches were made as the most _ the next week's work. Sunday is a day of rest for all hands. experienced fishermen had never before thought possible. Of course : The history of the Brixham fishery has a very important bearing | it was not long before this remarkable discovery became known, | on the charges that have been brought against the trawlers of | and a migration of trawlers from Brixham and Ramsgate soon took

destroying spawn and very young fish, and of gradually exhausting | place to Hull as a convenient station from which to work on this the fishing grounds on which they worked. The Brixham men, | promising ground. With the breaking up of the cold weather, how- as a rule, keep to a particular stretch of fishing ground, extending | ever, this extraordinary congregation

of soles became dispersed ; from the Start Point, past Torbay, towards the neighbourhood | but more attention was from that time directed to the North Sea of Portland, —practically about twenty miles long and of variable fishing generally, and in after years the Silver Pit has again been . breadth, but mostly from three to eight miles off the land. There | found very productive whenever the winter has been very severe, : iS no record of how many trawlers there were at Brixham at or, as the trawlers call it, in "pit seasons." The fact of temperature | the beginning of this century, but it is known that they were affecting the distribution of many kinds of fish, shown in such __ few and less than half their present size. In 1852, however, there | a marked manner in this particular ease, is now receiving systematic were 70 of them, 85 in 1863, and in 1872 their number was | attention from the Meteorological Socicty of Scotland in connexion about 100, besides 20 others which worked on this home ground | with the herring fisheries, and very important results have appar- _ during the Winter; and new vessels are being built every year, ently been obtained from an inquiry into the same subject on the not only to make up for losses, but to add to the flect. "This | coasts of Nova Scotia. small strip of fishing ground has certainly been worked for more The value of the North Sea fishery soon became established, and than a hundred years, the fishing smacks have been steadily increas- | nothing in the history of our sea fisheries is more remarkable than | ing il number and have more than doubled in size, and yet there | the rapid but steady development of the system of trawling which

i ho sign of the ground becoming exhausted. The greater demand | has taken plaec from the Humber ports. The Hull trawlers were ee fish has no doubt encouraged the fishermen in their work, for | 40 in 1845, and most of these were arrivals from the Channel ports, I ey have obtained better prices for their fish ; but if the effects of | as previously mentioned ; but in 1863 they had increased to 270,

trawling were the exhaustion of the fishing ground, the Brixham | and in 1877 there were 440 first-class fishing craft, with an aggregate 1 : a = | of 26/310 tons, on the Hull register,—these, excepting a few | Froude, in his History of England, vol. xii. p. 397 (cabinet shrimping boats just over 15 tons each, being all trawl-smacks. edition, 1870), speaks incidentally of trawlers at Brixham so long ago | Another port on the Humber, Great

Grimsby, situated nearer Grimsby. as the time of the Spanish Armada. In his description of the English | the entrance of the river, has made still greater progress. It had attack on the Spanish fleet, he says :—“ Drake, returning from the | for some years been known in connexion with the North Sea eod chase, came up with her [the ‘Capitana,’ the admiral’s disabled ship] | fishery ; and the practice of bringing home the cod alive in welled } Mthe morning. She struck her flag, and he took her with him to | vessels, and keeping them so till they were wanted for the market, ‘ te where he left her to the care of the Brixham fishermen. . . . | led to the selection of Grimsby, rather than the more important town f prize proved of unexpected value. Many casks of reals were | of Hull, as better suited, on account of the greater purity of the salt ound in her, and, infinitely more important, some tons of gunpowder, | water, for preserving the cod in good condition in the floating with Which the ‘Roebuck,’ the swiftest trawler in the harbour, flew | store chests; and the extension of the Manchester, Sheffield, and ™ pursuit of the fleet.” “The « Roebuck ” is spoken of, in another | Lincolnshire railway to the port provided the facilities for sending account of the attack, as Sir Walter Raleigh’s ship, and therefore, no away the fish to the various inland markets. In 1858, when te armed. vessel ; and we heve been unable to find any evidence | the railway was nearly completed, five of the Hull trawlers made ‘Aere having been trawlers at Brixham at that date (1588). Grimsby their headquarters, and in the following year the linc was

opened to the town. The advantages of the port at once became evident, and the trawlers rapidly increased from 5 in 1858 to 70 in 1863; in 1872, only nine years later, the number was 248, and there were 82 cod smacks besides. In the return by the Board of Trade of the first-class fishing craft registered at Grimsby for 1877, the number of vessels, including trawlers, cod-smacks, and a few smaller craft engaged in procuring whelks for cod-bait, is officially stated as 505, with an aggregate of 29,924 tons, new measurement, which is more than one-third less than that known as builder’s measurement. This gives an average of over 59 tons; but many of these vessels are 70 tons, and even more.

By the courtesy of Mr Reed, the dock-master at Grimsby, we are enabled to give the following return of the quantity of fish sent away by rail from that town in each of the years from 1856 to 1877 :—

The only break in this increasing series is in 1875, and is readily explained by the fact the herring fishery in that year was a very bad one, and that instead of about 4000 tons of herrings being then landed from Lowestoft and other boats at Grimsby as had been the case for some few years previously, the quantity was very much smaller. Great, however, as has been the increase of fish sent away by rail from Grimsby, especially during the last two years, the re- turns above given do not represent all the fish landed at the fish- wharf ; for a new trade to the Continent has lately sprung up, and fresh fish is exported direct to the following places, the returns being given for the two years in which this trade has been carried on:~

Hamburg Rotterdam Antwerp

It must be remembered that this great increase of the Grimsby trawl fishery has not been at the expense of Hull and other trawling stations, for, except at Plymouth, where, owing to local causes, the number of trawlers has remained about the same for several years, the others have also more or less largely added to their fleets. Grimsby is indeed comparatively new as a fishing station, but it is fast outgrowing in this particular trade the con- veniences which, at the time they were provided, were thought ample for anything that would be required. A special dock of 12 acres in extent was constructed for the use of the fishing vessels ; another of 11 acres has lately been finished, as well as a graving dock capable of holding ten smacks at a time. The fish are all landed on a covered pontoon 828 feet long and 48 feet wide; but so crowded has this landing wharf become, that an addition to it is likely to be made. Ice companies have also been established, with steamers of their own constantly bringing ice from Norway for the use of the fishcries. This is largely employed in packing the fish for transit by rail inland; but ice now also forms part of the regular fit-out of the trawlers, more particularly from September to May, when, there generally being plenty of wind, each vessel brings back its own catch of fish. An air-tight com- partment is fitted in the hold of the vessel, called the " ice-box," in which from two to four tons of Norwegian ice are placed when she starts on

her trip, or " voyage," as it is usually called. As the fish are caught they are stowed away below in bulk, with broken ice be- tween the layers, and this is continued till a good quantity of fish has been collected. Then the vessel returns to port, after an absence of perhaps ten or fourteen days. The fish are taken out loose and put up to auction, the buyers finding the packages ; in these the fish are packed with a sprinkling of crushed ice again between the layers, and an cxtra quantity at the top, which is covered with straw and tied down, From May to September, however, when light winds prevail, a different system is adopted, and the vessels fish in fleets of from twenty to fifty together. 'Their fish are collected every day by carriers, either steamers or fast-sailing cutters, which receive what each vessel has to send in, and with it a consignment note, or " pot-list," to the wholesale dealer who has to sell it as soon as it reaches the market. All the fish are packed in ice as before, and are repacked in ice when sent away to the fishmonger, who keeps them under the same cooling influence till almost the moment of sale to the consumer ; so that from first to last the value of ice in the trawl fishery is almost incalculable. Without this material the supply of trawl fish in a wholesome condition for food would not be a tenth of what it isnow, the price would be infinitely greater, and

the various trades benefiting by the trawling system would not be in such a thriving condition as is now the case. The public of course do not get their fish so fresh from the sea as formerly, and there is sometimes a want of flavour about it which is undoubtedly due to long icing ; but if the fish be cooked as soon as taken from the ice, it is still wholesome and generally palatable food.

Besides the trawling stations we have more particularly mentioned, Great Yarmouth is of some importance, as, in addition to a con- siderable fleet of trawlers belonging to the place, many of the Barking smacks also fish from that port ; but after what has been already said, there is nothing special to add regarding the trawling from Yarmouth, Lowestoft, Barking, Ramsgate, and some smaller stations.

Steam trawling.—An endeavour is now being made on a toler- Steam ably large scale to utilize steam in deep-sea trawling. The experi- ald ment is not altogether new, it having been tried on the Devonshire , coast a few years ago, but without success; for, although steam answered perfectly well in towing the trawl, and saved an immense deal of labour in hauling up the net, and time in going to and r- turning from the fishing ground, it was found that the expenses were too heavy. About five years ago a steam cutter fish-carrying company was started at Yarmouth, with the intention of using the vessels for either trawling or taking the fish to market; but it appears to have been soon found that it did not pay to use the steam for trawling, and that the vessels would be more profitably employed in the carrying trade. The steain-trawling now being . worked is from Shields ; and the fact is worthy of note, for it was along this particular part of the east coast—from Sunderland north- wards—that the complaints against trawling were so loud in 1863, ‘ that the royal commission of that year was appointed to inquire into the working of the trawl system, and they commenced their | inquiry at Cullercoats, only three miles north of the present head- quarters of steam-trawling. In 1877 it appears that trawling was tried with one or two steam-tugs, which, owing to the badness of the shipping trade, had very little to do; and it was found to he so successful that others fitted out for the same work, until about forty were engaged steadily in this fishery whenever there was nothing to keep them at home. The latest information is that other more suitable vessels are about to begin, and that by way of further ex- periment fast steamers are to be employed to collect the fish from the trawlers, which will take it to London, it is calculated, in about twenty hours. The best ground fished by these steam-trawlers is said to be north of Newbiggen, and at some little distance from the land. Very fine soles are reported to be taken there, and no doubt the character that part of the coast formerly had for turbot has not been entirely lost. The chief grievance of the Newbiggen fishermen in connexion with this trawling is that their long lines are interfered with; but as they are in the habit of setting their lines, and then leaving them all night to take care of themselves they can have no just or legal cause of complaint against fishermen who are working another method of fishing in the same neighbour- . hood, and who have no means of finding out where the lines are after it has become dark. It is well- established law that no one | can be held responsible for the loss of fishing gear in the open Sea if the owners leave it unguarded. |

With regard to trawling grounds, those hitherto worked in the Trav North Sea are principally on the Norfolk and Lincolnshire coasts °°” for the home fishing, whilst the off grounds are about the southem part of the Dogger, and towards the Dutch coast.!_ Some localities are famous for haddocks, others for plaice, while soles are abundant on particular grounds But there are seasons for each locality when the fish frequenting them become more numerous there. There 18 good trawling also to be had off Hastings, on the Diamond grounds, as well as on the Varne and the Ridge in mid-channel, and from the North Foreland far into the North Sea. On the western side of England, the Liverpool and Fleetwood trawlers work according t the season between the Isle of Man and the English coast, sometimes going into Carnarvon and Cardigan bays; and the Tenby ground 1s fished by smacks belonging to Tenby, and by several from Brixham during the sumnier months. at, Nut

The number of sea-going trawlers now working on the English coasts cannot be less than between 1700 and 1800, and of these = upwards of 1300 regularly fish in the North Sea. Taking a low average of five hands to each vessel, we have nearly 9000 inen am boys engaged in this fishery, and trained to a regular sailor’s life.

Drift Fisheries.—The next in importance to trawling among the English fisheries is that carried on with drift. nets for mackerel, herrings, and pilchards. It 18 Ur doubtedly the most common method of net-fishing the coasts of the British Islands, but nowhere is 1b 8? general as in Scotland. There are, however, some consider- ef ee ee

Drif fishe

1 The great increase of large trawlers within the last few years – naturally led to a more extended field of work, and many of them n0v go much further to sea than formerly.

-which we have the oldest records.

DRIFT FISHERIES. |

able drift fisheries on the eastern and southern coasts of England, and the important mackerel fishery is mainly at the western end of the Channel. The value of that mode of fishing, technically known as " drifting or driving," will be understood wheu it is remembered that it is the only inethod by which such fishes as herrings, mackerel, and pilchards, which generally swim at or near the surface, can be readily caught in the open sea, at any distance from the land, and in any depth of water, so long as there is sufficient for the floating of the nets in the proper position. The term '"drift-net" is derived from the manner in which the nets are worked, They are neitlier fixed nor towed within any precise limits of water, but are cast out or "shot" at any distance from the land where there are signs of fish, and are allowed to drift in whichever direction the tide may happen to take them, until it is thought desirable to haul them in. 'The essential principle of the working of the drift-net is that it forms a long wall or barrier of netting hanging for a few fathoms perpendicularly in the water, but extending for a great length horizontally, and that the fish, meeting these nets and trying to pass them, become meshed ; they force their heads and gill-covers through the meshes, but can go no farther; and as the gill-covers catch in the sides of the mesh, the fish are unable to withdraw and escape. Whether it be mackerel, herring, or pilchard, the manner in which the net works is the same ; the variations which exist relate only to the difference in habits and size of the fish sought after,

We will first speak of the Yarmouth herring fishery, one of the most important English drift fisheries, and the one of The thriving town of Great Yarmouth in Norfolk is said to have been the resort of fishermen during the herring season as early as the 6th century, and there is no reason for believing that the fishery with which its name has been so long associated was ever carried on by any other method than drift-nets, as at the present day. Animmense deal of information about the early records of the herring fishing at Yarmouth and other places has been compiled and published by Mitchell in his book on The Herring, and to him we must refer our readers for numerous historical details on the subject ; but we may mention that, according to authorities quoted by him, Yarmouth was erected into a burgh by Henry I. in 1108, the annual payment for this privilege being " ten milliers of herrings," The fishery was then evidently re- cognized as being well-established, and herrings as the~ Special trade of the town, A quaintly

written account also of the origin of Yarmouth, as given by Manship (who wrote in 1619), is quoted in the following note by Swinden? in his history of the town :—

“And now b iliti that from the Dilict Covtich eee im anno 495, now 1124 years past, this tides, did by little and little lift its head above the waters ; and so in short time after, sundry fishermen, as well of this kingdom, viz., of the Five Ports (being then the principal fishermen of England), i also of France, Flanders, and the Low Countries, yearly about the feast of St Michael the Archangel, resorted thither, where they pS oe In tents, made for the purpose, by the space of forty oa > Soni ta killing, trimming, salting, and selling of herrings, ne ente oF Len — oak purpose ; whereunto did resort the date the seas. pee me , and other places to buy pd Pho ardor: = i eparted ; as those fishermen who ki aft 0 do at this present. So in short time

er, as that sand became firm land, and that thereby traffic began More and more to be increased, men finding the same to be a com- Fete Place to dwell and inhabit in, did for that purpose gather

mselves together, to have a continual residence therein, and

“san to build houses, of which came streets, and of those streets 18 flourishing township.”

a —“‘“‘“‘ O™sS

1 : :

(186d) Herring ; its Natural History and National Importance

2 fox e o,@ Hisiory and Antiquities of Great Yarmouth, p. 5 (1772).

it is my opinion very clear, of the Saxon adventurers) sand, by the defluxion of

Manship's conclusions, of the antiquity of the

Without placing entire faith in however, there is sufficient evidence Yarmouth herring fishery ; and as it keeps up its repute at the present day, and has indeed considerably increased in recent years, some details of its working may be acceptable. The nets used in the drift-fishing were formerly all made of hemp or flax, but for some years past cotton has almost entirely superseded these materials. Cotton nets are manu- factured at Bridport, Manchester, Musselburgh, and other places, and are about 30 yards long and 9 or 10 yards deep. One of the long edges of the net, called the " back," is fastened to a rope corked at regular intervals, whose pur- pose is to keep that part of the net uppermost. The number of such nets used by each vessel depends chiefly on her size, and ranges from 80 to 130, or even more. They are fastened together end to end, and thus united form what is called a "train, fleet, or drift of nets," often ex- tending to a length of more than a mile and a quarter. The size of the mesh was at one time regulated by law, and the smallest dimensions allowed in herring nets were one inch "'from knot to knot along the line," or, to speak more con- cisely, one inch square. Under the present fishery regula- tions, however, it is wisely left to the fishermen to choose a mesh of such a size as will be most effective in catching the fish, and their practical good sense does not often lead them astray in this matter. With herrings of average size the inch mesh is found to do the most profitable work. An exception to this freedom from restriction to any particular sized mesh exists, however, on one part of the west coast of Scotland, and to that we shall direct attention when we speak of the Scotch fisheries. Twine nets are coarser than those made of cotton, and the material not being so flexible, machinery cannot be satisfactorily used in their manufacture ; they are therefore netted by hand, and are made in narrower pieces called " deepings," which are laced together one below the other to make up the required depth. The labour of hauling in these nets is of course more severe than with cotton, on account of their greater weight and faculty of absorbing the water; and the comparative stiffness of the mesh is not so favourable to the capture of the fish when they strike the net. On the other hand, it was objected to the cotton nets that the thread was so fine as to cut into the fish which were meshed, and to tear off their heads as the nets were hauled in. What- ever force there may be in this objection, the advantages in time and labour saved both in making and

working cotton nets have practically decided in their favour, and cotton is now almost universally employed in all our drift-fisheries, The object of the cork-rope is, as we have said, to keep that edge of the net uppermost, but in the ordinary uet the corks are only sufficient for that purpose, and will not prevent its sinking. This is provided against by the use of buoys, or "bowls," as they are called, one being attached by a rope to each net, and by lengthening or shortening this rope the net can be kept at any distance below the surface that may be considered best for catching the fish. It is always a matter of uncertainty at what depth the fish may be found, and a good deal of judgment is needed in sinking the nets, if there are no signs of the fish being near the surface. It is found couvenient to colour these bowls so as to mark the divisions of the fleet of nets. The first net, or the one nearest the fishing boat, is marked by a small white bowl, called the "puppy," and at the end of the next four nets is a "dan," or buoy with a pole carrying a small flag. The rest of the nets are marked in four divisions ; at the first quarter from the pole is a bowl painted one quarter red and three quarters white ; the next is half red and half white ; and at the beginning of the last division the bowl is three quarters red and one quarter white. All the rest of the bowls from the beginning to the

end of the train of nets are entirely black. The only part of the gear in connexion with the long string of nets is the warp, a stout rope to which each net is fastened by two smaller ropes called "seizings," and long enough to allow the warp to hang down near the foot of the nets. This warp has a twofold purpose: it prevents the loss of the nets if by any chance a vessel should pass through and cut them when near the surface, an accident not unlikely to happen, as the nets are only used at night and extend a considerable distance, often in the course of trading vessels going up and down the coast ; and it is by means of the warp the nets are hauled in, the strain being thus brought evenly, by means of the seizings, on each separate net. The Yarmouth drift boats are the largest used for this kind of fishing on any part of our coasts. They are fine decked vessels of about 36 tons, the largest being upwards of 52 feet on the keel, with about 17 feet beam and 7 feet depth of hold. The universal rig has long been that of a lugger, with two masts only, and they carry a jib, a large dipping fore-lug, and a mizen with

a topsail. ‘The mizen- mast is always kept standing, but the fore-mast is made to lower backwards when fishing is going on, so as to enable the vessel to ride easier, as at that time she is head to wind and without any sail that can steady her. The mast is not lowered on to the deck, however, but, as is the practice with all large drift-boats, the head is supported on a wooden crutch 10 or 12 feet high, in the Yar- mouth vessels called a “mitch-board.” In this manner the mast lies very suug, and does not interfere with the room on deck. The interior of the vessel is fitted up with separate spaces for the nets, warp, fish, and salt, of which last a quantity is always taken to sprinkle the fish with before they are stowed away. These boats carry as many as ten or twelve men, as the labour of hauling in the nets is considerable ; but more than half the crew are landsmen who are mainly employed at the capstan by which the warp and nets are got in. Strength, and not nautical know- ledge, is required for this work ; and all the important part of the fishing—the deciding where to work and at what depth to place the nets—is the business of the experienced fishermen.

Drift-net fishing is with rare exceptions only carried on at night. The time for commencing is just before sunset, and the nets are then got into the water by the time it is dark. When the vessel has arrived at what— from certain indications, such as numerous seabirds or possibly fish playing at the surface, or even without any special signs to guide the fishermen—may be thought a likely place for fish, for there is a great deal of speculation in the matter, the vessel is sailed slowly before the wind, and if possible across the tide; then the net is shot or thrown out over the vessel’s quarter, the men being distri- buted at regular stations, some hauling up the net from below, others throwing it over and taking care that it falls so that the foot is clear of the corked back; others, again, looking after the warp which has to be paid out at the same time, and seeing that the seizings are made fast to it in their proper places. When it is all overboard, and about 15 or 20 fathoms of extra warp, called the “swing- rope,” given out, the vessel is brought round head to wind by the warp being carried to the bow; the sails are then taken in, the mast lowered, a small mizen set to keep the vessel with her head to the wind, and the regulation lights are hoisted to show that she is fishing. A few of the hands remain on deck to keep a look out, and the vessel and nets are left to drift wherever the wind and tide may take them. It is very rarely that there is an absolute calm at sea; and if there is the faintest breath of air

stirring, the fishing boat will of course feel it more than the buoys supporting the nets ; she will consequently drift faster, and

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being at the lee end of the train, will have a constant pull upon them, and so keep them extended almost in a straight line, so that every portion of the nets hangs clear and free from folds. If there is a great deal of wind more swing- rope is allowed, so that the nets may not be dragged through the water or any undue strain be thrown on the warp, as the more warp there is out the greater spring there is in it, and the less danger of its breaking. The first net in the train is called the "look-on" net, and frequently after an hour or so, that one is hauled in to see if any fish have been taken, and if so, in what part of the net. If it has been allowed to sink too low, that will be shown by the fish being only in the upper part of the net, cr vice versa. Such an examination of one of the nets (called in Scotland by the name of "preeing") also some- times discloses the fact that dog-fish are unpleasantly abundant, and this makes it desirable to haul in the nets very soon, as these pests of the fisherman do a great deal of mischief to both the fish and the nets if they are allowed to remain long in the water. The operation of hauling in the nets is carried on in the same systematic manner as in the case of shooting them. The laborious part of the work is now perforined by the " capstan-men," whose duty it is to heave in the warp, the regular fishermen looking after the net as it comes on board, and shaking out the fish, which is at once sprinkled with salt and stowed away in the fish room.

After a day or two, depending on the success or failure of the fishing, the vessel returns to port; and the general practice siuce the opening of the extensive covered fish market by the side of the Yarmouth haven is for the luggers to go into the river and deliver their cargoes direct into the market. It is at times, however, a difficult matter to enter the haven, and then the old practice of landing the fish on the beach in front of the town is resorted to. The landing is effected by means of large " ferry-boats," which go off loaded with baskets of a peculiar shape, called "swills," each one capable of holding 500 herrings, and put them on board the lugger which is

anchored at a short distance from the shore. The fish are then counted rapidly into the baskets, which are placed, when full, in the ferry-boat, and as soon as she is loaded she returns and is laid broadside on to the beach. A set of strong, active fellows, known as " beachmen," at once go to work, and two men taking each basket between them in their arms, soon carry Up the fish to the carts waiting to take them either to the market or direct to the curing houses. The situation of the market by the side of the haven is very couvenient; and, if required, more room can be easily provided by adding some of the vacant land imme- diately adjoining it, and with the same river frontage. The market was completed only in 1867, and although the Yarmouth fishery has been carried on continuously for many centuries, it is only since the openiug of the new market that an accurate account has been kept of the quantity of herrings landed there.

The following statement shows the number of lasts of fish received at the market during each of the ten years 1868-77, and as a "last" of herrings contains 13,200 fish, some idea will be gained of the produce of the Yarmouth fishery, without taking into consideration what is landed elsewhere by Yarmouth boats:

Lasts.

15,098 13,608

Lasts.

18,796 17,724 11,820 12,824 18,900

19,420 19,008 14,450

The following is the mode of counting herrings on almost all

parts of the east coast of England :—

4herrings = 1 warp.

33 warps = lhundred = 132 fish 10 hundreds = 1 thousand = 1,320 ,, 10 thousands = 1 last = 135200

Only 30 warps or 120 fish, however, go to a “hundred” of mackerel.

It will be observed that considerable fluctuations have taken place in the produce of the Yarmouth fishery during the last eo years ; and there is no doubt that they have been almost entire y caused by variations of weather during the herring season.

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ee FISHERIES oct

A few words must be said here about the manufacture of | and December, and at the extreme west in the early part bloaters and red herrings, which las made Yarmouth famous | of the year. It is not a very important fishery there, ‘all over the world. ‘The same mode of curing herrings is | however, and the attention of the fishermen is soon entirely now adopted in inany other parts of England and in Scot- | given to the more lucrative fishing for mackerel, which may land, but the time spent on the operation is not in all cases | be said to have its headquarters at the mouth of the the same. Channel, although the fish gradually advance eastward as As soon as the herrings are brought to the curing houses at | the summer goes on. Yarmouth, the fish are all washed to get rid of the salt they were The mackerel drift fishery is worked practically in the Mackerel

sprinkled with on board the fishing boats, and then, without being ed . : : 4 : aa, or any other preparation, they are again put into salt, which — sale. “4 pis for herrings, but a larger mesh is of aa is generally brought from Liverpool. Their subsequent treatment | COUrse required, and about an inch and a half square has Ushery.

depends on whether they are to be made into red herrings or | been found most suitable. That, however, is not the only bloaters. The latter—Yarmouth bloaters, par exeellence—are gene- | difference between mackerel and herring nets. It is the

rally selected fish, full-roed and of the best quality. The finest are : F sie in October and part of November, when the home fishery is special habit of mackerel to keep near the top of the water,

going on, and they should be cured as soon as possible after they and the nets are consequently so well corked as to are taken out of the water. Strictly speaking, a bloater is nothing | float at the surface. It is also unnecessary to have the

more than a herring that has been only slightly cured; it is kept in | game depth of netting as when herring fishing, and what is salt from twelve to eighteen hours, and then smoked for about saved in this direction is added to the length, A full train

twenty-four hours. But as any herring can be made into what may : be patie a bloater, and there being always a demand for them, | Of mackerel nets as used by the large Yarmouth drift-boats

their manufacture is carried on throughout the season with the best | is as much as 24 miles long, or double that of a herring fish that can be obtained ; and we need hardly say that bloaters are | fleet. Twine was long used in their manufacture, but to be had all over the country, and cured in various places, which cotton has taken its place generally whenever new nets

come far short in excellence of the selected Yarmouth fish. A : : : properly cured bloater is ready for the market at once, and the | Were required. Mackerel first appear in deep water south

sooner it appears on the breakfast table the better it is likely to | and south-west of the British Islands, and are sometimes taste. In the last few years some bloaters have been prepared at caught as early as January many miles west of Scilly, but ‘ Yarmouth with even less curing than that we have spoken of, but the general Cornish fishery does not usually begin till

they will not bear keeping very long. It is the practice at Yar- : F mouth to keep the fish in salt for fourteen days if they are to be | towards the end of February, and it extends into June.

made into “red, well-cured, or high-dried herrings”; they are then | May, June, and July are the monthsin which the mackerel washed and hung in wood-smoke for another fortnight. The curing | drift fishery is carried on

farther up the Channel, and at is mainly done by women, and after the fish have been taken | the later part of that season in the southern portion of the

out of the salt and washed, they are “rived” or strung in ° : “spits,” or thin sticks, about 7 ee Wee. whieh are feta North Sea. The important fishery for mackerel is, however,

under one gill-cover and out at the mouth. ‘Twenty-five fish are | On the Cornish coast, and thither resort fishing boats from put on each stick. The spits are then taken to the smoke-room,— | Yarmouth, Lowestoft, and the various Channel ports, and, a lofty chamber, perhaps about 16 feet square, having a series of } jn company with the famous Mounts Bay luggers, devote

wooden frames reaching from floor to roof, with small transverse Sligo . : beams, called “loves,” beginning at a distance of six or seven fcet themselves to the ingathering of this great harvest of the

from the ground, and running, one above the other, from one side | 8¢@. Many thousands of tons of mackerel are landed at of the room to the other. The frames are four feet apart, and the | the western ports during the season, particularly at

spits are placed in rows between them, the ends of the spits resting Plymouth and Penzance, and are sent away by rail to the on opposite loves. The roof is made of tiles, uncemented, so as to London and other markets

allow a good draught through the room, which when filled contains : ; i ‘ three lasts of fish. About sixteen fires are made on the stone floor The pilchard drift fishery is worked in the same manner Pilchard

of this room, the fuel generally being oak billets, which give a high | as that for herrings, but rather a smaller mesh is used, and drift colour to the fish. Ash timber, producing a different colour, is herring nets which have shrunk too much for their original fishery.

used in some cases, to suit the fancics of particular foreign markets. When the room has been thus filled sith spits of fish, the firesmare | Purpose are

ag hii Se yeaa ag Saat!

lighted and kept burning for two days; they are then let out, and | Piulchards. This fishery begins in July and continues till the fish allowed to drip for a day ; the fires are again kept alight | September. It is mostly worked on the coast of Cornwall, for two days, and the process of alternately drying and dripping | but during the last few years a great many of these fish

is continued for a fortnight, when the herrings are considered thoroughly cured, or high-lried, and are fit for Tene We ie have been taken along almost every part of the south coast

export trade they are packed in barrels, each of which should hold | Of Devon. Pilchards = be regarded in England as 650 good-sized ‘fish, or a larger number of smaller ones. The. essentially Cornish fish ; there is very little sale for them

*manufacturer’s name and the number of fish are marked on each | out of their proper county, but there they are looked upon purrel. ‘The export trade is to Italy, the Greek lands, and the | almost aaron of the teceseanids “of life and over house- Levant. _ The time employed in curing these herrings is longer than ; ; ‘ TY siven in Scotland, but in some cases only half the usual time is | bold likes to have a store of salted pilchards for winter use. allowed, and such fish are sent by steamer to the Mediterranean, | These are all the produce of the drift nets, the fish taken where they are soon disposed off ; but it is not considered safe by the seans being cured for export to the Mediterranean. eal to consign any but *‘ well-cured ” herrings to the foreign A new industry in connexion with the pilchard fishery has Sardines. » especially in warm climates. For the home market both . : bloaters and ‘ reds” are packed as arule in flat boxes. been recently established at Newlyn in Mounts Bay, and at Mevagissey, further to the eastward. This is the manu-*

The drift fishery for herrings is carried on more or Jess | facture of “sardines” in precisely the same manner as has along the whole east coast of England, throughout the | long been carried out on the French coast. The so-called English Channel, and to a small extent on the Welsh and | «

sardines," caught so largely in the Bay of Biscay, being western side of England. The seasons for this fishery | nothing but young pilchards, there seemed no reason why

iffer, however, on different parts of the coast. It com- | the Cornish fish if treated in the same way as the French mences on the Northumberland coast in the latter part of | should not turn out as good. Curing establishments were July, becoming later as we go southward ; at Yarmouth | therefore set up at the two places named, and measures and Lowestofé the home fishery is in October and Novem- | having been taken to ensure a thorough knowledge of the er; but a spring fishing has been made for some years | French mode of curing, " Cornish sardines," or " piulchards Past at Lowestoft, beginning at some distance from the | in oil," were prepared, and with so much success that orders land, and gradually coming nearer as the season advances. | for them are now received for more than the present limited Itisa fishery that has given rise to much complaint on | means of manufacture can supply. "count of the generally small size of the fish then caught. Sean Fisheries.—Sean or seine nets are used on the Sean n the Channel herring fishing goes on during November | English coasts chiefly for the capture of mackerel and fisheries.

St Ives pilchard fishery.

pilchards, but sprats and various other fish are occasionally taken by them. 'The particular fishery with which this net is most commonly associated is that for pilchards at St Ives, on the north coast of Cornwall, where seans are kept in readiness for working on a very large scale. For a long course of years St Ives Bay has been more or less visited by shoals of pilchards, generally during the months of October and November. These fish are found in abundance off the south-west of Ireland rather earlier in the year, and it appears as if the shoals were

a time, and receive £3 a month, and one hogshead out of every hundred hogsheads of fish landed. When the shoal has come within a convenient distance of one of the sta- tions, the boats containing the sean and stop-sean, which have been previously joined together, commence shooting the nets at the same time, the larger net being thrown out in a direction parallel with the shore, while the stop-sean is shot in front of the shoal as the boat is

rowed towards the land. The two boats ultimately turn towards each other, and gradually bring the ends of the nets together, thus cut- ting off and surrounding as many fish as they can. The

returning towards the Bay of Biscay, when they arrive on the north coast of Cornwall in October. In their course southwards some of them enter St Ives Bay and sweep around it, and if, in doing so, they come within a certain range of part of the shore, the seans are brought into play, and large captures of fish may be made. The seaning ground is on the western side of the bay, and extends southwards for nearly three miles from the bar. It is divided into six stations or "stems," by marks or bound- aries on the land, in positions fixed by a local Act.1. These stems have each a name, and no fishing boats besides those employed in the sean fishery are allowed to fish or anchor within a certain distance of the stems between an hour before sunrise and the same period after sunset from the 25th of July to the 25th of December; and any passing boats must keep near the shore. Under favourable circum- stances the fishery is likely to be so valuable and of such general advantage to the town that the Act of Parliament regulating the proceedings is strictly carried out with the approval of all concerned. For this reason also no seans below a certain size are allowed to be used, so that the danger of disturbing a large body of fish, and perhaps frightening them into deep water without having secured a good haul, may be as much as possible avoided. The smallest sean of legal size at St Ives is 160 fathoms along the cork-rope, with a depth of 8 fathoms at the middle or bunt and 6 fathoms at the ends or wings. Some of the seans are as much as 200 fathoms long, and the mesh in all is three-quarters of an inch square throughout the net. The object is not to mesh the fish as in a drift-net, but to inclose them. What we have described is the sean proper, but there is another of smaller size and different proportions which also takes part in the fishery. This is called a tuck- sean, and is only 70 to 80 fathoms long, but it is 8 fathoms at the wings and 10 fathoms in the middle or bunt. Besides these there are other nets called stop-nets, which are practically only additions which can be made to the principal sean, and which are so used when the sean is being worked. As there are about 250 seans at St Ives, and only six stations in which they can be used, some arrangement is

necessary to prevent confusion and inter- ference, and this and other details are the subject of special regulations, The seans are all registered, and many of them belong to companies. Several boats are employed whena sean isto beshot. The largest, called the sean-boat, is about 32 feet on keel, with plenty of room for carry- ing the net; she has six men for rowing and two for shoot- ing the sean. Two tow-boats about 24 feet long, and each carrying a stop-net, with a crew of six men, make up the working party; but besides these there is a small boat called the "volyer" or "lurker," from which the master seaner directs all the proceedings. The position of the shoals of fish is pointed out by men called " huers," who are selected from the sharpest and cleverest of the fisher- men. 'There are generally two of them on the hill above each station, and when they see the shoals of fish, looking like the shadow of a cloud on the water, they signal with a large white canvas ball to the boats waiting below in the stations. These men remain on duty for three hours at

14 and 5 Vict. c. 57,

second stop-net is joined to the first if there is a probability of its being wanted. The nets are then fastened together at the point of meeting, and the circle gradually contracted until all the fish are inclosed by the single large sean. The ends being securely joined and the stop-nets taken away, the circle of netting with the inclosed pilchards is slowly hauled towards the shore, into some quiet place as much as possible out of the run of the tide, till the weighted foot of the net touches the bottom, and there it is safely moored. The fish cannot now escape, and if the haul be a large one several days may elapse before they are all taken out. " Tucking" the fish is the next operation, and this is per- formed with the tuck-sean, which we described as being very deep in the middle. It is shot in the ordinary way with one boat, but inside the other sean, and as it is hauled in, the foot of the bunt is raised so as to bring the fish to the surface, whence they are dipped out in large baskets and put into attendant boats to be carried on shore. This is of course the exciting moment of the day, and all the town is astir, and taking part in the general rejoicing. Landing and carrying the fish to the curing houses is done by men termed "blowsers," who are paid in proportion to the catch of fish. The seanmen receive certain wages in : money and a share of the fish, and every household does a little curing on its own account. The

great bulk of the fish, however, goes into the houses of the large curers, who | are generally the proprietors of the seans.

Women are employed in the curing, which consists in packing Pile, the pilchards in alternate layers of coarse salt and fish on_the curit stone floor of the curing house, until the " bulk," as it is called, has reached a height of five or six feet. The fish remain here @ month, and the oil and brine draining from the mass are carried off by gutters in the floor to a cistern. When the fish have been sufficiently salted they are washed and packed with the heads out- wards in hogsheads, and a "rose" of fish in the middle to keep the level. Gradual pressure is now applied on top of the fish, until the contents of the cask have been reduced one-third in bulk, and a large quantity of oil squeezed out ; this escapes through the sides of the hogshead, the hoops not being at first very tightly driven. The cask is filled up three times before the pressing is finished, and then, after eight or nine days, the hogshead of fish should weigh four hundredweight gross. The average number of fish in each hogs- head is 2500, and sometimes as many as 1000 hogsheads have been taken at one haul of the sean The largest single catch recorded at St Ives was 5500 hogsheads actually landed, and on that occasion great numbers of fish were lost besides. The fluctuation in thesean- pilchard fishery at St Ives is very great from year to year; and x | would appear remarkable, if the success of the fishery did not almost | entirely depend on whether or not the shoals came into that part |

|

of the bay where alone the seans can be used. The St Ives sean- fishery has been unsuccessful for the last four years, less than 10,000 hogsheads having been cured in each of those periods ; but in the 'Pilchard Circular" issued by Messrs G. C. Fox & Co. of Falmouth, giving an account of the fishery season of 1877, it is said that " considerable bodies of fish visited the coast, but did not come into the stems where seines might have inclosed them." ? The pil- Oe gs ce ee

6

2 It is difficult to suggest any satisfactory explanation of the fact) that, though large shoals of pilchards are every year observed passing the north

coast of Cornwall, it is only in particular years that any great numbers of these fish enter St Ives Bay and come within reach of the seaners. It might seem that the streams, containing drainage from mining works, which fall into the bay, would pollute the water, and tend to turn back the fish, but there is much less mining in the neighbourhood now than formerly. The fishermen's idea that the state) and direction of the tide, when a shoal of fish is near the entrance to the bay, affect the course of the shoals appears more plausible, for it must .

St -net fis ry.

Sj ts,

chards cured by the sean owners at St Ives are all sent to the Italian markets ;! and we have to thank Messrs Fox for the fol- lowing statistics of shipments since 1815. The fluctuations are almost entirely due to the variations in the great sean fisheries :—

Export of Pilchards to Italian Ports from 1815 to 1877.

Year. Hogsheads. Hogsheads. . Hogsheads.

1815 15,000 3,289 1816 20,000 5 4,981 1817 24,000 1 11,078 1818 1,700

1819 2,900

1820 800

1821 2,000

1822 9,123

1823 24,109

1824 7,611

1825 12,651

1826 10,670

1827 5,238

1828

1829

1830

1831

1832

1833

1834

1835

1836

The special sean fisheries for mackerel are along the Chesil Beach near Portland, and on the Sussex coast, at and near Brighton; but they do not call for particular notice.

Stow-net Fishery.—This fishery appears to be entirely confined to the Solent, inside the Isle of Wight, the estuary of the Thames, and the Wash, between the Norfolk and Lincolushire coasts. It is specially for the capture of sprats, although many young herrings are sometimes caught, and it is worked most extensively at the entrance of the Thames. The stow-net is a gigantic funnel-shaped bag having a nearly square mouth, 30 feet from the upper to the lower side, and 21 feet wide. It tapers for a length of about 90 feet to a diameter of 5 or 6 feet, and further diminishes to about half that size for another 90 feet to the end of the net. The whole net is therefore about 180 feet or 60 yardslong. The upper and lower sides of the square mouth are kept extended by two wooden spars called "balks," and the lower one is weighted so as to open the

work. The size of the meshes varies from an inch and three-eighths near the mouth to half an inch towards the end, where, however, it is again slightly enlarged to allow for the greater pressure of the water at that part. The

mode of working the net is very simple. Oyster smacks | = . ae ‘more or less all round the British Islands, and various fisheries.

kinds of fish, such as cod, haddock, whiting, coalfish,

are commonly used in this fishery, although shrimping boats are also employed in it in the Thames. The smack takes up a position at the first of the tide where there are signs of fish, or in such parts of the estuary as are frequented by the sprats during that part of the season ; she then anchors, and at the same moment the net is put overboard and so handled that it at once takes its proper

position, which is under the vessel. It is kept there by a | : in use at Harwich as early as 1712, and in them the cod

very simple arrangement. Four ropes leading, one from each end of the two balks, and therefore from the four corners of the mouth of the net, are united at some little distance in front, forming a double bridle, and a single

mooring rope leads from this point of union to the vessel’s |

anchor ; so that the same anchor holds both the vessel and

we net. The net is kept at any desired distance from the | ottom by means of two ropes, one from each end of the |

Upper balk to the corresponding side of the smack, where i ee that, though the fishery season lasts several months, it a a a pes that the nets are put into the water, and the tide ie ati, Fo avourable when the fish are heading towards the bay. It

clear that, as the sean fisheries of 1871 and 1873 were the

most successful on record, th uminuti Pilchards from over-fishing. a

fishery for pilchards hag recently been established along the |

coas ial : % t of Galicia, and Spanish pilchards, cured in the same manner as

the Cornish fish are i i , are making their i ’ a Siem § their way in the Italian markets.

it is made fast. The open mouth of the net is thus kept suspended below the vessel, and the long mass of netting streams away astern with the tide. The strain of this immense bag-net by the force of the tide is often very great, but if the vessel drags her anchor, the net being made fast to the same mooring, both keep their relative positions. Here they remain for several hours till the tide slackens, the vessel’s sails being all taken in, and only one hand being left on deck to keep watch. The way in which the fish are caught hardly requires explanation. The sprats, swimming in immense shoals, are carried by the tide into the open mouth of the net and then on to the small end, where they are collected in enormous numbers ; from this there is no escape, as the crowd is constantly increasing, aud they cannot stem the strong tide setting into the net. The first thing to be done in taking in the net is to close the mouth, and this is effected by means of a chain leading from the bow of the vessel through an iron loop in the middle of the upper balk down to the centre of the lower one, and by heaving in this chain the two balks are brought together and ultimately hoisted out of the water under the vessel’s bowsprit. The net is then brought alongside and overhauled till the end is reached, and this is hoisted on board. The rope by which it is closed having been cast off, the sprats are then measured into the hold of the vessel by about three bushels at a time, until the net has been emptied. The quantity of sprats taken in this manner by many scores of fishing craft during the season, which lasts from November to February, is in some years simply enormous ; the markets at Billingsgate and else- Where are inundated with them, and at last they can only be disposed of at a nominal price for manure ; and in this way many hundreds of tons are annually got rid of. The stow-boats do not generally take their fish on shore, but market boats come off to them and buy the fish out of the vessel’s hold, and carry it away The mode of working is the same in the Solent and the Wash as that we have

described in the Thames, and large quantities of sprats are

mouth of the net in a perpendicular direction when it is at landed by the Southampton boats.

“Whitebuit,” or young herrings, as they should properly White- be called, are caught in the Thames by a net which is bait.

_ practically nothing else but a very small stow-net, and it _is worked in essentially the same manner.

Lane Fisheries.—Hand-lining and long-lining are worked Line

pollack, bream, and conger are taken regularly on the English coast, some being more abundant in one part and

some in another. The cod fishery in the North Sea, North

however, is the one specially deserving uotice ; it has been Sea cod

carried on in a systematic manner, and on rather a large #Shery-

scale for a great number of years. Welled smacks were

were brought alive into port just as they are at the present day. The idea of keeping the fish alive appears to have been taken from the Dutch fishermen, and in the interval between 1712 and 1715 three vessels fitted for that purpose were built, but very inferior to those afterwards con- structed.? In the year 1720 the number had increased to 12, and in 1735 to 30. Of that number Mr Nathaniel Saunders, the progenitor of several generations of fish- factors and salesmen at Billingsgate, had six, and with four of these, which were very superior to the other two, he visited the coast of Scotland in the course of his fishing expeditions, and was at that time the chief medium for conveying goods to and from the north of Scotland. In 1766

3 Our notice of the early history of the cod fishery as carried on from Harwich is taken from a statement prepared by Mr Groom of Har- wich, and given to the Royal Sea Fisheries Commissioners in 1864,

a Mr Orlibar, a fishing smack owner at Harwich, made the first attempt to fish for cod with long lines on the Dogger Bank ; and although he was at first very unsuccessful, he persevered, and was so fortunate that in 1774 the number of smacks had increased to 62, of which 40 went regularly to the Dogger to fish with long lines. In 1788 there were 78 smacks, and in 1798 the number had increased to 96. About this time a few attempts were made at Gravesend, Greenwich, and Barking to construct smacks of a similar description, and the Harwich fishery gradually declined. Afterwards the three places on the Thames increased their connexion with this fishery, and Barking especially became an important station, not only for cod-boats, but also for trawlers. Many ood vessels were likewise owned at Gravesend and Greenwich, and these two towns for many years had stores of live cod in chests floating in the river. Great changes have, however, taken place in recent times; the Thames water became so impure that the cod could not be kept alive in it for many days, and ultimately the storing of the fish there was altogether given up. The Harwich river was still used for that purpose, and is so now, although there are but few cod-boats belonging to the place; but the opening of the railways on the east coast gradually brovght Grimsby into notice, and its position in relation to the fishing grounds was found so couvenient that it gradu- ally became, and there is every reason to believe it will re- main, the headquarters of the North Sea cod fishery.

The special feature in this fishery which distinguishes it from all other line fishing on the coast of the United King- dom is the systematic use of welled vessels, in which the cod are kept alive until thay are brought into port. These welled smacks are built for the purpose, the well not being a tank fitted into any suitable vessel, but a part of the original construction of the hull. Two strong water-tight bulkheads are built entirely across the vessel from keelsou to deck, enclosing a large space just in the centre of the smack. This is the "well"; and a constant supply and circulation of the water from the sea is kept up within it through large auger holes bored in the bottom of the vessel, in that part of it between the bulkheads. The vessel is in fact built in three compartments, and the water has access to the central one through the holes made at the bottom of it. The entrance to the well is on deck through a hatchway, the four sides of which are carried

down for about three feet to what is called the well-deck, above the level of the water-line, extending all round the hatchway to the bulkheads and sides of the vessel. The object of this lower deck is to keep tlie level of the water within certain limits when the vessel is rolling about or pressed down under sail. The cost of these welled smacks is about £300 more than that of the ordinary " dry-bottomed " vessels of the same size. The working expenses of a cod smack are also much heavier than in a trawler. Each of thiese line boats carries from nine to eleven hands, of whom as many as six or seven are apprentices of various ages; and the system of payment by shares, so general with the trawlers, is here only adopted in the case of the captain, who gets 9 per cent. of tle proceeds of the voyage, the mate receiv- ing 24s, per week, the men 22s, and the apprentices from £5 to £12 a year, according to their length of service. Provisions are found by the owner, entirely or nearly so. Both hand lines and long lines are used in this fishery, depending on season and locality. A complete set of long lines consists of about fifteen dozen, or 180 lines, 40 fathoms in length, each supporting 26 hooks on smaller short lines called "snoods," which are fastened to the main line a fathom and a half apart. A "string" of lines of this description is 7200 fathoms long, or nearly eight miles, and has 4680 hooks. Whelks or " buckies" are always used for bait where they can be procured in sufficient

quantities, and in the regular long-line season each smack takes about 40 wash! of whelks with her for the voyage, and about half that quantity as the season draws to a close in March, The whelks are preserved alive in net bags, and

'are kept in the vessel's well till wanted, when the shells are

broken and the tough fleshy animals extracted. Baiting the large number of hooks used gives plenty of employment to the large crew of the smack. The lines are shot at sunrise or earlier if the weather is fine and there is light enough to see what is being done. The smack is put under easy sail, and

kept as much as possible with the wind free, so long as a course can be sailed across the tide, which is im- portant, as then, as the line is paid out, the snoods drift clear of it. The lines are neatly coiled, and with the baited hooks are laid in trays all ready for running, each tray containing from 12 to 16 pieces of line, and as the vessel sails slowly along, the whole length of line is gradually put overboard. A small anchor at every 40 fathoms keeps the line steady on the ground, and its posi- tion at the two ends aud at every intermediate mile is marked by a conical buoy or "dan," with a staff passed through it and carrying a small fiag. When after a few hours the tide has nearly come to an end, the smack, which meanwhile has been hove to in the neighbourhood of the last buoy, gets the end of the line on board and works in short tacks along its course, the line being hauled in, and the fish taken off the hoaks as she proceeds. When the wind is very light a boat is used for hauling in the line, and the fish are kept elive in the stern of the boat, which is partitioned off so as to form a watertight division, In any case the strong and lively fish are transferred as soon as possible to the ship's well, and dead fish, or those which do not appear likely to live in the well, are stowed away in ice. The season for loug-lining is during winter, and the fishery is carried on both on the Dogger Bank and on well- known ground off the coast of Norfolk, In April this fishery comes to an end, and a few of the smacks go away hand-lining to Iceland and the Faroe Islands, salting the fish they catch there, and usually landing it at Shetland In July hand-line fishing for cod begins in the home waters, and is continued till October, the commencement of the long-line fishery of which we have just spoken. The July fishery is at a distance of from 10 to 30 miles from the coast, as the approach of the herrings to the land at that time causes a great gathering of cod in their neighbourhood. The smack is hove to when hand-lining, and each man works with a single line furnished with from two to six hooks. On the return of the vessel to Grimsby after a few days, the fish are taken out of the well by means of long handled landing nets, and are put into wooden chests which are kept float- ing in the fish-dock. These chests are 7 feet long, 4 feet wide, and 2 feet deep, and are constructed so that there 1s a free circulation of the water through them. The water in the dock at Grimsby being quiet, the chests are made with the ends square; but at Harwich, another storing place for live cod, the chests are moored in the tideway, and have the ends boat-shaped, so as to offer less resistance to the stream. There are about 400 of these chests in us? at Grimsby during the height of

the cod season, and as many as from 15,000 to 20,000 live cod in them ata time, There is a great advantage in thus storing these fish, they can always be sent quite fresh to market, and only as many forwarded as there is a demand for. Killing the co

for market is a strange scene, and it goes on daily during the season, Each chest will hold from 40 to 100 ¢od according to their size, and when the fish are wanted, & chest is hauled alongside a hulk kept in the dock for the

1 A wash is a stamped measure capable of holding twenty-one quarts

and a pint of water.

purpose, and hoisted up just clear of the water; the top is then opened, and a man steps into the chest and lifts the fish out, seizing them by the head and tail, and throwing them on the deck of the hulk. It is often difficult work to get hold of the struggling and slippery cod, but one after another they are taken out and handed over to the execu- tioner on the deck of the hulk; he grasps the fish tightly behind the head with his left hand, holding it down on the deck, and giving a few heavy blows with a short bludgeon on the nose, kills it at once. The dead fish rapidly accumulate in a heap, whence they are taken on shore to be packed in bulk in the railway trucks waiting by the side of the market to receive them. 'The fish thus killed and packed reach Billingsgate early the next morning, and are known in the trade as "live cod"; they fetch the highest prices; and there is something in the manner in which they are killed which enables them to be properly crimped many hours after their death.

' and the manner of working them is precisely the same as we have already described in our account of the Yarmouth fishery ; But there has been a

considerable increase in both the size and number of the nets worked by each boat. This has been" due to several causes. The lightness of cotton nets com- pared with those of hemp formerly in use enables a larger quantity of netting to be easily handled by the same number of men, and thus more catching power is provided, Then it is desirable to make up a certain weight of nets in proportion to the size of the boats, that they may not drift too fast and drag the nets through the water; for all the Strain that is needed on a fleet of nets is as much as will keep them extended in as near a straight line as may be. The fisheries have in late years been carried on far out at sea, and a remarkable change from open to decked fishing boats has taken place, a change that had for a long time been earnestly recommended to the fishermen for their own

Stoo Scorcu FiswErres.—The important fisheries on the coast | sakes, and to prevent the great loss of life which had so F teR- of Scotland are drift- fishing for herrings, and line-fishing frequently occurred when the open boats were overtaken by "for cod, haddock, ling, and some other kinds. Besides | bad weather. This change led to larger boats being built, these there is in particular localities sean or "trawl" fishing | capable of using an increased quantity of fishing gear. for herrings, and for sprats or " garvies," : There are thus many reasons for the additional netting now Hing Herring Fishery.—We will first speak of this special generally employed, without resorting to the idea that it has fi: ty. fishery, which from its profitable character, extensive range, | become necessary owing to herrings having gradually dimin- and the employment it gives to vast numbers of the coast | ished in the seas. We may here mention that the official population, both afloat and on shore, ranks as one of the | returns of Scotch fishing boats have of late years shown a most important fisheries of the United Kingdom, as it is steady diminution in their number, but it will be found on __ also one of the great harvests of Scotland. examination that the falling off has been only in the second Hing 'The herring season on the Scotch coast does not com- | and third class boats, and that those of the first class have . sen,

mence everywhere at exactly the same time, although the principal fishing is always during the summer months, the winter fishings being local and rather uncertain. The earliest herrings are taken on the west coast, and are

generally first met with outside a line between the Butt of Lewis and Cape Wrath during April. In May the herrings come into the Minch and work their way southwards; but they sometimes enter the Minch at the south end of the islands, and in 1870 in particular, there was a large fishery near South Uist and Barra, but mostly on the Atlantic side, Some miles south-west of Barra Head. It is rarely, how- ever, that herrings are taken on the western side of the outer Hebrides, and the great fishery may be said to lie between those islands and the mainland. The fish remain in these waters in greater or less abundance till nearly the end of September, but May and June are the most produc- tive months of the Season, and during that period a great number of boats from the east coast go to the western side to take part in this early fishery, As July approaches the order of proceeding is reversed : the time is near for com- mencing the great fishery on the east coast, and one by one the boats which had come from that side return to their own waters, and many others from the western districts accompany them. The eastern fishery begins about the middle of J uly, and continues until about the end of September, commencing at the north and extending gradually southwards as the season advances. Many changes In the importance of particular districts as centres of this fishery have taken place in the course of years,

ora long time Wick was the leading fishing and curing Station on the east coast, sending out 1000 boats daily during the best of the season; but recently the fisheries from Peterhead and Fraserburgh have been unusually suc- cessful, and they have taken the principal position on the fast coast for the extent of their curing operations.

been increasing. In the last report issued by the Board of Fisheries, that for 1876, a decrease of 109 boats is recorded ; but at the same time it is stated that there were 18] fisher- men and boys more than in the previous year, and the estimated value of the boats, nets, and lines, had increased by as much as £35,719, he size of the fishing boats is limited unfortunately by the general absence of natural deep-water harbours where they would be most useful, so that no very great increase in their tonnage can be con- veniently made ; and although first-class boats are taking the place of those which were in the second, the change does not involve an addition of more than four or five tons in one of the larger craft. Fourteen tons was a common size

for a large second-class boat, and as anything over 15 tons ranks in the first class, the new ones of 17 or 18 tons are all included under that head. There is little difference at first sight in the appearance above water of most Scotch fishing boats, but there are many distinctions below the water-line in accordance with local ideas. As a rule, excepting. on parts of the west coast, the boats are sharp at both ends and have a great deal of beam, but they differ much in depth and in the extent of rise to the floor. The Buckie boats have long been remarkable for their peculiar build and rig, having a low and broad midship section with a flat or rather hollow floor; they are very fine at both ends, and have considerable rake of both stem and stern post. 'They are commonly known as "scaffy" boats. Another peculiarity in these boats was that they carried a mizen lugsail in addition to the large fore and main lugs which were the usual working sails of the general run of Scotch fishing craft. Fishermen as a classare most unwill- – ing to make any change in their style of boats or methods of fishing ; but when decked boats were fairly tried on the Scotch coast, their advantages could not fail to be acknow- ° ledged ; and as it was found that profitable fishing! could

at here ttishing is the method by which most of the Scotch | be carried on with them in weather such as was dangerous d, nos are taken, the use of seans or " trawls " being Practically confined to a few localities on the west coast '0 far as regards the herrings, although they are employed

on the eastern side for the capture of garvies. Cotton

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1 As evidence of the advantage of using large-decked boats, the following extract from the fishery officer's report from Eyemouth is quoted by the Hon. B. F. Primrose, the energetic and obliging secretary to the Board of Fisheries, in his Annual Report for 1876:—

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for open boats, the change from undecked to decked fishing boats gradually gained favour, and is now very general. This alteration, however, involved

an important change in the rig of the boats in the doing away with the main-lug, a sail which for many years had given a distinctive character to the Scotch fishing boats. In our notice of the Yarmouth luggers we mentioned that when the vessel was fishing, the foremast was lowered on to a crutch on deck, so that the vessel might ride easier and not roll about, as the weight of the standing mast would be likely to make her do. This is the practice with all drift-fishing boats ; but in decked boats there is a difficulty in doing this with a second mast, aud if it were done there would be so much more hamper upon or near the deck and in the way of the fishermen as to cause muchinconvenience. The mainmast has therefore been done away with, and the necessary after-sail is pro- vided by means of a mizen, which, being outside the stern, has plenty of power when wanted, and is out of the way of the fishermen. The fore-lug is made larger than it used to be, so that there is still plenty of canvas, and the general rig of the boats is now just what has been for a very long time adopted by the English fishermen as the most convenient for drift-fishing. Steam-tugs have been advantageously used in towing the fishing boats towards and from their fishing ground; but such a system could hardly be generally applied to the vast fleet of boats which collect in certain years at some of the stations. miei The fluctuations in the herring fishing are very remark- ations in able, but they are not more so on the coast of Scotland herring than on that of Norway and elsewhere. Indeed, Norway fishery. ond Sweden afford instances unparalleled in Britain of the disappearance of herrings from particular districts, and their return in the most unexpected manner after a long course of years (see p. 267). On the coast of Scotland, the changes which take place in the fishery consist in an in- crease or decrease at particular districts rather than a total disappearance from any one of them. The most marked failure in recent years is in the Firth of Forth, where the summer fishing has now been given up, only a small winter fishing being carried on. At Wick, also, for a great number 'of years the most importaut station on the east coast, the Werring fishing has been more or less diminishing, whilst at 'the same time Fraserburgh, only about 70 miles distant _from it, has gradually assumed an unexampled importance. _-~ It is true that in 1876 there was an immense falling off in the quantity of fish landed at the latter port, but it was a bad year at almost every station on the east and west coasts, and the almost general decrease arose not from any apparent scarcity of fish, but from the boats being frequently kept in harbour by a continuance of very

bad weather during the fishing season, or being unable from the same cause to work their nets when they reached their regular grounds. There is some reason for believing the alleged scarcity of herrings near the land is not so great as has been supposed. Successful fishing many miles out at sea has attracted large numbers of boats from the home waters, and the catches inshore have been consequently much diminished ; still the general opinion appears to be well founded that the fish have not entered the firths and lochs in the last few years to the same extent as they used to do. That the fisheries, taken as a whole, have been gradually increasing is shown by the qpefully prepared statistics of the Board of

"The crews who had large-decked boats, and perseveringly followed a the fishing were successful ; while those crews about Berwick and oe who were not so well prepared did little good. Many of the

y emouth and Coldingham boats made from £200 to £300 for the Nal Several from £400 to £500, and afew from £500 to £700 each. The Berwick and Spittal crews, on the other hand, who fished

ane open boats and inferior netting, made only from £60 to £120." idence to the same effect is given from Anstruther, and similar records have appeared in former reports ;

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FISHEERTES

Fisheries ; and it is desirable to point out that the great in- crease in the quantity of netting now used 1s to some con- siderable extent counterbalanced by the shorter time the nets are in the water ; for the boats go long distances to sea, and they have to leave off fishing earlier in order to bring in their fish in good time to the curers, It may appear strange that after the lapse of centuries during which the herring fishery has been regularly carried on, so little knowledge should have been gained of the habits of this valuable fish ; but it must be confessed that at the present moment we can say nothing positively about what brings the herring towards the land, why at one time they will

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“ strike” the nets, and at another they will apparently not go near them—in short, what are the particular influences which regulate their movements. Of course, the old idea

that these fish come into shoal water in order to deposit

their spawn is the one still generally received, and we wiil

not venture to say itis incorrect ; but if it be true that the spawning fish come in for that purpose, that cannot be the inducement in tlie case of the “ maties” or fish which show

no development of the milt or roe. Yet both these herrings do precisely the same. Mackerel differ from herrings in spawning at the surface, and it has been abundantly proved that their ova float during the whole period of develop- ment; still we find that mackerel in full spawning condi- tion, and half-grown fish also, are mixed up in the same shoals at the time when they approach theland. Thus we find the habits of surface-spawners and ground-spawners are alike in this respect, yet the common explanation of the visits of the spawning herring will not apply in the case of the mackerel, or even in that of the “matie” With respect to the causes which induce the herrings to keep near the surface, or to remain at some little depth, a step seems to have been taken in the right direction in the observations now being made of the possible relation of the temperature of the sea to the higher or lower movements of the fish, Good service was done by the late Marquis of Tweeddale when he provided a number of deep-sea ther- mometers for the use of tlie fishery officers and fishermen, whose observations are reported weekly to the Meteorologi- cal Society of Scotland, and come under the careful scrutiny of the secretary, Mr Alexander Buchan. It is early yet to expect any definite results from this inquiry, as it has only been carried on for four or five years; but the observations hitherto made peint to a high degree of temperature in the sea being unfavourable to fishing, and show that, when the sea is found to be colder in any one district than in that ol either side of it, the herrings are more abundant and the fishery is more successful in the colder than in the warmer water, It is also stated that the influence of thunderstorms had been perceptible in each year; and that if a

thunder storm of some magnitude had extended over a large portion of the east of Scotland, good takes of fish might be made on that day, but on the following day few if any fish would be caught over that part of the coast, unless at the extreme verge of a deep part of the sea, as if the fish were retreating thither, Observations on the influence of winds and the temperature of the sea have also been made by the Dutch fishermen; and Herr von Freedon of Hamburg believes, from an analysis of these observations, that a temperature of from 53° to 57° F. is most favourable for the herring fishery, and that the chances of success diminish with higher or lower temperatures. Should these conclu- sions be confirmed, it is quite possible that the fishermen may be enabled, by a trial of the temperature of the sea at different depths, to determine how far their nets should be sunk to give them a fair hope of a successful fishing, instead of working, as they do now, very much on the chance system, often finding that they have been too bigh or too low for the principal part of the shoal,

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— at the present day.

HERRING FISHERY. |

The important system of curing herrings in the wet state, or, as it is properly called, as “ white herrings,” is more completely worked on the east coast than on the west. The whole process of curing is carried on under the supervision of the Board of British White Herring Fishery, which was established by the Act, 48 Geo. LIT. c. 110 (1808), and, with some slight changes in its organization and additions to its duties, has continued its labours to the present time. Its particular duties are to inspect the curing, and to see that the proper regulations are duly carried out ; to place the Government brand on the barrels when desired, according to the quality of the cure ; to see that the regulations for registering the fishing boats are duly attended to ; to maintain order on the fishing grounds ; to lay out to the best advantage a special grant of money for improving or building

fishery harbours ; and to prepare accurate statistics of the fisheries. Many years ago curing according to this system was done at some of the English ports,—hence the word British in the title of the board; but for some little time past 'white herrings" have practically only been prepared in Scotland, and the now ordinary name of " Fishery Board, Scotland," fairly ex-presses the geographical limits within which its duties are performed The general out-door work of the board is performed by a body of men who are well known by the title of fishery officers; and it is essential that they should have been brought up as coopers, an important part of their duties being to see that barrels! of a proper size and make are uscd for the packing of the cured herrings, and that they are securely headed and driven before they are sent abroad. The various duties these officers have to perform, and the careful training they have had in them, have resulted in the board gradually obtaining a staff of men by whose intelligence and experience a vast store of information about every-

filled. They may lie a longer or shorter time in this state, according to the supply of labour at command, and the immediate necessities of gutting and rousing ; but the next usual step in the routine is for a third hand to remove those herrings from the second vats or vessels, and re-salt and pack them carefully, every successive row crossing at right angles that which precedes it. Herrings intended for the foreign market are usually arranged with their backs down- wards, while those for the Irish market are preferred when packed flat, or more upon their sides. Each row gets a fresh sprinkling of salt until the barrel is filled. The head of the cask is then laid loosely on, the contents being allowed to settle down, or pine, as it is called, for a time,—which they soon do so considerably as to admit of each cask receiving another row or two, with additional salt, before being closed by the cooper. The barrels should then be headed up, tightened in the hoops, laid upon their sides, and placed under cover, so as to be shaded from the sun's rays,

which are injurious to the fish. They should also be rolled half over every second or third day, until they are bung-packed; which process, if the after intention is to receive the official brand of the Board of Fisheries, must not be sooner performed than after the lapse of ten free days from the date of capture." Sir Thomas Dick Lauder? thus describes the final operations :—" When the pickle has been sufficientiy poured off, a handful of salt, if required, should be thrown around the inside of the barrels, and the herrings should be pressed close to the inside of the casks, and addi- tional fish, of the same description and date of cure, should be packed in until the barrel is properly filled ; after which it should be flagged, headed, blown, and tightened, and the curing marks scratched upon the sides. The barrel may then have its pickle poured in, and be finally bunged up."

The cured herrings are separated into four classes:—"Full," or Classes fish having large milt or roe—in fact, those which are nearly or quite and ready to spawn ; " Maties," 3 or fat fish, in which the milt or roe is brands.

thing connected with the working of the Scotch fisheries has been collected. Each man is placed in charge of a district of the coast, ani the detailed reports they make to the secretary form the basis of

the valuable and instructive reports of the Commissioners of the Fishery Board annually presented to Parliament.

The operation of curing the herrings begins as soon as they are landed, and the busy scene which is presented at the large curing stations when this work is going on is well described in the article "Fisheries" in the last edition of the present work :—

" All along the inner harbour, and in almost every street and quay, of the town of Wick, as well as within many large inclosed yards and covered buildings, there are numerous square boxes as big as ordinary-sized rooms, the containing sides, however, being only two or three feet high. Into these huge troughs the herrings are carried from the boats as soon as possible after they arrive. There they are all tumbled in helter-skelter, in a long-continued stream of fish, until the boats are emptied or the troughs are filled. Then come troops of sturdy females of various ages and complexions, each armed with kmife in hand, who range themselves around the fishery

chambers ; the process of gutting immediately commences, and is carried on with such ceaseless and untiring activity that the unac- customed eye can scarcely follow the quickness of their manipu-

“lations. One woman will eviscerate about two dozen of herrings in a minute; and when nearly 2000 of them are working at that tate, with but briefintermission from early morning till the close of day, the amount of disembowelment may be more easily imagined than described. This important process is effected in the following manner. The practitioner takes a herring in her left hand, its back lying in her palm, and inserts the point of her knife into the near side of the neck, bearing well down upon the backbone, and making the weapon protrude a little through the other side. She then gives the knife a turn, and pulling it outwards and upwards, with an opposing pressure of the thumb, she draws forth in the first place the gills, stomach, and intestinal canal, and tosses them into an. adjoining barrel. She then inserts the knife a second time, and by a peculiar twitch removes what is called the crown gut or ceecal appendages and liver. There are thus two actions performed, each of which seems to occupy about a second of time. This is the ordinary Scotch practice. The Dutch method is somewhat different. They leave in the crown gut, and’so with them a single pull suffices to remove whatever is to be taken away. This latter method is partially followed in this country, as being best adapted for the Continental market, where it is believed that the crown gut has a powerful influence in improving the flavour of the fish, and where

the appearance of the herring is held to be injured if it is removed.

These fair gutters usually work together in little companies of two

or three, so that while one is filling a measure with her gutted fish, another carries them off to be roused, as itis called, that is, cast into vats or barrels, then sprinkled with salt, then more herrings and

More salt, and next a brawny arm plunged among them far above

the elbow, th ingli ‘ ° us mingling) ee 8 Bad soon fill the apare i | and the Netherlands, have failed to elicit any definite explanation. The Dutch

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Pe ia fish are brought on shore from the fishing boats, the quantity is herrings; y 4 “cran” measure, which should hold 45 gallons of ungutted gutted a a cran of such fish is expected to furnish enough good cured and between th ¥ to filla barrel “having a capacity of 373 gallons,—the difference

: suitable f< 1g Wo measures being usually accounted for by the broken fish un-

or curing, and the less space occupied by the gutted fish.

quite undeveloped ; “ Spent,” or shotten, those which have recently spawned, and consequently are in very poor condition, having neither the fat of the maties nor the roe of the full fish; and ‘ Mixed,” consisting of fish of allkinds, or unassorted. For these four classes the Board of Fisheries gives distinct brands, denoting the quality and description of fish in each barrel ; but the crown full brand, given only to “full” fish properly cured, is the one in special request. It denotes the finest production of the system of the British white herring cure. Branding is quite optional on the part of the curer ; but in any case this method of curing can only be carried on under inspection, and barrels of a particular size must be used for packing the fish in. 1t is one of the anomalies of the system, however, that although it is absolutely forbidden to use barrels of other than a certain specified size, there is not the slightest restriction as to the quality or condition of the fish to be packed in them, so long as the Government brand is not desired for them. Any refuse fish may be cured and packed, but the barrel must be of a certain size. The advantages or disadvantages of the branding system have been often discussed, and it has been frequently condemned as opposed to the general policy of making the sale of an article dependent on its merits alone; it has been contended that the Government is not justified in giving a certificate of the quality of cured herrings more than of any other manufactured article, and in no other case would such a guarantee be given. To this it is replied that there is a de- mand for “ white herrings” in numerous and distant European mar- kets ; that without the Government brand a barrel of herrings would in some places rarely be sold unless the contents were first examined ; and that the disturbance and exposure of the*

fish would lessen their value when they were ultimately unpacked at the end possibly of a distant journey. They may pass through many hands before they finally reach the consumer, and each person would be anxious to satisfy himself of their quality. There is no doubt that the brand facilitates the sale under such circumstances, but at the same time it cannot be dispnted that thousands of barrels are sold on the Continent every year with no other guarantee than that of the curer's name. Up to the year 1859 no charge was made for branding ; but since then a fee of fourpence per barrel has been paid, and the proceeds practically count against the expense of the board. It was believed in some quarters that the alleged value of the brand was really not so great as to make the curers willing to pay for it,

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2 Directions for taking and curing Herrings, and for the curing of Cod, Ling, re abe aoe by Sir Thomas Dick Lauder, Bart., Edinburgh, 1846. .

3 Maties" is a corruption of the Dutch maazes, the term applicd to herrings in which the roe is small or undeveloped. Its signification, however, is doubtful, and the nearest approach we can find to the word is maaije (Kleine maat), a small measure, which it seemed might possibly refer to the small size of the unde- veloped milt or roe, as compared with the bulky proportions of those organs in the full fish. But our inquiries on the subject from authorities, both in England

[heir herrings into three classes, as we do, according to the condition of Er erapadentine ones viz:—' Voll," full of roe; " Maatjes," with the roc un- developed; and "Ylen," empty or shotten. Maatjes are generally fat fish, but herrings are in that condition only when the roe is very small. As the breeding season advances, the fat is gradually absorbed, and the fish become voll; and when the spawn, then fully matured, is deposited, the herrings are called ylen, or

empty. .

West coast curing.

Close time for herrings.

and consequently the system might be quietly got rid of by the curers ceasing to make use of it. The result has been preciscly the reverse ; and the argument against the continuance of branding on the ground of the expenses in connexion with it has been cousid- erably weakened by the fact that the system is now to a large ex- tent self-supporting. ;

The following table shows the amount of fees collected in the years 1859-77, in accordance with the Act 21 and 22 Vict. cap. 69 (1858) :—

yreeye Fees Fees | Fees ems Colleeted. Collected. Collected.

£4158 10 0 £7254 11 ie 0

1859 | £2644 12 0

1860 3865 4 6 5290

1861 4422 9 0 | 3491 1862 5578 10 8 | 4075 1863 4614138 6 | 4989 6629 18

0 5777 8 7045

1864 3623 4 1865 3613 1

On the west coast of Scotland the herring fishery is also of great importance, and, as we have previously mentioned, it begins earlier than that on the eastern side. There is a good deal of curing in the Stornoway district, but the brand is in little favour. It is alleged that the western fish, especially those caught early in the season, are more delicate than those taken on the east coast, and will not bear the close packing requisite for cnsuring the proper weight in each barrel if it is to receive the brand. The real explanation is doubtless that the curers are anxious to catch the market as soon as possible, and will not allow the number of days for the fish to be in pickle before sending them away that is necessary according to the branding regulations. These early cured fish are maties or fat her- rings, and are chiefly sent to the Russian market. A very large quantity of the

western fish caught later in the season is, however, seut to market in the fresh state ; they are sprinkled with salt and loosely packed in barrels, aud quickly taken by special steamers te Glasgow and to Liverpool. These fish are given under the head of "bulk " in the published returns by the Fishery Board, and, being slightly salted, are included among the "cured fish," although not with those which have been gutted and have gone through the regular preparation for export. On arrival at the home markets they may be readily sold as fresh herrings, after the sprinkling of salt has been washed off.

It is on the western coast that the question of a close time for her- rings has been so much discussed, and unfortunately in 1860 an Act (23 and 24 Vict. c.92) was passed by which a close time was established there. The bill was brought in at the instance of some of the curers at Glasgow and other places, principally on the west coast. By this Act herring fishing was entirely prohibited from the 1st of January to the 31st of May on any part of the coast between Ardnamurchan Point and the Mull of Galloway on the south, and from the 1st of January to the 20th of May between Ardnamurchan and Cape Wrath on the North. Nota herring was allowed to be taken during the close season for the purpose of sale, or to be used as bait, or to keep the fishermen from starvation; and it appears that this cruel pro- hibition was to be enforced that the markets might not be supplied with fish which were not of the best quality, but yet were sufficiently good to command an easy sale, and therefore to lower the prices the curers would otherwise have obtained from the regular summer fishery. It was professed that the early fishing broke up the shoals before they entered the Minch, and therefore diminished the supply in June and July ; and it was said that many of the fish caught between January and May were unwholesome and unfit for food. But an inquiry into all the circumstances of the case clearly showed that the promoters of the Act for establishing close time were the curers alone, who held meetings of their own body, and, without consulting the fishermen, pressed forward a measure which sacrificed every one's interest to their own. It was one of the most unhappy episodes in the history of the Scotch fisheries ; but fortunately the effects of the close time were soon made known, and after a short experience it was found impossible to enforce a law which brought misery and starvation to the homes of a coast population, many of whom gree could only manage to obtain a bare

subsistence by hard and unremitting toil. The law remained practically in abeyance for a time, and no prosecutions for infringing it were carried ou pending the result of the report of the royal commission in 1862 on herring trawling. In 1864 this question of close time came also before the royal commission for inquiring into the condi- tion of the sea fisheries generally; and such overwhelming evidence of the evil effects of the close time was brought before the com- missioners that, in anticipation of their complete report, they did not hesitate to bring the subject before the Government, with the Her to some relief being given before the question could be finally pa oe off This resulted in instructions being given not to en-

orce the law ; aud in the following session of parliament a bill be passed by which close time was entirely abolished north of co ie eee 'This included all the inner and outer Heb-

p riction had becn so severely felt. South of that

part of the coast close time was continued as before, with the exception of January, which became free to the fishermen. By subsequent legislation (the Sea Fisheries Act, 1868) this close time | has been done away with beyond the three mile limit, so that at

the present time herring fishing is entirely free everywhere around

the British Islands except within three miles of that part of the

coast of Scotland which lics between Ardnamurchan Point and the

Mull of Galloway ; and the difficulties of enforcing the law there

are so great that the close time has now only a nominal existence, Another commission which has been recently engaged in inquiring

into the state of the herring fisheries of Scotland has also reported against the utility of close time.

The fisheries of the west coast of Scotland have unfortunately given "Tray}. rise to much bitter feeling among those whoare interested in them, ing" or

*either as fishermen or curers, and nothing has caused so much social seaning disturbance as the quarrels between the drift-fishermen and those for her. who have been using the sean-net, or, as it is called in Scotland, the rings, '*trawl," for catching herrings. The localities in which these dis-Loch putes have specially taken place are Loch Fyne and the Kyles of Fyne Bute, but more particularly in the former long famous waters. We disputes, have already described the general mode of working the sean, when speaking of the English fisheries, and we will only now repeat that this method of fishing consists in shooting a long sheet of netting in a semicircle, both ends of which are most commonly hauled on shore until the whole net with the inclosed fish is landed; but sometimes a hoat is used as the fixed point at which the ends of the net are madc to meet, and into which the net is hauled as before,*

In the former case the net is used as a ground-sean, in the latter as a circle-net. Both are equally objected to by the drift fishermen,

who, until about the year 1838, had fished Loch Fyne according to } the old established method. The trawl was then introduced, and

on several occasions a gunboat has been required to keep order be-

tween the fishermen when both modes of fishing were being carried

on. Loch Fyne, as we have said, was the special scene of these dis-

putes, and one common complaint by the drift fishermen was that

the trawls intercepted the fish at the entrance to the loch, and broke

up the shoals, so that the herrings did not find their way to the upper

water, where it was alleged there always used to be plenty of fish at

the proper season. There were complaints also that fish of all sizes

were caught by the trawl, those which were too small to be stopped

*by the drift nets and those too large to be meshed in them—the '*mother fish," as some of the fishermen called them. Then it was said that the trawlers sometimes made such enormous hauls that*

only a portion of the catch could be saved, and, besides other sins \ laid to their charge, it was finally stated as the crowniug offence— a one that really cxplained the principal opposition to the trawlers—

that they lowered the price of herrings to a considerable extent by the large supplies they could with little expenditure of time and trouble sometimes throw into the market, and so prevented the drift- men from obtaining the better prices they had commonly got from their smaller catches. . The result of these several complaints was that in 1851 an Act (14 and 15 Vict. c. 26) was passed to put an end to trawling for herrings on the coast of Scotland; but that not proving effect- ive, more stringent measures were brought to bear on the fishermen in 1860 (23 and 24 Vict. c. 92) and 1861 (24 and 25 Vict. c. 72), and fishing with the trawl was completely suppressed. So strong @ feeling existed, however, among a large body of the fishermen and others that the complaints against trawling were unjust, and the prohibition injurious to the interests of the public as well as to the fishermen immediately affected by it, that in 1862 a royal commis- sion was appointed especially to inquire into the subject; and in 1864 i the question was independently considered by two of the members of the general Sca Fisheries Commission, the third commissioner being purposely absent from the second inquiry, as he had taken part im the proceedings of the previous one. The conclusions arrived at by the two commissions, after hearing a great deal of evidence from both sets of fishermen, were decidedly adverse to the opponents of trawl ing, and were to the cffect that the herring fishery in Loch Fyne had suffered no diminution by that method of working; of the contrary, it had really been progressive, when the periods of comparison were made sufficiently long to correct the annual fluctua tions, which were always considerable in this as in all other herring fisherics, They say ! :—" The selected years of bad fishing, brought as proofs that trawling was destroying the fishery, have, when eX- amined, no application to the question, asan equal number of years of quite as bad fishing are found in every decennial period before the system of trawling had been discovered… . . Trawling for her- ring has been an important means of cheapening fish to

the consumer, by the large and sudden takes, and has thrown into ae market an abundant supply of wholesome fresh fish at prices whic enable the poor to enjoy them without having to come into com- petition with the curer. It is this circumstance which, mw sd opinion, has produced the demand for repressive legislation, for t : gains of the drift-net fishermen are much affected by the sudden ane ee oem mi

1 Report of the Royal Sea Fisheries Commisstoners, p. 43 (1866).

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HERRING FISHERY. |

‘ res of the trawler, who, working with less capital and ee a. productive kind of labour, is able to undersell the drift fishermen, and to derange the market for the curcrs. ;

It happened that in 1860, the last year of trawling before its com-

lete suppression, the fishing in Loch Fyne was the largest ever Caen there ; in 1861 it fell off, but in 1862 it was again very large, and that was followed by fluctuations as before, although the drift fishermen then had it all their own way. The recommendations of the two commissions were embodied in an Act (30 and 31 Vict. ec. 52) passed in 1867, by which any kind of herring net with what was then the legal mesh was permitted, and trawls so constructed again came into use. By the Sea Fisheries Act, 1868, all restric- tions as to the size of mesh were done away, but as that Act only applies to fishing beyond the three mile limit, the Act of 1867 stil]

ing : d that from 1868 to regulates the fishing in Loch Fyne. It chance 1874 the produce of this loch gradually fell off from 46,818 barrels to 6934 barrels; the herrings did not go to the upper waters of the loch in the same numbers as before, and we need hardly say that the drift fishermen accounted for it mainly by the fact that trawling had again been permitted.

The drift fishermen had little belief in the two commissions which had reported that trawling had done no harm; but in 1874, when matters were at their worst, three Scotch gentlemen of position, who were likely to command the confi- dence of the fishermen, formed themselves into a private committee to inquire into the causes of the failure in Loch F yne. The re- sult as regards the effects of trawling in keeping away the herrings may be best given in their own words :—"The fact cannot be ex- plained away that the fish seem to be at present disinclined to enter other narrow waters where trawling is unknown."! The idea, how- ever, that the opinions of these gentlemen would be received with respect has proved to be a mistaken one; and the fact that three inquiries had resulted in the same conclusions seemed only to make these fishermen the more determined to clamour against trawling. In 1877 a fourth commission was appointed ; its object was to ex- amine into the condition of the Scotch herring fisheries generally, aud the state of the Loch Fyne fisherics was therefore once lore investigated. Yet, notwithstanding that the produce of this loch had increased from 6934 barrels in 1874 to 15,097 in 1875, and to 34,471 in 1876, with a further increase in 1877, so far as the returns had been made up at the time, all the old statements were again brought forward by the drift men. But the facts against them appear to have been too strong, and this last commission, like the three previous ones, has declined to recommend that trawling should be suppressed.

There is abundant cvidence in the records for a great number of years that the annual produce of Loch F yne has been subject to large fluctuations, Butif we compare successive periods of ten years cach we shall find that not only are the average total catches in recent years far in excess of those in earlier times, but the average for each boat has very largely increased. The following official record for periods of ten years is very instructive :—

Average No.

Average No. of Boats.

Period, of Barrels.

1827-1836 1837-1846 1847-1856 1857-1866 1867-1876

300

350 396 558 479

The average for the ten years 1857-1866 was much raised by the

enormous catch of 79,893 barrels in 1862, whilst the small number of 6934 barrels only being taken in 1874 has materially lowered the average for the last ten years,

We now look at the produce of the fishery on the whole west Coast of Scotland for the last thirty years, taking the average M periods of ten years as before, we find the following :—

Average Catch. a

Highest Catch. | Lowest Catch.

1847-1856 85,837 109,806 56,206 1857-1866 122,154 178,827 83,218 1867-1876 156,988 226,037 83,892

The quantities here given are in barrels, fata and the preceding return are taken ail peowed by Mr George Reiach, assistant inspector under the

ie ah isheries, and furnished by him to the commission in 1877. i eu been 27 years in the service of the board, and for the last . = years the whole of the west coast fisheries had been under his

INspection,

ere is nothin that enab condition of fluc “ at records of its ann

as usual ; and the figures from the statistics care-

lat @ better to understand the actual tuating industry like our sea fisheries than accurate ual produce. In this respect Scotland, owing to

- *The Report of thes*

Annual Report for 1875; Sentlemen is given in full and ably discussed in the

of the Board of Fisheries,

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the careful labours of her Board of Fisheries, is in a far more for- tunate position than cither England or Ireland 3 and the following tables taken from the last report of the Fishery Board will] readily show, by the comparison of any two selected series of years, the gradually increasing importance of the Scotch herring fishery, notwithstanding the fluctuations arising from unfavourable weather aud other natural causes. Wo may add that considerable quantities of herrings which are sold in the local markets and consumed whilst quite fresh, do not appear in the board's returns, but those which are slightly salted for transit by ship to the great markets are so included. The quantities are in barrels, as before.

ABSTRACT showing the total quantity of White Herrings cured, branded, and exported, year by year, in so far as brought under cognizance of Fishery Officers, from the 1st of June 1809 to the 31st of December 1877 ; distinguishing the export to Ireland, to the Continent, and to places out of Europe. The periods for which each Return is made end on the 5th of April down to 1844 ; from that year to 1852, on the Sth of January ; and after- wards on the 31st of December; hence two returns were pub- lished in 1852. There were no returns for England after Jan- uary 1850, or for the Isle of Man after J anuary 1869.

Exported = Total Total |—----————_—____. Total Periods. Cured. Branded. To To the Out of | Exported. Ireland. | Continent, Europe.

1810 90,185 34,701 28,014 7,834 35,848

1sil 91,827 55,662 28,212 oe 9,921 38,133 1812 111519 58,430 30,417 4,730 | 27,672 62,820

1813 153,488 70,027 57,980 11,046 40,699 109,725

1814 110 542 38,184 43,061 23,943 | 51,399 | 118/403

1815 160,139 83,376 49,635 35,891 55,778 141,305 1816 162,651 116,436 29,456 15,563 62,668 107,688 1817 192,343 140,018 36,341 44,439 57,855 138, 628 1818 227,691 183,089 53,386 43,896 65,057 162,339 1819 340,894 270,022 89,704 52,333 85,125 227,162 1820 382,491 309,700 101,109 64,302 88,104 258,516

1821 442.195 | 363,872 | 125,445 89,524 | 79,836 | 9294’805

1822 316,524 263,205 102,719 34,752 77,485 214,956 1823 248,869 203,110 56,528 38,002 75,914 170,445 1824 392,190 299,631 116,747 40,231 82,652 239,630 1825 347,665 270,844 96,409 35,029 70,577 202,016 1826 379,233 294,423 121,386 28,167 67,519 217,073 1827 288,495 223,606 78,735 16,701 70,970 166,406 1828 399,778 279,317 109,108 24,489 78,061 211,659 1829 855,979 234,827 107,651 28,280 69,944 205,875

1830 329,557 | 218418 89,680 24,302 | 67,672 | 181,654

1831 439,370 237,085 130,300 61,655 72,947 264,903 1832 362,660 157,839 128,458 31,100 57,941 217,499 1833 416,964 168,359 114,137 47,556 58,991 220,684 1834 451,531 178,000 149,254 55,852 66,987 272,093 1835 277,317 85,079 73,960 34,050 50,795 158,805 1836 497,614 192,317 168,960 48,451 55,982 273,393 1837 897,829 114,192 102,968 46,777 39,520 189,265

1838 507,774 | 141,552 | 139,095 57,388 | 38,674 | 235,158

1839 555,559 153,659 149,926 64,870 24,934 239,730

1840 543,945 | 152,231 | 157,359 82,515 | 12,647 | 253 599 1841 557,262 | 154,189 | 150,517 90,951 8,668 | 250,137

1842 667,245 190,922 187,953 91,069 5,713 284,736

1843 623,419 | 162,713 | 165,327 | 120,136 6,336 | 291,800

1844 665,359 182,988 127,770 181,953 3,798 313,516 1845 526,032 140,632 120,293 143,754 2,326 266.378 1846 532,646 142,473 127,027 113,678 2,488 243,194 1847 607,451 156,278 102,585 148,363 4,765 255,714 1848 562,743 146,500 102,690 142,532 4,959 250,181 1849 644,368 153,944 78,262 168,049 3,682 249,994 1850 770,698 213,286 78,889 257,108 4,258 340,256 1851 544,009 172,024 66,138 198,403 2,367 266,908 1852 594,031 201,636 81,340 182,659 205 264,204

1852 498,787 160,159 60,414 PEAS) 1,133 283,526

1853 778,039 248,136 95,339 242,853 4,438 342,630

1854 636,562 | 211,844 | 121,883 237,893 1,919 | 361,696

1855 766,703 280,581 97,377 344,029 858 442,264 1856 609,988 223,281 89,670 256,741 1,199 347,611

1857 580,818 | 218.999 58,534 | 307,275 1,351 | 367,160 1858 636,124 | 233.374 79,054 | 269.819 1,331 | 350,204

1859 491,487 158,676 68,882 203,349 748 272,979 1860 681,193 231,913 86,413 291,401 156 377,970 1861 668,828 265,347 81,595 308,334 384 390,313 1862 830,904 364,712 70,879 423,182 847 494,910

1863 654,816 | 276,880 72,074 | 333,074 2,612 | 407,761 1864 643,650 | 217,399 55,420 | 307,282 1,805 | 364,507 1865 621,763 | 216,785 42,063 | 309,626 1,012 | 359,701

1866 658,146 249,510 47,319 328,272 4,474 380,066 1867 825,589 317,421 42.364 432,994 3,345 478,704

1868 651,433 | 209,462 43,414 | 323.479 1,850 | 868,744 1869 675,143 | 244.599 82,342 | 346,793 2,197 | 381,333

1870 833,160 299,381 41,524 486,064 2,970 530,558 1871 825,475 346,633 46,347 502,534 2,724 551,605 1872 773,859 422,731 24,147 528,540 1,943 549,631 1873 939,233 435,274 82,465 633,681 1,861 668,008 1874 1,000,561 517,558 28,137 706,967 2,209 737,314 1875

942,980 528,789 33,434 624,137 3,399 660,970 1876 598,197 252,979 20,333 378,740 1,350 400,423 1877 847,718 397 795 16,085 543,908 1,992 561,985

W.B—In the six years ending 5th April 1815 the bounty on herrings cured gutted was two shillings per barrel, while there was a bounty at the same time of two shillings and eightpence per barrel, payable by the excise, on the expor- tation of herrings, whcther cured gutted or ungutted, but which ceased on the Ist June 1815; in the eleven years ending 5th April 1826 the bounty on herrings cured gutted was four shillings per barrel; in the four succeeding years the bounty was reduced one shilling per barrel each year till the 5th of April 183. when it ce .sed altogether, and has not since been renewed.

Garvie fishing.

Line

fisheries.

Curing of cod.

zc.

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962 FISHERIE Ss [scorcH,

Garvie or Sprat Fishing.—This is carried on to some | extent at the upper end of the Firth of Forth, and in tlie Beauly Firth. In the former locality the garvies are caught by means of trawls (seans), and the principal fishing is on the western side of Inchgarvie. In the Beauly Firth drift-nets are used, and only fish of fair size are taken. Complaints have long been made in both places of the capture of young herrings with the garvies, and the herring fishers have done their best to get the garvie fishery put a stop to; but fortunately they have not succeeded, for this fishery gives profitable employment to a good many fisher- men, and there is not a particle of proof that the herring fishing farther out has suffered from the occasional capture

of young herrings with the garvies. Sprats are not in much demand in the Scotch markets, and almost all that

are taken in the localities mentioned are sent by rail to London. Weare sorry to say that the old fallacy of the sprat being nothing but a young herring still prevails among some of the fishermen and curers.

Line Fisheries.—The capture of cod, haddock, ling, and saithe or coalfish is general around the coast of Scotland ; and the tusk or torsk, a northern species of the cod family, and in shape like a sliort-bodied ling, is taken in some numbers at the Shetlands, and a few at the outer Hebrides. Long lines are in use for haddock, ling, and tusk, and also for cod on many parts of the coast; but at the Shetlands hand lines are employed for cod and saithe, and also at Faroe and Iceland. At Newhaven, Eyemouth, and other places in the neighbourhood in the Firth of Forth, two sizes of long line are regularly worked in the proper season. 'The smaller or haddock lines have from 800 to 1000 hooks each, or even more, on snoods 14 inches long and 23 feet apart, and mussels and lug worms are used as bait. Some little interest is attached to the state of this fishery, as it is an important one in Scotland, and a few years ago it was said to have fallen off very much. But it appears there are still plenty of haddocks on the coast, and now that larger and decked boats are used, and the fishermen are consequently more independent of weather, very large takes are not uncommon. In one week in January 1876 the Eyemouth boats were at sea six times, and landed 20,000 stones of haddocks, which sold at 2s. per stone, producing in that short period no less than £2000. .The season lasts here from October to April, and the average gain for the season by each boat usually ranges from £400 to £600. There is a considerable trade in smoked haddocks, particu- larly from Eyemouth, and the curing consists in soaking the fish in pickle for half an hour, and then hanging them

for about four hours in some hardwood smoke. The village |

of Findon, between Stonehaven and Aberdeen, has long been famous for first preparing the fish known as " Finnan haddies." Their peculiar flavour, which has made them so popular, arises from their being hung in peatsmoke. They ure cured in the cottages, and some little variation in the time in pickle and in smoke is made according to the time they are intended

to keep. This manufacture is now carried on at many places besides Findon. The cod or "oreat lines" are of the same description as those used for haddock fishing, but have longer snoods, and the hooks farther apart. It is unnecessary to speak of the manner in which these long-lines are worked, as we have fully described it in our notice of the North Sea cod fishery. A vast quantity of line fish is sent to the fresh market, but the great importance of this Scotch fishery is due to the large extent to which curing operations are carried on, and

more especially in the distant districts such as tle Shet- jJands and the outer Hebrides.

eke is performed in two ways—dry and in pickle. The latter method consists In packing the fish, after they have been split open, gutted, and part of the backbone and the head removed, with layers

of salt in barrels ; but when to be cured dried, these fish, perhaps

caught as far off as the Faroe Islands or Iceland, and landed at the

Shetlands, are unpacked, washed, and spread out either on stages

or on the beach, and exposed for some days to the air and sun, due

attention being given to them to ensure their being evenly dried, |

When thoroughly cured, they are kept in a cool dry place, until

wanted for shipment. The fish caught near the coast are salted as

goon as landed, and afterwards treated as the others. The produce

of the Shetland fishery is large in itself; but the return of fish

cured in those islands is greatly increased by the supplies of fish in

pickle landed there for curing by the Grimsby and Shetland smacks,

which go every year to Faroe, Iceland, and other more or less dis.

tant fishing grounds. A great deal of the cod and some of the ling go to the Spanish .

markets, and a little to Anstralia; but the ling and tusk are chiefly

sent to Dublin, Glasgow, and Leith, and the saithe to Belfast, Leith,

and Dundee.

ABSTRACT showing the Total Quantity of Cod, Ling, Hake, Saithe, and Tusk, cured and exported, year by year, i so far as brought under cognizance of Fishery Officers, from the 10th of October 1820, when the system for encouragement and improvement of the Cod and Ling Fishery commenced, to the 31st of December 1877. The periods for which each Return is made end on the 5th of April down to 1844; from that year to 1852 on the 5th of January, and afterwards on the 31st of December, Two Returns, therefore, appear for 1852 in the tables. The collection of Returns for England ceased from the 5th of January 1850, when also the Punching and Branding of Cod and Ling came to an end; and there were no Returns for the Isle of Man after January 1869.

Cured |Curedin F Cured Cured in Exported pickle. ried. "| dried. pickle. | dried.

es en Re

Barrels.

N.B—the books of the Fishery Board do not show the total quantity of cod, ling, &c., cured till the year commencing 5th Apiil 1625. The bounty from the earliest date in this abstraet to the 5th of April 1830, was four shillings per ewl, for fish eured dried, and two shillings and sixpence per barrel for fish cured in pickle, taken by the crews of vessels or boats not on the tonnage bounty; while the bounty for vessels licensed for the eod and ling fishery, on the tonnage bounty, was fifty shillings per ton, for tonnage and cargo, to the 5th of July 1826, diminishing five shillings annually to the 5th of April 1830, when the bounties altogether ceased.

In 1877! the number of fishing boats in Scotland was 14,623, and of fishermen and boys 45,890, and the estimated value of the boats, nets, and lines employed in the herring and cod and ling fisheries was £1,178,412, being an increase over the numbers for 1876 of 76 boats and 627 fishermen and boys, and also an increase of £50,418 in the estimated value of boats, nets, and lines.

Irisu Fiswertes,—After a continuous depression of 30 Init years, during which the number of boats and fishermen Oe on reduced to less than a third, the Irish sea fisheries showed some indications of an improvement in 1876, the last year" for which the inspectors have published their annual report.

187,200 | 8. ; |

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1 Report of Fishery Board, Scotland, for 1877.

2 After the above was in type the Inspectors' Report for 1877 has been published. Thcy state that there has been an apparent decreas? of no less than 583 fishing boats and 3300 fishermen and boys since 1876; but, as in previous years, they do not appear to have mue confidence in the accuracy of the returns. The herring fisheries wel?

IRISH. |

The difficulty in ascertaining the precise number of boats and fishermen on some of the wilder parts of the coast is so great, however, notwithstanding the important fact that the coastguard is employed in collecting the information, that, as the inspectors tell us, the returns even at the present time cannot be taken as quite trustworthy. There was, how- ever, an apparent increase of 46 craft and 589 fishermen, and this seemed certainly the most encouraging report that had reached us for many years, But an analysis of the return shows that this increase is more apparent than real. The inspectors conveniently divide the boats with their crews into three classes independently of tonnage, and this plan enables us in some measure to understand who are included under the head of fishermen. The divisions come under the following heads, and we give the returns for 1875 and 1876 for the sake of comparison :—

Mostly Fishing.

Solely Fishing. Occasionally Fishing.

Year, |— 1

Boats. | Men. Boats. | Men. Boats. Men.

1875 1341 6241 602 1870 3976 14,997 1876 1283 6105 644 2248 4038 15,340

The total number of boats and men in 1876 was—boats 5965, and fishermen 23,693, being a slight increase in both over the previous year. But

there is a falling off in the number of regular fishermen, and the increase is only in those who devote part of their time to fishing. We have it on the authority of the inspectors that the men in the third division, or occasional fishermen, are not employed in that occupation on an average for more than one month in the year, and yet we find the boats in this division form more than two-thirds, and the men nearly the same pro- portion, of the total numbers in Ireland.

The history of the Irish fisheries shows that great fluctua- tions have taken place at various times, but the last great decline undoubtedly dates from the period of the famine in 1846, and those who have been long acquainted with the west coast fishermen in particular believe that their present depressed state is entirely the result of that disastrous time. Local assistance has been given time after time with only a temporary improvement ; and now the experiment is being tried of advancing money from the Irish Reproductive Loan Fund to enable the fishermen to provide the necessary gear for fishing. The applications for loans have been, as was expected, far in excess of the amount available for the purpose, and in very many cases no security could be obtained that the money would be expended in the manner Proposed. No doubt some good will be done by these loans, but much lasting advantage is not to be expected from the system. Emigration has carried off thousands from the country, and mainly from the west coast, where, however, the majority of the fishermen were little more so than in name, and fishing was never allowed to interfere with sea-weed cutting, farming, and any chance occupation. There is this to be said, however, that on very many parts of the west coast of Ireland the weather is frequently so bad, and the seas so stormy that fishing cannot be carried on with any regularity; and when favourable times arrive, the neglected boats and fishing gear are too often unfit for use. On the east and south coasts things are in a better condition ; important fisheries for herrings and mackerel In their Seasons there provide profitable employment not only for Irish fishermen, but for large numbers of Cornish, Scotch, and Manx fishing boats, which until the last year or two have far outnumbered the native craft. There is plenty of fish to be caught on the Irish coasts ; and the

i in 1876, those for mackerel and pilchards not so good; connae oe quantity and value of the herrings, mackerel, and cod gned to the English markets

exceeded those of the year before.

influence of the strangers is telling on many of the Irish fishermen, and leading them to improvement in their boats and all that relates to carrying on their work.

The principal methods of fishing in Irish waters are trawling, drift-fishing, and line fishing ; there is also a little done with seans and trammels.

Trawling.—Dublin is the headquarters of the deep-sea Trawling.

trawlers, and possesses a fleet of about 50 smacks, ranging from 30 to 50 tons, and working chiefly from that station. Deep-sea trawlers were first used from Dublin in 1818, when, as previously mentioned, some Brixham boats and fishermen were brought over. The fishing was found to be profitable, and the fleet of smacks was gradually increased until it reached its present size. The trawlers work throughout the year when they can get sufficient hands, but the light summer weather is not very suitable for them ; and the attractions of the herring fishery and pro- fitable employment on board yachts take away a great many men for several weeks from their ordinary occupation. The principal trawling grounds lie within a triangular space between Dublin and Dundrum Bays and the Isle of Man, and consist of a number of patches differing in shape and extent, which are worked over, either on the inner or outer grounds, according to the season. The Isle of Man ground, lying in deep water, and a favourite place for soles, is usually fished from March to July. In January there is a partial migration of the trawlers to the south of Ireland, and a very productive fishing place known as the Saltee ground, and about south-west from the Saltee lightship, near Waterford, is worked by them with advantage. Farther out at sea, ata distance of 30 or 40 miles from the land, and without any very clearly defined limits, is what has long been spoken of as the Nymph Bank.) Extra-ordinary results have been anticipated from fishing this ground, and no donbt there is plenty of fish upon it; but there are difficulties in working it properly, partly on account of many scattered rocks which interfere with

trawling on it generally, and partly because of a want of organization for bringing in the fish and sending them to market. Foralong time the greatest difficulty encountered was from the local fishermen, who would not work in a deep-sea trawler, or allow one to use her nets anywhere within the headlands, although the weather was too bad to go outside. Companies have been formed for trawling from Waterford harbour, but the determined hostility of many of the native fishermen, and the fears of others in consequence, have done more to discourage trawling there on a large scale than anything else. English crews have been tried, but it is not surprising that they should be unwill- ing to remain in a locality where the feeling against them was so strong. Matters seem to have improved of late, but a good deal of enterprise is needed to carry on the fishing in the way in which it might be done. Trawling is worked in the shoaler parts of Waterford harbour by the local fishermen ; and the complaint made by them that the large trawlers did so much mischief in destroying the young fry, whilst the small boats habitually worked where the young fish were most abundant, was not too absurd to be listened to by the inspecting commissioner of fisheries a few years ago. A bye-law was therefore established (pro- bably with the object of preserving the peace) to keep the large trawlers beyond a certain depth of water, and the small ones then had it all their own way inside. Under

1 Mr Fraser mentions that in 1726 a proposal was made by Mr William Doyle, hydrographer, for supplying the large English markets with fish preserved in well-boats, from the southern coast of Ireland, and particularly from a fishing ground he states he had discovered, unto which he gave the name of Nymph Bank, from a vessel called the "Nymph," which he employed in the examination of this fishing ground.-—Review of Domestic Fisheries, p. 4 (1818).

the present more enlightened system of inspection the tendency is happily to remove restrictions to fishing rather than to make them; and the results of a

systematic search for spawn in the Irish bays are reported to have been such as to refute completely the charges brought against the trawlers of destroying it.

Drift Fishing.—Two of the most important fisheries in Treland are those for herrings and mackerel. That for herrings is carried on more or less on many parts of the coast, but its chief seat is in the Irish Channel, with Howth, the northern point of Dublin Bay, and Ardglass, opposite the Isle of Man, for its headquarters. 'Tle fishery begins at the end of May or beginning of June, and lasts well into September, or in some parts into October. By July it is in full work, and the two stations above men- tioned are then the scene of unusual life and activity, for a very large proportion of the fish landed there is at once packed and sent off fresh to the English and Scotch markets. A little curing is done at Howth, but it better answers the purpose of the Irish people to send their own fish fresh to market, and to import cured fish from Scotland.

The question of introducing the branding system into |

Ireland has recently been considered by the inspectors of fisheries, and inquiries were held on various parts of the coast in order to find out the general feeling about it. The inspectors say, however, in their report for 1876 — " With regard to branding, we felt it our duty to report that under existing circumstances we were unable to recommend ex- tension of the system to Ireland—there being, firstly, no bona fide desire for it existing amongst the Irish fishermen or curers ; and, secondly, that the fish caught in Ireland and sold fresh realized a much higher price to the captors than the price received by the fishermen in Scotland and cured for the foreign markets, and that no material benefit would therefore really be derived from such extension."

Treland is in fact well off in having a market across the channel for any quantity of fresh fish she may send over ; and a large proportion of the herrings and trawl fish caught on the east coast, and almost all the mackerel taken in the Kinsale fishery are at once despatched there. The drift fisheries are, as before mentioned, by no means monopolized by the Irish fishermen, but are taken part in by a large number of strangers. The inspectors in their report for 1876 tell us that "the highest number of boats

of each country at Howth during the season was—Cornish 206, Irish 209, Scotch 224, Manx 133. At Ardglass the highest average number that fished during one day (23d July) was—Scotch 140, Manx 20, Irish 42, Cornish, 19." These figures show a slight increase in the Irish boats over those in previous years. The east coast fishermen have of late shown inany signs of improvement; and the better boats and steady industry of the Manx, Scotch, and Cornish fishermen have not been without their use as examples of how to work the fisheries with profit.

Kinsale has in recent years come into notice as the great

mackerel station for the mackerel fishery. This fishing begins early

fishery.

in March and goes on till about the end of June, thus immediately preceding the herring season. In 1876 tliere were 217 English and Manx boats, 13 Scotch, and 133 Irish engaged in this fishery, besides more than 60 large French luggers, the last-mentioned boats salting their fish as soon as caught, and returning home when they have made their cargo. The mackerel fishery is a very important one for Kinsale, as it gives employment, not only to the fishermen, but to numerous other persons of various descriptions, The mackerel are almost all packed in ice and sent to England. During the season of 1876 there were 7 steamers and 11 cutters in this carrying trade, —the former at a monthly expense of £350 to £400 for each vessel, besides paying al] dues, coals, and pilotage ; and 4400 tons of ice were

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imported solely for the package of the fish. The mackere] are packed in boxes containing a " hundred," or six score of fish in each, and the official returns show a total capture of 139,083 boxes full in the season of 1876. The prices ranged from 12s. to £5 per box in the course of the regular season; but some boats made a large catch afterwards in July, when there was little demand for the fish, and prices then went as low as 3s. per 100.

The following is a summary of the quantity of herrings, Bxpms mackerel, and cod exported from Ireland to the under. of fish

mentioned places in England during 1876 :— ad and, Herrings., Mackerel. Cod. Boxes of 2 cwt. | Boxes of 2 ewt. | Boxes of 2 ewt London 31,606 29,500 11,882 Nottingham 3,552 2,770 4,829 Bradford. 6,977 3, 805 3,001 17,555 Oia

7,819 5,583

Bae 4,078

6,998 5,282

Liverpool 21,763 14,017 | Birmingham . 12,204 4,894

113,995 79,650 55,069

Herrmas valmed-at £2 per box….....0. .95…9s00e £227,990 Mackerel,! 139,083 boxes at an average of 16s. per box 111,266 Codlattes Wer DOR... caec.crsccscenercecscne osceocesen eee 165,207 Total. valttes:.:ets…00k. .coseeeeeeeeeee £504,463 It will be seen from the above figures that the Irish fisheries are by no means wanting in importance, and it is | much to be regretted that the fishermen of the country do | not take a larger share in working them. The produce of the deep-sea trawl fishery is also very valuable, but we can give no return of the considerable quantity of trawl-fish | sent to England. | It has been a matter of surprise to many that no system- Propose | atic attempt has been made to catch the large shoals of a pilchards which annually visit the south coast of Ireland,

The prejudice of the Irish fishermen against pilchards has | been so great as to almost dishearten the inspectors in their repeated endeavours to bring this fishery into notice | Whilst the great Cornish sean-fisheries have been languish- ing because the shoals of pilchards have not come into the bays within reach of the nets, they have been in plenty on parts of the Irish coast. One of the inspectors (Mr Brady) has been untiring in his exertious to procure every kind of information about the catching and curing of pilchards in the Cornish fashion, in the hope of its leading to the

establishment of curing stations in Ireland, but little progress has yet been made. The inspectors, how- ever, continue to be hopeful in the matter, and in their report for 1876 they say:—"No efforts have yet been made to cure for the Continental markets, but some have been cured for home consumption on various parts of the coast. By degrees this fish is being regarded with more favour by the country people, and if they continue to fre quent our coast as they have now done for some yeat®s there is little doubt but that a considerable trade will result, as they come more into favour."

We have now referred to all the important Inish sea fisheries. It may be added that line-fishing is more or less general around the coast, and is perhaps more systematl cally attempted on the north and west sides than else- where. bee,

Manx Fisuertzs.—The fisheries carried on from the Isle oo . of Man do not call for special notice, as they are practica ly ' those of the Irish sea, and in which the industrious Manx men always take a prominent part. eye ee ee

ooo NN eee

1 139,083 boxes of mackerel were recorded, and most of them were exported, but the returns of exports are incomplete.

ish es,

MINOR BRITISH. |

Minor Britiso FisHeries.—Crab and Lobster Fisheries. —The demand for these crustaceans has increased so much within the last few years that the supply from the coasts

'of Britain has been insufficieut, and from 400,000 to

600,000 lobsters have for some little time been annually imported from Norway. They travel without much loss in vessels fitted with wells; and for journeys lasting no longer than two or three days they will live very well if packed with wet seaweed mn boxes. The places from which the principal home supplies are sent to the large markets being now mostly within easy

reach of railways, there is little occasion to use welled vessels for collecting them.! The English markets are mainly supplied from Cornwall and the south coast of England, from the Orkneys and Hebrides in Scotland, and from the west coast of Ireland. Besides these about 200,000 come from France, the fishery for them being in the neighbourhood of Cherbourg, and a few from Sweden. The means adopted for catching lobsters and crabs in the British Islands are either circular basket- work "pots" with a mouse-trap entrance at the top, or cages covered with netting and with one or two entrances as in the pots. These cages are commonly called "creels." Crabs are taken in most abundance in the west and south of England, and more or less generally on the east coast, and in Scotland and Ireland, those from parts of Devon and Cornwall being the finest which are sent to market. There is a general disposition on the part of the fishermen to submit to some law limiting the size of both crabs and lobsters to be offered for sale, so as to put a stop to the falling off in these fisheries, which is apparent on some parts of the coast. A close time is objected to, asno month in the year is generally suitable, and " berried" lobsters are so valuable for the market that if they had to be returned to the sea the fishermen would lose a great part of their present profits. A limit to the size allowed to be sold seems therefore to be the best means of protecting these fisheries ; and such a law is now enforced on the coast of Norfolk,

Shrimp and Prawn Fisheries—The most important of these fisheries are carried on in the estuary of the Thames, Pegwell Bay near Ramsgate, and Morecambe Bay on the Lancashire coast, but they are more or less general wherever suitable ground is met with. Leigh is the headquarters of the Thames shrimpers. They fish with a net mounted very inuch like a beam-trawl, but having a long, straight piece of wood at the lower part of the mouth to work over the ground instead of the ordinary ground-rope. This is in fact like the common form of hand-shrimping net, but So fitted as to be towed instead of pushed. Ordinary trawls are used for prawns or "red shrimps," and in Some other places for true shrimps. The supply of shrimps from Leigh sometimes amounts to 2000 gallons In a day.

Shelljish:—Oysters, M ussels, Whelks, Periwinkles.—-The oyster fisheries of the British Islands have been ina failing condition for some few years past, owing to a deficiency of Spat, the cause of which has been the subject

of active controversy, not only between rival theorists, but also among practical fishermen. Over-fishing has been regarded by many as the main cause of the decrease, and it may pos- sibly have helped to make matters worse than tlley would otherwise have been ; but it is difficult to explain in this Manner the fact that, in England, Scotland, and Ireland, there has been a general failure of spat for some years past, on all kinds of ground and under every condition, in public and private beds, and whether they have been carefully protected, as in the case of old established private com- panies, or left to the working of the general public, except

1 os Report of Commission on Crab and Lobster Fisheries, p. ii. (1877).

during a definite close time, more or less enforced, In Ireland, where there are regulations for close time, and restrictions as to the size of oysters allowed to be sold, and where in some cases all fishing has been stopped for two or three years, the decrease of oysters has been as decided as in England or Scotland ; and Mr Blake, until recently one of the inspectors of Irish fisheries, and chair- man of the oyster commission in 1868, stated in his evidence given before the select committee of the House of Com. mons in 1876 that the decline in the oyster fisheries was due to the bad spatting seasons, and to the great increase of dredging ; "but if the spatting went on as it formerly did, the amount of dredging would not be of much import- ance."

The bulk of English supplies is obtained from the oyster beds of private companies, of which the Whitstable company is the most ancient, having worked from time immemorial on their present ground on the south shore of the entrance to the Thames, In 1793 they purchased from the lord of the manor the exclusive right of fishing there. The company is a corporation of fishermen governed by elected members of their own body. The men are paid for the daily work done by them, and each member of the company also receives his share of the profits on the sale of the oysters. A great part of their employment, besides dredging and keeping their own ground clean and free from vermin, con- sists in dredging for spat in the public portion of

the river for the purpose of laying it down on their own beds. A general failure of spat, such as there has been in recent years, is therefore not only felt by them on their own limited ground, but they suffer from the scarcity in what may be called their reserves. The Whitstable company is, however, only one among many which occupy the shores of the Thames estuary and the small rivers which flow into it. The oysters thus laid down or bred in these situations become remarkable for the thinness of their shells, and the good flavour and comparatively large size of their contents, and are what are known as " natives." There are numerous companies or individual proprietors engaged in cultivating oysters on various parts of the coasts, but at the present time they are, we believe, all more or less suffering from deficiency of spat. Channel or deep-sea oysters are generally large and coarse, and do not fetch more than one tenth of the price given for the more delicate "natives," Attempts at the artificial cultivation of oysters have not met with much success,

Mussels and whelks, while in some request for food Mussels among the lower classes, are in especial demand for — the purposes of fish-bait, and the value of mussels in Wh2lks.

this respect has recently led to a more careful protec- tion of the older banks, and some attempts at the cultiva- tion of new ones. Whelks are particularly valuable in the North Sea cod fishery, and a number of vessels from Grimsby are regularly engaged in fishing for them. Their mode of catching them is by means of shallow hoop-nets baited with refuse fish, and sunk to the bottom on suitable ground ; in these the whelks collect in large numbers, and are caught without any difficulty. A considerable supply is also obtained from the oyster dredgers; and at the mouth of the Thames they are caught largely by using " trots " or bulters—long-lines of small dimensions; but instead of having baited hooks, they have common small shore-crabs threaded on the snoods, about twenty on each; these are seized by the whelks and so firmly held whilst being devoured that the line may easily be hauled in without disturbing the numbers found on every snood.

course collected by hand. The London market is mainly supplied from the western islands of Scotlaud, the Orkneys, the Shetlands, and parts of the Irish coast.

IX. — 34

Peri- Peri- wrnkles are all procured between tide marks, and are of wiakles.

British American fisheries.

266

British Nortu AMERICAN FisHertEes.'—The principal fisheries coming under this head are for cod, herring, and mackerel, including the long-famous cod fishery of New- foundland. The fisheries of the Dominion of Canada are chiefly carried on with open boats, and consequently are to a great extent, though subject to some variation, what may be called shore fisheries. The proportion, as giveu by Professor Hind, of the shore fisheries to the deep-sea fisheries, in which decked vessels are employed, is 4-4 to I, so that "by far the largest proportion of the fishing industry of the Dominion is pursued in coastal waters, and much of it rarely extends beyond the limit of three marine miles from the coast line." The following table shows the number of boats and vessels, with the aggregate number of men employed in each, in 1876 :—

Nova Scotia New Brunswick

In the Newfoundland fisheries boats and vessels are also used, but the deep-sea fishery is scarcely distinct from that pursued in coastal waters, or within the three-mile limit from the shore. 'The total number of boats employed at Newfoundland in 1874 was 18,611, and the number of persons engaged in catching and curing fish 45,854, while the number of vessels was 1197, with an aggregate of 61,551 tons, and manned by 8394 fishermen sailors. These vessels, however, include the large number used for sealing. The number of "fishing rooms" or portions of the shore set apart for the curing and storing of fish was 8902 in the same year. The numbers of fishing craft, men, and fishing rooms in 1874 showed a considerable in-crease over those for 1869. Professor Hind, in speaking of the large proportion of inshore fishing, says :—" The changeable character of the weather on the British Ameri- can coast, the sudden and unexpected occurrence of fogs, the variations of currents produced by tides, the long ex- perience of the dangers attending fishing in open boats some distance

from the land, the pecuniary resources of the fishermen, conjointly with the abundant fish resources of the coastal waters, have combined to limit the industry of the British American fishermen in a great measure to the immediate vicinity of the shore line, and within easy reach of harbours. This is particularly the case with Newfoundland." This inshore fishery, however, depends for its success on the supply of bait fishes, especially the capelan and herring; and, as in every kind of fishery, there are years when migratory fish, those which more or less change their quarters at particular seasons, vary in abundance in certain localities, and sometimes forsake one part of a coast and go to another, so the important fisheries dependent on these movements are subject to fluctuations. The cod, in fact, there follow the bait-fishes precisely as, on the English coast, the cod and coalfish become most numerous near the land when the shoals of herrings come closest in. On the coasts of British North America the fishing interest is almost entirely concerned with species whose natural habitat is in cold waters; and as an immense area of fishing water is there influenced by the Labrador current, it is not surprising that cod, holibut, herring, mackerel, and others should be found in abundance on these coasts. The mackerel has also an extensive range

1 An elaborate and in man y respects valuable Report, by Professor pe Youle Hind, M.A., of the Fishery Commission, "Halifax, pub- ed so recently as 1877, has largely supplied us with materials for our notice of the fisheries of British North America.

south along the coast of the United States; but the Labrador current is little felt south of Cape Cod, its influence being there almost destroyed by the Gulf Stream, The really cold-water species are therefore mainly found in the Dominion seas; and the fact that American fishermen so systematically work there for them is the ground on which the Dominion claim for compensation from the United States Government was based. The sum recently awarded to the colony by the arbitrators is much less, how- ever, than the amount of the claim.

The methods of fishing in use in the Dominion and Newfoundland waters are of the same kind as in the British Islands, with the exception of beam-trawling, which seems to be practically unknown on the American coasts, Herrings are taken by drift-nets, anchored nets, and seans; mackerel by seans and hock and line; capelan by seans; and cod and its allies by long lines or bulters—there, strange to say, known as " trawls."

Professor Hind states (at p. 58 of pt. 1 of his report) that the aggregate number of barrels of herrings caught

in Dominion and Newfoundland waters in 1874 may be put down at—

DD OMMINMOMUWALCTS. 06.0. .5- 50. cee ese eee Newfoundland waters

534,307 barrels

271,382 ,,

Total 805,689 barrels

This number does not include the quantities used for manure or bait; and he adds :—' A million barrels of her- ring each year, and gradually increasing, will fairly repre- sent the quantity of this fish taken from British American seas." In the same year 164,879 barrels of mackerel were taken in Dominion waters, of which 80 per cent. were caught on the coast of Nova Scotia. The mackerel fishery at Newfoundland appears to have been very small for some years ; and the fishermen do not now seem to be well pro vided with the means of catching them; but there is reason to believe that this fishery might be largely increased in the Dominion waters if more attention were given to it. There is a very great demand for mackerel in the American market. The Newfoundland and Dominion cod fisheries are, as we have mentioned, almost entirely inshore fisheries, and the abundance or scarcity of capelan or other fishes there used as bait materially affects the success of the fishery, for if the bait fishes do not come inshore, there is no attraction for the cod. In the deep-sea fishery on the banks, the case is different; but they are almost neglected by the Dominion and Newfoundland

fishermen, for reasons pre- viously stated. The produce of the inshore cod fisheries, although fluctuating, shows no signs of being exhausted.

The following table, it is believed, represents with tolerable accuracy the catch of cod and allied fishes on the Dominion coasts in the years stated :—

Quintals. | Year. Quintals.

730,928 1873 1,405,804

801,553 1874 1,278,499

964,131 1875 1,193,579 1,372, 207

The export of dried cod in quintals from Newfoundland in the years 1869-1876 was :—

Quintals.

——$——

Quintals. | Year.

1,369, 205 1,609, 724 1,136, 235 1,364,068

1873 1874 1875 1876

1,204,086

1,328,726 1,221,156

| 1,213,737

The British American fishery for lobsters is of some importance, and cod roes and livers are among the valuable articles of export.

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1 ited £ tes f eries,

UNITED STATES. |

The French fisheries at Newfoundland are carried on both on the banks and near the island, the craft employed being of various sizes, ranging from vessels averaging about 170 tons down to open boats. The following table! gives the number of craft of all kinds and the total number of men in each year from 1867 to 1874 :—

ee Men. | Year ae Me

1867 804 7178 1871 665 1868 774 6552 1872 865 1869 806 6452 1873 899 1870 833 6397 1874 847

Of the numbers of fishing craft here given about 70 per cent. are boats. The produce of the French N ewfoundland fishery in 1872 was said to be 10 million francs.

Unirep States FisHERtes.—These may be divided into warm-water and cold-water fisheries, the latter being for the most part carried on in British American waters, The cod fishery, formerly prosecuted off the coast of New England, in the cold water north of Cape Cod, is said to have seriously decreased, and it is believed by Professor Baird, the commissioner of fish and fisheries, that the failure is largely due to the diminution of alewives and other bait- fishes, caused by the numerous dams and obstructions in the rivers in which these fishes were accustomed to spawn. The young fish formerly produced in such myriads are now said to be comparatively few, and the cod and allied fishes consequently have less food to attract them to the old haunts. As there is no reason to suppose that cod, as a Species, are diminishing in numbers, the conclusion obviously is that they are seeking other feeding grounds. The warm- water fisheries include the pursuit of a variety of fishes, but the " scup," a kind of bream, and the "blue-fish," both migratory species, are those whose capture is thought of most value. Although almost all the shore fisheries are said to be decreasing? Professor Baird, in his elaborate reports to the United States Government, does not seem to be quite clear as to an effectual remedy. The pounds and weirs are said to be very destructive to spawning fish, but they supply a large quantity of fish to the markets. The Scourge of the American coast appears to be the blue-fish, " destroying ten times as many fish as they really need for food,

*and leaving in their track the surface of the water covered with the blood and fragments of the mangled fish.”3 Professor Baird estimates that in 1871 there were 100 Taillions of these fish on part of the American coast, and that each one destroyed twenty fish per day; and as the blue-fish season lasts from 120 to 150 days, some idea may be formed of the extent of the mischief caused by them. Fortunately the blue-fish is in great request as an article of food, and about a million and a quarter were captured in 1871, or, as estimated, one in a hundred of those on the poast. To the blue-fish Professor Baird assigns the very first. position among the injurious influences that have affected the supply of fishes on the coast, The agency of man he places next,—the pounds and weirs along-shore catching spawning fishes, and the dams and other obstruc- Hons in the rivers preventing certain species from ascending : * Report on Newfoundland and Labrador Fisheries, 1875, by*

aptain Erskine, R.N.

- *Professor Baird says at page 19 of Part i. of his Report— It is ie i to be inferred from our remarks as to the scarcity of fish cont ue actually caught now than formerly at any time, the mae’ perhaps, being the case, since by means of the improved . at 8 of capture, in the way of pounds and nets, an immense supply ma €n out at certain seasons of the year, so as frequently to glut the*

Tinney {rhe scarcity is better shown by the great difficulty ex- Puenged by line fishermen in securing a proper supply throughout

© year, on grounds where they were formerly able to catch all they needed for their own use and for sale,”

Baird. Report for 1871 and 1872, part i. p. 23.

to their proper Spawning grounds. He proposed to limit the working of the pounds and weirs to a certain number of days in each week, and to do away

as much as possible with the river obstructions. The blue-fish is beyond control.

The estimated value of the United States sea fisheries in 1876 was—

Warm-water fisheries….00…0…ccccccc00-.. $3,274,138 Cold-water aaa eran 9,756,683

$13, 030,821

The comparative value of the cold-water fisheries of the United States and of British North America for the years 1870-6 is shown in the following table'—the greater portion of the value in the United States return being from fish caught in British American waters :—

Ths British North United States. Kidevics

$5,313,967 11,482, 410

$14,260,298 16,086,081 16,524,644 18,793,953 20,193,596 18,193,214 18,707,328

9,526,647 8,348,185 9,522,553 10,747,579 9,756,683

The oyster fisheries of the United States are on a very America large scale, and the coast line generally appears to abound oyster

with suitable localities for the production of these favourite

mollusks. The oysters are all of a more or less elongated form, and of large size, sometimes growing to a length of 12 or 15 inches. They are obviously more suitable for cooking than for consumption in a natural state; and it is therefore not surprising that they are unable to compete with the favourite " native" in the English market. The trade in oysters in the principal cities of the United States in 1859 was estimated as follows 5—

Bushels,

Virginia (State) .....css0.e.s0s0 cceees + 1,050,000 Baltimore….. Stee AR Cae pa eae 3,500,000 PEM ccc caewaseedasecans ce… 2,500,000 EU? i) Sais ae I 6,950,000 ls) 1 i en oe 2,000,000 0) Sc | Sa rn 4,000,000

Lc ee 20,000,000

fisheries.

Norweaian AND Swepisu Fisuertes.—The important Norwe- fishery of Norway is that for cod, and the special seat of gian and

it is at the Lofoden Islands. In 18766 the fishery was very successful, more than 22 millions of fish having been taken, a larger catch than in any previous year since 1860, excepting 1875, Of this number about 16 millions of fish were salted, and most of the remainder dried. The average price on the spot was £1, 6s. 8d. per 100. The Finmark cod fishery in the same year fell off very much, as will be seen by the following returns for the years 1872-6 :—

a 11,500,000 cod. eS 16,000,000 , 1 7 i ee 17,500,000 ,, Te. Pte ae 19,750,000 ,, (Les ane a 3,500,000 ,,

The catch of Norway mackerel in 1876 was 1,800,000 fish, and the estimated produce of the herring fishery in that year was 400,000 barrels; but the spring or winter herring disappeared about 1874, and the market has since been supplied with the large northern herring. A remark- able instance of the capricious movements of the herring

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4 Report of Fishery Commission, Halifax, part ii, p. 63.

> Report by Lieutenant P. de Broca to the French Government, 1862, given in Report by Prof. Baird, pt. iii. p. 282 (1876),

8 Consular Reports, part i., 1877. ;

Swedish fisheries.

French and Dutch fisheries.

Echinus fishery.

Tripang fisheries,

268

has just been reported! by Mr F. W. Duff, the British consul at Gothenburg, to the Foreign Office. He states that "great shoals of herrings of the large kind which disappeared from this coast in 1809 have now made their appearance again north of Gothenburg, on the coast in this country. The first appearance of the herring took place at Christmas (1877), when whales were seen following the shoals of herrings towards the coast." This is by no means the first time that herrings have returned to a particular locality after an interval of very many years.

FrencH AnD Dutcu FisHertes.—The French fisheries on the coast of the Channel are of much the saine kind as those ou the English side—trawling, drifting, and line- fishing. Trawling is carried on to a considerable extent from Boulogne, Treport, Calais, and some other places where there is convenient access to railways ; and recently two companies have been established for trawling with steamers along the sandy coast between Arcachon and the mouth of the Gironde. On the coast of Brittany the long-standing fishery for sardines, or, as they really are, young pilchards, is regularly worked. It is remarkable that this fishery is almost entirely dependent for its success on a good supply of cod-roes, in which a large trade with Norway and other places is carried on solely for this purpose, the separated ova of the cod being freely scattered among the sardine nets in order to attract the fish. French and Dutch vessels work regularly in the North Sea for herrings and cod, and the French fish in large numbers along the east coast of England in company with English boats during the herring season. They also take part in the Kinsale mackerel fishery. The French fisheries at Newfoundland have been already noticed ; considerable attention is also given by the French to the cod fishery at Iceland About 200 French: vessels visited Iceland in 1877, and during the five years 1872-6 the average annual produce of about 120 vessels from Dunkirk alone was 5 million kilos. of fish, and of oil about 500,000 kilos,?

The French oyster fisheries have for many years received considerable attention, and at Arcachon especially great success appears to have attended the cultivation of the beds. Eighty-five per cent. of the oysters obtained from these fisheries are said to be the produce of four or five breeding grounds, Auray and Arcachon being the most prolific. The total produce of all the French oyster fisheries in 1875 reached the enormous number of 97,227,000 oysters.®

Ecurnus FisHery.—On the French and Italian coasts of the Mediterranean the echinz or sea-eggs, animals belonging to the echinoderm or star-fish tribe, are regularly collected for the market, and are in great request among the poorer classes of the population. They are eaten uncooked, the egg-shaped spiny shell being divided into two parts by a single cut with a knife, and the soft and slippery contents then readily extracted. The echini form part of the various marine productions well known at Naples as fruti: di mare.

TripanG FisHeRy.—The tripang or béche de mer belongs to the order Holothurtade or sea-cucumbers. Representatives of the group are found in British seas, but by no means so abundantly or of such general large size as in tropical waters. Several species go under the commercial name of " tripang"; they are collected among almost all the islands of the Indian Archipelago down to New Guinea and Australia, and also on the north coast of Ceylon. In shape the tripang resembles a cucumber, but with a circle of short branched tentacles at one end, and surrounding the mouth. The colour is generally black, more or less varie- gated with red or orange, and although sluggish in its

» Commercial Reports, No, 2, 1878 (Herring Fishery). ? Consular Reports, part v., 1877.

3 See a Report by Major Hayes to the Lord-Lieutenant of Ireland, 1878, which contains an immense amount of valuable information.

Fipple i ts

movements, the animal has great power of contracting and altering its form. Coral reefs are favouzite haunts of the tripang, and it is found in both

deep and shallow water. The only preparation it receives after being gutted consists in drying in the sun and smoking over a wood fire. Macassar is the centre of the tripang trade, but the whole produce of the fisheries goes to China, and the trade ig entirely in the hands of native merchants, (&. W. H. H.)

Law relating to Fisheries.

Fish in English law fall under the general principles of the law as to animals feree nature. All mankind, says Blackstone, had by the grant of the Creator an original right to pursue them; and this natural right still continues unless so far as it is restrained by the civil law. Accordingly everybody has a right to take fish in the seas, in public rivers, or in private rivers belonging to himself, In private (i.¢., non-navigable) rivers the right of fishery belongs prima faeie to the owners of the land on either side, in public or navigable rivers to the public at large. In both, however, an exclusive right of fishery may exist, by which the presumptive right is excluded; and this, in the case of public rivers, can only take place by grant of the crown. Since Magna Charta the crown can no longer make such grants—at least such scems to be the better interpretation of the words in the statutc.

These various rights are more or less roughly distinguished in English law as follows. A eommon fishery is the right of fishing in the sea and public rivers open to allthe public. A several fishery is the exclusive right of an individual, derived through or on account of ownership of the soil. A free fishery is an exclusive right of fish- ing in public water, derived from royal grant. A eommon of fishery is the right of fishing "in another man's water," like common of pasture, &c. These rights include fish of all descriptions, with this exception that the crown has an old prerogative right to the whale and sturgeon, which, " when thrown ashore or caught near the coast, are the property of the sovereign on account (as it is said in the books) of their superior excellence." A curious distinction is made between the whale and the sturgeon :—De sturgione observetur quod rea tllun habebit integrum,; de balena vero sufficit st rex habeat caput et regina eaudam.

As to the mode in which fish may be caught there does not seem to be any restriction at common law. It is a question, however, whether a wear, " by

*which is meant a fixed structure on the bed of the river, the object of which is, either by means of an apparatus which then catches them or by impeding their progress, to prevent all or nearly all the fish from passing upwards," * 1s not illegal at common law. In the case of a public river a structure of this sort would be objectionable on the ground of its impeding the navigation, and in a casc relating to the River Severn the judges held that the crown could not derogate from the public right of navigation by any grant to erect wears in a public river. The legal writer from whom we have quoted above, while stating that no case had arisen directly on the point in England, Scotland, or Ireland, is of opinion that 'both wears and fixed nets, and all other apparatus which prevent fish passing to or fro are illegal at common law and forma good ground of action," even although they may: not obstruct navigation. 'Though one riparian owner may, by fishing by net or rod at all hours and by means of servants and assistants, almost use up the fish as cffectually as by keeping fixed nets, this kind of user could not properly be a cause of action, just as one owner who has a large nuniber of cattle could not be liable to an action at the suit of another who has no cattle, and so makes no use of the water. But itis otherwise where a total obstruction occurs. Hence, even independently of any statute, any fixed apparatus in a river of stream which prevents the fish going up to the other riparian owners is a good cause of action at common law, as it deprives him of one of the natural riparian rights."*

A considerable number of statutes have been passed on the subject of fisheries, the most important of which are those relating to salmon. See SALMON.

A short Act was passcd in 1876 enabling boards of conservators to fix a close term for trout, commencing not earlier than ad September, nor later than 2d November, and extending over 123 days. A bill for the protection of freshwater fish has passed through parliament during the present session (1878). Sections 8 and 9 of the Salmon Fishery Act 1861 (which relate to fish- ing with light spears and other prohibited instruments, and to using roe as a bait) shall, as amended by the subsequent _ Fishery Acts, apply to trout and char in all waters within the — of the Act, which are the same as the limits of the Salmon Act. #0F all other freshwater fish, not migrating to

or from the open on a close scason is established from 1st March to 81st May, bot

4 Fishery Laws of the United Kingdom, by James Paterson, Lon- don, 1863.

FIS—FIS§

‘ i ishing for or dealing in freshwater fish during this oe it Saas to a penalty not exceeding 40s. for the first or £5 for the second offence, recoverable on summary con- viction before two justices. The Fisheries (Dynamite) Act is ivate waters.

“The on Jo and 41 Vict. c. 62 is an Act to amend the law relating to the fisheries of oysters, crabs, and lobsters, and other sea fisheries. The sale of oysters is prohibited, in the case of “deep sea oysters,” between 15th June and 4th August; in other cases between 14th May and 14th August. Oysters taken in foreign waters, or preserved in tins, or intended for the purpose of oyster cultivation are not within this section. The Board of Trade has power to temporarily prohibit or restrict dredging for oysters on certain banks. Crabs measuring less than 4g inches across the back, or carrying spawn attached to the tail, &e., or having recently cast the shell may not be sold, except for bait. Lobsters measuring less than 8 inches “ from the tip of the back to the end of the tail, when spread as far as possible flat,” may not besold. Oysters are also specially dealt with by the “Sea Fisheries Act, 1868,” which isan Act to carry into effect a convention between England and France concerning the fisheries in the seas adjoining the British Islands and France, and to amend the laws relating to British sea fisheries.

International Law.—As between different nations, fishing in the high seas is common to all, while fishing in the territorial waters of any particular state (¢.c., within three miles of the coast) is limited to the subjects of that state. Between France and England the rights of fishing in the seas adjacent to both countries are regulated by the convention and Act of Parliament cited above. Between

FISHES. See IcuruyoLocy and Piscrcunrure.

FISHING-FROG, also Frog-fish or Sea-devil (Lophius piscatorius), a fish well known off the coasts of Great Britain and Europe generally, the grotesque shape of its body and its singular habits having attracted the attention of naturalists of all ages. Its head is of enormous size, broad, flat, and depressed, the remainder of the body appearing merely like an appendage. The wide mouth extends all round the anterior circumference of the head j and both jaws are armed with bands of long pointed teeth, which are inclined inwards, and can be depressed so as to offer .o impediment to an object gliding towards the stomach, but to prevent its escape from the mouth. The pectoral and veutral fins are so articulated as to perform the functions of feet, the fish being enabled to move, or rather to walk, on the bottom of the sea, where it generally

Fic. 1.—The Fishing-Frog (Lophius piscatorius)s hides itself in th Its head and also along the

eae resembling short fronds of sea-weed, a structure Which, combined with the extraordinary faculty of assimilat-

€ sand or amongst sea-weed. All round body the skin bears fringed

Ing the colour of the body to its surroundings, assists this Me wide ™ concealing itself in places which it selects on inte 4 the abundance of prey. To render the organ- pra ‘ this creature perfect in relation to its wants, it is L ff ee three long filaments inserted along the middle thine 6 Cad, which are, in fact, the detached and modified

ree Drst spines of the anterior dorsal fin. The filament

| filaments.

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Salmon and shad fisheries and all other fisheries in the rivers and mouths of rivers

are reserved for British subjects. Exactly similar rights are granted to British subjects on the eastern sea coasts and shores of the United States

north of the 39th parallel ofnorth latitude. But inasmuch as the English Government insisted that the privileges granted to the United States were of greater value than those conceded to England, it was agreed that commissioners should be appointed to determine the amount of any compensation which ought to be paid to the English Government in consideration of such excess. The commissioners have recently made an award finding the sum of £1,000,000 to be due from the United States to England. Certain places designated in the abrogated treaty of 1854 are to be excepted from the operation of the treaty as "' places reserved from the com- mon right of fishing." (E. R.)

most important in the economy of the fishing-frog is the first, which is the longest, terminates in a lappet, and is movable in every direction. There is no doubt that the fishing-frog, like many other fish provided with similar appendages, plays with this filament as with a bait, attract- ing fishes, which when sufficiently near, are engulphed by the simple act of the fishing-frog opening its gape. Its stoniach is distensible in an extraordinary degree, and not

Fic. 2.—A young Fishing Frog. rarely fishes have been taken out quite as large and heavy

as their destroyer. It grows to a length of more than 5 feet ; specimens of 3 feet are common. Young individuals are somewhat dissimilar in shape to old ones, and are provided with more numerous and longer appendages and The British species is found all round the coasts of Europe and western North America, but becomes scarce beyond 60° N. lat.; it occurs also on the coasts of the Cape of Good Hope. A second species (Lophius budegassa) inhabits the Mediterranean, and a third (Z. setigerus) the coasts of China and Japan.

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FISTULA, a term in surgery used to designate an abnormal communication leading either (1) from the surface of the body to a normal cavity or canal, or (2) from one normal cavity or canal to another. These communications are the result of disease or injury. They receive different names according to their situation :—lachrymal fistula, in connexion with the lachrymal

apparatus; salivary jistula, in connexion with the salivary duct on the cheek ; anal fistula, in connexion with the anus; urethral fistula, in connexion with the urethra,—are all examples of the variety of the first kind of fistula; while recto-vesical fistula, a communication between the rectum and bladder, and veszco- vaginal fistula, a communication between the bladder and vagina, are examples of the second. The abnormal canal may be straight or tortuous, of considerable diameter or of narrow calibre. Fistule are formed in various ways :— (1) by an obstruction of the normal channel, the result of disease or injury, which prevents, for example, the tears, saliva, or urine, as the case may be, from escaping; their retention gives rise to inflammation and ulceration, and the result is that they make a way of exit behind the obstruction ; (2) by the formation of an abscess near, for example, the anus, which bursts into the gut and through the skin; the cavity does not close, and a fistula im ano is the result; (3) by destruction, by injury or ulceration, of the septum between one cavity and another, as in recto-vesical fistula, or between a cavity and a canal, as in vesico-vagimnal fistula. The fistulous channel will remain patent as long as the contents of the cavity or canal with which it is connected pass along it in whole or in part. There is always a natural tendency to contraction. The treatment is founded on these principles :—remove the obstruction, encourage the flow along the natural channel ; for example, open up the nasal duct, allow the tears to reach the nasal cavity, and the lachrymal fistula will close ; so also in the salwary and urethral varieties. Some- times it may be necessary to lay the channel freely open, and allow it to close from its deeper parts to the surface, as in anal fistula ; in other cases it may be necessary to pare the edges of the abnormal opening and stitch them together, hoping for nnion of the edges.

FITCH, Joun (1743-1798), one of the first inventors in connexion with steam navigation, was born at Windsor, Connecticut, January 21, 1743. He was the son of a farmer, and received the usual common school education. At the age of seventeen he went to sea, but he discontinued his sailor life after a few voyages, and became successively a clock niaker, a brassfounder, and a silversmith. During the rebellion he followed the trade of sutler to the American troops, and amassed in that way a considerable sum of money, with which he bonght land in Virginia. He was appointed deputy-surveyor for Kentucky in 1780, and when returning to Philadelphia

in the following year he was captured by the Indians, but shortly afterwards regained his liberty. About this time he began an ex- ploration of the north-western regions, with the view of preparing a map of the district; and while sailing on the great western rivers, the idea occurred to him that they might be navigated by steam. He endeavoured by the sale of his map to find money for the carrying out of his pro- jects, but was unsuccessful. He next applied for assistance to the legislatures of different States, but though each reported in favourable terms of his invention, none of them would agree to graut him any pecuniary assistance. He was successful, however, in 1786, in forming a company for the prosecution of his enterprise, and shortly afterwards a steam-packet of his invention was launched on the Delaware. _ His claim to be the inventor of steam-naviga- tion was disputed by James Rumsey of Virginia, but Fitch obtained exclusive rights in steam-navigation in New

Jersey, Pennsylvania, and Delaware, while a similar pri- vilege was granted to Rumsey in Virginia, Maryland, and New York. A steam-boat built by Fitch conveyed pas- seugers for hire on the Delaware in the summer of 1790, but the undertaking was a losing one, and led to the dissolution of the company. In 1793 he endeavoured to introduce his invention into France, but met with no success. On his return to America he found his property overrun by squatters, and reaping from his invention nothing but disappointment and poverty, he committed suicide in 1798. He left behind him a record of his adventures and misfortunes, "inscribed to his children and futnre posterity ;" and from this a biography was com- piled by Thompson Westcott (Philadelphia, 1857). FITCH, Ratpy, a London merchant and one of the earliest English travellers in India, lived in the latter half of the 16th century. As he was engaged in a traffic in Eastern products it occurred to him that he might pursue a more profitable trade were he to visit the countries from which they came. Accordingly, along with other four merchants, he re-embarked in January 1583 in a ship called the " Tygre," and set sail for Tripoli in Syria. From Tripoli they journeyed to Aleppo and through Mesopotamia to Baghdad, from whence they sailed down the Tigris to Bussorah. From Bussorah they sailed in small boats down the Persian Gulf to the island of Ormus. Here from the jealousy of the

other European merchants at their success, they were apprehended by the governor of the castle as spies and sent to the Portuguese viceroy at Goa. They afterwards received their liberty on paying a fine, but fear- ing a second imprisonment they escaped secretly from Goa, and journeyed through the interior of India. Fitch ulti- mately left his companions, and after reaching Bengal he sailed in 1589 for Cochin, touching on his way at Ceylon. After sojourneying at Cochin eight months he re-embarked for Goa, and thence retraced his footsteps to Tripoli, finally reaching London on the 29th April 1591. Zhe Voyage of Mr Kalph Fitch, Merchant of London, to Ormus and 80 to Goa, in the Kast India ; to Cambaia, Ganges, Bengala ; to Bacola and Chonderi; to Pegu, to Jamahay in the kingdom of Siam, and back to Pegu, and from thence to Malacea, Zeilan, Cochin, and all the Coast of the East Indies, is included in Pinkerton's Collection of Travels.
FITCHBURG, a city of the United States, one of the capitals of Worcester county, Massachusetts, is situated on a branch of the Nashua river, 40 miles W.N.W. of Boston. It includes the villages of Crockerville, Rockville, South Fitchburg, Traskville, and West Fitchburg. It is the ter- minus of four railways—to Boston, Worcester, Brattleboro, and Keene and Bellows Falls. The principal buildings are

'the masonic hall, the city hall, the jail, the court-house, and

the high school. It has woollen, cotton, and paper mills, machine shops, chair manufactories, iron foundries, and brass foundries. Fitchburg was originally included under Lunenburg. It was incorporated as a separate town m 1764, and became a city in 1872. The population in 1860 was 7805, and in 1870 it amounted to 11,260, 2517 being foreigners.

FITZGERALD, Lorp Epwarp (1763-1798), one of the leaders of the Society of United Irishmen, was 4 younger son of the first duke of Leinster, and was born at Carton Castle, near Dublin, October 15, 1763, At ten years of age he lost his father, and, his mother marryg again, the family soon after settled in France. Lord Edward was carefully educated by his stepfather, Mr Ogilvie, chiefly with a view to the profession of a soldier. Returning to England in 1779 he entered the English army, and in 1781 he sailed with his regiment for America, where he soon obtained the appointment of aide-de-camp on the staff of Lord Rawdon. He served in the war with no litte

reputatiou for personal courage, readiness of resource, and humane feeling. He was severely wounded at the battle of Eutaw Springs. After the surrender of York Town he joined the staff of General O'Hara at St Lucia, and the same year (1783) returned to Ireland. He was soon returned as member for Athy to the Irish parliament; but the high hopes which he had cherished of serving his country faded away at the spectacle of political corruption and suppression of all genuine representation by the penal laws against Roman Catholics. In 1787 he set out fora visit to the south of Europe, went afterwards to America, and in 1790 returned to England, and soon resumed his seat in the Irish parliament. The French Revolution had broken out, and Lord Edward was one of those ardent spirits that welcomed with enthusiasm the promise of its first days. In 1792 he was attracted to Paris, and made the acquaintance of the most famous leaders of the Revolu- tion. Having publicly renounced his title of nobility and avowed his sympathy with the republicans, he was dis- missed, with other officers, from the English army. It was during this visit to Paris that he was introduccd to the lady then known as " Pamela," the daughter of Madame de Genlis, by the duke of Orleans (" Kgalité' '). In December 1792 they were married at Tournay, and returned to Ireland in January 1793. After a period of singular happiness spent in a country home, his sympathies with the struggles of his countrymen Jed him out to the troubled arena of politics. He joined in 1796 the society of United Irishmen, was sent to France to negotiate a treaty with the Directory fora French invasion of Ireland, and urged on with the utmost zeal the preparations for an Irish insurrec- tion. But the scheme was betrayed, several of the leaders were arrested, and Fitzgerald concealed himself in a house at Dublin, still continuing to direct the movement, A price was set on his head, the place of his retreat was dis- covered, and after a severe struggle he was captured by police officers (May 19, 1798) and committed to prison. There he died on the 4th of J une, of the wounds which he had received ; a bill of attainder was immediately passed against him, and his estates were confiscated ; but the attainder was at a later timereversed. His widow married Mr Pitcairn, American consul at Hamburg ; but the union Was au unhappy one, and ended in a separation by mutual consent. Lady Fitzgerald henceforward lived in retirement at Montauban till 1830, when she removed to Paris, Louis Philippe, the

associate of her childhood, having become king of the French. He, however, refused to see her, and she died poor in 1831. An interesting narrative of The Life and Death of Lord Edward Fitzgerald, by Thomas Moore, was published in 1831, in 2 vols. 8vo. A cheap reprint in 1 vol. was issued in 1875.

FITZGERALD, Lorp Tuomas (d. 1536), was vice- deputy of Ireland for his father, Gerald, ninth earl of Kil- dare, in the reign of Henry VIII. He appears to have accompanied his father to London early in 1534, on oveasion of the third summons of the earl to answer grave charges of maladministration as lord deputy. But after the earl's committal to the Tower he was sent back to Ireland to take the place of vice-deputy in his father's absence, mi, soeret Instructions to raise a rebellion against the

er Government, He was at this time hardly of age, and his amiable manners and accomplishments had pro- cured for him the appellation of "Silken Thomas." He Was, however, of a hich spirit and fiery temper, and fiercely Tesented the English rule. As soon as he arrived in Ireland, x cleared the way by formally surrendering his office and He ac of state, and then openly proclaimed a rebellion. Tal 0 a Possession of Dublin city before the end of 7 : and formed the Slege of the castle, into which the

nglish governor had withdrawn, Archbishop Allen, the

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primate who had been appointed by Henry VIII. to keep watch over Kildare and to report his proceedings, sought safety in flight and sailed for England, But the ship was run aground, and tie archbishop was seized by the young Lord Thomas and massacred in his presence with his English chaplains and attendants. This murder was reported by a special messenger from Fitzgerald to the pope and the emperor, the former being asked for absolution if necessary, and the latter for assistance. Sentence of excommunica. tion was pronounced on Fitzgerald for this murder of the archbishop. In August Fitzgerald was forced to relinquish the siege of Dublin Castle, and hasten to defend or recover his own domains which the

earl of Ormond had invaded, He tried in vain to seduce Ormond from his allegiance, but obtained a truce, of which he took treacherous advan. tage to attack him. He then again besieged Dublin, which had closed its gates against him. On October 14, in con- sequence of Ormond's renewed invasion of Kildare, he was compelled to raise the siege. Three days later the English army landed at Dublin, and was enthusiastically welcomed. Fitzgerald withdrew into the country ; but taking advan- tage of the inactivity of Skeffington, the new deputy, lie approached Dublin again and burnt two villages near the city (November). The old earl had been attainted, and he died in the Tower soon after hearing of his son's rebellion and excommunication. The deathblow to the rebellion was at length given by Skeffington, who in March 1535 stormed the castle of Maynooth, the chief stronghold of the ""Geraldines." Lord Thomas, who had now succeeded his father, but did not assume the title, retreated into Thomond, intending to sail for Spain and plead with the emperor. This scheme he relinquished, and after leading a wandering life for some months, with a price set upon his head, he surrendered without definite conditions to Lord Leonard Grey (August), and was at once conducted by him to England. He was committed to the Tower with his five uncles ; and the six Geraldines were hung at Tyburn as traitors (February 3, 1536). An act of attainder was passed against the earl of Kildare, Lord Thomas, and others, in 1537; but the family estates were restored by Edward VI., and the attainder was repealed by Queen Elizabeth. Moore has pointed out, in his Life and Death of Lord Edward Fitzgerald, some remarkable points of re- semblance between his story and that of his ancestor, Lord Thomas.

FITZHERBERT, Str Antuony, an eminent English lawyer, was born at Norbury. After studying at Oxford, he was called to the English bar, and in 1523 became justice of the court of common pleas, the duties of which office he continued to discharge till within a short time of his death in 1538, As a judge he left behind him a high reputation for fairness and integrity, and his Jegal learning is sufficiently attested by his published works.

He is the author of Le grawnde abridgement, a digest of import- ant legal cases written in Old French, first printed in 1524; The Office and Authority of Justices of the Peace, first printed in 1538, last ed. 1794; the New Natura Brevium, 1534, last ed. 1794, with a commentary ascribed to Sir Matthew

Hale and the Book of Husbandry, 1523, the first published work on agriculture in the English language.

FITZROY, Rosert (1805-1865), a vice-admiral in the English navy, distinguished as a hydrographer and meteor- ologist, was born at Ampton Hall, Suffolk, July 5, 1805, being a grandson, on the father's side, of the third duke of Grafton, and on the mother's, of the first marquis of Londonderry. He entered the navy from the Royal Naval College, then a school for cadets, on the 19th October 1319, and on the 7th September 1824 was promoted to the rank of lieutenant. After serving in the " Thetis" frigate in the Mediterranean and on the coast of South America, under the command of Sir John Phillimore and Captain

Bingham, he was in August 1828 appointed to the "Ganges," as flag-lieutenant to Rear-Admiral Sir Robert Otway, the commander-in-chief on the South American station; and on the melancholy death of Commander Stokes of the "' Beagle," 13th November 1828, was pro- moted to the vacant command, The " Beagle," a small brig of about 240 tons, was then, and had been for the two previous years, employed on the survey of the coasts of Patagonia and Tierra del Fuego, under the orders of Commander King in the "' Adventure," and, together with the " Adventure," returned to England in the autumn of 1830. Fitzroy had brought home with him four Fuegians, one of whom died of small-pox a few weeks after arriving in England ; to the others he endeavoured, with but slight success, to impart a rudimentary knowledge of religion and of some useful handicrafts ; and, as he had pledged himself to restore them to their native country, he was making preparations in the summer of the following year to carry them back in a merchant ship bound to Valparaiso, when he received his reappointment to the " Beagle," to continue the survey of the same wild coasts. The " Beagle" sailed from Plymouth on the 27th December 1831, carrying as a supernumerary Mr Charles Darwin, to whose experience, then gained, the study of natural history has beea so deeply indebted. After an absence of nearly five years, and having, in addition to the survey of the Straits of Magellan and a great part of the coast of South America, run a chronometric line round the world, thus fixing the longitude of many

secondary meridians with sufficient exactness for all the purposes of ordinary navigation, the " Beagle " anchored at Falmouth on the 2d October 1836. In 1834 Fitzroy had been advanced to the rank of captain, and was now for the next few years principally employed in reducing and discussing his numerous observations. In 1837 he was awarded the gold medal of the Royal Geographical Society; and in 1839 he published, in two thick 8vo volumes, the narrative of the voyage of the " Adventure" and " Beagle," 1826-30, and of the "Beagle," 1831-36, with a third volume by Mr Darwin—a book familiarly known as a record of scientific travel. Of Fitzroy's work as a surveyor it is superfluous to speak. Though carried on under circumstances of great difficulty, with scanty nieans, and with an outfit that was semi-officially denounced as " shabby," the results have long been before the world stamped with the approval of the nautical profession, and more especially of Sir Francis Beaufort, the Hydrographer to the Admiralty, who, in a report to the House of Commons, 10th Feburary 1848, wrote that "fram the cquator to Cape Horn, and from thence round to the river Plata on the eastern side of America, all that is tmmediately! wanted has been already achieved by the splendid survey of Captain Robert Fitzroy."

In 1841 Fitzroy unsuccessfully contested the borough of Ipswich, and in the following year was returned to parlia- ment as member for Durham. About the same time he accepted the post of conservator of the Mersey, and in lis double capacity obtained leave to bring in a bill for im-

proving the condition and efficiency of officers in the |

mercantile marine. This was not proceeded with at the time, but gave rise to the " voluntary certificate " instituted by the Board of Trade in 1845, and furnished some im- portant clauses to the Mercantile Marine Act of 1850. Early in 1843 Fitzroy was appointed governor and commander-in-chief of New Zealand, then recently esta- blished as a colony. THe arrived in his government in December, whilst the excitement about the Wairau massacre was still fresh, and the questions relating to the 1 This was written 30 years ago, before steam ships nearly 400 feet

long made the Straits of Ma i i J gellan a high road to the Pacific. The survey that was sufficient then is very far from sufficient now.

purchase of land from the natives weré in a very unsatis- factory state. 'The early settlers were greedy and un- scrupulous ; Fitzroy, on the other hand, had made no secret of his partiality for the aborigines. Between such discordant elements agreement was impossible: the settlers insulted the governor; the governor did not conciliate the settlers, who denounced his policy as adverse to their interests, as unjust and illegal ; colonial feeling against him ran very bigh ; petition after petition for his recall was sent home, and the Government was compelled to yield to the pressure brought to bear on it. Fitzroy was relieved by Sir George Grey in November 1845.

In September 1848 he was appointed acting superin- tendent of the dockyard at Woolwich, and in the following March to the command of the " Arrogant," one of the early screw frigates which had been fitted out under his super- vision, and with which it was desired to carry out a series of experiments and trials, When these were finished he applied to be superseded, on account at once of lus health and of his private affairs. In February 1850 he was accordingly placed on half-pay ; nor did he ever serve again, although advanced in due course by seniority to the rauks of rear and vice-admiral on the retired list (1857, 1868).

| In 1851 he was elected a fellow of the Royal Society, and

in 1854 after serving for a few months as private secretary to his uncle, Lord Hardinge, the commander-in-chief of the army, he was appointed to the meteorological department of the Board of Trade, with, in the first instance, the peculiar title of " Meteorological Statist."

From the date of his joining the "Beagle" in 1828 he had paid very great attention to the different phenomena foreboding or accompanying change of weather, and his uarratives of the voyages of the "Adventure" and "Beagle" are full of interesting and valuable details concerning these. Accordingly, when in 1854 Lord Wrottesley, the president of the Royal Society, was asked by the Board of Trade to recommend a chief for its newly forming meteorological department, he, almost without hesitation, nominated Fitzroy, whose name and career became from that time identified with the progress of practical meteorology. His Weuther Book, published in 1863, embodies in broad. out- line his views, far in advance of those then generally held; and though, in the rapid march of modern science, this book

must be considered as now in some measure obsolete, it is still worthy of careful attention and exact study, not only from the professed meteorologist, but from any oue who wishes to have an intelligent appreciation of that question of everyday interest, the weather. His storm warnings, 12 their origin, indeed, liable to a charge of empiricism, were gradually developed on a more scientific basis, and gave a high percentage of correct results. They were continned for eighteen months after his death by the assistants he had trained, and though stopped when tlie department was trans- ferred to the management of a committee of the Royal Society, they were resumed a few months afterwards. Bul though it is perhaps by these storm warnings that Fitaroy § name has been most generally known, seafaring men owe him a deeper debt of gratitude, not only for his labours m reducing to a more practical form the somewhat complicated wind charts of Captain Maury, but also for his great exel- tions in connexion with the life-boat association. Into this work, in its many ramifications, he threw himself with the energy of an excitable temperament, already, it may be feared, strained by his long and anxious service in the Straits of Magellan. His last years were fully and to an excessive degree occupied by it; his health, both bodily and mental, threatened to give way; but he refused to take the rest that was prescribed. In a fit of menta aberration he put an end to his existence on the 30th Apri

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Besides his works already named mention may be made of Remarks on New Zealand (1846); Sailing Directions for South America (1848); his official reports to the Board of Trade (1857-65) ; and occasional papers in the journal of the Royal Geographical Society and of the Royal United Service Institution. (J. K. L.)

FITZSTEPHEN, Witttay, an English historian, was a native of London, and died in 1191. Becoming a monk of Canterbury, he had very confidential relations with Thomas & Becket. Shortly after the death of Thomas he wrote his life in Latin, a work which bears internal evidence of greater

impartiality and truthfulness than most of the archbishop's biographies, and is besides of interest as containing a long description of the city of London. There is a manuscript copy of the work in the British Museum,

A translation of the description of London was inserted by Stowe in his Survey of London, and in 1772 Dr Pegge published a new and more correct edition, in Latin and English, accompanied with notes and an essay on the author. A corrected version, with a

translation, was also inserted in the edition of Stowe's Survey pub- lished in 1848.

FIUME (Slav. Rrexa, German St VEIT-AM-FLAUM), a royal free town and port of Hungary situated at the northern extremity of the Gulf of Quarnero, on the Recina (Fiumara), 46 miles by road 8.E. of Trieste, 45° 19' 19" N. lat., 14° 26' 43" E. long. It consists of an old and a new town, the former standing on a hill, the latter extending along the shore. The population in 1869 amounted to 14,039 for the town, and 4770 for the territory of Fiume ; of these the greatest number were Roman Catholics, Among the many important buildings are the old chapter or cathedral church of the Assumption of the Virgin, and the church of St Veit, built in imitation of Sta. Maria della Salute at Venice, the theatre, capable of holding 1600 persons, the palace of Gorup, the barracks, and the elegant marine academy founded in 1856. In the old town is an ancient Roman triumphal arch, said to have been erected in honour of the emperor Claudius II. Fiume possesses several educational establishments, among which are a real- gymnasium, two municipal high schools, and a Croatian gymnasium, The consuls of several states reside in the town, which is the seat of a high court of justice for com- merce and marine, and of a chamber of industry and com- merce. Among the benevolent institutions are asylums for lunatics and decayed citizens, and an industrial home for boys. N otwithstanding the revival of trade at Trieste, commercial enterprise and industry have considerably Increased at Fiume, and the town has now two railways, opened in 1873—one a branch of the southern railway from Vienna to Trieste, the other of the Hungarian state railway from Carlstadt. Fiume is the immediate outlet by sea for the produce of Hungary, with which country it is connected by the Louisen-strasse opened in 1809. It has

two harbours—Porto Canale Fiumara, suitable only for

coasting vessels and small craft, and Porto Nuovo, affording ood accommodation for large ships. The latter port, commenced in 1847, is now (1878) being much enlarged and extended to meet the increasing requirements of trade, and when completed will Occupy an area of 574 acres, and afford quay accommodation for 100 large vessels. The chief exports are wheat, wine, tobacco, timber, rags, salt, Tapeseed, hemp, and paper, of which last the annual exports amount to upwards of 30,000 ewt. Foremost on the industrial establishments are Whitehead's : : 0 factory, Messrs Smith & Meynie's paper-mill, the = tobacco factory (furnishing yearly more than 200 Aa cigars and cigarettes and employing above 3000 Me ws); a chemical factory where 1600 tons of sulphate of es aad made, and a large steam flour-mill. teres" may be mentioned several shipbuilding yards,

fries, and rope manufactories. The soil of the

surrounding country is stony, but the climate is warm, and wine is extensively produced. The Gulf of Quarnero yields a plentiful supply of fish, and the tunny trade with Trieste and Venice is of considerable importance.

Fiume is supposed to occupy the site of the ancient Liburnian town Tersatica ; later it received the name of Vitopolis, and eventually that of Fanum Sancti Viti ad Flumen, from which its present name is derived. It was destroyed by Charlemagne in 799, from which time it probably long remained under the dominion of the Franks. It was held in feudal tenure from the patriarch of Aquileia by the bishop of Pola, and afterwards, in 1139, by the counts of Duino, who retained it till the end of the fourteenth cen- tury. It next passed into the hands of the counts of Wallsee, by whom it was surrendered in 1471 to the emperor Frederick III., who incorporated it with the dominions of the house of Austria. From this date till 1776 Fiume was ruled by imperial governors, Tn 1723 it was declared a free port by Charles VI., in 1776 united to Croatia by the empress Maria Theresa, and in 1779 declared a corpus separatum of the Hungarian crown. In 1809

Fiume was occupied by the French ; but it was retaken by the English in 1813,

and restored to Austria in the following year. It was ceded to

Hungary in 1822, but after the revolution of 1848-49 was annexed to the crown lands of Croatia, under the government of which it remained for the next twenty years. Since August 1870 the town and territory of Fiume have been under the direct control of the Hungarian central Government.

See "'Fiume and her New Port," by G. L. Faber, H.B.M. Vice-Consul at Fiume, in Jour. of the Soc. of Arts, Nov. 1877.

FIVES is a game which has existed in various forms from the earliest times. The name is derived from the essential feature of the pastime consisting in striking a ball with the five digits of the human hand, the idea of there sometimes having been five players on each side requiring confirmation, Amongst the Greeks the améppagis was somewhat akin, since a ball was struck with the hand as many successive times as possible at each rebound from the ground. Of the method of playing the Roman pila we possess no details. Horace (Sat., i. 5, 48) speaks of it thus :—

Lusum it Mecenas, dormitum ego Virgiliusque; Namque pila lippis inimicum et ludere crudis. Judging from these lines the ball play of that day must have been both fatiguing and dangerous. In the Close Roll, 39 Edward IIT. (1365) mem. 23, pila manualts is mentioned as one of those pastimes which had caused the recent deterioration of archery, and some description of fives is no doubt referred to. During the 15th century palm play in England and jew de pawme in France were the chief analogous pastimes. In recent times our great public schools and universities have become the sole nurseries of fives. In the " open" court the only desiderata are a level piece of ground with a smooth wall in front against which the ball is struck. A " close" court has in addition two side-walls at right angles to the front one, and the whole may or may not be covered in. The invariable principle is to strike the ball, not later than at its first rebound from the ground, against the front wall and above a certain line as many consecutive times as possible. A single game comprises one player a. side, a double one two. The minor rules vary at most schools and universities, and are generally handed

down by tradition. About two inches is the usual diameter of the ball, the core being made of india-rubber, bound round with fine twine, and covered with white leather.

FIVES, a town in France, department of the Nord, now administratively connected with Lille. See LILLE.

FIX, THEovorE (1800-1846), a French journalist and political economist, was born at Soleure in Switzerland in 1800. His father was a French physician who had been expatriated by the edict of Nantes. Young Fix adopted at first the profession of a land surveyor, but, tiring of the monotony of thisemployment, he in 1830 became connected with the Budletin Universel des Sciences, to which he con- tributed most of the geographical ae In 1833 he

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uncertainty. In one case it was held that the privilege did not extend to a conservatory erected on a brick foundation 15 inches deep, and connected with other buildings. Mr Amos, in his book on fixtures, mentions four points which would be important in settling whether an ornamental fixture is removable or not :—(1) the mode in which it js united with the freehold ; (2) its nature and construction whether meant to be a temporary or permanent improve. ment ; (3) whether it can be easily removed without injury to the freehold ; (4) whether there is any local usage,

In all these cases the fixtures must be removed during the term. If the tenant gives up possession of the premises without removing the fixtures, it will be presumed, it appears, that he has made a gift of them to the landlord, and that presumption probably could not be rebutted by positive evidence vf a contrary intention. His right to the fixtures is not, however, destroyed by the mere expiry of the term, if he still remains in possession ; but if he has once left the premises, he cannot come back and claim his fix- tures. In one case where the fixtures had actually been severed from the freehold after the end of the term, it was held that the tenant had no right to recover them.

(2.) As between heir and executor or administrator. The question of fixtures arises between these parties on the death of a person owning land. His real property goes to his heir; his personal property goes to his executor. In this case exceptions introduced in favour of the tevant are not allowed in favour of the executor, for, as it is said, the "heir is a favourite of the law." There is some conflict of authorities on this point, and cases might be cited on both sides of the question, whether the executor as against the heir has a right to ornamental or even to trade fixtures. Thus in one case a cider-mill let into the ground was held to belong to the executor; in another (a Scotch case before the House of Lords) colliery machinery was awarded to the heir, although portions of it might have been detached without any injury tothe land. Blackstone lays down the rule that whatever is strongly affixed to the freehold (quod ex eedibus non facile revellitur) passes to the heir.

(3.) When a tenant for life of land dies the question of fixtures arises between his representatives and the persons next entitled to the estate (the remainder-man or reversionet) The remainder-man is not so great a favourite of the law as the heir, and the right to fixtures is construed more favourably for executors than in the preceding cases between heir and executor. Whatever is executor's fixtures against the heir would therefore be executor's fixtures against the remainder-man. And the result of the cases seems to be that, as against the remainder, the executor of the tenant for life would be certainly entitled to trade fixtures.

Similar questions may arise in other cases, 49. % between mortgagor and mortgagee. When land is conveyed the fixtures pass with it, unless a contrary intention Is eX pressed in the conveyance. Again, in reference to bills of sale the question arises, Bills of sale are dispositions of personal property similar to mortgages, the possession remaining with the person selling them. To make them valid they must be registered, and so the question has arise? whether deeds conveying fixtures ought not to have been registered as bills of sale. Unless it was the intention of the parties to make the fixtures a distinct security, it seems a deed of mortgage embracing them does not require to be registered as a bill of sale.

FLACOQUS, Carus Vazzrrus, a Roman poet of the first century of the empire, of whose personal history little or nothing is known. He has been

identified, but on wholly insufficient grounds, with the Flaccus, a poet friend 0 Martial, to whom the 77th epigram of the Ist book 18 addressed, and hence described as a native of Padua, a0 in needy circumstances. In the subscription of the Vatican.

founded the Revue mensuelle d'Economie Politique, which he continued till 1836. He also contributed to Le Srécle, La Quotidienne, Le Journal des Economistes, and La Revue Nouvelle. An article of his in the August number of the Revue Nouvelle for 1846, on the religious condition of Germany, attracted considerable attention. His principal work is Observations sur les Classes Ouvriéres, 1846, in which he argues against all attempts to regulate artificially the rate of wages. His pamphlet on L' Association des Douanes Allemandes was in 1840 crowned by the Academy of Sciences, but has not been published. He died suddenly at Paris 31st July 1846.

FIXTURES, in law, may be defined as things which have been fixed or attached to land, or, as it is expressed in English law, things annexed to the freehold. All systems of law make a marked distinction between immovables and movables, between real and personal property, between land and all other things. In the case of fixtures the ques- tion arises under which set of rights they are to fall—under those of real or of personal property The general rule of English law is that everything attached to the land goes with the land—quidquid plantatur solo, solo cedit. This, like many other rules of English law, is all in favour of the frecholder; and its injustice has been modified by a large number of exceptions formulated from time to time by the courts as occasion arose.

As to the kind of " fixing" necessary to change the legal character of the thing fixed, it would not be easy to lay down any precise rule. Things merely resting on the ground by the force of their own weight, removable easily and without damage to the soil, and intended not for the improvement of the inheritance but for temporary use, would not be regarded as fixtures. On the other hand, there is what is called constructive annexation, when the articles in question are not in any sense fixed at all, but pass with the freehold as if they were, ¢g., the keys of a house, heirlooms, &c.

Questions as to the property in fixtures may arise— (1) between landlord and tenant, (2) between heir and executor, (3) between executor and remainder-man or reversioner. These are the principal cases.

(1.) As a general rule, if the tenant has affixed anything to the freehold during his occupation, he cannot remove it without the permission of his landlord. But an exception was established in favour of trade fixtures. In a case before Lord Holt it was held that a soap-boiler might, during his term, remove the vats he had set up for trade purpose, and that not by virtue of any special custom, but "by the common law in favour of trade, and to encourage industry." Agriculture is nota trade within the meaning of this exception, and fixtures erected by a farmer for the purposes of agriculture may not be removed without the landlord's consent, On the other hand, nurserymen and gardeners, whose industry closely resembles agriculture, are allowed to remove trees, shrubs, &c., planted by them with a view to sale. It seems probable that the introduc- tion of more elaborate mechanical processes in agriculture— particularly the use of steam-power—may have the effect of modifying the law as to agricultural fixtures. The statute 14 and 15 Vict. c. 25 enacts that, when a tenant- farmer has, with the written consent of his landlord, erected buildings, machinery, &c., for agricultural or trade purposes, the same shall be his property, and removable by him, after giving notice to the landlord, who may, however, elect to purchase them.

Pe ie ental fixtures, such as hangings and looking- » tapestry, iron-backs to chimneys, wainscot fixed by ee marble chimney-pieces, are held to belong to the — and – be removable without the landlord's consent. gain the extent of the privilege is a matter of some

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MS. the names Setinus Balbus are appended, whence it is probable that he was born at Setia in Campania. The sole notice of him found in classical authors is a short sentence of Quintilian (Just. x. 1, 90), "' Multum in Valerio Flacco nuper amisimus," whence we gather that he must have died before 90 A.D., though it does not follow, as is commonly stated, that he was cut off by an untimely death. If we turn for information to his only known work, the Argonautica, we learn from the dedication, which is

addressed to Vespasian, that it was written during the siege or shortly after the fall of Jerusalem, 70 a.p. The Argonautica 1s an epic on the quest of the golden fleece. The poem is unfinished, tle eighth book terminating abruptly with the request of Medea to accompany Jason on his homeward voyage. It is a free imitation and in parts a translation of the work of Apollonius of Rhodes, which

had already been made familiar to the Romans by the.

popular version of Varro Atacinus. Various estimates have been formed of the genius of Flaccus, and some competent critics, such as Scaliger, Heinsius,and Weichart, have ranked him above his original. His diction is pure, his style correct, his versification smooth though monotonous, and he has some descriptive power, as is shown in the storm of the eighth book, and the picture of the dragon lulled to sleep by Medea's charms. On the other hand, he is wholly with- out originality, aud his poetry reads as if made to order. It is free from glaring defects, but is rendered all but worthless by its monotony, artificiality, and elaborate dul- ness. He deserves, no less than Silius Italicus, to be called the ape of Virgil. One instance will suffice to show how he has vulgarized the great poet. The desertion of Hypsipyle by Jason in tlie second book is closely modelled on the desertion of Dido by ineas, but instead of "Si quis mihi parvulus aula luderet /Zneas," we have "Per hunc utero quem linquis Iasona nostro"; instead of " Quem sese ore gerens," &c., 'Tales humeros ea terga relinquit." The corruptions of the text, and the obscurity of the mythologi- cal and geographical allusions, have attracted commentators and erities, but few except professed scholars will care to read a second-rate copy of a second-rate poet. Bibliography.—The Argonautica was unknown till the first tliree books and half of the fourth were discovered by Poggio at St Gall When attending the council of Constance. The editio princeps was published at Bologna, 1474, from the Vatican MS. 3277. Among other editions we may mention Burmann's Variorum, Leyden, 1724; J. A. Wagner's, Gottingen, 1805; G. Thilo's, Halle, 1863 (the first careful collation of the Vatican MS.); C. Schenkl's, Berlin, 1871; and the 8th book annotated by A. Weichert, Meissen, 1817. There are translations into French prose by J. J. A. Caussin de Perceval in the Bibliotheque Latine-Francaise ; into French verse by Dureau de la Malle, Paris, 1811 ; and into

Spanish verse by D. J. de Leon Bendicho y Quilty, Madrid, 1868 ; into Italian by Pindemonte, Verona, 1776 ; into German by Wunderlich, Erfurt, 1805. Warton speaks doubtfully of an English version: "We seem to have had a version of Valerius Flaccus in 1565 ; for in that year, I know not if in verse or prose, was entered to Purfoote 'The story of Jason, how he gotte the golden flece, and how he did

hegyle Media, out of Latin into Englische, by Nycholas Whyte.'" ¢ book is not recorded by Watt, nor is itin the British Museum.

FLACIUS (in German Vuacicy), MATTHIAS, surnamed Illyrieus (1520-157 5), a celebrated German theologian of the time of the Reformation, was born at Albona in Illyria in 1520. Having lost his father in early childhood, he owed his education almost wholly to his own unaided perseverance. At the age of seventeen he had resolved to enter @ convent in order to devote his life to sacred learn- ing; but on the advice of one of his relations, who had Imbibed Reformation principles, he abandoned his intention, – oa his studies successively at Basel, Tiibingen, ao ittenberg. At Wittenberg he fell for a time into Lu 7 anit and sought the advice of Martin Pi ay Who was successful not only in removing his

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mation zeal. In 1544 he became professor of Old Testa- ment literature at Wittenberg, and soon began to take an active and prominent part in the theological discussions of the time. He strenuously opposed the Augsburg Interim and also the compromise of Melanchthon, known as the Leipsic Interim, and was compelled on that account to resign his professorship. From Wittenberg he proceeded to Magdeburg, and in 1557 he was appointed professor of theology at Jena, but soon became involved in a controversy with his colleague Strigel on the power of the human will in conversion. Being a strong upholder of the doctrine of man's natural inability, he was induced by controversial straits to fall unwittingly into the Manichzan heresy of affirming that original sin was not an accident in human nature, but now belonged to its substance; and as he would not submit to ecclesiastical censure, he was compelled in 1562 to resign his

office. After staying for five years in retirement at Ratisbon, he accepted the charge of a con- gregation in Antwerp, but was soon compelled by religious persecution to leave that city for Strasburg. Here his views regarding original sin again exposed him to eccle- siastical censure, aud he went to Frankfort-on-the-Maine, in the hospital of which city he died in 1575, having spent the latter years of his life in great poverty. Though the keen and uncompromising controversial spirit of Flacius ultimately deprived him of the sympathy of almost all his friends, he is better known to posterity for his labours in hermeneutics and church history than as a controversialist. He may almost be called the founder of the science of hermeneutics, and in the department of church history he rendered important service by tracing to their source the legends and superstitious traditions by which, in the annals of the church, truth had in a great measure been either concealed or superseded. Among his numerous works may be mentioned his Clavis Scripture Sacre, and the Catalogus Lestium Veritatis, which he contributed to the Magdeburg Centuries,

See Ritter, Flacius's Leben und Tod, Frankfort, 1725 ; Twesten, Matth. Flacius Illyricus, Berlin, 1844; Preger, Matth. Flacius

Illyricus und seine Zeit, 2 vols. Erlangen, 1859-61; and Jfattia Flacio Istriano di Albone, notizie e docwmenti, Pola, 1869.

FLACOURT, Eriunne pe (1607-1660), a French governor of Madagascar, was born at Orleans in 1607. When he was named governor of Madagascar by the East India Company in 1648, the French troops had mutinied against the former governor, and a large number of them had also been massacred by the natives. Flacourt soon restored order among the soldiers, but in his dealings with the natives he was less successful, and their intrigues and attacks kept him in continual harassment during all his term of office. As he was in uncertainty regarding the affairs of the company, he returned in 1655 to France. Not long after he was appointed director general of the company ; but, having again returned to Madagascar, he was drowned on his voyage home, 10th June 1660. Several unknown districts of Madagascar and some small islands in its neighbourhood were explored by the orders of Flacourt, and he also in 1649 took possession of the island of Mascareigne, which he named Bourbon. He is the author of a Histoire de la grande isle

Madagascar (1st edition 1658, 2d edition 1661), which is divided into two parts,—the first containing an account of the island, its inhabitants, and its natural history, and the second detail- ing the history of the events connected with its occupation by the French. Of this work the only portion of much value is the natural history section, which gives evidence of a considerable amount of minute and careful observation. He published also in 1658 a dictionary of the language of the island, which, however, is very incomplete and full of mistakes,

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FLAG. It is probable that almost as soon as men began to collect together for common purposes some kind of con- spicuous object was used, as the symbol of the common sentiment, as the rallying point of the common force. In military expeditions where any degree of organization and discipline prevailed, objects of such a kind would be neces- sary to mark out the lines and stations of encampment, and to keep in order the different bands when marching or in battle. And, in addition to all this, it cannot be doubted that flags or their equivalents have often served, by remind- ing men of past resolves, past deeds, past heroes, to rally to entliusiasm those sentiments of esprit de corps, of family pride and honour, of personal devotion, patriotism, or re- ligion, upon which, as well as upon good leadership, discip- line, and numerical force, success in warfare depends. Among the remains of that people which has left the earliest traces of civilization, the records of the forms of objects used as ensigns are frequently to be found. From their carvings and paintings, supplemented by ancient writers, it appears that the several. companies of the Egyptian army had their own particular standards. These were formed of such objects as there is reason to believe were associated in the minds of the men with feelings of awe and devotion. Sacred animals, boats, emblems, or figures, a tablet bearing a king's name, fan and feather- shaped symbols, were raised on the end of a staff as standards, and the office of bearing them was looked upon as one of peculiar privilege and honour (fig. 1). Some-

Fig, 1.—Egyptian Standards. what similar seem to have been the customs of the As-

syrians and Jews. Among the sculptures unearthed by Layard and others at Nineveh, only two different designs have been noticed for standards ; one is of a figure draw- ing a bow and standing on a running bull, the other of two bulls running in opposite directions (fig. 2). These, says Layard, Mr Birch supposes may resemble the emblems of war and peace which were attached to the yoke of Darius's chariot. They are borne upon and attached to chariots, which method of bearing these objects was the custom also of the Persians, and prevailed during the Middle Ages. No representations of Egyptian or Assyrian naval standards have been found, but the sails of ships were embroidered and ornamented with devices, which was ane a custom during the Middle Ages. In both Egyptian = Assyrian examples, the staff bearing the emblem is requently ornamented immediately below with flag-like ep eaecte, Rabbinical writers have assigned the different

evices of the different Jewish tribes, but the authenticity

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of their testimony is extremely doubtful. Banners, stand: ards, and ensigns are frequently mentioned in the Bible "Every man of the children of Israel shall pitch by his standard, with the ensign of their father's house" (Num,

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ii. 2). 'Who is she that looketh forth as the morning, fair as the moon, clear as the sun, and terrible as an army with banners?" (Cant. vi. 10). See also Num. ii. 10, x. 14; Ps. xx. 5, lx. 4; Cant. ii 4; Is. v. 26, x. 18, lix. 19; Jer. iv. 21.

The Persians bore an eagle fixed to the end of a lanee, and also represented the sun, as their divinity, upon their standards, which appear to have been formed of some kind of textile, and were guarded with the greatest jealousy by the bravest men of thearmy. The Carian soldier who slew Cyrus, the brother of Artaxerxes, was allowed the honour of carrying a golden cock at the head of the army, it being the custom of the Carians to wear that bird as a crest on their helmets. The North American Indians carried poles fledged with feathers from the wings of eagles, and similar customs scem to have prevailed among other semi-savage peoples.

The Greeks bore a piece of armour on a spear in early times ; afterwards the several cities bore sacred emblems or letters chosen for their particular associations,—the Athenians the olive and the owl, the Corinthians ® pegasus, the Thebans a sphinx, in memory of Cidipus, the Messenians their initial M, and the Lacedeemonians A. A purple dress was placed on the end of a spear as the signal to advance. The Dacians carried a standard representing a contorted serpent, while the dragon was the military sign of many peoples,—of the Chinese, Dacians, and Parthians among others,—and was probably first used by the Romans as the ensign of barbarian auxiliaries (se? fig. 3).

The question of the signa militaria of the Romans 1s 3 wide and very important one, having direct bearing om the history of heraldry, and on the origin of national, family, and personal devices. With them the custom was reduced to system. "Each century, or at least each maniple," says Meyrick, "had its proper 'standard and standard-bearers." In the early days of the republic 4 handful of hay was borne on a pole, whence probably came the name manipulus. The forms of standards in later times were very various ; sometimes a cross piece of wood was placed at the end of a spear and surmounted by the

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figure of a hand in silver, below round or oval discs, with figures of Mars or Minerva, or in later times portraits of emperors or eminent generals (fig. 3). Figures of animals, as the wolf, horse, bear, and others, were borne, and it was not until after the time of Marius that the eagle became the special standard of the legion; the vexillum was a square piece of cloth fastened to a piece of wood fixed crosswise to the end of a spear, somewhat resembling the medieval gonfalon. The labarum of later emperors was similar in shape and fixing, and after Constantine bore the monogram of Christ (fig. 5, A). The Roman standards were guarded with religious veneration in the temples at Rome; and the reverence of this people for their ensigns was in proportion to their superiority to other nations in all that tends to success in war. It was not unusual for a general to order a standard to be cast into the ranks of the enemy, to add zeal to the onset of his soldiers by exciting them:

to recover what to them was per- haps the most sacred thing the earth possessed. The Roman soldier swore by his ensign.

Although in earlier times drapery was occasionally used for standards, and was often appended as ornament to those of other material, it was probably not until the Middle Ages that it became the special material of military and other

Fic. 3.—Roman Standards,

ensigns ; and perhaps not until the practice of heraldry had attained to definite nomenclature and laws does anything appear which is in the modern sense a flag.

The Bayeux tapestry, commemorating the Norman con- quest of England, contains abundant representations of the =a of the period borne upon the lances of the knights of ‘ illiam’s army. They appear small in size, and pointed,

requently indented into three points, and bearing pales, crosses, and roundels, One, a Saxon pennon, is triangular, and roundly indented into four points; one banner is of we shape and rayed, and bears the figure of a bird MS “id has been supposed to represent the raven of the war- j ne of the Scandinavian vikings (fig..4). These flags and

eir charges are probably not really siguificant of the people + pe them ; for even admitting that personal devices hate at the time, the figures may have been placed int : studied intention, and so give the general figure as ad flags as happened to have come under the An. mi of the artists. The figures are probably rather ii al and symbolic than strictly heraldic,—that is, Personal devices, for the same insignia do uot appear on tle

shields of the several bearers. The dragon standard which he is known to have borne is placed near Harold ; but similar figures appear on the shields of Norman warriors, which fact has induced a writer in the Journal of the Archeological Association (vol. xiii. p. 113) to suppose

Fia 4,—Pennons and Standards from the Bayeaux Tapestry.

that, on the spears of the Saxons, they represent only trophies torn from the shields of the Normans, and that they are not ensigns at all. Standards in form much resembling these dragons appear on the arch of Titus and the Trajan column as the standards of barbarians.

At the battle of the Standard in 1138, the English standard was formed of the mast of a ship, having a silver pyx at the top, and bearing three sacred banners, dedicated severally to St Peter, St John of Beverley, and St Wilfred of Ripon, the whole being fastened to a wheeled vehicle. Representations of three-pointed, cross-bearing pennons are found on seals of as early date as the Norman era, and the warriors in the first crusade bore three-pointed pennons. It is possible that the three points with the three roundels and cross, which so often appear on these banners, have some reference to the faith of the bearers in the Trinity and in the crucifixion, for in contemporary representations of Christ's resurrection and descent into hell he bears a three- pointed banner with cross above. The triple indentation so common on the flags of this period has been supposed to be the origin of one of the honourable ordinaries—the

ile. : The powerful aid of religion seems ever to have been sought to give sanctity to national flags, and the origin of many can be traced to a sacred banner, as is notably the case with the oriflamme of France. The banner of William the Conqueror was sent to him by the pope, and the early English kings fought under the banners of Edward the Con- fessor and of St Edmund; while the clumsily blended crosses of St George, St Andrew, and St Patrick still form the national ensign of the three united kingdoms of England, Scotland, and Ireland, whose patron saints they severally were. More secular characters were, however, not uncommon. In 1244 Henry ITI. gave order for a " dragon to be made in fashion of a standard, of red silk sparkling all over with fine gold, the tongue of which should be made to resemble burning fire and appear to be continually moving, and the eyes of sapphires or other suitable stones." The Siege of Carlaverock, an Anglo-Norman poem of the 14th century, describes the heraldic bearings on the banners of

the knights present with Edward I. at the siege of that

fortress. Of the king himself the writer says—. «En sa banniere trois luparte De or fin estoient mis en rouge ;”

and he goes on to describe the kingly characteristics these may be supposed to symbolize. A MS. in British Museum (one of Sir Christopher Barker’s Heraldic Collection, Har. 4632) gives drawings of the standards of English kings from Edward III. to Henry VIIL, which are roughly but artistically coloured.

The terms for describing a flag are the same as those applied in heraldry to the corresponding parts of a shield. The part of a flag furthest from the point of suspension 1s called the “fly.” The principal varieties of flags borne during the Middle Ages were the pennon, the banner, and the standard; guydhommes, banderolls, pennoncells, streamers, &c., may be considered as minor varieties. The pennon (fig. 5, B) was a small personal ensign, pointed or swallow-tailed, borne below the lance-head of its owner, and charged with his armorial bearings in such a manner that they were in true position when the lance was held

Fic. 5.—A, Labarum from medallion of Constantine; B, Medieval Pennon ; C, Medieval Banner; D, Standard of Henry V.

horizontally for action. It was a strictly personal flag, and was borne by every knight. Pennons were sometimes charged with the cross of St George in place of the personal bearings. A manuscript of the 16th century (Harl. 2358) in the British Museum, which gives minute particulars as to the size, shape, and bearings of standards, banners, pennons, guidhommes, pencells, &e., says—“A pennon must be two and a half yards long, made round at the end, and conteyneth the armes of the owner,” and warns that “ from his standard or streamer a man may flee, but not from his banner or pennon bearing his arms.”

The banner (fig. 5, C) was generally about square in form, charged in a manner exactly similar to the shield of the owner, and borne by knights bannerets, and all above them in rank. The rank of knights bannerets was higher – than that of ordinary knights, and they could be created on the field of battle only. It was the custom, after a battle, for the king or commander in person to honour a knight who had distinguished himself in

the conflict, by tearing off the fly of his knightly pennon, thus creating ita banner and its bearer a banneret. The banner was not a personal ensign but that of a troop. Every baron, who in time of war had furnished the proper number of men to his liege, was entitled to charge with his arms the banner which they followed.

The standard (fig. 5, D) was a large, long flag, gradually

FLAG

tapering towards the fly, varying in size according to the rank of the owner, and generally divided fesse-wise. The shape was not, however, by any means uniform during the Middle Ages, nor were there any definite rules as to its charges. It seems to have been first used by Edward IIL. the head of whose standard was charged as his shield of arms, and the fly powdered with jlewrs-de-lis and lions. The Tudor manuscript mentioned above says of the royal standard of that time—"The standard to be sett before the king's pavillion or tente, and not to be borne in battayle; to be in length eleven yards." "Every standard and guydon to have in the chief the cross of St George, the beast or crest with his devyce and word, and to be slitt at the end." The standard was always borne by an eminent person, and that of Henry V. at Agincourt is supposed to have been carried upon a car, and to have preceded the king. The guidon borne by a leader of horse " must be two yards and a half or three yards long, and therein shall no armes be put, but only the man's crest, cognizance, and devyce." A streamer was a long, tapering flag, and "shall stand in the top of a ship or in the forecastle, and therein be put no armes but a man's conceit or devyce, and may be of length 20, 30, 40, or 60 yards, and is slitt as well as a guydhomme or standard." A pencil was a small streamer-like flag borne by an esquire.

The present royal standard of England was hoisted on the Tower, January 1, 1801, and is thus described :— Quarterly : first and fourth, gules, three lions passant gardant, in pale, or, for England ; second, or, a lion rampant, gules, within a double tressure, flory counter flory of the last, for Scotland; third, azure, a harp or, stringed

argent, for Ireland. On an escutcheon of pretence were ~

charged the arms of the sovereign's German dominions; but after the accession of Queen Victoria these were removed. This flag is displayed at the main whenever the sovereign or a member of the royal family is on board a ship, and is also hoisted over the royal residence. The Admiralty flag

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Fic. 6.—A, St George's Banner; B, St Andrew's Banner, 0, St Patrick's Banner; D, First Union Jack; E, Present Union Jack. ~

stands next to this in importance, and is red charged, fesse- wise, with an anchor and cable. The national ensign of the United Kingdom, the Union Jack, is the not altogether

admirable result of an attempt to combine the several St George had long been the patron saint of England, and his banner, argent, a cr0ss

ensigns of the three countries,

gules, its national ensign (fig. 6, A). St Andrew in the same way was the patron saint of Scotland, and his banner, azure, a saltire argent, the national ensign of Scotland (fig. 6, B).

On the union of the two crowns, James I. issued a proclama

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tion that "all subjects of this isle and the kingdom of Great Britain should bear in the main-top the red cross commonly called St George's cross aud the white cross commonly called St Andrew's cross, joined together according to the form made by our own heralds." This was the first Union Jack (fig. 6, D). After the union with Ireland in 1801 a new ensign was ordered to be prepared which should com- bine the cross of St Patrick, a saltire gules on a field argent (fig. 6, C), with the other two. The result was the "meteor flag of England," the present Union Jack (fig. 6, E). It seems to have been produced in considerable contempt of heraldic rules, but excites no less enthusiasm, respect, and obedience on that account. The flag of the

lord lieutenant of Ireland is the Union Jack, having in the centre a blue shield charged with a golden harp.

The flags of the United States of America were very various before and after the Declaration of Independence; and even after the introduction of the stars and stripes, these underwent many changes in the manner of their arrangement before taking the position at present established. Historical events have also caused great changes in the standards and national ensigns of France. The ancient kings bore the blue hood of St Martin upon their standards, and this was succeeded by the oriflamme, which. originally, was simply the banner of the abbey of St Denis At what precise period it became the sacred banner of all France is not known, and even its appearance is very differently described in different writers, Guillaume Guiart in his chronicle says—

' Oriflambe est une bannitre De cendal roujoiant et simple Sanz portraiture d'autre affaire."*

The oriflamme was succeeded in the 15th century by the white standard powdered with flewrs-de-lis, which itself gave place to the standard of the empire, and is the "cornette blanche " for which Chambord contends. The im- perial standard was blue, bearing a golden eagle, and pow- dered with golden bees. The tricolor was introduced at tlie time of the Revolution, and is divided vertically into three parts, coloured blue, white, and red—the red to the fly, and the white in the middle. The origin of this flag and its colours is a disputed question. It is said by some to have been intended to combiue the colours of the St Martin's banner, of the oriflamme, and of the white flag of the Bourbons; by athers the colours are said to be those of the city of Paris ; and other autborities assert that the flag is copied from the shield of the Orleans family as it appeared after Philip Egalité had knocked off the Jleurs- de-lis, The present standards and ensigns of existing states are shown in Plate I.

In the British army the standards of the cavalry are the same in colour as the regimental facings; they bear the insignia, cipher, number, and honours of the regiment, and are richly ornamented. Those of the household cavalry bear On a crimson field the royal insignia. The colours of each infantry regiment are two in number—the queen's colour and the regimental colour.

The former is the Union Jack variously charged, the latter is in colour like the regi- mental facings, and is charged with the honours, &c., of the corps. The queen's colour of the foot guards, however, 'S cnmson, and its regimental colour the Union Jack. The Toyal artillery and the rifles have no colours. geri 1864 the ships of the British navy bore three —_— ee In that year, however, her Majesty pre- – a e discontinuance of the division of flag officers ob ose of the red, blue, and white squadrons, and

ered that the white ensign, with its broad and narrow

Teens, should be thenceforward established as the ours of the royal naval service, reserving the use of the red and

blue colours for special occasions. The white

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flag with St George's cross is borne by admirals, vice: admirals, and rear-admirals on their respective masts, The blue ensign is borne by ships in the service of public offices, and also under certain restrictions by such ships as are commanded by officers of the naval reserve. The red ensign is borne by all other British ships. Yacht clubs are allowed, however, certain privileges; they mostly carry the blue ensign with characteristic burgees. An admiral's flag is displayed at the main, a vice-admiral's at the fore, and a rear-admiral's at the mizen truck. Flag officer is another name for admiral, and the flag ship in a fleet is the one carrying the admiral's flag.

At sea the striking of the flag denotes surrender, and the flag of one country being placed over that of another denates the victory of the former, A yellow flag denotes quarantine, The universally understood flag of truce is pure white,

Flags would obviously suggest themselves for use as signals, and have no doubt always more or less served for the purpose. The numerical systems of Sir Hume Pop- ham and Captain Marryatt were very serviceable but limited in application, the sentences to which the num- bers referred being

arranged as in a dictionary. By the new commercial code the signals represent consonants, and by means of about a score of flags all the requisite communications can be made. A universal international code of signals would no doubt bea benefit. (w. HE.)

FLAG, or Flower br Lucs, botanically Jris, the popu- lar name of a genus of perennial plants of the natural order Iridacee, occurring in north temperate regions, and having the following characters :—Rootstock creeping, horizontal, thick, with dichotomous joints, or tuberous; leaves usually ensiform and equitant ; flowers large and showy; the perianth (see Borany, vol. iv. p. 144, fig. 268) superior, with the tliree outer segments large, spreading, or revolute, and frequently bearded at the base, and the three inner smaller, sub-erect, and converging ; stamens three, inserted at base of outer segments of perianth, and concealed by the stigmas ; anthers extrorse; stigmas three, petaloid, and arching over the stamens ; capsule three-celled, dehiscing loculicidally ; and seeds numerous, with a fleshy albumen. Many kinds of flag are cultivated in England, but only two species are indigenous. One of these, Jris Pseudacorus, the Yellow Flag or Iris, is common in Britain on river banks, and in marshes and ditches. It is called the "Water-flag" or " bastard Floure de-lnce" by Gerard, who remarks that "although it be a water plant of nature, yet being planted in gardens it prospereth well," Its flowers appear in June and July, and are of a golden-yellow colour. The leaves are from two to four feet long, and half an inch to an inch broad. Towards the latter part of the year they are eaten by cattle. The seeds are numerous and pale-brown; they have been recommended when roasted as a substitute for coffee, of which, however, they have not the properties. The astringent rhizome has diuretic, purgative, and emetic properties, and may, it is said, be used for dyeing black, and in the place of galls for ink-making. The other British species, J. foetidissima, the Fetid Iris, Gladdon, or Roast-beef Plant, the Xyris or Stinking Gladdon of Gerard, is a native of England south of Durham, and also of Ire- land, sonthern Europe, and north Africa. Its flowers are usually of a dull, leaden-blue colour; the capsules, which remain attached to the plant throughout the winter, are 2 to 3 inches long; and the seeds scarlet. When bruised this species emits a peculiar and disagreeable odour. Among other flags common in Europe are J. Germanica, probably the Illyrian iris of the ancients, the purple blossoms of which are a common ornament of English

gardens; J. pallida, a native of Istria, with pale-blue flowers ; and J. Florentina, indigenous to the Macedonian coast and

Asia Minor, having white flowers. The rhizomes or under- ground stems of these three species constitute the " orris- root" or rhizoma Iridis of pharmacy, formerly known as '"'ireos" or "orice," which is exported in considerable quantity from southern Europe, more especially from the neighbourhood of Leghorn aud Trieste. To prepare orris- root the rhizome is in August dug up and freed of its rootlets and brown outer bark; it is then dried, and packed in casks for sale. Orris-root occurs in commerce in whitish, knobby, sometimes branched pieces, of about the thickness of the thumb, and having on one side numerous pits where the rootlets were attached. Tt_has a bitterish and acrid taste, and is purgative and emetic in properties. By drying it acquires the odour of violets. It is exported to India, where it is called bekhbunufsha (violet-root). By the ancients it was valued both for its odour and its healing virtues; and in England it was in past times in repute as a medicine for various complaints. Gerard states that "the root of the common Flower de-luce, cleane washed, and stamped with a few drops of Rose water, and laid plaister-wise upon the face of man or woman, doth in two dayes at the most take away the blacknesse or blewnesse of any stroke or bruse"; he further advocates the use of the same remedy in dropsy and infirmities of the chest. It is now employed in the preparation of violet-powder, and of scented hair and tooth-powders and oils, as a perfume for the breath, for making issue-peas, and occasionally as an errhine. At the risk of causing irrita- tion of the mouth and disturbance of the bowels, it is sometimes given to teething infants to bite. In America the rhizome of J. versicolor, the Blue Flag, as also that of I. Florentina, is employed as a purgative and alterative in strumous complaints. Orris-root contains, besides gum, ligneous matter, and elliptical granules of starch, an acid resin, tridin or trisin, precipitable from the tincture by water, aud said in small doses to act as a stimulant of the glandular system ; also one-twelfth per cent. of a semi- solid substance, the butter or camphor of orris, which consists apparently of myristic acid with a little essential oil, and which with about 15 parts of spirits forms the odd or essence of orris-root. According to some writers the blossom of the iris is

represented in the well-known heraldic device, the FLEUR-DE-LIs (g. v.). The ancient arms

of Florence are a red shield bearing a white lily or iris. The Sweet Flag, or Sweet Sedge, probably the dxopoy of Dioscorides, is the species Acorus Calamus, L., a plant of the natural order Acoracew or Orontiacee. It has a wide distribution, growing in wet situations in the Himalayas, North America, Siberia, and various parts of Europe, including England, and has been naturalized in Scotland and Ireland. The leaves are sweet-scented, and are ensiform, equitant, 3 to 6 feet long, and two-thirds to 14 inches broad ; and the spadix is lateral, with bisexual flowers. The rhizome (rhzzoma calami aromatict), which has a more powerful odour than the herbage, is creeping, horizontal, and woody ; it has been employed as an aromatic stimulant, antispasmodic, and tonic. Sir J. E. Smith fing. Flora, ii. 158, 2d ed., 1828) mentions it as a popu- lar remedy in Norfolk for ague. In India it is used as an insectifuge, and is administered in infantile diarrhea. It isan ingredient in pot-pourri, is employed for flavouring heer, and is chewed to clear the voice ; and its volatile oil 1S employed by makers of snuff and aromatic vinegar. The ae . = Calamus is sometimes adulterated with ons aealt a ee which, however, is distinguish- ck of odour, astringent taste, and dark colour.

See J. Gerard, Herball, edition of Th Cae ; ; om. Johnson, 1633, p. 49 5 Hegel Med. and Gicon. Bot., 1856; J. D. Wookes, Wie oe ora, 1870 ;, Fliickiger and Hanbury, Pharmacographia, ; Bentley and Trimen, Afed. Plants, tab. 273 and 279.

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FLAGELLANTS. The practice of some form of flagel- lation as a religious observance is of very early origin, and has been more or less followed by nearly every nation, both savage and civilized. Special whipping ceremonies have also had a wide prevalence. According to Herodotus (ii, 40, 61), it was the custom of the ancient Egyptians to beat themselves during or after the sacrifice at the annual festival in honour of their goddess Isis. In Lacedemon, at the festival of Artemis Orthia or Orthosia, the chief ceremony was that of the Diamastigosis, or flogging of youths before her altar,—a custom which is said to have been introduced by

Lycurgus, and which is known to have existed down to the time of Tertullian. From Sparta it spread to other places in Greece, Asia Minor, and Italy (see vol. ii. p. 644). Flagellation was a prominent feature in the Roman festival of the Lupercalia, at which it was the custom of the Luperci to run through the most fre- quented parts of the city, having leathern thongs in their hands, with which they struck all whom they met, the blow being believed to have a salutary influence (see Ovid, Fastz, ii. 425 sqg. ; Plutarch, Cesar, 61).

The discipline of flagellation was introduced at a very early period into the Christian Church as a punishment ; the first recorded instances of it are isolated cases which happened about the beginning of the 5th century; thus Augustine (Zp. 159 ad Marcell.) mentions that in his day flogging was resorted to us a means of discipline, not only by parents and schoolmasters, but also by bishops in their courts ; and Joannes Cassianus, writing about the same period, says of offending monks, "vel plagis emendantur vel expulsione purgantur," In the decrees of several provincial councils the practice is referred to as usual and right, But self-flagellation as a voluntary penance was not introduced till a considerably later period. The custom seems to have made but little progress till about the end of the 11th century, when it was largely recommended by the precepts and example of Cardinal Peter Damian ; and in the 13th century fraternities were specially formed for its observance as a regular and public religious ceremony. The first of these was instituted about 1210 through the preaching of St Anthony of Padua, but the new order did not make much progress till about 1260, when, finding a favourable soil in the penitence and fear resulting from the disastrous effects of the long-protracted Guelph and Ghibel- line wars in Italy, it suddenly sprung up into vigorous growth through the exhortations and example of Rainer, 4 monk of Perugia. Great numbers of the inhabitants of this city, noble and ignoble, old and young, traversed the streets, carrying in their hands leathern thongs, with which, accord- ing to the chronicle of the monk of Padua, "they drew forth blood from their tortured bodies amid sighs and tears, singing at the same time penitential psalms, and en- treating the compassion of the Deity." Many of them soon began a pilgrimage through the neighbouring towns, and in- creasing in numbers as they went, some journeyed through Lombardy into Provence, and others carried the infection to Rome. As they at first effected a

considerable im- provement in the habits of the people, the religious authorities gave them their countenance ; but the Ghibel- lines, dreading their political influence, prohibited them from entering their territories. Other bands of flagellants visited Bavaria, Bohemia, Austria, Hungary, and Poland, making many converts on their way; but their exhibitions gradually awakened the disgust of the better classes of society, and the tumult and disorder resulting from such large and promiscuous gatherings soon Jed to their pro- hibition both by the clergy and the civil rulers. The fraternities again made their appearance after the great plague in the 14th century, this time in Hungary, and spread thence through Germany. From the Continent

120 of them passed over into England, but they were | Orleans, the king's eldest son, who gave him a situation of

finally obliged to retire without making a single convert. Pope Clement VI. fulminated a bull against the order 20th October 1349; and the officers of the Inquisition during the papacy of Gregory XI. persecuted them with such vigour that the sect at last disappeared altogether. An attempt made in Thuringia in 1414 by Conrad Schmidt to revive the order under the name of Cryptoflagellants was suppressed by the trial and execution of that leader and the more prominent among his followers. In the 16th century a milder form of the practice was prevalent in

France, especially in the southern parts of the kingdom ;

and in various places flagellating companies were formed, who, however, used the discipline chiefly in private, and only occasionally took part in public flagellating processions. Henry III. of France established a whipping brotherhood in Paris, and himself took part in the processions, but find- ing that his conduct so far from conferring ou him any political benefit awakened only ridicule, he allowed his zeal for self-mortification to abate. The fraternities were suppressed in France by Henry IV,, but until recent times the practice of self-flagellation continued to manifest itsclf

intermittently in the south of France, and also in Italy and Spain ; and so late as 1820 a procession of flagellants took place at Lisbon.

See Muratori, Antiquitates Italice Mediit Atvi; Boileau, His- toria Flagellantiwm, translated into English under the name History of the Flagellants, or the Advantages of Discipline ; Helyot, Histoire des ordres monastiques ; Gerson, Contra seetum flagellantium ; Cooper, Flagellation and the Flagellants ; Schneegans, Die Geissler, namentlich die Geisselfahrt nach Strassburg, 1349, Leipsic, 1840; and especially Forstemann, Die christl. Geisslergesellschaften, Halle, 1828, and the article by Dr Zacher in Ersch and Gruber's Eneyelopadie.

FLAGEOLET. See Frurs,

FLAHAUT DE LA BILLARDERIE, Avcusrz Cuartes JosepH, Comte px (1785-1870), a French general and diplomatist, was born in Paris on the 21st of April 1785. His father, a field marshal in the royal army, succeeded Buffon as intendant of the royal gardens, and was guillotined at Arras in 1793. His mother, an ingenious and elegant novel-writer, known as Madame de Souza, from the name of her second husband, the Portu- guese author J. M. de Souza-Botelho, emigrated with him to England, and, after he had spent some time in Germany for the sake of his education, brought him back to Paris in 1798, The following year, young Flahaut, being only fifteen years of age, enlisted ina troop of volunteer cavalry, who were to accompany General Bonaparte, then first consul, to Italy. He had a brilliant career, being suc- cessively aide-de-camp to Murat, Berthier, and Napoleon, In 1813 he was first gazetted general of brigade, and then Seneral of division, and, although already a count by birth, received a second time this title from the great soldier of fortune who sought by his simple fiat to create a new empire to be propped up by a new nobility. He was a peer of France during the Hundred Days, and supported With all his influence the project of making Marie-Louise regent, and of thus securing the imperial throne for the young king of Rome under the title of Napoleon IT. On the second return of the Bourbons he left France, and lived in exile from 1815 to 1830, In England, his usual place of retreat, he married (28th July 1817) the daughter of ms Keith, who became an Irish peeress as Baroness 5a mm 1823, and succeeded to the Scottish barony of

aim in 1838. By her he had no sons, but several i ely the eldest of whom married the fourth marquis — After the revolution of July 1830 he pie ne France, was restored to his former rank in the

ae and was made a peer by the Government of Louis-

“ppe. He soon became a favourite with the duke of

trust in his household. He also received at the same time the dignity of the grand cross of the Legion of Honour, of which he had been a commander since 1814. His services as a diplomatist were made use of more than once: he was ambassador at Berlin in 1831, and at Vienna from 1842 until the revolution of. 1848. When Louis Bonaparte became Napoleon III., Flahaut de la Billarderie, whose mother had brought up the duke of Morny, did not con- sider his fidelity as any longer pledged to the Orleans family, and was appointed senator (31st December 1852). Nor was this the only imperial favour he could boast of. From 1860 until 1862 he was ambassador to London, and, on the 28th of January 1864 he was promoted to the high dignity of grand chancellor of the Legion of Honour. After that time Flahaut did not play any considerable part in the management of public business. He died on the 1st of September 1870.

FLAMBARD, Ranutpn (Rata), (d. 1128), bishop of Durham, and justiciar under William Rufus, was a Norman of low birth, who came to England in the train of William the Conqueror in 1066. He took holy orders, obtained several church preferments, and was appointed chaplain to the bishop of London, and made prebendary of St Paul’s. He demanded the deanery also, and this being refused him, he left the bishop’s service. He afterwards passed into the service of the king, William IT., who made him his chaplain. Ambitious, greedy, and unscrupulous, he flattered and ministered to the vices of his master, and thereby raised himself to the highest places in church and state. To fill the royal coffers he suggested various arbitrary and oppressive measures, by which he earned the hatred of the people, and at the same time the eulogy of the king, that he was the only man who, to please a master, dared to brave the vengeance of mankind. Flam- bard appears to have been the first to apply the feudal theory to the estates of the church. He suggested that they should be considered as fiefs or benefices held of the king, and that as such at every vacancy they devolved to the

crown till the vacancy was supplied. The lesson was quickly learnt, and the immediate consequence was that benefices were kept vacant during the king's pleasure, and refilled only on payment of a large sum of money. It was not till after the death of Lanfranc that the king gave him- self up unreservedly to the influence of Flambard. The justiciar obtained for himself the custody of the vacant abbeys of Winchester and Chertsey, the bishopric of Lin- coln, and the archbishopric of Canterbury. His extortion and oppressions drew upon him the curses of the clergy as well as of the people, and in 1099 an attempt was made to murder him at sea, Buta storm arose and his murderers quarrelled, aud Flambard was allowed to land again. He then reappeared at court and was rewarded with the see of Durham. But he was at last "hoist with his own petard": for at his consecration he had to make the king a present of £1000. On the death of William IL, in the following year, the bishop, to satisfy the outcries of the people, was sent to the Tower, "the first man," says Mr Freeman, '"recorded to have dwelled as a prisoner in the Conqueror's fortress." He fared sumptuously in his confinement, treated his keepers, and at length, in February 1101, managed to escape from the Tower, and fled to Normandy. There he joined Duke Robert, instigated him to the invasion of England, and returned to England with him. He was ultimately restored to his see, and appears to have occupied himself thenceforward with its duties, and in various architectural works—the compietion of his cathedral, the building of Norham Castle, and the fortification of Durham. He endowed the college of Christchurch and founded the priory of Mottisford. Flambard died September 5, 1128.

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FLAME. An ordinary flame consists of a gas of vapour burning in contact with the air, and in most cases emitting light of greater or less intensity. It is thus distinguishable from the mere incandescence or glow produced by a burn- ing body which does not become gaseous previous to com- bustion. Many solid substances, however, burn with flame, because under the influence of heat they either, as wood and coal, evolve combustible gases and vapours, or, as zine, sulphur, and phosphorus, become volatile.

Charcoal, although a solid, when brightly heated in a furnace yields flame, since carbon dioxide, or carbonic acid gas, in pass- ing through it, furnishes the combustible gas carbon mon- oxide, or carbonic oxide. When the air or other supporter of combustion is intimately mixed with the combustible gas, ignition occasions an explosion, and the flame resulting '3 instantaneous and equally luminous throughout. The dark inner cone of a candle-flame (see BLowPIPe, vol. ili. p. 837, col. 2) is formed by the volatilized tallow raised by the capillary action of the wick, together with carbonic oxide, carbonic acid gas, and water vapour from the com- bustion going on in the outer part of the flame, and atmospheric nitrogen, but no free oxygen. By means of a short tube inserted into it, the inner cone of the flame may be made to yield up a portion of its contents ; the applica- tion of a light to the other end of the tube shows that they are combustible. That within the flame they are not ignited may be demonstrated in many ways. Thus, if a piece of paper be depressed upon the flame for a few seconds, that part of it which touches the central part of the flame is not charred. Again when a platinum wire is held horizontally in a candle flame, it is heated to redness at the two parts where it is in contact with the outer zones of combustion, remaining dark between them. In the intermediate, white-hot, and luminous zone of the candle flame the oxidation of the gases yielded by the inner core is chiefly effected. The reducing effect of the flame is greatest at the surface of contact of these two portions. On account of the slower combustion, the smaller prcpor- tion of unoxidized gases, and the greater penetration of oxygen at the upper part of the flame, the luminous zone is thicker, but less bright above than below. In the outer non-luminous zone or mantle, which envelops the whole flame except at its base, combustion is completed. The mantle may be conveniently observed by interposing a small piece of card between the luminous cone and the eye. At the base of the flame, reaching a little upward towards the inner cone, is a light blue zone.

The composition of wax and tallow flames, according to Hilgard, is hydrogen, marsh-gas, olefiant gas, carbon mon- oxide, carbon dioxide, nitrogen in large proportion, and small quantities of substances condensable to solids or liquids. The same gaseous constituents were found by Landolt in coal-gas, with tetrylene, water, and a very little oxygen. The size of a flame is in relation to the amount of oxygen required to consume a

definite bulk of its con- stituent gas, and to the purity of the oxygen supplied. Hence the flames produced by the same bulk of different gases vary considerably in magnitude, the flame of hydrogen being smaller than that of olefiant gas, but larger than that of a mixture of hydrogen and nitrogen. The flame of oxygen burning in marsh-gas, of which it needs only half its volume for complete combination, is much sinailer than that of oxygen burning in hydrogen, of which latter two volumes are required. The tapering shape of a candle- flame results from the spreading of the gases set free in its all nr the ascent of the products of combustion, ei fae me a higher temperature and consequently Miitasitors. or Fa ie = from the currents in the cooler aot : it thereby occasioned, and, lastly, from

ombustible material at the upper part of

FLAME

the flame. A flame of large size tends to be irregular in

form through variations in the force of air-currents, B

altering the atmospheric pressure to which they are sub-

jected, flames may be made to differ considerably in shape,

Thus at two atmospheres of pressure the flame of a sperm candle is spike-like, and scarcely one quarter of an inch in diameter below, whilst its upper part is enveloped in smoke, in which the apex is concealed. When the normal pressure is gradually reduced to that of half an atmosphere, the flame is changed in appearance chiefly through diminu- tion of its luminosity; but as the pressure is lowered thence to that of six inches of mercury, the flame becomes globular, and assumes a greenish-blue tint. ‘“ Just before the disappearance of the yellow portion of the flame, there comes into view a splendid halo of pinkish light,” due probably to incandescent nitrogen, “‘ forming a shell half an inch thick around the blue-green nucleus, and thus greatly enlarging the dimensions of the flame ” (Frankland), The colour of flames, due, according to Heumann, to heated vapours, is dependent principally on their temperature and on the nature of bodies contained in them. The flame of carbonic oxide, ordinarily blue, is

yellowish-red if the gas be heated before ignition. The colour of flames is subject also to modification according as one or other of any two gases burnt together is made the supporter of combus- tion.

Flames may be classed as luminous, such, e.g., as those produced by the burning of wax, tallow, oils, and other carbonaceous substances, and metals ; and non-luminous, as those of hydrogen, alcohol, sulphur, and carbon monoxide, A good illuminating flame may readily be procured from a non-illuminant gas by saturating it with the vapour of a heavy hydrocarbon ; thus hydrogen and marsh gas, when burnt with one pound of benzol, give a light equal to that yielded by 5-793 tb and 7°682 tb of spermaceti respectively, The diluents of coal-gas, namely hydrogen, carbon mon- oxide, and marsh gas, afford practically no light; the light given by the illuminants is not, however, altogether independent of the relative proportions of the diluents (Frankland and Thorne, in Journ. Chem. Soc., March 1878, p. 94). Flames transparent for all lights are non-luminous, since the power of an incandescent gas at a given temperi- ture to absorb and its power to emit light are proportional to each other.

Sir H. Davy, from experimental investigations, was Jed to the conclusion that the luminosity of flames is caused by minute solid particles of incandescent carbon or other sub- stances set free from the combustible body by heat. From researches by Frankland and other physicists it appears that this view is not tenable in respect to all flames. The flame of arsenic burning in oxygen emits a remarkably intense white light, although neither the metal nor the product of its combustion, arsenious acid, is gaseous at the temperature of the flame, Again, carbon disulphide and nitric oxide give on combustion together a light which 18 almost unbearable by the eye, and which, like that of a coal-gas flame, affords a perfectly continuous spectrum, and yet no solid particles are concerned in its production. From these and similar facts, and from the seeming trans parency of illuminating flames, it has been concluded by Frankland and others that although a non-luminous flame may be rendered luminous by the introduction into it of substances in the solid condition, e.g., asbestos, platinum wire, and fine powders, the light-giving power of ordinary flames is dependent to a great extent on the density of their constituent gases and vapours, and not on the presence ml them of any solid particles, Further, the deposits of soot formed

by the flames of ordinary illuminants on bodies with which they come in contact have been regarded 4s consisting, not of solid carbou set free by the elective

affinity of oxygen! for the hydrogen of the hydrocarbon, but of mixtures of condensed hydrocarbons of remarkably high boiling-points. The observations of several experi- menters do not, however, bear out these conclusions. M. J. L. Soret has demonstrated that the supposed transparency of many flames at high temperatures does not exist, and that at least for ordinary flames Davy's theory of the pro- duction of luminosity holds good,— a pencil of solar light being reflected by diffusion and polarized in precisely the same manner, whether it falls on a very brilliant flame, or whether it illuminates non-incandescent smoke, in which the presence of carbon particles is incontestible" (see Archives des Science, July 1874, trans. in Phal, Mag., 1875). Stein, moreover, has proved that the sooty deposit obtain- able from a coal-gas flame contains not more than 9 per cent. of hydrogen, and that, were it merely condensed vapour, exposure to a high temperature would cause its volatilization, which, however, is not the case (see Journ. Pract. Chem., new series, vol. vill. p. 402). Heumann holds that for the production of light from a hydrocarbon flame a high temperature is requisite,—first, to set free solid particles of carbon, and, secondly, to maintain these in a state of incandescence. In support of the theory that the luminosity of hydrocarbon flames does result from the existence within them of carbon particles he points out—

(1) That the luminous mantle of a hydrocarbon flame (as Stein also has proved) is not altogether transparent, the appearance of a continuous image when an object is viewed through the flame being attributable probably to the smallness of the illuminating particles and their rapid motion ;

(2) That flames the luminosity of which is due to the presence of finely divided solid matter give shadows when viewed in sunlight ; also that luminous hydrocarbon flames give shadows ; and that the only light-giving flames that are shadowless are those consisting of glowing gases and vapours ;

(3) That chlorine increases the luminosity of feebly luminous hydrocarbon flames by setting free in them particles of what must certainly be pure carbon;

(4) That the presence of solid particles in a hydrocarbon flame may be demonstrated by causing it to impinge upon a heated surface, or upon a similar flame; and

(5) That the lower surface of a small rod placed in a flame becomes covered with soot, which has been separated in the lower portion of the flame. This deposit cannot be the result of the cooling action of the rod, as it is not formed on all sides of the rod, and may be produced on hot as well as cold bodies introduced into the flame.

The influence of pressure upon luminosity has next to be considered. It was shown by Davy in 1817 that the intensity of the light of flamies is increased by the condens- ation, and diminished by the rarefaction of the atmosphere. Frankland has proved that flames ordinarily non-luminous, as those of hydrogen, carbonic oxide, and alcohol, can be made highly luminous by condensing the atmosphere in which they burn. Hydrogen yielding, under a pressure of three atmospheres, light estimated at one unit, at twelve atmospheres givesa light of 100 units. On the other hand the flame of arsenic in oxygen loses greatly in lumin- osity when subjected to reduced pressure, For each decre- ment of pressure from 30 down to 14 inches of mercury, according to Frankland, the flames of candles undergo an equal or nearly equal loss of luminosity ; for lower pres- Sures the diminution is less rapid. The blue portion of the a of candles burnt on the summit of Mont Blanc was ound by the same experimenter to extend to the height of oue eighth of an inch above the cotton, the rate of combus- tion being the same as at Chamounix; and it has been i by him that, owing to the difference of barome- , Pressure in the two cities, the illuminating effects of the

ame sample of coal-gas in London and Mexico must be in a

, a ee Compare the action of palladium sponge and foil on various

ydrocarbon flames, probabl r i Wohler, in Phil. Mag., 1877. ~ ——

the ratio of 100 to 46:2. From the above-mentioned facts the inference has been drawn that the decrease in light caused by rarefaction of air is attributable to the greater mobility at low pressures, and consequent readier oxidation of gaseous bodies, and also to the increase in the size of the flame. Conversely, tlie greater luminosity under pressure has been ascribed to the augmentation of the density of the burning gas or vapour thereby occasioned. It has, however, been proved that, although the density of constituents is not without effect on the luminosity of flames, it cannot be con- sidered alone as a cause of this phenomenon, since at high pressures the temperature of a flame is increased. (See Deville, Compt. Rend., lxvii. 1089.) Now, although the light and heat of flames are not related in degree, for the flame of the oxyhydrogen lamp, the hottest known, is scarcely luminous, yet for the same kind of flame luminosity increases with temperature.

The influence of temperature on luminosity may be exemplified in various ways. Thus, if the cooling of a flame be checked by decreasing its surface in respect of its volume, a greater amount of light is obtained. The smoky flame of turpentine becomes luminous when its tempera- ture is raised ; and if, by the use ofan outer glass cylinder in addition to an ordinary lamp chimney, the air supply- ing a flame be warmed at the expense of the escaping pro- ducts of combustion, a considerable increase of light is the result. Heumann finds that the cooling effect of a metallic burner on a gas flame notably diminishes its luminosity ; and he attributes the greater intensity of the light observed when the burner is heated to an earlier separation of carbon particles in the flume, and to their more vivid incan- descence.

Considerable insight into the conditions of the luminosity of flame has been afforded by experiments with mixtures of illuminating gas and air. The light of pure coal-gas being reckoned at 100 units, that of gas with 10 per cent. of air is 33 units, with 20 per cent. 7, with 30 per cent. 2, and with 40 per cent. 0 (Frankland). The non-lumin- osity of the flame of the Bunsen lamp, by means of which a mixture of coal-gas with 2 to 24 times its bulk of air is burnt, has been ascribed by some to the rapid destruction of the illuminants

of the gas by the oxygen of the admixed air; but some further explanation of the phenomenon is evidently necessary, since the volume of air employed is inadequate for the complete oxidation of the gas, and the flame is still lightless if hydrogen, carbonic oxide, steam, or indifferent gases, as nitrogen, carbon dioxide, or hydro- chloric acid, be substituted for air. Wibel (Deut. Chem. Ges. Ber., viii. 226), finding that the heating of the gas and air previous to ignition renders the flame luminous, concludes that the non-luminosity of the flame is the result of the cooling action of the gases entering it; but, as Heumann points out, it cannot be wholly due to this cause, for the temperature of the non-luminous flame of the Bunsen burner, as also of the blowpipe, is much above that of ordinary flames. From the observations of Stein (J. Pract. Chem., ix. 183), who shows that a flame made non-luminous by nitrogen is yet hot enough to decompose coal-gas, and that carbon monoxide, which has a pyrometric effect nearly equal to that of coal-gas, renders the flame of that gas non-luminous without lowering its temperature, it is evident that the mere introduction of a diluent into a burning gas diminishes its light, independently of any absorption of heat to which it may give rise. Heumann finds that decrease of luminosity through dilution and cool. ing takes place when a gas-flame giving light in ordinary air is plunged into a mixture of five volumes of air with two volumes of carbon dioxide, or when the products of combustion are allowed to accumulate in the air in which the flame is burning.

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The degree of rapidity with which oxidation takes place is a condition which atfects very considerably the lumin- osity of flames. If a small flame, free from unoxidizable substances, be placed in pure oxygen, its light becomes feeble, since the illuminants, instead of spreading through it in an incandescent state, are speedily oxidized ; within certain limits, therefore, the mixture with the oxygen of an inert gas, e.g., nitrogen or carbon dioxide, increases the luminosity of the flame. The simplest form of gas-burner, having a single orifice only, affords the minimum amount of light, as the gas rushes without interruption into the air. When, however, as by the use of the fishtail burner, two jets of gas are made to impinge upon each other, the velocity with which the illuminants are driven through the flame and oxidized is retarded, with the effect of con- siderably augmenting the light.

The insertion of a small piece of platinum plate between the two jets, as in Scholl's "platinum perfecter," by reducing still more their velocity, causes a further increase in the luminosity of the flame (Frankland).

The temperature of flames differs considerably according to the conditions of combustion and the nature of the substance burnt. That of hydrogen in air, calculated from its absolute thermal effect as measured by Favre aud Silbermann, is 2080° C.; that of carbon monoxide, 2828° ; and that of marsh-gas, 1935°. The oxyhydrogen flame has a temperature estimated by Bunsen at 2844° C. The flame of a common candle in its hottest portion is at a temperature high enough to melt a small filament of platinum held in it. Deville, experimenting with a mix- ture of oxygen and carbon monoxide, found that, at 54 millimetres above the orifice of the burner employed, the flame was hot enough to melt gold; at 12 mm. it melted platinum; and at about 2 mm. lower, at the apex of the inner cone of the flame or a little beneath it, the highest temperature was indicated. The temperature of the flame of alcohol, according to Becquerel, is nearly 1204° C. (2200° Fahr.). M.F. Rossetti (Journ. de Phys., vii. 61), by means of a thermo-electric element of iron and platinum, estimated the temperature of the external envelope of a Bunsen flame at 1350° C., that of the violet portion at 1250°, and that of the blue at 1200°, the temperature in the central dark cone ranging from 250° to 650°. The flame of a mixture of two volumes of illuminating gas with three of carbon monoxide indicated a temperature of 1000°. The determination of the higher temperatures of flame by means of thermo-electricity is, however, open to considerable sources of error.

The nature and the continuance of the combustion of a flame depend (1) on the supply of the supporter of the combustion ; (2) on the ignition-temperature of the gas or vapour; and (3) on the heat produced in burning, and therefore on the degree of rarefaction of the atmosphere, which by lessening chemical combination diminishes the heat of the flame.

(1) In the case of all ordinary flames the oxygen of the air is the supporter of combustion, and of this a free supply is requisite. A combustible hydrocarbon containing more than six parts of carbon to one of hydrogen burns with a smoky flame in air, unless a free draught can be provided by the use of a lamp-glass. A coal-gas flame sup- plied by an orifice of one

quarter of an inch in diameter is not smokeless when higher than 24 inches; but the flame 1s rendered clear if by lengthening or dividing the aperture of the Jet the exposure of a larger extent of its surface to the air is effected.

a poe ies Prans., 1816, pt. i p. 117) points a or Prd ed of air thrown upon a small aiten® ht hese clow the exploding point of its con-

D at the extinction of a flame by blowing

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upon it is probably produced by that cause, assisted by the dilution of the explosive mixture. The fact that, by the presence or neighbourhood of a cooler body, the temperature of a heated gas or vapour is lowered beneath the igniting point, explains the action of the wire gauze of the Davy lamp (see Coat, vol. vi. p. 72), and also explains why a candle-flame does not quite touch is wick, or a gas-flame its burner, unless the latter be some-what strongly heated. The presence of an inactive gas hinders, and if in large quantity prevents, by its cooling action, the explosion of gases. The rate of propagation of ignition in gaseous mixtures thus varies not only with the nature of their combustible constituents, but with the degree to which these are diluted with indifferent gases, The rate in a mixture of hydrogen and oxygen in com- bining proportions is 34 millimetres a second; aud that in a similar mixture of carbonic oxide and oxygen is less than 1 mm. a second (see Bunsen in Pogg. Ann., cxxxi, 165). The maximum velocity of the propagation of igni- tion for marsh-gas and air, according to M. E. Mallard (Ann. des Mines, tii. 355, 1875), is '524 mm., the minimum 041 mm. a second ; the velocities of coal-gas and air are maximum 1°01 mm. and minimum 0°097 mm. a second. A jet of combustible gas at high pressure, or much diluted with inert gases, can be ignited only at a considerable distance from the orifice at which it issues, owing apparently to the cooling action of the gas itself and of the outer air, and perhaps more especially to the velocity of the gas being greater than that of the propagation of ignition within it (Heumann).

(3) From numerous experiments, chiefly with gases, Davy concluded, first, that the extinction of flame on rare- faction of the atmosphere takes place only when the heat produced by the burning body is insufficient to keep up

the combustion, the mere removal of pressure from the burn- ing body being without effect on its combustibility; and secondly, that therefore those bodies which require least heat for their combustion burn in more rarefied air than those requiring more heat, and those which produce much heat in their combustion, other circumstances being the same, burn in more rarefied air than those producing little heat (Phil. Trans. 1817). Hence the extinction of a gas by rarefac- tion is hindered by raising its temperature. Davy found that a mixture of oxygen and hydrogen in combining pro- portions could not be exploded when rarefied to one eighteenth of its normal density, aud that hydrogen would not burn at a pressure of one- seventh of an atmosphere. Compression tends to make the combustion of flames less perfect, so that flames smoky at ordinary pressure can be rendered smokeless by rarefying the atmosphere in which they are burning.

It has been shown by Professor R. Bunsen that the combustion of a uniform mixture of an inflammable gas with oxygen takes place discontinuously. Thus, when a mixture of carbon monoxide and oxygen in combining proportions is exploded in a closed vessel, its temperature rises from 0° to 3033°C., and two-thirds of the carbon monoxide remains unconsumed and incombustible until, by radi- ation and conduction, the temperature sinks to 2558° C. Below this temperature a second burning begins, which restores the temperature to 2558° C., at which point it abides stationary until exactly half the carbon monoxide is consumed. The inflamed mixture now cools to 1146° C., when the combustion ceases; it must, however, be afterwards continued at lower as at higher temperatures, since the product of combustion consists eventually, on cooling, of carbon dioxide only. Bunsen has further pointed out that there is a simple molecular relation between the quantities of compounds which, 1 favourable circumstances, are formed simultaneously in a perfectly uniform gaseous mixture ; as, for example, when water and carbon dioxide are produced from hydrogen and carbon monoxide burnt with less oxygen than suffices for the combustion of both. (Cf. CHEMISTRY, vol. v. p. 483, col. 2.) This relation undergoes SUC- den alterations by the addition, by degrees, of a third body, as oxygen, the homogeneous nature of the mixture not being affected. (Sce Phil. Mag. [4], xxxiv. p. 489, 1867.)

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The radiation of heat from the flame of a Bunsen | third of an inch high was used, the magnetic force flattened

burner is cousiderably less than that from a luminous gas flame, and by most vapours is less powerfully absorbed. The absorption by the air of the heat radiated from a hydrogen flame, the source of which is the aqueous vapour produced by the combustion, has been shown by Tyndall to be due to the presence of moisture in the air, dry air being actually trausparent to the radiations of the flame, whereas on humid days undried air may absorb as much as 20°3 per cent. of them. This phenomenon is explicable on the theory that, notwithstanding the high temperature of the flame, there is an accord between its oscillating molecules and those of aqueous vapour at the ordinary temperature, the heat of the flame increasing the amplitude but not the rate of its molecular vibration. When a carbonic oxide flame, the product of which is carbonic acid gas, is made to radiate through an atmosphere of the same gas, the absorption is very great, insomuch that, at a pressure of 4 inches, 65 per cent. of the radiation is cut off. The radiation of heat from a flame, it is thus apparent, depends on the Jength of the heat waves to which, accord- ing to the nature of its products, it gives rise, and on the character of the atmosphere through which the radiations have to pass, The products of the combustion of alcohol are aqueous vapour and carbonic acid gas, the heat rays of which have a slow period of vibration and correspond to the ultra-red rays of the spectrum. 'The temperature of an alcohol flame may be lowered by plunging into it a spiral of platinum wire, but its heat, being thereby con- verted into heat of higher refrangibility, is consequently more readily transmitted through some substances, such as glass, than that of the original flame. (See Tyndall, Heat as a Mode of Motion, 5th ed., 1875, p. 385 sq.)

The phenomena of singing flames have already been alluded to (Acoustics, vol. i. p. 115). M. C. Decharme has produced persistent and varied sounds by directing a jet of air from a tube with a diameter of 3 to 5 mm. on a gas-flame supplied by an orifice of similar diameter. The effect of the jet of air seems to be attributable in great measure to its chemical besides its

mechanical action. By altering the diameter and position of the tubes, and the nature and pressure of the gas and air, the sounds and the colour and shape of the flame may be greatly modified. (Compt. Rend., Ixxx. p. 1602.) On the spectra of fiames see SPECTRUM ANALYSIS.

In consequence of the rarefaction of the air which it occasions, and also its tapering form, flame acts with great rapidity in dissipating a charge of electricity. It has been shown by Grove (Phil. Mag., 1854, [4], vii. 47) that a current of electricity is transmitted in flame, and is produced i it probably by chemical action:

t Edmund Hoppe, in a paper on the electrical resist- ance of flames (Nachrichten v. d. K. Ges. d. Wiss. u. d. Georg-Augusts-Universitat, 1877, p. 313), concludes as the result of his experimental investigations that— ‘ . (1) For every flame the electric conductivity incrcases with an Terapee of the heat and of the amount of the burning gases ; (2) ale conductivity of different flames is dependent on Ome bee c AE (gion burnt ; the vapours of salts and solu- y efficient in augmenting the conductivity of the

flame of hydrogen; and iOliia’s law, eviitrary to the suiiive of The diamagnetism of flame, on its discovery by M. P.

§ oe was in 1847 investigated both by Zantedeschi the Fcc When placed in various positions between tee = o & powerful electro-magnet, the flame of a wax on a Inclined, or assumes a fishtail shape, or even the pol out right and left in an equatorial direction between Pn €s, producing a double flame with two long tongues. ay found that when a small flame only about one*

-of their rites.

it into an equatorial disc. The brightest flames appeared to him to be the most diamagnetic (Faraday, Lup. Researches, vol. iil. pp. 467, 487, 490).

See, in addition to the authorities quoted above, Works of Str H. Davy, ed. by Dr John Davy, vol. vi. pp. 1-130, 1840; Frankland, A Course of Lectures on Coal-Gas, 1867, and Experimental Re- scarches, 1877; and Dr Karl Heumann, Contributions to the Theory of Iwminous Flames, translated by M. M. Pattison Muir from Liebig’s Ann. der Chemie, vol. clxxxi. pt. 2, pp.

129-158, and vol. clxxxii. pp. 1-29, in Phil. Mag., 1877, pp. 1, 98, 366. On the transparency of coloured flames see Gouy, Compt. Rend., Ixxxvi. 878-880. See also Gas. (F. H. B.)

FLAMEL, Nicoxas, a reputed French alchemist, and a caligrapher to the university of Paris, was born about 1330. Becoming a money lender, he amassed immense wealth, with which he built a large number of churches and endowed various charities, He died at Paris 22d March 1418, and was buried in the church of Saint-J acques-la-Boucherie, to which he bequeathed the bulk of his property. His unusual prosperity acquired for him, either during his life or shortly after his death, the reputation of being an alche- mist, and gradually his history became incrusted with legend. It was said that he accidentally discovered the secret of alchemy in an old book by a Jewish astrologer which happened to come into his hands, and that after reaching a good old age in France, he and his wife mysts- riously disappeared, presumably to live in splendour in the East through the aid of the philosopher's stone. A book on alchemy exists in the imperial library of Paris with an inscription professing to have been written by Nicolas Flamel, but plainly a forgery. In 1561 also, a small treatise entitled Sommaire Philosophique de Nicolas Flamel was published among a collection of alchemist treatises entitled Transformation métallique. These and similar inventions were, however, exploded by Vilain's Zssat sur Histoire de Saint-Jacques-la-Boucherie, 1758, whichcontains an account of the life of Flamel, derived from the archives and other authentic documents of the parish. See also Description de la Villede Paris au quinziéme Siecle, par Guallebert de Metz, published for the first time from De Metz's manuscript by Leroux de Lincy, Paris, 1855.

FLAMEN, a Roman sacrificial priest. The flamens were under the direction of the pontifices, and were con- secrated to the service of some particular deity. The highest in rank were the Flamen Dialis, Flamen Martialis, and Flamen Quirinalis, who were always selected from among the patricians. When the number of flamens was raised from three to fifteen, those already mentioned were entitled majores, in contradistinction to the other twelve, who were called minores, and were chosen from the plebs. The flamens were held to be elected for life, but they might be compelled to resign office for neglect of duty, or on the occurrence of some ill-omened event during

the performance The official dress of the flamens was the apex or cap (surmounted with a piece of pointed olive-wood, round the base of which a lock of wool! was twisted), the lena or mantle, and a laurel wreath. The highest of all these priests was the Flamen Dialis, or flamen of Jupiter, who in virtue of his office was entitled to a lictor, to a seat in the senate, to a curule chair, and to the toga preteata, woven by his wife of thick wool. The sight of fetters being forbidden him, his toga was not allowed to be tied in a knot but was fastened by means of clasps, and the only kind of ring permitted to be worn on his finger was a broken one. Ifa person in fetters took refuge in his house he was immediately loosed from his bonds; and if a criminal on his way to the scene of his punishment met him and threw himself at his feet he was respited for that

*1 Filum, whence, according to Varro and Festus, the name flamen, | ** quasi filamen," was derived, :*

day. The flamen Dialis was not allowed to leave the city for a single night, to ride or even touch a horse (a restric- tion which incapacitated him for the consulship), to swear an oath, to look at an army, or to witness the business of daily life. His marriage was dissoluble only by death. His wife was called Flaminica, and was obliged to assist her husband at the sacrifices and other religious duties which he perfurmed. She wore long woollen robes, a purple veil, and shoes made of the leather of sacrificed animals, and like her husband she carried the sacrificial knife. Some of the municipal towns in Italy had flamens as well as Rome. When it became customary tv deify the emperors, flamens were appointed in all the provincial towns to superintend their worship.

FLAMINGO (Portuguese Flamingo, Spanish Flamenco), a Water-bird conspicuous for the bright scarlet or flame- coloured patch upon its wings, and long known by its classic name Phenicopterus as an inhabitant of most of the countries bordering the Mediterranean Sea, in some of which it is still far from uncommon.! Other species have since been discovered, and both its common and scientific names are now used in a general sense. The true position of the Flamingoes (Pheenicopteride) has been much debated,

and ornithologists are as yet by no means agreed upon it. Professor Huxley (Proc. Zool. Soc., 1867, p. 460) considers the form "so completely intermediate between the Anserine birds on the one side, and the Storks and Herons on the other, that it can be ranged with neither."2 And he puts

1J : : n Greece and Asia Minor, however, it is rare, and to this cause

is most likely to be attributed Ari Je gi nae es

it was known to Aristophanes, ristotle's silence concerning it, though

ed 12 ones the opinion of Linnaeus a century old (Syst. Nat., – 12,1 p.)i—' Medium inter Anseres et Grallas, si quis ad

precedentem ordinem refe : it among the latter. rat, forte non errat." He himself places

it by itself as the type of a group Amphimorphe under the larger assemblage of Desmognathe. To the present writer its affinity to the Anatide seems on many accounts to be the strongest, but that it should stand as a distinct family is manifest.

Though not a few birds have in proportion to the size of their body very long legs aud a very long neck, yet the way in which both are employed by the Flamingo seems to be absolutely singular. In taking its food this bird reverses the ordinary position of its head so as to hold the crown downwards and to look backwards. The peculiar formation of the bill, which to the ordinary observer, looks

as if broken, is of course correlated with this habit of —

feeding, as well as the fact that the maxilla is (contrary to what obtains in most birds) not only highly movable, but is much smaller than the mandibula—while the latter is practically fixed. Both jaws are, however, beset with lamelle, asin must of the Duck-tribe, and the food is thereby

sifted out of the mud as the Flamingo wades with its long neck stretching to the bottom of the shallow waters it frequents. Still more extraordinary is one of the uses made of its long legs. The hen stands upon them? while performing that duty which in other birds is rightly called "sitting." This fact was noticed so long ago as 1683 by Dampier, and his statement has been confirmed by the evidence collected by many other travellers. It does not appear, however, that the act has been personally witnessed by any author subsequent to him, and therefore his quaint and obviously truthful account of the way in which Flamingoes build their nests and hatch their young, as observed by himin the Cape Verd Islands, may here be quoted :—'" They build their Nests in shallow Ponds, where there is much Mud, which they scrape together, making little Hillocks, like small Islands, appearing out of the Water a foot and half high from the bottom. They make the foundation of these Hillocks broad, bringing them up tapering to the top, where they leave a small hollow pit to lay their Eggs in; and when they either lay their Eggs, or hatch them, they stand all the while, not on the Hillock, but close by it with their Legs on the ground and in the water, resting themselves against the Hillock, and covering the hollow Nest upon it with their Rumps: For their Legs are very long; and building thus, as they do, upon the ground, they could neither draw their Legs conveniently into their Nests, nor sit down upon them otherwise than by resting their whole bodies there, to the prejudice of their eggs or their young, were it not for this admirable contrivance, which they have by natural instinct. They never lay more than two Eggs, and seldom fewer. The young ones cannot fly till they are almost full grown, but will run prodigiously fast; yet we have taken many of them,"—Dampier, Vew Voyage round the World, ed. 2, corrected, vol. i. p. 71, London, 1697.

It is of course only under very favourable circumstances that such nests as these can be built. When time or place is wanting the hens seem to drop their eggs at random, as Mr J. W. Clark was told they usually do at this day m the South of France (bis, 1870, p. 441), where a nest bas not been seen for some years. Flamingoes are eminently gregarious. Their favourite resorts are salt-lakes—ID- deed these may be said to be a prime necessity ; and when, as often happens, they are diminished by drought, the birds have to take long flights in quest of new haunts, Thus some of the wanderers occasionally ge separated from the main body, and appear in various

unwonted spots. On the wing the Flamingo is described as presenting a singular appearance, its neck and legs being re

3 By a mistake, it was before stated (Brrps, vol. iii. p. 772) that the hen Flamingo 'sits astride with dangling legs."

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stretched out in @ continuous straight line. When feeding or at rest, a flock of these birds, owing to their red plum- age, has often been likened to a body of British soldiers. The young appear to be a long time in arriving at the full beauty of their plumage, and as the sexes are said to differ greatly in size, some of the difficulties which the determina- tion of species in this genus presents may be excused. No fewer than four species of Pheenicopterus have been described as inhabiting the Old World. There is the large bird known to the ancients, Temminck's P. antiquorum, which cer. tainly ranges from the Cape Verd Islands to the Caspian and to India, if not further. The P. erythreus of Jules Verreaux has been described as differing in its brighter plumage, and is supposed to be a native of Southern and Western Africa, butit is also said to have strayed to Europe. Then two smaller species (P. minor, Geoffroy, and P. rubidus, Feilden)—-the one from Africa the other from India, have also been described, but whether their existence can bs substantiated remains to be seen. Four species have likewise been indicated as belonging to the New World. There is first a large and very brilliantly-coloured bird to which the Linnzan name P. ruber! has been con- tinued, inhabiting suitable localities from Florida south- wards to an undetermined latitude. To this species Mr Salvin (Trans. Zool. Soc., ix. p. 498) refers the P. glyphorhynchus of G. R. Gray, founded on a specimen from the Galapagos. Then there is the P. chilensis of Gmelin (P. ignipalliatus of later writers) which in colour: ing more resembles the European species, and is found in various parts of South America. Lastly comes the P. andinus of Philippi, which is easily distinguished from all others through the want of a back-toe, and was regarded by Bonaparte as meriting generic separation under the name of Phenicoparrus. 'This

appears to have its home on the salt-lakes of the elevated desert of Atacama.

The fossil remains of a Flamingo have been recognized from Lower and Middle Tertiary beds in France, and the species, which appears to have been very close to that com- monly called P. antiquorum, has received the name of P, erovzett from Professor Gervais. But a more interesting discovery is that by Professor A. Milne-Edwards of no fewer than five species of an extinct form of Pheenrcopteride, named by him Palelodus (Ois. Foss. de la France, ii. p, 53). These are from licustrine deposits of the Miocene epoch. The same distinguished zoologist also refers to this family remains designated by him Agnopterus, and those of the " Elornis" (properly ZZelornis) of M. Aymard. (A, N.)

FLAMININUS, Trrus Quincrivs, a Roman general and statesman, well known as the liberator of Greece, was born about 228, and died about 174 8.c. The patrician family of the Quinctii had already made their mark in Roman history, but of Titus's immediate ancestors nothing is known except that, according to the Fasti Capitolini, his ather bore the same name. He began his public life as a military tribune under Marcellus. On the death of his —o he was appointed propreetor of Tarentum and

e neighbouring district, His administrative abilities Wete recognized even in this subordinate post, and in 202 eH he was appointed one of a commission of three to sup- ae the colony of Venusium, whose numbers had been Fe by the war with Hannibal. In 199 B.c. he was a pa and the next year, skipping the regular ae a, edile and pretor, he obtained the consulship,

Wit. standing the Opposition of the tribunes on account

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ly; i" RB Been Teferred all the accounts of Flamingoes known to him to of the 0 ena P. ruber. Here he was decidedly wrong, since those d World and of the New are entirely distinct ; but the rea-

Son for assigning this trivi explained by ene name to one of the latter has yet to be

of his youth. The scanty records of his early years furnish nothing which will adequately account for this marvellously rapid promotion, but it is explained and justified by his subsequent career. Flamininus was one of the first and most successful of the rising school of Roman statesmen, the opponents of the narrow and almost provincial patriot- ism of which Cato was the type, the disciples of Greek culture, and the advocates of a wide imperial policy. His winning manners, his polished address, his knowledge of men, and the personal fascination which was mainly owing to these qualities, and lastly his knowledge of Greek, which, according to Plutarch, he spoke like his native lan- guage, all marked him out as the fittest representative of Rome in the East, and it was an auspicious lot for Rome which assigned to the consul the province of Macedonia, and the conduct of the war with Philip. No sooner was he appointed than he set to work to collect new levies, selecting the picked veterans who had served in the Spanish and African campaigns. His predecessors in the province, Sulpicius and Publius, had been dilatory and incompetent, not quitting Rome till their year of office had nearly expired. Flamininus sailed in the early spring, and, leaving his troops at Corcyra to follow him, crossed in a single galley to the mainland and hurried to the Roman camp in Epirus, dismissed his predecessor Publius Villius, and in a council of war determined to storm the pass of Antigonea, a narrow gorge a little below Clissoura, which was occupied by the enemy. Repulsed in the direct attack, he consented to parley with Philip, and the two commanders met on the banks of the Aous and conversed across the narrow streain. Flamininus at once revealed his intended policy, and in stern and uncompromising terms demanded the liberation of Greece and- Thessaly. Philip indignantly broke up the conference, exclaiming that harder terms could not have been proposed to him had he been conquered. This bold attitude of defiance and assertion of the claims of oppressed nationalities was in a great measure the secret of Flamin- inus's success. The news soon spread that a Roman had come, not to transfer the yoke of slavery, but to vindicate the liberties of Greece. Charops, an Epirot chieftain, re- vealed to Flamininus a by-path across the mountains by which the pass could be turned; a signal fire showed that the expedition had succeeded; and a simultaneous attack in front and rear completely routed the Macedonians, who were only saved from total

destruction by the nature of the ground, which rendered pursuit impossible. Flamininus found himself master of Epirus, and he cemented a lasting friendship with the Epirots by his mildness and moderation, which contrasted with the extortions and ravages of Philip. From Epirus he passed into Thessaly, and took Phaloria, though he was obliged to raise the siege of Atrax on the Peneus. Thence he marched into Locris, where Anticyra served him as a basis for further operations, and enabled him to communicate with the fleet, which was commanded by his brother Lucius. Many towns in Phocis opened their gates to him, and Elatea the capital was taken after a long resistance. His principal efforts were now directed to win over the Achzan league, and in this he was so far success- ful that a conference of the Greeks was held near Nica on the Meliac gulf, under his presidency, to treat with Philip. A truce of two months was agreed to, on condition of the evacuation of all the towns of Phocis and Locris, to enable both parties to send deputies to Rome. The Greek deputies were instructed to demand the expulsion of Macedonian garrisons from Demetrias, Chalcis, and Corinth, as the only guarantee for the freedom of Greece. When the senate demanded of Philip's ambassadors whether he was ready to grant these terms, they replied that they had no instruc- tions, and were sent back and told to treat directly with

| Flamininus, whose command, which was just expiring, they

extended for a second year. Flamininus, having thus secured his own object, showed no disposition to temporize with Philip, and the negotiations were abruptly broken off. The perfidy of Nabis, the tyrant of Sparta, secured him a valuable ally and the help of Argos, which Philip had delivered over to Nabis to garrison. Thebes, and with it Beeotia, was gained over partly by persuasion and partly by stratagem, and in the ensuing spring, 197 B.c., Flamin- inus took the field with nearly all Greece at his back. After a cavalry skirmish near Phere, the main armies met at Cynoscephale, a low range of hills so called from a fanciful resemblance to dogs' heads. It was the first time that the Macedonian phalanx and the Roman legion had met in open fight, and the day decided which nation was to be niaster af Greece and perhaps of the world. It was a victory of in- telligence over brute force,

and, where numbers and courage were equally matched, the superior strategy and presence of mind of the Roman general turned the scale. The left wing of the Roman army was retiring in hopeless confusion before the deep and serried ranks of the Macedonian right led by Philip in person, when Flamininus, leaving them to their fate, boldly charged the left wing under Nicanor, which was forming on the heights. The phalanx was like a steam hammer, irresistible if it hit its object, but moving only in one direction, and easily thrown out of gear. Before the left wing had time to form, Flamininus was upon them, and a massacre rather than a fight ensued. This defeat was turned into a general rout by a nameless tribune who collected twenty companies and charged in rear the victorious Macedonian phalanx, which in its pursuit had left the Roman right far behind. 8000 Macedonians were killed and 5000 taken prisoners, while the Romans lost only 700, Macedonia was now at the mercy of Rome, and Flamininus might have dictated what terms he liked, but he showed his usual moderation and farsightedness in disregarding the root-and-branch politics of his Aitolian _allies, whose heads were turned by the part they had taken in the victory, and contenting himself with his previous demands. Philip lost all his foreign possessions, but retained his Macedonian kingdom almost entire. Such a valuable bulwark against the outer world of Thracians and Celts was not lightly to be removed. Ten commis- sioners arrived from Rome to regulate the final terms of peace, and at the Isthmian games which were celebrated at Corinth in the spring of 196 B.c. a herald proclaimed to the assembled crowds that "the Roman people, and T. Quinctins their general, having conquered King Philip and the Macedonians, declare all the Greek states which had been subject to the king henceforward free and inde- pendent." A shout of joy arose so loud that it was heard by the sailors in the harbour, and in Plutarch's time the legend told how birds flying over the course had dropped down stunned by the noise. The games were forgotten, and all crowded round the proconsul eager to kiss the hands of the liberator of Greece, who was almost smothered with chaplets and garlands. This day was indeed the climax of Flamininus's career, of which even the stately triumph that two years later he obtained at Rome

must have seemed but a pale reflection. _ Of the rest of his public life, which was mainly occupied in consolidating the fruits of the victory of

Cynoscephala, we can only give the barest outline; but we will first attempt to estimate his work, and discuss how far he merited the proud title of benefactor of Greece, which Greeks and Romans alike bestowed on him. That he was animated by an ardent love of the Greek name and race, as genuine as that of Byron, of Canning, or of Kanaris Sanit of no en doubt. To attribute to Fibaniions a Macchiavel- oe ee oe have foreseen Corinth overthrown ed into a Roman province, is not only

disingenuous but absurd. There is more force in the charge which Mommsen brings against him, that his Hellenic sympathies prevented him from seeing the innate weakness and mutual jealousies of the Greek states of that period, whose only hope of peace and safety lay in sub- mitting to the protectorate of the Roman republic. But if the event proved that the liberation of Greece wasa political mistake, it was a noble and generous mistake, and reflects nothing but honour on the name of Flamininus,

The only military enterprise that remained after the conquest of Philip was to crush Nabis, who still held Argos, as well as his own tyranny of Sparta. In allowing the conquered tyrant to retain his nitive possessions, Flamininus was probably influenced by consideration for the Spartans, who would never, except under compulsion, have submitted to the Achzean league,

His last act before returning home is characteristic of the man. Of the Achzans, who vied with one another in showering upon him honours and rewards, he asked but one personal favour, the redemption of the Italian captives who had been sold as slaves in Greece during the Hannibalic war. These to the number of 1200 were presented to him on the eve of his departure, and formed tlie chief ornament of his triumph.

In 192 B.c., on the rupture between the Romans and Antiochus, Flamininus returned to Greece, this time as the civil representative of Rome, His personal influence and skilful diplomacy secured the wavering Achan states, cemented the alliance with Philip, and contributed mainly to the Roman victory of Thermopylae. Chalcis and Naupactus, which had joined the enemy, owed their preser- vation to his interposition with the consul

Glabrio. In 189 B.c. he was made censor, In this office his fair fame was sullied by an unseemly quarrel with Cato. Brotherly affection tempted him to shield from just punishment a dissolute and brutal ruffian. In 183 3.c, he undertook an embassy to Prusias, to induce the king of Bithynia to de- liver up Hannibal, Hannibal forestalled his fate by taking poison, and his dying words justly stigmatized this pitiful victory over a defenceless and destitute old man. The only excuse for his conduct is that it was prompted not by wanton cruelty or love of revenge,——motives which were wholly alien to his character,—but by restless ambition and an inordinate love of glory, the infirmities of a truly noble nature. The history of his later years is a blank, and we only learn from his biographer Plutarch that his end was peaceful and happy. (F. 8.)

FLAMINIUS, Carus, an eminent member of the plebeian gens Flaminia, who in the course of fifteen years of public life (232-217 3.c.) held successively the offices of tribune, praetor, and censor, and was twice advanced to the consular dignity. During his tribuneship (232 B.c.) he was success ful jn carrying a measure for distributing vritvm among the plebeians, in terms of the Licinian law, the ager Gallicus Picenus, an extensive tract of newly-acquired territory lying along the east coast of the peninsula to the south of Ariminum, This law was carried in face of the determine opposition of the entire senatorial party, who, according to Valerius Maximus (lib. v., c. 4, sec. 5), at one stage threatened to declare him a public enemy and raise an army against lim should he persevere in his agitation. In 227 B.C. he was appointed preetor, Sicily being assigned to him as his province; and there he so conducted himself as to win the lasting gratitude of the people whom he govern® This they took occasion to show thirty years afterwards when his son was curule edile. In 223 Bc, he was made consul, and, along with his colleague P. Furius Philus, hastened at once to the north to prosecute the Gallic wat, which had been occasioned, it is said, by the operation 0 his own agrarian law, and which had beeu going 0? wil

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indecisive results since 225. Rashly crossing the Po near the site of Piacenza, he sustained a clieck which compelled him to capitulate. The

facile Insubres having granted him a free retreat, he speedily, in conjunction with the Cenomani, renewed the attack at another point, perhaps on the river Oglio. On this occasion he was successful ; but it seems very doubtful whether the victory was not gained in spite of rather than by means of the generalship of the cousul. At all events his conquest of the Insubres failed to make any impression on the aristocratic party who had opposed his election and afterwards sought to obtain his recall; and the honours of a triumph were awarded to him only when the negative decision of the senate had been overborne by the popular voice. According to Plutarch (Marcellus, 4) he was nevertheless compelled to resign his oftice before the natural term had expired. In 221 he was chosen magister equitum under the dictatorship of M. Minucius Rufus, but was not permitted to take office owing to a bad omeu—the squeaking of a shrew-mouse—which had occurred immedi- ately after the election. In the following year (220 B.c.) he was censor; and this period of office was marked by the execution of two great public works which are permanently associated with his name—a circus anda road. The Circus Flaminius, erected in a locality which had previously been known as the Prata Flaminia, was designed for the accom- modation of the plebeians, especially for their public meet- ings, —they having no right at that period to sit in the Circus Maximus, The Via Flaminia was the first to be carried across the Apennines, thus connecting the Adriatic and Tuscan seas. It was a continuation of the old military road which had been carried as far as to Spoletium (Spoleto) in 240 Bc. From Spoletium it went to Fulginium (Foligno) and Forum Flaminii (San Giovanni in Fori- fiamma); thence it mounted the Apennine slope to tlie station Ad Ensem (La Schieggia), crossing the central ridge at what is now known as the pass of Furlo, and descending by the valley of the Metaurus to Fanum For- tune (Fano), whence it kept the coast as far as to Arimi- num, In 218 B.c., as a leader of the democratic opposi- tion, Flaminius was one of the chief promoters of the measure brought in by the tribune Claudius, which pro- hibited Senators and senators' sons from possessing sea- going vessels, except such as might be necessary for the transport of the produce of their own estates, and generally shut them out from everything which the Romans included under the category of commercial speculation (questus), such as undertaking public contracts (redemptiones), and the like. The effective support which he had given to this ieasure vastly increased the popularity of Flaminius with 'S Own order, and secured his second election

as consul in the following year (217 B.C.), shortly after the defeat of Sempronius at the Trebia, Without staying to go through the usual solemnities of installation at the Capitol, or to celebrate the feria Latin, Flaminius at once hastened to Ariminum and thence to Arretium, there to be ready for an aggressive campaign against Hannibal as soon as the ‘ Meanwhile Hannibal, uneasy in his be quarters, had accomplished with comparative ease Passage of the Apennines, and forced his way south-

cemeah fearing lest the enemy should find Rome unpro- ected, Impetuously set out in pursuit. Free to select his own ee Hannibal chose to make his stand between Bor- are and Passignano, in the narrow defile formed by the ls of Cortona, Which is closed at its entrance by the will ike; With the main body of his infantry he ie € turther outlet at the hill of Torre, while the vi and the cavalry were posted on the sides of the ioe 3 t was early morning (on the 23d of June, accord- 8 to the uncorrected calendar, but in reality on some

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day in April)! when Flaminius reached the Spot, and a thick haze covering hill and lake altogether concealed the position and even the existence of the enemy, until the Roman army found itself completely and hopelessly sur- rounded in the fatal defile. In the three hours’ carnage that followed 15,000 Romans perished, and Flaminius was among the slain.

From the materials which Livy and Polybius—no friendly critics—furnish, it is manifest that Flaminius was a man of ability, energy, and probity, who with the bravery of a true soldier combined many of the best qualities of a popular democratic leader. While eminent, lowever, as the head of a political party, and successful in carrying some pieces of useful legislation, he has little or no claim to rank among the greater statesmen of the republic. As a general, moreover, he was headstrong and self-sufficient, and he seems to have owed such victories as he achieved to personal boldness favoured by good fortune rather than to any superiority of strategical skill (see Livy, xxi, xxii; Polybius, ii., iii),

FLAMINIUS, Caius, son of the preceding, was questor uuder P. Scipio Africanus the elder in Spain in the year 210 B.c., aud took part in the

capture of New Carthage. Fourteen years later he was curule adile ; and this term of office was marked by the distribution among the citizens at very low prices of large quantities of grain, which ina time of Roman scarcity the Sicilians had sent in grateful remem- brance of his father's preetorship thirty years before. In 193 B.c. he himself attained a preetorship, and was sent to the recently constituted province of Hispania Citerior. There he carried on the war against the insubordinate

| populations, and after a siege took Litabrum, a city which

is described by Livy as having been strong and opulent, and made prisoner Corribilo, a powerful chieftain. In 187 B.C. he became consul along with M. Atmilius Lepidus, and was successful in giving peace to Northern Italy by the subjugation of the warlike Ligurian tribes. In the same year the branch of the Via /milia (traces of which are still discernible) connecting Bononia (Bologna) with Arretium (Arezzo) was constructed by him.
FLAMSTEED, Joun (1646-1719), the first astronomer- royal of England, was born at Denby near Derby, August 14,1646. He was educated at the free school of that town, where his father carried on business as a maltster. He began the study of mathematics and astronomy while still very young, and showed considerable ingenuity in the con- struction of mathematical instruments. At the age of fourteen he caught cold while bathing, and he suffered during the rest of his life from a rheumatic affection of the joints. In 1665 he went to Ireland to consult Greatrakes, a notorious quack of the period, who claimed to be able to cure such diseases by manipulation; but he returned to Derby uncured. He continued his astronomical studies here till 1669. About the year 1667 he wrote an able paper on the equation of time, afterwards appended by Wallis to his edition of Horrocks's works. In 1669 he communicated a paper to the Royal Society under the assumed name J, Mathesin a sole fundes, an anagram on his own name Johannes Flamsteedius ; but Oldenburg, the secretary, addressed a reply to him, showing that he was discovered, and from that time Flamsteed corresponded with many men of science. Sir Jonas Moore, whose acquaintance he made in 1670 when visiting London, furnished him with several instruments, amongst others with Townly's micro- meter. In 1673 Flamsteed composed his treatise on Zhe true and apparent Places of the Planets when at their greatest and least Distances from the Earth, a work

referred to by i ae is Mommsen, History of Rome, vol. ii. p. 122 (note), London, IX. — 37

Newton in the first edition of his Principia. In the same year he obtained his M.A. degree at Cambridge. He does not appear to have ever studied at Cambridge, though his name was entered at Jesus College in 1670, and he resided there for some months in 1674. In this year he published his Ephemeris, and drew up a table of the tides. Sir J. Moore at this time proposed to establish Flamsteed in a private observatory at Chelsea ; but Charles II., whose attention had been directed to the necessity of improved astronomical tables by a proposal for finding the longitude at sea, determined to establish an observatory, and Flamsteed was appointed " astronomical observator." His observations were made at the queen's house in Greenwich Park, till July 1676, when the observatory was ready. Of his work as astronomer-royal an account will be found under Astronomy (vol. ii, p. 756). Baily dates the com- mencement of modern astronomy from the year 1676, when Flamsteed began his observations.

Flamsteed was ill-paid and overworked in his new office. A salary of £100 a year was paid him, and he was left to provide his own instruments, Until 1684 he had to teach tivo boys from Christ's Hospital, as one of the duties of his post ; and he taught other boys, to defray the expenses he incurred for instruments. In 1684 his father died, and he was presented by Lord Keeper North to a small living. His means being thus somewhat improved, he resolved to incur the expense of a mural arc, on the assurance of

tovernment that he would be reimbursed,—a promise which, however, was never fulfilled.

Attention has been drawn since the year 1832 to cer-

tain private affairs of Flamsteed's. In that year Francis Baily discovered a large collection of Flanisteed's letters in private hands, and other letters afterwards at Greenwich. The Admiralty unfortunately decided to print these at the public expense. For some time it was supposed that the fair fame of Newton and Halley had been darkened by the publication of these

documents. But Sir David Brewster discovered among Newton's papers a series of letters and papers completely exculpating Newton and Halley froin charges affecting their honour, and placing Flamsteed's character in an unfavourable aspect. It must be remem- bered, however, that the case made out by Brewster against Flamsteed, and the case made out by Baily against Newton and Halley, both rest on ex parte statements. The conclusion to which a careful investigation of both sides of the story appears to point is that both Newtou and Flamsteed showed exceeding ill-temper, and that the charges affecting the honour of either (and of Halley as _ Newton's friend) had their origin entirely in the ill-feeling thus excited. It is unfortunate that the matter should ever have been opened. Let it be remembered only that, while ou the one hand Flamsteed furnished Newton with every lunar observation made before 1685, when the first edition of the Princiyia appeared, Newton on the other hand based on these observations the noblest theory the world of science has known. _ From 1715 to 1719, the year of his death, Flamsteed superintended the publication of the Historia Ccelestis, but the publication was not completed till 1723. His valuable Atlas Celestis was not published till 1753. The well- known British catalogue of 2884 stars appears in the third volume of the Historia Celestis. Though of feeble con- stitution, Flamsteed attained the age of seventy-three, his death occurring on the last day of the year 1719. He was succeeded in the office of astronomer-royal by Halley.

FLANDERS (German Flandern, Dutch Vlaendern), an ancient countship of the Low Countries, which has left its ee to two provinces of the modern kingdom of Belgium, ee ee It took its rise about

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line of counts is far from certain, the older chronicles giving very different statements. Leaving out of view those mythical personages through whom as a matter of course a connexion is established with Priam of Troy, we find the founder of the family of the Foresters, as they are called, in a certain Lideric le Buc, " only son of Saluart prince of Dijon, and of Madame

Eringarde daughter of Gerard lord of Roussillon," who, says Lambert, canon of St Omer ' videns Flandriam vacuam et incultam ac memorosam, occupavit eam." Even Lideric is of doubtful authenticity, though his death in 836 is mentioned in the Annales Blandinienses, which were compiled before 1064 from earlier documents. His son Ingelramn, say the chronicles, had a son Audacer ; but according to several modern investigators Audacer was merely a cognomen of Baldwin, the next person in the genealogical series. With Baldwin, whois distinguished as Bras de Fer or Iron Arm, we at length reach the terra firma of history. He was a strong, daring, and unscrupulous man, and made noise enough in his own day, more particularly by carrying off and marrying Judith daughter of Charles the Bald of France, a lady of easy principles, who had already been the wife of Atthelwulf of the West Saxons of England, and for a time of Aithel- wulf's son Aithelbald. Baldwin II., the Bald, born of this marriage, is mainly remembered as a vigorous opponent of the Normans, and as the builder of the walls of Bruges and Ypres. It is said that he also laid the foundation of the political liberties of his country by appointing twelve of his principal vassals as a council of state. He took to wife AElfthryth, daughter of King Alfred of England. On his death in 918, his possessions were divided between his two sons Arnulf the Elder and Adolphus; but the latter survived only a short time, and Arnulf sueceeded to the whole inheritance. His reign was full of troubles with the Normans on the one hand, and with the emperor Otho I. on the other; and he made one of his conferences memorable by murdering William Longsword the Norman duke. In his old age he placed the government in the liands of Baldwin, his son by Adela daughter of the count of Vermandois, and the young man, though his reign was a very short one, did a great deal for the commercial and industrial progress of the country, establishing the first weavers and fullers of Ghent, and instituting yearly fairs at Ypres, Bruges, Veurne, Cassel, Courtrai, Thorout, and Rousselare. On Baldwin's death in 961 the old count resumed the control, and spent the few remaining years of his life in securing the succession of his grandson Araulf or Arnold the younger. The reign of Arnulf was ter- minated by his death in 989, and he was followed by his son Baldwin IV., styled Pulchra Barba, Comely Beard, or simply Barbatus, Met den Baerd, With the beard. This Baldwin fought successfully both against the king of France and the emperor Henry IL, and obtained from the latter Valenciennes, Walcheren, and the islands of Zealand. The counts of

Flanders thus became feudatories of the empire as well as of France. Baldwin's son Baldwin V., surnamed of Lille (in Latin Insularius, in Duteb Van Ryssel) rebelled in 1028 against his father, at the instiga- tion of his wife Adela, daughter of Robert of France; but

two years later peace was sworn at Oudenarde, and the o d

man continued to reign till his death in 1036. V. proved a worthy successor, and acquired from the people the title of Debonnaire. He was an active, ambitious, en terprising man, and greatly extended his power by wats and alliances, Before his death he saw his eldest daughter Matilda sharing the English throne with William the Conqueror, his son Baldwin of Mons (in Dutch Bergen) "1 possession of Hainault in right of his wife Richilde the widow of the late count, and his son Robert the Ld ruling over the countship of Holland and Friesland in Tg

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of the countess Gertrude. His younger daughter Judith had married Tostig, brother of Harold IV. of England.

On his death in 1067, Baldwin of Mons succeeded to the

countship of Flanders, apparently without opposition on the part of Robert his elder brother ; but a few years afterwards a quarrel broke out, and Baldwin was slain. Robert now claimed the tutelage of Baldwin's children, and obtained the support of the emperor Henry IV.;

while Richilde, Baldwin's widow, appealed to Philip of

France. The contest was decided at Ravenchoven, uear Cassel, February 22, 1071, where Robert was victor, and Arnulf III., Baldwin's son, was slain. Arras, Douai, Tournai, and other towns of French Flanders had taken part with the countess and the French, while Ghent, Bruges,

Ypres, Courtrai, and other towns of Flanders proper were The successful competitor held the

on the side of Robert. countship till his death in 1093, when he was succeeded

by his son Robert I., who became famous for his exploits

in the first crusade, and acquired the title of Lance ant Sword of Christendom. Baldwin VII., surnamed A la Hache, or With the Axe, became count on Robert's death in 1119, and in his turn transmitted the dignity to his cousin Charles of Denmark, son of Canute and Adelais, daughter of Robert the Frisian. This Charles of Denmark was a religious enthusiast, and exercised his authority against all swearers, necromancers, Jews, and usurers, At Bruges in 1127 he ordered all the granaries to be thrown open; and the merchants who had expected to make gain by the dearth were so enraged that they formed a con- spiracy and procured his assassination in the church of St Donat. No fewer than six pretenders to the countship how appeared, and among the rest William Clito, son of Robert Courthose of Normandy, and Thierri or Theodoric of Alsace. The latter was the successful competitor, and he

married the widow of Count Charles, Marguerite of Cler-.

mont, He distinguished himself at home by the wise en- couragement which he gave to the growth of popular liberty, and abroad by the part which he took in several crusading expeditions. In the latter years of his life he retired to Gravelines, leaving the cares of state to his son Philip, who when he came to rule in his own name followed in his father's footsteps, and acquired the honourable reputation of "the greatest lawgiver of Flanders." He married Elizabeth of Vermandois, and on her death had a violent dispute with the French monarch about the possession of Vermandois, which was ultimately granted him during his life, As he had no children his inheritance went to Baldwin of Hainault, who had married his sister

Marguerite,—a change of the dynasty which considerably |

affected the relations of Flanders with France. The French king laid claim to the countship, and Raldwin was con- strained to cede Artois, St Omers, Lens, Hesdin, and a great part of southern Flanders to France, and to allow Matilda of Portugal, the widow of Philip, to hold Lille, Cassel, Veurne, Rille, and Sluys. Marguerite died in 1164 and Baldwin in 1195, and the countship devolved on their son Baldwin IX., who became the founder of the Latin empire at Constantinople, and perished in Bulgaria in 1206. The emperor's two daughters were both under mae and accordingly the government of Flanders and Pe ly Was entrusted to his brother Philip, assisted by — of Avesnes and William of Hainault, Johanna a @ elder daughter was married to Ferdinand or Ferrand of ortugal, but left no heir ; and sv the inheritance of both a and Hainault passed on her death in 1279 to the Mga ~ of the younger, Margaret—the latter to Johu her Me has by her first marriage with Bosschaert of Avesnes, marten vet to Guy of Dampierre, a son of her second marriage with William of Dampierre, a French nobleman. € government of Guy proved an unfortunate one:

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Flanders was involved in a severe struggle with France, and for a time almost lost its independence. The old count died at Compiégne in prison about two months after peace was concluded in 1305; and Robert of Bethune, his son, was acknowledged his successor both by the Flemings and by the French. Robert was an able and valiant prince, and has the honour of having established at Bruges the first insurance company. The reign of his grandson and suc- cessor Louis of Nevers and Rethel, who had been brought up at the French court and married to Margaret the French king's daughter, was rendered for ever memorable by the enterprise of Jacob van Artevelde, the great hero of Flemish liberty. Louis perished in the battle of Crecy, and Jeft his county to his son Louis IT. of Male, near Bruges, under whom the struggle of the Flemish towns for their liberties was maintained. By the marriage of Louis's daughter Margaret with Philip of Burgundy, the lordship of Flanders passed to the Burgundian family; and thus it ultimately became part of the possessions of the house of Austria. The title of count of Flanders has been borne since 1840 by the second son of Leopold I. of Belgium, Philip Eugene Ferdinand.

*See "Genealogia comitum Flandrie cdente D. L. C. Bethe mann," in Monumenta Germanie Historica Scriptorwm, vol. ix.; *'Genealogie der Grafen von Flandern, Sachsische Weltchronik, Anhang vi." in Mon. Germ. IHist., Seriptorum qui vernacula lingwe ust sunt Tomus H.; Vredius, Historia Comitum Flandric, 1650 – 1652; Van Praet, Histoire de la Flandre, 2 vols., 1828; Le Glay, Histoire des Comts de Flandre, 2 vols., 1843-4; Warnkonig, Flan- drische Staats- wad Rechtsgeschichte bis 1306, 3 vols., 1835-1839; Hendrik Conscience, Geschiedenis vun Belgie, 1845; F. G. Stephens, Flemish Relics, 1866; Kervyn van Lettenhove, Histoire de Flandre, 4 vols., 1874; Frédéricq, Réle politique ct social du duc de Bourgogne dans les Pays-Bas, 1875.*

FLANDRIN, Juan Hirrotyte (1809-1864), French painter, was born at Lyons in 1809. His futher, though brought up to business, had great fondness for art, and sought himself to follow an artist's career. Lack of early training, however, disabled him fur success, and he was obliged to take up the precarious occupation of a miniature painter. Hippolyte was the second of three sous, all painters, and two of them eminent, for the third son Paul is one of the leaders of the modern landscape school of France. Auguste, the eldest, passed the greater part of his life as professor at Lyons, where he died in 1840, After studying for some time at Lyons, Hippolyte and Paul, who had long determined on the step and economized for it, set out to walk to Paris in 1829, to place themselves under the tuition of Hersent. They chose finally to enter the atelier of Ingres, who became not only their instructor but their friend for life. At first considerably hampered by poverty, Flandrin's difficulties were for ever removed by his taking, in 1832, the Grand Prix de Rome, awarded for his picture of the Recognition of Theseus by his Father. This allowed him to study five years at Rome, whence he sent home several pictures which considerably raised his fame. St Clair Healing the Blind was done for the eathe- dral of Nantes, and years after, at the exhibition of 1855, brought him a medal of the first class. Jesus and the little Children was given by the Government to the town of Lizieux. Dante and Virgil visiting the Envious Men struck with Blindness, and Euripedes writing his Tragedies, belong to the museum at Lyons. Returning to Paris through Lyons in 1838 he soon received commission to ornament the chapel of St John in the church of St Séverin at Paris, and reputation increased and employment continued abundant for the rest of his life.

Besides the pictures mentioned above, and others of a similar kind, he painted a great number of portraits. The works, how- ever, upon which his fame most surely rests are his monu- mental decorative paintings. Of these the principal are those executed in the following churches :—in the sanctuary of

St Germain des Prés at Paris (1842-44), in the choir of the same church (1846-48), in the church of St Paul at Nismes (1848-49), of St Vincent de Paul at Paris (1850-54), +n the church of Ainay at Lyons (1855), in the nave of St Germain des Prés (185 5-61). In 1856 Flandrin was elected to the Académie des Beaux-Arts. In 1863 his failing health, rendered worse by incessant toil and exposure to the damp and draughts of churches, induced him again to visit Italy. He died of small-pox at Rome on the 21st March 1864. As might naturally be expected in one who looked upon painting as but the vehicle for the expression of spiritual sentiment, Flandrin had perhaps too little pride in the technical qualities of his art. There is shown in his works much of that austerity and coldness, expressed in form and colour, which springs from a faith which feels itself in opposition to the tendencies of surrounding life. He has been compared to Fra Angelico (see FrEsoLE); but the faces of his long processions of saints and martyrs seem to express rather the austerity of souls convicted of sin than the joy and purity of never-corrupted life which shines from the work of the early master.

See Delahorde, Lettres et Pensées de H. Flandrin, Paris, 1864.

FLANNEL (French jlanelie, German Flanel), an open woollen stuff of various degrees of fineness, from patent flannel, which does not shrink in washing, to baize, which is a coarse woollen stuff, or flannel with a long nap, first introduced into England, together with serge, by the Flemings. Domett is another variety of flannel, the warp of which is made of cotton, and the woof of wool. It is very thin, and is used for linings and for shrouds for coffins. The manufacture of flannel is almost the same as that of other woollen goods, though there are certain wools which are more used for flannel than for any other textiles. For instance, a short staple wool of fine quality from a South- down variety of the Sussex breed is principally in

favour with the flannel-makers at Rochdale, as also the wool from the Norfolk breed, a cross between the Southdown and Norfolk sheep. In Wales the short staple wool of the mountain sheep is used, and in Ireland that of the Wicklow variety of the Cottagh breed. Nearly 2000 persons are employed in this section of woollen manufactures, the chief seat of the industry being Rochdale in Lancashire, while blankets, a special branch of the flannel trade, are ex- tensively woven at Dewsbury in Yorkshire. The wool for these is chiefly obtained from the coarse staples of the Mysore breed in India. Nearly the whole population at Llanidloes and Newton, in Montgomeryshire, finds occupa- tion in flannel weaving, the Welsh flannels having attained a very high reputation. It is also manufactured at Rath-drum, Wicklow, Ireland.

A very considerable trade is carried on by England in flannel, as is shown by the exports for the year 1877, viz:—

Yards. Value.

Germany 121, 490 £9,167 Soublm Anta ~~. + sccss.~~ *cess csoasneet 389,834 21,389 Bombay and Scinde 325,510 14,436 Bengal and Burmah….....*~~-~~ *522,080 23,372*

162,640 9,435

Japan neeeeeecsersosesstssassenseuneass 147,760 9,061 Australia 5,817,700 291,451

1,189,170 55,888

597,245 32,193

9,273,429 £466,392

Flannel is highly recommended by medical men as a clothing, both in hot and cold countries, from its properties te promoting insensible perspiration, which, being absorbed

y the material, is immediately distributed through the whole thickness of the substance, and thus exposed over a very large surface, to be carried off by the atmosphere. Dr

Black assigns as a reason why flannel and other substances of the same kind keep the body warm, that they compose a rare and spongy mass, the fibres of which touch each other so lightly that the heat moves slowly through the in- terstices. These being filled up with air, and that too ina stagnant state, give little assistance in conducting the heat,

FLATBUSH, a town of the United States, situated in King's County, Long Island, New York, about 5 miles from Brooklyn, with which it is connected by tramway lines. Besides the churches, the principal public buildings are an educational institution known as Erasmus Hall, the town-hall, and the county almshouse, hospital, and lunatic asylum. The older houses are noticeable for their palatial style, and the native population is largely of Dutch descent. The battle of Long Island was fought in the neighbourhood, August 1776. Population in 1860, 3471; in 1870, 6309.

FLAT-FISH (Pleuronectide) is the name common to all those fishes which swim on their side, as the holibut, turbot, brill, plaice, flounder, sole, &c. The side which is turned towards the bottom, and in some kinds is the right in others the left, is generally colourless, and called " blind,' from the absence of aneye on this side. The opposite side, which is turned upwards and towards the light, is variously, and in some tropical species even vividly, coloured, both eyes being placed on this side of the head. All the bones and muscles of the upper side are more strongly developed than on the lower; but it is noteworthy that these fishes when hatched, and for a short time afterwards, are symmetrical like other fishes, swimming with the body in a vertical position, and having the eyes placed normally, viz., one on the right and the other on the left: side. With advancing growth one of the eyes is gradually pushed to the opposite side, and the fish assumes its horizontal position in the water. Flat-fishes are bottom-fish, rarely rising to the surface, and apparently not descending to very great depths. They are found in all seas, except perhaps the highest latitudes. More than 200 species are known ; they are most numerous towards the equator, whilst those of the largest size (holibut) occur in the temperate and cold regions,

Some enter fresh water freely, like the flounder. The size and abundance of the flat-fish, and the flavour of their flesh, render this family one of the most useful and economically important. See IcHTHYOLOGY.

FLAVEL, Joun (c. 1627-1691), an English noncon- formist divine, was born at Bromsgrove in Worcestershire, probably in 1627. He was the elder son of Mr Richard Flavel, described in contemporary records as "a, painful and eminent minister." After receiving his early education, partly at home, and partly at the grammar-schools of Bromsgrove and Haslar, he entered University College, Oxford. Soon after taking orders in 1650, he obtained 4

| curacy at Deptford, and on the death of the vicar he was

appointed to succeed him. From Deptford he removed in 1656 to Dartmouth. He was ejected from his living by the passing of the Act of Uniformity in 1662, but continued to preach and administer the sacraments privately til the Oxford Act of 1665, when he retired to Sloptor, five miles from the scene of his official labours. After the expulsion of the Stuart dynasty, he became minister of @ nonconformist church at Dartmouth, where he laboured till his death in 1691. Although the writings of Flavel now appear cumbrous in structure, yet their literary style has some merits; and from their tender and devotional charac- ter they were long popular with a certain class of readers.

His principal works are his Treatise on the Soul of Man; T he Fountain of Life, in forty-two Sermons ; The Method of Grace; A Token for Mourners; Husbandry Spiritualized ; and Navigator Spiritualized. A new edition of his collected works was pub ishec in 1820 in 6 vols., 8vo. His select works were published in 1823 in 2 vols., and an edition of these, with Life, in 1833.

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FLAVIAN L,, patriarch of Antioch, was born about 320, most probably in Antioch. He lost his parents in early youth, and, although inheriting great wealth, he renounced a life of worldly ease, and resolved to devote his riches and his talents to the service of the church. In association with Diodorus, afterwards bishop of Tarsus, he supported the catholic faith against the Arian Leontius, who had suc- ceeded Eustathius as patriarch of Antioch. The two friends assembled their adherents outside the city walls for the observance of the exercises of religion ; and, according to Theodoret, it was in these meetings that the practice of antiphonal singing was first introduced in the services of the church. When Meletius was appointed patriarch of Antioch in 361, he raised Flavian to the priesthood, and on the death of Meletius in 381, Flavian was chosen, by a majority of the bishops, to succeed him. The schism between the two parties was, however, far from being healed, and Paulinus, who by the extreme Eustathians had been elected patriarch in opposition to Meletius, still exercised authority over a portion of the church. On the death of Paulinus in 383, Evagrius was chosen as his successor, and after the death of Evagrius in 395 the Eustathians still continued to hold separate meetings;

but through the intervention of Chrysostom of Constantinople, they agreed, about the year 399, to acknowledge Flavian as their bishop. During the patriarchate of Flavian a serious sedition occurred in the streets of Antioch (387), and the statues of Theodosius and the empress were overturned 3 but Flavian went to Constantinople, aud by an eloquent dis- course, prepared for him, it is said, by his pupil St John Chrysostom, succeeded in averting the emperor's vengeance from the city. Flavian died in 404.

FLAVIAN IL, patriarch of Antioch, was chosen by the emperor Anastasius I, to succeed Palladius, most probably in 498. He endeavoured to please both parties by steering a middle course in reference to the Chalcedon decrees, but was induced after great hesitation to agree to the request of Anastasius that he should accept the Henoticon. His doing so, while it brought upon him the anathema of the patriarch of Constantinople, failed to secure a return of the favour of Anastasius, who in 5]1 found in the riots which Were occurring between the rival parties in the streets of Antioch a pretext for deposing Flavian, and banishing him to Petra, where he died in 518. Flavian was soon after his death enrolled among the saints of the Greek Church, and after some opposition he was also canonized by the Latin Church,

FLAVIAN, patriarch of Constantinople, succeeded Proclus in 447, He presided at the council which deposed Eutyches in 448, but in the following year he was deposed by the council of Alexandria, which reinstated Eutyches In his office. Not satisfied with the mere deposition of Plavian, his opponents were so carried away by their feel- Ings as to proceed to personal violence, and his death soon after at Hypepa in Lydia is attributed to a kick inflicted on him by Dioscorus, patriarch of Alexandria, the president of the council. The council of Chalcedon canonized him 48a martyr, and he is also enrolled in the martyrology of the Latin Church, his day being the 18th February.

FLAVIGN Y, VALERIEN, was born near Laon about the beginning of the 17th century, Having studied in the college of Sorbonne, he received from it his doctors diploma in 1628, and shortly afterwards obtained a canonry in the cathedral of Rheims, Tn 1630 he became professor of Hebrew in the college of France. He died at Paris, 29th April 1674. The works of Flavigny

are chiefly occupied With discussions regarding the Hebrew text of the Bible,

$ opinions acquired him for a time considerable celebrity, and engaged him in controversies with some of the doctors of the Sorbonne, but now possess scarcely any interest,

The following are his principal treatises i—Epistole IV. de ingentt Bibliorum opere septemlingut, 1636 ; Epistole duce in quibus de ingenti Bibliorum opere quod nuper Lutetice Parisiorum prodtit &e., 1646; Epistola II14 in qua de libello Ruth Syriaco, quem Abr. Echellensis insertum esse voluit ingenti Bibliorwm operi, 1647 . Epistola adversus Abr. Echellensem de libello Ruth, &e., 1648 ; Disquisitio Theologica, &e., 1666. He also published an edition of the works of William of Saint-Amour, a doctor of the 13th century.

FLAVIN is an extract or preparation of quercitron bark (Quercus tinctoria), used as a yellow dye in place of the ground and powdered bark. Flavin is not a definite chemical compound, and the commercial product is found to vary greatly in composition and tinctorial value, accord- ing, probably, to the nature of the varied processes employed in its preparation. The manufacture of flavin is principally carried on in the United States under various patents ; and while some kinds appear to be little other than finely powdered and sifted bark, others are almost pure quercitrin, the chemical principle peculiar to querci- tron bark. A kind of flavin made in England is obtained by exhausting the bark in a weak alkaline solution, and precipitating the colouring matter by neutralization with either sulphuric acid or hydrochloric acid. Flavin of good. quality ought to possess about 16 times the tinctorial strength of the bark from which it is extracted.

FLAX. The terms flax or lint (German Flachs, French Lin, Latin Linwm) are employed at once to denote the fibre so called, and the plant from which it is prepared. The flax plant (Linwm usttatissimum) belongs to the natural order Linacee, and, like most plants which have been long under cultivation, it possesses numerous varieties, while the wild or parent condition is not known. As cultivated it is an annual with an erect stalk rising to a height of from 20 to 40 inches, with alternate, sessile, linear-

lanceo- late leaves, branching only at the top into a corymbose panicle of bright blue flowers. The flowers are regular and

Fie. 1.—Flax Plant (Linum usitatissimum).

symmetrical, having five ovate-acute, slightly ciliate sepals, five deciduous petals, and a syncarpous pentacarpellary ovary with five distinct styles. The fruit or boll is round, containing five cells or loculaments, each of which is divided into two bya spurious dorsal dissepiment, thus forming ten divisions, each of which contains a single seed. The seeds, well known as linseed, are flat, oval in form, dark brown in colour, with a smooth shining mucilaginous

coat, and flat oily cotyledons. There are several other species which have been and are cultivated to an inconsider- able extent as sources of fibre, as the Greek or spring flax (LZ. crepitans), Siberian flax (Z. perenne), and the white plossomed or purging flax (L. catharticum), all grown in certain parts of Anstria, and the narrow-leaved flax (L. an- gustifolium), which was utilized at a very remote pertod. The cultivation and preparation of flax are the most ancient of all textile industries, very distinct traces of their existence during the stone age being preserved to thie present day. 'The use of flax," says Keller (Lake Dwell- ings of Switzerland, translated by J. E. Lee), back to the very earliest periods of civilization, and it was most extensively and variously applied in the lake dwell- ings even in those of the stone period. But of the mode in which it was planted, steeped, heckled, cleansed, and generally prepared for use, we can form no idea any more than we can of the mode or tools employed by the settlers in its cultivation. . . . . Rough or unworked flax is found in the lake dwellings made into bundles, or what are technically called heads, and, as much attention was given to this last operation, it was perfectly clean and ready for use." As to its applications at this early period, Keller remarks—'" Flax was the material for making lines and nets for fishing and catching wild animals, cords for carry- ing the earthenware vessels and other heavy objects ; in fact one can hardly imagine how navigation could be carried on, or the lake dwellings themselves be erected, without the use of ropes and cords ; and

the erection of memorial stones (menhirs, dolmens) at whichever era, and to what-

ever people these monuments may belong, would be |

altogether impracticable without the use of strong ropes." As to the variety of flax cultivated by the prehistoric races, Dr Heer is of opinion that it was the small-leaved flax (Linum angustifolium), a plant native of the Mediterranean coasts from Greece and Dalmatia to the Pyrenees.

That flax was extensively cultivated and was regarded as of much importance at a very early period in the world's history there isabundant testimony. Especially in ancient Egypt the fibre occupied a most important place, linen having been there not only generally worn by all classes, but it was the only material the priestly order was permitted to wear, while it was most extensively used as wrappings for embalmed bodies and for general purposes. In the Old Testament we are told that Pharaoh arrayed Joseph "in vestures of fine linen" (Gen. xlii. 42), and among the plagues of Egypt that of hail destroyed the flax and barley crops, "for the barley was in the ear, and the flax was bolled" (Exod. ix. 31). Further, numerous pictorial representations of flax culture and preparation exist to the present day on the walls of tombs and in Egypt. Sir J. G. Wilkinson in his description of ancient Egypt shows clearly the great antiquity of the ordinary processes of preparing flax. 'At Beni Hassan," he says, "' the mode of cultivating the plant, in the same square beds now met with throughout Egypt (much resembling our salt pans), the process of beating the stalks and making them into ropes, and the manufacture of a piece of cloth are distinctly pointed out." The preparation of the fibre as conducted in Egypt is illustrated by Pliny, who says—" The stalks themselves are immersed in water, warmed by the heat of the sun, and are kept down by weights placed upon them, for nothing is lighter than flax. The membrane, or rind, becoming loose is a sign of their being sufficiently macerated. They are then taken out and repeatedly turned over in the sun until perfectly dried, and afterwards beaten by mallets on stone slabs. That which is nearest the rind is called stupa ['tow'], inferior to the inner fibres, one fit only for the wicks of lamps. It is combed out with iron hooks until the rind is all removed. The inner

“reaches |

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part is of a whiter and finer quality. Men are not ashamed

to prepare it” (Pliny, V. H., xix. 1). For many ages, even

down to the early part of the 14th century, Egyptian flax oceu- pied the foremost place in the commercial world, being sent into all regions with which open intercourse was maintained, Among Western nations it was, without any competitor, the most important of all vegetable fibres till towards the close of the 18th century, when, after a brief struggle, cotton took its place as the supreme vegetable fibre of commerce.

Flax, as a field crop, having been described under the heading AGRICULTURE (see vol. i. p. 380), it is unnecessary to dwell here on that feature of the subject. When flax is cultivated primarily on account of the fibre, the crop ought to be pulled before the capsules are quite ripe, when they are just beginning to change from a green to a pale brown colour, and when the stalks of the plant have become yellow throughout about two-thirds of their height. The various operations through which the crop passes from this point till flax ready for the market is produced are—(1) pulling, (2) rippling, (3) retting, and (4) scutcling.

Pulling and rippling may be dismissed very briefly. Flax is always pulled up by the root, and under no circumstances is it cut or shorn like cereal crops. The pulling ought to be done in dry clear weather; and care is to be taken in this, as in all the subsequent operations, to keep the root- ends even, and the stalks parallel. At the same time it is desirable to have, as far as possible, stalks of equal length together,—all these conditions having considerable influence on the quality and appearance of the finished sample. As a general rule the removal of the “bolls” or capsules by the process of rippling immediately follows the pulling, the operation being performed in the field ; but under some systems of cultivation, as, for example, the Courtrai method, alluded to below, the crop is made up into sheaves, dried, and stacked, and is only bolled and retted in the early part of the next ensuing season. The best rippler, or apparatus for rippling,

consists of a kind of comb having, set in a wooden frame, iron teeth made of round-rod iron three-sixteenths of an inch asunder at the bottom, and half an inch at the top, and 18 inches long, to allow a sufficient spring, and save much breaking of flax. The points should begin to taper 3 inches from the top. A sheet or other cover being spread on the field, the apparatus is placed in the middle of it, and two ripplers sitting opposite each other, with the machine between them, work at the same time. It is unadvisable to ripple the flax so severely as to break or tear the delicate fibres at the upper part of the stem. The two valuable commercial products of the flax plant, the seeds and the stalk, are separated at this point. We have here to do with the latter only.

Retting or rotting is an operation of the greatest im- portance, and one in connexion with which in recent years numerous experiments have been made, and many projects and processes put forth, with the view of remedying the defects of the primitive system or altogether supplanting it. From the earliest times two leading processes of retting have been practised, termed respectively water-retting and dew-retting; and as no method has yet been introduced which satisfactorily supersedes these operations, they will first be described. ;

Water-retting.—For this—the process by which flax 1s generally prepared—pure soft water, free from iron and other materials which might colour the fibre, is essential. Any water much impregnated with lime is also specially objectionable. The dams or ponds in which the operation is conducted are of variable size, but should be not more than 4 feet in depth, It is calculated that a dam 50 feet long, 9 feet broad, and 4 feet deep is sufficient to ret the produce of an acre of flax. The rippled stalks are tied 1n small bundles and packed, roots downwards, in the dams

till they are quite full; over the top of the upper layer is placed a stratum of rushes and straw, or sods with the grassy side downwards, and above all stones of sufficient weight to keep the flax submerged. Under favourable elrcum- stances a process of fermentation should immediately be set up, which soon makes itself manifest by the evolution of gaseous bubbles. After a few days the fermentation subsides; and geuerally in from ten days to two

weeks, the process oughit to be complete; but everything depends upon the weather ; and as the steeping is a critical opera-

tion, it is essential that the stalks be frequently examined

and tested as the process nears completion. When it is found that the fibre separates readily from the woody "shive" or core, the beets or small bundles are ready for removing from the dams. Itis next spread, evenly and equally, over a grassy meadow, where it is left for about a fortnight, at the end of which time the fibres will have partly separated from the core and "bowed." At this point advantage is taken of fine dry weather to gather up the flax, which is now ready for scutching, but the fibre is improved by stooking and stacking it for some time before it is taken to the scutching mill.

_ Dew-retting is the process by which all the Archangel flax and a large portion of that sent out from St Petersburg are prepared. By this method the operation of steeping is entirely dispensed with, and the flax is, immediately after pulling, spread on the grass where it is under the influence of air, sun-light, night-dews, and rain. The process is tedious, the resulting fibre is brown in colour, and it is said to be peculiarly liable to undergo heating (probably owing to the soft heavy quality of the flax) if exposed to moisture and kept close packed with little access of air. Archangel flax is, however, peculiarly soft and silky in structure, although in all probability water-retting would result in a fibre as good or even better in quality.

The theory of retting, according to the investigations of J. Kolb, is that a peculiar fermentation is set up under the influence of heat and moisture, resulting in a change of the intercellular substance—pectose or an analogue of that body—into pectin and pectic acid. The former, being soluble, is left in the water ; but the latter, an insoluble body, is in part attached to the fibres, from which it is only separated by changing into soluble metapectic acid under the action of hot alkaline ley in the subsequent process of bleaching.

To a large extent retting continues to be conducted in the primitive fashions above described, although numerous and persistent attempts have been made to improve upon it, or to avoid the process altogether. The uniforin

result of all experiments has only been to demonstrate the scien- tiie soundness of the ordinary process of water-retting, and all the proposed improvements of recent times seek to obviate the tediousness, difficulties, and uncertainties of the process as carried on in the open air. In the early part of the present century much attention was bestowed, especially in Ireland, on a process invented by Mr James Lee. He proposed to separate the fibre by purely mechanical Means without any retting whatever; but after the Irish Linen Board had expended many thousands of pounds and much time in making experiments and in erecting his machinery, his entire scheme ended in complete failure. About the year 1851 Chevalier Claussen sought to revive a Process of " cottonizing" flax—a method of proceeding which had been suggested three-quarters of a century earlier, Claussen's process consisted in steeping flax fibre or tow for twenty-four hours in a weak solution of Caustic soda, next boiling it for about two hours in a similar solution, and then saturating it in a solution contain- mg 9 per cent. of carbonate of soda, after which it was mmersed in a vat containing water acidulated with a half

per cent. of sulphuric acid. The action of the acid on the carbonate of sods with which the fibre was impregnated caused the fibre to split up into a fine cotton-like mass, which it was intended to manufacture in the same manner as cotton. A process to turn good flax into bad cotton had however, on the face of it, not much to recommend it to public acceptance ; and Claussen's process therefore remains only as an interesting and suggestive experiment.

The only modification of water-retting which has hitherto endured the test of prolonged experiment, and taken a firm position as a distinct improvement, is the warm-water retting patented in England in 1846 by an American, Robert B, Schenck. For open pools and dams Schenck substitutes large wooden vats under cover, into which the flax is tightly packed in au upright position. The water admitted into the tanks is raised to and maintained at a temperature of from 75° to 95° Fahr. during the whole time the flax is in steep. In a short time a brisk fermentation is set up, gases at first of pleasant odour, but subsequently becoming very repulsive, being evolved, and producing a frothy scum over the surface of the water. The

whole process occupies only from 50 to 60 hours. A still further improvement, due to Mr Pownall, comes into opera- tion at this point, which consists of immediately passing the stalks as they are taken out of the vats between heavy

rollers over which a stream of pure water is kept flowing.

By this means, not only is all the slimy glutinous adherent matter thoroughly separated, but the subsequent processes of breaking and scutching are much facilitated.

A process of retting by steam was introduced by W. Watt of Glasgow in 1852, and subsequently modified and improved by J. Buchanan. The system possessed the advantages of rapidity, being completed in about 10 hours, and freedom from any noxious odour ; but it yielded only a harsh, ill-spinning fibre, and consequently failed to meet the sanguine expectations of its promoters.

In connexion with improvements in retting, Mr Michael Andrews, the energetic secretary of the Belfast Flax Supply Association, has made some suggestions and experiments which deserve close attention. In a paper contributed to the International Flax Congress at Vienna in 1873, he entered into details regarding an experimental rettery he had formed, with the view of imitating by artificial means the best results obtained by the ordinary methods. In brief, Mr Andrews's method consists in introducing water at the proper temperature into the retting vat, and main- taining that temperature by keeping the air of the chamber at a proper degree of heat. By this means the flax is kept at a uniform temperature with great certainty, since even should the heat of the air vary considerably through neglect, the water in the vat only by slow degrees follows such fluctuations. 'It may be remarked," says Mr Andrews, "that the superiority claimed for this method of retting flax over what is known as the 'hot-water steeping' is. uniformity of temperature; in fact the experiments have demonstrated that an absolute control can be exercised over the means adopted to produce the artificial climate in which the vats containing the flax are situated."

Scutching is the process by which the fibre is freed from its woody core and rendered fit for the market. For ordinary water-retted flax two operations

are required, first breaking and then scutching, and these are done either by hand labour or by means of small scutching or lint mills, driven either by water or steam power. Hand labour, aided by simple implements, is still much used in Continental countries; but the use of scutching mills is now very general, these being more economical, and turning out flax of a much better quality. The breaking is done by passing the stalks between grooved rollers, to which in some cases a reciprocating motion ig communi-

cated, and the broken shives are beaten out by suspending the fibre in a machine fitted with a series of revolving blades, which, striking violently against the flax, shake out the bruised and broken woody cores. A great many modified scutching machines and processes have been pro- posed and introduced with the view of promoting economy of labour and improving the turn-out of fibre, both in respect of cleanness and in producing the least proportion of codilla or scutching tow.

The celebrated Courtrai flax of Belgium is the most valuable staple in the market, on account of its fineness, strength, and particularly bright colour. There the flax is dried in the field, and housed or stacked during the winter succeeding its growth, and in the spring of the following year, it is retted in crates sunk in the sluggish waters of the river Lys. After the process has proceeded a certain length, the crates are withdrawn, and the sheaves taken out and stooked. It is thereafter once more tied up, placed in the crates, and sunk in the river to complete the retting process; but this double steeping is not in- variably practised. When finally taken out, it is unloosed and put up in cones, instead of being grassed, and when quite dry it is stored for some time previous to undergoing the operation of scutching. In all operations the greatest care is taken, and the cultivators being peculiarly favoured as to soil, climate, and water, Courtrai flax is a staple of unapproached excellence.

An experiment made by Professor Hodges of Belfast on 7770 ib of air-dried flax yielded the following results. By rippling he separated 1946 tb of bolls which yielded 910 tb of seed. The 5824 tb (52 cwt.) of flax straw remaining lost in steeping 13 cwt., leaving 39 ewt. of retted stalks, and from that 6 ewt. 1 qr. 2 Ib (702 ib) of finished flax was pro- cured. Thus the weight of the

fibre was equal to about 9 per cent. of the dried flax with the bolls, 12 per cent. of the bolled straw, and over 16 per cent. of the retted straw. One hundred tons treated by Schenck's method gave 33 tons bolls, with 27°50 tons of loss in steeping; 32°13 tons were separated in scutching, leaving 5:90 tons of finished fibre, with 1°47 tons of tow and pluckings. The following analysis of two varieties of heckled Belgian flax is by Dr Hugo Miller (Hoffmann's Berichte tiber die Entwickelung der chemischen Industrie) :—

Bie ites testes iictar~ acd) he Calgeamaelee ats 0°70 1°32 ee ee ee ee Sere 8°65 10°70 EiPRreChi Ve, MAELCE .....20re00scsenamasnnanmnnes 3°65 6°02 2 Lg Ee mine ee A 2°39 2°37 1 ep poe Ee Ee 82°57 71°50 Intercellular substance and pectose bodies 2°74 9°41

According to the determinations of Wiesner (Dee Rohstoffe des Pflanzenreiches), the fibre ranges in length from 20 to 140 centimetres, the length of the individnal cells being from 2°0 to 4°0 millimetres, and the limits of breadth between 0°012 and 0-025 mm., the average being 0°016

Fia, 2.—Fibre of Rough Russian Flax (magnified). Among the circumstances which have retarded improve-

cae a ans A nae and preparing of flax, the fact ' parative : , was conducted on y recent times, the whole industry

, ly on a domestic scale has had much awe At no very remote date it was the practice in ph eae on every small farmer and cotter not only to grow

or Hax in small patches, but to have it retted,

FLAX

scutched, cleaned, spun, woven, bleached, and finished entirely within the limits of his own premises, and all by members or dependants of the family. The same practice obtained and still largely prevails in other countries. Thus the flax industry was long kept away from the most power- ful motives to apply to it labour-saving devices, and apart from the influence of scientific inquiry for the improvement of methods and processes. As cotton

came to the front, just at the time when machine-spinning and power-loom weaving were being introduced, the result was that in many localities where flax crops had been grown for ages, the culture gradually drooped and ultimately ceased. The linen manufacture by degrees ceased to be a domestic in- dustry, and began to centre in and become the characteristic factory employment of special localities, which depended, however, for their supply of raw material primarily on the operations of small growers, working, for the most part, on the poorer districts of remote thinly populated countries. The cultivation of the plant and the preparation of the fibre have therefore, even at the present day, not come under the influence (except in certain favoured localities) of scientific knowledge and experience, and the greater part of the flax in use at the present moment is prepared pre- cisely by the processes employed in Egypt when the descendants of Jacob dwelt in the land of Goshen.

In England and Scotland the acreage under flax is now so limited, and it has decreased with such steadiness and rapidity, that, as a crop, flax may be regarded as practically extinct in these countries. Indeed, notwithstanding the numerous measures by which Government sought during last century to foster flax cultivation, and the direct grants to cultivators in Scotland, which down to the year 1828 were paid by the board of trustees for fisheries and manu- factures, the cultivation cannot be said ever to have thriven in a healthy manner. The following summary, showing the extent in acres of the cultivation in Great Britain for the years 1870 till 1877 inclusive, has been communicated by Mr Michael Andrews of Belfast :—

Total.

England. Scotland.

1399 1244 1262 741 259 150 239 243

22,354 15,949 14,011

18,752 9,018 6,547 7,366 7,210

In Ireland the cultivation of flax has always occupied a relatively much more important position than it has in the sister countries, though there also

the experience is that it isa rapidly declining agricultural crop. In the time of Queen Anne a board of trustees of the linen and hempen manufactures for Ireland was instituted, by which body liberal grants were administered. The board continued 1ts operations till the parliamentary grants were withdrawn In 1827, and itself dissolved in the following year. In 1841 a Royal Flax Society of Ireland was formed, which received from Government an annual subsidy of £1000, and it com tinued to exist till 1859. Still more recently a joint flax committee of the Royal Dublin Society and the Royal Agricultural Society of Ireland was formed, and admin- istered grants from the imperial exchequer from the year 1864 till 1871. The acreage of Irish flax cultivated has fluctuated with these subsidies, having reached a maximum of 181,909 acres in 1824, from which it steadily declined to 53,863 acres in 1848. In 1853, partly stimulated by high prices and scarcity owing to Russian complications, It it again rose to 174,579 acres; and the cotton famine

consequent on the civil war-in America again greatly

FL

stimulated the cultivation for a few years from 1862 onwards. The following are periodical returns from the registrar-general's statements since 1853 : —

Table showing gross produce of Flax, yield per acre, and acreage under crop in Ireland, from the year 1853 to 1877 inclusive, according to the Registrar-General's Returns.

Acreage under Flax.; Gross Produce,

Year. Yield per Acre.

Kae Stones. Lbs,

1853 174,579 ,862 40 3 1854 150,972 35,606 37 10 1855 97,106 23,428 38 9 1856 106,826 18,791 28 2 1857 98,074 14,475 23 9 1858 91,646 17,583 30 9 1859 136,282 21,576 25 5 1860 128,595 23,760 29 8 1861 147,866

22,568 24 6 1862 150,070 24,258 26 3 1863 214,099 42, 646 31 12 1864 301,693 64,506 34

1865 251,534 39,561 25

1866 263,507 40,991 24 1 1867 253,257 35,392 22 5 1868 206,446 24,987 19 5 1869 229,178 29,569 20 8 1870 194,893 30,771 25 10 1871 156,883 12,929 13 3 1872 122,003 17,089 22 6 1873 129, 432 19,843 24 8 1874 106,886 18,037 27 0 1875 101,248 22,464 35 7 1876 132,938 27,181 32 10

1877 123,362 No officialjreturn.

a Xx 297

have been extracted from the carefully compiled reports of Mr Michael Andrews for the Irish Flax Supply Association. The following statement embodies the latest available re- turns regarding the acreage and produce of flax in all the countries where the plant is cultivated on account of its fibre :—

Area under Flax and Gross Produce of various Countries.

Statute Acres.

253,323 at 21°48 per acre 34,009

Stones. Tons.

Austria…....178,397 Jochs …....

Belgium ….. 57,045 Hectares …. 140,901 ,, 33°59, 29,580 Wernatde, 2.5.00 sor one ence: 17,686 ,, 20°00 __,, 25211 J Men Oe esaaoe conee ae (estimated) 15,000 ,, 20°00 _,, 1,875 Wrance e263: 78,774 Hectares …. 194,571 ,, 34°84, 42,368 Germany …..214,835 _,, 530,642 ,,22°50 ,, 74,621 GreataBintaines css ..55.2heeeeens – 7,481 ,, 28°50" ,, 1,333 (CEs AA eee Oe ne eee 957 ,, 20°00 _—e, 119 Holland …... 19,444 Hectares…. 48,027 ,, 31°77 ,, 9,536 Hungary ….. 14,017 Jochs …... 19,903 ,,20°00,, 2,488 Mike Venti Meee esac cerca 123,362 ,, 28°74 _,, 22,159 Iikallyae. ses -c 81,386

Hectares… 201,023 ,, 18°14 _,, 22,791 RUUBEIAR ccc antes ee 1,928,568 ,, 20°00 ,, 241,071 ca See cena 37,500 ,,20°00 ,, 4.688

3,518,944 488,849

It thus appears that the breadth of lands under flax in Russia alone is little less than four-sevenths of the entire acreage devoted to the production of the fibre, and that it alone produces practically one half of the total produce of the world. The large extent to which the British manufac- turers are dependent on Russia is shown in the following

The foregoing table, and also the statistics given below, | table :-—

Imports and Exports of Flax, dressed and undressed, and Tow or Codilla, to and from the United Kingdom. IMPORTS.

1871. 1872, 1876. 1877.

ie | ton | ’ a ne , ion Tons. Tens. Tons. ihe | Tons, 10,933 | 8,889 | 10,617] 16,905] 15,872] 16,546 11,576 | 15,940

606 596 1,972 831 584 563 427 7

6,780 | 5,086 | 11,588] 12,197; 9,656] 10,922 2,164 | 8,509

6,961 5,930 8,979 8,794 6,696 8,356 4,944 7,315

64,755 | 54,392 | 80,585] 86,164] 66,401] 72,394 50,944 | 77,917 798 | 2,717 | 4,985] 4,462] 1,839 990 237 | 1,132 90,833 | 77,110 | 118,676 | 129,353 | 101,048 | 70,292 | 110,813

EXPORTS.

1869. 1870.

Tons.

714 957

1,659 843

Tons.

169 1,473 512 439

2,593 | 4,173

The total value of the imports was £3,539,501 in 1876, and in 1877 it was £5,054,555, the increase in quantity beng 57-6 per cent., and in vaiue 42°8 per cent.

Messrs George Armitstead é& Co. of Dundee have court- eously placed at our disposal their flax list for the week ended 14th May 1878, which not only shows the sources

and varieties of flax found in the British market, but also |

ia idea of the relative value of the various staples. a € substance of the remarks on the commerce which ow we have also to express obligation to that firm. © names and letters attached to the various brands are explained, commencing with Riga flax :-— K means Crown flax.

thus

K_ ,, Light crown flax. Pk. ., Preked crown flax. oak i, Light picked crown flax. ce »» Superior picked crown flax.

»» Light superior picked crown flax.

1871,

Tons.

126 2,563 689 1,797

No information.

5,175

It will be observed that the ““H” stands for “light” coloured flaxes; but besides being bracked as above, any of the Riga crown flaxes which are of a “white” or “grey” colour are laid aside and shipped from Riga as under (mostly, however, to France and Belgium), viz. :—

GK or WK, Grey crown, or white crown, GPK or WPK, Grey picked crown, or white picked crown.

GSPK or WSPK, Grey or white superior picked crown.

These are the principal marks of Riga crown sorts. Of other qualities shipped from Riga there are “ Hoffs” flaxes

(drawn from the Livonian district) :— HD means Hoffs Dreiband flax.

WHD ,, White Hoffs Dreiband flax. PHD ,, Picked white Hoffs Dreiband flax. WPHD ,, White picked Hoffs Dreiband flax. FPHD ,, Fine picked Hoffs Dreiband flax. WFPHD ,, White fine picked Hoffs Dreiband flax. SFPHD ,, Superior fine picked Hoffs Dreiband flax. WSFPHD _,,. White superior fine picked Hoffs Dreiband flax,

IX. — 38

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Dundee Market Report on Flax, May 14, 1878.

Quotations per Ton.

0

BS DA CrOWN….20..ccccccecsessnccesecs 0 £61

a B dg @nOW wees. <-0s-cone 0 658

a 4th Crown ….. 0 54

ee Ist Zabrack …. 0 49

a 2d s 990 oc 0 44 PETERSBURG Pscow 12 Head5
«.....cceseeeseseeeseerese 5 0 46 ra Louga and Staro Russ 12 Heads…..| 39 0 40

7 Saletsky 12 Heads…....-.0s-sscsesesees 29 : Es

a a?

Heads…. oe] 26

i, A 6 Heads…. 23 24

- Rjeff 8 Crown.. 40 41

ae IZQDVACK .ccccesccacroseons esr 36 1 37 NARVA NO.
Viu.ccccescecccsenesscescccceces aac 0 0

3 NO: Vir. —.-- ns eal 0 0

Pernav Livonian OD… 36 37 ‘ D…. 42 43

HD 47 48

iJ) io) SO CCO CO OOO SOS SOO SOOO SOS SSO SOS SOS SS SSS SSS SS SS OS

J)

=)

CODD OSC OSC OCOD OO OOOO OOO OOOO OS SOOO S SS oo we

» 4Brand….. asoesibacnes wevageees cose iD) 0 (MSE 4 eB ram… .c0-ccc.cacaccecscosesecsseceseeemmeeiee: seh Me 36 TOW—ARCHANGEL No. 1…....—....---+- 40 41 Hs ENO ston: caeewe casees 36 37 PETERSBURG No. 1 …... .---+ 37 40 re SO) eee ecorrecamcccote (Me 28 32 CODIL WAS ARGWANGEL INOU2).....-.cc0) ccccccseers-ces|| Mead 88 e NOOB .ccscescacce eeeseeeeeceeee|| Meu 30 IPBRERSBURG coc: c0a< cesses sccessseeeeeese secre Ue 0

GAG ee ~~wacs~~ sss ; 0 0 0 0

Of the lower qualities of Riga flax the following may be

named :—

W, Wrack flax. WPW, White picked wrac«. D, Dreiband (Threeband). LD, Livonian Dreiband. SD, Slanitz Dreiband.

PW, Picked wrack flax. GPW, Grey picked wrack flax. PD, Picked Dreiband flax. PLD, Picked Livonian Dreiband. PSD, Picked Slanitz Dreiband.

The last-named (SD and PSD) are dew-retted qualities shipped from Riga either as Lithuanian Slanitz, Wellish Slanitz, or Wiasma Slanitz, showing from what district they come, as there are differences in the quality of the The lowest quality of Riga flax

produce of each district. is marked DW, meaning Dreiband Wrack.

_ Another Russian port from which a large quantity of flax is imported is Pernau, where the marks in use are com-

paratively few. The leading marks are— eri indicating Low Ordinary Dreiband (Threeband).

*: * Ordinary Dreiband.*

D, ee Dreiband. HD, Br Light Dreiband. : Risten. , A Cut. M, Marienburg.

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Pernau flax is shipped as Livonian and Fellin sorts, the latter

being the best. The lowest mark of Pernau flax is the LOD. In addition to the exports from Riga aud Pernau, shipments of flax are made from Narva, Libau, Memel, and Revel; but, as compared with the two first-mentioned ports, the flax trade of the others is inconsiderable. The only remaining localities from which flax is extensively exported to Scotland are Archangel

and St Petersburg. From St Petersburg both white and brown flax is sent, the former variety being water-retted, the latter dew-retted. All the flax of Arch-

angel is dew-retted. The Pscow, Louga, Staro Russ, and Saletsky flaxes are ai or white flax, whereas the Rjeff flax is dew-retted. ith are many other kinds which come into the Dundee a 2 ah St Petersburg, such as Melinki, Bejetsky, a. 'a _Kostroma, J aroslav, Vologda, Wiasma, &c., § their names from the various districts, and all dew-

FLA=FLA

retted flax. These Petersburg brown flaxes are bracked mostly in Ist, 2d, 3d, and 4th crown, also Zabrack, the lowest mark. Some Petersburg sorts leave out the 1st crown and 4th crown, but in the Archangel flaxes all these marks appear, and the Zabrack is divided into two sorts, 1st and 2d Zabrack.

The distinction between codilla and tow is that the former is the tow or broken and ravelled fibres produced in the scutching process, therefore often called scutching tow, while tow proper is the similar product separated in the subsequent operation of heckling the flax preparatory to spinning. See AGRICULTURE (vol i. p. 380, 381), BrEacn- inG, Linen, and Linseep OIL. (3. Pa.)

FLAXMAN, Joun (1755-1826), was the greatest sculptor, or, if that title may be disputed on account of certain technical shortcomings in his work, at any rate the greatest designer of sculpture, that England has produced; and as a representative of the Greek spirit in modern art his name stands among the foremost, not of England merely, but of the world.

He was born on the 6th of July 1755. His name, John, was hereditary in the family, having been borne by his father after a forefather who, according to the family tradi- tion, had fought on the side of parliament at Naseby, and afterwards settled as a carrier or farmer, or both, in Buckinghamshire. John Flaxman the elder carried on with repute the trade of a moulder aud seller of plaster casts in New Street, Covent Garden, London. Our sculp- tor was the second son of his parents, and was born while they were temporarily living at York. Within six months of his birth they returned to London, and

in his father's back shop he spent an ailing childhood, in the course of which his life was once at least despaired of. His figure was high-shouldered and weakly, with the head very large for the body. His father by and by removed to a more commodious house in the Strand, and, his first wife dying, married a second, who proved a thrifty housekeeper and gentle stepmother. Of regular schooling the boy must have had some, since he is reputed as having remembered in after life the tyranny of some pedagogue of his youth; but his principal education he picked up for himself at home. He early took delight in drawing and miodelling from his father's stock-in-trade, and early endeavoured to understand those counterfeits of classic art by the light of translations from classic literature. Customers of his father took 8 fancy to the child, and helped him with books, advice, and presently with commissions. The two special encouragers of his youth were the painter Romney, and a cultivated clergy- man, Mr Mathew, in whose house in Rathbone Place the young Flaxman used to meet the lettered society of those days, and, among associates of his own age, the artists Blake and Stothard. 'Before this he had begun to work with success in clay as well as in pencil. At eleven yeals old, and again at thirteen, he won prizes from the Society of Arts. At twelve he became a public exhibitor in the gallery of the Free Society of Artists, and at fifteen in that of the Royal Academy, then in the second year of its eX- istence. In the same year, 1770, he entered as an Academy student, and won the silver medal. But all these successes were followed by adiscomfiture. In the competition for the gold medal of the Academy, Flaxman, who had made quite sure of victory, was defeated, the prize being adjudged by the president, Sir Joshua Reynolds, to another competitor named Engleheart. But this reverse proved no discourage ment, and the young Flaxman continued to ply his art diligently, both as a student in the schools and as al ex hibitor in the galleries of the Academy, occasionally also attempting diversions into the sister art of painting. Before long he received a commission, from a friend of the Mathew family, for a statue of Alexander. But by heroic and idea

work of this class—and it was work of this class that he at | first almost exclusively exhibited —he could of course make |

no regular livelihood. The means of such a livelihood, however, presented themselves in his twentieth year, when he first received employment from Josiah Wedgwood and his partner Bentley, as a modeller of classic and domestic friezes, plaques, ornamental vessels, and medallion portraits, in those varieties of "jasper" and "basalt" ware which earned in their day so prodigious a reputation for the manu- facturers who had conceived and perfected the invention, aud of which the examples, dispersed and disregarded during the first fifty years of this century, have now again returned into favour among the curious, and are disputed in sale-rooms at prices greater than they fetched in the first fever of the fashion. For twelve years, from his twentieth to his thirty-second (1775-1787), Flaxman subsisted chiefly by his work for the firm of Wedgwood. It may be urged, of the extreme refinements of figure outline and modelling which these manufacturers aimed at in their ware, that they were not the qualities best suited to such a material ; or it may be regretted that the gifts of one of the greatest figure designers who ever lived should have been employed upon such a minor and half-mechanical art of household decoration ; but the beauty of the product it would be idle to deny, or the value of the training which the sculptor by this practice acquired in the delicacies, the very utmost delicacies and severities, of modelling in low relief and on a minute scale By 1780 Flaxman had begun to earn something in another, and, so to speak, a more legitimate branch of his profession. This was in the sculpture of monuments for the dead. Three of the earliest of such laonuments by his hand are those of Chatterton in the church of St Mary Redcliffe at Bristol, of Mrs Morley in Gloucester Cathedral, and of a widow comforted by an angel, in the cathedral at Chichester. Flaxman's career memorial bas-reliefs of the same class occupied a principal part of his industry ; they are to be found scattered in miny churches throughout the length and breadth of England, and in them all the finest qualities of his art are represented. The best are quite unsurpass- able for pathos, for simplicity, for an instinct of composition as just, pure, and lovely as that of the Greeks themselves, and for the alliance with those harmonious lines and groupings of the ancients of that spirit of domestic tender- less and innocence which is the secret, and the holiest Secret, of the modern soul.

In 1782, being twenty-seven years old, Flaxman was married to Anne Denman, and had in her the best of helpmates until almost his life's end.

She was a woman of attainments in letters and to some extent in art, and the devoted companion of her husband's fortunes and of his travels, They set up house at first in Wardour Street, and lived an: industrious life, spending their summer holidays once and again in the house of the hospitable poet Hayley, at Hartham in Sussex. After five years, in 1787, they found themselves with means enough to travel, and set out for Rome. Records more numerous and more consecutive of Flaxman's residence in Italy exist in the shape of drawings and studies than in the shape of correspondence. Hesoon ceased modelling himself for Wedgwood, but continued to (rect the work of other modellers employed for the manu- facture at Rome. of a little more than two years, but was detained by a commission for a marble group of a Fury of Athamas, a commission attended in the sequel with circumstances of —— trouble and annoyance, from the notorious Comte-

veque, Frederick Hervey, earl of Bristol and bishop of

erry. He did not, as things fell out, return until the "immer of 1794, after an absence of seven years,—having Mm the meantime executed another ideal commission (a

During the rest of |

He had intended to return after a stay |

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Cephalus and Aurora) for Mr Hope, and having sent home models for several funeral monuments, including that of the poet Collins in Chichester Cathedral. But what gained for Flaxman in this interval an immense and European fame was not his work in sculpture proper, but those outline designs to the poets, in which he showed not only to what purpose he had made his own the principles of aucient design in vase-paintings and bas-reliefs, but also by what a natural affinity, better than all mere learning, he was bound to the ancients and belonged to them. The designs for the Ziad and Odyssey were commissioned by Mrs Hare Naylor; thosé for Dante by Mr Hope ; those for Auschylus by Lady Spencer. During their homeward

journey the Flaxmans travelled through central and northern Italy. On their return they took a house, which they never afterwards left, in Buckingham Street, Fitzroy Square. Immediately afterwards we find a sculptor exhibiting the model of a large monument in the round, that of Lord Mansfield, now in Westminster Abbey, and at the same time publishing a spirited protest against the scheme already entertained by the Directory, and carried out five years later by Napoleon, of equipping at Paris a vast central museum of art with the spoils of conquered Europe.

The record of Flaxman's life is henceforth an uneventful record of private affection and contentment, of happy and tenacious industry; with reward not brilliant, but sufficient ; with repute not loud, but loudest in the mouths of those whose praise was best worth having—Canova, Schlegel, Fuseli; of quiet, beloved, modestly enthusiastic, and simply honourable life. He took for pupil a son of Hayley's, who presently afterwards sickened and died. In 1797 he was made an associate of the Royal Academy. Every year he exhibited work of one class or another: occasionally a public monument in the round, like those of Paoli or Captain Montague for Westminister Abbey, and of Nelson or Howe for St Paul's ; more constantly, memorials for churches, with symbolic Acts of Mercy or illustrations of Scripture texts, both commonly in low relief; and these pious labours he would vary from time to time with a classical piece like those of his earliest predilection. Soon after his election as assoviate, he published a scheme, half grandiose half childish, for a monument to be erected on Greenwich Hill, in the shape of a Britannia 200 feet high, in honour of the naval victories of his country. In 1800 he was elected full Academician. During the peace of Amiens lie went to Paris to see the despoiled treasures now actually collected there, but bore himself according to the spirit of protest that was in him. The next event which makes any mark in his life is his appointment to a chair specially created for him by the Royal Academy—the chair of Sculpture: this took place in 1810. We have ample evidence of his thoroughness and judiciousness as a teacher in the Academy schools, and his professorial lectures have been often reprinted. With many excellent observa- tions, and with one singular merit,—that of doing justice, as in those days justice was hardly ever done, to the sculpture of the medieval schools,—these lectures lack point and felicity of expression, just as they are reported to have lacked fire in delivery, and are somewhat heavy reading, The most important works

that occupied Flaxman in the years next following this appointment were the monument to Mrs Baring in Micheldever church, the richest of all his monuments in relief; that to Lord Cornwallis, destined for

| India; and that to Sir John Moore, for Corunna ; with a

pastoral Apollo for Lord Egremont. At this time the antiquarian world was much occupied with the vexed question of the merits of the Elgin marbles, and Flaxman was one of those whose evidence before the parliamentary commission had most weight in favour of the purchase

which was ultimately effected in 1816. In 1817 we find him returning to his old practice of classical outline illustra- tions, and producing the happiest of all his series in that kind, the designs to Hesiod, engraved by the friendly hand of Blake. Immediately afterwards he is much engaged designing for the goldsmiths—a testimonial cup in honour of John Kemble, and, following that, the great labour of the famous Shield of Achilles. Almost at the same time he undertakes a frieze of Peace, Liberty, and Plenty, for the duke of Bedford's sculpture gallery at Woburn, and an heroic group of Michael overthrowing Satan, for Lord Egremont's house at Petworth.

In 1820 died Mrs Flaxman, after a first warning from paralysis six years earlier, Her younger sister, Maria Denman, and the sculptor's own sister, Maria Flaxman, remained in his house, and his industry was scarcely at all relaxed. In 1822 he delivered at the Academy a lecture in memory of his old friend and generous fellow-craftsman, Canova, then lately dead; in 1823 he received from A. W. Von Schlegel a visit of which that writer has left us the record. From an illness occurring soon after tlus he recovered sufficiently to resume both work and exhibition,

but on the 26th of December 1826, he caught cold in |

church, and died three days later, in his seventy-second year. Among a few intimate associates, he left a memory singularly dear; having been in companionship, although susceptible and obstinate when his religous creed —a devout Christianity with Swedenborgian admixtures—was crossed or

slighted, yet in other things genial and sweet tempered beyond all men, full of modesty, full of playfulness and of a homely dignity withal, the truest friend, the kindest master, the purest and most blameless spirit.

Posterity will doubt whether it was the fault of Flaxman

much encouragement toa sculptor, that he is weakest when

he is most ambitious, and then most inspired when he |

makes the least effort; but so it is. Not merely does he fail when he seeks to illustrate the intensity of Dante, or to rival the tumultuousness of Michelangelo—to be intense or tumultuous he was never made; but he fails, it may almost be said, in proportion as his work is elaborate and far carried, and succeeds in proportion as it is partial and suggestive. Of his completed ideal sculptures, the St Michael at Petworth is by far the best, and is indeed admir- ably composed from all points of view ; but it lacks fire and force, and it lacks the finer touches of the chisel; a little bas-relief like the diploma piece of the Apollo and Mar- pessa in the Royal Academy compares with it favourably. Again, of Flaxman's coniplicated monuments in the round —we speak of the three in Westminster Abbey and the four in St Paul's—there is scarcely one which has not something heavy and infelicitous in the arrangement, and something empty and unsatisfactory in the surface execu- tion. But when we come to his simple monuments in relief, in these we find usually an almost complete felicity. The truth is, that he did not thoroughly understand com- position on the great scale and in the round; but he

thoroughly understood relief, and found scope in it for all |

his unrivalled gifts of rhythmical design, and tender, grave, and penetrating feeling. Of pity and love he isa _ perfect master, and shows, as no one had ever sliown before, how poignantly those passions can be expressed in the simplest conceivable combinations of human shapes and gestures.

But if we would see even these the happiest of his concep- |

tions at their best, we must study them, not in the finished monument, but rather in the casts from his studio sketches, of which so precious a collection is preserved in the Flax- man gallery at University College. And the same is true of his happiest efforts in the classical and poetical vein, like the well-known relief of Pandora conveyed to Earth by

Mercury. Nay, going further back still among the rudi- ments and first conceptions of lis art, we can realize the most essential charm of his genius in the study, not of his modelled work at all, but of his outlined and tinted sketches on paper. Of these, too, there is at University College a choice collection, and many others are dispersed in public and private cabinets. Every one knows the ex- cellence of the engraved designs to Homer, Dante, Aischy- lus, and Hesiod, in all cases save when the designer aims at that which he cannot hit, the terrible or the grotesque, To know Flaxman at his best, it is necessary to be acquainted not only with the original studies for such designs as these, but still more with those almost innumer- able studies from real life which he was continually producing with pen, tint, or pencil. These are the most delightful and suggestive sculptor's notes, so to speak, in

| existence; in them it was his habit to set down, with a

perfect feeling and directness, the leading or expressive lines, and generally no more, of every group that struck his fancy. There are groups of Italy and London, groups of the parlour and the nursery, of the street, the garden, and the gutter; andof each group the artist knows how to seize at once the structural and the spiritual secret, expressing perfectly the value and suggestiveness, for Ins art of sculpture, of the contacts, intervals, interlacements, and balancings of the various figures in any given group, and not less perfectly the charm of the affections which link the figures together and harmonize their gestures. The materials for the life of Flaxman are scattered in various biographical and other publications; the principal are the follow- ing:—An anonymous sketch in the Huropean Magazine for 1823; an anonymous " Brief Memoir," prefixed to Flaxman's Lectures, ed. 1829, and reprinted in subsequent editions; the chapter in Allan

¢ oo ; —— | Cunningham's Lives of the Most Eminent British Painters, &e., vol. or of his age, which in England offered neither training nor |

iii.; notices in the Life of Nollekens, by John Thomas Smith; m the Life of Josiah Wedgwood, by Miss G. Meteyard, London, 1865; in the Diaries and Reminiscences of H. Crabbe Robinson, London, 1869, the latter an authority of great importance; in the Lives of Stothard, by Mrs Bray, of Constable, by Leslie, of Watson, by Dr Lonsdale, and of Blake, by Messrs Gilchrist and Rossetti; a series of illustrated essays, principally on the monumental sculpture of Flaxman, in the Arf Journal for 1867 and 1868, by Mr G. F. Teniswood ; Essays in English Art, by Frederick Wedmore ; The Drawings of Flaxman, in 32 plates, with Descriptions, and an Introductory Essay on the Life and Genius of Flaxman, by Prof. Sidney Colvin, M.A., atlas fol., London, 1876, (8. C.)

FLEA, an Anglo-Saxon name, probably derived from

|" fleogan," to fly, typically applied to Pulex irritans, 4

blood-sucking insect-parasite of man and other mammals, remarkable for its powers of leaping, and unfortunately too well known, even in our own temperate climate. Its position in classification has long been soniewhat undecided ;

_a separate order was erected for it and its allies under the

various names of Suctoria, Siphonaptera, Rophotewa, and Aphaniptera, by De Geer, Latreille, Clairville, and Kirby respectively ; and it is included in the Aptera of Lamarck, MacLeay, and others, and in the Rhyngota of Fabricius. Various affinities have also been attributed to the group, which has been supposed to have relations with the Hymenoptera, Hemiptera, and Anoplura, and even with the Coleoptera (beetles). As regards the latter order, it 1s

| noteworthy that a recently discovered allied group, Plaiy- _psyllide, founded wpon a parasite on the beaver (and con-

sidered as a separate order by Westwood, under thg name Achreioptera), has been with considerable show of reason referred to the beetles by so sound an entomologist as Dr Leconte, As regards the flea, however, it is now generally accepted that its true affinities are with the Dzptera of two-winged flies, as suggested by Lamarck and Strauss Durckheim. In that order, it is by some held to occupy, as a family Pulicider (with the Platypsyllida), the position of a sub-order, at the end, under the name Aphaniptert (see Diprera, vol. vii, p. 256); but by others it is placed

before the Mycetophilide, at the head of the tribe Eucephala of the Nematocerous section of the great division Orthorhapha. The community of parasitic habits with the Hippoboscider (forest-flies and sheep-ticks) is to a certain extent the reason for the former position ; but the earlier transformations seem to indicate a stronger relationship with the Hucephala. The general characters have been given under DiprERA ; but the structure of the mouth of the perfect insect may be specified. The labrum is obsolete ; the mandibles are represented by two flat and long processes, strengthened by a mid rib, and having very finely toothed edges, and uniting with the slender central lingua to form a puncturing lancet. When not in use, this is protected by the labial palpi, which form a sort of tube. The maxille are small leathery plates, and their palpi, which are four-jointed and large, have been mistaken for antenne. The power of leaping, as well known, is very great; but there is no apparent development of the hind femora to account for it (asin many jumping beetles), although the posterior legs are saltatorial. The great muscular power of fleas has been long turned to account by public exhibitors in all countries, who have, under the pretence of taming or educating these minute creatures, made use of various contrivances to render the natural efforts of the insect to escape assume the appearance of tramed action. An account of the methods employed will be found in the American Naturalist, vol. xi. p. 7, from the pen of Mr W. H. Dall. In some cases the steady carriage of the flea is to be traced to fracture of its jumping legs. The female flea lays a few oblong white eggs, in dirty places on floors frequented by domestic animals. The larvee, before hatching, have a frontal point, used in breiking the shell of the egg. They are long and worm-like, without feet, but with two small

hooks at the tail, and short antenne and mouth organs at the head. They are very active, and apparently feed upon animal substances, forming, when full grown, a silky cocoon. Many species are known, parasitic upon various animals and birds.) They have been recorded as infesting the inside of rabbits' ears, and the neck of a fowl, from hedgehog, mar- mot, cat, dog, bat, squirrel, dormouse, ferret, weasel, hare, rabbit, rat, mouse, field-mouse, shrew, moor-hen, jackdaw, thrush, missel-thrush, blackbird, jay, bullfinch, chaffinch, yellow-hammer, pipit, blackcap, whitethroat, skylark, willow-wren, long-tailed titmouse, siskin, stuck-dove, wood- pigeon, common pigeon, starling, swallow, &c. (though it 1s by no means certain that these are all necessarily of distinct specific value); and a species has been described from the common fowl in Ceylon, A large species is often found in sandy pits, near the openings of the nests of sand-martins, and a very large one sometimes occurs in wet and marshy places, probably living upon the mole. For the latter parasite, and others in which the antenne exhibit certain Supposed peculiarities, a separate genus, Ceratopsyllus, has been proposed. In another flea, also found on the mole, no trace of eyes could be found, even under a high power. A very large species has been found on the Australian porcupine in Tasmania; and Kirby, In the Fauna Boreali-Americana, described as Pulex gigas a flea two lines long, which he believed to be the largest. known. This was taken in 65° N. lat. Westwood has re€orded 17 British Species ; and oddly enough the same number are noted from the Netherlands by Ritsema. Any notice of these parasites would be incomplete without a reference to the "jigger," 'chigoe," "bicho de pé,"

nigua," or " earth-flea,"—Dermatophilus, Sarcopsyllus, ern penetrans, SO well known as a burrower Indies e a feet of men, in sandy localities in the West be and South America. So great is this pest, that

10us trouble has been occasioned by it even to military

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expeditions in South America; and the French army in Mexico was much troubled by it. The entry is effected usually under the nail, by the impregnated female, which thereupon becomes enormously distended with an immense number of eggs. Inflammation and ulceration follow this attack, and unless great care is taken in extracting the insect, serious illness

and even death result. A good plate of the metamorphoses of this species is given in the volume of the American Naturalist above quoted, p. 754. For an account of the medical aspects, see Dr Laboulbéne's article on the " Chique," in the Dictionnaire Encyclopédique des Sciences Médicales (Paris, 1875), p. 239; and for an exhaustive history, Guyon's memoir in the Revue et Magasin de Zoologie for 1868 and 1869. Much attention does not appear as yet to have been paid to the Pulicide by naturalists, except as regards the anatomy of the common species. Dugés's " Recherches sur les Caracttres Zoologiques du genre Pnlex," in the Annales des Sciences Naturelles, vol. xxvii. (1832) p. 145, and J. Kiinckel's observations in the Annales de la Société Entomologique de France, 5e sér. ili, p. 129, and, as regards P. irritans, W. H. Furlonge's descriptions in the journal of the Quekett Microscopical Club, 1871, p. 189, and 1873, p. 12, and C. Ritsema's in the Album der Natuur, xi. (1872), p. 65, may be specially noticed. The name "flea" is frequently erroneously applied to many jumping or lively insects not allied to the Pudi- cide ; for instance, the "turnip-flea" is a small beetle, Phyllotreta undulata, one of the Halticide. (B.C. R.) FLECHIER, Esprir (1632-1710), bishop of Nismes, a respectable author, and one of the most celebrated preachers of his age, was born at Pernes, department of Vaucluse, on the 10th of June 1632, and educated at Tarascon sur Rhone, in the college of the Fathers of the Congregation of Christian doctrine, of which his uncle, Hercule Audifret, also famous in his time for his talents as a preacher, was general. After having gone through the ordinary course of studies, Fléchier entered the Congregation, and, accord- ing to the constitution of the order, was immediately employed in teaching. Iu 1659 he became a professor of rhetoric at Narbonne, and there pronounced the funeral oration of M. de Rebé, archbishop of that city. A few months afterwards, the death of his uncle called him to Paris, where he laid aside the habit of the doctrinaire, and at first followed the humble occupation of a parochial catechist. He soon made himself known by his poetical compositions in Latin and French. In 1660, he addressed to Cardinal Mazarin a poem called Carmen Eucharisticum, celebrating the Peace of the Pyrenees; the following year he sang the birth of the dauphin in another poem (Genethlia- con) ; but what first made him famous was a description in Latin verse of a brilliant tournament (carrousel), Circus Regius, given by Louis XIV. in 1662. Chapelain, the most influential critic of that time, brought his name under the notice of Colbert, with the remark,

“ Fléchier est encore un trés bon poéte latin.” He was now intrusted with the education of Louis Urbain Lefevre de Caumartin, afterwards intendant of finances and counsellor of state; and as the house of his pupil’s father was then frequented by the most important personages both of the court and the city, Fléchier was introduced into the best society, and soon made many friends. He had to accompany Caumartin and his family to Clermont, where the king had ordered the Grands Jours to be held (1665), and where Caumartin was sent as keeper of the seals and representative of the sovereign. There he wrote his curious Jémotres sur les Grand Jours d’ Auvergne, first published in 1844 by Gonod, in which he relates, in a half romantic, half historical form, the pro- ceedings of this extraordinary court of justice. The duke of Montausier, who had become his patron, now procured for him the situation of lecteur to the dauphin. The

sermons of Fiéchier increased his reputation, which was afterwards raised to the highest pitch by his funeral orations. Having been chosen to pronounce that of Madame de Montausier (1672), he displayed so great ability on the occasion that in the following year he was made a member of the French Academy, along with Racine. The funeral oration of the Duchesse d’Aiguillon (1675), and, above all, that of Turenne (1676), are, with that of Madame de Montausier, his masterpieces in that branch of literature. The favours of the court now poured in upon F’léchier. The king gave him successively the abbacy of St Leverin, in the diocese of Poitiers, the office of almoner to the dauphiness, and in 1685 the bishopric of Lavaur, from which he was in 1687 promoted to that of Nismes. Here Fiéchier had occasion for the daily exercise of his great qualities, gentleness and moderation. ‘The edict of Nantes had been repealed two years before ; but the Calvin- ists were still very numerous at Nismes, and the sincerity of the conversion of such as had made abjuration was at best but doubtful. Fléchier, by his prudent conduct, in which zeal was tempered with charity, succeeded in bring- ing over some of them to his views, aud made himself esteemed and beloved even by those who declined to change their faith. During the troubles in the Cévennes, he softened to the utmost of his power the rigour of the edicts, and showed himself so sensible of the evils of persecution, and so indulgent even to what he regarded as error,

that his memory was long held in veneration amongst the Protestants of that district. Inthe famine which succeeded the winter of 1709, he did much to alleviate the prevalent distress, by assisting the poor in his diocese without regard to their religious tenets, declaring that all alike were his children, He died at Montpellier on the 16th February 1710, at the advanced age of seventy-eight. Pulpit eloquence is the branch of belles lettres in which Fiéchier excelled. He is indeed far below Bossuet, whose robust and sublime genius had no rival in that age; he does not equal Bourdaloue in earnestness of thought aud vigour of expression ; nor can he rival the philosophical depth or the insinuating and impressive eloquence of Massillon. But he is always ingenious, often witty, and nobody has carried further than he the harmony of diction,—a quality which is sometimes marred, it must be confessed, by an affecta- tion of symmetry and a love of antithesis at variance with the principles of good taste. His two historical works, the liistories of Theodosius and of Ximenes, are more re- markable for elegance of style than for the accuracy and compreliensive insight which are the chief requisites of a historian. _ The following is a list of Fléchier's works, in the order of pub- lieation :—1. La Vie du Cardinal Commendon, Paris, 1671, 4to (also published in Latin, 1699, 12mo); 2. Histoire de Théodose-le- Grand, Paris, 1679, 4to; 3. De Casibus Virorum Illustrium autore Antonio Maria Gratiano, opera et studio Sp. Flecherii, Paris, 1680, 4to; 4. Oraisons funébres, Paris, 1681, 4to and 12mo,; 5. Pané- gyriques des Saints, Paris, 1690, 4to; 6. Histoire du Cardinal Ximenes, Paris, 1694, 4to; 7. Sermons de moralc préchés devant le Roi, avec des Discours synodaux et les Sermons préchés par Fléehier aux Etats de Languedoc et dans sa cathédrale, 3 vols. 12mo; 8. Cures posthumes, contenant ses Harangues, Compliments, Discours, Poésies Latines, Poésies francaises, Paris, 1712, 12mo; 9. Mande- ments ct Lettres pastorales, Paris, 1712, 12mo; 10. Lettres choisies sur divers sujets, Paris, 1715, 2 vols. 12mo. The most complete collection of his works is that of the Abbé Ducreux, canon of Auxerre, Nismes, 1782, 10 vols. 8vo. Another edition, with a notice of his life by A. V. Fabre of Narboune, Paris, 1825-28, 10 bins 8v0, is very defective. His Mémoires sur lcs Grands Jours Sa eee aia published in 1844 (2d edit., with a Notice by th ite French Wa nee te Mee Paris, 1862). A MS. a few compositions by Fiéchior ep pt sae ate i. eae are as yet unpublished. For Figchier's es a: 4 ae wilewd du Jarry, Oraison funebre @E. Fléchi rom on ae "Pari: échier, évéque de Nimes, Paris,

1710, 4to; Ch. F. Trinquel , Lah i 4 Nimes, Nismes and Pane ee ge OMe Ee a

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FLECKNOE, Ricuarp, a poet and dramatic writer in the reign of Charles IJ. He was an Irishman by birth, and was originally a priest of the order of Jesus. Like many of the small wits and minor poets of that day, Flecknoe owes the rescue of his name from oblivion to the satirical genius of Dryden. That satirist availed himself of Flecknoe's name as a stalking horse from behind which to assail the poetaster Shadwell, who had been appointed to replace him in the laureateship. The opening fives of this satire may be quoted as a specimen of the whole :—

«« All human things are subject to decay ; And when fate summons, monarchs niust obey. This Flecknoe found, who, like Augustus, young Was called to empire, and had governed long ; In prose and verse was owned without dispute Throughout the realms of nonsense absolute."

It is but fair, however, to remark, that clever and effect- ive as this poem is, it is in its application to Flecknoe utterly unjust. Flecknoe was the author of several plays, only one of which, Love's Domenion, printed in 1654, was acted, This piece was republished in 1674, as Love's Kingdom, a Pastoral Trage-Comedy. This was not the play as acted, but as re-written and corrected, His minor pieces, thuugh possessing no great merit in the matter of versification, nevertheless contain many happy turns of thought and felicities of expression. His Damoiselles a la Mode, printed in 1677, and addressed to the duke and duchess of Newcastle, and Sir W. Davenant's Voyage to the Other World, are a witty exposure of the literary and dramatic foibles of the day. 'The characters of the first named, he says in his preface, are " like so many precious stones I have brought out of France, and as a lapidary set in one jewel to adorn our English stage." They are adaptations from Moliére. His unpopularity among the players, and the satire of Dryden, upon whom, nevertheless, Flecknoe composed a witty and graceful epigram, must have been in a great measure owing to his attacks on the immorality and general worthlessness of the English stage. An interesting but almost unknown production of Flecknoe's is The Idea of His Highness Oliver late Lord Protector, &c., London, 1659,—an

appreciative estimate of Cromwell's character, as evidenced in his parliamentary career and his achievements as soldier and statesman. Flecknoe died in

1678.

His principal remaining works are—LErmina, Lady; The Marriage of Oceanus and Britannia ; Epigrams and Enigmatical Characters, 1670, in 8vo; Afiscellanea, or poems of all sorts, with divers other pieces, 1653, in 12mo; Diarwm, O the Journal, divided into twelve Jornadas, in burlesque verse, London, 1656, in 12mo. See also his Discourse of the English Stage, first published in the volume for 1669 of the Roxburgh Library, edited by Mr W. C. Hazlitt.

FLEETWOOD, or Fieutwoop-on-WyRz, @ market- town, watering-place, and seaport of Lancashire, England, 22 miles by rail from Preston. It dates its rise from 1836, and takes its name from Sir P. H. Fleetwood, by whom it was laid out. The principal buildings are St Peters church, the Roman Catholic church, the Whitworth institute, and the Euston barracks, which have quarters for 300 men and 60 officers. The harbour is safe and eX-tensive, and the shipping accommodation was mcreas in 1877 by the completion of a new dock, with an ane of 10 acres and a maximum depth of 34 feet. Steamers ply regularly from Fleetwood to Belfast and the Isle of Man. The value of the imports in 1876 was £162,984 and of the exports of British produce £507. Population in 18/1,

4428,

FLEETWOOD, Crartss, lord-deputy of Treland under the Commonwealth, and son-in-law of Cromwell, was born most probably in 1620. Entering the ranks of the ve mentary forces, he rose in 1644 to the rank of colonel

or the Chaste

horse, and in 1645 was appointed governor of Bristol.

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the battle of Dunbar in 1650 he was lieutenant-general of the horse ; and at the battle of Worcester in 1651, the division commanded by him contributed chiefly to the victory of the parliamentary army. After the death of his first wife he was married to Bridget, eldest daughter of Cromwell and widow of Ireton ; and in the same year he was appointed commander-in-chief of the forces in Ireland. In 1654 he became lord-deputy, but manifested such weakness and irresolution in dealing with the different political parties of Ireland that Cromwell in 1655 found it necessary to recall him. He was honoured shortly after- wards, however, by being nominated one of the fourteen major-generals to whoni the internal administration of the Commonwealth was entrusted. On the death of the Lord Protector he made an attempt, by means of his influence with the troops, to supplant Richard Cromwell; but he wanted sufficient ability and energy to carry out his pur-pose, and in the midst of his intrigues the nation recalled the exiled Stuarts, Fleetwood's prominent position marked him out as an object of vengeance to the restored king, and it was only with very great difficulty that he escaped with his life. Not long after the Restoration he died in wretchedness and obscurity at Stoke Newington, whither he had retired. That defect in his character which helped to ruin both him and the Protectorate did not escape the shrewd observation of Cromwell, who, in a letter written shortly after Fleetwood's marriage to Bridget Cromwell, gives him the exhortation, "Take heed of your natural inclination to compliance."

FLEETWOOD, Witiram (1656-1723), a learned English bishop, was descended of an ancient family in Lancashire, and was born in the Tower of London, January 21, 1656. He received his education at Eton and at King's College, Cambridge. About the time of the Revolution he entered into holy orders, and was shortly afterwards made rector of St Austin's, London, and lecturer of St Dunstan's inthe West. He became canon of Windsor in 1702, and in 1706 he was nominated to the see of St Asaph, from which he was translated in 1714 to that of Ely. He died at Tottenham, Middlesex, on the 4th August 1723, Bishop Fleetwood was regarded as the best preacher of

his time, and his character stood deservedly high in general estima- tion. In liberal and enlightened piety he was considerably i advance of his age.

His principal writings are—Zssay on Miracles, 1701 ; Chronicum Preciosum, 1707; and Free Sermons, 1712, containing sermons on

the death of Queen Mary, the duke of Gloucester, and King William. A collected edition of his works was published in 1737,

FLEMING, Pavut (1609-1640), a German poet, was born at Hartenstein, a village in Saxony, on October 5, 1609. His father, a clergyman, was transferred while Paul was stilla child to a higher post at Wechselburg ; and here, on the charming banks of the Mulda, Fleming grew to boyhood, being treated with great affection by a kind and intelligent stepmother. From about the age of four- teen he attended school in Leipsic, and five or six years later he became a student at the university of that town.

© Was a youth of manly and generous character, and soon 8ave evidence of poetical talent in the occasional verses he Ne already fond of writing. He had many friends among

Ig fellow-students, and keenly enjoyed his life in Leipsic ; if In 1633 he was driven away by the horrors of the ; tty Years' War. It happened that about this time the uke of Holstein had resolved to send an embassy to Persia, Mi the view of Opening for his subjects new channels of ae hrough Olearius, who was made secretary of the mbassy, and afterwards wrote an interesting account of its Piret enss the young poet heard of the duke's purpose. 'led by the Prospect of foreign travel, and with a vague tea that great results might be achieved by bringing East [

and West into closer contact, he went to Holstein and offered the duke his services. The offer was accepted ; and when, a few months later, the embassy started, Fleming accom- panied it as a subordinate official. Difficulties arose at Moscow, and the chiefs of the expedition returned to Holstein for instructions, leaving the inferior members, among them Fleming, at Revel. Here they were detained for more than a year, but he had no reason to regret the fact, since there were in Revel many cultivated

German families who received him with pleasure. In the spring of 1636 the embassy set off anew, and it was absent rather

more than three years, reaching Ispahan in 1637, and pass-

ing through many stirring adventures on the way. The pleasure of the enterprise was marred by the tyrannical disposition of one of the leaders ; but if we may judge from the buoyant tone of the poems written during the journey, Fleming must have had many happy hours amid the strange scenes he visited, In April 1639 he found himself once more in Revel, and as a lady who had promised to become his wife had married during his absence, he now wooed a certain Fraulein Anna, who had been too young during his former visit to attract his notice. At Leipsic he had attended lectures in medicine, and after his betrothal it occurred to him to settle in Revel as a physician. He went to Leyden, and obtained a diploma ; but the fatigues of travel had helped to undermine his constitution, and on his way back to Revel he died at Hamburg, April 2, 1640, when little more than thirty years of age.

His fame was not very great in his own day; but it has steadily increased ever since, and he is now universally admitted to have been the most brilliant German poet of the 17th century. After the Reformation, poetry almost died out in Germany; it could not make itself heard amid the noise of contending theological sects. Martin Opitz, the founder of the so-called First Silesian school, heralded the approach of a new literary epoch. Fleming began his career as a disciple of this author, whose methods of versification he adopted; and without being aware of it he speedily rose far above his master. The younger poet had genius, of which there is no trace in the correct but tedious compositions of Opitz, Some of the rudeness of lis age still clung to Fleming; but his feeling is always intense, and he often gives it voice in lines of exquisite melody. Although he does not seem to have searched laboriously for appropriate epithets, he is justly famous for the wealth, aptness, and beauty of his phraseology. His genius was purely lyrical, and he never sought to pass beyond the limits which nature had imposed upon him. Within these limits, however, the range of his Geist und Weltliche Poémata is unusually wide. In his religious poetry—notably in the well-known hymn beginning "In allen meinen Thaten ?— the sorrows of a

generation tormented by a fearful war found pathetic utterance; but this did not hinder him from writing some of the gayest and most alluring love verses in the German language. His sonnets breathe a spirit of lofty independence, betokening a mind which has grappled seriously with the hardest problems of life, but which has lost none of the confidence, ardour, and charm of youth.

Fleming's writings were admirably edited by the late T. M. Lappenberg. As, however, alarge number of them relate to special events, and the poet did not always succeed in giving these events an ideal interest, most readers will be satisfied with the ample selec- tion from his works in the second volume of the series entitled Deutsche Dichter des siebzehnien Jahrhunderts, edited by K. Godeke and J. Tittmann (Leipsic, 1870). A valuable study of the poet will be found in Varnhagen von Ense's Biographischen Denk- matlen, bd. iv. (Berlin, 1826).

FLEMISH LITERATURE. See Hotzanp,

FLEMMING, or Fremmyncz, Ricwarp (died 1431), bishop of Lincoln, and founder of Lincoln College, Oxford,

was born at Crofton in Yorkshire. He was descended from a good family, and was educated at University College, Oxford. Having taken his degrees, he was made pre- bendary of York in 1406, and the next year was one of the proctors of the university. At this period of his life he embraced the doctrines of Wickliffe, and by his earnest advocacy won over many persons, some of high rank, to the side of the Reformer. But by some means a change was wrought in him, and he not only ceased to speak against the corruptions of the Roman system, but became one of Wicklitfe's most determined opponents. Before 1415 he was instituted to the rectory of Boston in Lincolnshire, and in 1420 he was consecrated bishop of Lincoln. In 1424 he attended the council of Siena, a continuation of the council of Constance, and in the presence of the pope, Martin V., made an eloquent speech in vindication of his native country. It was probably on this occasion that he was named chamberlain tothe pope. To Bishop Flemming was intrusted the execution of the decree of the council for the exhumation and

burning of Wickliffe's remains. The see of York being vacant, the pope conferred it on Flem- ming; but in consequence of the velement opposition of Henry V. to the project, it was given up, and Flemming remained bishop of Lincoln. In 1427 he obtained the royal licence empowering him to found a college at Oxford for the special purpose of training up disputants against Wickliffe's heresy. While the work was in progress the founder died at his palace at Sleaford, January 26, 1431. Lincoln College was, however, completed by his trustees, and its endowments were afterwards augmented by various benefactors.

FLENSBURG, or Fienszore, the capital of a circle in the government district of Schleswig-Holstein, Prussia, is situated at the head of the Flensburg Ford, 20 miles north by west of Schleswig. It is the most important commercial town in what was formerly the duchy of Schleswig, and possesses several wharfs, a large shipbuild- ing yard, breweries, distilleries, foundries, oil-mills, sail- cloth and paper manufactories, glass-works, copper-works, soap-works, and rice-mills. It has a number of vessels engaged in the West India trade, and in the Greenland

whale fishery; and it also carries on a considerable oyster |

trade. The principal public buildings are the market houses, the exchange, the theatre, the real school, the agricultural school, and the hospital. The cemetery is in- teresting as containing the remains of the Danish soldiers who fell in the battle of Idstedt (25th July 1850). A marble headstone has been placed at eacli grave—officers and common soldiers—with the same simple inscription on each, after the name and rank, "Fell at Idstedt." The colossal Lion monument, erected by the Danes to com- memorate the victory of Idstedt, was removed to Berlin in 1864. Flensburg was founded in the 12th century, and received the privileges of a town from King Waldemar in 1284, The population in 1875 was 26,525. FLETCHER, Anprew (1653-1716), of Saltoun, a pro- minent figure in Scotch history during the latter half of the 17th century, was born in 1653 at his ancestral home in East Lothian, and for five years was taught by the cele- brated Gilbert Burnet, who was then minister of the parish of Saltoun. On reaching manhood he visited the Conti- nent, where he spent several years in travel and study. In 1681 he was returned as commissioner for his native county to the Scottish

parliament, where he distinguished himself by such determined opposition to the arbitrary measures of the court that he was forced to seek refuge in Holland, while sentence of outlawry (with confiscation of his estates) was passed against him. Four years later he joined the expedition of the duke of Monmouth ; but on their landing at Lyme in Dorsetshire, he had the misfor-

tune to kill the mayor of the town in a quarrel, and was compelled once more to seek safety abroad, During the second period of exile he travelled in disguise through Spain, where he had some romantic adventures. He next made a tour through Hungary, where he fought as a volunteer in a Turkish campaign; and finally at the Hague he took an active part in forwarding the scheme of the English Revolution. In 1688 he returned to Scotland when he at once regained his estates, aud also sat as a member in the Scottish convention and afterwards in the parliament. An enemy ofthe monarchical form of govern- ment, he began to oppose the ministry of William almost as stoutly as he had resisted that of Charles ; and that he exercised power in parliament is shown by the triumphant passing of the Act of Security of 1703, which, ripened under his care, contained two important constitutional laws restraining the power of the monarch of making war with- out the consent of parliament, and providing that all places and offices should be given by parliament, During the years of negotiations, as leader of the national purty, he was consistent in his objections to the projected terms of the union of the crowns of England and Scotland, and supported his measure of limitations in animated speeches, After the Union he retired from public life ; but in 1710 he did his country a real if homely service by introducing from Holland the art of making pot barley, and also the use of fanners for sifting grain. He died in London in 1716. A contemporary describes him as a 'low, thin man, of a brown complexion ; full of fire; with a stern, sour look." Among the small band of good early Scotch prose authors he holds a prominent place, and in the domain of polities he is the most readable and entertaining of them all. His style has the singular freshness of foreign culture, and, charged with strong feeling, his sentences frequently turn into for- cible epigrams. But both his writings and his speeches possess a value beyond that of literary excellence; they afford us bright glimpses of the manners and state of the couutry of his time. In

literature his name is best known in connexion with an often quoted remark, which occurs in An Account of a Conversation concerning a right Regu- lation of Governments for the Common Good of Mankind — "T said I knew a very wise man so much of Sir Christopher's [Musgrave] sentiment, that he believed if a man were per- mitted to make all the ballads he need not care who should make the laws of a nation. And we find that most of the ancient legislators thought they could not well reform the manners of any city without the help of a lyric, and sometimes of a dramatic poet."

See The Political Works of Andrew Fletcher, Esg., Glasgow, 1749, to which estimates of his character by Rawlinson and Lockhart are prefixed ; Essay on his Life and Writings, by the Earl of Buchan, 1792; Historical Account of the Ancient Rights and Power of the

Parliament of Scotland, 1823, a laboured, interesting treatise, first published anonymously and now attributed to Fletcher.

FLETCHER, Gites (1548-1610), LL.D., father of the poets Giles and Phineas Fletcher, was himself a very dis- tinguished man. He was born at Watford, in 1548; he studied at Cambridge, and after a stormy youth represented Winchelsea in parliament in 1585. In 1587 he travelled in Holland and Germany, and spent 1588-89 in Russi. In 1591 he printed his singular work, Zhe Russ Com- monwealth, which was suppressed for fear of angering the czar; in 1593 he brought out a volume of poems entitle Iicia. He died in 1610.

FLETCHER, Gres (1584-1623), English poet of the 17th century, was born in London about 1584. He was the second son of Dr Giles Fletcher, nephew of Richard Fletcher, bishop of London, cousin of John Fletcher the dramatist, and younger brother of Phineas Fletcher. He went very young to Cambridge, and as early as 1603 ne contributed a poem on the death of Queen Elizabeth to &

"volume entitled Sorrow's Joy. He was a bachelor of divinity.of Trinity College, and remained at the university

until 1617 or later. In 1610 he published his great poem of Christ's Victory and Triumph, of which a second edition appeared in 1632. In 1612 he edited the Kemams of his cousin Nathanial Pownoll. It is not known in what year he was ordained, but he became a famous preacher from the pulpit of St Mary's, and was popular for the florid religious rhetoric then in vogue. He left Cambridge to accept, it is supposed from the hand of Lord Bacon, the rectory of Alderton, on the coast of Suffolk, where "his clownish and low-parted parishioners valued not their pastor according to his worth, which disposed him to melancholy and hastened his dissolution." In 1623 he published The Reward of the Faithful, a theological treatise in prose, and died in the same year, leaving a widow. The principal work by which Giles Fletcher is known is one of the most remarkable religious poems in the language. _ Its full title is Chrost's Victory and Triumph, in Heaven, in Earth, over and after Death. It is in four cantos, divided according to the suggestion of the title; the metre is an eight-line stanza adapted from the Spenserian by the omission of the seventh line. (Giles Fletcher, like his brother Phineas, was a disciple of Spenser, whom he follows with more vigour and brilliance than any poet of his time. His style has much more nervous strength, terseness, and melody than his brother's, and-he had his subject far more thoroughly under control. In his very best passages Giles Fletcher attains to a rare sublimity, and toa rich, voluptuous music which charmed the ear of Mil- ton, It was his misfortune to live in an age which con- sidered the poems of Marini and Gongora insuperable, and he strives too often to outdo these his patterns in grotesque conceit, But when he is carried away by his theme, and forgets to be ingenious, he attains an extraordinary solemnity and harmony of style. His description of the Lady of Vain Delight, in the second canto, has been greatly admired ; the portrait of Justice is even nobler still, and of the first order of poetry. Milton did not hesitate to borrow very considerably from the Christ's Victory and Triwmph in his Paradise Regained. Fletcher died in 1623.

The poetical writings of the Giles Fletchers, father and son, have been edited by Dr A. B. Grosart, who has succeeded in clearing Up a great deal of the obscurity that till lately lay around their

careers. The Russ Commonwealth has been reprinted and edited by

Mr Bond. The prose works of Giles Fletcher the younger have never been reprinted.

FLETCHER, Joun (157 93-1625). See Beaumont AND FLETcHer,

FLETCHER, Purgas (1582-c. 1665), English poet, and brother of Giles Fletcher the younger, was the eldest son of Dr Giles Fletcher. He was born at Cranbrook, in Kent, In April 1582. He wag admitted a scholar of Eton, and in 1600 entered King's College, Cambridge. In 1603 he contributed verses to Sorrow's Joy. He was in priest's orders in 1611. In 1614 his pastoral drama of Sicelides was acted before the university, He left Cambridge to become chaplain to Sir Henry Willoughby in 1616; the same patron presented him in 1621 with the rectory of

*ilgay in Norfolk; in the same year he married. He oe his eldest son Edmund, in honour, no doubt, of P mund Spenser, for whom he preserved an intense AS can Tn 1627 he published his long poem, in Latin ao of Locuste, or the Apollyonists, a furious a fe against the J esults. Next year appeared a fine i. ae Poem, entitled Britain's Ida, which was a * on the title-page to Spenser ; but many critics, re >" oad Dr A. B. Grosart, consider it to be ome 0 See Fletcher. The drama of Sicelides was oo In 1631, In 1632 he brought out a theological – ~#ulse IN prose, entitled Joy in Tribulation, and in 1633*

his magnum opus, the famous poem of The Purple Island. His Piscatory Eclogues and Miscellaneous Poems appeared on the same occasion. It is believed that in 1650 he was ejected from his living, but nothing is known of the date or circumstances of his death. In the preface to his posthumous prose work, A Father's Testament, published in 1670, he is spoken of as having been some years dead. The Purple Island, or the Isle of Man, is a poem in twelve cantos, describing in cumbrous allegory the whole physio-logical and intellectual construction of the human body. The veins are spoken of as rivers, the bones as mountains, aud the ingenuity as well as scientific knowledge displayed is very considerable. 'The manner of Spenser is preserved throughout, though not so closely as to destroy the distinct flavour of original genius. The allegory itself is found very tedious and prosaic at the present day; but some of the reflective passages, and the

rich, jewelled descriptions of Arcadian scenery possess living charm. Five cantos are occupied with the phenomena of the body, and seven with those of the mind. The Piscatory LEclogues have nothing to do with fishing ; they are simply pastorals in the usual style, the characters being supposed to be fisher- boys reposing by the river Cam. 'The poetry of Phineas Fletcher never approaches the occasional sublimity of that of his brother Giles ; it carries the Marini manner to a still more tasteless excess; but it is generally fluent, Juxurious, and lacking neither colour nor music,

A very complete edition of the poetical works of Phincas Fletcher, in 4 vols., was privately printed by Dr Grosart in 1868, It is the only careful reprint that has been issued.

FLEURANGES, Rozsrr (IIL) pz 1a Marcx, SeIGNEUR DE (1491-1537), marshal of France, historian, was born of an ancient family at Sedan in 1491. A fondness for military exercises displayed itself in his earliest years, and at the age of ten he was seut to the court of Louis XIL, and placed in charge of the count of Angouléme, afterwards King Francis I. In his twentieth year he married a niece of the Cardinal d'Amboise, but after three months he quitted his home to join the French army in the Milanese. With a handful of troops he threw himself into Verona, then besieged by the Venetians; but the siege was protracted, and being impatient for more active service, he rejoined the army. He then took part in the relief of Mirandola, besieged by the troops of Pope Julius IL., and in other actions of the campaign. In 1512, the French being driven from Italy, Fleuranges was sent into Flanders to levy a body of 10,000 men, in command of which, under his father, he returned to Italy in 1513, seized Alexandria, and vigorously assailed Novara. But the French were defeated, and Fleuranges narrowly escaped with his life, having received more than forty wounds. He was rescued by his father and sent to Vercellz, and thence to Lyons. Returning to Italy with Francis L in 1515, he distinguished himself in various affairs, and especially at Marignano, where he had a horse shot under him, and contributed so powerfully to the victory of the French that the king knighted him with his own hand. He next took Cremona, and was there called home by the news of his father's illness, In 1519 he was sent into Germany on the difficult errand of inducing the electors to give their votes in favour of Francis I.; but in this he failed. The war in Italy being rekindled,

Flcuranges accompanied the king thither, fought at Pavia (1525), and was taken prisoner with his royal master. The emperor sent him into confinement in Flanders, where he remained for some years. During this imprisonment he was created marshal of France. He employed his enforced leisure in writing his [istoire des choses mémorables advenues du régne de Louis XII. et de Francois I., depuis 1499 jusqw en Van 1521. In this work he designates himself Jeune Adventureux. Within a small

compass lic gives many curious and interesting details of the time, writing only of what he had seen, and in a very simple but vivid style. The book was first published in 1735, by Abbé Lambert, who added historical and critical notes; and it has been reprinted in several coilections. The last occasion on which Fleuranges was engaged in active service was at the defence of Peronne, besieged by the count of Nassau in 1536. In the following year he heard of his father's death, and set out from Amboise for his estate of La Marck; but he was seized with illness at Longjumeau, and died there in December 1537.

FLEUR-DE-LIS, an heraldic device. Concerning its origin the most diverse theories have been broached. According to an old tradition, it was first employed as an armorial bearing by Clovis I, and represents the lily pre- sented by an angel to that monarch at his baptism, the three fleurs-de-lis of his shield being tle sign of the Trinity. Newton (Display, p. 145) considers it to be the figure of a reed or flag in blossom, used instead of a sceptre at the proclamation of the Frankish kings. In the opinion of Chifflet, the device was first adopted by Louis VII. of France, surnamed le Jeune, in allusion to his name Louis Florus. Some, again, have held that it is the extremity of the francisque, a kind of javelin anciently used in France. An objection fatal to the above and other theories assigning to the fleur-de-lis a purely French origin is that it was early an ornament of the sceptres, seals, and robes, not only of the Merovingian, but of Greek, Roman, German, Spanish, and English kings, and was a symbol employed by many noble families in various parts of Europe in the 12th and 13th centuries. It is stated to occur, very per- fectly sculptured, in the head-dresses of Egyptian sphinxes (Notes

and Queries, 2d ser., i. p. 226). Gioja of Amalphi is said by Moreri to have marked the north end of the needle of the mariner's compass with a fleur-de-lis in honour of the king of Naples; but see Compass, vol. vi. pp. 225 and 227. Since the 12th century the fleur-de-lis, or " flower-de-luce" (Shakespeare), has been employed as the symbol of royalty in France.

See HerAtpry ; Berry, Eneyclopedia Heraldica, vol. i., 1828 ; Boutell, Heraldry, 1865: and Larousse, Dictionnaire Universel du ALIX Stéele, t. viii.

FLEURY, Anpré Hercure ve (1653-1743), cardinal, the celebrated minister of Louis XV. of France, was born in 1653 at Lodéve, in Langnedoc. He was educated by the Jesuits at Paris, and became successively almoner to Marie Thérase, queen of Louis XIV., in 1698 bishop of Fréjus, and in 1715 preceptor to the young prince, who after- wards succeeded to the throne as Louis XV. On the death of the regent Orleans in 1723, Fleury advised his royal pupil to choose the duke of Bourbon as minister, and was himself made a member of the council. In 1726, being then in his seventy-third year, he received a cardinal's hat, and was called to the office of prime minister, which he held till his death in 1743. At the time when Fleury was entrusted with the direction of affairs, the condition of France was truly deplorable. The nation was im- poverished and worn out, and the exchequer emptied by the long wars of the Grand Monarque and the extravagances of the regent. Commerce was annihilated, public credit ruined, the Government held in contempt, aud the church distracted by internal dissensions. Fleury immediately set himself to the task, and effected important reforms. Though he was a confirmed friend to peaceful measures, he was twice driven by court intrigues to take part in foreign wars,—first in the case of Stanislaus Leczinsky, the dethroned king of Poland, whose daughter Louis XV. had married; and afterwards in that of the Austrian Succession, of which he did not live to see the end. In these wars, his economy, which bordered on avarice, was fatal to the

cause espoused by France. The navy, neglected for fear of the expense, was no longer equal to any emergency, The Polish war he had energy neither to avert nor to carry on effectively. The meanly equipped expedition which he

sent to the coasts of Pomerania could not but fail, notwith- standing the heroism displayed at Dantzic by the count of Plélo and his 1500 soldiers. One of the most useful acts of Fleury's administration was the completion of the Royal (now the National) Library, which he enriched with many valuable manuscripts, chiefly in the Oriental languages. He was a scholar of considerable attainments. The French Academy elected him as a member in 1717, the Academy of Sciences followed this example in 1721, and the Academy of the Inscriptions et Belles-Lettres in 1725. He was also provisor of Sorbonne, and superior the college of Navarre.

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FLEURY, Craups (1640-1723), the famous ecclestas- tical historian, was born at Paris, December 6, 1640. Destined for the bar by his father, he was placed at the college of Clermont (now that of Louis-le-Grand), where the sons of the first families of France were educated. After passing brilliantly through the regular collegiate studies, he was nominated an advocate to the parliament of Paris in 1658, and continued during nine years to pursue the legal profession. Feeling a strong desire to enter the church, being fond of solitude, but especially influenced by the religious sentiments which he had imbibed during his early education, he renounced the law-—which, with history and literature, up to this time had formed the principal objects of his study—in order to devote himself to theology exclusively. He had already been some time in holy orders, when Louis XIV., in 1672, selected bim as tutor of the princes of Conti; and so well did he acquit himself in this office, that the king intrusted to him afterwards the education of the count of Vermandois, one of his natural sons ; and at the death of the young prince, Fleury received as recompense for his services the abbey of Loc-Dieu, 10 the diocese of Rhodez, Five years after this (1689) he was appointed sub-

preceptor of the dukes of Burgundy, of Anjou, and of Berri. He thus became intimately associated with Fénelon, the chief preceptor of his royal pupils. In 1696 he was selected to fill the place of La Bruyére in the French Academy ; and on the completion of the education of the young princes, the king bestowed upon him the rich priory of Argenteuil, in the diocese of Paris (1706). On assuming this benefice he resigned that of the abbey of Loc-Dieu, thus setting an example of rare disinterestedness. It was about this time that he decided, according to the suggestions of his friends, on commencing his great work, for which he had been collecting materials for thirty yen the Histoire Ecclésiastique. Hitherto France did not possess any work of equal merit in this department 0 literature. There existed many works more or less volu- minous on matters of doctrine and discipline ; but no ont had written a history of the church,—a complete and scientific exposition of the progress of Christian society, 0 its organization and its primitive doctrine, of its vane changes in connexion with the state, of the success!v? development of its institutions, of all the modifications a troduced into its symbols and its' rites. Fleury evidently the intention of writing a history of the chur!

_ vols, 8vo, carries the work down to 1684.

for all classes of society; but at the time in which his |

great work appeared it was less religion than theology that absorbed the attention of the clergy and the educated pub- lic; and his work, as well as all those that had been published previously, is therefore more a work for the student than one for the people, dwelling as it does very particularly on questions of doctrine, of discipline, of supremacy, and of rivalry between the priesthood and the imperial power, while it notices very slightly general ques- tions affecting religion and morality. This fault, which was then looked upon as a merit, secured to the Histoire Ecclésiastique a very great success. The first edition, printed at Paris in 20 volumes 4to, 1691, was followed by

many others, among which may be mentioned that of |

Brussels, in 32 vols. 8vo, 1692, and that of Nismes, in 25 vols, 8vo, 1778 to 1780. The work of Fleury only comes down to the year 1414. It was continued by J. Claude Fabre and Goujet down to 1595, in 16 vols. 4to. In con- sulting the work of Fleury and its supplement, the general table of contents, published by Rondel, Paris, 1758, 1 vol. 4to, will be found very useful. Translations have been made of the entire work into Latin, German, and Italian. The Latin translation, published at Augsburg, 1758-59, 85 Fleury, wlio i been appointed confessor to the king in 1716, died in

1723.

Fleury left many works besides his Histoire Ecclésiastigque. The following deserve special mention :—Histoire du Droit fran- gots, 1674, 12mo; Catéchisme historique, 1679, 12mo; Meurs des Israélites, 1681, 12mo ; Mowrs des Chréticns, 1682, 12mo; T'raité du choix et de la méthode des études, 1686, 2 vols. 12mo ; Institution du Droit ecclésiastique, 1687, 2 vols. 12mo ; Les Devoirs des mattres et des domestiques, 1688, 12mo. The Roman Congregation of the Index has condemned the Catéchisme historique and the Institution du Droit ecclésiastique. on Fleury's biography are—Chr. Ernst Simonetti, Der Character eines Geschichtsschreibcrs in dem Leben und aus den Schriften des Abbis C. Fleury, Gottingen, 1746, 4to; J. F. Lebret, Dissertatio de C. Fleuryo, Gallo-catholico an acatholico, Tiibingen, 1800, 4to ; Chr. F. Ph. Jaeger, Notice sur C. Fleury, considéré comme historicn de VEglise, Strasburg, 1847, 8vo.

FLIEDNER, Tuzoporz (1800-1864), a German phil- anthropist and restorer of the office of deaconess to the Protestant Church of Germany, was born January 21, 1800, at Eppstein, a small village on the frontiers of Hesse and Nassau, where his father was parish clergyman. He early showed a preference for the pastoral office, to qualify himself for which he studied at the universities of Giessen and Gottingen, and at the theological seminary of Herborn. At the age of twenty he passed his final examination ; and after a year spent in teaching and preaching, he accepted a call from the Evangelical Church at Kaiserswerth, a little town on the Rhine afew miles below Diisseldorf. His spend was only £27, and the failure, soon after he was settled, of a large firm of velvet manufacturers, which sup- Plied a large proportion of the members of his congregation, rendered even this

small sum no longer secure. To provide r endowment for his church, he undertook journeys a of Germany, and then to Holland and Eng- aa : e ee with considerable success, and had opportu- ft observing what was being done in those countries perm ee reform, a subject which soon attracted his ae , he German prisons were then in a very bad = es e coum were huddled together in dirty rooms, ont. ln da and were left in complete idleness. No ——, . ee instructing them or of collecting statistics Viiedner a1 e a of useful legislation on the subject. . i rs oo undertook the work. He applied oe a i. si imprisoned for some time, in order en ae : ook at prison life from the inside. _ This pm . used, bnt he was allowed to hold fortnightly

in the Diisseldorf prison, and to visit the inmates

The books to be specially consulted |

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individually. The work grew. Those interested in the subject banded themselves together, and on June 18, 1826, the first Prison Society of Germany was founded. The fact was clearly recognized that if any permanent good was to be done, the prisoners must be looked after on their release ; and therefore in 1833 Fliedner opened at Kaiserswerth a refuge for discharged female convicts. His circle of practical philanthropy rapidly increased. The state of the sick poor liad for some time excited his interest, and it seemed to him that hospitals might be best served by an organized body of women spccially trained and devoted tv the work. Accordingly in 1836 he began the first deaconess house, and the hospital at Kaiserswerth. By their ordination vows the deaconesses devoted them- selves to the care of the poor, the sick, aud the young. They were to be dressed in a plain uniform without dis- tinctive badge, and their engagements were not final— they night leave their work and return to ordinary life if they chose. To these institutions Fliedner added in 1836 an infant school, then a normal school for infant school mis- tresses, an orphanage for orphan girls of the middle class (1842), and an asylum for female lunatics (1847). Besides these, he assisted at the foundation and in the management of various similar institutions, not only in Germany, but in different parts of Europe.

In 1849 he resigned his pastoral charge, and from 1849 to 1851 he travelled over a large part of Europe, America, and the East,—the object of his journeys being to found "mother houses," which might not merely be training schools for deaconesses, but also centres whence other training establishments might arise. He established a deaconess house in Jerusalem, and after his return assisted by counsel and money in the erection of establishments at Constantinople, Smyrna, Alexandria, and Bucharest. Among his later efforts may be mentioned the Christian house of refuge for female servants in Berlin (connected with which other institutions soon arose) and the "house of evening rest" for retired deaconesses at Kaiserswerth. These and similar labours wore out a naturally strong constitution, and in 1856 he visited the East for the sake of his health. He returned worse rather than better, and thereafter was for the most part confined to his room; he continued, however, by correspoudence to promote the objects of his life. He died October 4, 1864, leaving behind him over 100 stations attended by 430 deaconesses ; and these by 1876 had increased to 150 with an attendance of 600.

In 1855 Fliedner received the degree of doctor in theology from the university of Bonn, in recognition rather of his practical activity than his theological attainments. He scarcely seems indeed to have concerned himself with the great controversies which during his lifetime agitated the German Church, his whole life being devoted to steady, well-directed, and eminently successful efforts to benefit the poor, the weak, and the suffering. His character was marked by prompt decision, clear insight, and great prac- tical sagacity. Nor was it without traits of quaint Teutonic humour which relieved its sterner features.

Fliedner's writings are almost entirely of a practical character. He edited a periodical, Der Armen und Kranken Freund, which con- tained information regarding the various institutions, and also the yearly almanac of the Kaiserswerth institution. Besides purely educational and devotional works, he wrote Buch der Méartyrer ; Nachricht tiber das Diakonissen- Werk in der Christ, Kirche; Die evangel. Martyrer Ungarns und Stebenbiirgens; and Beschreibung der Reise nach Jerusalem und Constantinopel. All were published at Kaiserswerth. There isa translation of the German life, prepared by the family, by C. Winkworth (London, 1867). On Fliedner and

his work see also Kaiscrswerth Deaconesses, London, 1857; Dean Howson's Deaconesses, London, 1862; The Service of the Poor, by E. C. Stephen, London, 1871; Stevenson's Praying and Working, London, 1865.

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FLIGHT, FLYING MACHINES. Of the many scien-

tific problems of modern times, there are few possessing a wider or more enduring interest than that of aerial navi- gation, To fly has always been an object of ambition with man; nor will this occasion surprise when we remember the marvellous freedom enjoyed by volant as compared with nou-volant animals. The traditions of Deedalus and Icarus illustrate the attempts in the past; and at the present day societies exist in Britain, France, Austria, and other countries, for the purpose of solving, if possible, the knotty problem. These societies embrace men of the highest scientific attainments, and as they evince great activity, and publish their proceedings at regular intervals, it is not too much to expect that the problem of artificial flight will be actually solved, or at least much simplified. For the first time in the history of the world, the subject of aerial navigation has been taken up 'in earnest by practical men with the necessary degree of preliminary knowledge and training. Investigators no longer dream about flight : they experiment upon and work towards it. It is, they main- tain, a physical problem to be solved by mechanical skill and ingenuity. But while writing thus hopefully, it is necessary to state that as yet no one has succeeded in con- structing a fully equipped flying machine. The number of successful flying models, however, is so considerable as to inspire the cultivators of aeronautical science with a very confident hope of success.

The object of the present article is threefold—(1) to demonstrate the laws of natural flight ; (2) to expound the principles on which a flying machine should be constructed ; and (3) to chronicle some of the more important attempts at aerostation in modern tines.

It is not necessary to enter upon a history of artificial flight. This has already been done in the article AERo- NAUTICS, to which the reader is referred. The fact is that aerostation in its modern form dates back only a

very few years. It will suffice, then, if the modern discoveries are recorded in the order of time as we proceed.

The subject of aerostation is admitted on all hands to be one of extreme difficulty. To tread upon the air (and this is what is really meant) is, at first sight, in the highest degree utopian ; and yet there are thousands of living creatures which actually accomplish this feat. These creatures, however varied in fourm and structure, all fly according to one and the same principle ; and this is a significant fact, as it tends to show that the air must be attacked in a particular way to ensure flight. The flying machine of the future, there can be no doubt, will be constructed on the type of flying animals,—the insect, bird, and bat. It behoves us then at the outset to scrutinize very carefully the general configuration of flying animals, and in particular the size, shape, and movements of their flying organs.

Flying animals, it may be premised, differ entirely from sailing ships and from balloons, with which they are not unfrequently though erroneously compared ; and a flying machine constructed upon proper principles can have nothing in common with either of those creations. The ship floats upon water and the balloon upon air; but the ship differs from the balloon, and the ship and the balloon differ from the flying creature and flying machine. The water and air, moreover, have characteristics of theirown. The analogies which connect the water with the air, the ship with the bal- loon, and the ship and the balloon with the flying creature and flying machine are false analogies. A sailing ship is supported by the water and requires merely to be propelled ; cori creature and a flying machine constructed on the pL Sa to be both supported and propelled.

rom the fact that water is much denser than

air, and because water supports on its which fall through ain pp surface substances

eA FLIGHT

While water and air are both to be regarded as fluid media, they are to be distinguished from each other in the following particulars. Water is comparatively very heavy inelastic, and incompressible ; air, on the other

hand, is comparatively very light, elastic, and compressible. [If water be struck with violence, the recoil obtained is great when compared with the recoil obtained from air similarly treated. In water we get a maximum recoil with a minimum of displacement ; in air, on the contrary, we obtain a minimum recoil with a maximum of displacement.

Fig. 3.

Fic. 1.—Chillingham Bull (Bos Scoticus). Small travelling extremities adapted for land. 7, s, ¢, u, figure-of-8 described by the feet in walking. (Pettigrew;

1867.

Fie. _— Turtle (Chelonia imbricata). Enlarged travelling extremities (flippers) adapted for water. (Pettigrew, 1867.) ? vemiti Fic. 3.—The Bat (Phyllocina gracilis), Greatly expanded travelling extremities

adapted for air. (Pettigrew, 1867.)

Water and air when unconfined yield readily to pressure. They thus form movable fulera to bodies acting upon them. In order to meet these peculiarities the travelling organs of aquatic and flying animals (whether they be feet, fins, flippers, or wings) are made not of rigid but of elasie materials. The travelling organs, moreover, increas 10 size in proportion to the tenuity of the fluid to be acted upon. The difference in size of the travelling organs © animals becomes very marked when the land animals -” contrasted with the aquatic, and the aquatic with the aerial, as in figs. 1, 2, and 3. d ‘

The peculiarities of water and air as supporting media are well illustrated by a reference to swimming, as and flying birds, A bird when swimming extends its fee simultaneously or alternately in a backward direction, pe 50 obtains a forward recoil. ‘The water supports the bird, and the feet simply propel. In this case the bird 2 lighter than the water, and the long axis of the ete horizontal (a of fig. 4). When the bird dives, or flies 0 –

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water, the long axis of the body is inclined obliquely down- wards and forwards, and the bird forces itself into and beneath the water by the action of its feet, or wings, or both. In diving or subaquatic flight the feet strike up- wards and backwards, the wings downwards and backwards (b of fig. 4). In aerial flymg everything is reversed. The long axis of the bird ;

lifting machine. It has no analogue in nature, and, as its history sufficiently shows, is incapable of improvement. The balloon, as is well known, was introduced by the Montgolfier brothers in 1782. It was first inflated by heated air obtained by burning trusses of straw under it, then by hydrogen gas, and lastly by coal gas. It is in no

is inclined obliquely up-

wards and forwards, and

thewings strike, not down-

wards and backwards, but downwards and forwards (cof fig. 4). These changes in the direction of the long axis of the bird in swim-

ming, diving, and flying,

and in the direction of the

stroke of the wings in sub-

aquatic and aerial flight, are due to the fact that the bird is heavier than the air and lighter than the water.

The physical properties

of water and air explain

in a great measure how

the sailing ship differs

from the balloon, and how

the latter differs from the

flying creature and flying machine constructed on the natural type. The sailing ship is, as it were, immersed in two oceans,—viz., an ocean of water and an ocean of air—the former being greatly heavier and denser than the latter. The ocean of water buoys or floats the ship, and the ocean of air, or part of it in motion, swells the sails which propel the ship. The moving air which strikes the sails directly strikes the hull of the vessel indirectly and forces it through the water, which, as explained, is a comparatively dense fluid. When the ship isin motion it can be steered either by the sails alone, or by the rudder alone, or by both combined. A balloon differs from a sailing ship in being immersed in only one ocean, viz., the ocean of air. It resembles the ship in floating upon the air, as the ship floats upon the water ; m other words, the balloon is lighter than the air, as the ship is lighter than the water. But here all analogy ceases. The ship, in virtue of its being immersed in two fluids having different densities, can be steered and made to tack about in a horizontal plane in any given direction. This in the case of the balloon, immersed in one fluid, is impossible. The balloon in a calm can only rise and fall im a vertical line. Its horizontal movements, which ought to be the more important, are accidental movements due to alr currents, and cannot be controlled ; the balloon, in short, cannot be guided. One might as well attempt to steer a boat carried along by currents of water in the absence of oars, sails, and wind, as to steer a balloon carried along by currents of air. The balloon has no hold upon the air, and this consequently cannot be employed as a fulcrum for regulating its course. The balloon, because of its vast size and from its being lighter than the air, is completely at the ae of the wind. It forms an integral part, so to speak, of the wind for the time being, and the direction of the an . every instance determines the horizontal motion of ol a _ The force required to propel a balloon against ali hen erate breeze would result in its destruction. The ka. cannot be transferred with any degree of certainty na ora : he of the earth's surface to another, and hence a e' Ganger in itsemployment. It may, quite as likely

not, carry its occupants out tosea, The balloon is a mere

Fig, 4.—The King Penguin in the positions assumed by a bird in (a) swimming, (8) diving, and © flying. (Pettigrew.)

sense to be regarded a flying machine. It resembles the flying creature only in this that it is immersed in the ocean of air in which it sustains itself. The mode of suspension is wholly different. The balloon floats because it is lighter than the air; the flying creature floats because it extracts from the air, by the vigorous downward action of its wings, a certain amount of upward recoil. The balloon is passive; the flying creature is active. The balloon is controlled by the wind; the flying creature con- trols the wind. The balloon in the absence of wind can only rise and fall in a vertical line; the flying creature ean fly in a horizontal plane in any given direction. The balloon is inefficient because of its levity; the flying creature is efficient because of its weight.

Weight, however paradoxical it may appear, is necessary to flight. Everything which flies is vastly heavier than the air. The inertia of the mass of the flying creature enables it to control and direct its movements in the air. Many are of opinion that flight is a mere matter of levity and power. This is quite a mistake. No machine, however light and powerful, will ever fly whose travelling surfaces are not properly fashioned and properly applied to the air.

It was supposed at one time that the air sacs of birds contributed in some mysterious way to flight, but this is now known to be erroneous. The bats and some of the best-flying birds have no air sacs. Similar remarks are to be made of the heated air imprisoned within the bones of certain birds.1 Feathers even are not necessary to flight. Insects and bats have no feathers, and yet fly well. The only facts in natural history which appear even in- directly to countenance the flotation theory are the pres- ence of a swimming bladder in some fishes, and the existence of membranous expansions or pseudo-wings in certain animals, such as the flying fish, flying dragon, and flying squirrel. As, however, the animals referred to do

1 According to Dr Crisp, the swallow, martin, snipe, and many birds of passage have no air in their bones.—Proc. Zool, Soc. Lond., part xxy,, 1857, p. 13.

not actually fly, but merely dart into the air and there sus- tain themselves for brief intervals, they afford no real sup- port to the theory. The so-called floating animals are well depicted at figs. 5, 6, and 7.

Pigs 7:

Fra. 5.—The Red-throated Dragon (Draco hematopogon). (Pettigrew, 1867.)

Fig. 6.—The Flying Colugo (Galeopithecus volans); also called flying lemur and flying squirrel. (Pettigrew, 1867.) ¢

Fig. 7.—The Flying Fish (Exocetus exiliens). (Pettigrew, 1867.)

It has been asserted, and with some degree of plausibility, that a fish lighter than the water might swim, and that a bird lighter than the air might fly; it ought, however, to be borne in mind that, in point of fact, a fish lighter than the water could not hold its own if the water were in the least perturbed, and that a bird lighter than the air would be swept into space by even a moderate breeze without hope of return. Weight and power are always associated in living animals, and the fact that living animals are made heavier than the medium they are to navigate may be regarded as a conclusive argument in favour of weight being necessary alike to the swimming of the fish and the flying of the bird. It may be stated once for all that flying creatures are for the most part as heavy, bulk for bulk, as other animals, and that flight in every instance is the product, not of superior levity, but of weight and power directed upon properly constructed flying organs.

This fact is important as bearing on the construction of flying machines. It shows that a flying machine need not necessarily be a light, airy structure exposing an immoderate amount of surface. On the contrary, it favours the belief that it should be a compact and moderately heavy and powerful structure, which trusts for elevation and propul- sion entirely to its flying appliances—whether actively moving wings, or screws, or aero-planes wedged forward by screws. It should attack and subdue the air, and never

give the air an opportunity of attacking or subduing it, It should smite the air intelligently and as a master, and its vigorous well-directed thrusts should in every instance elicit an upward and forward recoil. The flying machine of the future, there is reason to believe, will be a veritable example of "multwm in parvo." It will launch

itself in the occan of air, and will extract from that air, by means of its travelling surfaces—however fashioned and however applied—the recoil or resistance necessary to elevate and carry it forward. Extensive inert surfaces indeed are contra-indicated in a flying machine, as they approximate it to the balloon, which, as has been shown, cannot maintain its position in the air if there are air currents. A flying machine which could not face air currents would necessarily be a failure. To obviate this difficulty we are forced to fall back upon weight, or rather the structures and appliances which weight represents, These appliances as indicated should not be unnecessarily expanded, but when expanded they should, wherever practicable, be converted into actively moving flying sur- faces, in preference to fixed or inert dead surfaces,

The question of surface is a very important one in aerostation: it naturally resolves itself into one of active and passive surface, As there are active and passive surfaces in the flying animal, so there are, or should be, active and passive surfaces in the flying machine. Art should follow nature in this matter. The active surfaces in flying creatures are always greatly in excess of the passive ones, from the fact that the former virtually increase in propor- tion to the spaces through which they are made to travel. Nature not only distinguishes between active and passive surfaces in flying animals, but she strikes a just balance between them, and utilizes both. She regulates the sur- faces to the strength and weight of the flying creature and the air currents to which the surfaces are to be exposed and upon which they are to operate. In her calculations she never forgets that her flying subjects are to control and not to be controlled by the air. As a rule she reduces the passive surfaces of the body to a minimum; she likewise reduces as far as possible the actively moving or flying sur- faces. While, however, diminishing the surfaces of the flying animal as a whole, she increases as occasion demands the active or wing surfaces by wing movements, and the passive or dead surfaces by the forward motion of the body in progressive

flight. She knows that if the wings are driven with sufficient rapidity they practically convert the spaces through which they move into solid bases of support ; she also knows that the body in rapid flight derives support from all the air over which it passes. The manner in which the wing surfaces are increased by the wing move ments will be readily understood from the accompanying illustrations of the blow fly with its wings at rest and im motion (figs. 8 and 9). In fig. 8 the surfaces exposed by

Fig. 8. Fig. 9.

Fic. 8.—Blow Fly (Musca vomitoria) with its wings at rest. (Pettigr ew.)

Fic. 9.—Blow Fly with its wings in motion as in flight. (Pettigrew) the body of the insect and the wings are, as compared with those of fig. 9, trifling. The wind would have much less purchase on fig. 8 than on fig. 9, provided the surfaces exposed by the latter were passive or dead surfaces But they are not dead surfaces: they represent the spaces occupied by the rapidly vibrating wings, which are actively moving flying organs. As, moreover, the wings trave ata much higher speed than any wind that blows, they are superior to and control the wind; they enable the

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insect to dart through the wind in whatever direction it pleases. ing tee :

The reader has only to imagine figs. 8 and 9 cut out in paper to realize that extensive, inert, horizontal aero-planes' in a flying machine would be a mistake. It is found to be so practically, as will be shown by and by. Fig. 9 so cut out would be heavier than fig. 8, and if both were exposed to a current of air, fig. 9 would be more blown about than fig. 8.

It is true that in beetles and certain other insects there are the elytra or wing cases—thin, light, horny structures— which iu the act of flight are extended horizontally and act as sustainers or gliders, The elytra, however, are com- paratively long narrow structures which occupy a position in front of the wings, of which they may be regarded as forming the anterior parts. The elytra are to the delicate wings of some insects what the thick anterior margins are to stronger wings. The elytra, moreover, are not wholly passive

structures. They can be moved, and the angles made by their under surfaces with the horizon adjusted. Finally, they are not essential to flight, as flight in the great majority of instances is performed without them. The elytra serve as protectors to the wings when the wings are folded upon the back of the insect, and as they are extended horizontally when the insect is flying they contribute to flight indirectly, in virtue of their being carried forward by the body in motion.

The manner in which the wings of the insect traverse the air, 80 as practically to increase the basis of support, raises the whole subject of natural flight. It is necessary, there- fore, at this stage to direct the attention of the reader somewhat fully to the subject of flight, as witnessed in the insect, bat, and bird,—a knowledge of natural flight preceding, and being in some senses indispensable to, a knowledge of artificial flight.

The bodies of flying creatures are, as a rule, very strong, comparatively light, and of an elongated form,—the bodies of birds being specially adapted for cleaving the air. Flying creatures, however, are less remarkable for their strength, shape, and comparative levity than for the size and extraordinarily rapid and complicated movements of their wings. To Professor J. Bell Pettigrew is due the merit of having first satisfactorily analysed those movements, and of having reproduced them by the aid of artificial wings. This physiologist in 18672 showed that all natural wings, whether of the insect, bat, or bird, are screws structurally, and that they act as screws when they are made to vibrate, from the fact that they twist in opposite directions during the down and up strokes. He also explained that all wings act upon a common principle, and that they present oblique, kite-like surfaces to the air, through which they pass much in thesame way that an oar passes through water in sculling. He further pointed out that the wings of flying creatures (contrary to received opinions, and as has been already indicated) strike downwards and forwards during the down strokes, and upwards and forwards during the up strokes. Lastly, and most important of all, he demonstrated that the Wings of flying creatures, when the bodies of said creatures are fixed, describe Jigure-of-8 tracks in space, —the figure-of-8 tracks, when the bodies are released and advancing as in

ps flight, being Opened out and converted into waved racks,

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_" By the term aero-plane is meant a thin, light, expanded structure Intended to fl i alculat P © Hloat or rest upon the air, and calculated to afford a certain wp: of support to any body attached to it.

a . the various modes of Flight in relation to Aeronautics," We sell Pettigrew, M.D., F.R.S., &¢. (Proceedings of the Royal : _ of Great Britain, March 22a, 1867); " On the Mechanical Pe lanees by which Flight is attained in the Animal Kingdom,"

¥ the same anthor (Transactions ; . p the 1. XXVI1. PARR Gh ond 90%, 1se7, SY VO

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Professor Pettigrew's discovery of the figure-of-8 and waved movements, concerning which so much has been said and written, was confirmed some two years after it was made by Professor E. J. Marey® by the aid of the '"sphygmograph." The movements in question are now regarded as fundamental, from the fact that they are alike essential to natural and artificial flight.*

The following is Professor Pettigrew's description of wings and wing movements published in 1867 :-—

"' The wings of insccts and birds are, as a rule, more or less tri- angular in shape, the base of the triangle being directed towards the body, its sides anteriorly and posteriorly. They are also conical on section from within outwards and from before backwards, this shape converting the pinions into delicately-graduated instruments balanced with the utmost nicety to satisfy the requirements of the muscular system on the one hand and the resistance and resiliency of the air on the other. While all wings are graduated as explained, innumerable varieties occur as to their general contour, some being faleated or scythe-like, others oblong, others rounded or circular, some lanceolate, and some lincar. The wings of insects may consist either of one or two pairs,—the anterior or upper pair, when two are present, being in some instances greatly modified and presenting a corneous condition.

They are then known as elytra, from the Greek éaurpov, a sheath. Both pairs are composed of a duplicature of the integument, or investing membrane, and are strengthened in various directions by a system of hollow, horny tubes, known to entomologists as the neure or nervures. These nervures taper towards the extremity of the wing, and are strongest towards its root and anterior margin, where they supply the place of the arm in bats and birds. The neure are arranged at the axis of the wing after the manner of a fan or spiral stair,—the anterior ont occupying a higher position than that farther back, and so of the others. As this arrangement extends also to the margins, the wings are more or less twisted upon themselves, and present a certain degree of convexity on their superior or upper surface, and a corresponding concavity on their inferior or under surface,—their free edges supplying those fine curves which act with such efficacy upon the air in obtaining the maximum of resistance and the minimum of displacement. As illustrative examples of the form of wings alluded to, those of the beetle, bee, and fly may be cited,—the pinions in those insects acting as helices, or twisted levers, and elevating weights much greater than the area of the wings would seem to warrant" (figs. 10 and 11).

Fig. 11.

Fre. 10.—Right wing of the Beetle (Goltathus micans) when at rest; seen from

above. (Pettigrew, 1867.) as

Fig. 11.—Right wing of the Beetle (Goliathus micans) when in motion; seen from behind. This figure shows how the wing twists and untwists when in action, and how it forms a true screw. (Pettigrew, 1867.)

of) Suan 'To confer on the wings the multiplicity of move- ments which they require, they are supplied with double hinge or compound joints, which enable them to move not only in an upward, downward, forward, and backward direction, but also at various in- termediate degrees of obliquity. An insect with wings thus hinged may, as far as steadiness of body is concerned, be not inaptly com-

3 Revue des Cours Scientifiques de la France et de V Etranger, 1869.

4 The sphygmograph, as its name indicates, is a recording instrument. It consists of a smoked cylinder revolving by means of clock work at a known speed, and a style or pen which inscribes its surface by scratching or brushing away the lamp black. The movements to be registered are transferred to the style or pen by one or more levers, and the pen in turn transfers them to the cylinder, where they appear as legible tracings. In registering the movements of the wings, the tips and margins of the pinions were, by an ingenious modification, employed as the styles or pens. By this arrangement the different parts of the wings were made actually to record their own movements. As will be seen from this account, the figure-of-8 or wave theory of stationary and progressive flight has been made the subject of a rigorous expertmentum cructs. bs

pared to a compass set upon gimbals, where the universality of motion in one direction ensures comparative fixedness in another." ..... "All wings obtain their leverage by presenting oblique surfaces to the air, the degree of obliquity gradually increasing in a direction from behind, forwards and downwards, during extension when the sudden or effective stroke is being given, and gradually decreasing in an opposite direction during ficxion, or when the wing is being more slowly reeovered preparatory to making a second stroke. The effective stroke in insects, and this holds true also of birds, is therefore delivered downwards and forwards, and not, as the majority of writers believe, vertically, or even slightly backwards. ..... The wing in the insect is more flattened than in the bird ; and advantage is taken on some occasions of this eireum- stance, particularly in heavy-bodied, small-winged, quick-flying insects, to reverse the pinion more or less completely during the down and up strokes." ..... "This is effected in the following manner. The posterior margin of the wing is made to rotate, during the down stroke, in a direction from above downwards and from behind forwards,—the anterior margin travelling in an opposite direction and reciprocating. The wing may thus be said to attack the air by a screwing movement from above. During the up orreturn stroke, ou the other hand, the posterior margin rotates in a direction from below upwards and from before baekwards, so that by a similar but reverse screwing motion the pinion attacks the air from beneath." ..... 'A figure-of-8, eompressed

laterally and placed obliquely with its long axis running from left to right of the spectator, represents the movements in question. The down and up strokes, as will be seen from this account, cross each other, the wing smiting the air during its descent from above, asin the bird aud bat,

and during its ascent from below as in the flying fish and boy's kite" (fig. 12).

Fig. 12 shows the figure-of-8 made by the margins of the wing in extension (continuous line), and flexion (dotted line), As the tip of the wing is mid-way between its margins, a line between the continuous and dotted lines gives the figure-of-8 made by the tip. The arrows indicate the reversal of the planes of — a and show how the down and up strokes cross each other. (Pettigrew,

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.... . "The figure-of-8 action of the wing explains how an insect or bird may fix itself in the air, the backward and forward reciprocating action of the pinion affording support, but no propulsion. In these instances the backward and forward strokes are made to counterbalance each other. Although the figure-of-8 represents with eonsiderable fidelity the twisting of the wing upon its axis during extension and flexion, when the insect is playing its wings before an object, or still better when it is artificially fixed, it is otherwise when the down stroke is added and the insect is fairly on the wing and progressing rapidly. In this case the wing, in virtue of its being carried forward by the body in motion, describes an undulating or spiral course, as shown in fig 13."

b

Fig. 13.—Wave traek made by the wing in progressive flight. a, 6, crests of the wave; c,d, e, up strokes; x, x, down strokes; 7, point corresponding to the anterior margin of the wing, and forming a centre for the downward rotation of the wing (4, 9); g, point corresponding to the posterior margin of the wing, and forming a centre for the upward rotation of the wing (4, f). (Pettigrew, 1867.)

... The down and np strokes are compound movements— the termination of the down stroke embracing the beginning of the up stroke, and the termination of the up stroke including the begin- ning of the down stroke. This is necessary in order that the down and up strokes may glide into each other in such a manner as to prevent jerkiug and unnecessary retardation.”?.....

“The wing of the bird, like that of the insect, is eoncavo-convex, and more or less turisted upon itself when extended, so that the anterior or thick margin of the pinion presents a different degree of curva- ture to that of the posterior or thin margin. This twisting is in a great measure owing to the manner in which the bones of the wing are twisted upon themselves, and the spiral nature of their articu- lar surfaces,—the long axes of the joints always intersecting each other at right angles, and the bones of the elbow and wrist making a quarter of a turn or so during extension and the same amount during flexion. Asa result of this disposition of the articular sur- faces, the wing may be shot out or extended, and retracted or flexed in nearly the same plane, the bones composing the wing rotating on their axes during either movement (fig. 14). The secondary action,

Extension (elbow). Flexion (wrist). F< Serene See cariaciacncnccole is F me 3 Ss

Flexion (elbow). Extension (wrist).

Fic. 14.—a, B, line along which the wing travels during extension and flexion. The arrows indicate the direction in which the wing is spread out in extension and closed or folded in flexion. (Pettigrew, 1867.)

or the revolving of the component bones on their own axes, is of the greatest importance in the movements of the wing, as it communi- eates to the hand and forearm, and consequently to the primary and secondary feathers which they bear, the precise angles necessary for flight. It in fact ensures that the wing, and the curtain or fringe of the wing which the primary and secondary feathers form, shall be screwed into and down upon the wind in extension, and unscrewed or withdrawn from the wind during flexion. The wing of the bird may therefore be compared to a huge gimlet or auger, the axis of the gimlet representing the bones of the wing, the flanges or spiral

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stroke and the converse is greatly ot or in the substance of the wing. and, when necessary, in flexing and elevating it. They ure what may be regarded as the dead weight of the useful in giving it continuous play.

thread of the gimlet the primary and secondary feathers" (figs. 15 and 16). .... . 'From this description it will be evident that by the mere rota- tion of the bones of the forearm and hand the maximum and mini- mum of resistance is secured much in the same way that this object is attained by the alternate dipping Fic. 15—Right wing of the Red-legged Partridge and feathering of an (Perdix rubra). Dorsal aspect as seen from above. oar." .... . "The (ettigrew, 1867.)

wing, both when at rest and when in motion, may not inaptly be compared to the blade of an ordinary screw propeller as employed in navigation. Thus the general outline of the wing corresponds closely with the out- line of the propeller (figs. 11, 16, and 18), andthetrack described by the wing in space ts twisted upon itself propellerfashion? (figs.

12 90,21, 22.23). The

atk ye weloals) with Fic. 16.—Right wing of the Red-legged Partridge gt r y u (Perdiz rubra). Dorsal and ventral aspects as seen which the wing is from behind; showing auger-like conformation of driven converts the wing. Compare with figs. 11 and 18. (Pettigrew,

impression or blur 1887.)

into what is equivalent to a solid for the time being, in the same way that the spokes of a wheel in violent motion, as is well under- stood, more or less completely occupy the space contained with the rim or circumference of the wheel" (figs. 9, 20, and 21).

2"The importance of the twisted configuration or screw-like form cannot e over-estimated. That this shape is intimately associated with flight is apparen from the fact that the rowing feathers of the wing of the bird are evcry, one ie them distinctly spiral in their nature; in fact, one entire rowing feather is equ valent—morphologically and physiologically—to one entire insect wing. In wh wing of the martin, where thé bones of the pinion are short, and in some pe rudimentary, the primary and secondary feathers are greatly develope oe banked up in such a manner that the wing as a whele presents the same en the as those displayed by the insect's wing, or by the wing of the eagle, is =: bones, muscles, and feathers have attained a maximum development. } pies y formation of the wing is such that it presents a waved appearance in é 'ed direction,—_the waves running longitudinally, transversely, and obliquely. 1 greater portion of the wing may consequently be removed without on in altering either its form or its functions. This is proved by making so hinds various directions, and by finding that in some instances as much as ye cht" of the wing may be lopped off without materially impairing the power of fig: (Trans. Roy. Soc. Edin,, vol. xxvi. pp. 325, 326).

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which confer upon it the degree of

flight. rule, deeply concave

strikes the air pre- th , . ' cisely as a boy's kite would if it were jerked by its string, the only difference being that the kite is pulled Jorwards upon the wind by the string and the hand, whereas in the insect, bat, and bird the wing is pushed forwards on the wind by the weight of the body and the power residing in the pinion itself" (fig. 19).

FLIGHT

.. The wing of the bat bears considerable resemblance to that of the insect, inasmuch as it consists of a delicate,

semi-transparent, continuous membrane, supported in divers direc- tions, | r

towards its anterior margin, by a system

particularly of staysor stretchers ¢

rigidity requisite for It is, as a

on its under or ven-

tral surface, and in Fie. 17.—Right wing of the Bat (Phyllocina gracilis), this

respect re- Dorsal aspect as seen from above. (Pettigrew, 1867.)

sembles the wing of the heavy-bodied birds. The movement of the bat's wing in extension is a spiral one, the spiral running alter-

nately from below upwards and forwards and from above down-

wards and _ back- wards. The action of the wing of the bat, and the move- ments of its com- ponent bones, are Py) essentially the — Fic. 18.—Right wing of the Bat (Phyllocina gracilis). as in the bird Dorsal and ventral aspects, as seen from behind. (figs. 17 and 18). These show the screw-like contiguration of the wing, i. The win and also show how the wing twists and untwists a 5B & during its action. (Pettigrew, 1867.)

Fig. 19.—The Cape Barn-owl (Strix capensis), showing the kite-like surfaces pre-

sented by the ventral aspect of the wings and body in flight. (Pettigrew,

1867,)

The figure-of-8 and kite-like action of the wing referred to lead us to explain how it happens that the wing, which in many instances is a comparatively small and delicate

Fig. 22.

Fig, 23,

Figs, 20, 21, 29 and 23 sho , 21, th when the insect is fixed he the wing ake to vious. ese. Aare tse

__ trate the various angles made by the wing with the horizon as it hastens to and

*fro, and show how the win i i : *: ,Wing reverses and reciprocates, and how it twists upon itself in opposite directions, and describes a figure-of-8 'track in space.*

WING crosses its own, track and up strokes, (Pettigrew, 1870,)

Pc ac yet attack the air with such vigour as to extract ond lt the recoil necessary to elevate and propel the flying ee The accompanying figures from one of Professor

1 :

onieee various modes of Flight in relation to Aeronautics" (Pro- "On i Royal Institution of Great Britain, March 224, 1867) ; pend. a echanical Appliances by which Flight is attained in the read Jun — (Transactions of the Linnean Society, vol. xxvi. . Tofessor of tease 20th, 1867), by J. Bell Pettigrew, M.D., F.R.S., Sor of Medicine and Anatomy, University of St Andrews.

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Pettigrew's more recent memoirs? will serve to explain the rationale (figs. 20, 21, 22, and 23).

As will be seen from these figures, the wing during its vibration sweeps through a comparatively very large space. This space, as already explained, is practically a sclid basis of support for the wing and for the flying animal, The wing attacks the air in such a manner ag virtually to have no slip,—this for two reasons. The wing reverses

instantly and acts as a kite during nearly the entire down

and up strokes, The angles, moreover, made by the wing with the horizon during the down and up strokes are at no two intervals the same, but (and this is a remarkable cir- cumstance) they are always adapted to the speed at which the wing is travelling for the time being. The increase and decrease in the angles made by the Wing as it hastens to and fro are due partly to the resistance offered by the air, and partly to the mechanism and mode of application of the wing to the air. .The wing, during its vibrations, rotates upon two separate centres, the tip rotating round the root of the wing as an axis (short axis of wing), the posterior margin rotating around the anterior margin (long axis of wing). The wing is really eccentric in its nature, a remark which applies also to the rowing feathers of the bird's wing. The compound rotation goes on throughout the entire down and up strokes, and is intimately associated with the power which the wing enjoys of alternately seizing and evading the air.

The compound rotation of the wing is greatly facilitated by the wing being elastic and flexible. It is this which causes the wing to twist and untwist diagonally on its long axis when it is made to vibrate. The twisting referred to is partly a vital and partly a mechanical act ;—that is, it is occasioned in part by the action of the muscles and in part by the greater resistance experienced from the air by the tip and posterior margin of the wing as compared with the root and anterior margin,—the resistance experienced by the tip and posterior margin causing them to reverse always subsequently to the root and anterior margin, which has the effect of throwing the anterior and posterior margins of the wing into figure-of-8 curves, as shown at figs. 9, 11, 12, 16, 18, 20, and 21.

The compound rotation of the wing, as seen in the bird, is represented in fig. 24,

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Fig. 24.—Wing of bird with its root (a, 6) cranked forwards. a, 6, short axis of wing (axis for tip of wing, 2); c, d, long axis (axis for posterior margin of wing, h, t,j, k, 1); m,n, short axis of rowing feathers of wing; r, $, long axis of rowing feathers of wing. The rotation of the rowing feathers on their long axis (they are eccentrics) enables them to open or separate during the up, and close or come together during the down strokes. e J, g p, concave shape pre- sented by the under surface of the wing. (Pettigrew, 1870.)

Not the least curious feature of the wing movements is the remarkable power which the wing possesses of making and utilizing its own currents. Thus, when the wing descends it draws after ita strong current, which, being met by the wing during its ascent, greatly increases the efficacy of the up stroke. Similarly and conversely when the wing ascends, it creates an upward current, which, being met by

the wing when it descends, powerfully contributes to the

? "On the Physiology of Wings; being an analysis of the movements by which flight is produced in the Insect, Bat, and Bird" (Trans, Roy. Soe. Edin., vol. xxvi.).

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efficiency of the down stroke. This statement can be | mobility, and comparative imponderability, presents little readily verified by experiment both with natural and arti- | resistance to bodies passing through it at low velocities, If, ficial wings. Neither the up nor the down strokes are com- | however, the speed be greatly accelerated, the action of plete in themselves.

even an ordinary cane 1s sufficient to elicit a recoil. This The wing to act efficiently must be driven at a certain | comes of the action and reaction of matter, the resistance speed, and in such a manner that the down and up strokes | experienced varying according to the density of the atmo- shall glide into each other. {t is only in this way that the sphere and the shape, extent, and velocity of the body air can be made to pulsate, and that the rhythm of the wing | acting upon it. While, therefore, scarcely any impediment and the air waves can be made to correspoud. The air | is offered to the progress of an animal in motion in the must be seized and let go in a certain order and at a certain air, it is often exceedingly difficult to compress the air speed to extract a maximum recoil. 'The rapidity of the | with sufficient rapidity and energy to convert it into a wing movements is regulated by the size of the wing, small | suitable fulcrum for securing the onward impetus. This wings being driven at a very much higher speed than larger | arises from the fact that bodies moving in air experience ones. The different parts of the wing, moreover, are madeto | a minimum of resistance and occasion a maximum of dis- . travel at different degrees of velocity—the tip and posterior | placement. Another and very obvious difficulty is traceable margin of the wing always rushing through a much greater | to the great disparity in the weight of air as compared space, in a given time, than the root and anterior margin. | with any known solid, and the consequent want of buoy- . The rapidity of travel of the insect wing is in some cases | ing or sustaining power which that disparity involves. enormous. 'The wasp, for instance, is said to ply its wings | If we compare air with water we find it is nearly 1000 at the rate of 110, and the common house fly at the rate times lighter. 'To meet these peculiarities the insect, bat, of 330 beats per second. Quick as are the vibrations of | and bird are furnished with extensive flying surfaces in the natural wings, the speed of certain parts of the wing is | shape of wings, which they apply with singular velocity amazingly increased. Wings asarule are long and narrow. | and power to the air, as levers of the third order. In this As a consequence, a comparatively slow and very limited | form of lever, as the reader is aware, the power is applied movement at the root confers great range and immense | between the fulcrum and the weight to be raised. The ; speed at the tip, the speed of each portion of the wing | power is. represented by the wing, the fulerum by the alr, . increasing as the root of the wing is receded from. 'This | and the weight by the body of the flying animal, Although is explained on

a principle well understood in mechanics, | the third order of lever is particularly inefficient when | viz., that when a wing or rod hinged at one end ‘3 made to | the fulcrum is rigid and immobile, it possesses singular

move in a circle, the tip or free end of the wing or rod | advantages when these conditions are reversed, that is, when j

describes a much wider circle in a given time than a portion the fulcrum, as happens with the air, is elastic and yrelding.

of the wing or rod nearer the hinge (fig. 25). In this instance a very slight movement at the root of the pinion, or that end of the lever directed towards the body, ;

is followed by an immense sweep of the extremity of the wing, where its elevating and propelling power is greatest,— this arrangement ensuring that the large quantity of air necessary for propulsion and support shall be compressed under the most favourable conditions.

In this process the weight of the body performs an in- portant part, by acting upon the inclined planes formed by =

the wings in the plane of progression, The power and the |

or oneny

Fic. 25 shows how different portions of the wing travel at different degrees of speed. In this figure the rod a6, hinged at z, represents the wing. When the wing is made to vibrate, its several portions travel through the spaces dbvf,jki,ght, and eae in exactly the same interval of time. The part of the wing marked 6, and which corresponds with the tip, consequently travels very much more rapidly than the part marked a, which corresponds with the root. mn,op, curves made by the wing at the end of the up and down strokes; 7, position of the wing at the middle of the stroke. (Pettigrew, 1870.)

One naturally inquires why the high speed of wings, and why the progressive increase of speed at their tips and posterior margins? The answer is not far to seek. If the 7

wings were not driven at a high speed, and if they were | Fro. 26—In this figure 7,/' represent the movable fulers furnished Dy fe no 2 p p' the power residing in the wing, and 6 the body to be moved. t eccentrics made to revolve upon two separate axes, make the problem of flight more intelligible, the lever formed by

they would of necessity be large cumbrous structures ; but | Prolonged beyond the body (0), and to the root of the wink Sy er ltd Cae ° : weight (w, w') is attached; x represents the universa joint by W : a | large heavy wings would be difficult to work, and what is is attached to the body. When the wing ascends as shown at p, the air (ful :

worse, they would (if too large), instead o i crum f) resists its upward passage, and forces the body (b) or its represey bite J lled (: g)s tead of controlling the tive (w) slightly downwards. When the wing descends as shown at p', thea Pine controlled by it, and so cease to be flying organs. (fulerum f) resists its downward passage, and forces the body @) 7 – aon ere j . tative (w') slightly upwards. From this it follows that when 4 ' 18, however, another reason why wings should be the body falls, and vice versa,—the wing describing the arc of a large circle

made to vibrate at high speeds. The air, as explained, is | {° body (6); or the weights (w, w') representing it, describing the wr a@ very licht, thi : A ae E 2 small circle. (Pettigrew, 1873.) ght, thin, elastic medium, which yields on the

slightest pressure, and unless the wings attacked it with | weight may thus be said to reciprocate, the two sii e

via" bi necessary recoil or resistance could not | it were side by side and blending their peculiar infu ed. he atmosphere, because of its great tenuity, | to produce a common result, as indicated at fig. 26.

FLIGHT

When the wings descend they elevate the body, the wings being active and the body passive ; when the body descends it contributes to the elevation of the wings,! the body being active and the wings passive. It is in this way

that weight forms a factor in flight, the wings and the weight of the body reciprocating and mutually assisting and relieving each other.. This is an argu- ment for employing four wings in artificial flight,—the wings being so arranged that the two which are up shall always by their fall mechanically elevate the two which are down. Such an arrangement is calculated greatly to con- serve the driving power, and, as a consequence, to reduce the weight.

That the weiglit of the body plays an important part in the production of flight may be proved by a very simple experment. If two quill feathers are fixed in an ordinary cork, and so arranged that they expand and arch e above it, it is found that if the apparatus be dropped from a vertical height of three yards it does not fall vertically downwards, 2 but downwards and wo forwards in a curve, ut f the forward travel 2 o

amounting in some in-

Fig. 27.—.:, b, quill feathers; c, cork; d, e, 4, 9, stances to a yard and downward and Jorward curved trajectory made ahalf. Here the cork, by the feathers and cork before reaching the in falling, acts upon

ground (A, 2). (Pettigrew, 1870.)

the feathers (which are to all intents and purposes wings), and these in turn act upon the air, in such a manner as to produce a horizontal transference. The apparatus which formed the subject of the present experiment is repre- sented at fiz. 27. _ In order to utilize the air asa means of transit, the body in motion, whether it moves in virtue of the life it possesses, or because of a force superadded, must be heavier than air. It must tread and rise upon the air asa swimmer upon the Water, or as akite upon the wind. This is necessary for the simple reason that the body must be active, the air Passive. The flying body must act against gravitation, and elevate and carry itself forward at the expense of the air and of the force which resides in it, whatever that may be, If it were otherwise—if it were rescued from the law of gravitation on the one hand, and bereft of independent movement on the other, it would float about uncontrolled and uncontrollable like an ordinary balloon,

In flight one of two things is necessary. Either the wings must attack the air with great violence, or the air in rapid Motion must attack the wings: either suffices. If a bird attempts to fly in a calm, the wings must be made to smite the air after the manner of a boy's kite with great vigour and at a high speed. In this case the wings fly the bird. If, however, the bird is fairly launched in space and a stiff

*reeze 1s blowing, all that is required in many instances is to extend the wings at a slight upward angle to the horizon 80 that the under parts of the wings present kite-like surfaces, Under these circumstances the rapidly moving alr flies the bird. The flight of the albatross supplies the bind stn illustration. If by any chance this magnificent and alights upon the sea he must flap and beat the water * air with his Wings with tremendous energy until he*

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Sect other forces which assist in elevating the wings are—(qa) the (c) the ; =. of the wings, (6) the elastic properties of the wings, and

caction of the compressed air on the under surfaces of the wings.

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gets fairly launched. This done he extends his enormous pinions' and sails majestically along, seldom deigning to flap his wings, the breeze doing the work for him. A familiar illustration of the same principle may be witnessed any day when children are engaged in their favourite pastime of kite-flying. If two boys attempt to fly a kite in a calm, the one must hold up the kite and let go when the other runs. In this case the under surface of the kite is made to strike the still air. If, however, a stiff autumn breeze be blowing, it suffices if the boy who formerly ran when the kite was let go stands still. In this case

the air in rapid motion strikes the under surface of the kite and forces it up. The string and the hand are to the kite what the weight of the flying creature is to the inclined planes formed by its wings.

The area of the insect, bird, and bat, when the wings are fully expanded, is greater than that of any other class of animals, their weight being proportionally less. As already stated, however, it ought never to be forgotten that even the lightest insect, bird, or bat is vastly heavier than the air, and that no fixed relation exists between the weight of body and expanse of wing in any of the orders. We have thus light-bodied and large-winged insects and birds, as the butterfly and heron ; and others with heavy bodies and small wings, as the beetle and partridge. Similar remarks are to be made of bats. Those apparent incon- sistencies in the dimensions of the body and wings are readily explained by the greater muscular development of the heavy-bodied, small-winged insects, birds, and bats, and the increased power and rapidity with which the wings in them are made to oscillate. This is of the utmost import- ance in the science of aerostation, as showing that flight may be attained by a heavy powerful animal with com- paratively small wings, as well as by a lighter one with greatly enlarged wings. While, therefore, there is ap- parently no correspondence between the area of the wing and the animal to be raised, there is, unless in the case of sailing insects, birds, and bats, an unvarying relation as to the weight and number of oscillations; so that the problem of flight would seem to resolve itself into one of weight, power, velocity, and small surfaces, versus buoy- ancy, debility, diminished speed, and extensive surfaces,— weight in either case being a sine gua non.

That no fixed relation exists between the area of the wings and the size and weight of the body is evident on comparing the dimensions of the wings and bodies of the several orders of insects, bats, and birds. If such com- parison be made, it will be found that the pinions in some instances diminish while the bodies increase, and the con- verse. No practical good can therefore accrue to aerosta- tion from elaborate measurements of the wings and body of any flying thing; neither can any rule be laid down as to the extent of surface required for sustaining a given weight in the air. The statements here advanced are borne out by the fact that the wings of insects, bats, and birds may be materially reduced without impairing their powers of flight. In

such cases the speed with which the Wings are driven is increased in the direct ratio of the mutilation. The inference to be deduced from the foregoing is plainly this, that even in large-bodied, small-winged insects and birds the wing-surface is greatly in excess, the surplus wing area supplying that degree of elevating and sustaining power which is necessary to prevent undue exertion on the part of the volant animal, In this we have a partial explanation of the buoyancy of insects, and the great lifting power possessed by bats and birds,—the bats carrying their young without inconvenience, the birds

2 The wings of the albatross, when fully extended, measure some 14 feet. They are exceedingly narrow, being sometimes under a foot in width.

elevating surprising quantities of fish, game, carrion, &c. (fig. 28).

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Fig. 28.—Hawk and Pigeon.

While, as explained, no definite relation exists between the weight of a flying animal and the size of its flying surfaces, there being, as stated, heavy-bodied and small- winged insects, bats, and birds, and the converse, and while, as has been shown, flight is possible within a wide range, the wings being, as a rule, in excess of what are required for the purposes of flight,—still it appears from the researches of M. de Lucy that there is a general law, to the effect that the larger the volant animal the smaller by comparison are its flying surfaces. The existence of such

a law is very encouraging so far as artificial flight is con- cerned, for it shows that the flying surfaces of a large, heavy, powerful flying machine will be comparatively small, and consequently comparatively compact and strong. This is a point of very considerable importance, as the object desiderated in a flying machine is elevating capacity.

M. de Lucy has tabulated his results as under :—

INSECTS. Nk

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*Et seg Flying BS gr sa Surface Names. eB ESBS Names. referred BESO Be to the B58 Ws Kilogramme. eo ar a i] II sq. yds. ft. in. . ft. God -Siwroees. drew ese cea|| DD 8 * 92 SWAG Wis ccsctswsnewocenes|| | Me Dragon-fly (small)..... 7 2 56 SPRITOW veccicnes cicneen ac) | Oig® Coccinella (Lady-bird).... 5 18 87 Turtle dove.. .....| 0 4 100} Dragon-fly (common)... 5 2 89 PISBONI ss, o5.2—4.2see| 0 go', 8 Tipula, or ir wha 35 11 SSEGENS os cdcrovosiesinee'wesinesnie||- 0 te, De Lie ipepencenec SoeRe Cane VabEYG…ccccsctscacteeh O, 1 G6 BOG eo… 1 2 743 Crane of Australia…| 0 0 130 Meat-fly …..... 1 3. #54; Drone (blue). iL, 2 20 Cockchafer…. ee ee We Stag-beetle Lucanus (female) + ee cervus) Stag-beetle (male)... > Ps Rhinoceros-beetle …....) 0 6 1224*

***It is easy, by the aid of this table, to follow the order, always decreasing, of the surfaces, in proportion as the winged animal in- creases in size and weight, Thus, in comparing the insects with one another, we find that the gnat, which weighs 460 times less than the stag-beetle, has 14 times more of surface. The lady-bird weighs 150 times less than the stag-beetle, and possesses 5 times more of surface, &c. It is the same with the birds. The sparrow weighs about 10 times less than the pigeon, and has twice as much surface. The pigeon weighs about 8 times less than the stork, and has twice as much surface. The sparrow weighs 339 times less than the Australian crane, and possesses 7 times more surface, &c. If now we compare the insects and the birds, the gradation will become*

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even much more striking. The gnat, for example, weighs 97,000 times less than the pigeon, and has 40 times more surface; if weighs three millions of times less than the crane of Australia, and possesses 140 times more of surface than this latter, the weight of which is about 9 kilogrammes 500 grammes (25 tb 5 oz. 9 dwt, troy, 20 tb 15 oz. 2} dr. avoirdupois).

The Australian crane, the heaviest bird weighed, is that which has the smallest amount of surface, for, referred to the kilogramme, it does not give

us a surface of more than 899 square centimetres (139 square inches), that is to say, about an eleventh part of a square metre. But every one knows that these grallatorial animals are excellent birds of flight. Ofvall travelling birds they undertake the longest and most remote journeys. They are, in addition, the eagle excepted, the birds which elevate themselves the highest, and the flight of which is the longest maintained.”?

The way in which the natural wing rises and falls on the air, and reciprocates with the body of the flying creature, has a very obvious bearing upon artificial flight. In natn- ral flight the body of the flying creature falls slightly for- ward in a curve when the wing ascends, and is slightly elevated in a curve when the wing descends, The wing and body are consequently always playing at cross pur- poses, the wing rising when the body is falling and wice versa. The alternate rise and fall of the body and wing of the bird are well seen when contemplating the flight of the gull from the stern of a steamboat, as the bird is following in the wake of the vessel, The complemen- tary movements referred to are indicated at fig. 29,

where the continuous waved line represents the trajectory _

made by the wing, and the dotted waved line that made

Fig. 29 shows how in progressive flight the wing and the body describe waved tracks,—the crests of the waves made by the wing (a, ¢, e, g, 4) being placed opposite the crests of the waves made by the body (1, 2, 3, 4, 5). (Pettigrew, 1870.)

by the body. As will be seen from this figure, the wing advances both when it rises and when it falls. It is a com dition of natural wings, and of artificial wings constructed on the principle of living wings, that when forcibly elevated or depressed, even in a strictly vertical direction, they in- evitably dart forward. If, for instance, the wing is sud- denly depressed in a vertical direction, as at a 6 of fig. 29, it at once darts downwards and forwards (see continu ous line of figure) to ¢, thus converting the vertical down stroke into a down, oblique, forward stroke. Tf, again, the wing be suddenly elevated in a strictly vertical direction, as at c d, the wing as certainly darts upwards and forwards a curve to e, thus converting the vertical up strokes into an upward, oblique, forward stroke. The same thing happens when the wing is depressed from e to f and elevated from g to h, the wing describing a waved track as at eg, 9%

There are good reasons why the wings should always be in advance of the body. A bird when flying is a body m motion; but a body in motion tends to fall not vertically downwards, but downwards and forwards. The wings con-

sequently must be in advance of the body of the bird if they are to prevent the bird from falling downwards and forwards. If the wings were to strike backwards in aerial flight, the bird would turn a forward somersault.

That the wings invariably strike downwards and forwards in aerial flight is proved alike by observation and expert ment, If any one watches a bird rising from the ground or the water, he cannot fail to perceive that the head and body are slightly tilted upwards, and tbat the wings ate made to descend with great vigour in a downward and for- ward direction. The dead natural wing and a properly constructed artificial wing act in precisely the same Way- If the wing of a gannet, just shot, be removed and mal

1 On the Flight of Birds, of Bats, and of Insects, in reference to the subject of Aerial Locomotion, by M. de Lucy, Paris. °

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to flap in what the operator believes to be a strictly vertical downward direction, the tip of the wing, in spite of him, will dart forwards between two and three feet—the amount of forward movement being regulated by the rapidity of the down stroke. This is a very striking experiment. The same thing happens with a properly con- structed artificial wing. The down stroke with the artifi- cial as with the natural wing is invariably converted into an oblique, downward, and forward stroke. No one ever saw a bird in the air flapping its wings towards its tail, The old idea was that the wings pusked the body of the bird in an upward and forward direction ; in reality the wings do not push but pull, and in order to pull they must always be in advance of the body to be flown. If the wings did not themselves fly forward, they could not possibly cause the body of the bird to fly forward. It is the wings which fly the bird, and not the converse.

It only remains to be stated that the wing acts as a true kite, during both down and up strokes, its under concave or biting surface, in virtue of the forward travel communi- cated to it by the body of the flying creature, being

closely applied to the air, during both its ascent and its descent. This explains how the wing furnishes a persistent buoyancy alike when it rises and when it falls (fig. 30).

Fig. 30 shows the kite-like action of the wing during the down and up strokes, how the angles made by the-wing with the horizon (a, 6) vary at every stage of these strokes, and how the wing evades the superimposed air during the up stroke, and seizes the nether air during the down stroke, In this figure the spaces between the double dotted lines (ag, 45) represent the down strokes, the single dotted line (A, 7) representing the up stroke. The kite-like surfaces and angles made by the wing with the horizon (a, 6) during the down strokes are indicated at edefg, jk1m,—those made during the up strokes being in- dicated at ght. As the down and up strokes run intoeach other, and the con- vex surface of the wing is always directed upwards and the ¢oncave surface downwards, it follows that the upper surface of the wing evades in a great measure the upper air, while the under surface seizes the nether air. It is easy to understand from this figure how the wing always flying forwards furnishes a persistent buoyancy. (Pettigrew, 1870.)

The natural kite formed by the wing differs from the artifi- cial kite only in this, that the former is capable of being moved in all its parts, and is more or less flexible and elastic, whereas the latter is comparatively rigid. The flexibility and elasticity of the kite formed by the natural wing are ren dered necessary by the fact that the wing, as already stated, 1s practically hinged at its root and along its anterior margin an arrangement which necessitates its several parts-travel ling at different degrees of speed, in proportion as they are removed from the axes of rotation. Thus the tip travels ata higher speed than the root, and the posterior margin than the anterior margin. This begets a twisting diagonal movement of the wing on its long axis, which, but for th elasticity referred to, would break the wing into fragments, The elasticity contributes also to the continuous play of the wing, and insures that no two parts of it shall reverse at exactly the same instant. If the wing was inelastic, every part of it would reverse at precisely the same moment, and its vibration would be characterized by pauses or dead ag at the end of the down and up strokes which would ; : atal to it as a flying organ, The elastic properties of

© Wing are absolutely essential, when the mechanism and movements of the pinion are taken into account,

— Can never be an effective flying instrument.

Pe @ kite-like surfaces referred to in natural flight are

ose upon which the constructors of flying machines very ja sal ground their hopes of ultimate success. These

a may be conferred on artificial wings, aeroplanes,

eed Screws, or similar structures ; and these structures, if

fie Judge from what we find in nature, should be of wae, size and elastic. The power of the flying organs © increased if they are driven at a comparatively high

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speed, and particularly if they are made to reverse and re- ciprocate, as in this case they will practically create the currents upon which they are destined to rise and advance. The angles made by the kite-like surfaces with the horizon, should vary according to circumstances. They should be small when the speed is high, and wice versa. This, as stated, is true of natural wings. It should also be true of artificial wings and their analogues, There is no escap- ing from natural laws. A knowledge of natural laws alone will enable us to construct (it is to be hoped in the imme- diate future) the much-desired flying machine.

Having explained as far as space would permit how water differs from air, how the sailing ship differs from the balloon, and how the balloon differs from the flying creature and flying machine constructed on the living type, and having further explained the peculiarities of wings and wing movements as witnessed in natural flight, we are now in a position to enter upon a consideration of artificial wings and wing movements, and of artificial flight and flying machines.

a a

We begin with artificial wings. The first properly au- thenticated account of an artificial wing was given by Borelli in 1670. This author, distinguished alike as a q physiologist, §mathema- tician, and mechanician, describes and figures a iit bird with artificial wings, di each of which consists of se a rigid rod in front and flexible feathers behind. pithy The wings are represented i: Phibs as striking vertically down- ¢ I Fig. 31.—Borelli's bird with artificial wings. wards, as the annexed . é sitiarton 'bsg the Hens wits. duplicate of Borelli's figure consisting of a rigid rod; oa, posterior ent f th oF i + 4 . : shows (fig. 31). flexible feathers; 5 ¢ anterior, and 7; Borelli was of opinion potetion margin a sho, let ving pe b t right; @, tai ird; A 5] that flight resulted from Yertical direction of the down stroke of the application of an in- 'he wing. (Borelli, 1670.) clined plane, which beats the air, and which has a wedge action, He, in fact, endeavours to prove that a bird wedges itself forward upon the air by the perpendicular vibration of its wings, the wings during their action forming a wedge, the base of which (c 6 ¢) is directed towards the head of the bird, the apex (a f) being directed towards the tail (d). In the 196th proposition of his work (De motu Animalium, Leyden, 1685) he states that—

" Tf the expanded wings of a bird suspended in the air shall strike the undisturbed air beneath it with a motion perpendicular to the horizon, the bird will fly with a transverse motion in a plane parallel with the horizon." "Tf," he adds, " the wings of the bird be expanded, and the under surfaces of the wings be struck by the air ascending perpendicularly to the horizon with such a force as shall prevent the bird gliding downwards (i.e., with a tendency to glide downwards) from falling,it will be urged in a horizontal direction."

The same argument is re-stated in different words as under :— "If the air under the wings be struck by the flexible portions of the wings (flabella, literally fly flaps or small fans) with a motion perpendicular to the horizon, the sails (vela) and flexible portions of the wings (flabel/a) will yield_in an upward direction and form a wedge, the point of which is directed towards the tail. Whether, therefore, the air strikes the wings from below, or the wings strike the air from above, the result is the same,—the posterior or

flexible margins of the wings yield in an upward direction, and in so doing urge the bird in a horizontal direction."

There are three points in Borelli's argument to which it is necessary to draw attention :—(1) the direction of the down stroke: it is stated to be vertically downwards; (2) the construction of the anterior margin of the wing: it is stated to consist of a rigid rod ; (3) the function delegated to the posterior margin of the wing: it is said to yield in an upward direction during the down stroke. With regard to the first point. It is incorrect to say the

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wing strikes vertically downwards, for, as already explained, | consisting of a rigid ribbing in front, and a flexible sail the body of a flying bird is a body in motion; but as a. behind. A membrane so constructed will, according to body in motion tends to fall downwards and forwards, the | him, be fit for flight. It will suffice if such a sail elevates wing must strike downwards and forwards in order effect- and lowers itself successively. Tt will of its own accord ually to prevent its fall. Moreover, in point of fact, all | dispose itself as an inclined plane, and recevoing obliquely the natural wings and all artificial wings constructed on the | reaction of the aur, it transfers into tractile force a part of natural type invariably strike downwards and forwards. the vertical impulsion it has received. 'These two parts of With regard to the second point, viz., the supposed | the wing, moreover, are equally indispensable to each other, rigidity of the anterior margin of the wing, it is only Marey repeats Borelli and Durckbeim with very trifling necessary to examine the anterior margins of natural wings modifications, so late as 1869.1 He describes two artificial to be convinced that they are in every case flexible and elastic. | wings, the one composed of a rigid rod and sail—the Similar remarks apply to properly constructed artificial | rod representing the stiff anterior margin of the wing; wings. If the anterior margins of natural and artificial | the sail, which is made of paper bordered with card wings were rigid, it would be impossible to make them | board, the flexible posterior margin. The other wing vibrate smoothly and continuously. This is a matter of consists of a rigid nervure in front and behind of thin experiment. Ifa rigid rod, or a wing with a rigid anterior | parchment which supports fine rods of steel. He states margin, be made to

vibrate, the vibration is characterized | that, if the wing only elevates and depresses itself, “the by an unequal jerky motion, which contrasts strangely with | resestance of the air is sufficient to produce all the other the smooth, steady, fanning movement peculiar to natural | movements. In effect (according to Marey) the wing of wings. an insect has not the power of equal resistance in every As to the third point, viz., the upward bending of the | part. Onthe anterior margin the extended nervures make posterior margin of the wing during the down stroke, it is | it ragid, while behind it is fine and jlexeble. During the necessary to remark that the statement is true if it means | vigorous depression of the wing, the nervure has the power a slight upward bending, but that it is untrue if it means an | of remaining rigid, whereas the flexible portion, being pushed extensive upward. bending. in an upward direction on account of the resistance it Borelli does not state the amount of upward bending, | experiences from the air, assumes an oblique position which but one of his followers, Professor E. J. Marey, maintains | causes the wpper surface of the wing to look forwards.” The that during the down stroke the wing yields until its under | reverse of this, in Marey’s opinion, takes place during the surface makes a backward angle with the horizon of 45°. | elevation of the wing—the resistance-of the air from above Marey further states that during the up stroke the wing | causing the wpper surface of the wing to look backwards, yields to a corresponding extent in an opposite direction— |... “ At first,” he says, “the plane of the wing is parallel fr the posterior margin of the wing, according to him, passing | with the body of the animal. It lowers itself—the front through an angle of 90°, plus or minus, according to cir- | part ofthe wing strongly resists, the sail which follows it cumstances, every time the wing rises and falls. being flexible yields. Carried by the ribbing (the anterior That the posterior margin of the wing yields to a slight | margin of the wing) which lowers itself, the sail or posterior extent during both the down and up strokes will readily | margin of the wing being raised meanwhile by the aar, which be admitted, alike because of the very delicate and highly | sets it straight again, the sail will take an intermediate elastic properties of the posterior margins of wings, and | position and ccline itself about 45° plus or minus according because of the comparatively great force employed in | to circumstances… .. The wing continves its move their propulsion ; but that they do not yield to the extent | ments of depression inclined to the horizon; but the impulse |

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stated by Professor Marey is a matter of absolute certainty. | of the air, which continues its effect, and naturally acts This admits of direct proof. If any one watches the | upon the surface which it strikes, has the power of resolv- horizontal or upward flight of a large bird he will observe | ing itself into two forces, a vertical and a horizontal force} that the posterior or flexible margin of the wing never rises | the first suffices to raise the animal, the second to move . during the down stroke to a perceptible extent, so that the | 7 along.”? Professor Marey, it will be observed, repro under surface of the wing never locks backwards. On the | duces Borelli’s artificial wing, and even his text, ata dis- contrary, he will perceive that the under surface of the | tance of nearly two centuries. wing (during the down stroke) invariably looks forwards The artificial wing recommended by Professor Pettt- and forms a true kite with the horizon, the angles made by | grew is a more exact imitation of nature than either the kite varying at every part of the down stroke, as shown | of the foregoing. It is of a more or less triangular form, | more particularly atc de fg, ig kl m of fig. 30, p. 317. | thick at the root and anterior margin, and thin at the tip

The authors who have adopted Borelli’s plan of artificial | and posterior margin. Vo part of itis rigid. It is on the wing, and who have endorsed his mechanical views of the | contrary highly elastic and flexible throughout. It 1s wing’s action most fully, are Chabrier, Straus-Durkheim, | furnished with springs at its root to contribute to its con- Girard, and Marey. Borelli’s artificial wing, it will be re- | tinued play, and is applied to the air by a direct piston membered, consists of a rigid rod in front and a flewible | action in such a way that it descends in a downward and sail behind. It is also made to strike vertically downwards. | forward direction during the down stroke, and ascends In According to Chabrier, the wing has only one period of | an upward and forward direction during the up stroke. activity. He believes that if the wing be suddenly lowered | It elevates and propels both when it rises and falls. au | by the depressor muscles, it is elevated solely by the reac- | moreover, twists and untwists during its action and des- tion of the air. There is one unanswerable objection to | cribes figure-of-8 and waved tracks in space, precisely Us this theory: the bats and birds, and some if not all the | the natural wing does. The twisting is most marked at

the insects, have distinct elevator muscles, and can elevate their | tip and posterior margin, particularly that half of the Wings at pleasure when not flying and when consequently | posterior margin next the tip. The wing when in action the reaction of the air is not elicited. Straus-Durkheim | may be divided into two portions by a line running agrees with Borelli both as to the natural and the artificial | diagonally between the tip of the wing anteriorly and the mo ois is of opinion that the insect abstracts from ae

r by me incli jh ees a 4 soiarcnant aed mee en . 1 Revue des Cours Scientifiques de la France et de U Etranger, 1869 In hig theology of nature he describes a alice = Ee M. le Docteur Marey, professeur au College de France. § Professor E. J. Marey, op. cit., 1869.

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root of the wing posteriorly. The tip and posterior parts of the wing are more active than the root and anterior parts, from the fact that the tip and posterior parts (the wing is an eccentric) always travel through greater spaces, in a given time, than the root and anterior parts.

The wing is so constructed that the posterior margin yields freely in a downward direction during the up stroke, while it yields comparatively little in an upward direction during the down stroke ; and this is a distinguishing feature, as the wing is thus made to fold and elude the air more or less completely during the up stroke, whereas it is made to expand and seize the air with avidity during the down stroke. The oblique line referred to as running diagonally across the wing virtually divides the wing into an active and a passive part, the former elevating and propelling, the latter sustaining.

It is not possible to determine with exactitude the precise function discharged by each part of the wing, but experi- ment tends to show that the tip of the wing elevates, the posterior margin propels, and the root sustains.

The wing—and this is important—is driven by a direct piston action with an irregular hammer-like movement, the pinion having communicated to it a smart click at the beginning of every down stroke—the up stroke being more uniform. The following is the arrangement (fig. 32). If

Mic, 32.—Elastic spiral wing, which twists and untwists during its action, to form a mobile helix or screw. This wing is made to vibrate by a direct piston action, and by a slight adjustment can be propelled vertically, horizontally, or at any degree of obliquity.

ab, Anterior margin of wing, to which the neurz or ribs are affixed. ¢ d, Pos- terior Margin of wing crossing anterior one. 2, Ball-and-socket joint at root of wing, the wing being attached to the side of the cylinder by the socket. ¢, Cylinder. rr, Piston, with cross heads (w, w) and piston head (s). 0 0, Stuffing boxes. ¢, f, Driving chains. m, Superior elastic band, which assists in elevating the wing. n, Inferior elastic band, which antagonizes m. The ulternate stretching of the superior and inferior elastic bands contributes to the continuous play of the wing, by preventing dead points at the end of the down and up strokes. The wing is free to move in a vertical and horizontal direction and at any degree of obliquity. (Pettigrew, 1870.)

the artificial wing here represented (fig. 32) be compared with the natural wing as depicted at fig. 33, it will be seen

that there is nothing in the one which is not virtually Teproduced in the other. In addition to the foregoing,

vee shows the spiral elastic wings of the Gull. Each wing forms a mobile i pag @ 6, Anterior margin of left wing; ¢ d, posterior margin of dike: 9, primary ov rowing feathers of left wing; g a, secondary feathers wrist j x, Toot of right wing with ball and socket joint; 7, elbow joint; m, oint; n, 0, hand and finger joints. (Pettigrew, 1870.) = Pettigrew recommends a double elastic wing to a ef to the air like a steam-hammer, by being fixed ne ih ead of the piston. This wing, like the single wing a ed, twists and untwists as it rises and falls, and a Sesses all the characteristics of the natural wing (fig. H . : ae ‘al on recommends an elastic aerial screw consisting of tine “ee Which taper and become thinner towards the LPs and posterior margins. When the screw is made to

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rotate, the blades, because of their elasticity, assume a great variety of angles, the angles being least where the

Fie. 34.—Double elastic wing driven by direct piston action. During the up stroke of the piston the wing is very decidedly convex on its upper surface (a6cd,A A'); its under surface (eg h,A A') being deeply concave and inclined obliquely upwards and forwards. It thus evades, to a considerable extent, the air during the up stroke. During the down stroke of the piston the wing is flattened out in every direction, and its extremities twisted in such a manner as to form two screws, as seen at a' b'c' d',e' f gh', B, B'. The active area of the wing is by this arrangement considerably diminished during the up stroke, and considerably augmented during the down stroke; the wing seizing the air with greater avidity during the down than during the up stroke. t,j, k, elastic band to regulate the expansion of the wing; J, piston; m, piston head; n, cylinder. (Pettigrew, 1870.)

speed of the blades is greatest and wice versa. The pitch of the blades is thus regulated by the speed attained (fig. 35).

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Fie. 35.—Elastic aerial screw with twisted blades resembling wings (a b ¢ d, efgh); x,end of driving shaft; v,w, sockets in which the roots of the blades of the screw rotate, the degree of rotation being limited by steel springs (z, s) ; ab,e/f, tapering elastic rods forming anterior or thick margins of blades of screw; @c,hg, posterior or thin elastic margins of blades of screw. The alTOWs Mm, n, 0, P, g, 7 indicate the direction of travel. (Pettigrew, 1870.)

The peculiarity of Professor Pettigrew's wings and screws consists in their elasticity, their twisting action, and their great comparative length and narrowness. They offer little resistance to the air when they are at rest, and when in motion the speed with which they are driven is such as to ensure that the comparatively large spaces through which they travel shall practically be converted into solid bases of support.

Since Professor Pettigrew enunciated his views (1867) as to the screw configuration and elastic properties of natural wings, and more especially since his introduction of spiral, elastic artificial wings, and elastic screws, a great revolution has taken place in the construction of flying models, Elastic

aero-planes are now advocated by Mr Brown,! elastic aerial screws by Mr Armour,? and elastic aero-planes, wings, and screws by M. Pénaud.?

M. Pénaud's experiments are alike interesting and in- structive. He constructed models to fly by three different methods :—(a) by means of screws acting vertically up- wards ; (b) by aero-planes propelled horizontally by screws ; and © by wings which flapped in an upward and down- ward direction. An account of his helicoptére or screw model appears in the Aeronaut for January 1872, but before giving a description of it, it may be well to state very

*1"«*The Aero-bi-plane, or First Steps to Flight," Ninth Annual Report of the Aeronautical Society of Great Britain, 1874.*

2 "Resistance to Falling Planes on a Path of Translation," Ninth Annual Report of the Aeronautical Society of Great Britain, 1874.

3 The Aeronaut for January 1872 and February 1875,

briefly what is known regarding the history of the screw as applied to the air.

The first suggestion on this subject was given by Paucton in 1768. This author, in his treatise on the Théorie de la Vis d@'Archiméde, describes a machine provided with two screws which he calls a " ptérophores"" In 1796 Sir

Fig. 36.—Cayley's Flying Model (1796).

George Cayley gave a practical illustration of the efficacy of the screw as applied to the air by constructing a small machine, consisting of two screws made of quill feathers, a representation of which we annex (fig. 36). Sir George writes as under :—

"As it may be an amusement to some of your readers to see a machine rise in the air by mechanical means, I will conclude my present communication

by describing an instrument of this kind, which any one can construct at the expense of ten minutes' labour.

"'a and b, fig. 36, are two corks, into each of which are inserted four wing feathers from any bird, so as to be slightly inclined like the sails of a windmill, but in opposite directions in each set. A round shaft is fixed in the cork a, which ends in a sharp point. At the upper part of the cork 6 is fixed a whalebone bow, having a small pivot hole in its centre to receive the point of the shaft. The bow is then to be strung equally on each side to the upper portion of the shaft, and the little machine is completed. Wind up the string by turning the flyers different ways, so that the spring of the bow may unwind them with their anterior edges ascending ; then place the cork with the bow attached to it upon a table, and with a finger on the upper cork press strong enough to prevent the string from unwinding, and, taking it away suddenly, the instrument will rise to the ceiling."

Cayley's screws were peculiar, inasmuch as they were superimposed and rotated in opposite directions. He esti- mated that if the area of the screws was increased to 200 square feet, and moved by a man, they would elevate him. His interesting experiment is described at length, and the apparatus figured, in WVicolson's Journal, 1809, p. 172.

Other experimenters followed Cayley at moderate inter- vals :—Deghen in 1816, Ottoris Sarti in 1823, and Dubo- chet in 1834. These inventors all constructed flying models on the vertical screw principle. In 1842 Mr Philips suc- ceeded in elevating a steam model by the aid of revolving fans, which flew across two fields after having attained a great altitude ; and in 1859 Mr Bright took out a patent for a machine to be sustained by vertical screws, the model of which is to be seen at the patent museum, Ken- sington, London. In 1863 the subject of aviation by

vertical screws received a fresh impulse from the experi- ments of MM. Ponton d'Amécourt, De la Landelle, and Nadar, who exhibited models driven by clock-work springs, which ascended with graduated weights a distance of from 10 to 12 feet. These models were so fragile that they usually broke in coming in contact with the ground in their descent. Their

flight, moreover, was unsatisfactory, from the fact that it only lasted a few seconds, Stimulated by the success of his spring models, M, Ponton d'Amécourt had a small steam: model constructed. This model, which was shown at the exhibition of the Aeronautical Society of Great Britain at the Crystal Palace in 1868, consisted of two superposed screws propelled by an engine, the steam for which was generated (for light- ness) in an aluminium boiler. This steam model proved a

failure, inasmuch as it only lifted a third of its own weight. Fig. 37 embodies M. de la Landelle's ideas.

Fig, 87.—m,,0,P; 9,7, 8,¢, screws arranged on vertical axes to act vertically upwards. The vertical axes are surmounted by two parachutes, and the body of the machine is furnished with an engine, propeller, rudders, and an exten- sive aero-plane. (M. de la Landelle, 1863.) '

All the models referred to (Cayley's excepted') were pro- vided with rigid screws, which, for many reasons, we ate disposed to regard asanerror. In 1872 M. Pénaud discarded the rigid screws in favour of elastic ones, as Professor Pettigrew had done some years before. j

M. Pénaud also substituted india-rubber under torsion for the whalebone and clock springs of the smaller models, and the steam of the larger ones. His helicoptére or screw model is remarkable for its lightness, simplicity, and power. The accompanying sketch will serve to illustrate its col: struction (fig. 38). It consists of two superposed elastic screws (a a, b 0), the upper of which (a @) 18 fixed im vertical frame ©, which is pivoted in the central part (d) of the under screw. From the centre of the under screw an axle provided with a hook (e), which performs the part of a crank, projects in an upward direction.

Between the hook or crank (e) and the centre of the upper a re 1 Cayley's screws, as explained, were made of feathers, and ie 3 quently elastic. As, however, no allusion is made in his writings " the superior advantages possessed by elastic over rigid screws, it 1s 4 be presumed that feathers were employed simply for convenience i lightness. Professor Pettigrew, there is reason to believe, was ot first to advocate the employment of elastic screws for aerial purpos

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serew (a a), the india-rubber in a state of torsion (/) extends. By fixing the lower screw and turning the upper one a sufficient number of times the requisite degree of torsion

“Fr, 38.—Helicoptére or Screw-Model, by M. Pénaud. (1872.)

and power are obtained. The apparatus when liberated flies into the air sometimes to a height of 50 feet, and gyrates in beautiful large circles for a period varyiug from 15 to 30 seconds. .

M. Pénaud next directed his attention to the coustruction of a model, to be propelled by a screw and sustained by an elastic aero-plane extending horizontally, Sir George Cayley, it should be stated, proposed such a machine in 1810, and Mr Henson (as will be shown subsequently) constructed and patented a similar machine in 1842,

Several other inventors succeeded in making models fly by the aid of aero-planes and screws, as, ¢.g., Mr Stringfellow in 1847,! M. du Temple in 1857, and M. Jullien in 1858, As rigid aero-planes and screws were employed in the construction of these models they flew in a hap-hazard sort of a way, it being found exceedingly difficult to confer on them the necessary degree of stability fore and aft and laterally. M. Pénaud succeeded in overcoming the diffi- culty in question by the invention of what he designates lis automatic rudder, This consists of a small elastic aero-plane placed aft or behind the principal aero-plane which is also elastic, The two elastic aero-planes extend horizontally and make a slight upward angle with the horizon, the angle made by the smaller aero-plane (the rudder) being slightly in excess of that made by the larger. The motive power ig india-rubber in the condition of torsion ; the propellor, a screw. The reader will under-

stand the arrangement by a reference to the accompanying drawing (fig, 39).

m 39.—Acro-plane model with automatic rudder. » automatic Tudder; ¢ ¢, aerial screw centred at

Medel On the aero-plane screw type may be propelled ¥ two screws, one fore and one aft, rotating in opposite

1 — a bi Stringfellow constructed a second model, which was exhibited

xhibition of the Aeronautical Societ Crystal Palace), in 1868, It is described and figured further on, — ”

directions ; and in the event of only one screw being employed it may be placed in front of or behind the aero- plane,

When the model is wound up and let go it descends about two feet, after which, having acquired initia] velocity, it rises and flies in a forward direction at a height of from 8 to 10 feet from the ground for a distance of from 120 to 130 feet. It flies this distance in from 10 to 11 seconds, its mean speed being something like 12 feet per second. From experiments made with this model, M. Pénaud calcu- lates that one horse power would elevate and support 85 bb.

Mr Brown has also written (1874) in support of elastic aero-bi-planes. His experiments prove that two elastic aero- planes united by acentral shaft or shafts, and separated by a wide interval, always produce increased stability. The production of flight by the vertical flapping of wings is in Some respects the most difficult, but this also has been attempted and achieved. M. Pénaud and M. de Villeneuve have each constructed winged models. Professor Marey was not so fortunate. He endeavoured to construct an artificial insect on the plan advocated by Borelli, Straus-Durckheim, and Chabrier, but signally failed, his insect never having been able to lift more than a third of its own weight,

MM. de Villeneuve and Pénaud constructed there winged models on different types, the former selecting the bat, the latter the bird. M. Villeneuve made the wings of his arti- ficial bat conical in shape and comparatively rigid. He

Fie, 40.—Artificial flying bird, a Be d, a' Bb' ¢' d,

elastic wings, which twist and untwist when

made to vibrate; a 6, a' 0', anterior margins of wings; cd, ¢' a', posterior margins of wings; ¢, c', inner portions of wings attached to central shaft of model by elastic bands at é; J, india-rubber in a state of torsion, which provides motive power, by causing the crank situated between the vertical wing supports (g) to rotate: as the crank revolves the wings are made to vibrate by means of two rods which extend between the crank and the roots of the wings; A, tail of artificial bird. (M.Pénaud, 1872.) controlled the movements of the wings, and made them strike downwards and forwards in imitation of natural wings, as described by Professor Pettigrew. His model possessed great power of rising. It elevated itself from the ground with ease, and flew in a horizontal direction for a distance of 24 feet, and at a velocity of 20 miles an hour. M. Pénaud's model differed from M, de Villeneuve's in being provided with elastic wings, the posterior margins of which in addition to being elastic were free to move round the anterior margins as round axes (see p. 313, fig. 24). India-rubber springs were made to extend between the inner posterior parts of the wings and the frame, corresponding to the backbone of the bird.

A vertical movement having been communicated by means of india-rubber in a state of torsion to the roots of the wings, the wings themselves, in virtue of their elasticity, and because of the resistance experienced from the alr, twisted and untwisted and formed reciprocating screws, precisely analogous to those originally described and figured by Professor Pettigrew in 1867. M. Pénaud's arrangement is shown in fig. 40.

If the left wing of M. Pénaud's model (a b, ¢ d of fig, 40) be compared with the wing of the bat as drawn by

The defect of Mr Henson's machine consists mainly in its rigidity, and in the vast ainount of sustaining surface displayed by it, this approximating it im some measure to the balloon.

Mr Wenham, thinking to improve upon Mr Henson invented in 1867 what he designated his aero-planes!

The aero-planes are thin, light, long, narrow structures arranged above each other in tiers like so many chee

They are tied together at a slight upward angle, and combine strength and lightness. The idea is to obtain great sustain- j ing area in comparatively small space. It was hoped that when the aero-planes were wedged forward in the air by vertical screws, or by the body to be flown, each aero-plane

would rest or float upon a stratum of undisturbed air, and . that practically the aero-planes would give the same support . as if spread out horizontally. The aero-planes may be said

to form a compound kite, and have only been partially successful. They are rigid, and present a large extent of

dead surface, so that the same objections made to Mr Hen-

son's arrangement apply to them. The great sustaining surface they present forms at once their strength and weak-

ness. They sustain and lift, but are very difficult to wedge forward, and if a breeze be blowing they become unmanageable, in the sense that a balloon is unmanageable.

The accompanying figures illustrate Mr Wenham's views

(figs. 42 and 43). ;

Professor Pettigrew (fig. 18, page 313), or with Professor Pettigrew's artificial wing (page 319, fig. 32), the identity of principle and application

is at once apparent.

The twisting kite-like action of the wings, to which allusion has so frequently been made, and to which, as has been shown, Professor Pettigrew first strongly directed attention in 1867, justifies our introductory remarks as to the very intimate relation which subsists between natural and artificial flight. As already stated, it is not possible to understand artificial flight in the absence of a knowledge of natural flight.

In M. Pénaud's artificial bird the equilibrium is secured by the addition of a tai. The model cannot raise itself from the ground, but on being liberated from the hand it descends 2 feet or 80, when, having acquired initial velocity, it flies horizontally for a distance of 0 or more feet, and rises as it flies from 7 to 9 feet. The following are the measurements of the model in question :—length of wing from tip to tip, 32 inches; weight of wing, tail, frame, india-rubber, é&c., 73 grammes (about 24 ounces).

We have referred to Mr Henson's flying machine, which was designed in 1843. As it was the earliest attempt at aerostation on a great scale it deserves a more than passing notice. Mr Henson was one of the first to combine aerial screws with extensive supporting structures occupying @ nearly horizontal position. The accompanying illustration explains the combination (fig. 41).

Fig. 41,—Henson''s Aerostat (1843).

"The chicf feature of the invention was the very great expanse of its sustaining planes, which were larger in proportion to the weight it had to carry than those of many birds. The machine advanced with its front edge a little raised, the effect of which was to present its under surface to the air over which it passed, the re- sistance of which, acting upon it like a strong wind on the sails of a windmill, prevented the descent of the machine and its burden. The sustaining of the whole, therefore, depended upon the speed at which it travelled through the air, and the angle at which its under surface impinged on the air in tts front….. The machine, fully prepared for flight, was started from the top of an inclined plane, in descending which it attained a velocity necessary to sustain it in its further progress. That velocity would be gradually destroyed by the resistance of the air to the

forward flight ; it was, therefore, the office of the steam-engine and the vanes it actuated simply to repair the loss of velocity ; it was made, therefore, only of the power and weight necessary for that small effect." The editor of Newton's Journal of Arts and Sciences speaks of it thus :—" The apparatus consists of a car containing the goods, passengers, engines, fuel, &c., to which a rectangular frame, made of wood or bamboo cane, and covered with canvas or oiled silk, is attached. This frame extends on either side of the car in a similar manner to the outstretched wings of a bird; but with this difference, that the frame is immovable. Behind the wings are two vertical fan wheels, furnished with oblique vanes, which are intended to propel the apparatus through the air. The rainbow-like circular wheels are the propellers, answering to the wheels of a steam-boat, and acting upon the air after the manner of a windmill. These wheels receive motions from bands and pulleys from a steam or other engine contained in the car. To an axis at the stern of the car a triangular frame is attached, resembling the

Fig. 42 represents a system of aero-planes designed to carry aman. 4, % thin planks, tapering at each end, and attached to a triangle; |

inches broad and 16 feet long, the total length of the web being 80 feet. – apparatus, when caught by a gust of wind, actually lifted the aeronaul.

main spar; e é, thin tie-band of steel with struts starting from main spar. ting of six

webs of thin holland 15 inches broad. The aero-planes are kept in oo plane by vertical divisions of holland 2 feet wide. ¢, ¢, WINg propellers ¥

| Mr Stringfellow, who was originally associated with Mr | Henson, and constructed a successful flying model in 1847, built a second model in 1868, in which Mr Wenham s | aero-planes were combined with aerial screws. This model ! was on view at the Exhibition of the Aeronautical Society of Great Britain, held at the Crystal Palace, London, ™ 1868. It was remarkably compact, elegant, and light, and obtained the £100 prize of the exhibition for its engi which was the lightest and most powerful ever constrict The annexed woodcut (fig. 44), taken from @ photograp

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of Mr Stringfellow's model, gives a very good idea of the

posed planes, The sup

gus

arrangement,—a, 6, ¢ representing the superim d the tail, e, f the vertical screw propellers. imposed planes (a, 6, ¢) in this machine contained & ') taining area of 28 square feet, in addition to the tail (2).

er cs a ey is = oe with canvas or oiled silk. This | Its engine represented a third of a horse powe!, and a . nded or contracted at pleasure, and is moved up and : i i fuel, supel! | down for the purpose of causing the machine to ascend or descend. weight of the whole (engine, boiler, water, " "'Tts sus

posed planes, and propellers) was under 12 taining area, "tf that of the tail (2) be included, was , thing like 36 square feet, i.e, 3 square feet forw®

. ' 67 ° 1 '6Qn Aerial Locomotion,' > Aeronautical Socrety § Report for 18

Beneath the tail is a rudder for directi i

L ecting the course of the machine

hee ps oe to the left; and to facilitate the steering a sail is

st etween two masts which rise from the car. The amount

he iy ag oiled silk necessary for buoying up the machine is ed to be equal to one square foot for each half pound of weight."

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pound. The model was forced by its propellers along a wire at a great speed, but so far as an observer could determine, failed to lift itself, notwithstanding its extreme lightness and the comparatively very great power employed. Mr Stringfellow stated that his machine occasionally left

Fic. 44.—Stringfellow's Flying Machine (1868).

the wire and was sustained by its aero-planes alone. The horizontal speed attained was certainly very great; but as the machine was exhibited under cover in the Crystal Palace buildings, and ran along a wire, it is doubtful how

it would have deported itself in the open air. Everything about it was rigid, the aero-planes, screws, &c. 3 and as the dead surfaces displayed were comparatively very large, the chances are that it would not have been able to hold its own against aircurrents. That the principle of its construc- tion was faulty is proved beyond doubt by the fact that it weighed under 12 tb, while its engine exerted a third of a horse power. No flying creature, as is well-known, weigh- ing 12 tb possesses a tithe of the power indicated. This fact is significant as showing that flight is not a mere question of levity aud power. As has been more than once stated in the present article, the mystery of flight can only be cleared up by an intelligent study of the structure and mode of application of the flying organs of animals. It is to natural flight and the principles which underlie it that the aeronaut must look for a solution of the intensely interesting but vastly complicated problem of aerial navi- gation.

The idea embodied by Henson, Wenham, and String- fellow is plainly that of a boy's kite sailing upon the wind. The kite, however, is a more perfect flying apparatus than that furnished by these gentlemen, inasmuch as the inclined plane formed by its body strikes the air at various augles —the angles varying according to the length of string, strength of breeze, length and weight of tail, &c. Hen- son's, Wenham's, and Stringfellow's methods, although carefully tried, have hitherto failed, The objections are numerous. In the first place, the supporting planes (aero- planes or other forms) are not flexible and elastic as wings are, but rigid ; 2d, they strike the air at a given angle, Where, again, there is a departure from nature 5 Sd, oe machine so constructed must be precipitated from a height or driven along the surface of the land or water at a high speed to supply it with initial velocity ; 4th, it is unfitted for flying with the wind unless its speed greatly exceeds that of the wind ; Sth, it is unfitted for flying across the wind because of the large surfaces exposed; 6th, the sustain- ing surfaces are passive or dead surfaces, z.e., they have no Power of moving or

accommodating themselves to altered a Natural wings, as explained, present small ‘oat surfaces, and these can be applied to the air at any

egree of obliquity—the great speed at which wings are

a converting the spaces through which they pass

*what are practically solid bases of support, as indicated * FP. 310, 313 (figs. 9, 20, 21, 22, and 23).*

iS arrangement enables natural wings to seize and

© the air, and renders them superior to adventitious |

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currents. Natural wings work up the air in which they move; but unless the volant animal desires it, they are scarcely, if at all, influenced by winds or currents which are not of their own forming. In this respect they differ entirely from the balloon and all forms of fixed aero-planes. In nature small wings driven at a high speed produce the same result as large wings driven at alow speed. In flight a certain space must be covered, either by large wings spread out as solids, or by small wings made to vibrate rapidly. A like result is obtained if air currents travelling at a high speed strike the under surfaces of the wings of the volant animal. In the former cases the wings are active, the air passive; in the latter case the air is active and the wings passive.

It would be easy to multiply almost indefinitely our list of aerial models and flying machines.! As however the present article has already attained sufficiently large dimen- sions it will suffice if we refer in conclusion to the aerial steamer of Mr Moy, designed in 1874, and still in process of construction. Its leading features will readily be under- stood by a reference to the annexed drawing (fig. 45).

Fia. 45.—Moy’s Aerial Steamer (1874).

Mr Moy's invention consists of a light, powerful, skeleton frame resting on three wheels; a very effective light engine constructed on a new principle, which dispenses with the old-fashioned, cumbrous boiler ; two long, narrow, horizontal aero-planes ; and two comparatively very large aerial screws, 'The idea is to get up the initial velocity by a preliminary run on the ground, This accomplished it is hoped that the weight of the machine will gradually be thrown upon the aero-planes in the same way that the weight of certain birds—the eagle, e.g.—is thrown upon the wings after a few hops and leaps. Once in the air the aero-planes will become effective in proportion to the speed attained. Mr Moy's machine resembles in its general features that of Mr Stringfellow. It repeats its defects as far as rigid surfaces are concerned, but it has the advantage in presenting a relatively less amount of surface. The diminished surface of Mr Moy's machine is, moreover, more broken up, and what is important, a relatively greater proportion of the surface (so diminished and _ broken up) is made active or moving surface. These are hopeful features.

The unremitting efforts of Mr Moy and other British engineers to construct flying machines deserve well of science, They are significant as showing that the great subject of aerial navigation is at length receiving a fair share of the thought and energy of a country which has already produced the steamboat and locomotive, and which, there is good reason to believe, is destined also to produce the flying machine. (J. B. P.)

1 The most recent experiments in aerial transit are described in the Transactions of the New Zealand Institute, vol x., 1878.

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FLINCK, Goverr (1615-1660), born at Cleves in 1615, was apprenticed by his father to a silk mercer, but having secretly acquired a passion for drawing, was sent to Leuwarden, where he boarded in the house of Lambert Jacobszon, a Mennonite, better known as an itinerant preacher than as a painter. Here Flinck was joined by Jacob Backer, and the companionship of a youth deter- mined like himself to be an artist only confirmed his passion for painting. Amongst the neighbours of Jacobs- zon at Leuwarden were the sons and relations of Rombert Ulenburg, whose daughter Saske married Rembrandt in 1634. Other members of the same family lived at Amster-

dam, cultivating the arts either professionally or as amateurs. The pupils of Lambert probably gained some knowledge of Rembrandt by intercourse with the Ulenburgs. Certainly Sandrart, who visited Holland in 1637, found Flinck acknowledged as one of Rembrandt's best pupils, and living habitually in the house of the dealer Hendnk Ulen- burg at Amsterdam. For many years Flinck laboured on the lines of Rembrandt, following that master's style in all the works which he executed between 1636 and 1648 ; then he fell into peculiar mannerisms by imitating the swelling forms and grand action of Rubens's creations. Finally he sailed with unfortunate complacency into the Dead Sea of official and diplomatic painting. Flinck's relations with Cleves became in time very important. He was introduced to the court of the Great Elector, Frederick William of Brandenburg, who married in 1646 Louisa of Orange. He obtained the patronage of Johann Moritz of Orange, who was made stadtholder of Cleves in 1649. In 1652 a citizen of Amsterdam, Flinck married in 1656 an heiress, daughter of Ver Hoeven, a director of the Dutch East India Company. He was already well known even tlien in the patrician circles over which the burgomasters De Graef and the Echevin Six presided ; he was on terms of intimacy with the poet Vondel and the treasurer Uitenbogaard. In his house, adorned with antique casts, costumes, and a noble collection of prints, he often received the stadtholder Johann Moritz, whose portrait is still preserved in the work of the learned Barleius.

The earliest of Flinck's authentic pieces is a likeness of a lady, dated 1636, in the gallery of Brunswick. His first subject picture is the Blessing of Jacob, in the Amsterdam museum (1638). Both are thoroughly Rembrandtesque in effect as well as in vigour of touch and warmth of flesh tints. The four "civic guards" of 1642, and "the twelve musketeers" with their president in an arm-chair (1648), in the town-hall at Amsterdam, are fine specimens of composed portrait groups. But the best of Flinck's productions in this style is the Peace of Munster in the museum of Amsterdam, a canvas with 19 life-size figures full of animation in the faces, "radiant with Rembrandtesque colour," and admirably distributed. Flinck here painted his own likeness to the left in a doorway. The mannered period of Flinck is amply illustrated in the Marcus Curius eating Turnips before the Samnite Envoys, and Solomon receiving Wisdom, in the palace on the Dam at Amster- dam. Here it is that Flinck shows most defects, being faulty

in arrangement, gaudy in tint, flat and shallow in execution, and partial to whitened flesh that looks as if it had been smeared with violet powder and rouge. The chronology of Flinck's works, so far as they are seen in public galleries, comprises, in addition to the foregoing, the Grey Beard of 1639 at Dresden, the Girl of 1641 at the Louvre, a portrait group of a male and female (1646) at potest a lady (1651) at Berlin, In November 1659 a urgomaster of Amsterdam contracted with Flinck for a canvases to represent four heroic figures of David and Te a Curius and Horatius Cocles, and scenes

e Batavians and Romans. Flinck was

unable to finish more than the sketches. In the same year he received a flattering acknowledgment from the town council of Cleves on the completion of a picture of Solomon which was a counterpart of the composition at Amsterdam. This and other pictures and portraits, such as the likenesses of Frederick William of Brandenburg and Johann Moritz of Nassau, and the allegory of Louisa of Orange attended by Victory and Fame and other figures at the cradle of the first-born son of the elector, have disappeared. Of several pictures which were painted for the Great Kurfiirst, none are preserved except the Expulsion of Hagar in the Berlin museum. Flinck's death at Amsterdam on the 22d of February 1660 was sudden and unexpected. FLINDERS, Matruew (1774-1814), English navigator, explorer, and man of science, was born at Donington, near Boston, in Lincolnshire, March 16, 1774. Matthew was at first designed to follow his father's profession of surgeon, but his enthusiasm in favour of a life of adventure impelled him to enter the royal navy, which he did, October 23, 1789. After a voyage to the Friendly Islands and West Indies, and after serving in the ' Bellerophon" dunng Lord Howe's " glorious first of June" (1794) off Ushant, Flinders went out in 1795 as midshipman in the "Reliance" to New South Wales. For the next few years he devoted himself to the task of accurately laying down the outline and bearings of the Australian coast, and he did his work so thoroughly that he left comparatively little for his successors todo. With his friend George Bass, the surgeon of the ' Reliance," in the year of his arrival he explored

George's River; and, after a voyage to Norfolk Island, again in March 1796 the two friends in the same boat, the "Tom Thumb," only 8 feet long, and with only a boy to help them, explored a stretch of coast to the south of Port Jackson. After a voyage to the Cape of Good Hope, when he was promoted to a lieutenancy, Flinders was engaged during February 1798 in a survey of the Furneaux Islands, lying to the north of Tasmania. His delight was great when, in September of the same year, he was commissioned along with Bass, who had already explored the sea between Tasmania and the south coast to some extent and inferred that it was a strait, to proceed in the sloop " Norfolk" (25 tons) to prove conclusively that Van Diemen's Land was an island by circumnavigating it. In the same sloop, in the summer of next year, Flinders made an exploration to the north of Port Jackson, the object being mainly to survey Glasshouse Bay (Moreton Bay) and Hervey's Bay. Returning to England he was appointed to the command of an expedition for the thorough exploration of the coasts of Terra Australis, as the southern continent was still called, though Flinders is said to have been the first to suggest for it the name Australia. On July 18, 1801, the sloop " Investigator" (334 tons), in which the expedition sailed, left Spithead, Flinders being furnished with instructions and with a passport from the French Government to all their officials in the Eastern seas. Among the scientific staff was Robert Brown, one of the most eminent English botanists; and among the midshipmen was Flinders s relative, John Franklin, of Arctic fame. Cape Leeuwin, on the south-west coast of Australia, was reached on November 6, and King George's Sound on December 9. Flinders sailed round the Great Bight, examining the islands and indentations on the east side, noting the nature of the country, the people, products, éc., and paying special attention to the subject of the variation of the compas Spencer and St Vincent Gulfs were discovered and explore On April 8, 1802, shortly after leaving Kangaroo Islands, at the mouth of St Vincent Gulf, Flinders fell in with the French exploring ship, 'Le Géographe," under Captain Nicolas Baudin, in the bay now known as Encounter Bay. In the narrative of the French expedition published

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1807 (when Flinders was a prisoncr in the Mauritius) by M. Peron, the naturalist to the expedition, much of the land west of the point of meeting was claimed as having been discovered by Baudin, and French names were exten- sively substituted for the English ones given by Flinders. It was only iu 1814, when Flinders published his own nar- rative, that the real state of the case was fully exposed. Flinders continued his examination of the coast along Bass's Strait, carefully surveying Port Phillip. Port Jackson was reached on May 9, 1802.

After staying at Port Jackson for about a couple of months, Flinders set out again on July 22 to complete his circumnavigation of Australia. The Great Barrier Reef was examined with the greatest care in several places. The north-east entrance of the Gulf of Carpentaria was reached early in November ; and the next three months were spent in an examination of the shores of the gulf, and of the islands that skirt them. An inspection of the "Investi- gator" showed that she was in so leaky a condition that only with the greatest precaution could the voyage be com- pleted in her. Flinders completed the survey of the Gulf of Carpentaria, and after touching at the island of Timor, the "Investigator" sailed round the west and south of Australia, and Port Jackson was reached on June 9, 1803. Much suffering was endured by nearly all the members of the expedition: a considerable proportion of the men suc- eumbed to disease, and their leader was so reduced by scurvy that his health was greatly impaired.

Flinders determined to proceed home in H.M.S. " Por- poise" as a passenger, submit the results of his work to the Admiralty, and obtain, if possible, another vessel to com- plete his exploration of the Australian coast. The "Porpoiss" left Port Jackson on August 10, accompanied by the H.E.I.C.'s ship " Bridgewater " (750 tons) and the "Cato" (450 tons) of London. On the night of the 17th, the "Porpoise" and " Cato" suddenly struck on a coral reef, and were rapidly reduced to wrecks. The officers and men encamped on a small sandbank near, 3 or 4 feet above high water, a considerable quantity of provisions, with many of the papers and charts, having been saved from the wrecks. The reef was in about 22° 11' 8. and 155° E., and about 800 miles from Port Jackson. Flinders returned to Port Jackson in a six-oared cutter in order to obtain a vessel to rescue the party. The reef was again reached on October 8, and all the officers and men

having been satisfactorily disposed of, Flinders on the 11th left for Jones Strait in an unsound schooner of 29 tons, the 'Cumberland," with ten companions, and a valuable col- lection of papers, charts, geological specimens, &c. On December 15 he put in at Mauritius, when he discovered that France and England were at war. The passport he possessed from the French Government was for the 'In- vestigator ; still, though he was now on board another ship, his mission was essentially the same, and the work ./© Was on was simply a continuation of that commenced in the unfortunate vessel. Nevertheless, on her arrival at Port Louis the "Cumberland" was seized by order ie sovemor-general De Caen. Flinders's papers were

wi possession of, and he found himself virtually a Prem. We need not dwell on the sad details of this — captivity, which lasted to June 1810. But

cA = be no doubt that the hardships and inactivity roan .. compelled to endure for upwards of six : a seriously on his health, and brought his life to oe – ay end. He reached England in October 1810, 'apie P i of upwards of nine years. The official red- outed — day barred all promotion to the unfortunate oxtail sa himself to Prepare an account of his recordind 2 ough unfortunately an important part of his ad been retained by De Caen, The results of his

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labours were published in two large quarto volumes, entitled A Voyageto Terra Australis, with a folio volume of maps. The very day (July 19, 1814) on which his work was published Flinders died, at the early age of forty. The great work is a model of its kind, containing as it does not only a narrative of his own and of previous voyages, but masterly statements of the scientific results, especially with regard to magnetism, meteorology, hydrography, and navigation. Flinders paid great attention to the errors of the compass, especially to those caused by the presence of iron in ships. He is understood to have been the first to discover the source of such errors (which had scarcely been noticed before), and after investigating the laws of the variations, he suggested counter-attractions, an invention for which Professor Barlow got much credit many years afterwards. Numerous experiments on ships' magnetism were conducted at Portsmouth by Flinders, by order of the Admiralty, in 1812, Besides the Voyage, Flinders

wrote Observations on the Coast of Van Diemen's Land, Bass's Strait, &e., and two papers in the Phil. Trans.,—one on the " Magnetic Needle" (1805), and the other " Observa- tions on the Marine Barometer " (1806). (J. 8. K.)
FLINT is a calcedonic variety of silica found in the

form of irregular concretionary nodules of varying size,

chiefly in the Upper Chalk beds and in other similar lime- stone deposits. The mode in which flint originated is not altogether satisfactorily explained ; but as traces of some of the humbler marine organisms are almost invariably found in the nodules, it is assumed that the silicious matter was partly derived from these organisms themselves, and that they formed nuclei around which soluble silica accumulated. From the prevalence of silicious spiculs of sponges in the nodules, it is affirmed by Dr Bowerbank that all flints had, for their primary nuclei, the silicious framework of the sponges which flourished in the depths of the sea during the Cretaceous epoch. Flints occur in the chalk in stratified order, and the various beds are possessed of a uniformly distinctive character. In some cases they are found in continuous layers, at other places they occur as isolated nodules. In the county of Norfolk, huge flints termed "potstones," of a pear-shaped outline, measuring as much as three feet in length by one foot across, are obtained ; and these are imbedded in the chalk at right angles to the horizontal layers of small flints. Flint is a compact homogeneous substance, externally coated with a white silicious coat, and frequently hollow in the centre. It has a dark steely grey, almost black, sometimes brownish colour ; it is faintly translucent, and it breaks with a con- choidal or glassy fracture. In composition it consists of almost pure silica, partly in the crystalline or non-soluble quartzy form, and partly in the non-crystalline soluble state. It contains traces of lime, iron, and alumina, and when the proportion of lime present is large it passes into chert. When newly obtained from the pits the contained moisture of flint renders it easily flaked and other- wise worked, but after exposure to the air it becomes dry, hard, and intractable. From the earliest times flint has been employed as a fire-producer, by percussion with iron pyrites, and subsequently with a steel implement in the yet familiar form of "flint and steel." In classical authors occasional allusions are made to the use of flint knives ; and the employment of flint and steel to produce fire is very pointedly described by Virgil and other writers. Except to a

trifling extent in the preparation of strike-a- light flints, the only form in which flint industry now con- tinues is in the fabrication of gun-flints, an occupation carried on at Brandon, and toa smaller extent at Icklingham, two villages in Suffolk. In 1876 there were 21 flint knappers in Brandon, and about 80,000 flints were sent away weekly, the greater proportion of which go to West

Africa. 'The mining for flints is conducted by sinking a narrow pit into the chalk till the bed of suitable flints (the best are " floor-stones") is reached, and along this the miner drives a series of small galleries or burrows, carrying all the excavated material by hand to the surface. The knapper's tools consist of three simple forms of hammer and a chisel ; and probably the only essential modification these tools have ever undergone consists in the substitution of metal for stone, The flint is first broken into convenient sized angular pieces, cubes of about 6 inches, called '" quarters." The next operation, "flaking," consists in striking off, by means of carefully measured and well directed blows, flakes extending from end to eud of the quarter, this process of flaking being continued till the quarter or core becomes too small to yield good flakes. The subsequent operation termed "knapping" consists in cutting or breaking the flakes transversely into the sizes required for gun-flints, each flake yielding two or three flints of different sizes. An expert faker will make 7000 to 10,000 flakes in a day of twelve hours, and in the same time an average knapper will finish from flakes about 3000 gun-flints. Flint is also employed in building and for road metal, Calcined and powdered it is very much used in the manufacture of superior kinds of pottery. For the flint implements of primitive times, see ANTHROPOLOGY, vol. ii. p. 115, and ARcHaoLoey, vol, ii, p. 337.

FLINT, a maritime county of North Wales, the smallest but one of the Welsh and English counties, has an area of 264 square miles, or 169,162 acres; and (excluding the detached hundred of Maelor, which is divided from Den- bighshire by the Dee, and bounded N. by Cheshire and S. and E. by Salop, lying 8 miles to the S.E. of the rest of the county) its boundaries are the estuary on the N., Cheshire on the N. and N.E., and Denbighshire with the Clwydian range to the S. and S.W. The greatest length of the county from

S.E. to N.W. is 26 miles, and its breadth is from 10 to 12—Maelor being 9 miles by 5. The chief part of it is situate on the Coal-Measures and other members of the Carboniferous rocks group. A hilly tract of 50 miles breadth separates the Anglesey Coal-Measures from the Flintshire coal-field, which is again separated from that of Denbighshire to S.E. by the elevation of Mountain Lime- stone and Millstone Grit between Gresford and Hope. The latter runs continuously along the southern edge of the coal strata, followed, except in the extreme south, where we have the Wenlock rocks, by the Mountain Limestone. The extreme west and east, as well as the detached hundred, of the county is on the New Red Sandstone, Symonds says,—" The coal measures may be traced along the shore from Flint to the Point of Air; and the route from Flint to the west of Holywell crosses the Millstone Grit to the Mountain Limestone." The Wenlock rocks, of considerable altitude, forming the northern limb of the Berwen moun- tains, extend to within a mile of the shore of the Dee, near the western limit of the county, the margin still west being composed of the alluvial flat of Rhuddlan marsh and part of the vale of Clwyd. To the south the water-shed of the Berwens divides Flintshire and Denbighshire for some distance,—Moel Fammau, a meniber of the range common to both, rismg to 1845 feet. This is high for Flintshire, though Buckley and Halkin mountains, with the rest of the hill system north and south, indicate a generally moun- tainous character. A narrow alluvial tract to the east lies parallel to that already mentioned in the extreme west, and both are connected by a fertile strip of reclaimed land on the south shore of the estuary. The hundred of Maelor is flat, fertile, and highly picturesque. eee lovely valleys, such as those of the Clwyd,

"uy in the county, and the Alyn, and dingles and ravines, such as the course of the Wepre brock from Ewloe

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Castle to the Dee. The chief rivers are the Dee, Clwyd, and Alyn. The Dee, entering the county near Overton, divides Maelor from Denbighshire on the west, and, after passing Chester, bounds it also on the north. The Clwyd, rising in Denbighshire, enters Flintshire near Bodfary, and after a brief northward course, joins the Elwy near Rhuddlan past which they flow in oue channel into the Irish Sea ce Rhyl. The Alyn, a Denbighshire tributary,

enters Flint- shire near the base of Moel Fammau, winds between Cilcen and Mold,—with an underground course of half a mile, like fabled Alpheus, near Hesp-Alyn,—and then bending south to Caergwyrle, re-enters Denbighshire to join the Dee, Of Flintshire lakes, unimportant compared with those of neigh- bouring counties, Llyn Helig near Whitford is the chief.

Sloping seaward, with a mild climate, a moderate eleva- tion and shelter, and sufficient irrigation, Flintshire is well adapted for agriculture. Three-fourths of its area is under cultivation, as follows :—

Under cormrerops.?.....5. $1,740 acres, of which wheat and oats occupy each one-third, and barley one-fourth.

8,315 acres, of which potatoes occupy one-fourth.

Under grass under rotation 16,809 acres. ;

Under permanent pasture.. 66,509 acres,

Bane, fallow, &c: ..2…-...- 2,901 acres.

Under green crops….....

Total in cultivation …126,274 acres.

Of green crops, turnips and swedes are the chief; man- golds are little grown, To every 100 acres of cultivated land the proportion of horses is 4°5, of cattle 42:4, of sheep 100°8, and of pigs 11-8,—the cattle and pigs being about the same proportion as for Denbighshire, while the horses and sheep number only about one-half. Stock and dairy farming are keenly pursued by the Flintshire farmer, who crosses his native cattle with Herefords and Downs, his native sheep with Leicesters and Southdowns. Flintshire farms are of more than average size, and their occupiers are intelligent and progressive. In the thickly planted mining population they find a ready market for beef and mutton, as well as for cheese and butter.

With this important increment to their agricultural population, the census of 1871 gives Flintshire a popula- tion of 76,312, or an increase in ten years

of above 6500. In 1801 the number was 39,469, so that the increase during the century has been nearly double. Flint is now one of the most densely peopled counties for its size, rank- ing the third in numbers of North Wales. Its collieries, of which there are 27 of note in the county, producing all annual average of 500,000 tons, begin at Llanasa, and run south-east through Whitford, Holywell, Flint, Halkin, Northop, Buckley, Mold, and Hawarden. Much of the yield is exported. Lead is raised in Halkin mountain, and in some nine or ten mines of note about Mold, Holywell, Prestatyn, and Talacre, near Llanasa, the average annual produce being about 1200 tons. The town of Holywell has been reckoned the headquarters of the "ead ore ticketings." In some cases it is smelted on the spot. Elsewhere it is sent to Bagilt, Flint, or Chester for that purpose, At Dyserth zinc is worked to a limited extent, and copper in Talargoch mine, Flintshire has also cala- mine mines; and in addition to frequent smelting works, large manufactories of oil, vitriol, potash, &e,, employ the dwellers near the coast, while coarse clay-potterl@', the products of which go by train and rail to Connah's Quay, occupy those around Buckley. Little ironstone 18 now raised, the seams being thin and the yield low ; but an important source of industry is the large limestone quarries, eight in number, which produce a quantity of pbuilding stone, burnt lime, and small stone for chemical works about Halkin and elsewhere,

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In 1873 the county was divided between 3510 owners, of whom 2048, or 58 per cent., possessed less than one acre, or much the same proportion as Denbighshire (see vol. vii. p. 77). The average size of properties was 403 acres, the average value per acre £2, 13s. 84d. More than one- third of the county is owned by 13 proprietors, viz., Lord Hanmer (Hanmer Hall), 7318 acres; Captain Conwy (Rhyl), 5526 ; Mostyn Trustees, 5460 ; Right Hon. W. E. Gladstone, 6908; Sir Piers Mostyn (Talacre), 4186; Sir Hugh Williams (Bodelwyddan), 4011; Lord Kenyon (Gredington), 4004 ; River Dee Company, 3679; Duke of Westminster (Halkin Castle), 3338; P. B. D. Cooke (Gwysaney), 3204; Earl of Denbigh (Downing), 2938 ; Edmund Peel (Overton), 2897 ; W. R. Hughes (St Asaph), 9119. The county petty sessional divisions are—Mold ; Northop; Hawarden and Broughton ; Caergwyrle ; Holy- well; Caerwys; Rhyl, Prestatyn, and St Asaph; and

Hanmer. Flint borough has its separate commission of the peace, the borough magistrates holding their petty sessions at the town-hall for the borough district. The whole county constitutes one lieutenancy, and there are no highway districts. The principal towns are Flint, Mold, St Asaph, Rhyl, Holywell.

Flint (said to be derived from a corruption of the docu- mentary term " Castellum apud Fluentum" into "' Apud le Flynt") is the capital and svle corporate town of the county, a seaport and contributory borough, 173 miles from London, ou the south of the Dee estuary, between the sea and the hills inland. Jt has some good houses, and has recovered its decadence of twenty years ago since the establishment of vast chemical works, which make it the seat of great alkali manufactures, by Messrs Muspratt Brothers, Huntley, and others. Its chief imports are sulphur and other chemicals ; its exports coal, soda, potash, copper, and various chemical products. The church is not remarkable; but there are good parochial schools and several nonconformist chapels. The footways of the town are flagged, and there are other street improvements. Until five years ago the county jail occupied (as at Haverford- West) an angle of the Edwardian Castle on the edge of the estuary; it was then removed to Mold—where, however, the new and costly jail has been closed by the New Prisons Act, and Flintshire prisoners are now sent to Chester Castle. The old Flint jail has been bought by the Messrs Muspratt, and turned to good use as a " working men's club." It was in Flint Castle that Percy betrayed Richard II. to Bolingbroke in 1399. In 1643 if surrendered to the Roundheads, and four years later was dismantled. Its constable is still appointed by the crown, with duties limited since the Municipal Corporations Reforms Act to the care of the ruins,—a square court with towers at the angles abutting the sea, and a massive round tower with a draw- bridge. Flint was made a borough by Edward I., and chartered by Edward III. and Edward the Black Prince, ' earl of Chester. Since the Reform Act it is governed Y @ mayor, 4 aldermen, and 12 councillors. It is the nomination place for the group of contributory boroughs, viz, Flint, Caer 1

fe wins gwyrle, Caerwys, Overton, Rhuddlan, Watch with St Asaph, Holywell, and Rhyl returns one member of parliament. In 1871 the population of Flint

*was 4269, as against 3296 in 1851. “ = a well-built town on the Alyn, in the south-east ei * the centre of a great coal and lead district, a wat _ of the Chester and Holyhead branch railway, the hae a the county, and the great locale of county oan ts restored church of the early 16th century is ae e finest in the diocese ; and the Bailey Hill is the The an ancient fortress stormed in 1144 and in 1322.*

poetic of Mold is 12,237 by the last census.

saph, one of the four Welsh sees, anda cathedral

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town, lies near the confluence of the Elwy and Clwyd. Founded originally by Kentigern, bishop of Glasgow, and named after his successor Asa, or Asaph, it still possesses, outlasting the buffets and vicissitudes of ages, its plain yet massive cruciform church. The population in 1871 of that part of the town which is situated in the county of Flint was 2806.

At the same census the winter population of the flour- ishing watering-place of yl is given as 4229; but its summer average is from 10,000 to 12,000,—railway and water facilities bidding fair to eclipse the ancient neigh- bouring borough of Rhuddlan, which was once of such importance that Edward I. held his parliament in it, and the Statutes of Rhuddlan were passed there. Population of Rhuddlan, 5525,

Holywell depends for its prosperity on its lead mines and lime-works, its copper, brass, aud zinc, and its lead smelting. At the last census its population was 9980. It has a railway station on the Chester and Holyhead line, two miles from the town, and within a hundred yards of the Cistercian abbey of Basingwerk. Closer still is St Wini- fred’s well, the exquisite late Perpendicular chapel above which has been restored. Other places of antiquarian in- terest are Caerwys, on the Mold and Denbigh railway—with its streets at right angles and other indications of Roman occupation; Hope, or Hope Estyn, near Caergwyrle; and Overton, in the detached part of Flint. Bodfary re- tains the tradition of Roman occupation. ‘There is a for- tified British post at Moel-y-Gaer, near Northop, and a road- way at Halkin, near Whitford.

The history and antiquities of Flintshire are of some im- portance. Maes-y-Garmon, a mile from Mold, is the scene of the bloodless victory of the Britons under Gerinanus and Lupus over the Picts and Scots in 430 a.p., remembered as the " Alleluia victory." Bangor Iscoed, "the great high choir in Maelor," preserves the site of the monastery sud- denly and totally destroyed with more than 2000 monks by Ethelfred of Northumberland in 607. Watt's Dyke and Offa's Dyke—supposed to have run, the former from the coast near Basingwerk, past Halkin, Hope, and the Alyn gorge, towards Oswestry, and the latter from Prestatyn southward towards Mold, Minera, and across the Severn over the Long Mountain—perpetuate the names, one of a local hero, the other of a great Mercian ruler. At Cynsyllt, or Coleshill, is the scene of a second defeat of Henry II. by Owain Gwynedd about a mile from Flint, the first having been at Coed Ewloe, where a lone tower remains to recall the tale. Tumuli, maenhirs, and inscribed stones are frequent in Flintshire, the most remarkable of the last being the "Maen Achwynfan" of the 9th to 12th century near Pantasa, and the 14th-century cross in Newmarket church- yard. Most of the Flint castles are Edwardian, that at Caergwyrle bespeaking an earlier Roman and even British occupation.

Flintshire is well provided with public elementary schools, viz., 68 voluntary and 4 board schools, and Church of England Sunday-schools. It belongs to the diocese of

St Asaph.

On the history of the county may be consulted Areheologia Cambrensis, 3d series, vol. iii.; Thomas, History of the Diocese of St Asaph, 1874; Pennant's Tour in Wales; Nicholas, Annals of Welsh Counties and County Families; Notes on the History of the County Town of Flint, by Henry Taylor, town-clerk of Flint, 1875 ; Murray's Handbook of N. Wales, 1874. (J. DA.)

FLINT, Trmorny (1780-1840), an American clergyman and writer, was born in Reading, Massachusetts, July 11, 1780. He graduated at Harvard College in the close of 1800. Settled as a Congregational minister in Lunenburg, Massachusetts, he pursued scientific studies with interest ; and his labours in his laboratory seemed so strange to the people of that retired region, that some persons supposed

and asserted that he was engaged in counterfeiting. This led to disagreeable complications, which resulted in his leaving his parish and becoming a missionary in the valley of the Mississippi. There could have been no discipline better adapted to correct his natural sensitiveness than his work at the West in those days, where he came into contact with many rough people and peculiar social habits. His observations on the manners and character of the settlers of the Ohio and Mississippi valleys were recorded in a very picturesque work called Recollections of Ten Years passed in the Valley of the Miossissippt, Boston, 1826, This book passed tu a second edition, and excited 30 much interest as to be translated into French as well as reprinted in England. Indeed, it was the first account of the Western States of America which brought to light the real life and character of the people. Flint had acquired this knowledge of the young communities of the West, not only by his journeys among them as an itinerant preacher, but also by having been fora short period teacher and farmer on the banks of the Mississippiand Red Rivers. The success which this work met with, together with the failing health of the writer, led him to relinquish his more active labours for literary pursuits. His subsequent publi- cations were as follows :—/rancis Berrian, or the Mexican Patriot, 1826,—a novel, the scene of which is laid in Mexico at the period of the revolution in which Iturbide was overthrown; A Condensed Geography and History of the Western States in the Mississippi Valley, 2 vols. 8vo. Cincin., 1828; Arthur Clenning, a novel, 1828; George Mason, the Young Backwoodsman, a novel; Indian Wars in the West, 1833; Memoir of Daniel Boone, 1834. In addition to these works, Flint published several transla- tions from the French, and essays in the London Atheneum, the Western Review, and the New York Knickerbocker, of which last two magazines he was at different times editor. His style was vivid, plain, and forcible, and his matter in- teresting ; the spirit of his writings was always humane and genial; the Quarterly Review, in a notice of his first book, says: "These pages reflect a sincere, humane, and liberal character, a warm and gentle heart, and hardly even a pre- judice which is not amiable." He was very industrious, and had acquired such a power of abstraction that he prose- cuted the labour of translating the Diographie Universelle in a room where other persons were engaged in work or conversation, being so absorbed in .lis

work as to lose all consciousness of where he was or who was present. He died in Salem, August 16, 1840. His works on the Western States are still among the best we have on the subject.

FLODOARD, or Fropoarr (894-966), a French chronicler, was born at Epernay in 894. He was educated at Rheims, and for some time held the office of canon in the cathedral of that city. The later years of his life were spent in retirement at a neighbouring monastery, and were devoted to study and the exercises of piety. He died 28th March 966. His works are the most important contribu- tion to the French literature of his time, and consist of Histowre de Péglise de Rheims ; Chronique sacrée, a poetical history of Jesus Christ, the apostles, the popes, and the saints and martyrs of the church; and Chronicon Rerum inter Francos gestarum, which, beginning with the year 919 and ending with 966, throws more light than any other document on the annals of the 10th century, This work was first printed in the Rerum Burgundicarum Chronicon, Basel, 1575 ; and a translation of it was inserted by Guizot or his Collection des Mémoires relatifs & 0 Histoire de France. a ae of Flodoard is very correct and elegant, but

poetry 1s no exception to the mechanical, unmusical,

and co = : ; : oa =. place verses belonging to this period of

FLO—FLO

FLOOD. See DELuGE.

FLOOD, Henry (1732-1791), an eminent Irish orator and politician, born in 1732, was the son of the Right Honourable Warden Flood, chief-justice of the Queen's Bench in Ireland. He came of an old Kentish family, a branch of which had settled in Kilkenny during the Ciyil War. At the age of fifteen he was sent to Trinity College Dublin ; and he subsequently studied at Oxford under Markham, afterwards archbishop of York. On leaving the university with a good reputation for classical scholarship he proceeded to the Temple. Possessing a competent fortune, high social position, and considerable family influence, he determined to devote himself to a political life, and obtained a seat in the Irish House of Commons for his own county of Kilkenny. His abilities soon placed him in the position of a leader of the

opposition or popular party, to which he rendered good service on several occasions. Among his more intimate friends at this time were the agreeable and gifted Lord Charlemont, Mr Bushe, and the famous Grattan, who owed a good deal to Flood's assistance in entering upon public life. Though somewhat too solemn and dignified, Flood was an orator of considerable power, and especially master of that unsparing invective which was then one of the best employed weapons of debate, and which often degenerated into what would now be considered unwarrantable personalities, At that time, indeed, political rivalry frequently ended in personal hatred. In 1769 Flood had the misfortune to be involved in an election quarrel with a Mr Agar. The result was a duel, and on the second exchange of shots Agar was mor- tally wounded. Flood was brought to trial, but acquitted. In 1775 Flood was persuaded to an act which seriously diminished his influence. He accepted the office of vice- treasurer under Lord Harcourt and the duke of Buckingham. But in 1780, in consequence of his strong sympathy with the cause of Irish independence and his position as lieutenant-colonel of the Irish volunteers, he felt obliged to resign this office, and in consequence he was removed by the Government from the council, treatment which be bitterly resented. His influence was now entirely devoted to the support of the popular party, which in fact he had never deserted. He was present at the great armed con- vention of the volunteers which met at Dungannon, and proposed a resolution that the powers exercised by the Privy Council were unconstitutional. After the passing of the Irish Bill of Right through the splendid efforts of Grattan, Flood made an attempt to achieve what he considered would be a still greater triumph. He declared that the mere repeal of the Act (6 Geo. L) which had subjected Ireland to the control of the English parliament was not enough, and insisted upon an express renouncement of the right of the English parliament to interfere in any way with the goverment of Ireland. Grattan, maintaining that his own measure was sufficient, vigorously opposed the bill which Flood introduced; and the two orators, forgetting their old friendship, changed speeches full of the bitterest personal ivectivé The quarrel was about to end in a duel, and arrangements were actually being made for a meeting, when the affair was discovered, and both were bound over to keep the peace. Flood's bill was completely defeated, for it was altogether unnecessary, and could only have served as a triumph t0 irish national vanity. In 1783 Flood obtained a seat 10 the English House of Commons (while retaining his seat 1 the Irish

House), being elected M.P. for Winchester. He was afterwards (1785) member for Seaford. But his sut- cess was not such as he had enjoyed in Ireland, and his career in the English parliament was not of much import ance. Perhaps his greatest effort was his speech against Pitt's famous commercial treaty. Flood died on the ?

December 1791. He left £5000 a year to Trinity College, Dublin, part of which was to founda professorship of Irish and furnish prizes for English aud Trish composition, but this destination of the bequest was set aside.

FLOOR CLOTH is a covering for the floors of lobbies, halls, passages, and other situations where there is much trafic and heavy wear. Originally floor-cloth consisted of a heavy canvas coated with painters' colours and ornamented with patterns executed with the brush. Ata later period stencilled ornaments took the place of hand-painted patterns, and now ornamental designs are applied solely by means of hand-blocks, Kirkcaldy, in Scotland, is the leading centre of the oil floor-cloth manufacture, in which town it was firmly established by the energy of the late Michael Nairn —the operations of the firm founded by him being, it is understood, the most extensive in the trade. The brief outline of the manufactnre which follows represents the processes as conducted in the extensive establishments of Shepherd and Beveridge of Kirkcaldy, where the mechani- cal and other arrangements have reached the highest per- fection suggested by skill and experience.

The size of the canvas operated on, which must be free from all seams and joinings, is 8 yards wide by 25 yards long. The huge webs from which these canvasses are cut are woven, chiefly in power-looms, in lengths of 150 yards, from which six floor-cloth pieces are obtained. For the cheaper qualities of floor-cloth jute canvas is employed, but in the best kinds the material is woven of stout tow yarn. The pieces of canvas in sizes above indicated are mounted on a series of stout wooden stretching frames, ranged about 30 inches apart from each other in a lofty, well-ventilated hall. The back or under part of the floor- cloth is first dealt with, the first operation being to coat the whole surface with thin size, which fills up the interstices and prevents the oil of the pigment from penetrating and rotting

the fibres. The paint, which is next applied, is of the consistency of a thin plaster, and is made up of raw oil, some turpentine, and ochre, umber, and other earthy pig- ments. It is laid on, not with brushes, but with long trowels, the operation being called " trowelling," and the workmen go over a large surface with great expedition. When the operation is complete, the iron doors of the hall are closed and streams of heated, slightly moist air are blown by a fan blast into the apartment, a temperature of from 78° to 90° Fahr. being then maintained. The moist- ure in the heat is essential for keeping the paint while drying from shrinking, cracking, and scaling off. When the paint is dry the whole surface is smoothed with pumice, and the back is finished with a coat of thinner colour, in which boiled oil without turpentine is employed, thereby securing a glossy surface and finish. Ag soon as the back is dry the face or upper side has to be tured to the work-Men, an operation which demands great caution aud pre- cision to prevent the canvas from being torn and destroyed. The lower edge being carried up and secured along the top of the frame, the upper part is suddenly detached and let down to the floor, The face receives, in succession, a coat of Size and three " trowelling " coats, with pumicing between, and on the conclusion of these operations it 18 ready for printing The printing is a costly process, Owing to the great store of blocks which it is found necessary to provide and keep up; and the colours used are also expelisive, consisting as they do of the fine bright pig- ments with a foundation of white lead. The blocks have 2 printing surface of 18 Square inches, cut either of pear sie: i, other wood, or with faces of type metal cast in

oe the interstices being filled up with felt. ao a Saal Increased by the laborious and tedious an the Operations, tle printing of an eight-colour Over a full piece requiring no less than 7200

separate applications of the set of eight colour blocks and one finishing block. The cloth is brought to the printing room by a kind of overhead tramway arrangement, where it is passed over a long narrow table. At the side of this stands the printer, and the colour table, on which is spread the colour he is to print, is mounted on rails which run parallel to the table over which the cloth is spread. Guide bars are arranged over the cloth to

secure that the various impressions fall on their proper places with the utmost precision, and overliead are suspended from a spring beam screw presses which travel from end to end of the table. The block having received the needful amount of colour, and being laid in position over the cloth, receives by means of the movable screw press a tight elas- tie squeeze, which secures a uniform impression of the portion of the pattern brought out by one colour. The various colours are so printed in in succession, and there- after the whole is gone over with a finishing block, the surface of which is cut into fine straight grooves or lines. Finally, the finished cloth is moved to a drying room, where, suspended by the two extremities face outwards, it is left to harden and season.

Oil floor-cloth is open to the objection that it has a hard, cold, and uncomfortable surface, while it is almost as noisy to the tread as ordinary wooden flooring. Many substances have been proposed to supplant it, in which these objection- able features have been more or less overcome, while they retain its advantages of resistance to wear, cleanness, and freedom from damp. Of these bodies linoleum has proved most successful in experience, but various other materials of a similar kind have been introduced and used to a con- siderable extent.

Kamptulicon is a variety of floor-cloth, which, although invented about 1843, did not receive prominent public notice till the London International Exhibition of 1862. The materials and processes employed in its manufacture vary considerably, but it is essentially a preparation of india-rubber masticated up with ground cork, the prepara- tion and mixture being effected by repeated passing of the material between grooved rollers. When thoroughly incorporated the preparation is rolled out into sheets, some-times over a backing of canvas, by passing it between pairs of wide and heavy steam-heated rollers. In addition to the substances above mentioned, gutta-percha, sawdust, peat-dust, ground leather, boiled oil, resins, pitch, asphalt, tar, chalk, and fibrous residues have all been used in kamptulicon making. The rolled sheets are ornamented by printing simple patterns on their surface, but, as much of the peculiar advantages of kamptulicon would be lost were its whole surface covered with oil pigments, the kamp- tulicon surface is, as far as possible, left exposed. Kamp- tulicon forms a warm, pleasant, soft, and noiseless floor- cloth, but the higher qualities, in which

india-rubber and ground cork are the main ingredients, are rather expensive, and the manufacture has been curtailed since the introduc- tion of linoleum.

Linoleum.—This substance consists of oxidized linseed oil combined with ground cork, treated and rolled very much in the same manner as kamptulicon, to which, in appearance and properties, it bears a close resemblance. The manufacture was first conducted under a series of patents secured by Mr F. Walton, the essential feature of his process—his method of oxidizing linseed oil—having been patented in January 1860. The oxidation was effected by mixing the oil, perfectly clear and bright, with a suit- able drier, by preference from 5 to 10 per cent. of acetate of lead being used, and spreading it in thin films on sur- faces of considerable extent, which films were exposed to currents of heated air. In this way a rapid oxidation was induced, the oil being transformed into linoxein, a slightly

elastic semi-resinous body, common with india-rubber, with the advantage of a clear semi-translucent yellow colour. In his patent of December 1863, dealing chiefly with the production of coloured patterns on linoleum, Mr Walton specifies, as a suitable composition for the body of the material, 4 cwt. of oxidized oil, 14 ewt. of resin, 3 cwt. of kaurie-gum and colouring inatter, mixed together in a steam-heated pan and cast into cakes. It was afterwards to be mixed with an equal weight of cork dust, or a somewhat larger quantity of sawdust, and spread on and pressed into a woven fabric between steam-heated rollers. The breadth of the finished linoleum is determined by the breadth of the spreading rollers through which it passes; at present that does not exceed six feet. 'The manufacture of linoleum is rapidly extending, and since the expiry of Mr Walton's patent rights, it has been begun by the leading Kirkcaldy floor- clothmakers. Boulinikon.—Under this name a kind of floor-cloth with a linoleum-like surface is manufactured of waste materials, by a process patented in January 1865 by John B. Wood. It is composed of about equal portions of raw buffalo or other hide macerated and reduced to a pulp, pulped cotton or linen rags, and coarse hair ground up short and fine. These are mixed into a common

pulp in a form of rag engine, and subsequently spread, drained, dried, and pressed on a machine similar to that used in the paper manufacture. The ornamentation is effected in the manner employed for kamptulicon and linoleum; but the sub- stance may be entirely covered with pigment and finished like oil floor-cloth, (a? Bas) FLOR, Roger v1, a military adventurer who, in the early years of the 14th century, distinguished himself as leader of the Catalan Grand Company. He was the second son of a falconer in the service of the emperor Frederick II., and when eight years old was sent to sea in a galley belonging to the Knights Templars. He entered the order, and became commander of a galley. At the siege of Acre by the Saracens in 1291 he absented himself, took no part in the defence of the town, and was accused of appropriat- ing to his own use the treasures of his order. He was denounced to the pope by the grand master as a thief and an apostate, was degraded from his rank, and threatened with arrest. To escape imprisonment he fled to Genoa, where he began to play the pirate. The struggle between the kings of Aragon and the French kings of Naples for the possession of Sicily was at this time going on; and Roger entered the service of Frederick, king of Sicily, who gave him the rank of vice-admiral. At the close of the war, in 1302, Frederick being anxious to free the island from the auxiliaries whom he had no longer the means of paying, Roger induced his followers to seek new adventures in the East, in fighting against the Turks, who were ravaging the empire. The emperor Andronicus II. accepted his offer of service ; and in September 1303 Roger with his fleet and army arrived at Constantinople. He was adopted into tlie imperial family, was married to a granddaughter of the emperor, and was made grand duke and commander-in-chief of the army and the fleet. After some weeks lost in dis- sipation, intrigues, and bloody quarrels, Roger and his men were sent into Asia, and after some successful encounters with the Turks they went into winter quarters at Cyzicus. In May 1304 they again took the field, and rendered the important service of relieving Philadelphia, then invested and reduced to extremities by the Turks. But Roger, bent on advancing his own interests rather than those of the emperor, determined to found in the East a principality for ce ee nee his treasures to Magnesia, but the people ied se = and seized the treasures. He then formed 8 own but Lis attacks were repulsed, and he

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having many properties in | was compelled to raise the siege. Passing over into

Europe, he settled his troops in Gallipoli and other towns and visited Constantmople to demand pay for the Grand Company. Dissatisfied with the small sum granted by the emperor, he plundered the country and carried on intrigues both with and against the emperor. In the spring of 1306 Roger was created Cesar, this being the first time that the title was given to a mere adventurer. Before set- ting out ou a second expedition to Philadelpliia, he visited the young emperor Michael at Adrianople ; and there he was assassinated and his Catalan cavalry were massacred, April 4, 1306. His death was avenged by a war which was fiercely waged by the Grand Company against the Greeks.

FLORA, in Roman mythology, a goddess of spring-time and flowers, to whom for her fostering influence a festival (Floralia) of great gaiety and perhaps excessive licence was held in Rome, at first irregularly, but after 173 Bc, annually, with increasing popularity. This festival was extended to five days, April 28 to May 3, tlie date of April 28 answering to the foundation day of the temple of Flora near the Circus Maximus. To her worship was attached a Flamen Floralis.

FLORENCE (Italian Firenze, ancient Florentia), the capital of Tuscany, now a province of the kingdom of Italy, is an archiepiscopal see. It is situated 125 miles north of Rome, 43° 50’ N. lat., 11° 14’ E. long., on both sides of the river Arno, which here flows through a wide valley, bounded by spurs of the Apennine range to the north, and by lower hills to the south of the city. The bed of the river at Florence is 138 feet above the Mediterranean. The | geological formation of the surrounding country is Upper Cretaceous and Older Tertiary, partially covered by the fossiliferous upper Arno beds of Newer Tertiary, containing elephant bones. Pietra forte, belonging to the Cretaceous,

a durable sandstone witli calcareous ingredients, is largely quarried south of Florence, and has been used for centuries

as paving-stones for the city, as well as in the construction of the city walls, the palazzi, churches, &¢. North of Florence, pietra serena or macigno, a pure sandstone belonging to the Tertiary beds, is likewise worked for building purposes, its texture being finer than that of the | pietra forte; it has been adopted for the interior of churches and houses.

The soil is remarkably fertile: corn, vines, and olives — cover hilland valley, while the mountains, which rise above 3000 feet, have the cypress, ilex, chestnut, and pine. The country is celebrated for the abundance of its flowers, and presents a rich field for the botanist.

Climate and Sanitary Condition.—The climate of Florence is extremely variable, especially in the early spring, when the inhabitants are liable to diseases of the trachea, to brouchitis, and affections of the lungs. The summers are hot; but both the summers and autumns ar? peculiarly healthy, when the city is entirely free from inter: mittent fever, while typhoid fever is of rare occurrence Eruptive diseases and all children's complaints are exceed inglymild. Diphtheria appeared first in 1868, and continued as a severe epidemic until 1872, since which time It has only occurred at intervals and in isolated cases. Cholera has more than once visited Florence with severity, but the last time it was in Italy this city escaped the calamity. The migliaria, so much dreaded by the Florentines, 8 not confined to Italy, but here, as elsewhere, is found to be aut accompaniment of typhoid fever, pneumonia, and some other diseases. The average temperature throughout the year 18 about 15° centigrade (59° Fahr.). The greatest summ@ct heat averages 36° centigrade (96°8° Fahr.), but it has =. exceptionally to 39° centigrade (102:2° Fahr.). The gaa cold is about 6° centigrade below zero (21°2° Fabr.). 'The

is 15 hours 23 minutes; the shortest, 8 hours icon The average annual rainfall is about 9 inches. 'The drainage of the city is imperfect, and it is ill supplied with water, which is largely impregnated with carbonate of lime. The wells are shallow, not above 20 or 22 feet deep. The best drinking water is conveyed in pipes from a distance of seven miles north of Florence to the Palazzo Pitti. The water of the Arno above the town has latterly been filtered and pumped up to a reservoir for distribution in the city. Public

Buildings, Parks, and Charitable Foundations.— Florence contains more than 170 churches, several of which are Italian Evangelical, besides English, American, French, and German Protestant, and a large Jewish synagogue

been left standing, the former homes of Dante, Macchiavelli, Guiceiardini, &c., have tablets with their names inscribed. Some of the tabernacles, or frames containing pictures of sacred subjects, with lamps burning before them, still van, commemorating the ancient usage of praying in the corners of the streets, The walls of Florence north of the Arno have been demolished, leaving the gates isolated, huge monuments of the past. South of the Arno the four gates of Romana, San Frediano, San Giorgio, and San 1colo, remain as of old.

The city is intersected from S.E. to N.W. by the river, Which is crossed by six bridges. Two are suspension bridges, the remaining four of stone. The Ponte Vecchio, or Jewellers' bridge, alone retains its ancient form, and is still flanked on both sides by goldsmiths' shops; the bridge of

the S. Trinitd is adorned with statues, and is remarkable

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lately erected. The most remarkable are the Badia or ancient abbey, the cathedral with its campanile, and the baptistry, Sta Maria Novella, San Marco, the SS, Annunziata, and Or San Michele, with San Miniato and San Francesco beyond the walls. Of the palaces, whose construction of rough hewn stone gives a peculiar character to the city, those of greatest interest are the royal residence of the Pitti, the Palazzo Vecchio or municipal palace, and the Palazzo Riccardi, once the mansion of the Medici, but now the palace of the prefect. To these may be added the private palaces of the Strozzi, Rucellai, Corsini, Corsi, Quaratesi, Gondi, Albizzi, and Alessandri. The streets of modern Florence bear the names of many illustrious citizens of the past, and in the older narrower streets which have

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for the perfect symmetry of the arches. The fortresses of Belvedere and Del Basso are now only used as barracks for soldiers. Since the annexation of Tuscany to the Italian kingdom the convents in Florence have been suppressed. A few monks are allowed to remain in each sanc- tuary, but the Government has prohibited any new monks or nuns to be added to the present number. This prohibi- tion is, however, constantly evaded, and some of the schools for the young continue in their hands. There are twelve hospitals, including those for the blind, deaf and dumb, and insane. The hospital for the sick of Sta Maria Nuova, was founded by Folco Portinari, the father of Dante's Beatrice, and the institute for the relief of the poveri vergognosi, or those ashamed to beg, by the good bishop Antonino, in the 15th century. One of the most important and beneficial charities is that of the Misericordia, or brothers of mercy-

Florentines of all ranks belong to the society, and the members are equally bound to lend their services without remuneration when summoned, either to convey sick or wounded persons to the hospital, to nurse them in their homes, or to carry the dead to burial. Next in antiquity is the Bigallo for the reception of orphans or children abandoned by their parents, as well as the Innocenti or Foundling Hospital. The most admirably conducted modern charity is the work-house or Pia Casa di Lavoro of Monte Domini. The building comprises two former con- vents; the Pia Casa is self-supporting, and independent of the municipality. None are admitted who are able-bodied, or who have relations capable of supporting them. Au excellent education is provided for the boys, who are taught a trade by being bound apprentices tu one of the workshops attached to the establishment. The girls are provided with dowries when they leave the Pia Casa.

There are nine theatres, and several public parks or gardens, The Cascine, a large extent of ground surrounding a fancy farm formerly belonging to the

grand dukes, and planted in long avenues of ilex and other trees, is the fashionable resort of the Florentine nobility. The Strada dei Colli, outside the Porta Romana, winds round the hills of Arcetri and San Miniato, affording a magnificent pros- pect over Florence. The Boboli garden, behind the Pitti, and belonging to the royal palace, is open twice a week to the public, and, with its trim alleys, quaint terraces, statues, and fountains, is the delight of the Florentines.

Galleries of Artand Iibraries.—Besides some excellent private collections, such as those of the Torrigiani, Corsini, and Strozzi, the Uffizi contains a very fine gallery of paint- ings, especially of the Tuscan school, but including several of Raphael's and Titian's masterpieces. The greatest treas- ures of the gallery are contained in one room called the Tri- bune, where are also placed the most celebrated statues of antiquity. A suite of small rooms contains some admirable specimens of other schools of painting. In one of the larger rooms is the famous group of the Niobe ; two others are filled with portraits of artists, chiefly by their own hands ; and there are, besides, valuable collections of busts, coins, medals, gems, engravings, and drawings by the old masters. The Pitti collection of paintings is perhaps the finest in the world, not only from the chefs d'ewvre of the great masters, but from the small number of pictures which inay be considered of even mediocre merit. The Academy is assigned for the best examples of early art down to the time of Fra Angelico and Perugino; and connected with it are the cloisters of the former convent of the Scalzo or barefooted friars, where are some of the finest works of Andrea del Sarto in chiaroscuro. The Egyptian museum in the Via Faenza is small, but contains several objects of interest, and the museum of Etruscan art under the same roof is peculiarly important from a life-size bronze statue, a marble Greek sarcophagus with a coloured representation of the battles between the Greeks and Amazons, and a terra-cotta statue of a lady in the costume of the third century before Christ. Here also is an interesting fresco of the Last Supper attributed to Raphael, whilst the Convent de Pazzi possesses the finest work of his master Perugino, a Crucifixion, now open to the public.

There are three large and valuable libraries in the city. aa ational library, which unites the former library of the 'itti with the Magliabecchian, the two

together contain- ns 280,000 volumes; the Marucelliana, chiefly remarkable a ae Ae works on art; and the Laurentian, founded

y 4orenzo de' Medici, and attached to the convent of San Lorenzo. This last is rich in a collecti f£ h 9000 oA ingianatee collec 10n 0 more t an cca pts, as well as illuminated bibles

» Ane possesses about 20,000 volumes of print.

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The pride of the collection is an original and perhaps unique copy of the Pandects of Justinian. .

University and Schools.—The university of Florence which is rather an institute for advanced studies,—Istitutj de' Studi Superiori Pratici e di Perfezionamento,—has its origin as far back as the year 1348. It was divided into six '"schole," viz., theology, jurisprudence, medicine, belles lettres, Greek and Latin literature, and astrology or astronomy. 'To counteract the effects of the plague, which in the year just mentioned had decimated Florence and caused the city to be avoided by strangers, it was decreed that no one living within the walls, or even in the territory of the republic, should be allowed to seek an education abroad, and that those youths who were already attending other lyceums should forthwith return to their native city, In 1421 there were already 42 professors, and although in 1472 the Medici desired to revive the splendour of the Pisan university, and transferred several of the chairs from the city to Pisa, Florence retained many distinguished professors. The university underwent various changes, both in organization and name, but continued to flourish under the Medicean grand dukes. It gave rise to several academies, the most ancient of which was the Platonic, founded by Marsilio Ficino, for the cultivation of Greek literature, the Florentine academy, and the Accademia del Cimento (discussion) which had its rise with Galileo and his scholars. The Accademia della Crusca—named from crusca (bran) to express sifting the language—was foundel in 1552, and the agricultural academy of the Georgofili in 1783. The taste for botany of Cosimo I. led to the for- mation of a herbal garden (Giardino de' Semplici)—and ultimately to the botanic garden under the walls of the Boboli. Natural science first formed a branch

of study under the patronage of the Medici, who invited foreigners of scientific distinction to Florence. A vast collection of objects of natural science and physics having accumulated, the celebrated professor Giovanni Targioni Tozzetti, in the 18th century, threw them open to the public The observatory, once attached to the muscum, has been removed to a height corresponding with that ou which Galileo made his observations. The collection in the museum was enriched by the valuable waxen anatomical preparations of Giulio Zumino of Syracuse, and by a unique collection of physical instruments, most of which had belonged to the Accademia di Cimento. The university was reorganized in 1859, when Baron. Ricasoli presided over Tuscany. Several new professorships were founded, in law, philosophy, and philology. In 1869 a chair of anthropology was added. The medical school of Sta Maria Nuova has also been attached to the university. At one time the students of law, medicine, and natural science were expected to pursue their studies, first in Pisa, and the last two years 1! Florence, where they reccived their degrees. This has again been modified, and students in Florence have now the option of receiving degrees in Florence, Siena, or Pisa, Natural science degrees are conferred at the Specula, or institute of natural science, in the Via Romana.

The communal or municipal schools, where the pupils are admitted gratis, have increased enormously. Fron 4 schools under the last grand-duke, there are now, besides 32 elementary schools, 15 lyceums, of which three are for girls, and one of these a normal school for the trains of teachers. The entire number of pupils in the schoo averages 7900.

The manufactures are few and of small importance, that of silk standing first. The cultivation of the silk-worm and straw plaiting are the usual occupations of the people. The porcelain manufacture of the Marchese Ginori at Doceia, a few miles from Florence, has greatly fallen off work as well as reputation, but a successful attempt lo,

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revive majolica ware has recently becn made by Signor Can- tigalli, whose manufactory is beyond the Porta Romana.

Administration.—Florence is governed by a prefect or representative of the chief government, who has a force of carabineers (mounted police) at his disposal, besides guardie di sicurezza, partly paid by the municipality, although there is also a city police. The ancient office of gonfa- lonier is replaced by that of syndic, who is president of the junta or municipal council. The city is divided into four electoral districts, and sends four deputies to par- liament. Every male inhabitant above twenty-five years of age has the right of suffrage, although twenty-one is the usual age qualifying for official posts in Italy.

Population.—The population of Florence is very fluctu- ating. In 1854 the inhabitants numbered 115,675, but during the short period when it was the capital of the new kingdom there was a large increase of Italians as well as foreigners ; this diminished as rapidly on the transference of the capital to Rome. By the census taken December 31, 1871, the total population, foreigners included, amounted to 167,093. On December 23, 1876, the number had risen to 176,121. In 1871 there were 158,704 Italian Roman Catholics, 917 Italian Protestants, 2366 Jews, and 5106 of other sects.

The Florentines are gentle and courteous in 'their manners, though retaining the republican feeling of equa- lity, and are well disposed towards all who treat them with kindness and respect. They are justly proud of the traditions of their native city, but are hardly conscious that centuries of misgovernment have left them behind in the race of civilization. Though the advantages of a liberal education are now open to them, and they are remarkably rapid in acquisition, the more important moral training is still wanting,—a defect which, with the absence of chiv- alrous respect for women, renders men of all classes, as is too much the case also in other parts of Italy, tyrannical to their wives and children, as well as indifferent to the suf- ferings of the lower animals, all alike being regarded as pro- perty, over which they liave an absolute control. From their nervous physical organization the Florentines are defective in manly courage, but peculiarly sensitive to the beautiful in art, and able to reproduce all that is delicate and refined in decoration. As, however, with the decline of the healthy vigour and simple lives of their ancestors they have lost much of their originality, modern sculpture and painting are in general feeble, and wanting in truth of expression and colour. Though indolent and incapable of

great exerticn, the lower orders are industrious, and though Impetuous, they have displayed exemplary patience and Moderation in times of adversity. Their greatest misfor- tunes are the passion for gambling, with other vices remain- Ing from a corrupt state of society, and the extremes of Superstition and scepticism, which belong to the state of transition, political and religious, of the present era in Italy (1878). The large middle class, however, besides pro- ducing men eminent in literature and science, is rising in social and political importance, and by their intelligence and domestic virtues may well redeem faults in their fellow citizens, which are to be regarded rather as the result of adverse circumstances, than as a constant factor in the character of the Florentine people.

LHistory.—Florence was originally a sinall trading village belonging to the Etruscan city of Fiesole, whence mer- ee = sent down the Arno to Pisa, then a seaport. Me en colonized by the soldiers of Sulla, it gradually

aned the dignity of a city, with the rank and privileges of ae un, The name Florentia may have been derived a a Roman general, or from Fluentia, because

ated at the confluence of the Arno and Mugnone, or

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the reign of Tiberius Cesar the Florentines sent an embassy to Rome to deprecate a decree of the Roman senate, by which, in order to check the inundations caused by the number of tributary streams flowing into the Tiber, it had been proposed to turn the Chiano into the Arno. Christi- anity was first introduced in 313 a.p., and the most cele- brated of early Florentine bishops was Zanobius, who died in 417, and to whom various miracles are ascribed. During his lifetime an invading army of barbarians approached Florence, but were defeated and destroyed in the fastnesses near Fiesole by the Roman general Stilicho. The Floren- tines, however, attributed the preservation of their city to the prayers of Zanobius. The victory was won in 405 on the 8th October, a day dedicated to a youthful saint, Repa- rata, who is said to have appeared in the midst of the battle, bearing in her hand a blood-red banner with the device of the white lily, which from that time became the badge of the city, whilst a new cathedral,

built on the site of the old church of San Salvador, received her name. Florence had suffered the fate of other Italian cities at the hands of northern invaders, when Charlemagne, on his way to Rome, rebuilt its walls. Commerce began to flourish in the 10th century, when as yet German nobles or their descendants, who held their castles in fief of the German emperors, dwelt beyond the city. The pope, because an Italian sovereign, was regarded as the representative of national independence, and when Tuscany fell to the inheritance of the Countess Matilda, the Florentines found in her a patriotic champion of their rights, as well as a staunch adherent of the reigning pope, Gregory VII. A second circle of walls was built as a protection against the im- perialists, and Matilda obliged some of the powerful nobles in the neighourhood to yield their lands to the canons of Sta Reparata. She died in, 1115, leaving a name so beloved by the Florentines that their female children were frequently christened Contessa, or Tessa, in remembrance of their benefactress. As the Florentines conquered and destroyed the castles of the robber chieftains who infested their neighbourhood, they obliged them to reside within their city—an impolitic measure, which sowed the seeds of future discord and civic war. The romantic story of the Buondelmonti, whose assassination in 1215, for a breach of promise of marriage, occasioned a fierce outbreak of strife, is an instance of the many feuds that caused bloodshed in Florence during centuries.

About 1240 the Paterini, a sect of Reformers, after the manner of the Albigenses in France, had gained consider- ably in numbers and influence, especially among the im- perialists, who about this time assumed the name of Ghibel- lines. Their adversaries, the Guelphic or papal party, called in Peter Martyr, a Dominican friar of Verona, to rouse the multitude for the destruction of this heresy. Two columns in Florence still mark the spots where the Paterini were massacred. A few years later the Guelphic Florentines sustained a severe defeat from Manfred, a natural son of the emperor Frederick II., at Monteaperti near Siena; and the Ghibellines, whom they had banished, re-entered Florence. The Ghibelline conquerors proposed to level the city with the ground, but were deterred by the bold and determined opposition of one of their own party, Farinata degli Uberti, whose name has been immortalized by Dante. About this time a French pope, Clement IV., invited Charles of Anjou, brother of Louis IX. of France,

to take possession of Naples and drive the imperialists from Italy ; and after the defeat and death of Manfred at Benevento, Charles complied with the reqnest of the Florentine Guelphs, to assume the lordship of their city. In 1282, however, the wealthier guilds of Florence established a form of government or signory of their own,

rom { ap ae ats ; Tom the profusion of flowers growing in the vicinity. In | consisting of members chosen among themselves with the

title of priors. Not satisfied with having driven their Ghibelline rivals into banishment, they sent an army to encounter them at Campaldino, where the Ghibellines were defeated with great slaughter. To arrest the power of the nobles within the city, a new code was framed in 1293, which went so far as to exclude them from their rights as citizens, and an officer was appointed —gonfaloniere di gius- tizia (standard-bearer of justice)—with a guard of soldiers to enforce the laws. Seventy-two families were declared incapable of holding office, and as they naturally combined in self-defence, peace seemed as far removed as ever from the walls of Florence.

The 13th century is one of the most important in the annals of the city. When Boniface VIII. held his jubilee in 1300, twelve of the ambassadors representing forcign powers were Florentines. So vast were the riches of Florence at this period, that when a citizen of Verona beheld the yet unfinished campanile, and exclaimed that the wealth of two monarchies would not suffice for such a inonument, he was shown the public treasury to convince him that were the Florentines so inclined, they conld build their whole city of marble. The most illustrious of Florentine citizens, as well as poets, Dante Alighieri, born in 1265, was present at the battle of Campaldino in 1289, and was chosen prior of the republic in 1300. In his immortal poem, the Divina Commedia, he has preserved the names and deeds of the great men who made Florence renowned by their works. The friend of Dante, Guido Cavalcante, was considered no mean poet, and among the historians or chroniclers Dino Compagni and Giovanni Villani have left faithful records of their age. Cimabue commenced a new era in painting, and his pupil Giotto carried the art still further. Pre-eminent also in sculpture and architecture, in which Nicolo Pisano had led the way by

his study of Greek art, Giotto built the beautiful cam- panile of the cathedral. St Croce, founded in 1297, and the new cathedral of St Maria del Fiore, were the work of the celebrated architect Arnolfo di Cambio. The exquisite church of Sta Maria Novella was also begun in this cen- tury. The bridge of Rubaconte or Delle Grazie, and that of Carraia, were added to the Ponte Vecchio, and thus the two sides of the river were connected by three thorough- fares, although before the 13th century there had been no houses of importance south of the Arno.

With the commencement of the 14th century the parties which contended for power in Florence had assumed new names. On one side were the Bianchi, including the remnant of the old Ghibelline faction, but now represent- ing the popular party ; on the other, the Neri or Guelphs, who, under their leader, Corso Donati, represented the nobles or aristocracy of the city. Each party as it gained the ascendency sent its opponents into exile, until Pope Boniface VILL. again resorted to the fatal expedient of send- ing for a French prince, Charles of Valois, tu restore order, and establish papal supremacy in the peninsula. When Charles arrived in Florence, he gave full licence to the Neri to pillage the city, and avenge their wrongs. The signory endeavoured to conciliate him by bribes, a measure to which Dante, then a prior, refused his consent, thus lead- ing to his own banishment. A few years later the emperor Henry of Luxembourg descended into Italy, and the Florentines, whilst boldly preparing to resist his pretensions, added a third circuit of walls to their city. His death in 1313 put an end to this danger.

Tn a war with Castruccio Castracani, the tyrant of Lucca a Pisa, the Florentines sought the assistauce of Robert, aoe the son of Charles of Valois; but soou Aen ae os ce foreign power they had themselves ee : e a ed a new officer of justice, called the

gS T head of police, who exercised his authority with

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so much cruelty that for a few months Florence was guh. jected to a reign of terror. During another war with Lucca, the Florentines again applied to Robert of Naples who sent them his son, the duke of Calabria. He was accom. panied by Walter de Brienne, duke of Athens, who, acting as

lieutenant for the young prince, set aside the government of the priors, and ruled Florence with a rod of iron. The people could not long endure his acts of savage cruelty. and drove him from their city, after having put his minions to death in a manner so barbarous as to rival the deeds of the tyrant they had expelled. Tumults, a famine and lastly the plague, devastated the land; and as a cul: mination of disasters, the mercenary troops employed everywhere in Italy roamed over the country and spread desolation wherever they came.

In 1378 occurred the famous rebellion of the Ciompi (Wooden Shoes), in which the artisans of Florence, led by a wool-carder, Michele di Lando, gained possession of the Palazzo Vecchio, and turned out the signory. Lando proved himself a man of sense aud courage; he finally quelled the riot in which he had been engaged but had not roused, and restored the authority of the government. It was about this period that Salvestro de' Medici, Bettino Ricasoli, and Gino Capponi were among the leading men of the republic. From the riot of the Ciompi to the year 1390 Florence enjoyed the rare blessing of peace. This was broken by the ambitious thirst for universal dominion of Gian Galeazzo Visconti, lord of Milan, and Florence owed her preservation to her general, Sir John Hawkwood, an Essex tailor, who had joined the mercenary bands on the Continent, and earned himself wealth and celebrity as one of the greatest commanders of the age. The death of Gian Galeazzo in 1402 terminated the war. In 1406 the Florentines gained possession of their ancient rival Pisa after a long and cruel siege. The fall of Pisa put an end to the power of the Ghibelline or feudal party in Tuscany. In 1414, at the council of Constance, Pope John XXIII. was deposed, and came to reside in Florence, where his monument in the baptistry is one of the finest works of Donatello.

The wealth of the city was meantime always increasing, and manufactures of silk and woollen articles flourished within her walls. The richest of her citizens, Giovanni de' Medici, was chosen gonfalonier in 1426, but the popularity of this family had begun to excite the apprehension of all true patriots. When Giovanni introduced the " catasta," or inquiry into the possessions of every citizen, with a view to taxation according to their means—a measure favour- ably viewed by the lower orders,—it raised loud opposition on the part of the wealthy ; for, however great their riches, none

could compete with the Medici, and they saw in the "eatasta" another stepping stone to raise their rival to greater power and authority. At Giovanni's death his popularity descended to his eldest son Cosimo, who lived to be called (however undeservedly) the father of his country. From him descended Lorenzo the Magnificent, Popes Leo X. and Clement VII., Catharine de' Medici queen of Henty II. of France, and Alexander, the first duke of Florence From Giovanni's younger son Lorenzo descended the grand-dukes from Cosimo I. to Gian Gastone. Cosimo de Medici and Rinaldo dei Albizzi represented the two great families who aspired to rule Florence. The Albizzi for short time gained tle ascendency, and Cosimo was sent into exile. Before a year lie was recalled, and was create gonfalonier, and the Albizzi were banished.

In 1441 an cecumenical council was held in Florence My Pope Eugenius IV., to settle the claims of the Latin 4 Greek Churches, when learned men arrived from the East, and introduced the study of Greek classical authors. Neri Capponi alone ventured to oppose the ambition oF

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the Medici, and it was said of him that, i Cosimo was the wealthiest man, Neri was the wisest in Florence ; but the death of Capponi in 1457 left the Medici without arival. The death of Cosimo's favourite son Giovauni in 1463 cast a gloom over the few remaining months of his own life, for his surviving son Pietro was a man enfeebled by disease. At the death of Pietro in 1469, his young son Lorenzo relates how the principal men of the city aud of the state came to their house to condole with them ou their loss, and to encourage him to take on himself the care of the city and government, as his grandfather and father had doue. In 1470 Lorenzo was created syndic; and the next year he entertained with the utmost magnificence Galeazzo Sforza, duke of Milan. In 1472 Volterra was added to the Florentine dominions. Such horrible atro- cities were committed during the siege and sack of this city, that the crime lay heavy on Loreuzo's conscience in his dying hour. In the Pazzi conspiracy of 1478 Lorenzo narrowly escaped with his life, whilst his brother Giovanni was murdered before the altar of the cathedral. The con- spirators were put to death with great barbarity, and Lorenzo's popularity rose higher than ever. Surrounded by men of genius

and learning whom his wealth could buy, or the charms of his manners and accomplishments could attract, Lorenzo added to the houours of his native city by reviving Greek taste and culture.

The appearance of Girolamo Savonarola, or the " Frate," as he was called in Florence, awoke a new spirit. His denunciation of the immoral lives of the citizens, and of books and works of art which tended to lower rather thau exalt human nature, including the writings of Lorenzo himself, were listened to by crowded audiences, Such was his influence that even Lorenzo, when on his death-bed in 1492, sent for the " Frate" to receive his confession, and grant him absolution. That absolution Savonarola refused, unless Lorenzo repented of his usurpations, and promised to restore a free government to Florence; but to this Lorenzo would not consent, and he died unshriven. The dawn of art and literature in the 13th ceutury had attained its greatest brilliancy in the 14th and 15th. Before the Medici had risen to power, the city had been embellished by the works of Andrea Orcagna, Taddeo Gaddi, Fra Filippo Lippi, Fra Angelico, Andrea Castagno, Donatello, and Desiderio di Settignauo ; Ghiberti had designed his Gates of Paradise for the baptistry ; Brunelleschi had added a cupola to the cathedral ; and Maso Finiguerra had led by his niello work to the discovery of copperplate engraving. It was in the 15th century that Bernardo Cenniuni introduced the art of printing into Florence, Filippino Lippi, Fra Bartolommeo and his friend Mariotto Albertinelli, Baccio @Agnolo, Baldovinetti, Sandro Botticelli, the Ghirlandai, the Peselli, Benedetto da Rovezzano and Benedetto da Majano, Mino da Fiesole, Andrea Verocchio, and Leonardo da Vinci Were the precursors, aud some of them the contemporaries, of Michelangelo, the glory of his fellow citizens. With Andrea del Sarto and Raphael—who, though from Urbino, painted some of his finest works in Florence— painting reached its highest perfection. Amono the men of literature were Boccaccio Guicciardini, Macchiavelli Poliziano, Marsilio Ficino, oo Pico dela Mivandeli, eh eo son Piero succeeded to lis honours; his ee am os already a cardinal, became afterwards penis – Z youngest son Giuliano, duke of N emours, a y virtuous man among the Medici, died FT — eetidias of France was invited by Lodovico ciliate the ne "ll Th a Piero de' Medici, to moa om ne , tt the French king, visited him in his ag Bends aS 0 yield the fortresses of Tuscany into

. lero”s return to Florence he found himself

O39 condenmed as a traitor, and had to escape from the city, followed by the rest of his family. Charles VIII. entered Florence in 1494, intending to restore the Medici, but the signory refused to comply with his request, and when the king, affecting to play the part of a conqueror in a vauquished city, dictated terms which he expected the Florentines to accept, Piero Capponi, one of that family of staunch republicans, tore the obnoxious paper in his presence. Charles angrily declared he would summon his troops by the call of the trumpet. “ And we,” replied Capponi, “ will sound our bells”-—the old war signal of the Floreutines. Charles was forced to yield, but still lingered in Florence, until Savonarola, whose courage and sacred character appear to have overawed even this proud monarch, went to him and bade him begone. The influence of the “ Frate” daily increased as well as the number of his followers; and eager to restore a free constitution to Florence, which he believed could only exist with virtue in her citizens, he persuaded the signory to call a grand council or parliament of the people. Charles VIII. had restored independence to Pisa, but the Florentines were eager to recover possession of that city, and siuce Pisa was the ally of Pope Alexander VI., the Borgia of infamous memory, and the greatest enemy of Savonarola, the “Frate” sanctioned the act. Piero Capponi perished during the course of this short war, and the Medici made a fresh attempt to re-enter Florence. The tide of popular favour was turning against Savonarola ; step by step he lost ground with the people, till after a violent tumultuary attack on his convent of St Mark in 1498, he was dragged to prison, torture, and execution.

Early in the 16th ceutury Louis XII. of France having entered Italy to claim the duchy of Milan, by right of his grandmother Valentina, a Milanese princess, Pope Julius Il, who had placed himself at the head of the league to drive him from the country, insisted on the Florentines Joining the enemies of the French king and recalling the Medici. Piero had met his death by accidental drowning, but his son Lorenzo, duke of Urbino, returned to Florence, and after a short life of vicious indulgence, died in 1519, leaving an infant daughter, Catharine, afterwards married to Henry II. of France. Two illegitimate scions of the family, Ippolito and Alexander, now occupied the Medici palace in Florence. Clement VIT., also a Medici, who had

succeeded Pope Julius, was at this time besieged in his castle of St Angelo by the Constable Bourbon, general of the emperor Charles V.; aud in the year 1527 Rome was taken and sacked, to the consternation of all Europe, whilst the party in Florence hostile to the Medici alone perceived a gleam of lope in the destruction of a Medicean pope. Niccolo Capponi, a weak though amiable man, was the leader of this party, and Clarice, the sister of Lorenzo of Urbino and wife of Filippo Strozzi, one of the most unprincipled of Florentine citizens, appealed to Niccolo for aid to drive out of Florence the two youths Ippolito and Alexander, whom she refused to accept as belonging to her family. Meantinie Clement had been reconciled to the elperor, and both approached Florence with a large army. After enduring all the protracted sufferings of a siege, and after the gallant but vain attempts of the patriot Feruccio to relieve his fellow citizens, Florence fell by treachery into the hands of the enemy; the Medici entered the city in triumph, and Alexander was created its duke (1530). Ippolito died by poison, administered, it is supposed, by his cousin Alexander, wlio, after a reign rendered detestable by his vices, was murdered in his bed by his cousin Lorenzino, in 1537. Cosimo de' Medici, son of Giovanni delle Bande Nere, a brave soldier and captain of mercenary troops, and descended from Lorenzo the brother of Cosimo the "father of his country," succeeded to the dukedom.

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The conquest of Siena added to his wealth and power ; and in 1569 the pope created him grand-duke of Tuscany. Though accused of the murder of two of his sons and of a daughter, Cosimo had the force of character and ability to command fear, if not respect, from the people over whom he tyrannized. He was a patron of art, and this hereditary taste was continued in his son the grand-duke Francis L.

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ae school of art founded by Michelangelo had degener- ated into feeble exaggerations, without the genius of the great master. Giovanni Bologna and Benvenuto Cellini alone struck out new and original paths ; and the elegance and grace of their works in bronze and marble still adorn the public places of Florence, eclipsing the clumsy produc- tions of their

contemporaries, Francis was married first to Joauna of Austria, and secondly to a beautiful Venetian lady, Bianca Capello, whose first husband was assassinated to make way for the grand-duke. Francis and Bianca died on the same day, 1587, not without suspicion of having been poisoned by his brother and successor Ferdinand, wlio resigned a cardinal's hat for the dukedom, and married Princess Christina of Lorraine. A double alliance was formed with France by the union in marriage of his niece Marie de' Medici, daughter of Francis, with King Henry IV. Cosimo II, succeeded Ferdinand in 1609. The day of his accession Galileo Galilei discovered the satellites of Jupiter, which, in compliment to the young sovereign, he named " Stelle Medicei." See GaLiLeo.

Ferdinand JI, was still a child when he ascended the throne in 1621. He married Vittoria della Rovere, heiress of Urbino ; and though her lands were claimed by the church, she bronght a rich dowry to Florence, Ferdinand and his brother Cardinal Leopold added greatly to the art treasures in the galleries, and fonnded academies of art and science. Cosimo III., who succeeded in 1670, was a narrow- ininded bigot, whose marriage with a gay young princess of the court of Louis XIV. of France ended in separation. He died in 1713, leaving one son, Gian Gastone, whose mild character, aversion to the punishment of death, and abolition of oppressive taxes made him popular with his subjects. Commerce, industry, and agriculture flourished during the reign of this last of the Medici. At his death in 1737 he left no male heirs to the throne. Tuscany had been already assigned by a European agreement—the celebrated Prag- matic Sanction—to Francis duke of Lorraine in compensa- tion for his duchy, which had been annexed to France, In 1753 an edict gave Tuscany to the second son of Francis and the empress Maria Theresa; and two years later, on the death of his father, Pietro Leopoldo of Austria arrived in Florence to take possession of the throne. His short reign marked a new era of progress and reform, The Inquisition was abolished, privileges set aside, and plans proposed for draining and colonizing the Maremma, In 1790 Leopold was called to Vienna to succeed his brother Joseph IT. as emperor, and left his younger son Ferdi- nand IIL grand-duke of Tuscany. By an article of the Pragmatic Sanction, Tuscany had been declared a separate and independent sovereignty ; therefore, when, after the outburst of the French Revolution, the emperor Francis IL, claimed the assistance of a Tuscan

army to restore the Bourbons in France, the great minister Fossombroni refused, declaring that Tuscany was on terms of peace and amity with the French republic. But in 1796 Ferdinand, yield- ing to the importunity of the court at Vienna, joined in the war against France, and two years later Florence was cepled by a French army. The first consul, Napoleon

Cnaparte, conquered Tuscany, and whilst Ferdinand rengunced his rights on condition of a compensation in cae. ie oe Benin of Parma was placed on his

8 Turia. Tuscany was annexed to the

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French empire in 1808, but in 1809 the grand-duchy wag restored in favour of Eliza Bonaparte Bacciochi, sister of the emperor Napoleon.

Her reign lasted only five years, and after Napoleon had been exiled to Elba, Ferdinand resumed his sovereignty, On this occasion an Austrian, Prince Rospigliosi, was sent to Florence to announce his arrival, and in his proclamation he declared Tuscany to be an inheritance and patrimony of the imperial house of Austria. The vain attempt of Lombardy in 1820 to shake off the Austrian yoke, an attempt in which the crown prince of Piedmont, Carlo Alberto, was secretly implicated, ended in the incarceration of some of the noblest Italian patriots in Austrian fortresses for a period of from 16 to 20 years. It was vain for Fossombroni to protest, and declare that the Tuscan Govern-

ment did not require Austrian soldiers to play the masters; —

Austrian soldiers arrived to occupy Tuscany as well as the other Italian states, and the aulic counsellor Menz wrote to Prince Metternich that '“ the Tuscan Government, led to reflect on its dangers, had assumed a firmer attitude, and constituted a more active and vigilant police, and, at all events, the respect inspired by Austrian bayonets placed at the gates of Tuscany were sufficient to dispel revolutionary ideas.” Ferdinand died in 1833, and was succeeded by his son Leopold IJ., who had married a Neapolitan princess, Alarmed by the revolutionary movements of 1847,

Leopold, like other Italian princes, granted his people a constitution, but when they further demanded to be led against the Austrians, to assist in driving the foreigner from Italy, he reluctantly permitted the Tuscan army, chiefly consisting of young volunteers, to depart. 'The enthusiastic youths who fought for the independence of their country displayed unwonted valour at Curtalone and Montanara ; but the grand-duke signified his displeasure by withdrawing titles and pensions from even the surgeons who attended the wounded on the field of battle, Among the liberals m Florence who had long been seeking an opportunity to shake off foreign interference in the government of their country, were men of the greatest moderation and virtue,— Baron Bettino Ricasoli, the Marchese Cosimo Ridolfi, the poets Niccolini and Giusti, Salvagnoli, the Marchese Neri Corsini, and the Marchese Gino Capponi, the last of that family illustrious for virtue, for genius, and for patriotism,' The grand-duke, who either shared the principles of his family, or had not courage to place himself at the head of the distinguished men who coincided with the view of the Piedmontese minister Cavour, invited Austrian troops Mm 1850 again to occupy his dominions, and though Leopold affected to submit to necessity, the Austrian general de- clared he would not have come uninvited. This occupa- tion lasted six years, during which time the power of life and death of Tuscan subjects was delivered into the hands of the Austrian commanders. When Victor Emmanvel, king of Piedmont and Sardinia, with the assistance of France, made war against Austria for the independence of Italy in 1859, a vain hope was still entertained that Leopold would have consented to unite his army with that of Piedmont; but the proclamation of war went forth without a sign from Tuscany. On the 27th April 1899 the 'l'uscan troops unanimously declared their intention to throw down their arms unless they were allowed to join the War of Independence. The liberals insisted on the abdication of Leopold in favour of his son, and on an offen- sive and defensive alliance with Piedmont. Leopold de- clined these proposals, and quitted Florence with his family, amidst the silence of the assembled multitudes never to return.

1 Shortly before his death in 1876, at upwards of 80 years of ate he completed his admirable history of the Florentine Republic, Stor della Repubblica di Firenzé di Gino Capponi, 2 tom., 8v0, 1875.

The following year Victor Emmanuel entered Florence, | and of which 29 volumes appeared in the author's lifetime.

which in 1865 became the capital of his kingdom of Italy.

It was not until 1870 that the hopes of the Florentines |

were disappointed, and the seat of government was trans-

ferred to Rome.

See the histories of the Florentine Republic by Gino Capponi, Atto Vanucci, T. A. Trollope, and Henry Napier; P. Villari's Memoirs of Savonarola, translated by Leonard Horner, &c. (A.S.H.)

FLORENCE, of Worcester, an English chronicler who lived during the end of the 11th and beginning of the 12th century. Nothing more is known of him than that he was a monk of Worcester, that he had a great reputation for learning, and that he died on the 5th June 1118. His Chronicle begins with the creation of the world and ends with the year of his death. The earlier part is compiled from the Chronicle of Marianus Scotus, and the greater part of that which relates to English history is a translation from the Saxon Chronicle; but as he approaches his own times the independent value of his work increases, and in regard to contemporary events he is one of the most valuable of existing authorities. The Chronicle of Florence was continued from 1118 to 1141 by an anonymous writer.

An edition of the Chroniele was published at London in 1592, and another at Frankfort in 1601. It is also included in the Colleetion of Historians, edited by order of the Records Commission; and a translation with notes by Thos, Forester is contained in Bohn's Antiquarian Library.

FLORES, also called ENDER and MANGERAAI, an island of the East Indian Archipelago belonging to the residency of Timor. It lies in a line with

Java between Sumbava on the west and Timor on the east, and stretches from

8° 3’ to 9° 59’S. lat., and from 119° 49’ to 123° 1’ E. long. |

It is about 230 miles long, and from 20 to 40 broad, and its area is estimated at about 8900 square miles. Like most of the islands of the archipelago, it is both moun- tainous and volcanic, among the loftier summits being

Ombuu Romba or Gunong Keo, 9054 feet in height ; |

Lobetabi or, in a corrupted form, Lovotive, 7115; Ombuu

Soro or Gunong Rokka, 6557 ; and Larantuka or Ilimandiri, |

5180. The interior is very partially explored, though the forests are neither so dense nor so extensive as in Borneo or Celebes. Besides amber, which is found on the coast, the mineral products consist of sulphur, pumice-stone, copper, and a little iron and gold. Sandal-wood, rice, wild cinna- mon, aud birds’ nests are the most important articles of export, giving rise to a considerable trade with Celebes, Timor, Batavia, and Singapore. The inhabitants are mainly of Malay origin, and the language appears to be akin to that of Bima. ‘here are considerable settlements of Buginese and Wadjorese. Portugal lays claim to certain portions of the island, but practically it is all under Dutch suptemacy. Christianity has been introduced by the Portuguese on the east coast, and the converts are visited from time to time by priests from Timor.

See P. J. Veth, « : ae: oC ‘ Indi, 1858 ; fe :. Het eiland Flores,” in Tijdschrift voor Nederl.

pie: ambtenaur, 1856; 8. Muller, Bijdragen tot de Kennis van mor,

FLORES, the most westerly of the Azores. See AZORES,

FLOREZ, Enrique (1701-1773), Spanish historical scholar, was born at Valladolid in 1701. In his fifteenth ie he entered the order of St Augustine,

professed theo- a at the university of Alcala, and published a Cursus ae. 5 vols. 4to (1732-1738). He afterwards a i. elt exclusively to historical studies. Of these p – : ae was his Clave Historial, a work of the same aa 8 the French Art de Verifier les Dates, and preceding a y "pie years. It appeared in 1743, and passed

ough many editions. In 1747 was published the first

volume of La Espata Sagrada, a vast compilation of local

ecclesiastical history whi

rancis, Herinneringen uit den levensloop van een |

ch obtained a European reputation, .

It was continued after his death by Fathers Risco and Fernandez, and further additions have been made at the expense of the Spanish Government. The value of the work is considerably increased by the insertion of ancient chronicles and documents not easily accessible elsewhere. Florez was a good numismatist, and published Zspafia

| Carpetana: Medallas delas Colonias, in 2 vols. 4to (1757-

1758). A third volume appeared in 1773. His last work was the Memorias de las reynas Catolicas, 2 vols. 4to (1770). Florez led a retired, studious, and unambitious life, and died at Madrid in May or August 1773.

FLORIAN, the patron saint of Poland, was born at Zeiselmauer, Lower Austria, about the year 190. He served as a captain in the Roman army, and suffered death by drowning about the year 230, during the persecution of the Christians by the emperor Diocletian. His remains are said to have been buried on the site of the present Augustinian monastery at St Florian near Linz, but were afterwards transferred to Rome. About 1183 a portion of them was presented to King Casimir of Poland, and from that time Florian became the patron saint of that country. He is represented as a warrior holding in his hand a vessel from which he pours out flames, and on this

account his protection is often sought against fire. His day in the calendar is August 4.

FLORIAN, Jean Pierre Cuaris DE (1755-1794), a French poet and romancist, was born at the chateau of Florian, near Sauve, in that part of Languedoc which now forms the department of Gard. His mother; a Spanish lady named Gilette de Salgues, died when he was quite a child, and the person who seemed to have had most influence on his early years was his grandfather, an old noble who had run through his estate. His uncle, the marquis of Florian, who had married a niece of Voltaire, introduced him at Ferney, and Florianet, as he was soon affectionately nick- named, spent a pleasant time with the old dictator of French literature. In 1768 he became page in the house- hold of the duke of Penthiévre at Anet, and throughout his life he was the object of the powerful patronage of that cultured nobleman. Having studied for some time at the artillery school at Bapaume he obtained from the duke a commission in a dragoon regiment, and in this capacity it is said he displayed a boisterous behaviour as unlike as might be to what the reader of his works would naturally imagine. He afterwards left the army and became gentleman in ordi- nary. On the breaking out of the French Revolution he retired to Sceaux, but he was soon discovered and dragged to prison by the Parisian sans-culottes; and though his incarceration was not of long continuance, it so injured his health that he survived his release only a few months. His death took place on September 13, 1794.

Florian's first literary efforts took the shape of little comedies ; but he first attracted attention by an epistle in verse entitled Voltaire et le serf du Mont Jura and an

| eclogue called Ruth, which were crowned by the French

Academy in 1782 and 1783 respectively. In the latter year he also produced his Galatée, a professed imitation of the Galatea of Cervantes, and this was followed two years later by Numa Pompilius, an equally undisguised imitation of Fénelon's 7élémayue, which as an educational work has proved only less popular than its prototype. In 1788 he became a ember of the French Academy and published Estelle, a pastoral of the same class as G'alatée, which is reckoned one of the best of his works. Another romance,

Gonzalve de Cordoue, preceded by an historical notice of the Moors, appeared in 1791, and his famous collection of Fables in 1792. After his death there appeared an unfin- ished treatment of the story of William Tell, to which he had devoted the leisure of his confinement, and an IX. — 43

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Plate IT,

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abridgment of Don Quixote, which, though far from being a correct representation of the original, had great success. Florian was a professed imitator of Gessner, and his style has all the artificial delicacy and sentimentality of the Gessnerian school. Perhaps the nearest example of the class in English literature is afforded by Wilson's Lights and Shadows of Scottish Life. He is least affected in his fables, his comedies, and some of his minor tales. Among

the best of the fables are reckoned "the Monkey showing'

the Magic Lantern," "the Blind Man and the Paralytic," and "the Monkeys and the Leopard"; and Les Deux Billets, Le Bon Pare, and Le Bon Menage are the best known of the comedies. In the latter he brought the arlequinades again into fashion, and raised them to a higher level. Florian's @uvres Complétes appeared at Paris in 16 vol- umes, 1820; his Quvres inédites in 4 volumes, 1824. Didot published an edition in 24 volumes, Briand another in 13, and Jauffret a third in 12. The editions of soine of the more popular works are extremely numerous.

See 'Vie de Florian" prefixed to his @uvres posthumes; A. J. N. de Rosny, Vie de Florian, Paris, An V.; Jauffret and Lacretelle, Eloge de Florian, 1812; Sainte-Beuve, Causeries du lundi, t. iii.

FLORIDA, the most southern of the United States of America, is a large promontory extending southwards into the Atlantic ocean, its southern and western coasts forming in part the northern and eastern shore line of the Gulf of Mexico.

The name of Florida was in the 16th and early part of the 17th century indefinitely applied to the territory now lying south of Virginia. By its charter the southern boundary of Carolina was fixed at the 29th parallel, thus including about one half of the present State of Florida. In 1738 the stipulated northern boundary of Florida was a line drawn due west from the mouth of the St John's River (called by the Spaniards San Juan) to the little river Vasisa, cutting off all upper or continental Florida. At the time of its cession by Spain to Great Britain in 1763, the territory of Florida extended as far west as the Mississippi river, including portions of the present States of Alabama, Mississippi, and Louisiana. The present boundaries are comprised between 24° 30' and 31° N. lat., and 80° and 87° 45' W. long.

Florida makes the southern boundary of the State of Georgia, and in part that of Alabama, from which it is separated on the north-west by the river Perdido. The Atlantic washes its eastern, and the Gulf of Mexico its southern and western coasts, constituting a sea-board of more than 1000 miles. On the south-east it is separated from the Bahamas by the Straits of Florida. It points towards Cuba on the south, Havana being about 110 miles from Key West. Its entire length from Perdido river to Cape Sable is about 700 miles, its mean breadth 90 miles. The estimated area of Florida is 59,268 square miles, or 37,931,520 acres, of which 2,373,541 acres were in 1870 included in farms. The population in 1870 was 187,748.

The peninsula proper terminates on the south in Cape Sable ; but a remarkable chain of rocky islets, called the Florida Keys, begins at Cape Florida on the eastern shore, extends south-westerly nearly 200 miles in a direction generally conforming with that of the coast, and ends in the cluster of sand-heaped rocks known as the Tortugas, from the great number of turtle formerly frequenting them. — of the bank on which these Keys rise, and separated Poe them by a navigable channel, is the long, narrow, and

angerous coral ridge known as the Florida Reef. This group of keys and reefs is washed on the south by the wee current of the Gulf Stream. The most important Hoss i fm West, a nautical corruption of Cayo ae ate, 3 °) which name originated in the great

ound on the island by the Spaniards,

supposed to be those of the aboriginal inhabitants, The island was long the haunt of smugglers and pirates, but ig now a busy and thriving place, and one of the most im. portant naval stations possessed by the United States, on account of its commanding situation at the entrance of the most frequented passage into the Gulf of Mexico, as well as its nearness to Havana, Kingston, and other important ports of the West Indies, belonging to European powers,

The Gulf coast of the State is intersected by numerous bays, among which are Pensacola, Choctawhatchee, St Andrew's, Appalachicola, Appalachee, Tampa, Charlotte, Ponce de Leon or Chatham, and Florida Bays, the last lying between the Keys and mainland. The cluief rivers are §t John's, navigable about 100 miles for vessels of moderate draught, and emptying into the Atlantic after a northerly course of 300 miles; Indian River, a long narrow lagoon on the eastern coast, which it is proposed to unite bya canal with the St John's; the Suwanee and Ockloconee, which rise in Georgia and flow into the Gulf of Mexico; the Appalachicola, formed by the Chattahootchee and Flint rivers, and emptying into the bay of the same name; Choctawhatchee, Escambia, and Perdido, also flowing into the Gulf. The St Mary's makes for some distance the northern boundary of the State. Florida has also numerous lakes, some of which are navigable. Lake Okeechobee, in the Everglades, is about 40 miles long and 30 broad.

Surface and Soil.—The surface is generally level, the greatest elevation being not more than 300 feet above the sea, although old maps represent it as mountainous. The most remarkable feature is the immense tract of marsh filled with islands in the southern part of the state, called the Everglades, and by the Indians " grass-water." Between the Suwanee and Chattahootchee the country is hilly; the western portion of the State is level. De Bow designates the lands as high-hummock, low-hummock, swamp, savanna, and pine. The soil is generally sandy, except in the hummocks, where it is intermixed with clay. These hummocks vary in extent from afew to thousands of acres, and are found in all parts of the State. They are usually covered with a heavy growth of red, live, and water oak, magnolia, pine, and dogwood. When cleared they afford desirable openings for

cultivation. The savannas are rich alluvions on the margins of streams or lying in detached tracts, yielding largely, but requiring ditching and dyking in ordinary seasons. In the “ barrens, ” as the pine forests are called, the soil is very poor, and thickly overgrown with pine and cypress. The district comprised in the Everglades is impassable during the rainy season, from July to October. It is about 60 miles long by 60 broad, covering most of the territory south of Lake Okeechobee, or Big-water. The islands with which this vast swamp Of lake is studded vary from one-fourth of an acre to hundreds of acres in extent. They are generally covered with dense thickets of shrubbery or vines, occasionally with lofty pies and palmettos. The water is from 1 to 6 feet deep, the bottom being covered with a growth of rank grass. The vegetable deposit of the Everglades is considered well adapted to the cultivation of the banana and plantain. Another remarkable feature of Florida are the subterranean streams which undermine the rotten limestone formation, creating numerous cavities in the ground called “ sinks. These are inverted conical hollows, or tunnels, varying In extent from a few yards to several acres, at the bottom © which running water often appears.

A most remarkable spring, situated 12 miles from Tallahassee, has been sounded with 250 fathoms of line before finding bottom. The outflow forms a beautiful Jake, transparent and cold as ice even in the hottest weather. The great sink of Alachua county is a subterranean passage by which the waters of the Alachua savanna are suppos

to discharge themselves into Orange Lake. In fact, the geological structure of the State is remarkable, much of its surface seeming a crust through the openings of which underground lakes and rivers force their way.

Towns and Harbours. —Notwithstanding the great extent of its sea-coast, Florida has few good harbours. Besides being a naval station, Key West is a place of considerable importance. Pensacola, Appalachicola, St Mark’s, Cedar Keys, Tampa, and Charlotte on the Gulf, and Fernandina and St Augustine on the Atlantic coast, are the principal ports. Of these the harbours of Pensacola and Fernandina are the best. The cities of Florida are Jacksonville, popula- tion in 1870, 6912; Pensacola, 3347; Tallahassee, the capital, 2023; and St Augustine, A717. Jacksonville, on St John’s River,

is a flourishing city, much resorted to by invalids from the northern States on account of the salu- brity of its climate. Fernandina, the eastern terminus of the railway which crosses the State to. Cedar Keys, on the Gulf of Mexico, has 1722 inhabitants.

Olimate.—Florida, except in the vicinity of the swamps, possesses one of the most equable and agreeable climates of the continent. Occupying as it does a situation between the temperate and tropical regions, it enjoys exemption from the frosts and sudden changes of the one and the excessive heat of the other. The mercury, however, some- times falls to the freezing point, and great damage is done to the orange plantations. The winter climate of the Gulf coast is more rigorous than that of the Atlantic. The seasons partake of the tropical character, winter being dis- tinguishable by copious rains. Statistics show the State to be one of the healthiest, if not the healthiest, of the United States, and its resident population is largely increased in the winter months by invalids from the north, seeking a more genial clime, Jacksonville, St Augustine, and Key West are preferred by this class of visitors, who are every year becoming more numerous. The mean winter tem- perature as observed at Key West was slightly less than that of Havana; while for the months from July to November it was about the same. Besides the advantage of its climate, the semi-tropical character of Florida offers a grateful and striking change of scene to the health-seeker, who leaves the bare forests and frozen streams of New England for a country teeming with luxuriant vegetation and strewed with flowers.

Products.—The productions of Florida are of an essen- tially tropical character: cotton, tobacco, rice, sugar-cane, arrow-root, hemp, flax, coffee, and the cocoa-nut flourish there. The climate is also favourable to the cultivation of the silk-worm and for the cochineal insect, Oranges, bananas, lemons, limes, olives, grapes, pine-apples, grow abundantly, and are of exquisite flavour. Indian corn, sweet potatoes, beans, pease, and such products of a more northern climate as Irish potatoes, barley, buckwheat, hops, &e., are also raised. The cultivation and export of oranges and other fruits have grown to be a considerable Source of wealth to the State; and the manufacture of cigars, especially at Key West, is becoming an important industry. The pasturage afforded by the savannas is excellent, cattle requiring little or no attention from their owners, and no housing in winter.

Game and fish abound in every part of the state. Deer, wild turkeys, partridges, geese, ducks, and other small game are in all the forests and about all the lakes, rivers, and swamps ; green turtle, oysters, sheep's-head, red-fish, mullet, &., are found on all the coasts, and freshwater fish in all the inland waters. Magnificent Sponges are gathered along the reefs, and form a considerable item of trade. Cotton, rice, sugar, tobacco, lumber, fish, and fruits may be considered the most Valuable products. From selected statistics, compiled by the United States Government, it appears that Florida pro-

duced in 1870—Indian corn, 2,225,056 bushels; oats, 114,204 bushels; cotton, 39,789 bales; wool, 37,562 ib; rice, 401,687 Ib; cane, 553,192 galls. ; Irish pota- toes, 10,218 bushels; sweet potatoes, 789,456 bushels; pease and beans, 64,846 bushels; honey, 150,854 Ib. Florida cotton is grown almost exclusively in the northern group of counties, but the State is capable of producing the celebrated Sea Island variety, the cultivation of which was formerly confined to a few islands on the coasts of South Carolina and Georgia. Appalachicola, formerly a consider- able shipping port for cotton, has been superseded by Fernandina on the Atlantic. The crop of 1876-77 is reported at 34,303 bales, of which 11,214 was Sea Island ; but it should be stated that this computation includes only shipments from Florida outports, there being no data whence to estimate accurately the quantity going to ports out of the State by rail. The same remark will apply to the quantity of wool expcrted.,

The wool grown in Florida is long-stapled, of medium and coarse grades, little attention being as yet given to producing fine wools, In 1878 the flocks had increased to 56,500 head, yielding 200,000 tb of wool.

In 1874 Gadsden county produced on 327 acres planted 216,000 tb of tobacco, of excellent quality, valued at $44,000. East and South Florida rely mainly upon fruit culture. Florida is said to be the only section of the Union where the orange can be grown to any extent with success. There is no fear of winter-killing south of Pilatka. The quality of the fruit and the excellent condition in which it reaches the northern markets render this a most profitable crop,

The forests of Florida form no inconsiderable source of wealth. The live-oak, so valuable in shipbuilding, abounds, also the other varieties of oak, swamp cypress, hickory, pine, magnolia, dogwood, and laurel. The palma christi (castor-oil bean) becomes here a large tree ; on the islands and keys boxwood, satinwood, mastic, and lignum-vite grow abundantly. The pine is found from Cape Sable to near Indian river. In addition to fruit-bearing species, the pimento, coffee, pepper, clove, and other spice trees and shrubs may be successfully cultivated.

From the official sources of information it appears that in 1870 the value of the live stock on farms was $5,212,157. The number of horses was 11,902; mules and asses, 8,835; milch cows, 61,932; draught and other cattle, 322,701 ; sheep, 26,509; swine, 158,908, Florida also produced 100,989 tb butter. These numbers will be largely in- creased by the census of 1880.

Manufactures.—These are unimportant, and are chiefly confined to flour and grist mills, lumber mills, and establish ments for the manufacture of sugar and molasses, their total value in 1870 being $4,685,403. Agriculture and com- merce are the chief resources of the State,—the export of its fibrous products, cereals, fruits, fish, live-oak and other timber, giving employment to a considerable tonnage. Among the mineral productions may be named amethyst, turquoise, lapis-lazuli, ochre, coal, and iron-ore.

Trade.—The coasting trade employs many steamers and sailing craft, plying chiefly between Florida ports and Savannah, Baltimore, Philadelphia, and New York. Pen- sacola and Appalachicola are naturally points of shipment for southern Alabama and south-western Georgia. The bulk of foreign merchandise reaches the State from northern ports instead of by direct importation. Key West shows much the largest tonnage of vessels entering or clearing, St John's and Fernandina following in the order named. Shipbuilding is carried on at all the ports, the vessels usually being of small burthen, for coast trattic,

Railways.—In 1876 there were only 484 miles of railway in Florida. The Jacksonville, Pensacola, and.

Mobile railroad extends west from Jacksonville to Chatta- |

hootchee, and is the longest in the State. Lateral lines connect this line with the Georgia system by a branch from Live Oak due north to Dupont, and with St Mark's on the Gulf by a branch south from Tallahassee. The Atlantic, Gulf, and West India Transit Company's line extends from Fernandina on the Atlantic to Cedar Keys on the Gulf, distance 155 miles. The Pensacola and Louisville road extends from Pensacola north to a junction with the Mobile and Montgomery (Alabama) railroad, 45 niles. The St John's River line crosses from St Augustine to Tocoi on the St John's, 14 miles.

Administration.—The government of Florida is similar to that of the other States of the American Union. The executive power is vested in a governor elected by the people every four years. The legislative power is represented by a senate elected for four years, and a house of representatives or assembly chosen for two years, both by popular vote. The judiciary consists of a supreme court, having one chief and two associate judges, who hold three annual sessions in Tallahassee ; there are also seven circuit besides other inferior courts. Florida has two members in the national house of representatives, and has therefore (with the two senators to which each State is entitled) only four votes in the electoral college. The State is divided into 39 counties, viz., Alachua, Baker, Bradford, Brevard, Calhoun, Clay, Columbia, Dade, Duval, Escambia, Franklin, Gadsden, Hamilton, Hernando, Hillsborough, Holmes, Jackson, Jefferson, Lafayette, Leon, Levy, Liberty, Madison, Manatee, Marion, Monroe, Nassau, Orange, Polk, Putnam, St John's, Santa Rosa, Sumter, Suwanee, Taylor, Volusia, Wakulla, Walton, Washington.

Lducation.—F lorida has neither college nor university, although an agricultural college has been incorporated ; the financial condition of the State and people after the close of the great civil war has greatly retarded educa- tional development. There is no public library of 10,000 volumes in the State. In 1876, out of a school population numbering 74,828 persons, the number actually attending public schools was only 26,052. The total expenditure for educational purposes was $2,126,541. The slow development of education in the State may also be attributed to the numerous

coloured population (91,384 in 1870) formerly held in slavery, which is wholly engaged in tilling the soil and kindred pursuits. Since the war Florida has received large accessions to its population from other States, and is undergoing changes which will, it is believed, ultimately lead to its taking a higher rank in the Union. In 1870 there were in the State 23 news-papers and periodicals, with a total circulation of 10,545. The total number of religious organizations was 420, having 390 places of worship, and property valued at

$426,520.

HMistory.—The history of Florida is interesting, The various attempts at colonization by Europeans of which we have authentic accounts go farther back than in any other part of the North American continent, preceding the efforts of the French in Canada, the English in Virginia, and even of the Spaniards themselves in Mexico. St Augustine is the oldest settlement founded by Europeans, not only of the United States, but of North America, and still shows traces of Spanish occupation two centuries ago. Remains of fortifications, roads, &c., are found between the Suwanee and Chattahootchee. In 1512, seven years before the invasion of Mexico by Cortes, Juan Ponce de Leon discovered the mainland of Florida on Easter Sunday, # — bey the supposed derivation of the name. a se ae sano at a place called the Bay of the a. ‘ oi secre hei and planted a stone cross in

Jurisdiction of Spain. He continued his ex-

and dangerous shoals.

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plorations in the interior and along the coast for some months before sailing to Spain. ‘The following year he was named governor of and received permission from Ferdinand to colonize the “ Island of Florida.” His efforts however, proved unsuccessful. The place of hig original landing is supposed to be a few miles north of Saint Augustine.

The next effort at colonization was the disastrous one of Pamphilo de Narvaez in 1528. He sailed from Cuba with 400 men, landed in the bay of

Pensacola, and remained in the country nearly six months, when he re. embarked and perished in a tempest near the mouth of the Mississippi. Four survivors of this expedition succeeded, after incredible hardships, in reaching Mexico.

Hernando de Soto landed on May 30, 1539, at what is now Tampa Bay, called by the Spaniards " Spiritu Santo," De Soto believed Florida a new El Dorado. He had the title of Adelantado, or president, from the emperor, and undertook the conquest at his own expense. He passed the first winter in the country of the Appalachians, east of Flint river. After a sanguinary conflict with the natives, who opposed his advance into the interior, and the loss of many men by disease, De Soto reached the Mississippi, where he died from fever while endeavouring to descend its banks to the mouth.

Réné Goulaine de Laudonniére, who had accompanied Jean Ribault in his expedition to Port Royal (1562), landed first at what is now St Augustine, subsequently in the river St John, called by him the " River of May," and built Fort Caroline in 1564, The colonists, who were Huguenots, were on the point of abandoning the settlement when re-enforced by Ribault; but he had scarcely anchored when a Spanish fleet under Menendez appeared. Ribault made his escape for the moment. Soon after Menendez surprised and massacred the garrison of Fort Caroline, carrying out to the letter his barbarous order to " gibbet and behead all Protestants in those regions." In endea- vouring to return to Fort Caroline, Ribault and his party also fellinto the hands of Menendez, and shared the fate of their companions. The French were all hanged with the inscription affixed to them—" Not as Frenchmen, but as heretics."

Aviles de Menendez, referred to as exterminating the French settlement on the St John, landed September 1565, and laid the foundation of the town, named by him St Augustine. Two years later a French expedition com- manded by Dominique de Gourgues, seized two forts near the mouth of the St John, and the important one of San Mateo, and in retaliation for the cruelty of Menendez hanged all his prisoners, "not as Spaniards, but as assassins." De Gourgues's head was demanded by the Spanish king, and he was for a time compelled to live in concealment. Menendez afterwards rebuilt Sai Mateo.

On the 28th of May 1586 Sir Francis Drake, then returning from his memorable expedition to the West Indies, discovered a scaffold raised upon four high masts, evidently a look-out station, upon the Florida coast. No one in the fleet had any knowledge that the Spaniards possessed a place there. Drake therefore ordered the pinnaces to make a reconnaissance. Having entered am inlet they came to the fort St Juan de Pinos, from which the garrison fled to St Augustine; and on the approach of the English they also abandoned this place, which had the appearance of a prosperous settlement, with its couneil- house, church, and handsome gardens, The invaders destroyed the town and meditated an attack on St Helena, twelve leagues further up the coast, but were deterred from want of a pilot to conduct them safely through the intricate Drake pursued his voyage

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Virginia, where the queen had commanded him to afford relief to Sir Walter Raleigh's newly planted colony.

The English colonists of Georgia and Carolina continued to wage war against the Spaniards in Florida. Governor Moore of South Carolina made an unsuccessful attempt on St Augustine in 1702; and General Oglethorpe of Georgia besieged it in 1740 with the same resuit. Nearly a hundred years later, in 1837, the U.S. engincers found balls thrown by Oglethorpe in the moat of the old Spanish fortress. In 1763 Florida was ceded to Great Britain in return for Havana, captured by Albemarle the previous year. Most of the Spaniards left the country. Vigorous efforts were made by the British Government to promote settlement by liberal grants of land to settlers. Besides a large number of emigrants who came over from Europe, promising settlements were made under the patronage of Lords Rolle and Beresford and Governor Moultrie. In addition to these many royalists emigrated thither from Georgia and Carolina, on the breaking out of hostilities between Great Britain aud her American colonies, Twenty years of British possession accomplished more in settling aud improving Florida than two hundred years of Spanish rule.

In 1781 Don Bernardo de Galvez, Spanish governor of Louisiana, having previously taken Mobile, besieged and captured Pensacola, thus completing the conquest of West Florida. In 1783 Florida was ceded back to Spain,

when the greater part of the English population, estimated at 29,000, left the province and passed into the adjoining states. Some unimportant military operations took place in 1814. In February 1819 a treaty for the cession of Florida to the United States was concluded at Wash- ington, and in 1821 was reluctantly ratified by the king of Spain, thus concluding a long and tedious negotiation. Possession was taken in July by General J ackson, who had been appointed governor of the Floridas by the Govern- ment at Washington. Immigration flowed in rapidly from the southern States, the Bahamas, and even the North Atlantic States; but a great drawback to the prosperity of the newly acquired territory was found in the deter- mined resistance of the warlike nation of Seminole Indians to the encroachments of the whites upon their hunting- grounds, A resolution on the part of the United States Government to remove these Indians led to the long and bloody struggle known as the Seminole War, in which for seven years the Indians successfully defied every effort to subdue them, retreating into the fastnesses of the Ever- glades when closely pressed. Osceola, chieftain of the Seminoles, having been captured by treachery, the war ended in 1842. The remnant of the Indians were removed beyond the Mississippi, expulsion (1845) Florida as a State.

On the 10th January 1861, Florida, by a convention i ae on the 3d, seceded from the Union. Fort ae and the arsenals at St Augustine and Chattahoot- wee were seized on the 7th, the forts and dockyards at Pensacola on the 12th, except Fort Pickens, on Santa Rosa island, which was held by the United States forces. Not ae within the line of great inilitary operations, the con-

Icts between the Federal and Confederate forces were of minor aitportance. Fernandina, Jacksonville, and St eee fell into the hands of the national forces early . 62. Pensacola was reoccupied by them the same ~_ In April 1865 President Johnson, by a proclama- wale ie the restrictions on commercial intercourse aa orida removed; in July William Marvin was ime — on governor. A State convention assembled ae ae which repealed the ordinance of

- Civil government was practically resumed the

and in three years after their was admitted into the Union

following year by the election of State officers and a legis- lature. A subsequent State convention met at Tallahassee, January 20, 1868, to form a new constitution, which was ratified by the people in May, a legislature and State officers being chosen at the same election. The State having complied with the enactments of Congress relative to recon- struction resumed its place in the Union. In 1876 the election of Rutherford B. Hayes, republican, as president of the United States, over Samuel J. Tilden, democrat, was determined by the electoral votes of Florida and Louisiana, which by a decision of the extraordinary commission created by Congress were counted for the former. (S. A. D.)

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| and Resources, by S, A. Drake, Boston, 1878.

FLORIDA-BLANCA, Don Josz Montno y REDONDO, Count or (1728-1808), Spanish statesman, was born at Murcia in 1728. He was theson of a notary, and received a good education, which he completed at the university of Salamanca, especially applying himself to the study of law. For a time he followed the profession of an advocate, and acquired a high reputation. A more public career was opened to him by the marquis of Esquilache, then chief minister of state, who sent him ambassador to Pope Clement XIV. Successful in his mission, he was soon after appointed by Charles III. successor to his patron, and his administration was one of the most brilliant Spain had ever seen. He regulated the police of Madrid, reformed many abuses, projected canals, established many societies of agriculture and economy, and many philanthropical in- stitutions, and gave encouragement to learning, science, and the fine arts. Commerce flourished anew under his rule, and the long-standing disputes with Portugal about the South American colonies were settled. He sought to strengthen the alliance of Spain with Portugal by a double marriage between the members of the royal houses, design- ing by this arrangement to place ultimately a Spanish prince on the throne of Portugal. But in this he failed, His attacks on Algiers in 1775, and on Gibraltar in 1782, cost Spain the loss of nearly 80,000 men. He dealt a heavy blow to the Cortes, prevailing upon them by

various forms of bribery, and by sowing dissension among the members, to proclaim the heir to the throne without making the customary assertion of their privileges. He retained his office for three years under Charles IV. ; but in 1792, through the influence of his enemies, he was dis- missed and imprisoned in the castle of Pampeluna, Here he was saved from starvation only by the intervention of his brother, He was afterwards allowed to retire to his estates, and remained in seclusion till the French invasion of 1808. He was then called by his countrymen to take the presidency of the central junta. But his strength failed him, and he died at Seville, November 20 of the same year. He left several short treatises on jurisprudence,

FLORIO, Giovanni (about 1552-1625), lexicographer and translator, was born in London about 1552. He was of Tuscan origin, his father and mother being Waldenses who had fled from persecution in the Valtelline and taken refuge in England. The family left England on the acces- sion of Queen Mary, but returned after her death. The son resided for a time at Oxford, and was appointed, about 1576, preceptor to the son of Barnes, bishop of Durham, then studying at Magdalen College. In 1578 Florio published a work entitled First Fruits, which yield Familiar Speech, Merry Proverbs, Witty Sentences, and Golden Sayings (4to). This was accompanied by A Perfect Induction to the Italvan and English Tongues. The work was dedicated to the earl of Leicester. Three years later Florio was admitted a member of Magdalen College, and became a teacher of French and Italian in the university. In 1591.

appeared his Second Mruits, to be gathered of Twelve Trees, of divers but ,delightsome Tastes to the Tongues of Italian and English men; to which was annexed the Garden of Recreation, yielding six thousand Italian Proverbs (4to). His Italian and English dictionary, entitled A World of Words, was published in folio in 1598. After the accession of James 1, Florio was named French and Italian tutor to Prince Henry, and afterwards became a gentleman of the privy chamber and clerk of the closet to the queen, whom he also instructed in languages. His last work, and that by which he has been most known, was his translation of Montaigne's Zssays, published in folio in 1603, and dedicated to the queen. Special interest

attaches to this translation from the circumstance that of the several copies of the first edition in the British Museum library one bears the autograph of Shakespeare and another that of Ben Jonson. It has been suggested that Florio is satirized by Shakespeare under the character of Holofernes, the pompous pedant of Love's Labour's Lost. He is characterized by Wood, in Athen Oxonienses, as a very useful man in his profession, zealous for his religion, and deeply attached to his adopted country. When the plague raged in London in 1625, Florio sought escape from it by retiring to Fulham; but he was there seized and carried off by it in the autumn of the same year.

FLORIS, Frans, or more correctly Frans de Vriendt called Floris (1520-1570) was one of a large family trained to the study of art in Flanders. Son of a stone-cutter, Cornelis de Vriendt, who died at Antwerp in 1538, he began life as a student of sculpture, but afterwards gave up carving for painting. At the age of twenty he went to Liége, and took lessons from Lambert Lombard, a pupil of Mabuse, whose travels in Italy had transformed a style truly Flemish into that of a mongrel lLeonardesque. Following in the footsteps of Mabuse, Lambert Lombard had visited Florence, and caught the manner of Salviati and other pupils of Michelangelo and Del Sarto. It was about the time when Schoreel, Coxcie, and Heemskerk, after migrating to Rome and imitating the masterpieces of Raphael and Buonarroti, came home to execute Dutch- Italian works beneath the level of those produced in the peninsula itself by Leonardo da Pistoia, Nanaccio, and Rinaldo of Mantua. Fired by these examples, Floris in his turn wandered across the Alps, and appropriated without assimilation the various mannerisms of the schools of Lombardy, Florence, and Rome. Bold, quick, and resolute, he saw how easy it would be to earn a livelihood and acquire a name by drawing for engravers and painting on a large scale after the fashion of Vasari. He came home, joined the guild of Antwerp in 1540, and quickly opened a school from which 120 disciples are stated to have issued. Floris painted strings of large pictures for the country houses of Spanish nobles and the villas of Antwerp patricians. He is known to have illustrated the fable of Hercules in ten compositions, and the liberal arts in seven, for Clas Jongeling, a merchant of Antwerp, and adorned the duke of Arschot's palace of Beaumont with fourteen colossal panels. Comparatively few of his works have descended to us, partly because they came to be

contemned for their inherent defects, and so were suffered to perish, partly because they were soon judged by a different standard from that of the Flemings of the 16th century. The earliest extant canvas by Floris is the Mars and Venus ensnared by Vulcan in the Berlin Museum (1547), the latest a Last Judgment (1566) in the Brussels gallery. hae "— nor any of the intermediate works at Alost, e se Eee Dresden, Florence, Léau, Madrid, —— Poet _Vienna display any charm of originality – — or in form. Whatever boldness and force

y may possess, or whatever principles they may embody,

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they are mere appropriations of Italian models spoiled in translation or adaptation. Their technical execution reveals a rapid hand, but none of the lustre of bright colouring – and it is not too much to say that whilst Floris failed to acquire absulute mastery over design as improved by the Italians, he was equally devoid of the gifts which distinguish the earlier colourists of Flanders. Vasari justly praises the plates engraved by contemporaries from the drawings of Floris, but he adds that these plates would have been better had the skill of the draughtsman been more ably seconded by that of the engraver. A more temperate judgment will probably be that Floris owed much of his repute to the cleverness with which his works were transferred to copper by Jerome Cock and Theodore de Galle. Whilst Floris was engaged on a Crucifixion of 27 feet, and a Resurrection of equal size, for the Grand Prior of Spain, he was seized with illness, and died on the lst of October 1570 at Antwerp, His burial took place three days later in the cemetery of the Récollets.

FLORUS, a Roman historian, author of the Epitome de Gestis Romanorum, has by some writers been identified with the Lucius Julius Florus who lived in the time of Augustus, and to whom Horace addressed two of his epistles; but this position is hardly tenable, as Florus in the introduction to his history writes of the emperor Trajan as then reigning. By others he is, on account of certain similarities in style, identified with the Publius Annius Florus who lived in the time of Hadrian, and wrote a dialogue on the question whether Virgil was an orator or a poet, and the Pervigzlium

Veneris, an imitation of Horace's Secular Hymn. In some MSS. of the Epdome, the name of the writer is mentioned as L. Anneus Florus,

*in others as L. Julius Florus, in others J. Anneus_*

Seneca, and in the Bamberg codex Julius Florus If the historian be the same person as the poet and rhetorician, Julius Annzeus must be regarded asa corruption of Publius Annius. The Epitome of Florus is compiled chiefly from Livy, and gives a condensed view of Roman history from the foundation of the city to the closing of the temple of Janus by Augustus. The details of geography and chron- ology are not always to be implicitly trusted ; and the style is declamatory, and rather that of a panegyrist than of a critical historian. The best editions of the work are that of Titze, Prague, 1819, and that of O. Jahn, Leipsic, 1852. The latter has been revised by C. Halm, Leipst, 1854. |

FLOTSAM, Jetsam, and Lican, in English law, are goods lost at sea, as distinguished from goods which come to land, which are technically designated wreck. "Jetsam is when goods are cast into the sea, and there sink and remain under water; flotsam is where they continue swimming 0" the surface of the waves ; ligan is where they are sunk in the sea, but tied to a cork or buoy in order to be found again." Flotsam, jetsam, and ligan belong to the king 10 the absence only of the true owner. Wreck, on the other hand (z.e., goods cast on shore), was by the common law adjudged to the king in any case, because it was said by the loss of the ship all property was gone out of the original owner. This singular distinction which treated goods washed ashore as lost, and goods on and in the sea 2% not lost, is no doubt to be explained by the primitive practice of plundering ship wrecks. Sce the article WRECK, for the law relating to that subject. '

FLOUNDER, (Pleuronectes flesus) is one of the mos common Flat-fishes along the coasts of northern Europ, from the British Channel to Iceland. It is more partial to fresh water than any other Flat-fish, ascending rivers a beyond the reach of the tide, as, for instance, the i. ; as far as Cologne. It very rarely exceeds the lengia

'twelve inches, and a weight of 14 pounds,

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; FLOUR, ManuracTURE OF. Flour is the grain of wheat reduced to powder, and separated from the ovter husk or coverings in which the seed is enveloped. The name is also applied to the. grain of other cereals, and to the farinaceous seed of pulses similarly treated, and it is used generally to indicate any finely powdered dry sub- stance ; but when the term 1s employed without any quali- fication, it invariably means wheaten flour. As prepara- tions of flour form the staple food of all civilized communities of the West, the cultivation of wheat and the manufacture of flour are necessarily industries of the greatest magnitude and importance, rice being the only other grain which rivals (and which indeed possibly sur- passes) wheat in the number of human beings it feeds. The cultivation of wheat was one of the earliest develop- ments of human civilization, and there are not wanting evidences that in making use of the grain the primitive races submitted it to a coarse pounding or grinding, thereby reducing it to a state resembling the meal of the present day. From remains found on the sites of the ancient lake dwellings of Switzerland it is obvious that the original form of corn-crushing or mealing apparatus con- sisted of a roundish stone—generally very hard sandstone —about the size of a man's fist, with certain hollows or flattened surfaces on two opposite sides (figs. 1-3). The

Fig. 2.

Fig. 3. Fics. 1-3.—Primitive Corn-crushers (from Keller's Lake Dwellings).

rounded outline of the stone worked and fitted into a corre- sponding cavity in another stone in whicli the grain to be crushed or pounded was placed. By the deepening of the cavity in under stone and the addition of a wooden handle to the upper stone-ball, would be formed the mortar and pestle; and in another direction, by fitting the upper stone for a motion of rotation within the cavity of the lower, the form of the quern would be produced, and the germ of the modern flour-mill elaborated. In early times, and indeed amid rude forms of society still, the preparation of meal and flour was a part of the domestic operations of preparing bread and otherwise cooking of food. At a period so remote as that of the patriarch Abraham it appears

there was a distinction in the qualities of the flour or meal which could be produced, as Sarah was directed to " make ready bel three measures of fine meal, knead it, and make : es upon the hearth." There is much probability in the i rap of Dr Livingstone that the grinding apparatus re y Sarah was similar to that still used in Central

rica, and figured in the frontispiece of his Zambesi

and its Tributaries. In that work the apparatus is thus |

described :—

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"The mill consists of a block of granite, syenite, or even mica- schist, 15 or 18 inches square, and 5 or 6 thick, with a piece of quartz or other hard rock, about the size of a half brick, one side of which has a convex surface, and fits into a concave hollow in the large and stationary stone. The workwoman kneeling grasps this upper millstone with both hands, and works it back- wards and forwards in tle hollow of the lower millstone, in the same way that a baker works his dough when pressing it and push- ing it from him. The weight of the person 1s brought to bear on the movable stone, and while it is pressed and pushed forwards and backwards, one hand supplies every now and then a little grain, to be thus at first bruised, and then ground on the lower stone, which is placed on the slope, so that the meal when ground falls on to a skin or mat spread for the purpose. This is, perhaps, the most primitive form of mill, and anterior to that in Oriental count- ries, where two women grind at one mill, and may have been that used by Sarah of old when she entertained the angels."

That the two forms of grinding apparatus were familiar to the nations of antiquity is obvious from the allusions made to both in the Pentateuch. In the book of Numbers (xi. 8) we read that the Israelites gathered manna, " ground it in mills, or beat it in a mortar;" and again in Deuteronomy (xxiv. 6) there is an injunction that "no man shall take the nether or the upper millstone to pledge, for he taketh a man's life to pledge." Numerous other allusions to mills, mortars, and the grinding of corn are scattered throughout Scripture, from which it is made clear that the grinding of corn

was, among the Hebrews, a domestic employment left entirely to women. Among the ancient Romans the mortar and pestle were alone used for pounding wheat, and the work was similarly done by women down to the year 173 B.c. At that date baking was established as a separate occupation, the craftsmen being called pistores, from pinsere, to pound, in allusion to their manner of preparing flour. At a subsequent date mills were introduced, of which the quern was the simplest and original form. It was called the mola manuaria, or mola trusatilis, and was worked chiefly by slaves, the labour being regarded as eminently degrading. Later the mola asinaria moved by animal power, and the mola aquaria or water mill, were employed as a substitute for hand-worked mills. Their mola aguaria approached in form and mechanism the rude small mills which existed in the more remote parts of Scotland and Ireland down till the early part of the present century. At the beginning of last century a pair of Roman millstones were found at Adel in Yorkshire, and described in the Phalosophical Transactions. One stone, 20 inches in diameter, was con- vex in outline, while the other was concave, and retained traces of notching.

The quern, and exceedingly rude water mills, were in use throughout Great Britain for many centuries, and con- tinued to be employed in outlying districts of Scotland and Treland till very recent times. Strutt, in his Chronicle of England, says—' At what time mills were first used in Britain cannot be determined ; hand-mills, which without doubt were the most ancient of any, we may conceive were known in the time of Ethelbert, king of Kent, who ruled that nation from the year 560 to the year 616 ; for in his laws a particular fine of twelve shillings is imposed upon any man who should corrupt the king's griuding maid st hence it is also evident that they were turned and tended by women; but it is probable that before the end of the heptarchy water-mills were erected, because in ancient deeds and grants of lands we find mention made of mills, which are generally said to be situated near the water." Dr Johnson, in his Journey to the Western Islands of Scot- land, describes the working of the quern as seen by himself. "There are water mills," he says, "in Sky and Raasa, but where they are too far distant the housewives grind their oats with a quern or handmill, which consists of two stones

1 Teges Ethelberti, apud Wilkins,

about a foot and a half in diameter. The lower is a little convex, to which the concavity of the upper must be fitted. In the middle of the upper stone is a round hole, and on one side is a long handle. The grinder sheds the corn gradually into the hole with one hand, and works the handle round with the other. The corn slides down the convexity of the lower stone, and by the motion of the upper is ground in its passage." The accompanying woodcut (fig. 4) illustrates the leading forms of these primi-

Fia. 4.—Querns.

tive mills,—a representing a pair of rubbing stones, 6 a pot quern, and ¢ an ordinary quern with hole in the centre of the upper stone into which the grain was fed, another hole towards one side for receiving the handle, and in the lower stone a spout through which the ground meal was delivered.

The nature of the water mills which were formerly common in Great Britain and Ireland, and which continued in use well into the present century, may be gathered from the following description of one visited by Sir Walter Scott during his voyage to the Shetland Islands, &c., in 1814 (Lockhart's Life). " In our return, pass the upper end of the little lake of Cleck-him-in, which is divided by a rude causeway from another small loch, communicating with it, however, by a sluice, for the purpose of driving a mill. But such a mill! The wheel is horizontal, with the cogs turned diagonally to the water; the beam stands upright, and is inserted in a stone-quern of the old-fashioned con- struction. This simple machine is inclosed in a hovel about the size of a pig-stye, and there is the mill! There are about 500 such mills in Shetland, each incapable of grinding more than a sack at a time."

The ordinary flour mill of the present day is a structure of comparatively few essential parts; but in the arrange- ment and mounting of these the greatest amount of mechanical skill and experience has been exercised, and the accessories of the mill have been elaborated with much care, with the view of saving manual labour and perfecting the processes and results. Fully to appreciate the various processes of modern milling, it is necessary to bear in mind, not only that the wheat as delivered at the mill is dusty and mixed with sand and other refuse, but that it contains many light grains and

seeds of foreign substances, which might be deleterious, and would certainly interfere with the appearance of the finished flour. Again the structure of the wheat grain itself must not be overlooked. A grain (caryopsis) of wheat is not a seed, but a fruit con- sisting of a pericarp or outer envelope tightly adherent to its contained single seed. The envelope consists of several layers of ligneous tissue, within which are the embryo and a peculiar fermentive nitrogenous priuciple termed cerealin, and finally a central mass of thin cells filled with a white powdery substance largely composed of starch granules. The object of ordinary milling is to grind as perfectly as possible, without breaking the minute granules, the central eer of the grain, and to separate it from the embryo ~ aati husks, the former coustituting the flour, and

e latter the bran of the miller. Whole wheaten flour, on

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the other hand, consists of the entire grain ground up toa uniform mass.

The machines and processes by which flour is prepared are very numerous, alld are diverse in character; and it must further be said that, at the present moment, the whole industry is in a peculiarly unsettled and transition state. The system which has prevailed in the United Kingdom hitherto is what is known as ordinary or flat grinding with millstones ; but in the meantime a strong tendency is developing in favour of the use, either partially or entirely, of granulating or " high milling," and of some of the various systems of roller grinding which have been introduced. In Hungary and Austria the system of high inilling prevails, in which the action of the millstones con. sists more in granulating than grinding; and in connexion with that system of milling, the use of rollers is a prominent feature. To a limited extent also the principle of the disintegrator has been brought into operation, in which the grain is broken by the violent impact of studs or projections revolving in opposite directions with enormous velocity, Thus we have these various systems :—(1) flat milling or grinding ; (2) high milling or granulation ; (3) roller mill- ing or crushing; and (4) disentegrator milling or breaking,

Flat or Ordinary Milling.—In the ordinary or flat mill- stone milling of the United Kingdom there are three main points to consider—(1) the cleaning and preparation of the wheat ; (2) the grinding; and (3) the bolting or dressing of the ground products. The ordinary cleaning or screening apparatus through which the wheat, as received, passes, consists of a kind of cylindrical sieve of wire cloth, mounted in a sloping position, and having internal partitions so as to resemble an Archimedean screw. When the apparatus is set in motion, the grain, fed in at its upper end, tumbles from one division into another, thereby being freed from small refuse and sand, and as it issues at the lower extremity is subjected to a fan blast. For cleaning grain there are other kinds of apparatus, in which the prin- ciple of aspiration, or drawing currents of air through the grain, is now extensively employed, tlie most frequently used being Child's aspirator. A further cleaning is sometimes given by Child's decorticator, an implement which can be adjusted at will, for simply rubbing and scouring the grain, or for removing the thin bran and germ previous to the operation of grinding. The " Victor " brush machine is 4 recently introduced and highly approved apparatus for polishing and finishing wheat, its peculiar feature being that the "opposed brushes are constructed and worked in such a manner that they come in contact with every kernel of wheat in every conceivable position, and with as much force as the miller chooses to use—thus polishing it on the ends better than any other machine can do, and this not only on one pair of brushes, but on several," The pre- pared grain is next conveyed to the grinding apparatus, and here it may be said that, in moving the grain or flour horizontally, Archimedean screws working within an l- closed casing are employed, while in lifting from one floor to another, small boxes mounted on an endless band worked over pulleys and similarly encased are used, The grinding machinery consists first of a bin containing the grain to be ground, from which it passes by a spout to the hopper whence it is delivered by a feeding adjustment to the stones. These constitute the distinctive feature of the entire mill, and upon their condition and delicate adjust ment the whole success of the milling operation turns. They consist of two flat cylindrical masses inclosed within a wooden or sheet metal case, the lower or "bed-stone being permanently fixed, while the upper or "runner" 18 accurately pivoted and balanced over it. The average siz of millstones is about 4 feet 2 inches in diameter by }

.inches in thickness; and they are made of a hard but

cellular silicious stone called bubr-stone, the best qualities of which are obtained from La-Ferté-sous-J ouarre, department of Seine-et-Maine, France. Millstones are generally built up of segments, bound together around the circumference by an iron hoop, and backed with plaster of Paris. The bed- stone is dressed to a perfectly flat plane surface, and a series of grooves or shallow depressions are cut in it, generally in the manner shown in fig. 5, which represents

Fic. 5.—Upper Millstone, lower surface,

the grinding surface of an upper or runner stone. The grooves on both are made to correspond exactly, so that when the one is rotated over the other the sharp edges of the grooves, meeting each other, operate like a rough pair of scissors, and thus the effect of the stoues on grain sub- mitted to their action is at once that of cutting, squeezing, and crushing. The dressing and grooving of millstones is generally done by hand-picking, but sometimes black amorphous diamonds (carbonado) are used, and emery wheel dressers have likewise been suggested. The upper stone or runner is set in motion by a spindle on which it is mounted, which passes up through the centre of the bed- stone, and there are screws and other appliances for adjust- ing and balancing the stone. Further, provision is made within the stone case for passing through air to preveut too high a heat being developed in the grinding operation; and sweepers for conveying the flour to the meal spout are also provided. The ground meal delivered by the spout 18 carried forward in a conveyer or creeper box, by means of an Archimedean screw, to the elevators, by which it is lifted to an upper floor to the bolting or flour-dressing machine, The form in which this apparatus was formerly employed consisted of a cylinder mounted on an inclined plane, and covered externally with wire cloth of different degrees of fineness, the finest being at the upper part of the cylinder where the meal is admitted. Within the cylinder, which was stationary, a circular brush revolved, y which the meal was pressed against the wire cloth, and at the same time carried gradually towards the lower extremity, sifting out as it proceeded the mill products into different grades of fineness, and finally

delivering the coarse bran at the ey of the cylinder. For the operation of bolting or "essing, hexagonal or octagonal cylinders, about 3 feet in olameter and from 20 to 25 feet long, are now commonly eared. These are mounted horizontally on a spindle ieee Be externally they are covered with silk of oan. Srees of fineness, whence they. are called "silks ae ge Radiating arms or other devices for carry- 7 ea gradually forward as the apparatus revolves ——_ within the cylinders, and there is also an Pie eyes of beaters which gives the seginents of cloth a the ? P, and thereby facilitates the sifting action of Pparatus. Like all other mill machines, the modifica-

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tions of the silk dresser are numerous. Mill products are differently assorted and classified in various lozalities aud different mills—some distinguishing many qualities of flour and bran, and others making only three or four divisions. The following (from Professor Church's food) may be taken as a fair average representation of the product of 100 tb of good white wheat :—

1. iment four, «oo… .e0. ccsees 42 Ib

2, Seconds floar…. oo… cc. 18 ,

Flour…... ee re 4, Tails or tailings…..... Bis

Middlings 5. Middlings or fine sharps….. ©. 55 6. Coarse sharps…..... eo 55

. Fo Wie POUara £2)..005006508 bs. ces 3"; Bran …... 8. Coarse pollard…..... 6 " Oe Pesta iiss ase Sis esa Bigg

Loss by evaporation, &..... 5,

In the Crown Mills, Glasgow, belonging to John Ure & Son, the classification and general average mill products, dealing with 56 qrs., are as follows :—

en eee ee 60 to 62 bags of 280 Ib. Overheads or coarse flour …. 24,, 3 4, 280 #3 Pine, PDITIS Sos .acceeacenseavctes- Des GO. cs aes GUMS Seep

ce scietcecicc edits 10 ssh OBL. s Naa es Cr re eet m3 ;, 1%2,, Light Wheat: 5 …..5..00nccasderse 1 240 ,,

39 2 39

DPE Fats Pn Pata aoe 14 ,, 18 Ib per quarter.

An additional proportion of fine flour is obtained by dressing und remilling tailings and middlings, and the purification and regrinding of these products have now become of much consequence in connexion with the changed systems of milling rapidly coming into use. A great variety of middlings purifying machines have been introduced and eagerly pushed within the last few years, showing that this branch of economic milling is now receiving great attention.

Lhe Hungarian System or High Milling.—The object of the low or flat milling process, as practised in Great Britain, is to produce at one grinding operation as large a propor- tion of good finished flour as possible. Ju high milling, on the other hand, the stones are kept so far apart that grain is merely bruised in the first operation, and by a series of such grindings or bruisings, alternated with elaborate sifting, the bran and all the outer envelopes with the cerealin are detached, and a nucleus of very pure semolina only left. In this way a large proportion of very inferior branny flour is obtained in these early millings, and the proportion of exceedingly fine strong flour for which Austro-Hungarian millers are famous is comparatively small. It is only to the hard brittle wheats that the Hungarian system of mill- ing is applicable, and the method is only practicable under circumstances where there is a demand for the two extreme qualities of mill product which result from the system. Within the last few years the Hungarian millers have very largely adopted the roller mills, either to supplant entirely or to supplement the stone grinding.

Roller Mills.—In this form of mill a pair of horizontal rollers rotate face to face, and the grain or other material is submitted to their action by passing between them. The nature of that action varies according to the modification of roller surfaces, the closeness of the rollers to each other, and the equal or differential rate at which they revolve. Rollers of metal, either steel or chilled iron, having a toothed surface, revolving at different

rates of speed and at definite distances apart, have a cutting action on the grain submitted to them. Such rollers are employed in the Buchholz system for reducing hulled wheat to the condition of semolina, and a similar arrangement is employed in the machine of Ganz & Co. of Buda-Pesth. Fig. 6 shows a section of the face of a pair of such rollers, where B revolv- ing slowly serves as a holder for the grain, which is cut by the sharp edges of A, revolving at a ie three times

greater than B. Smooth surface roliers are mounted to press hard against each other, and are made in some cases of polished chilled metal ; and in other instances cylinders of porcelain are employed. Their ~ principal function is for the reduction 7 7> of purified middlings and semolina, and when no differential motion is / given the action is simply that of squeezing, but when the opposing 7 rollers revolve at different rates of ZY speed a grinding effect is further 7 superadded. A roller mill which has / met great and sudden public accept- 777 ance is that invented and patented by 7/7/77 F. Wegmann, a miller of Naples. In 77 Wegmann's will, fig. 7, porcelain 77 rollers are employed, there being — two pairs fed from opposite ends of one hopper in the machine figured. This machine possesses a self-acting pressure differential motion ; but its most valuable feature consists in the employment of porcelain for rollers, by which a surface at once exceedingly hard and slightly rough or porous is secured. It is claimed for these rollers that,

Toothed Rollers.

Fic. 7.—-Wegmann's Roller-Mill.

acting on middlings, they produce, with less expenditure of power, more and better flour than can be obtained by either stones or metal rollers. For the grinding of fine middlings English experience is, however, in favour of chilled iron rollers as the best. The roller mills have not yet been long enough in operation in Great Britain to enable any safe conclusion to be drawn as to their adapta- bility to British milling ; but though the system

originated only within the last few years, it has in the meantime practically superseded all other methods in the Austro- Hungarian districts, where milling is carried to greater ge omen than in any other part of the world. To show . Ah rip made in the introduction of roller mills in eae ac be noted that, while in January 1877

y one Wegmann's machine in operation, there

were by the close of t} . : 2 out the country. e year 350 in various mills through-

and a

FUOUS

The Disintegrator.—Under this name a form of machine was invented and introduced a few years ago by the late Thomas Carr for, among other purposes, the manufacture of flour. Carr's disintegrator consists of a pair of circular discs of metal set face to facc, and studded with circles of projecting bars so arranged thiat the circles of bars on the one disc alternate with those of the other. The discs are mounted on the same centre, and so closely set to each other that the projecting bars of the one dise come quite close to the plane surface of the other; and they are inclosed within an external casing into the centre of which a spout passes by which the grain is delivered into the machine. The discs are caused to rotate in opposite directions with great rapidity, making about 400 revolutions per minute, and as the outer circle of bars is 6 fect 10 inches from the centre, they move at a rate of 140 feet a second, or about 100 miles per hour. The grain in passing through the machine is struck by the oppositely revolving studs with enormous force,—a force which increases as the shattered grains approach the outer circles of studs, and it is almost instan- tancously reduced to a powder which falls under the discs and is carried away by a spiral creeper. It is stated that one of these machines 7 feet in diameter is capable of doing the work of as many as 27 pairs of millstones, and they have been fully tested in the flour mills of Gibson and Walker, Bonnington, near Edinburgh, where two of them have been in operation for a period of seven years. Notwithstanding this success, however, the disintegrator las not met with general acceptance as a flour mill, having been introduced

into only a very limited number of establishments. The following is a statement of the average results Messrs Gibson and Walker have obtained by the disintegrator from old Scotch wheat and from a mixture of Baltic and Ghirka wheats respectively :—

Old Scotch. Baltic and Ghirka, LOM ero str ~~iniseiesecinntaioinets 45 per cent. 35 per cent, SemGling.<; 2. .cgessiaeases 20 ps 36s, Bran four 4. ...cccue~~ cee as | oe 4k ,, Pichaust MOUr ss j.cccboe wn Re 5 1 es BecondS:...cScesceciess sae A a 23 % PEE sce sctieestad's- anaes te 45 as DO [Es oep Ren me ecansee ane 13 ; 13 ") Black dust, &c. .... ae 3 oy Ec ee ee ee eee oo le es

100 100

The semolina is reground under stones, and yields a fine strong flour; but it may be and sometimes is reduced by passing it again through the disintegrator.

Qualities of Flour.—There appears to be at present some conflict between public demand, as indicated by the i creasing attention paid to the production of a fine strong white flour, and the current of scientific opinion expressed, though with some hesitation aud doubt, in favour of whole meal or flour in which the richly nitrogenous outer portions of the wheat are retained. 'The fact that the outer portions of the wheat are richest in nitrogenous principle, and that also in a peculiarly active form, indisputable ; but it has not been satisfactorily determined whether the nutritive value of that portion of the grain exactly measured by its chemical composition. The cond tion of the nitrogenous substance, the amount and irnitat- ing nature of the ligneous tissue which accompanies 1t, an its peculiar influence on the other constituents of the wheat grain may and probably do affect its value. It is certain also that white flour is deliberately preferred by the labout- ing population, whose instinct is probably right, and it 18 also preferred by and for many purposes indispensable to the baker and cook. Good flour should present the appearance of a pure uniform white powder, only faintly tinged with yellow, free from all grit and lumps; and when

pressed in the hands it ought to show a certain amount of adhesiveness. It should be free from all smell of damp or mouldiness, and it should have no acidity of taste. For the purposes of the baker its strength 18 measured by the amount and quality of its gluten or nitrogenous constituents, which may be roughly estimated by making up a little dough and observing its tenacity when drawn out; but a more accurate means of measuring its elasticity is provided by the aleurometer of M. Boland, a Parisian baker. The following analytical statement of the constituents of flour, and other calculations concerned therewith, are extracted from Professor Church's Handbook of Food, prepared for the Science and Art Department :—

Composition of Fine Flour from Whate Soft Wheat.

Tn 100 parts. In 1 Ib. eee 13°0 20z. 35 grs. > anu. See 10°5 ee oy, BRON AC Cs ots wick avec aneceneee 74°3 rE 4 S68) % ig ME Bede sc siciiceianistads ae ae ns 0°8 Onde SBE cs MUM OSC as gereiss osac'ened ssuiees -oe 07 (Ca. are Mineral matter…..... ache wows 07 On Ao. a

"One pound of good wheaten flour, when digested and oxidized in the body, might liberate force equal to 2283 tons raised one foot high. The greatest amount of external work which it could enable a man to perform is 477 tons raised one foot high. For one part of flesh-formers in fine wheaten flour there are 7} parts of heat-givers reckoned as starch. One pound of wheaten flour can- not produce more than about 13 oz. of the dry nitrogenous sub- stance of muscle or flesh."

Statistics of the Flour Trade.—The disproportion between the grain producing and consuming capacity of the United Kingdom is very great and yearly increasing, and the deficiency in our own crops are made good from almost all quarters of the globe. In the discussion of this principal portion of the British food supply, the whole grain crops of the kingdom and the entire imports of all kinds of grain would require to be taken into consideration, and this large question cannot be here entered upon. The extent of our import trade in wheat and flour is indicated by the follow- ing table, relating to the five years 1872-6; and the detailed statement for 1876 gives the principal sources whence these supplies are drawn :—

Total Imports of Wheat and Flour, 1872-1876.

Wheat. Wheat Meal and Flour.

Cwt.

42,127,726

Value. Cwt. Value.

4,388,136 6,214,479 6,236,044 6,136,083 5,959,821

£26,169, 185

28,538,746 25,236,932 27,510,469 23,178,011

£4,087, 639

5,849,852 5,685,076 4,870,257 4,741,515

43,863,098 41,527,638 51,876,517 44,454,657

Wheat Meal and Flour. Cwt.

Country.

Value. Value.

Anstrian territories ….....

£487,163 ussia—

445,626

1,977,346 6,803,282 58,411 263,205 2,324,143

£1,000,226

3,403,375 30,511 146,416 1,331,521 81.071 42.898 292,050 158,439 243,744 138,542 215,735 117,789 862,884 399.596 379,079 168.558 2,223,238 955,615

12,737,096 6,585,958 982,379

\ 104,928 96,459

366,011 769,074

471,060 930,819

1,089,400 | 888,867

20.811 13,306 1,351,754 351,532 19,567

6,583,563 3,730,810 511,640

1,895,011 495,218 24,211

482,921 1,163,706 1,473,749 1,281,555

56,581

23,178,011

131,431 201,514 64.837

189,320 283,034 109,062 80,333

44.454.657

5,959,821

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Sources, Quantities, and Value of Imports of Wheat and Flour into Great Britain in 1876.

The subjoined extract from the London Corn Exchange Report for 4th March 1878 will suffice to show the market classification of flour, and give an approximately accurate idea of the re'ative value of the various descriptions :—

London, top-price brands….sk. of 280 tb 47s. to 50s.

», usual households,.....05 39s. ,, 41s, i tye ROCOHE IS 0555s tSoecees aioe 37s. ,, 388, 59) © Cheap hotseliolds) «....:c.ics.0a0000 36s. ,, 38s. Comes' Prom Ie TES Ny, aacarctore vena serecesrsreins Sue 34s. ,, 36s. ee RSet cuppa msiiaastearaossiackains 30s. ,, 338. Country households, Norfolk…..... ..... BOS. 4 oes Herts, Essex, and Suffolk….....00 36s. ,, 38s. Suimey;, Kent, and, Sussex. sic. -cecc -2c002.ce 36s. ,, 38s.

American —Extra State…. barrel of 186 Ib 25s. 6d. 28s.

Bn oe a a eon iia ee 27s. ,, 30s. Patent process, extra fine….....0 30s. ,, 36s. DOW and Stale wen cicc econo eer eee ah BS eee Value of empty barrels…..... 10d. 55. (hs. French—Gruanx, for pastry …..... 280 Tb 48s. ,, 54s. SUPEKION PARIS MATkSi52.. ccccccceccscenemons 45s. ,, 46s. Bight Marks, PAPIB 5.0…ccsc0acse0s0 geese 47s. ,, 48s. Dare laiys Aiscsecnancns a Senoeoiteare veer wel p59 SOS a Bee ean each are sah anit », 44s. – OAD yaa ccvarnem as mated ones 5 286 abit a Ue Spanish ——Iet quality. .....—sercscoenes ene 43s. ,, 46s. Baltie— Whites, gold

medal …..... 42s, ,, 44s. Pr Marked 000…..... ste a Hees Sasa pete 41s. ,, 43s. Oder rt tee Beenie OAb,y Wo: 2 44s. 5, 478s Hungariaun—P.W.M., 000….. 0… «0… 608. 4, ... _ Queen's "4! A yin ae eee 57s. ,, 58s Victoria Empress …... . 58s. ,, 59s. 5 BAUS Reece 2s wie nets eae 56s. ,, 57s. si 1 (CUGW iS… Se acsees Bac ope 56s. ,, 57s. a EE eed ease nec: somone ne 56s. ,, 57s. Australian—Superfine ….....cc0eeee eee 43s. ,, 45s. fs TAG Fares ocelot niece) cise 39s. ,, 41s. . POaSEhOlA, o.$66)

(J. PA.)

FLOURENS, Gustave (1838-1871), a French social democrat and writer, a son of M. J. P. Flourens, was born at Paris, August 4, 1838. Before he had attained his twenty-first year he obtained at the college of Louis-le- Grand the diplomas of licentiate in letters and in sciences. In 1863 he undertook for his father a course of lectures at the Collége de France, the subject of which was the history of mankind. His theories as to the manifold origin of the human race, however, gave offence to the clergy, and he was precluded from delivering a second course. He then repaired to Brussels, where he published his lectures under the title of Histotre de Homme; he next visited Constan- tinople and Athens, took part in the Cretan insurrection of 1866, spent some time in Italy, where an article of his in the Popolo d'[talia caused his arrest and imprison- ment, and finally, having returned to France, nearly Jost his life in a duel with Paul de Cassagnac, editor of the Pays. In Paris he devoted his pen to the cause of repub- licanism, and at length, having failed in an attempt to organize a revolution at Belleville, February 7, 1870, found himself compelled to flee from France. Returning to Paris on the downfall of Napoleon, he soon placed himself at the head of a body of 500 tirailleurs. On account of his insur- rectionary proceedings he was taken prisoner at Créteil, near Vincennes, by the provisional government, and con- fined at Mazas, December 7, 1870, but was released by his men on the night of January 21-22. On the 18th March he joined the Communists. As colonel of the 19th and 20th arrondissements he took part in an attack on Ver- sailles, and early in the morning of the 3d of April was killed in a hand-to-hand conflict at Rueil, near Malmaison. Besides his Sctence de ?Homme (Paris, 1869), Gustave Flourens was the author of numerous fugitive pamphlets.

FLOURENS, Marre Jean Pierre (1794-1867), a celebrated French vhysiologist, was born at Maureilhan,

near Béziers, in the department of Hérault, April 15, 1794. At the age of fifteen he began the study of medicine at Montpellier, where in 1823 he received the degree of doctor. In the following year he repaired to Paris, provided with an introduction from De Candolle, the botanist, to Cuvier, who received him kindly, and interested himself in his welfare. At Paris Flourens engaged in physiological research, occasionally contributing to literary publications ; and in 1821, at the Athénée there, he gave a course of lectures on the physiological theory of the sensations, which attracted much attention amongst men of science. His paper entitled Recherches eapérimentales sur les propriétés et les fonctions du systéme nerveux dans les animaux vertébrés, in which he, from experimental evidence, sought to assign their special functions to the cerebrum, corpora quadrigemina, and cerebellum, was the subject of a highly commendatory report by Cuvier, adopted by the French Academy of Sciences, July 22, 1822. He was chosen by Cuvier in 1828 to deliver for him a course of lectures on natural history at the Collége de France, and in the same year became, in succession to Bosc, a member of the Insti- tute, in the division "Economie rurale." In 1830 he became Cuvier's substitute as lecturer on human anatomy at the Jardia du Roi, and in 1832 was elected to the post of titular professor, which he vacated for the professorship of com- parative anatomy created for him at the museum of the Jardin the same year. In 1833 Flourens, in accordance with the dying request of Cuvier, was appointed a perpetual secretary of the Academy of Sciences ; and in 1838 he was returned as a deputy for the arrondissement of Béziers. In 1840 he was elected, in preference to Victor Hugo, to succeed Michaud at the French Academy ; and he was created on April 24, 1845, a commander of the legion of honour, and in the next year a peer of France. In March 1847 Flourens directed the attention of the Academy of Sciences to the anzesthetic effect of chloroform on animals; and it is an interesting fact in the history of therapeutics that " chloric ether," a spirituous solution of chloroform, was in the spring of the same year first employed, at the suggestion of Dr M. C. Furnell, in surgical operations at St Bartholomew's Hospital. On the

revolu- tion of 1848, Flourens withdrew completely from the political world ; and in 1855 he accepted the professorship of natural history at the Collége de France. Three years before his death, which took place at Montgeron near Paris, December 6, 1867, he retired from his active duties at the Academy of Sciences.

As an expcrimental physiologist Flourens holds the highest rank. Besides a multitude of shorter scientific memoirs, he published— Essai sur quelques points de la doctrine de la révulsion et de la déri- vation, Montpellier, 1818; Expériences sur le systéme nerveux, Paris, 1825; Cours sur la 'génération, Vovologie, et Vembryologie, 1836; Analyse raisonée des travaux de G. Cuvier, 1841; Recherehes sur le développement des os et des dents, 1842; Anatomie générale de la peau et des membranes muqueuses, 1848; Buffon, histoire de ses travaux et de ses idées, 1844; Fontenelle, ou de la philosophie moderne rela- tivement aus seienees physiques, 1847; Théorie expérimentale de la formation des os, 1847; Ginwres completes de Buffon, 1853; De la longévité humaine et de la quantité de vie sur le globe, 1854, numer- ous eds.; Histoire de la découverte de la cireulation du sang, 1854; Cours de physiologie eomparéc, 1856; Reeueil des éloges historiqnues, 1856; De la vie et de Vintelligence, 1858; De la raison, du génie, et de la folie, 1861; Ontologie naturelle, 1861; Examen du livre de

M. Darwin sur U Origine des Especes, 1864. For list of papers see Royal Society's Catalogue, vols. ii. and vii.

FLOWERS, Artirictat. There ara few branches of ornamental work used in the decoration of ladies' apparel which have more increased in importance than that of artificial flower making, in which, both in France and in England, large numbers of workpeople are engaged. Not only has the trade itself greatly extended within the last few years, but the improvement in the manufacture is very marked. and the bouquets and wreaths used in the trim-

ming of dresses may be almost said to rival nature, so truly and delicately are the individual flowers manipulated, Artificial flower making is almcst entirely done by hand giving occupation principally to young women and children, the majority of whom work at home or in small shops. The

numbers employed at the time of the census of 187] were returned as 4886, of whom 1740 were under twenty years of age. In France the numbers are much larger, for ten years ago it was estimated that there were at least 2000 shops where artificial flowers were made, and it is probable that now these have been increased to 3000. It is not entirely a woman's work, however, for men are em. ployed, particularly in Paris, in cutting out the materia] for the flowers by a stamp machine, in which 16 or 20 folds are operated upon at once, the folds being coloured green, blue, crimson, according to the flower which is to be imitated. Each piece is taken up separately by a girl armed with a pair of pincers, who, with one dexterous movement, moulds it, as it were, roughly into the shape of the flower, and then passes it on to another who givesa more precise form to the petal. A third girl attaches each petal to a very fine wire, thread having been pre- viously twisted round this wire to form the stalk ; while the remaining operations consist in goffering the petals and leaves to give them a curl, and finally gumming or waxing tliem over, or dusting them with fine powdered glass or potato flour to represeut the bloom. The

rapidity and accuracy with which these various processes

are completed are very remarkable. A new style of artificial flower has lately come into vogue, in France more especially, made by the "' enamel process," in which a young girl sits by a jet of flame, holding in her hand a stick of prepared glass. A momentary application to the flame makes the end of the stick red hot, and while it isstill ina pasty state, the operator pulls out a short length, and immediately rolls it up into the form of the petal or leaf, and passes it on to the painter for the proper colouring. The remaining processes are similar to those of the ordinary artificial flowers. These enamel flowers, though wondrously true and pretty, are more suited for room decoration thau for dress. While apparently a light and pleasant work, artificial flower makiugis not one of the healthiest of our trades, partly for the reason that it is so often carried on in small household shops, where ventilation is of the scantiest. It has, however, been much improved in this respect, since it has come nnder the supervision of the Factory Acts. There is always a certain amount of dust and colouring matter flying about the room, which is more or less injurious, though the use of Scheele's green and sulphate of copper (verdigris blue) is almost discontinued, and with it a

train of symp- toms that usually accompany arsenical poisoning. Weak eyes are a common source of complaint, especially the form called asthenopia, which is particularly induced when white flowers are made by gas light. In the manufacture of the flowers, the net cost is about three-fifths of the whole for material, and the remaining two-fifths for the labour, In France the earnings of the men who ent the folds are from 4 to 5 francs per day, of the workwomen from 24 to 3}; according to ability. In England a skilful flower worker will earn from 20s. to 25s. per week, though there is a drawback in its being a season trade, which is very brisk about the spring and fall of the year, and as inactive during the other times. Besides the very large number of artificial flowers made in England, the following table shows how great the importation, principally from France :— 1866…...£293,306 | 1870…... £266,502 | 1874…...£447,351

1B67…...: 304,440 | 1871… 367,186. | 18%o4e 510,800 1868…... 341,176 | 1879…... 411,540 | 1876…... 496,987 1869…... 365,407 | 1878…... 449,320 | 1878…... 544,625

to a much smaller extent.

FLO—FLU

FLOYER, Sir Jonn (1649-1734), M.D., physician and author, was born at Hinters in Staffordshire, and was educated at Oxford. He practised in Lichfield, and it was by his advice that Dr Johnson, when a child, was taken by bis mother to be touched by Queen Anne for the king's evil, March 30, 1714. Dr Johnson had a high opinion of his learning and piety. Floyer died February J, 1734. Besides letters and other short pieces in various publications, he wrote—

bapnaxo-Bdcavos: or the Touch-stone of Medicines, discovering the virtues of Vegetables, Minerals, and Animals, by their Tastes and Smells, 2 vols., 1687; The preternatural State of animal Humours described by their sensible Qualities, 1696; An Enquiry into the right Use and Abuses of the hot, cold, and temperate Baths in England, 1697; A Treatise of the Asthma, Ist ed., 1698; The ancient Yuxpo- rovota revived, or an Essay to prove cold Bathing both safe and useful, London, 1702 (several editions 8vo; abridged, Manchester, 1844, 12mo); The Physician's Pulse-wateh, 1707-10; The

Sibylline Oracles, translated from the best Greck copies, and compared with the sacred. Prophecies, 1st ed., 1718; Two Essays: the first Essay con- corming the Creation, citherial Bodies, and Offices of geod and bad Angels; the second Essay concerning the Mosaic System of the World, Nottingham, 1717; An Exposition of the Revelations, 1719; An Essay to restore the Dipping of Infants in their Baptism, 1722; Medicina Gerocomica, or the Galenic Art of preserving old Men's Healths, 1st ed., 1724; 4A Comment on forty-two Histories deseribed by Hippocrates, 1726.

FLUDD, Ropert (Latin obertus De Fluctibus), (1574-1637), an English physician and mystical philo- sopher, was the son of Sir Thomas Fludd, treasurer of war to Queen Elizabeth in France and the Low Countries, and was born at Milgate, Kent, in 1574. After studying at Oxford he spent six years in travelling in Europe. While on the Continent he became acquainted with the writings of Paracelsus, and he was so fascinated with them that he endeavoured to form a system of philosophy founded on the identity of physical and spiritual truth. He believed in two nniversal principles, the northern or condensing and the southern or rarefying power, and in the existence of four elemental spirits corresponding to fire, air, earth, and water. The central principle of his philosophy was that man was a representation or miniature of the universe, and he endeavoured to trace the analogy between what he called the microcosm and the macrocosm. The opinions of Fludd, preposterous as they now seem, had the honour of being refuted by Kepler, Gassendi, and Merseune. Though rapt in mystical speculation, Fludd did not disdain scientific experiments, and is thought by some to be the original in- ventor of the barometer, He died in 1637. De Quincey considers Fludd to have been the immediate father of free- masonry, as Andrea was its remote father.

Fludd wrote two books against Mersenne, the first entitled So- phie cum Moria Certamen, &c., 1629; and the second, Summum Bonorum quod est vernm Magic, Cabale, &c., 1629. Among his other works were—Utriusque Cosmé, majoris et minoris, Technica Historia, 1617; Tractatus Apologeticus integritatem Soc. de Rosea pee defendens, 1617; Aonochordon Mundi symphoniacum, seu io ee Apologiam Joannis Kepleri, 1620 ; Anatomie Thea- Medics o ae eee designatum, 1623; Philosophia Sacra, 1626 ; De =. ae? oe 3 Integrum Morborum Afysterium, 1631; aia. ae

‘ 1 sie Philosophice et Alchymic Flud- niger 640, ° See Pee ae 1638 ; and Pathologia Demo-*

a y’s Works, vol. xvi. pp. 406-412.

*FLUGEL, Gusrav Lesrecut (1802-1870), 2 German Orientalist, was born at Bautzen, February 18, 1802. He recetved his early education at the gymnasium of his native pe and studied theology and philology at Leipsic. eile he devoted his attention chiefly to Oriental = ee which he studied especially at the universities dina aa Paris, In 1832 che became professor at the mee ae of Meissen, but ill health compelled him to whee : at office in 1850, and in 1851 he went to Vienna, Bs * was employed in cataloguing the Oriental manu-*

Pts of the court library, He died at Dresden, July 5,

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His chief works are an edition of the Koran, originally published at Leipsic in 1834, followed by Concordantie Corant Arabice, Leipsic, 1842 ; Geschichte der Araber, Leipsic, 1832-1840 ; Diction- ary of Hadschi-Chalfa, with Latin translation and commentary, in 7 vols., London and Leipsic, 1835-1858 (published at the expense of the London Oriental Translation Committee) ; Mant, seine Lehren und seine Schriften, Leipsic, 1862 ; Die grammatischen Schulen der Araber, Leipsic, 1862. An edition of Kitéb-al-Fihrist, prepared by Fliigel, was published posthumously at Leipsic in 1871, and he also edited various other Oriental works,

FLUGEL, Joann Gortrriep (1788-1855), a German lexicographer, was born at Barby near Magdeburg, 22d November 1788. He was originally a merchant’s clerk, but emigrating to America in 1810, he made a special study of the English language, and returning to Germany in 1819, he was in 1824 appointed professor of the English language in the university of Leipsic. In 1838 he became American consul, and subsequently representative and cor- respondent of many literary and scientific institutions of America, He died 24th June 1855.

The fame of Fliigel rests chiefly on his Vollstindige englisch- deutsche und deutsch-englische Worterbuch, first published in 2 vols. at Leipsic in 1830, which has had an extensive circulation not only in Germany but in England and America. Among his other works are—Vollstdndige engl. Sprachlehre ; Triglotte, oder Kauf- miinnisches Worterbuch in drei Sprachen, deutsch, englisch, und franzdsisch ; Kleines Kaufménnisches Handworterbuch in dret Sprachen; and Praktisehes Handbuch der engl. Handelscorrespon- denz. All these have passed through several editions.

FLUORINE, one of the halogen group of chemical elements, symbol F, atomic weight 19°1. The compound fluorine forms with hydrogen, namely, hydrofluoric acid, or hydrogen fluoride, was known so long ago as 1670 for its property of etching glass; by Scheele it was regarded as a substance containing oxygen with some other element ; and by Ampére, in 1810, it was shown to consist of hydrogen with a new element, which from its source fluor spar received the name of fluorine. Fluorine is one of the less abundant, but one of the most widely diffused of the elements. It occurs in nature always combined with other elements, as in fluor spar (see below), in CryonirE (g.v., vol. vi. p. 667), and in fluor-apatite; in the rarer minerals topaz, yttrocerite, wagnerite, wavellite, and others; also in small quantities in some granites and trap rocks; in river and mineral waters; and in sea water, according to Forchhammer, to the extent of half a grain in 100 bb. Bischoff draws attention to the fact that no trace of fluorine is to be found in augite. It is a constant constituent of teeth and bones—in fossil in larger quantity than in recent bones; and it has been detected in corals, and in the ashes of milk and of ox-blood. Attempts to isolate fluorine have been made by several experimenters, but its strongly negative properties, by occasioning its coni- bination with the material of most vessels employed to receive it, have hitherto proved an obstacle to its investiga- tion m the free state. 'The presence of fluorine in minerals is usually detected by their evolution of hydrofluoric acid when heated with sulphuric acid, and the action of the evolved acid on glass. For the quantitative estimation of fluorine, its compounds may be decomposed by means of sulphuric acid or acid sulphate of ammonium, the fluorine being determined either by loss, or directly in the form of silicofluoride of potassium, sodium, or barium, according to Wohler's method. To obtain their finorine in a soluble combination many minerals require fusion with alkaline carbonates. Free

hydrofluoric acid and soluble fluorides are best determined by means of calcium chloride, which affords a precipitate of calcium fluoride, or fluor spar. See further, on the compounds of fluorine and their reactions, CuHemistTRY, vol. v. pp. 490-494.

FLUOR SPAR, Frvorite, or Catctum Fivorie, CaF, (Germ. Hluss-spath), the "blue John" of Derbyshire, and "cann" or "kann" of Cornish miners, occurs crystallized in

simple or modified cubes and octahedrons ; also nodular, compact and granular, and more rarely fibrous, or soft and earthy. Some octahedral crystals from the mines of St Agnes, in Cornwall, are made up of minute cubes, which may themselves show faces of other forms of tle monometric system of crystallography. Fluor spar is a brittle, trans- parent to sub-translucent mineral, with a perfect octahedral cleavage, a vitreous, sometimes splendent lustre, a hardness of 4, and a specific gravity of 3:01-3:25. Before the blowpipe it decrepitates, tinges the flame dull red, and fuses into an enamel. Heated with concentrated sulphuric acid it yields hydrofluoric acid (see CuEmistRy, vol. v. p. 491). In colour fluor spar varies much, being blue, purple, green, yellow, pink, or brown; it is sometimes dichroic. The colours are attributed by Wyrouboff to the presence of minute quantities of hydrocarbons, taken up from solutions from which the mineral has crystallized; by others they are considered to be due to peculiarities of molecular structure. In the Weardale fluors small cavities containing liquid have occasionally been found. Fluor spar, in common with some other substances, when exposed to light, or when raised to a temperature somewhat under redness, usually phosphoresces, emitting a bright light, the colour of which is not dependent on that of the mineral. A variety of fluor spar has received its name chlorophane from its fine green phosphorescence. Like the colour, the phosphorescence of fluor-spar is destroyed by exposure to a high temperature ; it may be partly restored by means of an electric discharge, or, it is said, by moistening with dilute hydrofluoric acid. From the name of the mineral Professor Stokes borrowed the term "fluorescence," applied by him to the quality which certain bodies, ¢.g., sulpliate of quinine, possess of rendering the ultra-violet rays of the

spectrum visible. W. Hankel (Ann. Phys. Chem. [2], ii. 66-83), experimenting on crystals of fluor spar from Weardale, found that when exposed to light they exhibited not only phosphorescence but electrical phenomena ; the rays of the sun, however, concentrated by a lens, deprived the crystals of their photo- electrical property, which they did not regain. Fluor spar is slightly soluble in water containing hydrated calcium carbonate. Pseudomorplis of hornstone, hematite, calamine, and other minerals after fluor spar are not unfrequent. Fluor spar is commonly used for the production of hydro- fluoric acid in etching on seals and glass, and in the smelting of lead and copper and in other metallurgical operations as a flux, whence its name, from the Latin fluo, to flow. The manufacture of vases and other ornamental articles from fluor spar, especially the variegated varieties, has long been carried on in Derbyshire. The stone, which is some- times first heated to change its blue toan amethystine tint, is shaped by means of the lathe and a fine steel tool, and is finished off with coarse stone, and after that with pumice and emery. Fluor spar is of frequent occurrence in metalliferous veins, being most commonly associated with ores of lead, as in the mines of Derbyshire, Cumberland, Cornwall, Saxony, and Bohemia. It is met with also in granite, gneiss, slates, various limestones and sandstones, and some volcanic products, and has occasionally been detected in beds of coal.

On the phosphorescence of fluor spar see Prof. C. Bohn's paper on ae Negative Fluorescence and Phosphorescence," Phil. Mag. [4], vol. XXXlv. p. 109, 1867.

FLUSHING (Dutch Viissingen), a fortified seaport town of the province of Zealand, Holland, is situated on the island of Walcheren, at the mouth of the estuary of the Western Scheldt, about 4 miles 8. of Middleburg, and 50 miles 8. W. ve Soe It possesses an academy of sciences, a

of navigation, a town-hall, a theatre, an exchange, aa a statue to Admiral Ruyter, who was born here in 7, Since 1872 it has had direct railway connexion

with the main lines of Europe ; and by the construction jn 1873 of a great harbour, docks, and canal works a com- munication between it and the North Sea has been opened up for vessels of the largest size. The outer harbour has a surface of 33°11 acres, and a depth at low water of 99 feet; the depth of both the inner harbours at low water is 27 feet, the surface of the one being 16°55 acres and that of the other 11‘86 acres. With these works Flushing possesses one of the finest and safest harbours of the Con- tinent, and the one on the Dutcli coast best adapted for the trade of Holland and Germany. Its chief exports are wheat, beans, fish (especially shrimps), and cattle; and its chief imports coal from England, and coffee, tea, and tin from Java. The number of vessels entering and clearing annually is upwards of 100. Besides the shipping trade the chief industries are brewing and the manufacture of oil and soap. Flushing was one of the “ cautionary towns ” delivered up to Queen Elizabeth in 1589 in security for the money aud soldiers sent by her to assist the Dutch under Sir Philip Sidney. It was captured by the French in 1795, and in 1809 it was bombarded by the English under Lord Chatham, and did not surrender till the fine town-hall, two churches, and about 100 houses were destroyed. Its fortifications have since that time been greatly strengthened, and now completely command the entrance to the river. Population in 1869, 8929.

FLUSHING, a post-village of Queens county, New York, is situated on Long Island at the head of Flushing Bay, about 7 miles NE. of New York, and 8 N.E. of Brooklyn. It possesses a State bank, a savings bank, an academy, a female seminary, and several other educational institutions. It is the residence of many of the New York merchants, and is noted for its large gardens and nurseries. Popul- tion in 1870, 6223.

FLUTE, a wind instrument which in a variety of forms lias been in constant use from the earliest ages To Olympus the Phrygian has been ascribed the introduction of flute-playing into Greece, an art which was much encouraged in the later days of the empire. The Greeks employed professional flute-players in many of their religious ceremonies, and competitive trials of skill were frequent. The old English flute, called the flute-d-bec, from the sup- posed resemblance of the mouthpiece to the beak of a bird, was played from the upper and wider end, had seven finger holes, and was made of various sizes, called treble, alto, tenor, and bass flutes

respectively. This instrument con- tinued in common use to about the middle of the 18th century, when it was gradually superseded by the modern horizontal (jlauto traverso) or " German" flute. Handel was one of the first to introduce the new instrument ito the orchestra, employing it for solos in Ze Ode on Saunt Cecilia's Day (1739), notably in the air " The soft com- plaining Flute." But the capacities of the ¢raverso of Handel's time were very limited in comparison with those of its modern representative, which possesses a workable compass of about three octaves from the low C in the treble clef, with all the chromatic intervals. Various systems of fingering have been introduced from time to time by the most eminent flautists and flute-makers, and concertos for the flute as a solo instrument have been composed with 2 view to exhibiting the powers of celebrated performers. In orchestral scores the flute part is generally placed at the top, and is written in the violin or G clef. The piccolo or octave flute, the E flat or téerce, the D flat or mor ninth (transposing piccolo), the flute d'amour, a mmm third below the ordinary instrument—are all varieties of the traverso, which like the fife is blown by an oval shape hole in the side, near the stopped end of the tnbe. Other branches, now obsolete, of the flute family were—t 4 recorder, varying in length of tube from about twelve

inches to three fect, the largest being known as the bass recorder; the cornet, shaped like a quadrant, and gradually tapering towards the mouthpiece ; and the pigrim's staff, having a tube about six feet in length. For other less important varieties the reader is referred to AMusurgia, Luscmius, 1536; Harmonie Universelle, Mersenne, 1636. Among the foundation stops of most organs will generally be found one or more "flute " stops, e.g., the hohl jlote, of eight feet tone, and the octavo fiute, of four feet tone. The flageolet is 2 smaller variety of the old jlute-d-bec, and was formerly used in the orchestra. Handel has written an obbligato part for it in the well-known barytone air " O, ruddier than the cherry." 'The fife, much used in military bands, is simply an octave flute in D, played horizontally, and havimg six finger holes and one key.

FLUX. See Meratuurey.

FLUXIONS. See Inrinirestmat Catcucus.

FLY. See Diptera and INsEcts.

FLYCATCHER, a name mtroduced in ornithology by May, being wu translation of the Afuscecapa of older authors, and applied by Pennant to an extremely common English bird, the Jf. grisola of Linneus. It has since been used in a general and very vague way for a great many small birds from all parts of the world, which have the habit of eatcli-

ing flies on the wing, and thus ornithologists who have.

trusted too mucli to this cliaracteristic and to eertain merely superficial correlations of structure, especially those ex- hibited by a broad and rather flat bill and a gape beset by strong liairs or bristles, have associated under the title of Muscicapide an exceedingly heterogeneous assemblage of forms that, though much reduced in number by later systematists, has scarcely yet been sufficiently revised. Great advance has been made, however, in establishing as independent Families the Zodide and Lurylemide, as well as in excluding from it various members of the Ampelide, Cotingide, Tyrannidee, Vireonde, Mniotiltide, and perhaps others, which had been placed within its limits. These steps have left the AMwuscicapide a purely Old-World family of the Order Passeres, and the chief difficulty now seems to lie in separating it from the Campephagide and the Lanude. Every ornithologist must own that its precise definition is at present almost impossible, and must await that truer knowledge which comes of investigating structural characters more deeply seated than any afforded by the epidermis. But here want of space forbids the pursuit of this kind of inquiry, and for the same reason only a very few of the forms of Flycatchers (which, after all the deduc- tions above mentioned, may be reckoned to include some 60 genera or subgenera, and perhaps 250 species) can be even named.1

The best known bird of this Family is that which also happens to be the type of the Linnean genus Jfuscicapa— the Spotted or Grey Flycatcher (Af, grisola) already men- tioned. It is a common summer-visitant to nearly the whole of Europe, and is found throughout Great Britain, though less abundant in Scotland than in England, as well os m many parts of Ireland, where, however, it seems to be bat locally and sparingly distributed. It is

one of the ae of i migrants to arrive, and seldom reaches these = 4 till the latter part of May, when it may be seen, a

a® Cust-coloured bird, sitting on the posts or railings of

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hate, 30 genera or subgenera which Swainson included in his (published NG a and Relations of the Family of Flycatcl.ers ail ea In ae at least 19 do not belong to the Muscicapida: at peta = of them, Todus, not even to the Order Passeres. Jt is 50 fle eae to name any ornithological work whose substance with Ban – i title as does this treatise. Swainson wrote it filled invented b i. € So-called "Quinary System "—that fanciful theory,

va, a lacleay, which misled and hindered so many of the best swaye ie mee of his generation from the truth, —and, unconsciously

¥ 4s bias, his judgment was warped to fit his hypothesis,

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our gardens and fields, ever and anon springing into the air, seizing with an audible snap of its bill sume passing insect as it flies, and returning to the spot it has quitted, or taking up some similar station to keep watch as before. It has no song, but merely a plaintive or peevish call-note, uttered from time to time with a jerking gesture of the wings and tail, It makes a neat nest, built amoug the small twigs which sprout from the bole of a large tree, fixed in the branches of some plant trained against a wall, or placed in any hole of the wall itself that may be left by the falling of a brick or stone. The eggs are from four to six in number, of a pale greenish-blue, elosely blotched or freckled with rust-colour. Silent and inconspicuous as is this bird, its eonstant pursuit of flies in the closest vicinity of our houses inakes it a familiar object to almost every- body. A second British species is the Pied Flycatcher (ML. atricapilla)—called by some writers the Coldfinch—a much rarer bird, and in England not often seen except in the hilly eountry extending from the Peak of Derbyshire to Cumberland, and more numerous

in the lake district than elsewhere. It is not eommon in Scotland, and has only once keen observed in Ireland. More of a woodland bird than the former, the brightly-contrasted black and white plumage of the eock, together with his agreeable song, readily attracts attention where it occurs, It isa summer vVisitant to all Western Europe, but further east- ward its place is taken by a nearly allied species (Jf. collaris) in which the white of the throat and breast extends like a eollar round the neck. A fourth European species (JZ. parva), distinguished by its very small size and red breast, has also strayed some three or four times to the extreme south-west of England. This last belongs to a group of more eastern range, which has received geueric recognition (possibly well deserved) under the name of Lrythrosterna, and it has several relations in Asia and particularly in India, while the allies of the Pied Flyeatchers (Picedula of Brisson) are chiefly of African origin, and those of the Grey or Spotted Flycatcher (Afuscicapa proper) are eommon to the two eontinents.*

One of the most remarkable groups of A/uscicapidee is that known as the Paradise' Flycatchers, forming the genus T'chitrea of Lesson. In nearly all the species the males are distinguished by the growth of: exceedingly long feathers in their tail, and by their putting on, for some part of the year at least, a plumage generally white, but almost always quite different from that worn by the females, which is of a more or less deep eliestnut or bay colour, though in both sexes the erown is of a glossy steel-blue. They are found pretty well throughout Africa and tropical Asia to Japan, and seem to affect the deep shade of forests rather than the open eountry. The best-known species is perhaps the Indian 7. paradist; but the Chinese 7. tnciz, and the Japanese 7'. princeps, from being very commonly represented

| by the artists of those nations on screens, fans, and the

| like, are hardly less so; and the eock of the last named,

with his bill of a pale greenish-blue and eyes surrounded

by bare skim of the same colour—though these are eharacters possessed in some degree by all tlic species—seems to be the most beautiful of the genus. 7. bourbonnensis, which is peculiar to the islands of Mauritius and Réunion, appears to be the only species in which the outward difference of

the sexes is but slight. In 7. corvina of tlie Seyclielles, the adult male is wholly black, and his middle tail-feathers are not only very long but very broad. In 7. mutata of Madagascar, some of the males are found in a blaekish plumage, though with the elongated median rectrices white, while in others white predominates over the whole body; but

2 By some writers this section is distinguished as Butalis of Boie, but to do so seems contrary to rule.

whether this sex is here actually dimorphic, or whether the one dress is a passing phase of the other, is at present undetermined. Some of the African species, of which many have been described, seem always to retain the rufous plumage, but the long tail-feathers serve to mark the males ; and the whole group deserves far more investigation than it has ever received, as it is likely to reveal facts of the highest importance in regard to the theory of " Sexual Selection.".

On the other groups of the Family tliere is not room to descant.. A few are distinguished by the brilliant blue they exhibit, as Mycagra azurea, and others as Monarcha (or, Arses) chrysomela by their golden-yellow. Australian forms assigned to the Muscicapidw are very varied, and probably require much further scrutiny. Sisura inguieta, for instance, has some of the habits of a Water-Wagtail (Aotacilla), and hence has received from the colonists the name of " Dishwasher," bestowed in many parts of England on its analogue ; and the many species of Rhipidura or Fantailed Flycatchers, which occur in various parts of the Australian Region, have manners still more singular—turning over in the air, it is said, like a Tumbler Pigeon, as they catch their prey; but concerning the mode of life of the majority of the Muscicapide, and especially of the numerous African forms, hardly anything is known. (a. N.)

FLYING anp FLYING MACHINES. See Fricur.

FLYING-FISH are of two different kinds. The one (Dactylopterus) belongs to the Gurnard family (Zriglde), and is more properly called Flying Gurnard ; the other (Exocetus) has been called Flying Herring, though

more nearly allied to the Gar-pike than to the Herring. Some other fishes with long pectoral fins (Pterovs) have been stated to be able to fly, but this has been proved to be incorrect. The Flying Gurnards are much less numerous than the LHxocett with regard to individuals as well as species, there being only three or four species known of the former, whilst more than fifty have been described of the latter, which, besides, are found in numerous shoals of thousands. The Dactyloptert may be readily distinguished by a large bony head armed with spines, hard keeled scales, two dorsal fins, &c. The Hxoceeti have thin, deciduous scales,

Fic. 1.—Dactylopterus volitans.

onty one dorsal fin, and the ventrals placed far backwards, below the middle of the body ; some have long barbels at

the chin. In both kinds the pectoral fins are greatly pro- longed and enlarged, modified into an organ of flight, and in many species of Hxocetus the ventral fins are similarly enlarged, and evidently assist in the aerial evolutions of these fishes. Flying fishes are found in the tropical and sub-tropical seas only, and it is a singular fact that the geogra- phical distribution of the two kinds is nearly identical. The literature on the subject of flying fishes is very ex- — and great diversity of opinion exists among . Servers as regards the mode and power of their flight ;

ut the most reliable agree that the fishes do not leave the

The =

FLY—FLY

water for the purpose of catching insects, and that they are unable to move their fins in the manner of a bat or bird, or to change voluntarily the direction of their flight, or to fly beyond a very limited distance. The most recent inquiries are those of K. Mébius (Die Bewegungen der Fliegenden Fische durch die Luft, Leip. 1878, 8vo), the chief results of which may be summed up thus. Flying fish are more fre-

Fie. 2.—LExocetus callopterus.

quently observed in rough weather and in a disturbed sea than during calms ; they dart out of tlhe water when pursued by their enemies or frightened by an approaching vessel, but frequently also without any apparent cause, as is also observed in many other fishes; and they rise without re- gard to the direction of the wind or waves. The fins are kept quietly distended, without any motion, except an occasional vibration caused by the air whenever the surface of the wing is parallel with the current of the wind. Their flight is rapid, but gradually decreasing in velocity, greatly exceeding that of a ship going 10 miles an hour and a distance of 500 feet. Generally it is longer when the fishes fly against, than with or at an angle to, the wind. Any vertical or horizontal deviation from a straight line is not caused at the will of the fish, but by currents of the air; thus they retain a horizontally straight course when flying with or against the wind, but are carried towards the right or left whenever the direction of the wind is at an angle with that of their flight. However, it sometimes happens that the fish during its flight immerses its caudal fin in the water, and by a stroke of its tail turns towards the right or left. In a calm the line of their flight is always also vertically straight or rather parabolic, like the course of a projectile, but it may become undulated in a rough sea, when they are flying against the course of the waves; they then frequently overtop each wave, being carried over it by the pressure of the disturbed air. Flying fish often fall on board of vessels, but this never happens during 4 calm or from the lee side, but during a breeze only and from the weather side. In day time they avoid a ship, flying away from it, but during the night, when they are unable to see, they frequently fly against the weather board, where they are caught by the current of the air, and carried upwards to a height of 2U feet above the surface of the water, whilst under ordinary circumstances they keep close to it. All these observations point clearly to the fact that any deflexion from a straight course is due to external cir cumstances, and not to voluntary action on the part of the fish.

FLYING FOX, or more correctly Fox Bat, a name ap- plied to a family of fruit-eating bats (Pteropide), found only in the Eastern hemisphere, and there confined to the tropical regions and Australia. It comprises 9 genera and 65 species, a considerable proportion of which occur in the islands of the Malay Archipelago. They are also found throughout Africa, and extend northward and eastward to China and Japan, and southward to Tasmania.

They are likewise included among the few indigenous mammals of the South Sea Islands, being found in Samoa and the Mananne Islands. The flying foxes are the largest of the bats, the kalong of Java (Pteropus edulis) measuring nearly @ foo and a half in length, and having an expanse of wing-melr

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brane measuring nearly five feet across. The flesh of this species is esteemed a delicacy in many parts of Malaya; but its use in this respect by no means compensates for the enormous amount of fruit which it destroys. The flying foxes are gregarious, nocturnal animals, suspending theni- selves during the day head downwards by thousands from the branches of trees, where with their wings gathered about them, they bear some resemblance to huge shrivelled- up leaves, or to clusters of some peculiar fruit. In Batchian, according to Wallace, they suspend themselves chiefly from the branches of dead trees, wliere they are easily cauglit

or knocked down by sticks, the natives carrying them home |

in basketfuls. They are then cooked with abundance of hare." Towards evening these bats bestir themselves, and fly off in companies to the village plantations, where they feed on all kinds of frnit, and so numerous and voracious are they, that no garden crop has much chance of being gathered which is not specially protected from their attacks. The flying fox of India (Pteropus medius) is a sinaller species, but is found in great numbers whierever fruit is to be had in the Indian peninsula. Of this species Mr Francis Day, who has had special opportunities of studying it, says —"Tn their diet they are exclusively frugivorous, and they do very great injury to cocoa-nut plantations and mango gardens. Their habits are very intemperate ; and they often pass the night drinking the toddy from the chatties in the cocoa-nut trees, which results either in their returning home in the early morning in a state of extreme and riotous intoxication, or in being found the next day at the foot of the trees sleeping off the effects of their midnight debauch." No fossil fox-bats have yet been found.

FOGARAS, the capital of an Hungarian county of the same name, in Transylvania, is situated on the left bank of the river Aluta, 55 miles east of Hermannstadt, 45° 47’ N. lat., 24° 54’ E. long, Among the principal buildings are @ Franciscan monastery, five churches, and a county court-house. The population in 1870 amounted to 4714 It was near this town that Bem was defeated by the Russian generals Engelhardt and Liiders on the 12th July, 1849. The county of Fogaras lies on the Wallachian frontier, between the county of Brassé or Cronstadt on the east, and that of Nagy Szeben or Hermannstadt on the west. The climate being cold, and the surface of the country for the most part mountainous and unfavourable to agriculture, the inhabitants are chiefly employed in rear- Ing cattle. The population of the old district in 1870 amounted to 82,852, of whom the greater number were Wallachians, the remainder being Saxons and Hungarians. The transformation of the district of Fogaras into a county took place in 1876,

FOGELBERG, Benepicr Er.anp (1786-1854), a Swedish sculptor, was born at Gothenburg in 1786. His father, a copper-founder, encouraging an early-exhibited taste for design, sent him in 1801 to Stockholm, where he studied at the school of art. There he came much under the Influence of the sculptor Sergell, who communicated to him his own enthusiasm for antique art and natural grace. Fogelberg worked hard at Stockholm for many years, although his instinct for severe beauty rebelled against the somewhat rococo quality of the art then prevalent in the city. In 1818 the grant of a Government pension enabled him to travel. He studied from one to two yeats in Paris, first under Pierre Guerin, and afterwards — puter Bosio, for the technical practice of in a & In 1820 Fogelberg realized a dream of his life

a ng Rome, where the greater part of his remaining years were spent in the assiduous practice of his art and the

@areful stnd and analysi Visiting ee ¥ ysis of the works of the past.

reliant imagination.

native country by royal command in 185 4, he |

was received with great enthusiasm, but nothiug could compensate him for the absence of those remains of antiquity and surroundings of free natural beauty to which he had been so long accustomed. Returning to Italy, he died suddenly of apoplexy at Trieste, December 22, 1854, The subjects of Fogelberg's earlier works are mostly taken from classic mythology. Of these, Cupid and Psyche, Venus entering the Bath, A Bather (1838), Apollo

Citharede, Venus and Cupid (1839), and Psyche (1854) may be mentioned. His native Scandinavian mythology

forcibly engaged the attention of Fogelberg, and in his re- presentations of that mythology he showed, perhaps for the

| first time, that he had powers above those of intelligent spices, and "are really very good eating, something like |

assimilation and imitation. His O.in (1831), Thor (1842), and Balder (1842), though influenced by his study of Greek art, still display considerable power of independent, self- His portraits and historical figures, as those of Gustavus Adolphus (1849), of Charles XII, (1851), of Charles XIII. (1852), and of Birger Jarl, the founder of Stockholm (1853), are faithful and dignified works. Thirty-eight copperplate engravings of Fogelberg's works, with a portrait and biographical notice, were published by M. Casimir Leconte, Paris, 1856.

FOGGIA, a city of Italy, capital of the province of Capitauata, situated near the centre of the great plain of Apulia, 122 miles by rail ENE. of Naples. It is well built, and the main streets are wide and clean. The prin- cipal church, originally a stately Norman edifice, was almost destroyed by an earthquake in 1731, and the upper part has been rebuilt in a different style, which greatly in- jures the effect. There are numerous other churches, a fortified palace now in ruins, a large theatre, a custom- house, an orphanage, a college for danghters of the nobility,

| 2 public library, an agricultural society, an economical

society, an ornithological museum, and an Artesian well. The town has now become a great railway junction, just as it was formerly the meeting place of the principal roads of the country. It is a staple market for corn and wool, and one of the largest fairs of southern Italy is held there in May. The corn magazines or fosse are very extensive, con- sisting of vaults lined with masonry under the principal streets and squares. Other articles of export are capers, wine, and oil. The flocks of sheep that descend annually in autumn from the mountains of Abruzzo into the plains of Apulia pay a toll as they pass through the city. The population in 1872 was 34,181.

Foggia was probably founded in the 9th century, and it is sup- posed that it oceupied the site of the ancient Arpi or Argyripa, and derives its name from the fovee or pits that were dug among the ruins. It was a favourite reside ice of Frederick IT., who in 1240 held a parliament within its wails ; and there he lost his third wife, Isabella, daughter of King John of England. In 1254 Manfred, the natural son of Frederick, defeated the forces of Pope Innocent IV. outside the city, which was not long afterwards laid in ruins by Charles of Anjou. Ferdinand I. summoned his barons and prelates to Foggia to prepare a crusade against the Turks.

FOIL, thin silvered sheet-copper, highly polished, and coated with mixtures of isinglass and transparent colours, is employed by jewellers to place at the back of paste and inferior stones to improve their tints and lustre. Copper foil, known also as Nuremberg or German foil, is made from thin hammered copper plates by heating between sheets of iron, boiling in solution of tartar and salt, drying, hammering, and lastly polishing with whiting on a convex smooth surface of copper.

FOIX (Lat. Fuxum), a town of France, capital of an arrondissement, and also of the department of Ariége, is situated on the left bank of the Ariége, in the gorge of a narrow valley at the foot of the Pyrenees, 44 miles south of Toulouse. It is badly built, and its streets are uneven and irregular. In the middle of the town rises the old castle of the counts of Foix, situated on a rock 5U fect

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high, and possessing three fine towers, all anterior to the 15th century. 'The principal industries of the town are connected with the manufacture of iron, but there are also breweries, tanneries, and dyeworks. Foix is the seat of a tribunal of justice of the first instance, and possesses @ com- munal college, a teachers' seminary, a library connected with the prefecture, a prison, and a correction-house. The population in 1876 was 5127.

FOIX, Counts or, an ancient French family which flourished from the 11th to the 16th century. The title was first assumed by Roger, nephew of Peter Roger count of Carcassonne, on his inheriting the town of Foix with the adjoining lands from his uncle. He died in 1064, and was succeeded by his brother Peter, who died in 1070 and was succeeded by his eldest son Roger II. This count was ex- communicated by Pope Pascal II. for taking possession of ecclesiastical property, but in 1095 he took part in the crusade, and afterwards by rich donations made his peace with the church. He died in 1125, and was succeeded by Roger III., who on his death in 1141 was succeeded by his eldest son Roger Bernard 1. Roger Bernard was succeeded in 1188 by his only son Raymond Roger, who in 1190 accompanied Philip Augustus to the Holy Land, and distinguished himself at the capture of Acre. He was afterwards engaged in the wars of the Albigenses, and on his being accused of heresy, Simon de Montfort was put in possession of his estates. He, however, made his peace with the church some time before his death, which took place in 1223 from exposure and fatigue at the siege of Mirepoix. This count was a patron of the Provengal poets, and reckoned himself one of their number. He was succeeded by his son Roger Bernard II., surnamed the Great, who distinguished himself in the wars against the Albigenses, joined in an alliance against Louis VIII. of France, lost his lands but succeeded in regaining them, was twice ex-communicated but obtained absolution, and died in 1241 in the abbey of Bolbone, where he was for a short time a monk. Roger IV., his son and successor, did homage for his lands to the king of France and the count of Carcas- sonne. He died in 1265. His son and successor, Roger Berard III, was more famous as a poet than a warrior. He was taken prisoner by Philip the Bold and again by Peter III. of Aragon; and before his death in 1302 began the quarrel of the house of Foix with that of Armagnac. His son and

successor, Gaston I., continued the war, was exconl- municated in 1308 by Clement V. and imprisoned in the ChAtelet, Paris, but, regaining his freedomshortly afterwards, joined Louis X. in 1315 in the expedition against Holland, and died on the way home. 'To him succeeded his eldest son Gaston IL, who became reconciled with the house of Armagnac, joined the Navarrese in their wars against the Castilians, over whom he won a great victory at Tudela in 1335, took part in the war of the French against the English in 1337, and in 1343 assisted Alphonso XI. of Castile against the Moors. He died at Seville in Septem- ber of the same year. His son Gaston III. (1331-1391), surnamed on account of his beauty Phcebus, was tlie most famous of the old Foix family. He took part in the wars against the English in 1345, and was on that account ap- pointed by the king of France governor of Languedoc and Gascony. In 1346 he married Agnes of Navarre, but on account of a dispute with her brother Charles the Bad, he divorced her in 1373. On suspicion of being concerned in a conspiracy in conjunction with his brother-in-law he in 1356 suffered a short imprisonment in the Chatelet. After obtaining his release he took part in the wars against the heretics of Prussia, and on his return in 1358 he assisted 1; releasing the royal princesses from the hands of the Sa al ea In the same year he recommenced

e house of Armagnac, and took the count

of Armagnac prisoner at the battle of Launac in 1372. Tn 1380 he was again appointed governor of Languedoc by Charles V., but that king dying the same year the regency replaced the count of Foix by the duke of Berry. Gas. ton defeated and slew the duke, but was afterwards induced to resign his claims. In 1390 Gaston entertained Charles VI. in his castle of Mazeéres, and agreed for a sum of money to make him heir of his dominions. He died sud- denly of apoplexy the same year when returning from the chase. Shortly after his death Charles VI. ceded the estate of Foix to Matthew, great-great-grandson of Roger I. who died without issue in 1398. On his death his sister's husband Archambault de Grailly took possession of the estates, and in 1401 assumed the title. Dying in 1412 he was succeeded by his son Jean de Grailly, who became governor-general of

Languedoc, Auvergne, and Guienne, and, dying in 1436, was succeeded by his son Gaston IV., who took part in the wars of Charles VII. against the English, and was raised to the peerage of France. Gaston's father-in-law, Jean Il. of Navarre, de- clared him in 1455 his successor; and Louis XL conferred on him the seignory of Carcassonne and the countships of Roussillon and Cerdagne. In 1471 he joined in a league against Louis, which, however, was rendered abortive by the death of the king's brother. On the death of Gaston in 1472, the house of Foix became merged in that of Navarre.

FOIX, Gaston pr. See NEMOURS.

FOLX, Pau. pE (1528-1584), a French prelate and diplomatist, was born in 1528. He studied Greek and Roman literature at Paris, and jurisprudence at Toulouse, where shortly after finishing his curriculum, he delivered a course of lectures on civil law, which gained him great reputation. At the age of nineteen he was named councillor of the parlement of Paris. Having im this capacity expressed himself favourable to the adoption of mild measures in regard to certain persons accused of Lutheranism, he was arrested, but escaped punishment, and subsequently regained the favour of the French court. At the end of 1561 he was sent ambassador to England, where he remained four years, and in 1565 endeavoured 10 vain to persuade Elizabeth to consent to the surrender of Havre to the French. He was afterwards sent to negotiate a marriage between Elizabeth and the duke of Anjou. On account of his former toleration of the Lutherans, Fox only with difficulty escaped perishing in the Massacre of St Bartholomew in 1572 ; but having been sent in 1573 on an embassy to Italy, he was admitted to an audience of the pope, and succeeded in thoroughly establishing his reputa- tion for orthodoxy. In 1576 he was made archbishop of Toulouse. He was afterwards employed by the king of France on various important missions, and in 1579 was appointed ambassador to Rome, where he remained till his death in 1584.

Les Lettres de Messire de Paul de Foix, archevesque de Toloze et ambassadeur pour le roy aupres du pape Grégoire XUL, a oi

Henry III., were published in 1628, but there are some doubts 48 to their authenticity.

FOKSHAN, or FoxsHant, a town of Roumania, 38 situated 104 miles N.E. of Bucharest on the river Milkov, which forms the boundary line between Wallachia Moldavia—the larger portion of the tewn being Wallachia. It possesses a normal school, and is the seat of a prefecture and of a criminal and district court © justice. It has a considerable trade in corn with Galata, and is in the vicinity of the district which produces the best Moldavian wine. A congress between Russian FP Turkish diplomatists was held near the town in li the neighbourhood the Turks suffered a severe defeat from the Austrians and Russians in 1789. The population 1873 was 20,323.

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FOLARD, JeAN CHARLES DE (1669-1752), a French writer on military tactics, was born at Avignon, 13th February 1669. His military ardour was first awakened by reading Czesar's Commentaries, and became so strong that he twice made his escape from parental control, the second time being successful in obtaining the fulfilment of his wishes. When he joined the army he was only sixteen years of age, but the zeal with which he studied the scientific department of his profession soon brought him into uotice, and in 1702 he became aide-de-camp to the duke of Vendéme, who was then in command of the French forces in Italy. For his services with the duke's brother in Lombardy in 1705 Folard received the cross of St Louis, and in the same year he distinguished himself at the battle of Cassano, where he was severely wounded. In 1706 he defended Modena against Prince Eugene. He was dangerously wounded at the battle of Malplaquet, and a few months afterwards was taken prisoner by the Austrians. In 1711 he was appointed governor cf Bourbourg, and he afterwards entered the service of Charles XII. of Sweden, and accompanied him in the invasion of Norway; but after the death of Charles he returned to France, and served as colonel in the Spanish campaign of the duke of Berwick. On the conclusion of peace he applied himself with renewed diligence to the study of military tactics, and expounded lis views in the following works :—Nouvelles Découvertes sur la Guerre, 1724; Commentaires sur Polybe, 1727; aud Lonctions et Devoirs @un Officter de Cavalrie, 1733. The system of column formation advocated by Folard, and many of his other opinions, have met with nothing but ridicule from tacticians; but Frederick the Great, while condemning his general system of tactics, nevertheless published an

abridgment of his works, under the title of Lsprit du Chevalier Folard, 1761, in the preface to which he expressed a high opinion of the sagacity of Folard's criticism of certain French generals, strongly recommended inany of his tactical rules aud methods of defence, and admitted that even in his most visionary plans hints were to be found very valuable and suggestive. Folard died at Avignon in 1752.

a Mémoires pour servir & Vhistoire de la vie du Chevalier Folard,

FOLDVAR, or Duna Féupvdn (Danube Foldvar), a town of Hungary in the county of Tolna, on the right bank of the Danube, 48 miles south of Buda, 46° 48' N. lat., 18° 45' E. long., is situated partly on the crest and partly on the side of a hill. Among the principal build- Ings are a circuit judge's court, customs office, barracks, four churches, a Franciscan monastery, and a high school. Féldvar, on account of its position, is an important steam-packet station, and carries on a considerable trade in wood for building purposes by means of the Danube; it is moreover a depdt for salt, and has an extensive sturgeon fishery. The surrounding country is fertile both in corn and wine, and the inhabitants are much engaged in agri- cultural and commercial pursuits, fruit-growing, the manu- facture of pottery, and fishing. The town, which is a domain of the university of Pesth, had formerly strong fortifications, of which some remains still exist. In the revolution of 1848-49 Féldvar was considered an important strategical position, on account of its commanding the com- munications between the upper and lower Danube. In 1869 the population was 12,382.

1 FOLENGO, Trorito (1491-1544), otherwise known as lerlino Coccajo or Cocajo, one of the principal macaronic jae of the 16th century, was born of noble parentage at ipada near Mantua, November 8, 1491. From his infancy

e showed great vivacity of mind, and a remarkable clever- ness In making verses,

the monastery of Monte Casino near Brescia, and eighteen

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months afterwards he became a professed member of the Benedictine order. For a few years his life as a monk seems to have been tolerably regular, and he is said to have produced a considerable quantity of Latin verse, written, not unsuccessfully, in the Virgilian style. About the year 1516 he forsook the monastic life for the society of a well- born young woman named Girolama Dieda, with whom he wandered about the country for several years, often suffer- ing great poverty, having no other means of support than his talent for versification, His first publication was the Merlini Cocait Macaronicon, which relates the adventures of a fictitious hero named Baldus. The coarse buffoonery of this work is often relieved by touches of genuine poetry, as well as by graphic descriptions and acute criticisms of men and manners, Its macaronic style is rendered pecu- liarly perplexing to the foreigner by the frequent intro- duction of words and phrases from the Mantuan patois. Though frequently censured for its occasional grossness of idea and expression, it soon attained a wide popularity, and within a very few years passed through several editions. Folengo's next production was the Orlandino, an Italian poem of eight cantos, written in rhymed octaves. It appeared in 1526, aud bore on the title-page the new

pseudonym of Limerno Pitocco (Merlin the Beggar) da Mantova. In the same year, wearied with a life of dis- sipation, Folengo returned to his ecclesiastical obedience ; and shortly afterwards wrote his Chaos del tri per uno, in which, partly in prose, partly in verse, sometimes in Latin, sometimes in Italian, and sometimes in macaronic, he gives a veiled account of the vicissitudes of the life he had lived under his various names. We next find him about the year 1533 writing in rhymed octaves a life of Christ entitled L'Umanita del Figliuolo di Dio ; and he is known to have composed, still later, another religious poem upon the creation, fall, and restoration of man, besides a few tragedies. These, however, have never been published. Some of his later years were spent in Sicily under the patronage of Don Fernando de Gonzaga, the viceroy; he even appears for a short time to have had charge of a monastery there. In 1543 he retired to Santa Croce de Campesio, near Bassano; and there he died on the 9th of December in the following year. Among writers of macaronics Folengo undoubtedly holds a very high place ; nor has his title to the name of poet been disputed even by his most hostile critics. He is frequently quoted and still more frequently copied by that other Benedictine, his great French

contemporary, Rabelais. The earlier editions of his Opus Macaronicum are now extremely rare. The often reprinted edition of 1530 exhibits the text as revised by the author after he had begun to amend his life.

FOLEY, Joun Henry (1818-1874), sculptor, R.A., was born at Dublin, May 24, 1818. Through a distant relative, a sculptor in the city, his attention was early directed to the profession which was to occupy his life, and at thirteen he began to study drawing and modelling at the schools of the Royal Dublin Society, where he took several first-class prizes. In 1834 he proceeded to London, and in 1835 was admitted a student in the schools of the Royal Academy. He first appeared as an exhibitor in 1839 with his Death of Abel and Innocence. Jno and Bacchus, exhibited in 1840, gave him inimediate reputation, and the work itself was afterwards conimissioned to be done in marble for the earl of Ellesmere. Conceived entirely with- out classical or other affectation, this work has the charm of rare simplicity and grace. Lear and Cordelia and Death | of Lear were exhibited in 1841, Venus rescuing Aiueas and The Houseless Wanderer in 1842, Prospero and Mir-

At the age of sixteen he entered.

| anda in 1843. In 1844 Foley sent to the exhibition at . Westininster Hall his Youth at a Stream, aud was, with

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Calder Marshall and John Bell, chosen by the commissioners tv do work in sculpture for the decoration of the Houses of Parliament. Statues of John Hampden and Selden were executed for this purpose, and received liberal praise fur the propriety, dignity, and proportion of their treat- nent. Commissions of all kinds now began to come rapidly, aud without going out of his way to seek it, Foley had from

this time until his death work sufficient to occupy not only | the whole of his own time, but also that of the numerous |

assistants and pupils whom he trained. Fanciful works,

busts, bas-reliefs, tablets, and monumental statues were in |

great numbers undertaken and executed by him with that steady equality of worthy treatment which is perhaps the uext best thing to the inspiration of great genius.

Academy; but although until his death his name remained on the list of Royal Academicians, he, after 1861, owing, it is said to some misunderstanding with the hanging committee of that year, ceased not only to exhibit but also to hold any communication with the body of which he was a member. Among his numerous works the following may be noticed, besides those mentioned above :—-The Mother ; Egeria, for the Mansion House; The Elder Brother in Comus, his diploma work; The Muse of Painting, the monument of James Ward, R. A.; Caractacus, for the Mansion House; Helen Faucit (Mrs Theodore Martin) ; Goldsmith and Burke, for Trinity College, Dublin ; Fara- day; Reynolds; Barry, for Westminster Palace Yard; John Stuart Mill, for the Thames embankment ; O'Connell and Gough, for Dublin; Clyde, for Glasgow; Clive, for Shrewsbury ; Hardinge, Canning, and Outram, for Cal- cutta; Hon. James Stewart, for Ceylon; the symbolical group Asia, as well as the statue of the prince himself, for

the Albert Memorial in Hyde Park; and Stonewall Jack-

son, for South Carolina. The statue of Outram is probably his masterpiece, and certainly displays more imaginative fire than any other of his works, while well exhibiting that perfect sanity of conception as well as that full mastery of the means of his art by which all his works are char- acterized. Foley's early fanciful works have some charming qualities; but he will probably be always best remembered for the workman-like and manly style of his monumental portraits. His life was entirely devoted to his art, and he seems to have addressed himself to it with all the work- day docility of a craftsman, and at the same time with strong feelings of duty and responsibility. Of great modesty, and rather reserved in manner, he was open to all that influences a refined nature; in poetry and music he was not only a student and admirer, but a composer and performer. He died at Hampstead of a pleuritic effusion after a short illness, preceded by a long indisposition, August 27, 1874, and was on the 4th of September buried in

St Paul's Cathedral. He left his models to the Royal Dublin Society, his early school, while a great part a = property goes eventually to the Artists' Benevolent und.

FOLIGNO, or Futieno (ancient Fulgintum), a town in the Italian province of Perugia, is situated in a beautiful and fertile valley on the Topino, 20 miles S.E. of Perugia by railway. It is an active and industrious town, its manufactures being chiefly woollen fabrics, silk, paper, wax-candles, and soap. Its principal buildings are the cathedral, the Palazzo del Governo, the Palazzo Comunale, the theatre, and the churches of S. Anna and S. Niccolé, both of which contain some fine paintings. Foligno was

the seat of a school of painting, the most distinguished |

master of which is Niccold Alunno, to whom a monument was erected there in 1872. Foligno is the Umbrian Fulginium, and afterwards became a Roman municipality. In the Middle Ages it was known as Fulignum, and for

In 1849 | he was made an associate and 1858 a member of the Royal |

to it was a monastery for Benedictine mouks,

| against him. in the course of which he found opportunity of consulting

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a long time retained its indepeudence, bunt in 128] it was destroyed by the Perugiaus. After it was rebuilt it was ruled by the Trincifamily until 1439, when it was united to the States of the Church. In 1832 it was much damaged by an earthquake, and it suffered from tlie same cause, but less severely, in 1839, 1853, and 1854. The population in 1871 was 8471.

FOLKES, Martin (1690-1754), an eminent English antiquary, was born at London, October 29, 1690. At the age of seventeen he entered at Clare College, Cambridge, where he distinguished himself so much in mathematics that when only twenty-three years of age he was chosen a fellow of the Royal Society. He was elected one of the council in 1716, and

in 1723 Sir Isaac Newton, president of the society, appointed him one of the vice-presidents,

On the death of Newton he became a candidate for the

presidency, but the higher standing and superior influence of the other candidate, Sir Hans Sloane, carried the election In 1733 he set out on a tour through Italy,

the best furnished cabinets of that country, and composed his admirable " Dissertations on the Weights and Values of Ancient Coins," which he read before the Society of Antiquarics. Before the same society he read in 1736 his "Observations on the Trajan and Antonine Pillars at Rome," and also communicated his "' Table of English Gold Coins from the 18th year of King Edward IIJ., when gold was first coined in England, to the present time, with their Weights and Intrinsic Values." In 1745 he printed this work along with another on the history of silver coinage. He also contributed both to the Society of Antiquaries aud to the Royal Society various other papers, chiefly on Roman antiquities, which were published in their transactions. In 1741 he succeeded Sir Hans Sloane as president of the

| Royal Society; in the following year he was made a

member of the French Academy; and in 1746 was honoured with the degree of LL.D. from Cambridge and Oxford. He died in 1754.

FOLKESTONE, or FoixsTonz, a municipal borough, seaport, and market-town of England, county of Kent, is situated on the London and South-Eastern Railway, 7 miles W.S.W. of Dover. It is very irregularly built, part of it lying in a hollow between the chalk and greensanil hills, and other portions on the hills. Folkestone is much frequented in summer for sea-bathing, and steam packets ply daily between the town and Boulogne. Many of the inhabitants are engaged in the fisheries, and there is also 2 considerable shipping trade. The pier-harbour is 19 acres in extent, and admits vessels of 150 tons burden. In 1861 a low-water landing-pier was erected, which enables passengers to land from the steamers at all states of the tide. The coast is defended by three martello towers, and a battery situated on the heights protects the town. Dung 1877 the number of vessels

that entered the port was 889, with a tonnage of 154,897, and 854 cleared, with a tonnage of 153,208. Of these the number engaged in trade with foreign countries was—entered 46, with a tonmag® of 9333; cleared 148, with a tonnage of 22,452. Among the public buildings may be mentioned the free grammar school, the harbour-house, the town-hall and market-housé, and the parish church, a cruciform structure in the early Gothic style, with a tower rising from the inte It has recently been enlarged and restored. The oe church of St Eanswitha was built in 1095, and attache but the of both

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devastations of the sea compelled the removal to the cliff on which the church now stands. monastery was destroyed at the dissolution of rel

houses in 1535, Ata very early period Folkestone Wa J

place of some importance, and Roman remains have bec#

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found near it. It was one of the manors attached to the Saxon crown, and it was granted by William the Conqueror to his knight William d'Avranches, who built a Norman stronghold near the site of the old castle founded by Eadbald, king of Kent, about 630. The cliff on which these stood has been almost wholly swept away by the encroachments of the sea. In the time of Queen Elizabeth Folkestone contained only 120 houses, and it was a mere fishing village until the formation of a harbour in 1809. The opening of the railway in 1844, and the establishment of the steam packet service with Boulogne lent additional impulse to the town, and for some years it has been rapidly increasing. Harvey, the discoverer of the circulation of the blood, was born there in 1578. Folkestone unites with Hythe in returning a member to parliameut. 'The popula- tiou in 1871 was 12,694.

FOLK-LAND, or Fotc-Lanp, in early English law was the land belonging to the community at large—the ager publicus—as distinguished from 4oc-land, or land granted to individuals in private ownership. The conception of the land as primarily belonging to the nation or tribe appears to be universal in early civilization. As civiliza- tion advances the rights of

individuals emerge and increase in importance until, as in England at the present day, the original conception has entirely disappeared. The process by which it was lost may be shortly stated as follows. (1) Grants of land were made to individuals and to religious corporations (boc-land), subject only to the trinoda necessitas (military service, and building bridges and fortresses). The king might hold land so granted. (2) Temporary rights over the folk-land were also granted to individuals, subject to various rent services or money payments. (3) The

remaining portion of the folk-land not disposed of in this |

way came to be regarded as belonging to the king. Ulti- mately all land was said to be held of the king. Even where traces of the original conception remained in the rights of commoners the natural order was reversed, and they were regarded as deriving their right from the grant of some individuil lord. While the folk-land became the terra regis, the private property of the king in land merged i the folk-land, and the king of England for many cent- unes occupied the anomalous position of being ultimate owner of all the land, and sole owner of the old folk-land, and yet, at the same time, incapable of holding land in Private owners'ip. If a king purchased land with any private moneys of his own, it devolved upon his successor In office like the rest of the crown lands. All this, how- ever, has now been changed. The crown lands have become public lands again, and the management of these is vested in the Commissioners of Woods, Forests, and Land Revenues; and the private estates of the sovereign are now held on the same conditions as those of ordinary persons.

FOLK-LORE — This word, formed in imitation of such German compounds as "Volksepos," "Volksfest," " Volks- lied," has recently become current in the English language! aS @ convenient though somewhat vague general heading under which to arrange all that has been observed or recorded of the traditions current among the 'common people" of different countries, civilized or uncivilized, whether in rncient, medieval, or modern times. Each nation and each locality has, of course, a " folk-lore" as it has a language; qe is obvious that to set forth any given folk-lore, with i Stratifications, in a comprehensive and orderly way, one age be equivalent

to exhibiting fully the past done a Intellectual, moral, religious, and social condi-

© people to whom it belonged. An exhaustive

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(: ae Suggested by Mr Thoms in the Atheneum of 1846 : equivalent does not actually occur in German.

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account of the folk-lores of the world would be equivalent to a complete history of the thoughts of mankind.

The eccentricities of traditionary story and traditionary practice have always been found a more or less interesting and amusing study by the contemplative observer of human nature; and almost all travellers and historians, from Herodotus downwards, have occasionally condescended to add something to the general collection of curiosities in that department. But to make a thorough investigation of the "vulgar antiquities" of any country, and especially of one's own, was, until very recently, regarded as childish and use- less. An exception, indeed, was made in favour of the folk-lores of ancient Greece and Rome, as being intrinsically beautiful and exceptionally instructive. But the very fact that these had been beautified by artistic treatment impaired their usefulness from the purely antiquarian point of view; and in any case the floating traditions of Attica and Latium were too few, too fragmentary, aud gathered from too narrow an area to furnish adequate data for the anthropologist and the sociologist. Here, asin so many other instances, it was necessary that men should greatly extend the area of their investigations before they could rightly understand that which alone they were curious to know.

It was in Germany that the study of folk-lore first entered upon its scientific stage. One of the earliest symptoms of the awakening of a wider and more sympathetic interest in the various products of a nation's mind, its legends and its tales, its manners and its customs, its. laws, government, religion, and daily life, was the appearance in 1778-9 of Herder's celebrated

collection of popular songs. But the new day was fairly usliered in by tle successive publications of the brothers Grimm, more particularly of the Kinder- und Haus-Mdhrchen in 1812, and of the Deutsche Mythologie in 1835. The latter work, which was closely dependent on the former, showed for the first time what results may be hoped for by an intelligent investigator, if only, laying aside all prejudice, he will put himself to the trouble of collecting largely and widely, and of interpreting faithfully and ration- ally, a nation's oral traditions and unwritten customs. It was seen that, although many relics of the past had been irrecoverably lost, enough had been preserved to furnish conclusive proof of the oneness in faith as well as in speech of the Teutonic race, and also to give indications, in many instances, of the precise points at which the divergences had occurred. This new knowledge, derived to a large extent from the skilful use of folk-lore "collected from the mouths of old women in the spinning-rooms of German villages," acquired an altogether peculiar interest and importance from the other discovery by which the philological labours of Bopp and others had been crowned, —the discovery, namely, of the original unity of all the Aryan races, and the demou- stration of the fact that the Teutons themselves were but one branch of a greater family, including Hindus and Celts, which had at one time inhabited the central plain of Asia, and before dispersing eastward and westward, had de- veloped an ineffaceably characteristic speech, civilization, and religion. The identification verbally of Dyaus, Zeus, Jo(vi)s, Tiw, Zio, and Tyr was followed, as investigation proceeded, by the identification really of many of the strange forms in which religious sentiment had found ex- pression ; and comparative mythology became an inseparable companion of comparative philology. (See MyrHotocy and PurLotocy.) It was thenceforward obvious that every inythology, in the Aryan family at least, however puerile or absurd it might at first sight appear, was a fit subject for scientific investigation, and capable of yielding scientific results. The problem in each case was to trace the nursery tale to the legend, and the legend to the myth, and the myth to its earliest germ, and as far as possible to indicate the foreign interpolations when they occurred, and account

for the local accretions. In this way the history of a story, like the history of a word, was frequently found to be more interesting and more instructive than the history of a cam- paign. Once this had been realized, the new field of folk-lore found many skilled labourers; and the quantity of material available for examination and classification rapidly increased. Each fresh comparison made it increasingly plain that in groundwork and plot the stories current among the Indo- European peoples were substantially identical. The reader of the fables of La Fontaine found nothing essentially and absolutely strange in the Pankatantra or Hitopadesa ; the Indian ayah was discovered to have unmistakably the same stock of stories as the German, Norwegian, or Celtic nurse. In a few cases, indeed, it could be shown that the wide dif- fusion of some particular fable was attributable to migra- tions which had taken place within the historic period ;' and in other cases it could hardly be doubted that certain very remarkable coincidences were still mere coincidences and nothing more ;? but in a great majority of instances, it was plain that the notion of borrowing or copying having occurred was inadmissible, and that nothing could account for their constant similarity except the theory of a common origin. They were " primitive or organic legends, represent- ing one common ancient stratum of language and thought reaching from India to Europe ;" the others were secondary or inorganic, consisting of "boulders of various strata carried along by natural and artificial means from one country to another."

The aboriginal Aryan legends may be arranged under one or other of two categories, the myth or the fable. That primitive fables actually exist, stories expressly invented for a moral or didactic purpose, seems a well-established fact. The fable of the King and the Bee, for example, crops up alike in India, in Greece, and in Norway, in forms that cannot be accounted for by direct oral or literary transmis- sion ; and it would seem that the story of tle Master-Thief (apxyés dyAnréwv) which is to be met with in the Hitopadesa, in Herodotus, in the Zales of the Alhambra, and which is current in Norway and also in the Westcrn Highlands of Scotland, must probably also be regarded as embodying at least a fable-germ.® The organic fables, however, are not so numerous as the organic myths,—those stories, that is to say, which, whether based on mistaken metaphor or distorted history, are at least the product of the unconscious play of fancy.*

The same characters and the same incidents constantly recur under innumerable names and shapes. "The story of the heroes of Teutonic and Hindu folk-lore, the stories of Boots and Cinderella, of Logedas Rajah and Surya Bai, are the story also of Achilleus and Oidipous, of Perseus and Theseus, of Helen and Odysseus, of Baldur, and Rustem, and Sigurd. Everywhere there is the search for the bright maiden who has been stolen away, every- where the long struggle to recover her. The war of Ilion has been fought out in every Aryan land " (Cox). What we are accustomed to associate with the name of William Tell is told of many archers under other names, in England

1 See Max Miiller's paper "On the Migration of Fables," in the Contemporary Review for 1870, republished, with additions, in Chips from a German Workshop, vol. iv.

? The Hottentots, for example, have a version of the "' vestigia nulla retrorsum" fable, and a number of traces of the stories of Renard the Fox. The Zulus also have tales resembling that of Jack the Giant- Killer. See Max Miiller, Chips, ii. 212; iv. 156. So with the large

family of stories which turn on the idea of gods wandering on earth in the likeness of men.

E Max Miiller, Chips, ii. 245. co Chips, ii. 232; iv. 153. Sir George W. Cox also ae at the legend of "The Carter, the Dog, and the Sparrow " uid never have found its way into the nurseries of German peasants

if written by Grimm himself in imitati tati f 7 (Mythology of the Aryan Races, i. 124-199, 167). sia clini

. > Cox, Mythology of the Aryan Races, i. 124 seq.

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(William of Cloudsle), Germany, Denmark, Norway, Iceland, and Lapland ; ° the same story of the young hero dying in the fulness of youth is told of

Baldur and Isfendiyar, Sifrit, and Achilles. The stories vary widely under the influence of climate, religion, and civilization, and yet remain sub. stantially the same. The sun-myth, when transferred from southern to northern latitudes, cannot but undergo some change of shape; the dramatis persone are as various in each fable as the fauna and flora of the regions in which it is told. Odin, when no longer recognized as a deity

. ; : ' becomes simply the wild huntsman or Hellequin; when civilization makes even such a being no longer credible, he still survives possibly as Harlequin or Robin Hood,

Hitherto the systematic study of comparative folk-lore has been almost exclusively confined within Aryan limits, But the successful application of scientific method in that field has encouraged many labourers in other regions, and an amount of material is being accumulated which may be expected ultimately to yield very important results in ethnology and anthropology. So far as the savage tribes of the world are concerned, it would seem that the greater proportion of trustworthy data is to be derived from that department of their " folk-lore" which manifests itself in traditionary practices; but in no case, indeed, can the com- parative mythologist afford to overlook the qualifying or corroborative evidence supplied by what may be called comparative "ethology." Every custom has an instructive history if we can but succeed in interpreting its lore, In ascertaining when, where, and how any given tribe came first to worship plants, or animals, or ghosts, we get de- finitely nearer the solution of the fundamental problem of anthropology, Even the modern usages of social and domestic life, the observances that accompany such incidents as marriage, birth, and death, when skilfully read, are cap- able of telling us something at least of the condition of pri- mitive man. See ANTHROPOLOGY, ANIMISM, DEMONOLOGY, Fire, FUNERAL RITES, MARRIAGE, &c.

Literature.—The oldest professed collections of English folk-lore are those of Aubrey (Miscellanies, 1686, and frequently reprinted), and Bourne (Antiquitates Vulgares, 1725), The latter was meor- porated by Brand in his Observations on Popular Antiquities, 1777, republished by Sir Henry Ellis in 1813, and again in 1841. The Every-Day Book of Hone appeared in

1826, and The Year Book in 1829. Among the more recent publications of a similar class may be mentioned the Book – Days, and Popular Rhymes of Scot- land, by Chambers. Max Miiller's Essay on Comparative Mytho- logy was first published in 1856; Dasent's Tales from the Norse, with an introduction, in 1859; Campbell's Popular Tales of the West Highlands in 1861; Kelly's Curiosities of Indo-European Tradition and Folk-Lore in 1863; see also Hardwick's Traditions, Superstitions, and Folk-Lore (1872); and Folk-Lore of the Northern Counties of England and the Borders, by W. Henderson, with an appendix on Household Stories, by S. Baring-Gould (1876). As for Germany, since the publication of the Kinder- wu. Hausméihrchen (1812), and of the Deutsche Mythologie (1835), "the myths, the legends, the nursery-tales, the songs, proverbs, and popular customs of the Scandinavo-Germanic race have had a whole host of faithful expounders and affectionate illustrators, who have scarcely left @ single foot unexplored of that vast and interesting field of tradition (De Gubernatis). Special reference may be made to the Deutsche Mythologie, by Mannhardt, and to the Zeitschrift fir Deutsche Mythologie wnd Sittenkunde, edited by Mannhardt and W olf (1853-1859). The collection of Norse popular tales by Asbjornsel and Moe (1842-3) has for the most part been translated by Dr Dasent (as above). Castrén has given an account of the mytho- logy of Finland (Finnische Mythologie, edited by Schiefner) j Kreuzwald of the popular tales of Esthonia (Zhstnische Mahrchen, 1869); and Afanassieff of the folk-lore of Russia. The i mythology has been specially treated by Popoff, Kaisaroff, Ua Hanusch ; while Osinski and Grohmann have dealt respectively wit q the folk literatures of Poland and Bohemia. Hahn has We a collection of Griechische u, Albanesisehe Mahrchen (1864), _ introduction to which he gives forty "' story-roots " (Marchen- un F Sagformeln) ; and something has been done for the. folk-lore & Rome hy R. H. Busk (1874). For Spain reference may be made to

6 But also, it ought to be added, among Turks, Mongolians, antl Samoyedes, —in other words, beyond the Aryan territory.

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: ittany to Villemarqué; for Iceland to fl ae ane others ; for Teed tales to Rink. Radloff has dealt with the folk literature of the Turkish races of south Siberia ; and a volume of Kalmuek and Mongolian Tradi- tionary Tales was published in 1873. For Corea, see Dallet (Eglise de la Corée, 1874); for China, the works of Doolittle and Dennys; for Dardistan, Leitner ; and for Southern Africa, the Zulu Nursery Tales, by Rev. Henry Callaway, M.D. (1866), and the Hottentot Fables and Tales of Dr Bleek (1864). For American folk-lore, see Brinton's Myths of the New World, and Bancroft's Races of the Pa- eifie. The works of Sir John Lubbock, and Messrs Herbert Spencer, Tylor, M'Lennan, and Morgan deal largely with the folk-lore of various savage tribes. As bearing upon the gencral subject of com- parative mythology, see the works of Kuhn, especially his Herab- kunft des Feuers und des Gottertranks (1859) ; Bastian (Der Mensch in der Geschichte); Roth (Ueber den Mythus von den fiinf Mensehen- geschlechtern); Max Miller (Leetures on Seience of Lan guage, 2d series, and Chips from a German Workshop, vol. ii.); M. Michel Bréal (Hereule et Caeus, Etude de mythologie comparée, and Le Mythe @ Gidipe); Husson (La Chaine Traditionelle, Contes et Légendes au point de vue Mythique, 1874); Fiske (Myths and Myth-makers, 1873); and Gubernatis (Zoologieal Mythology, 1872). (J. S. BL.)

FOLLEN, Aveust (or, as he afterwards called himself, Apour) Lupwic (1794-1855), a German poet, was born at Giessen in Hesse-Cassel, January 21,1794. He studied theology at Giessen and law at Heidelberg, and after leaving college edited the Lberfeld Allgemeine Zeitung. For connexion, real or supposed, with some radical plots, he was imprisoned for two years at Berlin. When released in 1821 he went to Switzerland, where he taught in the canton school at Aarau, farmed from 1847 to 1854 the estate of Liebenfels in Thurgau, and then retired to Bern, where he lived till his death (26th December 1855). Besides 2 number of minor poems he wrote Harfengriisse aus Deutschland and der Schweiz (1823), and Malegys und Vivian (1829), a knightly romance after the fashion of the romantic school, edited parts of Tristan und Isolde and the Mebelungentied, translated the Homeric Hymns in com- pany with R. Schwenck (Giessen, 1814), Tasso's Jerusalem Delivered (1818), and a collection of Latin hymns and sacred poetry (Elberfeld, 1819). In 1846 he published a brief collection of sonnets entitled An die Gottlosen Nichts-Wiithericlie. This was aimed at

Ruge, and was the occasion of a literary duel between the two authors. Follen's posthumous poem Zristan's Aeltern (Giessen, 1857) may also be mentioned, but his best-known work is a well- executed collection of German poetry entitled Bildersaal Deutscher Dichtung (2 vols., 1827).

_ FOLLEN, Cuarues (1796-1840) brother of the preced- lng, was born at Romrod, in Hesse-Darmstadt, September 4, 1796. He studied theology and law at Geissen, where he acted for some time as privatdocent. His liberal senti- ments and writings, and the part he took in the defence of popular rights, made him obnoxious to the Government of his own province. He accordingly went to Jena to lecture there, but the assassination of Kotzebue by Sand happened almost immediately after his arrival, and the Government believed or affected to believe that Follen was an accomplice. The inquiries that were made conclusively proved his innocence, but notwithstanding this he found ay to remove to Switzerland, where he taught in © cantonal school of the Grisons at Chur, and at the University of Basel. Whilst thus engaged the Prussian overnuent demanded his surrender as a political prisoner. Re a Government of Basel refused, but the third < Ht "wi SO peremptory that they were unwillingly ge! e comply, when Follen saved himself by a Fi Teed se In the beginning of 1825 he arrived in in bin pats was employed for the next ten years ieee g _ pain history, ethics, and the German aoe = ae . iterature at Harvard College. He then a nt arian clergyman at New York and East oa… € perished, along with 175 fellow-travellers, urning of the steamship "Lexington," in Long

Island Sound, January 13, 1840. Follen was the author of several very celebrated and popular songs written in the interests of liberty. The best is perhaps the Bundeslied, beginning " Brause du Freiheitssang." It is certainly one of the most spirited odes in modern German lyric poetry. Whilst in America Follen wrote a Gernian grammar and reader. His wife Eliza Lee (1787-1860), an American authoress of some reputation, published after his death his lectures and sermons, with a biography written by herself (5 vols., Boston, 1841).

FOLLETT, Sir Wittiam Wess (1798-1845), attorney- general of England, was born at Topsham in Devonshire, December 2, 1798. He was the son of

Captain Benjamin Follett, who had retired from the army in 1790, and engaged in business at Topsham. His mother was an Trish lady of Kinsale. The early indications which he gave of superior abilities induced his father to bring him up for the bar. He received his early education at Exeter grammar-school, of which Dr Lempriere, author of the well-known Classical Dictionary, was then head-master. After a short course of study under a private tutor, he entered, in 1814, Trinity College, Cambridge, and two years later the Inner Temple. In 1818 he took his degree of B.A. without academical honours, and the same year settled in London, becoming a pupil of Godfrey Sykes and Robert Bayley, two of the most eminent special pleaders of the day. He began to practise as a pleader below the bar in 182], was called to the bar in 1824, and joined the western circuit in 1825. At the very outset his great qualifications were universally recognized, and his rapid rise was assured, He was thoroughly master of his profession, having devoted himself to it with exclusive zeal; and with remarkable quickness of perception he combined a solidity and ripeness of judgment such as are rarely seen in one so young. 'Tlie statements current soon after his death as to the frequent interruption of lis studies by ill health are emphatically contradicted by Lord Brougham. His rapid and continuous success was owing not only to his unques- tionable superiority, but to his singular courtesy, kindness, and sweetness of temper. In 1830 he married the eldest daughter of Sir Ambrose Harding Gifford, chief justice of Ceylon. His reputation in Westminster Hall being solidly established, he sought in 1832 an entrance into parliament, and offered himself as candidate for the city of Exeter on tlie Conservative side. On this occasion he failed ; but in 1835 he was returned for the same city at the head of the poll. In parliament he early succeeded in gaining the ear of the house, and. attained a position of high distinction. Under the first administration of Sir Robert Peel, Follett was appointed solicitor-general (November 1834), but resigned with the ministry in April 1835. In the course of this year he was knighted. On the return of Peel to power in 184] Sir William was again appointed solicitor-general, and in April 1844 he succeeded Sir Frederick Pollock as attorney-general. But his health, which had begun to fail him in 1838, and had been permanently injured by a severe illness in 1841, now broke down, and he was compelled to relinquish practice and to visit the south of Europe. He returned to England in March 1845; but the disease, consumption, reasserted itself, and he died in London on the 28th of June follow- ing. His

death was mourned as a loss not only to the profession but to his country, and the public esteem for his character was marked by the attendance at his funeral in the Temple Church of many distinguished persons,—the lord chancellor, the first lord of the treasury, and the chief justice of the common pleas being among the pall-bearers. A noble statue of Follett, execnted by Behnes, was erected by subscription in St Paul's cathedral. (See Brougham's notice of Follett, Works, vol. iv.)

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FONBLANQUE, Atpaxy Winttam (1793-1872), was descended from a noble French Huguenot family, the Greniers of Languedoc. The titles of Comte de Hautserre et de Fonblanque were conferred by Henry IV. on the sons of the famous Sieur Pierre de Grenier, known in history by his gallant defence of the castle of Cessenan against the Duc de Montmorenci in 1584. After the revocation of the edict of Nantes, the Greniers underwent severe persecutions on account of their devotion to tlie Huguenot cause ; and in 1740, Abel de Grenier, Comte de Fonblanque, sent his two sons, Antoine and Jean, to England that they might be educated in the Protestant faith. John became nationalized in this country under the name of Fonblanque; and his son, John Samuel Martin Fonblanque, a distinguished equity lawyer, and the

author of a standard legal work, a Treatise on Hquity, | | Charles Dickens, &c., names which do not belong exclu-

became the father of the most brilliant journalist of his day. The father of Albany Fonblanque was, like his son, a staunch Liberal; he represented the borough of Camel- ford in parliament; and throughout his career was remarkable for the integrity and courage, as well as for the ability, with which he supported Liberal principles.

The subject of the present notice was born in London in 1793. At fourteen he was sent to Woolwich to prepare for the Royal Engineers. His health, however, failed, and for two years his studies had to be suspended. Upon his recovery, he studied for some time with Chitty, the eminent special pleader, with a view to being called to the bar. Fonblanque had no inclination for law, but he valued very highly the course of training he thus

obtained, and in after life maintained that a study of law should be included in a liberal education, At the age of nineteen (1812) he commenced writing for the newspapers, and

very soon attracted notice both by the bolduess and |

Hberality of his opinions, and by the brilliance of his style. Fonblanque's manner of working miglit have lent some colour to the definition of genius as an infinite capacity for taking trouble. His nephew, Mr Edward Fonblanque, to whose biography we are indebted for the details given in this notice, tells us that in his earlier days he frequently wrote an article ten times before sending it to press, and this not from timidity or anxiety, for from the first his popularity was assured, but because his own ideal of political thought and composition was infinitely higher than that of the public.

As a result of this arduous and earnest cultivation he soon obtained sufficient popularity as a journalist to be able to renounce all idea of following law as a profession ; but at the same time that he was eagerly taking his share in all the political struggles of this eventful period, he was also continuing his studies, devoting no less than six hours a day to the study of classics and political philosophy. Under this severe mental training his health once more broke down. At the age of twenty-one he had a long and dangerous illness, and continued weak and subject to nervous depression for the remainder of his life. His energy, however, was not impaired. He became a regular contributor to the newspapers and reviews, realizing a fair income, which, as his habits were simple and temperate, secured him against pecuniary anxieties. From 1820 to 1830 Albany Fonblanque was successively employed upon the staff of the Zvmes and the Morning Chronicle, whilst he contributed to the Hxaminer, to the London Magazine, and to the Westminster Review. In 1828 the Hxaminer newspaper, which had been purchased by the Rev. Dr Fellowes, the learned and amiable author of the Religion of the Universe, &c., was given over to Fonblanque's complete —_—- and for a period of seventeen years (1830 to 1847) 16 not only sustained the high character for political in- dependence and literary ability which the Zwvaminer had

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gained under the direction of Leigh Hunt and his brother Jolin Hunt, but even compelled his political opponents to acknowledge a certain delight in the boldness and bright- ness of the wit directed against themselves. When it was proposed that the admirers and supporters of the paper should favilitate a reduction in its price by the payment of their subscription ten years in advance, not only did Mr Edward Bulwer (Lord Lytton) volunteer his aid, but also Mr Disraeli and Mr Clay, M.P., who were thus voluntarily prolonging the reign and spreading the in- fluence of the representative Radical organ. But the Examiner under the direction of Fonblanque did not con- fine itself to the sphere of politics ; the fine arts, literature, and the drama occupied a due share of its attention, Amongst its contributors were such men as Thackeray, Marmion Savage, John Stuart Mill, Walter Savage Landor,

sively to any political party, but which, associated in the work of criticism, give firm assurance that the " discovery of the best that is known and thought in the world" (Mr Arnold's admirable definition of the true function of literary criticism) was for once at any rate in competent and impartial hands. During his connexion with the Examiner, Fonblanque had many advantageous offers of further literary employment ; but he devoted his energies and talents almost exclusively to tlie service of the paper lie had resolved to make a standard of literary excellence in the world of journalism. Whatever he wrote was as carefully prepared and revised as when he was only an aspirant to fame; every reference made and every anecdote used as an illustration he was careful to verify, and in Mr E. Fonblanque's biography of his distinguished relative are given several racy answers he received from Count d'Orsay and others, concerning some witty story or saying which had taken his fancy, but which he was too scrupulous to repeat from memory. Fonblanque was offered the governor- ship of Nova Scotia; but although he took great interest in colonial matters, and had used every effort to advocate the more generous political system which had colonial self-government for its goal, he decided not to abandon his beloved Examiner even for so sympathetic an employ- ment. In 1847, however, domestic reasons induced him to accept the post of Statistical Secretary of the Board of Trade. This of course compelled him to resign the editorship of the Examiner, but he still continued to con- tribute largely to the paper, which, under the control of John Forster, continued to sustain its influential

position. During the later years of his life, Fonblanque took no prominent part in public affairs; and when he died at the age of seventy-nine (1872) he seemed, as his nephew rightly observes, 'a man who had lived and toiled in an age gone by and in a cause long since established." The present generation, in the full enjoyment of those reforms he had laboured so bravely and unweariedly to promote, found it difficult to realize how much had been effected by Liberals of the stamp of Albany Fonblanque, in days not so remote from our own after all, before the passing of the Reform Act, when, to quote his own words—" The Test Acts were unrepealed ; the Catholics were excluded from the legislature ; slavery existed in our colonies ; the prestige of the perfection of the law was unbroken, and the sanguinary character of the criminal code unmitigated; the corporations were sinks of corruption ; a few individuals nominated nearly half the members of the House © Commons; and a parliamentary reformer was in common acceptation another word for a visionary." a The character of Albany Fonblanque's political activity may be judged of by a study of his England under Seven Administrations, in comparison with the course of soca and political events in England from 1826 to

1837."

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Although these volumes contain only articles reprinted fron the Examiner, they give a vivid and spirited history of one of the most important and stormy phases of Parlia- mentary Reform. Fonblanque, although an ardent up- holder of popular rights and an uncompromising opponent of bigotry and oppression, will never be found upon thie side of violence or licence. The Chartists received from no source more complete condemnation than from the Examiner, which consistently advocated the principle that moral force was in cvery case to be relied upon, and that the liberties of the constitution were to be enlarged by means which were also constitutional, "In describing Lord Durham's politics,' says Mr Edward Fonblanque, "he unconsciously depicted himself, He was not a reformer of the repablican class, but he occupied as it were the frontier line of constitutional reform." In a word, Fon- blanque was an honourable exaniple of the constitutional Radical who follows after liberty, but uses the pathway of the law. Asa

journalist, lie must also be regarded in the light ofa reformer. Journalism beforc his day was regarded as a somewhat discreditable profession; men of truc culture were shy of entering the hot and dusty arena lest they should be confounded with the ruder combatauts who fought there before the public for hire. But the fact that Fonblanque, a man not only of strong and earnest political convictions but also of exceptional literary ability, did not hesitate to choose this field as a worthy one in which both a politician and a man of letters might usefully as well as honourably put forth his best gifts, must have helped, in no small degree, to correct the old prejudice.

Life and Labours of Albany Fonblanque, edited by his nephew, Edward Barrington de Fonblanque, 1874; England under Seven Administrations, by Albany Fonblanque, 1837. (J. MA.)

FOND DU LAC, a city of the United States, capital of Fond du Lac county, Wisconsin, is beautifully situated on a rising ground at the southern end of Lake Winnebago, 63 miles N.W. of Milwaukee. Railways radiate from it in various directions, and its situation on Winnebago lake gives it access to a wide district of inland navigation. It has a considerable shipping trade in wood, hay, and cattle, and possesses a large tannery, foundries, sawmills, cigar factories, carriage and waggon factories, and a railway- car factory. The water supply is obtained chiefly from Artesian wells, which vary in depth from 90 tu 180 feet. The population in 1860 was 5400, and in 1870, 12,764.

FONDI, the ancient Fundi, a town of Italy in the Province of Caserta, about 11 miles N.W. of Gaeta. Its principal street lies along the Appian way, and portions of its old polygonal or Cyclopcan walls are still in good pre-servation. 'The castle, now in a sadly dilapidated condi- tion, is of interest for its connexion with the Colonna family, and the Dominican convent contains a chapel which was occupied as a cell by Thomas Aquinas, and an orange-tree said to have been planted by the saint. The church of Santa Maria is a building in the Italian Gothic style, much disfigured in the interior. Between the town and the sea lies the Lago de Fondi or Lacus Amyclanus, in the inidst of a marshy tract which has recently been greatly ditninished by draining ; and near this is a cave, where, according to Tacitus, Sejanus saved the life of Tiberius. The district was in ancient times

famous for its wine, in- cluding the Ager Cxecubus, which gave its name to the Ceecuban of the Latin poets. Population in 1871, 6632.

undi was probably at first a Volscian town. Its citizens were Pane 190 B.¢. with full Roman citizenship, and enrolled in a nhitan tribe, Under Augustus it received a colony of veter-

s. In the time of the barbarian invasions it suffered severely, wat specially from the Saracens in 845. The election of the ere Clement VII. took place in the town in 1378, and in

34 it was attacked and plundered by the Turkish corsair Barba-

Toss = : ee ‘ — who was anxious to capture the beautiful countess Giulia olzaga as a present for the sultan.

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FONT (Lat. fons, It. fonte, Fr. fonts), the vessel used in churches to hold the water for Christian baptism. The modes of administering baptism have varied at different periods of the existence of the Christian churches, causing corresponding changes in the forms and auxiliaries of the reccptacle of the consecrated water. There is reason to believe that in the times of the apostles and early mission- aries the rite was administered by sprinkling, as whole multitudes of people, and even whole kingdoms were baptized in one day. But a very general method in early times was no doubt that of total immersion, the catechumens being received by the priest in the water. As Christianity became more general of course fewer adults would present themselves for baptism, and consequently the size of the vessel would not need to be beyond what would allow of the total immersion of an infant. In fact down to the time of the Reformation fouts continued to be made quite large enough to allow of the total immersion of infants, and there is little doubt that down to that date the method was occasionally employed. Baptism by infusion and by aspersion followed this method, though they were no doubt used concurrently, and in a sense combined, for in certain representations of the rite in illuminations and stained glass the

infant is represented as seated naked in the font, while from a vessel the priest pours the water upon the head. Originally used only for sick or infirm persons, the method of baptism by infusion became gradually the established practice, and all doubts as to its validity were removed by appeal to papal and other high authority.

In early times the font was placed in the baptistery, a structure often entirely separate from the body of the church, of which the celcbrated Baptistery at Florence is the finest example. In these the well or basin for con- taining the water was usually reached by descending steps. The baptisteries were round, square, octagonal, or cross- like in form, and in design bear the impress of the period to which they belong. Few are found of late date, and the only existing structure at all recalling them in English churches is found at Luton in Bedfordshire. The font at Luton belongs to the Decorated style of English art, and is inclosed in an octagonal structure of freestone, consisting of eight pillars about 25 feet in height, supporting a canopy. The space around the font is large enough to hold comfort- ably half a dozen people. At the top of the canopy is a vessel for containing the consecrated water, which when required was let down into the font by means of a pipe. The space around the font in the ancient baptisteries was of size to admit several catechumens at the same time; and not only was the whole rite of baptism performed within them, but that of the holy eucharist likewise, and even the baptism of infants, As baptism was administered in early times by bishops only, baptisteries were rare except at the principal church of the diocese. Laster, Whitsuntide, and Epiphany were the principal seasons of its administration. In the 9th century fonts became general in all churches, and baptism was performed at all times by priests of all ranks.

Of fonts still in existence few are older than the 11th century. The material in the Western Church was generally stone, and the outsides and accessories are frequently orna- mented with some of the loveliest and most characteristic of the national arts of the Middle Ages. In the Eastern Church it was different. "The font, codAuuB7Opa," says Neale (Hastern Church, i. 214), "in the Eastern Church is a far less conspicuous object than it is in the west. Baptism by immersion has been retained; but the font seldom or never possessed any beauty. The material is usually either metal or wood. In Russia the columbetlira is movable, aud only brought out when wanted." The

proper material for fonts in the Western Church was hard stone, as marble, porphyry, or granite. Fonts of bronze and lead are, however, sometimes found, and the basins of many stone fonts were lined with lead to prevent the absorption of the water by the porous stone. A font shaped from one block of oak is in the church at Evenechtyd, Denbighshire. Continental fonts bear distinctly the im- press of the time to which they belong. They appear very early, ornamented with bas-reliefs, columns, and arches, as well as with the characteristic details of the ornamentation of their period. Representations of St John the Baptist are very common. At Pont-a-Mousson on the Moselle, one bears bas-reliefs of that saint preaching in the wilderness, and of the baptism of Christ, executed with that simple sincerity which is more valuable than the highest re- finement and finish in design and execution. In the 11th and 12th centuries cup-shaped and cylindrical forms were most common, either as simple cylinders and truncated cones or supported by one or more pillars. Frequently the basin is hollowed out of one large square or oblong slab, supported at the centre by a broad column, with auxiliary columns at the corners, all bearing the mouldings and ornaments charac- teristic of the period. Caryatids sometimes take the place of the pillars, and sculptured animals and other grotesques of curious design sometimes form the bases. Octagonal forms are not altogether absent from this period, and even hexagons have been occasionally found. Pentagons are very rare. The font, however, at Cabourg, on the north coast

of France, is formed of a pentagonal block rather bare of ornamentation, and supported by a group of columns. In the 13th century octagonal forms became more prevalent, although the earlier kinds were not discontinued.

The very remarkable font at Hildesheim in Hanover belongs to the 13th century, and is in complete preserva- tion. The basin rests upon the shoulders of four kneel- ing figures, each bearing a vase from which water is run- ning, emblematic of the four rivers of Paradise. Above is an inscription which explains the connexion of these rivers with the virtues temperance, courage, justice, and prudence. On the sides of the cup itself are bas-reliefs representing the Passage of the Jordan, the Passage of the Red Sea, the Baptism of Christ, and the Virgin and Child. These are separated by columns, by scrolls bearing inscrip- tions, and by medallions with figurative heads of the ab- stract virtues named above, and with heads of the prophets. The font has a conical lid, similarly ornamented, and bear- ing also four bas-reliefs. A cast of this font is now in the South Kensington Museum. At Mayence the font, which belongs to about the year 1328, is of lead, and bears images of the Saviour, the Virgin, St Martin, and the Twelve Apostles.

Cylindrical fonts become much more rare in the 14th century, the almost universal shape being the octagon. In the 15th and 16th centuries the most elaborate and remark- able of Continental fonts were produced, and some are indeed works of the highest art in sculpture. This superiority is probably more due to increased delicacy and moderation of design, than to any great change in the shape or in the mode of attaching ornament. In early fonts, though the exterior is polygonal, the cup itself is generally circular; but it is characteristic of the 15th ceutury fonts that the octagonal form is carried out even in the cup. The fonts at Strasburg, Freiburg, and Basel i examples of this, Few if any English fonts date from ie the Conquest, but a great nuniber of Norman fonts, i i than of any other period before the Reforma- Sie: Fr i and form some of the most SAE cone: oe : architectural remains of the time. In Back aaa a they are generally supported on

» and are ornamented with bas-reliefs,

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net-work of columns and arches, grotesques, rude foliage niches with figures, and many other forms. Good = amples of Norman fonts may be seen at Lincoln Cathedral ; Iffley, Oxon; Newenden, Kent; Coleshill, Warwickshire : East Meon, Hants; and Castle Frome, Herefordshire, im the Late Norman and Early English periods, octagonal fonts became common, and with few exceptions this form continued in use until the Reformation. Early English fonts are comparatively rare. They bear the moulding foliage, and tooth ornament in the usual style of the period, A good example of an Early English font is at All Saints, Leicester; others may be seen at St Giles, Oxford, and at Lackford, Suffolk. Fonts of the Decorated period are also less common than those of the precedent Norman or subsequent Perpendicular periods, but are superior in de- tail and execution to those of any other stage of our art. Fonts of the Perpendicular period are very common, and are generally raised upon steps, which, together with the body of the font, are frequently richly ornamented with panneling. It was also the custom during thus period to ornament the font with shields and coats of arms, and other heraldic insignia, as at Herne, Kent.

Leaden fonts of Norman date are found at Dorchester, Oxon, at Avebury, Wilts, and other places, In Holyrood Chapel there was a brazen font in which the royal children of Scotland were baptized. It was carried off in 1544 by Sir R. Lea, and given by him to the church at St Alban's, and was afterwards destroyed by the Puritans. A silver font was at Canterbury, which was sometimes brought to Westminster ou the occasion of a royal baptism. At Chobham, Surrey, there is a leaden font covered with oaken panels of the 16th century.

In 1236 it was ordered by Edmund, archbishop of Canterbury, that baptismal fonts should be kept under lock aud key, as a precaution against sorcery: " Fontes baptis- males sub sera clausi teneantur propter sortilegia." The lids appear at first to have been quite simple and flat. They gradually, however, partook of the ornamentation of the font itself, and are often of pyramidal and conical forms, highly decorated with finials, crockets, mouldings, and grotesques. Some very rich font covers may be seen at Ewelme, Oxon ; St Gregory, Sudbury; North Walsingham, Norfolk ;

Worlingworth, Suffolk. The ordinary position of the font in the church was near the entrance, usually to the left of the south door.

See Caumont, Cours d'antiquités monumentales, Paris, 1830; Simpson, Series of Antient Baptismal Fonts; Paley, Ancient Fonts ;

Viollet-le-Duc, Dict. de ? Architecture, vol. v.; Parker's Glossary of Architecture. (W. HE.)

FONTAINE, JEAN DELA. See La FONTAINE.

FONTAINE, Pierre Francois Lion arp (1762-1853), French architect, was born at Poutoise, September 20, 1762. He was of a family several of whose members had distinguished themselves as architects, and he early showed the taste and the ability which promised to revive 1D his person the family distinction, Leaving the college of Pontoise at the age of sixteen he was sent to T,'Isle-Adam, to assist in hydraulic works undertaken by the architect André. To facilitate his improvement André allowed him to have access to his plans and to copy his designs. At this time he formed a friendship with another young student of his art, Thibaut, whose passion quickened his own. In October 1779 he was sent to Paris to study in the school of Peyre the younger, and there began his acquaintance with Percier, which ripened into a life-long friendship. After six years of study he competed for a prize at the Academy, and, winning the second, received a pension and was sent to Rome (1785). Percier accompanied him. The Revolution breaking out soon after his return to France, he took refuge in England ; but after the establishment of the consulate,

he was employed by Bonaparte to restore the palace of Malmaison, Henceforth he was fully eugaged in the principal architectural works executed in Paris, as architect successively to Napoleon I., Louis XVIII, and Louis Philippe. In conjunction with Percier (till his death) he was eniployed on the Arch of the Carrousel, the restoration of the Palais-Royal, tle grand staircase of the Louvre, and the works projected for the union of the Louvre and the Tuileries. In 1812 he was admitted a member of the Academy of Fine Arts, and in 1813 was named first architect to the emperor. With

Percier he published the following works,—Palais, Mavsons, et autres Edifices Modernes dessinés & Rome (1798); Description des Fétes et Cérémonies du Mariage de Napoléon et de Marie Louise (1810); and Hecuel de Décorateons Intérveures (1812). Fontaine lost his friend and associate Percier in 1838, and

died himself at Paris, October 10, 1853. FONTAINEBLEAU, a town of France, at the head of an arrondissement, in the department of Seine-et-Marne, about 37 miles 8.E. from Paris on the railway to Lyons, in 48° 24' 23" N. lat. and 2° 42' 1" E. long. It stands in the midst of the forest of Fontainebleau, is well built, and has broad, clean, handsome streets. Among the more important buildings and institutions are the hotel de ville, the barracks, the court-house, two hospitals, a college, and a public library. The Pompadour mansion, and a portion of that which belonged to the cardinal of Ferrara, are still preserved ; and a statue of General Damesme adorns the principal square. Wood-turning aud the manufacture of porcelain and earthenware are the chief industries; and Wine, grapes, garden produce, aud paving stones are articles of export. The population in 1871 was 11,545. In the immediate vicinity of the town is the celebrated palace of Fontainebleau—one of the largest, and in the interior one of the most sumptuous, of the royal residences of France. The origin of the name and of the building are equally unknown ; but the old manor-house was used by Louis VII. in the latter part of the 12th century, and con- tinued a favourite residence of Philip Augustus and St Louis. The existing edifice was begun by Francis I., who laid out immense sums of money in its erection, employing Primaticcio, a famous Italian architect, to draw the plans, and commissioning Leonardo da Vinci, Andrea del Sarto, and Benvenuto Cellini to expend the resources of their arts in making it a truly royal residence. Henry IV. doubled the area of the buildings and gardens, adding among other portions the great Diana gallery, the Court of the Princes, and the Galerie des Cerfs. A canal which he constructed was afterwards filled up by Louis XIV. With Louis XV. the palace fell into disfavour, and for a time it was used as a military school. Napoleon JI. restored it with great splendour, at a cost of 6 million francs, and often resided in it; but after the return of the Bourbons it was again allowed to fall into disrepair. Louis XVIII. and Louis Philippe both did somewhat to its restoration. The congeries of build- Ings 1s very extensive, the roofing, it is

said, covering no less than 14 acres. There are five great courts, distinguished as the Court of the White Horse, the Court of the Fountain, the Oval or Donjon Court, the Court of Princes, and the Court of the Kitchens or of Henry IV. The first is also called the Court of Adieux in memory of the parting scene between Napoleon and his Old Guard in 1814, at the foot of the Horse Shoe staircase. The chapel of the Holy Trinity was built under Fraucis I., and the chapel of St aturnin dates from the same period, and occupies the site : an older building which was consecrated by Thomas a ie Ma 18 Impossible to do more than mention a few Font e ae events which have taken place at XI eau, Philip the Fair, Henry III., and Louis – were all born in the palace, and the first of these

kings died there. James of Scotland was there received by his intended bride; and Charles V. of Germany was entertained there in 1539. Christina of Sweden lived there for years, and the gallery is still shown where she caused her secretary Monaldeschi to be murdered, or, as she regarded it, executed. In 1685 Fontainebleau saw the signing of the revocation of the edict of Nantes, and in the following year the death of Condé. In the 18th century it

.had two illustrious guests in Peter the Great of Russia and

Christian VIL. of Denmark; and in the early part of the 13th it was twice the residence of Pius VII.,—in 1804, when he came to consecrate the emperor, and in 1812-1814, when he was that emperor's prisoner. It was within its walls that the sentence of divorce was passed against Josephine. The forest of Fontainebleau is one of the most beautiful wooded tracks in France, and for generations it has been the chosen haunt of French landscape painters. The most celebrated spots are the Vallée de la Solle, the Gorge au Loup, the Gorge d'Apremont, and the Fort 'Empereur. The whole area extends to 81,740 acres, and it is traversed by 12,000 miles of road and pathway.

See Pfnor, Monographie de Fontainebleau, with text by Cham- pollion Figeac, Paris, 1866.

FONTANA, Domenico (1543-1607), Italian architect and mechaunician, was born at Mili, a village on the lake of Como, in 1543. After a good training in mathematics, he went in 1563 to join his elder brother, then studying architecture at Rome. He made rapid progress, and was taken into the service of Cardinal Montalto, for whom he erected a chapel in the church of Santa Maria Maggiore and the Villa Negroni. When the cardinal's pension was stopped by the pope, Gregory XIII., Fontana volunteered to complete the works in hand at his own expense. The cardinal being soon after elected pope, under the naine of Sixtus V., he immediately appointed Fontana his chief architect. Amongst the works executed by him were the Laterau Palace, the palace of Monte Cavallo (the Quirinal), the Vatican Library, &c. But the undertaking which brought Fontana tbe highest repute was the removal of the great Egyptian obelisk, brought to Rome in the reign of Caligula, which was lying in the circus of the Vatican, and its erection in front of St Peter's. This he accomplished in 1586. After the death of Sixtus V., charges were brought against Fontana of misappropriation of public moneys, and Clement VIII. dismised him from his post (1532), This appears to have been just in time to save the Colosseum from being converted by Fontana into a huge cloth factory, according to a project of Sixtus V. Fontana was then called to Naples, and accepted the appointment of architect to the viceroy, the count of Miranda. At Naples he built the royal palace, constructed several canals, and projected a new harbour and bridge, which he did not live to execute. The only literary work left by this architect is his account of the removal of the obelisk, 1589. He died at Naples in 1607, and was honoured with a pompous funeral in the church of St Ann.

FONTANA, Lavina (1552-1614), daughter of Pros- pero (see below), was a painter of uo little fame, especially in portraits. She was greatly employed by the ladies of Bologna, and, going thence to Rome, painted the likenesses of many illustrious personages, being under the particular patronage of the family (Buoncampagni) of Pope Gregory XIII, who died in 1585. The Roman ladies, from the days of this pontiff to those of Paul V., elected in 1605, showed no less favour to Lavinia than their Bolognese sisters had done ; and Paul V. was himself among her sitters, Some of her portraits, often lavishly paid for, have been attributed to Guido. In works of a

different kind also she united care and delicacy with boldness. Among the chief of these are a Venus in the Berlin museum; the Virgin lifting a veil

from the sleeping infant Christ, in the Escorial; and the Queen of Sheba visiting Solomon. Her own portrait in youth—she was accounted very beautiful—was perhaps her masterpiece ; it belongs to the Counts Zappi of Imola, the family into which Lavinia married. She is deemed on the whole a better painter than her father; from him naturally came her first instruction, but she gradually adopted the Caraccesque style, with strong quasi-Venetian colouring. She was elected into the Academy of Rome, and died in that city in 1614. ,

FONTANA, Prospero (1512-1597), a painter, was born in Bologna, and became a pupil of Innocenzo da Imola. He afterwards worked for Vasari and Pierinodcl Vaga. It was probably from Vasari that Fontana acquired a practice of offhand, self-displaying work. He undertook a multitude of commissions, and was so rapid that he painted, it is said, in a few weeks an entire hall in the Vitelli Palace at Citta di Castello. Along with daring, he had fertility of combination, and in works of parade he attained a ccrtain measure of success, although his drawing was incorrect, and his mannerism palpable. He belongs to the degenerate period of the Bolognese school, under the influence chiefly of the imitators of Raphael—Sabbatini, Sammachini, and Passerotti being three of his principal colleagues. His soundest successes were in portraiture, in which branch of art he stood so high that towards 1550 Michelangelo introduced him to Pope Julius ITI. as a portrait-painter ; and he was pensioned by this pope, and remained at the pontifical court with the three successors of Julius. Here he lived on a grand scale, and figured as a sort of arbiter and oracle among his professional brethren. Returning to Bologna, he opened a school of art, in which he became the preceptor of Lodovico and Agostino Caracci; but these pupils, standing forth as reformers and innovators, finally extinguished the academy and the vogue of Fontana, His subjects were in the way of sacred and profane history and of fable. He has left a large quantity of work in Bologna, —the picture of the Adoration of the Magi, in

the Church of S. Maria delle Grazie, being considered his masterpiece—not unlike the style of Paul Veronese. His death took place in Rome in 1597.

FONTANES, Louis, Marquis DE (1757-1821), French poet and politician, was born at Niort, in Poitou, March 6, 1757. He was a descendant of a noble Protestant family of Languedoc, banished by the revocation of the edict of Nantes, but afterwards converted to the Catholic faith and restored to their native land. Having completed his education at the college of Niort, he went in 1777, after the death of his father and brother, to Paris, He had already made several attempts in verse; and in 1778 he published a short descriptive poem entitled La Forét de Navarre. This procured him the notice and friendship of Ducis, and he was encouraged to persevere. During the next twelve years he published Ze Cri de mon Coeur; Le Jour des Morts dans une Campagne, an imitation of Gray's Silegy ; a translation of Pope's Essay on Man (1783), with an elegant introduction which attracted more attention than the poem itself; Le Verger; La Chartreuse de Paris ; and L'Hssaz sur UAstronomie (1789). In this year appeared also his Hpitre sur l'Edit en Faveur des non- Catholiques, which was crowned by the academy. The Revolution converted the poet into a journalist, and he took part in the editorship of the Mercure Francots and the Moderateur, Compclled to leave Paris after the death of the king, he withdrew to Lyons, where he married and remained till the arrival of Collot d'Herbois in 1793. mace to lead a wandering life, he displayed at once Meee a his palsialsers and his intrepidity in the Collot d'Herbois benny be alf of the Lyonnese victims of

colleagues, which was presented

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'1804 he was made president.

to the convention in December of that year. For this bold appeal he was proscribed, and he owed his protection in concealment to the friendship of Madame Dufresnoy, After the fall of Robespierre, Fontanes was appointed pro- fessor of belles lettres at the central school, and admitted 9 member of

the Institute. About the same time he was associated with La Harpe in the conduct of the Mémorial, For one of his articles he was condemned to banishment by the Directory and expelled from the Institute. He escaped to England, and there renewed his acquaintance with Chateaubriand, also an exile. Returning to France after the 18th Brumaire, he was soon after commissioned by the first consul to write the funeral oration on Washington, and this opened a new chapter in his life. Bonaparte, satisfied with the Hloge, admitted Fontanes to frequent in- tercourse with him ; he was soon reinstated at the Iustitute, and became a member of the legislative body, of which in He was also one of the first members of the Legion of Honour; and in 1808 he was made grand master of the university. Fontanes was cen- sured by the republican party for alleged servility to the emperor ; but apparently without reason. He was created count, and in 1810 was called to the senate. He voted for the deposition of Napoleon, retained his offices under the provisional government, and was made a peer by Louis XVIII. In February 1815 the post of grand master of the university was suppressed, and Fontanes was promoted grand cordon of the Legion of Honour, He remained passive during the Hundred Days, and after the second restoration of the Bourbons was made a privy councillor. The title of marquis was conferred on him in 1817. In January 1821 he was chosen president of the Sociéte des Bonnes Lettres ; but his health had long been declining, and he died at Paris on the 17th of March of that year. He left unfinished a poem entitled La Gréce Delivrée, of which high expectations had been formed. A collected edition of the works of Fontanes was first published by Sainte-Beuve, with a critical and biographical memoir, in 1837.

FONTARABIA. See FUENTERRABIA.

FONTENAY-LE-COMTE, the chief town of an arron- dissement in the department of Vendée, France, is situated on both sides of the river Vendée at the point where it becomes navigable, 35 miles S.E. of La Roche-sur-Yon (Napoléon Vendée). The town has an antique and strag- gling appearance, but there are some good houses in the suburbs. It possesses a communal college, a prison, 4 hospital, a theatre, the remains of an old castle which formerly belonged to the counts of Poitiers, and two old and beautiful churches, Notre Dame and St John. Both are of Romanesque architecture,

terminated with Gothic spires, the spire of Notre Dame being 311 feet in height, The principal industries are the manufacture of coarse linen aud woollen cloths, brewing, and tanning; and there 1s 4 considerable trade in wine, fruits, timber, hemp, flax, and cattle.

Fontenay occupies the site of an old Roman town. It was captured by the English in 1361, and during the wars of the Huguenots it was ten times besieged. Louis XIII. in 1621 ordered the demolition of its fortifications, and in 1649, during the rebellion against the parliament, it fell into the hands of the nobles of Poitou. In the time of the Revolution it was called Fontenay-le Peuple. Population in 1876, 7309. zs

FONTENELLE, Bernarp LE Bovizr ve (1657-1751), author of the Dialogues des Morts, Entretiens sur la Pluralité des Mondes, &c., was born at Rouen on the Ilt of February 1657, and died at Paris on the 9th of Janualy 1757, having thus very nearly attained the age of 10! years. His father was an advocate settled in Rouen, his mother a sister of the great Corneille. He was educate at the college of the Jesuits in his native city, and ei tinguished himself by the extraordinary precocity, a8 W°

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as the amazing versatility, of his talents. His teachers, who readily appreciated these, were anxious to allure him into their order, but his father lad designed him for the bar, and an advocate accordingly he became; but, having lost the first cause which was entrusted to him, he soon abandoned law in disgust and gave himself wholly to literary pursuits. His attention was first directed to poctical composition ; and morc than once he competed for the poetry prizes of the French Academy, but never with success. He had also the sorrow of witnessing, in 1680, the total failure of his tragedy Aspar, a failure which was all the more mortifying because, for the purpose of annoying Racine, Thomas Corneille had previously sounded forth in the Mercure the praises of his. nephew as the most gifted of all the younger dramatists. Fontenelle afterwards acknowledged the justice of the public verdict by burning his unfortunate drama, of which nothing but the name now survives. But for sevcral years he persisted in the belief that

poetry was his true vocation, aud continued to produce dramatic compositions, the mediocrity of which, considering the author's real talent, is positively astonish- ing, His opera of Thétis et Pélée, though highly praised by Voltaire, cannot be said to rise much above the others ; and it is significant that of all his dramatic works, not onc has kept the stage. His Poésies Pastorales have no greater claim to permanent repute, being characterized by stiffness and affectation ; and the utmost that can be said for his poetry in general is that it displays much of the lime labor, great purity of diction, and occasional felicity of expression. It was by his Dialogues des Morts, published in 1683, that Fontenelle first established a gcnuine claim to high literary rank; and that claim was very much enhanced three years later by the appearance of the Hintretiens sur la Pluralité des Mondes, a work which was among the very first to illustrate the possibility of being scientific without being either unintcresting or unin- telligible to the ordinary reader. It was precisely the kind of work which Fontenelle was capable of executing well, both from the natural bent of his intellect and from the course of his previous studies. His object was to popularize among his countrymen the astronomical theories of Descartes; and it may well be doubted if that philo- sopher ever ranked a more ingenious or successful ex- pounder among the number of his disciples. Hitherto Fontenelle had continued to reside in Rouen, but in 1687 he removed to Paris for permanent residence there; and in the same year he published his Méstoire des Oracles, a book which made a considerable noise in the theological as well as in the philosophical world. It was not so much an original work as a reduction from the Latin of Van Dale, and consisted of two essays, the first of which was designed to prove that oracles were not given by the supernatural agency of demons, aud the second, that they did not cease with the birth of Christ. The clearness and precision of the style, and the smooth flow of the reasoning in this treatise, have been always much admired. It excited the Suspicion of the church, however, and a Jesuit, by name Baltus, published a ponderous refutation of it; but the peace-loving disposition of its author impelled him to leave his opponent unanswered. He was too busy, he wrote to

eclerc, and added, " Enfin, je n'ai point du tout Vhnmeur polémique, et toutes les qnerelles me déplaisent. J'aime mieux que le diable ait été prophdte, puisque le pére jésuite le veut, et qu'il croit cela plus orthodoxe."

To the follow- ing year (1688) belongs his Digression sur les Anciens et les — in which he took the modern side in a somewhat . essary controversy then raging; his Doutes sur le ysteme Physique des Causes Occasionelles (against Male- ees) appeared shortly afterwards. In 1691 he was

celved into the French Academy in spite of the determincd

efforts of Racine and Boileau, who on four previous occa- sions had secured his rejection. He subsequently was admitted a member both of the Academy of Inscriptions and of the Academy of Sciences ; and in 1699 he became perpetual secretary to the latter body. This office he actually held for the long period of forty-two years; and it was in this official capacity tliat he wrote the Hzstowre de Académie des Sciences, containing extracts and analyses of the proceedings, and also the Eloges of the members. These last are written with great simplicity and delicacy ; while of the prefaces to the //zstovre, Sainte-Beuve declares that in them "il & atteint 4 une véritable perfection, encore agréable et presque sévére." The only other works of Fontenelle that require to be mentioned are his Géométrie de (infin and his Apologie des Tourbillons. Of the former, his Academy composition, he himself is reported to have said (so far, justly)—" There, now, is a book which only eight men in Europe can understand, and the author is not one of the eight." Fontcnelle forms a link of connexion between two very widcly different pericds of French litera- ture, that of Corneille, Racine, and Boileau on the one hand, and that of Voltaire, D'Alembert, and Diderot on the other. It is not in virtue of his great age alone that this can be said of him; he actually had much in common with the beaux esprits of the 17th century, as well as with the philosophes of the 18th. But it is to the latter rather than to the former period that he properly belongs; and it is not a little significant that while as a poet and man of fashion he was "the butt of all the clever men in Paris" during the first fifty years of his life, he latterly came to be "'a force and an authority in the intellectual life" of the period. He has no claim to be regarded as a genius ; but, as Sainte-Beuve has said, he well deserves a place "' dans la classe des esprit infiniments distingués "— distinguished, however, it ought to be added by intelli- gence rather than by intellect, and less by the power of saying much than by the power of saying a little well. In personal character he has sometimes been described as having been revoltingly heartless ; and

it is abundantly plain that he was singularly incapable of feel- ing strongly the more generous emotions—a misfortune, or a fault, which revealed itself in many ways. "II faut avoir de l'€me pour avoir du gout." But the cynical expressions of such a man are not to be taken too literally ; and the mere fact that he lived and died in the esteem of many friends suffices to show that the theoretical selfish- ness which he sometimes professed caunot have been con- sistently and at all times carried into practice.

There have been several collective editions of Fontenelle's works. The best are those of Paris, in 8 vols. 8vo, 1790, and 5 vols. 8vo, 1825, Some of his separate works have been very frequently re- printed and also translated. The Pluralité des Mondes was trans- lated into modern Greek in 1794. Sainte-Beuve has an interesting essay on Fontenelle, with several useful references, in the Causerics du Lund, vol. ii.

FONTEVRAULT, or FontTevraup, in Latin Sons Ebraldi, a town of France, with a population of about 2500, in the department of Maine-et-Loire, 10 miles S.IE. of Saumur, and 2 miles from the confluence of the Loire and Vienne. Itis situated in the midst of a forest district, and the inhabitants carry on various minor industries fostered by the timber trade. The interest of the place centres in its abbey, which since 1804 has been utilized and abused asa central house of detention for convicts. In spite of mutilation and "translation," the building remains a fine example of the architecture of the 12th cen- tury. The church, of which only the choir and apse are appropriated to divine service, has a beautiful nave covered by four cupolas. Ina chapel in the south transept are the efligies of Henry I]. of England and his wife Eleonora of Guienne, and of Richard the Lion Heart and his wife

Isabella of Angouléme—Eleanora's being of oak and the | rest of stone. The second court of the abbey contains a remarkable building, which long went under the misnomer of chapelle funéraire, but was in reality the old kitchen. Details and diagrams will be found in Viollet-le-Duc's Dictionnaire de U Architecture. There are three stories, of

which the first is an octagon, the second a square, and the third an octagon; and the whole is surmounted by a sort of pyramidal structure. Fontevrault was founded about the end of the 11th century by Robert of Arbrissel, who was born in the village of Arbrissel or Arbresec, in the diocese of Rennes, and attained great fame as a preacher and ascetic. It consisted of a nunnery for virgins and widows, a magdaleneum, a hospital for lepers and other diseased folk, a convent, and a church. The church was used both by the monks and the nuns, but no communica- tion was permitted between the two sexes. The order of Fontevrault was recognized by Pascal II. in 1106, and again more expressly by a bull in 1113. It was placed by its founder under the patronage of the Holy Virgin, and entrusted to the superintendence of an abbess, who was supreme not only over the nuns but also over the monks. The first who held the office was Petronella de Craon- Chemillé. The success of the order was so great that at Robert's death it is said there were no fewer than 3000 nuns. It ultimately numbered fifty-seven priories, divided into the four provinces of France, Aquitaine, Auvergne, and Brittany. It continued till the French Revolution, and the abbey of Fontevraud was the usual place to which the princesses of the blood royal of France were sent for their education. The last abbess, Julie Sophie Charlotte de Pardaillan, died at Paris in 1799 in great destitution. See Edouard, Fontevrault et ses monuments, ow Histoire de cette royale abbaye depuis sa fondation jusqw a sa suppression (1100-

1798), ornée dune gravure et des arnoiries des abbesses, 2 vols.,

1875.

FOOCHOW. See Fun-cHow.

FOOD. See DiETETIcs.

FOOL. The class of fools, buffoons, or jesters, which reached its culminating point of influence and recognized place and function in the social organism during the Middle Ages, appears to have existed in all times and countries. Not only have there always been individuals naturally inclined and endowed to amuse others; there has been besides in most communities a definite class, the members

of which have used their powers or weaknesses in this direction as a regular means of getting a livelihood. Savage jugglers, medicine-men, aud even priests, have certainly much in common with the jester by profession. There existed in ancient Greece a distinct class of professed fools whose habits were not essentially different from those of the jesters of the Middle Ages. Of the behaviour of one of these, named Philip, Xenophon has given a picturesque account in the Banquet. Philip of Macedon is said to have possessed a court fool, and certainly these (as well as court poets and court philosophers, with whom they have sometimes been not unreasonably confounded) were com- mon in a number of the petty courts at that era of civili- zation. Scurrce and moriones were the Roman parallels of the medixval witty fool; and during the empire the manufacture of human monstrosites was a regular practice, slaves of this kind being much in request to relieve the languid hours. The jester again has from time immemoral existed at eastern courts. Witty stories are told of Bahalul (see D'Herbelot, s.v.) the jester of Haroun Al Raschid, which have long had a place in Western fiction. On the conquest of Mexico court fools and deformed human crea- Tg all kinds were found at the court of Montezuma. ra o at ee age we doubt hit upon one great cause of

vour of monarchs for this class when he said that

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'more instruction was to be gathered from them than from wiser men, for they dared to tell the truth." Mr Douce in his essay On the Clowns and Fools of Shakespeare, has made a ninefold division of English fools, according to quality and place of employment, as the domestic fool the city or corporation fool, the tavern fool, the fool of ie mysteries and moralities. The last is generally called the "vice," and is the original of the stage clowns so common among the dramatists of the time of Elizabeth, and who embody so much of the wit of Shakespeare. A very palpable classification is that which distinguishes between such creatures as were chosen to excite to laughter from some deformity of mind or body, and such as were so chosen for a certain (to all appearance generally very shallow) alertness of mind and power of repartee,—or briefly, butts and wits. The dress of the regular court fool of the Middle Ages was not altogether a rigid uniform, {'o judge

from the prints and illuminations which are the sources of our knowledge on this matter, it seems to have changed considerably from time to time. The head was shaved, the coat was motley, and the breeches tight, with generally one leg different in colour from the other. The head was covered with a garment resembling a monk's cowl, which fell over the breast and shoulders, and often bore asses' ears, and was crested with a cockscon.b, while bells hung from various parts of the attire. The fool's bauble was a short staff bearing a ridiculous head, to which was sometimes attached an inflated bladder, by means of which sham castigations were effected. A long petticoat wasalso occasionally worn, but seems to have belonged rather to the idiots than to the wits.

The fool's business was to amuse his master, to excite him to laughter by sharp contrast, to prevent the over-oppression of state affairs, and, in harmony with a well-known physiolo- gical precept, by his liveliness at meals to assist his lord's digestion. The names and the witticisms of many of the official jesters at the courts of Europe have been preserved by popular or state records. In England the list is long between Hitard, the fool of Edmund Ironside, and Muckle John, the fool of Charles L., and probably the last ofticial royal fool of England. Many are remembered from some connexion with general or literary history. Scogan was attached to Edward IV., and under his name Andrew Boorde published a collection of poor jests. Will Son- mers, of the time of Henry VIII., seems to have been a kind-hearted as well as a witty man, and occasionally used his influence with the king for good and charitable put poses. Arnim, who, in his Nest of Ninmies, gives @ ful description of Sommers, and introduces many popular fools, says of him—

"¢ Only this much, he was a poor man's friend, And helpt the widow often in her end.

The king would ever grant what he would crave, For well he knew Will no exacting knave.'

The literature of the period immediately succeeding his death is full of allusions to WillSommers. John Heywood was an educated man, a poet and dramatist, as well as jester to Queen Mary. Some of his dialogues have in co0- ception a racy national humour. John Tarleton, famous as a comic

actor, cannot be omitted from any list of Jesters. A book of Tarleton's Jests, was published in 1611, and, together with his Vews Out of Purgatory, was reprinted by Mr Halliwell for the Shakespeare Society 1844. Archie Armstrong, for a too free use of wit and tongue against Laud, lost his office and was banished the cout. The conduct of the archbishop against the poor fool Is not the least item of the evidence which convicts him of a certain narrow-mindedness and pettiness. In French bis tory, too, the figure of the court-jester flits across the gay or sombre scene at times with fantastic effect. Caillette

and Triboulet are well-known characters of the times of Francis I. Triboulet appears in Rabelais's romance, and is the hero of Victor Hugo's Le Rot s'amuse, and, with some changes, of Verdi's opera Mugoletto; while Chicot, the lithe and acute Gascon, wlio was so close a friend of Henry III., is pourtrayed with considerable justness by Dumas in his Dame de Monsoreau. In Germany Rudolph of Hapsburg had his Pfaff Cappadox, Maximilian I. his Kunz von der Rosen (whose features, as well as those of our own Will Sommers, liave been preserved by the pencil of Holbein) and many a petty court its jester after jester. Late in the 16th century appeared Le Sottilissime Astuzie di Ber- toldo, which is one of the most remarkable books ever written about a jester. It is by Giulio Cesare Croce, a street musician of Bologna, and is.a comic romance giving an account of the appearance at tle court of Alboin king of the Lombards of a peasant wonderful in ugliness, good sense, and wit. The book was for a time the most popular in Italy. A great number of editions and translations ap- peared, and it was even versified. Though fiction, both the character and the career of Bertoldo are typical of the jester. That the private fool existed as late as the last century is proved by Swift's epitaph on Dicky Pearce, the earl of Suffolk's jester. See Flogel, Geschichte der Hofnarren, Leipsic, 1789 ; Doran, The History of Court Fools, 1858. (W. HE.) FOOTBALL is a game which consists, as the name im- plies, in giving motion to a ball with the feet alone. It has been aptly designated the "' winter game" of Great Britain, and justly takes the place of cricket from Michael- mas to Lady Day. The ball requires to be larger than in all handball pastimes, in order that it may be easily kicked. This was accomplished in ancient' times by

inflating a bladder or skin termed follis. In Greece the érioxvpos seems to have borne a resemblance to the modern game. Of this we read in Smith's Dictionary of Antiquities—"TIt was the game at football, played in Much the same way as with us, by a great number of persons divided into two parties opposed to one another." Amongst the Romans the harpastum, derived from Greek verb dprdfw, to seize, thus showing that carrying the ball was permissible, bore a certain resemblance. Basil Ken- hett, in his Rome Antique Notitia, terms this missile a "larger kind of ball, which they played with, dividing into two companies and striving to throw it into one another's goals, which was the conquering cast,"—a description which, if correct, certainly bears a strong resemblance to the modern game of football. The antiquity of football in Great Britain (introduced, there can be little doubt, by the Romans) goes Some centuries farther back than cricket, probably because the requisites—only an inflated ball and rude goals—were fewer and simpler than in the summer game. 'The birth- place of the latter was in the southern counties, that of football in the north, In early times the great football festival of the year was Shrove Tuesday, though the con- hexion of the game with this particular date is lost in obscurity, William Fitzstephen, in his Mistory of London (about 1175), speaks of the young men of the city annually 9lng into the fields after dinner to play at the well- ae ae of ball on the day que dicitur Carnile- ie e far as is known this is the first distinct -~ ootball in England. A clear reference is made ae a a —. pedinam " in the Rotuli Clausarum, 39 ccs Aen (1365), memb. 23, as one of the pastimes to i i a ited on account of the decadence of archery, (1388) pou thing occurs in 12 Richard II. c. 6 ee _ nha to the end of the first quarter of the high fest; ntury Shrove Tuesday continued to be the 82 testival of football, but it had never taken root,

ike cricket, amongst the aristocracy and gentry. It was

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confined to the middle and lower classes. No clubs or code of rules had been formed, and the sole aim seems to have been to drive the ball through the opposing side's goal by fair means or foul. So rough did the game become that James I, forbade the heir apparent to play it, and describes the exercise in his Basilikon Doron as " meeter for laming than making able

the users thereof." Both sexes and all ages seem to have taken part in it on Shrove Tuesday ; shutters had to be put up and houses closed in order to prevent damage; and it is not to be wondered that the game fell into bad repute under such violent horse-play and eccentric usages, Accidents, sometimes fatal, occurred ; and Shrove Tuesday " football-day" gradually died out about 1830. For some thirty years football was only practised at the great public schools, at which there were, as still, two distinct forms of play. The Rugby game, so aptly described in Z'om Brown's School Days, resembles the Roman harpastum and the rough Shrove-tide play, since seizing and carrying the ball, charging, and one player's holding another are freely allowed, and actual hacking was abolished at Rugby only as lately as 1877, Harrow aid Winchester are the chief exponents of the game wherein kicking alone is allowed as a means of propulsion, Eton plays a hybrid game in two different ways, viz., " At the Wall" and "In the Field," the latter being a sort of mixture of both kinds of play. All other schools have arrayed themselves under one or other of these banners, with slight modifications in their rules. About the year 1860 when the great volunteer movement and the institu- tion of amateur athletic sports gave a zest to many kinds of exercises, there came a revival of football amongst old public school and university men. It was soon found that a universal code of rules and a society to legislate on matters of dispute were necessary. Followers of the strict foot _gaine were the first to recognize these wants, and the " Football Association " was accordingly formed in 1863, the exponents of the other method not banding themselves together till the '"" Rugby Football Union" was instituted in 187).

Football has extended most rapidly throughout the United Kingdom during the past few years, as is evinced by the fact of all large towns, villages, and schools now possessing football clubs, and has regularly taken the place of cricket during the winter months. It is a game more adapted to youths than to middle-aged persons, and should not be indulged in after the frame is full-grown and set, when the tumbles and scrimmages incidental to the Rugby code are apt to be baneful. The balls are now wade of inflated india-rubber bladders, covered with strong leather laced together, the Rugby balls being ellip- tical or egg-shaped, and the Association ones a perfect sphere.

The two games may be briefly described thus :—

Under the Rugby code a level piece of turf is the scene of action, and fifteen a side the usual number of players—ten " forwards," two 'half backs," one " three-quarters back," and two " backs." Each goal is composed of two upright posts, exceeding 11 feet in height, and placed 183 feet apart, with a cross-bar 10 feet clear from the ground. The choice of goals is decided by lot, the side which wins the choice either availing themselves of any favourable breeze or gradients which may prevail, or electing to play ata disadvan- tage for the first period of the game till " half time" is called. The game is commenced by the opposite side to that which has choice of goals kicking off the ball (placed on the ground) from midway between the two goals, The object of both sides then is to drive the ball over the cross-bar, and between the line of the two upright posts of their opponents' goal, which achievement con- stitutes 'obtaining a goal." This can be accomplished either by a player's touching the ball down behind his adversaries' goal line, then carrying it out, and thus obtaining a "try" or place kick at goal, or by kicking a goal with a direct drop-kick instantly the ball rebounds from the ground. A match is decided by a majority of goals ; if their number be equal, by a majority of ties ; and if none of either be obtained, the match is drawn, The other minutie are

so numerous that no less than sixty rules are required for their regulation.

*The intricacies of the Association game are far fewer, and only require a very plain set of thirteen rules. No handling or touch- ing the ball, except by the goal-keeper, is permissible, ** dribbling " or kicking with the feet being the sole mode of propulsion. The goal posts are 24 feet apart, and the eross-bar only 8 feet from the ground, the ball in this case having to be driven under the latter in order to obtain a goal. "Trics" are unknown, and the gaining of goals are the sole points whereby the game is decided.*

The rules of both games will be found in most football works, the chief of which are Routledge's Handbook of Football, 1867; C. W. Alcock's Football Annual, annually from 1868; Alcock's Football, Our Winter Game, 1874; G. H. West's Football Calendar, annually from 1874. (Hie WW")

FOOTE, Samvuet (c. 1720-1777), comic dramatist and actor, was born at Truro about the year 1720. Of his attachment to his native Cornwall he gives no better proofs as an author than by making the country-booby Timothy (iu Zhe Knights) sound the praises of that county and of its manly pastimes; but towards his family he showed a loyal and enduring affection. His father was a man of good family and position ; his mother, the daughter of a baronet (Sir Edward Goodere), is said, in person as well as in dis- position, to have strougly resembled her famous son. Ac- cording to tradition, she afterwards fell into pecuniary em- barrassments closely analogous to his own ; but in the days of his prosperity he liberally supported both her and an un- fortunate clerical brother. After her death he indignantly vindicated her character from the imputations recklessly cast upon it by the revengeful spite of the duchess of Kingston. About the time when Foote came of age, a family quarrel between his two maternal uncles ended in the brutal murder, under extraordinary circumstances, of the one by the other, who was, with his accomplices, hanged for the crime. By this event Foote came into his first fortune, through which he ran with great speed in the be- ginning of his London life. Before this he had completed his education in the collegiate school at Worcester, and at Worcester College, Oxford, distinguishing himself in both places by practical jokes, mimicry, and audacious pleasant- ries of all kinds, but also acquiring a classical training which afterwards enabled him neatly to turn a classical quotation or allusion, and helped to give to his prose style, when he chose to write seriously, a sufficient degree of fluency and elegance.

Foote was, it is stated, "designed " for the law, but cer- tainly not by nature. In his chambers at the Temple, and in the Grecian Coffee-house hard by, he learned to know something of lawyers if not of law, and picked up a smatter- ing of law-terms, aud a knowledge of the forms and features of ordinary law-suits. Thus he was afterwards able to jest at the jargon and to mimic the mannerisms of the bar, and to satirize the Latitats of the other branch of the profession with particular success. The famous argument in Hobson v. Nobson (in Zhe Lame Lovers) is as good of its kind as that in Bardell v. Pickwick itself; and doubtless Foote had duly studied some of the most ludicrous or contempt- ible types among the 1175 barristers ("'if we reckon one barrister to twenty attorneys") and 23,518 attorneys (if we "only quarter one attorney upon fifty houses"), of whom, according to the

lecturer in Z'he Orators, the profes- sion was in his day composed. But a stronger attraction drew him to the Bedford Coffee-house in Covent Garden, and to the theatrical world of which it was the social centre. After he had got rid of a second fortune (which he appears to have inherited at his father's death), and had in the interval passed through severe straits of want, he gave up playing the part of a fine gentleman, and in 1744 made his first ons on the actual stage. Whether before this time Mio a very doubtful question. It baciriod ut the time of the family catastrophe he had

a young lady in Worcestershire—actually, and not

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in imagination only, like young Wilding in The Liar: byt the traces of his wife (he affirmed himself that her Was married to his "washerwoman") are mysterious, sad probably apocryphal ; in after days no lady presided at his table, or controlled the libations of claret which flowed with equal abundance in his servants' hall, and his two gous were illegitimate.

Foote's first appearance as an actor was made little more than two years after that of Garrick, as to whose merits tle critics, including Foote himself, were now fiercely at war, His own first venture, as Othello, was a failure; and though he was fairly successful in genteel comedy parts, and was, after a favourable reception at Dublin, enrolled as one of the regular company at Drury Lane in the winter of 1745-6, he had not as yet made any palpable hit, Finding that his talent lay neither in tragedy nor in genteel comedy, he had begun to wonder (as he tersely expressed it) " where the devil it did lie," when his successful per- formance of the part of Bayes in The Rehearsal at last saggested to him the true outlet for his peculiar talent. Following the example of Garrick, he had introduced into this famous part imitations of actors, and had added a variety of other satirical comment in the way of what in stage parlance is called " gag." He lost no time in availing himself of the discovery that in his powers of mimicry lay his surest means of securing a hold over the public. After engaging a small company of actors, he boldly announced for April 22, 1747, at the theatre in the Haymarket ("gratis"), "a new entertainment called the Diversions of the Morning," to which were to be added a farce adapted from Congreve, and an epilogue " spoken by the B—d—d Coffee-house.' Though, of course,

nine-tenths of the fun in all such entertainments would evaporate even in a short land report, and though of these Diversions it is only possible to form a notion from scattered recollections aud trom such parts as were afterwards incorporated in one of Foote's comedies (Taste, act i.), or adapted for later repro- duction at Drury Lane (act ii, printed in Cooke's Memorrs), yet there is no difficulty in understanding the secret of Foote's immediate success, which is said at once to have obtained fer him the name of " the English Aristophanes.' The absurdity of this compliment has often been remarked upon; but it may be worth observing that Foote was probably himself the first (in his letter on Zhe Minor) to decline the comparison, while "leaving the task of poimting out the mistake to his enemies." The Diversions consisted of aseries of imitations of actors and other well-known per- sons, whose various peculiarities of voice, gesture, manner, or dress were brought directly before the spectators ; while the epilogue introduced the wits of the Bedford engaged 1 ludicrous disputation, and specially "took off" an eminent physician and a notorious quack oculist of the day. The actors ridiculed in this entertainment having at one procured the aid of the constables for preventing its repell- tion, Foote immediately advertised an invitation t0 his friends to drink a dish of tea with him at the Haymarket on the following day at noon— and ' tis hoped there wil be a great deal of comedy and some joyous spirits ; he Wi endeavour to make the morning as diverting as possi Tickets for this entertainment to be had at St Georges Coffee-house, Temple-Bar, without which no person will be admitted. N.B.—Sir Dilbury Diddle will be there, amt Lady Betty Frisk has absolutely promised." The device succeeded to perfection; further resistance was abandone as futile by the actors, whom Foote mercilessly ridicul in the "instructions to his pupils" which the on. tainer pretended to impart (typifying them under i. acters embodying their several chief peculiarities ¢ fects—the massive and sonorous Quin as 2 watchmar the shrill-voiced Ryan as a razor-grinder, the charms*

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Woffington, whose tones had an occasional squeak in them, as an orange-woman crying her wares and. the bill of the play); and Mr Foote's Chocolate, which was afterwards con- verted into an evening Zea, became an established favourite ith the town.

f The way to fame and its fruits having now at last been found, the remainder of Foote's professional career was on the whole prosperous enough. He seems, indeed, after this to have contrived to spend a third fortune, and to have found it necessary to eke out his means by a speculation in small-beer, as is recorded in an amusing anecdote told of him by Johnson. – But whatever abstract arguments he might find in favour of the life of a man in debt and against the practice of "muddling away money in trades- men's bills," he could now command a considerable in- come ; and when money came he seems (like a true actor) to have freely divided it between the pleasures of hospi- tality and the claims of charity, During his engagements at Covent Garden and at Drury Lane (of which he was, in passing, joint-manager), and in professional trips to Scot- land, and more especially to Ireland, he appeared both in comedies of other authors and more especially in his own. Among the latter, of which something will be said below, Taste (1752) is the first of a series numbering (exclusively of the Diversions and one or two similar pieces) eighteen. The majority of them were produced at the Haymarket, which continued the favourite home of Foote's entertain- ments, and for which in 1760 he succeeded in obtaining a licence from the lord chamberlain, afterwards (in 1766) con- verted into a licence for summer performances for life. The entertainments in question may be briefly described as a suc- cession of variations on the original idea of the Diversions and the Zea. Now, it was an Auction of Pictures (1748), of part of which an idea may be formed from the second act of the comedy Taste; now, a lecture on Orators (1754), suggested by some bombastic discourses given by Macklin in his old age at the Piazza Coffee-house in Covent Garden, where Foote had amused the audience and confounded the speaker by interposing his humorous comments. The Orators is preserved in the shape of a hybrid piece, which begins with a mock lecture on the art of oratory and its re- presentatives in England, and ends with a very diverting scene of a pot-house forum debate, to which Holberg's Politician-Tinman can hardly have been a stranger. Ata later date (1773) a new device was introduced in a Puppet- show; and it is a pity that the piece played in this by the puppets should not have been committed to print. It was called Piety in Pattens, and professed to show "by the moral how maidens of low degree might become rich from the mere effects of morality and virtue, and by the litera- ture how thoughts the most commonplace might be concealed under cover of words the most high flown." In other words, it was an attack upon

sentimental comedy, to which more than one blow had been already dealt, but which was still not altogether extinguished, Indeed, though no one now reads Pamela, it may be doubted whether she and her cousinhood will ever be altogether suppressed on the modern stage. The Puppet-show was also to have contained a witty attack upon Garrick in connexion with the notorious Shakespeare jubilee ; but this was withdrawn, and thus he ie @ recurrence of the quarrel which many years a ore had led to an interchange of epistolary thrusts, when Ee manager of Drury Lane had permitted Woodward to attempt an imitution of Foote. On the whole, the relations between the two public favourites were very friendly, and Tener part (notwithstanding a number of witticisms ree i pee crily against Garrick's interest in Queen ae oad 4 ings and the like) unmistakably affectionate ; iad ¥ Ewe been by no means fairly, or at least gencr- Y, tepresented by Garrick's most recent biographer. A

comparison between the two as actors is of course out of the- question ; but, though Foote was a buffoon, and his tongue' a scurrilous tongue, there is nothing in the well-authen-

ticated records of his life to suggest that his character

was one of malicious heartlessness. On the other hand,

it was not altogether the fault of his position that he was unable to conciliate the respect of society, though, unlike

Garrick, lhe could hardly have expected to form one of the

chosen circle into which (though not without protest) the

former gained admittance. It is at the same time charac- teristic of the difference between the London of that day and

the London of our own, where club secrets are among the: favourite morsels of public gossip, that the famous Club had

been ten years in existence before Foote knew of it. Of: Johnson's opinions of him many well-known records remain – in Boswell ; and if it is remembered that when Johnson had

at last found his way into Foote's company (he afterwards

found it to Foote's own table) he was unable to "resist": him, it should likewise not be forgotten that on hearing

of Foote's death he recognized his career as worthy of a

lasting biographical record.

Meanwhile most of poor Foote's friendships in high life were probably those that are sworn across the table, and require "t'other bottle" to keep them up. It is not a pleasant picture—of Lord Mexborough and his royal guest the duke of York, and their companions, bantering Foote on his ignorance of horsemanship, and after he had weakly protested his skill, taking him out to hounds on a dangerous animal. He was thrown and broke his leg, which had to be amputated, the "patientee" (in which character he said he was now making his first appearance) consoling himself with the reflexion that he would now be able to take off "old Faulkner" (a pompons Dublin alder- man with a wooden leg, whom he had brought on the stage as Peter Paragraph in Zhe Orators) "to the life." The duke of York made him the best reparation in his power by promising him a life-patent for the theatre in the Haymarket (1766) ; and Foote not only resumed his pro-fession, as if, like Sir Luke Limp, he considered the leg he had lost "a redundancy, a mere nothing at all," but ingeniously turned his misfortune to account in two of his later pieces, : The Lame Lover and The Devil on Two Sticks, while, with. the true instinct of a public favourite, making constant reference to it in plays and prologues. He seemed to have lost none of his energy with his leg, though it may be observed that the characters played by him in several of his later plays are comparatively short and light. He continued to retain his hold over the public, and about the year 1774 was beginning to think of withdrawing, at least for a time, to the Continent, when he became involved in what proved a fatal personal quarrel. Neither in his entertainments nor in his comedies had he hitherto (except in Garrick's case, and it is said in Johnson's) put the slightest restraint upon.

the personal satire by which he terrified his victims and delighted their neighbours. One of his earlier experiments of this kind (Zhe Author), in which, under tbe infinitely humorous character of Cadwallader, he had brought a. Welsh gentlemen of the name of Ap-Rice on the stage, had, indeed, ultimately led to the suppression of the play. But, to an extent of which it is impossible fully to judge, he had pursued his hazardous course, mercilessly exposing to public ridicule and contempt not only fribbles and pedants, quacks or supposed quacks in medicine (as in Zhe Devil on Two Sticks), impostors or supposed impostors in religion, such as Dr Dodd (in Zhe Cozeners) and Whitfield and his connexion (in The Minor). He had not only dared the wrath of the whole Society of Antiquaries (in The Nabob),. and been rewarded by the withdrawal, from among the pundits who rationalized away Whittington's Cat, of Horace Walpole and other eminent members of ne body, but had

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in the same play attacked a well-known representative of a very influential though detested element in English society, the " Nabobs" themselves. But there was one species of cracked porcelain or blemished reputation which he was not to try to hold up to contempt with impunity. The rumour of his intention to bring upon the stage, in the character of Lady Kitty Crocodile in The Trip to Calais, the notorious duchess of Kingston, whose trial for bigamy was then (1775) impending, roused his intended victim to the utmost fury ; and the means and influence she had at her disposal enabled her, not only to prevail upon the lord chamberlain to prohibit the performance of the piece (in which, it should be observed, there is no hint as to the charge of bigamy itself), but to hire agents to vilify Foote's char- acter in every way that hatred and malice could suggest. After he had withdrawn the piece, and letters had been exchanged between the duchess and him equally character- istic of their respective writers, Foote took his revenge upon the chief of the duchess's instruments, a " Reverend Doctor" Jackson, who belonged to the " reptile " society of the journalists of the day, so admirably satirized by Foote in his comedy of Z'ke Bankrupt. This mau he gibbeted in the character of Viper in Zhe Capuchin, under which name the

altered Zrip to Calais was performed in 1776. But the resources of his enemies were not yet at an end; and a discharged servant of Foote's was suborned by Jackson to bring a charge and apply for a warrant against him. Though the attempt utterly broke down, and Foote's character was thus completely cleared, his health and spirits had given way in the struggle —as to which, though he seems to have had the firm support of the better part of the public, including such men as Burke and Reynolds, the very audiences of his own theatre had been, or had seemed to be, divided in opinion. He thus resolved to withdraw, at least for a time, from the effects of the storm, let his theatre to Colman, and after making his last appearance there in May 1777, set forth in October on a journey to France. But at Dover he fell sick on the day after his arrival there, and after a few hours died (October 21st). His epitaph in St Mary's Church at Dover (written by his faithful treasurer Jewel) records that he had a hand " openas day for melting charity." His resting-place in Westminster Abbey is without any memorial ; nor indeed is it the actor's usnal lot to receive from posterity any recognition which the con- temporaries whom he has delighted have denied to him.

Foote's chief power as an actor inust clearly have lain in his extra-ordinary gift of mimicry, which extended, as the best kind of mimicry always does, to the mental and moral, as well as the mere outward and physical peculiarities of the personages whose likeness he assumed. He must have possessed a wonderful flexibility of voice, though his tones are said to have been harsh when his voice was not disguised, and an incomparable readiness for rapidly assum- ing characters, both in his entertainments and in his comedies, where he occasionally "doubled" parts. The excellent "' patter" of some of his plays, such as The Liar and The Cozeners, must have greatly depended for its effect upon rapidity of delivery. In person he seems to have been by nature ill-qualified for light comedy parts, being rather short and stout, and coarse-featured ; but the humour with which he overflowed is said to have found full expression in the irresistible sparkle of his eyes.

_ As a dramatic author, although he displays certain distinctive characteristics of indisputable brilliancy, he can only be assigned a subordinate rank. He was himself anxious to limit the definition of comedy

to "an exact representation of the peculiar manners of that people among whom it happens to be performed; a faithful imitation of singular absurdities, particular follies, which are openly produced, as criminals are publicly punished, for the correction of ae paaaals and as an example to the whole community." This = meas as the utile, or useful purpose, of comedy ; the dulce at ee nn be " the fable, the construction, machinery, conduct, "eRe ee of the piece." For part at least of this view Teaeplica « dS me in the spirited and scholarly "Letter" in which ae on eae Reverend Author of the ' Remarks, Critical and pa erage ¢ Minor"), he rather loftily appealed to classical adithe ee aioe to point out the relation between the wile , and to remember the indispensableness of the latter to

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the comic drama under its primary aspect as a species of art, Hig comic genius was particularly happy in discovering and reproducin

characters deserving of ridicule ; for " affectation," he says (in i. introduction to The Minor, where he appears in person), "T take n" be the true comic object ;" but he failed in putting them to fd artistic use. That he not only took his chief charactersfrom real life

but closely modelled them on well-known living men and women, was not in himself an artistic sin, though it may have been a practice of doubtful social expediency, as it certainly involved considerable per- sonal risk. Nor was the novelty of this absolute, but rather one of degree and quantity ; other comic dramatists before and after him have done the same thing, though probably no other has ever gone so far in this course, or has pursued it so persistently. The public delighted in his "d——d fine originals," because it recognized them as copies ; and he was himself proud that he had taken them from real persons, instead of their being ' vamped from antiquated plays pilfered from the French farces, or the baseless beings of the poet's brain." But the real excellence of Foote's comic characters lies in the fact that, besides being incomparably ludicrous types of manners, mauy of them remain admirable comic types of general human nature. Sir Gregory Gazette, and his imbecile appetite for news; Lady Pentweazel, and her preposterous vanity in her superannuated charms; Mr Cadwallader, and his*

view of the advantages of public schools (where children may "make acquaintances that may here- after be useful to them ; for between you and I, as to what they learn therc, does not signify twopeuce"); Major Sturgeon and Jerry Sneak ; Sir Thomas Lofty, Sir Luke Limp, Mrs Mechlin, and a score or two of other characters, are excellent comic figures in themselves, whatever their origin ; and many of the vices and weak- nesses exposed by Foote's vigorous satire will remain the perennial subjects of comic treatment so long as a stage exists. 'The real defect of his plays lies in the abnormal weakness of their construc- tion, in the absolute contempt which the great majority of them show for the invention or conduct of a plot, and ir the unwarrant- able subordination of the interest of the action to the exhibition of particular characters. In a good play, whether it be tragedy or comedy, the characters are developed out of and by means of the action ; but of this there is little trace in Foote. His characters are rcady-niade, and the action is only incidental to them. With the exception of The Liar (which Foote pretended to have taken from Lope de Vega, but which was really founded on Steele's adap- tation of Corneille's Le Menteur), and perhaps of The Bankrupt, there is hardly one of Foote's " comedies " in which the conception and conduct of the action rise above the exigencies of the merest farce. Not that sentimental scenes ani even sentimental characters arewant- ing, that virtue is not occasionally in distress, or fails to vindicate itself triumphantly from the semblance of vice ; but these familiar procedures are as incapable of exciting real interest as the ordinary course of a farcical action is in itself calculated to produce morethan the most transitory amusement. In his earlier plays Foote constantly resorts to the most hackneyed device of farce—a disguise —which helps on the progress of a slender fable for which nobody cares to a close which everybody foresees. Of course Foote must have been well aware of the defect under which his rapidly manu factured productions laboured ; he knew that if he might sneer at " genteel comedy " as suited to the dramatists of the servants' hall, and pronounce the arts of the drama at the great houses to be " directed by the genius of insipidity," he, like the little theatre where he held sway, was looked upon as "an eccentric, a mae summer fly."

His merits as a comic dramatist are not, however, obscured by his incontestable defects. He was inexhaustible in the devising of comic scenes of gennine farce, in which the humour and wit of the dialogue are on a level

*with the general excellence of the conception An oration of ‘old masters,” an election of a suburban mayol an examination at the College of Physicians, a newspaper conclave where paragraphs are concocted and reputations massacred—all and other equally happy scenes are brought before the mere rea er with unfailing vividness. And everywhere the comic dialogue Is instinct with spirit and vigour, and the comic characters are ae themselves with a buoyancy which at once raises them above * level of mere theatrical conventionalism. Foote professed to despis the mere caricaturing of national peculiarities as such, and genie A used dialect as a mere additional colouring ; he was, however, wide awake to the demands of his public not to treat France os Frenchmen as fair game, and perhaps there is nothing coarser nee plays than this constant appeal to national patriotic pre! at His satire against those everlasting victims of English cone farce, the Englishman in Paris and the Englishman retry 4 Paris, was doubtless well warranted ; and he was not § sit point out the fact—which Englishmen are wont to conceal aa they come liome from their travels—that they are nowhere addicted to the society of their countrymen than abroad. rie general, the purposes of Foote’s social satire are excellent, ated abuses against which it is directed are those which it m4 his courage to attack. The tone of his morality is healthy, 20 ae language, though not aiming at refinement, is yemarkably free*

i ional grosshess. Like all professed humorists, he made vais! Siion ; but he, too, was on the right side in the war- fare against the pretentiousness of Cant and the effrontery of Vice, the two master evils of the age and the society in which he lived.

The following is alist of Foote’s farces or “ comedies . as he calls them, mostly in three, some in two acts, which remain in print. The date of production, and the character originally performed by Foote, are added to the title of each :—

The Knights (1748—Hartop, who assumes the character of Sir Penurious Trifle) ; Taste (1752); The Englishman in Parts (1753— Young Buck); The Englishman Returned from Paris (1756—Sir Charles Buck); Zhe Author (1657— Cadwallader); The Minor (1760—Smirk and Mrs Cole); The Liar

(1760); The Orators (1762—-Lecturer) ; The Mayor of Garratt (1763—Major Sturgeon) ; The Patron (1764—Sir Thomas Lofty and Sir Peter Peppercorn) ; The Commissary (1765—Mr Zac. Fungus); The Devil upon two Sticks (1768—Devil) ; The Lame Lover (1770—Sir Luke Limp) ; The Maid of Bath (1771—Mr Flint) ; The Nabob (1772—Sir Mat- thew Mite); Zhe Bankrupt (1773—Sir Robert Riscounter); The Cozeners (1774—Mr Aircastle) ; 4A Trip to Calais; The Capuchin (1776—O' Donnovan).

Foote's biography may be read in W. (" Conversation ") Cooke's Memoirs of Samuel Foote (3 vols., 1805), which contain a large col- lection of his good things and of anecdotes concerning him, besides two of his previously unpublished occasional pieces (with the act of the Diversions in a later form already mentioned), and an admixture of extraneous matter. From this source seems to have been mainly taken the biographical information in the rather grandiloquent essay on Foote prefixed to "Jon Bee's," useful edition of Foote's Works (3 vols. 1830). But few readers will care to go further than to the essay on Foote, reprinted with additions, from the Quarterly Review, in the late Mr Forster's Biographical Essays; and none can fare better than those who turn to this delightful and discrimi- nating study of a man of real though peculiar genius. (A.W.W.)

FOPPA, Vincenzo, a painter, was born in Brescia soon after 1400, and died there in 1492. He settled in Milan towards 1425, and was the head of a school of painting which subsisted up to the advent of Leonardo da Vinci. His contemporary reputation was very considerable, his merit in perspective and foreshortening being recognized especially. Among his noted works are a fresco in the Brera Gallery, Milan, the Martyrdom of St Sebastian; a Crucifix in the Carrara Gallery, Bergamo, executed in 1455 ; the Trinity, in the church of S. Pietro in Oliveto, Brescia ; and other paintings in the same city.

_PORAMINIFERA. This designation is part of that given by D'Orbigny in 1825 to an order of animals form- ing minute calcareous shells (found recent in shore-sand, and fossi in various Tertiary Limestones), for the most part many-chambered, and often bearing a strong resemblance in form (fig. 1) to those of Nautilus, Orthoceras, and other chambered Cephalopods,—his (supposed) Cephalopoda foraminifera being distinguished from the

(real) Cephalo- poda sipunculifera (Nautilus and its allies) by the want of the "siphon" which passes from chamber to chamber in the latter, and its replacement in the former by mere

foramina" in the dividing septa. And it seems to have been the applicability of this term Foraminifera to the shells thus characterized which has caused it to be retained as their ordinary designation, notwithstanding that the knowledge since acquired of the animals that form these shells necessitates the removal of the group from the elevated position lowest grade of the whole animal series. It was by the admirable observations upon living Foraminifera published by Dujardin, In 1835, that attention was first drawn to the existence of a type of animals more simple than any pre- viously known,—their bodies consisting entirely of an apparently homogeneous semi-fluid substance, to which he 'call i name "sarcode"; and this substance projecting Pk if through apertures of the shell into indeterminate a Ting extensions (which he termed pseudopodia), cap-

® of being retracted and fused again (so to speak) into _ i ar of the body. section of the large group of Infusoria, whose bodies he Supposed to have a like lines sarcodie composition,

assigned to it by D'Orbigny, to nearly the |

Regarding these animals as |

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he distinguished them as Rhizopods, on account of the root- like character of their pseudopodial extensions.

The general correctness of Dujardin's description of the animals that form Foraminiferal shells has been fully con- firmed by subsequent researches ; but the larger knowledge since obtained of the nature of the Protozoa has led to a more correct apprehension of the relations of the Rhizopoda to the other components of that gronp. What is now regarded as

Fie. 1—Various forms of Foraminifera:—1, Cornuspira; 2, Spiroloculina; 3, Triloculina; 4, Biloculina; 5, Peneroplis; 6, Orbiculina (cyclical); 7,

Orbiculina (young); 8, Orbiculina (spiral); 9, Lagena; 10, Nodosaria; 11, éristellaria; 12, Globigerina; 13, Polymorphina; 14, Textularia; 15, Discorbina; 16, Poly- stomella; 17, Planorbulina; 18, Rotalia; 19, Nonionina.

the simplest type of an animal, designated a Moner (see

ANIMAL Kinepow, vol. ii. p. 50), consists of an independent

particle of the elementary form of living matter known as

"protoplasm" (the "'sarcode" of Dujardin), which is capable

of growth and maintenance by the assimilation of nutrient

material, and of multiplying itself either by subdivision or by some modification of that process. Now the first stage of differentiation of this apparently homogeneous substance into histogenetic elements consists in the appearance of certain rounded bodies termed endoplasts, which appear to be the equivalents of the nucle: of the " cells " whose indi- viduation marks a higher stage of differentiation. And the next stage (well seen in Ameba) consists in the differentia- tion of a more consistent external layer, or " ectosarc," from the less consistent substance of the interior, or '" endosare," in which are observable " vacuoles" containing fluid, of which one or more (that seem bounded by a definite pellicle, and are known as " contractile vesicles ") contract and dilate rhythmically. As yet, however, there is no definite point of entrance for alimentary particles, or of exit

for excrementitious matter,—nutrient ingesta being ad- mitted, and their unassimilable residue being got rid of, through any spot of the ectosare, It is in the presence of a definite mouth, and usually of an anus also, that even the simplest of the true ciliated Infusorva show a decided advance upon the "rhizopodal" type,—an advance which is still more marked in the higher Znfusoria by the complexity of their internal organization.

Now the animal bodies of Foraminifera, notwithstand- ing the regularity and complexity of the shells they form, show but a very slight advance on the simplest moneral type. For their protoplasmic substance does not seem to be differentiated into "ectosarc" and " endosarc,"—every part of it alike projecting itself into pseudopodial exten- sions, and these extensions being capable, not only of dividing and ramifying indefinitely, but also of reuniting by mutual fusion when they come into contact with each other, so as to constitute an irregular network (figs. 2, 3, 4). Tt is on account of this last peculiarity that the writer has distinguished the reticulose forms of the Rhizopod type from the lobose (consisting of Ameba and its allies) on the one hand, and from the radiolarian (of which Actzno- phrys is the type) on the other. The sarcodic bodies of Foraminifera were believed until recently to have neither "nuclei" nor "contractile vesicles"; but as the observa- tions of Hertwig and F. E. Schulze have established the presence of these in some instances (the writer also having observed " endoplasts" in Orbvztolites), it is probable that they exist universally.

The attention which has been given in recent years to the study of Foraminifera, has invested the group—formerly considered as comparatively insignificant—with a new interest and importance. For (1) these minute testaceous Rhizopods, instead of having mere local habitats, are diffused abundantly through all save polar seas, and seem to do the first. work of collecting by imbibition, and of converting into living substance, the organic matter which is contained, however sparingly, in all oceanic water, and the restoration of which, as fast as it is thus withdrawn, is effected by the various forms of marine vegetation.1 Again (2), without

1 That all marine animal life must ultimately depend upon marine vegetation is as certain as that all the animal life of the Zand ultimately depends upon terrestrial vegetation. And looking to the very large proportion which, not only among Fishes, but also in the higher Mol- lusca, Crustacea, and Echinodermata, the carnivorous bear to the phytophagous types, and to the abundance of the former on bottoms far too deep for the growth of the Algw required for the sustenance of the latter, and on which there is no " raining down" of Diatoms from the surface (as in polar areas), it seems obvious either that there must be animals capable of generating organic compounds for themselves out of the gases contained in ocean-

water, or that it must itself supply nutrient material in the liquid form to animals specially adapted to imbibe and assimilate it. Of the possibility of the former: hypothesis 'we have no evidence whatever ; and in the absence of light at great depths, any new production of organic compounds seems almost incon- ceivable. On the other hand, the analyses made by Dr Frankland of the specimens of ocean-water brought home in the " Porcupine" ex- pedition of 1869 have shown that it always contains an appreciable proportion of nitrogenous matter ; while in Foraminifera there seems to be a special capability of imbibing and assimilating such matter by 'the extension of the soft body into a protoplasmic network, exposing a very large surface. Of the importance of this provision (first sug- gested by Sir Wyville Thomson) in the economy of nature the following 1s an apt illustration :—Large quantities of cod are taken by fishermen on the Faroe banks, attracted thither by the abundance of star-fish, 'on which they greedily feed; and the stomachs of these star-fish are found to be filled with Globigerine. Thus man is dependent for this "harvest of the sea"—in the first place upon the star-fish that ey cod ; secondly, on the foraminifers that feed the star-fish ; oe y, on the organic material (in very weak solution) which ocean- be supplies to the foraminifers ; and finally, ou the various forms sae pein vessty on by which this supply is continually being renewed. em ie it, probable that the same function is performed by of ale t es ying internal canal-system provides a vast extent

, and that this is the explanation of the otherwise

my ae pst the "cold-area"" (temp. 30° Fahr.), not far from : roe banks, swarms with various types of boreal Echinoderms,

FORAMINIFERA

any thing that can be called organization, the protoplasmi¢ bodies of these animals give origin to protective casings of marvellous regularity of form, and often of great com. plexity of structure,—these being sometimes " tests" built up by the apposition of sand-grains or other particles collected from the bottom on which they live, the animals only furnishing the cement by which they are held together but being more often true " shells," formed (like the skele. tons of higher animals) by an interstitial deposit of car. bonate of lime drawn from the surrounding medium, in the substance of

living tissue. Notwithstanding (3) the absence of any perceptible differences in the character of the animals they respectively contain, these protective casings, whether sandy "tests" or calcareous "shells," present a wide diversity of fundamental form, which is almost indefinitely augmented by subordinate modifications; and these modifications are generally so gradational as to render it impossible (when a sufficient number of specimens are compared) to draw any lines of separation between what appear, when only the extremes are regarded, to be clearly differentiated types, And this is true, not merely of sgectes (which in the sense of constantly differentiated races cannot be said to have any existence among Poraminifera), but also of what would elsewhere be accounted genera; whilst even families cannot, as a rule, be sharply defined, many of them con- taining aberrant forms that defy all attempts at strict limitation. In fact it would be scarcely a figure of speech to say that, within each of the three primary subdivisions of the group to be presently marked out, every form passes gradationally into every other. Hence the study of Foraminifera—whose small (but not too small) size and numerical abundance are peculiarly favourable to the com- parison of large series of individuals—affords a most valuable lesson in taxonomy,—giving the best illustration that the whole animal kingdom can afford of the produc- tion of almost endless varieties of conformation by " descent with modification." Looking (4) to the almost universal diffusion of existing Yoraminzfera, and to the continuous accumulation of their calcareous exweice over vast areas of the ocean-bottom, there can be little doubt that they are at present doing more than any other tribe of marine animals to separate carbonate of lime from its solution in sea-water, so as to restore to the solid crust of the earth what is being continually withdrawn from it by the solvent action exerted by rain and rivers upon the calcareous material of the upraised land. And when (5) we look back into the past history of our globe, we not only find conclusive proof of the enormous contributions which Foraminifera have made to the calcareous strata of Tertiary and Secondary epochs (Nummulitic Limestone and Chalk having been almost entirely formed by their agency), but encounter strong reason for the belief that the principal mass of the Paleozoic Carboniferous Limestone had a similar origi. And when finally (6) we go still further back 1 geological time, and bring our knowledge of this type bear on the very earliest calcareous formation that has yet been found in stratified rocks (the Serpentine Limestone of the Canadian

Laurentians), we find distinct evidence that this also had its origin in Foraminiferal growth ; which has thus stamped the impress of its existence even upon the oldest of those Archaic rocks, which, through a long subsequent succession, have as yet yielded no other distinct evidence of the existence of either animal or vegetable life on our planet, And thus in all parts of the geological series we not only recognize the constructive work of these humble organisms; but, interpreting the past by the

notwithstanding the almost entire absence of Foraminifera caused by

the depression of temperature, their placc being taken by aa type of Sponge which there finds a congenial hubitat, and prove? supplies food to higher marine animals. 7.

in the figure, the

FORAMINIFERA

present, find ever-increasing reason to believe that it has exceeded that of all other marine animals taken collectively.

A concise statement of the evidence in support of each of these positions will be embodied in the following sketch of the life-history; present and past, of this group; which will be so drawn as rather to bring into view its great features of general interest, than those details with which the systematist only is concerned.

1 Although the testaceous Foraminifera are all marine, certain shell-less animals essentially similar in nature occur in fresh water; and these, of which Lreberkiihnia (fig. 2)

Fic. 2.—Lieberkithnia, with reticular pseudopodia.

is a characteristic example, afford the best means of study- ing the life-history of the "‘ reticulose" type. In its inac- tive state Lreberkithnia is an ovate corpuscle of granular protoplasm about 1-400th of an inch in diameter, not pre- senting either any distinct differentia- tion of "endosarc" and " ectosare " or "contractile vesicle," or any evident "nucleus," but

including a large number of vacuoles filled with: . a homogeneous liquid. In its active state, on the other hand, the body puts forth a sort of stem, which soon branches ir- regularly into pseu- dopodia ; and these subdivide and ramify with great minuteness to an extent two or three times as great as that represented

*ramifications coa- lescing whenever they come' into contact with each other, so ag to form an irregular network which Fig. 3.—Gromia, with extended pseudopodia. — be compared to an animated spider's-web. This net- se * to entangle either minute particles (such as chlo- top vy granules) or larger bodies (such as Infusoria) that tee on its way,—the former being transmitted to the central Y by asort of circulation (closely resembling the cyclosis*

of vegetable cells) which is constantly going on through the whole protoplasmic network, and the latter becoming enclosed in a kind of sheath formed by the blending of the neighbouring pseudopodia, which apply themselves to its surface and draw it into the central mass by their gradual contraction. Although destitute of any protective envelope, Lneberkiihnia does not put forth its pseudopodia indifferently from any part of its surface, —their primary stem being en- veloped in a transparent sheath, which may be traced as a thin pellicle over the whole body. And in Gromia (fig. 3), of which some forms inhabit fresh water (attaining a size that renders them visible to the naked eye), whilst others are marine, this pellicle is thickened into a distinct casing or " test" of ovoidal shape (probably composed of chitin'), with a single round orifice of moderate size, through which the sarcodic body puts forth its pseudopodial extensions. When the animal is in a state of repose, these are entirely retracted into the test; but when its activity recommences, they are put forth from its orifice, as from the stem of Lie- berkiihnia, and form a sarcodic network which is in a state of incessant change—new centres of radiation often arising where two or more pseudopodia coalesce, by the flowing of the protoplasm towards those points. It is specially noticeable in this type that the sarcodic body extends itself over the entire surface of the test, so as completely to enclose it, and that pseudopodia are put forth from every part of this extension, being

especially numerous at the posterior end, where they probably serve to fix the test, and thus to enable the animal to put forth more power in seizing the larger creatures that serve as its food. For whilst it is partly nourished by the minute granules that adhere to its outspread network, it lays hold of the smaller Infusoria and Diatoms, the zoospores of Conferve, &c., and draws them entire into the interior of the test, within which their indigestible remains may frequently be seen. Now, if the transparent pellicle of Lieberkiihnia were con- solidated by calcareous instead of by chitinous deposit, a monothalamous (single-chambered) " shell" would be pro- duced (9 in fig. 1), such as constitutes the permanent form of the simplest Moraminifera, and the primordial form of even the most complex. This shell, like the test of Gromia, may have but a single aperture, from which the pseudo- podial extensions are put forth, and through which alone nutriment is received into the contained body. But ina large proportion of the polythalamous (many-chambered) Foraminifera (fig. 4), the shell-wall is perforated with minute pores over its entire surface, through which pseudo- podia extend themselves in a radial direction ; and while the coalescence of these at their origin forms a continuous sarcodic layer that covers the exterior of the shell, the coalescence of their extremities forms new centres of radia- tion at a distance from it. The aperture or mouth in these types is much smaller than in the preceding, and appears to serve rather for the projection of the stolon-process, by which new chambers are formed (in the manner to be pre- sently described), than for the introduction of nutriment. And when it is considered that the diameter of the pores of the shell never exceeds 1-5000th of an inch (being often much less than 1-10,000th), and that the chlorophyll- granules, zoospores, &c., that nourish the fresh-water Rhizopods are altogether wanting in the sea-depths inhabited by the higher types of Foraminifera, there seems additional ground for the doctrine already propounded, that the nutri- tion of the animals of this group is mainly drawn rather from the organic matter that is dissolved in the medium they inhabit, than from solid particles suspended in it.

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1 There seems reason for regarding this as representing the " cellu- lose wall" of the vegetable cell; which, in the curious Chlamydomyxa

of Archer, opens at a certain stage of its life, and allows its protoplas- mic contents to project themselves into a " scticulose"' extension,

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In regard to the propagation of Foraminifera, little is as yet certainly known. The growth of the individual may proceed, as will be presently shown, to an almost indefinite extent, by the gemmiparous multiplication of the segments or divisions of its body, with a corresponding multiplication of the chambers of its shell ; but it more frequently happens that when the organism has attained a

Fig. 4.—Rotalia, with pseudopodia extended through the pores of the shell,

certain limited size, the new segments detach themselves, each one growing into the likeness of its parent ; and this is probably the ordinary way in which the continuance of the race is provided for. But it would also seem that under certain circumstances the sarcodic body of the parent breaks itself up into segments, each containing an "endoplast" or " nucleus," and that around each of these a shelly covering is formed while it is still enclosed within the original shell, the offspring finally escaping by its rupture. Whether this mode of propagation is preceded by any. process of "conjugation," and is thus related to sexual generation, is still undetermined.

By far the greater number of Yoraminifera are composite fabrics, evolved from a simple protoplasmic body by a process of continuous gemmation, each bud remaining in connexion with the stock from which it was put forth; and according to the plan on which this gemmation takes place, will be the configuration of the composite fabric thereby produced. Thus if the bud be put forth from the aperture of the monothalamous Zagena (9 in fig. 1) in the direction of the axis of its body, if a second chamber be formed around this bud in continuity with the first (receiving the neck of the latter into its own cavity), and if this process be successionally repeated, it is obvious that a straight rod-like shell (10 in fig. 1) will be produced, having a series of chambers communicating with each other by the apertures that originally constituted their mouths, and opening externally by the mouth or aperture of the last formed chamber. The successive segments may be all of the same

size, or nearly so; in which case the entire series may either resemble a string of beads, or may approach the = Senne form, according to the shape of the chambers. a by more frequently happens that each segment some- s at exceeds its predecessor in size, so that the entire shell Pil saan rate shape. If, on the other hand, the the beh oe ould be slightly curved instead of straight,

8 composite shell will be arcnate, while a more

rapid deflection gives it a spiral curvature (5 and 11 in figs 1). The form of the spire will depend in the first place upon whether its convolutions lie in the same plane, like those of a nautilus, 80 that the shell is equilateral (16 and 19 in fig, 1), or pass obliquely round a Vertical axis, asin a snail, so that the shell becomes " inequilateral" (18 in fig. 1), having a more or less conical form, with the primordial chamber at its apex. In other cases, again, the vertical axis is greatly elongated, and the number of chambers forming each re- volution around it is reduced to four, three, or even two (13 and 14 in fig. 1). But further, the spiral plan of growth may give place to the cyclical, successive circles of new chambers being formed around the interior growth, so as to give the shell a discoidal shape (6 and 17 in fig. 1). And sometimes all regularity of plan disappears in the later stages of growth, new chambers being added in various directions, so that the fabric becomes " acervuline."

In the older classifications of Soraminifera, these differences of plan of growth were adopted as characters of primary importance in the subdivision of the group. But it has now become obvious that comparatively little value is to be attached to them. For to associate together all rectilineal, all spiral, and all cyclical Foraminifera, is not only to run counter to the indications of natural affinity that are furnished by the intimate structure of the shell, the conformation of the individual chambers, and the mode of their intercommunication, but to set at nought two

general facts of fundamental significance, —jirst, that one

plan of growth often graduates insensibly into another, as

| does the straight into the spiral in the group of which

10 and 11 of fig. 1 are extreme forms; and, second, that it is not at all uncommon for the plan to change during the growth of one and the same individnal,—the spire, for example, either straightening itself out, so as to revert to the rectilinear type, or returning into itself so as to make a complete circle, round which a succession of concentric annuli is then produced on the cyclical type, while the original regularity is sometimes lost altogether in the "acervuline" piling up of the later-formed chambers. On the other hand, the fundamental importance of the perfora- tion or imperforateness of the external envelope, as affecting the physiological condition of the contained animal, is now universally admitted. For where (as in Peneroplis, 510 fig. 1) that envelope, whether composed of calcareous shell or built up by the cementation of sand-grains, has no other communication with the exterior than by the single or multiple aperture of the last chamber through which the whole pseudopodial apparatus of the contained animal 1s put forth, the nutrition of the entire segmental body that occupies the previously formed chambers must be carried on by a continual interchange of protoplasmic substance extending through the entire raass, however great may be the multiplication of its segments. Where, on the other hand (as in Rotalia, fig. 4), the wall of each chamber 18 perforated for the passage of pseudopodia, the segment it contains is thereby placed in direct communication with the surrounding medium from which it derives 1ts susten- auce, so as to be independent of the remainder of the sertes. The "imperforate" calcareous shells of Foraminifera «| algo termed "porcellanous," from the opaque-white aspee

they present when viewed by reflected light; though, = thin, they show a rich brown hue by transmitted hight. Even under a high magnifying power, their gubstance appears entirely homogeneous, The perforated shells, " the other hand, having an almost glassy transparen®™ (except where this is interrupted by tubulation), are ee

as " vitreous" or "hyaline." Where the shells are _ the perforations are- simply pores (fig. 4) ; but where pai are thick, the perforations are tubules usually a 6 straight and parallel from surface to surface (fig. 24}.

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_ Thus, then, the Foraminifera are naturally divisible in the first instance into two groups, the Imperforata and the Perforata ; the former of which is again divisible into the Arenacea, which build up " tests " by the aggregation of sand-grains, and the Porcellanea, which form porcellanous shells; whilst the latter, Vitrea, includes al] the perforate types. There is often a very curious parallelism between the forms contained in these three series respectively, still more between certain " porcellanous" and certain "vitreous" types; but this arises in each case from similarity in plan of growth, and does not indicate any real affinity. In fact the two calcareous-shelled series may be compared to two trees of different orders, wliich resemble each other in their mode of branching, but have dissimilar leaves and flowers.

I, Arenacea.—The calcareous shells of certain types of Foraminifera, alike in the "porcellanous" and in the "vitreous " series, are not unfrequently covered with sand- grains, cemented into the surface-layer of the true shell-substance. But in the group now to be described, the casing of the body is entirely composed of foreign particles (usually grains of sand, but sometimes minute Foraminifera, sponge-spicules, &c.), the animal furnishing nothing save the cement that holds them together; and in its lowest forms no special cement seems to be supplied, the sand- grains being simply imbedded in the sarcodic substance of the body. The increased attention which has of late been given to this group (our knowledge of whicli has been largely augmented by deep-sea dredging) seems to justify our regarding the " arenaceous" type as on the whole less advanced thaneitherthe "porcellanous" or the " vitreous,"— its lowest forms presenting a condition less specialized than even the simplest of the calcareous-shelled Foraminifera, whilst its highest, although sometimes attaining a compara- tively gigantic size, build up their massive "tests " upon a very simple plan, exhibiting no approach to the complexity of structure to be found in the "shells" which some of them closely resemble in external form. A few of the laore interesting types of the Arenaceous group will now be briefly noticed.

In the sandy mud which covers certain parts of the bottom of the 500-fathoms channel between the north of Scotland and the Faroes, the large monothalamous Astrorhize are so abundant as sometimes to form a great part of the contents of the dredge. Their typical shape (as the name implies) is discoidal with stellate radiations ;

but they are sometimes globular, sometimes cervicorn, and present every Intermediate gradation between these forms. The ‘ test” is composed of loosely aggregated sand-grains, not held together by any uuneral cement ; and it is destitute any definite orifice, so that the sarcode-body (of a dark green colour) which occupies the cavity must put forth its pseudopodial extensions between the sand-grains of its test. But there is, in the writer’s belief, a lower form even than this, For in the same dredgings there were found a number of little lobular masses varying in size from a pin’s head toa large pea, ies of aggregations of sand grains, foraminiferal shells, &c., held ge er by a tenacious protoplasmic substance, without any definite a al arrangement. And although these might be supposed b € mere accidental agglomerations, yet there seems adequate tason for regarding them as living organisms of the simplest pos-

of its two components—the sand being : er, So as to form an investing “test,” of which the whole ene . i – i

r . slon,—become spr eset 18 occupied by the sarcode-body aa degree of elevation is shown in the presence of a distinct held togeth a ee seb -enaina surrounding which are generally

‘ ya ferrugi r e remainder of th. pale SeRiginous cement, even when those of

ne of the 3 by ¥ a A

tube, close Ta: ig ee of this type isa simple cylindrical . And in a still higher type, this cylinder is ol ssion of chambers, each of which opens into the the last opens Tae bordered by cemented sand-grains, while rn me 3” Vleet by a like orifice, —thus sketehing out the larger scale. ype of the “ vitreous” Foraminifera, but on a much

lrdind

In the more advanced Arenaceous types, on the other hand, the sand-grains of the entire "test" are firmly united together by a cement composed of phosphate of iron, which must be exuded from the sarcodic body of the animal, its materials being originally de- rived from the sea water. In some instances the sand-grains selected are of such minute size that, when worked up with the cement, they form a sort of " plaster," the surface of which is quite smooth, both externally and internally. This is the case with the genus 7'rocham- mina, under which is ranged a whole series of forms ranging from a simple undivided tube to a perfect helical spire resembling a Catherine-wheel (whence the name given to the genus), and thence, by the alteration of its spire to the turbinoid, and by the subdivision of its cavity into chambers, to the "rotaline" type. In other instances the sand-grains are somewhat larger, but are apposed with such extraordinary regularity, and cemented together so artificially, as to form a most delicate but firm test of very uniform thickness, ey smooth both externally and internally. Tests of this

ind present a singular series of adumbrations of the " orbuline," "'globigerine," and "nodosarine " types of the vitreous series, In other cases, again, the sand-grains being larger, the "test" is con- structed more coarsely, but still with remarkable symmetry. One of the most interesting of the simple coarse-grained forms is the little Saccammina spherica, whose flask-shaped tests (fig. 5, a,b) of the size

Fie 5.—Arenaceous Foraminifera:—a, exterior of Saccammina; 6, the same laid open; c, portion of test more highly magnified; d@, Pilulina; e, portion of test more highly magnified.

of minute seeds, with prolonged necks and circular apertures, now found living abundantly in particular localities, have been also dis- tinctly recognized in Carboniferous Limestone. That the size of the sand-grains used in the construction of such tests is not accidental (depending on the fineness of division of the sandy bottom on which the animals live), but is the result of selection on the part of the animals that use them, is shown not only by the fact that coarse- grained and fine-grained " tests" are brought up from the same bottom, but by the very curious difference in the materials

used to form two kinds of tests nearly of the same size and of corresponding simplicity of type. The very same deep dredgings which yielded Saccammina brought up a number of other monothalamous spherical tests, filled with dark green sarcode, to which the name Pilulina has been given from their resemblance to homeopathic globules (fig. 5,d). These, instead of being constructed by the cementation of sand-grains, are composed of a sort of felt © made by the regular "laying" of siliceous fibres (the fine-pointed ends of elongated sponge spicules) with very minute sand-grains dispersed among them; and the aperture, instead of being a round hole at the end ofa short neck, is a sigmoid fissure with somewhat projecting lips. The constancy of these differences indicates a dissimilarity in the " potentialities a of the animals of the respective types, of whieh we find no indication in their apparently-homogeneous sarcodie bodies. ;

The highest development of this type known to exist at the present time is shown in thelarge polythalamous " nautiloid " ferms which have been brought up in considerable abundance from depths mostly ranging between 200 and 500 fathoms. The test (fig. 6, a) is for the most part composed of coarse sand-grains firmly cemented to each other ; but it is generally smoothed over exter- nally with a kind of " plaster" resembling that of which the "trochammine" tests are made up. On laying open the spire, it is found to be very regularly divided into chambers by partitions formed of cemented sand-grains (6), a communication between these chambers being maintained by a fissure left at the inner margin of. the spire. So far, the plan of structure accords with that of the smaller "nonionine"' forms (resembling 19 of fig. 1), which are

Frc. 6.—Nautiloid Lituola. a, exterior; 6, chambered interior; c, portion of labyrinthic chamber-wall, showing component sand-grains.

regular arrangement of sand-grains, as seen at'c. This "labyrin- thic" structure is of great interest, from its relation on the one hand to the still higher development of the like structure in the large fossil Litwola of the Chalk, whose crozier-like "test " has its principal chambers subdivided into "chamberlets," and on the other hand to that of two gigantic fossil Arenacea, one of the Cre- taceous and the other of early Tertiary age.

Geologists who have worked over the Greensand of Cambridgeshire have long been familiar with solid spherical bodies, varying in size from that of a pistol-bullet to that of a small cricket-ball, which there present themselves not unfrequently, and have been regarded by some as mere mineral concretions, whilst others supposed them to be fossilized Sponges. They prove, however, to be "tests" of

Arenaceous Foraminifera, which are distinguished from all other known foraminiferal types by their concentrically-spherical plan of growth (fig. 7), —the successive spheres being formed around a

Fra, 7.—General view of the internal structure of Parkeria, In the horizontal sectlon, ?), 72, 73, 14, mark the four thick layers; in the vertical sections, a marks the internal surface of a layer separated by concentric fracture; 8, the appear- ance presented by a similar fracture passing through the radiating processes; c, the result of a tangential section passing through the cancellated substance of a lamella; p, the appearance presented by the external surface of a lamella separated by a concentric fracture which has passed through the radial pro- cesses; E, aspect of section taken in a radial direction so as to cross the solid

pt and their intervening spaces; c, c?, c3, c#, successive chambers of ucleus,

"nucleus," which consists of a succession of chambers arranged sometimes in a straight line and sometimes in a spiral, the last of them opening out and extending itself over its predecessors. Each sphere contains a set of principal chambers, with labyrinthic ee of thein, corresponding in all essential particulars with = the nautiloid Lituola just described ; so that there is no- Se eee ae size (which simply results from continuity of pian ae Bar sp sieally-concentrie plan of growth) to differentiate i ns ae mech inary Foraminifera. It is not a little interesting an aa —— plan of construction carried out under a dif- Tertiary period, tenn spree fossil] Arenacean, probably of the early

usa ; which, agreeing with Parkeria

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in all essential particulars, differs from it in plan of growth Loftusia being formed, like Alveolina (fig. 10), by the rolling of a spiral round an elongated axis.

The discovery of these two singular types greatly enlarges our con. ceptions of the Arenaccous group, and shows how little justification there is for any attempt to lay down a@ priori restrictions as to the supposed '' possibilities " of Foraminiferal organization.*

II, PorcELLANEA.—In the sketch now to be given of the " porcellanous." series, it will be the writer's object to show the closeness of the relation between its simplest and its most complex and diversified forms (which he regards as all constituting but a single family, the Miliolida), and to indicate the chief of those gradational transitions by which a continuous affinity is established between them all.

Passing by the proteiform Nubecularia,—the tent-like incrustin, shells of which rudely foreshadow almost every plan of growth to be met with among higher Foraminifera,—we commence with the simple Cornuspira (1 in fig. 1), whose spirally-coiled undivided tube, the exact isomorph of the helical arenaceous T'rochammina, attaches itself to the Zoophytes and Sea-weeds of the British coasts. In full-grown specimens, the later turns of the spire generally flatten themselves out, like those of Peneroplis (5 in fig. 1), so that the form of the mouth is changed from a circle to a long narrow slit. From this simple undivided spire we may pass along two divergent lines, one conducting us to the milioline and the other to the orbicyline type, and the latter again leading us to the erbiteline, in which the spiral plan of growth gives place in the very earliest stage to the cyclical. The shells of the Afiliole (so named from their resem- blance to millet-seeds) are at present found in the shore sands of al- most every sea ; and they accumulated in certain localities during the early Tertiary period to.such an extent as to form massive beds of limestone. Their typical forms (3 and 4 in fig. 1) are composed of a succession of elongated chambers, usually arranged bi-serially on the opposite sides of a straight axis (3 in fig. 1), at one of the ends of which each chamber opens forwards into that which follows, whilst at the opposite end it opens backwards into that which preceded, the aperture in either case being partially closed by a "tongue" or " valve "

(which may be considered an imperfect septum), as shown at 4, fig. 1. Indications of such a division may be sometimes notice' even in Cornuspira, but it shows itself fully in Spirolocudina, inwhich the spire has the form of an ellipse, at the two ends of whose major axis the new chambers commence alternately. 'The spiral plan of growth here remains obvious throughout ; but in the typical Milio- lines (3 and 4 in fig. 1) it is more or less obscured by the extension of the later chambers over the earlicr, giving risc to the varied forms which have been distinguished under the generic names of Biloculina, Triloculina, and Quinqueloculina, according to the number of cham bers visible externally. The extreme inconstancy, however, which is found to mark this distinction, when large numbers of pie are compared, entirely destroys its value as a differential character. Milioline shells, though frequently quite smooth, often show some kind of "sculpture," their surface being sometimes more or less deeply " pitted," sometimes regularly honeycombed, and sometimes longitudinally ribbed ; and these diversities have been largely used for the characterization of species. Here again, however, the exam- ination of a sufficiently large collection shows the futility of any such differentiation, since every gradation is found between the smooth and the most sculptured forms, while it is not at all uncoml- mon for one and the same shell to be smooth on some parts of its surface, and deeply pitted, honey-combed, or ribbed on others— making it obvious that such differences have no more than hs varietal significance. There is not, in fact, any group in the whole Animal Kingdom of which the study is more instructive than thet of the Miliolines, in regard to the extent of variation which is com- patible with conformity to a fundamental type. :

The culminating form of the Milioline.type may be considered to show itself in Fabularia, a fossil of the Paris Tertiaries not known to exist at present, in which the principal chambers are subdivided into "'chamberlets," as in Orbiculina and Orbitolites, and the aperture is cribriform instead of single, the chamberlets opening externally by separate pores.

The undivided helical tube of Cornuspira, again, graduates through Hauerina and the spiral forms of Vertcbralina into the typical Pene- roplis (fig. 8), a beautiful little shell that abounds in the shallow watersof many parts of the Mediterranean, and is remarkable alike ae its glistening

porcellanous surface, for the constancy of the ridge a0 furrow sculpturing which crosses the intervals between the septa, se for the flattening-out of its spire, and consequent narrowiD 24 elongation of its septal plane (5a in fig. 1), which is perforate ay single linear series of pores. In tropical seas, however, this type shows itself under a very different aspect (fig. 9). The ed instead of being flattened out, is turgid ; and the septal plane, d stead of being perforated by a linear series of pores, has @ sing

large aperture, the dendritic shape of which has caused the name

Dendritina to be assigned to this type. Now, althongh such marked differences between Molluscan shells weuld undoubtedly iustify generic differentiation, yet among Foraminifera they prove to be not even of specific value; for when a sufficiently extensive series of this type is :

compared, its extrenie forms graduate insen- sibly one into the other. In proportion apparent- ly to the warmth of its habitat (the gradation being well seen in the Red Sea examples) the shell becomes less flat- tened and the septal plane broader, and the single row of pores be- – : comes a double or even a triple series, the pores of different series being sometimes partially confluent. With a further increase in the turgidity of the spire, and with a progressive widening of the septal plane at the expense of its length, the pores lose their linear arrangement, and run together in groups, so as to form several irregularly fissured openings ; and it is by the coalescence of these that the single dendritic aperture is formed in those ex- amples whose general shape most nearly approaches that of Nautilus. This transition often shows itself in the successive stages of growth of one and the same shell. When we consider the yhysiological import of this variation, we find that it has no rela- tion to any essential differences in the conformation of the animal, — all that it means being that the sarcodic pseudopodia, which issue separately in the one case, issue collectively in the other, It is in- teresting to remark, further, that in each of these types the spire often straightens itself out, so as to give to the shell the shape of a crozier (these "spiroline" forms being peculiarly common in the Red Sea), and that throughout the entire scries the surface- marking is singularly constant.

From this simply-chambered type we pass on to that in which each chainber is more or less completely divided by transverse par- tifions (or secondary septa) into a series of " chamberlets,"' giving to the shell what is designated the "'labyrinthic" structure, The first stage of this division, shown in figs, 11, 12, consists in a suc- cession of contractions by which the sarcodic segment that occupies the cavity of each chamber acquires a moniliform or bead-like shape,—the sub-segments into which it is partially subdivided being connected by a continuous band or "stolon." And even where the Separation of the chamberlets is most complete, there is still an aperture in each secondary septum, by which the lateral continuity of the sub-segments is maintained. 'he relation of the labyrinthic Orbiculina (6 and 8 in fig. 1), common in tropical seas, to the simple ; peneropline " type, is well seen in the early stage (7 in fig. 1) of the Sinn which is obviously a Peneroplis with subdivided chambers. ee as age advances, a remarkable change takes place. The later

urns of the spire very commonly grow completely over the earlier, 80 as to make the umbilicus protuberant, as shown at 8 in fig. 1; a their thickness progressively increases by the vertical elongation ~ = sarcodic "blocks" that occupy their chamberlets into She + he which communicate with the exterior and with each al i 1 age several ranges of marginal pores. In the very large ra . aly developed forms of this type (attaining a diameter of ug ch which make up the Tertiary Limestone of the Malabar diver ie surface of the spire has a thin layer of chamberlets uivide off from the intermediate columnar portion, as in the poser type of Orbitolites to be presently described. ia a if the axis round which this Orbiculine spire revolves were a ngs such an elongation (by a multiplication of its sub- Sments in that direction) as to equal the diameter of the spire,

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Fig. 8.—Peneropiis.

Fic. 9.—Dendritina,

*t Fia, 10.—Alveolina:—a, 4, septal plane, showing multiple ranges of pores. i fees Faull be changed to the globose, with a crescentic septal increase * cu by numerous separate pores; and a yet further "fusiform " 0*

comparative length of the axis would evolve the gated and type characteristic of Alveolina (fig. 10), with an elon- straightened septal plane showing several ranges of sepa-

rate pores. The largest specimens of this type at present known seldom exceed 0:4 inch in length; and are greatly surpassed by those massive forms of the early Tertiaries whose accumulation in particular localities produecd what is now known as the Alveolite Limestone.

Sometimes, on the other hand, even at an early age, the growing margin of Orbiculina extends itself laterally at both extremities, so that the two extensions meet on the opposite side of the original spire, which is thus completely enclosed by it. Its growth is thence-

Fre. 11.—Shell of simple type of Orbditolites, showing primordial chainber a, and cireumambient chamber 8, surrounded by successive rings of chamberlets con- nected by circular galleries which open at the margin by pores.

forth cyclical instead of spiral, concentric rings (each of them answering to one of the chambers of Peneroplis) being successively added, as shown at 6 in fig. 1, and the chamberlets into which they are subdivided opening by separate pores, usually arranged in several series, around the whole margin of the disk. Now, this is the plan of growth characteristic of Orbitolites, a type first known as fossil (abounding in the Calcaire grossier and other calcareous Eocene strata), but of which living furms have been since found abundantly in tropical and sub-tropical seas, frequently attaining a diameter of 8-10ths of an inch, anda thickness approaching 1-6th. While mar- ginal portions of the disks of the cyclical Orbiculina could not be distinguished from those of certain forms of Orbitolites, there is such a difference in their origins and early histories as necessitates their generic separation. For in the typical Orbitolite the plan of growth is cyclical from the first, successive rings being formed around a "nucleus," which is never overlaid by later growths ; and this nucleus consists of a " central" segment (a, figs. 11 and 12), which is more or less completely surrounded by a "circumambient seg- ment" (6), that gives off numerous radiating stolon-processes to form the first ring of sub-segments. It isa fact of no small morpho- logical interest, however, to find among the varietal forms of

this type a distinct reversion to the spiral origin,—the most complete example of it being presented in the deep-sea O. tenuissimus, whose ' nucleus" resembles a Cornuspira of three or four turns, of which the last turn rapidly opens itself out, showing a primary division into chambers and a secondary into chamberlets, thus distinctly connecting with the ordinary Milioline type the form whose plan of*

Fig. 12.—Animal of simple type of Orbitolites, showing primordial segment a, and circumambient segment 6, surrounded by annuli of sub-segments eon- ected by radial and circular stolon-processes,

growth appears at first sight most fundamentally different. This plan is most readily apprehended by examining such small "simple" forms of this type (figs. 11, 12) as occur im the Mgean and Red Seas, in which the successive rings continue to be formed on the pattern of the first. Each chamberlet of the shell (fig. 11) is con-

nected by a passage with those on either side of it ; and it is from these intermediate passages, not from the chamberlets themselves, that the radiating passages procced which lead to the chamberlets of the next ring, or which, in the case-of the outermost ring, open at the margin between the protuberant walls of the chamberlets. So, in looking at the sareodic body (fig. 12) of the animal which occupied the shell, we see that it consists of a succession of neck- lace-like rings, each consisting of an annular cord with bead-like enlargements at regular intervals, and giving off from the intervals between these beads the radiating stolon-processes which give origin to the sub-segments of the next annulus, as shown at the margin cf the figure. These, extending themselves laterally at the growing cdge of the shelly disk, will coalesce into a continuous cord, and a new ring of shell-structure will be formed by an excretion of calcareous matter from its surface. There is here no differentiation of parts whatever, every ring being a precise repetition (except as to number of parts) of that which preceded it; and in the living condition the semi-fluidity of the sarcode-body will allow of a perfectly free communication being kept up throughout the disk, so that

nutrient matter taken in at the margin may be readily conveyed towards the centre. The uniformity in the endowments of the segments is shown by the fact, of which accident has repeatedly furnished proof, that a small portion of a disk entirely separated from the remainder, will not only continue to live, but will so increase as to form a new disk (fig. 18) whose concentric annuli form themselves regularly around the fragment, obviously by the extension of the annular sarcodic band from its proper growing margin around its whole periphery,—

Fig. 13.—Orbitolite disk formed around a fragment of a previous disk, by the extension of the growing margin of the fragment along its broken edges.

a fact of extreme significance, as showing that even in this elabo- rately constructed shell the animal body retains its original protoplasmic homogencousness.

A yet greater complexity of structure presents itself in the large Orbitolite-disks of tropical seas, as also in those of whose fossil remains many Tertiary Limestones are chiefly composed. This com- plexity depends, in the first place, on the vertical elongation of the sub-segments into a columnar form, so as to produce a progressive thickening of the disk from the centre towards the margin, by which it comes to acquire a somewhat biconcave form ; and with this there is an increase in the number of radiating stolon-processes, showing itself in a vertical multiplication of the ranges of marginal pores. The ends of the columns of each ring are connected laterally by two aunular cords ; and from each of tliese is given off a series of sub- segments, that forms a layer of chamberlets on either surface of the disk, having no communication with those of the intermediate col- umnar structure except through the annular passages. Even this morphological differentiation does not seem connected with any diversity of function ; and a careful comparison of a sufficiently extensive series of forms, from the most simple to the most complex, renders it clear that they are gradationally connected, the transition being a process of "evolution," on which heat (probably coupled with a more copious supply of food) exerts an important influence,

III. Virrza.-—The vitreous-shelled Foraminifera consti- tute the most elevated division of the group, in regard alike to the high organization of

their shell-substance, and to the elaborate construction shown in the shells of its most Geveloped types. And it is in this division that we find

ie multiplication of individuals accomplishing by far the greater part of those two vast operations now in progress ab seem to have been through all Geological time of which we know anything), which have been already specified

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a3 the great functions of the group:—the extraction from sea-water (1) of the minute quantity of organic matter universally diffused through it, which is converted into a protoplasmic substance fit to serve as food for higher animals, and (2) of the minute quantity of carbonate of lime held by it in solution, which is solidified into the sub. stance of the shells whose accumulation gives rise to calcareous deposits on the ocean-bottom. The Vitreous Foramimfera may be grouped into three families, Lagenida, Globigerinida, and Nummulinida, the typical forms of which are distinguished by well-marked characters,

The chief feature of interest in the Family Zagenida is the unbroken succession of forms it presents, from the simple monotha-

_lamous Lagena to the complex polythalamous Cristellaria,—all

characterized by the very minute tubulation of the shell-substance, and by the circular form of the aperture of cach chamber, which has usually an everted lip marked by radiating furrows. The Lagena (9 in fig. 1) is a minute flask-shaped shell, with a prolonged neck, having the mouth at its extremity ; and its external surface usually presents some form of sculpture, such as prolonged ribs, separate tubercles, or honeycomb areolation. In Nodosaria (10 in fig. 1) we find a rectilinear succession of similar chambers, the neck of each re- ceived into the cavity of the next ; while in Oristellaria (11 in fig. 1) a series of progressively enlarging chambers, still presenting the characteristic radiate aperture, is arranged in a nautiloid spiral. These composite types, which are connected by a series of inter- mediate degrees of curvature, show also the characteristic seulptur- ing of the simple Lagena with an endless variety of modifications ; so that there is

no group of Foraminifera which presents a more complete gradation between extremes so extremely diverse in form and surface-marking that, taken alone, they might fairly be adopted as types of distinct genera. Thus, as Mr H. B. Brady! justly re- marks, "if the word 'species' is anything more than a conven- tional term, the whole ought to constitute a single species. But governed by the exigencies of a partially artificial arrangement, the modifications embraced in this single unbroken series constitute thirteen genera, or almost two entire families, in Professor Reuss's classification; while how many hundreds, if not thousands, of so- called ' species' have been founded upon the trivial characters above enumerated, it would need much patience to ascertain."

This variability shows itself also in the curious " polymorphism" sometimes exhibited during the growth of one and the same

individual, which is especially characteristic of the genus Polymorphina, The young shell of this type is obviously

made-up of lageniform chambers regularly arranged in a double series alternating on the two sides of a rectilinear axis (18 in fig. 1); but from this plan there are often very wide de- partures in later stages of growth, both in the form and in the arrangement of the chambers,—one of the most curious con- sisting in the backward prolongation of the last chamber over all that preceded it, and its extension into "stags-horn processes, which completely disguise the original conformation. In this aber- rant type the characteristic " sculpturing " of the typical Lagenida is generally wanting,—the shell in its young state being peculiarly thin and glassy ; whilst in the large ' wild-growing" forms the wall of the outer chamber is usually smooth, and has a porcellanous opacity. : The fundamental characters of the Family Globigerinida, which essentially consist in the coarse porosity of the shell (the pores being often sy45th of an inch in diameter), and in the fissured, crescen- tic, or semioval form of the aperture of each chamber, are well seen in the typical genus Globigerina, the principal agent in that pro- duction of globigerina-ooze which is now repeating (rather, perhaps, continuing) the formation of the old Chalk. As obtained from the bottom by sounding or dredging, the Globigerina presents itself in the form shownin

fig. 14,—that is, as an aggregation of nearly spher- ical chambers, having coarsely porous walls like those of Rotwlia

Fig. 14.—Globigerina bulloides, as seen in three positions.

(fig.4), and cohering externally into a more or less regular ne

spire, each turn of which consists of four chamters, pre a ds

increasing in size. These chambers, whose number seldom ¢ nn

1 Monograph of Carboniferous and Permian Foraminifera, P- I

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i omraunicate directly with each other, but each has its sy ee month, opening into a common " vestibule " which occupies the centre of the under-side of the spire. The younger shells, consisting of from eight to twelve chambers, are thin and smooth; but the older shells are thicker, and are raised intoridges that form a hexagonal areolation round the pores (fig. 15, a); and this thiekening is shown, by examination of thin sections of the shell (0) to be produced by an exogenous deposit (corresponding with the "in- termediate skeleton" of the more complex types) that invests the original shell-wall, sometimes containing little flask-shaped cavities filled with sarcode (Wallich). When taken alive by the tow-net, however, floating at or near the surface, the shells of Globigerine

Fig, 15 —Globigerina from the Atlantic 00ze, showing the thickening of the shell by exogenous deposit :—a, entire shell, showing the surface raised into areo- lated ridges; 6, portion of shell more highly magnified, showing orifices of tubuli, and large cavities filled with sarcode; c, section of shell, showing exogenous deposit formed around the original chamber wall, which is raised into ridges with tubuli opening between them, and includes sarcodiec cavities. (After Wallich.)

are found to be beset with multitudes of delicate calcareous s ines, which extend themselves radially from the angles at which the

ridges meet, to a length equal to four or five times the diameter of the shell (fig. 16).

Fig. 16.—Glodigerina, as captured by the tow-net floating near the surface.

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coma the living Globigerina is examined under favourable cir- oxalll ces, the sarcodic contents of the chambers may be scen to an gradual] through the pores of the shell, and spread out until ‘ ep a kind of flocculent fringe round the shell, filling up the He ae the Toots of the spines, and rising a little way along visible pret. This external coating of sarcode is rendered very oleeene the oil-globules, which are oval, and filled with intensely pes ae secondary globules, and are drawn along by the sarcode, tiga © Seen with a little care following its spreading or con- of a . At the same time an infinitely delicate sheath iiaiee €, containing minute transparent granules, but no oil- a ra rises on each of the spines to its extremity, and may be poe liar ee up one side of the spine and down the other, with the pseudo are’ movement with which we are familiar in the

Podia of Gromia. -1f the cell in which the Globigerina is

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floating receive a sudden shock, or if a drop of some irritating fluid be added to the water, the whole mass of sarcode retreats into the shell with great rapidity, drawing the oil-globules along with it; and the outline of the surface of the shell and of the hair-like spines is left as sharp as before the exodus of the sarcode.”!

When a sample of the surface-layer of the “ globigerina-ooze” is brouglit up from the sea-bottom by the sounding apparatus or the dredge, the shells are found for the most part perfect, except in the want of spines, but are of a more opaque whiteness than those cap- tured near the surface, and hence have been supposed to be dead. This difference of aspect, however, may be attributed to the increase in the thickness of the shell by exogenous deposit, which is doubt-

less the cause of the like change in Polymorphina; and asa large

proportion of these bottom-shells have their chambers filled with sarcode exactly resembling that of the types which unquestionably live at the bottom, the fact that in their young state they are found floating in the upper waters does not appear to the writer a suffi- cient disproof of the previously accepted belief that they live also at the bottom. And the fact that the thickened shells, when filled with their sarcodic contents, are so much heavier than sea-water as at once to sink to the bottom when placed in a vessel of that liquid seems strongly to indicate that so soon as adult growth (with suc- cessional increase in the number of chambers) has been attained, the carbonate of lime which the animal continues to separate from the sea-water is applied to the thickening of the shell, which will then sink to the bottom of the sea in virtue of its increased specific gravity. And since other Foraminifera undoubtedly pass their whole lives on the ocean-bottom, drawing their sustenance from sea-water in the manner already explained, there seems no reason why the subsidence of @lobigerine to similar depths should put an end to their vital activity. It is only in the surface-stratum of the globigerina-ooze, however, that the shell-chambers are occupied by sarcodic bodies, Its sub-surface layer consists partly of stil re- cognizable fragments of the shells, diffused through a mass of amorphous particles, which appears to be the product of a still fur- ther disintegration of their substance ; whilst the yet deeper layers of the "ooze" consist entirely of amorphous particles, all trace of shells being lost. It was observed in various parts of the 'Chal- lenger" voyage that in particular areas the " globigerina-ooze " was altogether wanting (being replaced by a red clay, probably re- sulting from the metamorphosis of volcanic products), even though the living animals were found as usual in the upper waters; and the absence of this calcareous deposit on the sea-bottom seemed attri- butable to the pressure resulting from its very great depth, —be- tween 2500 and 3000 fathoms,—which, with the aid of carbonic acid contained in all sea-water, would exert a solvent action, thus restoring to it these portions of the great calcareous deposit of which the materials had been drawn from it by the living Globigerine. The higher forms of the Globigerine type constitute two principal series, in one of which the chambers succeed each other along a straight axis, whilst in the other they form a spire. One of the most common types of the first group is the Teatularia (14 in fig. 1), in which the

chambers are arranged bi-serially, those of the two sides alternating with each other, and each communicating with the chamber above and below it on the opposite side ; as is well seen in the 'internal cast" (fig. 17, A), which is an exact model

'Fra, 17.—Internal casts of Foraminifera:—A, Textularia; B, Rotalia.'

(in glauconite or some other ferruginous silicate) of the sarcodic body that occupied the shell. The type of the second group is the almost universally diffused Rotalia, in which the chambers are dis- posed in a turbinotd spire (18 in fig. 1), through which passes a continuous stolon-process (as shown in the internal cast, fig. 17, B), lying on the lower and inner side. Of this type there are several very interesting modifications. Thus, in Discorbina (15, fig. 1) the chambers are flattened out over the surface to which the shell ad- heres; while in Planorbulina (17 in fig. 1) the early spiral plan soon gives place to the cyclical, and the shell thenceforth spreads, by concentric additions, over the surface to which it adheres. In those most-developed forms of this type which vccur in warmer seas, the

1 Sir W. Thomson in Voyage of the Challenger, vol. i. p. 213.

later-formed chambers do not merely surround the earlier, but are piled up more or less regularly upon them ; and we find such aggre- gations spreading over the surfaces of shells, or clustering round the stems of zoophytes. Two of the most remarkable modifications of the planorbuline type, which strikingly illustrate the extremely wide range of variation anion Foraminifera, are Polytrema and Orbitolina. The former, which was described by Lamarck as a coral, under the name of Millepora rubra, is a very common para- site upon shells and corals from the warmer seas, — sometimes spread- ing itself out horizontally in the form of a depressed cone, some- times rising up from a small base in an arborescent growth, and sometimes developing itself into knobby excrescences. In all these varieties, the structure of the individual chambers, and their mode of communication with each other, remain essentially the same,— the diversity in the aggregate forms being simply due to the want of any definite plan of increase. The Orbitoline (Lamarck), which occur abundantly in eertain

beds of Chalk, seem to have been gigantic forms of the planorbuline type, represented at the present time by some comparatively minute organisms found on the Aus- tralian coast, which commence life as Planorbulinw, and then, by the sequential addition of chambers both above and below, as well as at the margin, come to acquire a sugar-loaf or a globular form. The size of the globular examples of fossil Orbitolinw, which, like the flints of chalk, are often found in Tertiary strata, varies from that of a small pea to that of a large bullet. There is a spread- ing Orbitolina in the Chalk, which sometimes attains the extra- ordinary diameter of four inches. These forms are of peculiar in- terest, as showing the tendency of the Foraminiferal type to that indelinite Zoophytic extension, of which we have the highest example in the Kozodn to be presently described.

*The highest forms of the Rotaline type (which are confined to tropical seas) correspond with those of the "Numimuline" in the complexity of the organization of their shells, which only re- veals itself to microscopic investigation. Each chamber has its own complete chamber-wall, so that the partitions which separate two contiguous chambers are double; and between these we find an additional deposit of calcareous substance, which the writer has designated as the '*intermediate skele- ton." This deposit is channelled – through by a set of canals distributed upon a | regular plan, and al- together forming a '*canal-system" (fig. 18). These do not communicate direct- ly with thechambers, but give passage to sarcodic extensions formed by the coal- escence of pseudo- podia that have pass- ed through the pores of the proper cham- Fic. 18.—Section of Rotalia Beccarti, showing the*

ber-walls. And as canal system, a, 0, ¢, in the substance of the inter- the development of mediate skeleton; d, tubulated chamber-wall.

this " canal-system " ig exactly proportionate to that of the "in- termediate skeleton," it may be affirmed with some confidence that, as the formation of the latter proceeds, in the first instance, from the sarcodic expansion which covers the exterior of the chamber-walls, so it is continued by the prolongation of that

Fig. 19.—Calcarina laid o :

aid open: a tubulated wall of chambers; 8, intermediate

skeleton, extending into outgrowths; ¢, channelicd by canal-system.

expansion into the ‘ canal-s “J

t -system. named from its resemb extraordinary developm completely envelops t be seen of its chambe

Now, in Calcarina (so

ent of this intermediate skeleton,—which so he original rotalian shell, that nothing can ts externally, save towards the termination of

lance to a spur-rowel, fig. 19) we find an.

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the last whorl of the spire, and whicli extends itself into club shaped outgrowths that have no connexion with the chambered spire except through the canal system. There is no other recent Foraminifer at present known in which the ‘intermediate skele. ton” and the “ canal-system” attain such a remarkable develop. ment; and it was under the guidance of the structure of Coogee, as previously elucidated by the writer’s microscopic inquiries, that Dr Dawson was first led to recognize the “ canal-system ” in Eozoin canadense, and thus to determine its Foraminiferal character—as will be presently explained.

Another very interesting type which must be placed in the “ globigerine” series on account of the coarseness of the perfora- tious of its shell-wall, but whose spiral mode of growth differs entirely from that of ordinary Rotalians, is the Fusulina of the Carboniferous Limestone (fig. 20). This bears so strong a resem- blance in form to the Alveolina of the “ Milioline” series (fig. 10) that it was for a long time. associated with that type, although

differing from it in the opening of its chambered interior by a single fissure along the middle of the lip, instead of by a row of pores. The interior,

instead of being minutely divided into a number of separate chamberlets, is found to consist essentially of a symmetri- cal spire of simple chambers, each of which extends on either side

Fig. 20.—Section of Fusulina Limestone.

into an "alar prolongation," analogous to that of other spirally growing Foraminifera. But these alar_prolongations, instead of overlapping the preceding whorls, as in Nummulites, are prolonged in the direction of the axis of the spire, those of each whorl pro- jecting beyond those of the preceding, so that the shell is elongated with every addition to its diameter. These alar extensious are con- strieted at intervals, so as to form linear series of partially divided chamberlets, and frequently take a somewhat irregular course ; 80 that when the shell is traversed by sections (fig. 20) these reveal an aggregation of chamberlets (like those of the investing whorls © Nummulites, fig. 24), in which no definite arrangement can at first be traced.

The Family Nwmmulinida, of which the well-known fossil Num- mutite is a characteristic example, includes the greater part of the — and most elaborately constructed of the "vitreous" Foram- inifera. Various plans of growth prevail in this family ; but its

Fig. 21.—Internalcastof Polystomella craticulata: a, retral processes, — from the posterior margin of one of the segments; 6, d', smooth anterior margin of the same segment; ¢, cl, stolons connecting successive segments 2 J uniting themselves with the diverging branches of the meridional saa d, d@}, @, three turns of one of the spiral canals; e, e1, e, three of the meridiope canals; /, /!, 7%, their diverging branches.*

distinguishing characters consist in the completeness of the wall that surrounds each segment of the body (the partitions bene? the chambers being double), in the density and fine tubulation of the shell-substance, and in the presence of an " intermediate skeleton, with a "canal-system" for its nutrition. This last, howevel, i altogether wanting in the smallest and more feebly developed €%-

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the group, such as Nontonina (19 in fig. 1), and is scarcely a ni onic Polystomella crispa,(16 in fig. 1), one of the most common of British Foraminifera, though in the large Polystomella of tropical seas the canal-system presents a regular development not approached elsewhere. This is specially displayed by " inter- nal casts" of this shell (fig. 21), that have been fortunately obtained by the decalcification of specimens in which the sarcodic contents of the chambers had been replaced by mineral deposit, so as to give an exact model of the original animal. A The Nummuline type is most characteristically represented at the present time by the genus Operculina, which is so intimately re-

Fig. 22.—Operculina laid open, to show its internal structure: @, marginal cord seen in cross section at a'; 6, b, external walls of the chambers; c, c, cavities of the chambers; c', c', their alar prolongations; d, d, septa divided at d', d', and at a, so as to lay open the interseptal canals, the general distribution of which is seen in the septa ¢, e; the lines radiating from e, e point to the secondary pores; g, g, non-tubular columns.

lated to the true Nummulite by intermediate forms that the two types cannot be separated by any definite boundaries, notwithstand- ing the dissimilarity of their most characteristic specimens. This genus is represented in temperate seas by small and feeble examples; but it attains a much higher development in tropical seas, the largest existing Operculina, however, only attaining the size of the smaller fossil Nwmmulites. As the organization of Operculina affords the clue, not only to that of the great Nummulitic series, which, at the cominencement of the Tertiary epoch built up an immense mass of limestone that girdled a large part of the globe, but also to that of the far more ancient Eozobn, it will be described in some detail. The shell is a compressed nautiloid spire (fig. 22), the breadth of whose earlier convolutions increases in regular pro- gression, but of which the last convolution (in full-grown specimens) usually flattens itself out like that of Peneroplis (5 in fig. 1). As a rule, the shell-wall of each whorl of the spiral completely invests all the preceding whorls ; and each chamber-cavity (fig. 22, c, c) is continued from the margin towards the centre by two "alar pro-longations," one on either face of the spire (¢', ¢'), which are filled during

life by extensions of the sarcodic segments that occupy the Successive chambers, The size and extent of these "alar prolonga- tions" differ much in different varieties of Operculina, and often in different parts of the same shell,—being, as a rule, least marked in Proportion as the spire flattens itself out. There is often no ex- ternal indication of them, the successive whorls of the spire being visible from the centre to the margin; but in vertical sections the spiral lamina of each whorl is still seen to be continued over the whole of the preceding whorl, even to the centre of the spire, though it may adhere to it everywhere except near its margin. The chambers are separated by double septa, which are shown in trans- Verse section at d, d; these do not extend internally quite to the margin of the preceding whorl, but leave a fissured aperture, by which each chamber communicates with the one behind and before 1, and the last chamber with the exterior, as seen at a", The spiral lamina," which encloses the chambersand & their "lar prolonga- tions," is perforated by minute closely-set. tubuli of about rrtooth of an Inch in diameter ; the orifices of these are seen on the internal wall of the chambers to be disposed With great re larity, as In fig. 28 ; and they seem normally to run parallel to each other (fig. 24), so Fic. 23.—Internal surface of wall of two cham- as to open with equal foe bers, a, a, of Nummulite, showing the orifices of

ul its minute tubuli; 8, 6, the septa containing © etl on the external canals; ¢, ¢, extensions of these canals in the ace. But in their intermediate skeleton; d, d, larger pores.

it~ diane the interior towards the exterior of the shell these Metimes approach and soinetimes diverge from one another,

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so that the pseudopodia which pass through them issue forth in closely-set bundles, separated by intervening spaces of non- tubular shell. These imperforate portions are harder than the porous shell, and often project as ridges or tubercles, forming a more or less regular "sculpturing" of the surface. They frequently correspond to the septa beneath, which are themselves composed of non-tubular shell-substance, and are overlaid by ridges of the same vitreous imperforate material. Nothing can be more inconstant, however, than this sculpturing, even on different parts of the

same shell ; so that it cannot be accounted as of the least value as a specific character. The outer edge of the spire is bounded by a peculiar band, of different structure from the rest, which may be distinguished as the " marginal cord" (fig. 22, a, a). This band, instead of being perforated by minute parallel tubuli, is traversed by a set of larger canals, inosculating with each other, and forming part of the '"canal-system,"—+the peculiarity of its character being clearly shown in vertical sections of well-preserved fossil Num- mulites (fig. 24, d, 6). The "canal-system" consists in the first

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Fig, 24.—Vertical section of tubulated chamber-walls, a, a, of Nummulite; b, 6, marginal cord; ¢, cavity of chamber; d, d, non-tubulated columns,

place of a pair of 'spiral canals," which run along the edges of the marginal cord, communicating with each other through its system of inosculating passages ; while from each of these there pass off into spaces left between the two layers of each septum (as shown at d', d", fig. 22) a series of "'interseptal canals," the dis- tribution of which—marked out by causing them to imbibe coloured fluid—is seen in the septa e,e. The general arrangement of this canal-system will be better understood by reference to that of Polys- tomella shown in its "internal cast" (fig. 21),—the position of the "spiral canals," however, as well as the distribution of their branches, being very different.

The typical form of the Nuwmmulite is lenticular (fig. 25, B), some-

Fig, 25.—a, piece of Nummulitie Limestone from the Pyrenees, showing Num- mulites laid open by fracture through the median plane; 8, vertical section of Nummulite; c, Orbitoides.

times more nearly approaching the globular, whilst in other cases it is as compressed as that of Operculina,—great differences of this kind presenting themselves between individuals, which, on account of their general

conformity of structure, must be accounted specifi- cally identical. It is among the compressed forms that the largest size is attained,—some of these measuring 44 inches across, while the globose forms seldom much exceed an inch in diameter. The distinction which separates the typical Nummutites from the typical Operculine consists in this, that in the former the earlier whorls are completely invested by the alar prolongations of the later,—the successive turns of the spiral lamina being separated over their whole surface from those internal and external to them by intervening spaces, as shown in fig. 26, so that the spire is but little, if at all, discernible on the surface. On the other hand, we never find the later whorls ef true Nummulites flattening themselves out margin- ally, like those of the typical Operculine ; and there even seems reason to believe that when the spire has attained its full growth, it tends to close itself in. Curious differences are seen,in the course and arrangement of the "alar prolongations"; and it has been pro- posed to group the numerous modifications of the Nummulitic type in accordance with these differences. Thus, in some of these, the

-alar prolongations extend in a regular radial direction from the

margin to the centre of each whorl of the spire, being separated by corresponding radial prolongations ofthe marginal septa. In other instances, again, they follow a sinwous course, the septa prolonged from those of successive chambers still remaining distinct from one another. From these, again, we pass to a group in which the septa

inosculate, so as to break up the alar prolongations into subdivisions, the partitions between which (as secu in fig. 26) show themselves in vertical sections in far greater numbers than the proper septa.

intervening spaces, the superposed lamelle of Orbitoides are com: posed of chamberlets of irregular form (figs. 31, 32, a, a), which are piled up, onc upon another, communicating vertically by minute

Fic. 26.—Vertical.section of portion of Nummulite, showing the investment of the earlier whorls by the alar prolongations of the later: , marginal cord; 0, chamber of outer whorl; c, c, whorl invested by a: , one of the chambers of the fourth whorl from the margin; e, e', marginal portions of the enclosed whorls; jf, investing portion of the outer whorl; g. g, spaces left between the investing portions of sueeessive whorls; A, h, sections of the partitions dividing these.

And by a further increase of this subdivision, a complete reticula- tion is formed between the successive whorls of the spiral lamina, by the complex inosculation of the septal prolongations. Now, although it would not be diffi- cult to arrange a collection of Nummulites under a num- ber of specific types founded on these characters, if account were only taken- of the specimens showing the most strongly marked differences, yet when due attention is given to the intermediate forms, they are found to present such a transitional gradation as to make it im- possible to draw any absolute differential lines between the humerous components of the series. —The canal system of Nummutlina bears a close re- semblance to that of Opercu-
Fic. 27—Internal east of two ehambers, a, a, lina ; and it is sometimes Nummutlina, i pm ec between brought into beautiful dis- em passing into 6, marginal plexus. tinctness in fossil specimens by the infiltration of ferruginous or other fossilizing material. And sometimes fragmentary " internal casts" present themselves, which admirably display the distribution of parts of the system (fig. 27).

We find in the larger forms of the Nummuline type the same tendency to become ' labyrinthic," by the subdivision of the prin- cipal chambers into "chamberlets, " that we have seen in the Mili oline. Just as Pene- roplis is converted by such subdivision into a spiral Orbieulina, and this, again, by the early exchange of the spiral for the cyclical plan of | growth, into the cycli- cal Orbitolite, so Oper- culina, without any other departure from the ordinary Nummu- line type, becomes Heterostegina (fig. 28) ; whilst the substitution of the cyclical for the spiral plan of growth produces the discoidal Cycloclypeus (fig. 29), the largest existing Foraminifer yet discovered, its diameter sometimes reaching 2} inches, This is the recent representative of the very important fossil type Orbitoides, examples of which present themselves very abundantly in many localities in association

with Nummulites (fig. 25, c), which they so closely resemble as to be easily mistaken for them. Some of them are very thin flattened disks, of the proportion shown in vertical section in fig. 30; while others have two or three times the proportionate thickness. Each disk has a central plane of chamberlets (figs. 31, 32, 6, 6) resembling that of Cycloclypeus, arranged with a general but not constant regu- —_ — _ encortna circles; but whilst in the recent type this rf kub te is enclosed above and below by successive lamellae

tubular shell-substance not separated from each other by any

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Fie 28.—Heterostegina.

apertures in their shell-walls. This arrangement obviously cor. responds with that of the most reticulate forms of Nummulites.

Fic. 30.—Vertical section of Orbitotdes; a, primordial chamber,

Another important link of affinity between Orbitoides and Cyelo- elypeus is furnished by the disposition of the canal-system, which, allowance being made for the cyclical plan of growth of the former, as contrasted with the spiral 2

plan of the latter, is essentially the same in the two types. This, moreover, is beautifully shown in 'internal casts" of Orbitoides found by Professor Ehrenberg in the Greensand ; which, though fragmentary, display a canal-system precisely resembling that which the writer had worked out in Cycloelypeus by the examina- tion of sections of the shell.

It has been by the study of such " internal casts," recent and fossil, taken in connexion with the micro- scopic appearances shown in thin sections of its calcareous layers, that the Foraminiferal nature of the Serpentine-lime-stone of Canada has been

elucidated, of which some of Fic. 31.—Horizontal section of disk of

the deepest beds of the Lau- rentvan formation (the earliest

Orbitoides; showing at 6, b the cham- berlets of the median plane, and at a, a those of the superposed lamella.

series of stratified rocks at present known) are composed, aud which has its parallel in certain beds that lie near the base of the "fundamental gneiss" of central Europe. In order that the evidence of the organic origin of this rock— a point of the highest paleontological and petrological interest—may be properly understood, regard must be had to what is even now going on in the depths of the ocean.

Fig. 32.—Chamberlets of the superposed lamelle a, and of the median plane ?, of Orbitotdes, more highly magnified. The animals that form the enormous mass of globigerina ooze at present in course of deposit over vast areas of the sea-bottom increase and multiply by limited gemmation ; that is, the size of each zndividual shell, which depends upon the number of segments of which it is composed, 8 restricted by the cessation of continuous gemmation after 4 definite number of segments has been produced. An inde- finite extension of the type, however, is provided for by the detachment of further segments, which, increasing by gemmation, in their turn give origin to new shells, In the

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larger Foraminiferal types last described, on the other hand, conéenwous gemmation proceeds much further; and thus we may have in an Orbitolite, a Nummulite, or a Cycloclypeus, hundreds or even thousands of chambers, all formed by the segmental extension of the animal body from one " primordial segment." Further, in Polytrema we find a rotaline shell extending itself by the continuous gemma- tion of the animal, without any definite limit either of size or shape,—its increase taking place by vertical as well as by horizontal gemmation, so that it develops itself into forms which are essentially zoophytic. Hence there is nothing in the nature of Foraminiferal organization in the least degree inconsistent with the idea that a shell essentially "Nummuline" in its character should extend itself indefinitely by the continuous gemmation of the animal that forms it, not merely over horizontal planes, but also in the vertical direction, so as to

produce solid massive struc- tures bearing a strong general resemblance to Coral growths. _ Again, the dead shells of Foraminifera brought up from many parts of the sea-bottom are found to have their cavities filled with green or ochreous ferruginous silicates, which seem allied in composition to the "glauconite" of the Greensand formation; and these mineral deposits occupy not merely the climbers of the shell, but its canal- system also; so that when the calcareous shells have been dissolved away by dilute acid (which does not act on their contents), internal casts are obtained, which are perfect models, not only of the soft sarcodic segmented body of the animal, but also of its extensions into the canal-system that traverses the substance of the intermediate skeleton (figs. 21, 27). Yet further, this mineral deposit sometimes penetrates the minute tubuli of the shell itself 3 so that the surface of the internal cast of each chamber is beset with little points which represent the pseudopodia that ex- tended themselves into those tubuli from each sarcodic segment. There can be no reasonable doubt that these "internal casts" are formed by a process of chemical " sub- stitution," —the animal body, in the progress of its decay, being replaced, particle by particle, by ferruginous silicates precipitated from sea-water by the liberation of ammonia. And the explanation of the fact that this replacement only vccurs in particular localities (notably in the Agean, over the Agulhas bank near the Cape of Good Hope, and on certain parts of the Australian coast) probably lies in some local peculiarity in the composition of the sea-water, which may not improbably be due to the discharge from sub- matine springs of water containing an unusual quantity of the materials of the deposit.

Now there is ample evidence that a similar process has taken place at various geological periods, For, as was first pointed out by Professor Ehrenberg, the green sands which eecur in different formations from the Silurian to the Tertiary epoch (being especially characteristic of the earlier Cretaceous) consist very largely (though not exclusively) of the "internal casts" of Foraminifera,—as is shown by microscopic examination of their grains. Examples of such casts, which can be referred without the least difficulty to known Foraminifera] types, have been already given (figs. 17, 27). Hence there is no inherent improbability in such an occupation of the ehamber-cavities, of the canal- se a and even of the minute tubulation, of a still earlier eral structure, formed by the indefinite extension ; 2 N

*ummuline growth into coral-like masses. And as mae e ey reason to believe that the composition of toned a al has varied greatly at different _ geological weenie * an on ahead that it contained magnesian salts at vale c. Sin much larger quantity than at present, it biases : ae that the. silicates which replace the soft Ns oot ¢ animals of the earliest organisms should be*

my Magnesian. This expectation has been singu-

larly confirmed by the fact ascertained by Dr Sterry Hunt, that in certain Silurian Limestones from Wales and New Brunswick, the segments of Crinoidal stems have the soft animal tissue, which originally filled the interspaces of their calcareous network, replaced by a silicate of alumina, iron, magnesia, and potass—intermediate between glauconite and serpentine. Now, the Serpentine-limestone that lies near the base of the Laurentian formation in Canada is ordinarily composed of alternating layers of carbonate of lime (in the condition of calcite) and of silicate of magnesia (serpentine),—these layers being superposed upon one another with great general regularity (as shown in fig. 33), and frequently exceeding fifty of each kind innumber, In some localities, however, the calcite is replaced by dolomite (magnesian limestone), while the serpentine is replaced either by loganite (a compound of silex, alumina, magnesia, and iron), or by some other magnesian silicate; but the alter-

W.Gs se Fic. 33.—Section of the Eozoic Serpentine-limestone of Canada, showing alter-‘

nation of calcarcous (light) and serpentinous (dark) lamelle.

nation of calcareous and siliceous lamella is just as regular in these cases as in the typical ophicalcite, and there is every probability that the dolomitic layers were originally formed as calcite, and subsequently metamorphosed by magnesian infiltration. The regularity of this alternation of calcareous and siliceous lamella, which has no parallel in any undoubted mineral, taken in connexion with the re- semblance of the entire formation (extending continuously over hundreds of square miles) to ancient coral reefs, hav- ing suggested to Sir William Logan its organic origin, a careful

microscopic examination of specimens that seemed to have been least altered by metamorphic action was made at his instance by Dr Dawson of Montreal, with results that left him in no doubt either of the organic nature of the calcareous lamelle, or of the Foraminiferal affinities of the organism. These results were confirmed by the writer of this article, whose re-examination of the subject, to meet the objections raised from time to time against Dr Dawson's conclusions, has only had the effect of strengthening his original conviction of their truth. And the following general sketch of the structure of Hozoin canadense is here presented with full confidence, as expressing, not merely his own views, but those of the numerous eminent naturalists who have examined for themselves the evidentiary facts placed before them.

- *Of those who may be considered as qualified by special study of*

the Foraminifera to form a judgment on this matter, Mr H. Carter is the only one who has expressed his dissent ; and he hag never scen

The calcareous lamelle of the Canadian Ophicalcite, which are always thickest near the base of the mass, are superposed one upon another so as to include between them a succession of "stories " of chambers (fig. 34, a, A}, a, a?),—the chambers of each ""whery "

Fig. 34.—Calearcous skeleton of Eozoién canadense: al}, Al, chambers of lower story; A?, A?, chambers of upper,story, imperfectly divided at a, a; B, B, tubulated or Nummuline layers; c ¢, intermediate skeleton; D, large pussage from one story to another; E, E, E, bianching canal-systems.

opening one into the other, as at a, a, like apartments en suite, but being occasionally divided by complete septa, as at b, 6, which are traversed by passages of communication between the chambers they separate. Each layer of shell consists of two finely-tubulated or « Nummuline" lamelle, B, B, which form the boundaries of the chambers above and beneath, and of an intervening deposit of homogeneous shell-substance, ©, ©, which constitutes the " inter- mediate skeleton." The amount of this varies considerably in dif- ferent layers, while the thickness of the "proper wall"

of the chambers (or “ Nummuline lamella”) remains almost constant, the distinction between the two being just as marked (in well-pre- served specimens) as it is in the recent Calcarina (fig. 19). The

tubuli of the “ Nummuline” lamelle are usually filled up (as in the Nummulites of Nummulitic Limestone) by mineral infiltration,

ie a ss Z : Zs eas eee vee J Fic. 35.—Highly-magnified section of a portion of the calcareous skeleton of Eozoén canadense: a, a, Nummuline layer showing parallel tubuli with a wavy bend along the plane a’, a’; 6, origins of canal-system penetrating the

intermediate skeleton ¢, c, which is traversed obliquely by cleavage-planes that pass on into the Nummuline layer,

canals (fig. 35, }, 0) take their origin, not directly from the chambers, but from irregular Zacune or interspaces between the outside of the proper chamber-walls and the “ intermediate skeleton,” exactly as in Calcarina,— the extensions of the sarcode-body which occupied

et ee a ce | Se ee) a ee a eee

— most characteristic specimens of Kozoic structure. On the other easel ay ages Professor Max Schultze, who took up the enquiry porctad + end of his life, not only publicly and most explicitly — 1s conviction that the canal-system found in the calcareous

must be organic, but left behind him an elaborate Memoir on

the subj i ; : 2 ; : hark ‘oe ample illustrations, which unfortunately still remains

NIFERA

them having apparently been formed by the coalescence of the’ pseudopodial filaments which had issued forth through the tubulated bode It is to be remarked that the substance, not merely of the intermediate skeleton, but of the Nummuline layer, is traversed h oblique lines, indicating

the cleavage-planes of calcite. This » what is constantly seen in fossilized calcareous organisms—such ag the shells and spines of Echinida, or the stems of Crinoidea—which retain their organic arrangement unchanged, and thus affords no basis whatever for the contention that these calcareous layers are purely mineral. On the other hand, the fact that the portions of the canal-system, shown in thin sections (fig. 35), continually cross the cleavage planes, instead of lying between them, furnishes a strong objection to the hypothesis that the appearances which have been interpreted as indicating a regular distribution of ramifying canals can havebeen produced by mineral infiltration. Further, the distinct continuity of these cleavage-lines through the " Nummuline layer" (fig. 85, a, a) proves this layer to be essentially calcareous,—the layer of serpentine-fibres which is commonly found in its place after de- calcification being a secondary deposit, formed in the manner to be presently described.

When a well-preserved fragment of Hozoén has been treated with dilute acid, so as to dissolve away the calcareous lamelle, we have an " internal cast" in serpentine, which gives us a precise model of the sarcodic body by which the cavities of the calcareous struc- ture were originally occupied. We see, in the first place (fig. 36),

Fig. 36.—Internal cast, in Serpentine, of the animal body of Zozodn canadense..

that each of the layers of serpentine forming the lower part of such a.specimen shows more or less of a segmental arrangement,—being, in fact, made up by the coalescence of a number of minute serpen- tinous granules, such as are shown separately or but slightly coales- cing in the upper part of the figure. This shows that there is not that difference between the regularly "lamellated" and the "acervuline" plans of growth which might at first sight be sup- posed,—the chambers having been separate in the latter, whilst im the former they constituted imperfectly subdivided galleries. In those wider spaces between the serpentine-layers, which were origi ally occupied by the thicker calcareous layers forming the <

Geographical Distribution.—Most of the Families of this group have a very wide geographical distribution, —this

heing especially the case with the smaller and simpler re- presentatives of them that range over those vast areas in the deep oceanic basins, of which the bottom-temperature is kept down by the polar underflow. A striking resem- blance has long been noted between the poor and feeble Foraminiferal fauna of shallow waters in colder-temperate seas, and that of great depths in tropical seas; and this similarity is now explained by the correspondence of the temperature to which these two faunz are subjected. The larger and most developed examples of existing Fora- minifera, on the other hand, are limited to the shallower seas near tropical shores, or covering coral reefs where the bottom-temperature is comparatively high; or to partially enclosed seas, like the Mediterranean and Red Sea, which are cut off from the polar underflow by the shallowness of the straits which connect them with the oceanic basin. It is in such seas that we meet with the largest Orbiculine, and the most complex Orbitolites and Alveoline,—the first of these "imperforate" types being generally abundant in tropical shore-sands, the second in shallow dredgings along the Australian coast, the great barrier-reef, and the lagoons of "atolls" in the Coral Sea, while the third seems to attain its highest development in the Philippine Seas. So, again, among the "perforate" Zagenida, we find the "nodosarian " and "cristellarian" types attaining a very high development in the Mediterranean ; the most complex forms of the "rotalian" type, including the zoophytic Polytrema, are only met with in tropical or sub-tropical seas; while, with the exception of small and modified Polystomelle and dwarfed Operculine, there are no known representatives in the colder-temperate or polar seas either of the gigantic Cycloclypeus, or of the large Operculina and Heterostegina of the tropics. But while the Foraminifera] fauna thus obviously depends ou an elevated temperature for the attainment of its highest development as regards the size and complexity of its individual members, the numerical multiplication of its lower forms (as is the case in many other groups) seems to be favoured by a much lower degree of warmth ; so that we find the vast area of "globigerina-ooze" extending to the borders of the Polar seas. There, however, it ceases almost abruptly, the place of this caleareous deposit being taken by an accumulation of the siliceous skeletons of Radiolarians and Diatomacez.

It is not a little curious, however, that recent researches should have disclosed the fact, that the existing Arenace- ous Lituolida attain their highest development—in regard no less to size and complexity of structure than to number —on the deep sea-bottom,—the additions to our previous Knowledge of the Foraminiferal fauna made by the dredg- Ings of the " Porcupine," the " Valorous," and the '" Chal- lenger" having been far greater in this section than in either of the calcareous-shelled groups. And it would hence appear that an elevated temperature is not as essential to the high development of the foraminifera which construct "tests " by gluing together grains of sand, as it is to that of the shell-forming types which separate the material of their "porcellanous" or " vitreous " skeletons from the sea- Water in which they live.

Geological Distribution.—There is no division of the Animal Kingdom whose range in time (so far as is at present known)! can be compared with that of the Foraminifera. Looking, indeed, to the vast series of ages that must have

e2n required for the deposit of that long succession of

Pper Laurentian and Huroniau rocks which intervenes

*etween the Eozoic Limestone of the Lower Laurentians of Canada, and the lowest strata in which the most ancient *epresentatives of the Paleozoic fauna have ag yet been*

*L : Appearances resembling Annelid burrows have been found in Foe ea rocks ; but these cannot be safely relied on as evidence of * existence of Marine Worms at that epoch.*

found, it may even be said that all other fossils are modern by comparison. For the interval between the formation of the Canadian Hozodn and the period represented by thie oldest fossils of the Lower Cambrian series seems undoubtedly to have been quite as great—geologically speaking—as that which intervened between the latter and the existing epoch, if not greater,—the "fundamental gneiss " of Sir Roderick Murchison, which

represents in cen- tral Europe the Laurentians of Canada, and near the base of which is found the kindred Kozodn bavaricum, having a thickness estimated at 90,000 feet, and being overlaid by a great thickness of other non-fossiliferous rocks, Hence the determination of the organic origin of this Ophicalcite, and of its Foraminiferal affinities, which has been effected by the examination and comparison of parts of specimens so minute as to be scarcely visible to the naked eye, must be considered as one of the most remarkable results of micro- scopic research—fully equal in importance, when considered in all its bearings, to the discovery by Prof. Ehrenberg of the Foraminiferal origin of Chalk.?

Indications of Eozoic structure have been found in various strata of uncertain age underlying the Silurians of North America, and also in some of the older rocks of the Scan- dinavian series; and there is no improbability in the idea that its existence may have been prolonged through the whole of that long period, conimonly regarded as azoic, which has been designated by Prof. Dana as Archean. In the earliest strata usually accounted fossiliferous there are found, alike in the old and new continents, a number of curious organisms, sometimes of considerable size, which have received the names Archeocyathus, Stromatopora, and Lteceptaculites, The nature of these is still problematical, their internal structure not having yet been fully eluci- dated ; but while it seems probable, on the one hand, that among the organisms whose similarity of external confor- mation has led to their association under these names, there may be several types of structure essentially different, there seems considerable reason to believe that some among them are really gigantic Foraminifera, presenting approximations to calcareous Sponges. The Limestones of the Silurian period have not been as yet minutely searched for the smaller forms of Foraminifera ; but green sands of Silu- rian age occur in various localities, the grains of which can be identified as " internal casts" of Foraminiferal shells.

It is in the Carboniferous Limestone that we first recognize a varied and abundant Foraminifera] fauna, which has recently been made the subject of special study by Mr H. B. Brady, whose very interesting results may be summed up as follows. (1) Of the "imperforate" or " porcel- lanous" Foraminifera no examples have been detected. (2) Of the "perforate" or "vitreous" series, on the other hand, each principal group is represented:

the Lagenda very slightly ; the Globigerinida by Textularia and various Ltotalian types ; while of the Nummulinida we find, not only three generic forms that are at the same time indivi- dually small and scantily diffused, but (in certain localities) such an accumulation of comparatively large shells of ‘ Lusulina (fig. 20), that they constitute almost the sole material of calcareous beds extending over large areas, (3) A large proportion of the foraminiferal types of this period belong to that “arenaceous” group which at present contains not merely the Zztuolida, whose “tests” are entirely made up of cemented sand-grains (among which

2 «

3 Monograph of the Carboniferous and Permian Foraminifera, published by the Paleontographical Society, 1876.

“the Saccamina, fig. 5, a, b, is distinctly recognizable), but also a number of generic types more or less allied to the recent Valvulina, in which there is a “vitreous ” shelly basis, more or less thickly incrusted by an arenaceous envelope. The “ isomorphism” of these with true “ nodo- sariues” and “rotalines” suggests the question whether they are not really in an evolutionary stage between the true sandy-tested and the completely caleareous-shelled types. ,

But there is a larger question even than this,—namely, whether those massive beds of Carboniferous Limestone whose texture is sub-crystalline, and in which scarcely any traces of organic structure are now discernible, do not owe their origin, like analogous beds of the Cretaceous forma- tion, to Foraminiferal life. The general tendency of recent geological opinion has beea to account for the absence of all traces of organic structure in such beds by the “ meta- morphism” they have undergone subsequently to their original deposition. Of the completeness with which such metamorphism may obliterate the evidence of organic origin in caleareous rocks it is impossible to have more “ pregnant instances” than those afforded by the purely crystalline marble of Carrara, which is unquestionably a

metamorphic Oolite, and the crystalline conversion of the Antrim Chalk in the neighbourhood of the basaltic out- burst which forms the Giant's Causeway. The abundance of Corals, however, in various beds of Carboniferous Lime- stone, accompanied by such accumulations of Brachiopods, Crinoids, &c., as might have been associated with them on coral reefs, taken in connexion with the fact that the substance of existing reef-building corals, when raised by upheaval, sometimes exhibits a metamorphism that causes it to bear a close resemblance to carboniferous limestone, has seemed to favour the belief that the azoic sub-crystalline beds of that formation had their origin in Coral growths. Against this, however, it may be urged that we have at the present time no continuity of Coral-growth over areas that are at all comparable to those which we find coutinuously covered with Carboniferous Limestone ; that the real parallel to these is presented bythe continuousbedsof Chalk formerly deposited over vast marine areas, by those of the Nummuli- tic Limestone of the succeeding period, and by those of Globigerina-ooze still in progress of production ; and that, if the tropical sea-bottom were now elevated into dry land, we should find over the deeper areas a continuous Forami- niferal deposit, interrupted in particular localities by upheaved reefs of Coral, whose slopes would be covered with caleareous-shelled Mollusks, Echinoderms, &c., bearing a general correspondence with the great Carboniferous Lime-stone formation.

Moreover, it has now come to be generally admitted that "metamorphism" is connected with mechanical disturbance, and especially with that " lateral thrust" which is the prin- cipal source of the plication and contortion of strata, and which must have given rise to the evolution of great heat. That such a change was extensively produced in the Car- boniferous rocks of Great Britain at the end of the Palzo- zoic period, when the horizontal and continuous Coal- measures were thus broken up into separate ' basins," bordered by intervening ridges formed by the uplifting of their subjacent limestone, is universally recognized. But, on the other hand, over the vast area of Russia that lies ee the Baltic and the Ural mountains, there seems to al i – — force inaction. Its strata are so nearly acme ie a it of their order of superposition of SS ae t. And there is such a remarkable absence aneraca a et ay in those of Silurian age that we ee a os sewhere slates represented by beds of Fc ue g the original form of that deposit which

re acquired the slaty character by subsequent

metamorphism. Now, since it is here that we also find the most extensive development of /uswlina-limestone in the place of those sub-crystalline beds which elsewhere form the great bulk of the Carboniferous Limestone, there seems exactly the same reason for regarding such a Fora- miniferal deposit as the original form of those beds. And this view derives remarkable confirmation from the pheno- mena presented by the Carboniferous Limestone of Ireland, which has been recently studied with great care by Prof. Hull! This formation extends over a very considerable area of the island,—constituting in its central portion an elevated plateau, whose nearly horizontal strata present no indication of lateral thrust, whilst along the margin of this area tlie calcareous strata have been elevated into ridges by thrust from the outside, with more or less of plication and contortion. Now, in these marginal ridges the traces of organic origin are scanty,—the presence of fossils, whether large or minute, being the exception and not the rule. In the level strata of the central plateau, on the other hand, the evidence of organic origin is almost everywhere complete ; and whilst fossil Corals, Mollusks, Crinoids, &c., are abundant in particular beds, great masses of the lime- stone are found by microscopic examination to consist of little else than minute Foraminiferal shells. A very strong case, then, seems made out for the belief that Foraminiferal life has contributed very largely to the production of those vast beds of Carboniferous Limestone (often exceeding 1500 feet in thickness) in which scarcely any trace of organic origin can now be found,—this share bearing to that of the Corals, which are generally credited with the whole, some- what of the same proportion that the Foraminiferal ooze of the deep-sea-bottom at the present time does to the Coral reefs of shallow waters, and the shells of Mollusks and Echinidans that live among them.

In the earlier Secondary rocks we do not find by any means the same evidence of abundant Foraminiferal life ; but this is very probably to be accounted for by the condi- tions of their depgsition. For during the Triassic period we find no representative of a deep oceanic calcareous deposit,—the oply considerable limestone bed (the muschel- kalk) being gbviously composed of the remains of the more developed fauna of comparatively shallow water. It is interesting, however, to find certain clay

beds of the New Red Sandstone yielding Foraminifera, chiefly of the Cristel- larian type, which can be identified—not only generically and specifically, but even varietally—with forms common in the Italian Tertiaries, and still living in the Mediter- ranean. In many of the Liassic clays Foraminifera are found in great abundance ; and here the " porcellanous" group first characteristically shows itself under one of Its least modified types, the Spiroloculina. In the formation of many Oolitic Limestones it seems probable that Foram nifera lad a considerable share. For while the material of many of the calcareous beds belonging to this formation was obviously furnished by debris of Corals, Echinoderms, and Mollusks, the nuclei of the component grains of the true Oolitic beds are so often found to be minute Forammr- fera, that we seem justified in regarding those beds as having been formed by a sub-aerial metamorphosis of shore sands largely composed of the minute shells belonging t0 that group, like many tropical shore-sands of the present time.

It was by the comparative study of specimens of Chalk brought from different localities that Professor Ehrenberg was first led to the conclusion? that this vast formation was mainly produced by the progressive accumulation 2 subsequent disintegration of the minute shells of various

1 Physical Geography and Geology of Ireland, 1878. h 2 Ueber die Bildung der Kreidefelsen und des Kreidemergels dure unsichtbare Organismen," Berlin, 1838.

types of Moraminifera, especially Globigerina (fig. 14),— a conclusion to which Professor W. C. Williamson was in-

dependently led by his study of the "Levant mud," a

white chalk-like deposit at present in progress of formation

on the comparatively shallow bottom of the eastern end of

the Mediterranean.' This conclusion has been fully borne

Fig. 37.—Microscopic Organisms in Chalk from Gravesend: a, 6, c,d, Textularia globulosa; e, e, e, ¢, Rotalia aspera; f, Textularia aculeaia; g, Planularia hexas; h, Navicula.

out by the deep-sea soundings and dredgings since carried on; which have established the fact that large areas of the great ocean-basins are covered to an unknown thickness by a Foraminiferal ooze, which, when dried, corresponds in every particular with ordinary Chalk. And there is, more-Over, very strong evidence that this deposit is not a repeti- tion of the old Chalk formation, but an actual continuation of it over areas which have undergone no such upheaval as that which raised the chalk of Europe, Asia, and America into dry land. Not only the Chalk, but the subjacent Greensand appears to have originated in great degree in Foraminiferal life,—its glauconite grains being (in the localities in which they seem to have undergone least attrition) internal casts of easily-recognizable types of that group, formed by the process already described as still going on upon parts of the existing sea-bottom. Various larger types of all the principal groups of Foraminifera occur in different parts of the Cretaceous formation,—the "porcel- lanous " sub-order being now fully represented.

The highest development of the Foraminiferal type, as measured by the extraordinary abundance of its largest and most complex examples, seems to have been attained in the early Tertiary period, to which belongs the vast formation of Nummulitic Limestone, forming a band often of 1800 miles in breadth, and sometimes attaining several thousand feet in thickness, which may be traced eastwards from the Atlantic shores of Southern Europe and Northern Africa (the Pyramids being built of this rock, and on a terrace formed by it) through Western Asia to Northern India and China, and likewise over large areas in North America—thus taking, to use the words of Sir Charles Lyell, a far more conspicuous part than any other Tertiary group in the solid framework of the earth's crust. In some localities it seems to lie comformably upon Cretaceous strata, so as to establish the continuity between the latest Secondary deposits and the earliest Tertiaries formed in the deep sea. In some localities this Limestone is essentially composed of an assregation of Vummulites (including, however, the fossil

1 Memoirs of the Manchester Philosophical Society, vol. viii.

remains of higher organisms), the spaces between the large and entire shells being filled in by minuter forms and by the debris of previous generations of the larger; whilst in other localities the Vummulites are replaced, wholly or in part, by Orbztocdes and Orbitolites. In the Paris basin the Nummulitic Limestone is represented by the Calcaire grossier, which is for the most part of Foraminiferal origin. Its lower calcareous beds are chiefly Nummulitic ; but in the middle part of the series we find the Miléoline group pre- dominating, some of its beds being chiefly composed of Orbitolites, whilst others (notably those of which a large part of Paris is built) are essentially made up by the aggregation of the smaller Miliole. The calcareous sand of Grignon, which consists in great part (like many beds of the Oolitic formation) of shells comminuted by the action of the waves, contains a great abundance of Foramintfera,— among them the large and complex Dactylopora, which is only represented at the present time by a minute form of extreme simplicity. In various marine deposits of the middle and later Tertiary periods, especially those which form the slopes of the Apennines, Foraminifera are abund- ant; but the larger forms gradually give place to the smaller, and the Foraminiferal fauna progressively approxi- Inates more closely to that of the present time.

Altogether it would certainly be not tov much to affirm that, so far as we are justified by positive evidence, no single group of the Animal Kingdom has contributed, or is at present contributing, so largely as the one of which a sketch has now been given to the formation of the crust of the earth,—by separating carbonate of lime from its solution in sea water, and thus restoring to the solid form the vast quantity of that material which is continually being taken up in solution, and discharged into the oceanic basin, by the percolation of rain-water through the calcareous strata which have been elevated into dry land, which are thus undergoing continual degradation. And if the origin of the great part of the Carboniferous Limestone in Foramini- feral rather than in Coral life be accepted as probable, the share taken by Foraminiferal life in this process during the Palaeozoic period would appear to have been fully equalled by that which it took in the formation of the Chalk, and in the production of the Nummulitic Limestone, of more modern geological epochs. (W. B. ©.)

FORBACH, a town of Lorraine, Germany, the chief town of a circle, is situated on an affluent of the Rossel and on the Metz and Saarbriicken Railway, about 5} miles south-west of Saarbriicken. Its industries include brew- ing, tannivg, and the manufacture of glass, soap, and pasteboard. At a short distance from the town are the large iron-works of De Wendel, Enkel, & Company, which employ about 1500 workmen. There are also large coal mines in the vicinity. Forbach possesses a real school, a higher female school, a Catholic and two Protestant churches, and a synagogue. After the battle on the neigh- bouring heights of Spicheren, August 6, 1870, in which the French under General Frossard were defeated by the Germans under Prince Frederick Charles, the town was occupied by the German troops, and at the conclusion of the war it was annexed to Germany. The population in 1875 was 6178. !

FORBES, ALEXANDER PENROSE (1817-1875), bishop of Brechin, was born at Edinburgh, June 6, 1817. He was the second son of Lord Medwyn, a judge of the Court of Session, and grandson of Sir William Forbes of Pitsligo. He studied first at the Edinburgh Academy, then for two years under the Rev. Thomas Dale, the poet, in Kent, passed one session at Glasgow university, and, having chosen the career of the Indian civil service, completed his studies at Haileybury College. In 1836 he went to Madras, but in consequence of ill-health, the result of the

climate, he was obliged after two or three years to return to England. He then entered Brasenose College, Oxford, where in 1841 he obtained the Boden Sanskrit scholarship, and in 1844 took his degree of B.A. He was at Oxford

during the early years of the great religious movement |

known for some time as Puseyism, and he was powerfully influenced by association with its leaders, Newman, Pusey, and Keble, and entered heartily into their views and aims. In 1844 he was ordained deacon and priest in the English Church, and held an English curacy; but being naturally attracted to the Episcopal Church of his native land, then recovering from long depression, he removed in 1846 to Stonehaven, the

chief town of Kincardineshire. The same year, however, he was appointed to the vicarage of St Saviour's, Leeds, and co-operated in a mission formed there, with strong Romanizing tendencies, which ere long collapsed. In 1847 Forbes was called to succeed Bishop Moir in the see of Brechin. He removed the episcopal residence to Dundee, where he resided till his death, com- bining the pastoral charge of the congregation with the duties of the see. He laboured in season and out of season, never sparing himself when work was to be done, and won not only golden opinions but warin affections, especially among the working classes. Through his energy and devoted endeavours several new churches were built in Dundee, and among them tle pro-cathedral of St Paul's. He was once prosecuted in the church courts for heresy; the accusation being founded on his primary charge, delivered and published in 1857, in which he set forth his views on the eucharist. He made a powerful defence of the charge, and was acquitted with "a censure and an admonition." Keble wrote in his defence, and was present at his trial at Edinburgh. Forbes was a good scholar, and above all a scientific theologian, and his social qualities were such as to endear him to all who knew him. He was author of treatises on the Nicene Creed and the Thirty-nine Articles, various commentaries and devotional works, discourses, and reviews. He died at Dundee, October 8, 1875.

FORBES, Davin (1828-1876), F.R.S., an accomplished traveller, mineralogist, metallurgist, chemist, and writer on chemical geology, brother of Professor Edward Forbes, was born at Douglas, Isle of Man, and received his early education there and at Brentwood in Essex. When a boy he manifested "an enthusiastic disposition as regards science," aud at the age of fourteen had already acquired a remarkable knowledge of chemistry. This sub- ject he studied at the university of Edinburgh, and he was still young when he was appointed superintendent of the mining and metallurgical works at Espedal in Norway. Subsequently he became a partner in the firm of Evans & Aiken, nickel-smelters, of Birmingham, and in that capacity visited Chili, Bolivia, and Pern. He died in London, December 5, 1876. Micro-petrology and chemical geology owe much to the researches of David Forbes. Besides reports for the Iron and Steel Institute, of which, during the last years of his life, he was foreign secretary, he wrote upwards of 50 papers on scientific subjects, among which are the following :—'" The Action of Sulphurets on Metallic Silicates at High Temperatures,"

Rep. Brit. Assoc., 1855, pt. ii. p. 62; "The Relations of the Silurian and Metamorphic Rocks of the south of Norway," Jb., p. 82; "The Causzs producing Foliation in Rocks," Journ. Geol. Sees aig 1855 : . The Chemical Composition of the Silurian ion ee Limestones," Phil. Mag., xiii. pp. 365-373,

; he Geology of Bolivia and Southern Peru," Jioet Geol. Soc., xvii. pp. 7-62, 1861. Es a hs i 1 ee of Culloden, was born i) cateoniocs e oden near Inverness on the 10th of

> . ter he had completed his studies at

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the universities of Edinburgh and Leyden, he was admitted advocate at the Scottish bar in 1709. His own talents and the influence of the Argyll family secured his rapid advancement, which was still further helped by his loyalty to the Hanoverian cause at the period of the rebellion in 1715. In 1722 Forbes was returned member for Inver- ness, and in 1725 he succeeded Dundas of Arniston as lord advocate. He inherited the patrimonial estates on the death of his brother in 1734, and in 1737 he attained to the lighest legal honours in Scotland, being made lord president of the Court of Session. As lord advocate, he had laboured to improve the legislation and revenue of the country, to extend trade and encourage manufactures, and no less to render the Government popular and respected in Scotland. In the proceedings which followed the memorable Porteous mob, for example, when tle Government brought in a bill for disgracing the lord provost of Edinburgh, for fining the corporation, and for abolishing the town-guard and city-gate, Forbes both spoke and voted against the measure as an unwarranted outrage on the national feeling. As lord president also he carried out some useful legal reforms ; and his term of office was characterized by quick and impartial administration of the law. The rebellion of 1745 found him at his post, and it tried all his patriotism. For some years before, he had repeatedly and earnestly urged upon the Government the expediency of embodying Highland regiments, putting them under the command of colonels whose loyalty could be relied upon, but officering them with the native chieftains and cadets of old families in the north. "If Government," said he, "pre-engages the Highlanders in the

manner I propose, they will not only serve well against the enemy abroad, but will be hostages for the good behaviour of their relations at home ; and Tam persuaded that it will be absolutely impossible to raise a rebellion in the Highlands." Such a plan was afterwards successfully pursued by Chatham ; but, though Walpole is said to have approved of the scheme, it was not adopted by the council. On the first rumour of the Jacobite rising Forbes hastened to Inverness, and through his personal influence with the cliiefs of Macdonald and Macleod, those two powerful western clans were prevented from taking the field for Charles Edward; the town itself also he kept loyal and well protected at the commencement of the struggle, and many of the neighbouring proprietors were won over by his persuasions. His correspondence with Lord Lovat, published in the Culloden papers, affords a fine illustration of his character, in which the firmness of loyal principle and duty is found blended with neighbourly kindness and consideration. But at this critical juncture of affairs, the apathy of the Government interfered con- siderably with the success of his negotiations. Advances of arms and money arrived too late, and though Forbes employed all his own means and what money he could borrow on his personal security, his resources were quite inadequate to the emergency. It is doubtful whether these advances were ever fully repaid. Part was doled out to him, after repeated solicitations that his credit might be maintained in the country; but it is evident he had fallen into disgrace in consequence of his humane exertions to mitigate the impolitic severities inflicted upon his country- men after their disastrous defeat at Culloden. The i gratitude of the Government, and the many distressing cumstances connected with the insurrection, gunk deep into the mind of Forbes. He never fairly rallied from the depression thus caused, and after a period of declining health he died on the 10th of December 1747, in the sixty- second year of his age.

Forbes was a patriot without ostentation or pretence, 4 true

Scotsman with no narrow prejudice, an accomplished and = erudite scholar without pedantry, a man of genuine piety withou

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asceticism or intolerance. His country long felt his influence through her reviving arts and institutions; and the exainple of such a character in that

coarse and venal age, _and among a people distracted by faction, political strife, and national antipathies, while it was invaluable to his contemporaries in a man of high position, iseutitled to the lasting gratitude and veneration of his countrynien. In his intervals of leisure he cultivated with some success the study ot philosophy, theology, and biblical criticism. He As said to have been a diligent reader of the Hebrew Bible. His published writings, some of them of importance, include—A Letler to a Bishop, concern: ing some Important Discoveries in Philosophy and Theology (1732) ; Some Thoughts concerning Religion, natural and revealed, and the Manner of Understanding Revelation (1735); and Reflections on Ineredulity (2d ed. 1750). His correspondence was collected and published in 1815, and a memoir of him (from the family papers) was

written by Mr Hill Burton, and published along with a Life of

Lord Lovat,in 1847. His statue by Roubiliac stands in the Par- lament House, Edinburgh.

FORBES, Epwarp (1815-54), F.R.S., a celebrated naturalist, was born at Douglas, in the Isle of Man, Feb- ruary 12, 1815. While still a child, when not engaged in reading, or in the writing of verses and drawing of carica- tures—ever favourite recreations with him—he occupied himself with the collecting and arranging of insects, shells, minerals, fossils, specimens of plants, and other natural history objects. From his fifth to his eleventh year, delicacy of health precluded his attendance at any school, but in 1828 he became a day scholar at Athole House Academy in Douglas, where he was universally beloved by his companions, and was recognized by his master as an apt if not a good scholar. In June 1831 he left the Isle of Man for London, where during four months he studied drawing under Mr Sass, a well-known artist. In October, however, having given up all idea of making painting his profession, he returned home; and in the following month he matriculated as a student of medicine in the university of Edinburgh. During his first winter session there he attended lectures on anatomy, theoretical chemistry, and materia medica; and in the ensuing summer session bosany, natural history, and practical chemistry claimed his attention. His vacation in 1832 he spent in diligent work on the natural history of the Isle of Man. In 1833 he made a tour in Norway, the botanical

results of which were published in Loudon's Magazine of Natural History for 1835-36. In the summer of 1834 he visited the Isle of Man and Wales, and devoted much time to dredging in the Irish Sea; and in the succeeding year he travelled in France, Switzerland, and Germany. Born a naturalist, and haviug no relish for the practical duties of the surgeon or physician, Forbes was no zealous student of medicine, and he finally in the spring of 1836 abandoned the idea of taking a medical degree, resolving to devote himself to science and literature. The winter of 1836-37 found him at Paris, where he attended the lectures at the Jardin des Plantes on natural history, comparative anatomy, geology, and mineralogy, Leaving Paris in April 1837, he repaired to the south of France, whence he went to Algiers, aud

uring @ month there spent he obtained materials for a Paper on land and freshwater Mollusca, published in the Annals of Natural History, vol. ii. p. 250. In the autumn of the same ycar he registered at Edinburgh as a student of literature; aud in 1838 appeared his first volume, Malacologia Monensis, a synopsis of the species of Manx Mollusca, During the summer of 1838 he visited Styria and Carniola, and made extensive botanical collections. Tn the following autumn he read before the British Asso- clation at Newcastle a paper on the distribution of terres- trial Pulmonifera in Europe, and was commissioned to pre- Pore a similar report with reference to the British Isles,

0 returning to Edinburgh he delivered a course of 15 lec- tures on the natural history of the animals in the British Seas. In 184] was completed the publication of Forbes's reat work, 4 Listory of British Star-fishes, embodying the

results of researches carried on for a long series of years, and containing 120 illustrations, inclusive of humorous tail- pieces, all designed by the author. On April 17th of the same year Forbes, accompanied by his friend Willian Thompson, joined at Malta H.M. surveying ship '" Beacon," to which he had been appointed naturalist by her commander Captain Graves. From that date until October 1842 he was busily employed in investigating

the botany, zoology, and geology of the Mediterranean region. The results of his researches were made known in his "Report on the Mol- lusca and Radiata of the Aigean Sea, presented to the British Association in 1843," and in Travels in Lycia, pub- lished in conjunction with Lieut, Spratt in 1846. In the former treatise he discussed the influence of climate and of the nature and depth of the sea bottom upon marine life, and divided the Algean into eight biological zones; his conclusions with respect to bathymetrical distribution, however, have been shown by later investigators to require certain considerable modifications. Towards the end of the year 1842 Forbes, whom family misfortunes had now thrown upon his own resources for a means of livelihood, sought and obtained the curatorship of the collections of the Geological Society of London. To the duties of that post he, in May of the following year, added those of the professorship of botany at King's College, where he lectured with success to the second largest botanical class in London. On November 1, 1844, having resigned the curatorship of the Geological Society, he became palzontologist to the Geological Survey, with a yearly salary of £300. In 1846 Forbes published in the Memoirs of the Geological Survey, i. 336, his important treatise " On the Connexion between the existing Fauna and Flora of the British Isles, and the Geographical Changes which have affected their Area." It is therein pointed out that, in accordance with the theory of their origin from various specific centres, the plants of Great Britain may be divided into five well-marked groups :—the W. and S.W. Irish, represented in the N. of Spain; the S.E. Irish and S.W. English, related to the flora of the Channel Isles and the neighbouring part of France ; the S.E. English, characterized by species oceur- ring on the opposite French coast 3 @ group peculiar to mountain summits, Scandinavian in type ; and, lastly, a general or Germanic flora. From a variety of arguments the conclusion is drawn that the greater part of the terres- trial animals and flowering plants of the British Islands migrated thitherward, over continuous land, at three distinct periods, before, during, and after the glacial epoch. In the autumn of 1848 Forbes married the daughter of General Sir C. Ashworth. The year 1851 witnessed the removal of the collections of the Geological Survey from Craig's Court to the new museum in J ermyn Street, and the appointment of Forbes as professor of natural history to the Royal School of Mines just established in conjune- tion therewith. In 1852 was published the fourth and concluding volume of Forbes and Hanley's History of British Mollusca. In 1853 Forbes

held the presidency of the Geological Society of London, and in the following year he obtained the fulfilment of a long-cherished wish in' his appointment to the professorship of natural history in the university of Edinburgh, vacant by the death of J ameson, his former teacher, Since his return from the East in 1842, the determination and arrangement of fossils, the in- vestigation of strata, frequent lectures, and incessant and wearing literary work, including the preparation of his admirable paleontological memoirs, and of a variety of scientific articles and reviews, had precluded Forbes from giving that attention to the natural history pursuits of his earlier life which he had for years earnestly desired. It seemed that at length he was to find leisure to reduce to order and commit to the keeping of the press those vast

stores of biological information of which long protracted and original research had made him the possessor. At Edinburgh, in the summer session of 1854, he lectured to a large and appreciative audience; and in September of that year he occupied the post of president of the geologi- cal section at the meeting of the British Association. He had already commenced his winter's course of lectures in Edinburgh when he was seized with feverishness, culminat- ing in an attack of nephritic disease, from which he had on several previous occasions been a sufferer. His symptonis soon became alarming, and after not many days' illness he expired at Wardie, near Edinburgh, Nov. 18, 1854, in the fortieth year of his age.

See Literary Gazette, November 25, 1854; Edinburgh New: Philo- sophieal Journal (New Ser.), 1855 ; Quart. Journ. Geol. Soc., May 1855; G. Wilson and A. Geikie, Memoir of Edward Forbes, 1861, in which, pp. 575-588, is given a list of Forbes's writings. See also the Royal Society's Catalogue of Scientific Papers, vol. ii. pp. 654— 658. (F. H. B.)

FORBES, James Davip (1809-1868), successively pro- fessor of natural philosophy in the university of Edinburgh and principal of the United College in the university of St Andrews, was the fourth son of Sir William Forbes of Pitsligo, the lineal representative of the Forbeses of Mony- inusk and Pitsligo. His mother was Wilhelmina Belches- Stuart, sole child and heiress of Sir John Stuart of Fetter- cairn. Their family consisted of two

daughters and four sons, of whom James David, born at his father's town house, 86 George Street, Edinburgh, on the 20th April, 1809, was the youngest. Two years after his birth, the death of Lady Forbes took place. Sir William retired with his family from Edinburgh to Colinton, his country resi- dence, and thus it happened that, up to the age of sixteen, when he entered college, James Forbes was entirely a home-bred boy, and his only teacher the schoolmaster of the village. At an early age, however, he developed re- markable powers of self-education. Passionately fond of natural science, he stored his mind with all available knowledge of physics, constructed for himself astronomical instruments, and actually commenced a connected series of meteorological observations, which he kept up for many years. But these pursuits were carried on without the knowledge of his family; for Sir William had destined him for the bar, and Forbes loved his father too well to betray tastes and inclinations which might seem to point towards a different career. In November 1825 he entered the university of Edinburgh, and joined the classes of Latin and chemistry. He still continued his self-imposed studies, and at length forwarded anonymously to Sir David (then Dr) Brewster, who was at the time conducting the Hdin- burgh Philosophical Journal, a paper on "The Apparent Number of the Stars." It was at once inserted, and further communications were requested from the anony- mous "A." The request was complied with, and during an extended tour through France, Germany, and Italy, in company with a large family party, Forbes contributed a number of papers on "The Physical Geography of the Bay of Naples," "The Horary Oscillations of the Baro- meter at Rome," and other subjects, all of which were inserted in the Journal. On his return to Scotland after a year's absence, he made himself known to Brewster as his unknown correspondent. Brewster, astonished at his extensive reading and remarkable powers of observa- tion, encouraged him in his scientific pursuits, and pro- posed him as a fellow of the Royal Society of Edinburgh, to which, at the age of 19, he was elected. In the mean- time he had re-entered college, where his subsequent career sae a epee one. In the class of moral philosophy, a hoo A ae Professor Wilson, he gained the Poe Ros de ioe in Sir John Leslie's natural philo- ice carried off the gold medal. An event

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uow occurred which changed the whole tenor of his life, His father died on the 24th of October 1828, and it became necessary that Forbes should seriously consider his future course of life. The choice lay between the bar and a scientific career, and after much consultation with his friends he chose the latter. He passed his law trials indeed, and put on his advocate's gown, but never wore it, for a competence given him by his father had rendered him independent. About this time Sir David Brewster was engaged in laying the foundations of the British Associa- tion. Forbes joined cordially in the work, and contri- buted much towards placing the Association on the basis it now occupies. Throughout the rest of his life he attended, with rare exceptions, all its meetings, often breaking off a foreign tour, and hastening back to do so. The presidency of the meeting held at Dundee in 1867 was offered to him, but ill health compelled him to decline it.

Immediately after his election as fellow of the Royal Society of London, in June 1832, Forbes started on an extensive scientific tour, but was suddenly recalled from Geneva by news of the death of Sir John Leslie, professor of natural philosophy at the university of Edinburgh. Forbes had left word that should this chair at any time become vacant, he desired to be put in nomination, and on his return found that this had actually been done. He also found himself, to his surprise and dismay, the rival of his old friend Sir David Brewster. But Forbes was already committed, and had received testimonials from Whewell, Airy, Peacock, Vernon Harcourt, Chalmers, and others, bearing high testimony to his attainments, and the immense results they promised. After a more than usually excited contest, into which politics to some extent entered, Forbes was elected, at the age of twenty-four, to a pro- fessorial chair of the highest distinction. The inaugural lecture with which he opened the session of 1833-34 was listened to with unusual interest. As a professor, he more than realized the high expectations which had been formed of his special capacity for the work. During the twenty-seven years of his professorship his lectures left no branch of natural philosophy untouched, and owing to his thorough acquaintance with the literature of the subject, each of them was a mass of condensed information, —not, however, con- fined to old knowledge taken from books, but enriched from time to time by the results of original research, enlivened by many a happy illustration drawn from his travels and adventures, and rendered

more effective by his clear ringing voice and graceful delivery. He soon gathered round him an enthusiastic body of hard-working students, and although the high standard he aimed at made him a somewhat strict disciplinarian, their personal interest in his researches and their pride in his success increased as years went on. Forbes took an interest 1m his students no less personal, and more than one acquaint ance formed in the class-room ripened into a tender and affectionate friendship. But his energies were not confined to the work of his professorship; they soon made them- selves felt throughout all the machinery of the university. The system of examination for degrees—already for some time in operation at Oxford—was then much wanted at Edinburgh, where, owing to the absence of any sufficient test of proficiency, graduation was little valued and seldom sought for. Forbes became an energetic reformer in this direction, and to him is mainly owing the complete system of examination for degrees which, under his guidance as dean of the faculty of arts, greatly tended to raise the standard of Scottish education, Again, in 1841, there was much discussion in the senatus as to the disposal 0 a large sum of money bequeathed by General Reid for the foundation of a chair of music and for other purpose

Forbes strongly opposed the idea of a musical professor- ship, urging that the money would be more usefully employed in providing retiring allowances for superan- nuated professors. But controversy ran high, litigation ensued, and after years of contention a part of the Reid bequest was assigned by the law courts to the chair of music. Next year another large sum, the Straton fund, had to be dealt with, and here again Forbes was instru- mental in inducing the senate to devote what was left of the Reid bequest, combined with the Straton fund, to the foundation of fellowships to be held by distinguished students after graduation. In these and other controversies the uncompromising energy with which he strove to carry out his views of what was right could not fail to bring him into collision with men whose opinions were as decided, and their wills as strong as his own. When two such unbend- ing natures as Sir William Hamilton and James Forbes came into contact-—as they did more than once—the shock was a

rough one; but although they differed widely in opinions, each has left a permanent mark for good on the university.

It would be impossible to enter here into the subjects or method of Forbes's class lectures; nor is it necessary to give more than a brief notice of the important researches which shared with his class work the winter mouths. They were the subject of voluminous private correspond- ence with such men as Whewell, Brewster, Peacock, Airy, Faraday, Arago, Melloni, Cauchy, and many others, and their results were embodied in a long list of communi- cations to various scientific societies, ranging over a great variety of subjects.

For a paper on "The Transparency of the Atmosphere and the Laws of Extinction of the Sun's Rays passing through it," the Royal Society of London awarded him their Royal Medal. Another, on "The Selective Absorp- tion of the Sun's Light in passing through Steam," was one of the first steps in the direction of spectrum analysis. In 1832 he described the experiments by which he suc- ceeded in producing a spark by means of a natural rnagnet. He was the author of valuable memoirs on the thermal Springs of the Pyrenees, the extinct volcanoes of the Vivarais (Ardéche), and the geology of the Cucliullin and Eildon hills. Soon after his elevation to the chair Forbes resuined his researches in heat, begun some years before. He commenced experiments with Melloni's thermo-multi- plier, measured the refractive index of rock salt with heat from various sources, luminous and non-luminous, and pursued a course of investigations which led him to his most brilliant discovery, the polarization of non-luminous heat, by transmission through tourmaline and thin mica Plates, and by reflection from the latter. By employing mica for depolarization he succeeded in showing the double refraction of non-luminous heat, a fact of which this experi- ment remains the only proof. He also produced circularly polarized heat by two internal reflections, using Fresnel's thombs made of rock salt. By these researches the identity of thermal and luminous radiations was finally established. In 1846 he made careful arrangements for the measurement of underground temperatures, and by sinking his thermo- meters in three different sets of surface materials, he obtained an absolute determination of the thermal conductivity of trap- tufa, sandstone, and pure loose sand. His experiments on the conductivity of metals

occupied the closing years of his life. _ By a thoroughly original method he obtained dvantitative measurements of the absolute thermal conduc- tivity of Iron at various temperatures, and showed that this 1s diminished (contrary to the assumption of Fourier) by mcrease of temperature, thus following the known laws of electrical conductivity.

orbes Senerally devoted a part of each vacation to

excursions with his family in various parts of Scotland, and to geological tours among his native mountains, in the course of which, at times in company with some scientific friend, more often alone, he traversed on foot the greater part of the Highlands. In 1856 he acquired a beautiful cottage near Pitlochrie in Perthshire, where the succeeding summers were chiefly spent. From 1835 to 1851 Forbes usually passed some months on the Continent, travelling, as he expressed it, not as an amusement, but as a serious occupation, with De Saussure before him as a model. And it may be almost doubted whether science did not profit as much by his summer travels as by his winter work,

His first tour was devoted to the geology of the Pyrenees and of the Vivarais —the latter of which he afterwards revisited. In 1837, after a short sojourn at Bonn, for the purpose of study, he travelled throughout Germany and Austria, making frequent experiments on terrestrial mag- netism and other subjects. In 1839, among the crags and glaciers of Monte Viso, of the Pelvoux range, and of the Alps of Cogne, he learned to be an active and intrepid moun- taineer ; and during the intervals of his glacier investiga- tions he did good service in opening up Alpine districts before scarcely known to Englishmen, by a series of excur- sions extending over the whole of the Pennine chain.

But of all his journeys and discoveries, those made by him among the mountains of Savoy are most popularly known; and their results have associated his name for ever with the glaciers of the Alps. In 1840, while presiding over the physical section of the British Association at Glasgow, he met M. Agassiz of Neuchatel—who, after spending several years in the study of glacial phenomena, had just published his tudes sur les Glaciers,—

and agreed to visit Switzerland with him the following year. Accord- ingly, at the close of the session of 1840-41, Forbes joined Agassiz and his party at the well-known " Hotel des Neu- chatelois," a small hut on the moraine of the Lauter Aar Gletscher. After a fortnight spent in exploration and observation, in the course of which Forbes called attention for the first time to the veined structure of glacier ice, they ended the campaign by the passage of the Ober Aar Joch, aud the ascent of the Jungfrau. This was Forbes's appren- ticeship in glacier observation,—a field of inquiry then jointly occupied by two rival theories, the gravitation or sliding theory of De Saussure, and the dilatation theory of Charpentier. After a close analysis of these Forbes not only showed conclusive physical reasons for rejecting both, but pointed out the impossibility of forming a sound theory of glaciers until the internal structure of these anomalous bodies had been investigated, and the character and velocity of their motions ascertained.

These important data Forbes resolved to obtain for him- self, and the summer of 1841 found him at Chamounix, engaged in a close examination of the Mer de Glace. He attacked the problem for the first time as a question of pure physics, executed accurate measurements with instru- ments of precision, and at once established the fact that the motion of a glacier averages roughly a foot in 24 hours, and that such motion is continuous. As his observations went on, he successively discovered that the centre of the glacier moves faster than the sides, and the surface than the ice vertically below it, that its velocity increases directly with the steepness of its bed, and that the motion of a portion of the glacier when embayed behind a rock is greatly diminished, and the whole mass distorted, without any solution of continuity taking place. Convinced by these discoveries that the resemblance between a glacier and a river, already noticed by Captain Hall, Msgr. Rendu, and others, was more than a mere analogy, he deduced from the above mentioned data the following

theory of glacier motion :—A glaceer is an imperfect fluid | or a viscous body, which is urged down slopes of a certain inclination by the mutual pressure of its parts. In reply to the strongly urged objection that ice is by its nature a brittle solid, and not sensibly possessed of any viscous quality, he

asserted that ice is only hard and crystalline at a temperature of 30° F. or lower, and that at 32° it is a plastic solid possessing a slight but perfectly sensible genuine molecular plasticity. When the urgency of the forces to which it is subjected causes this limit to be over- powered, a general bruise takes place, producing innumer- able internal fissures, with finite displacements in certain planes, and subsequent restoration of continuity by " time and cohesion"; hence the blue bands of the conchoidal veined structure. When the urgency is still greater the mass acts like a solid, and crevasses open. In the case of glacier ice an additional element of plasticity exists, for glacier ice is scarcely ever coherent. It is usually a congeries of irregular polyhedrons tightly wedged together, possessing a rude flexibility, and always traversed by an infinity of capillary fissures. Hence a glacier is really a compound of ice and water, more or less plastic according to its wetness and infiltration,—a fact proved by its more rapid motion in summer when saturated with water, and its relative retar- dation in winter when the surface water remaius frozen. Forbes's " viscous theory " was sharply criticized, but it is now universally accepted, subject to some modifications which do not affect the groundwork of the structure, and rather elucidate than disprove his conclusions, But besides scientific criticism, he was compelled to defend himself—which he did with complete success—against in- sinuations, not only of plagiarism, but of an endeavour to suppress the rights of others to priority of discovery. During the winter which followed this eventful summer, Forbes was busily engaged in writing his Z'ravels through the Alps of Savoy, a charming contribution to Alpine literature, in which graphic descriptions of scenery and mountaineering are happily blended with accounts of his scientific researches. Its last lines were written almost on the eve of his marriage with Alicia, eldest daughter of the late George Wauchope, Esq. They started on their mar- riage tour to Switzerland, but had only got so far as Bonn, when Forbes was attacked by a dangerous illness, and it was not until August that they reached the Alps. He was then so far restored as to be able to resume his obser- vations on the glaciers of Chamounix and Grindelwald, but as the winter approached he was pronounced unequal to the work of the following session at Edinburgh. His request for permission to appoint a substitute was readily granted, and he set out with Mrs Forbes for Italy. Naples and Rome were their headquarters until the end of May, and the summer months were passed at the Italian lakes and in Switzerland. Forbes returned to Edinburgh in the

autunin of 1844, and carried on his work during the winter months, but his health had suffered a rude shock, from the effects of which he never entirely recovered, The succeeding summer was spent with his family in the Highlands of Scotland; but the vacation of 1846 found him again on the Mer de Glace, engaged in observations on the ablation of the surface of the glaciers, and the dif- ference of movement between the surface and the under- lying ice. His next and last visit to the Alps in 1850 was entirely occupied in putting the finishing touches to his survey of the Mer de Glace, which was for some years after its publication the only correct Alpine map in existence. At the close of the session of 1850-51 he _ ho Norway with the double purpose of observing a = aa of the sun visible at Bergen, and of comparing Al – — of the arctic glaciers with those of the pee ese objects were not attained without great |

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fatigue and exposure ; Forbes returned from Norway with health much impaired, and had scarcely recommenced his work wlien he was attacked by hemorrhage, the precursor of a long and dangerousillness. All through December he lay between life and death, but in January he was able to be removed to Clifton, which he made his headquarters for two years. During this enforced leisure he was con- stantly engaged in writing a very able " Dissertation on tlhe Progress of Mathematical and Physical Science," for the pages of the Lneyclopedia Britannica, and in preparing for the press a work on Norway and wuts Glaciers, similar in character to his Glacters of the Alps, and scarcely yield- ing to it in picturesqueness of narrative or careful observa- tion. In the summer of 1853 he was called froin Clifton to Oxford to receive the honorary degree of D.C.L. Dur- iug the three sessions of Forbes's absence, his class work had been conducted by Professor Kelland, but the session of 1854-1855 found him again at his post, and he worked with but little interruption from illness until 1899, assisted latterly by Dr Balfour Stewart. In that year the current of his life was turned into another channel, Owing to the translation of Sir David Brewster to the principalship of the Edinburgh university, the principalship of the United College of St Andrews became vacant ; Forbes offered him- self as a candidate, and was successful. His commission bears date December 2, 1859, but he did not resign his professorship until the following April. The

degree of LL.D. was then conferred on him by the university which his own labours had so greatly benefited and adorned.

His new post, although it relieved him of the fatigue of constant lecturing, was no sinecure. The Scottish University Commission were then in full session, and in their investigations of the affairs, financial and other, of his own college, and of the university, the responsibility of supplying information and suggesting reforms fell largely on him. A zealous reformer he always was, and he had not left beltind him at Edinburgh that dauntless spirit of "Thorough " which saw only one straight road to a right principle, and pnrsued it, not without collisions, and often painful ones. The duties of his office were performed with scrupulous industry. His own college is indebted to him for a laborious examination and classification of its ancient charters. He found the collegiate church of St Salvator in a condition of tasteless neglect; he left it partially restored and greatly beautified. He occasionally lectured on glaciers, climate, heat, and others of his favourite subjects, and even strained his failing powers to complete his researches on the thermal conductivity of iron. For the latter, shortly before his death, the Keith medal was awarded to him.

In the spring of 1867 Forbes's health gradually declined, and towards the end of September he set out with his wile and three daughters to Cannes, and afterwards went on to Hyéres. His health now continued to improve until the middle of January, when he was again attacked by heemor- rhage brought on by fatigue. He never sat up again, an while in that painful state the presidency of the Royal Society of Edinburgh was offered to him and declined. It was evident that a summer at Hyéres was impossible, 80 he was conveyed, together with one of his daughters who was almost in the same sad condition as himself, to Clifton, where he lingered for eight months, awaiting his end with patient calmness, sustained by the deep and fervent religious faith which had characterized his boyhood, and which a life of active scientific research had strengthened rather than impaired. He died on the 31st of December 1868.

Forbes received the honorary degree of D.C.L. from Oxford, a that of LL.D. from the university of Edinburgh. The Royal we of London awarded him

their Rumford medal for his discovery of the polarization of heat, and their Royal medal for a paper om the in-

fiuence of the atmosphere on the sun's rays. By the Royal Society of Edinburgh the Keith medal was thrice presented to him, and he filled the post of secretary to that body from 1840 till the failure of his health obliged him to resignit. In 1845 a pension of £200 a year was granted to him for his services rendered to science. He was fellow of the Royal Societies of London and Edinburgh, and of the Geological Society, corresponding member of the linperial Institute of Francc, and associate or honorary member of the Bavarian Academy of Sciences, of the Academy of Palermo, of the Dutch Society of Sciences (Haarlem), of the Helvetic Society, of the Pontifical Society, of the Pontifical Academy of " Nuovi Lincei" at Rome, and of the Natural History Societies of Heidel- berg, Geneva, and Vaud, and honorary member of the Royal Medical Society of Edinburgh, of the Cambridge, Yorkshire, St Andrews, and Isle of Wight Philosophical Societies, and of the Plymouth and Bristol Institutions.

A list of his scientific writings is to be found in the Royal Society Catalogue, but the following books may be mentioned as bearing more particularly on his glacier researches :—Travels through the Alps of Savoy, Black, Edin., 1848, 1845 ; Norway and its Glacters, Black, Edin., 1853 ; Occasional Papers on the Theory of Glaciers, Black, Edin., 1859. See also Théorie des Glaeters de la Savoie,

M. le Chanoine Rendu (translated by Alfred Wills, edited by Pitescor George Forbes), Macmillan, Lond., 1874.

Forbes's Life and Letters, by Principal Shairp of St Andrews, Prof. P. G Tait, and A. Adams-Reilly, was published by Macmillan, London, 1873. (A. A. R.)

FORBES, Str Joun (1787-1861), M.D., was born at Cuttlebrae, Banffshire. He attended the Grammar School at Aberdeen, and afterwards entered Marischal College. Having for nine years been assistant-surgeon and surgeon in the navy, he in 1817 graduated at Edinburgh, and then

commenced practice in Penzance, whence he removed to Chichester. He took up his residence in London in 1840, and was the same year appointed physician to the Prince Consort, and in 1841 physician to the Queen's household. He was a fellow of the Royal Society, and D.C.L. of Oxford; and in 1853 he received the honour of knighthood. He died November 13, 1861, at Whitchurch in Berkshire,

Sir John Forbes was better known as an author and cditor than as a practical physician. His works include the following :—Original Cases… illustrating the Use of the Stetheseope and Pereussion in the Diagnosis of Diseases of the Chest, 1824 ; Illustrations of Modern Mesmerism, 1845; .A Physietan's Holiday, 1st ed. 1849; Alemo- randums made in Ireland in the Autumn of 1852, 2 vols., 1853 ; Sight-seeiny in Germany and the Tyrol in the Autumn of 1855, 1856. He was joint editor with Drs Tweedie and Conolly of The Cyclopedia of Practical Medieine, 4 vols., 1833-35 ; and in 1836 he founded the British and Foreign Medieal Review, which, after a period of prosperity, involved its editor in pecuniary loss, and ceased to exist, in consequence of the advocacy in its later numbers of doc- trines obnoxious to the profession. '

FORBIN, Craupe px (1656-17 33), French naval com- mander, was born in Provence, of a family of high stand- ing, in 1656. High-spirited and ungovernable in his boyhood, he ran away fron: his home, and through the Influence of an uncle entered the navy, serving his first campaign in 1675. For a short time he quitted the navy and entered the army, but soon returned to his first choice. He made under D'Estrées the American campaign, and under Duquesne that of Algiers in 1683, on all occasions distinguishing himself by his impetuous courage. The Most remarkable episode of his life was his mission to Slam. During the administration of the Greek adventurer i aulcon in that country, the project was formed of intro- ducing the Christian religion and European civilization, and the king sent an embassy to Louis XIV. In response a French embassy was sent out, Forbin accompanying the Chevalier de Chaumont with the rank of major. When Chaumont returned to France, Forbin was induced to Fematn in the service of the Siamese king, and accepted, though with much reluctance, the posts of grand admiral, general of all the king's armies, and governor of Bankok. ~ 18 position, however, was soon made untenable by the Jealousy

and intrigues of the minister Faulcon ; and at the end of two years he left Siam, reaching France in 1688.

& was afterwards fully engaged in active service, first

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with Jean Bart in the war with England, when they were both captured and taken to Plymouth. They succeeded in making their escape, and were soon serving their country again. Forbin was wounded at the battle of La Hogue, and greatly distinguished himself at the battle of Lagos. He served under D'Estrées at the taking of Barcelona, was sent ambassador to Algiers, and in 1702 took a brilliant part in the Mediterranean in the war of the Spanish suc- cession. In 1706 he took command of a squadron at Dun- kirk, and captured many valuable prizes from the Dutch and the English, In 1708 he was entrusted with the com. mand of the squadron which was to convey the Pretender to Scotland ; but so effectually were the coasts guarded by Byng that the expedition failed and returned to Dunkirk. Forbin was now beginning to be weighed down with the infirmities of age and the toils of service, and in 1710 he retired to a country house near Marseilles. There he spent part of his time in writing his memoirs, published in 1730, which are full of interest and are written in a graphic and attractive style. Forbin died March 4, 1733.

FORCELLINI, Eetpro (1688-17 68), an Italian philo- logist, was born at Fener in the district of Treviso, and belonged to a very poor family. He went to the seminary at Padua in 1704, studied under Facciolati, and in due course attained to the priesthood. From 1724 to 1731 he held the office of rector of the seminary at Ceneda, and from 1731 to 1765 that of father confessor in the semi- nary of Padua. The remaining years of his life were mainly spent in his native village. He died at Padua in 1763 before the completion of the great work by which his name is preserved. This is a vast Latin Lexicon, usually referred to as Facciolati's, which has formed the basis of all similar works that have since been published. He was engaged with his Herculean task for nearly 35 years, and the transcription of the manuscript by Luigi Violato oc- cupied eight years more. It was ultimately

published at the expense of Cardinal Priole, under the title of Totéus Latinitatis Lexicon, consilio et cura Jacobi Facciolati, opera et studus Agidiit Forcellini, Seminarti Patavini Alumni, lucubratum, 4 vols., Padua, 1771.

FORCHHAMMER, Jouan Geore, a Danish mineralo- gist and geologist, was born at Husum on J uly 26, 1794, and. died at Copenhagen on December 14,1865. After studying at Kiel and Copenhagen from 1815 to 1818, he joined Oersted and Esmarch in their mineralogical explora- tion of Bornholm, and took a considerable share in the labours of the expedition. In 1820 he obtained his doctor's degree by a chemical treatise De Mangano, and immediately after set out on a journey through England, Scotland, and the Faroe Islands. In 1823 be was named university lecturer on chemistry and mineralogy; in 1829 he obtained a similar post in the newly established poly- technic school ; and in 1831 he was appointed professor of mineralogy in the university, and as such became curator of the geological museum. On the death of Oersted in 1851, he succeeded him as director of the polytechnic school and secretary of the academy of sciences. As a public instructor Forchhammer held a high place and con- tributed potently to the progress of his favourite studies in his native country. He delighted in the popularization of science, aud frequently brought his knowledge and influence to bear on such practical questions as the intro- duction of gas into Copenhagen, the establishment of the fire-brigade at Rosenberg, or the boring of Artesian wells,

Among his more important works are—Lerebog < de enkelte Radiealers Chemt, 1842; Danmarks geognostiske Forhold, 1835 ; Om de Bornholmske Kulformationer, 1836 ; Dit nyere Kridt ¢ Dan- mark, 1847; Bidrag til Skildringen af Danmarks geographiske Forhold, 1858. A list of his contributions to scientific periodicals, Danish, English, and German, will be found in the Catalogue of Seien- tific Papers published by the Royal Society of ai One of the

most interesting and most recent is "On the constitution of sea water at different depths and in different latitudes," in the Procee ings of the Roy. Soe., xii., 1862-1863.

FURCHHEIM, a fortified town of Bavaria, circle of Upper Franconia, is situated near the junction of the Wiesent with the Regnitz, 16 miles S.S.E. of Bamberg. It has a castle, a collegiate and two other churches, a syna- gogue, a monastery, and a hospital. Its industries include brewing, tanning, soap-boiling, and glass manufacture. Forchheim is of very early origin. Charlemagne trans- planted thither in 804 a number of Saxons from the Elbe, and made it an important commercial entrepot. In the 9th and 10th ceuturies many assemblies, both of the princes and the kingdom, were held at Forchheim, and in 890 a council of the church. In 1007 it was presented by the emperor Henry IL. to the newly founded bishopric of Bemberg, but in 1040 Henry IIL. united it again to the kingdom. Henry IV., however, again presented it to the bishopric of Bemberg, with which it remained till 1802, when it came into the possession of Bavaria. In 1552 it was captured by the Margrave Albert of Brandenburg, and in 1634 besieged by Bernhard of Wiemar. Its fortifications were restored in 1791. On the 6th and 7th August 1796 a battle took place near it between the French and Austrians, when the French held possession of the field. Forchheim ceased to occupy the position of a fortified town after 1838. The population in 1875 numbered 3847.

FORD, Joun (1586-c. 1640), one of the most noteworthy writers of the English old drama in the period of its first decline, was born in 1586 at Ilsington in North Devon. He came of a good family; his father was in the commis- sion of the peace, and his maternal grandfather, Sir John Popham, was successively attorney-general and lord chief justice. John Ford, like his cousin and namesake (to whom, with other members of the society of Gray's Inn, he dedicated his play of The Lover's Melancholy), entered the profession of the law, being admitted of the Middle Temple in 1602 ; but he seems never to have been called to the bar. Four years afterwards he made his first appear- ance as an author with an elegiac effusion called /ame's Memorial, or the Earl of Devonshire deceased, and dedicated to the widow of the earl (Charles Blount Lord Mountjoy, " coronized," to use Ford's expression, by King James in 1603 for his services in Ireland, which the

elegy celebrates) —a lady who would have been no unfitting heroine for one of Ford's tragedies of lawless passion, the famous Penelope formerly Lady Rich. This panegyric, which is accom- panied by a series of epitaphs, and is composed in a strain of fearless extravagance, was,as the author declares, writ- ten '"'unfee'd"; it shows Ford to have sympathized, as Shakespeare himself is supposed to have done, with the "awkward fate" of the countess's brother, the earl of Essex. Who the "'flint-hearted Lycia" may be, to whom the poet seems to allude as his own disdainful mistress, is unknown ; indeed, the record of Ford's private life is, like that of the lives of so many of our old dramatists, little better than a blank. To judge, however, from the dedications, prologues, and epilogues of his various plays, he seems to have en- joyed the patronage or goodwill of several men of rank—among them the excellent earl (afterwards duke) of New- castle, "himself a muse" after a fashion, and the gallant Lord Craven, supposed to have been the husband of the ex- queen of Bohemia. Ford's tract of Honor Triumphant, or the Peeres Challenge (printed 1606), and the simultaneously published verses The Monarches Meeting, or the King of Denmarkes welcome into England, exhibit him as an occa- ee to the festive demands of court and Tine is ae we eee moral essay by him, entitled A pate are he i 20), which contains a few not un-

s es to Raleigh, ends with a climax of

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praise to the address of "a good man, of whom it may be verified that he is bonorum maximus and magnorum optimus" —viz., King James I. Yet it may be noted in passing that one of Ford's plays contains an implied pro- test against the absolute system of government which usually found ready acceptance with the dramatists of the early Stuart reigns! Of our pvet's relations with his brother-authors little is known; it was natural that he should exchange complimentary verses with Shirley, a more various though less intense dramatic poet of his own age and school, and that he should join in the chorus of laments with which the poets of the time mourned the decease of their acknowledged veteran chief, Ben Jonson. It is more interesting to notice an epigram in honour of the auther of Love's Sacrifice

and The Broken Heart by a poet of a very different kind, but in whose genius it is not paradoxical to assert that there were points of contact with

| Ford's—Richard Crashaw, morbidly passionate in one diree- | tion as Ford was in another.

Towards the public Ford seems, by reason either of his social position or of his per- sonal character, to have assumed an attitude of independ- ence ; but for an assailant of the theatre, such as the author of Histriomastiz, he displays, like his friend Shirley, a dramatist's inevitable scorn.

It has been concluded, from evidence of a rather vague description, that in the latter part of his life he gratified the tendency to seclusion for which he has been thought to be ridiculed in a contemporary poem, by withdrawing from business (it had probably been legal business of one kind or another), and from literary life in London, to his native place; but nothing is known as to the date of his death. His career as a dramatist very probably began with some plays in which he assisted, or was assisted by, other authors. The titles of these (all we possess of them) are not without significance. With Dekker he wrote The Fairy Knaght and The Bristowe Merchant; with Webster A late Murther of the Sonne upon the Mother. A play attributed to Forl alone, and entitled An ill Beginning has a good End, was brought on the stage as early as 1613; and in 1615 followed Sir Thomas Overbury's Life and untimely Death— a subject to which the poet devoted some lines, which are preserved, of indignant regret. He also wrote, at dates unknown, The London Merchant and The Royal Combat; a tragedy by him, Beauty in a Trance, was entered in the Stationer's Register in 1653, but never printed. Of the plays by Ford preserved to us the dates span little more than a decade—the earliest, The Lover's Melancholy, having been acted in 1628 and printed in 1629, the latest, Phe Lady's Trial, acted in 1638 and printed in 1639.

When writing The Lover's Melancholy, it would seem that Ford had not yet become fully aware of the bent of his own dramatic genius, although he was already master of his powers of poetic expression. We may suppose him, when he first became a dramatic author, to have been attracted towards both domestic tragedy and romantic comedy—to the former by an irresistible desire to sound the depths of abnormal conflicts between

passion and ¢it- cumstances, to the latter by a strong though not widely varied imaginative faculty, and by a self-delusion (such as will alone account for his repeated—and nearly always unsuccessful—efforts in this direction) that he was possesse of abundant comic humour. In his next two works, ur

1 Orot.—' The king hath spoke his mind. Org.— '* His will he hath ; But were it lawful to hold plea against The power of greatness, not the reason, haply Such undershrubs as subjects sometimes might Borrow of nature justice, to inform That licence sovereignty holds without check Qver a meek obedience." ss The Broken Heart, act iii. se 4*

doubtedly those most characteristically expressive of his veculiar strength, viz, "Tvs Pity she's a Whore and The Broken Heart (both printed 1633), he had found themes the horrible situations in which required dramatic explanation by intensely powerful motives. Ford by no means stood alone amoug our dramatists in his love of abnormal subjects ; but few were so capable of treating them sympathetically, and at the same time without that reckless grossness or ex- travagance of expression which renders the morally repul- sive esthetically intolerable, or converts the horrible into the grotesque. For in Ford's genius there was an element of true refinement, except when the self-delusion referred to came into play. In a third tragedy, Love's Sacrifice (also printed in 1633) he again worked on similar materials ; but this time he unfortunately essayed to base the interest of his plot upon an unendurably unnatural possibility— doing homage tu virtue after a fashion in which to honour is almost equivalent to insulting her. He might seem hy this time to have been in danger of indulging still further amorbid tendency, the corroding influence of which is fatal to any genius abandoning itself to it; yet we find him in Perkin Warbeck (priuted 1634) choosing an historical sub- ject, and, alone among the dramatists of his age, seeking to emulate the glory of the great series of Shakespeare's uational histories. It is true that his treatment of his theme, though neither unskilful nor unworthy, could not at once compass the breadth and variety which this species of drama demands. But the effort is one of the most com- mendable, as it was by no means one of tlie least successful, in the dramatic

literature of this period; and we may un- hesitatingly regret that he should not have made another essay in the same field, instead of turning to romantic comedy, for which he was without the requisite buoyancy of spirit, while all but devoid of the faintest vestige of comic humour. The Fancies Chaste and Noble (printed 1638), though it includes scenes of real force and feeling, is dramatically a failure, of which the main idea is almost provokingly slight and feeble; and The Lady's Trial (acted 1638, printed 1639) is only redeemed from utter wearisomeness by an unusually even pleasingness of form. There remain two other dramatic works, of very ditferent kinds, in which Ford co-operated with other writers, the inask of The Sun's Darling (acted 1624, printed 1657), which is hardly to be placed in the first rank of early com- positions, and The Witch of Edmonton (printed 1658, but probably acted about a quarter of a century earlier), in which we see Ford as a joint writer of one of the most powerful domestic dramas of our own or any other stage.

A few notes may be added on some of the more remarkable of the plays enumerated, A wholly baseless ancedote, condensed into a stinging epigram by Endymion Porter, asserted that The Lover's Melwncholy was stolen by Ford from Shakespeare's papers. Lesser dramatists are in the habit of borrowing from greater; and there Were few among the writers of our old drama, of whatever eminence or calibre, to whom plagiarism, whether in the matter of situations and characters, or of passages and expressions, would have secmed a literary liberty requiring defence. Undoubtedly, the madness of the hero of this play of Ford's oceasionally recalls Hamlet, while the heroine is one of the many, and at the same time one of the most pleasing, parallels to Viola. But neither of them is a copy, as Friar Bonaventura in Ford's second play may be said to be a copy of Friar Lawrence, whose kindly pliability he disagreeably exag- gerates, or as D'Avolos in Love's Sacrifiee is clearly modelled on Tago. The plot of The Lover's Melaneholy, which is ineffective because it leaves no room for suspense in the mind of the reader, seems original; in the dialogue, on the other hand, a justly famous passage in Act i. (the beautiful version of thie story of the nightin- Gale's death) is translated from Strada; while the schenie of the tedious interlude exhibiting the various forms of madness is avowedly taken, together with sundry comments, from that store- house of useless learning, Burton's Anatomy of Melancholy. aeey in this play Ford

exhibits the singular force of his pathos ; i despondent nusery of the aged Meleander, and the sweetness of

le last scene, in which his daughter comes back to him, alike go to the heart. A situation—hazardous in spite of its comic substratum

—between Thaumasta and the pretended Parthenophil is conducted, as Gifford points out, with real delicacy; but the comie scenes are merely stagey, notwithstanding, or by reason of, the effort expended on them by the author.

Tis Pity she's a Whore has been justly recognized as a tragedy of extraordinary power; but it seems no hard matter to join in this recognition, while reserving to oneself the right, which uo canon of criticism can rebut, of protesting against the abuse of art of which this play furnishes an almost unparalleled example. Mr Swinburne, in his eloquent essay on Ford, has rightly shown what is the mean- ing of this tragedy, and has at the same time indicated wherein consists its poison. He dwells with great force upon the different treatment applied by Ford to the characters of the two miserable lovers—brother and sister. 'The sin once committed, there is no more wavering or flinching possible to him, who has fought so hard against the demoniac possession; while she who resigned body and soul to the tempter almost at a word, remains liable to the influences of religion and remorse." This different treatment shows the feel- ing of the poet—the feeling for which he seeks to evoke our inmost sympathy—to oscillate between the belief that an awful crime brings with it its awful punishment (and it is sickening to observe how the argument by which the Friar persuades Annabella to for- sake her evil courses mainly appeals to the physical terrors of retri- bution), and the notion that there is something fatal, something irresistible, and therefore in a sense self-justified, in so dominant a passion. The key-note to che conduct of Giovanni lies in his words at the close of the first scene—

- *All this I'll do, to free me from the rod Of vengeance ; else I'll swear my fate 's my god."*

Thus there is uo solution of the conflict (which in one form or the other all men have to undergo) between passion on the one side, and law, duty, and

religion on the other ; and passion triumphs, in the dying words of "the student struck blind and mad by passion"—

***O, I bleed fast! Death, thou'rt a guest long look'd for; I embrace Thee and thy wounds: O, my last minute comes! Where'er I go, let nie enjoy this grace Freely to view my Annabella's face."*

*It has been observed by a recent critic of mark that " English poets have given us the right key to the Italian temperament. ge The love of*Giovanni and Annabella is rightly depicted as more imaginative than sensual." It is difficult to allow the appositencss of Mr J. A. Symonds's special illustration; on the other hand, Ford has even in this case shown his art of depicting sensual passion without grossness of expression ; for the exception in Annabella's language to Soranzo seems to have aspecial intention, and is true to the pressure of the situation and the revulsion produced by it in a naturally weak and yielding mind. The entire atmosphere, so to speak, of the play is stifling, and is not rendered less so by the underplot with Hippolita.*

Like this tragedy, The Broken Heart was probably founded upon some Italian or other novel of the day; but since in the latter instance there is nothing revolting in the main idea of the subject, the play commends itself as the most, enjoyable, while, in respect of many excellences, an unsurpassed specimen of Ford's dramatic genius. The complicated plot is constructed with greater skill than is usual with this dramatist, and the pathos of particular situations, and of the entire character of Penthea—a woman doomed to hopeless misery, but capable of seeking to obtain for her brother a happiness which his cruelty has condemned her to forego—has an intensity and a depth which are all Ford'sown. Even the lesser characters are more pleas- ing than usual, and some beautiful lyries are interspersed in the play.

Of the other plays written by Ford alone, The Chronicle Historie of Perkin Warbeek—A Strange Truth alone appears to call for special attention. A repeated perusal of this drama suggests the judgment that it is overpraised when ranked at no great distance from Shakespeare's national dramas. Historical truth has not to be taken into consideration in the matter; and if (notwithstanding Mr Gairdner) there are still credulous persons left to think

and assert that Perkin was not an impostor, they will derive little satisfaction from Ford's play, which with really surprising skill avoids the slightest indication as to the poct's own belief on the sub- ject. That this tr.gedy should have been reprinted in 1714 and acted in 1745 only shows that the public, as is often the case, had an eye to the catastrophe rather than to the development of the action. The dramatic capabilities of the subject are, however, great, and it afterwards attracted Schiller, who, however, seems to have abandoned it in favour of the similar theme of the Russian Demetrius. Had Shakespeare treated it, he would hardly have contented himself with investing the hero with the nobility given by Ford to this personage of his play,—for it is hardly possible to speak of a personage as a character when the eluc to his conduct is is.tentionally withheld. Nor could Shakespeare have failed to bring out with greater variety and distinctness the dramatic features in Henry VIJJ,, whom Ford depicts with sufficient distinctness to

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give some degree of individuality to the figure, but still with a tenderness of touch which would have been much to the credit of the dramatist's skill had he been writing in the Tudor age. The play is, however, founded on Bacon's Life, of which the text is used by Ford with adimirable discretion. The minor eharac- ters of the honest old Huntley, whom the Seottish king obliges to bestow his daughter's hand upon Warbeck, and of her lover the faithful " Dalyell," are miost effectively drawn ; even "the men of judgmént," the adventurers who surround the ehief adven- turer, ate spirited sketches, and the Irishman among them has actually some humour; while the style of the play is, as befits a 'Chronicle History," so clear and straightforward as to make it easy as well as interesting to read. F :

The Witch of Edmonton was attributed by its publisher to William Rowley, Dekker, Ford, "&e.," but the body of the play has been generally held to be ascribable to Ford and Dekker only. Mr Swinburne agrees with Gifford in thinking Ford the author of the whole of the first act; and he is most assuredly right in econ- sidering that "there is no more admirable exposition of a play on the English stage." Supposing Dekker to be chiefly responsible for the scenes dealing with the unfortunate old woman whom

per- seeution as a witeh actually drives to become one, and Ford for the domestic tragedy of the bigamiist murderer, it cannot be denied that both divisions of the subject are effectively treated, while the more important part of the task fell to the share of Ford, Yet it may be doubted whether any such division can be safely assumed; and it may suffice to repeat that no domestic tragedy has ever taught with more effeetive simplicity and thrilling truthfulness the homely double lesson of the folly of selfishness and the mad rashness of erime. To us snch plays as this are singularly interesting, both as pictures of the manners of the age which they depict without the effort mote or less pereeptible in comedy, and as illustrations of a species of the modern drama whieh, in its best examples, is perhaps of all the least liable to essential change.

With Dekker Ford also wrote the mask of The Sun's Darling; or, as seenis most probable, they founded this production upon Phacton, an earlier mask, of which Dekker had been sole author. Gifford holds that Dekker's hand is perpetually traceable in the first three aets of The Sun's Darling, and through the whole of its comie part, but that the last two azts are mainly Ford's. If so, he is the author of the rather foreed occasional tribute on the accession of King Charles I., of which the last act largely consists. This mask, which furnished abundant opportunities for the decorators, musicians, and dancers, in showing forth low the seasons and their delights are suecessively exhausted by a " wanton darling," Ray- bright the grandchild of the Sun, is said to have been very popular. It is at the same time eommonplaee enough in conception; but there is niuech that is charming in the deseriptions, Jonson and Lyly being respectively laid under contribution in the course of the dialogue, and in one of the incidental lyrics.

Ford holds a position of his own among our dramatists of the second order. This he owes not to his skill as a con- structor of plots, which he at times prepares better than he executes them, thus verifying the observation that the supreme skiil of the dramatist lies, not in devising or finding the chief situation of his play, but in the harmonious build- ing-up of the action and development of the characters towards it. Nor does he owe it even to the beauty of his versification, the fluency and strength of which are incon- testable, notwithstanding a certain obscurity of style. His peculiar power

lies in the intensity of his passion, in parti- cular scenes and passages where the character, the author, and the reader are alike lost in the situation and in the sentiinent evoked by it; and this gift is a supreme dram- atic gift. But his plays—with the exception of Zhe Witch of KHdmonton, in which he doubtless had a prominent share—too often disturb the mind like a bad dream which ends as an unsolved dissonance; and this defect is a supreme dramatic defect. It is not the rigid or the stolid who have the most reason to complain of the insufficiency of tragic poetry such as Ford's; nor is it that morality only which, as Ithocles says in The Broken Heart, "is formed of books and school-traditions," which has a right to protest against the final effect of the most powerful creations of his genius. There is a morality which both

- *Keeps the soul in tune, At whose sweet music all our actions dance," and is able to physic*

' The sickness of a mind Broken with griefs."

me

Of that morality—or of that deference to the binding power within man and the ruling power above hin— tragedy is the truest expounder, even when it illustrates by contrasts ; but the tragic poet who merely places the pro- blem before us, and bids us stand aghast with him at its cruelty, is not to be reckoned among the great masters of a divine art.

The best edition of Ford is that by Gifford, with notes and intro- duction, revised with additions to both text and notes by the late Mr Dyce (8 vols. 1869). Mr Swinburne's " Essay on Ford," to

which reference has been made in this article, is reprinted amon his Essays and Studies (1875). (A. W. W.)

FORD, Ricuarp (1796-1858), author of one of the earliest and best of travellers' Handbooks, was the eldest son of Sir Richard Ford, who in 1789 was member of par- liament for East Grinstead, and for many years afterwards chief police magistrate of London. His mother was the daughter and heiress of Benjamin Booth, who was a distinguished connoisseur in art,

and from whom his grandson seemed to have inherited the artistic skill and taste which he developed to so high a pitch of excellence in his writings, his sketches, and his collections from Cov- tinental countries, particularly Spain. He was educated at Winchester, graduated at Trinity College, Oxford, and was called to the bar in Lincoln's Inn. Ford, however, never practised the profession of a lawyer, and in 1830 he landed for the first time in Spain, where he travelled for three years, spending much of his time in the Alhambra, and at Seville. On his return to England in 1833, he settled in Devonshire at Heavitree, near Exeter, where, writes his friend, the late Sir William Stirling Maxwell, "he built himself a charming residence, and surrounded it with gardens and terraces, which he adorned with graceful Moorish buildings, and planted with pines and cypresses fiom historic groves by the Xenil and Guadalquiver." From 1837 to 1857 he contributed to the Quarterly Renew, his first contribution to that periodical being a paper on the apparently uninviting subject of Devonshire cob walls, and his last a review of Zom Brown's School Days. His first work was the pamphlet, An Historical Inquiry into the Unchangeable Character of a War in Spain (Murray, 1837), in reply to one called the Policy of England towards Spain, and issued under the patronage of Lord Palmerston. He spent the winter of 1839-40 in Italy, where he added largely to his collection of majolica; and soon after his return he began, at Mr Murray's invitation, to write lus Handbook for Travellers in Spain, the literary work with which his name is chiefly associated. In consequence of the failure of his health, he was obliged to resign his seat on a royal coramission that had been appointed, iu the winter of 1856-7, to report on the best site for the Na tional Gallery, and he died on the 31st August 1858.

FORD, Tuomas, an English musician, of whose life little more is known than that he was attached to the court of Prince Henry, son of James I. His works also are few, but they are sufficient to show the high stage of efficiency and musical knowledge which the English school had attained at the beginning of the 17th centuty. They consist of canons and other concerted pieces of vocal music, mostly with lute accompaniment. The chief collec: tion of his works is entitled Mustke of Sundrie Kinds st forth in Two Books, &c., 1607, and the histories of music by Bumey and Hawkins give specimens of his art. Together with Dowland, immortalized in one of Shake-speare's sonnets, Ford is the chief representative of the school which

preceded Henry Lawes, the great master 0 declamatory music, who, according to Milton,

‘¢ First taught our English musie how to span Words with just note and accent.”

In this art, however, Ford is by no meaus deficient, bis

FOR—FOR

songs showing great care in the exact rendering of the words, with regard to both accent and meaning. FORDUN, Joy or. Little is known with any certainty of this chronicler, and the so-called lives of him are mainly a collection of conjectures more or less probable. The

credulity of our early writers is pardonable ; the nonsense |

of some later ones is without excuse. A notice inserted in the Vew Statistical Account of the parish of Fordoun in Kincardineshire begins thus :—“ John of Fordun, the his- torian, was either a native of the parish or resident in it,

when he wrote his history of Scotland. He is called by |

Bede ‘venerabilis vir Dominus Joannes Fordun, Pres- byter.’” The writer’s notions of chronology must have been somewhat peculiar. that the chronicler was born at Fordoun has apparently no better foundation than lis name. It is certain that he was a secular priest, and that he composed his history in the latter part of the 14th century; and it is probable that he was a chaplain in the cathedral of Aberdeen. The work of Fordun is the earliest attempt to write a continuous history of Scotland; nothing existed previously except brief chronicles and genealogical memoranda. It is divided into five books. ‘The first three are almost entirely iabulous, and form the groundwork on which Boece and Buchanan afterwards raised the huge structure of historical and political fiction, which was first exposed by Thomas Tunes in his Critical Essay. The 4th and 5th books, though still mixed with fable, contain much valuable infor- mation,‘and become more authentic the more nearly they approach the author’s own time. The 5th book concludes with the death of King David I. in 1153. Besides these five books, Fordun wrote part of another book, and collected materials for bringing down the history to a later period. These materials were used by a continuator who wrote in the middle of the 15th century, and who is commonly, and no doubt correctly, identified with Walter Bower, abbot of the monastery of Inchcolm. ‘The additions of Bower form eleven books, and bring down the narrative to the death of King James I. in 1437, Accord-

ing to the custom of the time, the continuator did not |

hesitate to interpolate Fordun’s portion of the work with additions of his own, and the whole history thus compiled is known as the Scotichronicon. The first printed edition of Fordun’s work was that of Thomas Gale in his Scriptores Quindecim, which was published in 1691. This was followed by Thomas Hearne’s edition in 1722. The whole Work, including Bower’s continuation, was published by Walter Goodall at Edinburgh in 1759. In 1871 and 1872 Fordun’s chronicle, in the original Latin and also in an

English translation, was edited by Mr William F. Skene In the series of The Historians of Scotland. Mr Skene's preface to this valuable edition contains full information both in regard to the author, the manuscripts of his work, and the printed editions, Reference may also be made to Thomas Innes's Critical Essay, vol. i. p. 201-214; to the biographical notice of Fordun in the second volume of Tytler's Lives of Scottish Worthies ; and to Mr Felix G. H. Skene's preface to the " Liber Pluscardensis," in the series of The Historians of Scotland,

_ FORESTS, FOREST ADMINISTRATION. A forest Sa tract of country covered with trees, of one or several spe- "les, or with trees and underwood. Forests are of the gteatest importance in the general economy of the globe, influencing the humidity of the air and the soil, mitigating the extremes of heat and cold, affording shelter to man and beast, and enriching the soil on which they grow. Trees Supply timber and fuel to man, and furnish him with a vast variety of economical products, such as gums, drugs, dyes, and articles of food. The management of latge areas of natural or planted wood-lands is called

' their characteristic forests.

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Forestry or Sylviculture. For the culture and uses of individual trees, see the separate articles, such as Bircu, Eum, Frr, Oak, &e. ; and for ornamental belts, avenues, c&e., the reader is referred to ARBORICULTURE,

Historical records give us reason to believe that the habitable earth was generally covered with forest growth before it became the abode of man, and additional proof of this is found in the extensive remains of ancient trees, The geological record may also be referred to, as evidencing by its coal-fields the extensive breadths once covered by the richest vegetation,

The arboreous vegetation of the earth is remarkable for

_its great variety: many countries are rich in pines, others The statement generally made |

in oaks; Australia in Eucalyptus or gum trees, India in teak, California in Wellingtonia or Sequoia, and Brazil in palms. Trees, like other plants, require different degrees of heat, light, moisture, and elevation above the sea for their vigorous development, and hence various countries have The birches and pines of the North make way in the temperate zone for oaks and beeches, and in the tropics for palms and other heat-loving trees. The same trees seem to require similar climates, but the same climates do not always produce the samé plants. The mountains of South India and Ceylon closely resemble the regions where the cinchona forests occur, but the genus is wanting in Asia. Again the teak is unknown in America, although parts of Brazil resemble its home in Malabar. These anomalies are explained perhaps mainly

_ by the primitive distribution of the plants (see DisTRIBU- | TION).

It is also remarkable that some forests consist solely of one particular tree (on the Continent technically called "pure forest," in contradistinction to mixed forests), such as the birch in Lapland, the deodar in the Himalaya, the Abies canadensis and Pinus Strobus in North America,

| The European forests, on the contrary, are generally com-

posed of coniferous trees mingled with oak, elm, ash, beech, poplar, willow, alder, birch, and lime, interspersed with hornbeam, and various species of Pyrus and Prunus, the underwood being hazel, elder, buckthorn, viburnum, roses, &c. The American forests contain a still greater variety of species, a fact strikingly illustrated by Sir J. D, Hooker, in speaking of a patch of native forest a few miles from St Louis on the Missouri:—" In little more than half an hour, and less than a mile's walk, I saw forty kinds of timber trees, including eleven of oak, two of maple, two of elm, three of ash, two of walnut, six of hickory, three of willow, and one each of plane, lime, hornbeam, hop-hornbeam, laurus, diospyros, poplar, birch, mulberry, and horse-chestnut, together with about half that number of shrubs."

Natural forests may be divided into several classes, and in Kurz's forest flora of British Burmah the classification adopted is as follows :—

Evergreen Forests,

1. Littoral Forests. | 3. Tropical Forests 2. Swamp Forests. 4, Hill Forests.

Deciduous or Leaf Shedding Forests. 5. Open Forests. 7. Mixed Forests. 6. Dry Forests. 8. Dune Forests.

The following table, calculated by Rentzsch (Der Wald), from statis- tics obtained prior to 1862, shows the proportion of woodland in different European countries, as estimated at that date :—

INO VEER Ecocennogocon 66:00 per cene. I Sardiniaveess.caeceesees 12 29 per eent. Sweden..,:.---....;— 60:00 <, Neapolitan States... 943 ,, ROSE cs eccsen ese. 3000 4, aad s ae Genmany ..... 26:58 |, OPIN... secesescestere ssc 552, Belgium: sosceec-o--) 1502 5, Denmark. .~~s24c..~~ 550, TN EROE® eponeoasnencan WO oy Great Britain…..... EXD) as Switzerland …..... 1500 ,, i, Portugalliey…2::... 4-40 f

Siemoni gave in 18/2 the proportion in Turkey at 24 per cent., and in United Italy 8°70 per cent.

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For comparison, we quote from the most recent official abstract the Population, Area, and Acreage under Wood in the United Kingdom and various foreign countries, according to returns furnished by

the agricultural and statistical departments of the respective countries.

Pop -— Gn Wore and i ee : nglish Forests woods tion Acres). (in Acres). | Jand.

ee Great Britain (1877) ....cerseees 26,072,284 55,802,360 1 2,187,078 3°92 Treland (1877) ..cccccoe-seccceeeees 5,412,377 20,327,196 1 328,413 1-62 United Kingdom, ineluding

Isle of Man and Chanel $1,629,299 76,323,203 1 2,515,491 3°29

Islands, 1877 …...cesesseeees Russia in Europe (1872) .....| 71,730,980 1,244.367,3512| 527,426,510 42°38 Sweden (1875)... .| 4,883,291 | 100,514,9561 40,686,883 | 40°43 Norway (1870).... 1,742,000 77,527,7661|

17,290,000 | 22°30 Denmark (1876) . «| 1,784,741 8,572,929} 364,474 4:25 Prussia (1876)..... .| 24,643,623 | 85,834,7031} 20,047,014 | 23:35 Baden (1876) .....- eee) adialao 3,726,080 1,337,767 | 35-90 Wiirtemberg (1876). ...-sssee-ee 1,881,503 4,786,114! 1,494,147 | 31°22 Holland (1875). ...secccesesceceeees 3,865,456 7,761,5281 486,229 627 Belgium (1866) ...-.eeceee-sseeeees 4,827,833 7,241,000!) 1,073,452 | 14°82 France O1ST4 tees setitecsssseceerae 36,102,921 | 130,675,2864| 20,641,953 | 15°79 NIG (QUES ee Dy receno sree oocenncre 96,801,154 | 73,187,3354| 9,031,310 | 12:34 Austria Proper (1875)..~~1~~.---- 20,394,980 | 74,176,000 | 23,284,174 | 31°39 Hungary (1875) ...cscrsccsceeeeree | 13,561,245 68,799,0001) 19,425,600 28-24 Switzerland (1877).....scccccecee 2,669,147 10,223,281 4 1,905,407 | 18°64 United States (1875).....0.0++-| 38,558,871 |2,095,600 0004 seo oe

2 Exclusive of lakes. 4 Inclusive of lakes and rivers.

1 Exclusive of lakes and rivers. 3 Exclusive of the Bodensee.

Russia…..... 42°38 p.c.| Hungary …..... 28°24 p. ¢. | Belgium…... 14°82 p. ¢. Sweden…..... 40°43 ,, | Prussia…..... 23°35 ,, | Italy …..... 12°34 ,, Teas) Vpconeeeon 35°90 ,, | Norway…..... 22°30 ,, : Holland Gi ~ 5, Wiirtemberg 31°22 ,, | Switzerland… 18°64 ,, : Denmark….. 425 ,, Austria…» 31:39 ,, | France…..... 1579 ,, | Great Britain 329 ,,

-The discrepancies observable in these tables are in some cases apparent; thus the latest returns from Russia, Sweden, Norway, &c., are exclusive of sheets of water, whereas in the same returns the area of France, Italy, and Switzerland includes the lakes and rivers. Great Britain also now includes the Isle of Man and Channel Islands. In other cases the discrepancies are real, arising from the greater accuracy of information which has been collected through Government organizations, which did not exist when the estimate of Rentzsch was made. An entire comparison is unattainable, but it will be observed that the largest proportion of woodland is in Russia, Sweden, Germany, and Austria. The lowest occurs in Britain, Denmark, Holland, Spain, and Portugal.

The physical history of every country proves incon- testably that a moderate extent of forest promotes in a luigh degree both its agricultural and its

manufacturing interests, as well as the productive resources of the country at large ; and the beneficial influence of forests in a physi- cal, economical, and hygienic aspect is now receiving more of the attention its importance deserves. The countries bordering the Mediterrancan—Spain, France, Italy, and Turkey—have all suffered in a marked degree from the reckless and wholesale destruction of the woods which covered the mountain slopes, and many springs which formerly existed under the shelter of the forest have now wholly disappeared. Though the insular position aud moist climate of the British Isles save them from suffering from the want of forest in an equal degree with Continen- tal nations, the Anglo-Saxon race has been slow to appre- hend the value of the forests with which nature has so liberally clothed the earth, and the history of North America, South Africa, Australia, and New Zealand bears testimony to the same improvidence and need of considera- tion. There can be no doubt that one of the causes of the terrible famines in India and China is the unwise denuda- tion of mountain slopes, where the forests formerly ab- sorbed a large portion of the rainfall which now quickly runs off to the sea (see Curate). No point has been more clearly established than the salubrious and fertilizing effect of forest clothing in the climate of India. It has on be Hea of much inquiry, and has been affirmed

ated in reports from many districts.

FORDLSTS

We propose in this article to indicate briefly the princi- pal wooded tracts of the earth, so far as known, and to describe the systems of conservancy adopted or the preli- minary measures taken for the better management of state forests. Timber trees and forest produce will be briefly enumerated, but for the distinctive flora the reader is re- ferred to the separate article on each country.

Forest science constitutes a separate branch of education in various countries of Europe. The first technical instruc- tion was given in the Hartz forest, and Germany has taken the lead in developing a wise forest administration. France, Italy, Sweden, and Russia have successively es- tablished forest academies, and now the conservation of woodland occupies the legislature of almost all civilized lands.

The general systems of forest management in Britain and on the Continent are essentially different. Beautiful enclosures and plantations are seen in almost every part of England and Scotland. With the exception, however, of coppice wood and a limited extent of natural forest in the Highlands of Scotland, the system generally followed is to cut down the mature crop and to plant again. But on the Continent natural reproduction is the rule, not of wood coppice only, but also of high forest. In France the term of maturity for cutting a forest is determined with great care by a committee of skilled officers, and is usually divided into periods of so many years each; the term for an oak forest, for example, say 150 years, is divided into five periods of thirty years. Each series of years represents so many blocks or portions of forest, and the yearly cut- tings are arranged so as to cover a certain extent of ground, and when one block has been felled another reaches matu- rity. France has a state department for the administration of the forests, and a very detailed code of forest laws (Code Forestier). The relation of woods to the regular drainage of the soil, and especially to the permanence of the cov- figuration of the terrestrial surface has been thoroughly investigated. The methods of resisting the encroachment of sands or dunes have also received special attention. In Germany forestry is eagerly followed as a profession, and forest academies are numerous and well organized. The examination of candidates is very strict, and the result of the system has been most beneficial. In forest science Germany is far advanced, and the literature is specially rich, Every tract is carefully surveyed and treated ona working plan made with great exactness as to actual details and expected growth; care is always taken that in high forest there is a good stock of self-sown trees before the old crop is entirely removed. Systematic observation and experiments are made as to the rate of growth, and the best soil for each description of tree.

In Italy, where the French and German systems have been tested, the principles of sylviculture adopted by Hartig, Cotta, &e., are not always applicable in the drier climate of the south. Onthe arid slopes of the Apennines pasture is more profitable, and there is as yet little sympathy with skilled conservation of woods

EUROPE.

Great Britain and Ireland —The British Isles were formerly much more extensively wooded than at present. The rapid increase of population has led to the disafforesting of woodland; the climate requires the maintenance of house- hold fires during a great part of the year, and there has been an increasing demand for arable land ; these along with the extension of manufacturing industries have been the chief causes of the diminution of wood. The propor tion of forest is now very small, and yields but a fraction of the required annual supply of timber which is importe

a

PORE ST Ss

with facility from America, northern Europe, and the nu- merous British colonies. a

Owing to the nature of the climate of the British Islands, with its abundance of atmospheric moisture and freedom from sucli extremes of heat and cold as are prevalent in continental Europe, a great variety of trees are successfully cultivated. In England and Ireland oak and beech are on the whole the most plentiful trees in the low and fertile parts; in the south of Scotland the beech and ash are perhaps most common, while the Scotch fir and birch are characteristic of the arboreous vegetation in the Highlands. Although few extensive forests now exist, woods of small area, belts of planting, clumps of trees, coppice, and hedge- rows are generally distributed over the country, constituting a mass of wood of considerable importance, giving a clothed appearance in many parts, and affording illustrations of skilled arboriculture not to be found in any other country.

The principal state forests in England are Windsor Park, 14,000 acres, the New Forest, &e, in Hamp- shire, 76,000 acres, and the Dean Forest in Qloucester- shire, 22,500 acres. The total extent of crown forests is about 125,000 acres, and the timber growing upon them is valued at between two and three millions of pounds, A large proportion of the crown forests, having been formed with the object of supplying timber for the navy, consists of fine oak, These wooded tracts are under careful man- agement, The total receipts from the royal forests exclu- sive of Windsor amounted in 1876-77 to £33,129. The largest forests in Scotland are in Perthshire,

Inverness- shire, and Aberdeenshire, Of these the most notable are the earl of Mansfield's near Scone (8000 acres), the duke of Atholl's larch plantations near Dunkeld (10,000 acres), and in Strathspey a large extent of Scotch fir, partly native, partly planted, belonging to the earl of Seafield. The last-named forest has been regularly planted in such @ gradation as to cut 1000 acres annually on a rotation of sixty years. In the forests of Mar and Invercauld, the native pine attains a very great size, and there are also large tracts of indigenous birch in various districts. The total area under wood in Scotland is less than it was in 1812 by 200,000 acres. Ireland was at one time richly clothed with wood; this is proved by the abundant re- mains of fallen trees in thie bogs which still occupy a large surface of the island. In addition to the causes above alluded to as tending to disafforest England, the long un- Settled state of the country also conduced to the diminish- Ing of the woodlands. At present indigenous timber is exceedingly scarce, the proportion of woodland being only 162. The abundance of peat compensates in some mea- sure for the want of wood as fuel.

The following acreages of land and woodland in the

Fi Kingdom are taken from the agricultural returns 0 _—

Total Area, Woods, Coppiccs, including and Water. Plantations.

LGN 32,597,398 1,325,765 les re 4,721,823 126,823 Sit 19,496,132 734,490 JACEE 1G ee oe 20,819,829 $25,173

77,635,182 2,512,251

In England, the woods, except the crown forests, being senerally on a small scale and private property, there has been no legislative interference with their management. No uniform system of education has been adopted, and a School of forestry is much required. Meanwhile the High. land and Agricultural Society of Scotland grants certifi- Cates for proficiency in the theory and practice of forestry tested by examination. Excellent instruction in surveying, botany, chemistry, geology, and collateral subjects is given n Edinburgh, at the Royal Agricultural College, Ciren- cester, at Glasnevin, Dublin, and in other places,

Norway and Sweden.—The peninsula formed by the kingdoms of Norway and Sweden is abundantly wooded. The principal trees are Scotch fir (Pinus sylvestris), spruce fir (Abzes excelsa), and birch (Betula alba). These grow to a large size, and the birch extends almost as far as the North Cape, only giving place at high altitudes to low, bushy willows. In the southern districts only is there any variety of hardwood. The forests are principally situated in the east of Norway. The western parts have been denuded, and the wants of the sea-coast are supplied from the inland districts.

Of the vast area of waste land returned as forest in Norway, about one-ninth belongs to the state or to various state institutions. In the greater part of the forests the population have a long established right for grazing, timber, and firewood ; and even in tracts in which land- owners or the state have a part ownership, the rights of the population, if they have any, take precedence of all other claims. Communal forests are managed by men chosen from among those who jointly own them. From the 16th century various laws attempted to regulate the private forests, but these were found vexatious, and were repealed in 1836. The forest department for the control of state forests consists of 27 officers, with a very large staff of men employed in felling and timber transport. The export of timber from Norway is chiefly from the Skeen Fiord, and the various ports between Cape Lindesnaes and the Swedish border. The annual export amounts to about 80,000,000 cubic feet, more than half being sent to Great Britain and Ireland, while the average annual value is estimated at £2,400,000. Some idea of the great timber resources of Norway may also be gatiered from the fact that in the census of 1865 there were 4937 men entered as working in the forests, and 17,549 described themselves as employed in woodwork, saw-mills, tar-preparing, &c. Ina Norwegian administration report it is stated that "the pre- sent destruction of forests has reached the limit of the per- missible, probably even exceeded it,"

Of the 100,500,000 acres in the kingdom of Sweden, 88,800,000 were officially reported in 1875 as forest waste land, 12 millions being public, and 76 millions private property. Only about half of this, however, is really covered with wood, including plantations formed in recent years. Of the

public forests only 4 million acres are under direct state management ; about an equal alea remains to be demarcated, while the rest belongs to other public insti. tutions, is attached to state residences, or is temporarily alienated. The trees in Sweden are the same as those of Norway, but oak, elm, lime, alder, and beech grow more extensively in the sonth. Birch-wood is chiefly used as fuel, and the wood of the aspen is largely employed in the manufacture of matches.

Forest management in Sweden is in course of progres- sive development, and the administration is conducted with energy. The department consists of a director and 700 men of different administrative and executive grades, Much labour is required to bring the timber to market from remote forests in the western part of the kingdom ; in winter sledges on ice and snow are used ior transport, and in floating down the rivers logs often take four and five years to reach the timber depot. Besides the control of the state and other public forests, -the department is entrusted with the surveillance of private forests.

In 1875 the total revenue of the state forests was £56,807. The actual expenditure was £35,787. The profits were therefore £21,020. The shipments of timber are annually increasing, and were in 1874 325,061 loads, and 704,741 standards. A Government forest school at Stockholm, which in 1875 had 13 students, supplies recruits for the higher grades of forest service, while there are six provincial schools for training men for the subordinate posts. Be-

sides these, there is a private forest school receiving a grant in aid from Government,

400 FORESTS

Denmark is one of the most poorly wooded countries in Europe, the percentage of woodland being now only 4°25 of the whole area. 'This small proportion is caused chiefly by the nakedness of the western part of Jutland, where the west winds have seconded the action of man in destroying the forests. Much of the wood which at one time covered nearly the whole of Denmark having been cut down, to make way for agriculture, and to supply fuel and timber, a vast area thus bared has become a sandy heathy desert.

The chief indigenous trees of Denmark are the spruce and Scotch fit, birch, and aspen. The oak also forms valuable forests on the islands of Falster and Lolland. Beech, which was later introduced, has flourished so well as almost to monopolize the forest ground, and special protection is afforded to the oak, while a variety of conifers are being introduced as rivals to the beech; in a few places only, such as Normandy and the Carpathian mountains, are beech forests so luxuriant as in Denmark. Although laws to check the destruction of forests were enacted in the 15th, 16th, and 17th centuries, they were treated asa dead letter; it is only since 1805 that effective measures have been taken to preserve the remains of Danish woodland and to create new plantations. A state forest department permits only small portions of old forests to be cleared at a time, and insists on the simultaneous planting of an equal area. The department also exercises a controlling supervision on private forests, forming plantations where necessary on private estates at the expense of the owner. About one- fifth of the entire area of Denmark may be described as lying waste ; sonie of this is unfit for the growth of trees, but already extensive plantations have been formed, on the heaths and dunes of West Jutland, of hardy trees such as Pinus montana, Abies alba, A. excelsa, and A. pectinata. In some instances, the state purchases tracts of heath on which to form plantations, and in others grants aid to private enterprise.

The Danish forest school is at Copenhagen, and forms a branch of an agricultural college. Admittance is obtained after passing an examination similar to that required for matriculation at the uvi- versity. The forest education requires four examinations, and the subjects comprised are—(1) mathematics, geology, natural philo- sophy, chemistry, zoology, botany, and drawing; (2) practical work, to acquire a knowledge of which the student generally ar- ranges to serve for a year or two under a forest officer ; (3) an oral examination in the principles of forestry, surveying, geology, hydrology, forest zoology, and botany; and (4) these principles applied practically, a tract of forest above 200 acres to be surveyed, and levels found for a line of 3000 or 4000 feet. The course of study

extends from four to six years ; the student then becomes a "' forest candidate," and may look for Government employment.

Holland, on account of its formation and climate, possesses no indigenous forests. The country is so inter- sected by water that it is extremely subject to fogs, and being little above the sea level it is greatly exposed to winds, those from the north-west especially being pre- judicial to tree growth, while the marshy ground prevents the roots from penetrating far into the soil. There is, however, along the roads and embankments, a considerable amount of timber, consisting of beech, poplar, willow, and ash, which attain a large size, and in the management of such avenues the Dutch excel. Elms also thrive on the embanknients. The extensive dunes, amounting to 140,000 acres, are planted chiefly with hardy conifers (Marsh).

Belgium.—tThe physical features of Belgium are, except in the northern part, very different from those of Holland. The chief forests are in the districts of Brabant and Flanders, and the old forest of Ardennes still extends along the south-eastern frontier. According to Siemoni, in 1872 Belgium had 18 per cent. of her soil covered with wood. Recent returns give the area of state forest in Belgium as nearly 7 5,000 acres, and of communal forests 300,000 acres, all being under Government control.

Germany is in general well wooded, the forests of Prussia being estimated to cover 23°35 per cent. of the whole surface ; while Witirtemberg has 31:22, and Baden 35°90. This wealth is partly due to the abundant natural supply, and partly to the methodical way of treating forests adopted by all the states of the empire. The winters being long and severe, an abundant supply of fuel is almost as essential as a sufficient supply of food. This necessity has led, in the absence of coal, and along with a passion for the chase, to the preservation of forests, and to the establishment of an admirable -system of forest cultivation, almost as carefully conducted as field tillage. We need only enumerate a few of the principal wooded tracts bordering on the Rhine and the Elbe. The Black Forest stretches the whole length of the grand-duchy of Baden and part of the kingdom of Wiirtemberg, from the Neckar to Basel and the lake of Coustance. The vegeta- tion resembles that of the Vosges; forests of spruce, Scoteli, and silver firs, mingled with birches,-beech, and oak, are the chief woods met with. The forest of Rippoldsau, on the head waters of the Kinzig, is one of the best forests, and is managed with great care. In the grand-duchy of Hesse, the Odenwald range of mountains, stretching between the Maine and

the Neckar, contains the chief supply of timber. These two large tracts of forest are favourably situated with respect to water carriage, and from them the supply of timber for exportation is mainly drawn ; it is now, however, so much diminished in passing down the Rhine through populous districts, that it no longer suffices for the demands of the Dutch shipbuilders. The largest spars are called " Hollander." . The floating operations down the several tributaries of the Rhine in the Black Forest are very instructive, and the timber trade may there be studied with advantage. In the duchy of Nassau there are the large wooded tracts of the Westerwald and the Taunus mountain ranges, and the forests cover a large area extending between Neuwied aud Bieberich. In Rhenish Prussia the valuable forests nearly equal the arable land in extent. These lie partly in the Ardennes, on the borders of Belgium, and on the mountains overhanging the Upper Moselle, but they do not furnish such stately trees as the Schwarzwald or Black Forest and the Odenwald. The Vosges forests were ceded to Germany in 1872, after the Franco-Prussian war. The Spessartwald, near Asch-affeuburg-on-the-Maine in Bavaria, is one of the most extensive forests of middle Germany, containing large masses of fine oak with extensive plantations of coniferous trees, spruce, Scotch fir, and larch. Bavaria possesses other fiue forest tracts, such as the Baierischewald on the Bohemian frontier, the Kranzberg near Munich, and the Frankewald in the north of the kingdom. North Germany has extensive forests on the Hartz and Thurin- gian mountains, while in East Prussia large tracts of flat ground are covered with Pinus sylvestris, Abies excelsd, and juniper. ;

Prussia, including Hanover, contains about 20 million acres of forest land. About half of this is private property, and of the other half, managed by the state, part is coml- munal or ecclesiastical forest. Of the state forests, equalling 6,200,000 acres, a small proportion is moorland yet to be planted. The yield of the state woodland in 1871, a large portion of which bears Scotch fir, was 204,796,260 cubic feet, or 34°5 cubic feet per acre of the area devoted to the produce of timber. The total income for the year for timber and other forest products amounted to £2,100,000, or about six shillings an acre, little more than half of which went to-working expenses, the cost of the forest academies, commutation of servitudes, and road taxes.

Much has been done in Germany to preserve and

develop the forest resources by establishing training

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schools, with the result that sylviculture has been most accurately studied, and the economical management of woodland most successfully carried out in that country. The following eight academies existed prior to the unifica- tion of theempire. Each large state had one school. They

are now being remodelled with a central office at Berlin.

Eisenach in Thuringia, Saxe | Giessen in Hesse. Weimar. Carlsruhe in Baden.

Tharant, near Dresden, Saxony. | Hohenheim, near Stuttgart, in

Neustadt Eberswald, near Berlin. Miinden in Hanover.

Wiirtemberg. Aschaffenburg in Bavaria.

The academies at Neustadt Eberswald and Aschaffen- burg are for the study of forestry alone, while in the others the pursuit of agricultural or engineering knowledge In Germany the forest service is a state department, filled by youths of good position, who are specially trained for the purpose. The period of train-

is combined with it.

ing extends over five years, and its course is thus described by Campbell Wulker.'

"Nothing struck me as more remarkable than the extent and

varied nature of the studies required from forest candidates or pro- batiouers in Prussia, and the number of years they are content to spend, first in studying and then in waiting for an appointment. The would-be oberférster must, after passing certain terms at a Government school of the first class, spend a year with an ober- forster in a 'revier,' and then pass an examination as forest pupil, after which there is a two years' course at a

forest academy, and an examination in scientific forestry, land surveying, &c., on passing which the pupil becomes a Jorst-kandidat; then other two years' practical study, during at least nine months of which he must actually perform the duties of a forester, after which comes the final Government examination, on passing which he enters the grade of oberforster-kandidat. The difference betwixt the two examinations is that the first tests the candidate's knowledge of theoretical forestry and cognate sciences, whilst the latter tests his ability to apply what he has learnt and capability for employment as oberforster and in the higher grades. 'After passing the final examination the ober- Sorster-kandidat isemployed as an assistant in the academies and control offices, in making forest surveys and working plans, and sometimes acting in charge of a revier, receiving certain daily or weekly allowances whilst so employed. After five or six years of this probation he may look forward to being permanently appointed. Thus we have at least five years spent in study and other five in probation, —the former without any pay, and the latter only with meagre allowances, whilst actually employed, before the would-be forest officer is installed ; and the time is generally much longer. Yet so great is the desire for Government service, and particularly forest service, in Prussia, and indeed in Germany generally, that there is no lack of competitors,

_. che forests form part of the revenue department, and are pre- sided over by an oberland-forstmeister and ministerial direktor, aided by a revenue councillor and joint ministerial direktor and a humerous council, with suitable establishments and secretaries for the various branches… . . The oberland-forstmeister is governor of the academies, and at the head of each is an ober-forstmeister, aided by a numerous staff of professors and assistants. . ee: There is a control office of account at Potsdam, where all the forest accounts of the several provinces are finally audited before going to the Munistry of finance. . . . . The 12 provinces of Prussia are divided into 30 circles (Regierungsbezirk), and to each of these an ober-Sorstmeister is appointed to represent the forest department in the council of local administration eeu) , and aided by councillors and by the Jorstmeisters, as a board, to represent forest interests in the Government, and administer the department to the best advan- tage. Next In order come the Sorstmeisters, numbering 108, in charge of divisions with an average

area of 25,000 hectares, and then the exe- cutive officers, 706 oberforsters, with charges averaging about 3000

ectares, to each of which is attached a forstrendant, or collector of forest Tevenue, and 3646 forsters (or overseers), with ranges of from 500 to 1000 hectares, The forests have all been surveyed, valued, ae divided into blocks, and there are accurate maps representing

€ extent and situation of each forest district, and the description and age of the timber growing in each block. Whatever be the size of the woods every tree ig recorded, and a working plan is drawn out and followed, —certain species being destined to longer or shorter growth, according to their promise of vitality or liability to decay.

may be remarked that such maps form the starting point of ever true system of forestry. ag : ils 2

At Aschaffenburg, which may be taken as an example of German forest schools, candidates for Government for-

1 Reports on Forest Manegement, London, 187 ey

est service must first pass the standard of the higher school or gymnasium, which includes classics, mathematics, natura] history, and chemistry. They are usually seventeen to nineteen years of age, and they first become apprentices for one year, assisting in the practical work of a forest district. The forest curriculum extends over two and a half years. Besides the director, there are four professors, who teach the following subjects :—

I. Forestry. General management, planting operations, valuation surveys, rotation and details of working plan, transport and sale of timber and other forest produce. :

Il. Natural Seienees, with special reference to forest require- ments : meteorological phenomena, organic chemistry, nutrition of plants, systematic botany and zoology, entomology.

Ill. Mechanics. Surveying and Engineering, with Road-making.

IV. Forest Legislation and Police,

Practical instruction is given in the laboratory, and excursions are made in the forests. The students who pass the final examination, after five years' training, are qualified for appointments in the forest service. Careful observations are made at Aschaffenburg regarding

the influence of forests on the air and soil, their hygienic import- ance and effect on climate.

Austria.—Austria, including Hungary and Bohemia, possesses a vast amount of timber, about one-third of the productive area being returned as woodland, and covering 66,000 square miles, situated, more in the east than in the west. There are 2,330,000 acres of forest belonging to the state, chiefly in Croatia, Slavonia, Transylvania, and the Alpine regions throughout the empire. Dalmatia and Istria alone have a deficient supply of timber, owing to previous devastations; but the Government is here making great efforts to restore the forests. The prevailing trees in the higher altitudes are Abies excelsa and pectinata and Pinus montana and Laricio. The larch mingles largely with the pines. In the low-lying tracts of the Alps and Carpathian mountains the beech is the principal] tree ; in the north-west several species of oak; in the south the elm, poplar, chestnut, and walnut. In Dalmatia and southern Tyrol the olive, mulberry, and fig trees abound. Austria produces annually about 67 million cubic feet of timber ; and of other forest products the following are principal

items :— 500,000 ewts. gall-nuts. 250,000 ewts. turpentine and resin, 100,000 ,, potash. 4,000,000 ,, tanning bark.

The total income in 1872 from the Austrian state forests was 4,148,000 gulden, the expenditure 3,049,000 gulden, leaving a net profit of about £90,000. The Austrian Government are wisely desirous to conserve and utilize their valuable forest property, and there is a state forest depart- ment with a staff of 1170 persons, 22 of whom are skilled officers of high position. In parts of Bohemia and Hun- gary entire forests have been destroyed, rendering useless much soil that is unfit for agriculture.

Encouragement is given by the state to persons who make successful efforts to plant denuded ground,

Scientific forestry is not so advanced as in Germany, but increasing attention is being given to the subject. The principal forest academies are at Marien-brunn near Vienna, with a large staff of professors, a laboratory and museum, and at Schemnitz in Hungary. The courses last three years after passing the gymnasium examination, as at Aschaffenburg. Other academies for training more exclu- sively in the practice of forestry have a shorter course.

Russia.—The inequality of the distribution of wood in the Russian empire is very remarkable. The north of Great Russia, the government of Perm, and Finland have a large proportion of forest land, and the export of timber from Archangel, St Petersburg, and Riga is very great, In central Russia there are also large and valuable forests, but in the south they become scanty. It was recently reported at the annual meeting of the geographical society of Vienna by Councillor Wex, that the Volga is decreasing

in volume owing to the destruction of wood in its valley, so as to affect materially the level of the Caspian Sea and Sea of Aral. With the exception of Bessarabia and the Caucasus, including the region south-west of the Caspian, the southern districts of Russia bordering the Black and Caspian Seas are extremely bare of wood, and for household fuel the people use a compost of straw, leaves, &c. The Government has attempted the planting of portions of the vast steppes, and near Odessa there are fine plantations of Ailanthus glandulosa, which give promise of success to further plantings (Marsh), The following statistics of the proportion of woodland in Russia are given in the Journal of Forestry, 1877 :—

‘There are in European Russia alone 172,418,000 dessiatins (about 400,500,000 acres) of forests, or 43°3 per cent. of the entire territory. Such an extent of forests is not to be found in any other country of Europe. Two-thirds, or 66 per cent., of the mass of forests extend over the north-eastern

districts; then follow the north- western governments, where the relative proportion tothe general area is 30 to 50 percent. In the middle Volga, the Baltic, and western and central provinces the proportion is 27-2 per cent., in the south- western it is2°5 percent.,in the Little Russia and Steppe governments, including the Crimea, it is only 0°7 per cent. Finland and the Caucasus are not included, which contain splendid timber in great variety, nor the Polish governments, where the forests occupy a very extensive area."

In the Paris Exhibition Report, 1867, the area of forest in Finland is given at 2,500,000 acres, but in the most accessible parts wasteful and serious denudation has taken place.

The Scotch fir, the spruce, and the Siberian larch are the most common coniferous trees in Russia. The spruce penetrates furthest north, the Scotch fir grows well in the Crimea and the Caucasus, while the larch is chiefly found in the district drained by the Petchora river, and through- out Siberia. These three form the staple of the Russian timber export trade. Birch is also a tree of the northern latitudes, and extends eastwards as far as Kamchatka. In the central and over a large part of the southern portions of European Russia there are good forests of oak, and the beech, boxwood, ash, lime, maple, and walnut all grow in more or less profusion. The oak does not cross the Urals. The ridges of the Crimea are clothed with Corsican pine (Pinus Laricio), while the Scotch fir and beech form fine forests in the Caucasus.

The annual consumption of wood within the Russian empire is enormous, the estimated value being 260 millions of roubles, the railways requiring for fuel alone 7 million roubles worth. In the absence of stone nearly all the buildings are made of wood. Every year upwards of 100,000 vessels of different descriptions descend the Russian rivers, most of which on reaching their destination are broken up for building or fuel. Scotch fir and spruce are usually employed for this purpose. The collection of resin and tar in the northern provinces is very great, about 7000 tons of tar being annually exported. A new industry has sprung up of late years, viz., making pulp for paper from the wood of the aspen, a tree which readily reproduces itself. The lime furnishes material for rope, cordage, and matting.

In 1858, Baron von Berg, a distinguished forest officer of Saxony, was requested to report on the forests and forest management of Finland, and subsequently also of Poland. The establishment of two schools of forestry resulted from his visit. At the school of Nova Alexandria in Poland, established in 1858, the teaching of agriculture is combined with that of forestry. The passing of a gymnasium examination is necessary before admission. The course of study covers three years, when, after the final examination, the students receive a diploma entitling them to employment in the service of Government. At Evois in Finland, where the school was founded in 1859, the instruction is inforestry only. Though at the commencement the education and quarters were given free, the school had to be closed for lack of pupils ; but in 1874 it was reorganized, and now it seems to be in a flourishing condition. The course extends to two years, and the instruction includes forest law and economy, surveying, book-keeping, engineering, mathe- matics, and kindred subjects. A forest school also exists at Peter- offsky near Moscow, and another at Berdiansk on the sea of Azoff, as many young Russians have been sent to the French and

erman schools to acquire a knowledge of forest science.

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Roumania.—It is computed that there are in Roumania 2 million acres of forest land, though not wholly covered with wood. In the plains species of oak predominate, and according to elevation, walnut, beech, yew, silver fir, and spruce. But the coniferous trees have mostly disappeared, and the forests have been greatly damaged, while, owing to grazing rights, no young trees have been allowed to spring up. A small forest staff has now been appointed, and plans are being formed for the establishment of a school for training forest assistants.

France.—The principal timber tree of France is the oak, and various species are much cultivated. The cork oak is grown extensively in the south and in Corsica, The beech, ash, elm, maple, birch, walnut, and poplar are all important trees, while the silver fir and spruce form magnificent forests in the Vosges and Jura Mountains, and the Aleppo and maritime pines are cultivated in the south and south-west. About one-seventh of the entire territory is still covered with wood.

Forest legislation took its rise in France about the middle of the 16th century, and the great minister Sully urged the enforcement of restrictive forest laws. In 1669 a fixed treatment of state forests was enacted, and in 1750 Mirabeau estimated the woodlands in France at 70 millions hectares. Duhamel in 1755 published his famous work on forest trees. Reckless destruction of the forests, however, was in progress, and the Revolution of 1789 gave afresh stimulus to the work of devastation. The usual results have followed in the frequency and destruc- tiveness of floods, which have washed away the soil from the hill sides and valleys of many districts, especially in the south, and the frequent inundations of the last filty years are no doubt caused by the deforesting of the sources of the Rhone and Saone. Laws were passed in 1860 and 1864, providing for the reforesting, " reboisement," of the slopes of mountains, and these laws take effect on private as well as state property. Beneficial results have already ensued. Thousands of acres are annually planted in the departments of Hautes and Basses Alps ; and during the summer of 1875, when much injury was done by floods in the south of France, the Durance, formerly the most dangerous in this respect of French rivers, gave little cause for anxiety, and it is round the head waters of this river that the chief plantations have been formed. While tracts formerly covered with wood have been replanted, plante- tions have been formed on the white shifting sands or dunes along the coast of Gascony. A forest of Pinus Pinaster, 150 miles in length and from 2 to 6 broad, now stretches from Bayonne to the mouth of the Gironde, raised by means of sowing steadily continued since 1789 ; and the cultivation of the same pine in the department of Landes has, along with draining, transformed low marshy grounds into productive soil. With the provinces of Alsace and Lorraine, a large extent of forest was ceded to Germany In

1871.

An official report, dated 1872, gives the following forest areas:—

SUEATED. S00) ROSES Page aM eee Se APE PBC H eRe coc 900,000 hectares.

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In 1877 the French state forests contained 985,086 hectares, and the communal 1,919,622 hectares. The revenue in 1827 amount, to 27,000,000 francs, three-fourths of which was from the sale Z timber, and one-fourth from other forest produce. The estimate revenue for 1877 was 38,500,000 francs, 29,500,000 of which was to come from the regular fellings, and the remainder from extraonlinty cuttings and minor forest produce. The annual expenses 0 t 1 forest department average 13,000,000 francs. For 1877 the a figures were 18,825,732 francs, of which about 5,000,000 is for ~ pay of the establishment, two and a half millions for roads, two 10 plantations, and the balance for conservancy and management.

The department is administered by the director general, who

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has his headquarters at Paris, assisted by a board of administra- tion, who meet twice a week, and are charged with the working of the forests, questions of rights and law, finance, and plantation works. The establishment consists of 36 conservators, 174 inspec- tors, 310 sub-inspectors, and about 420 gardes générauaz, the number being regulated by the exigencies of the service.

The department is supplied with officers from the forest school at Nancy. This institution was founded in 1824, when M. Lorentz, who bad studied forestry in Germany, was appointed its first director. Any French youth from eighteen to twenty years of age may compete for admission to the school on producing certain certifi- cates and filing a bond guaranteeing the payment of 1500 francs a

ear, and 600 francs from the date of his joining the establishment till fe is promoted garde général on full pay. The entrance cxamina- tion comprises arithmetic, algebra, geometry, trigonometry, physical sciences, chemistry, plan-drawing, mechanics, German, history, geo- graphy, and free-hand drawing. The pupils pass two years in the school, and during a third attend lectures, while taking practical charge of portions of forest near Nancy. The school is under a director, a sub-director, and eight professors, besides two officers for military instruction. In the winter session eight hours daily are spent in the school, and the summer term is chiefly passed in forest

tours,the pupils accompanying the professors, who apply the teach- ing of the school to objects found in the forest. There are usually 45 to 50 French pupils. The French Government has kindly extended the benefits of this well-equipped institution to candidates for employment in the state forests of British India.

Switzerland.—Forests in Switzerland cover about 18 per cent., or one-sixth of the whole area, but in some of the cantons excessive deforesting has taken place. On the precipitous mountain sides the forest is found to have a powerful influence in preventing the formation and descent of avalanches, and in the Alps the woods are preserved, though insufficiently, by law. A distinguishing feature of Swiss forests is the prevalence of the silver fir,

Vigorous attempts to preserve and restore wooded land are made in some of the cantons, and difficulties in the transport of timber from inaccessible points have been skilfully overcome by the ingenious adaptation of wooden tramways and iron rope slips.

tialy. —The kingdom of Italy comprises such different climates that within its limits we find the birch and pines of northern Europe, and the olive, fig, manna-ash, and palm of more southern latitudes. The ascertained extent of wood in 1872, including the wooded island of Sardinia, was, according to Siemoni, 5,025,893 hectares, or about 17°63 per cent. of the entire kingdom, a proportion which might with advantage be greatly increased, but in the latest return it has fallen to 12:34. By the republic of Venice and the duchy of Genoa forestal legislation was attempted at various periods from the 15th century downwards. These efforts were not successful, as the Governments were lax in enforcing the laws. In 1789 Pius VI. issued regulations prohibiting felling without licence, and later orders were published by his successors in the Pontifical States. In Lombardy the woods, which fifty years ago reached nearly down to Milan, have almost disappeared. The province of Como contains only a remnant of the primitive forests, and the same may also be said of the southern slopes of Tyrol. At Ravenna there is still a large forest of stone pine, Pinus Pinea, though it has been reduced to a third of its former extent, The Plains of Tuscany are adorned with planted trees, the olive, mulberry, fig, and

almond. Sardinia is rich in woods, which cover one fifth of the area, and contain a large amount of oak, Quercus Suber, Robur,and Cerris. In

Sicily the forests have been long felled save the zone at the base of Mount Etna.

The destruction of woods has been gradual but persistent ; in the end of the 17th century the effects of denudation were first felt in the destructive force given to mountain torrents by the deforesting of the Apennines, and up to the present time the work of demolition con- tinues. According to the statistics published by the Italian Government in 1870, there were 215,801 hectares of state forest, including woods attached to royal residences ; but by the sale, alienation, or destruction of the greater part, the area has since been very greatly reduced. Of com- munal and private forests the extent is, according to Government statistics,

1870, 1877.

Communal forests…2,169,914 hectares … 1,580,000 hectares.

Private forests…..... 2,662,178 ,, .-. 2,040,401 _,,

Only about 1,500,000 hectares are really covered with timber, as these figures include land with mere coppice or brushwood.

In 1867 the monastic property of Vallombrosa, Tuscany, 30 miles from Florence, was purchased by Government for the purposes of a forest academy, which was opened in 1869, and energetic measures were initiated throughout the kingdom for the preservation of the remaining woods. It is to be regretted that, by a change of policy, the area of forest has now greatly decreased. The administrative staff consists of 3 inspectors general, 35 forest inspectors, and about 300 subordinate officials. The royal forest school at Vallombrosa is surrounded by a splendid forest of silver fir, and a large extent of broad-leaved chestnut, beech, and other trees is also attached to it. Prnus halepensis and Pinea and larch are the other prevailing conifers, The number of pupils is about 60, and the course of

study resembles that at Nancy. A forest periodical is regularly published at Florence. Director di Berenger, who has superintended the school from its foundation, is a man of great learning, and author of several important works on forestry.

Spain and Portugal are very deficient in woodland. The Peninsula is not unsuited to the growth of timber, as evinced by the noble forests which existed in the times of the Moors, especially in the southern provinces. There was a code of forest laws in Spain in the reign of Philip II., but it seems never to have been carried out, and the fine forests have long since disappeared. The evils of denudation are perhaps nowhere more signally exeniplified than in Spain, and " Rentzsch even goes so far as to ascribe the political decadence of Spain wholly to the destruction of the forests" (Marsh, p. 306). Although her physical conditions render a large extent of forest almost indispens- able to industrial progress, Spain may be said to be the only European country, with perhaps the exception of Great Britain, in which there has been no provision for the protection of woods.

The evergreen oak (Quercus Ilex), and its congener the cork oak (Quercus Suber), are found associated with Pinus Pinaster. 'The Sierra de las Albujarras, southward of the city of Granada, is clothed with fir woods up to the peaks on certain places, so that the existing forests would appear to be the remnants of a destroyed girdle of coniferous trees, formerly covering all these ehains. In the fluviatile valleys of the Sierra Nevada isolated groups of trees present themselves, the wrecks of larger woods" (Henfrey, p. 995). In central Spain and on the slopes of the Pyrenees there are still considerable tracts covered with Pinus Larieio, P. pyrenaica, and P. halepensis, while on the northern coast Pinus Pinaster abounds. The sweet chestnut, indigenous in Spain, forms forests more or less cultivated for the sake of its fruit, whieh is an important article of food.

A forest school has been lately established in the Escorial, and good results from the training there may be hoped for.

The proportion of woodland in Portugal is nearly the same as that of Spain; but a system of management is in

operation under an administrator-general of forests. There |

are three forest zones characterized by the pine, the ever- green oak, and the deciduous oak. Pinus Pinaster abounds on the coast, giving place south of Lisbon to P. Pinea, the stone pine. The largest forest is that of Leiria, composed chiefly of the maritime pine, Pinus Pinaster; and adjoining the forest are establishments for the preparation of tar and resin, and the impregnation of wood. Asia,'

India.—The forests of British India are of great extent and value. Under the rule of Hindu and Mahometan princes, as well as in the earlier years of British domina- tion, the forests were recklessly injured by felling, or by the recurrence of destructive fires, thereby deteriorating the climate and impoverishing the people. But conserv- ancy has been introduced in time to preserve many of the advantages they are calculated to afford, to make them a considerable source of revenue to the state, and to provide for the needs of future generations. The change from un- controlled waste to careful state supervision is necessarily slow : immemorial usages have to be overcome, and many obstructions to be removed, before the department is in good working order ; great progress has, however, been made. The forest department is now a branch of the public service, for which candidates are annually selected

by the Secretary of State for India.

Attention was first directed to conservation in India by the appointment of a committee by the British Association in Edin- burgh in 1850, to consider the " probable effects, in an economical and physical point of view, of the destruction of tropical forests ;" and a report was printed in 1851, showing the importance of pre- serving every influence which tends to maintain an equilibrium of temperature and humidity, of preventing the waste of valuable material, and the special application to their various uses of the indigenous timbers of the country. Indian botanists, to their credit, had long urged on the Government the necessity of stopping the waste of valuable timber. Advancing civilization, the progress of agriculture, and the rapid extension of railways soon rendered it imperative that means should be taken to organize a general system of forest administration, to control the clearing of indigenous forests, and to economize public property for the

public good. About 1855 the first attempts at organization were made, the executive arrange- ments being left to the local administrations. In Bombay, Burmah, and Madras, conservators were appointed who started as it were single-handed and without skilled assistance, depending on such help as could be found in the local services. After the mutiny of 1857 a staff of five or six assistants was sanctioned in each of these provinces, the more valuable forests were mapped out, and exact information was obtained regarding their resources. In 1862 the Government of India organized a departmental system of conserv- ancy for the whole empire, and the office of inspector general of forests was created. A Forest Act, No. 4 of 1864, gave power to local administrations to demarcate the limits of state forests, and to reserve certain trees for state purposes, and notified the mode of procedure in cases of damage, conflagration, &c.; and in October 1877 the report of a select committee on a bill to amend the law relating to the preservation of state forests was under the con- sideration of the Indian Government. Many of the forest officers first appointed were chosen because of local knowledge and love for natural history rather than their knowledge of practical forestry, but with these extended operations the want of trained assistants soon became apparent. It was therefore determined to train young men specially for the work, and as forestry is in France a branch of Government service, advantage is taken of the forest school at Nancy in France, and five or six youths, after having passed through the usual course of study there, both theoretical and prac- tical, are annually sent to India. In 1876 the officers of the higher grades had increased to 147, —1 inspector general, 10 conservators of provinces, 136 deputies and assistants. The post of inspector general is held by Dr Dietrich Brandis, to whose energy and ex- perience 1s in great measure due the success which has attended the progress of the department,

é Many large and valuable tracts of forest are in the territories of na- pe chiefs ; and to prevent these being wholly destroyed, the British overnment leases them for a long term of years, paying an annual

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A very comprehensive view of the geographic botany of the

mee on and the distribution of its flora will be found in the

FURES YS

reut, or a seignorage on each tree felled. Throughout the empire the forest lands are burdened with grazing and other village rights

and it has required much tact to effect the formation of ona reserves to their present extent. As opportunity offers, unreserved forests are added to the reserves. The following figures embraceal] the provinces under the Government of India (excluding Madras and Bombay). In 1875-6 the area of reserved and leased forests was 15,089 square miles, being an increase of 3000 square miles during the year. 'The aggregate area of plantations is about 26,000 acres, and the trees cultivated in the different provinces are as follows :—

BGM Gali. css. cossoscssescesenee Toon and Teak. North West Provinces….Deodar, Walnut, and Horse-chestnut.

Punjad ..0…00000+0+0000-++---Deodar, Sissu, Kikar, Ber, and Mulberry. IBULTHO@N 22. coss

JAGBAM. .0s00sscn0scseszccaseeee Caoutchouc.

Madras…..... cacossceertid Teak, Red Sanderswood, Casuarina, Eucalyptus. Coorg and Mysore…..... Teak and Sandalwood.

US CUidleresevecerscanecessnessrees Teak and Babool.

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The most important articles of export are teak, sandalwood, cutch, caoutchouc, and lac, the last chiefly from the Central Pro- vinces. In 1875-6 the following amounts were exported from India :—

Tons. Prices per Ton.

Caoutchouc . 763 1282 rupces. Shell-lac…. 4,032 161 " Lac-dye … 533 00 ees Sandalwood.. 500 500 Cuteh (Catechu)... soe, DGS le NEV IG GRAMS hececccccsseccccecveeccccccssecescoueee 14,317 a Meak(OUlNBICH ECL) .cccessssseseesac0es5 <5" 60,656 73

The export of teak commenced about 1829, after the annexation of Tenasserim, and at first it was only from British territory. In 1835 teak began to come from beyond the frontier in largely in- ercasing quantities. After the annexation of Pegu forest operations in British territory were regulated, and the average export to Indian and foreign ports from 1856 to 1862 was 20,000 tons, four times that amount coming from beyond the frontier. Nearly two-thirds of the teak goes to Calcutta, Madras, and Bombay, and the rest to Britain. The finest teak plantation is the Conolly plantation in Malabar on the Beypur River (Madras Presidency), where the rainfall is 150 inches aunually. It now covers about 4000 acres, and 100 acres are added every year. The result has been most satisfactory, in the provision of an immense stock of valuable material, and the outlay incurred is being gradually recouped.

Cutch, the extract of the heartwood of Acacia Catechu, comes chiefly from Burmah, partly from Mysore and Malabar, It is used for tanning and dyeing. Lac is chiefly produced in Central India; the collection is expensive, but the quantity may be still further increased. Butca frondosa and Schleichera trijuga are the chief lac-yielding trees. Caoutchouc, the produce of Ficus elastica, is col- lected in Assam and Sikkim, and latterly also 11 Burmah, where, however, the tree is not indigenous, Most of the sandalwood of commerce (Santalwm album) is from Mysore and Coorg, and is ex- ported from Bombay. In Mysore more than half of the forest revenue is derived from this tree.

The surplus forest revenue from the different provinces for 1875-6 was as follows :—

The Presidency of Bengal…….ssssevere 22,86,840 rupees.

Madras .., (deficiency 3,724),

IBOMDRY. ..

27,583,311

Native States Administered, BMY SU Osecaeerdececomeessent econ tacaeeseetanerteatre 15,257 rupees. IB GUAM ec csacsseeccesc ces

cseseeteer ees ovecetteeosdeees 1,41,943 TOUT cccvescececcesteeeseeees 29,10,511 rupees, or £291,051.

Much expenditure is needful for improving the roads through the forests, and for the blasting of rocks in rivers, which, both in the plains and in the Himalaya, are much used for floating logs. Fuel plantations on a large scale, especially in Madras and the Punjab, have been formed for the supply of railways and steamboats ; the demarcation of forests is steadily carried on, the reserves are mapped, and laws are in force for the exclusion of cattle from the reserves and for the prevention of fires; waste has been prohibited, and in many ways a gradual improvement is taking place. New species of trees of rapid growth are being acclimatized. "From Australia several kinds of Eucalyptus and Acacia were introduced about twenty-five years ago, and they have made such progress that the station of Ootacamuud is now almost surrounded by a forest of these trees. Their rate of growth is wonderfully fast, much faster than that of theindigenous trees. Young forests of the quinine-yielding Cinchonas are coming up in many placcs. The management of ne cinchona woods will probably be siniilar to the treatment of he coppice in England ; for though oak bark has not one-twentitr the value of Jesuit's bark, itis the bark in both cases for whic these woods are mainly cultivated. There will, however, be the difference that while oak coppice in Europe, after having been cut over, requires from fourteen to twenty years to yield another me of bark, cinchonas grow so rapidly that they may probably be eu

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FORESTS

over every eighth or tenth year." It has been decided to establish a forest school in North India for training candidates for the execu- tive branches of service, and to attach to it a large area of reserved forest.

The teak, Teetona grandis, may be called the king of Indian timber trees; it is prized for shipbuilding beyond any other wood, and is specially valuable for works in contact with iron. It is in- digenous in Hindustan as well as in Burmah and the neighbouring states, generally growing in company with bamboos and other trees in dry deciduous woods. It grows to perfection in

Malabar and West Burmah, where the rainfall is heaviest. The northern limit is about 25° N. lat. The sal, Shorea robusta, another most import- ant tree, forms extensive pure forestsalong the base of the Himalaya, from Assam to the Sutlej, and in the eastern part of Central India, It yields a heavy durable timber, in great demand for building, gun carriages, and railway sleepers. The deodar, Cedrus Deodara, is to North India what teak is to Madras, Bombay, and Burmah, and what sal is to Bengal and the great Ganges Doab. It is indigenous in the north-west Himalaya and the mountains of Afghanistan, and forms extensive forests in the basins of the Indus, Tonse, Jumna, and Bhagirati rivers. Black wood (Dalbergia latifolia) and sissu Dalbergia Sissu, toon (Cedrela Toona), satin wood (Chloroxylon Swietenia), sandalwood (Santalwm album), red sanderswood (Perocarpus santalinus), and the various kinds of ebony (Dios- pyros) are amongst the most important of the many valuable woods of India.

Official Reports on Forest Conservancy (4 vols. folio), showing the progress of departmental administration in India from 1862 to 1871, issued among parliamentary papers, contain much statistical and practical information. The advance of forest Management in India has led to the publication of three useful handbooks :—(1) Lhe Flora Sylvatica of South India, by Col. R. H. Beddome, Madras, 1873 ; (2) the admirable Forest Flora of North-West and Central India, by Dr Brandis, London, 1874; and (3) The Forest Kora of British Burmah, by the late Sulpiz Kurz, Calcutta, 1877. The systematic working of the forests has also been facilitated by the publication of a code for the transaction of forest business. There is an annual conference of forest officers, when questions of principle and practice are discussed ; and a quarterly magazine of forestry— The Indian Forester—published in Calcutta, has been established for the record of observations and experiments, For a classified list of trees with vernacular names and local uses, see the works cited, and the jury reports of the Madras and Punjab Exhibitions ; Cleghorn's Forests and Gardens of South India, 1861; Drury's Useful Plants of India, 1873 ; Dalzell's Bombay Flora, 1861 ; and Stewart's Punjab Plants, 1869,

Ceylon.—The coast of Ceylon is fringed with the cocoa palm ; the betel palm, talipat, and palmyra also abound, the last in the north of the island, while the interior is richly wooded, having ebony, cala- mander, satin wood,

and 30 or 40 varieties of timber valued for con- struction and shipbuilding, but no teak. Forest reserves are being formed. (See Enumeratio Plantarum Zeylanice, Thwaites, 1864.)

Siam.—The forests of Siam contain a large amount of teak, some of which has been exported, Other principal trees are gamboge (Garcinia), gutta-percha (Jsonandra), eagle wood (Aquilaria Agallocha), ratans; durian, mangosteen, (Gareinia Mangostana), and several valuable palins, as the sago (Sagus farinifera).

_ Borneo is remarkable for its luxuriant vegetation, and the exten- Slve forests produce ironwood, gutta-percha, ebony, sandalwood, Tatans, sapanwood, gambir, dragon-blood, sago palm, and the mast (Calophyllwm) and camphor trees (Dryabalonops).

China.—The forest area of the great empire of China is little known, especially in the northern half, which resembles Japan, In the west there are large forests containing ebony, sandalwood, cam- phor tree, tallow tree (Stillingia sebifera), mulberry, paper-mulberry (Broussonetia, bapyrifera), varnish tree, funeral cypress. The mountain regions of the islands of Formosa and Hainau are wel] Wooded. From Formosa we obtain most of our supply of the cam- phor of commerce, (See Fortune's China, and Bentham's Flora Hong-kongensis,) ;

apan is well wooded, and the arboreal flora presents a jmarkable combination of sub-tropical and temperate forms, —the — bamboo, banana, and palm growing with the pine, the oak, 'a beech, and conifers in great variety. The evergreen oaks and = ' maples are the finest of all J apan trees, whilst the Rhus

tcifera or lacquer tree, FR. succedanea or vegetable-wax tree,

7 Cadi camphora or camphor tree, and paper-mulberry are among emarkable or characteristic trees of the country. (Siebold and uecarini's Flora Japoniea.) — qpossesecs immense tracts of forest, particularly in the a 4 es it of Tobolsk, Tomsk, and Ekaterinburg. Pines, larch, the laa | irch are the principal trees on the mountains north of pies aS "ppes and marshy plains. The northern limit of the ame out 70°. Willows, alders, and poplars

are used for fuel baa the on Elms and wild apricots are mentioned by travellers, tear Sm os not indigenous, It is estimated that Siberia con- 700,000 acres of forest in the districts above named. The

vast plateau of Tartary and Tibct is of great sterility, dry, and almost treeless, and the climate is very unpropitious. In Manchuria there are extensive coniferous forests, and on the east coast there is said to be oak on the mountains, while on the low land the maple, willow, apricot, and mulberry are found.

AMERICA,

America is of all quarters of the world the most thickly wooded with primeval forest. The territory on the north-west coast and islands is well stocked with pine timber.

Canada.—The forests of British North America are of the first importance for the comfort and welfare of its people, as no coal is found in the centre of the Canadian dominion. Canada contained immense forests, which are stil] extensive, chiefly of black and white spruce, the Weymouth (Pinus Strobus) and other pines, which grow to a great height and do not admit of undergrowth. The dark and sombre forests are also rich in other commercial woods, such as oaks, ash, maple, hickory, and walnut. The export of timber is very great, and Great Britain draws more from Canada than from any other country. Pinus Strobus yields the largest amount, and is the most valuable of Canadian woods. It is now chiefly obtained from the head waters of tributaries of the St Lawrence. The extensive lumber trade is causin g rapid denudation. 'Tracts of land are let to "' Lumber Companies," whose object is to get as large a return as possible, and annually thousands of acres are destroyed by fire. An Act has recently been passed regarding the public lands of the Dominion, which provides for the care of ° young trees ; and in Quebec it is no longer permitted to cut pine trees less than] foot diamcter at the stump. It has also been pro- posed to establish a school of forestry.

United States.—The primitive forests of America were of immense extent, and contained a remarkable diversity of species, covering in the 17th century, with insignificant exceptions, all that portion of the North American continent which has been occupied by British colonists, and apparently adequate to the exigencies of advancing settlements to an indefinite future ; but now, it is ‘ doubtful if any American State, except perhaps Oregon, has more woodland than it ought permanently to preserve” (Marsh, p. 326). About 40 species of oak are indigenous in America, 16 conifers, several maples, birch, ash, beech, elm, hornbeam, hickory, poplar, magnolia, walnut, butternut, &c. The eastern and niidland States were at one time dense forests ; now, Pennsylvania alone excepted, these are denuded of the pines and other commercial woods, and are compelled to draw much of their supply from Canada and the West. Even the forests in Pennsylvania, which once yielded the finest pines in America, are now greatly reduced in extent and value. The earliest restrictive measure of Government was adopted in1817, when oak and red cedar were reserved ; and a law was passed in 1831 to arrest spoliation. The enormous supplies of.timber still brought to market may be judged of from the fact that the number of saw-mills in 1870 was 25,817—an increase of over 6000 in ten years. Fortun- ately public opinion has been aroused, and a Forestry Association has been formed, to show the vast annual decrease of forests, and the urgent necessity of planting to a large extent. In Massa- chusetts valuable prizes are offered for planting white ash and white pine, spruce and larch, with a view to the raising of useful timber, and affording the needed shelter to the crops. In 1858 a premium of 1000 dols. was offered for the best plantation of forest trees planted in 1860, payable in 1870. The States of Illinois, Missouri, and Jowa have also encouraged tree-planting by State laws. Further west, in the prairie regions, energetic measures are being adopted to create woodlands on hitherto treeless plains. In Nebraska ash, walnut, and elm are largely planted, and along the Central Pacific Railway belts of Australian gum and other trees are being formed to protect the line from snow drifts, and for a future supply of tintber. In the State of California a forester has been appointed, and legal provision made to render the discharge of his duties effectual. By a law of California, dated 30th March 1868, the board of supervisors in each county are empowered to authorize owners of lands to plant and cultivate, along the public highways, shade and fruit trees, specifying the species to be planted, at

what age, at what distance from each other and froin the road bed, and making the necessary rules for their protection, &. Four years after the planting, upon receiving a duly certified statement of the number then in a good condition, the board are directed to pay to the cultivator one dollar for each such tree. California still possesses her magnificent Sequoias, S. gigantea, which attain when full grown an average height of 275 feet, and a girth of 70 feet at 6 feet from the ground. Sir J. D. Hooker tells of a forest forty miles long, and 3 to 10 broad, in the Sierra Nevada, where alone the tree is indigenous. Wood-cutters and saw-mills are, however, busy at work, converting the valuable Sequoias into marketable timber, and sheep grazing and fires kindled by the lumbermen are effectually destroying the saplings. Hooker writes in 1878—" The devastation of the Californian forest is proceeding at a rate which is utterly incredible, except to an cye-witness. It is true that a few

of the most insignificant groves of the big trees at the northern ex- treme of its range are protected by the State legislature, and a law has been enacted forbidding the felling of trees over 15 feet in diameter ; but there is no law to prevent the cutting or burning of the saplings, on which the perpetuation of the grove depends, or to prevent the burning of the old trees, which, if they do escape the fire, will succumb to the drought which the sweeping away of the environing forest will occasion." In Texas, where there is a very inadequate supply of timber, the growth of trees on the prairies 1s being attempted, but the frequency and destructiveness of prairie fires are great obstacles to success.

Central Ameriea.—Mexico and the various states of the isthmus uniting North and South America, as well as the West Indian Islands, possess abundant forests, which are as yet, however, imperfectly known. But they contain many fine timbers in large quantities, the chief of which, mahogany, Swietenta Mahagont, deserves special notice. The mahogany tree is found on the main- Jand and in the West Indian Islands between 11° and 20° N. lat. – It grows to a large size, with a perfectly straight stem, and is ex- ported from the different states and islands:where it grows. That which comes from British Honduras is esteemed the best, but the supply from there

has declined of late years. Mahogany was first imported into England about 1640. It has been introduced into Bengal and Malabar. In the neighbourhood of Panama 2000 persons are entployed in drawing off the juice of Castilloa elastiea, the Central American caoutchouc tree, and in Nicaragua 600 to 800 persons find similar employment. (Sce ature, 1875.)

Cuba.—For variety and value the woods of Cuba rival those of the mainland, but the Government forests have been neglected and left to chance and plunder. There has been no attempt to control the misuse, waste, and wanton destruction of forest. Valuable timber is felled for making enclosures, and much is burnt. Almost all the remaining' woods belong to private persons. Mahogany, cedar, and fustic wood, with many others, are produced freely. During last century forty-two ships of war were built in the Royal 'Arsenal of Havannah, and with proper management much timber for naval purposes might be obtained.

South America.—The richness and luxuriance of the tropical vegetation in South America are proverbial, and the whole chain of the Andes is clothed with wood, varying according to elevation, latitude, and aspect. Owing to the scarcity and high price of labour, with the few facilities of transport tothe sea-coast, the timber trade of South America has not as yet reached great dimensions ; but with the increase of population and the opening up of the country this commerce will be vastly developed. No data as to the extent of forest area are available, but with great variety of climate in the vast continent there is great diversity also in the vegetation. Each State has its own special forest-products to export, of which, how- ever, we can only name a few of the more valuable.

British Guiana furnishes two of the most valuable timbers known for shipbuilding, greenheart (Nectandra Rodiwi) and mora (Mora cacelsa) ; both of these grow to a large size, and are said to be very abundant, but owing to the great demand, and the want of legal restriction to prevent the cutting of saplings, it is becoming difficult to obtain good greenheart. It is to be hoped that the British colonies in the western hemisphere will follow the example of the East Indian empire, and introduce, ere it be too late, measures of conservancy and reproduction. Sir J. Hooker has urged this in strong terms. (Kew Report, 1877.)

French Guiana contains valuable forests, and produces “ ange- lique ” (Dicorynia paracnsis), a timber much employed in naval dockyards.

Venezuela.—Humboldt mentions in his travels that the waters of the Lake Valencia had greatly decreased owing to the clearings of forest in the Aragua valley, near the northern coast of Venezuela. The Orinoco, the great water highway of Venezuela, is fringed in its lower course with magnificent evergreen forests. The most import- ant trees of this republic are lignum vite (Zygophyllum arboreum), found chiefly on the coast, and “ guayacan,” used for cabinet work. Brazil wood is so common as to be generally used for fences. Cedar and ebony are also among the products. Venezuela is the home of the cow tree (Galaetodendron utile), which yields large quantities of nutritious thick milky juice. The cocoa plant (Theobroma Cacao) is also a native of the north of South America, thriving vigorously with a maximum of humidity and a high temperature.

Eeuador contains great forests east of the Andes, where the cli- mate is excessively humid. The export trade in 1874 amounted to £676,635, upwards of £500,000 being for cocoa, india-rubber, and cinchona bark. The bark of Cinchona Calisaya is no longer Pe that of C. succirubra is exported. hal een nen Hi empire of Brazil has forests covering an area thnenph Pract urope. For 2000 miles the river Amazon flows intertaption son tettitory, and forms with its tributaries the only

Truption in a rich level tract ri i : to W. and 800 f. act measuring 1200 miles from E. rom N. to S. covered with virgin forest. R.

Spruce : Zz a. a Ce describes the wonderful luxuriance of a forest on

rOoRE Dp Fs

“ As we ran along shore and gradually lessened our distance, I endeavoured to trace out the species composing the forest, but, with the exception of the palms, of the trees with bipinnate foliage, and of a few with remarkable dome-shaped crowns, there was such an intermingling of forms that I in vain attempted to separate them ; nor was there, among exogenous trees, any contour so striking as the twisted pyramid of our northern pines. When 1 entered the forest the confusion was still greater; for so mueh were

the branches of adjacent trees in- terwoven, and so densely veiled in many eases with twiners and epiphytes, that only an indistinet view could be obtained of any individual tree, and it was only when sailing along the banks of the rivers that 1 saw so much of the trees in the inundated forest as to give me a clear idea of the outlines and general aspect of many of them."—Jour. Linn. Soc., V- 3.

The productiveness of the Brazilian forests may be inferred from the fact that in the Paris Exhibition of 1878 were 300 different kinds of timber, many of them of great value both for naval and civil con- struction and for ornamental work. No plantations have yet been formed of these valuable woods, and fustic and Brazil wood are to be mct with only at a distance from the coast. The most important woods of construction are—jacaranda (Dalbergia nigra), Brazil wood (Cesalpinia echinata), ironwood (Cesalpinia ferrea), cedar (Cedrela brasilicnsis). But the Brazilian forests though rich in timber are richer still in gums, resins, drugs, dyes, and produce valuable for trade and manufacturing purposes. The great development of commerce in forest produce is illustrated by the export returns for 1871-72, viz.:—

Tons. £ CaOUtChoOuc «ccrcocccscceseecccrceesoes 4723 750,000 Maté (Paraguay Tea) .....cccreee 9357 227.581 COCCE ..ccccecrssccecescccensscecscecenee 3125 150,929 PROSEWOO .. nee cagerecacrecccreeescecee 105,100 Mamioe flout's…..csccsccscseoreeseeoeee 6960 85,813

Of dye stuffs the best are Brazil wood, fustic (Maelura tinetoria), red mangrove (Rhizophora), arnotto (Bixa Orellana); of drugs, sarsaparilla (Smilax sp.) ipecacuanha (Cephaelis Ipecacuanha), gnarana (Paullinia sorbilis), jalap (Exogonium Purga), &c. Europe draws from Brazil its largest supply of caoutchouc. from Siphonia elastica and IHaneornia speciosa, trees growing in abundance in the provinces of Ainazonas and Para, and so large has been the export that in some districts the supply begins to fail. Copernicia cerifera, the wax palm, is a most valuable tree,—the estimated annual production in wax and fibre is nearly £250,000 (official return). Brazil wood and Brazil nuts (Bertholletia excelsa) are among the largest exports. }

Poru.—In the Montana region of Peru (that is, the extensive area stretching eastward from the Andes to the confines of Brazil) are vast forests, yielding in spontaneous abundance Peruvian bark, india-rubber, vanilla, copaiba, cinnamon, sarsaparilla, ipeeaeuanha, vegetable wax, &c., but the collection of produce and its transport through the sierra and coast regions to the ports is attended with much difficulty and expense. The region of cinchona trees lies between 19° S, and 10° N. lat., and between 2500 and 9000 feet elevation above the sea. In South America the miserable Govern- ments of the cinchona districts have almost destroyed the inestim- able boon with which a bountiful providence has endowed them. Happily, in this case, the energy of such men as Markham, Spruee, and others has in great measure prevented a loss which would have been incalculable ; for the cinchona plantations established in India, in Java, and in various other colonies give promise that Europeans will not in the future suffer from the thoughtless greed of the semi-civilized Governments of the Andine States. :

Chilz.—In the inner valleys of the Cordilleras thereare estimated to be from 250,000 to 500,000 acres of virgin forest, containing trees of great dimensions.

Uruguay.—The " montcs" of South and Central Uruguay form narrow fringes to the larger streams, and rarely exceed a few hundred yards in width. Seenfrom distant higher ground they resemble rivers of verdure meandering through the bare campos, from whieh they are sharply defined —the reason being that the wood only grows where it is liable to inundation. N. and E. Uruguay are little known, but the same description is applicable to them. in the montes of the Rio Negro, Dr David Christison reports having seca twenty species of trees and shrubs, including a palm which extends southwards to the Santa Lucia. The montes of Uruguay are of no commercial value, and their extent must be trifling, but they "ee for the wants of the present scanty population. The beautilu ombu (Pireunia or Phytolacea dioiea) is the only tree —— possibly native on the campos. The softness of its spongy US i reuders it useless for burning and for timber. On the os ati of South America, continued in the whole stretch of 1 – south of the Rio de la Plata to the straits of Magellan, 'See ial é to be extremely rare, except a few thorny acacias In es : a Patagonia, some willows on the banks of one or two of the oe and the antarctic beech and the Winter's bark

tree cae ie to some of the islands of Tierra del Fuego, which, from t . aa tions of Darwin, we know to be completely covered with forest

AUSTRALIA.

’ : ized The large continent of Australia, so far as it has been on H

is emphatically a pastoral country, and no survey has yet be

It is obtained –

- passed in 1872.

FORESTS

of its surface bearing wood. There are vast tracts in the interior covered with serwb, but the total area of forest producing timber seems to he comparatively small. The growth of trees is more vigorous in the east than on the north and north-west coasts. The foliage is usually evergreen, and the leaves of many trees hang vertically. The chief forests occupy the flat margins of the rivers, and are composed of species of Acacia and Lucalyptus mingled with Callitris and Casuarina, Banksia, Melaleuca, Xanthorrhea, and Exocarpus. The Eucalyptus and Acacia are said to compose four- fifths of the forests of Australia and Tasmania. These trees, for- merly despised and thought of little value, are now introduced into many countries where artificial planting has been found necessary, and are extensively grown in India, Mauritius, Algeria, and Italy. The Eucalypti in particular possess many excellent qualities: their timber is of great durability, strength, and toughness; they are rapid in growth; and ZL. Globulus, or blue gum, is reputed to purify the surrounding air from malaria, and is frequently found 300-350 feet high, while £. diversicolor attains still larger dimensions. These, along with &. resinifera, iron bark tree, and EZ. marginata, Australian mahogany, “jarrah,” are reported to be abundant in many parts of Australia. Other principal trees, chiefly in the east, are Cedrela Toona, or red cedar, Gmelina Leichardti, Araucaria Cunninghamti, or the Moreton Bay pine, and Castanospermum australe, or Moreton Bay chestnut. In Western Australia, amongst other forest trees of note, are the “raspberry-scented acacia (A. acuminata) and sandalwood

(Fusanus spicatus). A simpler system of forest management than the elaborate organizations of France, Germany, or Scandinavia is applicable to thinly peopled colonies. In the province of Victoria a State Forest Board was appointed in 1867, and maps have been prepared showing the distribution of the principal trees within its bounds, the proposed reserves, and the forestranges. A Planting Encouragement Act was By the formation of the board, with an inspector of forests to aid by advice, provision has been made for the preser- vation of existing woods and young plantations. The first annual report appeared in 1875, from which we find that the total area of reserves is 1,805 square miles, estimated to contain 400,000 trees, yielding an average of 700 superficial feet. There is a large state nursery, and there has been great success in planting exotic trees, Abies Douglasti, Cedrus Deodara, Sequoia gigantea, Cupressus torulosa, &c. Thesc measures have been introduced mainly by the energy of Baron von Miller, the Government botanist in Victoria. Attention is directed to the subject in other Australian colonies, where there is an equal call for action, and a beginning towards conservation has already becn made in Queensland. Even firewood in some places is now scarce; and the demands for mining and various industrial pursuits render it needful to import timber from other countries,

South Australia.—Dr R. Schomburgk reports in 1878 that three valuable forest trees have been successfully introduced, and are recommended to the forest board :—(1) the American ash, Fraxinus Ainericanz, which has been largely grown in the forest reserves ; (2) English elm, Ulmus campestris; and (3) the plane tree, Plata- nus orientalis, With regard to replanting the country with road- side trees and clumps, the individual enterprise of farmers, agricul- turists, and landowners must be looked to.

In Tasmania the arboreous forms are similar to those of Australia. Eucalypti are even more abundant, and the acacia be- §in to disappear. It is remarkable that these two genera should be wholly absent in New Zealand. 'The vast forests of Western Tas- Mania are extensively utilized for timber. (See Bentham and Miiller's Flora of Australia and Hooker's Flora of Tasmania.)

New Zealand.—One of the richest portions of the globe as regards arboreous vegetation is the colony of New Zealand. It enjoys a climate similar to that of the south of Europe ; the vegetation is Most luxuriant, and many tropical plants flourish, while conifers, characteristic of colder regions, also abound. In Britain the num- ber of indigenous timber trees is only 35 out of a flora of 1400 7s, while New Zealand has 113 timber trees in a flora of only about 1000 species. The most valuable tree of New Zealand is the kauri (Dammara australis), which grows only in the northern island. It attains the height of 120-160 feet and is 5-12 feet in diameter, is unrivalled for masts, and has long been exported to British dock- yards for that purpose. The value for 7 years ending December 1873 from Auckland of kauri alone amounted to £1 44,000, against £19,739 of all other timber. Besides timber, kauri resin, obtained in great masses, is exported. In ten years the value amounted to £1,171,949 ; the price varies from £33 to £39 per ton. Other valuable trees are totara (Podocarpus totara),and matai (P. spate), both found throughout the colony, and, like the kauri, yielding timber of great durability and strength, and Vitex littoralis, or New Zealand:iteak, esteemed more lasting than any other native wood. There are several species of Fagus, forming beech forest, and many other trees yield valuable wood, as Leptospermum erveoides, the tea-tree, and Santalum Cunninghamii, sandalwood.

he forest area in New Zealand was calculated to have been 20,370 000 acres in 1830, and 12,130,000 acres in 1873, by Dr

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Hector. The public were permitted to fell in the forests on pay- ment of a small licence fee, and reckless unchecked felling has been the consequence. Such rapid deforesting of these densely wooded islands has naturally created an alarm in the legislature, and the Government in 1872 passed a Forest Planting Encouragement Act, offering a bonus for land cropped with trees. Several large planta- tions have been formed, and the Government has shown itself awake to the importauce of the subject. In 1876 Captain Campbell Walker, an experienced officer of the Indian forest service, was requested to examine the resources of the New Zealand forests, aud to propose a scheme of working them. His report was presented to both

Houses of Assembly in 1877, and deserves the earnest attention of the New Zealand Government. In this richly wooded country clearings have been made with rapidity, and the great work now must be to preserve and propagate the valuable indigenous trees. An idea of the vastness of forest operations in New Zealand is derived from the fact that there are 125 steam or water-power saw-mills at work, turning out 103,039,037 superficial feet in 1876, and from each of these mills a tramway is laid down penetrating into the forests; the rails are generally of wood, and the haulage is by horses. It is understood that large forest tracts are to be demarcated and placed under the control of Government officers. In this way only can a regular system of forest management be carried out, and the temptation to obtain quick returns by sale of valuable forest avoided.

AFRICA.

A large extent of the continent of Africa is arid and treeless; the drought in the desert is so great that no tree canresist it. But many parts are now ascertained to be rich in wood, and recent dis- coveries by Baker, Livingstone, Cameron, and Stanley have opencd up vast regions where much beautiful timber abounds. The Atlas Mountains are covered with magnificent forests, containing eight species of oak, Pistacia, Acacia arabica, Cedrus atlantica, closely allied toif not the same species as C. Libani and Deodara, and many other trees. To the south of the Atlas, on the borders of the great Sahara, are large tracts covered with date palms. The Sudan region has few trees ; among these are the baobab (Adansonia), tamarind, sycamore, fig, the doom and oil palms, with a few thorny acacias.
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Algcria.—tThe forests consist mainly of the Aleppo pine (Pinus halepensis), the cork oak (Quercus Subcr), Q. Ilex, the Atlas cedar (Cedrus atlantica), and the Atlas cypress (Callitris quadrivalvis) ; associated with these are the Quercus castaneeefolia, Q. ballota, Pinus Pinaster, and other species. The forest area is thus distributed :— state forests, 4,657,567 acres; communal forests, 191,487; total, 4,849,054 acres. About two-thirds of this area is under the man- agement of the forest service, the rest having been granted on long leases for cork production or olive culture. Cork is one of the most valuable of Algerian products, each tree yielding six to eight francs worth

at a stripping. A large amount of bark for tanning and 50,000 tons of alpha grass are exported from the province. Con- servancy has not yet proved remunerative, but with the extension of railroads an increase of revenue is expected (Major Seaton). The consul-general for Algeria alludes in the following terms to the evils which have attended the deforesting of Tunis :-—

"Nothing is more certain than that forests and tracts of brushwood not only prevent the evaporation of moisture by protecting the surface of the earth from the sun's rays, but they serve to retain the light clouds which otherwise would be dissipated, until they attain sufficient consistence to descend in rain or re- freshing mists. A hill side deprived of the forest whose foliage actcd as a huge parasol to the ground, and whose roots served to retain the vegetable soil which was formed by its decay, very soon loscs the power of gencrating vegetable life at all. The rich mould gets washed by winter rains into the valleys; in the summer months the sand is blown down on the top of this; succeeding rains carry down stones and gravel, till very soon all the most fertile portions of the soil disappear, leaving a residuum which is only capable of supporting vegetation when it becomes fertilized by an exceptional amount of moisture, which, as time progresses, must become rarer and rarer, like the efforts of the spendthrift to live off income, and spending every year a portion of his capital."—Colonel R. L. Playfair, Travels in the Footsteps of Brucein Algeria and Tunis (1877, p. 155),

Tunis.—The African traveller Bruce 110 years ago alluded to the forests through which he passed, where not a tree is now to be seen. Dr Shaw and Desfontaines the botanist mention the Aleppo pine and the making of pitch, but the wide plain over which they journeyed is now treeless, aud the forest described by the latter in 1784 has quite disappeared. ;

Egypt, though possessing no forests, has a considerable amount of wood in acacia, lebbek, tamarisks, tamarinds, zizyphus, &c., and has also a rich property in its date palms, which grow in great abundance. i

Abyssinia has extensive woods in the mountains, whence the coffee plant has spread over the world.

The tropical vegetation of Africa under the equatorial belt of rain is very luxuriant, and differs much on the two coasts. In the interior of Central Africa, Livingstone, Cameron, and Stanley tell us of vast tracts of primeval forest in the Manyuema country between Tanganyika and the coast, and also in Urungu south of Tanganyika, but as yet little is known of them in detail. The ex- plorations of Nachtigal have shed much light on the regions adjoin- ing Bornu,and Rohl fs describes gigantic tamarind, acacia, and komova

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trees. Stanley writes in glowing terms of the dense growth of lofty forests through which he had to cut his way, and specially refers to Bassia Parkwi, or shea butter, which attains a large size, Oldjicldia africana, or African teak, kola nut (Sterculia), cashew nut, and gigantic tamarinds. :

The western coast states—Congo, Sierra Leone, Senegambia—are all rich in wood, but comparatively little is known of the amount or of the value of the timbers, though some of these already find their way into European markets, in small quantities, viz., bar- wood or camwood (Baphia nitida), African mahogany (Swietenia Senegalensis),and African teak (Oldfieldia africana). The low-lying portions are malarious, where the mangroves and other swamp-lov- ing trees abound. The baobab (Adansonia digitata), which grows also on the east coast and in Nubia, attains a large size, with a huge rapidly tapering trunk, and yields a strong fibre from the bark. From the compact green appearance of the foliage of a mass of bao- bab Cape de Verd is said to have received its name. The Guinea palm (Hats guinensis) abounds on the western coast, and England imports annually from Africa 10,000 tons of the palm oil. Valu- able gums, as copal, &c., are also obtained from both the east and west coasts; and with the prospective opening up of Central Africa many valuable forest products will certainly come into com- merce.

Ashantee may almost be described as one continuous forest, “com- posed of tall and massive trees, with creepers extending like cordage from one to another, and so matting the foliage together overhead that a green roof is

formed almost impenetrable to the sun. Here and there are chinks and skylights through which the sun shoots in and falls upon the tree trunks and ground in gleams and splashes of crystal light. There is not much undergrowth, for that kind of vegetation cannot exist without sunshine, and in the virgin forest is always a kind of twilight"? (Winwood Reade).

Lower Guinca.— Welwitsch describes forests extending 700 miles along the coast from the Congo to the Cunene River. These con- sist of Diospyros, Cesalpiniee, Combretacee, and Celastrince, the higher mountains behind being covered with extensive forests of the same families, with Stereulie, Cynomatie, and Copatfera Mopane, Benth. He saw ten miles exclusively covered with Hypheene cueifera, Pers., and adds: "I conclude that these palm forests covered in past ages a great portion of the coast districts of Angola, where at present they only appear as dwarf bushes without stems, aud never blossom." The only tree which braves the general dwindling is the Adansonia, which is seen in full splendour through- out the district. The export of gum copal from Benguela is ahout 1,600,000 Ib per annum. (Jour. Linn. Soc., ix. 288.)

South Africa has suffered much from denudation, and according to the Colonial Botanists' reports many of its evil effects have followed, such as the frequent occurrence of sudden and destructive floods, and occasional droughts of extreme severity. But South Africa possesses a great variety cf forest trees, yielding timber of great strength and beauty ; they are, however, only found in moun- tain gorges and over a limited area. (Harvey and Sonder's Flora Capensis.)

Mauritius, with its insular position and humid climate, possessed a most luxuriant indigenous vegetation, reaching to the water's edge ; but the aboriginal forests have disappeared, and the scarcity of wood for building and fuel has necessitated an annual outlay of £20,000 for imported timber. To supply the wants of the people, to provide shelter, and to improve the sanitary condition of the island, the local Government adopted measures some years ago for forming plantations on the higher elevations. The Australian eucalypti flourish well, and the planting around Port Louis has been attended with marked advantage to the town. (Flora of Mau- rvitius, Baker.) Through the agency of fire and goats, supplemented by the rapid

spread of introduced plants, the rich primitive forests of Rodriguez and St Heleua have likewise become extinct. (Hooker's Insular Floras.)

Madagascar has been celebrated for its luxuriant vegetation, and in the north and east, where the climate is moist, magnificent forests clothe the hills. Elsewhere vegetation forms a narrow belt along the shore. The Ravenala, or traveller's tree, is character- istic of the island. (Rev. W. Ellis, Rev. Dr Mullens.)

From this sketch of the principal forest lands of the world it appears that, although the progress of civilization and the increase of population have greatly diminished the area of forests in many countries, they still cover a large portion of the earth's surface, and the necessity of main- taining them is now generally recognized. It is beyond doubt that these vast wooded tracts affect most powerfully the economy of the globe. The direct influences may be Summarized from the results arrived at by Humboldt and others :— (1) By screening the soil from the heat of the sun's rays; (2) by the immense surface these leaves offer

to the cooling process of radiation; and (3) by the copious evaporation of moisture from the leaves. Some of the indirect benefits which thus accrue from the presence of forests may be mentioned, such as the maintenance of equable temperature and humidity, the affording of pro- tection and shelter, the control of the regular flow of rivers, and the supply of perennial springs which fertilize and beautify the country. It is the climatic and physical im- portance of a due proportion of wooded land, independent of the utility of forest products in innumerable arts which now contribute to our comfort and progress, that has at length awakened most of the civilized Governments to the necessity of protecting forests from ruthless spoliation. The following general conclusions adopted in 1851 by the British Association committee already referred to contain principles which, although limited in the first instance to British India, have been found more or less applicable to all countries :—

1. That over large portions of the globe there is still an almost uncontrolled destruction of the indigcnous forests in progress, from the wasteful habits of

the population.

2. That where conservancy has becn introduced, considerable im- provement has already taken place.

3. That thesc improvements may be extended by a rigid enforce- ment of the present regulations, and the enactment of additional provisions of the following character, viz.,—careful maintenance of the forest by valuation surveys and working plans, and by the pre- servation or plantation of seedlings in place of mature trees removed, —nurseries being established; prohibition of cutting until trees are well grown, with rare and special exceptions for peculiar pur- poses; and provision, in the case of trees yielding gums, resins, or other valuable products, that greater care be taken in tapping or notching the trees, most serious damage in some countries resulting from neglect in this operation.

4, That especial attention should be given to the preservation and maintenance of the forests occupying tracts unsuited for other culture, whether by reason of altitude or peculiarities of physical structure. :

5. That in a country to which the maintenance of its water sup- plies is of extreme importance, the indiscriminate clearing of forests around the localities whence those supplies are derived is greatly to be deprecated.

6. That it is a duty to prevent the excessive waste of wood, the timbers useful for building and manufactures being reserved and husbanded.

7. That as much local ignorance prevails as to the number and nature of valuable forest products, measures should be taken to supply through the officers in charge information calculated to diminish such ignorance.

Necessity has caused the adoption of these principles in many lands of both the New and the Old World, and for- estry will henceforth be studied as a science as well as practised as an art. It is manifestly of the greatest im- portance that, in the progressive development of great countries, just and enlightened principles should influence the views and actions of those who are charged with the duty of advising Government in regard to the matenial resources committed to their care for behoof of present and future generations.

For greater detail and more exhaustive treatment of the subject, the reader is referred to the following works in addition to those already alluded to:—Great Britain. Selby, A History of British Forest Trees, 1842; Marsh, The Earth as modified by Human Action, 1874; Brown, The Forester, 1861; Journal of Forestry, monthly.—Francre. Mathieu, Flore Forestiérc, 1877; Jules Clave, Etudes sur V Economie Forestiérc, 1862; Nanquette, "Cours d Amén- agement des Foréts," 1868; Annuaire des Eaux et des Fortts; A. Parade-Lorentz, Cours Elémentaire de Culture des Bois, 1860; Becquerel, Mémoire sur les foréts et leur influence elimatérigque, 1868; Maury, Les Foréts de la Gaule, 1867; Croumbie Brown, Reboisement in Franee, 1876. —GERMANY. Leo, Forst-Statistik tiber Deutschland und Oesterreich-Ungarn, 1874; Schneider, Forst- und Jagd-Kalender fiir das Deutsche Reich; Fischbach, Lehr- buch der Forst-wissenschaft, 1865; Hartig, Lehrbuch fur Forster, 1861; Judeich, Die Forst-Einrichtung, 1871. —Swi1TZERLAND- Bericht an den hohen Bundesrath tiber die Hoehgebirge W ale 1862.—ITaty. Di Berenger, Studii di Archeologia Forestale, Ls > Raccolta delle Leggi Forestali, 1866; Siemoni, Manuale G Forestale. (H. ©.

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Forest Law.

One of the most cherished prerogatives of the king of England, at the time when his power was at the highest, was that of converting any portion of the country into a forest in which he might enjoy the pleasures of the chase. The earliest struggles between the king and the people testify to the extent to which this prerogative became a public grievance, and the charter by which its exercise was bounded (Charta de Foresta) was in substance part of the great constitutional code imposed by his barons upon King John. At common law it appears to have been the right of the king to make a forest where he pleased, provided that certain legal formalities were observed. The king having a continual care for the preservation of the realm, and for the peace and quiet of his subjects, he had therefore amongst many privileges this prerogative, viz., to have his place of recreation wheresoever he would appoint.! Land once afforested became subject to a peculiar

system of laws, which, as well as the formalities required to con- stitute a valid afforestment, have been carefully ascertained by the Anglo-Norman lawyers. " A forest," says Manwood, "fs acertain territory of woody grounds and fruitful pastures, privileged for wild beasts and fowls of forest, chase, and war- ren to rest, and abide there in the safe protection of the king, for his delight and pleasure ; which territory of ground so privileged is mered and bounded with unremovable marks, meres, and boundaries, either known by matter of record or by prescription ; and also replenished with wild beasts of venery or chase, and with great coverts of vert, for the succour of the said beasts there to abide: for the preserva- tion and continuance of which said place, together with the vert and venison there are particular officers, laws, and privi- leges belonging to the same, requisite for that purpose, and proper only to a forest and to no other place."2 And the same author distinguishes a forest, as "the highest franchise of princely pleasure," from the inferior franchises of chase, park, and warren—named in the order of their importance. The forest embraces all these, and it is distinguished by having laws and courts of its own, according to which offenders are justiceable. Au offender in a chase is to be punished by the common law; an offender in a forest by the forest law. A chase is much the same as a park, only the latter is enclosed, and all of them are distinguished according to the class of wild beasts to which the privilege extended. Thus beasts of forest (the " five wild beasts of venery") were tle hart, the hind, the hare, the boar, and the wolf. The beasts of chase were also five, viz., the buck, the doe, the fox, the marten, and the roe. The beasts and fowls of warren were the hare, the coney, the pheasant, and the partridge. (See Gamez Laws.)

The courts of the forest were three in number, viz., the court of attachments, swanimote, and justice-seat. The court of attachments (called also the wood-mote) is held for the foresters to bring in their attachments concerning any hurt done to vert or venison (in viridi et venatione) in the forest, and for the verderers to receive and mark the same, but no conviction takes place. The swanimote is the court to which all the freeholders within the forest owe suit and service, and of which the verderers are the judges. In this court all offences against the forest laws may be tried, but ho Judgment or punishment follows. This is reserved for the justice-seat, to which the rolls of offences presented at the court of

attachment, and tried at the swanimote, are Presented by verderers. The justice-seat is the court of the chief Justice in eyre, who, says Coke, "is commouly & man of greater dignity than knowledge of the laws of the forests ; and therefore where justice-seats are to be held —, __————————

; Coke, 4 Insé., 300, Manwood's Treatise of the Forest Laws, 4th edition, 1717.

some other persous whom the king shail appoint are associated with him, who together are to determine omnia placita foreste." There were two chief justices for the forests intra and ultra T'rentam respectively. The necessary officers of a forest are a steward, verderers, foresters, re- garders, agisters, and woodwards. The verderer was a judi- cial officer chosen in full county by the freeholders in the same manner as the coroner. His office was to view and re- ceive the attachments of the foresters, and to mark them on his rolls A forester was "an officer sworn to preserve the vert and venison in the forest, and to attend upon the wild beasts within his bailwick." The regarders were of the nature of visitors: their duty was to make a regard (visi- tatio nemorum) every third year, to inquire of all offences, and of the concealment of such offences by any officer of the forest. The business of the agister was to look after the pasturage of the forest, and to receive the payments for the same by persons entitled to pasture their cattle in the forests. Both the pasturage and the payment were called " agistment."

The legal conception of a forest was thus that of a definite territory within which the code of the forest law prevailed to the exclusion of the common law. The ownership of the soil might be in any one, but the rights of the proprietor were limited by the laws made for the protection of the king's wild beasts. These laws, enforced by fines often arbitrary and excessive, were a great grievance to the un- fortunate owners of land within -or in the neighourhood of the forest. The offence of "purpresture" may be cited as an example. This was an encroachment on the forest rights, by building a house within the forest, and it made no difference whether the land belonged to the builder or not. In either case it was an offence punishable by fines at discretion. And if a man converted woodlands within the forest

into arable land, he was guilty of the offence known as "assarting," whether the covert belonged to himself or not.

The hardships of the forest laws under the Norman kings, and their extension to private estates by the process of afforestment, were among the grievances which uuited the barons and people against the king in the reign of Jolin. The Great Charter of King John contains clauses relating to the forest laws, but no separate charter of the forest. The first charter of the forest is that of Henry III., issued in 1217. 'As an important piece of legislation," says Pro- fessor Stubbs,' "it must be compared with the forest assize of 1184, and with 44th, 47th, and 48th clauses of the charter of John. Itis observable that most of the abuses which are remedied by it are regarded as having sprung up since the accession of Henry II.; but the most offensive afforestations have been made under Richard and John. These latter are at once disafforested ; but those of Henry II. only so far as they had been carried out to the injury of the landowners and outside of the royal demesne." Land which had thus been once forest land and was afterwards disafforested was known as purlieu—derived by Manwood from the French pur and lieu, i.e, "'a place exempt from the forest." The forest laws still applied in a modified manner to the purlieu. The benefit of the disafforestment existed only for the owner of the lands; as to all other persons the land was forest still, and the king's wild beasts were to "have free recourse therein and safe return to the forest, without any hurt or destruction other than by the owners of the lands in the purlieu where they shall be found, and that only to hunt and chase them back again towards the forest without any forestalling" (Manwood, On the Forest Laws—article "Purlieu ").

The revival of the forest laws was one of the means

3 Documents Illustrative of English History, p. 338. IX. — 52

resorted to by Charles I. for raising a revenue independently of parliament, and the royal forests in Essex were so enlarged that they were hyperbolically said to include the whole county. The earl of Southampton was nearly ruined by a decision that stripped him of his estate near the New

Forest. The boundaries of Rockingham Forest were increased from six miles to sixty, and enormous fines imposed on the trespassers,—Lord Salisbury being assessed in £20,000, Lord Westmoreland in £19,000, Sir Christopher Hatton in £12,000 (Hallam's Constitutional History of England, c. viii.). By the statue 16 Charles I. c. 16 the royal forests were determined for ever according to their boundaries in the twentieth year of James, all subsequent enlargements being aunulled. (im: BR.)

FORFAR, or ANGUS, a maritime county of Scotland, is situated between 56° 27' and 56° 59' N. lat., and between 2° 26' and 3° 24' W. long. It is bounded on the N. by the shires of Aberdeen and Kincardine, on the E. by the German Ocean, on the S. by the Firth of Tay, which separates it from Fife, and on the W. by Perthshire. Its greatest length from north to south is about 37 miles, and its greatest breadth from east to west 27 miles ; its average length is about 35 miles, and its average breadth about 25 miles. The area comprises 890 square miles or 569,840 imperial acres.

Forfar presents great variety of surface. The northern division, comprising nearly half the county, is occupied by the Binchinnin hills or " Braes of Angus," which form part of the Grampian mountain range, and join the " Braes of Mar" in Aberdeenshire. At the head of Glen Clova they rise boldly and abruptly, and are clothed in summer by agreen covering of grass; but for the most part they are rounded and rather tame, and covered with a thin coat of moorish soil beariug stunted heath. The highest summit is Glas Meal, 3502 feet, and a large number are over 3000 feet. The range is intersected by several wooded and fruitful valleys, the principal of which are Glen Isla, Glen Prosen, Glen Clova, Glen Lethnot, and Glen Esk. These are watered by streams that rise in the west and north, and commonly flow south-east, receiving the mountain torrents in their progress. Some miles south from the Grampians, and parallel to them, there is another and lower mountain range called the Sidlaw hills, the higher eminences generally covered with moor and heath, but the lower ridges cultivated or wooded. Their highest suminits are Auchterhouse hill (1399 feet), and Gallow hill (1242); and a considerable number are above 1100 feet. The breadth of this range is from 3 to 6 miles.

Between these two mountain districts lies Strathmore or |

the Great Valley, as the name means in Gaelic, or, as it is commonly called, the " Howe of Angus," forming a con- tinuation of the " Howe of the Mearns," and having a breadth of from 6 to 8 miles,—a district beautifully diversified by gentle eminences, fertile fields, plantations, villages, and gentlemen's seats, very little of it being 200 feet above sea-level. From the Sidlaw Hills to the German Ocean on the east and the Firth of Tay on the south there extends a tract of low and level ground, vary- ing in breadth from 3 to 8 miles, and comprehending about a fourth part of the whole county. The southern shore is level and sandy, but from Arbroath to Lunan Bay the coast line is formed of sandstone cliffs, in some parts very steep and precipitous, and containing a number of caves, most of which are only accessible from the sea.

The principal rivers are the Isla, the South Esk, and the North Esk. The Isla rises in the Grampians in the north- west of the county, and flows from north to south through the glen which bears its name, until at Ruthven it bends to the westward and joins the Tay in Perthshire. Below the Bridge of Craigs it has cut a chasm, in some places

more than 100 feet in depth, through a barrier of porphyry and gravel stone rocks, where it forms cascades of singular beauty. The South Esk has its source in the Grampians a few miles east of the Isla, and flows south-east till is reaches the valley of Strathmore, after which it takes an eastward course, and passing Brechin discharges itself into the basin of Montrose. The North Esk issues from Loch Lee, and, flowing first eastward and then south-east, forms for about 10 miles of its course the boundary between this county and that of Kincardine, and falls into the sea about 3 miles north-east of Montrose. Among the smaller streams are the Dean, a tributary of the Isla; the Prosen, which falls into the South Esk ; the Mark, the Westwater, and the Cruick, which join the North Esk ; the Dighty, which flows south-eastwards into the Firth of Tay at Broughty Ferry; and the Lunan, which empties itself into the German Ocean at Lunan Bay. There are a number of small lochs, the principal being Loch Lee, Lintrathen Loch, and the lochs of Forfar, of Rescobie, and of Balgavies.

Geology and Minerals.—In the northern portion of the Forfarshire Grampians the prevailing rock is granite, some of it very beautiful, and containing in its cavities topazes and rock erystals called "'cairngorms," from the mountain of tliat name in Aberdeenshire. Other portions of the Gram- pians are composed of micaceous schist and porphyry, dykes of the latter in some places intersecting the former. Laminated mica is found in veins in mica slate, and rock crystals are found in the beds of torrents. Lead was at one time wrought at Gilfianan, above the old castle of Invermark, in the upper part of the parish of Lochlee ; and according to Edward, in his Description of Angus published in 1678, it yielded one sixty-fourth part of silver. It has also been wrought at Ardoch near Millden on the Esk. Limestone occurs in various parts of the Grampians, and jasper is frequently embedded in the micaceous schist. In the lower portions of the Grampians pudding-stone prevails, and afterwards sandstone. Clay marl is found both in Strathmore and the Sidlaw hills. Shell marl abounds m the beds of the various lochs, some of which have been partly or wholly drained to render it easy of access, The Sidlaw hills are chiefly composed of sandstone of various colours. Sandstoue flags are quarried in large quantities on the hill of Balmashanner, in the moor to the south of Forfar, in the parish of Carmylie, and along the southern declivity of the Sidlaw hills. In this sandstone district lies the famous Forfarshire fishbed, containing the earliest known vestiges of vertebrate life! In the maritime district there are numerous beds of red sandstone, which, however, are frequently intersected by whinstone aud porphyry. The priucipal limeworks are in this division,—at Hedderwick near Montrose, and at Boddin in the parish of Craig.

Climate and Agriculture.—The climate differs consider- ably in various parts of the county; but is on the whole salubrious aud favourable for agricultural pursuits. Ac cording to observations taken by Alexander Brown, LL.D., at Arbroath, for ten years, from March 1868 to March 1878, the mean of the barometer, reduced to sea-level and a temperature of 32° F. was 29°83 inches. The mean tem perature was in spring 46°-1 F., summer 58°°3, autumn 47°°7, winter 39°-0. The mean annual rainfall was 29° inches. The average annual number of days whereon the wind was from the N. was 29, N.E. 15, E. 26, SE 28, S. 69, S. W. 36, W. 78, and N.W. 38, while 46 were calm. In Strathmore, owing to the proximity of the Grampians, the

rainfall is considerably greater than in the maritime district. In these two districts the harvests are nearly as early as 2

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1 See paper by James Powrie, F.G.S., F.R.S.E., in Transactions of Edinburgh Geological Society for 1870.

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any other district of Scotland, but in many of the uplands they are often very late. The total area of arable ground in 1878 was 252,902 imperial acres, of which 95,448 were under corn crops, 51,396 under green crops, 81,415 under rotation grasses, 24,295 permanent pasture, and 348 fal- low. There were 31,857 acres under wood. The prin- cipal wheat district is the valley of Strathmore and the neighbourhood of Dundee and Montrose ; and the yield is excelled by few districts in Scotland. Its acreage (9416 in 1878) has, however, as elsewhere in Scotland, been de- creasing, while there has been a gradual increase in that of barley (31,593 acres in 1878). Oats, for which the soil generally is well adapted, are the principal crop, the acre- age (1878) being 52,802. Potatoes are chiefly grown in the upland and maritime districts; the acreage was 16,479. As a large number of sheep and cattle are kept, turnips are very largely grown, their acreage being 33,953. The acre- age under beans was only 1060. The system of rotation varies according to soil and situation. The five years’ shift, at one time the most common, has of late been largely superseded by a seven-shift, The number of cattle in 1878 was 44,405, or an average of nearly 17°8 to every 100 acres under cultivation as compared with 23°6 for Scotland. Of these the number of cows and heifers in milk or in calf was only 11,452, and except in the vicinity of the towns there are no dairy farms. The polled Angus eattle are not so much bred in this their native district asin the neighbouring county of Aberdeen. Shorthorns are now being largely introduced. A large number of Irish cattle are imported for winter feeding. Forfar has suffered more from contagious diseases than any other Scotch county. Their prevalence is thought by some to be partly due to the practice of letting grass and turnips to be consumed by the cattle of dealers and middlemen. The number of horses was 10,164 or an average of nearly 4 to every 100 acres under cultivation, just the average for Scotland. The most common breed is the

Clydesdale, the small native garrons being now little used. The num- ber of sheep was 122,798, an average of 50:1 to every 100 acres under cultivation, as compared with 149-3 for Scotland. The blackfaced breed are the most common in the mountain districts, but their number has been much diminished of late years, owing to the large extent of country that has been converted into deer forests. Cross- bred lambs are bought in considerable numbers for winter- feeding in the lowland districts, and cross-bred ewes are kept on many farms for breeding. There are also a few flocks of pure-bred Border Leicesters, and some Shropshire downs and other varieties. The number of pigs was 5900, or an average of 2°3 to every 100 acres, as compared with 3°3 for Scotland.

In Forfar the holdings called crofts, of 10 acres and under, and those from 100 to 300 acres are the most common. A large number are between 10 and 100 acres, a considerable number between 300 and 590, and a few above 500. The general colour of the soils in the lower districts is red, in other parts often inclining to dark- brown or black. The soil in the Grampians is generally moorish over white retentive clay, but loose, friable, and productive in the glens. Over the pudding-stone, in the lower grounds, it is sometimes thin, mossy, and encumbered with stones, and over the sandstone a tenacious clay often occurs, which, however, when properly cultivated, is very productive. The soil above whinstone is fertile though Sometimes shallow. Along the coast there are large stretches of barren sand, but the soil of the district where cultivated is quick and very fertile. There is no great extent of peat; but nearly the whole of the northern division of the county is either waste land or occupied as Sheep walks or deer forests. Farm management, except in

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the case of the crofts, is fully abreast of the times. Steam- cultivation is gradually increasing, and reaping machines are universally in use. Most farms possess excellent farm- houses and steadings, and covered courts for cattle are generally in use. Considerable progress has been made in the erection of suitable cottages for the farm servants, but bothies for unmarried servants are much too common in the county, and in these the accommodation provided is often of the rudest kind.

According to the owners and heritages return of 1872-73, the land, exclusive of Dundee, was divided between 4898 proprietors, holding land the gross annual value of which was £795,581, 7s. Of the owners 80 per cent. possessed less than one acre, and the average value all over was £1], 8s. 8jd. There were no fewer than 20 proprietors holding upwards of 5000 acres, viz., Earl of Dalhousie (Brechin Castle), 136,602; Earl of Airlie (Cortachy Castle), 65,059; Earl of Southesk (Kinnaird Castle), 22,525 ; Donald Ogilvie of Clova (Balnaboth), 21,893; Glamis Trustees (Glamis), 17,034; James Small (Brewlands), 10,300; Fotheringham Trustees (Fotheringham House), 8826 ; Helen C. Arbuthnott (Balnamoon), 8066; James T. Mackenzie, 7129; Hon. Mrs E. Maule of Fearn, 6992; Lord Wharncliffe (Belmont Castle), 6926; Major W. Lyon, 6888 ; Earl of Camperdown (Camperdown House), 6770 ; Col. Ogilvy of Ruthven, 6336 ; Trustees of Charles Lyell, 5728; Sir Thomas Munro, Bart. (Lindertis), 5702; J. L. D. Stewart (Glenogil), 5524; Countess of Home, 5209 ; Lord John F. G. Hallyburton (Hallyburton House), 5199; Trustees of Robert Smith (Baharry), 5097.

There are extensive grouse and blackcock shootings on the moors; the roe deer is met with on the mountains, and the stag is also occasionally seen; the alpine hare is plentiful on the uplands; eagles tenant the cliffs of the Grampians; there are numerous waterfowl in the lochs; and otters and seals inhabit the eastern coast. Particulars regarding the botany of the county will be found in Williain Gardner's Botany of Forfarshire.

Manufactures and Trade.—The staple industry of For- farshire is the manufacture of flax and jute, Dundee being the principal seat of the linen trade in Britain. Besides employing a large portion of the population of the burghs, linen in various forms is also manufactured at Kirriemuir, Coupar Angus, Carnoustie, Friockheim, Edzell, Lochee, Letham, Monifieth, and Newtyle. In some villages hand- loom weaving exists to a considerable extent. According to the census returns for 1871, the number of persons engaged in the different branches of the linen manufacture was 45,633, 15,418 males and 30,215 females. There are breweries, tanneries, and bleach-works in most of the towns. The herring, white fish, and salmon fisheries are pretty extensive. The number of herring boats connected with

the Montrose district is upwards of 900, with a total estimated value of nearly £50,000. ;

The number of royal burghs, all of which are also parlia- mentary, is five, viz., Dundee, Arbroath, Brechin, Forfar, and Montrose. The other towns and the principal villages on the coast are—Broughty Ferry (5817), a watering place and suburb of Dundee; the manufacturing village of Monifieth (919); Carnoustie (3012), a watering place, but possessing also manufactures and fisheries; and the fishing villages of Auchmithie (412) and Ferryden (1395). Inland there are Coupar Angus (the larger part of which is, however in Perthshire), Kirriemuir (4145), Friockheim (1129), Letham (953), Newtyle (542), and Edzell (415), all chiefly engaged in the linen manufacture. The total population of the county in 1871 was 237,567, of whom 106,324 were males and 131,243 females ; the population in 1861 was 204,425. Inthe towns the population in 1871 was 186,185, in the villages 8203, and in the rural

districts 43,179, as compared with 149,309, 6602, and 48,514 respectively in 1861.

One member of parliament is returned by the county, two by the burgh of Dundee, and the other burghs unite with Inverbervie in Kincardineshire in returning a third.

History and Antiquitties.—Forfar belongs to that portion of Scot- land inhabited in the tinie of the Romans by the Picts. The county is supposed by some to have received the name Angus from being granted to a son of one of the Scottish kings who bore that name; but others trace the origin of the title to a Gaelic designation for a particular kind of hill, and connect its use with the hill of Angus, to the east of the church of Aberlemno. It is only a few centuries ago that the name Forfar, borrowed from the county town, was applied to the whole county. In ancicnt times the county was governed by hereditary earls, and it was made an hereditary sheriff- dom by David II. The principal historical events, not connected immediately with the burghs, are the Sapieest Roman battle of the Grampians; the battle of kgfrid, king of Northumbria, and Bridei, king of the Picts, near Dunnichen, in 685, in

which the former was slain; battles with the Danes at Aberlemno and other places; the defeat of Elpin, king of the Scots, by Angus, in the parish of Liff, in 730; abattle between the Picts and Scots near Restinoth, about the year 835; and the defeat of Lord Montfort near Panmure by the earls of Fife and March about the year 1336.

*In various parts of the county pretty entire remains of the "weems," or old subterranean dwellings of the Celts, are found; traces of Roman camps are very common; there are a large number of stone forts, and there are vitrified forts at Finhaven, at Dumsturdy Muir, and on the hill of Laws, near Monifieth. Spear heads, battle- axes, sepulchral deposits, Scandinavian bronze pins, gold bullets (used for coin), and other antiquarian remains are frequently met with. There are sculptured stone pillars at Aberlemno, Auldbar, Glammis, Kirriemuir, St Vigeans, and other places. The principal ecclesias- tical antiquities are connected with the burghs. Among the old castles may be mentioned the roofless square tower of Redcastle, at the mouth of the Lunan; the old tower of the modern castle of Guthrie; the tower of the castle of Auchinleck; the stronghold of Inverarity, near Kirriemuir; the large square keep of Broughty castle; the ruins of the castle of Finhaven; the two towers of the old Edzell castle; the ruins of Melgund castle, which are in a pretty entire condition; the ancient part of the splendid castle of Glammis; the small castle of Newtyle; the old square tower and gateway of the castle of Craig; and the remains of the old castle of Airlie, whose burning by the earl of Argyll in 1640 gave rise to the ballad of '*The bonnie house of Airlie."" The number of fine modern residences is too great to admit of their being here particularized.*

The principal works on Forfarshire are Edward's Description of Angus, pub- lished in 1678, and reprinted in 1791; Forfarshire Illustrated, 1848; Gardner's Botany of Forfarshire; and Memorials of Angus and the Mearns, by Andrew Jer- vise, 1861.

ForFAR, a royal and parliamentary burgh of Scotland, and capital of the county of the same name, is situated in the valley of Strathmore near the railway from Aberdeen to Perth. The principal buildings are the court-house, the town-hall, the county buildings, and the infirmary. The staple industry is the linen manufacture, but there are also breweries and

tanneries. Forfar is of considerable antiquity, having been constituted a burgh before 1300. It was at one time the residence of royalty; and in the accounts of the chamberlain of the royal household, in the reign of Alexander III., and of some preceding monarchs, a charge is entered for the king's gardeners at Forfar. The town was protected by a castle which stood on a mound on the north side. Its origin is uncertain, but it is believed to have been the place where, in 1057, the first parliament of Malcolm Canmore assembled after the defeat of Macbeth. It was occupied and strongly garrisoned by the English in the beginning of the 14th century; but in 1307 Bruce, on his way through Angus, captured and destroyed it, putting the English to the sword. Its site is now marked by the town cross. It appears that the weekly market-day pre- vious to the reign of James VI. was Sunday, when it was changed by Act of Parliament to Friday. In 1661 a spe- cial commission was appointed by the crown to try several Lhe accused of witchcraft, some of whom were con- : saa age s The bridle which was put into their ae nea a "eg them out for execution is still preserved etn: gh. "urther, it 1s recorded that John Ford, for

vices as a "witch ricker" was on the same occasion

admitted a burgess along with Lord Kinghorn. Previous to the middle of last century, the town possessed very few houses of two stories; and notwithstanding its proxhnity to good grey slate quarries, the houses were almost all thatched. This burgh unites with Montrose, Arbroath, Brechin, and Inverbervie in sending one member to parlia- ment. The population of the burgh (royal and parliamen- tary) in 1861 was 9258, and in 1871 11,031.

FORGE, a fire urged by a blast for the purposes of the smith. Of late years many improvements have been made in its construction. Formerly the forge was almost made entirely of bricks, and many so constructed exist still. From the attention of engineers having been ealled to the special requirements and increasing wants of the day, the old forge has undergone many changes. Undoubtedly these changes are for the better. The modern forge leaves little to be desired. It is only in cases where the metal is of small dimensions, and the work of rare occurrence, that the old method of

building them in brick is still resorted to. The forge seen in country smithies and in small shops is made entirely of brieks. It is generally built against a wall upon arches to a convenient height.

The hearth, which should be made with fire-bricks, is sunk

to a depth of three inches or more, according to the nature of the work for which it is constructed ; so that the upper and outer course of brickwork forms a rim. About 2 feet 6 inches, more or less, above the hearth is placed the hood. This is also made of brick, and is built upon a flat iron rim. It is cone shape, and at the apex is an orifice leading into a flue for the escape of the smoke. In front of the forge is placed a water tank for quenching the work, tools, &c. The tuyere or tweer is placed at the back of the hearth, as well as asmall water tank for keeping the nozzle from burning under the action of the severe heat to which it is submitted. A pair of bellows, either single or double, worked by a rocking staff or lever is placed on one side of the forge in a convenient position. The bellows are placed on each side, if the forge be provided with two fires; when this is the case it is called a double forge. Modern or the latest constructed forges are made almost entirely of cast or wrought iron. The wrought iron forges are asa rule portable for the purpose of ships, dockyards, &c. They are constructed with sheet iron of a suitable gauge, the pieces being riveted together, and generally have the bellows placed underneath the hearth so that it may be out of the way. This particularly applies to portable forges of any description. Cast iron forges (either single or double) are cast in one or two pieces, and are of superior thickness, so as to give strength and solidity. They are used as fixed hearths in shops. They are bricked up when the work is of a very heavy nature so as to support the weight. The hoods of these forges are also made of cast iron, and are bolted on to the main casting. They vary inshapes and sizes. Messrs Handyside of Derby have designed some which have found much favour in the English Government and other works. Some of the smaller forges are now fitted with a fan blast—to be worked by hand. These are very powerful, and give a very uniform current of air. They also have the advantage of being made entirely of metal, which adds considerably to their strength and lightness. The exertion in blowing is much less with them than with the ordinary bellows, from the motion being circular and the fan running between centres. At the Paris Exhibition

(1878) there were several forges constructed upon an improved method, The blast was obtained by a pump, a reservoir being attached for maintaining the current—which was very easy to keep up-

In large smithies the hearths are all placed in a row OF scattered about the shops in convenient situations, each having a flue passing through the roof. They are worked

FOR{FOR

hy a powerful air blast situated at one end of the building. The air is conveyed by a series of main pipes sunk to the depth of a few feet under the ground. Smaller tubes are employed to convey the blast to the hearths. Under these circumstances the smith has but to turn a small lever, in order to open or close the air-valve which is placed in a small standard at the side of each hearth. By this means the workman is saved much labour and consequently much time. Steam has also been adopted as a means of forcing air into the forge. With special appuratus for drying the steam it is very successful. large blast furnaces than those of the smithy. Another description of the forge is the battery forge. This is used in military service. It is constrncted somewhat like a enisson. The bellows are situated in the place usually occupied by the ammunition chests. A box to contain coal, aset of tools, horse shoes, iron, and steel is attached to the body of the carriage, which is mounted on a pair of wheels,

The forge gives its name to " Forging," one of the most important arts connected with engineering work. The strength and durability of engines and other machinery in general depends to a very great extent upon the art and care bestowed upon those parts which have to sustain great weight, much strain, and an amount of wear and tear, Thus the smith holds in engineering shops a very important place. He has to depend upon his eye and judgment in many cases where the fitter and turner is assisted by drawings setting forth every detail. The smith, however, of the present day is not such an adept as his predecessor. The introduction of the steam hammer, stamps, &c., have to a great extent rendered his work nothing more than mechanical. To meet the urgent re- quirements of the present day, he has to study the engine and machine; that he has succeeded is evident, and the manufacturer can produce more work in less time than he could formerly.

But though this is undoubtedly a gain, it has unfortunately been the means of rendering skilled manual labour in many branches of our industries almost superfluous. This being the case, the skill on which the older workmen so much prided themselves is slowly disappearing, and indeed has become almost extinct. _ One great change in the history of forging was thie latroduction of the steam hammer in 1833 by Mr Nasmyth. By the means of that machine, the welding and forging of pieces of metal of any size has become comparatively easy. Mr Nasmyth's steam hammer has been improved upon by himself from that time, and is now to be seen in almost all engineering shops throughout the world. The tilt hammer is still in use, and for various purposes may be sad to be of great utility. But the smaller sizes of steam hammer are more convenient and manageable, and as a natural consequence are rapidly taking its place. To the Steam hammer we are indebted for the Y anvil, which is used in the forging of rods and bar iron. Rolling mills are, however, much quicker, and are used in preference.

A forging machine, invented by Mr Ryder many years back, and still in full operation, possesses many qualities unattainable by any other known means. It consists of a Setles of small anvils of various sizes. These are held by set screws passing through the frame of the machine, Which allow of the anvils being raised or lowered, so that @ perfect adjustment might be obtained. The hammers are placed over the anvils, and work up and down in

eaTings, moved by an eccentric. This is worked by a cradle upon the liead; the hammer is raised by a strong . Spring, The strokes made by this machine vary from 7 to 1200 per minute. According to Mr Platt (of Platt

rothers, Oldham), one of the original makers of the a Squeeze than a blow which does the

machine, it is rather Work. Many improvements 'have been pomento Shy

It is, however, more adapted to |

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| hard or difficult to file up.

Platt's firm ; and the Bolton blacksmith, as it is commonly

called, is now being extensively used in the Government | workshops for the manufacture of bayonets,

&c. The tools used are wedge-shaped, and the surface of the iron after forging, or rather squeezing, is said to be anything but The spindles of mules (cotton- spinning machines) are now forged by this tool, and indeed every description of small work. The contour

| produced by it is such that the work is almost as true

as though it had been surfaced in the lathe. There have been several other machines. upon 'Ryder's principle brought out, but none appear to answer so well as that designed by the original inventor.

Another invention, the steam stamp, is now most ex- tensively used. This is similar to a steam hammer ; it place of the anvil and hammer head is placed a pair of dies, in which is cut the form of work necessary. The iron is placed over the die, the stroke is delivered, and the iron is forced into the shape of the die, Machinery and separate tools are now often forged in this hammer.

The quality of the coals used in forging is of the utmost importance; the coal preferred by smiths is that which makes plenty of coke, and which leaves after being burnt a quantity of white ashes.

The art of forging is by no means easy to acquire, Great practice is neccssary to arrive at excellence in this important branch of our great industries.

See The Forge (published by the Society for the Propagation of Christian Knowledge), W. Harrison's Light of the Forge, and The Smith's and Metal Worker's Director. (D. A. A.)

FORGERY, in English law, is defined as " the fraudu- lent making or alteration of a writing to the prejudice of another man's right," or "as the false making, or making malo animo, of any written instrument for the purpose of fraud or deceit." This definition, it will be seen, com- prehends all fraudulent tampering with documents. ' Not only the fabrication and false making of the whole of a written instrument, but a fraudulent insertion, alteration, or erasure, even of a letter, in any material part of a true instrument whereby a new operation is given to it, will amount to forgery,—and this though it be afterwards executed by another person ignorant of the deceit" (Russell on Crimes and Misdemeanours, vol. ii. p. 619). Changing the word Dale into Sale in a lease, so that it appears to be a lease of the maner of Sale instead of the manor of Dale, is a forgery. And whena country banker's note was made payable at.the house of a banker in London who failed, it was held to be forgery to alter the name of such London banker to that of another London banker with whom the country banker had subsequently made his notes payable, As to the fraud, "an intent to defraud is pre- sumed to exist if it appears that at the time when the false document was made there was in existence a specific person, ascertained or unascertained, capable of being defrauded thereby; and this presumption is not rebutted by proof that the offender took or intended to take measures to prevent such person from being defrauded in fact, nor by the fact that he had or thought he had a right to the thing to be obtained by the false document " (Stephen's Digest of the Criminal Law, ¢, 43). Thus when a man makes a false acceptance to a bill of exchange, and circulates it, intending to take it up and actually taking it up before it is presented for payment, he is guilty of forgery. Even if it be proved as a matter of fact that no person could be defrauded (as when A forges a cheque in B's name on a bank from which B had withdrawn his account), the intent to defraud will be presumed. But it would appear that if A knew that B had withdrawn his account, the absence of fraudulent intention would be inferred. A general intention to clieat the publi¢ is not.

the kind of fraud necessary to constitute forgery. Thus if a quack forges a diploma of the college of surgeons, In order to make people believe that he is a member of that hody, he is not guilty of forgery. The crime of forgery in

English law has been from time to time dealt with in an enormous number of statutes. "Mr Hammond, in the title Forgery of his Criminal Code, has enumerated more than 400 statutes which contain provisions against the offeuce" (Sir J. T. Coleridge's notes to Blackstone). Black- stone notices the increasing severity of the legislature against forgery, and says that " through the number of these general and special provisions there is now hardly a case possible to be conceived wherein forgery that tends to defraud, whether in the name of a real or fictitious person, is not made a capital crime." These Acts were consolidated by 1 Will. IV. c. 66, now repealed. The later statutes, fixing penalties from penal servitude for life downwards, were consolidated by the 24 and 25 Vict. c. 98 (the Forgery Act). It would take too much space to enumerate all the varieties of the offence with their appropriate punish- ments. The following condensed summary is based upon chapter xxiv. of Sir J. Stephen's Digest of the Criminal Law.

1. Forgeries punishable with penal servitude for life as a maxi- mum are—

(a) Forgeries of the Great Seal, Privy Seal, &c.

(b) Forgeries of transfers of stock, India bonds, exchequer bills, bank-notes, deeds, wills, bills of exchange, &Xc.

(c) Obliterations or alterations of crossing on a cheque.

{2 Forgeries of registers of birth, &c., or of copies thereof and others.

9. Forgerics punishable with fourteen years penal servitude arc—

(a) Forgeries of debentures.

(b) Forgeries of documents relating to the registering of deeds, &c.

(c) Forgeries of instruments purporting to be made by the account- aut general and other officers of the Court of Chancery, &c.

(d) Drawing bill of exchange, &c., on account of another, per pro- curation or otherwise, without authority.

(e) Obtaining property by means of a forged instrument, knowing i to be forged, or by probate obtaincd on a forged will, false oath,

C.

3. Forgeries punishable with seven years' pena] servitude :— Forgeries of seals of courts, of the process of courts, of certificates, and of documents to be used in evidence, &c.

Forgery of trade marks is a misdemeanour punishable with two years' imprisonment. (E. RB.)

FORGET-ME-NOT, or Scorpion-Grass (German Ver- gissmeinnicht; French, grémillet, scorptonne), the name popularly applied to the small annual or perennial herbs forming the genus Myosotis of the natural order Boraginacece, so called from pvs, a mouse, and ots, an ear, on account of the shape of the leaves. The genus is represented in Europe, North Asia, North America, and Australia, and is characterized by oblong or linear stem- leaves ; flowers in terminal scorpioid cymes (see Botany, vol. iv. p. 125, fig. 169); small ebracteate blue, pink, or white flowers; a five-cleft persistent calyx; a salver or funnel-shaped corolla, having its mouth closed by five short scales ; and hard, smooth, and shining nutlets. The com- mon or true Forget-me-not, the Water Myosote, Mf. palus- tris, With., is a perennial plant growing to a height of 6 to 18 inches, with rootstock creeping ; stem clothed with lax spreading hairs; leaves light green, and somewhat shining ; buds pink, becoming blue as they expand ; corolla rotate, broad, with retuse lobes, and bright blue with a yellow centre. The divisions of the calyx extend only about one-third the length of the corolla, whereas in the other British species of Myosotis it is deeply cleft. The forget-me-not, a favourite with poets, and the symbol of constancy, is a frequent ornament of brooks, rivers, and ditches, and, according to an old German tradition, received its name from the last Lei : knight who was drowned in the attempt to pro- ca wus eae lady. It attains its greatest perfec- ee: ivation, and, as it flowers throughout the

er, 18 used with good effect for garden borders. A

variety, M. strigulosa, is more hairy and erect, and its flowers are smaller. The species JZ. versicolor bears both blue and yellow flowers.

FORKEL, Jouann Nixotaus (1749-1818), was a native of Coburg in Saxony. As a practical musician, especially as a pianoforte player, Forkel achieved some eminence in his profession ; but his claims to a more abid- ing name rest chiefly upon his literary skill and deep research as a writer and historian in the department of musical science and literature. He obtained the degree of doctor-in philosophy, and for some time held the appoint- ment of director of the music at the university of Gottin- gen. The following is a list of his principal works ;:— Ueber die Theorie der Musik, Gottingen, 1774 ; Musicalis

Kritische Bibliothek, Gotha, 1778 ; Allgemeine Geschichte .

der Musik, Leipsic, 1781. The last is his most important work. He also wrote a Dictionary of Musical Literature, which is full of valuable material.

FORLI, the ancient Forum Livit, a city of Italy, at the head of a province which was formerly a legation of the Papal States. It is situated in a fertile plain between the Montone and the Ronco, alittle to the right of the railway line between Rimini and Bologna, about 50 miles 8.E. of the latter city. It is a well-built and flourishing town, with broad streets and a central piazza, which was reckoned one of the finest in Italy, but has been completely modernized in 1873. The cathedral is of special interest for the chapel of the Madonna del Fuoco, so called from the long-laboured masterpiece of Carlo Cignani; and the church of 8S. Girolamo contains frescoes said to be by Melozzo da Forli, the Conception by Guido Reni, and a beautiful tomb erected for a Barbara Ordelaffi of the 15th century. From most of the other churches the paintings have been removed to the grnacoteca or picture-gallery in the convent of the Frati della Missione, where, besides Melozzo and Cignani, Palmezzano, Guercino, Guido Reni, and Zanganelli are represented. The citadel, known as Rocca di Ravaldino, was founded in 1361 by Cardinal Albornoz; it is in great measure destroyed, and what still remains is utilized as a prison. Besides its administra- tive and ecclesiastical offices, the town possesses a chamber of commerce and arts, a public library, and several institu- tions for higher education. A considerable trade is carried on in the varied agricultural produce of the

neighbourhood, and there are manufactures of silk ribands and twist, of oil-cloth, nitre, wax, matches, and tiles. The population in 1872 was 15,324.

Forli is said to have been founded either by Livius Salinator or by Lucius Arminius, after the defeat of Hasdrubal on the Metanrus in 207 B.c., but its name does not appear in Strabo or Ptolemy. After the fall of the Roman empire it became a republic, and had authority, it is said, over no fewer than 5 cities and 40 towns and villages. It stood a long siege from the French in 1287, and re- mained independent till 1315. During the troublous times of the

14th and 15th centuries the Ordelafli, the Orgogliosi, and other |

powerful families were in possession of the lordship, which finally came to Pope Julius II. in 1508. In 1521 a battle was fought In the neighbourhood by the French and the Spaniards. On the occu- pation of the county by the republicans in 1797 the town was made the head of the department of the Rubicon. A considerable number of eminent men are natives of Forli:;—Cornelins Gallus, the Latin poet; Guido Bonate, the astrologer; Melozzo, the painter (see next article); and Morgagni, the founder of pathological anatomy, born in 1682. Cignani and Torricelli are both buried in the cathedral, FORLI, Metozzo pa (c. 1438-1494), an eminent painter, particularly renowned as the first who practised foreshortening with much success. He was born, as his ordinary designation indicates, at Forli about the year 1438; he came of a wealthy family named Ambrosl. In all probability, Melozzo studied painting under Piero della Francesca, of Borgo 8. Sepolero; he seems also to been well acquainted with Giovanni Santi, the father 0 Raphael. It has been said that he became a journeyma®

and colour-grinder to some of the best masters, in order to prosecute his studies; this lacks confirmation. Only three works are now extant which. can safely be assigned to Melozzv. (1) He painted in 1472 the vault of the chief chapel' in the church of the Apostoli in Rome, his subject being the Ascension of Christ ; the figure of Christ is so boldly and effectively foreshortened that it seemed to "burst through the vaulting"; this fresco was taken down in 1711, and the figure of Christ is now in the Quirinal

Palace, not worthy of special admiration save in its perspective quality; while some of the other portions, almost Raphaelesque in merit, are in the sacristy of St Peter's. (2) Between 1475 and 1480 he executed a fresco, now transferred to canvas, and placed in the Vatican picture-gallery, representing the appointment of Platina by Pope Sixtus IV. as librarian of the restored Vatican library,—an excellent work of dignified portraiture. (3) In the Collegio at Forli is a fresco by Melozzo, termed the "Pestapepe," or Pepper-grinder, originally painted as a grocer's sign ; it is an energetic specimen of rather coarse realism, now so damaged that one can hardly assess its merits. Melozzo also painted the cupola of the Capuchin church at Forli, destroyed in 1651; and it has been said that he executed at Urbino some of the portraits of great men (Plato, Dante, Sixtus IV., &c.) which are now divided between the Barberini Palace and the Campana collection in Paris ; this, however, appears to be more than doubtful, and it is even questionable whether Melozzo was ever at Urbino. In Rome he was one of the original members of the academy of St Luke, founded by Sixtus IV. He returned to Forli, probably towards 1480, and died in November 1494. He contributed sensibly to the pro- gress of pictorial art; and, without being remarkable as a colourist, gave well graded lignts, with general care and finish, and fine dignified figures. His works bear acertain degree of resemblance to those of his contem- porary Mantegna. Marco Palmezzano was his pupil; and the signature "Marcus de Melotius" on some of Palmezzano's works has, along with the general affinity of style, led to their being ascribed to Melozzo, who has himself been hence incorrectly called "Marco Melozzo." FORLIMPOPOLI, a town of Italy, about five miles east of Forli, with a station on the railway between Bologna and Rimini. It was once a bishop's seat, and still possesses a cathedral and an ancient castle. The name and the situation identify it with one of the three places that bore the Latin designation of Forum Popilii. Its history 1s marked by great vicissitudes, Destroyed by the Lombards and restored by the people of Forli, it was again laid utterly waste in 1370 by Cardinal Egidio, and though twenty years later it was refounded and refortified by Sinbaldo Ordelaffi, it never recovered its former prosperity, Population in 1872 about 5000. FORMAN, Simon (1552-1611), a physician and astrologer, was born in 1552 at Quidham, a small village near Wilton, Wiltshire. At the age of fourteen he became apprentice to a druggist at Salisbury, but at the end of four years he exchanged this profession for that of a school- master. Shortly

afterwards he entered Magdalen College, Oxford, where he studied chiefly medicine and astrology. After contiuuing the same studies in Holland he com- menced practice as a physician in Philpot Lane, London, but as he possessed no diploma, he on this account under- Went more than one term of imprisonment. Ultimately, owever, he obtained a diploina from Cambridge uuiversity, and established himself as a physician and astrologer at 'ambeth, where he was consulted, especially as a physi- clan, by many persons of rank, among others by the hotorious countess of Essex. He expired suddenly while rossing the Thames in a boat, September 12, 1611.

A list of Forman's works on astrology is given in Bliss's edition of the Athene Oxonienses ; many of his MS. works are contained in the Bodleian Library, the British Museum, and the Plymouth Library. A Brief Description of the Forman MSS. in the Public Library, Plymouth, was published in 1853.

FORMEY, Joann Hetwricn Samuen (1711-1797), a German author, was born of French parentage at Berlin, 3lst May 1711. He was educated for the ministry, and at the age of twenty became pastor of the French church at Brandenburg. Having in 1736 accepted the invitation of a congregation in Berlin, te was in the following year chose professor of rhetoric in the French college of that city, and in 1739 professor of philosophy. On the organization of the academy of Berlin in 1744, he was named a member, and in 1748 became its perpetual secretary. He died at Berlin on the 7th Mareh 1797. His principal works are La Belle Wolfienne, 1741-1758, 6 vols. 8vo, a kind of novel written with the view of enforcing the precepts of the Wolfian philosophy ; Biblio- théque Critique ou Mémoires pour servir & U' Histoire Littéraire Ancienne et Moderne, 1746; Le Philosophe Chrétien, 1750; L' Emile Chrétien, 1764, intended as an answer to the Hmile of Rousseau ; and Souvenirs dun Citoyen, Berlin, 1789. He also published an immense number of contemporary memoirs in the transactions of the Berlin Academy, and. besides founding and editing several periodical publications contributed largely to others. He enjoyed a considerable reputation for ability and learning during his lifetime, but his works, which display a varied but somewhat superficial erudition, are now almost for- gotten.

FORMIA (formerly Mola Gaéta or Castelmola), a town of Italy, in the province of Caserta, beautifully situated near the ancient Via Appia, on the inuermost recess of the Gulf of Gaéta. The surrounding country is occupied with vineyards, olive plantations, and fruit gardens. Formia occupies the site of the ancieut Formia, said to have been founded by the Tyrrhenians, Atan early period it received the Roman franchise and became a municipium., Villas were built near it by many of the noble Romans ; and in the grounds of the Villa Caposele there are ruins which are thought by some to have been the baths of the villa of Cicero. The villa Caposele was at one time ono of the residences of the kings of Naples. The vine of the Formian hills produced excellent wine in the time of Horace. Population in 1871, 9151.

FORMOSA, in Chinese Zatwan, a Jarge island in the Pacific lying between what the Chinese call Nan-hai and Tong-hai, or the Southern and the Eastern Sea, and separated from the Chinese mainland by the strait of Fokien, which has a width of about 91 miles in its narrowest part. It extends from 121° 15' to 122° 5' EK, long.; Foki, its most northern point, lies in 25° 19', and its most sonthern, Lin-hai-shan or South Cape, in 21° 54'N. lat. Its area is estimated at 14,978 square miles, or about half the size of Ireland. It forms part of the long line of islands which, in the words of Mr Bridge, are interposed as a protective fortification between the Asiatic coast and the broad expanse of the Pacific, and produces that happy immunity from the typhoon which is enjoyed by the ports

of China from Amoy to the Yellow Sea. A chain of mountains, called simply Ta-shan or Great Mountain by the Chinese, traverses the island from N. to S., and attains in several of its summits no inconsiderable elevation, The loftiest point is usually said to be Mu Kang-shan or the " Wooded Mountain," which has been named Mount Morri- son by the English, "after the captain of one of the early vessels trading to Taiwanfu," and is said to be 12,850 feet in height ; but it is not improbable that this estimate is too high, and that the range really culminates elsewhere. | Towards the north the English maps show a Mount

Sylvia or Shan-chas-shan, 11,300 feet high, and a summit in the Middle, Western, or Dodds range, 12,800 feet. Be this as it may, Formosa, as far as its vertical relief is con- cerned, is divided into three regions,—the mountains proper, the broad western versant with its alluvial plains, and the narrow eastern versant terminating in a high and precipitous coast. The formation of the island appears to have been due in part at least to volcanic agency ; the Chinese accounts mention a mountain called Ho-shan or Fire Mountain, said to be a small volcano about 20 miles south of Kagee; and Huropean explorers have described the jets of steam and sulphur-springs which occur among the calcareous rocks near Tam-sui. Coal, sulphur, and petroleum are the ouly mineral productions of Formosa which are known to exist in quantities sufli- cient to make them of economical importance. The principal coal-fields are in the north of the island, near Kelung and Tam-sui; and the coal is all shipped in Kelung arbour. Till 1877 mining operations were conducted after the simple Chinese fashion ; but in that year Mr Tyzack, an English engineer, engaged by the Chinese Government, opened a pit with a regular shaft 300 feet deep, and all the necessary machinery and engines for the proper working of the mine. The bed of coal is 3 feet thick. The mineral is highly bituminous, and burns very fast, but can be used for steamers on short voyages. It is regularly employed by many foreign vessels, as well as in the Chinese men-of-war, and iu the arsenal at Fuh-chow. In 1873, 45,000 tons were shipped in foreign ships ; in 1874, 15,221 tons; in 1875, 27,665 tons; and in 1876, 31,593 tous. In the plains the soil is generally of sand or alluvial clay, covered in the valleys with a rich vegetable mould. As might be inferred from what has been already said, the streams that flow eastward are little better than torrents; but the western region is traversed by several rivers of moderate development—the Taiwanfu and Pakan rivers, the Black river, the Lokan, the Taika, the Heon-lang, the Tion-kan, the Tonk-slian, and the Tam-sui. Of these the Black river is the widest, but the Tam-sui or Tang-shui-khi alone is navigable, allowing sea vessels to proceed about 3 miles inland, and junks of considerable size about 10 miles farther. There isa fine lake 4 miles long by 2 broad called the Tsui-sia-hai, or Lake of the Water Savages, not far from Posia. The scenery of Formosa is frequently of majestic beauty; and to this it is indebted for its European name, happily bestowed by the early Spanish navigators. As seen from the eastern coast " the outline of the mountains is at once beautiful and fantastic; domes and peaks and wall-

like precipices succeed each other in stile variety ; a brilliant verdure clothes their sides, down which dash cas- cades that shine like silver in the tropical sunlight " (Bridge in Fortnightly Review, 1876). The climate, though a tropi- cal one, is agreeable and healthy, being tempered by the influences both of the sea and the mountains. According to thermometric observations made at Kelung in 1874, the hottest mouths are June, July, August, and September, with an average of from 81-76° to 82'8]° F. in the shade, and the coldest month is January, with an average of 57°70°. The thermometer almost reached 90° in the early part of July, and in January was frequently about 52° or 55°. For the same year the rainfall amounted to 118 inches, of which the most fell in January, February, March, and May. The vegetation of the island is charac- terized by tropical luxuriance,—the mountainous regions being clad with dense forest, in which various species of palins, the camphor-tree (Laurus Camphora), and the aloe are conspicuous. Mr Swinhoe obtained no fewer than 65 different kinds of timber from a large yard in Taiwantfu ; a on are now to be seen in the museum at

ew. The tree which supplies tle materials for the pith

FORMOSA

paper of tle Chinese is not uncommon, and Mr Pickering found the cassia tree in the mountains. Travellers are especially struck with the beauty of some of the wild flowers, more especially with the lilies and convolvuluses ; and our European greenhouses have been enriched by several Formosan orchids and other ornamental plants, The pine apple grows in abundance. In the lowlands of the western portion, the Chinese have introduced a large number of cultivated plants and fruit trees. Rice is grown in such quantities as to procure for Formosa the title of the "granary of China"; and the sweet potato, taro, millet, barley, wheat, and maize are also cultivated, Sugar, tea, indigo, ground pea-nuts, jute, hemp, oil, and ratans are all articles of export, and some of them pro- duce no inconsiderable trade. The principal tea district is about Banka, but the area devoted to this valuable crop is rapidly increasing. A large part of the tea finds its way to America. In some parts of the island it is probable that coffee may be grown with advantage. The Formosan fauna has been but partially ascertained; but at

least three kinds of deer, wild boars, bears, goats, monkeys (probably Macacus speciosus), squirrels, and flying squirrels are fairly common, and panthers and wild cats are not unfrequent. A poisonous but beautiful green snake is often mentioned by travellers. Pheasants, ducks, geese, and snipe are abundant; and Dr Collingwood in his Natu- ralist's Rambles in the China Seas mentions Ardea prasio- sceles and other species of herons, several species of fly- catchers, kingfishers, slirikes, and larks, the black drongo, the Cotyle sinensis, and the Prinia sonitans. Dogs are kept even by the savages for hunting. The horse is hardly known, and his place is taken by the ox, which is regu- larly bridled and saddled and ridden with all dignity. The rivers and neighbouring seas seem to be well stocked with fish, and especial mention must be made of the turtles, flying-fish, and brilliant coral-fish which swarm in the waters warmed by the Xwros¢wo current, that gulf- stream of the Pacific. Shell-fish form an important article of diet to both the Chinese and the aborigines along the coast—a species of Cyrena, a species of Tapes, Cytherwa petechiana, and Modiola teres being most abundant.

The inhabitants of Formosa may be divided into three classes :—the Chinese, many of whom have immigrated from the neighbourhood of Amoy and speak the dialect of that district, while others are Hakkas from the vicinity of Swatow; the subjugated aborigines, now largely intermingled with the Chinese; and the uncivilized aborigines of the eastern region, who refuse to recognize the Chinese authority, and carry on raids as opportunity occurs. The semi-civilized aborigines, who have adopted the Chinese language, dress, and customs, are called Pe-pa- hwan (Anglice Peppo-hoans), while their wilder brethren bear the name of Che-hwan or green savages. They appear to belong to the Malay stock, and their language, accord- ing to Gabelentz's investigations in the Zeitschrift der Morgenlind. Gesellschaft, 1859, bears out the supposition.' They are broken up into almost countless tribes and clans, many of which number only a few hundred individuals, and their language consequently presents a variety of dialects, of which no classification has yet been effected : in the district of Posia alone, says Dr Dickson, of the Presbyterian mission, there are "eight different mutually unintelligible dialeets." Mr Corner of Amoy describes the people themselves as of '" middle heiglit, broad-chested, an muscular, with remarkably large hands and feet, the eyes large, the forehead round, and

not narrow or receding 10 many instances, the nose broad, the mouth large and. dis- 2) enol re

1 Compare lists in Journ. of Roy. Geog. Soc., 1873, and in Colling- wood's Appendix.

figured with betel." The custom of tattooing is universal. In the north of the island at least, the dead are buried in a sitting posture under the bed on which they have ex- pired. Petty wars are extremely common, not only along the Chinese frontiers, but between the neighbouring clans; and the heads of the slain are carefully preserved as trophies. In some districts the young meu and boys sleep in the skull-chambers, in order that they may be inspired with courage. Many of the tribes that have had least intercourse with the Chinese show a considerable amount of skill in the arts of civilization. The houses, for instance, of the village of Ka-fri-ang in the south are described by Rev. W. Campbell as "built of stone, tiled with immense slabs of a slaty kind of rock, and fitted up within with accommodation for sleeping comfortably as well as for cooking, and for storing up abundance of materials for personal and household use." Manchester prints and other European goods are in pretty general use ; and the women, who make a fine native cloth from hemp, introduce coloured threads from the foreign stuffs, so as to produce ornamental devices. The office of chief- tain is sometimes held by women. Intermarriage between the Chinese and the natives is very common.

The Chinese portion of the island was till 1876 divided into the districts of Komalan, Tam-sui, Chang-hua, Kia-i, Tai-wan, Feng-shan, of which Komalan or Kapsiulangting was the only one on the eastern side; but the districts of Komalan and Tam-sui have been abolished, and a depart- ment of North Formosa established with three dependent magistracies. A highway runs from Bangka in the north to Pangliavu in the south. Beginning at the north we find the following places of importance :— Kelung, the ancient Pe-Kiang, a treaty port in the neighbourhood of the mines ' Tam-sui, or properly Howei or Hobay, also a treaty port with 100,000 inhabitants, on the harbour of the same name, which is formed by hills upwards of 2000 feet high and has a depth of 3} fathoms and a bar of

74 feet; Twa-tu-tia, about 13 miles up the Tam-sui river in a tea district, and possessing a population of 20,000 ; Mengka, Bangka, or Banca, a little higher up the river, one of the most flourishing commercial towns in the north, with 30,000 inhabitants ; Teukcham or Teuxham, a walled town at the head of the Tam-sui district, with a population of 40,000 inhabitants; Heong-san and Tiong-Kang, both near the coast; Oulan and Suikang, both inland; Changhwa the capital of a district, and the second city in the island, with a population of 60,000 or 80,000 ; Chip-Chip, a large town inhabited solely by Chinese ; Kagee, or Chin-la-san, and Ung-Kan-bay; Kok-si-Kong, with a small harbour; Taiwanfu, the capital of the island, with 30,000 inhab- itants (or, according to another statement, 100,000), a treaty port, and the remains of the Dutch port of Zelandia ; Takao or Takow, also a treaty port, in 22° 37' N. lat., 120° 16' E. long., to the south of Ape's Hill; Pataou or Pitau, a few miles inland, the Feng-shan-hsien of ancient documents ; and Tang-Kang, a town of 20,000 inhabitants. Besides these there are many places of several thousands of "population, and the whole of the Chinese territory is dotted with villages and hamlets. The whole island is estimated to contain from one and a half to two million souls, the smaller number being probably nearer the truth. +he Chinese influence is rapidly spreading, and the island 1S More and more attracting the attention of foreigners.

The island of Formosa must have been known from a very carly Gate to the Chincse who were established in the Pescadores. The habitants are mentioned in the official works of the Yuan dynasty Fa ed or southern barbarians ; and under the Ming dynasty 16th a gins to appear as Kilung. In the beginning of the

: y it began to be known to the Portuguese and Spanish

sae oators, and the latter at least made some attempts at cstablish- Hg settlements or missions. The Dutch were the first, however, to

take footing in the island ; in 1624 they built a fort, Zelandia, on the east coast, where has since risen the town of Taiwan, and the settlement was inaintained for thirty-seven years. On the expulsion of the Ming dynasty in

China a number of their defeated adherents cameover to Formosa, and, under a leader called in European accounts Coxinga, succeeded in expelling the Dutch and taking possession of a good part of the island. In 1682 the Chinese of Formosa re- cognized the emperor Kanghi, and since then it has formed part of the empire. In 1714 the Jesuit mathematicians from the court visited the island. In 1782 occurreda most destructive storm, whicli laid the public buildings in ruins and wrecked twenty-seven of the imperial war-ships ; and in 1788 there broke outa violent rebellion, which was put down only after the loss, it is said, of a 100,000 (2) men by disease and sword, and the expenditure of 2,000,000 taels of silver. In the early part of the present century the island was principally known to Europeans on account of the wrecks which took place on its coasts, and the dangers that the crews had to run from the cannibal propensities of the aborigines, and the almost equally cruel tendencies of the Chinese. Among the most notable cases was the loss in 1842 of the British brig ' Ann," with fifty- seven persons on board, of whom forty-three were executed at Taiwan. By the treaty of Tientsin (1860) Taiwan was opened to European commerce, but Mr Swinhoe found the place quite unsuitable for a port of trade, and the harbour of 'T'am-sui was selected instead. Shortly afterwards a rebellion broke out, to which several of the Chinese authorities fell victims ; and for some time the condition of the foreign settlers was rather pre- carious, while the trade of the new port was so small that it was proposed to relinquish the consulate. In 1865 Dr Maxwell of the English Presbyterian Church established a medical mission first at Taiwan and afterwards at Takao; and the organization thus origi- nated comprised in 1877 thirteen churches among the Chinese, and as many among the aborigines of the southern provinces, with upwards of 1000 baptized converts and 3000 attendants at worship. The northern provinces are in the hands of the Presbyterian Church of Canada, which commenced its opcrations in 1872, and had nine stations in 1877. A Roman Catholic mission has also been in existence in the island since 1859. In 1867 the United States consul at Amoy made a treaty with Tok-a-Tok, a chief of the aborigines of the southern part of the island, by which the safety of foreigners was sccured in that district. An attack made on the Protestant and Roman Catholic missions at F eng-shan-hsien in 1868 led the British consul to authorize the occupation of Fort Zelandia and Amping by Colonel Gordon ; but his action was afterwards dis- approved by the home Government, and the indemnity*

demanded from the Chinese restored. In 1872 the crew of a J apanese vessel shipwrecked on the coast being murdered by the savages, thie Japanese Government sent an expedition to punish the assassins, and a war between China and Japan would have been the conse- quence if Wade the English ambassador had not succeeded in bringing them to terms,—China agreeing to pay 500,000 taels as compensation to the friends of the murdered men and to purchase the houses, &c., erected by the Japanese, and the J apanese on their side withdrawing their troops and giving up all claims to oceupa- tion. According to Mr Hewlett's report for 1872, the political statc of the island is very bad ; the official classes, he says, have a proverb "every three years an outbreak, every five a rebellion," and the reason of this instability is to be found in their own rapacity and glaring violations of justice. A more hopeful account is given by Mr Morrison in 1877; under the enlightened government of Ting, formerly futai of Fulichow, roads are being constructed throughout the Chinese territory, and other measures adopted for the develop- ment of its resources. A telegraph has been laid between Taiwanfu and Takao ; and the proposal to make a railway from the south to the north of the island is being seriously discussed. .A fort was built at Anping (the port of Taiwanfu) between 1874 and 1876, and two others at Takow. A scheme is in operation for the military reduction of the east coast districts, and a road is being pushed

south from Sauo.

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FORMOSUS, the successor of Stephen V. (or VL), as pope, first appears in history when, as bishop of Porto, he was sent on an embassy to the Bulgarians. Having afterwards sided with the German faction against John VIII. he was excommunicated, and compelled to take an oath never to return to Rome, or again to assume his priestly functions. From this oath he was, however, absolved by Martin IL, the successor of John VIII., and restored to his dignities; and on the death of Stephen V. in 891 he was chosen pope. The Italian faction had chosen Sergius, and the election of Formosus, which was in opposition to an old rule against the translation of bishops from one see to another, had to be confirmed by recourse to violence, but was rendered secure for a time by the success of the arms of Arnulf of Germany. After the withdrawal of Arnulf, Formosus was compelled to grant the imperial crown to Lambert, son of Guido of Italy, but this act did not pacify the Italian faction, and Formosus was only released from very hard straits by the arrival of Arnulf, who captured the city in the end of 895. In the following year Arnulf was crowned emperor by Formosus, but before the death of the latter in May, the excesses of Arnulf and his soldiers had begun to create a strong opposi- tion to the German power amongst all parties in Italy. By Stephen VI. the body of Formosus was disinterred, and treated with contumely as that of a usurper of the papal throne ; but Theodorus II. restored it to Christian burial, and at a council presided over by John IX. the pontificate of Fermosus was declared valid and all his acts confirmed.

FORRES. See Etarn, vol. viii. p. 130.

FORSKAL, Prrer (1736-1763), a celebrated Oriental traveller and naturalist, was born in Sweden in 1736. He studied at Gottingen, where he published a dissertation entitled Dubia de Principtis Philosophie Recentioris, which gained him some reputation. Thence he returned to his native country; but in 1759 he alienated the good-will of the Government by the publication of a pamphlet entitled Pensées sur la Lnberté Cwile. His acquaintance with natural history, however, had gained him the friend- ship of Linnzeus, who recommended him to Frederick V. of Denmark. From that sovereign he obtained the title of professor at Copenhagen, and Frederick also appointed him to accompany Carsten Niebuhr in an expedition to investigate Arabia and Egypt. He died of the plague at Jerim in Arabia,

July 11, 1763. His friend and com- panion Niebuhr was entrusted with the care of editing his MSS., and published in 1775 Descriptiones Animalium, Avium, Amphibtorum, Piscium, Insectorum, Vermium, que in itin. Orient. observavit Petrus Forskal. In the same year appeared also an account of the plants of Arabia Felix and of Lower Egypt, under the title of Mgyptiaco-Arabica, which is important as containing the first discussion of the relation of vegetation to climate.

FORST, originally Forsta or Forstz, a town of Brandenburg, Prussia, circle of Sorau, is situated on the Neisse, 44 miles SE. of Frankfort-on-the-Order. Its principal industries are tanning and the manufacture of woollen cloth ; and it has also a considerable cattle trade. Near the town are the ruins of an old castle. Forst was

24, 1791.

founded in the 13th century, and was burned down by the Hussites in 1430. From 1667 it belonged to the dukes of Sachsen-Merseburg, from 1740 to the palatinate of Saxony, and from 1815 to Prussia. Population in 1875 (including Altforst, united to it in 1874), 14,148,

FORSTER, Frangois (1790-1872), a French engraver, was born at Locle in Neufchatel, 22d August 1790. Ip 1805 he was apprenticed to an engraver in Paris, and he also studied painting and engraving simultaneously in the Ecole des Beaux Arts. His preference was ultimately fixed on the latter art, and on his obtaining in 1814 the first " grand prix de gravure," the king of Prussia, who was then with the allies in Paris, bestowed on him a gold medal, and a perision of 1500 franks for two years. With the aid of this sum he pursued his studies in Rome, where his attention was devoted chiefly to the works of Raphael. In 1844 he succeeded Tardieu in the Academy. He died at Paris, 27th June 1872. Forster occupied the first position among the French engravers of his time, and was equally successful in historical pieces and in portraits. —

Among his works may be mentioned—The Three Graces, and La Vierge de la légende, after Raphael; La Vierge au bas-relief, after Leonardo da Vinci;

Francis I. and Charles Y., after Gros; St Cecilia, after Paul Delaroche; Alfred Diirer and Henry IV., after Porbus; Wellington, after Gérard; and Queen Victoria, after Winterhalter.

FORSTER, Frieprich (1791-1868), a German historian, brother of Ernst Joachim Forster the painter, was born at Miinchengrosserstadt on the Saale, September After receiving his early education in the gymnasium at Altenburg, he studied theology at Jena, but subsequently devoted his attention for a time chiefly to archeology and the history of art. On the uprising of Prussia against France in 1813 he joined the army, where he soon attained the rank of' captain. At the close of the war he was appointed professor at the school of engineering and artillery in Berlin, but on account of certain democratic writings he was dismissed from that office in 1817. He then became connected with various literary journals, and in 1830 undertook with his brother an art tour in Italy. Shortly after his return he received an appointment at the royal museum of Berlin, with the title of court councillor. Forster was the founder and secretary of the Wissenschaft-lichen Kunstverein (scientific art union) of Berlin, He died at Berlin, 8th November 1868.

The following are his principal works:—Der Feldmarschall Blicher und seine Umgebungen, Leipsic, 1821; Friedrich's d. Gr Jugendjahre, Bildung, wnd Geist, Berlin, 1822 ; Albrecht von Wallen stein, Potsdam, 1834; Wallenstein's Process, Leipsic, 1844; Geschichte Friedrich Withelms I., Kénigs von Preussen, 3 vols., Potsdam, 1834- 35; and Die Héfe und Cabinete Europas im 18%" Jahrh., 3 vols., Potsdam, 1836-39. He also wrote a number of popular historical works, the principal of which are Newere und neweste preuss. Geschichte, and Geschichte der Befreiungskriegc, 1818, 1814, and 1815, both of which have reached several editions ; and besides editing an edition of Hegel's works, and adapting several of Shakespeare's and other dramatists' plays for the theatre, he is the author of a number of poems, which were collected and published at Berlin 1838, and of a historical drama, Gustav Adolf, 1832. The beginning of an autobiography of Forster was published at Berlin in 1873, under the title Kunst und Leben.

FORSTER, Jonann Georg Apam (1754-1794), an eminent German naturalist and writer on scientific sub- jects, was born at Nassenhuben, a small village near Dantzic, in November 1754. His father, Johann Reinhold Forster, a man of great scientific attainments but an intract- able temper, was at that time pastor of the place; the family are said to have been of Scotch extraction. In 1765 the elder Forster was commissioned by the empress Catherie to inspect the Russian colonies in the province of Saratov, which gave his son an opportunity of acquiring the Rus- sian language and the elements of a scientific education. After a few years the father quarrelled with the Russian

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Government, and suddenly embraced the resolution of pro- ceeding to England, where he obtained a professorship of natural history aud the modern languages at the famous nonconformist academy at Warrington, His violent tem- per soon compelled him to resign this appointment, and for two years he and his son earned a precarious livelihood by translations in London,—a practical education, however, exceedingly useful to the younger Forster, who became a thorough master of English, and acquired many of the ideas which chiefly influenced his subsequent life. At length the turning point in his career came in the shape of an invita- tion for him and his father to accompany Captain Cook in his third voyage round the world. Such an expedition was admirably calculated to call forth Forster's peculiar powers. He attained no remarkable distinction as an original dis- coverer or investigator, but his insight into nature was accurate and penetrating ; he conceived of her as a living whole, and reproduces her vitality in his animated pages. His account of Cook's voyage is almost the first example of the glowing yet faithful description of natural phenomena which has since made a knowledge of them the common property of the educated world,—a prelude to Humboldt, as Humboldt te Darwin and Wallace. The publication of this great work was, however, impeded for some time by differences with the Admiralty, during which Forster pro- ceeded to the Continent to obtain an appointment for his father as professor at Cassel, and found to his surprise that it was conferred upon himself. The

elder Forster, however, was soon provided for elsewhere, being appointed professor of natural history at Halle. At Cassel Forster formed an intimate friendship with the great anatomist Soemmer- ting, and about the same time made the acquaintance of Jacobi, who inspired him with a mystical spirit from which he subsequently emancipated himself. These were the

days of secret societies, masonic lodges, and conventions of

illuminati. Forster was for a long time deeply implicated in their proceedings, the purpose of which remains obscure. The want of books and scientific apparatus at Cassel induced him to resort frequently to Gittingen, where he betrothed himself to Therese Heyne, the daughter of the illustrious philologist, a clever and cultivated but heartless woman, who became the evil genius of his life. To be able to marry he accepted (1784) a professorship at the university of Wilna, where he found himself greatly misplaced. The penury and barbarism of Polish circumstances are graphi- cally described in his and his wife's letters of this period. After a few years' residence at Wilna he resigned his ap-

pointment to participate in a scientific expedition projected. |

by the Russian Government, and upon the relinquishment of this undertaking became librarian to the elector of Mayence. In 1790 he published his travels in the Nether- lands, with special reference to the art of the country—a Work displaying the same power of exposition in esthetic matters as he had previously shown in the description of the aspects of nature. This was his last work. 'The princi- pality of Mayence was now involved in the vortex of the French Revolution, and Forster unhappily suffered himself to be drawn into a position incompatible either with fidelity to his master the elector, or allegiance to his country. With his liberal sympathies and deficiency in political in- sight, he might be excused for welcoming the French as deliverers, but in promoting the actual incorporation of Mayence with France, he justly incurred the execration of patriotic Germans, notwithstanding the unquestionable purity of his intentions. Domestic sorrows were added to public calamities : Forster found himself not only deserted by his wife but deprived of his children. It is difficult to determine whether his apparent resignation should be ascribed

to romantic self-sacrifice or to the apathy of an exhausted spirit. The situation was nearly the same as that

ence in the worst days of the Reign of Terror. sonal character was most amiable; he was high-minded,

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of George Sand's Jacques, and the catastrophe not very

dissimilar. Forster died suddenly and opportunely, January

1794, in Paris, whither he had gone as deputy from May- His per-

disinterested, ingenuous to a.fault; but he was weak, im- pulsive, ill-starred throughout his life, and totally unequal to the difficult circumstances in which he ultimately found

himself. As an author he stands very high; he is almost

the first and almost the best of that valuable class of writers who have made science and art familiar by representing them in their essential spirit, unencumbered with technical details. Schlegel remarks that no other German prose writer carries his reader so far, leaving him not merely enriched with positive knowledge but animated with the passion for further progress; that the books of no other such writer convey so lively an impression of having been composed outside the study in the free air; and that no other is animated by so constant a sense of the infinite per- fectibility of human nature.

Forster's writings have been frequently collected. The most important have been mentioned above, but there are numerous minor essays of great value and artistic completeness. His corre- spondence with his friend Soemmerring has been recently published by Hettner, and is full of interest. The biography by Moleschott is very agreeably written, but is rather a delineation of a typical naturalist than of the actual man, and its account of Forster's political career is vitiated by the writer's own deficiency in patriotic feeling. The other side of the question is presented with unneces-

sary asperity in Klein's George Forster in Mayence. : There are excel- lent critical estimates by Schlegel and Gervinus, the latter prefixcd to the seventh volume of Forster's writings. (R. G.)

FORSTER, Jonn (1812-1876), an English historian, biographer, journalist, and critic, was born April 2, 1812, at Newcastle, where his father, 2 member of the Unitarian Church, followed the occupation of a butcher. He was well grounded in classics and mathematics at the grammar- school of his native town, and gave early promise of future distinction. After a brief residence at Cambridge he removed in 1828 to London, where he attended law classes in connexion with the recently founded university, but devoted himself chiefly to literary pursuits, The earlier productions of his pen were contributed to various liberal papers, particularly to Zhe True Sun, The Morning Chronicle,and The Examiner. As literary and dramatic critic for the last-named journal, he from the outset showed much conscientiousness, discrimination, and tact, and the influence of his powerful individuality soon made itself strongly felt. He had not long passed his twentieth year when the publication of his Lives of Eminent British Statesmen began. This work, originally undertaken for Lardner's Cyclopedia, and published separately in 1840 under the title of Zhe Statesmen of the Commonwealth of England, with a Treatise on the Popular Progress in finglish History, was immediately recognized as a work of great interest and value, entitling its author to high literary rank. Thenceforward he was a prominent figure in that distinguished circle of literary men which included such names as Bulwer, Talfourd, Fonblanque, Landor, Carlyle, Dickens. In 1843 he was called to the bar by the benchers of the Inner Temple; but while highly valuing this honourable connexion with the legal profession, he never became or sought to become a practising lawyer. His energies were mainly devoted to laborious historical investigations, while relaxation was sought chiefly in lighter forms of literary activity. For some years he edited the Foreign Quarterly Review; in 1846, on the retirement of Charles Dickens, he took charge for almost a year of the Daily News; in 1847, on the resignation of Albany Fonblanque, he became editor of the Haamzner, and this post he retained till 1856. From 1836 onwards he con- tributed to the Kdinburgh, Quarterly, and Foreign Quarterly

Heviews a variety of articles, some of which were republished in two volumes of Biographical and Historical Essays in 1858. In 1848 appeared his Life of Oliver Goldsmith, which, especially as revised and improved in a second edition (1854), has taken an acknowledged place as one of the most admirably executed biographies to be found in the whole range of English literature. Continuing his original researches into English history at the period of the Revolution, he published in 1860 two volumes, respect- ively entitled Arrest of the Five Members by Charles 1. A Chapter of English History rewritten, and The Debates on the Grand Remonstrance, with an Introductory Essay on English Freedom. These were followed by his Biography of Sir John Hot, published in 1864, an elaborate and finished picture from one of his earlier studies for the Lives of the Statesmen. In 1868 appeared his biography of his friend Walter Savage Landor. For several years he had been collecting materials for a life of Swift, but his studies in this direction were for a time suspended in con- sequence of the death of Charles Dickens, with whom he had long been on terms of intimate friendship. The first volunie of Forster's Life of Dickens appeared in 1871, and the work was completed in 1874. Towards the close of 1875 the first volume of his Life of Swift was published ; and he had made some progress in the preparation of the second, when lie was seized with an illness of which he died on the Ist of February 1876. He lies buried in Kensal-Green Cemetery, where a just and discriminative inscription tells that he was " noted in private life for the robustness of his character and the warmth of his affec- tions ; for his ceaseless industry in literature and business, and the lavish services which, in the midst of his crowded life, he rendered to his friends; for his keen appreciation of every species of excellence, and the generosity of his judgments on books and men." In 1855 Forster had been appointed secretary to the Lunacy Commission, and for some years after 1861 he held the office of a commis- sioner in lunacy. In 1860 he received the honorary degree of LL.D. from the university of Edinburgh. His valuable collection of manuscripts, along with his books and pictures, was bequeathed to the South Kensington Museum.

FORT DE FRANCE, formerly Port Royat, the capital of the French island of Martinique, one of the smaller Antilles, is situated on the west coast of the island, on the north side of a well-sheltered bay. It is the residence of the governor, and possesses a court of justice and a chamber of commerce. The

harbour, which is commanded by a fort, is good and safe, and connected with it there is a floating dock and a repairing dock. The town possesses sugar works, and its chief exports are sugar, coffee, and rum. Its trade will be considerably increased by the railway to St Pierre. During the war with France Port Royal was for a time the headquarters of the British West Indian fleet. The population of the town is about 11,500.

FORTESCUE, Sir Jonny, an eminent English lawyer in the reign of Henry VI., was descended from an ancient family in Devonshire, and, in all probability, was born at Norris, near South Brent in Somersetshire, towards the close of the 14th century. He was educated at Exeter College, Oxford. During the reign of Henry VI. he was three times appointed one of the governors of Lincoln's Tun. In 1441 he was made a king's sergeaut at law, and in the following year chief justice of the king's bench. As a judge Fortescue is highly commended for his wisdom, gravity, and uprightness; and he seems to have enjoyed great favour with the king, who is said to have given him Some substantial proofs of esteem and regard. He held his office during the remainder of the reign of Henry VI, to whom he steadily adhered ; and having faithfully served that unfortunate monarch in all his troubles, he was

attainted of treason in the first parliament of Edward IY, When Henry subsequently fled into Scotland, he is sup- posed to have appointed Fortescue, who appears to have accompanied him in his flight, chancellor of England. In 1463 Fortescue accompanied Queen Margaret and her court in their exile on the Continent, and returned with them afterwards to England. During their wanderings abroad the chancellor wrote for the instruction of the young Prince Edward his celebrated work De laudibus legum Anglie. On the defeat of the Lancastrian party, he made his submission to Edward IV., from whom he re- ceived a general pardon dated Westminster, October iss 1471. He died at an advanced age, but the exact date of his death has not been ascertained.

Forteseue's masterly vindication of the laws of England, though received with great favour by the learned of the profession to whom it was cominunicated, did not appear in print until the reign of Henry VIII., when

it was published by Whitechurch in 16mo, but without a date. In 1516 it was translated by Muleaster, and printed by Tottel; and again in 1567, 1578, and 1575, and also by White in 1598, 1599, and 1609. It was likewise printed, with Hengham's Summa Magna et Parva, in 1616 and 1660, 12mo; and again with Selden's notes in 1672, in 12mo. In 1787 it appeared in folio; and, in 1775, an English translation, with the original Latin, and Selden's notes, besides a variety of remarks relative to the history, antiquities, and laws of England, was published in 8yo. Waterhouse's Forteseuc Illustratus, which appeared in 1663, though prolix and defective in style, may be consulted with advantage. Another valuable and learned work by Fortescue, written in English, was published in 1714, under the title of The Difference between an Absolute and Limited Monarchy, as it more particularly regards the English Constitution, and aceompanted with some remarks by John Forteseuc Aland, of the Inner Temple, London; aud a second edition with amendments appeared in 1719. In the Cotton Library there is a manuscript of this work, in the title of which it is said to have been addressed to Henry VI.; but many passages show plainly that it was written in favour of Edward IV. Of Fortescue's other writings, which were pretty numerous, the mest important are—l. Opuseulum de Natura Legis Nature, et de ejus eensura in suecessione Regnorum Supremorum; 2. Defensio juris Domus Lan- eastrie; 3. Genealogy of the House of Laneaster; 4. Of the Title of the House of York; 5. Genealogie Regum Seotie; 6. A Dialogue between Understanding and Faith; 7. .A Prayer Book which savours nuch of the Times we live in. In 1869 his descendant, Lord Clermont, printed for private distribution The Works of Sir John Forteseue, now first collected and arranged, aud A History of the Family of Forteseue in all its branches (see Lambeth Review, 1872).

FORTH, one of the largest rivers in Scotland. It is formed of two streams rising to the north of Ben Lomond, (one of them passing through Loch Chon and Loch Ard), which unite above Aberfoyle. The river flows cast- ward in a direct course for above 100 miles, receiving in its progress the Goodie, the Teith, and the Allan above Stirling, and below it the Devon, the Carron, the Avon, the Almond, the Leith, the Esk, the Leven, the Tyne, and others; and it discharges itself into the German Ocean in about 56° 10' N. lat. The windings or "links" of the Forth above and below Stirling are extremely tortuous. From its junction with the Teith to the " carse" or al- luvial plain

below Gartmore they extend about 28 miles, although the distance in a direct line is only about 20. From Stirling harbour to Alloa, where it widens into an estuary, the length of the river is 10} miles, though the distance in a straight line is not more than 5. From Grangemouth to North Queensferry the depth increases in the first mile from 10 to 15 feet, in the second to 25, and in the third mile to 53 feet, while the remaining part of the distance—7 miles, including the great anchorage of St Margaret's Hope—has a depth generally of about 60 feet at low water. At Queensferry the firth is 2 miles wide ; between Dysart and Aberlady about 12 ; and between St Abb's Head and Fifeness, where it joins the German Ocean, it is from 35 to 40 miles. Near Queensferry, be- tween Inchgarvie and the North shore, it deepens to 37 fathoms. The bed of the river consists to a great extent of mud,—the depth of the deposit in some places being

upwards of 200 feet; and there are extensive alluvial for- mations along the lower part of its course, and in the upper reaches of its estuary. The tides are felt 44 miles above Stirling, and at Stirling harbour the spring tides rise 7 feet 9 inches. At Leith and Kinghorn their average height is 17} feet. Steamers go as far up the river as Stirling,— the only important obstructions to the navigation between that town and Alloa, the "Town Ford" and the " Abbey Ford," having been removed since 1843. The shallowness of the channel seems to have been occasioned by the prac- tice in vogue from 1732 among the Stirlingshire pro- prietors of using the river to carry off the peat from their lands; Mr Drummond of Blair-Drummond, for example, between 1783 and 1839 floated away upwards of 1000 acres of this substance. Further down in the firth the principal obstructions are the Drumsands near Cramond and the Sand-end to the east of Burntisland harbour. The anchorages in the firth are excellent ; and it thus forms the most important harbour of refuge to the north of the Humber. Several of its ports carry on a large foreign trade, more especially Leith, Granton, Bo'ness, and Grangemouth. The fisheries of herring, white fish, and salmon are all of great economical importance, not only giving employment toa considerable local population, but attracting English and even foreign fishermen. 'The traffic between the two

sides of the firth has been an object of legislation since 1467. Both the principal ferries—that between North and South Queensferry, and that between Granton and Burnt- island—are now in the hands of the North British Railway Company. In connexion with their system they have undertaken to construct a magnificent viaduct across the firth, the foundation stone of which was laid on the 30th of September 1878. Thomas Bouch, the engineer entrusted with the enterprise, has practically revived a plan proposed as early as 1818 by James Anderson. The bridge is to cross a little to the east of the present line of traffic between North and South Queensferry, advantage being taken of the small island of Inchgarvie, which lies about mid channel. Its most striking features will be two spans of 1600 feet, constructed on the suspension principle, at a height of 150 feet above high water of spring tides. In order to secure sufficient stability against the lateral pres- sure of the winds, which sometimes blow with great violence in the firth, these central portions will be split into two branches, each about 14 feet wide, which will lie 100 feet apart, but be bound together by horizontal braces. Both the great spans will 'be laid on a dead level, but the shore- ward sections will have gradients of about one in 77 and one in 80. The total cost is estimated at £1,250,000, and it is expected that the works will be completed in 1882.

FORTIFICATION

ORTIFICATION is the art of strengthening, by works of defence, positions in which it is proposed to place troops so as to render them secure from the attack of an enemy. Such positions may contain within them towns, dockyards, arsenals, and ports, or may serve merely for shelter for an army in the field; but the object to be attained is always the same, and the works of defence are so disposed round the position that, while they offer the greatest obstacles to the advance of their assailants, they afford the utmost shelter to their defenders. Fortifica- tion is, in short, the art of enabling the weak to resist the strong.

Various terms have been adopted in connexion with the general term of Fortification, but none of them are of much use in considering the subject, and some may lead to error, by inducing the engineer to restrict himself

under some cir- cumstances to a very limited view of his subject. Thus, Fortification Natural and Fortification Artificial imply a use- less distinction, as every engineer must avail himself of the natural advantages or obstacles of ground, as well as of the obstacles his science and genius enable him to add to them; and thus in every Fortification nature and art must act together. Fortification Regular and Fortification Irregular are defective terms, as no Fortification can possibly be regular unless it should so happen that the ground it occupies, as well as the ground surrounding it on all sides, is uniform in level and general character. Again Fortification Permanent and Fortification Field or Temporary have reference only to the immediate object of the works, or to the application of the science, and in no way affect its principles, which remain the same whether the work is a simple earthen intrenchment, or a great for- tress surrounded by inasonry walls. Fortification Offensive and Fortification Defensive are, however, of all terms the most objectionable, since they imply a contradiction to fact, for the perfection of defence depends as much on its active offensive operations as on the protection of its Covering works, while the perfection of attack depends as much on the skill with which its passive protective works are pushed forward as on the fire of its batteries.

The principles of Fortification then should be studied un-

shackled by any of these distinctions, and the engineer should apply his means to his end, using without restriction the works best suited to his purpose; and it is in this way that the study of the subject will be here treated.

ELEMENTARY FORTIFICATION.

It is desirable to examine the exact meaning of technical words, in order to acquire a distinct notion of the ideas they were intended to convey, and to obtain a glimpse of the historical progress of the science in which they are used, Fortify, Fortifications, Fortress, Fort, are all derived from fortis, strong; and the idea the first two convey is that, by artificial arrangement, additional strength is bestowed upon one combatant over another, or upon one party of combatants over another party. A rock, the trunk of a tree, a bank of earth, or any natural object, which shelters the body of a man from

the missiles of his opponent whilst it leaves him free to discharge his own, may be considered the simplest form of fortification.

A bank of earth, when reduced to the requisite thickness, and moulded into proper form, with such slopes as the particular tenacity of the earth may require to insure stability, or which the intended direction of the fire over its summit may render necessary, becomes a Parapet, so called from the Italian words para, a defence or guard, and petto, the breast, or, in English, a breastwork. Ifthe Breast- work or Parapet be made only sufficiently high to permit the soldier to fire over it, he will be exposed after firing, and will be forced to crouch in order to obtain cover. The parapet is therefore made high enough to cover the soldier when standing up so that he can load with ease and security, and can move with safety from place to place behind it. This increased height renders it necessary to introduce a Banquette or step (accessible by an easy slope), standing upon which the soldier can fire over the parapet and from which he can retire by the interior slope to the lower ground behind it; the name Banquette is derived from banchetta, a little bench or step. As Parapets are usually formed arti- ficially, the earth for their construction is derived from a ditch, which being dug immediately in front of and parallel

to the parapet, forms by its depth an additional obstruction toan advancing enemy. Ordinary intrenchments are formed of a simple parapet and ditch, but in more important out- works and in fortresses the height is further augmented by elevating the parapet on another mound of earth called the Rampart (rparo in Italian), and as this additional height requires a greater quantity of earth, the ditch is made both wider and deeper. By these means the difficulties of attack are increased, additional cover is given to the magazines or other buildings within the fortress, and the command over the country is raised and improved in efficiency, by elevating the soldier so that he can see over the many minor obstacles which would otherwise restrict his field of view. .

Some writers, regarding the presence or absence of the rampart as the main distinction between permanent and temporary works, have proposed to call the former Ram- part or Town Fortification, the latter Parapet or Field

Fortification ; but this distinction is not of universal appli- cation, and the more ordinary divisions of Permanent and Field Fortification better indicate the nature of the works and the objects for which they are intended.

In order to study efficiently the combinations of these simple elements, with a view to form from them works of

Fig. 1.—Simple Parapet.

Plan above, profile below.

defence, it is necessary that we should know the manner in which such works are represented on paper. As in architecture, of which in earlier times fortification was only a military branch, this is effected by the plan, the section, and the elevation, of which the first two are the most important. The plan of a work is the orthographic pro- jection of the lines of intersection of the planes of its slopes on the plane of con- struction. The elevation is a similar projection on a vertical plane. The section or profile is made on a plane perpendi- cular to the lines of intersec- tion of the planes or slopes, and therefore represents the traces of these planes on the sectional plane. Fig. 1 represents a small portion of a simple parapet in plan and profile, and leads to the follow-

ing explanation of terms :—

_ In the plan, ce represents the crest of the parapet or highest ridge line of the work. In delineating the outline of a work, it is this line which is always drawn ; it is called the "trace." Between th and 4 1s the superior slope ; between ce and a line parallel to it : ae 51s the exterior slope, prolonged in this case to the bot-

om of the ditch dd, being continuous with the escarp sd; gg is the crest of the glacis, or ridge of a slightly elevated mound of earth raised on the exterior edge of the ditch, or counterscarp, and slop-

ing gently outward, so that the assailants passing over its surface may be in the prolongation of the superior slope of the arapet, and therefore in the line of fire from its crest ; by its elevation the glacis increases the amount of descent into the ditch, Within the crest of the parapet are seen the interior slope of the parapet, bounded by 0', the banquette, between 0'b' and bd, and the interior slope of the banquette, bounded by aa.

felief.—This term is adopted to indicate the height of any point of the work either above the plane of construc. tion, which is sometimes the plane of site, when it is called constructive relief, or above the bottom of the ditch, when it is called absolute relief. The absolute relief is 9 very important datum, as it expresses the total obstruction offered by the parapet and ditch to the ascent of the assailant, and it has a bearing on the regulation of the length of lines, which mutually defend each other. The Relief of a work is the relief of the crest of its parapet. The Command of a work is the height of the crest of its parapet, either above the plane of site if horizontal, or above any point of that plane specially referred to, or above the crest of the parapet of any other work in front of it; the difference of height, therefore, between the crest of the parapet in fig. 1 and the crest of the glacis is the command of the parapet over the glacis; in the one case the com- mand is absolute, in the other relative.

But after all a simple parapet and ditch afford only tem: porary protection, and it is necessary to stop an enemy as he advances to them by placing obstacles in his path which shall retain him as long as possible under the fire of the works opposed to him either in front or in flank. In the profile in fig. 1, the simplest form of such an obstacle, viz., a Palisade, isshown. When, however, in combination with direct fire only, as in the figure, palisades check an enemy but for & short time, and are principally useful as affording more time to the defenders. Indeed in any combination of defence palisades are now of much less value than formerly, as they are readily destroyed by indirect fire, and by the new explosives which are more portable and far stronger than gunpowder ; they are mainly used in closing the gorges of temporary works, Many other obstacles may, however, be so arranged as to assist materially in rendering simple direct fire more effective. é

Abattis are formed of trees cut down, and arranged side by side with the branches interlaced outwards, and the stems inwards; the branches should be freed from foliage, and their ends cut sharp. They may be arranged in one or more rows, so that the fire from the parapet shall sweep along their summits, their stems being firmly fastened by pickets to the ground and partly buried in it; an enemy would suffer great loss whilst attempting to remove them under fire. The best abattis are formed of good-sized growing trees. The trunks are partially cut through a little above the ground, and the trees are bent down and

Fig. 2,—Arrangement of Abattis.

securely fastened to the ground and to one another by pickets and iron wire. +e

Fig. 2 exhibits an arrangement of Abattis; and it will be observed that in this profile the exterior slopes of the parapet and the escarp are formed into one gentle slope,

whilst the counterscarp retains its ordinary slope. By this modification the difficulty of descending into the ditch remains as before, and the sloping pickets in front of the abattis prevent the assailants from clearing it away. - In

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simple inclosed works, such as redoubts, and in lines, the | and to act upon the obstacles

defence frequently depends on direct fire alone 5 and in these cases a work of the profile here figured with obstacles would be far more effective in checking an enemy than a work of ordinary profile without obstacles, and would render it impossible that a watchful garrison should be surprised; and this is a very important consideration, as a vigorous and bold enemy could scarcely be stopped if he had suc- ceeded in arriving at the foot of the escarp unchecked. Fig. 3 exhibits another arrangement formed only of large branches securely picketed down to the ground. In this

Fia, 3.—Simpler arrangement of Abattis.

case the form of the ground is taken advantage of, and the profile of the defensive line is modified, a trench being eut out behind it, and the banquette being formed on the surface of the ground. By simple arrangements of this kind, it will often be possible to carry defensive lines over a large extent of ground in a short period of time, and to obtain more effective defence by taking advantage of the natural facilities of the ground than by the construction, with a great expenditure of labour and time, of elevated works, not so well fitted to sweep the surface of the ground,

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placed to check the progress of the assailants.

Chevaux-de-frise—The Cheval-de-frise (fig. 4) is a sub- stitute for an abattis. It consists of a strong horizontal beam, 12 feet long and 9 inches square, through which are passed strong lance-like rods of wood or iron, sharp at both ends, and about 6 inches apart. Several of these may be joined together by rings and hooks with which the ends of the beams are fitted.

Chevaux-de-frise require a considerable amount of skilled labour in their construction ; hence they can only be em- ployed in limited quantities for limited ob-

parts are separable for convenience of package and trans- port. If planted at the bottom of a hollow, exposed to

direct fire, so that they must either be pushed uphill for-

Fic. 5.—Profile showing Fraises on the Escarp.

ward or pulled downhill backward, and securely fastened by chains to the ground or to upright posts, they form a very formidable obstacle,

Fraises are palisades placed in a horizontal or nearly horizontal position. They are of wood or iron, and are usually made about 10 feet long and 15 inches thick, bound together by two ribands, nailed above and below them and buried in the ground, without which they would

be more easily torn away. They are fixed both on the

counterscarp and on the escarp. When on the escarp, they are inclined downwards, and the berm is cut away; when on the counterscarp, they are inclined upwards. On the Counterscarp they are safe from direct fire, and retain an enemy outside the ditch.

Fig. 5 represents, in section, a row of fraises on the escarp. Tn this profile the ordinary banquette for musketry is repre- sented by dotted lines below a wider terreplein, formed for artillery to fire over the parapet, or " en barbette," as it 1s penely called; but this will be more fully explained

Ow.

The " Wire Entanglement" is the best and most easily made of hasty accessory defences. It can be applied everywhere, and can be made by anybody; the material of it is carried in a small compass ; it does not interfere with the fire of the defence ; it cannot be seen from a

distance ; and artillery has little effect upon it.

Fic. 6.—Wire Entanglements.

chequer-wise ; strong wires are wound round them about 1 foot 6 inches above the ground, crossed diagonally by

finer wires. No entanglement should be less than 36 feet in depth, The wires should hang slackly from their sup- ports, as when strained they are easily divided by a sword- blow, and the stakes should vary in height. 14 B.W.G. steel wire is very suitable for the thicker wires; it is strong and weighs only 90 ib per mile. Wire entanglements in the bottom of a ditch offer a strong resistance. They are well placed in the slopes of the glacis and counterscarp and on the berm; but they are most effective when inter- woven with bushes

and trees in the defence of woods. Iron “band Gabions,” when disposed as in fig. 7, form a good entanglement. The bands are buttoned and placed:

in lines 4 feet apart, and connected together by strong wires | cated by the dotted lines, an exterior slope and escarp

passing through the bridging holes.

Fic. 7.—Gabions as an Entanglement.

Crows’ Feet (fig. 8) are made of iron with four points so arranged that one shall always project up- ——<—4~—>— ward in whatever manner they may be ae thrown on the ground; the points are either 2 or 4 inches long. Crows’ feet are sown over a space about 12 feet broad. ‘Troops coming suddenly, and in the dark, on these obstacles, would be much annoyed by them. They are most effective against cavalry,and =~.” were formerly much used,—more so than Fic. 8.—Crows’ now. Feet.

Trous-de-loup are holes in the ground in the form of an inverted cone or square pyramid, the sides of which are as steep as is consistent with the stability of the soil. They are made 6 or 8 feet in diameter and 6 feet deep, so that an enemy cannot use them as shel- ter pits to fire from. At the bottom is fixed a sharp stake 3 ‘feet long, or the branch of a tree cut into sharp points, or a num- ber of smaller sharp pickets, or a quantity of crows’ feet. Fig. 9 shows, in plan and section, the arrangement of trous-de-loup proposed by Wenzel.

If along the line of a position, either on the glacis or on the vf escarp (when gradually sloped os as in fig. 2), small trees or Fic. 9.—Plan and section of shrubs are planted, they can be HeonesdeAiaey, on an emergency cut down, and with the points of their stumps sharpened they would become very annoying to an assailant. arrows and many other substitutes can also be used; indeed every expedient which ingenuity can sug- gest should be

adopted by the engineer to check the pro- gress of an advancing enemy, and to delay him as long as possible under fire.

Stockades.—Before proceeding to the investigation of the principles which should regulate the relief and thickness of ordinary parapets, viewed in reference to simple defensive lines and to direct fire, it is right to notice the " Stockade" as a substitute, and in some circumstances an advantageous substitute, for a parapet. The Stockade is formed of one or more rows of stout palisades, and in its simplest form is thus constructed. A row of very strong palisades, usually pointed at the top, from 9 to 12 inches in diameter, is fixed deeply in the ground, with intervals of about 3 inches between the palisades. These intervals are filled by smaller palisades cut square at the top—every alternate palisade being shortened 44 inches, so that the open space above it may be used as a loophole. A stout riband nailed hori- zontally to the upper ends of the palisades strengthens the construction materially.

_ Sucha Stockade is shown in plan, elevation, and section in fig. 10; it has a banquette of earth, which may be replaced when desirable by a wooden step. By cutting out the triangular portion shown in the section, and throwi the earth i : pergpsts UP against the front of the palisades, as indi-

are formed which keep an enemy constantly in view, A stockade of this description placed close to the edge of

SAS \ ¥ '_iyYy7 CNA Fra. 10.—Plan, elevation, and section of Stockade.

a steep bank, has this great advantage over a parapet, that the men behind it have a more effective command of the ground before them when firing through the loopholes than they could possibly have when firing over a parapet. It is here supposed that artillery fire cannot act directly against

the stockade, but artillery may possibly be placed to act ~

against it in a longitudinal direction, or, as it is termed, to enfilade it, and in this case the line of stockade should be interrupted by traverses, which are usually banks of earth placed transversely to the line they are intended to protect from such artillery fire. Fig. 11 shows a stockade of this description

applied to the defence of #f precipitous ground. , 2 When stockades are 7) __>y>---~. formed into inclosed "7 , works, they are called ""Tambours." Under some cir- cumstances it may be desirable to throw an ordinary parapet forward to the edge of a bank, the slope of which supplies the function of escarp, and hence to dig the ditch behind instead of before it, as in fig, 12, where it will be also observed that the slope of the banqnette

Fic. 11.—Stockade on steep ground.

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Fig. 12.

is broken into two steps, the tenacity of the earth when first excavated allowing it to stand firm ; the principle of this ex- cavated form of structure is adopted in sunken batteries. Sometimes the object of the parapet is merely cover and not active defence, in which case the banquette is omitted asin fig. 13, and the work is called an " Epaulement." In this profile it will be observed that a space is left between the face of the epaulement and the internal ditch. Such a space should always be left, whether the ditch is within or without, when the work to be formed is of any considerable elevation, as it affords a stage upon which the builders can stand, and lessens the height to which the diggers have to

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throw the earth from the ditch ; it is very important to | protected by the parapet at C. The line OF represents the supposed

; . normal height at which it is presumed the assailants ma fire, in keep this ss ane clear by throwing forward or backward this case 8 feet; BE will be the same 3; and AD cut ty tbe line drawn from F to E will be 8 feet.

In fig. 17, A, B are still considered to be in one horizontal plane,

H i ‘ 5 zy 721 but C is considerably elevated ; and hence, adopting the same data

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Fie. 138.—Epaulement.

the earth as quickly as it is raised. The distinguishing characteristic of an able engineer is the power of varying his appliances—thus in his hands the abattis may become the fraise, or may take the place of the palisade, as in fig. 14. If this be not borne in mind, evil rather than good

may result from adherence to systematic instruction; as the engineer who has acquired a knowledge of one con- trivance may be found crippled by his constant efforts to conform to it rather than to seek some other better fitted to the circumstances of the case. In this profile a berm is represented, as it would be difficult to arrange the abattis and to build the parapets without it,

The arrangement of the trous-de-loup, combined with stakes driven into the ground is shown in fig. 15, an ad-

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Fig, 15.—Trous-de-loup in front of triangular ditch.

vanced glacis having been formed of the earth thrown out of the excavations. The ditch is in this case triangular ; and it is scarcely necessary to add that the particular form of ditch must be determined by the nature of the ground, re- membering that the contents of the ditches must supply material for the parapets; and their depth, as it adds to the difficulty of assault, should not be diminished except from necessity, :

After these preliminary remarks, the student should be prepared to enter on the consideration of Field Fortification.

Rules for determining the Dimensions of Parapets.

Determination of the Relief of a Parapet.—First, where the ground is horizontal,—for the protection of troops in a normal position. The minimum for a simple parapet may be here stated at 6 feet 6 inches, as a musket ball would penetrate the parapet for a few inches below its crest, and | the maximum at 8 feet, a height which gives the defenders | perfect security under almost every circumstance of fire,

Fig. 19. Fras, 16- 19 illustrate rules for different heights of Parapets.

as to height, and drawing the line FE and the line C'B parallcl to it, AD, or the height of the parapet, is equal to Al+ID,—ID

being equal to BE, or OF, or N, the normal height. Calling also AB, or the distance to be covered, d; AH, or the distance from the commanding point, D; and HO, or the height of C above A and B, H,—we have AI: HC::AB: HB; or Al: H::d :@+D; and hence

d a Al=5—5) – H and AD N+op (1) ; so that the necessary height of the parapet increases as the height of the commanding point increases, or as the distance AB to be defiladed increases, and diminishes as the distance from the com- manding point increases. Taking D=600 ft., d=30 ft., H=60 fit…

then AI=S, or 2 ft. 10 in., and AD, the height of the crest of the

parapet =8 ft. + 2 ft. 10 in. =10ft. 10 in.; or taking D=1200 ft., or 400 yards, then AD=9 ft. 6 in.

Fig. 18 represents A lower than B by a quantity= AO=GH =A ; hence AD =AO + OL + ID, andor =OBCG_ 4 y_ yy

d = =——. = 2); AD saints 5 9 (H—-h) (2) ; which shows that the deeper A is sunk below B and C the more ele- vated must be the parapet, and hence that this is a very unfavourable condition of parapet. For example, let A be 2 ft. below B, and all other data the same as before, then — . (H-A) = 2 ft. 9 in., and AD=8 ft.+2 ft. 9 in. +2 ft.=12 ft. 9 in.; or when D=1200 ft., AD=11 ft. 4in.; and if it should be necessary to defilade a distance of 90 ft. instead of 30, the heights of the parapet would necessarily become 18 ft. 8 in., and 14 ft. 2 in. , Again, in figure 19, A is higher than B, and C is lowest of all; and if H still represents the difference of level of A and ©, and A the difference of level of A and B, then

AD aN – 4-32, GI-8)

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including that from mounted soldiers. and, of course, so far as concerns the ee alone of the parapet, ; Defilade.—Secondly, where the ground is uneven, and | this is bate mip apen eka oak aes

it is necessary + ; i Any other case is easily resolvable by one or other of the for- which orp ae efilade the work from a oe mule ;—thus, when A and C are on the same level, and B higher

than A, His 0, and equation (2) becomes AD=N+h-.2. , 5,

. And in equation (3), if B be higher than A, & becomes positive, and IX, —
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Fig. 16 explains the first case, in which the points A, B, ©, are on the same level, the distance AB being the space intended to be

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a eee. ee ee Ce AD=N+h ig ’ (4) ; or if % be 0, A and B being on the same level, AD=N)—— H.

In equation (4), if the station C, though below A and B, falls between the horizontal line drawn through A and the line BR, or BA be prolonged till it cuts the surface of the ground sloping from B towards D, then Daa (H h) is less than A, and AD is greater than N 5 but should C be below the line BR, then ~“— . (H) is greater than h, and AD is less than N ; or, in other words, should the line of defilade passing through BA meet the ground at R within the prescribed limits of defilade, or the effective ranges of musketry and artillery, which may be now assumed as 800 yards for the first and 3000 yards for the second, then if the point C be above that line the parapet at A must be made higher than the normal height, and if below it may be made lower. A comparison of the examples under equation (2) will exhibit the great dis- advantage to the defenders of simple lines of having any ground near to their own moderately elevated, and care should be there- fore taken either to occupy such ground or to throw back the lines opposite to it as far as possible, and, should it have the character of a ridge, to bring some portion of the fire of the lines to act in the direction of its length. The space AB to be defiladed must depend upon circumstances; the minimum, to allow safe communication for the troops behind and actually defending the parapet, ought not to be less than 30 feet, but when it is necessary to draw up troops behind the parapet it ought not to be less than 90 feet ; in cases of double lines or of inclosed works the distance must of course vary, as the object will be to protect, not only the troops near to the enemy from a direct fire, but the troops arming the more distant parapet from a reverse fire. In assuming the normal height as 8 feet, on the supposition that protection is required from the fire of mounted soldiers, a condition is assumed which is

not generally likely to occur in the attack of intrenchments. Never- theless, the command of a work should be sufficient to cover the defenders standing on the ground inside. Infantry are assumed to be 6 feet high, and to protect them, within a reasonable distance of the parapet, from projectiles clearing the crest and tending down- wards in the latter part of their trajectory, the command of a para- pet on level ground should be at least 8 feet. Shrapnel fire being effective at 3000 yards, and the elevation of the heaviest gun of position for a range of 3000 yards being 7°, the balls clearing an 8-feet parapet will strike the ground 18 yards in rear of the crest of the parapet. In equation (3), and in one case of (4), as explained, the height of the parapet becomes less than N, but should the diminution extend so far as to reduce the height of the parapet below 7 feet, the relief should be restored to its proper amount by excavating the ground behind the parapet, or, in other words, forining a terrepleine below the level of the plane of site. In a similar manner, in equation (2), and in one case of (4), where the parapet becomes greater than N, it would be very inconvenient to augment the height above 12 feet, and it is preferable therefore to excavate behind the parapet, whenever the defilade requires so great an increase of height.

In the preceding observations the parapet has been con- sidered as a simple straight line, deriving its defence solely from its own direct fire ; but such a condition would most frequently be found inapplicable, in respect of form, in consequence of the natural inequalities of the ground, and unsatisfactory, in respect of defence, in consequence of the imperfect operation of direct fire from the top of a parapet, which can strike the ground in front only in the pro- longation of its superior slope, leaving everything within this defenceless ; the line in which the superior slope meets the ground is called the "Limiting Line of Defence."

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Referring back to tbe subject of defilade, it is evident that a bent line of this kind affords more facility for de- filade than a straight line, as it is often possible so to arrange the position of the angles that the salients shall oceupy higher ground, while the re-entering angles, though placed lower, shall be compensated for this disadvantage by being further removed from the commanding ground of the enenly.

Though a simple straight line has the disadvantage of depending for its defence solely on direct fire, it is not exposed to be swept along its whole length by an enemy's fire. Fire of this kind is called " enfilade" fire, and is very destructive; it produces the same effect upon the defence as flanking fire upon the attack, viz., it takes the defenders of the line in flank. To guard against this evil, should it be necessary to take up a position in front of ground of a superior command, the long lines AB, AC (fig. 20) should be so directed that thei prolongations

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Fig, 20.—MHlustrating defence against Enfilade Fire.

may fall on low ground at E, F, and not as they would do in the case of AB', AC', on the high ground at E', F'; and, if possible, as where the high ground is not continuous the prolongations of both short and long lines should fall on low ground between the commanding eminences, an arrangement which will be especially advantageous should the low ground

be marshy or otherwise difficult of oceupa- tion by an enemy. Such observations as these are only

suggestive, since no fixed rules can be laid down to meet

all cases. The engineer should examine the ground and adjust his works so as to make the most of its advan- tages, and to neutralize, as far as possible, its disadvan- tages. To determine the height of the parapet by the rules for defilade formulated above, it is necessary to have 3 correct plan of the ground, and to know the exact levels of the points A, B, C, in every case; but where there is no such plan, the defilading may be effected in practice by levelling poles or boning rods. In this case, the inner boundary of the ground within the parapet to be defiladed being staked out, a boning rod of 7 or 8 feet high, according to the intended normal height of the parapet, should be placed at Bon the staked-out line, and another of equal height

on the commanding point or ground C (fig. 21), supposed to'

be at a distance equal to the range of the projectiles from the fire of which the work is to be defiladed. A rod about 12 feet high is then fixed at A, and a cross piece or marker 1s raised up or down it until it meets the point where the visual line from the top of B to the top of C intersects the pole at A; this operation is simply the mechanical determination of the height obtained in the other method by calculation. If it be required to defilade the whole space between two parallel lines, or that included between the two lines forming the salient angle in fig. 20, it is evident that the

work must be defiladed from both sides, and further, that

the soldiers standing on the banquette of one line should be secured from the fire of the ground in front of the other, which fire is called reverse fire, because it strikes them in rear. This is effected by placing a mound of earth or traverse between them, and determining its height as well as the height of the parapets in the following manner :— On the commanding point C (fig. 21) is placed a boning rod CD of the normal height, and another BE of

the same height at B, or at the position of the traverse; then the height of the crest of the

parapet of A is determined by the intersection of the visual line from D to Ewith the pole fixed at A, at the point a, which is here high,

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as Cisso much higher than A. See preceding rules and equations, In like manner a pole of the proper height being fixed at the extent of range on the opposite side at C', the visual line from D' to E determines the height, a', of the parapet of A', which is much lower than the parapet of A, as A' and c' are nearly on the same level. Now, to defilade the banquettes, and to determine the height of the traverse necessary for that purpose, set up on the banquette of A a pole bb of the same height as CD, C'D', BE, and the visual line from D' to b determines the height of the traverse at J, which is necessary to secure the banquctte of A from the reverse fire of C', whilst the visual line drawn from D to 0' determines the

height of the traverse sufficient to protect the banquette of A' from the reverse fire of C.

Fie. 21.—Practical Measurements in Defilading.

The application of these principles to a work formed of two lines (or "faces" as they are called), terminating in a salient angle is shown by fig. 22, but the application is

the same whether the work is connected with a line of

intrenchment as a "redan," is detached as in a 'ravelin" and other outworks, or forms part of a peculiar system or arrangement of works, as in the tenaille system of Monta- lembert, called by its author the angular system,—terms and works which will be hereafter more fully explained. Here the commanding point is supposed to be at M, and to

oor" err"

Fig. 22.

secure the defenders of the face AB from a reverse fire it 1s necessary to interpose the traverse cd, called from its object a "parados." The length of the traverse cd is deter- mined by the line MB, beyond which it should project sufficiently to give ample security to a space about 50 feet wide behind the parapet. At the other end, the traverse 18 not carried up to the salient angle, as it would interfere with the communication, but is completed by ba, perpendi- cular to the other face, by which arrangement the space within the salient and the banquette are left free. The two lines MdB and Mcf, passing through points at the

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Fig. 23, showing Bonnette DAD', and Traverses T, 'T' T?.

normal height above the banquette, determine the height of the traverse, It may, however, happen that the commands

are so situated as to give an enfilade fire along both the faces AB, AB’ (fig. 23). In this case a small work DAD’ is formed in connexion with the parapet, by drawing lines parallel to the crests CB and C’B’ at a distance from them equal to the breadth of the banquette, and then determin- ing, in the manner explained, the heights at A necessary to defilade a certain length of the banquettes of CB and O’R’ from the fire sweeping them, and assuming the greater of the two as the height of the parapet at A. This work is called a bonnette; and when the height necessary to defilade the whole of one or both faces is found to exceed 12 feet, the height of A should be restricted to that limit, and traverses T’, I’, T? should be placed at such distances as shall defilade the remainder of the work.

The internal space may frequently be sufficiently defil- aded by raising the salient portion of the parapet without disturbing the line of direction of the crest; but in that case

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the banquettes of the two faces would not be covered from enfilade fire, and hence the necessity of a bonnette. The increased height of the parapet of the bonnette renders it necessary to adopt two banquettes 8, b', one below the other, and each provided with steps to facilitate ascent (figs. 23, 24). The operation of defilading may be also effected by planes of defilade ; as, for example, if the line which marks out or limits the space to be defiladed be first drawn, and a plane be supposed to pass through a line either 6 ft. 6 in. or 8 ft, (or whatever height between these may be assumed as the normal height N) above the limiting line, and through a point the same height above the commanding point, this

Fig. 24.

plane will determine the height of the parapet, the crest of which will necessarily be in it.

Where the parapet is continued not only on the flanks but also in rear, so as to form an inclosed work, it may often be necessary to defilade it in various directions as in fig. 25, Where two traverses or parados cross each other, they must, of course, be so placed that they shall not only completely defilade the whole interior space of the work, but shall secure from reverse fire the banquette on each side, the normal N being therefore at least 6 ft. 6 in. above the banquette. Where traverses of this kind become necessary, the engineer must ; take in to account the space Fig. 25. they will occupy, and plan his work accordingly ; and should he be able to render the difficulty of attacking one side of his works very great, he may construct the traverses so that they may be used as retrenchments, and thus increase the means of defence; for example, S being the salient of greatest strength, bcb might be defended, and then bed.

This subject has been enlarged upon because it is of much importance in military engineering, as the safety of a long line of works may be endangered by defective defilade. Though considered here in a practical form, it depends entirely upon geometrical principles, and instruction in descriptive geometry is therefore essential in all schools of military engineering.

Having determined the relief of the crest of the para- pet in reference to the plane of site, all the other vertical dimensions follow from it, as shown in several of the preceding figures; whilst the horizontal dimensions are determined by the thickness necessary to resist the enemy's missiles and by the slopes required to ensure stability. The Penetration at a mean range into common earth after it has been dug up and well-rammed and into other materials is as stated below, aud to these dimensions one half should be added for the thickness for security.

English Field Artillery.

Fic Guan, Min. euthanased

a8 Brick Remarks.

Nature. Wood.

in Mortar.

16 Prs. . in.| ft. in.| These shells break

ft: int Shell. 0 ae) up on hard ma- sonry. The pene- tration into con- crete is about two-thirds that into brick-work.

9 Prs.

7 Prs.

English Rijled Small Arm.

Penetration at 300 yards.—Inches. Weapon. Projectile. j ; Brick. | Iron.

Martini- Henry.

480 grs. ; 0°25

_ The penetration into sand is about two-thirds the penetration into earth, and about one-half that into clay.

The penetration into oak is about half that into fir.

With light, sandy, or gravelly soil, or, when ramming can only be imperfectly performed, greater thickness should be allowed; and as a wide and deep ditch must always materially strengthen the work before which it is placed, there can be no reason other than want of time, want of

- works, of sand bags.

FORTIFICATION

men, or difficulty of ground, for reducing the thickness of the parapet below 14, or at the utmost 12 feet. For form- ing the parapet under peculiar circumstances of difficulty the engineer will avail himself of every fitting substance which may be at hand, such as bags of wool, mattresses, fire-wood, inanure heaps, and fascines, either by themselves or packed in gabions. The resistance of fascines is not great, their strength being rapidly diminished by the speedy fracture of their branches when exposed to sharp fire. :

With these data it will be easy to regulate all the dimensions of the parapet, —the height of its crest, or the relief of the work, having been first established. Thus the banquette or step on which the men stand, when firing over the parapet, should for convenience be 4 ft. 3 in. below the crest. The breadth or tread should for a single rank be 3 ft., for a double rank 5 ft.; the surface should slope backwards 2 inches in the 3 ft., 3 inches in the 9 ft., so as to discharge water freely and keep the banquette dry ; the base of the interior slope of the banquette up which the men mount should be twice its height; if the height of the parapet exceed the normal height, the banquette should have two treads or steps, the lower about seven feet below the crest, so that one rank of men may stand thereon whilst reloading the muskets of the rank on the step above them; or it should have three steps, each witha rise of 1 ft., and a tread of 1 ft. or 1 ft. 3 in., sloping slightly to the rear, by which arrangement the necessary excavation of the ditch will be diminished, and lessof the interior space occupied. The interior slope of the parapet should be made very steep, so that a man firing over the parapet should be as close to it as possible; the base should not exceed one half tle height; the superior slope, or " plongée," of the parapet, by which the fire is directed towards the point on which it is to act, should not be less than one-ninth, nor more than' one-fourth of its thickness, and in service is generally made one-sixth; but as the in- crease of the slope facilitates the destruction of the crest, it should be kept as slight as possible. It is usual on the Continent to retain the angle of the crest, as a constant quantity, at 100°, and to increase the base of the interior slope as the plunge increases, and vice versa; but this is not satisfactory, since, the height of the soldier's shoulder remaining constant whilst the line of plunge varies, the fire will not be always in the true direction; and it is preferable to keep the base of the interior slope as small as possible, and to make the top of the parapet at

the crest horizontal for one or two feet, commencing the plunge therefrom, but reducing the top as the plunge increases, This flat top will facilitate the use of sand bags (bags filled with earth), which are sometimes so arranged on the crest of the parapet as to form loopholes for the musketry, there- by adding to the cover of the men. The base of the exterior slope of the parapet should at least equal its height, though possibly in some soils—eg., chalk—the exterior slope may stand at a steeper angle than 45°. The slopes of the escarp and counterscarp should be as steep as prac ticable, but generally they will be the same as the exterior slope. Between the exterior slope and the escarp a " berm" is left. This berm is a space at least 1 ft. 6 in. wide and slightly inclined downwards and outwards for drainage ; it gives greater stability to the exterior slope and to the escarp, prevents the earth from the exterior slope from falling into the ditch, and is a standing ground for the repair of the parapet. Where steeper slopes are indispensable, the earth must be retained in place by a wall called a " revetment, which may be formed of fascines (long cylindrical faggots), hurdles, sods, planks, clay puddling, and, in the interior of The base of the interior slope of the glacis should be equal to its height, and the exterior slope

should have aslope of 1 in 12. The command of the crest | parapet should pass at no greater distance than 2 feet above of the parapet over that of the glacis should be such that | its surface ; and inno case should the plunge or slope of the an assailant, standing on the crest of the latter, should not | glacis be greater than that of the parapet. An advanced be able to fire into the interior of the work,—a condition glacis is sometimes adopted either to render the cover which requires a command over the glacis of 54 feet, so that | more effectual, or to occupy a favourable line for first with a parapet 7 feet high the maximum height of glacis opposing the progress of the enemy. Fig. 26 shows this would be 15 feet. The minimum height of the glacis is | arrangement, gg', being the first or ordinary glacis, and determined by another condition, viz., that the fire from the 9° the second or advanced glacis, The slope of these

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glacis should not be such as to withdraw the assailants from the grazing fire of the parapet, and if it be not possible to extend the slope of g'g? so far as to keep it in the prolongation of the line cg', it should be so arranged that no point of the slope should be more than 2 feet below that line or the plane corresponding to it, namely, the plane passing through the crest of the parapet and the crest of the advanced glacis. To form the advanced glacis, the slope at g is prolonged below the surface of the ground to }, the earth excavated in doing this supplying the material for the glacis. When it is intended that the defence of this advanced glacis shall be derived solely from the parapet, either an abattis or rows of stakes may be placed im- mediately behind it, soas to stop the advance of the enemy when at the point of maximum exposure, but advanced glacis may often assume the character of successive in- trenchments, and be defended with vigour and success. This figure will be again referred to when treating on defence by mines. The height of the parapet being deter- mined by the amount of cover required, and the thickness by the nature of projectile to which it is exposed, the whole profile or section is necessarily completed on the principles pointed out, and the bulk therefore of earth contained in any portion of the parapet will be equal to the area of the mean or average profile multiplied by the length of that portion. N ow, as this earth must be obtained from the ditch, the dimensions of the latter depend on those of the former ; and the volume of any portion of the excavated ditch will also be equal to the mean section of that portion multiplied by its length. If, therefore, P represent the area of the mean section of this portion

of the parapet, D the area of the mean section of the corresponding portion of the ditch, and L the length of this portion, then LP =LD,

provided the earth be of the same bulk after as before ex- cavation ; but this is not the case, for after having been broken mp from its previously closely packed condition, it is found that the

remblai" or earth built up exceeds the "deblai" or earth exca-

vated by a coefficient varying with the nature of the soil, being in

Bie Fe: sandy soil nearly 0. Thus if ™m Tepresent the coefficient, in sand

it is 0, in earth of medium tenacity yy, and in very strong and ied compressed earth 4; so that to render the earth of the ltch just equal to that of the parapet, the above equation should

*be LP = i 1 *.*

P=L (p +7D) and P= Dis D, or Se tr | however, the earth resulting from this excess, even allowing for the el length of the ditch in polygonal works, will be required for 4 ne ite glacis, or for making up the banks, called ‘ barbettes,” ~ – lents constructed for raising guns sufficiently high to fire

- © parapet, the dimensions of the ditch may be safely esti-

*without reference to the excess, as follows :— * * x be the breadth of the bottom of the ditch, and y its depth ; et the sum-of the bases of the slopes of the escarp and counter.*

scarp be represented as a function of the depth by the fraction oy; then #+ ny will be equal to the breadth of the ditch at top,

and D=4(ata+ ry) wheuce an? ty and y =

=(-2+ a/ 2+). Now, as the defensive object of the ditch requires that it should be both deep and wide enough to form a decided obstacle to an enemy, the width ought not to be less than 18 feet, whilst the depth should have no other limit than that arising from the difficulty of raising the earth, which

fixes 12 feet as about the maximum. Taking y =12 feet, <= 3,

and D=108 square feet, then x=9-9=0, and the width of the

ditch therefore = $ of 1218 feet,—the ditch being triangular. Assuming a profile area of 70, corresponding to a parapet 7 feet

high and only 6 feet thick, and making #=0 fora triangular ditch,

ho J "8 D=$9ft. 7in., and the width of the ditch =144 feet; with

a profile area'of 116 feet corresponding toa parapet 74 feet high and 12 feet thick, the depth of the ditch, if triangular, is 124 fect, and the width 18} feet ; so that this profile appears about the maximum for a triangular ditch with a profile area of 168 feet, corresponding to a parapet 8 feet high and 18 feet thick. Witha banquette 44 feet wide a triangular diteh would give y=143 feet, so that such a form would be inconvenient ; but taking z=4 feet as the width of the bottom of the ditch, y or the depth becomes 12 ft. 4in., and the width of the top of the ditch 224 feet—a very well-proportioned ditch.

In the preceding cases the base of the slope of the escarp has been assumed as equal to its height, and that of the slope of the counterscarp as equal to half its height. Should the nature of the soil be such as to require the base to be equal

to the height in both escarp and counterscarp, # y= 2y; and should the soil be sufficiently firm to admit of a base of one-half in both, s y=y. In the first of these cases, even

with the large profile area last named, the ditch may be made triangular with a depth of 124 feet, and a breadth of 25 feet; and in the second a triangular ditch is inadmis- sible with a profile area of 116 feet, as the depth would be more than 15 feet; indeed it would be inadmissible with pro- file areas beyond 85 square feet, for which a depth of 13 feet would be required. Before leaving this subject, a few words may be said respecting the "' berm." The most effec- tual escarp for defence is that which forms one continuous plane with the exterior slope, or at least which commences immediately where the other ends, as the absolute relief of the parapet is then a maximum, and there is no berm; bat in many cases it would be imprudent to carry the parapet to the edge of the escarp, as injury to the latter would occa- sion the fall of part of the parapet, while the difficulty of

construction would be greatly increased by having no inter- mediate stage between the bottom of the ditch and the top of the parapet. The " berm," or step between the top of the escarp and the bottom of the parapet, is made from 1 foot 6 inches to 4 feet wide, according to the nature of the soil, and it then becomes possible in some cases to increase the slope of the escarp to a base of one-half or two-thirds, or at least to such a slope as shall place the foot of the escarp in the prolongation of the exterior slope of the parapet. The berm is encumbered with obstacles to prevent an enemy from making use of it as a halting place (see fig. 14). The slope of the counterscarp is usually one-third, one-half, or two-thirds, when that of the escarp is one-half, two- thirds, or 1; the bottom of the ditch should slope from the sides to the centre, to carry off the water, and obstacles should be provided there to prevent the enemy from col- lecting and reforming his men in the ditch, which, in all cases of simple lines, without flanking defences, he would do were it left free from obstructions,

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The parapet has been hitherto considered principally in its character as the simplest element of defence, affording at once protection to the soldiers behind it and obstruct- ing the advance of their enemies; but it is now time to consider the manner in which this parapet may be so arranged as to constitute a series of defensive and mutually defending works. If the antiquity of an invention be estimated by its position in the social history of the races of mankind, there can be no doubt that earthworks claim the priority over other forms of defence. In North America vestiges of circular earthen intrenchments, as well as of works of other forms, have been discovered, the antiquity of which is unknown; and in more recent times small parties of the aboriginal inhabitants encountering greater numbers of a hostile tribe have been known to exca- vate hollow spaces in the ground, and, throwing out the earth, to form around them circular intrenchments in which they have defended themselves to the last. In Ireland the ancient inhabitants have left similar relics of their earthen defences ; in Great Britain there are numerous similar remains, the works of the Romans and of people long antecedent to the Romans; but the consideration of earthen works for the defence of extensive positions will be resumed further on, and such works will be considered here only in connexion with the

arrangements adopted by an army in the field for its own immediate security.

The art of constructing temporary works in the field for this purpose is called Field Fortification. This art is of very high antiquity ; the Roman soldiers relied much upon such works, and executed them with wonderful rapidity, even in the presence of an enemy.

Shelter Trenches.—Of this art the simplest form is that in which troops are preserved intact until the moment of attack arrives. At first sight it would seem that this can best be effected by keeping them out of fire. The increase in the range of arms of all kinds has, however, become so great that it is no longer possible to keep troops out of fire and yet in a sufficiently advanced position from which they shall be able to attack promptly ; hence it has become an absolute necessity to provide shelter for them.

A very shallow trench with the earth thrown to the front will afford, to men lying in it, cover against artillery fire, and a good rest for their arms when they have occasion to deliver their own fire. Moreover, it presents no obstacle to the advance of supporting troops, and offers os ney mark to the enemy. Such trenches (figs. 27, 28,

2, 30) are called shelter trenches, and may be made of any depth or form according to the time and means avail-

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able. They are very difficult of capture by the front attack, when defended by trained troops with breech-loading rifled

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Fic. 27.—Shelter Trench,—constructed in 25 min. to 4-hour,

arms, and can be quickly developed into regular intrench- ments. The ordinary forms of shelter trench in use in the British army are shown in figs.

28, 29, and 30,

The Russians made use of shelter trenches with great

Fic, 28,—Shelter Trench,—1 hour.

effect in the defence of Sebastopol, and since that siege their employment has steadily developed.

In more recent times the greatest use of hasty intrench- ments, though perhaps in the form rather of a line of

Fie, 29,.—Shelter Trench,—1 hour.

intrenchments than of shelter trenches, was made by

the Americans in the war of secession. Wherever they halted, no matter how short the time at their disposal, they threw up shelter. Each man worked for himself, and as if

mS 3

Fie. 30.—Shelter Trench,—34 hours.

by instinct, and before fires were lit or provisions cooked, an intrenchment of some kind was formed. Probably the Americans had acquired this habit in their campaigns against the neighbouring Indians; and no doubt the superiority of rifled small arms, then for the first time freely used, thoroughly imbued them with a sense of the value of the slightest protection. General Sherman's campaign in Atalanta, and the actions in the neighbourhood of Rich- mond and Petersburg, furnish numerous instances. With reference to them General Barnard reports that a simple trench defended by two ranks of foot soldiers is an obstacle unassailable by direct attack. General Wright relates that, attacking a handful of infantry, in single rank, behind a parapet and trench, with two divisions in line, the num- ber of his casualties exceeded the number of the enemy, and that if the intrenchment had been defended by two ranks of good troops, a whole army corps would not have taken it; and in summing up his relation, he says that

a simple trench, defended by two ranks of foot soldiers, covered by abattis and other obstacles, placed so that the new rifled arms have full scope, is absolutely impregnable except by surprise. ; After the fall of Nicopolis in August 1877, 28 battalions

of Turks, numbering about 10,000 men, collected at Plevna, and at once commenced to form shelter trenches ; they were very deficient in artillery. Krudener attacked them four daysafter with 7000 Russians and 30 guns, and was defeated witha lossof 2800 men, Ten days later he again attacked with 30,000 men and 170 guns, but in the meantime the Turks had thrown up several redoubts, and had so extended their shelter trenches that their position was beginning to assume the condition of an intrenched camp; moreover, their strength had been swelled by reinforcements to 45,000 men. The Russians were again defeated with a loss of 8000 men. Six weeks later, upon the 30th September, Krudener, who had received 30 siege guns, having shelled the Turkish position for four days previously, attacked a third time with 50,000 Russians and Roumanians; but the Turks had in the interval received reinforcements of 10,000 men, aud he was a third time repulsed with a loss of 15,000 men, though the Roumanians obtained possession of and held a large redoubt called Gravitza. It then be- came evident to the Russians that Plevna could not be taken by assault, and they commenced to besiege by rule. By the 24th of October they had completed the investment by the occupation of the Loftcha and Rahova roads, all of which were previously open to the Turks, and had brought into battery against it 300 guns, 40 of which were siege guns. By the 10th of December they had collected 110,000 men and 500 guns around Plevna 3 and shortly after, Osman Pacha, having been repulsed with a loss of 6300 men in an attempt to cut his way out, surrendered, and his whole force, amounting to 43,000 men and 70 guns, became prisoners of war.

An army intrenched or fortified in the field is in many respects of the same effect as a fortress; the intrenchments supply the lack of numbers, and enable it to cover a country, to stop the advance of a superior enemy, or, if he chooses to risk a battle, oblige him to engage at a dis- advantage. Charles V. furnishes a notable instance of the first. Opposed to a combined

force of twice his strength, he at once commenced to intrench his army. Ina few hours he was in a position to resist attack ; in ten days he was so secure that, upon receiving reinforcements a few days later, he was enabled to assume an offensive which led in four months to the termination of the campaign in his favour. "In a war of march and manoeuvre," says Napoleon, "if you would avoid a battle with a superior army, it is necessary to intrench every night, and to occupy a good defensive position, The natural positions which are ordinarily met with are not sufficient to protect an army against superior numbers without recourse to art. Those who proscribe lines of circumvallation, and the assist- ance which the science of the engineer can afford, deprive themselves gratuitously of an auxiliary which is never in- Jurious, always useful, and often indispensable."!

Whenever Napoleon had time and occasion for strength- ening his position by field-works, he acted upon the prin- ciples recommended in the above extract, as almost all his predecessors had done. In the wars which followed the Revolution of 1688, in those of Queen Anne's reign, and during the Seven Years' War, we find the commanders of each period, William III., the duke of Marlborough, Marshal Villars, Marshal Saxe, Frederick II., and Marshal Daun, practically exemplifying their conviction of the great utility of field-works. Seven redoubts thrown up over- night saved Peter the Great at Pultowa, and enabled him to gain a decisive victory over his formidable antagonist; aud at Borodino, three redoubts and eight fléches thrown up hastily by the Russians, caused the French great loss, and rendered the victory, which they gained by incredible

1 Military Maxims of Napoleon.

efforts of gallantry, fatally costly ; and it is not improbable that if the main redoubt had been closed at its gorge the French would have failed to take it. In 176] Frederick the Great, having only 55,000 men to oppose to the united Austrian and Russian forces of 130,000 men, intrenched himself in the strong position of Bunzelwitz, in Upper Silesia, not far from Schweidnitz, which he held until the united armies were forced to retire for want of supplies. It has been argued by some that intrenchments and field-works have oftener been carried than successfully defended, and that hence incommensurate importance has been attached to them. But it should be

remembered that victory in such circumstances has been purchased at an expense which has often rendered it in effect equivalent to defeat, and that a practice which the greatest commanders of ancient and modern times have approved and followed cannot be of doubtful utility. At Austerlitz, where the contending armies were nearly equal, Napoleon was preparing to superintend the construction of intrenchments when he found himself called upon to receive battle; and in Portugal, the duke of Wellington showed to what account the art of the engineer might be turned for influencing, not merely the fortune of a campaign, but the fate of a cause. The lines of Torres Vedras, which the powerful French army under Masséna was unable to pass, and from which the wave of war was rolled back broken into Spain, were perhaps the most remarkable works of the kind ever constructed,

" Lisbon," says Sir John Jones, "being situated at the extremity of a peninsula formed by the sea and the Tagus, it is plain that if an army be posted across the peninsula, no enemy can penetrate into the city without a direct attack on the army so posted. It was on this principle that the lines covering Lisbon were planned by Lord Wellington. Nature drew the rude outline of a strong defensive position, and art rendered it perfect. A tract of country thirty miles in extent from the mouth of the Zizandra on the ocean to Alhandra on the Tagus, was modelled into a field of battle; mountains were scarped perpendicularly, rivers dammed, and inundations formed ; all roads favourable to the enemy were destroyed, and others made to facilitate the communications of the defenders ; formidable works were erected to strengthen and support the weak parts, whilst numerous cannon, placed on inacces- sible points, commanded the approaches and gave an equality of defence to the whole position."2 These lines were not continuous and connected works ; they consisted of independent forts, redoubts, fléches, redans, batteries, So placed as to command and enfilade every approach, and to support each other by a cross and flanking fire. The first line occupied a front of twenty-nine miles between the sea and the Tagus, and by means of telegraphs in- telligence could be conveyed from one extremity to the other in a few minutes; whilst the troops, disposed in masses in the rear of the works, were ready to move upon any point of attack by interior communications shorter than any by which the enemy could advance. "The aim and scope of these works," says Colonel N apier, 'was to bar the passes, and to strengthen the fighting positions

2 War in Spain, p. 124. The French army which invaded Portugal under Masséna consisted of three corps, under Marshals Ney and Junot and General Regnier, amounting in all to 66,000 infantry and 6000 cavalry, besides a strong body of the imperial guard, which crossed the Pyrenees after the invading force had commenced its march from the neighbourhood of Salamanca. The force collected to oppose this threatened invasion did not exceed 48,000 infantry and 3000 cavalry, of which about half were Portuguese levies, yet untried in any general action, and of which a very unfavourable opinion still continued to be entertained. In point of numbers, and still more in the composition of their army, therefore, the French had a decided superiority; but all their advantages were neutralized by the defensive position of Torres Vedras.

between them, without impeding the movements of the army. 'These objects were attained; and the loss of the first line would not have been injurious, save in reputation, because the retreat was secure upon the second and stronger line, and the guns of the first were all of inferior calibre mounted on common truck carriages, and consequently, im- movable and useless to the enemy."! The two lines covered an extent of fifty miles, on which were erected one hundred and fifty forts, mounting in all about six hun- dred pieces of artillery.

Before this formidable position, defended by a double line of works, and by an army massed and ready to move upon any point by interior communications, the French remained five months, wasting their numbers and resources ; until at length, finding it utterly impracticable to force any part of even the first line, they were obliged to retire from Portugal, closely followed and harassed by the army which they had previously driven out of Spain. Yet perfect as were the lines of Torres Vedras, and though one of the ablest of the French generals and a veteran French army were foiled before them, it is not meant to infer that the system of separate field-works is a model to be followed on all occasions ; for, though the old method of covering a con- siderable front by a continued line of regular bastions and curtains has been generally condemned bymodern engineers, there may be situations where the application of continued lines may be judiciously

made, There is no fixed rule ; the nature of the ground and of the position to be defended must determine the proper description of works.

But as in defence artillery should be combined with mus- ketry, it is necessary that in the arrangement of lines provi- sion should be made for the use of cannon; and as they should be preserved for action at the right moment, they should, when practicable, be mounted on carriages of such a height as will enable them to give their fire over a full parapet, the gun and carriage disappearing below the parapet after the fire is given, so that the loading may be effected in security. In particular cases, such as in flanks where the lateral range of the guns is restricted, and where the guns are not exposed, or are exposed to indirect fire only, openings in the parapet called " Embra- sures" may be made use of, but they have many serious disadvantages :—they weaken the parapets ; they offer dis- tinct marks to the enemy; they are easily blown down by shells ; they are destroyed by the fire of their own guns ; they are difficult to construct, and still more difficult to maintain. The interior opening, called the "Throat" of _ the embrasure is made wide enough to admit the muzzle of the gun, about 20 inches; the width of the outer opening called the " Mouth " is determined by the lateral range of the gun, which should not exceed 20°. The slope of the bottom of the embrasure, called the " Sole," is determined by the object upon which the fire of the gunis to be directed. When required for indirect fire only, the sole is made countersloping ; by this arrangement the exposure of the gun detachment is considerably lessened, and, in order to dimin- ish still farther this exposure, the sides of the embrasures are made with a winding slope,— steep at the throat, from 6 tol or less, and flattening out at the mouth to 1 to 1. Asa rule, embrasures should not be made till they are re- quired, so that the parapet may be made solid in the first instance (see fig. 31).

The portion of parapet below the embrasure is called Genouillére (from genou, the knee), and should be 2 feet 5 Inches high ; the portion between two embrasures is called a Merlon, from the Italian merlone, a battlement ; the bottom of si embrasure is called its Sole; and, as has been suggested in

'spect to the superior slope of the parapet, it may be hori-

Pe : History of the War in the Peninsula, vol. iii.

zontal for the first two feet from the neck, and then slope downwards as much as may be necessary for the depression

SECTION THROUGH A.B. Fia. 31.—Embrasures.

required in firing. The direction of the embrasure depends on the direction of the line of fire: it may be either per- pendicular to the crest or oblique. should the obliquity be very great, or exceeding 70°, the crest of the parapet must be made re-entering, so as to strengthen it near the neck, and to enable the gun-carriage to be brought up square to the parapet. The sides of the embrasure are called Cheeks, and should be revetted with sods, fascines, gabions (cylindrical baskets made of wicker, and filled with earth after they are in position), sand- bags, planks, or hurdles.: In fig. 32, on the left, at B, a

Fic. 32.—Embrasures and Barbettes.

direct embrasure is seen cut straight through the parapet ; and on the right at A, an oblique one, both being intended to enfilade the ditches opposite them; and it will be ob- served that, from the obliquity of the right-hand embrasure, the interior of the work becomes so much exposed, that a traverse, T, behind the embrasure, becomes necessary. Barbettes are also shown in this figure—one at the salient at D for four guns, and another at C, perpendicular to the face, for two. The terrepleine of the Barbette should be 34 feet below the crest of the parapet; its length from front to rear from 18 feet to 20 feet; and its breadth, for a single gun, from 15 feet to 18 feet, according as it may be necessary to fire more or less obliquely ; a breadth of 15 feet should be added for each additional gun. To add to the lateral sweep or range of the gun, without diminishing the banquette, or, in other words, the musketry fire, the

barbette may be made wider in the rear than in front. In.

proportion to its magnitude should be the number of " Ramps," or slopes of approach ; as, for example, at C only one, at D three. wide, and their slopes should have bases equal to 4 times

In the latter case,

The ramps. should be from 8 to 9 feet

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the height of the barbette. The lateral slopes of the bar- | conversion of stores of information to the best practical uses, bette and of its ramps should be revetted whenever it is | In passing through a country, it requires an experienced possible to obtain sods, fascines, hurdles, or other materials . suited for the purpose, in order to economize space in the work, as the base of the slope may be then reduced to one-fourth or one-sixth the height; when unrevetted they have slopes of one-sixth. The terrepleine of the barbette may require, as at C, to be covered in flank by a traverse. The mode of con- structing a barbette in a salient is ex- hibited in fig. 33. At any point g of the face AB raise a perpen- dicular gh, either 18 or 20 feet in length, to in- clude the amount of re- coil; at the point % thus determined raise a per- pendicular to gh, and prolong it to its inter- section with the other face AC at E, then set- ting off AF on the other face equal to AE. On the capital AD set off a double perpendicular at any point 7, prolonging it both ways, and mak-

Fig. 35.

eye to seize quickly on whatever it presents calculated to prove advantageous or disadvantageous for attack or defence ; to appreciate the value of villages, inclosures, and broken ground ; to know where to dam up rivers, to scarp heights, to form abattis, trous-de-loup, and other obstacles ; to select the best situations for field-forts and redoubts, and the best

ing t& and 7/ each at least equal to 44 feet to represent the half breadth ae py pateoenas 3 he pols ar the pas Gee of the platform on which the gun-carriage is intended to stand and | “12 relerence to the number of troops disposable, so that

move ; through the points & and 7 draw parallels to the capital, | the movements of the defenders may not be obstructed or ping oa se = a fe — : j ae bv steve a to | retarded, and their communications may be short and

easy. mnPO forms the platform. Join FO and EP, and AEPOF will | 22° V@tiety of ground upon which military operations must represent the contour or trace of the barbette. The manner in be carried on precludes the possibility of laying down fixed which the crest of the parapet is formed above the salient A, and | rules in regard to this subject ; the accidents of the ground, the mode in which the firing may be effected in directions perpen- | and the peculiar circumstances of each individual case, must dicular to the faces, as well as in the direction of the capital, are determine the extent and description of the works to be shown in fig. 84.

constructed, as well as the obstacles most proper to be

formed for retarding the advance of an enemy.!

But though the observance of fixed rules be imprac- ticable, general principles are of universal application ; and certain maxims founded upon them hold good in the con- struction of field-works as much as in the erection of the complicated works of a fortress. These maxims, which are of invariable application, are—(1) that the works to be flanked must never be beyond the range of the projectiles used in the works flanking them, or, in other words, that the length of the lines of defence must never exceed the effective range of the weapons in use; (2) that the angles of defence

Fia. 33.—Construction of a Barbette in a Salient.

ey) must be about right angles; (3) that the salient angles of all works must be as obtuse as possible; (4) that the | ditches must be efficiently flanked; (5) that the relief of

the flanking works must be determined by the length of the lines of defence ; and (6) that the works must be con- Fig. 34 structed with reference not only to the direct and immediate Fb obstacles which they present to the enemy and to the In the case of a partly sunken parapet, in which the por- | positive effect of their fire on the approaches to them, but tion above the banquette is raised above and the portion | also to the support they derive from or afford to other below the banquette excavated below the plane of site,— | works. as in fig. 35, the barbette constructed in the hollow portion Field-works are either open at the gorge as in figs. 36, will enable the gun

to fire over the parapet ; and it should | 37, 38, 39, or inclosed all round as in figs. 40, 41, 42, 43 be protected by forming a bonnetted embrasure, which may They are of the following kinds :—

be sometimes made large enough, as here represented, to Redans, or simple heads,.....02…c0e 0000 fig. 36. hold two guns, It need scarcely be added that an engineer Double redans, or queues d'hironde…..... so Of: ought to be ready to adapt any of the expedients here pg eee me ee is =, briefly noticed to the circumstances ei the ease hafire him, Bastiqnorl dhe ad Sire 28 953,400 soceatlsaccnes esi Ssewee 2 ere % ; and that a mind stored with resources against any contin. Federhie Te ET Pe OM Wee er ET, ¥. ni} pency 1s the highest endowment of a good officer. | It must Baatlomed forte 5.00006. cocc-ceccs-cs.s) scented gas

fe obvious that in Field Fortification even a limited know- |

edge of the art of war opens a wide field for the exercise of | 2Shaw's Course of Field Fortification, p. 9 seg. Much assist-

the talents and resources of engineers; but the possession of | #8¢e has been derived from this useful work in the compilation of this

a milita “Deat : article, as well as from the admirable treatise on Field Fortification ry coup-d’ceil, which comprehends at a glance the true by Fischmeister, translated by Rieffel into French, the figures of which

bearing or character of objects and events is necessary for the | have been freely used,

IX. — 55

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emi aetiened LOT i 5. sci skaters .acsesea teonds fig. 43 EVES OR RE GAIA tein coxa nce ener satrap ctiosemnincrre aoe 1» 44 imresvor bem allles..c. Sissi. sate recs caaivee nce eee. 3 40. WyinGsre Crem ailare… csc ccccttcannsncmct sears aay 46 AMES Ol AS ONG io fo ody ac cvenaesyadaunwineso sien piacloss re. i Lines broken or with intervals….....06008 » 48

The first class are of the simplest kind of field-works, and serve as cover in front of avenues, bridges (see fig. 49), causeways, and the like; being open at the gorge, they are only wsed when their extremities rest on rivers, or on ob- stacles which prevent their being turned, or when within the full sweeping fire of works in their rear. To increase the strength of a ‘“‘ Redan” its faces are sometimes broken into

Fig. 36.—Redan. Fie. 37.—Double Redan.

a kind of flank, as in fig. 36. In the “ Double Redan,” or “queue d’hironde,” fig. 37, the re-entering faces defend

AB from 30 to 80 Yards Fie. 38.—Tenailled Heads.

each other. “Tenailled Heads” (fig. 38) are used in situ- ations which require a greater extent of front. ‘ Bas-

Fria, 39.—Bastioned Heads.

tioned Heads” (fig. 39) are also employed in similar cir- cumstances.

“Redoubts” (fig. 40) are closed works of square or polygonal figure. In square redoubts provision should be made for defending the ground before the angles, which, how- tiom 22 to 45 Yards ever, are sometimes rounded or cut en cré- mavllére, so that a di- rect fire may be de- livered from them.

Half-closed Redoubts, that is, redoubts in which the gorges are closed by thin parapets or timber stockades, may more fitly be classed here. They are employed when it is intended that their inter.or shall be open to artillery fire, so that an enemy having captured may not be able either to retain them or to convert them to his own uses.

Forts are works the parapets of which defend the ditches,

and this distinguishes them f d Of which ac a m from redoubts, the parapets

- *Star-Forts” fire from the adj*

Fig. 40.—Redoubts.

(fig. 41) are designed to deliver a cross acent sides ; but according to Jomini, they

are the very worst description of fortification > they cannot have flanks, and the re-enter- ing angles take so much from the in- terior space that it is impossible to place troops and artillery in them sufficient for their defence,” an opin- ion confirmed by the practice of Sir Richard Fletcher and Sir John Jones in the construc. tion of the lines of Torres Vedras, where the trace of 1. Sa

the redoubts was varied to suit the conformation of the ground.

In “Bastioned Forts,” fig. 42, the flanking defence afforded by the pares 4. ccossccue ss Ginna pets to the ditches : . a is nearly perfect, As :\ \ ~ssaedaseet bastioned forts are : = me only constructed in ; special cases of im- : portance, no labour or : expense should be : spared in their forma- : tion. The bastioned : face may be applied : to any polygon pro- | vided that its angles : f are not less than 90°. : When the angles are

becimnccacmnncsinsnesnnsnicionniis aie less than 90° the Fic. 42.—Bastioned Forts. salients of the bastions are too acute.

“ Demi-bastioned Forts” (fig. 43) inclose a greater in- terior space than Bastioned Forts, but a portion of their

Fig. 43.—Demi-bastioned Forts.

ditches are only defended by an oblique fire from the parapets of their faces.

The parapets of all these works should be of sufficient thickness to resist the fire of the heaviest guns that can be brought against them. In some cases it will be necessary that the parapets should be strong enough to resist the fire of light field-guns, whilst in others it will be sufficient if they serve as a cover to the men within them against musketry. This latter cover is that which, when time for more does not avail, is thrown up at the close of a march,

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after taking up a position, and which, if the army does not move next day, may be strengthened in parts, according to circumstances.

Continued Lines, or connected works, are resorted to in order to inclose the front of a position, or ta connect im-

a B AB varies from 180 to 400 yards. Fria. 44.—Lines of Redans.

portant works or forts. The most simple trace is that of redans joined together by curtains (fig. 44); the ditches of these curtains can only be defended by an oblique fire from the faces of the redans, but this defect may be remedied

AB varies from 300 to 600 yards, Fig. 45.—Lines of Tenailles.

by breaking the curtains so as to form nearly right angles with the faces of the redans, in which case they are called “Tines of Tenailles” (fig. 45).

“Tines en Crémaillére” have long faces, with flanks perpendicular to them, in order to defend their ditches

” Fig. 46.—Lines en Crémaillére.

(fig. 46). When the faces can be directed towards ground upon which it is impracticable to establish enfilading bat- teries, this trace is good.

Bastioned Lines (fig. 47) form the strongest trace which can be given to continued lines, when the ground will admit

Fic. 47,—Lines of Bastions.

of its adoption. A perfectly regular trace can only be applied to level ground, The ditches in field-works are often sloped en rampe towards the adjoining flanks, in order that the “ deblai,” or quantity of earth excavated, may not exceed the “ remblai,” or quantity in the mass of the ram- part or parapet, a condition which might otherwise occur In field-works, where there is seldom any rampart, and only cover sufficient for the defenders.

Fig, 48 shows the general trace of “ Lines with intervals.”

Fig. 48.—Lines broken or with intervals,

ab varies from 200 to 500 yards.

The salient works should never be beyond the range of musketry from the re-entering works, and the angles of defence between the two lines should be as nearly right angles as possible.

“ Tétes-de-pont,” or Bridge-heads, are works, open at the gorge, whose flanks rest upon a river, designed to cover one or more bridges. The best situation for these Works is the re-entering sinuosity of a river. As Tetes-de-pont (fig. 49) are usually constructed for the purpose of en- abling a retiring army to cross a river in order, and to check an enemy pressing upon it, their trace and profile should be such as to secure this double advantage to the greatest. extent possible. In Sir Howard Douglas’s able

work on the Construction of Military Bridges will be found much valuable information upon this important subject.

The obstacles which are usually added to field-works, in order to render the ap- proaches more difficult to the enemy, such as shel- ter trenches, entanglements, Fic. 49.—Téte-de-pont. palisades, barriers, abattis, trous-de-loup, chevaux-de- frise, harrows, and crows' feet, have been already de- scribed.

Defence of Open Towns and Villages (fig, 50).—To admit of a town being advantageously intrenched it is necessary that it should not be commanded within range of field- guns, that its houses should not be of a construction easily set on fire, such as of wood with thatched roofs, and that

its extent should not be out of proportion to the means

and time at the disposal of the defenders. The last considera- tion is of much importance and should be well weighed, as this kind of defence is prodigal of men. It is however rapidly organized ; and, as the number and the nature of the troops allotted to it are effectually concealed, it is sus- ceptible of being prolonged obstinately. When time presses the first step is to occupy the outer inclosures and to bar the principal thoroughfares upon the enemy's side, to construct abattis and shelter trenches, to loophole the buildings flanking the barriers, and then to form a strong "shooting line" behind the outer inclosures, clearing enough of the ground in rear to receive the supports and reserves, and to enable them to act efficiently either in assist- ing to expel the enemy or in covering the retreat. The approaches to the " shooting line" should be cleared for a distance of at least 300 yards, by levelling houses, hedges, shrubberies, filling ditches, and clearing away whatever may favour the assailants. Wood should be cut down about 2 ft. 6 in. above the ground, and with wire or other means formed into an entanglement ; hedges may often be so formed into most ef- fective entanglements. The squares and open places should be occupied by the main reserves; the main approaches should be subjected to artillery fire; and distinct communications should be formed for the re- treat of the defenders of the "shooting line." The in- closure round the town should be completed, and for this purpose some houses should be removed, others should be loopholed, streets should be barricaded, secure places found for

the magazines, and cover provided for the main supports and reserves, and wide and easy communications laterally and to the rear should be made. Streets leading out of town should be barricaded. The barricades should be sufficient to resist field artillery, and high enough not to be easily surmounted ; and they ought to be flanked by loopholing the neighbouring houses. When time presses, carts filled with dung with the wheels removed, sand-bags, bales of wool or cotton, and furniture taken from the neighbouring houses can be used as barricades. A church, a manufactory, a town-hall, a market, or any large sub- stantial building should be converted into a keep, by blocking up useless entrances, loopholing its walls, and surrounding it by a ditch or abattis. Loopholes are slits or notches cut in walls with such tools as may be at hand. They are usually about 3 inches wide and 12 inches long – externally, and are splayed internally so as to allow varia- tion in the direction of the fire. Loopholes are cut vertically or horizontally as the case requires, and are much used as temporary means of supplementing the cover afforded by the parapets of temporary and permanent works ; they are then formed of any materials at hand, such as sand-bags, logs of wood, and brushwood. – Sand-

bag loopholes are the best, as the whole loophole is not necessarily destroyed by the blow of a projectile, and they are easily moved from place to place; two sand-bags are placed side by side with an interval between them, and a third covers this interval. Logs of wood are disposed similarly; brushwood or board loopholes are embedded in the parapets. If a town is situated near a stream or river, by which part of it may be covered by inundations, the resources this affords should never be neglected.

- Villages are intrenched on similar principles, and being generally surrounded by gardens with live hedges, the latter may be made use of in the lines of defence. If there should only be sufficient troops to defend part of a village or town, a part of it only should be intrenched, and should be separated from the rest by means of carts and barricades. If there are very few houses, it may be necessary to confine

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House preparee : for 20€, PRA ‘ MOTE 7 fipé KEY Abatio. a ete: Wi Shelter trench. ANG ae any Leopholed wall CE pS KOUUuX Entanglement. ete win Wire Ei retanrglaneunt, Scate. =| B ~ . YARDS e igo : joo ° 00 10 soo

Fie. 50.—lLlustrating Defence of Towns or Villages.

the defence to the church or churchyard. Villages are often in one long street ; then only the rear portion is in- trenched, clearing in front of this portion a space sufficient for the effective action of musketry.

The Destruction of Bridges.—Nothing is of greater con- sequence to a retreating army than to destroy the bridges in its rear, in order to retard the advance of the enemy. Its existence may depend upon the success with which this operation is performed. To destroy a stone bridge with gunpowder a trench in the form of a cross is made in the crown of the arch, the branches of which are about 10 feet in length, and sunk to the top of the arch-stones. For an arch 3 feet thick, 160 Ib of powder are placed in each trench ; strong planks are then laid over the powder, and covered with rubbish. The fire is communicated by means of powder-hose or Bickford’s fuze. Stone bridges are de- Stroyed also by simply cutting a trench about 18 inches deep across the crown of the arch, and placing in it 345 bb of powder covered in the manner just described. This quantity has been found sufficient to destroy semicircular arches of oe span, and of 3 feet in thickness at the key. Wooden

Ter may be destroyed in various ways; they may be pulled to pieces, burned, or blownup. When there is time to take them to pieces, they are unspiked, and the timbers

so separated that they may be speedily removed. The best method of burning such bridges is to tar them, and then to cover and surround them with fascines or tarred brushwood. Wooden bridges may be blown up by large charges of powder suspended under the superstructure, and fired in the manner above described. But these and other hasty demolitions may be more quickly and more certainly effected by the use of Compressed Gun-cotton, which is, weight for weight, four times as strong as gunpowder, and requires no tamping. Compressed gun-cotton is stored damp, and in this state it is perfectly safe for transport and handling, as it can only be detonated by the agency of a small quantity of dry gun-cotton, called a primer, and a de- tonator. The detonator is fired in the ordinary way or by electricity. Compressed gun-cotton is made in many con- venient forms and sizes, such as 1 oz. and 4 oz. discs, 1 or 2 ib slabs, pellets, and grains. Generally it should be evenly distributed over the surface of stone bridges—if heaped, it forces an opening clean through. Supports of timber bridges may be destroyed by a girdle of half-ounce discs tied round them; or, if time avails, by charges placed in auger holes bored in them ; 4 oz. of gun-cotton is sufficient for each square inch of the sectional area of the support. Iron bridges are destroyed by attacking the bottoms of the piers, or, in the case of girder bridges, the junction of 2 girders; 2 tb of compressed gun-cotton per foot lineal laid against an 18-inch brick wall will de- stroy it.

A ford is rendered impassable by throwing large stones into it, by sinking boards with spikes standing upright in them, or by placing crows' feet or barrows in it. A low rubble wall may be formed across it, so as not to be per- ceptible above the water; strong stakes may be driven into the bottom, and trees fastened to them; waggons loaded with stones, with the wheels removed, may also be employed ; and a number of other things which may often be found at hand will answer the purpose equally well. Rendering a ford impassable is only second in importance to the destruction of a bridge, when the enemy, whose progress it is desired to retard, either has no

pontoon-train, or has outstripped it bythe rapidity of his advance. By such expedients to retard the pursuit much valuable time may be gained by the retreating army.

The essential characteristic of all intrenchments which are formed of earth is that the musketry fire, on which the defence must mainly depend, being discharged over the crest of the parapet, the line of fire, will be nearly in the plane of the superior slope of the parapet, and perpendicular to the line of its crest; and hence opposite a salient angle, as in the Redan (fig. 51), there will be a large space of ground

Fic. 51.—Redan.

in this case extending over 180° — 60° = 120°, undefended by the fire of the work itself; this space is called a "dead angle." Opposite re-entering angles, on the other hand, the defect is of a different kind, as the plane of the superior slope or plane of fire passing high above the foot of the escarp necessarily leaves it unseen and unprotected, not- withstanding that the two lines theoretically flank each

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other. The object, therefore, in arranging field works for mutual defence should be so to regulate their reliefs that the lines of defence should terminate at such distance from the ground as to give effective defence to the parts of the works intended to be flanked. The Redan may be considered the most simple form of defensive work, though a straight parapet terminating by short returns at each flank, in the form either of epaulements or of regular para- pets, may occasionally be combined with defensive works. The redan is open in the rear, and the line joining B and C is called the gorge.

The " Lunette" is a redan to which flanks or lateral wings have been added; in form, therefore, it resembles a bastion. In fig. 48 Lunettes are shown so arranged that the faces of those in rear may flank the faces of

those in front; but with respect to the distribution and arrangement of the works destined to form Lines of Intrenchment more will be said hereafter.

The "'Tenaille" is the reverse of the redan; it consists of two lines forming a re-entering angle facing the exterior. It can, from its form, only be used in direct or approximate connection with other works which close up or cover the ends of its lines. Either alone or combined with redans it is very commonly used in continued Lines of Intrench- ments. Fig. 44 represents a Line of Redans joined by straight lines, and fig. 45 a Line of Irregular Tenailles, whilst fig. 52 represents a normal line of Tenailles, of which the

Fic. 52.—Tenailles, re-entering angles do not exceed 100°, and the sides are

equal, and fig. 53, an arrangement of Tenailles, with irre-

gular sides, by which a Redan, as DEF, is interposed be-

Fia. 58.—Combined Tenailles and Redans.

tween every pair of Tenailles. (fig. 46) is also derived from a combination of irregular ten- ailles, and is in many circumstances a very satisfactory

The Line en crémaillére

arrangement. In selecting between these and other arrangements, including the bastion trace (fig. 47), the engineer must be guided by the nature of the ground and the special objects to be attained. A slight consideration 18 sufficient to show that the combination of regular tenailles In fig. 52 is only applicable to ground in itself regular. In Most cases, however, the ground will be more or less irre- gular, and the works to defend it must be so also. When It is necessary to approach close to the bank of a river or a ravine, the Crémaillére Line (fig. 49) is the simplest and best, the short or flanking sides being so placed as to face the probable direction of approach, and next to that the combined Redan and Tenaille. Of open works, Lunettes admit of the most scientific arrangement, as they can be so placed in lines with intervals as reciprocally to flank each other, and thus to form a line of defence very similar to a Tegular bastioned line. The employment, however, of works Open at the gorge must be restricted to positions where the enemy

can only approach in front, his approach in other directions having been rendered impossible by obstacles or

by other works. In every case it is desirable to take ad- vantage of peculiarities in the features of the country, and to modify them into such obstacles as shall relieve the de- fenders from apprehension of danger, and leave them at liberty to direct their attention more exclusively to the weaker points of their position ; but in no case should even apparently inaccessible points be left unwatched, as an en- terprising and skilful adversary will at times surmount difficulties which had appeared insurmountable. As nat- urally defended points in a position can only be looked upon as exceptional advantages, it is evident that works left open at their gorges would be liable to surprise, and would therefore prove but imperfect instruments of defence. On this account it has been not unfrequently pre- scribed that such works should be left unclosed when with- in range of musketry fire from the defences behind them ; but it is better to lay down the fixed principle that in all cases they should be closed at the gorge, as the power of driving an enemy out of the interior of such a work is of little value, for his object would be not to remain in its mtertor, but to turn its parapet to his own uses. The manner in which they are generally closed is shown in fig. 54, which is a lunette secured at its gorge by a loop- holed stockade, an obstacle effective against an enemy,

Fic, 54.—Lunette closed at the Gorge.

and, at the same time, easy of destruction, should he suc- ceed in temporarily obtaining possession of the work. Any of the obstacles previously described, such as abattis, &c. ‘ may be used for the same purpose, but they have the dis- advantage of not covering the defenders of the work from the enemy’s fire. An engineer in deciding between open works, such as have been described, and closed works such as will now be described, ought to take into consideration the circumstances of ground not only as affecting the security of the work itself, but as affecting the ease or difficulty with which support can at any moment be afforded to its garrison. Open works are not fitted for any position where they are likely to be left to their own resources, even for a short time, as small bodies of men cannot be

expected to stand firm against a vigorous attack from a superior force, unless satisfied that support is at hand. Closed works, therefore, in which the parapet is continuous on all sides, can alone be relied upon under such circumstances; and the nature of the obstructions adopted in their construction should be such as to afford the garrison a reasonable con-.- fidence that by a vigorous defence they may be able to hold the enemy at bay; for no general should expect to find in soldiers, as a body, that heroism which leads to self-sacrifice without hope. The easy capture of the the redoubts at Balaclava, garrisoned by the Turks, is an illustration of this principle ; for though it is possible that they might have been longer maintained by French or British soldiers, it would have been unreasonable to expect that their defenders should remain firm until overpowered and cut down by their assailants, which must have been the result had not a supporting. force been at hand to re-

lieve them. The rules may therefore be laid down, that in all detached works the mode and time of relief should be palpable to the garrison ; that the nature of the construc- tions should inspire the garrison with confidence in its power of resistance for a reasonable time ; and, above all, that the garrisons of such works should be composed of the best soldiers.

Redoubts, as has been said, may be either regular or irregular polygons of any number of sides, but the square redoubt is the most simple (see fig. 40). All redoubts have the disadvantage of "dead" salient angles; and it is usual, therefore, to place the guns used in their defence in the salients, so that their fire may be along the capitals or lines bisecting the salient angles, as well as upon the dead space in front of them. The sides should be made to front the probable line of approach, and, as shown in one half of fig. 55, which represents a Rectangular Redoubt, the

Fig. 55.—Rectangular Redoubt.

escarp is sometimes sloped gently down to the bottom of tle ditch, and covered with abattis or other obstacles, which can then be seen and defended in front by direct fire. It is indeed impossible to repeat too often

that in all works the efficiency of defence must mainly depend on the power of arresting the progress of the assailants at those points

which are under the fire of the defenders. The entrance to a redoubt should be made in the least exposed side, and be protected by a parapetted traverse placed behind it, as in fig. 55, where an arraugement of palisades is shown by which the traverse may be connected with the parapet of the works, aud the entrance closed by gates or barriers. Traverses may be also constructed either for the purpose

Fia. 56.—Plan and Section of Magazine behind a Gabion Traverse.

Peviede or for affording additional cover to the troops.

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tween them, which can be covered over or blinded when it is likely that the work will be held for a considerable time, and when, in consequence, a more secure and comfortable lodging is desirable for the garrison. Maga- zines for ammunition may be constructed either against or in such traverses ; and fig. 56 represents, in plan and gec- tion, a magazine behind a gabion traverse, and isolated from the parapet in front of it. This magazine is partly sunk in the ground, with sides of plank and a roof of strong timbers forming a ridge in the centre, covered first with fascines and then with 4 or 5 feet of earth. Its dimensions are— length 8 feet, breadth 5 feet, height 6 feet.

Having thus generally described this portion of the sub- ject, it is necessary to. determine the least size which can be given to redoubts, so as to ensure interior

A d B space sufficient to ac- commodate the garri- son required for the defence of the parapet, remembering that in

works not provided with flanking defences the whole parapet, un- less secured in part by some insurmountable natural obstacle, must be defended. : A general formula Fig, By. may be easily obtained for determining the

least regular polygonal trace in the following manner :— Let « be the side in feet of any regular polygon, » the number of sides, A the interior surface reckoned from the foot of the ban- quette, y the number of men forming the garrison, f the number of

linear feet allotted to each soldier, F the number of square feet occupied by each man in the interior,—then A F Sy =nzx, and Fy=A, or y= FF whence "Faas Again, let the perpendicular Cd, from the centre of the polygon (fig. 57) to its side AB, be y, and let the distance db from the side AB to the boundary line of the available interior space mn be d; then Cb=p-d; andas Cd: AB:: Cb: mn, p:x%::p—d: mn, or m= — dx x

>" Now, the value of » expressed as a function of x and of the angle of the centre ¢, which is=z $ cot. 4 9, varies with the nature of the polygon; and replacing therefore the variable coefficient 4 cot. $¢ by 8B, we have p=fa, and mn, the

side of the interior space mnpo, =x — a ag = aige a. and Cb =

da =f-—.

mn x 4 cot.4 p=B (#- 5) . The surface of the interior triangle

2

Cmn =} mn x Cb is thus =4a(2-2), and A=" (a4)

whence also a = a8 (2 -4) , and thence by reduction

a kA i iy B iable >a pat Ft 4(2a+=) The values of the variable

x B=3 cot. § ¢ are as follows :—

In the triangle, 0°288 »» square, 0-500 » pentagon, 0°688 », hexagon, 0°866

Taking the square, and supposing we have d=12 feet, f=3, F=6×3=18, 2=62°81 feet (21 yards), which may therefore be taken as the side of the smallest square redoubt to be defended by one rank only of soldiers, the

garrison being 84 men in single rank, and a reserve equal to one-third of the garrison; if f=2, then x=76‘66 feet, or nearly 26 yards, the garrison being 156 men. If there are to be two ranks, f=14, and z=89°6=30 yards nearly, the garrison being 240 men; and if two ranks, with a reserve equal to one-third of the whole garrison, f=1 and a=115 feet, or about 38 yards, the garrison being 456 men.

Triangular Redoubts are rarely used, as their interior

ey may be formed, when the work is sufficiently | space is small and out of proportion to the length of acious, of long parallel epaulements, with a space be- | parapet; thus the smallest triangular redoubt to be de-

rvrnriricrz Tr oN

fended by two ranks should have a side (x) 54 yards in length, and a garrison of 324 men, the total length of parapet required for this force being 162 yards; whereas a square redoubt of 38 yards side, which has a total length of parapet of only 152 yards, will accommodate a garrison of 456 men, admitting a “ two-rank” defence, with a reserve of one-third the whole garrison. Another objection to Triangular Redoubts is the great amount of dead-angle space – before the salients. Keeping these figures in recollection, the engineer will readily be able to determine his arrange-ment of the proposed garrison, and to limit himself to the least amount of work in parapet. If, however, he has to provide, in addition, for guns, for traverses, and for other constructions, he must increase the side of his square, bear- ing in mind that in the square of 38 yards side the augmentation of 1 yard per side adds only 12 men to the garrison, raising it to 468, whilst it adds 549 square feet to the interior space ; so that, as the 12 men require only 216 square feet, there will be an addition of 333 square feet towards the additional provision specified. And if the side be increased to 45 yards, and the garrison to 540 men there will be a surplus interior space of 2709 square feet, being sufficient for barbettes, for three guns and one howitzer, and for a traverse; this size may therefore be assumed as the best for a normal redoubt. It has been usual to assume that a redoubt should not have more than 180 yards of parapet, but there does not seem to be any reason for this assumption; and it may be said with confidence that a redoubt with double this extent of parapet will be superior to a field fort of

the same strength of garrison, even though the fort has the theoretical advantage of reciprocal defence. The ditches of larger redoubts are sometimes, when circumstances admit, defended by Caponniéres (fig. 58) placed either at the angles or in the middle of the sides.

>

SECTION THROUGH C D,

Fra. 58.—Caponniére.

These caponniéres are built of timber and roofed with logs or fascines, covered with earth 3 occasionally the ditches are defended by counterscarp galleries at the angles, con- structed of the same materials as the caponniéres, but buried

in the counterscarp. Access is obtained by galleries revetted with timber descending from the interior of the work into the caponniére, and beneath the ditch to the counterscarp galleries. In fig. 40, one of the angles is shown with an indented parapet as a means of correcting the defect of a dead salient; but this is difficult of construction, and it will generally be preferable either to cut it off as in another angle of the figure, or to round it as in a third, or to occupy it by a gun en barbette, 48 in the fourth. Of Forts, fig. 41 exhibits a Star-Fort of

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to one of six points formed upon a triangle, as giving com- paratively more available interior space. The defect, how- ever, in this trace is that, though the intermediate angle F is sufficiently open—as it exceeds 60°—the angles A and B are less than 60°. Down to the lowest limit of such forts, in which AB of fig. 41 is taken at 60 yards, and the sides AE, EF, EBat 20 yards, there is still sufficient space to accommodate the necessary garrison, which should bein that case about 900 men. It is useless to describe those forms of star-forts which would not accommodate the re- quired garrisons; but that represented in fig. 59 is well

Fie. 59.—Trace of Star-Fort.

fitted for a large garrison. The following is a simple construction on a pentagon. Bisect AB in C; make the perpendicular CP=3 AB; join APand BP; make Bd and Ad each 5% of AB, and join de, de. In this case the angles at A and B will be 64°, and the short sides (with an exterior side of 120 yards) each 23 yards. From what has been already said, Demi-bastioned Forts (fig. 43) will rarely be used ; but when the proposed garrison requires a large amount of accommodation, and there is time to under- take such works, the bastioned trace should be adopted, as it introduces a principle not observed in the preceding traces, namely, that of defending the whole by a part, the op- posite flanks EG, FG (fig. 42) of the two bastions GEAEG, GFBFG defending the intervening curtain GG between

| them, as well as the faces AE, BF of the bastions—whilst

the fire of one flank necessarily sees the escarp of the Opposite one and defends it. The bastions are indeed, like their analogous lunettes, works in themselves, the curtain being only a connecting line, forming several bastions into one connected whole. Fig. 42 is a square bastioned fort, but the pentagon is a better form, and should be adopted when practicable. The bastioned form of field forts has been derived from the more massive struc- tures adopted in the permanent defences of fortresses, and its history, so interesting in itself, will be given in a future page. Little further need be said on this sec- tion of the subject, except to point out the great import- ance of field-works in securing a base of operations for an advancing army. Fig. 49 (page 435) exhibits, for ex- ample, a bridge head consisting of a bastioned front, with either simple straight branches or branches with a short flank, as shown in the figure (see also fig. 60 below). This is technically called a Horn Work; and if there had been two such fronts so placed as to throw a bastion in the centre, and connected as before with the river by straight branches, the work would have been called a Crown Work. Lunettes and even Redans may also be used, as in left side of fig. 36, for a similar purpose, where the object is first to secure the bridge from the enemy's

eight points formed upon a square, which is far preferable | attack and fire, and secondly to allow the defending army

to manceuvre on the opposite side; but in proportion to the numbers to be passed over the bridge, and to

Fic. 60.—Horn Work defending Bridge.

the extent of advance contemplated, it will be necessary either to increase the importance of the works forming the bridge head, or to form more than one bridge in connexion with them. Nothing can be more fatal toa retreating army than to be driven back upon a river without a line of intrench- ment sufficient to enable it to maintain its ground whilst its arrangements for passing the river are in progress. Fig. 60 exhibits one such arrangement, in which the Horn Work front has been much enlarged, and a lunette as a keep introduced within it The mode in which the troops can move out at the sides, under protection of covering and flanking parapets, is shown, as well as the barbettes for guns, which become necessary in works having so im- portant an object. Fig. 61 represents a line of Tenaille

Fra. 61.—Tenaille Intrenchments protecting Bridge.

Intrenchments in front of the lunette, and a line of intrenchment on the near side of the river, from part of which the last terminal branches of the tenailles are flanked. In this figure T, T represent traverses, and F,F either chains or lines of pickets placed across the stream,— the object of the first being to secure the bridge from the ricochet fire of the enemy, and of the second to secure it from destruction by burning or explosive bodies launched by the enemy up the stream, to float down upon the bridge. More extended intrenchments might be formed of lines of lunettes with intervening intrenchments; but it is unnecessary here to pursue the subject further, as the engineer must necessarily adapt his works to the nature of the ground, and to the strength of the army for which he is required to prepare a defensive position, from which it may either advance or retire, without risk or confusion, as the necessities of war may require.

PERMANENT FortTIFICATION. @

If, as has been stated, simple lines or works of fortifica- cation have been adopted even by the rudest tribes of wandering Savages, for their

temporary defence or security, the more massive and artistic works of permanent defence would seem to imply a certain amount of civilization. As

an art, indeed, Fortification is almost co-existent with society. When men first assembled together for mutual] protection, and placed their habitations in one spot, the law of necessity, springing in this case from the prin- ciple of self-defence, rendered it indispensable for them to adopt means for securing their families and their property against the sudden inroads of enemies. In the early ages, men were sufficiently protected by a wall, from behind which they could with safety discharge darts, arrows, and other missiles against an assailant. But when, in the progress of improvement, new and more powerful means of attack were discovered, it became necessary to increase, in a cor. responding degree, the power of resistance; and so it came to pass that the feeble defensive structures of primitive times were superseded by solid ramparts, flanked and com- manded by elevated towers; and, as the power of attacking fortresses or places of strength became augmented by suc cessive devices and inventions, so the means of resistance became proportionally increased, until the art of Fortifica- tion arrived at a state of comparative perfection, in which for many ages it remained nearly stationary.

The various improvements which were from time to time made, in strengthening the walls and in adding to the defences of ancient cities, are recorded in history, and need not be detailed in this place. The first walls of which we read were of brick. Amongst the ancient Greeks, brick and rubble stones intermixed were used, as we find from the description of the wall which con- nected Mount Hymettus with the city of Athens; but, surrounding several cities were works of Cyclopean char- acter, built of Luge stones, without mortar, placed with their longer axis transversely to the line of wall, and arranged with great care and skill. The walls of Babylon and Nineveh indicate a prodigious advancement in the art of Fortification, and are justly accounted amongst the wonders of the ancient world. Those of the former city, ascribed by some to Belus, and by others to Semiramis, were thirty-two feet in thickness, and one hundred feet in height, surmounted at intervals by towers ten feet higher, and cemented by means

of bitumen or asphaltum ; they encompassed a vast area, and presented a solid defence, which no means of attack known in ancient times were sufficient to overcome or beat down. The walls of Jerusalem, though of smaller dimensions, appear to have been little inferior in strength and solidity to those of Babylon ; for, in the siege of that capital by Vespasian, all the Roman battering-rams and other engines, though used with the utmost vigour through a whole night, only succeeded in disengaging four stones in the masonry of the tower of Antonia. But after Fortification had arrived at the state in which we find it in the works of these and other cities, it remained stationary for ages, and perhaps even retrograded somewhat, until the discovery of gunpowder, the invention of artillery, and the application of both to military purposes, effected an entire revolution in the prin- ciples of attack and defence. Then the towers, which had formed secure flanking defences against assailants armed only with arrows and darts, no longer afforded protec- tion against projectiles discharged from cannon; and even those battlements which had defied the catapult and the bat- tering-ram speedily fell before the new force with which they were assailed, burying their defenders in their ruins.

The ancient system of Fortification being thus found of little avail against the new method of attack which came into general use towards the close of the fifteenth century, it became indispensably necessary to adopt 1m- proved methods of defence. The plan of fortifying with bastions is believed to have originated with the Italians early in the fifteenth century; though Papacino D'Antonl, professor of artillery and engineering of Turin, states,

Architettura Militare (1759), that several small bastions had been constructed in the preceding century, and that the ruin of a large bastion which had formed part of the fortifications of Turin, built for Duke Louis of Savoy, still existed in the royal gardens at that time. The bastions on the enceinte of Verona, built by the Italian engineer Micheli, in the year 1523, are generally supposed to be the oldest extant; and the next, probably, are those of the citadel of Antwerp, which were constructed for the em- peror Charles V. in 1545, by the Italian enyineer Paciotto D'Urbino. These bastions are small, with narrow gorges and short flanks and faces, and are

placed at great distances from one another, it being the invariable practice, at the time when they were built, and for a considerable time afterwards, to attack the curtains, and not the faces of the bastions.

Errard of Bois-le-duc was the first in France who laid down rules respecting the best method of fortifying a place, so as to cover its flank. He was one of the principal officers of the engineers in ordinary to the king, a corps formed by Sully, who was grand master or master general of artillery in the reign of Henry IV., out of the best instructed and most experienced military men. This corps is now the Corps de Génie, and to this day maintains its scientitic character. At the command of the minister, Errard wrote a book on the subject, which was published in 1594, and in which the details of his method are explained. As a writer on fortification, he was preceded in France by Beril de la Treille, who published his work on fortifying towns and castles in 1557. Errard fortified inwards ; and in the square, pentagon, hexagon, heptagon, and octagon he made the flank perpendicular to the face of the bastion j but in the enneagon, and in polygons of a greater number of sides, he made it perpendicular to the curtain. In his method, however, the gorges are too small, the embrasures are too oblique, and the ditch is almost defenceless. This engineer constructed part of the enceinte of the citadel of Doutens, the citadel of Amiens, and some works at Mont- reuil and Calais.

Antoine de Ville, who succeeded Errard, published a treatise, dated 1629, in which he completed much that his predecessor had only sketched, and rectified various defects in the method of the latter. He was employed under Louis XIII., and constructed new enceintes for Montreuil and Calais. His method of fortifying has been denomin- ated by some the French Method, and by others the Com- pound System (Systeme a trait composé), because it united the Italian and Spanish methods, from the latter of which it differs only in having no second flanks and fichant lines of defence, and in not confining the flanked or salient angle of the bastion to ninety degrees. The leading maxims of De Ville were to place the flanks perpendicularly to the curtain, to make them equal to the demigorges, or a sixth part of the side of the interior polygon, and, in the hexagon and all higher polygons, to confine the flanked angle to ninety degrees, But this method is liable to

nearly the same objections as that of Errard, as the embrasures are too oblique, especially in the polygons, and the ditch is ill defended,

In 1645, sixteen years after the publication of De Ville's, appeared the treatise of the Comte de Pagan, which Contained the development of a system that, in a short time, entirely superseded those of his predecessors. It was the Comte de Pagan who first disengaged the science of Fortification from a number of suppositions which custom had Consecrated, and which, resting more on abstract mathematical reasoning than on practical experience, had hitherto retarded the progress of the art. This engineer Served at twenty-five sieges with great reputation; but having become blind at the age of thirty-eight, he was

obliged to retire from the service, in which he had already obtained the rank (then second only to that of marshal of France) of mareschal-de-camp, and he died six years after completing the treatise above mentioned. He had from his earliest years devoted himself to the study of mathe- matics and fortifications, and he published several works on astronomy besides his celebrated work on Fortification, Pagan made the flank perpendicular to the line of de- fence, in order as much as possible to cover the face of the opposite bastion; and he devised a method of building casemates peculiar to himself. Vauban borrowed from Pagan the length of his perpendicular, and Allain Manesson Mallet, whose construction has found much favour, pro- ceeded upon the principles Pagan had laid down.!

The Mareschal de Vaaban was born in 1633; and at the time of the Comte de Pagan's death, he had already acquired reputation at several sieges. Vauban followed up the principles suggested by Pagan, and em- ployed them extensively, with consummate skill and judg- ment, He constructed 33 new fortresses, repaired and im- proved 100, and conducted about 50 sieges. His extensive works, especially the treatise De l'Attaque et de la Défense des Places, published in 1737, speak for themselves. From these works have been compiled the systems which, in the military schools, are denominated Vauban's first, second, and third systems of Fortification, and which the reader will find developed in the sequel. Had the genius of Vauban been applied to the discovery of a method for securing a perma-

nent superiority to the defence of fortified places, posterity would have been greatly indebted to him, and even human- ity would have had cause to rejoice in such a triumph of military art. But, being engaged in the service of the most ambitious monarch of modern times, Louis XIV., he applied his great talents to forward his master's views, and perfected that irresistible system of attack? which has ever since been so successfully followed. Before his time the superiority was on the side of the defence; but he so completely reversed the case that the success of an attack, conducted scientifically and with adequate means, has been until the present time a matter of certainty.2 Vauban was no ordinary man in any sense. As the inventor of parallels in sieges, and of rico- chet fire, he stands in the first rank of military engineers ; and as he conducted 53 sieges, and took part in 140 battles and skirmishes, it must be admitted that in respect of experience he stands in no inferior position. At fifty- five years of age he attained the highest honour of the French army, being created marshal of France; yet amidst his stirring and successful military life he never ceased to turn to account the geometrical knowledge for which he was distinguished when a youth, and which had obtained for him the early notice of the Prince de Condé. His mind was never idle, and was constantly directed to pro-

jects of public utility, civil as well as military; and he left

behind him records of such labours in 12 folio manuscript volumes, entitled Ifes Ozsivetés, a wonderful monument of his ability and industry. '

M. Minno, Baron de Coehorn, first a general of artillery, then a lieutenant-general of infantry, and ultimately direc-

1 Mallet constructed outwards, making in every figure or polygon the demigorge equal to a fifth part of the side of the interior polygon or figure, the capital of the bastion equal to a third part of the same side, the curtain equal to three-fifths or thrice the demigorge, and the angle of the flank equal to 98°. The faces of the bastions and the flanks are determined by the lines of defence, which are razant. From these data all the other lines and angles are easily found.

2 See his work De l' Attaque et de la Défense des Places, passim.

3 The protracted siege of Sebastopol is no exception to this rule. The length of its resistance was due to the fact that the resources at the disposal of the allied armies did not suffice for its investment, and that the Russians were in consequence able to introduce at their plea- sure reinforcements of men, material, and provisions; indeed, at times

| they were more numerous than the attacking force.

tor-general of all the fortified places belonging to the United Provinces of Holland, was the contemporary and rival of Vauban. This able engineer, convinced that, however ex- pensively the rampart of a town may be constructed, it cannot long resist the shock of heavy ordnance, invented three different systems by which such obstacles are thrown in the way of a besieging force that, although the place be not thereby rendered impregnable, it can only be reached with great difficulty and hazard. But these systems, with- out modification, are only applicable to low and swampy situations, such as are to be found in Holland, and are therefore not available in localities of a different description. Nevertheless, Bergen-op-Zoom, Mannheim, and other places fortified by this engineer, particularly the two named, have very great merit, inasinuch as it is impossible for a besieger to penetrate into any of the works without being exposed, on all sides, to the fire of the besieged, who are under cover, and from whose artillery and musketry fire it is scarcely possible for an assailant to shelter himself. In fact, Coehorn was a great master, and combined with the bastioned trace, as will be explained when his system is noticed, many of the means of defence springing from another source. He published his first work on Fortifica- tion before he had acquired much experience ; and in forti- fying Bergen-op-Zoom, which is allowed to be his master- piece, he did not reproduce, except in fragmentary details, any of his published systems,

Since Vauban's time several improvements have been suggested, particularly by Cormontaigne, who entered the corps of French engineers in 1716, nine years after Vau- ban's death, and died a mareschal-de-camp

in 1750. Some account of the system of Cormontaigne will be found in a subsequent part of this article. The three methods enunciated by Belidor are all applicable to an octagon of 200 toises. Scheiter distinguished his systems as great, mean, and little, in imitation of Pagan, requiring the ex- terior sides of the polygon to be 200, 180, and 160 toises re- spectively. Headopted from Castriotto detached bastions, and made use of a continuous fausse-braye. Fritach, a Pole,

proposed two methods, which he exemplified on different |

polygons. Dogen, a Dutchman, after enumerating, in a different writers for determining the salient angle, selected three as most worthy of approval, and proposed as many methods of construction, one of which is borrowed from Fritach, the Pole. Pietro Sardi, an Italian, suggested a peculiar method of construction on a hexagon. The Sieur de Fontaine found the flanked or salient angle of the bas- tion by adding 15° to half the angle of the figure, from the square up to the dodecagon, in which last it becomes 90°, and at this he continued it in all the higher polygons. He also constructed outwards, and, in every regular figure, mede the curtain equal to 72 toises, the face of the bastion to 48, and the flank, which he placed perpendicularly to the curtain, to 18 toises, or a fourth part of the curtain. Ozanam and Miiller delivered each four methods of construc- tion, the particulars of which will be found in their respec- tive ae In 1751 Charles Bisset, who, as engineer- extraordinary, served with the duke of Cumberland in the Netherlands, and was present during the siege of Bergen- op-Zoom by Marshal Lowendahl, published a treatise on the theory and construction of Fortification, in which there are many sensible and judicious remarks; and this may also be said of an Lssai sur la Fortification, ou Examen des Causes de la grande supériorite de 1 Attaque sur la Defense, published anonymously in 1755. In a work entitled Scvence de la Guerre, which appeared at Turin in 1747, a new method of construction is proposed, in which the principal novelties are mines under all the works, and regular communications with them by means of subter-

raneous galleries, to be resorted to as the enemy ap- proaches the body of the place. The third volume of the Guvres Militaires contains useful

observations and maxims relative to irregular Fortification ; and in the supplement to the Jeéverces of Marshal Saxe, by Baron d'Espagnac, the subject of Fortification is amply discussed, and an accurate description given of the different means of attack and defence. Besides the writers above enumerated may

'be mentioned the Chevalier St Julien, an able engineer,

who published a method by which, he asserts, works may be constructed at less expense, yet in such a manner as to render the defence more formidable; Francisco Marchi, of Bologna, who in 1599 furnished no less than 139 different methods of constructing fortifications, many of which are valuable, and from which subsequent engineers have greatly profited ; Bombelle, who established three kinds of Fortification, called the grand royal (grand royal), the mean royal (moyen royal), and the little royal (petit royal); Blondel, who published a system divided into two principal heads, the great and the little, whose exterior sides are re- spectively 200 and 170 toises; Donato Rosetti, a canan of Leghorn, who wrote on the method of constructing works in what he calls Fortification & rebours, or Fortification in re- verse, so denominated because the re-entering angle of the counterscarp being opposite to the flanked angle, it will, ac- cording to him, be necessary to attack it from the reverse side of the other works; and Antonio de Herbart, major of artil- lery in the duke of Wiirtemberg's service, who published a treatise on Fortifications with what he calls angular poly- gons. The treatise entitled Nouvelle Maniére de fortifier les Places, tirée des méthodes du Chevalier de Ville, du Comte de Pagan, et de M. Vauban, avec des Remarques sur Vordre renforcé, sur les dessens du Capitaine Marchi, et sur ceux de M. Blondel, which appeared in 1689, is full of strong reasouing, whence the author deduced a new system; but it contains little that is original, though it gives numer- ous references to what had previously appeared, and dis- poses the different parts in a judicious manner. M. de Montalembert's system of casemated and reverse fire has been in part adopted in the splendid fortress of Alessandria,

_in Italy, which was constructed under the direction of large volume on Fortification, various modes employed by |

Napoleon.

Of the more recent treatises on fortification, that of M. de Bousmard, entitled Hssat Général de Forttjication, @ At- taque et de Défense des Places, dans lequel ces deux Scvences sont expliquées et mises Pune par autre a la portée de tout le monde, is very elaborate and complete, and enjoys a de- servedly high reputation for accuracy and research.

Carnot's Traiwté de la Défense des Places Fortes was written to serve a temporary purpose ; and the exaggerated celebrity which it acquired on its first appearance has been succeeded by an equally unfounded neglect. The more prominent innovations recommended in this treatise were— first, an alteration, which, however, was not original, in the trace or outline of the polygon; secondly, the suppression of the exterior revetment of the covered-way, known as the counterscarp ; thirdly, the detachment of the escarp- wall from the rampart, and the construction of the latter without revétement ; fourthly, destructive personal con- flict with the besiegers by means of frequent sorties; and, lastly, vertical fire as the basis rather than the accessory of the defence. With regard to these innovations, all of which the reader will find ably discussed in Jones's Journals of Sieges in Spain and Portugal, vol ii., it may be remarked that by means of an increased expenditure for retrench- ments and casemates, as recommended by Carnet, the strength of particular portions of the polygon may be In- creased; and that, if he has failed in tracing a perfect front, founded on the basis of Montalembert's system of casemated and reverse fire, he has at least rescued a valu-

able suggestion from unmerited neglect, and rendered an important service to science by directing the attention of military men to means likely to create a barrier against the growing powers of the attack.

The Traité de Fortification Souterraine, suivi de quatre Mémoires sur les Mines, by M. Mouzé, lieutenant-colonel of engineers in the French service, published at Paris in 1804, is the most complete work on the subject of which it treats which has yet been given to the public. Subter- ranean Fortification is a branch of the art which, until recently, was wholly

neglected in England, and in which British engineers were far behind their brethren of the Continent. We learn from Colonel Jones's work on the Peninsular sieges that the duke of Wellington's army in Spain was without a trained sapper or miner until late in the year 1813. In this respect things are now changed, and in the Engineers the army has the assistance of a body of men well instructed in the duties of the trench, the sap, and the mine, though it cannot be said even now that the corps of Engineers is of sufficient strength. Nor can this corps, as some contend, be supplemented by civil labour in time of war. Discipline is the foundation upon which the whole military system rests, and the highest skill, unless strictly subordinated to it, will avail little in war. The undisciplined labourer, who, under ordinary circum- stances would have worked with the greatest effort, would be found worse than useless if forced to work on his knees in a sap, exposed to an enemy's fire, or upon his back in a countermine, with the knowledge that the enemy's miner, though he cannot fix his precise position, is probably within striking distance.

Before going further it is desirable to recur to the earlier methods, and to investigate the manner in which the ancient arrangement of a wall, with round or square towers, passed into the present systems of defence. Fig. 62 will explain the natural and probable manner in which

of earth, the Italians completed the system of bastioned defence, which, notwithstanding all the modifications of the French, ought to be called the Italian system. In this system, whilst imitating the construction of the old towers by using casemated or masonry-vaulted chambers for artillery, in addition to the guns mounted on the ram- part, the Italians placed the musketeers on the banquette of the parapet, and made them fire over it. Now this ar- rangement of the musketry fire is an essential characteristic of the Italian system, and the reliefs of the several works are by it restricted within certain limits, as it is necessary so to determine the levels of the opposite flanks that the fire along their superior slopes shall defend the whole of the intervening curtain: but there are other modes of using musketry as well as artillery fire in the defence of the ditches, and on these were founded other systems of Forti- fication.

The first Italian writer on Fortification was Tartaglia, whose work was published in 1546; but the really first writer on the science was Albrecht Diirer, a great painter, sculptor, and engraver, and a civil and military architect, whose work is dated 1527, being published one year before his death. This remarkable man founded his system on the old circular tower-forts C, fig. 62, with which the dead space is much less than with square tower forts, and, enlarg- ing the towers to an enormous extent, he adopted the name " Bastei," or in the plural " Basteien," for his new work. As attention was at this early period more directed to cannon than to the rude musket as an instrument of de- fence, it was natural that the latter should be less con- sidered in these arrangements than the former. Diirer based his systems on the principle that the defences of basteien or other works which depend only on the cannon placed on their terrepleines may be effective whilst the enemy is at a distance, but cannot be so when, under cover of his epaulements, he has reached the ditch; and leaving therefore to the cannon on the terrepleine the task of firing upon the enemy's troops and batteries at a dis- tance, he placed cannon and musketry either in vaulted galleries running along the base of the escarp, or in caponniéres,

Fig. 62.—Illustrating the Growth of the Bastion. the old tower or rather tower-fort (baluardo) grew into the

pentagonal bastion. If, for example, lines of defence be drawn from the extremes of two adjacent curtains to the angles a and c of the square tower-fort A, a space would be left, cha, unseen from the adjacent forts B and ©, and therefore undefended, except by downward or vertical fire from machicoulis, or projections from the walls supported by corbels made for the purpose. Such a space would be turned to account by the besiegers in fixing their scaling ladders; and the change of the straight line ac into the two faces cb, ab seems but the result of a self-evident necessity. As the work became enlarged, the portions of the fort within the connecting walls m, m were omitted, and the flanks de, fa alone remained of the old wall, form- ing with the faces the bastion fabcd, which only required to be improved in proportions to become the bastion of modern times. It is, however, said that the towers were Sometimes placed with an angle salient as in B, and if so, omitting the portions nn, the resulting bastion has a strong analogy to those of Errard before mentioned. By using the old wall merely as a retaining

wall, and as an obstacle against escalade, and adding to it a rampart and a parapet

also vaulted or casemated works, built across or transversely to the ditch. The great circular bastei of his third and most improved system was no less than 130 yards in diameter, with an escarp 120 feet high, a ditch in front 100 feet wide, and a massive envelope, about 80 feet thick and 100 feet high, formed of earth with thick masonry revétements both in front and in rear, as a mask between the main work and the counterscarp. Such gigantic proportions as these have led many to con- sider Diirer as little more than a speculative writer, but this would be an unjust estimate of his real merits. Reducing his works to more reasonable dimensions, they would, with proper modifications, have become practicable, and they have afforded many useful hints to the scientific engineer. The defects of the circular form were compensated by the grazing fire of the caponniéres in his system, and the main . work was retained in an effective state by the cover afforded to it by the envelope. We shall have occasion to refer again to Diirer, but in the meantime it may be said that whilst the Italians are properly considered the originators of bastioned systems with an earthen parapet over which the musketry fire is directed, Diirer has an undoubted claim to be considered the author of the systems of Fortification in which casemated defence in the main works and in the caponniéres becomes the essential characteristic—a system which has proved more fertile in results in modern times than the bastioned system.

Plate III.

Systems oF PERMANENT FORTIFICATION.

1. Vauban's First System.

Before commencing to draw a plau of Fortification, it is usual to determine the polygon on which to describe it. In Plate IIL. fig. 1, the angle taken is that of an octagon, and the length of the side is 360 yards. In constructing a fortification, a figure is determined on, as near a regular polygon as possible, within which the enceinte or chain of main works is to

becontained. The enceinte or body of the place consists of as many bastions, connected with curtains, as there are sides to the figure, and each of these is made about 400 yards.

The Principal Line or Outline denotes the line by which the figure of the work is defined. This line is supposed to pass along the cordon of the escarp, and is that from which all the other parts of the work are set off.

The Hxterior Side, or side of the polygon above mentioned as equal to 360 yards, is that upon which the Front of the Fortification is described, and it extends from the flanked angle of one bastion to the corresponding flanked angle of the next, as AB. These lines are bisected, and a perpen- dicular CD is drawn from the point of bisection towards the place, its length being proportional to the length of the exterior side and adjacent angle of the polygon,—that is, one-sixth for the hexagon and all figures of a greater num- ber of sides, one-seventh for the pentagon, and one-eighth for the square.

The Lines of Defence, AEG, BFH, are drawn from the ex- tremities of the exterior sides through the point D, and produced to an indefinite length; and upon the lines so drawn are set off two-sevenths of the exterior sides, equal to 102$ yards, which mark the points for the shoulders of the bastions, E and F. The distance between these points is then laid along the continuation of each line of defence, viz., from E to G and from F to H, and the line connect- ing G and H is the curtain GH, from the extremities of which lines are drawn to the points marked off for the shoulders of the bastions, and these form the flanks. Iu this manner is drawn a Front of Fortification, and this being re- peated upon each side of the polygon, completes the works of the enceinte, or body of the place.

Vauban divided his first system into three classes, namely, the little, the mean or intermediate, and the great. The first he used for small forts of four or five sides, citadels, horn-works, and crown-works, making the exterior side from 120 to 240 yards, the perpendicular equal in the square to one-eighth, and in the pentagon to one-seveuth, and the faces of the bastions in each equal to two-sevenths, of the exterior side. In the mean or intermediate, which is adapted for all sizes of towns, the exterior side varies from 250 to 360 yards, the perpendicular is one-sixth, and the faces of the

bastions are two-sevenths. In the great the exterior side varies from 360 to 520 yards. This was never adopted for all the sides of a place, but only in the case of one which happened to be near a river or a marsh, when the distances of the bastions sliould be so regulated that they may not be out of musketry range from one another. When the curtain becomes unavoidably too long, this defect is in part remedied by erecting on it a flat bastion, which is not so high as the rest of the works.

Ground which will admit of being regularly fortified throughout is seldom met with ; nevertheless, the rules of regular fortification must be observed as nearly as pos- sible. These are—that the flanked angles should not be less than 60°, that the lines of defence should not exceed musketry range, and that the sides should be lengthened or shortened so as to obtain a well-proportioned front upon each. After an Irregular place has been reduced to as regular a figure as possible, lines are drawn parallel to

the sides of the figure at the distance of about 50 yards from the houses, in order to give sufficient space for the rampart; and these lines form the interior polygon, which may be fortified outwards, by setting off the demi-gorges of tlie bastions, and raising their flanks at angles of 100° with the curtain. Or the exterior side may be formed and fortified inwards by drawing a line parallel to each of the interior sides; and when the angle is that of a polygon of more than five sides, the distance from the exterior to the interior sides should not be legs than 100 yards. If a side extend from 360 to 520 yards, the perpendicular should be diminished to about 50 yards, and the faces of the bastions be made from 100 to 120 yards. All these dimensions should, however, be now much increased, and placed in relation to the range of the modern rifled small arm.

The Dztch or Fosse is an excavation of from 15 to 30 feet in depth, and from 30 to 50 yards in breadth, surrounding the rampart on the exterior side; the earth dug out of it serves for the ranipart and parapet. The side of the ditch

| next the place is called the escarp, the side next the

country is called the cownterscarp, and is made circular opposite the salient angles of the works. In the figure ares are described with a radius of 30 yards, opposite the salient angles of the bastions, tangents to which are drawn upon the shoulders of the neighbouring bastions, and thus the width of the ditch is fixed. The general dimensions of a ditch should be such that its excavation, or deblai, would produce sufficient earth, or remblai, for the formation of the works. The breadth varies from 30 to 50 yards, in order that, in passing across it to the assault, the enemy may, for a considerable time, be exposed to the fire of the works ; and its depth must be such as to render difficult the escalade of the parapet, as well as to prevent the besiegers at the crest of the glacis from being able to see the lower part of the revetment of the escarp. The line of the counterscarp is drawn from the rounding at the salient angles of the bastions upon the shoulders of the bastions next adjoining, in order that the whole of the ditch may be defended by the fire of the flanks of the bastions. Ditches are of three kinds, —wet, dry, and such as may be rendered either wet or dry. The wet ditch-is effectual against surprises or sudden assaults, excepting during hard frost, for it may be passed when frozen, as in the attempt to surprise Bergen-op-Zoom in the year 1814; but the number of bridges of communication, which require continual repair, and the difficulty of making sorties, render a wet ditch extremely inconvenient. A dry ditch, which is capable of containing works for its own de- fence, and by means of which communications round the works may more easily be maintained, is therefore prefer- able; but the third kind, which unites the advantages of the other two, is to be preferred to either. It is only in particular situations, however, that such a ditch is practic- able.

The Yenaille, in the form given to it by Vauban, does not appear in the works of earlier engineers, but it seems to be naturally derived from the trace of Rimpler (1678), in which the middle flank is analogous in function to the tenaille, and occupies its position. It is a work placed in front of the curtain, and is thus formed :—its side faces are upon the lines of defence, and commence at points 11 yards distant from the shoulders of the bastion ; its front face 18 28 yards from aud parallel to the curtain ; its gorge is pat- allel toand 17 yards from the faces; its ends are parallel to the flanks of the bastions. The relief or height of the ten- aille is determined by that of the neighbouring flanks, and it has a parapet of 74 feet in height and from 12 to

15 feet in thickness. The use of the tenaille is to cover the pos- tern gate, which is often made in the curtain or flank; 10

dry ditches it protects the troops formed behind it for the defence of the ditch ; in wet ditches it covers the boats collected for the same purpose. It adds materially to the defence, as its fire, from being more horizontal and nearer to the bottom of the ditch, is of course very effective. It fires into the ravelin, and acts as a partial traverse to the escarps of the curtain and the flanks.

The Ravelin or Demilune was originally designed to cover the entrance to the fortress, but it soon developed into a most important work of defence, appearing as such in some early Italian Traces. Speckle, the great German engineer, who fortified Schlottstadt, Hagenau, Ulm, Col-

mar, Basel, and Strasburg, was, however, the first who re-

cognized fully its importance, and laid down the rule that "great ravelins materially augment the defensive power of a bastioned system." Constructed upon this principle, the ravelins of Speckle were even larger than the ravelins of Cormontaigne's system, and covered nearly the whole of the bastions, their faces being directed on the salients of the bas- tions and their capitals, extending about 150 yards in ad- vance of the exterior side of the polygon. Speckle was a man of science, having studied mathematics and military engineering in his youth, and perfected his knowledge by visiting and inspecting the most remarkable Italian Fortifi- cations existing in his time. The Ravelin is a work con- structed opposite the curtain, of two faces meeting in an out- ward or salient angle, with two demigorges formed by the counterscarp. Its use is to cover the curtain, the gates, and the flanks of the bastion, The Ravelin is constructed as follows. At 11 yards from the shoulder along the faces of the bastion, points are set off ; an are is described from the angle of the flank upon the perpendicular produced, with a radius of 160 yards; from this intersection lines are drawn towards the points set off, but not further than the lines of the counterscarp ; at the intersection of the lines of the counterscarp or re-entering angle 6 yards are set off on the capital or line bisecting its angle, whence lines are

drawn parallel to the lines of defence till they meet those of the countersearp. Stairs, called pas-de-souris, are constructed here in order to facilitate the entrauce into the ravelin from the ditch. The ditch in the ravelin, which is 24 yards in breadth, is made circular at the salient angle, and drawn parallel to the faces till it joins the main ditch.

The Covered-way was first described by Tartaglia in 1554, so that it must have been used at a very early epoch of Italian Fortification. Some of the first bastioned fortresses were, however, without this highly important work 3 and it is recorded that at the siege of Vienna by the Turks, the garrison having made a sortie, some companies were pur- sued by the Turks up to the counterscarp, and forced over it into the ditch. The necessity of being able to assemble under cover from the enemy's fire the troops intended for a Sortie, and to afford them when repulsed a place for reform- ing and checking the enemy's progress, and thus insuring an orderly retreat into the body of the place, soon became apparent, and a Covered-way was supplied to works origin- ally constructed without one. It is a space of 10 yards in breadth, extending all round the work between the edge of the counterscarp of the ditch and the parapet which covers It; this parapet is from 7 to 9 feet in height, and has a banquette for musketry. The superior part of this parapet forms a gentle slope towards the country, which terminates at the distance of from 40 to 70 yards ; and this slope is called the Glacis, The Covered-way serves for drawing up troops in order to make sorties, and costs less than any other part of the works in proportion to the difficulty of taking it. In its salient and re-entering angles are open spaces called Places of arms.

The Salient Places of arms are the open spaces between the circular parts of the counterscarp and the prolongation

to intersection of the branches of the covered-way, The Re-entering Places of arms are constructed with two faces, forming a salient angle of 100° with the covered-way. The demigorges of the re-entering places of arms are generally from 24 to 30 yards; but when they are intended to con- tain a redoubt or intrenchment, they are from 40 to 48 yards. The Re-entering Places of arms are meant to flank the branches of the covered-way, and to

contain the troops for its defence. The Salient Places of arms also serve for the assembly of troops for the defence of the covered-way.

Traverses are constructed across the covered-way, upon the prolongation of the sides of the ravelins and bastions, perpendicular to the line of the counterscarp ; they are from 18 to 20 feet thick, and serve to cover the troops from the enfilading fire of the enemy. Other traverses are constructed between these, so placed that the distances between them should not exceed 40 yards. Passages 10 or 12 feet wide, which are formed by cutting into the parapet of the covered-way round the ends of the traverses, afford thorough communication ; the openings are closed when necessary by gates. In the more improved systems of Cormontaigne and others, these openings are constructed in such a manner that each can be defended by the fire from the traverse in rear of it.

The Glacis, as already stated, forms a gentle slope from the parapet of the covered-way towards the country, and varies from 40 to 70 yards in length, Its parapet cannot be ruined by the fire of the enemy ; it covers the revetment of the body of the place ; and being an inclined plane, it can be easily seen and defended from any part of the works.

The Rampart is an embankment of earth, and is the part of the works next to the town which it surrounds. It must be broad enough to carry the parapet and to pro- vide sufficient space behind it for working the guns, and for the free passage of the defenders. The Ditch is im- mediately in front of the rampart, which is sustained by a revetment-wall of masonry or brickwork, called the escarp, strengthened by interiur buttresses, called counterforts, placed at intervals regulated by the height of the wall and their own thickness. The Rampart is divided into the terrepleine, the banquette, the parapet, and the escarp, See Plate III., fig. 4.

The Levetment or face of masonry around the work on both sides of the ditch is intended to prevent the earth above from falling into the ditch. To ascertain the proper thickness of niasonry for revetments has always been a matter of considerable trouble and difficulty. General Sir Charles Pasley of the Royal Engineers has given the follow- ing rules, (1) For full-scarped revetments without berms, and for demi-revetments having berms equal to one-fourth the height of the masonry, the thickness of the wall should be

seventeen-sixtieths, and the length of the counterforts or buttresses one-fifth of their height. (2) For demi-re- vetments without berms, the mean thickness of the wall should be three-tenths, and the length of the counterfort one-fifth of the height. (3) For counterscarp revetments, having only to retain simple terrepleines, the mean thickness should be one-fourth, and the counterfort one-sixth of the height. In all these cases General Pasley supposes the re-vetment to be countersloped, that is, to have the exterior slope in a vertical plane, and the interior face inclined, so that the base of the wall may be broader than its top by one-fifth of its height; and he also supposes the counterforts to be rectangular, and the intervals between their centres to be equal to four times their width, (4) He recommends that the foundations be made deeper in rear than in front,—that the courses of masonry form an angle with the horizon of about 10° till within a foot from the exterior, where they should be horizontal, to prevent the rain from penetrating,—and that the interior face

of the wall should be of irregular form. The lateral pres- sure of the earth against the revetments may be diminished by building arches in one or two tiers between the counter- forts.

The Cordon is a round projection of stone, about a foot in diameter, near the top of the revetment wall, which serves to throw the drip of rain off the face of the masonry. Itis alsoa considerable obstacle to besiegers, as it prevents their ladders for escalade being placed against the escarp.

The profile or section of Vauban's first system is given in Plate IIL, fig. 4, in order to illustrate the relative relief or height of the respective works, and to show the com- mand which each has over the work in its front. When the height of the rampart, including that of its parapet, is 20 feet, and that of the parapet of tle covered-way is 9 feet above the plane of the site, then the rampart will have a command of 20 feet over the country, and 11 feet over the crest of the covered-way; and the latter, again, will have a command of 9 feet over the country. There are three sorts of command, namely, in front, in rear, and in enfilade, That in front is when any eminence which commands the work directly faces it; that in rear when tlie eminence is beliind the work ; and that in enfilade when the eminence is on the

prolongation of any line or work. The last, which is the mast dangerous kind of command, is best remedied by raising the salient of works exposed to it (see fig. 23, p. 427), or by erecting traverses. In fig. 4 of Plate III. a line, called the line of site, and supposed to be the surface of the ground on which the fortification stands, is drawn, and perpendiculars are erected on it equal to the respective heiglits of the different parts of the works corresponding to the lines in the figure;—a showing the terrepleine, the banquette or step to enable the soldiers to fire over the parapet, c the parapet, d the revetment, e the escarp, f the counterscarp, and so on.

2. Vauban's Second and Third Systems.

The principles of Vauban's First System having been thus explained, no great difficulty will be experienced in under- standing the methods of other engineers who have con- structed works varying but little in essentials from this system, the variations having arisen from difference of situation and local peculiarities rather than from other causes. In his other methods of construction, as, for example, in his second and third systems, Vauban himself merely modified, according to circumstances, the principles upon which his first is based. When this cele- brated military engineer was called upon to repair or improve the fortresses of Landau, Breisach, é&c., and found these places surrounded with strong walls strengthened by small towers at the angles, he did not destroy these de- fences, but constructed, nearly in the same proportions as in his first system, large counterguards or bastions in front of the towers which crowned the angles of the wall, just as the Italian Castriotto had done in 1584. And by this method an important object was attained ; for, as in front of each tower, or rather tower-bastion, there ran a ditch which cut off all communication between it and the counter- guard, so the enemy, even if they should have succeeded in establishing themselves in the counterguard, would still have another ditch to cross, and another wall to breach, before they could attempt to give the assault.

There is so little difference between the second and third systems of Vauban that a description of the former will enable the reader to appreciate the peculiarities of the latter. In the second system (Plate IIIL., fig. 2), the interior side of the polygon, from the centre of one tower- bastion to that of

the next, is supposed to be 240 yards, and at 24 yards from its extremities perpendiculars are erected equal to 36 yards for the flanks of the tower-

bastions. A line is then drawn through the extremities of these perpendiculars, parallel to the interior side AB, till it meets the oblique radius of the polygon, or line drawn from the centre of the polygon bisecting its angle, and this being done on both sides of the angle forms the tower-bastion. The oblique radius is produced 78 yards, and lines of defence are drawn to the angle where the tower-bastion joins the curtain or line AB. On these lines of defence, the faces of the counterguard, or exterior bastion, are set off equal to 128 yards, and from the point forming the shoulder, flanks are directed to a point set off on the line AB, at the distance of 70 yards from its ex- tremities. From the salient angles of the tower-bastions ares are described with a radius of 14 yards for the breadth of the ditch, and tangents to these arcs are drawn parallel to the faces of the tower-bastion, but stopped where they would meet a line drawn from the salient angle of the tower-bastions, at the distance of 20 yards from the flanks,

The ¢enazile is the same as in the first system, excepting that at its ends it is carried down till it meets the lines of defence drawn between the flanked or salient angles of the tower-bastions. The ditch in front of the counterguards, or, in other words, the main ditch, is constructed in the same manner as in the first system. The ravelin is formed by setting off 90 yards from the re-entering angle of the counterscarp, and directing its faces to points set off on the counterguards, at the distance of 20 yards from the shoulders. A flank is formed by cutting off the corners of the ravelin at the distance of 14 yards on its demigorge, and 20 on its face; and this flank serves for the placing of guns in such a manner that their fire may be directed into the counterguard, or into the ditch before them, as occasion may require. Again, at the distance of 48 yards from the re-entering angle of the counterscarp, lines are drawn parallel to the faces of the ravelin for the redoubt; a ditch is formed in front of this, and parallel thereto, about 18 feet in breadth ; and the redoubt thus constructed has a command of 4 feet over the parapet of the ravelin, as the tower-bastions have over the

counterguards. The covered-way and glacis are formed as in the first system. It sometimes happens that redoubts are constructed in the re-entering places of arms; in which case their demigorges are made from 15 to 40 yards, and their faces set off at an angle of 100°, as before.

3. Cormontaigne's System.

The difference between the Systems of Vauban and Cor- montaigne may easily be discovered by an examination of Plate JIL, fig. 3. Vauban makes the faces of his bas- tions two-sevenths of the exterior side, and Cormontaigne one-third. Vauban, in his first system, directs the faces of his ravelin to points upon the faces of the bastion distant 11 yards from the shoulders, and in his second and third systems, to points distant 20 yards; but Cormontaigne makes the capital of his ravelins about 120 yards, and directs the faces to points distant 30 yards from the shoulders ; by which means the flanks are better covered, and the bastions and ravelins are enlarged. And this is aD advantage; for he is thus enabled to construct a larger re- doubt in his ravelin, the curtain and flank are also better covered, and, as the former is shorter, communications are more easily kept up between the bastions. Cormontaigne gives the same breadth to his covered-way as Vauban, but he arranges in a different manner the communication round the extremities of the traverses, as may be seen by inspect ing the plate. By this zig-zag line of communication, which resembles the crémaillére trace adopted by Speckle in his covered-way, the passage round the extremity of one tra- verse may be defended by the fire of the other im its rear, or nearer to the body of the place, and the advance of

assailants along the covered-way checked. As Speckle planned in 1589, or long before the invention of ricochet fire by Vauban had rendered traverses an essential element in fortification, his object was not the same as that of Cormontaigne, but simply to ensure a more perfect flank- ing defence of the branches of the covered-way than that afforded by the places of arms of hissystems. The ditches are, as shown in fig. 3 of Plate IIL, on different levels— the main ditch being about 23 feet deep, and the ditch of the

redoubt of the ravelin only 7 feet, so that from this latter ditch there is a fall of 16 feet to the main ditch, rendering it impossible to attack the ravelin by its gorge without the aid of ladders. An examination of the several figures which represent Vauban's and Cormontaigne's systems, as also the outworks of fig. 3, Plate IV., will at once render evident the vital defect of the ordinary ar- rangements of outworks—that they expose through the openings of their ditches the escarp of the body of the place, or of the work on which their faces or branches are directed, to be breached. In the System of Cormontaigne, as well as in the Modern System next to be con- sidered, the increased projection of the ravelins, by throwing the intervening bastion into a deeply re-entering position, secures it from attack by ap- proaches until the salients of the ravelins have been taken; but this great advantage is diminished by the power of breaching the bastion from the glacis through the opening afforded by the ravelin ditch. For the purpose of covering the communication to the re-entering place of arms, a demi-caponniére, or work composed of a parapet and glacis, was thrown across the ditch of the ravelin, as shown in the figure of the modern system (Plate IV.,fig.2). This work afforded cover also to troops assembling pre- paratory to a sortie upon the enemy when making the passage of the ditch, but, from the depth of the ravelin ditch, it was insufficient to mask the revet- ment of the bastion behind it. It will presently be shown how this object was afterwards effected; and it may be said that without any material change in system, Cormontaigne's variations from Vauban's trace are unquestionable improvements

4, The Modern System.

The Modern System, which is shown in Plate IV., fig. 2, varies little from Cormontaigne's. Its perpendicular is one-sixth of the exterior side, and the faces of the bastions are one-third. The flanks are at right angles to the lines of defence, whereas in Vauban's System they form an angle of about 82°,—which is not so good, because, in the Modern System, the guns placed in the flanks can fire straight along the ditch without being moved or turned on their platforms. The ravelin is formed by setting off points 34 yards from the shoulder along the face of each bastion ; a line joining these points is the base of an equilateral triangle, the vertex of which, opposite the centre of the curtain, forms the salient angle of the ravelin. The re- doubt of the

ravelin is formed by drawing its faces parallel to those of the ravelin from the shoulder of the parapet of the bastion ; and it has flanks With a ditch about 20 yards in breadth. The cavalier in the bastion is drawn parallel to the faces of the bastion, at the distance of 48 yards from them. The ditch of the faces is 10 yards in width, but there is no ditch to the flanks. In bas- tions strengthened by a cavalier retrenchment, a coupure is formed perpendicularly across the faces of the bastion ; the ditch of the coupure is 30 feet wide, and

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the counterscarp is traced from a point 36 yards from the shoulder of the bastion to meet the counterscarp of the ditch of the cavalier. This system originated in the school of military engineering instituted at Méziéres in 1750, and was for some time called the system of the school of Méziéres. It has, however, been much im- proved since ; and the system which is now recognized as the " Modern System" is that of General Noizet. Referring, however, to fig. 2 of Plate IV., it will be seen that coup- ures have been introduced in the faces of the ravelin; and as the ditch of the ravelin in this system is less by 7 or 8 feet than the main ditch, there is a sufficient fall be-

Scale of Metres = 10 00r

% , }

0 10 20 80 40 50 60 70 80 90 100

Fic. 63.—Half-Front of the Modern System.

| tween the two to check the enemy in his passage to the latter, whilst the demi-caponnitre is raised so much) Pp

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higher, aud therefore begins to mask more effectually the revetmeut of the bastion. In General Noizet's system this demi-caponniére is formed into an elevated mask, which tends to secure the revetment from the breaching effect of the fire from the enemy's battery on the crest of the ravelin glacis.

This is shown in fig. 63; and the system modified from the former modern system in this respect, as well as in other arrange- ments, is now the normal bastioned system of the French schools. In General Noizet's arrangement the flanks are not nade perpendicular to the lines of defence, but, as in Vauban's first system, form angles of about &0° with them. In the citadel of Ghent, which is a beautiful example of this system, but with still further modifications, the re- trenchment of the bastion is so formed as to take advantage of this construction ; and the flanks, being casemated and pierced in both directions, become on one side the flanks of the retrenchment, whilst on the other they are the ordinary fianks of the bastion, thus giving a much longer curtain to the retrenchment, which occupies the whole gorge of the bastion, than in the form exhibited in fig. 2 of Plate IV.

5. Outworks.

Plate IV., fig. 3, shows several kinds of Outworks, as a horn-work g, tenaillons & and k, a bonnette d, lunettes a and d, an entrenched bastion e, a batardeau f, and a caponnitre A. These, and other works of a similar description, are con- structed for the purpose of occupying ground which might otherwise be of service to the besiegers, or, as in the capon- niére, to cover communications ; but their application must of course depend upon localities, and the judgment of the eugineer must therefore determine in each particular case, which are the best to adopt.

PoLYGoNAL oR GERMAN SysTEm,

The Systems of Fortification of which mention has been made were devised to meet the attack of horizontal fire, but henceforward the efforts of the engineer must be di- rected to devise methods of protection against curved and indirect fire of greatly increased range and power. It is true that the efforts of the later engineers have been in this direction, but the recent introduction of rifled guns and the still more recent development of indirect fire have rendered a recourse to very different measures absolutely neces- sary.

Before entering upon the consideration of these measures, it may be well to point out that a rigid adherence to the theory of defilade, which is based on the erroneous supposi- tion that the path of projectiles is in a straight line,

and, as a consequence, that artillery can only strike that which it sees, has contributed more than anything else to detain the art of defence behind the art of attack; indeed en- gineers of great weight were wont to maintain that, if the cordon of the escarp were in the plane passing through the crest of the glacis, the escarp was perfectly covered from artillery fire. Cormontaigne and Montalembert have fallen into this error, and so in more recent times have Choumara and later writers upon the Polygonal System.

The increase in the weight, range, and energy of projec- tiles, the greater accuracy of fire, not only direct, but indi- rect, curved, and vertical, the enormous increase in the numbers of armies, and the wonderful mobility afforded to them by the development of railroads and steam vessels, by the subordination of steam, machinery, telegraphy, and other scientific applications of modern life, to military pur- poses, have rendered necessary fortresses of an enlarged and of a more expensive nature, and have led to the adoption

of a system of defence more simple, and based upon broader principles.

FORTIPICATSA OF

The Bastioned Trace designed to afford from uncovered flanks a complete defence to the escarp of the body of the place can accomplish this end no longer, since these flanks

Power of English Siege Artillery.

Penetration at 1000 yards with common shell.

Remarks,

Concrete Masonry.

The two penetrations marked (*) are with battering shell.

With brick ineement the penetration is about one half that with brick in mor- tar.

{ This is in sand- stone. There iy hardly any pene-

in.| ft.in.| ft. in.| ft. in.

Siege Guns. ‘ M.L.R. 64 Prs./17 0/7 0/8 OF]4 6! 0 114*

40 Prs.|16 0}6 0/2 0 |1 6430 6

25 Prs.}10 0/4 6/1 8 |1 0/0 8 tration into granite, H but the blocks split, |:

V.B.—The penetration of the siege howitzers is comparatively small. The low- est effective velocities against revetments are considered to be from 450 to 500 feet a second. can now be destroyed by the fire of distant artillery, and the faces of the bastions themselves can be ricochetted from an equal distance.

Moreover, this trace, in which the relations between the length of the front, the depth of the ditches, and the com- mand of the enceinte are obligatory, is difficult of applica- tion, and weak in its direct artillery defence, inasmuch as a portion of the rampart which should be available for the defence is withdrawn for the service of the flanks and cur- tains.

In the Polygonal Trace,—which requires no inter-relation between the length of the front, the depth of the ditches, and the command of the body of the place, in which the exterior sides may at pleasure be longer or shorter within the limits of musketry fire, and the line of parapet may be in- dependent of the line of ditch, —these defects disappear, and its application to every variety of ground is more easy and more economical. As, too, the flanks are entirely protected from distant fire, and the faces are not exposed, or are far less exposed, to ricochet than in the angular traces, the poly- gonal trace offers greater facilities for the employment of artillery as the priucipal arm of defence, while it has yet another advantage, viz., that its communications are far more simple.

The main difference between the Polygonal and the Bas- tioned Systems lies in the arrangements for the defence of the ditches. In the latter it is provided by the flanks of the bastions, in the former by caponniéres, powerful casemated works, constructed across the ditclies. In the flank of the bastion the guns are exposed, and limited in number by the length of the flank; if the flank be lengthened, the face of the bastion must be shortened,

thereby diminishing the direct artillery defence of the bastion, or the flanked angle of the bastion must be diminished, rendering the faces— already too liable—still more liable to enfilade. Moreover, a second or lower tier of casemated guns cannot be added to the flank of the bastion without the suppression of the tenaille and consequent exposure of the curtain; whereas the caponniére may be increased in length to any reasonable extent, and may be in two tiers. Again, in the bastion the flank is enfiladed by direct fire on the adjoining face, and is taken in reverse by the enfilade of that face, and by the direct fire against the opposite face and flank. Lastly, in the Polygonal System a direct fire can be given upon the capital of the angle, while in the Bastioned System this capital is undefended.

The advantage of this system in direct artillery defence

PeoV.

PerTiWnirCATION

appears to be 100 per cent. Brialmont—no mean authority —states it at from 25 to 60 per cent., or even 100 per cent., if the artillery of the outworks is left out of calculation. In a comparison of the fortress of Posen, which is a faulty application of the polygonal system, with an equally strong fortress on the bastioned system, it has been calculated that the siege park of a besieging army would require 20 per cent. more guns for the attack of the former; and the writer goes on to state that more siege materials, a greater development of batteries, a greater number of troops, and a larger park are necessary for the attack of the polygonal as compared with the bastioned system.

Unquestionably, long exterior sides are advantageous for fortresses ; and admirably, as lias been shown, as the poly- gonal trace 1s adapted for fortresses, it is equally well adapted for detached forts, which are often so small that the bastioned trace is inapplicable to them.

The most complete application of this System to a great fortress may be seen in the enceinte of the new fortress at Antwerp, one front of which is shown in Plate V.

In this enceinte the main ditch is wet and wide, and flanked by a powerful central self-flanking caponniére ; the flanks are retired and protected by orillons, and the curtain between the latter is broken into two half curtains, separated by a defensible barrack, which forms a retrenched cavalier, The central caponniére is separated from this curtain by a ditch; it is, moreover, covered by a counterguard of two branches, revetted with a loopholed counterscarp gallery from which the countermines diverge ; this is further covered by a ravelin of two branches, terminating at the salient in a powerful reverse casemated battery; the ditches of the ravelin are flanked by low casemated batteries. The ex- terior side is 1100 yards long, the perpendiculars from the centre of this side marking the saliency of the caponnidre and the retirement of the centre of the curtain are 104 yards and 71 yards long respectively. The curtain is 250 yards long; the flanks, which are not straight, are formed of two sides, 34 yards and 12 yards long. The flanks of the caponniéres are 27 yards long. The salients of the counterguard and ravelin are 190 yards and 295 yards in advance of the exterior side, and the branches of the latter are directed upon points on the exterior line 245 yards on each side of its centre. The front of the defensible bar- rack is covered by the central caponniére, and the flanks are 84 yards long, forming angles of 100° with the front. The main ditch is 88 yards wide at the salients, and 95 yards wide in front of the orillons 3 the ditch of the ravelin is 66 yards wide at the salient, and 55 yards wide at the low casemated batteries of its flanks. 'The ditches are unrevetted, with slopes of two-thirds, except at the head of the central caponniére and in front of the curtain and flanks; the depth of water in them is 10 feet, and its surface is 6 feet below the plane of site ; the berms of the enceinte and of the ravelin are 16 feet and 6 feet wide respectively. The command over the country is, in the body of the place, 32 feet at the salients, falling 14 feet to flanks and curtains, in the ravelin 15 feet, in the Counterguard 21 fect designed that the outworks may not obstruct the fire of the body of the place; in the caval- lers of the salients the command rises to 41 feet. The Parapets are slight, not more than 27 feet thick, but they have very wide terrepleines, and are provided with hollow traverses and large bonnettes, The ramps leading to the terrepleines are unusually wide. The guns are either On carriages firing over a 5-feet parapet, or on siege GE SR tenet cnn ls ee ot

- *The German engineer Rimpler, writing in 1673, says that, not being agreed with respect to principles, engineers have disputed about insignificant details, while they have neglected two most important Conditions, protection for the garrison from the besiegers' fire, and the Concentration of a more powerful fire upon the besiegers.*

carriages firing from raised gun banks. The armament is heavy, especially in the central caponnidres and flanks ; an the former, 22 guns on each: face, viz., 16 in casemates and 6 in open battery above, in the latter, 14 guns in two tiers, The ravelin has in addition to the guns on its faces 8 caso- mated guns in its reverse battery of the salient, and 12 casemated guns in its two low batteries; and provision is made for armouring the embrasures of these. The covered way is 22 yards wide in front of the body of the place, and from 9 yards to 15 yards wide in front of the ravelin. The communications with the country are wide and ample, two through each front; they are also level, very direct, and convenient for sorties.

Epitomized as this description has necessarily been, it will be seen that advantage has been taken very skilfully of a low site and wet ditch, which while offering serious obstacles to the enemy impede as little as possible the offensive operations of the defenders. For the effective de- fence of the fortress, however, a strong and well-handled garrison, prompt to assume offensive measures, and a large armament are necessary.

The city of Antwerp, Plate VI, lies upon the east Plate VI.

bank of the Scheldt, and was originally closely girt by works of the bastioned trace, of which the last remnant, viz., the old citadel, which joined the new enceinte to the river on the south west, has recently been removed. This enceinte consists of 11 fronts of polygonal trace in two lines, of which the 6 on the south and east line are about 2300 yards, and the 5 on the north line are about 1800 yards from the town, and are closed upon the river to the north by the new citadel, a work of con- siderable size and of the polygonal trace also. The fronts are about 1100 yards long, but the two lines join in rather an acute angle ; and to compensate for the weakness of the enceinte at this angle, an advanced ravelin has been con- structed on

either side which prevents the lines from being enfiladed. The length of the enceinte is about 7 miles ; butas this line of defence would not keep an enemy beyond bombarding range from the town, a line of 8 detached forts has been constructed about 4000 yards in advance of the enceinte.?_ These forts, also of the polygonal trace, are placed about 2200 yards apart; they close on the river on their right, and, extending over a circle of about 10 miles, rest upon an inundation on their left. Both fronts and forts are very strong, and form a great intrenched camp of about 17,000 square acres in extent. The forts are of the same trace, have wet ditches about 50 yards broad, unre- vetted scarps, and bomb-proof accommodation for 1400 men in each; so that to fully garrison the enceinte and the forts about 25,000 men are required. On the west side the river runs in a deep re-entering angle towards the city, and four forts about 2200 yards apart close the space be- tween its bends, and form a very strong defence, placing the city upon this side out of reach of the assailant's fire.

In England the polygonal trace has of late years been Plate VII.

habitually adopted as the most suitable for general pur- poses, but it has not hitherto been found necessary to have recourse to a regular and continuous system of forti- fication, the insular position of the country, and its pre- dominating strength at sea, calling merely for the forti- fication of the principal dockyards and military ports, and for the defence of the more important and more exposed harbours. The defence of the military ports is partly on the water and partly on the land, and has been so arranged in the more important ports that they form large naval and military intrenched camps. See Plate VII.

As with modern artillery bombardment is practicable at distances of from four to five miles, the works of defence

——————————— *eee 2 A second and still more advanced line of detached forts has been commenced considerably in front of this line. 1X, — 57*

have been disposed with a view of keeping an enemy at | protected with shields or walls of iron upon their sea fronts,

not less than that distance from the dockyards. and when they stand alone in advance of the channel are Upon the sea fronts the works consist generally of iso- | constructed with a continuous iron wall. The various modes

lated forts, placed, according to the width of the channels, | in which the iron composing their armour is disposed will

at intervals of 1500 to 2500 yards; these forts, being ex- | be discussed in a future paragraph. The power of heavy

posed to the very heavy rifled guns which form the arma- | rifled guns is shown in accompanying table.

ment of the largest iron-clads of the present time, are Upon the land fronts the forts are ordinarily placed at

Table showing the power of the present English Armour-piercing Guns, and of a few of the corresponding Foreign Guns,

ss Remaining at 1000 | Penetration Muzzle; di in inches in- Battery to unbacked

Nature. = 34 Charge. j ' wrought Projectile. Velocity. | Energy | Velocity. | Energy | iron plates

Feet per | in Feet per in at 1000

Tbs. Ibs. second. | Foot-tons.| second. | Foot-tons. yards.

The muzzle energy has since 17 in., 100 tons. | 2000 | 375 1545 | 33000 22 reached 41,000 foot-tons,

Heavy English DE he olive

Wrought iron.

$$ 16 in., 80 tons. 12°5in., 38 tons.

ll in., 25 tons.

It is proposed to increase the . 10 in., 18 tons. length of this from 14°55 to 21 calibres. ;

9in., 12 tons. “| 1420 3496 1236

The 7-inch of 6°5 tons may

7in., 7 tons. 1525 1835 | 1261 1265 be taken as the same.

oe

~~ “eet -89| 1371 | 10054 | 1257 | 8451

56°5 ton.

se te ae 14in. (8556cent.),, 1443 | 1631 | 21077 | 1515 | 18186 | 18-0 | Steel. 1312 1185 | 1112 760 5°56 | A bronze gun.

BLR 1096 1440 813 6°0 | Steel.

results. But the garrison of a small fort can never be in a position to undertake such measures; it must always re- strict itself to a passive defence, whereas the garrison of 4 large fort will be able to act offensively, will be in better heart, and better commanded. Brialmont, speaking of small detached forts, says that one of the inconveniences of works of mutual defence is to require a great number of com- mandants, while in the best armies the men fit to command a fortified place are few.

The trace of these forts is very simple. It ordinarily consists of five sides, the longest of which fronts the enemy;

intervals of about 2000 yards, though these intervals vary according to the nature of the ground. Where the ground is uneven they are smaller, but where the ground is level 2000 yards should be the least interval, and the forts should be of considerable size ; beyond this distance the movement of troops becomes indistinct, and the support afforded by

Qq ,

Fie, 64.—Plan of Sea Fort, with continuous Iron Wall. The piers

marked (*) are filled with concrete. — Fic. 65.—Section through AB of fig. 64.

the flank defence of the ditches is provided by three ca ponniéres, one in themiddle and one at each extremity of the front face. The ditches are deep with good scarps, and the defensive power is increased by a keep, which is separa

one fort to another is lessened, especially at night and in thick weather. A strong reason for constructing large rather than small forts is that at night or in thick weather offensive measures may often be resorted to with the happiest

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FORTIFICATION

from the fort by a ditch. There is sufficient bomb-proof cover for the garrison and munitions of war, and the faces are well traversed, while special arrangements are made for the service of the ammunition. The general arrangements may be readily perceived by a reference to the accompany- ing plan (fig. 64) and sections (figs. 65, 66).

Between the land fronts and the sea fronts the circle of defence is com- pleted by coast batteries. These batteries, which are constructed of earth, con- crete, or granite, are of various types, with em- brasures —_ pro- tected by iron shields when near the sea- level, but when / upon heights = not below 100 feet above the sea level, with unbroken parapets, the gun firing over a height of 4 feet 3 inches, the cover for the gun detachment being provided by a "sunken way," 3 feet 9 inches wide and 2 feet 10 inches

deep, between the platform and the parapet. Over this sunken way, which is provided with rails, a 'loading stage" travels, upon which the charge is brought immediately under the muzzle of the gun,

Though at this and heights above it the "sunken way" affords fair protection to the gun detachment, except at the period of loading and pointing, yet, at these periods, the men employed upon these services are highly exposed, and at all times the gun itself stands high above the parapet, and offers a good mark to an enemy's ship. Some form of " dis-appearing carriage," upon which the gun is raised above the crest of the parapet at the moment of delivering its fire, and falls by the force of its recoil to a safe position for loading below the parapet, has long been sought for by artillerists. Such a carriage was proposed by Corneille Redeichkeit in

1775 for the defence of the covered way ; but his system, which depended on cords and counterweights, was too cum- brous to move from place to place, and liable to be readily put out of order, and was abandoned. Other inventors endeavoured to attain the same end by the use of eccentric trucks and axletrees so disposed that the gun was on the greater axis for firing, on the smaller for loading; but the difference between the heights of the gun in the two posi- tions was so small that this idea was also abandoned. Two guns were next yoked together by ropes, so that one falling from the firing to the loading position raised the other from the loading to the firing position. General Chasseloup, Who proposed this twin-gun system, was occupied thirteen years upon its consideration ; and though a mode proposed by him, by which one gun recoiling down one inclined plane drew its twin-gun up a similar adjoining inclined plane, Was tried with some success at Milan, it does not appear to have been adopted elsewhere. The matter then rested until Moncrieff produced his counterweight carriage, in which the recoil, while carrying the gun and carriage under cover to the position for loading, raises and holds up, by means of elevators, a heavy counterweight; this counterweight, when the time for firing arrives, is set free, and by its descent raises the gun to the firing posi- tion over a parapet 9 feet high, behind which the gun detachment find ample cover—one man only being exposed While laying the gun. The main objection to this system

18 the great weight of the accessories, which for the 7-ton gun amount, including the carriage, to 20 tons. This has

Fia. 66.—Section through CD of Fig. 64.

rendered it impossible to apply this counterweight system to guns larger than 7 tons, and even to these its application is very limited. This system is costly and difficult of exe- cution as compared with barbette batteries, and as com- pared with casemated batteries is far less secure against plunging and vertical fire, which cannot fail to strike some one of its many parts, a slight injury to any of which must put the gun out of action. It is asserted by its partisans that it can be applied to hill sides, so that the presence of a battery of such guns shall be undiscernable by an enemy; but this assertion is not well founded. So much skilled labour is required for the construction of Moncrieff pits that they cannot be improvised, and when made they are by no means invisible. This system has been used to a limited extent by Great Britain, but has not been adopted in other countries. Brialmont, after describing it, says, " We should not be able to share the infatuation for the Moncrieff carriage which has been manufactured in England"; and, he adds, it is easy to foresee that the earth and rubbish which will be thrown into the battery during the combat will render the working of it slow, difficult, and, in some cases, impossible. Certainly the carriage is complicated, and could not be repaired during action.

In earthen batteries protected with iron shields the para- pets between the guns are comparatively weak, and, if they be increased in thickness so as to afford sufficient protection, they trench upon the interior space, and inter- fere with the service of the battery. The parapet can, however, be strengthened by the insertion either of blocks of cement concrete or of plates of iron.

But as under given conditions the disposition and thick- ness of armour plates remain the same whatever be the nature of battery or fort in which the armouring is placed, the mode only in which the armouring is fixed being varied to suit the circumstances of each particular case, it will pro- bably best meet the purpose of the present paper to give a short summary of

the rise and progress of iron armour in its application to works of defence, illustrated by drawings of the most recent construction of each type of work.!

Attention first began to be directed to the application of iron to works of coast and harbour defence about the year 1860. At that time armour was being extensively applied to ships of war, and the manufacture of rifled guns had received considerable development, but iron had not been employed for the protection of defensive works, and nothing was known as to the best principles of construc- tion for iron defences or for the capability of this metal for resisting heavy blows. It was soon perceived that it was necessary to have recourse to experiment in respect to every detail of material aud construction, and it was laid down as a fixed rule that no detail should be adopted until it had obtained the stamp of experience. Previous to the period of which we are treating an advance in this direction had been madein America in 1855, by the application of metal (lead) concrete to masonry embrasures (but this did not withstand the smooth-bore guns of that day), and at Portsmouth in 1859, by the construction of an embrasure shield, 14 inches thick, of rolled iron bars, which opposed a fair resistance to wrought iron shot from the 68- pounder smooth-bore gun, the most effective gun at that date. In 1860 the most important of the preliminary trials took place against an ordinary embrasure with an iron throat 8 inches thick. The guns used were the 40-pounder, 80-pounder, and 120-pounder (shunt) Armstrong rifled guns, and the 12-ton gun, with cast iron shot. The em-

1 In this part of the subject the writer, in addition to other sources of information, has availed himself of a compilation prepared by Colonel Inglis, R.E., who has designed the principal part of the iron- work of the English sea defences, and who is the highest authority upon iron constructions employed for defensive purposes,

Plate VITO.

brasure gave way, and it became apparent that the accuracy of rifled guns rendered splayed embrasures inadmissible in such positions. About this

time, too, experiments with plates of various thicknesses in different positions—vertical, and inclined at angles varying from 10° to 60° with the horizon—showed amongst other results that a given mass of armour plates in a vertical position offered as much resist- ance as the same mass disposed over the same vertical height in an inclined position. In all these experiments the backings and fastenings occupied important positions. Tar- gets were accordingly made with elastic backings, without elastic backings, and with compound backings of various kinds; but the general result of trials against these targets was to establish the advantage of elastic backings. The armour plates were fitted mechanically without bolts or rivets, were fastened with bolts, and were fastened with continuous rivetting round their edges; the result of the experiments established the superiority of bolts as fast- enings for armour plates. Many more experiments had, however, to be made before the proper form of bolt was settled; these were by no means the least interesting of the experiments made in working out this subject, but space does not avail to give the history of them here; and it may be sufficient to say that a bolt has been adopted about 3 inches in diameter in the shank, or rather less than the lesser diameter of the screw, which has a rounded thread (about 6 to the inch) and a shallow rounded cut; that the bolt holes are made one inch larger in diameter than the bolts; that the edges of the holes are coned, and that cupped washers receive the nut on the inner end, which is cup- shaped (as is the washer of the front of the bolt) as shown in Plate VITI.; and that various minor arrangements have been made for inducing gradual action, and so relieving suddenuess of strain upon the bolt. Finally these bolts are made of special iron of a fibrous nature, and elongating from 35 to 45 per cent. under pressure.

The law of the resistance of armour plates received early investigation during the course of these experiments. Sir W. Fairbairn, supposing that the resistance of armour plates to the impact of a shot was analogous to the resistance of plates to a punch, deduced this general formula (C being made equal to 3,374,900) :—

Thickness of plate perforated = of meee

*CR **

Sir W. Armstrong endeavoured to ascertain the resist- ance by the application of the dynamic theory of heat. Captain Noble, R.A., from many experiments, concluded that the penetration of steel shot is directly proportional to the work in the shot, whether a heavy shot with a low velocity or a light shot with a high velocity be employed ; and that the resistance of armour to steel shot varied as the $ power of its thickness. But Captain English, R.E., who appears to have treated this subject most scientifically, considers that the energy absorbed by a plate in resisting a shot is made up of the energy expended in enlarging an indefinitely small hole through the plate, and of the energy absorbed in frictional resistance, and is equal to the cube of the diameter of the shot multiplied by a constant —a separate constant being required for each proportion to the diameter of the shot, of depth of indent in the one case, and thickness of plate in the other.

Having obtained a law which can be relied upon for thick armour plates (it is not, however, applicable to very thin plates), the mode in which the iron in an armour- plated wall should be disposed, z.e.,in one solid plate or in two or three thicknesses of plates, was shortly settled. A com- eae of experiments against 7 inches of iron armour plate hes fe eee two, and three thicknesses gave resistances

portion of 100, 96, and 89. Further experiments

against single and double plates of 5 inches showed tliat . the double plate offered nearly three times the resistance of | tle single plate ; and finally a comparison between a 15-inch

plate and three 6-inch plates showed that though the solid

plate offered slightly more resistance to a single blow it broke up sooner under repeated blows than did the three plates ; but as, of course, there is a limit in manufacture to

the mass of an armour plate, it is evident that the thicker

the plate the more numerous will be the joints ina given

area, and if the armour be in one thickness, all these joints

are lines of weak resistance. The disposal of the joints, then,

is a matter of first importance in designing iron structures,

and in this respect the arrangement in several thicknesses, or

the plate upon plate system, as it is called, offers the greatest advantage, for the plates can be soarranged that no joint goes . through more than one-third the thickness ; moreover, this system is more easy and more economical in construction, and

can be strengthened with greater facility at any future time.

In order to put the conclusions arrived at to practical test, a shield for a casemate opening 12 feet long and 8 feet high was constructed of three 5-inch plates placed at inter- vals of 5 inches, the intervals being filled with iron concrete ; the plates were whole, each covering the entire opening, and each was bolted to the plate next to it, the imner plate being bolted to the shield frame in rear; the front plate was secured by 10 bolts, the others by 8 bolts each; the total weight of the shield was 56 tons 8cwt. It was struck with 16 shot from 25-ton, 18-ton, and 14°5-ton muzzle. loading rifled guns at 200 yards distance; the average energy of each blow was 5321 foot tons, and the aggregate 90,000 foot tons,—upwards of 1000 foot tons per foot superficial of the shield's face ; but the shield was not driven out of shape, and its back or interior face was uninjured.

This experiment was so satisfactory in its results that henceforward there was no hesitation with respect to the broad principles of armour construction, and it only re- mained to adapt these principles to the different cases which presented themselves. These are sufficiently illustrated by the drawings in Plates VIII. and IX. The first is an Plates open battery shield for an opening 9 feet wide and 7 feet Vill. high; the second is an ordinary casemate shield 12 feet _ wide and 9 feet high, and the third is a portion of an iso- lated sea fort with an exterior iron wall. The application of iron has facilitated improvements in the construction of the roofs of bomb-proof buildings, and the form of roof shown in the sea fort may serve

as a model of construction of this kind. It is composed of arch plates of #-inch iron curved to a radius of 5 feet 6 inches, springing from iron girders 1 foot 9 inches deep and 1 foot 2 inches wide. The arch plates are covered with brick arches, which are again covered with 3 or 4 feet of Portland cement concrete. This roof is equal to a load of one half ton per foot superficial, with a tensile strain upon the iron not exceeding 5 tons per square inch. Such a roof covered with 5 feet of earth was tested by vertical fire of 13-inch mortar shells at 1000 yards. The few rounds which struck it produced no effect, | and after the 298th round practice was discontinued ; but the earth was removed, and the bared concrete was struck by a shell, which only produced an indentation of 8 inches.

The cost of iron structures is, however, a drawback to their more general employment,—so much so that only wealthy nations can afford to erect them, and but in limited numbers. 'The cost of an open battery shield may be stated at £800, its weight 10 tons; of a casemated shield, £1800, its weight 40 tons ; of an iron-walled fort, £5550 per guy, its weight 125 tons per gun.

It is, however, to be observed that, in special cases where the forts are constructed in very deep water, and where, consequently, the increase in the quantity of masonry 1 the substructure becomes very great fcr every additional foot

- te X,

of radius, an iron-walled fort, which admits of the guns | form of construction. With an armament of breech-loaders, being placed in a comparatively very small area, is the most | the turret might be reduced in internal diameter ; the port

economical method of construction, and tliat for constructive purposes a circle is the best form of such fort. _ Ss

In all forts designed for very heavy guns special provision becomes necessary for the ammunition service of the guns. The cartridge and shell stores are kept separate, aud are pro- vided in the proportion of one of each for each gun, or each pair of guns. Asa rule, these stores are securely placed in the basement under the gun they supply, the cartridges and projectiles being raised by mechanical appliances through "lifts" in the heart of the building to the rear of the gun. The ammunition stores are lighted by lamps placed in "licht chambers," separated from the stores by thick plate glass; these "chambers " are entered from passages entirely distinct from the passages used for the service of the am- munition. The proper organization of the ammunition service is of the utmost importance for the efficiency of the fort; by it the labour of the gun detachment is lessened, and the rapid service of the gun facilitated. Each gun chamber is in speaking communication, by means of tubes, with its own ammunition stores, so that the men in the latter, though absolutely shut in below during action, still form part of their own gun detachment. Finally, the guns of the fort are collected into groups for purposes of command, and the guns of each group are directed from a "look-out" place constructed on the top of the fort, which is in speaking communication with each gun of the group.

Tt has been found that when armour is struck by a shot, lining of some kind is necessary to deaden the effect of vibration and sound, and to act as a target to receive, and protect the gun detachment from, splinters thrown off from the interior. This lining should be flexible, so that it may be drawn close round the gun while it is being discharged, thereby keeping the smoke out of the gun chamber, may reduce the effect of blast and concussion, and may prevent splinters and balls entering through the port. No material has been found to answer so well as rope, and " mantlets," as such appliances are called, are now invariably made of this material. The only drawback to rope is its liability to catch fire, but this is entirely obviated by washing it with a saturated solution of chloride of calcium.

There are two other forms in which iron has been applied which should not be passed by without notice, viz., " curved- fronted shields" and "turrets." In the former the case- mate is of the ordinary character, but the shield frame, which is constructed with a sharp curve of 13 feet or 14 feet internal radius, is more difficult to make, and more costly. Two ports of the usual

dimensions are formed in the shield, and the gun is placed behind it upon a turn-table, on which racers are laid so that the gun will fire through a lateral arc of training of 60° at each port. The gun is trans- ferred at pleasure from one port to the other by the move- ment of the turn-table, and commands an arc of 120°. The Weight of iron is 150 tons per gun, the cost £7500 per gun; but in considering the cost of this arrangement it should be observed that by it one gun does the work of two.

In the turret one or two guns are placed in the interior of a cylindrical wall of iron armour closed overhead with ordinary bomb-proof covering. The turret with its con- tents is revolved by steam or other motive power, so that each gun commandsa whole circle. Various arrangements have been designed for the service of the gun,—in one thie loading is done inside the turret, in another under the glacis, in a third while the turret is being turned to the rear,—-but whatever the arrangement, no time need be thereby lost, as the guns may be so placed that one revolves into action, while the other revolves out of action for load- ing. It would seem that a breech-loading arrangement for

avy guns would lend itself more readily to the turret

opening need be no larger than the chace of the gun, which would not have to be withdrawn for loading, and which is laid by means of a small aperture contrived in the roof of the turret—the man who lays the gun having the machinery under his hand, and "training" the turret and gun himself in any direction. In turrets provision is made in the basement in the usual way for the accommodation of the garrison, and for the storage and service of the ammunition, as well as for the motive power and machinery. Special arrangements are made for ventilation and for the escape of smoke. The surface of the exterior to a certain distance in advance of the turret is plated with iron and sloped up- wards "en glacis," so as to cover the base of the turret, and protect the turning gear from dislocation under the blows of heavy projectiles. See Plate X., fig. 1.

_ Before quitting this subject it may be well to offer a few remarks on the employment of cupolas or turrets on land defences. Hither of these forms of iron construction may be advantageously employed in advanced positions where it is necessary to retain guns until the very last—such as the salients

of ravelins, and in the angles of fronts of fortifica- tions ; also in points which are commanded from heights in their vicinity. As these constructions are indestructible by the direct fire of siege guns, and are absolutely safe from enfilade and reverse fire, they confer very great advantages upon the defence. They should mount heavier guns than can be brought against them; they cannot be silenced by the concentration of any number of light guns, and, judici- ously used, they should place the artillery defence above the artillery attack. They render the construction of the first batteries of attack far more difficult, and force them to open at a greater distance from the place; and, at any period of the attack, they can meet its artillery with heavier metal. The guns of the attack are practically limited to about the calibre of the 64-pounders, and comparatively light armour will withstand these, and will preserve in security and render more easy the service of guns at least two calibres higher. Such constructions have been made by the Belgians in the detached forts round Antwerp and in Antwerp; by the Germans in the detached forts round Metz and in Metz, on the Rhine, and on the Weser; and by the Russians. In England there has as yet been no occasion to resort to them.

In some at least of the places mentioned above, a system of construction and a material advocated by Grusen have been employed ; a type is shown in Plate X., fig. 2. The plates which are made of chilled cast iron manufactured by the Grusen process, are fitted together, without screws or bolts, in a simple manner. Lach plate is a segment of the cupola, and is grooved at the edges; the segments are placed in position, and melted zinc is poured into the grooves, form- ing a close and solid joint. A glacis similarly constructed protects the base, which is set in motion by hand machinery. The interior arrangements do not differ in principle from those described above for turrets. It is said that such a turret weighing 133 tons can be made to revolve round the whole circle by four men in three and a half minutes. Its cost is about £16,000.

The Grusen metal is reported to have a very hard exterior surface, with great interior toughness and tenacity, and may probably be used with advantage in cupolas for land defence ; but the experience in England does not lead to the conclusion that it is a suitable material for resisting the extremely heavy projectiles carried by the war ships of the present day.

Particular attention has been directed to the nature and manufacture of armour plates in Britain, and, up to the present time, the results afforded have been most satisfactory. The iron employed is best described in

the wording of the specification for manufacture, viz.:— "The plates must be soft, fibrous, thoroughly welded, and capable of offering good resistance to cannon shot, without indication of brittleness, and without the separation of the several moulds of which they may be composed." This Specification was adopted after many experiments with hammered and rolled plates, in which the former, in conse- quence of the absence of fibre, conspicuously failed in com- parison with the latter.

The best material for armour plates is, however, again prominently under consideration ; so great an increase in penetration was obtained with chilled iron shot that the manufacture of steel projectiles was stopped as far back as 1866. Great advances have since taken place in the pro- cesses by which steel is made, and steel projectiles of great penetrating power have recently been under trial; by the use, too, of prismatic powder disposed in cartridges with a definite amount of air space, by which the combustion is rendered more gradual and more thorough, a far higher velo- city is obtained with a materially diminished strain upon the chamber of the gun. This has rendered it possible to enlarge the chambers of the heavy guns and to increase their lengths by several calibres, with a resulting increase in energy of about one-third, so that a plate which would keep out a projectile of 800 ib weight from a 38-ton gun will now barely keep out a projectile of 400 ib from an 18-ton gun. It is not impossible, however, that by a combination of iron and steel the resistance of armour may be again brought up tothe penetrating power of projectiles. During this consideration many curious and unexpected results have been obtained, but they have not been reduced to such a form at present as to modify what is stated above. The whole question is, however, full of interest, and will, it may be 'anticipated, receive considerable development before long.

ARMAMENT OF FORTRESSES.

The Systems of Fortification having been briefly described, it is right to say a few words here respecting the means

of defending a place after it has been fortified. It is,

difficult to lay down exact rules as to the proportion of ordnance, ammunition, and stores of all kinds required for the defence of a fortified place, seeing they must necessarily vary according to the particular situation of each fortress, the system on which its works have been constructed, and the species of attack to which it may be exposed. If, for example, one of the sides be covered by a morass, swamp, or other obstruction which it is difficult or perhaps impossible to surmount, it must be obvious that a smaller proportion of artillery will be required than if the fortress were equally accessible on every side; and, on the other hand, a mari- time fortress, accessible at all points, will necessarily require for its defence a larger proportion of ordnance than if it were only assailable on one or a few of these points. Where every front is equally exposed to attack, all must be equally prepared.

On this subject, however, certain maxims have been established, of which the following appear to be the most im- portant. First, the proportion of ordnance, ammunition,

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and stores should never exceed the quantity necessary for |

a brave and resolute defence. Secondly, those fronts which are considered the most exposed to attack should be the most completely armed, whilst a partial armament of the remaining fronts may suffice. Thirdly, to the front to be attacked the following pieces of ordnance should be allotted, viz., to each Bastion, 1 for the salient, 5 for each face, 3 for each flank; to the Ravelin, 5 for each face; to the Lunette, 3 for each face, and a few pieces for the places of arms in the covered-way ;—so that if one front be completely armed, the proportion of ordnance will be

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17 for the Bastion, 10 for the Ravelin, 6 for the Lunette, and 6 for the places of arms,—in all a total of 39 pieces for the front. This proportion is less than has been fixed by many authorities, but the range and accuracy of guns has so increased since the introduction of rifled ordnance that it will be necessary to provide a traverse for every gun on the most exposed faces, and this, while it affords security to the artillery, materially diminishes the space available for mounting guns. It may be thought by some that this arrangement provides too much traverse shelter, but a few well-protected and well-served guns are better than double the number in exposed positions, Fourthly, when a place is exposed to attack on two con- tiguous fronts, the armament of each should be augmented one-half; when it is threatened with attack on detached fronts, the armament should be doubled. Fifthly, each of the other fronts should merely be provided with such a proportion as to secure it against insult. From this it may be assumed that a hexagon having only one front liable to attack should be completely armed on the two adjoining fronts, and that about seven guns per bastion and seven per outwork will be sufficient for the remaining frouts, and that a total of 178 pieces of ordnance will be sufficient for a hexagon.

The next consideration is the proportion which the several kinds of ordnance should bear to one another. Ord- nance of the higher calibres is not the only ordnance which ought to be employed; in many cases medium and light guns are more efficacious ; for when only troops or working parties are to be fired at, light guns will answer every pur- pose ; their range is nearly equal to that of larger guns, and they are more manageable and may be worked with greater rapidity. Short guns of heavy calibre which throw heavy charges of case and shrapnel are best adapted for the flanks; and, generally, the largest or heaviest ordnance should only be employed to destroy the besiegers' batteries and dismount their guns. The light guns, as they can easily be withdrawn, should be placed in the covered-way, in the places of arms, and in the outworks of every descrip- tion. The heavy guns and mortars, which are not so easily moved, should be within the body of the place, and as they require large charges of ammunition, they should be less frequently used, and only upon urgent occasions. A judi- cious economy of ammunition isa duty incumbent upon every commandant of a fortified place. The conduct of General Chassé in the defence of the citadel of Antwerp was a model in this respect. From the commencement till the close

of the attack, scarcely a single shot was needlessly expended by the garrison.

ATTACK AND DEFENCE OF FoRTIFIED PLACES.

Having brought the discussion of Permanent Fortifications to this point we may now consider the attack of fortified places, the general system of which was introduced and perfected by Vauban, so that it has ever since served as @ model for the plans of his successors,

“La résolution des siéges,” says the Marshal, “est une affaire de cabinet. Elle est une suite naturelle de la supériorité que l’on croit avoir sur ses cnnemis ; mais leur exécution étant une des plus sérieuses, des plus importantes, et des plus difficiles parties, elle

| demande aussi le plus de mésure et de circonspection.” He then

goes on to state that the success of sieges depends on several cir- cumstances, such as “1. Du secret, sans lequel il est difficile de réussir; 2. Des forces que l’on a sur pied pour attaquer les places

des ennemis, et défendre les siennes; 3. De la disposition des —

ennemis ; car s’ils sont réunis, et aussi forts que nous, ils peuvent nous empécher d’en faire; 4. De l’état des magazins les plus

portée des lieux sur lesquels on peut entreprendre ; 5. De la con- Joncture des tems, parce que tous ne sont pas propres aux siéges, et rien n’étant plus ruineux que ceux d’hyver, on les doit éviter tant qu’on peut ; 6. Des fonds nécessaires & leurs dépenses ; car l’argent est le nerf de la guerre, sang lui on ne scauroit réussir en rien, Ce

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sont 14 des mésures a prendre de longue main, qui doivent étre dirigées 4 loisir; et aprés tout cela, quand on croit les avoir bien prises souvent tout échappe ; car l’ennemi, qui n’est jamais @’accord avec vous, pourra vous

interrompre. . . . _ I faut bien peser toutes ces considérations, avant que de se déterminer ; et prendre toujours si bien son tems, que l'ennemi ne puisse vous tomber sur les bras avant vos établissemens,"'}

A siege, therefore, being one of the most arduous under- takings in which an army can be employed,—one in which the greatest fatigue, hardships, and personal risk are en- countered, and in which the prize can only be won by com- plete victory,—it is obvious that upon the success or failure of such an enterprise may depend the fate of a campaign or of an army, and perhaps the existence of a state. Of this the failures before Pavia in 1525, before Metz in 1552, before Prague in 1557, before St Jean d'Acre in 1799, and before Burgos in 1812 present instructive examples. By the first, France lost her monarch, the flower of her nobility, and all her Italian conquests ; by the second, she was saved from destruction, whilst 30,000 of her enemies perished ; by the third, the greatest warrior of his age, Frederick the Great, was brought to the very brink of destruction ; by the fourth, the most successful general of France, and per- haps the greatest commander that any age or country has produced, was stopped short in his career of victory ; and by the last, a beaten enemy gained time to recruit his forces, concentrate his scattered corps, and regain that ascendency of which the victory at Salamanca had for a time deprived him.

It is therefore of the greatest importance to a state that the sieges undertaken by its armies should be carried on in the best and most efficient manner possible, or, in other words, that by a due combination of science, labour, and force these operations should be short and certain, and without excessive expenditure of life. But the Sleges undertaken by the British have seldom, if ever, united;these three indispensable conditions ; and with regard to those which took place during the contest in the Peninsula, it is well known that defects of organization, particularly the want of a body of men, such as sappers and miners, trained to the labour required at sieges, and an inadequate supply of material, necessitated a partial departure from esta- blished principles and rules of attack, which led to a waste of life unprecedented in modern sieges. Till late in 1813 the army had not a Single sapper or miner ; regular approaches were therefore difficult if not impracticable. It Was necessary, in almost every case, to take the bull, as the saying is, by the horns; the last operation of a siege scien- tifically

conducted, namel , battering in breach, was amongst the first undertaken: and the troops, marched to the assault whilst the defences remained nearly entire, were ex- posed to every species of destruction which the unreduced Means of the besieged could bring to bear against them. The army of a country which has outstripped all others in the useful arts and in mechanical improvements was left Wholly unprovided with those appliances which at once economize life and labour, and serve to render both most effectual for the purposes to which they are applied. Never- theless, it may be observed that, in all periods and in all countries, the means employed for the reduction of fort- tresses have generally increased and become more overwhelm- Ing and irresistible in proportion to the advancement of knowledge and to the improvement of the useful arts; and that in Europe during the last two centuries, the extension of wealth and knowledge, accompanied by an unprecedented development of talent, directed towards military movements, has caused the results of sieges, and indeed of almost all the operations of war, to depend much less on individual

eV Attaque et de la Défense des Places, pp. 1 and 2. Hague, 1787, Ato.

exertion or casual displays of heroism, than on combina- tion and expenditure. This may be made apparent by a slight retrospect of the sieges of the 16th century.

At the period referred to, the art of disposing the severa works of a fortress so as to cover each other, and to be covered by their glacis from the view of an enemy, was un- known ; whilst the limited supply of artillery, its unwieldi- ness, and the great expense and difficulty in moving it rendered it so little available for sieges, that the chief object in fortifying towns was to render them secure against escalade and surprise, by means of lofty walls or altitude of situation. All places fortified prior to the 16th century are invariably of this construction. And as the simplicity of the fortresses to be attacked necessarily gave the same character to the operations directed against them, 80, in those days, much was effected by daring courage, without the aid of science; and gallantry in individual combat, or fearlessness in confronting danger, were esteemed the highest qualities of a besieger. 'Thus con- tests dragged on for months, in petty but sanguinary

affairs, and the most persevering or the most hardy troops, however ill organized or supplied, were the most dreaded, and not unfrequently the most successful. But when artil. lery became more movable, and large quantities were em- ployed in sieges, lofty and exposed walls no longer opposed an adequate barrier ; large breaches were speedily effected ; places which had formerly resisted for months were carried in a few days; and so, in order to restore an equality to the defence, it became necessary to screen the ramparts from distant fire. The attempt to gain security by conceal- ment rapidly advanced, whilst the means of the besiegers remained the same; and between the middle of the 16th and commencement of the 17th century works were so skilfully disposed and so well covered that the defence of towns obtained a temporary superiority over the attack. Of this the obstinate and successful defences made by the Dutch against the Spaniards during the reigns of Philip II. and Philip III. may be cited as remarkable examples?

The pre-eminence of the defence over the attack was mainly due to the great difficulty of dragging up heavy ordnance with a besieging army, so that, the weight of metal being generally in favour of the besieged, the fire of the fortress was able to subdue that of the batteries of attack. Vauban, however, in the reign of Louis XIV., restored the preponderance of power to the attack by the invention of ricochet fire, as,the guns of the besieged were thereby dis- mounted or disabled at an early stage of the siege, and the besiegers being relieved in great measure from the effects of a direct and powerful fire of artillery, were enabled to push forward their approaches by the sap. Vauban also matured into a system the attack, by laying down rules for the establishment of parallels, for the position of enfilade and other batteries, and for the general conduct of the ap- proaches. The real type of an attack is a moving parapet, the besieger carrying forward with him his cover, and thus depending for his success not so much on his offensive as on his defensive arrangements. It was by this combination of science and labour, aided by the steady advances of brave and well-trained sappers, that the reduction of fortresses which would have resisted for ever the rude assaults of the most determined enemy was rendered comparatively easy and certain,

These increased means of attack, to which it was found impossible to oppose a successful resistance, caused the art of concealment or covering to be further studied, till at length, in well-constructed fortresses, not a single wall re- mained exposed to view, and the sap and the mine became

- *Journals of Sieges in Spain, by Colonel Sir John T. J ones; Pre- liminary Observations on the Attack of Fortresses,*

as necessary as the gun and the mortar to the success of a | besieger. To render this intelligible to the general reader, a descriptive sketch of the progress of a modern attack,

from the excellent work of Sir John Jones already referred to, is introduced here.

‘The first operation of a besieger,” says that able and experienced engineer, “is to establish a force able to cope with the garrison of the town to be attacked, at the distance of some hundreds of yards from its ramparts. This is effected by approaching the place secretly in the night with a body of men, part carrying entrenching tools, and the remainder armed. The former dig a trench in the ground parallel to the front to be attacked, and with the earth that comes out of the trencli raisea bank on the side next to the encmy, whilst the latter remain formed in a recumbent posture, in readi- ness to protect those at work, should the garrison sally out. During the night this trench and bank are made of sufficient depth and extent to cover from the missiles of the place the number of men

requisite to cope with the garrison, and the besiegers remain in the trench during the following day, in despite of the fire or sorties of the besieged. This trench is afterwards widened and deepened, and the bank of earth raised, forming a covered road, called a parallel, which embraces all the fortifications to be attacked; and along this road, guns, waggons, and men securely and conveniently move, sheltered from the view and the missiles of the garrison. Batterics of guns and mortars are then constructed on the side of the road, to oppose the guns of the place, and in a short time, by superiority of fire, principally arising from situation, silence all those guns

which bear on the worksof the attack. After this ascendency 1s attained, the same species of covered road is, by certain rules of art, carricd forward, till it passes over all the exterior defences of the place, and touches the main rampart wall at a spot where it has been previously beaten down by the fire of the batteries erected expressly for the purpose in the more advanced parts of the road.

"'The besiegers' troops, being thus enabled to march in perfect seenrity to the opening in the walls of the place, assault it in strong columns, and, being much more numerous than the garrison defending the breach, soon overcome them, the more easily as they are assisted by a fire of artillery and musketry directed on the garrison from portions of the road only a few yards from the breach, —which fire can at that distance be maintained, without injury to the assailants, on the defenders of the breach until the very instant of personal contention. The first breach being carried, should the garrison have inner works, the covered road is by similar rules of art pushed forward through the opening, and advanced batteries are erected in it to overpower the remaining guns of the place ; which effected, the road is again pushed forward, and the troops march in security to the assault of breaches made in a similar manner in those interior works, and invariably carry them with little loss. But as it is always an object to preserve the life of even a single soldier, so, when time is abundant, the loss of men attendant on the assault of breaches under these favourable cir- cumstances may be avoided, by pushing up the covered road through the breach, without giving the assault, and thus, by art and labour, fe strongest defences frequently fall without any exertion of open

orce."

From this description it must be obvious that the most important object at a siege is to carry forward the covered road to the walls of the place, that all the other operations are secondary to and in furtherance of such an advance, and that hence the efficiency of armies at sieges depends upon their ability to complete the road at a small expense of life. But as this covered road advances, the difficulty increases. At its commencement, the work, being many hundred yards from the fortifications, can be performed by the common soldiers. But when the road or trench has arrived within a

fair range of musketry from the place, then particular precautions are required ; yet the work at this stage is not so difficult as to prevent its being executed by soldiers who have had a little previous training. At the last stage, when the approaches have been pushed close to the place, when to be seen is to be killed, when mine after mine blows up the head of the road, with the officers and men on the spot, when the space becomes so confined that little or no front of defence can be obtained, and when the enemy's grenadiers sally forth every moment to attack and deal out destruction to the workmen,—then the work becomes truly hazardous, and can only be performed by selected brave men, called sappers, who have acquired

the difficult and dangerous art from which they derive their

name. An indispensable auxiliary to the sapper is the miner, who in the exercise of his art requires even greater skill, conduct, and courage. 'The duty of a miner at a siege is to accompany the sapper, to listen for and discover the enemy's miner at work, and to prevent his blowing up the head of the road, either by sinking a shaft down to and meeting him, in which case a subterranean conflict ensues, or by running a gallery close to that of his opponent, and forcing him to desist from working by means of suffocating compositions, and by various arts the knowledge of which he has acquired from experience. Without the aid of skil- ful miners, sappers would be unable to execute that part of the covered road forming the descent into the ditch, not to mention other operations in the progress of which tlie assistance of the miner is equally indispensable ; and with- out their joint labours and steady co-operation, no besiegers' approaches would ever reach the walls of a fortress. In tle British service they are blended into one honourable body, the Royal Engineers.

But a siege, though it calls for personal bravery, unre- mitting exertion, and extraordinary labour in all employed, if scientifically prosecuted, is certain in its progress and its result. More or less skill and exertion in the contending parties may prolong or abridge its duration ; but the sapper and the miner, when skilfully directed and adequately sup- ported, will ultimately surmount every obstacle. On the other hand, sieges undertaken by armies imperfectly sup- plied with these auxiliaries are hazardous in the

extreme. The only chance of success consists in scrutinizing the ex- terior of the fortress, in order to discover some spot whence, from the irregularity of the ground, or fault of construction, the main escarp wall may be seen at a distance sufficiently great to enable the ordinary working parties to approach with the covered road, and there to establish batteries for breaching or forming an opening through it into the place. When this is effected, the troops advance to the assault of the breach, as in the 16th century, thus passing from the shelter of the covered road into the fire of the place at the moment when it becomes most powerful and destructive ; and as the fire of the besiegers' distant batteries is neces- sarily suspended during the assault, lest it should destroy the storming party, the garrison can with impunity mount the ramparts and employ every kind of weapon, missile, and instrument in their defence, All the chances are thus in favour of the besieged ; for should the columns of attack, under these disadvantages, arrive in good order at the brink of the ditch, they must descend into it down a wall from 14 to 16 feet in depth, which cannot fail to break their order and throw them into confusion ; and as no new for- mation can be attempted in a spot where death meets them in every shape, the assailants rush to the breach more like a rabble than a solid column. From this moment success hinges on the individual bravery of the officers and men, and the unshrinking firmness of the general commanding, in encouraging and supporting their efforts. But although these qualities, when united in a high degree, may, at @ great sacrifice of life, enable the assailants to overcome all resistance, yet an assault of this nature, under ordinary circumstances, has almost always proved unsuccessful. Indeed, it ray be laid down as the result of experience that, should an army unprovided with sappers and miners, and with the materials and means to render their services efficient, be opposed to a place fortified according to the modern system, with its walls completely covered, all the usual methods to reduce it would prove unavailing; n0 period of time nor sacrifice of men would be sufficient to purchase success, and the prudent course would be to decline an attempt pregnant with hazard, perhaps ruin.

'These considerations," says Sir John Jones, to whom we are indebted for the above account of the various modes of attacking

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fortified places, "have for many years had their due weight with the great powers of Europe, and have induced them to form and keep up, as integral portions of their military strength, every neces- sary auxiliary for the reduction of fortresses ; and sieges have in consequence become certain 'and comparatively bloodless. But England, constitutionally jealous of permanent military establish- ments, has always discountenanced military organization and mili- tary eon till the hour of need, and with respect to sieges, . roalons feelings beyond the bounds of rational prudence ; for,

ossessing a corps of officers professionally educated and well grounded in the science of attack and defence, she has denied them every requisite establishment to render their acquirements availing, and has most unreasonably expected her armies to reduce the skilfully fortified and well-covered places of the 19th century with means inferior to those used against the exposed and ill-constructed places of the 16th and 17th centuries,"

And what was the immediate consequence of this irra- tional jealousy and niggardly parsimony? Contrary to all ordinary calculation, the fortresses garrisoned by the French in Spain were reduced ; but at what a prodigious expendi- ture of life was this effected! In the several attacks upon Badajoz, two of which from extrinsic circumstances proved abortive, a little army was sacrificed; as many men, in short, as would have been sufficient for ten sieges under- taken with adequate means, and conducted according to the ordinary rules of science. But this is not to be under- stood as involving any reflection on the military talents of the general or the professional ability of the engineers, General Foy, in his work on the war in the Peninsula, has indeed made such a charge, condemning the mode of attack- ing fortresses adopted by the British in Spain as unskilful and inefficacious, and bringing it forward as indisputable proof of the low state of their military knowledge. But it should be recollected that the adoption of this mode was not a matter of choice, but of necessity, and that, if it was in its nature rash, hazardous, and inefficient, the fact of its having been directed against Ciudad Redrigo and Badajoz with such rapidity of development and certainty of result as to outstrip the calculations of the French mar- shals, deceive the vigilance of French governors, paralyse the science of the Freuch engineers, and baffle every defen- sive effort of the French garrisons, is surely no evidence of deficiency in military talent and professional skill. The objections to this

mode of attack are insurmountable and decisive ; that it succeeded in the instances referred to is merely a proof of what British soldiers, even when acting under the greatest disadvantages, are capable of accomplish- ing. These remarks are, however, no longer applicable. Since the Crimean war great attention has been bestowed upon the education and training of sappers and miners, and though England has neither the numbers of men nor the quantities of stores possessed by Continental nations, yet what she has of each: is of the best. Every advance in Science, if applicable, has been at once adopted into the military service; and as our civil engineers are as a body ad- mittedly without superiors in the civil world, it may be confidently stated that in the military world our military engineers hold no inferior position.

Having thus given a general description of the methods of attack, we shall now subjoin, on high authority, a view of what is considered necessary for the proper defence of fortified places. An order issued by the French minister of war in 1813 contains directions on the subject which are almost "universally applicable, and therefore deserve a place here. Every commander is directed to consider his garrison as liable to be unexpectedly attacked, and to pass at once from a state of peace into a state of war or siege, either by rebellion, by unlawful assemblies, by the presence of an enemy, by surprise, or by sudden assault,—in a word, by unforseen causes, of which the history of war offers numer- ous examples, He is therefore ordered, even in time of Peace, to fix his plan and arrangement for defence, accord-

are rare, and exclusively offensive operations, has even carried | apne . : J be within the circle of action, of investment, and of attack ;

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ing to such supposed attacks as may appear most probable, and to determine, for the principal cases which may be likely to occur, the necessary posts, reserves, and move- ments of the troops, and to take' measures to ensure the due and active co-operation of every corps of the garrison. He ought, particularly, to make himself? thoroughly ac- quainted with (1) the ground beyond the place which may

(2) the fortifications of the place, its interior, its build- ings, its military edifices or establishments ; (3) the gar- rison, the means of the place in artillery, in ammunition, and in other stores of every kind; (4) the population to be maintained in time of siege, the men capable of bearing arms, the master and journeymen artificers fit to be employed either on the works or in case of fire 3 and (5) the provisions, materials, tools, and other resources which the town itself and surrounding country can furnish, and which it might be necessary to secure in case of siege. In order to enable governors and commanders to comply with these instructions, which are clear and precise, the minister proceeds to detail their principal duties, according to the circumstances in which they may find themselves placed ; but for these we must refer to the general order itself, which is a masterpiece of its kind, and in all proba- bility emanated directly from'Napoleon himself. Its object appears to have been to inspire a governor with hopes that, by taking proper precautions, and making a full use of means previously provided, the defence might be rendered equal, if not superior, to the attack; and whether this be so or not, the importance of the directions embodied in the order is not diminished, and where they are duly observed the nature and extent of the resistance must be materially increased.

The protracted and able defence of Sebastopol led many to imagine that the Russians by new defensive arrange- ments had solved the problem so long under discussion, and had again restored to the defence much of its former superiority over the attack. But the real merits of the Russian engineers consisted not in the discovery of new principles, but in the skilful application of those prin- ciples which, recognized at an early period, have been by degrees matured and enlarged. In estimating the com- parative results of the attack and defence of Sebastopol, it must be remembered that neither can be judged by strict rules, as neither conformed to such rules. The north side being left open by the impossibility of investing both sides, the south became a detached line of powerful intrench- ments, to the defence of which the whole force of an army, not a garrison, could be directed at will. The strength of the garrison, continually renewed from without, per- mitted the fullest use of detached works, which, when backed by a line in rear sufficiently strong to resist a cowp- de-main, constitute one of the most powerful modes of de-

Fria. 67.—Lunette of Dargon.

fence. Such a fort or work was the celebrated Malakoff

Tower, and the redoubt enveloping it, the type of which

may be found in the lunette of Dargon, of which fig. 67 is

a plan. In this lunette, intended to Being before- IX. — 58

Plate XI.

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hand, T is a powerful tower, LL a lunette, which in this case is revetted, but might have been made, as at the Malakoff, a simple earth-work—c an underground com- munication to g,g, loopholed galleries for flanking the ditches. This sketch will show the general principle of defence involved in such works, but of course the form must vary in the hands of an able engineer, to suit the peculiarities of the ground. At the Malakoff the redoubt was made circular, but in principle it was strictly ana- logous to the lunette.

Siege of the Citadel of Antwerp.

We shall now, as an example, give a sketch (abridged from the United Service Journal) of the attack on the cita- del of Antwerp in 1832—first, because this was the most regular and scientific siege which had taken place for many years ; and secondly, because as a practical operation an account of it must be more interesting and more instructive than any description of the formal theoretical plans which are usually drawn in the military schools. See Plate XI.

Without entering into any detail of the complicated cir- cumstances out of which the siege arose, in a time of

‘ general peace, it may be stated here that Great Britain and

France, as joint guarantors of the integrity and independ- ence of Belgium, having failed to procure the evacuation of Antwerp by means of negotiation,

were obliged to have recourse to force. Hence the siege is to be viewed as an ejectment executed against the king of Holland, who had refused to renounce possession, unless compelled to do so.

The French army employed to cover and conduct the attack of the citadel of Antwerp in November and December 1882 was placed under the command of Marshal Gerard, and amounted to 66,450 men, viz.:—54,000 infantry, 6000 cavalry, and 6450 engineers, artillery, and pontonniers, with 14,300 horses, and 144 pieces of siege and 78 of field artillery. On the 24th of November Marshal Gerard established his headquarters at the village of Berchem, about 2500 yards from the citadel, and issued orders to commence opera- tions in the evening .as soon as it became dark. The garrison of the citadel, under General Baron Chassé, amounted to 4470 men, with 144 pieces of ordnance of all calibres, and abundance of ammunition and stores. It will be observed that a garrison of about 5000 men was opposed to the attack of a besieging army thirteen times its strength.

At eight o'clock p.m. on the 29th November, the French troops destined for this service, consisting of 18 battalions, 900 artillery, and 400 sappers, in all about 17,140 men, assembled at the depots of intrenching tools. The flank companies of these brigades, sup- ported by twelve eight-pounders and a strong piquet of cavalry, formed the covering party under the direction of General Haxo, by whom and the officers of his department (the engineers) the first parallel and approaches were traced out, whilst General Niégre and the officers of artillery marked the sites of the projected batteries, The first parallel leaned on the covered-way of the right face of Montebello, and extended towards Kiel, its nearest point being about 325, and its farthest 485 yards from the advanced front of the citadel. The extent of the first parallel was 1870 yards, and that of the approaches 8750 yards. The communications from the right and centre debouched from the Malines Chaussée, in the village of Berchem, parallel to the road leading from that village to the Harmony and St Laurent; the communication from the left commenced near the garden called Heinrich's ; whilst a fourth, on the extreme right, sprung from the covered-way of the left flank of Montebello, opposite to the first traverse.

On the second night, from 30th November to 1st December, five approaches were pushed on in front of the first parallel,—two in the direction of the capital of the Toledo bastion, two upon that of the Lunette St Laurent, and one, being the fifth, terminating in a place of arms on the extreme left. From the 1st to the 2d December two zig-zags were added to the approaches,—one from the centre, in the direction of the gorge of St Laurent, and the other on the right, diverging towards the curtain, between the Toledo and Fernando — ce Ee ee oe work-

' artillery getting tle guns into battery. eye the 2d and 3d December four zig-zags Ere made in foal Pproaches on the right and centre, and half a parallel was

formed to complete the place of j the night of the son peg a constructed on the left during

advanced to within 185 yards of

v th 2, 3, 4, 5, 6, and 9 (see Pinte were armed, and Teady to be

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arming of Nos. 7, 8, and 10, ou the extreme left, was impeded by the difficulties ofthe ground. From the 3d to the 4th December, the second parallel was traced and commenced, its right leaning on the foot of the glacis of the counterguard, its centre and right 130 yards distant from the place of arms in the covered-way of the Toledo bastion, and its left towards the right of the covered-way of the St Laurent, at 90 yards from the crest, and 15 from the foot of its glacis. The length of the second parallel was 1250 yards, and with its approaches from the first parallel it occupied 3025 yards of ground. By the greatest exertions batteries Nos. 7, 8, and 10 were armed during the night. This completed the armament, and, at 11 A.M. on the 4th, the embrasures were unmasked, and the bat- teries opened their fire from centre to flanks, and maintained it steadily during the day.

From the 4th to the 5th of December an approach was pushed on from the second parallel, directly upon the salicnt 'angle of St Laurent, and an entry was made into the covered-way by a return to the left. The garrison

discovered this, and opened a sharp fire from the lunette; a lodgment was, however, effected near the spot usually occupied by the first traverse. At this time the garrison suffered much from the fire of the besiegers. From the 5th to the 6th the lodgment made the previous night in the covered-way of the salient place of arms of St Laurent was prolonged as far as the first traverse. But the besieged kept up so vigorous a fire that the French engineers were obliged to renounce the flying and adopt the full sap. The zig-zag in the counterguard, being about three feet in width and four in depth, was conducted along the parapet, nearly to the extremity of the right flank, and within 180 yards of the counterscarp of bastions Toledo and Fernando; and two lodgments, blinded with fascines, were made in the parapet for six guns to enfilade the covercd-way of the Toledo bastion. In the meantime a steady fire was kept against Kiel, the ravelin in its rear, aud the Paciotto bastion. From the 6th to the 7th a battery of 24-pounders near the village of Burcht on the left and Hoboken on the right opened on the gun-boats which flanked the French post at the Melk Huys. It was intended to assault St Laurent this evening ; but as the lunette was found to be well pro- tected by trows-de-loup, the project was abandoned, and the regular method of descent, passage, and mine determined on.

Between the 7th and 8th of December a shell penetrated the blindage of the laboratory, and, setting fire to the combustibles in it, caused considerable havoc. A battery for six mortars, E, on the right, now opened its fire; another, F, also for six mortars, was traced behind the centre of the parallel; and platforms for four mortars were laid near Montebello. The fire of these batteries was directed on the Toledo bastion and the buildings withinit. On the previous day jets of flame had been seen to issue from the Great Barracks, and, in spite of every exertion, the building was entirely consumed by the evening of the 8th.

From the 9th to the 10th of December the operations against St Laurent were renewed with great activity, and the sap advanced to the crotchet of the second traverse, whilst that intended to debouch upon it from its right was likewise pushed on. The third parallel was opened 130 yards in advance of the second, its right de- bouching beyond the Boom Chausséc, from the branch running into the covered-way of the counterguard, and its left uniting with the boyau parallel to the foot of the glacis of St Laurent.

The garrison suffered much from the vertical fire of the mortars and howitzers, especially the great mortar and the new-model eight- inch howitzers. Until the year 1822 the eight-inch howitzer in common use in France measured 3 feet 6 inches French, and weighed 1096 tb, or twenty-three times the weight of the loaded projectile, whilst its calibre was equal to a solid shot of 80 tb, and contained 65 ounces of powder. The new-model howitzer was all improvement on the Russian licorne and the Spanish heavy how- itzer, perfected by Colonel Paixhans. The raft for the blinded descent into the ditch was brought up to the lodgment, and 2 second descent a ciel eowvert was commenced to the left of the first. The third parallel was improved and widened. A little after dusk on the 10th the besieged made a sortie, which was driven in, but not until damage enough had been done to occupy the Frenchiall the night of the 10th and the morning of the 11th in repairing it. From the 11th to the 12th three rafts were got ready, and placed in the descents to the ditch ; they were about 12 feet by 8. At dusk the miners returned to the escarp, and, in an excavation made tlie previous night, fixed two petards, which, by their explosion, produced a fissure in the wall, and a serjeant having immediately entered the hole, commenced a gallery under the centre of one of the arches. At 11 a.m. on the 12th the battery H, on the extreme right of the second parallel, opened fire, which, combined with that from the others, told severely om the Toledo bastion. The miners still continued their work under the lunette St Laurent, and conrmenced chambers for three mines. The fourth parallel was widened during the day.

Between the 12th and 18th of December the miners were at work in the chambers under St Laurent, which were not yet completed. On the right the covered-way of the left face of the 'Toledo bastion

siege 108 killed and 695 wounded—total, 803. The Dutch had

was crowned to within 65 yards. From the 13th to the 14th, after nearly sixteen nights of open trenches, the arrangements for the assault of St Laurent were completed, and orders were issued to prepare for the storm. Too much value was set on this outwork, defended by little more than a hundred men, one five-and-a-half inch howitzer, two Coehorn mortars, and

a six-pounder. The mines being charged, the blinded descent into the ditch was pierced as soon as it became dark, and everything prepared for the assault. Three storming parties of the flank companies of the 65th regiment of the line were posted in readiness, with a column of reserve 3 and at 5 A.M. on the 14th the match was applied to the saucissons of the mines. Three successive explosions took place, and the escarp im- mediately presented a wide and practicable breach. The fascines for crossing the ditch had been injured by the eagle but after a little delay the storming party entered almost without opposition, and made/prisoners one lieutenant and forty-eight rank and file, the others having escaped into the citadel. Thus fell the lunette St Laurent.

After this operations were carried on against the citadel, and at 11 A.M. of the 21st December the battering in breach commenced, and continued until the 23d. When a practicable breach had been formed, and Marshal Gerard was about to deliver the assault, the garrison surrendered, after a gallant defence, remarkable, however, for its passive rather than for its active character. When Marshal Gerard entered the fortress, General Chassé was found in a case- mate in the Alba bastion, which he had occupied during the siege. On their progress from the gate to the governor's quarters, they passed through a scene of desolation and ruin which bafiles de- scription; with the exception of the principal powder magazine, two or three service magazines, and the hospital, not a building remained standing. The terrepleines of the bastions were ploughed into deep ruts by the shells; the gorges were encumbered with heaps of fallen rubbish; and though the casemates and subter- ranean Communications were not perforated, all of them had sus- tained damage from the incessant explosion of shells, and they emitted an almost insupportable odour, caused by the number of men who had been crowded into them. When Count Gerard took his leave of General Chassé, he observed "that it was high time to surrender, that he had gallantly and honourably done his duty, and that he ought not to have held out a day longer." With a fortress reduced to a heap of ruins, a garrison exhausted and at- tenuated, and a breach sufficiently wide to admit a column formed upon a front of a hundred, it would indeed have been madness to attempt to stand an assault.

The following is a list of the different batteries, with the direction of their fire respectively :—

4937 men in the garrison, of whom they lost 122 killed, 369 wounded, and 70 missing —total 561.

A careful comparison of the details of this siege with the general principles which have been enunciated will enable the reader to recognize the importance of the following maxims :—

1, Independently of the great amount of labour to be provided for in the construction of parallels, approaches, and batteries, there will be a daily drain upon the besieger's forces by casualties, so that he can scarcely expect success unless his original preponderance in numbers has been such as to leave him at the final moment of assault in a condition to attack the diminished garrison with an overwhelming force. In addition, therefore, to a covering army when external relief is threatened or anticipated, the besieging army should be from four to five times the strength of the garrison, or even more, should the nature of the ground add to the ordinary difficulties of appinack: This superiority of force is necessary to give celerity and steadiness to the operations, which would otherwise be tedious and interrupted.

2. A perfect investment is not merely expedient but indispens- able. So long as any portion of the enceinte of a fortress is left open the garrison is able to recruit its strength from without, and it is relieved from that moral depression which must oppress men when closed up within a narrow space, and exposed, day after day, to fatigue and danger. Under such circumstances there seems to be no limit to the power of defence, as fresh supplies of men enable the besieged to add intrenchment to intrenchment, and it is only possible to overcome him by determined, reiterated, and over-whelming assaults. Such were the circumstances of Sebastopol ; the system of attack forced upon the allies never enabled them to isolate even the southern section of the fortress, and the means of communication between the south and north remaining available fresh troops were continually brought to the south side, and a supe- riority in numbers given to the defenders over the attacking force. It ought not therefore to be a matter of surprise that the progress of the siege was slow.

8. Good and secure lines of communication are most essential, as there ought to be no interruption after the ground is broken and the siege hascommenced. Neither in the attack nor in the defence should guns be fired idly, or from distances and positions from which their fire would be useless or even uncertain ; but when the proper distance has been ascertained, battery should succeed battery as the works of approach advance, and no interval for rest or for the repair of injuries should be allowed to the besiegers.

4. The importance of advanced works was well exemplified at the siege of Antwerp, where the whole force of the attack was directed against the advanced lunette St Laurent, whilst the defence, though good, had not the advantage of the collateral defence of the lunette

é| g| 2 : : 5 §).3.4 : ‘sg Z | Dis! ~~ Montebello (see Plate XI.). Where the garrison is an army, such gia) fe | Bel gad Direction of Fire. works afford the best means for an‘obstinate defence, and, by forcing alee | sp a ae the besieger to act on the circumference of a larger circle, diminish — atin a | | very much his ordinary advantage of concentration. lee

4¢ a8 ap x £09 $/ Ricochetting the left face of To- Siege of Dantzic. 4 Bes , inate Sie ae eee Having thus given an example of an interior and passive 5 [S| abn Be defence, we shall now, in further illustration of the prin- Eh. Pir ded © al rae ee ee ciples already laid down, advert to an example of a different | | 680 & (| Battering right face of Toledo, and : 5 i r considered with re-

2 |s | On LE a aot see kind. The siege of Dantzic, whether c ee coe. 1 2 2 | ... | “a0 Ricochetting left face of Toledo. ference to the magnitude of the operation, the difficulties

a | Ricochetting left face of St Lau- : i i me; 6 | 2) 1]... {io rent, and battering right face of | | to be surmounted by the besiegers, or the active and varied ae ahs Ricctoeae poe trae ree character of the defence, was certainly one of the most me-

a ore ace 0. avelin, ° ° . a |9 6 Battering salient angle of Pa-| | morable events in the campaign of 1807. Before the war of = rogetl left face of

Raveli 1806 and 1807 the fortifications had been much neglected, : avelin ae ‘i Se 5 “ : ‘ nrand Lunette of Kiel. ‘| | because from the position of the place it was not antici-

t 4 : : :

5 |B 9 Body, Sai Citadel pated that it would have to sustain a siege. But when D me the battles of Jena and Auerstadt had entailed destruc.

= tion on the Prussian army, and had laid open the king-

dom, General Manstein, who commanded at Dantzic in the absence of Field-marshal Kalkreuth, the titular governor, laboured with much activity in repairing the walls and the palisades, and in completing the enceinte. It is neces- sary, therefore, to describe the principal defences at the

| Battering the right face of To- ledo.

Battering the Batardeau. Battering the left face of Ravelin. The body of the Citadel.

Do.

ae time the place was invested by Marshal Lefebvre, at the

ae h d army, and before th

Do. head of the tenth corps of the grand army, 8 ees. commencement of the trenches on the Ist of April.

Between the 8th and 18th,

Counter-battery against the left flank of Fernando.

{ The city of Dantzic, traversed by the Mottlau, was sur- 125 { Six pierriers on the Ravelin and

rounded with large ditches filled from that river, the waters of which, retained by several sluices, formed, to the east- ward, a vast inundation,

which, reaching on one side to the suburbs of Oliva and St Halbrecht, and on the other to the dykes of the Vistula, extended about four leagues, and

Toledo. Terrepleine and rampart of To-

Out of their force of 66,450 men, the French lost during the

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covered two-thirds of the eastern fronts. On the north the Vistula runs about 260 yards from the covered-way, leav- ing between the left bank and the glacis of the place an impracticable marsh intersected by canals; at its embouch- ure, distant nearly three miles, the banks were defended on the right by the fort of Weichselmunde, and on the left by an intrenched camp in the small island of Neufahrwasser, intended to cover and protect the arrival of such succours as might come from the seaward. 'The ground adjoining the banks of the Vistula being intersected by canals and covered with marshes, was extremely unfavourable to a besieger, as it rendered it difficult for him to form establish- ments or raise works of proper solidity, and forced him to extend his quarters, disseminate his troops, and multiply his posts. At the period in question this inconvenience was the more severely felt, because the besieging force, though nominally 18,000 strong, was inferior in numbers to that of the garrison, which consisted of 12,000 Prussians and 3 Russian battalions, and it required the most vigilant caution to occupy numerous posts without unduly weak-: ening it. The communication between the place and the fort of Weichselmunde was maintained by a series of re- doubts constructed on the borders of the Vistula, and parti- cularly by the advantageous position of the isle of Holm, which continued the defence of the place to the fort with the exception of an interval of about 1400 yards, and ren- dered the communication with Weichselmunde by the canal of Laack secure in spite of any batteries which the besiegers could establish at Schellmiihl. The French, therefore, could not attempt to throw a bridge over this part of the Vistula until they had made themselves masters of the isle of Holm. On the west two chains of hills, separated by the valley of Schidlitz, covered the enceinte ; and the pro- longations of these hills were crowned by the two forts of Bischopsberg aud Hagelsberg, which, being connected by intrenchments, formed a second enceinte, leaning upon one side on the inundation of the Mottlau, and upon

the other on the left bank of the Vistula. This new enceinte, though constructed of earth and without revetment, was secure against assault, and as the covered-way as well as the foot of the scarps bristled with strong fraises which served

instead of revetments, the besiegers had no hope of suc- ceeding by a coup-de-main, and were therefore obliged to proceed by regular attack.

From this description of the defences of Dantzic, it is easy to perceive that the difficulties attending the operation must have been very great. The principal of these, as stated by General Kirgener, who until the arrival of General Chasseloup directed the attack, were, first, that Marshal Lefebvre had at first an army inferior to that of Marshal Kalkreuth, all of those destined for the siege not having then arrived, and that this army was in a great measure composed of new troops ; secondly that, owing to the badness of the roads and the inclemency of the season,

the artillery experienced the greatest difficulty in bringing up its convoys, the establishment of the batteries was re- tarded, and a scarcity of ammunition sometimes prevailed ; thirdly, that the place, which could not be completely in- vested because the approach from seaward was in the hands of the British, required an immense cireumvallation, which, in fact, could not be completed until after the arrival of re- inforcements ; the corps of troops which occupied the quar- ters were extremely weak, and could neither furnish a sufficient number of workmen, nor even the number of men necessary for guarding the trenches ; and fourthly, that the besiegers had no good plan of the place, and did not know oe depth of the ditches, and as the accidents of ground in ieee je a onesies were extremely diversified, they ree y a epee! in proportion as the works

: Se circumstances, joined to the necessity of |

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concentrating the greater part of the troops close to the camp of Neufahrwasser, by which succours arriving by sea might debouch, and the advantage which the besieged had in retaining the mastery of part of the suburbs, determined the chief engineer, after the investment had been

effected, to direct the principal attack against the Hagelsberg, and a false one against the Bischopsberg fort. The true point of attack was the long branch of lines in the plain connected with the bastion on the right of the Hagelsberg : " c'était la le défaut de la cuirasse ;' but, for the reasons above stated, approaches were directed against the fort itself.

As the details of this great siege would fill a considcrable volume, all that our limits permit is merely to indicate the principal occur. rences. On the Ist of February 1807 the troops of General Dom- browski began to approach Dantzic, and took up a position at Mewe, upon the left bank of the Vistula. On the 15th General Menard, commanding the Baden contingent, arrived at the same point, and repulsed a detachment of the garrison of Dantzic, which had advanced from Dirschau to attack him On the 28d General Dombrowski, having been reimforced, received orders to attack a large detachment of the enemy which occupied an advantageous position at Dirschau and its environs. The combat here was obstin- ate and sanguinary ; but the Prussians, though intrenched in a church and a churchyard, were dislodged and driven back, chiefly by the Poles, who, exasperated by their long resistance, put to death without mercy all who fell into their hands. After the combat of Dirschau, General Manstein no longer sought to obstruct the distant approaches. The troops destined to form the besieging army now arrived in succession, and the formation of the park of artillery was commenced. On the 12th of March Marshal Lefebvre found himself in a condition to close in on the place ; and the troops of the garri- son having withdrawn, he distributed his own in the following positions:—a battalion of French light infantry at Oliva, a Saxon battalion at St Halbrecht in the Burgerfeld, and two at Tiefensee and Kemlade ; the Poles occupied Schonfeld, Kowaid, and Zunk- endin; some battalions took post at Wonnenberg, Neukau, Schudel- kau, and Sniekau; the Saxon cuirassiers and light horse were stationed at St Halbrecht and Guirsehkens; the 19th regiment of French chasseurs at Burgfeld, and the 23d at Schudelkau ; the Baden dragoons and hussars at Wonnenberg, and the Polish lancersat Lan- genfurt. On the 16th the marshal attacked the village of Stolzen- berg, which he carried after a warm resistance, as he did also the suburb of Schidlitz, to which the Prussians had retired ; and on the 18th the place was invested, with the exception of the eastern part, which, by the isle of Nehrung, communicated with Konigsberg. Field-marshal Kalkreuth now

arrived in Dantzic, and assumed the command of the place. The next operation of the besiegers was the attack of the isle of Nehrung, which, after a severe and protracted struggle, was carried in the most gallant manner, and measures were immediately taken to secure the possession of this important con- quest. A bridge was also established on the Vistula, and various works constructed to check the attempts of theenemy either on the side of Dantzic or on that of Pillau. At this time the governor, who had under his command agarrison of 18,000 men, besides the burgher militia, made a sortie for the purpose of destroying the works of the besiegers ; but the attempt failed, and the Prussian columns were compelled to retreat into the place without having obtained the smallest success upon any point.

It had been decided that the principal attack should be directed against the fort of Hagelsberg (because the redoubt of Bischopsberg was more complete and better flanked by the fire of the place), fav- oured by two false attacks, the one directed against the intrenched camp at Neufahrwasser, and the other against Bischopsberg, and by two secondary attacks on the left bank of the river; and ground was broken on the night of the Ist and 2d April, at the distance of 1600 yards from the palisades. The approaches were pushed forward with the greatest vigour, and on the night of the 11th the second parallel was commenced by flying sap. On the morning of the 12th the batteries were armed. On the 18th the enemy made a sortie in force, attacked the Saxons with great impetu- osity, carricd a redoubt constructed upon the mamelon of Hagels- berg, and penetrated even to the head of the trenches; but they were ultimately repulsed, though not without difficulty and loss. By the 23d all the batteries of the first and second parallels, and those of Stolzenberg, were armed, and emplacements were provided for field howitzers, from which to throw shells into all quarters of the city. Atdaybreak on the 23d the batteries were unmasked, and, though the garrison returned the fire with the greatest vivacity, by the 24th the besiegers, firing with 56 heavy guns, had obtained the ascendency, committing great ravages inthe place. Being apprised of this circumstance, Marshal Lefebvre summoned the governor, who replied in a manner worthy of himself. The fire of the mor- tar and reverse batteries continued during the 25th, in the course of which a new battery was constructed between the low flanks of the

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lzenberg, aud the direction of some others changed, in order to me the eh bastion of Bischopsberg, the fire of which had greatly incommoded the French batteries. During the day of the 26th the fire on both sides was exceedingly animated; but at seven in the evening, that of the garrison suddenly ceased, and a column "of 600 Prussian grenadiers, followed by 200 workmen, sallied out of the place. As the sortie had been foreseen, preparations had been made to repulse it. It was attacked in front and on both flanks; the whole column waseither killed or taken prisoners. Meanwhile the works were vigorously pushed forward at all points. The batteries of Stolzenberg were united with the attack on the Bischopsberg; emplacements were prepared for batteries @ ricochet; at the attack of the lower Vistula the works were continued, and a tongue of land situated at the extrenity of the isle of Holm taken possession of and isolated by means of a cut, whilst at the principal attack the greatest exertions were made to prolong the right of the third parallel, and enlarge the communications. On the 30th April the batteries of the besiegers, augmented by several pieces which had arrived from Warsaw, thundered on the place, in different quarters of which conflagrations appeared ; and the besieged replied by the fire of all the batteries of the front attacked, directing more than thirty picces on a redoubt which fired with the greatest effect. But as the fire of the besiegers had made little impression on the ex- terior fortifications, which were of earth, it was during the first days of May directed chiefly against the palisades, and the utmost acti- vity was at the same time evinced in extending, improving, and urging forward the attack; whilst, on the other hand, the garrison showed equal vigour in obstructing the approaches and destroying the works of the besiegers. In fact, notwithstanding the address of the French artillery, that of the garrison still remained effective, because it had not been possible to ricochet the lines of the fortifi- cations, and the resources of the besieged in munitions of all kinds were more considerable than those of the besiegers.

On the urgent recommendation of General Chasseloup, who had by this time assumed the direction of the attack, it was decided that the isle of Holm should be assaulted, as the possession of it would enable the besiegers to take in reverse the front attacked. The be- sieged had spared no pains for the preservation of this important post, from a redoubt on which,

called Kalke Schauze, they had con- tinually annoyed the left flank of the trenches. In the night of the 6th and 7th of May, however, it was attacked, and carried after a desperate resistance, whilst the possession of it was secured by works added to the intrenchments which had just been stormed, and its batteries were turned against the place. At the principal attack the fire of the besiegers had also mastered that of the besieged ; and Marshal Lefebvre was preparing to assault the fort of Hagelsberg, when on the 12th a Russian corps d'armee of 18,000 men, under the command of General Kamenskoi arrived by sea, and disembarked at the intrenched camp of Neufahrwasser.

_ At the moment of landing his troops, General Kamenskoi was ignorant of the capture of the isle of Holm, and he was disconcerted to find such an obstacle to his communications with the place. This occasioned delay which proved fatal to his enterprise ; for had he attacked immediately on landing, it is not improbable that he would have succeeded. "It was only on the 15th of May, however, the third day after the disembarkation, that he made an attempt to succour the besieged city. He began to debouch at four in the morning, and, under cover of a brisk cannonade, formed his force, Consisting of 12,000 men, in four columns of attack. The onset was impetuous, and at first the Russians gained ground ; but they were ultimately repulsed at all points, and forced to retreat with great loss to the intrenched camp. Field-marshal Kalkreuth made no attempt to second this attack by a general sortie, which would have tg the French between two fires ; and by its failure the fate of antzic was decided.

The works of the besiegers were now pushed forward with re- doubled vigour; and the following day preparations were made for the assault of Hagelsberg. Foreseeing this, Marshal Kalkreuth resolved to make a last effort to destroy the ncarest works of the besiegers, and for this Ag pend ordered a grand sortie, which took

lace on the evening of the 20th May ; but although the Prussians ought with all the fury of despair, they were driven back, and pursued into the ditch 'of the place. On the 2ist the besieging army was reinforced by the arrival of the troops of Marshal Mortier, part of which had remained before Colberg ; the marshal himself quickly followed ; and orders were immediately issued

for the assault of Hagelsberg. Before giving the signal, however, Marshal Lefebvre again summoned the governor of Dantzic, who, having no longer hope of succour, and being convinced that the besiegers were Ma condition to make themselves masters of the fort of Hagelsberg, showed a disposition to capitulate. A suspension of arms was accordingly agreed to, and this was followed, on the 24th of May, bya Capitulation, the principal conditions of which were similar to those which the field-marshal himself had granted to the Salrison of Mayence in 1793.1 iat =

1 See Dumas, Précis des Bvénemens Militaives, tom. xviii. p. 128.

These two sieges illustrate so well the principles of attack and defence, and are so perfect of their kind, that it has not been thought worth while to add an example of a more recent siege; but it should be observed that in future the preliminary operations of the besieger must take place at far greater distances; he will break ground for his first parallel at not less than twice the distance hitherto laid down, and will place his first batteries in rear of the parallel. This, while entailing on him much greater labour in parallels, trenches, and approaches, offers counter- balancing advantages, as it allows him to disperse his bat- teries in small units without the sacrifice of any of their power of simultaneous concentration on the point of attack, and with diminished exposure to the counterblows of the enemy's artillery.

BASTIONED SystTEMs oF THE N ETHERLANDS.

The Bastioned System of the Italians was carried into other countries by their engineers, who were extensively engaged in the service of foreign princes, and the celebrated Italian engineer Marchi, coming to Brussels with Margaret of Austria in 1559, appears'to have introduced the Bastioned System into the Netherlands. It has been shown that in permanent defences, the ordinary earthen scarp adopted in ditches of field works had been replaced by a masonry revet- ment as a security against surprise, in consequence of which : in old Italian fortresses, lofty revetments were almost uni. versal ; but in a country the soil of which is permeated by water within a few feet of the surface, such a mode of guarding against escalade would have been enormously ex- pensive, and the alternative was adopted

of forming broad wet ditches round the ramparts, and by thus securing them from sudden attack, revetment became unnecessary. The first example of a fortress surrounded by simple earthen ram- parts without revetments is said to be that of Breda, for- tified in 1553 by Count Henry of Nassau, and this arrange- ment required only to be moulded into the bastioned trace to constitute the ancient system of the N etherlands, as described by Freitag in 1630. Freitag made the flanks of his bastions perpendicular 'to the curtain, the faces 98 yards long, with a tlanked angle not exceeding 90°, and the length of the curtain 149 yards,

Freitag had strange notions respecting his profiles, regu- lating the height and thickuess of his ramparts not so much by the resistance they were required to offer to artillery as by the number of sides of his polygon; but disregarding these vagaries of the systematist, the annexed cut (fig. 68)

may be assumed to represent the profile usually adopted by the Dutch engineers, R being the body of the place, F the fausse-braye, D the ditch.

It will be observed that the main rampart is surrounded by an advanced parapet called a fausse-braye. This ad- vanced parapet was intended to deliver a grazing fire on the ditch, whilst the space between it and the rampart formed a spacious chemin des rondes for the assemblage and move- ment of troops; but great as these fadvantages are, the fausse-braye has dropped into disuse. It is not possible to remain in it under a heavy vertical fire, the shells either dropping directly, or rolling down into it from the slope of the rampart above. Such shell traps, as they are called, are scrupulously avoided by modern engineers, who know that the improvement of vertical fire will ere long add materially to the difficulties of defence. In the bombard- ment of Sweaborg, an illustration was afforded of what may be expected of heavy mortars, when the shell becomes a

better representative of a mine than it now is. At present a 13-inch shell weighs, when loaded, 200 pounds, and can carry a charge of 11 ib of powder, which is ample for break- ing the shell and scattering its fragments, but is insufficient for producing the effects of a mine.

The Dutch System of Cochorn deserves especial attention, and is represented in Plate IV., fig. 1, which exhibits his first system. The great characteristic in this system is the combination of wet and dry ditches, and the use of covering

works, or couvre-faces, intended to preserve the body of the place from injury till an advanced period of the siege, These envelopes were first proposed by Diirer, and it is worthy of note that the remarkable orillon of Coehorn is a reproduction on a modern scale of the complicated case-mated structure of one of Diirer's basteien. Coehorn was

well acquainted with the principles and the systems of the eminent German engineer Speckle, and adopted them when applicable to his purpose.

The profile (fig. 69) may enable

Fic. 69.—Profile of Coehorn's Bastion—A, inner or upper bastion} B, outer or lower bastion; D!, dry ditch between the two; D?, wet ditch.

the student to appreciate the difference between the dry ditches of Coehorn and the narrow passage afforded by the fausse-braye of the older engineers.

The profile exhibits also the loopholed galleries of the counterscarp, by which a reverse musketry fire is directed on the revetted escarp of the inner rampart,—a system of defence which has since been generally adopted, and is most valuable when a secure communication can be kept up between the galleries and the work which they are in- tended to defend. After the great siege of Corfu by the Turks, and its successful defence by Schullemburg, soine Dutch engineers who had been invited to Corfu by him, and

had taken part in the defence, were employed in adding |

detached forts to the old Italian bastioned fronts. In these works the ruins of numerous examples of loopholed galleries and loopholed traverses may be observed; and they de- monstrate that though Coehorn adopted in his writings his reliefs to the aquatic sites of Holland, he developed prin- ciples

of defence which were equally applicable to other sites and other countries. It has been argued by Bousmard and others that an opening would be formed by shells through the couvre-face, and that the flanks of the bastions would be thereby exposed to the fire of the counter batteries on the glacis; but it remains to be proved whether such an opening through an earthen mass could really be effected by the horizontal fire of shells; and the French translator of Zastrow, M. Neuens, captain of artillery, justly remarks that, "if shells fired horizontally into earthen works are so efficacious in destroying them, such shells must be a still more powerful instrument in the hands of the defenders for destroying the besiegers' batteries." Zastrow observes that, if we admit with Coehorn and others that, though the besieger may succeed in destroying a few feet of the parapet of the lower or outer face of the bastion, he would in vain, by firing shells horizontally into its mass, endeavour to lay.open the counterscarp galleries, it must be admitted that he would, on mounting the low face, find himself in a most critical position, as all the defences, both direct and reverse, of the dry ditch, would remain uninjured, and be in full action against him. These dry or inner ditches, which facilitate the war of sorties, and the reverse or counterscarp galleries, are defensive arrangements of great merit, and may, by modification of profile, be adapted to any site ; though the advantage dry ditches offer in such countries as Holland, where the besiegers cannot excavate in them with- out coming to water, cannot be expected in other sites, and must be made up for by stone pavements, or other contriv- ances likely to embarrass the besieger in his excavation.

Coehorn assumes the plane of site to be 4 feet above the level of the water, and the dry ditch of his bastion is at its centre on the level of the water, so that a passage by sap becomes impossible, as the spade sinks at once into water; but near the escarp and counterscarp the ditches are 2} feet below the plane of site sloping on each side towards the central portion. The breadth of the dry ditch of the bas- tion is 98 feet, and that of the wet ditch before the salient 148 feet. All the slopes are at an angle of 45°, The whole breadth or thickness of the couvre-face, measured at the water level, is 52 feet, so as not to afford space for the besiegers' batteries, and its relief of construction only 12} feet. In the ravelin the relief of the low face is 10 feet, of the high face 18} feet, and the height of its revetment 8 feet; in this work also the thickness of the low face would not afford space for batteries. The

width of the dry ditch is the same as that of the bastion. These few details, with an examination of Plate IV., and of woodcut 69, will enable the student to comprehend the general principles of this great engineer; and it is rather by tracing out the ideas of a master mind, as exhibited in the peculiarities of his plans, than by studying the plans themselves as wholes, that the engineer will acquire practical knowledge which will enable him to vary his own projects, so that they may really be the best suited for the ground he is working upon.

Coehorn never restricted himself to the rules even of his own system. In fortifying Groningen he was required to construct works on an eminence which commanded the town and he adopted a trace towards the exterior of ten- ailles, the gorges of which were closed by small bastioned fronts constructed by walls which should be easily breached from the main works when the enemy had succeeded m gaining possession of any one of the intervening redans. By this curious combination of the tenaille and bastioned systems, Coehorn gave an undoubted proof of his superiority to the narrow prejudices which often prevent the adoption of the system best suited for the place.

MetHops or BousmarD, Carnot, CHassELoup, DuFovR, Noizet, Haxo, AnD CHOUMARA,

It would be wrong to dismiss the subject of Bastioned Systems without at least some more reference to the works of these distinguished engineers than has been given 1m tracing the history of this subject. Bousmard makes the faces of his bastions as well as their flanks curvilinear, the former convex, and the latter concave outwards; but though by this arrangement the effect of ricochet fire may be dim-

inished, the difficulty of defending the salient from the flanks is much increased. His great innovation, however, consisted in placing the ravelin and its redoubt in advance of the glacis of the body of the place, and forming in front of them a second or advanced covered-way, the object

being to close the main ditch entirely, so that the besiegers' bat- teries should not he able to fire upon the body of the place through the ditch of the ravelin. The covered-way is made en cremaillére, and at each bend there is a sort of redoubt, or casemated traverse, not a simple hollow traverse loop-holed, such as those in the detached works of Corfu. It has been objected to Bousmard's system that his advanced works would be speedily taken by turning the gorges both of the ravelin and its redoubt, but it should be remembered that the interior slope of both is replaced by a loopholed wall, being the front of an arched gallery running all round, so that the enemy could not remain within these works exposed to the fire from the galleries, as well as from the body of the place. Without advocating the precise form and disposition of the works recommended by Bousmard, it may be reasonably asserted that in every case of a power- ful and well-appointed garrison, the defence will gain by assuming an active character beyond the precincts of the glacis.

As already observed, an unmerited indifference has been manifested by many engineers to the merits of Carnot, principally, it may be believed, from his exaggerated esti- mate of the effects of a vertical fire of small projectiles. Although he appealed to imagination rather than to calcula-tion, when he assumed that by substituting 600 wrought iron balls, weighing each 4 ib, for the one shell of 150 ib, with 6 mortars projecting 3600 balls, he might expect to put hors de combat 20 men at each discharge, or 2000 in 100 discharges, he was right in urging the importance of vertical fire. Carnot constructed his escarp without a re- vetment, but placed a detached loopholed wall in frontof it with a chemin des rondes between, which is ono esseutial feature of his system, the wall being constructed with arched niches in rear so as to shelter the men defending it; the loop- holes are in two rows. He provided arched casemates for mortars on the gorge of his bastion in order to fire upon the capital, and the loopholed wall of an inner curtain, being continued along the retired flanks and in front of these mortar casemates, formed a complete inner retrenchment. Between the tenaille and the ravelin was an earthen cavalier, occupying the position of a redoubt in the ravelin, before the bastion's counterguard, so that the whole of the interior works were masked by these earthen envelopes. There is much ingenuity in these arrangements, and at least as full an appreciation of the value of earthen works as can be found in the writings of any modern

writer. Carnot's lead- Ing principle, however, was, that a successful defence must depend on the active operations of the garrison, and that sorties therefore should be frequent and determined as soon as the enemy had approached close to the fortress, – For this purpose he removed the revetment from the counter- Scarp, and formed it into an easy or countersloping glacis, to admit of the ready advance of the troops from the ditch upon the head of the besiegers' sap. He supposed that the overwhelming vertical fire of the 10 mortars in the mortar batteries in the gorges of his bastions would prevent the enemy from accumulating large covering parties in the trenches, and that he should therefore be able to fall upon the working parties and successfully delay the progress of the works. It has been shown that Carnot entertained an exaggerated view of the effects of vertical fire, but the idea of securing his mortars in casemated buildings is good, and has been adopted in the citadel of Ghent, and in several English works at Portsmouth and Plymouth; and it is im- Possible to study his works without profit.

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Chasseloup (1754-1835), like Bousmard, placed his ravelin in advance of the glacis, and provided it with a small casemated keep, the flanks of. which are pierced for two guns each. The tenaille is also provided with casemated flanks, and in front of it is a casemated redoubt or bastionette to supply the place of the ordinary ravelin, and to flank the salient portion of the face of the bastion, the general face being by him bent into two, so as to place the salient portion in line with the exterior side of the polygon, and thereby secure it from the ricochet fire. Casemated redoubts in the re-entering and salient places of arms, a defensive barrack, and a permanent en-trenchment on the bastion are also included in his arrange- ments. De Sellon (AMémorial de L'Ingénieur Militaire) observes, "It would indeed be well to force the besieger to pass through two sieges, if the outworks pushed so far forward | had higher scarps, and were not so easily turned at the gorge, but as the scarp is only 13 feet high, this possibility of attacking the works by the gorge without a previous descent into the ditch presents such serious in- conveniences that it is surprising to observe that Bousmard and Chasseloup should have adopted so defective an arrange- ment." But notwithstanding this strong condemnation, it is at least doubtful whether

such works are not the most suitable for a vigorous defence by a strong garrison, as they would enable the besieged to fall upon the assailants at the most critical moment of their attack with a powerful force ; and it may be added that a skilful engineer would know how to throw many difficulties in the way of turning these advanced works, whilst the continuance of the besiegers in them might be rendered both difficult and dangerous in the extreme.

The most remarkable feature in Dufour's modification of the modern system is, that, one face of the redoubt in the re-entering place of arms is carried across the ditch, and connected with the coupure of the ravelin, so as completely to close the ditch and cover the face of the bastion from the fire of a battery on the glacis of the salient of the rave- lin. Dufour also raised the salient of the ravelin into a high cavalier, so as to secure the faces from ricochet; and he proposed that the cavalier should be formed of gravel or small stones, so that the fire from the body of the place might, by scattering about these natural missiles, cause great damage to the enemy, when attempting to form a lodgment.

General Noizet has been already mentioned in connexion with the Modern System, his modification of which is now the normal system adopted at the French military schools. Rejecting Dufour's mode of closing the ditch of the ravelin by carrying across it one face of the redoubt of the re-enter- ing place of arms, he effected the same object by placing a massive mask between the coupure of the ravelin and the re-entering place of arms, from the inner escarp of which it is separated bya passage. The counterscarp of the bastion is carried continuously along the inner edge of the mask, whilst in front of it is a ditch which separates it from a demi-caponniére forming its counterscarp and covered-way, and a glacis sloping down the ravelin of the ditch. The mask, the lunette redoubt in tlie ravelin, and the redoubt in the re-entering place of arms form a combined series of works of great efficiency for defence, which completely cover all but the salient portion of the face of the bastion. The flank of the bastion, as before observed, forms an angle of 80° with the line of defence, and the advantage taken of this in the citadel of Ghent in forming a most powerful in- trenchment in the bastion, with a curtain as long as that of the main front, has also been pointed out.

General Haxo, one of the ablest engineers of modern times, did not publish his scheme of defence, nor did he re- produce it as a whole in the works he constructed, doubt-

less considering, as has been so frequently urged, that systems, so-called, can only be looked upon as the exhibi- tion of great principles, not as rigid rules for their applica- tion. His ravelin is made very prominent, and the salient is formed into a traverse, or mask, casemated and armed with artillery. Within the ravelin there is a redoubt, and within that a casemated caponniére or bastionette. The ditch of the ravelinis closed by continuing the counterscarp across it with a glacis slope into the ravelin ditch, and by this arrangement the ditch of the redoubt in the ravelin is also closed. The counterguards, the higher and the lower bastions, form almost three lines of defence, of which two, the outer and inner, are powerfully armed with artillery. The peculiar characteristic of the system is, that the parapet is thrown back, and made in its trace independent of the escarp, so that, whilst the latter retains the usual straight line, the parapet is broken into several portions not in the same line, and thus secured from the effects of ricochet—an arrangement of very great merit, and largely adopted in the Polygonal system. Haxo is probably better known to English engineers as the inventor of casemated batteries a l'Haxo than from his merits as an engineer, great as they were. These batteries are formed im the parapet, and though arched over with masonry, are covered with earth, They are open in the rear to the terrepleine, and the openings in front for the guns are continued into embrasures formed in an extension of the parapet at these points beyond its ordinary retired position in Haxo's system. These batteries are thus secured from the effects of the enemy's fire, and when the embrasures are masked are equally hidden from his view, so that they may at any moment suddenly open a powerful and unexpected fire upon the besiegers. Being open in the rear, and connected to- gether by arched openings between every pair, the circula- tion of air is sufficient to do away with the inconvenience from smoke, so generally complained of in casemated bat- teries, The batteries 2 /'Haxo have been used at Grenoble and Lyons, in the forts of Loyasse and Sainte-Foy, and in many English works. Their value has been much dimin- ished by the range, penetration, and accuracy of modern rifled artillery.

The work of the commandant of engineers, M. Choumara, entitled Afémotres sur la Fortification, was published in 1847. In this treatise he maintains the principle that the direction of the parapet should be independent of that of the escarp, the latter bcing formed in straight lines, and considered permanent during the siege, whilst the former may be broken into several lines, and may be moditied dur- ing the siege so as to facilitate the defence in any direction. Haxo had in his lessons or studies pointed out the import- ance of this principle, but Choumara was the first to advo- cate it in print. The castle of Naples exhibits an early example of the reverse operation, a new escarp having been built in front of the ancient round tower forts, so as to change them at the base only into bastions, whilst the upper portion of the towers became retired and independent para- pets. Choumara, not relying on the bent trace of his re- tired parapet as a security from ricochet, proposed a traverse on the capital of his bastion, placed outside of the retired parapet, and 33 yards in length. This traverse, made 26 feet high and 78 feet wide at its base, would occupy less than two-thirds of the space of the twelve ordinary traverses required to secure from enfilade the faces of Choumara's bastions 164 yards in length, whilst it would cover not only the bastions but the flanks also. In addition to the tra- verse or mask on the capital, Choumara proposed high tra- verses, parallel to the flanks, at about 22 yards from the salients, which would not only secure the faces from enfil- ade, but would form secure or interior flanks, as cavalier flanks, commanding and firing over those in front. By

making the cavalier flanks 98 yards long, and casemating them @ ?Haxo, 15 guns might be placed in each, and the covered-way of the bastion attacked would be commanded by 30 guns in addition to those of the ordinary flanks, whilst the traverse of the capital would secure the flank cavaliers from ricochet. The last and most remarkable suggestion of Choumara is the proposal to widen his ditch to about 50 yards, and leaving a passage of communication of 16 yards round the base of the escarp, to form an interior glacis, sloping up from the base of the counterscarp towards the summit of the escarp, and having a base of 34 yards wide, thus constituting a continuous mask round the escarp. In respect to countermines, Choumara proposed to replace the great galleries, which are

usually made 6 feet high and 3 feet wide, and which are the great arteries of a system of mines, by large vaulted galleries from 16 to 20 fcet wide, pierced through the counterscarp, and continued as far as the third parallel. Six of these galleries were to be formed in each front, being placed about 55 yards apart, and con- nected together by minor transverse galleries or branches. Galleries of this magnitude would, in time of peace, be use- ful as stores, and in time of war would greatly facilitate the operations of the miner.

The details of military mining cannot be discussed here; but it may be stated that this subterranean warfare re- quires great skill on the part of both besieged and besieger. The besieged has the advantage of having had the main galleries of his countermines formed beforehand, but in spite of this a war of mines must generally be in favour of a besieger, since every explosion of the mines of the besieged, however destructive it may prove to the assailants, must destroy some portion of the works of defence, whilst every explosion of the besieger's mines must operate upon his enemy only. Starting, however, upon the assumption that a fortress, except in situations which renders regular attack impossible, must ultimately fall, the real object of defence is to occupy the enemy for at least the time for which the fortress was designed to resist ; and the destruction of the lodgment or of the battery of a besieger may materially protract the resistance of the intrenchment formed in a bastion, and thus enable the besieger to maintain his ground the longer.

The most simple form of mine, and that which may be most readily applied as an obstacle in the way of the assailant, is the fougasse. It eonsists of a ehamber placed at the bottom of a pit about 12 fectdeep. The charge is placed in a wooden box, and both the charge and size of the box may be thus estimated. When the line of least resistance, or shortest line drawn from the centre of the eharge to the surface of the earth, which in this case is the depth of the pit, is 10 feet, a charge of 100 tb will produee an entonnotr or excavation, the radius of which is equal to the line of least re sistance ; and it has been ascertained that the volume of the exca- yation varies with the charge, the line of resistance and the resist- ing medium being the same, and that the volume varies also as the eubes of the lines of least resistance ; hence, therefore, if W repre- sent the weight of the charge,

B the bulk of the entonnoir corre- sponding to 100 tb of powder and a line of resistance equal to 10 feet, and } that of the entonnoir corresponding to the charge W and the line of least resistance R, we have 100: W::B:6; but as

B:5::103: R3, we have 100: W:: 103: R3, and W=5 R3. Now let S=side of cubical box to contain the charge (55 ib of powder thrown

sf 13 nae ——_ = . 0 Thee nearly } Rin fect. The pits for fougasses vary generally from 8 gs 12 feet in depth, and from 3 to 4 fect in width, being made square, and are revetted with planks when the carth is not firm enough to stand without support ; and for this latter purpose gabions may De used of different diameters, so that the smaller may be slipped through the larger, whieh have been previously fixed. The pe for the powder is well tarred, and when intended to be left in ee ground for some time, it should be covered with tarred eanvas an put into another box, also tarred both inside and outside. The chal is ignited by Biekford's fuze, or by a saueisson oF linen tube abou an inch in diameter, filled with powder, and enclosed in @ wooden case well tarred. The saucisson and its covering should be laid in

loosely in filling one cubic foot), and S=

PORTIFICATION

a trench, sunk some feet in the earth, from the charge and pit to the place of ignition, in order to secure it from accidents as well as from the enemy's observation (see fig. 26, page 429, in which is also represented the mode whereby the fire 1s applied by what may be called the fire-box, the end of the trough and powder-hose being introduced into it). As for the thorough fulfilment of the object of a military mine the explosion should be "immediate," it is requisite to employ a contrivance for producing instantaneous ignition. This can be most readily and perfectly effected by employ- ing electricity, and this is now as a rule employed in regular mining operations.

Experience has shown how little real injury the explosion of fougasses do to an assailant; but, as the moral effect of them is a degree of hesitation or irresolution often greater than that produced by musketry fire, and as they are easily extemporized, the fougasse may still be considered an ob- stacle

of some value to the defence. Loaded shells packed in a case may be substituted for the ordinary charge, the case being formed with a horizontal partition, and the fuses of the shells placed on the lower portion of the case, passing through lioles in the partition, so as to be brought into con- nection with the firing-hose in the upper portion of the case. Another form is the stone fougasse, which is probably the most effectual of all, Itis constructed thus. A conical pit is made in the earth about 5 or 6 feet deep, the axis being directed towards the enemy at an angle of 45° with the plane of construction, and at the bottom a charge of 50 ib of powder is placed in a well-tarred box. Over the box, and perpendicular to the axis of the cone, is fixed a lid, on which as a platform are packed either stones or broken bricks, which, on explosion, are scattered over a space of about 60 by 70 yards. It should be laid down as a rule that facilities for discharging mines ought to be in every fortress, whether electric apparatus be used for the purpose, or openings be prepared in the works through which the powder-hose may be carried.

The last great modification proposed by Choumara is the extension of the exterior side, and the value of this can no longer be matter of doubt, now that the effective range of musketry has so miuch increased. The length of the line of defence may now be safely and advantageously fixed at between 400 and 600 yards, so that musketry and artillery can co-operate together efficiently. Chasseloup had, indeed, proposed to make his exterior side about 700 yards long, and he was no mere speculative engineer, for he had fortified with great skill Alessandria in Piedmont ; but it must be borne in mind that no greater distance should be allowed for musketry than is compatible with distinct vision and a correct appreciation of distance ; and further that the men intended to use the rifle in a for- tress ought to be well trained for that object. The Gatling gun may in fitting positions be used with effect instead of musketry ; it delivers a continuous stream of bullets at the rate of 400 per minute. The value of one Gatling is equal to 22 rifles, and nearly equal to two 9-pounders, and though it has a range of 1200 yards, it produces its best effect at short distances. In the defence of ditches its defect is that it cannot break or overturn scaling ladders,

GERMAN SysTEM oF DEFENCE.

Having traced the history of bastioned defence to the high state of perfection it attained, a summary of other systems will complete the subject. It has been shown that no sooner had the Italians invented the Bastioned System of defence than it found in every country persons who devoted themselves to the improvement of its details, —in France, Errard, Pagan, and Vauban ; in the Nether- lands, Freitag and Coehorn ; and in Germany, Speckle, who was at least equal to any of the others. Germany however justly it prided itself on Speckle, has gone back to Diirer, and has adopted from him the system of flank-

ing defence, which depends on casemated galleries, and caponnieres or casemated works placed across the ditches. Yet, notwithstanding this, it is remarkable that the Ger. mans have taken much of their works from a French officer —the celebrated Mare René, Marquis de Montalembert, who in 1776 published his celebrated work, Perpendicular Fortification, or an Essay on Several Methods of Fortifying a straight line, a triangle, a square, and all polygons of any number of sides, giving to their defence a perpendicular direc- tion; also, Methods of improving Existing Defences and rendering them much stronger ; also, Redoubts, Forts, and Held Intrenchments, of a New Construction, in 11 quarto

volumes, with 165 large plates,—a work which must be considered the source from which all the modern " inven- tions" in this branch of Fortification have beeu derived. — Referring back to earlier German writers, it appears that Rimpler in 1673 proposed a system which is a combination of bastions with tenailles, and that Landsberg in 1712 proposed a purely tenaille system ; but both these adhere to earthen ramparts and parapets, the first with revetments, the second without them, and their systems are little more than extensions of Field Fortification. But Montalembert, in his Tenaille System, replaces the simple revetment at the re-entering angles with casemated works in two stages, thus affording direct fire, both of artillery and musketry, for the defence of the ditches and faces of the redans, the remaining portion of the trace being occupied by an earthen couvre-face work, with a detached loopholed gallery in front of it, evidently the prototype of Carnot's detached revetment, The re-entering

casemates are calculated to hold 24 guns in two tiers. Behind the couvre-face is the body of the place of the redan, being also fronted by a casemated gallery, and separated from the couvre-face by an inner wet-ditch. In this system, then, the defence by musketry as well as by artillery is from two levels, the upper at a moderate height above the bottom of the ditch, and not, as in the old Italian systems, at the high level of the crest of the parapet. At the gorge of each redan is placed a formidable casemated tower; whilst in front of the main ditch there is a general couvre-face provided with casemated galleries, a second or advanced ditch, places of arms in front of the re-entering angles, a covered- way, and a glacis.

The Polygonal System may, however, be considered as springing directly from Diirer's work of the same name, only in this system the simple earthen ramparts of Diirer are replaced bya combination of casemated towers, casemated galleries, and earthen couvre faces. In Diirer's polygon the sides were straight or unbroken, but in Montalembert's the centre was thrown back and formed into an Italian bastioned trace, the faces flanking the faces of the caponniére. In forts which formed a triangle or square Montalembert was rich in resources, though the massive casemated tower, case- mated galleries, and earthen couvre-faces were the essential elements of all. Tn France, the views of Montalembert have never been received with enthusiasm, though Cher- bourg is fortified in conformity to them, and it was even alleged that the corps du genie was indisposed to receive instruction from an officer of another arm; but it is more reasonable to suppose that the cherished name of Vauban

has induced its officers to direct their attention rather to the improvement of the Bastioned System, which they have certainly carried to perfection, than to the develop- ment of a system depending on such different principles. In Germany, on the contrary, Speckle is less known than Vauban, and though probably a thought of Diirer may not have entered into the question, Montalembert's Systems, founded upon some of Diirer's principles, have been adopted, and may be studied in the works of defence of Coblentz. In | all such works masonry defences or casemated buildings IX. — 59 |

assume a character of the highest importance, but it should not be forgotten that masonry can never resist the effects of a concentrated fire of heavy guns, and can be considered safe only when protected by earthen masks or couvre-faces. The Maximilian towers of the defences of Lintz are no longer approved by modern engineers, and in closing the harbour of Sebastopol against approach by sinking a large portion of their own fleet, the Russians exhibited their dis- trust of masonry defences when opposed to ships. And this distrust is not to be wondered at, when it is reinembered. that, to bring the guns forward enough to afford them lateral training, the walls of casemated batteries must be cut into, and greatly weakened. This great defect of masonry defences, and the evils of smoke in close case- mates, are well known to engineers. In the earliest periods of Italian fortification, the necessity of increasing the active power of the flanks beyond that afforded by their length was strongly felt ; and retired flanks, rising one above the other, were adopted, as well as casemated flanks admitting two or more tiers of guns, thus obtaining, as in Montalembert's System, a greater number of guns by extending the battery vertically. At first sight this appears an obvious mode of acquiring a superiority over the attack, in which the batteries can only be extended laterally, but in practice the retired flanks were soon found to be un- tenable, while the front flanks were complete shell-traps, and the casemates were practically useless from the diffi- culty of clearing the smoke from them. The systems of Montalembert partake of the same defects; and however imposing the appearance of several successive tiers of guns may be, it should be remembered that, covered by a mask, they can only be partially used when the enemy is at a considerable distance, and that exposed to view they can be easily destroyed at 2500 yards by the guns of attack of the calibres now in use. Several writers have proposed systems based upon principles similar to those of Montalembert, but it is perhaps sufficient here to mention the work of Don Jose Herrera Garcia (Z'eorva Analytica de la Fortificacion Permanente), as it is unques- tionably the most remarkable development of the tower system of defence. Garcia proposes several successive lines of massive casemated buildings or towers, of an egg-shape, connected together with casemated curtains, The towers are surmounted by parapets, which at the ends next the enemy are broken into a series of smaller curves, and are retired or independent of the exterior wall or scarp. As each of these towers is defensible of itself, the work of forcing a way through three

lines of them would be most formidable, but the expense of such a system would be enormous.

The system of the Swedish general Virgin. belongs to the bastioned systems, but it is mentioned here in contrast to Garcia's, as it disperses in the defences separate bastioned forts,—of a form somewhat approaching to Rimpler's, and covered by outworks so arranged as to secure the inner works from injury until the enemy has effected his lodg- ment upon them. 'These forts are surrounded on all sides by ditches, and connected together by secure com- munications. Ingenious as Virgin's system is, it is manifest that though the loss of one fort would not ensure the fall of the others, it would at least render all the interior space inclosed by the line of forts untenable, and place the town, the arsenal, or other public buildings, at the mercy of the besiegers. This may be said of all detached forts, and it must be again laid down as a maxim that the ultimate value of such forts, as a means of securing an important object, depends on an inner line of defence of a nature to resist any sudden attack or cowp-de-main. Detached forts may be, for the purpose of keeping an enemy at a distance, a= me than a simple continuous line, but they

of use if an enemy can pass them and attack

FORTIFICATION

a defective interior line behind, incapable of resisting a coup-de-main.

It has been well stated by the French translator of Zas- trow, that the reduction of a place may be considered as a certain amount of work to be performed, the magnitude of which depends on various elements, amongst which the dis- position and nature of the works constitute the most im- portant; and that the attack has to perform this work in a certain time, and with certains means, amongst which the principal elements are the quantity of heavy artillery, and the nature of the ground over which the approaches must be carried. When, therefore, it is said that a work forti- fied on Vauban's first system would fall on the twenty- eighth day,—on Cormontaigne's, with a cavalier entrench- ment in the bastion, on the thirty-first,—it must be remembered that this implies the possibility of complete investment, and of steadily advancing the approaches over soil easily

worked by the sapper; but that if the invest- ment be incomplete, if the ground be rocky, and every inch have to be gained by hard and incessant toil, pro- tracting the time during which the sapper is uncovered, and therefore greatly adding to the daily losses in the trenches, such periods may readily be extended to twice or three times their ordinary length.

INTRENCHED CAMPS.

It would not be proper to leave the subject without a brief description of intrenched camps, especially as they have an important bearing upon the defence of capitals, with which this article closes.

An intrenched camp is a position, prepared beforehand, in which an inferior army rests in security from the attack of a superior army, and from which it may operate upon the communications of such superior army, or in which a beaten army takes refuge for the purpose of reorganization, The position selected for an intrenched camp is usually around the capital, or around an important city, or on an important line of communication. The position should, therefore, contain sufficient space to receive the army for which it is constructed, to contain ample supplies of all kinds, and to keep an enemy beyond bombarding distance not only from the city but from the camping grounds within it. An intrenched camp should consist of a chain of independent forts, with, wherever practicable, a strong inner work; the forts should be as large as possible, and disposed in aright or slightly convex line. No fort should have undue prominence over the others, as such a fort would be a source of weakness, inasmuch as it might be at- tacked by itself, and being further removed from the centre of defensive operations would be more difficult to succour. The camp should be traversed by free and easy commun: cations; and if it have an intcrior work, that work should command the whole of the interior. It should also possess facilities for passing rapidly from the defensive to the offen- sive, and sufficient interior space for the execution of such manceuvres as are necessary for the defence of the position.

FORTIFICATION OF CAPITALS.

Whether capitals, as capitals, should be fortified has' given rise to much difference of opinion ; but all autho- rities are agreed that the capitals of

highly centralized countries must be fortified. In such countries the prim cipal resources of the state, both public and _ private, are collected in the capital; in it is placed the centre of government, and from it administration and organization radiate. Such a capital is truly the heart of the nation ; 4 deadly blow to it stops the national circulation, and national paralysis may and will probably follow. Take, for

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example, Eagland, perhaps the most highly centralized of countries. Can it be doubted that an enemy in possession of London could exact what terms he pleased? Upon this point the commissioners appointed to consider the defences of the United Kingdom say,—-" There can be no doubt that the main object of an enemy invading the country would be to push for the capital, in the hope that, if he succeeded in obtaining command of it, such a disaster would result in our buying him off upon any terms he might think it ex- pedient to exact." This was written in 1860, but within eleven years its general truthfulness was thoroughly esta- blished by the fall of Paris, when the exactions of the Germans were only limited by the ability of the French to comply with them. It is then scarcely too much to say that the fall of London would result in the downfall of England. Speaking of the general confusion and ruin which the presence of a hostile army on British soil must produce, Lord Overstone said : " The occupation of London by an invading army! . . . . I cannot contemplate or trace to its consequences such a supposition." And he might well say so ; not England only, but the cause of civilization throughout the world would be shattered by such an occu- pation. ;

At a time when capitals were by no means the national centres which they have since become, owing to the develop- ment of the means of locomotion, aud to the discoveries of electrical science, Napoleon said that a great capital is the native place of the flower of the nation, the central point of public opinion, and the general depdt ; and he added that itis the greatest of absurdities to leave so important a place destitute of immediate defence.

How then should a capital be fortified? The answer is, that it should be so fortified that it may be safe from bom- bardment and from blockade, and that its defences may be beyond the control of its inhabitants.

These objects may be attained by two mcthods,—first by constructing a circle of detached forts round the capital, and at such a distance in advance of it as shall render investment impossible, or, secondly, by forming a cordon of intrenched camps far in advance of the capital, making at the same time such arrangements as shall facilitate the rapid concentration of troops in any of them.

With respect to these two methods there is much differ- ence of opinion, and eminent military authorities may be cited in support of one or the other according to the bias of the writer. Nevertheless it may be safely asserted that the value of either is dependent upon the number and quality of the troops available for its service. If the troops be few, or insufficiently trained and poor in quality, then it would be proper to have recourse to a system of detached forts round and not far in advance of the capital, and so disposed that they may, in a measure at least, be manned by local auxiliary levies. If, on the other hand, the troops be fully equipped, thoroughly trained and disciplined, with high — of manceuvring, then, even though inferior in num- ber, it may be advisable to have recourse to a cordon of Intrenched camps.

Generally, if circumstances admit of its adoption, the second method is the better, especially if the camps are dis- posed at such intervals that an enemy in force cannot pass between them, and at such distance from the capital that, if driven out of them, there is still timc left to fall back and take up some inner position upon which to deliver a decisive battle. The capital, though well covered by the camps,"would take no part in the active defence, and would not be attacked after the fall of one of them, while the Occupants of the camps could fight with no apprehension of the populace rising in their rear, a danger to be apprehended from the most patient of people, as they become pinched by the privations and miseries of a siege.

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In practice it will almost always happen that a combina- tion of the two methods will be adopted; but whatever method be adopted it will generally

be inadvisable to surround the capital, more especially if large, with a close enccinte. If, however, it have such an enceinte, the works of which the enceinte is composed should be provided with stroug interior defence. In all large cities there is a con- siderable cosmopolitan and vagrant element, possessed of no property, and having no interest in the maintenance of order, whose contact with the soldiery may be attended with deplorable results, inasmuch as it must tend to lessen the bands of discipline, to destroy the habits of obedience, and to weaken those feelings of devotion and self-restraint which are more than ever necessary under the privations of a close siege,

Against this view it may be urged that the enceinte con- structed round Paris in 1840 prevented its falling into the hands of the Prussians after the battle of Chatillon. This may be true; but in estimating the value of this enceinte it should be borne in mind that 236,000 Prussians were sufficient to shut up in it, and eventually reduce by famine, a garrison of 300,000 men, and it is certain that the absence of interior defences in that enceinte permitted a merc hand- ful of communists to make themselves masters of Paris and its fortifications, and to force back the regular troops upon Versailles. Generally, however, the rapid growth of the population in very large cities precludes a close enceinte. Indeed, the enormous extent of very large capitals, and the very long range of present artillery, render the fortifica- tion of them so costly that, in elaborating any scheme for their defence, cost must enter largely into calculation, and must materially modify theoretical andscientific conclusions.

But however elaborately the capital may be fortified, the full effect of the expenditure upon 'its fortifications is not obtained unless other strong places are formed in appro- priate positions in relation to it; for if the capital only be fortified, defence will cease with its fall. It is asserted upon the authority of official documents that the Irench would not have yielded to the conditions exacted by the conquerors of Paris in 1871, if there had remaincd to them strong defensive positions such as Orleans, Tours, and Bourges, upou which the armies, poor in quality as they were, of Chanzy, Faidherbe, and Bourbaki could have operated. In fact, if the capital only be fortified, the object of invasion will be limited to it, and the task of the invader will be much simplified, for he will have little fear of his

communications, and will be able to make his circle of in- vestment of such strength as seems best to him. And when once the investment is completed, it is matter of great diffi- culty for the inclosed army, even if superior in numbers, to break out. Its best chance of breaking out is during the first days of the investment, particularly at the period when the enemy commences to extend himself round the circle of investment, and in so doing presents his flank to it. After the investment is complete, the inclosed army is in a bad position for delivering an attack, as it must advance and deploy under concentric fire playing upon it in front and in flank. The difficulties of such an attack are exemplified in the French attack during the siege of Paris upon the 5th German corps between St Cloud and Buzenval, when 84,000 French attacking from an interior position were defeated with a loss of 6000 men by 20,000 Germans with a loss of only 646.

The advantage of other strong places was shown when 180,000 Germans were detained for a time before Metz. But Metz and Strasburg were so far from Paris that they had scarcely any relation to it. Moreover, they lay close to the frontier ; and as here there were no intermediate strong places they were rapidly isolated, and when they fell into the invader's hands proved of great service to him.

The absence of an intermediate line of defence probably led | is rich and populous ; uondon is richer and far more popu-

to the disaster of Sedan and the fatal investment of Paris, while on the other hand the fortresses on the northern frontier, out of date and ill adapted as they were to meet the appliances of modern warfare, enabled Faidherbe's raw levies to hold their ground as successfully as they did.

If one truth be taught more clearly than another by the Franco-German war, it is the advantage, nay, the absolute necessity, of fortifying, but of properly fortifying, the capital of a highly centralized country. When we consider France deploring the flower of her youth sacrificed, the de- struction wrought in her capital, and the spoliation of two of her fairest

provinces, and mulcted in a money payment of £200,000,000, with an addition of £170,000,000 more to her debt,—can we avoid the conclusion that no sum spent upon fortifications would have been too large if it had pre- served her from such calaniities? All that Paris is to

France, London is, and more, to the British empire. Paris

lous. Paris was a tempting prize to an invader; London is more tempting and more accessible. The resources of France in her soil and in her climate are great, and her children are so thrifty that she is self-dependent ; but it is far otherwise with Great Britain. She depends upon foreign countries for half the necessaries of life, and the commerce by which her supplies of food are gathered is mainly centred in her capital. France, as we see, has already recovered from the fall of ber capital; but the fall of England's might be without a rise, for it might be attended with a collapse of commerce from which there should be no recovery. Yet notwithstanding the pressure of unheard of ills, and with the regeneration of her army straining her resources heavily, France finds means to spend £4,000,000 upon the fortifications of Paris. With this example before her eyes shall Great Britain in the full tide of prosperit

do less for London ? (J. E. P.—C. H, N.)

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land, county of Ross, is situated on the N. side of the Moray Firth, nearly opposite Fort-George, from which it is 24 miles distant, and with which it has regular ferry com- munication. It was made an episcopal see in the 12th century by David I., but only a small portion of the cathe- dral now remains. It has a handsome Episcopal chapel and academy, and a good harbour, with a depth of 14 feet water at high tide. On account of the romantic scenery of the neighbourhood, the town possesses considerable attractions as a watering place. The parish church is at Rosemarkie, about a mile eastward. Sir James Mackintosh received his early education at Fortrose. This borough unites with Inverness, Forres, and Nairn in returning one member to parliament. The population of the parliamentary burgh (which includes Rosemarkie) was 1017 in 1871. FORTUNA, the Latin goddess of Fortune, answering to the Greek Tyche, rvxy. This deity was of far more importance in Italy than among the Greeks, the special characteristic of the Italian or Latin religion being the worship of abstract qualities. At Rome the culture of Fortune was said to have been introduced and established

by Aneus Marcius and Servius Tullius; and her temples were especially honoured at Antium and Preneste, where her oracular responses were in the highest repute. She was worshipped under a vast variety of epithets, the most prominent being wril's, as denoting the power which secured to women the affections of their husbands; muliebris, a name connected with the legend which made the women of Rome prevail over the resolution of Coriolanus; publica, privata, conservatriz, primigenia, &c. We hear also of a Fortuna Mammosa, corresponding to the many-breasted Artemis of Ephesus, and to the Teutonic Ciza, Zizi, whose name Tacitus in his Germania, c. 9, seems to have con- founded with that of the Egyptian Isis.

FORTUNATE ISLANDS. See Canary Istanps.

FORTUNATUS, the legendary hero of one of the most popular of European chap-books, He was a native, says the story, of Famagosta in Cyprus, and after many strange adventures and vicissitudes fell in with the goddess of Fortune in a wild forest, and received from her a purse which was continually replenished as often as he drew from its stores. With this he wandered through many a city and kingdom, and at last arrived at Cairo as a guest of the

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sultan. Among the treasures which the sultan showed him was an old napless hat which had the curious power of transporting its wearer to any place where he desired to be. Of this he feloniously possessed himself, and returned home to Cyprus, where he lived in the free gratification of all his fancies and desires. On his death he left his purse and his hat to his sons Ampedo and Andelosia; but instead of harmoniously putting them to use, they were jealous of each other, and by their recklessness and folly soon landed themselves in the depths of misery. The motzf of the story is very obvious: in the words of the preface, the reader should learn that all men should desire reason and wisdom before all the treasures of the world. In its full form the history of Fortunatus is a brisk narrative of con- siderable length, occupying in Simrock's Die Deutschen Volksbiicher, vol. 1i1., upwards of 158 pages. The scene is being continually shifted—from Cyprus to Flanders, from Flanders to London, from London to France; and a large number of secondary characters appear from time to time on the stage. The general features of the style and the allusions seem to indicate a comparatively modern date for the authorship ; but the nucleus of the legend can be traced back to a much earlier period. The stories of Jonathas and the three jewels in the Gesta Romanorum, of the emperor Frederick and the three precious stones in the Cento Novelle Antiche, of the Mazin of Khorassan in the Lhousand and One Nights, and the flying scaffold in the Bahar Danush, have all a certain similarity. The earliest known edition of the German text of Fortunatus appeared at Augsburg in 1509, and the modern German investigators are disposed to regard this as the original form. Innumer- able rifacimentos have been made in French, Italian, Dutch, English, &c,, and cheap editions are still common enough on the bookstalls. The story was dramatized by Hans Sachs in 1553, and by Thomas Dekker in

1600 ; and the latter comedy appeared in a German translation in Englische Komodien und Tragodien, 1620, Tieck has utilized the legend in his Phantasus, and Chamisso in his Peter Schle- mihl; and Uhland has left an unfinished narrative poem entitled " Fortunatus and his Sons."

See Dr Fr. W. V. Schmidt's Fortunatus und seine Sthne, cine Zauber-Tragidie, von Thomas Decker, mit einem Anhang, &e. Berlin, 1819; Gorres, Die deutsche Volksbiicher, 1807.

FORTUNATUS, Venantivs Honorivs CLEMENTIANUS, bishop of Poitiers, and the chief Latin poet of his time, was born near Ceneda in Treviso, in 530. He studied at Milan and Ravenna, with the special object of excelling as a thetorician and poet, and in 565 he journeyed to France, Where he was received with much favour at the court of Sigbert, king of Austrasia, whose marriage with Brunhild he celebrated in an epithalamium. After remaining a year or two at the court of Sigbert, he travelled in various parts of France, visiting persons of distinction, and composing short pieces of poetry on any subject that occurred to him. At Poitiers he visited Queen Radegonda, who lived there in retirement, and she induced him to prolong his stay in the city indefinitely. Here he also enjoyed the friendship of the famous Gregory, bishop of Tours, and other eminent ecclesiastics. He was elected bishop of Poitiers in 599, and died about 609. The later poems of Fortunatus were collected in 11 books, and consist of hymns, epitaphs, Poetical epistles, and verses in honour of his patroness

adegonda and her sister Agnes, the abbess of a nunnery at Poitiers. He also wrote a large poem in 4 books in honour of St Martin, and several lives of the saints in prose. His Prose 1s stiff and mechanical, but most of his poetry has an easy rhythmical flow. > An edition of the works of Fortunatus was published by Ch.

Tower at Fulda in 1603, 2d edition at Mayence in 1617. The best edition is that of M. A. Luschi, Rome, 1785, which was afterwards Teprinted in Migne's Patrologiee cursus completus, vol. 88.

FORT WAYNE, or, as it is sometimes called, "Summit City," a city of the-United States, at the head of Allen county, Indiana, situated 751 miles W. of New York aud 102 N.E. of Indianopolis, at the junction of the St J oseph and the St Mary, which form what is known as the Maumee River. The Wabash and frie canal passes through the town, and no fewer than eight railway lines branch out from it in various directions. Besides the ex- tensive works maintained by several of the railway com- panies for the building of carriages, &c., there are a num- ber of engineering establishments, planing mills, flour mills, and tanneries, sash and door works, and-a woollen factory. The churches are twenty-seven in all; the educational institutions comprise a high school, a normal school, a Methodist college (founded in 1846), the Concordia Lutheran college (founded in 1850), and two public libraries ; and among the other public buildings may be mentioned the court-house, the county jail, the city hospital, and the orphans' home. Interior communication is facili- tated by six miles of tramway lines. In the early part of the 18th century the French established a trading port on the site of the present city, which took its name, however, froma British fort erected in 1794 by General Wayne. The town was laid out in 1825, but did not become of much importance till the opening of the Wabash and Erie canal in 1840. In that year it attained the rank of a city, though its inhabitants numbered only 2080. By 1850 they had increased to 4282, by 1860 to 10,388, and by 1870 to 17,718.

FORUM, the word employed by the Romans to denote any open place in which men congregated for the transac- tion of mercantile or political business. It is connected with forts, and the same root also appears in the Greck 6upa, the Sanskrit dudra, and the English door. In the laws of the Twelve Tables it occurs as equivalent to the vestibule of a tomb! (Cic., De Leg., ii. 24); in a Roman camp the forum was an open place immediately beside the preetorium; and perhaps the word may at one time have been applied generally to the space in front of any public building or gateway. In the city itself, however, during the period of the early history, forum was almost a proper name, denoting the flat and formerly marshy space between the Palatine and Capitoline hills, which probably even at the regal period had afforded the accommodation necessary for such public meetings as could not be held within the area Capitolina (see Roms). During the days of the republic the city had only one forum, but under the empire a

considerable num- ber both of fora civilia and of fora venalia came into exist- ence. To the former class belonged those of Julius and of Augustus, and also that of Nerva, which wassometimes called Transitorium or Pervium. Of the latter order the most important were the Olitorium, Piscatorium, and Boarium. Those called after Trajan, Sallust, Diocletian, and Aure- lian were probably intended merely as public lounges. The word forum frequently appears in the names of Roman market towns; as, for example, in Appii Forum, Forum Julii (Frejus), Forum Livii (Forli), Forum Sempronii (Fossombrone). The fora were distinguished from mere vici by the possession of a municipal organization, which, however, was less complete than that of a prefecture. In legal phraseology, which distinguishes the forum commune from the forum privilegiatum, and the forum generale from the forum speciale, the word is practically equivalent to our "court" or "jurisdiction."

FOSBROKE, Toomas Dupiry (1770-1842), an Eng- lish antiquary, was born in London, and was called Dudley after a cousin of that name, esquire of Lebotwood Hall in Shropshire. Fosbroke has given accounts of himself aud family in most of his works, accompanied with lists

| and statements of facts supporting possible aliiances. He

was of an old Staffordshire family, no individual of which ever attained to any particular eminence. It had long been the custom in this family that one of the sons should enter the church, and the dying wish of the father in this case was that his son should take holy orders. Going to St Paul's school at nine years of age, Fosbroke took in 1785 a Tesdale scholarship at Pembroke College, Oxford, and graduated as M.A. in 1792. In that year he took also deacon's orders and settled in the curacy of Horsley in Gloucestershire, where he remained till 1810, taking priest's orders in 1794. In 1810 Fosbroke removed to Walford in Herefordshire, and passed there the remainder of his life, as curate till 1830, and afterwards as vicar of the parish. In 1796 he published the Lconomy of Monastic Life, which is, according to his own account, "a poem in Spenserian measure and style, written upon Darwin's doctrine of using only precise ideas of pic- turesque effect, chiefly founded on the sense of vision." Whatever all that may ean

the poem is entirely unread- able, although "the reviews were favourable." This with other poetical attempts of Fosbroke's was reprinted at the end of the third edition (1843) of his next book, the British Monachism, 2 vols. 8vo, 1802,—a compilation from manuscripts in the British Museum and Bodleian libraries, with subordinate use of printed authorities, of facts relating to the manners and customs of the monks and nuns of England, which was very favourably received. In the second and third editions this work was much enlarged. In 1799 Fosbroke had been elected fellow of the Society of Antiquaries, and resolved to devote himself to the study of archeology. British Monachism, the first result of his studies, was always his favourite work. In 1807 was published by subscription his Abstracts aud Records of Manuscripts respecting the County of Gloucester, after which he entered into an engagement with Sir Richard Philips for several important works, including an encyclopaedia of antiquities ; but owing to the commercial failure of that euterprising gentleman in 1810, these plans fell through. In 1814 he published an Abridgment of Whitby's Com- mentary on the New Testament; in 1819 a LMistory of the City of Gloucester, from new materials ; in 1818 Zhe Wye Tour; and in 1821 its companion, Ariconensia, or Archeo- logical Sketches of Ross and Archenfeld, illustrative of the Campaigns of Caractacus and the Station Ariconium. In 1821 also was issued his edition of the Berkeley Manu- scripts, with a history of the castle and town of Berkeley and a life of Jenner. The work for whicli Fosbroke is best remembered, the Hncyclopedia of Antiquities, was first published in 1824, 2 vols. 4to; a second' enlarged edition appeared in 1840. This work, though perhaps open to objection on account of a certain incoherence and disproportion, embodies the results of a large amount of reading among manuscript and other obscure sources. A sequel to this, called Foreign Topography, was published in 1828. His other works are A Picturesque and Topo- graphical Account of Cheltenham and its Vicinity (1826) ; The Tourist's Grammar, or Rales relating to the Scenery and Antiquities incident to Travellers (1826) ; " A Treatise on the Arts, &c., of the Greeks and Romans" (1833), for Lardner's Cabinet Cyclopedia; "Extracts from Manuscripts relating to English History," and "Illustrations of the Constitution of our Ancient Parliaments," contributed to the Transactions of the Royal Society of Laterature, of which body Fosbroke was elected honorary associate in 1827. He also made extensive researches into the pedigree and history of the Clinton family at the desire of the duke of

Newcastle, in the possession of whom three large folio volumes of his MSS. now remain. Fosbroke was in the early part of this century a regular contributor to the Gentleman's Magazine of both original articles and

reviews. author or judgment as a critic of antiquities, he was a student and writer of good aims; and despite a recurring

Although without pretension to style as an

tendency to whine at his fate in prefaces, his works can be read with some pleasure and profit. He died at Wal- ford on the lst January 1842.

FOSCARI, Francesco (d. 1457), doge of Venice," was born probably about 1372. He was of a patrician family, early displayed an ambitious temper, and rose to high honours in the state. He was already a member of the great council, when in 1412 he was named one of the guardians of the young marquis of Mantua ; and by his wise administration he won the gratitude both of his ward and of the people. In 1421, being then one of the pro- curatort of St Mark, he zealously advocated war on behalf of Florence against the powerful duke of Milan. The reigning doge, Tommaso Mocenigo, was opposed to this policy ; and when dying two years later, he warned his countrymen against electing Foscari as his successor, on the ground that he would plunge Venice into a disastrous war. The warning, however, was ineffectual ; for after six days' deliberations, with nine scrutinies, Foscari was elected doge. His success was ensured by bribery on a large scale. In proclaiming his election, a significant omission was made from the customary formula, the words which recognized the popular share in the appointment being entirely dropped. The ancient formula was never again used. Florence continued to press for an alliance with Venice against Milan, and the negotiations were still going on when, in 1425, the famous Carmagnola, who had for eight years commanded the Milanese armies and made many conquests for his master, the duke Filippo Maria, arrived at Venice, a fugitive in disgrace. His influence gave the decisive impulse to the hesitating Venetians; and in January 1426 a league was formed and war was declared against Milan, Carmagnola being appointed captain- general of the army of Venice. Bresciaand Cremona were

conquered for Venice, and the war was carried on with alternation of success and failure and intervals of peace till 1433, when Foscari consented to treat, and peace was signed at Ferrara. The doge then offered his abdication, but the senate refused to acceptit. After another troublous period of nine years he renewed his proposal, when the senate not only refused as before, but exacted from him an oath that he would retain his sovereignty for life. To the toils and harassments of office and of war were added, during his remaining years, great family sorrows. He had four sons, three of whom were already dead. The fourth, Giacopo, connected himself by marriage in 1441 with the noble house of Contarini. Within four years of this event, Giacopo was denounced to the council of teu as having received presents from several foreign princes, one of the highest offences a noble could be guilty of. He was tortured in the presence of his father, and, having made a confession, was condemned to perpetual banishment to Napoli di Romania. The aged doge was compelled to pronounce the sentence on his son. Five years later (1450), the assassination of Hermolas Donati, one of the ten, took place at Venice, and suspicion fastened on the banished Giacopo, one of whose servants was seen at Venice at the time. The servant was arrested and repeatedly tortured, but no confession was wrung from him. Giacopo was then recalled from his place of exile, was again put on the rack in his father's presence, and although not 4 particle of evidence was to be had against him, he was condemned and banished to the isle of Candia. The real assassin was afterwards discovered, but the sentence against Giacopo was unrevoked. He was forbidden all communication with his wife and family, and life became an intolerable burden. In 1456 he wrote a request to the

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Succeed Francesco Loredano as doge.

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duke of Milan to intercede for him, and purposely left the letter open and discoverable. It was presented to the council of ten, and his end was gaincd, for he was immedi- ately summoned to his native city to answer the charge of seeking foreign intercession. ‘or the third time he was examined before his father, the doge. This time he con- fessed the crime of which he was accused. He was never- theless put on the rack no less than thirty times with a view to extort a declaration of innocence, and this in his father’s presence. But it was in vain, and the wretched man, torn and dislocated, was once more banished. He died shortly afterwards in Candia. The father henceforth remained in retirement, incapable of discharging the duties of his office. At length through the intrigues of Giacopo Loredano, 2 member of a family which had a hereditary feud with the Foscari, the council were induced to request his abdication. He pleaded his oath not to resign which they had compelled him to take; but they discharged him of it, declared the dogate vacant, gave him a pension, and expelled him from the palace (1457). They wished him to withdraw by a private staircase to escape the notice of the people, but this he firmly refused todo. Supported by his brother, he slowly descended the giants’ stairs, and with the parting words-—“ My services brought ine within these walls, the malice of my enemies drives me away,’—lie took his leave (Oct. 25). A decree of the council pro- hibited any mention of his name, under penalty of death, thus suppressing all expression of popular regret. On the 30th of the same month his successor was elected, and the announcement of the election by the bell of the campanile agitated him so violently that he ruptured a blood-vessel and died in a few hours. One year after his death it was declared that the council of ten had exceeded their authority. ‘The melancholy story of the Foscari furnished Byron with a theme for a tragedy, and is narrated by Rogers in one section of his Zéaly—the two poems being published within a few days of each other (1821). FOSCARINI, Marco (1696-1763), doge of , Venice, historian, was born January 30, 1696. He was of an illustrious patrician family, and his fine character ani superior abilities opened for

him at an early age the path of public service and advancement. He rose througli the regular stages of office to be cavaliere and procuratore of St Mark, and was nominated historiographer of the republic. Tt was intended that he should take up and continue the Story from the point to which it had been brought by Michele Foscarini and the senator Garzoni. But his Services were turned into another channel. He was entrusted successively with important embassies to the courts of Vienna, Rome, and Turin, his task being to main- tain the strict neutrality of Venice in the wars between the French and the imperialists. During these embassies he drew up, after the manner of Venetian ambassadors, reports of his negotiations and proceedings, and also of his obser- vations of affairs at the various courts. Thus removed from Venice and from access to the public archives, from which the materials of his projected history must have been drawn, it was impossible for him to write it. He under- took, however, to collect materials for a literary history of his country, proposing to treat the subject under two heads, first the useful (or scientific) literature, aud secondly the more strictly literary works. In 1752 appeared. the first volume of the first division, in four books ; and this remains a fragment, no more having been published. Foscarini after his return from Turin was placed at the head of the university of Padua, in the conduct of which he brought about some important reforms. In 1762 he rose to the highest dignity of the state, being elected to } Among the other literary remains of Foscarini are an oration on the adminis:

tration of Dalmatia, not published till 1831; an account of the imperial court and administration, published in 1843; a report on his Sardinian embassy, &c. ; besides several unpublished pieces. He held the dogate for ten months only, dying on the 31st of March 1763. He left a large collection of books and manuscripts, the latter now forming part of the Imperial Library, Vienna.

FOSCARINI, Micneve (1632-1692), Venetian histo- rian, was born in 1632. By the deaths of his father and mother he became head of his house at the age of nineteen. Of patrician rank, he entered upon official life in 1657, and after filling various posts became in 1662 one of the avoga- dort of the

republic. Two years later he was appointed governor of Corfu with the title of prowveditore and captain. Returning to Venice in 1668, he was selected to fill some of the most honourable offices of the republic. On the death of Battista Nani in 1678, Foscarini was called to suc- ceed him as historiographer of Venice. He continued the history begun by Bembo, and carried on by other writers, from 1669 to 1690, but had not quite completed his work when he died suddenly, March 31, 1692. The Jstoria della Republica Veneta was published by his brother Sebastiani in 1696, and has been several times reprinted. Foscarini was author also of two Vovelle written in his youth ; and he annotated Caramella's Afuseum illustriorum Poetarum (1653).

FOSCOLO, Uco (1778-1827), the Italian writer who next to Alfieri has most contributed to free the literature of his country from the pedantries and affectations of the 17th and 18th centuries, was born at Zante on the 26th of January 1778. On the death of his father, a physician at Spalatro, in Dalmatia, the family removed to Venice, aud in the university of Padua Foscolo prosecuted the studies begun in the Dalmatian grammar school. The fact that amongst his Paduan masters was the Abbé Cesarotti, whose version of Ossian had made that work highly popular in Italy, was not without influence on Foscolo's literary tastes, and his early knowledge of modern facilitated his studies in ancient Greek. His literary ambition revealed itself by the appearance in 1797 of his tragedy Treste—a production which obtained a certain degree of success. Foscolo, who from causes not clearly explained, had changed his Christian name Niccolo to that of Ugo, now began to take an active part in the stormy political discussions wltich the fall of the republic of Venice had provoked. He was a prominent member of the national committees, and addressed an ode to Napoleon the liberator, expecting from the military successes of the Frencli general, not merely the overthrow of the effete Venetian oligarchy, but the establishment of a free republican government. The treaty of Campo Formio (17th Oct. 1797), by which Napoleon handed Venice over to the Austrians, gave a rnde shock to Foscolo, but did not quite destroy his hopes. The state of mind produced by that shock is reflected in the letters of Jacopo Ortis, a species of political Werther, — for the hero of Foscolo embodies the mental sufferings and suicide of an undeceived Italian patriot just as the hero of Goctlie places before us the too delicate sensitiveness embittering and at

last cutting short the life of a private German scholar. The story of Foscolo, like that of Goethe, had a groundwork of melancholy fact. Jacopo Ortis had been a real personage; he was a young student of Padua, and comniitted suicide there under circumstances akin to those described by Foscolo. At this period Foscolo's mind appears to have been only too familiar with the thought of suicide. Cato and the many classical examples of self-destruction scattered through the pages of Plutarch ap- pealed to the imaginations of young Italian patriots as they had done in France to those of the heroes and heroines of the Gironde, In the case of Foscolo as in that of Goethe,

the effect produced on the writcr's mind by the composition of the work seems to have been beneficial, He had seen the ideal of a great national future rudely shattered; but he did not despair of his country, and sought relief in now turning to gaze on the ideal of a great national poet. At Milan, whither he repaired after the fall of Venice, he was engaged in other literary pursuits besides the composition of Ortis. The friendship formed there with the great poet Parini was ever afterwards remembered with pride and gratitude. The friendship formed with another celebrated Milanese poet soon gave place toa feeling of bitter enmity. Still hoping that his country would be freed by Napoleon, lie served as a volunteer in the French army, took part in

the battle of the Trebbia and the siege of Genoa, was |

wounded and made prisoner. When released he returned to Milan, and there gave the last touches to his Oritzs, published a translation of and commentary upon Calli- machus, commenced a version of the liad, and began his translation of Sterne's Sentemental Journey. The result of a memorandum prepared for Lyons, where along with other Italian delegates he was to have laid before Napoleon the state of Italy, only proved that the views cherished by him for his country were too bold to be even submitted to the dictator of France. The year 1807 witnessed the appear- ance of his Carme sut Sepolcri, of which the entire spirit and language may be described as a sublime effort to seek refuge in the past from the misery of the present and the darkness of the future. The mighty dead are summoned

from their tombs, as ages before they had been in the inaster-pieces of Greek oratory, to fight again the battles of their country. 'The inaugural lecture on the origin and duty of literature, delivered by Foscolo in January 1809 when appointed to the chair of Italian eloquence at Pavia, was conceived in the same spirit. In this lecture Foscolo urged his young countrymen to study letters, not in obedience to academic traditions, but in their relation to individual and national life and growth. The sensation produced by this lecture had no slight share in provoking the decree of Napoleon by which the chair of national eloquence was abolished in all the Italian universities. Soon afterwards Foscolo's tragedy of Ajax was represented but with little success at Milan, and its supposed allusions to Napoleon rendering the author an object of suspicion, lie was forced to remove from Milan to Tuscany. The chief fruits of his stay in Florence are the tragedy of fzccrarda, the Ode to the Graces, left unfinished, and the completion of his version of the Sentimental Journey. His version of Sterne is an important feature in his personal history. When serving with the French, he had been at the Bou- logne camp, and had traversed much of the ground gone over by Yorick; and in his memoir of Didimo Cherico, to whom the version is ascribed, he throws much curious liglit on his own character. He returned to Milan in 1813, until the entry of the Austrians; thence he passed into Switzerland, where he wrote a fierce satire in Latin on his political and literary opponents; and finally he sought the shores of England at the close of 1816.

During the eleven years passed by Foscolo in London, until his death there, he enjoyed all the social distinction which the most brilliant circles of the English capital confer on foreigners of political and literary renown, and ex- perienced all the misery which follows on a disregard of the first conditions of domesticeconomy. His contributions to the Hdinburgh and Quarterly Reviews, his dissertations in Italian on the text of Dante and Boccaccio, and still more his English essays on Petrarch, of which the value was enhanced by Lady Dacre's admirable translations of some of Petrarch's finest sonnets, heightened his previous fame as a man of letters. But his want of care and fore- thought in pecuniary matters involved him in much

embarrassment, and at last consigned liim to a prison; and when released, he felt bitterly the change in his social position, and the coldness now shown to him by many whom he had been accustomed to regard as friends. Hig general bearing in society—if we may accept on this point the testimony of so keen an observer and so tolerant a man as Sir Walter Scott —had unhappily not been such as to gain and retain lasting friendships. He died at Turnham Green on the 10th of October 1827. Forty-four years after his death, in 1871, his remains were brought to Florence, and with all the pride, pomp, and circumstance of a great national mourning, found their final resting place beside the monuments of Macchiavelli and Alfieri, of Michel- angelo and Galileo, in Italy's Westminster Abbey, the church of Santa Croce. To that solemn national tribute Foscolo was fully entitled. For the orginality of his thoughts and the splendour of his diction his country honours him as a great classic author. He had assigned to the literature of his nation higher aims than any which it previously recognized. With all his defects of character, and through all his vicissitudes of fortune, he was an ill- judging but always a sincere and courageous patriot. He was, if ever Italian deserved those titles, the precursor and prophet of the unity and independence which his country now enjoys.

Ample materials for the study of Foscolo's character and career may be found in the complete series of his works published in Florence by Le Monnier. The series consists of Prose letterarie, in 4 vols., 1850; Epistolario, in 8 vols., 1854; Prose polttiche, 1 vol., 1850; Poesie, 1 vol., 1856; Lettere di Ortis, 1 vol., 1858; Saggi di critict storico-letterarto, 1st vol. 1859, 2d vol. 1862. To this series must be added the very interesting work published at Leghorn in 1876, Lettere inedite del Foscolo, del Giordani, e della Stgnora di Stael, a Vineenzo Monti. The work published at Florence in the summer of 1878, Vita di Ugo Foseolo, di Pellegrino Artusi, throws much doubt on the genuineness of the text in Foscolo's writings, as given in the complete Florence edition, whilst it furnishes somé curious and original illustrations of Foscolo's fami- liarity with the English language. (J. M. 8.)

FOSS, Epwarp (1787-1870), a solicitor by profession, was the author of a considerable number of works on legal antiquities, the most important of which are his Judges of England, in 9 vols., and his Biographia Juridica, a

Buo- graphical Dictionary of English Judges. The accuracy and extensive research of the author have made thesc— especially the larger work—of great historical authority.

FOSSANO, a city of Italy, in the province of Cuneo, on the Stura, about 40 miles from Turin. It is a well-built prosperous place, with a cathedral, an academy of science and letters, a public library, a philharmonic academy, and a veterinary college. Silk and leather are manufactured, and a trade is maintained in grain and cattle. In the llth century Fossano was a little borough, but in the 13th it was peopled by a body of refugees and raised to considerable importance. The Astigiani family surrounded it with walls shortly afterwards ; and in 1214 Filippo d'Acaia laid the foundation of the great four-towered castle, which still forms one of its most striking features. 'The population in 1871 was 7272 for the town, aud 16,544 in the commune.

FOSSANO, AmBrocio STEFANI DA, better known as Ambrogio Borgognone, or simply I] Borgognone, was the foremost painter of the Milanese school, so far as it is pos- sible to speak of a Milanese school independently of Leonardo da Vinci. It is well known how, when Leonardo left Florence to settle at Milan, the influence of his power- ful genius presently transformed and dominated the art of those parts of Lombardy. Borgognone was approximately contemporary with Leonardo, but represented, at least during a great part of his career, the tendencies of Lombard art anterior to the arrival of that master—the tendencies which he had adopted and perfected from the hands of his predecessors Foppa and Zeuale, We are not precisely

informed of the dates either of the death or the birth of Borgognone. His fameis principally associated with that of one great building, the Certosa, or church and convent of the Carthusians at Pavia, for which he worked much and in many different ways. It is certain, indeed, that there is no truth in the tradition which represents him as having designed, in 1473, the celebrated fagade of the Certosa itself. His residence there appears to lave been of eight years' duration, from 1486, when he furnished the designs of the figures of the virgin, saints, and apostles for the choir-stails, executed in

¢arsia or inlaid wood work by Bartolommeo Pola, till 1494, when he returned to Milan. Only one known picture, an altar-piece at the church San Eustorgio, can with probability be assigned to a period of his career earlier than 1486. For two years after his return to Milan he worked at the church of San Satiro in that city. From 1497 he was engaged for some time in decorat- ing with paintings the church of the Incoronata in the neighbouring town at Lodi. Our notices of him thenceforth are few and far between. In 1508 he painted for a church in Bergamo; in 1512 his signature appears in a public document of Milan ; in 1524—and thisis our last authentic record—he painted a series of frescoes illustrating the life of St Sisinius in the portico of San Simpliciano at Milan. Without having produced any works of signal power or beauty, Borgognone is a painter of marked individuality. He holds an interesting place in the most interesting period of Italian art. The National Gallery of London has two fair examples of his work—the separate frag- ments of a silk banner painted for the Certosa, and con- tuning the heads of two kneeling groups severally of men and women, and a large altar-piece of tle marriage of St Catherine, painted for the chapel of Rebecchino near Pavia. But to judge of his real powers and peculiar ideals —his system of faint and clear colouring, whether in fresco, tempera, or oil—his somewhat slender and pallid types, not without something that reminds us of northern art in their Teutonic sentimentality as well as their Teutonic fidelity of portraiture—the conflict of his instinctive love of placidity and calm with a somewhat forced and borrowed energy in figures where energy is demanded— his conservatism in the matter 'of storied and minutely diversified backgrounds—to judge of these qualities of the master as they are, it is necessary to study first the great series of his frescoes and altar-pieces at the Certosa, and next those remains of later frescoes and altar-pieces at Milan and Lodi, in which we find the influence of Leonardo and of the new time mingling with, but not expelling, his first predilections.

Calvi, Visita alla Certosa di Pavia, and Notizie, vol. ii.; Crowe and Cavaleaselle, Mist. of Painting in North Italy, vol. ii. p. 41 sg.

FOSSOMBRONE, a town of Italy, in the province of Pesaro and Urbino, about 7 miles from Urbino, on the left bank of the Metauro, which is there crossed by a fine bridge of a single arch. It is commanded by an old castle

on the heights, and it possesses a cathedral with ancient Inscriptions and pictures, a Capuchin church, a seminary, and the vestiges of a Roman theatre. There are several silk factories in the town, and the silk produced in the district ranks as the finest in all Italy. The population of — proper in 1871 was 3821, and of the commune

Of the origin of Fossombrone nothing is definitely known. It appears by the name of Forum Sempronii as a flourishing muni- cipal town under the Roman empire. Ruined by the Goths and Lombards, it was soon afterwards restored on a slightly different site. The Malatesta and Galeazzo families had for a long time pos- Tae of the lordship, but they sold it in 1440 to the duke of

rbino,

FOSSOMBRONI, Vrrrorio (1754-1844), a Tuscan Statesman and mathematician, was born at Arezzo in 1754.

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He was educated at the university of Pisa, where he devoted himself particularly to mathematical science. He obtained an official appointment in Tuscany in 1782, and twelve years later was entrusted by the grand-duke with the direc- tion of the works for the drainage of the Val di Chiana, a task for which he had already shown his fitness by the publication of a treatise on the subject. In 1796 he was made minister for forcign affairs; and on the erection of the grand-cuchy into the ephemeral kingdom of Etruria, he became a member of the commission of finance. After the annexation of Tuscany to the French empire, he was created by Napoleon I. chevalier of the Legion of Honour. He was also named head of the commission established for carrying out the drainage of the Pontine marshes. He became first minister of the restored grand-duchy (1814), and his administration, which was only terminated by his death, greatly contributed to promote the wellbeing of the country. Fossombroni was author of many treatises on mathematical and mechanical science, most of them relating to hydraulics. At the age of seventy-eight he married, and twelve years afterwards died, in 1844, at the age of ninety.

FOSTER, Joun (1770-1843), an English author and dissenting minister, generally known as the " Essayist," was born in a small farmhouse near Halifax, Yorkshire, September 17, 1770. Partly from constitutional causes, but partly also from the want of proper companions, as well as from the grave and severe habits of his parents, the outward and physical life of boyhood had for him scarcely an existence, and his earlier years were enshrouded in a somewhat gloomy and sombre atmosphere, which was never afterwards wholly dissipated. His youthful energy, finding no proper outlet, developed within him a tendency to morbid intensity of thought and feeling ; and, according to his own testimony, before he was twelve years old he was possessed of a 'painful sense of an awkward but entire individu- ality ;" what observaticns he made on men and things were characterized by a precocious shrewdness and gravity, but he lived in an interior world of emotions and senti- ments which he recoiled from communicating to any human being ; his imagination often exercised on him a tyrannous sway, endowing past or fictitious events with a stronger and more importunate reality than the actual circumstances which surrounded him, and sometimes arousing almost insupportable emotions of pain or terror. A_ partial counteractive to the predominance of this inward life was supplied by his love of natural scenery, but even here his interest was rather in the grand and sublime than in the beautiful, and nature awakened his strong enthusiasm more frequently than it inspired him with quiet and genial enjoy- ment. The most wholesome influence exercised on his earlier years was perhaps that obtained from the perusal of books of travel—a species of literature for which he had always a decided preference. It supplied him with actual scenes and adventures on which to exercise his imagination, and helped to deliver him from a too constant contempla- tion of abstractions aud a too minute analysis of his own moods and sentiments. His moral feelings in youth were not only sensitive but deeply rooted and constant and steadfast in their influence, being manifcsted in entire dutifulness to his parents, strong but "not malicious " antipathies, habitual abhorrence of cruelty, intense love of the heroic, and a tone of mind whose seriousness was ex- cessive.

The small income accruing to Foster's parents from their farm they supplemented by weaving, and at an early age he began to assist them by spinning wool by the hand wheel, and from his fourteenth year by weaving

double stuffs. Even " when a child," however, he had the "feelings of a foreigner in the place;" and though he p2rformed his monotonous task with conscientious diligence, IX. — 60

le succeeded so indifferently in fixing his wandering thoughts upon it that his work never without difficulty passed the ordeal of inspection. There is little information as to the manner in whicli he obtained his primary education, but at an early period he had acquired a great taste for reading, to gratify which he scmetimes shut himself up alone in a barn, afterwards working at his loom "like a horse," to make up for lost time. He had also at this period "a passion for making pictures with' a pen." Shortly after completing his seventeenth year he became a member of the Baptist church at Hebden Bridge, with which his parents were connected ; and with the view of preparing himself for the ministerial office, he began about tlle same time to attend a seminary at Brearley Hall con- ducted by his pastor Dr Fawcett. The mental processes of Foster followed a course which was entirely their own, and the manner of their operation was often awkward and unwieldy. He had difficulty in bending his attention to

the continuous contemplation of a subject as it had been viewed by otliers, and smaller niceties and details only made an impression on his mind after a repeated perusal. He therefore mastered his tasks very slowly and with great labour, and his application was so intense and protracted as to awaken the serious anxiety of his friends. To excel in literary composition was the purpose which occupied his most eager attention, and with a view to obtain facility and variety of diction, it was his custom to select paragraphs from different writers and to alter the structure and expression of each sentence in as many different ways as his ingenuity could invent, a method which, if it helped him to acquire the particular kind of flexibility which his style afterwards manifested, was perhaps also in part the means of betraying him into his occasional use of lumbering expressions, and of a harsh, involved, or clumsy order of arrangement.

After remaining three years at Brearley Hall he was admitted to the Baptist College, Bristol, and on finishing his course of study at this institution, he obtained an engagement at Newcastle-on-Tyne,where he preached to an

audience of less than a hundred persons, in a small and dingy room situated near the river at the top of a flight of steps called Tuthill stairs. At Newcastle he remained only three months. In the beginning of 1793 he proceeded to Dublin, where after failing as a preacher he attempted to revive a classical and mathematical school, but with so little success that he did not prosecute the experiment for more than eight or nine months. From 1797 to 1799 he was minister of a Baptist church at Chichester, but though he applied himself with more earnestness and perseverance than formerly to the discharge of his ministerial duties, his efforts produced little apparent impression, and the gradual diminution of his hearers necessitated his resignation. After employing himself for a few months at Battersea in the instruction of twenty African youths brought to England by Zachary Macaulay, with the view of having them trained to aid as missionaries to their fellow-countrymen, he in 1800 accepted the charge of a small congregation at Down- end, Bristol, where he continued about four years. In 1804, chiefly through the recommendation of Robert Hall, he became pastor of a congregation at Frome,'but a swelling in the thyroid gland compelled him in 1806 to resign his charge. In the same year he published the volume of Essays on which his literary fame most largely if not mainly rests. They were written in the form of letters addressed to the lady whom he afterwards married, and consist of four papers, Bint a Man writing Memoirs of himself ;" "On Decision of

raracter ;" "On the Application of the Epithet Romantic ;" and "On some Causes by which Evangelical Religion has been eased unacceptable to Men of Cultivated Taste." The success of this work was immediate, and was so considerable |

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that on resigning his charge he determined to adopt literature as his profession, The eclectic Review was the on]

periodical with which he established a connexion; but his contributions to that journal, which were begun in 1807 number no fewer than 185 articles. On his marriage 7 May 1808 he removed to Bourton-on-the-Water, a small village in Gloucestershire, where he remained till 18 when he returned to Downend and resumed his duties to his old congregation. Here he

published in 1820 his Essay on Popular Ignorance, which was the enlargement of a sermon originally preached on behalf of the British and Foreign School Society. He describes this essay with a certain degree of happiness and accuracy as a " broad, true, and strongly delineated picture of the intellectual and moral state of the mass of our people;" only it must be added that the contemplation of the gloomy features of his subject has so reacted on his vision that an artificially darkened atmosphere seems to overespread his whole canvas, and his picture somewhat resembles that of a landscape painted during an eclipse. In 1821 he removed to Stapleton near Bristol, and in 1822 he began a series of fortnightly lectures at Broadmead Chapel, Bristol, which were afterwards published in 2 vols. On the settlement of Robert Hall at Bristol this service was discontinucd, as in such circumstances it appeared to Foster to be "altogether superfluous aud even bordering on impertinent." The health of Foster during the later years of his life was soniewhat infirm, the result chiefly of the toil and effort of literary composition; and the death of his only son, his wife, and the greater number of his most intimate friends combined with his bodily ailments to lend additional sombreness to his manner of regarding the events and arrangements of the present world—the " visage of death" being almost his "one remaining luminary." He died at Stapleton 15th October 1843.

The cast of Foster's mind was meditative and reflective rather than logical or metaphysical, and though holding moderately Calvinistic views, his language even in preach. ing very seldom took the mould of theological forms. His "apprehension of the divine mercy, and of the terms of hope and safety for poor mortals, was," he says, " widely remote from the austerity of the systematic divines." He rejected the doctrine of eternal punishment, because the idea of such protracted and hopeless misery following such a "brief trial and sojourn on earth" seemed inconsistent with the divine goodness, and he was thus compelled to believe that the language of Scripture which seemed to support this doctrine was susceptible of another and milder interpretation. Though always retaining his connexion with the Baptist denomination, the evils resulting from organized religious communities seemed to him so great that he caine to be "strongly of opinion that churches are useless and mischievous institutions, and the sooner they are dissolved the better." The only Christian observauces which he

regarded as of any importance were public worship and the Lord's Supper, and it so happened that he never administered the ordinance of baptism.

Though he was mild and charitable in his interpretation of the conduct of individuals, his moral constitution was narrow and stern rather than sympathetic, and his creed left little room for laughter, and on the question of amusements was strongly puritanical. The dark and sombre scenes which his imagination so vividly pictured forth riveted his contemplation by a fascination from which he vainly struggled to be free. With such mournful views of life the "weight of this unintelligible world" pressed rather heavily upon him, and his cast of thonght is largely coloured by aconstant reference to the "endless future." He was a firm believer in supernatural appearances, and cherished a longing hope that a ray of light from the

other world might sometimes in this way be vouchsafed to mortals, ;

Apart from the singularity of his modes of thought, and the unusual forms of his spoken as well as _ his written style, Foster was constitutionally unfitted to excel as an orator, and Robert Hall testifies that ' though his words might be fire within, the moment they left his lips they froze and fell down at his feet." As a writer his most characteristic quality is his searching discernment of every kind of moral falsity and weakness, the dark and subtle windings of which he tracks with unerring and dogged sagacity, and exposes either with easy irony, or with a keen and scathing satire, whose indignation, however, is slightly qualified by a faint suggestion of sorrowful contempt. He often strangely interweaves the hackneyed and commonplace with the novel and unexpected. The substance of his thought is old and worn, but after passing through the crucible of his mind it acquires a brilliant lustre, and he places it in such new and striking lights that his exhibition of it resembles the revelation of something hitherto unknown. He is, however, so intent on adequately representing the minutest aspects of his subject that he does not sufficiently distinguish between the important and the unimportant ; and he often employs a beautiful some- times a sublime figure to illustrate either an almost self- evident proposition, or a thought otherwise much too lowly for such a splendid dress; while, on the other hand, an elevated thought or sentiment is sometimes associated with

imagery as much out of harmony with its surroundings and position as would be the rags of a beggar with the splendour and magnificence of a court. His originality consists chiefly in placing old and time-honoured beliefs in new and unexpected relations, and imparting a vividness to truths which are so generally recognized that their importance is almost forgotten. He has therefore given no new impulse to thought, and he has scarcely entered upon the threshold of the speculation and ideas of the 19th century. Though his intellectual was much wider than his moral sympathy, his literary criticisms—apart from the fact that they are totally unfettered by artificial rules and maxims, and record in ingenuous language the actual impression produced upon his mind by the work he examines—are chiefly of value for their keen detection of what is hollow and false in sentiment, and their sarcastic exposure of affectation and pretence. He wrote with intense mental strain and effort, and sometimes spent days in the elaboration of a single paragraph. His style has the merit of entire individuality ; as he himself says, his " language is simply and absolutely

formed for the thought—is adapted and flexible to it—is.

taken out of the whole vocabulary of our tongue just on purpose for the thoughts, and moulded to their very shape, with an almost perfect independence and avoidance of all the set artificial forms of expression." With this merit however, it has the defects formerly 'adverted to; and While scarcely ever weak or ambiguous, but even in the midst of its frequent involutions surprising by terse and pointed or vivid and graphic interpolations, and pre- serving throughout its winding structure a compact, nervous, and sinewy strength which occasionally assumes the form of a rhythmical and measured eloquence, it is yet on the whole deficient in directness, freedom, ease, and grace,

Besides the works already alluded to, Forster is the author of a Discourse on Missions, 1818; 'Introductory Essay" to Doddridge's Rise and Progress of Religion, 1825; 'Observations on Mr Hall's Character as a Preacher," prefixed to the collected edition of Hall's Works, 1832; an "Introduction" to a pamphlet by Mr Marshman on the Serampore Missionaries ; several political letters to the Morning Chronicle, and contributions to the Eelectic Review, pub- lished posthumously in 2 vols., 1844. His Life and

Correspondence, edited by J. E. Ryland, originally published in 1846, has passed through several editions. (FB)

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FOSTER, SrerHen Corts (1826-1864), a prolific American song and ballad writer, was born at Alleghany, Pennsylvania, July 4, 1826. He was the youngest child of a merchant who became mayor of his native

| city, and a member of the State legislature, and was related

by marriage to President Buchanan. As a boy Stephen was delicate, and through life he was of a quiet retiring dis- position—in strong contrast with the spirit of many of his most popular songs. He early showed talent for music, and played upon several instruments ; he also acquired a fair knowledge of French and German. When thirteen years old he wrote a song afterwards published in his works —"Sadly to Mine Heart Appealing." At sixteen he wrote the then much admired "Open thy Lattice, Love ;" at seventeen he entered his brother's business house, Cincinnati, Ohio, where he remained about three years, composing meanwhile such popular pieces as 'Old Uncle Ned," " O Susanna!" &c, For the latter he received 100 dollars, which induced him to adopt song-writing as a vocation. His chief successes were songs written for the negro melodists or " minstrels." Besides those mentioned, the following attained great popularity, viz., "Nelly was a Lady," "Old Kentucky Home," "Old Folks at Home," "'Massa's in the Cold Ground," &c. For these and other songs the composer received considerable sums, " Old Folks at Home" bringing him, it is said, 15,000 dollars. For the most of his songs Foster wrote both words and music. His reputation rests chiefly on his negro melodies, many of which have been popular on both sides of the Atlantic, and sungin many tongues. His later songs were of a more refined and somewhat higher order of musical composition, and after his mother's death were characterized by melancholy. Among these are "Old Dog Tray," "Gentle Annie," " Willie, we have missed you," &c. His "Come where my Love lies Dreaming" is considered one of the most pleasing and popular vocal quartets ever written. Composers and poets of celebrity recognized his peculiar talent, and great musicians incorporated many of his melodies into concert fantasias. Although as a musician and composer Foster would, strictly

speaking, have little claim to high rank, his song-writing made an epoch in popular music of a class which certainly possessed melody united to beauty of harmony, while to the words employed he gave fitting musical expression. He died at New York, January 13, 1864.

FOTHERGILL, Jonn (1712-1780), F.RS., an eminent physician, 2 member of the Society of Friends, was born at Carr End in Yorkshire. He took the degree of M.D. at Edinburgh in 1736. After visiting the Continent, he in 1740 settled in London, and gained there an extensive practice. In the epidemics of influenza in 1775 and 1776 he is said to have had sixty patients daily. In his leisure he made a study of conchology and botany ; and aiter his death, which took place in December 1780, his collections of shells, prints, and other objects were sold for a considerable sum. Fothergill was a lieentiate of the College of Physicians of London, and a fellow of that of Edinburgh, of which he was a great benefactor. He was the patron of Sidney Parkinson, the South Sea voyager. A translation of the Bible (1764 sg.) by Anthony Purver, a Quaker, was made and printed at his expense. His pamphlet entitled Account of the Sore Throat attended with Ulcers (1748, 2d ed. 1754), prepared with the assistance of information supplied by Dr Letherland, attracted great attention, and was translated into several languages. His works were edited by Dr John Elliot (1781), by Gilbert Thomson (1782), and by Dr Lettsom (1783).

FOUCAULT, Jean Brrnarp Lion (1819-1868), a distinguished French physicist, was the son of a well-known publisher at Paris, where he was born September 18, 1819,

After an education received chiefly at home, he studied medicine, which, however, he speedily abandoned for physical science, the improvement of Daguerre's photo- graphic processes being the object to which he first directed his attention. During three years he was experimental assistant to M. Donné in his course of lectures on micro- scopic anatomy. With M. Fizeau he carried on a series of investigations on the intensity of the light of the sun, as compared with that of carbon heated in the voltaic arc, and of lime in the flame of the oxyhydrogen blowpipe; on the interference of heat rays, and of light rays differing greatly in lengths of path; and on the

chromatic polariza- tion of light. In 1849 he contributed to the Comptes Rendus of the Academy of Sciences, t. xxviii., a description of an electromagnetic regulator for the electric lamp, and, in conjunction with Regnault, a paper on binocular vision. By the use of a revolving mirror similar to that used by Wheatstone for measuring the rapidity of electric currents, but having a concave mirror centred in its axis, he was enabled in 1850 to demonstrate the greater velocity of light in air than in water, and to establish the law deduced from the undulatory theory that the velocity of light in different media is inversely as the refractive indices of the media. In the same year he was created a chevalier of the Legion of Honour. For his demonstration in 1851 of the

diurnal motion of the earth by the rotation of the plane of |

oscillation of a freely suspended, long, and heavy pendulum in an E.S.W, direction, exhibited by him at the Pantheon in Paris, and again in the following year by means of his invention the gyroscope, he in 1855 received the Copley medal of the Royal Society of London, He was also in 1855 made physical assistant in the imperial observatory at Paris. In September of that year he discovered that the force required for the rotation of a copper disc moving in its own plane becomes greater, the disc at the same time growing hotter, when tlie disc is made to rotate with its rim between the poles of a horse-shoe magnet. Foucault invented in 1857 tlie polarizer which bears his name, and in the succeeding year a method of giving to the speculum of reflecting telescopes the form of a spheroid or a para- boloid of revolution. His reflector for the great telescope in the Paris observatory was mounted in June 1859. With Wheatstone's revolving mirror he in 1862 deter- mined the absolute velocity of light to be 298,000 kilometres (about 185,000 miles) a second, or 10,000 kilom. less than that obtained by previous experimenters. He was created in that year a member of the Bureau des Longitudes and an officer of the Legion of Honour, in 1864 a foreign member of the Royal Society of London, and next year a member of the Mechanical Section of the Institute. In 1865 appeared his papers on a modification of Watt's governor, upon which he had for some time been experiment- ing with a view to making its period of revolution constant, and on a new apparatus for regulating the electric light ; and in the following year (Compt. Rend. \xiii.) he showed how, by the deposition of a

transparently thin film of silver on the outer side of the object glass of a telescope, the sun could be viewed without injuring the eye by excess of light. Foucault died of paralysis, February 11, 1868. From the year 1845 he edited the scientific portion of the Journal des Débats. His chief scientific papers are to be found in the Comptes Rendus, t. xxv., 1847—lxix., 1869.

See Revue Cours Scient. vi., 1869, pp. 484-489; Proc. Roy. Soe. Xvil., 1869, pp. lxxxiii.-Ixxxiv.; Lissayous, Notice historique sur la vie et les travaux de Léon Foueault, Paris, 1875.

FOUCHE, JosePH (1763-1820), duke of Otranto, minister of police under Napoleon I., was born in a small village near Nantes, 26th May 1763. He was the son of a ship captain, and at the age of nine years began the study of mathematics-at the college of his native place, with the

view of entering the merchant marine. That such a call- ing would have proved congenial to him is not very probable, aud at any rate it presented so little attraction to his youthful fancy that he induced his father to consent to the abandonment of this intention, and to permit him to continue his studies at Paris under the superintendence of the principal of the oratory. He afterwards taught successively iu the colleges of Juilly, Arras, and Vendéme ; and at the time of the Revolution he was préfet des études at Nantes. He now renounced his connexion with the ecclesiastical profession, and in 1792 succeeded in being chosen one of the national deputies for Loire-Inférieure, In this capacity he made a violent speech in support of the execution of Louis XVI., without respite and without appeal to the people, taunting those who hesitated to udopt such an extreme measure with "trembling before the shade of a king." In the midst of the political chaos he determined to "ride on the whirlwind and direct the storm :" thougli he had little or no interest in moral speculation, he became an ardent asserter of atheism; and, though devoid of all political predilections, and actuated in his political purposes simply by a cool calculation of advantages that was seldom if ever surprised or ruffled even by the most critical contingencies, he soon manifested a zeal for republicanism which exceeded that of the wildest enthusiasts of that exceptional time. Having at the end of 1793 been commissioned to put in operation the law des suspects in the department of

Niévre, then one of the centres of the royalist sympathizers, he not only succeeded in completely crushing all insurrectionary symptoms, but initiated the movement for the spoliation of the churclies, by which the treasury was supplied with money for the campaign of 1794; and he also further inaugurated the age of reason by suppressing the priests and causing to be inscribed on the doors of the cemeteries a sentence afterwards generally adopted for this purpose—La mort est un sommeil éternel. In November of the same year he was appointed, along with Collot d'Herbois, to execute the decree of the convention against the royalist city of Lyons; and here he vied with his colleague in a mania for destruction and bloodshed, inditing bombastic regrets that the mine and the guillotine did their work too slowly to accord with the impatience of the republic, or to express the omnipotence of the people. This devoted enthusiasm for freedom led to his being elected president of the Jacobin Club, 4th June 1794, soon after his return to Paris. He now so far allowed his audacity to overcome his discretion as to make some derisive allusions to the part played in the féte de Etre Supréme by Robespierre, who on that account denounced him as an impostor and peculator, and procured his expulsion from the society. Fouche had erred, however, only by a too quick anticipation of public opinion, for the execution of Robespierre fol- lowed on the 25th July. The star of Fouché was thus for a short time again in the ascendant; but having awakened distrust by some new intrigues, he was denounced as a terrorist, expelled the convention 9th August 1799, and placed under arrest. He obtained his freedom by the amnesty of the 26th October following; and having obtained the confidence of the socialist Babeuf, and revealed his conspiracy to Barras, then president of the directory, he was rewarded by an interest in the contracts of the army, and by being appointed in 1798 ambassador to the Cis- alpine republic. Soon afterwards his intrigues against the directory of Milan led to his recall, but when the party of Barras again cameiuto power he was appointed to the Hague. There he remained only a few months, returning to Paris to enter upon his famous career as minister of police. In this capacity he for some years exercised an influence on the internal affairs of France perhaps greater than that of

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any one else; and it was chiefly owing to his well-chosen measures of repression, his ready and dexterous use of expedients, his almost omniscient faculty of detection, and his just appreciation of political contingencies, that at this critical period of France's history the reign of anarchy was averted. Recognizing the necessity of a new political departure, he suppressed the Jacobin clubs and newspapers, and was concerued in instigating the beginning ofa reaction towards monarchical principles. Though he failed to effect an understanding between Barras and Napoleon, he resolved. rather to desert his patron than to share his overthrow, and exerted all his powers of management and finesse to bring the coup d'état of the 18th Brumaire to a successful termination. Besides taking an important though carefully guarded share in the preliminary negotiations, he suspended in the name of the directory the twelve municipalities of Paris, tranquillized the citizens by posting on the walls re- assuring intiraatious, and took the precaution of shutting the gates of Paris to prevent the fugitive deputies from re- entering the city.

Under the consulate, Fouché, notwithstanding the op- position of Sieyés, was continued minister of police, partly because he was to be dreaded as an opponent, and partly because no one else could bear comparison with him in fitness for the office. Its duties he discharged, not only with unequalled tact and discretion, but with a justice and mildness rendered possible only by his perfect confidence in his superior cunning. At the same time there was necessarily attached to it a very great irre- sponsible power, and far from neglecting to make undue use of this he took care to lend an additional appearance of necessity and value to his services by a continual supply of political fomentations. If his audacity and assumption aroused the jealousy of Napoleon, his cool impenetrability no less disconcerted him, and matters were not improved by the ludicrous blunders of the secret police which Napoleon had the folly to employ, in order both to test his minister's fidelity and render him less indispensable. Actuated therefore most probably by a regard to his own position, Fouché endeavoured to prevent a too rapid aban- donment of the lines of republicanism, and deprecated as imprudent

the means that were being used towards the establishment of a monarchical government. Such advices doubtless increased Napoleon's irritation and distrust, and on becoming consul for life in 1802 he determined to rid lumself of the galling fetters of his minister's ascendency. He did this, however, with great caution and respect; and while he suppressed the office as no longer necessary, he conferred on Fouché the dignity of a senator, and presented him with half the police reserve funds. The association of the functions of the old office with those of the ministry of justice did not prove a happy arrangement; and Fouché by maintaining for his own purposes the same system of esplonage as formerly, was able, by revealing the Georges conspiracy to reassert his influence in the affairs of state. Divining Napoleon's secret wishes and intentions, he now took every opportunity to press upon him the advisability of immediately assuming the monarchical crown, and applied himself to the furtherance of this object with an ostentatious zeal that was doubtless meant to suggest that he was almost the sole agent in determining events towards that end. And indeed he might, after Napoleon, justly claim the chief merit of that great political change, for at any rate the smoothness with which it was accom- plished was greatly due to Fouché's skilful management.

; After Napoleon's coronation Fouché was therefore re- installed in his old office, 4th J uly 1804, uniting with its functions those of the ministry of the interior. In this position he took a very prominent part in the rule of France under Napoleon, and to some extent rivalled his master in

ave influence ; for if the empire gained glory by Napoleon's achievements, it owed its internal harmony to Fouché, who had for a time the entire direction of its administration. On the revival of the titles of nobility he was created duke of Otranto, and it appearcd as if his tenure of office were indissolubly connected with the empire's stability. The bond between him and the emperor was, however, solely one of interest, and the very antipodes of one of affection and mutual esteem. His imperturbable self-control, his connexion with the old republicans, the obscurity and mystery in which he shrouded his intentions, and his power of secret strategy gained him almost a kind of mastery over the arbitrary spirit of Napoleon, but it was a mastery borne both with impatience and with resentment. Apart from this, his cold and vulgar ambition and his cynical contempt for all unsubstantial glory

irritated the sensitive egoism of Napoleon, whose magnificent projects he often pierced with shafts of truth that were too painfully effective, and whom he somewhat imprudently tormented with warnings as to the necessity of limiting his designs of conquest, When matters were in this critical condition, they were brought to a crisis by a proclamation of Fouché calling on France—then threatened by the English inva- sion—to prove that Napoleon's presence was not necessary to scatter his enemies. The proclamation was effectual ; but on Napoleon's return to Paris Fouché was deprived of the ministry of the interior. Shortly afterwards he sent an ageut to England to carry on negotiations with tlie English Government, in ignorance that Napoleon had sent another for the same purpose; and the English minister, suspecting a trick, declined all further negotiations. This mischance completed Fouché's disgrace; he ceased to be minister of police, 3d June 1810; and to secure his absence from France, he was appointed governor of Rome. While delaying his departure he was requested to deliver up the autograph Ictters of Napoleon and other Government documents in his possession; and ltis- answer that they were all destroyed was deemed so little satisfactory that he found it expedient to go into voluntary exile. On deliver- ing up the papers the destruction of which he had asserted, he was afterwards permitted to return to his estate at Pont- Carré ; but in 1813 Napoleon judged it prudent to appoint him governor of Illyria, after which he was sent to Rome to watch the movements of Murat. Being recalled to France some time before the entrance of the allies into Paris, he in anticipation of events came to an understanding with Talleyrand, and becoming one of the principal members of the provisional Government, proposed that a deputation should be sent to the Comte d'Artois, brother of Louis XVIII. He afterwards wrote letters to the king recom- mending the adoption of certain measures fitted to reconcile the opponents of the Bourbon dynasty, and on the 25th April addressed a letter to Napoleon at Elba, advising him, instead of making an effort to remount the throne of France, to seek a sphere for his ambition in America, " where his genius would be admired without being feared." On the news of Napoleon's escape frorn Elba the Govern- ment of Louis offered Fouché the portfolio of police, but he declined it on the ground that the Government could no longer hold its position. Next day he was ordered to be arrested, but deluding by a clever stratagem the officers sent for that purpose, he escaped to the hotel of Hortense Beauharnais, and received on the following day his old office

from the hands of Napoleon. He now determined merely to prepare for Napolcon's downfall, which he saw to be imminent; and besides securing the confidence of both patriots and royalists, he opened a communication with the allies. After the battle of Waterloo it was therefore to him that all eyes turned for guidance ; and, becoming the head of the provisional

Government, he succeeded in producing the impression that his skilful diplomacy had saved Paris from extreme humiliation. Having played such an important part in this political crisis, his name could not be omitted from the list of the new Government, and he received his old office from the king, of whose brother's death he had been one of the principal instigators. His dexterity, however, had now set itself a task for which it was incompetent; and gradually finding his position untenable, he resigned office 19th September 1815. As a kind of solatium he was appointed ambassador to Dresden ; but on the passing of the law of banishment against those who had voted for the death of Louis XVI., he retired to Prague. He became a naturalized Austrian subject in 1818, and died at Trieste, 25th December 1820, in possession of enormous wealth. Fouché, notwithstanding his equivocal expression of countenance and his known untrustworthiness, had a pecu- liar faculty of captivating the eminent politicians with whom he came into contact. This was due at once to his instinctive divination of their weak point, and to his wonderful knowledge of the varying conditions of the political barometer. Though somewhat boastful, his con- versation was remarkably agreeable and interesting, and was frequently lighted up by terse and sarcastic witticisms which would have done credit to Talleyrand. His tem- perament was too cold to enable him to achieve success as an orator, but his writings, though sometimes bombastic, must be allowed the merit of cleverness, and are often characterized by a graphic felicity. His unparalleled political career is to be accounted for not perhaps so much by his peculiar intellectual abilities as by the apparent fact that he was, as M. Thiers has expressed it, completely " indifferent to good and evil"—that he was influenced neither by the impulses of passion nor by the dictates of couscience. His private life was virtuous compared with that of many of his contemporaries, and his political life—apart from his connexion with the death of Louis XVI, and the atrocities of Nantes and Lyons—was not only

unstained by heinous crime, but to an unenlightened spectator seemed wholly devoted to the public interest. Inhabiting a region beyond the influence of party bias, he appeared when a political crisis was at hand almost in the character of the guardian angel of France, cherishing no remembranceof past ingratitude, but benevolently proffering for her acceptance the only aid that could save her from disaster. He was, if not the leading actor, at least the principal wire-puller and prompter in many of the great events of his time; but his only important legacy to pos- terity is the grand spy-system which he brought almost to perfection, and which has since exercised such a baneful in- fluence on European politics. |Next to his love of intrigue, his main motive in all his purposes was something re- sembling avarice ; but in all probability he did not love even money, and sought to lay hold of it chiefly as the one stable rock amid the billows and quicksands of political life. Though his purposes were not held in check by any moral principle, yet so strong was his self-control, and so calm his estimate of possibilities, that he never committed himself irrevocably to a conspiracy that was not successful. The atrocities, however, which inaugurated his political career, and at the close of it his acceptance of office under Louis XVIII., were, though widely separated in time, so incompatible with each other that he at last completely lost the confidence of all parties in the state, and his past career was placed in a light so strongly sinister as to render its character unmistakable. Many politicians of his own time had been guilty of equally heinous crimes; ee ee so consistently and uninterruptedly ee: ai oe) political and moral consideration, including pect, to a temporary success.

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Fouché is the author of Léflewions sur le jugement de Louis Caper, 1793 ; Réflexions sur Véducation publique, 1793; Rapporé et projet de loi rclatifs aux eolléges, 1793 ; Rapport sur la situation de Com- mune-A ffranchte, 1794; Lettre awe prefets, eoneernant les préires, de. 1801; two Rapports au Roi and Notes aux ministres étrangers, 1815, where he ably discusses the condition of France at the time; and Lettre aw due de Wellington, 1817. He is said to have been the author of the Préeis de la vie publique du due d' Otrante, published at London and Leipsic in 1816. The Afémoires de Fouehé, Paris 1824, were declared by his family to be a forgery, but

although their naiveté is often too pronounced to be compatible with their authenticity, they are evidently founded on original sources of information. See also Vie de Fouehé, 1821; Bourrienne, Life of Napoleon; Desmarest, Témoignages historiques, ou quinze Ans de haute police sous Napoléon, 1833; Martel, Etude sur Fouché et sur le communisme dans le pratique en 1798, 1873, which contains a number of documents never before published ; and an interesting account of an interview with Fouche by Earl Stanhope, in Lord Brougham's collected works, vol. v. (T. Fag

FOUCHER, Simon (1644-1696), a sceptical writer during the latter part of the 17th century, was born at Dijon on the 1st March 1644. Extremely little is known of his life. He was the son of a merchant at Dijon, and appears to have taken orders at a very early age. For some years he held the position of honorary canon at Dijun, but this he resigned in order to take up residence in Paris, He graduated at the Sorbonne, and spent the remainder of his life in literary work in Paris. Foucher's name is now almost completely forgotten, but in his day he enjoyed considerable repute as a keen opponent of Malebranche. His point of view in philosophy may be called the sceptical, but the scepticism extends to only one doctrine, external perception. On this point he revived the old arguments of the Academy, and advanced them with much ingenuity against Malebranche's doctrine. Otherwise his scepticism is subordinate to orthodox telief, the fundamental dogmas of the church seeming to him intuitively evident. His writings against Malebranche were collected under the title Dissertations sur la Recherche de la Vérité, 1693. See Rabbe, Z' Abbé Stmon Foucher, Dijon, 1867.

FOUGERES, a town of France, at tle head of an arron- dissement in the department of Ille-et-Vilaine, situated for the most part ou an eminence near the left bank of the Nancon, a tributary of the Couesnon, by which the lower town is not unfrequently laid under water. It was for- merly one of the strongest places on the frontier towards Normandy, and it still preserves some portions of its 15th- century walls. The castle is now a picturesque ruin, with abundant evidence in iis noble towers and outworks at once of its strength and its magnificence. The finest of all the towers was erected in 1242 by Hugues of Lusignan, and named after Melusine the mythical foundress of the family. The churches of St Léonard and St Sulpice both

date, at least in part, from the 15th century; and the town-hall has a gate of the 16th and a belfry tower of the 15th. Among the other public buildings are a hospital founded in 1688, a civil and military prison, an institution for deaf- mutes, an orphanage, and a normal school. The trade and manufactures of the town are considerable—the former consisting mainly of agricultural and dairy produce, and the latter of shoes and boots, sail-cloth and other hempen fabrics, flannel, hats, and leather. Fougéres frequently figures in history from the 11th to the 15th century. It was taken by the English in 1202, and again in 1448; and the name of Surienne, the captor on the second occasion, is still borne by one of the towers of the castle. Popula- tion in 1851, 8771; in 1876, 10,396,

FOULD, Acuttte (1800-1867), French financier and politician, was, born at Paris, November 17, 1800. The son of a rich Jewish banker, he was associated with and afterwards succeeded his father in the management of the business, As early as 1842 he entered political life, having been elected in that year as a deputy for the

department of the Hautes Pyrénées. From that time to

his death he actively busied himself with the affairs of his _

country. He readily acquiesced in the revolution of February 1848, and is said to have exercised a decided influence in financial matters on the provisional Govern- ment then formed. He shortly afterwards published two pamphlets against the use of paper money, entitled,

Pas @ Assignats/ and Opinion de M. A. Fould sur les |

Assignats. During the presidency of Louis Napoleon he was four times minister of finance, and took a leading part in the economical reforms then made in France. His strong conservative tendencies led him to oppose the doctrine of free trade, and disposed him to hail the "Coup d'Etat" and the new empire. On the 25th of January 1852, in consequence of the decree confiscating the property of the Orleans family, he resigned the office of minister of finance, but was on the same day appointed senator, and soon

after rejoined the Government as minister of state and of the imperial household. In this capacity he directed the Paris exhibition of 1855. The events of November 1860 led once more to his resignation, but he was recalled to the ministry of finance in November of the following year, and retained office until the publication of the imperial letter of the 19th of January 1867, when M. Kmile Olivier became the chief adviser of the emperor. During his last tenure of office he kad reduced the floating debt, which the Mexican war had considerably increased, by the negotiation of a loan of 300 millions of francs (1863). Fould, besides uncommon financial abilities, had a taste for the fine arts, which he developed and refined during his youth by visiting Italy and the eastern coasts of the Mediterranean. In 1857 he was made an honorary member of the Academy of the Fine Arts. He died at Tarbes on the 5th October 1867.

FOULIS, AnpRew and Rosert, two learned Scotch printers and publishers, whose enterprise and devotion to the interests of the higher education deserve to be gratefully remembered, Robert, the elder of the two, was born in 1707, and his brother in 1712. Their father was a maltman in Glasgow, and they consequently had very ordinary opportunities for intellectual culture in their early years. Robert was apprenticed to a barber; but his ability attracted the attention of Dr Francis Hutchison, who strongly recommended him to establish a printing press, After spending 1738 and 1739 in England and France in company with his brother Andrew, who had been intended for the church and had received a better educa- tion, he started business about 1740-1, and in 1743 was appointed printer to the university. In this same year he brought out Demetrius Phalereus, the first Greek book ever printed in Glasgow ; and this was soon followed by the famous 12mo edition of Horace which was long but erroneously believed to be immaculate : though the Successive sheets were suspended in the university and a teward offered for the discovery of any inaccuracy, six errors at least, according to Dibdin, escaped detection. Soon afterwards the brothers entered into partnership, and they continued for about SO years to issue earefully corrected and elegantly printed editions of classical works in Latin, Greek, English, French, and Italian. Upwards of 500 Separate publications proceeded from their press—among the more noticeable being the small editions of Cicero, Tacitus, Cornelius Nepos, Virgil, Tibullus and Propertius, Lucretius, and Juvenal 3; a beautiful edition of the Greek

Testament, in small 4to; Homer, 4 vols. fol., 1756-1758 ; Herodotus, Greek and Latin, 9 vols. 12mo, 1761; Xenophon, Greek and Latin, 12 vols. in 12mo, 1762-1767 ; Gray's Poems ; Pope's Works; Milton's Poems. The brothers spared no pains, and Robert went to France to Procure manuscripts of the classics, and to engage a

avo skilled engraver and a copper-plate printer. Unfortunately it became their ambition to establish an institution for the encouragement of the fine arts; and though one of their chief patrons, the earl of Northumberland, warned them to "' print for posterity and prosper," they spent their money in collecting pictures, pieces of sculpture, and models, in paying for the education and travelling of youthful artists, and in copying the masterpieces of foreign art. Their countrymen were not ripe for such an attempt, and the "Academy" not only proved a failure but involved the projectors in ruin. Andrew died in 1775, and his brother went to London, hoping to realize a large sum by the sale of his pictures. They were sold for much less than he anticipated, and he returned broken-hearted to Scotland, where he died at Edinburgh in June 1776. The debts of the firm amounted to £6500. Robert was the author of a Catalogue of Paintings with Critical Remarks, 3 vols. See W. J. Duncan, Notices and Documents illustrative of the Literary History of Glasgow, printed for the Maitland Club, 1831, which inéer alia contains a catalogue of the works printed at the Foulis press, and another of the pictures, statues, and busts in

plaster of Paris produced at the " Academy " in the university of Glasgow.

FOUNDING, the art of reproducing solid objects in metal or other fusible substances by pouring the melted substancé into moulds. It is also known as casting, and objects so produced are said to be of cast metal. Works where founding or casting is carried on are termed foundries, and their proprietors founders. The verb to found is not, however, in current use, being almost entirely replaced by cast. The root of the word is the Latin fundus.

Three principal operations are involved in founding :— (1) moulding, or the production of a hollow mould to re- ceive the melted metal; (2) melting, or ranning down the metal; and (3) pouring, or filling the mould with the liquid metal, The preparation of the original object or pattern from which

the mould is made is not strictly part of foundry work proper, the founder receiving the pattern prepared in wood from the original drawings from the engineer's pat- ternmaker, except in those cases where no pattern is re- quired, and the inodel is built up on the foundry floor by the moulder by the use of revolving templates, dividing engines, or other contrivances.

The metals best suited for foundry work are those that possess the property of increasing in volume at the moment of passage from the liquid to the solid state so that its particles may be pressed into and fill up the finest cavities of the mould in setting. This property is best developed in bismuth, the alloys of copper with tin and zinc (bronze and brass), and cast iron. Lead does not take a sharp impression unless alloyed with tin or antimony, as in type metal. Copper also does not give sound castings.

Patterns for moulding require to be made somewhat larger than the cast required, the difference being determined by the linear dilatation of the metal between the ordinary temperature and that at the moment of solidification. This varies for different metals; for cast iron it is about ae; for hard bronze, ;4,; soft bronze, 74z; brass, 75; ZINC, gy; lead, sty; tin, z}7; and bismuth, y}5. Patterns for iron founders are therefore made larger than the finished size required in the proportion of one-eighth of an inch to the foot in their linear measurement, an allowance known as "shrinkage "—the patternmaker's rule being longer by that quantity than the ordinary engineer's rule. Patterns are usually made of wood, except when the object is in- tended to be reproduced in great numbers, when brass or iron ones are often used. The more easily fusible alloys, such as pewter, type metal, Britannia metal, &c., are cast in metallic (iron or brass) moulds, which are used inde- finitely ; but with metals having a higher melting point, a separate mould is required for each cast, metal moulds

being only used with these, for the production of ingots or masses that are brought to shape by other means, or when a special quality of surface is required, as in chill casting. In most cases castings are hollow, the thickness being determined by the empty space included between the mould proper which represents the external surface of the object, and a false mould or core, which may also reproduce a finished surface, as in cylinders, pipes,

&c., or be rough and uneven, as in statuary castings, where only the external surface is exposed. The material generally used in monld- ing from patterns is fine sand, either “ green,” @.e., slightly damp, or dry, that is, dried by artificial heat—the first method being adopted for all castings of moderate size and weight, while dry sand mouldings are chiefly used for heavy castings where great solidity and strength are required. The priucipal requisites of a good foundry sand are fine and uuiform grain, a certain amount of cohesiveness without being sticky, infusibility at the temperature of the metal poured, and freedom from combustible or other substances giving off gases when heated. These are best fulfilled by a nearly pure quality of siliceous sand, with at most 3 or 4 per cent. of clay and a slight proportion of hydrated peroxide of iron; the particles when moulded should allow free passage for gases to escape, while perfectly impermeable to the

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FOUNDING

melted metal. Good foundry sands are easily procured in most parts of the United Kingdom, the best being those obtained from reconstructed sandstones in the alluvia of — the Thames and other large rivers, and the drift of the New Red Sandstone districts of central England. In other countries not so well provided, foundry sands are often im- ported or brought from considerable distances inland.

The same sand is used continuously,—the moulds after use being emptied into a pit in the foundry floor, whience the supply for new moulds is taken as required. Fresh sand is added from time to time to make up the waste and to maintain the required plasticity, which diminishes by constant heating. A proportion of ground coal or char- coal is mixed with the sand, so that, although the latter is actually red or brown when fresh, it is reduced to a dark grey or black in the foundry. |

The sand forming the mould is held together by an outer frame or box called a flask, as many flasks being used as there are separate parts in the mould. These are united by lugs and cotters, the top one being sometimes loaded ~ when the object is large to prevent it moving uuder the pressure of the finid inetal. A proper division of the mould — is one of the chief points to be attended to in foundry work; where the object is divisible by‘a central plane into two

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Fic, 1.—Arrangement of Patterns in casting Railway Chairs.

equal and similar halves, two flasks are usually sufficient ; but in complex and irregular forms three, four, or even a larger number are required, its divisions being so arranged that no portion of the pattern overhangs within any section, so that it raay be withdrawn by a straight pull without shaking tlie sand.

The ordinary operation of moulding is as follows. A flask laid with its lugs uppermost is rammed up with old sand to a smooth surface. In this the lower half of the pattern is imbedded, and the surface is covered with dry or facing sand to prevent adhesion. Upon this a second flask is placed, and sand is carefully rammed upon the pattern until the box is completely filled, when the whole is turned over, and the first or false part is emptied, the surface of the upper half smoothed down or faced with sand or finely ground coal or charcoal, and a runner stick, which forms the passage or ingate for the metal, inserted. The second half is then similarly moulded in a second flask, and when finished the upper box is lifted by a crane, leaving the pattern in the lower one or drag, from which it is lifted by spikes or rods screwed on temporarily, a slight vibrating motion being Set up by striking it rapidly with a piece of wood or iron in order to start it more easily. This is an Operation of some nicety, as the blows must be moderate

so as not to risk injury to the sand. Provision is made for the exit of gases by piercing vent holes through the sand by a fine wire during ramming. Thesurface of the mould is finished by dusting it over with charcoal or graphite, In moulding railway chairs and similar objects of an irregular form required in great numbers, metal patterns are used with loose pieces

united by spikes and dove-tails for the overhanging parts, such as the inner faces of the jaws,—the joints being so arranged that the straight parts of the pattern may be withdrawn, leaving the loose parts behind in the mould, whence they are afterwards removed by hand. Fig. 1 represents in section an arrangement of this kind, as applied to moulding railway chairs. The right hand figure shows the pattern in place with the sand rammed, and the left the mould with the pattern D with- drawn, the loose jaws or "core prints" a, 5, c, remaining in the sand, but in such a position as to be easily removed when the flask is turned over. The pattern is with- drawn by a straight pull on the handle H. The stop P gives support to the cores, &c., which represent the trenail holes in the finished casting (fig. 2), and prevent them being dragged away with the pattern, as they might be if left unsupported. The regular descent of the pattern 1s ensured by the deep sides A and the guides they move 1n..

Usually four patterns are fixed upon one table, so that four chairs are moulded at one operation, the withdrawal

Fia, 2.—Finished Castings.

hydraulic press or other mechanical arrangement. The lower mould forming the base of the chair is a nearly flat plate moulded in another machine.

In loam moulding, as used for large pipes or cylinders, a hollow core of iron or brick is placed in the centre of the foundry, and around it a layer of loam, that is, a mix- ture of sand and clay rendered plastic by mixture with water, is laid on by trowels and finished up by a revolving tem- plate working round a central vertical spindle to the dimen- sion of the interior, forming the "nowel" or core, which when dried is washed with finely ground charcoal and water, Upon this a loam pattern is made up by another template representing the outer surface of the cylinder to the thick- ness of the finished work. This in like manner is dried and black-washed, and finally a shell of brickwork is built outside, leaving a few inches space between it and the second moulded surface, which is carefully filled up with loam, and forms the "cope" or mould proper. This when dried is lifted by a

crane, and either separates from the pattern or "thickness " or drags it away with it, but in either case the latter is broken away, and when the cope is replaced the mould is ready for use as soon as the necessary air-vents, ingates, runner passages, &c., have been provided. In many large foundries, however, gas and water pipes of large size are now produced from permanent moulds af cast iron faced with a thin layer of sand or loam; the outer moulds, being divided into two parts, are brought up to the work and removed by trucks running upon railways.

The method of moulding for bell-founding and statuary is generally similar in principle to that of a loam moulding, with this difference, that the thickness representing the finished object is made up not of loam but of wax, and in the case of statuary, where the object is to use as little metal as possible, it is usually very thin. A plaster cast divided into sections, taken from the original work, forms the matrix within which the wax is moulded of the proper thickness, the inside core being formed of clay with Some metal bars to give support, when the work is large. When the plaster mould is removed, the waxen surface is finished up by the sculptor, and the outer mantle or mould, proper is formed by coating it with a porous clay mixture. This when dried is carefully baked or burned in a furnace, aud the wax melting at the same time leaves the hollow to receive the metal. It is sometimes necessary to leave holes in the casting to allow of the withdrawal of the surface ; these are afterwards stopped with plugs of the same metal. Great care is required in the placing of the ingates and runners so as to allow the mould to be regularly and rapidly filled, and prevent any part of the metal setting or chilling before the proper moment.

Melting.—This may be effected either with or without contact with the fuel. In the former case the metal is charged alternately with coke, and occasionally a little flux, into a cylindrical or slightly conical blast furnace known as a cupola, and accumulates in a hollow or sump at the bottom below the tuyeres or blast pipes, whence it is tapped out from time to time, either directly into the mould or

more generally into a ladle, for conveyance to the moulds arranged upon the foundry floor. In the second case the fusion takes place either upon the

bed of a reverberatory furnace or in crucibles in air furnaces heated by coke or by gaseous fuel. Of these methods the first or cupola is only fitted for iron founding, the reverberatory furnace is used for bronze and iron, and in special forms for steel ; while crucible melting is most general for brass and bronze small castings, as well as for the finer kinds of steel, or generally for any metal that is likely to be altered by direct contact with the fuel. The description of these appliances belongs more properly to the article FURNACE. The founder's ladle or "shank" is a bucket or cup-shaped vessel of wrought iron lined with a shell of fire-clay, with a lip for pouring, having two projecting handles. One of these is straight and serves as a pivot; the other with a cross bar called a crutch is used as a tipping handle when pouring. When of small size the filled ladle can be carried from the cupola to the work and poured by two men, but when of large size containing several tons of metal they are slung from a crane and tipped by a tangent screw and worm wheel, manipulated by a man standing at a distance. The perfection of ladle arrangement is to be seen in Bes- semer's process of steel making, where several tons of melted steel are distributed into a ring of ingot moulds in a circular pit by two or three men in a very few minutes. In Krupp's arrangements for making large steel castings from crucibles an intermediate or equalizing ladle is used. The crucibles, which contain about 70 ib each, are drawn from the furnaces in regular order, and poured in such a manner that an uninterrupted stream of metal is kept up from the ladle to the mould.

Large castings when filled from above are liable to be spongy or unsound in the upper part of the mould, or that last filled. In such cases an extra length is given at the top of the mould, as the unsound portion or dead-head is afterwards removed. This plan is usually followed in casting bronze guns. Sound and dense castings can be obtained by filling with a vertical side runner, so that the metal enters the mould from below and solidifies under the hydrostatic head represented by the vertical height of the runner. A method employed by Sir Joseph Whitworth, of applying hydraulic pressure to the metal in the mould until it solidifies, has been adopted with great success by the inventor in the prevention of blow holes and similar imperfections in steel ingots.

In “chill casting” a portion of the surface of the whole or a part of the mould is made of cast iron, so that the metal brought in contact with it is rapidly cooled. It is adopted in the production of Palliser’s cast iron projectiles for penetrating armour plates, rolls for boiler and other iron plates, and paper glazing, and in America for hardening the treads of railway wheels. The iron where in contact with the chill surface becomes white, of a platy crystalline structure, and intensely hard, while such portions as are cooled in contact with the sand remain finely granular, dark grey, and comparatively soft. (H. B.)

FOUNDLING HOSPITALS are intended to save children from death by exposure, and it is therefore difficult to describe them properly apart from the general subject of infanticide. This practice was extremely common among nearly all ancient nations. It may still be studied in such horrible institutions of sdvage life as the Areoi of the Society Islands, or the Meebra of New South Wales ; and it may be found in the greatest variety of form among the tribes of Hindustan.! The motives which suggested the

1 Compare Moore on Hindu Infanticide, 1811, with Brown on Jn- fanticide in India, 1868. In Baluchistan, where children are often drowned in milk, there is a euphemistic proverb, “ The lady’s daughter

_| died drinking milk.”

practice were sometimes superstitious, more often extremely practical. As the natives of Gujarat said to Major Walker, “ Pay our daughters’ marriage portions, and they shall live.” The feeling here was one of social dignity mixed with the strong contempt which many savages express for the single life. But in most cases children were killed simply because the parents, having no realized wealth, did not expect to be able to clothe and feed them. ‘This is espect- ally seen in the frequent killing of female children and those who are sick or deformed. In some places the practice has been confined to the children of concubines, of stranger fathers, or of mothers dying from sickness. In the earliest society the right to kill belonged to the father,

sometimes assisted by a person skilled in omens, or by a council of friends. But the usage soon hardened into a binding custom or into express legislation. Thus in the exogamous communities girls were clearly a source, not of weakness only, but of danger. At amuch later period the number of a family, or of the daughters, was often fixed by law, and both Lycurgus and the Roman decemvirs directed the slaughter of deformed children. This violence to the domestic affections was probably made easier by the notion which appears in Greek science and in Roman law that neither the foetus nor the newly-born child is entitled to the privileges of humanity. The Greek pastoral of Longus (The Loves of Daphnis and Chloe), and the Heautontimoru- menos of Terence, show still better than the text of laws how the conscience of a civilized society reconciled itself to such cruelties, And the sober reasoning of Aristotle (Republic, vii. c. 16) goes even beyond the custom of his time. Pliny the elder defends infanticide as a necessary check on population, and Quintilian and Seneca bear witness to the frightful mortality among children exposed, and thie systematic mutilation of those who survived. Notwith- standing the eloquent protests of the Christian fathers, it was not till the time of Severus and Caracalla that a Roman lawyer ventured to make the noble statement, " Necare videtur non tantum is qui partum perfocat, sed is qui abjicit et qui alimonia denegat, et is qui publicis locis misericordie causa expopit quam ipse non habet."! The legislation of Constantine did not go beyond a declaration that the killing of a son was parricide, but the famous law of Valentinian, Valens, and Gratian (unusquisque suam sobolem nutriat, C. viii, 52, 2) punished exposure by the loss of the patria potestas, and secured the rights of the foster-father. Fin- ally, by Novel 153, Justinian declared that the found- ling should no longer be tne slave of the foster-father, but should be free. This, however, did not affect western Europe, where social disorder and the recurrence of famine led to extensive sales of children. Against this evil, which was noticed by several councils, the church provided a rough system of relief, children being deposited (jactatc) in marble shells at the church doors, and tended first by the matricularw or male nurses, and theu by the nutricard or foster-parents.2, Nothing is known of the brephotrophia which are said to have existed in the Eastern empire at this time, nor of the public tables (such as Velleiana, Boebiana) which particular emperors are said to have provided for the support of children. The earlier traditions of a hospital at the Cynosarges in Athens and at the Columna Lactaria in the vegetable market

at Rome are disputed. It is in the 7th and 8th centuries that definite institutions for foundlings are established in such towns as Tréves, Milan, and Montpellier. In the 15th century Garcias, archbishop of Valentia, is a conspicuous figure in this charitable work ;

1 See Julius Paulus, sive d. itt e ; € partus expositione et nece apud vetcres by weg Noodt, 1700, criticized by Bynkershoek, De Jure occidendi, vendendi, et exponendi liberos apud Romanos, 1719.

? See Capitularia Regum Francorum, ii. 474,

Paul, who in the reign of Louis XIIL, with the help of the countess of Joigny, Mme. le Gras, and other religious ladies, rescued the foundlings of Paris from the horrors of a primitive institution named La Couche (Rue St Landry), and ultimately obtained from Louis XIV. the use of the Bicétre for their accommodation. Letters patent were granted to the Paris hospital in 1670. The Hotel-Dieu of Lyons was the next in importance. No provision, how- ever, was made outside the great towns; the houses in the cities were overcrowded and administered with laxity; and in 1784 Necker prophesied that the state would yet be seriously embarrassed by this increasing evil? From 1452 to 1789 the law had imposed on the setgneurs de haut justice the duty of succouring children found deserted on their territories. The first constitutions of the Revolution undertook as a state debt the support of every foundling, For a time premiums were given to the mothers of illegiti- mate children, the " enfants de la patrie." By the law of 12 Brumaire, An IT. "' Toute recherche de la paternité est interdite," while by art. 341 of the Code Napoléon, "la reclierche de le matérnité est admise."

France.—The present laws of France relating to this part of what is called L' Assistance Publique are the decree of January 1811, the instruction of February 1823, the decree of 5th March 1852, and the law of 5th May 1869. These laws carry out the general prin- ciples of the law of 7th Frimaire An V., which completely decen- tralized the system of national poor relief established by the Revolu- tion. The " enfants assistés" include, besides orphans and found- lings proper, infants brought by their parents into the asylum, and those born in lying-in hospitals and left there by their

mothers, children of persons undergoing a judicial sentence, children tem- porarily taken in while their parents arc in the hospital, and an increasing number of children, legitimate, illegitimate, and orphans, who are supported by a system of out-door relief. The asylmn which receives them is a departmental and not a cominunal insti- tution. The state pays only the cost of inspection and superin- tendence. There remain the '"'home" expenses, for the nurse (nourrice sédentaire), washing, and clothes; and the "out-door" expenses, which include (1) temporary assistance to unmarried mothers in order to prevent desertion ; (2) allowances to the foster- fathers (péres noutriciers) in the country for board, school money, &c.; (8) clothing ; (4) travelling money for nurses and children; (5) printing, &c.; and (6) expenses in time of sickness and for burials and apprentice fees. In 1868 the total cost was11,300,171fts., of which 2,570,171 frs. were paid by the regular foundling asylums, and 8,730,000 frs. by the departments and communes. This repre- sented the support of 67,000 children. In 1828 there were 112,730 children supported at a cost of 9,794,737 frs. The decrease 18 attributed partly to out-door relief and partly to the suppression of the "tours,"' of which there were 235 in 1812, and only 25 m 1860. No payments are made for the children after the age of twelve, They are generally apprenticed to a peasant or artisan, and until majority they remain under the guardianship of the administrative commissioners of the department. These commils- sioners arc about to receive a representative character, the councils of the communes aud the department, the chambers of commerce, and the chief religious communities receiving a right of nomination, as well as the prefect who represents the state. The ministry of marine have a legal claim to the services of male foundlings, whichis seldom exercised. The droit de recherche is conceded to the parent on payment of asmallfee. The decree of 1811 contemplated therepay- ment ofall expenses by a parentreclaiming a child. The same decree directed a "tour " or revolving box (Drehcylinder in Germany) to be kept at each hospital. These have been gradually discontinued. The ' Assistance Publique" of Paris is specially provided for by the law of 10th January 1849. The management consists of a "directeur" appointed by the minister of the interior, and associated with a representative " conseil de surveillance."" The Paris Asylum for Enfants Trouvés, with a small branch at Forges, contains about 700 beds. It receives about 4200 children in the year, or nearly one-seventh of the whole annual supply in France ; and the

total average cost of each child for twelve years is said to be only 1500 frs. There is also in Paris (43 Ruc de Journelles) a private charity called Guvre de V Adoption for the adoption of poor children and orphans. Among the better known school farms which receive children from the hospitals at very small rates of board are those of M. Fournet at Montagny near Chalon-sur-Saéne, and of l'Abbé Vedey at Varaignés in the Dordogne. It is impossible here to give even 4

3 De V Administration des Finances, iii. 136 ; see also the article "Enfant Exposé" in Diderot's Encyclopédie, 1755, and Chamousset $ Mémoire politique sur les Enfants, 1757, '

sketch of the long and able controversies which have occurred in France on the principles of management of foundling hospitals, the advantages of " tours" and the system of adimission a bureau ouvert, the transfer of orphans from one department to another, the free communication between parent and child, the hygiéne and service of hospitals and the inspection of nurses, the education and reclamation of the children and the rights of the state in their future. Reference may be made to the work of Terme and Mont- falcon noticed at the end of this article.

Belgium.—In this country the arrangements for the relief of foundlings and the appropriation of public funds for that purpose very much resemble those in France, and can hardly be usefully described apart from the general questions of local government and poor law administration. The Conimissions des Hospices Civiles, however, are purely communal bodies, although they receive pecu- niary assistance from both the departments and the state. A decree of 1811 directed that there should be an asylum and a wheel for receiving foundlings in every arrondissement. The last " wheel," that of Antwerp, was closed in 1860. The present law of 30th July 1834 distinguishes foundlings born of unknown parents from infants abaudoned by known parents. Of the former the cost is divided between commune and province ; of the latter the cost falls entirely on the domicile de scecowrs. The law of 1834 directs that the state budget shall contain an annual foundling subsidy, which is distributed among the provinces. The suppression of the "wheels" is supposed to have reduced the subsidy from

94,608 frs. to 50,000 frs, in 1873, and the number of foundlings from 7708 in 1849 to 5745 in 1860. The great mass of the foundlings are in Brabant, that is, in Brussels, which in 1872 paid out nearly 300,000 frs. on their account. In the Netherlands many of the foundlings are sent to the "beggar colonies,"—agricultural, spinning, and weaving establishments introduced in 1810 in imitation of the French dépots de mendicité. They also resemble the Flemish écoles agricoles de réforme. (See Des Institutions de Bienfaisance et de Prévoyance en Belgique, 1850 4 1860, par M. P. Lentz.)

Tialy is very rich in foundling hospitals, pure and simple, orphans and other destitute children being separately provided for. Pied- mont has 18, making an annual expenditure of 1,084,000 frs.; Genoa has 6, with an expenditure of 350,000 frs.; Lombardy has 18, with an expenditure of 1,468,000 frs.; and the Emilia has 15, with an expenditure of 833,000frs. In 1870 the gross expenditure in Italy on foundlings alone was 8,044,754 frs., more than twice the sum expended on pauper lunatics. The law concerning charitable works (3d August 1862) contemplates the erection of a charity board in every commune. At present both the communal council and the provincial deputation have certain rights of control over charitable administration. (See Della Carita Preventiva in Italia, by Signor Fano.) In Rome one branch of the St Spirito in Sassia (so called from the Schola Saxonum built in 728 by King Ina in the Borgo) has, since the time of Pope Sixtus IV., been devoted to foundlings. For ten years before 1869 the annual average of children admitted was 1141, of whom 382 were ascertained to be illegitimate and 300 legitimate, the rest uncertain. The average annual number of foundlings supported is 3268, the average annual deaths 981. The death-rate in the hospital is said to be 88°78; in the country at the nursing houses 12°80. The Conservatory is for the support of foundling girls who after passing through the hospital do not get settled in life. The whole institution costs 305,603 frs. per annum. (Sec The Charitable Institutions of Rome, by Cardinal Morichini.) In Naples the foundling hospital is called "1'An- nunziata." It receives yearly about 2000 ' figli della Madonna," as they are called. It must not be confounded with the more famous Albergo Reclusorio, or Seraglio dei Poveri, which is an ordinary charity for the education of children and the maintenance of infirm old persons. The chief house at Florence is called 'degli Innocenti"; at Genoa, the "Pammatone"; at Milan, "Santa Caterina alla ruota." In

Venice the Casa degli Esposti or foundling hospital, founded in 1346, and receiving 450: children annually, Was recently separated from the "Riunione di Instituti Pii," and placed under provincial administration. The splendid legacy of the last doge, Ludovico Manin, is applied to the support of about 160 children by the "Congregazione di Carita" acting through 30 parish boards (deputazione fraternate).

Austria.—In Austria foundling hospitals occupied a very pro- munent place in the general instructions which, by rescript dated 16th April 1781, the emperor Joscph II. issued to the charitable en- dowment commission. Acting under the advice of Count Boucquoy, the author of The Neigibourly Love Association, which supplied first Bohemia and then the empire with a type of poor law adnunis- tration, the emperor provided for the case of destitute children before proceeding to deal with the cases of destitute sick and infirm poor. This class of children includes, besides foundlings proper, the children born in lying-in hospitals of unmarricd women, and the children of unmarried women who can show that they have

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1 For the history of the Misericordia and Bigallo (White Cock), founded by the Brothers of Mercy, see Horner's Walks in Florence, vol i.

been suddenly confined when on their way to the lying-in hospital, and even in some cases legitimate children whose parents are pre- vented by illness or other temporary cause from maintaining them

and orphans when below the age required for admission to a regular orphanage. In 1818 these foundling asylums and the lying-in houses were declared to be state institutions, They were accordingly supported by the state treasury until the fundamental law of 20th October 1860 handed them over to the provincial com- mittees. They are now local institutions, depending on provincial funds, and are quite separate from the ordinary parochial poor insti- tute. Admission is gratuitous when the child is actually found on the street, or is sent by a criminal court, or where the mother undertakes to serve for four months as nurse or midwife in an asylum, or

produces a certificate from the parish priest and ' poor- father" (the parish inspector under the Boucquoy scheme) that she has no money. In other cases payments of 30 to 100 florins are made. When two months old the child is sent for six or ten years to the houses in the ncighbourhood of respectable married persons, who have certificates from the police or the poor-law authorities, and who are inspected by the latter and by a special medical officer. These persons receive a constantly diminishing allowance, and the arrangement. may be determined by 14 days' notice on either side. The foster-parents may retain the child in their service or enlploy- ment till the age of twenty-two, but the true parents may at any time reclaim the foundling on reimbursing the asylum and com- pensating the foster-parents. The enlightened principles of the rescript of 1781, with regard to the general and technical education of the children, do. not seem to be carried out in practice. It is said that there are in the empire 35 foundling hospitals, receiving annually 120,000 children.*

Turkey.—Under the Greek system of vestry relief, which works very efficiently at Constantinople, a large sum is spent on found- lings. There is no hospital, but the children are brought before the five members (émtropot) of the vestry (fabrique) or parish church committee, who, acting as the cowmbaros or god-father, board out the child with some poor family for a small monthly payment, and afterwards provide the child with some sort of remunerative work.

fussia.—Under the old Russian system of Peter I. foundlings were received at the church windows by a staff of women paid by the state. But since the reign of Catherine II. the foundling hospitals have been in the hands of the provincial officer of public charity (prykaz obshestvennago pryzrenya). The great central institutions (Vospitatelnoi Dom), at Moscow and St Petersburg (with a branch at Gatchina) were founded by Catherine. When a child is brought the baptismal name is asked, and a receipt is given, by which the child may be reclaimed up to the age of ten. The mother may nurse her child. After the usual period of six years in the country very great care is taken with the education, especially of the more promising children. Of the 26,000 sent annually to these two houses from all parts of Russia, only 25 per cent. are said to reach majority. The hospital is still, however, a valuable source of recruits for the publie service. Malthus (The Principles

of Population, vol. i. p. 484) has made a violent attack on these Russian charities. He argues that they discourage marriage and therefore population, and that the best management is unable to prevent a high mortality. He adds: "An occasional child murder from false shame is saved at a very high price if it can be done only by the sacrifice of some of the best and most useful feelings of the human heart in a great part of the nation." It does not appear, however, that the rate of illegitimacy in Russia is comparatively high; it is soin the two great cities. The rights of parents over the children were very much restricted, and those of the Govern- ment much extended by a ukase issued by the emperor Nicholas in 1837, The most eminent Russian writer on this subject is M. Gouroff.. See his Reeherehes sur les Enfants Trouvés, and Essai sur Uhistoire des Enfants Trouvés, Paris, 1829. , –

In America the foundling hospitals are chiefly private charities. There is a large one called the Cuna in the city of Mexico. The house for: girls at Rio de Janeiro is once a year frequented by men in want of wives, each application being considered by the managers. In Brazil there are several houses of mercy for found- lings, and exposures are often made at the doors of private houses. The foundling asylum of the sisters of charity in New York was opened in 1869. In 1878 it received 1124 infants not three weeks old. The annual cost is.115,000 dollars. A crib is placed in the vestibule at night, and the name and date of birth are generally left with the child. : :

Great Britain.—The Foundling Hospital of London was incor- porated by Royal Charter in 1789 " for the maintenance and educa- tion of exposed and deserted young children. The petition of Captain Thomas Coram, who is entitled to the whole credit of the foundation,? states asits objects "to prevent the frequent murders of poor miserable children at their birth, and to suppress the in- human custom of exposing new-born infants to perish in the streets." At first no questions were askcd about child or parent, but a distin-

2 Addison had suggested such a charity (Guardian, No. 3).

guishing mark was put on each child by the parent. 1 often marked coins, trinkets, pieces of cotton or ribbon, verses writ- ten on scraps of paper. The clothes, if any, were carefully recorded. One entry is, " Paper on the breast, clout on the head." The applications became too numerous, and a system of balloting with red, white, and black balls was adopted. In 1756 the House of Commons came to a resolution that all children offered should be received, that local receiving places should be appointed all over the country, and that the funds should be publicly guaranteed. A basket was accordingly hung outside the hospital; the maximum age for admission was raised from two to twelve months, and a flood of children poured in from the country workhouses. In less than four years 14,934 children were presented, and a vile trade grew up among vagrants of undertaking to carry children from the conutry to the hospital,—an undertaking which, like the French meneurs, they often did not perform, or performed with great cruelty. Of these 15,000 only 4400 lived to be apprenticed out. The total expense was about £500,000. This alarmed the House of Commons. 'After throwing out a bill which proposed to raise the necessary funds by fees from a general system of parochial registration, they came to the conclusion that the indiscriminate admission should be discontinued. The hospital, being thus thrown on its own resources, adopted a pernicious system of recciving children with considerable sums (¢.g., £100), which sometimes led to the children being re- claimed by the parent. This was finally stopped in 1801; and it is now a fundamental rule that no money is received. 'The committee of enquiry must now be satisfied of the previous good character and present necessity of the mother, and that the father of the child has deserted it and the mother, and that the reception of the child will probably replace the mother in the course of virtue and in the way of an honest livelihood. The principle is in fact that laid down by Fielding in Tom Jones—"Too true 1 am afraid it is that many women have become abandoned and have sunk to the last degree of vice by being unable to retrieve the first. slip." At present the hospital supports about 500 children up to the age of fifteen. The average annual number of applications is 236, and of admissions 41. The children used to be named after the patrons and governors, but the treasurer now prepares a list. After three years in the country the children come back to town. At sixteen the girls are generally apprenticed as servants for four years, and the boys at the age of fourteen as mechanics for seven years. There is a small benevolent fund for adults. The hospital has

an income of above £11,000, which will be cnormously increased in 1895, when the leaseholds of the Lamb's Conduit grounds expire. From the famous chapel built by Jacobsen in 1747 the hospital derives a net income of £500. The musical service, which was originally sung by the blind children only, was made fashionable by the generosity of Handel, who frequently had the " Messiah" per- formed there, and who bequeathed to the hospital a MS. copy (full score) of his greatest oratorio. The altar-piece is West's picture of Christ presenting a little Child. In 1774 Dr Burney and Signor Giardini made an unsuccessful attempt to form in connexion with the hospital a public music school, in imitation of the Conserva- torium of the Continent. In 1847, however, the present successful '"' Juvenile Band" of about 30 boys was started. The educational effects of music have been found excellent, and the hospital supplies many musicians to the best army and navy bands. The early con- nexion between the hospital and the eminent painters of the reign of George II. is one of extreme interest. Thc exhibitions of pictures at the Fonndling, which were organized by the Dilettanti Club, nn- doubtedly led to the formation of the Royal Academy in 1768. Hogarth painted a portrait of Captain Coram for the hospital, which also contains his March to Finchley, and Roubiliac's bust of Handel. Coram, the founder, was remarkable for the versatility of his public spirit. He did much for the development of Georgia and Nova Scotia. (See History and Objects of the Foundling Hospital, with Memoir of its Founder, by J. Brownlow, 3d ed., 1865.) _ In 1704 the Foundling Hospital of Dublin was opened. No inquiry was made about the parents, and no money received. From 1500 to 2000 children were received annually. A large income was derived from a duty on coal and the produce of car licences. In 1822 an admission fee of £5 was charged on the parish from which the child came. This reduced the annual arrivals to about 500. In 1829 the select committee on the Irish miscellaneous estimates recommended that no further assistance shonld be given. The hospital had not preserved life or educated the foundlings. The snortality was nearly 4 jn 5, and the tptal cost £10,000 a year. Accordingly in 1835 Lord Glenelg (then Irish Secretary) closed the

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cotland never seems to have possessed a foundling hospital. In 1759 J ohn Watson left funds anh were to be apne' ele pious and charitable purpose "of

preventing child murder” by the a ae of a hospital for receiving pregnant women and Forint i188" inch Se ote deta arto 6 pope Ws Teich uawean ets for oubts as to the propriety hospital for ee eel e, the moncy was given to trustees to erect a

aintenance and education of destitute children.

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These were | The fundamental difference between Scotland and most other Pro.

testant countries on the one hand, and those Catholic countries which have adopted the Code Napoléon on the other, is that in the former proceedings for aliment may be taken against the putative father. Hence the mother is not helpless. She cannot, however

in Scotland deposit her bastard in the poorhouse, unless she herself is entitled to relief and prepared to go there ; and relief is of course given only so long as the mother is not able to support herself, ‘An infant absolutely deserted would of necessity be taken care of by the poor law authority. It is in Scotland a crime at common law to “expose” a young child to the risk of death or to any serious danger ; and it is also an offence against the Poor Law Act of 1845 for either the mother or the putative father (who has acknowledged the paternity) to desert an illegitimate child. In England the offence is defined as the abandoning or exposing a qhild under the age of two, whereby its life is endangered, or its health is, or is likely to be, permanently injured (24 and 25 Vict. c. 100, § 27), Besides this the provisions of the Industrial Schools Acts apply to a large proportion of the cases of homeless and deserted children which in other countries might be entrusted to the foundling hospitals. And indeed the system of boarding out pauper children seems to have realized most of the advantages promised by the hospital. The disagreeable feature of the Scotch practice is the number of women who, without any feeling of shame, get a family of illegitimate children by different fathers, whom they attack in succession for aliment. The rate of illegitimacy in some Scotch counties has reached 14, 15, and 16 per cent. It is not likely, however, that the hospital principle, though cured of its worst fault, that of secret admission without inquiry 1, will ever be

received in Great Britain or Ireland. The key-note of public opinion on the question was probably struck by Lord Brougham.in his Letters to Sir Samuel Romilly on the Abuse of Charities, and by Dr Chalmers in his Christian Eeonomy of Large Towns. The true solution, however, depends less on abstract political reasoning than on prudent management of existing institutions. In France, for instance, a great fund of practical skill in administration has been accumulated. In Great Britain the evil may be more safely left to private charity and religious effort. If fewer women fall there, there is perhaps a profounder degradation of those who do.

The following are the most important systematie works on this subject. Histoire Statistique et Morale des Enfants Trouvés, by MM. Terme et Montfalcon, Paris, 1837, The authors wete eminent medical men at Lyons, connected with the administration of the foundling hospital. Remacle, Des Hospices d' Enfants Trouvés en Europe, Paris, 1838. Hiigel, Die Findelhduser und das Pindelwesen Buropas, Vienna, 1863. Emminghaus, " Das Armcenwescn und die Armengesetz- gebung." in Huropdischen Staaten, Berlin, 1870. An English translation of part of this book was published in 1873, by Mr E. B. Eastwick, M P., in the interests of the Charity Organization Society, but it does not contain the German editor's European statistics. Some recent information may also be got in the Reports on Poor Laws in Foreign Countries, communicated to the Local Government Board by the Foreign Secretary. Accounts and Papers, 1875, vol, 65, c. 1225. See also the well-informed articles by MM. Esquiros and de Marisy, in vols. xiii. and liv, of the Revue des Deux Mondes. The references to Montesquicu, Lsprit des Lois, xxiii. 22, and to Voltaire, Dict. Phil., article " Charité," are more of literary than of practical interest. (W. C. 8.)

FOUNTAIN, a spring of water. The term is applied in a restricted sense to such springs as, whether fed by natural or artificial means, have arrangements of human art at a point where the water emerges. Pure water 18 80 necessary to man, and the degree of plenty, constancy, and purity in whick it is procured, transported, prepared for use, and distributed in populous districts is so fair a standard of civilization, that it hardly seems unreason- able in Pausanias to put it among the criteria, asking, with reference to Panopzeus, if that can rightly be called a city which has neither

ruler, gymnasium, forum, nor fountain of water. Among the Greeks we learn, mainly from Pausanias, that fountains were very common in the cities; and springs being very plentiful in Greece, little engineering skill was required to convey the water from place to place. Receptacles of sufficient size were made for it at the springs; and to maintain its purity, structures were raised inclosing and covering the receptacle.

It is not surprising that so beneficent an object as & spring of water should be connected with religious belief. It is certain that until modern times fountains have been in some way connected with the religion of the people among whom they sprang, and dedicated to one or other of its personalities. In Greece they were dedicated to gods and goddesses, nymphs and heroes, and were frequently The references to fountains by

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Pausanias are frequent, but he gives no full descriptions. That of Pirene at Corinth (mentioned also by Herodotus) was formed of white stone, and contained a number of cells from which the pleasant water flowed into an open basin. Legend connects it with the nymph Pirene, who shed such copious tears, when bewailing her son who had been slain by Diana, that she was clianged into a fountain. The city of Corinth possessed many fountains. In one near the statues of Diana and Bellerophon, the water flowed through the hoofs of the horse Pegasus. The fountain of Glauce, inclosed in the Odeum, was dedicated to Glauce, because she was said to have thrown herself therein, believing that its waters could counteract the poisons of Medea, Another Corinthian fountain had a bronze statue of Neptune stand- ing on a dolphin from which the water flowed. The fountain constructed by Theagenes at Megara was remark- able for its size and decorations, and for the number of its columns. One at Lerna was surrounded with pillars, and the structure contained a number of seats affording a cool summer retreat. Near Phare was a grove dedicated to Apollo, and in it a fountain of water. .Pausanias gives a definite architectural detail when he says that a fountain at Patrae was reached from without by descending steps. Mystical, medicinal, surgical, and other qualities, as well as Supernatural origin, were ascribed to fountains. One at

Cyanz near Lycia was said to possess the quality of endow- ing all persons descending into it with power to see whatever they desired to see; while the legends of fountains and other waters with strange powers to heal are numerous in many lands. The fountain Enneacrunus at Athens was called Callirrhoe before the time the water was drawn from it by the nine pipes from which it took its later name. Two temples were above it, according to Pausanias, one dedicated to Demeter and Proserpine, and the other to Triptolemus. The fountain in the temple of Erechtheus at Athens was supplied by a spring of salt water, and a similar spring supplied that in the temple of Poseidon Hippias at Mantinea.

Though no doubt most tribes of other than nomadic habits of life must have contrived, in their settlements, appliances of some kind for maintaining the supply of water constant and pure, very few remains of these have been found that possess any degree of architectural importance. Layard mentions an Assyrian fountain, found by him in a gorge of the river Gomel, which consists of a series of basins cut in the solid rock, and descending in steps to the stream. The water had been originally led from one to the other by small conduits, the lowest of which was ornamented by two rampant lions in relief,

The water-supply of Rome and the works auxiliary to it were on a scale to be expected from a people of such great practical power. The remains of the aqueducts which stretched from the city across the Campagna are amongst

the most striking monuments of Italy. Vitruvius (book –

Vili.) gives minute particulars concerning the methods to be employed for the discovery, testing, and distribution of water, and describes the properties of different waters with great care, proving the importance which was attached to these matters by the Romans. The aqueducts supplied the baths and the public fountains, from which last all the populace, except such as could afford to pay for a separate Pipe to their houses, obtained their water. These fountains were therefore of large size and numerous. They were formed at many of the castella of the aqueducts (see Aquepuct). According to Vitruvius, each castellum should have three pipes,—one for public fountains, one for baths, and the third for private houses. Considerable revenue was drawn from the possessors of private water-

pipes. The Roman fountains were generally decorated with figures and heads, Fountains were often also the ornament

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of Roman villas and country houses ; In those so situated the water generally fell from above into a large marble basin, with at times a second fall into a still lower re- ceptacle.

To the remains of Pompeii we are indebted for much exact knowledge of Roman antiquity in its minutest particulars; and not the least interesting of the disin- terred forms are those of the public and private fountains Which the city possessed. Two adjacent houses in Pompeii had very remarkable fountains. One, says Gell, "is covered with a sort of mosaic consisting of vitrified tesserze of different colours, but in which blue predominates. These are sometimes arranged in not inelegant patterns, and the grand divisions as well as the borders are entirely formed and ornamented with real sea-shells, neither calcined by the heat of the eruption nor changed by the lapse of so many centuries" (Pompeiana, i. 196). Another of large size was similarly decorated with marine shells, and is sup- posed to have borne two sculptured figures, one of which, a bronze, is said to be inthe museum at Naples. This fountain projects 5 feet 7 inches from the wall against which it is placed, and is 7 feet wide in front, while the beight of the structure up to the eaves of the pediment is 7 feet 7 inches. On a central column in the piscina was a statue of Cupid, with a dove, from the mouth of which water issued. Cicero had, at his villa at Formie, a fountain which was decorated with marine shells.

Fountains were very common in the open spaces and at the crossways in Pompeii. They were supplied by leaden pipes from the reservoirs, and had little ornament except a human or animal head, from the mouth of which it was arranged that the water should issue. Not only did simple running fountains exist, but the remains of jets d'eau have been found ; and a drawing exists representing a vase with a double jet of water, standing ona pedestal placed in what is supposed to have been the impluvium of a house. There was also a jet d'eaw at the eastern end of the peristyle of the Fullonica at Pompeii.

As among the Greeks, so with the early Celts, traces of superstitious beliefs and usages with relation to fountains can be traced in monumental and legendary remains. Near the village of Primaleon in Brittany was a very remarkable monument,—one possibly unique, as giving distinct proof of the existence of an ancient cult of fountains. Here, according to Freminville, is a dolmen composed of a horizontal table supported by two stones only, one at each end. All the space beneath this altar is occupied by a long square basin formed of large flat stones, which receives a fountain of water. At Lochrist is another vestige of the Celtic cult of fountains. Beneath the church, and at the foot of the hill upon which it is built, is a sacred fountain, near which is erected an ancient chapel, which with its ivy-covered walls has a most roman- tic appearance, A Gothic vault protects this fountain. Miraculous virtues are still attributed to its water, and on certain days the country people still come with offerings to draw it (see La Poix de Freminville, Antiquités de la Bretagne, i. 101). In the enchanted forest of Broche- lande, so famous from its connexion with Merlin, was the fountain of Baranton, which was said to possess strange characteristics. Whoever drew water from it, and sprinkled the steps therewith, produced a tremendous storm of thunder and hail, accompanied with thick dark- ness.

The Christian missionaries could not easily overcome beliefs so planted in the heart of the people, and so strengthened by daily practices. By a wise stroke, whether of policy or instinct, finding themselves unable to eradi- cate the superstitions which ascribed miraculous power to rocks and woods, streams and fountains, and connected

them with the divinities of the old religions, they changed their form and direction by dedicating these objects to the Virgin and to saints, so making the force of the old belief an instrument for its own overthrow.

Fountains were attached to the new religion by the erection of statues of the Virgin or of saints upon the possibly rude structures that collected the water and pre- served its purity. There is some uniformity in the architectural characteristics of these structures during the Middle Ages. A very common form in rural districts was that in which the fountain was reached by descending steps (fontaine grotte). A large basin received the water, some-

times from a spout, but often from the spring itself, This basin was covered by a sort of porch or vault, with at times moulded arches and sculptured figures and escutcheons. On the bank of the Clain at Poitiers is a fountain of this kind, the Fontaine Joubert, which though restored in 1597 was originally a structure of the 14th century. This kind of fountain is frequently decorated with figures of the Virgin or of saints, or with the family arms of its founder; often, too, the water is the only ornament of the structure, which bears a simple inscription. A large number of these fountains are to be found in Brittany and indeed throughout France, and the great antiquity of some of them is proved by the superstitions regarding them which still exist amongst the peasantry. A form more common in populous districts was that of a large open basin, round, square, polygonal, or lobed in form, with a columnar structure at the centre, from the lower part of which it was arranged that spouts should issue, playing into an open basin, and supplying vessels brought for the purpose in the cleanest and quickest manner. The columns take very various forms, from that of a simple regular geometrical solid, with only grotesque masks at the spouts, to that of an elaborate and ornate Gothic structure, with figures of virgins, suints, and warriors, with mouldings, arches, crockets, and finials. At Provins there isa fountain said to be of the 12th century, which is in form an hexagonal vase with a large column in the centre, the capital of which is pierced by three mouths, which are furnished with heads of bronze projecting far enough to cast the water into the basin. In the public market-place at Brunswick is a fountain of the 15th century, of which the central structure is made of bronze. Many fountains are still existing in France and Germany which, though their actual present structure may date no earlier than the 15th or 16th century, have been found on the place of, and perhaps may almost be considered as restorations of, pre-existing fountains. Except in Italy few fountains are of earlier date than the 14th century. Two of that date are at the abbey of Fontaine Daniel, near Mayenne, and another, of granite, is at Limoges. Some of these Middle Age fountains are simple, open, reservoirs inclosed in structures which, however plain, still carry the charm that belongs to the stone-work of those times. There is one of this kind at Cully, Calvados, walled on three. sides, and fed from the spring by two circular openings. Its only ornamentation is a small empty niche with mouldings. At Lincoln is a fountain of the time of Henry VIIL, in front of the church of St

Mary Wickford. At Durham is one of octangular plan, which bears a statue of Neptune.

The decay of architectural taste in the later centuries is shown by the fountain of Limoges. It is in form a rock representing Mount Parnassus, upon which are carved in relief Apollo, the horse Pegasus, Philosophy, and the Nine sens At the top Apollo, in 16th century costume, plays

ee : eee grass, and sheep fill up the scene. oe. eee drawing of any drinking fountain in Ga apiien(G50ie Moxon's Tutor to Astronomie and

): it is "surmounted by a diall, which

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was made by Mr John Leak, and set upon a composite column at Leadenhall corner, in the majoralty of Sir John Dethick, Knight." The water springs from the top and base of the column, which stands upon a sqnare pedestal and bears four female figures, one at least of which repre- sents the costume of the period. This fountain is referred to and a copy of the engraving given in Chambers's book of Days. The public drinking fountains in towns and villages are now very common and quite secular objects. In the East they are a very important institution. In Cairo alone there are 300. These "sebeels" are not only to be seen in the cities, but are plentiful in the fields and villages, and the great number of them endowed for the gratuitous supply of water to the passengers is referred to by Lane as proving the possession by the Egyptians of a benevolent and charitable character.

Purely ornamental fountains and jets d'eau are found in or near many large cities, royal palaces, and private seats. The Fontana di Trevi, at Rome, is. very large and very celebrated, but from an artistic point of view about as bad work as could possibly be conceived. It was erected early in the last century under Pope Clement XII, and has all the characteristics of decadence. La Fontana Pavlina and those in the piazza of St Peter's are perhaps next im celebrity to that of Trevi, and are certainly in better taste. At Paris, the Fontaine des Innocens (the earliest) and those of the Place Royal, of the Champs Elysées, and of the Place de la Concorde are the most

noticeable. The fountain of the lions and other fountains in the Alhambra Palace are, with their surroundings, a very magnificent sight. The largest jets d'eaw are those at Versailles, at the Sydenham Crystal Palace, and at San Ildefonso, With the excep- tion of the last, these are supplied from artificial elevated reservoirs.

For information regarding the geological conditions which cause natural springs and aid in the formation of artificial ones, see ARTESIAN WELLS. W. HE.)

FOUNTAINS ABBEY. See Assy, vol. i. p. 18.

FOUQUE, Frieprich Hemrich KARL, BARon DE LA Morrs (1777-1843), oneof the most industriousand popular of German authors in the early part of this century, was born February 12, 1777, at Brandenburg on the Havel. The family of De la Motte Fouqué was, as the name suggests, of French extraction, but had been driven from France by the revocation of the edict of Nantes; and Fouqué's grandfather, having entered the Prussian army, rose to the rank of general, and became the friend of Frederick the Great. Fouqué's father, at one time an officer of dragoons, lived, at the date of the boy's birth, in retirement at Brandenburg ; and his mother, who died in 1788, was a daughter of the Hofmarschall von Schilegell of Dessau. The little Friedrich, godson and namesake of the great king, was brought up in the neighbourhood of Potsdam, first at his father's estate Sacro, and afterwards at Lentzke, a property to which they removed when he was nine years old. An only child, he was educated at home by 4 succession of tutors, one of whom, the author August Hiilse, did much to encourage the boy's literary tastes. The somewhat monotonous home life, also, was relieved by holidays spent with relations in a romantic old castle near Halle, and by brilliant visits to Potsdam, whence he came with his little head turned by glimpses of the revered king, by blasts of military music and the tramp of soldiers. When the French Revolution broke out, the young Fouque eagerly espoused the cause of the royal family. He became discontented with the prospect of studying law at the university of Halle, and in 1794 entered the army as tiber- completer Cornet in the grand-duke of Weimar's cuirassler regiment, then in the field, At the age of nineteen he served in the unfortunate campaign of the Rhine; and

for several years afterwards he led a half military half literary life with his regiment, whose headquarters were first at Aschersleben and then at Biickeburg.

Fouqué married very early in life; but the union was an unhappy one, aud ended in divorce. In 1802, when still only twenty-five, he married his second wife, the widowed Frau von Rochow, better known as Caroline, Baronzss de la Motte Fouqué, herself an authoress of some note; and, having obtained his discharge from military ser- vice, he retired to his wife's family estate of Nennhausen, near Rathenau, devoting himself to the study of Italian and Spanish, and to bringing out his first work Dramatische Spiele, under the feigned name of Pellegrin (1804). The volume was published by the brothers Schlegel, and their names were enough to win popularity for what Fouqué himself afterwards called a " Schiilerwerk." It was followed by Komanzen aus dem Thal Ronceval, and by two plays, tie Halk and the Heh, which appeared simultaneously. Cheered by praise from the brothers Schlegel, Fouqué set to work with renewed vigour, and in 1806 published a metrical rendering of an old prose romance, the Listorie vom edlen Kutter Galmy, und einer schinen Herzogin von Lretagne. In the same year appeared the poem Schiller's fodtenferer, the joint work of Bernhardi and Fouqué, who still wrote under the name of Pellegrin ; and in 1808 he published Alwix, a romance in 2 vols. This won for him many literary admirers, perhaps the chief of whom was Jean Paul Friedrich Richter. Sigurd der Schlangentédter (published 1808) was founded on the story of the Nie- belungenlied, and formed the first of a collection which appeared in 1818 under the title Heldenspiele. Sigurd was the first work published in Fouqué's own name. In 1811 appeared a play, Eyinkard und Kmma, two volumes en- titled Vaterldndische Schauspiele, aud the chivalric romance Der Zauberring. Conjointly with Frau von Helvig of Heidelberg he issued a T'aschenbuch der Sagen. und Legen- dew (1812-13), and with his friend Wilhelm Neumann began a periodical called Die Musen (1812-1 4), An- other collection of plays, Schauspiele Sir Preussen, was published in 1813, and in 1814 Corona, a poem, and Der Podesbund, a romance, forming the first of a series in six Separate volumes entitled Kleine Romane (1814-19). In the same year (1814) he published a series in four parts entitled the

Jahreszeiten, the spring number of which con- tained his romance Undine, the summer number Die beiden Hauptlente, the autumn number Aslauga's Ritter and Algin und Jucunda, and the winter number Sintram und seine Gefihrten. Die Fakrten Lhiodolfs des Isléndersanother story of chivalry, appeared in 1814, and was considered by Fouqué himself to be one of his most successful works, In 1816 he translated a tragedy, Numancia, from the Spanish of Cervantes, and published also Der Sdngers Lnebe, Karl's des Grossen Geburt und Jugendsjahre, and a tragedy called the Pilgerfahrt. Meanwhile, in February 1813, he had rejoined the army as lieutenant of cavalry, and twice narrowly escaped with his life at the battle of Liitzen. After the battle, while he was carrying an im- portant dispatch over country at night, his horse stumbled Into deep water ; and this misadventure resulted in an ilness which disabled him for further service. He received an honourable discharge, was presented with the decoration of the « Johanniterorden," and promoted to the rank of Major of cavalry. The invalided soldier now returned to his wife and daughter at N ennhausen, and again took up his pen. His wife died in 1831; and, having removed to Halle, he married there for the third time. He delivered lectures in Halle on the history of poetry and other forms of literature, and had gone to Berlin with the purpose of lecturing there also, when he died suddenly, January 23, 1843. aged 66.

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The following is a list of his publications from 1817 downwards: —Die Wunderbaren Fahrten des Grafen Alethes von Lindenstein (1817); Altstiehsisehe Bildersaal (1818-20); Der Mord Augusts von Kotzebue: Freundesruf an Deutsehlands Jugend (1819); Bertrand du Gueselin (1821); Hieronymus von Stauf (1821); Der Verfolgte, Wilde Liebe, and Ritter Elidone (1822); Refugié, oder Hetimath und Fremde: ein Roman aus der neuen Zeit (1824); Lebensbeschreibungen des Konigl. Preuss. Generals der Infanterie, H. A. Baron de la Motte Fouqué (1824); a collection of his poems in 5 vols., contain-

ing most of his lyrics and drainas (1816-27); Geschichte der Jung- Srau von Orleans (1826); Der Stingerkrieg auf der W artburg (1828); General v, Riichel, eine militdrische Biographie (1828); Fata Mor- gana (1830);

Krzthlungen wu. Novellen (1833) ; Die Weltreiehe (1835-40) ; Bichlein von der Liebeslehre (1837); Der Pappenheimer Cutrassier (1842); Lebensgeschichte des Baron Friedrich dela Motte Fouqué, aufgezeichnet durch thn selbst (1840); Goethe und Einer seiner Bewunderer (1840) ; Ausgewdhlte Werke des Baron Fr. de la Motte Fouqué, Ausgabe letzter Hand (1841). A posthumous romance, entitled Abfall und Busse, oder die Seelenspiegel,—ein Roman aus der Grenzscheide des 18 und 19 Jahrh., was published in 1844; also a collection entitled Geistliche Gedichte (1858), and Christlicher Liedersehatz (1862).

Fouqné's popularity was great; but he had the mis- fortune to outlive it. A disciple of the brothers Schlegel and the Romance School in Germany, he became one of its most illustrious representatives. There was a time when Fouqué's volumes were in every German household, and people waited eagerly at the libraries for his newest work. But he lived to see the change in literary taste which shelved the romance school, and with it almost all his own writings, The greater part of these are being now quickly forgotten. Those which have survived, and will survive, the varia- tions of popular taste, are his romances—the Zauberring and the contents of the Jahreszeiten, especially the ex- quisite Undine, which has always been considered his masterpiece. Fouqué's was not an intellect of the very highest order, neither was he a man of intense feelings ; and those who expect to find in his works deep thinking or highly-wrought passion will be disappointed. Should they, however, desire the graceful, the romantic, the exquisite, itis therein abundance. They will finda beauty and simplicity of style unsurpassed in the German lan- guage ; plots, light aud airy, laid in scenes of opal hue. For Fouqué aimed at ethereal beauty, delighted in word- painting, and flitted continually between the glories of a crimson Spanish sunset aud the cold steel-blue of a north German nightfall. There is in his works plenty of sweet pathos, of a kind which may wet the eye but never wrings the heart ; there is also a truly German love of the weird and supernatural ; but their especial characteristic is their pure, chivalric tone : —' An ideal of Christian knighthood," says the translator of Wilhelm Meister, in his German Romance, "whencesoever borrowed or derived, las all along, with more or less distinctness, hovered round his fancy." It is in allusion to this same characteristic that Jean Paul Richter, Fouqué's

illustrious critic in the Heidelberger Jahrbiicher, has christened him "Der Tapfere," or 'The Valiant."

Of Fouqué's works, the Undine, the Zauberring, Aslauga's Ritter, and Sintram have been translated into English. The translation of Aslauga's Ritter is in Carlyle's German Romance. (F. M.)

FOUQUET, Nicotas (1615-1680), viscount of Melun and of Vaux, marquis of Belle-Isle, superintendent of finance under Louis XIV., was born at Paris in 1615, Destined to official life, he was carefully educated ; and so evident was his superior ability that he was appointed master of requests at the age of twenty. He was only thirty-five when he obtained the important post' of pro- cureur-général to the parliament of Paris (1650). During the civil war Fouquet devoted himself to the interests of the queen-mother, Anne of Austria, and enjoyed ih return her protection and patronage. At her instance he was called in 1652 to the office of superintendent of finance. | The finances were then in a state of the utmost disorder,

from the long wars and the shameless greed of courtiers and officials; and it is stated that Fouquet for a time provided the means of meeting the expenses of the state out of his own fortune or by loans obtained on his own credit. He had long been in the confidence of the first minister, Cardinal Mazarin, and was his zealous instrument. But soon after the marriage of Louis XIV. a quarrel broke out between them, and thenceforth each was bent on injuring the other. The increasing deficit in the treasury alarmed the king; inquiries were addressed to Colbert, who was secretly ambitious of succeeding Fouquet as minister of finance, and he consequently made the worst of the case against Fouquet. The extravagant expenditure and personal display of the superintendent served to in- tensify the ill-will of the king. Fouquet had bought the port of Belle-Isle, and strengthened its fortifications, with a view to taking refuge there in case of disgrace. He had spent enormous sums in building a palace on his estate of Vaux, which in its extent, magnificence, and splendour of decoration, was almost a forecast of Versailles. He had cherished the hope of succeeding Mazarin as first minister, and had even made advances to Mademoiselle de la Valliére. In

August 1661 he entertained the king at his palace of Vaux, giving him a féte unrivalled for magnificence, at

which Les Fdcheux of Molitre was for the first time-

produced. But the king could not be appeased. By crafty devices Fouquet had been induced to sell his office of procureur-général, thus losing the protection of its privi- leges, and he had paid the price of it into the treasury. 'The king, however, was only prevented from arresting him at the féte by the pleading of the queen mother. He dissembled for a short time, and the arrest was made about three weeks later at Nantes. Fouquet, after several re- movals from prison to prison, was sent to the Bastille. His trial extended over several years, and excited the deepest interest. In 1664 he was condemned and sentenced to perpetual exile and confiscation of his property. The sentence, however, was commuted into one of imprison- ment for life in the fortress of Pignerol. He bore his fate with manly fortitude, and composed in prison several devotional works. He died at Pignerol, March 23, 1680. The report of his trial was published in Holland, in 15 vols., in 1665-1667, in spite of the remonstrances which Colbert addressed to the states-general. A second edition, under the title of Huvres de M. Fouquet, appeared in 1696. FOUQUIER-TINVILLE, AyroiIne QuentTIN (1747-1795), was born at Hérouel, a village in the department of the Aisne. Originally a procwreur (attorney) attached to the chatelet jurisdiction at Paris, he is said to have been driven by his debts to accept a humble employment under the lieutenant-général de police. When the Revolution broke out he was, a3 the friend of Danton and Robespierre, appointed public prosecutor to the revolutionary tribunal of Paris, and discharged this office with the most unim- passioned rigour from the 10th of March 1793 to the 28th of July 1794. He dealt as pitilessly with his friends as with his enemies, if only they were charged by the committee of public safety. He sent to the guillotine his protector Danton, just as he had sent Vergniaud and the Girondists. He was not an eloquent speaker, but main- tained his accusations with an obstinacy so cold, convine- ing, and pressing that he never failed to obtain from the judges the sentence of capital punishment, which he always claimed. Although it seems that he had been somewhat unscrupulous in the earlier part of his career, he a during the period of his bloody mission, inaccessible 0 bribery ; and, having accepted it as his

business to provide the guillotine with a constant supply of victims oe might well boast of faithfulness in its discharge. And is he actually did in the pamphlet that he published in

his own defence, when he had been imprisoned by order of the convention (August 1, 1794), on the motion of Fréron, whose hands had been as deeply imbrued in blood as those of Fouquier. But the men then in power wielded the terrors of the law in a spirit of revenge that made them as unsparing as Robespierre and his companions had been. After a trial which lasted forty-one days, Fouquier- Tinville was in his turn sent to the scaffold, on the 8th of May 1795.

See Mémoire pour A. Q. Fouquier, ex-aceusateur public pres le tribunal révolutionnaire établi & Paris, et rendu volontairement & la Coneiergerie le jour du déeret qui ordonne son arrestation, Paris, 1794, 4to; A. J. T. Bonnemain, Les Chemises rouges, ou mémotres pour servir & Vhistoire du régne des anarchistes, Paris, 1799, 2 vols. 8vo; Ch. Berriat-Saint-Prix, La Justice révolution- naire & Paris, Bordeaux, Brest, Lyon, Nantes, ete., Paris, 1861, 18mo; E. Campardon, Histoire du Tribunal révolutionnaire de Paris, Paris, 1861, 2 vols. 18mo (the 2d edition, Paris, 1866, 2 vols. 8vo, has a slightly altered title, Tribunal révolutionnaire de Paris); Mortimer-Ternaux, Histoire de la Terreur d'apres les docw- ments authentiques et des pices inédites, Paris, 1861, &c., 8 vols. 8vo,

FOURCHAMBAULLT, a town of France in the depart- ment of Niévre, on the right bank of the Loire, witha station on the railway about 5 miles S.E. of Nevers, It owes its importance to its extensive iron-works, which were established in 1821 by MM. Boignes, and give employment to from 2000 to 5000 workmen. Among the more remark- able chefs d'cuvre which have been produced at Fourcham- bault are the metal portions of the Pont du Carrousal, some of the bronzes of the Colonne du Juillet, the frame- work of the cathedral at Chartres, and tlie vast spans of the bridge over the Dordogue at Cubzac. The population of the town in 1871 was 5835, and of the commune 6054.

FOURCROY, Anrtorne Francois, Comre vx (1755- 1809), a celebrated chemist, son of an apothecary in the household of the duke of Orleans, was born at Paris, June 15, 1755. Some of his ancestors had been distinguished at the bar, but the branch of the family to which he belonged had become greatly reduced in circumstances, At the age of fourteen Fourcroy left the college at Harcourt, where he had profited but little by the instruction of a harsh teacher. Deterred by the ill-success of a friend from going upon the stage, he for two years maintained himself as a copyist aud writing-master ; he then, in con- sequence of unjust treatment there received, left the office of hisemployer. At this juncture, Vicq d'Azyr, who having boarded at his home had become acquainted with the young man's talents, encouraged him to enter upon @ medical career. We accordingly now behold Foureroy a poor and hard-working student of medicine, his lodging a garret, in the middle only of which was it possible to stand upright, and his near neighbour a water-carrier, to whose family of twelve he acted as physician, receiving for his services a good supply of water. To support himself he gave lessons to other students, and made translations for a bookseller, who, 30 years later, when Fourcroy had become director-general of public instruction, conscientiously offered to make up for the meagreness of his former remuneration. In 1777, under the auspices of the Société Royale de Médecine, appeared Fourcroy's first publica- tion, Essai sur les Maladies des Artisans, the translation of a Latin work by Ramazzini, with notes and additions. At length Fourcroy, who was recognized as the most successful alumnus of the Parisian medical school, became an applicant for a gratuitous degree and licence, provision for the granting of which to the best deserving poor student had been made by the bequest of a Dr Diest. It so happened that the faculty of physic at Paris entertained feelings of the most jealous enmity against the newly- founded Société Royale de Médecine, of which Vieq d'Azyt was perpetual secretary, and to humiliate him, and in him the whole society, it rejected his protégé Fourcroy.

Upon this the society itself subscribed the fees requisite for a diploma (£250), which was obtained by Fourcroy in 1780; but as the degree of "docteur regent" was unanimously refused, it was impossible for him to

procure any professorship under the faculty. However, in 1784 his reputation as a chemist gained for him, although Berthollet was his fellow candidate, the lectureship of chemistry at the college of the Jardin du Roi, which had become vacant by the death of Macquer, one of the last of the phlogistic school. 'This post he continued to hold for the next 25 years; and so great were the crowds which his eloquence attracted that it was twice necessary to enlarge his lecture-theatre. Fourcroy was one of the first converts to the theories of Lavoisier, which he designated "Ta Chimie Frangaise," a name which, as Thomson remarks (History of Chemistry, ii. p. 130), " certainly contributed more than anything else to give the new notions currency, at least in France." Together with Berthollet, Fourcroy was associated with Lavoisier and Guyton de Morveau in 1786 and 1787 in the preparation of a work entitled Méthode de Nomenclature Chimique, published in the latter year. In 1785 a memoir on the tendons, subsequently completed in six parts, gained for him admission into the French Academy of Sciences. He became in 1792 one of the deputies of the National Convention, and in 1793 a member of the Assembly, and soon proved himself one of the most active of the committee for the public instruction. To him was due the enlargement of the Jardin des Plantes, and the formation of a commission for the preservation of works of art. He further was the means of releasing from imprisonment Desault, surgeon of the Hétel-Dieu, and of preventing the execution of Darcet, though, unfortunately for science, he found no opportunity of rescuing Lavoisier. On the 9th of Thermidor he was appointed a member of the committee for the public safety, and in this capacity he instituted three Schools of medicine, assisted in the organization of the Ecole Polytechnique (at that time the Kcole des Travaux Publiques), and was concerned also in the establishment of the Ecole Normale, the Institut, and the Musée d'Histoire Naturelle. After the revolution of the 9th November 1799 he was made a councillor of state; and, being appointed director-general of instruction, he in the course of 5 years superintended the formation of 12 schools of law, over 30 lyceums, afterwards called royal colleges, and 300 elementary schools. His incessant labours at length told on his health, and he suffered greatly from palpitation of the heart. On the 16th December 1809, the very day on which by letters patent he had been created acount of the French empire, with a yearly pension of 20,000 francs, he was signing some despatches when he suddenly exclaimed " Je suis mort," and with those words expired,

Among the separate publications of Foureroy are Lecons élémen- taires d Histoire naturelle, et de Chimie, 2 vols. 8vo, 1782, enlarged, after several editions, to 10 vols. 8vo, with the title Systéme des Connaissances chimiques, 6 vols. 4to, 1801-2 ; Alémoires et Observo- tuons de Chimie, 8vo, 1784; L' Art de connattre et ademployer les Médicamens dans les Maladies, 2 vols. 8vo, 1785; Essai sur le Phlogistique et les Acides, 8vo, 1788, from the English of Kirwan, with notes by De Morveau and De Fourcroy ; Philosophie Chimique, ou Vérités fondamentales de la Chimie moderne, 8vo, 1795, perhaps his best work, of which several editions and translations appeared ; Notice sur la Vie ct les Travaux de Lavoisier, 8vo, 1796; Tableaux synoptiques de Chimie, 4to, 1800; Discours sur U Instruction pub- lique, 8vo, 1802. He was the author of more than 160 papers on chemical subjects, contributed to the Jlémoires of the Academy and the Institute, the Annales de Chimie, and the Anngles de Musée & Histoire Naturelle, and was editor of Le Médecin Eelairé. The more important of his later researches were published jointly in his own name and that of Vanquelin, whom he befriended, and Was the means of first bringing into notice.

See Palissot de Beauvois, Lloge Historique, 1810; G. Cuvier, es Eloge His- torique," Mém. de ?Inst., 1810, pp. xevi.-cxxviii., and Ann. Mus. Hist. Nat., xvii. 1811, pp. 99-132; Thomson, Annals, i., 1818

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FOURIER, Francois Cartes Marte (1772-1837), one of the most celebrated socialist writers, was born at Besangon in Franche-Comté, on the 7th April 1772. His father was a draper in good circumstances, and Fourier received an excellent education at the college in his native town. After completing his studies there he travelled for some time in France, Germany, and Holland. On the death of his father he inherited a considerable amount of property, which, liowever, was lost when Lyons was besieged by the troops of the Convention. Being thus deprived of his means of livelihood, Fourier entered the army, but after two years' service as a chasseur was discharged on account of ill-health. In 1803 he published a remarkable article on European politics which attracted the notice of Napoleon, some of whose ideas were foreshadowed in it. Inquiries were made after the author, but

nothing seems to have come of them. After leaving the army Fourier entered a merchant's office in Lyons, and some years later undertook on his own account a small business as broker. He obtained in this way just sufficient to supply his wants, and devoted all his leisure time to the elaboration of his first work on the organization of society.

During the early part of his life, and while engaged in commerce, he had become deeply impressed with the conviction that social arrangements resulting from the principles of individualism and competition were essentially imperfect and immoral. He proposed to substitute for these principles co-operation or united effort, by means of which full and harmonious development might be given to human nature. The scheme, worked out in detail in his first work, Théorte des Quatre Mouvements (2 vols., Lyons, 1808, published anonymously), has for foundation a particular psychological proposition and a special economical doctrine. Psychologically Fourier held what may with some laxity of language be called natural optimism,—the view that the full, free development of human nature or the unrestrained indulgence of human passion is the only possible way to happiness and virtue, and that misery and vice spring from the unnatural restraints imposed by society on the gratification of desire. This principle of harmony among the passions he regarded as his grandest discovery—a dis- covery which did more than set him on a level with Newton, the discoverer of the principle of attraction or harmony among material bodies. Throughout his works, in uncouth, obscure, and often unintelligible language, he endeavours to show that the same fundamental fact of harmony is to be found in the four great departments,— society, animal life, organic life, and the material universe. In order to give effect to this principle and obtain the resulting social harmony, it was needful that society should be reconstructed ; for, as the social organism is at present constituted, innumerable restrictions are imposed upon the free development of human desire. As practical principle for such a reconstruction Fonrier advocated co-operative or united industry. In many respects what he says of co-operation, in particular as to the enormous waste of economic force which the actual arrangements of society entail, still deserves attention, and some of the most recent efforts towards extension of the co-operative method, e@., to house-keeping, were in essentials anticipated by him. But the full realization of his scheme

demanded much more than the mere admission that co-operation is economically more efficacious than individualism. Society as a whole must be organized on the lines requisite to give full scope to co-operation and to the harmonious evolution of human nature. The details of this reorganization of the social structure cannot be given briefly, but the broad outlines may be thus sketched. Society, on his scheme, is to be divided into departments or phalanges, each phalange numbering about 1600 persons. Each phalange inhabits

a phalanstére or common building, and has a certain portion of soil allotted to it for cultivation, The phalanstéres are built after a uniform plan, and the domestic arrangements are laid down very elaborately. The staple industry of the phalanges is, of course, agri- culture, but the various series and groupes into which the members are divided may devote themselves to such occupations as are most to their taste; nor need any occupation become irksome from constant devotion to it. Any member of a group may vary his employment at pleasure, may pass from one task to another. The tasks regarded as menial or degrading in ordinary society can be rendered attractive if advantage is taken of the proper principles of human nature: thus children, who have a natural affinity for dirt, and a fondness for "cleaning up," may easily be induced to accept with eagerness the func- tions of public scavengers. It is not, on Fourier's scheme, necessary that private property should be abolished, nor is the privacy of family life impossible within the phalanstére. Each family may have separate apartments, and there may be richer and poorer members, But the rich and poor are to be locally intermingled, in order that the broad distine- tion between them, which is so painful a feature in actual society, may become almost imperceptible. Out of the common gain of the phalange a certain portion is deducted to furnish to each member the minimum of subsistence ; the remainder is distributed in shares to labour, capital, and talent,—five-twelfths going to the first, four-twelfths to the second, and three-twelfths to the third. Upon the changes requisite in the private life of the members Fourier was in his first work more explicit than in his later writings. The

institution of marriage, which imposes un- natural bonds on human passion, is of necessity abolished ; a new and ingeniously constrneted system of licence is sub- stituted for it. Considerable offence seems to have been given by Fourier's utterances with regard to marriage, and generally the later advocates of his views are content to pass the matter over in silence, or to veil their teaching under obscure and metaphorical language.

The scheme thus sketched attracted no attention when the Théorie first appeared, and for some years Fourier remained in his obscure position at Lyons. In 1812 the death of his mother put him in possession of a small sum of money, with which he retired to Bellay in order to perfect his second work. The TZ'razté de [Association Agricole Domestique was published in 2 vols. at Paris in 1822, and a summary appeared in the following year. After its publication the author proceeded to Paris in the hope that some wealthy capitalist might be induced to attempt the realization of the projected scheme. Dis- appointed in this expectation, he returned to Lyons. In 1826 he again visited Paris, and as a considerable portion of his means had been expended in the publication of his book, he aecepted a clerkship in an American firm. In 1829 and 1830 appeared what is probably the most finished exposition of his views, Le Nouveau Monde Industriel, In 1831 he attacked the rival socialist doc- trines of St Simon and Owen in the small work Pzéges et Charlatanisme de deux Sectes, St Simon et Owen. His writings now began to attract some attention. A small body of adherents gathered round him, and the most ardent of them, Victor Considérant, published in 1834 his Destinée Sociale, undoubtedly the most able and most important work of the Fourierist school. In 1832 a newspaper, Le Phalanstére ou la Réforme Industrielle was started to pro- pagate the views ef the school, but its success was not great. In 1833 it declined from a weekly to a monthly, and in he dia inanition. It was revived in 1836 as Le Pact ge, and in 1843 becamea daily paper, Za Democratie

que. In 1850 it was suppressed.

FOURIER

Fourier did not live to see the success of his newspaper

and the only practical attempt during his lifetime to establish a phalanstére was a complete failure. In 1839 M. Baudet Dulary, deputy for Seine-et-Oise, who had become a convert, purchased an estate at Condé sur Vesgre near the forest of Rambouillet, and proceeded to establish a socialist community. The capital supplied was, however, inadequate, and the community broke up in disgust, Fourier was in no way discouraged by this failure, and till his death, in October 1837, lived in daily expecta- tion that wealthy capitalists would see the merits of his scheme, and be induced to devote their fortunes to its realization. It may be added that subsequent attempts to establish the phalanstére have been uniformly unsuccessful, For an examination of the principles on which Fourier's socialist scheme is based, reference must be made to the general articles ComMUNIsM and SoctALism, but a word must be added as to the character of the man and his works. Fourier seems to have been of extremely retiring and sensitive disposition. He mixed little in society, and appeared, indeed, as if he were the denizen of some other planet. Of the true nature of social arrangements, and of the manner in which they naturally grow and become organized, he must ke pronounced extremely ignorant. The faults of existing institutions presented themselves to him in an altogether distorted manner, and he never appears to have recognized that the evils of actual society are immeasurably less serious than the consequences of his arbitrary scheme. Out of the chaos of human passion he supposed harmony was to be evolved by the adoption of a few theoretically disputable principles, which themselves impose restraints even more irksome than those due to actual social facts. With regard to the economic aspects of his proposed new method, it is of course to be granted that co-operation is more effective than individual effort, but he has nowhere faced the question as to the probable consequences of organizing society on the abolition of those great institutions which have grown with its growth. His temperament was too ardent, his imagination too strong, and his acquaintance with the realities of life too slight to enable him justly to estimate the merits of his fantastic views. That this description of him is not expressed in over-strong language must be clear to any one who not only considers what is true in his works,—and the portion of truth is by no means a peculiar discovery of Fourier's,—but who takes into account the whole body of his specu lations, the cosmological and historical as well as the economical and social. No words can adequately describe the fantastic nonsense which he pours forth, partly

in the form of general speculation on the universe, partly in the form of prophetic utterances with regard to the future changes in humanity and its material environment. From these extraordinary writings it is no extreme conclusion that there was much of insanity in Fourier's mental constitution. Ch. Pellarin, Fourier, sa Vie et sa Théorie, 5th ed., 1872; Sar- gant, Social Innovators, 1859; Reybaud, Réformateurs Modernes, 7th ed., 1864; Stein, Socialismus und Communismus des heutigen

Frankreichs, 2 ed., 1848; Booth, Fortnightly Review, N.5., vol. xii. (R. AD.)

FOURIER, Jean Baptiste JoserH (17 63-1830), French mathematician, was born at Auxerre, March 21, 1768. He was the son of a tailor, and was left au orphan in his eighth year; but through the kindness of a friend, who observed in him the promise of superior abilities, admission was gained for him into the military school of his native town, which was then under the direction of the Benedictines of Saint-Maur. He soon distinguishe himself as a student, and made rapid progress, delighting most of all, but not exclusively, in mathematics. 1t was his wish to enter the artillery or engineer corps, but failing

in this, he was appointed professor of mathematics in the school in which he had been a pupil. This post he held for about four years (1789-1794), and during this time be was frequently called to lecture on other subjects, rhetoric,

philosophy, and history. On the institution of the normal | school at Paris he was sent to teach in it, and was after- | Fourier was

wards attached to the polytechnic school. one of the savants who accompanied Bonaparte to Egypt in 1798; and during this expedition le was called to discharge important political duties in addition to his scientific ones. He was for a time virtually governor of half Egypt, was for three years secretary of the institute of Cairo, and undertook to deliver the funeral orations for Kléber and Desaix. On his return to France he was nominated prefect of Grenoble, and was created baron and chevalier of the Legion of Honour. He took an important part in the preparation of the

famous Description de PEgypte, and wrote the historical introduction. He held his prefecture for 14 years; and it was during this period that he carried on his elaborate and fruitful investigations on the propagation of heat in solid bodies. His first memoir on the mathematical theory of heat was crowned by the Academy. On the return of Napoleon I. from Elba in 1815, Fourier published a royalist proclamation, and left Grenoble as Napoleon entered it. He was then deprived of his prefecture, and, although immediately named prefect of the Rhéne, was soon after again deprived. He now settled at Paris, was elected to the Academy of Sciences in 1816, but in consequence of the opposition of Louis XVIII. was not admitted till the following year, and was afterwards made perpetual secretary in conjunction with Cuvier. In 1822 he published his most celebrated work, entitled La Théorie Analytique de la Chaleur, which by its new methods and great results made an epoch in the history of mathematical and physical science. Of this work M. Cousin said that the grandeur of its results was no more to be questioned than their certainty, and that in the opinion of scientific Europe the novelty of the analysis on which they rest is as evident as its completeness. In 1827 Fourier was received at the French Academy, and the same year succeeded Laplace as president of the council of the polytechnic school. In 1828 he became a member of the Government commission established for the encouragement of literature. He died at Paris, May 16, 1830. After his death appeared his remarkable work entitled Analyse des équations determinées, which was written in his youth and left unfinished. It was completed and edited by M. Navier in 1831. In addition to the works above mentioned, Fourier wrote many Memoirs on scien- tific subjects, and éloges of distinguished men of science.

FOURMONT, Errenne (1683-1745), a French Orientalist, was born at Habelai, near Saint Denis, in 1683. He studied in Mazarin College, and afterwards in the seminary of Trente-trois, Here his attention was attracted to Oriental languages, and shortly after leaving the Seminary he published a Traduction du Commentaire du Kabbin Abraham Aben Esra sur ? Ecclésiaste. Ue sub- sequently studied at Navarre, and in 1705 brought out Vou- velle Critique Sacrée, which gained him the notice of the Professors of the Sorbonne. In 1711 Louis XIV. appointed curmont to assist a young Chinese, Hoan-ji, in compiling a Chinese grammar, and notwithstanding that Hoan-ji died in 1716, Fourmont persevered alone at the task assigned him, and published in 1737 Meditationes Sinice, and in 1742 Grammatica

Sinica, Besides numerous other works connected with Oriental literature, he is the author of é. flexions Critiques sur les Histotres des Anciens Peuples, Paris, 1735, and several dissertations printed in the Mé- woures of the Academy of Inscriptions. He became pro- fessor of Arabic in the Royal College in 1715. In 1713

he was elected a member of the Academy of Inscriptions, in 1738 a member of the Royal Society of London, and in 1741 a member of that of Berlin. He died at Paris in December 1745. He must not be coufounded with Michel Fourmout (1690-1746), his youngest brother, who also was a member of the Academy of Inscriptions, was pro- fessor of the Syriac language in the Royal College, and was sent by the Government to copy inscriptions in Greece.

FOURNIER, Pierre Simon (1712-1768), French engraver and typefounder, was born at Paris, September 15, 1712. He was the son of a printer, and was brought up to his father's business. After studying drawing under the painter Colson, he practised for some time the art of wood-engraving, and ultimately turned his attention to the engraving and casting of types. He designed many new characters, and his foundry became celebrated not only in France but in foreign countries. Not content with his practical achievements, he sought to stimulate public inte- rest in his art by the production of various works on the subject. In 1737 he published his Zable des Propor- tions qu'il faut observer entre les Caractéres, which was followed by several other technical treatises, In 1758 he assailed the title of Guttenberg to the honour awarded him as inventor of printing, claiming it for Schoffer, in his Dissertation sur U Origine et les Progrés del Art de graver en Bois. This gave rise to a controversy in which Schopflin and Baer were his opponents. Fournier's contributions to this debate were collected and reprinted under the title of Traités historiques et critiques sur lOrigine de l'Im- primerve. His principal work, however, was the Manuel Lypographique, which appeared in 2 vols, 8vo in 17 64, the first volume treating of engraving and type-founding, the second of printing, with exainples of different alphabets, It was the author's design to complete the

work in four volumes, but he did not live to execute it. He died at Paris, October 8, 1768.

FOWL (Danish Fugl, German Vogel), originally used in the sense that Bird! now is, but, except in composition,— as Sea-Fowl, Wild-Fowl, and the like, —practically almost confined? at present to designate the otherwise nameless species which struts on our dunghills, gathers round our barn-doors, or stocks our poultry yards—the type of the genus Gallus of ornithologists, of which four well-marked species are known. The jirst of these is the Red J ungle- Fowl of the greater part of India, G. Jerrugineus, —called by many writers G. bankiva,—which is undoubtedly the parent stock of all the domestic races (¢f Darwin, Animals and Plants under Domestication, i. pp. 233-246). It inhabits Northern India from Sindh to Burmalh and Cochiu China, as well as the Malay Peninsula and many of the islands as far as Timor, besides the Philippines. It occurs on the Himalayas up to the height of 4000 feet, and its southern limits in the west of India proper are, according to Jerdon, found on the Raj-peepla hills to the south of the Nerbudda, and in the east near the left bank of the Godavery, or perhaps even further, as he had heard of its being killed at Cummum. This species greatly resembles in plumage what is commonly known among poultry-fanciers as the "' Black-breasted Game" breed, and this is said to be especially the case with examples from the Malay countries, between which and examples from India some differences are observable—the latter having the plumage less red, the ear-lappets almost invariably white, and slate- coloured legs, while in the former the ear-lappets are crimson, like the comb and wattles, and the legs yellowish.

1 Bird (cognate with breed and brood) was originally the young of any animal, and an early Act of the Scottish parliament speaks of " Wolf-birdis," z.e., Wolf-cubs.

2 Like Deer (Danish Dyr, German Thier). Beast, too, with some men has almost attained as much specialization.

that the name G. bankiva properly applies. This species is said to be found in lofty forests and in dense thickets, as well as in ordinary bamboo-jungles,

and when cultivated land is near its haunts, it may be seen in the fields after the crops are cut in straggling parties of from 10 to 20. The crow to which the cock gives utterance morning and evening is described as being just like that of a Bantam, but never prolonged as in some domestic birds. The hen breeds from January to July, according to the locality ; and lays from 8 to 12 creamy-white eggs, occasionally scraping together a few leaves or a little dry grass by way of anest. The so-called G. giganteus, formerly taken by some ornithologists for a distinct species, is now regarded as a tame breed of G. ferrugineus or bankiva, The second good species is the Grey Jungle-Fowl, G. sonnerati, whose range begins a little to the northward of the limits of the preceding, and it occupies the southern part of the Indian peninsula, without being found elsewhere. The cock has the shaft of the neck-hackles dilated, forming a horny plate, the terminal portion of which is like a drop of yellow sealing-wax. His call is said to be very peculiar, being a broken and imperfect kind of crow, quite unlike that of G. ferrugineus, and impossible, says Jerdon, to describe. The two species, where their respective ranges overlap, occa- sionally interbreed in a wild state, and the present readily crosses in confinement with domestic poultry, but the hybrids are nearly always sterile. The third species is the Cingalese Jungle-Fowl, G@. stanleyi (the G. lafayetti of some authors), peculiar to Ceylon. This also greatly resembles in plumage some domestic birds, but the cock is red beneath, and has a yellow comb with a red edge, and purplish-red cheeks and wattles. He has also a singularly different voice, his crow being dissyllabic. This bird crosses readily with tame hens, but the hybrids are be- lieved to be infertile. The fourth species, G. varius (the G. furcatus of some authors), inhabits Java and the islands eastwards as far as Flores. This differs remarkably from the others in not possessing hackles, and in having a large unserrated comb of red and blue, and only a single chin wattle. The predominance of green in its plumage is another easy mark of distinction. Hybrids between this species and domestic birds are often produced, but they are most commonly sterile. Some of them have been mistaken for distinct species, as those which have received the names of G. wneus and G. temminck.

*Several circumstances seem to render it likely that Fowls were first domesticated in Burmah or the countries adjacent thereto, and it is the tradition of the Chinese that they received their poultry from the West about the year 1400 B.c. By the Institutes of Manu, the date of which is variously assigned from 1200 to 800 B.c., the tame Fowl] is forbidden, though the wild is allowed to be eaten—showing that its domestication was accom- plished when they were written. Tlie bird is not men- tioned in the Old Testament nor by Homer, though he has *"AXéxrwp (Cock) as the name of a man, nor is it figured on ancient Egyptian monuments, Pindar men- tions it, and Aristophanes calls it the Persian bird, thus indicating it to have been introduced to Greece through Persia, and it is figured on Babylonian cylinders between the 6th and 7th ceuturies B.c. It is sculptured on the Lycian marbles in the British Museum (cerca 600 B.c.), and Blyth remarks (J0cs, 1867, p. 157) that it is there represented with the appearance of a true Jungle-Fowl, for none of the wild Galli have the upright bearing of the tame breed, but carry their tail in a drooping position. For further particulars of these breeds see Pouutry. (A. N.)*

FOWLER, Cuaruzs (1792-1867), architect, was born at Collumpton, Devon, May 17, 1792. After serving an

If the Malayan birds be considered distinct, it is to them |

apprenticeship of five years at Exeter, he went to London in 1814, and entered the office of David Laing, where he remained till he commenced practice for himself. His first work of importance was the Court of Bankruptcy in Basinghall Street, finished in 1821. Although he gained in the following year the first premium for a design for the new London bridge, a design by another architect was ultimately agreed upon and carried out. Among Fowler's other desigus for bridges is that for the one constructed across the Dart at Totness. He was also the architect for the markets of Covent Garden and Hungerford, the new market at Gravesend, and Exeter lower market; and besides several churches he designed Devon lunatic asylum (1845), the London fever hospital (1849), and the hall of the Wax Chandlers' Company, Gresham Street (1853). For some years he was

honorary secretary of the institute of British architects, and he was afterwards created vice-president. He retired from his profession in 1853, and died at Great Marlow, Bucks, September 26, 1867. FOWLER, Joun (1826-1864), inventor of the steam plough, was born at Melksham, Wilts, July 11, 1826. He learned practical engineering at Middlesborough-on-Tees, and in 1849 invented a machine for laying drain tiles, which was at first worked by horses but afterwards by steam. In 1852 he began experiments in steam cultiva- tion, and at the Chester meeting in 1858 he received for his steam plough the Royal Agricultural Society's prize of £500. In conjunction with two partners he established in 1861, at Leeds, the well known firm of Fowler & Co. He died 4th December 1864. See AGRICULTURE, FOWLER, Wrt11aM (c. 1560-1614), one of the poets who frequented the court of James VI. before his accession to the throne of England, was born about the year 1560. After attending St Leonard's College, St Andrews, between 1573-74 and 1578, he seems to have selected the legal profession, and in 1580, when about twenty years of age, he was at Paris studying the civil law. He subsequently became private secretary and master of requests to Anne of Denmark, wife of James VI. On the occasion of the baptism of Prince Henry on 30th August 1594, the pre paration of the pageants exhibited "was by the king's majesty committed to the lord of Lindores and Mr William Fowler"; and the description of these "rareshows and singular inventions" was published at the time. The sister of Fowler, Susannab, was married to Sir John Drummond, Knight, and gentleman usher of the black rod, and was mother of the celebrated poet Drummond of Hawthornden. On the title of some of his works Fowler styles himself P. of Hawick, thus indicating that he was parson or rector of Hawick. He is frequently styled Sir William Fowler, but there is no evidence that he was ever knighted. That Fowler was a inan of very superior literary merit is evinced by his works, which are still preserved. The first of these is a collection of sonnets entitled The Tarantula of Love; the other is a translation from the Italian of the Zriwmphs of Petrarch. These two manuscripts were presented by his nephew, Drummond of Hawthiornden, to the library of the university of Edinburgh in 1626, and it is understood both will shortly be published. Fowler was a great favourite at court. He prefixed a panegyrical sonnet to The Furnes, a composition of James VI., while the king in return performed a similar office for his Z'riwmphs of Petrarch, m a strain of versification which for vigour and fluency was vastly superior to

his common style. Besides the above, two volumes of his manuscript notes, scrolls of poems, &., are preserved among the Drummond MSS., in the library of the Society of Antiquaries of Scotland. Specimens of Fowler's verses were published in 1823 by Leyden in his Scottish Descriptive Poems, and are also to be found 10 other collections illustrating the poetry of the period.

FOW—-FOX

FOWNES, Georce (1815-1849), Ph.D., F.R.S., an eminent chemist, was born in London. He early showed an interest in scientific pursuits, and when seventeen or eighteen years of age joined with Dr Henry Watts and Mr Everett in establishing a philosophical class at the Western Literary Institution in Leicester Square. In 1837 he entered the laboratory of Everett, lecturer on chemistry at the Middlesex Hospital; and in 1839 he studied for some time under Professor Liebig at Giessen. He was lecturer on chemistry first at the Charing Cross and then at the Middlesex Hospital Medical School, as also at the school of the Pharmaceutical Society. In 1845 he was appointed director of the Birkbeck Chemical Laboratory in University College, London. He died of consumption, January 31,1849. Besides his well-known and frequently re-edited Manual of Chemistry, and the Acton prize essay of the Royal Institution, entitled Chemistry, as exemplufy- ing the Wisdom and Beneficence of God, Fownes wrote humerous scientific papers, among others the following :—

*"On the Direct Formation of Cyanogen from its Elements," ftep. Brit. Assoc., 1841, part ii. pp. 52, 53; "On the Preparation of Artificial Yeast," Mem. Chem. Soc., i., 1841-43, pp. 100-103; "On the Preparation of Hippuric Acid," Phil. Mag., xxi., 1842, pp. 382-384; " On the Food of Plants [prize essay], Journ. Agric. Soc., iv., 1843, pp. 498-556; '*On the Existence of Phosphoric Acid in Rocks of Igncous Origin," Phil. Trans., 1844, pp. 53-56 ; "An Account of the Artificial Formation of a Vegeto-alkali " (Furfurol), and 'On Benzoline," 7., 1845, pp. 2538-268; 'On the Production of Furfurol," Pharm. Journ., 18 49, 113-116; 'On the Equivalent or Combining Volumes of Solid Bodies," 7b., pp.*

334-339,

FOX (Vulpes), a genus of digitigrade Carnivora, be- longing to the Canide or dog family, but differing from the true dogs (Cands) in the greater elongation and sharp- ness of the muzzle, and in the greater length and bushiness of the tail. They likewise differ in the pupil of the eye being elliptical when contracted, and in the possession of a subcaudal gland, in which a fetid substance is secreted, the emission of which gives to foxes their peculiarly dis- agreeable odour. There are 24 recent species of foxes known, distributed over all the great continents except South America and Australia. Of these the Fennec foxes are exclusively African, and the bristle-tailed foxes North American. The Common Fox (Vulpes vulgaris), the. pet of the hunting field and the pest of the farmyard, occurs throughout Europe, wherever it has not been exterminated by man. It is the Scottish tod and the French renard. It measures about two feet in length exclusive of the tail, which is about a foot long Its fur is of a reddish-brown colour above, and more or less white beneath ; the back of its ears and the fore part of its limbs are black, and the tip of its bushy tail, or brush as it is called, is white. Its long, Sharp muzzle, erect pointed ears, and sharp eye give it an appearance of sagacity and cunning which its real character fully justifies. The fox is undoubtedly the subtlest of British beasts of the field, its intellectual capacity having no doubt been enlarged by the peculiarly hard conditions under which alone it is permitted to exist in this country. It is regularly hunted by the fleet and keen-scented fox- hounds, urged on by mounted huntsmen, all of whom are not unfrequently baffled by the speed, cunning, and Ingenuity of this wily creature. The fox is a solitary animal, inhabiting a burrow known as its earth, which it either excavates for itself, or, as more usually happens, obtains by previously ejecting the badger or the rabbit from its home. So averse, indeed, is the fox to dig for itself, that when foiled in its attempts to dispossess the badger, it has been known to take up its quarters with the latter, and in Germany it is readily induced to make its home in artificial burrows, constructed of stone and earth for the purpose of facilitating the operation of digging out the cubs. The fox also occurs in woods, and even in the

open country without burrows, lying in its "cover" by day and stealing forth at night, when alone it can be said to see properly, in search of its

prey. Its food consists of rabbits, hares, poultry, and game-birds, although when these are not to be had it is fain to satisfy its hunger with rats, mice, and even insects—“ the droppings of these creatures,” says Bell, “being often composed almost entirely of the wing cases of beetles.” The fox also visits the sea-shore, where it feeds on shell-fish and crustaceans ; and on the Continent it is said to frequent the vineyards in order to gratify its taste for ripe grapes. Although the flesh of most birds forms its favourite food, it is a curious cireum- stance, noticed by Dr Weissenborn, that even the severest hunger cannot compel it to eat the flesh of birds of prey, while there is good reason to believe that the fox enjoys, if it does not even prefer, “high” meat. The female produces her young in April—the period of gestation extending from 60 to 65 days. These are usually from 5 to 8 in number, and for them she shows the greatest solicitude) defending them with the utmost courage, and exhibiting a boldness altogether foreign to her character at other times. The cubs, attain their full size in about 18 months, and the duration of life in the species, judging from individuals kept in confinement, probably extends to 13: or 14 years. The cubs, like those of most Carnivora, are exceedingly playful, and may often be seen amusing themselves, after the manner of young dogs, in pursuit of their own brushes. Their resemblance to the dog does not, however, extend much further, for, unlike it, they seem incapable of attach- ment to man. Although taken young and brought up with dogs, their attachment does not go beyond refraining from biting the hand that is accustomed to feed them. They remain timid and suspicious, and are always ready to snap at any one seeking to be familiar. This incapability of domestication, and the fact that the dog and fox have never been known to interbreed, would seem to prove that these animals are by no means so nearly related as was at one time supposed. Ample proof of the very considerable intellectual capacity of the fox is to be found in the stratagems to which it has recourse in securing its prey, but still more in the quickness with which it detects man’s Strategic effurts to outwit and capture it. “ Its instinctive cunning,” says Bell, “leads it soon to suspect the wiles of its enemies, and it will in a very short time ascertain the design of a trap or a gin, though concealed with the utmost care.” Nothing can exceed the caution with which reynard approaches and examines the baited trap, or the non- chalance with which he approaches, enters, and rifles the snare in which some animal has been already caught, and which he evidently knows can do him no injury until reset. There are also several well-authenticated

cases of the fox counterfeiting death in order to escape from its enemies. Attempts have been made to put a different interpretation on such instances, but examples of " feign- ing " have of late years been noticed in so many and such diverse animals,—among insects, reptiles, birds, and mammals,— that there seems no reason to doubt that the wily fox has recourse to a stratagem which, for want of a better term, may be described as counterfeiting death. Closely allied to the common fox of Europe is the Red Fox (Vulpes fulvus) of eastern North America, regarded by many naturalists as only a variety of the common species— an opinion which receives some confirmation from the fact that hitherto no remains of the red fox have been found in the cave deposits of that continent, although remains of the grey fox are abundant. It may thus possibly be the descendant of individuals of the European species, intro- duced at a comparatively early period, and owing the differences that now distinguish it to the greatly altered conditions under which for centuries it has existed. It is

altogether larger than the common fox of Europe, and the fur is longer and softer, the colour more brilliant, and the muzzle less extended. According to Sir J. Richardson, it preys largely on the smaller animals of the rat family, and is very fond of fish. 'The red fox," he says, "does not possess the wind of its English congener. It runs for about 100 yards with great swiftness, but its strength is exhausted in the first burst, and it is soon overtaken bya wolf or a mounted horseman." In Canada and the United States it is largely hunted for its valuable fur, about 60,000 skins of this species being annually imported into the London market. There are several well-known varieties of the red fox, as the cross fox and the black or silver fox. The latter is very scarce, and its fur is more valuable than any other found in North America. La Hontan states that in his time a skin of the silver fox was worth its weight in gold, and an unusually fine skin has been sold in the London market for £50. The fur is sometimes of a uniform black shining colour, except at the tip of the tail, which is white ; but more usually it has a hoary appearance from the admixture of white tipped hairs with those entirely black. This fox is exceedingly shy and difficult of approach, owing probably to the persistency with which it is hunted by the fur traders. About 1600 skins of the silver fox are annually imported into Britain. The Arctic Fox

(Vulpes lagopus) is an inhabitant of the boreal regions of Europe, Asia, aud America. It is somewhat smaller than the European fox, its ears being less pointed and the nizzle shorter. The soles of its feet are densely furred, resembling those of a hare, hence its specific name, Jagopus. As with many Arctic animals the colour of its fur changes with the season, being in most cases of a pure white colour in winter, with the exception of a few black hairs at the extremity of the tail. Towards the end of April, however, when the Arctic snows begin to disappear, the long white fur gives place to shorter hair of a dark brown or sooty colour. Occasionally a dark-coloured fox may be seen in winter, and a white oue in summer, and in Iceland, according to Professor Newton, the winter coat differs very slightly in colour from that of summer, probably owing to the com- paratively mild character of the Icelandic winter. The Arctic fox has little of the proverbial cunning of its kind, having been seen to walk unsuspiciously into the trap which had been baited in its presence. It is an exceedingly cleanly animal, and the fetid odour characteristic of the entire genus is almost absent in this species. It differs also from the common fox in being gregarious, living, according to Richardson, in little villages consisting of 20 or 30 burrows placed near each other. The Arctic foxes seek their food, which consists of lemmings, birds, eggs, and carrion, at night, and their first impulse, says Captain Lyon, on securing it is to hide it, even though suffering severely from hunger. It was suggested some years ago by Pro- fessor Newton that this species supported itself during winter on a store of provisions laid up during summer, and Captain Feilden was able during tie recent polar expedition (1875) to confirm this. When in Grinnell Land he and his companions came upon Arctic foxes, and were greatly surprised on discovering numerons deposits of dead lem- mings. 'In one nook," says Captain Feilden, "under a rock we pulled out over 50; we disturbed numerous caches of 20 and 30, and the ground was honeycombed with holes, each of which contained several bodies of these little animals, a small quantity of earth being placed over them" (A Voyage to the Polar Sea, by Captain Sir G. Nares, 1878). Nearly 10,000 skins of the Arctic fox, chiefly in winter fur, are annually brought into Britain.

Foxes are found fossil in caverns in many parts of

Europe, and extinct speci i : . species occur in the Tertiary deposits of both hemispheres. e ri)

FOX, Cuartes James (1749-1806), born on the 24th of January 1749, at 9 Conduit Street, in the city of Westmiuster, was the third son of Henry Fox, first Lord Holland. His mother was the eldest daughter of the second duke of Richmond. As his great-great-grandmother was duchess of Portsmouth, he had in his veins the blood of Charles II. of England and Henry IV. of France. His paternal grandfather, Sir Steplien Fox, was born shortly after Charles I. ascended the throne, and died shortly after the accession of George I. The public services of this member of the Fox family have received less notice than they deserve. He was a yeoman's son who, having been taught to read, write, and cipher, was considered capable of rising in the world. When a youth he first obtained a situation in the household of the earl of Northumberland; then he entered the service of Lord Percy, the earl's brother, and he was present with the royalist army at the battle of Worcester as Lord Percy's deputy at the ordnance board. Accompanying Charles II, in his flight to the Continent, he served him in a menial capacity during his exile, till he was promoted to be keeper of the privy purse. He was employed as intermediary between the king and General Mouk. Honours and emolument were his reward after the Restoration ; he was knighted, and appointed to the lucrative offices of clerk of the green cloth and paymaster of the forces. He entered the House of Commons, first as member for Salisbury, and secondly for Westminster. He succeeded the earl of Rochester as a commissioner of the treasury, filling that office for 23 yearsand during three reigns. At the mature age of seventy-seven he married for the second time ; font children were the issue of this marriage. He died iu 1716 at the age of eighty-nine, and left a large fortune. It is his distinction to have founded Chelsea hospital, and to have contributed £13,000 in aid of this laudable publie work. Though his place as a statesman is in the second or even the third rank, yet he was a useful man in his generation, and a public servant who creditably discharged all the duties with which he was entrusted. Unlike other statesmen of his day, he grew rich in the service of the nation without being suspected of corruption, and without forfeiting the esteem of his contemporaries. Sir Stephen Fox's second son by his second marriage was named Henry. Inheriting a large share of the riches which his father had accnmu- lated, he squandered it

soon after attaining his majority. Henry Fox went to the Continent to escape from his creditors. There he made the acquaintance of a country- woman of fortune, who became his patroness and was 80 lavish with her purse that, after several years' absence, he was in a position to return home and to enter parliament as member for Hindon. He became the favourite pupil and devoted supporter of Sir Robert Walpole, achieving nnequalled and unenviable proficiency in the worst political arts of his master and model. As a speaker he was fluent and self-possessed, imperturbable under attack, audacious in

exposition or retort, and able to hold his own against Pitt

himself, Thus he made himself a power in the House of Commons, and an indispensable member of several adminis: trations. He heaped up riches when acting as paymaster of the forces during the war which Pitt conducted with extraordinary vigour, and in which the nation was intoxl- cated with glory. He served under the earl of Bute im order that he might exercise his skill in cajolery and cor ruption to induce the House of Commons to approve of the treaty of Paris; as a recompense, he was raised to the House of Lords with the title of Baron Holland. He strove, but in vain, to obtain promotion to the dignity of an earl, a dignity upon which he had set his heart, and he died a

sorely disappointed man, with a reputation for cunning and unscrupulousness which cannot easily be matched, and with

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an unpopularity which justifies the conclusion that he was the most thoroughly hated statesman of his day. Henry Fox's affection for his son Charles James verged on idolatry. The boy was both precocious and engaging. Whatever he chose to learn, he acquired with ease, and he displayed more than a boy's good sense in correcting his faults. Once he overheard his mother, with whom he was no favourite, remark to his father, 'Charles is dreadfully passionate ; what shall we do with him?" and the

reply, “Oh, never mind ; he is a very sensible little fellow, and he will learn to cure himself.” Thereupon he resolved to

temper. He went to Eton when he was nine, having spent the preceding year, at his own request, in the school kept at Wandsworth by Pampelonne, a French refugee. The boy’s health was delicate, and this caused his father much anxiety. He was not diligent in learning, nor was his tendency towards indolence at school counteracted by the discipline to which he was subjected. The Rev. Dr Francis, his tutor, sent to his father accounts more flattering than just of his son’s progress and attention, and better fitted to gratify parental fondness than set forth the truth. He often went home in order to accompany his parents to some notable spectacle, chief among them being the

coronation of George III., where he met with a slight |

accident, which, being reported in the newspapers, caused his father to write, “The article [in the newspapers] of Charles’s mishap has brought several messages. The boy is a great deal better beloved than his father is.” When fourteen he left school for four months, which he spent with his parents at Spa and Paris. His father taught him to game at Spa, giving him several gold pieces wherewith to try his luck, as the saying is, every evening. which was for some years his besetting sin, and for which he could urge no other excuse, when taunted with it later by Lord Hillsborough in the House of Commons, than that it was a vice “ countenanced by the fashion of the times, a vice to which some of the greatest characters had given way in the early part of their lives, and a vice which carried with it its own punishment, and entailed a curse upon those who were addicted to it.” He returned to Eton thinking himself a thorough young man of the world; bat his dandi- fied airs only excited the ridicule of his comrades, and Dr Barnard, the head master, by flogging him for misconduct, made him feel keenly that he was still a mere schoolboy.

tinent and visits to Continental gaming houses were thie visits which he made to the Houses of Parliament, in com- pany with his father, to hear important debates. He was in the gallery of the House of Commons when Lord North moved “that the paper entitled the Vorth Briton is a false, Scandalous, and seditious libel.” His father impressed upon him that John

Wilkes was a bad man, and that the earl of Bute was a sagacious minister; these opinions were embodied by him in some French verses, which injudicious admirers have reproduced to show his want of mastery over the French language, and the absurdity of his boyish political Sentiments. Leaving Eton in 1764, Fox went to Oxford, where he entered Hertford College. In aletter to his friend Mr Macartney, he professed a great liking for Oxford and fondness for mathematics, adding, in another letter, that he believed mathematics were useful, and was sure they were entertaining, this being enough, in his opinion, to recommend them. The same letter contained his judgment on a newly published poem, which is far less paradoxical and more creditable to his discernment than the foregoing statement concerning mathematics. The poem was the 7'raveller, which the youthful critic pronounced, with perfect truth,

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"to have a good deal of merit." A trip to Paris anda stay there of two months interrupted Fox's university career. Dr Newcome, the head of his college, readily sanctioned this holiday, making the complimentary remark that such appli- cation as his required "some intermission, and you are the only person with whom I have ever had connexion to whom Icould say this. . . . You need not interrupt your amuse- ments by severe studies; for it is wholly unnecessary to make a step onward without you, and therefore we shall stop until we have the pleasure of your company." This

| visit to the capital of France was no more serviceable to him, repress his angry passions, and he succeeded in rendering | himself a pattern for gentle bearing and command of |

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Hence he early became addicted to the vice |

in a moral sense, than his previous une. His father en- couraged him to indulge himself without stint in pleasures to which young men are only too prone, and, what is still more blameworthy, jested at the scruples of a son who had no strong liking for vicious courses. On his return to Oxford he worked hard at his studies, spending the greater part

_ of a vacation in systematic reading along with his friend

Dickson, who was afterwards bishop of Down. Their leisure was devoted to perusing the works of the early English dramatists, all of which they read. Taking his degree in 1766, he left Oxford and spent the succeeding two years in Continental travel, traversing France and Jtaly, either in company with his parents, or else with his friends Lord Carlisle, Lord Fitzwilliam, and Mr Uvedale Price. Along with Mr Price he visited Voltaire at Ferney, where he was heartily welcomed by the great Frenchman for his father's sake, and was advised to read Voltaire's published works in order that he might emancipate himself from religious prejudices and increase his stock of ideas. He became a proficient in speaking the French tongue, and he practised himself in writing it by penning poetical epistles in French to his friend Fitzpatrick. He also mastered Italian, which he admired beyond measure, saying that there was "more good poetry in Italian than in all other languages that I understand put together." He was

| then passionately fond of amateur acting and of wearing | fine clothes.

In after days his friends could scarcely credit the assurance of the friends of his youth when the latter stated that Fox, who had become a sloven in dress, was once a "macaroni," having made a journey from Paris to Lyons in order to buy waistcoats, and was in the habit of walking about with a little French hat on his head and red-heeled shoes on his feet. As difficult was it for some among them to realize that Fox, the leader of the Whigs, and even further advanced in Liberal opinions than the

| majority of his party, had been such a Tory at the outset More instructive and advantageous than trips to the Con- |

of his parliamentary career as to write to George Selwyn in the following terms: "I am reading Clarendon, but scarcely get on faster than you did with your Charles VY. I think the style bad, and that he has a great deal of the old woman in his way of thinking, but hate the opposite party so inuch that it gives one a kind of partiality for him." Hating the opposite party so thoroughly, it is not surpris- ing that he should have been inimical to the first adminis- tration of the marquis of Rockingham, an administration that repealed the Stamp Act which George Grenville hal designed to raise a

revenue in the American Colonies, an administration which was far too liberal in tendency and independent in character to suit the narrow and personal views of George IIL, and that he should have written to Sir George Macartney, 'every body laughs at its mem- bers, holds then1 cheap, but, according to the fashionable phrase, doing justice to their good ztentions." In 1768, when still under age, Fox was returned for Midhurst, then a pocket borough. His father having made the arrangements necessary for his election had thereby pro- vided a supporter of the ministry of the day which the earl of Chatham had formed, and in which the duke of Grafton was first lord of the treasury. Fox's maiden speech in the

House of Commons was delivered in defence of the ministry and in opposition to seating John Wilkes as member for Middlesex. He at once made his mark as a parliamentary speaker, recalling to some members the best traits of Charles Townshend and the elder Pitt. His father, delighted at the success achieved by his favourite son, communicated his satisfaction to his acquaintances, and wrote to one of them that he had been told Charles had spoken extremely well :—-"It was all off-hand, all argumentative, in reply to Mr Burke and Mr Wedderburn, and excessively well indeed. I hear it spoken of by everybody as a most extraordinary thing, and I am, you see, not a little pleased with it." Fox had his reward by being appointed a lord of tlie admiralty im- mediately after attaining his majority, and when Lord North had succeeded the duke of Grafton as prime minister. Two years afterwards he resigned, on account of a misunder- standing with his chief and a determination to oppose the Royal Marriage Bill, which the ministry introduced out of deference to George ITI., and about which the king wrote to Lord North :—"I do expect every nerve to be strained to carry the Bill through both Houses with a becoming firmness, for it is not a question that immediately relates to administration, but personally to myself; therefore I have a right to expect a hearty support from every one in my service, and shall remember defaulters." Fox not only opposed this bill, which was framed to discourage members of the royal family from marrying, and to throw artificial obstacles in their way should they desire to make love matches, but he also introduced a bill to amend Lord Hardwicke's Act, "For the better preventing of Clandestine Marriages," which his father had

virulently opposed. This conduct, which gave great offence to George IIT., was the origin of that implacable enmity to his great subject which ever after prevailed in the royal breast, to the detriment alike of the throne and the country. In introducing his bill Fox is said by Horace Walpole to have spoken "with ease, grace, and clearness"; he effectively answered Edmund Burke and Lord North who opposed it, ridiculing the arguments of the former and con- futing those of the latter, "with a shrewdness that, from its multiplicity of reasons, as much exceeded his father in embracing all the arguments of his antagonists as he did in his manner and delivery." This was doubly agreeable to his father, who had formed a clandestine marriage, and who thought such an Act as Lord Hardwicke's a slur upon himself. The attempt of his son failed, though he had the triumph of beating the ministry by a majority of one on a motion for leave to introduce the bill. After being a year out of office, he became reconciled to Lord North, and re-entered the administration asa junior lord of the treasury. But he soon reasserted his independence, differing from Lord North on a question of procedure, and causing the defeat of the ministry in the House of Commons by pressing an unwelcome motion to a division. The king was incensed at what he styled Charles Fox's presumption, adding, in a letter to the premier, " Indeed, that young man has so thoroughly cast off every principle of common honour and honesty that he must become as contemptible as he is odious; aud I hope you will let him know you are not insensible of his conduct towards you." Lord North, acting in conformity with the king's suggestion, wrote as follows to Fox :— Sir, his Majesty has thought proper to order a new commission of the treasury to be made out, in which I do not see your name." Thus ended the first stage of Fox's political career. A year later he avowed in the House of Commons that "the greatest folly of his life was eens supported Lord North." He was chargeable a = – of another kind. Among the young men of the

y Ae was conspicuous for staking money at play and

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making bets on horse races. Sometimes he won bets made at Newmarket, but he almost invariably lost larger sums in a gaming club at Almack's, where the stakes were £50, and where as much as £10,000 was on the

tableata time. Lord Holland advanced £40,000 to pay his debts, but this did not suffice, and he became the dupe of a Mrs Grieve, who, on the pretext of introducing him to a Miss Phipps, a West Indian heiress, obtained money from him. His reputation stood so low in public estimation that, according to Horace Walpole, it was commonly supposed he had been dismissed by Lord North for robbing the treasury. In 1774 Fox began that opposition to the ill-advised and _ ill-fated measures of Lord North which gave him a place among the greatest of orators and the most prescient of statesmen. He lost both his parents in that year, and his brother Stephen, second Lord Holland, soon followed them to the grave, leaving behind him the boy whom Fox treated with almost paternal fondness and care, whose memory as third Lord Holland is held in kindly remembrance, and who, with characteristic modesty, considered it his chief glory to have been the nephew of Fox and friend of Grey. Soon after Fox entered the ranks of the Oppo- sition he became its acknowledged chief. This rapid advancement was largely due to the lessons in practical politics taught him by Edmund Burke, whose acquaintance he had made in early life. The story of his career from 1774, when he left Lord North's administration, to 1782, when Lord North resigned and when he became secretary of state in the second Rockingham administration, is asso- ciated with the unsparing and brilliant opposition of the Whig party to the war which ended with the ratification of the independence of the Thirteen United Colonies of America. An important episode during that period was his election as member for the city of Westminster. On the 2d of February 1780, a meeting in favour of parlia- mentary reform was held in Westminster Hall, at which such leading members of the Whig party were present as the duke of Portland, Earl Temple, John Wilkes, General Burgoyne, Alderman Sawbridge, Edmund Burke, and over which Fox presided. He delivered a stirring speech in favour of a redress of grievances, and in particular of a reform in the representation of the people. After it had been resolved that a petition to that effect should be pre sented to parliament, it was proposed and carried by acela- mation that Fox, "the Man of the People, " should become a candidate to represent Westminster in the House of Commons, and before the year closed he was a member for the constituency which he represented till the end of his life. A little more than a century had then elapsed since Sir Stephen Fox, his grandfather, had been first returned for the city of Westminster. George IIL encouraged the opposition to the election of the "

Man of the People," of whom he wrote that "Fox never had any principle, and can thereforé act as his interest may guide him." Eight thousand pounds were contributed out of the civil list to promote the success of Lord Lincoln, the favourite of the court, yet neither corrupt expenditure nor royal disapproval sufficed to hinder the triumph of Fox. As secretary of state in the ministry of the Marquis of Rockingham, and leader of the House of Commons, Fox displayed great business aptitude and capacity for conciliation. A short time before he became minister, Horace Walpole wrote to Sir Horace Mann :—" Mr Fox is the first figure in all the places I have mentioned,—the hero in parliament, at the gaming-table, at Newmarket." After he became minister, the same writer informed his correspondent—"Mr Fox already shines as greatly in place as he did in opposition, though infinitely more difficult a task. He 1s now as indefatigable as he was idle. He has perfect temper, and not only good humour but good nature, and,

which is the first quality of a prime minister in'a free country, has more common sense than any man, with amaz- ing parts that are neither ostentatious nor affected." His experience of high office was very short. Lord Rockingham became premier on the 27th of March 1782; he died on the first of the following July, and Fox resigned immedi- ately afterwards. He had finally resolved to do so before the death of his chief, having been outvoted in the cabinet on the question of unconditionally acknowledging the in- dependence of the United Colonies. His brother secretary of state, the earl of Shelburne, and other colleagues thought that the concession of independence should be made one of the conditions of peace. Fox regarded Shelburne with un- disguised aversion. When the administration was formed, he fancied that Shelburne was disposed to imitate Lord North and to pay undue deference to George III., and he told him that it appeared "the administration was to consist of two parts, one belonging to the king, the other to the public." Four weeks after being in office Fox wrote to his friend Fitzpatrick :—" Shelburne shows himself more and more every day, is ridiculously jealous of my encroaching on his department, and wishes very much to encroach upon mine." Shelburne, in turn, suspected Fox of designs to monopolize power, and to have his own way in all things. This unfortunate antagonism between two men of remarkable ability caused a

split in the Whig party, and enabled the king to succeed in his policy of entrust- ing power only to ministers who were subservient to his will. Succeeding Lord Rockingham as premier, Shelburne held office till the 24th February 1783. The coalition ministry, in which the duke of Portland was premier, and Lord North and Fox were secretaries of state, took the place of that over which Shelburne bad presided. It was with extreme and undisguised reluctance that the king per- mitted this administration to be fornied. When he found it hopeless to struggle against the inevitable result, he communicated his real feelings on the subject to those politicians who prided themselves upon being his friends. In conversation with Mr Wyndham Grenville, he poured out his indignation "upon Fox, whom he loaded with every expression of abhorrence; upon the duke of Portland, against whom he was little less violent ; upon Lord North, to whose conduct he imputed all the disasters of the country; upon American independence, which seemed to have been a most bitter pill indeed." His early detestation of Fox had now been intensified, owing to the unnatural behaviour of his eldest son, which he erroneously attributed to the teaching of the great Whig statesman. The king even consulted Lord Chancellor Thurlow and Lord Ashburton as to "what redress he could have against a man who alienated from him the affections of his son," and it is said that Thurlow told him "he would have no peace till his son and Fox were secured in the Tower." One of the first acts of the coalition was to arrange about the establish- ment and income of the Prince of Wales. The king was shocked at the proposition which the ministry laid before him, considering the sum which had been agreed upon as a fitting one for the prince to receive utterly extravagant ; and he alleged that his advisers were ready to sacrifice the public interests to gratify an "ill-advised young man." In consequence of the king's disapproval of the scheme, his eldest son had to content himself with an allowance which was wholly inadequate; hence he had to make repeated applications to parliament to pay his debts. While the coalition ministry held office the definitive treaties of peace Were signed between Great Britain and France, Spain, and the United States of America, and thus the war which a ministry after George ITI.'s own heart had provoked and carried on with amazing incompetence ceased to impo- Verish and humiliate the nation. But the chief act of the

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administration and the cause of its downfall was the in- troduction of a bill for the just and efficient government of British India. Though Burke had the principal share in planning the measure, yet Fox, having made himself thoroughly master of the questions at issue, expounded the scheme in the House of Commons with great lucidity and impressiveness. The opposition to it was vehement and disingenuous; the measure was falsely described as having been solely designed in order to confiscate the property of the East India Company and establish the supremacy of the Whig party. William Pitt, who was then unsparing and unfair in his criticism, afterwards did practical justice to the wisdom of Fox and his colleagues by bringing a measure into parliament resembling that of the coalition ministry in many essential particulars. Fox's prediction was thus verified, for the day arrived when his statesmanlike and much maligned bill was " regarded in its true light as a strong, but as a necessary and a just measure." But the king had determined that the bill which Fox had safely piloted through the House of Commons should never pass into law; several persons calling themselves his friends aided him in accomplishing his object, and the ministry, after being defeated by a small majority in the House of Lords, was summarily and contemptuously dismissed. Twenty-two years elapsed before Fox returned to office. During three months after his dismissal, Fox endeavoured to counteract the power of the sovereign to dissolve parlia- ment; but he was baffled by the boldness and patience of William Pitt, the young prime minister. Then followed a more trying discomfiture when the country pronounced in favour of his rival at the general election of 1784. Even the Nonconformists, who had no warmer advocate than Fox, and whose only hope for the redress of intolerable grievances consisted in the Whig party being in office, turned against their true friends, rallying to the shout of "Pitt and the constitution," instead of aiding by voice and vote the cause of "Fox and free government." They deserted him at a critical juncture. Nevertheless he con- tinued to plead for them with his whole heart and soul, and merely remarked, "on recollection of what had been their conduct upon that occasion [the coalition], the House would at least do him the justice to say that, in sup- porting them that day, he was not influenced by any very obvious motives of private partiality or attachment. Yet he was determined to let them know that, though they could upon some occasions lose sight of their principles of liberty, he would not upon any occasion lose sight of his principles of toleration." It was not enough for the king and the

young and haughty premier that the Whig party should be defeated in the country; they were resolved to exclude Fox from parliament, and in any case to prevent his re-election for Westminster. Admiral Lord Hood, Sir Cecil Wray, and Fox were tle candidates for the two seats. The court and the ministry were bent upon the first two being chosen. What the king styled " gold pills " were lavished on the occasion. Moreover, 280 of the Guards were sent to vote as householders, a thing which Horace Walpole said his father "in the most quiet season would not have dared todo." The character of the struggle recalled an envenomed contest 89 years previously, when the Jacobites strove with all their might to hinder the re-election of Sir Stephen Fox, a declared supporter of the Revolution settlement. In 1784, as in 1695, the party of freedom and constitutional government carried the day in Westminster, and Fox was returned by a majority of 236. But the partisans of divine right in 1695 never dreamed of retrieving their defeat in the manner which found favour in the eyes of George ITI. and his advisers in 1784, A scrutiny was demanded, in order that Fox might not take his seat. Happily, this pettifogging manceuvre was IX. — 63

thwarted by the action of attached friends, who procured his election for the Kirkwall burghs. The validity of this election was challenged, but without result, and Fox was able to make that impassioned and masterly protest in the House of Commons against the shameful treatment to which he had been subjected, which is known as his speech on the Westminster scrutiny, and which ranks among the best speeches ever delivered in parliament. The scrutiny went on for a year, till even Pitt's docile majority resented the further continuance of the uncon- stitutional farce, and voted that it should end. In con- sequence of this Fox took his seat as member for West- minster, brought an action against the high bailiff, who had conducted himself in the affair as a tool of the min- istry, and recovered £2000 damages, which he distributed among the Westminster charities. The remainder of Fox's parliamentary career is more remarkable for eloquent speeches than for stirring personal incident. His criticism of Pitt's measures was always shrewd and vigorous, though not invariably just. He blundered most seriously in denouncing the commercial treaty with France, a scheme of far-seeing policy and admirable patriotism. When this subject was debated

he gave utterance to a phrase which, like the utterances of many other notable men, has been repeated to his discredit by persons who, purposely or inadvertently, dissociate it from the context, and withhold the qualifying clauses. Having said that 'France was the natural political enemy of Great Britain," he was re- proached for calling the French the natural enemies of the Englishe What he meant to convey was, not that enmity necessarily existed between the English and the French, but that the policy of France, as directed by the house of Bourbon, was irreconcilably opposed to the interests of England,—a proposition which was really incontrovertible. His liking for the French people was extreme, and this was openly displayed so soon as they had emancipated themselves from a rule which they detested, and which rendered them the disturbers of the world. Then he avowed his conviction that the new form of government in France "would render her a better neigh- bour, and less disposed to hostility, than when she was subject to the cabal and intrigues of ambitious and inter- ested statemen." Again, it is forgotten or concealed by those persons who have censured Fox on account of his objection to this treaty, "that he earnestly recommended, instead of the present treaty, a more intimate connexion with the United States of America, such an intercourse for Britain that could be devised, and was entirely con- sistent with her true political interests, and such an inter- course he had the best reasons for believing America was both willing and eager to enter into upon fair and equitable terms." Indeed, Washington was anxious to con- clude a commercial treaty with Great Britain, but Pitt dis- countenanced the notion. It was wise in Fox to urge this as most desirable, yet he would have shown still greater wisdom in aiding to the utmost the project for increasing commercial intercourse with France also. On other ques- tious he displayed genuine liberality of sentiment and the highest statesmanship. He declared emphatically against the slave trade at a time when Pitt took credit for deliver- ing no opinion in favour or in disapproval of the traffic in negroes. He repeatedly moved for the repeal of the Test and Corporation Acts, and he advocated a thorough-going scheme of parliamentary reform. He was one of the managers when Warren Hastings was impeached by the popes of England of high crimes and misdemeanours; like ee the subject, spoke on it in a more business- and Sheric, ess Haile and sensational style than Burke ols caged . e his judgment Was accepted as conclu- f is brother managers differed in opinion. His

| the gospel, and a king above the laws."

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health being impaired, he went to the Continent in 1788 for relaxation and change, revisiting Switzerland and Italy. He spent a short time with Gibbon at Lausanne. The luminous historian has chronicled the pleasure which he reaped from this visit of the illustrious statesman; how they conversed without ceasing from morning to night, adding, ""we had little politics; though Fox gave me in a few words such a character of Pitt as one great man should give of another his rival; much of books, from my own, on which he flattered me very pleasantly, to Homer and the Arabian Nights; much about the country, my garden (which he understands far better than I do); and upon the whole I think he envies me, and would do so were he a minister." At Bologna, in November 1788, he re- ceived an urgent summons to return home, owing to the meeting of parliament on the 20th of that month having been rendered necessary on account of the king's sudden and serious illness. While journeying to England he heard a report that George IIT. was dead, being the truth that the monarch had been suddenly bereft of his reason. Travelling with all the speed possible in those days, Pox arrived in Lundon on the ninth day after leaving Bologna. He had gone abroad for his health; the journey back nearly: killed him. Wraxall says that Fox's appearance when he entered the House of Commons on the 4th of December, " excited a great and general sensation. I never saw him, either previously or subsequeutly, exhibit so broken and shattered an aspect. His body seemed to be emaciated, his counte- nance sallow and sickly, his eyes swollen; while his stock- ings hung upon his legs, and he rather dragged himself along, than walked up the floor to take his seat." Both Pitt and he made mistakes during the debates on the regency, both thinking less of what was best to be done in the circumstances than about the most suitable course to pursue for the purpose of securing the supremacy of their respective parties. Pitt dreaded the loss of office should the Prince of Wales become regent, with full power to con- duct the government; Fox was confident that, if the prince exercised the royal prerogatives, a Whig adminis- tration would be constituted. The unexpected recovery of the king put an end alike to hopes of promotion and fears of dismissal; but the record of blunders which can- not be excused, and of aspirations which

were wanting in patriotism, remained to sully the fame of Tory and Whig leaders. The divergence of opinion between the Whig and Tory parties, and among the members of the Whig party, grew wider and more deplorable when the French Revolution agitated Europe and terrified many Englishmen. An outcry was raised against French prin- ciples, and against those persons who held that the surest way to avert danger to England was to remove all reason- able grounds for popular dissatisfaction. The mob of Bir- mingham, frenzied with panic and overflowing in loyalty, pillaged the houses of Dr Priestley and other Nonconfor- mists, in order to testify attachment to " church and king," a cry which Dr Parr characterized as the toast of Jacobites and the yell of incendiaries, meaning, "a church without Handbills cir- culated in the neighbourhood where Fox dwelt contained the threat, "' Destruction to Fox and his Jacobite crew." He expressed in the House of Commons his foreboding that his own dwelling might be dealt with in the same way as Dr Priestley's, yet he persevered in upholding free- dom of speech and of the press when the ministry carried the Traitorous Correspondence Act, the Seditious Prac- tices Act, and the suspension of the Habeas Corpus Act. He too suffered for his attachment to liberal principles. For proposing as a toast at the Whig club, "the sover- eignty of the people of Great Britain," his name was ex- punged by the king from the list of privy councillors, at

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FOX

the special suggestion of Pitt. The duke of Norfolk had previously been subjected to the like indignity for having proposed on Fox's birthday the toast :—" Our sovereign's health; the majesty of the people." Finding it hopeless to struggle agaiust the ministerial majority, which had been swelled by defections from the ranks of his own party and friends, he discontinued attending parliament in 1797, and spent his time at St Anne's Hill in literary study and in writing a history of England from the reign of James IJ. The debts which had long embarrassed him were discharged by private friends in 1793, who settled an annuity of £3000 upon him. From that date he never touched a card. In 1795 he married Mrs Armitstead, a lady with whom he had lived for some time. During this period lie watched

over the training of his nephew, the third Lord Holland, and prepared him for playing a useful part on the political stage. Immediately after the peace of Amiens he visited Paris, chiefly in order to examine the archives in the Frencli foreign office for historical purposes. He visited Lafayette, and was cordially welcomed by thie republican patriot, planting, in remembrance of his visit, tlle ivy which now mantles the turrets of tlle gateway at Lagrange. In common with other distinguished visitors to Paris, he was presented to Bonaparte. The war recom- mencing soon after his return home, he resumed his advocacy of peace; indeed, as the poet has truly said of this stage in his career, "peace, when he spoke, was ever on his tongue." Another feature of it was a complete under- standing with tle marquis of Lansdowne, formerly earl of Shelburne, on questions of foreign policy, the two acting in concert when any such matter was under debate in either House of Parliament.

Pitt died in January 1806. The ministry of " All the Talents" was then formed, with Lord Grenville as first lord of the Treasury and Fox as secretary of state, despite the aversion and resistance of George III. Though loving peace as much as ever, he was yet ready to resist the inor- dinate pretensions of Bonaparte, and he declared war against Prussia when that power, acting as the vassal of the French conqueror and at his suggestion, annexed Hanover. Fox's last appearance in the House of Commons was on the 10th of June 1806. Feeble in health, he appeared there at the risk of his life; but he could not forbear making a special effort in order to move resolutions preparatory to introducing a bill for the suppression of the slave trade. The resolutions were carried by large majorities in both Houses. The bill giving effect to them became law the following year. In this, his farewell speech, he said, "So fully am I impressed with the vast importance and necessity of attaining what will be the vbject of my motion this night, that if, during the almost forty years that I have had the honour of a seat in parliament, I had been so fortunate as to accomplish that, and that only, I should think I had done enough, and could retire from public life with comfort, and the conscious satisfaction that I had done my duty." Onthe 13th of the following September, he died, at the age of fifty-eight, of a schirrous affection of the liver. The room in which he drew his last breath is in the duke of Devonshire's villa at Chiswick, and is the one wherein, at a later day, Canning died also. By Fox's death the country lost a statesman

who, despite his fail- ings, 1s one of the finest and most fascinating figures in modern history,—a man who, in the phrase which Burke uttered six years after the friendship between them had ended, was "a man made to be loved," and of whom even George IIL., his single open and bitter enemy, said to Lord Sidmouth, "little did I think that I should ever live to regret Mr Fox's death," and to his daughter Princess Mary, "TI never thought I should have regretted the death of Mr Fox asmuch as I do." Lamented by an unapprecia-

tive sovereign and by all discerning men, the mortal re- mains of the incomparable Whig statesman were carried in public funeral to Westminster Abbey, and laid alongside those of bis brilliant and triumphant rival William Pitt. It is not easy to determine the exact place which Fox would have held among English statesmen, if he had been allowed a suitable opportunity for the exercise and display of his talents. His name is associated with one great measure of practical legislation, the Act for amending the law of libel. Peace with the United States, the better government of India, the abolition of the slave trade, were some grand results of his untiring efforts and com- manding advocacy. Scarcely any of the measures of reform carried into effect after lis death had not been sanctioned and supported by him. Yet he performed but a small part of what he desired to accomplish. His fate had a close similarity to that of the earl of Shelburne, for whom, till a late period in his career, he felt a repugnance which was none the less unfortunate because it was reci- procated. Lord Shelburne, in common with Fox, was far in advance of his age. He neither dreaded the people nor overestimated their capacity. But he never had. the chance of giving full effect to his convictiovs, and his best

traits remained in obscurity till a descendant, with ample knowledge and admirable taste, has made them clear to the public of our day. Like Shelburne, the Wlig com- moner has been the victim of popular misunderstanding. His addiction to pleasure was considered by many cuntem- poraries to be a fatal blot on his character. They argued in his case as Junius did in that of the duke of Grafton, who was denounced as an incompeteut statesman because he appeared in public with Nancy Parsons,

and was sup- posed to prefer the attractions of Newmarket to the sober business of cabinet councils. That the duke of Grafton was a man of exceptional capacity is now indisputable. Notwithstanding his liking for gaming and horse-racing, Fox was a thorough man of business, and a statesman for whom no work was too severe and no problem too difficult. The obstacles which Fox could not overcome, and which proved equal stumbling-blocks in Shelburne's path, were the dislike and distrust of George III. Yet, intensely as the king detested what he considered the Jesuitism of Shelburne, his feeling of antipathy to Fox was still more extreme and indefensible. This was due to aver- sion to his father, to the independence displayed by Fox when a member of Lord North's administration, and to the supposition that the undutiful behaviour of his worth- less eldest son was the result of Fox's direct influence and prompting. Charles Butler notes in his interesting miscellanies—" Cardinal de Retz said to a person who taunted him with the superiority of Cardinal Mazarin, 'Give me the king but for one day, and you'll see who has the real superiority. Mr Fox never had the king with him, even for one hour." When he was secretary of state in the coalition ministry, the king in his demeanour to him was "civil, but no more." The reason of this is obvious to all those persons who have studied George ITI.'s character. Not deficient in shrewdness, and abound- ing in the cunning which is tle characteristic of men conscious and ashamed of their weakness of intellect, that monarch liked to have advisers who were not too strongly in contrast to himself, or else who would veil their capacity in their intercourse with him, A mere simpleton was as distasteful to him as a towering genius. Pitt, who liked to surround himself with dummies, had chosen Lord Hawkesbury to conduct foreign affairs. His incompetency being too conspicuous, the king told George Rose with gusto that, though the foreign ministers differed on many points, they were unanimous in their contempt and dislike | for Lord Hawkesbury, and that "his lordship always ap-

proached him with a vacant grin, and had hardly ever any thing business-like to say to him." In the presence of men of strong individuality and of great intellect, such as Chatham, Shelburne, and Fox, the king felt ill at ease, being con- scious that his nominal servants were his real superiors.

William Pitt pleased him, because Pitt, though a man of supreme talent and haughty to his equals and_inferiors, was supple in the presence of his sovereign, and ready to defer to the sovereign's desires, to flatter his prejudices. Instead of impressing him with the opinion of the public on a given question, he professed anxiety to learn what his own view was in order to give effect to it. Once only did Pitt insist upon having his own way; failing, he resigned. But he returned to power on the clear understanding that he would not press the measure of justice to the Roman Catholics which he previously held to be necessary, and to which the king was sternly opposed. If George III. had deemed it possible that Fox would have been as submissive and considerate as Pitt, he would never have told George Rose that "he had taken a positive determina- tion not to admit Mr Fox into his councils, even at the hazard of a civil war," nor would he have written to Addington that "Mr Fox is excluded by the express com- mand of the king to Mr Pitt." The wonder is that, despite the hindrances which were thrown in Fox's path, and the slight occasion which he had of proving in office how well fitted he was to discharge the most onerous tasks, he should yet have proved that no statesman of his age was better qualified for conducting the government of England. What Gibbon said of him during the war with the Ameri- can colonies is applicable to his entire political career; he exhibited in the conduct of a party capacity for governing

an empire. It is unquestionable that, as a parliamentary orator, Fox has no superiors. Yet, notwithstanding many volumes contain his speeches, there is an insuperable difficulty in setting forth the secret of his oratorical greatness. One speech only is there printed as it was delivered, the single speech which he wrote out beforehand, being a eulogium on the deceased duke of Bedford. Another, that on the Westminster scrutiny, is said to have been reported with the accuracy which is now the rule. The records of Warren Hastings's trial comprise verbatim reports of the speeclies which he delivered before the House of Lords, But no such evidence suffices to explain the extraordinary effects which his spoken words produced ; hence, it is necessary to rely upon the testimony of contemporaries, and to accept their decision as conclusive. Pitt styled him a magician who laid a spell upon his hearers so long as words issued from his lips. A noble lord, thinking to curry favour with the premier, abused one of Fox's speeches, and received the generous reply from Pitt: "Don't disparage it ; nobody

could have made it but himself." Rogers has recorded that never did he "hear anything equal to Fox's speeches in reply ; they were wonderful. Burke did not do himself justice as a speaker; his manner was hurried, and he always seemed to be in a passion. _Pitt's voice sounded as if he had worsted in his mouth." Charles Butler said that Fox had a captivating earnestness of tone and manner ; "the moment of his grandeur was when, after he had stated the argument of his adversary, with much greater strength than his adversary had done, and with much greater than his hearers thought possible, he seized it with the strength of a giant, and tore and trampled it to destruction." Sir James Mackintosh records that Fox 'certainly possessed, above all moderns, that unison of reason, simplicity, and vehemence which formed the prince ae Burke pronounced him "the most brilliant ies eel ished debater that the world ever saw." A y be accomplished in statecraft and unrivalled in

oratory, and yet may want the charm which renders him as worthy of love as of admiration. Few men whose statesmanship is indisputable, and whose pre-eminence ag orators is acknowledged, have surpassed Fox in the graces which soften life and attract affection. His friends regarded him with idolatry. At the time of the French Revolution, when his party had become a fragment, Lord Thurlow said, "there are but forty of them, but there is not one of them who is not ready to be hanged for Fox." Lord Sidmouth, an uncompromising Tory, could not resist the fascination of his nature, and wrote, after knowing him personally, "I never knew a man of more apparent sincerity, more free from rancour, or even severity, and hardly any one so entirely devoid of affectation." Gibbon, another political opponent, admired in him "the powers of a superior man, as they are blended in his attractive character, with the softness and simplicity of a child. Perhaps no human being was ever more perfectly exempt from the taint of malevolence, vanity, or falsehood." It is unnecessary to supplement these testimonies with the eulogies of enthusi- astic friends. Nor can there be any excess of partiality for him in the decision that Charles James Fox stands con- spicuous among the English statemen whose virtues ought to be kept in loving and perpetual remembrance. (w. F. RB.)

FOX, Grorcx (1624-1690), the founder of the "Society of Friends" or "Quakers," was born at Drayton, Leices- tershire, in July 1624. His father, Christopher Fox, called by the neighbours " Righteous Christer," was a weaver by occupation ; and his mother, Mary. Lago, "an upright woman and accomplished above most of her degree," came of a family that had suffered much in former days of religious persecution. Both were members of the Church of England, and took great pains in the training of their children. George from his childhood "appeared of another frame than the rest of his brethren, being more religious, inward, still, solid, and observing beyond his years ;" and he him- self declares, " When I came to eleven years of age I knew pureness and righteousness ; for while a child I was taught how to walk to be kept pure." Some of his relations wished that he should be educated for the church ; but his father, after le had barely learned to read and write, lost no time in apprenticing him to a certain shoemaker, who also dealt in wool and cattle. In this service he remained till his nineteenth year, and acquired some proficiency in all the branches of his master's somewhat miscellaneous business ; according to Penn, "He took most delight in sheep," but he himself simply says, "A good deal went through my hands. . . . People had generally a love to me for my innocency and honesty." In 1643, being upon busi- ness at a fair, and having accompanied some friends to the village public-house, he was deeply scandalized by a pro- posal to "drink healths," and abruptly withdrew in great grief of spirit. 'When I had done what business I had to do I returned home, but did not go to bed that night, nor could I sleep, but sometimes walked up and down, and sometimes prayed and cried to the Lord, who said unto me, 'Thou seest how young people go together into vanity and old people into the earth; thou must forsake all, both young and old, and keep out of all, and be a stranger unto all.' Then, at the command of God, on the ninth day of the seventh month, 1643, I left my relations and broke off all familiarity or fellowship with old or young." Thus briefly he describes what appears to have been the greatest moral crisis in his life. Of the four years which followed —the "times of the first workings of the Lord in him"— he has left but a confused account. They were on the whole years of great perplexity and distress, though sometimes "I had intermissions, and was sometimes brought into such a heavenly joy that I thought I had been in Abraham's bosom." He did not continue for many months

to adhere to the letter of the command he believed himself to have received; he soon began to have some misgivings as to the propriety of his action in having forsaken his relations ; and, apparently without waiting for any new revelation, he ultimately conceded so much to the claims of natural affection as occasionally to visit those whom he had formerly thought it his duty to leave. Still, throughout this period his wanderings were very numerous, and covered a very wide area. He would go from town to town, "travelling up and down as a stranger in the earth, which way the Lord inclined my heart ; taking a chamber to myself in the town where I came, and tarrying sometimes a month, more or less, in a place ;" and the reason he gives for this migra- tory habit is that he was "afraid both of professor and pro- fane, lest, being a tender young man, he should be hurt by conversing much with either." The same fear often led him to shun all society for days at a time; but frequently he would apply to " professors" for spiritual direction and consolation. 'These applications, however, never proved suc- cessful; he invariably found that his advisers '" possessed not what they professed." Some recommended marriage, others enlistment as a soldier in the civil wars; one "ancient priest" bade him take tobacco and sing psalms ; another of the same fraternity, "in high account," advised physic and blood-letting. About the beginning' of 1646 his thoughts began to take more definite shape; or, as he himself expresses it, he began to receive more revelations. For example, as he was one day approaching the gate of Coventry, "the Lord opened to him" that none were trie believers but such as were born of God and had passed from deatli unto life; and this was soon followed by other "openings" to the effect that " being bred at Oxford or Cambridge was not enough to fit and qualify men to be ministers of Christ," and that "God who made the world did not dwell in temples made with hands." 'TI had also great openings concerning the tliings written in the Revela- tions." He also experienced deeper manifestations of Clirist within his own soul, 'When I myself was in the deep, shut up under all [the burden of corruptions], I could not believe that I should ever overcome; my troubles, nly sorrows, and my temptations were so great that I thought many times I should have despaired, I was so tempted. But when Christ opened to me how He was tempted by the same devil, and overcame hiin and bruised his head, and that through Him, and His power, light,

grace, and spirit, I should overcome also, I had confidence in Him; so He it was that opened to me, when I was shut up and had no hope nor faith. Christ, who had enlightened me, gave me His light to believe in; He gave me hope which He Himself revealed in me; and He gave me His spirit and grace, which I found sufficient in the deeps and in weakness." With the knowledge he had thus received, Fox, towards the end of the year 1647, felt himself constrained to begin the work of his life as an itinerant preacher, the positive element in his teaching being to the effect that men ought to give sincere and earnest heed to the inner light—the light of Christ— Which God had placed in every human heart. The scenes of his early labours and early successes were in the neighbourhood of Dukinfield and Manchester, where he had "great openings and propliecies," and succeeded in establishing his influence over a considerable number of followers. From this date his creed grew rapidly in point of explicitness, especially on its negative and practical sides. For example, in 1648 it was revealed to him by the inner light that he was not to take off his hat to any person, high or low; that he was to use in addressing any single individual of whatever rank no other pronouns than the simple "thou" and "thee"; that he was not to bid people good morning or good evening; and that he was not to "bow

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or scrape with his leg to any one." Increasingly persuaded of the truth and importance of his message, he daily became bolder in the delivery of it. In the year 1649, as he was walking towards Nottingham on a first-day morning accom- panied by some friends, he heard the bell of the "steeple house" of the city, and was admonished by an inward voice to go forward and cry against the great temple and the wor- shippers in it. Entering the church he found the preacher engaged in expounding the words, " We have also a more sure word of prophecy," from which the ordinary Protestant doctrine of the supreme authority of Scripture was being en- forced in a manner which appeared to Fox so defective or erroneous as to call for his immediate and most energetic protest. Lifting up his voice against the preacher's doctrine, he declared that it is not by the Scripture alone, but by the divine light by which the Scriptures were given, that doctrines ought to be judged. The result of the disturbance which not unnaturally ensued was that he was seized by the constables and carried off to prison, where he was

detained for some time, and from which he was released only by the favour of the sheriff, whose sympathies he had succeeded in enlisting. A similar adventure at Derby ended less favourably. For raising a discussion which seemed not unlikely to end in a breach of the peace in the church there, he was brought before the magistrates, and after examina- tion, committed along with one of his comrades to the house of correction as a blasphemer ;! and not till the beginning of 1651, after he had been a prisoner for almost a year, did he succeed in regaining his freedom. It would be here out of place to follow with any minuteness the details of his subsequent imprisonments, such as that at Carlisle in 1653, at London in 1654, at Launceston 1656, at Lancaster in 1660 and again in 1663, at Scarborough in 1666, and at Worcester in 1674, They are related with a certain monotony, which is yet far from being tedious or un- interesting, in the Journal, fortunately an easily accessible book. Suffice it to say that during these terms of imprisonment his pen was not idle, as is amply shown by the very numerous letters, pastorals, and exhortations which have been preserved by his followers ; while during his intervals of liberty he was unwearied in the work of preaching and making disciples. While his labours were for the most part confined to the midland and northern counties of England, he found time in 1657 for a tour through Scotland, which, in his opinion, was not altogether without result. In 1669 hse married the widow of a Welsh judge, Margaret Fell, who, with her family, had been among his earliest converts ; but almost immediately afterwards his proselytizing ardour impelled him to proceed alone to Barbados, Jamaica, and the American continent. In all places visited by him there he met with a good reception, and was successful in making many converts. Shortly after his return in 1673 he was, as has been already noted, apprehended in Worcestershire for attending meetings that were forbidden by the law. He was ultimately set at liberty on account of errors in the indictment which had been drawn up against him, but this was not until after he had suffered a captivity of nearly fourteen months. In 1677 he visited Holland along with his followers Barclay and Penn; and this visit he re- newed in 1684, extending his tour through a considerable part of North Germany. The later years of his life were spent mostly in London, where he continued to give public addresses, comparatively unmolested, until within a few days of his death, which took place November 13, 1690.

1 It was about this time that the epithet "Quaker" was first bestowed upon Fox and his friends (by Justice Bennett of Derby, it is said) because "they bade the people tremble at the word of the Lord." It soon passed into common use, and is to be found even in the Records of the House of Commons as early as 1654.

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In personal appearance Fox was tall and strongly built, 'graceful in countenance, manly in personage, grave 1n gesture ;" in manner he was courteous and unaffected, "civil, beyond all forms of breeding," and "tender, com- passionate, and pitiful ;" essentially, he was "a heavenly-minded man, zealous for the name of the Lord, and preferred the honour of God before all things ;" "a man that God endued with a clear and wonderful depth, a discerner of others' spirits, and very much a master of his own." These and similar characterizations by his friendly contemporaries, who, for the rest, do not pretend that he was in any way remarkable either for grasp of intellect or for profundity in learning, surely deserve some weight as against the somewhat prevalent opinion that Fox was nothing more than a vulgar charlatan whom we have "no reason for placing morally or intellectually above Ludowick Muggleton or Joanna Southcote" (Macaulay). The mere fact that he was able to attract to himself so considerable a body of respectable followers, including such men as Ellwood, Barclay, and Penn, is sufficient to prove that he possessed in a very eminent degree the power of conviction, persuasion, and moral ascendency; while of his personal uprightness, single-mindedness, and sincerity there ought to be no question.

The writings of Fox have been colleeted in three volumes folio, — the first containing his journal, the second his correspondence, and the third all that he has written in vindication of his doctrines. The Journal is especially interesting; of it Sir James Mackintosh has said that "itis one of the most extraordinary and instructive narratives in the world, which no reader of competent judgment ean peruse without revering the virtue of the writer." Of other works attributed to him, perhaps the most curious is that originally published in London in 1660, entitled A battle door for teachers and professors to learn singular and plural; you to many and thow to one;

singular, one, thou; plural, many, you. Aceording to the Journal, however, this performanee is not to be attributed solely to Fox. 'J. Stubbs and Benjamin Furly took great pains in com- piling it, which I set them upon, and some things I added to Ga Indeed, it has sometimes been seriously doubted whether he was the real author of any of the Pace whieh have been attributed to him; but this doubt, which proceeds merely upon the fact of his very imperfect literary education, seems to be conclusively scttled by the elause in his will (which doeument may be seen in the Harlevan Miscellany, vii. 599) referring to his "Bookes, Episeles, and Papers." The Journal was originally published in London in 1694, and has frequently been reprinted. A very useful edition is the seventh, with notes biographical and historical by Wilson Armistead, Lon- don, 1852. Several Memoirs of Fox have reeently appeared,—one by J. Marsh in 1846; another by Janney, with dissertations on his views concerning the doetrine, testimonies, and discipline of the Christian ehurch (Philadelphia, 1852); a third by the Rev. John Selby Watson (London, 1860). history.of the Soeiety of Friends, see the article QUAKERS. (J.S. BL.)

FOX, RicHarp, an English prelate, statesman, and

For details of the principles and |

diplomatist, bishop successively of Exeter, Bath and |

Wells, Durham, and Winchester, and founder of Corpus Christi College, Oxford, was born about the close of the reign of Henry VI. He was a native of Ropesley, near Grantham, in Lincolnshire, and his parents are said to have been in humble circumstances. His education, however, was not neglected, for he was sent to school either at Boston or at Winchester, and thence transferred to Magdalen College, Oxford. His studies, in which he gained much distinction, were interrupted by an outbreak of the plague, and he went to continue them at Pembroke Hall, Cam- bridge. He next went to Paris, and there pursued the study of theology and the canon law, At Paris he became acquainted with Morton, bishop of Ely, then an exile, and by him he was introduced to Henry, earl of Richmond, who was preparing his invasion of England. Heat once gained Henry's confidence, and managed for him the delicate busi- ness of getting assistance in men and money from the king of France. After the victory of Bosworth and accession of the earl

as Henry VIL, Fox, now a doctor of divinity, was made a privy councillor, and became one of the most trusted

advisers of the king. Honours fell thick upon him. In rapid succession he was made a prebendary of Sarum, bishop of Exeter, keeper of the privy seal, principal secre- tary of state, and master of St Cross, Winchester (1487), From this time he was almost constantly employed by the king in political affairs both at home and abroad. He was several times sent ambassador to Scotland, and several times to France. In 1491 he was translated to the see of Bath and Wells, and three years later to that of Durham, In 1497 he personally defended his castle of Norham when besieged by the Scots, until it was relieved by the earl of Surrey. The same year he negotiated a truce for seven years between England and Scctland. He also tcok part in the treaty for the marriage between James IV. of Scot- land and Margaret, daughter of Henry VII. In 1500 he was chosen chancellor of the university of Cambridge, and held the office fortwo years. The same year he was trans- lated to the see of Winchester, which he held till his death, a period of twenty-eight years. He was master of Pem- broke Hall, Cambridge, from 1507 to 1519. During the reign of Henry VIL. his influence was supreme in the state, no important affair being undertaken without consulting him. Theking named Fox one of his executors, and espe- cially recommended him to his son and successor Henry VIII. But his credit soon declined under the new king, partly owing to the character of Henry, and partly to the rivalry of the earl of Surrey. Amongst the chaplains of Bishop Fox at this time was Thomas Wolsey ; and in order to counteract the influence of Surrey, Fox introduced Wolsey to the king. In a little while the new comer took precedence of both the rivals. Fox, however, did not sud- denly lose the royal favour. In March 1510 he was sent ambassador to France with Surrey and the bishop of Dur- ham, and signed the treaty of alliance with Louis XIL In 1513 he attended Henry VIII. in his expedition to France, and was present at the taking of Terouenne. The same year he took part in negotiating a treaty with the emperor Maximilian. Fox was one of the executors of Margaret, countess of Richmond, and in this capacity had a share in completing the settlement of St John's College, Cambridge. Continually mortified by the supremacy of his former pro-

_tegé, Wolsey, and by the insults he had to endure from him,

he at length (1515) withdrew from the court and retired to his diocese. The rest of his life was devoted to the dis- charge of his ecclesiastical duties and to works of charity and munifieence. During this period he rendered great service to the cause of liberal education by his foundation of Corpus Christi College, Oxford. His first intention was to make it a monkish seminary, and for this he obtained a licence. But on the advice of Oldham, bishop of Exeter, he changed his plan, and made it simply a school for the increase of learning. Bishop Oldham contributed largely to the cost of the buildings, Fox was founder also of free schools at Taunton and at Grantham. He became blind some years before his death, and was pressed by Wolsey to resign his see to him, but this he stoutly refused to do. He died, in a good old age, September 14, 1528.

FOXE, Jonw (1517-1587), was born at Boston in Lincolnshire in 1517. At the age of sixteen he entered Brasenose College, Oxford, where at twenty-one he took the degree of B.A., and five years later that of M.A. He attained a fair reputation for scholarship, was elected to a fellowship at Magdalen, and wrote several Latin plays on Scriptural subjects, of which the best, the De Christo Trt- umphante, was repeatedly published (London, 1551, Basel, 1556, &c.), and was thought worthy of translation ito English by Richard Day, the son of the printer. Having become deeply interested in the more advanced religious inquiry of his time, he devoted himself to the study of Hebrew, of the ancient fathers, and of the doctrines of the

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Reformers; and at length his views coming to thie ears of the authorities were considered so unorthodox that in 1545 he was deprived of his fellowship and expelled from the uni- versity. Here his punishment would probably have ended had not his stepfather taken advantage of his misfortune to deprive him of his patrimony. He was glad to accept a situation as tutor to the children of Sir Thomas Lucy of Charlecote, near Stratford-on-Avon, who is famous as the prototype of Shakespeare's "Justice Shallow." But he did not long retain this situation, and he was in

London in very destitute circumstances when the duchess of Richmond appointed him tutor to the children of her nephew, the unfortunate earl of Surrey. During the reign of Edward, Foxe's circumstances were more comfortable. He married, and settled at Reigate, where, having been ordained deacon by Ridley in 1550, he preached and acted as tutor to the orphan children of Surrey throughout the rest of the reign. On the accession of Mary, he was for some time protected by his pupil, the duke of Norfolk, but was at length obliged to seek safety by fleeing with his family to Basel, where lie maintained himself by writing and correcting the press for the priuter Oporinus. At the sug- gestion of Lady Jane Grey, he had already commenced a Latin history of the Christian persecutions. He now re- ceived assistance from two distinguished exiles, belonging to opposed sections of the Protestant party—from Grindal, who afterwards as Puritan archbishop of Canterbury distin- guished himself by the noble firmness with which he main- tained his convictions, even at great personal cost, and in opposition to the commands of Queen Elizabeth ; and from John Aylmer, the tutor of Lady Jane Grey, who afterwards, as bishop of London, was oue of the bitterest enemies of the Puritans. The first outline of the work appeared in 1554, and the first complete edition was published by Oporinus in 1959. About a year after the accession of Elizabeth, Foxe returned to England. The duke of Norfolk again ex- tended to him his patronage. For some time he resided at the duke's manor of Christchurch in London, and on the duke's death he received a small pension. He became as- sociated with John Day, the printer, himself once a Pro- testant exile, with whom he had many sympathies in com- mon. We find him staying in Grub Street laboriously engaged in varied literary work, and occasionally preaching at St Paul's Cross and in other parts of London. Church preferment was offered him by the Government, to which his works had rendered invaluable service. Cecil appointed him to the prebend of Shipton in Salisbury Cathedral, and he held for a short time the living of Cripplegate ; but true to his Puritan views, which prevented him from subscrib- ing to the Articles, he accepted nothing further, though more was offered him. In 1563 the first English edition of the "Book of Martyrs," in which several gross errors which had been exposed were corrected, appeared from the press of John Day.! Its popularity among a people which had just passed through the horrors of the Marian persecu- tions was naturally immediate and signal. The Government commanded it to be placed in each parish church ; and more

than any other influence it fanned the flame of that fierce hatred of Spain and the Inquisition which was the master passion of the reign. Nor was its influence transient. For generations the popular conception of popery has been derived from its melancholy and bitter pages. It was

1 The following is the full title:—Acts and Monuments of these latter and perillous Dayes, touching matters of the Church, wherein are comprehended and described the great Persecutions and horrible Troubles that have been wrought and practised by the Romishe Pre- lates, especiallye in this Realme of England and Scotland, from the Yeare of our Lorde a thousande to the time now present. Gathered and collected according to the true Copies and Wrytinges certificatorie as well of the Parties themselves that Suffered, as also out of the Bishop? Registers, which were the Doers thercof, by John Foxe.

vigorously attacked by Catholic writers, and its accuracy in details has been successfully challenged, even such blunders as indicate gross over-credulity having been exposed ; but the honourable lives of Foxe and his assistants place the work above the charge of wilful falsehood. If in all those who had been engaged in the persecution he could only re- cognize the spirit of cruelty and Antichrist—if in the noble Sir Thomas More he could only see 'a persecuting spirit,"— this was but natural in a man who had witnessed the un- timely destruction of some of the noblest spirits of the age, of some whom he had personally known and loved, and whose own career has been undeservedly blighted by the ruthless hand of persecution; and it must be remembered to his honour that in his firm grasp of the principle of re- ligious toleration he rose far above his age and his fellow Protestants. He hated impartially al/ religious persecution, and he wrote to Queen Elizabeth pleading even for the despised Dutch Anabaptists. It is interesting to note that Foxe was one of the earliest students of Anglo-Saxon, aud that John Day was the only printer of the day who could print the Anglo-Saxon characters. In 1571 they published, under the patronage of Archbishop Parker, an edition of the Saxon Gospels, dedicated to the queen. Foxe died on the 18th April 1587, at the age of seventy, and was buried in

the Church of St Giles, Cripplegate. His life was written by his son, Samuel Foxe.

FOXGLOVE. See Dicrrauis.

FOY, Maximinien Stpastien (1775-1825), French general and political orator, was born at Ham in Picardy, February 3, 1775. He was the son of an old soldier who had fought at Fontenoy, and had become post-master of the tuwn in which he lived. His father died in 1780, aud his early instruction was given by his mother, a woman of English origin and of superior ability. He continued his education at the college of Soissons, and thence passed at the age of fourteen to the artillery school of La Feére. After eighteen months' successful study he eutered tlie army, served his first campaign in Flanders (1791), and was present at the battle of Jemmapes. He soon attained the rank of captain, and served successively under Dam- pierre, Jourdan, Pichegru, and Houssard. In 1794, in con- sequence of having spoken freely against the violence of the extreme party at Paris, he was imprisoned by order of the commissioner of the Convention, Joseph Lebon, at Cam- bray, but regained his liberty soon after the fall of Robes- pierre. He served under Moreau in the campaigns of 1796 and 1797, distinguishing himself in many engage- ments. The leisure which the treaty of Campo Formio gave him he devoted to the study of public law and modern history, attending the lectures of Professor Koch at Stras- burg. Recommended by Desaix to the notice of General Bonaparte, he joined the army assembled for the invasion of England, and afterwards fought, with much regret, against the Swiss. He gained the confidence of Masséna, and was promoted chef de brigade. After the peace of Amiens he returned to France with the rank of colonel. He was at Paris at the time of Moreau's trial, and having earnestly censured the proceedings escaped arrest only by joining the army in Holland. Foy voted against the esta- blishment of the empire, but the only penalty for his inde- pendence was a long delay before attaining the rank of general. In 1806 he married a daughter of General Bara- guay d'Hilliers. In the following year he was sent to Constantinople, and there took part in the defence of the Dardanelles against the English fleet. He was next sent to Portugal, and served in the Peninsular War from the battle of Vimeira to the battle of Orthez, at which he was severely

wounded. At the first restoration of the Bourbons he was made one of the inspectors-general of infantry, and

| was stationed at Nantes. He joined Napoleon I. on his

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escape from Elba, and fought with distinction at Quatre- Bras and at Waterloo, where he was again badly wounded. After the second restoration he returned to civil life, and in 1819 was elected to the chamber of deputies. For this position his experience and his studies had especially fitted him, and by his first speech he gained a commanding place in the chamber, which he never lost, his clear, manly elo- quence being always employed on the side of freedom and justice. In 1823 he made a powerful protest agalust French intervention in Spain, and after the dissolution of 1824 he was re-elected for three constituencies. He died at Paris, November 28, 1825, and his funeral was celebrated amidst the mourning of the city and the nation. His family were provided for by a national subscription.

A collection of his speeches was published in 1826, and his un- finished Histoire de la Guerre de la Péninsule sous Napoléon in 1827. Several biographies of Foy have been published.

FRAAS, Kart Nixozas (1810-1875), a German _bot- anist and agriculturist, was born at Stettelsdorf, near Bam- berg, 8th September 1810. After receiving his preliminary education at the gymnasium of Bamberg, he in 1830 en- tered the university of Munich, where he took his doctor's degree in 1834. Having devoted great attention to the study of botany, he went to Athens in 1835 as inspector of the court garden; and in April 1836 he became professor of botany at the university. In 1842 he returned to Germany and became teacher at the central agricultural school at Schleissheim. In 1847 he was appointed profes- sor of agriculture at Munich, and in 1851 director of the central veterinary college. For many years he was secre- tary of the Agricultural Society of Bavaria, but resigned in 1861. He died at his estate of Neufreimann near Munich, 9th November 1875. Besides his important contributions to the sciences of botany and agriculture, Fraas devoted much of his effort to improve the condition of the peasants.

His principal works are—Zrorxeta Tis Boravjs, Athens, 1835, Synopsis flor: elassiec, Munich, 1845; Klima und Pfhanzenwelt in der Zeit, Landsh., 1847; Histor-eneyklopid. Grundriss der Land- wirthsehaftslehre, Stuttgart, 1848; Gesehiehte der Landwirthsehaft, Pragne, 1851; Die Sehule des Landbaues, Munich, 1852; Baterns Rinderrassen, Munich, 1853; Die Kiinstliehe Fiseherzeugung, Munich, 1854; Die Natur der Landwirthsehaft, Munich, 1857; Bueh der Natur fiir Landwirthe, Munich, 1860; Die Ackerbaukrisen und thre Heilmittel, Munich, 1866; Das Wurzellebender Culturpflanzen, Berlin, 1872; and Gesehichte der Landbau und Forstwissensehaft sevt dem 16ten Jahrh., Munich, 1865. He also founded and editeda weekly agricultural paper, the Sehranne.

FRA BARTOLOMMEO. See Baccto DE LA Porta.

FRACASTORIO, Hizronymo (1483-1553), a learned physician and poet, was born at Verona in 1483. It is re- lated of him that at bis birth his lips adhered so closely that a surgeon was obliged to divide them with his incision knife, and that during his infancy his mother was killed by lightning, while he, though in her arms at the moment, escaped unhurt. Fracastorio became eminently skilled, not only in medicine and belles-lettres, but in most arts and sciences. It was by his advice that Pope Paul III., on account of the prevalence of a contagious distemper, re- moved the council of Trent to Bologna. He was the author of many works, both poetical and medical, and was inti- mately acquainted with Cardinal Bembo, Julius Scaliger, and most of the great men of his time. He died of apoplexy at Casi, near Verona, on the 8th of August 1553; and in 1559 the town of Verona erected a statue in his honour.

The principal work of Fracastorio is a kind of medical poem entitled Syphilidis, sive Morbi Gallicit, libri tres, Verona, 1530, which has been often reprinted, and also translated into French and Italian. Among his other works (all published at Venice) are De Vini Temperatura, 1534; Homoeentricorum, 1535; De Sym- patha et Antipathia Rerum, 1546; and De Contagionibus, 1546.

Seed works were published at Venice in 1555, and his poetical productions were collected and printed at Padua in 1728.

FRA—

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FRA DIAVOLO is the popular name given by his countrymen to the most notorious and dreaded of modern Italian brigands ; and the name, associated during his life- time with the political revolutions of southern Italy, has acquired a world-wide celebrity since it became the title of a favourite French opera. His real name was Michele Pezza. It would be as hopeless to fix the precise dates in his career as to determine those in the lives of Rob Roy or Jonathan Wild. He is stated, however, to have been born at Itri. His crimes became invested with a more general aud political interest in 1799. At that time, from the fre- quency and audacity of his robberies and murders along the froutier of the Terra di Lavoro, he became known as Fra Diavolo, the popular superstition investing him with the blended attributes of a monk and a demon. When the kingdom of Naples was overrun by the troops of the French Republic, Fra Diavolo, acting in concert with the head of the Bourbon partisans, Cardinal Ruffo, waged a fierce and untiring war against the French soldiers, whenever his sup- erior knowledge of the localities afforded the prospect of his being able to do so with effect. He continued for a con- siderable period in absolute possession of the line of com- munication from the Garigliano to Portello, falling upon and massacring the French Government couriers, and all whom he suspected of conveying information to the military or civil functionaries of the Republic. At one moment he succeeded in completely interrupting all communication between Naples and Rome. Like his fellow agents under Cardinal Ruffo—like Mammone, Pronio, Sciarpa Guar- riglia—he styled himself "the faithful servant and subject of his Sicilian Majesty." As the turning point in Fra Diavolo's career must be regarded the arrival in Naples of Joseph Bonaparte, and the establishment of the extraor- dinary tribunals charged with the repression of this half civil half political brigandage. Fra Diavolo was sentenced to death, and a price was set on his head. After spreading terror through Calabria by his deeds of cruelty he had passed over into Sicily, but soon returned to the mainland at the head of 300 liberated convicts placed at his disposal by the Bourbon Government. His landing at Spelonza with these ruffians was marked by unusual excesses, but the French troops were everywhere on the alert to

capture him, and he was compelled to seek refuge amongst the woods and mountains of Lenola. During a period of two months he succeeded in evading his pursuers, alwaysin the hope of making his way back to Sicily. At length, ex- hausted by hunger and requiring medical aid, he repaired in disguise to the village of Baronissi, but was there recog- nized and put to death. It is stated that on his person were found papers from Queen Caroline of Naples and Admiral Sidney Smith, those from the former recognizing his rank as colonel in the Bourbon army, and that in his last moments he cursed both his employers and his own folly which had led him to engage in such a reckless enter- prise. The most authentic source for the career of Fra Diavolo is Colletta's [/istory of Naples, which the English reader may consult in the version, equally faithful and spirited, of Miss Horner.

FRAHN, Curistran Martin, a numismatist and his- torian, was born at Rostock, 4th June 1782, aud died at St Petersburg, 28th August 1851. He commenced his

Oriental studies under Tychsen at the university of Ros-

tock, and afterwards prosecuted them at Gottingen and Tiibingen. He became a Latin master in Pestalozzi's famous institute in 1804, returned home in 1806, and in the following year was chosen to the chair of Oriental lan- guages in the Russian university of Kasan. Though in 1815 he was invited to succeed Tychsen at Rostock, he preferred to go to St Petersburg, where he became director of the Asiatic museum and councillor of state. The inde-

fatigable ardour with which he pursued his studies is shown by the number of his works, which altogether amount to more than 150, great and small.

Among the more important are—Nwmophylactum orientale Poto- tianum, 1813; De nwmorum Bulgharieorum fonte antiquessimo, 1816; Das Muhanmedanische Minzkabinet des Asiatischen Museum der Kaiserl. Akademie der Wissenschaften zu St Petersburg, 1821; Nami eufiet ex variis museis seleett, 1823; Notice Mune centaine Pouvrages arabes, &e., qui

manguent en grande partie aux biblio- theques de ’ Europe, 18384; and Nova Supplementa ad recenstonenr Num. Muham. Acad. Imp. Sei. Petropolitanee, 1855 (posthumous). A description of some medals struck by the Samanid and Bouid princes (Kasan, 1804) deserves special mention, as the author composed it in Arabic because he had no Latin types at command.

FRAMLINGHAM, a market town of England in the county of Suffolk, about 4 miles north-east of Ipswich. It is the terminus of a branch railway, and has a corn ex- change, a people’s hall, and a newspaper office. The church is a fine old building mostly in the Perpendicular style, con- structed of black flint stone, and surmounted by a tower 96 feet high. In the interior there are a number of in- teresting monuments, among which the most noticeable are those of Thomas Howard, third duke of Norfolk, and of Henry Howard, the famous earl of Surrey who was be headed by Henry VIII. The castle forms a picturesque ruin, consisting of the outer walls 44 feet high and 8 feet thick, 13 towers about 58 feet high, a gateway, and some outworks. About half a mile from the town is the Albert Memorial Middle Class College, opened in 1865, and cap- able of accommodating 300 boys.

use of the masters and fellows of Pembroke Hall, Cam- bridge. (See Trans. of Brit. Archeolog. Assoc., 1865.) FRANQAIS, Anrorne, Count, better known as Frangais of Nantes, a French politician and author, was born at Beaurepaire in the department of Isére on January 17, 1756, and died at Paris, 7th March 1836. In 1791 he was elected to the Legislative Assembly by the department of Loire Inférieure, and soon attained a high position among his fellow representatives ; but he was not re-elected to the Convention. During the Reign of Terror he was obliged to seek safety in the mountains. In 1798 he was elected to the council of the Five Hundred, and became one of its secretaries; and in the following year he voted against the Directory. He took office under the consulate as prefect of Charente Inférieure, rose to be a member of the council-of state, and in 1804 obtained the important post of director-general of taxes. The value of his services was recognized by the titles of count of the empire and grand officer of the Legion of Honour. On the second restoration he retired into

private life; but from 1819 to 1822 he was representative of the department of Isére, and after the July revolution he was made a peer of France.

Frang¢ais wrote a number of works, but his name is more likely to be preserved by the eulogies of the literary men to whom he afforded protection and assistance. It is sufficient to mention Le Manuserit de feu M. Jéréme, 1825 ; Reeueil de fadaises composé sur la montagne & Vusage des habitants de la plaine, 1826 ; Voyage dans la vallée des originaux, 1828 ; Tableau de la vie rwrale, ow Vagriculture enseignée d'une maniére dramatique, 1829.

FRANCAVILLA, a town of Italy, in the province of Lecce, about 21 miles W.S.W. of Brindisi, sometimes called Francavilla Fontana, to distinguish it from Franca- villa in Sicily and other towns of the same name. It stands in a very beautiful situation, and is regularly built, with wide streets and handsome if somewhat heavy looking houses. There are a cathedral,a college, and several hospitals and conventual buildings. The town was founded in the 15th century and owes its name to the freedom from taxa- tion which was granted for ten years to all who made it their place of residence. In 1734 it suffered considerably from an earthquake. The population of the town in 1871 was 16,997, and that of the commune 19,052.

FRANCE

PART I.—GEOGRAPHY AND STATISTICS.

I. Situation and Extent.—Face of the Country.—

Climate and Soil. Tes HIS important part of continental Europe extends from 1= the 43d to the 51st degree of north latitude, and

from longitude 7° 35' E. to longitude 4° 43' W. The Tition boundaries of France are—on the N. the English Channel @ (Manche), the Straits of Dover (Pas-de-Calais), Belgium, Fut and Luxembourg; on the E. Germany (Alsace-Lorraine), Switzerland, and Italy ; on the S. the Mediterranean and Spain; on the W. the Atlantic Ocean. From north to south its length is about 576 miles, measured from Dun- | kirk to the Col de Falguéres; its breadth

from east to west is about 494 miles, from Mont Donon to Cape Saint-Mathieu at the extremity of Brittany, which ee into the Atlantic, like a wedge, and without which France would approach in form to a square; and its superficial extent, including Corsica and the small islands on the coasts, is 204,147 English square miles, nearly twice the total area of the British Isles. ¢- Though in point of extent of coast and ready access from the interior to the sea France is far inferior to Great Britain and Ireland, it is, on the other hand, more fortu- nate in these respects than the vast inland territories of

Austria and Russia,—its coast-line extending 395 miles on the Mediterranean, 572 on the North Sea, the Straits of Dover, and the Channel, and 584 on the Atlantic. The country has the advantage likewise of being separated from its neighbours by natural barriers of great strength, the Pyrenees forming a powerful bulwark on the south- west, the Alps on the south-east, and the Jura and the Vosges mountains on the east. The boundary line on the side of Belgium is the only one which nature has left un-

protected. ,

Orography.—The line which separates the basins of the Mountains.

Mediterranean and the Atlantic runs to the north from the Pyrenees through the Cevennes and Vosges, and finally joins the Alps in the south-east. 'The most remarkable summits in the Pyrenees are the Pic du Midi d'Ossau (9734 feet), not far from the favourite town of Pau, the Pic d'Anie (8219 feet), the cirque of Gavarnie, Mont Néthou (J1,168 feet), Mont Perdu (10,995 feet), the Pic Long (10,476 feet), the Vignemale (10,820 feet), the Tour de Marboré (9861 feet), An offshoot of the Pyrenees, the Corbiéres, deserves mention, on account of the huge granitic mass that it contains, called the Canigou. The Cevennes are about 600 kilometres (373 miles) in length, IX. — 64

lying between the Rhone on the east and the Garonne | resumes its north-westerly direction at Montereau, passes and Loire on the west; here,

proceeding from south to | through Paris, and discharges itself into the Channel be. north, we have Mont Naurouze, the Pic of Montaut | tween Le Havre and Honfleur above Rouen and Quillebouf, (3412 feet), the Malpertus (5512 feet), the Hort de Dieu | Its affluents are, on the right, the Aube, the Marne (which (5135 fect), Mont Pila (4474 feet, Vivarais), Gerbier des | joins the Seine at Charenton near Paris, after having Jones (5121 feet), Mézenc (5820 fect), Tarare (4757 feet), received the Ourcq and the Saulx), the Oise (which has its Haute-Joux (3262 feet, Charolais). Smaller chains detach | source in Belgium and is enlarged by the Aisne), and the themselves from the Cevennes, among which may be noticed | Epte; on the left the Yonne, the Loing, the Essonne, the the Montagnes d'Auvergne, the Plomb du Cantal (6095 | Eure, and the Rille. The Orne is a short river, which feet), the Puy-de-Saucy (6220 feet), the Puy-de-Déme | waters Argentan and Caen (Normandy), and flows into (4806 feet), the Mount Dore (6187 feet), the mountains the Channel. The Vilaine, not much more considerable, of Limousin, and those of Velez, Forez, and Madeleine. | passes Rennes, Redon, and La Roche-Bernard (Brittany), The Vosges, which reach no great height, trend northward | near which it falls into the Atlantic. The Loire rises in between the Rhine and the Moselle. Their ramifications are | Mount Gerbier des Joncs, in the range of the Vivarais the hills of Belfort, the Faucilles mountains, the Langres | mountains, flows due north to Nevers, then turns to plateau, the Montagnes de la Céte d'Or, which are con- | the north-west as far as Orléans, where it takes its course tinued by the mountains of Morvan, the Orleans plateau, and | towards the south-west, and lastly from Saumur runs west, the hills of Picardy, Normandy, and Brittany. The Vosges | till it reaches the Atlantic between Paimbceuf and St Na- end in the north with the Argonne and the Ardennes, | zaire. It passes through several large towns, as Nevers, which separate the Seine from the Meuse. The Jura is a | Orléans, Tours, Angers, and Nantes. On the right the Loire chain of the Alps extending between the Rhine and the | receives the waters of the Furens, the Aroux, the Niévre, the Rhone from the north-east to south-west. Its principal | Maine (formed by the Mayenne and the Sarthe with its afflu- summits are the Crét de la Neige (5656 feet), the | ent the Loir), and the Erdre, which joins the Loire at Reculet (5630 feet), Mont Tendre (5518 feet), and the | Nantes; on the left, the Allier (which receives the Dore and Dole (5514 feet). Mont Blanc (15,780 feet), the highest | the Sioule), the Loiret, the Cher, the Indre, the

Vienne with mountain in Europe, is in the Alps of Savoy, which pro- | its affluent the Creuse, the Thouet, and the Sévre-Nantaise, ject the Graian Alps, the mountains of Maurienne (Mount | The Loire, the longest of French rivers, is navigable for Cenis), the Cottian Alps, the Maritime Alps, the Alps of | about 512 miles of its course. It is often in many places Dauphiné, and the Alps of Provence. As may be seen | dried up during the hot season of the year, while, on the from these particulars, the surface of France exhibits, | other hand, it is subject to frequent and disastrous floods at in general, an advantageous succession of high and low | the time when the snows melt in the upper valleys, or asa ground. Less level than Poland, the north of Germany, or | consequence of the long rains of autumn. The Charente the greater part of European Russia, it is, on the whole, | descends from Chérounac (Haute-Vienne), traverses Angou- less mountainous than Spain or Italy, and may with great | léme, and falls into the Atlantic not far from Rochefort, propriety be compared to England, with this distinction | The Garonne rises in the valley of Aran (Spanish Pyrenees), that, whilst in the latter the mountainous tracts are in the | enters France near Bagnéres-de-Luchon, has first a north- north and west, in France they are in the south and east. | west course, then bends to the north-east, and soon resumes Throughout Flanders, Picardy, Normandy, and the countries | its first direction. It flows through Toulouse, Agen, and to the north and south of the Loire, we find plains, diver- | Bordeaux, and joins the Atlantic between Royan and the sified occasionally by hills (either insulated or rising in suc- | Point de Grave, opposite the tower of Oordouan, In the) cession), but having none of those massy elevations entitled | lower part of its course, from the Bec-d'Ambez, where it to the name of mountains. The south and east of France, | receives the Dordogne, it becomes considerably wider, and) on the contrary, are rugged and elevated tracts, and may | takes the nameof Gironde. The principal affluents are the be said to be to that country what Wales and Scotland are | Ariége, the Tarn with the Aveyron and the Agout, the to Great Britain. Lot, and the Dordogne, which descends from the Mont Rivers. Hydrography.—The course of the great rivers is easily | Dore-les-Bains, and joins the Garonne at Bec-d'Ambez, to connected with this view of the surface of the territory of | form the Gironde. All these affluents are on the right; France. With the exception of the Rhone, they all flow | the Gers is the only one of note which joins it on the left. either from south to north or from east to west, and dis- | The Adour

rises near the Pic-du-Midi in the Pyrenees, charge themselves into the North Sea, the Channel, and | and discharges itself into .the Bay of Biscay at Bayonne; the Atlantic. The Rhine, which not long ago formed the |.the mass of its waters is much increased in winter by boundary between France and Germany, has part of its | several mountain streams, of which the Gave de Pau, the basin in France ; the Moselle, one of its affluents, takes Bidouze, and the Nive may be mentioned. The Hérault its source in the Vosges (Ballon d'Alsace), and waters Re- | is the first river of France which runs south and discharges miremont, Epinal, Toul, and Pont-&'-Mousson, before enter- | itself into the Mediterranean. It comes from the Mont ing the German territory ; the Valogne, the Meurthe, and | Laigonat in the Cevennes, and debouches into the Gulf of the Seille are its tributaries. The Meuse rises not far from | Lyons. The Rhone, the source of which is in Mount St Bourbonne-les-Bains, and becomes a Belgian river at Givet. Gotthard, in Switzerland, enters France by the narrow defile During its course, it receives on its right bank the Chiers | of L'Ecluse, and has a somewhat meandering course, first and the Semoy, and on its left the Bar and the Sambre. flowing south, then north-west, and then west as far as The Escaut (or Scheldt) has its source near Le Catelet | Lyons, whence it runs straight south till it reaches the (Aisne), and leaves France after having watered Cambrai, Mediterranean, into which it discharges itself by two prin- Valenciennes, and Condé; the upper courses of its two cipal branches, which form the delta or island of the affluents, the Scarpe and the Lys, also belong to France. Camargue. Lyons, Vienne, Valence, Avignon, Beaucaire, The Somme, which receives the Avre, rises near St Arles, are the chief towns passed by the impetuous waters Quentin, and empties itself into the Channel between St | of the Rhone. The Ain, the Saéne (which passes through Valery and Le Crotoy. The Seine, one of the four large Macon, receives the Doubs, and joins the Rhone at Lyons), (Ginn of France, the others being the Loire, the Garonne | the Ardéche, and the Gard are the affluents on the right ; Cee and the Rhone, descends from the Langres | on the left we may mention the Arve, the Isére, the Drome, plateau, flows north-west down to Mery, turns to the west, | and the Durance. The Var, a large and rapid stream,

CLIMATE AND GEOLOGY. |

descends from Mont Caméléon (Alpes Maritimes), and flows into the Mediterranean near Saint-Laurent-du-Var. Lakes.—France has very few lakes. The Lake of Geneva, which forms 32 miles of the frontier, belongs to Switzerland. The most important French lake is that of Grand-Lieu, between Nantes and Paimbceuf (Loire- Inférieure), which presents a surface of 17,300 acres. We may also mention the lakes of Bourget and Annecy (both in Savoy), St Point (Jura), Paladru (Isere), and Nantua (Ain). The lakes, or étangs, of Villers (Cher), Indre, Stock, Con- drexange (Meurthe), Horre (Aube), Chaussée (Meuse), Ploérmel (Morbihan), La Pelaque (Maine-et-Loire) are artificial creations. The coasts present a number of mari- time inlets, forming inland bays, which communicate with the sea by channels of greater or less width. Some of these are on the south-west coast, in Clascony, as Carcans, Lacanau, Biscarosse, Cazan, Sanguinet ; but more are to be found in the south and south-east, in Languedoc and Pro- vence, as Leucate, Sigean, Thau, Maguelonne, Berre, Cour- thezon, Citis, Pourra, &c. Their want of depth prevents them from serving as roadsteads for shipping, and they are useful chiefly for fishing, or for the manufacture of bay-salt. Forests.—The artificial or ornamental plantations of France are much fewer in number than those of England, its natural forests far more numerous, the total extent of ground covered by wood being computed at 32,250 square miles, about one-sixth of the surface of the country. There are forests in almost every department. Lower Normandy contains several of considerable extent. There isa large one at Fontainebleau, only 45 miles from Paris, anda larger to the north of the Loire, in the vicinity of Orléans. The department of Ardennes and the mountain- ous tract that forms the boundary of France on the side of Switzerland abound in forests. The state possesses 991,766 hectares (3830 square miles); 1,903,258 hectares (7348 square miles) belong to the communes or to public institutions, and are managed by the state; the rest are private property. They represent a total value of about three thousand millions of francs (£120,000,000 sterling), the annual revenue of which exceeds 38,000,000 francs. Climate.—The climate of France is generally temperate, but by no means uniform. The division into the north, west, south, and central regions, although it seems the most natural, does not satisfactorily correspond to the actual differences. A more convenient division is that of the fol- lowing four regions or zones :—the region in which the olive tree is cultivated, which is limited by a line from Bagnéres-

de-Luchon (Haute-Garonne) to Die (Isére) ; the region of the maize, or Indian corn, from the mouth of the Gironde to Raon-L'Etape (Vosges); the region of the vine, from the mouth of the Loire to Méziéres (Ardennes); and the northern region, which is characterized by the culture of the apple-tree. These limits are, however, far from being absolute ; the Indian corn, for example, is successfully cul- tivated in Brittany, and vineyards are to be found much farther north than the mouth of the river Loire. The north and north-west of France bear a great resemblance, both in temperature and produce, to the south of England, rain occurring frequently, and the country being consequently fit for pasture. In the interior the rains are less frequent, but, when they occur, are far more heavy, so that there is much less difference in the annual rainfall there as compared with the rest of the country than in the number of rainy days ; but, on the whole, the climate of the interior is the most pleasant in France, that region being exempt equally from the oppressive heat of the south and the frequent humidity of the north. The great current of wind which prevails in France blows from west to east, from the Atlantic, over the whole surface of the country, except the lower basin of the Rhone, where the mistral (a cold wind coming from the

north-north-west), the east wind blowing from the Alps, and the south winds do considerable damage both to the produce of the soil and to the health of the inhabitants.

Pau, Cannes, Nice, &c., in the south, are much resorted to by invalids, and by English families for winter quarters.

Geology.—In a geological point of view France may be Geology.

divided in three great regions, which comprehend a nearly complete series of the different kinds of soils,

1. Mountains. (a.) Granite and Schist. Alpes.—Part of Istre (S.E.); Dréme; Hautes-Alpes; part of Basses-Alpes (E.); Savoie; Haute-Savoie. Pyrénées —Part of Aude (S.E.); Pyrénées-Orientales; part of Ariége (S.), of Haute-

Garonne (S.), of Hautes-Pyrénées (S.), and of Basses-Pyrénées (S.W.) Vosges.—Part of Vosges (E.) = Maures.—Part of Var (S.E.) (b.) Limestone. Jura.—Doubs; Jura; part of Ain (E.) Provence-—Partof Basses-Alpes (W.) and of Var (N.W.); Vaueluse: Bouehes-du-

Rhéne. 2. Plateaus. (a.) Granite and Schist.

Central Plaieau—Part of Nievre (E.) and of Saéne-et-Loire (W.); Rhone; Loire; Ardéche; part of Gard (W.), of Allier, and of Puy-de-Dome (E. and W.); Haute- Loire; part of Lozére (N.); Crevse; Haute-Vienne; Corréze; Cantal; part of Aveyron (N.) and of Tarn (E.)

Ardennes.—Part of Ardennes (N.)

Bretagne.—Part of Orne (W.); Mayenne; part of Maine-et-Loire (W.) and of Deux- Sevres (N.W.); Manche; Ille-et-Vilaine; Loire-Inférieure; Vendée; Cétes-du- Nord; Morbihan; Finistére.

(6.) Limestone.

Causses.—Part of Lozbre (S.) and of Aveyron (S.)

Languedoc.—Part of Gard (E.); liérault.

Quercy.—Lot.

Haut Poitou.—Part of Vienne (S.), of Charente (N.) and of Deux-Sevres (N.)

Bourgogne.—Haute-Sabne; Haute-Marne; Cote @ Or; part of Yonne (S.E.) and of Niévre (W.)

Lorraine.—Moselle; Meurthe; part of Vosges (W.); Meuse

8. Level Tracis.

Champagne.—Aube; Marne; Ardennes.

Neusirie—Nord; Aisne; Seine-et-Marne; part of Yonne (N. .W.); Pas-de-Calais; Somme; Oise; Seine-et-Oise; Seine; Loiret; Cher; Seine-Inférieure;

Eure; Eure-et-Loire; Loir-et-Cher; Indre; Calvados; part of Orne (E.); Sarthe; Indre-et-Loire; part of Vienne (N.) and of Maine-et-Loire (E.)

Aquitaine.—Part of Tarn (W.) and of Ande (N.W.); Tarn-et-Garonne; part of Haute-Garonne (N.), of Ariége (N.) and of Charente (S.); Dordogne; Lot-ct-Garonne; part of Hautes-Pyrénées (N.); Charente-Inférieure ; Landes: part of Basses-Pyrénées (N.E.)

Limagne.—Part of Allier (W.) and of Puy-de-Déme (central part).

Bresse.—Part of Céte-d'Or (E.), of Saéne-et-Loire (E.), of Ain (W.) and of Istre (N.W.)

The following table shows the same districts classified ac- cording to the nature of their soils. It will be remarked that the Tertiary rock forms nearly the third part of France, whilst the coal- fields are scarccly the two-hundredth part of it.

Primitive rock—Vendée, part of Brittany, part of the Maures, the Vosges, and the Alps—10,416,000 hectares (40,217 square miles).

Transition rock—Pyrenees, central part of Brittany, Cotentin, Ardenne, part of the Vosges—5, 200,000 hectares (20,077 square miles).

Porphyritic and Carboniferous rocks.—North of Ardenne; north-west of the cen- tral plateau; the Maures; small portions of the surface in the Corbiéres, Brittany, and the Vosges—520,000 hectares (2007 square miles).

Triassic and Permian rock.—East of Lorraine, and asmall part of the Vosges— 3,480,000 hectares (12,436 square miles).

Jurassic rock.—The Causses, Quercy, and Haut-Poitou; Lorraine and Burgundy; part of the Alps—10,371,000 hectares (39,943 square miles).

Chalk.—Champagne, west of Neustrie, and some places in Aquitaine and the Pyrenees—6, 245,700 hectares (24,115 square milcs). ~

Tertiary rock.—The greater part of Neustrie, Limagne, Aquitaine, Bresse, part of Languedoc, Provence, and some places in Brittany and Vendée—

14,853,500 hectares (57,350 square miles). ;

Volcanic rock—Several masses in the eentral platcau, and various places in the Causses, Languedoc, Provence, the Maures, and Lorraine—520,000 hectares (2007 square miles). . ;

Alluvial soils.—These are to be found in all valleys, but chiefly near Dunkirk and Niort, and on the Mediterranean eoasts—520,000 hectares (2007 square miles).

The Statistique générale of France divides the soil thus :—

Hectares. Square Miles Mountainous tracts …..- ssccseessereserccceeeseesercers 4,268,750 16,481 Heaths and moors (landes) 5,670,089 21,892 Soil of rich Moulds…....ceeeerserserseessc eee 7,276,369 28,094 Chalk or limestone 9,788,197 37,793 Gravel ..-ccceese 3,417,893 13,196 Stony soil… 6,612,348 25,530 Sandy soil…..... 5,921,377 22,863 Clay….sseesereeecnererers 2,232,885 "yes Marshy and Swampy SOIL.....ssccessseeersereecereree 284,454 1,098 Miscellancous areenhen seccescecescccectencsessenccouen sees > 7,290,238 28,148

Or, considering the use rather than the nature of the soil, the surface of France may be divided thus :—

Hectares. Square Miles, Arable land…...cscessoeeseees sovutelWiactensceseeeesessoe 25,500,675 98,460 Forests, woods, and parks….. — 8,800,399 33,978 Heaths and moors (landes).....- .. 7,138,282 27,551 Meadowland…....- Re Pere souteresee .- 5,159,179 19,920 Vineyards…...cscoceseee icReatoraeeesaesee seseeesseeseess .. 2,088,048 8,062 Roads, streets, public walks, and puilt lands….. 1,361,757 5,157 Wattel…...ccesccrsseesoees estate see reoseakenes! pee Do ec 737,587 2,837 Orchards and Gardens…..~~.eseeeeres seaneenance 627,704 2,423 Chestnut plantations.....~~.ce-0 Bote Sead 559,029 2,158 Olive, almond, and mulberry plantations…..... 109,262 421 Miscellaneous …..... ee ee 2,955

508 rkA WN Ce [porunatioy.

II. Population. . The annual increase of population in France between

The population of France, which in 1801 was 27,349,003, | 1801 and 1876 has been very small. Allowing for the was 36,905,788 in 1876, of whom 11,405,000 were living alterations in extent of territory which took place in 1860 in towns. The following table shows the extent of each and in 1871, it amounts to about 0°43 per cent. ; so that

department and the population in 1861 and 1876.1 while in England the population during the same period . : has been doubling in about 53 years, it would require 16] . Eats Revalin er ie years to bring about a similar result in France. The | nare 11e€8. ui ° 0. a ae || | census of 1876 returned 18,373,639 males and 1ejosaeme ae SSCS CUE HDEEDeCECHECOnOCESOSEchCS ae ee Peay females, of whon 9,805,761 males aaa 8,944,386 Allier ae EP ae 17 females were single. In 1874 there were 954,652 births, ec coascccerscsseccses {685 ‘ 5 – Ales ae aoe 2/158 125,100 119,094 981,709 deaths, and 303,113 marriages; of the births ere or ra ates 69,294 were illegitimate, and 44,613 were children still- ON I see : : ; : : f 5 PAOIES oo. .csnceoscesacsseasecvees 2,020 820,111 826,782 born, Population is not so dense in France as in the iég “ 1,89 51,850 244.795 F : . . fae. 2317 262.785 255.217 United Kingdom, the proportions being about 181 and Aude …..... os 2,438 283,606 300,065 270 inhabitants respectively to the square mile. Aveyron Rrsiscucees 3,376 396,025 413,826 2 5 Belfort (territory Of) .....0+ “935 – 68,600 The following table of the population arranged accord- oon las a Ls yee pone ing to employments (exclusive of children and servants) is 3 yee ? 2,217 240,523 231,086 taken from the census of 1872 :—

2,294 879,081 378,950

2,636 481,060 465,628 a a Total 2,779 323,393 345,613 _ Men. omen. Numb 2,265 310,118 311,535 p Seal 252,889 262,701 i a = ae = ae a… 3,388 384,140 377,663 Agriculture 1,305,316 | 5,970,171 2,652 628,676 630,957 Manufactures 1,308,873 | 3,982,870 Dordage 3345 so1es7 | 480.848 Commerce 808,754 | 1,490,268 iene ee 2‘019 296,280 306.094 Liberal professions 161,740 | 994,482 . DOM emer eee honcacsceec ree 2,518 $26,684 821,756 Persons living on their in- epee Me enc ee 2‘300 398,661 373,629 a 545,050 | 425,584 | 980,584 Eure-ct-Loir 2,268 290,455 283,075 iW: . : i Finistere 2595 627,304 666,106 Without profession, or

pro- a: _ 980.939 Gard 2,253 422.107 423,804 fession unknown : Garonne (Haute-)... 2,429 484,081 477,730 Gers 2,425 298,931 283,546 aoe ” a BeeL prea in The first of the following tables shows the population y eee ovo a 3,0 + A Ille-et-Vilaine ee 2,597 584,930 602;702 for 1832, 1851, and 1876 of the towns in France that had finden ee ee 2,624 270,054 281,248 : . . < : a. Gieecions 2360 393°572 324875 upwards of 50,000 inhabitants in the last-mentioned year: Tsére 8,201 577,748 581,099 Jura 1,928 298,053 288,823 1882. 1851. Land 3,597 300,839 303,508 ee (pice Che 2452 269°029 972'634 i ee, en 774,838 1,053,262 1,988,806 Loire 1,838 517,603 590,603 Lyous (/r, Lyon) 183,715 156,169 822,612 Loire (Haate-) si ccc.cccccccsceeses 1,916 305,521 313,721 Marseilles (/7.Marseille) 145,115 185,082 234,690 Lofre-Inférieure.....ccssceseseeee 2,654 580,207 612,972 TBO TLE UNS rr perepcecceceeecae 99,062 128,935 212,111 Loiret..... 2,614 352,757 360,908 _ 69,078 68,463 137,150 Lote: 2,012 295,542 276,512 - 99,630 85,554 120,208 Lot-et-Gai oe . 2,067 332,065 316,920 Sco 53,741 117,537 WOZOT Crass oecccaa re ere 1,996 137,367 138,319 “ 77,992 91,303 116,093 Maine-et-Loire..... 2,750 526,012 517,258 . 88,086 91,512 104,893 IMSTIGHE .c..cc6ccsseess 2,289 591,421 539,910 : . 23,816 26,410 85,407 Wainy. sese-as. 22sec: 3,159 385,498 407,780 35,971 43 643 80,098 Marne (llaute-) 2,402 254,413 252,448 aus 31,038 74,946 NERC DR Bee recone ey: 1,996 875,163 351,933 j 29,860 36,492 66,828 Wilietpihier. st. te ee [2,352] 428,648 vas vaney 29,783 40,289 66,303 Meurthe-et-Moselle.....066 2,020 sis 404,609 iens 45,001 49,139 61,606 WeSC 2 ese .izccevescsosssoc-coneees 2,405 805,540 294,054 28,419 45.510 61,382 MWonbilanie: sc cteter soso sce s eee 2,625 486,504 506,573 41,266 49,480 60,804 Moselle .. : [2,073] 446,457 wae 82,743 43,088 55,866 Nigvre.. : 2,632 332,814 846,822 27,070 37,010 55,097 NO oe ee 2,193 1,303,280 1,519,585 a 29,680 33,066 53,598 Oise oe en) ee 2,250 401,417 401,618 i 35,825 40,222 51,838 Ours ee i ee 2,354 423,350 392,526 Bas-he-Calnis c.ccscsesesesseeressss 2,550 724,338 793,140 . : ° Piy-de- DOM evecessccsecssscecser- 3,070 576,409 570,207 Towns with from 20,000 to 50,000 Inhabitants in 1876. Pyrénées (Basses-).....cccceee0 2,945 436,628 431,525 ONS eeecen: eeeseccesescesees Rochefortscccscirctae--.00 eee 25,454 Pyrénées (Hantes-).....0+06- 1,750 240,179 238,037 Versailles. Layal...ssscceceesessesscsceeesees 25,110 Pyrénées-Orientales.. .....0.008 1,592 181,763 197,940 TOUTS te eete Berpignan .....0..ceeees 24,379 PEDIET ON CUSED SE) vee sotto es <1

*~~sscseeeeees [1,758] 577,574 ome INTC secossare Carcassonne .....2..0eseecereme 23,517 Wehiie (ISCLUE=) sec cacccussausreeten [1,586] 515,802 re Le Mans... NT% 200) ccoseace ovsaseessaeeeereeree 23,407 JC eece tacorcee ree eroe rece 1,077 662,493 705,181 Dijon..... DOUAi «.....eseeeeeeseesteeseeeessees 23,348 Sadne (Haute~~). Pen 2,062 317,183 804,052 Grenoble…... : PETIG*UCUX ~~...seeseeessesesecceeeees 23,290 pw oe ae Bue ae one emer 614.309 pean oo ae Age ree a Z aoe GO ee monéonnctionnsneeeencoceneeonea: iff 66,15. 446,239 MOYiCS toe~~---- = 200 evallois-Perret.. o 224 SavGlein:.. caeses ences tcssescuossseces 9994 275,039 268‘361 Boulogne (Pa Bh Valenciennes ….. Fe 22-686 Savoie (Haute-) ... ...-.sccesscees 1,666 267,496 273,801 St Quentin : St Pierre-lés-Calais….....66 pees PSE Seen ccR AR RB URDE SCO CSG CEECEEREECRCE 184 1,953,660 2,410,849 Clermont-Ferrand…..... 7,074 PSHVIGUMNG.. cess sceesessaed seoee Zor Seine-Inféi icure 2,530 789,088 “798,414 Bézicrs kc RS 36,928 Elbeuf csesséseess ae 21,085 eine-et-Marne 2215" 52,312 347,323 NET OOUNGE i:esccsacesseccceeeseee OOS MONEtHICON …...eceeee-seveeeeee Seine-et-Oise 2,164 513,073 561,990 Dunkirk (Fr. Dunkergne) 35,012 Boulogne (Seine) .....~~00 21,556 S@vres (Deux~~) .....csscesareeeee 2,317 328,817 336,655 OAV GMON ccc. sevesiccsecss+eesce20— POGHIOD, ROanite: <.....ccsseeAIG ETUTIOS caopenmeqsonacsa aeoee 2 Tarn-et-Garonne . bes 1,436 232,551 221,364 Poitiers …. A Neuilly < Beh eka, comrerperercco reat 2,827 ! 815,526 295,763 Bourges…. e Nevers Vaucluse Pedecesaveecesessecccceeecenas 1,670 268,255 255,703 EOI Clie… occneceeasecess-2eees Chalon-su Vendée 2,588 895,695 411,781 SUMDCNISiresscrscesess Armentitres …..... Vienne 2,691 822,028 830,916 Angouléme …..... QASHTIES aes csessceteres — (Haute-) .... 2,130 319,595 336,061 WCE Chrerstsstcescnces ae OS ZOSS, .cescsecscsecses 2,259 415,485 407,082 DEE ee cecnneenacge ApeeiccoOCnOotee 27,5538 Niort YOM? Sisco eee 2,868 370,305 359,070 JSUT apagenpencenemonnaccons0ca0n. 26,764 Chalons-sur-Marne…....+0 LOLal i teeeecetresscceerees 204,147 37,472,732 36,905,788 Ill. Government and Administration. LO Se*

- *After the cession of territory to Germany in 1871 ingle de oo paar and constitutions which have ae Pee partment (Meurthe-et-Moselle) ie the ee of two ‘ieee add France since 1789 have been many, and have pee ‘*

ment. Moselle), the Bas-Rhin disappears, and of the Haut-Rhin there re- | Wide differences. We have not, however, to consider here mains only the territory of Belfort. those frequent changes, which belong to history; we have

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ADMINISTRATION. |

merely to state from a geographical and statistical point of view how France is now governed and administered. The law of the 25th February 1875 confirmed in France the republican government which had existed from the fall of the empire; but the institutions of the country still bear strong evidence of their monarcliical origin and tendency. The sovereignty of the people, acknowledged and proclaimed since 1789, is now represented by three powers,—the cliamber of deputies, the senate, and the president of the republic. The deputies are elected by universal suffrage; each district or "arrondissement " sends one deputy to the chamber, if its population does not exceed 100,000, and an additional deputy for every additional 100,000 inhabitants, or fraction of that number. The senate consists of 300 members, the fourth part of whom were at first elected by the national assembly, and hold office for life, each vacancy being filled up by a vote of thesenate. The others are elected by special bodies formed, in each department and in the colonies, by the deputies, the general councillors, the councillors of arrondissement, and a delegate of each municipal council. They are in office

FRANCE

tered by the president of the republic and his cabinet coun- Ministers,

cil, consisting of nine ministers, viz.:—the minister of jus- tice and keeper of the seals ; the minister of foreign affairs ; the minister of the interior ; the minister of finance; the minister of war ; the minister of marine and colonies; the minister of public instruction, ecclesiastical affairs, and the fine arts; the minister of agriculture and commerce; and the minister of public works. They are appointed by the président of the republic, and are responsible to the chamber. They receive a salary which has been reduced from 100,000 to 60,000 francs, and may live, if they choose, in the "hétels" where the duties of their ministry are discharged.

Administratively, France is divided into 87 departments Adminis-

cut rather arbitrarily out of the territory of the ancient tttive D divisions,

provinces. These departments are subdivided into 36 " arrondissements," 2865 "cantons," and about 36,000 "communes." The table on page 510 contains a list of the departments, with their capital towns and arrondisse- meuts, and also a reference to the old division into pro- vinces.

for nine years, and every third year are partly renewed. "si: The president of the republic is chosen for seven years by (it. the senate and chamber of deputies voting together. He

Each department is administered by a prefect appointed Depart- by the president of the republic, and each arrondissement mental

is : adminis- by a sub-prefect. The prefects are divided into three tthe,

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promulgates the laws passed by the parliament ; he has the command of the land and sea forces, but cannot declare war without the advice of the chambers; he makes treaties of peace, alliance, and commerce, nominates to all Govern- ment offices, and has power to dissolve the chamber of deputies, with the sanction of the senate. He receives a yearly salary of 600,000 francs, with an allowance of 162,400 francs for household

expenses. Senators and deputies have an allowance of 9000 francs each per annum. It may here be interesting to compare the salary now paid to the president of the republic with the civil list or revenue of the various dynasties which have successively ruled France since the beginning of the century. Louis XVIII. had 15,510,000 franes per annum, and 4,000,000 were allowed to the royal family. Charles

X. got 25,000,000 for himself and 7,000,000 for the princes. –

Louis Philippe was satisfied with 12,000,000 francs a year, and adequate allowances to his children. And lastly, the second empire cost 25,000,000 francs a year, not including the pensions to the members of the imperial family, the revenues of the palaces, castles, aud forests, and those mysterious resources which have become known by the name of virements.

Next to these three great powers must be mentioned the council of state, presided over by the minister of justice, and composed of a vice-president, 22 councillors in ordinary ser- vice, 15 councillors in extraordinary service, representing the different ministers, 24 mattres des requétes, 20 auditors of first class, 10 auditors of second class, a general secretary hay- ing the title and rank of a maitre des requétes, and a secrétaire du contentieux. The auditors are appointed after a com- petitive examination; the councillors in ordinary service are elected by the chamber, and the other members of the council of state are nominated by the president of the re- public. The business of the council is to give its advice on the projects of law which the parliament or the Government Wish to submit to it, and on administrative regulations and byelaws, All disputes arising in matters of administration, and all claims or complaints against administrative officials, are brought before the council of state, whose decision is final, The Vice-president receives a salary of 25,000 francs, the presidents of sections or committees 18,000 francs, tlie councillors 16,000, the mattres des requétes 8000 franes, and the auditors of first class 4000 francs ; auditors of second class have no remuneration.

The executive department of the Government is adminis-

classes, the salary being 35,000 francs for the first class, 24,000 for the second class, and 18,000 for the third class. The prefect of the Seine has

50,000 francs a-year. The authority of each prefect is great in his own department : he can issue Jocal decrees ; he appoints and dismisses a number of agents who depend directly on him ; he is at the head of the police to maintain public order, and for this purpose can summon the military forces; he super- intends the collection of taxes; he is in correspondence with all the subordinate functionaries in his department, to whom he transmits the orders and instructions of the min- isters ; in one word, he is the general agent of Government, and the principal instrument of centralization in the state. He is assisted in his work by two bodies, the general coun- cil (consetl général), which is elected by universal suffrage, and the council of prefecture, which is nominated by the head of the executive power. The business of the council of prefecture is to decide all legal questions and to advise the prefect, when asked todo so. The general councils asséss the taxes, authorize the purchase, sale, or exchange of departmental property, superintend the management of the same, decide about new roads, railways, or canals, vote the budget for sanitary and charitable institutions belong- ing to the department, and give advice on every matter of local interest, political questions being strictly excluded. The law of the 23d February 1872, however, has invested them with great political importance; in case of the parliament being violently dissolved by a coup d'état, they must immediately assemble, and form a new parliament with their delegates, in order to oppose by all means the criminal attempt. 3

As the prefect in the department, so the sub-prefect, with Arron- a more limited authority, is the representative of the central disse-

power in the arrondissement. He is assisted, and toa certain extent controlled, in his work by the council of arrondisse- ment—an elective body tc which each canton of the arron- dissement sends one member. Except in that case, the canton is not an administrative division. It will be noticed again in connexion with the judicial system of the country.

The commune is the administrative unit in France.

number of whom varies according to the population ; com- munes of 2500 inhabitants have one deputy-mayor; up to 10,000 inhabitants they have two, from 10,000 to 30,000 three, and one additional for every 20,000. The mayor has a double part to perform, as he represents both the

At Com- its head is a mayor assisted by deputy-mayors (adjoints), the Me.

510 FRANCE [TABLE OF DEPARTMENTS,

Departments.

Capital Towns. Arrondissements. Ancient Provinces.

ING cei saVieeets corsateavscesseas| AB OULS.cs-cese-z-c—> ners 5. Bourg; Belley; Gex; Nantua; Trévoun….s.cccccscersesrerenrveres Bourgogne (Bresse, Bugey, Dombes). SUSIE cteesssaccctactses. acess yo) eee coe …| 5. Laon; Chateau-Thierry ; Soissons ; St Quentin; Vervins. .| Ile-de-France; Picardie; Champagne (Brie). ALLIER.. eaeceececoreessccaerorses Moulins ,..... 4, Moulins; Gannat; La Palisse; Montlugon .. ghsbs Bourbonnais. ALPES (BASsES-)... seg) MIRE ccscetenca-n-as-n050 5. Digne; Barcelonnette; Castellane ; Forealquier; Sisteron .. Haute- ~~Provence. ALPES (HAUTES~~)... GAD c.cts03 .| 8. Gap; Briancons EMDIun..cssssseseees Racbseucstcice ooceth eisceeeseaesnas Haut-Dauphiné; Provenc ALPES Manitiaes « e Nite: <4... 3. Nice; Grasse; Puget. -Théniers .... aot : ARDECHE... Privas, 2] oe Privas; Largentiere ; MT OHENOM csceees-0acceeaasngee Languedoc (Vivarais). ‘ARDENNES - Mézitre | 5. Mézitres ; Rethel; Rocroi; Sedan; Vouziers ... ...| Champagne (Réthelais, Rémois) A hn WOES. peraess -| 3. Foix; Pauley: BEANO sis. crose-naieeaa asa Foix ; Gascogne (Conserans). Meek... ,---| "E¥oyes .. 5. Troyes ;_ Nogent-su sur-Seine ; Arcis-sur-Aube; Bar. nin git i Champagne ; Bourgogne. AUGDR.....<-- scsceeseseeee] CArCasSONN€ .....+.--) 4. Carcassonne ; Castelnaudary ; ‘Limoux; Narbonne Soave Bas-Languedoc. AVEYRON cssscessssensoseeetee Rodez .... serene] 5, Rodez; Espalion Millan; St t Affriques oe Guyenne (Rouergue). BELFORT .....-cseceeees seene || DOM O©bsteassasueneneerse~| ide Belfort... seeeeesectes Besconee sickdervsges doce] enleace: Marseille ..... | oF Marseille; “Aix; SY ee aE teres 4 ce Ht ie ..| Basse-Provence. Caen ..... ~~| 6. Caen; Bayeux: Falaise; Lisieux; Pont~~ ots Vire.. Basse-Normandie (Bessin, Bocage). : Aurillac …. | 4, Aurillac ; Mauriac; Murat; St Flour . “oe <3 Haute-Auvergne. CHARENTE . .eassscccseseeeeee, ANGOUEME... 5. Angouléme; Barbezicux ; Cognac; Confolens; “Rutfec.. aac Angoumois; Charente; Poitou. : Cuanenrs-Inviminune...| La Rochelle... | eet ae i cettnaeth le etn “A Aunis ; Saintonge. | GREE kbc... Besstececccccets| BOUPRES Aaccsce

.| 8. Bourges; St Amand-Mont-Rond; Saneerre... .«| Haut-Berry; Bas-Bourbonnais. CORREZE ..cccconererceceeseee Wulle.... 8. Tulle; Brive; Ussel .....cccccccccsssseseversescvevecors +++] Bas-Limousin. COTE-D'OR s.ccsecceessecseses DijOM).;~~0ss~~ 4. Dijon; Beaune; ChA&tillon-sur-Seine; Semur…..... Bourgogne (Dijonais, Auxerrois C6TES-DU-N ORD -| St Brieue….....| 5. St Brieue; Dinan; Guingamp; Lannion ; seine «| Haute-Bretagne. CREUSE.....000 scos| GUERH..8.0xa0ua3 -| 4. Guéret; Aubusson; Bourganeuf ; Boussac .. -| Haute-Marche. DORDOGNE..... w—| Périgueux 4 Bs Périgueux ; Bergerac; Nontron; Ribérac ; Sarlat …. Guyenne (Périgord). DOUBS.....000¢ seca} IBPRATIGON «cess ceenc0s: 0----| 4 Valence; Die; Montélimart; Nyons … saeneeesans S38 Bas-Dauphiné. WORE Ascesessegee es wes} MYCE. 20 -| 5. Evreux; Les 'Andelys; Bernay; Louviers; Pont-Audemer.. Haute-Normandie (Evreux, Véxin normand). EURE-ET- Loir.. Soaveeses Chartres… | 4, Chartres; Chateaudun; Dreux; Nogent-le-Rotrou D waeiccenanteeeing Orléanais (Pays chartrain) ; Perche. FINISTER Ee sreccccsccscceseeeee| Quimper… -| 5. Quimper; Brest; Chateaulin; Morlaix ; ay tall Ba Basse-Bretagne. GARD) seccctenagecen Sesinf GAINCE. vsinccle cok as .| 4. Nimes ; Alais: Le Vigan; Uzes .. sagete st 75 Bas-Languedoc. ' GARONNE (HAUTE-). -| Toulouse .. .| 4. Toulouse; Muret; St Gaudens; Villefranche .. Haut-Languedoc ; Gascogne (Comminges). ; GERS ...sece0 Beer eienns= |, ACN ees sacs —| 5. Auch; Condom ; Lectoure ; Lombez; Mirande Gascogne (Astarac, Armagnac). ; GIRONDE ..sseeeee eooe| RENNES.....0000—1 6, Rennes; Fougeres ; Montfort; Redon; St Malo; Vitré eter Haute-Bretagne. NDS occ ocgeeouiengsesoas=~oe Chateauroux …....++- 4, Chateauroux; Le Blane; La Chatre ; Issoudun… Bas-Berry ; Touraine. : INDRE-ET-LOIBE .....000000 TOBTS: 24. wecss o, LOUTE: Chinon ; Loches .. sesesestarcareuseeesosstsssrerseseeetsorsseeeeee] Touraine; Anjou; Orléanais ; Poitou. Grenoble…....-| 4. Grenoble; La-Tour-du-Pin ; St} Mareellin ; |; Vienne Fee Reacts gp to oon ae ge Bas-Dau- Lons-le-Saulnier…...| 4. Lons-le-Saulnier; Déle; Poligny; St Claude …....sceseseee-| Franche-Comté (Aval). f .-| Mont-de-Marsan …...| 8. Mont-de-Marsan; Dax; St Sever…..... cians oe ee cee eeae ance Gascogne (Landes, Chalosse). 1 Sarees ..~~(St Etienne… ...(3. St Etienne: Montbrison; Roanne …....00~~ Lyonnais (Forez, Beaujolais). : Lo1RE (Havre) =e son| Le PUy.. sctsesoessreess-| 8: Le Puys rioude ; Yasingeaux

Languedoc (Velay, Haute-Auvergne). Lo1RE-INFERIEURE «....+00-] NAnteS….reeceees .| 5. Nantes; Ancenis; Chateaubriant; Paimboouf; St Nazaire….) Haute-Bretagne. i LOIRET.....- sees —| Orléans.. ‘sees 4, Orléans; Gien; Montargis; DPiGAVICIS c.noccrsecet secesoueseteecescass Orléanais (Sologne, Gatinais). Lo1R-ET-CHER ... -| Blois….. ~~| 3. Blois; Romorantin; VendOme sesevseeees seeeeeee| Orléanais (Blaisois, Beauce). Lot.. ..| Cahors .| 8. Cahors; Figeac; Gourdon ……..0~~ Guyenne (Quercy). LoT-kT- Garonne . Agen. .| 4. Agen; Marmande; Nérac;. Villeneuy: Guyenne (Agénois, Gascogne). Lozige.. MOMGG o.oo vance ssene 3. Mende; Florac; Marjevols .. senses +++] Languedoc (Gévaudan). \ MAINE-BT. “Lome… cancel ATRIOS cons esis sicoces gases 5. Angers; Baugé; Cholet; Saumur; “Segré.. Sccan gaisclew’sass aasenicunenae Anjou. MANCBHE.. ae ss Sue ScsCOah Mb AMON Maueiyenn stevens 6, St L6; Avranches; Cherbourg; Coutanees; Mortain; Valognes} Basse-Normandie (Cotentin). MARNE. aacittie sence MOMBIOINS| cos vscscavesce=|h th Chlons, Epernay; Rheims; Ste Menehould; Vitry-le-Frangois Champagne (Brie, Perthois, Rémois). HaAvTE-MARNE . -| Chaumont -| 3. Chaumont; Langres; Vassy «. cceseeseresassecssreesacreereeeeel Champagne (Bastigny, Vallage). MAYENNE.. Laval .. -| 3. Laval; Chateau-Gontier ; Mayenne … a Haut-Maine; Haut-Anjou. MEURTHE-ET-MOSELLE .. | Nancy eee eae tegeseatea 4, Nancy; Briey ; Lunéville; HOG oss cxeesuiecp soars Lorraine (Toulois). MEUSE.. aewesseadesf) Bak-le-Dinels.« | 4, Bar-le-Due; Commerey; Montmédy; Verdun…. Lorraine (Bar, Verdunois). MoRBIHAN….. a «=| VAMOS, ...96 e-| 4. Vannes; Lorient ; Ploérmel ; per ell aes — ---| Basse-Bretagne. INIRVIRR, .cccstcarsticedsewesece| NOVETS. ..0descccnesessde 4, Nevers; Chateau-Chinon ; Clameey ; Cosne.. ao Re es Se noe Nivernais; Orléanais ; Bourgogne. | N Lill 7. Lille; Avesnes; Cambrai ; Douai; Dunkirk; Hazebrouck; \ &; | OE once er meee eg ai eae Valenciennes …..e.creccsscsseccecrees ibe oe pone eee nore ‘i Flandre ; Hainaut (Cambrésis).

ONG oo ssc covuecio ee ccewacs acess es) DOOMEVAIS! 5 coc sesees cae

Ile-de-France; Beauvaisis (Vexin); Haute- Picardie. ? Normandie (Marches, Houlme); Maine

(Perche).

Artois; Picardie ; Boulonnois

Basse-Auvergne (Limagne). Béarn; Basse-Navarre; Gascogne (Soule,

. Beauvais; Clermont; Compitgne; Semlis…..ccccsrrssscecceeeses

ORME wevsecssscsccrsssccssseee] AICNCON ..cscsscseseeeeet 4, Alencon; Argentan; Domfront; Mortagne…...-.ssrereeseeerers . Arras; Béthune; Boulogne; Montreuil-sur-Mer; St-Omer; St- I MOT) cises toss seess's ws sien esore nas lege on toevidtae lenge le

Clermont-Ferrand; Ambert; Issoire, Riom; Thiers. Pau; Bayonne; Mauléon; Oloron; Orthez…..... Sureacsecennesses

PAS-DE-CALAIS ...0.00000008 PUY-DE-DOME ..1….0ceeeee- PYRENEES (BASSES-).....

Clermont-Ferrand… PWG Srchdbteadisececedest

OC ae a ee a

Labour). 'Pyrinbus (HAUTES-)..... Tarbes …..... Tarbes; Argelds; Bagndres …...sssssssssssesreesssesssneseeseseees] Gascogne (Bigorre, les Quatre-Vallées). PYRENEES- Parmmergs Perpignan.. Perpignan; Céret, Prades …| Roussillon (Cerdagne) ; Bas-Languedoc. RaO6NE… Tacseen calf LOD : Lyon; Villefranche …..... ..| Lyonnais ; Beaujolais. SaoneE (Havre: 7 Vesoul 'Wesonls Grays: Tignes. 22.5… 2a—vagses esnb ih Chosntept hs Has sw eb eseas cone Franche-Comté (Amont). SA6NE-ET- pre Macon Macon; Autun; ChAlon-sur-Sajne; Charolles; Louhans…...,| Bourgogne (MAaconnais, Charolais). SARTHE.. .| Le Mans…..... Le Mans; La Fléche , Mamers, St Calais …....scccessssscsseres Bas-Maine ; Haut-Anjou. SAVOIE.. seoseee.| Chambéry …. Chambéry ; Albertville; Moutiers; St-Jean-de-Maurienne ….. SAVO1E (HAvTE-).... +) ADMECY...casses . Annecy; Bonneville; St Julien; Thonon ….....0+0 eocseeeceel SINE . sive, sell) Parl@'s;:csi2 . Paris; St Denis; Sceaux …..... rect ets Ladougs Ile-de-France. SEINE-ET-MARNE... Melun …...5. samapveenes Melun;

Coulommiers ; Fontainebleau; Meaux ; Provins easaed Te-de-France (GAtinais, Brie) ; Channa SEINE-ET-OISE ...0sc000s Versailles 6. Versailles; Corbeil ; Etampes ; Mantes ; Pontoise; Rambouillet | ede Rene Cenreeee, Mantais, Se1NB-INFERIEURE .....| Rouen. .| 5. Rouen; Dieppe; Le Havre; Neufchatel; Yvetot…..... ..ese| Haute-Normandie (Roumois, Caux, Bray). SEVRES on eames Niort…... 4 Niort; Bressuire; Melle; Parthenay jacbaeawoenseeeneaee ue Haut-Poitou. SoMME.. as .-..| Amiens., 5. 'Amiens; Abbeville ; Doullens; + MSs eemnRm Picardie. TARN... A DRUID Yc cctsec: .| 4. Alby; Castres; Gaillac; Te i Ra ae Haut-Languedoc (Albigeois). TARN-HT-GARONNE. Montauban . .| 8. Montauban ; Castel-Sarrasin ; Moissac .. Guyenne; Gascogne ; Languedoc. VAR... hee ….| Draguignan -| 3. Draguignan ; Brignoles; Toulon …..... Basse-Provence, VAUCLUSE. ...| Avignon… 4, Avignon; Apt; Carpentras; Orange ….. ..| Comtat; Haute-Provence. VENDEE., .».| La Roehe- sur-Yon.. ..| 3. La Roche-sur-Yon; Fontenay-le-Comte ; Les 'Sables-d'Olonne Bas-Poitou. VIENNE.... ef, POIGIGES s.c.scasssteasonse« 5. Poitiers; Chatellerault: Civray; Loudun; Montmorillon…... Haut-Poitou. VIENNE (Havre) . ERIO SES... cccsncscoeanes 4, Limoges; Bellac; Rochechouart; St ae aes Haut-Limousin; Basse-Marche. VOSGES .. oe .| 5. Epinal; Mirecourt; Neuchateau; Remiremont; St Dié…....|. Lorraine (Vosges). ; 'i YOnnNE… 5. Auxerre; Avallon; Joiguy; Sens; Tonnerre….. sasasecsecsecceseed Bourgogne (Auxerrois); Champagne (Sénonais)- CORSE 1,-2.4. ..| 5, Ajaeeio; "Bastia; Calvi; Corte; SartONe..seessecveeoes seoreee| Corse.

Prior to 1790 France was divided into thirty-two great and eight small military governments, often called provinces, which are, however, to be distinguished from the provinces formed under the feudal system. The great governments were—Alsace, Angouny rie Artois, Aunis and Saintonge, Auvergne, Béarn and Navarce, Berri, Bourbonnais, Bourgogne (Burgundy), Eeoteane (Baten : sad, he ok Dauphing, Flandres, Foix, Franche-Comté, Guyenne and Gascogne (Gascony), Ile- de-France, Languedoc, Limon dant

aine, Lyonnais, Maine, Marche, Nivernais, Normandie, Orléanais, Picardie, Poitou, Provence, Roussillon, an Touraine. e elg

all nD Tiss, gogernments_were—Paris, Boulogne and Boulonnais, Le Havre, Sedan, Toulois, Pays Messin and Verdanois, cmanien

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LAW. |

central power and the commune; and often it is a dif- ficult matter to avoid a conflict of duties. He is besides officer de état civil, or official registrar of births, marriages, and deaths. The mayor and deputy-mayor are not salaried officials. In the large towns they are nominated by Government, but they must always be chosen out of the municipal council, which is elected on the principle of universal suffrage, and has with regard to the commune much the same power and duties as the general council with regard to the department.

Every canton must have a commissary of police, who is under the direct control of the mayor. This police-officer is appointed by the prefect in towns having not more than 6000 inhabitants, and by the president of the republic in the others. He has rather complex duties, being at the same time a governmental, judicial, and municipal agent.

Paris and Lyons have in some respects a special and ex- ceptional administration, the consideration of which belongs to the articles devoted to these cities.

IV. Law and Administration of Justice.

Judicial proceedings may be classed under civil, com- mercial, and criminal jurisdictions ; there are besides some special departments, such as military and maritime tribunals, councils of discipline, and the cour des comptes.

In civil matters, every canton has a juge de paix, whose decision is final when the amount in dispute does not exceed 100 francs (£4); up to 200 francs, he only can give a sentence subject to appeal. His principal business is, however, one of conciliation; and no suit can be brought before the tribunal of first instance till he has endeavoured without success to bring the parties to agreement.

A tribunal of first instance, or primary court, is esta- blished in every arrondissement. Its decision may be appealed against for sums above 1500 francs. The cours

dappel decide the actions when the sentence of the first

court has been appealed from. They are 26 in number,

established in the following towns :—

Cours d'Appel. _ Departments depending on them.

2 Seine, Aube, Eure-et-Loir, Marne, Seine-et-Marne, Seine-et-Oise; Yonne.

AGEN ...Gers, Lot, Lot-et-Garonne.

AIX ...Basses-Alpes, Alpes-Maritimes, Bouches-du-Rhéne, Var.

AMIENS ...Aisne, Oise, Somme.

ANGERS ...Maine-et-Loire, Mayenne, Sarthe.

PEVASTRVA sec esseeee Corse.

BESANCON..... Doubs, Jura, Haute-Saéne, Belfort.

BorDEAvX…...Charente, Dordogne, Gironde.

BOURGES.....4.0- Cher, Indre, Niévre.

BOSTON ons sescce cess Calvados, Manehe, Orne.

CHAMBERY.....Savoie, Haute-Savoie.

IDIsON…... ...C6te-d' Or, Haute-Marne, Sadne-et-Loire.

Dowaz ….....Nord, Pas-de-Calais.

GRENOBLE ..... Hautes-Alpes, Dréme, Isére.

Linoges ….....Corréze, Creuse, Haute-Vienne.

HEXONS/s00..2ssss0 Ain, Loire, Rhéne. Montreiier…Aude, Aveyron, Hérault, Pyrénées-Orientales.

NANCY ..... Meurthe-et-Moselle, Meuse, Vosges, Ardennes. Nimes… ...Ardeehe, Gard, Loztre, Vaueluse. ORLEAN. -..-Lndre-et-Loire, Loir-et-Cher, Loiret. BEAU) co ceesee .-..Landes, Basses-Pyrénées, Hautes-Pyrénées. IPOITIBRS...:2…. Charente-Inférieure, Deux-Sévres, Vendée, Vienne. RENNES wceeseeees Cétes-du-Nord, Finistére, Ile-et-Vilaine, Loire-Inférieure, Morbihan. BETOME cscseeeesessee Allier, Cantal, Maute-Loire, Puy-de-Déme. ROUEN... eeeees Eure, Seine-Inférieure. Tounousz….....ATriége, Haute-Garonne, Tarn, Tarn-et-Garonne. Tribunals of commerce to decide disput2d points arising

out of business transactions are instituted in all the more Important commercial towns, and consisi of judges chosen from among the leading merchants, and elected by their fellows. For sums above 1500 francs there can be appeal from their decision. In small towns, the judges of the civil tribunal decide such commercial cases.

The courts of criminal jurisdiction are of three kinds. The tribunals of ordinary police (that is, the justice of the peace court in each canton) have the cognizance of small offences, which are punishable by a fine not exceeding 15 francs (12s.), or by imprisonment not exceeding 5 days. Offences of a more serious character, which French law

calls délits, are judged by a special section of the tribunals of first instance, bearing the name of tribunal correctionnel. This tribunal can be appealed to from the sentences pro- nounced by tribunals of police; but its judgments are also subject to the revision of the cours d'appel. Offences which rank as crimes are judged by the cour d'assises, con- sisting of three magistrates and twelve jurors. The jury, as in England, decides only on the facts of the case, leaving the application of the law to the judges. The assizes are the only courts that are not stationary. They are held in the chief towns of the departments once in three months. In all criminal suits, the first inquiry is confided to a special magistrate attached to the tribunal, called juge diustruction. He conducts the necessary investigations privately and with almost absolute power. An order of non-liew issued by this magistrate at once puts an end to any prosecution. But if he finds that the case should go to trial, he hands it over to the court, before which a public prosecutor, with the title of procureur, or procureur-général de la république, maintains and endea- vours to prove the accusation.

Above these various tribunals the court of cassation Court It is held at Paris, and is composed of eassa-

*stands supreme. three chambers, the chambre des requétes, the chambre civile, * and the chambre criminelle. Its province is to decide in all appeals from the other courts, investigating, not the facts of the case, but the forms of law, and ordering, wherever these have been infringed or deviated from, a new trial before such other tribunal as it thinks fit.*

Among the special jurisdictions may be mentioned the Special inilitary tribunals or councils of war, which sit in judgment courts.

on crimes and offences committed by soldiers, or by civilians in a town or district proclaimed by the Government as in a state of siege; the maritime tribunals, which are to tlle navy what the councils of war are to the land forces ; and the councils of discipline for lawyers and other pro- fessional corporations. The cour des comptes deserves special notice. It consists of three chambers, with a presi- dent in chief over the whole court, and three presidents (one for each chamber), a general procurator, a chief grefier, 102 councillors, 20 auditors, and 81 clerks. This im- portant institution, which costs 1,554,500 francs a year, was created in 1807 in order to control

all the accounts of the Government officials. Certain agents whe are not magis- trates are, however, connected with the administration of justice. Such are the grefiers (clerks of the court), who keep the archives, and receive a salary from the Govern- ment; the hwissiers (sheriff-officers), who give notice of summonses and sentences; and the avowés (solicitors) and the public notaries (wotazres).

Statistics of Justice (1874).—In 1874 the juges de paix had Statistics before their bar, with a view to private settlement, a total of of justice 2,160,116 cases, and brought the parties to an agreement in 856,340, (1874).

a result which is hardly satisfactory. As judges, they had on their rolls 391,129 cases, to which 5166 electoral disputes must be added. Their decisions were appealcd from in 4460 cases. There were 125,248 cases on the rolls of the civil tribunals of first instance. The commercial courts had 255,333 cases before them, 5596 of which were cases of failure or bankruptcy. In 1850 the number was only 138,027. The decisions of the various courts above mentioned were followed by 10,555 appeals, which were brought before the cours @appel. In about 67 per cent. of these the original sentences were confirmed. _ Of offences 168,835 were brought under the consideration of the tribunaua correctionnels, 171,431 males and 31,678 females being implicated in them. Of these 7509 were under sixteen years of age, and 146,588 above twenty-one. The tribunals acquitted 13,506. Out of 7949 appeals the cowrs d'appel confirmed about three-fourths of the original sentences, and in 1206 cases increased the punishment awarded by the tribunaux correetionnels. The jury and judges of assize courts tried 4084 cases, affecting 5228 prisoners, 4368 being males and 860 females; 55 were under sixteen years of age, 799 under twenty-one, and 284 above sixty; 2818 were uninarried ; and nearly the half of the number consisted of people living in towns; 170 only had reeeived a good education; 1810 eouid

Prisons.

Police.

Roman Catholics.

not read, and 2160 could read and write but imperfectly. The jurors found 1056 prisoners not guilty ; 31 were condemned to death, 151 to hard labour for life, 972 to hard labour for a limited time, 1 to transportation ; 29, who were under sixteen years of age, were sent to houses of correction; sentences of imprisonment for various periods were passed on the others, cxcept two, who were fined. Four women were among the prisoners condemned to death; the sentence was carried out in the case of 13 of the convicts; the others, including one of the women, had their sentences commuted. Besides these criminal cases, the cowrs d'assise had to decide on 20 alleged infring- ments of the laws and regulations affecting the liberty of the press, and on 10 political offences, consisting of speeches, cries, or display- ing of emblems considered as seditious. The accused were 52 in number, of whom 28 were acquitted, 4 fined, and 20 sent to prison.

There were 1100 criminal cases brought before the cour de cassation, which has the same jurisdiction in criminal matters as in civil. In a large majority of cases it confirmed the decrces of the tribunals, only 103 having been sent back for a new trial.

Prisons.—Although the prisons are attached to the min- istry of the interior, it is impossible to treat of the adminis- tration of justice without saying a word about them. The convicts who have to serve more than one year are distri- buted into 24 central prisons (mazsons centrales). Depart- mental prisons receive those whose sentence does not exceed one year. Political convicts are kept in custody in the two maisons de détention of Doullens (Somme) and Belle-Ile (Morbihan). Two places of transportation, Cayenne and New Caledonia, receive those who were formerly confined in bagnes, or convict prisons. The population of these penal colonies is considerably increased by the victims of internal discord; for in France it seems as if the victorious party thought that by banishing its opponents from their native land it could eradicate the ideas for which they unsuccess- fully fought. The expenses of these different penitentiary establishments amount to about 18,500,000 francs. On the other hand, the produce of prison labour has a value of 2,800,000 francs.

Police.—The public peace is maintained by an armed police or gendarmerie, partly on foot and partly mounted ; and in all emergencies, when this force is found insufiicient for the preservation or execution of the laws, the troops may be called in to assist, subject, however, to the orders of the police. About 7000 gardiens de la paix, formerly sergents de ville (policemen), under the orders of the prefect of police, form in Paris an additional police force; and similar organizations exist in all the larger towns.

V. Religion.

Three churches are recognized and supported by the state in France,—the Roman Catholic, the Protestant (sub- divided into Calvinist and Lutheran), and the Hebrew. In Algeria the Mussulman creed is equally recognized.

Roman Catholic.—The Roman Catholic Church is much stronger than the others, It may perhaps be said that France is the country where this church is the most power- ful; at any rate, it has there its most perfect organiza- tion, and raises the largest sums of money; and it is to France that, directly or indirectly, the Holy See appeals in all its difficulties. Most of the provisions of the "con- cordat" concluded in 1801 between the first consul Bona- parte and Pope Pius VII. are still in force. France is divided into dioceses, each governed by an archbishop or a bishop, and the dioceses into parishes, each of which has at its head a curé, or parish priest. Archbishops and bishops are appointed by the head of the Government and confirmed by the pope; the archbishop of Paris receives a salary of 50,000 francs, and the others are paid 20,000 franes ayear. The stipend of the bishops is 15,000 francs per an- num, In 1789 France contained 135 dioceses, 18 of which were archbishoprics, The Constituent Assembly made the dioceses correspond exactly with the departments; but-this was changed by the concordat of 1815. The archbishop- rics and bishoprics now existing in France are as follows :—

Arehbishopries. Bishoprics. JENGRIS cosansassoqdosandoonocsAeoee Chartres, Meaux, Orléans, Blois, Versailles. Aix, ARLES, AND EmBrwn… Marseilles, Fréjus and Toulon, Digne, Gap, Nice, Ajaccio, IAN. oi-jcie-sseeaeeeseeeeekt0dez, Cahors, Mende, Perpignan, [AUICH=. cccsee ….Aire and Dax, Tarbes, Bayonne.

AVIGNON... ..seasaseNimes, Valence, Viviers, Montpellier.

BESANCON .....+see0eeeee- Verdun, Belley, St Dié, Naney.

BORDEAUX evessssseeeeeeeeeeeee Agen, Angouléme, Poitiers, Périgueux, La Rockella, Lugon.

BOURGES we -ssessereeseveeeeeeess-Clermont, Limoges, Le Puy, Tulle, St Flour.

GUARUD WATE. csc decesescssceccesres NIRS.

CHAMBERY .....—400..-Annecy, Tarentaise, Maurienne.

LYONS AND VIENNE.....Autun, Langres, Dijon, St Claude, Grenoble.

ERGIIM Steet ees esis cor enmmnceseieses Soissons, Chalons-sur-Marne, Beauvais, Amiens,

RENNES necesescscseeseceeeeeee— Quimper, Vannes, St Brieue.

ROUEN .....1.--- .... Bayeux, Evreux, Sées, Coutances,

SENS AND AUXERRE .... Troyes, Nevers, Moulins. TOULOUSE AND NARBONNE..Montauban, Pamiers, Carcassonne. POURS seers: or cess seees-L@ Mans, Angers, Nantes, Laval.

Every archbishop has three vicars-general, and every bishop two, making a total of 190. They are assisted by a chapter attached to each cathedral church, and presided over by the bishop. The cwrés have a minimum salary which varies from 1500 to 1200 francs, but additional money may be allowed by the municipal councils. They also receive the fees charged for baptisms, marriages, funerals, and extra masses, and have the benefit of a

free house called a presbytére. The curés are about 3500 in number, and are assisted by curates (wcazres), and by des servants, the latter being priests attached to. swccursales or chapels-of-ease in large parishes. In 1873 the sums paid to the prelates and priests of France by the Government amounted to 39,382,495 francs—about two and a half millions more than in 1859.

The Roman Catholic Church possesses in France 89 grands séminaires, in which special instruction is given to young men wlio intend to enter the church, and 150 petits séminaires, or establishments of secondary education, by which the clergy endeavour to rival the /ycées of Govern- ment. 'There are besides a number of schools and colleges kept by the Jesuits and other religious bodies. A recent law has even allowed the clergy to found independent unt- versities, which will be noticed in the chapter on education. Convents are very numerous in France, especially for females. They are inhabited by about 140,000 persons (including 120,000 women), whose property is worth more than a thousand millions of francs.

Protestants. —The Eglise Réformée (Calvinist Church) has about one million of members in France, distributed into parishes, which form 103 consistories, and 21 synodal dis- tricts, including Algeria. The Lutheran Church (Zglise de la Confession d'Augsbourg) is far inferior in number. It is ruled by a directory, now sitting in Paris, instead of Strasburg as formerly. Sixty-one pastors compose the staff of this Church, whilst the Calvinist Church has 600. The seminary of the latter is at Montauban, and that of the former at Paris since the loss of Strasburg.

Jews.—The Hebrew Church is administered by a central consistory presided over by the chief rabbi. It is subdi- vided into eight provincial consistories, sitting respectively at Paris, Lyons, Bordeaux, Nancy, Marseilles, Bayonne, Lille, and Vesoul. Their seminary used to be at Metz, but has been transferred to Paris.

Vi. Education.

The National Convention laid the foundation of the system of public instruction that is still in force in France ; the Government of the first Napoleon developed and com- pleted it. At the head of public instruction is

a minister, who has the title of grand-master of the university, this term describing, not an institution for liberal education as in Great Britain and Germany, but the branch of adminis: tration under which public instruction in its universality 1s placed. The minister appoints all the officers of university administration, and fills up all the vacancies in colleges and schools. He is assisted by the superior council of public instruction, which has to examine the books adopted in

Protest: ants,

Jews.

Ministry cf instruc tion.

EDUCATION. |

schools and colleges, to judge and remove incompetent teachers,—in short, to watch over the concerns and interests of public instruction in all its branches. Attached to this council are 19 inspectors-general, who visit the principal establishments in the country for the purpose of inquiring into their management aud the way in which instruction is conducted.

Académies.—The whole territory of France is divided into 16 académies, or districts of educational jurisdiction, a list of which is appended.

Académies. Departments ineluded in them.

PARIS .c.eeeseeeeeeees-ee ine, Cher, Eure-et-Loir, Loir-et-Cher, Loiret, Marne, Oise, Seine-et-Marne, Seine-et-Oise.

AIX ceccccccsseeseeseseeeeess-BOUCHES-du-Rhéne, Basses-Alpes, Alpes-Maritimes, Corse,

: Var, Vaueluse.

BRSANCON .....-00..s.«.. Doubs, Jura, Haute-Saéne. ‘

BorDEAUX aie ae Dordogne, Landes, Lot-et-Garonne, Basses- Pyrénées.

CAEN ..ccsssseeseeseeee-s—Calvados, Eure, Manche, Orne, Sarthe, Seine-Inférieure.

CHAMBERY .....9avole, Haute-Savoie.

CLERMonT-FERRAND...Puy-de-Déme, Allier, Cantal, Corréze, Creuse, Haute-Loire.

Dison ….....COte-d'Or, Aube, Hante-Marne, Niévre, Yonne.

Dovat .Nord, Aisne, Ardennes, Pas-de-Calais, Somme.

GRENOBLE ... Lsére, Mautes-Alpes, Ardéeche, Dréme.

LYONS.....es00—s0e0eee— HONE, Ain, Loire, Saéne-et-Loire.

MONTPELLIER.....0.+. Hérault, Aude, Gard, Lozé:e, Pyréuées-Orientales

NANCY.....s00-e0008-. »-Meurthe-et-Moselle, Meuse, Vosges.

POITIERS .....000---e.06es Vicrine, Charente, Charente-Inférieure, Indre, Indre-et- Loire, Deux -Sévres, Vendée, llaute-Vienne.

RENNES .....—.--0020+0e4-T1e-et-Vilaine, Cétes-du-Nord, Finistére, Loire-Inférieure, Maine-et-Loire, Mayenne, Morbilian.

TOULOUSE ..…+-.—.----Llaute-Garonne, Ariége, Aveyron, Gers, Lot, Hautes-

Pyrénées, Tarn, Tarn-et-Garonue.

At the head of each académie is a rector, assisted by an academical council, and by the inspectors of the district. His business is to superintend all the schools, colleges, and faculties within the bounds of his educational province, and to serve as the organ of communication between the inferior officials and the minister of public instruction. In the académie of Paris the rector is the minister himself, who is represented by a vice-rector. The rectors have not, how- ever, the entire management of all educational

matters, for primary schools are mostly under the superintendence of the prefect and of a departmental council.

Superior education is given by faculties of theology, law, medicine, sciences, and literature. The faculties of theo-

gatory bylaw. In 1827 only 420 out of 1000 could read ; in 1857 this average liad risen to 675, and in 1867 to 775. The following table was published in 1873 by the general bureau of statistics :—

Can Instrue- + + Can read £ neither : : tion not Sha Can read _ Secer Total. read. 'ie tained. Under 6 years ….....| 3,540,101) 292,348 | 141,595] 38,042 | 4,022,086 From 6 to 20 years…..} 2,082,338 | 1,175,125 | 5,458,097 70,721 8,786,281 Above 20 years….....| 7,702,362 | 2,305,130 | 13,073,057 | 214,005 | 23,294,554 13,824,801 | 3,772,603,| 18,682,749 | 322,768 | 36,102,921

To provide the staff of teachers necessary for these edu- Training cational establishments, training schools (écoles normales) schools.

have been instituted. The écoles normales primaires are now 90 in number, —79 for the training of male and 11 for the training of female teachers. The école normale supért- eure, founded by the decree of the 9th Brumaire, year III. (30th October 1794), provides for the education of profes- sors for the lycées or facultés; it maintains 100 students, who, during a course of three years, not only attain considerable proficiency in literature and science, but are trained to the art of communicating their knowledge to others in an attract- ive and interesting form. It is not, however, necessary to have gone tlirough the course of study of the école normale to become a secondary teacher or a faculty professor; the condition required of students of the école normale, as of others, is to pass a series of examinations, and to acquire the degrees of bachelier, licencré, and agrégé, the last being the only one conferring rights of membership in the uni- versity.

The law of the 21st June 1865 has laid down in the lyeées and communal colleges a special course of teaching, more especially intended to prepare pupils for commercial and industrial pursuits ; it is called exseignement secondaire spécial. A normal schocl, for the training of teachers who choose this line, was founded at Cluny (Sadne-et-Loire) in 1868.

Private Educational Establishments.—The systematic provision Priyate thus made by the state for public instruction in France is supple- and mented in various ways. Not only may any one who possesses special the diploma of bachelor engage in the work of primary and secondary gchools,

logy are established at Paris, Aix, Bordeaux, Lyons, Rouen, Montauban ; those of law at Paris, Toulouse, Aix, Caen,

ee

Dijon, Poitiers, Rheims, Bordeaux, Grenoble, Douai, Nancy ; those of medicine at Paris, Montpellier, Nancy; those of sciences at Paris, Besancon, Rennes, Caen, Bordeaux, Clermont, Poitiers, Dijon, Grenoble, Lille, Nancy, Lyons, Marseilles, Montpellier, Toulouse; and those of literature at Paris, Aix, Besancon, Bordeaux, Caen, Clermont, Dijon, Douai, Grenoble, Lyons, Montpellier, Poitiers, Rennes, Toulouse, Nancy. The faculties not only impart superior teaching, but are also examining bodies, which confer the degrees of bachelor, licentiate, and doctor.

The teaching work of the faculties is in some measure shared by 3 superior schools of pharmacy established in the same towns as the faculties of medicine, 22 preparatory schools of medicine and pharmacy, 5 preparatory schools of science and literature (at Angers, Lyons, Nantes, Chambéry, Rouen),and by the Ecole pratique des Hautes Etudes, founded in 1868 at Paris. Secondary education is given in 80

lycées, attended by about 37,000 pupils, and 244 colléges

communausx, with an attendance which is not much inferior in number to that of the lycées ; but the organization of many of them is still in an imperfect state. The third and lowest stage of national instruction is that of the écoles primaires or primary schools. Every commune of 500 in-

habitants has to maintain a boys' and a girls' school. The law is not yet very strictly observed; in 1871 the total number of schools was 51,881, of which 20,374 were boys schools, 14,837 schools for girls, and 16,670 schools attended by girls and boys together. Primary instruction Steadily gains ground in France, although it is neither gratuitous—except when parents cannot pay for 1t—nor obli-

education on his own account, but recently by a special law sanction has been given to the existence of institutions for superior instruc- tion distinct from those of the state. The Roman Catholic clergy have not been slow to take advantage of this new state of things, and have established universities in which students may get their degrees, as in the old university of France. In 1872 there were, besides the Governmental schools, 657: establishments for second- ary education directed by laymen, and 278 by priests, the latter giving instruction to 34,000 pupils, whilst the 657 others were only attended by 48,000. There are other high class schools devoted to various special purposes, and not in all cases depending on the minister of public instruction. Such are the Ecole des chartes, in which twenty students are trained during a three-years' course to study the documents and historical remains of the Middle Ages ; the Ecole des langues orientales; the Ecole des beaux-arts, which every year sends to Rome its best pupil in each of the departments of painting, sculpture, and architecture; the Ecole de Rome ct Athenes, where young savanis find the opportunity of studying antiquities in the two great capitals of the ancient world ; several special schools for the teaching of drawing and mathematics applied to the industrial arts at Paris, Lyons, and Dijon; the Ecole poly- technique, in which the highest scientific education is imparted to young men who have passed a very difficult preliminary examination, and who wish to prepare themselves for the ordnance office, for engineering, or for high positions in the different branches of admin- istration ; the Ecole spéciale militaire, established at St Cyr for officers; the Ecole de cavalerie, at Saumur ; the Prytanée militaire, at La Fléche, in which gratuitous instruction is given to sons of officers and non-commissioned officers ; the Ecole d'application d'état-major, for the training of staff officers ; the Ecole d application de Vartillerie et du génie, at Fontainebleau, formerly at Metz, where old students of the polytechnic school reccive a more special and developed instruction ; the naval school, at Brest ; the Ecole `Mapplication di génie 'maritime, for students`

of the polytechnic school who are intended for maritime engineering; the Ecole hydrographie, for sea- captains ; the Ecole des ‘ponts et chaussées, which is under the minister

IX. — 65

The In- stitute.

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of public works, and prepares the old students of the polytechnie school for civil engineering ; the Heole des mines, towards which a stage in the polytechnic school is also a first and necessary step ; the Conservatoire des arts et métiers, under the control of the minister of agriculture and commerce ; the Ecole centrale des arts et manufactures, for the training of private engineers and manu- facturers; the schools of arts ef métiers, established_at Chalons- sur-Marne, Angers, and Aix ; the Ecole forestiére, at Nancy, which trains the administrators of the forests belonging to the state and to the communes; the agricultural schools of Grignon (Seine-et-Oise), Grandjouan (Loire-Infeérieure), and Montpellier (Herault) ; the veter- inary schools of Alfort (Seine), Toulouse, and Lyons; the MMazsons déducation de la légion @honneur at St Denis, Ecouen, and Les Loges, for daughters of knights of the Legion of Honour in straitened circumstances.

Notice must also be taken of the Collége de France, in which 34 srofessors deliver lectures to the public on almost every branch of Temas knowledge; the Muséum d’Histoire Naturelle, with 16 lecturers; and the chair of archeology attached to the national library of Paris. Government supports three great establishments devoted to astronomical study,—the Bureau des Longitudes and the observatories of Paris and Marseilles.

The highest institution founded and kept up by the French Government on behalf of science and literature is the Institut de France, composed of five Academies as Tollows :—

Honorary | Foreign

Members. | yembers. | Members.

Academies. Sections.

es os |

40 40

63 40

40

Académie Frangaise ……. Académie des Inscrip-

tions et Belles-lettres Académie des Sciences Académie des Beaux-Arts. Académie des Sciences

morales et politiques.

The Académie de Médecine is a separate body, divided into 11 sections ; it is composed of 100 resident members, and a number of fellows and correspondents, chosen from among the medical celebrities of the world.

VIL Charitable Institutions.

Although there is no poor law in France, charitable esta- blishments, either private or created and managed by the state, are very numerous, and, on the whole, efficient. Orphelinats (orphans' houses) receive infants which have neither parents nor friends to care for them; créches and salles asile (infant schools) gratuitously give shelter and the first elements of education to poor children whose mothers must earn their daily bread by out-door work ; young girls of the destitute class may learn a trade in the ouvroirs or workshops freely open to them in many towns ; whilst lads find employment and agricultural training in such establishments as the colonies agricoles of Mesnil-St- Firmin (Oise), St Jean, Petit-Mettray (Somme), Lesparre (Gironde), Montmorillon (Vienne), &c, There are also other charitable institutions, analogous to those which exist in other countries. Besides these private

charities, more or less supported by Government grants, there is a special department, called assistance publique, a branch of the minister of the interior, established to superintend, and in some cases organize, the bureaux de bienfaisance and hospitals. The bureaux de bienfarsance give out-door relief to the poor when it is deemed necessary. They are 12,989 in number, or about 36 bureaux for every 100 com- munes, a proportion quite inadequate—there should be one for each commune. In1873 these bureaux assisted 1,312,847 people, or an average of 3°61 per cent.; but this help is still very unequally distributed, the average being 18 per 100 in the department of the North, and under 0°35 per 100 in On departments of Corsica, Ardéche, and Pyrénées Orien- es. The total amount of their disbursements, covered by weunsatigns grants, a tax on the theatres, and private gifts,

out 12,500,000 francs which gives an average of less

FRANCE

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than 17 francs (13s. 8d.) for each pauper assisted. The same inequality appears here; for, whilst in the depart- ment of the Seine the average is 26°95 francs (£1, 1s, 7d.) per head, it falls as low as 6°45 francs (5s. 2d.) in less favoured districts.

The number of hospitals, in addition to the Maison Hospi. Municipale de Santé and the seven great establishments tals. of Paris, is 1481, furnished with 161,520 beds, and em- ploying 2673 physicians and surgeons, 3212 officials, 11,032 nuns, and 11,534 servants. In 1873 the number of patients received was 410,441,—that is, 1 patient for 88 inhabitants. Out of 100 patients, 79 were discharged cured, at least for a time, and the death average was not above 9 per cent. Besides the patients who only pass through the wards (37 days is the average duration of their stay), 69,786 infirm, incurable, or old people live as in- mates in some of the hospitals, which are specially desig- nated by the name hospice; this number is divided into 27,256 men, 31,037 women, and 11,493 children. This

population of invalids, both in héprtals and hosprces, was maintained at a cost of 93,269,886 francs.

It must be confessed that all these means of relief, good as they are, provide but very insufficiently for the wants of the million of poor which France reckons among her 36 millions of inhabitants. Pauperism is, there as else-where, a sore which civilization has been as yet quite unable to heal.

The census of 1872 shows that there were at that time Lunatic 87,968 lunatics in France, an average of 2°44 for 1000 asylums. inhabitants. Of these 51,004 were kept at home, and 36,964 in asylums, public or private. In 1873 the number of asylums in France was 102, of which 61 were public; of the 41 private asylums 17 received the poor gratuitously. These asylums, at the end of the year, contained 41,064 inmates, of whom only about 8000 were able to pay for board and attendance; the rest were paupers. The average number of cures was 6 per cent., and of these part only would be permanent.

VIIL Finance.

All the agents who have'the charge of collecting taxes ave Ministry under the minister of finance, who, besides, distributes to the other departments the sums necessary for their expenses. a In each department a trésorier payeur général receives the taxes raised in his district, and is accountable for them to the central office of the treasury at Paris. These érésorers payeurs généraux have a salary of 6000 francs a year, but they also get a percentage on the amount of taxes collected, and are allowed to transact private banking business with the funds of the state, as well as with their own. As security they have, before entering on their duties, to deposit with the treasury a sum, which varies with the importance of their situation, but on an average amounts to 800,000 franes. A part of their business is to pay the creditors of the state in their respective departments. They are assisted in their work by receveurs particuliers in each arrondissement, except that in which the trésorier payeur général resides. These officials havea salary of 2400 francs a year, and @ percentage on the amount that they collect. The security which they are bound to give is five times their total income.

The taxes that pass through the hands first of the receveurs particuliers, then of the trésoriers payeurs gene ’ raux, and finally into the treasury, are of two kinds, direct Li and indirect. The land tax, the poll and rent-tax, the tax) a on doors and windows, the licence tax, and the tax on money invested in public funds or in bonds of private companies (valeurs mobiliéres) are now the chief sources of the direct revenue of the French treasury. The land-tax or contribu- tion fonciére is assessed onthe net revenue of landed property,

FINANCE. |

In order to obtain as correct a vaiuation as possible, a land register book was commenced in 1821, in which every piece of ground has to be described, with its extent and value, and the name of the owner. This work is not yet quite completed, and the continual changes which occur in the ownership of holdings, as well as in valuc or size, will always prevent it from being perfect. As it is, this gives the average net revenue of assessed land in France as amounting to 1,053,907,113 francs 56 centimes. In 1874 this yielded to the treasury a revenue of 169,905,814 francs. Each citizen owes to the state the value of three days’ work ; this is the contribution persovnelle (poll tax). The value of a day’s work varies with the districts ; put it cannot exceed 1 franc 50 centimes (1s. 24d.) or be less than 50 centimes (5d.). Every proprietor or tenant, ex- cept paupers, soldiers in service, and foreign diplomatic or consular agents, is assessed in proportion to the rent of the house he lives in. This tax, which is collected along with the preceding one, is distinctively called contributeon mobiliere. In 1875 the contribution personnelle mobilére gave a return of about 56 millions of francs.

The tax on doors and windows rises in proportion to the population of the communes or towns, the average being 30 centimes (3d.) for one aperture in communes having under 5000 inhabitants, and 1 franc (10d.) in those of 100,000 inhabitants and upwards. In 1871 the 8,467,483 houses in France were divided thus :

Houses with one aperture…..... 276,384 “ hwo dperturess…...ss.se.e- 1,883,924 3 three apertures. ..... 1,601,050 As POUT APCEUULESs.

ccc. —0106 1,112,024 7 five apertures …..... 793,551 Mt six and upwards…..... 2,800,550

The value of the assessment was 43,275,000 francs in 1875; butthe enormous number of houses having only one door, and of those having two doors without a window, or one door and one window, tells strongly against the wis- dom of such a tax.

The licence tax is imposed on every person carrying on any business whatever; physicians, bankers, and manu- facturers are subject to this tax, as well as the humblest shopkecper. On the Ist January 1873, 1,529,363 names were ou the rolls as patentés, and the amount produced by the tax was for the same year 73,726,331 francs.

A law of the 29th June 1872 has established a tax of 3 per cent. on the income derived from money invested in the public funds and from bonds and shares in commercial or industrial companies, 'This tax, added to other duties previously established, as the stamp and the duty of transmission, raises to 74 per cent. the charges that this kind of property has to bear.

These various taxes are collected by agents called percep- teurs, under the orders of the receveurs particuliers or trésoriers payeurs généraux. Their number is 7000,— hardly enough for the amount and intricacy of the work they have to do. They are paid, not by a salary, but by a percentage on the money they raise. The collecting of other less important taxes, as the tax on mortmain, on mines, on weights and measures, on houses and carriages, on billiards and clubs, is also entrusted to them.

The excise revenue, or contributions indirectes, is man- aged by a central office at Paris, with a directeur général, three adménistrateurs, and 94 other officials and clerks of varicus ranks. Each department has a directeur, assisted by inspecteurs, sous-directeurs, and contrdleurs. Under this head are comprised the taxes on intoxicating drinks, salt, tobacco, gunpowder, on public coaches and railways, on gold and silver work, on sugar, paper, matches, soap, stearine, salad oil, receipt stamps ; also the navigation dues, bridge tolls, and a few other special taxes of little import- ance, The excise appears on thé budget of 1877 for a

old

sum of 1,039,293,800 francs. The taxes on paper, soap, stearine, oil, matches, &c., have been established in con- sequence of the war of 1870-71. A numerous staff is employed to collect these duties. Besides the high func- tionaries mentioned above and their clerks, there are 1795 receveurs ambulants, with 4637 commis ; alcohol, matches, paper, salt, &c., require 218 officials ; 200 are employed to collect the navigation tax ; 2038 are attached to the manu- factures of sugar, &c. The total number is above 19,000.

For along time the customs (dowane) were only a branch Customs.

of the administration of the contributions indirectes, but since 1869 they have formed a special office, at the head of which is a directeur général, with a salary of 25,000 francs, assisted by two administrateurs and 93 clerks. As far as this office is concerned, France is divided into 26 districts, administered by 26 directewrs, residing at Dunkirk, Lille, Valenciennes, Charleville, Nancy, Epinal, Besangon, Bourg, Lyons, Chambéry, Nice, Marseilles, Montpellier, Perpignan, Bayonne, Bordeaux, La Rochelle, Nantes, Vannes, Brest, St Brieuc, Caen, Rouen, Le Havre, Boulogne, and Bas- tia. These directors have under them 81 inspectors, 71 sub-inspectors, and 130 clerks of allranks. An armed force, composed of 245 captains, 469 lieutenants, 4056 non- commissioned officers, and 14,207 privates (préposés), is dis- tributed along the frontiers to prevent smuggling ; for the same purpose 1257 sailors, commanded by 371 patrons and sous-patrons, keep guard along the coasts, The customs contributed to the budget of 1877 a sum of 268,355,800 francs, and their collection cost 30,362,105 francs.

There are still other sources from which money flows Other into the treasury. The administration of the enregistrement, Sources of timbre, et domaines yielded 634,605,451 francs in 1877, VNU'

This sum is made up—(1) by the fees charged for the regis- tration of all legal documents and deeds; (2) by shooting and hunting licences; (3) by the sale of stamps; (4) by the revenues and sales of state property; and (5) by

fines of various sorts and the cost to the public of legal proceedings. From this amount 19,038,400 francs must be deducted, being the expenditure required to pay the expense of col- lection. The public forests and those managed by the state gave a return of 38,548,680 francs, and cost 12,995,732 francs. For all purposes connected with these taxes the country is divided into 32 districts, administered by as many conservatewrs, whose residences are Paris, Rouen, Dijon, Nancy, Amiens, Troyes, Epinal, Chalons-sur-Marne, Besancon, Lons-le-Saulnier, Grenoble, Alencon, Bar-le-Duc, Macon, Toulouse, Tours, Bourges, Moulins, Pau, Rennes, Niort, Carcassonne, Aix, Nimes, Aurillac, Bordeaux, Ajaccio, Chaumont, Vesoul, Chambéry, Nice, and Valence. The post office department employs about 32,000 offi- cials, at a cost of about 71,500,000 francs, and yielded 116,126,000 francs in 1877. The telegraph service is under the minister of the interior. In 1872, 123,000 kilometres (76,430 miles) of wires were laid along distances of 44,965 kilometres (27,940 miles). In 1877 the total income from this source amounted to 16,600,000 francs. 'The income from other less important resources, which cannot here be noticed in detail, may be estimated at not much less than 2 millions of francs.

The total income of the public treasury in France, in- National

cluding the revenues of the departments and communes, is above 3,000,000,000 francs (£120,000,000), which is more than any other nation has to pay for the expenses of its government ; and yet this enormous sum has not been sufficient to meet the wants of the state, for repeated loans have constantly increased the public debt. Not taking into account the petty payments of all sorts that Government has always to make, the public debt is divided into funded (dette consolidée) and floating debt . (dette fiottante), The funded debt is not subject to reimburse-

ment, but only to the payment of a certain interest fixed by law. This debt, which was arranged by the law of the 9th of Vendémiaire, year VI. (27th September 1797), to liquidate the old debts of the monarchy, then amounted to 40,216,000 francs of interest to be paid yearly to the creditors. From

1800 to 1814 it increased by 23,091,635 irancs; and the Government of the Restoration added 101,260,463 francs, making a total of 164,568,100 francs in interest. Louis Philippe carried it to 176,845,367 francs, and at the time of the coup @état, it amounted to 930,768,863 francs. The second empire, during a period of eighteen years, created 168,187,663 francs of consols, thus charging France with an annual As an unavoidable consequence of

the public debt, including some other items under the name of capitaux remboursables & divers titres, appears in the budget of 1877 for the much lower figure of 300,226,686 francs.

The following table gives a summary of the budget

for 1877. proposed for 1877 :—

Army.

Com- pulsory service,

Expenditure. Francs.

Ministry of justice and religion ….....cssceseeees 87,960, 485 a5 PORGIOUN AIMMES. .0.c. 0.6.2 sconsdnossessuta ens 12,720,590

e TNGENL Olae sesiscs satimaieencessmecccesestacsless 81,528,386

5 HIMANIGES, socsctbanes sone c

5 VET scene rete eee close sean scsuowaseuss 531,148, 836

ie Marine ANGNCOLOMIES mee. eos seeceeleleeee 186,622,116

of public instruction and the fine arts… 56,628,762

af agriculture and commerce…..... 19,762,388

Ke UDLICHW ORKSi…...0.ccnse see esr eens ace 238, 246,535 Govermment of Algoma: ca) coi. ccieteseicscnesensnnsanes 24,587,322

2,736, 247,962

Receipts.

BD) ineGt itAXGSs.dcosecceo aso seuceeoeuiodueosmes coeommeneeere ..ss2++e-sees secede 227,600,481

2,737,008, 812

IX. Army and Navy.

The principie that every citizen is a soldier is the found- ation of the military system of France; but it has received a new force and a more complete application from the law of the 27th July 1872. According to this law, every young man of twenty years of age, free from bodily defects, owes to the country five years of active service, five years in the territorial army, and six years in the reserve of the terri- torial army. 'The chief causes of exemption are physical infirmities and diminutive stature (the standard of height being 1 metre 54 centimetres or 60°631 inches). In a family of orphans, or of a widow, or of a septuagenarian, or of blind parents, the eldest son is also exempt. If the eldest son is himself blind or invalid, the next one enjoys the privilege. Exemptions are likewise granted to brothers of soldiers on active service, or that have died when so engaged, or that have been pensioned, and to the elder of two brothers who should, on account of their age, be included in the same levy. Men serving in the navy, students of the Polytechnic school, of the Ecole forestiére, Ecole des Langues ortentales vivantes, and Ecole des Chartes, public teachers, and munisters of any of the religions recognized by the state

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are not called upon, but must serve the public in their ro- spective capacities during a period which varies from five to ten years. In 1875, out of a total number of 283,768, 72,065 were exempted, 29,797 of them because of unfit- ness to serve, and 30,073 were deducted from the contingent as serving the state in some of the ways mentioned above, The

law authorizes young men who hold the diploma of bachelier, or a certificate bearing that their studies have been carried on ata public school to a certain fixed standard (certificat @études), and those who pass a special examin- ation held for the purpose, to engage for one year as volun- tary recruits, at the end of which, they are sent home, provided they can give evidence of having received a good military training ; but they are always, as long as they have not served for the time fixed by law, subject to be called out again in case of need. In 1875, 9804 men took advantage of this partial exemption. Voluntary enlistments are also permitted in the French army, which are binding for a period of not less than two years and not more than five. Many soldiers who have completed their legal time of service contract a re-engagement.

[ARMY,

Such engagés volontaires receive extra pay, but no bounty

as formerly. They numbered 24,091 in 1875.

The minister of war is assisted at Paris by 2 general Military directors, a brigade major (chef d'état major), a historio- Sm grapher, a law-agent, and 434 other functionaries of various in

ranks, attended by 108 servants ; the whole costs 1,895,350 francs a year.

Under the control of this central office, the army is divided into 19 corps, quartered in 19 territorial districts, Algeria being one of them. The infantry is composed of 144 regiments (three battalions of six companies each forming a regiment), numbering in all 225,111 men; 30 battalions of chasseurs &@ pied (light infantry), with 8 com- panies in each battalion, giving a total of 18,889 men; 4 regiments of zowaves, 12,000 men; 3 African battalions of light infantry, 3000 men; 5 compagnies de dascupline, 1000 men; 1 foreign regiment, 3000 men; and 3 regi- ments of natives (Algerians), 9000 men. The cavalry consists of 75 regiments, viz., 12 cuirassiers, 26 dragoons, 19 chasseurs and 11 hussars,—numbering 47,498 men; 4 regi- ments of chasseurs d'Afrique, 8812 men; and 3 regi- ments of spahis, 2134 men. The ordnance comprises 38 regiments, each of them having 3 batteries served by foot soldiers, and 6 mounted batteries,—in all

42,500 men; 1 regiment of pontoon soldiers, 1877 men; 15 companies of workmen (owvriers) and pyrotechnists (artificiers), In all 2215 men; 50 compagnies du train, 3870 men. There are 3 regiments of engineers, numbering 9000 men. Finally, 8000 men, distributed into 64 companies, are specially charged with the équipages militaires, The gendarmerie and the republican guard of Paris (mounted police) are also, for all military duties, under the orders of the minister of war, and now form a corps of about 40,000 men. France has thus in time of peace an effective force of about 440,000 men.

The French army is commanded by a staff of 5 marshals, 121 generals of division, and 200 generals of brigade. There are besides 81 generals of division and 197 generals of brigade on the rolls of the reserve.

The following table shows the division of France into 19 military districts :-—

ALGERIA.

AMIENS .u..s0ssssssseeeseeeeeAisne, Oise, Somme, part of Seine-et-Oise, and Seine.

BESANCON .....++-s00reseeeeeeAin, Doubs, Jura, Haute-Marne, Belfort, Haute-Saéne,

; : part of Rhéne.

BORDEAUX; .000.0.s0+0eeeeeesCharente-lnférieure, Gironde, Landes, Basses-Pyrénées, Hautes-Pyrénées.

BOURGES w…00s.s0se0000ee..Cher, Céte-d'Or, Nigvre, Sadne-et-Loire, part of Rhéne.

CHALONS-SUR-MARNE..... Ardennes, Aube, Marne, Meuse, Vosges, Meurthe-et- Moselle.

CLERMONT-FERRAND ..... ae, Loire, Puy-de-Déme, Haute-Loire, Cantal, part of Rhone.

GRENOBLE ecccssecosesesccenss Hautes-Alpes, Dréme, Istre, Savoie, Haute-Savoie, part of Rhone. ;

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teldes zation of France. | alides. hy Louis XIV. as a house of refuge for old infirm soldiers

sion of the state 1,123,053 francs.

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Navy. |

Li MANS...,..00.eeneereeeesee-Eure-et-Loir, Mayenne, Orne, Sarthe, part of Seine-et- Oise, and Seine.

ISYELE sec. sc cccceccecseserseee NOLU, Pas-de-Calais,

LIMOGES 0. .0-s00eseeereeeeee Charente, Corréze, Creuse, Dordogne, llaute-Vienne,

MARSEILLES.....00-.....Dasses-Alpes, Alpes-Maritimes, Corse, Bouches-du- Rhéne, Gard, Ardéche, Var, Vaucluse.

MoNTPELLIER ….....Aude, Aveyron, Hérault, Loztre, Tarn, Pyrénées-Orientales,

NANTES ..,,ececeseeseoeesreeee-Finistére, Loire-Inférieure, Morbihan, Vendée,

ORLEANS .....-100.~~002~~---Loiret, Loir-et-Cher, Scine-et-Marne, Yonne, part of Seine-et-Oise and of Seine.

RENNES ..sce ee eee acces eeeseee-COtes-du-Nord, Manche, Llle-et-Vilaine.

ROUEN ...s0cerseoeeeeerseeeeesCalvados, Eure, Seine-Inférieure, part of Seine-et-Oise and of Seine. ‘

TOULOUSE....,.....0+000.Ariége, Mlaute-Garonne, Gers, Lot, Lot-et-Garonne, Tain-et-Garonne. |

TOURS ..0secessseeceeeseees see Maine-et-Loire, Indre-et-Loire, Deux-Sevres, Vienne.

The national guard no longer exists; one of the first | measures of the Government of M. Thiers, after crushing the Parisian insurrection of 1871, was to suppress it.

Some institutions must be mentioned here as attached to the war department, and completing the military organi- The Hétel des Invalides was founded

of all grades; but the number of the inmates is always decreasing, as old soldiers now generally prefer to live at home on their pensions and private resources, rather than to live in common apart from their families and under military discipline. In 1875 the Znvalides numbered only 642; but the same year the maintenance of the Hétel cost The order of the Legion of | Honour, founded by Bonaparte in 1802, embraces both | soldiers and civilians among its members, It is composed | of knights (chevalier’s), officers, commanders, grand-officers, and grand-crosses. The chief of the government of France has the title of grand master, and is the head of the order, which is managed by a grand chancellor and a council, the members of which are appointed by the president of the republic, as well as all the / égionnaires, whose number is now about 38,500.

Under the minister of the navy and the control office at |

Paris, which employs 260 officials, there are five maritime prefects, one in each of the maritime arrondissements of France. These are—Cherbourg, with the subdivisions of Dunkirk and Le Havre; Brest, with St Servan;

Lorient, with Nantes ; Rochefort, with Bordeaux; and Toulon, with Marseilles, Nice, and Bastia.

The naval officers in active service are—2 admirals, 18 vice-adinirals, 30 rear-admirals, 343 captains of ships or frigates, and about 1377 lieutenants and officers of inferior rank. There are besides 14 vice-admirals and 20 rear- admirals on the rolls of the reserve.

The recruiting of sailors for the navy is secured by the inscription maritime, established by Colbert in 1681, and regulated since by various decrees and laws. Accord- ing to the law as it now stands, all fishermen and men em- ployed on board merchant ships must have their names Inscribed in a special register, and are bound to give, Whenever required, a minimum of three years' service in the navy. In 1873 this register contained 151,830 names. A special body of ordnance, called artillerie de marine, is com- posed of 243 officers and 4216 soldiers, part of whom are in garrison in the colonies. The general staff of the naval ordnance at Paris is composed of a general of division, 2 generals of brigade in active service and 2 in the reserve, 1 colonel, 2 lieutenant-colonels, and a few subaltern officers. The administration is divided into 6 directions, the seats of which are Cherbourg, Brest, Rochefort, Toulon, Lorient, | and La Villeneuve.

_ The marines in the fleet number about 15,000, divided | into 4 regiments with 780 officers, and a staff consisting of | 2 generals of division, 4 generals of brigade, 1 chief of battalion, and 3 aides-de-camp.

FRANCE

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The fleet consisted in 1876 of 110 vessels of all sizes (10 of them iron-clads of first and second rank), armed with 529 guns, and of a reserve comprising 18 iron-clads and 60 other vessels.

X. Roads.—Railways.— Navigable Rivers and Canals,— Harbours.

Before referring to the state of agriculture, manufactures, and commerce in France, it is important to have an idea of the means of communication by which the different pro- ductive districts are connected with one another. The minis- ter of public works has the superintendence of all roads and ways, natural or artificial, by land or by water. A special department, called Administration des Ponts et Chaussées, assisted by a council with the minister as its president, is charged with the management of that important branch of public business ; 569 engineers and inspectors, and 2153 inferior officials form the administrative staff.

Roads are either national, departmental, military, or Roads,

vicinal (cross roads). National roads are kept up entirely at the expense of the public treasury. The departments have to provide for departmental roads and a portion of the military roads, the rest being charged on the state. As to cross roads, or chenvins vicinaux, they depend, by an awkward anomaly, on the ministry of the interior, and are kept up by the communes, or, when of a higher importance, by the departments. At the end of 1811 229 roads were classified as imperial roads. They ex- tended over a length of 46,500 kilometres (28,894 miies). In 1815, after the territory of France had been brouglit back to its ancient limits, the length was only 27,200 kilo- metres (16,901 miles); in 1873 there were 223 na- tional roads, giving a total of 37,304 kilometres (23,180 miles), 2627 kilometres (1632 miles) of which are still paved like a street. The average breadth of that class of road is 16 metres (52 feet 6 inches), 6 metres for the cause- way, 6 for the sideways, and 4 for the ditches and embank- ment. Although the great extension of railways has some- what reduced the importance of high roads, it has been calculated that the traffic has changed very little during tlie last twenty years. The departmental roads are not quite so wide as the national ones, their average breadth being 12 metres (39 feet). In 1872 their length was 46,939 kilometres (29,167 miles). Military roads were made in the west of France, after the last insurrection of Vendée. They are 28 in number, distributed in the departments of Charente-Inférieure, Ille-et-Vilaine, Loire-Inférieure, Maine- et-Loire, Mayenne, Sarthe, Deux-Sévres, and Vendée, and extend to a length of about 1500 kilometres (932 miles). A sum of nearly 34 millions of frances is spent yearly for the purpose of making new roads or repairing old ones. The chemins vicinaux, or cross roads

establishing a communi cation between rural places not far distant from each other, are managed by a special branch of the department of the minister of the interior; about 3000 agents-voyers and 42.000 cantonniers or workmen are specially charged with the duty of keeping them in repair. In 1872 these roads, divided into three classes according to their importance, were 544,390 kilometres (338,273 miles) in length, and covered a surface of about 370,000 hectares (915,000 acres). To the very considerable resources which the cora- munes must apply to the extension and repair of their rural roads the Government used to add a yearly grant of 11,500,000 francs; but this sum has been reduced to 5,750,000 francs since 1873. The Axnales of the adminis- tration of the Ponts et Chaussées mention 1982 large bridges, of which 79 are cast iron. The chief are the bridge over the Gironde at Bordeaux, which has 17 arches, is 501 metres (1643 feet) in length, and cost 6,850,000 francs ; the bridge of Cubzac, over the river Dordogne ; the turn-

Railways.

Navig- able rivers and canals,

518

ing bridge of Penfeld at Brest; the bridge St Esprit, over the Rhone, with 18 arches on a length of 730 metres (2395 feet); those of Toulouse, Libourne, Tours, and Rouen ; the new bridge (Pont-Neuf) and the bridge of Iena at Paris ; and the bridge of La Guillotiére at Lyons. Although the system of railways in France is far from. being so complete as in England and Belgium, the country is now traversed by great lines which connect together all the principal towns; and lines of less importance have been made, or will ere long be established, in every dis- trict. The chief lines, which are worked by powerful com- panies under the superintendence of the state, are —(1) the Chemins de fer du Nord, which run between Paris and Soissons, Boulogne, Calais, Rouen, Amiens, &c., traverse the coal districts of Picardy, and reach the Belgian terri- tory at Quiévrain and at Tournay; (2) the Chemins de fer de UV Est, from Paris to Strasburg, Mulhouse, and Basel in Switzerland, through Alsace, with branch lines to Sedan, Metz, Luxembourg, Rheims, Sarreguemines, &c., joining Bel- gian and Prussian railways at several points of the fron- tier; (3) the Chemins de fer de

(Ouest, which traverse Normandy in every direction, and connect Paris with the towns of Brittany; (4) the Chemins de fer dOrléans, which go to Nantes, Bordeaux, Limoges, Bourges, and Tou- louse; (5) the Chemins de fer de Paris & Lyon et ala Méditerranée, which connect the valley of the Seine with that of the Rhone, and have branch lines to St Etienne, Clermont-Ferrand, Grenoble, Toulon, Cette, &c, esta- blishing regular and direct communication between France and Switzerland,—the railways of Savoy being also worked by the same company. Paris is the starting point and the administrative centre of all these lines. Another great line worked by the Compagnie du Midi, starts from, Bordeaux, which it connects with Cette and Bayonne, with branches between Bayonne, Toulouse, and Foix, Agen and Tarbes, Toulouse and Auch, Montpellier and Milhau, &c. Through this line Spain is brought into communication with Frauce. The other lines worthy of mention are—the railways of the Charente', connecting La Roche-sur-Yon, La Rochelle, Rochefort, Coutras, Angouléme, Saintes, Limoges, and St Jean d'Angély ; the line from Chauny to St Gobain; the railway of the docks of St Ouen, Paris; the line from Dunkirk to Fumay (Belgian frontier); those from Epinay to Velars, from Béthune to Lille, from Somain to Anzin and the Belgiau territory, from Vitré to Fougéres, and from Perpignan to Prades ; the Médoc railway; the Ven- dée railways; and the Chemin de fer de ceinture, which encircles Paris. The capital required for the making of these railways has been calculated at not less than 10,000,000,000 francs— which gives, for a total length of 21,987 kilometres (13,662 miles), an average of 297,000 francs per kilometre, or £19,118 per English mile. The state has granted and still grants large sums to the companies; but in return they are subject to a tax in proportion to their traffic, as well as to other dues, which are a considerable source of revenue to the public treasury, the profit realized by it having been 55,942,330 fraucs in 1873. The yearly re- turns of the companies show an average income of 840

millions of francs. __All navigable rivers are state property. A table is sub- joined of the navigable rivers arranged by basins, with the length of their navigable course, and also of the canals and the small rivers which have been converted into canals. Owing to the cheap rate of transport by water, canal traffic has been but little injured by the exteusion of rail- hae this inexpensive way of conveyance being used for ae ta whenever practicable.

In 1875, 1,721,070,943 Uivied ik. ons (about 1,748,500,000 tons avoirdupois) were y Tiver and canal navigation, besides 176 551,434

FRANCE

[COMMUNICATION,

cubic metres (230,933,000 cubic yards) of – wood or bois flotté. The duties levied on these goods amounted to more than 4,177,940 francs.

Navigable Rivers.

Kilo- yy; Kilo- 4). 5. metres. Miles. Lorre, continued— metres, Miles. PSOE) psccnppeerpacceccncoocne, 1°55 78 Sevre-Nantaise…..... 20 192 Midouze.::.:teee ee. aS 27 POUL. . ..ccssscassacseeeee, Mae 7 30h Ganpoirereccaccaeremncooo rN hs; \ViieNNG'....cctscscceenn. TO Re Gave de Pau …..... 9 5A | WYRM SG eee ee -scer eco ~~*so ree eas CHARENTE.....0.000ceee0e*~~ *— 190 118 | MOSELEE.....0.. 173 108 IBOWtOnNe see… cacroe-asc 20 PACTITC .....:-:10se-ee ee 3 Sévre-Niortaise…..... 71 444) ORNE BVIEMEO ccc ott sen esaser er ceureO 16 TOUQUES:..:.0<.2.<:ccee ae? 28 G!RONDE TRHONE ...:scccrsoceese cessor) UG) meee TOR SMEs sacar eeeeeses oc 541 AUINy socsssssccecesert eases smn 564 Mordgenetes terete. Ca aaa, Doubs..... 987° "aT Garonne ccscrecae BIE = ZAE VIR Ve eess ccocuartcice 158 = 99 MSG fe conccies eoseseess sess ss) eee 89 Petit-Rhiéne..... 57 354 MO sh sccesccusacredesss ae Mae SAGME.....c.cccececscecee GUE MAT able cccccccccssccccssese IHG «© QTR) GuSeille , .- 22 eee WiEZClGtr sss cccctecceecceecee BaD, 37 SBINK 0 sesesecsccsccascstuenees O00 Wegeree MOM eer. ccee eee oll PISTIC . <0... ac0000 + coteseereeey ELD 37 (A@BeMG ale .nsscaccece ~~ sng O 14 JAUIDE:. come ccetcassiee 45 28 MMlier eevee re. eae LOL PUT'. .csstsessesaceeseene: Meee 9 (CINE aE R aeRO EERE DOCECEEEEER 4 583 Grand-Morin\.....¢.....5 1G 10 GTEUSCI sccmecsttesesess LG 10 Marne ....c.c0cc+aceeceseses ete TDS 00) cpoppporseepbepoeaocsce, 0] 875 OCC wae: Sk: Date, eeeeerccnereerete, Lt 72 NQMC) so, casinesie seece ene 73h Mayenne ....ceeeecereeeee LB 8B VILAINE ceeesceeseeeneecee WE 895*

MulOnM..... cece ae 1 — mlicheccrscrsesceescecseses) Laas 82 6960 4826 Canals. Kilo- 4; Kilo- 4,- metres. Miles metres,

Miles. From Aire to La Bassée... 48 27 | Latéral,A la Marne..... 67 = 43 From the Aisne to the Latéral & l'Oise..... 29 18 MEAT Ns scotescreresescsseree (OO 3 I Lisit i eeireteeertdsBesSencs Ul 3l Wardennes iss seeds. scxaic-->-- 1106 6G, | qhanieamp.....-2-20-m- 2 3 From Arles to Boue..... 47 292 | From Marans to La Ro- , From Berguesto Dunkirk 8 5 ehelle..... Beeseeceaeds Mee 15 Bennyacsht sseicss-sss--e Coe » SED. axon the Marne to the Pe eciie-crsscensacccsececccenes MOU Bit RULING. otecce st ttesctess5e. ZOE PE OUGDOMGP HS -+-c-csivse-cnes gee 18. | Haute-Afarne.::.-28.... 39 See Bourgogne.....+se. 242 1502 | From Mons to Condé..... 5 3 NOnIATC cote seeks. toe 87. | From Nantes to Brest... 860 223} (Cis) fru Se eeaeesecoaronteceeeeccces 1 254 | Nemffossé...csso.cs:-.-+-+- a0 pace! entren veces ee LE Gy WNivernals .....s0-:s-scccess Lote From the Charente to the OrlGang.....000 sees 46 Clandiihegenemoraciaocsda: 2) 20 | From the Rhone to the Connemara fb Zee BDINe .....5--2ecnecceeo SO Pew Ec necnepercancmocecaceog ac) 402 | From Roanne to Digoin. 56 39 SC ecco ecu eaaies scien cs eee 15 | St @uentin.....:..-—— Latéral 21a Loire…..... 207 1283 8315 2060 Rivers converted into Canals. Kilo yr; Kilo- are metres. Miles. metres. Miles. AG. Sa 8 Re 29 18 | Part of the Olse…..... 105 653 TOK uti Pnceoempeworoereeeaenag 3) 39 | Scarpe Sopdet Sl Tee TLGS AR acoomeeEeene Pecnccsocgpem Ss) 113 —_— — Thi Gicoconcoccoomborepetincns Se) 338 299 1853

her long tract of coast washed by the Atlantic and the Bay of Biscay has scarcely three or four good seaports, and those on the southern shore of the channel form a striking contrast to the spacious maritime inlets on the English side. To begin from the north-east, Dunkirk has a small harbour, enlarged, however, by docks, and approached in the Duteli manner by a canal leading from the sea. Calais, one of the best ports on the coast, is not to be compared with Dover. Boulogne has a roadstead, which has been of late greatly deepened and improved. The port of Dieppe is €X- posed, and of course unsuitable for winter. The best mer- cantile harbour in the north of France, Le Havre-de-Grace, at the mouth of the Seine, has large basins and docks, formed at a very great expense. Cherbourg is now a port and arsenal of great utility and importance to the navy; its roadstead, extensive

but open, has a sea-wall, affording protection from the swell of the sea; and its spacious dock, excavated since the beginning of this century, at an expense of £3,000,000 sterling, is capable of contammg fifty sail of the line. St Malo, on the north coast of Brittany, possesses a good and large harbour, with quays extending to a length of 2,950 metres (3231 yards); its entrance is protected by fortified islets. Brittany also possesses Brest, the great maritime port of the Atlantis

France is but very inadequately provided with harbours ; Harbours.

ree 2

Agricul- tural popula- tion.

Progress in agri- culture.

Average land

Grain crops,

AGRICULTURE.]

for the navy, and, in the south-west, Lorient. Proceeding further to the south, we find Nantes, with its two ports at the mouth of the Loire, Paimbceuf and St Nazaire ; Les Sables d'Olonne, now connected with Liverpool by a regular service of steamers ; Rochefort, on the Charente, one of the great dockyards and naval stations; La Rochelle, a small but secure harbour ; and Bordeaux, where the Gironde is nearly equal in width to the Thames at Lon- don. From this there is no seaport worthy of mention until we reach Bayonne, a place of difficult access. On the Mediterranean, France las the ports of Cette, Marseilles (the most spacious and secure on the coast), Nice, and the great maritime port, arsenal, and dockyard of Toulon.

XI. Agriculture.

The rural population of France is equal to about a half of the total number of the inhabitants. The census of 1872 gave a return of 18,513,325, or

52°71 per cent. of the whole population. That number was divided thus: —

Landowners living on their estates ……..... 9,097,758 RIM ESRATOGHOMAIIGS «ccc 6esetestccerssecaennsces 4,570,068 Gardeners and NUISCTYMEN «2.0… -ceeee eee eee 378,827 Woodcutters and charcoal burners……..... 270,743 RE PERRS Se Mtn cc Seite ns sn sistie aaah sr acts sens 940,311 PP ME OUEUS css scusecscesersterscentscereres once' 3,255,618

In the general description of the country, some infor- mation has been given as to the nature of the soil and its various kinds of produce, which must be supplemented here. The extent of agricultural improvement in France since the first Revolution has certainly been less than in England and Scotland, and it has been repeatedly said that this in- feriority had its chief cause in the insignificant size of the occupancies, a feature of French agriculture which Arthur Young observed in his time, but which has been much in- creased by the law obliging a father to make an almost equal division of his property amongst his children. It would be perhaps nearer the truth to say that generally the more fertile a country is the less care the inhabitants take to cultivate it ; if we add to this the influence of the climate, which makes country people more frugal, and at the same time more indolent, we shall be able to account for the difference in the state of agriculture as between the northern and the southern provinces'of France. It does not appear, however, that land thus divided produces less in proportion than large estates, and, notwithstanding the great progress that France has still to make, it is in an agricultural point of view as rich as any other country.

The Statestique Oficielle gives a statement of the average

alue of land per hectare, and the average rent paid for it, distinguishing in each case three classes of land, thus :— 1) Lands under tillage: value, 3066, 2175, 1355 francs; rent, 96, 69, 45 francs; (2) meadows: value, 4151, 3958, 2022 francs; rent, 152, 104, 72 francs; (3) vineyards : value, 3564, 2638, 1783 francs ; rent, 139, 98, 68 francs.

The value of wood varies from 2877 to 1435 francs for the forests, and from 1081 to 569 francs for copsewoods.

The cultivation of grain has always been the chief busi- ness of French agriculturists. In 1873 about 13,000,000 hectares were under this crop, and in 1875 this had in- creased to about 15,000,000, distributed thus :—-

Hectares. re oP | Total Produce. Hectolitres, Hectolitres.

6,966,419 12°04 83,861,193 503,178 12°50 6,287,301 1,912,601 10°86 20,779,367 1,118,071 16‘75 18,732,827 3, 182,456 1°33 67,891,995 677,626 14°35 9,722,257 505,993 A= 72, 8,918,352 49,984 12°24 612,031

FRANCE

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Wheat sells at prices varying from 20 to 26 francs a hectolitre (46s. 6d. to 60s. 5d. a quarter), and costs the agriculturist about 17 francs 50 centimes (40s. 8d. a quarter). The quantity which is produced in France, large as it is, does not meet the wants of the population, and several millions of hectolitresare every year imported from Russia, Prussia, Roumania, Spain, Italy, Egypt, and America.

The cultivation of meslin and rye is on the decline; wherever the progress of agricultural science had succeeded in making a poor soil more rich and fertile, wheat takes their place, as being better and more profitable.

The area allotted to barley has been much the samo for a long period, and is likely to remain so. The same may be said of maize, which is especially cultivated in the east and south-west, and of buckwheat, which in Auvergne and Brittany forms no small part of the food of the inhabitants. Oats are extensively cultivated, and

yield a good return; this crop was on the increase from

1815 to 1862, but has since been almost stationary. Potatoes form a very important article, occupying in Other

1873 1,176,496 hectares (2,907,290 acres), and. yielding ‘Tops.

120,410,929 hectolitres (331,274,554 bushels). The other crops are tabulated here with the results they yielded for 1873 :—

Hectares. Average Crop. Total.

Hectolitres, Hectolitres.

Pease, beans, &c…..... 322,681 leer) 4,434,107

ce lee us Rs eae 482,247 13°68 6,567,381

olza and other olea- ;

ginous plants …... 21°08 Ihg 4.062, 42} Olive: treds:.... cc: s00c e002 148, 626 Bee 4,594,010 Quintals, Quintals.!

[BCS Rade eae E SAPS ONPG E 258,335 306 77,435,100

PGW Sec. wes cdeesecanecsates 3,528 14 50,244

14, 858 12 ile nee

95,521 5°28 503,941

87,671 PHS 503,917

Miscellaneous…..... 10,900 20 319,898

1 The quintal métriquets 3} Tb less than 2 cwt.

Meadows, both natural and artificial, are very numerous Meadows.

in France, and give a higher return than any other kind of land. Artificial meadows, sown with clover or lucerne, have considerably increased in extent, as will be seen from the following comparative table :—

1842, 1862.

1852,

Hectarcs. Hectares. Hectares. Natural meadows…... 105,108,888 | 129,290,229 | 160,095,347 Artificial meadows…) 47,256,674 | 84,806,847 | 103,663,376 Pasturage of various || 99 509,000 | 36,049,858 | 39,355,398

kinds

eee eeeeeseerens

174,860,562 | 250,146,934

308,114,121

The vineyards cover 4‘27 per cent. of the surface of Vine- France, and are one of the chief sources of its agricultural yards.

wealth. They are to be found, more or less, in every dis- trict, except in ten northern departments, viz., Calvados, Cétes-du-Nord, Creuse, Finistére, Manche, Nord, Orne, Pas-de-Calais, Seine-Inférieure, and Somme. In 1862, according to statistical documents then published by the Government, the departments in which the vine was most extensively cultivated were—Hérault (162,172 hectares), Charente-Inférieure (157,753), Gironde (126,220), Charente (100,008), Gers (94,790), Gard (94,200), Dordogne (87,252), Aude (81,869), Var (79,040), Lot-et-Garonne (69,166). The vintage of 1876 gave a total of about 41,846,748 hectolitres (921,033,017 gallons).

The census taken in 1872 gave 2,882,851 as the total Live number of horses, comprising 400,454 colts, 351,654 stock.

stallions of 4 years and upwards, 872,911 geldings, and 1,257,832 mares. The number of mules was 299,129,

Ministry of agri- culture,

Textile manufac- tures.

Linen.

520

and of asses 450,625. The returns for the same year gave 10,023,716 head of eattle and 24,707,496 sheep. The goats, particularly numerous in Corsica and some mountainous parts, were 1,791,725. The addition of 2,500,000 beehives, of a total value of about 32,800,000 francs, 58,300,000

poultry of all kinds, and 2,300,000 dogs completes the enumeration in its principal divisions of the live stock of agrieultural France.

Tn France the interests of agriculture are entrusted to a special minister. Under him are general inspectors, whose duty it is to visit the different parts of the country, and to report on their respective position and wants. These reports serve to determine the distribution of grants and re- wards which the state dispenses every year. In 1869 the sum of money given as relief in eases of fires, eattle diseasc, and damage caused by storms, frost, or excessive drought, floods, and other aecidents, amounted to 2,171,340 francs. As rewards, the state gives premiums to the owners of the best stallions and broodmares (826,000 franes in 18738); it supports by grants riding schools and establishments for training horses (160,500 francs), gives prizes for race- horses (404,500 franes), and distributes about 1,400,000 franes a year for the creation and maintenance of agricul- tural societies. The principal object of these societies is the organization of provincial shows of eattle, implements, and agricultural produce, under the name of comices agri- coles. The Government has, besides, founded institutions that are entirely under its management and belong to the state. Sueh are the sheep-folds of Haut-Tingry (Pas-de- Calais) and Rambouillet (Seine-et-Oise), the cow-house of Corbon (Calvados) for the breeding of Durham cows only, and the haras or stallion stables. These stables, eontain- ing together about 1085 horses, and kept at an expense of 1,844,000 franes, are established in 22 central towns, and send stallions every year to 340 stations. Two great banking establishments have been founded in order to help those who are engaged in agricultural businces. The one, the crédit foncier, grants loans on land seeurities; these loans amounted for the year 1872 to 45,482,242 francs 60 cen- times, divided among 1156 borrowers. The other, the crédit agricole, which dates from 1860, discounts bills and lends on personal or other seeurity, but always with the object of promoting the progress of agricultural pursuits. In 1872 this compauy negotiated bills to the value of 248 millions of francs. It paid the same yeara dividend of 15 franes for each 500 francs share. The crédit foncier, which is an older institution (1852), paid 35 franes for each share of the same value.

XID. Manufactures, Mines, and Quarries.

Q ne of the foremost branches of manufacture in France is that which has for its object the working up of textile materials. The gross amount of its produce is not less than 3,500,000,000 franes a year, and statistics published in 1873 return it as employing 308,481 men, 306,898 women, 69,948 children, 2777 steam-engines, and about 9,500,000 spindles. These figures relate to the period between 1861 and 1865, and are certainly very much less than if the enumeration had been taken more reeently.

The flax gathered in 1873 weighed 54,874,740 kilo- grammes (1,081,276 ewt.), and represented a minimum value of 84 millions of franes; to which must be added 10,188,721 kilogrammes (200,766 cwt.) of hemp, at an average price of one frane a kilogramme. About 800,000 spindles are kept busy with this material. In this branch a trade the department of Nord ranks first 3 it manufac- ot than one-third of the total amount of linen pro- =. Seine, Sarthe, Maine-et-Loire, Scine-Inférieure,

alvados, Ille-et-Vilaine, Lot-et-Garonne, Indre-et-Loire,

and Seine-et-Oise are, next to the department of Nord, the chief seats of this industry.

The eotton manufacture has its centre in Normandy, Cotton,

More than a third of the total produce of the French cotton looms comes from the department of Seine-Inferieure ; Nord, Vosges, Calvados, Aisne, Aube, Orne, Meuse, and Eure have also a large share in the production of eotton yarn and cotton cloth. The department of Rhone is famous for its cotton muslins, the value of which is not less than 28 millions of francs. Meurthe produces a special kind of trimming, valued at about 3 millions of franes a year. French cotton goods cannot cope in eheapness with the English, but they are of fine quality, and on this account command a sale in the markets. In the absence of auth- entic documents, we may safely estimate the produce of eotton manufaetnre for 1872 at 500 millions of francs, and the plant engaged in the trade at 6 millions of spindles and 260

millions of looms of various kinds. The loss of Alsace has been a heavy blow to the cotton trade of France.

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In the woollen factories 3,200,000 spindles are employed, Woollen,

giving work to more than 172,000 people. Wool fabrics amount in value to 1,200,000,000 franes, figures which present a striking contrast to the valuation of Count Chaptal in 1812, which was uot above 250 millions of franes. Large manufacturing houses are to be found especially in the departments of Ardennes (Sedan), Nord (Lille, Cambrai, &e.), Marne, Eure (Louviers), Hérault ; while Rhéne is noted for shawls, Bouches-du-Rhéne for washing and combing, Calvados for wool yarns, Aisne for both yarns and tissues, Aude for drapery, &c. The special manufacture of Paris is that of shawls, damuasks for furni- ture, merinos, and lighter fabrics as gauzes, muslins, bareges, &e.

The rearing of silk-worms and the production of silk can Sik

be traced far back in the industrial history of Franee. The firsts Avignon pope, Clement V., is said to have introduced the first silk-worms and the first mulberry trees (1308). This branch of industry soon assumed a national character, and all kings who, like Louis XI. and Henry IV., eared for the progress of commerce and manufactures, gave it encouragement and privileges. In 17&0 France produced 6,600,000 kilogrammes of cocoons (14,549,194 ib), having a value of 15,500,000 francs. The following table shows the progress made in the rearing of silk-worms from that date :—

Weight of Cocoons. _Value.

Kilogrammes. Cwt. Franes.

1781-88 6,200, 600 122,167 18,600, 000 1789-1800 3,000,000 59,113 9,800,000 1801-1807 4,200,000 82,761 13,600,000 1808-12 5,147,800

101,436 17,502,550 1813-20 5,200,000 102, 463 21,520,000 1821-30 10,800,000 212,808 44,080,000

1831-40 11,537,000 Dodo 42,840,000

1841-45 17,500,000 344,631 66, 500, 000 1846-52 24,254,000 477,911 91,816,000 1853 26,000, 000 512,335 117,000,000 1863 9,578,804 188,745 51,916,837 1867 14,082,945 277,496 98,580,515 1869 8,076, 545 159,144 60,170, 260 1872 9,871,116 194,505 60,707,363

aaa ee ee A Se eS

These 9,871,116 kilogrammes of cocoons gave 636,800 kilogrammes (12,547 ewt.) of raw silk, Twenty-one de- partments are engaged in the rearing of silk-worms,— those which yield the largest produce being Gard, Dréme, Ardache, Vaueluse, Bouches-du-Rhéne, Var, Isere, Heérault, Basses-Alpes, &c. After having undergone the various operations which transform the eocoon into regular yarn, the silk gocs to the weaver. Nine-tenths of the silk 1s

| | t

ni

Lace The manufacture of lace gives employment to 240,000 | send out not less than 7,400,000 hectolitres of beer andem- women at Alengon, Bailleul (Valenciennes), Lille, Chan- | (162,871,543 gallons), worth about 200 millions of frances ; broidery. ¢ily, Caen and Bayeux, Mirecourt, Le Puy, and Paris; and | but, as hops are but little cultivated in France, 3 mil- there are 150,000 embroiderers spread over Paris, Lyons, | lions of francs are spent yearly in importing them. The Nancy, Epinal, Tours, Mirecourt, Lunévillc, Plombiéres, | largest manufactories of vinegar are in the departments of St Mihiel, St Dié, Alengon, Tarare, Caen, Le Puy, Lille, | Loiret and Loire-Inférieure ; it is nade almost exclusively Cambrai, St Quentin, &c. The two industries contribute | from wine, but malt and some other substances are now to the public wealth about 90 millions of francs every | beginning to be used. ‘The total value is about 3 millions year. of francs. Hosiery. Cotton hosiery has its central point in the department The

dressing and tanning of hides and skins has greatly Tanning. of the Aube, wool in Picardy, and silk at Nimes, Lyons, and | increased of late years ; it now represents a sum of 400 Paris; the last also manufactures nearly the whole produce | millions of francs, or about a million of francs more than of France in linen hosiery. The annual value of this | in 1852. branch of industry may be stated approximately at 200 The principal soap manufactories are at Marseilles, its pro- Soap. millions of francs. duction being 800,000 quintals (1,576,354 ewt.) ; Nantes Bue The number of shoemakers is above 83,000, and they | and Paris hold the second rank. It has been calculated naking. employ about 120,000 workmen and assistants. Shoes of | that France produces annually 2 millions of quintals cloth (chaussons) are made by 819 firms, employing 5200 | (3,940,886 cwt.) of soap. Candles are chiefly made at Paris, Candles. workmen and assistants ; and wooden shoes, an important | This branch of manufacture has a total value of 300 branch of the business, are made chiefly in the departments | inillions of francs, whilst the production of soap amounts of Cantal, Orne, Sarthe, Vosges, Vaucluse, and Puy-de | to 450 millions. French perfumery is appreciated through Per- Dome, and in Brittany, by 34,700 makers, assisted by | the world, and gives a yearly return of more than 50 fumery. 77,500 workmen, It has been calculated that this article | millions of francs. iloves. has a value of about 530 millions of francs. Paris, Gre- The departments of Vienne, Seine, Sarthe, and Puy- Pottery noble, Lunéville, Vendéme, Blois, Béziers, Annonay, and | de-Déme are the centres of the fabrication of earthenware and glass. Niort are the chief seats of the manufacture of gloves, | and bricks; in Haute-Vienne, Var, and Gironde the which represents a sum of about 70 millions of francs. special manufacture is china. In 1847 official statistics dther Hats and caps are made every year to the value of 50 | valued at 85,964,000 francs the total produce of that lothing. millions, by 6200 heuses, employing about 24,000 workmen. | industry ; but this value has certainly more than doubled Millinery, chiefly made in Paris, gives work to about 4000 | since. | A great manufactory kept up by the state at persons, most of whom are women. It may be valued at | Sévres forms a school in which artistic workmen are 25 millions of francs. Tailors and outfitters of all kinds | trained, so that the art is maintained in a high degree of number about 74,000, and give work to 82,000 workmen, | perfection. Crystal wares are made in eight works, esta- Seamstresses, and shop-assistants. blished in the departments of the Meurthc-et-Moselle, Beet

Beet sugar is extensively made in the north of France. | Seine, and Orne, among which special mention must be uga. The manufacture of this sugar in a raw state was thus | made of Baccarat, which is to this branch of industry what distributed for the year 1876 :— Sevres is to the ceramic. Looking-glasses are a very im- Kilogrammes. Cwt. portant article of manufacture in France,—that country ALSS® cobceess eee eee 92,721,965 1,827,034 possessing no fewer than 6 out of the 15 or 16 establish- Nord sssessessssseeeesttsessee 111,114,778 2,189,454 ments in Europe. The principal manufactory is at St Le coscoaeeeeeenneeaeeeercnEpeeee 41,367,892 815,131 . . Pas-de-Calais…..... 60,102,110 '1.184.278 Gobain (Aisne), and the value of the produce of the whole on nis 67,747,541 1,334,997 is above 14 millions of francs. Glass of a more common Other Departments …..... 75,817,002 1,493,931 kind is made in about 250 establishments, and is valued at These quantities are produced by about 510 manufac-| 80 millions of francs. The departments of Nord, Haute- tories. Ninety establishments are especially engaged in | Sadne, Haute-Loire, Allier, Seine-Inférieure, Seine, Avey- : refining the first produce extracted from beetroot, or from | ron, and Loire are famed for common window and plate the sugar cane; about 180,000 tons of raw sugar are | glass; bottles are chiefly manufactured in the department received annually from the colonies, French and foreign, | of Nord, and in the basins of the Loire and Rhéne; the by these refining establishments, which employ 3400 | most ancient works established for this manufacture are | workers. The yearly value of the manufacture amounts | at Quiquengrogne (Aisne), and date as far back as 1291. ; to 140 millions of francs. The most important paper-mills are situated in Charente, Wine, treacle, and the juice of the beetroot are the Pas-de-Calais, Seine-et-Oise, Istre, Vosges, Seine-Inférieure, Seine, Eure, and Seine-et-Marne. Paris is celebrated for

Liquors,

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MANUFACTURES. |

woven at Lyons, by 120,000 looms, belonging to 400 firms, with nearly 800,000 workers, who every year produce silk goods to a value of about 460 millions of francs.

substances from which the largest quantity of the alcohol produced in France is extracted. About 3500 firms are engaged in distillation ; the produce for the year 1875-76 Was divided thus :—

FEAN CE

O21

Brittany are the chief centres for the production of cider. In 1876 about 7,035,669 hectolitres (154,845,539 gallons) were manufactured. There are about 3200 brewers, who

its paper-hangings and stained papers. In 1856 Moreau de Jonnés valued the produce of this manufacture at 55 millions of francs. Notwithstanding the special taxes

Hectolitres. Gallons. | now levied on it, this amount has undoubtedly increased Alcohol distilled from WAGE Yeeens.., . ae 415,967 9,155,295 by a large sum.

y 1 corn and potatoes _ 97,467 eee In the period between the Ist November 1811 and the Books | 3 treacle." Gartrad — asinodt7ao | STst December 1872 603,849 works have been published a2 | " 99 other substances.. 48,017 1,056,838 | in France, subdivided thus :—

nic a an ee Books and pamphlets in all languages …..... 463,617

1,558,209 34,295,661 ines a and plans opens Soyeee 85,787

To this 429,648 hectolitres (9,456,409 gallons) are to be Musical publications …..... ea 5 tae added, distilled by small proprietors who do not manufac- In 1872 the number of publications of all kinds was ture much more than for their own consumption, and are | 15,744, 3614 of which were musical works, and 1571 en- known by the name of bowdlleurs de cru. Normandy and | gravings, maps, or plans. Proprietors of political news-

IX. — 66

Coal.

Peat,

Tyron.

522

papers must deposit with the treasury a guarantee that they will pay the fines to which the press law often renders them liable; security to the amount of 24,000 francs is required in the department of Seine, and 12,000 francs in the others. If the paper appears only once or twice a week, the security required is only 18,000 francs in the depart- ment of Seine and 6000 in the rest of France. The paper on which political newspapers are printed is charged besides with a tax of 20 franes per 100 kilogrammes (about 8s. 13d. per cwt.). Notwithstanding this 854 political newspapers, 910 of which were daily, were published in France (54 of them in Paris) in 1873. Non-political periodicals were not fewer than 1220, to which number Paris contributed 718, divided thus :—religious, 81 ; educational, 21; legal, 42 ; administration, 18; political economy, insurance, and commerce, 40; stock-exchange interests, 39; medical, 54 ; natural philosophy, 45; agricultural, 37; military and naval, 23; history and geography, 17 ; fine arts and archi- tecture, 49; literary and critical, 56; fashion and [the amusement of the young, 84; archeological, 14; public works, 26; technology and popular science, 50.

The printing and bookselling trades are carried on by about 7000 persons, who may be classed as follows :—

Printers Printers and lithographers

Copper-plate printers Booksellers

The principal mines which France possesses are coal and iron mines. Coal-pits are almost exclusively confined to the east, south-east, and north of the country. The richest departments are Nord (239 square miles), Pas-de-Calais (201), Gard (187), Sadne-et-Loire (165), Hérault (113), Loire (110), and Bouches-du-Rhéne (107). The whole area is about 2200 square miles, and comprises 623 sepa- rate concessions, which, however, are not all

being worked. The yield of coal mines in 1876 was 170,477,613 quintals (16,795,824 tons), the following being the most productive districts :—

Names of the Basins. Departments. Quintals. Valenciennes …...seccereeeeeeeseeeeres Nord, Pas de Calais …..::ssssecee eeee 65,832,909 TiRren Deets cceeettessorreccss OOiNG RD OBE en -tece-senraveracneenacs ng 34,717,183 AIaiS cccccccsescceecsvececvecscsccenseercesenee ATOCCHE, Gard …-creeeeereeeererccoerees 16,448,587 Creuzot; Blalzy …..-seccseeccreree SAONC-CL-LOIE «+0. ~~++. 9,905,876 COMMENLLY.....~~-ceeeerecresecetcneeceeeees PIGS Gaespenpcnocbocte 2) 952195227 AUDID o.cceecssccecccecscseeeecencreceeesenees AVEYTOD. «10. c0eceeceeeeecees 7,046,129 ANTS ppeecereee … Bouehes-du-Rhéne, Var 3,545,100 GraisseSSAae …~~..00+ HEraullt …ccccccccesceeeeere 2,757,831 Carmaux …... . Tarn 2,571,700 Ahun.…...~~ . Creuse… ee 22a. ..- cons 2,10 01808 Brassae….. . Haute-Loire, Puy-de-Dome…..... 2,020,896 Ronchamp ….esesccserecessceereeerecearens Jeli, 0) epacenoesoroncooenpcaocoorng mlb. ‘$h 234 St Eloy….. sesecee PUY-AE-DOME o…..s:ceccreccenecreaee 1,772,765 Deeize Iweeton INULX PF @eebopenceoneoomeecnacsomocmoqnag IYO Ee Si) Epinae ….. sopgpenee .. Sadne-et-Loire….....sss-ceeeeeees 1,490,170 Lhe Maine ….....sseceeseeeeeeneee wes Mayenne, Sarthe …...seeeeeeeee 1,190,680 Ti 2uI DY concenreporooninmnrseepoceoncocaenee: 2S” Si rceensenoecccogenatpemonaaacoes coats 1,086,520 Hardinghem …...csccesessereessereeeeees Pas-de-Calais… .ceseccesececssecererees 942,734 PrssGehoirG ies. cc. occetcstaeeesss—« KRONE SINE Lene, Maine-et-Loire… 680,293 Vouvant, Chantonnay …....++ssee Deux-Sevres, Vendée.. aad 5,819 BuxiWre-la-Grue vvcccccecesceccveeeeseseee ADMICL ceseseceseeesererseneers 437,282 Manosque w.cssscsccreereesecreessesceseeees Basses-Alpes, Vauelus 388,054 IESE cacen en ncontsosno uecbormocnccenonecsee 2 tll GIF ggeneppomccanengusccas 358,145 Sainte-Foy-l’Argentibre …....seeue. RNONC.....+ 332,103 Maurienne-Tarentaise, Briangon …. Hautes-Alpes, Savoie …....+ 299,690

Peat is to be found in 40 departments, but especially in Somme, Pas-de-Calais, Loire-Inférieure, Isére, Oise, Seine- et-Oise, Aisne, Nord, Doubs,

Marne, Vosges, and Aube. The cutting of this fuel, so useful to the poorer classes, gives work to from 30,000 to 40,000 men, whose wages amount to a total of about 4 millions of francs, The mines of mineral tar yield about 3 millions of quintals (295,566 tons) annually. Saéne-et-Loire, Allier, and Ardeche are the principal centres of its production.

France is very rich in iron mines; but as these are generally far from the districts which produce coal, the

FRANCE

[MINES,

working expenses are considerably increased, and some: times to such an extent that the metal extracted cannot repay the outlay required for its extraction, and the mines have to be abandoned. 'The production of iron, however, ts on the increase, and reaches 74 millions of quintals (738,915 tons), which represent about 14,500,000 quintals (1,428,571 tons) of pig-iron. The details in quintals of this production for 1876 are appended :—

Departments. | Pig-Iron. lron. Departments. Pig-Iron. | Tron. Allier wceceeeeeeeeee| 947,730] 247,990 |) Marties…...s cece eeees 29,226 Ardeche….....| 808,597 || Haute-Marne. 841,193 |} 822,026 'Ardennes …....) 142,700| 848,650 || Mayenne …..…….| 20,553 130 Ariége … 209,195| 87,550 || Meurthe-ct-Moselle | 3,267,959 | 568,393 Aube ….. 1.200 | 69,906 || Meuse …...ssssee 176,150] 125,000 Aveyron… 297230 | 368,250 || Morbihan …....0.| 25,350 ; Bouches-du: INTE Cc ocpermacnanadcno: 203,187

Rhone …~~eee~~ 225,000} 18,400 |) Nord…....cs-eee| 1,486,525 1,778,348 Charente …..... 6,750 || O1SE .. 1 ceeeesecescerenes 166,653 Cher ..cccecceseeees] 351,185 | 84,596 || OTME w.rrcrreeserseersees 1,900 COPS ...00seeeeeeeee 48000] 12,000 | Pas-de-Calais…....] 602,390 6,000 Céte-d'Or …....} 110,200} 150,450 Basses-Pyrénées …. 4,432 Cotes-du-Nord .. 14,750 25,006 | Pyrénées-Orientales 79,074 Dordogne…....-. 54,900} 44,823 | Haut-Rhin (Belfort 11,313 DOHUS Rss… ern se = 30,677 | 32,412 || Rhone…..... | 697,737 TDiS0P3) Seicoonpeeboepoe 43,520 Haute-Sadne….....| 128,785 | 20,570 Finistére …..... 4,767 || Sadne-et-

Loire …...| 1,506,927) 509,925 Gard ccassscceseeef 854,868 | 255,878 |] Sarthe …... ccc eeeee 8492! 1,442 Haute-Garonn 17/000 |(SavOlG… oeaneeees 2,850} 1,255 GG OMME Hasvencc- = 55,000 9,442 || Haute-Savoie…..... 7,960 lle-et-Vilaine… 19,790 1,550 || Seine ….....eeee eee 240,400 THe Tee aoaenepocooe 39,970| 16,925 || Seine-Inféricure ….. 6,040 ISTE .cuceseeseeee-l 220,369] 73,145 | Seine-ct-Oise…..... 25,085 Tura .esccsececeeees] 297,310) 167,110 | Somme…....seeeeees 8,300 Landes ….---.-.| 152,185 | 25,566 || Tarn…..srseseeeeeres 1264 Loir-et-Cher…... 2,350 | Tarn-et-Garoune … 53,500] 49,750 Loire ….ceceeeeeee-| 467,895 | 569,901 || Vienne…....—eee- ,600 Loire-1nféricure 83,600} 66,500 | Vosges….. 17,075 Lot-et-Garonne 128,000 j| YOMME co scercvceeseeees 96,806

14,495,877 |7,882,716

In some iron-works, especially those which are established in the chain of the Pyrenees, wood is still used as fuel : 185,024 quintals (18,266 tons) of iron were made by this process in 1876. The production of steel was for the same year 2,618,767 quintals (258,006 tons), the largest part of which came from the departments of Loire, Sadne-et- Loire, Gard, Allier, Nord, and Rhone.

tracted, viz, 39 of silver ore (galene argentifere and alquifoux) in the departments of Hautes-Alpes, Finistére, Gard, Haute-Garonne, Ille-et-Vilaine, Istre, Loire, Haute- Loire, Lozére, and Puy-de-Déme ; 12 of copper (Rhone and Vosges) ; 8 of antimony (Cantal, Haute-Loire, Lozére, Puy- de-Déme) ; 4 of manganese, and 1 of nickel. There were 5066 men employed in working these mines, which gave a return of 4,955,515 francs. But these statistics cannot be relied on, except for the year of their publication, as old mines are constantly closed and new ones opened. In 1869, for example, there is no mention of silver mines, and the mines of manganese are 9 in number instead of 4 as given above.

The quarries of France are about 24,000 in number, giv- Quamies.

ing employment to more than 88,000 men. The last valua- tion of the produce was made in 1846, and amounted to 41,047,519 francs, but it must be much higher now. Marble is abundant, especially in the departments of

Pyrénées, Bouches-du-Rhone, Puy-de-Déme, Hérault, Hautes-Alpes, Corse, Ariége, &c. Alabaster is found in the departments of the Yonne, in the valley of Aspe (Pyrénées), at Lagny (Seine-et-Marne), and at Montmartre (Paris). Lithographic stones are cummon in the departments of Ain, Indre, and Céte-dor. Slates are principally extracted from the quar- ries of Cherbourg and St L6 (Manche), Angers (Maine- et-Loire), and Fumay (Ardennes). Limestone is abundant in 50 departments, and 38 yield plaster.

Paris is the chief centre of the manufacture of artistic me @ 81 ver 5

objects in gold or silver; in 1860 the workmen wer 18,731 in number, distributed among 3199 establishments, and the business was transacted to the value of not far from 184 millions of francs. Lyons holds the second place, and

In 1864 there Other were 64 mines from which other metals than iron were ex- metals,

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then Bordeaux, Marseilles, Nimes, Besancon, Clermont-Fer- rand, and Toulouse. The gross value of the various metals used by the trade at the same period was calculated at 52,625,000 francs, silver forming about a third of the whole.

The manufacture of watches and clocks yields a revenue of 30 millions of franes. Large iron clocks are made at Morez (Jura); time-pieces are constructed in part at St Nicolas d'Aliermont (Seine-Inférieure) and at Montbéliard, and finished at Paris; watches are begun at Montbéliard and Cluses (Haute-Savoie), and finished at Paris and Be- sangon. This last town is the central place of the trade, and represents 994 per cent. of the total manufacture ; 15,000 persons, men, women, and children, are employed in this trade, and in 1872 they turned out 135,276 gold and 259,626 silver watches.

XIII. Commerce and Banking Establishments.

Commerce is naturally divided into home and foreign trade, the former being greatly more important than the latter. It is impossible to give a strict and correct valua- tion of the inland traffic, but, judging of the whole from the few accessible details, we may, without exaggeration estimate its amount at about 35 or 40 thousand millions of francs. The gross weight of goods conveyed through the canals and navigable rivers has been given above (p. 518); these goods principally consist of coals, wood, stones, metals, wines, corn, and other heavy materials. This mode of conveyance is slow, but cheap, the duty levied varying from 1 to 5 centimes per 1000 kilogrammes per kilometre, z.¢., the maximum rate is about 3d. a ton per mile.

The administration of public works published in 1867 a table of the traffic on French railways by goods trains, from which the following is an extract : —

Metric Tons. Metric Tons.

Flour and corn…..... 8, 238, 369 | Manures…..... 521,932 Wine, spirits, and vine- (Con! Sas enaseeeeeeeeeee 11,638,662

2° ones eee 2,670,424 | Carriages, ... 11,724 Grocery and provisions 1,836,678 | Horses .. ..00.. 218,504 ee 38,298,317 | Cattle .. ite esesecces OPQ2ONO OM Building materials….. 5,242,354 | Miscellaneous …..... 10,124,766

In 1869 the total weight of goods conveyed by petite witesse (goods trains) was 44,013,433 metric tons.1 Since that time a considerable increase has evidently taken place, the consequence at once of the general progress of com- merce and of the great extension of railways.

The coasting trade has always been of great importance in France, though it is far inferior to that of England. In 1875 the total weight of goods transported by coasters was 2,022,559 tons, an increase of nearly 7000 tons on the preceding year. These goods were of various kinds, — building materials (258,174 tons), wines (225,595 tons), Salt (213,185 tons), wood (207,211 tons), corn and flour (199,461 tons), coals (125,243 tons), being the chief articles in the general traffic. 62,396 vessels, the tonnage of which amounted to 3,207,933 tons, were engaged in this trade, while in 1874 there were only 57,888, of 2,952,414 tons. The harbours most frequented by coasters are Mar- seilles, Le Havre, Bordeaux, Dunkirk, Rouen, Cettes, Dieppe, N antes, St Nazaire, and Boulogne.

The annual produce of river and pond fishing in the interior of France may be valued at about 10 mil- lions of francs. Coast fishing was carried on in 1871 by 8995 boats, manned by 38,150 meh, with a tonnage of 68,517 tons, giving a return of 51,609,200 francs. In 1875 the increase was considerable, the number of the

boats being 20,159, the tonnage 101,852 tons, the crews 0 Sse EAE Eee eee 1 The ton here and in what follows (as well as in the table) is the French metric ton of 10 quintals, which is about 33 tb less than the ‘nglish ton,— the latter in commerce being held equivalent to 1015 kilogrammes,

68,651 hands, and the revenue 61,780,160 francs. The same year 178 vessels, with a tonnage of 30,295 tons, and manned by 7800 men, sailed from French ports to fish for cod on the coasts of Newfoundland; the year before the number of the boats engaged in cod fishing was 188. The average value of the Newfoundland fisheries is estimated at about 17 millions of francs. 'The rearing of oysters has of late made very great progress in France. Large beds are established on almost every suitable point of the coast, as at Cancale, Auray, Marennes, Oléron, and Arcachon. The last-named place is the most important of all, the beds being not fewer than 2427, which gave for 1876 a return of 3,941,309 frances, represented by 196,885,450 oysters, 4,700,000 of which were shipped to England,

In 1510 towns a duty is levied on goods, especially upon Oetrei,

provisions and liquors, brought to market for public sale, or disposed of privately. In 1871 the total revenue yielded by this tax, which is known by the name of "octrot," was 156,490,935 francs, divided as follows :—

Franes, Franes. AAT a oo ASAD ROOM | Piiel….cceececcessces 17,704,919 Cider 2,1 il jao |) WOdter…....-.. <0. 7,906,196 Si, ae 8,997,298 | Building materials… 7,891,322 Other drinks…..... 15,624,090 | Miscellaneous …..... 5,319,968 PROVASIONS. . <..0<...0c00 41,847,475

The following table shows the returns of the octroi tax, in the towns where it yielded more than 1 million of francs for the years 1874 and 1876 :—

1874, 1876,

Franes. Franes, HATIG toe Seccscesorsscesectasccececssae 98,896,890 124,238,118 HON OS re sccsscosascacoscsteeeeeeteeets 8,570,618 11,138,497 MRAMSCIUNGS, ...0220..0cccseeeecoees 6,228,699 9,782,279 BSONUGATEX! sccss.cePUOUCTI be ocvocrcctctre aces seteeiees 2,883,526 8,499,820 Whe HANYC!::..ccsscoscscossssccceees 2,309,623 2,484,347 Re THIGNITIG® 0. 22-coccneceeee ¢ 2,847,545 Rheims . 1,072,340 Roubaix …. 1,350,249

1,095,857 1,107,082 1,096,869 1,363,654 1,140,029 1,207,100 1,277,581 1,148,469 1,023,582

Wrersaill@s) -sceeeccsscsceeeeste ee 1,146,738 (Grenople =. -ccccerecscer stor seeeee 1,049,734

This tax is far from being uniform, the percentage in some places, as Paris, being as low as 4°76 francs for every 100 inhabitants, and in some others, as high as 13:55 (Amiens), 14:15 (Rouen), 14°98 (Bordeaux), and 15°56 (Versailles). It is fixed by a decision of the municipal council, sub- ject to the sanction of the legislative chambers. If the average of the tax be reckoned at 10 per cent. of the value of the goods liable to it, the returns would show that such goods have a value of about 16 millions of francs, not including, of course, the considerable trade which is carried on in places where no octroi has been yet established.

Although the principles of free trade are now better Foreign, understood in France than they were formerly, and are trade.

generally considered by French economists and statesmen as most conducive to the interests of a nation, their appli- cation is still far from complete, owing to the enormous charges brought upon the country by the late war, but chiefly to the personal influence of M. Thiers, the first president of the republic, who was a determined uphalder of protection. This is not the place to enter on any dis- cussion of the merits of the two opposite doctrines ; but the fact does not admit of question that, notwithstanding the tax on raw materials and other duties which hamper the commercial intercourse of France with other nations, her foreign trade has been constantly increasing. The imports amounted in 1875 to 3,537,000,000 francs, and the exports to 3,872,000,000 frances (goods in transit not

524:

24 millions for imported and

goods over the year 1874. 3,074,900 francs.

quintals (195,938 tons) entere

FRANCE

being included in these numbers), which is an increase of

171 millions for exported

In 1869 the value of the imports was 3,153,100 francs, and that of the exports

Foreign goods weighing 1,988,770

d and left France in transit

during the course of 1875, showing a decrease

quintals as compared with of this class are silk goods cottons, woollens, jewellery,

manufactured leather, corn, coffee, &c.

1874,

The

of 318,745

The principal articles (value 137 millions of francs), gold and silver plate, mats,

commercial

transactions of France with foreign countries and her own colonies are shown in the following table, the returns being

those of 1875:—

Imports. A Value. Countries. Eyanes. England…….~~+++: 624,300,000 Belem. ....~~—+.~~++:~~ 439,200,000 (Gla wiTE INN? op soansecooDe 349,000, 000 [0s hronppenoseereeeen: 322, 500,000 JRTISSIEY coooneannnnanacéos 196,500,000 United States…..... 190, 200,000 British India …..... 129,500,000 UMGKES7 pogepses Gpeendec 122,500,000

Algeria …..cccseseeee 108,600,000 ho Ul? Rec eee ueeeractr 94,100,000 Siyaltzerlama secen-sse 93,700,000 Argentine Republic. 90,000,000 (QIN ccocopsseoancseone 88,600,000 ANQEIDEE), Gononbosadoooger 57,900,000 JDSTHi ce coo coneccnaceosser 51,600,000 TRIES! cnoposeveonesonneT 50,500,000 SVEN. a onconononanceoosc 45,700, 000 ISIGTINL 5 saeeeeReenanee eee 40,700,000 Ways se.ec ore sees 39,700,000 Spanish America…. 37,600,000 ISA Di: pcopsconacnepnnsce 36,500,000 IVoliein dlQteeseeee cere: 38,200,000 West Coast of Afriea 32,500,000 Mex biinigitG ings… +=. 24,900,000 Barbary States…..... 24,700,000 St Pierre & Miquelon 24,300,000 INIGIESZNY 5 ooconconteonoDe 21,600,000 Island of Réunion … 20,000,000 Guadeloupe …..... 17,800,000 a Ws: currence sacs 15,900,000 Cie. sau: 14,000,000 Vetezela ….:2…< 1s. 12,800, 000 New Granada ..... 9,900,000 Sencgal 9,600,000 IVE RUC OM ercasGecesnns 9,100,000 Mutely Indies=::..... 8,900,000 IPantinieel scussenoson gee 8,000,000 French colonies in Thiele Wreaneencnonesere 7,800,000 ie 6, 000,000 Greece ee viee ee seccueces 5,800,000 English colonies in PAUIDICAM nse nsec 5,300,000 English possessions in Mediterranean 2,300,000 British America..... 2,100,000 Cochin-China..... 1,900,000 Siam ....cceceeeeeeeeees 1,700,000 Mayotte, Nossi-Bé,&c. 1,700,000 Philippine Islands... 1,300,000 Guatemala .c..cc.000s- 900,000 IBGE Babcacondecono: 900, 000 Duteh colonies in ATMETIGCA: ho .cc0se es 400,000 Wrecks and Salvages 400,000 Denman. osqeie...~~: 300,000 St Thomag.…….~~:- 300, 000 French Guiana…..... 300, 000 Islands of Oceania… 200,000 Holiviee sc nsecees 100,000 Australia;,. ...cot

3, 536,700,000

With re

Exports.

Countrics. , Bugland 0.2.2.5 1,067,200,000 Belgimm…….....60 527,200,000 (CACRETENNY Gap ooaponoor 426,900,000 Switzerland…..... 315,200,000 United States…..... 264,400,000 Wes. ois ~~neaes 218,700,000 AMIG@ 1H) co nbacenecunee 146,100,000 SyPRNED o soneancnesageec 140,600,000 MIG VAe. esecccees cos 75,600,000 Argentine Republic 74,500,000 Bradt Sserca nap acetone 73, 200,000 Nate lamdteeeeesseces.~~

~~50,200,000 IRATSSIa weeceeseies ccs 47,300,000 AE ova cavedunaae 42,100,000 (Clin iesepsedanenaceeda 31,200,000 Portugal vee. c6 25,400,000 Wert ot sae gaeceeer 23,800,000 Spanish America.. 22,100,000 1S ENG emeEarmteen capac 21,800,000 PANUSERIeUr ees ee ese: is 21,400,000 New Granada …... 19,000,000 Greece: voceeaeses ees 17,800,000 MiCKIEO vse sce seescs 17,600, 000 Martinique …..... 15,400,000 USHER? Soone oonapne 14,100,000 Barbary States….. 13,700,000 Sweden …...0..0+0e+ 13,200,000 Guadeloupe…..... 12,200,000 VA WAM chuceeces se 11,800,000 StePhomeasy fese.c.~~ *11,200,000 INORG Grcancanecene 10,600, 000 British America … 9,000,000 Island of Réunion. 8,300, 000 English Indies …. 8,200, 000 West Coast ofA frica 8,100,000 Vientemelar…....: 7,600,000 Denmark…..... 7,000,000 English colonies in*

BSMTIGR) mere cnn ess 6,600,000 English possessions

in Mediterranean 6,600,000 StPierre& Miquelon 6,200,000 French Guiana….. 5,200,000 Seneca lems aes 4,800,000 Cochin-=Chinar….. 4,800,000 Islands of Oceania 3,300,000 Dutch Indies …... 3,200,000 (@hiitias, Feeces sees nee: 3,200,000 Guatemala…..... 2,300,000 Dutch colonics in

PATIVERICAR seen ae: 1,600,000 HE GUAbOT ec secs.c eee 1,200,000 ONGTICH oo once jdetics 900,000 French colonies in

iia eee sce sees 900,000 PACS iivalliaeee eee eceeee 600,000 Philippine Islands 600,000 WBolitvatar csencceeren ect 400,000 Mayotte, Nossi-Bé,

| TOR 800,000 Siam… ; 200,000

3, 872,600,000

gard to the nature of the goods, the values of

the imports and exports (1875) were as follows :—

IMPORTS. Francs. Silk and floss-silk …830, 100,000 WOO) Lo WSseqneubesaaenans 326,500,000 VAN; COULOM con eccer emer

321,300,000 Hides, skins, and ae. 2.03, 300,000 @ealsiios. sacs epouoonee 188,200,000 Common woods…... 164,100,000 ce cece 138,600,000 (OR TEA saodansnseencsones 111,600,000 Colic eee sectors 105,100,000 Iie aot et ane 90,500,000

Oleaginous grains. ... 90,500,000

@ottonsstutisy sees. 84,400,000 Woollen stuffs…..... 78,100,000 Foreign sugar …..... 58,400,000

French colonial sugar 51,200,000

Cotton yarns …..... 42,600,000 Vegetable oil…..... 42,600,000 Tanned hides…..... 42,200,000

Oleaginous fruits…. 38,800,000

Slike s GUMS eps ae assis or 37,200,000 Ores of all kinds …. 36,500,000 Coppetaresacscscsercr 34,100, 000 Engines and machi-

TOY cansdcnasnenanene 32,400,000 Guanoand other man-

WIRGS qgeBeeancree eee 29,700,000

Cheese and butter… 28,800,000 Fruits for the table. 27,800,000

Seapiishityace c.. agence 26,600, 000 Nitrates of soda and

OL POPES. .....0006s 24,100,000 SUS PDG ORES ponnonpesoen 23,500, 000 GMCASESIs cea irsscceiciectine 22,900, 000 1 -ary0 eae aeareeces 21,800,000 Exotic woods…..... 21, 800,000 Tobacco (in leaf)..... 21,100,000 IbWOUKERC) sa canaenmodcancen 19,500,000 Woollen yarns…..... 18,300,000

Fresh and salt meat 17,900,000 orsesWs.15-cc:aseaesemee 17,500,000 NMG rey poeeecec ee cneeras 16, 400,000 idee con eS 16,300,000 Pe cecetums 15,200,000 Tel D/PBb5 coesnosoonannpoane 15,200,000 AVTTIES Sescacceseneeereeeee 14,600,000 Tron and stecl…..... 14,000,000 WWAIINORE cescaceceecete ces 18,800,000 Mineral oils and

ESSENCES 5250225000 18,400,000 MEME... cesesssecse 13,300,000 Implements and tools 13,200,000 Paper, books, and

engravings. .....0. 12,600,000 Cocontenantec sees 12,500,000 1k ee. an 12,200,000 Flax or hemp yarns 11,200,000 Pease, beans, and

pease-meal…..... 8,300, 000

Brandies and spirits 7,900,000 SUING? socsooanaasnace 7,800,000 (CRSTSTRO sapeocenouseeeD 6,700,000 Seed sterrsscc.—say.-: 6,400,000

Manufactured tobacco 4,100,000 Jewellery, gold and

silver plate..... Articles made of

leather or skin…. oe NOM gs sanaeaan oconeae Watches and clocks. 2,200,000 Eggs of silk worms.. 900,000 Miscellancous…..... 412,600,000

3,600,000

2,700,000 2,500,000

3,536, 700,000

[FOREIGN TRADE,

Exports. Francs. Silkjstulisi yee 376,700,000 Woollen stuffs…..... 346, 400,000 WAMES... 2. 2.. 0. cceerenee 247,500,000 Com .. ..ssccme em 202,700,000

Mercery, toys, and

fancy articles …... 181,100,000 Manufactured skins 173,300,000 Refined sugar…..... 152,100,000 SUNG) ssacoee ssss.133,000,000 Cheese and butter… 96,100,000 Tanned hides…..... 89,500,000 Ready made garments 86,100,000 Woolls)...scnecastee eee 84,100,000 Cotton stuliss a. , 81,500,000 Horses, mules, cattle 80,700,000 Brandies and spirits 79,500,000 Implements and tools 70,600,000 Jewellery, gold and

silver plate ..:...c0 60,500,000 Earthenware, glass,

and crystal ~~.csee 60,000,000 Paper and its appli~~

Cations… .-.seeeee 58,800,000 Raw sugar…..... 53,000,000 Raw cotton …..... 52,000,000 Higgs… ..s.~~0eee 46,500,000 Chemicals 2.2… 45,800,000 Mallinéty:. 0.2.2. 42,200,000 Common woods…... 41,400,000 Raw skins and furs 41,100,000 Fruits for the table 39,400,000 Woollen yarns …..... 36,700,000 Jurmens' .....5.+2:0eeeee 35,500,000 Seabfish: .....0.c0.eeee 30,200,000 Seeds ..i.0.…0~~: cee 29,700,009 Engines and machi-

TASTE YenpNaBpoen cade 3° 25,000,000

Potatoes, pease, beans 28,900,000

*Flax and hemp …... 19,800,000 Articles bearing '*fancy " prices … 17,500,000*

Watches and clocks. 17,400,000 GTeHSES «.....0-40eeee 17,200,000 Oilzealeesi=))-.. .-e ere 17,000,000 Building materials… 16,800,000 Oleaginous fruits and

BOCAS). a jcnccisiemseeenee 14,100,000 IREVES pa agooopaancos0ae +6" 18,900,000 Vegetable oil …..... 18,700,000 Weapons. 07 eeee 18,300,000

Musical instruments. 13,100,000 Flax or hemp yarns. 12,700,000

ARV ANT: oisees eidac eee 11,200,000 Oalls:, 6.03.2. ee 10,700,000 olours).:2 eee 10,300,000 IDIAWS8F caoseanegssaoaoc: 10, 100,000 COUPET..... <.0302s5eem 10, 100,090 Melt hats..,... 20-0 9,800,000 Iron, cast-iron, steel 9,000,000 GER. .... 260-00 8,900,000 "Parisian" articles. 8,600,000 @andiles), sactseuccemeeen 8,100,000 Perfumery …....0a 7,200,000 Garancine…....0+ 4,900,000 Ores of all kinds….. 4,500,000 Saltemeati.q0sseeees ,200,000 Cotton yarns …...22) 4,100,000 Madder …0..-«.ssne 4,000,000 Salfton …... tees 3,200,000 Tidigo:.....:.0e 2,700,000 Manufactured tobacco 2,400,000 Miscellaneous …..... 349,500, 000

3, 872,600,000

The whole export and import trade, along with the salt tax, brought in the same year to the custom house a returm of 267,907,791 francs, divided thus :—

Import duties….....6000 Export duties….....s0s0+ Droits de statistique…..... Navigation duties….....

Accessory duties

Del bata . «asics } PAPERS

eee ce ere eereceessaes

Cen cervceecccsasesesestossesees

Francs. a eee -seeee.228, 457,837

353,018

Ae

24,907,791

Banks,

Coinage,

BANKS. |

The foreign trade is for a great part carried on by sea. France, however, has a very limited number of trading vessels ; and foreign ships, chiefly English, convey about two-thirds of her goods, both imports and exports.

Besides the two banking companies especially founded with a view to assist agriculture, of which notice has been taken under that heading (crédit foncier, crédit mobilier), there are other establishments of credit which partake of the nature of public institutions, and must not be passed over in

silence when speaking of French trade. The first of them is the Banque de France, founded in the year VII. (1799), and definitely organized by the law of the 26th April 1806, which gives the management of the bank to a governor aud two deputy governors appointed by the chief of the state, and assisted by a council of fifteen régents and three censewrs elected by the shareholders. The capital of the Bank of France is 182,500,000 francs. Besides issuing bank notes, which circulate as freely as gold, the bank has the power to discount bills and letters of exchange at three months, when endorsed by three signatures; to collect bills payable given to it by private persons or com- mercial houses for that purpose; to receive déposits and open current accounts; and to keep in trust the coupons, deeds, silver and gold bars, bullion, and jewels which may be entrusted to it, at the rate of one per cent. per annum. The Bank of France has now a branch in each depart- ment. In the following towns, Bourg, Cahors, Tarbes, Aurillac, Mende, Tulle, Digne, Belfort, Foix, Gap, Mont- de-Marsan, La Roche-sur-Yon, and Meaux, these branches are not yet open; but the law has been passed, and their being opened is only a question of time. This establish- ment is the great instrument of credit in the country. It has more than once supported the Government by loans in difficult circumstances. The Government, which holds a great number of its shares, is therefore interested in its preservation, and, when money is unusually scarce, gives to its notes the value and privileges of coin, by decreeing what is called the cows forcé. This measure was resorted to during the late war, and confidence in the bank remained unshaken. During the year 1876 the quotation of the shares of the Bank of France fluctuated between 3875 and 3470 francs, Of other banks the Comptoir ad' Escompte, which dates from 1848 and was reorganized in 1854, the Société générale de Crédit industriel et commercial, founded in 1859 after the model of the London joint stock banks, the Société générale pour favoriser le développement du Commerce et de U Industrie en France, established in 1864, whose special feature is to endeavour to make the use of cheques popular in France, and the Caisse des Dépéts et Comptes-courants, are also worth mentioni ng. Among the local banks, the Crédit Lyonnais, the Colonial Banks, and the Bank of Algeria may be named, as the most important.

The coining of money is carried on by private contractors under the strict superintendence of the state. There are now in France six Aétels des

monnaies (mints), in Marseilles, Bordeaux, Lille, Lyons, Paris, and Rouen respectively. Paris is the chief centre, and the other mints hardly now issue anything except copper coins. From 1795 till the Ist January 1874 the quantity of gold and silver monies coined in France was as stated below :-—

GoLp. }

Value, francs.

44,346,400 46,568,700

204, 432,360

4, toh ae 6,273,174, 360

965,051,690

210,947,190

7,744,520, 700

1 It is to be remarked that no gold money was coined in 1872 or 1873.

FRANCE ‘a5

SILVER.

1795-1871. 1872, | 1873. |

Value, francs. Value, francs

389,190 | 154,649,045

Value, franes.

4,685,641, 250

a tae 70,512,344] 7,547,588 | 1,056,152 ee ead 86,998,118} 15,958,333 19,101 ,, 0°50 centimes| 40,480,856] 2,943,258 545,862 » 020 4, 2,504,728 ” ”

4,886,137,296] 26,838,369 156,270,160 Total, 5,069, 245,825 francs.

This amount (with 307,232,889 francs value re-coined) is apportioned thus among the different governments which have ruled France during the period specified :—

Gold. Silver.

; Value, francs.

Value, francs. Value, francs,

106,237,255) 106,287,255 528,024,440) 887,830,055) 1,415,854,495

389,333,060| 614,830,110 52,918,920] 632,511,320

215,912,800/1, 756,938,333 1,972,851, 133

First Republic …...) Bonaparte and

Napoleon I. ... § | Toms SVT, ... SUC > One Louis Philippe…....

Second Republic….| 427,282,860! 459,248,282 886,531,142 Louis Bonaparte | aah Napelecs 111, } 65151,961,600 626,294,792 6,778,256,392 Third Republic…... 50,169,880 221,505,707, 271,675,587

t

7,815, 608,560 5,805,895,85413,120,699,414

Measures, Weights, and Money.—The basis of all French Measures measurements is the metre, the length of which is the ten- — ov millionth part of the are from the pole to the equator. “8

Multiples of this, increasing by tens, are expressed by Greek prefixes (the decametre, hectometre, and kilometre being 10, 100, and 1000 metres respectively), while the subdivisions have Latin prefixes (the decimetre, centimetre, and millimetre being +5, zé5, and zgypq of a metre). Similar decimal systems are formed from the other units of measure. The a7e is 100 square metres, and the lztre the thousandth part of a cubic metre. The gramme is the weight of a cubic centimetre of distilled water at 4° C. (its maximum density). The measures in common use are here given, with their English equivalents :—

*iinegt- MeasumeiNietnes. 202. 0sscecss0c2ss0s02es00- = 39°3707904 inches. *6213824 mile. 2°471148 acres.*

Square Measure Hectare …….....c0sececsecee0s0- = 386116 sq. mile.

Kilometre carré (100 hectares) =

Capacity…..... Lo ee = 1°7607734 imp. pints. Te CLOWETC hacer tees cts cescee se eete = 22-0096677 gallons. PI oss ce ORM Chas Gees artincns isle vec = 1543234 grainstroy.

Kilogramme (or kilo)..... = 2°20462 Ib avoird. In commerce 10 kilos=22 tb, but 1015 kilos=1 ton.

Money is reckoned by the franc of 100 centimes, in Money.

value a little over 94d. £1 sterling = 25 francs. XIV. Colonies.

Algeria is the most important colonial possession of Algeria.

France. Its extent, between the Mediterranean in the north, Tunis in the east, Morocco in the west, and the Sahara in the south, is about 47,000,000 hectares (181,474 square miles), 4,597,000 hectares of which are peopled by 1,132,414 inhabitants, ruled by the ordinary laws of the mother country. A part of the rest is divided into dowars, dependent on regularly administered communes, 166 in number. This portion extends to 1,511,000 hectares (5834 square miles), with 555,807 inhabitants, 127,321 of whom are French, 32,660 Jews, 113,018, foreigners, and 282,808 Mussulmans.

Another portion of the dowars is administered by French functionaries either civil or military, assisted by native and European council- lors; the territory under civil authorities measures 3,086,000 hectares (11,915 sq. miles), and contains 576,007 inhabi- tants; 9,888 are French or naturalized Jews, 1683

Other:

colonies.

Produce

and trade the

of

colonies.

526

foreigners, and 567,036 Mussulmans. Finally, 32 com- munes are still directly managed by native chiefs, although their authority is subordinate to that of French officials'; the number of inhabitants is 1,219,285, 1747 of whom are French, 93 Jews, 649 foreigners, and 1,216,796 Mussulmans.

The European colonists who have settled in Algeria number about 117,175. They have received from the state (1875) 565,000 hectares (2181 square miles) ; they have bought from the natives 260,000 hectares (1004 sq. m.), and 130,000 hectares (502 sq. m.) have been conceded to the Société Générale Algérienne and to the Société Génévoise. The budget of Algeria in 1876 amounted to about 27 millions of francs, of which two-thirds was devoted to public works or works of general interest. In 1869 the surface of ground under tillage was 1,684,000 hectares (6502 sq. m.), which produced 10,676,500 quintals (1,051,371 tons) of grain, In 1874, 2,950,000 hectares (11,390 sq. m.) gave a harvest of 16,676,290 quintals (1,642,984 tons), more than two millions of which were exported, representing a value of about 40 millions of francs. Vineyards occupied a surface of 11,360 hectares (28,072 acres), without taking into account the plantations made

by the natives, and yielded 230,000 hectolitres (5,062,236 gallons) of wine ; in 1866 this crop did not give more than 99,000 hectolitres (2,178,957 gallons). The importance of the cultivation of flax has doubled during the last five years, this plant covering now about 9000 hectares (22,240 acres) of ground. The same progress is to be noticed everywhere ; thus the last census (1874) showed that there were in Algeria about 4,500,000 head of cattle and 10 millions of sheep, double the numbers returned in 1869. Algeria contains mines of iron, copper, lead, and zinc, which give a produce of about 600,000 metric tons, of a value of 7 millions of francs at least,—that is, a fifth part of the production of those metals in France. Alfa (a plant which gives excellent material for the manufacture of paper) and tobacco are the other pro- ducts of importance. Alfa was exported in 1874 to the extent of 45,000 metric tons, 72 per cent. of this being sent to England. About 9000 planters are engaged in the cultivation of tobacco, which gave in 1875 a crop of more than 4,300,000 kilogrammes (84,629 cwt.), represent- ing a value of about 3,300,000 francs. See ALGERIA.

The other colonies of France are—in Asia, Pondichéry, Karikal, Mahé, Yanaon, Chandernagor and Surate, and the French Cochin-China; in Africa, Senegal, with the island of Gorée, the island of Réunion or Bourbon, the islands of Sainte-Marie de Madagascar, Mayotte, and Nossi-Bé; in America, Martinique, Guadeloupe, St Barthélemy, French Guiana, and the islands of St Pierre and Miquelon; in Oceania, the Marquesas Islands, Tahiti, and New Caledonia. Among these settlements, Martinique, Guadeloupe, La Reé- union, and Guiana are, properly speaking, the only colonies, the rest being rather mercantile stations, except perhaps the French possessions near Madagascar and in the Pacific Ocean, which have better prospects, and one of which, New Caledonia, now contains the principal penitentiary establish- ments maintained abroad by France.

All these colonies submitted, till 1861, to what was called the colonial pact, which bound them to France so closely and jealously that they could trade with no other nation than the mother country. This state of affairs has been greatly changed, chiefly for Martinique, Guadaloupe, and La Réunion; and but for some privileges of navigation and some special taxes, trade with the colonies is almost as free as trade with France itself.

An account of the colonies of France will be found under particular headings. It is only necessary here to give Some statistical information about their produce and trade,

s ; o far as it concerns the general state and interests of French commerce.

FRANCE

[coronres,

The island of Martinique specially produces sugar canes; they were cultivated in 1874 on a surface of 19,314 hectares (47,727 acres), more than a third of the entire area of the island, and yielded a return of 38,653,000 francs. Cocoa trees eame next, eovering 262,000 hectares of ground (647,539 acres), and giving a erop of 284,000 francs ; then coffee, planted on 210,000 heetares (518,940 acres), tepreseuting a yearly ineome of 203,000 francs; and lastly, eotton, which oecupies only 42,000 heetarcs (103,788 acres), and does not bring more thau 34,000 francs. The foreign trade amounts (1874) to 61,816,481 francs, 28,398,309 francs for imports, and 33,412,172 francs for exports. In these totals the trade with Franee amounts to 36,700,560 francs.

The large island of Guadeloupe, with its dependencies La Dési- rade, Les Saintes, and the French part of St Martin, imported in 1874 goods to the value of 24,526,212 francs, and exported 22,470,302 francs value, making a total of 46,996,414 francs, to which trade with France contributed 27,825,183 francs. The value of the natural produce is as follows:—sugar eanes (20,686 heetares, or 51,100 acres), 40,775,732 frances; coffee, 676,846 francs; cotton, 35,470 francs; cocoa trees, 120,300 francs.

Cod fishing is the principal industry of the islands of St Pierre and Miquelon. The imports amount to 8,285,416 francs, the exports to 10,825,336 francs, and the trade with France to 9,913,532 francs.

French Guiana (Cayenne), which also contains penitentiary esta- blishments, produces the same articles of trade as Guadeloupe, as follows : —coffee to the value of 48,028 francs; sugar eanes, 243,984 francs; cocoa trees, 52,430 francs; eotton, 1,750. Its trade with France amounts to

4,914,002 francs; its imports to 6,571,067 franes, and its exports to 681,211 francs.

La Réunion or the island of Bourbon produces sugar canes to the value of 34,474,825 franes; coffee, 294,850 francs; tobaeco, 494,100 franes; cocoa trees, 43,959 franes. The imports amount to 24,819,421 francs, and the exports to 30,219,829 frances. The trade with Franee is 34,869,267 francs.

The imports of Senegal (St Louis and Gorée) amount to 12,134,631 francs, the exports to 16,628,069 francs, and the trade with France to 16,346,032 francs. The chief articles of trade are gum, gold powder, wax, ivory, a kind of vegetable oil, and valuable woods.

For Mayotte, Nossi-Bé, and Sainte-Marie-de-Madagascar the value of the imports is 4,080,229 francs, and of the exports, 3,773,280 francs. The trade with France amounts to 2,978,941 francs. The principal productions are sugar (5,088,750 francs), rice (1,799,008 raion rum (334,480 franes), and coffee (11,275 franes).

For the French establishments in India (Pondichéry, Karikal, Yanaon, Mahé, Chandernagor, Surat) the imports are 6,675,583 francs; the exports, 17,671,100 francs; and the trade with France, 7,600,116 frances. Pondichéry and Karikal are the most important centres of cultivation, the former having 19,835 hectares under cul- ture, which produce 1,494,714 francs, and the latter 9114 hectares yielding' 1,122,525 francs.

The imports of French Cochin-China amount to the value of 67,044,022 franes, and the exports to 88,011,128 francs. This settlement comprises extensive cultivated grounds, distributed thus:—rice, 279,708 hectares; fruit trees, 32,989; vegctables, 30,938; sugar canes, 8052; water palm trees, 5,640.

In Oceania, the returns for the Society Islands, Tahiti and Mouréa, are—imports, 3,458,735 francs; exports, 3,112,989 francs; and trade with France, 562,369 francs.

For New Caledonia the returus are—imports, 12,561,577 frances; and exports, $80,970 francs. This large island might afford an extensive and

profitable field to the enterprise of colonists, but it has hitherto been too much neglected by the Government, which considers it almost exclusively as a penal settlement, and has not even taken the necessary steps to seeure the few plantations around the town of Nouméa against the inroads of the native tribes, who still possess the greatest part of the country.

France has lately acquired from Sweden the island of St Bar- thélemy, in the Antilles. It is an islet of 25 kilometres (16 miles) in cireumference, without drinkable water. This aequisition was made, it is reported, with the view of founding there a new penal settlement less distant from the mother country.

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Pad- Biblio- of the graphy.

Early inhabit- ants of Gaul.

Therians,

Belgians and Gauls.

FRANCE

PART II.—HISTORY.

I. IntTRopvucTORY.

THE extinct tribes which once thinly peopled the soil of France have left but scanty traces of their existence in the weapons and ornaments dug out of gravel-beds and river courses. However interesting they may be to the student of ethnology aud of the origin of man, they find no place in history; for neither in blood, nor manners, nor speech have they left any mark on the land they inhabited. Very different are those tribes whom Cesar met when he first entered Gaul. The history of France may well begin with the words which open his famous chronicle — Gaul is all divided into three parts."

Of the inhabitants of these divisions, the Belgians, Gauls, and Iberians, the third were in all ways different from the others; for the Iberians were a race of other origin, shorter, darker of complexion, less sociable, less bright, of more tenacity, possessed of that power of resistance which those whom stronger races drive out of the plains into the mountains quickly learn. On the northward and southward slopes of the Pyrenees, amid the fastnesses of that great chain, and in the Basque provinces of Spain, this race still dwells, easily discerned by characteristics of speech and appearance, which mark them off alike from Spaniards and Frenchmen.

The Belgians and the Gauls were blood-relations. The former, dwelling chiefly in the northern districts of France, were later comers than their kinsmen the Gauls, stronger men and of a finer development. The Gauls, the men of central France, were a bright intelligent people, full of vivacity, frank and open of disposition, brave and scornful of tactics, as though all strategy were a lie and a disgrace. The Belgians seem to have been more staid, less active, less easily cast down, more thoughtful; they Were not without a physical and moral resemblance to their neighbours and distant cousins the Germans. From these two tribes has sprung the modern Frenchman, who to this day, according to his part of France, bears the mark and sign of one or other origin.

When Julius Cesar entered Gaul (58 B.c.), he found these natives in a half-barbarous state, split up into clans, each with its elected chieftain, its

Druids or priests, and its body of warriors or horsemen; while below these was an undistinguished company of servile men, women, and children, who did all works of peace for their idle fighting aristocracy. Each clan lived to itself, with little or no power of combining even with its nearest neighbours. Its home was usually an open village of circular wattled huts, with one family dwelling in each hut. Sometimes, in places of strength and importance, the Gaul built himself a fortified town enclosed by earthworks, perched sometimes, like Alesia, on a strong hill-top, or entrenched in dark recesses of wood and marsh. The more close the tighten- ing of the Celtic clanship, the more completely did each little community live to itself, apart from other clans; so that in spite of the great difficulties of the country, Cesar found the reduction of it a tolerably easy task.

Before Ceesar's days Gaul had already known something of foreign invasion. On her northern and eastern frontiers were the Germans; in the south stood the Greek city of Massilia, the ancient rival of Carthage; and in 122 Bo. Caius Sextius had founded the town which bore his name, Aquee Sextix, now Aix in Provence, whence, as from a centre, the Roman occupation spread through the district watered by the Rhone and its tributaries, until it received the name of Gallia Braccata, and became a province of the

republic. Narbonne (Narbo Martius, founded 118 3.c.) was the new capital of the district, the first Roman municipium on the soil of Gaul. But invasion took an entirely new

character when Czsar was made proconsul (59 B.c.). Cesar in He entered on his great conquest in the following year, Gaul.

and the reduction of the whole country was complete by 50 B.c. In the course of those years the great Roman penetrated to the utmost limits of Gaul, beat down all opposition, crushed the Helvetians back into their Swiss home; he defeated the Germans who had made secure lodgment in the Sequanian lands, and drove them into the Rhine; broke the resistance of the Nervii, all but exterminating that gallant tribe; severed the connexion between Gaul and Britain, on which the Armoricans especially relied, by two expeditions across the Channel, in which he gained a great addition of glory, if little fresh power; the conquest of far-off Britain fired the imagina-

tions of men: finally he brought the long wars to a close by the submission of Vercingetorix under the walls of Alesia.

Thenceforward Czsar, having conquered the Gauls, became their emperor. He saw what boundless supplies of force, of enthusiasm and intelligence, were now at his disposal; with Gallic support and his own devoted legions, he was now able to give law to Rome herself. Meanwhile, he did all in his power for Gaul,—lightened her tribute, mitigated slavery, forbade human sacrifices, repressed the Druids. The country lost its independence, and became the docile pupil and follower of Roman civilized life.

For more than four hundred years the Roman domination influenced Gaul. At the beginning of the time the natives were savages, dwelling in a wild land of forests and wastes, a thinly scattered company of unsociable clans, without towns or roads or industries; at the end they had fine cities, and much cultivated land, wore the Roman dress, had adopted the Roman law, and had exchanged their own tongue for a new form of the common Latin language.

After the murder of Julius Cesar, the administrative Au- genius of Augustus found wide scope for its activity in gustus.

Gaul. Lyons was the new capital, whence his four great roadways and his civilization radiated out in every direction. Several of the later emperors vied with him in their interest in Gallic affairs: Caligula spent mucli time at Lyons, and, in his grotesque way, encouraged letters there; Claudius was a native of that city, and threw open the senate to the Gallic chiefs; he established schools, emancipated slaves, and taught the Gauls the equality of all men under the law; Nero, with his Greek sympathies, delighted in Provence, though he cared little for the rest of the country—then called ‘ Imperial” Gaul. All through this period new ideas, new pleasures and efforts, characterize the life of Gaul; and after the fall of Civilis in 70 A.D., no one in ail the country dreams of any further struggle in behalf of the independence she had finally lost.

All things were now preparing for the next great influence Chris- which should affect the Gallic race. For nearly a century, tianity though Gaul and Rome seemed together to tread the™ Gaul,

downward path towards ruin, the Roman ideas as to justice, law, and order, were fitting the Gallic mind for the reception of Christianity. And Christianity soon came, In 160 or 161 a.p. we find a bishop of Lyons, Pothinus, and with him the well-known name of Irenzus. These men ministered at first to Greek and other settlers, for the early church of Lyons long bore marks of a Greek:

nota Latin origin. Gradually, however, the life-giving ideas and doctrines of Christianity spread abroad among the Gauls, and churches sprang up at Autun, Dijon, Besangon, and other towns within comparatively easy reach of Lyons. Roman Christendom, however, did little for Gaul till the middle of the 3d century (244 a.p)., when seven Latin bishops were sent thither, and formed new centres of Christian life in the land at Limoges, Tours, and even Paris, whither came Dionysius with a little company of brethren in 251. Henceforward Christianity spread swiftly ; and though in the next century St Martin of Tours still found heathen temples to overthrow and multitudes of country pagans to convert, still we may say generally that in three generations from the time of the Roman mission of 244 A.D. all Gaul had embraced the Christian faith.

These were also the days of what is called "the Gallo- Roman empire"; of the provincial emperors who strove to sever the Eastern from the Western world. Along her northern frontier also Gaul saw the establishment of the two Germanies, districts on the left bank of the Rhine, where German warriors held their lands by feudal tenure of the sword. Thus as Gaul herself languished under the loss of her independence and the influence of the moral corruption of Rome, she began to become aware of the two powers which were destined to mould her character— the Christian Church, and the fierce Germans. They advance upon her from south and north; when they ineet, the Gaul bows the head before them, and in new union the feudalism of the Teuton and the Christianity of the Latins begin their task of education. The combina- tion of the institutions of Germany with those of the church forms the basis on which the history of France is reared.

The Germans, who uow began to overrun the soil of Gaul, were a very different race from those with whom they came into contact. Stronger and larger in frame, they were also more stable and enduring than the Gauls. Far back they claimed the same ancestry ; in language and in personal characteristics alike we can trace the connexion. Yet, thanks to climate and circumstances, the two races were by this time completely severed, alien in speech, ideas, institutions, and tastes. The German was a hunter, a man of independence of character ; the Gaul lived in his clan, and shrank from personal freedom; slaves were un- known in Germany, while they swarmed in Gaul; the Gaul had an organized faith, a regular hierarchy betweeu him and the supernatural; the German worshipped, inde- pendent and alone, without human mediator, in the depths of his forests. The fighting-men who grouped themselves round a German chief were his free comrades, connected with him only by a personal tie, each prepared to act independently if his time came, and to build up for liimself a lordship of his own. On many sides these men now began to press into Gaul, The Goths, after wandering apparently from Scandinavia to the Black Sea and thence into western Europe, settled down,—the Ostrogoths in Italy, the Visigoths in Spain and southern France. The Burgundian Vandals, from Low Germany about the Elbe and Vistula, now began to stream over into eastern Gaul, giving their name toa large district of the country; the Franks, an aggregate of northern tribes, Low Germans of the centre and the west, were destined to be the chief conquerors of the land, the authors of her modern name.

But before the German had become master of Gaul, the Christian Church had already firmly established itself. Thanks to the support he received from Christianized Gaul, Constantine was enabled (312 a.p.) to enter Rome in triumph, and to assure the victory to the church in her eee against paganism. Henceforth the church, which

‘vil aiways endeavoured in her organization to copy the Civil power, was officially modelled on the lay institutions

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of the later empire; her dioceses corresponded in position and extent to those of the civil administration ; the chief clergy became important magistrates. The bishop of each city with his clergy took the place of the older curials, the members of the civil municipality ; the old relations of church and state were profoundly modified by the rise of the bishop of Rome to the position of supreme pontiff, a title given up by the emperor. In the downfall of Roman society in the fourth century, the clergy alone retained some power, and showed promise of the future. The lay power struggled hard for a while against the German in- vasion, specially against the Franks; the church stayed in the cities, secure and growing stronger against the day when she too would have to face the invader, and to con- vert him from a heathen foe into a firm ally and friend. In the 5th century the Germans ceased to plunder and ravage, and began to settle; it is the age in which Gaul exchanges her Latin for her Teutonic masters. Larly in the century a vast horde crossed the Rhine on the ice in mid-winter, and streamed over northern, central, even southern Gaul, passing thence a little later into Spain.

In 412 Ataulf the Visigoth settled down in the valley of TheVis- the Rhone, and allied himself with Rome ; the Burgundians goths.

also occupied the Sequanian lands. These two tribes were friendly towards the older inhabitants, and were recog- nized as peaceable settlers by the imperial power; they showed that they deserved well of the falling empire by the gallant and successful resistance with which in 450 the Visigoths and Gallo-Romans defeated the terrible hordes of Attila at Chalons-sur-Marne. Yet the empire thus saved for a time could not be saved from internal decay ; confusion reigned throughout Gaul, the Germans and the Gallo-Romans struggling as it were in the dark for possession; and when in 476 the empire of the West finally went under, Ewarik (or Euric), the prudent Visigoth, was left as master of all that had belonged to Rome beyond the Alps towards the west. 'The Arian Goths, with Toulouse as their capital, might have secured their authority over all France if the church had accepted the views of Ewarik, and if that vigorous prince had lived. He died, however, in 485, leaving behind him only a weak boy as his successor; and far to the north the fierce Frankish warriors had already taken as their chief the youthful Hlodowig (Clovis).

century on the right bank of the Rhine, and for a long time showed no wish to migrate into Gaul. By degrees one of these tribes, the Salians, headed by a family called the Merewings or Merwings (the Merovingians), began to take the lead; they soon made themselves formidable by their incursions on northern Gaul, aud established them- selves masters of the left bank of the lower Rhine. As the Roman power declined along that district, their authority increased ; early in the 5th century they had spread from the Rhine tothe Somme. Another leading tribe of Franks, the Ripuarians, whose home lay on the Rhine about Cologne, less tempted towards Gaul, seemed to hold themselves in reserve for the future.

In 481 Hilderic, chief of the Salian Franks died, Hlodo-

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leaving behind him a boy of fifteen, Hlodowig or Clovi This youth, endowed with unusual vigour and fierceness, soon won a great reputation among the Franks, and iu 486 broke in on the only Roman power now left in northern Gaul, the degenerate legions commanded by the patrician Syagrius of Soissons. These were swept away like the autumn leaves before the wind, and Hlodowig settled down in the lands'which he had won. Here he at once came into contact with Christianity; Remigius bishop of Rheims becoming his friend and adviser Jong before he adopted the Christian faith. It was probably through his

The Franks, a loose con- The federation of Germanic tribes, were in existence in the third Frauks,

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FEUDAL INSTITUTIONS. |

influence tnat the young king married Hlotehild, niece of the Burgundian king, a Christian maiden. In the quiet years which followed, Hlodowig

doubtless became more and more inclined towards his wife's belief; and when, in repelling the invasion of the Allemans in 496 he believed that the "god of Hlotehild" had heard his vow, he at once declared his gratitude and his conversion. Some thousands of his wild warriors followed him to the font, as willingly and with as little thought as they would have followed him to death or victory. From this moment the firm alliance between the church aud the Frank began, an alliance which affected both; the church became more warlike and aggressive, the Frank grew more civilized, and learnt the art of ruling.

With their headquarters fixed in northern Gaul, the Franks, under Hlodowig's command, reduced first their cousins the Burgundians (500 a.p.) and then (507) the Visigoths under Alaric. All France, with exception of a rich strip of land between the mountains and the Gulf of Lyons, afterwards called Septimania, was overrun and plundered. 'This done, Hlodowig spent the rest of his days securing his dominion by the destruction of all powerful neighbours or competitors; for the grim Frank, vigorous and ambitious, knew neither scruple nor pity, and the clergy round his throne passed over crimes which they were powerless to prevent. When he died in 511 the settlement of the German ou the soil of Gaul had been accomplished, and Hlodowig, who has no claim to honour as a man of constructive power, still stands out in history as the founder of a new world in France. To him France owes that feudal relation which has so deeply marked her story; in him the church first made that connexion with feudalism, which lowered her character, while it streugthened her power and influence. Not without reason does France inscribe on the first page of her history this German con- queror, a robber, a liar, a murderer,—for it is from him that modern France rightly dates her beginning.

The origins of feudalism are simple enough. When the Franks came in under Hlodowig, they were a host of free and equal Germans under the king of their choice. The belief that he brought with him a graduated hierarchy of chieftains, who at once established a complete " feudal system" on the conquered soil is no longer tenable. No doubt the most influential and vigorous of Hlodowig's followers got most in the distribution of lands and spoils; still, in theory at least, all free Franks were equal, and in the new settlement of the country each man according to his strength took what he

could get. The older conditions of the Germanic peoples had died out of the Salian's life; the institutions which appear in an indistinct form in the Germania of Tacitus had already undergone great change ; the family of tribes, with common rule of usage and very slight bonds of political union, is, as Professor Stubbs remarks (Constitutional History, i. p. 36), "singularly capable of entering into new combinations; singularly liable to be united and dissolved in short-lived confedera- tions." It was one of their late-formed confederacies Over which Hlodowig, with the vigour of barbarous youth,

ad now come to rule. The Salian law, a collection of the customs of Frankish law in the 5th century, gives usa fairly clear view of the condition of those who streamed Over into Gaul at this great chieftain's back. We learn from it that among the Franks the kingly office was fully recognized, and though the form of election by the nation 18 preserved, the choice is limited to the members of a single family, so that hereditary succession partly prevails.

he king, once chosen, is the real head of the nation; he has not as yet run any risk of becoming a fainéant; he "Ppoints the rulers of provinces, if we may use this oman term,—that is, the grafs who are set over certain

aggregations of hundreds ; and the graf or reeve, to take the English form of the word, is an administrative officer, who carries out the sentences of the courts of justice. The king also appoints the officers who collect the royal dues in the "'vills" which had succeeded in the place of the primitive "marks" of the Germanic peoples. Round the king's per- son is his "comitatus," his aggregate of immediate followers, who form his guard, and are the germ of the later feudal nobility. The nation in arms forms the equal couucil, in which all men give voice aud vote alike; justice is administered by a hundred-court or mall, composed of qualified landowners; if any one is aggrieved by their decision, he can appeal directly to the king. It is round this 'hundred " that the Frankish system really moves, for it is out of a group of hundreds that a district with its graf

is formed ; and there seems to be no court of law superior to that of the hundred. All political questions are of course the affair of the national council. There is in the Salian law no trace of a primitive nobility ; though the old system of common land has disappeared, giving place to separate ownership, the land does not carry with it any special honour ; the Franks are still very far from any ideas as to a territorial nobility.

These were the institutions which Hlodowig transplanted out of the districts of the lower Rhine into Gaul. They came into contact with the tenacious Gallic temper, and the masterful organization of the Romans. The Franks, with singular energy and success, adapted themselves to their new place as conquerors ; and, giving and taking, laid the foundations of modern French life. Their settlement was slow and unsystematic ; the king, receiving a large portion of the soil as his domain, granted out of it benefices for his imiuediate friends and followers. These gifts were at first held on pleasure, and were liable to be resumed at any time ; after a while this precarious tenure suited neither party ; these fiefs became first life-holdings, and finally hereditary possessions, held on tenure of service of some kind. The greater chiefs, with the king, took their share of conquered lands, asserting their rights to an alodial holding, and, if they chose to do so, granting out benefices from these districts to their followers. The common sort of Franks, who were neither king's friends nor independent chiefs and their friends, took what they could get, their share of the spoil as it fell to them ; and as their strong arms were useful and marketable possessions, we may be sure that many of them grouped themselves round the king, and, if they were for- tunate, were rewarded with small benefices. A considerable part of the Jand was left in the hands of the Gallo-Romans undisturbed, and became tributary—the tribute being a kind of rent paid by the old owners to their new masters.

Thus the Franks were spread over the whole surface of the soil; they were at home in the country, and shunned the cities; civic life was distasteful to them ; the air of the streets too confined for those who loved the forest and the chase as all Germans did. Consequently, in the towns the Gallo-Roman bishops retained sole authority, ruling by the Roman law, and preserving the last remains of the civiliza- tion of the past. The church, however, was far from con- fining herself within these civic limits; though she stood aloof

from feudalism at first, deeming her own ways better, she soon showed a consciousness that the centre of power no longer lay in the cities, and that her influence must be felt at the king's court. Consequently, we soon find the bishops grouping themselves round the king, acting as his advisers, modifying the Germanic ideas, and in turn receiv- ing new ambitions from their masters. Ere long the bishops will begin to take place in the feudal hierarchy, and will form a recognized part of the new nobility of the realm ; though for a very long time the Franks clearly regarded the clerical life as unsuited to their —s ve the influ-

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511-567 ence and fortunes of the church entirely in Gallo-Roman |

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Parti- tion of the Frank kingdom

Neustria.

Second parti- tion of Frankish kingdom.

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Before Hlodowig died (511) he had destroyed all the old chieftains and knights who ruled in Gaul. He took the place of Roman and Goth ; the Visigoth shrank away south- ward; the Burgundian became tributary; the Frank was recognized as undispnted master of all the country; the northern barrier lines between Gaul and Germany perished ; as fresh bands of Franks poured into northern France from time to time, the Austrasian princes renewed the Germanic influence over Gaul; and for five ceuturies the history of France must be regarded as in most respects subordinate to that of Germany.

Germanic use prevailed in the new kingdom, and when Hlodowig was gone, his four sons all became kings, each representing one of the divisions of the

original invasion. Theodorik, the eldest, took the north-eastern part, and be- came king of what ere long began to be called Austrasia ; he lay on both banks of the Rhine, and was almost entirely German, with his capital at Metz. Hildebert, eldest son of Hlotehild, had the central district, the country round Paris, with Paris as his capital. Hlodomir, the next, was king of Orleans, and had western Gaul along the Loire. The youngest, Hlothar, was king over the old Salian land, the north-western corner of Gaul, with his capital at Soissons. The partition was a division of estates rather than of governments ; the four kings regarded the country north of the Loire as their home, and divided out all beyond that river at will by arbitrary lines. As yet a king was little more than a leader in war, and his free men, his "leudes," looked to him to give them plentiful employment in that way, even compelling him at times to go on expeditions against his own better judgment. Thus it fell out that this first partition did not weaken the Franks; they attacked their neighbours on every hand. In one cf these wars (in 524) Hlodomir, king of Orleans, was killed; his brothers seized his inheritance, and on Hildebert's death (558) Hlothar of Soissons became sole king of the Franks ; in 555 he had taken possession of Austrasia.. Hlothar's rule brings the name of Neustria into prominence. The two branches of the Frankish power become clearly distinguish- able,—the German Austrasians coming down to Lorraine, and including the eastern part of Champagne, as these dis- tricts were later called, and the Gallic Neustria covering almost all modern France. And Neustria settled quickly into a monarchy of more modern type. ound Hlothar were grouped his reeves or counts; the clergy made their court to him ; the "leudes" now become thie king's " trusty men"; not a few Gallo-Romans also held office under him.

On Hlothar's death (561) the Frankish kingdom was once more divided into four parts—Austrasia, Paris, Sois- sons, and Burgundy,—the eldest son, Sigebert (as in the earlier partition), taking the north-eastern country. When Haribert, king of Paris, died in 567, Hilperik, his brother, king of Soissons, seized his share, and became king of Neustria. And now the three Frankish kingdoms of Austrasia, Neustria, aud Burgundy take definite forms. Speaking generally, Austrasia lay between the Meuse and the Rhine, Neustria between the Meuse and the Loire, though Austrasia trenched somewhat on Neustria on one hand, and stretched far up and even beyond the Rhine on the other side. Burgundy included the upper waters of these

rivers, aud of the Saone as well. The rivalry lay be- tween the Austrasians and the Neustrians; the Burgundians, being the weakest and most peaceful of the three, sided ee with the one, sometimes with the other. This a poe its expression in the half-legendary strife be-

€ haughty high-born Brunhild, wife of Sigebert,

king of Austrasia, and F Weak Fredegond, th : Hilperik, king of eens gond, the low-born mistress of

FRANCE

Before the end of the 6th century we discern a new 567-638, power rising into distinctness,—the power of the mayor of ip, the palace, an officer, as his name denoted, having great mayors authority in the king's court, elected by the chiefs, and of the In Neustria, Palace.

[HISTORY.

acting almost independently of his master. we usually find the mayor of the palace siding with the royal power; in Austrasia, where the nobility were much stronger, he cliecks and overshadows the king ; in Burgundy he is only an insignificant person, being of inferior import- ance to the patrician, whose office, as the name tells us, was a relic of past Roman days. Another, and a far more beneficial influence, also appeared at this time; the Benedictines came across from Italy, and spreading through- out France, formed many centres of fresh life in the con- fusion of the land. They revived the faith in industry, well-nigh destroyed by the Franks ; they did something to rescue the older inhabitants from misery, and culture and letters, thanks to their well-directed energies, again raised their heads.

At the end of the century the two queens, Brunhild and Fredegond, were the two rulers of all the country; for Brunhild had charge of her two grandsons, Theodebert IL., king of Austrasia, and Theodoric IL, king of Burgundy, while Fredegond governed Neustria for the youthful Hlothar IJ. So early does the extraordinary prominence of regency appear in French history. After Fredegond's death in 598, Brunhild seized on almost the whole of Neustria, and fora while seemed once more to unite the Merwing lordship

under her rule. Her chief aim was the establishment of a solid monarchy in Austrasia, which should curb the power of the nobles ; they, in opposition to her, placed at their head two brothers, Arnulf bishop of Metz, and Pippin of Landen, the ancestor of that great family under the auspices of which modern society laid its founda- tions in both Germany and France, the great Karling or Carolingian dynasty. Led by these two men, heads of the lay and spiritual aristocracies, the Austrasian nobles met the aged queen ; her army deserted her, leaving her with her four great-grandchildren in the hands of Hlothar IL, the nominal chief. He put the children to death at once, and after shameful indignities, the queen, it is said, was tied to the heels of a wild horse and so dashed to pieces. Her death was a triumph of aristocracy over monarchy. Hlothar II., now sole king of Franks, was entirely in the hands of the mayor of the palace, who became a real power in the state, representing the interests of the nobles as against the cen- tralizing tendencies of the kings.

This victory of Neustria, though it paved the way for the eventual domination of the Carolings, was in itself "the triumph of weakness over strength, of the Gallo-Romans and the priests" (Sismondi). The victorious nobles endca voured to secure their supremacy. The bishops, who were now found sitting in the assembly of the "leudes," drew up a new ordinance, a " perpetual constitution," a first attempt to substitute ideas of justice in the place of custom based on force. This, however, in the nature of things, could not check the growing power of the nobles, especially in Aus- trasia; though for a time royalty, under Dagobert (628-638) showed a good front in Neustria. In him the Merwing monarchy reached its highest point ; his splendid court at Paris laid the foundations, not altogether sound ones, of the civilization of France. At his death his monarchy crumbled away. Children were kings in both Austrasia and Neustria ; we reach the days of the "do-naught" princes, the rois fainéants, and of the struggle between the mayors of Austrasia and Neustria. Ebroin, the Neustrian, for a time held out against his rivals ; but the Austrasians placed at their head the representatives of the Martin and Pippin, grandsons of Pippin of Landen ; and, Ebroin having been assassinated, Nenstria had nothing

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Charles Martel,

THE EARLY CAROLINGIANS. |

wherewith to resist the onslaught of the German Franks. Led by Pippin of Heristal, they burst into the valley of the Seine, and at Testry in the Vermandois, the long struggle of the two Frankish powers came at last to an end (687). There the Neustrians under Berthar, mayor of the palace to Theodoric III., were entirely defeated, and henceforth, though the line of Merwing kings lasts till 752, they be- come insignificant and powerless. We turn our eyes with pleasure towards the rising splendour of the Caroling house. France finds herself on the skirts of a new Roman empire, of which the seat is in Germany, and which in its main features belongs to German not to French history. To no small extent the Neustrian Franks had lost their old Germanic vigour before this time; perhaps among the chief symptoms of change is the fact that many Frankish names may be read among the upper clergy of the time. In the absence of sufficient evidence it is impossible to say how far they had condescended to learn the " rustic Latin" which the older inhabitants all spoke, the parent of the inodern French language; still, there can be no doubt that they must have spoken it to some extent, if not as their sole speech. Now, however, the Austrasiau conquerors began to bring things back to a German form. The ancient " Fields

of March" are held again; thither come the warriors in

arms as of old; German conceptions as to justice seem again to prevail over the more orderly Roman law. The new-comers are above all things an army; and it is the fortune of the Austrasians, not only that they have soldiers and love fighting, kut that they have great captains at their head. From Testry (687) to the end of his life in 714, Pippin of Heristal was unquestioned master of all Tranks, the kings under him being utterly insignificant. While he kept his Neustrian subjects submissive, he applied the enthusiasms of the sword and the cross to the wild Germans on his eastern border. Under him

began the heroic labours of those English monks whose is the high honour of having first introduced the Christian faith among the pagan Teutons.

On Pippin's death things seemed likely to fall back into confusion; the Neustrians shook off the yoke of their German lords, and Austrasia was threatened at once from every side; Frisians and Saxons, as well as Neustrian Franks, overran the country, vainly opposed by Pippin's widow, Plectrude, who ruled in the name of her grandson, a child. Austrasia, however, was saved by the energy of Pippin's natural son Charles, whom Plectrude had thrown into prison, and who now emerged as a strong leader of the nobles. He defeated the Neustrians at Vincy, near Cambrai, in 717, repelled the Saxons from the Rhine, re- duced Plectrude, who had taken refuge at Cologne, and became undoubted head of the Franks, as his father had heen before him. His father's rise had been the work of the lay and spiritual nobility ; the power of Charles was based on the sword alone; he was regarded by the church- men as their foe; he took of their lands to reward his soldiers, punishing the noble bishops while he encouraged the more popular monks, Though the clergy treated his memory with vindictive anger, the lay lords were firm on his side, and enabled him to found the great dynasty of the Carolings. For it was their ready sword which won him the victory of Poitiers (or Tours), in which Europe set a limit to the advance of Asia, in 732. The Arabs, pos- Sessors of almost the whole of Spain, had for several years poured over the Pyrenees into southern Gaul; held in check awhile by the vigorous Odo (or Eudes) king of Aquitaine, they proved at Jast too strong for him, and he appealed to Charles to rescue him. The Franks responded nobly to the call, and in a few years Charles had driven the Saracens out of all their points of vantage north of the Pyrenees. It is said that to the battle of Poitiers Charles

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owes his name of " Martel," the Hammer, for the vigour 732-771.

with which he smote the Mussulmans. Uther accounts have been given of this soubriquet; on the whole the common explanation of it is the most probable and the best sup- ported. All the rest of his life this great duke of

the Franks struggled against the pertinacious foes who attacked his frontiers. His power may be said to have been limited by the Rhine to the north and east, and by the Loire to the south.

Just before his death he divided his dukedom between his sons Carloman and Pippin the Short. As usual, the elder had the Germanic share, but under the influence of Boniface, the English monk and missionary, whom he made archbishop of Mainz, he, after six years of success- ful rule, laid down the burden of power and became a Benedictine monk. His ducal rights he handed over to his brother Pippin, who had become sole duke of Franks.

by the help of the monks; it remained for Pippin to go a step farther, and linking together the monks with the papacy, to win for himself the name of king. The monks had been the papal militia for the conversion of Germans ; the converted Germans in their turn became firm friends of the Frankish dukes. The head of the whole movement was St Boniface, the founder of the church in Germany ; he it was who, acting under command of Pope Zachary, crowned Pippin king of Franks in the cathedral at Soissons. Pippin thereby became lord by a new title of the eastern and western Francia, or Frank-land, ruling over a large part of modern Germany and of modern France north of the Loire at least. The last of the Merwing shadow-kings, Hilderik III, was deposed, and thrust into the convent of St Omer, where lie shortly after died, and the race be- came extinct. On three sides Pippin was called to combat three powers, foes of his new royalty, foes also of the Church of Rome. 'The pagan Saxons did not detain him long: in one campaign he extorted from them the right to send his monks among them as missionaries; the rest he left to time. The Lombards, under their king Haistulf (Adolphus), had seized Ravenna, and threatened Rome her- self, and Pope Stephen fled to Pippin for help. The Frank king crossed the Alps, and compelled Haistulf to give up to the Church of Rome the town of Ravenna, the Emilia, the Pentapolis, and the duchy of Rcme itself. This is the famous " Donation of Pippin," the foundation of that temporal power of the papacy the end of which we have seen with our own eyes. The papacy raised up the Franks as their champions and defenders ; they were set asa counterpoise to the grand claims of the empire at Constanti- nople, and as antagonists to enemies in Italy. No wonder if before long the papacy saw its advantage in the restora- tion of an empire of the West under new auspices,

and if Germany in return willingly interfered in the affairs of Italy. The political life of modern Europe now begins. The rest of Pippin's reign was chiefly occupied with the re- sistance he found in southern Gaul. In 758 he took Narbonne, the capital of the Arabs, and drove the Mahometans out; he attacked the Aquitanians, who, after their wont, made tenacious resistance. On the death of their duke Waiffer, he overran their whole country, though he never occupied it permanently. Centuries must elapse before northern and southern Gaul could become one France.

His Pippin father and brother had opposed the power of the bishops Ort.

In 768 Pippin died at Paris, leaving his dominions to Charles

his two sons Charles and Carloman. also died, and Charles became sole king of Franks. The reign of "Charlemagne" is begun, the great German lord who in fact and legend filled all the world. The seat of his father's power lay, on the whole, in Neustria, and his chief struggles had been for dominion over Aquitaine ; the

In 771 Carloman the

reat.

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prevailed over Neustria, the Germans over the Frenchmen, 14, and he lies at rest these thousand years past in the church he himself had built in the city he loved so well.

The state of what is now France under his care was this. gtate of The land was cut asunder at the Loire; to the north of France that river was Francia Occidentalis, the earlier Neustria and it his Burgundy ; to the south of the Loire lay Hlodowig's king "8

532

771-814. seat of the power of Charles himself lay on or near the Rhine ; his three chief palaces were at Engelenheim, Aix- la-Chapelle, and Nimwegen.

His whole temper, history, relations, were strictly German ; the part played in his life by Neustria and Aquitaine was, by comparison, insignificant, for Charles the Great belongs to world's history, not to the history of France.

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Charles crowned emperor,

800.

His first task after his father's death was to complete the reduction of Aquitaine; for here war had broken out again when Pippin's death seemed to the southerners to give them their opportunity. Charles beat the old Duke Hunold in the field, and drove him to take refuge with the Lombards, where some time later he fell, helping to defend Verona against his and their hereditary foe. The struggle in Aquitaine, hopeless if vexatious, lingered on, until at last the wise king, as imperial ideas grew stronger in him, saw that his one hope of success with them lay in giving them an independent life of their own, under due restrictions. He therefore set over them his little son Hlodowig as king, and appointed William Courtnez, count of Toulouse, as his tutor. The child was established at Toulouse, and brought up as an Aquitanian. The south retained its distinctive characteristics, and was saved from the degradation of having to fall back to the lower level in art and civilization which prevailed among the Franks. The kingdom of Aquitaine had for its southern frontier the river Ebro in Spain, and crossing the mountains reached the open sea just below Bayonne; the northern frontier at first was less well- defined ; before the end of the 8th century it was pushed on as far as to the Loire.

And just as Hlodowig was established in Aquitaine, so in 776 Charles set his second son Pippin over the Lombards, thereby securing his permanent influence over the see of Rome. The papacy throughout leant on him for support, and was even content to recognize his supremacy. Fora quarter of a century Charles's life was spent in ceaseless wars on every side, in which he slowly though surely beat down the resistance of heathen Saxons, of Huns, of Lom- bards, of Saracens. Within the limits of modern France, after the pacification of Aquitaine, the only war was that against the Armoricans, inhabitants of Brittany,—a slow stubborn contest, which lasted till near the

end of his life. For a short time Brittany became a portion of the empire, without, however, in the least losing any part of its inde- pendent character.

By 796 Charles had secured his ascendency throughout Europe, so that when in 799 Pope Leo III. was ejected from Rome by the citizens, he fled to him for refuge and help ; and Charles in the autumn of 800 replaced him on the pontifical throne, receiving in return, on Christmas day, the solemn titles of Emperor of the Romans, Augustus; and certainly, if ever the great echoes of the past were to be awakened, they could not have been aroused for a worthier prince. 'A Latin priest gave to a German soldier the name of that which had ceased to exist," says La Vallée. None the less was Charles a real emperor, rul- ing over subject princes; the Germans and the Romance peoples alike accepted his sway; and for fourteen years, with less of fighting and more of organization, Charles the Great proved that he was worthy of his high title and re- vived office of Emperor of the West. In 806 at Thionville he settled the succession to his empire ; but as death bereft him of his eldest son Charles and his second son Pippin, he was obliged in 813 to make a fresh arrangement. He made Hlodowig, the one surviving son of his second wife Hilde- gond, his heir and successor, crowned him, and saw him saluted emperor. After this, he lingered a few months, wie a eatly in 814 at Aix-la-Chapelle. It was doubted ep sate ia be buried there or at St Denis, where

é ones had been laid. Austrasia, however,

dom of Aquitaine, governed by Roman law, and home of precious remains of Roman culture. In Francia Occiden- talis were Frankish nobles, the clergy, the free Franks, the inhabitants of cities, and the slaves, the last in ever-growing numbers. The first and second of these classes soon began to secure their position as great feudal lords, half independ- ent. They laid the foundations of that system of feudal noblesse which became almost omnipotent under the weaker Carolingian princes, which brought about the revolution placing Hugh Capet on the throne, which resisted the centralizing tendencies of the monarchy under Louis XI. and Louis XIII., which became the devout servants of the Great Monarch, and finally ended with the monarchy at the Revolution. The reign of Charles the Great is the time at which these nobles began to see that their strength was based on the

land; their position grew more territorial, their allegiance and honours less personal. Charles endea- voured to resist this tendency, but his hand could not be everywhere, and the nobles on the whole held their own, though so long as he lived they still bent before his power.

The administration of Gaul at this time was in appear- ance fairly complete, though it doubtless often failed in its practical application. Handed down from former days, in the larger towns there were always two chief personages, the count and the bishop, of whom the former officer was of Frankish origin, the latter of Roman. To a considerable extent, as was the case throughout all early Christendom, the functions and jurisdiction of the bishops originally answered very closely to those of the lay power, the church-organi- zation being copied from the organization of the empire. Now each of these greater officers had his own jurisdiction and court; each administered therein law, the bishop ac- cording to the Roman order, the count according to Frankish usage; and, though their functions might some- times clash, on the whole they joined in preserving peace and quiet within the walls. The counts also attended to the war-force and collected the taxes ; while the bishops, on their side, were charged with the teaching and the moral life of their flocks. Between them they preserved a com- siderable amount of municipal life and character in the ancient cities. Under the counts we find local officers whose business it is to hold lesser courts in the bourgs and villages round about. These were the centeniers, or hundred-men ; there were also here and there traces, as in England, of a lower division into decuries or tythings; the counts had also their "' vigueurs, " their " viscounts," as they were afterwards called, who represented them, and they also appointed (if the work were not done by the Missi Dominici, the imperial commisssioners) officers called scabini (échevins, or in German Schéffen), local judges who held lesser courts in country places. In addition to these courts, each chief and each considerable churchman held his own pleas; by these the condition of the free Franks, of the slaves, and of such persons as were stil] just above the servile state, was decided, all questions between them and those above them adjudged, with no very happy results in the main.

The emperor, honestly desiring, so far as he could, to arrest the downward progress of the feeble free Franks and of the still more wretched slaves, sent

forth the above named Missi Dominici to travel through the different dis- tricts of the empire, and to see with their own eyes the state of the people. Usually, they went out in pairs, 3

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FRANCE UNDER CHARLES. |

layman and an ecclesiastic, so that the secular and church courts and benefices should each be inspected by a man cf the same order as the lord whom they visited. They tra- versed the districts assigned to them in circuit four times a year, held courts to which even the counts were bound to come, looked into the details of government, reformed gross abuses, reported to their master on all persons, even the highest, appointed when needed fresh scabini and others, removed unworthy persons, looked to the poor, protecting them as far as possible from waut and want's kinsman the oppressor. The great evil of the time was injustice de- fended by bribery; the local judges could not resist the powerful or wealthy ill-doer, and so the wrongs of the poor remained unredressed. The Missi, with more or less suc- cess, endeavoured to lessen these evils. We may believe that in the main the clergy worked willingly with them: they had closer relations with and warmer sympathies for the poor folk ; they administered a more stable and intelli- gent code of laws; they were the depositories of learning, and desired to educate those around them; even in the worst times the humane morality of the Gospel gleams forth. In the days of Charles the Great all churchmen turned to the emperor and paid willing allegiance to him; the ancient political coolness between the Carolings and the episcopate entirely disappears.

The elements of society in Gaul at this time may be easily summed up. 'There were great Frankish lords, gradually diminishing in numbers as they grew in power and territorial independence; there were great bishops, chiefly in the cities, and lordly abbots in country places, who were all by degrees becoming assimilated in condi- tion to the Frankish nobles; there

was also a rustic clergy, whose state was poor in the extreme; then there were the free Franks, scarcely above the level of slaves, and ever slipping down into the servile class; then Gallo-Romans in much the same condition; and lastly the slaves, who are said to have formed nine-tenths of the population. The picture is one of great wretchedness, oppression, injus- tice; the great Charles himself felt no sure ground under his feet in dealing with the social condition of his subjects. It is clear that society must pass through vast changes be- fore anything like an orderly and flourishing community could exist, and that even the splendid climate and soil of Gaul would long do little to better the condition of its inhabitants. The wretched period which comes to Gaul after the death of Charles is the time in which, from the older relations of chief, free Frank, and slave of war, we pass gradually and almost insensibly to the later feudal relation of lord and vassal and serf. The coming time was, as has been said by Hallam, " the age of the bishops ;" but in fact the bishops were only doing in their sphere what the lay chiefs were also achieving in theirs,—laying the foundations of a feudal independence which was for ever striving to lapse into feudal anarchy.

On the death of Charles the Great, the eyes of all turned hopefully to his only surviving son the gentle Hlodowig, Lonis the Pious, His father had summoned him to Aix-la- Chapelle, had made him emperor, and then had sent him again to Aquitaine till his time should come. In him all sweet qualities of piety, morality, culture, seemed to find their home. His Aquitanian rule had brought with it untold blessings to the south ; he, too, had learnt their best lore, had become acquainted with their art, their poetry, above all with the Roman law ; he was a man of thirty-five when he became emperor, vigorous, pure-souled, intelligent. Men thought that his father had done the rough-hewing of his great work, and that the new emperor would be the organizing Augustus following the creative Cesar. His soul was full of high and conscientious aims; he would make reforms which should regenerate without weakening society;

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he would restore the clergy to high authority, would give 814-840.

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full powers to the great lords, would save free Franks from slavery, and thus secure harmony and peace throughout his vast dominions. How different was the actual result ! This noble prince, so dignified, earnest, right-minded, of "sound mind in sound body," gentle and simple, had all the dangerous virtues which grow to be calamities in rough times ; his monkish tastes, his Christian forbearance, his want of an unscrupulous will, all pointed towards failure. Even within his house he was not master; and in the broad wild territories of the empire he was destined to a like failure. On the death of his first wife, Hermingond, who had borne him three sons, Hlothar, Pippin, and Hludwig, he married Judith, daughter of Welf the Bavarian, a dangerous and ambitious lady. Her son Charles, after- wards styled "the Bald," brought the emperor many troubles, for the natural jealousies sprang up between the children of the first bed and the second wife and her son. War soon followed, in which personal ambitions were seconded by the ancient enmity between Germanand GallicFrauks. Struggle followed struggle, partition led to partition ; there is no drearier piece of history than Nithard's short chronicle of those years. The unlucky Hiodowig was buffeted about, now deposed, then restored again; now bowing his head before the clergy of Roman France at Compiégne, now recalled to rule, as it seemed, by the unanimous voice of his sons and his subjects. The main result was the separa- tion, which then began, of France from Germany. In the midst of it Hlodowig the Pious died in 840, and was buried at Metz.

His death was the signal for the final disruption of the empire of Charles the Great. Hlothar, his eldest- born son, took the imperial name, and claimed supreme headship over the Franks, The Bavarian or German Hludwig, and Charles, who represented the Franks in France, both resisted ; the Franks in Italy, Aquitaine, and Gothia, rallied to the emperor. War broke out at once. As soon as ever the Aquitanians had joined his forces Hlothar challenged his brothers to battle, and they at once accepted his wager. On the banks of the Cure, near Troyes, was fought the great battle of Fontanet, which brought the griefs of the age to a point. There the whole Frankish race struggled for the mastery. From Italy, Austrasia, Aquitaine, Gothia, came tle emperor's supporters ; Germany, Neustria, Burgundy, supported Charles and Hludwig. The carnage was terrible; Fontanet is the burial ground of the old Frankish life; free Franks are heard of no more;

“there remained in Gaul only lords and serfs; all things are made ready for the increasing of feudalism.” Hlothar was entirely defeated and fled northwards to Aix-la-Chapelle; Charles and Bavarian Hludwig were masters of the field. When next year the two brothers found themselves once more menaced by the emperor, they met with all their forces at Strasburg, and took solemn oath each to other, Hludwig swearing in the “Roman” tongue, the earliest French in existence, and Charles the Bald in the “‘Teudisc” or German ; and the armies standing round them repeated the words, the German Franks in German, the Gallic Franks in French. The text of the oaths is preserved for us in Nithard ;) they are a striking evidence of the way in which Germany and France were asserting each its independent character. The “Romance tongue,” the speech of the common people in France, their modification of the Latin they had learnt long before, henceforth took the place of the Latin lan- guage on the one side, and of the native Germanic speech of the Franks on the other; henceforth the name of French- man may come into use.

1 Nithard, Iist., iii. (ed. Pertz, p. 38, 39).

843.

Charles the Bald.

534 reo

As a result of this agreement between Charles and Hludwig, Hlothar was driven back to Aix-la-Chapelle. He thence fled to Lyons, to be near his southern friends ; and, finally, finding himself completely overborne by their opposition, he made with them the famous Treaty of Verdun in 843, in which three kingdoms were distinctly marked off :—France for Charles the Bald; Germany for Ludwig the Bavarian; for the emperor Italy and a long narrow strip lying between Germany and France, a con- ventional district, which a little later received from its lord, the second Hlothar, the conventional name of Lotharingia or Lorraine. Charles the Bald bad for his kingdom all Gaul west of the Scheldt, the Meuse, the Saone, and Rhone; it ran down to the Mediterranean, and was thence bounded by the Pyrenees and the Atlantic. It included therefore the chief part of modern France. It was Charles the Bald also who allowed the county of Paris to become a

part of the duchy of France, so that the dukes of France were also counts of Paris; from this arrangement sprang eventually the decision of the momentous question as to what city should become the capital of modern France. In this manner the magnificent empire of Charles the Great came to an end, and in its place arose the nations of Europe. Speaking of the year 841, Nithard tells us that throughout the breadth of France the utmost confusion and rapine oppressed the people ; in thirty years there had been five partitions of the Frankish empire, each marked with its own violence and misery ; and the condition of the inhabit- ants, groaning under the ambitious foreign rule of quarrel- sone princes, was as bad as well could be. The time, however, was now coming in which the greater lords of Neustria began to forget their German interests and nature, and to move towards a national French life. At first their action was chiefly disruptive, aiming at a local territorial independence ; lay lords and great bishops alike pushed their pretensions to the farthest point; hostile to the imperial ideas of Germany, they had no sympathy with any national ideas for France. Nor is this strange, for France can hardly in any sense be said to have existed in their day. We have reached the time in which feudalism emerges from its earliest stages, and strives to lay the foundations of its independence. From the Treaty of Verdun in 843 to the accession of Hugh Capet in 987, France passes through a dreary and confused period of formation.

Charles the Bald is a fit representative of such an age; he passed a long life sweeping together territories under his. nominal sovereignty, and endeavouring to secure to himself the imperial dignity and the commanding position of his great namesake and grandfather ; and though he was at the outset king of Neustria, his interests lay far more outside than inside France; the instincts and sympathies of Charles, as of all his family, were German. His schemes and struggles, rewarded in the end with apparent success,—for just before his death he was crowned king of Italy and emperor,—in reality were fatal to the Caroling dynasty. He bought his advancement first by subservience to the greater clergy, and afterwards by grant- ing to the feudal lords the charter of their independence. After the Treaty of Verdun had apparently given to Charles the Bald undisputed lordship over the western portion of the empire, three states still resisted his authority :—Brittany, which, under Nomenoe, asserted and secured her

independence ; Septimania, which drove out his armies for a while ; and Aquitaine, in which the vices of Pippin gave Charles a footing, and made a way to his Success. For several years his whole energies were engaged in these bootless struggles, while at the same time his coasts were being ravaged by the Northmen. He was obliged to pay a heavy scot before he could deliver at one

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time the rich valley of the Somme, at another the walls of 843-875,

Paris herself, from their devastations. In a capitulary of 877, the last year of his reign, we have the levy of a contribution in order to buy them off from the Seine. In 855 the death of the emperor Hlothar was the signal for a fresh division of lands, in which Charles got his share in Lorraine and the kingdom of Provence. His fortunes, however, scarcely mended; overshadowed by nobles and bishops, his tenure of ,his kingly throne was ever precarious. The great lords, seeing in him a tendency towards resistance of their claims, called in German aid to dispossess him ; and Ludwig the German came to their help. The inhabitants of Gaul, roused by the appearance on their soil of these German antagonists, rose and drove them back to the Rhine. Charles seized the opportunity of strengthening himself, as he hoped, by appealing to the church ; the church by its spokesman, the great Hinemar of Rheims, replied by accepting the call, by declaring her authority over kings, and by tracing the lines of episcopal and royal power :—‘“‘If kings rule after God’s will, they are subject to none; if they be great sinners, then is their judgment in the hands of the bishops.” Hincmar, in these words, stretched wide the rule by which the clergy had claimed to exercise judicial functions in the case of ordinary malefactors. And thus the clergy rewarded themselves for having saved Charles from the hands of the nobles and the Germans. The reins of power were now entirely Ieft in Hincmar’s hands, and the dreary capitularies of the reign bear evidence in every page of the overwhelming influence of the clergy. Not satisfied with his supremacy in church and state, the great arch- bishop pressed forward into philosophical and theological controversy, and took his share in those discussions which heralded the incoming of

scholasticism. He opposed the views and influence of John Scotus Erigena, the head of the palace school of Charles, and may be perhaps said to have given that direction to thought and speculation which marks in the main the course of the whole philo- sophy of the schools.

Towards the end of his reign there was only one prince, Ludwig the German, who shared with him the vast empire of Charles the Great. And in 875 on the death of Ludwig II., emperor and king of Italy, a handful of bishops and counts assembled at Pavia offered the imperial crown to both these princes. Charles arriving first was forthwith proclaimed "protector, lord, aud king of Italy" by the pope. In the next year Ludwig the German also died, and Charles, not content with the imperial dignity, which he already possessed, nor with the ample extent of the terri tories nominally subject to him, desired to restore the old imperial unity, and to obtain the crown of Germany in addition to those of the west and south. The sons of Ludwig naturally resisted ; and then, in order to secure the hearty aid of his followers, he held the diet of Quiersy- sur-Oise (Carisiacum) in which was drawn up the great capitulary sometiines styled the Magna Charta of French feudalism. Beneath a cumbrous covering of words, and connecting the hereditary succession of his own son with his large concessions to his nobles, Charles in fact con- ceded hereditary rights to all freeholders. Any lord who should desire to renounce the world might leave his benefices and honours to his son, or otherwise as might seem good to him; and any lord whose hold on his worldly goods was brought to an end by death might leave his dignity to his son (Baluze, Capitularies, li. p. 259), and thus in definite terms the hereditary usage of centuries became hereditary right. Hitherto, in France at least, a fiefholder held at his lord's pleasure, and was, in theory, liable to deprivation at any time ; henceforth, he was as secure in law as in fact, and could transmit his lands

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|y77-888.

THE CAROLINCS. |

and dignities to his son without risk of loss. The title of duke or count is heuceforth attached to one family; as the royal and the imperial power become weaker, the great families grow in strength; until a century of fuinéant Yarolings comes at last to an end, and their place is taken by the representative of one of the great houses, the duke of France and count of Paris. Then the new kingdom of France with its new capital will begin with Hugh Capet in 975. For the family of the counts of Paris had come to occupy the ground abandoned by the Carolings; they were the champions of the Gallic people against the North- men. Only twenty-seven years after the death of Charles the Great, in 841, Rouen had fallen into Norman hands, open- ing the way for them up the rich Seine valley as far as to Paris. From that moment the city had no peace; and in 861 Charles the Bald invested a brave adventurer, Robert the Strong, with the county of Paris, and set him to resist the invaders. Bravely he struggled against them, and in the end gave up his life in defence of his people. In so doing he laid the foundations of the first French monarchy: his two sons were, to all practical intents, local kings of France; his great-grandson was Hugh Capet. Very dif- ferent was the career of Charles the Bald. His famous order to his assembled lords, " Let each man defend him- self in his fortress," with which high sanction for castle building and local independence he dismissed his feudal levies to shift for themselves, showed that the centre of power was completely gone. people to any one who would defend them; their defen- ders rose to greatuess, and the Caroling house sank into supine nothingness. Yet he still struggled, though in vain, against the sons of Ludwig the German; after an unsuccessful campaign in North Italy, death overtook him as he was recrossing the Mont Cenis pass (877). Louis his son succeeded him, the Louis II. of French historians, the "Stammerer." He had been for ten years king of Aquitaine, and, when he succeeded to his father's throne, found himself little but the slave and puppet of the great nobles. He soon died (879), leaving a kingship weakened and divided. His two sons, Louis III. in the north and Carloman in the south, were set on their thrones by the nobles, headed by Count Hugh, " first of abbots." These also soon died,— Louis in 882, Cartoman in 884; and the representatives of the Caroling family were reduced to two princes of the name of Charles,— Charles the Fat, the emperor, son of Ludwig the German, and Charles "the Simple," "the Fool," a child of five years, youngest sou of the stammering king. To the emperor fell the nominal sovereignty over the chief part of the Caroling

territories. He, however, was incapable, lazy, a most degenerate shoot of the great house of Pippin. In France he did almost nothing ; the Northmen scourged the land incessantly, and in 885-886 laid terrible siege to Paris. The citizens, led by their bishop Gozlin, by Hugh, "first of abbots " (for he was abbot of St Martin at Tours as well as of St Denis), and by Odo (or Eudes), count of Paris, made heroic and dauntless resistance. In vain did Hrolf the Northman press the town with active siege or dull blockade ; the death of Gozlin and Hugh could not shake the fortitude of the defenders ; Count Eudes repulsed attack after attack, and held his own. At last Charles the Fat appeared on Montmartre with a great host of Germans ; and the Parisians hoped to see vengeance taken on their pagan foes. Charles the Fat, however, had none of their heroism ; he contented himself with buying the Northmen off. As they retired, the citizens rushed out and inflicted one great blow on them, and the great siege was over. Charles withdrew into Germany, and in 887 was deposed and abandoned by all. He died the uext year at Reichenau.

On his death in 888 the nobles of France, irritated

PREAWNCE

The king abandoned his'

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against their half-foreign Caroling lords, chose Eudes, the 888-912. stout defender of Paris, the elder son of Robert the Strong, The as their king; he ruled over the land between the Meuse Capetian and the Loire, and was the forerunner of the Capetian line

line of princes, the first person who may be spoken of as a French king. The Carolings still spoke German, and had small love for France; the family of Robert the Strong was patriotic and vigorous, and had shown in the great siege that it might be trusted for defence. In the election of Eudes we see the victory of the feudal lords over the iniperial or royal power ; we feel that the Frankish name and influence are dying out, and that another set of lords and defenders is rising up to cope with the Northmen, and to reduce the land into something like order. Eudes ruled from 888 to 893, striving

manfully against the Northmen, whom he so far quelled as to induce them to cease from their devastations of France, and to turn their arms against the English shores. He tried in vain to conquer the southern part of France, and after a long struggle was fain to leave them in their independence. Then the southern lords held a great assembly with the Caroling party of the north at Rheims in 893, and elected Charles the Simple their king. He placed himself under the protection of Arnulf, king of Germany, who formally invested him with the kingdom of France, and sent soldiers to assert his claims. This was quite natural; for in the eyes of the Carolings the head of the German branch was the head of the whole family; all other members of it were his vassals, them he protected, to him they swore allegiance. After a struggle of some years Eudes died, and Charles then became sole king of France. Robert, brother of Eudes, received the great title of duke of France ; and these two personages headed the two parties, the Germanic Carolings and the French-speaking nobles.

begins.

Charles the Simple reigned undisturbed for many years : Charles

perhaps he was not altogether so foolish as his name de- clares him. In his day the Northmen, hitherto mere de- predators, became permanent settlers in France. LEvery- thing there was so weak and defenceless that the invaders had only to choose ; the miserable people, the old Celtic in- habitants of Gaul, welcomed their settling ; it was a relief from the infinite woes under which the land was suffering. One band of Northmen established themselves on the Loire ; another, under Hrolf, the fierce leader of the attack on Paris, settled at Rouen (911) and subdued all the country round, on both sides of the Seine. An orderly and strong government once more grew up in France, and Charles the Simple, advised by the churchmen, made terms with Hrolf, giving him his daughter Gisela to wife, and on due feudal tenure granting him the lands he had won by the sword (912). The stout pagan was baptized by the name of Robert; his followers, after their fashion, loyally did as he had done, and the history of Normandy began: Hrolf becomes Duke Robert, his people become French- men. The duchy soon grew into a compact and orderly state, prosperous and vigorous; Norman towns and churches sprang up on all hands, French

manners and speech soon ruled supreme, and in all the arts of peace, in building, commerce, letters, the Normans forthwith took the lead. The noble Scandinavian race, destined to influence so large a portion of the world's history, herein made worthy mark on the soil and the institutions of France.

Soon after this time the French lords, headed by Robert, duke of France, the "king of the barons," second son of Robert the Strong, rose against their Caroling king, and shut him up in Laon, the last stronghold of his family ; thence he fied into Lorraine. On the death of Robert, the barons made Rodolf of Burgundy their king, and continued the strife ; and Charles, falling into the hands of Hubert of Vermandois, was held by him as a hostage till his death in

the Simple.

929-987.

Hugh Capet, first true king of France.

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929. Rodolf then became undisturbed king till he too died in 936. The barons under the guidance of Hugh "the White" or "the Great," son of Robert, the greatest man of his age, sent over to England for Louis, son of Charles, who had been carried thither by his mother for safety. This is that "Louis d'Outremer," " Louis from Over-sea," who now became king; after showing unusual vigour in a struggle with Otho the Great of Germany, who claimed the kingship over France, he was recognized by all in 941. His reign could be nothing but the miserable record of a struggle against the great lords, Hugh the Great and Richard of Normandy. In this perpetual and wearisome strife he spent his latter days, and died, still a young man, in 954. He was the only man of energy among all the later Carolings. His son Lothair succeeded; his was a long and inglorious reign, ending in 986. His son Louis followed, ruling for a single year. He died childless in 987; and the only heir to the throne—if the feudal lords chose to recognize an hereditary claim—was his uncle Charles, duke of Lorraine. The barons did not choose to be so tied ; they set the Caroling prince aside, and elected Hugh,

duke of France, to be king. He was afterwards solemnly crowned at Rheims by Arch- bishop Adalberon.

Thus did Hugh Capet, founder of a great dynasty, come to the throne. With him begins the true history of the kingdom of France; we have reached the epoch of the feudal monarchy.

{I. Tae Feupat Monarcuy.

Hugh Capet, eldest son of Hugh the Great, duke of France, was but a Neustrian noble when he was elected king. The house of the Carolings was entirely set aside, its claims and rights denied, by the new force now growing up, the force of feudalism. The head of the barons should be one of themselves ; he should stand clear of the imperial ideas and ambitions which had ruled the conduct of his pre- decessors ; he should be a Frenchman in speech and birth and thought, and not a German; but, above all, he must be strong enough to hold his own. And among the great lords of northern France, the representative of the house of Robert the Strong held the most central position, and united in himself most elements of strength. His lands lay between the Burgundians and the Normans, and stretched, north and south, from Flanders to Aquitaine. Not so long ago the duke of France had been the champion of the whole land against the invasions of the Northmen, and the successful defence of Paris had assured to the duke that position of protector of French interests which passed uaturally into a kingship. The connexions of the house were also a great source of strength; the duke was abbot of St Martin near Tours, the spiritual lord of the Loire, and abbot of St Denis near Paris, the spiritual lord of the Seine. And not only in connexion with the church was he strong; his alliances with the lay-lords were equally fortu- nate. The lesser barons looked up to him ; he was brother to Eudes Henry, duke of Burgundy, on the one side, and Richard the Fearless, duke of Normandy, on the other side, was his brother-in-law. Lastly, his was a compact aud central territory : he was feudal lord of all Picardy, and held a large part of Champagne; Paris, Orleans, Chartres, the counties of Blois, Perche, Tours, Maine, were also his. The domains of the dukes of France formed a long and rather narrow strip; the western border running nearly north and south touched the sea just above the mouth of the Somme, and reached the Loire a little below Orleans. _ Paris was as nearly

as might be the centre of this district, which was bounded to the north by Flanders and Hainault, to the east by Champagne and a corner of Burgundy, to the south by Aquitaine, to the west hy

Normandy. The lords of these districts regarded them- 987-996.

selves as at least the equals of the new king; the chief of them were the dukes of Normandy, Brittany, Burgundy, and Aquitaine, and the counts of Flanders, Champagne, and Vermandois.

The accession of Hugh to the throne was not undisputed. Charles of Lorraine, rightful heir to the Caroling throne, re- sisted him for a time, and was upheld by a formidable party among the nobles and churchmen. Their head- quarters were at Laon, on the northern frontier of Hugh's domain; their strongest friend was William Fier-a-Bras, duke of Aquitaine, on its southern limit. The hearty sup- port of the Nurmans alone secured the new king's throne. After a short, sharp struggle, in which clerical treachery was as prominent as knightly valour, Hugh got his rival into his hands, and imprisoned him at Orleans, where he died. In ashort time all the princes north of the Loire had recognized his authority. The clergy of his domains and territories looked up to him as their friend and champion, and willingly, as an end of strife, deposed Archbishop Arnulf of Rheims, who was nephew of the fallen Caroling prince, and elected in his room the famous Gerbert (afterwards pope as Sylvester IT.), the most learned man of his age, who had dared to visit Saracenic Spain, and to bring thence to the north some of that science which gave him the fascinating reputation of being a sorcerer. He had been also in Italy, weleomed and rewarded by Otho the Great; he had taken the lead in the election of Hugh Capet. His elevation to the archbishopric of Rheims placed Hugh in direct antagonism to the papacy, and added much to the troubles of the king's life. And in truth his reign was a constant struggle; he won his kingly name with a life-time of anxious work, and with loss of much of his own domain, which he had to grant out as rewards tv the faithfulness of his followers. At the time of his death in 996 it looked as if he was a weaker man than he had been nine

years before. The Norman and Aquitanian dukes were stronger than he was, stronger than they theinselves had been nine years before; in Burgundy his brother's power was little more than a nominal lordship ; the eastern frontier of France seemed to be split up into a chain of in- dependent principalities.

On the Christmas day after his election in 987, Hugh Capet had called together his friends at Orleans, and had persuaded them to elect his eldest son Robert as a joint- king. Himself king by the will of his peers, he clearly desired to give the new kingship the hereditary impress, and to secure it to his fainily ; and it may be noticed that in no country has the strict law of hereditary succession been so potent as in France, overbearing, as it did in the extreme case of Henry IV., even the opposition which that prince aroused, and securing an unbroken male descent down to the Revolution.

Robert succeeded as sole king in 996,—not a good ex- change for the infant kingship. For if the vigorous Hugh was embarrassed by both friends and foes, Robert, with far more piety and. far less force of character, seemed cet- tain to be overwhelmed. For Robert "the Pious" or "the Debonair, " was an easy kindly man, the delight of monkish chroniclers, endowed with all the charming and dangerous virtues which commend themselves in the man, and often prove fatal to the king. His was a Jong inglorious reign of twenty-five years,—a constant struggle, first with the church for his wife, afterwards with his barons for his ex- istence.

His first wife had been his distant cousin. The papacy, which could do nothing against his father, forced him to put her away ; and though he did so very reluctantly, he speedily took another wife, Constance of Aquitaine, politically an important alliance, though she led him but a wretched

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Heredi- tary prin ciple in France.

Robert.

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997- 1059.

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Henry I.

THE CAPETIAN KINGS. |

life. The followers who came with her from the south introduced new tastes and ideas into the ruder north, and were regarded with detestation by the clergy as effeminate and vicious foreigners. We note a national feeling spring- ing up,—for nationality is nowhere so marked as in its hatreds; to the barons and clergy of the Seine the people of the Garonne were aliens. existed between feudal nobles aud churclimen, and the oppressed people struggling for some liberty of action and belief, expressed itself in the futile rising of the peasantry in Normandy (997), and in the slaughter of the Manichzan heretics of Orleans. The whole country was also vexed with civil strife ; the king had to contend with his masterful queen, backed by her rebellious sons Henry, heir to the throne, and Robert, duke of Burgundy; in Normandy Richard the Fearless died in 1027, leaving war between his sons; the successful brother Robert secured the dukedom, and, thanks to dark suspicions as to his methods, went by the title of "the Devil."

Robert I. died in 1031, to the great grief of his poor people, to whom, after his way, he had tried to be as a father. His son Henry, whom he had crowned as joint-king in 1017, succeeding to the throne, had to face the bitter hostility of his mother and of the duke of Burgundy. The duke of Normandy, following the policy of his house, sided with the king, and, crushing the revolted barons on his flank and that of France, made his already terrible name a curse to central France. A peace was patched up by Fulk Nerra, count of Anjou; Robert was confined in his duchy of Burgundy, and ere long Constance, by dying, smoothed the way to tranquillity; the weak king gave in before the strong nature of Robert le Diable, and Nor- mandy became the most powerful state in France. The con- dition of the whole country, scourged with incessant private war, and lacking all central authority, became so bad that the church at last intervened ; in 1036 the " Peace of God" was proclaimed, and accepted in southern and eastern France; the bishops of Burgundy also did their best for peace, and at last

the bishops of the north also followed their example. In 1041 was proclaimed the famous "Treuga Dei," the Truce of God, in which all fighting was forbidden from Thursday evening to Monday morning, on all feast days, in Advent and in Lent; religion thus endea- voured to extend her protection over almost all the year, and greatly mitigated, if it did not abolish, the evils of private warfare. Many were the signs that some great change was coming. The terrors and hopes roused at the millennial year ; those feelings renewed and strengthened, only to be disappointed, at the date of the thousandth year from the crucifixion of our Lord; the fearful contrast between the famine and misery desolating France and the brilliant dreams of the coming kingdom of the just; the slow but real entry of Oriental learning into the west of Europe; the steady set of a stream of pilgrims toward the Holy Land, pre-eminent among whom was Robert of Normandy; the renewal of Norman adventure and conquest, specially in southern Italy; the establishment of the ascendency of Monasticism with its champion Hildebrand at Rome, and is renewed vigour in both France and Germany,—all these things mark the reign of Henry I. as a time of preparation for the world's struggle that was coming, for the terrible strife of Christian and Saracen over the holy places of Palestine. The conquest' of Sicily and southern Italy, as well as that of England a few years later, made the Nor- mans the foremost champions of the papacy, and the lead- ing power in Europe.

During these years the kingship of France was in very unworthy hands: Robert, weak and pious, had done nothing to strengthen his throne; his son Henry, immersed in petty warfare, fared no better, and feeling his end to be drawing

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The opposition also which |

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near, in 1059 had his son Philip crowned as joint-king 1059-96.

with himself. He died in 1060, leaving his throne toa prince weaker even than himself. The contrast between these petty kings of France and the grim

dukes of Normandy must strike every one: Richard the Fearless, Robert the Devil, William the Conqueror, colossal figures, strong and fierce, take all the sunlight from gentle Robert,

weak Henry, dissolute Philip, kings of France. And, in Philip 1.

fact, a history of France which should take account only of her kings and their reigns would be completely delusive; the royal power is felt in this 11th century over a very small part of the surface of the country; the great lords are stronger by far than the king in their midst. Normandy rises to very great eminence; Aquitaine is fairly consoli- dated into a strong sonthern power; though towards the east the more Germanic princes split the land into petty lordships, the two Lorraines are sometimes under one duke ; on the other side Brittany was entirely independent. Across the whole northern frontier the German infiuence was supreme. Philip was little able to cope with these antagonists. He made an attempt, which failed, to secure Flanders ; he withstood William the Bastard in 1076, and made peace with him; and when, after the Conqueror's death, Norman and English interests were somewhat parted, the dangers of a Norman ascendency over France dim- inished. Somewhat later (1094) Philip was involved in a contest with Rome, the church being now the champion of Fulk of Anjou, whom the king had wronged by carrying off his wife,—a struggle as honourable for the papacy as it was discreditable to Philip. The church, however, was not now led by the mighty hand of Hildebrand. Gregory VII. had died in 1085, and in the reaction which followed it looked as if the papacy itself might fall. Germany, ever protesting, opposed its claims, often with an anti-pope of her own; the French king, a weak man with a wretched cause, was yet able to defy the pontiff ; William the Bastard, even in Hildebrand's days, had refused to acknowledge his claims ; the Normans in Italy were at best but turbulent friends; the Saracen was still a threatening neighbour. In these dark, cloudy times the papacy, by a wise instinct, took for its motto the ancient "ex Oriente lux," and placed itself in the van of that general movement which led to the crusades.

stir the warm blood of turbulent French nobles, and the sterner valour of the Norman character, he might head a holy enterprise, and so doing

deliver the papacy from all its difficulties, and perhaps assert its lordship over the world.

Urban crossed the Alps in 1095, and came to Clermont in Auvergne. There he was in a central position, within reach of both southern and northern France, and yet not within the domain of the excommunicated Philip, sitting sulkily at Paris. The pope's famous sermon at the council, though at the moment it seemed to fall flat on princely ears, set the crusades in motion, and was the prelude to great events, great changes in Asia and Europe. France took the foremost part in the movement ; she seemed to lead the half-formed nations of Europe in the common enterprise ; her great men are the heroes of the epoch ; " the crusades," says Michelet, "had their ideal in two Frenchmen ; they are begun by Godfrey of Bouillon [who, however, was not strictly a Frenchman], and Saint Louis closes them." The latent uneasiness and misery of the people needed only the call; a countless multitude of the common folk flocked to the banner of Peter the Hermit. The excitement went on increasing throughout the year 1096, and as it slowly gathered force and form, bystanders must have looked with amazement at tle strange materials out of which so great a movement grew. The first crusade was altogether popu-

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The pope who took the great step was Urban II., The Cru- a Frenchman by birth ; it seemed to him that if he could sades.

1096-97.

The first crusade,

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lar in character ; there was in it little of knowledge or dis- cipline; it was rather like those instinctive emigrations which, flowing from the north or east from time to time, have overwhelmed the more civilized portions of the world. In the pope's sermon at Clermont there was a striking passage which contrasted the wretchedness of men's daily life in France with the comfort of the "land flowing with milk and honey" towards which he directed their

eyes. Religious enthusiasm joined with present misery; the dream of a millennial home in Palestine instead of famine and pestilence in France—here is the force which set the first army moving towards the East. And, naturally enough, that first army was almost entirely composed of the com- non people; the feudal lord felt none of the stings of want, and as yet had no interest in Eastern adventure.

The vast throng of crusaders who set off eastwards in the summer of 1096 was divided into three hosts. The van was led by the one soldier of the company, Walter the Pennyless,—he had at his back about fifteen thousand footmen ; the main body of French pilgrims, led by Peter the Hermit, followed next; then came a rabble of German peasants, under the guidance of Godescale, a monk ; on the skirts of the whole force hung an independent body of horsemen. A small band of Norman knights alone saved this crusade from absolute contempt. With great loss the host traversed Europe, and were put across the Bosphorus by the emperor Alexius. There they met the Turk at last, and found him more than their match. The energy of Kilidg Arslan, the sultan of Nicza, soon destroyed them all; they perished far from the walls of Jerusalem,

Meanwhile the interest in the holy places was far from growing less in France. of the lord as well as of the vassal, and the second expedi- tion promised to be very different from the first. Like the first, it was also divided into three hosts,—a northern, a central, and a southern. The northern army was composed of Flemings and Lorrainers, under command of Godfrey of Bouillon, duke of Lower Lorraine, a Caroling prince ; it had little or no French blood in it. The central army was French, Norman, and Burgundian, headed by Hugh, count of Vermandois, King Philip's brother, who commanded the Frenchmen; by Robert, duke of Normandy, leading English- men and Normans; by Alan of Brittany, with his Celtic following ; and by Stephen of Blois, head of that powerful house, who had espoused Adela, the daughter of William the Bastard, and was father of Stephen afterwards king of England. The third army, by far the most complete and best equipped, was composed of the southerners sub- ject to Raymond of Toulouse. The Italian Normans, under Tancred and Bohemond, set forth by themselves. These all, by sea or land, converged on Constantinople, and great was the anxiety of Alexius, who had but one wish, that he might see

them safely across the narrow strait which severs Europe from Asia. At last they were all passed over; and William of Tyre declares that at a great muster held on the Asiatic shore there stood forth seven hundred thousand men in all. The figures may be extravagant; there is no doubt that the host was vast and strong. And so Kilidg Arslan found it. He attacked them again and again as they moved southwards through Asia Minor; but they de- feated and crippled him so that he could not stay their ad- vance. They reached Antioch, and took it after a long siege and fierce fighting, which broke the power of the Seljukian Turks. They left Bohemond the Norman as prince of Antioch, and marched onwards. Baldwin, Godfrey's Meee moving eastward to succour the Christian lord of 3 essa, took the place for himself, and founded the atkins county of Edessa in 1097. The main body, re- a – many causes to about forty thousand warriors,

erusalem, and after a desperate siege, signalized

by prodigies of valour, stormed the holy city on the 15th 1099- The crusaders at once elected Godfrey of 1100.

Tt at last attracted the attention |

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of July 1099. Bouillon king of Jerusalem ; and though he did not accept go sacred a title, he became lord of the holy city, and the Latin kingdom of Jerusalem began. So long as he lived, he ruled with vigour and success; and the year 1100 seemed to have almost fulfilled the millennial hopes which had been so bright a century before. The battle of Antioch in 1098 had broken the Seljukian power ; that of Ascalon in 1099 checked the Fatimites; and Godfrey seemed likely to found a permanent Christian lordship in the East. But death soon closed his career, and the organi- zation of the great conquest was left to others. Four Latin principalities, Jerusalem, Tripolis, Antioch, and Edessa, were formed, and arranged on the strictest principles of conscious feudalism: the new kingdom of Jerusalem held only of the papacy.

At home the French monarchy was far from quiet, indo- lent Philip being threatened by the vigorous attack of William II. of England, who claimed once more the French Vexin, and also made war on the count of Maine. In this obscure warfare Philip's eldest son Louis, to whom was en- trusted the defence of the western frontier, showed ample promise of his vigour, though it was the arrow in the New Forest which in 1100 relieved the French king of all fear of his rival. Henry Beauclerc, the Conqueror's youngest son, succeeded William in England, and before long (1106) had conquered and captured at Tinchebray his elder "brother Robert Courthose, the crusading duke of Normandy. Under his capable government England and Normandy enjoyed repose and prosperity.

When it was known in the West that Godfrey of Bouillon was dead, and that the infant kingdom of Jerusalem was in danger, William IX. of Aquitaine, who, now that Raymond of Toulouse had settled at Tripolis, had become the

foremost prince of southern France, set forth with new levies to the succour of the cause. few northern barons, one of whom, Herpin of Bourges, sold his lordship to Philip of France, and began that transfer of feudal territory which was of the highest service to the kingly power. With Bourges the French monarchy for the first time got footing on the south bank of the Loire. The expedition failed ignominiously; William came home to Aquitaine almost alone; and an attempt made somewhat later by Bohemond of Antioch on Constantinople itself came also to nothing. With these two failures the first crusade ended. As yet its effects on France could hardly be felt ; the papacy alone was at first seen to be a gainer by the movement. For the new and rigid feudalism of Jeru- salem, with its hierarchy of lords, and its code of justice, the famous Assises, all eventually looked to the papacy as its head. While the Western monarchs all strove against the pope, the pope was the sole support and undisputed master of the monarchy of the East. In one respect this first crusade is specially interesting to France; her language, newly assured of independent life, no longer a patois ora dialect of the common Latin, received fresh recognition, and spread abroad in the world. As Latin was the common speech of the church, so French became the common speech of warlike Christendom. It had been carried by the Normans into England and Sicily; now it was the recognized tongue of the Latinized East ; and from this time onward it was adopted as the language of feudal and political life.

He was joined by some ~

In the year 1100 Philip, following the traditional usage Louis

of his house, had made his son Louis joint-king, and put off the burdens of his royalty. The young man, full of vigour and a true king, had a hard struggle at the first ; the limits of the royal power were very narrow ; Louis is said to have puilt the greater Chatelet at Paris as a defence agaiust the

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1100-24.

tours vI.]

neighbouring lord of Montmorency, who disputed with him the mastership over the plain of St Denis; on the other side, he had much ado to come by the castle of Montleheri, which barred his way southwards to Orleans ; his mastery over his own barons was very slight ; his suzerainty in dis- tricts farther off, over Champagne and Burgundy, over Normandy and elsewhere, was scarcely more than nominal. But Louis had force of character; his nicknames testify thereto, for was he not styled "'the Eveillé, the Wideawake," and "the Batailleur, the Bruiser"? He knew how to rouse enthusiasm among his followers; no prince ever had a more loyal household or a stronger ; the crusades relieved him of some of his most turbulent neighbours ; the upspringing of the communes, with their civic liberties, afforded a counter- poise to the feudal violence of the baron's castle ; above all, the royal domains under him were well administered. First of Capetian kings, he was felt to be the fount of justice, and it was seen that, as his wise biographer Suger says, "' he studied the peace and comfort of ploughmen, labourers, and poor folk, a thing long unwonted," and all the more grateful for its novelty. The most marked of these charac- teristics of King Louis VI.'s reign was the growth of town liberties, which began just before and after the year 1100. France has always been remarkable for the large number of her small towns and her deficiency in large ones; the time we have reached gives us the beginning of this phenomenon. 'The little towns all through central France now became the refuge of the population against feudal lawlessness and oppression; and in the very centre, in the district round Paris, they took up the defence of thie royal power against its most dangerous feudal neighbour, the duke of Normandy. " At this period," says Ordericus Vitalis, "popular communities were established by the bishops, in such sort that parish priests accompanied the king to siege or battle, bearimg the parish flag, and followed by all the youth of the township." This movement showed itself most clearly in the towns just to the north of Paris. Laon, Noyon, Beauvais, the three seats of the clerical party, Saint Quentin, and a few others, all at this time bargained for and bouglit their liberties. The king placed himself at their head. As each parish priest, representing some little town, marched with the banner of that saint to whom his church was dedicated, so did King Louis go forth with the flag of his own church, the oriflamme of St Denis. He is the first king of France who bore it officially ; by it he declared himself champion of the Church of France, and of the new burgher-life

which was springing up around him. The peasant also was glad to be on the same side, In the king's struggle against feudal independence we see continually how well he was seconded by the aggrieved rustics as well as by the civic levies, or by the "damsels," the young gentlemen who formed his warlike court. It would be inisleading to say that this new burgher-life was the king's doing ; he seems to have felt but little interest in it, great as was its influence on the future. He granted and withdrew charters according as it suited him, or as men offered him more or less. Even to the larger towns, the chief cities of the royal domain, Paris, Orleans, Melun, Ktampes, and Compiégne, he only granted privileges, not any real constitutional rights. It is one of the misfortunes of French history that constitutional liberties never seem possible,—that even in the outset they are blighted, and in the end they perish.

By degrees Louis VI. secured his frontiers to the east, the north, and the south; with the west, where lay the fiercer Norman, it was a harder task. In 1119 he lost the battle of Brenneville, and had to abandon the cause of William Clito, son of Robert duke of Normandy, who claimed the duchy against Henry I. of England. In 1124

for Henry Beauclere had allied himself with his son-in-law 1124-37,

Henry V. of Germany, who promised to attack the French king from the éast, while Henry I. should assault him in the west. Louis VI. raised all central France to the rescue – it was seen how powerful he had become. His own men came in at once, and formed the nucleus of his army ; his body-guard and the men of Paris, Orleans, and Etampes were in the centre round the sacred oriflamme, which Louis now brought forth for the first time. Champagne and Burgundy were there ; Vermandois also with horse and foot ; Pontoise, Antiens, and Beauvais sent the men of their com- munes. The greater lords farther off, though they held back, did not contest the king's right to call them out. The emperor, struck by this show of energy, or aware of troubles behind his back in Germany, abandoned all his plans of revenge against Rheims, where the council of French clergy had

excommunicated him. The king soon made peace with Henry of England, and the storm passed over,

The fortunate issue of this war, and the king's interposi- tion in the affairs of his neighbours, the submission of William of Aquitaine to his judgment, his attempt to find a lordship in Flanders for his friend William Clito, marked Louis VI. out as a powerful king, who had in fact triumphed over opposition at home and abroad. He followed pre- cedent, and had Philip his eldest son crowned in 1129; he, however, was killed by accident in 1131, and the king then took his younger son Louis, " Louis the Young," as men called him, and crowned him as joint-king. The troubles of England, connected with the reign of Stephen, relieved him of anxiety for the rest of his days on his western borders ; and the offer of William of Aquitaine to wed his daughter Eleanor to the young joint-king seemed to promise the happiest future for France. Louis VI. just lived to arrange the marriage, and then, on his way to St Denis, where he yearned to end his days, for it was the school of his youth and the home of Abbot Suger his dearest friend, he was taken ill at Paris, and there died in the year 1137.

This was the first real king of France, a man of noble nature and true kingly gifts. His greatest cross was his unwieldy bulk, though it could not hinder his activity ; he was humble of heart and kindly, cheerful in health or sick- ness, a true father to his people. Had his successor been a man like himself, the task of welding France into one kingdom might have been achieved centuries ere it was at last brought to pass.

But Louis VIL, the Young, and his queen Eleanor of Louis Aquitaine, left by her father's death at this same time V1.

heiress of his great possessions in the south, were far below the level of the fat king, and retarded instead of forwarding the growth of the French monarchy. The advance of the country in mental and material prosperity during the late reign had been immense. Thanks to the crusades, and to the tranquillity which prevailed at home, town-life flourished, religion woke to new life, church-building took a fresh departure, philosophy began to feel her strength. If these are the days of St Bernard, last of fathers, they were also the days of Abélard, one of the first of intellec- tual inquirers. 'To him is due the mental reputation of Paris, which in its turn led on at the end of

the century to the establishment of the university of Paris, mother of all the learned corporations of modern Europe.

Louis VII. was no sooner sole king than he began to show how far he was below his great father; he was weak, timid before the church, vexed with a scrupulous conscience, the delight of monkish chroniclers, the contempt of men. From the beginning his ventures failed. He tried to coerce the great count of Toulouse into submission, and was ignomini-

he was once more in collision with his Norman neighbour; | ously repulsed; he carried on a quarrel with the papacy

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1187-54.

The second crusade.

The abbot Suger.

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over the cathedral at Bourges; declared, with Suger's sup- port, that he had the right to nominate to that arci- bishopric; found Theobald count of Champagne for his own purposes opposed to him ; attacked him impetuously, and burnt down Vitry church, in which a crowd of poor folk had taken refuge. The village bears in consequence to this day the name of Vitry le Bralé, the Burnt. Then, stung with remorse, he gave way before the pope, who en- joined on him a crusade as a penance. In vain did the prudent and patriotic Suger oppose the royal impulse. Weak and excitable, the young king could not be held ; the passionate appeals of St Bernard were far more to his taste. It is interesting to note these two great and rival churchmen pitted against one another: St Bernard champion of the universal lordship of the papacy, Suger endeavouring to defend the independence of the French monarchy. St Bernard was the life of the movement; he was, however, too prudent to undertake the leading of it ; he

would provide the impulse, others must shape it to its end. In this crusade (1147) Germany preceded France, and the expeditions were headed by Conrad the emperor, and by the French king, who entrusted the charge of his country to his old preceptor Suger, although he would not follow his advice. This great churchman, a little man, weakly and thin, was of obscure and ignoble origin ; he was educated at St Denis, side by side with the good king Louis VL, and afterwards appointed abbot of that famous church. While St Bernard represented patristic learning, and Abélard Greek philosophy, Suger was noted as a diligent student of holy scripture. He was the trusted adviser of both Louis VI. and Louis VIL., and by his conduct as regent justified their confidence, and earned the name of Pater Patri. He has left in his writings more than one proof of his interest in the wellbeing of the French people, and of their wretchedness under their feudal masters, —one village "under the lord's castle trodden down and as miserable as if it were under Saracen oppression ;" another, "subject to three talliages,— almost entirely destitute through the rapacity of its masters ,;" another, "so ravaged by the lord that it became utterly unfruitful aud useless ;" or again, in a fourth place, "the poor folk could scarce exist under the burden of so wicked an oppression." Under Suger's eye prosperity in part caine back ; but he could not hinder the failure of the crusading king, whose career in the East was a discredit and calamity. It alienated Queen Eleanor, lost him southern France, made him the contempt of his subjects. In 1149 he returned home with the merest fragment of an army, and Suger humbly withdrew from public life to St Denis, spending the remnant of his days in good works and wise reforms within that narrower sphere.

At once Queen Eleanor sent to the pope for a divorce, and Louis VII. made but a half-hearted opposition, for she was in truth far too proud and vehement for him. The pope granted her wish in 1152, and immediately after Henry of Anjou wooed and won her, becoming thereby the strongest prince in France. The king tried in vain to make a league against him. Henry compelled all his foes to make peace with him, and became lord over France from the Norman frontier across to the Gulf of Lyons. In 1154 he ascended the English throne as Henry IT Vigorous and determined, fortunate in his marriage, his own

ieee resources, his kingship in England, it seemed certain that ir, > he would overthrow his feeble rival, and wear on his head

the two crowns of France and England. Forthwith began the struggle which lasted all his life. He made Rouen his chief and favourite capital,—for he was far less English than French,—attempted Toulouse, attacked the Bretons, reduced Louis VII. to peace, getting Margaret the daughter of Louis

frontier castles, which much strengthened his hold on 1160-99.

Normandy. By about the year 1160 Henry II, had reached the highest limit of his almost imperial power. He had pianted out his sons as vassal kings in Normandy, Anjou, Treland ; he completely overshadowed all the other princes of Europe. It was not till he tried to restrain the clergy that his troubles began. The Constitutions of Clarendon were passed in 1164; the quarrel with Becket did not tarry. The French king gladly supported Henry's foe, and the struggle lasted till Becket's murder in 1172, a crime which was fatal to the fortunes of Henry II. In 1172 Eleanor, deeming herself wronged by her spouse, set her Aquitanians in revolt against him; her sons also joined her, and Louis VII. entered once more into the strife. He was soon taught that it was folly for him to measure swords with Henry; the great Angevin monarch held firm hold of all his Coutinental possessions.

Then Louis in 1179, feeling himself old, caused his son Philip, then aged fifteen, to be crowned as joint-king. At the coronation of Philip Augustus at Rheims it is said that the twelve peers of France,—six laymen, six ecclesiastics, —were all present. They were the dukes of Normandy, Burgundy, and Guienne, the counts of Flanders, Cham- pagne, and Toulouse, the archbishop of Rheims, and the bishops of Laon, Noyon, Chalons, Beauvais, and Langres.

This was the last act of this long-reigning prince, who diedin 1180. He had been sole king since 1137, and in the main had done little harm if little

good. He was kindly and pious, learned beyond the princes of his age; and so long as he listened to the sage counsels of Suger he reigned not amiss. In his days agriculture largely improved, lands were brought under tillage, the countryman had peace and felt some sunshine of prosperity; the lesser towns also flourished, for Louis VII. was friendly on the whole to the communal advance, and issued no less than twenty- four civic charters. His greatest misfortune was his spouse, his greatest blunder his crusade ; for a weak well-meaning man, it is wonderful how little harm he did. As so often occurs in history, he is the mean prince between two great men; we are obliged to contrast him with Louis VL, his active and able father, and with Philip Augustus, his proud, unscrupulous, and vigorous son. It is under these three princes that the French feudal monarchy takes definite shape.

Philip Augustus, cold and patient, proud and firm, with- Philip out high impulses, lacking in enthusiasm, ungenerous, Angus' sometimes even deceitful and mean, a hard man and terrible ™

rather than noble, a man who trusted in law and cared little for justice, was clearly a formidable person. His reign of forty-three years—just the same in length with that of his father—could not fail to have great influence on the fortunes of hiscountry. History must favour him : the con- trasts, " Louis the Young," his father, and John Lackland of England, are all entirely in his favour; the rivalry between the houses of Capet and Anjou turned to his ad- vantage ; the sum of results in his reign leaves on us the sense of greatness and strength, supported by good fortune.

Philip Augustus began his long reign with acts of vigour and severity. His gentler father could not be persuaded to touch the Jews: but Philip banished them from the realm in 1182; he issued edicts, which he also enforced, against vices, and against heretics; in all he showed signs of a strong and unpleasant character. In 1185 he began with his neighbours,— had a little war with the count of Flanders, which won him the county of Vermandois and the border city of Amiens, key of the line of the Somme. Next, he fell to blows with the duke of Burgundy, and reduced him to submission. In 1186 we find him holding peaceful dis- cussions with his most formidable neighbour, the duke of

as wife for his eldest son Henry. She brought him some | Normandy, and beginning a movement which after long

1186-99.

Thethird

crusade,

PHILIP AUGUSTUS. |

years ended in the annexation of the proud ducliy to the kingdom. Richard Cceur de Lion was too turbulent a prince to let things long remain at peace. Disputes sprang up as to frontier districts, such as the Vexin, and as to the falling-in of the Breton dukedom. Sometimes with Henry II., sometimes with his rebellious son, Philip was constantly conferring or quarrelling, though the grandeur of the old king of Englaud overawed his young rival, whose policy with respect to him looks to us timid and irresolute, and sometimes mean. So things went on till 1187, when tid ings of the fall of Jerusalein seemed to still all lesser contro- versy ; and Philip and Henry, meeting once more under the Gisors oak, made peace and took the cross. All Europe was stirred into action; tle emperor Frederick Barbarossa and the chief German dukes, Richard Coeur de Lion, with all the greater lords and barons, prepared to set forth. But ere they went troubles again broke out between the two kings, and Henry, deserted by his sons, was forced to a shameful peace, which involved the cession of Berri to France, aud involved also the death of the broken-hearted monarch (1189).

With the death of Henry IT. we feel that we have passed the highest poiut in the fortunes of the house of Anjou, and that now the Capets must prevail in France.

Now followed the third crusade, which brought much barren glory to the new king of England, which caused the death of Barbarossa, drowned in the little river Cydnus (Carasu) in Cilicia, which added nothing to the honour or the power of Philip Augustus. He saw the taking of Ptolemais, and ere long, wearying of the uncongenial sport, handed over lus Frenchnien to his kinsman the duke of Burgundy, and, swearing not to molest Richard's

territories, set sail for Europe. He broke his word at once by allying himseif with John, and fanning that mean prince's jealousy of his nephew Arthur of Brittany. When tidings reached Philip that Richard had been taken prisoner by Leopold of Austria, the French king did not hesitate at once to take advantage of his misfortune. He attacked Normandy, and, in concert with John, laid siege to Rouen. When, however, the emperor let Richard go free, his onward course was cliecked, and the war ended by a truce, Philip be- coming master of Auvergne and withdrawing his hand from Normandy (1196). Richard at once did his best to raise up obstacles against him. Now rose the noble walls of Chateau Gaillard to protect Rouen, which, siace Gisors had returned to France, was entirely open towards the east. For a while his warlike genius and skill in fortification seemed to check the French king's ainbition. His end, however, was at hand ; besieging Chalus, he was wounded by an arrow, and the wound was fatal. He died in 1199, leaving his crown to his brother John, whose weakness was sure to be Phulip's Opportunity. Of all the great house of Anjou none re- mained save John and little Arthur of Brittany; it was clear that ill-will must spring up between these two princes, and what so clear as that Philip would be ready to pluck advantage froin the quarrel. At once, on Jolin's accession, while England and Normandy accepted lim, the other F rench-speaking districts, Anjou, Maine, Poitou, and Touraine, as well as Brittany, declared for Arthur, and placed themselves under the willing protection of Philip, who sug- gested a fair division—the French-speaking lands, including Normandy, for Arthur, England for King John. It was clearly impossible that Jolin, with his un-English character and bringing up, should accept banishment to the island; war broke out, and Philip, in Arthur's name, seized on Brittany, and presently making peace with John, abandoned Arthur's cause. He made his profit out of the short war and peace, no doubt ; but the true reason for his peaceable humour was his controversy with the pope, who had inter- fered with him over the old royal difficulty, his wife.

FRANCE

D4]

Philip had sent away Ingeborg, his Danish queen, and had 1200-17,

taken the fair Agnes of Meran. The pope, Innocent IIL, came to the rescue of the wronged lady, threatening Philip with excommunication and France with interdict. In 1200 he carried out his threat. The proud king struggled awhile against papal interference; in the end he found it better to yield, and replaced Ingeborg on his throne. He was now ready to interpose once more between King Johu and hap- less Arthur. In 1202 John gave him the chance. Arthur fell into his uncle's hands, was lodged in the castle at Rouen, and from that day vanished from life and history. His subjects at once rose in his behalf, and Philip marched southwards into Poitou. Having there secured his authority as Arthur's avenger, he turned north again and swiftly fell on Normandy. In the autumn of 1203 he laid siege to Chateau Gaillard, then defended by Roger de Lacy, constable of Cliester. In vain did Innocent III. interfere

between the kings. Philip now had justice and an outraged

people on his side, and soon showed the pope that his in- tervention would not be allowed. Early in 1204 the great fortress fell. John, who had done nothing to avert the blow, had actually fled from his capital Rouen to England ; from that day onward the centre of the kingdom was des- tined to be at London ; the controversy for precedence be- tween England and Normandy on that day came to an end. Philip passed triumphantly through Normandy. Poitou, Touraine, Anjou, also placed themselves in his hand, and King John retained a few places near the coast, with Rochelle as his one port of entry into France. Brittany, hitherto a fief ot Normandy, henceforth must pay homage to the conqueror of that duchy.

The next decade of years was marked by the beginning The A1-

of great troubles in the south.

*literature, the arts; there men thought and spoke as they § would ; there the Jew and thie infidel could live side by **

side with the Christian ; there the church was weak and feudalism liad no hold. The earlier efforts of Innocent ITI. bearing little fruit, in 1208 his vengeance fell on Raymond of Toulouse, and the Albigensian crusade began. The pope called on the French to help; and, though Philip himself

did not interfere, he did not hinder crowds of his ecclesiastics aud lay lords from taking the cross. Under the command of St Dominic, the spiritual power plied its merciless arms; led by Simon of Montfort the elder, the lay sword vigorously supported the thunders of the church. Languedoc was laid waste, her fair culture trodden in the dust, her ancient cities, centres of civilization, burnt and ravaged. No war was ever more atrocious; the grim fanaticism of Simon ably seconded the pitiless orthodoxy of Dominic. The war raged til] 1212, when Raymond was forced to flee into Aragon, while Montfort seemed certain to found for lumself a great southern principality. The attempt of Peter of Aragon to drive him out, and to keep back the northerner from his borders, ended in that prince's defeat and death, and by 1215 Simon was lord of almost all the south ; the great Lateran Council, held in that year, confirmed him and his crusaders in possession of it. The two Raymonds of Toulouse, father and son, now made yet one more effort; the south was weary of the foreign in vader, and nade common cause with them ; Toulouse rose against Simon, and in the siege which followed he was killed (1217). Philip now interfered at last, with an army reinforcing Amaury, Simon's son; the heroic south resisted gallantly, and the elder Raymond was able to be- queath his whole inheritance to his son. For a few years tlie invader and the persecutor were driven out of the land.

Meanwhile Philip had not been idle; the crusade was doing his work in the south, and the incapacity of king John of England gave him an opening in the north. In

There flourished sciences, bigen-

jan cru- ad

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both he showed himself as the chief friend of the papacy ; but while in the south he mainly contented himself with passive approval till towards the end of the struggle, in the north he set himself to take an active part, and in 1213 called an assembly of barons at Soissons, to prepare for an invasion of England. From this, however, lie was stayed by Pandulf, the pope's legate, and turned his hand in- stead against Ferrand of Flanders, who had refused to obey his summons. His fleet, sent up to occupy the mouth of the

Scheldt, was attacked and ruined by English ships, and Philip got but a poor consolation by pillaging some of the wealthy Flemish cities. In 1214 he had to face a grand coalition of enemies. Ferrand was supported on one hand by the king of England, on the other by the emperor Otho,—the former undertaking to attack Poitou, the latter to enter Flanders. The moment was very critical for Philip; his barons went in heart with the feudal lords against their royal master. John, however, though he landed at La Rochelle and took Angers, fell back on the first resistance, and was of no avail. Otho entered Flanders, and Philip came up to meet him. They met at Bouvines (29th Aug. 1214), and there Philip won a great victory over Flemings, Germans, aud English. Otho fied, a ruined man ; Ferrand of Flauders, the earl of Salisbury, and Renaud of Boulogne were prisoners. 'To the battle of Bouvines are due on the one hand the firm establishment of the French monarchy, on the other the security of English baronial liberties by Magna Charta. Philip had now secured the west, weakened the south, and crushed the great coalition of the north. Little remained for him but to consolidate his power. He liad sent his son Louis into England to support the barons against King John ; when, however, John died the English barons and people refused to depose his son Henry III. ; Louis had to withdraw to France.

For the remainder of his life Philip lived in peace, save when he interposed to support the northern invaders of the south of France. His government was wise and tranquil ; he allied himself closely with the church throughout ; and when he died in 1223 he left a large part of the fortune he had amassed to his clergy, while he took care to hand his great territories unbroken to his son Louis VIII.

Philip Augustus was, as has been said, "a great king, not a great man." His name survives to France in the memory of the fact that by conquering Normandy he made royalty great. He was also king of Paris, for he built the present Notre Dame, erected her market, paved and cleansed the streets, built almshouses, secured a good water-supply, strengthened her defences by making new walls around the city ; above all, he sanctioned and supported, if he did not actually found, her university. To his action in this and to the abatement of grudges between France and England we owe it that the first of English universities, Oxford, drew her earliest inspiration

from Paris, and was established in the main on the same lines. New branches of study were cultivated ; medicine, experimental philosophy, and law began to occupy the minds of men. And Philip was, by character and knowledge of his position, a lawyer. If great men are noted for their passion for justice, great kings are irresistibly attracted towards law ; and Philip, with lus de- light in the newly-revived Roman law, stands fair compari- son with the "English Justinian,' Edward I. For the Roman law provided high sanction for his kingly claims,— a sharp instrumeut for the punishing of popes and princes. The king's sagacity carried hin safely through great crises of the fate of royalty, through his struggles with the papacy and with the powerful feudal princes. Besides Normandy and Brittany, Flanders, Champagne, and Languedoc had to bow before his authority ; while he reduced the power of the great lords, he actually had the courage to give them a special organization by establishing

the great court of peers, whom he called together to help 1223-45,

him in condemning King John. Proud, cold, and sagacious, Philip is among the greatest of the founders of the later French royalty.

His successor Louis VIII. reigned only three years Louis In an attempt to carry out the wishes of the Vill.

(1223-1226).

church in the south, and to crush the heretics, he was at- tacked by camp fever after the siege of Avignon. He died,

leaving behind him a young son Louis, then twelve years Saint old, under the care of his vigorous and ambitious widow Louis.

Blanche of Castile. The early years of the reign of Louis IX. were spent in ceaseless strife. The great lords thought that they discerned in the accession of a child their watched- for opportunity; but the vigour of Queen Blanche,

and the hearty support of Paris and the towns, made them accept the treaty of St Aubin du Cormier in 1231; the king's posi- tion was secured, and his troubles came to anend. Henry III. of England, on whose aid the princes had depended, failed them, and they were fain to make the best terms they could. This struggle was followed by a long contest with the bishops, in which the young king learnt lessons which stood him in good stead ; it is probably to this con- test that he owed the successes of his later hfe,—that he was able, as few kings had been, to combine earnest devo- tion with an absolute superiority to priestly rule and in- fluence. In many ways circumstances proved friendly to the young king. Theobald of Champague, becoming king of Navarre, sold some valuable fiefs to Louis ; the Treaty of Meaux a little time before had closed the contest between north and south by the submission of Raymond VIL, count of Toulouse; one after another the leading nobles ceased to compete with the crown. During all these early years of his reign Louis had constant help from the strong hand of his mother; iniperious and masterful, she ruled him and the land thoroughly and successfully. He stood wisely clear of the great struggle which went on all these years between Frederick II. and the papacy.

In 1242 came the king's first serious warfare. He had tried to set his brother Alphonse over Poitou and Auvergne, whereon the reluctant nobles called in Henry IIL. to their help. Henry came with a small army and large sup- plies. Louis, however, hastened down to meet him, reduced all the country north of the Charente, defeated him twice, and that incompetent prince fell back to Bordeaux, wliere he wasted lis time and means. In 1243 he was obliged to make his peace with Louis, and gladly withdrew to England. At this same time Raymond VII. also rose against the king; he was, however, soon reduced to order. In 1244 the last of the Albigensians perished at Mont Segur, the whole of them preferring to be burnt rather than retract their opinions. Fitly to end this period of his life, Louis IX. issued an edict that no lord should hold fiefs under both the king of France and the king of England; almost all his lords abandoned their English allegiance, and rallied round him alone. This movement made the distinction between English and French feeling stronger, and rendered the wars of the future more really national. In 1245 Charles of Anjou, the king's brother, wedded the great heiress of the south, the Countess Beatrice. This fortunate marriage closed the independent political life of Provence, which thus

passed to the house of Anjou; its fortunes were consequently long bound up with those of the kingdom of Sicily.

Up to this time Louis IX., being mostly under the com- mand of his mother, had shown little sign of greater quali- ties; now came the crisis which called them forth. He had acted with singular prudence in the contests which sur- rounded his earlier years, had held aloof from the investi- ture wars, had stood clear of eastern complications, had kept his barons quiet. Now, however, he was no longer

1245-59.

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to confine himself to affairs at home; the East, with its dazzling attractions of religion and romance, called for his care; by going thither he would escape from the conflict nearer home, the internecine struggle between the emperor Frederick II. and the papacy, under Innocent IV., and would fulfil the devout longings of his pious spirit by suc- couring the afflicted Christians against the Moslem and the Tartar. Louis took the cross in 1244, with his three brothers, Robert of Artois, Alphonse of Poitiers, and Charles of Anjou; at Christmas 1245, "the day of new clothes," when his courtiers donned their new-made cloaks, they found the significant cross on every shoulder ; still nothing was done awhile, for in truth France was rightly very re- luctant to embark in eastern politics. It was not till 1248 that Louis set sail from Aigues-Mortes for Cyprus, the rendezvous for this crusade. The sultan of Cairo was now lord of Palestine ; the Tartars had destroyed the power of the sultan of Konieh ; Jerusalem was a defenceless heap of ruins. It therefore seemed best to attack the Moslem power at its centre ; and this crusade, instead of making for Con- stantinople, Asia Minor, and Jerusalem, began on the other side by an attack on the headquarters of the Mahometan power in Egypt. In June 1249 the good king landed on the Egyptian shore and took Damietta without a blow. There the crusaders lingered till the place became a Capua to them ; for idleness brought on debanch, and debauch disease ; and fever, the avenger of war, soon attacked the army. After nearly six months of ruinous delay the king marched southward, fought the heroic though inconclusive battle of Massourah, which finally arrested his farther pro- gress towards Cairo; and

after another long delay the Christians were obliged to retire towards Damietta. On the retreat the whole army was taken by the Saracens, who taassacred the common folk and held the nobles to ransom. Louis had to surrender Damietta, and to pay a heavy sum before he could sail from Egypt; and even so, he was obliged to leave behind a vast number of Christian captives. Of the remnant.of his great host only about one hundred knights followed him to Palestine,—a fever-stricken com- pany depressed with ill-fortune and defeat; the rest made forhome. Louis landed at Ptolemais, one of the very few cities left in Christian hands, and found little to restore his confidence or the spirits of his followers. He remained four years in the Holy Land, chiefly engaged in arranging the ransom of his captive soldiers; he freed all the prisoners left in Egypt, strengthened the few places held by the Christians, and was almost unmolested by the Saracens, who were nearly as weak in Palestine as he was. At last, on the death of his noble mother Blanche in 1253, finding that his army had almost entirely melted away, that he could not hope to achieve anything in Palestine, and that he was much wanted at home, he set sail at last, and reached France in September 1254, a sorrowful and beaten man. The one bright spot in this crusade was the development of the king's character ; men recognized in him the hero and saint, and what was least wise in his career has covered him with greatest glory.

Still, the best part of his reign was to come; nowhere had better government ever been seen in Europe than that Which Louis carried on for the sixteen peaceful years which followed his first crusade. Some of his acts have been sharply criticized ; all, however, were in the direction and Interests of peace. In 1258 he made treaty with King James of Aragon, settling all points of lordship at issue on that frontier ; In 1259 he came to terms with Henry IIL of England, yielding to him the Limousin, Perigord, and Parts of Saintonge, in return for Henry's abandoment of all claims on the rest of France. Louis hoped thereby to se- cure perpetual peace and amity between the two countries. At home all his action tended to good. His noble charac-

ter, his recognized justice, fairness, and holiness, enabled him 1267-79.

to intervene as a peacemaker between his lords; there was in him a generous vein of sympathy and love for his people, which prompted him to succour those in distress, to govern well because mercifully, to rule in church and state as one who loved justice and judgment, and to whom the welfare of his subjects was a chief object and the aim of Life:

Throughout it all, however, he still cherished in heart the enthusiasm of the crusading spirit. He had failed once ; he would try again for the faith against the miscreant. And so in 1267 he again took the cross, and in 1270, in spite of the remonstrances of his wisest friends, set sail once more,— this time not for Constantinople or Palestine, or even Egypt, but for Tunis. The probable motive of this attack on Tunis was the ambition of the king's brother, Charles of Anjou; for a strong Saracen power on that shore was always a menace to his newly acquired Sicilian and Neapolitan kingdom. Be that as it may, the expedition, as a crusade, attacking the very outskirt instead of the heart of the Moslem strength, was foredoomed to fail. The failure came from the beginning; hardly were the crusaders landed when fever and dysentery set in. The king caught it and died. With him ended the crusading era (St Bartholomew's day, 1270).

Louis the Saint had been a great king, as well as a pious and a virtuous one; in this he stands almost alone in French history. Nor was he backward in matters of learning ; his age is an epoch in the growth of French literature. The university of Paris under his care rose to high repute ; the greatest learned men in Europe are con- nected with this period of its history; Albertus Magnus, Roger Bacon, Saint Thomas Aquinas, all studied at Paris. In his reign Robert of Sorbon (1252) founded his college for ecclesiastics, and the famous Sorbonne began its long career. Literature flourished in prose and poetry ; the arts took a fresh beginning; Saint Louis raised that chief orna- ment of architecture in Paris, the Sainte Chapelle.

Above all, the king was notable for his justice, and the use he made of the law. The law, the natural ally of the throne in France, came to his help: by its aid he attacked or undermined feudal privileges; he established a higher jurisdiction than that of the feudal courts, appointed itinerant justices, insisted on a real right of appeal in last resort to himself, curtailed the powers of baronial courts, and the freedom of baronial warfare, and finally

rendered the king's "parliament" a great law-court. His legists issued a new code, the " Establishments of Saint Louis," in which feudal custom was largely modified by the Roman law. The king also increased and consolidated the royal domain, acquiring property whenever it was possible, and administering throughout a uniform rule of law. The king- dom also was greatly enlarged by his care: a large portion of the lands of the count of Toulouse, Chartres also, Blois, Sancerre, Macon, Perche, Arles, and Foix, all became his ; Normandy was formally made over to him by Henry III. His brother Charles of Anjou not only secured Provence for himself, and eventually for France, but by finally con- quering the last of the Hohenstauffen secured, a doubtful good, French influence in southern Italy. Frederick II. had died in 1250; Manfred, his base-born son, became king of Naples; and Charles, invoked against the hated Hohen- stauffen by pope Urban IV., defeated Manfred in 1266, and his nephew Conradin, the last of the house, in 1268, thereby becoming king of the Two Sicilies. Then began that system of traditional savageness and cruelty which charac- terizes all the medieval relations of France with Italy. The "Pragmatic Sanction of Saint Louis" is placed in the year 1269, and (if genuine, which is doubtful) laid down the maxims on which the liberties of the Gallican Church

1270- 1300.

Philip Ill.

Philip IV., the Fair.

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are founded. The king and his lawyers were certainly | quite as unwilling to allow the church as the baronage to win independence, and to plunge the kingdom into con- fusion.

Philip III., the Rash, succeeded on his father's death,— an unlearned, weak man, whose history is uneventful, save that it is the period in which the foreign influence of France received a great check through the Sicilian Vespers (1282), which deprived Charles of Anjou of his throne, in spite of the urgent efforts of the papacy. Philip was also unlucky in his dealings with

Aragon ; on his return from an expedition into Spain, in which he ruined, a great fleet and army, he fell ill and died, in 1285.

In 1274 the count of Champagne, Henry of Navarre, had died, leaving one child, a girl, three years old. _ She was affianced in 1276 to Philip, sou of Philip IIL, and Navarre was thus brought into the French kingdom. And so it fell out that when Philip IV., the " Fair," that proud young prince, succeeded, he was already master of the fortunes of a larger France than had ever yet been known. Lawyers surrounded his throne from the beginning; he was the fitting leader in a great revival of the Roman law, that terrible enemy to feudalism and the medieval papacy. . |

In the beginning of his reign Philip IV. worked -by means of his lawyers; they put a stop, in large part, to clerical administration ; the parliament fell completely into their hands, and ere long (1302) was permanently fixed at Paris, and became the chief legal authority in the realm. The king's fiscal necessities threatened to overwhelm him ; the older system of sustenance, based on the royal domain, had completely given way. To this reign France owes the first beginnings of a formidable system of taxation; to Philip IV. is due the ill-sounding maltéte, the " ill-levied " tax. He seized what he could, wrung the Jews, confiscated the wealth of the Templars, turned everything into hard cash, sold privileges to towns, tampered with the coin ; by sumptuary laws he succeeded in taxing even his nobles. This state of need and greed brought on the great strife of his reign, the quarrel with Boniface VIIl. It was a many-sided struggle,—that of the temporal against the spiritual authority, that of the civil against the canon law; that of the lawyers against the clergy; that of France against Italy. Soon after his accession in 1294 Boniface VIII. had tried to mediate between the two great lawyer-princes, Edward I. of England and Philip the Fair. The kings took it much amiss; and when in 1296 Boni- face issued the famous bull Clericis laicos, which forbade the clergy to pay taxes to the civil power unless the papal power sanctioned them, Philip answered by an ordinance which prohibited the export of valuables of all kinds from the kingdom. The pope's reply created open breach, and Philip let loose his lawyers on the Italian priests. The strife, however, was speedily allayed, and a seeming reconciliation took place over the canonization of Louis IX., which occurred on the anniversary of his death, St Bartholomew's day 1297. Boniface also

mediated success- fully between the French and English kings, securing a large part of Aquitaine to France. It was, however, but a truce, which enabled Philip, not only to win this portion of Aquitaine, but to attach to himself the friendship of the duke of Brittany, and to occupy Flanders. So things went on till the year of jubliee, 1300, when Boniface seemed to have been lifted up above all the princes of the earth. About this time the pope nominated as his legate in rl re bishop of Pamiers, an open foe to Banca mie He made use of his new authority to

in the south, and Philip IV. arrested him at

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met by papal bulls, which affirmed (as in the great Aus- 1300-12,

eae as a traitor. Forthwith the old strife broke out gain,—a terrible war of words ensuing, lawyer's pamphlets

[HISTORY.

culta fili bull) the supremacy of the pope over all kings. The king threw himself on the patriotism of his people, and called together the three Estates of France, nobles, clergy, and burghers, to sit at Paris and consider his grievances. The nobles and burghers spoke out bravely for their king against the papal claims; thie clergy applied for leave to attend the council convoked at Rome. Their request was refused; if they went their goods would be forfeited. Just before this had broken outa revolt at Bruges (1302), in which the enraged Flemish had risen on and destroyed their new masters ; the French nobles, eager for vengeance and spoil, hastily assembled and marched northwards, under the guidance of Robert of Artois; hard by Courtrai the Flemish burghers, led by Guy of Namur, inflicted on them the worst defeat ever yet sustained by French chivalry ; the "Day of the Spurs" was a fitting name for a carnage

'after which four thousand gilt spurs were hung as trophies

in Courtrai cathedral.

The foremost men of France had perished in a ditch; and though for the moment Boniface rejoiced, and deemed his rival to be ruined, in the event this overthrow of feud- alism turned completely to the king's advantage. The bishops, thinking also that the royal power was broken, set forth. for Rome. For the moment even Philip seemed to lose confidence, and the papacy enunciated its highest claims. The king, however, soon recovered force ; he made peace with Edward of England, ceding Guienne to him,

and marrying his daughter Isabella to the younger Edward.

It was now that he debased the coin and imposed the odious maltéte. William of Nogaret was sent to Italy to lodge with the pope the king's appeal from his authority to a general council and a legitimate pope. In reply the pope announced that he was about to lay an interdict on the kingdom. Then Nogaret called in the help of the Colonnas, the family foes of Boniface, who gladly seized the pope at Anagni; the mortifications and privations of the moment were too much for the aged pontiff, and though the Romans delivered him from captivity, he gave way and died. Thus was Philip IV. delivered from his worst antagonist. In 1304 he made peace with the Flemish, giving up his claim to Flanders, and drawing himself to- gether to complete his victory over the papacy. In 1395 he succeeded in forcing on the conclave of cardinals his nominee Bertrand de Goth, archbishop of Bordeaux, who became pope as Clement V., and was consecrated at Lyons; then the great "captivity" began. Clement, as the price of his elevation, cancelled the bulls of Boniface, and pardoned the king's lawyers ; he created nine French cardinals, so as to secure the king's influence in the conclave. Philip pressed him to condemn the memory of Boniface, and to consent to the ruin of the Templars ; this, however, the poor pope avoided, with pretexts sufficient for the time. When Philip pressed him still more closely, for the Templars were rich and unpopular, and busy rumour had darkened their character with fancied details of unholy crimes, Clement endeavoured to escape by flight. The king arrested him, and brought him back to Poitiers. In 1309 this miserable pontiff was allowed to travel southward, though Philip absolutely refused to let him return to Rome, and was fain to fix his seat at Avignon on the Rhone, a city then in the possession of Charles V. of Anjou, and hard by the papal county of the Venaissin. Here the papacy abode in discredit and subjection to the

French crown for seventy ears. 7 The condemnation of Boniface was deferred awhile; it was but a barren revenge, and the Templars were a richer spoil. In spite of their heroic defence and resistance, they were condemned in 1310, and perished as martyrs to their cause. In 1312 the abolition of the Order was

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THE HOUSE OF VALOIS. |

of Philip him. In the house of Capet, there had hitherto been alter-

Neca 545

1314-28. decreed by Clement V., and their wealth, in large part, | ing; he also dealt harshly with the traders hampering 1328-39 fell into the king's hands. These gloomy years fitly close | and all but ruining them, till the country was Pigeci and the reign of Philip IV.; he died in 1314 from the effects of | discontented. On the other hand, young Edward of Eng a hunting accident. He had not added much to the | land had succeeded 'to a troubled inheritance, and at the dimensions of the kingdom; the addition of Lyons | beginning was far weaker than his rival; his own sagacity. ' (1312) was his greatest achievement in this way ; he had | and the advance of constitutional rights in England, soon . immensely increased the royal authority at home, and | enabled him to répair the breaches in his kingdom, and to had triumphed over the papacy, the conqueror of the | gather fresh strength from the prosperity and good-will of

empire. : a united people. While France followed a more restrictive | The sons Philip IV. died, leaving three sons, who all succeeded | policy, England threw open her ports to all comers; trade

grew in London as it waned in Paris; by his marriage with

_ the Fair. nately weak and strong monarchs; now, however, the Philippa of Hainault, Edward secured a noble queen, and "vigour of the race was gone. The reign of Louis X., "le | with her the happiness of his subjects and the all-important Hutin," the quarreller, was brief and unimportant ; it was

| friendship of the Low Countries. In 1336 the folly of Begin- naturally enough a time of reaction, in which things seemed | Philip VI. persuaded Louis of Flanders to arrest the Eng: nings of to fall back into feudal anarchy and weakness. There | lish merchants then-in. Flanders; whereon Edward retali- was great distress and famine in France in 1315-1316, and | ated by stopping the export of wool; and J acquemart van a campaign against the Flemings was a complete failure. | Arteveldt of Ghent, then at the beginning of his power, In June 1316 Louis died, leaving his queen with child. | persuaded the Flemish cities to throw off all allegiance to France. She bore a son, named John, who lived seven days, being | their French-loving count, and to place themselves under during that time nominal king of France; on his death, | the protection of Edward. In return Philip VI. put him the late king's next brother Philip V., "the Tall," succeeded | self in communication with the Scots, the hereditary foes to the throne, basing his claims on the so-styled Salic law | of England; and the great wars which were destined to of France, according to which '"'no woman could succeed | last 116 years, and to exhaust the strength of two strong to Salian soil," and,a@ forteort, no woman could succeed to | nations, were now about to begin. They brought brilliant the Salian, that is, to the French throne. He reigned six | and barren triumphs to England, and, like most wars, were miserable years, without credit, though he published not a | a wasteful and terrible mistake, which, if crowned with few ordinances. He died in 1322, and was succeeded by | ultimate success, might, by removing the centre of the his youngest brother Charles IV., "the Fair," whose six.| kingdom into France, have marred the future welfare of years' reign ended in 1328. With him the direct line of the | England; for the happy constitutional development of the house of Capet came to an end,—cursed with barrenness | country could never have taken place with a sovereign and incapacity, men held, by the curse of the dying Tem- | living at Paris, and French interests becoming ever more plars. powerful. Fortunately, therefore, while the war evoked by The Charles, count of Valois, was the younger brother of | its brilliant successes the national pride of Englishmen, by hg Philip the Fair, and therefore uncle of the three sovereigns | its eventual failure it was prevented from inflicting per-

lately dead. His eldest son Philip had been appointed guardian to the queen of Charles IV.; and when it ap- peared that she had given birth to a

daughter and not ason, the barons, joining with the notables of Paris and

manent damage on England.

The war began in 1337, and ended in 1453; the epochs in it are the treaty of Bretigny in 1360, the treaty of Troyes in 1422, the final expulsion of the English in 1453.

The French king seems to have believed himself equal The to the burdens of a great war, and able to carry out the "Hun- most far-reaching plans. The pope was entirely in his ied

hands, and useful as a humble instrument to curb and ae

the good towns, met to decide who was by right the heir to the throne, "for the twelve peers of France said and say that the crown of France is of such noble estate that by no succession can it come to a woman nor to a woman's

son," as Froissart tells us. This being their view, the baby daughter of Charles IV. was at once set aside, and the claim of Edward III. of England, if, indeed, he ever made it, rested on Isabella of France, his mother, sister of the three sovereigns. And if succession through a female had been possible, then the daughters of those three kings had rights to be reserved. It was, however, clear that the throne must go to a man, and the crown was given to Philip of Valois, founder of a new house of sovereigns. The new monarch was a very formidable person. He had been a great feudal lord, hot and vehement, after feudal fashion; he was now to show that he could be a severe master, a terrible king. He began his reign by subduing the revolted Flemings on behalf of his cousin Louis of Flanders, and having replaced him in his dignities, re- turned to Paris, and there held high state as king. And he clearly was a great sovereign: the weakness of the late king had not seriously injured France; the new king was the elect of the great lords, and they believed that his would be a new feudal monarchy ; they were in the glow of their revenge over the Flemings for the day of Courtrai ; his cousins reigned in Hungary and Naples, his sisters Were married to the greatest of the lords; the queen of Navarre was his cousin; even the youthful king of Eng- land did him homage for Guienne and Ponthieu. The barons

soon found out their mistake. Philip VI., supported by the lawyers, struck them whenever they gave him open-

harass the emperor. Philip had proved himself master of the Flemish, and, with help of the king of Scotland, hoped so to embarrass Edward ITI. as to have no difficulty in eventually driving him to cede all his French possessions. While he thought it his interest to wear out his antagonist without any open fighting, it was Edward's interest to make vigorous and striking war. France therefore stood on the defensive; England was always the attacking party. On two sides, in Flanders and in Brittany, France had out- posts which, if well-defended, might long keep the English power far away from her vitals. Unluckily for his side, Philip was harsh and rash, and threw these advantages away. In Flanders the repressive commercial policy of the count, dictated from Paris, gave Edward the opportunity, in the end of 1337, of sending the earl of Derby with a strong fleet to raise the blockade of Cadsand, and to open the Flemish markets by a brilliant action, in which the French chivalry was found powerless against the English yeomen-archers; and in 1338 Edward crossed over to Antwerp to see what forward movement could be made. The other frontier war was that of Brittany, which began a little later (1341), The openings of the war were gloomy and wasteful, without glory. Edward did not actually send defiance to Philip till 1339, when he proclaimed himself king of France, and quartered the lilies of France on the royal shield. The Flemish proved a very reed ; and though the French army came up to meet the is in the

1339-50. Vermandois country, no fighting took place, and the cam-

paign of 1339 ended obscurely. Norman and Genoese ships threatened the southern shores of Englaud, landing at Southampton and in the Isle of Wight unopposed. In 1340 Edward returned to Flanders ; on his way he attacked the French fieet which lay at Sluys, and utterly destroyed it. The great victory of Sluys gave England for centuries the mastery of the British Channel. But, important as 1t was, it gave no success to the land-campaign. Edward wasted his strength on an unsuccessful siege of Tournal,

of Aragon, and in 1349 also bought the territories of 1349-56,

Humbert, dauphin of Vienne, who resigned the world, under influence of the revived religion of the time, a con- sequence of the plague, and became a Carmelite friar. The fief and the title of dauphin were granted to Charles, the king's grandson, who was the first person who attached that title to the heir to the French throne. Apart from these small advantages the kingdom of France had suffered terribly from the reign of the false and heartless Philip VI. Nor was France destined to enjoy better things

under John " the Good," one of the worst sovereigns with John

and, ill-supported by his Flemish allies, could achieve whom she has been cursed. He took as his model and "the

nothing. The French king in this year seized on Guienne ;

and from Scotland tlidings came that Edinburgh castle, the strongest place hed by the English, had fallen into the hands of Douglas. Neither from Flanders nor from Guienne could Edward hope to reach the heart of the French power ; a third inlet now presented itself in Brittany. On the death of John III. of Brittany in 1341, John of Montfort, his youngest brother, claimed the great fief against his niece Jeanne, daughter of his elder brother Guy, count of Penthievre. He urged that the Salic law which had been

recognized in the case of the crown, should also apply to |

this great duchy, so nearly an independent sovereignty. Jeanne had been married to Charles of Blois, whom John TI. of Brittany had chosen as his heir; Charles was also uephew of king Philip, who gladly espoused his cause.

'Tereon John of Montfort appealed to Edward, and the two |

kings again met in border strife in Brittany. The Bretons sided with John against the influence of France. Both the claimants were made prisoners; the ladies carried on a chivalric warfare, Jeanne of Montfort against Jeanne of Blois, and all went favourably for the French party till Philip, with a barbarity as foolish as it was scandalous,

example the chivalric John of Bohemia, who had been one Good."

of the most extravagant and worthless of the princes of his time, and had perished in his old age at Crécy. The first act of the new king was to take from his kinsman, Charles "the Bad" of Navarre, Champagne and other lands; and Charles went over to the English king, King John was keen to fight ; the States-General gave him the means for carry- ing on war, by establishing the odious " gabelle" on salt and other imposts. Jolm hoped with his new army to drive the English completely out of the country. Petty war began again on all the frontiers,—an abortive attack on Calais, a guerilla warfare in Brittany, slight fighting also in Guienne. Edward in 1355 landed at Calais, but was recalled to pacify Scotland; Charles of Navarre and the duke of Lancaster were on the Breton border; the Black Prince sailed for Bordeaux. In 1356 he rode

northward with a small army to the Loire, and King John, hastily summoning all his nobles and fiefholders, set out to

|

tempted the chief Breton lords to Paris and beheaded them |

withouttrial, 'The war,suspended bya truce, broke out again,

to attack on three sides at once,—from Flanders, Brittany, |

and Guienne. The Flemish expedition came to nothing ; for the people of Ghent in 1345 murdered Jacques van Arteveldt as he was endeavouring to persuade them to re- ceive the Prince of Wales as their count; and Edward, on learning this adverse news, returned to England. Thence in July 1346 he sailed for Normandy, and landing at La Hogue overran with ease the country up to Paris. He was not, however, strong enough to attack the

capital, for Philip lay with a large army watching him at St Denis: After a short hesitation Edward crossed the Seine at Poissy, and struck northwards, closely followed by Philip. He got across the Somme safely, and at Crécy in Ponthieu stood at bay to await the French. Though his numbers were far less than theirs, he had a good position, and his men were of good stuff; and when it came to the battle, the defeat of the French was crushing. Philip had to fall back with his shattered army; Edward withdrew unmolested to Calais, which he took after a long siege in 1347. Philip had been obliged to call up his son John from the south, where he was observing the English under the earl of Derby ; thereupon the English overran all the south, taking Poitiers, and finding no opposition. Queen Philippa of Hainault had also defeated and taken David of Scotland at Neville's Cross.

The campaign of 1346-1347 was on all hands disastrous to King Philip. He sned for and obtained a truce for ten months. These were the days of the " black death," which raged in France from 1347 to 1349, and completed the gloom of the country, vexed by an arbitrary and grasping monarch, by unsuccessful war, and now by the black cloud of pestilence. In 1350 King Philip died, leaving his Se to John of Normandy. He had added two districts

nd a title to France: he bought Montpellier from James

meet him. Hereon the Black Prince, whose forces were weak, began to retreat; but the French king outmarched and intercepted him near Poitiers. He had the English completely in his power, and with a little patience could

'have starved them into submission; instead, he deemed and the English raised large forces and supplies, meaning |

it his chivalric duty to avenge Crécy in arms, and the ~

great battle of Poitiers was the result (19th September 1356). The carnage and utter ruin of the French feudal army was quite incredible; the dead seemed more than the whole army of the Black Prince; the prisoners were too many to be held. The French army, bereft of leaders, melted away, and the Black Prince rode triumphantly back to Bordeaux with the captive King John and his brave little son in his train. A two years' truce ensued; King John was carried over to London, where he found a fellow in misfortune in

David of Scotland, who had been for 11 years a captive in English hands, The utter degradation of the nobles, and the misery of the country, gave to the cities of France an

opportunity which one great man, Etienne Marcel, provost Btienne |

of the traders at Paris, was not slow to grasp. He Marcel.

fortified the capital and armed the citizens; the civic clergy made common cause with him; and when the dauphin Charles convoked the three Estates at Paris, it was soon seen that the nobles had become completely discredited and powerless, It was a moment in which a new life might have begun for France; in vain did the noble order clamour for war and taxes,—they to do the war, with what skill and success all men now knew, and the others to pay the taxes, Clergy, however, and burghers resisted. The Estates parted, leaving what power there was still in France in the hands of Etienne Marcel. He strove in vain to reconcile Charles the dauphin with Charles of Navarre, who stood forward as achampion of the towns. Very reluctantly did Marcel entrust his fortunes to such hands, With help of Lecocq, bishop of Laon, he called the Estates again together, and endeavoured to lay down sound principles of government, which Charles the dauphin was compelled to accept. Paris, however, stood alone, and even there all were not agreed. Marcel and Bishop

1358-64.

The peace

of Bretigny.

Charles V.

DuGues- clin,

HUNDRED YEARS' WAR. |

release of Charles of Navarre, then a prisoner. The result was that ere long the dauphin-regent was at open war with Navarre and with Paris. The

outbreak of the miserable peasantry, the Jacquerie, who fought partly for revenge against the nobles, partly to help Paris, darkened the time ; they were repressed with savage bloodshed, and in 1358 the dauphin's party in Paris assassinated the only great man France had seen for long. With Etienne Marcel's death all hope of a constitutional life died out from France ; the dauphin entered Paris, and set his foot on the conquered liberties of his country. Paris had stood almost alone; civic strength is wanting in France; the towns but feebly supported Marcel; they compelled the movement to lose its popular and general character, and to become a_ first attempt to govern France from Paris alone. After some insincere negotiations, and a fear of desultory warfare, in which Edward III. traversed France without meeting with a single foe to fight, peace was at last agreed to at Bretigny in May 1360. By this act Edward JII. renounced the French throne, and gave up all he claimed or held north of the Loire, while he was secured in the lordship of the south and west, as well as of that part of northern Picardy which included Calais, Guines, and Ponthieu. The treaty also fixed the ransom to be paid by King John.

France was left smaller than she had been under Philip Augustus, yet she received this treaty with infinite thank- fulness; worn out with war and weakness, any diminution of territory seemed better to her than a continuance of her unbearable misfortunes. Under Charles, first as regent, then as king, she enjoyed an uneasy rest and peace for 20 years. The monarchy was disgraced by failure and captivity; the nobles weakened and discredited in war

and peace, headed by factious and self-seeking lords, could

offer no hope for France; the cities had shown, during the effort of Marcel, that rare man of energy and genius, that they were unfit to take the command; the Jacquerie had declared the peasantry to be wretched and powerless; the black death with equal hand had smitten all, and had shown with lurid light the scandalous manners of the Avignon papacy, the want of patriotic or religious energy in the clergy ; the country was pitilessly ravaged by the free companies, the inheritance of the war. In all Europe it

was a dark and gloomy time; in France men might well |

despair. King John, after returning for a brief space to France, went back into his pleasant captivity in England, leaving his country to be ruled by the regent the dauphin. In 1364 he died, and Charles V., "the Wise," became king in name, as he had now been for some years in fact. This cold, prudent, sickly prince, a scholar who laid the foundations of the great library of Paris by placing 900 MSS. in three chambers in the Louvre, had nothing to dazzle the ordinary eye; to the timid spirits of that age he seemed to be a malevolent wizard, and his name of "Wise" had in it more of fear than of love. Yet he was a successful prince for the times; he discerned that nothing could be gained by fighting battles, that Ennius had given him the clue to victory in describing Fabius as one who "ecunctando restituit rem ;" and he had the passive cold- ness of heart needful to carry out such a plan. Healso is notable for two things: he reformed the current coin, and recognized the real worth of Du Guesclin, the first great leader of mercenaries in France, a grim fighting-man, hostile to the show of feudal warfare, and herald of a new age of contests, in which the feudal levies would fall into the background. The invention of gunpowder in this century, the incapacity of the great lords, the rise of free lances and mercenary troops, all told that a new era had arrived, It was by the hand of Nu Guesclin that Charles

PRARE EF

Lecocq, seeing the critical state of things, obtained the |

overcame his cousin and namesake Charles of Navarre, and |

'it did nothing to restore the English cause.

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compelled him to peace. On the other hand, in the Breton 1364-80.

war which followed just after, he was defeated by Sir John Chandos and the partisans of John of Montfort, who made him prisoner ; the treaty of Guerande which followed gave them the dukedom of Brittany ; and Charles V., unable to resist, was fain to receive the new duke's homage, and to confirm him in the duchy. The king did not rest till he had ransomed Du

Guesclin from the hands of Chandos; he then gave him commissiun to raise a paid army of free- booters, the scourge of France, and tou march with them to support, against the Black Prince, the claims of Henry of Trastamare to the crown of Castile. Successful at first, by help of the king of Aragon, he was made constable of Spain at the coronation of Henry at Burgos ; Edward the Black Prince, however, intervened, and at the battle of Najara (1367) Du Guesclin was again a prisoner in English hands, and Henry lost his throne. Fever destroyed the victorious host, and the Black Prince, withdrawing into Gascony, carried with him the seeds of the disorder which shortened his days. Du Guesclin soon got his liberty again; and Charles V., seeing how much his great rival of England was weakened, determined at last on open war. He allied himself with Henry of Trastamare, listened to the grievances of the Aquitanians, summoned the Black Prince to appear and answer the complaints. In 1369 Henry defeated Pcdro, took him prisoner, and murdered him in a brawl; thus perished the hopes of the English party in the south. About the same time Charles V. sent open defiance and declaration of war to England. Without delay he surprised the English in the north, recovering all Ponthieu at once; the national pride was aroused; Philip, duke of Burgundy, who had, through the prudent help of Charles, lately wen as a bride the heiress of Flanders, was stationed at Rouen, to cover the western approach to Paris, with strict orders not to fight ; the Aquitanians were more than half French at heart. The record of the war is as the smoke of a furnace. We see the reek of burnt and plundered towns; there were no brilliant feats of arms ; the Black Prince, gloomy and sick, abandoned the struggle, and returned to England to die; the new governor, the earl of Pembroke, did not even succeed in landing: he was attacked and defeated off Rochelle by Henry of Castille, his whole fleet with all its treasure and stores taken or sunk, and he himself was a prisoner in Heury's hands. Du Guesclin had already driven the English out of the west into Brittany; he now overran Poitou, which received him gladly ; all the south seemed to be at his feet. The attempt of Edward III. to relieve the little that remained to him in France failed utterly, and by 1372 Poitou was finally lost to England. Charles set himself to reduce Brittany with considerable success ; a diversion from Calais caused plentiful misery in the open country; but, as the French again refused to fight, By 1375 England held nothing in France except Calais, Cherbourg, Bayonne, and Bordeaux. Edward IIL, utterly worn out with war, agreed to a truce, through

intervention of the pope; it was signed in 1375. In 1377, on its expiry, Charles, who in the two years had sedulously improved the state of France, renewed the war. By sea and land the English were utterly overmatched, and by 1378 Charles was master of the situation on all hands. Now, however, he pushed his advantages too far; and the cold skill which had overthrown the English was used in vain against the Bretons, whose duchy he desired to absorb. Languedoc and Flanders also revolted against him. France was heavily burdened with taxes, and the future was dark and threatening. In the midst of these things, death over- took the coldly-calculating monarch in September 1380. Little had France to hope from the boy who was now

followers of the Avignon pope, Clement VII. But his lucid 1390-94, intervals were too short and few; and the French court Urban. was ulso too much engaged in the Burgundian and Orleanist ists and

1380-90. called on to fill the throne. Charles VI. was not twelve Charles years old, a light-witted, handsome boy, under the guar- VI. dianship of the royal dukes his uncles, who had no

principles except that of their own interest to guide them in bringing up the king and ruling the people. They selfishly quarrelled round his person; the duke of Anjou stole his money and set off to make good his claims on Naples and Sicily; the duke of Burgundy had great prospects in the Low Countries; the duke of Berri ruled in southern France, and was a man of no character or worth; the duke of Bourbon, the late king's brother-in-law, with Burgundy, had charge of the boy's education; Oliver Clisson was made constable of France in the room of Du Guesclin. Before Charles VI. had reached years of discretion he was involved by the French nobles in war against the Flemish cities, which, under guidance of the great Philip van Arteveldt, had overthrown the authority of the count of Flanders. The French cities showed ominous signs of being inclined to ally themselves

with the civic movement in the north. The men of Ghent came out to meet their French foes, and at the battle of Roosebek (1382) were utterly defeated and crushed. Philip van Arteveldt himself was slain. It was a great triumph of the nobles over the cities; and Paris felt it when the king returned. All movement there and in the other northern cities of France was ruthlessly repressed; the noble reaction alsv overthrew the "new men" and the lawyers, by whose means the late king had chiefly governed. Two years later, the royal dukes signed a truce with England, includ- ing Ghent in it; and Louis de Male, count of Flanders, having perished at the same time, Margaret, his daughter, wife of Philip of Burgundy, succeeded to his inheritance (1384). Thus began the high fortunes of the house of Burgundy, which at one time seemed to overshadow emperor and king of France. In 1385 another of the brothers, Louis, duke of Anjou, died, with all his Italian ambitions unfulfilled. In 1386 Charles VI, under guid- ance of his uncles, declared war on England, and ex- hausted all France in preparations; the attempt proved the sorriest failure. The regency of the dukes became daily more unpopular, until in 1388 Charles dismissed his two uncles, the dukes of Burgundy and Berri, and began to rule. For a while all went much better; he recalled his father's friends and advisers, lightened the burdens of the people, allowed the new ministers free hand in making prudent government; and learning how bad had been the state of the south under the duke of Berri, deprived him of that command in 1390. Men thought that the young king, if not good himself, was well content to allow good men tv govern in his name; at any rate the rule of the selfish dukes seemed to be over. Their bad influences, however, still surrounded him; an attempt to assassinate Oliver Clisson the constable was connected with their intrigues and those of the duke of Brittany; and in setting forth to punish the attempt on his favourite the constable, the unlucky young king, who had sapped his health by debauchery, suddenly became mad. The dukes of Burgundy and Berri at once seized the reins, and put aside his brother the young duke of Orleans. It was the beginning of that great civil discord between Burgundy and Orleans, the Burgundians and 'Armagnacs, which worked so much ill for France in the earlier part of the next century. The rule of the uncles was disastrous for France ; no good government seemed even possible for that unhappy land. From time to time the unfortunate king had lucid intervals; he seems even to have tried to put a stop to the great schism of the West, that struggle a rival popes, the scandalous quarrel of '" Urbanists,"

wers of Urban VI. elected at Rome (in 1378) in opposition to the French power, and of "Clementines,"

contest to care much for the peace of the church. There is ©! no more gloomy period of French history than the coming 50 years. It is the record of party strife of a mean and unscrupulous kind, in which also Paris begins her new réle of partisan. The struggle in the 15th century between royalty and aristocracy is an unlovely sight, whether it be watched in England, in Germany, or in France. In France the contest took a peculiar form ; the whole country seemed to be arrayed under two hostile banners—that of the house of Burgundy, and that of the duke of Orleans. The house of Burgundy was headed by men of grasp and power, and its party bore the name of Burgundians, little as it expressed the true position; while the duke of Orleans was a mean and foolish person, and his party did not go by his name, but, by some accident, took that of the count of Armagnac, who was father-in-law to the duke of Orleans, and a prince of great name and vigour in the south of France. The duke of Burgundy was Philip the Bold, fourth son of King John of France, to whom his father had granted the duchy on the death: of Philip de Rouvres, who had left no heirs, so that his inheritance had escheated to the crown. The duke was therefore uncle to Charles VI., and to his rival in France, Louis, duke of Orleans. By his marriage with Margaret of Flanders, to whom the county of Burgundy had descended by female succession, he reunited the duchy and county, and also became lord of Flanders. Though the county (Franche Comté) carried him to the east of France into the empire, his chief power lay in the north, His connexion with Germany led him to espouse the side of the Urbanists against the corrupt Avignon papacy. The policy of the duke made him popular with the cities of the north of France, and specially with Paris,—a popularity in no way impaired by his terrible punishment of Liége, which opposed him in 1408; that policy professed to relieve the cities of their worst burdens, and to give them a position of some independence in the presence of their unhappy sovereign and the corrupt court around him. In his foreign politics the duke had also added much to his strength by supporting the house of Lancaster in its successful attack on Richard II.; the friendship of Henry IV. and Henry V. of England was the result. In resources the house of Burgundy was deemed the richest in the world, and its magnificence on great occasions rivalled all that had been dreamt in*

fable. Lastly, while the French monarchs were a weary series of diseased or dissolute princes, their Burgundian cousins were all strong men,— nien of faults enough, no doubt, but not of weak vices. On the other hand, the duke of Orleans, with his follow- ing of nobles, was of the south; all his strength lay beyond the Loire, and his party represented the old aristocracy against the modern princes and the popular instincts of the cities. There is no greater mistake than that of speaking of the Burgundian dukes as the last great leaders of feudalism; the feudalism of the age was far more definitely on the side of the Armagnacs. In his church politics Orleans supported the southern Avignon pope against the Germanic and Italian Urbanists ; in his foreign politics he and the court went with the losing Yorkist party in England, Richard II. having in 1396 espoused Isabelle of Valois, eldest daughter of Charles VI. At the beginning the Armagnacs were a mere court and noble party ; no general or patriotic feelings seemed to be in question; as, however, time went on, and the house of Burgundy drew closer and closer to that of Lancaster, and when England and Burgundy in the days of Henry V. aud Bedford seemed to be subjecting France for ever to the foreigner, then the Armagnac party gradually asserted

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were Normandy, Maine, and Anjou, not without a good sum of money. The French court, on the other hand, offered him her hand with Aquitaine aud the money, ar offer rejected instantly; and Henry made ready for a rough wooing in arms. In 1415 he crossed to Harfleur, and while parties still fought in France, after a long and exhausting siege took the place ; thence he rode northward for Calais, feeling his army too much reduced to attempt more. The Armagnacs, who had gathered at Rouen, also pushed fast to the north, and having choice of passage over the Somme, Amiens being in their hands, got before King Henry, while he had to make a long round before he could getacross that stream. Consequently, when on his way he teached Azincourt, he found the whole chivalry of France

arrayed against him in his path. The great battle of |

Azincourt followed, with frightful ruin and carnage of the French. With a huge crowd of prisoners the young king passed on to Calais, and thence to England. The Armagnacs' party lay buried in the hasty graves of Azincourt

; never had there been such slaughter of nobles. Still, for three years they made head against their foes; till in 1418 the duke of Burgundy's friends opened Paris' gates to his soldiers, and for the time the Armagnacs Seemed to be completely defeated; only the dauphin Charles made feeble war from Poitiers. Henry V. with a

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1404-18. a far higher position for itself, took up the national canse, | fresh army had already made another descent on the 1417-29. and rousing the hitherto unconscious patriotism of the | Normandy coast ; the dukes of Anjou, Brittany, and Bur- people, swept away the invader and his friends. gundy made several and independent treaties with him 5

Party An obscure strife went on until 1404, when Duke Philip | andit seemed as though France had completely fallen

strifein of Burgundy died, leaving his vast inheritance to John the | in pieces. Henry took Rouen, and although the common

| France. Fearless, the deadly foe of Louis of Orleans. Paris was peril somewhat silenced the strife of faction, no steps were with him, as with his father before him ; the duke entered | taken to meet him or check his course ; on the contrary, the capital in 1405, and issued a popular proclamation | matters were made even more hopeless by the murder of against the ill-government of the queen-regent and Orleans. | John, duke of Burgundy, iu 1419, even as he was kneeling Much profession of a desire for better things was made, | and offering reconciliation at the young dauphin's feet. The with small results. So things went on till 1407, when, after | young Duke Philip now drew at once towards Henry, whom the duke of Berri, who tried to play the part of a mediator, | his father had apparently wished with sincerity to check ; had brought the two princes together, the duke of Orleans | Paris, too, was weary of the Armagnac struggle, and desired was foully assassinated by a Burgundian partisan. The | to welcome Henry of England ; the queen of France also duke of Burgundy, though he at first withdrew from Paris, | went over to the Anglo-Burgundian side. The end of

it speedily returned, avowed the act, and was received with | was that on May 21, 1420, was signed the famous treaty of plaudits by the mob. For a few years the strife continued, | Troyes, which secured the crown of France to Henry, by the The obscure and bad; a great league of French princes and | exclusion of the dauphin Charles, whenever poor mad Charles treaty of nobles was made to stem the success of the Burgundians; | VI. should cease to live. Meanwhile Henry was made regent Troyes. and it was abont this time that the Armagnac name became | of France, promising to maintain all rights and privileges common. Paris, however, dominated by the "Cabochians," | of the parliament and nobles, and to crush the dauphin the butchers' party, the party of the "'marrowbones and | with his Armagnac friends, in token whereof he was at cleavers," and entirely devoted to the Burgundians, enabled | once wedded to Catharine of France, and set forth to quell John the Fearless to hold his own in France; the king | the opposition of the provinces. By Christmas all France himself seemed favourable to the same party. In 1412 the | north of the Loire was in English hands. All the lands princes were obliged to come to terms, and the Burgundian | to the south of the river remained firmly fixed in their triumph seemed complete. In 1413 the wheel went round, allegiance to the dauphin and the Armagnacs, and these and we find the Armagnacs in Paris, rudely sweeping away | began to feel themselves to be the true French party, as all the Cabochians with their professions of good civic opposed to the foreign rule of the English. For barely rule. The duke of Berri was made captain of Paris, and | two years that rule was carried on by Henry V. with for a while all went against the Burgundians, until in 1414 | inflexible justice, and northern France saw with amazement Duke John was fain to make the first peace of Arras, and | the presence of a real king and an orderly government. to confess himself worsted in the strife. The young | In 1422 King Henry died ; a few weeks later Charles VI. dauphin Louis took the nominal lead of the national | died also ; and the face of affairs began to change, although party, and, ruled supreme in Paris in great ease and self. | at the first Charles VII. the " Well-served," the lazy, listless Charles indulgence. prince, seemed to have little heart for the perils and efforts VII. Henry The year before Henry V. had succeeded to the throne | of his position, He was proclaimed king at Mehun in | K a 3 of England,—a bright and vigorous young man, eager to | Berri, for the true France for the time lay on that side of "ame be stirring in the world, brave and fearless, with a

stern | the Loire ; and the regent Bedford, who took the reins at grasp of things beneath all,—a very sheet auchor of firmness Paris, was a vigorous and powerful prince, who was not and determined character. Almost at the very opening of | likely to give way to an idle dreamer. At the outset lis reign, the moment he had secured his throne, he began | Charles suffered two defeats, at Crevant in 1423 and at Ver-) @ negotiation with France which boded no good. He | neuil in 1424, and things seemed to be come to their worst. offered to marry Catharine, the king's third daughter, and | Yet he was prudent, conciliatory, and willing to wait ; and therewith to renew the old treaty of Bretigny, if her dower | as the English power in France,—that triangle of which the

base was the sea line from Harfleur to Calais, and the apex Paris,—-was unnatural, and far from being really strong, and as the relations between Bedford and Burgundy might not always be friendly, the man who could wait had many chances in his favour. Before long things began to mend ; Charles wedded Mary of Anjou, and won over that great house to the French side; more and more was he regarded as the nation's king ; symptoms of a wish for reconciliation with Burgundy appeared ; the most vehement Armagnacs were sent away from court. Causes of disagreement also shook the friendship between Burgundy and England. Feeling the evils of inaction most, Bedford in 1428 decided on a forward movernent, and sent the earl of Salisbury tothe south. He first secured his position on the north of the Loire, then, crossing that river, laid siege to Orleans, the key to the south, and the last bulwark of the uational party. All efforts to vex or dislodge him failed; the attempt early in 1429 to stop the English supplies was completely defeated at Bouvray; from the salt fish captured, the battle has taken the name of "the Day of the Herrings." Dunois, bastard of Orleans, was wounded ; the Scots, the king's bodyguard, on whom fell ever the grim- mest of the fighting, suffered terribly, and their leader was killed. All went well for Bedford, till it suited the duke of Burgundy to withdraw from his side, carrying

1429-31.

The Maid of Orleans.

with him a large part of the fighting power of the besiegers. Things were already looking rather gloomy in the English camp, when a new and unexpected rumour struck all hearts cold with fear. A virgin, an Amazon, had been raised up as a deliverer for France, and would soon be on them, armed with mysterious powers.

A young peasant girl, one Jeanne Dare, had been brought up in the village of Domrémy, hard by the Lorraine border, The district, always French in feeling, had lately suffered much from Burgundian raids; and this young damsel, brooding over the treatment of her village and her country, and filled with that strange vision- power which is no rare phenomenon in itself with young girls, came at last to believe with warm and active faith in heavenly appearances and messages, all urging her to deliver France and her king. From faith to action the bridge is short; and cre long the young dreamer of seventeen set forth to work her miracle. Her history is quite unique in the world; and though probably France would ere many years have shaken off the English yoke, for its strength was rapidly going, still to her is the credit of having proved its weakness, and of having asserted the triumphant power of a great belief. All gave way before her; Charles VIL., persuaded doubtless by his mother-in-law Yolande of Aragon, who warmly espoused her cause, listened readily to the maiden's voice ; and as that voice urged only what was noble and pure, she carried conviction as she went. In the end she received the king's commission to undertake the relief of Orleans. Her coming was fresh bluod to the defence ; a new spirit seemed to be poured out on all her followers, and in like manner a deep dejection settled down on the English. The blockade was forced, and in eight days the besicgers raised the siege and marched away. They withdrew to Jargeau, where they were attacked aud routed with great loss. A little later Talbot himself, who had marched to help them, was also defeated and taken. Then, compelling Charles to come out from his inglorious ease, she carried him triumphantly with her to Rheims, where he was duly crowned king, the Maid of Orleans standing by, and holding aloft the royal standard.

She would gladly have gone home to Domrémy now, her mission being accomplished ; for she was entirely free from all ambitious or secondary aims. But she was too great a power to be spared. Northern France was still in English hands, and till the English were cast out her work was not

complete ; so they made her stay, sweet child, to do the work which, had there been any manliness in them, they ought to have found it easy to achieve for themselves. The dread of her went before her,—a pillar of cloud and darkness to the English, but light and hope to her countrymen. Men believed that she was called of God to regenerate the world, to destroy the Saracen at last, to bring in the millennial age. Her statue was set up in the churches, and crowds prayed before her image as before a popular saint.

The incapacity and ill-faith of those round the king gave the English some time to recover themselves ; Bedford and Burgundy drew together again, and steps were taken to secure Paris. When, however, Jeanne, weary of courtly delays, marched, contemptuous of the king, as far as to St Denis, friends sprang up on every side. In Normandy,

on the English line of communications, four strong places

were surprised ; and Bedford, made timid as to his supplies, fell back to Rouen, leaving only a small garrison in Paris. Jeanne, ill-supported by the royal troops, failed in her attack on the city walls, and was made prisoner by the Burgundians ; they handed her over to the English, and she was, after grievous indignities, and such treatment as chivalry alone could have dealt her, condemned as a witch, and burnt as a relapsed heretic at Rouen in 1431.

FRANCE

[WISTORY.

Betrayed by the French court, sold by the Burgundians, 1431-39,

murdered by the English, unrescued by the people of France which she so much loved, Jeanne Dare died the martyr's death, a pious, simple soul, a heroine of the purest metal. She saved her country, for the English power never recovered from the shock. The churchmen who burnt her, the Frenchmen of the unpatriotic party, would have been amazed could they have foreseen that nearly 450 years afterwards, churchmen again would glorify her name as the saint of the church, in opposition to both the religious liberties and the national feelings of her country,

The war, after having greatly weakened the noblesse, and having caused infinite sufferings to France, now drew towards a close; the duke of Burgundy at last agreed to

abandon his English allies, and at a great congress at Arras The VIL., by which he treaty On condition that 41™:

in 1435 signed a treaty with Charles solemnly came over to the French side. he should get Auxerre and Macon as well as the towns on and near the river Somme, he was willing to recognize Charles as king of France. His price was high, yet it was worth all that was given ; for after all he was of the French blood royal, and not a foreigner. The death of Bedford, which took place about the same time, was almost a more terrible blow to the fortunes of the English. Paris opened her gates to her king in April 1436; the long war kept on with slight movements uow and then for several years. In these same days the council of Basel sat, and declared the supremacy of councils over the papacy ; the long evils of schism had brought the pontiff very low. In connexion with this council Charles VII. in 1488 held a national council at Bourges, and enacted therein his

Pragmatic Sanction, in which the French church repeated The and affirmed the Prag- matic Sanction

the conclusions of the Basel council, liberties of the Gallican Church, in close connexion with its allegiance rather to the king than the pope ; it also claimed o¢

for capitular bodies and monasteries the right of elect- Bourges.

ing their heads, declared the worst of the taxes levied by the papacy on the church illegal, and restrained the right of appeal to Rome. The French Church received the proclamation with gratitude and applause, while the papacy protested, and the dukes of Brittany and Burgundy refused to recognize it or adopt its principles within their dominions. It continued to be the church-law of France till the necessities of Francis I. bartered it away in 1516 for the Bologna concordat.

The next year was marked by the meeting of the States- General, and the establishment, in principle at least, of a standing army. The Estates petitioned the willing king that the system of finance in the realm should be remodelled, and a permanent tax established for the support of an army. Thus, it was thought, solidity would be given to the royal power, and the long standing curse of the freebooters and brigands cleared away. No sooner was this done than the nobles began to chafe under it ; they scented in the air the coming troubles; they took as their head, poor innocents, the young dauphin Louis, who was willing enough to resist the concentration of power in royal hands, Their champion of 1439, the leader of the

“ Praguerie,” as this new league was called, in imitation, it The Pr

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is said, of the Hussite movement at Prague, the enthusiastic 84" —

defender of noble privilege against the royal power, was the man who afterwards, as Louis XI., was the des- troyer of the noblesse on behalf of royalty. Some of the nobles stood firmly by the king, and, aided by them and by an army of paid soldiers serving under the new con- ditions, Charles VII., no contemptible antagonist when once aroused, attacked and overthrew the Praguerie: the cities and the country people would have none of it; they preferred peace under a king’s strong hand. Louis was sent down to the east to govern Dauphiny; the lessons of

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1441-53. the civil war were not lost on Charles ; he crushed the _-_— freebooters of Champagne, drove the English out of Pontoise in 1441, moved actively up and down France, reducing anarcliy, restoring order, resisting English attacks. In the last he was loyally supported by the dauphin, who was glad to find a field for his restless temper. He re- pulsed the English at Dieppe, and put down the count of Armiznac in the south. During the two years’ truce with England which now followed, Charles VII. and Louis drew off their free-lances eastward, and the dauphin came into .

rude collision with the Swiss not far from Basel, in 1444. Some sixteen hundred mountaineers long and heroically withstood at Saint Jacob the attack of several thousand Frenchmen, fighting stubbornly till they all perished. It is said that the experience so dearly bought on the field of Saint Jacob was very useful to Louis in aftcr days, when he was content to leave Charles the Bold to ruin himself by his attacks on Switzerland. The red wine grown on the slope of the graveyard where they fell is called "Schweitzer-blut," Swiss-blood, to this day. It was at this time also that the cardinal of Winchester wedded Henry VI. of England to Margaret of Anjou, the ambitious daughter of King René, the laughter-loving troubadour of Provence, who cared so much for poetry and so little for kingship. The king and dauphin returned to Paris, having defeuded their border-lands with credit, and having much reduced the numbers of the lawless free-lances. They next set themselves to organize a regular army of fifteen com- panies of one hundred lances (each lance representing six fighting men), led by fifteen captains appointed by the king, and raised in different districts of France. This army partly absorbed and partly crushed the troublesoine free-lances, and became a powerful police, which restored security and made good government once more possible. Round his own person Charles placed those sturdy and faithful fight- ing men the Scottish guard ; under John Stewart d'Aubigné

| HUNDRED YEARs' WAR. |

. troubles were placed as a colony at St Martin d'Auxigny near Bourges, where their descendants still live in the enjoyment of special village-advantages, preserved to them

by long use and tradition through all the changes of

French history. This army, with the contingent due from

the nobles, which was also reduced to order and made to

; receive pay, raised the power of the French monarchy far above anything that had as yet been seen; and had

Charles VII. been more ambitious he might have begun

to play the part reserved for his son. The dauphin, dis-

) contented again, was obliged once more to withdraw into Dauphiny, where he governed prudently and with activity.

Close of | In 1449 the last scene of the Anglo-French war began. Tae In that year English adventures landed on the Breton Years' COaSt; the duke called the French king to his aid. Charles War, did not tarry this time; le broke the truce with England, sent Dunois into Normandy, and himsclf soon followed. In both duchies, Brittany and Normandy, the French were welcomed with delight; no love for England lingered in the west. Somerset and Talbot failed to defend Rouen, and were driven from point to point, till every stronghold Was lost to them. Dunois then passed into Guienne, and in a few months Bayonne, the last stronghold of the English, fell into his hands (1451). When Talbot was sent over to Bordeaux with 5000 men to recover the south, the old English feeling revived,—for England was their best cus-tomer, and they had little in common with France. It was, however, but a last flicker of the flame; in July 1453, at the siege of Castillon, the aged Talbot was slain, and the

War at once came to an end; the south passed finally into

the kingdom of France. Normandy and Guienne were assimilated to France in taxation and army organization;

and all that remained to England across the Channel was

they served the French king well, and at the end of his |

NCE Dol

Calais with Havre and Guines Castle. Her foreign ambi- 1453-61. tions and struggles over, England was left to consume her- self in civil strife, while France might rest and recover from the terrible sufferings she had undergone. The state

'of the country had become utterly wretched. We are told

that from the Loire to the Somme, as fertile a part as any in France, all lay desert, given up to wolves, and tra- versed only by thie robber and the free-lance; the peasant, despairing of his tillage, got him a weapon, and took to the roads; the danse Macabre, grimly limned on churchyard- walls, was a parable of the age, in which all men lived in the presence of death ; mysteries and moralities were the chief literature of the time; Froissart was gone, and Commines had not yet come; the duke of Orleans, so long a prisoner in England, is the one true poet of the time; the "good king René" is but in his earlier days, and gave himself most to poetry in his old agc; within the walls of a few towns rose some splendid examples of domestic architecture, like the house of Jacques Coeur, the great merchant at Bourges ; the stir and movement of the Renaissance finds little sympathy in France in these dark days.

With the end of the English wars new life began to gleam State of out on France ; the people grew more tranquil, finding that France. toil and thrift bore again their wholesome fruits ; Charles VII. did not fail in his duty, and took his part in restoring quiet, order, and justice in the land. With the return of peace came also the arts of peace; the poet's song is heard. Olivier Basselin, whose verses were afterwards retouched and published by Jean de Houx, belongs to this period; now, too, comes Villon, the first of French pvets, whose writings ring still with some of the misery of the past; and Alain Chartier follows a little later.

The French crown, though it had beaten back the – English, was still closely girt in with rival neighbours, the great dukes on every frontier. All round the east and north lay the lands of Philip of Burgundy; to the west was the duke of Brittany, cherishing a jealous independence; the royal dukes, Berri, Bourbon, Anjou, are all so many poten- tial sources of danyer and difficulty to the crown. The conditions of the nobility are altugether changed; the old barons have sunk into insignificance ; the struggle of the future will lie between the king's cousins and himself, rather than with the older lords. A few non-royal princes, such as Armagnac, or St Pol, or Brittany, remain, and will go down with the others; the "new men" of the day, the bastard Dunois or the constables Du Guesclin and Clisson, grow to greater prominence; it is clear that the old feudalism is giving placc to a newer order, in which the aristocracy, from the king's brothers dowuwards,

will group themselves around the throne, and begin the process which reaches its unhappy perfection under Louis XIV.

Directly after the expulsion of the English, troubles began between King Charles VII. and the dauphin Louis; the latter could not brook a quiet life in Dauphiny, and the king refused him that larger sphere in the government of Nor- mandy which he coveted. Against his father's will, Louis married Charlotte of Savoy, daughter of his strongest neigh- bour in Dauphiny; suspicion and bad feeling grew strong between father and son ; Louis was specially afraid of his father's counsellors; the king was specially afraid of his son's craftiness and ambition. It came to an open rupture, and Louis in 1456 fled to the court of Duke Philip of Burgundy. 'There he lived at refuge at Geneppe, meddling a good deal in Burgundian politics, and already opposing himself to his great rival Charles of Charolais, after- wards Charles the Bold, the last duke of Burgundy. Bickerings, under his bad influence, took place between king and duke; they never burst out into flame. So things went on uncomfortably enough, till Charles VII. died in 1461, and the reign of Louis XI. began.

way towards the capital. The hostile armies met at 1465-68,

146)-64. Between father and son what contrast could be greater ? |

Contrast Charles VII., "the Well-served," so easy-going, so open

of and free from guile; Louis XI., so shy of counsellors, so

Charles energetic and untiring, so close and guileful. History does VII. and ¢

LouisX1, PUt apologize for Charles, and even when she fears and

islikes Louis, she cannot forbear to wonder and admire.

And yet Louis enslaved his country, while Charles had seen

it rescued from foreign rule ; Charles restored something of

its prosperity, while Louis spent his life in crushing its

institutions and in destroying its elements of independence.

A great and terrible prince, Louis XI. failed in having little or lo constructive power; he was strong to throw down the older society, he built little in its room. It is the fatal evil of absolute monarchy that it is not bound to replace what it crushes; so that the old order passes away, and no new society springs up in its place. It is to this that France owes the barrenness of her constitutional history. Reign 'The reign of Louis XI. is well divided into three periods. gahaes The first six years of it represent his strife with his great ' lords (1461-1467) ; the next period, of nine years, is vccu- pied by his rivalry with Charles the Bold (1469-1476) ; the third, a time of seven years, gives us the king " trium- phant and miserable" (1476-1483).

We are so wont to associate the name of Louis XI. with all that is cold, measured, and crafty that we can scarcely believe we are reading his history when we hear the narrative of his first acts on coming to the throne. He appears as a young impulsive prince, whose frank imprud- ence calculated no cost. He offended the duke of Bur- gundy's followers who escorted him to his consecration at Rheims, and thence into Paris, by seuding them away empty; he deprived the duke of Bourbon of the govern- ment of Guienne, which he held; he dismissed all his father's ministers and friends; he set free the noble cap- tives whom his father had been obliged to restrain; he alienated the nobles and clergy by negotiating with the pope and threatening to abolish the Pragmatic Sanction. In all this he seemed inclined to depend on the support of the good towns. Most serious of all was his action with respect to the district of the river Somme, at that time the northern frontier of France. The towns there had been handed over to Philip of Burgundy by the treaty of Arras, with a stipulation that the crown might ransom them at any time, and this Louis succeeded in doing in 1463. The act was quite blameless and patriotic in itself, yet it was exceedingly unwise, for it thoroughly alienated Charles the Bold, and led to the wars of the earlier period of the reign. Lastly, as if he had not done enough to offend the nobles, Louis in 1464 attacked their hunting rights, touching them in their tenderest part. No wonder that this year saw the formation of a great league against him, and the outbreak of a dangerous civil war. The

“ League of the Public Weal” was nominally headed by his own brother Charles, heir to the throne; it was joined by Charles of Charolais, who had completely taken the command of affairs in the Burgundian territories, his father the old duke being too feeble to withstand him; the dukes of Brittany, Nemours, Bourbon, John of Anjou, duke of Calabria, the count of Armagnac, the aged Dunois, and a host of other princes and nobles flocked in; and the king had scarcely any forces at his back with which to withstand them. His plans for the campaign against the league were admirable, though they were frustrated by the bad faith of his captains, who mostly sympathized with this outbreak of the feudal nobility. Louis himself marched southward to quell the duke of Bourbon and his friends, and returning from that oe only half done for lack of time, he found that ie eee had passed by Paris, which was faith- nate ing, and was coming down southwards intending

join the dukes of Berri and Brittany, who were on their

Montleheri on the Orleans road ; and after a strange battle minutely described by Commines—a battle in which both sides ran away, and neither ventured at first to claim a victory—-the king withdrew to Corbeil, and then marched into Paris (1465). There the armies of the league closed in on him; and after a siege of several weeks, Louis, feeling disaffection all around him, and doubtful how long Paris herself would bear for him the burdens of blockade, signed the peace of Conflans, which, to all appearances, secured the complete victory to the noblesse, “ each man carrying off his piece.” Instantly the contented princes broke up their half-starved armies and went home, leaving Louis behind to plot and contrive against them, a far wiser man, thanks to the lesson they had taught him. They did not let him wait long for a chance. The treaty of Conflans had given the duchy of Normandy to the king’s brother Charles ; he speedily quarrelled with his neighbour the duke of Brittany, and Louis came down at once into Normandy, which threw itself into his arms, and the whole work of the league was broken up. The count of Charolais, occupied with revolts at Dinan and Liége, could not inter- fere, and presently his father the old Duke Philip died (1467), leaving to him the vast lordships of the house of Burgundy.

And now the "imperial dreamer,' Charles the Bold, was brought into immediate rivalry with that royal trickster, the " universal spider," Louis XI. Charles was by far the nobler spirit of the two: his vigour and intelligence, his industry and wish to raise all around him toa higher cultivation, his wise reforms at home, and attempts to render his father's dissolute and careless rule into a well- ordered lordship,—all these things marked him out as the leading spirit of the time. He was completely free from those mean faults which marked his antagonist: he could not lie nor cheat; he was not cold and heartless; he despised the immoral life, the loose tales, the disorderly company of the dauphin's sojourn at Geneppe. Unfortu- nately, in this noble and otherwise harmonious instrument the1e was that "one little rift," which gradually ruined all: his pride, which was high, would not have been fatal to him; it was his anger, combined with a certain strength of obstinacy, which brought him to ruin. His territories were partly held under France, partly under the empire: the Artois district, which also may be taken to include the Somme towns, the county of Rhetel, the duchy of Bar, the duchy of Burgundy, with Auxerre and Nevers, were feudally in France; the rest of his lands under the empire. He had therefore interests and means of interference on either hand; aud, in fact, it is clear that Charles set before himself two quite different lines of policy, according as he looked one way or the other. He looked towards Paris, and seeing the king there growing stronger, desired to curb him by a league of princes; he looked towards the east, and saw there a splendid field for his ambition, in the scattered territories which lay on the edge of the Holy Roman Empire. At first he followed the former line, seek- ing to weaken his neighbours, and by coalition against the strongest of them to become undoubted master of the rest; this was in the times of his active hostility towards Louis X1.; afterwards he made truce with the king, and turned his arms against the east, attacking first Lorraine, and then Switzerland.

At the time of Duke Philip's death a new league had been formed against Louis, embracing the king of England, Edward IV., the dukes of Burgundy and Brittany, and the kings of Aragon and Castile. Louis strained every nerve, he conciliated Paris, struck hard at disaffected partisans, and in 1468 convoked the States-General at Tours. The three Estates were asked to give an opinion as to the power

Charles the Bold.

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1468-77:

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of the crown to alienate Normandy, the step insisted on by the duke of Burgundy. Their reply was to the effect that the nation forbids the crown to dismember the realm; they supported their opinion by liberal promises of help. Thus fortified by the sympathy of his people, Louis began to break up thie coalition. He made terms with the duke of Bourbon and the house of Anjou; his brother Charles was a cipher; the king of England was paralysed by the antagonism of Warwick; he attacked and reduced Brittany; Burgundy, the most formidable, alone remained to be dealt with. How should he meet him?—by war or by uegotia- tion? His court was divided in opinion; the king decided for himself in favour of the way of negotiation, and came to the astonishing conclusion that he would go and meet the duke and win him over to friendship. He miscalculated both his own powers of persuasion and the force of his antagonist's temper. The interview of Peronne followed;

LOUIS XI.]

'Charles held his visitor as a captive, and in the end com-

pelled him to sign a treaty of peace, on the basis of that of Conflans, which had closed the War of the Public Weal. And as if this were not sufficient humiliation, Charles made the king aceompany him on his expedition to punish the men of Liége, who, trusting to the help of Louis, had again revolted (1469). This done, he allowed the degraded monarch to return home to Paris. An assembly of notables at Tours speedily declared the treaty of Peronne null, and the king made some small frontier war on the duke, which was ended by a truce at Amiens in 1471. The truce was spent in preparation for a fresh struggle, which Louis, to whom time was everything, succeeded in deferring from

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to raise up a barrier against this dangerous neighbour, 1477-83.

offered her hand with all her great territories to young Maximilian of Austria, and married him within six months after her father's death. To this wedding is due the rise to real greatness of the house of Austria; it begins the era of the larger politics of modern times.

After a little hesitation Louis determined to continue the struggle against the Burgundian power. He secured Franche Comté, and on his northern frontier retook Arras, that troublesome border city, the "bonny Carlisle" of those days; and advancing to relieve Therouenne, then besieged by Maximilian, fought and lost the battle of Guinegate (1479). The war was languid after this; a truce followed in 1480, and a time of quiet for France. The misconduct of the French cavalry, which had lost the battle of Guinegate, was followed by the abolition of the free-archer army ; the cities were ordered to provide money in place of men, and the age of mercenary foreign armies began. In 1480 also, on the death of the old poet-king René, the two important districts of Anjou and Provence fell in to the crown, Margaret of Anjou, René's daughter and heiress, having ceded them to Louis in return for help ; and in the end of 1482 the third peace of Arras closed awhile the rivalry between France and Burgundy. Charles the dauphin was engaged to marry the little Margaret, Maxi- milian's daughter, and as her dower she was to bring Franche Comté and sundry places on the border line disputed between the two princes. In these last days Louis XI. shut himself up in gloomy seclusion in his castle of Plessis near Tonrs, and there he died in 1483.

A great Char-

point to point, till the death of his brother Charles, now duke of Guienne, in 1472 broke up the formidable combina- tion. Charles the Bold at once broke truce and made war

king and a terrible, he has left an indelible mark on the acter and history of France, for he was the founder of France in its ee ~ later form, as an absolute monarchy ruled with little regard "©"S"*

dangerous rival.

on the king, marching into northern France, sacking towns and ravaging the country, till he reached Beauvais. There the despair of the citizens and the bravery of the women saved the town. Charles raised the siege and marched on Rouen, hoping to meet the duke of Brittany; but that prince had his hands full, for Louis had overrun his terri- tories, and had reduced him to terms. The duke of Bur- gundy saw that the coalition had completely failed; he too made fresh truce with Louis at Senlis (1472), and only deferred, he no doubt thought, the direct attack on his Henceforth Charles the Bold turned his attention mainly to the east, and Louis gladly saw him g0 forth to spend his strength on distant ventures; saw the interview at. Tréves with the emperor Frederick ITl., at which the duke's plans were foiled by the suspicions of the Germans and the king's intrigues; saw the long siege of Neusz wearing out his power; bought off the hostility of

Edward IV. of England, who had undertaken to march on

Paris; saw Charles embark on his Swiss enterprise; saw the subjugation of Lorraine and capture of Nanci (1475), the battle of Granson, the still more fatal defeat of Morat (1476), and lastly the final struggle of N ancl, and the duke's death on the field (January 1477).

While Duke Charles had thus been running on his fate, Louis XL. had actively attacked the larger nobles of France, and had either reduced them to submission or liad destroyed them. By the time of the fall of the house of Burgundy scarcely one great prince was left who could be formidable; even the power of the duke of Brittany was much strait-

to its own true welfare. He had crushed the older feu- dalism, and substituted autocracy for anarchy ; in all ways he did what he could to centralize the administration ; he imposed heavy taxes, and enabled his people to bear them ; he employed men of middle condition, and cared for commerce and industry; he treated his towns fairly well, travelled much up and down the realm, acted judiciously in retaining the local estates and parliaments. To his rule is due the rise of that official spirit, which marks the practical progress of the life of France; there is no lack of intelligence and vigour in his numerous ordinances, which show that his despotism was

not unen- lightened or selfish. Though not himself a man of learn- ing, he favoured the universities, and set up a printing press in the Sorbonne. We may believe that Louis was perfectly sincere when on his deathbed he longed for a few more years to have set the state in order. He had crushed all resistance; he had enlarged the borders of France, till the kingdom took nearly its modern dimensions; he had organized its army and administration. The danger was lest in the hands of a feeble boy these great results should be squandered away, and the old anarchy once more raise its head.

For Charles VIIL., who now succeeded, was but thirteen Charles years old, a weak boy whom his father had entirely VIII.

neglected, the training of his son not appearing to be an essential part of his work in life. The young prince had amused hiinself with romances, but had learnt nothing useful. A head, however, was found for himin the person

*of his elder sister Anne, whom Louis XJ. had married to Anne of Peter II., lord of Beaujeu and duke of Bourbon. To her Franceas the dying king entrusted the guardianship of his son; and T8*t.*

ened, The king had, therefore, free hand to make the best profit he conld out of the disasters of his Burgundian rival, and the weakness of his heiress, the young Duchess Mary.

As Duke Charles had left no male heir, the king at once re- sumed the duchy of Burgundy, as a male fief of the king- dom; he also took possession of Franche Comté at the Same time; the king's armies recovered all Picardy, and ven entered Flanders. Then Mary of Burgundy, hoping

for more than nine years Anne of France was virtual king. For those years all went well. Her prudence and high intelligence overcame her brother's ill-will, and defeated the plots of the nobles, and, almost in spite of Charles, won

; for him a complete triumph over feudalism. She was, in

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1488-95. truth, a very remarkable woman, and history, because

The Italian

expedi-

tions begin.

she was just and true and successful, has left her on one side, neglected and forgotten. Yet France flourished greatly under her: she solaced the people according to her father's dying wish; she also with vigorous and triumphant hand overcame the rivalry of Maximilian of Austria, and the selfish opposition of the princes. She it was who enabled Henry of Richmond to seize the throne of England, and to give peace to that troubled realm ; she it was who defeated the allies at the battle of St Aubin du Cormier (1488), thereby asserting the power of France against Brittany ; she it was who compelled Maximilian, in the treaty of Sablé, to close the struggle, and to leave the French monarchy in peace. Finally, it was she who out-manceuvred Maximilian in his wooing of Anne of Brittany, and secured the great prize, the heiress and her lands, for her brother Charles. In 1491 the marriage took place which led to the eventual absorption (in 1515) of Brittany into the kingdom of France. After this "Madame la Grande," as this noble lady was rightly styled, withdrew from public life, leaving the country in a healthier state than it had been in for ages, leaving also to the young king a splendid army and a well-filled treasury.

With her disappearance from the scene, the controlling hand is lost, and France begins the age of her Italian ex- peditions, which, while they introduced her into the general arena of modern politics, and formed the platform on which the rivalry between the houses of France and Austria dis- played itself, also influenced the home-life of France dis- astrously, and exhausted resources and energies so much needed for the wholesome development of the country. The Italian wars led to the civil wars, and they, in the end, cleared the ground for the despotism of Louis XIV.

When the house of Anjou came to an end in 1481, and Anjou and Maine fell in to the crown, there fell in also a far less valuable piece of property—the claim of that house, descended from Charles the youngest brother of St Louis, on the kingdom of Naplesand Sicily. There was much to tempt an ambitious prince in the state of Italy. Savoy, which held the passage into the peninsula, was then thoroughly French in sympathy; Milan, under Lodovico Sforza, "il Moro," was in alliance with Charles; Genoa preferred the French to the Aragonese claimants for influence over Italy; the popular feeling in the cities, especially in Florence, was opposed to the despotism of the Medici, and turned to France for deliverance; the misrule of the Spanish kings of Naples had made Naples thoroughly discontented ; Venice was, as of old, the friend of France. Tempted by these reasons, in 1494 Charles VIII. set forth for Italy with asplendid host. He displayed before the eyes of Europe the first example of a modern army, in its three well-balanced branches of infantry, cavalry, and artillery. There was nothing in Italy to withstand his onslaught; he swept through the land in triumph; Charles believed himself to be a great conqueror, giving law to admiring subject-lands; he entered Pisa, Florence, Rome itself. Wherever he went, his heedless ignorance, and the gross misconduct of his followers, left behind implacable hostility, and tured all friendship into bitterness. Atlast he entered Naples, and seemed to have asserted to the fullthe French claim to be supreme in Italy, whereas at that very tine his position had become completely untenable. A league of Italian states was formed behind his back; Lodovico il Moro, Ferdinand of Naples, the emperor, Pope Alexander VL. Ferdinand and Isabella, who were now welding Spain into a great and united monarchy, a!l combined against France; and in presence of this formidable confederacy, Charles VIIT. had to cut his way home as promptly as he could. At Fornovo, north of the Apennines, he defeated the allies in July 1495; and by November the main

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French army had got safely out of Italy. The forces left 1496- behind in Naples were worn out by war and pestilence, 1501.

[HISTORY.

and the poor remnant of these, too, bringing with them the seeds of horrible contagious diseases, forced their way back to France in 1496. It was the last effort of the king. His health was ruined by debauchery in Italy, repeated in France ; and yet towards the end of his reign he not merely introduced Italian arts, but attempted to reform the state, to rule prudently, to solace the poor; wherefore when he died in 1498 the people lamented him greatly, for he had been kindly and affable, brave also on the battle-field; and much is forgiven to a king.

His children died before him, so that Louis of Orleans, Louis his cousin, was nearest heir to the throne, and succeeded XU.

as Louis XII. By his accession in 1498 he reunited the fief of Orleans county to the crown; by marrying Anne of Brittany, his predecessor's widow, he secured also the great duchy of Brittany. The dispensation of Pope Alexander VI. which enabled him to put away his wife Jeanne, second daughter of Louis XI., was brought into France by Cesar Borgia, who gained thereby his title of duke of Valentinois, a large sum of money, a French bride, and promises of support in his great schemes in Italy.

As a younger man Louis XII. had been idle and dis- sipated ; and to the end self-indulgence clung to him, as a Nessus-shirt, eating into his bones. Yet he was kindly and humane to his people, friendly and without revenge or malice, even in the case of those who had done him most mischief. His reign was the reversal of all the princi- ples of Louis XI. That prince had avoided foreign com- plications, and had sternly repressed his nobles at home: Louis XII. began at once to interfere in foreign politics, and desired to strengthen the great nobles round the throne. The days were good for France, with this cheer- ful " pater patrie" ruling over it. He tried to govern with economy and care, and to develop the resources of the country: it is said that one-third of the realm was brought under cultivation in his time. His ministers were men of real ability. George of Amboise, archbishop of Rouen, the chief of them, was a prudent and sagacious ruler, who, how- ever, unfortunately wanted to be pope, and urged the king in the direction of Italian politics, which he would have done much better to have left alone. Louis XII. was lazy and of small intelligence; George of Amboise and Cesar Borgia with their Italian ambitions easily made him take up a spirited

foreign policy which was disastrous at home. Louis XII. had different aims in Italy from those of Charles VIII. His grandfather Louis had married, in 1389, Valentina Visconti, daughter of Gian Galeazzo, duke of Milan; and it had been agreed that if the duke had no male heirs, Milan should pass to the descendants of Valentina. Thishad now taken place; and Louis XIL, as Valentina's grandson, claimed the duchy; he also asserted his rights to the Two Sicilies. Utterly as the last Italian expedition had failed, the French people were not yet weary of the adventure, and preparations for a new war began af once. In 1499 the king crossed the Alps into the Milanese, and carried all before him for a while. The duchy at first accepted him with enthusiasm; but in 1500 it had had enough of the French and recalled Lodovico, who returned in triumph to Milan. The Swiss mercenaries, however, be- trayed him at Novara into the hands of Louis XII., who carried him off to France. The triumph of the French in 1500 was also the highest point of the fortunes of their ally Cesar Borgia, who seemed fora while to be completely successful. In this year Louis made a treaty at Granada, by which he and Ferdinand the Catholic agreed to despoil Frederick of Naples; and in 1501 Louis made a second ex- pedition into Italy. Again all seemed easy at the outset, and he seized the kingdom of Naples without difficulty;

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ITALIAN WARS. |

falling out, however, with his partner in the bad bargain, Ferdinand the Catholic, he was speedily swept completely out of the peninsula, with terrible loss of honour, men, and wealth.

It now became necessary to arrange for the future of Louis XII. had only a daughter, Claude, and it was proposed that she should be affianced to Charles of Austria, the future statesman and emperor. This scheme formed the basis of the three treaties of Blois (1504). In 1500, by the treaty of Granada, Louis liad in fact handed Naples over to Spain; now by the three treaties he alienated his best friends, the Venetians and the papacy, while he in fact also handed Milan over to the Austrian liouse, together with territories considered to be integral parts of France. The marriage with Charles came to nothing; the good sense of some, the popular feeling in the country, the open expressions of the States-General of Tours in 1506, worked against the marriage, which had no strong advocate except Queen Anne. Claude, on intercession of the Estates, was affianced to Francis of Angouléme, her dis- tant cousin, the heir presumptive to the throne.

In 1507 Louis made war on Venice ; and in the follow- ing year the famous treaty of Cambrai was signed by George of Amboise and Margaret of Austria. It was an agreement for a partition of the Venetian territories,—one of the most shameless public deeds in history. The pope, the king of Aragon, Maximilian, Louis XII, were each to have a share. The war was pushed on with great vigour : the battle of Agnadello (14th May 1509) cleared the king's way towards Venice; Louis was received with open arms by the north Italian towns, and pushed forwards to within sight of Venice. The other princes came up on every side; the proud "Queen of the Adriatic" was compelled to shrink within her walls, and wait till' time dissolved the league. This was not long. The pope, Julius II, had no wish to hand northern Italy over to France; he had joined in the shameless league of Cambrai because he wanted to wrest the Romagna cities from Venice, and because he hoped entirely to destroy the ancient friendship between Venice and France. Successful in both aims, he now withdrew from the league, made peace with the Venetians, and stood forward as the head of a new Italian combination, with the Swiss for his fighting men. The strife was close and hot between pope and king; Louis XII. lost his chief adviser and friend George of Amboise, the splendid church- man of the age, the French Wolsey ; he thought no weapon better than the dangerous one of a council, with claims opposed to those of the papacy ; first a national council at Tours, then an attempted general council at Pisa, were called on to resist the papal claims. In reply Julius II. created the Holy League of 1511, with

Ferdinand of Aragon, Henry VIII. of England, and the Venetians, as its chief members, against the French. Louis XII. showed vigour ; he sent his nephew Gaston of Foix to subdue the Romagna and threaten the Venetian territories. At the battle of Ravenna in 1512, Gaston won a brilliant victory and lost his life. From that moment disaster dogged the footsteps of the French in Italy, and before winter they had been driven completely out of the peninsula ; the succession of the Medicean pope, Leo X., to Julius II. seemed to promise the continuance of a policy hostile to France in Italy. Another attempt on northern Italy proved but another failure, although now Louis XII., taught by his mishaps, had secured the alliance of Venice; the disastrous defeat of La Tremoille near Novara (1513) compelled the French once more to withdraw beyond the Alps. In this Same year an army under the duke of Longueville, endea- Vouring to relieve Therouenne, besieged by the English and Maximilian, the emperor-elect, was caught and crushed at

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James IV. of Scotland, failed completely ; the Scottish king 1514~15,

was defeated and slain at Flodden Field. While his northern frontier was thus exposed, Louis found equal danger threatening him ou the east ; on this side, however, he managed to buy off the Swiss who had attacked the duchy of Burgundy. He was also reconciled with the papacy and the house of Austria. Early in 1514 the death of Anne of Brittany his spouse, a lady of high ambi- tions, strong artistic tastes, and humane feelings towards her Bretons, but a bad queen for France, cleared the way for changes. Claude, the king's eldest daughter, was now definitely married to Francis of Angouléme, and invested with the duchy of Brittany; and the king himself, still hoping for a male heir to succeed him, married again, wedding Mary Tudor, the lovely young sister of Henry VIII. This marriage was probably tlie chief cause of his death, which followed on New Year's Day 1515. His was, in foreign policy, an inglorious and dis- astrous reign ; at home, a time of comfort and material pros- perity. Agriculture flourished, the arts of Italy came in, though (save in architecture) France could claim little artistic glory of her own; the organization of justice and administration was

carried out; in letters and learning France still lagged behind her neighbours.

The heir to the crown was Francis of Angouléme, great- Francis I.

grandson of that Louis of Orleans who had been assassinated in the bad days of the strife between Burgundians and Armagnacs, in 1407, and great-great-grandson of Charles V. of France. He was still very young, very eager to be king, very full of far-reaching schemes. Few things in history are more striking than the sudden change at this moment, from the rule of middle-aged men or (as men of fifty were then often called) old men, to the rule of youths, —from sagacious, worldly-prudent monarchs to impulsive boys,—from Henry VII. to Henry VIII., from Louis XII. to Francis I., from Ferdinand to Charles. On the whole Francis I. was the least worthy of the three. He was brilliant, "the king of culture," apt scholar in Renaissance art and immorality; brave also and chivalrous, so long as the chivalry involved no self-denial, for he was also thoroughly selfish, and his personal ainis and ideals were mean. His reign was to be a reaction from that of Louis XII.; Francis should set the monarchy once more upright, and secure its autocratic development. He reversed his predecessor's home policy, and was hailed with wild delight by the young nobles, who had found Louis XTI. too sparing of gifts. Gifts they wanted now, not power ; and they preferred a prince who gave while he crushed them to one who prudently forbore to give while he allowed them to retain their strength. The reputation of Francis I. is infinitely beyond his deserts; his reign was a real misfortune for France, and led the way to the terrible waste and mismanagement which mark her history through- out the century. For Francis was an altogether shallow person: he could not read the character of lus great antagonist Charles V., nor the meaning of the vast move- ment which was but now beginning to develop itself out of, and to take the place of, the Renaissance. He wasted all the energies of France on bootless foreign wars: never has any land been so sinned against as France; her vast wealth of resources, her intelligent and thrifty people, her commanding central position, were all as nothing to her rulers in comparison with that most wasteful and disastrous of snares, a spirited foreign policy.

From the beginning Francis chose his chief officers unwisely : in Antoine du Prat, his new chancellor, he had a violent and lawless adviser ; in Charles of Bourbon, his new constable, an untrustwortliy commander. Forthwith, he plunged into Italian politics, being determined to make

Guinegate. A diversion in favour of Louis XII., made by | good his claim both to Naples and to Milan; he made most

His char- acter andaims.

1515-25.

The con- cordat of Francis I.

The struggle for the empire.

The ri- valry of Charles Vv. and Francis I.

The battle of Pavia.

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friendly arraugements with the archduke Charles, his future rival, promising to help him in securing, when the time came, the vast inheritances of his two grandfathers, Maximilian the emperor-elect, and Ferdinand of Aragon : never was a less wise agreement entered on. This done, the Italian war began; Francis descended into Italy, and won the brilliant battle of Marignano, in which the French chivalry crushed the Swiss burghers and peasant mercenaries. The French then overran the north of Italy, and, in con- junction with the Venetians, carried all before them. But the triumphs of the sword were speedily wrested from him by the adroitness of the politician; in an interview with Leo X. at Bologna, Francis bartered the liberties of the Gallican Church for shadowy advantages in Italy; the Pragmatic Sanction of Bourges, which now for nearly a century had secured to the Church of France independence in the choice of her chief officers, was replaced by a concor- dat, whereby the king allowed the papacy once more to drain the wealth of the Church of France, while the pope allowed the king almost autocratic power over it. He was to appoint to

all benefices, with exception of a few privileged offices ; the pope was no longer to be threatened with general councils, while he should receive again the annates of the church.

The years which followed this brilliantly-disastrous open- ing brought little good to France. In 1516 the death of Ferdinand the Catholic placed Charles on the throne of Spain; in 1519 the death of Maximilian threw open to the young princes the most dazzling prize of human ambition, the headship of the Holy Roman Empire. Francis I., Charles, and Henry VIII. were all candidates for the votes of the seven electors, though the last never seriously entered the lists. The struggle lay between Francis, the brilliant young prince, who seemed to represent the new opinions in literature and art, and Charles of Austria and Spain, who was as yet unknown and despised, and, from his education under the virtuous and scholastic Adrian of Utrecht, was thought likely to represent the older and reactionary opinions of the clergy. After a long and sliarp competition, the great prize fell to Charles, henceforth known to history as that great monarch and emperor Charles V.

The rivalry between the princes could not cease tliere. Charles, as representative of the house of Burgundy, claimed all that had been lost when Charles the Bold fell; and in 1521 war broke out between him and Francis, the first of w series of struggles between the two rivals. While the king wasted the resources of his country on these wars, his proud and unwise mother, Louise of Savoy, guided by Antoine du Prat, ruled, to the sorrow of all, at home. The war brought no glory with it: on the Flemish frontier a place or two was taken; in Biscay Fontarabia fell before the arms of France ; in Italy Francis had to meet a new league of pope and emperor, and his troops were swept completely out of the Milanese. In the midst of all came the defection of that great prince the Constable Bourbon, head of the younger branch of the Bourbon house, the most powerful feudal lord in France. Louise of Savoy had enraged and offended him, or he her; the king slighted him, and in 1523 the constable made a secret treaty with Charles V. and Henry VIII, and, taking flight into Italy, joined the Spaniards under Lannoy. The French, who had again in- vaded the Milanese, were again driven out in 1524; on the other hand the incursions of the imperialists into Picardy, Provence, and the south-east were all complete failures. Encoura

ed by the repulse of Bourbon from Marseilles, Francis I. once more crossed the Alps, and overran a great part of the valley of the Po; at the siege of Pavia he was pe by Pescara and Bourbon, utterly defeated and A ones (24th February 1525) ; the broken remnants

rench were swept out of Italy at once, and Francis

FRANCE

I. was carried into Spain, a captive at Madrid. His 1595-9;

| HISTORY.

mother, best in adversity, behaved with high pride and spirit ; she overawed disaffection, made preparations for resist- ance, looked out for friends on every side. Had Francis been in truth a hero, he might even as a prisoner have held his own; but he was unable to bear the monotony of con- finement, and longed for the pleasures of France. On this mean nature Charles V. easily worked, and made the captive monarch sign the treaty of Madrid (January 14, 1526),—a compact which Francis meant to break as soon as he could, for he knew neither heroism nor govd faith. The treaty stipulated that Francis should give up the duchy of Burgundy to Charles, and marry Eleanor of Portugal, Charles's sister; that Francis should also abandon his claims on Flanders, Milan, and Naples, and should place two sons in the emperor's hands as hostages. Following the precedent of Louis XI. in the case of Normandy, he summoned an assembly of nobles and the parliament of Paris to Cognac, where they declared the cession of Burgundy to be impossible. He refused to return to Spain, and made alliances wherever he could,—with the pope, with Venice, Milan, and England. The next year saw the ruin of this league in the discomfiture of Clement VII. and the sack of Rome by the German mercenaries under Bourbon, who was killed in the assault. The war went on till 1529, when Francis having lost two armies in it, and gained nothing but loss and harm, was willing for peace; Charles V., alarmed at the progress of the Turks, was not less willing; and in August 1529 the famous

Treaty of Cambrai, 'the Ladies' Peace," was agreed to by The Margaret of Austria and Louise of Savoy. Though Charles treaty of V. gave up all claim

on the duchy of Burgundy, he had

secured to himself Flanders and Artois, and had entirely cleared French influences out of Italy, which now became firmly fixed under the imperial hand, as a connecting link between his Spanish and his German possessions. Francis lost ground and credit by these successive treaties, conceived in bad faith, and not honestly carried out. His whole policy, throughout, was tortuous and uncertain; he was misled by showy advantages, and not sufliciently sagacious to discern his trueinterests. He had in fact little grasp of the great movements of his age, and floated to and fro; neither from the enthusiasm of the Reformation, nor from the instinctive loyalty of his subjects, nor even from the threatening power of Charles, could he succeed in creating for himself a consistent and honourable policy. His Italian ambitions proved a fatal hindrance to his reign; in hopes of recovering Milan, for example, he let Charles delude lim, and displeased his natural allies. His foreign alliances were insecure; he would not evoke the sympathy and help of his own people.

No sooner had the treaty of Cambrai been effectual in bringing his sons back to France, than Francis began to look out for new pretextsand means for war. Affairs were not uupromising. His mother's death in 1531 left him in possession of a huge fortune, which slie had wrung from defenceless France; the powers which were jealous of Austria, the Turk, the English king, the members of the Smalkald league, all looked to Francis as their leader ; Clement VII, though his misfortunes had thrown him into the emperor's hands, was not unwilling to treat with, France; and in 1533 by the compact of Marseilles the pope broke up the friendship between Francis and Henry

VIII., while he married his niece Catherine de' Medici to -., This compact was a real Time 0°

Henry, the second son of Francis. disaster to France; the promised dowry of Catherine,— certain Italian cities,was never paid, and the death of Clement VII. in 1534 made the political alliance with the papacy a failure. The influence of Catherine affected and corrupted French history for half a century. Preparations

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peace of Crespy,

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FRANCIS I. |

for war went on ; Francis made a new scheme for a national army, though in practice he preferred the tyrant's arm, the foreign mercenary. From his day till the Revolution the French army was largely composed of bodies of men tempted out of other countries, chiefly from Switzerland or Germany.

While the emperor strove to appease the Protestant princes of Germany by the peace of Kadan (1534), Francis strengthened himself with a definite alliance with Soliman; and when on the death of Francesco Sforza, duke of Milan, who left no heirs, Charles seized the duchy as its over-lord, Francis, after some bootless negotiation, declared war on his great rival (1536). His usual fortunes prevailed so long as he was the attacking party: his forces were soon swept out of Piedmont, and the emperor carried the war over the frontier into Provence. That also failed, and Charles was fain to withdraw after great losses into Italy. The defence of Provence—a defence which took the form of a ruthless destruction of all its resources—had been eun- trusted to Anne of Montmorency, wlio henceforward became constable of France, and exerted great influence over Francis I, Though these two campaigns, the French in Italy and the {mperialist in Provence, had equally failed in 1536, peace did not follow till 1538, when, after the terrible de- feat of Ferdinand of Austria by the Turks, Charles was anxious to have free hand in Germany. Under tlie media- tion of Paul III. the agreement of Nice was come to, which included a ten years' truce, and the abandonment by Francis of all his foreign allies and aims. He seemed a while to have fallen completely under the influence of the Sagacious emperor. He gave way

entirely to the church party of the time, a party headed by gloomy Henry, now dauphin, who never lost the impress of his Spanish captivity, and by the constable Anne of Montmorency ; for a time the artistic or Renaissance party, represented by Anne duchess of Etampes and Catherine de' Medici, fell into dis- favour. The emperor even ventured to pass through France, ou his way from Spain to the Netherlands. All this friendship, however, fell to dust, when it was found that Charles refused to invest the duke of Orleans, the second son of Francis, with the duchy of Milan, and when the emperor's second expedition against the sea-power of the Turks had proved a complete failure, and Charles had returned to Spain with loss of all his fleet and army. Then Francis hesitated no longer, and declared war against him (1541), The shock the emperor had suffered inspirited all his foes ; the sultan and the Protestant German princes were all eager for war; the influence of Anne of Mont- morency had to give way before that of the house of Guise, that frontier-family, half French half German, which was destined to play a large part in the troubled history of the coming half-century. Claude, duke of Guise, a veteran of the earliest days of Francis, was vehemently opposed to Charles and the Austro-Spanish power, and ruled in the king's councils. This last war was as mischievous as its predecessors : no great battles were fought ; in the frontier affairs the combatants were about equally fortunate; the battle of Cerisolles, won by the French under Enghien (1544), was the only considerable success they had, and even that was almost barren of results, for the danger to northern France was imminent ; there a combined invasion had been planned and partly executed by Charles and Henry VIIL.; and the country, almost undefended, was at their mercy. The two monarchs, however, distrusted one another; and Charles V., anxious about Germany, sent to Francis proposals for peace from Crespy Couvrant, near Laon, where he had halted his army; Francis, almost In despair, gladly made terms with him. The king gave up his claims on Flanders and Artois, the emperor his on the duchy of Burgundy; the king abandoned his old

Neapolitan ambition, and Charles prumised one of the princesses of the house of Austria, with Milan as her dower, to the duke of Orleans, second son of Francis, The duke dying next year, this portion of the agreement was not carried out. The peace of Crespy, which ended the wars between the two great rivals, was signed in autumn, 1544, and like the wars which led to it was indecisive and lame. Charles learnt that with all his great power he could not strike a fatal blow at France; France ought to have learnt that she was very weak for foreign conquest, and that her true business was to consolidate and develop her power at home. Henry VIII. deemed himself wronged by this independent action on the part of Charles, who also

1544-47,

had his grievances with the English monarch; he stood |

out till 1546, and then made peace with Francis, with the aim of forming a fresh combination against Charles. In the midst of new projects, and much activity, the marrer of man's plots came on the scene, and carried off in the same year, 1547, the English king and Francis I., leaving Charles V. undisputed arbiter of the affairs of Europe. In this same year he also crushed the Protestant princes at the battle of Miililberg.

Francis reigned long enough to have been able to do The char-

mucli for France, and, following Louis XIL, might have been another "father of his country," setting it in the way of true grandeur and prosperity. And something of this he seemed to see. He liked in the great movements of the age to take that middle course which commends itself to France: like France herself he wished to be Catholic and yet to become champion of the Reformed cause ; he loved letters and art ; he was a brilliant and chivalrous personage, who had the French qualities strongly marked in character and action. His people felt that he, in the main, repre-sented them; they honoured and loved him as a part of themselves. They accepted their position as a united nation,—united, that is, under a master who offered them no constitutional rights or liberties; it was enough for tlem that their master was good-natured and kindly; his vices aud weaknesses were little blamed, and mucli followed. History will record that he was mean and self- ish, false and licentious, and that, if he knew what

was the nobler path for himself and his country, he could not rise to the heroism of following it, when to do so demanded self-denial. History ought also to remember that he was pitted against the ablest statesman of his age, and that lie was called on, with insufficient knowledge and strength, to defend the liberties of Europe against an overwhelming power. 'That he failed to choose the right weapons, that he failed to make the best use of the weapons he did take up,—this was the real weakness of his life. His reign filled those years in which Renaissance passed into Reformation —in which the new enthusiasm, for art and letters made the way ready for a more grave and solemn enthusiasm in reli- gion, an enthusiasm which in its simpler side aimed at re- storing purity of faith and manners, while in its more extreme developments it mixed itself up with bold political theories, or with a condemnation of all that learning and culture could do for human life. Under the direct king- ship of God, men believed that all the older usages, restric- tions, and political principles of life were out of place. The Anabaptists carried out, in harsh developments, many of the ideas proclaimed half a century before by Savonarola at Florence. appears so well-established as this, that she ever " subord- inated her religious feelings to her political interests." It is almost as generally true that her political interests were ever subordinated to the personal interests of her leaders, Consequently, we shall always expect to find very little movement of public opinion in France, and only a weak:

influence of religious sentiment on the general current of-

Now, in the history of France no principle

acter of his reign.

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1547. affairs; we shall also find ker appreciation of political

, – juterests weak and ill-informed, her desire for self-govern- ment at home as dimly felt as her desire for a right policy abroad ; and lastly, we shall see that for ages her history is the history of men not of institutions, and that her worst struggles are caused by personal not national questions. It is one of the grand results of the Revolution that it raised France from this vicious

moral and mental state, introducing the rule of ideas and opinions, and the general participation of citizeus in their own affairs.

Why the In the reign of Francis I. the court looked not unkindly

Refor- on the Reformers, more particularly in the earlier years,

fant in While the new opinions were mostly those of Luther.

France, Margaret, the king's sister, the duchess of Etampes, his mistress, Renée of France, the daughter of Louis XII., who took Clement Marot as her secretary, and was a declared Protestant,—all these ladies patronized and protected the Reformers. The king himself, regarding them as a people having ideas and some education and enlightenment, was well inclined towards them for a time. Later on, the excesses of the image-breakers, and the tendency of some of them to depreciate carnal learning, entirely alienated him from them. He never had any religious sympathy with them; and though both he and his mother sided in the beginning with the learned world against the monks and "hypocrites," as Louise of Savoy calls them, they never were interested in those theologica) questions which, though they might seem to them often to degenerate into unmeaning subtleties, still in reality gave to the reforming movement its true strength. The nobles went with the court, and beyond it. About half the great families with more or less earnestness adopted the Reformed opinions, and that more specially in their second or Calvinistic development. With them went a not inconsiderable body of the upper clergy. With these strong elemeuts in its favour, how did the Reformation come to fail in France? It failed, first because the general body of the people took absolutely no interest in the matter; no popular feeling had been aroused; no discontent with either the clergy or the monasteries existed; and the people, uneducated and unused to political controversy or expression, were in fact never called on to form a judgment in the matter. Personal religion, or per- sonal judgment as to theological questions, even in their more practical bearings, was but little known or cared for in France. And this was true not only of the people, but of the nobles and the court. There was, too, a want of that wholesome cathartic effect which the Reformation worked elsewhere ; men's lives became no purer, the family relation was not strengtheued, and from the moral side the move- ment was a failure also. Lastly, France has few great cities though

many small ones, and her cities had little or no use of independence of thought and opinion. The towns were much divided ; the capital, with its preponder- ating influence, was distinctly hostile to the Reformers. The Champagne towns, specially Meaux, showed themselves favourable to the new opinions ; in the rest of France they had little sway ; the persistent piety of the hill country of the south-east and south was an entirely independent pheno- menon, which seemed to exert very little influence on the rest of France, In the later days of Francis L., the politico- religious movement connected with the name of Calvin, the series of ideas which formed the basis of Latin Pro- testantism, as distinct from the Germanic movement of the north, spread over a great part of the south and west of France. It was warmly welcomed by the dissidents of Dauphiny, the Cevennes, the Garonne valley ; the nobles also adopted it with enthusiasm. It became a disruptive force in France. While Paris and northern France cling to the old opinions, round which a good number of the great families group themselves, Poitou and the western provinces

are the home of the new ideas in church and state, They 1547-59,

utter opinions which combine reform in religion with aristo- cratic and republican views in politics. France thus divided falls a prey to civil war.

Henry II., who succeeded in 1547, " had all the faults Hemy of his father, with a weaker mind"; and as strength of II

mind was not one of the characteristics of Francis I., we may imagine how little firmness there was in the gloomy

king who now reigned. Party spirit ruled at court. Henry Partics IL, with his ancient mistress Diana of Poitiers, were at thie at court,

head of one party, that of the strict Catholics, and were supported by old Anne of Montmorency, most unlucky of soldiers, most fanatical of Catholics, and by the Guises, who chafed a good deal under the stern rule of the constable. This party had almost extinguished its antagonists ; in the struggle of the mistresses, the pious and learned Anne of Etampes had to

give place to imperious Diana. Catherine, the queen, was content to bide her time, watching with Italian coolness the game as it went on ; of no account beside her rival, and yet qaite sure to have her day, and ready to play parties against one another. Meanwhile, she brought to her royal husband ten sickly children, most of whom died young, and three wore the crown. Of the many bad things she did for France, that was perhaps among the worst.

On the accession of Henry II. the duchy of Brittany finally lost even nominal independence ; he next got the

land of Mary queen of Scots, then but five years old, for Mary the dauphin Francis ; she was carried over to France, and queen of being by birth half a Guise, by education and interests of °°

her married life she became entirely French. It was a great triumph for Henry, for tle protector Somerset had laid his plans to secure her for young Edward VI; it was even more a triumph for the Guises, who saw opened out a broad and clear field for their ambition.

At first Henry IT. showed no desire for war, and seemed to shrink from rivalry or collision with Charles V. He would not listen to Paul III, who, in his anxiety after the fall of the Protestant power in Germany in 1547, urged him to resist the emperor's triumphant advance ; he seemed to show a dread of war, even among his neighbours. After he had won his advantage over Edward VI., he escaped the war which seemed almost inevitable, recovered Boulogne from the English by a money-payment, and smoothed the way for peace between England and Scotland. He took much interest in the religious question, and treated the Calvinists with great severity ; he was also occupied by troubles in the south and west of France, Meanwhile a new pope, Julius IIJ., was the weak dependant of the emperor, aud there seemed to be no head left for any move- ment against the universal domination of Charles V. His career from 1547 to 1552 was, to all appearance, a trium-phal march of unbroken success. Yet Germany was far from acquiescence ; the princes were still discontented and watchful ; even Ferdinand of Austria, his brother, was offended by the emperor's anxiety to secure everything, even the imperial crown, for his son Philip; Maurice of Saxony, that great problem of the age, was preparing for a second treachery, or, it

may be, for a patriotic effort. These German malcontents now appealed to Henry for help ; and at last Henry seemed inclined to come. He had lately made alliance with England, and in 1552 formed a league at Chambord with tle German princes ; the old con- nexion with the Turk was also talked of. The Germans agreed to allow him to hold (as imperial vicar, not as king of France), the "three bishoprics," Metz, Verdun, and Toul ; he also assumed a protectorate over the spiritual princes, those great bishops and electors of the Rhine, whose stake in the empire was so important. The general lines of

| French foreign politics are all here clearly marked ; in this

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1552-57.

Maurice of Saxony.

FRANCE AND SPAIN. |

Henry II. is the forerunner of Henry IV. and of Louis XIV.; the imperial politics of Napoleon start from much the same lines; the proclamations of Napoleon III. before the Franco-German war seenled like thin echoes of the same.

Early in 1552 Maurice of Saxony struck his great blow at his master in the Tyrol, destroying in an instant all the emperor's plans for the suppression of Lutheran opinions, and the reunion of Germany in a Catholic empire; and while Charles V. fied for his life, Henry II. witha splendid army crossed the frontiers of Lorraine. Anne of Mont- morency, wliose opposition to the war had been overborne by the Guises, who warmly desired to see a French pre-dominance in Lorraine, was sent forward to reduce Metz, and quickly got that important city into his hands; Toul and Verdun soon opened their gates, and were secured, in reality if not in name, to France. Eager to undertake a protectorate of the Rhine, Henry II. tried also to lay hands on Strasburg; the citizens, however, resisted, and he had to withdraw ; the same fate befell his troops in an attempt on Spires. Still Metz and the line of the Vosges mountains formed a splendid acquisition for France. The French army,

leaving strong garrisons in Lorraine, withdrew through Luxemburg and the northern frontier ; its remain- ing exploits were few and mean, for the one gleam of good fortune enjoyed by Anne of Montmorency, who was unwise and arrogant, and a most inefficient commander, soon deserted him. Charles V., as svon as he could gather

FRANCE

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Egmont and the Flemish horse, and with incredibly 1557-59.

small loss to the conquerors, was utterly routed (1557). Montmorency himself and a crowd of nobles and soldiers were taken; the slaughter was great. Coligny made a gallant and tenacious stand in the town itself, but at last was overwhelmed, and the place fell. Terrible as these mishaps were to France, Philip II. was not of a temper to push an advantage vigorously ; and while his army lingered, Francis of Guise came swiftly back from Italy; and instead of wasting strength in a doubtful attack on the allies in Picardy, by a sudden stroke of genius he assaulted and took Calais (January 1558), and swept the English finally off the soil of France. This unexpected and brilliant blow cheered and solaced the afflicted covutry, while it finally secured the ascendency of the house of Guise. The duke's brother, the cardinal of Lorraine, carried all before him in the king's councils; the dauphin, betrothed long before, was now married to Mary of Scots; a secret treaty bound the young queen to bring her kingdom over with her ; it was thought that France with Scotland would be at least a match for England joined with Spain. In the same year 1558 the French advance along the coast, after they had taken Dunkirk and Nieuport, was finally checked by the brilliant genius of Count Egmont, who defeated them at Gravelines. All now began to wish for peace, especially Montmorency, weary of being a prisoner, and anxious to get back to court, that he might check the fortunes of the Guises; Philip desired it, that he might have free hand

forces, laid siege to Metz, but, after nearly three months of late autumnal operations, was fain to break up and with- draw, baffled and with loss of half his army, across the

against heresy. And so at Cateau Cambresis a peace was Peace of made in April 1559, by which France retained the three Cateau bishoprics and Calais, surrendering Thionville, Montmédy,

Rhine. Though some success attended his arms on the northern frontier, it was of no permanent value: the loss of Metz, and the failure in the attempt to take it, proved to the worn-out emperor that the day of his power and

and one or two other frontier towns, while she recovered Ham and St Quentin; the house of Savoy was reinstated by Philip, as a reward to Philibert for his services, and formed a solid barrier for a time between France and Italy ;

Netherlands agreed to crush heresy with the strong hand.

Charles opportunity was past. The conclusions of the diet of | cross marriages between Spain, France, and Savoy were V. lays Augsburg in 1555 settled for half a century the struggle | arranged; and finally the treaty contained secret articles | aisuitice between Lutheran and Catholic, but settled it in a way | by which the Guises for France and Granvella for the |

not at all to his mind ; for it was the safeguard of princely interests against his plaus for an imperial unity. Weary of the losing strife, yearning for ease, ordered by his physicians to withdraw from active life, Charles in the course of 1555 and 1556 resigned all his great lordships and titles, leaving Philip his son to succeed him in Italy, the Netherlands, and Spain, and his brother Ferdinand of Austria to wear in his stead the imperial diadem. These great changes sundered a while the interests of Austria from those of Spain.

Henry endeavoured to take advantage of the check in the fortunes of his antagonists; he sent Anne of Mont- morency to support Gaspard Coligny, the admiral of France, in Picardy, and in harmony with Paul IV., in- structed Francis, duke of Guise, to enter Italy to oppose the duke of Alva. As of old, the French arms at first carried. all before them, and Guise deeming himself heir to the crown of Naples (for he was the eldest great- grandson of René IL, titular king of Naples) pushed eagerly forward asfaras the Abruzzi. There he was met and outgeneraled by Alva, who drove him

back to Rome, whence he was now recalled by urgent summons to France; for the great disaster of St Quentin had laid Paris itself open to the assault of an enterprising enemy. With the departure of Guise from Italy the age of the Italian expeditions comes toanend. On the northern side of the realm things had gone just as badly. Philibert of Savoy, commanding for Philip with Spanish and English troops, marched into France as far as to the Somme, and laid seige to St Quentin, which was bravely defended by Admiral Coligny. Anne of Montinorency, coming up to relieve the place, managed his movements so clumsily that he was caught by Count

As a sequel to this peace, Henry Il. held a great tourna- ment at Paris, at which he was accidentally slain by a Scottish knight in the lists.

The Guises now shot up into unbounded power. The F new king, Francis IL, was devoted to his young wife, and she was entirely Jed by her uncles the Guises; so strong they seemed that Philip of Spain was alarmed lest Mary Stewart should also win the English crown, and he allowed the accession of Queen Elizabeth, in con- sequence of his fears, to pass unchallenged. As yet, parties at court were not marked simply by their theological views; that would follow in time. On the Guise side the cardinal of Lorraine was the cleverest man, the true head, while Francis the duke was the arm; he showed leanings towards the Lutherans. On the other side the head was the dull and obstinate Anne of Montmorency, the constable, an unwavering Catholic, supported by the three Coligny brothers, who all were or became Huguenots. The queen- mother, Catherine, fluctuated uneasily between the parties, and though Catholic herself, or rather not a Protestant, did not hesitate to befriend the Huguenots, if the political arena seemed to need their gallant swords. Their noblest leader was Coligny the admiral ; their recognized head was Antony king of Navarre, a man as foolish as fearless. He was heir presumptive to the throne after the Valois boys, and claimed to have charge of the young king. Though the Guises had the lead at first, the Huguenots seemed, from their strong aristocratic connexions, to have the fairer prospects before them.

Thirty years of desolate civil strife are hefore us, and we The civil must set it all down briefly and drily. The prelude to the wars.

“1560.

troubles was played oy the Huguenots, who in 1560, guided by La Renaudie, a Perigord gentleman, formed a plot to carry off the young king; for Francis Il. had already treated them with considerable severity, and had dis missed from his councils both the princes of the blood royal and the Constable Montmorency. The plot failed miserably, and La Renaudie lost his life; it only secured more firmly the authority of the Guises. As a counterpoise to their influence, the queen-mother now conferred the vacant chancellorship on one of the wisest men France bas ever seen, her Lord Bacon, Michel L'Hopital, a man of the utmost prudence and moderation, who, had the times been better, might have won constitutional liberties for his country, and appeased her civil strife. As it was, he saved her from the Inquisition ; his hand drew the edicts which aimed at enforcing toleration on France; he guided the assembly of notables which gathered at Fontainebleau, and induced them to attempt a compromise which moderate Catholics and Calvinists might accept, and which might lessen the power of the Guises. This assembly was followed by a meeting of the States-General at Orleans, at which the prince of Condé and the king of Navarre were seized by the Guises on a charge of having had to do with La Renaudie's plot. It would have gone hard with them had not the sickly king at this very time fallen ill and died (1560).

This was a grievous blow to the Guises; they had their hands on their rivals, and would have got rid of them in a few days; they had laid their plans to crush the south, and put down the Huguenots by martial law; the queen- mother was powerless, the middle party behind her was as nothing, Now, asin a moment, all was shattered ; Catherine de' Medici rose at once to the command of affairs ; the new king, Charles IX., was only ten years old, and her position as regent was assured. The Quises would gladly have ruled with her; but she had no fancy for that; she and Chancellor L'Hépital were not likely to ally themselves with all that was severe and repressive. Still, parties made a kind of armistice for a while; the queen-mother drew towards easy-tempered Antony of Navarre; the Guises retained much of their power; Condé was set free; the extremer measures proposed by the

*Huguenots, who wished the king of Navarre to seize the regency for himself, were not regarded with any favour. While the Guises had been omnipotent, the discontented parties excluded by them from power and office were held together by the bonds of a com- mon adversity; the change of affairs loosened their friend- ship. They fell into three groups:—the princes of the blood, with the queen-mother ; the constable Anne of Montmor- ency and his Catholic friends ; and thirdly, the Huguenot nobles and cities of the south and west. The princes of the blood, through Antony of Navarre, had close connexions with the Huguenots; and when the queen-mother had secured him, she doubtless deemed that she would at least be able to neutralize their influence on affairs. She there- fore set herself to secure also the constable and his party, and created a kind of triumvirate (composed of herself, Antony of Navarre, and Anne of Montmorency), with which she hoped to rule the country, and to keep the Guises in check. Here was a splendid field for those intrigues in which she had her being; yet the queen's ultimate aim was a good one, for she really desired the tranquillity of France, and hoped to see Catholics and Huguenots dwell- ing like brethren side by side. * It must not be forgotten that the best part of her policy was inspired by the Chan- cellor L'H6pital.*

Now it was that Mary Stewart, the queen-dowager, was compelled to leave France for Scotland; her departure aa marks the fall of the Guises, and it also showed ae of Spain that it was no longer necessary for him to

se aid and counsel to the Guises ; their claims were no

longer formidable to him on the larger sphere of European 1g61-¢9, | politics ; no longer could Mary Stewart dream of wearing the triple crown of Scotland, France, and England. The tolerant language of L'Hépital at the States-General of Orleans in 1561 satisfied neither side. The Huguenots were restless; the Bourbon princes tried to crush the Guises, in return for their own imprisonment the year before; the constable was offended by the encouragement shown to the Huguenots; it was plain that new changes impended. Montmorency began them by going over to the Guises; and the fatal triumvirate of Francis, duke of Guise, Mont- The ty. morency, and St André, the marshal, was formed. We wnvirate find the king of Spain forthwith entering the field of French intrigues and politics, as the support

and stay of this triumvirate. Parties take a simpler form at once,— one party of Catholics, and another of Huguenots, with the queen-mother and the moderates left powerless between them. These last, guided still by L'Hopital, once more convoked States-General at Pontoise: the nobles and the third estate seemed to side completely with the queen and the moderates; a controversy between Huguenots and | Jesuits at Poissy only added to the discontent of the . Catholics, who were now joined by foolish Antony king of Navarre. The edict of January 1562 is the most remark- | able of the attempts made by the queen-mother to satisfy . the Huguenots ; but party-passion was already too strong for it to succeed ; civil war had become inevitable. The |

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recall of the duke of Guise from Lorraine by his party made an outbreak certain. The Guises themselves were not without Lutheran sympathies; their border-position between France and Germany, their literary tastes, and i relations with German princes, made this natural enough. | Still they were Catholics, and Lutheran sympathies were very different from Huguenot politics. The sudden out- break at Vassy on the borders of Champagne, which marked the entry of the Guises into France proper, and the murder i of Huguenots in the granary in which they were holding : service,—a massacre condemned by Francis of Guise him- . self,—mark the opening of the civil wars (lst March 1562). The period may be divided into four parts : —(1) Periods the wars before the establishment of the League (1562—of the 1570); (2) the period of the St Bartholomew (1570-1578); a (3) the struggle of the new Politique party against the Leaguers (1573-1589) ; (4) the efforts of Henry IV. to | crush the League and reduce the country to peace (1589- : 1598). The period can also be divided by that series of i agreements, or peaces, which break it up into eight wars. : 1. The war of 1562, on the skirts of which Philip of The first Spain interfered on the one side, and Queen Elizabeth with Y™ the Calvinistic German princes on the other, showed at once that the Huguenots were by far the weaker party. The English troops at Havre enabled them at first to com- | mand the lower Seine up to Rouen; but the other party, after a long siege which cost poor

Antony of Navarre his life, took that place, and relieved Paris of anxiety. The Huguenots had also spread far and wide over the south and west, occupying Orleaus; the bridge of Orleans was their point of junction between Poitou and Germany. While the strength of the Catholics lay to the east, in Picardy, and at Paris, the Huguenot power was mostly concentrated in the south and west of France. Condé, who commanded at Orleans, supported by German allies, made an atteinpt on Paris, but finding the capital too strong for him, turned to the west, intending to join the English troops from Havre. Montmorency, however, caught him at Dreux ; and in the battle that ensued the marshal of France, St André, perished ; Condé was captured by the Catholics, Mont- morency by the Huguenots. Coligny, the admiral, drew . off his defeated troops with great skill, and fell back to ij beyond the Loire; the duke of Guise remained as sole

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THE CIVIL WARS. |

head of the Catholics. Pushing on his advantage, the duke immediately laid siege to Orleans, and there he fell by the hand of a Huguenot assassin. Both parties had suffered so much that the queen-mother thought she might

interpose with terms of peace ; the edict of Amboise (March 1563) closed the war, allowing the Calvinists freedom of worship in the towns they held, and some other scanty privileges. A three years' quiet followed, though all men

'suspected their neighbours, and the high Catholic party

tried hard to make Catherine sacrifice L'H6Opital and take They on their side were restless and suspicious, and it was felt that another war could not be far off. Intrigues were incessant, all inen thinking to make their profit out of the weakness of France. The struggle between Calvinists and Catholics in the Netherlands roused much feeling, though Catherine refused to favour either party. She collected an army of her own; it was rumoured that she intended to take the

Huguenots by surprise, and annihilate them. In autumn

1567 their patience gave way, and they raised the standard of revolt, in harmony with the heroic Netherlanders. Condé and the Chatillons beleaguered Paris from the north, and fought the battle of St Denis, in which the old constable Anne of Montmorency was killed. The Hugue- nots, however, were defeated and forced to withdraw, Condé marching eastwards to join the German troops now coming up to his aid. No more serious fighting followed; the peace of Longjumeau (March 1568) closed the second war, leaving matters much as they were. The aristocratic re- sistance against the Catholic sovereigns, against what is often called "the Catholic Reaction," had proved itself hollow; in Germany and the Netherlands, as well as in France, the Protestant cause seemed to fail; it was not until the religious question became mixed up with ques- tions as to political rights and freedom, as in the Low Countries, that a new spirit of hope began to spring up.

The peace of Longjumeau gave no security to the Huguenot nobles; they felt that the assassin might catch them any day. An attempt to seize Condé and Coligny failed, and served only to irritate their party ; Cardinal Chatillon escaped to England ; Jeanne of Navarre and her young son Henry took refuge at La Rochelle; L'Hopital was dismissed the court. The queen-mother seemed to have thrown off her cloak of moderation, and to be ready

to relieve herself of the Huguenots by any means, fair or War accordingly could not fail to break out again before the end of the year. Condé had never been so strong ; with his friends in England and the Low Countries, and the enthusiastic support of a great party of nobles and religious adherents at home, his hopes rose ; he even talked of deposing the Valois and reigning in their stead. He lost his life, however, early in 1569, at the battle of Jarnac. Coligny once more with difficulty, as at Dreux, saved the broken remnants of the defeated Huguenots. Condé's death, regarded at the time by the Huguenots as an irre- parable calamity, proved in the end to be no serious loss ; for it made room for the true head of the party, Henry of Navarre, No sooner had Jeanne of Navarre heard of the mishap of Jarnac than she came into the Huguenot camp, and presented to the soldiers her young son Henry and the young prince of Condé, a mere child. Her gallant bearing and the true soldier-spirit of Coligny, who shone most brightly in adversity, restored their temper ; they even won some smalladvantages. Before long, however, the duke of Anjou, the king's youngest brother, caught and punished them severely at Moncontour. Both parties thenceforward Wore theniselves out with desultory warfare. In August 1570 the peace of St Germain-en-Laye closed the third war, and ended the first period.

2. It was the most favourable peace the Huguenots had

won as yet; it secured them, beside previous rights, four 1570-72.

strongholds. The Catholics were dissatisfied ; they could not sympathize with the queen-mother in her alarm at the growing strength of Philip IL, head of the Catholics in Europe; they dreaded the existence and growing influ- ence of a party now beginning to receive a definite name, an honourable nickname, the Politiques.

These were The Po-

that large body of French gentlemen who loved the honour litiques.

of their country rather than their religious party, and who, though Catholics, were yet moderate and tolerant. The day will come when they will assert themselves as the true patriot-party, and, supporting Henry IV., will find out a solution for the vexed questions and the troubles of their times. On the other hand, the Huguenots were frightened by the peace, and regarded its favourable terms as baits and snares. They withdrew sullenly to La Rochelle; the friendly attitude of Charles IX. alarmed them still more: they were scarcely reassured by seeing him ally himself with the house of Austria, then not friendly with Spain. A pair of marriages now proposed by the court amazed them still more. It was suggested that the duke of Anjou should marry Queen Elizabeth of England, and Henry of Navarre Margaret of Valois, the king's sister. Charles IX. hoped thus to be rid of his brother whom he disliked, and to win powerful support against Spain, by the one match, and by the other to bring the civil wars to a close. The sketch of a far-reaching resistance to Philip II. was drawn out; so convinced of his good faith was the prudent and sagacious William of Orange, that on the strength of these plans he refused good terms now offered him by Spain. There seems no doubt that whatever the subtle Catherine may have thought and meant, Charles IX. was sincere, Catherine cared more for her favourite son Henry of Anjou than for the king, whom she despised ; she took no pleasure in those schemes for helping the Netherlanders in their revolt, by which Charles hoped to occupy his Huguenot subjects, while he preserved peace at home. She seems all this while to have wished to see some half dozen Huguenot leaders assassinated ; thereby she thought the party would be neutralized. She was far from pleased at the ascendency which Coligny, from the moment the king saw him, exer- cised in the royal councils. The duke of Alengon, the re- maining son of Catherine, the brother who did not come to the throne, was deeply interested in the plans for a war in the Netherlands; Anjou, who had withdrawn from the scheme of marriage with Queen Elizabeth, was at this moment a candidate for the throne of Poland; while nego- tiations respecting it were going on, Margaret of Valois was married to Henry of Navarre,—the worst of wives to a hus- band none too good. Coligny, who had strongly opposed the candidature of Anjou for the throne of Poland, was set on by an assassin, employed by the queen-mother and her favourite son, and badly wounded ; the Huguenots were in utinost alarm, filling the air with cries and menaces. Charles showed great concern for his friend's recovery, and threatened vengeance on the assassins. What

was his astonishment to learn that those assassins were his mother and brother! Catherine worked on his fears, and the plot for the great massacre was combined in an instant. The very next day after the king's consent was wrung from him,

24th August 1572, the massacre of St Bartholomew's day The St

took place. son-in-law Teligny perished ; all the chief Huguenots were slain; the slaughter spread to country towns ; the church and the civil power were at one, and the victims, taken at unawares, could make no resistance. The two Bourbons, Henry and the prince of Condé, were spared; they bought their lives by a sudden conversion to Catholicism. The chief guilt of this great crime lies with Catherine de' Medici ; for though itis certain that she did wae plan it long before, X.—7I

The murder of Coligny was completed ; his Bartho- lomew.

1572-76.

The fourth war.

Ths Wars of the League.

The fifth war.

Henry Hil.

The Catholic League.

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assassination was a recognized part of her way of dealing with Huguenots ; only she was too fine to do it in the coarse and wholesale way of the St Bartholomew. It is from her that the taste for murder in France chiefly sprang. The Guises may well share with her; they planned and executed the hasty act; they too had long dabbled in murder. The king's share in it was, like himself, weak and impulsive ; he was the last to come in, the first to repent. The evil deed was highly applauded as a master-stroke by pope and Spanish king. Yet it soon became clear that the crime was a blunder also,

The effects of it, startling for the moment, enabled the middle party to take the lead. The duke of Alengon never approved of the massacre; the moderates throughout France were shocked and outraged ; the Huguenots, weakened for a while, were content to unite with the Politiques, and place themselves under their lead- ing; Catherine lost her power of balancing between the parties, for they are now but two,—that of theiLeague, and that of the rest of France. A short war followed,—a revolt of the southern cities rather than a war. They made tenacious and heroic resistance; a large part of the royal forces sympathized rather with them than with the League ; and in July 1573, the edict of Boulogne granted them even more than they had been promised by the peace of St Germains.

3. We have reached the period of the "Wars of the League," as the four later civil wars are often called. The last of the four is alone of any real importance.

Just as the peace of La Rochelle was concluded, the duke of Anjou, having. been elected king of Poland, left France ; it was not long before troubles began again. The duke of Alengon was vexed by his mother's neglect; as heir pre- sumptive to the crown he thought he deserved better treat- ment, and sought to give himself consideration by drawing towards the middle party; Catherine seemed to be in- triguing for the ruin of that party ; nothing was safe while she was moving. The king had never held up his head since the St Bartholomew ; it was seen that he now was dying, and the queen-mother took the opportunity of laying hands on the middle party. She arrested Alencon, Mont- morency, and Henry of Navarre, together with some lesser chiefs; in the midst of it all Charles IX. died (1574) in misery, leaving the ill-omened crown to Henry of Anjou, king of Poland, his next brother, his mother's favourite, the worst of a bad breed. At the same time the fifth civil war broke out, interesting chiefly because it was during its continuance that the famous League was actually formed.

Henry III., when he heard of his brother's death, was only too eager to slip away like a culprit from Poland, though he showed no alacrity in returning to France, and dallied with the pleasures of Italy for months. An attempt to draw him over to the side of the Politiques failed com- pletely ; he attached himself on the contrary to the Guises, and plunged into the grossest

dissipation, while he posed himself before men as a good and zealous Catholic. The Politiques and Huguenots therefore made a compact in 1575, at Milhaud on the Tarn, and chose the prince of Condé as their head ; Henry of Navarre escaped from Paris, threw off his forced Catholicism and joined them. Against them the strict Catholics seemed powerless; the queen-mother closed this war with the peace of Chastenoy (May 1576), with terms unusually favourable for both Politiques and Huguenots:—for the latter free worship throughout France, except at Paris; for the chiefs of the former great governments,—for Alengon a large central district, for Condé Picardy, for Henry of Navarre Guyenne.

To resist all this the high Catholic party framed the League they had long been meditating; it is said that the cardinal of Lorraine had sketched it years before, at the time of the later sittings of the council of Trent. Lesser com-

pacts had already been made from time to time ; now it was 1575-g4. _

proposed to form one great league, towards which all should gravitate. The head of the League was Henry, duke of Guise, the second " Balafré," who had won that title in fighting against the German reiters the year before, when they entered France under Condé. He certainly hoped at this time to succeed to the throne of France, either by deposing the corrupt and feeble Henry IIL, "as Pippin dealt with Hilderik," or by seizing the throne, when the king's debaucheries should have brought him to the grave, The Catholics of the more advanced type, and specially the Jesuits, now in the first flush of credit and success, sup- ported him warmly. The headquarters of the movement were in Picardy, its first object opposition to the establish-ment of Condé as governor of that province. The League was also very popular with the common folk, especially in the towns of the north. It soon found that Paris was its natural centre ; thence it spread swiftly across the whole of France; it was warmly supported by Philip of Spain. The States-General, convoked at Blois in 1576, could bring no rest to France; opinion was just as much divided there as

in the country; and the year 1577 saw another petty war, The counted as the sixth, which was closed by the peace of sixth

Bergerac, another ineffectual truce, which settled nothing. It was a peace made with the Politiques and Huguenots by the court; it is significant of the new state of affairs that the League openly refused to be bound by it, and continued a harassing, objectless warfare. The duke of Anjou (he had taken that title on his brother Henry's accession to the throne) in 1578 deserted the court party, towards which his mother had drawn him, and made friends with the Calvinists in the Netherlands. The southern provinces named him 'Defender of their liberties"; they had hopes he might wed Elizabeth of England ; they quite mistook their man.

brother Anjou, to whom had been offered sovereignty over the seven United Provinces in 1580, offered the insurgents easy terms, and the treaty of Fleix closed the seventh war. Anjou in the Netherlands could but show his weakness ; nothing went well with him; and at last, having utterly wearied out his friends, he fled, after the failure of his attempt to secure Antwerp, into France. There he fell ill of consumption, and died in 1584. | This changed at once the complexion of the succession question. Hitherto, though no children seemed likely to be born to him, Henry III. was young and might live long, and his brother was there as his heir. Now, Henry IIL was the last prince of the Valois, and Henry of Navarre in hereditary succession was heir presumptive to the throne,

In 1579 "the Gallants' War" The broke out; the Leaguers had it all their own way; but seventh Henry IIL, not too friendly to them, and, urged by his™""

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unless the Salic law were to be set aside. The fourth The de-

son of St Louis, Rebert, count of Clermont, who married ca vd

Beatrix, heiress of Bourbon, was the founder of the house =

of Bourbon. Of this family the two elder branches had died out :—John, who had been a central figure in the war of the Public Weal, in 1488; Peter, husband of Anne of France, in 1503; neither of them leaving heirs male. Of the younger branch Francis died in 1525, and the famous Constable Bourbon in 1527. This left as the only repre- sentatives of the family the counts of La Marche; of these the elder had died out in 1438, and the junior alone sur- vived inthe counts of Vendéme. The head of this branch, Charles, was made duke of Vendéme by Francis I. in 1515; he was father of Antony, duke of Vendéme, who, by marry- ing the heroic Jeanne of Albret, became king of Navarre, and of Louis, who founded the house of Condé; lastly, Antony was the father of Henry IV. He was therefore a very distant cousin to Henry IIL; the houses of Capet, of Alengon, of Orleans, of Angouléme, of Maine, and of

1584-88.

The Sixteen of Paris.

The eighth war, the 'War of theThree ~ Henrie,"

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Burgundy, as well as the elder Bourbons, had to fall ex- tinct before Henry of Navarre could become heir to the crown. All this, however, had now happened ; and the Huguenots greatly rejoiced in the prospect of a Calvinist king. The Politique party showed no ill-will towards him ; both they and the court party declared that if he would become once more a Catholic they would rally to him; the Guises and the League were naturally all the more firmly set against him; and Henry of Navarre saw that he could

HENRY IV. |

not as yet safely endanger his influence with the Huguenots, –

while his conversion would not disarm the hostility of the League. They had before this put forward as heir to the throne Henry's uncle, the wretched old Cardinal Bourbon, who had all the faults and none of the good qualities of his brother Antony. Under cover of his name the duke of Guise hoped to

secure the succession for himself; he also sold himself and his party to Philip of Spain, who was now in fullest expectation of a final triumph over his foes. He had assassinated William the Silent; any day Elizabeth or Henry of Navarre might be found murdered; the domina- tion of Spain over Europe seemed almost secured. The pact of Joinville, signed between Philip, Guise, and May- enne, gives us the measure of the aims of the high Catholic party. Paris warmly sided with them; tlle new develop- ment of the League, the ‘ Sixteen of Paris,” one representa- tive for each of the districts of the capital, formed a vigorous organization and called for the king’s deposition ; they invited Henry, duke of Guise, to Paris. Soon after this Henry III. humbled himself, and signed the treaty of Nemours (1585) with the Leaguers. He hereby became nominal head of the League, and its real slave.

The eighth war, the “ War of the Three Henries,” that is, of Heury III and Henry of Guise against Henry of Navarre, now broke out. The pope made his voice heard; Sixtus excommunicated the Bourbons, Henry and Condé, and blessed the leaguers. For the first time there was some real life in one of these civil wars; for Henry of Navarre rose nobly to the level of his troubles. At first the balance of successes was somewhat in favour of the Leaguers; the political atmosphere grew even more threatening, and terrible things, like lightning-flashes, gleamed out now and again. Such, for example, was the execution of Mary Stewart, queen of Scots, in 1586. It was known that Philip II. was preparing to crush England. Elizabeth did what she could to support Henry of Navarre ; hehad the good fortune to win the battle of Coutras, in which the duke of Joyeuse, one of the favourites of Henry III., was defeated and killed. The duke of Guise, on the other hand, was too strong for the Germans, who had marched into France to join the Huguenots, and defeated them at Vimory and Auneau, after which he marched in triumph to Paris, in spite of the orders and opposition of the king, who, finding himself powerless, withdrew to Chartres. Once more Henry ITI. was obliged to accept such terms as the Leaguers chose to impose; and with rage in his heart he signed the “Edict of Union” (1588), in which he named the duke of Guise lieutenant-general of the king- dom, and declared that no heretic could succeed to the throne. Unable to endure the humiliation, Henry IIL that same winter assassinated the duke and the cardinal of Guise, and seized many leaders of the League, though he missed

the duke of Mayenne. This scandalous murder of the "King of Paris," as the capital fondly called the duke, brought the wretched king no solace nor power. His mother did not live to see the end of her son; she died in this the darkest period of his career, and must have been aware that her cunning and her immoral life had brought nothing but misery to herself and all herrace. The power of the League party seemed as great as ever; the duke of Mayenne entered Paris, aud declared open war on Henry

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III., who, after some hesitation, threw himself into the hands of his cousin Henry of Navarre in the spring of 1589. The old Politique party now rallied to the king; the Huguenots were staunch for their old leader ; things looked less dark for them since the destruction of the Spanish Armada in the previous summer. The Swiss, aroused by the threats of the duke of Savoy at Geneva, joined the Germans, who once more entered north-eastern France ; the Leaguers were unable to make head either against them or against the armies of the two kings; they fell back on Paris, and the allies hemmed them in. The defence of the capital was but languid ; the populace missed their idol, the duke of Guise, and the moderate party, never extin- guished, recovered strength. All looked as if the royalists would soon reduce the last stronghold of the League, when Henry III. was suddenly slain by the dagger of a fanatical half-witted priest. The king had only tiine to commend Henry of Navarre to his courtiers as his heir, and to exhort him to become a Catholic, before he closed his eyes, and ended the long roll of his vices and crimes. And thus in crime and shame the house of Valois went down. For a few years the throne remaind practically vacant: the hero- ism of Henry of Navarre, the loss of strength in the Catholic powers, the want of a vigorous head to the League,—these things all sustained the Bourbon in his arduous struggle ; the middle party grew in strength daily, and when once Henry had allowed himself to be converted, he became the national sovereign, the national favourite, and the high Catholics fell to the fatal position of an unpatriotic faction depending on the arm of the foreigner.

1589.

4. The civil wars were not over, for the heat of party Henry raged as yet unslaked ; the Politiques could not all at once LV.

adopt a Huguenot king, the League party had pledged itself to resist the heretic, and Henry at first had little more than the Huguenots at his back. There were also formidable claimants for the throne.

Charles II., duke of The

Lorraine, who had married Claude, younger daughter of claim-

Henry II., and who was therefore brother-in-law to Henry IV., set up a vague claim; the king of Spain, Philip IT. thought that the Salic law had prevailed long enough in France, and that his own wife, the elder daughter of Henry II., had the best claim to the throne; the Guises, though their head was gone, still hoping for the crown, proclaimed their sham-king the cardinal of Bourbon as Charles X., and intrigued behind the shadow of his name. The duke of Mayenne, their present chief, was the most formidable of Henry's opponents; his party called for a convucation of States-General, which sliould choose a king to succeed, or to replace, their feeble Charles X. During this struggle the high Catholic party, inspired by Jesuit advice, stood for- ward as the admirers of constitutional principles; they called on the nation to decide the question as to the suc- cession ; their Jesuit friends wrote books on the sovereignty of the people. They summoned up troops from every side ; the duke of Lorraine sent his son to resist Henry and sup- port his own claim; the king of Spain sent a body of men; the League- princes brought what force they could. Henry of Navarre at the same moment found himself weakened by the silent withdrawal from his camp of the army of Henry IIL; the Politique nobles did not care at first to throw in their lot with the Huguenot chieftain ; they offered to confer on Henry the post of commander-in- chief, and to reserve the question as to the succession ; they let him know that they recognized his hereditary rights, and were hindered only by his heretical opinions ; if he would but be converted, they were his. Henry tem- porized ; his true strength, for the time, lay in his Huguenot followers, rugged and faithful fighting-men, whose belief was the motive-power of their allegiance and of their courage. If he joined the Politiques at their price, the

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1589-91. price of declaring himself Catholic, the Huguenots would

be offended if not alienated. So he neither absolutely re- fused nor said yes; and the chief Catholic nobles, in the inain, stood aloof, watching the struggle between Huguenot and Leaguer, as it worked out its course.

Henry, thus weakened, abandoued the siege of Paris, and fell back; with the bulk of his forces he marched into Normandy, so as to be within reach of English succour ; a considerable army went into Champagne, to be ready to join any Swiss or German help that might come. These were the great days of the life of Henry of Navarre. After the rough training of his boyhood, when his noble mother was no more, and he had become entangled with the dis-

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from the duke of Mayenne; and consequently the duke 1591-98,

ceased to be the recognized head of the League, which now looked entirely to Philip IJ. and Parma, while Paris ceased to be its headquarters ; and more moderate counsels having taken the place of its fierce fanaticism, the capital came under the authority of the lawyers and citizens, instead of the priesthood and the bloodthirsty mob. Henry meanwhile, who was closely beleaguering Rouen, was again outgeneraled by Parma, and had to raise the siege. Parma, following him westwards, was wounded at Caudebec; and though he carried his army triumphantly back to the Netherlands, his career was ended by this trifling wound. He did no more, and died in 1592.

In 1593, Mayenne having sold his own claims to Philip The con. of Spain, the opposition to Henry looked more solid and version dangerous than ever; he therefore thought the time was a

solute Valois court, he had taken willing share in their debaucheries, and seemed no better than the rest ; after he had secured his throne, he relapsed again into a scandalous

life, which dimmed the lustre of his vigorous government. But now he was at his best; in the life of camps, the ex- citements of the battlefield, in the flashes of genius with which he fought successfully against heavy odds, Henry showed himself a hero, who strove for a great cause—the cause of European freedom—as well as for his own crown.

The duke of Mayenne followed the Huguenots down into the west, and found Henry awaiting him in a strong posi- tion at Arques, near Dieppe; here at bay the " Béarnais" inflicted a heavy blow on his assailants; Mayenne fell back into Picardy; the prince of Lorraine drew off alto- gether; and Henry marched back triumphantly to Paris, ravaged the suburbs, and then withdrew to Tours, where he was recognized as king by the parliament. His campaign of 1589 had been most successful ; he had defeated the League in a great battle, thanks to his skilful use of his position at Arques, and the gallantry of his troops, which more than counterbalanced the great disparity in numbers. He had seen dissension break out among his enemies ; even the pope, Sixtus V., had shown him some favour, and the Politique nobles were certainly not going against him. Early in 1590 Henry had secured Anjou, Maine, and Normandy, and in March defeated Mayenne in a great pitched battle at Ivry, not far from Dreux. The Leaguers fell back in consternation to Paris. Henry reduced all the country round the capital, and sat down before it for a stubborn siege. The duke of Parma had at tliat time his hands full in the Low Countries ; young prince Maurice was beginning to show his great abilities as a soldier, and had got possession of Breda ; all, however, had to be suspended by the Spaniards on that side, rather than let Henry of Navarre take Paris. Parma with great skill relieved the capital without striking a blow, and the campaign of 1590 ended in a failure for Henry. The success of Parma, however, made Frenchmen feel that Henry's was the national cause, and that the League flourished only by in- terference of the foreigner. Were the king of Navarre but a Catholic, he should be a king of France of whom they mightall be proud. This feeling was strengthened by the death of the old Cardinal Bourbon, which re-opened at once the succession question, and

compelled Philip of Spain to show his hand. He now claimed the throne for his daughter Elizabeth, as eldest daughter of the eldest daughter of Henry II. All the neighbours of France claimed some- thing ; Frenchmen felt that it was either Henry IV. or dismemberment. The " Béarnais" grew in men's minds to be the champion of the Salic law, of the hereditary prin- ciple of royalty against feudal weakness, of unity against dismemberment, of the nation against the foreigner.

The middle party, the Politiques of Europe,—the English, = is, and the Germans,—sent help to Henry, by means of which he was able to hold his own in the north-west and 5 throughout 1591. Late in the year the violence of the Sixteen of Paris drew on them severe punishment

come for the great step which should rally to him all the moderate Catholics. After a decent period of negotiation and conferences, he declared himself convinced, and heard mass at St Denis. The conversion had immediate effect ; it took the heart out of the opposition ; city after city came in; the longing for peace was strong in every breast, and the conversion seemed to remove the last obstacle. The Huguenots, little as they liked it, could not oppose the step, and heped to profit by their champion's improved position. Their ablest man, Sully, had even advised Henry to make the plunge. In 1594 Paris opened her gates to Henry, who had been solemnly crowned, just before, at Chartres. He was welcomed with immense enthusiasm, and from that day onwards has ever been the favourite hero of the capital. By 1595 only one foe remained,—the Spanish court. The League was now completely broken up; the parliament of Paris gladly aided the king to expel the Jesuits from France.

things, in which Philip's hand secretly supported all oppo- sition. The war in 1596 was far from being successful for Henry; he was comforted, however, by receiving at last the papal absolution, which swept away the last scruples of France.

By rewards and kindliness,—for Henry was always will- ing to give and had a pleasant word for all,—most of the reluctant nobles, headed by the duke of Mayenne himself, came in in the course of 1596. Still the war pressed very heavily, and early in 1597 the capture of Amiens by the Spaniards alarmed Paris, and roused the king to fresh energies. With help of Sully

(who had not yet received the title by which he is known to history) Henry recovered Amiens, and checked the Spanish advance. It was noticed that while the old Leaguers came very heartily to the king's help, the Huguenots hung back in a discontent and suspicious spirit. languished ; the pope offered to mediate, and Henry had time to breathe. He felt that his old comrades the offended Huguenots had good cause for complaint; and in April

1598 he issued the famous Edict of Nantes, which secured The their position for nearly a century. They got toleration Raict of for their opinions ; might worship openly in all places, with "™

the exception of a few towns in which the League had been strong; were qualified to hold office in financial posts and in the law; had a Protestant chamber in the parlia- ments. The number of Huguenots is said to have been at this time rather over a million in all, though little trust can be put in figures; they were strong in Burgundy, Poitou, Saintonge, Provence, Guyenne, and Dauphiny ; in the rest of France there were but few of them.

Immediately after the publication of the Edict of Nantes = , t realy

the Treaty of Vervins was signed. Though Henry by i broke faith with Queen Elizabeth, he secured an honourable

| peace for his country, aud undisputed kingship for himself.

In November 1595 Henry declared war against War Spain, for 'anything was better than the existing state of with

After the fall of Amiens the war .

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1598

HENRY IV. | It was the last act of Philip IT., the confession that his great schemes were unfulfilled, his policy a failure.

Ill. Toe Bourspon Monarcuy.

The year 1598 closes the medizval history of France ;

an epoch henceforth she takes her part in modern history. The

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Henry’s court,

power of the feudal noblesse has passed away ; the earlier rivalries between France and Austria take a new character; the centralized absolutist monarchy begins. We are coining to the days of the great ministers,—first Sully, then Riclte- lieu, lastly Colbert, under whose rule France becomes great, almost in spite of her kings. The age now past had little to look back on with pleasure ; the utter corruption of the court, reign after reign, the selfish partizanship of the nobles, and the harsh incidence of civil war, incline us to believe the age to have been thoroughly wretched. Yet the condition of the French people was less miserable than it had been; without seeing much prosperity we hear less of famine than in previous or iu later ages; for civil wars do not so much exhaust the well-being of a country as might appear. It has been observed that the wars of the Roses did little to check the progress of England ; and in like manner the wars of the League do not seem to have deeply afflicted France. These wars, in fact, were all the fighting of lords and princes with their retainers; they were languid and partial ; and though their story might be wretched enough, the

wretchedness of it chiefly fell on the heads of the belligerents themselves. There is no Jacquerie in this age, as in the 15th and as in the 18th century in France; and in some respects the country made a real advance. In arts she has never been really great, and her age of poetry was not yet come. Ronsard and Du Bartas, great as their reputation was once, do not rise into the first rank of poets, and there are no better names. In political and legal writings, on the other hand, we have the great names of Montaigne and L'H6pital, of Bodin and Hottmann, of Cujas and Etienne Pasquier. Stephanus and Joseph Scaliger represent classical tastes and chronological investi- gation. Town-life was but little injured, except in Paris herself, by the wars of the period; and even Paris was not altogether the worse for them, for even Henry III. took an interest in the capital, and tried to develop its resources.

Whether the Christian Republic, that great political romance, was ever laid before the eyes of Henry IV. we shall never know ; at all events it represents, in a rather extreme form, the broader politics of modern history, and inarks a great change in the relations of states. Many of its ideas were, consciously or not, adopted by the imperialism of our own century ; for they favoured the national vanity, which sought to impose its principles and wishes on Europe. It represented the resistance of France to the Austro-Spanish power, affirmed the general principle of toleration, en- deavoured to substitute a court of arbitration in place of war, recognized many different forms of government, and sought to weld all civilized Europe into one harmonious community. That it was a dream the world's history has plentifully proved ; that there was in it much to admire, much to strive for, is equally proved by the persistence of many of its ideas, and their agreement with the best parts of the development of Europe in modern times.

In 1598, on the close of the Spanish war, when Henry IV. was at last fully recognized as king of France on all Sides, we find at ~~his court representatives of the two Policies which for ages contended for the possession of the great resources of the country. These were the HIispano~~ Catholic policy, which aimed at uniting French and Spanish Interests against the north and west of Europe ; and on the other side, the policy of the tolerant party, which desired to make France the leader of the Protestant and

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liberal part of Europe, which allied itself with the Dutch, with the North German I.utherans, with the English, with the Swedes. It is the glory of Sully, of Richelieu, and of Colbert that they advanced the greatness of France by following the latter of these lines ; whereas Louis XIV. lost power 'from the moment that he abandoned himself to the Spanish policy.

So at Henry's court we find Maximilian of Bethune, lord of Rosny (he was not made duke of Sully till 1606), who headed the liberal party, the party of economy and good government, opposed to Villeroy, who represented the Spanish party, and seemed to have an equal share in the king's regard. Between these two were Jeannin, a great lawyer, and president of the Paris parliament, who worked with Sully and Sillery, who held a middle course, and was the most trusted diplomatist of his time. Villeroy and the Spanish advisers were strongly supported by the court, especially after the appearance of Mary de' Medici. The court of Spain was only too glad to thwart Henry where it could; the English court, after the accession of Jamies, was too much set on windy schemes and grand im- possibilities to afford a counterpoise on the other side.

1598- 1600.

Sully had been made head of the finances in 1597, and Maximi-

had found everything in frightful disorder. temper, Severe manners, even his narrow grasp, proved him to be admirably suited for the part he had to play ; a more enlightened statesman might have failed where he succeeded. We find in his finance no large views as to economic princi- ples ; we only see a rigid determination to stop waste, to punish thieves in high places, to make the taxes yield their full worth to the crown. So far as he occupied himself with general politics, Sully's views were right and liberal ; he disliked the Spanish tendencies of the court, and did his best to keep his master clear of them. He could not make the king economical, or reduce the outgoings of the state; on the contrary, he felt himself obliged to make a strong army and plentiful artillery, and to accumulate good store of coin at the arsenal, so as

to be ready for any need. In spite of these expenses, he speedily lessened the severity of the taxation ; and as good government made tranquillity, and tranquillity plenty, France bore her burdens with increasing willingness and ability. The chief failure of Sully's administration lay in his having done nothing to equalize taxation, by compelling noble land to bear its share with the labour of the peasant, He laid on some new taxes, increased some of the worst of the existing imposts, reduced the amount of the public debt, and encouraged agriculture. Henry, who with all his faults had broader views than his finance minister, also did his best for manu- factures ; the edicts of the reign are numerous, and for the most part very sensible and helpful.

Though the civil wars were over before 1598, content had not returned to the country. Henry was often ungrateful to his old friends and loyal supporters ; and the leaders of the Politique party, who might well think they had secured his throne for him, were especially dissatisfied. Conse- quently, when war broke out with the duke of Savoy in

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1600 over some frontier question, the duke of Biron entered Biron's into a great plot with Savoy and Spain, and carried with plot.

him a formidable party of nobles. Sully, however, was prepared for all; his artillery and munitions of war were such as had never before been seen; and the duke of Savoy, seeing Montmélian, an impregnable stronghold, as it was deemed, actually taken, sued for peace. He re tained Saluzzo, for Henry had no desire to meddle in Italian politics, and ceded to France Bresse and Bugey, Valromey and Gex, so securing French influences up to the very gates of Geneva, and making it certain that the duke of Savoy must never again hope to crush that vigorous republic. Just before the end of this war, his

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1600-10 divorce from Margaret of Valois having come from tlie pope, Mary de Henry married Mary de' Medici (1600), then in the prime

Medici. of her beauty; later on she grew fat and heavy. She was always stiff and obstinate, a prejudiced follower of

FRANCE

France resume ber true direction and lead the resistance to 1610-14 the house of Austria.

Henry IV. had the great quality of individuality. He Chara. stands out fresh and clear as a distinct personage, of high ter of

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the old ways, who spent her life first in thwarting, after- wards in obliterating, the traces of the higher schemes and acts of her spouse. The duke of Biron, utterly dissatisfied at the result of the Savoyard war, plunged into fresh con- spiracy ; then Henry IV. felt no more pity for him, but seized and beheaded him; it was believed that the queen herself was mixed up in his plot, which had far-reaching ramifications. By 1605 Henry had reduced all the rest of his recalcitrant nobles, treating them without rancour or revenge if they came in, and setting trusty officers of his own to watch over them.

The remainder of tlie king's life was occupied with two things :—first, the strengthening of the resources of France at home; secondly, the preparations for authoritative inter- vention in the affairs of Europe, which were now beginning to attract the attention of all, The king was called on to intervene as a mediator between the papacy and Venice in 1606-1607, and decided their quarrel in a way which ought to have roused the gratitude of the papal power. Chiefly through Henry's firmness, a truce for twelve years was signed between Spain and the United Provinces,—for the Spaniards, exhausted by the siege of Ostend, the greatest siege the world had ever seen (1601-1604), and quite unable to cope with the genius of Maurice of Nassau, gladly accepted the peaceful overtures of Olden Barneveldt and the commercial grandees of the towns, who then, as afterwards, were opposed to the democratic and war-loving population of the country, which

supported the house of Orange. This truce closed the great struggle of the Low Countries for their independence, and virtually secured it to them. While, however, tranquillity reigned in Holland and Italy, Germany was growing ever more uneasy; in more districts than one the struggle between the communions, deferred not ended by the peace of Augsburg of 1555, had become acute. Not only in the Slavonic lands connected with the house of Austria was there excitement and dis- turbance, but in the Rhine districts questions had arisen which called out the warm interest of all the three confes- sions,—the Catholic, Lutheran, aud Calvinistic. The death of the duke of Cleves in 1609 brought matters to a head ; the Dutch and Spaniards, the elector of Brandenburg, and the emperor, all interfered. Then Henry IV. took up the cause of the Protestant princes, and sent envoys to the Evangelic Union of Halle (January 1610), and made most vigorous preparations for war, in combination with Maurice of Nassau, who agreed to join him with 20,000 Dutchmen in Cleves. It was arranged that the queen should be regent in the king's absence, and as she had never been solemnly crowned, she delayed Henry's departure till that ceremony lad taken place ; in the days of waiting the king, fretting to be off, went to visit Sully, who lay ill at the Arsenal, and to feast his eyes once more on the splendid armoury and munitions of war collected there. As he went, he was

Assassi- assassinated by Ravaillac, who plunged a knife into his

heart. It is said to have been the eighteenth attempt made

soul, bright temper, original and characteristic speech. All great men leave sayings behind them, and Henry's ring with vigorous good nature aud humour. His brilliancy in war was that of a captain; he had not the coolness and combination of a general; his moral character was restless, bad, ungrateful, self-indulgent; he took little trouble to help his subjects to greater comfort, though he ever wished them well. They felt that there was in him something of the lazy kindliness of Louis XII. He chose a grand minister in Sully, and, in spite of some wavering, followed him iu the right policy for France. He had the faults of the Bourbons; yet he was their greatest king,—on the whole, their noblest man.

Voltaire sums up the good deeds of his reign in nervous phrases :—

‘Justice is reformed, and—far harder task!—the two religions live in peace —to all appearance. Agriculture is encouraged; as Sully said, ‘ Plough and cow, these are the breasts of France, whereat she sucks; they are the true mines and treasures of Peru.’ Com- merce and the arts, which Sully cared for less, were still honoured; gold and silver stuffs enriched Lyons ard France. Henry esta- blished manufactures of tapestry; French glass after the Venetian style began to be made. To him alone France owes the silkworm and the mulberry, in spite of Sully. It was Henry who dug the canal which joins the Seine and the Loire. Under him Paris grew and grew fair; he built the Place Royale, he rebuilt the old bridges. Before his day the St Germain suburb was not connected with the town, and was improved; he saw to that. He built that fine bridge © on which every Frenchman as he passes still looks up with emotion at his statue. St Germain, Monceaux, Fontainebleau, above all the Louvre, were enlarged, almost rebuilt, by him. He established in his long gallery in the Louvre artists of all kinds, and encow- aged them frequently with his presence as well as his presents.” _

Finally, he had made France the arbiter of Europe, as was felt at Venice and Amsterdam, and as would have been also felt on the Rhine, had not the Spanish faction, and the undying hatred of the Catholic fanaticism, cut short his life on the very eve of great events.

The regency in France belonged in theory to the princes Lonis of the blood-royal ; as, however, Catherine de’ Medici had XIE.

made her a precedent, and as Henry IV. had as good as named his spouse regent, Marie de’ Medici seized the office at ouce. She took no vengeance on Sully for his opposition to her in past time, but made friends with him, taking from him all real power and command of the finances, while she left him the charge of the artillery and woods, together with the government of Poitou. The princes of the blood- royal were easily disposed of: Condé was in exile, the prince of Conti a cipher ; the count of Soissons she quieted with great gifts. Then she composed a council of regency, which was managed by her favourites Concini and his wife Leonora Galigai. Concini, who purchased the marquisate of Ancre, and was made marshal, though an ambitious and greedy foreigner, did not use his power amiss for a time. When the princes, headed by Condé, opposed him and clamoured for the

convocation of the States-General, Concini quieted them skilfully, and in 1614 caused the young king's majority to be declared,—for Louis XIII. was then thirteen

on his life. All the grand plans for interference in the affairs of Europe, and for the reduction of the house of Austria, fell to the ground at once, and German affairs were

years old,—and summoned the States-General to meet at cay Paris. As this was the last time that they were called ai together before the eve of the Revolution, it may be well to jr yg14,

IV.

left to seethe as they would, until in 1618-1619 they came to a head in the outbreak of the Thirty Years' War. The knife of Ravaillac, whether he was set on by the queen and the Spanish party or not, did their work ; it left the Pro- testants of the north to fight for themselves, relieved the king of Spain of grave anxieties, and plunged France once more into confusion and trouble. Not till the reign of Richelieu had succeeded the administration of Sully did

say a word as to the body, its nature and composition. The States-General of France, in which the three orders met from time to time at iuvitation of the king, was an assembly of clergy, nobles, and "third estate" or commons. The three formed three entirely independent chambers, sitting, debat ing, and voting separately. Consequently the vote of two orders could always veto the wislies of the third ; and as clergy were a class and nobles a caste, and as to a large

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extent the interests of these bodies were identical, and as, moreover, they both enjoyed a fatal immunity from the burdens of taxation, the chance of legislation or taxation on fair principles was very smallindeed. Representing the clerical estate sat the bishops and abbots, together with a certain number of lower clergy; in the noble house sat the holders of noble

fiefs; the third estate was represented (except in 1789) chiefly by deputies elected in the towns.

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(namely, Douai and Lille), Provence, Béarn, Lower 1614-21. Navarre, Bigorre, Foix, Soule, Armagnac, Nébouzan, and Marsan,

The States-General of 1614 did nothing ; they faithfully represented the jealousies and ill-will between the orders, and broke up in confusion. Armand du Plessis of Riche- Riche- lieu, bishop of Lugon, was the orator of the clergy on this licu ap- occasion, the person charged to lay the grievances of his Pe

. STATES-GENERAL. |

1614.

Parlia- ment in France,

Pays d'é- lection,

Pays d états,

These bodies had really no legislative power; and though just before the Revolution the parliament of Paris opened the way to great changes by declaring that taxes could only be legally voted by the States-General, they had, as a fact, very little authority even in this respect; in only a few cases did they sanction taxation or vote subsidies ; the royal power found it more convenient, till the bankrupt state of the country under Louis XVI. compelled it to call on the Estates for help, to arrange the taxation asit thought good. The great doctrine of the relation between tax-paying and political power was unknown in France. The true function of the Estates seemed to be limited to expressions of opinion on points submitted to them by the king, and to the lay- ing before him, on their side, grievances which they had brought up in their cahzers or "quires," from the country. These grievances they could not remedy : all they could do was solemnly to call the attention of the king to them, who could redress them if he liked. 'This

solemn process was almost the only occasion on which the Estates met together. They went to church together at the opening, and then in one chamber were met by the king, who addressed them and dismissed them to their several chambers with the business he chose to entrust to their deliberations ; then, once more, at the end of their labours they all met again. At the upper end of the halla platform was erected for the king and his court, the twelve peers, and the household officers ; on the right hand of it sat the clergy, on the left the nobles, in front, at the foot-of the hall, the third estate. Each order presented its statement of grievances ; the king replied with promises and assurances, which came to very little, and the Estates were then dismissed; and if the court had got the money or the help it sought, very little more was thought about gravamina to be redressed. So little was their practical importance,—so rarely were they con- voked, that their composition, method of election or nomination, rules of procedure, rights and legislative com- petency, were never made clear. It was not in the interests of the monarchy, or indeed of the privileged orders, that the Estates should have any power, or meet very often. This, then, was all that France, before the Revolution, ever had by way of what Englishmen call a parliament. The word parliament in France has always signified only a law court; and the parliament of Paris, the chicf law court of the realm, claimed a certain constitutional power, as having the duty of registering the royal edicts. As a rule, it proved itself the obsequious servant of the king's will; from time to time, however, it was stubborn, and, refusing to register, held that the royal edict so unregistered was void of authority. In such cases the king was wont to hold what was curiously styled a "lit de justice," a "bed of justice," or solemn visitation of the parliament, in which he personally attended and compelled the reluctant body to register his edict. These things, for the " generalities" or "Pays d'élection,"—that is, for the chief part of France,— werethe sum total of constitutional life and power enjoyed,— a total which, under a strong and determined monarch, or Such a minister as Richelieu, meant absolutely nothing at all. In the outlying districts, called the " Pays d'états," more liberties existed ; these parts voted their own local taxation, and managed to a great extent their own local affairs; they were, however, a mere fringe round the borders of ancient France,—the estate of Flanders

order before the king. This is the only interesting fact in the history of this meeting of the Estates. In 1615 Louis XIII. married Anne of Austria, who afterwards played a con- siderable part in the troubles of the Fronde. For two years Marshal Ancre steercd his perilous way between the young king, who cared little for him,—his mother's favourite, not his,—the princes of the blood, and the discontented Hugue- nots. In 1617 the new favourite of Louis, Charles d' Albert, count of Luynes, overthrew and killed him; Leonora Galigai, his wife, was executed as a sorceress; the queen- mother and Richelieu, who was just hoping to secure his foothold at court, both fell, —she withdrew to Blois, he to Lugon ; the young king, weak and frivolous, fell into the hands of the noblesse. After a time the nobles were as little pleased with Luynes as they had been with Concini, and rallied round the court of Mary de' Medici at Angers. Richelieu, whose great abilities had already been recognized, was charged by Luynes with the delicate task of attempt- ing a reconciliation between the king and his mothcr; he succeeded by the treaty of Angers in 1620 in averting civil war. Then Luynes, thinking it well to amuse the king, marched with him into Béarn, where the inhabitants, suddenly bereft (in 1617) of their rights as Protestants, were in open ferment and revolt. Here, as in all the south and west of France, the Huguenots were uneasy and sus- picious; the incidents of war in Bohemia, where the Calvinists had but just been crushed, and the political changes in the United Provinces, excited their already high- wrought feelings. They claimed the full benefit of the Edict of Nantes, which seemed to the court to be the esta- blishment of a republic in the heart of the monarchy. In 1621 they held an assembly at their capital, La Rochelle, and made a kind of declaration of independence. They divided their 700 congregations throughout France into eight circles, after the German fashion, thus indicating a tendency towards decentralization, which must be offensive to the court and the gencral body of French people ; they arranged their own levies of men and money, and in fact went far towards the full organization of what they styled "the republic of the Reformed churches of France and Béarn." They named the duke of Bouillon their chief, and made Lesdiguiéres most plentiful offers. These great nobles, however, refused to join them, and the duke of Rohan with his brother Soubise became the heads of this Huguenot movement. 'There were in it not a few elements of con- stitutional life ; these Protestants had a far better idea of wholesome government than prevailed elsewhere in France. The

noblesse, however, would have nothing to do with them, and their efforts were of little avail. The king, who showed considerable energy, took the command against them, and encouraged his army to treat them with barbarous cruelty, for he was a weak and heartless creature. At the siege of Montauban, however, he failed completely, and had to with- draw discomfited. Soon after this, in the end of 1621, Luynes was taken with camp fever and died. The king, who was weary of him, heard with pleasure the tidings of his death. Round him were now formed two parties,—that of the queen-mother upheld by Richelieu, and that of the prince of Condé. The king, leaning towards the latter, which wished for war, set forth on a second carapaign against the Huguenots, and conducted it with the same mischievous cruelty as before. The Huguenots showed

the Palatinate and the course of the Rhine, by which they 1694-9 could communicate with the Spanish Netherlands and inti- pir, midate the Dutch; they were also masters of the important period

1623-24. nothing but weakness; their chief men submitted, and place after place fell. After this war had lasted about a year, the queen-mother got the upper hand at court, and

[nIstory.

Riche- 1623). Richelieu, who in 1622 had received the cardinal's |} Denmark, though he would have much preferred that of lieu hat in reward of his services in reconciling the king with | Gustavus Adolphus; in the Alps by allying himself with ee his mother, was now ready to take charge of and to rule the | Charles Emmanuel, duke of Savoy, with Venice, and with oa weak, unstable king, who already appeared to fear and dis- | the Grison leagues. With hardly any resistance he swept like his future master. He entered the council in April | the Spanish and papal troops out of the Valtelline; for 1624. Urban VIII. was only half-hearted on the side of Spain, His "T venture on nothing without first thinking it out ; but | and was to some extent influenced by the true winner of policy. once decided, I go

straight to my point, overthrow or cut | some of Richelieu's greatest triumphs, the crafty capuchin, down whatever stands in my way, and finally cover it all | Father Joseph. Just, however, as all was going on well, up with my cardinal's red robe." Such are the words put | Richelieu was paralysed by an unlucky outburst of Hugue- into Richelieu's mouth ; and whether he said them or not, | not independence ; affairs in Germany took a bad turn, for they represent fairly enough his deliberation, resolution, and | Wallenstein now appears on the scene with a new imperial cold severity. Nor does the final touch as to the red robe of | army; the attack of the duke of Savoy on Genoa failed ; his clerical office go much beyond the truth ; for he made | the French in Piedmont and the Valtelline felt themselves great use of his dignity as a cardinal to cover the intrigues | insecure. A temporary peace was made with the Hugue- and cruelties on which otherwise he might perhaps have | nots, and in May 1626 the treaty of Monzon with Spain The never ventured. In his earlier days he seems to have | closed Richelieu's first attempt to reduce the preponderance treaty of desired to build upa strong monarchy, absolute, without | of that power. It is perhaps the darkest hour of his career ; Momo. constitutional checks, on the goodwill of a satisfied and well- | the treaty was secretly and treacherously agreed on; he governed people. The alliance between despotism and de- | left his allies to shift for themselves ; he seemed to reverse mocracy, which our own age has also seen, appeared to be | his whole policy. The truth was that the strength of the especially adapted for France, where the constitutional lifa | Spanish party at home, the ill-success of the Lutherans in was always so weak. As soon, however, as the despotism | Germany, and the weakening effect of Huguenot insurrec- was established on a firm footing, the people were forgotten ; | tion made it impossible for him to persevere. and Richeliew's administration in the end oppressed them 2. It was clear that he must bridle the Rochelle Protest- gecond quite as much as it crushed the nobles or kept the church | ants before he could advance a step; so doing, he would period in order. also make a beginning in his second aim, that of bringing of bis His When Richelieu entered the king's council in 1624 he | down the noblesse,—for some of the proudest aristocrats of earlier was thirty-nine years old. Born in 1585, he was the | France were Huguenots; then he could coerce the queen- history. youngest son of a noble family of Poitou, springing origin- | mother and her party, with its Spanish leanings ; and after ally from the village of Richelieu. In

that family the elder | that he would be free to resume his foreign policy. This son, if he chose, took orders, because they could always dis- | second period of his public career, therefore, is chiefly occu- pose of the bishopric of Lugon, a kind of family benefice ; | pied with the overthrow of the Huguenot power, which was the younger son became a soldier. As such, Armand du | concentrated at La Rochelle. It was, however, preceded Plessis learnt lessons in warfare, which were very useful to | by a great court intrigue, for he was already very obnoxious him at a later time ; the cardinal's robe did not take the | to the nobles near the throne, and to the princes of the place of the soldier's coat,—it only concealed it. When, how- | blood. The plot was easily detected and crushed; Marshal ever, his brother gave up his preferment at Lucgon, Armand Ornano perished in prison; Gaston of Orleans, the king's at once left the calling of a soldier, was ordained, and suc- | dissolute younger brother, was compelled to make abject ceeded to the bishopric in 1607, at the age of twenty-two. | submission ; the duke of Vendéme lost his government of The States- General of 1614 made the young prelate's for- | Brittany; the duchess of Chevreuse was banished; the tune; he pleased Concini and the queen- mother, acted with | queen herself was warned to behave more wisely in the consummate skill and prudence through the ten years which | future. The influence of women during this century is followed, was made cardinal in 1622, and member of the | almost uniformly baleful ; that of Henrietta Maria, sister council in 1624, His later life may be divided into four | of Louis XIII. and wife of Charles L, led to the attempt Periods Pperiods:—(1) from 1624 to 1626, the time of his first resist- | of Buckingham to recover his popularity in England by ofhis ance against the Austro-Spanish power and his failure, as | espousing the Huguenot cause, which was exciting a warm career.

Condé had to withdraw ; bya treaty which recalled the old peaces of the civil wars, the chief part of the Edict of Nantes was confirmed, while the Huguenots were forbidden to hold political meetings or to fortify towns ; they retained only La Rochelle and Montauban as strongholds (October

shown by the peace of Monzon; (2) from 1626 to 1628, when he punished the Huguenots of La Rochelle for that failure, and laid firmer foundations for his after-success ; (3) from 1628 to 1635, the period in which he secured

his own and his master's despotism in France, and began to interfere in the affairs of Europe; and lastly (4), from 1635 to 1643, the days of his successful lead in the arena of general politics, and of his triumphant overthrow of his domestic foes; the fruits of this period he left for Mazarin to gather in abroad by his triumphs at the peace of West- phalia ; Louis XIV. carried out his principles to their utmost development in domestic policy.

1. When he began to rule in 1624, the Austro-Spanish ae had already become very strong. The first results of

e Thirty Years' War were all in their favour ; they held

Valtelline, that long pass which led from the Milanese ° his*

territory, at this time in their hands, to their German a

friends in Bavaria and Tyrol. Richelieu determined to attack them both in Germany and in the Italian Aips,—in Germany by supporting the leadership of Christian IV. of

interest in the English people. The Huguenots, irritated by the establishment of Fort Louis as a check on La Rochelle, declared war on France herself; they were secretly enconraged by Anne of Austria and the court party, as well as by the Spaniards, who were delighted to see the cardinal thwarted and France weakened by civil war. They were also openly backed by England, which declared war on France, and sent a strong fleet under Buckingham to succour La Rochelle. But there was in light-headed hand- some Buckingham nothing of the soldier; he failed igno- miniously, while the cardinal's siege grew daily stricter and more certain of success. After fourteen perilous months of siege, Richelieu entered the town in triumph. With the fall of La Rochelle ends the stubborn resistance of the Huguenots to the monarchy ; the siege was a kind of after-

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1628-32.

Third

_ period

of his career.

Gusta- vusAdol- phus entersin.

RICHELIEU. |

blow to the civil wars of the previous century. No very severe penalties were exacted from the town; it was simply rendered powerless. The fall of the place roused a warm patriotic feeling in France ; it was regarded as a great de- feat of England. Buckingham's assassination had opened the way to peace, which was signed between the courts of England and France in September 1628.

3. It was full time for Richelieu to interfere elsewhere. The utter collapse of the resistance against the house of Austria in Germany had come. Wallenstein was omni- potent in the north ; Christian 1V. had been driven back into Denmark ; the king of Spain was in league with the duke of Rohan and the discontented Huguenots of Langue- doc; affairs in Italy were very threatening ; the Spaniards were pressing Casale, the key of the great valley of the Po; on the two sieges, La Rochelle and Casale, which took place at the same time, the fortunes of Europe turned. Richelieu, while he sent his agent Charnacé to North Germany to do what he could to check the Austrian ad- vance and to raise up fresh barriers, set himself to relieve Casale. In January 1629 he had carried Louis XIII. into Italy, and the Spaniards at once raised the siege of Casale. Thence he returned into Languedoc, where the Protestant rebels were moving; they too were speedily put down; and Richelieu, with Father Joseph, once more posed before Europe as the champion of Catholicism. Urban VIII, who little knew his man, wrote him a letter of warm thanks and congratulations. With the fall of Montauban, the last glimmer of local independence in France died out. Before the end of 1629 Richelieu was called on once more to in- terfere, and this time more seriously, in Italy ; the pope, the duke of Mantua, the republic of Venice, all in alarm appealed to him to save them from Spanish domination. He prevailed on the king to appoint him heutenant-

general, and with a splendid staff and army crossed the mountains into Italy early in 1630. His campaign, which did not include any open warfare against Spain, was thoroughly successful: he reduced all Savoy to submission, in spite of the duke's ill-will, While he was thus making a splendid and theatrical campaign in Italy, he was quietly engaged on far greater things elsewhere; he was busy organizing and encouraging the resistance of northern Europe to the house of Austria. Charnacé with Gustavus Adolplius, and Father Joseph at the Ratisbon Diet, were charged with this duty, and fulfilled it witheminent success, It wasin 1630 that Gustavus accepted the friendship aud help of France, and early in 1631 signed at Baireuwald a treaty of alliance with that power, which consented to pay him a great subsidy for five years. This treaty, in which Gustavus promised not to coerce peaceful Catholics, was approved even by Urban VIII. At the Ratisbon Diet in June 1630 Father Joseph had a more delicate task; yet he too succeeded. The jealousies of the German princes neutralized all the advan- tages of the emperor Ferdinand, and brought about the fall of Wallenstein, who withdrew in haughty disdain to Bohemia; the princes also protested against the attempts of Ferdinand on Italy ; and he, wishing above all things to conciliate them, and to get his son Ferdinand named Rex Romanorum, promised to secure the Gonzaga-Nevers duke at Mantua, and to withdraw his troops from the second siege of Casale. The first treaty of Cherasco (April 1631) brought the Italian war to an end; a second treaty, made by Richelieu with Victor Araadeus, the new duke of Savoy, secured for France Pinerolo, the key of the approaches to Turin. Giulio Mazarini, the pope's agent, made his first public appearance in the negotiations of this Italian war, and laid the foundations of his fortunes in }'rance.

A little before this time Richelieu had passed through the most critical moment of his career; the queen-mother, the reigning queen, Gaston of Orleans, still heir to the throne,

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the house of Guise, a group of generals and officers of the 1632-38.

crown, the duke of Bouillon, the count of Soissons, all the favourites and courtiers of Louis XIII., had conspired together to overthrow the cardinal. In the very moment of their apparent success, when the king, as they thought, had entirely given him up, the skilful audacity of Richelieu reversed all their plans. He threw himself on Louis XIII. for support, and the king, glad to be delivered from their hands, gave the cardinal carte blanche, the "great storm of the court," the " Day of Dupes," passed by and left him stronger than before. He showed no hesitation in punish- ing aud crippling his foes. The queen-mother was got rid of ; she took refuge at Brussels, and her ladies were exiled ; Gaston fled to Lorraine, the duke of Guise to Italy ; the parliament of Paris, which had favoured the plot, was re- duced to humble submission. Richelieu was now made duke and peer, with the government of Brittany. The attempts of the emigrant nobles to raise the provinces on the borders were sternly and swiftly put down; the battle of Castelnaudary in Languedoc closed the series of out- breaks. The duke of Montmorency, son of the constable, was taken there, and afterwards executed. After pacifying Languedoc, Richelieu rearranged the governorships of the provinces, removing hostile or suspected governors, and putting his own friends in their places. By the end of 1632 he had crushed all the serious elements of resistance throughout France.

This period coincides with the splendid career and pre- mature death of Gustavus Adolphus. His rapid advance and high aims had alarmed Richelieu; his fall at Liitzen was a distinct relief to his ally ; it enabled him to step in between the combatants with emphasis, and to shape the latter years of the Thirty Years' War so that they might condnce to the advantage of France. In July 1632 he had seized the duchy of Lorraine, almost without striking a blow, the duke having taken part with the emigrants against him. He was now prepared to advance thence to the Rhine ; he took the Protestant adventurers, Bernard of Saxe-Weimar and others, into his pay. Things worked well for Richelieu: the murder of Wallenstein in 1634, the abandonment of the prince's party by the elector of Saxony (peace of Prague, 1635), the lack of a head for the German Calvinists,—all these things combined to open the way for the last and most brilliant period of Richelieu's career.

4, Late in 1634 he had renewed his alliances with Sweden Fowth and the German Calvinists; he persuaded the Dutch to period attack the Spanish Netherlands in May 1635 ; he declared Eg

war on Spain, and came openly into the field, in which hitherto he had worked only by secret and oblique methods. He had under his command such a force as France had never seen: 132,000 men in four armies seemed likely soon to bring the weary war to an end. One army was to join the Dutch under Frederick Henry of Orange and to march on Brussels, a second to unite with Bernard of Weimar and the Swedes across the Rhine, a third to hold the line of the Vosges and protect Lorraine; the fourth with the duke of Savoy should reduce the Milanese country. The result, however, in no way answered the expecta- tions; the campaigns of 1635 and 1636 were unsuccessful and burdensome; neither glory nor profit followed ; the Spaniards and Austrians invaded France on three sides,—in Picardy, across the Pyrenees, and in Burgundy. Nor was 1637 more decisive. Though the invaders had been swept out, no important actions took place, no great results followed. 'The successes of Bernard of Saxe-Weimar on the Rhine in 1638 first showed that the Austro-Spanish power was checked. In this year the first steps were made towards the peace of Westphalia. The birth of the dauphin Louis also now ruined the court party, and secured to Richelieu a firmer lease of power; if their sickly king IX, — 72

career.

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1638-42. were to die, as seemed only too likely, he would continue

Charac- ter of Riche- lieu.

to guide the fortunes of the state under a regency; the hopes and future of Gaston of Orleans were reduced to nothing. 'The fall of Breisach at the end of the year, which placed the upper Rhine completely in the hands of Bernard

.of Saxe-Weimar, though it might not be altogether grate-

ful to Richelieu, who feared the skill and abilities of the ambitious and patriotic German, proved to the world that the Austrian power was worn out. The death of Father Joseph at the same moment caused tlie cardinal no small embarrassment ; his place was taken by tlie supple Mazarin. The death of Bernard, just as his plans seemed on the point of being realized—just as he thought he had made for himself a principality on the Rhine to check the progress as much of France as of Austria,—came very opportunely for Richelieu. There was now no one engaged in the war who could interfere with his objects; he got pos- session of the army which had served Bernard so well, the best body of fighting men the war had produced after tlie Swedes had been exhausted ; he also seized on the districts in their hands. In 1641 the count of Soissons went over to the Spaniards and invaded northern France. He fell in battle, and the attempt failed. In Germany and Italy the strength of France was more and more distinctly shown. The last battles of the Thirty Years' War were chiefly won by Frenchmen; the cession of Sedan by the duke of Bouillon, and the capture of Perpignan close to the Spanish border, were 'the last present made by Richelieu to France" (Michelet). The one helped to secure her northern, the other her southern frontier. The cardinal's last struggle for supremacy took place now. In 1641 the parliament of Paris was humbled, and its ambition to rival the English parliament rudely destroyed; in 1642 the conspiracy of Cing Mars gave expression to the old and undying hatred of the court for Richelieu. The plot was detected and un- ravelled as soon as it was spun, and Cing Mars with his friend De Thou perished on the scaffold at Lyons. After this, all were prostrate and obedient ; the court party was utterly foiled, its chief members dead or exiled ; the car- dinal's foreign policy was triumphant, and neither Spain nor Austria could do more. But he had no time to enjoy the successes his cold heart and strong hand had won; he fell into the hands of the one enemy whom no subtlety could baffle, and died in December 1642. Richelieu had an inflexible will, vigorous abilities, and a clear idea of what he desired that France should be; and it is hardly too much to say that he made France what she has continued to be almost to our days. Not till the centre of power in Germany had passed from Austria to Prussia did the old foreign policy of France fail; not till constitutional life had got firm hold on the French people did the republic succeed in reversing the evil principles and consequences of Richelieu's home governnient. His leading idea was that unity brings strength; and into unity

his stern resolves and pitiless severities forced his reluctant country. In the career of Louis XIV. we read the true commentary on his acts and principles; in the corrupt and deadly despotism of the 18th century we read its punishment; even the Revolution, though it scourged the older system with scorpions, could not at once destroy it, or build on surer foundations. When we remember how Richelieu crushed, one after another, those elements of society which had in them germs of a modern constitutional life, we are tempted to speculate on the splendid career which was possible for France kad a wiser statesman ruled her in these critical years. The base subserviency of the church, the humilia- sae " = lawyers in the parliaments, the loss of noble See reg overthrow of all healthy civic life, the rie of Huguenot opinions, the silence of the

ral, the diminution of local liberties even in

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the "pays d'états," the assertion of the king's independent 1649,

right to levy taxes and issue edicts,—all these evils might have been avoided, and the strong life, strong often to tur- bulence, which lived in these different institutions might have been liarmonized, brought into friendly and fruitful action, until an original and characteristic constitutional history had given France that strength and prosperity, that home development of magnificent resources, which would have secured her the undisputed lead and lordship among the nations of Europe. Instead, Richelieu gave her unity and glory. The burdens of France increased enormously ; her aggressive power, now that she was concentrated in the hand of a despot, who had unchecked command of the persons and purses of his subjects, was immensely increased. If we look into Richelieu's character, we shall discern, side by side with that pride which could rejoice in debasing the noblest and strongest, a vanity which, like a vein of im- purer metal, spoilt the ring and clearness of his life. He was always conscious of effects: as an author, a dramatist, or a statesman, he was on the look-out for " situations" ; his most striking political successes seemed due as much to the necessity of impressing men by startling novelties as to an honest belief in the justice of his cause or the wholesome- ness of his course of action. His extraordinary powers, his life-long devotion to the

policy he had drawn out for him- self and France, secure him his safe position as a great man,—-a great man on the lower level,—one whom one fears, perhaps adinires, but never loves; because there were in him no rea!ly high aims, nor any true love of the people under him, nor any desire to rule them well. Richelieu has been often compared with Wolsey and contrasted with Mazarin. The red robe of the cardinal is common to all three; beyond this the comparison with Wolsey is of little value, for tle men were essentially unlike in character and aim. The contrast with Mazarin, who lived with him, studied his policy, and succeeded him, is of more value and interest. It is brilliantly treated by Voltaire in his Henriade (vii. 327 sg.) —

Henri, dans ce moment, voit sur des fleurs-de-lis

Deux mortels orgueilleux auprés du tréue assis.

Ils tiennent sous leurs pieds tout un peuple & la chaine;

Tous deux sont revétus de la pourpre romaine;

Tous deux sont entourés de gardes, de soldats;

I] les prend pour des rois . . . . Vous ne vous trompez pas;

Tls le sont, dit Louis, sans en avoir le titre;

Du prince et de l’etat l’un et l’autre est l’arbitre.

Richelieu, Mazarin, ministres immortels,

Jusqu’au tréne élevés de ’ombre des autels,

Enfants de la fortune et de la politique,

Marcheront 4 grands pas au pouvoir despotique.

Richelieu, grand, sublime, implacable ennemi:

Mazarin, souple, adroit, et dangereux ami;

L’un fuyant avec art, et cédant & J’orage,

L’autre aux flots irrités opposant son courage;

Des princes de mon sang ennemis déclarés;

Tous deux hais du peuple, et tous deux admirés;

Enfin, par leurs efforts, ou par leur industrie,

Utiles 4 leurs rois, cruels a la patrie.”

One thing they had in common, the love and encourage- ment of letters; yet even this in Richelieu’s hands must be organized, despotic. Still, he and Mazarin have an honourable claim to remembrance when we speak of the writers of the “great age,” for it was under them in the first half or so of the century, rather than under Louis XIV. in the latter half, that the chief masterpieces were produced. The tendency of the reign of Louis XIV. was rather to depress than to ennoble literature. Richelieu founded the French Academy in 1635, and set on foot the Gazette of France ; he established the royal printing press ; he desired to patronize learned men, though his own literary efforts failed, and men of real independence of character, like Corneille and Descartes, shunned the fatal honours of his patronage. He was in all his tastes a great and showy

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| 643-45.

The rise of Maza- rin.

Louis XIV.

Regency of Anne of

Austria.

The “ “Import- ants,”

prince ; his bearing and surroundings were more than noble ; he called to his side artists of every kind ; art, in its 17th century decadence and formalism, was well content to do his bidding, and gild an age of splendour without genius.

Louis XIII. died within six months after Richelieu's death ; he did but give time to Mazarin to win the favour of the queen and to secure his position as first minister. Mazarin was destined tu fail completely in home government, while in foreign affairs he brought all his great master's policy to asplendid and successful end. At home his rule reversed Richelieu's stern principle of repression. The subtle and flexible Italian, after the manner of his countrymen, hoped to succeed by counterpoises, by playing factions off against one another, by trading on the meaner side of human nature, by love affairs and jealousies, and all the stock in trade of weak intriguing characters. His rule is characterized by the burlesque wars of the Fronde, which sufficiently showed his want of firmness and the degradation of the age.

Louis XIII. left at his death two sons, Louis the dauphin, now Louis XIV., and Philip. duke of Anjou, afterwards duke of Orleans, who. founded the Orleans branch of the Bourbon family, which ceased to reign on the deposition of Louis Philippe in 1848. The regency was in the hands of Anne of Austria, his. queen ; Gaston of Orleans was named lieutenant-general of the kingdom ; the direction of the government was placed with a council, the prince of Condé, Mazarin, Seguier the chancellor, and two more. The king's will, however, was. little respected. Anne, a haughty and ambitious woman, with Mazarin to back her, was not likely to care much for the clog of a council of regency. The parliament of Paris, flattered at appearing to be the arbiter of the counsels of kings, set aside the will, and declared Anne independent regent. The old court party, of which Anne had always been the head, expected to rule at will ; Mazarin was tolerated only because he was necessary to bring foreign affairs. to a successful issue; that done he would have to go. The "'Importants," as they were nick- named, a frivolous.and unworthy company of noble nobodies, reckoned on a long lease of power; the king was little more than a babe,—he was but four years and a half old,

— and it would be strange if they could not secure themselves. The war on the frontiers, however, ruthlessly destroyed their hopes. The Spaniards, cheered by the deaths of Richelieu and Louis XIII., had besieged the little frontier- town of Rocroi; Mazarin hastily sent up an army to relieve the place, commanded by Marshal L'H6pital and the young duke of Enghien, eldest son. of Henry L., prince of Condé, a distant cousin of the kimg. In spite of L'H6pital's prudent counsels, Enghien recklessly with the confidence of genius and youthful inexperience attacked and utterly defeated the world-famous Spanish infantry, and killed their aged general Fuentes, The battle of Rocroi (1643) destroyed for ever the older fighting-power of the world, the solid Spanish foot, and gave to France her first taste, of that military glory which marks the reign; it was the baptéme de few of the child-king of France; it also secured the dominance of Mazarin. The house of Condé was his friend ; Rocroi enabled him to hold up his head against both Spain and the '"Importants"; their party, for the time, was utterly broken up. In these closing years of the Thirty Years' War two able soldiers came to the front, the Great Condé and Turenne,—the one all fire and dash, alike dangerous to friend and foe, the other the greatest tactician of the age. The one represents at its best the old noble fighter, the other the modern skilful officer. In 1644 they drove the imperial general Mercy out of his position at Freiberg, and became masters of the middle Rhine-land ; in 1645, pressing the Austrians nearer home, they fought

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much were they weakened by that Cadmean victory that they were unable to keep the advantage, and were thrust back to the Rhine. In 1646 they directed their attention against the elector of Bavaria, in hopes of being able to detach him from Austria; Turenne took undisputed possession of the whole upper Danube valley, and threatened the elector Maximilian at Munich, the invader, who mercilessly ravaged and plundered his lands, signed a separate truce with France, and abandoned at last the imperial cause. Well might the house of Austria now feel that by any sacrifices it must bring the long war to anend. When the elector broke truce early next year, his resistance was crushed by the French at Zusmarshausen, and the

fighting in Germany was over. The war had rather more life in it as between France and Spain. In Italy, Flanders, and Catalonia considerable movements. went on; that in Flanders, where Condé com- manded, was alone decisive; the battle of Lens (9th August 1648), the last of the fighting on that side, was a crushing and final defeat of the Spanish, and even more fatal to their power than the overthrow of Rocroi.

For years there had been negotiations for peace; they had taken definite form as long back as 1639 at Cologne. In 1643 the congresses of Miinster and Osnabriick were set permanently going: at Miinster, France, Spain, and the Catholic princes were to make terms with the emperor ; at Osnabriick negotiations should go on between him and Sweden, and the Protestant princes ; the results should be welded. into one coherent treaty of peace. The Dutch and Spaniards made peace together in January 1648, so ending their eighty years' struggle. The terms between the empire and Sweden were signed at Osnabriick in August; those between the empire and France at Miinster in October 1648. The quarrel between France and Spain alone re- mained unsettled. The peace of Westphalia, as was neces- sary, largely favoured France. As the war had gone on, her growing strength, and at last her preponderance, had made this quite inevitable ; yet in actual gain of territory France received but little, only Austrian Alsace being added to the kingdom. In influence and in relative strength, how- ever, she grew much. The power of Germany was broken up; the princes friendly to France, the elector of Treves, the Palatine house, the house of Hesse Cassel, the Swiss cantons, were all strengthened. The three bishoprics, Metz, Verdun, Toul, were ceded in full sovereignty to France, as was also Pinerolo; she might garrison Philips- burg; the chief Rhine fortresses, barriers against her ambition, were to. be dismantled ; Breisach remained in her hands. Austria was cut off from the Netherlands, and was rendered almost powerless. Thus the foreign policy of France was finally triumphant, although Richelieu did not live tosee it. He had marked out its course, had watched over the preparations for it, had set it in motion, and had seen it through its earlier failures and difficulties ; then he bequeathed it to Mazarin, who, though far inferior to him in tenacity and unity of purpose, was perhaps better fitted to steer things to their end; for his subtle skill and flexi- bility were exactly calculated for the intricate mazes of long negotiations, and could well defend F rench purposes amidst the

innumerable and conflicting claims and wishes of the states represented at the congresses.

No sooner had the peace of Westphalia settled, as it did for long years, the basis of the public law of Europe, than Mazarin was obliged to turn his attention to home-affairs, in which he was never so fortunate as in his foreign ven- tures. verse to the claims of monarchy, was at this very moment sweeping across Europe. The rulers of every state seem to lose power, sometimes are overthrown entirely. The

1646-48, ©

In 1647 he, to free himself from –

The peace of West- phalia.

Mazarin and

home-

affairs.

It has been noticed that a singular movement, ad-.

and won the sanguinary second battle of Nérdlingen ; so | characteristics of the Thirty Years' War tended to produce

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1648. this result,—partly by depressing Austria and Spain, partly

by familiarizing men with the careers of brave adventurers not royal, not even princely, partly by arousing enthusiasm for strong Protestantism, as in the English volunteers who supported the Calvinist "winter king," or took service under the "Protestant hero," Gustavus Adolphus, partly

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THE FRONTIER

OF FRANCE

1648 & 1659

Districts ceded to France shaded thus

*in 1648/// intes9 *

Chart of Districts ceded to France in 1648 and 1659.

also by the results of the war, as seen in the acknowledged independence of the United Provinces and Switzerland, two republics finally freed from royal control. Besides this there was an aristocratic reaction which had brought down the monarchy of the papacy, as was clearly seen in the long pontificate of Urban VIIL.; there was the popular reaction which was steadily destroying the absolutist theories of the Stewarts in England; there was a certain weakening of royalty in Scandinavia, whether at Stockholm or at Copenhagen. And France could not fail to feel the same influencesat work. Mazarin’s easier rule allowed the princes and nobles whom Richelieu had steadily kept down to raise their heads again, and the lawyers who composed the parliament of Paris, flattered at having been allowed to pronounce an anthoritative judgment on the last will of Louis XTIL., and thinking themselves an institution parallel to the, parliament of England, were also much disposed to take advantage of the childhood of the king, the weakness of the queen-mother, the easier disposition of the cardinal. The French people, who liad much rejoiced when Richelieu died, thinking that his heavy burdens would be lightened, were deeply irritated to find that they had fallen into the

hands of a greedy foreigner; that their financial position |

was worse and their burdens grew yearly heavier; that Mazarin allowed Emeri, a harsh and cruel creature, also an Italian, to manage the purse of France, and to plunder it at will for his own and his master's profit. These causes are quite enough to account for the outbreak of civil war in mae? YE ee eee 5 ae ee

L ' EN ta feed) by permission of the Delegates of the Clarendon

| , Broussel, "'an old counsellor in his dotage, whom the mob

1648. The only wonder is that this war, the " War of the 1648-5 Fronde," or the Sling (a nickname drawn from the boys in The way the city ditches of Paris, who played at mimic fights with of the slings), proved so hollow and absurd, when one sees engaged ronde. in it the great names of Condé and Turenne. The namie of | the Fronde was first adopted by the leader of the move-

ment, the coadjutor to the archbishop of Paris, Paul of

Gondi, who is best known to history as the Cardinal de

Retz. The immediate cause of the outbreak was the attempt

of Mazarin to punish the parliament of Paris for having — brought about the dismissal of his corrupt agent Emeri, The news of Condé's great victory at Lens (9th August / 1648) had inspirited the court party, which counted Condé as its champion; and Mazarin determined to use the en- thusiasm thus aroused to strike terror into the parliament. On the thanksgiving day for the victory, four members of the parliament were suddenly arrested, one of them being

loved for his rude manners and his fine head of white hair." All Paris was at once in an uproar; the coadjutor De Retz threw himself into the disturbance, obtained Broussel's re-

| lease, and quiet for the moment was restored. The queen- _ mother and Mazarin, alarmed at the troubled look of affairs,

fled from Paris to Ruel, The parliament took the lead in what seemed to be a revolution, and De Retz, a born agita-

| tor and demagogue, gave to the lawyers a popular force in | the discontent of the Paris mob. Though the court had

been induced to return to Paris in October 1648, Mazarin thought it safer to escape with it again early in 1649 to St) Germains. Then the discontented nobles, chiefly influ- enced by that romantic intriguer, the duchess of Longue- ville, Condé's sister, united their cause with that of Paris and the parliament, and seemed likely to overbear all oppo- sition. The prince of Conti, Condé's younger brother, the | duke of Longueville, a crowd of others, and eventually

Turenne himself, formed the heads of a new " War of the

Public Weal." Condé saved the court; his siege of Paris,

and the weariness of the people, who had to pay for all the brilliant follies of their noble allies, led to the peace of , o Ruel early in 1649,—a delusive peace, negotiated by the . stiff pedantic president of the parliament, Matthew Molé. ; This movement marks the division between the Old The Old Fronde and the New,—the Old the Fronde of Paris and and the the parliaments, the New the Fronde of the discontented aes nobles. These latter were by no means inclined to accept

the agreement of Ruel; the second period of the Fronde began at once; Condé tried to play a middle part, intrigu-

ing with both sides, and equally disliked by both. He formed a kind of party of his own, that of the "petits maitres," the frivolous young nobles, dazzled by his bright manners and warlike reputation. The chiefs of the New Fronde began serious negotiations with Spain, and Spanish troops. entered northern France, descending as far as to Rheims. Anne of Austria, somewhat strengthened by the adherence of the Old Fronde, ventured now to arrest Condé, Conti, and Longueville, early in 1650. But the duchess of Longueville escaped, whereby the stroke was rendered & complete failure. :She carried Turenne over to the New Fronde, and he, supported by Spanish

troops, threatened Paris. The three prisoners were sent down to Havre for safety ; Turenne's Spaniards were driven back to the frontier,

and the royal troops retook Rethel from them. Feeling

that Paris was still too uneasy for him, Mazarin released

the three prisoners, and withdrew to Briihl on the Rhine.

His cunning thought was that Condé would certainly arouse jealousies and confusion, out of which the royal power might

soon recover authority. Nor was he wrong: in the autumn

of 1651 the Old Fronde had come entirely over to the court ; De Retz, satisfied by the exile of Mazarin, was bought with a cardinal's hat ; Condé withdrew, and roused

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| War with Spain.

Crom- well and Mazarin,

MAZARIN'S RULE. |

revolt in Guyenne, where he was strong. He reckoned on the help of Turenne and the Spaniards in the north; but all calculations were certain to be vain in a war in which love and vanity, jealousies and mean ambitions, ruled su- preme. Turenne at once went over to the court, and took command of the king'stroops; Mazarin came back, the king's majority was declared. A struggle for Paris followed, in which Turenne showed himself the master of his great rival, first checking him at Etampes, and then defeating him completely in the suburbs of the capital (1652). Condé with the remnant of his force took refuge in the town through the St Antoine gate. Next year, all being weary of the war, the young king was invited back to Paris; Condé withdrew into Champagne and joined the Spaniards, with whom he remained till the peace of the Pyrenees. The New Fronde was entirely broken up; the Old Fronde had long been weary of the whole affair;

Cardinal de Retz was a prisoner at Vincennes, and his career was over. Ere long Mazarin, who had again withdrawn from court to Sedan, was recalled; the parliament of Paris, which in 1654 de murred to the heavy cost of the Spanish war, was ordered by the king to abase itself; its meetings were forbidden ; for nearly a century and a half its political action was sus- pended. |

All this "burlesque war," this " war of children, with a child's nickname," " comic in its origin, its events, its prin- ciple," as Michelet says of it, had been like the light scene which the. skilful dramatist interposes between the great movements of his tragedy, at once to relieve the strained attention of the hearers and to heighten the effect of the catastrophe. It fills with light and merry motion the period between Richelieu and Louis XIV.; it was "the game of lively schoolboys in the interval between the lessons of those two stern and severe teachers." The Spaniards were still at war with France; and nothing so clearly shows their utter exhaustion as their inability to take any serious advantage of the troubles of their adversaries. The civil wars over, France soon drove Spain to the wall, Condé, in command of Spanish troops could achieve nothing ; in 1654 the Spaniards failed at the siege of Arras, and the French took Stenay ; Louis XIV., who was with the army, perhaps here imbibed that love of sieges which always marked his military career. In 1655-1656 the fortunes of the war were almost eveuly balanced, the Spaniards having perhaps the best of it in the north; and troubles with the noblesse began again, while the new. opinions and party of Jansenius of Utrecht, which had been condemned by Pope Innocent X. in 1653, found great favour among the French clergy, who disliked the doctrines and tendencies of the Jesuits. From this time to the end of the reign of Louis XiV. the Jansenists of Paris are in more or less open op- position to the court ; in these days they sympathized much with De Retz. Now, however, Mazarin's skill as a foreign minister enabled him to triumph over all opposition. The strong government of Cromwell had in 1654 secured the tranquil progress of England by treaties with the chief northern powers and with Portugal; now in 1655 he had to choose between alliance with France or with Spain. Nor could he hesitate, Spain still spoke her ancient tongue—the tongue of intolerance and Catholic repression; France in Mazarin's hand had been willing to tolerate the Huguenots, and to aid the Protestant party in Germany. A treaty be- tween England and France was accordingly signed

in October 1655, a treaty of peace and commerce ; a little later it was followed (March 1657) by an offensive and defensive alliance. Six thousand English Puritans, led by Turenne, made an immediate change in the character of the war, and the Spaniards began at once to give way. In 1658 Turenne caught them at the Dunes, not far from Dunkirk, and de- feated them completely ; Dunkirk yielded, and was duly

handed over to the keeping of the Enghish ; the Spaniards were swept away, Gravelines, Furnes, Oudenarde, all fell ; Brussels was threatened. In August of this year Liomne, Mazarin's agent, on occasion of an election to the Holy Roman Empire, concluded an agreement with the princes on the Rhine for the upholding of the peace of Westphalia ; and France could show herself as thie ally at once of England, Sweden, Bavaria, the ecclesiastical electors, the house of Brunswick. At last in 1659 Spain yielded, being utterly unequal to the strife. The peace of the Pyrenees gave to France Gravelines, Landrécy, Thionville, aud Montmédy, and Spain also ceded all she held in Artois; though the duke of Lorraine was replaced at Nancy, the duchy of Bar, aud some smaller places along the Champagne border, were ceded to France. In Germany itself Louis XIV. secured Juliers to the duke of Neuburg, and the original trouble which led to the Thirty Years' War was finally settled eleven years after that war had ended. All French conquests in Catalonia were restored to Spain, while France became finally master of Roussillon and Conflans ; Condé was par- doned and taken into favour. Finally, the treaty involved a great marriage compact between Louis XIV. and the infanta Maria Theresa of Spain. The actual marriage, which took place next year, was garnished with a dowry never paid, and with a renunciation by the infanta of all her rights to the Spanish crown or Spanish possessions, which was thrust contemptuously aside when in 1667 Louis XIV. desired to get hold of the Spanish Netherlands, or when forty years later he placed the crown of Spain on the brows of his young grandson Philip. The peace of the Pyrenees and this Spanish marriage firmly established Louis XIV. on his throne as the most powerful monarch of Christ- endom ; it was time for Mazarin to withdraw and leave his pupil in

full command of the realm. He spent the last year of his life in teaching the young monarch those lessons of king-craft on which he built up his career, —taught him to avoid a first minister, instilled into him a belief that ill- faith in treaties was good policy, and urged him to cultivate his "natural gift of dissimulation"; called his attention to the miserable state of finance, and commended to him his trusted agent Colbert, as the man best fitted to bring order out of confusion ; finally, he placed his own huge fortune, some ten millions sterling of our present reckoning, wrung from the misery of France, at the king's disposal. Louis, however, replaced it honourably in the cardinal's hands, who left the bulk of it to his nieces, and with part founded his "College of the Four Nations" for the education of noble children from the districts added to France in 1648 and 1659. To this college he bequeathed that splendid library which he had based on Richelieu's fine collection, and had admirably enlarged by the care and skill of his librarian Naudé. He had done what he could for arts, literature, and science, had established the academy of paint- ing and sculpture, had pensioned Descartes in Holland, and had introduced at Paris the Italian opera. In all the solid elements of good government he was entirely wanting ; and it remained for Colbert to struggle against his fate,— the fate of serving a grand monarch, who would neutralize his endeavours to secure financial and commercial prosperity for France. Mazarin died in March 1661, leaving the state in the unfettered hands of Louis XIV., who, though now twenty-two years old, and a king for 18 years past, had as yet been little but a cipher on the throne.

Nothing is more striking in all history than the con- trast between the Louis whom men saw under Mazarin's tutelage, and the Louis whom France Jong adored as her Great Monarch. In the earlier period there was the dull and tranquil docility of a great creature which as yet knows not its amazing strength, and has as yet none of the ambi- tions of power, and has never tasted blood, His nature,

1659-61

The peace of the Py- renees.

Maza- rin's endl

andchar-

acter.

Charac- ter of Louis

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developing itself very slowly and late, seemed to onlookers to be only heavy and commonplace ; courtiers noted with keen eyes that the young prince liked amusements, and they promised themselves a bright and joyous reign, in which they would have free leave to spend as they liked the hardly-won wealth of France ; it seemed to them perfectly natural that they should waste at will what they had never earned, and they fully believed that the young king would be their accomplice. His capacity seemed to be small; he was timid and ignorant. Mazarin almost alone was not mistaken in him, and no one knew him so well; "he will set off late, but will go further than all the rest," was his judgment, and a just one, on the young monarch's charac- ter. For he was serious, severe, obstinate ; lie learnt little, and that slowly; but what he did learn he never forgot. He would neither bend nor forgive ; and when he had once taken on himself the heavy burden of his kingly duties he never flinched nor repined for more than half a century. From the beginning he declared that he would rule without a first minister,—this Mazarin had instilled into him as a fundamental law of his kingcraft; and he kept his word, although it becaine clear in time that it was quite possible to hold him in close leading strings, so long as he himself did not find it out. At first, however, he was determined to have only agents around him,—men of business who should never expect to become too prominent,—not great lords of church or state, but men of middle or humble origin, With them he was prepared to undertake any amount of dry detail work of public business. Without a sigh he dedicated henceforth four or five hours a day, or even more, to public affairs; his commonplace abilities, his instinct of orderliness, his love of minutiz, his punctual routine, which would have disgusted a livelier prince, formed the happiness of his life. 'His ministers," says Michelet, 'might change or die; he, always the same, went through his duties, ceremonies, royal fétes, and the like, with the regularity of the sun, which he had chosen as his emblem." With a morbid conscience, he easily became subject to his confessor; with a limited intelligence and great lack

of knowledge, he was dependent on his ministers without knowing it; with a vein of small vanity in his char- acter, he was not above being led by the flatteries of the woman he loved. Finally, Louis XIV., though heavy-look- ing, was handsome and majestic in person ;.no one has ever played the part of a king with such equable gravity and success ; his dignity was as striking as his selfishness; for his heart was dull, and neither surprises nor warm feelings could throw him off his balance. His whole reign passed without his ever showing any real feeling for his poor sub- jects ; and his indifference to the health and feelings of those nearest him, his treatment of his court, especially of the ladies of it, was such as nothing tut their abject fear of him, and the meanness engendered by the atmosphere of such a court, could explain.

Louis XIV. began his true reign in 1661 by dividing the business of government into three agencies. He placed all foreign affairs under Lionne, who had served him so well in the war against Spain; Le Tellier had charge of the army and was war-secretary, supported by his strong-handed son, the terrible Louvois ; and finance was entrusted to Fou- quet, the most brilliant and unsatisfactory of his ministers. All three were men of middle origin: Lionne came of a family of gentle birth in Dauphiny ; Le Tellier's father was a lawyer; and Fouquet was a citizen who pretended (as many Frenchmen have since done) to be of noble birth. The king had at his side.also Mazarin's most trusted depend- ant Colbert, grandson of a wool-seller of Rheims. It was thought at court, where Louis was no better understood than elsewhere, that Fouquet would before long earry all before

him, and fill the coveted post of first minister of the crown. | seilles and Dunkirk free ports. He then re-established old

The queen-mother, seeing that the king did nothing for his 1661.67 governor Villeroy, and that he was stepping resolutely for- ward in the path he had chosen, complained bitterly of her

son's ingratitude, and declared with a sneer that he "wanted to pretend to be a man of ability." Fouquet, ambitious and bright, a favourite with the queen-mother, | the court ladies, the literary world, the Jansenists, a man who let the finances fall into hopeless confusion and stooped to dishonest representations to save his credit, was not the man to suit the young king,

and in a few month's time he had fallen for ever from power, and Colbert sat in his place.

John Baptiste Colbert, who was minister of Louis XIV. Colbert, for two-and-twenty years, claimed descent from a Scottish family settled in France, and his character, his common- sense, rigid principles, business ways and tastes, and his simple habits, were just what one might have expected from such an origin; "a mind somewhat heavy and harsh, but solid, active, unwearied in work." He was first named comptroller-general of finance; he had also the supreme care of all home-affairs, and when the navy (after 1669) was first in his own and then in his son's hands, he may be said to have had charge of thatalso. Till Louvois succeeded to the ministry of war in 1666, Colbert's influence on all parts of the administration was paramount ; and the young king, partly understanding what he was doing, and wholly desirous of doing his best, gladly seconded him in every- thing. At first Colbert found everything in the financial department in a melancholy state: more than half the sum

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' gathered in taxes disappeared before it reached the treasury, 'and the expenditure had so far grown as to leave a yearly

deficit of nearly twenty-two, millions of livres. To reorgan- . ize the. finances was his first task; and by stern dealing

with intermediate officials, by fixing the interest of loans

at a maximum of five per cent., by sweeping away masses

of useless officers, he succeeded in so far reducing the cost

of levying the taxes and the burdens of the state that in

six years' time the position of affairs was reversed, and the

treasury had a good balance. in hand, while the burdens

imposed on the people. were lightened. The years which

preceded the Devolution war of 1667 are perhaps the most prosperous that France had ever seen. She made extra-

ordinary progress in all directions. Even, in foreign affairs France

her power was shown : she humbled the papacy, she asserted under

lier precedence over Spain in, the streets of London, she Cai helped the emperor Leopold to resist the Turks and en-

abled Montecuculi, to win a decisive victory over them at

St Gothard in Hungary, her fleets in the Mediterranean

cleared away the African pirates. At, home the triumphs) of peace were far more splendid even than these warlike signs of power. Colbert's activity was unflagging ; to re- organize the finances might have seemed enough to another minister; he regarded it as only the groundwork of his structure ; on it he would raise a new and brilliant France, splendid among the nations, not only feared—that was something—but admired as well, and humbly imitated. So he set himself in these years to develop his country on every side. For agriculture indeed he would do but little, for his temper was the opposite of that, of Sully. Sully, a great lord, and owner of broad estates, rated manufactures as of little value by the side of tillage ; Colbert, a towns- man, and of the middle classes, thought that the encourage- ment of agriculture signified the increase of noble wealth and privilege, while manufactures would tend to build up a rich and useful burgher class, obedient. to. the king and fruitful in taxpaying. He therefore devoted his attention to manufactures and commerce, and to the communications by land and water necessary for them. He made good roads, set on foot the canal of Languedoc, declared Mar-

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—Tanu- actures.

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The arts.

Learn- ing.

FRANCE UNDER COLBERT. |

inanufactures and introduced new ones, such as tapestries, silk, mosaics, cabinet-making, lace, cloth of gold, pottery, steel-work, and the like, a long series of "royal manufac- tures," the industries of taste and luxury, which can flourish only on the favour of the great. Colbert's system was therefore one of protection and bounties, and never enabled France to discover for what forms of labour she was by nature specially suited. The true wealth of France lies in her soil,—in her varied agriculture and the thrifty habits of her people; yet the world has ever believed that these "Louis Quatorze" ornaments, these works of art and of little use, are the special glory of French workmanship, the models of good taste. This royal direction thus given to French industry, though it only slowly (if at all) increased the true wealth of the nation, added largely to its credit, and heightened its splendour in the eyes of the world. On industrial movement commerce must naturally wait ; and Colbert attempted much for the circulation of productions. He set on foot four great companies, though they never really prospered. Patronage and direction, which could establish and freshen manufactures, failed here. In the end Frenchmen, with little gifts for colonization, and no decided bias for the sea, learnt chiefly to produce for their own con- sumption. In these years, the same royal and official patronage was largely extended to letters and science as well as to the arts, The last was no doubt regarded as directly connected with the general progress of the favourite industries mentioned above ; in building a great palace at ruinous cost, Louis XIV. and Colbert both thought that French industry was being encouraged, and money circu- lated. Versailles was undertaken in 1661 (it had previ- ously been a royal hunting-box built by Louis XTII.); the famous colonnade of the Louvre, Perrault's work, was begun in 1665; Bernini was summoned from Rome that sanie year to assist inthe great works. 'The buildings erected in this period have all the same

deadness of style; they are splendid, no doubt, and crowded with ornaments; we note in all a want of spontanecus fire; no longer does genius create; talent, at the service of a master, can only copy or conceal its poverty under the cloak of rich ornamenta- tion. The paving and lighting of Paris was a more bene- ficial work ; the quays, squares, and triumphal gates of the period did much to make up for the abandonment of the capital by its kings,—for after the days of Henry IV. the Bourbons spent very little time in Paris. Colbert also established at Paris those new learned or scientific academics which were intended, after the pattern of the new Royal Society of London, to stimulate and direct the progress of knowledge. Such were the Academy of Inscriptions, founded in 1663 ; that of the Sciences, in 1666; of Archi- tecture, in 1671. He also established the school of Rome, built the Observatory, and in every way did his utmost to advance learning and observation. In all, his practical principle was to trust to rule and organization, and to leave as little as possible to genius or national selection,—and French industry, arts, and sciences have all suffered accordingly. Nor was the case different in literature: here also Colbert desired to encourage and direct ; the baneful patronage of kings finds here its highest example. For the true golden age of French literature scarcely touches the active reign of Louis XIV.; it is to Richelieu's time, when at the head of affairs was one who not merely patron- ized but who warmly interested himself in literature, that the greatest inasterpieces belong. The 17th century saw two periods of literary activity, of which the earlier extends to 1661, and is the period of originality and fire; the later runs from 1661 to the end of the century, and (except for Moliére and the great preachers) is lacking in character, if Improved in taste and style. France has always been justly proud of her stage, little as we imay admire its pedantic

of its finest efforts: we feel that we are among those who would have thought Addison's Cato far superior to Shake- speare. Still, in its own style, French tragedy produced masterpieces, and these chiefly under Richelieu aud Mazarin, rather than under Louis XIV. Rotrou, who showed the way,

died in 1630; the great Corneille wrote the Cid in 1636, Les Horaces and Cinna in 1639. After 1646 his powers declined, and though he still wrote to his life's end, no one now cares for his Agéstlaus or his Attila. His brother Thomas, a far inferior dramatist, was worthily re- served for Colbert's days. Moliére belonged to both ages ; his Précreuses Ridicules appeared in 1659, Sganarelle in 1660, U'Hcole des Maris in 1661, while the Médecin malgré lui (1666) and the Tartugfe (1667) belong to Louis XIV. Racine's earlier period, and the best part of him, extends to 1677 ; after that he fell under royal influences, wrote nothing for some years, and afterwards became the quasi- religious poet of the court; the Hsther appeared in 1689 and the Athalie, which the French public treated with indifference, was printed 1691. In other lines of poetry Malherbe, the great purist of the century, who, as Boileau sung, "réduisit la muse aux régles du devoir," died in 1628; Benserade, a trifling wit, flourished with pensions from Richelieu, Mazarin, and Colbert ; La Fontaine wrote many of his fables in the days of the Précieuses, and pub- lished his first volume in 1668,—he was one of Fouquet's friends, and therefore not likely to attract the favour of Louis XIV.; Boileau is properly of the later age; satire and comedy seemed alone able to thrive by the side of obsequious oratory.

In these palmy days of the reign, Louis XIV. saw with pleasure war break out between England and the Dutch (1664). He was slowly preparing to take part in it against Charles II. when the death of Philip IV. of Spain changed his views completely. He made peace with England in July 1667 (treaty of Breda), and plunged into those complications of European law and usage which interested him intensely. The Spanish succession ques- tion at once came up,—for no one expected Charles IT.

of Spain to live long or leave posterity; and the imme-

diate question of the claims of the queen of France on a large part of the Spanish Netherlands occupied his ener- gies. Louis and Lionne snapped their fingers at the queen's renunciations of her Spanish rights, and went even further ; they made claims which, to modern international law, seem to be utterly indefensible. The claim for the Spanish Netherlands was based on the " Jus Devolutionis," the old feudal custom by which certain territories descended to the offspring, male or female, of the first wife, to the ex-

clusion of the children by the second. Now Maria Theresa, queen of France, was daughter of Elizabeth of France, the first wife of Philip IV., while his other children sprang from his second wife, Maria Anna of Austria; and Louis there. fore proposed to apply ancient customs of feudal lordship to international matters, to the transfer of territories from one monarch toanother. The customs of different districts varied much ; in one way or another he hoped to lay undis- puted hands on the Netherlands, Hainault, part of Luxem- bourg, even of part of Franche Comté ; he was prepared to support these flimsy claims by the stronger argument of war. To war it came; the king with Turenne overran the Netherlands in 1667; Condé, who was governor of Bur- gundy, overran Franche Comté in 1668. It was a little war of town-taking; places fell, like ripe fruit, for the shaking. Meanwhile Lionne, busy over the negotiations which sprang out of the succession question, had sketched out a partition treaty, in which Leopold and Louis arranged the whole affair to their liking. With this in hand the king, who had returned in high triumph to Paris, and who

| limitations, its unnatural heroics, and the frigidity of some 1661-6.

The De- volution

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Devolu- tionis.”’

1668-71.

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knew of Sir William Temple’s Triple Alliance, which had been signed in the spring of 1668, made peace as easily as he had made war, and on May 2, 1668, signed the treaty of

Treaty of Aix-la-Chapelle, by which he restored Franche Comté to

Aix-la- Chapelle.

The Triple Alliance.

Rise of Louvois.

Spain, and secured the Netherlands. It was to all appear- ance a very moderate peace, and much enhanced the king's reputation ; men did not know that it was meant to lay the basis for an entire reconstruction of the map of Europe, so soon as ever sickly young Charles II. of Spain had died; and that, every one thought, must follow very soon. 'The long reign of that prince (who lived till 1700) had much to do with the great wars which followed, and with the consequent exhaustion of France.

Louis now set himself to break up the Triple Alliance ; it was a combination opposed to all the diplomatic ideas and plans of France. Sweden was her old ally; and her policy was to encourage the two sea powers, England and Holland, to weaken one another on the water, so as to give France a chance of constructing a navy. Therefore she was necessarily jealous of the Alliance ; nor was it hard to over- throw it. Sweden, as was said, had joined it as a specula- tion, and had her price; Charles IT. of England could easily be bought; Holland thus left defenceless, having lost her barrier of the Spanish Netherlands, could expect nothing but the anger of her new neighbour. But how changed were the world's politics, when the three Protestant powers, England, Holland, and Sweden could unite, even for a short time, for the defence of their ancient foe, Catholic and cruel Spain.

The king's dislike for the Datch is one of those things which illustrate the evils of personal rule. They were dis- tasteful to him as Protestants, as burghers, as tradesmen, as a sea power, as a constitutional republic ; they had given shelter to refugees who could not bear the brilliant despot- ism of France. Of old times French policy had favoured the growth of the United Provinces, as a counterpoise to Spain ; henceforward Spain and Holland were friends, and Louis was eager to revise the old lines of his country's foreign relations. So he at once made use of his connexion with the small Rhine-princes, those unpatriotic Germans who were ever on sale, and who almost till our own days sided with France against Germany. With them he arranged for a great flank attack on the republic ; he secured England by buying over her king; the wishes and feelings of the people could easily be disregarded in these early days after the fall of the Commonwealth. In 1670

the treaty of Dover, that standing scandal of the Stewart period, was signed ; it contained a secret clause, of which the second duke of Buckingham, who negotiated it with the fair duchess of Orleans, sister of Charles II., was ignorant. The two kings played their comedy behind the backs of the two clever negotiators, and laughed in their sleeves at them and at the English nation, Sweden had been easily detached from Holland, and the Triple Alliance entirely swept away within two years of its formation. The efforts made by Leibnitz and others to divert Louis to a Mediterranean war proved utterly unavailing ; Colbert's reluctance to furnish the costs of war was overborne ; Lionne died in 1671, and was not there to guide the foreign policy of France ; Lou- vois, the " brutal minister whom all men hated," was just rising to the height of his influence, and threw that influ- euce in with the king's prejudices in favour of a Dutch war. Colbert was the man to be pitied ; the rapid rise of Louvois, who wielded all the war-power of the kingdom, and whose reorganization of the army drained the resources of the treasury, not only lessened his influence but made great war-expenses inevitable ; and those terrible outlays were by no means undertaken in the wisest direction. In vain did the dry and common-sense minister try the way of flattery : he was too gross ; he could not catch the subtle undertones

of praise and adoration which pleased the Great Monarch's 1671.79

love of approbation. " We are bound," he writes, " to save

a sixpence in things not necessary, and to lavish thousands.

when thy glory is in question. A hundred pounds fora useless banquet breaks my heart; but when millions of gold are wanted for a great object, I would sell all I have, pawn wife and children, and go afoot all my life, rather than fail to provide it." Such protestations, which did protest too much, such bathos of adulation, could not please the wilful monarch; Colbert's influence henceforward steadily declined, and Louvois climbed into his place, sit- ting as an evil genius at his master's ear, to whisper war with Holland, the crushing of Genoa, the double ravaging of the Palatinate,

—the horror of which survives even to these days in which atrocities are popular,—the dragounades of Nantes, the revocation of the Edict of Nantes.

The Dutch war broke ont in 1672, and France had at last a considerable fleet to send to sea. joined the English navy, which was pledged to neutralize the sea-power of Holland, and to find employment for Admiral Ruyter's hands. Ruyter was the stay and strength of the aristocratic or burgher party at Amsterdam—the party which had now ruled for years, and had with no small glory rivalled England on the high seas. Little did Louis XIV. deem that by this war of 1672, and by this very alliance with England, he was laying the foundations of that power which would in the end frustrate his splendid plans, and hold up against him the liberties of Europe.

The sea-party in the Provinces had resisted and overcome Parties – Louis was now about to overthrow i Hoel-

all the efforts of Spain. that party, to make room for the land-party, which, led by William of Orange and England, was to withstand him to the end. The sea-party, the aristocratic and commercial republic, headed by the two distinguished brothers, John and Cornelius de Witt, was inevitably hostile to England, and as naturally friendly to France. The land-party, democratic and agricultural, and headed by the great house of Orange-Nassau, was naturally a friend to Germany, with which it had close counexions, and to England also ; for it was no rival on the sea, and lastly, William, the head of the house, was first cousin to the king of England.

Louvois had raised the army to 125,000 men; the French navy could count about a hundred sail. With almost all this great force Louis began the Datch war of 1672. Guided by Turenne he set forth for the Rhine, leaving an army to mask Maestricht. The friendly princes gave him passage; the trembling Dutch with a raw ill-dis- ciplined army of scarcely 25,000 men, under command of the prince of Orange, sheltered themselves behind the half-furnished forts of the river Yssel. By crossing the Rhine into the ancient " Betuwe," Turenne hoped to get between the Dutch and Amsterdam, and with one hand to crush the army, while with the other he coerced the seat of govern- ment into submission. The plan was simple and good; the earlier stages of it were successfully carried out; the famous passage of the Rhine

dazzled the eyes of all France, and, unopposed in fact, and perfectly easy, made Paris believe her monarch to be a complete hero of romance. Turenne at once pushed on and seized Arnheim, which gave him passage out of the Betuwe into the country behind the Yssel ; and had his voice been heard, nothing could have saved the prince of Orange. But, with overwhelming force, the king missed completely the point of the campaign. He set himself to reduce the unimportant Yssel forts, led by his own taste for siege-warfare and Louvois's advice ; he wasted time and weakened his army by garrisoning the captured places. Presently he moved on and occupied Utrecht; Naarden, half way from thence to Amsterdam, was taken. The Dutch despaired of help, and offered terms to Louis ; but he contemptuously refused them, Then the mob of

The

Thirty ships of war Dutch

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LOUIS XIV. |

Amsterdam in fury of despair rose on the De Witts and murdered them both, and called on William of Orange to rescue the state. He at once accepted the perilous task, and with equal skill and courage saved the republic, first by flooding the country, so as to defend Amsterdam from a land-attack, and then by arousing the jealousies of Germany and Spain. Louis had gone back to Paris; his armies achieved nothing more in 1672. In 1673 the in terest of the war lay in the seige of Maestricht; for Germany was no longer a safe French roadway, and the line of the Meuse was necessary, if Holland was to be reached atall. Maestricht fell; but then no more wasdone. Louis returned

again in triumph to Paris, and the war lagged. At this time (August 1673) a great league of the Hague was formed against France ; its members were the emperor, the Spaniards, and the Dutch; the young stattholder became the leader of the opposition to Louis XIV. The campaign on the Rhine, in which William of Orange and Montecuculi were pitted against Turenne and Condé, while the duke of Orleans attacked the Spanish Netherlands, went on the whole against France. compelled the Rhine-princes to abandon France. The Great Elector, Frederick William of Brandenburg, who had hitherto leant towards the French, in 1674 joined the allies ; public feeling in England forced Charles IJ. to make peace with the United Provinces. Sweden, jealous of Brandenburg, remained as almost the sole ally of France.

In this year Turenne was charged with the duty of de- fending the Alsace frontier ; the war, from being offensive, had become strictly defensive, except in Franche Comté, which was retaken by Louis in a six weeks' campaign, and the ancient county now fell for ever into the hands of France. When the king's brilliant campaign was over, Turenne pushed forward into the Palatinate, defeated the imperialists at Sinzheim, and then deliberately destroyed the whole country ; this was the well-known first destruction of that fair territory. The allies in September crossed the Rhine at Mainz and then at Strasburg, occupying all the plain of Alsace. It seemed as if Turenne could do little to arrest them. He observed them till winter had set in, and then, making his wonderful march along the west flanks of thie Vosges mountains, suddenly came out in force at Belfort, and drove the Germans from point to point, till he had entirely cleared them out of Alsace. As the wasting of the Palatinate was the one great blot on his career, so this famous march raised his strategic fame to its highest point. In the north the campaign was not so brilliant; William of Orange lost the hard-fought battle of Senef, and was unable to carry out his plans for penetrating into France. When he had retaken Grave, the campaign of 1674 was over.

The campaign of 1675 on the Rhine was to be once more a trial of strength between Turenne and Montecuculi. The great Turenne, however, was killed by a chance cannon- shot, and the whole plans of the French were shattered. Marshal Créquy was defeated at Saarbriick; the advan- tages gained by the king in the north, where he had secured the Meuse by taking

Liége, Limburg, and Dinant, were altogether neutralized ; the army destined for Holland had to help the dispirited army of the east. Condé, who here fought his last battles, upheld the honour of the French arms on the Rhine, and, having secured Alsace for his master, now withdrew from warfare altogether. The age of an inferior series of generals begins. .

In 1676 the war was feeble ; nothing was done in the north ; in the east the Germans took Philipsburg, a place of the utmost value to France before she had got Strasburg. On sea, however, the year was far more brilliant: in the Mediterranean Du Quesne in two great battles destroyed the combined fleets of Holland and Spain; and in the

FRANCE

The allies took Bonn, aud thus |

old

second battle off Palermo, Ruyter himself perished. 'Both 1677-85.

France and Holland now began to wish for peace; the Dutch, seeing their navy ruined, and conscious that they could not recover Maestricht, were very weary of war ; and the French were also fretting under the burdens of the struggle, which had ruined all Colbert's plans for the de- velopment of their commerce and wealth. Troubles broke out in more than one district. Negotiations went on, and war also. In 1677 the French arms were more successful ; the duke of Orleans, whom his brother never forgave for it, defeated William of Orange at Cassel, and was never again put in command; the French overran all Flanders; the duke of Lorraine was completely defeated by Marshal Créquy. Towards the end of this year William of Orauge was espoused to his young kinswoman, Mary, daughter of the duke of York, and early in 1678 King Charles was obliged to declare war on his royal patron. These things swelled the tide in favour of peace, The burgher party of Amsterdam, afraid of William's growing power, leant strongly on that side; Charles II. had never been sincere in his declaration of war, and gladly forwarded tke wishes of Louis. Finally, the peace of Nimwegen closed the war. The first treaty was one between Holland and France, which restored Maestricht, the only place William had not retaken,

to the Dutch; a friendly treaty of commerce was attached to it. The second treaty was between Spain and France ; while the king restored some strong places to the Spaniards, they ceded a chain of strong frontier-cities to him ; France became mistress of Valenciennes, Condé, Bou- chain, Maubeuge, Cambrai, Saint-Omer, Aire, Ypres, and other towns. 'Tliey also ceded Franche Comté, which has ever since been French. Thirdly, there was a treaty with the German princes, which reaffirmed tlie treaty of Minster of 1648. France ceded Philipsburg, and retained Freiburg in the Brisgau. The peace of Nimwegen was but a starting point for further ambitious steps, yet it formed the highest point of the greatness of Louis. His fortunes seemed to rise a little higher through the "reunion policy" in the next few years; yet he was already beginning to descend from the topmost height. After this peace France could not enough praise and flatter her great monarch ; all thought of resistance died away ; the needy nobles flocked to his court and begged for place,—they did not dream of asking for power ; the king absorbed them into all possible offices—army and navy, finance, in all were to be seen swarms of noblemen ; it is to Louis X1V. that the absolute and fatal severance between noble officer and peasant soldier is due. The clergy were kept in fit subjection ; no great cardinal now could overshadow the throne ; the Jesuits were in full favour,—masters of speech, miracles of per- suasiveness, they set the fashion of that age of pulpit elo- quence, which is perhaps the most marked of the literary characteristics of the reign. These were the days of Bour- daloue and Bossuet. From this time to about 1685 the French monarchy stands at its highest ; Europe is amazed and paralysed ; France if exhausted is full of glory ; the king has become more august and magnificent as he has grown older, and now in the prime of life is, as has been said, "if not the greatest king, the finest actor of royalty the world has ever seen." One person, at anyrate, was dissatisfied with, and suspicious of, the peace of Nimwegen ; and that was William of Orange. Four days after the peace had been signed, he made a sudden attack on the French camp at St Denis near Mons. Marshal Luxembourg was taken by surprise; but the French troops soon recovered and drove out their Dutch assailants with heavy loss. With this uncalled-for bloodshed the war ended. The history of the next decade of years in France justified to

the full the disapproval William had so roughly expressed, ?

though it could not justify the bloodshed and the failure a IX. — 73 ;

The peace of Nim-

wegen.

Louis XIV. t his highest.

1688. Mons. It was in these years that abroad and at home | sources. She had a soft and gentle beauty, a grace and 1683-85, ; Louis XIV. carried out to the full his autocratic ideas,— | tact, a cold temperament and placid manner, which recom- the king all powerful at home, the kingdom omnipotent mended her, by way of contrast, to Madame de Montespan, abroad. So in this time, while the other nations thank- | the violent and dangerous beauty who for several years fully disbanded their armies, those of Louis remained on | reigned supreme over Louis XIV. At her suggestion foot. Vauban was named commissary-general of fortifica- | poor Madame Scarron was engaged, in 1666, as a kind of tions, a new office, in 1677, and the moment peace was | Nursery governess to her children, the duke of Maine and signed began to fortify and secure all the frontiers of a daughter. It is curious to see how great are the contrasts France with strongholds which should be at once gateways | In her history. At first Louis was offended and hurt at the for aggression and bulwarks against attack. Finding also introduction of this person at court ; she seemed odious to that a complete scheme of defences demanded some points him. He gave her the little Maintenon estate with a stipu- which were not yet in his hands, the king began that system | lation that he should see her no more; he thought hera

The of "reunions," as they were called, by means of which he | precise and disagreeable préciewse. She had been the wife

Shad applied old feudal rules to the acquirement of territories | of a playwright, the centre of a little literary coterie; the

— and towns in time of peace. ‘Thus, for example, he filched | king, with his instinctive dislike for literature, felt a distaste,

” Strasburg away from Germany, because he wanted that | almost an aversion, for her. Her placid temperament stood ancient Teutonic city to make his eastern frontier safe and | the trial well; after a time, when Madame de Montespan aggressive. The peace of Westphalia to which that of | was unusually imperious, he would betake himself to the Nimwegen, so far as it dealt with Germany, went back, | sweet gentleness of the governess, and cool his heated had in it the feudal term “dependencies.” When it de- | temper in her calm society. Her influence was all for good ; clared a city to be ceded, it spoke of it as being ceded | she weaned him from Montespan, and did not take her “with its dependencies”; and Louis XIV. having determined | place ; she reconciled him to his poor queen, whom he had to push this phrase to its furthest application, established | so long aud so scandalously neglected ; and when the queen in 1679 and the following years three “Chambers of | died in 1683, the governess became the king’s wife, and Reunion,”—one for the three bishoprics at Metz, a second | queen in all but name. She never was publicly acknow- at Besangon for Franche Comté, the third at Breisach for | ledged ; still her position was recognized, and her power Alsace. These bodies inquired into all matters of feudal | felt. Louis worked with her, consulted her in all things ; jurisdiction ; and as these old usages, specially the episcopal | she was a warm friend to the high Catholic party ; though ones, were wide and vague, they formed a convenient basis | not openly subject to Jesuit influences (her early training for decisions in which the claimant was both judge and | making that unlikely), she did work which the Jesuits could executor of his own judgments. The French overlordship | not but like. The king, naturally religious in a stiff and over many Germanic districts was at once affirmed and | ignorant way, and Madame de Maintenon, narrow, placid, acted on; territories were occupied with French soldiers, | and obstinately afraid of intellect or independence, worked and the strong points fortified or further strengthened ; and | together towards the same ends. The necessity of disarm- before Europe well knew what was doing, the frontiers of | ing any suspicion the king might feel as to the leaven of France had been pushed forward into Germany, and so | Huguenot opinion still fermenting within her led Madame strengthened as to make it very difficult to wrest them

again | de Maintenon often to countenance things which she could away. The Breisach chamber thus secured almost all the | not in heart have approved. She had known the light, and lordships in that district, and succeeded, partly by legal | could never afterwards have fallen into utter darkness. argument, partly by bribery, lastly by force, in winning | Jansenists and Huguenots, in these years, felt the king's Strasburg in November 1681. At the same time by secret | dislike increased ; the eagerness for the submission of the agreement with Charles III. of Mantua, the last of the | one, the conversion of the other, grew day by day into an Gonzaga-Nevers dukes, Louis XIV. became master of Casale, | absorbing passion. And Louis had had no small temptation which seemed to secure his permanent influence in northern | to interfere with the Jansenists. They held opinions which,

Italy. The capture of Luxembourg, Courtrai, and Dixmuyde, | his Jesuit advisers assured him, were of a fatal wrongness ; in the little war with Spain which was waged in 1683- | and in 1682 they had sided to a great extent with Innocent 1684, set the French frontier well forward on the north side | XI. against him. His horror of independence of views of the three bishoprics. All went well with the monarch | combined with his horror of a divided allegiance, and led in these days. Unfortunately for his glory he had still thirty- | him to act promptly against them. He convoked a great two years of reign before him; and these years, the period | assembly of clergy, which, under the influence of Bossuet, Bosst of Madame de Maintenon, are crowded with blunders, | drew up those four articles which have often been quoted ae 4

darkened with misfortune. 'Here ends" (in 1683), says | as the clearest statement of the liberties of the Gallican sitions.

the duke of Saint-Simon, "the apogee of this reign,—fhe | church,—liberties, that is, as face to face with the pope, not

height of its glory and prosperity. The great captains, the | as against the royal power. These articles affirm (1) the t

great home and foreign ministers, are no more ; only pupils | mdependent authority of the secular power; (2) the superl- and disciples remain. We are

now to see the second age, | ority of general councils ; (3) the inviolable character of

which will fall short of the first, though it will be far better | the Gallican usages ; (4) the fallibility of the pope except .

than the third and last period of the reign." Colbert died | when supported by the assent of the church, There was .

in this year; in this year John Sobieski drove the Turks | talk also of a Gallican patriarchate, so far did the quarrel | from the wallsof Vienna ; and from the day of their defeat, | go. The Jansenists, the " Ultramontanes" of that day, the fortunes of the Ottoman allies of France also began to | seemed to side with pope against king. In these years the recede. Above all, in this same year Louis XIV. was| papacy and the monarch were not on good terms together. privately married to Madame de Maintenon, and she, with | Innocent XI. looked with favour on the growing resistance, unbounded influence over him, intentionally or not, had a | and rejoiced when Protestant William overthrew Catholic share in the worst errors-of his reign. James of England. The Jansenists were thus kept down; ak Francoise d'Aubigné was a Huguenot by birth and | the Huguenots were more severely treated, Louvois, un- coma… breeding ; in 1652 the comic poet Scarron, a cripple, and, | luckily for them, here taking the lead. Great numbers : as he called himself, "an abstract of all human miseries," | were bribed or threatened into giving up their opinions, | married her when she was penniless and friendless ; eight | others were driven to it by actual hard usage, until in 1685 years later she was left a widow, and again without re- | Louis, believing that ull had been converted except a smalk

REVOLUTION oF 1689.]

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"685-88. stiff-necked remainder, with whom he need not scruple to | it came to decision, Louis and Louvois, here as ever his 1688-92: Revo- deal sharply, finally ordered the revocation of the Edict of | evil genius, were

both in favour of securing the influence of é ‘sation: Nantes, and therewith the total abolition of all the privi- | France on the Rhine; both thought the dynastic question of the leges unwillingly granted ninety years before to the Hugue- | involved in the Palatinate to be more important than the os nots, and always permitted with a grudging hand. The | great European question involved in the plans and move-

” severities of 1685, and the exodus of the Huguenots, finally | ments of William. Moreover, the vacancy in the electorate brought that party to an end as a political organization. | of Cologne in 1688, in which question the pope was openly Whatever difference of opinions there may be as to the | opposed to the king’s nominee, excited the royal pride, and numbers who fled from the kingdom at this time, there can | made interference in Germany a point of honour; a French be no doubt as to the quality of them. They were the | garrison was sent to occupy Cologne. For these reasons thriftiest and readiest hands in France; they carried the | Louis, underrating the danger elsewhere, and thinking that arts and taste which were till then the special gift of their | a threat would keep the timid Dutch quiet, despatched the country, to Spitalfields, or Amsterdam, or even to Berlin. | dauphin to the east with the main army in September They crowded into the armies which were arrayed against | 1688. He took Philipsburg; the Palatinate and the three their oppressor ; they helped to man the ships which de- | Rhine electorates fell easily into his hands, stroyed the navy of France ; they planted their industries in | Immediately William, freed from his worst anxieties, set The many places, and gave that wealth and prosperity to other | sail for England, aud the Revolution took place at once and English lands which was driven from their homes. In England | without bloodshed. The Declaration of Rights was issued Gn they influenced opinion not a little, and stedfastly sup- | by parliament in February 1689, and William and Mary ii ported the house of Orange against the Stewarts, friends of | were seated on the throne of England. James II. took the king of France. refuge at the French court, and was established at the

In this same year 1685 Louis pushed his plans in | palace of St Germaius; his presence in France, and that Germany also further than was prudent. He alarmed the | of his family, becomes an element in the politics of more greater princes by intriguing, seriously or not, for the im- | than half a

century. And now Louis recognized the error perial dignity, against the next vacancy ; he alarmed the | he had committed; his troops were withdrawn from the Rhine princes also by claiming the Lower Palatinate for | Palatinate, which (again at the advice of Louvois) had to Charlotte Elizabeth of Bavaria, the Princess Palatine, who | undergo that scathing of fire and sword which moved the had married the king's brother the duke of Orleans, and | feelings of all Germans, and gave earnestness to the war. who in this prime of her fortunes and brilliancy almost | Early in 1689 the Diet of Ratisbon declared war against scared the dismal court with her bright sallies and the | France. The great duke of Marlborough, now only General freedom of her tongue. When the princes heard this claim, | Churchill, defeated the French at Walcourt near the Sambre ; coming so soon after the loss of Strasburg,—a claim which | the French were also thrust back into Alsace and Lorraine. would have brought Louis into the very heart of Germany,— | King James was furnished with a strong force of troops and Affairsin they hesitated no longer; and in July 1686 was signed that | ships, with which he landed safely in Ireland, and almost !reland.

The great league of Augsburg which was the beginning of the | all the island declared for him, A French-Irish court was a long struggle between France and the rest of Europe. The | established at Dublin. William ITI. sent Schomberg to the a emperor, the king of Spain, the Dutch, the elector of Saxony, | north of Ireland to make head against this great danger ;

'the Palatine elector, and a number of lesser princes, all | and William himself followed so soon as ever he could ven- joined it ; in 1687 the pope secretly acceded ; the duke of | ture to leave England. Things were looking very serious Savoy and the elector of Bavaria also came in; the soul of | for him. The French had kept up communicatiuns with the combination was William of Orange. It is a strange | Ireland without difficulty; the English fleet was not moment of history in which the pope and the emperor, the | thought to be loyal tothe new government, for King James king of Spain and the elector of Bavaria, unite to resist the | had been a sailor, and many of the higher officers were held advance of Catholic France and the Catholic king of | likely to side with him. The battle of the Boyne (1st July England. The league was at first purely defensive, and | 1690), however, cleared away this peril. James lost heart, for two years held simply an observant

and ready position. | and fled to France ; in a very short time the ascendency of The tension, however, was 00 great, and by 1688 Louis saw | William III. was secured in Ireland. It was not too soon. clearly that peace could not last much longer. France had | A very few days after the battle of the Boyne, Tourville, had peace for ten years, yet her strength had not increased ; | commanding the French fleet, had defeated the Anglo-Dutch for the court had been very profuse in these days, and the | navy off Beachy Head; and in the same month, Marshal "reunions" had cost somewhat,— the exodus of the Hugue- | Luxemburg won the battle cf Fleurus from Waldeck with nots still more. The works at Versailles had wasted men | his German and Dutch troops. In Piedmont Catinat in- and money ; the great ministers and generals were dead, | flicted a grave defeat on Victor Amadeus at Staffarda. and the country was surely drifting into war again. In | Still, the war of 1690 was in the end indecisive, thanks to the last war the king's armies had followed two lines—that | the battle of the Boyne. In 1691 Louis seemed determined of the Rhine and that of Flanders. Then, however, war | to make a greater effort, and himself besieged Mons, which was being made on the Dutch alone ; now it would have to | he took in spite of the attempts of William to relieve it. be against the Dutch and Germans combined. To all ap- | Little, however, followed after the fall of Mons; the year pearance the hostility of Germany was likely to be more | was marked by the death of Louvois, whose brutal onStey dangerous than that of Holland, and the Rhine had been | had done much to sustain the war. The eampaigns of 1692 proved to be the best roadway of attack for both countries. | were to be differently planned : in Catalonia, in Piedinont,

For this purpose the Cologne country, the electorate and its | and in Germany, there should be no offensive movement ; territory, appeared to Louis to be of the utmost value to | the whole energy of the nation should be staked on a fresh War him, Occupied with this idea, and not realizing either the | descent of King James in Ireland, and on a land-attack on — force of the character of William of Orange, or the depth of | the Netherlands. The war was therefore to be a duel be-

- *dissatisfaction against James II. in England, the king now | tween Louis and William. Tourville was ordered to engage committed the great blunder of his life. A small de- the English fleet wherever he*

might meet it; ib was monstration against Holland would have made it impossible believed that Admiral Russell and half the ships would for William to make his attempt on England, and would | desert in action. The experiment was tried off Cape La have cost France very little in expense or risk. But when | Hogue, and with disastrous results to the French arms;

1692-97.

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it was the ruin of the French fleet, the shipwreck of King James's cause. In the Netherlands Louis in person invested Namur, and, again baffling William IIL, took that strong place, which carried the line of the Meuse, in June, This, which might have been the decisive success of the war on lind, brought with it no results; the victory of Steenkirke, in which Luxembourg defeated William, ended the Nether- lands campaign. Elsewhere, as had been planned, the operations of the war were insignificant. The campaigns of 1693 were also indecisive; although Luxembourg again defeated William at Neerwinden, the capture of Charleroi was the only result. The aggressive period of the war was coming to an end. In 1694 it became almost entirely de- fensive ; and the death of Marshal Luxembourg in the first days of 1695 took from Louis his most fortunate general. Villeroy, who succeeded him, was a poor officer; the ancient credit of the French army was upheld by Vauban and Catinat. The war in that year was exceedingly lan- guid. The generals were afraid of the court; the king re- warded and promoted the less able over the heads of the more capable. The recovery of Namur by William IIT. in this year showed how France had lost strength since 1692. In 1696 Louis succeeded in detaching Victor Amadeus from the allies by abandoning Casale and Pinerolo to him, and securing to him his Savoyard territory; aud the duke's daughter was betrothed to the duke of Burgundy, the eldest

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to acquire the whole heritage; the Bavarian elector would 1697. have been satisfied with a partition. The emperor Leopold, 1700.

(aistory.

head of the house of Austria, desired the Spanish throne for his younger son the archduke Charles, nephew (by marriage) of Charles IL, and grandson of Maria of Spain, spouse of the emperor Ferdinand III; he was therefore only very distantly related to the dying king. Louis XIV, claimed, in spite of renunciations, for Philip his grandson, grandson of Maria Theresa, half sister to Charles II.,— Philip's elder brother, Louis duke of Burgundy, waiving his claim on his behalf. Lastly, Maximilian Emmanuel, elector of Bavaria, claimed for his son Joseph Ferdinand, ou behalf of the child's mother, Maria Antonia, daughter of Leopold I. and Margaret Theresa, daughter of Philip IV. of Spain. Leopold I. was the only male cousin of the Spanish king, and his nearest male relation; and Charles IT. had also married Maria Anna of Neuburg, Leopold's sister-in- law. Moreover, his rights had never been renounced, while Maria Theresa, on marrying Louis XIV., had renounced hers, and so also had Maria Antonia, mother of the Bavarian electoral prince. The knotty question, however, was not to be solved by paper-considerations ; it was a matter for the law of the stronger, and the more unscrupulous ; Louis XIV. therefore won. William III, earnest in his desire for peace, and anxious that France should get no additional strength, threw in his lot with the Bavarian prince, and

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son of the dauphin, the father of Louis XV. This defection of Savoy, the appearance of Catinat in the Netherlands in 1697, the renewed vigour of the French arms, the difficulty

*thought that such a partition might be made as would Theyar. satisfy all. Charles II. also was strongly in favour of the tition- same cause, aud made a will in favour of Joseph Ferdinand, "™"**

of governing England now that Queen Mary was dead, at last led William ITI. to accept the mediation of Sweden. Louis XIV. was at least as willing to come to terms; France was worn out witli the long war and its great sacrifices ; and, above all, it was seen tliat Charles II. of Spain had not long to live. To be ready to deal with the great questions of tlie Spanish succession

Louis agreed to terms which he otherwise would not have granted. The peace of

This, however, pleased neither Austria nor France, and Count Harrach, the Austrian envoy, got the will annulled, though he could not persuade the king of Spain to recognize the archduke Charles as his heir. Directly after the signature of the peace of Ryswick, Louis XIV. sent the Marquis d' Harcourt, a most successful choice, to represent his interests at Madrid, and ordered Tallard to amuse William ITI. with a scheme for a partition-treaty. Harcourt was to intrigue

The Ryswick in 1697 was soon agreed to. Louis recognized | for the whole succession at Madrid, while Tallard should peace of William III. as king of England, and Anne, second | make sure of a part at St James's, in case Harcourt's difficult Ryswick. daughter of James II., and a decided Protestant, as his | mission failed. William ITI. was only too glad to enter successor. He ceded to the allies all places won from | into the scheme; and a first partition-treaty was drawn up, England, Holland, or Spain since the peace of Nimwegen, | by whicl: France, Austria, and Bavaria each should get its and consented to a Dutch garrison in each of the Spanish- | part. This treaty Louis used against itself; for it was one Netherland barrier-fortresses. These three powers had no | of the most cogent arguments by which Harcourt succeeded fault to find with the treaty of Ryswick; Germany, how- | in persuading the Spanish court and people that if they ever, was not so well pleased. She had made war chiefly to | would keep the great inheritance unbroken, and not destroy reduce the French hold on the Rhine; William had pledged | the ancient kingdom, they must have the French prince as himself that Strasburg should be restored; but, as neither | their future monarch. In spite of much ill-will and great dis- England nor Holland would support him in demanding | couragement, Harcourt won his way into the complete con- this of Louis, he was fain to make peace without it. | fidence of the court of Spain, and utterly outstripped the The emperor and the princes were very unwilling to come | rough and unwise Austrians. Early in 1699 the young in; at last, however, they signed a separate peace, in | electoral prince died, and the first partition-treaty became which they got back all places taken by France since Nim- | void. A second treaty followed, though it was not accepted wegen, excepting Strasburg, and

recovered all the strong- | by Austria; and Louis XIV. in accepting it had no inten- holds on the right bank of the Rhine. Lorraine was re- | tion of keeping his word, unless it suited him to do so. stored to its German duke; the French candidate for the | French influences, from the moment that this second treaty electorate of Cologne was abandoned ; and the claims of | became known at Madrid, were omnipotent with the the Princess-Palatine on the Lower Palatinate commuted for | Spanish court; and in 1700 Charles II. signed another asum of money. Germany had fair cause therefore to be | will, in which he left the whole of the grand inheritance to well pleased with the result. Louis now turned all his | Philip duke of Anjou. After some simulated, and perhaps # attention to the Spanish question ; and the failure of his | a little real hesitation, Louis XIV. accepted the will for his N18,

succes- sion.

candidate for the throne of Poland, the prince of Conti, in 1€97, perhaps made him all the more anxious to prepare the way for the great triumph which he hoped might be won at Madrid. The closing years of the century were passed in active negotiations for this object. The three houses which hoped to gain by the death of Charles II.,— for nations were now treated as the private inheritance of princes,—-were the house of Bourbon, the house of Austria, and the house of Wittelsbach. Austria and France desired

grandson, aud enjoyed for a brief while the triumph that it brought,—the triumph of successful diplomacy and of a vastly enlarged influence and power. As time went on, it became clear that the king of Spain would not always be the obedient servant of the king of France, and that the connexion between the monarchies was a source of weak- ness rather than of strength.

War did not break out in consequence, as had been ex- pected ; the English, who had disliked the partition-treaties,

4700-2.

Philip

of Anjou Huropean politics, desired to fight; and Philip of Anjou | ployed, as they retreated before him from point to point. aT became king of Spain. Louis XIV. protested at once | The defeat of the French fleet in Vigo Bay, and the out

of Spain. against the view that the two crowns of France and Spain | burst of the Protestants of the Cevennes mountains, both should never be united, —though he had used their certain | added largely to the difficulties of France. In the winter separation as an argument to influence Spanish opinion,— }| Marlborough enlarged his base of operations by occupying and reserved the rights of Philip V. to the French crown ; in | the electorate of Cologne, and early in 1703 he had cleared 1714 there was only one person, and he a sickly child, be- | out all the Spaniards in his rear or on his flank. Before tween him and the hereditary right to the crown of France. | the end of 1703 everything was ready for that great ad- Though war did not follow at once, it could not long be | vance which was destined to raise his fame to its highest delayed, and meanwhile Louis XIV. did all he could to | point. And it was time that he went, ashe said, " to teach strengthen himself. Early in 1701 he made an agreement | the Germans how to beat the French ;" for in 1703 Villars with the elector of Bavaria, governor of the Spanish | had been very successful in Germany; he had forced his Netherlands, and ejected tne Dutch troops from the barrier | way through the Black Forest, and had joined the elector fortresses. It was a haughty denial of the validity of the | of Bavaria in the upper valley of the Danube; and the peace of Ryswick ; and, in open violation of the spirit of | elector had already driven the Austrians down the valley the same treaty, he soon after, on the death of James | to below Passau. A threatened attack on Vienna came to I., recognized James Stewart, his eldest son, the "Old { nothing. Towards the end of the campaign the elector and Pretender," the "Chevalier de Saint George," as king of | Villars drove Louis of Baden from his positions, and defeated England, under title of James III. About the same time | Styrum at Hochstatt ; Tallard, with the army which had the Germans and Dutch, thoroughly alarmed, signed at the | watched Louis of Baden in the lines of Stolhofen, returned Hague a great treaty, "the Grand Allianee," with William | to the Rhine and took Old Breisach and Landau, as well as Iil., and bound themselves to restore the Netherlands | won the battle of Spires. On this side the war had been barrier, to regain the Milanese territory for

the empire, to | very favourable to France,—an advantage against which the win for the emperor all the Italian and Mediterranean pos- | transfer of Savoy and Portugal to the side of the allies had sessions of Spain, to attack and take the Spanish Indies. | to be set. The emperor, without delay, sent Prince Eugene, his greatest These changes, and the continued resistance of the Marlbor general, to begin the war in Italy; the double-dealing | Huguenots in the south of France, enabled Marlborough to ough's Victor Amadeus, the skilful strategy of the prince, the | arrange with Prince Eugene his great campaign of 1704, in ©?" f excellence of the fresh troops under lhis command, were toc | a conference near Heilbronn. Here the so-called triumvi- oO i much for Catinat, who was obliged to fall back. Louis, | rate,—Marlborough, Eugene, and Heinsius—England, the — who never had liked his best general, was not at all | empire, and the Dutch,—laid their plans to neutralize the sorry, and sent Villeroy, one of his worst, to supersede | French advantages in Bavaria, and by cutting the line of him. Villeroy speedily justified his choice by losing the | their communications, to relieve Vienna from all anxiety. battle of Chiari (1701); almost the whole of the Man- | The peril to Austria was great, for the French and Bavarians tuan territory fell into Prince Eugene's hands. After | formed a long unbroken line from the Vosges to Passau.

the surprise of Cremona, early in 1702, Vendome, who, in- | Quite early, therefore, in 1704, Marlborough began to move ; dolent as he was, was a good general, replaced Villeroy, | he misled Villeroy and Boufflers, who were watching him, and and by the indecisive battle of Luzzara (August 1702) re- | crossed the Rhine at Cologne, with a view to joining Prince covered some of the lost foothold of France in Italy. Eugene, who held the famous Stolhofen lines. The French | The war Ere this war had broken out on all sides. The death of | and Bavarians drew together to meet this formidable attack ;

a William ITI. and the accession of Queen Anne, early in | the elector entrenched himself near Donauwérth ; Villeroy

— 1702, made no change in the arrangements of the allies for | and Tallard observed the Stolhofen lines. Marlborough,

aan their four campaigns,—the Italian campaign, which was | with Prussian and other help, passed through Mainz, crossed

begins, least in importance; the Belgian, in which they aimed at | the Black Forest, and came out in the Danube valley, join- the fortresses ; the German, chiefly on the Danube; the | ing Louis of Baden near Ulm. Their united forces defeated Spanish, in which the archduke Charles struggled for the | the elector and took Donauwérth. Thus doing, they had crown. Catinat, transferred to the Rhine, and ill-supported | placed themselves between him and his French allies, by an unfriendly court at home, the ill-will of which was | Marsin and Tallard ; and Marlborough, fecling his commu-

SUCCESSION WAR. |

even preferred the acceptance of the will by Louis XIV. to the cause for which William, with his larger views of

reflected in the conduct of his officers, could not make head against the prince of Baden, who crossed the Rhine and took Landau. Catinat, who soon after this sent in his re- Signation, was coldly allowed to withdraw, and France thus lost the most prudent and capable of her remaining generals, The elector of Bavaria was the only strong and

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ened his position by taking a group of towns, and keeping 1702-4.

Marshal Boufflers and the duke of Burgundy actively em-

nications to be critical, and rather alarmed as to his position, drew back up the Danube, till he had effected a junction with Prince Eugene. The elector had also joined his French friends, and they lay in wait for their antagonists in a strong position on the left bank of the Danube, between Hochstatt

and Blenheim. There, on the 13th August 1704, was The

fought the great battle of Blenheim. The French and battle of Bavarians had the superiority in numbers and_ position ; Blen- this, however, they neutralized hy faulty arrangements, and ,

true friend the courts of France and Spain had in this war ; he bore the brunt of the early periods of it. Louis of Baden had occupied in force the strong elbow of hills and

forests between the valley of the Rhine and that of the Danube, thereby threatening the elector, and hindering him from joining the French. His position was very strong ; yet Villars, who was ambitious and lively, and longed for the marshal's staff, determined to attempt the task of driv ing him out. He accordingly crossed the Rhine, and attacked the Germans at Friedlingen (14th October 1702), and by good fortune rather than by skill defeated them. His success, however, was not such as to enable him to shake Louis of Baden ; he could not even penetrate into the Black Forest. In the Netherlands Marlborough strength-

by shutting up a large force in the village of Blenheim. The battle was hot and heavy, and the loss to the allies, who were the assailants, great. Eugene made little impression on the lines, but towards evening Marlborough succeeded in breaking through Tallard's position. Thereby he cut the enemy in two, and the French cavalry fled in panic towards Hochstatt. Many were drowned in the Danube; Marsin and the elector drew off in good condition towards the Black Forest; Tallard was a prisoner, his whole force either dispersed or taken. It was the worst mishap that had ever befallen Louis XIV. Bavaria was entirely subdued ; Aus-

1705-6.

The cam- paigns of

1706.

War in Spain.

tria and the empire saved; the elector took refuge in France. Louis of Baden was able now to cross the Rhine ; Landau again fellinto German hands ; Marlborough returned to the Moselle, taking Trarbach and Tréves. The war drew nearer to the frontiers of France, and Germany ran no fur- ther risk of invasion.

In 1705 the duke's plans for an attack on France were neutralized by the slowness and jealousy of Louis of Baden, who did not care to play secoud to " the handsome English- man." The Cevennes insurrection being now over, Villars was free to face the allies, and did so with such skill and success that Marlborough was obliged to fall back towards the Netherlands. On the other hand, Louis XIV. weak- ened Villars in order to strengthen Villeroy in the Nether- lands; so that the campaign of 1705 ended without any decisive operations. Not so 1706, the great year of the succession war. Louis XIV. fully intended that the Nether- lands' campaign should have in this year decisive results. It was unfortunate for him that his personal likings led him to place in command on that side the incompetent Villeroy, who had to grapple with the victorious troops and masterly generalship of Marlborough. The result was that the duke easily won the great victory of Ramillies (23d May, 1706), which was as decisive as Blenheim ; for as Blenheim swept the French out of Bavaria, so Ramillies made them power- less in the Netherlands. The allies took Louvain, Brussels and Malines, Ghent and Bruges, all in the name of the archduke Charles, whom they proclaimed king of Spain as Charles III. Antwerp, Oudenarde, all Brabant, accepted him at once. His fortunes seemed equally good elsewhere. The alliance between England and Portugal in 1703 had given a turnto warfare in the Peninsula. The archduke in 1704 tried to penetrate into Spain from the Portuguese frontier; this failed, partly from the difficulties of the country, and partly from the ability of the duke of Berwick, a natural son of James II., and nephew of the duke of Marlborough, one of the few real soldiers in the service of the king of France at this time. On the other hand the English fleet under Rooke, which was waiting on the arch- duke, by a stroke of happy audacity surprised Gibraltar (4th August 1704), and occupied it in strength. The ut-

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the allies. Thus in the Netherlands, Spain, and Italy, their 1708-9,

fortunes by the autumn of 1706 seemed to be completely triumphant. In Spain, however, the Castilians succeeded in ejecting Charles IIJ., and in replacing their favourite Philip V.; and in the opening of 1707, the victory of Almanza, gained by Berwick over Ruvigny, a French refugee officer of ability, finally settled the Spanish ques- tion in favour of the Bourbon dynasty. A treaty of neutrality for Italy, by which the emperor Joseph I. secured his conquests there, also released Louis XIV. from some of his anxieties.

The campaigns of 1707 were as unimportant as those of 1706 had been decisive. The appearance of Charles XII. of Sweden in Germany paralysed both sides a while ; Villars, in command on the Rhiue, stormed the Stolhofen lines, and pushed into Bavaria, hoping that the Swede would join him with his invincible Scandinavians. Charles, however, cared not to unite his fortunes to the Catholic side, and after some delay marched eastward towards Poland. Villars fell back to the Rhine; Vendéme quietly watched Marl- borough ; on the sea Duguay-Trouin, the most brilliant of French captains, harassed the Anglo-Dutch commerce, and won very considerable advantages over the English fleet. In 1708 an expedition for Scotland failed completely; and in the Netherlands the duke of Burgundy and Vendéme were caught by Marlborough and Eugene at Oudenarde (11th July 1708), and utterly defeated. The allies crossed the French frontier and sat down before Lille,—Eugene besieging, Marlborough protecting. By the end of the year the place had fallen into their hands, after a brilliant defence, which, though unsuccessful, won for Marshal Boufflers the distinction of duke and peer of France. Ghent and Bruges, with all Flanders, were secured by the allies; their light cavalry overran northern France, and appeared almost at the gates of Versailles.

The fortunes of France now seemed to be at their worst : The famine and a bitter winter closed the disastrous year ; every-§ thing was at a stand-still, trade completely ruined, finance in a dreadful state; even the king began to despair, and to negotiate for peace. He had felt his way thitherwards in vain in 1706; now in 1709 he made serious offers. The

most efforts of the French, under the count of Toulouse, one of the natural sons of Louis XIV., failed to recover this all- important rock. The battle of Malaga, though the French

allies treated his proposals with great severity; he was Louis willing to dismantle Dunkirk and ruin its port if Lille were propos restored to France, to give up his grandson's throne of

fleet had the best of it, damaged their navy so seriously that they could attempt no more; and in the exhaustion of France it proved impossible to refit the ships, or continue the struggle on the seas. In 1705 Charles ITI,, unmolested by them, sailed round Spain, and landed at Barcelona, The Catalans and Aragonese were inclined to support him, while proud Castile held by Philip V. These were the days of the romantic career of the earl of Peterborough. In 1706 the French and Castilian siege of Barcelona came to nothing ; the party of Charles took heart, and supported by English, Portuguese, and French refugees, drove Philip out of Madrid, and placed their candidate on the throne. In Italy, the death of the emperor Leopold having called Prince Eugene away, Venddme with unwonted energy de-

Spain if Philip might have Naples; he did not absolutely refuse to abandon the electors of Bavaria and Cologne. With such concessions peace was not impossible. The allies, however, insisted on stipulations which touched the old king's personal honour, declaring that as Louis had placed Philip V. on the Spanish throne, he must, with his own troops, if necessary, dispossess him of it again. They also demanded the cession to Germany of Strasburg and Breisach, the erection of a new line of barrier-fortresses between Holland and France, and other lesser matters. To these Louis would not consent, and the negotiations broke down. He appealed warmly to the country to support him, and was answered by an outburst of patriotism which enabled him to send Villars, at the head of a good army, into the Netherlands.

feated the Austrians at Calcinato, and swept the allies out of all the Milanese territory. Turin alone remained in the hands of Victor Amadeus II., and was the object of a fierce

There he fought the great battle of Malpla- Malpla quet (11th September 1709), in which Marlborough and bie Prince Eugene were again victorious, though their losses i.

siege. Prince Eugene, however, returned in time to save the capital ; for Vend6nie, after Ramillies, had been ordered to the Netherlands, and the change of commanders was everything to theallies. Prince Eugene attacked the French 'lines at Turin ; differences sprang up between Marsin and the duke of Orleans (the nephew of Louis XIV.), and the Austrians won a great victory. Marsin was killed; the French army would not obey the duke; the whole force melted away, and Italy fell completely into the hands of

were tremendous, as they had been obliged to attack a very strong position held by a powerful army. The fall of Mons was the only advantage which resulted to the allies ; with that the campaign came to an end. While the battle actu- ally restored the spirit of the French soldiers, who had been

| skilfully and successfully withdrawn from the field by Mar-

shal Boufflers, it produced a very bad feeling in England. There men were very weary of the war, and the carnage at Malplaquet had been terrible. Louis again offered large

Change of

1710-14

opinionin confusion and despair, the old king at bay and too infirm

England. +> head the remnants of his armies, the allies firmly planted in northern France, it was believed that, if they could but

THE SUCCESSION WAR. |

concessions to the allies in 1710; the triumvirate, however, were not contcnt to make peace, and still demanded what they knew he would not consent to —his personal interfer- ence against Philip V. The campaign of 1710, which fol- lowed, was intended to strengthen the allies, with a view to their

penetrating the next year into the heart of France. Douai, Bethune, and some lesser places were taken; Vil- lars covered Cambrai and Arras; in Spain Charles JIL. again entered Madrid, though he was unable to hold his ground there, and before the year's end Philip V. was again triumphant.

In this gloomiest state of French affairs, when all was in

hold together, they would in one more campaign succeed in entirely breaking the power of their great rival. In England, however, that change of opinion had begun which saved Louis from this last humiliation. The Tory party, vchemently opposcd to Marlborough and the war, were gathering strength; the elections of 1710 went in their favour, aud early in 1711 the fall of the duchess of Marl- borough at court told every one that the reign of the Whigs was over. The death of Joseph IL, the emperor, by placing Charles ITI. on the imperial throne as Charles VI. (Decem- ber 1711), changed the whole position of affairs, and made men still more unwilling to carry on the war. It was felt that Europe could no longer sacrifice herself to place him on the throne of Spain as well as that of the empire, and to create a. power which might endanger the stability of

Holland got a strong barrier on the side of France; the Span- 1714-15.

ish Netherlands were handed over to the United Provinces, which undertook to transfer them to Austria on the final con- clusion of peace. She, too, made a favourable commercial treaty with France. The duke of Savoy was made a king and got Sicily, while Austria received Naples and Sardinia. Prussia received part of Gelderland, and gave up to France all her claims on the Orange principality. England was re- cognized as mistress of Gibraltar and Minorca. France re- covered Lille, and retained Strasburg and the whole of Alsace. Freiburg in the Brisgau, Breisach and Kehl, she had to restore to Germany ; the rights of Philip V. to the throne of Spain remained unshaken; the resistance of Barcelona, which obstinately refused to recognize him, was overcome by Berwick in 1714. Far lighter were the terms of peace than those which the triumvirate had tried to force

on Louis XIV.; yet the aged monarch must have deeply felt the permanent retrogression which they involved. His splendid ambitions were shown to be unattainable, after they had well-nigh ruined France in the pursuit; she had paid already a terrible price for the glories of a grand monarch anda great age. It would require the awakening of the Revolution to restore her to her right place in Europe. Her old antagonists, Austria and Spain, were also losers by the war; north Germany, under the guidance of the new kingdom of Prussia, was destined gradually to reduce the supremacy of the south, and at last to take its place ; England was fitted for the great destinies she was to fulfil in the course of the century ; Holland, secure from all dis- turbance, withdrew from the political arena,

A short time before the conclusion of the peace, when The cala- things were almost at their darkest for France, domestic mities of

Europe, and overthrow the balance at which men were aim-

*ing, The warfare of 1711 was languid; Prince Eugene * Trance.*

was called away to the imperial election ; Marlborough and Villars long watched each other on the northern frontier of France. The only result was the capture by the allies of Bouchain, and the arrangement by Marlborough of "a grand project,'—a plan for the invasion of France in the next campaign, when he hoped to have Eugene by his side. In the winter, however, the duke was overthrown at St Jaines's, and his plans came to nothing. Negotiations for peace were far more to the taste of the Tories than a vigor- ous foreign policy ; and it was announced, late in 1711, that Utrecht had been chosen as a place of conference ; the bases of an agreement were easily arrived at. In 1712 the duke of Ormond replaced Marlborough in the Low Countries; his business was to neutralize the Dutch and Germans, who were still eager for war; and in May Eng- land signed a separate truce, abandoning her allies. They continued the war a while, but after being sharply defeated by Villars at Denain (24th July 1712) they accomplished nothing more ; the French retook Douai, Le Quesnoy, and Bouchain. Then the Dutch gave up all thoughts of further war, and came in to the English truce; war ceased on all hands, and negotiations went on merrily at Utrecht. At

losses in appalling succession had stricken down the king. In April 1711 the dauphin died; early in 1712 the duke and duchess of Burgundy and their eldest boy were carried off by fever; in 1714 the duke of Berry also died. And now of the direct line of the Bourbons remained only Louis XIV. and his great-grandson, the duke of Anjou, the future Louis XV. If the arrangements as to the Spanish crown held good, the dissolute duke of Orleans, whom Louis XIV. disliked and shunned, was the next heir after the little Louis. The country was famine-stricken and most miserable, finance in hopeless confusion, the debt grown to vast size; an annual deficit had long been going on. The whole of the institutions of the country seemed to have fallen into ruin. The nobles had become needy hangers-on at court; they filled the army, and by making it impossible for mcrit to rise had contributed largely to the disasters of the Succession War.

The brief remainder of this long reign was of little im- portance. The ignoble persecution, which had overthrown Port Royal in 1710, continued against the Jansenists to the end; and in 1714 Louis tried to strengthen Madame de Maintenon's party against that of the duke of Orleans by

The last, in April 1713, peace was signed by all the powers ex- | decreeing the legitimization of his bastard sons by Madame i. of cept the empire on the basis of the treaty of Ryswick. | de Montespan—the duke of Maine and the count of Tou- echt. "The Germans, thus once more abandoned by their allies, | louse,—and by making a will to secure the regency to the found it impossible to continue long. Villars outgeneraled | duke of Maine and Le Tellier, his Jesuit confessor. Then Prince Eugene, and by defeating him before Freiburg in the | on the Ist of September 1715 he dicd, leaving the crown Death of Brisgau, and taking that town, showed to the emperor that | of France to his great-grandson Louis, a child five years old, Louis he also would do well to come to terms, In 1714 two more | Madame de Maintenon, who had at last shown how weari- treaties were signed by the princes of the empire and the | some was the task she had borne for thirty-two years, and Austrians, and the Succession War at last came to an end. | how thankful she was in her old age to be relieved from it, Results England was the chief gainer: she secured her succession abandoned the king just before his death, and withdrew to a through the house of Hanover, which now became a ninth | St Cyr. And so passed away a monarch who had cer- sion War,

electorate; the Pretender was to be compelled to leave tainly been great, though not in the highest sense of that

rance ; the crowns of France and Spain were never to rest on one head; Dunkirk was dismantled ; Newfoundland, Acadia, and the Hudson's Bay Territory were transferred

word,—whose soul had been beneath the level of his circum- stances. It was withan instinctive movement of relief and pleasure that France heard the tidings of his death. The

from France to her ; a friendly commercial treaty followed. | load of misery he had laid on the shoulders of his people

1715.

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had become too great to bear. He had used them, their strength and the labour of their hands, without stint or re- gret ; but had never done anything to solace their woes, and in the worst and most famine-stricken times the wasteful

. expenditure of the court remained undiminished, and the

A new age. begins,

Philip of bitious to represent the future.

Orleans regent,

The re- actionin France.

cares of the Great Monarch never descended so low as to the poor people, whose fortunes the steady growth of the absolute monarchy had placed entirely in his hands.

For France the 18th century begins with the death of Louis XIV. The party which had surrounded the late king, the party of Madame de Maintenon, the

Jesuits, the duke of Maine, represented the past; their opponents were am- At their head stood Philip, duke of Orleans, who had in extremest form all the char- acteristics of the Orleans branch of the Bourbon family,— who was brilliant and most intelligent, highly educated and cultivated ; who was brave and capable as a soldier, full of good ideas as to the benevolent managenient of the people, and lastly, profligate and utterly without rule in his moral life, so that his better side was always neutralized by his worse qualities, and he ended by failing completely in his attempt to govern France on principles opposed to those of Louis XIV. Like so many of the prominent personages of the 18th century, his intellect grasped the future, while his vices clung to the past. Even while the old monarch's re- mains were being hurried with scanty pomp and tearless eycs to St Denis, Philip of Orleans swept away all the arrangements of the royal will, aud had himself declared regent, with full power to appoint his council of regency. The public opinion, as far as it could exist and express itself, warmly supported this coup d'état, and the party of the duke of Maine shrank into utter obscurity. At once the regent set himself to reform the government, and alter the foreign policy of France; in this he was guided partly by his knowledge of the plans of the late duke of Burgundy, and partly by the acute intclligence of his former tutor the Abbé Dubois ; the duke of Burgundy represented also the virtuous, the abbé the scandalous, side of the new Govern- ment. In home affairs the regent's action aimed at a com- plete reversal of the late king's methods. He proposed to shift the work of governing from the king to the nobles; there were to be six business councils or boards,—for foreign affairs, army, navy, church affairs (the "council of con- science"), home affairs, and finance. 'This system of govern- ment failed, partly through the indolence of the regent,

partly through the inaptness of the nobles for practical

business. In church matters, the Jansenists were not un- popular, and came back to Paris; Cardinal Noailles, head of the council of conscience, was moderate and tolerant, and the Jesuits felt that their power was much weakened. The regent even talked of inviting back the Huguenots to France; this, however, was beyond his powers. He had Fenelon's Lélémaque published at last, as a kind of manifesto against the late reign, and a prophecy of the coming era of benevo- lent princes. He hoped to introduce

throughout France the system known as that of the pays d'états, a system of local estates or parliaments, which should lead up to a real and substantive States-General, and make all the provinces alike in form of government. This also he could not carry into effect. In foreign affairs Dubois led; his main view was that France and Spain could not be friends, that Philip V. would gladly represent the old high Catholic interference in France, and would do his worst to overthrow the regent, whose character and ideas alike were odious to

im. This being so, here was reason for another reversal of the late king's views ; France should seek her friends among the natural foes of Spain,—England under the house of Hanover, and Holland. The marked Anglomania, the enthusiasm for everything English, which is to be seen

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at this time in France, worked in well with these new lines |

[HIsTorY.

of foreign policy. With these views Dubois set himself to resist the bold schemes of Cardinal Alberoni, the adventurer, the would-be regenerator of Spain. In 1717 he succeeded in combining the three countries in opposition to Alberoni,

and in 1718, ou the emperor acceding to the league, the Quad- The Quad. ruple Alliance (France, England, Holland, the empire) was tuple

signed. 'The detection of the Cellamare plot, for the over- throw and assassination of the regent, had enabled Dubois, just before this time, to get rid of all the Spanish party. He deported Ccllamare, the Spanish ambassador, and im- prisoned the duke of Maine and the leaders of that side; he also took for himself the post of foreign minister, War now began; England crushed the Spanish fleet ; the im- perialists, in British ships, seized Sicily ; Marshal Berwick won some successes in northern Spain. The basis on which Alberoni had built was too slight to bear the strain of un-successful war; he fell, and early in 1720 the treaty of London closed this

little war. Spain ceased thenceforward to cherish schemes of life and energy ; the ancient kingdom lapsed once more into proud decay.

At this very moment France greatly needed some triumph and some tranquillity, for she was now rudely waking from new dreams of garmbler-wealth at home. The financial difficulties inherited from the late reign had baffled all the skill of the duke of Noailles, who presided over the council of finance. His "chambre ardente," with which he had hoped to cure the evils of the time by punishing and frighten- ing financiers, brought no relief; and the regent, whose active mind and indolent disposition led him to adopt new and brilliant schemes, wascarried away by the clever sugges- tions of John Law of Lauriston, an adventurer, in whose ready brain new ideas as to finance and banking teemed. He had hold of some half-truths respecting the real objects and character of money and conimercial circulation. Paper money was a new thing; and Law believed that notes, based on the permanent wealth of the country, the soil, might be made to double the nation's capital, and relieve it of all its embarrassments. He was allowed to establish a bank of his own in 1716. This answered so well that in 1718 Government undertook the whole mystery of banking, with Law as director of the new Royal Bank. In connexion with this institution, intended to set afloat paper sup- ported by the property of the state, he started his famous Joint-stock Mississippi Company, with its grant of Louisiana, and all the unknown, and therefore marvellous, wealth and resources of the interior of North America. The shares were greedily taken up; the new bank notes seemed to afford an easy and inexhaustible supply of wealth, which would extinguish the debt, and set the country forward in lucrative enterprise. For a few months the fever was amazing ; the wildest excesses of stock-jobbing and gam- bling were committed; on the wings of this paper-wealth the state should escape out of its difficulties, and private persons fly up to splendour. Law himself bought a hand- ful of titled estates, and seemed to become one of the great- est men in France. Early in 1720, however, confidence was shaken, and then the bubble burst. Law stood his ground a while, but at the end of the year he was obliged to take flight, as poor as when he began. The embarrass- ments of France were not got rid of in this way ; the royal bankruptcy which was impending would in the end pull down the monarchy. Dubois, who had prudently kept clear of this downfall, now turned his ambition towards church preferment ; on his unworthy head were placed

first the archiepiscopal mitre of Cambrai, then the cardinal's hat. His rise made it nccessary for him to appease the Jesuits and depress the Jansenists, and this he did without a moment's hesitation. For a year Cardinal Dubois, as first minister, was the foremost man in France. He pro- claimed the majority of Lopis XV. in 1723; and. just-as

1715-28,

liance,

John Law the financier,

The Mis- sissippi jompany.

Cardinal Dubois.

1723-88.

Charac-

LOUIS Xv. |

his career of scheming, of clever unprincipled government, seemed crowned with fullest success, a little accident brought him to his grave. Four months later his boon companion the duke of Orleans was carried off by apoplexy. Thus had the long reign of Louis XV. begun with shame- less vice and prosperous hypocrisy ; as it began, so it con- tinued to the end; and all the time the financial difficulties of the country grew apace. The debt, seed-plot of revolu- tion, soon passed all power of management.

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| their king; he had been the nominee of Charles XII. in

1704, and bad fallen with him. The Russian party among the nobles elected Augustus ILI. of Saxony, and as Austrian and Russian soldiers supported him, while France, in fact, did nothing but declare war against Austria, he

seated himself firmly upon the throne of Poland. French influence for the time was utterly defeated, and Stanislas, after suit- able romantic adventures, found refuge in France. The war with Austria, which began late in 1733, in 1734 occupied

The young king had some chances given him: he had | the last energies of the last of the old generals of Louis ter of good preceptors, and intelligent people around his youth. | XIV. Marshal Berwick, commanding across the Rhine, a His temperament was, however, entirely bad: the religious | was killed in the trenches before Philipsburg ; and Villars,

Tror,

element in him was superstition and fear, which led him to mix up piety and debauchery in most ghastly connexion ; he was coldly selfish, indolent, vicious; the absolutions of his courtly confessors and directors gave him an easy con- science, if he lad a conscience at all, and encouraged him to continue his career of shameless immorality, till at last his vices did what religion seemed unwilling to do,—they arrested the scandal of his life by bringing him suddenly and directly to his grave.

calls him " honest Fleury,"—and all society, from the king downwards, thoroughly trusted him. His honesty, how- ever, was narrow and limited, and his home government ob- scure and uneventful. He made no scandals and attempted no reforms. Against his will and judgment he left his mark on foreign politics, though here, too, his was a " hand- to-mouth" policy, which involved no large view or grasp. At first he succeeded, with no little dexterity, in arresting the war which Austria and Spain, supported by Russia and Prussia, threatened against England and France. The

neighbours, Russia, Prussia, and Austria, who had made a secret compact together as to Polish affairs in 1732, ap-

in Italy, after one brief campaign, in which he was thwarted by the duke of Savoy, died at Turin about tbe same time. The French fought well in this Italian war; they won a hotly contested victory near Parma, lost a sharp affair at La Secchia, and defeated the Austrians at Guastalla. The Spaniards, taking advantage of the weakening of Austria in south Italy,

landed Don Carlos at Naples, where he was warmly welcomed, and the "Two Sicilies" passed from Austria to the Spanish Bourbons. The French having

The From 1723 to 1726 the duke of Bourbon, who had been | taken Philipsburg were in a commanding position on the Duke of president of the council of regency, was first minister. It | Rhine, while the Austrians were much weakened in Italy. e 3 is an obscure period, which produced only, through a back- | The emperor therefore made proposals for peace, which "stairs intrigue, the marriage of the young king with Marie | pacific Fleury gladly met. The treaty of Vienna (3d Leczinski, daughter of that Stanislas who had been king of | October 1735) seemed to secure French influence in central Poland, and was to be the last duke of Lorraine, and who | Europe; the Two Sicilies were made a kingdom for Don rejoiced in the high-sounding title of the "Beneficent | Carlos; Lorraine and ducal Bar were given to Stanislas Philosopher." In this 18th century princes and great min- | Leczinski, who abandoned all claims on Poland, and at his isters adopted titles and phrases which in our days have | death the duchies were to fall into France; the duke of descended to the level of the vendors of quack medicines. | Lorraine was made heir of Tuscany, and succeeded to that Still these affectations of princely humanity were a pheno- | government in 1737; France undertook to guarantee the The menon of some importance in the period, as showing how | Pragmatic Sanction of Charles VI. Charles VI., under Pragma- the current of feeling and opinion was setting towards those | whom the house of Austria daily grew weaker, was daily oe principles of right, that love for mankind, that zeal for good | more eager for the flimsy security of this famous document, Gisties works, which is based on the intrinsic equality of all men. | which aimed at ensuring the undisputed succession of his vi, The rule of the brutal duke of Bourbon and his mistress, the | daughter Maria Theresa to all bis possessions, as head of the Marquise de Prie, came to anend in 1726, and then André | house of Austria. Fleury, by acceding to this paper-guar- Hercule Fleury, bishop of Fréjus, the king's preceptor, took | antee, became all powerful with him, and induced the his place. The statesman Fleury, and the church historian, | emperor to sign the peace of Belgrade (1739), by which contemporaries, are not the same person. The historian | the possession of that important city passed to Turkey. was confessor to Louis XV., the statesman his tutor. In

these years Fleury's policy seemed thoroughly successful, Jardinal André Fleury, now first minister and cardinal, had the | and France was believed to be prosperous. Her prosperity, 'leury. credit of being au upright and disinterested man,—Pope | however, did not reach her people; the misery of the peas-

antry in 1738-1740 was exceedingly great; famine came each winter; the people died in crowds. D'Argenson in his Memoirs declares that "more Frenchmen died of misery in these two years than perished in all the wars of Louis XIV."

*In 1740 died both the emperor Charles VI. and Frederick The first William, king of Prussia; the strength of the Pragmatic Silesian Charles VI. ¥**

Sanction had now to be brought to the test. \ left no male issue, and his daughter Maria Theresa, married to a weak prince, Joscph of Lorraine and Tuscany, was his sole heir. To the throne of Prussia succeeded Frederick

Che congress of Soissons in 1729 arranged the points at issue, | IL., a slight and ingenious prince, who admired the French worth of at least for a time, In the north, however, matters were | and playedon the flute. He reigned for forty-six years, and "NTOPE. more difficult, for here new elements had entered into the | was Frederick the Great. Instantly there was a scramble political world. The new ambitions of Russia under Peter | for the great and widespread lands thus left to a womau's the Great, and the consolidation of the young kingdom of | care. Joseph of Lorraine failed to get the imperial crown ; Prussia, at once affected the position of Austria, involving | this, however, was a little matter, and after all it came to that ill-placed state in fresh relations and duties; while | him in 1745. For the territories there were several claim- the situation of Poland, amidst them all, was obviously | ants: Bavaria, Spain, and Saxony, all asserted their claims threatened. France, of old the friend and always the rom- | to the whole inheritance ; the king of Sardinia wanted some antic admirer of Poland, could not fail to be involved in the | Italian fiefs; the young king of Prussia laid hands on quick and unstable changes of the chivalric kingdom. This | Silesia. France obviously lay outside the quarrel; yet it 'he now occurred. In 1733, Augustus II. of Poland dying, the | was hard to think, with Fleury, that a

peaceful and reserved °olish electing nobles, instinctively dreading the power of their | position was her best policy. A war-party, headed by the

two Belle-Isles, Fouquet's grandsons, negotiators and soldiers, rose up at court in opposition to the old minister. All

pealed for French hélp, and re-elected Stanislas Leczinski | Europe ranged itself for or against the fair young queen of

her ally, now hoped finally to effect the partition of the territories of the house of Hapsburg, and joined Prussia ; Spain followed on the same side, being already at war with England ; the elector of Bavaria and other German princes, Poland also and Sardinia, were on the same side. At first Maria Theresa seemed to have no friends save England and Russia. The first Silesian war had already begun by the swift seizure of Silesia itself by Frederick. The French plan was to repeat the German campaigns of the Spanish Succes- sion War,—with Bavaria asan ally to cross into the Danube valley, and having taken the outworks of Austria, to threaten Vienna, and drive the queen tosubmission. The French army was led by Belle-Isle, wlio was made marshal for the occasion. It crossed the Rhine, pushed down the Danube, tovk Linz and Passau, and seemed to carry out its plan in full. Maria Theresa took refuge in Hungary ; the elector of Bavaria had himself proclaimed archduke of Aus- tria, and then, supported by French help, marched into Bo- hemia, and took Prague, the capital. He was now crowned king of Bohemia, and soon afterwards elected emperor (1742). Belle-Isle's schemes seemed all to succeed. Time, however, had told on the struggle; Russia began to inter- vene; England and Holland sent help to Maria Theresa ; Prussia, securing the main part of Silesia, made peace with the queen of Hungary ; ani the French by the autumn of 1742 were left alone in Bohemia, face to face with the re- vived strength and spirit of the

tenacious house of Austria. In midwinter Belle-Isle was compelled to retreat from Prague, and after terrible sufferings and losses, brought his army back to the Rhine. In this campaign the one great general of the age, Maurice of Saxony, whom the French henceforth called Marshal Saxe, distinguished himself greatly. Early in 1743 the aged Fleury, whose last days had been embit- tered by the war and by its failure, dizd in his ninetieth year. Henceforward, Louis XV. had no one at his side to save him from the disasters of mistress-government, of which the malign influences grew yearly stronger. The war in 1743 again followed the ideas of Marlborough. The Eng- lish and Germans hoped to command middle Germany, to capture or eject Charles VII. at Frankfort, and then to catch the French in Bavaria. With this view George II. and the allies pushed forward hastily to the Main, and, but for the equa! rashness of the duke of Grammont, would have been intercepted and ruined by the French army. As it was, George II. won the battle of Dettingen, which in England was celebrated by Handel's famous Ze Deum, and in France aroused vast merriment; for defeat in the 18th century meant the discrediting of the noble officers. The Parisians called the battle the "Journée des batons rom- pus,"—the day on which the marshals' batons were not won by D'Harcourt and Grammont. The French armies of Bavaria and the Rhine fell back into Alsace, and Charles VIL, seeing how little help they could give, made peace with Maria Theresa. Her fortunes and hopes had risen vastly ; she thought she saw her way to the recovery of Silesia from Prussia,—the recovery of Alsace and Lorraine from France. In 1744 war, which had slackened, renewed its force. A new league of Frankfort brought Frederick of Prussia again into the field. France undertook to reduce the Netherlands, and to check England by landing Charles Edward, the "Young Pretender," in Scotland. This part of the scheme failed completely. In the Netherlands the genius of Marshal Saxe accomplished all France desired ; the barrier-towns had been neglected, and fell one after another. The ill-success of their army in Germany, and the vigorous attack of Prince Charles of Lorraine on Alsace, — the French to suspend operations in the Nether- the = a © strengthen Coigny, who commanded on = ' sir want of power spoiled Frederick's cam-

paign in Bohemia; Charles of Lorraine returning thither 1745-4,

forced him to withdraw into Saxony. In 1745, in spite of Frederick's wishes, the war on the French side returned to the Netherlands, and there, on the 10th May, the French army won its one decisive victory of the period, defeating the Anglo-German and Dutch forces under the-duke of Cumberland at Fontenoy. Louis XV. was present in this action, and showed uo lack of fire and bravery. This vic- tory was decisive for the campaign ; tlle Netherland towns fell fast. In Italy also the battle of Bassignano laid Lom- bardy at the feet of the French. On the other side Fre- derick the Great, though he still won great victories, felt that Maria Theresa was growing stronger, Her husband's ambition was gratified with the imperial crown ; andat the very end of tlie year she consented to make peace, ceding Silesia to her vigorous rival, and securing the universal re- cognition of her spouse as emperor. (Christmas 1745) closed the second Silesian war. was now almost isolated; her successes in the late year seemed of little avail to her; the attempt of Charles Edward on Scotland was crushed (April 1746) by the duke of Cumberland at the battle of Culloden; and the English sea-power began to show its vigour. Off the Frencli and Spanish coasts England gave her foes no rest ; in India she recovered Madras, which had fallen into Dipleix's hands, and spoiled the French plans for ascendency in the Kast. In this year, too, the French armies were very unfortunate in Italy, and lost all their command of the peninsula. The Netherlands campaign, guided by Marshal Saxe, alone sus- tained the honour of the French arms; Belgium fell com- pletely into their hands. In 1747 Marshal Saxe, thorgli he took Bergen-op-Zoom, failed before Maestricht; and France seemed as far as ever from being able to coerce Holland. In the following year the siege of Maestricht was resumed, but negotiations for peace intervened, and ths

The peace of Dresden The

France peace of Dresden.

great fortress was not reduced. The peace of Aix-la-Chap- The elle, of which the preliminaries had been signed in April, peace o

ix-la-

was finally concluded in October 1748. It greatly dis- Chapelle

credited France; the successes of her arms in Belgium, Savoy, and Nice, were of no avail against the strength her antagonists had developed. England and France mutually restored their conquests,—France receiving back Cape Breton and England Madras ; the frontier fortresses, chief

prizes of the late war, were handed back to Holland. France ~~

agreed to remove Charles Edward from within her borders, and guaranteed the succession of the house of Hanover. Silesia was secured to Frederick ; the Pragmatic Sanction, in all other points, was once more accepted by Europe ; the house of Austria also ceded Parma and Piacenza to the Spanish Don Philip. With this peace closes the long rivalry between France and Austria; when war breaks out again they will be allies.

“To the government of an old priest succeeded that of Madame

a young mistress," says Michelet; for this was the time in which Madame de Pompadour rose to power. Her authio- rity lasted twenty years,—the twenty years in which France sank rapidly in Europe into weakness and discredit, while her great writers were awaking all the dormant echoes of the world, and summoning together the forces which brought on the Revolution. The mistress made and un- made ministers at will, and changed the whole face of the foreign policy of France; the scandals of the court under her rule set men listening to the new ideas which spread swiftly through France; the more the noblesse descended in worth and strength, the more its younger members talked the language of modern humanity. Almost all, like the state, were more or less bankrupt, and unable by char- acter, training, circumstances, to take advantage of the movement of society around them. When France awoke she scattered them to the winds.

de Pam-

adour.

1748.

The un- settled condi- tion of

Europ.

Rivalry of Eng- land and France,

CHANGES IN EUROPE. |

Europe was very far from being finally pacified by the peace of Aix-la-Chape'le ; on the contrary, every one seemed

-to see rents and holes in it through which he might win

new advantages. Frederick the Great was no doubt con- tent witli it, and so was England; others, however, were far from such feelings. Maria Theresa had reluctantly set her hand to the cession of Silesia, and scanned the horizon fur help to enable her to recover that important duchy. France was almost as uneasy, for England had gained ad- vantages which were in fact

her losses ; and slie, too, hoped ere long to reverse the decisions of the treaty. In India her prospects seemed bright, under the brilliant leadership of Dupleix; in North America the peace had left very serious matters still unsettled, and it was hardly likely that any court save that of the sword could decide the diffi- cult questions still open,—questions as to the limits of the Acadia which had been ceded to England; vital questions as to tle connexion between Canada and Louisiana, botli still French territories ; questions as to the islands off the coasts of America, the ownership an1 possession of which had been left undetermined. Acadia had been ceded with- out any definite statement as to whether the cession carried any portion of the mainland as well as the peninsula of Nova Scotia; and England claimed the territory as far as the shore of the St Lawrence river. This was a smaller matter ; the question as to the relation between Canada and

'Louisiana involved no less than the ultimate possession of

France and Austria,

all North America. For while England held the coast, and hoped to combine the wealth of agriculture with that of commerce, she hid always behind her the long line of French possessions and claims, which interfered with her cvlonizing development, and threatened to push her back to the sea. For France had the Canadian lakes, the valley of the Ohio, and that of the Mississippi ; she had communi- cation with the sea on the north at the estuary of the St Lawrence, on the south in the Gulf of Mexico, Were she to secure the connexion through this long line, the English colonies would be terribly straitened and endangered ; the French forts along the Ohio seemed a perpetual menace to English interests. Consequently the doors were scarcely shut on the negotiators at Aix-la-Chapelle, when fresh discussions began to spring up, and conferences were held, in a more or less angry tone, at Paris. In 1754 England, thinking that France was only lengthening out the dispute becaase she hoped to strengthen her navy for a fresh struggle, suddenly male war, without a proper declaration, and fell on French ships and forts whenever she could capture them. It was a high-handed and offensive proceeding. In India also an undeclared war was going on between the officers and forces of the East India Company and the

French under Dupleix, which brought out the latent power of that young civilian, Clive, and ended in 1754 in the recall of Dupleix, and in a peace, or at least a cessation of warfare, between the rivals on the Indian shores. It was quite plain that before long this state of half-warfare must develop into a more serious struggle. To that also the whole movement of European politics speedily began to tend. For it was not only at Paris and London that negotiators were busy in these years; the Austrian court, eager for revenge on Prussia, and led by a strongand dangerous statesman, Kaunitz, was looking hither and thither for new alliances. The world had grown weary of the old lines of opinion, the old rules of policy, the old relations of courts. Kaunitz deemed himself the chosen instrument of a new departure, which would rearrange the map of Europe, and restore its proper authority to Austria and the empire. This statesman, father of modern diplo- macy, and more especially of that side of it which has ever since been cultivated at Vienna, had administered the Austrian Netherlands in the last years of the late war, and

had represented Austria at the congresses of 1748. In 1750 he was sent as ambassador to Versailles, and, as he watched the manners and temper of French society, persuaded him- self that he saw his way to new combinations which might be very profitable for his mistress. The experience of Aix- la-Chapelle had convinced him that England was not trust- worthy when her interests clashed with those of Austria. He saw how his country had suffered by the peace; it seemed to him that France would be a far better ally than England. Hitherto France had steadily played the part of frieud and protector of the smaller North-German states, in their struggle against the dominance of the house of Austria,—this was a natural and necessary result of the secular rivalry against the Austro-Spanish power. Now, however, Prussia had taken up the post of champion of North-German interests and opinions ; whereas France, by her new Bourbon relations in Spain, and her support of the Jacobites against tle Hanoverians in England, had entirely changed her ground. She was far more likely to find a cordial friend in south than in north Germany; she had nothing to

fear from Austria ; she had much to lose or gain in the north; the Hanoverian interests of the reigning dynasty in England led the Guelfs to oppose the advance of France on the Rhine ; the jealousies on other sides between France and England all tended in the same direction,—the direction of compelling France to look for new friends, and to abandon her ancient policy. Prussia became the inevit- able ally of England; France began to look towards Austria, The disagreements between Austria and Holland as to the barrier-towns in the Belgian country naturally threw the sea-powers together; for neither Holland nor England cared to see Austria on that side, or to find a new rival rising up at Antwerp. Now, all political alliances are based rather on interest than on sentiment; and when it grew tolerably clear that the interests of England and France and those of England and Austria had become widely divergent, it became equally clear that new com- binations must come. Austria was altogether implacable towards Prussia; England, or rather the English court, in its anxiety for Hanover, felt that Prussia could be no rival, and might be a good friend. Prussia was not a sea-power, and was a very near neighbour to Hanover. And so, when Kaunitz tried to persuade the English cabinet that it ought to join Austria in a war for the recovery of Silesia, he found so cool a reception that he at once turned else- where. His knowledge of France taught him how to suc- ceel there; it must be by appeasing and_ interesting Madame de Pompadour; and the king of Prussia had lately offended not only her but her parasite the Abbé Bernis by his unpleasant trick of plain speaking ; and the political independence of late years asserted for Prussia was also highly distasteful at Versailles. He knew that if he could overcome the reluctance of Louis XV., who clung to the older ideas of French policy, and persuade him also that Austria could be a good friend against England, he might succeed in reversing the political conditions of Europe, and perhaps win Silesia back for his mistress. He easily per- suaded Madame de Pompadour ; her influence was his from 1751; but the king was slow to move. Not till 1755, when the insults of England to the flag of France were too great to be borne, did he determine to accept the good offices of Kaunitz, and to threaten Hanover. England at once drew towards Prussia, Hanover being the bond of union between them. While the two Catholic powers formed their alliance together, and Madame de Pompadour, as men noticed with a smile, showed quite a fervour of devotion, which seemed not in the least incompatible with her moral position, the two Protestant

powers, England and Prussia, set themselves to resist the Catholic movement, and, if

| possible, to secure the triumph of toleration in northern

1750-55.

Changes in Eu- ropean policy.

1755-56.

The "Al- liance des trois Cotil- lons."

The Seven Years'

War.

Europe. In this France undertook an ulira-conservative line of policy, in union with her old antagonist ; she ceased to lead, or even to sympathize with, the advancing states of Europe ; it was the old world she would support, the new order of things could no longer count on her. And, beside all this abandonment of traditional policy, in itself no little risk, the new alliance made with Austria was, on the face of it, a political blunder; there was nothing to be gained by it, and much to be lost. For the essential points to which the whole care of France should have been given were across the sea, in Canada and in India; and here she was allying herself with the most inland of European powers, excepting Poland, which could scarcely be reckoned as a power at all, and bending all her energies to attack England by a march across north-western Germany into Hanover; hither went her strength, while the English were left to carry out unmolested the plans on whicli their future greatness hung. Had the new coalition been successful, Austria would doubtless have crushed Prussia, but what advantages could France have reaped from the war? Her position in it was that of quite an inferior and secondary power; the contest would exhaust her already diminished strength, and teach the world how low she had fallen ; and if she failed, it would be little less than ruin to her. Eng- land, however,

having (early in 1756) signed a treaty of neutrality with Prussia, France delayed no longer. On Mayday 1756 the '" Alliance des trois Cotillons," "of the three petticoats," as it was styled, the coalition of Madame de Pompadour with Maria Theresa and Elizabeth empress of Russia, was formally undertaken, to the vast delight of the French court and nobles, which longed for the pleasures of a great military promenade in such good society, assuming that the French people would, as usual, bear the cost, and leave to them the excitement and thie glory. It did not turn out so amusing as they had expected. This treaty of Versailles was immediately followed by a declaration of war on the part of England ; and Pitt before very long had smoothed over all difficulties which lay in the way of an offensive and defensive alliance with Prussia. The elder Pitt was regarded with as much fear and hatred by the court of Madame de Pompadour as the younger Pitt was by the republicans forty years later in the days of the Terror. The allies were chiefly tied by circumstances and mutual convenience to occupy different portions of the field of war,—England grappling with France, and Prussia with the Austrians.

At the beginuing the French navy had no small share of success. During the peace great attention had been paid to it, and the growing importance of her commerce had reared for France no despicable school of mariners. At the outset of the war a great expedition commanded by Mar- shal Richelieu, who has the bad distinction of having done more than any other man to debauch and corrupt that apt pupil the king, set sail from Toulon harbour, and directed its course for Minorca, which was occupied by the English in force. Richelieu took Port Mahon and invested St Philippe, on which the English had expended vast toil, hop- ing to make of it a second Gibraltar,—a second point of in- fluence in the Mediterranean. A relieving force of seven- teen ships, commanded by Admiral Byng, son of the first Lord Torrington, was handled so ill that it was defeated and driven off by the French fleet under La Galissonniére, and shortly afterwards the fort of St Philippe was carried by assault in a very brilliant manner by Richelieu. With it the French became masters of Minorca, and Richelieu returned in glory to Paris. Very different was the reception of Byngin England. There the news of the fall of Minorca % created terrible excitement ; the ministry fell, and Pitt

ook the reins of power in his hands. He and the old Whigs at his back were known to be anxious for vigorous measures,

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[HISTORY.

and for a hearty co-operation with Prussia. Byng was sacri- 1756-57,

ficed to the resentment of the people; his incapacity and vacillation in the presence of the enemy were regarded as signs of treason, and he was shot asa traitor. The war, thus favourably begun by France, ought to have been carried on by the same lines; her chief strength should have been directed to the sea. If fortune favoured her still in the maritime struggle, she might fairly have hoped to win her cause in Canada and India. But the unlucky likings of Madame de Pompadour for Kaunitz and the Austrian alliance threw the country off its riglit course, aud embarked it on a harassing and perilous Continental struggle, At first, though Spain, Poland, and Holland remained neu- tral, almost all the rest of Europe,—Russia, the elector of Saxony, the German diet, and Sweden,—declared for Austria; and after that Frederick's sudden invasion of Saxony in autumn 1756 showed that the war was really begun, Louis XV. in January 1757 declared war on him, and openly joined the league for his destruction. Hesse and Brunswick alone supported Frederick. For this France willingly abandoned lier success on the sea. She had seen Pitt's first effort, the attack on Rochefort, fail ignomini- ously ; she had driven off another fleet which threatened St Malo and Havre; she had news of successes in botli Canada and India; still, rather than make these omens of fortune her own, she turned aside to invade Hanover, and plunged into the larger war, in which she could never hope to win any real profit for herself. While Frederick was attempting in vain to crush the Austrians by reducing Be- lemia, whence he was obliged to retreat after the disas- trous battle of Kolin (18th June 1757), the French army, 80,000 strong, and commanded by Marshal D'Estrées, crossed the Rhine, and directed its course towards the Weser. the victor of Culloden, the unwieldy duke of Cumber-? land, who posted them beliind tlie Weser at Hastenbeck ; here D'Estrées overtook and defeated him (26th July 1757). The victory was, however, not complete enough to please the French court, with whom D'Estrées was not popular. He was removed, and the duke of

Richelieu taking his place pushed the English before him to the Elbe; at Stade the duke of Cumberland was compelled to surrender ltis army, and to sign the shameful convention of Kloster-Zeven, (8th Sept. 1757), which permitted the defeated Germans to return home. Home also went the duke of Cumberland, shorn of his honours as the saviour of the Hanoverian cause ; him, however, the English did not shoot, as they had shot poor Byng. Marshal Richelieu having thus dis- posed of his antagonists, deemed that his work was done; it only remained for him to make the most of his conquest in the way of pillage; so instead of marching on Brand- enburg, which was almost bare of troops, he contented himself with extorting a fine fortune from the Westphal- ians and Hanoverians, with which he built himself a splendid palace at Paris, the Pavilion de Hanovre. This was but a poor result, considering that it was believed that, had he pushed forward, he might have brought the war to an end in one campaign, His selfish indifference to the duties of high generalship wrought the ruin of his cause. While he lingered in Westphalia, the English began to recover from their panic; and Frederick, returning with incredible swiftness out of Saxony, arrested the course of disaster. The French army under Richelieu had been told off to overcome the Anglo-Hanoverian resistance ; another army, under the prince of Soubise and the duke of Saxe- Hildburghausen, who commanded the troops of the Ger- man circles, was slowly moving towards Berlin, hoping to co- operate with Richelieu's victorious forces. Their progress, however, was rudely interrupted at Rosbach, on the 5th of

| November 1757, by Frederick, who caught and utterly

The English and their allies were commanded by He . enc in Ger: > many.

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1757-583.

The battle of

Rosbach.

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ruined them in a battle which cost him almost nothing, and was over in an hour and a half. Rosbach was one of the decisive battles of the world, little as it has been thouglit of by history. Perhaps it has never happened, before or since, that so hollow and slight a contest has produced such great results. At first it seemed like a mere comedy ; the crowd of French captive regiments, the spoils of the camp, the bewilderment of the captors, the "host of cooks and players, of wigmakers and wigs and hairdressers, the parasols and cases of lavender water," the absurdly incon- gruous lumber with which the young French nobles had prepared for war, contrasted strangely with the gaunt and tattered soldiers of Frederick the Great, grim with war, privations, and forced marches. A shout of merriment rang through Germany, and was re-echoed from France herself. The light-hearted French were far from being depressed or vexed by the defeat; in the middle of the 18th century France was utterly indifferent as to glory, and the country saw in Dettingen and Rosbach not its own defeat, but the discomfiture of the frivolous noblesse ; to the temper of the times these glaring instances of noble incapacity were rather pleasant than not. The effects of the battle on England were also very marked. It was there seen that Frederick's cause was not hopeless; and the English Government at once refused to be bouud by the convention of Kloster-Zeven, appointing as commander- in-chief, in place of the duke of Cumberland, the vigorous and able Ferdinand, duke of Brunswick, one of the best soldiers of the age, who won and thoroughly deserved the respect and confidence even of Frederick the Great. Hitherto England had sent over nothing but money and the duke; now Pitt undertook to bring 20,000 English- meu into the field, and henceforth England holds a prin- cipal place in the French side of the Seven Years' War. The greatest, however, of the results of the battle of Ros- bach was its effect on public and national feeling in north Germany. Hitherto all men of cultivation and thought had turned to France for inspiration ; all men of taste and fashion regarded France as the arbiter of their destinies in dress and manners; the French language was alone polite in courts and good society; the German tongue was counted rude and barbarous; Frederick the Great himself, the very champioa of Germany against France, of modern free- dom of thought

against his Catholic opponents, the odd "' Protestantium Defensor " of his medals, could never bring himself to speak or write German if it could be avoided. But after Rosbach the older fashion passed away; French manners, which before had seemed so beautiful, were now seen to be corrupt and frivolous; the slower Germans saw that their own manners and tongue were worth something ; from the battle of Rosbach begins that upspringing of a uational life in north Germany, which finds immediate expression in the splendid new-born literature of the day, of which the most direct and marked example is the Minna vom Barnhelm of Lessing. In this way, then, the battle of Rosbach is an epoch in the national history of Europe. It restored the fortunes of Frederick the Great, and roused a new sense of national patriotism in the North-German peoples,

After 1757 the Seven Years' War may be considered as having two chief theatres,—that of Frederick against Austria, and that of England with Hanover and Brunswick against France and the lesser Germau princes, the "army of the circles." It is with the latter only that we have to do. In 1758 France made great efforts to reorganize her armies, and fit them for decisive action in Low Germany. A new commander-in-chief, the count of Clermont, a weak offslioot of the great house of Condé, replaced Richelieu ; Soubise, whose favour at court endured to the end of the reign of Louis XV., and who was the only courtier who ventured

to escort that monarch's remains to the grave, was placed at the head of a newarmy. Under these two generals the court hoped to achieve good results in this campaign. The two main armies were directed, the one towards the Rhine, the other towards the Weser; that of the Rhine, under Clermont, had the strong position of Wesel, now in French hauds, as a base of operation, and proposed to push on thence into Hanover, joining the other army under Soubise, which was to advance along the Weser through the Hessian country. Before, however, they could draw their scattered forces together, the new general of the allies, Ferdinand of Brunswick, was on them, and in a campaign which Frederick the Great did not hesitate to compare with that of Turenne in Alsace, he succeeded in dislodging Cler- mont from

Brunswick. He speedily cleared the line of the Weser, recovering Minden, and driving the French under Clermont tothe westward. They made no stand, and when they reached the Rhine at Diisseldorf, succeeded in crossing the river only with heavy loss of prisoners,—for Ferdinand stuck to their skirts like an avenging fury, and at last caught them at Crefeld, a little town between the Rhine and the Meuse, not far from Diisseldorf, where he inflicted on them a defeat which covered Clermont with discredit, and utterly ruined the prospects of the campaign. The Germans had now driven the French out of Hanover, Brunswick, and the Rhine provinces; Clermont was re- called, and withdrew into private life. He and his antago- nist Ferdinand were both freemasons, and both had sym- pathies with the philosophical and political ferment of the age ; yet the masonic brotherhood had not hindered Ferdinand from punishing him very severely in this cam- paign. Marshal Contades, a really good general, was sent to take command of the beaten forces; and Soubise, having won the battle of Sondershausen, and having taken Cassel, threatened Ferdinand's rear, while a reorganized army under Contades endangered his communications on the Rhine; they were twice as numerous as the forces he could bring against them, and he was obliged to draw back on Miinster, giving up the whole left bank of the Rhine. There he hindered the junction of the two French armies, and compelled Contades to retreat again beyond the Rhine ; while Soubise withdrew to the Maine, and lay for the winter about Frankfort and Hanau. So ended the German cam- paign of 1758, into which the French Government had thrown all its strength, and had once more got in return nothing but discredit, while the other interests of the country had been left to drift to ruin. The English fleets harassed the coasts of France, destroyed ships, burnt build- ing-yards, took Cherbourg, and paralysed her whole naval force. Abroad, she did nothing for the vital contests her sons were waging ; the English took Senegal on one hand, and, in spite of the ability of Montcalm, mastered Fort Du Quesne on the Ohio, and Louisburg, which they renamed

1758,

Pittsburg. At the same time the struggle in India, which Affairsin had begun to turn against France, was restored by the bril- India.

liant courage of an Irish Jacobite, Lally, whom the French court named governor general. On his arrival he at once effected wonders, recovering the ground the French had lost ; he vaunted that no Englishman should be left in the Peninsula. But Lally, brave and brilliant as he was, was also harsh and impetuous, arousing ill-will even by his good qualities. Nothing offended his subordinates so much as his refusal to allow them to pillage at will; and the bright opening of his career in India was very soon clouded over by disputes and insubordination among his officers, which foretold a coming failure.

The mishaps of 1758 on every side at last awoke the Abbé Bernis from his dreams of security and glory, and that obsequious churchman, the henchman of Pompadour, in his cowardly alarm, instead of trying to repair the evil done,

1758-59.

The Duke of Choiseul.

The cam- paign of

175.

The battle of Minden.

The dis- asters of France.

withdrew to his bishopric of Aix, giving place to an abler statesman, the duke of Choiseul, oue of the most unfortu- nate of the noble ministers who have ever presided over the affairs of France. His first act was the signature of a second treaty of Versailles, in which he and Madame de Pompadour committed France to terms which plainly meant that France should bear the chief burdens of the war, while Austria should win all the fruit, For she promised to keep 100,000 men on foot, to support the whole Swedish contingent, to restore the elector of Saxony, to defend the Austrian Netherlands, and to support the candidature of Joseph, eldest son of Maria

Theresa, for the title of Rex Romanorum, and the succession to his father in the em- pire, and finally to make no peace with England till Prussia had restored Silesia to Austria, With this amazing treaty France again went stupidly down into the contest, as ai ox to the shambles.

In 1759 the old blunders were again repeated ; all was abandoned for the sake of the German campaigns; the Rhine army under Contades lay in the Cleves country; the Maine army near Frankfort was commanded by the duke of Broglie, who had already given sufficient proof of his incompetence at Rosbach. Between these armies, watching both, and purposing to hinder their junction, and, if he could, to beat them in detail, lay Ferdinand of Brunswick, now reinforced with twelve thousand English and Scottish soldiers, who had joined him in the last autumn. He thought himself strong enough to attack Broglie, but was repulsed with loss at the battle of Bergen on the Nidda, a few miles from Frankfort ; and B: .glie, made a marshal for this success, succeeded in effecting a junction with Con- tades at Giessen; thence they advanced together to the Weser, occupying one place after another. At Minden they paused before pushing on to overrun Hanover, while Fer- dinand, having gathered all his forces together, came down to observe and check them. Differences arose between Contades and Broglie; the latter was successful, popular, incapable; the former a good officer, whom the fatality which had beset the French court since the later days of Louis XIV. had thrown into the cold shade; the two were hardly likely to work well together. Ferdinand took ad- vantage of their errors, and (lst Augnst 1759) with much smaller numbers and the worse position, veutured on a great battle at Minden. The English regiments of foot, with unheard off audacity, charged and overthrew the French cavalry, which, with amazing ineptitude, had been placed in the centre, as if it were the most solid part of the army. Had Lord George Sackville, who commanded the English horse, done his duty also, the whole French army might have been destroyed or made prisoners. As it was, the exploit of the "Minden regiments" rang through Europe; and the French army, hastily evacuating its posi- tions, fell back to the Maine. Contades, the good geueral, was of course punished; Broglie remained in command. Later on, he showed his gratitude to the Bourbons by op- posing the Revolution as an émigré. Henceforward Fer- dinand was able to hold his own in western Germany, and England felt secure for Hanover. The French went on placing huge armies in the field for

the rest of the war ; yet thanks to “the most perfect incapacity,” as Napoleon once said, of Broglie and Soubise, this great force achieved nothing, and succeeded only in still further discrediting the noblesse and the monarchy, while it exhausted with fearful speed the resources of the country. Nor did France pay the price here only ; her efforts in Germany still hindered her from attending to her interests elsewhere ; the disasters – ae navy went on; her influence in Canada and India to eetecs by day. An attempt to invade Eugland in ti cates titer ae the battle of Quiberon Bay, and

e of Conflans who commanded there, ruined

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the French navy ; a squadron sent out to harass the coasts of Scotland and northern England, under Thurot, a real sailor, was attacked early in 1760 by a stronger force; Thnrot was killed, the squadron captured, and so the French naval power came toan end, Henceforward, no help could pass from France to the outlying scenes of conflict. Point by point the English had advanced in Canada, until (September 13, 1759) the battle of Quebec, which proved fatal to both Wolfe and the brave Montcalm, finally decided the destinies of North America, That vic- tory gave to England the ascendency over Canada, and secured to the sons of the Puritans the eventual mastery over the rest of that great continent. The fall of Montreal in 1760 was the close of the struggle. In India also French affairs had gone very ill in these days ; the quarrel between Lally and Admiral d’Aché increased in bitterness; the English finally captured even Pondicherry, the last remain- ing stronghold of the French in India, This year 1799 is, on the whole, the most disastrous in all the annals of France; it proclaimed with a clear voice to all who would hear that the days of the ancient monarchy were numbered. The monarchy could not defend France abroad, it was dying of debt and corruption at home. It was little help to France that in 1760 the unhappy Lally, whom men in their vexation accused of treason, was bronght home, tried, and shamefully executed at Paris. It was not on him that the eventual punishment would fall; in 1778 the generous voice of Voltaire made France confess her injustice, and restore to honour the name

of the unfortunate and brilliant Irishman. His son Lally-Tollendal gave to the fallen monarchy a loyalty and support it surely little deserved from him.

Changes now began which pointed towards peace. The accession of George IIT. shook the power of Pitt ; in France the subtle address of Choiseul had carried all before him, and he at last saw his way, too late, to reverse the direc- tion which the efforts of France had hitherto taken, The war in Germany, always a blunder, should become of secondary importance; the active friendship of Spain and other Bourbon princes should restore something of the old sea-power of France. The king of Spain had also found out his folly in remaining neutral, while England grew to be supreme on the water; and consequently in 1761 the famous "Family Compact," the Bourbon league, was signed by all the sovereigns of the house of Bourbon. By it they made alliance offensive and defensive, guaranteeing the territories of one another, promising to support each other and to make no separate peace or war, throwing open re- ciprocally all their harbours and frontiers, and declaring that for war or peace, for trade or pleasure, France, Spain, Naples and Sicily, Parma and Piacenza, should count as but one country, one land blessed by Bourbons, and led by their great chief Louis XV. Here was a splendid scheme for the reconstruction of European politics! It was the Latin races clasped together by the Bourbon family, and determined to reassert their importance in Europe. Had the family compact been signed three years earlier, or had there been one man of real power among the Bourbons, its result might have been serious for the rest of the world; as it was, the chief effect of it was the resignation of Pitt, and the half burlesque ministry of Lord Bute. For Pitt got some ink- ling of this secret compact, and, confirmed in his suspicions by the equivocal language of the Spanish court, urged on his colleagues the necessity of declaring instant war ou Spain, so as to crush her fleets before France could come to her help. But George III. would none of it; the mime ters refused to take the bold step, not having the justi- fication for it in their hands ; and Pitt threw up the seals of office, When the compact became known to the world in 1762, England justified Pitt's foresight by at once declar-

The Family Compact.

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1769 63. ing war; in a few months the Spanish navy had ceased to exist, and France lost her West-Indian Islands one after au- other. Bute with the young king stood aghast at the series of brilliant triumphs which signalized their efforts to bring war toanend, Meanwhile the French armies in Germany continued an inglorious if not any longer a disastrous career. In 1760, 1761, 1762, they still occupied Hesse and the thine country, fighting a few battles with varying success, and displaying in the clearest light the incapacity of their leaders. Negotiations for peace went on through 1762 between France and England, and before the year ended the preliminaries of peace had been signed, just in time to save Soubise with his 80,000 men from being ignominiously driven out of Hesse-Cassel. Frederick the Great, thus abandoned by George ITI., was also ready for peace. In February 1763 the two treaties of Paris between France and England, Spain and Portugal, and of Hubertsburg be- tween Prussia and Austria with Saxony were signed, and closed the Seven Years' War. To French historians it had seemed, as Michelet ventures to call it, "an ignoble war"; a record of blunders and follies, met by shouts of derision at home ; for the French people were, at the time, as much amused with the downfall of their incapable nobility as if they had belonged to a totally different race. It was as if they wished to say to Europe that these defeats and scandals were not the defeat of the French people, but of an intrusive clique of strangers ; it was also as if the in- extinguishable gaiety of the nation could find even the ruin of the country comical. Doubtless, in more or less uncon- scious fashion, France felt that the war had brought the domination of the Bourbon monarchy and its noble flatterers nearer to an end.

A summary of the stipulations of the peace of Paris shows at a glance how low France had fallen, how futile had been the Family Compact. She ceded all her claims to Nova Scotia, Canada, Cape Breton, reserving only her fishing rights and some small islands useful for that in- dustry ; she ceded all the territory which lay between tlie English settlements along the Atlantic and the line of the river Mississippi ; she ceded the islands of Grenada, Saint Vincent, Dominique, Tobago. She received back Pondi-

cherry, and a certain district on the east coast of India ; she gave up Minorca, the one flower slic had plucked in all the war, to England, and withdrew all her troops out of Germany. England came out chief gainer from the war; her development in these years was immense. To this time we owe the maritime supremacy of this country, and the spread of the English language and race to every shore. We have good reason to be proud of it, and to read with kindling eye the chronicle of our incessant advances. Yet it has, too, its dark side: a world filled with pushing English- men could scarcely be a paradise; there are races which object to being thrust aside ; there are civilizations which English commonplace cannot supersede; the dull self-satis- faction of ordinary " Anglo-Saxonism" is at least as offen- Sive as the livelier "'Chauvinisme" of our neighbours.

In the eleven uneventful years which form the remainder of Louis XV.'s reign the characteristics of the 18th century displayed themselves with clearness, and we shall do well to pass them briefly in review. In them we shall recog- nize at once most of the germs of those movements of the Revolution-era, towards which affairs in France had long been tending. To begin at the top ;—the court was so cor- rupt that we must go to the history of the most Oriental despots for a parallel. The king, coldly dissolute, idle, careless as to everything except his scandalous pleasures, and the direction of foreign affairs, which he kept in his own hands, shut himself up at Versailles, leaving Madame de Pompadour to manage everything, even the details of his own debaucheries ; the infamous Parc aux Cerfs spread

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Close of the Seven Years' War.

The peace of Huberts- burg.

The peace of Paris,

The State of France, The

court,

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shame and misery among hundreds of families, and added heavily to the financial difficulties of the time. No mem-. ber of the royal family was of any mark; the pious queen lived neglected and forgotten ; the dauphin, whom the king disliked, because he did not wish to be reminded of his successor, was a friend of the Jesuits ; there was no other ptince of consideration. Consequently, all fell into Madame de Pompadour's hands; and till her death in 1764 she too might well have cried "L'état,c'est moi." And if the princes The of the blood were ciphers, still more so were the nobles,—a noblesse. needy well-bred throng, if of the older race, an obsequious

and despicable crowd, if of the newer creations. To a large extent this proud noblesse was quite modern; for a long

time noble fiefs had been changing hands rapidly ; and as citizens grew wealthy they bought themselves into the sacred circle of privilege. No love of country, no desire

to devote themselves or to resign their rights, existed in a

body which had been steadily degraded by Louis XIV.,

had been tempted into display which meant debt, and had

been carefully kept away from their estates, lest social independence should lead them to think and act for them- selves. The more embarrassed and dependent they were,

the better pleased was the spirit of absolutism, which thought it natural that they should crowd the army and disgrace the country in war by their vices, frivolities, and imbecility. When at last they had to staud up, face to face

with the crisis of the Revolution, they were absolutely un-

able to defend themselves; their pride and poverty alike forbade them to sacrifice their privilege, and to submit to taxation with their fellow subjects. The clergy were cut The asunder, and had a divided existence. The prelates, clergy. bishops and dignitaries, and the religious houses, on the

one hand, were in all essential respects on the footing of

the nobles, and took part with them. They, too, were privileged landholders, who could inflict heavy burdens on

the people, while they would bear no weight on their

own shoulders. These are the privileged classes, whvu brought about the Revolution. The king and his court, the nobles, and the upper clergy,—these chiefly caused it, and

these were the chief sufferers from it. The rest of the clergy were a very different race; they were simple curés, parish priests, by birth and interest allied with the people,

not with their lords—men whose meaner position gave them a chauce of being and doing good. Arthur Young,

who travelled through France on the eve of the Revolution,

bears witness to their general excellence and devotion to

their duties. The burgher class in France had grown The wealthier; manufactures were not unknown; trade increased citizeas. rapidly ; financiers, money-lenders, new nobles sprang.

from this class; the public creditor in these days grew to

be a power in the state, very far removed from the peasant

on the soil or the fierce artisan in towns, and yet advancing

the revolutionary current by producing many of the writers,

and much of the general intelligence of the time. By

the side of them we may place the legal profession, that The conservative body, which struggled in vain against all in- lawyers. vasions of ancient usage, whether from the side of king or

of people, and which in the end gave many victims and

some leaders to the Revolution. In the country the state The pea- of the people was wretched, though it is true that in many santry. districts the soil was already much subdivided, and the peasant proprietors numerous. It was reckoned that about

a quarter of the soil was in their hands ; yet their condition

was little the better for this. Their burdens were still very heavy, their knowledge and methods of tillage rude; they

had no capital to expend on the land, no good tools, no cattle, no manures; winter after winter they fell to famine-level, and sustained a miserable existence till the

sun again revived them, and sent them forth once more to labour in the fields. Fortunately, the French winter is

1763.

The

capital,

Litera- ture in

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short ; if, however, a long winter did set in, as in 1709, or again at the beginning of the Revolution, then the sufferings of the people were extreme, and multitudes perished of cold and hunger. The feudal aids and services—the corvée, the "pigeon-right," the game laws, the common winepress, and common mill, and a hundred other oppressive and even fantastic services—left the peasant no rest, and forbade him ever to hope for comfort. As he gained in intelligence, and rose above the dead level of ignorance in which his masters had carefully kept him, he saw more and more to vex and anger

him; as the people gained, they became more ripe for revolution. The robber bands in central France, and the inability of the authorities.to cope with them; the growth of a large class of restless spirits, who dimly echoed some of the theories of the philosophers, and practised a new and lawless method of distribution of property, by robbing and destroying as they could; the diminution of population in the country, and the tendency of the Jand in the less fruitful parts to relapse into a wilderness,—these things all go to prove the wretchedness of the peasant life, and were all ominous of change. These conditions of the country, and the improvements of the burgher class, brought on another change, which was little noticed at the time, though it afterwards forced itself on the attention of all Europe. For miles round Paris it became known that there was work to be had in the capital. In the 18th cen- tury Paris changed her character; no longer a mere court- seat or city of pleasure, she had gradually become a great manufacturing centre, and into her flowed crowds of dissatis- fied or starving folk from all the country round. This immigration went on down to the great outbreak. It largely increased the city population, provided the rough material for the excesses of the Revolution, and helped to stamp the mark of Paris on the whole republican movement. It is hardly too much to say that the want of money at court, combined with the want of food in the cottage, brought about the explosion. These were the social and physical conditions of ferment,—the intellectual movement which dignified the Revolution with great names and imbued it with grand ideas demands brief independent notice.

The literature of the Great, Monarch's time is usually assumed to be the golden age of letters in France. Yet if power and effcct on the destinies of men and states be taken as the test, the literature of the 18th century far sur- passes that of the 17th. Molire and Racine had been at the beck of the court. They never appealed to the people ; still less would the lofty muse of Corneille care to speak to common ears. But in the 18th century, by the side of the superstructure of society falling fast to pieces, and the oppressed substructure, growing daily more restless, the authors formed a third and an independent power, eager to push on the ideas of the age, as they found expression in sciences or practical matters, or as they formulated an easy philosophy or announced as startling novelties the earliest commonplaces of political rule. And the significant fact is that these simple rules of

political life were really a re- velation to France, and for the first time set her people thinking on such matters. So completely had the country ceased to be a political body,—so completely had the per- nicious principles of Louis XIV. destroyed liberty and con- stitutional life, that all had to be begun again ; and the field seemed open, as well for what appear to us to be the most -harmless commonplaces, as for the most startling speculations and theories. The difficulty was that to oe the one was just as new and strange as the other. a never be forgotten that the Revolution called on her Bek, > ees ; constitution, but to make a fresh start, casa very eginning, Moreover, this state of things

arily placed literature in opposition to all existing

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powers. The ancient faith, the old traditions of noble lordship, the learning of the lawyers, all alike were attacked with unsparing hand; and literature built up for itself a strong public opinion of its own among the classes which had hitherto been as nothing in the government of the country. The 18th century literature of France received its first impulses from England. The age of Queen Anne, the advance of philosophy and natural sciences and of letters in England, the quickened connexion between the two countries in the days of the regency, had enormous in- fluence on intelligent Frenchmen. Montesquieu, a noble- man and a lawyer, with the temper of a constitutional statesman, was the advocate of political liberty, after the English pattern, Voltaire became the champion of tolera- tion and freedom of conscience, and had learnt from Locke ; the Encyclopedists, following the English leaders in natural science, wrote their vast dictionary of human knowledge, in oppositicn to all established beliefs ; and lastly, Rousseau, the sentimentalist, addressed himself to the sympathies of the people, and was, in the end, the chief teacher of those who carried out the Revolution. Voltaire began his literary life in 1718, with his Wdipus, an attack on priestcraft. He had been brought up by the Jesuits, and yearned to attack them; in 1725 his Henriade exalted Henry IV., afterwards the hero of all Frenchmen in the Revolution, at the cost of Louis XTV.; then he was in England for threc years, and came back full of English deism and English

humanitarianism, Henceforth his life passed in alternate attacks on courts and adulation of them; he withdrew at last into the Genevan territory, whence he directed the defence of the oppressed, if they fired his sympathies, Thence also he encouraged the progress of the Encyclopédie, which, more than anything, undermined the shaking fabric of society. Meanwhile Montesquieu, in his Esprit des Lows (1748), as well as in his previous work on The Great- ness and Fall of the Romans (1734), appeared as a first master of modern French style, and as a champion of English constitutionalism in opposition to the despotism of France, Though his works have been perhaps more popular in England than in France, their effect on educated opinion was still very strong. His views did not prevail in the Re- volution-period ; still, they had no small influence destruc- tively, by pointing out to Frenchmen how indefensible was the government under which they were willing to live. "The sprit des Lois," said Count Grimm in 1756, "has produced a complete revolution in the mind of the nation. The best heads in this country (France) for the last seven or eight years have been turned towards objects of import- ance and utility. Government is becoming more and more a matter of philosophic treatment and discussion." The writers on political economy also deeply influenced the tone of the age; their doctrines effectually disposed of the faulty maxims on which financial affairs had been conducted

since the days of Colbert, and prepared men to see the

importance of Turgot's plans, and the significance of Necker's Compte rendu.

strains. Musician and sentimentalist, he hit the right tone for the popular ear; between 1759 and 1762 he published the Nouvelle Héloise, the Contrat Social, and the Emile; the Contrat was greedily devoured by society, high and low, as a revelation of a new code of politics, in which he boldly affirmed the sovereignty of the people, and the equality of all men, all being born free. His Emile was an attack on all existing ideas as to education: nature should take the place of the schoolmaster ; and the priest and philosopher should alike be kept aloof from the training-ground for men and women,—for Rousseau was as little tolerant of the Encyclopedists and

their science as of the Jesuits and their religion. Lastly, his /7élovse dealt with the moral code of

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‘4 Lastly, Jean Jacques Rousseau, Rousseau s the clockmaker’s son from Geneva, began his seductive WU?S

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1763-68.

The Encyclo- pédie.

Buffon.

The fall of the Jesuits,

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a revolution in morals as much ag in religion or politics.

It was the outcry of nature against the infinite falsenesses of a complex and corrupt society. The great Hncyclopédie was managed chiefly by D’Alembert and Diderot; the

former traced its ground plan, and wrote the preface and some mathematical treatises, while the latter supervised it, and acted as the chief editor. The general tendency of the work was to attack religion, and to substitute in its place the conclusions of modern science: with D’Alembert and Diderot worked Helvetius the materialist, Holbach, Grimm, Rayual, and Condorcet, of whom the last represents that passion for man, that warmth of heart and sentiment, which draws him somewhat near to Rousseau. Among the great writers of the time must not be omitted the harmonious Buffon, who laid before his countrymen a splendid sketch of the material world and of the creatures that inhabit it. It is the work of a poet rather than of a scientific student : we find a cosmogony, an eloquent

picture of man and man's fellow-dwellers on the globe,—if written with truthfulness or not we need not ask; at any rate, with skill and power he enlarges men's horizon. He too can praise God in his works, and in so doing can leave the established beliefs on one side. In all the literature of the age we see new grounds for speculation on every stage: theology, letters, sciences, natural history, politics, constitutional ideas, morality, all alike are grappled with by writers who shake themselves clear of existing trammels. Rejoicing in a new freedom, they familiarize the younger generation of France with revolutionary ideas in every line, aud render the coming explosion more complete and more permanent than any movement that the world has seen since the first preaching of the gospel to mankind.

At the close of the Seven Years' War the Society of Jesus was on its trial throughout Europe. The Order had changed its ground ; it had long ruled in kings' courts, and was paying the price of the means by which it had gained ascen- dency therein; it had become both rich and troublesome to society. And the general tendencies of the times were against it; above all, it incurred the deadly hostility of those enlightened ministers who, in almost every court of Europe, were directing the new-born energies of states.

'Such men as Pombal in Portugal or Choiseul in France

Choiseul's policy,

could not but resist Jesuit influences which clashed with their own, whether these regarded the interests of courts or the welfare of peoples. In 1762 the parliament of Paris, influenced largely by Madame de Pompadour, took their affairs, which had become secular enough, into its considera- tion, and decreed that the Order should be abolished. Louis XV., after some hesitation, confirmed their decision in 1764, and the Order was expelled from France. It is significant of the general movement of the period that the other Catholic powers speedily did the same, until in 1773 a Clement XIV. (Ganganelli) finally suppressed the rder.

Ou the death of Madame de Pompadour in 1764, Choi- seul still continued to hold the chief direction of affairs. His ministry, besides his belated foreign policy of the pacte de famille, was noted for more than one solid reform 3 he reorganized the army, instituted the "Ecole militaire, saw to the

progress, so far as he could, of the navy, encouraged colonization, and in 1768 united Corsica to France. He Tepresented the philosophic spirit at court, in antagonism

mankind, subverting many ideas, filled with noble, often impracticable sentiments, and leaving the impression of change and uncertainty even in those subjects which seemed least open to difficulty. He appealed to men's conscience and sense of right against the ruling vices and selfish im- moralities of the day ; and men, seeiug these glaring evils sanctioned by the presence of the priesthood, if not by its participation, warmly adopted the new ideas, and desired

to the Jesuit party, and the favour of Madame de Pompa- 1770-74. dour more than neutralized the king's dislike to him,—for

Louis XV. was very jealous of avy interference with the one

branch of government in which he took interest, foreign affairs ; and in these Choiseul was ambitious, if not very successful, So things went on till 1770, when a new mis

tress made the ground untenable for him. The low-bory beauty, Madame du Barry, was the tool of all intriguers, Madame and gained unbounded influence over the worn-out king, du Barry. Choiseul and the Jansenists, who had enjoyed a brief tran- quillity after the fall of the Jesuits, now went out of favour :

the parliaments, which Madame de Pompadour had used and 'The Par- favoured, were exiled, and-in their stead came a new system lement of administration of law. 'The old purchase system, which M@- gave stability to the parliaments, and dated from early Bour- Rs bon times, was swept away, and royal nominees were set to

fulfil the functions of the parliaments. It was thought that

the change from officials by purchase to officials by royal

grace would be welcome. France, however, distrusted them,

and said that the "gratuitous justice" so much vaunted,

meant nothing but injustice guided by gratuities,

*Louis XV. lived long enough to see the first partition of Parti- Poland (1772), that great blow to French influences in the tion of north ; nor could his interference hinder the signature of *°!224- the peace of Kainardji in 1774, by which Russia, supported by England, got hold of the Black Sea shores. His effort to seize the Netherlands, as a counterpoise to these rapid additions to the strength of the northern powers, was a complete failure.*

*In the same year 1774 Louis XV. died,—died as he had Death of lived, in flagrant vice. His reign of nearly fifty years Louis had been a continual misfortune for France. During the *V- period she is brilliant only in her literature, and even there we are couscious of something unwholesome and unnatural.*

Some years before this the dauphin had died, leaving a The char- young son, Louis, who was married in 1770 to Marie An- acter of toinette, daughter of Maria Theresa of Austria. This young ae couple, handsome end well-meaning, now came to the throne z in 1774, inheritors of the terrible destiny which Louis XV. had prepared for his grandchildren. He, cold and selfish, had foreseen the coming tempest; but "it will last my time," he said, and cared no more about it; he felt as little for his grandson as for his country. In the midst of the scandals of the court Louis XVI. had preserved his purity, and with it a charming simplicity which, while it seemed likely to render the difficulties of his position less, seemed also likely to arouse men's sympathies for him, and find him friends in need. And in later days, when he deserved it less, men, even while they struggled against him, often fondly called him "their good king." He loved his people, as a good despot might, and tried to mitigate their niisery in famine-times ; his kindliness, however, was but weak- ness—his simplicity stupidity ; he was obstinate and yet not firm; and his good and bad qualities alike made him incapable of grappling with the new phenomena of society which broke on his astonished sight. We

find that in the most thrilling moments of his history, his chief anxiety often was how he might get out to his hounds. Marie Antoinette Marie was a very different personage; she had much of her Sanne mother's high spirit ; she was always a foreigner in France. ; In the early days of her beauty, when all Frenchmen were inclined to worship chivalrously at her feet, she shocked them by laughing at usages which seemed to them the ordinary course of nature. As time went on it was plainly seen that she came between the king and his tendencies towards reform ; that she formed a court-party of her own, made and unmade ministers with no regard for the feelings of France, and no preferences except for the worse over the better public servants; that she more than neutralized all the king's economical wishes, and was extravagant and reck-

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1774-76.

"Begin- ning of the reign.

The min- istry of Turgot.

The pacte de Jamine.

Necker becomes finance minister.

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less ; his subjects,

that in the crisis of affairs she led the king away from and taught him to rely on German help. And

so, while the virtues of Louis XVI. may have retarded the

revolutionary outbreak for a few years, his weaknesses and the character of his spouse made the eventual explosion all the more complete and terrible.

The opening of the reign was a period of hope; all seemed to go so well. The king and queen themselves were no common mortals: so young, so

innocent, so graceful, they formed a strange contrast to the gloomy selfishness of the past. And roused by a gleam of hope, literature itself also passed into sentimental idyls ; the court was itself idyllic ; at the Little Trianon the king and queen played at farm and mill; the unreadable sentimentalities of Florian were the delight of Versailles ; the innocent pictures of Gessner's pen had a great popularity ; the days of Paul and Virginia were not far off. These things occupied and deluded the upper world ; the middle world smiled in bitterness over the keen satires of Beaumarchais; the lower world starved and turned uneasily on its frozen couch. The well-meant attempts of the court to administer charities, " to make little alms and great galas," as Michelet phrases it, only served still more to irritate the discontented crowd.

At first all seemed well; the ministers of Louis XV., obscure and corrupt, vanished ; some gleam of prosperity shone on agriculture, and the court was inclined to reduce the disorders of finance. No able statesman could the king find at the beginning ; he was obliged to trust to Maurepas, a frivolous and incompetent old man, who did the state one great service, for he led Louis XVI. to entrust the finances to Turgot. Turgot was a disciple of the economists, who had worked miracles of prosperity as intendant of the Limoges district, —a man of good faith, high character, and ability; but, like many others, he thought that what seemed so simple to him wonld at once commend itself to all, and entirely underrated the resistance which the interested noblesse and the court itself would make to his reforms. He at once proposed his remedies for the evils of the time,— the only true remedies—economy and the abolition of privi- lege. The state should spend less, and should draw its supplies from all orders of men alike. To the court and the nobles this seemed revolution and ruin; even the king was startled. Instead of supporting his minister manfully, he recalled the banished parliaments, and thought to shelter himself behind the law. The lawyers, however, special lovers of use and privilege, felt instinctively that Turgot was their foe; from that moment his fate was sealed. A great league was formed against him ; the powerful help of the scandalous pacte de famine, the grain-ring which had been established with the approval and participation of Louis XV., was enlisted in behalf of the privileged orders ; a famine ensued in 1775, and lasted three years. Louis XVI. was frightened; all seemed to be against him ; and at last in 1776 he dismissed his one great

minister, ‘“ Tur- got and I are the only men in France who care for the people,” was the king’s mournful complaint; it was time that the people should begin to care for themselves.

Jacques Necker, an ingenious Genevan banker, who seemed to have the art of creating resources, now became finance minister. He was a high-typed charlatan, who grasped no principles, tried no heroic remedies, but thought only how to make credit and float the country over its diffi- culties. Unfortunately for him, the strain of war expendi- ture was added to his other burdens, for France was moved by her fate to take part in the American struggle now beginning. Necker’s idea was that he might stave off the imminent bankruptcy of the state with paper and credit, and that, to be successful in this, he must lay the il foundations of credit, knowledge and honesty in

ealing. With this end before him, he wished from the

beginning to issue his Compte rendu, and thereby to let 1776-81,

France know how she really stood. This, however, he could not at first carry through, so that he was obliged to borrow for the state on his own credit, and to shift as he best might. People trusted him, and he crossed no angry and alarmed interest ; but for the American war, he might have held out a considerable time. The war, however, was grow- ing urgent. At first it had been volunteer work; for young French nobles, fired with a new zeal for liberty, went over to support the colonists in their struggle; and though the court at first was afraid of war, thanks to its embarrass- ments, it could only look with favour on this new sea-power rising up to counterbalance the overbearing supremacy of England. The most noted of the volunteers was the Mar- quis de Lafayette, who manned a frigate at his own cost. The Saratoga disaster in 1777 made more active measures necessary ; the Americans were enthusiastic, and France, pushed by the popularity of the war at court, made a treaty of alliance and trade with the colonists early mm 1778. Then began a great maritime struggle. England declared war on

France, and tried to raise up embarrassments for her in Germany; but the skilful diplomacy of Vergennes, foreign minister of France, arranged the peace of Teschen (May 1779), thereby avoiding a great European war, and also, in all probability, secnring the independence of the United States; for it freed France from anxiety by land, and

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enabled her to push on her war at sea, An alliance with —

Spain against England followed, The war lasted about five years, and was marked at first by a striking revival of vigour in the French navy. The sea fight off Ushant (July 1778), though it did not enable the French admiral D'Orvilliers to claim an actual victory, had revived hope and confidence in the country. The war was waged in five theatres,—in the Channel, at Gibraltar, in North America, in the West Indies, and in India. The French attack on Gibraltar in 1779 was entirely foiled by the strength of the place and the ability of Elliot; the threatened descent on the English shores came to nothing ; in the West Indies D'Estaing de- feated Admiral Byron. In 1780, however, the English roused themselves, and their more real strength began to appear. Rodney defeated the Franco-Spanish fleet, reliev- ing Gibraltar and Minorca from blockade ; then sailing for the West Indies, he helped the English cause against the insurgent colonists and their friends. At this time a new and powerful engine was set in motion against England ; it

was in 1780 that the system of the Armed Neutrality, in Thearm: |

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which French diplomacy had a hand, was proclaimed by Catherine II. of Russia. Freedom of navigation for all was asserted. England had insisted

on visiting neutral ships, and on confiscating all warlike munitions; she defined these by a long list of articles possibly useful to a belli- gerent, such as timber or iron, out of which ships could be built. The contention of the empress was that the flag protects the cargo; also that neutral ships, if escorted by a neutral war ship, are frea from visitation, and that a "' naper-blockade,"—that is a blockade announced but not supported by a sufficient force,—is not to be recognized as real. France, Prussia, Spain, Denmark, and Sweden, the kingdom of the Two Sicilies, Austria, all adhered to the Russian proclamation, and equipped armed ships to assert this new and liberal maritime code. When Holland also joined the other states, England at once declared war ou her, and crushed her without mercy. As an immediate result, the French navy seemed to secure the ascendant in every quarter. De Grasse defeated Howe in the West Indies, and sailed thence to support Washington and Rochambeau against Lord Cornwallis, The combination was thoroughly successful, ending in the famous capitulation of York Town (October 1781), which indicated that the struggle between England and her colonies must soon end

trality.

1782-85.

The treaty of Ver- sailles.

The re- sult of the war.

The Compte rend,

The mis- manage- ment at

court.

Calonne becomes ininister.

THE FALLING MONARCH y. |

in the discomfiture of the mother-country. In 1782, how- ever, things seemed to go better with England: in India

affairs looked brighter; Rodney defeated De Grasse off

Saintes in the Antilles ; Gibraltar held out firmly, though Minorca had fallen. Later in the year England made peace with the colonists, and recognized the independence of the

United States ; it was felt that the new Rockingham min-

istry would be willing to make peace with France. And France, much as she had distinguished herself in the war, was too much exhausted to wish to push it further. The sea-rights of Europe had been asserted against England ; America had secured her freedom; France had played a brilliant part, with one hand protecting Holland, and with the other giving independence to the United States ; she, too, was quite ready for peace. In September 1783 the treaty of Versailles was signed between France, England, and Spain. England restored to Holland the main part of her conquests, ceded Minorca and Florida to Spain, and to France her Indian possessions, confirming also the stipu- lation of the peace of Utrecht respecting Dunkirk. On the same day England also solemnly recognized the independ- ence of the young republic of the West.

France came out of the war with much hononr on all hands; as champion of liberty abroad, as founder of re- publics, as apostle of new ideas, she could scarcely be ex- pected to feel a stronger attachment than before for her own despotic monarchy. The contrast was all against the old régime, and the heavy debts incurred in carrying on the war had added greatly to the embarrassments of the crown. Moreover, Necker was gone. He had struggled hard against the inherent difficulties of his position and the per- sistent hostility of the court ; at last he had persuaded Louis XVI. to let him issue his balance sheet, the famous Compte rendu, early in 1781. The document, afterwards shown to be erroneous on the side of hope, was an offence to the spending classes, an assault on their privilege, a kind of act of treason in their eyes ; that the king should keep accounts, and lay them before his people, was in their view scandalous; from the moment it appeared Necker's fate was sealed. The Compte rendu was more clear than convincing; it made out an actual surplus of ten million livres; and Necker hoped that, seeing this, con- fidence would recover, and, like a prophecy of good, the Compte rendu would then accomplish its own statements and

make a solid surplus. For France in these years had cer- tainly been growing richer and stronger ; the duties on ob- jects of consumption had increased two million livres a year; and Arthur Young declared that "in these late days the advance of maritime commerce has been more rapid in France than in England. Commerce has doubled in twenty years." Necker had therefore a sound basis to go on; but the court could not endure life on such terms, and in May 1781 he had to resign office. From this time the queen's influence was omnipotent over the feeble king. She ruled with a succession of obscure and incompetent ministers,— first Joli de Fleury, then D'Ormesson, who, when he re- signed office, left only about £14,400 in the treasury, after having borrowed nearly £14,000,000 sterling in two years andahalf. These inen were followed by the " ladies' minis- ter,"—the Fouquet of that age, even as Necker had been its Law,—Calonne, the " enchanter," the " model minister," as the court styled him, He found "two little bags of gold, with 1200 frances in each, in the royal treasury,"—a rather slight foundation to begin upon. "There was," he says, "neither money nor credit ; the current debts of the crown were immense, the income pledged far in advance, the re- sources dried up, public property valueless, the coin of the realm impoverished and withdrawn from circulation—the whole, in a word, on the very verge of bankruptcy." His idea was to mend matters by a gay and profuse expenditure ;

the queen shonld have whatever she wanted ; "' waste is the 1786-87. true alms-giving of kings" again became a state-maxim; and all things should go on merrily, from minute to minute. So the great annual deficit continued unchecked. In the autumn of 1786 Calonne himself, in spite of his lively expedients and " gaiety of heart," as he dragged the nation to its ruin, was forced to admit that the finances were in a hopeless state. He seemed to think that the privileged orders, which had so praiscd and petted him, would be flexible to one they knew to be their friend, and induced Louis XVI. to call an assembly of notables in 1787, before whom he laid the state of the finances and his proposals for reform. For forty years finance had been steadily going wrong ; the deficit, which began in 1739, was a million

and a third per annum in 1764; was, even in Necker's days, well over two millions ; by 1786 had increased to more than six millions and a half; the best estimate Calonne could make for 1787 involved a deficit of five million pounds. Since Necker had come to power the total loans had amounted to fifty million pounds. Calonne, with irresistible force, argued from this that the ruin of the privileged classes impended, The argunient was so unpleasant that they wonld not see it. He proposed that the ¢az//e, or land-tax, should be levied equally on all; that the odious right of corvée, which took the peasant's labour, and brought him under subjection to the lord, the intendant, and the money-lender, also should be swept away ; that there should be free trade in grain, so that another pacte de famine might be impossible, and that all restrictions on traffic should be abolished. The notables replied with one voice (for they were all men of the privi- leged orders) that they would none of it. So Calonne fell, astonished at the ingratitude of his friends. Another queen's nominee, the incompetent Cardinal Loménie de Brienne, succeeded him. The anger of the people against the queen and her friends grew daily hotter ; and, though she was absolutely guiltless in the matter, the scandal of the diamond. necklace story in 1785-1786 seemed to give point to the popular discontent against her. She was frivolous and ex- travagant, and without the slightest feeling for the French nation; her love of amusement easily led people to take the worst view of all she did ; she was identified in their suinds with offensive foreign tastes and interests, and cre- dited with French morals at their worst.

The accession to the ministry of Loménie de Brienne was Ministry the beginning of the end of the monarchy. He found at of le once that he must press on the privileged classes Calonne's pio, proposals; and parties formed afresh,—on the one side the king, the queen, and the minister, supported by some of the noblesse; on the other the duke of Orleans, already beginning to take an active and ominous part in affairs, the main bulk of the nobles, and the parliament of Paris; the lawyers went with them in defending privilege. Below them all were the starving and angry people; in front of them the yawning deficit. The queen and her minister thought to save the ancient monarchy by abandoning the noblesse. To the people, however, it did not appear to be a question of one or other, but of their own claims and rights against both, No doubt the general bulk of the people

would have welcomed a king who would reform loyally; Louis XVI, unfortunately, for all his honesty and well-meaning wishes, was not strong enough to face the difficulties before him.

In August 1787 the king held a great lit de justicv, The lit or personal visitation of the parliament, to enforce the "ejustice registration of his edicts, and after he had thus over- of Louis borne its opposition, he exiled that learned body to Troyes. Though the edicts were for a stamp-tax and for the equal distribution of the land-tax, the popular voice went with the parliament; for the more ambitious and active spirits would not accept as sufficient the reforms recommended by

Brienne.

1788. the queen's party. Their temper was becoming dangerous ; | 1789 was terrible—especially in Paris; and all France was 1789, the king's action was considered arbitrary; the people of | excited by distress and hope. The capital swarmed with Distress Paris still deemed the parliament their friend. Before | incomers from the country districts round ; ever since the in Paris, being exiled, the parliament had uttered the word which | great hailstorm of July 1788, when the crops ripe for the was destined to bring things toa head. In declaring their sickle had been destroyed in all the best corn-growing dis- forced registration illegal and void, they had stated, in | trict of France, the district round Paris, = of desper- their anxiety to escape the new imposition of the equalized | ate country folk had been pressing in. All this mass "taille," that the States-General alone could legally impose floats about Paris," says M. Taine, "is engulfed therein, as taxes, a doctrine unfortunately unknown in France for many | in a great sewer, the honest poor and the criminal alike ; centuries. The whole nation heard the word, and learnt | some seek work, some beg, all prowl about, a prey to with emotion that the ancient monarchy had long been an | hunger and the rumours of the streets. The officials note The usurper. Throughout the

kingdom now rose up a cry for | that a large number of sinister-looking men pass the cry for the convocation of the States-General. No one clearly knew | barriers inwards." .. . "The general aspect of the mob ay what they were or how they would work ; the last meeting | changes; it contains now a quantity of strangers from ener" of those august bodies, 173 years back (1614), had broken | all parts of the country, mostly in rags, armed with great up in confusion ; of the organization, procedure, and powers | sticks, whose very look is menacing." ' Vagabonds, ragged of the Estates no one could speak with certainty. Neverthe- | fellows, many almost naked, with appalling faces—beings less, at the moment they seemed to offer hopes of a solution | one does not remember to have seen by daylight,—a of pressing difficulties; and at last the king, with much | frightful physiognomy, a hideous attire." Such is the reluctance, promised that they should be called together | impression left by the crowd of refugees and others who within five years. swarmed in the lower districts of Paris; this is the Court The parliament was then recalled to Paris; and the king | rough material out of which the Parisian and decisive and Par- held a "royal sitting," a different thing from the offensive | element in the Revolution will be made. The Government ee lit de justice, and expounded to the lawyers his views as to | thought little of this for the time ; the States-General were

the position of affairs. Ominous were his words, fur they proved that he had no insight into the great questions seething, and that he clung in a dull and obstinate way to the traditions of the ancient monarchy. He showed France that he meant to deal in a narrow and hostile spirit with the States-General, and that he reserved to himself in all

to meet not in Paris but at Versailles, under the shadow of the monarchy ; Paris, long neglected and disliked by the kings of France, was left out of their calculations at this moment.

IV. THe Revoivution.

matters the ultimate decision. Lastly, lie offered for their registration two edicts, framed, one might think, specially to affront his hearers,—the first (in opposition to the previous declaration of the parliament) authorizing loans to the frightful amount of 420,000,000 livres (£16,800,000) ; the other ordering the restoration of Protestants to their civil rights. Then the duke of

Orleans, great-grandson of the regent Philip, protested, and the parliament, en-

We are come to the verge of the French Revolution, The which surpasses all other revolutions the world has seen in French its completeness, the largeness of its theatre, the long pre- " paration for it, the enunciation by it of new points of view — in politics, its swift degradation into imperialism, its influ- ence on the modern history of Europe. It has been truly said that France had for centuries been preparing for it, for centuries she would feel the effects of it. The imperial-

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couraged by his example, declared that the edicts had been registered by force. Orleans was exiled; and the ferment in Paris and through France became extreme.

The struggle between court and parliament grew bitter ;

ism, which has traversed and marred its due development, has perhaps already passed away—its destructive work is over ; the republic under which France now lives may be the turning point of European history.

For all revolutions there are needed first a favourable Cansesof concurrence of external circumstances,—such as, in France, revolu-

the parliament declared lettres de cachet to be illegal, and affirmed that the queen's influence was the cause of the present evils.

The court-party in rejoinder proposed to establish a plenary court for the registration of edict The parliament protested, and posed itself as defender of the liberties of France. They were forthwith shorn of much of their power, and their function of registration taken away. The-local parliaments throughout France were treated in like manner, and it is from this circumstance that one of the most tremendous organizations of the Revolution took its rise. Remonstrants travelled up to Paris from different

centres,—among others from the Breton parliament of Rennes,—to protest against the high-handed action of

the character of Louis XVI. succeeding after his grandfather, #°™

tlle anti-national temper of his court, the outbreak of the American War of Liberation, the ferment of modern ideas in all the countries of Europe. Next, there must be a "semen martyrum," a faith of internal conviction which will strengthen men to face death for their cause, because their minds are lifted above common life and its trivial affairs ; this, too, existed in France, and cannot be under- rated as a motive power. Sometimes partial and narrow, yet always generous and warm, was the enthusiasm of younger France for the "principles of '89": the equality

The the court. The Bretons formed themselves into a club, | of allmen before the law and for the burdens of citizenship, ee which, having headquarters in the old Jacobin convent in | the excellence of virtue, the sovereignty of the people, obed-

the St Honoré street, soon changed its name from the Breton Club to the Jacobin Club, and became the home of the most advanced republicanism.

Things now weut even worse. The old pacte de famine, which the humanity of the king had kept down, again began its baleful operations ; the disorders of finance went on : there was no money with which to carry on the government. Brienne, at last driven to despair, induced the king, in spite of the queen's strong opposition, to convoke the States- oan for the 5th May 1789. Soon after this, unable to a a difficulties of finance, and having tried in vain a wei Of concealed bankruptcy, he gave way and sent in his

esignation. Necker was recalled. The winter of 1788—

ience to the law, the blessings of freedom of person, press, and belief,—these and the like, afterwards embodied in the Déclaration des droits de Vhomme, were great engines which set the Revolution moving, and directed its general course. Joined with these ideas, which cannot reach down to all, there must be a general feeling of misery, oppression, wrong. This the scandals of finance administration, the despair of frequent famines, the

grievous incidence of the corvée and other ancient services, the inability to get away from the soil or to rise, largely supplied. Moreover, the divergence of classes, which in France had long been increasing, was such as to endanger in itself the stability of society. The older creeds, too, were dying down into

1/89.

The claims of de- mocracy.

The States- General of 1789.

THE STATES-GENERAL. |

their embers, and had lost the power to arouse enthusiasm ; while the ancient framework of long worn-out institutions still encumbered all the land, and with their dead weight pressed men down. Selfishness above, hypocrisy in faith, inisery below,—these things demanded vocal leaders for attack, and the leaders were not wanting—they were first the great writers, and afterwards the chiefs whom the violence of the time threw to the surface.

Enrope had long been uneasy ; the " benevolent despots " had tried their utmost for the people and against privilege , enlightened ministers seemed to themselves to be carry- ing out the principles of Richelieu; they fought against custom and institutions, irritating, weakening, even revers- ing them. And yet in all they scarcely recognized the ex- istence of Democracy, of a people which would be heard, and would take the foremost place in the rearrangement of Europe. While the monarchs who said of their business with Joseph IL, ' C'est @être royaliste," were levelling privilege or church immunities, dismissing parliaments or exiling Jesuits with a view to raising their own authority, they little knew that they themselves were in danger. For the new democracy changed the centre and place of sove- reignty, and while, as De Tocqueville says, "it swept away the feudal institutions and replaced them witli a social and political order, more uniform and simple, and based on the equality of the condition of all," it was also sure pro- foundly to modify the views of Europe as to the position of the monarch, as to the headship and sovereignty in a nation. And the great change began in

France, not because she was more, but partly because she was less oppressed than her neighbours. In comparison with the German, the French peasant had many advantages,—there was less serfage, there were more peasant proprietors. " This," said Arthur Young in 1788, "is the mildest government of any considerable country in Europe, our own excepted." This milder state of things made men more capable of indig- nation against the injustice they could feel; the most crushed do not feel the most; they are helpless, ignorant ; but when men have begun to rise and to understand, then they grow dangerous to their masters. The very attempts made by benevolence in high place to succour the misery of the people roused their anger against their lords,—a point to which De Tocqueville dedicates a whole chapter, entitled 'Comment on souleva le peuple en voulant le soulager." In addition to this we must remember that the Revolution found much to forward it in the brightness of the French temperament. The simple principles it preached, with accompanying appeals to virtue and patriotism, at once commended themselves to a people fearfully ignorant, yet unusually intelligent and lively. In their strength and their weakness alike the French people were singularly well fitted to be the heralds of the new conditions of political life in Europe.

Early in 1789 all France was busy with the elections to the States-General, and in drawing up the ca/zers, or papers of grievances. From the moment of the king's edict (8th August 1788), convoking the States-General, discussions had gone on with growing eagerness as to their proper consti- tution and form. Some urged the pattern of the English constitution ; others wished for the forms of 1614; others pointed out the increased importance of the third Estate in numbers and wealth. It was seen that the Estate which in fact would be called on to pay almost the whiole sum to be raiscd must have greater strength than the precedent of 1614 could give it. Bankruptcy stared the court in the face ; the king only called the Estates together because the finances were in a frightful condition ; he openly sets this forward as the chief reason for their convocation. A demand accordingly arose for two things :—first, that the third Estate should be composed of as many members as

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tlle other two orders combined ; secondly, tbat the three 1789.

orders should debate and vote by head, in one chamber. It was urged on this hand that thus only could those defend themselves who would have to pay the taxes; on the other hand, that to sit in one chamber would be a dangerous innovation, and that a majority of the third Estate would set the unprivileged public above the privi- leged few. The parliament of Paris, with its lawyer-like preference for precedent over justice, and its incapacity to discern the real issucs before it, warmly supported the latter view, and urged the king to follow the rules of 1614. The popularity they had up to that time rather undeservedly enjoyed was destroyed in a moment; it was seen now that the lawyers were as earnest for privilege as the rest. A convocation of notables, chiefly members of the privileged orders, to rule the form of procedure, in spite of Necker's efforts, supported the views of the parliament. The matter grew warm; the princes of the blood, Artois and Condé and the others, who had supported the queen inall herfollies, added thcir remonstrances in the same direction; the popular ferment spread all the more, and Necker became the idol of the people. By his influence the king was induced at last to issue an edict to the effect that there should be in all full a thousand deputies to the States- General, made up in proportion to the population, and that there shonld be as many deputies of the third Estate as of the other two combined. As to the one-chamber ques- tion the decree was silent. In former States-General the third Estate had usually sent more than either of the others ; in those of 1560 the third Estate had much exceeded the other two combined, so that this great concession was little more than a continuance of ancient use. It was also de- cided that the election should be by adouble process. The electors, in number about three millions, were limited by no property qualification ; it was a kind of simple household suffrage in the country districts, each 200 hearths choosing two representatives, and so on; in the towns two delegates for each 100 inhabitants, and so on upwards,—so that the towns chosé twice as many primary delegates as the country districts did for their numbers. These delegates from bailiwicks and towns were empowered to meet in the chief town of each province, there to draw up their cahvers, and to choose from

their own body the persons who should proceed with the grievances in hand to Versailles as members of the third Estate.

The elections to the first Estate, the clergy, returned 291 members,—48 archbishops and bishops, 35 abbés and canons, 208 parish priests ; these latter were largely in favour of liberty, and when the time came supported the third Estate in its struggle, while the bishops and higher clergy mostly went with the privileged orders. The second Estate, the noblesse, returned in all 270 persons, one prince of the blood, 28 magistrates, 241 "gentlemen " or holders of noble fiefs. The smallness of their total is due to the proud abstention of the Breton nobles. There were among them a few who sympathized with the popular movement,—at their lead the duke of Orleans. The third Estate was composed. of 557 members, nearly half of them barristers, and almost all united in defence of the country against privilege. The cahiers of all the orders, the third no less than the others, breathed a very moderate spirit. Almost all spoke warily and hopefully of the king,—all expressed respect for the royal power. The cahiers of the nobles urged the interests of their order without hesitation ; those of the clergy desired the bettering of the condition of parish priests ; those of the third order insisted on the abolition of the unequal rights and services, which were felt throughout France to be a great grievance and hindrance to the well- being of the country.

When the three Estates met at Versailles, it was seen

Theman- ner of election.

The numbers. of the Estates.

1788.

The treat- ment of the third Estate.

The Na- tional Assem- bly.

The king's want of wisdom.

The Con- stituent Assen bly.

that the points at issue were not easily to be settled. The action of the king and his ministers was exceedingly foolish and weak; instead of taking a vigorous line with the question of the vote by head or by Estate, they lingered over trivial questions as to order and etiquette, which could only irritate the "representatives of the people," as men now began to call the third Estate. They must kneel to present their cahiers; when they met they must enter through a backdoor, while the others entered through the main gateway and stood in the royal presence. Ina number of petty matters the court seemed determined to remind them that they were inferior to those with whom they sat, while they, in the language of the Abbé Sieyés, felt that "the third Estate was the nation, less the privileged orders." The folly of this treatment strengthened their hands, as did also the blunder of providiug no separate hall for them to sit in. After the opening session, when all met the king, they installed themselves in the great Hall of the Estates, and so took possession of the ground they were only too eager to occupy. 'The verification of powers was the first step to be taken. They urged at once that the three orders ought to verify together, sent invitations to the other orders, which verified separately, and set to work at their deliberations. The third Estate waited, refusing to proceed till they had solved the main question. Meanwhile the court upbraided them for wasting precious time ; it became daily clearer that all their masters cared for was that they should arrange for the payment of the deficit and be gone ; and then after some delay, they began to verify, taking on themselves to call the roll of all three orders. At the first call no response was made by either noble or clergyman ; at the second three curés answered, and were received with enthusiasm; after a short time as many as 100 members of the clergy joined them. They named themselves "the National Assembly" (17th June 1789), and issued a declara- tion that the creditors of the state were guaranteed by the honour and loyalty of the French nation ; that if they were dissolved, taxation levied thereafter would be illegal; that a committee should be named to inquire into the general distress. Then the clergy, by a small majority, agreed to

join the third Estate, and did so; Necker thereon advised

the king to yield the point of separate chambers, and to "deign to resign himself to the English constitution," a phrase singularly indicative of Necker's temper and views, and just as inapplicable to the real state of the case. The king, however, would not yield. Though Necker knew, and the king should have known, that the army could not be trusted against the Assembly, he committed himself once more to stupid and irritating tactics. The great hall was closed against the representatives, and they adjourned to the neighbouring tennis court, where they took solemn oath (20 June, 1789) that they would not separate till "the constitution of the kingdom had been established and confirmed,.on solid foundations." Under this oath the Assembly claimed a new name, that of the Constituent Assembly,—the Assembly charged to create a new constitu- tion. The king showed utter want of discretion : he annoyed the moderate party in the chamber, who were headed by Count Mirabeau, by refnsing to give them any insight into his plans and policy; he alienated any support he had within the Assembly, because he regarded it as a usurping body, insulting to him by its claim of permanence and authority. Next, the Assembly was told that the tennis court was wanted by the count of Artois—the most unlucky of all the supporters of the queen's policy, the most offensive to the people. Once more treated by the court with con- oe because it could not venture to use violence, the oe in the church of St Louis at Versailles sarey hee a ytule On the 23d they were summoned

ya' sitting" of all the orders, in which the king

-the queen would not loyally accept the situation.

NE lamented the conduct of the commons, and declared the concessions he would grant. 'The representatives of the people, who had been treated with the scantiest courtesy that morning, received the discourse in silence—a silence deep and anxious, especially when Louis XVI. told them, speaking as an angry master to disobedient servants, that the orders shonld not act together, but should meet next day in their separate chambers. When he rose to go, he was followed by most of the nobles, the bishops, and some clergy ; the third Estate and a large proportion of the parish priests remained, and sent a message to the king to say that they would only retire if forced to do so by the bayonet. Necker, feeling that the king was

completely committed, now resigned. The duke of Orleans, with 46 of the nobles, joined the Assembly; after that, force being out of the question, Louis XVI. was obliged to tell the remainder of the noble order to join the others. And thus by June 27, 1789, the orders had all accepted the victory of the commons. The king now threw himself entirely into the hands of the court; Necker's resignation was accepted ; attempts were made to get regiments that could be trusted to Versailles; the Swiss aud German troops seemed the mainstay of the monarchy. On Monday, 12th July, it came to a collision between the troops and the people. In

dispersing a " Necker procession," an enthusiastic unarmed – with the

crowd following a bust of the ejected minister, Prince Lambesc, acting under Baron Besenval's orders, fired on the people. A French guard chanced to be among the killed ; thereon the whole guard sprang into revolt ; the old municipality of Paris, the ancient provost and échevins, who were royal nominees, were swept away ; a new provisional municipality arose, and a new Parisian militia. The

tricolour flag sprang into existence,—red and blue, the old The tri-

colours of Paris, with white, the significant ground-work of the new constitution. The troops cantoned on the Champ de Mars were now powerless against Paris, which had taken the lead in insurrection and incipient revolution ; while the Assembly at Versailles was surrounded by foreign troops, and in danger of forcible dispersal. Paris quickly consolidated her movement. On the 14th of July the new civic guard seized the arms at the Invalides, and on the same day took place the assault on the Bastille. The troops at the Champ de Mars could not be trusted; Besenval them back to Versailles. with broken promises and unnecessary bloodshed ; for now the fierce passions of civil war began to move, and the Paris mob had in it desperate and savage elements, The Bastille was levelled to the ground; it symbolized the overthrow of the ancient and worn-out institutions of the monarchy.

Then the king again appeared in the Assembly, declared that he wonld remove his troops from Paris and Versailles, and appealed to the fidelity of the Estates. Paris grew calm at once; Bailly was made mayor, and Lafayette commander of the civic forces. Louis XVI. went further still; he visited the capital (17th July) and appeared wit the tricolour cockade on his breast. The Parisians welcome him with enthusiasm, and a happy reconciliation seemed to have taken place. The party of Philip of Orleans sank into the background. Unfortunately for the monarchy, Louis XVI. might have become a constitutional sovereign—a first roi des Francais; his court made it impossible for him. On the very night before his visit to the Hotel de Ville the emigration of dissatisfied nobles began, and the plans of the court-party at once changed form; from plans they became plots. The queen stayed behind, for she was fear- less in disposition and loyal to the king. She only succeeded in involving him with herself in utter ruin. |

By the 22d of July the first stage of the Revolution was

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First

people,

colour.

Fall of

*drew the Bas- The fall of the Bastille was sullied ***

Lonis

Xvi. in A Paris.

THE RIGHTS OF MAN. |

complete. The events of Paris and Versailles found re-

sponse throughout France ; national guards were organized

everywhere ; the nobles, attacked by the peasantry, made

for the frontiers; some laid down their privileges, and hoped

to stay in France. The Assembly, backed by Paris, had

all power in its hands; the king had to recall Necker, whose vanity and shallowness were not yet found out.

Consti: On the 4th of Angust the Assembly got to work at its

tution business, the framing of a new constitution. With so

making. few solid institutions as France had, with not one true

constitutional tradition, with passions aroused and great

underhand opposition at court,—it is a marvel that so

much was achieved. Privilege was at once abolished,

the last relics of feudal use swept clean away; nobles,

clergy, the pays d'états, cities which enjoyed local liberties

and advantages, all laid down their characteristic and

special privileges, and begged to be absorbed in the equality

of one general French citizenship. Equality is the promi-

nent feature of the Revolution epoch; it overshadows at

this moment both liberty and fraternity. The practical

carrying out of the principles of equality was not so easy ;

many who laid down their privilege in words, clung to it

in fact; it caused ugly scenes in the country ; and the

feudal burdens were in some places hardly removed till the very end of 1790. The Assembly next declared the king to be " the resturer of French liberties," and offended him, on the other hand, by reducing his hunting-rights to those of an ordinary landowner. The king's captitainertes, a circuit of some 40 to 50 miles round Paris, which had been felt to be very mischievous to agriculture, and connected only too closely with the famines of Paris, were much cur- tailed. When these things were laid before the king, it was seen that his heart was not with the Assembly ; on technical grounds he refused to sanction them. Then the Assembly advanced to the consideration of a great declara- The de- tion of the rights of man—a general statement of the prin- aration ciples and bases of civil society. Carlyle sneers at the re- ofthe sulting document :—rights, yes, but duties, where are they ? ie of snd what reference is there to might? Still, it is clear that,

- *had the Assembly not occupied itself with this reasonable and logical statement, its enemies could at once have accused it of haste and inconsequence, of passion and pure love of destruction. As a fact, the Declaration of the*

Rights of Man ranks, as Madame de Staél says, side by

side with the English Bill of Rights and the American

This last was addressed to a people happily

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Declaration. quite ignorant of all feudal questions, while the English Bill of Rights dealt solely with practical matters, assum- ing the main principles of constitutional life to be known, whereas the French Declaration had to begin a fresh epoch—to appeal to a people shaking themselves free from absolutism and feudal oppressions, to affirm the first prin- ciples of civil life, to give practical expression to opinions floating in every mind. To us the Declaration reads like a string of political commonplaces ; we are familiar with the whole row. To the French it was very different, for they were beginning a new life, and scarcely knew where to tread,

The This charter of the Revolution is in substance as follows. (1) All men are born and continue free and equal in rights ; ars. social distinctions are purely conventional. (2) Society is tion, 20 association of men to preserve the natural rights of men.

(3) Sovereignty resides in the nation ; all authority, vested in an individual or a body of men, comes expressly from the nation. (4) Liberty is the power of doing what we will, so long as it does not injure another; the only hmits of each man's natural right are such as secure the same rights to others; these limits are determinable only by the law. (5) The law can forbid only such actions as are mis- chievous to society ; 'Quod lex non vetat, permittit." (6) Law is the expression of the general will ; alt citizens have

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a right to take part, through 'their representatives, in the 1789. { making of the laws; law must be equal for all ; all citizens have equal rights (according to their fitness) to fulfil all offices in the state. (7) Accusation,

arrest, detention, can only be in accordance with the law, which aJl are bound to obey. (8) The law must be reasonable ; it must not have any retroactive force. (9) Every one is to be deemed in- nocent till he has been convicted ; persons under arrest on suspicion must therefore be treated gently. "(10) All men are free to hold what religious views they will, provided they are not subversive of public order. (11) Freedom of speech, of writing and printing (save in cases reserved by the law), is one of the most precious of the rights of man. (12) A public force is needed to guarantee the mghts of man; such a force is for the benefit of all, not of its own class. (13) To support such force a common contribution is necessary; it is to be equally laid on all citizens accord- ing to their means. (14) All citizens have a mght to show (personally or by representatives) that such public contribu- tion is necessary, to consent thereto, to arrange its applica- tion, its incidence, its manner of ingathering, its duration. (15) Society has a right to demand from every public servant an account of his administration. (16) A society, the rights of which are not assured, the power of which not definitely distributed, has no constitution. (17) Pro- perty being an inviolable and sacred right, no one can be deprived of it, save when public necessity, legally esta- blished, evidently demands it, and then only with the con- dition of a just and previously determined indemnity. Having laid down these principles, the Assembly went on The de- toabolish such institutions as offended against the liberty and claration equality of the rights of man. "Nobility, peerage, heredi- acted ™ tary distinctions, distinctions of orders, feudal régime, patri- monial justice, titles, denominatives or prerogatives thence derived, orders of chivalry, corporations, &c., which re- quired proof of nobility or presupposed distinctions of birth," were all declared to be swept away, such distinctions alone remaining as belonged to public functionaries in discharge of their duties, Wenality or hereditary succession in offices was also abolished; all Frenchmen in all parts of the country should have equal and common rights ; no guilds or corporations should remain ; nor would the law recognize any religious vows or other engagements which might mill- tate against either natural rights or the constitution. Such, from end to end, is the Declaration of the Rights of Man. Equality of all men, abolition of feudal privilege, inclusion of the monarchy under the coutrol of the sovereign people —these are the chief principles involved in it ; out of these the Revolution grew. In itself the Declaration was not subversive of monarchy ; only the French monarch, with. two

centuries of Bourbon tradition behind him, could not stoop to take a new position in France 5 Louis XVI. could not become a constitutional king. The Assembly also framed its new constitution, according to the promise of its The con- oath of the tennis court. A limited monarchy, without an stitution. absolute veto, and a single chamber having alone the right of initiation of laws, formed the chief elements of it,—the nation to order, the king to execute. " The Revolution from its social side attacked the aristocracy," says La Vallée, "from its political side it attacked the monarchy ;" and the single chamber, with a royal suspensive veto which might be overruled in time, seemed to the French people best and simplest. The great danger of the Revolution lay in its simplicity : everything was to begin from a pure white basis; there should be no checks or counterpoises ; all should be consecutive, logical. The ambitions, vices, prejudices of men were regarded as nothing; the nation, not even educated as yet, was thought fit to be trusted with absolute power. It is indicative of the ferment and the ignorance even of Paris that the very name of veto aroused

vehement disturbances; the royal veto was in their eyes the old régime restored.

The excitement of Paris grew ; famine reigned ; distrust and irritation followed. It was seen that the royal family were surrounding themselves with troops ill-affected towards the Revolution, and with a great number of devoted officers. Rumours flew through the town; plans of vengeance were supposed, communications with foreign powers and emigrant nobles. The king's reception of the Declaration of the Rights of Man had been cold and partial ; the new journals of the time threatened fresh disturbances. At this moment (3d October 1789) the amazing folly of Versailles showed The Ver- itself in a great banquet given to the soldiers, in which sailles royalist songs, white cockades, ladies' smiles, and plenty of banquet. food goaded the hungry "patriots" of Paris to madness.

A vast crowd, chiefly of women, with the national guard, headed unwillingly enough by Lafayette, streamed out of the gates, and marched to Versailles, insulted the Assembly then sitting, and swarmed round the palace gates. When the king came back from his hunting,—his one solace in these

difficult days, —he spoke them fair ; but a struggle having begun, in which some blood was shed, he became in fact their prisoner. In an interview with Lafayette, he showed his wonted obstinacy, and practically refused to send away his Swiss guards. Things became very threaten- ing, and Louis at last consented to go to Paris. The queen and the dauphin refused to leave his side ; a deputa- tion of 100 members of the Assembly also accompanied him. The Thus Paris at one blow gained the ascendant over both triumph king and Assembly, and the Revolution entered at once on of Paris. 1 new phase. Changes will become easier, the seat of government and movement being narrowed to one city. The vehement eagerness for discussion of political questions, already so prominent a feature of the time, will increase greatly; crowds will frequent the meetings of the Assembly, interfere with its discussions, sway its fears and wishes. "There is a gallery," says Arthur Young, an eye-witness (12th January 1790), "at each end of the saloon, which is open to all the world. . . . The audience in these galleries are very noisy ; they clap when anything pleases them, and they have been known to hiss—an indecorum which is ut- terly destructive of freedom of debate." The press became more active than ever, with countless pamphlets on the questions of the day ; and lastly, the influence of the clubs, especially of that of the "Friends of the Constitution," The Ja- the Jacobins Club, now began to take the chief direction ag of affairs for the more thorough revolutionists. With its affiliated clubs throughout France, it formed an all-power- ful confederacy, and became the rival of the Assembly itself. The virtual imprisonment of the royal family at the Tuil- erles frightened the royalist gentry; a second and more The emi- numerous emigration now took place. Suspicion and dis- gration. trust reigned ; all held their breath, and thought they felt beneath them the muffled mining of some plot. Royalists accused the ambitious and unsteady Philip of Orleans of making disturbances for his own purposes in Paris; repub- licans felt sure that the queen and her party were plotting the overthrow of the new order of things with the emi- grants and her German relations. The duke of Orleans, a silly and stupid giggler, as Arthur Young found him, was driven by Lafayette to take refuge in Eugland. The two chief parties of the Assembly, the Right and the Left, repre- sented those who hoped, as Mirabeau did or Lafayette, to securea modified and constitutional monarchy in France, and those who desired to see a republic. Independent of sage were intent on the framing of the constitution, S the court party, which hoped to restore things to their

ancient form, and to inc system of the past. ring back the monarchy and the

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The Assembly now set itself to frame the constitution,— 1789, the task to which it had solemnly dedicated itself. In Themak. France herself there were no precedents to go on, no healthy ing of : institutions to be worked in. The clergy were powerless ; a — | the nobles, who might have modified and influenced matters, — . were contemptuous and careless. Arthur Young specially notices their flippant treatment of the crisis they were in; they did not really believe that the new order of things could last, and even expected a counter-ievolution. Some of them thought that by pushing the innovators on- ward they would secure an earlier reaction ; doing so, they worked their own ruin and the king's death. The active leaders of the Assembly had then no help at home; they spurned the example of the English constitution, which was often urged on them, for they considered it with truth far too monarchical and far too aristocratic for their prinei- |

ples. It was then almost from a "tabula rasa" that they had to start, — without institutions to use, without experience to warn, or examples to guide them. They were sincere, and knew their own minds, fearlessly pushing the principles { they held to their results. Their first achievement was to carry out the Declaration of the Rights of Man in terri- torial matters, by totally rearranging the soil of France. They would consolidate and centralize, and show that unity f pervaded all. With this end in view they swept away all The geo- | the ancient historic provinces, which one misses so much graphical | on the map of France. No more duchies and counties, mento | pays @états and pays a élection ; no local rights or specialties France, were preserved ; the local parliaments were swept off, the

local administrations abolished; the very names of Breton

or Provengal, it was hoped, would be absorbed in the greater i! name of Frenchmen. Instead of the old divisions, the country was distributed into 83 portions, as nearly as might fi be of one size, and these were named departments ; each department was subdivided into districts, and each district | into cantons or communes. This done, the political struc- ture was at once begun in accordance with it: each department should have a council of thirty-six members and I an executive directory of five; the districts similarly should have officers, subordinated to those of the department; the communes also, in like wise, under the districts. Then came the distinction between active and passive citizenship, iy as a base for the franchise. Active citizens, who paid taxes Active | equivalent to three days' labour and upwards, alone had a 24 | vote; there was a higher property-qualification for the ate. . electors whom they had to choose. The passive citizens a were excluded from all share of power. The electors were charged to choose deputies for the National Assembly, ad- ministrators of departments, districts, and-communes, and if eventually judges, bishops, and parish priests. The judicial Revision system was entirely recast. In place of the local parliaments ° a 1 there were to be three orders of tribunals,—cantonal, ae. district, and departmental; and above all, at Paris, a great supreme court. The system of trial by jury was intro-

duced for criminal cases. The National Assembly should The |

be the fountain of legislation, should be permanent, and | of one chamber only; it should be renewed by biennial % om. elections. Its number should be 745, distributed among ply. departments according to the proportions of land, of popu- lation, and of taxation. 'The Assembly also laid down

a definition of the citizenship, and marked out the position

of the king, It next considered the state of the finances; Finance. for now, even as under the old régime, France was threatened with imminent bankruptcy. Loans were not

taken up, taxes fell short, patriotic contributions ran dry.

In this great peril, Talleyrand-Perigord, bishop of Autun, proposed to apply the lands of the clergy for the purpose of meeting the deficiency. The

committee of finance declared Sale ot by his voice that the clergy were not proprietors but ad- ministrators only, and that the nation could take on itself ;

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the expenses of public worship, and resume its ownership of the lands of the church. In spite of the vigorous resist- ; ance of the clergy, and their offer to make a gratuitous gift ' of part of their lands, the Assembly adopted the proposal,

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power in their hands. The gulf between them aud the 1790. privates, the scandals of mismanagement, the spread of re- Officers volutionary opinions in the ranks, after a time rectified the and pri- evil, and the army before long became the chief support of tes:

CHANGES IN FRANCE. |

1789-90.

Civil "civil constitution of the clergy," in which the state made | civic oath, all seemed to promise well. 'The Assembly had constitu: a great step in the direction often since taken with more | voted a liberal civil list ; they had treated him with courte- a or less success,—the direction of controlling the spiritual | ous respect ; he seemed thoroughly popular. Had ho been a powers, The Assembly began by affirming the constitution | a man of any real vigour of character, he miglit have held to be based on Christianity, while it refused to admit a | the movement entirely in his own hands, and have shaped state-religion, abolished monastic vows, religious orders, | the future constitution of his country, saving it from extreme and confraternities, with exception of some useful ones. | measures, great excesses, savage civil war, and tremendous It then, following the impulse of uniformity given by the | efforts to keep off the foreigner. This, however, was not in new partition of the soil into departments, rearranged the | him ; his amiable disposition drew him one way, the tradi- ecclesiastical divisions on the same basis,—a bishop to | tional belief in his irresponsible and divine

right drew him each department, and so on. The influence of the Jan- | the other; he became undecided ; people grew suspicious. The end senists among the clergy in the Assembly was felt in all | Necker, not a strong man, had hitherto been his guide ; he F the this; it is their last appearance in French history; after | had now lost all his popularity, for public opinion had gone a 1790 their name hardly ever occurs again. It was clear | far beyond him, and he was not statesman enough either that the upper clergy and the bulk of the lower would | to direct or to assist it. He sent in his resignation (4th resist this propossl. If the state severed the ancient re- | September 1790), and was followed by the rest of the minis- lations between the church and itself, it must, to a large | ters, who were suspected of underhand communications extent, leave the church to manage its own affairs. As | with the émgrés at Coblentz. The king was deeply moved it was, the state had laid hands on church lands, had de- | at finding a new ministry not of his own choosing ; and clared against the connexion, and yet was determined to | finally, when the Assembly made its attack on the clergy, rearrange the spiritual domain. Finding strong opposition, | he ceased to feel a wish to keep terms with the Revolution. the Assembly next ordered the clergy to take an oath of | It must be stopped, either by combining against it all the obedience to the civil constitution. This, however moder- | moderates with the dissatisfied and alienated classes and ate as it was in itself, involved an acknowledgment of the | their supporters, or by calling in the refugees from abroad authority of the state, which in fact prejudged the whole | with foreign help at their back, Between these two plans The two question ; consequently, fully five-sixths of the clergy re- | the king stupidly oscillated, in the end ruining both his courses fused the oath, and they with their flocks were still a very | friends and himself. Bouillé, Lafayette, the royalist depu- en considerable power in France. The result was that the in- | ties, the moderates in and out of the Assembly, desired the yyy. terference of the Assembly in church matters broke up | former course; the Austrian queen, the count of Artois, the parties very much, and threw the power almost entirely into | emigrant nobles, who all lacked real patriotism and were the hands of the non-religious sections of the body. The | half foreign, desired to be replaced by German bayonets. sight of the church in rebellion, the contempt and aversion | Louis, before the end of 1790, was in negotiation with with which the priests who took the oath were regarded, | almost all the kings of Europe ; at the same time the queen, put religion into

definite opposition to the Revolution ; | who hated Lafayette, kept the constitutional party at home though Jansenists and Huguenots were warmly attached to | at arm's length. She hoped to neutralize the movement at the new order of things, their influence was weak. Hence- | home, while she intrigued abroad, by winning Mirabeau, Mira- forward, in the mind of France, Christianity was regarded | the terrible orator of the Assembly, in its earliest days the —_ as identical with reaction. fearless champion who did not quail before the king or the P sii Aboli- The lawyers and the clergymen had thus been dealt with ; | king's servant, the revolutionary nobleman whom his own a, it remained to abolish nobility. "The lawyers had caused | order had cast out ; he might retain all his opinions, which ™Y: agitation in the country ; the clergy had kindled civil war ; | were not republican, should be subsidized by the court, and

and ordered the sale of the ecclesiastical domains. The argument that these lands were part of the absolute pro- perty of the Church Catholic in general, and not of the French clergy in particular, was too unpatriotic to be listened to. The sale, however, was a failure; men were too much frightened by the rapid movement of affairs to feel much confidence, and things again seemed to be at a stand-still. Then the Paris commune hit on a plan which succeeded. The municipalities throughout France were authorized to buy these lands from the state, and to sell them again to private purchasers ; and the municipalities might pay for them in bonds, or asstgnats as they were called, based

on the actual value of the land. It was ordered that the | lost ground through it. Up to this time Louis XVI. had The po- issue of assignats should be limited, and that they should | shown himself willing to go with the Assembly. Fora while sition of be extinguished as the lands passed into private hands, and | he seemed really to wish to be a constitutional monarch, oa

hard money was given for them. The measure brought instant relief to the Government, and the assignats, as has been said, "saved the Revolution." Then followed the

the nobles were now about to produce foreign wars." The decree of June 19, 1790, swept away the last distinctions of feudal origin, and the nobles

and bishops deemed them- selves no longer bound by any ties to the new order of things. They did all they could to push matters to excess, with terrible results to themselves. As the nobles alone officered all the regiments of the army, they had great

the new republic. In August 1790 a kind of struggle went on; in many places the regiments chose officers from among themselves, and turned out their noble masters ; in other places they accused the officers of plundering the military chests,—an accusation in some cases only too well founded. At Nancy, under Bouillé's orders, a revolt of three regiments on this ground led to a terrible battle in the streets, in which the regiments and citizens were mercilessly crushed by the garrison and national guards of Metz It was done by command of the Assembly; Paris, however, and the revolutionists generally, sided with the defeated regiments, and the king, the Assembly, and Lafayette all

and, till after the féte of July 14, at which he, the Assem- bly, the national guard, and a crowd of spectators from all France, renewed, in the midst of boundless enthusiasm, the

should uphold the throne. The suspicion and watchfulness of the Jacobins Club, and of the extremer party in the Assembly, did not hinder Mirabeau from operily doing his utmost to preserve portions of the royal authority; and when, early in 1791, he felt that he had some hold on the court, he advised the king to escape to Lyons, and there to establish himself as a mediator —— or emigrants aes /)

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and the Assembly, to issue a constitution of his own, | embodying the main principles of the Revolution, and ap- pealing to the people to support him. In the midst, however, of these schemes, Mirabeau, worn out by his loose living and the excitement of his political life, suddenly fell ill and died, and with him perished all chance of a constitutional monarchy for France. His guiding hand gone, the king thought only how he might escape in safety, and eagerly adopted Bouillé's proposal that he should take refuge uuder the shelter of hig army on the eastern frontier. It was ob- vious that this step, if successful, would bring him close to the émigrés and the German influence

; if it failed, would make men regard him asa traitor. It failed. The court got out of Paris (20th June 1791), and reached Varennes, not far from Verdun; there they were recognized, stopped, and sent back to Paris. Bouillé entered the place a very short time after they had left; found all the streets barred against him, and, comprehending that the game was lost, turned about and fled to the emigrants.

The Re- The Assembly, at once and with calmness, assumed full volution direction of affairs; no disturbance followed. The king's triumphs return was a triumph of the revolutionary spirit, which showed itself all along his route. All firmly believed that his only wish had been to escape to the emigrants and to make open war on France. The clubs and the advanced section of the Assembly gained greatly in strength. Pétion and Robespierre now began their career as republican leaders. The excitement of Paris broke out in open fighting over the great petition of the clubs in the Champ de Mars for the deposition of the king; and Lafayette dispersed the republi- can crowd with vigorous bloodshed. The Assembly for the moment seemed to win strength byit ; the country showed no wish to be rid of their king. The Jacobins had to draw back for a while; the division between Paris and the country, between the bourgevisie and the bulk of the people, grew plainer; the Jacobins Club was almost de- serted by the members of the Assembly; a new club, the

1791.

The king's flight.

The Feuillants, was organized out of the more moderate section

Feuil- of the Jacobins, among whom were Lafayette, Bailly, the

oan two Lameths, and others known as tlie representatives of the party which wished to unite the old monarchy with the new constitution. The old Jacobins became absolutely re- publican, and, in contempt, called the Feuillants the ' Club Monarchique." In these two clubs the new and clean- cut division of the country into monarchists and republicans was plainly to be seen.

Thecon- The Assembly was now coming to the end of its labours ;

stitution before finishing them, it made the grievous blunder of eel passing a "self-denying ordinance," and decreed that no "member of its body should be eligible for the new Assembly

to be at once elected, nor should accept any office under the

crown. Lafayette and Bailly resigned their offices as general and mayor of Paris ; every one of the men who had

voted together in the tennis court, who had gained experi-

ence and insight into the proposed constitution, and might

have worked it successfully, was rigorously excluded. The constitution was then laid before the king; he accepted

it at once, and, going to the Assembly (14th September

1791), swore that he would observe it faithfully. Then,

after decreeing a general amnesty for all political crimes

*Close of and offences, the Assembly (30th September 1791) closed sia a its critical labours, and declared itself dissolved. As the * members passed out of the chamber they held their heads high, in the belief that they had laid the firm foundations*

of a reasonable and constitutional government. The country welcomed the constitution with delight ; a new era

was about to begin ; the middle classes were all in its

ae and believed that they had the future in their hands.

a A ections to the new Assembly, which took place before

¢ Vonstituent dispersed, were loyally made ; the middle

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party seemed to have a great majority; the king accepted the 1791. situation fairly. There were no representatives of the old régime in it to irritate men ; violent republicans were few ;

it was thought that all promised well, and that the Legisla-

tive Assembly would have a long and peaceful life, The The Le. Legislative Assembly met on October 1, 1791 ; at once it gislative shaped itself into parties, all more or less loyal to the new — constitution. The,“ Extreme Right and the Right” (to the iio oe right, that is, of the president’s chair) were usually called ties. the Feuillants, were constitutionalists who represented the burgher interests, and feared the people, and who wished to uphold the king as far as they could. The “ Left,” the Girondists, was composed of men inclined towards a re- Girond- public, also of the burgher class chiefly, also all devoted to ists the constitution as it stood ; the “ Extreme Left,” which sat

on the higher benches, and took the nickname of “the Moun- The

tain,” was composed of popular delegates and representa- — |

tives of the advanced clubs, with Robespierre as their out-of- — doors leader at the Jacobins, and Danton at the Cordeliers

Club. The Centre of the Assembly was timid, and wanting

in any principle or clearness; it usually voted with the

Left. Thus, the more extreme partisans, whether of

royalty or republicanism, were not in the Assembly, but | worked outside for their objects; it remained to be seen (whether the moderate parties would succeed in holding their i own. The conventions of Pilnitz (27th August 1791) had The Pil- already shown the excluded royalists whither they might nitz con. |

look for succour ; Leopold of Austria and Frederick William vous. of Prussia had then agreed, in vague terms, that they |

would invade France unless Louis XVI. were set free, the \] Assembly dissolved, the emigrants restored to their posses- Ij

*sions and dignities. It was a challenge to revolutionary | France, and a temptation to the unstable king. At every . step he and his friends blundered ; a loyal acceptance of the constitution and the new Assembly seemed impossible ; i the royalists at home stirred up civil strife, especially 1 through the clergy; abroad they threatened open war The Assembly, backed by the new department of Paris,] an organization given to the capital early in 1791, fought against the former; against the latter stood the army, mostly strong republicans, supported by the sympathy of i the people generally, whose anger rose at threats of invasion. 1. To meet its pressing dangers, the Assembly, in November The As- 1791, ordered the emigrants to return, on pain of confisca- eH : tion of their property, and penalty of death. This decree p, the king at once vetoed, at the same time issuing a strong order to the emigrants to return. They refused to listen, and the popular feeling on the other hand was much exvited by his interference in what seemed to be a matter of life and death to them. The Assembly next passed to attack those of the clergy who had not taken the oath, declaring that "refractory" priests should lose their pay, should be forbidden to perform divine service, should be put under surveillance. The king again exercised his veto; and those who supported the Revolution felt that in the two all- important matters—the threat of foreign war from the émigrés, and the threat of domestic war from the " refrac- i tory" clergy—Louis XVI. was against them, and with their i enemies. They murmured the word " traitor." . j After some hesitation the German princes began toshow The =~ signs of movement ; troops were raised by Austria, Prussia, . * Piedmont; the other monarchs of Europe threatened. i France set on foot three armies,—one of the north under Rochambeau, one under Lafayette on the north-east, @ third under Luckner on the Rhine as far as to Basel. The Montagnards alone, distrusting the officers and the king, . opposed a declaration of war. All France suspected treason, and had only too good reason to think that the king's ministers, excepting Narbonne, minister of war, were in coul-*

1792.

The Gi- rondist ninistry.

War de- clared against Austria.

Camn- paign in Belgium.

Lafay- ette's position.

Insurrec- tion of the 20th of June,

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communication with the enemy. The feeling against the ministers was so strong that after the trial of one of them, known to be the queen's agent, they all resigned, and a Girondist cabinet was appointed by the king. Roland,a man of intelligence, spirit, and uprightness, married to the noblest lady of these troubled times,—a lady whio was the inspiring genius of the Gironde, —was made minister of the interior. The other name of note was that of Dumouriez, who had the portfolio of foreign affairs. This ministry at once took up a resolute position against the allied sovereigns ; and Francis II., the new head of the house of Austria, unlike J.eopold, who had never wished for war, at once replied with defiance, ordering France to replace king, clergy, and nobles in their ancient dignities and privileges. On the 20th April 1792 the Girondist ministry declared war against Francis, and the long wars of the republic and the eimpire began.

The French army was in a state of great confusion ; most of its officers liad joined the emigrants, eager to show the Germans "the way to Paris"; those who remained were suspected by the people; there was little muney in the treasury, little experience in the camp. Dumouriez hoped to make a good beginning by invading Belgium, under its Austrian masters, and only lately in revolt. All, however, went amiss. One column was checked near Tournay, lost its guns, killed Dillon its general, and fled with cries of "treason"; a second column was defeated near Mons; Lafayette and the other generals hereon halted and stood on the defensive. All France was uneasy. Had her ancient courage departed? was she powerless with- out her noble officers?

or was she the victim of treachery? The Jacobins grew more vehement; the terrible voice of Marat was now heard calling for heads ; suspicion became greater than ever against the king, above all against the Austrian queen, and the guards around them, who were thought to be inclined to betray the people. The Assembly declared itself as sitting in permanence. It levelled mea- sures against the refractory priests; it decreed that the king's guard should be dismissed, and that a camp of fed- eral soldiers should be formed at Paris. The king refused to dismiss his guards ; and on a strong remonstrance from Roland, he at once dismissed the three chief Girondist minis- ters. Dumouriez finding the king obstinate, also resigned office. Louis named a ministry of obscure members of the Feuillant party,—men who believed in the constitution of 1790, and in the royal a thority. It wasat this time that he sent Mallet du Pan on a secret mission to Vienna, to pray the Germans to rescue him from the tyranny of those " who now ruled with a rod of iron."

The Girondists, thus ejected from power, made common cause with the Jacobins, and watched with keen eyes the course of Lafayette, the centre of the constitutional party ; the ministry and all those who in heart loved the older system or dreaded the progress of the Revolution, looked to Lafayette and his army as their only hope. He was no statesman, loyal and upright as he was, and committed the great blunder of defying the Jacobins. At once his waning popularity was lost; his party was seen to be that of reaction ; the people could see no difference between the constitutionalist Feuillants and the aristocrat emigrants, and the doom of the party was sealed.

by raising the Parisian populace against the Assembly. That body, overawed and powerless, could do nothung against so fierce and determined an invasion. They next forced their way into the palace, and there Louis XVI met them with admirable dignity. The populace shouted "down with the veto," "recall the ministers," and so forth. The king wore the Paris red cap, and the crowd was appeased at once. It was an excited, not a bloodthirsty, mob that day. Louis

On the 20th of | June 1792 the Jacobins replied to Lafayette's manifesto

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assured them that "he would do whatever the constitution ordained that he should do,"—-words which, though they meant little, yet, when joined with the red cap and the king's manly bearing, satisfied the people, who departed quietly. Publie opinion seemed at once to go with the monarch and the ministers against this outrage ; the Girondists, who had been partics to it, lost ground; Lafayette even ventured to come up to Paris from the army to demand the punish- ment of the insurgent chiefs. His attempt, however, was a failure. The Assembly threatened to arrest him for leaving his troops without orders; the courtiers of the Tuileries looked coldly on him ; the king gave him no thanks ; as for the queen, she liked him no better than of old. He had to return quickly to the army. The truth was that at this time the court policy had gone entirely over to the emi- grants and their foreign friends. There were 80,000 men at Coblentz commanded by the duke of Brunswick; the royalists cared nothing for such constitutionalists as La- fayette ; "in a month I shall be free," was the queen's remark,

Prussia had now also declared against France, and was on the march; this movement restored all power and popularity to the Jacobins. The Assembly took measures in self-defence against the court and the foreigners; men began to call for the deposition of the king; the country was proclaimed in danger, and 50,000 volunteers were de- creed; men flocked to enrol themselves from every quarter ; the excitement grew daily; the fiercest threats and sug- gestions made themselves heard. The Jacobins organized, almost openly, a new insurrection, which should force the hand of the Assembly, and '"'save the Revolution." The van- guard of the attack on the constitution was entrusted to the battalion of men of Marseilles, who have attached their name to the ever-famous song, whicl: has been sung by Frenchmen on so many a hard-won battlefield, in poli- ties or in campaign, the Marsetllaise. The extravagant proclamation with which Brunswick heralded the opening of his campaign did but add to the fury of the people ; and on the 10th of August the great insurrection, led by the popular chief Danton, swept over the Assembly and the monarchy, overpowering everything as it passed along. The guards at the Tuileries were of uncertain

fidelity to the king; the commissioners of the sections of Paris seized on the Hétel de Ville, and at once set up an " insurrectionary commune"; they summoned before them the commandant of the national guard, Mandat, who was massacred as he left the hall. The guards, thus left headless, refused to fire on the people ; the insurrection swept over all; the king with difficulty, surrounded by his family, took refuge under protection of the trembling Assembly. The Swiss guards of the palace were massacred, the Tuileries taken and sacked ; the new municipality, flushed with victory, com- pelled the Assembly to confirm its powers; to order the election of a new National Convention ; to declare the king suspended provisionally, and placed at the Luxembourg under civic guard ; to dismiss the ministers ; to make into law the decrees passed but vetoed by the king. The Assembly was crushed, the royal family prisoners In the Temple ; the Paris people, under inspiration of Robespierre and Danton, were omnipotent. Forthwith began the terrible scenes of the prisons, the mockery of trial, the massacres of the "killers at six francs a day." It was clear that the new commune of Paris was now the sovereign power in France; it established a committee of surveillance, and swept away all the older administration of Paris.

1792.

The court goes over to the emi- grants,

Insurrec- tion of the 10th of Au-

The Marseit- laise.

The Pa- Tis come mune.

Danton, burly representative of popular passions, and of Danion.

popular kindness also, was the leading spirit cf the time. He was no statesman, and had little chance of permanent power, when pitted against the virtuous, the incorruptible Robespierre, who had kept sedulously clear of the insurrec-

1792.

Robes- pierre.

Marat.

The in- vasion.

The Na- tional Conven- tion: parties in it.

Aboli- tion of royalty.

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tion, and was already planuing how he might rise by it to the top of his ambition. Danton with all his roughnesses was a man; Robespierre was a vain fop. Danton had com- paratively little personal ambition ; Robespierre always thought first of himself, and intended to become the dictator of a new commonwealth. Marat, who must be named here, was the leading spirit of the committee of surveillance, the leader and instigator of all the bloodshed of the Reign of Terror. He wished, too, to be dictator, that he might purify society,—that he might have in his power the sole and unquestioned right to slay.

Lafayette, in spite of the invasion, would have marched on Paris to save society. He found himself abandoned, and took to flight ; the Germans, to whom he went, imprisoned him and treated him ill) Meanwhile, the allies took Longwy and Verdun, while they besieged Thionville ; the road to Paris seemed quite free to them. The effect on Paris was terrible ; no one knew who was in communication with the foreigners; fear and anger made men brutal; the massacres in the prisons went on incessantly. Danton, "fiercely as he might bellow, was ashamed, for he had a human heart; aud he delivered from the fury as many of the victims as he could." Meanwhile, the Prussians had forced their way into France through the Argonne, in spite of Dumouriez; and the duke of Brunswick, who hoped to cut him off, and had abandoned the direct road for Paris through Chalons, was met by Kellermann who lay in his path at Valmy, The spirit which Kellermann infused into his raw troops staggered the assailants, who hesitated and drew back. The cannonade of Valmy, for it was little more, was more to France than many a great victory; the Germans had to fall back discomfited

; the siege of Thiou- ville was raised. By the 1st of October not one of them remained in France. Unfortunately, no steps were taken to harass them in the retreat; their state was so bad that a little vigour might have entirely ruined them. Shortly afterwards came news to Paris that the army of Alsace under Custine had taken Worms, Spires, and Mainz, where lay the chief magazines of the allies ; in the north an attack on Lille was repulsed. Savoy was occupied by French troops, who also seized on the coast line, and occupied Nice and Villafranca, with its great munitions of war. Abroad the Revolution showed itself proud and defiant ; at home the National Convention replaced the Legislative Assembly.

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The new governmen of France reflected the changes which had taken place. Paris sent the chief Jacobins to it; the Girondists sat on the right and had a large majority; the Jacobins on the left, high up, with the soubriquet of the Mountain ; below sat the "' Plain" and the " Marsh," the timid moderates, who leant towards the Girondists. Paris was behind all, fierce and bloodstained, supporting the Jacobins. At once the Convention decrecd (21st September 1792) the abolition of royalty in France, and proclaimed the Republic. The 22d of September 1792 is the "' First day of year I. of the Republic." Roland, the most influential of the Girondists, retained office as minister of the interior ; and his party, encouraged by the protests of the permanent department of Paris, which felt itself set aside, attacked the anarchy of the capital and the Jacobins. Robespierre was denounced, and great debates ensued; the Girondists, however, in spite of their majority in the Con- vention, had no force, and little political sagacity. Paris was a no mood for submission to the more moderate and consti- Pp friends of the republic ; before the end of 1792 the a. | = the Mountain with it, had defeated the ra _ – ¢ executive power, and Roland himself. Fora

' ever, the trial of the king absorbed all attention.

It had begun in November 1792 ; in December Louis had 1799-93, been questioned by the Convention ; all France discussed The triat with vehemence the different views as to the method of the and exe. trial. Who should judge him? The parties here split ; a ot the Gironde, anxious to gain time, and to save the king from XVL death, and the country from a great blunder, called for an

appeal to the sovereign people ; they still clung to constitu-

tional forms. The Mountain held that the Convention was competent to undertake the task of an immediate trial. . The opinion of the country re-echoed the cries of Paris ; and the Convention, on the 15th, 16th, and 17th January 1793, took on itself to decide the question; by a majority of a few votes (387 against 334) it decreed that the king's punishment should be death. Philip Egalité, his nearest kinsman, was one of those who voted with the majority, to the disgrace of his name; even those who wished for the king's death despised and condemned him for an act dic- tated by weak ambition and cowardice. On the 21st of January 1793 Louis XVI. was executed on the Square of the Revolution.

By this act, as the Montagnards themselves said, "the Revolution threw down the glove to all ancient Europe." They had accused their rivals the Girondists of intriguing to save the monarchy, of coquetting with the emigrants and the foreign sovereigns. The Girondists, in their turn, accused them of being "anarchists sold to the foreigner," men who were treacherously pushing on the Revolution to excess in order to discredit it, and to bring in the foreign help which the court desired ; men who were in the pay of Pitt, the supposed Macchiavelli of the time, whose | hand was believed to be in everything which could turn to the harm of France. If Henry IV. was the hero of i the Revolution, Pitt was its bugbear; Frenchmen were seared in those days by his name, just as twenty years later . Englishmen were scared by the name of Napoleon. The . truth is that the Girondists represented the burgher classes, and were honestly eager to establish the new constitution | in all its parts; they were on the defensive, while the i] Mountain, the party of offence, represented the suffering populace—eager, defiant, weary of negotiation, suspicious of treason at every point, and zealously determined to push the principles of the

Revolution to their limits. In this they were utterly careless of political considerations, eager for war, come what might, quite honest and narrow,—a very dangerous and powerful party. Their victory in the trial and execution of " Louis Capet" was complete ; it brought with it inevitably the fall of Roland. When Robespierre and Danton attacked him in the Convention, finding that, the Girondists no longer had a majority, he laid with dignity his resignation before the Convention, and was re- placed for the time by the indolent and philosophic Garat, the minister of justice. The ascendency of Robespierre was Robes- assured—the man to whom the Revolution, as his enemies Piertés said, "was the religion of which he was the priest." ™ '"Robespierre preaches, Robespierre censures, thunders against the rich and great, lives simply, has no physical passions, has created for himself a reputation for austerity —the austerity of a saint. He speaks of God and Provi- dence, calls himself the friend of the poor and feeble, is followed by the women and the weak, whose adoration and homage he solemnly accepts." This is the dangerous man in whose hands lay the fortunes of France throughout the dark days of the Terror. He was the prophet who should realize on earth the beautiful and popular dreams of the Contrat Social.*

After the withdrawal of the Germans from France at the es, ; end of the previous September, Dumouriez had easily per- he q suaded the Executive Council at Paris that, by seizing the © moment of amazement and disquiet, the French armies might secure for France her "natural frontiers,'—that is.

1792-93.

Foreign could scarcely hold his own on the Rhine. While France | secret spring to push the whole machine forwards without relations was laying her hand on monarchy at home, she challenged | being seen. It was an ominous fact that not one of the ae oe, at the same moment the hostility of Europe, by this con- | nine representatives who formed it was a Girondist. They nee quest of Belgium, and by the declaration of a crusade by | had still a majority in the Convention ; it was all they had. the army against all its ancient institutions. The army Matters moved on fast ; Paris, the commune, the ministers, began henceforth to regard itself as a great republican pro- the army, were all against them; in the country they had paganda; it was by

usiug this belief that Napoleon event- | no adherents in the east and north-east of France; for ually worked his will on France. the nearer Germany the stronger the Jacobin feeling. In The po- This development of a warlike tendency in the republic, | the south-east royalist sentiments were still powerful, though sition of coupled with the fall of the king, decided the policy of for atime concealed. Their headquarters were at Lyons, Insurree- England. Fyeland, which hitherto had shown some sympathy with and violent and bloody disturbances had already occurred tion in France. The ferment of opinion in England, roused by the | there; in the west, in Brittany, Poitou, and Anjou, the ee ial revolutionary movement and republican ideas, was much | royalist feeling was stronger still, aud broke out, on the stilled by the news of the death of Louis XVI; aud Pitt 10th March 1793, in the terrible Vendean insurrection on with great ability both used the feeling in favour of the | behalf of the white flag and the refractory priesthood. The Tory Government at home and tempted the French mini- Girondists had their strength in the south-west, with Bor- sters to declare war against England (1st February 1795). | deaux for their headquarters; the Normans and Picards, Pitt at once proclaimed it, by a happy phrase, to be "the | on the whole, supported the constitution of 1791, and thus war of armed opinions," and drew tighter his friendly rela- could go with the Girondists. tions with the European courts. All ancient lines of policy At the beginning the Vendeans carried all before them, were entirely obliterated by the new phenomenon. Spain | and in fanatical enthusiasm sullied each advantage they and Portugal agreed; Austria ceased to be jealous of | gained by horrible massacres, by shooting their prisoners Prussia ; Russia and Prussia found the moment good for a | in cold blood, pillaging towns, burning villages, maltreating farther partition of Poland; the only neutral powers re- the defenceless. The civil war from the beginning took a maining in Europe were Sweden and Denmark, Switzerland, fierce colour—a colour given it by the royalists. The Venice, and Turkey. The Mountain did not quail before | Girondists also in the south threatened to march on Paris France $0 great a display of force. "France shall be an armed | to put down the Jacobins. The allied powers, however, defiesthe camp," and every Frenchman a soldier ; "conquer or die," | instead of closing in resolutely on France at her weakest, world. the watchword of an united people; the "principles of the | saved her by their long discussions as to what each of them Revolution" a new religion for which men of good will | was to take

rather than what each was to undertake. At should devote themselves, The enthusiasm was great; a | last they moved forwards in the north ; Austrians, Dutch- levy of 300,000 men was voted at once; the revolutionary | men, and English, under Coburg and the duke of York, propaganda filled Belgium, and alienated the friendly feel- | slowly drove back the army of the north, which unfortun- ing there by its violence. They had also ruined Dumouriez's | ately lost its commander Dampierre, who was skilfully re- plans, and he, with an ill-equipped army, and feeling that | viving its confidence, and besieged Valenciennes. The king hostility was rising against him at Paris, set himself to | of Prussia blockaded Mainz ; in the other scenes of war the recover ground by a bold attempt to conquer Holland. He French were too weak to do anything, and suffered losses was caught by the prince of Coburg at N eerwinden, and | and defeats. The struggle of Girondists and Montagnards defeated after a vehement battle (18th March 1793). | went on all the same; it was the gloomiest moment of the Dumou- Then, as a last step, Dumouriez came secretly to terms with | history of the Revolution. In Maya Committee of Twelve tezs the Austrians, agreed to evacuate Belgium, and carrying | was appointed by the moderate party of the Convention, at plans, ' : ' the suggestion of Barrére, a moderate who had the confi

THE REPUBLIC. |

might become masters of the whole left bank of the Rhine from Basel to the sea. Custine and Kellermann should master the middle Rhine at Coblentz, and Dumouriez should invade Belgium. He set out at once, and on November 6, 1792, by winning the battle of Jemmapes, roused the ainazement of all Europe. It is true that the French were two to one, yet so low had their reputation for fighting- power fallen, that the courage they showed on the field took men by surprise. The Austrians fell back, and Dumouriez occupied all Belgium down to the Meuse. The Scheldt, which had been closed since 1648, thanks to the jealousy of England and Holland, was reopened ; Antwerp and all Belgium regarded the French as their deliverers, and a Belgian republic, in which the clergy took the lead, was formed at once. Dumouriez, poorly seconded by the other armies, and ill-provided from France, could push the Austrians no further than Aix-la-Chapelle; Custine, who had occupied Frankfort, and thereby forced the German diet to declare war on France, was driven out of that place, and

with him the young duke of Chartres, who had shown great gallantry and ability in the face of the enemy, marched for the French frontier, intending to restore the constitution of 1791, to secure the Girondists, overthrow the Jacobins, and proclaim the duke as constitutional king of France. In Paris, the struggle between the parties in the spring of 1793 was acute and close, The news of the disaster of Neerwin- den and the march of Dumouriez for Paris aroused all the fury of the Jacobins; the Girondists, with horror, saw themselves innocently implicated in a counter-revolutionary

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scheme, carried out lightly and suddenly by a general 1793. The Jacobins at once took the The ascendant, proposed the creation of the terrible Committee Commit-

whom they did not trust.

of Public Safety, summoned Dumouriez to the bar of the

Convention, and sent off four deputies and the minister of Safety.

war to him. When they came he seized them, sent them over the frontier to the Austrians, and openly proclaimed his objects. His regular troops might have supported him ; the volunteers, full of Jacobin ideas, rose on him, and com- pelled him to take refuge, with the Orleans princes and a handful of soldiers, within the Austrian lines. It was clear enough that the Jacobins would assume that he and the princes had had throughout an understanding with the Gironde. The Convention in alarm decreed that its own members should not be inviolable, but might be arrested on suspicion of treason; that the Orleans family should be sent to Marseilles ; that three representatives should be sent to look after each army. The Committee of Public Safety was now formed of nine members re-elected monthly, as a

dence of more extreme men. It was composed of Girondists. Over against this move the sections of Paris established their Central Revolutionary Committee, May, guided by Danton, Paris rose against the Convention, and compelled it to suppress the Committee of Twelve. Marat at the head of his sans-culottes, supported by the minority of the representatives, the Mountain, on the 2d of June overthrew the Girondists, arresting two of the ministers and thirty-one deputies. More than half the departments

On the 31st of Fall of

1793.

The re- publican calendar.

War in

1793.

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rose to defend the defeated party; in the Cevennes the white flag was unfurled, and the emigrants began to stream back into France. "On the one side was Europe with three- fourths of France ; on the other side Paris with a few depart- ments" (La Vallée). The position of things might well have seemed desperate for the Mountain, hadtherebeen any strong man, any true head, to direct the attack on them. But they had unity, energy, devotion to their principles, the main part of the army at their back ; while their antagonists were divided in views and principles, and were in confusion. Danton, who in fact carried his party through the crisis, showed real power and energy. Under his direction the Convention proclaimed martial law in the hostile depart- ments, called up the army, as far as possible, to the capital, and in eight days constructed a new constitution, that of the year]. —simple, thoroughly democratic. It never was really acted on ; men were too busy to care about constitu- tions, The assassination of Marat by Charlotte Corday, which occurred at this moment, inflamed men's minds still more against the Girondists ; she had come from Caen, one of their towns, and was thought to agree with them The first active measures taken by the Jacobins showed that the (Jirondists were powerless ; Paris and the

army were at once triumphant, and by the beginning of August the Girondists were crushed.

Elsewhere things looked very dark: Toulon fell into Eng- lish hands; La Vendée remained unsubdued, and defeated the incompetent officers sent to reduce it; Mainz and Valenciennes fel] ; all France was vexed with famine, and the assignat-system had utterly paralysed commerce. The republic, however, was full of energy. After the féte of the 10th of August, with its statues of Nature and Ieason, its classical and pagan affectations, and those light frivolities which were natural to Paris even in the darkest days, men turned at once to the ever-recurring question, how the re- public should be saved. The Convention decreed a levée en masse to resist the invader and to keep down the ill-affected at home; to the Committee of Public Safety was entrusted the real government of the country; the new constitution was not to be introduced till peaceful days came round. The overthrow of all things old was further indicated by the issue, on 24th November 1793, of the new republican calen- dar. Year J. was fixed to have begun on the 22d of Sep- tember 1792, the date of the proclamation of the Republic. The new year should have twelve months like its predeces- sors, each with a new name, in four groups of three; each of 30 days, and each divided into three decades, of which the tenth days should be days of rest, in lieu of tlie old ex- ploded Sunday. These 12 months of 30 days a piece, cutting across the old months so awkwardly, only made up 360 days; so that a little bundle of 5 days (in leap years of 6) had to be tacked on at the end of the Fructidor month (August-September) in an awkward and shapeless way, and called, poor things, the Sans-culotttdes. Such interferences with symmetry will nature cause, when she sets herself against the spirit of system, and the advance of enlight- enment. Attempts were also made at this time to grapple with the confusion in the currency and the crushing deficit ; the mass of assignats was reduced by more than a half; a maximum price was set on the necessaries of life; trade also had to bow to the will of the Revolution.

In the affairs of war the new life of the Revolution found expression in the vigorous plans of Carnot, an engineer officer, who saw the trnth of the principle afterwards acted mg by Napoleon, that "God aids the big battalions."

Attack in mass, and cover the want of discipline and skill ee anh was the new order. eee a : Fl ouchard was deprived of command in es. : i ad to give place to Jourdain, who, helped

i not himself, defeated Coburg at Wattignies (16th

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Oct. 1793); onthe Rhine the battle of Pirmasens was lost (13th October), and the allies occupied Hagenau and Fort- Vauban ; they threatened Landau, and had friends in Stras- burg. Hoche was then sent down to the army of the Moselle, and Pichegru to that of the Rhine, The former, after a series of rather unsuccessful battles against the duke of Brunswick, in which he failed to relieve Landau, sud- denly left his adversary, and, in concert with Pichegru, cleared the Vosges, and brilliantly stormed the Wissemburg lines. The Austrians at the end of the year had raised the siege of Landau, and were across the Rhine; the Prussians took winter-quarters at Mainz; the French lay in the Pala- tinate. In the south also things went better with the new Government; Lyons and Toulon were retaken, though on the slopes of the Pyrenees the Spaniards forced the French to take refuge under the walls of Perpignan. In the Vendée the terrible civil war still raged; the peasants, point after point, defeated the isolated columns of the army. A more coherent plan of action, however, gave the victory at Chatillon (16th October 1793) to the Republicans ; then the Vendeans crossed the Loire, and defeated Lechelle near Laval. They next attacked Cherbourg, meaning to make it their point of union with the English ; here, however, they were manfully withstood, and, incapable of siege-opera- tions, withdrew. On their return they defeated Rossignol and made a push for Angers, meaning there to recross the Loire to the left bank. Westermann and Kleber drove them thence with loss, and with Marceau pursued them to Le Mans, where, after a terrible battle in the streets, in which no quarter was given or taken, the Vendeans were utterly defeated. Westermann pressed on their heels with pitiless vigour ; caught at last between the Loire and the Republicans, they were finally defeated (23d December 1793). Thenceforward they ceased to be formidable, though still troublesome at times.

So ended 1793, with fortunes, on the whole, very favour- able to the French army, and very fatal to the Girondists. Meanwhile, the Reign of Terror had begun at Paris; the queen, the leading Girondists, all who were "aristocrats," or "ci-devants," as the phrases of the day called them, Philip Egalité, and a crowd of others, passed under the guillotine. In La Vendée, the revolutionary fury, goaded by the blood shed by its opponents, spared none it suspected. From Toulon most of the inhabitants had fled for refuge to the English ships; at Lyons the Convention ordered the destruction of the city, and the establishment of a new town to be called "Commune Affranchie"; many hundreds of the citizens were guillotined, and when that process proved too slow, were shot down by platoon fire.

Two parties were now to be discerned in opposition to the rule of the Committee of Public Safety,—the Hxagérés,

Dantonists, who tried to calm men's minds, and lessen the atrocities of the time. The Hebertists were the stronger party ; they abolished the Catholic worship, swept away the past, set up a goddess of Reason, and professed atheism. The party of Robespierre in the Committee disliked both the indulgent and the savage sections. Early in 1794 the Hebertists were seized and condemned to death; it was a first victory of the Government over the violent party. Had Robespierre been willing to ally himself with Danton, a stable rule, at least for a while, would have been possible. But he refused ; he was not a person to brook a manly rival at his side; and Danton, with his party, fell victims to the ambition of the ascetic and heartless Robespierre. "If my friend is culpable, I will sacrifice him to the Republic," was his phrase,—had he said "to myself," he would have hit the truth. Then Robespierre became for a while a dictator ; all France bowed before him; the revolutionary spirit in

Hebert- |

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or Hebertists, so named from their leader Hebert, the party al –) of terror and reckless bloodshed; and the Modérés, the

1793-94,

Close of the war in La

Vendée.

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1794.

Robes- pierre's rule.

The Great Terror.

Robes- pierre's fall.

ROBESPIERRE'S RULE. |

the eleven armies on foot was on his side. The campaigns of 1794 proved glorious for them ; the battle of Fleurus (26th June) won for them the second conquest of Belgium ; in the Pyrenees, the French stormed the Spanish camp at Ceret, and threatened Catalonia; in Italy, where young Bonaparte commanded the artillery, they swept the Pied- montese out of their camp at Saorgio, and got the command of all the strong points along the Alps. It was only on the sea that the French armies failed ; Corsica was taken, and Howe defeated the squadron in charge of a corn-fleet from San Domingo.

In the midst of his foreign cares Robespierre also busied himself with the exposition of his ideas. Those whom he had destroyed, Hebertists and Dantonists, had becn anarchic aud atheist; he, pale reflex of Rousseau, would bring back the reign of virtue and the love of God. He desired to be at once high priest and dictator of a regenerated France. 'o this end he passed a decree recognizing the Supreme Being and declaring that the soul is immortal. His ad- iairers at once hailed him as a great prophet; the emotion throughout the country was great. On the 8th of June 1794 he took the lead in the great féte of the Supreme Being, which amused and offended many of his old friends. Finding himself far from being admired by them, he

deter- mined that the Terror, which he had in some ways miti- gated, should go on again; the Convention, however, re- sisted, and he withdrew completely from public life, giving his enemies the opportunity of strengthening themselves against him. At the same time he left the reins of power in the hands of his terrible colleagues, who at once applied with the utmost ferocity the law by which suspected persons could be put to death with but the shadow of a trial. This was the time of what is called the Great Terror, June and July 1794. The reaction soon came ; in spite of his friends and the power of the Jacobins, he had arrayed against him the majority of the Committees, and almost all the old Montagnards; his pride and vanity, the féte and his conduct of it, their fears of a dictator, their fear for their own heads, all undermined his position. Before long the struggle began. Robespierre was no Marat; he would not strike a crushing blow, and '" making solitude, call it peace." He trusted too much to the strength of his ideas, the influence of his party; and on the 27th of July 1794 (the 9th Thermidor) it came to an explosion in the Con- vention. Permanetce was voted, the arrest of Robespierre and his chief supporters was agreed to; a proclamation to the people was issued; five members of the Convention were carried off to prison. Instantly, the commune of Paris declared itself in insurrection, the tocsin was rung, and the five deputies were at once rescued from the jailor's hands, and carried in triumph to the Hétel de Ville. Two hundred cannoniers marched on the Tuileries, where the Convention was sitting, and all seemed over there. But the artillery- men were not firm ; when the deputies talked to them, they hesitated, and that hesitation was fatal to Robespierre ; for those sections of Paris which hated him had also put them- selves in motion to defend the Convention ; indecision fell on the Jacobins, their forces melted away, and the resistance came to an end. Robespierre tried to shoot himself, and shattered his lower jaw; he and his friends were again arrested, and perished the next day on the scaffold. And thus ended the early history of the French Revolution. From the proclamation of the Republic to the days of the Legislative Assembly, from the overthrow of their power to the death of the king, thence to the fall of the Girondists, then to the death of Hebert and Danton, now to the failure of Robespierre's bloodstained Utopia,—thus had the Re- volution moved onwards, violent, yet often generous, proudly patriotic, yet destructive of all the stability of the country. There remained but the army. The army was

heartily republican, and had suffered enough and triumphed 1794. enough to have a high idea of its own organization and its The tu- worth. When a man comes to lead it, the army will set 'ure of itself to organize France into an instrument of tremendous thearmy. power ; a despotism, solid and strong, aggressive abroad, vigorous at home, using all the terms and calls of the Re- volution, will take the place of the ill-fated men who have hitherto tried to guide the destinies of the country. It will

call itself an empire; it will be a despot ruling with the

liberal ideas and phrases.

Meanwhile, as Mr Carlyle says, "here was the end not The re- of Robespierre only, but of the Revolution-system itself," action on for his death was the signal of a great revulsion of feeling. no France, so gay and light of heart, had lived an unnatural Heth, life under the preachings of this virtuous dictator ; she was weary of the gloom and burden of a system which crushed out gaiety, made wealth a crime, and pleasure impossible ; and public opinion hailed with joy the tidings that the régime of virtue and the guillotine was over. The Terror was past ; the committees which had destroyed Robespierre perished with his death; the "Thermidorians," the Mountain, who had caused this revolution, became a reactionary party, sitting on the right, and remodelling, if not over- throwing, the existing government. The prisons were emptied, the terrible cruelties of Nantes stopped ; amnesty was offered to the rebels; the sections of Paris were reduced in importance, the administration of the capital reorganized.

All the parties in hiding came forth ; the Girondists returned ;

society began once more to dance and glitter ; it was like

the temper of England after the return of Charles II. In Close January 1795 the Convention closed the Jacobins Club ; of the the agents who had carried out the inhuman orders of the aa past were put to death. :

The armies, which by no means sympathized with the The war

movement of affairs at home, still pursued in the autumn abroad, and winter of 1794 a brilliant career under Pichegru in the north, Jourdain on the Sambre and Meuse, and other generals for the Moselle and the Rhine. The whole course of the Rhine from Basel to the sea was in their hands ; and the winter campaign, in which Pichegru conquered Holland, raised the fame of the commander and of his troops to the highest point. Pichegru had done what Louis XIV. had failed to do; 1795 wiped out the discredit of 1672; Hol- land and Belgium were to become republics on the French model; the Amsterdam populace welcomed the French as brethren. 'The capture of the Dutch fleet at the Texel by hussars, who stormed it on horseback, riding across the ice, seemed to the French people to realize a tale of fairyland. At home, too, the suppression of the Chouans, those Breton peasants who, taking advantage of the troubles, plicd the trade of brigands and highway robbers, added to the general content. The Vendeans struggled still ; their country was a scene of desolation, and the central authority had_to re- call their barbarous agents, and to try to reduce the district to peace by way of conciliation.

So ended the year 1794, which saw the reaction set 1n Things at Paris, and saw, too, the Revolution triumphant on every look frontier, and the area of its influence extended widely. aoe The coalition against France showed signs of breaking ; the prance, Dutch made peace, ceding northern Flanders with other districts to France; the king of Prussia also abandoned the coalition, ceding to France the left bank of the Rhine ; the Bourbon king of Spain next abandoned "the cause of all kings"; the little states of Germany followed ; Portugal made advances in the same direction, as did Naples, the papacy, and other Italian powers. England and Austria alone

stood firm against the new ideas, and Pitt, though he could not hope to direct, or have to pay, half Europe, still felt strong enough to carry on the war.

Paris, where famine raged unchecked, was still uneasy

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1795. and dissatisfied with the new Government. Men who knew Disturb- how to excite the populace to fury told them that the ances in scarcity was factitious; and they broke out into insurrec- Paris. tion on the Ist of April, and again on the 20th of May.

On each occasion the disturbance was easily put down. The multitude was thus completely overthrown, and the guidance of affairs lay entirely with the middle classes ; the reign of wealth and comfort was what men longed for ; it was in sharp contrast with the general distress and suffering of the people, and provoked vain contests and bloodshed. The royalists thought that their time was come ; and ina large part of the south of France they rose, and pitilessly massacred their political oppenents, The murders com- mitted by them far exceeded in indiscriminate butchery and savageness even the brutal bloodshed which had defiled the progress of the Revolution. Throughout 1795 the efforts of the armies of France were languid—there was a feeling of uncertainty ; the troops were firm to the republic, but it was not clear that the generals were so as well. Pichegre paralysed the army of the Rhine, as well as Jourdain's army of the Sambre and Meuse, and ended the year by making an armistice with the Austrians, after which he Troubles was recalled and deprived of his command. The English

inthe armament, destined to rekindle the troubles of Brittany

West: aaaie daa Vendée, failed wretchedly at Quiberon Bay; the genius of Hoche crushed it in the outset, and captured a large number of royalists. The central Government sent him orders to destroy themall. He shot 711 émigrés. And Charette on the other side, to be at least even with him, murdered in cold blood 2000 republican prisoners in his hands.

Consti- The Constitution of the year ITI. now appeared, the

tution of work of the restored Girondists. It was republican, of a

be yea¥ modified type ; it entrusted legislation to two councils, the

council of the Ancients, 250 persons of forty years of age and upwards, a kind of senate, who sanctioned the laws (or, to put it the other way, had the veto-power) ; and the council of Five Hundred, men at least thirty years old, who had the preparation and initiation in law-making. The executive power was entrusted to a Directory of five mem- bers, under whom should be responsible ministers, and all the niachinery of practical government. The general principles of the rights of man were reaffirmed. The Convention at once accepted it, only taking care that the royalists should not be able to get hold of power by means of it. The country generally adopted the new constitution, which seemed likely to be moderate and stable. The royalists

Bona- made one determined effort (5th October 1795) to over- aed throw it; the fighting was severe, and for a time Paris the seemed likely to accept a counter-revolution. The cnergy

royalisis, Of Bonaparte, who had been set aside because of his Jacobin opiuions, but was now recalled by Barras, swept away the insurrection ; Bonaparte had guns, he was a great artillery officer already, and the loose resistance of the royalists was vain against his skill and iron resolution. The elections, which took place this same month, being over, the Conven- tion, as a last and, for the time, a very significant act, de- creed the abolition of the punishment of death, and then declared its mission ended, and so ceased to exist. The army had saved the Convention; it had set a new man forward ; anid he, for all his faults, a great man anda

true ruler, became after a short time tlie central figure of all Europe.

al Napoleon Bonaparte was born in Corsica, on the 15th – Nevo: August 1769, just two months after the patriot Paoli had

leon Bo. L2H obliged to cede that island to France. His was a naparte, dark and thoughtful boyhood. He loved Kistory, above all the history of great

men in the republics of anti- quity. He read with eagerness both Ozesar's Commentaries and, like so many other great men, Plutarch's Lives. The

French tongue was @ foreign language to the boy ; he learnt 1795. it late, and never altogether mastercd it. In 1785 he was at the military school at Paris, where he learnt to grumble at and to criticize the ancient régime ; in the next year he entered the army. When the Revolution began he declared warmly for it, though at first his ambition seemed rather to point to a career in Corsica than to one in France. When Paoli ejected him theuce in 1792, he settled, first at Nice, then at Marscillcs, with his mother and sisters, who had gone from Corsica with him, In 1793 he became captain of artillery, and was charged to put down the Marseilles federalists ; this successfully accomplished, he was madc adjutant-general at the siege of Toulon, and by storming the Eguillette fort, secured the fall of the town. He was at once, at the age of twenty-four, named a brigadier-general, and, after arming the Provencal shores against English attacks, was sent to command the artillery (in 1794) in Italy. Here his vigour, amazing power of organization, and genius in war gave a new turn to affairs, and secured the brilliant success of the campaign, which, in about a month's time, made France the mistress of the Alps. This triumph made Bonaparte a great favourite with the Robespicrres, especially with the younger brother, who had at this moment the charge of the army of Italy; and the young general, without believing much in them, echoed the high- flown sentiments of his chiefs, accepted, with contempt, their opinions, while, as far as he dared, to his honour be it said, he sheltered those who in Italy were obnoxious to their vengeance. In after life he always shunned reference to this period of his career, and his connexion with the brief ascendency of Rousseau's reign of virtue as expounded by Robespierre. At the time he saw that it would not last, and tried his best to avoid compromising himself. He got his reward; when Robespierre fell, though he was arrested, and had a narrow escape, his prudence had kept him suf- ficiently clear of the fallen leader to save him. For a time he was in disgrace, and with other officers of the army of Italy was suspected of strong Jacobin tendencies. When, however, Barras,

in October 1795, needed a vigorous artillery-officer for the streets of Paris, he fonnd one in Bonaparte, wlhiom Pontécoulant, with a clear sight which does him great credit, had made president of the "topo- graphical cabinet." For Bonaparte, not being a real French- man, knew the value of geography, and understood how to use a map. The remarkable skill and energy with whic the young general crushed the Vendémiaire insurrection secured his fortunes ; with the army he had defeated Paris. He was made general of division and commander-in-chief of the army of the interior at the age of twenty-six. The event "showed the world," says Lanfrey, "what can be the weight of a soldier's sword in the balance; from this inauspicious day power learnt to reckon on the army, the army to dis-

| pose of power; the path towards a military government

was now open."

First, however, the Directory must have its course. Legislative Assembly, with seemingly the fairest prospects, Tectory- had lasted less than a year. The National Convention saw the fall of the Girondists, then of Hebert and Danton, lastly of Robespierre, and existed three clear years. The Direc- tory, which came into office with a new constitution on October 28, 1795, had before it no less than four years of power. And yet at first, so far as could be seen, its chances were bad. The five directors, with exception of Barras, who was a noble, and suspected of reactionary leanings, were honest republicans, and men of character ; they set them- selves to allay the commercial and popular misery of the country, by absorbing a large portion of the assignats, and then by replacing them with " territorial mandates," which represented a fixed amount of public lands ; a considerable amount of coin came again into circulation, and credit

The The Di:

FRANCE

seemed to revive. They also abolished the commune of Paris, created an army for the "interior," and established guards for the public service. Stability seemed to return ; men were weary of the agitations of late years ; the famine

will find honour, glory, and wealth." Splendidly seconded 1796-97. by Massena, Laharpe, and Augereau, he at once took the Bona- ascendant, and placed his victorious army between the parte Piedmontese and the Austrians. By a succession of rapid ™ C™-

mand in

also abated, so as to render Paris less difficult of management. It was felt that the Government was in a way provisional, that France had need of repose, and, as usually happens, indifference succeeded as a reaction from the heroic measures of the past. The councils of the Ancients and of the Five Hundred were one-third new; and the elections had shown that the country was weary of the Revolution, and desired a return to a constitution, and perhaps even to amonarchy. The bourgeoisie of France were the strength of this movement. The republican party, which had offended Paris, and refused to ally itself with the doings of the Jacobins, seemed weak, and was obliged to stand on the defensive. The royalists, to whom had rallied many of the old Girondists, were able to pass more than one decree in favour of their views. Had there been a prince of any re- solution at their head, their chances would have been good ; as it was, the count of Provence, who in this year was recog- nized by the crowned heads as Louis XVIII. on the death of his nephew the dauphin (the titular Louis XVIL.), was an intelligent and liberal person, but wanting in power, while his brother the count of Artois (afterwards Charles X.), whom he now named lieutenant-general of the realm, was a miserable and narrow creature, of good manners and bad morals, incapable of any worthy or heroic effort. When the Vendeans and Bretons were eager to revolt again, and Charette had prepared everything, the count of Artois could not even be persuaded to laud; he returned to England, discredited and despised. The fierce outbreak of despair with which Charette signalized his disappointment and anger was soon mastered by the devotion and genius of Hoche, who circled round the revolted districts, gradually hemmed in the insurgents, and eventually

took and shot the desperate chieftain himself. His comrade Stofflet had perished a month before. By April 1796 the west was completely pacified, and 80,000 of the best soldiers of France were free for foreign service. At the other extreme, the former " Terrorists" formed a great secret society called

victories he forced the Turin court to sue for an armistice (28th April 1796), securing the neutrality of the Sardinian and Savoyard troops, and the cession of Nice and Savoy to France at the end of the war. Then with the swiftness of an eagle he crossed the Po, won the hard-fought battle of Lodi (10th May 1796), and entered Milan in triumph. There he re-equipped and rested his army, made terms with the dukes of Parma and Modena, raised a contribution of twenty million francs on Lombardy, the half of which, with some of the masterpieces of Italian art, he sent at once to Paris to the Directory, which received his favours with a gratitude which trembled on the verge of jealousy. When they proposed to interfere with him, he threatened to throw up his command; and so marked already was this young officer's popularity in France, that the Government shrank from accepting his resignation, and the great career was not checked. In spite of infinite difficulties, by un- scrupulous assertion, audacity, genius in war, Bonaparte succeeded in humbling the Italian states: Venice, with lier unarmed neutrality, was easily mastered; Beaulieu, who commanded the Austrian army now falling fast asunder, was driven back towards Tyrol; Mantua was blockaded ; the pope, Pius VI., signed an armistice with the young conqueror; the English were dislodged from Leghorn and Corsica; Genoa gave in; Piedmont was quieted. When Wurmser came down into Italy with 40,000 Aus- trians from the armies of the Rhine, these unwilling friends of France at once turned against her; it might have well appalled a man of slighter nerve. But Bonaparte at once made head against his newfoes. He was a man who never failed to see the critical point in a campaign or in a battle; and at Lonato, Castiglione, Bassano, and Saint George he drove the old marshal, with his ancient ways of warfare, completely out of Italy with vast loss. The whole series of operations had taken but a week (July 30 to August 5). He hoped next to penetrate, according to Carnot's plan, through Tyrol into Bavaria, and there to unite with

Conspir- the Conspiracy of Babeuf; their plans were betrayed to | Moreau. He had, however, underrated the Austrian ob- mee the Directory, and the movement easily crushed; the | stinacy; for Wurmser, gathering fresh forces, resumed the ADeUL,

Foreign wars,

Government used no vengeance ; only Babeuf and one com- rade were executed.

These things gave stability and confidence to the new administration ; it seemed to win the good-will of all except the extreme parties; there was a distinct lull in political passion; and as the Directory proved very enterprising and warlike in foreign affairs, it also secured the army. This was in large part due to the military genius and temper of Carnot, "the organizer of victory," who was one of the Five. He now planned a grand attack on Austria, feeling that the hostility of England might for the moment be neglected. Three armies, led by three young generals, were to make their way in harmony towards Vienna, one under Jourdan, the army of the Sambre and Meuse, the second under Moreau, that of the Rhine and Moselle, the third under Bonaparte, the army of Italy. This army, hitherto commanded by Scherer, who had under him Serrurier, Massena, and Augereau, had not been inactive in 1794 and 1795. Scherer, however, had no enterprise in him, and was content with partial success; his army lay Scattered along the Alps, and he seemed powerless to draw it together so as to crush either Piedmontese or Austrians ; the army also was not powerful in numbers, though its quality was very good. Bonaparte, on his arrival to take the command, at once addressed them in the tone of a con- fident adventurer speaking to hungry mercenaries: "I am going to lead you into the richest plains on earth j—there you

offensive, hoping to free Mantua, and to repulse the small French army. Bonaparte, who had won the battles of Roveredo and Calliano, and had reached Treut on his way for Innsbriick, at once hastened back, defeated Wurmser at Bassano and drove him towards Mantua, in which place he shut him up by the middle of September. In vain did whole German armies, released from the campaigns else- where, pour from the mountains down into Italy; the in- credible swiftness, clearness of insight, vivacity of genius,

ascendency over the soldierly mind, which mark the great commander, saved Bonaparte from being crushed. Seconded by his admirable captains, he won the fields of Arcola and Rivoli, of La Favorita and Corona, in which he utterly para- lysed the Austrians, secured the fall of Mantua, the prize for which the antagonists were striving, and led to the capitula- tion of Marshal Wurmser himself.

which he paid a heavy subsidy, and ceded Avignon and the Venaissin to France, and the Romagna, with Bologna and Ferrara, to the friends of France in the Milanese ; Bona- parte also extorted from him a hundred of the chief works of art at Rome, which were sent as spoils of war to Paris. It was believed in France that the last hour of the papacy had struck. The young conqueror, in the midst of his most active movements, had found time to sketch out a future for Italy, and to frame his Cispadane and Lombard IX. — 77

Bonaparte instantly set Bona- out to reduce the feeble pope, who, scared by his approach, parte signed (19th February 1797) the treaty of Tolentino, under i

papacy,

1796-97.

The cam- paign in Germany.

Bona- parte's plans for

1797.

The pre- limin- aries of Leoben.

Fall of Venice.

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republics ; uit all things he acted promptly and resolutely, awaiting no man's orders, with perfect confidence in himself and his army. The Directory at Paris could but look on in amaze- ment, and, by seeming tu

advise and approve, endeavoured to associate itself with his dreaded triumphs.

The campaign of 1796 in another way was favoured by fortune, so far as Bonaparte's interests were concerned ; for the Rhine armies, ill-supplied, and under two commands, were opposed by the archduke Charles, aud were not strong enough to carry out the great and dangerous plans of Carnot. Jourdan was repelled, and Moreau, who had penetrated into Bavaria, seeing himself almost cut off and isolated, with Jourdan on the Rhine, and the Tyrolese Alps between him and Bonaparte, was forced to retreat, and late in October was back again in Alsace. A great expedition to Ireland under Hoche also failed completely ; and by the beginning of 1797 Bonaparte seemed to the eyes of all Frenchmen their only great and successful captain. ,

Now he startled all Europe by his audacious plan for the

'campaign of 1797. He saw his way to achieve that which

*Louis XIV. had attempted in vain, the overthrow of Austria by a march on Vienna. His army was strengthened, and those on the Rhine ordered to begiu active operations, in order to occupy their opponents; quite early in the spring Bonaparte began his great campaign by driving the archduke Charles away from his defences. In spite of the vehement resistance of the Tyrolese and the threatening attitude of Venice in their rear, the French advanced always, aud Bonaparte, crossing the Noric Alps, penetrated in April as far as Leoben in Styria; his outposts were pushed to within easy reach of Vienna. Then the Austrian court fell into panic; the Austrian armies were either beaten and scattered or were far off ; there was no resisting this terrible and swift advance. The emperor gladly signed with Bona- parte (who had no authority*to do it, only the power), 'the Preliminaries of Leoben" (18th April) ceding to France Belgium and the left bank of the Rhine frem Basel to Ander- nach, as well as Lombardy, which was to be an independent state, The successful outset of the Rhine campaign, in which Hoche and Moreau had already thrust the Austrians back into the Black Forest, was early arrested by the tidings of Leoben. In Italy fortune again favoured Boneparte. A Venetian insurrection gave him the oppor- tunity of finally overthrowing the ancient republic of Saint Mark.*

‘The Venetian citizens were in the main favourable to France, while the oligarchical senate and the peasantry detested the “deliverers,” A democratic government, centred in the people of Venice, replaced the rule of the senate, Genoa, under the grand title of the Ligurian Re- public, became the submissive ally of France. The amaze- ment of all Europe, the sympathy of the peoples everywhere, the embarrassments of the Governments, forced even Pitt to make serious proposals for peace. .

Yet at home affairs looked ill. In spite of the glorious suc- cess of the armies abroad, paper money,—which, as La Vallée says, “had done its work, had couquered Europe, had in five years subdivided property far beyond all that had been done in that direction by centuries of feudalism,” because it was with paper that the thriftier peasants had been able to purchase the lands of the crown, the church, and the nobles, —these assignats had become almost worthless, and a field for gamblers, who scandalized even Paris with their sham wealth and real dissipation, Republican manners and institutions were alike corrupted and tottering to their fall. It was thought that the elections of the year V., which re- newed. one-third of the two councils (May 1797), would mie the political position, for they showed clearly that – se was returning to royalist opinions. In some

‘ ents a “ White Terror,” the usual accompaniment

of the rising spirits of royalists, broke out. A reaction at 1797, once began in the Directory, of which three members were Royalist still firmly republican, while two, Carnot and Barthélemy, reaction

he also signed a treaty of peace with Spain. Inj

were with the new majority, the “Clichy” party. The ™ Directory was censured for the war against Venice, and the — new alliances in Italy ; the exiled and depressed party were favoured ; it was openly said that the councils would reor- ganize the national guard, overthrow the Directory, and proclaim Louis XVIIL “While Europe was learning to speak with

terror-born respect of the name of Republican," says Thibaudeau, " it had become at home a term of con- tempt, a title to proscription." Napoleon Bonaparte, with his devoted and Jacobin army, had won that respect for France abroad ; how would he presently face the difficulties | at home? The Directory, finding itself menaced, and its very existence at stake, recalled Hoche, the most single- minded of republicans, with his army from the Rhine, and . asked Bonaparte for one of his generals, He sent them . Augereau, whom he could trust both to do the work well, and not to stand afterwards in the way of his own ambition. With these the Directory carried out the " Coup d'Etat" of The the 18th Fructidor (4th September 1797); with cries of Coup "Tong live the Republic" the soldiers occupied Paris ; the rm . three directors, who had the stroke in hand, Barras, Rewbel, ign and Jaréveilliere, arrested their fourth colleague Bar- Frme- thélemy, while Carnot, the fifth, escaped. The majority in tidor. the Councils was overthrown, fifty-three of them condemned to exile, and a kind of Reign of Terror ensued, without much bloodshed. 'The liberty of the press was suspended, the laws favourable to the royalists repealed, the party of the old régime crushed. Hoche, who had received the command of both the Rhine armies on the suspension of Moreau, suddenly died (it was said, of poison), at the age of twenty-nine ; he left behind him an untarnished name— that of a peasant-hero of purest and noblest character.

The Directory, though it breathed again, felt that it lived only by the grace of the army ; and so, while it signed the treaty of Campo Formio (Oct. 18, 1797), which embodied Treaty the Preliminaries of Leoben, it broke off negotiations with ofCamp?| — England. Bonaparte's work in Italy done, he was named — general of the "army of England," and at the end of 1797 returned in triumph to Paris. In him men saw a uew development of Revolution principles, a man of genius under whom those principles were to bring happiness and glory to France, while he taught them by force to the unwilling nations of Europe. He too saw before him an open field for his ambition; he would destroy the kings of the earth by the agency of his Jacobin army ; and then, "head of the army," he would become master of France. His Italian blocd and tastes taught him how the Roman republic had passed into empire ; he would tread the same path, and reach the same splendid goal. The coup état of the 18th Fructidor had destroyed the

authority of the elective body over the Government ; when the departments had sent up royalists, the Directory put. them down ; and,

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’ by a natural consequence, the press was at once coerced, lest public opinion, never strong in French history, should gain too much power. The result of all was the weaken-

ing of the Directory, and the gradual preparation of France for the coming of a real master. } For the republican party was by no means content with The Di- the five Directors,—the “ five tyrants of the Luxembourg ;” rectory it was a Government without splendour, or principles, Lae or virtue. Consequently, the elections of the year VI. popular showed a decided majority in favour of republican prin- }

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ciples. The Directory did not hesitate to make a second coup Wétat, this time against the republicans. They also put a lawyer instead of a general into the vacant place in the Directory itself, as if to show that they could do with- out the army now. Yet, at the same time they had refused

Threatof

BONAPARTE IN EGYPT.]

the advantageous terms offered them by Pitt at Lille, and were eager for war; they proposed to remodel all Europe on democratic lines, and rejoiced to have a hand in the overthrow of the papal government, which was replaced by a Roman republic (February 1798), and in April of a Hel- vetic republic which replaced the old aristocratic govern- ment of Bern. By the former France defied the oldest in- stitution in the world; by the latter she

destroyed the ancient neutrality of Switzerland, a step which afterwards turned to her own loss.

War witb England was now the chief affair for France ;

war with she made preparations on the western coasts, and set a

England.

Bona- parte's position.

The reasons for the

Egyptian

expedi- tion.

The

considerable fleet afloat. The state of Ireland, which was thoroughly hostile to England, invited the Directory in one direction ; the appeal of Tippoo Sahib in Mysore was heard atthe same moment. Should they listen to either? Should they not rather strike at the heart of the enemy by an in- vasion of England? Bouaparte, who was now at Paris, standing aloof from parties, advising the Directory, living tranquilly with his wife Josephine, interested in bis new membership of the Institute, was destined to answer this question for them. Afraid of dropping out of sight, anxious to strike the imagination of France by some singular and distant success, attracted by that love of wide combinations which characterized him, Bonaparte now proposed to the Directory to conquer Egypt. The conquest itself would be easy, for the Ottoman power was all but gone. Egypt would be a splendid colony for France, assuring her on the one hand of the Mediterranean, and on the other hand rendering the trade and mastery of England precari- ous, if it did not at once prove fatal to it. The thought had been presented to Louis XIV, by Descartes, aud ap- proved by Colbert. Choiseul had not rejected it in his day. "We can destroy England in Egypt," was Bonaparte's belief. On the other hand the Directory, after much doubt, adopted the project, partly because of its dimensions and startling boldness, partly

because the Five could thereby, for a time certainly, probably for ever, be delivered from the terrible young general whose ambition was clear to them, and whom they feared. And so, in spite of all whisperings of pru- denca, and in spite of the threatening state of Europe, and the precarious condition of their power at home, the Direc- tory sanctioned Bonaparte's plan, and furnished him with a fine fleet and army for the purpose. That able negotiator Talleyrand set out for Constantinople charged to endeavour to satisfy the Ottoman Porte as to the objects of the ex- pedition.

Bonaparte sailed from Toulon (19th May 1798) for Malta,

Egyptian which, by good will of some of the knights and the idleness

expedi- tion,

and decadence of the Order of St John, he took at once ; thence to Alexandria, having escaped the English fleet under Nelson. He landed, and sent Kléber forward to capture Alexandria; then leaving him to garrison that city, he marched on Cairo, threw off the gallant attacks of the Mamelukes on the way, showed to his soldiers the "forty centuries looking down on them from the Pyra- mids," defeated Mourad Bey, who endeavoured to defend Cairo, and entered that city in triumph. The whole of Egypt was thus subdued with one blow; and Bonaparte was already, with his wonted energy, making plans for the permanent occupation and government of the country, was setting out with his savants to explore the wealth and wonders of the land, was writing home bulletins of glory, when there spread through the camp the news of the battle of the Nile, and one great disaster ruined all. Brueys, after receiving orders either to enter the port of Alexandria or to withdraw to Corfu, had lingered near Aboukir, and was there caught by Nelson. The battle had lasted all the night of August 1; by the morning the English fleet was much shattered, but it had destroyed its enemy, with the

exception of four ships which escaped to Malta. It was the ruin of the French navy; and how should the victorious army at Cairo ever get reinforcements or escape from Egypt? Was the fate of St Louis in store for these new crusaders, who, unlike him, affected Mahometan ways and customs, and issued proclamations which the pious Mussul- man might have thought written by a true believer ?

1798.

The Ottomau Porte, far from being appeased by French Second explanations (indeed Talleyrand, shrewd man, saw that it coalition

was hopeless, and never went to Constantinople), declared war ou France, and allied itself with England and Russia,— it was the beginning of the new politics of the Mahometans in Europe, the beginning of the end for them. A second coalition was at once organized against France. Russia, under Paul I., entered warmly into it, and constituted her- self the special patron and protector of the emigrant royal- ists ; the court of Vienna made its preparations to shake off the yoke of Campo Formio; the five republics round about had learnt already that republicanism under French patronage was very like servitude,—the French having an unhappy knack of always alienating those they patronize as liberators,—and seemed weary of seeing their finest works of art sent to Paris, as if to the world's centre. They were already listening to the court of Naples which hotly urged on war. France, on the other hand, was very unfit to fight. She liad lost all control of the Mediterranean ; the army was weaker in itself, and much weaker by the absence of Bonaparte in Egypt; finance was still amiss, with a terrible deficit ; the Directory inspired little confidence. The only ally of France was Spain, and her navy had been destroyed the year before off Cape St Vincent by Admiral Jervis.

against France.

The Directory raised money as it could, and passed the The con- great law of the "conscription," by which every Frenchman scription.

was compelled to be a soldier from the age of twenty to twenty-five, and ordered an immediate levy of 200,000 men. War began at once in Italy ;

before the end of the year the whole peninsula from Piedmout to Sicily was at the feet of France.

The Directory, having destroyed the neutrality of Swit- Opera- zerland, thought it now necessary to occupy that country, in tions in

order to protect the frontiers of France on that side; they e

also spread their forces along their whole line, from Brune who commanded in Holland, to Macdonald who was at Naples. 'The army of Masséna formed the centre of the whole ; he was instructed to enter Switzerland, seize the central Alps and the Vorarlberg and Tyrol, and thence to threaten Venice. It was an entirely new combination in European warfare, thanks to the new Helvetic Republic. Masséna pushed forward into Tyrol, but was arrested there by the ill-success of his colleagues in Bavaria, and in Italy on the Po. Jourdan had been twice defeated by the arch- duke Charles on the Danube, while Scherer, in Italy, after some successes, had been obliged to fall back after a disas- trous campaign. The Helvetic strategy had proved a failure, and Masséna had to abandon his enterprise. The news of French reverses reaching Rastadt, where France was still trying to intimidate the feeble princes of the empire, the French envoys were told to leave the town, and were murdered on the road by Austrian hussars. The news of this barbarous insult to the sacrosanct persons of a nation's envoys roused immense excitement in France, and entirely did away the depression which had crept over the country. The ranks of the army filled with amazing speed. The Helvetic plan of advance was abandoned ; Massena had com- mand of his old army and that of the Rhine, with his centre from the Lake of Constance to Basel; Macdonald was withdrawn from Naples; the army of Italy was com- manded by Moreau, whom the Directory had restored to favour after eighteen months of inaction, consequent on his ambiguous dealings with Pichegru.

ar.

1799.

Cam- paign in Italy.

Bonas parte's return.

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The campaign on the upper Rhine showed that the French were not strong enough to defend so long a line; they were pushed back as far as to Zurich, where Masséna defended himself for two days against the archduke Charles, and though in the end successful, he still found it better to fall back again. The Austrians occupied the chief part of Switzerland, and waited for the Russians to come up. In Italy Moreau was also overpowered ; his great ability as a captain alone saved his army from terrible disasters after the defeat of Cassano, in which Suwarrof treated him very roughly, driving him back and entering Milan. He took up a good position near Alessandria, and waited for Macdonald, who was coming up from Naples. After a very difficult campaign, in which Moreau showed great vigour and devotion, and Macdonald had done his best, and the French soldiers had displayed all their old bravery, the two armies, after terrible losses, united at Genoa. The Directory dismissed Macdonald, gave Moreau the command of a new force on the Rhine, and sent Joubert to command the army of Italy. In attempting to save Alessandria, he was met by Suwarrof, who defeated him completely (15th August 1799) at Novi, after a very hard- fought battle. This defeat ended the French resistance in Italy ; Naples, Rome, the valley of the Po, were all in the hands of the allies. From all sides news of disaster reached Paris ; the Dutch fleet passed over to the English ; an ex- peditionary force reached Ireland, only in time to be taken prisoners ; the English took Minorca and blockaded Malta ; the Russians became masters of the Ionian Islands; Bona- parte even, with the army of Egypt, had suffered defeat from Sir Sidney Smith at St Jean d'Acre on the Syrian shore, in May, after having taken Gaza and Jaffa. In India the friend of France, Tippoo Sahib, lay dead in the breach of Seringapatam (4th May 1799). No wonder if after this the position of the Directory became very critical. It was loudly declared, in spite of facts, that the Five had inten- tionally saerificed Bonaparte; the public feeling in his favour grew with men's sympathy and indignation. The Government was, with exception of Barras, one of honest mediocrity, a dangerous type in France; Sieyés, who entered the Directory in the year VIL. (1799), was regarded as its enemy, and men rallied round him; Lucien Bona- parte, who was one of the Five Hundred, led the

opposition, which declared the councils to be in permanent session ; and thus the legislative power once more asserted its authority over the executive (18th June 1799). It was a republi- can revival ; the constitution of the year III. seemed to be set aside; the character of the Directory was changed by new appointments; things fell into confusion. It was clear that a head was wanted.

Tidings of this state of things at last reached Bonaparte, who had been completely cut off from France by the disaster of the fleet. It is said that he learnt it from a packet of gazettes forwarded to him by Sir Sidney Smith. Turkish armies had been gathering force against him, and baffled in Syria, he had now to fight for existence in Egypt. The battle of Aboukir (24th July 1799), which destroyed one of their armies, set him free. Not without lies and decep- tions he stole away, leaving his army under command of Kléber, whose independent temper troubled him ; for as he had failed to conquer Syria, and to win an Oriental empire, he must now hasten home to push his fortunes in France. About the time that he reached Paris (October 1799) in a kind of triumph, as the hero of the brilliant success of Aboukir, the anxious country also received tidings of the splendid campaign of Masséna in Switzerland, the victory of Zurich (24th September 1799), the quarrels of Russia aN Austria, the retreat of Suwarrof into Bavaria, and of – eer eich with which Brune defeated the duke of

in Holland, and forced him to sign the capitulation

of Alkmaar (18th October 1799). France, relieved rather 1799 than triumphant, welcomed Bonaparte with enthusiastic transports. No one cared to inquire what he had done with

his army ; he was there, and that sufficed; he was there,

and the reign of order was about to begin. To this, then,

had the reign of reason, the rights of men, the republican propaganda, fallen; men yearned only for a strong man, a stable government under which they might have equal peace.

And Bonaparte was willing enough to accept the part thus pressed on him; he called to himself the moderate party,

by far the largest in France, and prepared to seize on a dic- tatorship. On the 18th and 19th of Brumaire (9th and The 10th November 1799) Bonaparte, who had allied himself Coup with Sieyés, and had round him a powerful group of friends ee and generals, carried out his plans in spite of the resistance and 19th of the patriots, the hostility of the Five Hundred, the un- Bru- certain temper of the troops. It was a moment of immense Maire. peril for Bonaparte and his brother Lucien, until, in reply

to an appeal to the soldiers, in which nothing was spared

that could rouse them, the grenadiers rallied to their hero,

and ejected the council then sitting at St Cloud. The Direc-

tory was suppressed, and in their place were three consuls, | appointed provisionally. These were Napoleon Bonaparte, Sieyés, and Roger-Ducos. Twocommissions were named to revise the constitution. The three consuls took oath to

the Republic.

Thus the Revolution passed into its last stage. It had The last tried to live with a king, had tried to govern by democratic Staset severities, had also been moderate; it now became mili-\oision, tary. The despot, who, according to Aristotle, haunts like a dark spectre the steps of democracy, had now, at ten years' end, overtaken and destroyed its forerunner. " Hadem magistratuum nomina," no doubt; also, as in the case of | imperial Rome, a new dynasty founded on the sword. i

Bonaparte had no sooner secured his revolution than he Bona- set himself with his wonted vigour and sagacity to consoli- parte's date it. THe saw

that France was weary at heart of the Pos struggles and changes of parties ; he wished to sweep away all remembrance that he too had been, in profession at least, an ardent partisan; he felt that he, supported by his bayonets, was strong enough to treat faction with contempt.

Therefore he said, " Let there be no more Jacobins, nor

moderates, nor royalists ; let all be Frenchmen ;" and as he

said it, all France recognized that this was the equality they

sought, and hailed him as their master. When the consuls

sentenced fifty-nine democrats to exile, the popular feeling a showed itself so completely in favour of an amnesty for all ; that they were compelled to recall the order. Parties were

now insignificant, because Bonaparte was great.

On the 13th of December 1799 the "Constitution of the Consti- . year VIIL.," chiefly the work of Sieyés, was put forth, ttionot There were to be three consuls, first, second, and third, ed not equal as at Rome, named for ten years, and re-eligible. | Of these the first consul had in fact all the power ; he alone could promulgate Jaws, name ministers, ambassadors, and officers generally, while the second and third had only a consultative voice, which could not be of great avail; their two voices could not out-vote that of their so-called colleague. A council of state was to be charged with the drawing of all laws, its members to be named by the first consul ; laws thus framed should be presented to a tribunate of a hundred members ; this body, after discussion of the project, was to pass it ou, in the hands of three orators, who should discuss it against three counsellors of state nominated by the Government, in the presence of the legislative body, which finally adopted or rejected the law by a secret ballot without debate. This legisiative body was composed of three hundred members. Lastly, there was to be a senate of eighty life members, who should confirm or annul all acts which might be referred to it, on grounds of their constitutional

character. They also were to name the consuls, tribunes, and the legislative body, choosing them from a list of 5000 names, which were to be chosen by 50,000 persons, who themselves should be elected by 500,000 electors, who in

wrote a letter to George III., with characteristic indifference 1800-1. to the English constitution, offering to make peace directly Proposals' with him. Pitt, as minister, replied by refusing to nego- to George, tiate, till France should replace on the throne her ancient 14-

their turn were to be named by universal suffrage. Sena- tors were to be elected to vacancies by cooptation, from a list of three candidates presented by the legislative body, the tribunate, and the first consul. Bonaparte had modi- fied this elaborate structure before it saw the light, by significantly cutting out all the poor guarantees for liberty it contained. As it stood, it was merely the decent robe which shrouded the naked dictatorship of the first consul. The people, by an enthusiastic plebiscite, adopted it almost unanimously. Bonaparte having accepted the post he had arranged for himself, two new men were associated with him; Cambacéres, a distinguished lawyer, and not a politician, as second consul; and Lebrun, an elderly man, good at the bureau, the type and representative of French officiality, as third consul. The senate was filled with the most distinguished names in France—men great in science and arts, as well as in arms or politics; the legislative body whom they selected, after the decimal system explained above had reduced the candidates to 5000, were certain to be quiet obsequious people. Finally, lest public opinion should be disturbed in its happy unanimity, the freedom of the press came suddenly to an end; for the First Consul thought that thirteen journals were enough for France, and these were all duly submissive to the Govern- ment. Thus did dictatorial power usurp the place of liberty, and a system began, based on falsehood and illegal force, yet so splendid and so well-suited to the needs of fainting France that she has only in our day at last escaped from the glamour of it, and from the worship of the Napoleonic idea. The First Consul took up his

abode, early in 1800, at the Tuil- erles, and at once formed a ministry :—his brother Lucien

dynasty. The terms of the refusal offended the French people, and strengthened Bonaparte's position. Russia made peace ; Prussia stood neutral. Austria and England, with Bavaria, Wiirtemberg, and Mainz, determined to con- tinue the contest.

The campaigns of 1800 were thus planned by Bonaparte. cam- Masséna with a weak army was left to defend the Riviera paigns of from Nice to Genoa, and there to employ as much as 180.

possible the Austrians in Italy. The Rhine army, led by Moreau, should threaten Bavaria, after finally grasping the all-important strategic position of the corner of the Black Forest, between Rhine and Danube ; meanwhile Bonaparte himself, quietly aud with scrupulous secrecy, collected a third great army for himself, destined forthe Po. Masséna's army was driven back and suffered considerable reverses ; the Austrians under Melas penetrated across the frontier ; Bonaparte, however, knew that Provence was not the heart of France, and that with Masséna holding out at Genoa, no very serious attack could be made in the south. Moreau's army of the Rhine penetrated into Bavaria, drove the Austrians back to Ulm, and prepared to send a part of its right flank across the Alps to join the main central movement of Bonaparte. His army of the centre, collected rapidly at Geneva, made its famous passage of the St Ber- nard, while his right went over the Mont Cenis, and the right flank of Moreau's army, now his left, crossed the St Gotthard. To the amazement of all, the Austrians saw Bonaparte returning to the scene of his old triumphs, and entering Milan in triumph. They hastily drew themselves together; the fall of Genoa, after a splendid defence by Masséna, freed a large force. The astounding battle of

and his

a for the home office ; Gaudin for finance; Berthier for the ministers,

army; Talleyrand, ex-bishop, for foreign affairs; and Fouché,

Marengo (14th June 1800) decided the campaign ; "in it The the Austrians lost all they had gained in eighteen months battle of

lord of spies, for police,—the last two the only politicians in the company; they both had abandoned holy orders. Without a portfolio, in close relation with Bonaparte, was Maret, better known by his later title of duke of Bassano, the first founder of the Moniteur Universel, a man of upright character and unwearied industry. The spirit of system, visible in the constitution, and in the tastes and character of Bonaparte, was at once indelibly impressed on the adminis- tration of the country. Allsprang from one centre, the First Consul; a prefect was set over each department, with sub- prefects under him; it was a more perfect development of the intendant's office under the old régime; the prefects named the local mayors, and thus the whole machine re- ceived all its impulses from headquarters, and formed a per- fectly compact and easy-going government. Local law and local finance were also organized in a similar way; and by a simple edict as to the method of tax-gathering, joined to the new confidence all France felt in her ruler, the crushing difficulty of the deficit was at once got rid of. Peculation became impossible; taxpayers were equally and fairly charged ; none were allowed to fall into arrears; and the country, being really rich, speedily rose into prosperity. Salaried officials covered the whole land with a network, each for his daily bread interested in the stability of govern- ment. The prineiple of the new government, in general administration, in finance, in the church, in the law, was

that of absolute subservience of all officials to the head ; and |

the love of France for bureaucracy, which has made her the chosen land of an official hierarchy, made this organi- zation the most complete and successful that the world had hitherto ever seen. The disturbances in the west, caused by the monarchists, were put down without difficulty.

and by twenty victories." followed at once; for Marengo had given Bonaparte the command of all the upper valley of the Po, and the Austrians withdrew behind the Mincio. Meanwhile Moreau, with the army of the Rhine, was doing excellent work in Bavaria, and had taken the ascendant all along his line, when tidings of the convention of Alexandria brought his

campaign to an end, Peace, however, did not follow; the English Govern- ment eagerly urged the Austrians to hold on, and hostilities began again, late in the year, in the valley of the upper Danube, where Moreau, supported by Ney, won the splendid victory of Hohenlinden not far from Munich (2d December 1800), and after a series of brilliant combats drove the Austrians back, till Vienna was in terror. Then an armistice was signed at Steyer, by which Austria ceded her strong places in Tyrol and those of Bavaria to the French army. The army of Italy also won great advantages, and compelled Austria to sign an armistice, by which France occupied a number of important points in north Italy. In concert with Pius VII., lately elected pope, Murat menaced the kingdom of Naples, and a third armistice, which closed the Neapoli- tan harbours to England, ended the war.

France and Austria, treaty of Campo Formio ; France secured the left bank of the Rhine and the Belgian provinces ; the independence of the four republics was recognized; the pope was replaced in his states ; Tuscany was ceded to France, and became the heart of a new kingdom of Etruria. The king of Naples also made his peace with France, on the terms of his armistice.

England alone stood out against the First Consul, who

Bonaparte had promised peace to France ; and he at once | seemed able to impose his will on Europe. It isimpossible,

The armistice of Alexandria Marengo.

*The peace of Peace of Lunéville was concluded on February 9, 1801, between Luné- It was drawn on the basis of the **

1801-2.

The op- position of Eng- land.

The peace of Amiens,

Bona- parte's organiz- ing power.

at this distance of time, to realize completely the combina- tion of causes which led to the determined resistance of England ; the most prominent and least defensible cause was the "dominium maris," asserted in opposition to the principles of the armed neutrality of 1780. At the end of the 18th century the English navy had risen to very great proportions, and the interests of the country, as was then thought, were hostile to the claims of neutral com- merce. Consequently, the northern powers, irritated and insulted by English claims carried out with the strong hand, formed a great coalition at the end of 1800, in which Den- mark and Sweden, Russia and Prussia, set themselves to secure the liberty of the seas. They invited the First Consul to join them, and he desired nothing better ; it seemed asif the national hatred of France against Pitt and England would now find vent, and would overthrow that persistent enemy. It seemed, too, as if Bonaparte, as he consolidated his power at home, would be able to assert himself also as the protector of the liberties of Europe abroad. On the other side, the English Government did not waste time. Parker and Nelson were sent into the Baltic, to break up the coali- tion, if possible. As Denmark had the most ready fleet, and was in fact the most active member of the coalition, Nelson determined to strike hard at Copenhagen. The hard-fought battle of Copenhagen, in which the Danes made heroic resistance to the English forces, led to an armistice ; and the assassination of the emperor Paul I., which reversed the policy of Russia, brought the great coalition to au end, By the summer of 1801 the northern powers were all again the friends and allies of England. It was in vain that Bonaparte threatened the English shores with invasion ; he felt that his great plan had broken down, and wanted a little breathing time. He made peace with Portugal, occu- pying with French troops two of its provinces. On the other hand, the army Bonaparte had left in Egypt, after the re- fusal of England to allow it to return to Europe, had lost its general Kléber, who had been assassinated by a Turk ; all the efforts made to reinforce the army from France failed ; an English force from Minorca, and 7000 sepoys from India, as well as a Turkish army, now converged on Egypt. Abercromby, at Aboukir, repulsed the attack of the French under Menou; the French army after a short time had to capitulate (27th June 1801), and was carried over to France in English ships.

At the same time war between France and England was drawing to an end; the negotiations were concluded in March 1802 by the peace of Amiens. The principles of the armed neutrality had failed to establish themselves, and England secured not only her command of the sea, but her lordship over India, She had also freed Portugal, the kingdom of Naples, the States of the Church, from French control ; Egypt was restored to the Sublime Porte. On the other hand, the authority of France in central Europe remained unbroken; the great campaigns on the Po and the Danube had secured this result, The brilliant successes of the French arms, and the treaties of Lunéville and Amiens, prepared the way for the next forward movement of the First Consul. Meanwhile France at home was prosperous and productive ; Bonaparte's splendid gifts of organization continued to work wonders; he made the income of the country meet all the outgoings, and created a real surplus, a thing unknown throughout the previous century. On every side fresh energy was evoked, new enterprise stimulated ; all things were felt to proceed from one centre, —a centre not, as in the old monarchy, of selfishness and waste, but of active and beneficent influence. Too little was left for private and spontaneous effort, that being the weak side of the development of France; yet considering the state of the country, the rule of a beneficent despot was welcome and most successful, The greatest work of this period

- when France was in the first flush of an unwonted tran-

was the construction of the civil code, on which Bonaparte 1800-4, himself worked with amazing zeal, clearness, and ability. The Code It was issued in January 1804. In other domestic matters Napo- | his ascendency displayed itself more and more; the at- eon,

tempts made against his life enabled him to crush and

terrorize the extremer republicans. The system of senatus-

consultes, by which he veiled his arbitrary edicts under the

authority of an obsequious senate, enabled him by degrees

to crush the remnant of free discussion still possessed by

France in the tribunate of the constitution. He got rid of constitutional opposition as readily as he had freed himself

from the attempts of conspiracy, and reduced the legislative

assembly to a nullity. The age of the Revolution seemed

to be past; the grand organizing faculty of the First Consul

was doing what the destructive forces of the republic could

not do,—was reconstructing society on a basis partly new

and partly old, was centralizing authority, was creating a

despotism adapted to the phraseology of a " republic one

and indivisible," and giving to France a new position among

the nations, For the autocracy of Napoleon was the direct

outcome of republicanism, as it allied itself with military organization, and slowly attracted to itself many of the

relics of the old order of things. Though essentially hostile

to real liberty, the coming empire sprang out of a great and

*generous effort made by France in that direction; it was **

not till our own days that she succeeded, if even now she

has succeeded, in shaking off the iron trammels of imperial-

ism, and ruling herself with constitutional freedom and

calmness under the republic of her choice.

In these years (1800-1804) the First Consul not only The re- . crushed the spirit of the two chambers and the tribunate, construc: | but also passed on boldly to reconstruct French society, a ee | much harder task. Directly after the peace of Amiens, > ti quillity, Bonaparte made terms with the papacy, and by the ; Concordat reconstructed the Church of France. All the old TheCon- — | divisions were swept away; ten archbishoprics and_fifty cordat. bishoprics were newly mapped out by First Consul and Pope; and in 1802 the will of Bonaparte and Pius VII. per- emptorily put an end to the schism between refractory and constitutional clergy, and so cut away front the ancient mon- archy its chief support. The traditional life of the church was rudely cut off; the authority of the state was displayed in full; the constitutional priests were sacrificed to the political needs of the First Consul, who saw that, if he would have firm hold of power, he must first win over the royalist clergy. The chief opponents of the Revolution got the chief rewards; the constitutionalists were mortified. From . this moment dates the friendship between the Napoleonic dynasty and the Church of Rome ; from this dates also that secret hostility between the clergy and the army, which has : often since that period produced results none the less strik- | ing because their origin was concealed. For the time, . however, the paramount authority of Bonaparte over the army made resistance impossible. The weak point in the arrangement was the certainty that 'in their hearts the courtier-like clergy would always prefer a Bourbon to Napoleon; and of this, too, history has provided more than | one proof. Still, for the time, in church as in army, the step was successful, and gave strength to Bonaparte's position. The emigrants also returned, thanks to an armistice, Return and in large numbers took oath to respect the new govern- ote ment, It wasa bold and hazardous step, which the first ead consul afterwards saw good reason to regret. An exiled adherent of a lost cause never changes, never learns pru- dence, never is satisfied with the de facto ruler of his people ; his mind is warped, his moral sense, in matters political, vitiated; the existing goverument has in him a secret enemy, 2 plotter and intriguer, a fierce fanatic, outwardly

-subdued, inwardly smouldering, and ready to burst forth in

flame whenever the breath of a royal whisper fans the embers.

In restoring the Catholic clergy and the ancient nobles to France, Bonaparte affirmed a principle hostile to the revolution, necessary fora despotism. He must have classes of society "intermediate," as he said, " between the people and the powers"; "to settle the bases of the Republic, one must throw on the sand some masses of granite," an apt illustration of the way in which this despot of an iron will determined to crush all liberty in France. Unfortunately for him his heavy "masses of granite" after all, while they crushed the people, formed but an insecure foundation Theuni- for himself. The same motive led him to reorganize educa- versity of tion and to establish the university—in his hauds a mere France. creature of power, a machine to turn out public officers, and

to centralize and unify all education in France; public schools or lycées throughout France were all dependent on this central university. Education, as is always the way under a despot, took a mathematical and scientific bias ; moral sciences and history found no place; theology was left for the clergy in their seminaries ; the dead languages held a secondary position. To this new organization France owes, in large part, her unpractical ignorance of modern languages, geography, political economy ; she has not yet

- *entirely shaken off the load thus imposed on her shoulders. The Next, the institution of the Legion of Honour was the Legionof beginning of a new aristocracy, and was meant to supply Wonour. another blank in the new hierarchy of this growing military*

despotism. Finally, the First Consul constructed a new con- The con- stitution, that of the year X., which strengthened his own stitution nosition, and weakened still further all the elements of re- of the : ssh one year X. publican and constitutional opposition. It was adopted

with obsequious unanimity (4th August 1802). During this period the influence of the First Consul was also domin- ant across a large part of Europe: the four republics rested on him, and were much modified at his

demand ; the lesser states of Germany allowed him to interfere in their affairs ; he was able to overcome, at least for a while, the suspicion and ill-will of Russia. On the seas also his activity was felt: he was anxious to restore the colonial power of France, shattered by the war ; he interfered in the affairs of Hayti, and hoped also to recover his influence over Egypt and the Mediterranean. England, seeing her special province of the seas thus invaded, and never very well pleased with Bona- parte and the peace of Amiens, declared war against France in the spring of 1803.

Second Bonaparte at once occupied on the one hand Hanover, Bean. on the other Naples, made friendly overtures to the United

States, and threatened the English shores with invasion. Europe was divided into two hostile camps, and a great and stubborn war impended. Russia at once sided with Eng- land; the court of Vienna, though unable at once to go to war, warmly sympathized with the opposition to France ; Prussia held aloof; England also seconded the underground resistance of the old royalists in France. This was the period of the conspiracy which led to the seizure by Bona- parte of the duke of Enghien, a seizure on the soil of Baden, excusable on no plea of international law or sudden necessity, his military and violent mockery of a trial, and his per- emptory execution. Moreau, whom the First Consul was glad to be rid of, for healoue could be a rival in the affec- tions of the army, was exiled to the United States; Pichegru committed suicide in prison; a handful of others were executed; and the First Consul, taking advantage of the excitement and indignation of all France, had himself pro- claimed Emperor of the French (18th May 1804). A new constitution, of imperial texture, was woveD for the occasion, Hereditary succession was affirmed ; six great dignitaries, with high sounding imperial titles and no power, were established ; the military splendours of the marshalate

The Empire.

reappeared; the council of state and the senate were charged 1805-6. with all legislative functions; the older bodies, the tribunate

and the legislative body, were a mere appendage; and thus

began the imperial age.

VI. Tue Empire.

Imperialism is an overlordship over nations. It is more Impe- than this; itis, strictly speaking, the representation of both rialism. the empire of old Rome and the Holy Roman Empire, with all the high claims involved therein. In this sense, im- perialism claims temporal lordship over all the earth, and rears its head side by side with the papacy, which asserts a spiritual headship as wide and as complete. The full theory of neither has ever been realized; and as time has gone on, both ideas have grown weaker, and pale images of both have sprung up. As the world has become wider, it has become clear that neither the principle ofnationality nor that of independence of thought was compatible with either empire or papacy. And, as time has gone on, the imperial name itself has undergone large modifications. We have seen an empress of India, an emperor of Austria, an emperor of China, an emperor of Mexico,—all names com- pletely wide of the true imperial idea. And the title of '"'Empereur des Frangais," which Bonaparte now assumed, with acclamation of France, carried in itself a reversal of old ideas, for it affirmed a personal lordship, based on the sovereignty of the people, as expressed by a plébiscite. Be this as it may be, the power was real, and was wielded with iron will and unscrupulous genius.

- The strength of England on the seas soon compelled The third

Napoleon to make his chief attack on Austria, while Eng- coalition. land and Russia once more drew together against him. In

1805 his grand army penetrated into the valley of the Danube, took Ulm, and in spite of the king of Prussia's accession to the coalition, pushed on as far as to Vienna. Napoleon occupied all the upper and middle Danube valley,

and then marched northwards in pursuit of the emperor Francis of Austria, who had fled into Moravia. On the

2d of December 1805 he won the great battle of Austerlitz,

which for the time reduced the allies to impotence. Peace followed at Presburg (26th December 1805) between Peace of France and Austria, by which that ancient power was Presburg. parted out among its neighbours.

Two months before this the decisive battle of Trafalgar Battle had finally disposed of the remaining naval force of France of Tra- and Spain (2lst October 1805), and, leaving England in fale: complete security, enabled her to continue without fear her task of obstinate resistance, at the very moment when France seemed to have completely triumphed over the united hostility of continental Europe.

The emperor at once, characteristically guided by his love Napo- of grand conceptions and far-reaching combinations, sct leon's himself to surround France with a great system of " federa- po tive states of the empire," in " three compact nations of of ae Italians, Germaus, Spaniards." But if he overrated his own Rhine. constructive genius, he underrated the obstinacy of his enemies, and soon found liimself met by a fourth coalition, against which he proposed to build up the Confederacy of the Rhine, and to restore the dependence of the lesser German princes on France, and so to carry out the ideas of Henry IV., of Richelieu and Mazarin. War, however, broke out in a different quarter. The restoration by France of Hanover to England, a part of the series of negotiations which followed the peace of Presburg and the death of Pitt, roused the utmost anger in Prussia, and led to new com- War binations, as a consequence of which the king of Prussia, with — without waiting for help from England or Russia, rushed eee ou war (September 1806). The battle of Jena (14th October 1806) and Auerstadt completely overthrew the

1807-9.

The treaty of Tilsit.

The Spanish war.

Fifth coalition.

Battle of Cha: 5 Wagram. rles, in the d

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Prussian power, and the conquest of Prussia was completed before the end of the year, and before the Russians had time to come up to the succour of their allies. A winter campaign followed, in which the sufferings of the troops and the obstinate resistance of the Russians at Pultusk and Eylau (8th February 1807) arrested the triumphant move ment of the emperor for a time. Iu the summer of 1807, having secured the line of the Vistula, he defeated the Russians at Friedland (14th June), and took Kénigsberg. The treaty of Tilsit (7th July 1807) followed; for Russia needed rest, and Napoleon was not sorry to pause. It is the highest point of the emperor's renown. His hand was felt throughout all Europe ; it seemed as if England alone was beyond his power.

The deterniination of the emperor to rearrange the whole map of Europe, and to assert his power in every quarter, led him to that Spanish war whence sprang the resistance which at last overthrew him. For he decided on subduing the whole Peninsula, including Portugal ; the Portuguese court took flight to Brazil on the approach of Junot, and Charles IV. of Spain abdicated when Murat threatened Madrid. Na- poleon at once placed Joseph Bonaparte, a very incompetent person, on the Spanish throne; and when the Spaniards showed their irritation with him, he too abdicated, and gave place to Murat, who had married Caroline, sister of the em- peror. Then the Spaniards rose in revolt, and that wearing guerilla warfare began which opened the way for the suc- cessful arms of England. The capitulation of Baylen ruined for the time the French power in Spain ; Dupont and Vedel were compelled to lay down their arms; in Portugal England now began to appear, and on 21st August 1808 Sir Arthur Wellesley won the battle of Vimiera. When Napoleon found that, as thus in Spain, the peoples rose against him, he ought to have recognized the hollowness of his friendships with the kings. He longed, however, to be one of their comity, as well as to have vassal kings and princes under himself; to this end he had created a new and high-sounding aristocracy around his throne; for this end when Germany, led by Austria, now began again to

move against him, Napoleon drew towards Russia, and was com- pletely duped by the emperor Alexander. Having, as he thought, 1nade all safe on that side, he turned his attention to Spain, and, in spite of guerilla warfare, entered Madrid (4th December 1808). Sir John Moore, who from the west coast had penetrated as far as to Salamanca, was driven back by Soult supported by the emperor, and after the battle of Corunna (14th January 1809), in which he fought at bay and lost his life, the English had to embark and withdraw. The siege of Saragossa, however, contested with all the tenacity and devotion of the Spanish character, wore out the strength of the French forces, and their tenure of Spain was felt to be most precarious.

Now followed a fifth coalition against Napoleon, whose subjects at home were beginning to show signs of exhaus- tion. Still, when his army marched into Bavaria, it seemed as strong, as enthusiastic, as well commanded as ever. By splendid combinations and a series of victories, Napoleon swept down the Danube valley, and took Vienna. Ere long he was checked by the terrible battle of Gross Aspern or Essling (21st and 22d May 1809) just below Vienna, in which his victory was purchased at a price he could ill afford. He had to pause, while the Austrian court gathered itself together in Moravia. When he saw this, and felt that all Europe was beginning to move behind him, he too gathered fe Strength up, and marching against the Austrians

eated them, under me command of the archduke ecisive battle of Wagram (5th and 6th Le ane victory which, while it tel for the time Bie conus a ae also weakened him to a

. as therefore at once followed by

FRANCH

the armistice of Znaim, which led, in a short time, to the 1910-19 hollow peace of Vienna. This agreement broke up the Peace of coalition, handed over to Napoleon the Illyrian provinces Vienna.

[HISTORY.

with a part of Tyrol, and gave him an imperial bride in Maria Louisa, daugliter of the Austrian emperor. Napoleon at once returned to Paris, to celebrate his marriage, and to organize afresh his vast empire. Nothing escaped his care; he coerced the press, rearranged finance, which had grown to be a very heavy burden, saw that the church was duly submissive and duly paid, and held the pope in honourable bondage at Savona. In other parts things went not amiss: the foolish Walcheren expedition mouldered away; in Spain Wellington with difficulty held out against Spanish indolence and corruption, and the genius of Marshal Soult. The lines of Torres Vedras (1810-1811), which the English general defended against Masséna, form the turning-point of the history of Napo- leon's triumphs. His last great victory was Essling ; henceforward his successes will bring no lasting good ; his failures will draw him towards his fall, The successful winter in the Torres Vedras lines was followed by Wellington's famous campaign of Almeida, Badajoz, and Ciudad-Rodrigo (1811-1812), in which the English general separated Soult and Masséna, while he secured for himself a splendid base of operations for the future.

But before this, the flattering friendship of Russia had The war Ever since the end of 1809 Napoleon had with

turned to gall. seen how hollow all was in the north, and at last, early in 1812, warbroke out. Napoleon, misled by brilliant schemes, and ever trustful in his star, determined at once to crush the resistance of Russia ; as he had entered Berlin, Madrid, and Vienna, so he would also enter Moscow, and thence at last dictate peace to all the world. He seemed to think he had two things only to do, 'conscrire et prescire,"—to sum- mon up and sacrifice the whole youth of France as conscripts, and then to prescribe his own terms to Europe. This terrible blunder cost him his throne. He left his soldiers in Spain to take care of themselves ; though he must have seen that they were almost as much in want of help as that army had been which he so selfishly left behind him in Egypt. With this difficulty in his rear, and the vast dis- tances, huge armies, and terrible climate of Russia before him, he set forth in the spring of 1812 on his famous and fatal march to Moscow. He crossed the Niemen, and reaching Wilna, the capital of Lithuania, haltcd there to re- eruit his troops (June 1812), which were in unusual dis- order. Here he proclaimed his sympathy for Poland, while he tried not to offend

the Austrians or to unsettle their share of the dismembered kingdom. Negotiations also went on; the emperor of Russia offered terms, which were refused at once ; Bernadotte, now by election prince-royal of

Sweden (21st August 1810), who knew the character of his Sixth late master, also had dealings with Napoleon, while at the coalition.

same time he made alliance with the czar, and began a sixth coalition against France ; England joined the new league, and Turkey made peace with Russia. Still Napoleon per- severed ; he won the hard-fought battle of Smolensk (17th August 1812), though he did not succeed in cutting off the retreat of the Russians, who burnt everything as they with- drew, leaving a desert for the French. 'The terrible battle of Borodino, one of the hardest struggles in history, gave Napoleon a victory, though the Russians again with- drew in good order (7th September). They did not attempt to defend Moscow, retiring thence, and leaving the capital as "a snare in which the ruin of the foe was inevitable." And so it proved; the French army entered Moscow in triumph, and Napoleon established himself at the Kremlin (15th September) ; the next day the whole town burst into flames ; after five days nothing was standing save the. churches, and perhaps a tenth of the city. It was savage

PALL OF NAPOLEON. |

, ba as it was heroic; at any rate, it was completely successful. his armies grew more threatening ; the French communica- tions were clearly unsafe; the winter was not far off; it looked as if Napoleon might even be shut up in Moscow, The great retreat was inevitable. In the middle of October the French army began to pour out of the gates of Moscow, and then began a running battle at every point. The army bled at every pore, and Ney with the utmost heroism protected therear. Atlast Napoleon reached Wilna ; there the worst of the pursuit seemed to be over, and there was both food and raiment; there he, leaving Murat in com- mand, abandoned the shattered remnants of the grand army, and took flight to France (5th December 1812). The remainder of the retreat was even more ruinous than what had gone before ; it was but a handful out of so great a host that reached the frontiers of France again. Of 450,000 men who set forth, probably not 100,000 returned. The war In Spain affairs had been almost as bad for

*France. arly in Spin. in 1812 Wellington had taken Ciudad Rodrigo and Badajoz, and then advancing into Spain, defeated Marmont and the French at Salamanca (22d July 1812), and occupied Madrid. In the autumn Soult, by able dispositions and a stronger force, compelled him to retreat again to Ciudad Rodrigo. The campaign had shown the weakness of the French occupation, while it lad greatly lessened their resources and the part of the Spanish territory at their disposal, War France still worshipped her chief. The new and severe with conscription gave him another vast army ; and he set forth Prussia. +o punish Prussia, which had declared war against him, in concert with Russia. The Germans always have honoured this period of their history as a great resurrection, and as the birthtime of their true national life. The emperor passed through Mainz to Erfurt, and fought his first battle, a severe one, on the plain of Liitzen; the defeated Prussians and Russians fell back in good order through Dresden, Napoleon following them hard, defeating them and driving them out of their intrenched camp at Bautzen (20th and 21st May 1813), whence they retreated again in perfect order. It was evident that the temper of Ger- many had entirely changed since Jena, An armistice, which followed, led to much negotiation at Dresden, where Napoleon's headquarters lay. The upshot of it all was that Austria joined Russia and Prussia, and the war went on. The attack of the allies on Dresden, which lasted two days (26th and 27th August), ended in their repulse and defeat ; Russian supports came up in October, and it was plain that they were going to cut the French communications, and coop Napoleon up in Dresden for the winter. The king of Bavaria at this moment joined the allies, and made the emperor's position still more precarious. He now withdrew from Dresden, and near Leipsic came into collision with his enemies, who were waiting for him there. On the 16th of October 1813 * began one of the decisive battles in the world's history. Napoleon's forces were far outnumbered by those of the allies; and some of his German troops deserted in the thick of the fight. The battle raged on the 16th and the 18th ; on the 19th Napoleon, completely defeated, began to withdraw. At Hanau he overthrew Wrede, and cut a passage for his army; the victorious emperors followed closely on his heels, and barely half his men reached home. The campaign had broken to pieces the dominance of France in Europe; and all the imperial creations, the confederation of the Rhine, the kingdom of Westphalia, the Batavian republic, came to an end. George III. resumed the electorate of Hanover; Austria recovered her lost provinces; in*

Spain the throne of Joseph Bonaparte fell, for the battle of Vittoria (21st June 1813)

The battle of Leipsic

PrRAN CE

The emperor Alexander spurned all overtures for peace ;_

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had utterly destroyed the power of the French in the 1813-14, peninsula. Wellington drove them out of Spain, and in spite of the vigour and ability of Soult, the two great fron- tier fortresses of Pampeluna and St Sebastian fell. Wellington entered southern France, and in November threatened Bayonne. Napoleon could only complain, with the tone of an irritated master, that he had been defeated by the treason of his servants, that is, of his German subjects.

On his return to Paris, the emperor found thie tone of feeling very much changed. In the legislative body men ventured to denounce his rule; such outspoken words had not been heard for years. He angrily replied with his " Vétat, c'est moi," "to attack me is to attack the nation," and abruptly closed their session. Henceforth he would rule alone, and alone with the ruins of his armies face the terrible invasion that was coming on. The whole conditions The in- of his warfare changed ; he must now act on the defensive, vasion of and bear to see France trodden under foot, even as France F?"°e- till now had trodden all Europe under her feet. The allies came in almost without resistance in three armies,—the Austrians from Basel advancing to Langres; Blucher with the Prussians crossed the Vosges to Nancy ; the army of the north, Russians and Prussians, came down to Namur, and thence to Laon. In all there were full 200,000 of them, a force quite double that at the emperor's disposal, They all sat on the inner slopes of the mountains which form the northern, north-eastern, and eastern defenves of France, awaiting the moment to advance. Napoleon had the one great advantage of the inner line. But after fighting the severe battle of Arcis-sur-Aube, he tried to paralyse the allies by striking at their communications, and so lost his one advantage; for they, instead of

hesitating, marched boldly on for Paris, defeated Mortier and Marmont in the very suburbs, and forced the proud capital to surrender before Napoleon could come up to its defence. The allied emperors were received with cries of " Long live the king," "Long live the emperor Alexander." A provisional govern- ment of senators decreed the downfall of Napoleon ; the other constituted bodies followed ; the imperial government was swept away as in an instant. The emperor, amazed at this sudden impulse of the country, abdicated (6th April 1814) on behalf of his son, and finally (11th April) he abdicated completely, offering himself, as he said, a " per- sonal sacrifice" to France. His titles, honours, an ample income, and the island of Elba in full sovereignty, were left to him.

The restoration of the Bourbons followed at once. Louis Louis XVIII. appeared in Paris, the protégé of foreign bayonets, XVIII. and not ashamed to own that he owed his return to English help. Peace followed at once; France shrank back to her old dimensions, as she had been in 1792, with some slight modifications. Louis XVIII. lastly promulgated a new charter, granting some constitutional rights to his subjects. The document was dated as of the 19th year of his reign, as though Napoleon and the Revolution had never been. The peerage was restored, its numbers now unlimited except by the king's will, who alone conld appomt peers ; 4 chamber of deputies, elected by a limited suffrage, had really but little power, as the king reserved to himself the initiative of all laws; the Roman Catholic religion was declared the faith of the state, and full toleration granted to all dis- sidents. This was the constitutionalism of the reaction. Tt showed how far France had travelled from the days of the old régime. There was no question of ancient privileges or of feudal usages ; the very name of States-General had disappeared. No reaction, however severe, ever brings things back to the point from which they had drifted ; France could never again be what she had been under Louis XIV.

1814-15 naturally untrue as he; he never hesitated to he and to 1816,

A congress at once assembled at Vienna, under Metter- nich's presidency, with a view to a peaceful resettlement of Europe. It was, however, suddenly turned to warlike thoughts by the startling news that N apoleon, leaving Elba, had landed near Cannes (1st March 1815). He appealed to citizens and soldiers alike; he appealed to the people ; he spoke only of peace and liberty, and a popular constitu- tion. The army at once saluted him aguin as 1ts emperor ;

Hundred France with a spontaneous plébiscite restored him to his

throne, and Louis XVIII. fled to Ghent. Napoleon en- tered Paris amidst delirious transports of delight. Cooler reflexions soon followed, when the declaration of the allied sovereigns was heard, and troubles began in the old royalist districts. Nor were men better pleased when it was seen that Napoleon returned at once to his old despotic manner of governing ; signs of alienation showed themselves ; the allied armies drew towards the frontiers of France. Bliicher, with his Prussians, came down to join Wellington, who had landed in Flanders, and Napoleon hastened up to pre- vent their union. He sent Ney to encounter and check the English, while he himself tried to destroy the Prussians. He found them at Ligny, where, on June 16, 1815, he defeated them, though Ney was unable to force Quatre Bras, so as to be ready to fall on their flank and complete the rout. The consequence was that Bliicher drew off his army unbroken to Wavre; and Wellington, to keep near him, also fell back to the village of Waterloo, where he could both cover Brussels and await the Prussians. There, on the 18th of June, 1815, took place the battle of Waterloo, in which Napoleon and Ney made their final effort for the empire. The object of Wellington was to hold his ground till Bliicher could come up; the object of Napoleon was, by detaching Grouchy towards Wavre, to hinder the Prussians, till he could crush the English. Grouchy, however, let him- self be deluded by a single Prussian corps, while Bliicher slowly made his way towards Waterloo; and Wellington's Englishmen and Germans, with heroic tenacity, had held their ground against all attacks. In the afternoon the Prussians began to come up, and after the repulse of the French guards towards evening, Napoleon knew that all was lost, He entrusted his shattered army to Soult, and fled headlong to Paris. There, finding all hope gone, he once more abdicated, on behalf of his son. He withdrew to Rochefort, hoping to find means of

escaping to America ; but the English cruisers rendered this impossible, and he threw himself on the generosity of his hated foes. He was taken on board the Bellerophon, and conveyed as a state prisoner to the island of St Helena, where he lived, the mere shadow of his former self, in a hated and inglorious

deceive ; the most important despatches he would readily falsify, if he thought there was anything to be gained by it, There was in him a swiftness of intelligence which answered to his hot and passionate nature; the true and solid balance was wanting. He could not rest, and knew not when he had achieved success. And this was immedi- ately connected with another Oriental quality, his vast and unmeasured ambition, and the schemes and dreams of a visionary, which led him to the greatest errors of his life,— his expedition to Egypt and his hopes of an Eastern em- pire, and his terrible attack on Russia. The same large- ness of vision showed itself in his endeavours to reconstruct

‘the map of Europe, and to organize anew the whole of

society in France. He could have in his mouth the phrases and cries of the 18th century, and with them he knew how to charm mankind. Yet with this gift, and with his amazing power of influencing his soldiers, who sacrificed themselves in myriads for him with enthusiasm, there was a coldness of moral character which enabled him to abandon those who had given up all for him, and made him show shameless ingratitude towards those who had done him the greatest services. We can gauge a man’s character by his complaints against others, for those complaints are always the reflexion of his own characteristics. Napoleon was ever inveighing against the deceit of Alexander, the treachery of the Germans, the perfidy of Pitt, the warfare of savages which he had to face; and the phrases represent the worst elements in his own character. He was, in fact, the succes- sor and representative of the ‘18th century despots,” the military follower of the Pombals, the Arandas, the Struenzees of the past. He had their unbalanced energies, their fierce resistance to feudalism and the older world, their ready use of benevolent and enlightened phraseology, their willingness to wade through blood and ruin to their goal, their undying ambition, their restlessness and revolutionary eagerness to reorganize society. Like them, with well-

sounding profes- sions, he succeeded in alienating the peoples of Europe, in whose behalf he pretended to be acting, And when they learnt by bitter experience that he had absolutely no love for liberty, and encouraged equality only so long as it was an equality of subjects under his rule, they soon began to war against what was in fact a world-destroying military despotism. When the popular feeling was thoroughly aroused against him in Spain, in Germany, in England, his wonderful career was at last brought to an end,

VII. Tue RESTORATION.

While Napoleon had held together the enthusiasm of the The

ease, till death released him in 1821, at the age of fifty- | French army, and had flattered the national vanity, and had royalist |

two. The char-

There is a saying attributed to Talleyrand, which hits the prominent characteristics of Napoleou's nature :—" What a pity that so great a man was so ill brought up!" For he had genius and no breeding ; he never shook off the adven- turer-element in his life; nor had he that high sense of honour, truthfulness, and gentleness which go with true nobility of soul. With a frame of iron, Napoleon could endure any hardships; and in war, in artillery especially and engineering, he stands unrivalled in the world's history. His quick intelligence was altogether scientific in the colder and harder aspects of scientific knowledge. He took no interest in moral sciences or history, or the brighter works of imagination. Throughout we discern in him the pre- cisian, the despot on exact principles. Even when he unbent among his intimate friends, his was "a tyrant's familiarity," be a touch of Oriental ferocity under it. He was ever on jemi a aa ever full of distrust, treating great mae oe and feline grace of manner, which

pecting a surprise. No one was ever so

raised a bulwark between the peasant tiller of the soil and his ancient oppressor, the Bourbons came back, having learnt nothing, and under auspices painful to French feeling. The peasant suspected them of wishing

to restore noble privilege with the ancient throne ; the army was suspicious if not hostile; the national feeling was vexed by the patronage of the victorious hosts of Russia, England, and Germany. Paris was treated by them as a conquered capital, the whole country was garrisoned by their armies, and Louis XVIII. was little but their instrument and de- pendant. The royalist reaction was violent, though not cruel; the new legislative chambers proved vehemently Legitimist ; Fouché, who had hitherto successfully held his ground, come who might, in his dangerous department of the police, now fell and was exiled; Talleyrand also was got rid of; and the duke of Richelieu, grandson of that hoary old sinner who had been at the right hand of Louis XV., became chief minister. Meanwhile, the congress of Vienna had at last (20th November 1815) dictated its terms

. yg15-24. of peace to France. The "' Holy Alliance," of the emperors | drove him into reactionary courses which he could not 1894-30 | The of Russia and Austria and the king of Prussia, that league | approve. His successor, the count of Artois, was a very Charles x. Holy of monarchs against the liberties of Europe, compelled | different man. He had been the chief cause of the misfor- Alliamce. France to pay a huge indemnity, to surrender her Rhine | tunes of the monarchy in the Revolution, and had both the fortresses of Philippeville, Sarrelouis, Marienburg, Landau, | fine manners and the faults of the old régime. He was and Huningen ; the frontier of France was to be garrisoned | the fourth son of the dauphin, and brother of Louis XVI. for five years by a foreign army commanded by a foreign | and Louis XVIII, and now became king under the title of general, and paid by France; this period was cut short in | Charles X. It was speedily seen that now the ultra- 1818 at the Congress of Aix-la-Chapelle. royalists would have none to check them ; the new monarch Louis XVIII, who was no mere reactionary, allowed | was bigoted, stupid, ignorant; from the scandals of his little blood to be shed; Labédoyére, who had led the army | early life to the devotion of his later days there had been in its rally round Napoleon in 1814, and Marshal Ney were | but a step; the sublime is

not so near the ridiculous as the only victims. Murat, taken in an attempt to recover | superstition is to immorality. He was regarded as a his throne of Naples, was shot by the Italians. mere tool of the Jesuits, and his reign was but a struggle New As the chamber of deputies seemed determined to push | against the more liberal instincts of his country. Now, if arrange- the reaction to its utmost limits, Louis XVIII. dissolved it, | ever, it was seen that the old Bourbons "could never learn boa of and, declaring that he would rule constitutionally in accord- | and never forget." In 1827, the national guard, which had pares. nce with the charter, rallied round himself all the moder- | shown itself too free in its cries, was disbanded; a new ate party, headed by the Duke Decazes. Power came now | chamber of deputies was, in spite of all efforts, strongly into the hands of the middle classes, and in 1818 the | opposed to the policy of the king's Government; a more burgher party ruled. It was supported by the newly-risen moderate cabinet followed. Doctrinaires, men who wrote for the press, and began the In this year England, France, and Russia joined to put War modern career of French journalism. The chief of these | a stop to the quarrel between Turks and Greeks, and their with were De Barante, Guizot, and Villemain; on one side of combined fleet under Sir Edward Codrington won the battle Turkey.

them were the extremer royalists, headed by the count of Artois; on the other side stood the new party of the Independents, from whom sprang the men of the "three days of July." Between these Decazes kept up the new "systome de bascule," the balance-system, as it was called,

of Navarino, and ruined the maritime power of Turkey (20th October 1827). Early in 1828 the French occupied the Morea, and ere long the independence of Greece was accepted by the Ottoman Porte, and a new national life began in Europe.

allowing now this side and now that to taste the sweets In 1829, finding the new ministry too moderate for The re- of power, and to make some pretence to party-government. | him, Charles X. dismissed it, and gave the seals to Prince action- In 1820, however, the murder of the duke of Berri, | Polignac. This meant war to the knife against all constitu- fel >. second son of the count of Artois, gave the ultra-royalists , tional liberties in France,

and was the return to power of ict an excuse for freeing themselves from a man who kept all that Frenchmen most feared and disliked. The cham- x.

The ef- them somewhat in order. Using the excitement caused | bers, supported by popular feeling, stood firm, and carried

te by the assassination, they compelled the king to dismiss | an address to the throne, which declared that the new

— his favourite minister, and seized the reins of power. | ministry did not enjoy their confidence. Thereupon the They at once modified the constitution in such a way as | chambers were dissolved, and the fresh elections which to secure their majority in the chambers, and prepared to | followed were a decisive struggle between liberty and carry matters with a high hand. despotism. The success of the expedition to Algiers, in

Just at this time the extravagant conduct of the reac- | which France vindicated her honour by the capture of the

tionary Bourbon princes of Spain and Italy had aroused in- robber-city and the complete defeat of the dey, while she surrection and armed resistance everywhere. The people acquired for herself her most flourishing and important of Spain and Naples declared against arbitrary government, | colony, brought no relief to the Government in its contest and were at once attacked by those "champions of order," | against the people. The new chamber was stronger against the sovereigus of the Holy Alliance. At their bidding | the ministry than the late chamber had been. Then Louis XVIII. also declared war against Spain ; the French | Charles X. suddenly attempted the usual coup état, and Government, being now entirely guided by the count of | assumed a kind of provisional dictatorship, which produced Artois, was thoroughly in harmony with all that was | at once the five famous ordinances of St Cloud (25th July repressive and reactionary in Europe. In the spring of | 1830). These were—(1) the suspension of the liberty of The or- 1823 the French army, commanded by the duke of Angou- | the press ; (2) the dissolution of the new chamber of de- i léme, the eldest son of the count of Artois, crossed the | puties ; (3) a new system of election, so as to secure abso- (yo 04. Bidassoa and entered Spain. No serious resistance was | lute power to the king ; (4) the convocation of a new cham-

met with except at Cadiz, and the triumph of the French ber ; (5) some ultra-royalist appointments to the council of arms was mercilessly used to crush the Spanish liberties. | state. At this time a young journalist from Marseilles, M.Thiers Ferdinand VII. of Spain returned to Madrid, and ruled | Thiers, was editor of the National; under his fearless pages henceforth as most absolute, most Catholic sovereign. | leadership the "fourth estate" made its first collective ae The duke of Angouléme was thought by his success and | revolt against illegal power, and signed a Vigorous PYO- jifo, personal bravery to have aroused in the French army an test against the ordinances. It is the beginning of that enthusiasm for its old Bourbon masters; reaction ruled | wholesome influence of the press on modern politics of supreme in France; the Jesuits were conspicuous in their which the history has yet to be written, because its limits delight ; and the system of influences, corruption, and | have not yet been reached. Men waited breathlessly to see maneuvres, so long the disgrace of French elections, | what steps would follow such an insurrection of opinion Sprang at once into full bloom. against power. On the 27th of J uly it was announced that

Charae- In September 1824 Louis XVIII. died, with his last Marshal Marmont, although he disapproved of the measures

Es of breath urging the count of Artois to rule prudently and in | agreed on, and did not sympathize with the five ordinances,

Xvi, accordance with the charter. He was one of the best of | had been charged with the defence of the capital. Then

insurrection broke out at once, and the " Revolution of the three days of July" began. On the 27th the barricades raised by the citizens were forced and the streets cleared ;

the Bourbons, a man of ability and learning, fond of litera- ture and science, moderate and loyal in opinion and act,—a far better man than those who surrounded his old age, and

on the 28th the insurgents, not abashed by their defeat, seized the Hétel de Ville, and hoisted the tricolour. Marmont, who urged pacification, was ordered by Charles, who kept out of the way, to crush all opposition ruthlessly; before evening his troops had retaken the Hotel de Ville, and most of the important positions. Again he urged ynoderation on the king, and the leaders of the revolt offered to lay down arms if the ministers were dismissed and the five ordinances withdrawn. Charles, however, would listen to nothing, and sent orders to Marmont to persevere. On the 29th, however, two regiments fraternized with thie people ; and Marmont, paralysed by their defection, and by suspicions as to the fidelity of other troops, gave way. The populace rushed into the Louvre and the Tuileries, sacking and destroying the insignia of Bourbon power. They neither stole nor murdered. Charles X. at St Cloud now offered all he had refused the day before; of course it was a day too late. Paris had triumphed over the reaction, and the unteachable older Bourbons had to go. The veteran La-fayette was once more named chief of the national guard ; —how much had France seen and done since he had first girded on that same sword! The tricolour flag and cockade reappeared everywhere. Thiers and Mignet issued a pro- clamation, urging the Parisians to transfer the crown of France to the duke of Orleans, who came up to the capital at once, and declared his ready acceptance of the office of lieutenant-general of the realm. In his first address he assured France that thenceforward the charter should be a reality. On the 2d of August 1830 Charles X., finding that the army had deserted his cause, was on him, abdicated in favour of his young grandson Henry duke of Bordeaux, son of the duke of Berri; dauphin, who was childless, also renounced his own claims on behalf of his nephew, who was then ten years old. This last representative of the older Bourbons, the last hope of the legitimists of France, lives still, cherishing his claims, and known to modern history as Henry, count of Chambord. Charles withdrew to England, where he died in 1836. The day after his abdication Louis Philippe, duke of Orleans, the representative of the Orleans branch of the Bourbons, son of Philippe Egalité, and great-great-grandson of the Regent Philip, opened the session of the chambers as lieutenant-general of the realm. The charter was care- fully revised in a liberal direction, and the crown was offered to the duke and his heirs-male with the title of "King of the French." On the 9th of August 1830 the new con- stitutional monarch, ruling, not by divine right, nor by territorial possession, but by the will of

the sovereign people, “king of the French,” not “ king of France,”! king of the tricolour, not of the lilies and the white cockade, took oath faithfully to observe the amended charter. The era of constitutional monarchy seemed at last to have begun in France ; men thought that the fires of the Revolution had died down, that republicanism was discredited, while the follies of the older Bourbons, on the other hand, had been shown to be no longer possible. ‘The days of July” were hailed as heralding a new epuch of moderate politics ; the ‘citizen-king,” who had carefully shunned the reactionary party, and was by family tradition head of the liberal branch of the Bourbons, should lead France along a new course of decorum and material prosperity. It should be the reign, not of noble and priest, nor of grim artisan and sans-culotte, but of broadcloth burgher, a rule of common co and constitutional use. Lafayette, who in these we had sided much with carbonari and republicans, me greatly blamed for lending the support of his name to ay monarchical system of government. His excuse lay in

*Ge a nhc * a – ale to la ta “3*

Pacis \ estphalicee y stress des Francois,”

1830.

The three days of July.

Charles X. ab- dicates.

The count of Cham- bord.

Louis Philippe succeeds.

The new constitu- tional govern- ment.

on this change of style. In the Acta

(1648) even Louis XIV. is actually styled “ Roi not ‘ Roi de France,” i aa*
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and that necessity | the Government

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[HISTORY.

his belief that, for the time at least, the republicans were 1880-94,

but a small minority of the people. The events of subse-

quent years seemed to prove him right ; yet in the end the tronger beliefs and energies of republicanism were fatal

to the throue. Peace at home and abroad, and a constitu-

tional government, allied with such countries as also enjoyed

the blessings of a moderate form of polity, especially with England,—these were the chief aims of the reign, as it

was worked out by the two antagonistic statesmen, thie rivals Thiers and Guizot.

This revolution of the "three glorious days of July" was:Changes a part of a general movement throughout a large part of in Europe; for men were weary of the triumphs of reaction. Europe, In England these were the days of the Reform agitation which is indissolubly connected with the name of Earl Russell. In Belgium the news of the three days led toa violent insurrection, and the Belgians, who hated the union with the Dutch, threw them off and declared them- selves independent ; they bestowed a constitutional crown on Prince Leopold of Saxe-Coburg. When the Dutch

re- fused to deliver up Antwerp and let the Scheldt run free, England and France combined to help the young kingdom ;

a strong French army soon forced the Dutch to evacuate Antwerp citadel.

At home the country was still uneasy ; both legitimists Disturb. and republicans were anxious to embarrass the Govern- ancesin ment. There were troubles in Paris, at Lyons, at Grenoble, France, and in La Vendée, where the romantic duchess of Berri kept up the hopes of the old Bourbon party. After a time succeeded in capturing her, and then it came out that she had been for some time secretly married gentleman ; this, and the birth of a daughter, discredited the legitimist cause completely ; the duchess was allowed to retire in peace to Palermo. The disturb- ances at Paris and Lyons were also put down, and their chief instigators punished. After this the efforts of the dissatisfied took the form of attempts at assassination, and this in turn led in 1836 to the passing of the Laws of Sep- tember, which treated press offences with severity, and regulated strictly the procedure of the law-courts. In this period could be seen a more marked divergence of parties, Two even among the Orleanists themselves. On the one hand partiesin there were the more conservative or reactionary men ; on Ts the other the upholders of the English theory that "the ~ king reigns, but does not govern." At first Louis Philippe had chosen his Government from the former party, which, at the beginning of the reign had embraced not only Casimir Périer, the head of the Government, but Guizot, Thiers, and other men of name in politics and literature. Casimir Périer, vigorous in combat, but not a large-minded statesman, was carried off in 1832 by cholera, then raging fearfully in Paris; and soon after that time the life- long feud between Guizot and Thiers began. A series of Thiers Governments followed one another in quick succession, and and without stability ; at last, the cabinet, headed by Marshal Gui Soult, having proved unable to hold its own, a new ministry followed, of which Thiers was the head (Feb- ruary 1836). The ambitious little statesman, with the fire and heat of the south in him, advocate, newspaper editor, historian, and politician, seemed now to have reaclicd his goal. His ministry, however, lasted but a very few months. He wanted to interfere in the affairs of Spain, while the king refused to change his policy of non-interven- tion; the cabinet broke up, and Count Molé, with Guizot as minister of public instruction, succeeded. The new

Government had to face the anger of France at the failure of French troops in Algeria before the hill-fort of Con- stantine, and the agitation which succeeded the strange attempt (October 1836) of Prince Louis Napoleon to arouse imperialist echoes among the troops at Strasburg. Though,

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1836-40.

Parties in the Assem- bly.

Eastern affairs.

Trrita- tion in France.

LOUIS PHILIPPE’S REIGN. |

when he showed himself ant read a proclamation to the soldiers, many replied with shouts of ‘ Vive l’Empereur,” the bulk of the troops refused to listen, and he was arrested with his companion, a M, Persigny, and sent on to Paris. The Government treated him leniently, and allowed him to leave France for New York. In 1838 Count Molé, finding the state of parties very uneasy, dissolved the chambers, and fresh elections followed. There had been four chief parties in the Assembly,—the Right, led by the famous conservative lawyer Berryer; the Right Centre, under guidance of Guizot; the Left Centre, headed by Thiers; and the Left, led by Odillon-Barrot, formerly president of the society “Aide toi, le ciel t’aidera,” an association formed to advance purity and freedom of elections, and a chief motive-power in the revolution of July. This last party, till 1840, was in con- stant opposition to Government. It was felt that the king, who was obstinate in his opinions, and not very scrupulous, had for some time past been interfering more than was whole- some in electioneering matters ; the system of help to official candidates, the snare of Frencli politics, took large develop- ment under him. The elections resulted in a majority for Moléand the

Government. The other parties, however, made a coalition against him, which, under the leading of Thiers and Guizot, overthrew the ministry in 1839. The parties, however, did not agree well after their victory; the king was not cordial with them, and chose his ministers so as to exclude the three victorious leaders. In 1840 the king's friends were again defeated. Thiers again became chief minister, and Guizot was sent as ambassador to St James's, where he had a very difficult part to play, in consequence of the state of the Eastern question. The rebellion of Mehemet Ali, the able viceroy of Egypt, against the sultan had aroused no small excitement in Europe. Mehemet was well known in France, where his adventurous career had attracted much attention. Though the French and their allies had destroyed his fleet at Navarino in 1827, he had since (1831-1833) acquired the government of Syria as well as that of Egypt, by the energy of his son Ibrahim Pasha. When the sultan in 1837 endeavoured to reduce his power, he again declared war against him, and Ibraliim once more defeated the Turks, securing Syria for his father. Now arose agreat difference between France and England. The French Government wished that. both Egypt and Syria should be finally guaranteed to Mehemet; the English Government, declaring that such a step would be fatal to the Turkish empire, insisted that Syria should be, with some small exceptions, restored to the Porte. In July 1840 England formed a quadruple alliance with Russia, Austria, and Prussia, without communicating at all with Guizot till after the treaty had been actually signed. Napier speedily bombarded and took Beyrout, while Stopford blockaded Alexandria. In one short campaign the Egyptians were easily cleared out of Syria, and Mehemet Ali acquiescing in the power of the stronger, secured his position in Egypt, while he finally restored Syria to the Porte.

In France the irritation was extreme. The nation had watched Mehcmet's regeneration of Egypt, a country in which, ever since Bonaparte's expedition, France had seemed to have a special interest; it was a great shock to her to see her diplomacy rudely foiled, her sympathies neglected, her strength unemployed. The restoration to France in 1840 of the ashes of Napoleon, a rash act due to Louis Philippe himself, woke many a slumbering echo of the old national pride ; Napoleon, it was urged, had never let his country fall, as the present Government had done, out of the foremost place in the councils of Europe. The second attempt of Louis

Bonaparte to win over the garrison of Boulogne, in spite of the absurdities of the tame eagle, and the utter failure of the venture, added not a little to the

popular uneasiness, By shutting up the adventurer in the | the Revolution

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castle of Ham, the Government made him a martyr, and 1841-48.

roused much dormant sympathy for him. The ministry accordingly fell, and Guizot, under the nominal presidency of Marshal Soult, became the real head of the new Govern- ment. The step was far from allaying the strong feeling in France; men accused Guizot of having played the country false while in London; his bitter antagonism to Thiers

seemed to them to be the cause of the humiliation of France. Fortifi- For the moment, however, the only result was the fortifica- meg of

tion of Paris, which was begun in 1841. The annals of France were now tranquil, under the cold administration of Guizot ; party spirit seemed to have died

aris.

down ; the " Pritchard affair," arising out of the occupation The Prit- by France of Otaheite, in accordance with a treaty in 1842, chard aroused again the slumbering irritation between France and =,

Zngland. The English Government had not objected to the

treaty between Queen Pomare of Otaheite and the French Government; Mr Pritchard, however, consul, missionary and medical man to the queen, believing that the treaty was bad for the natives, had succeeded in persuading Queen Pomare to repudiate it, and to call on England to support her. Thereon in 1844 the French arrested him, sent him back to England, and occupied the island as its protector. The success of the French

arms in Africa also angered the English ; Marshal Bugeaud had vigorously attacked and punished the emperor of Morocco for giving refuge and sup- port to Abd-el-Kader, and the defeated emperor was obliged to sue for peace (September 1846). In 1847 Lamoriciére succeeded in capturing the picturesque chieftain who had caused France so much trouble, and sent him as a prisoner to France. Lastly, the vexed question of the Spanish marriages, in 1846, in which Louis Philippe succeeded in re-allying the Bourbons of France and Spain by a double marriage, caused very strong feeling in England; it was felt that Guizot had broken his word in the matter, and that France was taking unfair means of avenging herself for the affront of the quadruple alliance of 1840.

So things stood when 1847 opened with gloomy aspects for the French Government: irritation, want, the feeling that the Government had done little to lessen the commer- cial andagricultural distress ; the desire of a more popular and perhaps more brilliant rule ; the distrust of Guizot's policy, as shown in the risks of the Spanish marriages, by which he had endangered the peace of France for the sake of illu- gory dynastic advantages ; the consciousness that the king's feelings were not friendly to the people, that his govern- ment was selfish, and that he did not hesitate to use corrup- tion and influence in elections,—these things all made affairs seem unsettled and precarious. Guizot's policy in the affair of the marriages, in his support of the Swiss Sonder- bund, which was the resistance of reactionary against popu- lar principles in Switzerland, his appeals to the treaties of 1815, his friendly attitude towards Metternich and Austria, his divergence from the liberal views of Lord Palmerston, his dislike for the patriots of Italy, shocked and alienated all liberal opinion in unpopular. The role of prudence at home and peace abroad, never an heroic one, had been abandoned by Guizot for a system which endangered peace with the neighbours of France and irritated the passions of party at home. Trickery and subterfuge seemed to rule in high places.

VIIL Tar Seconp REVOLUTION.

The agitation of the country at first was seen chiefly in speeches made at fervid banquets. When the session of 1848 opened, the opposition, led by Odillon-Barrot, showed itself strong and resolute ; the interference of

Government against a popular banquet in Paris led to the outbreak cf (22d February 1848). On the 23d the

The gloomy outlook in 1847.

France, and made the minister completely Guizot's unpopu- larity.

1848.

The re- volution of 1848.

The re- public of

1848,

The re- public at once esta- blished.

Louis Bona- parte,

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national guard took part with the populace against the troops, and the scldiers, unwilling to attack them, hesi- tated, and the day passed by. Guizot now yielded, and. sent in his resignation; it was, however, too late ; that evening, the troops having fired on and killed some of the mob, a ghastly procession with the bodies of the slain passed through the streets. The excitement redoubled ; the troops refused to act; Louis Philippe even called on Thiers to form a liberal ministry with Odillon-Barrot. A proclama- tion was issued stating that the troops were ordered to with- draw. Forthwitk the regular soldiers laid down their arms, and the people with the national guards marched on the Tuileries. Louis Philippe now abdicated in favour of his grandson the count of Paris, and, assuming the name of Mr William Smith, closed an inglorious reign by an inglorious flight in a hackney cab. He reached England, and died there in peace some two years later. Writers have called the Revolution of 1848 a mere trick, and have wondered how go mean an effort could have overthrown a constitutional and organized government. The truth is that France was weary of such a rule, that Paris wanted a republic, and that in the country generally the citizen-king was

unpopular. In the chamber of deputies the republican party at once took the command, and established a provisional Government, which immediately proclaimed a republic, to be ratified by a popular vote; to be based on the sovereignty of the people ; to re-echo the old watchwords, " liberty, equality, fraternity ;" to secure a pure and liberal administration. The presidency of the new Government was given to Dupont de 'Eure; Lamartine had the portfolio of foreign affairs ; Cremieux, justice; Ledru-Rollin, the home-office ; Arago, the admiralty; Bédeau, the army; Carnot, education ; Bethmont, trade; Garnier-Pagés was named mayor of Paris ; Louis Blanc, with three others, were first named as secretaries, and soon after became actual members of the Government. The decree which established the tricolour flag, with a red rosette, indicated, as trifles often will do, the position taken up by the new administration. They would not accept the red flag of the Parisian communists, which Louis Blanc wished to take as symbol of a thorough republicanism; they added the red rosette to express a certain sympathy with that side; they kept the tricolour as the flag of the old Revolution. One step—and it was a great blunder—they did make under the influence of Louis Blanc: they issued a decree promising to provide work for all,—promising in fact to suspend the first laws of political economy on behalf of the working man,

Though the revolution had been a thorough Parisian surprise at the moment, all France was ready to accept it. From every side cheerful acquiescence came in.; the army approved ; the clergy were guided by the liberal archbishop of Paris, M. Affre, who three months later lost his life in the sacred attempt to stay bloodshed in the streets of the capital; politicians either were silent or joined the Government; the adventurer of Strasburg and Boulogne, who had escaped frorn Ham in 1846, offered his services to France, and was politely sent back to England. In April the elections to the new constituent assembly took place. They returned a body of, on the whole, moderate republi- cans, not favourable to the extremer views of Paris, and appointed an executive commission of five members, Lam- artine, Arago, Garnier-Pagés, Marie, and Ledru-Rollin. A serious outbreak was easily quelled in May ; in June, how- ever, things took a more alarming turn. The reaction, which had already begun in France, was supported by the conviction of moderate men that the "national workshop " system, a practical socialism, was too burdensome for the anaes of ite state, and that

the country generally would acs ae ae the Parisian artisan. A decree ordering

e working men to be enrolled in the army

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led to the terrible revolt of eastern Paris, The Government 1948-51, declared the town to be in a state of siege, and entrusted The re-

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General Cavaignac with a dictatorship. For four days the volt of battle of the barricades raged ; the artisans did not yield till Paris,

the last barricade of the Faubourg St Antoine had bee stormed. Then Cavaignac laid down his dictatorship and was named president of the council, with right of naming the ministers. The national workshops were absolutely closed on the 3d of July, and thus tlie republic freed itself from the dictation of Paris. After the May dis- turbance the leaders of reaction had begun to pluck up courage, and to offer themselves for the elections ; Thiers was returned for the Lower Seine, and became its political leader ; Changarnier was its military chief. Louis Bona- parte was also among the elected. He veiled his ambition under popular phrases, and, as had been seen before, a Bonaparte made ready to pass into absolute power by an alliance with the people and a seeming deference to its sovereignty. "My name," he said, "is the symbol of order, nationality, and glory."

ized the Government thus :—A president of the republic, elected for four years, and then not re-eligible till after four years more; a council of state, named by the assembly for six years, and charged with tlie drafting of all

public acts, and other honourable functions; a legislative assembly of 750 members. The date of election of a president was fixed for the 10th of December. The true republicans failed to support their man, General Cavaignac ; they also left Lamartine entirely out, in spite of his honourable ser- vices.

The Assembly next pro- Thenew

ceeded to do its work as a constitutional body, and organ- constitu- tion,

The instincts of the nation turned towards one who Louis 7

bore the charmed name of Bonaparte, and the prince-adven- Bona-

turer was elected by a vast majority of votes, nearly five millions and a half supporting him against less than one million and a half who voted for Cavaignac. 'Napoleonic idea," strong in the country-places, prevailed over the moderate republicanism of tle Assembly, and the wishes of the cliief towns of France. The new president was formally proclaimed, and took oath of office on Decem- ber 20, 1848.

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Thus the dent. |

of the republic of Rome, and the military restoration of Pius acts.

IX. By this the president declared himself hostile to all the liberal movements of Europe, aud won the firm gratitude and allegiance of the Catholic clergy of France. Before Louis Bonaparte had been in office a year, it was seen that he was preparing to move in the direction of absolute power. Stormy debates in the Assembly took place; a law was passed limiting the suffrage, as it was seen that in the existing temper of the country the ignorant peasant- vote was at the mercy of adventurers. Discussion also followed as to a revision of the constitution of 1848. At last, on December 2, 1851, the prince-president, guided by a group of friends and brother-conspirators, ventured

existing fabric of the constitution. less manner sixteen prominent members of the Assembly # were arrested, among them Cavaignac and Thiers; the Assembly itself was forcibly dissolved, universal suffrage re- stored, and a plébiscite on the new form of government was appointed to follow at once; the capital was placed in a state of siege; the council of state dismissed. A new ministry was also formed of the chief members of the suc- cessful conspiracy,—Morny for the home-office, St Arnaud

‘ on his famous coup détat, and swept away the whole Thecoup | In the most law- @éatot | |

The first act of the new Government was the overthrow His first |

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for war; Fould, finance; Rouher, justice.

responsible only to the president, a council of state to draft and prepare laws, a legislative body, and a conservative senate,—this was the new constitution of 1852. It was clearly a reminiscence of that form of government which

Napo- leon ITI.

The second empire.

Charac- ter of Napo- leon ITT. and of his reign.

THE SECOND EMPIRE. |

led to the first empire. Outbursts of despairing resistance in Paris were sternly put down, with brutal severities, which aimed at striking terror into the capital; the men round Louis Bonaparte did not want for vigour; they had won power by conspiracy, and did not hesitate to keep it by a massacre. The new constitution was accepted by an over- whelming majority; it seemed as if the Napoleonic idea was omnipotent in France. The new government was, like that of the great Napoleon, the union of strong and

arbitrary rule with an appeal to the ignorant passions of the populace. The burgher world acceded to it, because it was strong, and promised order and hopes of material prosperity, and because it was scared and puzzled by the fitful appearances of the "red spectre " of eastern Paris.

Little trouble did the successful party take about the re- maining step. The high tide of the popularity of Louis Bonaparte was still running up in flood ; and in November 1852 an almost unanimous vote (7,824,129 against 253,149) accepted him as hereditary emperor of the French under the name of Napoleon III. Before the end of the year he made solemn entry into Paris.

IX. Tur Seconp Empire.

The second empire lasted from November 4, 1852, to September 4, 1870, a period of nearly 18 years. It was openly modelled on the first empire, and Napoleon IIL. never forgot that he was his uncle's nephew. His mother, the ex-queen of Holland, was Hortense Eugénie de Beau- harnais, daughter of the empress Josephine by her first hus- band, the viscount Alexandre de Beauharnais ; the emperor married her to his brother Louis Bonaparte in 1802; and her son Louis was born in 1808. He was now forty-four years of age, a man of no dignity of moral character, ambi- tious and unscrupulous, but somewhat wanting in nerve ; far better than the adventurers who surrounded him ; a man of very considerable clearness of vision, who did his utmost to develop the home-prosperity of France, by sweeping away the barriers which wrong-headed Governments had placed on comunerce, and by introducing the new doctrines, strange to French ears, of free trade, which he had learnt to admire by seeing their applications in England. His government was frequently, almost incessantly, involved in wars ; yet the emperor himself was doubtless sincere in pro- claiming his wish for peace. "The empire," he said, "menaces no one; it desires to develop in peace and full independence the vast resources it has received from heaven." It is but one of the inevitable results of a bad tradition that he, like his predecessors, hoped to succeed in securing prosperity to France by constant interference, and by making the nation feel the presence at its head of an irresponsible yet beneficent master. At the same time this ostentatious activity assured labour to the restless arti- sans of the great cities; towns were half rebuilt; Paris especially felt this malign benevolence, which, while it fed the

workman, made him destroy his own means of re- sistance to government,— for the rebuilding of Paris by Haussmann was planned so as to drive great and straight military roads through all the disaffected quarters of the north and east. Railways, canals, harbours; public build- ings, above all, new churches and old, owned the imperial hand. If, as must be granted, this lower empire was based on popular ignorance and plentiful bloodshed and terrorism, both in Paris and in the provinces, it must also be conceded that the emperor himself, dreamer as he was, was heartily anxious for the welfare of France. He was unfortunate in his associates, and perhaps also in the beautiful lady he chose as empress.

When the second empire began, the sovereigns of Europe thought that republicanism was gone for ever ;- they recog-

nized the new government of France with some cordiality. 1852-54

England came first—for in England the unmistakable expression of the popular will was regarded just as the re- sult of a general election at home might have been; the vote of the people had expressed their wishes clearly, and England was ready to accept their views as to their own affairs. It was noticed that Prussia was unfriendly towards the new government; and when the emperor, anxious to secure the hereditary succession promised to him by France, looked round him for a wife, his proposal to wed a Hohen-

zollern princess met with a marked rebuff. He had before Marriage failed to win a Swedish princess; he finally chose for himself of the the handsome Eugénie de Téba, a Spanish lady, who had ®™Pert

already been conspicuous for her beauty at his court. France was divided in mind respecting her: her appearance won men's hearts; the national vanity was vexed at the rebuffs, while it was pleased to say that the emperor had . disdained royal and formal alliances in order to choose the lady after his own heart ; and lastly, there were not a few who grumbled that he ought not to have slighted the ladies of France by selecting a Spaniard. Anyhow, the

young empress bore him a son, the prince imperial, on whom rested all the hopes of the new dynasty. For the rest, her extravagant and frivolous tastes in dress and habits set a very bad example to a nation far too willing to copy it; and her influence and advice were invariably on the unlucky side. She was a devoted Catholic, and to her counsels are due some of the worst mishaps of the reign.

In 1854 began the first war of the second empire,—the The first denial to the famous utterance of Bordeaux in 1852, Crimean "T'empire, c'est la paix," which had enlisted the warm W?"

partisanship of commerce and finance. The large and am- bitious schemes of the czar Nicholas against Turkey, " the sick man" of that day, alarmed all Europe; the dispute between Russia and the Porte as to the holy places was re- ferred to a conference at Vienna, which proposed to solve the difficulty on the lines of the treaty of 1841, which had placed Turkey under the guarantee of the five great powers. Before diplomacy had got to work the Russians had invaded the Turkish territory ; the Anglo-French fleet had moved up to Besika Bay, to be within call of Constantinople, and the Russian fleet (30th November 1853) had destroyed the Turkish ships at Sinope. War, however, did not 'openly break out till the next spring. In Aprila treaty of alliance was signed between France and England, who were after- wards joined by the king of Sardinia, while Austria and Prussia also guaranteed the possessions of each other; the imperial guard was re-established, and an army of 60,000 men, one-third English, two-thirds French, set sail for the Black Sea,. After halting first at Gallipoli, then at Varna, the allied fleets and armies set sail for the Crimea, and landed under protection of the ships near the mouth of the river Alma. Thence tliey marched along the coast towards Sebastopol, and came on the Russiaus strongly posted on the left bank of the Alma; on the 20th of September 1854 the allies defeated the Russians there and took their posi- tion. Mentschikoff, who commanded them, withdrew into Sebastopol, round which the allies marched, taking up their quarters not far from Balaclava, to the south-east of the great fortress. Then began a siege which lasted through the winter; on October 25 the Russians were re- pulsed at Balaclava itself, by the wild charge of the English cavalry ; on November 5 the allied armies won the battle of Inkermann, in which the English, who

were defending the points attacked, bore the chief brunt of the fighting. It was not till June that the bombardment of the allies was effectual in producing the fall of some of the outworks. Sebastopol eventually fell on the 10th of September, in con- sequence of the storm of the Malakoff tower by the French troops. The French and Russians had now done enough, and

1856 -59.

The peace of Paris.

The Orsini attempt.

The Italian 'war,

the war speedily came to an end. The English would will- ingly have gone on till they had ruined the Russian navy ; the emperor of the French was glad to be done with it. In 1856 the czar Alexander, who had succeeded Nicholas in the winter of the great siege, signed a treaty of peace, the terms of which had been agreed on at the Congress of Paris. The Black Sea and the Danube were neutralized ; the Danubian principalities taken, in part at least, from under Russian protection ; the sultan was admitted to the council-board of Europe. The peace did little for the real good of France, created a cold feeling between her and Eng- land, annoyed Prussia, and did not satisfy Austria. The war had not been very brilliant; the losses had been heavy ; the appearance of Count Cavour at the congress liad forecast the coming events of 1859.

The attempt of Orsini on the emperor's life in January 1858 led the way. A man who had been among the carbonari, and had handled the explosive substances which lay like torpedoes in all the water ways of European politics, ought not to have been astonished that Italians, smarting under their country's wrongs, should try to avenge them- selves on him for the expedition to Rome and the restoration of the papacy. To them Napoleon JIT. seemed to be a traitor, and the chief cause of their subjection to hateful and foreign masters. And Orsini's attempt was by no means the first. The French journals spoke gratefully of the fact that no Frenchmen were

compromised in these attempts at assassination ; the emperor himself, alarmed for his personal safety, and also sympathizing to some degree with the aspirations of Italy, began to think that he could secure himself from these secret and successive attacks only by satisfying the irritated feelings of Italy. The first result of it, however, was a period of terrorism at home, and of swaggering menace on the part of the army, unchecked by the Government, against England, that "lair of these monsters who are sheltered by its laws." England, dis- abused since the peace of its admiration for the imperial rule, replied by the volunteer movement, and the construc- tion of defences on the coasts. But the emperor's mind was not set on war with England. New Year's Day 1859 dis- closed to the diplomatic world his schemes against Austria, and showed that Italy would be the sceve of warfare and change. The empress was known to be averse to a war which must be against the instincts of Catholicism. Prince Napoleon, who in January 1859 married the Princess Clotilde, daughter of Victor Emmanuel, king of Sardinia, was known to be in favour of an alliance with the Pied- montese for the liberation of Italy. The emperor hoped to steer between the two; hoped to satisfy the Italians and to escape the alarms of conspiracy, and at the same time to satisfy the empress and the Catholic party by constructing an Italian federation of states under pre- sidency of the pope. The current of affairs, the strength of the "doctrine of nationalities," the definite and heroic attitude of Italy herself, proved too strong for him. A federation in Italy, a federation in Switzerland, and a third in Germany, would have left France in the centre of the world, compact and powerful among weak and divided neighbours on every hand. This was the imperial policy; united Italy and united Germany destroyed the plan, and brought the empire with it to the ground.

In July 1858 Cavour and Napoleon had agreed on the terms of an alliance ; Victor Emmanuel should be king of Italy, with possession of the north; Nice and Savoy, the cradle of his race, he agreed to surrender to France. With es understanding war began, after delusive talk respecting eo in April 1859, Austria at the last moment he g it on by. ordering the cabinet of Turin to reduce its Free, SS dismiss the volunteers. On the 3d of May the tench Government also declared war, amidst the plaudits

N C E (utsToRY:

of Paris, and the enthusiasm of the army. The French at 1859, once entered Italy, by the Mont Cenis pass, and by sea,

landing at Genoa. The emperor himself took the command

in chief; King Victor Emmanuel placed himself under his

orders. The affairs of Montebello and Palestro, in which

the Piedmontese fought well, secured for France the safe

passage of the Po. On June 4 the battle of Magenta, fought

to open the passage of the Ticino, was won, after a very doubtful struggle, by the arrival of MacMahon, whom the : emperor named marshal of France and duke of Magenta. The Austrians fell back, and the allies at once entered Milan. Baraguay-d'Hilliers pushed the Germans out of Marignano ; and Garibaldi, with his chasseurs of the Alps, dislodging the Austrians from their positions round the Lago Maggiore, threatened their communications with Tyrol, their only sure line of retreat in case of ultimate disaster. Giulay, who commanded the Austrians, drew back within the Quadrilateral, as it was called, formed by the great fortresses of Peschiera, Mantua, Legnano, and Verona, a square within which, ever since 1815, the Austrians had been accumulating all their means of resistance. This Quadrilateral, well held, could effectually block the passage through North Italy; for Legnano stands on tho Lago di Garda, which runs up into Switzerland, while Mantua is not far from the Po; anenemy venturing down southwards could never leave these great strongholds on his flank ; their siege and reduction would give their holders time to recover from any disasters. To the attack of this strong position the allies now advanced ; and on June 24 they met the Austrians to the west of the Mincio, and, therefore, just in advance of Peschiera and Mantua, in the 7) broken ground which lies about the town of Solferino. The Battle battle which then took place was fought with great of Sok

ferino.

gallantry by the allies, and some tenacity by the Austrians, : who were on the defensive, and had the great advantage of } the position, and of a

thorough knowledge of the ground. French historians themselves allow that there was little strategy shown on either side: "At Solferino, as through- out the campaign, the command-in-chief wes below its proper level." The defeat of the Austrians, without being crushing, was complete; they fell back to the ueighbour- hood of Verona, the rally-point of the Quadrilateral, and the allies laid siege to Peschiera.

These successive victories, and the release of the Milanese from Austrian domination, had an immediate effect on the rest of Italy. The duke of Tuscany had fled, and his terri- tories were occupied by French troops under Prince Napoleon. The duke of Modena, after Magenta, also made his escape, and his duchy proclaimed Victor Emmanuel in his stead. The same took placein Parma. The '"Legations," the northern portion of the States of the Cliurch, threw off the papal government, and joyfully proclaimed their adhesion to the national cause. A French fleet in July appeared be- fore Venice, and the Queen of the Adriatic was burning to throw off the Austrian yoke. Still, every one thought that ' the war was scarcely begun, and, considering the strength of the Quadrilateral and the proverbial tenacity of the Austrians under defeat, it seemed not unlikely that changes in the fortune of war might yet favour the reactionary cause, when Europe was astonished to hear that the two emperors, in a conference at Villafranca, had agreed on the bases of a peace. There should be an Italian confederation under presidency of the pope; Lombardy (with exception of Peschiera and Mautua) should be surrendered to Napoleon, who should present it to the king of Sardinia ; Venice should be allowed to enter the Italian confederacy, though it was still to be an Austrian possession ; the dukes of Tuscany and Modena were to be replaced; reforms to be introduced into the papal states ; not a word about the south of Italy. These terms agreed on, viva voce, between the

1959-63. emperors without a single witness on either side, were the ratified in October, in the treaty of Yurich. The result, treaty of for the moment, satisfied no one. Austria was humiliated Zurich. ty it; Italy disappointed, in the very moment of hope and

and in spite of all official efforts, sent up a strong minority 1863-66. to the opposition. It was clear that the educated and think- ing part of France was already weary of the second empire.

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triumph ; Germany and England deemed both the war and the peace a high-handed proceeding ; and France herself, in spite of the successes of her army, wished that the high- sounding promise of her emperor, "Italy free, from the Alps to the Apennines," had been more nearly fulfilled. Finally, military critics noted that the generalship of the war left much to be desired, and that the organization of the army was very far from perfect. Further changes, re- sults as much of the force of ideas as of diplomacy or of war, were sure to follow before long. Ominous utterances and influences of the Ultramontanes in France heralded coming difficulties even before the conclusion of the peace of Zurich. 'The pope, Pius IX., guided by the Jesuits, threw himself into the arms of the reactionary party ; and Napoleon saw good reason to give up his chimerical scheme for an Italian federation under papal presidency. He de- clared his intention of founding a great kingdom of Northern Italy, and announced that Savoy and Nice were to be united to France, by way of counterpoise. The forms of a plébiscite were duly gone through in those districts ; and the transfer took place shortly afterwards.

Eveu this change of attitude on the Emperor's part, coupled as it waz with the continuance of the French garrison at Rome, and the cession of Nice and Savoy, was offensive to Italian independence. Garibaldi, with his noble band of volunteers, amidst the warm sympathy of all liberal Europe, landed in Sicily, and soon defeated the half- hearted supporters of the wretched Neapolitan Government ; Naples and Sicily were at once united to the Italian king- dom. Piedmontese troops entered the papal territories, and won the battle of Castelfidardo ; general Lamoriciére, who commanded the Papalini in the battle, was soon after taken, when Ancona surrendered, and was sent back to France by the Italian Government. The victorious troops, leaving Rome and its French garrison on one side, joined the triumphant voluntecr-army of Garibaldi, In February 1861 Francis IL. king of Naples,

who was besieged in Gaeta, capitulated, and a new Italian parliament in thie same month proclaimed Victor Emmanuel king of Italy. Rome alone was left out, the natural capital of the king- dom, defended from herself and from Italy by French bayonets. The political situation was indefensible.

During these years France had also been engaged in distant expeditions ; a Chinese war, in alliance with Eng- land, occupied her from 1858 to 1860; the capture of Pekin brought this war to an end. In Cochin-China, also, France had Spain as an ally, and closed an obscure if successful war with a treaty of peace in 1862. The Syrian expedition of 1860, undertaken in harmony with the other Christian powers, speedily reduced the sultan to reason, and a French occupation, which lasted till June 1861, did much to relieve the oppressed Christians of that part of the Turkish dominions. Lastly, the affairs of Mexico, in which the empress, guided by her clerical tastes, took an active part, led to the intervention of the emperor on behalf of the archduke Maximilian of Austria; at first England and Spain, which also had grievances against the revolu- tionary Government of Mexico, joined with France. England, however, had little real interest at stake; Spain wanted to place a prince of her own on the Mexican throne ; when it came to the point, France was left to carry out her schemes as she could. The whole affair ended in a terrible disaster for the archduke in 1867, and discredit and loss to the imperial Government. It was seen by the elections of 1863 that, while the peasant-vote remained true to Napoleon IIL. the towns, following the leading of Paris,

Now broke out the Danish war, which was the begimning The of the consolidation of Germany. In 1852 the conference Danish of London had settled the succession to the Danish crown "™ on the duke of Gliicksburg, who had married a Danish princess ; when Frederick VII. died in 1863 and Christian 1X. succeeded to the throne, the Germanic confederation, which had never agreed to the arrangement, protested against the union of Schleswig and Holstein to the Danish kingdom. Holstein had always been a German duchy, and vigorous colonization had made South Schleswig in large part German in population. The Danish Government allowed the federal forces, commanded by Baron Halkett, a Hano- verian general, to occupy Holstein provisionally, while it refused them possession of Schleswig; Prussia and Austria, acting in concert, early in 1864 invaded*

Schleswig, drove the Danes back, and stormed their lines at Diippel ; after which they quietly occupied all the disputed territory. When England, with Russia and Sweden, pressed for a conference to settle the dispute by international arbitration, France held back, and refused to oppose Prussia and Austria. The emperor suggested, as a middle course, that a plébiscite, his favourite idea when nationalities were in ques- tion, should be taken in the two duchies. The conference admitted this for Holstein, and refused it for Schleswig, and on this point the negotiations were broken off. The allied Germans speedily brought the war to an end by their over- whelming strength, and in October 1864 it was agreed, after some difficulties, that Austria should take charge of Holstein, and Prussia of Schleswig. The confederation

gained nothing; and it was obvious tliat Austria, 00,

could gain nothing by the occupation of so distant a province. France, which had so much to lose, according to the "doctrine of nationalities," had placed on record her firm belief in that idea, and had helped Prussia to become the champion of it for Germany; the foolish Mexican war, and the state of feeling at home, had in fact hampered France so much as to render her almost powerless at this moment.

The jealousy between north and south Germany, which The has existed ever since the time of the Reformation, now growth passed into a new phase. Prussia stood forward again as retin the champion of German unity, which had failed in 1848, power. though it had never ceased to be the desire of the nation ; and the convention of Gastein, by which Austria retained Holstein, provided a starting-point for a new war in 1866, the "Seven Weeks' War." A visit of Count Bismarck to Napoleon in 1865 had shown that great statesman that he had nothing to fear from France ; the second empire seemed paralysed; Italy hastened to treat at Berlin for the com- pletion of her unity, for north Germany and she had the same aims and the same enemies. They both wanted their national life to be completed ; both were struggling, in Jarge part, against the Catholic Church; both had Austria as their chief foe. Thus secured, Bismarck went boldly to war ; and in an incredibly short time had crushed the resistance of Hanover, while he destroyed the Austrian power at Sadowa. 'The treaty of Prague, under the

mediation of The Napoleon FII., soon followed. Though the Italians had treaty of been defeated at Custozza in the end of June, Sadowa had Prague. stricken such a blow at the heart of Austria that she aban- doned all thought of further resistance, delivered Venetia over to Napoleon, who restored it at once to Italy, and signed the peace of Prague in August 1866. By this docu- meut the old German Confederation was dissolved ; Prussia took full possession of Holstein, and also of Schleswig, under the promise that if the northern or Danish-speaking part of that duchy desired to return to es it might

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FRANCE

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1866-69. say so. Up to the present time, Prussia, true to her ancient | candidates. In this assembly M. ae made his first 1870. tradition of never letting go, has quietly retained the whole | public appearance among the "'irreconcila es." In January – La of the duchy. A new confederacy of the north of Germany 1870 a quasi-liberal cabinet, headed by M. Ollivier, who had ie was established under the headship of the king of Prussia, been won over by the emperor and empress in a private inter- and that kingdom also received considerable additions. | view, endeavoured to face the growing dissatisfaction 3 tore-

It was agreed that the river Main, which runs across that | concile the "irreconcilables, without endangering the impe- narrowest part of Germany, that hilly and wooded country | rial position. After many liberal professions, the emperor which has seen so many struggles for mastery, and which once more appealed to the country for a vote of confidence for centuries has been, roughly speaking, the dividing-line | in himself, and in the hereditary character of his govern- between Low and High Germany, should now once more | ment. The reply of France seemed to be overwhelming and separate the northern from the southern confederacy. This | decisive,—7,358,786 Yes, against 1,57 1,939 No. This vote

arrangement, however, came to naught; Baden at once | was taken on the 8th of May 1870 ; within two months placed itself under the command of Prussia, and Wiirtem- | the Hohenzollern question had begun its ominous course. berg and Bavaria before long did the same. Austria was In 1868 the Spanish insurrection of September had dis- left alone, and almost excluded from Germany, while | lodged Queen Isabella. She took refuge in France, with The Prussia became at once the strongest power in Europe. | a crowd of partisans, and became at once the favoured Hohen- France, which had weleomed with enthusiasm the restora- | guest of the emperor and his Spanish spouse. In the pro- tiou of Venetia to Italy, looked with less glad eyes at this | visional Government of Madrid General Prim in 1869 be- growth of German strength across the Rhine. Thiers, | came president of the council of ministers, and began almost with clear foresight, in 1866 predicted the coming empire | at once to search about Europe for an eligible king. In the of Germany ; M. Magne, addressing Napoleon, did not hesi- | course of his inquiries he happened on Prince Leopold of tate to say that "the national feelings would be profoundly | Hohenzollern- Sigmaringen, to whom he offered the crown wounded if the final result should be that France has only | of Spain without first announcing his intentions to the gained by her intervention the establishment on her two | courtof France. The intimacy existing between the empress ilanks of two neighbours of abnormally increased strength. | and the ex-queen of Spain was no doubt a sufficient reason | Greatness is after all a relative affair ; and a country which | for this reticence. Prince Leopold at once informed the in itself is no weaker than it was may be diminished by the | head of his house, the king of Prussia, of the fact, and the accumulation of new forces around it." king authorized him to accept the offer. So stood affairs French In 1866, after a convention with Italy, the French troops | when the French cabinet thought it necessary to intervene. troops withdrew from Rome, while Victor Emmanuel promised | The two nations had regarded one another with distrust for eae not to molest the pope. There came, however, to Rome a | years ; in the beginning of the imperial rule the Prussians from French legion, composed of volunteers, chiefly old Bourbon | had stood aloof ; the irritation which France felt at the Rome. partisans, commanded by a French general and officers of | Danish war passed into alarm after Sadowa. 'The failure the French army. 'The presence of these troops was natu- | of Benedetti's negotiation in 1870 with Bismarck as to rally regarded

by Italy as a violation of the convention ; so | Belgium added to the tension. The French Government that when Garibaldi with his volunteers, in 1867, attempted | was also uneasy at the evident signs of opposition at to raise patriotic feelings in the territory round Rome, | home, the decay of its popularity, the penalty of its and in concert with the citizens to gain entrance into the | corruption and extravagance ; finally, there existed two Eternal City, the Italian Government took no steps to pre- | courts, that of the empress and a more patriotic one, which vent him. The emperor, however, with unlucky zeal, after | dimly reflected the ancient antagonism between a Span- much hesitation, despatched General de Failly witha strong | ish party in high place and the true interests of the force to succour the pope, and thus placed himself openly | country. The emperor of the French, worn-out and more in antagonism with Italy. The French and papal troops | irresolute than ever, became the prey and victim of a defeated the Garibaldians at Mentana (3d November 1867) ; | faction. When Prince Leopold, on learning the objections and Italy regarded herself as thenceforward frec from all | of France, withdrew his candidature, the French Govern- obligation of gratitude towards imperial France. On the | ment, instead of accepting the act in a conciliatory spirit, other hand, the clerical party loudly complained that the | seemed to be inspired by the temper of the duke of emperor had but half done his work, and grumbled because | Grammont's speech in the Assembly at the time. "We he had not used his victory to restore to the papacy its lost | cannot allow the actual balance of power in Europe to be Discon- territory. Thus Napoleon IIL. lost the favour of both deranged, and the interest and honour of France to be im- eee: sides, and left on men's minds the impression that he was | perilled. We firmly hope this may not happen; against it

a weak and irresolute ruler. Nor did his efforts to pur- chase the duchy of Luxembourg from Holland add to his reputation (1866-]867). For the intervention of Prussia defeated all his plans; and although the fortifications of Luxembourg were demolished, and the Prussian garrison withdrawn, it was felt that the emperor's attempt to strengther. his north-eastern frontier had completely failed, and that the antagonism between France and Prussia must one day lead to troubles. The boldness of the opposition increased ; each slight advantage yielded by the Government in these days gave it fresh strength ; Thiers was listened to with great interest

when he demonstrated in 1868 the hollowness of imperial finance, the terrible burden of debt, the growing dimensions of the army expenditurc, which was not accompanied by any real increase in the fighting- strength of the nation. The elections of 1869 showed the gure growth of the opposition ; far from the old unanimity, – imperial Government did not obtain quite three-fifths of

@ votes; and again the large towns returned republican

we count on both the prudence of Germany and the friend- ship of Spain. Were it to be otherwise, strong in your support and in that of the nation, we should know how to do our duty, without hesitation and without weakness ; ”— brave words and menacing, but words which required real strength behind them, the very thing which was lacking. The empress and her friends wanted war; and conse- quently the king of Prussia was pressed, as a further step, to give assurances that he never would support Prince Leopold in any future candidature for the Spanish throne. This was equivalent to saying that war was determined on; and the Prussian cabinet made no further effort for peace. Steps were taken in Paris for a fresh coup d’état against the liberals, if they proved too obstructive; the empress was eager to secure, by a successful war, the throne for her son, and to appear as the champion of Catholic and Ultramontane principles in Europe. While the liberal party in the chamber and the country, headed by Thiers, persistently opposed the war, the Bonapartists

END OF THE SECOND EMPIRE.]

1970. fiercely pushed matters on ; they refused the good offices of the other states of Europe ; in shameful ignorance of the truth, they declared that everything was ready—“‘five times ready,” “ready to the last gaiter-button”—and were only eager to begin. The ruffians of Paris, intoxicated after their sort by the brilliancy of an imperial policy, mobbed Thiers, attacked his house, and filled the streets

with yells of & Berlin. War with And thus war began, with the emperor as commander-in- Germany. ghief and the empress as regent at Paris. France had no allies; her appeal to South Germany failed ; Austria, however friendly, was paralysed by Russia; for it was known that if Austria moved

against Prussia, Russia would at once attack her; and the people of the lesser German states, whatever their Governments might think, were favourable to Prussia; for she seemed to them to be uphold- The ing a national cause. At Paris, the profoundest ignorance ignorance pejoned. Nothing was known of the state of feeling in an Germany, or of the real condition of the Prussian prepara- tions for war. As little was known of the fitness of their own army for a great war; it was thought that it was strong and ready, whereas it was ill-organized, ill-supplied, and without proper reserves, while the incapacity of its leaders was appalling. No one knew anything of strategy ; maps and plans were bad; even the employment of rail- ways in war had never been properly studied; bravery there was in plenty, but leading and management were abso- lutely wanting. The French army was stretched across the frontier-line looking towards Germany from Strasburg to Metz; Metz became the French quarters-general, Mainz the German. By the 2d of August the hostile armies came into collision; the emperor's reconnaissance drove the Germans out of Sarrebruck on that day, and the prince imperial there underwent his " Baptéme de Feu," a baptism into misfortune. 'This was the one and only success of the French arms across the German frontier; for on that same day General Douay was attacked and defeated at Wissem- bourg, and his position forced. Attacks followed sharply ; on the 6th MacMahon was driven in at Worth, and on the same day Frossard was defeated at the other end of the line. Before Paris had recovered from her delight at the trivial success of Sarrebruck, the ominous telegram, " Tout peut se retablir," awoke her to a true view of the state of things. It was soon seen that the emperor was unfit to command, and wasa mere encumbrance ; there was neither strategy in detail nor a definite plan of cam- paign ; having let in the invasion, he resigned the post of commander-in-chief into the hands of Marshal Bazainc, and withdrew into Metz. The forward movement of the Germans soon alarmed both him and Paris, and then he decided (August 14) to retire to the camp at Chalons, where Marshal MacMahon was in command. 'The emperor's slow retreat, with a long train of useless followers, blocked the roads, and stopped the movement of troops and supplies. At this very time the Prussians and their allies were closing in on Metz; onthe 14th at Borney, the 16th at Gravelotte, the 18th at Saint Privat, tremendous battles, in which the attacking Germans did not always get the best of it, hemmed the French in, and Bazaine withdrew with his large army into Metz. The French

view of his conduct is that he meant to keep this army intact in order that afterwards, in conjunction with the Germans as his accomplices, he might secure, with a fresh military cowp d'état, the imperial tule over France. Whatever he may have meant, the Germans had no intention of intrusting the fortunes of France to him. At this time General Trochu, an able soldier, whom the empress did not like, was appointed governor of Paris; the army of MacMahon was at Chalons intact, and a prudent ruler would have made these two strong forces act in concert. The empress, on the contrary,

refused to hear of the emperor's return to Paris, and ordered 1870-71. MacMahon to march to the Belgian frontier, to take the Prussians on the flank, and to relieve Bazaine at Metz,—a

plan excellent with a strong force able to march fast, fatal

with an imperial army, disorganized, doubtful, and slow.

The northward movement ended speedily in the great The catastrophe of Sedan (1st September 1870). On the 2d battle of the emperor, with an army of more than 80,000 men, was Sedan. the prisoner of war of the king of Prussia.

X. Tue Tuirp REPUBLIC.

In spite of all precautions the news oozed out at Paris all

too soon for the dismayed imperialists. On September 4,

1870, the third Republic was proclaimed, with a Government The

of national defence, of which the chief members were Thiers, third Jules Favre, Jules Simon, and Gambetta ; General Trochu Republic. was its military head. Gradually the Germans closed in

on Paris ; no serious resistance in the field being attempted,

or indeed being possible, at a moment when one half of the available army of France lay in Metz and the other half was

either destroyed or prisoners at Sedan. The first siege of The first Paris lasted from September 19, 1870, to January 30, 1871, siege of during which period also the temporal power of the papacy eae: came to an end (September 1870), for it fell with the im-

perial cause, which alone had held it up; and in December

1870, at Versailles, the king of Prussia was proclaimed head

of a new empire of Germany. With a German emperor,

and Victor Emmanuel at Rome, and France in extremities,

it was clear that great changes had come, and must lead eventually to broad rearrangements of the political world.

While Paris held out bravely enough, if not very wisely, Gambetta at Tours used incredible efforts to raise fresh armies for France; the old hero of Italy, Garibaldi, also appeared, now that imperialism was gone, and placed his sword at the disposal of the struggling republic. Before

the end of October the capitulation of Metz had released a

whole German army, which protected the operations of the besieging hosts ; at last, on January 28, 1871, an armistice

was announced, which brought the despairing resistance of

Paris to an end. The war elsewhere died out almost at

once; the Germans occupied all the forts round Paris.

On 8th February elections took place for a National The As- Assembly to be held at Bordeaux, to deliberate on the ques- sembly tion of peace or war, or rather, to arrange the terms of ae peace,—for the country returned the Assembly with that ~~~ intention, It was a body nominally republican, with

strong monarchical leanings, as yet unexpressed ; hardly half a dozen Bonapartists were returned to it. Garibaldi was among the deputies elected, though he declined the honour of actingasa Frenchman. The new republican Government of France now had M. Grévy as president, and Thiers as chief of the executive power ; and it was decided that the Assembly should sit at Versailles. The fierce outbreak of the hot republicans of Paris interfered sorely with their peaceful labours. On 18th March the commune of Paris declared itself in opposition to the Versailles republic; the old grudges of artisan Paris once more asserted their un- pleasant existence ; and Marshal MacMahon was instructed by the Versailles Assembly to reduce the insurgent capital.

Then followed the second siege of Paris, from April 2 to The May 21, with its accompanying horrors, and the gloomy noone spectacle of street-fighting and the burning and ruin of the 5°S.° public buildings of the town.

Meanwhile M. Thiers, with infinite toil, and with jour- The neys from court to court of Europe, had at last, by his treaty of unwearying activity, succeeded in getting terms of peace ee agreed to. The treaty of Frankfort was signed on the 10th °”” of May 1871; by it Alsace and a large part of Lorraine were ceded. back to Germany, while Belfort was restored to

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France; a huge money indemnity was to be paid to Germany for the costs of the war.

The reactionary measures of the Versailles Assembly soon began,—timidly at first, to push forward with boldness, if the first steps succeeded. Thus, it suppressed thie national guard, in spite of the moderate opposition of M. Thiers ; it allowed Orleanist princes and members of the Bonapartist family to enter the Assembly ; it strengthened its position at Versailles, though it had not the courage to move the Government offices thither. Early in 1872 the opposition of the Assembly to his financial proposals led to a first re-signation of M. Thiers; only on its earnest and almost unanimous petition did he consent to hold office any longer.

. Meanwhile, the attempts at a fusion between thie legiti- ties in it.

mists and Orleanists failed completely; the efforts of the Bonapartists, led by M. Rouher, were redoubled ; a great organized propaganda was set afoot; newspapers, pamplilets, photographs, bribes for the army and for Government officials, intrigues of every kind, were in motion, in order to create a public opinion on behalf of the emperor and the young prince imperial, as he was still persistently called. The three parties agreed in one thing, at least,—that they would before long put an end to the republic. At the end of 1872 a commission of thirty was appointed to regulate the arrangement of public powers and duties, and to settle the vexed question of ministerial responsibility. It was composed of a majority of the Right, the members of the different anti-republican parties in the Assembly. From it sprang the attempts of the Assembly to postpone the day of its dissolution, and to frame the government of France in such a way as to secure the

defeat of the republic. The weakness of the majority lay in the fact that their union was only negative; and that if they did agree, it was only till they could rid themselves of the republic.

The death of Napoleon III. at Chiselhurst in January 1873 created little or no feeling in France, and showed that imperialism had small hold on the popular mind. The Assembly now decided that it would remove the president from the chamber, because of the great influence which Thiers could always exert ona debate ; and, secondly, that it would push back its own dissolution as far as possible. These proposals Thiers accepted, rather than run the risk of a collision. When, however, it was announced that, thanks chiefly to the president's exertion, the evacuation of France by the Prussian troops would take place two years sooner than had been originally stipulated, and that the last foreign soldier would march off in September 1873, the parties of the majority became seriously alarmed ; for the life of the assembly had been, by their own admission, connected with the period of continuance of German troops in France. Early in April 1873, on the resignation of M. Grévy, pre- sident of the chamber, they carried their candidate M. Buffet, against the Thiers Government ; in May they came to close quarters, and brandishing their favourite weapon, the "red spectre," these three reactionary parties defeated Thiers by a majority of 16 (360 against 344). Then the old minister resigned, and the parties, which had arranged their plans beforehand, at once elected as president Marshal MacMahon, the "'honnéte homme et soldat," as he styled himself. With him they associated a cabinet of which the head was M. de Broglie. Immediately the functionaries were changed throughout France, and everywhere old imperialists were put in. At the beginning of 1875 it was agreed that the presidency should be for seven years, and a new constitution, with the republican element as much as possible effaced, was set up in February 1875. Before this M. de Broglie had fallen under the ill-will of he monarchical parties, and had been compelled by an ad-

erse vote of the chamber to send in his resignation. He Was succeeded by General de Cissey, with what was called,

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by an inopportune invention, "a business cabinet." #e:'The 1875-77.

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new coustitution provided a president with a cabinet, a body which, by being thus styled "a business cabinet," seemed to make the president's personality all the stronger ; then there was a senate of 300 members, of whom 75 were life-holders,and the rest elected for nine years, renewable by triennial elections of a third at a time; and, lastly, a chamber of deputies, to be elected by the country in the usual way. The time came at last when the chamber, which had been T

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elected to decide on peace or war, and had taken to itself solution

the functions of a constituent assembly, and had framed new constitution, and had defied the public opinion of France expressed at almost every bye-election, must bring its half-usurped functions to an end. The successive triumphs of the republicans in bye-elections had strength- ened them so much that they could now hold their own in the chamber. The president, aware that his strength was going, got rid of the cabinet of Dufaure and Jules Simon, and, trusting to official pressure at a new election, hoping also to work on the old fears respecting the extremer party, the "irreconcilables," took advantage of an adverse vote, and after having in May 1877 adjourned the chamber for a month, eventually dissolved it on June 25,1877. The republican party showed extraordinary prudence and mo- deration under excessive provocation; the influence of thie great jurists, Dufaure and Grévy, made itself felt, neutraliz- ing all the plots of the reaction, and quietly prolonging the crisis, until the country could speak; the ' Opportunists," as the followers of Thiers and Gambetta were now styled, united with the "irreconcilables" in opposition to the "party of order," as the intriguers of the three reactionary groups, legitimists, Orleanists, imperialists, loved to call themselves. In spite of shameless interferences with the election, in spite of the unseemly appeal of the president himself, in spite of threats and all the ancient weapons of reaction, the country was so decidedly republican that even

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the death of Thiers (3d Septentber 1877) could not for a Death of | moment check the fortunes of his party. His death perhaps Thier. |

even strengthened it, for he became the saint instead of being the leader of it. His chequered political career, so long past, was quite forgotten; his memory was revered as that of the statesman who in his old age saved Belfort to France, brought peace, secured the payment of the war in- demnity, and relieved the country from the German occu- pation. All France felt that under his guidance tranquillity had returned, and the timid middle classes had learned to couple prosperity with the republic, And so the elections of

1877 returned a decisive majority for the republicans, now The As-

headed by MM. Grévy and Gambetta; the " irreconcilables were not strong in the new chamber; the reactionary parties ° lost ground; and M. Grévy was at once re-elected president of the chamber. Consequently, the marshal president, after France had been deeply agitated by rumours of a new coup détat, and by ominous movements of troops, at last gave way, and, honestly if reluctantly, accepted the verdict of the country. The reactionary "Ministry of May 16" fell, and, after a new attempt at a "business ministry," a re- publican cabinet was formed at last (14th December 1877), under the presidency of M. Dufaure. By degrees, as the shameless behaviour of officials at election after election came to light, the bureaucracy of France began to resume a republican colour, by removals of reactionary prefects, by opportune changes of political views, and acquiescence in the loudly pronounced opinion of the nation. The army, which was far from satisfied with the late Government, showed signs of content under the new. In the senate only did the three reactionary parties still possess any power; and even there their majority was so small that they could not venture on serious resistance. The Orleanist section, which, though very weak in numbers,

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CONCLUSION. |

still held the balance, and could give the majority to either side, was timid and moderate, and averse to heroic measures. 'heir refusal to prolong the crisis by consenting

to a second dissolution of the chamber of deputies gave

time for the moderate republic to consolidate its powers. The elections of 5th January 1879, in which, according to the present constitution of France, one-third of the senate has undergone re-election, have happily brought that body into harmony with the chamber of deputies and the country. Fresh rumours of trouble had been industriously circulated ; the temper of France is, however, so thoroughly tranquil, and so decided in favour of a constitutional republic, that the hopes of the reactionary parties have all been frustrated.

It is always absurd to indulge iu historical prophecy ; and forecasts as to the future of France, thanks tu the quick movement of opinion, the general ignorance of the country people, the vehemence in the towns, the long succession of changes in government and constitution, must be specially precarious. Still, it is clear that, for a time at least, the reaction, however strong elsewhere, has been defeated in France; above all it is clear that imperialism has received a heavy if not a fatal blow. This is no little matter. We live in days in which the growth of a modern imperialism, based on huge armaments and destructive of small states, had become a standing menace to the well- being of the world; it is a ground for hope and thankfulness that France, the central state of Kurope. has definitely

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and calmly abandoned her imperialist traditions, and set her- 1879.

self to live the temperate life of a constitutional republic. Fach race has its own special function in the general polity of uations; France seems called to lead in the pro- pagation of wholesome political ideas. Even in her most violent moods, her principles have been right, her theories humane and noble. It is true that she is deficient in many practical gifts; religion with her has ever held a very secondary place; her ideas on economical questions are narrow, and in many points her sympathies are not enlisted on behalf of what seems to us to be best. Still, her present position is an incalculable gain to Europe, and a promise of good for the future. With France as a prudent republic, the resistance of the peoples of Europe to arbitrary power and crushing armies will gradually be strengthened ; and constitutional life, already developing itself throughout the Latin races, will find its best guarantee of stability. The movements of Europe have often taken their rise from France; the union of a strong government with a vigorous national life may also come to date from her; if England has striven to impress the practical rendering of her consti- tutional principles and her tongue on half the world, France can also boast that she has provided her part by enunciating, with the most admirable clearness of speech and thought, those general ideas as to the relations between man and man which lie at the basis of any wholesome system of government. (Gc. W. K.)

PART IlI.—FRENCH LANGUAGE.

I. Geography.—French is the general name of the north- north-western group of Romanic dialects, the modern Latin of northern Gaul (carried by emigration to some places—as Lower Canada—out of France). In a restricted sense it is that variety of the Parisian dialect which is spoken by the educated, and is the general literary language of France. The region in which the native language is termed French consists of the northern half of France (including Lorraine) and parts of Belgium and Switzerland ; its boundaries on the west are the Atlantic Ocean and the Celtic dialects of Brittany; on the north-west and north, the English Channel ; on the north-east and east the Teutonic dialects of Belgium, Germany, and Switzerland. In the south-east and south the boundary is to a great extent conventional and ill-de- fined, there being originally no linguistic break between the southern French dialects and the northern Proveugal dia- lects of southern

France, north-western Italy, and south- western Switzerland. It is formed partly by spaces of in- termediate dialects (some of whose features are French, others Provengal), partly by spaces of mixed dialects result- ing from the invasion of the space by more northern and more southern settlers, partly by lines where the inter- mediate dialects have been suppressed by more northern (French) and more southern (Provengal) dialects without these having mixed. Starting in the west atthe mouth of the Gironde, the boundary runs nearly north soon after passing Bordeaux ; a little north of Angouléme it turns to the east, and runs in this direction into Switzerland to the north of Geneva.

Il. Hxternal History.—(a) Political—By the Roman conquests the language of Rome was spread over thie greater part of southern and western Europe, and gradually supplanted the native tongues. The language introduced was at first nearly uniform over the whole empire, Latin provincialisms and many more or less general features of the older vulgar language being suppressed by the pre- ponderating influence of the educated speech of the capital. As legions became stationary, as colonies were formed, and as the natives adopted the language of their conquerors,

this language split up into local dialects, the distinguishing features of which are due, as far as can be ascertained (ex- cept, to some extent, as to the vocabulary), not to speakers of different nationalities misspeaking Latin, each with the peculiarities of his native language, but to the fact that linguistic changes, which are ever occurring, are not per- fectly uniform over a large area, however homogeneous the speakers. As Gaul was not conquered by Cesar till the middle of the first century before our era, its Latin cannot have begun to differ from that of Rome till after that date ; but the artificial retention of classical Latin as the literary and official language after the popular spoken language had diverged from it, often renders the chronology of the carlier periods of the Romanic languages obscure. It is, however, certain that the popular Latin of Gaul had become differen- tiated from that of central Italy before the Teutonic con- quest of Gaul, which was not completed till the latter half of the 5th century; the invaders gradually adopted the language of their i.ore civilized subjects, which remained unaffected, except in its vocabulary. Probably by this time it had diverged so widely from the artificially preserved literary language

that it could no longer be regarded merely as mispronounced Latin ; the Latin documents of the next following centuries contain many clearly popular words and forms, and the literary and popular languages are distin- guished as latina and romana. The term gallica, at first denoting the native Celtic language of Gaul, is found ap- plied to its supplanter before the end of the 9th century, and survives in the Breton gallek, the regular term for "French." After the Franks in Gaul had abandoned their native Teutonic language, the term francisca, by which this was denoted, came to be applied to the Romanic one they adopted, and, under the form frangaise, remains its native name to this day; but this name was confined to the Romanic of northern Gaul, which makes it probable that this, at the time of the adoption of the name francesca, had become dis- tinct from the Romanic of southern Gaul. Srancisca is the Teutonic adjective frankisk, which occurs in Old English in the form frencisc; this word, with its umlauted e from

a with following ¢, survives under the form /'rench, which, though purely Teutonic in origin and form, has long been exclusively applied to the Romanic language and inhabi- tants of Gaul. The German name franzose, with its accent on, and o in, the second syllable, comes from frangovs, a native French form older than francais, but later than the Early Old French franceis. The Scandinavian settlers on the north-west coast of France early in the 10th century quickly lost their native speech, which left no trace except in some contributions to the vocabulary of the language they adopted. The main feature since is the growth of the

political supremacy of Paris, carrying with it that of its | dialect; in 1539 Francis I. ordered that all public docu

ments should be in French (of Paris), which then became the official language of the whole kingdom, though it is still foreign to nearly half its population.

The conquest of England in 1066 by William, duke of Normandy, introduced into England, as the language of the rulers and (for a time) most of the writers, the dialects spoken in Normandy. Confined in their native country

to definite areas, these dialects, following their speakers, be- came mixed in England, so that their forms were used to some extent indifferently ; and the constant communication with Normandy maintained during several reigns introduced also later forms of Continental Norman. As the conquerors learned the language of the conquered, and as the more cultured of the latter learned that of the former, the Nor- man of England (including that of the English-speaking Lowlands of Scotland) became anglicized; instead of fol- lowing the changes of the Norman of France, it followed those of English. The accession in 1154 of Henry IL of Anjou disturbed the Norman character of Anglo-French, and the loss of Normandy under John in 1204 gave full play to the literary importance of the French of Paris, many of whose forms afterwards penetrated to England. At the same time English, with a large French addition to its vocabulary, was steadily recovering its supremacy, and is officially employed (for the first time since the Conquest) in the Proclamation of Henry IIL, 1258. The semi-arti- ficial result of this mixture of French of different dialects and of different periods, more or less anglicized according to the date or education of the speaker or writer, is gene- rally termed "the Anglo-Norman dialect"; very mislead- ingly for a great part of its existence, because while the French of Normandy was not a single dialect, the later French of England came from other French provinces be- sides Normandy, and, being to a considerable extent in artificial conditions, was checked in the natural development implied by the term "dialect." The disuse of Anglo-

French as a natural language is evidenced by English being |

substituted for it in legal proceedings in 1362, and in schools in 1387; but law reports were written in it up to 1600, and, converted into modern literary French, it re- mains in official use for giving the royal assent to bills of parliament.

(6) Literary.—Donubtless because the popular Latin of northern Gaul changed more rapidly than that of any other part of the empire, French was, of all the Romanic dialects, the first to be recognized as a distinct language, and the first to be used in literature; and though the oldest speci- men now extant is probably not the first, it is consider- ably earlier than any existing documents of the allied languages. In 813 the council of Tours ordered

certain homilies to be translated into Rustic Roman or into Ger- man; and in 842 Louis the German, Charles the Bald, and their armies confirmed their engagements by taking oaths in both languages at Strasburg. These have been preserved to us by the historian Nithard (who died in 858) ; and though, in consequence of the only existing manuscript {at Rome) being more than a century later than the time

of the author, certain alterations have occurred in the text of the French oaths, they present more archaic forms (pro- bably of North-Eastern French) than any other document. The next memorials are a short poem, probably North- Eastern, on St Eulalia, preserved in a manuscript of the 10th century at Valenciennes, and some autograph frag- ments (also at Valenciennes) of a homily on the prophet Jonah, in mixed Latin and Eastern French, of the same period. To the same century belong a poem on Christ's Passion, apparently in a mixed (not intermediate) language of French and Provengal, and one, probably in South-Eastern French, on St Leger; both are preserved, in different handwritings, in a MS. at Clermont-Ferrand, whose scribes have introduced many Provengal forms. After the middle of the 11th century literary remains are comparatively numerous; the chief early representatives of. the main dialects are the following, some of them preserved in several MSS., the earliest of which, however (the only ones here mentioned), are in several cases a generation or two later than the works themselves. In Western French are a verse life of St Alexius (Alexis), probably Norman, in an Anglo-Norman MS. at Hildesheim ; the epic poem of Roland, possibly also Norman, inan A.-N. MS. at Oxford ; a Norman verbal translation of the Psalms, in an A.-N. MS. also at Oxford; another later one in an A.~~N. MS, at Cam~~ bridge ; a Norman translation of the Four Books of Kings, in anative MS. at Paris. The earliest work in the Parisian dialect is probably the Travels of Charlemagne, preserved in a late Anglo-Norman MS. with much-altered forms. In Eastern French, of rather later date, there are translations of the Dialogues of Pope Gregory, in a MS. at Paris, contain- ing also fragments of Gregory's Moralities, and (still later) of some Sermons of St Bernard, in a MS. also at Paris. From the end of the 12th century literary and official docu- ments, often including local charters, abound in almost every dialect, until the growing influence of

Paris caused its language to supersede in writing the other local ones. This influence, occasionally apparent in the 12th century, was overpowering in the 15th, when authors, though often displaying provincialisms, almost all wrote in the dialect of the capital ; the last dialect to lose its literary independence was the North-Eastern, which, being the Romanic language of Flanders, had a political life of its own, and (modified by Parisian) was used in literature after 1400. |

III. Lnternal History.—So little has.been done until recently, and so much remains to be done, in the scientific investigation of the sounds, inflexions, and syntax of the older stages and dialects of French, that what follows can- not claim to be more than a fragmentary sketch, mainly of the dialects —that which is now literary modern French, and those which were imported into England by the Nor- mans—in which English readers will probably take most interest, and especially of the features which explain the forms of English words of French origin. Dates and places are only approximations, and many statements are liable to be modified by further researches ; want of space obliges many exceptions and limitations to the general laws, and many points of hardly inferior importance to those here noticed, to be passed over insilence. The primi- tive Latin forms given are often not classical Latin words, but derivatives from these; and reference is generally made to the Middle English (Chaucerian) pronunciation of English words, not the modern.*

(a) Vocabulary.—The fundamental part of the vocabulary of French is the Latin imported into Gaul, the French. words being simply the Latin words themselves, with the natural changes undergone by all living speech, or de- rivatives formed at various dates. Comparatively few words were introduced from the Celtic language of the native inhabitants (ec, ewe from the Celtic words given

by Latin writers as beccus, leuca), but the number adopted from the language of the Teutonic conquerors of Gaul is large (guerre = werra; laid = laidh; choi = kausjan). The words were imported at different periods of the Teutonic supremacy, and consequently show chronological differences in their sounds (hair = hatan; francais = frankisk; écrevisse =krebiz;

échine=skina). Small separate importations of Teutonic words resulted from the Scandinavian settlement in France,and the commercial intercourse with the Low German nations on the North Sea (friper = Norse hripa ; chaloupe = Dutch sloop; est=Old English east). In the meantime, as Latin (with considerable alterations in pronunciation, vocabulary, &c.) continued in literary, official, and ecclesias- tical use, the popular language borrowed from time to time various more or less altered classical Latin words; and when the popular language came to be used in literature, especially in that of the church, these importations largely increased (virginitet Eulalia = wrginitdtem; emagena Alexis = imdginem—the popular forms would probably have been vernedet, emain). At the Renaissance they became very abundant, and have continued since, stifling to some extent the developmental power of the language. Imported words, whether Teutonic, classical Latin, or other, often receive some modification at their importation, and always take part in all subsequent natural phonetic changes in the lan- guage (Early Old French adversarie, Modern French adver- satire). Those French words which appear to contradict the phonetic laws were mostly introduced into the language after the taking place (in words already existing in the language) of the changes formulated by the laws in ques- tion; compare the late imported /aigue with the inherited lat, both from Latin laicuwm. In this and many other cascs the language possesses two forms of the same Latin word, one descended from it, the other borrowed (meuble and mobile from mobelem). Some Oriental and other foreign words were brought in by the crusaders (amiral from amir) ; in the 16th century, wars, royal marriages, and literature caused a large number of Italian words (soldat = soldato; brave= bravo; caresser =carezzare) to be introduced, and many Spanish ones (alcdve=alcoba ; hdbler=hablar). A few words have been furnished by Provengal (abevlle, cadenas), and several have been adopted from other dia- lects into the French of Paris (esguiver Norman or Picard for the Paris French eschiver). German has contri- buted a few (blocus =blochtis; choucroute = siirkrit); and recently a considerable number have been imported from England (drain, confortable, flirter). In Old French, new words are freely formed by derivation, and to a less extent by composition; in Modern French, borrowing from Latin or other foreign languages is the more usnal course. Of the French words now obsolete some have disappeared because the things they express are obsolete ; others have been replaced by words of

native formation, and many have been superseded by foreign words generally of literary origin ; of those which survive, many have undergone con- siderable alterations in meaning. A large number of Old French words and meanings, now extinct in the language of Paris, were introduced into English after the Norman Conquest ; and though some have perished, many have survived—strife from Old French estrif (Teutonic sé77); quaint from cointe (cognitum); remember from remembrer (rememorare); chaplet (garland) from chapelet (Modern French "chaplet of beads") ; appointment (rendezvous) from appointement (now "salary"). Many also survive in other French dialects.

(6) Dialects—The history of the French language from the period of its earliest extant literary memorials is that of the dialects composing it. But as the popular notion of a dialect as the speech of a definite area, possessing certain peculiarities confined to and extending throughout that area,

is far from correct, it will be advisable to drop the mislead- ing divisions into " Norman dialect," " Picard dialect," and the like, and take instead each important feature in the chronological order (as far as can be ascertained) of its development, pointing out roughly the area in which it ex- ists, and its present state. The local terms used arc inten- tionally vague, and it does not, for instance, at all follow that because "Eastern" and '" Western" are used to denote the localities of more than one dialectal feature, the boundary line between the two divisions is the same in each case. It is, indeed, because dialectal differences as they arise do not follow the same boundary lines (much less the political divisions of provinces), but cross one another to any extent, that to speak of the dialect of a large area as an individual whole, unless that area is cut off by physical or alien linguistic boundaries, creates only confusion. Thus the Central French of Paris, the ancestor of classical Modern French, belongs to the South in having ts, not tsh, for Latin & (c) before ¢ and ¢; tsh, not k, for k © before a; and gu, not w, for Teutonic w; while it belongs to the East in having 07 for earlier e¢; and to the West in having é, not e, for Latin a; and 7, not ez, from Latin é+7. It may be well to note that Southern /rench does not

correspond to southern rance, whose native langnage is Provencal. ‘Modern French” means ordinary educated Parisian French.

(c) Phonology.—The history of the sounds of a language is, to a considerable extent, that of its. inflexions, which, no less than the body of a word, are composed of sounds. This fact, and the fact that unconscious changes are much. more reducible to law than conscious ones, rendcr the phono- logy of a language by far the surest and widest foundation for its dialectology, the importance of the sound-changes in this respect depending, not on their prominence, but on the earliness of their date. or several centuries after the divergence between spoken and written Latin, the history of these changes has to be determined mainly by reasoning, aided by a little direct evidence in the misspellings of in- scriptions, the semi-popular forms in glossaries, and the warnings of Latin grammarians against vulgarities. With the rise of Romanic litcrature the materials for tracing the changes become abundant, though as they do not give us the sounds themselves, but only their written represcuta- tions, much difficulty, and some uncertainty, often attach to deciphering the evidence. Fortunately, early Romanic orthography, that of Old French included (for which see next section), was phonetic, as Italian orthography still is; the alphabet was imperfect, as many new sounds had to be represented which were not provided for in the Roman alphabet from which it arose, but writers aimed at re- presenting the sounds they uttered, not at using a fixed combination of letters for each word, however they pro- nounced it.

The characteristics of French as distinguished from the allied languages and from Latin, and the relations of its sounds, inflexions, and syntax to those of the last-named language, belong to the general subject of the Romanic lan- guages. It will be well, however, to mention here some of the features in which it agrees with the closely related Proven- gal, and some in which it differs. As to the latter, it has already been pointed out that the two languages glide insen- sibly into one another, there being a belt of dialects which possess some of the features of each. French and Provengal of the 10th century—the earliest date at which documents exist in both—agree to a great extent in the treatment of Latin final consonants and the vowels preceding them, a matter of great importance for inflexions (numerous French examples occur in this section). (1) They reject all vowels, except a,

of Latin final (unaccented) syllables, unless pre- ceded by certain consonant combinations or followed by nt

after having caused the development of 7 before the ¢ (Hast French ci) derived from a not in position, is abandoned in the north, the

(here, as elsewhere, certain exceptions cannot be noticed) ; (2) they do not reject a similarly situated ; (3) they reject final (unaccented) m; (4) they retain final s. French and Northern Provencal also agree in changing Latin `from a labio-guttural to a labio-palatal vowel; the modern sound (German` *) of the accented vowel of French June, Provengal luna, contrasting with that in Italian and Spanish za, appears to have existed before the earliest extant documents. The final vowel laws generally apply to the unaccented vowel preceding the accented syllable, if it is preceded by another syllable, and followed by a single consonant—maten (matiitinum), dortow (dormitorium), with vowel dropped canevas (cannabaceum), armedure, later arméure, now armure (armatiram), with e=a, as explained below.*

On the other hand, French differs from Provengal:— (1) in uniformly preserving (in Early Old French) Latin final t, which is generally rejected in Provencal—French avmet (Latin amat), Provengal ama; aiment (amant), aman; (2) in always rejecting, absorbing, or consonantizing the vowel of the last syllable but one, if unaccented; in such words as angele (often spelt angle), the e after the g only serves to show its soft sound—French veintre (vaincre, Latin vancere), Provengal vencer, with accent on first syllable; French esclandre (scandalum), Provengal escandol ; French olte (dis-syllabic, 7=y consonant, now hwzle), Provengal ol (olewm) ; (3) in changing accented `not in position into av before nasals and gutturals and not after a palatal, and elsewhere into é (West French) or e¢ (East French), which develops an é before it when preceded by a palatal—French main (Latin manum), Provencal man; aigre (derem), agre; ele (alam), East French ed/e, ala; meitvé (medietdétem), Hast French mottieit, meitat; (4) in changing` *in unaccented final syllables into the vowel a, intermediate to « and e; this vowel is written a in one or two of the older documents, elsewhere e—*

French aime (Latin amd), Provengal ama; awimes (amds), amas; aimet (amat), ama; (5) in changing original aw into d—French or (aurum), Provengal aur; rober (Teutonic raubin), raubar; (6) in changing general Romanic é, from accented @ and % not in position, into e.— French veine (vénam), Provengal vena; pei! (pilum), pel.

As some of the dialectal differences were in existence at the date of the earliest extant documents, and as the exist- ing materials, till the latter half of the 11th century, are scanty and of uncertain locality, the chronological order (here adopted) of the earlier sound-changes is only tentative.

(1.) Northern French has ¢sh (written ¢ or ch) for Latin & (c) and t before palatal vowels, where Central and Southern Freneh have ts (written ¢ or z) —North Norman and Picard chive (céram), brach (brachium), plache (platewm); Parisian, South Norman, &c., cire, braz, place. Before the elose of the Early Old French period (12th eentury) és loses its initial consonant, and the same happencd to tsh a century or two later; with this change the old distinction is maintained—Modern Guernsey and Picard chire, Modern Pieard plache (in ordinary Modern French spelling); usual Freneh circ, place. English, having borrowed from North and South Norman (and later Parisian), has instances of both tsh and s, the former in eomparatively small number — chisel (Modern French ciseau= (?) cacsellumn), escutcheon (écusson, scitionem); city (ctté, eivitatem), place, (2.) Initial Teutonic w is retained in the north-east and along the north eoast ; elsewhere, as in the other Romance languages, g was prefixed—Picard, &e., warde (Teutonie warda), werre (werra) ; Parisian, &¢c., guarde, guerre. In the 12th century the u or w of gu dropped, giving the Modern French garde, guerre (with gu=g); w remains in Picard and Walloon, but in North Normandy it becomes v—-Modern Guernsey vésor, Walloon wazon, Modern French gazon (Teutonie wason). English has both forms, sometimes in words originally the same—wage and gage (Modern French gage, Teutonie wedi); warden and guardian (gardien, warding). (3.) Latin b after aecented @ in the imperfect of the first conjugation, which becomes v in Kastern French, in Western Freneh further changes to w, and forms the diphthong ow with the preeeding ee sa (amabam), portout (portabat); Burgundian rally the impenee? of ee nee coe ee a cuee

rst conjugation is assimilated to that

of the others—amoit, like avoit (habéba izati 2 mou, sbat). (4.) The palatalization of every then existing & and g (hard) when followed by a, ¢, or ¢,

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consonants returning to ordinary & or g, while in the centre and south they are assibilated to ish or dzh—North Norman and Picard cachier (cuptiare), kier (cérum), cose (causam), eskiver (Teu-

tonic skiuhan), wiket (Teutonic wik+dttum), gal (gallum), gardin

(from Teutonie gard); South Norman and Parisian chacier, cher,

chose, eschiver, guichet, jal, jardin. Probably in the 14th eentury the initial consonant of tsh, dzh disappeared, giving the modern

French chasser, jardin with ch=sh and j=ch; but tsh is retained

in Walloon, and dzh in Lorraine. The Northern forms survive—

Modern Guernsey cachier, gardin; Picard cacher, gardin. English possesses numerous examples of both forms, sometimes in related words—catch and chase; wicket, eschew; garden, jaundice (gaunisse, from galbanum). (5.) For Latin aeeented a not in position Western French usually has é, Eastern French e?, both of which take an 4 before them when a palatal precedes—Norman and Parisian per (parem), otez (audiatis); Lorraine petr, oteis. In the 17th and 18th centuries elose é changed to open é, except when final or before a silent cousonant—amer (amarum) now having é, aimer (amare) retaining é. English shows the Western elose é—peer (Modern French pair, Old French per), chief (chef, caput); Middle High German the Eastern ez —lameir (Modern Freneh lamer, (aimer, la mer= Latin mare) (6.) Latin accented ¢ not in position, when it came to be followed in Old French by 7, unites with this to form z in the Western dialeets, while the Eastern have the diphthong ei—Pieard, Norman, and Par- isian pire (pejor), pie (pectus);

Burgundian peire, pez. The distinction is still preserved—Modern French pire, pis; Modern Burgundian

peire, pet. English words show always 1—price (prix, pretiwunr),

spite (dépit, déspectwm). (7.) The nasalization of vowels followed by a nasal consonant did not take place simultaneously with all the vowels. -A and ¢ before % (guttural 7, as in sing), % (palatal), x, and m were nasal in the 11th eentury, such words as tant (¢antwm) and gent (gentem) forming in the Alexis assonances to themselves, distinet from the assonances with and ¢ before non-nasal con- sonants. Inthe Roland wmbre (ombre, wumbram) and ewlches (couche, collocat), fier (ferwm) and chiens (canés), dit (dictwm) and vint (vénit), cetnte (ctrictam) and vete (voile, via), brun (Teutonic brain) and fut (fuit) assonate freely, though o (w) before nasals shows a tendeney to separation. The nasalization of 7 and u (= Modern Freneh w) did not take place till the 16th century ; and in all eases the loss of the following nasal eonsonant is quite modern, the older pronuneiation of tant, ombre being tant, émbra, not as now 4, dbrh. The nasalization took place whether the nasal consonant was or was not followed by a vowel, femme (féminam), honncur (hondrem) being pronounced with nasal vowels in the first syllable till;after the 16th century, as indicated by the doubling of the nasal consonant in the spelling, and by the phonetic ehange (in femme and other words) next to be mentioned. English generally has az (now often reduced to a) for Old French d—vaunt (vanter, vanitare), tawny (tanné, (?) Celtic). (8.) The assimilation of é (nasal ¢) to d (nasal a@) did not begin till the middle of the 11th eentury, and is not yet universal in France, though generally a eentury later. In the Alexis nasal (as in tant) is never confounded with nasal ¢ (as in gent) in the assonances, though tho copyist (a eentury later) often writes for nasal ¢ in unaceented syllables, as in amfant (enfant, infantem); in the Roland there are several cases of mixture in the assonances, gent, for instance, occurring in ant stanzas, tant in et ones. English has several words with @ for e before nasals—rank (rang, Old French rene, Teutonie hringa), pansy (pensée, pensatam); but the majority show e—enter (entrer,

intrare), fleam (flamme, Old Freneh fleme, phlebotomum). The distinction is still preserved in the Norman of Guernsey, where az and en, though both nasal, have different sounds—ldnchier (lancer, lagcedre), but meéntrie (Old Freneh menterie, from mentirz). (9.) The loss of s, or tather 2, be- fore voiced consonants began early, s being often omitted or wrongly inserted in 12th century MSS.—FEarliest Old French masle (snas- eulum), sisdre (siceram); Modern Freneh mdle, eidre. In English it has everywhere disappeared—male, cider; except in two words, where it appears, as occasionally in Old French, as d—meddle (méler, miseulére), medlar (néflier, Old Freneh also meslier, mespilarium). The loss of s before voiceless eonsonants (except f) is about two centuries later, and it is not universal even in Parisian—Larly Old Freneh feste (festam), escuier (scutarium) ; Modern Freneh (fete, écuyer, but espérer (spérare). In the north-east s before ¢ is still retained— Walloon ehestai (chdteau, castellum), fiess (féte). English shows s regularly—feast, esquire. (10.) Medial dh (soft th, as m then), and final th from Latin ¢ or d between vowels, do not begin to disappear till the lattcr_ half of the 11th century. In native French MSS. dA is generally written d, and ti written 2; but the German scribe of the Oaths writes adjudha (adjutam), cadhuna (Greek katé and aam); and the English one of the Alexis euntretha (coutratam), lothet (lawdatwm), and that of the Cambridge Psalter heritcth (héréditatem). Medial dh often drops even in the last- named MSS., and soon disappears; the same is true for final th in Western Freneh—Modern French contrée, lowé. But in Eastern French final éh, to which Latin ¢ between vowels had probably been

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reduced through `and dh, appears in the 12th century and later as t, rhyming on ordinary French final ¢—Picard and Burgundian pechiet (peccatum), apeleit (appellatum). In Western French some final ths were saved by being changed to f—Modern French soif (sitim), meuf (obsolete, modwm). nglish has one or two instanccs of final th, none of medial dh—faith (foi, fidem); Middle English caritep (charité, caritatem), drud (Old French`

*dru, Teutonic drid); generally the consonant is lost—couwntry, charity. Middle High German shows the Eastern French final consonant—*moraliteit (moralité, méralitatem). (11.) 7 from Latin final ¢, if in an Old French unaccented syllable, begins to disappear in the Roland, where sometimes ateet (amat), sometimes azine, is required by the metre, and soon drops in all dialects. The Modern French t of aime-t-il and similar forms is an analogical insertion from such forms as dort-il (dormit), where the ¢ has always existed. (12.) The change of the diphthong az to é7 and afterwards to eéé (the doubling indicates length) had not taken place in the earliest French documents, words with a7 assonating only on words with a; in the Roland such assonances occur, but those of az on é arc more frequent—faire (facere) assonating on parastre (patraster) and on estes (estis); and the MS. (half a century latcr than the poem) occa- sionally has e¢ and'e for ai—recleimet (reclamat), desfere (disfacere), the latter agreeing with the Modern French sound. Before nasals (as in laine=lanam) and 7é (as in payé=pdcdtwm), at remained a diphthong up to the 16th century, being apparently e7, whose fate in this situation it has followed. English shows ai regularly before nasals and when final, and in a few other words—vain (vain, vanwin), pay (payer, pacare), wait (guetter, Teutonic wahtén); but before most consonants it has usually éé—peace (pais, paeem), feat (fait, factum), (18.) The loss or transposition of 7 (=y-consonant) follow- ing the consonant ending an accented syllable begins in the 12th century—Karly Old French glorie (glériam), estudte (studiuar), alte (olewm); Modern French glotre, éude, huile. English sometimes shows the earlier form—glory, study; sometimes the later—dower (dowaire, Karly Old French doarie, détartwm), oil (huile). (14.) The vocalization of J preceded by a vowel and followed by a consonant becomes frequent at the end of the 12th century ; when preceded by open é, an a developed before the Z while this was a consonant—11th century salse (salsa), beltet (bellitatem), solder (solidadre); Modern French sauce, beauté, souder. In Parisian, final éd followed the fate of él before a consonant, becoming the*

triphthong eww, but in Nor- man the vocalization did not take place, and the / was afterwards rejected— Modern French ruisseau, Modern Guernsey russé (v2vi- cellum). English words of French origin sometimes show / before a consonant, but the general form is w—scald (échauder, excalidare), Walter (Gautier, Teutonic Waldhari); sauce, beauty, soder, Final él is kept—veal (veau, vitellum), seal (sceau, sigilium). (15.) In the east and centre éi changes to od, while the older sound is retained in the north-west and west—Norman estreit (étvoit, strictum), preie (proie, praedam), 12th century Picard, Parisian, &c. estvoit, proie. But the earliest (10th century) specimens of the latter group of dialects have ¢i—pleier (ployer, plicdre) Eulalia, mettreiet (mettrait, mittere habebat) Jonah. Parisian 07, whether from ef or fron1 Old French 07, 6¢, became in the 15th ceutury we (spellings with owe or oe are not uncommon—#mérouer for miroir, miratorium), aud in the following, in certain words, é, now written ai—francais, connaitre, from frangois (franeeis, fratciscum), conoistre (conuistre, cognéscere); where it did not undergo the latter change it is now ua or wa—roi (ret, régem), croix (cruts, eriicem). Before nasals and palatal 7, ec (now=é) was kept—veine (véna), veille (vigila), and it everywhere survives unlabialized in Modern Norman—Guernsey ételle (étoile, stélla) with é, ser (sotr, sérwm) with é. English shows generally e (or az) for original ei—stratt (estrett), prey (preie); but in several words the later Parisian ot—coy (coi, qviétum), loyal (loyal, légalem). (16.) The splitting of the vowel- sound from accented Latin 6 or w not in position, represented in Old French by o and u indifferently, into uw, o (before nasals), and ew (the latter at first a diphthong, now=German), is unknown to Western French till the 12th century, and is not general in the cast. The sound in 11th century Norman was much nearer to u (Modern French ow) than to 6 (Modern French 6), as tle words borrowed by English show wz (at first written w, afterwards ow or ow), never 66; but was probably not quite w, as Modern Norman shows the same splitting of the sound as Parisian. Examples are —Early Old French espose or espuse (spénsam), nom or num (nomen), flor or flur (flérem); Modern French épouse, nom, fleur; Modern

Guernsey goule (queule, gulam), nom, flleur. Modern Picard also shows #, which is the regular sound before r—flowr ; but Modern Burgundian often keeps the original Old French 6—vo (vous, 6s). English shows almost always wu—spouse, noun, flower (Early Middle English spuse, nun, flur); but nephew with éu (neveu, nepotem). (17.) The loss of the u (or w) of qu dates from the end of the 12th century—Old French quart (qvartum), quitier (qviétare) with qu=kw, Modern French quart, quitter with qu =k, In Walloon the w is preserved—eoudr (quart), cwitter; as is the case in English—quart, quit. The w of gw seems to have

been lost rather earlier, English having simple y—gage (gaye, older

guage, Teutonic wadt), guise (guise, Teutonic wisa). (18.) The change of the diphthong ou to wu did not take place till after the 12th century, such words as Anjou (Andegavum) assonating in the Roland on fort (fortem); and did not occur in Picardy, where dw became au—eaus from older cous, cdls (cows, collés) coinciding with caus from ealz (chauds, calidés), English keeps du distinct from uu—vault for vawt (Modern French vodte, volvitam), soder (souder, solidadre). (19.) The change of the diphthong 7é to simple é is specially Anglo-Norman; in Old French of the Continent these sounds never rhyme, in that of England they constantly do, and English words show, with rare exccptions, the simple vowel—-fierce (Old French fiers, ferus), chief (chief, caput), with ic=ece; but pannier (panier, panarium). At the beginning of the modern period, Parisian dropped the 7 of ze when preceded by ch or j—chef, abréger (Old French abregier, abbreviadre); elsewhere (except in verbs) ve is retained—fier (ferwi), pitié (pietatem). Modern Guernsey retains te after ch—ap'rchier (approcher, adpropedre). (20.) Some of the Modern French changes have found their places under older ones; those remaining to be noticcd are so recent that English examples of the older forms are superfluous. In the 16th century the diphthong aw changed to ao and then to 6, its present sound, rendering, for instance, mawx (Old French mails, malés) identical with mots (muttés). The au of cau underwent the same change, but its e was still sounded as @ (the e of gue); in the next century this was dropped, making veawx (Old French véels, vitellds) identical with vaux (vals, vallés). (21.) A more general and

very important change began much earlier than the last; this is the loss of many final consonants. In Early Old French every consonant was pronounced as written; by degrees many of then disappeared when followed by another consonant, whether in the same word (in which case they were generally omitted in writing) or in a following one. This was the state of things in the 16th century ; those final con- sonants which are usually silent in Modern French were still sounded, if before a vowel or at the end of a sentence or a line of poetry, but generally not elsewhere. Thus a large number of French words had two forms; the Old French fort appeared as for (though still written fort) before a consonant, fort elsewhere. Ata later period final consonants were lost (with certain exceptions) when the word stood at the end of a sentence or of a line of poetry; but they are generally kept when followed by a word beginning with a vowel. (22.) A still later change is the general loss of the vowel (written ¢) of unaccented final syllables; this vowel preserved in the 16th century the sound a, which it appears to have had in Early Old French. In later Anglo-Norman final a (like every other sound) was treated exactly as the same sound in Middle English ; that is, it came to be omitted or retained at pleasure, and in the 15th century disappeared. In Old French the loss of final a is con- fined to a few words and forms; the 10th century savetet (sapébat for sapiébat) became in the 11th saveit, and ore (ad horam), ele (illam2) develop the abbreviated or, e2. In the 15th century a before a vowel generally disappears—mdr, Old French méur(matirum); and in the 16th, though still written, a after an unaccented vowel, and in the syllable ent after a vowel, does the same—vraimeut, Old French vraiement (véraca mente); avoteut two syllables, as now (avaient), in Old French three syllables (as habébant). These phenomena occur much earlier in the anglicized French of England —14th cen- tury aveynt (Old French aveient). But the universal loss of final ¢, which has clipped a syllable from half the French vocabulary, did not take place till the 18th century, after the general loss of final consonants ; fort and forte, distinguished at the end of a sentence or linc in the 16th century as fort and forta, remain distinguished, but as for and fort. The metre of poetry is still constructed on the obselete pronunciation, which is even revived in singing; "dites, la jeune belle," actually four syllables (da, la zhan bel), is con- sidered as seven, fitted with music accordingly, and sung to fit the music (dita, la zheno béle). (23.) In Old French, as in the other Romanic languages, the stress (force, accent) is on the syllable which

was accented in Latin; compare the treatment of the accented and unaccented vowels in latré, amas, giving lére, dime, and in latronem, amatis, giving larén, améz, the accented vowels being those which rhyme or assonate. At present, stress 1n French is much less marked than in English, German, or Italian, and is to a certain extent variable; which is partly the reason why most native French scholars find no difficulty in maintaining that the stress in living Modern French is on the same syllable as in Old French. The fact that stress in the French of to-day is independent of length (quantity) and pitch (tone) largely aids the confusion; for though the final and originally accented syllable (not counting the silent ¢ as a syllable) is now generally pronounced with less force, it very often has a long vowel with raised pitch. In actual pronunciation the chief stress is usually on the first syllable (counting according to the sounds, not the spelling), but in many polysyllables it is on the last but one; thus in caution the accented (strong) syllable is cau, in occasion it is ca. Poetry is still written according to the original place of the stress; the rhyme-syllables of larron, aimez are still ron and mez, which when sct to music receive an accented (strong) note, and are sung accordingly, though in speech the la

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and ai generally have the principal stress. In reading poetry, as distinguished from singing, the modern pronunciation 1s used, both as to the loss of the final a aud the displacement of the stress, the

result being that the theoretical metre in which the poetry is written disappears. (24.) In certain cases accented vowels were lengthened in Old French, as before a lost s; this was indicated in the 16th century by a circuinflex—béte, Old French beste (bestiam), dme, Old French anime (anima). The same occurred in the plural of many nouns, where a consonant was lost before the s of the flexion ; thus singular coe with short vowel, plural cos with long. The plural cos, though spelt cogs instead of e6 (=Kd6), is still sometimes to be heard, but, like other similar ones, is generally refashioned after the singular, becoming 0k. In present French, except where a difference of quality has resulted, as in céte (Old French coste, costam) with 6 and cotte (Old French cote) with 0, short and long

vowels generally run together, quantity being now variable and uncertain; but at the beginning of this century the Early Modern distinctions appear to have been generally preserved.

(d) Orthography.—The history of French spellings is based on that of French sounds; as already stated, the former (apart from a few Latinisms in the earliest docu- ments) for several centuries faithfully followed the latter. When the popular Latin of Gaul was first written, its sounds were represented by the letters of the Roman alphabet; but these were employed, not in the values they had in the time of Cesar, but in those they had acquired in consequence of the phonetic changes that had mean- time taken place. Thus, as the Latin sound w had become 6 (close 0) and % had become y (French w, German %), the letter « was used sometimes to denote the sound 6, some- times the sound y,; as Latin & (written c) had become tsh or ts, according to dialect, before e and 2, ¢ was used to represent those sounds as well as that of &. The chief features of early French orthography (apart from the specialities of individual MSS., especially the earliest) are therefore these :—c stood for & and tsh or ts; d for d and dh (soft th); ¢ for é, é, anda; g for g and dzh; h was often written in words of Latin origin where not sounded; 2 (/) stood for 7, y consonant, and dzh; o for 6 (Anglo-Norman w) and 6; s for s and z; ¢ for ¢ and th; w (v) for 6 (Anglo- Norman w), y, and v; y (rare) forz; 2 for dz and ts. Some new sounds had also to be provided for: where tsh had to be distinguished from non-final ts, ch—at first, as in Italian, denoting & before ¢ and e (chi = ki from qvz)—was used for it; palatal 7 was represented by 2/2, which when final usually lost one J, and after ¢ dropped its 7; palatal » by gn, ng, or ngn, to which 7 was often prefixed; and the new letter w, originally we (vv), and sometimes representing merely wv or vu, was employed for the consonant-sound still de- noted by it in English, All combinations of vowel-letters represented diphthongs; thus az denoted a followed by 2, ou either 6u or du, ue either 6¢ (Anglo-Norman wz) or y, and similarly with the others—e?, eu, 02, cu, ve, we (and oe), and the triphthong zew. Silent letters, except initial A in Latin words, are very rare; though MSS. copied from older ones often retain letters whose sounds, though exist- ing in the language of the author, had disappeared from that of the more modern scribe. The subsequent changes in orthography are due mainly to changes of sound, and find their explanation in the phonology. Thus, as Old French progresses, s, having

become silent before voiced consonants, indicates only the length of the preceding vowel; ¢ before nasals, from the change of é (nasal ¢) to (nasal a), represents ; c, from the change of ¢s to s, represents s; gu and gu, from the loss of the w of kw and gw, represent & and g (hard); ai, from the change of az to ¢, represents ; ow, from the change of du and du to ux, Tepresents w; ch and g, from the change of tsh and dzh to = and zh, represent sh and zh; ew and ue, originally ls diphthongs, represent (German 4); z, from om ee % ts and dz to s and z, represents sandz The ee: . some of these letters were applied to words

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e was replaced by qu (evesque, eveske, Latin epescopum); Old French u and o for 6, after this sound had split into ew and a, were replaced in the latter case by ow (vous, for ros or rus, Latin russwm); s was inserted to mark a long vowel (pasle, pale, Latin pallidum); eu replaced ue and oe (neuf, nuef, Latin novwm and novem); z replaced s after é (nez, nes, nadsum). The use of x for final s is due to an ortho- graphical mistake; the MS. contraction of ws being some- thing like x was at last confused with it (zex for zeus, oculés), and, its meaning being forgotten, w was inserted before the # (yeux), which thus meant no more than s, and was used for it after other vowels (voix for vois, vdcem). As literature came to be extensively cultivated, traditional as distinct from phonetic spelling, began to be influential ; and in the 14th century, the close of the Old French period, this influence, though not overpowering, was strong—stronger than in England at that time. About the same period there arose etymological as distinct from traditional spelling. This practice, the alteration of tradi- tional spelling by the insertion or substitution of letters which occurred (or were supposed to occur) in the Latin (or supposed Latin) originals of the French words, became very prevalent in the three following centuries, when such forms as debvoir (débére) for devoir, faulx (falsum) for faus, autheur (auctdrem, supposed to be authorem) for auteur, poids (supposed to be from pondus, really from pensum) for pois, were the rule. But besides the etymo- logical, there was a phonetic school of spelling (Ramus, for instance, writes

é¢me, éimates—with e=é, é=é, and ¢=a— for aimai, aimastes), which, though unsuccessful on the whole, had some effect in correcting the excesses of the other, so that in the 17th century most of these inserted letters began to drop; of those which remain, some (jlegme for flemme or flewme, Latin phlegma) have corrupted the pro- nunciation. Some important reforms—as the dropping of silent s, and its replacement by a circumflex over the vowel when this was long; the frequent distinction of close and open e by acute and grave accents; the restriction of and w to the vowel sound, of j and v to the consonant; and the intro- duction from Spain of the cedilla to distinguish c=s from c =k before a, u, and o—are due to the 16th century. The replacement of 02, where it had assumed the value é, by az, did not begin till the last century, and was not the rule till the present one. Indeed, since the 16th century the changes in French spelling have been very small, compared with the changes of the sounds; final consonants and final e (unaccented) are still written, though the sounds they represent have disappeared. French orthography is now quite as traditional and unphonetic as English, and gives an even falser notion than this of the actual state of the language it is supposed to represent. Many of the features of Old French orthography, early and late, are preserved in English orthography; to it we owe the use of ¢ for s (Old English c= only), of 7 (2) for dzh, of v (w) for v (in Old English written f), and probably of ch for tsh. The Eng- lish w is purely French, the Old English letter being the runic p. When French was introduced into England, kw had not lost its w, and the French gw, with that value, replaced the Old English cp (queen for cpen). In Norman, Old French 6 had become very like w, and in England went entirely into it; 0, which was one of its French signs, thus came to be often used for w in English (come for cwme). U, having often in Old French its Modern French value, was so used in England, and replaced the Old Eng- lish y (busy for bysi, Middle English brud for brid), and y was often used for 7 (day for daz). In the 13th century, when ow had come to represent w in France, it was borrowed by English, and used for the long sound of that vowel (sour for sir); and gw, which had come to mean simply g (hard), was occasionally used to represent the

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sound g before ¢ and e (guess for gesse). Soine of the Early Modern etymological spellings were imitated in England ; ficam and autour were replaced by phlegm and authour,

‘the latter spelling having corrupted the pronunciation.

(c) Inflewions.—In the earliest Old French extant, the influence of analogy, especially in verbal forms, is very marked when these are compared with Latin (thus the present participles of all conjugations take ant, the ending of the first, Latin antem), and becomes stronger as the lan- guage progresses. Such isolated inflexional changes as saveit into savoit, which are cases of regular phonetic changes,

are not noticed here.

i. Verbs.—(1.) In the oldest French texts the Latin pluperfect (with the sense of the perfect) occasionally occurs—avret (habuerat), roveret (rogdverat); it disappears early in the 12th century. (2.) The u of the ending of the Ist pers. plur. mus drops in Old French, except in the perfect, where its presence (as 9) is not yet satisfactorily explained—amoms (amamus), but amames (amavimus). In Picard the ending mes is extended to all tenses, giving amomes, &c. (3.) The replacement of the 2d plur. ending edz (Latin étzs) by the ez (Latin dis) of the first conjugation begins early in Norman; in the Roland both forms occur, portereiz (portdre habétis) assonating on ret (roi, régenv), and the younger porterez on eitet (cité, civitatem). \n Eastern French, where ez, in accordance with phonetic laws, appears as eiz, etz for the same reason becomes Ole and ots, and is found in the 13th century—avois and avroiz corre- sponding to aveiz (habétis) and avreiz, but ameiz to amez (amatis). (4.) In Eastern French the Ist plur., when preceded by 7, has ¢, not 0, before the nasal, while Western French has 2 (or 0), as in the present; posciomes (possedmus) in the Jonah homily makes it probable that the latter is the older form—Picard aviemes, Burgun- dian avicus, Norman aviums (habébamus). (5.) The subjunctive of the first conjugation has at first in the singular no final ¢, in accord- ance with the final vowel laws—plur, plurs, plurt (plorem, plorés, plore). The forms are gradually assimilated to those of the other conjugations, which, deriving from Latin am, as, at, have ¢, es, e(t); Modern French pleure, pleures, pleure, like perde, perdes, perde (perdam, perdas, perdat). (6.) In Old French the

present sub- junctive and the Ist sing. pres. ind. generally show the influence of the dor ¢ of the Latin tam, eam, 16, e6—Old French muire or moerge (moriat for moriatur), tiegne or tienge (tencat), muir or moerc (morté for morior), tieng or trenc (tenco), By degrees these forms are levelled under the other present forms—Modern French meure and meurs following meurt (morit for moritur), tienne and tiens following tient (tenet). A few of the older forms remain— the vowel of aie (habeam) and ai (habed) contrasting with that of (habet). (7.) A levelling of which instances occur in the 11th century, but which is not yet complete, is that of the accented and unaccented stem-syllables of verbs. In Old French many verb- stems with shifting accent vary in accordance with phonetic laws— parler (parabolare), amer (amare) have in the present indicative parol (parabola), parvles (parabolas), parolet (parabolat), parlums (parabolamus), parlez (parabolatis), parolent, (parabolant); aim (amé), aimes (amas), aimet (amat), amums (amamus), amez (amatis), aiment (amant). In the first case the unaccented, in the second the accented form has prevailed—Modern French parle, parler ; aime, aimer. In several verbs, as tenir (tenére), the distinction is retained—tiens, tiens, tient, tenons, tenez, tiennent. (8.) In Old French, as stated above, 7é instead of é from a occurs after a pea (which, if a consonant, often split into 7 with a dental); the

iphthong thus appears in several forms of many verbs of the 1st conjugation —preier (=pret-ter, precare), vengier (vindicare), laissier (laxdre), widier (adjatare). At the close of the Old French period, those verbs in which the stem ends in a dental replace ¢ by the ¢ of other verbs—Old French laissier, aidier, laissiez (laxatis), aidicz (adjatatis); Modern French latsser, aider, laissez, atdez, by analogy of aimer, aimcz. The older forms generally remain in Picard— laissier, widier. (9.) The addition of ¢ to the 1st sing. pres. ind. of all verbs of the first conjugation is rare before the 13th cen- tury, but is usual in the 15th; it is probably due to the analogy of the third person—Old French chand (eqnto), aim (ams); Modern French chante, aime. (10.).In the 13th, century s is occasionally added tothe Ist pers. sing., except those ending in ¢ (=a) and at, and to the 2d sing. of imperatives; at the close of the 16th cen- tury this becomes the rule, and cxtends to imperfects and

condi- tionals in oie after the loss of their e. It appears to be due to the influence of the 2d pers. sing.—Old French vend (vendo and vende), vendoie (vendebam), parti (partivi), ting (ten?) 5 Modern, French vends, vendais, partis, tins; and donne (dong) in certain cases becomes donnes. (11.) The Ist and 2d plur. of the pres. subj., which in Old French were generally similar to those of the in- dicative, gradually take an 7 before them, which is the rule after the 16th century—Old French perdons (perdamus), perdez (per- datis); Modern French perdions, perduez, apparently by analogy

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of the imp. ind. (12.) The loss in Late Old French of final s, ¢,

&c., when preceding another consonant, caused many words to have in reality (though often concealed by orthography) double forms of inflexion, —one without termination, the other with. Thus in the 16th century the 2d sing. pres. ind. dors (dormis) and the

3d dort (dormit) were distinguished as dorz and dort when before a

vowel, as dors and dort at the cnd of a sentence or line of poetry,

but ran together as ddr when followed by a consonant. Still later, the loss of the final consonant when not followed by a vowel further reduced the cases in which the forms were distinguished, so that the actual French conjugation is considerably simpler than is shown by the customary spellings, except when, in consequence of an im- mediately following vowcl, the old terminations occasionally appear. Even here the antiquity is to a considerable extent artificial or delusive, some of the insertions being due to analogy, and the popu- lar language often omitting the traditional consonant or inserting a differentone. (13.) The subsequent general loss ofe =9 in unaccented final syllables has still further reduced the inflexions, but not the distinctive forms, —perd (perdit) and perde (perdat) being generally distinguished as pér and pérd, and before a vowel as pert and perd. ii, Substantives.—(1.) In Early Old French (as in Provengal) there are two main declensions, the masculine and the feminine; with a few exceptions the former distinguishes nominative and accusative in both numbers, the latter

in neither. The nom. and ace. sing. and acc. plur. mas. correspond to those of the Latin 2d or 3d declen- sion, the nom. plur. to that of the 2d declension. The sing. fem. corresponds to the nom. and ace. of the Latin 1st declension, or to the ace. of the 3d; the plur. fem. to the acc. of the 1st declension, or to the nom. and ace. of the 3d. Thus masc. dors (taurus), lere (latra); tor (taurum), laron (latronem), tor (taurz), laron (latroni for ~~*nés); tors (tawrds), larous (latronés) : but fem. unly ele (ala and alam), flor (florem); eles (alas), flors (florés nom. and ace. ye AME the end of the 11th century feminines not ending in e=9 take, by analogy of the masculines, s in the nom. sing., thus distinguish*~~ *ing nom. flors from ace. flor. A century later, masculines without sin the nom. sing. take this consonant by analogy of the other masculines, giving leres as nom. similar to tors. In Anglo-Norman the accusative forms very early begin to replace the nominative, and soon supersede them, the language following the tendency of contemporaneous English. In Continental French the declension- system was preserved much longer, and did not break up till the 14th century, though acc. forms are occasionally substituted for nom. (rarely nom. for acc.) before that date. In the 15th century the modern system of one case is fully established ; the form kept is almost always the accusative (sing. without s, plural with s), but in a few words, such as fils (filius), sour (soror), the nom. survives in the sing., and occasionally both forms exist, in different genses—sire (senior) and seigneur (sentorem), on (homo) and homme (hominem). (2.) Latin neuters are generally masculine in Old French, and inflected according to their analogy, as ciels (eaelus for caelum nom.) ciel (cacluen acc.), ciel (caelt for caela nom.), cvels (caelas for. caela acc.); but early cases of nom. sing. without s occur, which, if not due to, substitution of acc. for nom., are the older forms (ciel =caclum nominative). Many neuters lose their singular form and treat the plural as a feminine singular, as in the related languages—merveille (mirabilia), fewille (folia). But in a few words the neuter plural termination is used, as in Italian, in its primitive sense—carre (carra, which exists as well as carr?), dete, later dote (digita for digiti); Modern French chars, doigts. This form became extinct after the 13th century—paire (Latin paria), in Old French both fem. sing. and neut. plur. (as Italian poja is fem. plur.), being now,only the former. (3.) In Old French the in- flexional s often causes phonetic changes In the stem; thus palatal 1 before s takes ¢ after it, and becomes dental J, which afterwards changes to w or drops—fil (filiwm, and fait) with palatal l, filz (filius and*

filids), afterwards fiz, with z—ts (preserved in English Fitz), and then jis, as now (spelt fils). Many consonants before s, as the ¢ of fiz, disappear, and @ is vocalized—vif (vivum), mal tive sing. and acc. plur. vis, aus (earlier mals). These forms of the plural are retained in the 16th century, though often etymologically spelt with the consonant of the singular, as in vifs, pronounced ws + but in Late Modern French many of them disappear, vifs, with f sounded, as in the singular, bein, the plural of vif, bals (formerly baws) that of bal. In many words, as chant (cantas) and champs (coanpos) with silent ¢ and p (Old French chans in both cases), mawx (Old French mals, sing. mal), yews (oculos, Old French oelz, sing. oct2) the old change 1n the stem is kept. Sometimes, as in cieux (caelés) and ciels, the old traditional and the modern analogical forms coexist, with diffcrent meanings. (4.) The modern loss of final s (except when kept as z before a vowel) has seriously modified the French declension, the singulars fort (for) and forte (fort) being generally undistinguishable from. their plurals forts and fortes. The subsequent loss of 9 in finals has not affected the relation between sing. and plur. forms; but with the frequent recoining of the plural forms on the singular present Modern French has very oftenno distinction between ane and plur., except before a vowel. Such plurals as maua have al-

ways been distinct from their singular mal; in those whose singular ends in s there never was any distinction, Old French faz (now spelt Zaes) corresponding to lagueus, laqvewm, lagvez, aud lagveds. iii. Adjectives.—(1.) The terminations of the cascs and numbers of adjectives are the same as those of substantives, and are treated in the preceding paragraph. The feminine generally takes no ¢ if the masc. has none, and if there is no distinction in Latin—fem. sing. fort (fortem), grant (grandem), fem. plur. forz (fortes), granz (grandés), like the acc. masc. Certain adjectives, which in Pro- vencal take an @ not existing in Latin, take the corresponding ¢ in Old French—fem. dulee (douce, duleiam for duleem, Provengal dolza), masc. dulz (duleem). In the 11th century some other femi- nines, originally without ¢, begin in Norman to take this termina- tion—grande (in a feminine assonauce in the Alexis), plur. grandes ; but other dialects generally preserve the original form till the 14th century. In the 16th

century the ¢ is general in the feminine, and is now universal, except in a few expressions—grand' mere (with erroneous apostrophe, grandem méatrem), lettres royaux (literas régalés), and most adverbs from adjectives in -ant, ~~ent—couram~~ ment (currante for ~~ente mente), sciemment (sciente mente). (2.) Several adjectives have in Modern French replaced the masc. by the feminine—Old French masce. rott (rigidum), fem. roide (rigt~~ dam); Modern French roide for both genders. (3.) In Old French several Latin simple comparatives are preserved—maiur (majoremt), nom. maire (major); graignur (grandiorem), nom. graindre (gran- dior); only a few of these now survive—pire (pejor), meilleur (me- lidrem), with their adverbial ncuters pis (pejus), micusx (melius), The few simple superlatives found in Old French, as merme (mini- mum), proisme (proximum), haltisme (altissimum), are now extinct. (4.) The modern loss of many final consonants when not before vowels, and the subsequent loss of final 9, have greatly affected the distinction between the masc. and fem. of adjectives —/fort and forte are still distinguished as for and fort, but amer (amarum) and amére (amdéram), with their plurals amers and améres, have run together.

(f) Derivation.—Most of the Old French prefixes and suffixes are descendants of Latin ones, but a few are Celtic (et =tttum) or Teutonic (ard=hard), and some are later borrowings from Latin (arie, afterwards atre, from arium). In Modern French many old affixes are hardly used for forming new words; the inherited der (arium) is yielding to the borrowed aire, the popular contre (contra) to the learned anti (Greek), and the native ée (atam) to the Italian ade. The suffixes of many words have been assimilated to more common ones; thus sengler (svigu- larem) is now sanglier.

(g) Syntax.—Old French syntax, gradually changing from the 10th to the 14th century, has a character of its own, distinct from that of Modern French; though when com- pared with Latin syntax it appears decidedly modern.

(1.) The general formal distinction between nominative and accusative is the chief feature which causes French syntax to resemble that of Latin and differ from that of the modern lan- guage; and as the distinction had to be

replaced by a comparatively fixed word-order, a serious loss of freedom ensued. If the forms are modernized while the word-order is kept, the Old Freuch Parehevesque ne puet flechir li reis Henris (Latin arehiepiseopum non potest flectere rex Henrieus) assumes a totally different meaning — lVarehevéque ne puet fléchir le roi Henri. (2.) The replacement of the nominative form of nouns by the accusative is itself a syntactical.feature, though treated above under inflexion. A more modern instance is exhibited by the personal pronouns, which, when not immediately the subject of a verb, occasionally take even in Old French, and regularly in the 16th century, the accusative form; the Old French je qua sui (ego gvi swm) becomes mot qui suis, though the older usage survives in the legal phrase je, soussigné, . . . (3.) The definite article is now required in many cases where Old French dispenses with it—jo ewnquis Engleterre, suffrir mort (as Modern French avoir faim); Modern French 1' Angleterre, la mort. (4.) Old French had distinct pronouns for " this" and 'that "— cest (ecee istum) and cel (ecee illum), with their cases. Both exist in the 16th century, but the present language employs ect as adjective, cel as substantive, in both meanings, marking the old distinction by affixing the adverbs e¢ and la— cet homie-ci, cet homme-la; celui-et, celui-la. (5.) In Old French, the verbal terminations being elear, the subject pronoun is usually not expressed—st ferat (ste Sacerc habeo), est durs (dirus est), que feras (qvid facere habés)? In the 16th century the use of the pronoun is general, and is now universal, except in one or two impersonal phrases, as n'importe, peu sen faut. (6.) The present participle in Old French in its uninfleeted form coincided with the gerund (amant=amantem and wee and in the modern. language has been replaced by the

T, except where it has become adiectival; the Old French com-

plaingnans lewr dolours (Latin plangentés) is now plaignant lewrs douleurs (Latin platigends). The now extinct use of este with the participle present for the simple verb is not uncommon in Old French down to the 16th century—sont disanz (sunt dicentés)= Modern French zs disent (as English they are saying). (7.) In present Modern French the preterite participle when uscd with

avoir to form verb-tenses is invariable, except when the object pre-'

cedes (an exception now unknown to the conversational language)— jat éerit les lettres, les lettres que j at érites. In Old French down to the 16th century, formal concord was more common (though by no means necessary), partly because the object preceded the parti- ciple much oftener than now—ad la culur muée (habet eoldrem mutatam), ad faite sa venjance, les turs ad rendues. (8.) The sentences just quoted will serve as specimens of the freedom of Old French word-order,—the object standing either before verb and participle, between them, or after both. The predicative adjective can stand before or after the verb—halt sunt li pwi (Latin podia), e tenebrus e grant. (9.) In Old French ne (Early Old French nen, Latin én) suffices for the negation without pas (passwm), point (puietum) or mie (mieam, now obsolete), though these are fre- quently used—jo ne sui tis sire (je ne swis pas ton seigneur), autre feme nen ara (il n'aura pas autre femme). In principal sentences Modern French uses ne by itself only in certain cases—je ne puis mareher, je wai rien. The slight weight as a negation usually attached to ne has caused several originally positive words to take a negative meaning,—rien (Latin rem) now meaning " nothing " as well as " something." (10.) In Old French interrogation was ex- pressed with substantives as with pronouns by putting them after the verb—est Saul entre les prophetes? In Modern French the pro- nominal inversion (the substantive being prefixed) or a verbal periphrasis must be used—Savl est-i1, or est-ce que Saul est.

(hk) Summary.—Looking at the internal history of the French language as a whole, there is no such strongly inarked division as exists between Old and Middle English, or even between Middle and Modern English. Some of the most important changes are quite modern, and are con- cealed by the traditional orthography; but, even making allowance for this, the difference between French of the

lth century and that of the 19th is less than that between English of the same dates. The most important change in itself and for its effects is probably that which is usually made the division between Old and Modern French, the loss of the formal distinction between nomina- tive and accusative; next to

this are perhaps the gradual loss of many final consonants, the still recent loss of the

vowel of unaccented final syllables, and the extension of:

analogy in conjugation and declension. In its construction Old French is distinguished by a freedom strongly con- trasting with the strictness of the modern language, and bears, as might be expected, a much stronger resemblance than the latter to the other Romanic dialects. In many features, indeed, both positive and negative, Modern French forms a class by itself, distinct in character from the other modern representatives of Latin.

IV. Bibliography.—The few works which treat of French philo- logy as a whole are now in many respects antiquated, and the important discoveries of the last few years, which have revolu- tionized our ideas of Old French phonology and dialectology, are seattered in various editions, periodicals, and separate treatises. For many things Diez's Grammatik der Romanisehen Sprachen (4th edition—a reprint of the 3d—Bonn, 1876-77; a French translation, Paris, 1872-75, is to be followed by a supplementary volume by G. Paris) is still very valuable; Burguy's Granwmaire de la Langue @ oil (2d edition—a reprint of the 1st—Berlin, 1869-70) is useful only as a collection of examples. G. Paris's edition of La, Vie de S. Alexis (Paris, 1872) was the pioneer of, and retains an, important place amoung, the recent original works on Old French; Darmesteter and Hatzfeld's Le Seiziéme Sitele (Paris, 1878) contains the first good account of Early Modern French. The leading periodicals now in existence are the Romania (Paris), founded (in 1872) and edited by P. Meyer and G. Paris; and the Zeitschrift fiir Romamisehe Philologie (Halle), founded (in 1877) and edited by G. Grober. To these reference should be made for information as to the very numerous articles, treatises, and editions, by the many and often distinguished scholars who, espe- cially in France and Germany, now prosecute the scientific study of the language. It may be well to mention that, Old French phonology especially being complicated, and as yet incompletely investigated, these publications, the views in which are of various degrees of value, require not mere acquicscent reading, but critical study. (H. N.)

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PART IV.—FRENCH LITERATURE.

Origins.—The history of Freuch literature in the proper gense of the term can hardly be said to extend further back than the 11th century. The actual manuscripts which we possess are seldom of older date than the century subsequent to this. But there is no doubt that by the end at least of the llth century the French language, as a completely organized medium of literary expression, was in full, varied, and constant use. For many centuries previous to this literature had been composed in France, or by natives of that country, using the term France in its full modern acceptation; but until the 9th century, if not later, the written language of France, as far as we know, was Latin; and despite the practice of not a few literary historians, it does not seem reasonable to notice Latin writings in a history of French literature. Such a history properly busies itself only with the monuments of the French language from the time when the so-called Lingua Romana Rustica assumed a sufficiently independent form to deserve to be called a new language. 'This time it is indeed impossible exactly to determine, and the period at which literary compositions, as distinguished from mere conversation, began to employ the new tongue is entirely unknown, althongh much in- genuity has been spent on the effort approximately to discover it. The beginnings of literary composition come most naturally from the priest and the poet. As early as the 7th century the Lingua Romana, as distinguished from Latin and from Teutonic dialects, is mentioned, and this Lingua Romana would be of necessity used for purposes of clerical admonition, especially in the country districts, though we need not suppose that such addresses had a very literary character. On the other hand, the mention at early dates of certain cantilene or songs composed in the vulgar language has served for basis to a superstructure of much ingenious argument, not merely in reference to the chrono- logical question, but also with regard to the highly interest- ing problem of the origin of the chansons de gestes, the earliest and one of the greatest literary developments of northern French. It is sufficient in this article, where

speculation would be out of place, to mention that only two such cantilenze have been traced, and that neither is French. One of the 9th century, the "Lay of Saucourt," isin a Teu- tonic dialect ; the other, the '"'Song of St Faron," is of the 7th century, but exists only in Latin prose, the construction and style of which present traces of translation from a poeti- cal and vernacular original. As far as facts go, the most ancient monuments of the written French language consist of a few documents of very various character, ranging in date from the 9th to the 11th century. The oldest gives us the oaths interchanged at Strasburg in 842 between Charles the Bald and Louis the German. The next pro- bably in date and the first in literary merit is a short song celebrating the martyrdom of St Eulalia. The discussion indeed of these short and fragmentary pieces is of more philological than literary interest, and belongs rather to the head of French language. They are, however, evidence of the progress which, continuing for at least four cent- uries, built up a literary instrument out of the decomposed and reconstructed Latin of the Roman conquerors, blended witha certain limited amount of contributions from the Celtic and Iberian dialects of the original inhabitants, the Teutonic speech of the Franks, and the Oriental tongue of the Moors who pressed upwards from Spain. All these foreign ele- ments, however, bear a very small proportion to the element of Latin; and as Latin furnished the greater part of the vocabulary and the grammar, so did it also furnish the principal models and helps to literary: composition. The

earliest French versification is evidently inherited from that of the Latin hymns of the church, and for a certain time Latin originals were followed in the choice of literary forms. Rut the original impulses of the new nation were too strong to content themselves with mere imitation, and it soon began to create afresh. By the 11th century it is tolerably certain that dramatic attempts were already being made, that lyric poetry was largely cultivated, that laws, charters, and such like documents were written in the vernacular, and that commentators and translators busied themselves with religious subjects and texts.

most certain, is that of which we have evidence remaining in the famous Chanson de Roland, so long hidden except in obscure allusions, and discovered in a manuscript at Oxford some forty years ago. This poem represents the first and greatest development of French literature, the

chansons de gestes. The origin of these poems has been hotly debated, and it is only recently that the importance which they really possess has been accorded to them,—a fact the less remark- able in that, until the last half century, the hundred epics of ancient France were unknown, or known only through late and disfigured prose versions. There has:long been a vague idea that Provengal literature preceded the literature which is properly called French, and this idea was helped by the natural prepossessions of Fauriel and Raynouard, the earliest authorities on old French who obtained a wide hearing. The attribution of the chansons de gestes to a Provencal origin necessitates indeed suppositions of the most extravagant character. We possess in round numbers a hundred of these chansons. Three only of them are in Pro- vencal. Two of these, Ferabras and Betonnet @ Hanstonne, are obviously adaptations of French originals. The third, Girartz de Rossilho (Gerard de Roussillon), is undoubtedly Provencal, and is a work of great merit and originality, but its dialect is strongly tinged with the characteristics of the Langue d'Oil, and its author seems to have been a native of the debatable land between the two districts. To suppose under these circumstances that the Provengal originals of the hundred others, or even such Provengal originals as served for models to the trouvéres, were completely and by a process of laborious selection destroyed in the Albigensian crusade, seems one of the most gratuitous hypotheses ever put forward, and would hardly require notice here were it not that it has found some credence in England. It is sufficient to say that not only is the chanson de geste the unquestionable property of northern France, but that it 1s in all probability older than the oldest troubadour whose works we possess. Nor is there much more authority for another widely entertained supposition that the early French poets merely versified with amplifications the stories of chroniclers.. On the contrary, chroniclers like Philippe Mouskés and Alberic des Trois Fontaines draw largely from the chansons, and the question of priority between Roland and the pseudo-Turpin, though a hard one to determine, seems to resolve itself in favour of the former.

Chansons de Gestes,—Early French narrative poetry was divided by one of its own writers under three heads,— poems relating to French history, poems relating to ancient history, and poems of the Arthurian cycle. To the

first only is the term chansons de gestes in strictness applic- able. The definition of it goes partly by form and partly by matter.

earlier. ‘These verses have a regular cesura, which, like the end of a line, carries with it the licence of a mute e.

But the most important de- Epic velopment of the 11th century, and the one of which we are poetry.

A chanson de geste must be written in verses Chansons either of ten or twelve syllables, the former being the de gestes.

Volume and changes of early epics,

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The lines are arranged, not in couplets or in stanzas of equal length, but in lasses or tirades, consisting of any number of lines from half a dozen to some hundreds. The lines are, in the earlier examples, assonanced,—that is to say, the vowel sound of the last syllables is identical, but the consonants need not agree. Thus, for instance, the final words of a tirade of Ams et Amiles (1. 199-206) are erbe, nouvelle, selles, nouvelles, traversent, arrestent, guerre, cortége. Sometimes the tirade is completed by a shorter line, and the later chansons are regularly rhymed. As to the subject, a chanson de geste must be concerned with some event which is, or is supposed to be, historical and French. The tendency of the trouveres was constantly to affiliate their heroes on a particular geste or family. The three chief gestes are those of Charlemagne himself, of Doon de Mayence, and of Garin de Monglane; but there are not a few chansons, notably those concerning the Lorrainers, and the remarkable series sometimes called the Chevalier au Cygne, and dealing with the crusades, which lie outside these groups. By this joint definition of form and subject the chansons de gestes are separated from the romances of antiquity, from the ro- mances of the Round Table, which are written in octosyllabic couplets, and from the romans d’aventures or later fictitious tales, some of which, such as Brun de la Montagne, are written in pure chanson form.

Not the least remarkable point about the chansons de gestes is their vastextent, Their number, according to the strictest definition, exceeds 100, and the length of each chanson varies from 1000 lines, or thereabouts, to 20,000 or even 30,000. The entire mass, including, it may be sup- posed, the various versions and extensions of each chanson, is said to amount to between two and three million lines ; and when some twenty years ago the publication of the Carlovinginn cycle was projected, it was estimated, taking the earliest versions alone, at over 300,000. The successive developments of the chansons de gestes may be illustrated by the fortunes of Huon de Bordeaux, one of the most lively, varied, and romantic of the older epics, and one which is interesting from the use made of it by Shakespeare, Wieland, and Weber. In the oldest form now extant, though even this is probably not the original, won consists of over 10,000 lines. A subsequent version contains 4000 more ; and lastly, in the 14th century, a Jater poet has amplified the legend to the extent of 30,000 lines. When this point had been reached, J7uon began to be turned into prose, and with many of his fellows was published and republished during the 15th and subsequent centuries, and retained, in the form of a roughly printed chap-book, the favour of the country districts of France to the present day, It is not, however, in the later versions that the special character- istics of the chansons de gestes are to be looked for. Of those which we possess, one and one only, the Chanson de Roland, belongs in its present form to the 11th century. Their date of production extends, speaking roughly, from the 11th to the 14th century, their palmy days from the 11th tothe 12th. After this latter period the Arthurian romances, with more complex attractions, became their rivals, and in- duced their authors to make great changes in their style and subject. But for a time they reigned supreme, and no better instance of their popularity can be given than the fact that manuscripts of them exist, not merely in every French dialect, but in many cases in a strange macaronic jargon of mingled French and Italian. Two classes of per- sons were concerned inthem. There was the trouvére who composed them, and the jougleur who carried them about in manuscript or in his memory from castle to castle and sang them, intermixing frequent appeals to his auditory for silence, declarations of the novelty and the strict copyright character of the chanson, revilings of rival minstrels, and frequently requests for money iv plain words. Nota few

of the manuscripts which we now possess appear to have been actually used by the jongleur. But the names of the authors, the trouvéres who actually composed them, are in very few cases known, those of copyists, continuators, and mere possessors of manuscripts having been often mistaken for them.

The moral and poetical peculiarities of the older and more authentic of these chansons are strongly marked, though perhaps not quite so strongly as some of their encomiasts have contended, and as may appear to a reader of the most famous of them, the Chanson de Roland, alone. In that poem, indeed, war andreligionare the sole motives employed, and its motto might be two lines from another of the finest chansons (Aliscans, 161-2) :—

‘ Dist & Bertran : ‘ N’avons mais nul losir Tant ke vivons alons paiens ferir.’” In Roland there is no love-making whatever, and the hero’s betrothed “la belle Aude” appears only in a casual gibe of her brother Oliver, and in the incident of her sudden death at the news of Roland’s fall. M. Léon Gautier and others have drawn the conclusion that this stern and masculine character was a feature of all the older chansons, and that imitation of the Arthurian romance is the cause of its dis- appearance. This seems rather a hasty inference. In Amis et Amile, admittedly a poem of old date, the parts of Bellicent and Lubias are prominent, and the former is de-monstrative enough, In Aliscans the part of the Countess Guibourc is both prominent and heroic, and is seconded by that of Queen Blancheflor and her daughter Aelis. We might also mention Oriabel in Jourdans de Blanes and others. But it may be admitted that the sex which fights and counsels plays the principal part, that love adventures are not introduced at any great length, and that the lady usually spares her knight the trouble and possible indignities of wooing. The characters of a chanson of the older style are somewhat uniform. There is the hero who is unjustly suspected of guilt or sore beset by Saraceus, the heroine*

‘ who falls in love with him, the traitor who accuses him

or delays help, who is almost always of the lineage of Gan- elon, and whose ways form a very curious study. There are friendly paladins and subordinate traitors; there is Charlemagne (who bears throughout the marks of the epic king common to Arthur and Agamemnon, but is not in the earlier chanson the incapable and venal dotard which he becomes in the later), and with Charlemagne generally the duke Naimes of Bavaria, the one figure who is invariably wise, brave, loyal, and generous. In a few chansons there is to be added to these a very interesting class of personages

| who, though of low birth or condition, yet rescue the high-

born knights from their enemies. Such are Rainoart in Aliscans, Gautier in Gaydon, Robastre in Gaufrey, Varocher in Macaire. These subjects, uniform rather than monoton- ous, ate handled with great uniformity if not monotony of style. There are constant repetitions, and it sometimes seems, and may sonietimes be the case, that the text isa mere cento of different and repeated versions. But the verse is generally harmonious and often stately. The re- current assonances of the endless tirade soon impress the ear with a grateful music, and occasionally, and far mare frequently than might be thought, passages of high poetry, such as the magnificent Granz doel por la mort de Rollant, appears to diversify the course of the story. The most remarkable of the chansons are Roland, Aliscans, Gerard de Roussillon, Amis et Amile, Raoul de Cambrai, Garin le Loherain and its sequel, Les quatre Fils Aymon, Les Saisnes (recounting the war of Charlemagne with Witekind), and lastly, Le Chevalier au Cygne, which is not a single poem but a series, dealing with the earlier crusades. It is remarkable that one chanson and one only, /loovant, deals with Mero- vingian times. But the chronology, geography, and historic

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Manners in early epics,

EARLY ROMANCES. |

facts of nearly all are, it is hardly necessary to say, mainly arbitrary.

Arthurian Romances.—The second class of early French epics consists of the Arthurian cycle, the earliest composi- tions of which are at least a century junior to the earliest chanson de geste, but which soon succeeded the chansons in popular favour, aud obtained a vogue both wider and far more enduring. It is not easy to conceive a greater contrast in form, style, subject, and sentiment than is presented by the two classes. In both the religious sentiment is promi- nent, but the religion of the chansons is of the simplest, not to say of the most savage character. To pray to God and to kill his cnemies constitutes the whole duty of man. In the romances the mystical element becomes on the contrary prominent, and furnishes in the Holy Grail one of the most important features. In the Carlovingian knight the courtesy and clemency which we have learnt to associate with chi- valry are almost entirely absent. The gentix bér contra- dicts, jeers at, and execrates his sovereign and his fellows with the utmost freedom. He thinks nothing of striking his cortoise moullier so that the blood runs down her cler vis, If a servant or even an equal offends him, he will throw the offender into the fire, knock his brains out, or set his whiskers ablaze. The Arthurian knight is far more of the modern modcl in these respects. But his chief dif- ference from his predecessor is undoubtedly in his amorous devotion to his beloved, who, if not morally superior to Bellicent, Floripas, Esclairmonde, and the other Carlo- vingian heroines, is somewhat less forward. Even in minute details the difference is strongly marked. 'The romances are in octosyllabic couplets or in prose, and their language is different from that of the chansons, and contains much fewer of the usual epic repetitions and stock phrases. A voluminous controversy has been held respecting the origin of these differences, and of the story or stories which were destined to receive such remarkable attention. It is suffi- cient to say here that the attempted production of early Breton originals is open to the gravest suspicion, and that Geoffrey of Monmouth's account of his Armorican text-book meets with little credence. M. Paulin Paris seems to have clearly proved that nothing older than Nennius can be pro- duced, and that this and nothing else was Geoffrey's autho- rity, so far as he had any. What we are at present con- cerned with, however, is a body of verse and prose composed in the latter part of the 12th century and later. The earliest romances bear the names of Walter Map and Robert de Borron, which are undoubtedly authentic. Later,

we have the names of Helie de Borron, Luce de Gast, &c., which are probably fictitious. Walter Map is responsible for the Saint Graal and the Quéte du Saint Graal, Robert de Borron for Joseph d@'Arimathie and Merlin. Artus and part at least of Lancelot du Lac (the whole of which has been attributed to Walter Map) appear to be due to un- known authors. Z'ristan came later, and has a stronger mixture of Celtic tradition. Latest of all came the great Arthurian miscellany of Giron le Courtois. Most of these works, though not all, are in prose. At the same time as Walter Map, or a little later, Chrétien de Troyes threw the legends of the Round Table into octosyllabic verse of a singularly spirited and picturesque character. The chief poems attributed to him are the Chevalier au Lyon (Sir Ewain of Wales), the Chevalier a la Charette (one of the epi- sodes of Lancelot), Eric et Enide, Tristan, and Percivale. These poems, independently of their merit, which is great, had an extensive literary influence. They were translated by the German minnesingers, Wolfram von Eschenbach, Gottfried of Strasburg, and others. With the romances already referred to, which were mostly written in England and at the English court, Chrétien's poems complete the early forms of the Arthurian story, and supply the matter

of it as. it is best known to English readers in Malory's book. Nor does that book, though far later than the original forms, convey a very false impression of the char- acteristics of the older romances. Indeed, the Arthurian knight, his character and adventures, are so much better known than the heroes of the Carlovingian chanson that there is less need to dwell upon them. They had, however, as has been already pointed out, great influence upon their rivals, and their comparative fertility of invention, the much larger number of their dramatis persone, and the greater variety of interests to which they appealed, sufficiently explain their increased popularity. The ordin- ary attractions of poetry are also more largely present in them than in the chansons ; there is more description, more life, and less of the mere chronicle. They have been accused of relaxing morality, and there is perhaps some truth in the charge. But the change is after all one rather of manners than of morals, and what is lost in simplicity

is gained in refinement. Doon de Mayence is a late chanson, and Lancelot du Lac is an early romance. But the two beauti- ful scenes in the former between Doon and Nicolette, in the latter between Lancelot, Galahault, Guinevere, and the Lady of Malehaut, may be compared as instances of the attitude of the two classes of poets towards the same subject. Romances of Antiquity.—There is yet a third class of early narrative poems, differing from the two former in subject, but agreeing sometimes with one sometimes with the other in form. These are the classical romances which are not much later than those of Charlemagne and Arthur. The chief subjects with which their authors busied them- selves were the conquests of Alexander and the siege of Troy, though other classical stories come in, 'The most remarkable of all is the romance of Alixandre by Lambert the Short and Alexander of Bernay. It has been said that the excellence of the twelve-syllabled verse used in this romance was the origin of the term alexandrine. The Trojan romances, on the other hand, are chiefly in octo- syllabic verse, and the principal poem which treats of them is the Roman de Troie of Benoit de Ste More. Both this poem and Alixandre are attributed to the last quarter of the 12th century. The authorities consulted for these poems were, as may be supposed, none of the best. Dares Phrygius, Dictys Cretensis, the pseudo-Callisthenes sup- plied most of them. But the inexhaustible invention of the trouvéres themselves was the chief authority consulted. The adventures of Medea, the wanderings of Alexander and the Trojan horse, were quite sufficient to spur on to exertion the minds which had been accustomed to spin a chanson of some 10,000 lines out of a casual allusion in some preceding poem. It is needless to say that anachronisms did not dis-turb them. From first to last the writers of the chausons had not in the least troubled themselves with attention to any such matters. Charlemagne himself had his life and exploits accommodated to the need of every poet who treats of him, and the same is the case with the heroes of anti- quity. Indeed, Alexander is made in many respects a pro- totype of Charlemagne. He is regularly knighted, he has twelve peers, he holds tournaments, he has relations with Arthur, and comes in contact with fairies, he takes flights in the air, and so forth. There is perhaps more avowed lmagin- ation in these classical stories than in either of the other divisions of French epic poetry. Some of their authors even confess to the practice of fiction, while the trouvéres of the chansons invariably assert the historical character of their facts and personages, and the authors of the Arthurian romances at least

start from facts vouched for partly by national tradition partly by the authority of religion and the church. The classical romances, however, are import- ant in two different ways. In the first place, they connect the early literature of France, however loosely, and with

links of however dubious authenticity, with the great his- tory and literature of the past. They show a certain amount of scholarship in their authors, and in their hearers they show a capacity of taking an interest in subjects which are not merely those directly connected with the village or the tribe. The chansons de gestes had shown the creative power and independent character of French literature. There is, at least about the earlier ones, nothing borrowed, traditional, or scholarly. They smack of the soil, and they rank France among the very few countries which, in this matter of indigenous growth, have yielded more than folk- songs and fireside tales. The Arthurian romances, less in- dependent in origin, exhibit a wider range of view, a greater knowledge of human nature, and a more extensive command of the sources of poetical and romantic interest. The classi- cal epics superadd the only ingredient necessary to an ac- complished literature,—that is to say, the knowledge of what has been done by other peoples and other literatures already, and the readiness to take advantage of the materials thus supplied.

Romansd' Aventures. —Theseare the threeearliest develop- ments of French literature on the great scale. They led, however, to a fourth, which, though later in date than all except their latest forms, is so closely conuected with them by literary and social considerations that it had best be mentioned here. This is the roman daventures, a title given to those almost avowedly fictitious poems which con- nect themselves neither with French history, with the Round Table, nor with the heroes of antiquity. These be- gan to be written in the 13th century, and continued until the prose form of fiction became generally preferred. The later forms of the chansons de gestes and the Arthurian poems might indeed be well called romans d'aventures them- selves. Jfugues Capet, for instance, a chanson in form and class of subject, is certainly one of this latter kind in treat- ment. But for convenience sake the definition we have given is preferable. The style and subject of these

romans d'aventures are naturally extremely various. G'ucllawme de Palerme deals with the adventures of a Sicilian prince, who is befriended by a were-wolf; Ze Roman de I' Escoufle, with a heroine whose ring is carried off by a sparrow-hawk (Escoufle), like Prince Camaralzaman's talisman; Guy of Warwick, with the well-known slayer of the dun cow; Meraugis de Portléguez is a sort of branch or offshoot of the romances of the Round Table. There is, in short, no possi- bility of classifying their subjects. The habit of writing in gestes, or of necessarily connecting the new work with an older one, had ceased to be binding, and the instinct of fiction writing was free; yet these romans d'aventures do not rank quite as high in literary importance as the classes which preceded them. This under-valuation arises rather from a lack of originality and distinctness of savour than from any shortcomings in treatment. Their versification, usually octosyllabic, is pleasant enough; but there is not much distinctness of character about them, and their inci- dents, commonly taken from some preceding fabliau or lai, often strike the reader with something of the sameness but nothing of the naiveté of those of the older poems. Never- theless some of them attained to a very high popularity, such, for instance, as Partenopex de Blois. With them may be connected a large number of early romances and fictions of various dates in prose and verse, such as Aucassin et Nicolette, Le Chatelain de Coucy, Le Roman de la Violette, and others. This class possesses representatives in Pro- vengal as well as in northern French, some of which, for instance, Mlamenca and Jaufrey, are full of interest. But none of those smaller stories in verse, prose, or the two com- bined, can vie in charm with Aucassin et Nicolette (13th

century), an exquisite literary presentment of medieval sen- timent in its most delightful form,

In these four classes may be said to be summed up the literature of feudal chivalry in France. They were all, ex- cept perhaps the last, composed by one class of persons, the trouvéres, and performed by another, the jongleurs. The latter, indeed, sometimes presumed to compose for himself, and was denounced as a ¢troveor batard by the indignant members of the superior caste. They were all originally General intended to be performed in the palais marberin of the character. baron to an audience of knights and ladies, and, when read- 'tics of ing became more common, to be read by

such persons. They oo dealt therefore chiefly, if not exclusively, with the class to whom they were addressed. The bourgeois and the villain, personages of political nonentity at the time of their early composition, come in for the slightest possible notice. Occasionally in the few curious instances we have mentioned, persons of a class inferior to the seigneur play an important part, but this is rare. The habit of private wars and of in- surrection against the sovereign supply the motives of the chanson de geste, the love of gallantry, adventure, and | foreign travel those of the romances Arthurian and miscel- laneous. None of these motives much affected the lower classes, who were, with the early developed temper of the middle and lower class Frenchman, already apt to think and speak cynically enough of tournaments, courts, crusades,

and the other occupations of the nobility. The communal system was springing up, the towns were receiving royal encouragement as a counterpoise to the authority of the . nobles. The corruptions and maladministration of the

church attracted the satire rather of the citizens and peas- antry who suffered by them, than of the nobles vho had ‘ less to fear and even something to gain. On the other Spread of hand, the gradual spread of learning, inaccurate and ill- literary — digested perhaps, but still learning, not only opened up St new classes of subjects, but opened them to new classes of

persons. The thousands of students who flocked to the ‘ schools of Paris were not all princes or nobles. Hence there 7: arose two new classes of literature, one consisting of the : embodiment of learning of one kind or other in the vulgar |

tongue, and ranging from the half-fabulous histories of the Jerseyman Wace, the Roman de Brut, and the Roman de

Rou, to bestiaries such as that of Philippe de Thaun and

popular treatises on science and morality. The other, one

of the most remarkable developments of sportive literature

which the world has seen, produced the second indigenous

literary growth of which France can boast, namely, the bh fabliaux, and the almost more remarkable work which is an

immense conglomerate of fabliaux, the great beast-epic of

the Roman du Renart.

Fabliaux.—There are few literary products which have more originality and at the same time more diversity than the fabliau. The epic and the drama, even when they are independently produced, are similar in their main charac- teristics all the world over. But there is nothing in pre-

vious literature which exactly corresponds to the fabliau. s It comes nearest to the A‘sopic fable and its Eastern origins 7 or parallels. But it differs from these in being less allego- | rical, less obviously moral (though a moral of some sort is t usually if not always enforced), and in having a much more j

direct personal interest. It is in many degrees further re- moved from the parable, and many degrees nearer to the novel. The story is the first thing, the moral the second, and the latter is never suffered to interfere with the former. These observations apply only to the fabliaux, properly so called, but the term has been used with considerable loose- ness. ‘The collectors of those interesting pieces, Barbazan, Méon, Le Grand d’Aussy, have included in their collections large numbers of miscellaneous pieces such as dats (rhymed descriptions of various objects), and débats (discussions between two persons or contrasts of the attributes of two things), sometimes even short romances, farces, and mystery

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Social import- ance of fabliaux.

ROMAN DU RENART.]

plays. The fabliau proper, according to the definition of its latest editor, is “the recital, generally comic, of a real or possible incident occurring in

ordinary human life." The comedy, it may be added, is usually of a satiric kind, and occupies itself with every class and rank of men, from the king to the villain. There is no limit to the variety of these lively verse-tales, which are invariably written in eight- syllabled couplets. Now the subject is the misadventure of two Englishmen, whose ignorance of the French language makes them ask for some donkey instead of some lamb ; now it is the fortunes of an exceedingly foolish knight, who has an amiable and ingenious mother-in-law ; now the de- served sufferings of an avaricious or ill-behaved priest ; now the bringing of an ungrateful son to a better mind by the wisdom of babes and sucklings. Not a few of the Canter- bury Tales are taken directly from fabliaux ; indeed, Chaucer, with the possible exception of Prior, is our nearest approach to a fabliau-writer. At the other end of Europe the prose novels of Boccaccio and other Italian tale-tellers are largely based upon fabliaux. But their influence in their own country was the greatest. They were the first expression of the spirit which has since animated the most national and popular developments of French literature. Simple and unpretending as they are in form, the fabliaux announce not merely the Cent Nouvelles Nouvelles and the Heptameron, L'Avocat Patelin, and Pantagruel, but also L'Avare and the Roman Comique, Gil Blas, and Candide. They indeed do more than merely prophesy the spirit of these great performances,—they directly lead to them. The prose-tale and the farce are the direet outcomes of the fabliau, and the prose-tale and the farce once given, the novel and the comedy inevitably follow.

The special period of fabliau composition appears to have been the 12th and 13th centuries. It signifies on the one side the growth of a lighter and more sportive spirit than

ad yet prevailed, on another the rise in importance of other and lower orders of men than the priest and the noble, on yet another the consciousness on the part of these lower orders of the defects of the two privileged classes, and of the shortcomings of the system of polity under which these privileged classes enjoyed their privileges. There is, however, in the fabliau proper not so very much of direct satire, this being indeed excluded by the definition given above, and by the thoroughly artistic spirit in which that definition is observed. The fabliaux are so numerous and so various that it is difficult to select any as specially repre- sentative. We may,

however, mention, both as good ex- amples and as interesting from their subsequent history, Le Vair Palfroi, treated in English by Leigh Hunt and by Peacock; Le Vilain Mire, the original of Le Afédecin malgré lui; Le Roi d' Angleterre et le Jongleur @El; La Howe Partie; Le Sot Chevalier, an indecorous but ex- tremely amusing story; and Les Deux Bordeors Ribaus, a piece of great literary interest, as containing allusions to the chansons de gestes and romanees most in vogue.

Roman du Renart.—If the fabliaux are not remarkable for direct satire, that element is supplied in more than compen- sating quantity by an extraordinary eomposition which is closely related to them. Le Roman du Renart, or History of Reynard the Fox is a poem, or rather series of poems, which, from the end of the 12th to the middle of the 14th century, served the citizen poets of northern France, not merely as an outlet for literary expression, but also as a vehicle of satirical comment,—now onthe general vices and weaknesses of humanity, now on the usual corruptions in church and state, now on the various historical events which occupied public attention from time to time. The enormous popu- larity of the subject is shown by the long vogue which it had, and by the empire which it exercised over generations of writers who differed from each other widely in style and

temper. Nothing can be farther from the allegorical erudi- tion, the political diatribes, aud the sermonizing moralities of the authors of Aénart le Contre-fact than the sly naiveté of the writers of the earlier branches. Yet these and a long and unknown series of intermediate bards the fox-king pressed into his service, and it is scarcely too much to say that, during the two centuries of his reign, there was hardly a thought in the popular mind which, as it rose to the sur- face, did not find expression in an addition to the huge cycle of Renart.

We shall not deal with the controversies which have been raised as to the origin of the poem and its central idea. The latter may have been a travestie of real persons and actual events, or it may (and much more probably) have been an expression of thoughts and experiences which recur in every

generation. France, the Netherlands, und Germany have contended for the honour of producing Renart; French, Flemish, German, and Latin for the honour of first describing him. It is sufficient to say that the spirit of the work seems to be more that of the border- land between France and Flanders than of any other dis- trict, and that, wherever the idea may have originally arisen, it was incomparably more fruitful in France than in any other country. The French poems which we possess on the subject amount in all to nearly 100,000 lines, independently of mere variations, but including the two different versions of Renart le Contre-fait. This vast total is divided into four different poems. The most ancient and remarkable is that edited by Méon under the title of Roman du Renart, and containing, with some additions made by M. Chabaille, 37 branches and about 32,000 lines. It must not, how- ever, be supposed that this total forms a continuous poem like the neid or Paradise Lost. On the contrary, the separate branches are the work of different authors, hardly any of whom are known, and, but for their community of subject and to some extent of treatment, might be regarded as separate poems. 'The history of Renart, his victories over Isengrim, Bruin, and his other unfortunate rivals, his fainily affection, his outwittings of King Noble the Lion, and all the rest, are too well known to need fresh descrip- tion here. It is perhaps in the subsequent poems, which are far less known and much less amusing, that the hold which the idea of Renart had obtained on the mind of northern France, and the ingenious uses to which it was put, are best shown. The first of these is Le Couronnement Renart, a poem of between 3000 and 4000 lines, attributed, on no grounds whatever, to the poetess Marie de France, and describing how the hero by his ingenuity got himself crowned king. This poem already shows signs of direct moral application and generalizing. These are still more apparent in Lenart le Nouvel, a composition of some 8000 lines, written in the year 1288 by the Fleming Jacquemart Giélée, Here the personification of which, in noticing the Roman de la Rose, we shall soon have to give extended mention, becomes evident. Instead of or at least beside the lively personal Renart who used to steal sausages, set Isengrim fishing with his tail, or make use of Chanti- cleer's comb for a purpose for which it was certainly never intended, we have Renardie, an abstraction of guile and hypocrisy, triumphantly prevailing over other and better qualities. Lastly, as the Koman de la Rose of William of Lorris is paralleled by Renart le N ouvel, so its continuation by Jean de Meung is paralleled by the great

miscellany of Renart le Contre-fait, which, even in its two existing versions (Ménage seems to have known a third), extends to fully 50,000 lines. Here we have, besides floods of miscellaneous erudition and discourse, political argument of the most direct and important kind. The wrongs of the lower orders are bitterly urged. They are almost openly incited to revolt, and it is scarcely too — to say, as M.

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Audefroi le Bastard.

Thibaut de Cham- pagne.,

Rute- boeuf,

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Lenient has said, that the closely following Jacquerie is but a practical carrying out of the doctrines of the anonymous satirists of Renart le Contre-fait.

Early Lyric Poetry.—Side by side with these two forms of literature, the epics and romances of the higher classes, and the fabliau, which, at least in its original, represented rather the feelings of the lower, there grew up a third kind, consisting of purely lyrical poetry. The song literature of medizval France is extremely abundant and beautiful. From the 12th to the 15th century it received constant ac- cessions, some signed, some anonymous, some purely popu- lar in their character, some the work of more learned writers, others again produced by members of the aristo- cracy. Of the latter class it may fairly be said that the catalogue of royal and noble authors boasts few if any names superior to those of Thibaut de Champagne, king of Navarre, and Charles d'Orléans, the father of Louis XII. Although much of this lyric poetry is anonymous, the more popular part of it almost entirely so, yet M. Paulin Paris has been able to enumerate some hundreds of French chansonniers between the 11th and the 13th century. The earliest song literature, chiefly known in the delightful col- lection of Bartsch (Alt-Franzdsische Romanzen und Pastour- ellen), is mainly sentimental in character. The collector divides it under the two

heads of romances and pastourelles, the former being usually the celebration of the loves of a noble knight and maiden, and recounting how Belle Doette or Eglantine or Oriour sat at her windows or in the tourney gallery, or embroidering silk and samite in her chamber, with her thoughts on Gerard or Guy or Henry,—the latter somewhat monotonous but naive recitals, very often in the first person, of the meeting of an errant knight or minstrel with a shepherdess, and his cavalier but not always success- ful wooing. With these, some of which date from the 12th century, may be contrasted, at the other end of the medi- ceval period, the more varied and popular collection dating in their present form from the 15th century, and published recently by M. Gaston Paris. In both alike, making allow- ance for the difference of their age and the state of the language, may be noticed a charming lyrical faculty and great skill in the elaboration of light and suitable metres, skill to which the hitherto usual preference of the Provengal poets as metrists has done but scant justice. Especially remarkable is the abundance of refrains of an admirably melodious kind. It is said that more than 500 of these exist. Among the lyric writers of these four centuries whose names are known may be mentioned Audefroi le Bastard, the author of the charming song of Belle Idoine, and others no way inferior, Quesnes de Bethune, the ancestor of Sully, whose song-writing inclines to a satirical cast in many in- stances, the Vidame de Chartres, Charles d'Anjou, King John of Brienne, &c. But none of them, except perhaps Audefroi, can compare with Thibaut IV., who united by his possessions and ancestry a connexion with the north and the south, and who employed the methods of both districts but used the language of the north only. Thibaut was supposed to be the lover of Blanche of Castile, the mother of St Louis, and a great deal of his verse is concerned with his love for her. But while knights and nobles were thus employing lyric poetry in courtly and sentimental verse, lyric forms were being freely employed by others, both of high and low birth, for more general purposes. Blanche and Thibaut themselves came in for contemporary lampoons, and both at this time and in the times immediately following, a cloud of writers composed light verse, sometimes of a lyric sometimes of a narrative kind, and sometimes in a mixture of both. ae oo most remarkable of these is Ruteboeuf (born in

+09), the first of a long series of French poets to whom in ee the title Bohemian has been applied, who passed their lives between gaicty and

misery, and celebrated their

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lot in both conditions with copious verse. Rutebceuf is among the earliest French writers who tell us their personal history and make personal appeals. But he does not con- fine himself to these. He discusses the history of his times, upbraids the nobles for their desertion of the Latin empire of Constantinople, considers the expediency of crusading, inveighs against the religious orders, and takes part in the disputes between the pope and the king. He composes pious poetry too, and in at least one poem takes care to distinguish between the church which he venerates and the corrupt churchmen whom he lampoons. Besides Ruteboeuf

the most characteristic figure of his class and time is Adam Adam de de la Halle(cir. 1240-1286), commonly called the Hunchback !@ Halle.

of Arras. The earlier poems of Adam are of a sentimental character, the later ones satirical and somewhat ill-tempered. Such, fur instance, is his invective against his native city. But his chief importance consists in his jeux, the Jew de la Feuillie, the Jeu de Robin et Marion, dramatic compositions which led the way to the regular dramatic form. Indeed the general tendency of the the 13th century is to satire, fable, and farce, even more than to serious or sentimental

poetry. We should perhaps except the dazs, the chief of Lais,

which are known under the name of Marie de France, These lays are exclusively Breton in origin, though not in application, and the term seems originally to have had re- ference rather to the music to which they were sung than to the manner or matter of the pieces. Some resemblance to these lays may perhaps be traced in the Breton songs (perfectly trustworthy, which cannot be said of some more famous ones) published by M. Luzel. The subjects of the lais are indifferently taken from the Arthurian cycle, from ancient story, and from popular tradition. The most famous of all is the Lay of the Honeysuckle, traditionally assigned to Sir Tristram.

Satiric and Didactic Works.—Among the direct satirists

| of the Middle Ages, one of the earliest and foremost is Guyot de Provins, whose Bible, as he calls it, contains an elaborate

satire on the time. The same spirit soon betrayed itself in curious travesties of the romances of chivalry, and some- times invades the later specimens of these romances them- selves, One of the earliest examples of the travestie is the remarkable composition entitled Audigier, This poem, half fabliau and half romance, is not so much an instance of the heroi-comic poems which afterwards found so much favour in Italy and elsewhere, as a direct and ferocious parody of the Carlovingian epic. The hero Audigier is a model of cowardice and disloyalty ; his father and mother, Turgibus and Rainberge, are deformed and repulsive. The exploits of the hero himself are coarse and hideous failures, and the whole poem can only be taken as a counterblast to the spirit of chivalry, Elsewhere a trouvére, prophetic of Rabelais, describes a vast battle between all the nations of the world, the quarrel being suddenly atoned by the arrival of a holy man bearing a huge flagon of wine. Again, we have the history of a solemn crusade undertaken by the citizens of a country town against the neighbouring castle. As erudition and the fancy for allegory gained ground, satire naturally availed itself of the opportunity thus afforded it; the disputes of Philippe le Bel with the pope and the Templars had an immense literary influence, partly in the concluding portions of the Renart, partly in the Roman de Rose, still to be mentioned, and partly in other satiric allegories of which the chief is the romance of Fauvel. The hero of this is an allegorical personage, half man and half horse, signifying the union of bestial degrada- tion with human ingenuity and cunning. Fauvel is a div- inity in his way. All the personages of state, from kings and popes to mendicant friars, pay their court to him.

But this serious and discontented spirit betrays itself also in compositions which are not parodies or travesties in form.

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One of the latest, if not absolutely the latest, and yet not one of the least remarkable of the chansons de gestes is

and fanciful descriptions. Forty years after Lorris's death, Jean de Jean de Meung completed it in an entirely different spirit. Meung.

ROMAN DE LA ROSE. |

paudouin-entitled Le Chevalier au Cygne.

Baudouin de Sebourc, one of the members of the great rom- ance or cycle of romances dealing with the crusades, and Baudouin de Seboure

make up a not inharmonious whole. It is a love poem, and yet it is satire. But both gallantry and raillery are treated in an entirely allegorical spirit ; and this allegory, while it makes the poem tedious to hasty appetites of to-day, was exactly what gave it its charm in the eyes of the Middle Ages. It might be described as an Ars Amoris crossed with a Quodlibeta. This mixture exactly hit the taste of the time, and continued to hit it for two centuries and a half. Wheu its obvious and gallant meaning was attacked by moralists and theologians, it was easy to quote the example of the Canticles, and to furnish esoteric explanations of the allegory. The writers of the 16th century were never tired of quoting and explaining it. Antoine de Baif, indeed, gave the simple and obvious meaning, and declared that '" La rose cest d'amours le guerdon gracieux;" but Marot, on the other hand, gives us the choice of four mystical interpreta- tious,—the rose being either the state of wisdom, the state of grace, the state of eternal happiness, or the Virgin her- self. We cannot here analyse this celebrated poem. It is sufficient to say that the lover meets all sorts of obstacles in his pursuit of the rose, thoagh he has for a guide the metaphorical personage Bel-Accucil. The early part, which belongs to William of Lorris, is remarkable for its gracious

He keeps the allegorical form, and, indeed introduces two new personages of importance, Nature and Faux-semblant. In the mouths of these personages and of another, Raison,

de dates from the early years of the 14th century. It is | he puts the most extraordinary mixture of erudition and _ Seboure. strictly a chanson de

geste in form, and also in the general | satire. At one time we have the history of classical heroes, I run of its incidents. The hero is dispossessed of his inherit- | at another theories against the hoarding of money, about ance by the agency of traitors, fights his battle with the | astronomy, about the duty of mankind to increase and world and its injustice, and at last prevails over his enemy | multiply. Accounts of the origin of loyalty, which would Gaufrois, who has succeeded in obtaining the kingdom of | have cost the poet his head at some periods of history, and Friesland and almost that of France. Gaufrois has as his | even communistic ideas, are also to be found here. In Faux- assistants two personages who were very popular in the | semblant we have a real creation of the theatrical hypo- poetry of the time, —the devil, namely, and money. These crite. All this miscellaneous and apparently incongruous two sinister figures pervade the fabliaux, tales, and fantastic material really explains the success of the poem. It has literature generally of the time. M. Lenient, the historian | the one characteristic which has at all times secured the of French satire, has well remarked that a romance as long | popularity of great works of literature. It holds the mirror as the Ienart might be spun out of the separate short | up firmly and fully to its age. As we find in Rabelais the poems of this period which have the devil for hero, and | characteristics of the Renaissance, in Montaigne those of many of which form a very interesting transition between the sceptical reaction from Renaissance and reform alike, the fabliau and the mystery. But the devil is in one | in Moliére those of the society of France after Richelieu respect a far inferior hero to Renart. He has an adver- had tamed and levelled it, in Voltaire and Rousseau re- sary in the Virgin who constantly upsets his best-laid spectively the two aspects of the great revolt, —so there schemes, and who does not always treat him quite fairly. | are to be found in the Roman de la Rose the characteristics The abuse of usury at the time, and the exactions of the | of the later Middle Age, its gallantry, its mysticism, its Jews and Lombards, were severely felt, and money itself, | economical and social troubles and problems, its scholastic as personified, figures largely in the popular literature of methods of thought, its naive acceptance as science of every- the time. thing that is written, and at the same time its shrewd and Roman de la Rose-—A work of very different import- | indiscriminate criticism of much that the age of criticism ance from all of these, though with seeming touches of the | has accepted without doubt or question. The Roman de same spirit, a work which deserves to take

rank among la Rose, as might be supposed, set the example of an im- the most important of the Middle Ages, is the Roman de la | mense literature of allegorical poetry, which flourished more Rose,—one of the few really remarkable books which is the | and more until the Renaissance. Some of these poems we work of two authors, and that not in collaboration but in have already mentioned, some will have to be considered continuation one of the other. 'The author of the earlier | under the head of the 15th century. But, as usually part was Guillaume de Lorris, who lived in the first half of happens in such cases and was certain to happen in this the 13th century ; the author of the later part was Jean de | case, the allegory which has seemed tedious to many, even Meung, who did not die until 1320, and whose part in the | in the original, became almost intolerable in the majority Roman dates at least from the extreme end of the preceding | of the imitations. To a great extent, however, it held its century. This great poem, while it has perforce attracted ground in forms more or less disguised. The tradition of much attention, has suffered from the disrespect with which allegorizing and personifying found refuge especially in all nations, and the French perhaps more than any, are | the French classical tragedy, where the heroes of the school wont to treat literature that is out of date. Yet the Roman | of Racine talk about their passions and their flames in a

de la Rose is a great deal more interesting merely as litera- | style by no means alien from that of William of Lorris. ture, and without any antiquarian considerations, than a We have observed that, at least in the later section of the William very large number of so-called classics. It exhibits in its | Roman de la Rose, there is observable a tendency to import ... two parts very different characteristics, which yet go to into the poem indiscriminate erudition. This tendency 1s

now remote from our poetical habits; but in its own day it was only the natural result of the use of poetry for all literary purposes.

and moral as for recreative and artistic purposes. French verse was the first born of all literary mediums in modern European speech, and the resources of ancient learning were certainly not less accessible in France than in any other country. Dante, in his De Vulgari Eloquvo, acknowledges the excellence of the didactic writers of the Langue d'Oil. We have already

alluded to the Bestiary of Philippe de Thaun, a Norman trouvére who lived and wrote 1n England during the reign of Henry Beauclerc. Besides the Bestiary, which from its dedication to Queen Adela has been con- jectured to belong to the third decade of the 12th century, Philippe wrote also in French a Leber de Creaturis, both works being translated from the Latin. These works of mystical. and apocryphal physics and zoology became extremely popular in the succeeding centuries, and were frequently imitated. A moralizing turn was also given to them, which was much helped by the importation of several miscellanies of Oriental origin, partly tales, partly didactic

Tt was many centuries before prose Early | became recognized as the proper vehicle for instruction, and arena at a very early date verse was used as well for educational ;

in character, the most celebrated of which is the oman des Sept Sages, which, under that title and the variant of Dolopathos, received repeated treatment from French writers both in prose and verse. The Aisopic fable, a similar mix- ture of instruction and amusement, had many cultivators, of whom Marie de France is the most remarkable. Art, too, soon demanded exposition in verse, as well as science. The favourite pastime of the chase was repeatedly dealt with, notably in the Rot Modus, 1325, mixed prose and verse; the Deduits de la Chasse of Gaston de Foix, 1387, prose ; and the Tresor de Venerie of Hardouin, 1394, verse. Very soon didactic verse extended itself to all the arts and sciences. Vegetius and his military precepts had found a home in French octosyllables as early as the 12th century ; the end of the same age saw the ceremonies of knighthood solemnly versified, and rapes (maps) du monde also soon appeared. Finally, in 1245, Gautier of Metz translated from various Latin works into French verse a sort of encyclo- pedia. Profane knowledge was not the only subject which exercised didactic poets at this time. Religious handbooks and commentaries on the scriptures were common in the 13th and following centuries, and, under the title of Castote- ments, Enseignements, and Doctrinaux, moral treatises became common. In the 14th century tlie influence of the Roman de la Rose helped to render moral verse frequent

and popu- lar. The same century, moreover, which witnessed these developments of well-intentioned if not always judicious erudition witnessed also a considerable change in lyrical poetry. Hitherto such poetry had chiefly been composed in the melodious but unconstrained forms of the romance

Artificial and the pastourelle. Advancing taste, and possibly some forms of echo of the refinements of the troubadours, induced the

verse,

writers of northern France in the 14th century to subject themselves to severer rules, which, however, present no trace of being directly borrowed from the south. In this age arose the forms which for so long a time were to occupy French singers,—the ballade, the rondeau, the rondel, the triolet, the chant royal, and others. These received con- siderable alterations as time went on. We possess not a few Artes Poeticce, such as those of Eustache Deschamps at the end of the 14th century, of Henri de Croy at the end of the 15th, and of Thomas Sibilet in the 16th, giving particulars of them, and these particulars show considerable changes. Thus the term rondeau, which since Villon has been chiefly limited to a poem of 15 lines, in which the 9th and 15th repeat the first words of the first, was originally applied both to the rondel, a poem of 13 or 14 lines, where the first two are twice repeated integrally, and to the triolet, one of 8 only, where the first line occurs three times and the second twice. The last is an especially popular metre, and.is found where we should least expect it, in the dialogue of the early farces, the speakers making up triolets between them. As these three forms are closely connected, so are the ballade and the chant royal, the latter being an extended and more stately and difficult version of the former, and the characteristic of both being the identity of rhyme and refrain in the several stanzas. It is quite uncer- tain at what time these fashions were first cultivated, but the earliest poets who appear to have practised them exten- sively were born at the close of the 13th and the beginning of the 14th century. Of these Guillaume Machaut (1282 or 1295-1380) is the oldest. He has left us 80,000 verses, few of which have ever been printed. Eustache Deschamps (1828-1415) was nearly as prolific, but more fortunate and more meritorious, though a complete edition of him is

only Fie promised. Froissart the historian (1333-1410) was & “i an agreeable poet. Deschamps, the most famous as a ee is cae three, has left us nearly 1200 ballades and = a 0 rondeaux, besides much other verse all manifest-

& Very considerable poetical powers, Less known but not

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less noteworthy is Jehannot de Lescurel, most of whose works are lost, but whose fragments are full of grace. Froissart appears to have had many countrymen in Hainault and Brabant who devoted themselves to the art of versifica- tion; and the Livre des cent Ballades of the Marshal Bouci- eault and his friends—cir. 1390—shows that the French gentleman of the 14th century was as apt at the ballade as his Elizabethan peer in England was at the sonnet.

Early Drama.—Before passing to the prose writers of the Middle Ages, we have to take some notice of the dramatic productions of those times,—productions of an extremely interesting character, but, like the immense majority of medieval literature, poetic in form. The origin or the re- vival of dramatic composition in France has been hotly de- bated, and it has been sometimes contended that the tradi- tion of Latin comedy was never entirely lost, but was handed on chiefly in the convents by adaptations of the Terentian plays, such as those of the nun Hroswitha. There is no doubt that the mysteries (subjects taken from the sacred writings) and miracle plays (subjects taken from the legends of the saints and the Virgin) are of very early date.

The mystery of the Foolish Virgins (partly French partly Mysteries Latin), that of Adam, of Saint Nicolas, and perhaps others, 2nd

are of the 12th century. But the later moralities, soties, and farces seem to be also in part a very probable develop- ment of the simpler and earlier forms of the fabliau and of the tenson or jeu-parti, a poem in simple dialogue much used by both troubadours and trouvéres. The fabliau has

been sufficiently dealt with already. It chiefly supplied the subject ; and some miracle-plays and farces are little more than fabliaux thrown into dialogue. Of the jeuz- partis there are many examples, varying from very simple questions and answers to something like regular dramatic dialogue; even short romances, such as Awcassin et Nicolette, were easily susceptible of dramatization. But the Jeu de la Feuillie of Adam de la Halle seems to be the earliest piece, profane in subject, containing something more than mere dialogue. The poet has not indeed gone far for his subject, for he brings in his own wife, father, and friends, the interest being complicated by the introduction of stock characters (the doctor, the monk, the fool), and of certain fairies—personages already popular from the later romances of chivalry. Another piece of Adam's, Le Jeu de Robin et Marion, also already alluded to, is little more than a simple throwing into action of an ordinary pastourelle. Nevertheless later criticism has seen, and not unreasonably, in these two pieces the origin in the one case of farce, and thus indirectly of comedy proper, in the other of comic opera.

For a long time, however, the mystery and miracle-plays remained the staple of theatrical performance, and until the 13th century actors as well as performers were more or less taken from the clergy. It has, indeed, been well pointed out that the offices of the church were themselves dramatic performances, and required little more than development at the hands of the mystery writers. The occasional festive out- bursts, such as the Feast of Fools, that of the Boy Bishop, and the rest, helped on the development. The variety of mysteries and miracles was very great. A single manu- script, now in course of publication, contains forty miracles of the Virgin, averaging from 1200 to 1500 lines each, written in octosyllabic couplets, and at least as old as the 14th century, most of them perhaps much earlier. The mysteries proper, or plays taken from the scriptures, are older still. Many of these are exceedingly long, There is a Mystére de l' Ancien Testament, which extends to many volumes, and must have taken weeks to act in its entirety. The Mystére de la Passion, though not quite so long, took several days, and recounts the whole history of the gospels. But these performances, though they held

Profane drama.

Moral- ities.

Soties.

EARLY DRAMA. |

their ground until the middle of the 16th century, were soon rivalled by the more profane performances of the moralities, the farces, and the soties. The palmy time of all these three kinds is the 15th century, while the Confrérie de la Passion itself, the special performers of the sacred drama, only obtained the licence constituting it by an ordinance of Charles VI. in 1402. In order, however, to take in the whole of the medieval theatre at a glance, we may anticipate a little. The Confraternity was not itself the author or performer of the profaner kind of dramatic performance. This latter was due to two other bodies, the clerks of the Bazoche and the Enfans sans Souci. As the Confraternity was chiefly composed of tradesmen and persons very similar to Peter Quince and his associates, so the clerks of the Bazoche were members of the legal pro- fession of Paris, and the Enfans sans Souci were mostly young men of family. The morality was the special pro- perty of the first, the sotie of the second. But as the moralities were sometimes decidedly tedious plays, though by no means brief, they were varied by the introduction of farces, of which the jeux already mentioned were the early germ, and of which L'Avocat Patelin, 200 years subse- quent to Adam de la Halle, is the most famous example. The morality was on the stage the natural result of the immense literary popularity of allegory in the Roman de la Rose and its imitations. There is hardly an abstraction, a virtue, a vice, a disease, or anything else of the kind, which does not figure in these compositions. There is Bien Advisé and Mal Advisé, the good boy and the bad boy of nursery stories, who fall in respectively with Faith, Reason, and Humility, and with Rashness, Luxury, and Folly. There is the hero Mange-Tout, who is invited to dinner by Banquet, and meets after dinner very unpleasant company in Colique, Goutte, and Hydropisie. It is even said that Cheese and Tart figured among the dramatis persone, while Honte-de-dire-ses-Péchés seems an anticipation of Puritan nomenclature. Some of these moralities possess distinct dramatic merit; among these is mentioned Les Blasphémateur's, an early and remarkable presentation of the Don Juan story. But their general character appears to be gravity, not

to say dulness. The Enfans sans Souci, on the other hand, were definitely satirical, and nothing if not amusing. The chief of the society was entitled Prince des Sots, and his crown was a hood decorated with asses' ears. The sotie was directly satirical, and only assumed the guise of folly as a stalking-horse for shooting wit. It was more Aristophanic than any other modern form of comedy, and, like its predecessor, it perished as a result of its political application. Encouraged for a moment as a political engine at the beginning of the 16th century, it was soon absolutely forbidden and put down, and had to give place in one direction to the lampoon and the prose pamphlet, in another to forms of comic satire more general and vague in their scope. The farce, on the other hand, having neither moral purpose nor political intention, was a purer work of art, enjoyed a wider range of subject, and was in no danger of any permanent extinction. Farcical interludes were interpolated in the mysteries themselves; short farces introduced and rendered palatable the moral- ities, while the sotie was itself but a variety of farce. It was a short composition, 500 verses being considered suf- ficient, while the morality might run to at least 1000 verses, the miracle-play to nearly double that number, and the mystery to some 40,000 or 50,000, or indeed to any length that the author could find in his heart to bestow upon the audience, or the audience in their patience to suffer from the author. The number of persons and societies who acted these performances grew to be very large, being estimated at more than 5000 towards the end of the 15th century. Many fantastic personages came to join the Prince des Sots,

such as the Empereur de Galilce, the Princes de lEtrille, and des Nouveaux Mariés, the Roi de l'Kpinette, the Recteur des Fous. Of the pieces which these societies represented one only, that of Maitre Patelin, is now much known; but many are almost equally amusing. Patelin itself has an immense number of versions and editions. Other farces are too numerous to attempt to classify; they bear, however, in their subjects, as in their manner, a remarkable resemblance to the fabliaux, their source. Conjugal disagreements, the unpleasantness of mothers-in-law, the shifty or, in_ the

earlier stages, clumsy valet and chambermaid, the mishaps of too loosely given ecclesiastics, the abuses of relics and pardons, the extortion, violence, and sometimes cowardice of the seigneur and the soldiery, the corruption of justice, its delays, and its pompous apparatus, supply the subjects. The treatment is rather narrative than dramatic in most cases, as might be expected, but makes up by the liveliness of the dialogue for the deficiency of elaborately planned actiou and interest. All these forms, it will be observed, are directly or indirectly comic. Tragedy in the Middle Ages is represented only by the religious drama, except for a brief period towards the decline of that form, when what were called profane mysteries, such as those of the Srege of Troy and the Siege of Orleans, came to be represented. These were, however, rather histories, in the Elizabethan sense, than tragedies proper.

Prose History.—In France, as in all other countries of whose literary developments we have any record, literature in prose is considerably later than literature in verse. We have certain glosses or vocabularies possibly dating as far back as the 8th or even the 7th century; we have the Strasburg oaths, already described, of the 9th, and a commentary on the prophet Jonas which is probably asearly. In the 10th century there are some charters and muniments in the ver- nacular ; of the 11th the laws of William the Conqueror are the most important document; while the Assises de Jerusalem of Godfrey of Bouillon date, though not in the form in which we now possess them, from the same age. The 12th century gives us certain translations of the Scriptures, and the remarkable Arthurian romances already alluded to ; and thenceforward French prose, though long less favoured than verse, begins to grow in importance. History, as is natural, was the first subject which gave it a really satisfac- tory opportunity of developing its powers. Fora time the French chroniclers contented themselves with Latin prose or with French verse, after the fashion of Wace and Philippe Mouskeés. then original, became common ; have been that of the Pseudo-Turpin, which thus recovere in prose the language which had originally clothed it in verse, and which to gain a false appearance of authenticity it had exchanged for Latin. Then came French selections and versions from the great series of historical compositions undertaken by the monks of St Denys, the so-called Grandes Chroniques de France. But the first really remarkable author who used French prose as a vehicle of historical ex- pression is Geoffroi de Villehardouin, marshal of Chani-

pagne, who was born towards the middle of the 12th cen- tury, and died in Greece in 12138. Congquéte de tory of the fourth crusade, which has been accepted by all competent judges as the best picture extant of feudal chivalry in its prime. The Conquéte de Constantinoble has been well called a chanson de geste in prose, and indeed the surprising nature of the feats it celebrates, the abund- ance of detail, and the vivid and picturesque poetry of the narration, equal the very best of the chansons. Even the repetition of the same phrases which is characteristic of epic poetry repeats itself in this epic prose ; and as in the chansons so in Villehardouin, few motives appear but religi-

But soon chronicles, first translated Early

the earliest of all is said to chron- d icles,

Under the title of Villehar- Constantinoble Villehardouin has left us a his- douin.

Joinville.

Froissart.

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ous fervour and the love of fighting, though neither of these excludes a lively appetite for booty and a constant tendency to disunion and disorder. Villehardouin was continued by Henri de Valenciennes, whose work is less remarkable, and has more the appearance of a rhymed chronicle thrown into prose, a process which is known to have been actually applied in some cases. Nor is the transition from. Ville- hardouin to Joinville (considerable in point of time, for Joinville was not born till ten years after Villehardouin's death) in point of literary history immediate. The rhymed chronicles of Philippe Mouskés and Guillaume Guiart belong to this interval; and in prose the most remarkable works are the Chronique de Reims, a well-written history, having the interesting characteristic of taking the lay and popular side, and the great work (977-1209) attributed to Baudouin d'Avesnes, and written both in French and Latin. Joinville, whose special subject is the Life of St Louis, is far more modern than even the half-

century which separ- ates him from Villehardouin would lead us to suppose. There is nothing of the knight-errant about him personally, notwithstanding his devotion to his hero. Our Lady of the Broken Lances is far from being his favourite saint. He is an admirable writer, but far less simple than Villehar- douin ; the good King Louis tries in vain to make him share his own rather highflown devotion. Joinville is shrewd, practical, there is even a touch of the Voltairian about him ; but he, unlike his predecessor, has political ideas and anti- quarian curiosity, and his descriptions are often very credit- able pieces of deliberate literature.

Tt is very remarkable that each of the three last centuries of feudalism should have had one specially and extraor- dinarily gifted chronicler to describe it. What Villehar- douin is to the 12th and Joinville to the 13th century, that Froissart is to the 14th. His picture is the most famous as it it is the most varied of the three, but it has special drawbacks as well as special merits. French critics have indeed been scarcely fair to Froissart, because of his early partiality to our own nation in the great quarrel of the time, forget- ting that there was really no reason why he as a Hainaulter should take the French side. But there is no doubt that if the duty of an historian is to take in all the political pro- blems of his time, Froissart certainly comes short of it. Although the feudal state in which knights and churchmen were alone of estimation was at the point of death, and though new orders of society were becoming important, though the distress and confusion of a transition state were evident to all, Froissart takes no notice of them. Society is still to him all knights and ladies, tournaments, skirmishes, and feasts. He depicts these, not like Joinville, still less like Villehardouin, as a sharer in them, but with the facile and picturesque pen of a sympathizing liter- ary onlooker. As the comparison of the Conquéte de Con- stantinoble with a chanson de geste is inevitable, so is that of Froissart's Chronique with a roman d'aventures.

_ Provengal Literature.—No account of French medizval literature would be complete without at least some reference to the literary products of the Langue d'Oc. Provengal literature will receive separate treatment elsewhere, and here our chief business is to contrast briefly its develop- ments with those of the Langue d'Oil. The older belief of the antecedence and originality of the troubadours has in- deed been shown of late years to

be false, and all evidence goes to prove that trouvére and troubadour were in the main independent of each other ; while the creations of the former, if less artistically elaborate, were more varied, more considerable, and more fertile in their developments. The pg de geste, the Arthurian romance, the fabliau, the allegoric poems of the type of the Renart and the Rose, the ee the mystery, the farce, belong to the north ;

n € first developments of the epic in particular ap-

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pear to have actually preceded the composition of finished literature in the south. The earliest accents of the trouba- dours are only heard at the extreme end of the 11th century. By the end of the 14th, less in consequence of the Albigen- sian erusade than of the political changes which that crusade eventually caused, they ceased. The 300 years be- tween these terms were occupied by a literature more rich than varied. It is, however, too often forgotten that the literature of the Langue d'Oc is by no means confined to the productions of these famous minstrels. Two centuries before William of Poitiers, the earliest singer of the class (fl. 1087-1127), was written the Provengal poem on Boetius, the oldest monument that we have. It was,

moreover, long after the extinction of the troubadour Trouha- class that Provencal ceased for a time, except at long dours.

intervals, to be used as a literary language. But though the identification of Provencal literature with the lyric products of the troubadours is not scientifically correct, it is at least not destitute of a certain excuse. In thus poetry alone are found works of an individual savour and a lasting interest, and had it not been for this, Provencal would have run the risk of being regarded as a mere dialect, perliaps even a patois. A few romances and tales, and the metrical chronicle describing the Albigensian wars, sum up the longer compositions of the troubadours. On the other hand, their lyrical fecundity was extremely great, and their versification was most elaborate and correct, but their subjects were very limited. Love, war, and satire,

almost exhaust the list. The satire, moreover, is for the most part of a purely personal character, and entirely lacks the diver- sified historical and social interest which distinguishes tle satirical poems of the Langue d'Oil. Nor are the war songs of the troubadours extremely numerous, the cliief writer of them being the famous Bertrand de Born. Certain moral or didactic poems of their authorship also exist, but the bulk of their compositions deals with the subject of love, and deals with it in a manner for which, while its sweetness and grace have been universally recognized, the most ar- dent champions of the literary achievements of Provence and Languedoc have not been able to claim variety, vigour, or even, in the majority of cases, passion and truth. The alba, the serena, the pastorela, are alike open to the charge of monotony which has been brought against the northern equivalent of the latter, the pastourelle. The planh or com- plaint is also somewhat of a monotonous and unreal charac- ter; the tenson or verse dialogue and the ensenhamen or didactic epistle are apt to be dull; and the sirventé or satirical poem, though spirited enough, is apt, as we have said, to degenerate into the mere lampoon. So much for the disadvantages of Provencal verse, disadvantages which would scarcely require notice but for the contrast they present to the corresponding advantages of northern poetry. On the other hand, in its peculiar and somewhat limited way, Provencal poetry and the spirit which it expresses surpass anything which can be paralleled with them in northern French up to the date of their disappearance. The latter, except in the 15th and 16th centuries, and in our own time, has always been deficient in impassioned amatory poetry, while, on the other hand, the anonymous alba, "En un vergier sotz folha d'albespi," which Mr Swin- burne has finely paraphrased, stands at the head of almost all poetry of this class; and many of the fancies of the trouba- dours, such as the love of Geoffroi Rudel for the Lady of Tripoli, have fixed themselves durably in the literary imag- ination of Europe. But the great glory of the troubadours was their strenuous and successful attention to the formal part of poetry. Assisted by the melodious if somewhat monotonous cadences and terminations of their language, they framed most intricate and elaborate systems of verse and rhyme, which undoubtedly served as a stimulus to

Christine de Pisan.

Alain Chartier,

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the trouvéres their neighbours, and were very probably models for the creations in poetical form of the 14th cen- tury, such as the virelai, the rondel, the rendean, the ballade, and the chant royal. The beauty and grace of Provengal poetry, and the melancholy fate of the nation which pro- duced it, have naturally attracted much interest. But it must be remembered that the Albigensian crusade by no means, as is sometimes held, stamped out the troubadours. They continued for nearly a century after it to be prolific ; and their extinction, though partly traceable to political causes, was in all probability equally owing to the inherent defects of their poetry, especially its lack of range. Soon afterwards Proveneal ceased for 300 years to be, except fitfully and at long intervals, a literary language. In our own time a band of zealous devotees have attempted to revive it in that character, with what permanent success remains to be seen.

15th Century.—The 15th century holds a peculiar and somewhat disputed position in the history of French litera- ture. It has sometimes been regarded as the final stage of the medieval period, sometimes as the earliest of the modern, the influence of the Renaissance in Italy already filtering through. Others again have taken the easy step of marking it as an age of transition, There is as usual truth in all these views. Feudality died with Froissart and Eustache Deschamps, The modern spirit can hardly be said to arise before Rabelais and Ronsard. Yet the 15th century, from the point of view of French literature, is much more remarkable than its historians have been wont to confess. It has not the strongly marked and compact originality of some periods, and it furnishes only one name of the highest order of literary interest ; but it abounds in names of the second rank, and the very dif- ference which exists between their styles and characters testifies to the existence of a large number of separate forces working in their different manners on different per- sons. Its theatre we have already treated by anticipation, and to it we shall afterwards recur. It was the palmy time of the early French stage, andall the dramatic styles which we have enumerated then came to perfection. Of no other kind of literature can the same be said. The century which witnessed the invention of printing

naturally devoted itself at first more to the spreading of old literature than to the production of new. Yet as it perfected the early drama, so it produced the prose tale. Nor, as regards individual and single names, can the century of Charles d'Orléans, of Alain Chartier, of Christine de Pisan, of Coquillart, of Comines, and, above all, of Villon, be said to lack illustrations.

First among the poets of the period falls to be mentioned the shadowy personality of Olivier Basselin. Modern criti- cism has attacked the identity of the jovial miller, who was once supposed to have written and perhaps invented the songs called vaux de vire, and to have also carried on a patriotic warfare against the English. But though Jean le Houx may have written the poems published under Basselin's name two centuries later, it does not seem un- likely that an actual Olivier wrote actual vaux de vire at the beginning of the 15th century. About Christine de Pisan (1363-1420) and Alain Chartier (1886-1458) there is no such doubt. Christine was the daughter of an Italian astrologer who was patronized by Charles V. She was born in Italy but brought up in France, and she enriched the literature of her adopted country with much learning, good sense, and patriotism. She wrote history, devotional works, and poetry; and though her literary merit is not of the highest, it is very far from despicable. Alain Chartier, best known to modern readers by the story of Margaret of Scotland's Kiss, was a writer of a somewhat similar character. In both Christine and Chartier there is

a great deal of rather heavy moralizing, and a great deal of rather pedantic erudition. But it is only fair to re- member that the intolerable political and social evils of the day called fora good deal of moralizing, and that it was the function of the writers of this time to fill up as well as they could the scantily filled vessels of medizeval science and learning.

he was the father of a king of France and heir to the duchies of Orléans and Milan. Charles, indeed, was not exactly a hero; captured at Agincourt, he endured his English captivity very patiently, and its chief effect on him was

to make him write poems in English. He made little effort to secure or recover his Cisalpine heritage from the rough hands of Sforza, and he seems at no time to have exercised much political influence in France. But if he was not a Roland or a Bayard, he was an admirable poet. He is the best-known and perhaps the best writer of the graceful poems in which an artificial versification is strictly observed, and helps by its recurrent lines and modulated rhymes to give to poetry something of a musical accompaniment even without the addition of music properly so called. His ballades are certainly inferior to those of Villon, but his rondels are unequalled. For full a century and a half these forms engrossed the attention of French lyrical poets. Exercises in them were produced in enormous numbers, and of an excellence which has only recently obtained full re- cognition even in France. Charles d'Orléans is himself sufficient proof of what can be done in them in the way of elegance, sweetness, and grace. On the other hand, his writings and the exercises to which he was addicted lay him open to a certain charge of effeminacy, which, though it has been much exaggerated, cannot be altogether denied. But that this effeminacy was no natural or inevitable fault of the ballades and the rondeaux was fully proved by the most remarkable literary figure of the 15th century in France. single writers, no attempt can be made to do justice in this place. His remarkable life and character especially lie outside our subject. But he is universally recognized as the most important single figure of French literature before the Renaissance. His work is very strange in form, the undoubtedly genuine part of it consisting merely of two compositions, known as the great and little Testament, written in stanzas of eight lines of eight syllables each, with lyrical compositions in ballade and rondeau form inter- spersed. Nothing in old French literature can compare with the best of these, such as "the Ballade des Dames du Temps Jadis," the "Ballade pour sa Mére," "La Grosse Mar- got," "Les Regrets de la belle Heaulmiere," and others ; while the whole composition is full of poetical traits of the most extraordinary vigour, picturesqueness, and pathos. Besides these more remarkable names, a crowd of minor poets hastened to copy the compositions we have described. Towards the end of the century the poetical production of the time became very large. The artificial measures already alluded to, and others far more artificial and infinitely less beautiful, were largely practised. The typical poet of the end of the 15th century is Guillaume Crétin, who distin- guished himself by writing verses with punning rhymes,

verses ending with double or treble repetitions of the same sound, and many other tasteless absurdities, in which, as Pasquier remarks, "il perdit toute la grace et la liberté de la composition." Crétin, who had hundreds of imitators, was held up by Rabelais to the ridicule of his readers under the name of Raminagrobis. The other favourite direction of the poetry of the time was a vein of allegorical moralizing drawn from the Roman de la Rose through the medium of Chartier and Christine, which produced " Castles of Love," "Temples of Honour," and such like ; yet some of the minor

A very different person is Charles d'Orléans Charles (1391-1465), one of the greatest of grands seigneurs, for dOrleéans.

To Francois Villon (1431-1500), as to other great Villon,

poets of the time are not to be despised. Such are Baude (1430-1490), Martial d'Auvergne (1420-1508), and others, many of whom proceeded from the poetical court which Charles @'Orléans kept up at Blois after his release.

While the serious poctry of the age took this turn, there was no lack of lighter and satirical verse. Villon, indeed, were it not for the depth and pathos of his poetical senti- ment, might be claimed as a poct of the lighter order, and the patriotic diatribes against the English to which we have alluded easily passed into satire. The political quarrels of the latter part of the century also provoked much satirical composition. The disputes of the Bien Public and those between Louis XI. and Charles of Burgundy employed many pens. 'The most remarkable piece of the light litera- ture of the first is " Les Anes Volants," a ballad on some of the early favourites of Louis. The battles of France and Burgundy were waged on paper between Gilles des Ormes and George Chastelain, typical representatives of the two styles of 15th century poetry already alluded to—Des Ormes being the lighter and more graceful writer, Chaste- lain a pompous and learned allegorist. The most remark- able representative of purely light poetry outside the theatre is Guillaume Coquillart, a lawyer of Champagne, who resided for the greater part of his life in Rheims. This city like others suffered from the pitiless tyranny of Louis XI. The ' beginnings of the

standing army which Charles VIL had started were extremely unpopular, and the use to which his son put them by no means removed this unpopularity. Coquillart described the military man of the period in his Monologue du Gendarme Cassé. Again, when the king entertained the 1uea of unifying the taxes and laws of the different provinces, Coquillart, who was named commis- sioner for this purpose, wrote on the occasion a satire called Les Drovts Nouveaux.

The 15th century was perhaps more remarkable for its achievements in prose than in poetry. It produced, indeed, no prose writer of great distinction, except perhaps Comines ; but it witnessed serious, if not extremely successful, efforts at prose composition. The invention of printing finally substituted the reader for the listener, and when this sub- stitution has been effected, the main inducement to treat unsuitable subjects in verse is gone. The study of the classics at first hand contributed to the same end. As early as 1458 the university of Paris had a Greek professor. But before this time translations in prose had been made. Nicholas Oresme, the tutor of Charles V., gave a version of certain Aristotelian works, which enriched the language with a large number of terms, then strange enough, now familiar. Raoul de Presles turned into French the De Civitate De. of St Augustine. These writers and Charles himself composed Le Songe du Vergier, an elaborate discus- sion of the power of the pope. The famous chancellor, Jean Gerson (1363-1429), to whom the JZmitation has among so many others been attributed, spoke constantly and wrote often in the vulgar tongue, Christine de Pisan

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and Alain Chartier were at least as much prose writers as poets; and the latter, while he, ike Gerson, dealt much with the reform of the church, used in his Quadriloge Invective really forcible language for the purpose of spurring on the nobles of France to put an end fo her sufferings and evils. These moral and didactic treatises were but continua- tions of others, which for convenience sake we have hitherto left unnoticed. Though verse was in the centuries prior to the 15th the favourite medium for literary composition, it was by no means the only one ; and moral and educational treatises—some referred to above—already existed in pedestrian phrase. Certain household books (Livres de Raison) have been preserved, some of which date as far back as the 13th century. These contain not merely accounts but family chronicles, receipts, and the like. Of the 14th century, we have a Menagier de Paris, intended for the instruction of a young wife, and a large number of miscellaneous treatises of art, sctence, and morality, while private letters, mostly as yet unpublished, exist in consider- able

numbers, and are generally of the moralizing character ; books of devotion, too, are naturally frequent.

But the most important divisions of medizeval energy in prose composition are the spoken exercises of the pulpit and the bar. The latter has been hitherto somewhat neglected, though the recent history of M. Aubertin devotes special attention to it. The beginnings, however, of French sermons have been much discussed, especially the question whether St Bernard, whose discourses we possess in ancient but doubtfully contemporary French, pronounced them in that language or in Latin.

1196) present the first undoubted examples of homiletics in the vernacular, and they are followed by many others— so many indeed that the 13th century alone counts 261 sermon writers, besides a large body of anonymous work. These sermons were, as miglit indeed be expected, chiefly cast in a somewhat scholastic form—theme, exordium, de- velopment, example, and peroration following in regular order. The 14th century sermons, on the other hand, are little known, probably because no one has yet taken the trouble to investigate the manuscripts. It must, however, be remembered that this age, as the most famous of all for its scholastic illustrations, and for the early vigour of the Dominican and Franciscan orders, ought to yield favourable returns. With the end of the century and the beginning of the 15th, the importance of the pulpit begins to revive. The early years of the new age have Gerson for their repre- sentative, while the end of the century sees the still more famous names of Menot (1450-1518), Maillard (1440- 1502), and Raulin (1443-1514), all remarkable for the practice of a vigorous and homely style of oratory, recoiling before no aid of what we should now-a-days style buf- foonery, and manifesting a creditable indifference to the indignation of principalities and powers. Louis XI. is said to have threatened to throw Maillard into the Seine, and many instances of the boldness of these preachers and the rough vigour of their oratory have been preserved. Froissart

/had been followed as a chronicler by Monstrelet, and by

the historiographers of the Burgundian court, Chastelain, already mentioned, and Olivier de la Marche. The memoir and chronicle writers, who were to be of so much import- ance in French literature, also begin to

be numerous at this period. Juvenal des Ursins (1388-1473), an anonymous bourgeois de Paris (two such indeed), and the author of the Chronique Scandaleuse, may be mentioned as presenting the character of minute observation and record which has distinguished the class ever since. 1509) is no imitator of Froissart or of any one else The

last of the quartette of great French medizval historians, he

does not yield to any of his three predecessors in originality

Towards the end of the 12th Early

century, however, the sermons of Maurice de Sully (died Ta Writers,

But Comines (1445— Comines.

— TheCent Cent Novelles Nouvelles.

Nou- velles Nou- Velles.

Antoine de la Salle,

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or merit, but he is very different from them. He fully re- presents the mania of the time for statecraft, and his book has long ranked with that of Macchiavelli as a manual of the art. He is a painter of character rather than of scenes or events; he has very few prejudices or predilections ; he gives us an early example of those Renaissance statesmen who looked at politics chiefly as a game in which means are connected with ends, without much, if any, reference to thie goodness or badness of the one or the other. But he has not the absolutely non-moral character of the Italian, and he is sincerely religious in his way. His memoirs, con- sidered merely as literature, show a style well suited to their

purport,—not, indeed, brilliant or picturesque, but clear, –

terse, and thoroughly well suited to the expression of the acuteness, observation, and common sense of their author. But prose was not content

with the domain of serious literature. It had already long possessed a respectable posi- tionasa vehicle of romance, and the end of the 14th and the beginning of the 15th centuries were pre-eminently the time when the epics of chivalry were re-edited and extended in prose. Few, however, of these extensions offer much literary interest. On the other hand, the best prose of the century, and almost the earliest which deserves the title of a satisfactory literary medium, was employed for the telling of romances in miniature. The Cent Nouvelles Nouvelles is undoubtedly the first work of literary prose in French, and the first, moreover, of a long and most remarkable series of literary works, in which French writers may challenge all comers with the certainty of victory. The short prose tale of a comic character is the one French literary product the pre-eminence and perfection of which it is impossible to dispute, and the prose tale first appears to advautage in the This remarkable work has usually been attributed, like the somewhat similar but later Heptameron, to a knot of literary courtiers gathered round a royal personage, in this case the dauphin Louis afterwards Louis XI. Some evidence has recently been produced which seems to show that this tradition, which attributed some of the tales to Louis himself, is erroneous, but the question is still undecided. The subjects of the Cent Nouvelles Nouvellesare by no means new. They are simply the old themes of the fabliaux treated in the old way. The novelty is in the application of prose to such a purpose, and in the crispness, the fluency, and the elegance of the prose used. The fortunate author to whom these admirable tales have of late been attributed is Antoine de la Salle (1398— 1461), who, if this attribution and certain others be correct, must be allowed to be one of the most original and fertile authors of early French literature. La Salle's one acknow- ledged work is the story of Petit Jehan de Suintré, a short romance exhibiting great command of character and abundance of delicate draughtsmanship. To this it is now proposed to add the Cent Nouvelles Nowvelles; and the still more famous and inportant work of L'Avocat Patelin bas been assigned by respectable authority to the same paternity. The generosity of critics towards La Salle has not even stopped here. A fourth masterpiece of the period, Les Quinze Joies du Mariage, has also been assigned tohim. This last work, like the other three, is satirical in subject, and shows for the time a wonderful niastery of the language. Of the fifteen joys of marriage, or, in other words, the fifteen miseries of husbands, each has a chapter assigned to it, and each is treated

witli the peculiar mixture of gravity and ridicule which it requires. All who have read the book confess its infinite wit and the grace of its style. It is true that it has been reproached with cruelty and with a lack of the moral sentiment. But hnmanity and morality were not the strong point of the 15th century. There is, it must be admitted, about most of its productions a lack of poetry and alack of imagination. The hideous disorders

of the Hundred Years' War had exasperated men's minds, and had at the same time accustomed them to suffer, to witness, and in too many cases to perpetrate outrage and injustice of all kinds. The glaring disregard of anything but their own private interest which actuated almost all those of the higher orders, from the great crown vassals and princes of the blood to the leaders of free companions and the owners of petty fortresses, disgusted the people. The great schism of the West, and the scandals which accom-

panied it, shook their confidence, not merely in individual Influence ecclesiastics, but in the whole theory and government of of the the church. 'The old forms of literature had lost their Ail

interest, and new ones possessing strength to last and power : to develop themselves had not yet appeared. It was im- possible, even if the taste for it had survived, to spin out any longer the old themes. The new learning was slowly soaking in; the discoveries of the navigators of the Iberian peninsula were opening up entirely new regions for specula- tion and inquiry; and, above all, the decay of scholasticism was dismissing the most active minds of the time from the cld mill-horse round, and setting them free to speculate, at once with all the ardour of reaction and with the vigour, the acuteness, aud the trained logical skill which scholasti- cism itself had given them. But all these new forces re- quired some time to set to work, and to avail themselves of the tremendous weapon which the press had put into their hands. Even from a strictly material point of view, the horrible devastation occasioned by the English wars required a long time of reparation and recovery. The time actually accorded was not very long, and much of it might have been far better spent than under the influence of such a

monarch as Louis XI. This period of brief and disturbed repose was, moreover, followed by the Italian wars, in which the French meted to another and weaker nation much the same measure as the English had meted to them. But these wars, little justifiable in themselves, completed the good effect which the equally unjustifiable violence and treachery of Louis XI. had begun. They consolidated the nation, they gave it a common hope, object, and spirit; they opened the way to deeds of daring in which it took pride, in place of the indiscriminate, brutal, and irrational savagery which had begun with the Jacquerie, and hardly ended with the quarrels of the Burgundians and Armagnacs. Not only did the lower orders gain in wealth, position, intelligence, and culture, by the disasters of their superiors, but there arose a new chivalry, not indeed more moral than the old, but more polished, more learned, and more disposed to produce and enjoy literature. Under all these circum- stances, literature of a varied and vigcrons kind became once more possible and indeed necessary, nor did it take long to make its appearance,

16th Century.—In no country was the literary result of the Renaissance more striking and more manifold than in France. The double effect of the study cf antiquity and the religious movement produced an outburst of literary developments of the most diverse kinds, which even the fierce aud sanguinary civil dissensions to which the Refor- ration gave rise did not succeed in checking. While the Renaissance in Italy had mainly exhausted its effects by the beginning of the 16th century, while in Germany those effects only paved the way for a national literature, and did not themselves greatly contribute tlrereto, while in England +t was not till the extreme end of the period that a great literature was forthcoming,—in France almost the whole century was marked by the production of capital works in every branch: of literary effort. Not even the 17th century, and certainly no other till our own day, can show such a group of prose writers and poets as is formed by Calvin, St Francis de Sales, Mcntaigne, Du Vair, Bodin, D'Aubigné, the authors of the Satire Menippée, Monluc, Brantéme,

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Pasquier, Rabelais, Des Periers, Herberay des Essarts, Amyot, Garnier, Marot, Ronsard and the rest of the Plciade, and finally Regnier. These great writers are not merely remark- able for the vigour and originality of their thoughts, the freshness, variety, and grace of their fancy, the abundance of their learning, and the solidity of their arguments in the cases where argument is required. Their great merit 1s the creation of a language and a style able to give expression to these good gifts, The foregoing account of the medizval literature of France will have shown sufficiently that it is not lawful to despise the literary capacities and achieve- ments of theolder French. But the old language, with all its merits, was ill-suited to be a vehicle for any but the simpler forms of literary composition. Pleasant or affecting tales could be told in it with interest and pathos. Songs of charming naiveté and grace could be sung; the require- ments of the epic and the chronicle were suitably furnished. But its vocabulary was limited, not to say pcor; it was barren of the terms of art and science; it did not readily lend itself to sustained eloquence, to impassioned poetry, or to logical discussicn. It had been too long accustomed to leave these things to Latin as their natural and legitimate exponent, and it bore marks of its original charaeter as a lingua rustica, a tongue suited for homely conversation, for folk-lore and for ballads, rather than for the business of the forum and the court, the speculations of the study, and the declamation of the theatre. Efforts had indeed been made, culminating in the heavy and tasteless erudition of the schools of Chartier and Crétin, to supply the defeet ; but it was reserved for the 16th century completely to efface it. The series of prose writers from Calvin to Montaigne, of pocts from Marot to Regnier, elaborated a language yielding to no modern tongue in beauty, richness, flexibility, and strength,—a language which the reactionary purism of suc- ceeding generations defaced rather than improved, and the merits of which have in our own time been triumphantly vindicated by the confession and the practice of all the greatest writers of modern France.

16th Century Poetry.—The first few years of the 16th century were naturally occupied rather with the last de- velopments of the medizeval forms than. with the pro- duction of the new model. The elerks of the Bazoche and the Confraternity of the Passion still produced and acted mysteries, moralities, and farces. Crétin, Le Maire, and Meschinot wrote elaborate allegorical and rhetorical poetry. Chansons de gestes, rhymed romances, and fab- liaux

had Jong ceased to be written. But the press was multiplying the contents of the former in the prose form which they had finally assumed, and in the Cent Nouvelles Nouvelles there already existed admirable specimens of the short prose tale. The first note of the new literature was sounded by Clément Marot (1497-1544). The son of an elder poet, Jehan des Mares called Marot, Clément at first wrote, like his father's contemporaries, allegori- cal and mythological poetry, afterwards collected in a volume with a charming title, LZ' Adolescence Clémentine. Born in 1497, it was not till he was nearly thirty years old that his work became really remarkable. From that time forward till his death, about twenty years afterwards, he was much involved in the troubles and persecutions of the Huguenot party to which he belonged ; nor was the protec- tion of Marguerite d'Angouléme, the chief patroness of Huguenots and men of letters, always efficient. But his troubles, so far from harming, helped his literary faculties ; and his epistles, epigrams, blasons (descendants of the medizeval dits), and coy-a-ldne became remarkable for their easy and polished style, their light and graceful wit, and a certain elegance which had not as yet been even attempted many modern tongue, though the Italian humanists had not been far from it in some of their Latin compositions.

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Around Marot arose a whole school of disciples and imi- tators, such as Roger de Collerye, Brodeau (died 1540), the great authority on rondeaux, Scéve, a fertile author of blasons, Salel, Marguerite herself (1492-1549), of whom more hereafter, and Melin de St Gelais (1486-1558), of whom the first and the last are the most remarkable. Collerye is a poet of poverty, like so many other French bards from Rutebouf downwards; St Gelais, son of a poetie bishop of the same name (Octavien de St Gelais, 1465-1502), is a courtly writer of occasional pieces, who sustained as well as he could the style Marotique against Ransard, and who has the credit of introducing the regular sonnet into French. But the inventive vigour of the age was so great that one school had hardly become popular before another pushed it from its stool. (1524-1585) was the chief of this latter. At first a courtier and a diplomatist, physical disqualification made him change his career. He

began to study the classics under Daurat, and with his master and five other writers, Jodelle, Belleau, Dubellay, Baif, and Pontus de Tyard, composed the famous

“ Pléiade.” The object of this band was to bring the French The language, in vocabulary, constructions, and application, on Pliade,

a level with the classical tongues by unlimited borrowings from the latter. They were not far from turning the whole Latin dictionary into the French tongue. They would have imported tlie Greek licence of compound words, though the genius of the French language is but little adapted thereto; and they wished to reproduce in French the regular tragedy, the Pindaric and Horatian ode, the Virgilian epic, &c. Being all men of the highest talent, and not a few of them men of great genius, they achieved much that they designed, and even where they failed exactly to achieve it, they very often indirectly produced results as important and more beneficial than those which they intended. Their ideal of a separate poetical language distinct from that intended for prose use was indeed a doubtful if not a dangerous one, and the wholesale Latinizing and Hellenizing of their mother tongue, by which they aimed at it, was still more dangerous and doubtful. But it is certain that Marot, while setting an example of elegance and grace not easily to be imitated, set also an example of trivial and, so to speak, pedestrian language which was only too imitable. If France was ever to possess a literature containing something besides fabli- aux and farces, the tongue must be enriched and strength- ened. ‘This accession of wealth and vigour it received from Ronsard and the Ronsardists. Doubtless they went too far, and provoked to some extent the reaction which Malherbe led. Their importations were indiscriminate, and sometimes unnecessary. It isalmost impossible to read the /ranciade of Ronsard, and not too easy to read the tragedies of Jodelle and Garnier, fine as the latter are in parts. But the best of Ronsard’s sonnets and odes, the finestof Dubellay’s Antiquatés de Rome (translated into English by Spenser), the exquisite Vanneur of the same author, and the Avril of Belleau, even the finer passages of D’Aubigné and Du Bartas, are not only admirable in themselves, and of a kind not previously found in French literature, but are also such things as could not have been previously found, for the simple reason that the medium of expression was wanting. They constructed that medium for themselves, and

no force of the reaction which they provoked was able to undo their work. Adverse criticism and the natural course of time rejected much that they had added. The charming diminutives they loved so much went out of fashion; their compounds (for the most part, it must be confessed, justly) had their letters of natural- ization promptly cancelled ; many a gorgeous adjective, in- cluding some which could trace their pedigree to the earliest ages of French literature, but which bore an unfor- tunate likeness to the new comers, was proscribed. But for all that no language has ever had its destiny influenced

Pierre de Ronsard Ronsara

Du _ longer allusion. Du Bartas (1544-1590) whom Sylvester's | Sots and his Mystere de St Lows are among the best of their | Bartas. translation, Milton's imitation, and the copious citations of | kind. An enormous volume of composition of this class Southey's Doctor, have made known if not familiar in | was produced between 1500 and 1550. One morality by England was partly a disciple and partly a rival of Ronsard. | itself, L'homme juste et Vhomme mondain, contains some His poem of Judith was eclipsed by his better known La | 36,000 lines. But in 1548 when tne Confraternity was : Divine Sepmaine or epic of the Creation. Du Bartas was | formally established at the Hotel de Bourgogne, leave to . a great user and abuser of the double compounds alluded | play sacred subjects was expressly refused it. Moralities | to above, but his style possesses much stateliness, and hasa | and soties dragged on under difficulties till tle end of the . peculiar solemn eloquence which he shared with the other | century, and the farce is immortal. But the effect of the | D'au- French Calvinists, and which was derived from the study Renaissance was to sweep away all other vestiges of the bigné partly of Calvin and partly of the Bible. D'Aubigné (1550- | medieval drama, at least in the capital. An entirely new 1630), like Du Bartas, was a Calvinist. His genius was | class of subjects, entirely new modes of treatment, and a of a more varied character. He wrote sonnets and odes as | different kind of performers were introduced. The change became a Ronsardist, but his chief poetical work is the | naturally came from Italy. In the close relationship with satirical poem of Les Z'ragiques, in which the author brands | that country which France had during the early years of the factions, corruptions, and persecutions of the

time, and | the century, Italian translations of the classical masterpieces in which there are to be found Alexandrines of a strength, | were easily imported. Soon French translations were vigour, and original cadence hardly to be discovered else- | made afresh of the Llectra, the Hecuba, the Iphigenia in where, save in Corneille and Victor Hugo. Towards the | Audis, and the French humanists hastened to compose end of the century Desportes (1546-1606) and Bertaut | original tragedies on the classic model. . It was impossible (1552-1611), with much enfeebled strength, but with a | that the Pléiade should not eagerly seize such an oppor- certain grace, continue the Ronsardizing tradition. Among | tunity of carrying out its principles, and one of its members, their contemporaries must be noticed Passerat (1534-1602), | Jodelle (1532-1573), devoting himself mainly to dramatic a writer of much wit and vigour and rather resembling | composition, fashioned at once the first tragedy, Cléopatre, Regular Marot than Ronsard, and Vauquelin de la Fresnaye (1536— | and the first comedy, Hugene, thus setting the example tragedy 1606), the author of a valuable Ars Poetica and of the first | of the style of composition which for two centuries and Coa French satires which actually bear that title. Jean le Houx | a half Frenchmen were to regard as the highest effort op" (fl. ctr, 1600) continued, re-wrote, or invented the vaux de | literary ambition. The amateur performance of these vire, commonly known as the work of Olivier Basselin, and | dramas by Jodelle and his friends was followed by a | already alluded to, A curious poetical trio is also formed | Bacchic procession after the manner of the ancients, which at this time by Guy du Faur de Pibrac (1529-1584), | caused a great deal of scandal, and was represented by both Antoine Faure (1557-1624), and Pierre Mathieu (b. 1563), | Catholics and Protestants as a pagan orgie. The Cléopatre all authors of moral quatrains, which were learnt by heart | is remarkable as being the first French tragedy, nor is it in the schools of the time, replacing the distichs of the | destitute of merit. It is curious that in this first instance grammarian Cato, which, translated into French, had served | the curt antithetic oreyouvOia, which was so long character- the same purpose in the Middle Ages. istic of French plays and plays imitated from them, and Regnier. ©The nephew of Desportes, Mathurin Regnier, marks the | which Butler ridicules in his Dialogue of Cat and Puss,

The Ron-

sardists.

more powerfully and more beneficially by a small literary clique than the language of France was influenced by the example and disciples of that Ronsard whom for two cen- turies it was the fashion for the Malherbes and the Boileaux, and those who took their cue from them, to deride and decry.

In a sketch such as the present it is impossible to give a separate account of individual writers, the more important of whom will be found treated under their own names. The effort of the Pléiade proper was continued and partaken by a considerable number of minor poets. Olivier de Magny (d. 1560) and Louise Labé (b, 1526) were poets and lovers, the lady deserving far the higher rank in literature. There is more depth of passion in the writings of "La Belle Cordiére," as this Lyonnese poetess was called, than in almost any of her contemporaries. Jacques Tahureau (1527-1555) scarcely deserves to be called a minor poet. 'There is less than the usual hyperbole in the contemporary comparison of him to Catullus, and he reminds an Englishman of the school represented nearly a century later by Carew, Randolph, and Suckling, though he possesses a sincerity and truth superior to anything to be found in those poets. The title of a part of his peems—AMignardises de ? Admirée— is characteristic both of the style and of the time. Doublet, Jamyn (1540-1605), and Delataille (1528-1590) deserve mention at least as poets, but two other writers require a

end, and at the same time perhaps the climax, of the poetry of the century. A descendant at once of the older Gallic spirit of Villon and Marot, in virtue of his consummate acuteness, terseness, and wit, of the school of Ronsard by his erudition, his command of language, and his scholarship, Regnier is perhaps the best representative of French poetry at the critical time when it had got together all its

materials, had lost none of its native vigour and force, and had not yet submitted to the cramping and numbing rules and restrictions which the next century introduced. The satirical poems of Regnier, and especially the admirable epistle to Rapin, in which he denounces and rebuts the critical dogmas of Malherbe, are models of nervous strength, while some of the elegies aud odes contain expression not easily to be surpassed of the softer feelings of affection and regret. No poet has had more influence on the revival of French poetry in the last half-century than Regnier.

16th Century Drama.—The change which dramatic poetry underwent during the 16th century was at least as remarkable as that undergone by poetry proper. The first half of the period saw the end of the religious mysteries, the licence of which had irritated both the parliament and the clergy. Louis XIL, at the beginning of the century, was far from discouraging the disorderly but popular and powerful theatre in which the Confra- ternity of the Passion, the clerks of the Bazoche, and the Enfans sans Souci enacted mysteries, moralities, soties, and farces. He made them, indeed, an instrument in his quarrel with the papacy, just as Philippe le Bel had made use of the allegorical poems of Jehan de Meung and his fellows. Under his patronage were produced the chief works of Gringore (1474-1534), by far the most remark- able writer of this class of composition, His Prince des

already appears. There appears also the grandiose and smooth but stilted declamation which came rather from the imitation of Seneca than of Sophocles, and the tradition of which was never to be lost. Cléopatre was followed by Didon, which, unlike its predecessor, is entirely in alex- andrines, and observes the regular alternation of masculine and feminine rhymes. Jodelle was followed by Grévin

Garnier.

Larivey.

(1540-1570) with a Mort de César, which shows an improve- ment in drarnatic art, by Jacques de la Taille and others, such as Pierre Mathieu,

who is strongly moral, and Jean de la Taille brotlier of Jacques. A very different poet from all these is Robert Garnier (1545-1601). Garnier is the first tragedian who deserves a place not too far below Rotrou, Corneille, Racine, Voltaire, and Hngo, and who may be placed in the same class with them. He chose his subjects indifferently from classical, sacred, and medieval literature. Sédécie, a play dealing with the capture of Jerusalem by Nebuchadnezzar is held to be his masterpiece, and Brada- mante deserves notice because it is the first tragi-comedy of raerit in French, and because the famous confidant here makes his first appearance. Garnier's successor, Antoine de Monchrétien (d. 1621), set the example of dramatizing con- temporary subjects. His masterpiece is L' Ecossaise, the first of many dramas on the fate of Mary Queen of Scots. While tragedy thus clings closely to antique models, comedy, as might be expected in the country of the fabliaux, is more independent. Italy had already a comic school of some originality, and the French farce was too vigorous and lively a production to permit of its being entirely overlooked. The Pléiade and their imitators made endeavours, without inuch success, to write comedies on tlie classical model, but the first comic writer of great merit was Pierre Larivey (1540-1611) (Giunto), an Italian by descent. Most if not all of his playsare founded on Italian originals, but the adaptations are made with the greatest freedom, and deserve the title of original works. The style is admirable, and the skilful management of the action contrasts strongly with the languor, the awkward adjustment, and the lack of dramatic interest found in contemporary tragedians. 16th Century Prose Fiction.—Great as is the importance of the 16th century in the history of French poetry, its importance in the history of French prose is greater still. In poetry the Middle Ages could fairly hold their own with any of the ages that have succeeded them. Tlie epics of chivalry whether of the cycles of Charlemagne, Arthur, or the classic heroes, not to mention the mis- cellancous romans d'aventures, have indeed more than held their own. Both relatively and absolutely the Franciade of the 16th century, the Pucelle of the 17th, the Henriade of the 18th, cut a very poor figure beside Roland and Percivale, Gerard de Roussillon, and Parth- enopex de Blois. "The romances, ballads, and pastourelles, signed and unsigned, of medizeval France were not merely the origin, but in some respects the superiors, of the lyric poetry which suceceded them. Thibaut de Champagne, Charles d'Orléans, and Villon need not vail their crests in any society of bards. The

charming forms of the rondel, the rondeau, and the ballade have won admiration from every competent poet and critic who has known them, The fabliaux give something more than promise of La Fontaine, and the two great compositions of the Loman du Renart and the Roman de la Rose, despite their faults and their alloy, will always command tlie admiration of all persons of taste and judginent who take the trouble to study them. But while poetry had in the Middle Ages no reason to blush for her French representatives, prose (always the younger aud less forward sister) had far less to boast of. With the ex- ception of chronicles and prose romances, no prose works of any real importance can be quoted before the end of the loth century, and even then the chief if not the only place of importance must be assigned to the Cent Nouvelles Nouvelles, a work of admirable prose, but necessarily light in character, and not yet demonstrating the efficacy of the French language as a medium of expression for serious and weighty thought. Up to the time of the Renaissance and ce es reformation, Latin had, as we have already arked, been considered the sufficient and natural organ

for this expression. In France as in other countries the disturbance in religious thought may undoubtedly claim the glory of having repaired this disgrace of the vulgar tongue, and of having fitted and taught it to express whatever thoughts the theologian, the historian, the philosopher, the politician, and the savant had occasion to utter. But the use of prose as a vehicle for lighter themes was more con- tinuous with the literature that preceded, and serves as a natural transition from poetry and the drama to history and science. Among the prose writers, therefore, of the 16th century we shall give the first place to the novelists and romantic writers.

Among these there can be no doubt of the precedence, in Rabelais, |

every sense of the word, of Francois Rabelais (1495 1-1553). No detailed account can here be attempted of this extra- ordinary person, the one Freuch writer whom critics the least inclined to appreciate the cliaracteristics of French literature have agreed to place among the few

great writers of the world, and not far from Shakespeare and Dante. Immense ingenuity and research have been spent on the task of determining the origin and indebtedness of Gargantua and Pantagruel. It is sufficient to say that their form is roughly that of a prose roman d'aventures, that Gargan- tua is taken in outline from a burlesque romance of the same name, and that Panurge, who rather than Pantagruel is the hero of the second part, has some resemblance to Cingar, a personage of the macaronic poem of the Italian, Merlinus Coccaius or Folengo. But the borrowings of Rabelais are of little more importance than the borrowings of Shakespeare. With an immense erudition representing almost the whole of the knowledge of his time, with an untiring faculty of invention, with the judgment of a philo- sopher, and the common sense of a man of the world, with an observation that let no characteristic of tlie time pass unobserved, and with a tenfold portion of the special Gallic gift of good-humoured satire, Rabelais united a height of speculation and depth of insight and a vein of poetical imagination rarely found in any writer, but altogether por- tentous when taken in conjunction with his other character- istics. His great work has been taken for an exercise of transcendental philosophy, for a concealed theological polemic, for an allegorical history of this and that person- age of his time, for a merely literary utterance, for an attempt to tickle the popular ear and taste. It is all of these, and it is none,—all of them in parts, none of them in deliberate and exclusive intention. It may perhaps be called the exposition and commentary of all the thoughts, feelings, aspirations, and knowledge of a particular time and nation put forth in attractive literary form by a man who for once combined the practical and the literary spirit, the power of knowledge and the power of expression. The work of Rabelais is the mirror of the 16th century in France, reflecting at once its comeliness and its uncomeli- ness, its high aspirations, its voluptuous appetites, its poli- tical and religious dissensions, its keen criticism, its eager appetite and hasty digestion of learning, its gleams of poetry, and its ferocity of manners. In Rabelais we can divine the Pléiade and Marot, the Cymbalum Mundi and Montaigne, Amyot and the Amadis, even Calvin and Duperron ; and if in this lengthy mention of the curate of Meudon we have broken through our principle of allotting only scanty notice to individual authors, his unique repre- sentative character must be pleaded in excuse.

It was inevitable that such extraordinary works as Gar- gantua and Pantagruel should attract special imitators in the direction of their outward form. It was also inevitable that this imitation should frequently fix upon these Rabel- aisian characteristics which are least deserving of imitation, and most likely to be depraved in the hands of imitators. It fell within the plan of the master to indulge in what has

Des

Periers.

The Hep- tameron.

Amadis of Gaul.

been called fatrasze, the huddling together, that is to say, of a medley of language and images which is best known to English readers in the not always successful following of Sterue. It pleased him also to disguise his naturally terse, strong, and nervous style in a burlesque envelope of redun- dant language, which is partly ironical, partly the result of superfluons erudition, and partly that of a certain childish wantonness and exuberance, which is one of his raciest and pleasantest characteristics. In both these points he was somewhat corruptly followed. But fortunately the roman- cical writers of the 16th century had not Rabelais for their sole model, but were also influenced by the simple and straightforward style of the Cent Nowvelles Nowvelles and the Histoire des Sept Sages. The joint influence gives us some admirable work. Nicholas of Troyes, a saddler of Champagne, came too early to copy Rabelais. But Noel du Fail (1520-1591), a judge at Rennes, shows the double in- fluence in his Propos Rustiques and Contes d Lutrapel, both of which are lively and well-written pictures of contem- porary life and thought, as the country magistrate actually saw anddealt with them. In 1558, however, appeared two works of far higher literary and social interest. These are the Heptameron of the queen of Navarre, and the Contes et Joyeux Devis of Bonaventure des Periers (1500-1544). Des Periers, who was a courtier of Marguerite's, is thought to have had a good deal todo with the first-named work as well as

with the second. Indeed, not merely the queen's prose works, but also the poems gracefully entitled Les Marguerites de la Marguerite, are often attributed to the literary men whom the sister of Francis I. gathered round her. However this may be, some single influence of power euough to give unity and distinctness of savour evidently presided over the composition of the Heptameron. Composed as itis on the model of Boccaccio, its tone and character are entirely different, and few works have a more individual charm. The 7Z'ales of Des Periers are shorter, simpler, and more homely ; there is more wit in them and less refinement. But both works breathe more powerfully perhaps than any others the peculiar mixture of cultured and poetical volup- tuousness with a certain religiosity and a vigorous spirit of action which characterizes the French Renaissance, and dis- tinguishes it equally from the effeminate languor and mere bookishness of the earlier Italian movement and the more serious, sterner, and almost uncouth characteristics of the later poetical outburst in England. Later in time, but too closely connected with Rabelais in form and spirit to be here omitted, came the Moyen de Parvenir of Béroalde de Verville (1550-1612), a singular fatrasie, uniting wit, wis- dom, learning, and indecency, and crammed with anecdotes which are always amusing though rarely decorous.

At the same time a fresh vogue was given to the chival- ric romance by Herberay's translation of Amadis de Gaula, French writers, relying partly on tradition and partly on a general assumption that the romance of chivalry is essen- tially French in origin, have supposed a French original for the Amadis in some lost roman d'aventures. It is of course impossible to say that this is not the case, but there is not one tittle of evidence to show that it is, and there seems no reason to doubt the accepted statement that Vasco de Lobeira wrote a lost Portuguese original in the 14th cen- tury, which Garciordoiiez de Montalvo adapted in Spanish a century later. Montalvo found many continuators, and the adventures of Amadis were prolonged through genera- tion after generation of his descendants. This vast work Herberay in 1540 undertook to translate or re-translate, but it was not without the assistance of several followers that the task was completed. Southey has charged Herberay with corrupting the simplicity of the original, a charge which does not concern us here. It is sufficient to say that the French Amadis is an excellent piece of literary work,

and that Herberay deserves no mean place among the fathers of French prose. His book had an immense popu- larity ; it was translated into many foreign languages, and for some time it served as a favourite reading book for foreigners studying French. Nor is it to be doubted that the romancers of the Scudéry and Calprenéde type in the next century were much more influenced both for good and harm by these Amadis romances than by any of the earlier tales of chivalry.

16th Century Historians,—As in the case of the tale- tellers so in that of the historians, the writers of the 16th ceutury had traditions to continue It is doubt- ful indeed whether many of them can risk comparison as artists with the great names of Villehardouin and Join- ville, Froissart and Comines. The 16th century, how- ever, set the example of dividing the functions of the chronicler, setting those of the historian proper on one side, and of the anecdote-monger and biographer on the other. The efforts at regular history made in this century were not of the highest value. But on the other hand the practice of memoir-writing, in which the French were to ex- cel every nation in the world, and of literary correspondence, in which they were to excel even their memoirs, was solidly fonnded.

One of the earliest historical writers of the century was Claude de Seyssel (1450-1520), whose history of Louis XII. aims not unsuccessfully at style. But it is not till close upon the end of the century that much effort was made at methodical history. Only one work falls properly to be mentioned here, and that is Du Haillan's (1537-1610) Histoire de France, a history composed on Thucydidean principles, but Thucydidean principles transmitted through the successive mediums of Polybius, Guicciardini, and Paulus Amilius. The instance invariably quoted after Thierry of Du Haillan's method is his introduction, with appropriate speeches, of two Merovingian statesmen, who argue out the relative merits of monarchy and oligarchy on the occasion of the election of Pharamond. Besides Du Haillan, La Popeliniére (fl. 1580), who less ambitionsly attempted a history of Europe during his own time, and ex- pended immense labour on the collection of information and materials, deserves mention.

There is no such poverty of writers of memoirs. La Mark Du Bellay, Marguerite d'Angouléme, Villars, Tavannes, La Tour d'Auvergne, and many others, composed commentaries and autobiographies. Vincent Carloix (fl. 1550), the secretary of the Marshal de Vielleville, composed some memoirs abounding in detail and incident. But there are four collections of memoirs concerning this time which far exceed all others in interest and importance. The turbu- lent dispositions of the time, the loose dependence of the nobles and even the smaller gentry on any single or central authority, the rapid changes of political situations, and the singularly active appetite, both for pleasure and for busi- ness, for learning and for war, which distinguished the French gentleman of the 16th century, place the memoirs of Lanoue (1531-1591), Monluc (1503-1577), D'Aubigné, and Brantéme (1540-1614) almost at the head of the literature of their class. The name of the latter, indeed, is known to all who have the least tincture of French litera- ture, aud the works of the others are not inferior in interest, and perhaps superior in spirit and conception, to the Dames Galantes, tlie Grands Capitaines, and the Lfommes Jllustres. The commentaries of Monluc, which Henri Quatre is said to have called the soldier's Bible, are exclusively military, and deal with affairs only. Monlue was governor in Guienne, where he repressed the savage Huguenots of the south with a savagery worse than their own. He was, however, a partisan of order, not of Catholicism. He hung and shot both parties with perfect impartiality, and refused

Bran- tome.

Calvin.

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to have anything to do with the massacre of St Bartholomew. Though he was a man of no learning, his style is excellent, being vivid, flexible, and straightforward. Lanoue, who was a moderate in politics, has left his principles reflected in his memoirs. D'Aubigné, so often to be mentioned, gives the extreme Huguenot side as opposed to the royalist partisan- ship of Monluc and the via media of Lanoue. Brantome, on the other hand, is quite free from any political or religi- ous prepossessions, and, indeed, troubles himself very little about any such matters. He is the shrewd and somewhat

cynical observer, moving through the crowd and taking note of its ways, its outward appearance, its heroisms, and its follies. It is really difficult to say whether the recital of a noble deed of arms or the telling of a scandalous story about a court lady gave him the most pleasure, and impos- sible to say whiclt he did best. Certainly he had ample material for both exercises in the history of his time.

The branches of literature of which we have just given an account may be fairly connected, from the historical point of view, with work of the same kind that weut before as well as with work of the same kind that followed them. It was not so with the literature of theology, law, politics, and erudition, which the 16th century also produced, and with which it for the first time enlarged the range of com- position in the vulgar tongue. Not only had Latin been in- variably adopted as the language of composition on such sub- jects, but the style of the treatises dealing with such matters had been traditional rather than original. In speculative philosophy or metaphysics proper, even this century did not witness a great development ; perhaps, indeed, such a devel- opment was not to be expected until the minds of men had in some degree settled down from their agitation on more prac- tical matters. It is not without significance that Calvin (1509-1564) is the great figure in serious French prose in the first half of the century, Montaigne the corresponding figure inthe second half. After Calvin and Montaigne we expect Descartes.

16th Century Theclogians.—In France, as in all other countries, the Reformation was an essentially popular movement, though from special causes, such as the ab- sence of political homogeneity, the nobles took a more active part both with pen and sword in it than was the case in England. But the great text book of the French Reformation was not the work of any noble. Calvin's Institution of the Christian Religion is a book equally remarkable in matter and in form, in circumstances and in result. I tis the first really great composition in argumentative French prose. Its severe logic and careful arrangement had as much influence on the manner of future thought, both in France and the other regions whither its widespread popularity carried it, as its style had on the expression of such thought. It was the work of a man of only seven-and-twenty, and it is impossible to exaggerate the originality of its manner when we remember

that hardly any models of French prose then existed except tales and chronicles, which required and exhibited totally differ- ent qualities of style. It is indeed probable that had not the /nstitution been first written by its author in Latin, and afterwards translated by him, it might have had less dignity and vigour ; but it must at the same time be remembered that this process of composition was at least equally likely in the hands of any but a great genius to produce a heavy and pedantic style neither French nor Latin in character. Something like this result was actually produced in some of Calvin's minor works, and still more in the works of many of his followers, whose lumbering language gained for ce in _ to their exile from France, the title of – "a r et . Oe ie te the use of the vulgar tongue importance ns ~ and the possession of a work of such

erein, gave the Reformers an immense

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advantage which their adversaries were some time in neut- ralizing. Calvin was much helped by Pierre Viret (1511- 1571), who wrote a large number of small theological and moral dialogues, and of satirical pamphlets, destined to captivate as well as to instruct the lower people. The more famous Beza (1519-1605) wrote chiefly in Latin, but he composed in French an ecclesiastical history of the Reformed churches and some translations of the Psalms. Marnix de St Aldegonde (1530-1593), a gentleman of Brabant, fol- lowed Viret as a satirical pamphleteer on the Protestant side. On the other hand, the Catholic champions at first affected to disdain the use of the vulgar tongue, and their pamphleteers, when they did attempt it, were unequal to the task. Towards the end of the century a more decent war was waged with Du Plessis Mornay (1549-1623) on the Protestant side, whose work is at least as much directed against freethinkers and enemies of Christianity in general as agaiust the dogmas and discipline of Rome. His adver- sary, the redoubtable Cardinal du Perron (1556-1618), who, originally a Calvinist, went over to the other side, employed French most vigorously in controversial works, chiefly with reference to the eucharist. Du Perron was celebrated as the first controversialist of the time, and obtained dialectical victories over all comers. At the same time the bishop

of Geneva, St Francis of Sales (1568-1622), supported the Catholic side, partly by controversial works, but still more by his devotional writings. The Jntroduction to a Devout Life, which, though actually published early in the next century, had been written sometime previously, shares with Calvin's Jnstitution the position of the most important theological work of the period, and is in remarkable contrast with it in style and sentiment as well as in principles and plan. It has indeed been accused of a certain effeminacy, the appearance of which is in all probability mainly due to this very contrast. The 16th century does not, like the 17th, distinguish itself by literary exercises in the pulpit. The furious preachers of the League, and their equally violent opponents, have no literary value.

16th Century Moralists and Political Writers.—The religious dissensious and political disturbances of the time could not fail to exert an influence on ethical and philosophical thought. Yet, as we have said, the century was not prolific of pure philosophical speculation. Tlie scholastic tradition, though long sterile, still survived, and with it the habit of composing in Latin all works in any way connected with philosophy. The logic of Ramus in 1555 is cited as the first departure from this rule. Other philosophical works are few, and chiefly express the doubt and the freethinking which were characterstic of the time. This doubt assumes the form of positive religious scepticism only in the Cymbalum Mundi of Bonaventure des Periers, a remarkable series of dialogues which excited a great storm, and ultimately drove the author to commit suicide. The OCymbalum Mundi is a curious anticipation of the 18th century. The literature of doubt, however, was to receive

its principal accession in the famous essays of Montaigne Mon- Tt would be a mistake to imagine the exist- taigne.

(1533-1592).

ence of any sceptical propaganda in this charming and popular book. Its principle is not scepticism but egotism ; and as the author was profoundly sceptical, this quality necessarily rather than intentionally appears. We have here to deal only very superficially with this as with other famous books, but it cannot be doubted that it expresses the mental attitude of the latter part of the century as completely as Rabelais expresses the mental

attitude of the early part. There is considerably less vigour and life in this attitude. Inquiry and protest have given way to a placid conviction that there is not much to be found out, and that it does not much matter; the erudition though abundant is less indiscriminate, and is taken in and given

out with less gusto; exuberant drollery has given way to quiet irony ; and though neither business uor pleasure is decried, they are regarded rather as useful pastimes incident to the life of man than with the eager appetite of the Renaissance. From the purely literary point of view, the style is remarkable from its absence of pedantry in construc- tion, and yet for its rich vocabulary and picturesque bril- liancy. The follower and imitator of Montaigne, Pierre Charron (1541-1603), carried his master's scepticism to a somewhat more positive degree. His principal book, De la Sagesse, scarcely deserves the comparative praise which Pope has given it. On the other hand Du Vair (1556- 1621), a lawyer and orator, takes the positive rather than the negative side in morality, and regards the vicissitudes in human affairs from the religious and teleological point of view in a series of works written in a style less diffuse than that of Montaigne, and characterized by the special merits which the style of great orators often though not always has when they betake themselves to literary composition.

The revolutionary and innovating instinct which showed. itself in the 16th century with reference to church govern- ment and doctrine, and even in some respects with regard to religious principles generally, spread naturally enough to political matters. The intolerable misgovernment which prevailed during the greater part of the century in France in consequence of religious dissensions, naturally set the thinkers of the age speculating on the doctrines of govern- ment in general, The favourite and general study of anti- quity helped this tendency, and the great accession of royal power in all the nionarchies of Europe invited a specula- tive if not a practical reaction. The persecutions of the Protestants naturally provoked a republican spirit among them, and the violent antipathy of the League to the houses of Valois and Bourbon made its partisans adopt almost openly the principles of democracy and tyrannicide.

The greatest political writer of the age is Jean Bodin (1550-1596), whose République is founded partly on specu- lative considerations like the political theories of the an- cients, and partly on an extended historical inquiry. Bedin, like most lawyers who have taken the royalist side, is for unlimited monarchy, but notwithstanding this, he condemns religious persecution and discourages slavery. In his specu- lations on the connexion between forms of government and natural causes, he serves as a link between Aristotle and Montesquieu. On the other hand, the causes which we have mentioned made a large number of writers adopt opposite conclusions. Etienne de la Boétie (1530-1563), the friend of Montaigne's youth, composed the Contre Un or Discours dela Servitude Volontaire, a protest against the monarchical theory. The bolduess of the protest and the affectionate admiration of Montaigne, have given La Boétie a much higher reputation than any extant work of his actually deserves. The Contre Un is a kind of prize essay, full of empty declamation borrowed from the ancients, and showing no grasp of the practical conditions of politics. Not much more historically based, but far more vigorous and original, is the Franco-Gallia of Hotmann, a work which appeared both in Latin and French, which extols the authority of the states-general, and represents them as direct successors of the political institutions of Gauls and Franks. In the last quarter of the century political animosity knew no bounds. 'he Protestants beheld a divine instrument in Poltrot de Méré, the Catholics in Jacques Clément. The Latin treatises of Languet and Buchanan formally vindi- cated the first the right of rebellion, the second the right of tyrannicide. Indeed, as Montaigne confesses, divine authorization for political violence was claimed and denied by both parties acccording as the possession or the expect- ancy of power belonged to each, and the excesses of the preachers and pamphleteers knew no bounds.

Every one, however, was not carried away. The literary

merits of the Chancellor Hdpital (1503-1575) are not very great, but his efforts to promote peace aud moderation were unceasing. On the other side

Lanoue, with far greater literary gifts, pursued the same ends, and pointed out the ruinous consequeuces of continued dissension.

Du Plessis Mornay took a part in political discussion even more im-

portant than that which he bore in religious polemics, and

was of the utmost service to Henri Quatre in defending his

cause against the League, as was also Hurault, another

author of state papers. Du Vair, already mentioned, powerfully assisted the same cause by his successful defence of the Salic law, the disregard of which by the Leaguer states-general was intended to lead to the admission of the Spanish claim to the crown. But the foremost work

against the League was the famous Satire Menippee, in a Satire literary point of view one of the most remarkable of poli- Menippée.

tical works. The Jfenippée was the work of no single author, but was due, it is said, to the collaboration of five, Leroi, Gillot, Chrétien, Rapin, and Pithou, with some assistance in verse frum Passerat. The book is a kind of burlesque report.of the meeting of the states-general, called for the purpose cf supporting the views of the League in 1593. It gives an account of the procession of opening, and then we have the supposed speeches of the principal characters,—the Ducde Mayenne, the papal legate, the rector of the university (a ferocious Leaguer), and others. But by far the most remarkable is that attributed to Claude d'Aubray, the leader of the 7%ers Etat, in which all the evils of the time and the malpractices of the leaders of the League are exposed and branded. The satire is extra- ordinarily bitter and yet perfectly good-humoured. It re- sembles in character rather that of Butler, who unquestion- ably imitated it, than any other. The style is perfectly suited to the purpose, having got rid of almost all vestiges of the cumbrousness of the older tongue without losing its picturesque quaintness. It is no wonder that, as we are told by contemporaries, it did more for Henri Quatre than all other writings in his cause. In connexion with politics some mention of legal orators and writers may be necessary. Tn 1539 the ordinance of Villers-Cotterets enjoined the ex- clusive use of the French

language in legal procedure. The bar and bench of France during the century produced, however, besides those names already mentioned in other connexions, only one deserving of special notice, that of Etienne Pasquier, author of a celebrated speech against the right of the Jesuits to take part in public teaching. This he inserted in his great work, Recherches de la France, a work dealing with almost every aspect of French history whether political, antiquarian, or literary.

16th Century Savants.—One more division, and only one, that of scientific and learned writers pure and simple, remains. Much of the work of this kind during the period was naturally done in Latin, the vulgar tongue of the learned. But in France, as in other countries, the study of the classics led to a vast number of trans- lations, and it so happened that one of the translators deserves aS a prose writer a rank among the highest. Many of the authors already mentioned contributed to the literature of translation. Des Periers translated the Platonic dialogue Lysis, La Boétie some works of Xenophon and Plutarch, Dn Vair the De Corona, the In Ctesiphontem, and the Pro Milone. Sulel attempted the Iliad, Belleau the false Anacreon, Baif some plays of Plautus and Terence. Besides these Lefevre gave a version of the Bible, Saliat one of Herodotus, and Louis Leroi, not to be confounded with the part author of the Menippée, many works of Plato, Aristotle, and other Greek writers. But while most if not all of these translators owed the merits of their work to their originals, and deserved, much

more deserve, to be read only vy those to whom those originals are sealed, Jacques Amyot (1513-1591), bishop of Auxerre, takes rank asa French classic by his transla- tions of Plutarch, Longus, and Heliodorus. The admiration which Amyot excited in his own time was immense. Montaigne declares that it was thanks to him that his con- temporaries knew how to speak and to write, and the Academy in the next age, though not too much inclined to lonour its predecessors, ranked him as a model. His Plutarch which had an enormous influence at the time, and coloured perhaps more than any classic the thoughts and writings of the 16th century, both in French and English, was then considered his masterpiece. Now-a-days per-

haps, and from the purely literary standpoint, that position would be assigned tu his exquisite version of the exquisite story of Daphnis and Chloe. It is needless to say that absolute tidelity and exact scholarship are not the pre- eminent merits of these versions. They are not philo- logical exercises, but works of art. We have already had occasion to mention Jean le Maire des Belges. His [dlustra- tions des Gaules is an antiquarian rather than an historical work, which assembles or inventsa mass of fables about the origin of Franks and Gauls, and a group of antiquarian writers of the history of different provinces followed his lead. On the other hand, Claude Fauchet, in two anti- quarian works,

two whole centuries, and to determine, not merely the language and complexion, but also the form of French verse during the whole of that time. Accidentally, or as a matter of logical consequence (it would not be proper here to at- tempt to decide the question), poetry became almost synony- mous with drama. It is true, as we shall have to point out, that there were, in the early part of the 17th century at least, poets, properly so called, of no contemptible merit. But their merit, in itself respectable, sank in comparison with the far greater merit of their dramatic rivals. Théo- phile de Viau and Racan, Voiture and St Amand, cannot for a moment be mentioned in the same rank with Rotrou, still less with Corneille. It is certainly curious, if it is not something more than curious, that this decline in poetry proper should have coincided with the so-called reforms of Malherbe. more gifted Boileau was at one time all-powerful in France, and, notwithstanding the romantic movement, is still strong. In rejecting a Jarge number of the importations of the Ronsardists, he certainly did good service. But it is difficult to avoid ascribing in great measure to his influence the origin of the chief faults of modern French poetry, and modern French in general, as compared with the older language. Like Pope, he sacrificed everything to " correct- ness," and, unluckily for French, the sacrifice was made at a time when no writer of an absolutely supreme order had yet appeared in the language. With Shakespeare and Milton, not to mention scores of writers only inferior to them, safely garnered, Pope and

his followers could do us little harm. Corneille and Moliére unfortunately came after Malherbe. Yet it would be unfair to this writer, however badly we may think of his influence, to deny hin talent, and even a certain amount of poetical inspiration. He had not felt his own influence, and the very influences which he despised and proscribed produced in him much tolerable and some admirable verse, thougli he is not to be named as a poet with Regnicr, who had the courage, the sense, and the good taste to oppose and ridicule his innova- tions. Of Malherbe's school, which was numerous, Racan (1589-1670) and Maynard (1582-1646) were the most re- markable. The former was a true poet, though not a very strong one. Like his master, he is best when he follows the models whom that master contemned. Perhaps more than any other poet, he set the example of the classical alex- andrine, the smooth and melodious but monotonous and rather efferninate measure which Racine was to bring to the highest perfection, and which his successors, while they could not improve its smoothness, were to make more and more monotonous until the genius of Victor Hugo once more broke up its facile polish, suppled its stiff uniformity, and introduced vigour, variety, colour, and distinctness in the place of its feeble sameness and its pale indecision. But the vigour, not to say the licence, of the 16th century could not thus die all at once. In Théophile de Viau (1590- 1626) the early years of the 17th century had their Villon. The later poet was almost as unfortunate as the earlier, and almost as disreputable, but he had a great share of poetical power. The étotle enragée under which he complains that he was born, was at least kind to him in this respect ; and his readers, after he had been forgotten for two centuries, have once more done him justice. Racan and Théophile were followed in the second quarter of the century by two schools which sufficiently well represented the tendencies of each. The first was that of Voiture (1598-1648), Benser- ade (1612-1691), and other poets who were connected more or less with the famous literary céterie of the Hotel de Rambouillet. Théophile was less worthily succeeded by a class, it can hardly be called a school, of poets, some of whom, like St Amand (1594-1660), chiefly wrote drinking songs and sch like productions; others, like Scarron

The tradition of respect for this elder and Malherbe,

inn. as

(1610-1660) and Sarrasin (1603-1654), devoted them- selves rather to burlesque of serious verse. Most of the great dramatic authors of the time also wrote miscellaneous poetry, and there was even an epic school of the most singular kind, in ridiculing and discrediting which Boileau for once did undoubtedly good service. The Pucelle of Chapelain (1595-1674), the unfortunate author who was deliberately trained and educated for a poet, who enjoyed for some time a sort of dictatorship in French literature on the strength of his forthcoming work, and at whom from the day of its publication every critic of French literature has agreed to laugh, was the most famous and perhaps the worst of these. But Scudéry (1601-1667) wrote an Alaric, the Pére le Moyne (1602-1671) a S¢ Louis, and St Amand a Moise, which are not much better, though Théophile Gautier in his Grotesyues has valiantly defended these and other contemporary versifiers. St Amand, indeed, was capable of writing excellent poetry in other styles, and not seldom actually produced such. Some of the lighter poets and classes of poetry just alluded to also produced some remarkable verse. The Précieuses of the Hotel Rambouillet, with all their absurdities, encouraged if they did not produce good literary work. In their society there is no doubt that a great reformation of manners took place, if not of morals, and that the tendency to literature elegant and polished, yet not destitute of vigour, which marks the 17th century, was largely developed side by side with much scandalmongering and anecdotage. Many of the authors whom these influences inspired, such as Voiture, St Evre- mond, and others, have been or will be noticed. But even such poets and wits as Sénecé (1643-1737), Segrais (1624-1701), Charleval, Godeau (1605-1672), Gombaud (1570-1666), are not without interest in the history of literature; while if Cotin (1604-1682) sinks below this level, Menage (1630-1692) certainly rises above it, not- withstanding Moliére's satire. Ménage's name naturally suggests the Ana which arose at this time and were long fashionable, stores of endless gossip, sometimes providing instruction and often amusement. The G'wirlande de Julre, in which most of the poets of the time celebrated Julie d'Angennes, daughter of the Marquise, is perhaps the best of all such albums, and Voiture, the typical poet of the cdterie, was certainly the best writer of vers de société who is known tous. The poetical war which arose between the Uranistes, the followers of Voiture, and the Jobistes, those of

Benserade, produced reams of sonnets, epigrams, and similar verses. This habit of occasional versification con- tinued long. It led as a less important consequence to the rhymed Gazettes of Loret, which recount in octosyllabic verse of a light and lively kind the festivals and court events of the early years of Louis XIV. It led also to perhaps the most remarkable non-dramatic poetry of the century, the Contes and Fables of La Fontaine (1621-1695). No French writer is better known than La Fontaine, and there is no need to dilate on his merits. It has been well said that he completes Moliére, and that the two together give something to French literature which no other litera- ture possesses. Yet La Fontaine is after all only a writer of fabliaux, in the language and with the manners of his own century.

All the writers we have mentioned belong more or less to the first half of the century, and so do Conrart, Furetiére, Chapelle, Desmarets, and others not worth special mention. The latter half of the century is far less productive, and the poetical quality of its production is even lower than the quantity. In it Boileau (1636-1711) is the chief poetical figure. Next to him can ouly be mentioned Madame Deshouliéres (1638-1694), Brébeuf, the translator of Lucan, Quinault (1655-1688), the composer of opera libretti. it is almost impossible to call either of these writers poets,

with the doubtful exception of Quinault. The denunciation Boileau. of Boileau as a versifier whose best verses are those of a promising sixth-form boy, and his worst those of an un- promising boy in the third form, is not epigram or exag- geration. His satire, where it has much merit, is usually borrowed direct from Horace. He had a certain faculty as a critic of the slashing order, and might have profitably used it if he had written in prose. But of his poetry it must be said, not so much that it is bad, as that it is not poetry at all, and the same is generally true of all those who followed him, with the possible exception of J. B. Rousseau, from Chaulieu (1639-1720) and La Fare (1644-1712) to Delille (1738-1813) and Le Brun (1729-1807).

17th Century Drama.—We have already seen how the medizval theatre was formed, and how iu the second half of the 16th century it met with a formidable rival in the classical drama of Jodelle and Garnier. In 1588 mysteries had been prohibited, and with the prohibition of the mysteries the

Confraternity of the Passion lost the principal part of its reason for existence. The other bodies and societies of amateur actors had already perished, and at length the Hotel de Bourgogne itself, the home of the con- fraternity, had been handed over to a regular troop of actors, while companies of strollers, whose life lias been vividly depicted in the Roman Comique of Scarron and the Capitaine Fracasse of Théophile Gautier, wandered all about the provinces. The old farce was for a time main- tained or revived by Tabarin, a remarkable figure in dram- atic history, of whom but little is known. The great dramatic author of the first quarter of the 17th century was Alexandre Hardy (1560-1631), who surpassed even Hey- Hardy. wood in fecundity, and very nearly approached the porten- tous productiveness of Lope de Vega. Seven hundred is put down as the modest total of Hardy's pieces, but not much more than atwentieth of these exist in print. From these latter we can judge Hardy. They aré hardly up to the level of the worst specimens of the contemporary Elizabethan theatre, to which, however, they bear a certain resemblance. Marston's Jnsatiate Countess and the worst parts of Chapman's Bussy d'Ambois may give English readers some notion of them. Yet Hardy was not totally devoid of merit. He imitated and adapted Spanish litera- ture, which was at this time to France what Italian was in the century before and English in the century after, in the most indiscriminate manner. But he had a considerable command of grandiloquent and melodramatic expression, a sound theory if not a sound practice of tragic writing, and that peculiar knowledge of theatrical art and of the taste of the theatrical public which since his time has been the special possession of the French playwright. Tt is instruc- tive to compare the influence of his irregnlar and faulty genius with that of the regular and precise Malherbe. From Hardy to Rotrou is, in point of literary interest, a great step, and from Rotrou to Corneille a greater. Yet the theory of Hardy only wanted the genius of Rotrou and Corneille to produce the latter. Rotrou (1 609-1650) has been called the French Marlowe, and there is a curious likeness and yet a curious contrast between the two poets. The best parts of Rotrou's two best plays, Venceslas and S¢ Rotrou. Glenest, are quite beyond comparison in respect of anything that preceded them, and the central speech of the last-named play will rank with anything in French dramatic poetry. We must, despite the necessity of excluding personal details from this article, add that the noble personal character of this little known French dramatist, his generous acknow- ledgment of Corneille who

succeeded and surpassed him, and the devotion with which he sacrificed his life to his official duty, are almost as admirable as his works. Con- temporary with Rotrou were other dramatic writers of con- siderable dramatic importance, most of them distinguished

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by the faults of the Spanish school, its declamatory rodo- montade, its conceits, and its occasionally preposterous action, Jean de Schélandre (d. 1635) has left us a remark- able work in 7'yr et Sidon. Théophile de Viau in Pyrame et Thisbé and in Pasiphaé produced a singular mixture of the classicism of Garnier and the extravagancies of Hardy. Seudéry in L'Amour Tyrannique and other plays achieved a considerable success. The Marianne of Tristan (1601- 1655) and the Sophonisbe of Mairet (1604-1688) are the chief pieces of theirauthors. Mairet resembles Marston in something more than his choice of subject. Another dramatic writer of some eminence is Du Ryer (1605-1648), But the fertility of France at this moment in dramatic authors was immense; nearly 100 are enumerated in the first quarter of the century. The early plays of Corneille (1606-1684) showed all the faults of his contemporaries combined with merits to which none of them except Rotrou, and Rotrou himself only in part, could lay claim. His first play was J/élite, a comedy, and in Clitandre, a tragedy, he soon produced what may perhaps be not inconveniently taken as the typical piece of the school of Hardy. A full account of Corneille may be found elsewhere. It is suf- ficient to say here that his importance in French literature is quite as great in the way of influence and example as in the way of intellectual excellence. The Crd and the MJen- teur are respectively the first examples of French tragedy and comedy which can be called modern. But this influ- ence and example did not at first find many imitators. Corneille was a member of Richelieu's band of five poets. Of the other four Rotrou alone deserves the

title ; the remain- ing three, Boisrobert, Colletet, and Lestoile, are as dramatists worthy of no notice, nor were they soon followed by others more worthy. Yet before many years had passed the exam- ples which Corneille had set in tragedy and in comedy were followed up by unquestionably the greatest comic writer, and by one who long held the position of the greatest tragic writer of France. Beginning with mere farces of the Italian type, and passing from these to comedies still of an Italian character, it was in Les Précieuses Ridicules, acted in 1659, that Moliere (1622-1673), in the words of a spectator, hit at last on "la bonne comédie." The next fifteen years comprise the whole of his best known work, the finest ex- pression beyond doubt of a certain class of comedy that any literature has produced. The tragic masterpieces of Racine (1639-1699) were not far from coinciding with the comic masterpieces of Moliére, for with the exception of the re- markable aftergrowth of Hsther and Athalie, they were produced chiefly between 1667 and 1677. Both Racine and Molicre fall into the class of writers who require separate mention. Here we can only remark that both to a certain extent committed, and, which is still more to our purpose, set the example of a fault which distinguished much subse- quent French dramatic literature. This was the too great individualizing of one point in a character, and the making the man or woman nothing but a blunderer, a lover, a cox- comb, a tyrant, and the like. The very titles of French plays show this influence,—they are "Le Grondeur," "Le Joueur," &c. The complexity of human character is ignored. This fault distinguishes both Moliére and Racine from writers of the very highest order; and in especial it distinguishes the comedy of Moliére and the tragedy of Racine from the comedy and tragedy of Shakespeare. In all probability this and other defects of the French drama, Which are not wholly apparent in the work of Molitre and pe are shown in their most favourable light in those or dvacine, and appear in all their deformity in the succes- me of the latter, arise from the rigid adoption of the : ote theory of the drama with its unities and other estrictions, especially as transmitted by Horace through

Boileau. This adoption was ve i : ry much due to the influence

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of the French Academy, which was founded in 1629, and The which continued the tradition of Malherbe in attempting Academy, constantly to school and correct, as the phrase went, the somewhat disorderly instincts of the early French stage. It is difficult to say whether the subordination of all other classes of composition to the drama which has ever since been characteristic of French literature was or was not due to the predilection of Richelieu, the main protector, if not exactly the founder of the Academy, for the theatre. Among the immediate successors and later contemporaries of the three great dramatists we do not find any who deserve high rank as tragedians, though there are some whose comedies are more than respectable. It is at least significant that the restrictions imposed by the academic theory on the comic drama were far less severe than those which tragedy had to undergo. The latter was practically confined in respect of sources of attraction to the dexterous manipulation of the unities ; the interest of a plot attenuated as much as possible, and intended to produce, instead of pity a mild sympathy, and instead of terror a mild alarm (for the purists decided against Corneille that 'admiration was not a tragic passion"); and lastly the composition of long tirades of smooth but monotonous verses arranged in couplets tipped with delicately careful rhymes. Only Thomas Corneille (1625-1706), the inheritor of an elder tradition and of a great name, deserves to be excepted from the condemnation to be passed on the lesser tragedians of this period. He was unfortunate in possessing his brother's name, and in being, like him, too voluminous in his com- positions ; but Camma, Ariane, Le Comte d' Essex, are not tragedies to be despised. On the other hand the names of

Campistron (1656-1737) and Pradon (1632-1698) only serve to point injurious comparisons ; Duché (1660-1704) and La Fosse (1653-1708) are of still less importance, and Quinault's tragedies are chiefly remarkable because he had the good sense to give up writing them and to take to opera. The general excellence of French comedy, on the other hand, was sufficiently vindicated. Besides the splendid sum of Moliére's work, the two great tragedians had each, in Le Menteur and Les Plaidewrs, set a capital example to their successors, which was fairly followed. Brueys (1640-1723) and Palaprat (1650-1721) brought out once more the ever new Advocat Patelin. Quinault and Campistron wrote fair comedies. Dancourt (1661-1726), Dufresny (1684-1721), Boursault (1638-1701), were all comic

writers of consider- | able merit. But the chief comic dramatist of the latter I period of the 17th century was Regnard (1655-1709), 1 whose Joueur and Léyatavre are comedies almost of the first ‘ rank.

17th Century Fiction.—In the department of literature which comes between poetry and prose, that of romance } writing, the 17th century, excepting one remarkable de- || velopment, was not very fertile. It devoted itself to so | many new or changed forms of literature that it had no | time to anticipate the modern novel. Yet at the beginning Heroic | of the century one very curious form of romance writing romances. was diligently cultivated, and its popularity, for the time im- | mense, perhaps prevented the introduction of any stronger style, to which at the same time the poetical trifles of the literary céteries, the memoirs of the Fronde, and the dramas of the epoch of Louis XIV. were unfavourable. It is perhaps curious that, as the first quarter of the 17th century was pre-eminently the epoch of Spanish influence in France, the distinctive satire of Cervantes should have been less imitated than the models which Cervantes satirized. How- ever this may be, the romances of 1600 to 1650 form a class of literature vast, isolated, and, perhaps of all such classes of literature, most utterly obsolete and extinct. Taste, affectation, or antiquarian diligence have, at one time or another, restored to a just, and sometimes a more than just,

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measure of repntation most of the literary relics of the past. Romances of chivalry, fabliaux, early drama, Provengal poetry, prose chronicles, have all had, and deservedly, their rehabilitators. But Polexandre and Cléopatre, Clélie and the Grand Cyrus, have been too heavy for all the industry aud energy of literary antiquarians. As we have already hinted, the nearest ancestry which can be found for them ‘s the romances of the Amadis type. But the Amadis, and in a less degree its followers, although long, are long in virtue of incident. The romances of the Cléze type are long in virtue of interminable discourse, moralizing, and description. Their manner is not unlike that of the Arcadia and the Euphues which preceded them in England ; and they express in point of style the tendency which simultaneously manifested itself all over Europe at this period, and whose chief exponents were Gongora in Spain, Marini in Italy, and Lyly in England. Everybody

knows the Carte de Tendre which originally appeared in C/élie, and niost people have heard of the shepherds and shepherdesses who figure in the Astrée of D'Urfé (1567-1625), on the borders of the Lignon; but here general knowledge ends, aud there is perhaps no reason why it. should go much further, It is sufficient to say that Mademoiselle de Scudéry (1607-1701) principally devotes herself to labori- ous gallantry and heroism, La Calprénéde (1610-1663) to something which might have been the historical novel if it liad: been constructed on a less preposterous scale, and Gomberville (1600-1647) to moralizings and theological discussions on Jansenist principles. In the latter part of the century, the exaniple of La Fontaine, though he himself wrote in poetry, helped to recall the tale-tellers of France to an occupation more worthy of them, more suitable to the geuius of the literature, and more likely to last. The reac- tion against the Clélie school produced first Madame de Villedieu (Catherine Desjardins) (1631-1683), a fluent and facile novelist, who enjoyed great but not enduring popu- larity. The form which the prose tale took at this period was that of the fairy story. Perrault (1628-1703) and Madame d'Aulnoy (d. 1705) composed specimens of this kind which have never ceased to be popular since. Hamilton (1646-1720), the author of the well-known Mémoires de Grammont, wrote similar stories of extraor- dinary merit in style and ingenuity. There is yet a third class of prose writing which deserves to be mentioned. It also may probably be traced to Spanish influence, that is to say, to the picaroon romances which the 16th and 17th centuries produced in Spain in large numbers. The most remarkable example of this is the Roman Comique of the burlesque writer Scarron. The oman Bourgeois of Furetiére also deserves mention as a collection of pictures of the life of the time, arranged in the most desultory manner, but drawn with great vividness, observation, and skill. A remarkable writer who had great influence on Molidre, has algo to be mentioned in this connexion rather than in any other. This is Cyrano de Bergerac (1620- 1655), who, besides composing doubtful comedies and tragedies, writing political pamphlets, and exercising the task of literary criticism in objecting to Scarron's burlesques, produced Voyages a la Lune et au Soleil, half romantic and half satirical compositions, in which some have seen the original of Gulliver's Travels, in which others have dis- covered only a not very successful imitation of Rabelais, and which, without attempting to decide these questions, may fairly be ranked in the same class of fiction

with the master- pieces of Swift and Rabelais, though of course at an immense distance below them. One other work, and in literary influ. ence perhaps the most remarkable of its kind in the century, remains. Madame de Lafayette, the friend of La Rochefoucauld and of Madame de Sévigné, though she dil

not exactly anticipate the modern novel, showed the way , lated into French

to it in her stories, the principal of which are Za%de and still nore La Princesse de Cleves. The latter, though along way from Manon Lescaut, Clarissa, or Tom Jones, is a longer way still from Polexandre or the Arcadia. The novel be- comes in it no longer a more or less fictitious chronicle, but an attempt at least at the display of character. La Prin- cesse de Cleves has never been one of the works widely popu- lar out of their own country, nor perhaps does it deserve such popularity, for it has more grace than strength; but as an original effort in an important direction its historical value is considerable. But with this exception, the art of fictitious prose composition, except on a small scale, is cer- tainly not one in which the century excelled, nor are any of the masterpieces which it produced to be ranked in this class.

17th Century Prose.—If, however, this was the case, it cannot be said that Frencli prose as a whole was unproduc- tive at this time. On the contrary, it was now, and only now, that it attained the strength and perfection for whicli it has been so long renowned, and which has perhaps, by a curious process of compensation, somewhat deteriorated

since the restoration of poetry proper in France. The prose Balzac Malherbe of French literature was Balzac (1594-1654). and

The writers of the 17th century had practically created the

literary language of prose, but they had not created a prose py os0,

style. The charm of Rabelais, of Amyot, of Montaigne, and of the numerous writers of tales and memoirs whom we have noticed, was a charm of exuberance, of naiveté, of pic- turesque effect,—in short, of a mixture of poetry and prose, rather than of prose proper. Sixteenth century French prose is a delightful instrument in the hands of men and women of genius, but in the hands of those who have not genius it is full of defects, and indeed is nearly unreadable. Now, prose is essentially an instrument of all work. The poet who has not genius had better not write at all; the prose writer often may and sometimes must dispense with this qualification, He has need, therefore, of a suitable machine to help him to perform his task, and this machine it is the glory of Balzac to have done more than any other person to create. He produced himself no great work, his principal writings being letters, a few disconrses and dissertations, and a work entitled Le Socrate Chrétien, a sort of treatise on political theology. But if the matter of his work is not of the first importance, its manner is of a very different value. Instead of the endless diffuseness of the preceding century, its ill-formed or rather unformed sentences, and its haphazard periods, we find clauses, sentences, and para- graphs distinctly planned, shaped, and balanced, a cadence "atroduced which is rhythmical but not metrical, and, in short, prose'which is written knowingly instead of the prose which is unwittingly talked. It has been well said of him that he "écrit pour écrire"; and such a man, it is evident, if he does nothing else, sets a valuable example to those who write because they have something to say. He has time which they have not to make technical discoveries in his art, and his technical discoveries are in turn at their service, while they are almost compelled to make use of them by the appetite for such refinements which his works have created in the public. Voiture seconded Balzac without much intending to do so. His prose style, also chiefly con- tained in letters, is lighter than that of his contemporary, and helped to gain for French prose the tradition of vivacity and sparkle which it has always possessed, as well as that of correctness and grace.

17th Century History.—tIn historical composition, espe- cially in the department of memoirs, this period was ex- ceedingly rich, yet the first and perhaps the greatest of its historical works was not composed in French. The Z'hwana, or history of De Thou, was written in Latin, and only trans- more than a century after its author's

death. But, also at the beginning of the century, another writer composed on a larger plan an entire history of France. This was Mézeray (1610-1685) whose work, though not exhibiting the perfection of style at which some of his con- temporaries had already arrived, and though still more or less uncritical, yet deserves the title of history. The example of Mézeray and De Thou was followed by a large number of writers, some of extended works, some of histories in part. Mézeray himself is said to have had a considerable share in the [Histoire du Roi Henri le Grand by the Archbishop Péréfixe (1605-1670); Maimbourg wrote histories of thie Crusades and of the League; Pellisson (1624-1693) gave a history of Louis XIV. Still later in the century, or at the beginning of the next, many lengthy historical works were composed. The Pére d'Orléans (1644-1698) wrote a history of the revolutions of England, the Pere Daniel (1649-1728), like D'Orléans a Jesuit, composed a lengthy history of France and a shorter one on the French military forces. Finally, at the end of the period, comes the great ecclesiastical history of Fleury (1640-1723), a work which perhaps belongs more to the section of erudition than to that of history proper. Three small treatises, however, composed by different authors towards the middle part of the century, supply remarkable instances of prose style in its application to history. These are the Conjurations du Comte de Fiesque, written by the famous Cardinal de Retz (1614-1679), the Conspiration de Walstein of Sarrasin, and the Conjuration des Espagnols contre Venise, composed in 1672 by the Abbé de St Réal, the author of various his- torical and critical works deserving less notice. These three works, whose similarity of subject and successive composi- tion at short intervals leave little doubt that a certain amount of intentional rivalry animated the two later authors, are among the earliest and best examples of the monographs for which French, in point of grace of style and lucidity of exposition, has long been the most successful vehicle of expression among European languages. Among other writers of history, as distinguished from memoirs, need only be noticed Agrippa d'Aubigné, whose Histoire Uni- verselle closed his long and varied list of works, and Varillas (1624-1696), a historian chiefly remarkable for his extreme untrustworthiness. In point cf memoirs and correspond- ence the period is hardly less fruitful than that which pre- ceded it. The Réyistres-Journaux of Pierre de Etoile (1540-

1611), only now being published as a whole, consist of a diary something of the Pepys character, kept for nearly forty years by a person in high official employment. The memoirs of Sully (1560-1641), published under a curious title too long to quote, date also from this time, as do the Letters of Cardinal d'Ossat (1536-1604), much and de- servedly praised by Lord Chesterfield as models of business writing, and the Négociations of the President Jeannin (1544-1622), who conducted the affairs of Henry IV. in Holland. The king himself has left a considerable corre- spondence, which is not destitute of literary merit, thongh not equal to the memoirs of his wife. The rule of Richelieu was scarcely favourable to memoir writing ; but both this and earlier times found chronicle in the singular J/istoriettes of Tallemant des Réaux (1619— 1%), a collection of anec- dotes, frequently scandalous, reaching from the times of Henry IV. to those of Louis XIV., to which may be joined the Letters of Guy Patin (1602-1676). The early years of the latter monarch and the period of the Fronde had the Cardinal de Retz himself, than whom no one was certainly better qualified for historian, not to mention a crowd of others, of whom Madame de Motteville (1621-1689) is per- 'aps the principal. From this time memoirs and memoir er went ever multiplying. The queen of them all is Fg crane (1627-1696), on whom, as on most of

: er-known writers whom we have had and

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shall have to mention, it is impossible here to dwell at length. The last half of the century produced crowds of similar but inferior writers. The memoirs of the Duchesse d'Orléans, of Fouquet, of Bussy-Rabutin (author of a kind of scandalous chronicle called Histoire Amoureuse des Gaules), and of Madame de Maintenon, perhaps deserve notice above the others. But this was in truth the style of composition in which the age most excelled. Memoir writing became the occupation not so much of persons who made history, as was the case from Comines to De Retz, as of those who, having culture, leisure, and oppor- tunity of observation, devoted themselves to the task of recording the deeds of others, and still more of regarding the incidents of the busy, splendid, and cultivated if some- what frivolous world of the court, in which, from the time of Louis XIV.'s majority, the political

life of the nation and almost its whole history were centred. Many, if not most, of these writers were women, who thus founded the cele- brity of the French lady for managing her mother-tongue, and justified by results the taste and tendencies of the blue- stockings and précieuses of the Hétel Rambouillet and similar céteries. The life which these writers saw before them furnished them with a subject to be handled with the minuteness and care to which they had been accustomed in the ponderous romances of the Clélie type, but also with the wit and terseness hereditary in France, and only tem- porarily absent in those ponderous compositions. The efforts of Balzac aud the Academy supplied a suitable lan- guage and style, and the increasing tendency towards epi- grammatic moralizing, which reached its acme in La Roche- foucauld (1663-1680) and La Bruyére (1639-1696), added in most cases point and attractiveness to their writings. 17th Century Philosophers and Theologians.—To these moralists we might, perhaps, not inappropriately pass at once. But it seems better to consider first the philosophical and theological developments of the age, which must share with its historical experiences and studies the credit of pro- ducing these writers. Philosophy proper, as we have already had occasion to remark, had hitherto made no use of the vulgar tongue. The 16th century had contributed a few vernacular treatises on logic, a considerable body of political and ethical writing, and a good deal of sceptical specnlation of a more or less vague character, continued into our present epoch by such writers as La Mothe le Vayer (1588-1672), the last representative of the ortliodox doubt of Montaigne and Charron. But in metapltysics proper it had not dabbled. The.17th century, on the con- trary, was to produce in Descartes (1596-1650) at once a master of prose style, the greatest of Frencli philosophers, and one of the greatest metaphysicians, not merely of France and of the 17th century, but of all countries and times. Even before Descartes there had been considerable and important developments of metapliysical speculation in France. Early in the century, the Italian Lucilio Vanini was burnt at Toulouse, nominally, like Bruno, for atheism, but really for the adoption of the negative philosophy of Pomponatius and others. The first eminent philosopher of French birth was Pierre Gassendi (1592-1655). Gassendi devoted himself to the maintenance of a modernized form of the Epicurean doctrines, but he wrote mainly, if not en- tirely, in Latin. Another sceptical philosopher of a less scientific character was the physicist Naudé, who, like many others of the philosophers of the time, was accused of

atheism. But as none of these could approach Descartes in Descartes.

philosophical power and originality, so also none has even a fraction of his importance in the history of French litera- ture. It is with this latter alone that we are here concerned. Descartes stands with Plato, and possibly Berkeley and Malebranche, at the head of all philosophers in respect of style; and in his case the excellence is far more remarkable

Male- branche,

Bayle.

SEVENTEENTH CENTURY PHILOSOPHY. |

than in others, inasmuch as he had absolutely no models, and was forced in a great degree to create the language which he used. The Discours de la Méthode is not only oue of the epoch-making books of philosophy, it is also one of the epochi-making books of French style. Almost every page of it might have been written by a master of. the language at the present day, while there is the greatest possible contrast between these pages and those of even the best French prose writers a few years previously. Nor was the influence of Descartes in literature less than his influence in philosophy. The tradition of his clear and perfect style was taken up, not merely by his philosophical disciples, but also by Pascal (1623-1662) and the school of Port Royal, who will be noticed presently. The very genius of the Cartesian philosophy was intimately connected with this clearness, distinctness, and severity of style ; and there is something more than a fanciful contrast between these literary characteristics of Descartes, on the one hand, and the elaborate splendour of Bacon, the knotty and crabbed strength of Hobbes, and the commonplace and almost vulgar slovenliness of Locke. Of the followers of Descartes, putting aside the Port Royalists, by far the most distinguished, both in philosophy and in literature, is Malebranche (1631-1715). His Recherche de la Vérité,

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land, especially on the Continent. It has been or might be called the Bible of the 18th century, and contains in the germ all the desultory philosophy, the ill-ordered scepticism, and the critical but negatively critical acuteness of the Aufklérung. Locke and Newton had indeed to be super- added to Bayle, and Voltaire in matter, though by no means in form, represents little more than the union of the three.

We have said that the philosophical, theological, and moral tendencies of the century, which produced, with the exception of its dramatic triumphs, all its greatest literary works, are almost inextricably intermingled. Its earliest years, however, bear in theological matters rather the com- plexion of the previous century. Du Perron and St Francis of Sales survived until nearly the end of its first quarter, and the most remarkable works of the latter bear the dates of 1608 and later. It was not, however, till some years had passed, till the counter-Reformation had reconverted the largest and most powerful portion of the Huguenot party, and till the influence of Jansenius and Descartes had time to work, that the extraordinary outburst of Gallican theo- logy, both in pulpit and press, took place. The J ansenist The Jan- controversy may perhaps be awarded the merit of provoking seuists. this, as far as writing was concerned. The extraordinary

admirable as it is for its subtlety and its consecutiveness of | eloquence of contemporary pulpit oratory may be set down

thought, is equally admirable for its elegance of style. Malebranche cannot indeed, like his great master, claim absolute originality. But his excellence as a writer is as great as, if not greater than, that of Descartes, and the Le- cherche remains to this day the one philosophical treatise of great length and abstruseness which, merely as a book, is delightful to read,—not like the works of Plato and Berkeley, because of the adventitious graces of dialogue or description, but from the purity and grace of the language, and its admirable adjustment to the purposes of the argument. Yet, for all this, philosophy hardly flourished in France. It was too intimately connected with theological and ecclesi- astical questions, and especially with

Jansenism, to escape suspicion and persecution. Descartes himself was for much of his life an exile in Holland and Sweden; and though the unquestionable orthodoxy of Malebranche, the strongly religious cast of his works, and the remoteness of the abstruse region in which he sojourned from that of the con- troversies of the day protected him, other followers of Descartes were not so fortunate. Holland, indeed, became a kind of city of refuge for students of philosophy, though even in Holland itself they were by no means entirely safe from persecution. By far the most remarkable of French philosophical sojourners in the Netherlands was Pierre Bayle (1647-1706), a name not perhaps of the first rank in respect of literary value, but certainly of the first as regards literary influence. Bayle, after oscillating between the two confessious, nominally remained a Protestant in religion. In philosophy he in the same manner oscillated between Descartes and Gassendi, finally resting in an equally nominal Cartesiauism. Bayle was in fact, both in philo- sophy and in religion, merely a sceptic, with a scepticism at once like and unlike that of Montaigne, and differenced both by temperament and circumstance. Thescepticism of Montaigne is mainly moral in character, and represents the good-humoured but satiated indifference of the gentleman of the Renaissance, who has known both business and pleasure, and, though undervaluing neither, sees the drawbacks of both. That of Bayle is the scepticism of the mere student, exercised more or less in all histories, sciences, and philo- sophies, and intellectually unable or unwilling to take a side. His style is hardly to be called good, being diffuse and often inelegant. But his great dictionary, though one of the most heterogeneous and unmethodical of compositions, exercised an enormous influence both on the Continent and in Eng-

partly to the zeal for conversion of which Du Perron and De Sales had given the example, partly to the same taste of the time which encouraged dramatic performances, for the sermon and the tirade have much in common, Jan- senius himself, though a Dutchman by birth, passed much time in France, and it was in France that he found most disciples. These disciples consisted in the first place of the members of the society of Port Royal des Champs, a coterie after the fashion of the time, but one which devoted itself not to sonnets or madrigals but to devotional exercises, study, and the teaching of youth. This cdterie early Port adopted the Cartesian philosophy, and the Port Royal logic Royal. was the most remarkable

popular hand book of that school. In theology they adopted Jansenism, and were in conse- quence soon at daggers drawn with the J esuits, according to the polemical habits of the time. The most distinguished champions on the Jansenist side were the Abbé de St Cyran and Antoine Arnauld, but by far the most important literary results of the quarrel were the famous Provinciales of Pascal, or, to give them their proper title, Lettres Lerites a un Provincial. The original occasion of these remark- able letters was the condemnation of Arnauld at the Sor- bonne. They produced an immense effect ; their printers were subjected to vigorous police investigations, but in vain; and the incognito of the author was long preserved. With their matter we have nothing to do here. Their Pascal. literary importance consists, not merely in their grace of style, but in the application to serious discussion of the peculiarly polished and quiet irony of which Pascal is the greatest master the world has ever seen. Up to this tinie controversy had usually been conducted either in the mere bludgeon fashion of the Scaligers and Saumaises,—of which in the vernacular the Jesuit Garasse (1585-1631) had already contributed remarkable examples to literary and moral controversy,—or else in a dull and legal style, or lastly under an envelope of Rabelaisian buffoonery, such as sur- vives to a considerable extent in the Satire Ménippée. Pascal set the example of combining the use of the most terribly effective weapons with good humour, good breeding, and a polished style. The example was largely followed, and the manner of Voltaire and his followers in the 18th century owes at least as much to Pascal as their method and matter do to Bayle. The Jansenists, attacked and perse- cuted by the civil power, which the Jesuits had contrived to interest, were finally suppressed. But the Provinciales

had given them an unapproachable superiority in matter of argument and literature, Their other literary works were inferior, though still remarkable. Arnauld (1612-1694) and Nicole (1625-1695) managed their native language with vigour, if not exactly with grace. They maintained their orthodoxy by writings, not merely against the Jesuits, but also against the Protestants, such as the Perpétuité de la Foi due to both, and the Apologie

des Catholiques written by Arnaud alone. The latter, besides being responsible for a good deal of the logic (Z'Art de Penser) to which we have alluded, wrote also much of a Grammaire Génerale composed by the Port Royalists for the use of their pupils ; but his principal devotion was to theology and theological polemics. To the latter Nicole also contributed Les Visionnaires, Les Imaginatires, and other works. The studious recluses of Port Royal also produced a large quan- tity of miscellaneous literary work, to which full justice has been done in Sainte-Beuve's well known volumes.

17th Century Preachers—When we think of Gallican theology during the 17th century, it is always with the famous pulpit orators of the period that thought is most busied. Nor is this unjust, for though the most prominent of them all, Bossuet (1627-1704), was remarkable as a writer of matter intended to be read, not merely as a speaker of matter intended to be heard, this double char- acter is not possessed by most of the orthodox theologians of the time; and even Bossuet, great as is his genius, is more of a rhetorician than of a philosopher or a theologian. In no quarter was the advance of culture more remarkable in France than in the pulpit. We have already had occa- sion to notice the characteristics of French pulpit eloquence in the 15th and 16th centuries. Though this was very far from destitute of vigour and imagination, the political frenzy of the preachers, and the habit of introducing anecdotic buffoonery, spoilt the eloquence of Maillard and of Raulin, of Boucher and of Rose. The powerful use which the Re- formed ministers made of the pulpit stirred up their rivals ; the advance in science and classical study added weight and dignity to the matter of their discourses. The improvement of prose style and language provided them with a suitable instrument, and the growth of taste and refinement purged their sermons of grossness and buffoonery, of personal allusions, and even, as the monarchy became more absolute, of direct political purpose. The earliest examples of this improved style were given by St Francis de Sales and by Fenouillet, bishop of Marseilles (d. 1652); but it was not till the latter half of the century, when the troubles of the Fronde had completely subsided, and the church was esta- blished in the favour of Louis XIV., that the full efflores- cence of theological eloquence took place. There were at the time pulpit.oraturs of considerable excellence in England, and perhaps Jerenty Taylor, assisted by the genius of the language, has wrought a vein more precious than any which the somewhat

academic methods and limitations of the French teachers allowed them to reach. But no country has ever been able to show a more magnificent concourse of orators, sacred or profane, than that formed by Bossuet, Fénelon (1651-1715), Flechier (1632-1710), Mascaron (1634-1703), Bourdaloue (1632-1704), and Massillon (1663-1742), to whom may be justly added the Protestant divines Claude (1619-1687) and Saurin (1677-1730). The characteristics of all these were different. Bossuet, the earliest and certainly the greatest, was also the most uni- versal. He was not merely a preacher; he was, as we have said, a controversialist, indeed somewhat too much of a controversialist, as his battle with Fénelon proved, He was a philosophical or at least a theological historian, and his Discours sur 0 Iistoire Universelle is equally remarkable from the point of view of theology, philosophy, history, and literature. Turning to theological politics, he wrote his

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Politique tirée de Ecriture Sainte, to theology proper his Méditations sur les Evangiles and his Hlevations sur les

Mystéres. But his principal work, after all, is his Oradsons Funébres. The funeral sermon was the special oratorical

exercise of the time. Its subject and character invited the gorgeous if somewhat theatrical commonplaces, the display of historical knowledge and parallel, and the moralizing analogies, in which the age specially rejoiced. It must also be noticed to the credit of the preachers that such occasions gave them opportunity, of which they rarely failed to avail themselves, of correcting the adulation which was but too frequently characteristic of the period. The spirit of these compositions is fairly reflected in the most famous and often quoted of their plirases, the opening " Mes fréres, Dieu seul est grand" of Massillon's funeral discourse ou Louis XIV.; and though panegyric is necessarily by no means absent, it is rarely carried beyond bounds, While Bossuet made himself chiefly remarkable in his sermons and in his writings by an almost) Hebraic grandeur and rudeness, the more special characteristics of Christianity,

largely alloyed with a Greek and Platonic spirit, displayed them- selves in Fénelon. found that even a previous canonization was not a safeguard for imitators. The MMJaximes des Saints of Fénelon, and later his Mémotres Particulters and Directions pour la Con- sctence dun Hot, were distinguished not only by a mystical theology which was not relished, but also by a very moder- ate admiration for despotic government. In pure literature Fénelon is not less remarkable than in theology, politics, and morals. His practice in matters of style was admirable, as the universally known 7élémaque sufficiently shows to those who know nothing else of his writing. But his taste, both in its correctness and its audacity, is perhaps more ad- mirable still. Despite of Malherbe, Balzac, Boileau, and the traditions of nearly a century, he dared to speak favour- ably of Ronsard, and plainly expressed his opinion that the practice of his own contemporaries and predecessors had cramped and impoverished the French language quite as much as they had polished or purified it, The other doctors whom we have mentioned were more purely theo- logical than the accomplished: archbishop of Cambray. Fléchier is somewhat more archaic in style than Bossuet or Fénelon, and he is also more definitely a rhetorician than either. Mascaron has the older fault of prodigal and somewhat indiscriminate erudition. But the two latest of the series, Bourdaloue and Massillon, had far the greatest repute in their own time purely as orators, and perhaps de- served this preference. The difference between the two re- peated that between Du Perron and De Sales. Eourdaloue's great forte was vigorous argument and unsparing denuncia- tion, but he is said to have been lacking in the power of influencing and affecting his hearers. His attraction was purely intellectual, and it is reflected in his style, which is clear and forcible, but destitute of warmth and colour. Massillon, on the other hand, was remarkable for his pathos, and for his power of enlisting and influencing the sympathies of his hearers. The two Protestaut ministers whom we have mentioned, though inferior to their rivals, yet deserve honourable mention among the ecclesiastical writers of the period. Claude engaged in a controversy with Bossuet, in which victory is claimed for the invincible eagle of Meaux. Saurin, by far the greater preacher of the two, long con- tinued to occupy, and indeed still occupies, in the libraries of French Protestants the position given to Bossuet and Massillon on the other side.

17th Century Moralvsts.—It is not surprising that the works of Montaigne and Charron, with the immense popu- larity of the former, should have inclined the more thoughtful minds in France to moral reflexion, especially as many other influences, both direct and indirect, contributed to produce

A successor of St Francis de Sales, he Fénelon.

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Pascal and pensée- writing.

St Evre- mond.

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the same result. The constant tendency of the refinements in French prose was towards clearness, succinctness, and precision, the qualities most necessary in the moralist. 'he characteristics of the prevailing philosophy, that of Descartes, pointed in the same direction. It so happened, too, that the times were more favourable to the thinker and writer on ethical subjects than to the speculator in philo- sophy proper, in theology, or in politics. Both the former subjects exposed their cultivators, a8 we have seen, to the suspicion of unorthodoxy ; and to political speculation of any kind the rule of Richelieu, and still more that of Louis XIV., were in the highest degree unfavourable. No succes- sors to Bodin and Du Vair appeared; and even in the domain of legal writings, which comes nearest to that of polities, but few names of eminence are to be found. The parlia- ments were rapidly becoming the submissive instruments of the monarch, and might be expected soon to degenerate into the assemblies which, in the next century, disgraced themselves for ever in the affairs of Calas and Sirven, La Barre and Lally. Only the name of Omer-Talon (1595- 1657) really illustrates the legal annals of France at this period on the bench, and that of Patru (1604- 1681) at the bar. Thus it happened that the interests of many different classes of persons were concentrated upon moraliz- ings, which took indeed very different forms in the hands of Pascal and other grave and serious thinkers of the Jansenist complexion in theology, and in those of literary

courtiers like St Evremond (1613-1703) and La Rochie- foucauld, whose chief object was to depict the motives and characters prominent in the brilliant and not altogether fri- volous society in which they moved. Both classes, however, were more or less tempted by the cast of their thoughts and the genius of the language to adopt the tersest and most epigrammatic form of expression possible, and thus to originate the "pensée" in which, as its greatest writer of this century has said, "the ambition of the author is to put a book into a page, a page into a phrase, and a phrase into a word." The great genius and admirable style of Pascal are certainly not less shown in his Pensées than in his Provinciales, though perhaps the literary form of the former is less strikingly supreme than that of the latter. The author is more dominated by his subject, and dominates it less. The depth of his thought, of his doubt, of his belief, troubles sometimes the literary perfection of his style, but after all the excellence as literature of the Pensées is rather different from that of the Provinciales than inferior to it. Nicole, a far inferior writer as well as thinker, has also left a considerable number of Pensées, which have about them something more of the essay and less of the apborism. They are, however, though not comparable to Pascal, ex- cellent in matter and style, and go far to justify Bayle in calling their author "lune des plus belles plumes de Europe." In sharp contrast with these thinkers, who are invariably not merely respecters of religion but ardently and avowedly religious, who treat morality from the point of view of the Bible and the church, there arose side by side with them, or only a little later, a very different group of moralists, whose writings have been as widely read, and who have had as great a practical and literary influence as perhaps any other class of authors. The earliest to be born and the last to die of these was St Evremond. St Evre- mond was long known rather as a conversational wit, some of whose good things were handed about in manuscript, or surreptitiously printed in foreign lands, than as a writer, and this is still to a certain extent his reputation. He was at least as cynical as his still better known con- temporary La Rochefoucauld, if not more so, and he had less intellectual force and less nobility of character. But his wit was very great, and it was not restrained by any inconvenient convictions or scruples. Presiding as he did

in the society of Ninon de |'Enclos, and over a considerable number of lesser wits, he set the example of the brilliant societies of the next century. These in turn culminated in the Holbachian group which was to render such powerful assist- ance in the diffusion of philosophism, and to distinguish itself by the freedom, in every sense of the word, of its style of thought and conversation. Many of St Evremond's printed works are uominally works of literary criticism, but the moralizing spirit pervades all of them. No writer had a greater influence on Voltaire, aud through Voltaire on the whole course of French literature after him. In direct literary value, however, no comparison can be made between St Evremond and the author of the Sentences et Maxvmes Morales. The Duc de la Rochefoucauld has other literary La Roche- claims besides those of this famous book. His Aémotres foucauld. were very favourably judged by his contemporaries, and they are still held to deserve no little praise even among the numerous and excellent works of the kind which that age of memoir writers produced. But while the Mémovres thus invite comparison, the Masximes et Sentences stand alone. Even allowing that the mere publication of detached re- flexions in terse language was not absolutely new, it had never been carried, perhaps has never since been carried, to such a perfection. Beside La Rochefoucauld all other writers are diffuse, vacillating, unfinished, rough. A very large number of his maxims do not exceed two lines; many are contained in half adozen words ; and though he has no prudish or childish objection to more lengthy reflexions, these lengthier sections are proportionately as much cram- med and packed with thought as the shorter. The most remarkable thing, however, about them is not that there is never a, word too much, but that, pregnant as they are, there ig never a word too little. The thought is always fully expressed, not compressed. Frequently as the metaphor of minting or stamping coin has been applied to the art of managing words, it has never been applied so appropriately as to the maxims of La Rochefoucauld, each of which has the beauty, the value, and the clear-cut compactness of a medal. Such criticism as has been directed against them has invariably and necessarily busied itself with their matter, and with the supposed selfish aud cynical character of their thought. The form of them is almost beyond praise, and its excellencies, combined with their immense and enduring popularity, have had a very considerable share in influencing

the character of subsequent French literature. Of hardly less importance in this respect, though of considerably less intellectual and literary individuality, was the translator of Theophrastus and the author of the Caractéres, La Bruyére. La Bruyére, though frequently epigrammatic, did La not aim at the same incredible terseness as the author of Bruyére. the Maximes. His plan did not, indeed, render it neces- sary. Both in England and in France there had been during the whole of the century a mania for character writing, both of the general and 'Theophrastic kind and of the historical and personal order. The latter, of which our own Clarendon is perhaps the greatest master, abound in the French memoirs of the period. The former, of which the naive sketches of Earle and Overbury are English ex- amples, culminated in those of La Bruyére. These sketches were made palatable originally, though they are

erhaps rendered less attractive now, by the multitude of half-veiled allusions to contemporary characters. They do not contain any of the appalling and to some persons re- pulsive directness and ruthlessness of La Rochefoucauld. They are not only light and easy in manner and matter, but also in style, and in this respect, as in most others, the con- trast is remarkable. The work of La Bruyére is essentially amusing, though it is instructive as well. It is the work of a man of great talent, acuteness, and observation, but tolerant to a certain extent of commonplaces and compro-

Contro- versy between ancients and mo- derns.

mises. There is neither compromise nor commonplace in | All the greatest men whose names had illustrated the reign

La Rochefoucauld. We have dwelt on these two remark- able books somewhat longer than on most single chef d'ewvres of French literature, because of their extraordinary and enduring effect on the literature which followed them— an effect perhaps superior to that exercised by any other

single work except the Roman dela Rose and the Essais of Montaigne. . 17th Century Savants.—Of the literature of the 17th century there only remains to be dealt with the section of those writers who devoted themselves to scientific pursuits or to antiquarian erudition of one form or another. It was in this century that literary criticism of French and in French first began to be largely composed. It was very far, however, from attaining the excellence or observing the form which it afterwards assumed. The institution of the Academy led to various linguistic works. One of the earliest of these was the Remarques of the Savoyard Vaugelas (1585-1650), afterwards re-edited by Thomas Corneille. Pellisson wrote a history of the Academy itself when it had as yet but a brief one. The famous Hxvamen du Cid was an instance of the literary criticism of the time. Later, Boileau set the example of treating such subjects in verse,

and in the latter part of the century Reflexions, Discourses, |

Observations, and the like, on particular styles, literary forms, and authors, became exceedingly numerous. In earlier years France possessed a numerous band of classical authors of the first rank, such as Scaliger and Casaubon, wlio did not lack followers. But all or almost all this sort of work was done in Latin, so that it contributed little to French literature properly so-called. On the other hand, mathematical studies were pursued by persons of far other and far greater genius, and, taking from this time forward

a considerable position in education and literature in France, |

had mnch influence on both. The mathematical discoveries of Pascal and Descartes are well known, and from their time forward until the Revolution men of letters, such as Voltaire and Diderot, who would in England have been likely to hold aloof from such studies, devoted themselves thereto. Of science proper, apart from mathematics, France did not produce many distinguished cultivators in this century. 'The philosophy of Descartes was not on the

whole favourable to such investigations, which were in the –

next century to be pursued with ardour. Its tendencies found more congenial vent and are more thoroughly exem- plified in the famous quarrel between the ancients and the moderns, which was long carried on in the latter part of the century between Boileau and Madame Dacier, on the one hand, and Perrault on the other, and which was so curiously renewed in England, The discussion was con- ducted, as is well known, without very much knowledge or judgment among the disputants on the one side or on the other. But at this very time there were in France students and scholars of the most profound erudition. We have already mentioned Fleury and his ecclesiastical history. But Fleury is only the last and the most popular of a race of omnivorous and untiring scholars, whose labours have ever since, until the modern fashion of first-hand investiga- tions came in, furnished the bulk of historical and scholarly references and quotations. To this century belong Tille- mont (1637-1698), whose enormous Histoire des Empereurs and Mémoires pour servir a [Histoire Ecclesiastique served Gibbon aud a hundred others as quarry ; Ducange (1614- 1688), whose well-known glossary was only one of numerous productions ; Mabillon (1622-1707), one of the most volu- minous of the voluminous Benedictines ; and Montfaucon (1655-1741), chief of all authorities of the dry-as-dust kind on classical archeology and art.

Opening of the 18th Century.—The beginning of the 18th century is among the dead seasons of French literature.

of Louis XIV. in profane literature passed away long before him, and the last if the least of them, Boileau and Thomas Corneille, only survived into the very earliest years of the new age. The political and military disasters of the last years of the reign were accompanied by a state of things in society unfavourable to literary development. A show, purely external and hypocritical, of devotion, put on to please the aged monarch, covered an interior of frivolity and licentiousness which was for the time dissevered from such intellectual activity as has often accompanied similar states of morality in France. The devotion to pure litera- ture and philosophy proper which Descartes and Corneille had inspired had died out, and the devotion to physical science, to sociology, and to a kind of free-thinking optimism which was to inspire Voltaire and the Encyclopedists had not yet become fashionable. Fénelon and Malebranche still survived, but they were

emphatically men of the last age, as was Massillon, though he lived till nearly the middle of the century. The cliaracteristic literary figures of the opening years of the period are D'Aguesseau, Fontenelle, St Simon, personages in many ways interesting and remark- able, but purely transitional in their characteristics, and neither themselves indicating new and original paths to others, nor following out to their extremity and climax the paths which others had struck. Fontenelle (1657-1757) is, indeed, perhaps the most typical figure of the time. He was a dramatist, a moralist, a philosopher, physical and metaphysical, a critic, a historian, a poet, and a satirist. The manner of his works is always easy and graceful, and their matter rarely contemptible. We may adopt the same division of subjects in this period as heretofore, with one important addition—a separate heading, namely, for the essayists and literary critics who before the end of the century became of remarkable prominence. The spread of culture, however, and the increase of the mass of literature produced, render it more and more necessary to limit the notice given to those names whose bearers are in one way or another important. Modern literature once fairly con- stituted, the rank and file of its practitioners must be left unmentioned.

18th Century Poetry.—The dispiriting signs shown dur- ing the 17th century by French poetry proper received entire fulfilment in the following age. The two poets who were most prominent at the opening of the period were the Abbé de Chaulieuc (1639-1720) and the Marquis de la Fare (1644-1712), poetical or rather versifying twins who are always quoted together, and the fact of whose quotation as the chief poets of any period, however short, is sufficient proof of the low estate into which poetry must at that period have fallen. They were both men who lived to a great age, yet their characteristics are rather those of their later than of their earlier contemporaries. They derive on the one hand from the somewhat trifling school of Voiture, on the other from the Bacchic sect of St Amand ; and they succeed in uniting the inferior qualities of both with the cramped and im- poverished though elegant style of which Fénelon had com- plained. It is only fair to say that the abbé is not nearly so bad a poet as the marquis. Their compositions are as a rule lyrical, as lyrical poetry was understood after the days of Malherbe,—that is to say, quatrains of the kind ridiculed by Moliére, and Pindaric odes, which have been justly described as made up of alexandrines after the manner of Boileau cut up into shorter or longer

lengths. They were followed, however, by the one poet who succeeded in pro- ducing something resembling poetry in this artificial style. J. B. Rousseau (1674-1741).

theless strongly influenced, as Marot had been, by tle Psalms

Rousseau, who in someJ.B. | respects was nothing so little as a religious poet, was never- Rousseat

Voltaire (poetry).

EIGHTEENTH CENTURY POETRY. |

of David. His Odes and his Cantates, though still to English taste curiously devoid of the poetical je ne sais quot, which an Englishman rarely finds in any Frencli lyrist between Regnier and Hugo, are perhaps less destitute of that spirit than the work of any other poet during that long period excepting André Chénier. Rousseau was also an extremely successful epigrammatist, having in this respect, too, resem- blances to Marot. Le Franc de Pompignan (1709-1784), to whom Voltaire's well-known sarcasms are not altogether just, and Louis Racine (1692-17 63), who wrote pious and altogether forgotten poems, belonged to the same poetical school; though both the style and matter of Racine are strongly tinctured by his Port Royalist sympathies and education. Those authors form the first of the three poeti- cal schools of the century, though perhaps it would be safer to mark out only two, leaving Voltaire to himself as a master of both schools and a member of neither. The first method of versifying, indeed, subdivided itself into classes, not dissimilar in style to those which we have noticed in the preceding age as characterized respectively by elegance of a somewhat frivolous kind, and jollity not always free from ignoble admixture. The former was represented in the 18th century by the long-lived St Aulaire (1643-1742), by Gentil Bernard, by the Abbé (afterwards Cardinal) de Bernis (1715-17 94), by Dorat (1714-1789), and by Parny (1753-1814), the last the most vigorous, but all somewhat deserving the term applied to Dorat of ver luisant du Parnasse. The jovial traditions of St Amand begat a similar school of anacreontic song- sters, which, represented in turn by Panard (1674-1765), Collé (1709-1783), Gouffé (1775-1845), and Desaugiers (1772-1827), led directly to the best of all such writers,

Béranger. To this class Rouget de Lisle (1760-1 836) perhaps also belongs ; though his most famous composition, the Marseillaise, is of a different stamp. Nor is the account of the light verse of the 18th century complete without reference to a long succession of fable writers, who, in an unbroken chain, connect La Fontaine in the 17th century with M. Viennet in the 19th. None of the links, however, of this chain, with the exception of Florian, deserve much attention. The universal faculty of Voltaire (1694~1778) showed itself in his poetical productions no less than in his other works, and it is perhaps not least remarkable in verse. Itis impossible now-a-daysto regard the Henriade as anything but a highly successful prize poem, but the burlesque epic of La Pucelle, discreditable as it may be from the moral point of view, is remarkable enough as literature. The epistles and satires are among the best of their kind, the verse tales are in the same way admirable, and the epigrams, impromptus, and short miscellaneous poems generally are the ne plus ultra of verse which is not poetry. It is impossible, more- over, not to be grateful to Voltaire for refusing to counte- nance by his example the second school of verse to which we havealluded. The Anglomania of the century extended into poetry, and the Seasons of Thomson set the example of a whole library of tedious descriptive verse, which in its turn revenged France upon England by producing or helping to produce English poems of the Darwin school. The first of these descriptive performances was the Sazsons of St Lambert (1717-1803), identical in title with its model, but of infinitely inferior value. St Lambert was followed by Delille (1738-1813) in Les Jardins, Le Mierre (1723- 1793) in Les Fastes, and Roucher (1745-1794) in Les Mois. Indeed, everything that could be described was seized upon by these describers. Delille also translated the Georgics, and for a time was the greatest living poet of France, the title being only disputed by 1807), a lyrist and ode writer of the school of J. B. Rousseau, but not destitute of energy. poets until Chénier who deserve notice are Gilbert (1751-

Le Brun (1729- The only other

| 665 1780),—the French Chatterton, or perhaps rather the French Oldham, who died in a workhouse at twenty-nine after producing some

vigorous satires and, at the point of death, an elegy of great beauty,—and Gresset (1709-1777), the author of Ver-Vert and of other poems of the lighter order, which are not far, if at all, below the level of Voltaire.

André Chénier (1762-1794) stands far apart from the art Chénier.

of his century, though the strong chain of custom, and his early death by the guillotine, prevented him from breaking through the fatal restraints of its language and its versifica- tion. Chénier, half a Greek by blood, was wholly one in spirit and sentiment. The manner of his verses, the very air which surrounds them and which they diffuse, are different from those of the 18th century ; and his poetry is probably the utmost that the language and versification of Racine could produce. Todo more, the Revolution which followed a generation after his death was required.

18th Century Drama.—The results of the cultivation of dramatic poetry at this time were even less individually remarkable than those of the attention paid to poetry proper. Here again the astonishing power and literary aptitude of Voltaire gave value to his attempts in a style which, not-withstanding that it counts Racine among its practitioners, was none the less predestined to failure.

to Bajazet and Mithridate, though there is no doubt that no work of Voltaire's comes up to Polyeucte and Rodogune, as certainly no single passage in any of his plays can approach the best passages of Cinna and Les Horaces. But the remaining tragic writers of the century, with the single exception of Crébillon pére, are scarcely third-rate. Crébillon (1674-1763) himself had genius, and there are to be found in his work evidences of a spirit which had seemed to die away with S¢ Genest, and was hardly to revive until Hernant. Of the imitators of Racine and Voltaire, La Motte (1672-1731) in Inez de Castro was not wholly unsucccessful. La Grange-Chancel copied chiefly the worst side of the author of Britannicus, and Saurin (1706-1781) and De Belloy (1727-1775) performed the same service for Voltaire. There was an infinity of tragic writers and tragic plays in this century, but hardly any others of them even deserve mention. The muse of comedy was decidedly more happy in her devotees. Moliére was a far safer if a more difficult model than Racine, and the 'nexorable fashion which had bound down tragedy to a feeble imitation of Euripides did not similarly

prescribe an undeviating adherence to Terence. Tragedy had never been, has scarcely been since, anything but an exotic In France ; comedy was of the soil and native. Very early in the century Le Sage (1668-1747), in the admirable comedy of Turcaret, produced a work not unworthy tostand by the side of all but his master's best. Destouches (1680-1754) was also a fertile comedy writer in the early years of the century, and in Le Glorieux and Le Philosophe Marié achieved considerable success. As the age went on, comedy, always apt to lay hold of passing events, devoted itself to the great struggle between the Philosophes and their oppon- ents. Curiously enough, the party which engrossed almost all the wit of France had the worst of it in this dramatic portion of the contest, if in no other. The Méchant of Gresset and the Métromanie of Piron (1689-1773) were far superior to anything produced on the other side, and the Philosophes of Palissot (17 34-1814), though scurrilous and broadly farcical, had a great success. On the other hand, it was to a Philosophe that the invention of a new dramatic style was due, and still more the promulgation of certain ideas on dramatic criticism and construction, which, after being filtered through the German mind, were to return to France and to exercise the most el aad IX. — 84

Voltaire's own Voltaire efforts in this kind are indisputably as successful as they (plays). could be. Foreigners usually prefer Mahomet and Zaire

Diderot (plays).

Beaumar- chais.

Le Sage.

666

on its dramatic productions. This was Diderot (1713- 1784), the most fertile genius of the century, but also the least productive in finished and perfect work. His chief dramas, the Fils Naturel and the Pére de Famille, are cer- tainly not great successes; the shorter plays, Est-ol bon? est-il méchant ? and La Piece et la Prologue, are better. But it was his follower Sédaine (1717-1779) who in Le Philo- sophe sans le savoir and other pieces produced the best ex- amples of the bourgeois as opposed to the heroic

drama. Diderot is sometimes credited or discredited with the invention of the Comédie Larmoyante, a title which indeed his own plays do not altogether refuse, but this special variety seems to be in its invention rather the property of La Chaussée (1692-1754). Comedy sustained itself, and even gained ground towards the end of the century; at the extreme limit of our present period there appears the re- markable figure of Beaumarchais (1732-1799). The Mariage de Figaro and the Barbier de Séville are well known as having had attributed to them no mean place among the literary causes and forerunners of the Revolution. Their dramatic and literary value would itself have sufficed to obtain attention for them at any time, though there can be no doubt that their popularity was mainly due to their political appositeness. The most remarkable point about them, as about the school of comedy, of which Congreve was the chief master in England at the beginning of the century, was the abuse and superfluity of wit in the dialogue, indis- criminately allotted to all characters alike.

18th Century Fiction..—With prose fiction the case was altogether different. We have seen how the short tale of a few pages had already in the 16th ceutury attained high if not the highest excellence; how at three different periods the fancy for long-winded prose narration developed itself in the prose rehandlings of the chivalric poems, in the Amadis romances, and in the portentous recitals of Gomber- ville and La Calprenéde ; how burlesques of these romances were produced from Rabelais to Scarron ; and how at last Madame de Lafayette showed the way to something like the novel of the day. If we add the fairy story, and a small class of miniature romances, of which Aucassin et Nicolette in the 13th, and the delightful Jehan de Paris (of the 15th or 16th, in which a king of England is patriotically sacrificed) are good representatives, we shall have exhausted the list. The 18th century was quick to develop the system of the author of the Princesse de Cléves, but it did not abandon the cultivation of the romance, that is to say, fiction dealing with incident and with the simpler passions, in devoting itself to the novel, that is to say, fiction dealing with the analysis of sentiment and character. Le Sage, its first great novelist, in his Diable Boiteux and Gu Blas, went to Spain not merely for his subject but also for his inspiration and manner, following the lead of the picaroon romance of De Rojas and Scarron. Like Fielding, however, whom he much resembles, Le Sage mingled with the romance of incident the most careful

attention to char- acter and the most lively portrayal of it, while his:style and language are such as to make his work one of the classics of French literature. The novel of character was really founded in France by the Abbé Prévost (1697-1763), the author of Cleveland and of the incomparable Manon Lescaut. The popularity of this style was much helped by the im- mense vogue in France of the works of Richardson. Side by side with it, however, and for a time enjoying still greater popularity, there flourished a very different school of fiction, of which Voltaire, whose name occupies the first or all but the first place in every branch of literature of his time, was the most brilliant cultivator. This was a direct development of the 16th century conte, and consisted Poy of the treatment in a humorous, satirical, and not a'ways over-decent fashion of contemporary foibles, beliefs,

philosophies, and occupations. These tales are of every rank of excellence and merit both literary and moral, and range from the astonishing wit, grace, and humour of Candide and Zadig to the book which is Diderot's one hardly pardonable sin, and the similar but more lively efforts of Crébillon fils (1707-1777). These latter deeps led in their turn to the still lower depths of La Clos and Louvet. A third class of 18th century fiction consists of attempts to return to the humorous fatrasie of the 16th century, attempts which were as much influenced by Sterne as the sentimental novel was by Richardson. The Homme aux Quarante Ecus of Voltaire has something of this char- acter, but the most characteristic works of the style are the Jacques le Fataliste of Diderot, which shows it nearly at its best, and the Compére Mathieu, sometimes attributed to Pigault-Lebrun (1753-1835), but apparently in reality due to Du Laurens (1719-1797), which shows it at perhaps its worst. Another remarkable story-teller was Cazotte (1724-1793), whose Diable Amowreux displays much fantastic power, and connects itself with a singular fancy of the time for occult studies and dzablerte, manifested later by the patronage shown to Cagliostro, Mesmer, St Germain, and others. In this connexion, too, may perhaps also be mentioned most appropriately Restif de la Bretonne, a re- markably original and voluminous writer, who was little noticed by his contemporaries and

successors for the best part of a century, and whom bibliomania chiefly has of late induced French critics to resuscitate. Restif, who was nick- named the " Rousseau of the gutter," Nowsseau du rucsseau, presents to an English imagination many of the character- istics of a non-moral Defoe. While these various schools busied themselves more or less with real life seriously depicted or purposely travestied, the great vogue and suc- cess of Télémaque produced a certain number of didactic works, in which moral or historical information was sought to be conveyed under a more or less thin guise of fiction. Such was the Voyage du Jeune Anacharsis of Barthélemy (1716-1795); such the Vuma Pompilius and Gonzale de Cordoue of Florian (1755-1794), who also deserves notice as a writer of pastorals, fables, and short prose tales ; such the Bélisaire and Les Incas of Marmontel (1728-1799). Between this class and that of the novel of sentiment may perhaps be placed Paul et Virginie and La Chaumieére Indienne; though Bernardin de St Pierre (1737-1814) should perhaps properly be noticed after Rousseau and as a moralist. Diderot's fiction-writing has already been re- ferred to more than once, but his Melegieuse deserves citation here as a powerful specimen of the novel both of analysis and polemic; while his undoubted masterpiece, the Veveu de Rameau, though very difficult to class, comes under this head as well as under any other. There are, however, two of the novelists of this age, and of the most remarkable, who have yet to be noticed, and these are the author of Mari-

anne aud the author of Julie. Wedo not mention Marivaux Mariva

(1688-1763) in this connexion as the equal of Rousseau (1713-1778), but merely as being in his way almost equally original and equally remote from any suspicion of school influence. He began with burlesque writing, and was also the author of several comedies, of which Les Fausses Con-Jidences is the principal. But it is in prose fiction'that he really excels, He may claim to have, at least in the opinion of his contemporaries, invented a style, though perhaps the term marivaudage, which was applied to it, has a not altogether complimentary connotation. He may claim also to have invented the novel without a purpose, which aims simply at amusement, and at the same time does not seek to attain that end by buffoonery or by satire. Gray's definition of happiness, "to lie on a sofa and read endless novels by

Marivaux" (it is true that he added Crébillon), is well known, and the production of mere pastime by means more or Jess

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harmless has since become so well-recognized a function of the novelist that Marivaux, as one of the earliest to dis- charge it, deserves notice. The name, however, of Jean Jacques Rousseau is of far different importance. His two great works, the Wouvelle Héloise and Emile, are as far as possible from being perfect as novels. But no novels in the world have ever had such influence as these. To a great extent this influence was due mainly to their attractions as novels, imperfect though they may be in this character, but it was beyond dispute also owing to the doctrines which they contained, and which were exhibited in novel form. They had not only a greater popularity than any other works of the same class during the century, not only a more important political and philosophical infiu- ence, butalso a far greater practical influence thanis generally supposed. As the fact bas been lately treated as doubtful, it may be well to repeat that the Wmile did actually to a great extent put a stop to the habit previously pre- vailing among French mothers of refusing to nurse their own infants, and that the recommendation which the same book contained that all children should be taught a trade undoubtedly contributed to the preservation and power of self-support of great numbers of the emigrants during the French Revolution. Great as has been the influence of prose fiction in various ways, this is perhaps the most direct and certain instance of its influence upon the daily life and conduct of large classes of men. Certainly it is the earliest of such instances, and this makes it remarkable in the his- tory of literature.

Such are the principal developments of fiction during the century; but it is remarkable that, varied as they were, and excellent as was some of the work to which they gave rise, none of these schools were directly very fertile in results or successors. 'The period with which we shall next have to deal, that from the outbreak of the Revolution to the death of Louis XVIIL, is curiously bar- ren of fiction of any merit. It has been frankly noticed by French writers that since the Middle Ages many if not most of their great literary developments have needed the stimulus of foreign example and

importation. Thus, in part of the 16th century the influence of Italy was predominant and productive, in the 17th that of Spain, in the 18th that of England. Less powerful during the thirty years of war, English influence began again to assert itself in the 19th century. Byron and Shakespeare, well or ill understood, were responsible for much of the development on the poeti- cal side of the romantic movement. But their influence was as nothing compared with that of Scott on the prose side, and especially on the side of prose fiction. As yet, however, this influence was remote. The result of its working was that the prose romance began once more to be written in the later days of the Restoration, with the astonishing success which in the course of the last half-cen- tury has placed the French novel in quantity and general excellence, if not in the quality of a few chosen examples, at the head of the fictitious literature of modern Europe.

18th Century History.—It is not, however, in any of the departments of belles lettres that the real eminence of the 18th century as a time of literary production in France consists. In all serious branches of study its accomplish- ments were, in a literary point of view, remarkable, uniting as it did an extraordinary power of popular and literary expression with an ardent spirit of inquiry, a great specula- tive ability, and even a far more considerable amount of laborious erudition than is generally supposed. The popu- lar and rather desultory character of many of these re- searches and speculations makes it somewhat difficult to arrange them in an orderly fashion under the heads of separate departments of science. 'Historical, theological,

metaphysical, physical, economical, political, and moral

the Letters,

speculations confuse themselves constantly in the same author, and very often in the same work, and any division that can be adopted must be almost of necessity in many respects a cross division. The advantages, however, of maintaining some sort of order are so unmistakable that we

shall continue to observe the arrangement hitherto adopted. The historical studies and results of the 18th century speculation in France are of especial and pecu- liar importance. There is no doubt that what is called the science of history dates from this time, and though the beginning of it is usually assigned to the Italian Vico, its complete indication may perhaps with equal or greater

justice be claimed by the Frenchman Turgot. Before

Turgot, however, there were great names in French histori- cal writing, and perhaps the greatest of all is that of Montesquieu (1689-1755).

political in character. In the Lettres Persanes he handled, with wit inferior tothe wit of no other writer even in that witty age, the corruptions and dangers of contemporary morals and politics. 'The literary charm of this book—the plan of which was suggested by a work of Dufresny (1648-1724), a comic writer not destitute of merit—is very great, and its plan was so popular as to lead to a thousand imita- tions, of which all, except those of Voltaire and Goldsmith, only bring out the immense superiority of the original. Few things could be more different from this lively and popular book than Montesquiew's next work, the Grandeur et Deca- dence des Romains, in which the same acuteness and know-

ledge of human uature are united with considerable erudi- tion, and with a weighty though perhaps somewhat crandilo-

quent and rhetorical style. His third and greatest work, the Esprit des Lois, is again different both in style and character. Its defect is too hasty and sweeping generalization on facts

insufticiently collected and observed. But this defect is as nothing as compared with the merits of its fertility in ideas, its splendid breadth of view, and the felicity with which

the author, in a manner unknown before, recognizes the

laws underlying complicated assemblages of fact which had

up to that time been considered as connected only by the hazards of fate or by arbitrary causes. The style of this great work is equal to its substance ; less light than that of less rhetorical than that of the Grandeur des Romaine, it is still a marvellous union of dignity and wit. Around Montesquieu, partly before and partly after him, is a group of philosophical or at least systematic historians, of whom the chief are Dubos (1670-1742), Boulainvilliers (1658-1722), and Mably (1709-1785). Dubos, whose chief work is not historical but esthetic (Réjlexcons sur la Poésie et la Peinture), wrote a so-called Histoire Critique de ? Etablissement de la Monarchie Francaise, which is as far as possible from being in the modern sense critical, inasmuch as, in the teeth of history, and inorder to exalt the Zrers Etat, it pretends an amicable coalition of Franks and Gauls, and not an irruption by the former. Boulainvilliers, on the other hand, maintained the rights of the nobility in virtue and as a consequence of the Frankish conquest. Mably (Observations sur 0 H istoire de la France) had a much greater influence than either of these writers, and a decidedly mis- chievous one, especially at the period of the Revolution. He, more than any one else, is responsible for the ignorant and childish extolling of Greek and Ronian_ institutions, and the still more ignorant depreciation of the Middle Ages, which was for a time characteristic of French politicians. Montesquieu was, as we have said, followed by Turgot (1727-1781), whose writings are few in number, and not re- markable for style, but full of original thought. Turgot in his turn was followed by Condorcet (1743-1794), whose tendency is somewhat more sociological than directly his- torical. Towards the end of the period, too, a considerable

The three principal works of Montes- this great writer are all historical and at the same time dieu.

number of philosophical histories were written, the usual object of which was, under cover of a kind of allegory, to satirize and attack the existing institutions and government of France. The most famous of these was the Histozre des Indes, nominally written by the Abbé Raynal (1711-1796), but really the joint work of many members of the Philosophe party, especially Diderot. Side by side with this really or nominally philosophical school of

history there existed another and less ambitious school, which contented itself with the older and simpler view of the science. The Abbé de Vertot (1655-1735) belongs almost as much to the 17th as to the 18th century ; but his principal works, especially the famous Histoire des Chevaliers de Malte, date from the later period, as do also the Révolutions Romaines. Vertot is above all things a literary historian, and the well-known "Mon siége est fait," whether true or not, certainly ex- presses his system. Of the same school, though far more comprehensive, was the laborious Rollin (1661-1741), whose works in the original or translated were long the chief historical manuals of Europe. In the same class, too, far superior as is his literary power, must be ranked the historical works of Voltaire, Charles XIT., Pierre le Grand, &c. A very perfect example of the historian who is literary first of all is supplied by Rulhiére (1735-1791), whose évolution en Russie en 1762 is one of the little master- pieces of history, while his larger and posthumous work on the last days of the Polish kingdom exhibits perhaps some of the defects of this class of historians. Lastly must be mentioned the memoirs and correspondence of the period, the materials of history if not history itself. The century opened with the most famous of all of these, the memoirs of the Duc de St Simon (1678-1755), an extraordinary series of pictures of the court of Louis XIV. and the Regency, written in an unequal and incorrect style, but with something of the irregular excellence of the great 16th century writers, aud most striking in the sombre bitterness of its tone. The subsequent and less remarkable memoirs of the century are so numerous that it is almost impossible to select a few for reference, and altogether impossible to mention all. Of those bearing on public history the memoirs of De Staal, of D'Argenson, of Duclos, of Weber, of Madame de Genlis, of Bésenval, of Madame Campan, may perhaps be selected for mention ; of those bearing on literary and private history, the memoirs of Madame d'Epinay, and the innumerable writings having reference to Voltaire and to the Philosophe party generally. Here, too, may be mentioned a remarkable class of literature, consisting of purely private and almost confidential letters, which were written at this time with very remarkable literary excellence. As specimens may be selected those of Mademoiselle Aissé (1693-1733), which are models of easy and unaffected ten- derness, and those of Mademoiselle de Lespinasse, the com- panion of Madame du Deffand and afterwards of D'Alembert. These latter, in their extraordinary fervour and passion, not merely contrast strongly with the generally languid

and frivo- lous gallantry of the age, but also constitute one of its most remarkable literary monuments. It has been said of them that they "burn the paper," and the expression is not exag- gerated. While the imaginative works of the period were quite unable, with perhaps the exception of Manon Lescaut and the Nouvelle Héloise to express depth or heat of passion, these letters, written straight from the heart, equal anything that poet or novelist has ever elaborated. Of lighter letters the charming correspondence of Diderot with Madem- oiselle Voland deserves special mention. But the correspond- = like the memoirs of this century, defies justice to be owe to i in any cursory or limited mention. In this con- ton, however, it may be well to mention some of the most apg works of the time, the Confessions, Réveries, nd Lromenades d'un Solitaire of Rousseau. In these

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works, especially in the Confessions, there is not merely exhibited passion as fervid though perhaps less unaffected than that of Mademoiselle de Lespinasse,—there appear in them two literary characteristics which, if not entirely novel (no literary characteristic is ever entirely novel), were for the first time brought out deliberately by powers of the first order, were for the first time made the'mainspring of literary interest, and thereby set an example which for more than a century has been persistently followed, and which has pro- duced some of the finest results of modern literature. The first of these was the elaborate and unsparing analysis and display of the motives, the weaknesses, and the failings of individual character. This process, which Rousseau un- flinchingly performed on himself, has been followed usually in respect to fictitious characters by his successors. Up to his time character-handling had been mainly abandoned to the dramatist, the satirist, the historian, the moralist, and the preacher, whose purposes led them to use bright or dark colours, bold outlines, and strongly contrasted lights and shades. Rousseau set the example of drawing a character in all its complexity, of showing the mixture of meanness and nobleness, and the intricate processes which lead to the commission of acts the simplest in appearance. The other novelty was the feeling for natural beauty and the elaborate description of it, the credit of which latter must, it has been agreed by all impartial critics, be assigned rather to Rousseau than to any other writer. His influence in this direction was, however, soon taken up and continued by Bernardin de St Pierre, some of whose works have been already alluded tv. In sentiment as well as in literary history Bernardin de St Pierre is the connecting link between Rousseau and Chateaubriand, and thus occupies a position of considerable interest. In particular the author of Paul et Virginie set himself to develop the example of description which Rousseau had set, and his word-paintings, though less powerful than those of his model, are more abundant, more elaborate, and animated by a more amiable spirit.

18¢h Century Philosophy.—The Anglomania which dis- tinguished the time was nowhere more strongly shown than in the cast and direction of its philosophical speculations. As Montesquieu and Voltaire had imported into France a vivid theoretical admiration for the British constitution and for British theories in politics, so Voltaire, Diderot, and a crowd of others

popularized and continued in France the philosophical ideas of Hobbes and Locke and even Berkeley, the theological ideas of Bolingbroke, Shaftesbury, and the English deists, and the physical discoveries of Newton. Descartes, Frenchman and genius as he was, and though his principles in physics and philosophy were long clung to in the schools, was completely abandoned by the more adventurous and progressive spirits. At no time indeed, owing to the confusion of thought and purpose to which we have already alluded, was the word philosophy used with greater looseness than at this time. Using it as we have hitherto used it in the sense of metaphysics, the majority of the Philosophes have very little claim to their title. They were all more or less partisans of materialism, but few of them were contented with arguing materialism out on purely philosophical grounds, or with purely philosophical applications. They usually busied themselves with deduc- ing it from physical considerations, and with applying it to ethical and theological conclusions, There were some who manifested, however, an aptitude for purely philo- sophical argument, and one who confined himself strictly thereto. Among the former the most remarkable are La Mettrie (1709-1751) and Diderot. La Mettrie in his works L'Llomme Machine, L'Homme Plante, &c., applied a lively and vigorous imagination, a considerable familiarity with physics and medicine, and a brilliant but unequal style to the task of advocating materialistic ideas on the constitu-

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Condillac.

BIGHTEENTH CENTURY PHILOSOPHY.]

tion of man. Diderot, ina series of early works, Lettre sur les Aveugles, Promenade d'un Sceptique, Pensées Phalo- sophiques, &c., exhibited a good acquaintance with philo- sophical history and opinion, and gave sign in this direction, as in so many others, of a far-reaching intellect. As in almost all his works, however, the value of the thought is extremely unequal, while the different pieces, always written in the hottest haste, and never duly matured or corrected, present but few specimens of finished and polished writing. Bonnet (1724-1793), a Swiss of Geneva, wrote a large number of works, many of which are purely scientific. Others, however, are more psychological, and these, though advocating the materialistic

philosophy generally in vogue were remarkable for uniting materialism with an honest adherence to Christianity. The half mystical writer, St Martin, also deserves notice. But the French metaphysician of the century is undoubtedly Condillac (1714-1780), almost the only writer of the time in France who succeeded in keeping strictly to philosophy without attempting to pursue his system to its results in ethics, politics, and theology ; still more without desiring to anti- cipate such results, and to discuss the application of a philo- sophy before the philosophy was itself established. In the Traité des Sensations, the Essai sur POrigine des Connais- sances Humaines, and other works Condillac elaborated and continued the imperfect sensationalism of Locke. As his philosophical view, though perhaps more restricted, was far more direct, consecutive, and uncompromising than that of the Englishman, so his style greatly exceeded Locke's in clearness and elegance. It cannot pretend to vie with the beauty and artistic suitability of the styles of Descartes and Malebranche, nor with that of Condillac's elder contem- porary Berkeley. But for all that, it is a good medium of philosophical expression, and its literary character did not a little to assist the diffusion of the principles of materialism.

18th Century Theology.—To devote a section to the history of the theological literature of the 18th century in France may seem something of a contradiction ; for, indeed, all or most of such literature was anti-theological. The magnificent list of names which the church had been able to claim on her side in the 17th century was exhausted before the end of the second quarter of the 18th with Massillon, and none came to fill their place. Very rarely has ortho- doxy been so badly defended as at this time. The literary championship of the church was entirely in the hands of the Jesuits, and of a few disreputable literary free-lances like Fréron (1719-1776) and Desfontaines, The Jesuits were learned enough, and their principal journal, that of Trévoux, was conducted with much vigour and a great deal of erudition. But they were in the first place discredited by the moral taint which has always hung over Jesuitism, and in the second place by the persecutions of the Jansen- ists and the Protestants, which were attributed to their influence. No single name or work on the orthodox side has preserved the least reputation; while, on the other hand, the names of Pére Nonotte and several of his fellows have been enshrined unenviably in the imperishable ridicule of Voltaire, one only of whose adversaries, Guénée

(1717- 1803), was able to meet him at something like his own weapons. At the same time, while religion and the church were never so badly off for defenders, they had never been, and have never been, so desperately in need of defence. The financial condition of the church was in scandalous con- trast with the need and bankruptcy of the state. The lives of too many of its ministers were in more scandalous con- trast still with its doctrines and precepts; while its poli- tical ascendency, and the use made of it, were felt to be, not merely unjust and improper in themselves, but an almost insuperable barrier to social and political reform. Meanwhile a spirit of hostility had long been growling up,

not merely to the church, but to Christianity and religion itself, which was not entirely due to ecclesiastical corrup- tions. The Renaissance by its paganism, the Reformation by its latitudinarian developments, and the growth of modern science by its materialistic tendencies, had all con- tributed to this anti-theological movement. Even in the reign of Louis XIV. there was a considerable school of free- thinkers at the French court, and when the restraint of that monarch's devotion was removed the number became largely increased, especially as the study of the writings of the English deists came to strengthen the tendency. It has never been at all accurately decided how far what may be

called the scoffing school of Voltaire represents a direct re- Voltaire volt against Christianity, and how far it was merely a kind (theology).

of guerilla warfare against the clergy. It is positively cer- tain that Voltaire was not an atheist, and that he did not approve of atheism. But for his aggressive and reforming tendencies he miglit very likely have confined himself to the colourless and speculative deism of Bolingbroke and Shaftesbury. As it was, however, he went farther, and his Dictionnaire Philosophique, which is typical of a vast amount of contemporary and subsequent literature, consists of a heterogeneous assemblage of articles directed against various points of dogma and ritual and various characteris- tics of the sacred records. From the literary point of view, it is

one of the most characteristic of all Voltaire's works, though it is perhaps not entirely his. The desultory arrangement, the light and lively style, the extensive but not always too accurate erudition, and the somewhat cap- tious aud quibbling objections, are intensely Voltairian. But there is little seriousness about it, and certainly no kind of rancorous or deep-seated hostility. With many, however, of Voltaire's pupils and younger contemporaries the case was altered. They were distinctively atheists and anti- supernaturalists. The atheism of Diderot, unquestionably the greatest of them all, has been keenly debated ; but in the case of Damilaville, Naigeon, Holbach, and others there is no room fordoubt. By these persons a great mass of atheistic and anti-Christian literature was composed and set afloat. The characteristic work of this school, its last

word indeed, is the famous Systeme de la Nature, attributed The

to Holbach (1723-1789), but known to be, in part at System of hy Nature.

least, the work of Diderot. In this remarkable work, whic caps the climax of the metaphysical materialism or rather nihilism of the century, the atheistic position is clearly put. It made an immense sensation; and it so fluttered not merely the orthodox but the more moderate free-thinkers, that Frederick of Prussia and Voltaire, perhaps the most singular pair of defenders that orthodoxy ever had, actually set themselves to refute it. The extreme mnpopularity and startling nature of its tenets, which we do not here judge, have been wont to reflect themselves in the criticisms passed on it merely as a book. Viewed in this light, without pre- judice either way, it must be pronounced undeserving of much of this unfavourable criticism. Its style and argu- ment are very unequal, as books written in collaboration are apt to be, and especially books in which Diderot, the paragon of inequality, had a hand. But there 1s on the whole a great consistency and even rigour in the argument ; there =; an almost cntire absence of the heterogeneous assemblage of anecdotes, jokes good and bad, scraps of accurate or inac- curate physical science, and other incongruous matter with which the Philosophes were wont to stuff their works; and lastly, there is in the best passages a kind of sombre grandeur which recalls the manner as well as the matter of Lucretius. It is perhaps well to repeat, in the case of so notorious a book, that this criticism is of a purely literary and formal character; but

there is little doubt that the literary merits of the work considerably assisted its didactic influence. As the Revolution approached, and the victory

Chamfort. Rivarol.

Helvétius.

Thomas.

Vauven- argues,

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of the Philosophe party was declared, there appeared for a brief space a group of cynical and accomplished phrase- makers presenting some similarity to that of which a hundred years before St Evreniond was the most promt- nent figure. The chief of this group were Chamfort (1747-1794) on the republican side, and Rivarol (1753-1801) on that of the royalists. Like the older writer to whom we have compared them, neither can be said to have produced any one work of eminence, and in this they stand distin- guished from moralists like La Rochefoucauld. The float- ing sayings, however, which are attributed to them, or which occur here and there in their miscellaneous work, yield in no respect to those of the most famous of their pre- decessors in wit and a certain kind of wisdom, though they are frequently more personal than aphoristic. 18th Century Moralists and Poltticians.—Not the least part, however, of the energy of the period in thought and writing was devoted to questions of a directly moral and political kind. The grave social and economical evils under which France laboured made this devotion almost inevitable; and though we have already noticed under the head of his- tory a certain number of works written under this inspi- ration, a still larger proportion remains to be mentioned— moral, political, and economical works having had, froin the time of Aristotle downwards, sufficient connexion to be treated together. With regard to morality proper the favourite doctrine of the century was what is commonly called the selfish theory, the only one indeed which was suit- able to the sensationalism of Condillac and the materialism of Holbach. The pattern book of this doctrine was the De PEsprit of Helvetius (1715-1771), the most amusing book perhaps which ever pretended to the title of a solemn philo-

sophical treatise. There is some analogy between the prin- ciples of this work and those of the Systéme de la Nature. With the inconsistency—some would say with the question- able honesty—which distinguished the more famous mem- bers of the Philosophe party when their disciples spoke with what they considered imprudent outspokenness, Voltaire and even Diderot attacked Helvétius as the former after- wards attacked Holbach. Both were guilty of disregard- ing the curious cant of noble sentiment which was so dear to the 18th century, and with the tenacious steadiness of traditional criticism it has been usual to speak slightingly of Helvetius ever since. The truth is that, whatever may be the general value of De I' Zsprit, it is full of acuteness, though that acuteness is as desultory and disjointed as its style. As Helvétius may be taken as the representative author of the cynical school, so perhaps Thomas (1732- 1795) may be taken as representative of the votaries of noble sentiment to whom we have also alluded. The works of Thomas chiefly took the form of academic éloges or formal panegyrics, and they have all the defects, both in manner and substance, which are associated with that style. They were, however, useful in their way, as counteracting the prevailing cynicism, and. have some literary importance, as being perhaps the least dead of an enormous mass of similar literature which was composed at the time. Of yet a third school, corresponding in form to La Rochefoucauld and La Bruyére, and possessed of some of the antique vigour of preceding centuries, was Vauvenargues (1715-1747). This writer, who died very young, has produced maxims and reflexions of considerable mental force and literary finish. From Voltaire downwards it has been usual to compare him with Pascal, from whom he is chiefly distinguished by a striking but somewhat empty stoicism. Between the moralists, of whom we have taken these three as examples, and the politicians may be placed Rousseau, who in his es and. miscellaneous works is of the first class, in his ee Contrat Social of the second. The characteristics Ousseau are too well known to need lengthy description.

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[LITERATURE.

His discontent with the established social order and arrange- ments of the world led him, on the one hand, to advocate alterations in individual

morality, such as the discarding of the vices and corruptions of civilization, and the return to a simpler and less complicated manner of living ; on the other to develop and urge theories respecting the constitu- tion of the body politic, which, if not altogether novel in their nature, were made so by the force of their statement and the literary beauties of its form. Rousseau's work was continued on the moral and literary rather than the political side by Bernardin de Saint Pierre. Of direct and avowed political writings there were few during the century, and none of anything like the importance of the Contrat Social, theoretical acceptance of the established French constitution being a point of necessity with all Frenchmen. Neverthe- less it may be said that almost the whole of the voluminous writings of the Philosophes, even of those who, like Voltaire, were sincerely aristocratic and monarchic in predilection, were of more or less veiled political significance. There was one branch of political writing, moreover, which could be indulged in without much fear, The form of govern- ment was sacred, but the conduct of government could be discussed without much danger, for, whatever miglit be the divine rights of the best of princes, his intentions might always be frustrated by wicked or incapable ministers and officials. Political economy, therefore, and administrative theories, received much attention. The earliest writer of eminence on these subjects was the great engineer Vauban (1633-1707), whose Ovsivetés and Dime Royale exhibit both great ability and extensive observation. A more utopian econoniist of the same time was the Abbé de St Pierre (1658-1743), not to be confounded with the author of Paul et Vurguie. Soon {political economy in the hands of Quesnay (1694-1774) took a regular form, and towards the middle of the century a great number of works on questions connected with it, especially that of free trade in corn, on which the Abbé Galiani (1728-1787), Morellet, and above all Turgot, distinguished themselves. Of writers on legal subjects and of the legal profession, the century, though not less fertile than in other directions, produced few or none of any great importance from the literary point of view. The chief name which in this connexion is known is that of Chancellor d'Aguesseau (1668—1751), at the beginning of the century, an estimable writer of the Port Royal school, who took the orthodox side in the great disputes of the time, but failed to display any great ability therein. He was, as became his profession, more remarkable as an orator than a writer, and his works contain valuable testimonies to the especially perturbed and unquiet condition of his century

—a disquiet which is perhaps also its chief literary note. There were other French magistrates, such as Mon- tesquieu, Hénault (1685-1770), Des Brosses (1706-1773), and others, who made considerable mark in literature; but it was usually (except in the case of Montesquieu) in subjects not even indirectly connected with their profession. The bench and bar of France were indeed at this time almost as full of abuses as the other departments of state; and though the parliaments, metropolitan and provincial, would occasionally withstand a corrupt ministry, it was much more in the interest of their own privileges than of the community. The Lsprit des Lois stands alone.

L8th Century Criticism and Periodical Interature—We have said that literary criticism assumes in this century a sufficient importance to be treated under a separate heading. Contributions were made to it of many different kinds and from many different points of view. Periodical literature, the chief stimulus to its production, began more and more to come into favour. Even in the 17th century the Journal des Savants, the Jesuit Journal de Trévousx, and other publi- cations had set the example of different kinds of it. Just

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before the Revolution the Gazette de France was in the hands of Suard, a man who was nothing if not a literary critic. Perhaps, however, the most remarkable contribution of the century to criticism of the periodical kind was the Fenilles de Grimm, a circular sent for many years by the comrade of Diderot and Rousseau to the German courts, and containing a compte rendu of the ways and works of Paris, literary and artistic as well as social. These Leaves not only include much excellent literary criticism by Diderot, but also gave occasion to the incomparable salons or accounts of the exhibition of pictures from the same hand, essays which founded the art of picture criticism, and which have hardly been surpassed since. The prize competitions of the Academy were also a considerable stim- ulus to literary criticism, though the prevailing taste ;.in such compositions rather inclined

to elegant themes than to careful studies or analyses. Larger works on the arts in general or on special divisions of them were not wanting, as, for instance, that of Dubos before alluded to, and those of the Pére Bouhours, the Abbé Trublet, and the Abbé Terrasson, the Essai sur la Peinture of Diderot, and others. Critically annotated editions of the great French writers also came into fashion, and were no longer written by mere pedants. Of these Voltaire's edition of Corneille was the most remarkable, and his annotations, united separately under the title of Commentatre sur Corneille, form not the least important portion of his works. Even older writers, looked down upon though they were by the general taste of the day, received a share of this critical interest. In the earlier portion of the century Lenglet-Dufresnoy and La Monnoye devoted their attention to Rabelais, Regnier, Villon, Marot, and others. Barbazan (1696-1774) and Le Grand d'Aussy (1737-1800) gathered and brought into notice the long scattered and unknown rather than neglected fabliaux of the Middle Ages. Even the chansons de gestes attracted the notice of the Comte de Caylus (1692-1765) and the Comte de Tressan (1705-1785). The latter, in his Bibliotheque des Romans, worked up a large nuniber of.the old epics into a form suited to the taste of the century. In his hands they became lively tales of the kind suited to readers of Voltaire and Crébillon. But in this travestied form they had considerable influence both in France and abroad— Wieland, for instance, writing his Oberon merely from a knowledge, and very soou after the appearance, of Tressan's version of Huon de Bordeaux. By these publications attention was at least called to early French literature, and when it had been once called, a more serious and ap- preciative study became merely a matter of time. The style of much of the literary criticism of the close of this period was indeed deplorable enough. TLaharpe (1739- 1803), who thougli a little later in time as to most of his critical productions is perhaps its most representative figure, shows criticism in one of its worst forms. He has all the defects of Malherbe and Boileau, with few of their merits and none of their excuses. The critic specially abhorred by Sterne, who looked only at the stop-watch, was a kind of prophecy of Laharpe; but such a writer is a natural enough expression of an expiring principle. The year after the death of Laharpe Sainte-Beuve was born.

18th Century Savants.—In science and general erudition the 18th century in France was at first much occupied. with the mathematical studies for which

the French genius is so peculiarly adapted, which the great discoveries of Descartes had made possible and popular, and which those of his supplanter Newton only made more popular still. Vol- taire took to himself the credit which he fairly deserves of first introducing the Newtonian system into France, and it was soon widely popular—even ladies devoting them- selves to the exposition of mathematical subjects, as in the case of the Marquise du Chatelet. Many of the greatest

mathematicians of the age, such as De Moivre and Laplace, were French by birth, while others like Euler belonged to French-speaking races, and wrote in French. The physical sciences were also ardently cultivated, the impulse to them being given partly by the generally materialistic tendency of the age, partly by the Newtonian system, and partly also

by the extended knowledge of the world provided by the

circumnavigatory voyage of Bougainville (1729-1811), and other travels. Maupertuis (1698-1759) and La Condamine (1701-1774) made long journeys for scientific purposes, and duly recorded their experiences. The former, a mathema- tician and physicist of some ability but more oddity, is chiefly known to literature by the ridicule of Voltaire in the Diatribe du Docteur Akakia. D'Alembert (1713-1783), a great mathematician and a writer of considerable though rather academic excellence, is principally known from his connexion with and introduction to the Lneyclopédie, of which more presently. Chemistry was also assiduously cultivated, the Baron d'Holbach, among others, being a de- votee thereof, and helping to advance the science to the point where, at the conclusion of the century, it was illus- trated by Berthollet and Lavoisier. During all this devo- tion to science in its modern acceptation, the older and more literary forms of erudition were not neglected; especially by the illustrious Benedictines of the abbey of St Maur. Calmet (1672-1757), the author of the well- known Dictionary of the Bible, belonged to this order, and to them also (in particular to Dom Rivet) was due the beginning of the immense [Zzstoure Littéraire de la France, a work interrupted by the Revolution and long suspended, but for the last

quarter of a century diligently continued. Of less orthodox names distinguished for erudition, Fréret (1688-1749), secretary of the Academy, is perhaps the most remarkable. But in the consideration of the science and learning in the 18th century from a literary point of view, there is one name and one book which require particular and, in the case of the book, somewhat extended mention. The man is Buffon (1747-1780), the book the Zncyclopédie. The Buffon. «mmense Natural History of Buffon, though not entirely his own, is a remarkable monument of the union of scientific tastes with literary ability. As has happened in many simi- lar instances, there is in parts more literature than science to be found in it; and from the point of view of the latter, Buifon was far too careless in observation and far too solicit- ous of perfection of style and grandiosity of view. The style of Buffon has sometimes been made the subject of the highest eulogy, and it is at its best admirable ; but one still feels in it the fault of all serious French prose in this cen- tury before Rousseau,—the presence, that is to say, of an artificial spirit rather than of natural variety and power. The Encyclopédie, unquestionably on the whole the most import- The Ency- ant French literary production of the century, if we except clopédie. the works of Rousseau and Voltaire, was conducted for a time by Diderot and D'Alembert, afterwards by Diderot alone. It numbered among its contributors almost every Frenchman of eminence in letters. It is often spoken of as if, under the guise of an encyclopedia, it had been merely a plaidoyer against religion, but this 1s entirely erroneous. Whatever anti-ecclesiastical bent some of the articles may have, the book as a whole is simply what it professes to be, a dictionary,—that is to say, not merely an historical and cri- tical lexicon, like those of Bayle and Moreri (indeed, history and biography were nominally excluded), but a dictionary of arts, sciences, trades, and technical terms, Diderot himself had perhaps the greatest faculty of any man that ever lived for the literary treatment ina workman-like manner of the most heterogeneous and in some cases rebellious subjects ; and his untiring labour, not merely in writing original articles, but in editing the contributions of others, deter- mined the character of the whole work. There is no doubt

that it had, quite independently of any theological or political influence, an immense share in diffusing and grati- fying the taste for general information by which the century which has succeeded its publication has been more distin- guished than perhaps any other in history.

1789-~1830.— General Sketch.—The period which elapsed between the outbreak of the Revolution and the accession of Charles X. has often been considered a sterile one in point of literature. As far as mere productiveness goes, this judgment is hardly correct. No class of literature was altogether neglected during these stirring five-and-thirty years, the political events of which have so engrossed the attention of posterity that it has sometimes been necessary for historians to remind us that during the height of the Terror and the final disasters of the empire the theatres were open and the booksellers' shops patronized as much or more than ever. Journalisin, parliamentary eloquence, and scientific writing were especially cultivated, and the former in its modern sense may almost be said to have been created. But of the higher products of literature the period may justly be considered to have been somewhat barren, During the earlier part of it there is, with the exception of André Chénier, not a single name of the first or even second order of excellence. Towards the midst those of Chateaubriand (1768-1848) and Madame de Stael (1766-1817) stand almost alone; and at the close those of Courier, Béranger, and Lamartine are not seconded by any others to tell of the magnificent literary burst which was to follow the publication of Cromweli. Of all departments of literature, poetry proper was worst represented during this period. André Chénier was silenced at its opening by the guillotine. Le Brun and Delille, favoured by an extraor- dinary longevity, continued to be admired and followed. It was the palmy time of descriptive poetry. Fontanes, Castel, Boisjolin, Esmenard, Berchoux, Ricard, Martin, Gudin, Cournaud, are names which chiefly survive as those of the authors of scattered attempts to turn the Encyclopeedia into verse. Chénedollé (1769-1833) owes his reputation rather to amiability and to his association with men eminent in different ways, such as Rivarol and Joubert, than to any real power. Even more ambitiously, Luce de Lancival, Campenon, Dumesnil, and Parseval de Grand-Maison endeavoured to write epics, and succeeded rather worse than the Chapelains and Desmarets of the 17th century. The characteristic of all this poetry was the description of everything in metaphor and

paraphrase, and the careful avoidance of anything like directness of expression ; and the historians of the romantic movement have collected many instances of this absurlity. Lamartine will be more pro- perly noticed in the next division. But about the same time as Lamartine, and towards the end of the present period, there appeared a poet who may be regarded as the last important echo of Malherbe. This was Casimir Dela- vigne (1793-1843), the author of Les Messéniennes, a writer of very great talent, and, according to the measure of Rousseau aud Lebrun, no mean poet. It is usual to reckon Delavigne as transitionary between the two schools,

speare to classical rules, passed with his contemporaries as an introducer into French poetry of strange and revolu- tionary novelties. Comedy, on the other hand, fared better, as indeed it had always fared. Fabre d'Eglantine (1755-1794) (the companion in death of Danton), Collin d'Harleville (1755-1806), Andrieux (1759-1833), Picard, Alexandre Duval, and Népomuctne Lemercier (1771-1840) were the comic authors of the period, and their works have not suffered the complete eclipse of the contemporary trage- dies which in part they also wrote. If not exactly worthy successors of Moliére, they are at any rate not unworthy children of Beaumarchais. In romance writing there is again, until we come to Madame de Stael, a great want of originality and even of excellence in workmanship. The works of Madame de Genlis (1746-1830) exhibit the ten- dencies of the 18th century to platitude and noble sentiment at their worst. Madame Cottin, Madame Souza, and Madame de Krudener exliibited some of the qualities of Madame de Lafayette and more of those of Madame de Genlis, Fiévée (1767-1839), in Le Dot de Suzette and other works, showed some power over the domestic story ; but perhaps the most remarkable work in point of originality of the time was Xavier de Maistre's (1763-1852) Voyage autour de ma Chambre, an attempt in quite a new style, which has been happily followed up by other writers. Turn- ing to history we find comparatively little written at this period. Indeed, until quite its close, men were too much occupied in making history to have time to write it. There is, however, a considerable body of memoir writers, especially in the earlier years of the

period, and some great names appear even in history proper. Many of Sismondi's (1773-1842) best works were produced during the empire. De Barante (1782-1866), though his best known works date much later, belongs partially to this time. On the other hand, the pro- duction of philosophical writing, especially in what we may call applied philosophy, was considerable. The sensation- alist views of Condillac were first continued as by Destutt de Tracy (1754-1832) and Laromiguiére, and subsequently opposed, in consequence partly of a religious and spiritualist revival, partly of the influence of foreign schools of thought, especially the German and the Scotch. The chief philo- sophical writers from this latter point of view were' Royer Collard (1763-1846), Maine de Biran (1776-1824), and Jouffroy (1796-1842). Their influence on literature, how- ever, was altogether inferior to that of the reactionist school, of whom De Bonald (1753-1840) and Joseph de Maistre (1754-1821) were the great leaders. These latter were strongly political in their tendencies, and political philosophy received, as was natural, a large share of the attention of the time. In continuation of the work of the Philosophes, the most remarkable writer was Volney (1757- 1820), whose Funes are generally known. On the other hand, others belonging to that school, such as Necker and Morellet, wrote from the moderate point of view against re- volutionary excesses. Of the reactionists, De Bonald is ex- tremely royalist, and carries out in his Législations Primi- tives somewhat the same patriarchal and absolutist theories

but in strictness he must be counted with the classicists. Dramatic poetry exhibited somewhat similar characteristics. The system of tragedy writing had become purely mechan- ical, and every act, almost every scene and situation, had its regular and appropriate business and language, the former of which the poet was not supposed to alter at all, and the latter only very slightly. Poinsinet, Laharpe, M. J. Chénier, Raynouard, De Jouy, Briffaut, Baour-Lormian, all wrote in this style. Of these Chénier (1764-1811) had tore of the vigour of his brother André, from whom he was or eae by more popular political principles and

: er fortune. On the other hand Ducis (1733-1816), Who passes with Englishmen as a feeble reducer of Shake-

as our own Filmer, but with infinitely greater genius. As De Bonald is royalist and aristocratic, so De Maistre is the De Mais: | advocate of a theocracy pure and simple, with the pope y for its earthly head, and a vigorous despotism for its system i of government. Of theology proper there is almost necessarily little or nothing, the clergy being in the earlier period proscribed, in the latter part kept in a strict and somewhat discreditable subjection by the empire. In moralizing literature there is one work of the very highest excellence, which, though not published till long afterwards, belongs in point of composition to this period. This is the Pensées of Joubert (1754-1824), the most illustrious suc- Joubert cessor of Pascal and Vauvenargues, and to be ranked

perhaps above both in the literary finish of his maxims, and certainly above Vauvenargues in the breadth and depth of thought which they exhibit. Of science and erudition the time was fruitful. At an early period of it appeared the remarkable work of Cabanis (1757-1808), the Rapports du Physique et du Morale de ? Homme, a work in which physi- ology is treated from the extreme materialist point of view, but with all the liveliness and literary excellence of the Philosophe movement at its best. Another physiological work of great merit at this period was the Zraaté de la Vie et dela Mort of Bichat, and the example set by these works was widely followed; while in other branches of science La- place, Lagrange, Hauy, Berthollet, &c., produced contri- butions of the highest value. From the literary point of view, however, the chief interest of this time is centred in two individual names, those of Chateaubriand and Madame de Stael, and three literary developments of a niore or less novel character, which were all of the highest importance in shaping the course which French literature has taken since 1824. One of these developments was the reactionary movement of De Maistre and De Bonald, which in its turn largely influenced Chateaubriand, then Lamennais end Montalembert, and has been recently re- presented in French literature in different guises, chiefly by M. Louis Veuillot and Mgr. Dupanloup. The second and third, closely connected, were the immense advances made by parliamentary eloquence and by political writing, the

latter of which, by the hand of Paul Louis Courier (1773-1825), contributed for the first time an undoubted masterpiece to French literature. The influence of the two combined has since raised journalism to even a greater pitch of power in France than in any other country. It is in the development of these new openings for litera- ture, and in the cast aud complexion which they gave to its matter, that the real literary importance of the Revolutionary period consists; just as it is in the new elements which they supplied for the treatment of such subjects that the literary value of the authors of Aené and De VAllemagne mainly lies. We have already alluded to some of the beginnings of periodical and journalistic letters in France. Forsome time, in the hands of Bayle, Basnage, Des Maizeaux, Jurieu, Leclerc, periodical literature con- sisted mainly of a series, more or less disconnected, of pamphlets, with occasional extracts from forthcoming works, critical adversaria, and the like. Of a more regular kind were the often-mentioned Journal de Trévoux and Mercure de France, and later the Année Littéraire of Fréron and the like. The Correspondance of Grimm also, as we have pointed out, bore considerable resemblance to a modern monthly review, though it was addressed to a very few persons. Of political news there was, under a despotism, naturally very little. 1789, however, saw a vast change in this respect. An enormous efflorescence of periodical litera- ture at once took place, and a few of the numerous journals founded in that year or soon afterwards survived for-a considerable time. A whole class of authors arose who pretended to be nothing more than journalists, while many writers distinguished for rnore solid contributions to litera- ture took part in the movement, and not a few active politicians contributed. Thus to the original staff of the Moniteur, or, as it was at first called, La Gazette Nationale, Laharpe, Lacretelle, Andrieux, Garat, and Ginguené were attached. Among the writers of the Journal de Paris André Chénier had been ranked. Fontanes contributed to many royalist and moderate journals. Guizot and Morellet, representatives respectively of the 19th and the 18th cen- tury, shared in the Vowvelles Politiques, while Bertin Fievée and Geoffroy contributed to the Journal de ? Empire, after- wards turned into the still existing Journal des Débats. Of active politicians Marat (L'Ame du Peuple), Mirabeau

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(Courier de Provence), Barere (Journal des Débats et des Déerets), Brissot (Patriote Francais), Hébert (Pere Du- chesne), Robespierre (Défensew de lu Constitution), and Tallien (La Sentinelle) were the most remarkable who had an intimate connexion with journalism. On the other hand, the type of the journalist pure and simple is Camille Desmoulins (1759-1794), one of the most brilliant, in a literary point of view, of the short-lived celebrities of the time. Ofthesame class were Pelletier, Durozoy, Loustalot, Royou. As the immediate daily interest in politics drooped, there were formed periodicals of a partly political and partly literary character. Such had been the Décade Philo- sophigue, which counted Cabanis, Cliénier, and De Tracy among its contributors, and this was followed by the Revue Francaise at a later period, which was in its turn succeeded by the Reese des deux Mondes. On the other hand, parlia- mentary eloquence was even more important than journalism during the early period of the Revolution. Mirabeau nat- urally stands at the head of orators of this class, and next to lim may be ranked tle well-known names of Malouet and Meunier among constitutionalists; of Mobespierre, Marat, and Danton, the triumvirs of the Monntain ; of Maury, Cazales, and the Vicomte de Mirabeau, among the royalists ; and above all of the Girondist speakers Barnave, Vergniaud, and. Lanjuinais. The last-named survived to take part in the revival of parliamentary discnssion after the Restoration. But the permanent contributions to French literature of this period of voluminous eloquence are, as frequently happens in such cases, by no means large. 'The union of the journalist and the parliamentary spirit pro-

duced, however, in Paul Louis Courier a master of style. Cowier.

Courier spent the greater part of his life, tragically cut short, in translating the classics and studying the older writers cf France, in which study he learnt thoroughly to despise the pseudo-classicism of the 18th century. It was not till he was past forty that he took to political writing, and tle style of his pamphlets, and their wonderful irony aud vigour, at once placed them on the level of the very best things of the kind. Along with Conrier should be mentioned Benjamin Constant (1767-1830), who, thongh partly a ro- mance writer and partly a philosophical author, was mainly a politician and an orator, besides being fertile in articles and pamplilets. Lamennais like Lamartine will best be dealt with later, and the same may be said of

Béranger; but Chateaubriand and Madame de Stael must be noticed here. The former represents, in the influence which changed the literature of tlie 18th century into the literature of the 19th, the vague spirit of unrest and " Weltschmerz," the affec- tion for the picturesque qualities of nature, the religious spirit occasionally turning into mysticism, and the respect sure to become more and more definite and appreciative for antiquity. He gives in short the romantic and conservative elenient.

sophe character and the traditions of the 18th century, especially its liberalism, its sensibilité, and its thirst for general information ; to which, however, she added a cosmo- politan spirit, and a readiness to introduce into France the literary and social, as well as the political and philosophical, peculiarities of other countries to whicli the 18th century, in France at least, had been a stranger, and which Chatean- briand himself, notwithstanding his excursions into English literature, had been very far from feeling. She therefore contributed to the positive and liberal side of the future movement. Both of these remarkable persons have in their works a certain taint of what it is difficult to call by any other name than insincerity, though it is certain that there was in their case nothing consciously insincere. The 18th century, however, had left a tradition of "posing" in French literature from which these writers, two of its most IX. — 85

Madame de Stael, on the other hand, as became Madame a daughter of Necker, retained a great deal of the Philo- de Stael.

Chateau- briand.

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distinguished children, were by no means free. The abso- lute literary importance of the two was very different. Madame de Stael's early writings were of the critical kind, half sesthetic half ethical, of which the 18th century had been fond, and which their titles, Lettres sur J. J. Rousseant, Del' Influence des Passions, De la Inttérature considérée dans ses rapports avec les Institutions Sociales, sufficiently show. Her romances, Delphine and Corie, have singularly lost their attraction in seventy years, but their influence at the time was immense. The work, however, which had really the most fertile influence was the De 2' Allemagne, which practically opened

up to the rising generation in France the till then unknown treasures of literature and philosophy, which during the most glorious half century of her literary history Germany had, sometimes on hints taken from France herself, been accumulating. The style of these vari- ous works is not of the most admirable, and in their matter there is still, as we have said, much hollow talk. But the enthusiasm which pervaded them had a powerful effect, and the indications of new sources at which this enthusiasm might satisfy itself had an effect more powerful still. The literary importance of Chateaubriand is far greater, while his literary influence can hardly be exaggerated. Chateaubriand's literary father was Rousseau, and his voyage to America helped to develop the seeds which Rousseau had sown. In René and other works of the same kind, the naturalism of Rousseau received a still further development. But it was not in mere naturalism that Chateaubriand was to find his most fertile and most successful theme. It was, on the contrary, in the rehabilitation of Christianity. The 18th century had used against religion the method of ridicule ; Chateaubriand, by genius rather than by reasoning, set up against this method that of poetry and romance. "Christianity," says he, almost in so many words, "is the most poetical of all religions, the most attractive, the most fertile in literary, artistic, and social results." This theme he de- velops with the most splendid language, and with every con- ceivable advantage of style, in the Génie dw Christianisme and the Martyrs. The splendour of imagination, the sum- monings of history and literature to supply effective and touching illustrations, analogies, and incidents, the rich colouring so different from the peculiarly monotonous and grey tones of the masters of the 18th century, and the fervid admiration for nature which were Chateaubriand's main attractions and characteristics, could not fail to have an enormous literary influence. The romantic school acknow- ledged, and with justice, its direct indebtedness thereto ; but at the same time Chateaubriand's power of argument is perhaps weaker than that of any writer of equal emi- nence; and great as has been his literary following, his followers have very rarely adopted his principles. Literature since 1830.—In dealing with the history of French literature during the last half century, a slight alteration of treatment is requisite, The subdivisions of literature have lately become so numerous, and the contri- butions to each have reached such an immense volume, that it is impossible to give more than cursory notice, or indeed allusion, to most of them. It so happens, however, that the purely literary

characteristics of this ‘period, though of the most striking and remarkable, are confined to a few branches of literature. The characteristic of the 19th century in France has hitherto been at least as strongly marked as that of any previous period. In the Middle Ages men of letters followed each other in the cultivation of certain literary forms for long centuries. The chanson de geste, the Arthurian legend, the roman d’aventure, the fablian, the allegorical poem, the rough dramatic jeu, pete and farce, served successively as moulds into which an we and writing impulse of generations of authors | ccessively cast, often with little attention to the

suitableness of form and subject. The end of the 15th century, and still more the 16th, owing to the vast:extension of thought and knowledge then introduced, finally broke up the old forms, and introduced the practice of treating each subject in a manner more or less appropriate to it, and whether appropriate or not, freely selected by the author. At the same time a vast but somewhat indiscriminate addi- tion was made to the actual vocabulary of the language. The 17th and 18th centuries witnessed a process of restric- tion once more to certain forms and strict imitation of pre- decessors, combined with attention to purely arbitrary rules, the cramping and impoverishing effect of this (in Fénelon’s words) being counterbalanced. partly by the efforts of indi- vidual genius, and still more by the constant and steady enlargement of the range of thought, the choice of subjects, and the familiarity with other literature, both of the ancient and modern world. The literary work of the 19th century and of the great romantic movement which began in its second quarter was to repeat on a far larger scale the work of the 16th, to break up and discard such literary forms as had become useless or hopelessly stiff, to give strength, suppleness, and variety to such as were retained, to invent new ones where necessary, and to enrich the language by importations, inventions, and revivals. The result of this revolution is naturally most remarkable in the belles lettres and the kindred department of history. Poetry, not dram- atic, has been revived ; prose romance and literary criticism have been brought to a perfection previously unknown ; and history has produced works more

various, if not more re- markable, than at any previous stage of the language. Of all these branches we shall therefore endeavour to give some detailed account. But the services done to the language were not limited to the strictly literary branches of litera- ture. Modern French, if it lacks, as it probably does lack, the statuesque precision and elegance of prose style to which between 1650 and 1800 all else was sacrificed, has become a much more suitable instrument for the accurate and copious treatment of positive and concrete subjects. These subjects have accordingly been treated in an abundance corresponding to that manifested in other countries, though the literary importance of the treatment has perhaps pro- portionately declined. We cannot even attempt to indicate the innumerable directions of scientific study which this copious industry has taken, and must confine ourselves to those which come more immediately under the headings previously adopted. In philosophy France, like other nations, has principally devoted itself to the historical side of the matter, and the names of Damiron, Jules Simon, Vacherot, Quinet, De Rémusat, and Renan must be men- tioned. Victor Cousin (1792-1867), after enjoying a brief celebrity as the chief of an eclectic school, is now princi- pally remembered as a philosophical historian and critic. Towards the latter part of his long life he quitted even this connexion with philosophy, and devoted himself chiefly to the study of French history. The importance of Auguste Comte (1793-1857) is rather political and scientific than literary. We must also mention M. Taine (b. 1828), a brilliant writer, who busies himself alternately with history, philosophy, and criticism. Theology again, with the ex- ception of Lamennais, to be mentioned hereafter, supplies no name on which we need linger except that of M. Renan (b. 1823), whose somewhat florid literary style has contributed largely to the influence of his theological ideas. Montalem- bert (1810-1870), an historian with a strong theological tinge, deserves notice, and among orators Lacordaire (1802 – 1861) and the Pére Félix (b. 1810) on the Catholic side, and Athanase Coquerel (1820-1875) on the Protestant. The Penseés of Joubert, partly moral and partly literary, belong, in point of publication and interest, to this period,

‘and so do the melancholy moralizings of De Sénancour

RECENT PHILOLOGY. |

(1770-1846), which have had a great influence, though on a somewhat limited circle. Political philosophy and its kindred sciences have naturally received a large share of attention. Towards the middle of the century there was a great development of socialist and fanciful theorizing on politics, with which the names of St Simon, Fourier, Cabet, and others are connected. As political economists Bastiat, De Lavergne, Blanqui, and Chevalier may be noticed. In De Tocqueville (1805-1859) France produced a political observer of a remarkably acute, moderate, aud reflective character. The name of Lerminier (1805-1857) is of wide repute for legal and constitutional writings, and that of Jomini (1779-1869) is still more celebrated as a military historian ; while that of Lenormant (1801-1859) holds a not dissimilar position in archeology. With the publications devoted to physical science proper we do not attempt to meddle. Philology, however, demands a brief notice. In classical studies France has not recently occu- pied the position which might be expected of the country of Scaliger and Casaubon. She has, however, produced gome considerable Orientalists, such 'as Champollion the younger, Burnouf, Silvestre de Sacy, and Stanislas Julien. In attention to the antiquities of their own country the French have been at last stimulated by the example of Germany. The foundation of Romance philology was due, indeed, to the foreigners Wolf and Diez. But early in the century the curiosity as to the older literature of France created by Barbazan, Tressan, and others continued to extend. Méon published many unprinted fabliaux, gave the whole of the French Renart cycle, with the exception of Renart le Contrefait, and edited the Roman de la Kose. Fauriel and Raynouard dealt elaborately with Provengal poetry as well as partially with that of the trouvéres ; and the latter produced his comprehensive Lexique Romane. These examples were followed by many other writers, who edited manuscript works and commented on them, always with zeal and sometimes with discretion. Foremost among these must be mentioned M. Paulin Paris, who for fifty years has served the cause of old French literature with untiring energy, great literary taste, and a pleasant and facile pen. His selections from manuscripts, iis Romancero Francais, his editions of Garin le Loherain and Berte aux Grans Piés, and his Romans de la Table Ronde may especially be men- tioned. Soon, too, the Benedictine Hzstorre Inttéraire, so long interrupted, was resumed under M. Paris's general management, and has proceeded nearly to the end of the 14th century. Among its contents M. Paris's dissertations on the later

chansons de gestes and the early song writers, M. Victor Le Clere's on the fabliaux, and M. Littré's on the romans d'aventures may be specially noticed. For some time indeed the work of French editors was chargeable with a certain lack of critical and philological accuracy. This reproach, however, has recently been wiped off by the efforts of a band of young scholars, chiefly pupils of the Freole des Chartes, with MM. Gaston Paris and Paul Meyer at their head. The Société des Anciens Textes Francais has also been formed for the purpose of publishing scholarly editions of inedited works, Yet France has as yet produced no lexicon of her older tongue to complete the admirable dictionary in which M. Littré (b. 1801), at the cost of a life's labour, has embodied the whole vocabulary of the classical French language. Meanwhile the period between the Middle Ages proper and the 17th century has not lacked its share of this revival of attention. To the literature between Villon and Regnier especial attention was paid by the early romantics, and Sainte-Beuve's Tableau Historique et Critique de la ~~Poésie et du Théatre au Seiziéme Siecle was one of the manifestoes of the school. Since the appearance of that work in 1828 editions with critical comments of the literature of this period have con~~

stantly multiplied, aided by the great fancy for tastefully produced works which exists among the richer classes in France ; and there are probably now few countries in which works of old authors, whether in cheap reprints or im édt- tions de luxe can be more readily procured.

The Romantic Movement.—It is time, however, to return to the literary revolution itself, and its more purely literary results. At the accession of Charles X. France possessed three writers,and perhaps only three, of already remarkable eminence, if we except Chateaubriand, who was already of a past generation. These three were Béranger (1780-1857), Béranger. Lamartine (1790-1869), and Lamennais (1782-1854). The first belongs definitely in manner, despite his striking originality of nuance, to the past. He has remnants of the old periphrases, the cumbrous mythological allusions, the poetical properties of French verse. He has also the older and somewhat narrow limitations of a French poet ; foreigners are for him mere barbarians. At the same time his extraordinary lyrical

faculty, his excellent wit, which makes him a descendant of Rabelais and La Fontaine, and his occasional touches of pathos made him deserve and obtain something more than successes of occasion. Bé- ranger, moreover, was very far from being the mere impro- visatore which those who cling to the inspirationist theory of poetry would fain see in him. His studies in style and composition were persistent, and it was long before he attained the firm and brilliant manner which distinguishes him. Béranger's talent, however, was still too much a matter of individual genius to have great literary influence, and heformed no school. It was different with Lamartine, Lamar- who was, nevertheless, like Béranger, a typical Frenchman. tine. The Meditations and the Harmonies exhibit a remarkable transition between the old school and the new. In going direct to nature, in borrowing from her striking outlines, vivid and contrasted tints, harmony, and variety of sound, the new poet showed himself an innovator of the best class. In using romantic and religious associations, and expressing them in affecting language, he was thie Chateaubriand of verse. But with all this he retained some of the vices of the classical school. His versification, harmonious as it is, ig monotonous, and he does not venture into the bold lyrical forms which true poetry loves, and with which the alex- andrine of Boileau could not unite itself. He has still the horror of the mot propre; he is always spiritualizing and idealizing, and his style and thought have a double portion of the feminine and almost flaccid softness which had come to pass for grace in French. Nevertheless the Lac is a poem such as had not been written in France for 200 years. The last of the trio, Lamennais, represents an altogether bolder and rougher genius. Strongly influenced by the Catholic reaction, Lamennais also shows the strongest possibie influ- ence of the revolutionary spirit. His earliest work, the Lamen- Essat sur VIndifférence en Matiére de Religion, was a defence nais. of the church on curiously unecclesiastical lines. It was written in an ardent style, full of illustrations, and ex- tremely ambitious in character. The plan was partly critical and partly constructive. The first part disposed of the 18th century ; the second, adopting the theory of papal absolutism which De Maistre nad already advocated, proceeded to base it on a supposed universal consent, which the Church of Rome was very far from accepting as a contribution to its defence. The after history of Lamennais was perhaps not an unnatural recoil from this; but with this after history we are not concerned ; it is sufficient to point out that in his prose, especially as af terwards developed

in the apocalyp- tic Paroles d'un Croyant, are to be discerned many of the tendencies of the romantic school, particularly its hardy and picturesque choice of language, and the disdain of esta- plished and accepted methods which it professed. Thesigns

of the revolution itself were, as was natural. first given in

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periodical literature. The feudalist affectations of Chateau- briand and the legitimists excited a sort of zsthetic affec- tion for Gothicism, and Walter Scott became one of the most favourite authors in France. Soon was started the periodical La Muse Franccise, in which the names of Hugo, De Vigny, Deschamps, and Madame de Girardin appear. Almostall the writers in this periodical were eager royalists, and for some time the battle was still fought on political grounds. There could, however, be no special connexion between classical drama and liberalism; and the liberal journal, the Globe, with no less a person tlian Sainte-Beuve among its contributors, declared definite war against classi- cism in the drama. Svon the question became purely literary, and the romantic school proper was born in the famous cénacle or clique in which Hugo was chief poet, Sainte-Beuve chief critic, and Gautier, Gerard de Nerval, Emile and Autony Deschamps, Petrus Borel, and others were officers. Alfred de Vigny and Alfred de Musset stand somewhat apart, and so does Charles Nodier (1783-1844), a versatile and voluminous writer, the very variety and number of whose works have somewhat prevented the in- dividual excellence of any of them from having justice done to it. The objects of the school, which was at first violently opposed, so much so that certain Academicians actually petitioned the king to forbid the admission of any romantic piece at the Thdéatre Frangais, were, briefly stated, the burning of everything which had been adored, and the adoring of everything which had been burnt. They would have no unities, no arbitrary selection of subjects, no re- straints on variety of versification, no academically limited vocabulary, no considerations of artificial beauty, and, above all, no periphrastic expression. The mot propre, the calling of a spade a spade, was the great commandment of roman- ticism ; but it must be allowed that what was taken away in periphrase was made up in adjectives. De Musset, who was very much of a

free-lance in the contest, maintained indeed that the differentia of the romantic was the copious use of this part of speech. All sorts of epithets were in- vented to distinguish the two parties, of which Mamboyant and Gisétre are perhaps the most accurate and expressive pair,—the former serving to denote the gorgeous tints and bold atterapts of the new school, the latter the grey colour and monotonous outlines of the old. The representation of Hernani in 1830 was the culmination of the struggle, and during great part of the reign of Louis Philippe almost all the younger men of Jetters in France were romantics. The representation of the Lucréce of Ponsard (1814-1867) in 1846 is often quoted as the herald or sign of a classical re- action. But this was only apparent, and signified, if it signified anything, merely that the more juvenile excesses of the romantics were out of date. For forty years all the greatest men of letters of France have been on the innovat- ing side, and all without exception, whether intentionally or not, have had their work coloured by the results of the movement.

Drama and Poetry since 1830,—Although the immediate subject on which the battles of classics and romantics arose was dramatic poetry, the dramatic results of the movement have not been those of greatest value or most permanent character. The principal effect in the long run has been the introduction of a species of play called diame, as opposed to regular comedy and tragedy, admitting of much freer treatment than cither of these two as previously under- stood in French, and lending itself in some measure to the lengthy and disjointed action, the multiplicity of personages, and the absence of stock characters which characterized the English stage in its palmy days. All Victor Hugo's dramatic Works are of this class, and each, as it was pro- duced or published (Cromwell, Hernani, Marion de lOrme, Le Roi vamuse, Lucrdce Borgia, Marie Tudor, Ray Blas,

aud Les Burgraves), was a literary event, and excited the most violent discussion,—the author's usual plan being to prefix a prose preface of a very militant character to his work. A still more melodramatic variety of drame was that chiefly represented by Alexandre Dumas (1803-1874), whose Henri I/I. and Antony, to which may be added later La Tour de Nesle

and Mademoiselle de Belleisle, were almost as much rallying points for the early romantics as the dramas of Hugo, despite their inferior literary value. At the same time Alexandre Soumet (1788-1845), in Norma, Une Féte de Neron, &c., and Casimir Delavigne in Marino Faliero, Lowis XI, &c., maintained a somewhat closer adherence to the older models. The classical or semi- classical reaction of the last years of Louis Philippe was re-presented in tragedy by Ponsard (Lucréce, Agnes de Méranie, Charlotte Corday, Ulysse, and several comedies), and on the comic side, to a certain extent, by Emile Augier (b. 1820) in L'Aventwriére, Le Gendre de M. Poirier, Le Fils de Gaiboyer, &e. During almost the whole period Eugétne Scribe (1791-1861) poured forth innumerable comedies of the vaudeville order, which, without possessing much literary value, attained immense popularity. For the last twenty years the realist development of romanticism has had the upper hand in dramatic composition, its principal representatives bemg on the one side Victorien Sardou (b. 1831), whoin Vos Intimes, La Famille Benotton, Rabagas, Dora, &c., has chiefly devoted himself to the satirical treat-

| iment of manners, and Alexandre Dumas jils (b. 1824),

who in such' pieces as Les Idées de Madame Aubray and LP? Kirangére has rather busied himself with morals. Cer- tain isolated authors also deserve notice, such as Autran. (1813-1877), a poet and Academician having some resem- blance to Lamartine, whose Fille d'Aschyle created for him a dramatic reputation which he did not attempt to follow up, and Legouvé (b. 1807), whose Adrienne Lecouvreur was assisted to popularity by the admirable talent of Rachel, A special variety of drama of the first literary importance has also been cultivated in this century under the title of scénes or proverbes, slight dramatic sketches, in which the dialogue and style is of even more importance than the ac- tion. The best ofall of these are those of Alfred de Musset (1810-1857), whose Il faut qu'une porte soit ouverte ou JSermée, On ne badine pas avec Vamour, &e., are models of grace and wit. Among his followers may be mentioned especially M. Octave Feuillet (b. 1812).

In poetry proper, as in drama, M. Victor Hugo showed Victor the way, and has never allowed any one since to take the Hus

lead from him. In him all the romantic characteristics are expressed and embodied,—disregard of arbitrary critical rules, free choice of subject, variety and vigour of metre, splendour and sonorousness of diction. If the careful atten- tion to form which is also characteristic of the movement is less apparent in him than in some of his followers, it is not because it is absent, but because the enthusiastic conviction with which he attacks every subject somewhat diverts atten- tion from it. As with the merits so with the defects. A deficient sense of the ludicrous which has characterized many of the romantics is strongly apparent in their leader, as is also an equally representative grandiosity, and a fond- ness for the introduction of foreign and unfamiliar words, especially proper names, which occasionally produces an effect. of burlesque. Victor Hugo's earliest poetical works, his chiefly royalist and political Odes, are cast in the older and accepted forms, but already display astonishing poetical qualities. But it was in the Badlades (for instance, the splendid Pas d'Armes du Ror Jean, written in verses of three syllables) and the Orientales (of which may he taken for a sample the sixth section of Vavarin, a perfect torrent of outlandish terms poured forth in the most admirable verse, or Les Djinns, where some of the stanzas have lines

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Musset.

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of two syllables each) that the grand provocation was thrown to the believers in alexandrines, careful casuras, and strictly separated couplets. Les Fewzlles d'Automne, Les Chants du Crépuscule, Les Voix Intérieures, Les Rayons et les Ombres, the productions of the next twenty years were quieter in style and tone, but no less full of poetical spirit. The Revolution of 1848, the establishment of the empire, and the poet's exile brought about a fresh determination of his genius to lyrical subjects. Les Chdtuments and La Légende des Siécles, the one political, the other historical, reach perhaps the high water mark of French verse; and they were followed by the philosophical Contemplations, the lighter Chansons des Rues et des Bois,

the Année Terrible, the second Légende des Siécles, and one or two more volumes which lead us to the present day. We have been thus par- ticular because the literary productiveness of Victor Hugo himself hasbeen the measureand sample of the whole literary productiveness of France on the poetical side. At five-and twenty he was acknowledged as a master, at seventy-five he is a master still. His poetical influence has been repre- sented in three different schools, from which very few of the poetical writers of the century can be excluded. These few we may notice first. Alfred de Musset, a writer of great genius, felt part of the romantic inspiration very strongly, but was on the whole unfortunately influenced by Byron, and partly out of wilfulness, partly from a natural want of persevering industry and vigour, allowed himself to be careless and even slovenly in composition. Notwith- standing this many of his lyrics are among the finest poems in the language, and his verse, careless as it is, has extra- ordinary natural grace. Auguste Barbier, whose Jambes shows an extraordinary command of nervous and masculine versification, also comes in here; and the Breton poet Brizeux, together with Hégésippe Moreau, an unequal poet possessing some talent, and Pierre Dupont (1821-1870), one of much greater gifts, also deserve mention. Of the school of Lamartine rather than of Hugo are Alfred de Vigny (1799-1865) and Victor de Laprade (b. 1812), the former a writer of little bulk and somewhat over-fastidious, but possessing one of the most correct and elegant styles to be found in French, the latter a meditative aud philosophical poet, like De Vigny an admirable writer, but somewhat de- ficient in pith and substance, as well as in warmth and colour. The poetical schools which more directly derive from the romantic movement as represented by Hugo are three in number, corresponding in point of time with the first 'outburst of the movement, with the period of reaction already alluded to, and with the closing years of the second empire. Of the first by far the most distinguished member was Théophile Gautier (1811-1872), the most perfect poet in point of form that France has produced. The side of the romantic movement which Gautier developed was its purely pagan and Renaissance aspect. When quite a boy he devoted himself to the study of 16th century masters, and though he acknowledged the supremacy of Hugo, his own talent was of an individual order, and developed itself more or less independently. Albertus alone of his poems has much of the extravagant and grotesque character with distinguished early romantic literature. The Comédie de la Mort, the

Poésies Diverses, and still more the Hmaux et Camées, display a distinctly classical tendency—classical, that is to say, not in the party and perverted sense, but in its true acceptation. The tendency to the fantastic and horrible may be taken as best shown by Petrus Borel (1809- 1859), a writer of singular power almost entirely wasted. Gerard Labrunie or de} Nerval (1808-1855) adopted a manner also fantastic but more idealist than Borel's, and dis- tinguished himself by his Oriental travels and studies, and by his attention to popular ballads and traditions, while his style has an exquisite but unaffected strangeness hardly inferior

to Gautier's. This peculiar and somewhat quintessenced style is also remarkable in the Gaspard de la Nuit of Louis Bertrand, a work of rhythmical prose almost unique in its character. The two Deschamps were chiefly remarkable as translators. The next generation produced three re- markable poets, to whom may perhaps be added a fourth. Théodore de Banville (b. 1820), adopting the principles of Gautier, and combining with them a considerable satiric faculty, composed a large amount of verse, faultless in form, delicate and exquisite in shades and colours, but so entirely uentral in moral and political tone that it has found com. paratively few admirers. Leconte de Lisle (b. 1819), carrying out the principle of ransacking foreign literatures for subjects, has gone to Celtic, classical, or even Oriental sources for his inspiration, and despite a science in verse not much inferior to De Bauville's, and a far wider range and choice of subject, has diffused an air of erudition, not to say pedantry, over his work which has disgusted some readers. Charles Baudelaire (1821-1867), by his choice of unpopular subjects and the terrible truth of his analysis, has revolted not a few of those who, in the words of an English critic, cannot take pleasure in the re- presentation if they do not take pleasure in the thing represented. Thus by a strange coincidence each of the three representatives of the second romantic generation has for various reasons been hitherto disappointed of his due fame. The fourth poet of this time, Joséphin Soulary, is probably little known in England. His sonnets, however, are of rare beauty and excellence. In 1866 a collection of poems, entitled after an old

French fashion Le Parnasse Contemporain, appeared. It included contributions by many of the poets just mentioned, but the mass of the contributors were hitherto unknown to fame. A similar collection appeared in 1869, and was interrupted by the German war, but continued after it, and a third in 1876. The contributors to these collections, who have mostly published separate works, were very numerous, and have become collectively known, half seriously and half in derision, as Les Parnassiens. From time to time aspirants to poetry, such as MM. Bouchor and Lafagette, have attempted to revolt against this society, but they have ended by being absorbed into it. The cardinal principle of the Parnassiens is, in continuation of Gautier and Baudelaire, a devotion to poetry as an art, but under this general principle there is a considerable diversity of aim and object, and a still greater diversity of subject. Frangois Coppée has devoted himself chiefly to domestic and social subjects. Sully Prudhomme has a certain classical tinge. Catulle Mendes has followed Leconte de Lisle in going far afield for his subjects ; Louisa Siefert indulges in the poetry of despair; while Albert Glatigny, a poet who lived as a strolling actor, and died young, perhaps excelled any of thie others In individuality of poetical treatment. As the Parnasseens, however, muster some three or four score poets, it is impossible to deal with them atlength here. It is sufficient to say that the average merit of their work is decidedly high, though it is difficult to assign the first rank to any poet among them. Assuming that their work is to be classed as minor poetry, there has assuredly not even in the Elizabethan age in England been such a school of minor poets. It is fair to add that they appear to be little read in France, and hardly at all elsewhere. To complete the history of French poetry in the 19th century we must add that considerable efforts have been made to give Provencal rank once more as a literary tongue. The Gascon poet Jacques J asmin has produced a good deal of verse in the western dialect of the language. Within the last twenty years a more cultivated and literary school of poets has arisen in Provence itself, the chief of whom are Frédéric Mistral (Aftrevo, Calendau) and Théodore Aubanel.

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Dumas.

Prose Fiction since 1830.—Even more remarkable, because more absolutely novel, was the outburst of prose fiction which followed 1830. We have said that in this department the productions of France since the discrediting of the Scudéry romances had not on the whole been remarkable, and had been produced at considerable intervals. Madame de Lafayette, Le Sage, Marivaux, Voltaire, the Abbé Prévost, Diderot, J. J. Rousseau, Bernardin de St Pierre, and Fiévée had all of them produced work excellent inits way, and comprising in a more or less rudimentary condition most varieties of the novel. But none of them had, in the French phrase, made a school, and at no time had prose fiction been composed in any considerable quantities. The immense influence which, as we have seen, Walter Scott exercised was perhaps the direct cause of the attention paid to prose fiction ; the facility, too, with which all the fancies, tastes, and beliefs of the time could be embodied in such work may have had considerable importance. But it is difficult on any theory of cause and effect to account for the appear- ance in less than ten years of such a' group of novelists as Hugo, Gautier, Dumas, Mérimée, Balzac, George Sand, Jules Sandeau, and Charles de Bernard, names to which might be added others scarcely inferior. There is hardly anything else resembling it in literature, except the great cluster of English dramatists in the beginning of the 17th century, and of English poets at the beginning of the 19th ; and it is remarkable that the excellence of the first group has been maintained by a fresh generation,—Murger, About, Feuillet, Flaubert, Erckmann-Chatrian, Droz, Daudet, Cherbuliez, and Gaboriau, forming a company of diadochi not far inferior to their predecessors. The romance writing of France during the period has taken two different direc- tions,—the first that of the novel of incident, the second that of analysis and character. The first, now mainly deserted, was that which, as was natural when Scott was the inodel, was formerly most trodden ; the second required the astonishing genius of George Sand and of Balzac to attract students to it. The novels of Victor Hugo are novels of incident, with a strong infusion of purpose, and considerable but rather ideal character drawing. 'They are in fact lengthy prose drames rather than romances proper, and they have found no imitators, probably because no other genius was equal to the task. They display, however, the powers of the master at their fullest. On the other hand, Alexandre Dumas originally

*composed his novels in close imitation of Scott, and they are much less dramatic than narrative in character, so that they lend themselves to almost indefinite continuation, and there is often no particu- lar reason why they should terminate even at the end of the score or so of volumes to which they sometimes actually extend. Of this purely narrative kind, which hardly even attempts anything but the boldest character drawing, the best of them, such as Vingt Ans Aprés, Les Trois Mousque- taires, La Reine Margot, are probably the best specimens extant. Dumas possesses almost alone among novelists the secretof writing interminable dialogue without being tedious. Of something the same kind, but of a far lower stamp, are the novels of Eugene Sue(1804-1857). Dumas andSue were accompanied and followed by a vast crowd of companions, independent or imitative. Alfred de Vigny had already attempted the historical novel in Cing-dfars. Henride La Touche, an excellent critic who formed George Sand, but a mediocre novelist, may be mentioned, and perhaps also Roger de Beauvoir and Frédéric Soulié. Paul Féval and Amédée Achard are of the same school, and some of the at- tempts of Jules Janin (1804-1874), more celebrated as a critic, may also be connected with it. By degrees, however, ue Soe of incident, at least of an historical * Aides 7 was revived in another form, and with omestic Interest, by MM, Erckmann-*

Chatrian. The last and one of the most splendid instances of the old style was Le Capitaine Mracasse, which Théophile Gautier wrote in his old age asa kind of tour de force. The last-named writer in his earlier days had modified the incident novel in many short tales, a kind of writing for which French has always been famous, and in which Gautier's sketches are masterpieces. His only other long novel, Jademoiselle de Maupin, belongs rather to the class of analysis. With Gautier asa writer, whose literary character- istics even excel his purely tale-telling powers, may be classed Prosper Mérimée (1803-1871), one of the most exquisite 19th century masters of the language. Already, however, in 1830 the tide was setting strongly in favour of novels of contemporary life and manners. These were of course sus- ceptible of extremely various treatment. For many years Paul

de Kock, a writer who did not trouble himself about classics or romantics or any such matter, continued the tra- dition of Marivaux, Crebillon jils, and Pigault Lebrun, in a series of not, very moral or polished but lively and amusing sketches of life, principally of the bourgeois type. Later Charles de Bernard (1805-1850), with infinitely greater wit, elegance, propriety, and literary skill, did the same thing for the higher classes of French society. But the two great masters of the novel of character and manners as op- posed to that of history and incident are Honoré de Balzac (1799-1850) and Aurore Dudevant, commonly called George Sand (1793-1876). Their influence affected the entire body. of novelists who succeeded them, with very few exceptions, At the head of these exceptions may be placed Jules Sandeau (b. 1811), who, after writing a certain num- ber of novels in a less individual style, at last made for himself a special subject in a certain kind of domestic novel, where the passions set in motion are less boisterous than those usually preferred by the Freuch novelist, and reliance is mainly placed on minute character drawing and shades of colour sober in hue but very carefully adjusted (Catherine Mademoiselle de Penarvan, Mademoiselle de la Seigliére). In the same class of the more quiet and purely domestic novelists may be placed X. B. Saintine (Pecciola), Madame ©. Reybaud (Cleméntine, Le Cadet de Colobriéres), J. T. de St Germain (Pour un Epingle, La Feuille de Coudrier), Madame Craven (Récit d'une Sur, Hlewrange). Henri Beyle, who wrote under the nom de plume of Stendhal, also stands by himself. His chief work in the line of fiction is La Chartreuse de Parme, an exceedingly powerful novel of the analytical kind, and he also composed a considerable number of critical and miscellaneous works. Last among the independents must be mentioned Henry Murger (1822- 1861), the painter of what is called Bohemian life, that is to say, the struggles, difficulties, and amusements of students, youthful artists, and men of letters. In this peculiar style, which may perhaps be regarded as an irregu- lar descendant of the picaroon romance, Murger has no rival; and he is also, though on no extensive scale, a poet of great pathos. But with these exceptions, the influences of the two writers we have mentioned, sometimes combined, more often separate, may be traced throughout the whole of later novel literature. strongly tinged with the spirit of revolt against moral and social arrangements, and she sometimes diverged into very curious paths of pseudo-philosophy, such as was popular in the second quarter of the century. At times, too, as il Lucresia Floriané and some other

works, she did not hesi- tate to draw largely on her own personal adventures and experiences. But latterly she devoted herself rather to sketches of country life and manners, and to novels involving bold if not very careful sketches of character and more or less dramatic situations. She was one of the most fertile of novelists, continuing to the end of her long life to pour forth fiction at the rate of many volumes a year. 'This

George Sand began with books G. Sand.

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fertility, and the inexhaustible supply of comparatively novel imaginations with which she kept it up, is one of the most remarkable characteristics of her work, and in this respect she is perhaps second only to Sir Walter Scott ; but there is at the same time a certain want of finish about her fertility, and she is not generally found to be an author whose readers return to her individual works, as in the case with less productive but more laborious writers. Of her different styles may be mentioned as fairly characteristic, Lélia, Lucrezia Floriani, Consuelo, La Mare au Diable, La Petite Fadette, Francois le Champy, Mademoiselle de ta Balzacthe Quintinie, Considering the shorter length of his life the younger. productiveness of Balzac was almost more astonishing, especially if we consider that much of his early work is never reprinted, and has passed entirely out of remembrance. He is, moreover, the most remarkable example in literature of untiring work and determination to achieve success despite the greatest discouragements. His early work was, as we have said, worse than unsuccessful, it was positively bad ; and even the partiality which is usually shown to the early work of a man of genius has found it impossible to reverse the verdict of his first readers. After more than a score of unsuccessful attempts, Les Chouans at last made its mark, and for twenty years from that time the astonish- ing productions composing the so-called Comédve Humaine were poured forth successively. The sub-titles which Balzac imposed upon the different batches, Scénes de la Vie Parisienne, Dela Vie de Province, Dela Vie Intime, &c., show like the general title a deliberate intention on the author's part to cover the whole ground of human, at least of French life. Such an attempt could not succeed wholly ; yet the amount of success attained is astonishing. Balzac has, how- ever, with some justice been accused of

creating the world which he described, and his personages, wonderful as is the accuracy and force with which many of the characteristics of humanity are exemplified in them, are somehow not alto- gether human, owing to the specially French fault which we noticed in Racine and Molitre of insisting too much on the ruling passion. Since these two great novelists, many others have arisen, partly to tread in their steps, partly to strike out independent paths. Octave Feuillet, beginning his career by apprenticeship to Alexandre Dumas and the historical novel, soon found bis way in a very different style of composition, the roman intime of fashionable life, in which, notwithstanding some grave defects, he has attained much popularity. The so-called realist side of Balzac has been developed by Gustave Flaubert (b. 1821), who, to all his master's acuteness, and more than his knowledge of human nature, adds culture, scholarship, and a literary power over the language inferior to that of no writer of the century. Madame Bovary and L'Education Sentimentale are studies of contemporary life; in Salammbé and La Tentation de St Antoine erudition and antiquarian know- ledge furnish the subjects for the display of the highest literary skill. Of about the same date (b. 1828) Edmond About, before he abandoned novel-writing, devoted himself chiefly to sketches of abundant but always refined wit (L'Homme @ Oreille cassée, Le Nez d'un Notaire), and sometimes to foreign scenes (Zolla, le Roi des Montagne). | Champfleury (b. 1821), an associate of Murger, deserves . notice for stories of the extravaganza kind. During the whole of the second empire one of the most popular writers

. was Ernest Feydeau (1821-1874), a writer of great ability,

RECENT FICTION. |

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but morbid and affected in the choice and treatment of his subjects (Fanny, Sylvie, Catherine d'Overmeire). In the last ten years many writers of the realist school have en- deavoured to outdo their predecessors in unflinching fidelity, nominally carrying out the principles of Balzac and Flaubert, but in reality rather reverting to the extravagance of the very earliest romantic school, such as that of Jules

Janin in L'Ane Mort, and Petrus Borel in Champavert. Emile Zola, for instance, in parts of his long series Les Rougon-Macquart, descends to mere thieves' Latin and rhyparography. Emile Gaboriau, taking up that side of Balzac's talent which devoted itself to inextricable mys- teries, criminal trials, and the like, produced M. Le Coq, Le Crime @Orewal, La Degringolade, &c.; and Adolphe Belot for a time endeavoured to out-Feydeau Feydeau in La Femme de Feu and other works. Of a different stamp, and less of a mere exaggerator, is Victor Cherbuliez, who has produced in Le Roman d'une honnéte Femme a good novel of the analytic class, and in Le Comte Kostva, Ladislas Bolski, &c., less successful romances of incident. Gustave Droz deserves praise for extraordinarily witty and finely drawn domestic sketches, and Alphonse Daudet has written novels of manners the popularity of which is too recent to allow us to judge its chances of continuance. Periodical Literature since 1830.—Criticism.—One of the causes which led to this extensive composition of novels was the great spread of periodical literature in France, and the custom of including in almost all periodicals, daily, weekly, or monthly, a fewilleton or instalment of fiction. The same spread of periodical literature, together with the increasing interest in the literature of the past, led also to a very great development of criticism. Almost all French authors of any eminence during the last half century have devoted themselves more or less to criticism of literature, of the theatre, or of art, and sometimes, as in the case of Janin and Gautier, the comparatively lucrative nature of journalism and the smaller demands which it made for labour and intellectual concentration have diverted to feuilleton-writing abilities which might perhaps have been better employed. At the same time it must be remembered that from this devotion of men of the best talents to critical work has arisen an immense elevation of the standard of such work. Before the romantic movement in France Diderot in that country, Lessing and some of his successors in Germany, Hazlitt, Coleridge, and Lamb in England, had been admir- able critics and reviewers. But the theory of criticism, though these men's principles and practice had set it aside, still remained more or less what it had been for centuries. The critic was merely the administrator of certain hard and fast rules, There were certain recognized kinds of literary composition ; every new book- was bound to class itself under one or other of these. There were certain recognized rules for each class; and the goodness or badness of a book consisted simply in its obedience or

disobedience to these rules, Even the kinds of admissible subjects and the modes of admissible treatment were strictly noted and numbered. This was especially the case in France and with regard to French elles lettres, s0 that, as we have seen, certain classes of composition had been reduced to unimportant variations of a registered pattern. The romantic protest against this absurdity was specially loud and completely victorious. It is said that a publisher advised the youthful Lamartine to try "to be like somebody else" if he wished to succeed. The romantic standard of success was, on the contrary, to be as individual as possible. Victor Hugo himself com- posed a good deal of criticism, and in the preface to his Orientales he states the critical principles of the new school clearly. The critic, he says, has nothing to do with the subject chosen, tlie colours employed, the materials used. Is the work, judged by itself and with regard only to the ideal which the worker had in his mind, good or bad? It will be seen that as a legitimate corollary of this theorem the critic becomes even more of an interpreter than of a judge. He can no more satisfy himself or his readers by comparing the work before him with some abstract and ac- cepted standard, and marking off its shortcomings. He has to reconstruct, more or less conjecturally, the special

ideal at which each of his authors aimed, and to do this he has to study their idiosyncracies with the utmost care, and set them before his readers in as full and attractive a fashion ashe can manage. The first writer who thoroughly grasped this necessity and successfully dealt with it was Sainte-Beuve (1804-1869), who has indeed identified luis name with the method of criticism just described. Sainte- Beuve's first remarkable work (his poems and novels we may leave out of consideration) was the sketch of 16th century literature already alluded to which he contributed to the Globe. But it was not till later that his style of criticism became fully developed and accentuated. During the first decade of Louis Philippe's reign his critical papers, united under the title of Critiques et Portratts Littéraires, show a gradualadvance. During the next ten years he was mainly occupied with his studies of the writers of the Port Royal school. But it was during the Jast

twenty years of his life, when the famous Causeries du Lundi appeared weekly in the columns of the Constetutionnel and the Moniteur, that his most remarkable productions came out. Sainte-Beuve's style of criticism (which is the key to so much of French literature of the last half century that it is necessary to dwell on it at some length), excellent and valuable as it is, lent itself to two corruptions. There is, in the first place, in making the careful investigations into the character and circumstances of each writer which it demands, a danger ot paying too much attention to the man and too little to his work, and of substituting for a critical study a mere collection of personal enecdotes and traits, especially if the author dealt with belongs to a foreign country or a past age. The other danger is that of connecting the genius and character of particular authors too much with their conditions and circumstances so as to regard them as merely so many products of the age. These faults, and especially the latter, have been very noticeable in many of Sainte- Beuve's successors, particularly in M. Henri Taine, the most brilliant of living French critics, and owing to his [/istoire de la Inttérature Anglaise, the best known in England. A large number of other critics during the period deserve notice because they have, though acting more or less on the newer system of criticism, manifested considerable origin- ality in its application. As far as merely critical faculty goes, and still more in the power of giving literary expres- sion to criticism, Théophile Gautier yields to no one. His Les Grotesques, an early work dealing with Villon, De Viau, and other enfants terribles of French literature, has served as a model to many subsequent writers, such as Charles Monselet and Charles Asselineau, the affectionate historian of the less famous promoters of the romantic movement, On the other hand, Gautier's picture criticisms, and his short reviews of books, obituary notices, and other things of the kind contributed to daily papers, are in point of style among the finest of all such fugitive compositions, Janin, chiefly a theatrical critic, excelled in light and easy Journalism, but his work has neither weight of substance nor careful elaboration of manner sufficient to give it permanent value. This sort of light critical comment has become almost a specialty of the French press, and among its numerous prac- titioners the names of Armand de Pontmartin (an imitator and assailant of Sainte-Beuve), Arséne Houssaye, Fiorentino, may be mentioned. Edmond Scherer and Paul de St Victor —the former of whom was born in 1812, the latter in 1827—represent different sides of Sainte-

Beuve's style in literary criticism; and in theatrical censure Fran- cisque Sarcey, an acute but somewhat severe judge, has succeeded to the good-natured sovereignty of Janin. The criticism of the Revue des Deux Mondes has played a suffi- ciently _mportant part in French literature to deserve separate Notice in passing. Founded in 1829, the Revue, after some Vicissitudes, soon attained, under the direction of the Swiss

Buloz, the character of being one' of. the first of European critical periodicals. Its style of criticism has on the whole inclined rather to the classical side,—that is, to classicism as modified by, and possible after, the romantic movement. Besides some of the authors already named, its principal critical contributors have been Gustave Planche, an acute but somewhat truculent critic, Henri Etienne, St René Taillandier. Lastly we must notice the important section of professorial or university critics, whose critical work has taken the form either of regular treatises or of courses of republished lectures, books somewhat academic and rhe- torical in character, but often representing an amount of influence which has served largely to stir up attention to literature. The most prominent name among these is that of Villemain (1790-1870), who was one of the earliest critics of the literature of his own country that obtained a hearing out of it. M. Nisard (b. 1806) has perhaps been more fortunate in his dealings with Latin than with French, and in his History of the latter literature represents too much the classical tradition; Alexandre Vinet (1797-1847), a Swiss critic of considerable eminence, Saint-Marc-Girardin (1801-1873), whose Course de Littérature Dramatique is his chief work, and Eugene Géruzez (1799-1865), who is the author not only of an extremely useful and well- written handbook to French literature before the Revolu- tion, but also of other works dealing with separate por- tions of the subject, must also be mentioned.

Iistory since 1830.—The remarkable development of historical studies which we have noticed as taking place under the Restoration was accelerated and intensified in the reigns of Charles X. and Louis Philippe. Both the scope and the method of the historian underwent a sensible altera-

tion, For something like 150 years historians had been divided into two classes, those who produced elegant literary works pleasant to read, and those who produced works of laborious erudition, but not even intended for general perusal. The Vertots and Voltaires were on one side, the Mabillons and Tillemonts on another. Now, although the duty of a French historian to produce works of literary merit was not forgotten, it was recognized as part of that duty to consult original documents and impart original observation. At the same time, to the merely political events which had formerly been recognized as forming the historian's province were added the social and literary phenomena wliuch had long been more or less neglected. Old chronicles and histories were re-read and re-edited ; innumerable monographs on special subjects and periods were produced, and these latter were of immense service to romance writers at the time of the popularity of the histori- cal novel, Not a few of the works, for instance, which were signed by Alexandre Dumas consist mainly of extracts or condensations from old chronicles, or modern monographs ingeniously united by dialogue and varnished with a little description. History, however, had not to wait for this second-hand popularity, and its cultivators had fully suffi- cient literary talent to maintain its dignity. Sismondi, whom we have already noticed, continued during this period his great [/istoire des Francacs, and produced his even better known J/istoire des Republiques Italiennes au Moyen Age. The brothers Thierry devoted themselves to early French history, Amédée Thierry (1787-1875) producing a Histoire des Gaulovs and other works concerning the Roman period, and Augustin Thierry (1795-1856) the well-known history of the Norman Conquest, the equally attractive Lécits des Temps Mérovingiens, and other excellent works, Philippe de Ségur (1780-1875) gave a history of the Russian cam- paign of Napoleon, and some other works chiefly dealing with Russian history. The voluminous Ztstovre de France of Henri Martin (b. 1810) is perhaps the best and most impartial work dealing in detail with the whole subject,

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RECENT HISTORY. |

De Barante, after beginning with literary criticism, turned to history, and in his Histoire des Ducs de Bourgogne pro- duced a work of capital importance. As was to be expected,

inany of the most brilliant results of this devotion to histori-

cal. subjects consisted of works dealing with tlre French Revolution. No series of historical events has ever per- haps received treatment at the same time from so many different points of view, and by writers of such varied literary excellence, among whom it must, however, be said that the purely royalist side is hardly atall represented. One of the earliest of these histories is that of Mignet (b. 1796), asober and judicious historian of the older school. About the same time was begun the brilliant work of M. Thiers (1797-1877) on the Revolution, which established the literary reputation of the future president of the French republic, and was at a later period completed 'by the /Zistotre du Consulat et de PEmpire. The downfall of the July monarchy and the early years of the empire witnessed the publication of

several works of the first importance on this subject. De

Barante contributed histories of the Convention and the Directory, but the three books of greatest note were those of Lamartine, Michelet (1798-1873), and Louis Blanc (b. 1813). Lamartine's Histoire des Girondins is written from the constitutional republican point of view, and is some-

times considered to have had much influence in producing |

the events of 1848. It is, perhaps, rather the work of an orator and poet than of a historian. The work of Michelet is of a more original character. Besides his history of the Revolution, Michelet wrote an extended history of France, aud a very large number of smaller works on historical, political, and social subjects. His imagmative powers are of the highest order, and his style stands alone in French for its strangely broken and picturesque character, its turbid abundance of striking images, and its somewhat sombre magnificence, qualities which, as may easily be supposed, found full occupation in a history of the Revolution. The work of Louis Blanc is that of a sincere but ardent republi- can, and is useful from this point of view, but

possesses no extraordinary literary merit, The principal contributions to the history of the Revolution during the last twenty years are those of Quinet, Lanfrey, and Taine. Edgar Quinet (1803-1875), like Louis Blanc a devotee of the Republic and an exile for its sake, brought to this one of his latest works a mind and pen long trained to literary and historical studies ; but La Révolution is not considered his best work. P. Lanfrey devoted himself with extraordinary patience and acuteness to the destruction of the Napoleonic legend, and the setting of the character of Napoleon I. in a new, auth- entic, and very far from favourable light. Quite recently M. Taine, after distinguishing himself,as we have mentioned, in literary criticism (Histoire dela Littérature Anglaise), and attaining less success in philosophy (De /'Intellagence), has begun an elaborate discussion of the Revolution, its causes, character, and consequences, which has excited some com- motion among the more ardent devotees of the principles of '89. To return from this group, we must notice Michaud (1767-1839), the historian of the crusades, and Guizot (1787-1876), who, like his rival Thiers, devoted himself much to historical study. His earliest works were literary and linguistic, but he soon turned to political history, and for the last half-century of his long life his contributions to historical literature were almost incessant and of the most various character. The most important are the histories Des Origines du Gouvernement Représentatif, De la Révolution d' Angleterre, Dela Civilisation en France, and latterly a Histoire de France, which he was writing at the time of his death. Among minor historians of the century

may be mentioned Duvergier de Hauranne (Gouvernement | Parlementaire en France), Mignet (Histoire de Marve

Stwart), Ampere (Histoire Romaine & Rome), Beugnot

| literary development.

(Destruction du Paganisme d'Occident), Haussonville (La Réunion dela Lorraine & la France), Vaulabelle (Les Deux Restawrations.)

_Summary and Conclusion.—We have in these last pages given such an outline of the 19tli century literature of France as seemed convenient for the completion of what has gone before. It has been already remarked that the nearer approach is made to our own time the less is it possible to give exhaustive accounts of the individual cultivators of the different branches of literature. It may be added, perhaps, that such exhaustiveness becomes, as we advance, less and less necessary, as well as less aud less possible. The indi- vidual Parnassien may and does produce work that is in itself of greater literary value than that of the individual trouvere. Asa matter of literary history his contribution is less remarkable because of the examples be has before him and the cirenmstances which he has around him. Yet we have endeavoured to draw such asketch of French litera- ture from the Chanson de Roland to the Légende des Svécles that no important development and hardly any important partaker in such development should be left out. A few lines may, perhaps, be now profitably given to summing up the aspects of the whole, remembering always that, as in no case is generalization easier than in the case of the literary aspects and tendencies of periods and nations, so in no case is it apt to be more delusive unless corrected and supported by ample information of fact and detail.

At the close of the 11th century and at the beginning of the 12th we find the vulgar tongue in France not merely in fully organized use for literary purposes, but already employed in most of the forms of poetical writing. An immense outburst of epic and narrative verse has taken place, and lyrical poetry, not limited as in the case of the epics to the north of France, but extending from Roussillon to the Pas de Calais, completes this. The 12th century adds to these earliest forms the important development of the mystery, extends the subjects and varies the manner of epic verse, and begins the compositions of literary prose with the chronicles of St Denis and of Villehardouin, and the prose‘romances of the Arthurian cycle. All this litera- ture is so far connected purely with the knightly apd priestly orders, though it is largely composed and still more largely dealt in by classes of men, trouvéres and jongleurs, who are not necessarily either knights or priests, and in the case of the jongleurs are certainly neither. Witha possible ancestry of Romance and Teutonic cantilene, Breton lats, and vernacular legends, the new literature has a certain pattern and model in Latin and for the most part ecclesi- astical compositions. It has the sacred books and the

legends of the saints for examples of narrative, the rhythm of the hymns for a guide to metre, and the ceremonies of the church for a stimulant to dramatic performance. By degrees also in this 12th century forms of literature which busy themselves with the unprivileged classes begin to be born. The fabliau takes every phase of life for its subject ; the folk-song acquires elegance and does not lose raciness and truth. In the next century, the 13th, medizeval litera- ture in France arrives at its prime—a prime which lasts until the first quarter of the 14th. The early epics lose something of their savage charms, the polished literature of Provence quickly perishes. But in the provinces which speak the more prevailing tongue nothing is wanting to

The language itself has shaken off all its youthful incapacities, and, though not yet well adapted | for the requirements of modern life and study, is in every way equal to the demands made upon it by its own time. The dramatic germ contained in the fabliau and quickened by the mystery produces the profane drama. Ambitious works of merit in the most various kinds are published ; | Aueassin et Nicolette stands side by side with the Vee de

Saint Louis, the Jeu de la Feuillie with Le Miraele de Théophile, the Roman de la Rose with the Roman du Kenart. The earliest notes of ballade and rondeau are heard; en- deavours are made witli zeal, and not always without under- standing, to naturalize the wisdom of the ancients in France, and in the graceful tongue that France possesses. Romance in prose and verse, drama, history, songs, satire, oratory, and even erudition, are all represented and represented worthily. Meanwhile all nations of Western Europe have come to France for their literary models and subjects, and the greatest writers in English, German, Italian, content themselves with adaptations of Chrétien de Troyes, of Benoit de Ste More, and of a hundred other known and unknown trouveres and fabulists. But this age does not last long. The language has been put to all the uses of which it is as yet capable ; those uses in their sameness begin to pall upon reader and hearer; and the enormous evils of the civil and religious state reflect themselves inevitably in literature. The old forms die out or are prolonged only in half-lifeless

travesties. The brilliant colouring of Froissart, and the graceful science of ballade and rondeau writers like Lescurel and Deschamps, alone maintain the literary reputation of the time. Towards the end of the 14th century the trans- lators and political writers import many terms of art, and strain the language to uses for which it is as yet unhandy, though at tlie beginning of the next age Charles d'Orléans by his natural grace and the virtue of the forms he used, emerges from the mass of writers. Throughout the 15th century the process of enriching or at least increasing the vocabulary goes on, but as yet no organizing hand appears to direct the process, Villon stands alone in merit as in peculiarity. But in this time dramatic literature and the literature of the floating popular broadsheet acquire an immense extension—all or almost all the vigour of spirit being concentrated in the rough farce and rougher lampoon, while all the literary skill is engrossed by insipid rhetori- gueurs and pedants. Then comes the grand upheaval of the Renaissance and the Reformation, An immense influx of science, of thought to make the science living, of new terms to express the thought, takes place, and a band of literary workers appear of power enough to master and get into shape the turbid mass. Rabelais, Amyot, Calvin, and Herberay fashion French prose; Marot, Ronsard, and Regnier refashion French verse. The Pléiade introduces the dramaas it is to be and the language tliat is to help the drama to express itself. Montaigne for the first time throws inveution and originality into some other form than verse or than prose fiction. But by the end of the century the tide has receded. The work of arrangement has been but half done, and there are no master spirits left to complete it. At this period Malherbe and Balzac make their appear- ance. Unable to deal with the whole problem, they determine to deal with part of it, and to reject a portion of the riches of which they feel themselves unfit to be stewards, Balzac and his successors make of French prose an instrument faultless and admirable in precision, unequalled for the work for which it is fit, but unfit for certain portions of the work which it was once able to perform. Malherbe, seconded by Boileau, makes of French verse an instrument suited only for the purposes of the drama of Euripides, or rather of Seneca, with or without its chorus, and for a certain weakened echo of those choruses, under the name of lyrics. No French verse of the first merit other than dramatic is written for two whole centuries. The drama soon comes to its acme, and during the succeed- ing time usually maintains itself at a fairly high level until the death of Voltaire. But prose lends itself to

almost ee that is required of it, and becomes constantly a a align ai perfect instrument. To the highest efforts

sublimity its vocabulary and its arrangement

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likewise are still unsuited, though the great preachers of the 17th century do their utmost with it. ~~But for clear exposi~~ tion, smooth and agreeable narrative, sententious and pointed brevity, witty repartee, it soon proves itself to have uo superior and scarcely an equal in Europe. In thiese directions practitioners of the highest skill apply it during the 17th century, while during the 18th its powers are shown to the utmost of their variety by Voltaire, and re- ceive a new development at the hands of Ronssean. Yet, on the whole, it loses during this century. It becomes more and more unfit for any but trivial uses, and at last it is employed for those uses only. Then occurs the Revolution, repeating the mighty stir in men's minds whicli the Renais- sance had given, but at first experiencing more difficulty in breaking up the ground and once more rendering it fertile. The faulty and incomplete genius of Chateaubriand and De Stael gives the first evidence of a new growth, and after many years the romantic movement completes the work. The force of that movement is now, after fifty years, all but spent, though its results remain; and France in a literary point of view occupies a position not very dissimilar to that which she ocenpied at the extreme end of the 16th century, save that the greatest of her regenerators is yet alive. The poetical power of French has been once more triumphantly proved, and its productiveness in all branches of literature has been renewed, while in that of prose fiction there has been almost created a new class of composition. In the process of reform, however, not a little of the finish of French prose style has been lost, and the language itself has been affected in something the same way as it was affected by the less judicious innovations of the Ronsardists. The pedantry of the Pléiade led to the preposterous com- pounds of Du Bartas; the passion of the Romantics for foreign tongues and for the mot propre has loaded Frencli with foreign terms on the one hand and with argot on tlie other. There is, therefore, room for new Malherbes and Balzacs, if the days for Balzacs and Malherbes had not to all

appearance passed. Should they be once more forth- coming, they have the failure as well as the success of their predecessors to guide them.

Finally, we may sum up even thissummary. For volume aud merit taken together the product of these eight centu- ries of literature excels that of any European nation, though for individual works of the supremest excellence they may perhaps be asked in vain. No French writer is lifted by the suffrages of other nations—the only criterion when sufficient time has elapsed—to the level of Honier, of Shakespeare, or of Dante, who reign alone. Of those of the authors of France who are indeed of the thirty but at- tain not to the first three Rabelais aud Moliére alone unite the general suffrage, and this fact roughly but surely points to the real excellence of the literature which these men are chosen to represent. It is great in all ways, but it is greatest on the lighter side. The house of mirth is more suited to it than the house of mourning. To the latter, in- deed, the language of the unknown marvel who told Roland's death, of him who gave utterance to Camilla's wrath and despair, and of the living poet who sings how the mountain wind makes mad the lover who cannot forget, has amply made good its title of entrance. But for one Frenchman who can write admirably in this strain there are a hundred who can tell the most admirable story, formulate the most pregnant reflexion, point the acutest jest. There is thus no really great epic in French, few great tragedies, and those imperfect and in a faulty kind, little prose like Milton's or like Jeremy Taylor's, little verse (though more than is generally thought) like Shelley's or like Spenser's. But there are the most delightful short tales, both in prose and in verse, that the world has ever seen, the most polished jewellery of reflexion that has ever been wrought, songs of

incomparable grace, comedies that must make men laugh as long as they are laughing animals, and above all such a body of narrative fiction, old and new, prose and verse, as no other nation can show for art and for originality, for grace of workmanship in him who fashions, and for cer- tainty of delight to him who reads.

Bibliography.—The bibliography of such a subject as French literature cannot be dealt with here exhaustively. We shall, how- ever, indicate the

principal works on the subject, and its subdivi- sions, which will serve to fill up the outline of the foregoing pages. On the general subject there is no work in English of any extent, except the recent compilation of Mr H. Van Laun (Edinburgh). Notices more or less detailed of the earlier periods will be found in Hallam's works, and of the 17th and 18th centuries (which must, however, be read with great caution) in Buckle's History of Civiliz- ation in Europe. The chief English critical periodicals will supply monographs, though until recently in no great abundance, of the chief naines and some of the chief forms. Mr Besant's French Poets and French Humorists may be noticed.

In French the chief works on the whole subject are that of Géruzez, already noticed, and another by Demogeot. These works are both excellent, and being composed on different plans, they may with advantage be read together. They are chiefly deficient with regard to the earliest and latest literature.

For the literature of the Middle Ages the fountain-head is the ponderous Histoire Littéraire already referred to, which, notwith- standing that it extends to 27 quarto volumes, and has occupied, with interruptions, 150 years in publication, has only reached the 14th century. Many of the monographs which it contains are the best authorities on their subjects, such as that of M. P. Paris on the early chansonniers, of M. V. Leclere on the fabliaux, and of M. Littré on the romans d'aventures. For the history of literature before the 11th century, the period mainly Latin, J. J. Ampére's Histoire Littéraire de la France avant Charlemagne, sous Charle- magne, et jusqwau onziéme siécle is the chief authority. Léon Gautier's Epopécs Frangaises (4 vols., but now reprinting on a still larger scale) contains almost everything known concerning the chansons de gestes. M. P. Paris's Romans de la Table Ronde 1s the main authority for this subject, though it does not include the contributions of Chrétien de Troyes. On the cycle of Reynard the standard work is Rothe, Les Romans dw Renart. All parts of the lighter literature of old France are excellently treated by M. Lenient, Le Satire au Moyen Age. The early theatre has been

frequently treated by the brothers Parfaict (Histoire du, Thédtre Frangais), by Fabre (Les Oleres de la Bazochc), by Leroy (Etude sur les Mystéres), by Aubertin ({tstotre dela Langue ct dela Littérature Francaise au Moyen Age). This latter book, recently completed, will be found a useful summary of the whole medieval period. The historical, dramatic, and oratorical sections are especially full.

On the 16th century an excellent handbook has recently been written by MM. Darmesteter and Hatzfeld. Sainte-Beuve's Tableau has been more than once referred to. Ebert (Entwicklungsgeschichte der Franzisischen Tragodie vornehmlich im 16ter Jahrhundert) is the chief authority for dramatic matters. The various cditions of the great authors of this and other periods do not need special reference. For Provengal the most convenient and trustworthy handbook is Karl Bartsch, Grundriss zur Geschichte der Provenzal- ischen Literatur. In English, Dr Hueffer's Zroubadours is the only work of value.

The 17th century, as the supposed classical age, has been re- peatedly treated in French. We may mention Sainte-Beuve's Studies on Port Royal, Demogeot's Tableau du 17¢me Siecle avant Corneille,and Géruzez (Essais d' Histoire Littéraire). Godefroy's His- totre de la Litt. Francaise depuis le 162me Siecle jusqu'a nos jours is an important work, as yet carried no further than the Revolution.

On the 18th century we may mention, in English, Mr Carlyle's essays on Voltaire and Diderot, and Mr John Morley's elaborate and exhaustive works on Voltaire, Diderot, and Rousseau, with his smaller essays on Turgot, Vanvenargues, &c. In Frencli, the works of Vinet, Godefroy, and Villemain, and for the philosophical side Damiron may be consulted. 'The best work on the period, in a small compass, is, however, a Tableaw which M. Godefroy has pub- lished in addition to his larger work. Post-Revolution literature is as yet too recent to have been treated in works of sufficient com- prehension to be noticed here. We may, however, mention Géruzez, Littérature de la Révolution, and Nettement, Littérature Francaise sous la Restauration et la Monarchie de Juillet.

On the subject of popular poctry, which, though a contrary inl- pression appears to prevail in England, is of extreme importance in French

literature, the main authorities are,—for the Breton district, M. Luzel (Chants Populaires de la Basse-Bretagne), (the more famous works of M. de la Villemarqué, Barsaz-Breiz and others, are of doubtful trustworthiness) ; for those of Lorraine, M. de Puymaigre; for those of Champagne, M. Tarbé. M. Haupt's Franzosische Volkslieder, Gaston Paris's Chansons du 15eme Siecle, Wackernagel's Alt-Franzisische Lieder und Leiche, and Bartsch's Romanzen und Pastourellen may also be consulted, though rather for specimens than for comment. (G. SA.)

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FRA—FRA

FRANCE, Istz or. See Mauritius.

FRANCESCA. See Pretro DELLA FRANCESCA.

FRANCESCHINI, Batpassars (1611-1689), a painter of the Tuscan school, named, from Volterra the place of his birth, I] Volterrano, or (to distinguish him from Riccia- relli) I Volterrano Giuniore, was the son of a sculptor in alabaster. At a very early age he learned from Cosimo some of the elements of art, and he started as an assistant to his father. This employment being evidently below the level of his talents, the Marquises Inghirami placed him, at the age of sixteen, under the Florentine painter Matteo Rosselli. In the ensuing year he had advanced sufficiently to execute in Volterra some frescos, skilful in foreshorten- ing, followed by other frescos for the Medici family in the Valle della Petraia. In 1652 the Marchese Filippo Niccolini, being minded to employ Franceschini upon the frescos for the cupola and back-wall of his chapel in 8. Croce, Florence, despatched him to various parts of Italy to perfect his style. The painter, in a tour which lasted some months, took more especially to the qualities dis- tinctive of the schools of Parma and Bologna, and in a measure to those of Pietro da Cortona, whose

acquaintance he made in Rome. He then undertook the paintings coin- missioned by Niccolini, which constitute lis most noted performance, the design being good, aud the method masterly. Franceschini ranks higher in fresco than in oil painting. His works in the latter mode were not unfre- quently left unfinished, although numerous specimens remain, the cabinet pictures being marked by much sprightliness of invention. Among his best oil paintings of large scale is the St John the Evangelist in the church of S. Chiara at Volterra. One of his latest works was the fresco of the cupola of the Annunziata, which occupied him for two years towards 1683, a production of much labour and energy. Franceschini died of apoplexy at Vol- terra on 6th January 1689. He is reckoned among those painters of the decline of art to whom the general name of "machinist" is applied. He is not to be confounded with another Franceschini of the same class, and of rather later date, also of no small eminence in his time— the Cavaliere Marcantonio Franceschini, who was a Bolog- nese (1648-1729). ;

FRANCHE COMTH, from 1674 till the great Revolu- tion one of the provinces of France, was bounded on the E. by the principality of Montbéliard or Mémpelgard and Switzerland, S. by Bresse, Bugey, and Gex, N. by Lorraine, and W. by the duchy of Burgundy and Champagne. It lay to the west of the Jura, and included the valley of the upper Saéne and the greater part of the valley of the Doubs. In earlier history it is usually called the countship of Burgundy or Upper Burgundy ; in later French history, on the other hand, it is frequently mentioned as the count- ship (la Comté) par excellence. The countship probably took its rise in the 10th century as a fief of the kingdom of Burgundy, which was dependent on the empire. It was held in the beginning of the 11th by Otto William, the warlike son of the king of the Lombards; his son and suc- cessor Reinhold or Reinaud I. ventured to refuse his homage to his suzerain Heury JII., and his example was followed about a century afterwards by Reinhold III, who took up & position of independence against the emperor Lothar. In neither case was the attempt to throw off the yoke per- initted to succeed, but on the latter occasion at least the prestige of the countship was improved, and according to

one theory the honourable title of Free Countship (/ret-

grafschaft) was then acquired. After Lothar's death Rein- hold again refused homage to the emperor Conrad, and though the emperor consequently bestowed his countship on Conrad of Zihringen, Reinhold was still in actual possession at his death in 1148, His daughter and heiress Beatrix

was married to Frederick Barbarossa in 1156; and on her de- cease in 1185 Frederick bestowed the countship on his third son Otto, and raised Besangon to the rank of a free imperial city. Otto's daughter Beatrix married Duke Otto of Meran, and was succeeded first by their son Otto and afterwards by their daughter Alix. Otto, the son of Alix, offended the emperor Rudolph I., and his city Besangon was conse- quently besieged by the imperial troops in 1289; but it made a successful defence, and peace was soon after- wards concluded. A treaty was made with Philip the Fair of France, by which Otto's daughter Jolanua was to marry Philip of Poitiers the king's second son, and the suzerainty of France was to be recognized by Franche Comté. The marriage took place in due course in 1307, and the importance attached by the king to his claims on Franche Comté is shown by the leniency with which the charges against the princess Johanna or Jeanne were enforced when her sisters-in-law were degraded and imprisoned and their paramours tortured and executed. On Philip's death in 1322 the countship passed to Otto IV. duke of Burgundy, and it was successively held by Philip de Rouvre, Margaret of France, Louis de Male, and Charles the Bold. On Charles's death, Louis XI. of France claimed the protectorate "for the good of the country and the lady of Burgundy, and in favour of the marriage of the dauphin with that lady." By feudal law the countship still held of the empire, being a Ger- man and a female fief; but the states accepted the French protection (February 1477), and the claims of Maximilian were appeased by the promise of the hand of Charles of France for his daughter Margaret. In April, however, a rebellion broke out; the emperor recalled the people to their allegiance, and the Swiss hastened to support the popular cause. 'The French were constrained to withdraw ; but in 1479 the Sire de Chaumont invaded the country, captured Déle in spite of a vigorous defence, in which the students of the university displayed a desperate but resultless valour, and forced the people to submit.

Besangon, the free imperial city, recognized the French king on the same conditions which it had de- manded from the dukes of Burgundy, and promised to pay over half the product of its taxes. The parliament of Déle was transferred to Salins, and the university to Besangon. When Charles VIIL refused to marry Maxi- milian's daughter, the people of Franche Comté rose in re- volt, and the king relinquished his claims by the treaty of Senlis, May 23, 1493. Along with the rest of the domains of the house of Burgundy the countship was bestowed on Philip, Maximilian's son, and passed to the crown of Spain. As a Spanish territory its position was a peculiar and iso- lated one; and it was consequently treated with great leniency by the Spanish Government. It paid a" gratuitous gift" of not more than 200,000 livres every three years, and furnished very few soldiers to the royal army. Under the nominal authority of the governor-general of the Low Countries, it was practically governed by the parliament of Déle and a governor chosen from the ranks of its own nobility. In 1668 Louis XIV. east his eyes on the pro- vince, and Condé effected its conquest in fifteen days. On the 14th of February the king swore at Déle to preserve the liberties of the town and province as count palatine of Burgundy, and the parliament issued an edict against those who refused to submit to his authority. By the peace of Aix-la-Chapelle, which almost immediately followed, Franche Comté was restored to Spain; but in 1674 Louis made a new invasion. Besangon was taken after a length- ened siege, at which Vauban and the king were both personally present ; Déle shared the same fate ; and by the 4th of July the whole country was again in the hands of the French. To celebrate the conquest the triumphal arch of the Saint Martin gate at Paris was erected. The count-

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ship now became a French province ; its gratuitous dona- tion became a regular impost, which was soon after increased in amount ; and the chief authority was placed in the hands of a governor-general. Instead of three great bailiwicks, as formerly, there were four:—Amont, Aval, Besangon, and Déle—their chief towns being Vesoul, Salins, Besangon, and Déle. See Clerc, Histoire de la Franche Comteé.

FRANCHISE, in law, means some right or privilege, of a local or exclusive character, eg., the right of free fishery. The term is more particularly applied to the right of vot- ing at an election for a member of parliament. See Par- LIAMENT.

FRANCIA, a celebrated Bolognese painter was born towards 1450, and died 6th January 1517. His real name was Francesco Raibolini, his father being Marco di Giacomo Raibolini, a carpenter; he was apprenticed to a goldsmith named Francia, and from him probably he got the nick- name whereby he is generally known; he, moreover, studied design under Marco Zoppo. The youth was thus originally a goldsmith, and also an engraver of dies and niellos, and in these arts he became extremely eminent. He was particularly famed for his dies for medals; he rose to be mint-master at Bologna, and retained that office till the end of his life. A famous medal of Pope Julius II. as liberator of Bologna is ascribed to his hand, but not with certainty. At a mature age—having first, it appears, become acquainted with Mantegna—he turned his atten- tion to painting. His earliest known picture is dated 1494 (not 1490, as ordinarily stated). It shows so much mastery that one is compelled to believe that Raibolini must before then have practised painting for some few years. This work is now in the Bologna gallery,—the Virgin enthroned, with Augustine and five other saints. It is an oil picture, and was originally painted for the church of S. Maria della Misericordia, at the desire of the Bentivoglio family, the rulers of Bologna. The same patrons employed him upon frescos in their own palace ; one of Judith and Holophernes is especially noted, its style recalling that of Mantegna. Francia probably studied likewise the works of Perugino; and he became a friend and ardent admirer of Raphael, to whom he addressed an enthusiastic sonnet. Raphael cordially responded to the Bolognese master's admiration, and said, in a letter dated in 1508, that few painters or none had produced Madonnas riore beautiful, more devout, or better portrayed than those of Francia. If we may trust Vasari—but it is diffi- cult to suppose that he was entirely correct—the exceeding value which Francia set on Raphael's art brought him to his grave. Raphael had consigned to Francia his famous picture of St Cecilia, destined for the church of &. Giovanni in Monte, Bologna; and Francia, on inspecting it, took so much to heart his own inferiority, at the advanced age of about sixty-six, to the youthful Umbrian, that he sickened and shortly expired.

Distanced though he may have been by Raphael, Francia is rightly regarded as the greatest painter of the earlier Bolognese school, and hardly to be surpassed as representing the art termed "'antico- moderno," or of the "quattrocento." It has been well observed that his style is a medium. between that of Perugino and that of Giovanni Bellini; he has somewhat more of spontaneous naturalism than the former, and of abstract dignity in feature and form than the latter. The magnificent portrait in the Louvre of a young man in black, of brooding thoughtfulness and saddened profundity of mood, would alone suffice to place Francia among the very great masters, if it could with confidence be attributed to his hand, but in all probability its real author was Franciabigio ; it had erewhile passed under the name of Raphael, of Giorgione, or of Sebastian del Piombo. The London National Gallery contains two remarkably fine

specimens of Francia, once combined together as principal picture and lunette,—the Virgin and Child and St Anne euthroned, surrounded by saints, and (in the lunette) the Pieta, or lamentation of angels over the dead Saviour. They come from the Buonvisi chapel in the church of §. Frediano, Lucca. Other leading works are—in Munich, the Virgin sinking on her knees in adoration of the Divine Infant, who is lying in a garden within a rose trellis; in the Borghese Gallery, Rome, a Peter Martyr; in Bologna, the frescos in the church of St Cecilia, illus- trating the life of the saint, all of them from the design of Raibolini, but not all executed by himself; a public passage now traverses these frescos, and they are in a pitiful state of decay. His landscape backgrounds are of uncommon excellence. Francia had more than 260 scholars. Marcantonio Raimondi the famous engraver is now the most renowned of them ; next to him, the painter Lorenzo Costa; also Amico Aspertini, and Francia's own son Giacomo, and his cousin Julio.

FRANCIA, Jost Gaspar RopRicuEz, commonly called Dr Francia, dictator of Paraguay, one of the most remark- able men connected with the history of South America, The date of his birth is not definitely ascertained, but pro- bably falls about 1757. According to one account, he was of French descent; but the truth seems to be that his father, Garcia Rodriguez Franca, was a native of 8. Paulo in Brazil, and came to Paraguay to take charge of

a planta- tion of black tobacco for the Government. He studied theology at the college of Cordova de Tucuman, and is said to have been for some time a professor in that faculty ; but he afterwards turned his attention to the law, and practised in Asuncion. Having attained a high reputation at once for ability and integrity, he was naturally selected for various important offices, and exercised great persunal influ- ence. The Robertsons, whose accounts have done so mucli to blacken his memory, relate how, when he was requested by one of his friends to undertake an unjust cause in his behalf, he not only refused, but went and offered his services to the man who was likely to be wronged, and by his bold- ness and energy secured his case. On the declaration of Paraguayan independence in 1811, he was appointed secre- tary to the national junta, and exercised an influence on affairs greatly out of proportion to his nominal position. When the congress or junta of 1813 changed the constitu- tion and established a duumvirate, Dr Francia and the Gaucho general Fulgencio were elected to the office. A story is told in connexion with their installation, whicli recalls the self-coronation of William I. of England and Napoleon the great. In theatrical imitation of Roman custom, two curule chairs had been placed in the assembly, one of them bearing the name of Cesar and the other that of Pompey. Francia seated himself in the Ceesar chair, and left his colleague to play the part of Pompey as best he might. _In 1814 he secured his own election as dictator for three years, and at the end of that period he obtained the dictatorship for life. He was no mere nominal sove reign ; but for the next twenty-five years he might have boasted, with even more truth than Louis XIV., " L'état c'est moi." In the accounts which have been published of his administration we find a strange mixture of capacity and caprice, of far-sighted wisdom and reckless infatuation, strenuous endeavours after a high ideal and flagrant viola- tions of the simplest principles of justice. He put a stop to the foreign commerce of the country, but carefully fostered its internal industries; was disposed to be hospi- table to strangers from other lands, and kept them prisoners for years ; lived a life of republican simplicity, and punished with Dionysian severity the slightest want of respect. As time went on he appears to have grown more arbitrary and despotic, more determined to maintain his mastery over the

country, and more apprehensive lest he should lose it. And yet at the time of his death it is said that he was generally regretted, and his bitterest opponents cannot deny that if he did much evil he also did much good. Deeply imbued with the principles of the French Revolution, he was a stern an- tagonist of the church, He abolished the Inquisition, sup- pressed the college of theology, did away with the tithes, and inflicted endless indignities on the priests. " What are they good for?" was his saying; " they make us believe more in the devil than in God." He discouraged marriage both by precept and example, and left behind him several illegitimate children. For the extravagances of his later years the plea of insanity has been put forward ; and it was evident that his worst characteristics were at their worst when the east wind blew. The circumstances of his death were in strange keeping with his life. He was about to sabre his doctor when he was seized with a fit, and he expired the same day, September 20, 1840. He was buried in the cathedral of Asuncion, but the spot is no longer known, and a story is told by Mr Mansfield and by Lieutenant-Colonel Thomson, to the effect that his body was dug up by some private enemies and flung into the river. On the other hand, it is well known that the greatest respect was shown to his memory by those who succeeded him in the govern- ment of Paraguay. Unfortunately for the history of his administration, Francia kept no records ; and he caused all his orders to be returned to him with the word "executed " on the margin, and then to be destroyed.

The first and fullest account of Dr Francia was given to the world by two Swiss surgeons, Rengger and Longchamps, whom he had detained from 1819 to 1825—Essai historique sur la révolution de Paraguay et la gouvernement dictatorial du docteur Francia, Paris, 1827. Their work was almost immediately translated into English under the title of The Reign of Doctor Joscph G. R. De Francia in Paraguay, 1827. About eleven years after there appearcd at London Leticrs on Paraguay, by Jn Pane. Wr. Robertson, two young Scotchmen whose hopes of commercial suc- cess had been rudely destroyed by the dictator's interference. The account which they gave of his character and government was naturally of the most unfavourable description, and they rehearsed and emphasized their accusations in Francie's Reign of Terror, 1839, and Letters on South America, 3 vols., 1843. From the very pages of his detractors Thomas

Carlyle succeeded in extracting mate- rials for a brilliant defence of the dictator "as a man or sovereign of iron energy and industry, of great and severe labour." It appeared in the Forcign Quarterly Review for 1843, and is reprinted in vol. iv. of the author's Critical and Miscellaneous Essays. Comparatively little new light has since been thrown on the subject. Captain Richard F. Burton gives a graphic sketch of Francia's life and a favourable notice of his character in his Letters from the Battleficlds of Paraguay, 1870, while C. A. Washburn takes up a hostile position in his History of Paraguay, 1871.

FRANCIABIGIO (1482-1525), a Florentine painter. The name of this artist is generally given as Marcantonio Franciabigio ; it appears, however, that his only real ascer- tained name was Francesco di Cristofano; and that he was currently termed Francia Bigio, the two appellatives being distinct. He was born in Florence, and studied under Albertinelli for some months. In 1505 he formed the acquaintance of Andrea del Sarto ; and after a while the two painters set up a shop in common in the Piazza del Grano. Franciabigio paid much attention to anatomy and perspective, and to the proportions of his figures, though these are often too squat and puffy in form. He had a large stock of artistic knowledge, and was at first noted for diligence. As years went on, and he received frequent commissions for all sorts of public painting for festive occasions, his diligence merged in something which may rather be called workmanly offhandedness. He was particularly proficient in fresco, and Vasari even says that he surpassed all his contemporaries in this method—a judgment which modern connoisseurship does not accept. In the court of the Servi (or cloister of the Nunziata) in Florence he painted in 1513 the Marriage of the Virgin,

as a portion of a series wherein Andrea del Sarto was chiefly concerned. The friars having uncovered this work before it was quite finished, Franciabigio was so incensed that, seizing a mason's hammer, he struck at the head of the Virgin, and some other heads; and the fresco, which would otherwise be his masterpiece in that method, remains thus mutilated to the present day. At Lo Scalzo, in another series of frescos on which Andrea was likewise

/ employed, he executed in 1518-19 the Departure of John

the Baptist for the Desert, and the Meeting of the Baptist with Jesus ; and, at the Medici Palace at Poggio a Caiano, in 1521, the Triumph of Cicero. Various works which have been ascribed to Raphael are now known or reason- ably deemed to be by Franciabigio. Such are the Madonna del Pozzo, in the Uffizi Gallery; the half figure of a Young Man, in the Louvre (a noble work already mentioned in the article Francia); and the famous picture in the Fuller-Maitland collection, a Young Man with a Letter. These two works show a close analogy in style to another in the Pitti Gallery, avowedly by Francia- bigio, a Youth at a Window, and to some others which bear this painter's recognized monogram. The series of portraits, taken collectively, places beyond dispute the eminent and idiosyncratic genius of the master. Two other works of his, of some celebrity, are the Calumny of Apelles, in the Pitti, and the Bath of Bathsheba (painted in 1523), in the Dresden Gallery.

FRANCIS I. (1494-1547), king of France, son of Charles of Orleans, count of Angouléme, and Louisa of Savoy, was born at Cognac 12th September 1494. As heir- presumptive of the throne of France, he received special favours from Louis XII., who created him duke of Valois and in 1512 gave him the command of the army of Navarre. In this position, though achieving no important results, he conducted himself with such prudence and courage that in 1513 he was appointed to the command of the army in Picardy, where he successfully carried out the plan of defensive operations that was entrusted to him. He married Claude daughter of Louis XII. in 1514, and succeeded him on the throne Ist January 1515. After his accession the first and great object that occupied his ambition was the recovery of Milan, the inheritance of which he claimed through his great-grandmother Valentina Visconti. Accordingly, while, in order to render himself secure against external attacks, he negotiated an alliance with Charles of Austria, afterwards the emperor Charles V., and the renewal of a treaty concluded by Louis XI. with Henry VIII. of England, he also began to collect his forces for an Italian expedition, The politic negotiations which won him Genoa, the acquisition of which was all-important as commanding the connexion between Milan and the sea, placed the purpose of his preparations beyond all doubt, and caused Leo X. to unite in an alliance against him with the

Spaniards and the Swiss. The Swiss at once occu- pied all the mountain passes ; but Francis, guided by a Piedmontese peasant, succeeded after great labour and diffi- culty in leading his army over the Alps by a pass deemed impracticable, and, descending into the friendly territories of the marquis of Saluzzo, surprised and routed at Villa Franca Colonna the general of the papal cavalry, and thus outflanking the Swiss caused them to fall back upon Milan. Completely disconcerted by the sudden movement, they at first actually entered into negotiations for a truce; but re- ceiving shortly afterwards a reinforcement of troops and their arrears of pay, they endeavoured to surprise tho French at Marignano. This battle, begun on the 13th Sep- tember 1515, prolonged into the night, and renewed on the following morning, was fought on both sides with furious and stubborn courage; but on the arrival of Alviano the Venetian commander to the succour of Francis, the Swiss

retreated unpursued to Milan. Shortly afterwards Milan surrendered, and in November a treaty was concluded between Francis and the Swiss, which subsequently took the form of a perpetual alliance. Such rapid and brilliant success at once gave Francis a position of commanding 1n- fluence, and enabled him still further to strengthen himself by additional advantageous treaties. In 1516, he compro- mised the long dispute with the popes by superseding the Pragmatic Sanction of Bourges by a " Concordat," an act which, while it recognized the superiority of the pope over the councils, and gave him the command of the annates and other rich sources of revenue, entrusted the French monarch with the power of nominating to vacant benefices. In 1517 he entered into an alliance with the emperor Maximilian and Charles I. of Spain against the Turks ; and in 1518 he made an arrangement with Henry VIII. of England, by which France bought back Tournay. On the death of Maximilian in 1519, Francis became a candidate for the imperial crown; but chiefly through the recommendation of Frederick the Wise of Saxony the choice fell on Charles I. of Spain, from that time known as Charles V. The success of Charles was prophetic of the relative positions which the two rivals were thenceforth to occupy, for the

resolute and persevering ambition of the emperor, and his hitherto wholly unsuspected abilities both in war and in diplomacy, were to prove themselves more than a match for the headstrong valour and showy accomplishments of the French monarch. War between them could scarcely have been avoided, even if the materials for kindling it had not been already prepared ; but inherited disputes in regard to Navarre, Milan, Burgundy, and Arles would in any case have sooner or later rendered an appeal to the decision of the sword almost inevitable. With a view to such possibilities, the great aim of both was to secure the alliance of Henry of England and the pope, and here fortune again ultimately smiled on Charles. Francis, elated by his previous achievements on the battlefield, and chagrined at the overthrow of his hopes of obtaining the imperial crown, was naturally eager to strike the first blow ; and the request of Henry IT. of Navarre to aid him in regain- ing his kingdom came opportuuely to second his wishes. Accordingly, in Apri] 1521 he sent an army to the aid of Henry. Charles at once retaliated by an invasion of France, and in May concluded a treaty with Pope Leo X. for the ex- pulsion of the French from Italy. Navarre after being almost won was again lost by Henry; and in Italy the French, chiefly through the blunders of Lautrec, the brother of the king's mistress, lost Milan, Genoa, and all their conquests with the exception of tlie stronghold of Cremona; but the attempt of the imperialists to enter France was pushed back, and Francis, following in pursuit, only by unaccount- able negligence missed the opportunity of inflicting a crush- ing defeat on Charles between Cambray and Valenciennes. After this, difficulties continued to thicken round the French king; on the 9th January 1522 the papal throne was mounted by Adrian VI, who had formerly been tutor to Charles V., and in May Henry VIII. declared war against France; in August 1523 a coalition was formed against her which included the pope, the emperor, the king of England, the archduke of Austria, the duke of Milan, and the principal Italian republics ; and about the same time Charles Constable Bourbon, having been unjustly used by Louise of Savoy, withdrew from France, and offered his sword to Charles V. The Spanish troops crossed the French frontiers at Bayonne; the English entered Picardy, and advanced to within 11 leagues of Paris; and after the re pulse of the French army despatched against Milan, the aap passed over into Provence and laid siege to a ae Through cautious but stubbornly defensive actics, however, both the Spanish and English incursions

were foiled, and Francis was thus able to advance to the relief of Marseilles with a large army. 'The imperialists did not wait his approach ; but, determined on retaliation, he crossed the Alps and laid siege to Pavia, where a strong Italian force had taken refuge. Here he was attacked, 24th February 1525, by a relieving army under Bourbon end Pescara. The attack was unsuccessful ; but, flushed with the victory which he believed already in his grasp, he rashly left his impregnable position, and so blundered in his manceuvres as to render his overwhelming defeat inevitable. His army was speedily either cut down or dispersed in flight, and he himself, after a desperate attempt to rally, was made prisoner and conveyed by Charles to Madrid. He only regained his

'liberty, 21st February 1526, by signing a treaty whereby

lie ceded to Charles both Burgundy and Milan. Its stipula- tions were guaranteed by the retention of his two sons in the emperor's hands ; but he nevertheless resolved to disregard it, and in this he was supported by Pope Clement VII. and also by Henry of England, whom jealousy and alarm at the emperor's success had induced to change sides. Though formal war was not declared, a French army was despatched to Italy, but the supineness with which the campaign was prosecuted enabled the imperialists to have it all their own way; and an army of mercenaries under Bourbon, who perished in the assault, marching unopposed to Rome, cap- tured and sacked the city, and took the pope prisoner. On this Francis and Henry at once declared war against the emperor ; but the army sent into Italy under Lautrec almost melted away before the walls of Naples; and Genoa, by sud- denly declaring for the emperor, completed the ruin of the French cause in Italy. The pope soon thereafter saw it to be his interest to be reconciled with Charles; and in August 1529, Charles and Francis agreed tothe treaty of Cambray, by which Francis retained Burgundy and obtained by a ransom the release of the French princes, but renounced his claims in Italy and ceded Artois and Flanders to his rival. He also agreed to fulfil the promise entered into at Madrid to marry Eleanor of Portugal, sister of Charles, his first wife having died in 1524. During the years of peace that fol- lowed this treaty, Francis, though he had encouraged the Smalkald League in

Germany, persecuted with great vigour the adherents of Protestantism in his own kingdom ; but when war was again declared, he issued an edict of tolera- tion. The pretext for the renewal of the war was the mur- der of the French ambassador by Duke Sforza of Milan in 1533, but hostilities were delayed till 1535, when, embold- ened by the weakened condition of the emperor after his war against the Turks, Francis overran Savoy and took pos- session of Turin. His advantages were, however, followed up with so little energy that Charles, after driving the French out of Italy, began an invasion of Provence; and his progress was only checked by the barbarous destruction of the country before him by Anne of Montmorency. Meantime Francis attacked Flanders, and entered into an alliance with Sultan Soliman IT., whose invasion of Hungary induced Charles in 1538 to consent to the ten years' truce of Nice. In 1540 Charles, while the guest of the French monarch, held out to him the hope of a complete satisfaction of his wishes through the investiture of the duke of Orleans with the duchy of Milan; but the promise, if definitely made, was never fulfilled, and Francis, finding a favourable opportunity after the disastrous issue of the emperor's expc- dition against Algiers, renewed on a flimsy pretext the war in 1542. An offensive alliance was formed with the Turks, the duke of Cleves, and Denmark and Sweden; separate armies attacked at various points the Spanish, Flemish, and Italian frontiers ; and the united French and Turkish forces captured and burned Nice. The monotony of the indecisive conflict was relieved in April 1544 by a brilliant French victory at Ceresoie, but the success came

too late to permit of its being followed up by an advance into Italy; for in the July following, the emperor from Champagne and the king of England from Picardy were marching to join their forces before the walls of Paris. The siege of Boulogne by the English gave Francis, however, sufficient time to make a show of defence such as convinced Charles of the doubtful nature of the enterprise ; and with- out consulting the king of England he sent to Francis from Crespy terms of peace, which were signed 17th September. By this treaty France retained Burgundy and resigned its claims on Flanders, Artois, and Naples, while the duchy of Milan was promised to the duke of Orleans on his marrying one of the imperial princesses—an arrangement,

however, which his death in 1545 rendered nugatory. Forsome time afterwards the English king continued the war in Picardy, but a treaty of peace was signed in June 1546. As soon as peace was concluded with the emperor, the prosecution of the Protestants in France was renewed, and in 1545 an edict was passed for the expulsion of the Waldenses from Provence. The health of Francis had for several years been completely undermined, and he succumbed to an acute attack of disease, 3lst May 1547.

In the reign of Francis were combined most of the faults and excellences which have been specially prominent in the subsequent history of his country. He was in a sense the creator of a new political aud intellectual era. As regards government, he was virtually the founder of the "ancient régime," whose final result and overthrow was the great Revolution ; he gave its death blow to feudalism ; he de- prived the parlements of all independent power; under the auspices of the minister Du Prat he confirmed and extended the system of corruption in civil and ecclesiastical appoint- ments ; and he turned the efforts of statesmanship away from the paths of constitutional progress, and into those of military renown. His reign in its social and intellectual results was more beneficial, for if he sanctioned by his example licentiousness of manuers, he at the same time gave a great impulse to refinement in taste and to intel- lectual progress by fostering in his country the offshoots of the Italian Renaissance. He founded in 1530 the college of France for the study of the three languages; he was himself a writer of verses, and a special friend and bene- factor of artists and men of letters; and by the purchase of the great masterpieces of Italian painting and sculpture, and in the magnificent structures of Chamford, Azai-le- Redeau, Amboise, and Fontainebleau he left behind him a permanent influence on French art. Compared with his great rival Charles V., he was open, impulsive, and gener- ous, but he was less actuated by consistent principles ; he was hopelessly inferior in diplomacy, and in sagacity and comprehensiveness of purpose; he had perhaps equal abilities as a general, but his occasional victories were more than counterbalanced by the results of his own indo- lence and by the blunders of his subordinates ; and while able to defend France against all external attacks, he was. compelled to content himself with a place second to that of the emperor in the sphere of European politics.

See, besides the usual French histories, La Vie de Chevalier Bayard, Bouchet's La Vie et les Gestes de Lowis de la Tremoille and Les Triomphes du roi trés ehrétien Frangois I., Vielleville's Mémoires, Mleurange's L' Histoire des choses mémorables advenues de 1499 @ 1531, and Du Bellay's Afémoires historiques de 1513 a 1547, —all contained in the Collection wniverselle; Montluc, Commentatres (1st ed. 1592, afterwards printed both in Italian and English); Va- rillas, Histoire de Francois I., 1685; Gaillard, Histoire de Frangois L, 1766-1769, 7 vols.; Roderer, Louis XIL. et Francois I. 1825; Cape- figue, Francois I. et la Renaissanee, 1844; De La Barre-Duparcq, Frangois I. et ses actions de guerre, 1872; Mignet, Rivalité de Fran- gois I. et de Charles-Quint, 2 vols., Paris, 1875 ; Herman, Franz I., Leipsic, 1825; Life and Times of Francis the First, London, 1829.

FRANCIS II. (1543-1560), king of France, eldest son of Henry ITI. and of Catherine de' Medici, was born at Fontaine-

bleau, 19th January 1543. He married the famous Mary Stuart, daughter of James V. of Scotland, 25th April 1558, and ascended the French throne 10th July 1559. During his short reign he was the mere tool of his uncles, the duke of Guise and the cardinal of Lorraine, into whose hands he virtually delivered the reins of government. The exclusiveness with which they were favoured, and their high-handed proceedings, awakened the resentment of the princes of the blood, Anthony king of Navarre and Louis prince of Condé, who gave their countenance to a conspiracy with the Protestants against the house of.Guise. It was, however, discovered shortly before the time fixed for its execution in March 1560, and an ambush having been pre- pared, most of the conspirators were either killed or taken prisoners. Its leadership and organization had been en- trusted to Godfrey du Barry, lord of la Renaudie; and the prince of Condé, whv was not present, disavowed all con- nexion with the plot. The duke of Guise was now named lieutenant-general of the kingdom, but his Catholic leanings were somewhat held in check by the chancellor Michel de l'Hopital, through whose mediation the edict of Romoran- tin, providing that all cases of heresy should be decided by the bishops, was passed in May 1560, in opposition to a proposal to introduce the Inquisition. Ata meeting of the states-general held at Orleans

in the December follow- ing, the prince of Condé, after being arrested, was con- demned to death, and extreme measures were being enacted against the Huguenots; but the deliberations of the As- sembly were broken off, and the prince saved from execu- tion, by the king's somewhat sudden death, on the 5th of the month, from an abscess in the ear.

Varillas, Histoire de Francois II.; Mémoire de Condé; Hénault,

Francois IT. roi de France, 1748; De La Barre-Dupareq, Histoire de Frangows IT., 1867.

FRANCIS I. (1708-1765), head of the Holy Roman Empire, the eldest son of Leopold, duke of Lorraine, was born on the 8th of December 1708. His full name was Francis Stephen. At the age of fifteen he was sent to Vienna, where he received the Silesian duchy of Teschen. In 1735, in return for Lorraine, which Charles VI., at the end of the war of the Polish succession, gave to Stanislaus Leszezynski, Francis Stephen obtained the reversion to the duchy of Tuscany, to which he succeeded in 1737. The year before the latter date he married Maria Theresa, the daughter of the emperor Charles VI., and after the em- peror's death in 1740 he was declared by his wife joint regent of her dominions. He was elected emperor after the death of Charles VIL. and crowned at Frankfort on the 4th of October 1745. He carried on extensive trading opera- tions, and was an enthusiastic collector of works of art; but he had no energy of character, and was quite willing that the empress-queen, Maria Theresa, should do all the real work of government. When Austria and France, laying aside the animosities of two centuries, were coming to an understanding before the Seven Years' War, he was shrewd. enough to see the difficulties which would inevitably arise from such an alliance. Maria Theresa, however, althougli she sincerely loved him, had no respect for the political judgment of her good-natured husband, and he quietly acquiesced in her will. He suddenly died at Innsbruck on the 18th of August 1765, falling into the arms of his second son Leopold, who succeeded him as duke of Tuscany, and ultimately (after the death of Joseph II.) became emperor.

FRANCIS II. (1768-1835), the last Holy Roman Em- peror, and, as Francis L., first emperor of Austria, was born in Florence on the 12th Feburary 1768. He was the son of the emperor Leopold IL., after whose death, in

1792, he suc- ceeded to the hereditary dominions of the house of Austria, being crowned emperor in the same year. Before this time he had gained sonie experience of war during the conflict of

the emperor Joseph II. with the Turks. He was immedi- ately involved in the first of his famous wars with France, in which, till 1795, he had the support of the king of Prussia. In 1794 he himself was with the Austrian army which defeated the French at Tournay; but when fortune turned on the side of France he went back to Vienna. He was compelled, mainly in consequence of the victories of Napoleon, who pressed northward from Italy into Carinthia, to conclude, on the 17th October 1797, the treaty of Campo Formio, whereby the empire lost the greater part of the left bank of the Rhine, and Austria had to give up the Netherlands and Lombardy. Austria received in return Venetia, Friuli, Istria, and Dalmatia. In 1799 war broke out afresh, the emperor having on this occasion England and Russia asallies. During the first campaign the French were everywhere defeated; but in the following year Napoleon gained the brilliant victory of Marengo, whiie Moreau was equally successful at Hohenlinden. The shock of these two battles made it impossible for Austria to con- tinue the war, and on the 9th February 1801 she concluded the treaty of Lunéville, which confirmed that of Campo Formio, besides exacting fresh sacrifices. France now obtained the whole of the left bank of the Rhine. Once more in association with Russia and England, the emperor began another war with France in 1805. The capitulation of Ulm and the battle of Austerlitz, great as were these disasters, did not make the case of Austria hopeless, for she still had large forces, Russia was willing to continue the war, and the power of France had been seriously crippled at Trafalgar. But Francis was dispirited, and craved peace. On December 25, 1805, was concluded the treaty of Pres- burg, which deprived Austria of Venetia and Tyrol. In 1806, after the formation of the Confederation of the Rhine, he formally resigned the imperial crown, thus bringing to an end the (Holy Roman Empire and the kingdom of Germany. 'Forgetting the true meaning of the word emperor, he had in 1804 proclaimed himself, as Francis I., here- ditary emperor of Austria ; and this title has been retained by his successors. He took no part in the war of Prussia with France in 1806, but after some time began to

make preparations for a determined struggle, by which he should regain all the advantages lost in previous wars. The new con- flict broke out in 1809, and the whole of Germany awaited the result with intense anxiety. Austria was unfortunate at first ; but the highest hopes were excited by her thorough victory of Aspern. It was followed by the battle of Wagram, which enabled Napoleon to dictate peace from the palace of Schénbrunn, where he had once before taken up his quarters, By the treaty of Schénbrunn (October 14, 1809) he transferred the allegiance of about four millions of Austrian subjects to other rulers; but as in the follow- ing year he married Maria Louisa, the eldest daughter of Francis, it seemed probable that the two sovereigns would in future be on friendly terms. Francis was the ally of

Napoleon in his war with Russia in 1812; and when, after,

the retreat from Moscow, France found herself confronted by Russia and Prussia, Austria at first remained neutral, and in the summer of 1813 acted as mediator. In August of the same year she joined the allies; and, like the sove- reigns of Prussia and Russia, Francis accompanied his troops in the war which followed. The settlement of Europe which resulted from the final defeat 'of N apoleon made Francis a more powerful sovereign than he had been at the beginning of his reign ; and from this time forward he lived at peace, except that he had to put down a rising in Lom- bardy in 1821. He wasa well-meaning ruler, but had been 80 alarmed by the successes of the French Revolution that he detested modern ideas of government. The aspirations of his various states for some measure of independence he regarded as criminal, and in Prince Metternich he found

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a willing agent for his policy of stern repression. Thus a large amount of discontent was excited, which prepared serious troubles for the emperors who came after him. Francis was married four times, having by his second wife, Maria Theresa, princess of Sicily, thirteen children. He died on the 2d March 1835, and was succeeded by his son Ferdinand.

FRANCIS, Sr (1182-1226), a well-known saint of the Roman Catholic Church, the founder of the great order of Franciscans, was born at Assisi in the year 1182. His father was a trader in goods which he appears chiefly to

have purchased in the south of France, to which he made frequent journeys; and his son was born during one of these journeys, and in consequence received from the grate- ful father on his return the name of Francesco. His mother had wished to call him, it is said, Giovanni or John. The youth grew up very much like any other boy of his class. He received but little learning from the priest of the parish, and does not seem to have manifested any special love for school instruction. He was by nature a merry-hearted and careless fellow, and developed early an inclination for fine clothes and street amusements with other boys of his class. His parents, indulgent to his gaieties, saw with pride the higher tastes and bright intelligence of their son, and would sometimes say to one another, "He is like the son of a prince." The father formed expectations of a successful courtly career ; but the mother, seeing more into the boy's heart, would say to her neighbours, " If he lives like the son of a prince now, he shall hereafter be a child of God."

Soon a great change came tohim. At the age of twenty- five Francis was seized with a severe illness. Reflections came to him on his sick-bed, and he rose from it an altered man. Henceforward, says one of his biographers, "he held that in contempt which he had hitherto held in admiration and love." The ardour of his natural character flamed forth first in the idea of military devotion, and then in a consum- ing spirit of self-sacrifice for the good of others. All his love of amusement and worldly display disappeared. He began to speak of poverty as his bride ; and the poor and the sick and the leper became the objects of his peculiar care. He would seek ont the lepers, hitherto abhorred by him as by the popular feeling, and kiss them and minister to their wants. He madea pilgrimage to Rome, and in his enthusiasm for poverty flung all he had on the altar of St Peter's, joined himself to a troop of beggars, and gave him- self up to a wandering life of almsgiving and charity. His mother guessed something of the feelings that were strugg- ling in her son's heart; but his father, not unnaturally, was greatly concerned at his conduct. At last matters came to an open rupture between them; and the saint's severance of the parental tie for the sake of his divine mission is a significant incident in his career with all his biographers. It happened in this wise. There was an old church or small chapel of the name of St Damian in the neighbour- hood of Assisi which had falleu into ruins. The spot was a favourite one with the youthful enthusiast

for meditation and prayer ; and one day as he sat in meditation among the ruins he seemed to hear a voice saying to him clearly, "« Francis, seest thou not that my houseis in ruins; go and restore it for me." To hear was to obey. The divine voice, as with some other enthusiasts, seemed to silence every other voice in his heart, even the voice of conscience. He returned home, saddled his horse, took a bale of his father's goods, and repairing to Foligno he sold both horse and goods, and rushed to the priest of St Damian with the money to pay for the restoration of the church. The good priest was startled ; his father heard with indignation of his son's conduct, and at length with blows and curses securely imprisoned him from any further freaks. But his father's harshness overshot the mark. Released by

the tenderness of his mother, and summoned to restore the goods he had taken away and renounce all his patri- monial rights, the popular feeling, which had previously sided with his father against him, now turned in the youth's favour. The bishop, before whom the case finally came, discovered the youth's vocation to a religious life, and in- duced him to restore the value of the goods to his father. The money had been all the while lying neglected amidst the ruins of the church, This accomplished, Francis re- nounced all dependence upon his father, and gave himself up to the profession of a religious mendicant. "I have but one, a Father in heaven, now," he said. The people were melted to tears by his devotion, and the good bishop took him for a time under his own charge.

Gradually Francis found his full vocation, not only in a life of entire devotion and poverty for himself, but in found- ing an order of mendicants devoted to the service of the church. Tt was in the old scene of his earlier inspiration that the new idea came to him. Once more the divine voice was heard sounding in his ears: " Provide neither gold nor silver nor brass in your purses, nor scrip for your journey, neither two coats, nor yet staves," This was about the year 1208 or 1209, when, therefore, the saint was about twenty-six years of age. He was henceforth a preacher as well as an exemplar of poverty. He essayed to reproduce the picture of the divine life on earth, having not where to lay his head, going about doing good, and preaching the gospel of the kingdom. 'Sell all that thou hast, and give to the

poor; then thou shalt have treasure in heaven." Gradually there gathered round his cell, which he had fixed outside the town near a little church, the St Maria degli Angeli, better known as the Portiuncula, a band of disciples as enthusiastic as himself. "Fear not," he said to them, " because you are small and seem foolish. Have confidence in the Lord who has vanquished the world. Some will receive you. Many proud will resist you. Bear all with sweetness and patience. Soon the wise and the noble will be with us. The Lord hath given me to see this. I have in my ears the sounds of the languages of all the people who will come to us,—French, Spaniards, Germans, English. The Lord will make us a great people, even to the end of the earth."

In this insignificant manner was laid the foundation of the great Franciscan order. At first there were only seven, himself the eighth, but all were animated by the same spirit, and all followed the same rule of life. As he sent them forth he said, "Goand preach two and two, Preach peace and patience ; tend the wounded; relieve the distressed ; reclaim the erring; bless them which persecute you, and pray for them that despitefully use you." The gospel of divine poverty was proclaimed everywhere. The spirit of self-renunciation spread by-and-by like wildfire, and multi- tudes were added to the order day by day. It may seem to our modern imagination a fantastic dream, but the gospel of St Francis met a congenial root in the social and spiritual life of the 13th century, and rapidly grew into great results. The sanction and blessing of the papacy, however, were necessary to give the order ecclesiastical posi- tion and influence. Francis himself undertook a new journey to Rome, and suddenly appeared before the great Tnnocent III. as he was walking one day on the terrace of the Lateran. The startled pope dismissed the mean stranger with mingled pity and contempt; but the same night a vision came to him of the marvellous growth of a palm tree from meanness to magnificence ; and, as he pondered the meaning of the vision, a divine whisper reached him that thus powerful on behalf of the church was to prove the poor man whose appearance had startled him. The natural con- clusion followed. The poor man was recalled, his projects were submitted to the judgment of the Vatican, and the

result was that the papal sanction was formally extended to the order,—a few years before the same sanction was given to the great rival order

headed by the learned and noble Dominic. The founders of the two great mendicant orders are said to have met afterwards at Rome, and again at a great meeting of the Franciscans in 1219. St Dominic is credited with the most friendly greetings offered to his brother saint. 'Thou art my companion ; thy work and mine is the same." It is said also that he looked with amazement at the second meeting on the remarkable fas- cination which the simple-minded Francis exerted over his followers. But it is difficult to know whether these reputed rapprochements of the great leaders were not an afterthought of their biographers, interested in promoting the idea of the friendliness of the two powers which were destined for a time to divide the influence of the church between them. Francis founded an order of poor sisters as well as poor brothers, known by the name of Poor Claras or Clarisses. The origin of the sisterhood is encircled in a halo of romance, such as everywhere surrounds the footsteps of St Francis. Clara was a young lady of the neighbourhood, who, either attracted by the saint's preaching, or enamoured of his life of poverty, or both, resolved to devote herself to self-sacrifice as he and lis companions had done. He is said to have ' poured into her ears the sweetness of Christ." The result was that she forsook her home, fled to the Portiuncula, and, being first a member of the order, was then placed in a female convent. From this questionable beginning sprang the sisterhood nearly as famous in its history as the great brotherhood, and which survives till this day. There was a third order also sprung up in the course of the saint's lifetime. So marvellous were the consequences of his preaching that whole populations, it is said, wished to devote themselves tu consecrated poverty. But many, of course, had no real vocation to such a service, and Francis, visionary as he was, saw that the excesses of his system might prove its ruin, So he arranged to receive persons of this class into an order of what was called Tertiaries or Brethren of Penitence, who retained their social position and their customary employments in the world, while coming under general vows to abstain from worldly dissipations, such as the theatre, and otherwise to be scrupulous in all their con- duct. Women were not admitted to this order without the consent of their husbands. Its members did not wear silk or other costly materials, but they had no special costume, and otherwise were at liberty. His conduct in this matter is sufficient to prove that, amidst all the apparently child- like enthusiasm of the saint, he possessed, as indeed cannot be doubted, no inconsiderable vein of shrewd discernment and of

practical ability. This order was established in 1221. Meanwhile Francis was unceasing in his personal labours. It is not easy to trace the chronology of his age or his adven- tures; but the same spirit of self-sacrifice, of burning ardour and spiritual industry, is everywhere conspicuous. He made long missionary journeys to lyrica, to Spain, and even to the East, to preach to the Mahometans. He gained access to the sultan, it is said, and proclaimed to him the gospel of poverty. He was for some time in the Holy Land, and everywhere he gained multitudes of disciples. The atmo- sphere of miracle everywhere accompanied him, and his fame was spread throughout Christendom. Whatever we may think of many events of his life, and impossible as it is now to disentangle the legendary thread of the supernatural from its more credible texture, there are many traits of the saint's character which are in no sense doubtful, but show with a clearand life-like impress what sort of a man he was. He was passionately fond of all living things, and found his chief happiness in ministering to the needs of his fellow- creatures or the enjoyment of the lower creatures around him. His love foranimals of all kinds was one of his most

remarkable and winning features. Of the birds in the woods, the sheep in the fields, the ass on which he rode, the bees, the hares, the rabbits, he always spoke as his brothers and sisters. When the birds sang he said, " Our sisters, the birds, are pleasing God." A little rabbit ran to him for protection ; it was received into his bosom, as one of his biographers, the famous general of the order Bonaventura, says, "as if it had some hidden sense of the perfection of the father's heart." The very wolves, which all men were afraid to encounter, were tamed by him, and came like lambs and crouched at his feet. So at least it is related in one memorable case in the legends of the " Fioretti di San Francesco" (the " Little Flowers of St Francis,"—a collec- tion of marvellous stories about the saint very popular in Italy to this day). There may be muchi in these stories that exceeds the limits of credibility; the amount of accurate fact lying beneath them can no longer be traced; but none can hesitate to believe the beautiful depth of love which they reveal in the character of St Francis, and the fascination of personal influence which they show to have been possessed by him.

Connected with his love of nature and all living things was his poetry—for St Francis was not only saint but poet. The stream of Italian song, so soon to swell into the full volume of Dante (1265-1321), began to flow in the rugged but touching verse of the great preacher of Assisi. In him the troubadour inspiration, dying out in its original seat, was transmuted into a spiritual minstrelsy—hardly poetry, so imperfect is its form, but a lyrical cry, as Ozanam says (in his volume Les poétes franciscains, 1852), the first broken utterance of a new voice which was soon to fill the world. The most characteristic of his songs is a Cantico delle Creature (Song cf the Creation), which has been translated in Mrs Oliphant's interesting life of the saint.

Marvellous as is the life of St Francis, the marvel that followed his death is more astonishing than any that marked his earthly career. It is said that when his naked body was visible after death, there was found upon it legibly impressed the marks of our Lord's passion; and the sacred story is that one day as he prayed in the solitude of Mount Averno, near the sources of the Tiber and the Arno, there appeared to him the vision as of a seraph with the arms extended and the feet asif fixed to a cross; and as he thought in his heart what the vision might mean, there were revealed on his hands and feet the signs of nails as in the Crucified One. This is well known as the famous miracle of the Stigmata or wounds of our Lord. There seems to be no doubt that some such marks were found on the dead body of the saint, whatever explanation the phenomena may admit of. That there was anything really supernatural in the phenomena will be so readily discredited by the modern reader that it is unnecessary we should attempt any elaborate solution of the marvel. An interesting analysis of all the facts, and such historical explanation as they seem to admit of, will be found in Hase's life of the saint, aud an article, founded upon the analysis there given, in Good Words for 1867, p. 38 ('History of a Miracle"), St Francis, worn out by his many Jabours and consuming zeal, died on 4th October 1226.

"Of all saints," says Milman (Zist. of Latin Christ., vol. iv. 268), "St Francis was the most blameless and gentle. He was emphatically the saint of the people,—of a poetic people like the Italians." And to this day the name, the life, and the longsuffering of the popular saint live in the hearts of the poorer and devout Italians.

Of what may be called more or less original biographies of the ot there are in the well known

ocut, three companions of the saint written in 1247; and,

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lastly, (3) the Life by Bonaventura, Platonic schoolman and general of the order in 1263. The works of the saint have been collected and edited by Joh. de la Haye, &. Francisci Opera, 1739 sq. There is an elaborate biography by Malan, Hist. de 8. Francois d' Assisi, 1841; and notices are also to be found in Helyot's Hist. des Ordres Religieux, t. vii., and Butler's Lives of the Saints. There are two recent lives, both of special interest, by the German divine, Hase, and by Mrs Oliphant in Macmillan's Sunday Library series. See FRANCISCANS. (J. T.)

FRANCIS BORGIA, St (1510-1572), duke of Gandia, and afterwards general of the Jesuit order, was the son of John, duke of Gandia, a scion of the well-known family of Borgia or Borja to which Popes Calixtus III. and Alexander VI. had belonged, and of Joanna of Aragon, daughter of Alphonso, a natural son of Ferdinand the Catholic. He was born at Gandia (Valencia), on the 10th of October 1510, and from his infancy was remarkable for his piety. Educated from his twelfth year at Saragossa under the charge of his uncle the archbishop, he had begun to show a strong inclina- tion towards the monastic life, when his father, wishing to divert his thouglits elsewhere, sent him in 1528 to the court of Charles V. Here he soon distinguished himself greatly by his diligence and fidelity; and on his marriage with Eleanor de Castro, a Portuguese lady of high rank, he was created by the emperor Marquis of Lombay, and at the same time received the appointment of master of the horse to the empress. He accompanied Charles on his African expedition in 1535, and also into Provence in 1536; and on the death of the empress in 1539 he was deputed to convoy the body to the burial place in Granada. Circum- stances connected with the funeral obsequies there deepened in his mind long-cherished impressions as to the vanity of all worldly things, and fixed his determination to leave the court betimes, and also, should he survive his consort, to embrace the monastic life. On his return to Toledo, however, new honours were thrust upon him, much against his will; he was made viceroy of Catalonia and commander of

the order of St James. At Barcelona, the seat of his government, he lived a life of great austerity, but discharged his official duties with energy and efficiency until 1543, when, having succeeded his father in the dukedom, he at length obtained permission to resign his viceroyalty, and to retire to a more congenial mode of life at Gandia, Having already held some correspondence with Loyola, he now encouraged the recently founded order of Jesuits to the utmost of his power. One of his first cares at Gandia was to build a college for them; and on the death of Eleanor in 1546, he resolved to become himself a member of their society. The difficulties arising from political and family circumstances were removed by a papal dispensation, which allowed him, in the interests of his young children, to retain his dignities and worldly possessions for four years after he should have taken the vows, In 1550 he visited Rome, where he was received with every mark of distinction, and where he furnished the means for building the Collegium Romanum. Returning to Spain in the following year, he, with the emperor's consent, formally resigned his rank and estate in favour of his eldest son, laid aside his ducal robes, assumed the Jesuit habit, was ordained as a priest, and en- tered upon a life of, penance and prayer. At his own earnest request, in which he was seconded by Loyola, a proposal that he should be created a cardinal by Julius III. was departed from ; and at the command of his superior he employed himself in the work of itinerant preaching. In 1554 he was appointed commissary-general of the order in Spain, Portugal, and the Indies, in which capacity he showed great activity, and was successful in founding many new and thriving colleges. In 1556, shortly after the retirement from public life of his old master Charles, Borgia had an inter- view with him. Charles, unfavourable to all innovation, and looking with distrust upon Jesuit pretensions, endea-

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patched a special message to beg of the holy man that he would come and restore him to health. Not until he had been commanded by Pope Sixtus IV. could Francis overcome his reluctance to undertake so long a journey on so doubtful an errand; and on his arrival at Plessis-lés-Tours, in April 1482, to the king's entreaties for his intervention to prolong his life he simply replied

that the lives of kings had their appointed limits, that God's decree was unchangeable, and that for his Majesty nothing remained to be done but to resign himself to the divine will and prepare for death. Atthe request of Louis, Francis remained at Plessis ; where he was treated with great respect by that sovereign, and also by his successor Charles VIII. built two convents for the order, one near Plessis and another at Amboise ; and on his triumphant arrival in Rome in 1495, he caused a third to be erected there. a new and stricter constitution was granted to the order by Alexander VI., who at the same time conceded all the

voured, it is said, to induce thie commissary to transfer lis allegiance to the older order of Jeronymites. This attempt, though unsuccessful, did not disturb the old relations of confidence and friendship between the two men, as was shown some time afterwards when Borgia was employed by Charles to conduct some delicate negotiations with reference to a project which was to secure for Don Carlos of Spain the succession to the Portuguese crown in the event of the death of his cousin Don Sebastian. On the death of Lainez in 1565, Francis Borgia was chosen to succeed him as third general of the Jesuits. In this capacity he showed great zeal and administrative skill; and so great was the progress of the society under his government that he has sometimes been called "its second founder." It is to be noticed, however, that the peculiarities which are under- stood to be most characteristic of the order have been derived from Loyola and Lainez rather than from Borgia, whose ideal was a pure and simple monasticism rather than a life of manifold and influential contact witli the world. His death took place at Rome towards midnight on the 30th of September 1572. He was beatified by Urban VIII. in 1624, and canonized by Clement X. in 1671, his festival being afterwards (1683) fixed by Innocent XI. for the 10th of October.

Several works by St Francis Borgia have been published, the principal of these being a series of Hxercises similar to the Exercitia Spiritualia of Loyola, and a treatise Rhetorica Concionandi. The Opera Omnia were published at Brussels in 1675. His life was written by his confessor Ribadeneira. See also Butler's Lives of the Saints, and the Breviarium Romanum (second nocturn for 10th October).

FRANCIS, Sr, or Paona (1416-1507), founder of the order of Minims (Ordo Minimorum Fratrum Eremitarum Fratris Francisci de Paula), was born of humble parentage at Paola in Calabria in the year 1416. His education appears to have made very little progress until he reached his thirteenth year, when, in accordance with a vow, he was taken by his father to the Franciscan convent of San Marco in Calabria. Here he learned to read, and distinguished himself by his austerities ; but at the close of a probationary year he, for some reason that is not mentioned, left San Marco, and, after a pilgrimage to Assisi and Rome, retired to the neighbourhood of his native town, where in a cave by the sea-shore he gave himself wholly to a hermit life, after the example of the great St Francis, having no bed but the bare rock, and no other food than the herbs which ke

gathered in the neighbouring wood, or which were sometimes

brought to him by his friends. In the course of time he was joined by some others like-minded with himself, and the building of a chapel in 1436 is generally considered as marking the first beginning of the Minimite order. At that time, however, and for many years afterwards, they were mere " Eremites of St Francis," and did not claim to be distinguished from other Franciscans unless by a stricter fidelity to the common principles of the order. In eighteen years the little community had increased so much in num- bers and in popularity that, with the help of a friendly neighbourhood, it was able to build a large church and mon- astery in 1454. In 1469, owing to reports which he had received, Pope Paul II. sent one of his chamberlains into Calabria to ascertain the actual condition of matters at Paola ; the account brought back by him was highly favour- able, and the result was that in 1474 the order of the Eremites was incorporated by a bull of Sixtus IV., and Francis appointed its first "corrector" or superior-general. In addition to the usual vows, there was a special rule, which pledged the members to the observance of a perpetual Lent. Several new convents were founded in Calabria and Sicily during the following years; and the fame of Francis for sanctity aud miraculous powers increased daily. When Louis XI. of France was seized with his last illness, he des-

In particular, the latter In 1501-2

privileges and immunities enjoyed by the other mendicant orders, and bestowed, at the urgent request of Francis, the distinctive name of Minimi, which has ever since been re-

tained. At the same time a lay order of Tertiaries was

sanctioned, under a special rule. In 1506 the fourth vow (to observe a perpetual Lent) was made more definite and stringent in its character by Julius II. The death of Francis took place in his ninety-first year, at Plessis, on the 2d of April 1507. He was canonized by Jeo X. in 1519,—his day in the calendar being April 2 (Duplex).

A graphic incidental notice of Francis occurs in the Memoirs of Philip de Comines (b. vi. ¢. 7), who says, "] never saw any man living so holy, nor ont of whose mouth the Holy Ghost did more manifestly speak." A brief sketch of his life occurs in the Breviarium Romanum ; and his miracles and prophecics are related at considerable length by the Bollandists. Reference may also be made to Butler's Lives of the Saints. The order of Minims, called also Les Bons Hommes in France, Los Padres de la Vitoria in Spain, and Paulaner or Pauliner in Germany, never attained to any great prominence by the side of the great societies of Dominic and Francis of Assisi. Their cloisters never exceeded 450, and at present are very much fewer. The principal establishment is in Rome.

FRANCIS, $1, of Sates (1567-1622), bishop of Geneva, and a well-known devotional writer of the Roman Catholic Church, was born at the Chateau de Sales, near Annecy in Savoy, in 1567. His father, known as M. de Boisy, was a Savoyard, seigneur, soldier, and diplomatist ; his mother was also of a noble family and an heiress, the title de Boisy being derived from one of her hereditary possessions. Francis was their eldest son, born six years after marriage, and the child of many prayers. He received his education first at Annecy, then at the Jesuit College de Clermont in Paris, and for some time it seemed uncertain whether he should devote himself to law or the church. He studied jurisprudence, after leaving Paris, at Padua, became an ad- vocate of the senate of Savoy, and seemed likely to gratify his father's cherished ambition for his future career. But all the while Francis'sown inclinations were strongly towards the church. He had received the tonsure as early as 1578, while still a boy at Annecy, very much

against his father's wishes, and the spirit shown in this early manifestation of pious self-devotion never forsook him. Notwithstanding all his father's remonstrances, he resolved to enter an ecclesi- astical life ; and, the office of provost or dean of Geneva becoming vacant, the dignity of this office, which was offered to him, was used as a temptation tu secure the father's consent. At length M. de Boisy gave way. Francis received holy orders (1593), and entered upon his duties as dean and preacher. He possessed great gifts as a preacher, and his fame soon spread through Savoy. His sermons were marked by great simplicity and persuasiveness. "The only real point of preaching,' he said, "is the over- throw of sin and the increase of righteousness 3" and thie principle of this saying guided him in all his sermons, He

preached constantly, and in the simplest and most touching and popular words he could find. His father failed to ap- preciate his style of preaching, as he had failed to under- stand his self-denial. 'I never refused to preach," Francis tells us, 'ou the principle of ' give to them that ask you.' My dear father used to hear the bells ringing, and asked who preached. 'Who but your son,' was often the answer. One day he took me aside and said, ' Provost, you preach too often ; even on week days the bells go, and it is always the same story, the provost, the provost! It used not to be so in myday. Sermons were much rarer. But then, to be sure, God knows those were something like sermons— full of learning, well got up, more Latin and Greek in one than you stick into adozen.'" Francis, however, knew his own mind, and was not moved. " My test of the worth of a preacher," he said, "is when his congregation go away saying not 'what a beautiful sermon,' but 'IT will do some- thing.'" A man may set forth his own learning and elo- quence ina fine sermon, but the true sign of success is when his words induce people to leave off bad hakits. And as he preached often, he preaclied briefly. " The more you say, the less people remember ; the fewer your words, the greater their profit," was his motto. 'When a sermon is too long, the end makes one forget the middle, and the middle the beginning."

Francis was plainly a man of some originality both of mind and character, and destined to become a power in the church to which he had so

passionately devoted himself. Accordingly he soon became marked out for arduous work. Savoy was at this time greatly invaded by Calvinistic "heresies." The neighbourbood of Geneva—a focus for the dissemination of Protestantism—and the political and military complications arising out of the hostile relations of the duke of Savoy and the king of France, all tended to the progress of Calvinism. Chablais had been invaded, and Protestant ministers long established at Thonon and other towns. For nearly sixty years in fact this region had been Protestant, and the people by express stipulation enjoyed the exercise of the Reformed religion. A mission- ary of apostolic fervour and courage was required to recover the lapsed district to the Catholic faith, and all eyes were turned to the young provost of Geneva as the only man fitted to grapple with the exigencies of the position. His father as usual was the obstacle. He entreated his son not to expose himself to the dangers of such a mission, but Fraucis felt the call within him, and calmly replied, "I cannot refuse to obey, 'Wist ye not that I must be about my father's business?'?" The result was that he gave himself for four years (1594-1598) to laborious and self-denying work in the district, often, it is said by his flattering biographers, preaching and administering the offices of his church at the peril of his life. His persuasive eloquence and the apostolic simplicity of his life were at first un- successful. The inhabitants of Chablais remained hardened in Protestanism. But more violent measures, some of them reflecting little honour on Francis, at length suc- ceeded in reclaiming the district to the Catholic faith. His success in this work led the pope to believe that he might gain over Calvin's celebrated successor, Theodore Beza; and lengthened conferences were held between the Protestant teacher and the Roman Catholic missionary, but without result, In 1598 Francis was appointed coadjutor bishop of Geneva, and became the official com- panion, as he had long been the warm friend of Claude de Garnier, the aged bishop who had fostered his talents and largely shaped his career. Some years after this, in 1602, he spent some time in France and especially in Paris, where his preaching attracted great crowds, and his influence was felt from the court of Henry IV. tothe poor sisters at Port Royal. Before St Cyran became the spiritual leader of

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*Angelique Arnaud and others of the devoted band which gathered around him, Francis had given a definite direction to her thoughts and aspirations. It is not the name of Angelique Arnaud, however, but that of another celebrated pietist, wlio was destined to be associated with Francis de Sales. Shortly after his succession to the bishopric by the death of his aged friend, he mét at Dijon Madame de Chantal, a character of rare enthusiasm and devotion, whose spirit had been greatly chastened by the loss of her husband and child. She pnt herself under his direction, cut off her beautiful hair, and clothed herself as a religieuse. Her good works were incessant, and she became known as tlie "Sainte de Monthélon." At length Francis prepared a mission for her. Submitting her saintly obedience to various tests, he intimated his decision that she was destined to establish an order for the relief of the sick and the poor, the only rules for which were to be "charity and the love of Jesus Christ." The order was not fully established till 1610, but gradually acquired great influence. The relation of the saint to Madame de Chantal and other devout ladies has been much canvassed. There was a good deal of spiritual coquetry in it, and some of his letters to them contain doubtful sentiments; but there is no reason to doubt the purity of his character, and that his main object was to promote what he considered to be the interests of religion. He liked to be "surrounded by women," but chiefly that he might influence them for the good of the church. «In 1608 Francis published his best known and most valuable work, the Jntroduction & la Vie Dévote, the circulation of which was immense. He became famous through all the Catholic world. Henry IV. sought to tempt him by a French bishopric; *but he remained true to the country of his birth, and the com- paratively quiet and unambitious life he was able to con- tinue there. Loving, as all men of his temperament and religious attractiveness more or less do, to impress the force of his mind and character upon others, he yet seems to have been honestly free from vulgar ambition. He was a true priest, and found ample gratification in the diffusion of the spiritual charm and potency which radiated from his character and writings. His apparent simplicity was one of the most powerful elements of the wide influence which he exerted. Both asa preacher and as a writer a certain overweenivg "sweetness" may be said to be his marked characteristic,—a sweetness at times not without duplicity and a taint of cold-blooded fanaticism. Possessing singular graces of character, he was yet above all things an ecclesi- astic, and had few*

scruples in serving the interests of his order and church. Superior to the coarser aspirations and the more commonplace ambitions of his time, he was yet often a subtle politician in the guise of a saint; and if his animating aim was to rule hearts rather than possess for himself a great position, the means by which he sought to do so were in many cases more adroit than magnanimous. He died in the end of 1622, and was canonized in 1665. In addition to the Zntroduction & la vie dévote already mentioned, which has been translated into all languages, St Francis de Sales published other works, especially a Tratté de [Amour de Dieu. His complete works were published in 17 vols. in 1885. There are elaborate lives of St Francis in French by the Abbé Marsollier and Loyau d'Amboise. There is also an interesting but rather highly coloured life of the saint (Sears's Christian Biographies, 1877) by the writer of the lives of Bossuet and Fénelon, who has likewise translated his Spiritual Letters. Clay, FRANCIS, Sir Puitip (1740-1818), a conspicuous Whig politician and, even apart from his supposed con- nexion with the Letters of Junius, a powerful pamphleteer, was born in Dublin on the 22d of October 1740. He was the only son of Dr Philip Francis, a man of some literary celebrity in his time, who is still known by his translations of Horace, /Eschines, and Demosthenes. He received the

first rudiments of an excellent education at a free school in Dublin, and afterwards spent a year or two (1751-2) under his father's roof at Skeyton rectory, Norfolk, with Edward Gibbon as a fellow-pupil. In March 1753 he entered St Paul's school, London, where he remained for three years and a half, and became head boy. Here Henry Sampson Woodfall and Philip Rosenhagen were for some time his companions. In 1756, immediately on his leaving school, he was appointed to a junior clerkship in the secretary of state's office by Mr Henry Fox (afterwards Lord Holland), with whose family Dr Francis was at that time on intimate terms; and this post he retained under the succeeding administration. General Bligh in the expedition against Cherbourg; and in the same capacity he accompanied the earl of Kinnoul on his special embassy to the court of Portugal in 1760, In 1761 he became personally known to Pitt, who, recognizing his ability and discretion, once and again made use of his services as

privateamanuensis. In 1762 he was appointed to a principal clerkship in the war office, and in the same year he married Miss Macrabie, the daughter of a retired London merchant. 'The union was not approved by his father, and led to some estrangement; but it does not appear to have been on the whole unhappy. 'The ten years which followed are very obscure, and a long-continued and close scrutiny by numerous and skilful investigators has led to few definite results, beyond the certain conclusion that the events of this period in the life of Francis must have been such as to have wielded a singularly commanding influence over all his subsequent conduct and career. Com- paratively humble in position, and somewhat straitened in means, he had few opportunities of mingling aoe in the society of the great ; but his official duties brought him into direct relations with many who were well versed in the politics of the time, while he all along enjoyed a peculiar intimacy with Calcraft, the rich army agent, who has been described as having been Chatham's " wire-puller and poli- tical agent as well as informant." Public events of great interest took place during these years. It was in 1763, for example, that the great constitutional questions arising out of the arrest of Wilkes began to be so sharply canvassed. It was natural that Francis, who from a very early age had been in the habit of writing occasionally to the newspapers, should be eager to take an active part in the discussion, though his position as a Government official made it neces- sary that his intervention should be carefully disguised. He is known to have written to the Public Ledger and Public Advertiser, as an advocate of the popular cause on many occasions about and after the year 1763;! he frequently attended debates in both Houses of Parliament, especially when American questions were being discussed; and between 1769 and 1771 he is also known to have been favourable to the scheme in which Calcraft and others were engaged for the overturn of the Grafton Government and afterwards of that of Lord North, and for persuading or forcing Lord Chatham

1 A letter in the Public Ledger (March 1763) signed " One of the People," in which the popular cause is supported in a contest that had arisen between the public and the proprietors of Drury Lane and Covent Garden theatres, is among the earliest known productions of his pen. There is strong evidence that he was the author of the "Candor" pamphlet (September 1764), in which the verdicts obtained by the Government against the

printers of the North Briton for libel in “No. 45” are condemned. With regard to the “ Anti-Sejanus ” letters (January and February 1766), written in condemnation of the American policy of the Rockingham ministry, Parkes affirms that “the most sceptical cannot doubt that they emanated from his pen;” but Merivale brings evidence to show that, if so, he must at least have had colleagues in writing them. ‘The communication in the Public Advertiser (June 1768), signed “A Friend to Public Credit,” is undoubtedly attributable to him, There is some likelihood also that sundry letters to the North Briton and other periodicals (1768-70), copies of which have been found among lis papers corrected and punctuated by himself, may have been his contributions.

In 1758 he was employed as secretary to.

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into power. In January 1769 the first of the Letters of Junius appeared, and the series was continued till January %1,1772. They had been preceded by others under various signatures, which, however, are all attributed to one and the same hand. ‘The authorship of these letters has been assigned to Francis on a variety of grounds, but it must be said that the evidence is still only of the circumstantial kind, and far from conclusive (see Junius). It ought to be mentioned here that, so far as can be ascertained, no one of his intimate friends suspected him at the time to be Junius, and also that he himself in after life energetically denied the charge. There was, however, it must be added, every motive for concealment on his part, both at the time and afterwards, if he was indeed the writer of the Letters.

In January 1772 the office of deputy secretary in the war office became vacant, and the post was offered by Lord Barrington to Francis, who decliued it. By a curious coincidence the last letter of Junius appeared on the very day in which Anthony Chamier was gazetted deputy sec- retary (January 21st). Two months afterwards Francis finally left the war office. “It is my own act,” he wrote to an intimate friend. “Be not alarmed for me. Every- thing is secure and as it should be!” In July of the same year he left England for a tour through France, Germany, and Italy, which lasted until the following December. On his return he was, according to an autobiographical frag- ment which has been preserved, contemplating

emigration to New England, when, in June 1773, Lord North, on the recommendation of Lord Barrington, appointed him a mem- ber of the newly constituted supreme council of Bengal, at a salary of £10,000 per annum. Along with his colleagues Monson and Clavering he reached Calcutta in October 1774, and a long struggle with Warren Hastings immediately began. That struggle passed through three phases, during the first of which, until the death of Monson in 1776, Francis had the majority of votes in the council; after- wards, until the arrival of Wheler in December 1777, he was continually overborne; while, during the remaining three years, forces were more evenly balanced, Hastings having on the whole the preponderance. A dispute, more than usually embittered, led in August 1780 to a minute being delivered to the council board by Hastings, in which he stated that "he judged of the public conduct of Mr Francis by his experience of his private, which he had found to be void of truth and honour." A duel was the consequence, in which Francis received a dangerous wound, Though his recovery was rapid and complete, he did not choose to prolong his stay abroad. He arrived in England in October 1781, and was received with little favour. Little is known of the nature of his occupations during the next two years, except that he was untiring in his efforts to procure first the recall and afterwards the impeachment of his hitherto triumphant adversary. It may be mentioned, as a curious coincidence at least, if nothing more, that the "bookseller's edition" of Juntus, described on the title page as more complete than any yet published, appeared in 1783. In the same year Fox produced his Tndia Bill, which led to the overthrow of the coalition Government. In thegeneral election of April 1784 Francis was returned by the borough of Yarmouth, Isle of Wight, and his first appearance in the house was made in the following July, when the financial affairs of the East India Company were under discussion. On this occasion he took an opportunity to disclaim every feeling of personal animosity towards Hastings. 'This did not prevent him, however, on the return of the latter, in 1785, from doing all in his power to bring forward and support the charges which ultimately led to the impeachment resolutions of 1787. Although excluded by a majority of the House from the list of the managers of that hi Francis was

none the less its most energetic promoter, supplying his ; Countries, Saxony, the Islands of the Mediterranean,

friends Burke and Sheridan with all the materials for their eloquent orations and burning invéctives. At the general election of 1790 he was returued a member for Bletchingley. In common with all English politicians he found his atten- tion very strongly called to the events which were then oc- curring in France ; his sympathies were strongly with the revolutionary party, and he opposed in parliament all the measures of the Government against reformers and Jacobins at home. In 1793 he supported Mr (afterwards Lord) Grey's motion for a return to the old constitutional system of representation, and so earned the title to be regarded as one of the earliest promoters of the cause of parliamentary reform. He rendered further services to the same cause by repeated vindications of the Society of the Friends of the People in the days of its unpopularity, The acquittal of Hastings in April 1795 again disappointed Francis of the governor-generalship, and in 1798 he had to submit to the additional mortification of a defeat in the general election. He was once more successful, however, in 1802, when he sat for Appleby, and it seemed as if the great ambitions of his life were about to be realized when the Whig party came into power in 1806. His disappointment was great when the governor-generalship was, owing to party exigen- cies, conferred on Sir Gilbert Elliot (Lord Minto); he declined, it is said, soon afterwards the governinent of the Cape, but accepted a knight companionship of the order of the Bath. Though re-elected for Appleby in 1806, he failed to secure a seat in the following year; and the re- mainder of his life was spent in comparative privacy. In 1814 he married his second wife, Miss Emma Watkins, who long survived him, and who has left voluminous manu- scripts relating to his biography. He died on the 23d of December 1818.

Among the later productions of his pen were, besides the Plan of a Reform in the Election of the House of Commons, a pamphlet entitled Reflections on the Abund- ance of Paper in Circulation and the Scarcity of Specie (1810), and a Letter to Harl Grey on the Policy of Great Britain and the

Allies towards Norway (1814). His Memoirs, with Correspondence and Journals, commenced by the late Joseph Parkes, and completed and edited by Mr Herman Merivale, were published in two volumes in 1867. They help the reader to form a tolerably vivid conception of the man, and show that in his domestic relations he was exemplary, and that he lived on terms of mutual affection with a wide circle of friends. They indicate at the same time, however, that he was far from incapable of vindictiveness, dissimulatiou, and treachery. His biographers are firmly convinced of his identity with Junius, and bring a great body of circumstantial proof in support of their belief.

FRANCISCANS. The Franciscan orders include the three orders of the Minorites, and all the less important associations who trace their rule to Francis of Assisi. The three orders of the Minorites, or Franciscans proper, include (1) the Minorite friars, properly so-called, under a succes- sion of generals of the whole order from the foundation; (2) the order of the Poor Ladies or Poor Clares—the Fran- ciscan nuns; (3) the order of Penitent Men and Women, which includes (a) all those who dwell in Franciscan cloisters and keep the third rule, (4) those who live in cloisters of their own, keeping the third rule, and © the Tertiaries properly so-called. All these three orders of Friars, Nuns, and Tertiaries are more or less under the Jurisdiction of the general-minister of the Franciscan order. _ L The Minorite friars, or the first order, are divided into two " fainilies," Cismontana, or convents in Italy, ey: Hungary, Poland, Syria, and Palestine, and

amontana, or convents in France, Spain, the Low

Africa, Asia, and the Indies—the one ruled directly by the minister-general, and the other by a commissary-general. Each family is divided into provinces ruled over by a pro- vincial. 'The Cismontane has sixty-six provinces, and the Ultramontane has eighty-one. A province is the union of a certain number of convents under a chief directly respon- sible to the minister-general. Besides provinces the order originally contained vicarates and custodia. The vicarates were @ number of conveuts united together, but too few to be counted a province. The custodia were at first subdivi- sions of provinces, but since Leo X, the custodia are like the old vicarates, and are

governed by a vicar or custos directly responsible to the minister-general. The convents of the order in partibus infidelium are governed by prefects. The minister-general is chosen in full chapter for a term of six years, and if he dies or removes to a higher office during his term, the "discreet perpetual fathers" choose a deputy for the remainder of the term. The minister-general is chosen from the two families alternately, and the chapter at the same time elects a commissary-general for the other family.

The rule originally prescribed by St Francis was very strict, and, rigidly enforced, would have made all the mem- bers of the order pious beggars. This was the founder's idea, but when the order became popular it was found that few of its members could act up to its requirements; and even in the life-time of the founder attempts were made to relax them. The relaxations sanctioned by the decrees of popes and by general usage were repeatedly fought against by small but zealous minorities, and these struggles gave rise to various divisions in the order. Since the time of Leo X. and his union bull these divisions have been re- duced to three,—the Observants, the Conventuals, and the Capuchins,—all of whom belong to the first order of the Franciscans ; and they are the survivals of a much more numerous division. The Observants are supposed to keep the rule of Francis with some strictness, and they take the first rank among the Franciscans ; their minister-general has pre-eminence. The Conventuals follow the rule of Francis with certain relaxations permitted by successive popes. Their general has to be confirmed by the great minister- general, but otherwise they are independent. Since 1528 the Capuchins have had an independent general under the minister-general.

1. The Observants.—The relaxation of the rule of Francis and attempts at reformation to the original simplicity and strictness date from the time of Elias, successor as minister- general to Francis himself. Some of these reforms were unsuccessful, and only resulted in small schisms condemned by the general and by the pope; others were successful, and resulted in the formation of separate congregations more or less independent, until they were all abolished or rather brought together under one rule by Leo X. The Cesarins were the followers of Ceesarinus of Spires, who revolted against the relaxations and innovations of Elias. After varying fortunes the reformers were punished as rebels. They gradually returned to the ranks of

the order, and ceased to exist separately in 1256. The Celestines were the followers of Peter of Macerata, who called himself Liberatus, and Peter of Fossombrone, called Angelus, from his frequent fellowship with angels. They taught and professed a life of the strictest poverty and solitude, and were permitted to live separately from the rest of the order by Pope Celestine V. in 1294. The permission was recalled by later popes, and after many struggles the Celestine hermits were reckoned schismatics and heretics (see CELESTINES). From them came the Fratricelli (see FRATRICELLI). The Congregation of Narbonne, the Spirit- uales, were mainly followers of Peter John de Oliva. They

were really a branch of the Celestines settled at Nar- bonne; but their special grievances were that their laxer brethren did not wear the clothes prescribed by Francis,— their robes were too long and too rich, and their hoods too large,—and that they accepted presents of wine and corn during the vintage and harvest. After some struggles they forced on a controversy in 1282, and were finally condemned by John XXII, at Vienna in 1312. They refused to submit, and were pronounced schismatic in 1318. The Clarenins were a revival, in 1302, of the Celestine hermits under Angelus of Cordova. They fought for re- cognition and existence down to 1581. The Congregation of Philip of Majorca arose in 1308. They were refused recognition, but struggled on only to disappear among the fanatical schismatics of the period. The reform of John of Vallées and Gentilis of Spoleto was occasioned by a further relaxation of the rule in 1336, sanctioned by Pope Benedict XII. Their fight for existence lasted almost forty years. These six attempts to return to the original rule of St Francis, and to follow in the letter and spirit his principles of a religious life, were all unsuccessful. The historians of

the order ascribe the failures to the rashness of the refor- –

mers or their followers, but the real cause was the utter in- compatibility of the rule of Francis with social life in any form. Any thorough-going return to the primitive rule was impossible, but many partial reforms were attempted. The aim of each reformer was to reconstruct the society, or at least to found a small society, which would be so inde- pendent of the rules and officials of the Franciscan order as to be free from interference with their endeavours to obey the rule of Francis in their own way. Some of these re- forms achieved a very considerable degree of independence, and lasted for a long time. They were all, nominally at least, brought under the common government of the order by the famous union bull of Pope Leo X. Of these reforms the most important are the following :—

The Soccolantes (named from wearing a wooden sandal), were founded by Paul of Foligny in 1368, noted from his fourteenth year for his enthusiastic piety. 'This is the most important, because it started with the principles of the earlier unsuccessful reforms, and succeeded because it professed unconditional submission to the pope. Paul and his companions showed all

the idiosyncracies of Francis their cells were full of frogs, and their beds of serpents; they rejoiced in ill health, and nausea at the sight of food was esteemed a sign of the complete mortification of the body, They obtained permission, and retained it against many attempts at deprivation, to live in independence of the ordinary officials of the order. Their reform became successful and spread, and when Leo X. issued his bull of union they were sufficiently numerous to impose their name (Observantes) on one of the great divisions of the reorganized order. At the first they held disputations with the Fratricelli and Beghards regarding the principles of Francis, for these heretics with great justice declared that they were more true to the Christian ideal of Francis than the professed followers of the saint. The only argu- ment the Observants could adduce against their opponents was that Francis had made unconditional submission to the pope part of his ideal. F

The congregation of Villacrezes was founded_by Peter of Villa- crezes, inthe convent of Our Lady of Salceda in Castile, about 1390. His principles were very like those of Paul of Foligny, but were even more strictly enforced. The brethren were obliged to wear the scanticst and coarsest raiment, and to content themselves with the barest necessaries of life. The independence of the congregation was finally secured at the council of Constance. (Cf. Mendoza, Hist. del Monte Celia de nuestra Sefiora de la Salceda.)

‘ ae Congregation of Collette, from the nun Collette, is noticed elow.

The Congregation founded by Amadeus of Assisi obtained inde- pendence in 1469 and 1471; it was never very strong, laboured under suspicion of heresy, refused to submit to the bull of Leo X., and was finally suppressed by Pius V.

The Congregation of Philip Berbegal took its rise from attempts of Martin V. to reform the order in 1430. Nominally suppressed in 1433, it reappeared under another name (the Neutrals), obtained recognition, but was finally suppressed in 1463.

The Caperolani, or followers of Peter Caperole, were for a short time independent, and then were reunited with the Observants. Two famous preachers, Anthony of Castcl St Jean and Matthew of

Tivoli, held out and gathered around them a new congregation, which for long refused to submit itself to the order.

More important, however, than any of thesc reforms, save the first, were the series of national reformatory movements within the order, which produced in Spain the Bare-footed Friars under the leadership of John of Guadaloupe, in Italy the Riformati led by Stephen Molina, and in France the Récollets. These congregations arose to embody the reforms suggested by John of Puebla, and sur- vived Leo's bull of union. Lapse of time brought relaxations, and these led again to a reaction which produced the reform of Peter of Alcantara, who named his fellows The Brethren of the Strictest Observance. Peter obtained a species of independence for his con- vents. They were under the rule of the general of the order, but not of the provincials. From this congregation arose a further reform under John of Paschase and Jerome of Lanza, which, after some years of independent life, reunited with the congregation of Peter of Alcantara.

Most of these reforms were brought together by the bull of Leo X., and are merged under the general name of Observants.

2. The OConventuals included, at the time of Leo X., all the Franciscans who kept the rule in a relaxed form, and had not been influenced by the various attempts at refor- mation. They claimed to be the Franciscan order, and in fact at the time were so. Now they are only one of the great divisions of the order. Au attempt was made after the council of Trent to reform the Conventuals, and a con- gregation of Reformed Conventuals was founded, but it did not exist very long.

3. The Capuchins exist as an independent congregation, and do not take rank with the Observants and Conventuals. They owe their origin to Matthew of Bassi, a Franciscan of the family of Observance, who had conscientious scruples about the shape of his hood or capuce. It was revealed to him in visions that St Francis had worn a long pointed hood, and he began to wear one of the revealed pattern. Others began to copy it. They were persecuted by their fellows, strove for freedom, and at length got it. In 1536 Paul III. formally recognized them under the title of Capuchins

of the order of the Minorites, but ordained that their vicar-general or chief was to be confirmed by the general of the Conventuals, and that they were to march under the cross of the Conventual Minorites in religious processions, In 1619 Paul V. removed these restrictions. They now have their own cross and choose their own chief quite independently, and he is called general, not vicar- general. See CAPUCHINS.

Il. The Franciscan nuns owed their origin to Clara, a noble maiden of Assisi. Born in 11938, she left her home in 1212, fied to the Portiuncula to Francis, and refused to return. The same year she gathered a company of ladies, including her three younger sisters, and founded the order of Franciscan nuns. 'The order spread rapidly through Italy, France, Spain, Germany, and Bohemia. In 1220 Cardinal Hugolin gave them a rule of life taken from the rule for the strictest sect of the Benedictine nuns, with some special observances. Four years later Francis gave them a written rule, which was approved of by Gregory IX. and by Innocent IV.

The rule of Hugolin compelled the nuns among other things to fast every day, to abstain at all seasons on Wed- nesdays and Fridays from wine and soup, and to content themselves on those days with some fruits or raw herbs, to fast also on bread and water thrice a week during Lent and twice during Advent. They were also to keep perpetual silence, to be broken only by the permission of the superior. They were to wear two tunics, a mantle and scapulary, be- sides a hair shirt. The rule of Francis was not so strict ; he did not oblige them to fast on bread and water during certain seasons, and there were other relaxations. These two rules gave rise to disputes and divisions, and Pope Urban IV. gave the sisters a third rule which was less strict than either. The result was that several convents adhered to the first and strictest rule; that of the reform

of Collette, a French sister, adhered to the second rule, that of Francis ; while the large proportion of the nuns followed the new rule of Urban.

The Capuchin movement within the Franciscan order also affected the Minorite nuns, and the Capuchin nuns soon be- came a large and prosperous community. The only other important reform was that set in

motion by Peter of Alcantara. The sisters who followed him are called the Poor Clares of the Strictest Observance. They take the vow of perpetual silence. .

III. The Tertiaries consist of lay brethren and sisters in the Franciscan monasteries, confraternities who keep the third rule of St Francis, and men and women living in society who have taken the third rule. The Tertiaries of the begging monks have become so famous that many are disposed to trace their origin to Francis and Dominic, but the class of penitents existed in connexion with other and older orders. The third rule was intended to suit the re- quirements of all those who wished to live a higher religious life, and who could not from their circumstances embrace the monastic life. It is said that the origin of the Francis- can Tertiaries dates from Francis preaching at Canari, a small town near Assisi, where the whole population wished en masse to enter the Franciscan order and desert their life and duties in society. Francis refused to permit this, but to assist them framed a third rule to serve as a religious guide. Its provisions resemble the rules commonly found in pious books with which the present ritualistic movement has made us familiar, and the associations of Tertiaries may be compared with the guilds now found in connexion with many High Church congregations, These Tertiaries believed that they were imitating not Christ but his early disciples ; they had to spend some time in novitiate, and then vowed obedience to the third rule, which enjoined that they were to wear poor clothing of an unobtrusive colour, without worldly ornament of any kind. It forbade them to bear arms save for the defence of the church or their country. It prohibited attendance at fétes, balls, dancing parties, and the theatre. It forbade meat on Monday, Wednesday, Friday, and Saturday. It enjoined fasting at Lent and Advent, and at other times only two meals a-day. The hours of devotion and the devotional exercises were pre- scribed. 'Tertiaries were bound to attend mass and preach- ing at least once a month, to go to confession and holy communion at least thrice a year, and to attend the funerals of their fellows, This third order was very successful, but it is worth noticing that the common people, after the first burst of enthusiasm, seemed unable to distinguish the Tertiaries from the Fratricelli and Beghards, who professed a somewhat similar mode of life, and had been condemned by various popes.

At some period of their existence, when it is difficult to say, many of the Tertiaries began to practise the monastic life, and to take the vow of chastity in addition to the third rule. Convents of the third rule were in existence in the 15th century, and in 1433 brethren living under this rule were permitted to choose a general. The earlier bulls per- mitting such confraternities were at first generally addressed to penitents living in particular countries, and the divisions of the brethren take generally a loeal name. There were, for example, the religious penitents of the third order of St Francis of the regular observance in Italy, in Sicily, Dal- matia, and Istria, and in the Low Countries ; these three were united in the congregation of Lombardy. There were besides the congregations of Germany, Spain, Portugal, and France. Congregations were also formed to observe the rule with complete and literal strictness. The Tertiaries included Women as well as men, and these also began to — @ special vow of chastity and live in cloisters. One

ranch of these includes the lay sisters in the ordinary con-

vents of the Poor Clares, who devote themselves to menial work. Their foundress was Elizabeth of Hungary. Another branch was founded by Angeline of Corbaro, and has convents of its own. There are also the Grey Sisters, the Recollectines, and several other congregations, who live in cloisters under regular government, but practise the third and not the second rule. From the beginning of the move- ment the Tertiaries were charged to take special care of the poor, the sick, and the aged; and several confraternities, both of men and of women, have been formed, who live under the third rule, and devote themselves to hospital work,

Besides these three orders of Friars, Nuns, and Tertiaries, the Franciscans may also be said to include one or two orders of minor importance which trace their origin to Francis,—such, for example, as the Chevaliers of the Order of the Immaculate Conception of the Blessed Virgin, and the Archiconfraternity of the Stigmata of St Francis, but they are of minor importance.

The Franciscan soon became one of the most important of the medizval monastic orders, It had a peculiar charac- ter, and attracted minds of the sympathetic mystical cast. This led to its curious connexion with many of the medieval heretical sects. The Franciscan theology was also peculiar. It had the same Pelagian characteristics that distinguish the modern Jesuit theology, which has done little more than develop the Franciscan ideas on the immaculate con- ception, the doctrines of freedom and grace, &. During the Middle Ages the Franciscans, however, furnished many strong opponents to the papal theology and ecclesiastical claims. The order has produced a long array of distin- guished theologians and churchmen,—Bonaventura, Alex- ander of Hales, John Duns Scotus, and William of Occam were all Franciscans. Wadding, the great historian of the Franciscans, has filled a folio volume with names of distin- guished members of the order.

Authorities. —Wadding, Annales Minorwm, 22 vols. fol., and Brother Anthony's Supplement; Tossinian, Historia Seraphiea; Dominic de Gubernatis, Orbis Seraphicus; Helyot, Histoire des Ordres Monastiques, vol. vii.; Marianus, Chronie. Observ. Strietior. et Reform.; Boverius, Annal. Fr. F. Min. Capucinorum; Brewer's Monumenta Franciscana; Hase, Franz v. Assisi, cin Heiligenbild, 1864; Mrs Oliphant's Life of Francis of Assisi ; Maclear's History of Christian Missions in the Middle Ages (where the mission work of St Francis has been well described, chap. 16); Mrs Jameson's

Legends of the Monastie Orders as represented in the Fine Arts; Milman's Latin Christianity, bk. ix. chap. 9. (T. M. L.)

FRANCISQUE. Jean Francois Millet (c. 1644-1680), commonly called Francisque, was born at Antwerp about 1644, and is generally classed amongst the painters of Flanders on account of the accident of his birth. But his father was a Frenchman, a turner in ivory of Dijon, who took service with the prince of Condé, and probably re- turned after a time to his native country. He remained long enough in Antwerp to apprentice his son to an obscure member of a painter family called Laurent, pupil of Gabriel Franck. With Laurent Franck Francisque left Antwerp for Paris, and there settled after marrying his master's daughter. He was received a member of

the Academy of Painting at Paris in 1673, and after gaining consideration as an imitator of the Poussins he died in 1680, bequeathing his art and some of his talents to one of his sons. Fran- cisque probably knew, as well as imitated, Nicolas Poussin, Gaspar Dughet, and Sebastian Bourdon; and it is doubt- less because of his acquaintance with these travelled artists that, being himself without familiarity with the classic lands of Italy and Greece, he was able to imagine and reproduce Italian and Arcadian scenery with considerable grace and effectiveness. It is indeed surprising to observe, even at this day, how skilfully he executed these imaginary sub- jects, enlivened them with appropriate figures, and shed

over them the glow of a warm yet fresh and sparkling tone. Unhappily time has been unkind to Francisque. Twelve of his most important landscapes, which remained in the palace of the Tuileries, were destroyed by fire quite recently; and though many of his pieces may still be found catalogued in Continental and English collections, others in great number remain unknown and unacknowledged. In England there are specimens of Francisque in the galleries of the duke of Devonshire, and Earls Dudley and Suffolk. Abroad, most of his known works are in public museums. It often happens that his name is appended to pictures by Jean Frangois, his son.

Jean Francois Millet, the younger, was born in Paris, and was made a member of the Academy of Painting at Paris in 1709. He died in 1773. He is not quite so n- dependent in his art as his father; but he had clever friends, and when he wanted figures to his landscapes, he consulted Watteau, and other followers of the "court shepherdess" school. But on the whole Jean Frangois the younger's work is often lost in that of his father, and it is difficult to point to any picture by him except that in the museum of Grenoble, which is prettily adorned with Watteau's figures.

FRANCK. The name of Franck has been given indis- criminately but improperly to painters of the school of Antwerp who belong to the families of Francken and Vranex (see FRANCKEN and VRANEX). One artist truly entitled to be called Franck is Gabriel, who entered the guild of Antwerp in 1605, became its president in 1636, and died in 1639. Gabriel Franck

formed a great number of pupils, amongst whom we notice Abraham Genoels the elder, and Laurent Franck, the master of Francisque. But none of his works are now to be traced.

FRANCK or FRANK, Sesastian (c. 1500-1543), not unfrequently called by the Latinized form of his name Francus, an important German writer of the Reformation period, was born about 1500 at Donauworth, and regularly styled himself Franck of Word. Of his early years nothing is known except by inference. It appears that he studied at Heidelberg, and about 1524 was ordained a Roman Catholic priest. In 1528 he married Ottilia Behaim at Nuremberg ; and the same year he produced his Ger- man translation of Althamer's Diallage, or Reconciliation of the Contradictions of the Scriptures, and wrote a treatise against the Horrible Vice of Drunkenness. Two years later appeared, with an introduction by Luther, his translation of a Chronicle and Description of Turkey, written by a Transylvanian who had been Twenty-two Years in Turkish Captivity. In 1531 he was in Strasburg, and published his Chronika, Zeitbuch, und Geschichtbibel, one of the first German works in which an attempt was made to give a sur- vey of universal history. From Strasburg he removed to Ksslingen ; and there during 1532 and 1533 he attempted to support himself by soap-boiling, but found it on the whole an unprofitable occupation. In hope of a better market for his wares he went to Ulm, where in 1534 he received the freedom of the city. For some time he remained peacefully printing his books, but on the publica- tion of his Parodoxa his privileges were withdrawn, and he was ordered to depart. A promise to submit his writings to censure procured a temporary reprieve of the sentence, but in 1539 he was finally banished, and from that time he appears never to have settled long in one place. He was engaged as a printer and publisher at Basel when he died, in 1543 or 1545. Besides the works already mentioned, he wrote also a collection of proverbs (Sprauch-Wérter) in 1532, which appeared in fuller formin 1591, a Germanie Chron- won, 1538, and the Guldin Arch or Arca Aurea, 1538, a col- lection of Seripture doctrines with proof passages, not only from the Bible itself, but also from pagan writers. Franck's

position as a thinker was a peculiar one. Though associ- ated at first with the Reformers, he soon showed that he was out of sympathy with their dogmatic tendencies, and at length was branded by Luther as a "devil's

mouth." He was naturally inclined to subjectivity and mysticism, and may to a certain extent be regarded as a forerunner of modern German idealism. His religion was practically pantheistic, and tended to foster a spirit of tolerance that found good in everything. Amid the bitter controveries of contending sects it was rare to find a professed theologian maintaining that the true church consisted of "all pious and good-hearted men in all the world, even among the heathen." As an historian, while still credulous enough to believe in the Trojan myths of the Middle Ages, he dis- played a remarkably modern spirit in the attention he gave to social conditions. The first part of his Chronicon, &c., contains the history of antiquity, the second includes the period from Christ to Charles V., and the third gives account of the popes, councils, heretics, ceremonies, é&c. His German style is plain, vigorous, and idiomatic, and ranks him high among the founders of German prose.

See Wald, De vita Franei, Erlangen, 1793; Ch. K. am Ende, Nacehlese zu Franek's Leben und Sehrifien, Nuremberg, 1796; Hagen, Geist der Reformatoren und seine Gegensdtze, Krlangen, 1844; Hein- rich Merz in Herzog's Real Eneyelopddie fiir Prot. Theol., 1855; Bischof, Sebastian Franck und die Deutsche Gesehichtsehreibung, Tiibingen, 1857; Hase, Sebastian Franck von Word der Sehwarm- geist, Leipsic, 1869; Latendorf in his edition of Sebastian Franek's erste namenlose Spruchwortersammlung vom Jahre 1532, Posneck, 1876; and a valuable review of this last work in the Jena Lit. Zeitung, 1877, No. 22.

FRANCKE, Aveust Hermann (1663-1727), an influ- ential German philanthropist and theologian, was born on the 22d of March 1663 at Liibeck, where his father, a doctor of laws, at that time held a professional appointment. He was educated, chiefly in private, at Gotha (to which his family had removed in 1666), and afterwards at the univer- sities of Erfurt, Kiel, and Leipsic. During his student career, he busied himself specially with the Hebrew and Greek languages ; and in order to acquire the former more thoroughly, he for some time put himself under the instruc- tions of Rabbi Ezra Edzardi at Hamburg, at whose in- stance he is said to have read through the entire Hebrew Bible seven times within a year. He graduated at Leipsic in 1685, but, having found employment as a " privat- docent," did not quit the university until the end of 1687. During the last year of his

residence he had, by the help of his friend P. Anton, and with the approval and encour- agement of Spener, who was at that time coming into notice, originated the afterwards famous collegium philobiblicum, at which a number of graduates were accustomed to meet for the regular and systematic study of the Bible He next passed a number of months at Liineburg as assistant or curate to the learned and pious superintendent Sand- hagen, and there his religious life was remarkably quickened and deepened. His own account of his experience at that crisis in his life, and of the influence of the particular text (John xx. 31) to which he believed he owed his con- version, is very interesting and characteristic. On leaving Liineburg, he spent some time in Hamburg, where he was engaged as a teacher in a private school, and there also he considered himself to have acquired some experience which proved invaluable in after life. After a long visit to Spener, who was at that time in Dresden, and who encouraged him in the plans he had formed, he returned to Leipsic in the spring of 1689, and began to give Bible lectures of an exegetical and practical kind, at the same time resuming the collegia philobiblica of earlier days. He rapidly became very popular as a lecturer ; but the peculi- arities of his teaching almost immediately aroused a violent opposition on the part of the university authorities ; and

before the end of the year he was, on the ground of his alleged pietisin, interdicted from lecturing. Thus it was that Francke's name first came to be publicly associated with that of Spener, and with one of the most fruitful church movements of the 17th century. Although, how- ever, the majority of those claiming to be orthodox chose to regard the pietists as a new and dangerous sect, it must be remembered that neither Spener nor Francke taught in any spirit of sectarianism or with any consciousness of antag- onism to any of the doctrines of the Lutheran Church. Loyal churchmen, they were distinguished from other Lutherans simply by their readiness to subordinate mere confessional orthodoxy to the interests of spiritual religion and practical morality, and also by the unusual earnestness with which they insisted on the necessity of conversion, and of the appearance of certain symptoms of a moral and spiritual change, before any one could rightly lay claim to the Christian name. The pietism of Francke, at all

events, was quite as compatible with churchliness as was the methodism of Wesley or the evangelicalism of Simeon; and it is well known that neither of these two men desired to set up asect against the church. Prohibited from lecturing in Leipsic, Francke in 1869 found work at Erfurt as "deacon z of one of the city churches. Here his evangelistic fervour attracted multitudes to his preaching, but at the same time excited the jealousy of his less zealous colleagues as well as the antipathy of the Catholic section of the population ; and the result of their combined opposition was that after a ministry of fifteen months, he was, in September 1691, banished from the town by the civil authorities. The same year witnessed the expulsion of Spener from Dresden. In December Francke received and accepted an invitation to fill the chair of Greek and Oriental languages in the new university of Halle, which was at that time being organized by the elector Frederick III. of Brandenburg ; and at the same time, the chair having no salary attached to it, he was appointed minister of the parish of Glaucha in the im- mediate neighbourhood of the town. Here, for the next thirty-six years, he continued to discharge the twofold office of pastor and professor with rare energy and success. ~ Be- sides preaching on Sundays, with an eloquence and earnest- ness and depth that attracted and held together a large con- gregation, he found time for many week-day meetings for edification, and was unwearied in the work of catechizing the young and of giving spiritual direction to those who sought his private advice. At the very outset of his labours, he had been profoundly impressed with a sense of his responsibility towards the numerous outcast children who were growing up around him in ignorance and crime. After a number of tentative plans, such as that of gather- ing them together once a week at the parsonage, and that of paying their school fees, he resolved in 1695 to institute what would be called in this country a ragged school, rely- ing for funds upon the charity of the benevolent public. A single room was at first sufficient for the needs of the institu- tion; but within a year it was found necessary to purchase a house, to which another was added in 1697. In 1698 there were 100 orphans under his charge to be clothed and fed, besides 500 children who were taught as day scholars. The later statistics of the many and various educational institutions of Halle which owe their origin to him will be found in vol. vii. p. 675. The principles there indicated were consistently applied in his university teaching. Even as professor of Greek he had given great prominence in his lectures to the study of the Scriptures; but he found a

much more congenial sphere when, in 1698, he was appointed to the chair of theology. Yet his first courses of lectures in that department were on Old and New Testa- ment introduction ; and to this, as also to hermeneutics, he always attached special importance, believing that for

theology a sound exegesis was the one indispensable requi- site. ‘“‘Theologus nascitur in scripturis,” he used to say; but during his occupancy of the theological chair he lectured at various times upon other branches of the science also, according to the custom still usual in Germany. Amongst his colleagues were Anton, Breithaupt, and Joachim Lange —men like-minded with himself. Through their influence upon the students, Halle became a centre from which pietism, as it was called, became very widely diffused over Germany; but while in some quarters the new light was welcomed and cherished, in others every effort was made to suppress it. Thus, while Frederick William L of Prussia is said to have gone so far as to issue an edict forbidding that any one should receive a cure of souls in his domi- nions who had not studied in Halle for two years, and received from the faculty there satisfactory certificates as to his status gratic, legislative enactments were elsewhere frequently directed against the Halle school. It ought to be borne in mind with reference to these that Francke can- not fairly be held responsible for the separatistic and per- fectionist and chiliastic tendencies which are now most commonly associated with the pietistic name. He died at Halle on the 8th of June 1727.

His principal contributions to theological literature were—Manu- duetio ad Leetionem Seripture Sacre (1693); Preelectiones Hermen- eutiece (1717); Commentatio de Scopo Librorum Veteris et Novi Tes- tamenti (1724); and Lectiones Parcenctiew, (1726-36). The AManu- duetio was translated into English in 1813, under the title 4 Guide to the Reading and Study of the Holy Scriptures. An account of his orphanage, entitled Segensvolle Fuss- stapfen, &e. (1709), which subsequently passed through several editions, has also been par- tially translated, under the title The Footsteps of Divine Providence: or, The bountiful Hand of Heaven defraying the Eapenses of Faith. See Guerike’s 4. H. Franeke (1827), which has been translated into

English (The Life of A. H. Francke, 1837); and Kramer's Beitrdge zur Gesehichte A. H. Franeke's (1861), and Neue Bettrage (1875).

FRANCKEN. Eleven painters of this family cultivated their art in Antwerp during the 16th and 17th centuries. Several of these were related to each other, whilst many bore the same Christian name in succession. Hence unavoidable confusion in the subsequent. classification of paintings not widely differing in style or execution. When Franz Francken the first found a rival in Franz Francken the second, he described himself as the " elder," in contradistinction to his son, who signed himself the "younger." But when Franz the second was threatened with competition from Franz the third, he took the name of "the elder," whilst Franz the third adopted that of Franz "the younger." It is possible, though not by any nieans easy, to sift the works of these artists. The eldest of the Franckens, Nicholas of Herenthals, died at Antwerp in 1596, with nothing but the reputation of having been a painter. None of his works remain. He bequeathed his art to three children, Jerom Francken, the eldest son, after leaving his father's house, studied under Franz Floris, whom he afterwards served as an assistant, and wandered, about 1560,to Paris. In 1566 he was one of the masters em-

_ ployed to decorate the palace of Fontainebleau, and in 1574

he obtained the appointment of court painter from Henry III., who had just returned from Poland and visited Titian at Venice. In 1603 when Van Mander wrote his biography of Flemish artists, Jerom Francken was still in Paris living in the then aristocratic Faubourg St Germain. Among his earliest works we should distinguish a Nativity in the Dresden Museum, executed in co-operation with Franz Floris. Another of his important pieces is the Abdication of Charles V. in the Amsterdam Museum. Equally inter-esting is a Portrait of a Falconer, dated 1558, in the Bruns- wick Gallery. In style these pieces all recall Franz Floris. Franz, the second son of Nicholas of Herenthals, is to be kept in memory as Franz Francken the first. He was born about 1544, matriculated at Antwerp in 1567, and died

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there in 1616. He, too, studied under Floris, and never settled abroad, or lost the hard and gaudy style which he inherited from his master. Several of his pictures are in the Museum of Antwerp, one dated 1597 in the Dresden Museum represents Christ on the road to Golgotha, and is signed by him as D. 6 (Den ouden) F. Franck. Ambrose, the third son of Nicholas of Herenthals, has bequeathed to us more specimens of his skill than Jerom or Franz the first. He first started as a partner with Jerom at Fontainebleau, then he returned to Antwerp, where he passed for his guild in 1573, and he lived at Antwerp till 1618. His best works are the Miracle of the Loaves and Fishes and the Martyrdom of St Crispin, both large and ambitious compositions in the Antwerp Museum. In both these pieces a fair amount of power is displayed, but marred by want of atmosphere and shadow, or by hardness of line and gaudiness of tone. 'here is not a trace in the three painters named of the influence of the revival which took place under the lead of Rubens. Franz Francken the first trained three

sons to his profession, the eldest of whom, though he prac- |

tised as a master of guild at Antwerp from 1600 to 1610, left no visible trace of his labours behind. Jerom the second took service with his uncle Ambrose. He was born in 1578, passed for his guild in 1607, and in 1620 produced that curious picture of Horatius Cocles defending the Sublician bridge which still hangs in the Antwerp Museum. The third son of Franz Francken the first is Franz Francken the second, who signed himself in pictures till 1616 "the younger," from 1630 till his death "' the elder " F'. Francken. These pictures are usually of a small size, and are found in considerable numbers in Continental collections. Franz Francken the second was born in 1581. In 1605 he entered the guild, of which he subsequently became the president, and in 1642 he died. His earliest composition is the Crucifixion in the Belvedere at Vienna, dated 1606. His latest compositions as "the younger" F. Francken are the Adoration of the Virgin (1616) in the Gallery of Amsterdam and the Woman taken in Adultery (1628) in Dresden. From 1616 to 1630 many of his pieces are signed F. Francken ; then come the Seven Works of Cha- rity (1630) at Munich, signed "the elder F. F.," the Pro- digal Son (1633) at the Louvre, and other almost countless examples. It is in F. Francken the second's style that we first have evidence of the struggle which necessarily arose when the old

customs, hardened by Van Orley and Floris, or Brueghel and De Vos, were swept away by Rubens. But ¥.Franck the second, as before observed, always clung to small surfaces; and though he gained some of the freedom of the moderns, he lost but little of the dryness or gaudi- ness of the earlier Italo-Flemish revivalists. F. Francken the third, the last of his name who deserves to be recorded, passed in the Antwerp guild in 1639, and died at Antwerp in 1667. His practice was chiefly confined to adding figures to the architectural or landscape pieces of other artists. As Franz Pourbus sometimes put in the portrait figures for Franz Francken the second, so Franz Francken the third often introduced the necessary personages into the works of Pieter Neefs the younger (museums of St Peters- burg, Dresden, and the Hague). In a Moses striking the Rock, dated 1654, of the Augsburg Gallery, this last of the Franckens signs D. 6 (Den ouden) F. Franck. In the pictures of this artist we most clearly discern the effects of Rubens's example.

FRANQOIS DE NEUFCHATEAU, Nicoxas Lovts, Count (1750-1828), a French statesman and poet, was born at Saffais, in the district of Meurthe, 17th April 1750. He studied at the college of Neufchateau in the Vosges, and at the age of fourteen published a volume of poetry which obtained the approbation of Rousseau, and secured or its author so much éclat that Neufchateau conferred on

him its name, and he was elected member of some of the principal academies of I'rance. In 1783 he was named procureur-general to the council of St Domingo. He had previously been engaged on a translation of Ariosto, which he finished before his return to France five years afterwards, but it perished during the shipwreck which occurred during his voyage home. After the Revolution he was elected deputy to the National Assembly, of which he first became secretary and then president. In 1793 he was imprisoned on account of the political sentiments of his drama Pamela, but a few days afterwards the Revolution of the 9th of August restored to him his freedom. In 1798 he became minister of the interior, in which office he distinguished himself by the thoroughness of his administration in all departments, It is to him that France owes its system of inland navigation. From 1804 to 1806 he was president of the senate, and in that capacity the duty devolved upon him of soliciting Napoleon to assume the title of

emperor. In 1808 he received the dignity of count. Retiring from public life in 1814, he occupied himself chiefly in the study of agriculture, until his death, 10th January 1828, Fran- gois de Neufchateau had very multifarious accomplishments, and interested himself in a great variety of subjects, but his fame rests chiefly on what he did as a statesman for the encouragement and development of the industries of France. His maturer poetical productions did not fulfil the promise of those of his early years, for though some of his verses have a superficial elegance, his poetry generally lacks force and originality. He had considerable qualifications as a grammarian and critic, as is witnessed by his editions of the Provinciales and Pensées of Pascal, Paris, 1822 and 1826, and Gil Blas, Paris, 1820. His principal poetical works are Poésies Diverses, 1765 ; Ode sur les Parlements, 1771 ; Nouveaua Contes Moraum, 1781; Les Vosges, 1796 ; Fables et Contes, 1814; and Les Tropes, ow les Figures de Mots, 1817. He is also the author of a large number of works on agriculture.

See H. Bonnelier, Mémoires sur Francois de Neufchdteau, Paris, 1829; and J. Lamouroux, Notice historique et littératre sur la vie ct les écrits de Francois de Neufchdteaw, Paris, 1843.

FRANCONIA, in German FRANKEN, a name of very different application in different historical periods. It pro- perly signifies the land of the Franks, and is consequently identical in original meaning with the word Francia or France. In the beginning of the 4th century the Frank- ish territory stretched from the Loire eastward to the basin of the Rhine and the Main ; but it was shortly after- wards broken up into two divisions—Austrasia, Francia Orientalis, or the kingdom of the East Franks, and Neustria, Francia Occidentalis, or the kingdom of the West Franks. As time went on both kingdoms extended their boundaries ; and when the treaty of Verdun in 845 settled the claims of the grandsons of Charles the Great, there was a kingdom of Western France with Latin tendencies, and a kingdom of Eastern France with Teutonic tendencies, each possessing a central district or duchy of its own name. These districts were separated from each other by the district of Lotha- ringia or Lorraine. The western was soon after lost sight of; but the eastern continued for a long period to be con- sidered the very core and kernel of the German kingdom, and a theory became prevalent that it was the original seat, of the Franks in Germany. Under the

Saxon and Franconian emperors it was subdivided into Ost-Fran- ken, Francia Orientalis, or Hastern Franconia par ex- cellence, and Rhein-Franken, Francia Rhenensis, or Rhen- ish Franconia. The former, which was also distinguished as Saal-Franken, stretched from the Fichtelgebirge and the Rhone to the Danube, and from the Upper Pala- tinate to the Spessart and the lands of the Neckar; while the latter was the country between the Spessart and

the Rhine, and included the present district of Frankfort-on- the-Main. Though the name frequently occurs in our his- tories, there was probably no proper "duchy" of Franconia, in the same sense at least as there was a duchy of Saxony or a duchy of Bavaria. Conrad I. and Conrad IL., for ex- ample, do not style themselves dukes "of" Franconia but dukes "in" Franconia. Both Eastern Franconia and Rhenish Franconia were broken up into a number of dis- tinct territories—countships, lordships, &c. When Maxi- milian divided Germany into circles in 1501, he gave the name of Franconia to the circle whichincluded the bishoprics of Wiirzburg, Bamberg, and Eichstidt, the district of Mer- gentheim belonging to the grand master of the Teutonic Order, the territory of the abbey of Schénthal, the prin- cipalities of Baireuth and Ausbach, the countships of Henneberg and Schwarzenberg, the territories of the curia of Franconian counts, the imperial towns of Nuremberg, Rothenburg, Schweinfurt, Weissenburg, and Windsheim. Altogether the circle comprised 69 territories and had an area of about 10,430 square miles, and in 1792 its popu- lation amounted to 1,547,000. The name of Franconia ceased to be officially used after the dissolution of the German empire in 1806; but in 1837 King Louis I. of Bavaria gave the names of Upper, Middle, and Lower Franconia to what had previously been known as the circles of the Upper Main, the Rezat, and the LowerMain. Upper Franconia forms the north-east portion of Bavaria, and is partly conterminous with the frontiers of Bohemia, Saxony, and Prussia. Its mountains are the Fichtelgebirge, the Frankenwald, the Bohmerwald, and the Steigerwald; and the Main, the Naab, the Saale, and the Eger take their rise within its territory. The seat of the administration is at Baireuth, and the court of appeal at Bamberg. Lower Franconia lies to the west, and forms the north-west province of the kingdom,—conterminous

with Prussia, Weimar, Meiningen, Wiirtemberg, Baden, and Hesse. Its rivers are the Main, the Saale, the Itz, and the Baunach. The prin- cipal town is Wiirzburg. Middle Franconia lies to the south of the other two, conterminous with the Upper Palatinate, Swabia, and Wiirtemberg. It is watered by the Regnitz and the Altmiihl. The principal town is Nurem- berg, the seat of the administration is at Ausbach, and the court of appeal at Hichstidt.

FRANEKER, a town of Holland, province of Friesland, is situated 10 miles W, of Leeuwarden, on the canal between that town and Haarlingen. The university founded here in 1585 was abolished by Napoleon I., and its endowments were diverted in 1815 to the support of an atheneum, and later of a gymnasium, with which a physiological cabinet and a botanical garden are connected. Franeker also possesses a very fine observatory. The uni- versity buildings are occupied by an asylum for insane. The chief industries of the town are silk-weaving, woollen spinning, and shipbuilding. Population in 1876, 6643.

FRANKENBERG, an important manufacturing town of Saxony, circle of Zwickau, is situated on the Zschopau, 7 miles N.E. of Chemnitz. The priucipal buildings are the great church, restored in 1874-5, and the new town-house. Frankenberg has extensive woollen, cotton, and silk manu- factures, and also dye-works and cigar factories. Its educa- tional establishments include a city school, a real school, and a technical school for engineering, in connexion with which there is a chemical laboratory. Population in 1875, 10,462.

FRANKENHAUSEN, a town of Germany, principality of Schwartzburg-Rudolstadt, is situated on the Little Wipper, 36 miles N.N.E. of Gotha. It consists of an old and a new town, the latter mostly rebuilt since a very destructive fire in 1833, and has an old castle, two tshons a seminary for. teachers, a hospital, and a new

own-house. Its industries include the manufacture of

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sugar, cigars, and buttons, and there' is a salt mine in the vicinity. At Frankenhausen a battle was fought 15th May 1525, in which the peasants under Thomas Miinzer were defeated by the Saxon, Brunswick, and Hessian troops. Population in 1875, 4725.

FRANKENSTEIN, a town in the Prussian province of Silesia, government of Breslau, is situated 35 miles S. by W. of the town of that name. It has a monastery of the charity-friars, a garrison, and an old castle. The principal manufactures are linen, woollen, and cotton goods, straw hats, chemical substances, and salt. Population in 1875,

7492.

FRANKENTHAL, a town in the Rhenish district of Bavaria, is situated on the Isenach, 9 miles N.W. of Mann- heim, and is connected with the Rhine by a canal 4 miles in length. It has a poorhouse, an infirmary, a deaf and dumb institution, an asylum for insane, and the ruins of an old monastery. Its principal industries are the manufacture of machinery, bell-founding, and brewing.

Frankenthal existed as a village in the 8th century, but it owes its prosperity to a colony of Flemish Protestant refugees who settled there in 1562. After this it rose very rapidly, so that in 1577 it became a town. The Spaniards made an unsuccessful attempt to capture it in 1621, and it was taken by them in 1623. In 1689 it was burned to the ground by the French, and it delivered itself up to the same power in 1796. Population in 1875, 7907.

FRANKFORT, a city of the United States, capital of Franklin county and of the State of Kentucky, is pictur- esquely situated on both sides of the Kentucky river, on a space of elevated ground bounded by a bluff 150 feet high. It is distant 29 miles W.N.W. from Lexington, and 65 miles E. from Louisville, by rail. The river is crossed at Frankfort by two bridges, and that portion of the town lying on the south side of the river is known as South Frankfort. The principal buildings are the State house, a marble building with a handsome portico sup- ported by Ionic columns, the institution for imbecile children, the State penitentiary, the county court-house, and the public hall. The beautiful cemetery contains the remains of Daniel Boone, the pioneer of Keutucky, who died September 20, 1820.

Frankfort has distilleries and flour and cotton mills, and a considerable trade in lumber. The river is navigable for steamers 40 miles above the city. Frankfort was laid out in 1787, and became the capital of the State in 1792. In 1862 it was occupied for a short time by the Confederates. The population in 1860 was 3702, and in 1870, 5396, of whom 2335 were coloured.

FRANKFORT-on-THE-MAIN, in German FRANKFURT or FRANKFURTH-AM-MAIN, one of the principal cities of the German empire, in the circle of Wiesbaden, in the Prussian province of Hesse-Nassau, and till 1866 one of the four free cities of Germany. It lies about 330 feet above the level of the sea, in 50° 6' 43" N. lat. and 8° 41' 9" E. long., 22 miles E. of Mainz and 16 miles N. of Darmstadt. The position which it occupies is one of no small natural beauty in the broad and fertile valley of the Main, its northern horizon being formed by the soft outlines of the Taunus range. The surrounding country is richly clad with orchard and forest, and in the season of spring especially presents a prospect of indescribable luxuriance. In earlier times the city with its fortifications had the form of an irregular

entagon, of which the longest side was defined by the right ay of the river ; but now that the fortifications have been demolished, new suburbs have spread out widely in all directions, and the village of Sachsenhausen on the opposite side of the stream has extended in a similar fashion, so that the whole area of architectural occupation measures about 21 miles from E. to W., aud about 2 miles from N. to S. Even within the old encincture great transformations have been effected, and much of the quaint domestic architecture and the intricate network of narrow streets and lanes has

given way to modern improvenients. Only one side, for

example, of the famous Judengasse or Jews' Street is now standing, the other having been demolished since 1870; but the visitor can still see the house where Ludwig Borne was born in 1786, and the dingy and unpretentious pre- niises of No. 148 which saw the rise of the Rothschild family.

When the whole of what remains of this street has

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Plan of Frankfort-on-the-Main.

1. Bethmann’s Museum. 16. Cathedral and Dom Platz.

2. Bethmann’s Monument. 17. St Paul’s Church and Platz. 8. Hessian Monument. 18. Goethe’s House.

4. Senckenberg Museum. 19. Stadel Institute.

5, Taxis Palace. 20, Rémer or Townhouse.

6. Barracks. 21. St Leonard’s Church.

7. Schiller’s Monument. 22. Saalhof (Picture Gallery).

8. Hauptwache. 23. Library.

9. St Catherine's Church. 24. Strangers' Hospital. 10. Post-Office. 25. Exchange. 11. Goethe's Monument and Platz. 26. Bank. 12, French Reformed Church. 27. German Reformed Church. 13. Gutenberg's Museum. A. Jews' Market and Infirmary. 14, 15. Barracks. B. Liebfrauenberg and Cathedral.

been pulled down and rebuilt, as it must be ere long, there will still be many less celebrated parts of the old city of no small interest as eloquent relics of bygone conditions of life. In the modern quarters Frankfort will compare favourably, both in the general appearance of the streets and in the architectural character of individual buildings, with all except a very few of the greater cities of the Continent ; and almost every year this is becoming more certainly true. Among the more spacious streets are the Schone Aussicht or Beautiful Prospect along the Main, the Kaiser-Strasse or Emperor Street, and the Zeil. The business of the city is largely concentrated in the Zeil, the Rossmarkt or Horse Market, the Kaiser-Strasse, Friedens-Strasse, and their im- mediate vicinity.

The principal ecclesiastical building in Frankfort is the cithedral of St Bartholomew's, which is situated not far from the river between the Domplatz on the N. and the Weekmarkt on the 8. The date of its first foundation is not precisely known. A church called Salvator's was erected on the site by Louis the German at least as early as 874 A.D., and he enriched it with considerable donations, and

instituted a chapter of twelve priests and an abbot. Charles '

the Fat not only confirmed his father's gifts in 882, but he added a nona or ninth of the produce of Frankfort, Trebur, Ingelheim, Kreiznach, and other royal domains. In the 12th century the church obtained possession of the skull of St Bartholomew, and by the early part of the 13th it appears to have been known as St Bartholomew's church. The building was by that time in a very dilapidated con- dition ; and consequently Pope Gregory IX. urged the

faithful of the diocese of Mainz to contribute to its restora- tion. When in 1315 the church was appropriated to the religious ceremonies connected

with the coronation of the emperors, it was found necessary to enlarge its dimensions. The eastern portion, consisting of the choir and two towers, was pulled down and rebuilt on a larger scale about 1338, and in the same century the wings of the transepts and the imperial election chapel were added. The so-called Pfarrthurm or Parson's Tower was built between 1414 and 1512. In 1855 the interior was renovated; but on the night of the 14th August 1867 the whole building was laid in ruins by a conflagration. In 1869F. J. Denziger, chief architect of the Ratisbon (or Regensburg) cathedral was entrusted with the work of restoration, and his task has been steadily prosecuted. The only portions of the enter- prize uncompleted in 1878 were the cloister and the grand organ. In the interior are still to be seen the high altar at which after 1562 the imperial coronations were celebrated, the tombstone of the emperor Giinther of Schwarzburg, who died in Frankfort in 1349, and the tomb- stone of Rudolph, the last knight of Sachsenliausen, who died in 1371. The other Catholic churches are Leonhards- kirche and Liebfrauenkirche, and the Deutschhauskirche in Sachsenhausen. St Leonhard's ranks second to the cathedral in point of antiquity, and is said to occupy the site of the palace of Charles the Great. It possesses a stained glass window above the high altar, with a Lord's Supper by Hans Holbein. Our Lady's Church was founded in 1322 by Schoffen Weigel of Wambach, was made col- legiate in 1326, and underwent a restoration in the second half of the 18th century. St Paul's (Paulskirche), the principal church of the Evangelical Lutherans, was built between 1786 and 1833 on the site of the old church of the Minorites, and is mainly interesting as the seat of the national parliament of 1848-49. The church of St Nicholas (Nicolaikirche) dates from the 13th century, and has a fine cast-iron spire erected in 1843. From 1570 to 1721, and again from 1813 to 1841, it was used as a ware- house. St Catherine's was built about 1678-1680 on the site of an older building famous in Frankfort history as the place. where the first Protestant sermon was preached in 1522. The principal synagogue—there are three altogether —is a Mauro-Byzantine structure erected between 1855 and 1860 in room of an older synagogue of the 15th century. Of the secular buildings in Frankfort perhaps the most characteristic is the Ratlhhaus or Romer, which by a strange coincidence bears a name suggestive of, though not derived from, its principal historical associations. It was here, in the Wahlzimmer or election room, that the electors or their plenipotentiaries decided the choice of the emperors, and

here, in the Kaisersaal or emperor's hall, the coronation festival was held, at which the new recipient of the crown dined with the electors after having shown himself from the balcony to the people assembled in the Rémerberg, as the open place in front of the building is called. The building dates from the 15th century, and occupies the site of the Golden Swan and two private houses which from time im- memorial had borne the name of the Romer. The Kaisersaal retained its antique appearance till 1843; but it is now ornamented with a series of modern paintings by Veit, Jung, Ballenberger, and a score of other German artists re- presenting the " German " emperors from Charlemagne to Francis II., in all fifty-two. The palace of the prince of Thurn and Taxis is a large building in the old French style of considerable historical interest: from 1806 to 1810 it was the residence of the "prince-primate," or head of the confederation of the Rhine; after the battle of Leipsic it was occupied by Francis I. of Austria ; and from 1816 to 1866 the parliament of the German confederation held its gessions within its walls. The Eschenheim Tower is a pic- IX. — 89

turesque relic of the ancient fortifications dating from the middle of the 14th century.

Hardly any fact about Frankfort is more familiar to the reader of Goethe than that it has an old bridge over the Main, and that on the bridge there has been for centuries an iron crucifix surmounted by a somewhat insignificant figure of a cock, commemorating, according to tradition, the unfortunate fowl which first crossed the bridge, and thus fell a prey to the devil who, in hope of a nobler victim, had sold his assistance to the original architect. The first distinct mention of a bridge over the river occurs in 1222, and the present structure dates from the 14th century. As late at least as 1475 the central span was not arched over. 'There are now fourteen arches in all, the total length of the bridge being 869 feet. The cock and crucifix are mentioned as early as 1405, and antiquaries assert that it probably marks the spot where criminals in the olden time were flung into the river. About half a mile below the old bridge a new bridge, called the " Unter- Main Briicke," was constructed by P. Schmick, between 1872 and 1874; and about midway between the two lies the footbridge or "Steg,"

erected by the same engineer in 1868-69, and the first example of its kind in Germany. The “ Ober-Main” or Upper-Main Bridge was opened to traffic in the spring of 1878. Several other bridges for railway purposes are projected.

Few cities of the same size as Frankfort are so richly furnished with literary, scientific, and artistic institutions, or possess so many handsome buildings appropriated to their service. The town theatre was built between 1780 and 1827 in a Dutch-French style, and was restored in 1855 ; and as it has proved too small for the wants of the people, a new opera house has been erected near the Bockenheim gate, after the plans of Professor Luca of Berlin. There is a public picture-gallery in the Saalhof, containing works by Hans Holbein, Griinewald, Vandyck, Teniers, Van der Neer, Hans von Culmbach, Lucas Cranach, Martin Schon, &c. The nucleus of the collection is of very ancient date ; considerable additions were made in 1803 at the seculariza- tion of the monasteries; in 1839 Ernst Fr. K. Prehn’s cabinet of more than 850 small oil-paintings was presented by his heirs, and 220 that had belonged to Johann G. Chr. Daems were added in 1856, in terms of his bequest. The Stidel Art Institute (Stadel’sche Kunst-Institut) takes its name from Johann Friedrich Stadel, who not only left his collection of paintings, engravings, and other property to the town, but appropriated a million marks to the erection of an institute and college. Its picture gallery and cabinet of engravings are both extremely rich in works of German art: the latter in 1874 had 54,300 plates. In the town library, which is kept in a building erected between 1820 and 1825, there are upwards of 100,000 volumes; and among its rarer treasures are a Gutenberg Bible printed at Mainz between 1450 and 1455, another on parchment dated 1462, the Znstitutiones Justiniant, Mainz, 1468, the Thewer- Dank, with woodcuts by Hans Scheufelein, Abyssinian manuscripts presented by the African traveller Riippel, and autographs of Luther, Melanchthon, Wallenstein, Napoleon I., Goethe, Schiller, &c. The Bethmann Museum owes its celebrity principally to Dannecker’s Ariadne, but it also possesses the original plaster model of Thorwaldsen’s En- trance of Alexander the Great into Babylon. Among the scientific institutions perhaps the chief place belongs to those named after J. Chr. Senckenberg, the physician. Sencken- berg himself founded both the Biirger or citizens’ hospital and the medical institute, with an anatomical theatre, botani- cal garden, and library; aud a

society of natural science (Senckenbergsche Naturforschende Gesellschaft) was instituted in his honour in 1817, and now possesses an extensive and valuable museum. Large gardens were opened for the

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patients of the citizens' hospital in 1851, and in 1875 new buildings were added. A physical association was founded in 1824, an association for geography and statistics in 1836, a medical association in 1845, the association for history and archeology in 1857, and the free German institute for science, art, and general culture in 1859. for the cultivation of classical and especially of cliurch music (the Cacilien-Verein) was instituted by Schelble in

An association

1818, and a similar association (the Riihl'sche Verein) by

Riithl in 1851; and there are several other musical unions, such as the Phillarmonische Verein, the Liederkranz, &c. In 1858 a zoological garden was opened by a joint stock

company near the Bockenheim Road; and in 1873 it was transferred to a new site on the Pfingstweide or Pentecost Meadow, and assigned to a new company. When in 1868 the duke of Nassau offered the plants of his winter garden for sale, a company, the Palm Garden Company, was formed at Frankfort, which purchased the collection, and established what is now the most beautiful of all the pleasure-grounds in the city.

Besides the Biirger Hospital already mentioned, Frank- fort has several large institutions for the sick aud infirm. The Holy Ghost Hospital, originally founded in 1278 for invalid pilgrims, is now appropriated to the servants and apprentices of Frankfort citizens. Its convalescent hospital, opened in 1868 at the Mainkur, was the first establish- ment of the kind in Germany. It maintains in each of the fourteen quarters of the town a physician, a surgeon, and an apothecary for the gratuitous assistance of the poor. 'The new asylum for the insane, with room for 200 patients, was erected between 1859 and 1863, partly by public sub- scription, and partly

by a donation of 100,000 florins from Herr von Wiesenhiitten. For its deaf and dumb institution the town is indebted to Ludwig Kosel, who in 1827 started with three pupils ; and it was at his suggestion that the blind asylum was established by the society for the furtherance of the useful arts. The Waisenhaus or orphan asylum erected in 1829 is no longer employed for its original pur- pose, as it has since 1860 been thought better to board tlie orphan children with families in the neiglibouring villages of Lich, Wachtersbach, &c. It is sufficient to mention the Jewish infirmary, built at the expense of the Rothschilds ; the new Jewish hospital, erected in 1874; Dr Christ's children's hospital, originated in 1835 ; and the maternity hospital, opened in 1855. Among thenumerous associations for benevolent purposes are the Frauen-Verein or ladies' union, founded in 1813 for the assistance of sick families and women in childbed ; the Jewish ladies' union for the education of orphan girls; the association originated in 1851 for taking charge of infants during the working hours; the Pestalozzi union (1846) for the education of neglected children, and its auxiliary the Schuboth institute for Protestant boys (1865); the prison association, dating from 1868; and the Martha asylum, dating from 1866,

Frankfort has always been much more of a commercial than an industrial town, and at present it manufactures little else but Frankfort black, waxcloth, jewellery, gold and silver thread, tapestry, and such like articles. Bockenheim, however, a small town with which it is connected by tramway lines, is a flourishing manufacturing centre ; and the Frank- fort capitalists are connected with the industrial enterprises of Wiesbaden, Hanau, Offenbach, &c. There are two great fairs held in the town,—the Ostermesse or spring fair, and the Herbstmesse or autumn fair. The former, which was the original nucleus of all the commercial prosperity of the city, begins on the second Wednesday before Easter; and the latter on the second Wednesday before the 8th of Sep- tember. They last three weeks, and the last day save one, called the Wickelchestag, is distinguished by the influx of people from the neighbouring country. The trade in

leather is of great and growing importance. A horse fair lias been held twice a year since 1862 under the patronage of the agricultural society ;

and the wool market was re- instituted in 1872 by the German Trade Society. Frank- fort has long been famous as one of the principal banking centres of Europe; and throughout the city there are upwards of 220 banking offices. The so-called " Frank- fort Bank" was founded in 1854, with a capital of 10,000,000 gulden. The exchange occupies a building opposite the Paulskirche, erected since 1840 according to the plans of Stiiler of Berlin; and it is remarkable for the large business that is done in Government stock. In the 17th century the town was the seat of a great book- trade; but it has long been distanced in this department by Leipsic. The Mrankfurter Journal was founded in 1615, the Postzeitung in 1616, the Neue Lrankfurter Zeitung in 1859, and the Frankfurter Presse in 1866. The zoolugical garden company publish a monthly magazine devoted to the popularization of natural history; and the Senckenberg society have issued Z'ransactions since 1854—5.

There are four railway stations in Frankfort: by the Weser station the traveller leaves for Nauheim and Cassel, for Homburg, for Kronberg, and the north generally; from the Taunus station he proceeds along the right bank of the river to Mainz; from the Neckar station he leaves for Darmstadt and the south, and for Mainz by the line along the left bank of the river; and from the Hanau station he pro- ceeds eastwards. In Sachsenhausen there is the Offenbach- Hanau station. The Neckar railway crosses the river by a bridge erected in 1846-48, which is also used by the Offenbach and the " Linksmainisch" lines, Several other bridges across the river are projected in connexion with the scheme for centralizing the railway systems. Com- munication within the town is facilitated by tramways ,; and there is also a line all the way to Bockenheim.

Frankfort has been the birthplace of not a few of the most celebrated men of Germany. J. G. Schlosser the his- torian, Feuerbach the philosopher, Kirchner the scholar and naturalist, Clement Brentano, Bettina von Arnim, and Ludwig Borne, are all in the list; but what the city con- siders its highest literary distinction is the fact that Johann Wolfgang Goethe was born in 1749 at No. 23 Hirsch- graben. In 1863 the house was purchased for 56,000 florins by the Free German "Hochstift" (or Grand Asso- ciation) for the sciences, arts, and general culture, and thus made for ever the common property of the German people. The society consists of members in

all parts of the world, associated by admiration of the poet. Under the direction of Otto Volga the house has been as much as possible put into the state in which it was in Goethe's youth; and at the same time the rooms are turned into so many little museums of Goethe literature and art. On the high grounds to the south of the river there is a spot, now known as the Gothe Ruhe, or Goethe's Rest, where the poet is said to have admired the prospect of his native town, and there a tasteful wooden tower in the Swiss chalet style was built in 1877 by the Verschdnerungs-Verein, or associa- tion for the beautifying of the city. The Goethe statue was erected in 1844 in what is now the Goethe Platz to the north of the Rossmarkt; it was designed by Schwanthaler, and cast in the royal foundry at Munich.

Of memorial monuments the largest and most elaborate in Frankfort is that erected in 1858 in honour of the early German printers. It was modelled by Ed. von der Lausitz and executed by Herr von Kreis. The statues of Gutenberg, Fust, and Schoffer form a group on the top; an orna- mented frieze presents medallions of a number of famous printers ; below these are figures representing the towns of Mainz, Strasburg, Venice, and Frankfort; and on the corners of the pedestal are allegorical statues of theology,

poetry, science, and industry. The Scliiller statue, erected in 1863, is the work of a Frankfort artist, Dielmann. A monument in the Bockenheim Anlage, dated 1837, pre- serves the memory of Guiollet, the burgomaster, to whom the town is mainly indebted for the beautiful promenades which occupy the site of the old fortification; and similar monuments have been reared to Senckenberg (1863), Beth- mann, and Wiesenbiitten. A statne of Charlemagne adorns the old Main bridge.

The new cemetery (opened in 1828) contains the graves of Arthur Schopenhauer and Feuerbach, of Passavant the biographer of Raphael, Ballenberger the artist, Hessemer the architect, Sommerring the naturalist, Dr Bohmer, and Stidel. The Bethmann vault attracts attention by three bas-reliefs from the chisel of Thorwaldsen; and the Reichenbach mausoleum is a vast pile designed by Hessemer at the command of William II. of Hesse, and adorned with sculptures by Zwerger and Von der Lausitz. In the Jewish

section, which is walled off from the rest of the burying-ground, the most remarkable tombs are those of the Rothschild family.

The present municipal constitution of the town dates from 1867, and conforms to the Prussian system. The electors choose 54 representatives for a term of 6 years ; and every two years a third of the number retire, but are eligible for re-election. The 54 representatives elect twelve town councillors, six of whom receive a salary and serve for 12 years, while the rest receive no salary and serve for 6 years. The chief burgomaster is nominated by the king for 12 years, and the second burgomaster must receive the king's recognition. Since 1873 the town has been supplied with water from the Vogelsberg and the Spessart by the Frankfurter Quellwasserleitung Gesellschaft at the rate of about a million cubic feet per day, the natural pressure being sufficient to carry the water to the highest stories. The population of Frankfort has continued almost steadily to increase since the beginning of the century, the yearly percentage varying from 01 in 1843 to 89 in 1872; dh 1817 the civil population was 41,458 ; in 1840, 55,200: in 1849, 58,599; in 1855, 63,495; and in 1864, 77,372. The events of 1866 led to a decline, and in 1867 the number was only 75,918. By 1871 it had again risen to 89,265; in 1872 it was 97,230; in 1873, 102,680; and in 1875, 103,136. Including the suburban villages (Born-heim 10,085, Bockenheim 13,043, Oberrad 4609, and Rodelheim 3903), the total is 134,776.

History.—Though the Romans certainly had settlements in the valley of the Main, as at Mattiacum (Wiesbaden) and Novus Vicus (Heddernheim), there is no proof that the site of Frankfort was permanently occupied before the arrival of the Franks, from whom it derives its name. Father Fuchs of Mainz, indeed, asserted in the end of the 18th century that he had epigraphic evidence for the statement that Frankfort was founded by the Romans in the 2d century of the Christian era, and that by the 3d century it had become a great fortified city; but unfortunately none of the Inscrip-tions to which he referred have ever been shown to exist. Popular tradition connects the origin of the town with the history of Charle- magne, asserting that the name Frankfort is due to the fact that once, when he was retreating from the Saxons, heand his Frankish army were safely conducted across the river by a doe, and that Sachsenhausen was so called because he settled

there a colony of the Saxons whom he had subdued. The first truly historical notice of the town occurs in 793, when Eginhard, Charlemagne's biographer, tellsus that he spent the winter in the villa Frankonovurd. Next year there is mention more than once of a royal palace there, and the early importance of the place is indicated by the fact that it was chosen as the seat of an ecclesiastical council, which was attended not only by German but by French and Italian bishops, ag well as by two papal legates. The name Frankfort is also found in several official documents of Charlemagne's reign; and from the notices that occur in the early chronicles and charters it would appear that the place was the most populous at least of the numerous villages of the Main district. During the Carlovingian period it was the geat of no fewer than 16 imperial councils or colloquies. The town was probably at first built on anisland in the river. It was origin-

ally governed by a royal officer or actor dominicus, and down even to the close of the empire it remained a purely imperial or royal town. It gradually acquired various privileges, and by the close of the 14th century the only mark of dependence was the payment of a yearly tax. Louis the Pious dwelt even more frequently at Frank- fort than his father had done, and about 823 he built himself a new palace, the basis of the later Saalhof. In 822 and 823 two great diets were held in the palace, and at the former there were present deputies from the eastern Slavs, the Avars, and the Normans. The place continued to be a favourite residence with Louis the German, and he died there in 876. By the rest of the Carlovingian kings it was less frequently visited, and this neglect was naturally greater during the period of the Saxon and Salic emperors from 908 to 1137. Diets, however, were held in the town in 951, 1015, 1069, and 1109, and councils in 1000 and 1006. From a privilege of Henry IV, in 1074, granting the city of Worms freedom from tax in their trade with several royal cities, it appears that Frankfort was even then a place of some commercial importance. In 1217 we find mention made of an imperial mint and a corn market in the town. About 1227 it was already in possession of a yearly fair. Between 1140 and the beginning of the interregnum it saw 21 diets, and that of 1142 gave rise to the Guelph and Ghibelline parties. No fewer than 10 new churches were

erected in the 50 years from 1220 to 1270. It was about the same period, probably in 1240, that the Jews first settled inthe town. In the contest which Louis the Bavarian maintained with the papal throne Frankfort sided with the emperor, and it was consequently placed under an inter- dict for 20 years from 13829 to 1849. On Louis's death it refused to accept the papal conditions of pardon, and only yielded to Charles IV., the papal elect, when Giinther of Schwarzburg thought it more prudent to abdicate in his favour. Charles granted the city a full amnesty, and confirmed its liberties and privileges. By the famous bull of 1356, called by way of distinction the Golden Bull, or, after the emperor, Bulla Carolina, Frankfort is declared the seat of the imperial elections (Wahlstadt Reiches), and it still pre- serves an official contemporaneous copy of the original document as the most precious of the eight imperial bulls in its possession. In the 17th and 18th centuries, says Kriegk, the bull was regarded as the most notable sight of the city, and was only exhibited to persons of high rank. From the date of the bull to the close of the empire, Frankfort retained the position of " Wahlstadt," and only five of the two-and-twenty monarchs who ruled during that period were elected elsewhere. In 1388-89 Frankfort assisted the South-German towns in their wars with the princes and nobles, and in a consequent battle with the troops of the Palatinate, the town banner was lost and carried to Kronberg, where it was long preserved as a trophy. On peace being concluded in 1391, the town had to pay 12,562 florins, and this brought it into great financial difficulties. In the course of the next 50 years debt was contracted to the amount of 126,772 florins. The diet at Worms in 1495 chose Frankfort as the seat of the newly instituted Imperial Chamber, or " Reichs- Kanmergericht," for the settlement of discussions between the dif- ferent states of the empire ; and it was not till 1527 that the chamber was removed to Spires. At the Reformation Frankfort heartily joined the Protestant party, and in consequence it was hardly treated both by the emperor Charles V. and by the archbishop of Mainz. It re- fused to subscribe the Augsburg Recess, but at the same time it was not till 1536 that it was prevailed to join the Smalkaldic League. On the failure of this confederation it opened its gates of its own accord to the imperial general Biiren on 29th Dec. 1546, although he had passed by the city, which he considered too strong for the forces under his command. The emperor was merciful enough to leave it in possession of its privileges, but he inflicted a fine of 80,000 gold gulden, and the citizens had to endure till Oct. 1547 the

presence of from 8000 to 10,000 soldiers. This resulted in a pestilence which not only lessened the population but threatened to give the death-blow to the great annual fairs; and at the close of the war it was found that it had cost the city no less than 228,931 gulden. In 1522 Frankfort was invested for three weeks by Maurice of Saxony, who was still in arms against the emperor, but it continued to hold out till peace was concluded between the principal combatants. Between 1612 and 1616 occurred the great Fettmilch insurrection, perhaps the most remarkable episode in the internal history of Frank- fort. The magistracy had been acquiring more and more the charac- ter of an oligarchy ; all power was practically in the hands of a few closely-related families ; and the gravest peculation and malversation took place without hindrance. The ordinary citizens were roused to assert their rights, and they found leaders in Fettmilch, Gerngross, and Schopp, who carried the contest to dangerous excesses, but lacked ability to bring it to a successful issue. An imperial commis- Slon was ultimately appointed, and the three principal culprits and poate of their associates were executed in 1616, with the barbarous oe. of the times. It was not till 1801 that the last moulderiug me @ Pe company dropped unnoticed from that old tower Sane oe 8 position near the bridge, is known as the Briicken- bale ae the words of Dr Kriegk, who has furnished a detailed his-

¥ of the whole period, the insurrection completely destroyed the

political power of the guilds, gave new strength to the supremacy of the patriciate, and brought no further advantage to the rest of the citizens than a few improvements in the organization and adminis- tration of the magistracy. The Jews, who had been attacked by the popular party, were solemnly reinstated by imperial command in all their previous privileges, and received full compensation for their losses. During the Thirty Years' War Frankfort did not escape. In 1631 Gustavus Adolphus garrisoned it with 600 men, who remained in possession till they were expelled four years later by the imperial general Lamboy. In 1792 the citizens had to pay 2,000,000 gulden to the French general Custine ; and in 1796 Kléber bombarded the town, and exacted 8,000,000 francs. The independ- ence of Frankfort was brought to an end in 1806, on the formation of the Confederation of the Rhine; and in 1810 it was made the capital of a grand-

duchy of Frankfort, which had an area of 3215 square miles, with 302,100 inhabitants, and was divided into the four districts of Frankfort, Aschaffenburg, Fulda, and Hanan. On the reconstitution of Germany in 1815 it again became a free city, and in the following year it was declared the seat of the German Confederation. In April 1833 occurred what is known as the Frankfort Riot (Frankfurter Attentat), in which a number of German students, assisted by the peasants of the vicinity, attempted to break up the diet. The city joined the German Zollverein in 1836, During the revolutionary period of 1848 the people of Frankfoit took a chief part in political movements, and the streets of the town were more than once the scene of conflict. In the war of 1866 they were on the Austrian side. On the 16th of July the Prussian troops, under General Vogel von Falken- stein, entered the town, and on the 8th of October it was formally incorporated with the Prussian state. A fine of 6,000,000 florins was exacted. In 1871 the treaty which concluded the Franco- German war was signed in the Swan Hotel by Prince Bismarck and Jules Favre, and it is consequently known as the Frankfort Peace. See Béhmer, Urkundenbuch der Reichsstadt Frankfurt, 1886; Kirchner, Ge- schichte der Stadt Frankfurt, 1807-1810; Feyerlein, Nachirdge, etc., zur Geschichte Frankfurts, 1819; Tableau historique et topographique de Francfort, Frankfort, 1828; Mitthettungen tber Physisch-geographische …. Verhdlinisse von Frankfurt am Main, 1839-41; Krug, Mtstorisch-topogr. Beschreibung von Frankfurt, 1845; Meidinger, Statistische Uebersicht, 1841, and Zur Statistik Frankfurts, 1848; Battoun, Oertiiche Beschreibung der Stadt Frankfurt, 1861, and Kaiserdom zu Frankfurt, 1869; Kriegk, Geschichte von Frankfurt, 1871; Archiv fiir Frankfurts Geschichte und Kunst, 1839-1874; Stricker, Neuere Geschichte von Frankfurt, 1874-75; the Mittheilungen of the Society in Frankfort for History and Archzo- logy; Ravenstein's Fiithrer durch Frankfurt a. M, und Umgebungen (no date). In 1864 Fr. W. Delkeskamp published a beautiful Malerischer Plan von Frankfurt

a. M. und seiner nichsten Umgebung; nach der Natur aufgenommen und auf geometrischer Basis in Vogelschau gezeichnet. (H.A.W.)

FRANKFORT-ON-THE-ODER, in German Frankfurt- an-der-Oder, a town of Germany at the head of a govern- ment in the Prussian province of Brandenburg, about 40 miles in an easterly direction from Berlin. The town

pro- per, which has far outgrown the limits of its ancient walls, lies on the left of the river, but it is connected by a wooden bridge 900 feet long with the suburb of Damm. Among the more important buildings are the Protestant church of St Mary's (the Oberkirche), a handsome brick edifice of the 13th century, the Roman Catholic church, the Jewish synagogue, the Rathhaus, dating from 1607, and bearing on its southern gable the sign of the Hanseatic League, the city infirmary, three hospitals, an orphan asylum, a work- house, a theatre, the Frederick gymnasium, and the pro- vincial industrial school. 'The university of Frankfort, whicl: was founded in 1506 by the elector of Brandenburg, Joachim J., was removed to Breslau in 1811, and the university buildings are now occupied by the Realschule. As the chief town of a province, Frankfort is the seat of a court of appeal, a general commission, and a number of administrative boards. Its industry is mainly devoted to the manufacture of iron-wares, pottery, paper, silk and woollen goods, bone-dust, chocolate, and liqueurs. Being situated on the high road from Berlin to Silesia, command- ing an extensive system of water communication by means of the Oder and its canals to the Vistula and the Elbe, and in modern times having become an important railway junction, it maintains no small commercial activity, which is further fostered and concentrated by its three annual fairs held respectively at eminiscere or the second Sunday in Lent, at St Margaret's day, and at Martinmas. The popu- lation, which in 1849 was 29,969, had at the census of 1875 attained to 47,176. The municipal existence of Frankfort goes back to 1253, when it was colonized by

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Frankish merchants introduced by John and Conrad of Brandenburg, who had recently conquered the district from the Wends. The principal facts in its external history are— tie siege which it successfully sustained against the emperor Charles IV. in the time of the pretender Waldemar; the papal excommunication in 1426, on account of its quarrel with the bishop of Lebus; the siege of the Hussites in 1432, of the Poles in 1450, and of the duke of Sagan in 1477 ; and its capture by Gustavus Adolphus in 1631, and by the Russians in 1759. The presence of the Russians on this occasion cost

the town 300,000 thalers, and in the earlier part of the following century the continual quarter- ing of foreign troops created great destitution, compelling the magistrates to procure a loan of 208,000 thalers. Ewald von Kleist died in the town in August 1759, from the effects of a wound received in the battle at the neigh- bouring village of Kunersdurf; a monument was erected over his grave in the "park" in 1779. Henrich von Kleist was born in the town in 1776, and Franz von Gaudy in 1800.

See K. R. Hausen, Gesch. der Universitat und Stadt Frankfurth, 1806, and the Gesch. der Stadt Frankfurt, of Sachse (1830), Spieker (1853), and Philippi (1865).

FRANKINCENSE,! or Ot1Banum? (Gr., ABavwrds, later Ovos; Lat., tus or thus; Heb., lebonah;> Ar., lubdn ; Turk., ghyunluk ; Hind., ganda-birosa®), a gum-resin obtained from certain species of trees of the genus Boswellia, and natural order Burseracee. The members of the genus are pos- sessed of the following characters :—Bark often papyrace- ous; leaves deciduous, compound, alternate, and impari- pinnate, with leaflets serrate or entire ; flowers in racemes or panicles, white, green, yellowish, or pink, having a small persistent, 5-dentate calyx, 5 petals, 10 stamens, a sessile 3 to 5-chambered ovary, a long style, and a 3-lobed stigma; fruit trigonal or pentagonal; and seed compressed. Dr George Birdwood (Trans. Lin. Soc., xxvii., 1871) distin- guishes five species of Boswellia :—(A) B. thurifera, Colebr. (B. glabra and B. serrata, Roxb.), indigenous to the moun- tainous tracts of central India and the Coromandel coast, and B. papyrifera (Plésslea floribunda, Endl.) of Abyssinia, which, though both thuriferous, are not known to yield any of the olibanum of commerce ; and (B) B. Frereana (see ELEM, vol. viii. p. 122), B. Bhau-Dajrana, and B. Carteria, the "Yegaar," "Mohr Add," and 'Mohr Madow" of the Somali country, in East Africa, the last species including a variety, the '" Maghrayt d'Sheehaz" of Hadramaut, Arabia, all of which are sources of true frankincense, or olibanum. The trees on the coast of Adel are described by Captain G. B. Kempthorne as growing, without soil, out of polished marble rocks, to which they are attached by a thick oval mass of substance resembling a mixture of lime and mortar :*

1 Stephen Skinner, M.D. (Htymologicon Lingue Anglicane, Lond., 1671), gives the derivation: “ Frankincense, Thus, g.d. Incensum (7.e.) Thus Libere seu Liberaliter, ut in sacris officiis par est, adolendum.”

2 Sic olibanum dixere pro thure ex Greco 6 AfBavos” (Salmasius, C. S. Pliniane Exercitationes, t. ii. p. 926, b. F., Traj. ad Rhen., 1689, fol.). So also Fuchs (Op. Didact., pars. ii. p. 42, 1604, fol.), “Officinis non sine risu eruditorum, Greco articulo adjecto, Olibanus vocatur.” The term olibano was used in ecclesiastical Latin as early as the pontificate of Benedict IX., in the 11th century. (See Ferd. Ughellus, Italia Sacra, tom. i. 108, D., Ven., 1717, fol.)

3 So designated from its whiteness (J. G. Stuckius, Sacror. et Sacrific. Gent. Descrip., p. 79, Lugd. Bat., 1695, fol.; Kitto, Cycl. Bibl. Lit., ii. p. 806, 1870): cf Laben, the Somali name for cream (R. F. Burton, First Footsteps in E. Africa, p. 178, 1856).

4 Written Louan by Garcias da Horta (Aromat. et Simpl. Medica- ment. Hist., C. Clusii Atrebatis Exoticorum Lib. Sept, p. 157, 1605, fol.), and stated to have been derived by the Arabs from the Greek name, the term less commonly used by them being Conder: of. Sanskrit Kunda. According to Colebrooke (in Asiatick Mes., ix. p. 379, 1807), the Hindu writers on Materia Medica use for the resin of Boswellia thurifera the designation Cunduru. ;

5 A term applied also to the resinous exudation of Pinus longifolia (see Dr E. J. Waring, Pharmacopeia of India, p. 52, Lond., 1863).

the purer the marble the finer appears to be the growth of the tree. The young trees, he states, furnish the most valuable gum, the older yielding merely a clear glutinous fluid resembling copal varnish.® To obtain the frankincense a deep incision is made in the trunk of the tree, and below it a narrow strip of bark five inches in length is peeled off. When the milk-like juice (“spuma pinguis,” Pliny) which exudes has hardened by exposure to the atmosphere, the incision is deepened. In about three months the resin has attained the required degree of consistency. The season for gathering

lasts from May until the first rains in September. The large clear globules are scraped off into baskets, and the inferior quality that has run down the tree is collected separately. The coast of South Arabia is yearly visited by parties of Somalis, who pay the Arabs for the privilege of collecting frankincense.' In the interior of the country about the plain of Dhofar,® during the south-west monsoon, frankincense and other gums are gathered by the Beni Gurrah Bedouins, and might be obtained by them in much larger quantities ; their lawlessness, however, and the lack of a safe place of exchange or sale are obstacles to the development of trade. (See C. Y. Ward, The Gulf of 'Aden Pilot, p. 117, 1863.) Much as formerly in the region of Sakhalites in Arabia (the tract between Ras Makalla and Ras Agab),° described by Arrian, so now on the sea-coast of the Somali country, the frankincense when collected is stored in heaps at various stations. 'Thence, packed in sheep and goat-skins, in quantities of 20 to 40 Ib, it is carried on camels to Berbera, for shipment either to Aden, Makalla, and other Arabian ports, or directly to Bombay.° At Bombay, like gum-acacia, it is assorted, and is then packed for re-exporta- tion to Europe, China, and elsewhere. Arrian relates that it was an import of Barbarike on the Sinthus (Indus). The idea held by several writers, including Niebuhr, that frank-incense was a product of India, would seem to have origin- ated in a confusion of that drug with benzoin and other odoriferous substances, and also in the sale of imported frankincense with the native products of India. The gum resin of Boswellia thurifera was described by Colebrooke (in Asiatick Researches, ix. 381), and after him by Dr J. Fleming (Z0., xi. 158), as true frankincense, or olibanum ; from this, however, it differs in its softness, and tendency to melt into a mass!? (Birdwood, doc. cié., p. 146). It is sold in the village bazaars of Khandeish in India under the name of Dup-Salai, i.e., incense of the "'Salai tree"; and according to Mr F. Porter Smith, M.B. (Contrvb. towards the Mat. Med. and Nat. Hist. of China, p. 162, Shanghai, 1871), is used as incense in China, The last authority also mentions olibanum as a reputed natural product of China. Bernhard von Breydenbach,!? Ausonius, Florus, and others, arguing, it would seem, from its Hebrew and Greek names, concluded that olibanum came from Mount Lebanon ; and Chardin (Voyage en Perse, &c., 1711) makes

6 See " Appendix," vol. i. p. 419 of Sir W. C. Harris's Highlands of Aithiopia, 2d ed., Lond., 1844; and Trans. Bombay Geog. Soc., xiii, 1857, p.

136.

7 Crnttenden, Zrans. Bombay Geog. Soc., vii., 1846, p. 121; S. B. Miles, J. Geog. Soc., 1872.

8 Or Dhafar. The incense of " Dofar" is alluded to by Camoens, Os Lusiadas, x. 201.

9H. J. Carter, " Comparative Geog. of the South-East Coast of Arabia," in J. Bombay Branch of R. Asiatic Soc., iii., Jan, 1851, p. 296; and Miiller, Geog. Greci Minores, i. p. 278, Paris, 1855.

10 J, Vaughan, Pharm. Journ., xii., 1858, pp. 227-9 ; and Ward, On Cit., p. OT.

1 Pereira, Elem. of Mat. Med., ii. pt. 2, p. 380, 4th ed., 1847.

12 '© Boswellia thurifera," ... . says Waring (Pharm. of India, p. 52), 'has been thought to yield East Indian olibanumi, but there is no reliable evidence of its so doing."

*13 *Tibanus igitur est mons redolentie & summe aromaticitatis. nam ibi herbe odorifere crescunt. ibi etiam arbores thurifere coalescunt. quarum gummi electum olibanum a medicis nuncupatur."— Perigri- natio, p. 53, 1502, fol.*

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the statement that the frankincense-tree grows in the moun- | A tribute of no less than a thousand talents' weight of it

tains of Persia, particularly Caramania.

That frankincense, or olibanum, was in ancient times, as now, of West-Asiatic origin there is abundant evidence 1n the writings of classical authors. It was Sabsean incense that was burnt on the altar of Venus at Paphos (Virg., Ain, i. 416; of. Georg., ti. 117), and Arabia and the land of Thus were synonymous (cf. Plautus, Lrinummus, lv. 2. 89, and Penulus, v. 4. 6). Herodotus (iii. 107) and Pliny (loc. cit.) speak of Arabia as the only

country that yields frankincense ; Strabo (xvi. 4) and Arrian more correctly mention it as an export also of the neighbouring African coast. According to Diodorus Siculus (v. 41), the ‘ Holy Island,” at the furthest point of Arabia Felix, the habitation of the Panchzeaus, was the source of frankincense.

In the Scriptures “incense,” or frankincense, is noticed as forming part of the merchandise of the Sabseans (Heb. Shebatim), who inhabited Sheba or Arabia Felix (¢f. Is. xl. 6, Jer. vi. 20, and 1 Kings x. 10). Theophrastus (Opera, ix. 4,,ed. F. Wimmer, p. 143) relates that with other spices it was produced by the regions of Arabia about Saba, Adra- myta, Citibeena, and Mamali, and after transportation to the Sabzean temple of the sun was purchased by mer- chants who cante thither.

The libanotophorous region of the ancients is defined by Carter (J. Bombay Br. R. Asiatic Soc., ii. p. 387, 1847) as extending between the Sabhan Mountains, in 17° 30° N. lat. and 55° 23’ E. long., and the town of Damkote, in the bay of Alkammar, in 52° 47’ EK. long. The trees there are congregated in two distinct localities—on the Nejdee or high land, two days’ journey from the sea-shore, and on the Sahil or plain on the coast.1_ Its ancient evil reputation as a land of fogs and dark atmosphere, where slaves, as a punishment, collected the frankincense (Vincent’s Voyage of Nearchus, &c., p. 89, Oxf., 1809), and where the trees that afforded that substance were infested with winged ser- pents of various colours, which could be driven away only by the smoke of storax (Herod., iii. 107), was not impro- bably due to the fertile imaginations of Arabian spice-mono- polists. By their trade in frankinceuse and other aromatics the Sabzeans and Gerrheei, we are informed by Strabo, be- came the richest of all the Arabian tribes; and .it- was doubtless from their emporium at Petra that these, with other articles of commerce, were by caravan conveyed into Egypt and Canaan by tlie Edomites, Idumzeans, or, as they came to be called, Nabateeans, and into the Mediterranean coast-regions by the Phoenician Arabs. (See Dr G. Bird- wood’s Handbook to the British Indian Section, Paris Uni- versal Exhibition of 1878, Lond. and Par., 1878, p. 32.) In what is believed to have been the early part of the 15th century B.C. (see Eaypt, vol. vii. p. 737), the ships of the Egyptian queen Hatasu, or Hatshepu, made an expedition to Pun or Punt (held by Professor Diimichen

to be the countries on the Arabian coast of the Red Sea where the Pheenicians were established before they settled on the shores of the Mediterranean), and thence brought to Thebes, together with ivory, gold, silver, dog-faced baboons," leopard- skins, and other of the " magnificent products of Pun," not only incense-resin, but 31 incense-trees, planted in tubs, from the " mountains of the barbarians."

From the frequent employment of frankincense in the sacrifices of the ancients, shown by nunterous passages in their prose and poetic writings, it is evident that the trade

- *Of. Theophrastus (op. cit., p. 144): 7a wév ev 7G Bper ra 8 ev Tais lars yewpytais bd Thy Umdpetay."*

Cf. King Solomon's imports in the ships of the Phoenician city of Tarsus or Tarshish (2 Chron. ix. 21). See Dr J. Diimichen, The Fleet of an Egyptian Queen, &c.,

Saale by Anna Diimichen, plates ii., iii., xv., xvii.-xix., Leipzig,

was brought to Darius every year by the Arabs, and the same quantity was yearly burnt by the Chaldzeans on their great altar to Bel at Babylon (Herodotus, iii. 97, i. 183), From the spoils of Gaza, in Syria, 500 talents' weight of frankincense was sent by Alexander the Great to Leonidas (see Plutarch's Les). It was in olden times accounted one of the most valuable of the products of the East. Ten talents' weight of it was one of the precious gifts sent by Seleucus II., king of Syria, and his brother Antiochus Hierax, king of Cilicia, to the temple of Apollo at Miletus, 243 8.c.;4 and gold, frankincense, and myrrh were prc- sented by the magi from the East to the infant Saviour (Matt. ii 11).5 Later, in the time of St Silvester (314-335 A.b.), we find 100 pounds of " aromatum in incensum," or frankincense, mentioned among the costly offerings made by the emperor Constantine in the basilica of St Marcellinus and St Peter at Rome.®

Frankincense, or olibanum, occurs in commerce in semi- opaque, round, ovate, or oblong tears or irregular lumps, which are covered externally with a white dust, the result of their friction against one another. It has an amorphous internal structure, a dull fracture ; is of a yellow to yellowish-

*brown hue, the purer varieties being almost colourless, or possessing a greenish tinge; and has a somewhat bitter aromatic taste, and a balsamic odour, which is developed by heating. Immersed in alcohol it becomes opaque, and with water it yields an emulsion. It contains about 72 per cent. of resin soluble in alcohol (Kurbatow) ; a large proportion of gum soluble in water, and apparently identical with gum- arabic; and a small quantity of a colourless inflammable essential oil, one of the constituents of which is the body oliben, C,,H,, Frankincense burns with a bright white flame, leaving an ash consisting mainly of calcium carbonate, the remainder being calcium phosphate, and the sulphate, chloride, and carbonate of potassium (Braconnot).' Good frankincense, Pliny tells us, is recognized by its whiteness, size, brittleness, and ready inflammability. Tlat which occurs in globular drops is, he says, termed '" male frank- incense ;" the most esteemed, he further remarks, is in breast-shaped drops, formed each by the union of two tears.§ The best frankincense, as we learn from Arrian,® was for- merly exported from the neighbourhood of Cape Elephant in Africa (the modern Ras Fiel) ; and A. von Kremer, in his description of the commerce of the Red Sea (Agypten, &c., p. 185, ii. Theil, Leipzig, 1863), observes that the African frankincense, called by the Arabs "asli," is of twice the value of the Arabian '"'luban." Captain S. B. Miles (loc, cit., p. 64) states that the best kind of frank- incense, known to the Somali as '" bedwi" or "sheheri," comes from the trees " Molir Add" and ' Mohr Madow" (vide supra), and from a taller species of Boswellia, the *' Boido," and is sent to Bombay for exportation to Europe; and that an inferior "mayeti," the produce of the*

4 EB. Chishull, Antiquitates Asiatice Christianam Airam Antece- dentes, p. 65-72, Lond., 1728, fol.

5 According to an old Persian legend, and other traditions, the gold signified the kingship, the frankincense the divinity, the myrrh the healing powers of the child. See H. Yule, The Book of Ser Marco Polo, vol. i. pp. 78-78, 1871.

8 Vignolius, Liber Pontijicalis, t. i. p. 101, Rome, 1724, 4to.

7 See, on the chemistry of frankincense, Braconnot, Ann. de Chimie, Ixviii., 1808, pp. 60-69; Johnston, Phil. Trans., 1839, pp. 801-305; J. Stenhouse,

Ann. der Chem. und Pharm., xxxv., 1840, p. 306; and A. Kurbatow, Zettsch. fiir Chem., 1871, p. 201. ;

*8 '*Precipua autem gratia est mammoso, cum herente lacryma priore consecuta alia miscuit se" (Mat. Hist., xii, 32). One of the Chinese names for frankincense, Jw'-hiang, " milk-perfume," is ex- plained by the Pen Ts'au (xxxiv. 45), a Chinese work, as being derived from the nipple-like form of its drops. (See E. Bretschneider, On the Knowledge possessed by the Ancient Chinese of the Arabs, &c., p. 19, Lond., 1871.)*

® The Voyage of Nearchus, loc. cit.

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'¢ Yegaar," is exported chiefly to Jeddah and Yemen ports.} The latter may possibly be what Niebuhr alludes to as "Tndian frankincense." 2 Garcias da Horta, in asserting

"Indian" is often applied by the Arabs to a dark-coloured variety.? According to Pliny (Nat. Hist., xiv. 1; of. Ovid, Fast. i. 337 sq.), frankincense was not sacrificially employed in Trojan times. It was used by the ancient Egyptians in their religious rites, but, as Herodotus tells us (il. 86), not in embalming. It constituted a fourth part of the Jewish incense of the sanctuary (Ex. xxx. 34), and is frequently inentioned in the Pentatench. With other spices it was stored in a great chamber of the house of God at Jerusalem (1 Chron. ix. 29, Neh. xiii. 5-9). On the sacrificial use and import of frankincense and similar substances see INCENSE. In the Red Sea regions frankincense is valued not only for its sweet odour when burnt, but as a masticatory ; and blazing lumps of it are not infrequently used for illumina- tion instead of oil lamps. Its fumes are an excellent insec- tifuge. Asa medicine it was in former times in high re- pute. Pliny (Mat. Hist., xxv. 82) mentions it as an anti- dote to hemlock. Avicenna (ed. Plempii, lib. ii. p. 161, Lovanii, 1658, fol.) recommends it for tumours, ulcers of the head and ears, affections of the breast, vomiting, dysentery, and fevers. Dr Delioux of Toulon (Bull. Gén. de Thérap., Feb. 28, 1861) considers its curative properties equal to those of other balsamic medicines, and that for

cheapness it is preferable for hospital use to the balsams of Peru aud. Tolu, and, being more,agreeable to the stomach, to tar, Asa fumigating agent, he advocates its employment in bronchitis and chronic laryngitis. In the East frankincense has been found efficacious as an external application in carbuncles, blind boils, aud gangrenous sores, and as an internal agent is given in gonorrhcea. In China it was an old internal remedy for leprosy and struma, aud is accredited with stimulant, tonic, sedative, astringent, and vulnerary proper- ties. Its stimulant action appears to be directed chiefly to the mucous surfaces of the body. (See Waring, Pharm. of India, p. 443, &c.; and F. Porter Smith, op. cit., p. 162.) Common Frankincense or Thus, Abzetisyresina, is the term applied to a resin which exudes from fissures in the bark of the Norway spruce fir, Abces excelsa, D.C.; when melted in hot water and strained it constitutes " Burgundy pitch," Pia abietina. The concreted turpentine obtained in the United States by making incisions in the trunk of a species of pine, Pinus australis, is also so designated. It is commercially known as "scrape," and is similar to the French " galipot" or "barras." Common frankincense is an ingredient in some ointments and plasters, and on account of its pleasant odour when burned has been used in incense as a substitute for olibanum. (See Fliickiger and Hanbury, Pharmacographia.) The "black frankincense oil" of the Turks is stated by Hanbury (Science Papers, p. 142, 1876) to be liquid storax. (F. H. B.) FRANKLIN. See Freenop.

1 Vaughan (Pharm. Journ., xii., 1853) speaks of the Arabian Lubin, commonly called Morbat or Shaharree Luban, as realizing higher prices in the market than any of the qualities exported from Africa. The incense of "Esher," 7¢.e., Shihr or Shehr, is mentioned by Marco Polo, as also by Barbosa. (See Yule, op. cit., ii. p. 377.)

' J. Raymond Wellsted (Travels to the City of the Caliphs, p. 173, Lond.,

1840) distinguishes two kinds of frankincense—" Meaty," selling at $4 per cwt., and an inferior article fetching 20 per cent. less.

2 "Bs scheint dass selber die Araber ihr eignes Réuchwerk nicht hoch schiitzen; denn die Vornehmen in Jemen brauchen gemeiniglich indianisches Riuchwerk, ja eine grosse Menge Mastix von der Insel Scio" (Beschreibung von Arabien, p. 143, Kopenh., 1772).

3 “De Arabibus minus mirum, qui nigricantem colorem, quo Thus Indicum preditum esse vult Dioscorides [lib, i. c¢. 70], Indum ple- rumque vocent, ut ex Myrobalano nigro quem Indum appellant, patet” (op. sup. cit., p. 157).

FRANKLIN, Bengamin (1706-1790), one of the most eminent journalists, diplomatists, statesmen, and philo-

sophers of his time, was born in the city of Boston, and the Arabian origin of the drug, remarks that the term —

in the colony of Massachusetts Bay, on the 17th of

January 1706. He was the youngest of ten children, and the youngest son for five consecutive generations. His

father, wlo was born at Ecton, in Northamptonshire,

England, where the family may be traced back for some

four centuries, married young, and emigrated to America with three children in 1682. From his parents, who never knew any illness save that of which they died (the father at eighty and the mother at eighty-five), he inherited an excellent constitution, and a good share of those heroic mental and moral qualities by which a good constitution is preserved. In his eighth year Benjamin, who never could remember when he did not know how to read, was placed at school, his parents intending him for the church, That purpose, however, was soon abandoned, and in his tenth year he was taken from school to assist his father, who, though bred a dyer, had taken up, on his arrival in New England, the business of tallow-chandler and soap-boiler. The lad worked at this, to him, most distasteful business, until his twelfth year, when he was apprenticed to his elder brother James, then just returned from England with a new printing press and fount of type, with which he proposed to establish himself in the printing business. In 1720-21 James Franklin also started a newspaper, the second that was published in America, called The New England Courant. Benjamin’s tastes inclined him rather to intellectual than to any other kind of pleasures, and his judgment in the selection of books was excellent. At an early age he had made himself familiar with the Pilgrin’s Pro- gress, with Locke On the Understanding,

and with some odd volumes of the Spectator, then the literary novelty of the day, which he turned to good account in forming the style which made him what he still remains, the most uniformly readable writer of English who has yet appeared on his side of the Atlantic. His success in reproducing articles he had read some days previously in the Spectator led him to try his hand upon an original article for his brotlier's paper, which he sent to him anonymously. It was accepted, and attracted some attention. The experiment was re- peated until Benjamin had satisfied himself that his suc- cess was not an accident, when he threw off his dis- guise. He thought that his brother treated him less kindly after this disclosure ; but that did not prevent James froin publishing his paper in Benjamin's name, when, in consequence of some unfortunate paragraphs which appeared in its columns, he could only obtain his release from prison, to which the colonial assembly had condemned him, upon condition that he " would no longer print the Vew England Courant." The relations of the two brothers, however, gradually grew so inharmonious that Benjamin determined to quit his brother's employment and leave New England. He sold some of his books, and with the proceeds, in October 1723, he found his way to the city of Philadelphia, where, 400 miles from home, at the immature age of seventeen, without an acquaintance, and with only a few pence in his pocket, he was fortunate enough to get employment with a Jew printer named Keimer. Keimer was not a mau of business, and knew very little of his trade, nor had he any very competent assistants. Franklin, wlio was a rapid composer, ingenious and full of resources, soon came to be recognized by the public as the master spirit of the shop, and to receive flattering attentions from prominent citizens who had had opportunities of appreciating his cleverness. Among others, Sir William Keith, the governor of the province, who may have possessed all the qualifications for his station except every one of the few which are quite indispensable to a gentleman, took him under his patronage,

and proposed to start him in business for himself, and to give him the means of going to England and purchasing the material necessary to equip a new printing office. Franklin, rather against the advice of his father, whom he revisited in Boston to consult about it, embraced the governor's pro- posal,

took passage for London, which he paid with his own money (the governor being more ready with excuses than coin), and on reaching London in December 1724, where he had been assured he would find a draft to cover his expenses, discovered too late that he had been the dupe of Keith, and that he must rely upon his own exertions for his daily bread. He readily found employment at Palmer's, then a famous printer in Bartholomew Close, where, and afterwards at Wall's printing house, he continued to be employed until the 23d of July 1726, when he again set sail for Philadelphia in company with a Mr Dunham, whose acquaintance he had made on his voyage out, and who tempted him back by the offer of a position as clerk in a commercial business which he proposed to establish in Philadelphia, While in London Franklin had been engaged in setting up the type of a second edition of Wollaston's Religion of Nature. The perusal of this work led him to write and print a small edition of a pamphlet, which he entitled A Dissertation on Liberty and Necessity, Pleasure and Pain. Had he deferred printing it a few years, it would probably never have been heard of, for he lived to be rather ashamed of it. It procured him, however, the acquaintance of Dr Mandeville, author of the Fable oy' the Bees, whom he described as a most facetious and enter- taining companion. Only a few months after Franklin's return to Philadelphia, the death of Mr Dunham put an end to his career as a merchant. While awaiting something more favourable, he was induced by large wages to return to his old employer Keimer. This led to his making the acquaintance of a young man of the name of Meredith, whom he afterwards described as a " Welsh Pennsylvanian, thirty years of age, bred to country work, honest, sensible, who had a great deal of solid observation, was something of a reader, but given to drink." He was learning the printer's art, and offered to furnish the capital to establish a new prititing office—his father being a man of some means—if Franklin would join him and direct the business. This proposal was accepted, the types were sent for, a house was rented at £20 a year, part of which was sublet to a glazier who was to board them, and before the expiration of a year from his return to Philadelphia, Franklin, for the first time in his life, was in business for himself. " We had scarce opened our letters and put our press in order," he says, "before George House, an acquaintance of mine, brought a countryman to us whom he had met in the street inquiring fora printer. All our cash was now expended in the variety of particulars we had been obliged to procure, and this countryman's five

shillings, being our first-fruits, and coming so seasonably, gave us more pleasure than any crown I have since earned, and the gratitude I felt towards House has made me often more ready than perhaps I should otherwise have been to assist young beginners."

Almost simultaneously, in September 17 29, he bought for a nominal price the Pennsylvania Gazette, a news- paper which Keimer had started nine months before to defeat a similar project of Franklin's which accidentally came to his knowledge. It had only 90 subscribers. His Superior arrangement of the paper, his new type, some spirited remarks on a controversy then waging between the Massachusetts assembly and Governor Burnet (a son of the celebrated Bishop Gilbert Burnet) brought his paper into immediate notice, and his success, both as a printer and as a journalist, was from that time forth assured and complete. pl which he was enabled to exert by his pen

en is paper, and by his industry and good sense, bore

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abundant fruit during the next seventeen years, during which he was at the head of journalism in America. In 1731 he established the first circulating library on the con- tinent ; in 1732 he published the first of the Poor Richard's Almanacs, a publication which was continued for twenty- five years, and attained a marvellous popularity. The annual sale was about 10,000 copies, at that time far in ex- cess of any other publication in the colonies, and equivalent to a sale at the present time of not less than 300,000. In the next ten years he acquired a convenient familiarity with the French, Italian, Spanish, and Latin languages.

In 1736 Franklin was chosen a clerk of the general assembly, and was re-elected the following year. He was then elected a member of assembly, to which dignity he was re- elected for ten successive years, and was appointed one of the commissioners to treat with the Indians at Carlisle. In 1737 Colonel Spotswood, then postmaster-general, appointed him deputy postmaster at Philadelphia. About this time he organized the first police force and fire company in the colonies, and a few years later initiated the movements which resulted in the foundation of the university of

Pennsylvania and of the American Philosophical Society, in the organization of a militia force, in the paving of the streets, and in the foundation of a hospital; in fact, he furnished the impulse to nearly every measure or project which contemplated the welfare and prosperity of the city in which he lived. It was during this period, and in the midst of these very miscellaneous avocations, that he made the discoveries in electricity which have secured him undis- puted rank among the most eminent of natural philosophers. He was the first to demonstrate that lightning and elec- tricity were one. The Royal Society, when an account of his experiments, which had been transmitted to a scien- tific friend in England, was laid before it, made sport of them, and refused to print them. Through the recom- mendation of his friend they were printed, however, in an extra number of the Gentleman's Magazine, of which the publisher ultimately sold five editions. A copy chancing to fall into the hands of Buffon, he saw their value, and advised their translation and publication in France, where they immediately attracted attention. The '" Philadelphia experiments," as they were called, were performed in the presence of the royal family in Paris, and became the sen- sation of the period. The Royal Society of London found it necessary to reconsider its action, published a summary of the experiments in its Transactions, and, as Franklin afterwards averred, more than made him arnends for the slight with which it had before treated him, by electing him an honorary member, exempting him from the cus- tomary payments, and sending him for the rest of his life a copy of the Z'ransactions. Since the introduction of the art of printing, it would be difficult to name any dis- covery which has exerted a more important influence upon the industries and habits of mankind.

In 1754 a war with France was impending, and Franklin, who by this time had become the most important man in the colony of Pennsylvania, was sent to a congress of com- missioners from the different colonies, ordered by the Lords of Trade to convene at Albany, to confer with the chiefs of the Six Nations for their common defence. Franklin there submitted a plan for organizing a systein of colonial defence which was adopted and reported; it provided for a president-general of all the colonies to be appointed by the crown, and a grand council to be chosen by the representa- tives of the people of the several colonies. The colonies so united, he thought, would be sufficiently strong to defend themselves, and there would then be no need of

troops from England. Had this course been pursued, the subsequent pretence for taxing America would not have been furnished, and the bloody contest it occasioned might have been

avoided. The Lords of Trade, however, feared that any such union of tlie colonies would reveal to them their strength ; and the project of union, though accompanied with a recommendation from the governor of the province of Pennsylvania, when it was brought into the assembly, as it was during Franklin's casual absence from the hall, was rejected, This Franklin thought a mistake. " But such mistakes," he said, "'are not new; history is full of the errors of states and princes. Those who govern, hav- ing much business on their hands, do not generally like to take the trouble of considering and carrying into exe- cution new projects. The best public measures are there- fore seldom adopted from previous wisdom, but forced by the occasion." Instead of allowing the colonists to unite aud defend themselves, the home Government sent over General Braddock with two regiments of regular English troops, whom the colonists were expected to maintain. The proprietaries, Thomas and Richard Penn, sons of William Penn, and the hereditary governors of the colonies, however, "with incredible meanness," instructed their deputies—the governors they sent out—to pass no act for levying the necessary taxes unless their vast estates were in the same act exempt. They even took bonds of their deputies to observe these instructions, The assembly finally, "finding the proprietaries obstinately persisted in manacling their deputies with instructions inconsistent not only with the privileges of the people but with the service of the crown,"—we are quoting the language of Franklin,— "resolved to petition the king against them," and appointed Franklin as their agent to go to England and present their petition. He arrived in London on the 27th July 1757, not this time as a poor printer's boy, but as a messenger to the most powerful sovereign in the world from a cor- porate body of some of his most loyal subjects.

Franklin lost no time, after reaching London, in waiting upon Lord Grenville, then president of the council, and held with him a conversation which he deemed of so much im- portance that he made a record of it

immediately upon returning to his lodgings. Nor did he exaggerate its im- portance, for in it were the germs of the revolt and independ- ence of tlie North American colonies. “ You Americans,” said Grenville, “have wrong ideas of the nature of your constitution ; you contend that the king’s instructions to his governors are not laws, and think yourselves at liberty to regard or disregard them at your own discretion. But those instructions are not like the pocket instructions given to a minister going abroad for regulating his conduct in some trifling point of ceremony. They are first drawn up by judges learned in the law; they are then considered, debated, and perhaps amended in council, after which they are signed by the king. They are then, so far as they relate to you, the law of the land, for the king is the legis- lature of the colonies.” Franklin frankly told his lordship that this was new doctrine,—that he understood from the colonial charters that the laws of the colonies were to be made by their assemblies, approved by the king, and when once approved the king alone could neither alter nor amend them. Franklin admits that he was alarmed by this con- versation, but he was not as much alarmed as he had reason to be, for it distinctly raised the issue between the king and a fraction of his people which was to require a seven years’ war to decide. Franklin next sought an interview with the brothers Penn to lay before them the grievances of the assembly. Finding them entirely inaccessible to his reasonings, he supplied the material for an historical review of the controversy between the assembly and the proprie- taries, which made an octavo volume of 500 pages. The success of Franklin’s mission thus far was not encourag- ing, for he appealed to a class largely interested in the abuses of which he complained. Meantime, Governor

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Denny, who had been recently sent out to the province by the proprietaries, tired of struggling with the public opinion which was surging about him in Pennyslvania, and in disregard of his instructions, assented to the passing ot laws which taxed equally the entire landed property of the province, and assumed that the assembly was thie proper judge of the requirements of the people it repre- sented. An equivalent in paper money was issued upon the faith of this tax. The proprietaries were very angry with the governor,

recalled him, and threatened to prosecute him for a breach of his instructions. But they never carried their threat into execution.

The subject of "taxing all estates," after a careful dis- cussion by counsel on both sides in London, was finally referred to a committee of the privy council for plantations, who reported adversely to the petitioners whom Franklin represented, Disappointed, but not discouraged, he sug- gested a compromise involving a personal engagement on his part that, among other things, the assembly should pass an act exempting from taxation the unswrveyed waste lands of the Penns' estate, and secure the assessment of the sur- veyed waste lands at the usual rate at which otlier property of that description was assessed. Upon this proposal, to the infinite disgust of the Penns, a favourable report was made, and approved by the king, George II., then within a few weeks of his death. "Thus," wrote Franklin, a few days later, to Lord Kames, "the cause is at length ended, and in a great degree to our satisfaction." Frankli's stipulation gave to the Penns nothing, in fact, which they had not always had, and therefore the assembly never passed the superfluous act for securing it. They did, however, relieve Pennsylvania from the financial embarrassments that must have followed the repeal of a money bill which had already been a year in operation, and it established the principle till then denied by the proprietaries, that their estates were subject to taxation. The success of his first foreign mission, therefore, was substantial and satisfactory.

During this sojourn of five years in England, Franklin made many valuable friends outside court and_ political circles, anong whom the names of Hume, Robertson, and Adam Smith are conspicuous. In the spring of 1759 he received the degree of doctor of laws from the Scottish university of St Andrews. He also made active use of his marvellous and unsurpassed talent for pamphleteerng. He wrote for the Annual Register, of which young Edmund Burke was then editor, and with whom, at a later day, he was destined to have closer relations, a paper "On the Peopling of Countries," traces of which may readily be discerned in the first book of The Wealth of Nations. In this paper Franklin combated the popular delusion that the people and wealth of the colonies were necessarily so much population and wealth abstracted from the mother country, and he estimated that the population of the colonies, by doubling once in every twenty-five years,

would, at the end of a century, give a larger English population beyond the Atlantic than in England, without at all interfering with the growth of England in either direction. Franklin's conjecture, that the population of the colonies would double every twenty-five years, commended itself to the judgment of Adam Smith, who adopted it ; and it has thus far been vindicated by the census.

On the 25th of October 1760 King George II. died, and his grandson ascended the throne. A clamour for peace followed. Franklin was for a vigorous prosecution of the war then pending with France, and wrote what purported to be a chapter from an old book, which he said was written by a Spanish Jesuit to an ancient king of Spain, entitled, On the Means of disposing the Hnemy to Peace. It was ingenious and had a great effect, and, like everything Franklin wrote, is about as readable to-day as

when first printed. Soon after the capture of Quebec, Franklin wrote a more elaborate paper, entitled, Z'he Interests of Great Britain considered with regard to her Colonies and the Acquisitions of Canada and Guadeloupe. Its purpose was to show that, while Canada remained French, the English colonies of North America could never be safe nor peace in Europe permanent. Tradition reports that this pamphlet had great weight in determining the ministry to retain Canada, which, thanks in a large degree to his foresight and activity, is to-day one of the brightest jewels in the English crown. "I have long been of opinion," he wrote about this time to Lord Kames, " that the foundations of the future grandeur and stability of the British empire lie in America; and though, like other foundations, they are low and little now, they are nevertheless broad and strong enough to support the greatest political structure that human wisdom ever erected. I am, therefore, by no means for restoring Canada. If we keep it, all the country from the St Lawrence to the Mississippi will in another century be filled with British. Britain will become vastly more populous by the immense increase of its commerce. The Atlantic sea will be covered with your trading ships ; and your naval power, thence continually increasing, will extend your influence round the whole globe and awe the world." What

Englishman can read these papers to-day without a feeling of regret that Franklin was not permitted to occupy a seat in parliament as one of the representatives of the British colonies, so that England and the world might have had the advantage in a larger measure of his rare wisdom, sagacity, and patriotism 4

Franklin sailed again for America in August 1762, after an absence of five years, during which he had found an opportunity of visiting large portions of the Continent, and of acquiring information about European affairs both in and out of England, which made him more than ever an en- lightened and trustworthy authority in America upon all foreign questions affecting the interests of the colonists. The peace with the proprietary government was only temporary. The question of taxing their estates had come up ina new form, and finally resulted in a petition from the assembly drawn by Franklin himself fora change of govern- ment for Pennsylvania. The election which took place in the fall of 1764 turned upon the issue raised in this petition, and the proprietary party succeeded, by a majority of 28 votes out of 4000, in depriving Franklin of the seat to which he had been chosen for fourteen successive years in the provincial assembly. The victory, however, was a barren one, for no sooner did the assembly convene than it resolved again to send Franklin as its special agent to England to take charge of their petition for a change of government, and to look after the interests of the province abroad. On the 7th of November following his defeat, he was again on his way across the Atlantic. We may as well here say at once that the petition which he brought with him fora change of government came to nothing. Franklin presented it, and the Penns opposed it; but matters of so much graver consequence continually arose between 1765, when it was presented, and 1775, when the revolution began, that it was left to the final disposition of time. The Penns at last had the sagacity to sell betimes what they were not wise enough to keep. The State of Pennsylvania gave them £130,000 for their interest in its soil, and the British Government settled upon the head of the family a pension of £4000 a year.

Early in the year of 1764 Grenville, the prime minister, had sent for the agents of the American colonies resident in London, and told them that the war with France which had just terminated had left upon England a debt of

£73,000,000 sterling, and that he proposed to lay a portion of this burthen upon the shoulders of the colonists by

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means of a stamp duty, unless the colonists could propose some other tax equally productive and less inconvenient. He directed the agents to write to their several assemblies for instructions upon this point. The assembly of Pennsylvania, which expressed the sentiment of all the colonies, was decidedly of the opinion that to tax the colonies, which were already taxed beyond their strength, and which were surrounded by aboriginal enemies and ex- posed to constant expenditures for defence, was cruel, but to tax them by a parliament in which they were not repre- sented was an indignity. While such was their feeling, they allowed it to be understood that they would not reject any requisition of their king for aid, and if he would only signify his needs in the usual way, the assembly would do their utmost for him. These views were summed up in a "resolution" thus expressed: "that, as the assembly always had, so they always should think it their duty to grant aid to the crown, according to their abilities, whenever required of them in the usual manner." To prevent the introduction of such a bill as the ministry proposed, and which Franklin characterized as "the mother of mischief," he left no stone unturned, by personal intercession, by private correspondence, and through the press. At last, in despair, he, with his associate agents, sought an interview with the, minister. They found him inexorable. The Government wanted the money, and it did not wish to recognize the principle upon which the colonists resisted the Government method of obtaining it. The bill was intro- duced, and was promptly passed, only 50 voting against it in the Commons, and the Lords not dividing upon it. The sum expected from this tax being only £100,000, it was thought the colonists would soon be reconciled to it. This was evidently Franklin's hope, which he did his utmost to realize. Writing home toa friend shortly after the passage of the Act he said, 'The tide was too strong for us. We might as well have hindered the sun's setting ; but since it is down, my friend, and it may be long before it rises again, let us make as good a night of it aswe can, We may still light candles. Frugality and industry will go a great way towards indemnifying us. Idleness and pride tax with a heavier hand than kings and, parliament." But when the news of the passage of the Stamp Act reached

the colonies, and its provisions came to be scanued,} the indiscretion of those who advised it was manifest. Meetings were held in all the colonies, where resolves were passed unanimously to consume no more British manufactures until the hateful Act was repealed. For simply recommending a trusty person to collect the tax, Franklin himself was denounced, and. his family in Philadelphia was in danger of being mobbed. The Act not only failed of its purpose in producing a revenue, but before it went into operation a formidable agitation for its repeal had already commenced.

The succeeding session of parliament, which began in December 1765, is specially memorable for Franklin's ex- ainination before a committee of the House on the effects of the Stamp Act; for the magnificent parliamentary debut of Edmund Burke, whose speeches for the repeal, said Dr Johnson, " filled the town with wonder ;" and for the repeal of the offensive Act by a majority of 108. The first six weeks of this session were devoted to taking testimony at the bar of the house on American affairs, and especially upon the probable advantages and disadvantages of the Stamp Act. Franklin was the only one of the witnesses who lifted a voice that could be heard by pos-

1 One clause of the Act provided that the Americans shall have no commerce, make no exchange of property with each other, neither purchase, nor grant, nor recover debts; they shall neither marry nor make their wills unless they pay such and such sums in specie for the stamps which are to give validity to the proceedings. Franklin

testified under oath before a committee of parliament that such a tax would drain the Government of all their specie in a single year.

terity. Burke said the scene reminded him of a master exaniined by a parcel of schoolboys. George Whitfield, the great field preacher, wrote—'" Our trusty friend, Dr Franklin, has gained immortal honour by his behaviour at the bar of the House. The answer was always found equal to the questioner. He stood unappalled, gave pleasure to his friends, and did honour to his country." The examina- tion was first published in 1767, without the name of printer or of publisher, and the following remarks upon it appeared in the Gentleman's Magazine for July of that year : "From this examination of Dr

Franklin the reader may form a clearer and more comprehensive idea of the state and disposition of America, of the expediency or inexpediency of the measure in question, and of the character and con- duct of the minister who proposed it, than from all that has been written upon the subject in newspapers and pamphlets, under the titles of essays, letters, speeches, and considerations, from the first moment of its becoming the object of public attention till now. The questions in general were put with great subtlety and judgment, and they are answered with such deep and familiar knowledge of the subject, such precision and perspicuity, such temper and yet such spirit, as do the greatest honour to Dr Franklin, and justify the general opinion of his character and abilities."

The light thrown upon colonial affairs by Franklin's ex- amination, more probably than all other causes combined, determined parliament to repeal the bill almost as soon as it was to have gone into operation, and immediately upon the conclusion of Franklin's examination. It was to Franklin a never-to-be-forgotten triumph. He celebrated it characteristically. "As the Stamp Act," he wrote to his wife, "is at length repealed, J am willing you should have anew gown, which you may suppose I did not send sooner as I knew you would not like to be finer than your neigh- bours unless in a gown of your own spinning. Had the trade between the two countries totally ceased, it was a comfort to me to recollect that I had once been clothed, from head to foot, in woollen and linen of my wife's manu- facture, that I never was prouder of my dress in my life, and that she and her daughter might do it again if it was necessary. I told the parliament that it was my opinion, before the old clothes of the Americans were worn out, they might have new ones of their own making, I have sent you a fine piece of Pompadour satin, 14 yards, cost 11s. a yard ; a silk négligée and petticoat of brocaded lute string, for my dear Sally [his daughter]; with two dozen gloves, four bottles of lavender water, and two little reels."

The news of the repeal filled the colonists with delight, and restored Franklin to their confidence and affection. From that time until the end of his days he was, on the whole, the most popular man in America. Unhappily the repeal of the Stamp Act was a concession to the commercial interests of the mother country not to the political dogmas of the colonists. The king's party was more irritated than instructed by-its defeat, and instead of

surrendering any of its pretensions to tax the colonies, almost immediately brought ina bill, which was passed, asserting the absolute supremacy of parliament over the colonies, and in the suc- ceeding parliament another bill, which also passed, imposing duties on the paper, paints, glass, and tea imported by the colonies. This tax was resented by the colonies with no less bitterness and determination than they had resented the Stamp Act. It conveyed sterility into their recent triumph, and aroused a feeling akin to disloyalty. It made the minor differences among the colonists disappear, and crystallized publie opinion with marvellous rapidity around the principle of "no taxation without representation,"—a principle which it was impossible to make acceptable to the king, whose old-fashioned notions of the royal prerogative

had only been confirmed and strengthened by the irritating pertinacity of the colonists. Thus the issue was gradually made up between the mother country and its American dependencies. Each party felt that its first duty was to be firm, and that any concession would be disastrous as well as dishonourable. Such a state of feeling could terminate but in one way. It is now clear to all, as it was then clear to a few, that the passing of the tea and paper bill, made the difference between the crown and the colonists irrecon- cilable, and that nothing but the death of the king could prevent a war. The nine succeeding years were spent by the contending parties in struggling for position,—the colonies becoming more indifferent to the mother country, and the mother country less disposed to put up with the pretensions of her offspring. Franklin, when he went to London in 1764, confidently expected to return in the follow- ing year ; but he was not destined to leave England till ten years later, and then with the depressing suspicion that the resources of diplomacy were exhausted. Meantime he remitted no effort to find some middle ground of conciliation. Equipped with the additional authority derived from com- missions to act as the agent of the provinces of Masse- chusetts, of New Jersey, and of Georgia, and with a social influence never possessed probably by any other American representative at the English court, he would doubtless have prevented the final alienation of the colonies, if such a result, under the circumstances, had been possible. But it was not. The colonists were Englishmen for the most part, and they could

not be brought to make concessions which would have dishonoured them; and Franklin was not the man to ask of them such concessions. He took the position that "the parliament had no right to make any law whatever binding the colonies; that the king, and not the king, Lords, and Commons collectively, was their sovereign; and that the king, with ¢hecr respective parliaments, is their only legis- lator." In other words, he asked only what England has since granted to all her colonies, and what, but for the fatuous obstinacy of the king, who at this time was rather an object of commiseration than of criticism, she would undoubtedly have yielded. But under the pressure of the crown, negotiation and debate seemed rather to aggravate the differences than to remove them. The solemn peti- tions of the colonists to the throne were treated with neglect or derision, and their agents with contumely, and Franklin was openly insulted in the House of Lords, was deprived of his office of deputy-postmaster, and was scarcely safe from personal outrage. Satisfied that his usefulness in England was at an end, he placed his agencies in the hands of Arthur Lee, an American lawyer practising at the London bar, and on the 21st of March 1775, again set sail for Philadelphia. On reaching home his last hope of maintaining the integrity of the empire was dissipated by the news which awaited him of collisions which had occurred, some two weeks previous, between the people and the royal troops at Concord and at Lexington. He found the colonies in flagrant rebellion, and himself sud- denly transformed from a peacemaker into a warmaker. The two years which followed were among the busiest of his life. The very morning of his arrival he was elected, by the assembly of Pennsylvania, a delegate to that conti- nental congress then sitting in Philadelphia which consoli- dated the armies of the colonies, placed George Washington in command of them, issued the first continental currency, and assumed the responsibility of resisting the imperial government. In this congress he served on not less than ten committees. One of its first measures was to organize a continental postal system and to make Franklin post- master-general. Thus he was avenged for his dismissal 18 months before from the office of deputy by being appointed to a place of higher rank and augmented

authority. He planned an appeal for aid from the king of the French, and wrote the instructions of Silas Deane, a member of the congress, who was to convey it; he was sent as one of three commissioners to Canada, in one of the most inclement months of the year, on what proved an in- effectual mission to persuade the Canadians to join the new colonial union; he was elected a delegate from Phil- adelphia to the conference which met on the 18th of June 1776, and which, in the name of the people of the colonies, formally renounced all allegiance to King George, and called for an election of delegates to a convention to form a con- stitutional government for the United Colonies. He was also one of the committee of five which drew up what is known as the " Declaration of Independence." When about to sign it, Hancock, one of his colleagues, is reported to have said, " We must be unanimous ; there must be no pulling different ways ; we must all hang together." "Yes," replied Franklin, " we must hang together, or we will be pretty sure to hang separately." He was also chosen president of the convention called to frame a constitution for the State of Pennsylvania, which commenced its session on the 16th of July 1776. He was selected by congress to discuss terms of peace with Admiral Lord Howe, who had arrived in New York harbour on the 12th of July 1776, to take com- mand of the British naval forces in American waters, and on the 26th of September, upon the receipt of eucouraging news from France, he was chosen unanimously to be one of three to repair to the court of Louis XVi. and solicit his support. His colleagues were John Adams, destined to be Washington's successor in the presidency, and Arthur Lee, Franklin's successor in the agency in London.

Franklin, now in the seventieth year of his age, proceeded to collect all the money he could command, amounting to between £3000 or £4000, lent it to congress, and with two grandsons set sail in the sloop of war "Reprisal" on the 27th day of October, arriving at Nantes on the 7th of December, and at Paris towards the end of the same month. With his usual tact and forcaste he found quarters in a house in Passy (then a suburb but now a part of the city of Paris) belonging to an active friend of the cause he represented —Le Ray de Chaumont—who held influential relations with the court, and through whom he was enabled to be in the fullest communication with the French Govern- ment without compromising it.

At the time of Franklin's arrival in Paris, he was already one of the most talked about men if the world. He was a member of every important learned society in Europe ; he was a member, and one of the managers of the Royal Society, and one of eight foreign members of the Royal Academy of Sciences in Paris. Three editions of his scientific works had already appeared in Paris, and a new edition, much enlarged, had recently appeared in London. To all these advantages he added a political purpose —the dismemberment of the British empire—which was entirely congenial to every citizen of France. " Franklin's reputa- tion," wrote Mr Adams, who, unhappily, was never able to regard his colleague's fame with entire equanimity, " was more universal than that of Leibnitz or Newton, Frederick or Voltaire, and his character more beloved and esteemed than all of them. ... If a collection could be made of all the gazettes of Europe for the latter half of the 18th century a greater number of panegyrical paragraphs upon le grand Franklin would appear, it is believed, than upon any other rman that ever lived."

"Franklin's appearance in the French salons, even before he began to negotiate," says the German historian Schlosser, "was an event of great importance to the whole of Europe…. His dress, the simplicity of his external appearance, the friendly meekness of the old man, and the

apparent humility of the Quaker, procured for Freedom a

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mass of votaries among the court circles who used to be alarmed at its coarseness and unsophisticated truths." We may here add that such was the number of portraits, busts, and medallions of him in circulation before he left

Paris that he would have been recognized from them by nearly every adult citizen in any part of the civilized world. Writing to his daughter in the third year of his residence in Paris, of a medallion to which she had alluded, he says—

"A variety of others have been made since, of different »

sizes; some to be set in the lids of snuff-boxes and some so small as to be worn in rings, and the numbers sold are incredible. These, with the pictures, busts, and prints (of which copies are spread everywhere) have made your father's face as well known as the moon, so that he durst not do anything that would oblige him to run away, as his phiz would discover him wherever he should venture to show it."

The story of Franklin's mission to France, as recorded in his own correspondence, is singularly interesting and romantic. In these respects it is difficult to find its parallel in the literature of diplomacy. Its results may be summed upin afew words. He became at once, as already stated, an object of greater popular interest than any other man in France,—an interest which, during his eight years' sojourn there, seemed always on the increase. Streets in numerous cities, and several societies, were named after him; the French Academy paid him its highest honours, and he conferred more distinction upon any salon he frequented than it could reciprocate. He animated French society with a bouudless enthusiasm for the cause of the rebel colonists, persuaded the Government that the interests of France required her to aid them, obtained a treaty of alliance at a crisis in their fortunes in the winter of 1777, when such an alliance was decisive, and the great moral advantage of a royal frigate to convey the news of it to America. A few months later he signed the treaties which bound the two countries to mutual friendship and defence, and on the morning of the 20th March 1778 the three envoys were formally received by the king at Versailles, and through them the country they represented was first introduced into the family of independent nations.

In February of the following year General Lafayette, who had distinguished himself as a volunteer in the rebel army, returning to France on leave, brought a commission from the American congress to Dr Franklin as sole plenipoten- tiary of the United States to the court of France. From this time until the close of the war it was Franklin's para- mount duty to encourage the French Government to supply the colonists with money. How successfully he discharged this duty may be inferred from the following statement of the advances made by France upon his solicitation :—In 1777, 2,000,000 francs; in 1778, 3,000,000 francs ; in 1779, 1,000,000 franes; in 1780, 4,000,000 frances ; in 1781, 10,000,000 francs; in 1782, 6,000,000

francs; in all, 26,000,000 francs. To obtain these aids at a time when France was not only at war, but practically bankrupt, and in defiance of the strenuous resistance of Necker, the minister of finance, was an achievement, the credit of which, there is the best reason for believing, was mainly due to the matchless diplomacy of Franklin. Writing to the French minister in Philadelphia, December 4, 1780, the Count de Vergennes said—

“¢ As to Dr Franklin, his conduct leaves congress nothing to desire. It is as zealous and patriotic as it is wise and circumspect, and you may affirm with assurance, on all occasions where you think proper, that the method he pursues is much more efficacious than it would be if he were to assume a tone of importunity in multiplying his demands, and above all in supporting them by menaces (an allusion to the indiscreet conduct of Franklin’s colleagues), to which we should give neither credence nor value, and which would only tend to render him personally disagreeable.”

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Again, February 15, 1781, Vergennes wrote :—

“Tf you are questioned respecting an opinion of Dr Franklin, you may without hesitation say that we esteem him as much on account of the patriotism as the wisdom of his conduct; and it has been owing in a great part to this cause, and the confidence we put in the veracity of Dr Franklin, that we have determined to relieve the pecuniary embarrassments in which he has been placed by con- gress. It may be judged from this fact, which is of a personal nature, if that minister’s conduct has been injurious to the interests of his country, or if any other would have had the same advan- tages.”

Franklin had been for some years a martyr to the gout, which, with other infirmities incident to his advanced age of seventy-five, determined him to ask congress, in 1781, to relieve him, in a letter so full of dignity and feeling, that

*no one can read it even now, after the lapse of nearly a_*

century, without emotion.

“‘T must now,” he wrote, after disposing of official topics, “ beg leave to say something relating to myself—a subject with which I have not often troubled congress. | have passed my seventy-fifth year, and I find that. the long and severe fit of the gout which I had the last winter had shaken me exccedingly, and 1 am yet far from having recovered the bodily strength I before enjoyed. I do not know that my mental faculties are impaired,—perhaps I shall ~~be the last to discover that,—but I am sensible of great diminution of my activity, a quality I think particularly necessary in your minister at this court. 1am afraid, therefore, that your affairs may some time or other suffer by my deficiency. I find also that the business is too heavy for me and too confining. The constant attendance at home, which is necessary for receiving and accepting your bills of exchange (a matter foreign to my ministerial functions), to answer letters, and perform other parts cf my employment, pre~~ vents my taking the air and exercise which.my annual journeys formerly uscd to afford me, and which contributed much to the preservation of my health. There are many other little personal attentions which the infirmities of age render necessary to an old man’s comfort, even in some degree to the continuance of his exist- ence, and with which business often interferes.

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Congress not only declined to receive his resignation, but with its refusal sent him a commission, jointly with John Adams and John Jay, who had been the agent of the con- gress in Spain, to negotiate a peace. Cornwallis had sur- rendered at Yorktown on the 17th of October of that year, the anniversary of Burgoyne’s disastrous surrender at Saratoga just four years before, and a farther prosecution of the war beyond what might be necessary to secure the most favourable terms of peace was no longer advocated by any party in England. Active negotiations with Franklin and his associates were opened, and on the 30th of November a preliminary treaty was signed by the English and American commissioners ; a definitive treaty was signed on the 30th of September 1783, and ratified by congress January 14, 1784, and by the English Government on the 9th of April

following. At the conclusion of the pre- liminary treaty Franklin renewed his application to congress to be relieved, to which he received no answer. A few weeks after signing the definitive treaty, he renewed it again, but it was not until the 7th of March 1785 that congress adopted the resolution which permitted "The Honourable Benjamin Franklin to return to America as soon as convenient," and three days later 1t appointed Thomas Jefferson to succeed him.

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During his stay in Paris' Franklin gave by no means all his time to political problems. He wrote a paper for the Royal Society on the subject of balloons, a topic which, under the auspices of the Montgolfiers, attracted a great deal of attention at that time in France. Sir Joseph Banks commended it for its completeness. To some one who asked the use of the new invention Franklin replied by asking, " What is the use of a new-born baby?" In 1784 he was appointed by the French Academy one of a commis- sion ordered by the king to investigate the phenomena of "mesmerism"; and to a large extent he directed the investigation which resulted in the disgrace and flight of

| Mesmer and his final disappearance from the public eye.

Franklin's Information to those who would Remove to America, his New Treatise on Privateering, his Essay on Raising the Wages in Europe by the American Revolution, his Letter to Vaughan on Luxury, his Story of the Whastle, together with lis private as well as official correspondence, kept the world constantly talking about him and wondering at the inexhaustible variety and unconventional novelty of his resources, ' You replace Dr Franklin," I hear, said the Count de Vergennes to Jefferson when they first met. '"'T succeed, no one can replace him," was Jefferson's reply.

It was on the 12th of July 1785 that, accompanied by some members of his family and most intimate friends, he set out for Havre on his returnto America. In view of his infirmities, the queen had placed one of her litters at his disposal; the next day he was constrained by a most

| pressing invitation to accept the hospitality of Cardinal de

la Rochefoucauld at Gaillon, At Rouen, he was waited upon by a deputation of the Academy of that city. At Ports- mouth, where the party joined the vessel that was to take them home, the bishop of St Asaph's, "the good bishop," as Franklin used to style him, an old friend and correspond- ent, came down with his family to see him, and remained with him for the two or three days before they sailed.

On the 13th of September Franklin, who had become by far the most widely known and the most eminent of Americans, disembarked again at the very wharf in Philadelphia on which, sixty-two years before, he had landed a houseless, homeless, friendless, and substantially penniless runaway apprentice of seventeen. The day suc- ceeding his arrival, the assembly of Pennsylvania voted him a congratulatory address; the public bodies very generally waited upon him, and General Washington, by letter, asked to join in the public gratulations upon his safe return to America, and upon the many eminent services he had rendered. Sensible as his countrymen were of the mag- nitude of their obligations to him, and of his increasing infirmities, it never seems to have occurred to them that they could dispense with his services. In the month suc- ceeding his arrival he was chosen a member of the munici- pal council of Philadelphia, of which he was also unani- mously elected chairman. He was soon after elected by the executive council and assembly president of Pennsyl- vania, by seventy-six out of the seventy-seven votes cast. "T have not firmness enough," he wrote to an old friend, "to resist the unanimous desire of my country folks, and I find myself harnessed again to their service another year. They engrossed the prime of my life. They have eaten my flesh, and seem resolved now to pick my bones."

At the expiration of his term in 1786, he was unani- mously re-elected, and again unanimously in 1787. He was also chosen a member of the national convention, of which Washington was a member and president, which met on the second Monday of May 1787, to frame a constitution for the new confederacy. To the joint influence of Franklin and Washington probably should be ascribed the final adoption of the constitution which this convention framed, and which continues to be the fundamental law of the

United States. The most original, if not the most ingeni- ous, and perhaps, in view of the grave difficulties it disposed of, the most important feature of the constitution they con- structed—that which gave the States equal representation in the upper house or senate and in the lower house repre- sentation according to population—was the device of Frank- lin. For his three years' service as president of Pennsyl- vania Franklin refused to

accept any compensation beyond a reimbursement of the postage he had paid on official letters, amounting to some £77, 5s. 6d., it being one of his notions, which he advocated in the convention, that the chief magistrates of a nation should serve without pecuniary compensation. Franklin survived his retirement from office two years, which he consecrated almost as exclusively to the public use as any other two of his life, although most of the time the victim of excruciating pain. His pen was never more actively nor more effectively employed. He helped to organize and was president of the first society formed on the American continent or anywhere else, we believe, for the abolition of slavery, and as its president wrote and signed the first remonstrance against slavery addressed to the American congress.

Franklin died in his own house, in Philadelphia, on the 17th of April 1790, and in the eighty-fifth year of his age. Since then, as in life, his fame has gone on increasing. No American has ever received such varied and extensive homage from his countrymen. 'There is no State in the United States, and there are few counties that have not a town called Franklin (Ohio has nineteen of them) ; scarce a town that does not boast of its Franklin Street, or its Franklin Square, or its Franklin hotel, or its Franklin bank, or its Franklin insurance company, and so on; his bust or portrait is everywhere ; and some sort of a monu- ment of Franklin is among the attractions of almost every large city.

When Franklin, the fugitive apprentice boy, in 1723, walked up Market Street on the morning of his first arrival in Philadelphia, munching the rolls in which he had in- vested a portion of the last dollar he had in the world, the curious spectacle he presented did not escape the attention of Miss Read, a comely girl of eighteen years who chanced to be standing in the door of her father's house when he passed. Not long after, accident gave him an introduction to her; they fell in love, and, soon after his return from his trip to England, he married her. By her he had two children, a son who died young, whom Franklin spoke of as the finest child he ever saw, and a daughter, Sally, who married Richard Bache, of Yorkshire, England. Mrs Bache had eight children, from whom are descended all that are now known to inherit any of the blood of Benjamin Franklin. Before his marriage Franklin had a son whom he named William, who acted as his secretary during his first official residence in England, and who, as a compliment to

the father, was made governor of the province of New Jersey. When the rebellion broke out, William adhered to the mother country, which exposed him to serious indig- nities and was a source of profound mortification to his father. Next to the loss of his only legitimate son, this was perhaps the greatest sorrow of Franklin's life.

"You conceived, you say," wrote Franklin to him nine years after the rupture, "that your duty to your king and regard for your country required this. I ought not to blame you for differing in sentiments with me on public affairs. We are men all subject to errors. Our opinions are not in our own power. They are formed and governed much by circumstances that are often as inexplicable as they are irresistible. Your situation was such that few would have censured your remaining neuter, though there are natural duties which precede political ones, and cannot be extinguished by them." Bl ae to extenuate anything that was itn oe Franklin's conduct, we cannot help

g that Franklin, with a blindness common to

parents, quite overlooked the fact that his son, when he determined to adhere to the sovereign whom he had sworn loyally to serve, was a lusty lad of forty-five years.

In his will the father left William his lands in Nova Scotia, and forgave him the debts due to him. " The part he acted against me in the late war," continued the will, 'which is of public notoriety, will account for my leaving him no more of an estate he endeavoured to deprive me of." Governor Franklin had a son who also was not born in wedlock, named William Temple Franklin, He was brought up by his grandfather and served him in the capacity of private secretary during most of his residence in France, and after his return to the United States. Franklin tried repeatedly but unsuccessfully to have the young man appointed to some subordinate mission. He had been brought up in France, his education was strangely deficient, and he does not seem to have left an altogether favourable impression upon his countrymen abroad or at home after his return. It would not be strange if they judged him more correctly than his grandfather did. To this grandson Franklin bequeathed most of his books and all his manu- scripts and papers, from which he published the first edition of the writings of his grandfather, purporting to be complete, in 1816, and after a

delay never satisfactorily explained and apparently inexcusable. A criticism of this publication, attributed to Jeffrey, appeared in the Edin- burgh Review, No. 56, August 1817.

Though spending more than half of his life in the public service, Franklin was never for a moment dependent upon the Government for his livelihood. With the aid of his newspaper, his frugality, and his foresight, he was enabled to command every comfort and luxury he desired through his long life, and to leave to his descendants a fortune neither too large nor too small for his fame, and valued at the time of his death at about £30,000 sterling. Though rendering to his country as a diplomatist and statesman, and to the world as a philosopher, incalculable services, he never sought nor received from either of these sources any pecuniary advantage. Whcrever he lived he was the inevitable centre of a system of influences always important and constantly enlarging ; and dying, he perpetuated it by an autobiography which to this day not only remains one of the most widely read and readable books in our language, but has had the distinction of en- riching the literature of nearly every other. No man has ever lived whose life has been more universally studied by his countrymen or is more familiar to them.

Though his pen seemed never idle, the longest production attributed to his pen was his autobiography, of less than 300 8vo pages, and yet, whatever subject occupied his pen, he never left the impression of incompleteness. He was never tedious, and an inexhaustible humour, a classic simplicity, ap exquisite grace, and uniform good sense and taste informed and gave permanent interest to everything he wrote. Franklin was not an orator, but when he spoke, as he did occasionally in the several deliberative bodies of which he was a member, his word, though brief, was, like his writ- ings, always clear, judicious, felicitous, and potential. No man ever possessed in a greater degree the gift of putting an argument into an anecdote.

His country owes much to him for his service in various public capacities ; the world owes much to the fruits of his pen; but his greatest contribution to the welfare of mankind, probably, was what he did by his example and life to dignify manual labour. While Diderot was teaching the dignity of labour in France and the folly of social standards that proscribed it, Franklin was

illustrating it in America, and proving by his own most conclusive example that

‘ Honour and fame from no condition rise.”*

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There are few born into this world so ill-conditioned that they cannot find comfort and encouragement from some portion of the life of Franklin; none of any station who may not meditate on it with advantage. That feature of it which is most valuable will probably be found most difficult to imitate. It is stated by himself in the following extract from his diary in 1784 :—

“ Tuesday 27th.—Lord Fitzmaurice called to see me, his father having requested that I should give him such instructive hints as might be useful to him. I occasionally mentioned the old story of Demosthenes’s answer to one who demanded what was the first point of oratory? Action; the second? Action; the third? Action,— which I said had been generally understood to mean the action of an orator with his hands in speaking, but that I thought another kind of ‘action’ of more importance to an orator who would persuade people to follow his advice, viz.,—such a course of action in the conduct of life as would impress them with an opinion of his integrity as well as of his understanding; that this opinion once established, all the difficulties, delays, and oppositions usually occasioned by doubts and suspicions were prevented; and such a mau, though a very imperfect speaker, would almost always carry his points against the most flourishing orator who had not the character of sincerity. To express my sense of the importance of a good private character in public affairs more strongly, I said the advantage of having it, and the disadvantage of not having it, were so great that I even believe if George III. had had a bad private character and John Wilkes a good one, the latter might have turned the former out of his kingdom.”

Though Franklin was far from being insensible to what are termed worldly considerations, his public life was singularly free from any vulgar or degrading trace of self- seeking; he never is found making the public interests secondary to his own ; though holding office a good portion of his life, he never treated office holding as a profession, nor the public treasury as the accumulations of the many forthe good of a few. His private affairs and the public business were never allowed to become entangled or to depend the one upon the other. Though, from the nature of his various employments, a target for every form of malevo- lence and detraction during the last half of his life, his word was never impeached, nor his good faith and fairness, even to his enemies, successfully questioned. Of some irregularities in his youth he early repented, and for the benefit of mankind made a public confession, and all the reparation that was possible.

The most complete edition of Franklin's works is that of Jared Sparks, in 10 vols. 8vo, Boston, 1836-40. An edition of the auto- biography, revised by John Bigelow, from original MSS., appeared in 1868, and again in 1875, 3 vols. Parton's Life and Times of Benjamin Franklin, 2 vols., was published at New York in 1864, (J. BL)

The foregoing article is reprinted, by permission of Messrs Little, Brown, & Co., Boston, Mass., from Franklin, a Sketch, by John Bigelow, Boston, 1879.

FRANKLIN, Sir Joun (1786-1847), rear-admiral, was born at Spilsby, Lincolnshire, April 16,1786. Sprung from a line of freeholders, or '" franklins," his father inherited a small family estate, which was so deeply mortgaged by his immediate predecessor that it was found necessary to sell it; but by his success in commercial pursuits he was enabled to maintain and educate a family of twelve children. John, the youngest son, was destined for the church by his father, who, with this view, had purchased an advowson for him. He received the rudi- ments of education at St Ives, and afterwards attended Louth Grammar School for two years; but having em- ployed a holiday in walking 12 miles with a companion to look at the sea, which up to that time he knew only by description, his imagination was so impressed that he determined to be a sailor. In the hope of dispelling what he considered to be a boyish fancy, his father sent him on a trial voyage to

Lisbon in a merchantman; but it being found on his return that his wishes were unchanged, an entry on the quarterdeck of the " Polyphemus," 74, Captain Law- ford, was procured for him in 1800 ; and this ship having

led the line in the battle of Copenhagen in 1801, young Franklin had the honour of serving in Nelson's hardest- fought action. Two months after the action of Copen- hagen, he joined the ' Investigator," discovery-ship, commanded by his relative Captain Flinders, and under the training of that able scientific officer, while employed in exploring and mapping the coasts of Australia, he acquired a correctness of astronomical observation and a skill in surveying which proved of eminent utility in his future career. Franklin was on board the '" Porpoise" when that ship and the "Cato" were wrecked, August 18, 1803, on a coral reef, off the coast of Australia (see Fuinpers). After this misfortune, Franklin proceeded to Canton, where he obtained a passage to England in the "Harl Camden," East Indiaman, commanded by Sir Nathaniel Dance, commodore of the China fleet of 16 sail. On the 15th of February 1804 Captain Dance repulsed a strong French squadron, led by the redoubtable Admiral Linois. In this action Franklin performed the important duty of signal midshipman. On reaching England, he joined the " Bellerophon," 74, and in that ship he was again entrusted with the signals, a duty which he executed with his accustomed coolness and intrepidity in the great battle of Trafalgar. In the " Bedford," his next ship, he attained the rank of lieutenant, and remaining in her for six years, latterly as first lieutenant, served in the blockade of Flushing, on the coast of Portugal, and in other parts of the world, but chiefly on the Brazil station, whither the " Bedford" went as part of the convoy which escorted the royal family of Portugal to Rio de Janeiro in 1808. In the ill-managed and disastrous attack on New Orleans, he commanded the "Bedford's" boats in an engagement with the enemy's gunboats, one of which he boarded and cap- tured, receiving a slight wound in the hand-to-hand fight. On peace being established, Franklin turned his attention once more to the scientific branch of his profession, and sedulously extended his knowledge of surveying. In 1818 the discovery of a north-west passage, became again, after a long interval, a national object, and Lieutenant Franklin was appointed to the " Trent," as second to Captain Buchan of the "Dorothea," hired vessels equipped fur penetrating to the north of Spitzbergen, and, if possible, crossing the Polar Sea by that route. During a heavy storm, both

ships were forced to seek for safety by boring into the closely packed ice, in which extremely hazardous operation the "' Dorothea " was so much damaged that her reaching England became doubtful; but the "Trent" having sustained less injury, Franklin requested to be allowed to prosecute the voyage alone, or under Captain Buchan, who had the power of en:- barking in the "Trent" if he chose. The latter, however, declined to leave his officers and men at a time when the ship was almost in a sinking condition, and directed Franklin to convoy him to England. Though success did not attend this voyage, it brought Franklin into personal intercourse with the leading scientific men of London, and they were not slow in ascertaining his peculiar fitness for the command of such an enterprise. To calmness in danger, promptness and fertility of resource, and excellent seaman- ship, he added other qualities less common, more especially an ardent desire to promote science for its own sake, and not merely for the distinction which eminence in it confers, together with a love of truth that led him to do full justice to the merits of his subordinate officers, without wishing to claim their discoveries as a captain's right. Added to this, he had a cheerful buoyancy of mind, which, sustained by religious principle of a depth known only to his most in- timate friends, was not depressed in the most gloomy times. It was, therefore, with full confidence in his ability and ex- ertions that he was, in 1819, placed in command of an ex- pedition appointed to travel through Rupert's Land to the

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shores of the Arctic Sea, while Lieutenant Parry was despatched with two vessels to Lancaster Sound. At this period, the northern coast of America was known at two isolated points only, viz, the mouth of the Coppermine River, discovered by Hearne,—but placed erroneously by him four degrees of latitude too much to the north,—and the mouth of the Mackenzie. Lieutenant Franklin, accom- panied by a surgeon, two midshipmen, and a few Orkney- men, embarked for Hudson's Bay, in June 1819. His instructions left the route he was to pursue much to his own judgment, guided by the information he might be able to collect at York Factory from the Hudson's Bay Company's servants there assembled. Wintering the first year on the Saskatchewan, the expedition was fed by the Hudson's Bay

Company; the second winter was spent on the “ barren grounds,” the party subsisting on game and

fish procured by their own exertions, or purchased from —

their native neighbours ; and in the following summer the

expedition descended the Coppermine River, and surveyed |

a considerable extent of the sea coast to the eastward. The survivors of this expedition travelled, from their start at York Factory to their return to it again, by land and water, 5550 miles. While engaged on this service, Franklin was promoted to be a connnander, and after his return to England in 1822 he obtained the post rank of captain, and was elected a fellow of the Royal Society. In the suc- ceeding year he married Eleanor, the youngest daughter of Mr Porden, an eminent architect.

In a second expedition, which left home in 1825 (his

wife dying within the same year), Franklin descended the |

Mackenzie and traced the coast-line through 37 degrees of

longitude, from the mouth of the Coppermine River, where | his former survey commenced, to near the 150th meridian, |

and approaching within 160 miles of the most easterly point

attained by Captain Beechey, who was co-operating with —

him from Behring’s Strait. His exertions were fully appreciated at home and abroad.

Geographical Society of Paris, and was elected in 1846 correspondent of the Paris Academy of Sciences. Though

the surveys executed by himself and by a detachment under command of Dr Richardson comprised one, and within |

a few miles of two, of the spaces for which a parliamentary reward was offered, the Board of Longitude declined making the award ; but a bill was soon afterwards laid before par- liament by the secretary of the Admiralty abrogating the reward altogether, on the ground of the discoveries contem- plated having been thus effected. The results of these expeditions are described by Franklin and his companion Dr (afterwards Sir John) Richardson in two magnificent works published in 1824-29. In 1828 he married his second wife, Jane, second daughter of Mr John Griffin. His next official employment was on the Mediterranean station, in command of the " Rainbow," and his ship soon became proverbial in the squadron for the happiness and comfort of her officers and crew.! As an acknowledgment of the essential service he had rendered off Patras in the 'war of liberation," he received the Cross of the Redeemer of Greece from King Otho, and after his return to England he was created Knight Commander of the Guelphic order of Hanover.

In 1836 Sir John accepted the lieutenant-governor- ship of Van Diemen's Land (now Tasmania). His government, which lasted till the end of 1848, was marked by several events of inuch interest. One of his most popular measures was the opening of the doors of the

The sailors, with their usual f i i é ' ' ondness for epithets, named the shi the "Celestial Rainbow" and " Franklin's Bernese," i

He was knighted in | 1829, received the honorary degree of D.C.L. from the- university of Oxford, was awarded the gold medal of the –

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legislative. council to the public. He also originated a college, endowing it largely from his private funds with money and lands, in the hope that it would eventually prove the means of affording to all parties secular and religious instruction of the highest kind. He requested Dr Arnold to select some one competent to take the direction of this institution; and the choice fell on the Rev. John Philip Gell. Tn his time also the colony of Victoria was founded by settlers from Tasmania ; and towards its close, transportation to New South Wales having been abolished, the convicts from every part of the British empire were sent to Tasmania. On an increase to the lieutenant-

governor's salary being voted by the colonia] legislature, Sir John declined to derive any advantage from it personally, while he secured the augmen- tation to his successors. In 1838 he founded a scientific society at Hobart Town (now called the " Royal Society of Tasmania"), the meetings of which were held in Govern- ment House, and its papers printed at his expense. He welcomed eagerly the various expeditions for exploration and surveying which visited Hobart Town under com- mand of Captains Wickham, Stokes, Owen Stanley, and others. Conspicuous among these, and of especial interest to himself, were the French and English Antarctic expedi- tions of Dumont D'Urville and Sir James C. Ross,—the latter commanding the "Erebus" and "Terror," with which the name of Franklin was to be for ever so patheti- cally connected. A magnetic observatory, fixed at Hobart Town as a dependency of the central establishment under Colonel Sabine, was an object of deep interest up to the moment of his leaving the colony.

Thus pleasantly occupied, the years allotted to a colonial governorship drew to a close. Franklin had passed through phases of difficulty common to all governors of colonies remote from the imperial centre ; and it was impossible for an impartial and high-minded ruler to avoid collusion with personal interests. But that his unflinching efforts for the social as well as the political advancement of the colony were already appreciated was abundantly proved by the affection and respect universally testified by the addresses which proceeded from every section of the community, and by the demonstrations from all classes on his de- parture. A local newspaper, describing the scene in much detail, adds, '"'Thus departed from among us as true and up- right a governor as ever the destinies of a British colony were entrusted to." That this was no evanescent feeling is attested by the fact that several years afterwards the colonists showed their remembrance of his virtues and ser- vices by sending to Lady Franklin a subscription of £1700 in aid of her efforts in the search for their former governor, and later still by a unanimous vote of the legislature for the erection of a statue in honour of him at Hobart Town.

Sir John found, on reaching England, that the confidence of the Admiralty in him was undiminished, as was shown by his being offered in 1845 the command of an expedi- tion for the discovery of the North-West passage; this offer he accepted. The prestige of Arctic service and of his former

experiences attracted a crowd of volunteers of all classes, from whom were selected a body of officers conspicuous for talent and energy. 'Thus supported, with crews carefully chosen (some of whom had been engaged in the whaling 'service), victualled for three years, and furnished with every appliance then known, Franklin's expedition, consisting of the "Erebus" and " Terror J (134 officers and men), with a transport ship to convey additional stores as far as Disco in Greenland, sailed from Greenhithe on the 19th of May 1845. The ships were last seen on the 26th of July in Baffin's Bay by a whaler which was moored to an iceberg in lat. 74° 48' N. and long. 66° 13' W.; and at that time the expedition was proceed- ing prosperously. Letters written by Franklin a few days

previous to that date were couched in language of cheerful anticipation of success, while those received from his officers expressed their glowing hope, their admiration of the sea- man-like qualities of their commander, and the happiness they had in serving under him.

Franklin's instructions were framed (in conjunction with Sir John Barrow and upon his own suggestions) by the eminent explorers with whom his former work had closely connected him. The experience of Parry made it evicent that a fresh attempt to force ships through the heavy ice seen by him to the south-west of Melville Island would be futile, as has since been fully proved. On the other hand, Franklin's surveys of the north coast of America had long before satisfied him that a navigable passage existed along it, from the Fish River to Behring's Strait. He was there- fore directed to pursue a course towards the coast after he had approached the longitude of about 98° W., and was allowed the single alternative of previously examining Wellington Channel if the navigation were open. An explicit prohibition was given against a westerly course beyond the longitude of 98° W.

In 1847, though there was no real public anxiety as to the fate of the expedition, preparations began to be made for the possible necessity of succouring the explorers. As time passed, however, and no tidings of the expedition reached England, the search began in earnest ; expedition after expedition was despatched in quest of them in 1848 and succeeding years,

regardless of cost or hazard. In this great national undertaking Sir Jolin's heroic wife took a part which will ennoble her name for all time Between 1848 and 1854 about fifteen expeditions were sent out by England and America in the hope of rescuing, or at least finding traces of, the missing explorers. The details cf the work done by those expeditions will be given in the article on Potar Reaions ; here we shall confine ourselves to the results, so far as the search for Franklin was con- cerned. Lady Franklin's exertions were unwearied ; she exhausted her private funds in sending out auxiliary vessels to quarters not comprised in the public search, and by her pathetic appeals she roused the sympathy of the whole civilized world. 'Traces of the missing ships were dis- covered by Ommanney and Penny in August 1850, and were brought home by the " Prince Albert," fitted out by Lady Franklin with the especial object of following to the southward the route which would be almost cer- tainly taken by Franklin in carrying out his instruc- tions. It was thus ascertained that the first winter had been spent behind Beechey Island, where they had remained at least as late as April 1846. No further tidings were obtained until the spring of 1854, when Dr Rae, then conducting an exploring party of the Hudson's Bay Com- pany from Repulse Bay, was told by the Eskimo that (as was inferred) in 1850 white men, to the number of about forty, had been seen dragging a boat over the ice near the north shore of King William's Island, and that later in the same season, but before the breaking up of the ice, the bodies of the whole party were found by the natives at a point a short distance to the north-west of Back's Great Fish River, where they had perished from the united effects of cold and famine. 'The latter statement was afterwards disproved by the discovery of skeletons upon the presumed line of route; but indisputable proof was given that the Eskimo had communicated with members of the missing expedition, by the various articles obtained from them and brought home by Dr Rae, who, on his return to England, claimed, and succeeded in obtaining, the reward of £10,000 offered by the Admiralty in 1849, "to any party or parties who, in the judgment of the Board of Admiralty, shall, by virtue of his or her efforts, first succeed in ascertaining '7 the fate of the missing expedition, On account of the 1n-

formation obtained by Dr Rae, a party in two canoes under Messrs Anderson and Stewart was in 1855 sent by Govern- ment down the Great Fish River, and they succeeded in obtaining from the Eskimo at the mouth of

the river a considerable number of articles which had evidently belonged to the Franklin expedition ; and many others were picked up on Montreal Island, articles evidently belonging to a boat which, it was reported, had been cut up by the Eskimo. This expedition was unable to make sv thorough a search as was desirable, but it was clear from the results obtained by it, and from the examinations which had been made by the many other expeditions of all straits and inlets and coasts except the region to the north of Great Fish River, that King William's Island, the west coast of Boothia, and the neighbouring sea were the fields likely to yield the most satisfactory results. It was clear that a party from the "Erebus" and " Terror" had endeavoured to reach by the Fish River route the settlements of the Hudson Bay Company, and equally evident that the expedition in making a southerly course had been arrested within the channel into which the Great Fish River empties itself. At this time Government was wholly taken up with the events in the East, and when the war was over, it was deemed useless to spend any more money and risk any more lives in what was regarded as a hopeless quest. But Lady Franklin's pious devotion to the memory of her noble husband prompted her to make one last effort to ascertain his fate; to this object she dedicated all her available means, aided, as she had been before, by the subscriptions of sympathizing friends, her judgment being confirmed by the opinion of all those best able to form one as to the hopefulness as well as the feasi- bility of such an attempt. Accordingly she purchased and fitted out the little yacht ' Fox," which sailed from Aber- deen in July 1857 ; the command was accepted by Captain (afterwards Sir) Leopold M'Clintock, whose high reputation had been won in three of the Government expeditions sent out in search of Franklin. Having been compelled to pass the first winter in Baffin's Bay, it was not till the autumn of 1858 that the expedition passed down Prince Regent's Inlet, and the '"'Fox" put into winter quarters at Port Kennedy at the eastern end of Bellot Strait, between North Somerset and Boothia Felix. In the spring of 1859 three sledging parties went out, Captain (now Sir) Allen Young to examine Prince of Wales Island, Lieutenant (now Captain) Hobson the north and west coasts of King William's Island, and M'Clintock the east and south coasts of the latter, the west coast of Boothia, and the region about the mouth of Great Fish River. The search was successful so far as ascertaining the course and fate of the expedition is con- cerned. From the Eskimo in Boothia many relics were obtained, and reports as to the fate of

the ships and men ; all along the west and south coast of King William's Island remains of articles belonging to the ships were discovered, and skeletons that told a terrible tale of disaster. Above all, in a cairn at Point Victory a precious record was dis- covered by Lieut. Hobson that briefly told the history of the expedition up to April 25, 1848, three years after it set out full of hope. In 1845-6 the " Frebus" and "Terror" wintered at Beechey Island on the 8.W. coast of North Devon, in lat. 74° 43' 28" N., long, 91° 39' 15" W., after having ascended Wellington Channel to lat. 77° and returned by the west side of Cornwallis Island. Tris state- ment was signed by Graham Gore, lieutenant, and Charles F. Des Voeux, mate, and bore date May 28,1847. These two officers and six men, it was further told, left the ships on May 24, 1847, no doubt for an exploring journey, at which time all was well.

The success of the first year's work, thus briefly stated, was greater than has been since attained within any one

season in arctic service. The alternative course permitted by Franklin's instructions had been attempted but was not pursued, and iu the autumn of 1846 he followed that which was especially commended to him. But on his attempting to reach the coast of America, the obstruction of heavy ice, which presses down from Melville Island through M'Clintock Channel (not then known to exist) upon King William's Island had finally arrested his progress. It must be remembered that in the chart carried out by Franklin this island was laid down as a part of the mainland of Boothia, and he therefore could pursue his way only down its western coast. The record that revealed all which has been briefly stated was written upon one of the forms sup- plied by the Admiralty to surveying vessels, to be thrown overboard after the required data had been filled in. But upcen the margin around the printed form was an addendum dated the 25th April 1848, which extinguished all hopes of a successful terminatiou of their graud enterprise. The facts are best conveyed by the terse and expressive words of the record, which is therefore given verbatim :—" April 25th 1848. H. M. Ships 'Terror' and ' Erebus' were deserted on 22d April, five leagues N.N.W. of

this, having been beset since 12th September 1846. The officers and crews, consisting of 105 souls under the command of Cap- tain F. R. M. Crozier, landed here in lat. 69° 37’ 42” N., long. 98° 41’ W. Sir John Franklin died on the 11th June 1847 ; and the total loss by deaths in the expedition has been to this date 9 officers and 15 men.” The hand- writing is that of Captain Fitzjames, to whose signature is appended that of Captain Crozier, who also adds the words of chief importance, namely, that they would “start on to- morrow 26th April 1848 for Back’s Fish River,”

All of the party had without doubt been greatly reduced through want of sufficient food, and the injurious effects of three winters in these regions. They had greatly over- rated their strength in attempting to drag with them two boats, besides heavily laden sledges, and doubtless had soon been compelled to abandon much of their burden, and leave one boat on the shore of King William’s Island, where it was found, near the middle of the west coast, by M‘Clintock ; it contained two skeletons. From the Eskimo we learn that the men dropped down as they walked, and often had to be left unburied. Although many rélics were found in possession of the Eskimo, there seems no reason to believe that the retreating crews met with foul play. From all that can be gathered, one of the vessels must have been crushed in the ice and the other stranded on the shore of King William’s Island, where it lay for years, forming a mint of wealth for the neighbouring Eskimo. M‘Clintock examined all the shores of the island with the greatest care, but found no trace of a stranded vessel.

This is all we know of the fate of Franklin and his brave men. His memory is cherished as one of the most conspicuous of the naval heroes of Britain, and as one of the most successful and daring of her explorers, He is certainly entitled to the honour of being the first dis- coverer of the North-West passage; the point reached by the ships brought him to within a few miles of that attained from the westward by the explorations of earlier years ; he had indeed all but traversed the entire distance between Baffin’s Bay and Behring’s Strait. On the monument erected to Franklin by his country, in Waterloo Place, London, the honour of discovering the passage is justly awarded to him and his companions,—a fact which was also affirmed by

the president of the Royal Geographical Society, when presenting to Lady Franklin in 1860 their gold medal. More recently a fine monument, erected in 1875 in West- minster Abbey, commemorates the heroic deeds and fate of Sir John Franklin, the death (which occurred in that year) of Lady Franklin, and the inseparable connexion of her name with the fame of her husband. Most of the Franklin relics brought home by M'Clintock were presented by Lady Franklin to the United Service Museum, while those given by Dr Rae to the Admiralty are deposited iu Greenwich Hospital. Captain Hall, so well known in connexion with the ' Polaris" expedition, spent five years with the Eskimo, and made two journeys in endeavouring to trace the remnant of Franklin's party, bringing back in 1869 a number of additional relics and some informa- tion confirmatory of that given by M'Clintock. In 1878 a search expedition was sent out from America in con- sequence of a tale told to Mr Barry, the mate of a whaler, by some Nechelli Eskimo met by him at Whale Point, Hudson's Bay. He obtained from these Eskimo some spoons bearing Franklin's crest. The Eskimo were understood to say that these were received from a party of white men, who passed a winter near their settlement, and all died. The white men, the Eskimo stated, left a number of books with writing in them, which were buried. The story has some points about it that make one inclined to doubt its accuracy. Still it is satisfactory that the search party has been sent out, and we can only hope that it will be rewarded by discovering some of the records of the unfortunate expedition.! (use KD

FRANKS, Tue. When, in the year 241 a.D., the sol- diers of Aurelian, who just before had been on the north German frontier, marched out of Rome on their way to the Persian war, they sang (Vopiscus in Aureliano, c.7)a rough barrack song—

¢ Mille Sarmatas, mille Francos, semel et semel occidimus ;

Mille mille mille mille mille Persas querimus;"

and the words, caught up by the admiring mob, became a street boys' ballad in those days of debased imperialism. Unless we give to Peutinger's Ztinerary an earlier date than is probable, this street song marks the first appearance in history of the Frankish name. Cesar, Tacitus, Ptolemy, are alike silent as to it, although they often speak of other tribes which occupied

the very districts in which we after- wards find the Franks. It is therefore probable, though Jacob Grimm (Geschichte der Deutschen Sprache, p. 518) says that the view has "only a moderate value," that Frank is the newest of all German names, and represents, somewhat vaguely, a group of tribes who dwelt about the lower and middle Rhine. The Frank lived in districts previously occupied by tribes bearing other names ; nor have we proof of any incursion of a strange tribe called Franks from north or east. The old Frankish legend that they came from the Danube to the Rhine probably arose from the fact that a colony of the Sicambrian cohort was planted by the Romans on the spot where Buda-Pesth now stands; nor need we seriously consider the usual annalist statement that they were "reliquize Troianorum." The meaning and origin of the term also lends itself to the view above stated,—the words 'frank and free," usually grouped together, are in fact the same in origin and meaning (fri, frech, M.H.G.; frekkar, Scand.; froks, Goth. =audax, avidus ; then, by insertion of », ep. inguo from root of ligui, we get frank). The two words thus grouped together form an epithet rather than a proper name: the " free Franks " are those tribes whose freedom suffered most attack ; the name probably came into being in the 3d cen-

1 The first portion of this notice is mainly from Sir John Richard- son's article in last edition, and the whole has been revised by Miss Cracroft, Sir John Franklin's niece.

tury A.D. as a part of the resistance of northern and north- western Germany to the ceaseless attempts of Rome. © Francus habet nomen a feritate sua," says Ermoldus Nigellus (i, 344) ; and the word carries the sense of bold- ness, defiance, freedom. As it did not lend itself well to Latin verse-endings, and as its origin was late, we find the silver and leaden poets delighting to call the Franks Sicambri, as in the famous speech of St Remi to Hlodowig, " Depone mitis colla, Sicamber," dc. When their history begins, the Franks are in three groups, mostly on the left bank of the Rhine, from Mainz to the sea. It is, however, quite clear that in earlier days they dwelt also on the right or German bank ; for if at first the Romans pressed on them, ere long they began to press on the Romans in return. The oldest

Frankish land was then on the Rhine; some of it lay to the north of the Betuwe (the island between Meuse and Rhine), having the river Yssel as its eastern limit, and a line drawn through Durstede, Utrecht, and Muyden as its western boundary. The Franks of this district, afterwards called Salians (a name derived either from Sala, an inheritance, or from the river Saal, or Yssel), filled the parts called the Veluwe and the territory of the Sicambri; south-east of these was a

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The Salians and Ripuarians, cir. 400.

second group, the Chamavi, Bructeri, Attuarii, also at first on the right bank of the Rhine ; beyond these, a group of Chatti and Suevi, from a little above Cologne to the Main, filling up all the country between the Taunus hills and the Rhine. It is to this group of tribes, says Watterich (Germanen des Rheins, p. 166), that the title Frank was first given. This view of their geographical distribution is supported by the evidence of Peutinger's Jiinerary, in which Francia stands on the right bank of the Rhine from just above Nimwegen to a little below Coblentz ; and though this famous map is a road-chart rather than a record of ethnology and tribal distribution, still it may fairly be urged that its author would not have placed the Franks on the very outside of his map had their home been on the left bank of the Rhine.

In the middle of the 3d century these Franks began to press into the First and Second Germany, two tracts of land on the left bank of the Rhine from Alsace to the sea. In 240 the Chatti crossed at Mainz ; in '258 Franks are in the army of Postumus as well as opposed to him ;

with them he drove their brethren across the Rhine and made Cologne his capital. By degrees they filled the whole district from the Moselle to the

Betuwe, occupying the lands of the Ubii and Tungri, that is, from the Ardennes to the Rhine and Meuse. 'These Franks are known to his- tory as the Ripuarians, receiving, as was not unnatural, a partly Latin name (Ripuarii, Riparii, bank-men ; or pos- sibly Rip-wehr-ii, bank-defenders). About the same time the Salian Franks also moved southward, crossing the Rhine, which in those days was slow and shallow in its lower course, the main waters having been diverted into the Meuse. They occupied the whole Betuwe, and spread down to the sea, inhabiting the marshy delta of the rivers ("paludicole Sigambri," or " Franci inviis strati palu- dibus," circa 280 a.v.); and presently (287) they took part in naval expeditions down the coast of Gaul. Then, pass- ing the Meuse also, they seized on Toxandria, which was given over to them in 358 by the emperor J ulian, who defeated them, and admired their bravery and independ- ent spirit. Henceforth we find plenty of Franks taking service under the empire: Frankish chiefs, like Bald, Mellobald, Arbogast, rise to high places in court and army; their names appear even in the Consular Fasti; they make or tnmake emperors. By the end of the 4th century the frontiers of the empire to the north had permanently receded: Andernach was the outmost Rhine station held by the Romans; Tournay was still theirs; they had a fleet on the Sambre; all beyond was Frankish land. Before long the Franks advanced again: in 429 we hear (in Gregory of Tours) that the Salians, coming ' from Dispargum (Disiburg, the city of the goddesses), in Tor- ingia," won a great battle at Cambrai under Chlodion their king, and penetrated even as far as the Loire. This Toringia is probably a confusion with Tougria, a little district on the Meuse; the Franks were never in Thuringia. With their two capitals, the Salians at Dispar- gum, the Ripuarians at Cologne, the Franks now became the bulwark of the Romans: they resisted the barbarians who crossed the Rhine at Mainz in 406 ; and in 451 again joined the legions to repel at Chalons the hideous invasion of Attila, Thus feeling their strength, it was not long be- fore, under their young king Hlodowig, or Clovis, the Salian Franks became masters of northern Gaul, while their brethren the Ripuarians remained for the time near the Rhine. And "as the son of Childerich, following in the steps of his kinsfolk, pressed southwards, in mid career of victory he met the Cliristians' God. The Disi, the wild goddesses, abandoned him; he trusted in the god of Hlotehild, and conquered all his foes" (Watterich, Dte Germanen des Rheins, p.238). These Christianized Salians, under the Merwing house, became in time lords of all Gaul, and

gave it a new name, Francia Occidentalis, or Interior, or Latina, to distinguish it from the older Francia Orientalis, the Germany of the middle Rhine; the latter name drifted off towards the east, and has found a home in that central district of Franconia, which lies far away from the true Frankish land.

Henceforth the history of the Franks falls under that of France ; while their institutions were mainly those of all Germans. (See FRaNcE and Gzrmany.) 'Their physical features were also those of the race in general: the fierce-ness of their looks; the wrinkled scowl about their brows, "torvi Sicambri ;" their wild blue eyes; their large limbs, which contrasted with the little stature of the Romans ; their long fair hair, which was a choice commodity at Rome, being bought eagerly by the ladies of fashion in those late imperialist days,—all these things had little in them that was specially Frankish, Their weapons were more charac- teristic, being their own and connected closely with their name. They fought either with the "framea" (a word which

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i3 almost certainly a copyist's error for "franca"), which was a light javelin, tipped with iron sharpened on either side, a weapon fit for casting or smiting, and sometimes spoken of as a little axe; or with the francisca, which was a heavy battle-axe. It is tothe Franks that the great Siegfried Saga properly belongs; and their early history is hopelessly mixed up with legend. It is not till the days of Hlodowig that any light is thrown on their institutions,—the Lex Salica, the law of the Salian Franks, and the Ler Ripuaria, of which the origin was a little later, belonging probably to the end of the 5th and the early part of the 6th centuries, The Lex Salica was afterwards enlarged and altered ; in its earliest form it presents to us the Iranks in their Toxandrian or Tongrian time, before Christianity had touched them, This law shows no trace of a feudal nobility or a " feudal system" of any kind; as Waitz (Deutsche Verfassungsgeschichte – Das alte Recht der Salischen Franken, p. 103) says, " Das Salische Gesetz kennt keinen Adel; auch nicht die leiseste Spur desselben findet sich." The tribes had chiefs or kings, elected by the whole body of free men from one family (as Hlodowig from among the Merwings); there were also sundry officers of

justice and administration, rachimburgs or crafs, but these are no more noble than the rest of the free l'ranks, who formed a republic of fighting men, each man's voice being as potent in tlie mall as his arm was in the battle. The "lati," or the " pueri regis," the king's "'dam- sels," and the antrastions belong to the later editions of the law. King, free Frank, and slave of war,—these are the only grades. The code endeavours, always by imposition of carefully graduated fines, to protect the sanctity of the Frank's family, to determine his duties towards the king, the graf, and the tribal council or mall, to provide for the security of his property, whether personal or landed. It is in this last part of the code that we find the famous clause (Lex Salica, lix., De Alodis, § 5; Waitz, p. 266) on which the so-called Salic law of France was afterwards based : "De terra vero nulla in muliere hereditas est, sed ad virilem sexum qui fratres fuerint tota terra perteneat." This special limitation as to the inheriting of Salic land (the Stamm-land as the Germans call it, tle Odal of the xcelanders) is but a scanty basis on which to build a great liw of royal succession, which lasted in France as long as the monarchy continued, and might still reappear, were the present republic to prove untrue to itself. Up to the time of the Revolution, the French noblesse prided themselves on being the " proud descendants of the conquerors;" but though it is possible, in earlier times, to trace or to fancy distinctions of feature and character, marking off the noble from the roturier or the psasant, still in the later days of the monarchy the 'noble race of conquerors" was so much changed, so many old houses had become extinct, so many had been diluted with foreign blood, so many new patents of nobility had been issued, that it would require no small ingenuity and imagination to see in the courtiers of Louis XVI. the representatives of the Franks of Hlodowig or Charles the Great. :

The chief authorities for the Franks are Jakob Grimm, Geschichte der deutsehen Sprache, Leip., 1848; Waitz, Das alte Recht der Salischen Franken: Beilage zur deutschen Verfassungsgeschiehte, Kiel, 1846; Gohm, Frankische Reiehs- und Geriehts- Verfassung, Weimar, 1871; Watterich, Die Germanen des Rheins, Leip., 1872. There is also an ingenious lecture by Giesebrecht. In modern days not much has been written on the Franks, except in connexion with the history of institutions. (G. W. K.)

FRANZEN, Frans Micnasn (1772-1847), Swedish poet, was born at Uleaborg in Finland, 9th February 1772. At thirteen he entered the university of Abo, where he graduated in 1789, and became " eloquentize docens" in 1792. Three years later he started on a tour through Den- mark, Germany, France, and England, returning in 1796 to accept the office of university librarian at Abo. In

1801 he became professor of history and ethics, and in 1808 was elected a member of the Swedish Academy. On the cession of Finland to Russia Franzén removed to Sweden, where he was successively appointed parish priest of Kumla in the diocese of Strengnés (1810), minister of the Clara Church in Stockholm (1824), and bishop of Herndsand (1831). He died at Sabra parsonage, 14th August 1847, From the autumn of 1793, when his 77/7 en ang Flicka and Menniskans anlete were inserted by Kellgren in the Stockholmspost, Franzén grew in popular favour by means of many minor poems of singular siniplicity and truth, as Till Selma, Den gamle knekten, Riddar St Géran, De Sma, Blommorna, Modren vid vaggan, Nyarsmorgonen, and Stlernhimmelen. His songs Goda gosse glaset tim, Sorj ei den gryende dagen forut, Champagnevinet, and Bevarings- sang were widely sung, aud in 1797 he won the prize of the Swedish Academy by his Sang 6fver grefve Filip Creutz. This noble lyric is the turning-point of Franzén's poetic life. Henceforth his muse, touched with the academic spirit, grew more reflective and didactic. His longer works, as Lmili eller en afton 1 Lappland, and the epics Sven Sture eller motet ud Alvastra, Kolumbus eller Amerikas upptdckt, and Gustaf Adolf 1 Tyskland (the last two incomplete), though rich in beauties of detail, are far inferior to his shorter pieces. Franzén was a true lyric poet, fixing with masterly art the fleeting traits of common life in a glorified and fascinating form. At a time when revolution shrieked against every traditional bond of society, the lyre of Franzén breathed innocence and peace. With gentle earnestness and naiveté he sang the sweetness of love and family life— his highest human type the prattling child, the flowery meadows his elysium. His innocence is his peculiar charm ; "his very espréglerre," says Malmstrém, "is but the laugh of children's lips." ;

The poetical works of Franzén are collected under the title Skalde- styeken (7 vols., 1824-61; new ed., Samlade dikter, with a biography by A. A. Grafstrom, 1867-69). A selection is pnblished in 2 vols. (1871). His prose writings, Om svenska drotiningar (1828), Skrifter zt obunden stil (vol. 1., 1835), Predikningar (5 vols., 1841-45), and Minnesteekningar, prepared for the Academy (3 vols., 1848-60), are marked by faithful portraiture and purity of style. See Malmstrom, Intradestal 1 Svenska Akademien (1850); Hollander, Minne af F. M. Franzén (1868); Cygneus, Teekningar ur F. MM. Franzéns lefnad

(1872); and Gustaf Ljunggren, Svenska vitterhetens héfder efter Gustaf IIT,'s did, vol. ii. (1876).

FRANZENSBAD, KaiIser-FRANZENSBAD, EGERBRUN- NEN, and formerly SCHLADAER SAUERLING, a well-known Bohemian watering-place which owes its most popular name to the emperor Francis II. It is a little over three miles N.W. of Eger, at a height of about 1500 feet above the sea, in the neighbourhood of the Fichtelgebirge, the Béhmerwald, and the Erzgebirge. There are altogether eight mineral springs, of whicli the first known was the Franzensquelle or Francis's fountain. The Poltersbrunnen gives off carbonic acid gas, which is utilized for medical purposes in a building erected in 1826. Besides the great cursaal or pump-room, thie village contains several bathing establishments, one of which belongs to the town of Eger. In the park, which is also the property of the Eger muni- cipality, there is a bronze statue of Francis I. by Schwan- thaler. The mineral waters are saline and alkaline, and act as mild aperients and tonics. They have a great repu- tation, and have given rise to a considerable literature. See the works of Cartellieri (1869), Hamburger (1873), and Klein (1874).

FRASCATI, a town of Italy, in the province of Rome and about 10} miles south of the city, with a station at the terminus of a branch railway from the main line between Rome and Naples. It is the seat of a bishop, and a favour- ite summer residence of the Roman nobility. Among the public buildings are the old cathedral of S. Rocco, dat- ing from the beginning of the 14th century; the new

cathedral of San Pietro, founded about 1700 by Innocent XIL; the church of Santa Maria, of the 9th century ; and seven old conventual establishments. But the interest of the place is due rather to its palatial villas. The villa Aldobrandini takes its name from Cardinal Pietro Aldo- brandini, was designed by Della Porta, contains frescos by Arpino, and now belongs to the Borghese family. The villa Ruffinella or Tusculana dates from the 16th century, was for some time in the possession of Lucian Bonaparte, and afterwards passed into the hands of King Victor Emmanuel. Inu the chapel are the tombs of Lucian Bona- parte, his wife, his father, and his son Joseph. Thevilla Mon- dragone, the largest of all, was erected by Cardinal Altemps in the 16th century, now belongs to the Borghese family, and is partly occupied by a Jesuit school. The villa Couti, formerly known as the Ludovisi, is the property of the Torlonia family. The villa Falconieri, having been founded in 1550 by Cardinal Ruffini, ranks as the oldest in Frascati ; and the villa Piccolomini is interesting as the place where Baronius composed part of his Annals. About 3 miles from Frascati is the Greek monastery of Grotta Ferrata, interesting mainly for the frescos of Domenichino in the chapel of St Nilus, the best of the Greek manuscripts formerly contained in its library having been removed to Rome. The extensive gardening operations of the people of Frascati have rendered tlie name " Frascatese" almost equivalent to garden-girl. In 1871 the population was 7045. For Roman remains and history see-TuscuLuM.

FRASER, James BaILure (1783-1856), Scottish diplo- matist, traveller, and author, was born at Reelick or Relig in the county of Inverness, in June 1783. He was the eldest of the four sons of Edward S. Fraser of Reelick, all of whom found their way to the East, and gave proof of their ability. When Reza Kooleé Murza and Nejeff Kooleé Murza, the exiled Persian princes, visited England, he was appointed to be their mehmindar, and on their return he accompanied them as far as Constantinople. He was afterwards sent to Persia on a diplomatic mission by Lord Glenelg, and effected a most remarkable journey on horseback through Asia Minor to Teheran. His health, however, was impaired by the fatigue and exposure; and he consequently retired to his estate in Scotland. In 1823 he married a daughter of Lord Woodhouselee, and sister of Patrick Fraser Tytler. He died at Reelick in January 1855. Fraser is said to have displayed great skill in water-colours, and several of his drawings have been engraved; and the

astronomical observations which he took during some of his journeys did considerable service to the cartography of Asia. The works by which he attained his literary reputation were accounts of his travels and fictitious tales illustrative of Eastern life. In both he employed a vigorous and impassioned style, which was on the whole wonderfully effective in spite of minor faults in taste and flaws in strueture. Some of his tales have not yet altogether lost their popularity.

In 1820 there appeared a Journal of a Tour through part of the Snowy Range of the Himala Mountains; in 1825, a Narrative of a Journey into Khorasan in the years 1821 and 1822, ineluding an Account of the Countries to the North-East of Persia; and in 1826, Travels and Adventures in the Persian Provinees on the Southern Banks of the Caspian Sea. he first part of The Kuzzilbash, a Tale of Khorasan, was published in 1828, and the second part or con- tinuation in 1830, under the title of the Persian Adventurer. These were followed in 1833 by The Rhan's Tale, of which the scene is laid in Khorasan. In 1834 appeared a History of Persia (in the Edinburgh Cabinet Library), and in 1838 a Narrative of the Residenee of the Persian Prinees in London, 1835-6, and 4 Winter Journey (Tatar) from Constantinople to Teheran, with Travels through various parts of Persia, Next came Travels in Koordistan and Mesopotamia, 1840; The Highland Smugglers, 1842 ; Allee Neemroo, 1842; The Dark Faleon, a Tale of the Attruek, 1844; Mesopotamia and Assyria (Edinburgh Cab, Tibp), Use; Military Memoirs of Lieut.-Col. Skinner, 1851.

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FRASER, Smion. See Lovart.

FRASERBURGH, a seaport town of Scotland, Aber- deenshire, on the south side of Kinnaird's Head, 42 miles north of Aberdeen. It is built nearly in the form of a square, and most of the streets cross each other at right angles. The cross is a fine structure of a hexagonal form, covering an area of 500 feet, and surmounted by a stone pillar 12 feet high, ornamented by the British arms and the arms of Fraser of Philorth. Fraserburgh is one of the chief stations of the herring fishing in Scotland, the number of herring boats engaged by the curers of the port averaging about 900. During the herring season the increase to the popula- tion of tle town is upwards of 10,000. In

1877 the num- ber of barrels of herrings cured in Fraserburgh was 180,000, and the value of the herring landed was about £280,000. The harbour, originally constructed as a refuge for British ships of war, is one of the best on the east coast of Scotland, and has lately been improved by the widening of the piers, and the extension of the breakwaters. The total sum ex- pended on the harbour from 1857 to 1877 was £87,485. It has an area of upwards of six acres, is easy of access, and affords anchorage for vessels of every size. Still further improvements are proceeding, which, when completed, will afford outside the harbour an area of 8 acres of sheltered water, with a depth of from one to two fathoms at low tide. The population of Fraserburgh in 1871 was 4268.

Fraserburgh takes its name from Sir Alex. Fraser of Philorth, who in 1613 obtained for it a charter as a burgh of regality, and whose representative, Lord Saltoun, is now superior of the town. The same Sir A. Fraser obtained in 1592 a charter for the institu- tion and endowment of a college and university here; and at the west end of the town is a quadrangular tower of three stories, which formed part of the building designed for this seminary. The inten- tion was subsequently abandoned, probably from want of funds.

FRATRICELLI was a common name given to a number of obscure medieval sects who flourished in the 13th and 14th centuries. They were also called Bioschi, Bighini, Bocasoti, Frérots, &c., and included such sects as the Brethren of the Full Spirit, the Brethren of the Free Spirit, the Beghards, the Brethren of the Common Life, &c. The history of these medieval sects is very obscure ; but it seems now made out that while they had some relation to and sympathy with the older Cathari and other Manichzan heretics, they had a distinct origin in the Franciscan order, and that their real aim was to carry out the principles of St Francis even in defiance of the court of Rome. Their origin has been traced to Peter of Macerata and Peter of Fossombrone, who put themselves at the head of certain malcontent Franciscans, who, having been condemned by Pope Celestine in 1294, declared that the rule of Francis was of more authority than any pope, and that papal opposition only showed that the pope himself might become anti-Christian. They soon began to teach opposition to the pope, the clergy, and the church. They held millenarian views, and preached and practised communism after the fashion, they said, of the early Christians. Their

opinion soon spread among the Fraricisсan Tertiaries, and the com- mon people everywhere favoured them. Boniface VIII. ordered the Inquisition to look after them, and on a report of Matthew of Chieti they were condemned in 1297 and handed over to the Inquisition. This only roused opposition. They held a general meeting in Rome, elected a pope of their own, organized themselves, spread over Europe, and by preaching missions made converts everywhere. Their ranks were continually recruited from the malcontent friars, especially from the Franciscans. Pope John XXII. condemned them under the names of Fratricelli, Fratres de paupera vita, Bizochi, and Bighini, and issued briefs against them in 1322 and 1331. They gave great trouble to the church: in Strasburg, Cologne, and the Rhineland. In Italy their headquarters were in the Mark of Ancona and in Turin,

where persecutions were organized against them in 1335, 1368, 1373-88. Popes Martin V., Eugenius IV., and Nicholas V. also persecuted them. In spite of all they survived until the Reformation. Their smouldering fire probably burnt itself out in the Anabaptist movement of the 16th century.

The best collective accounts are to be found in Mosheim, De Bequinis et Beguinabus, and Hahn's Gesch. der Ketzer im Mittel- alter, vol. ii. bk. iv.

FRAUD, inlaw, isa word of wide import, to whichit is diffi- cult to assign any exact definition. The courts have in fact deliberately refrained from defining it, because they did not wish to limit their power of dealing with fraudulent trans- actions. The word, however, carries its own meaning on the face of it, and there is practically no difference betwecn fraud in the popular and fraud in the legal sense. Any course of conduct that would generally be described as dis- honest, any cheating or deceiving another so that he would be injured thereby, would be fraud in law as in common parlance. In some writers, indeed, there is found an attempted distinction between legal and moral fraud. The acts of a vendor who puffs the goods he sells are, it is said, in so far as they conceal the truth or produce a false im- pression in the mind of the buyer, fraudulent from an ethical point of view. The law, however, regards them not, holding that the buyer must look to his bargain for himself. Caveat emptor ; if he chooses to believe the assertions

of the puffer when he might verify the facts for himself, so much the worse for him. An examination of the case, however, shows that there is little or no value in the alleged distinction. The meaning of the maxim is that when the parties are dealing at arm's length, neither is in fact decewed by the exaggerations or depreciations of the other. If actual and intentional misrepresentation is proved the law will avoid the contract, but it will not readily listen to the claim of a man who, having the opportunity of examining what he bought, protests that he purchased on the strength of the vendor's recommendations,

The essential element in fraud is misrepresentation,— producing a false impression on the mind of another—caus- ing him to believe that which is not true. And misrepre- sentation, to amount to fraud, must also be intentional. There is a wide difference between a false statement believed to be true by the person who makes it and a false statement known to be false by the person who makes it. The latter is clearly fraudulent, and although it would not be safe to set this down as a sufficient definition of fraud, something of this sort will be found to exist in all conduct which is recognized as legally or morally fraudulent. The innocent misrepresentation of facts is, both in law and in common morality, a much less serious thing than wilful misrepresentation, The latter would include not merely the cases where the statement is known to be false by the person making it, but also the cases in which the statement is made recklessly without any belief one way or the other. He who deliberately makes a statement which he does not know or believe to be true does so at his peril, and if it turns out to be false he will find himself in the same position as if he had known it to be false from the beginning.

It is in reference to contracts that the legal treatment of fraud is of the greatest importance. The broad rule is that auy contract tainted by fraud is void at the option of the party injured. Innocent misrepresentation in the sense above defined has no such effect on a contract, has in general no effect at all unless in certain exceptional cases. Thus if the representation is a condition, the contract is avoided if it turn out not to be true. Or if itis a warranty, its falsehood will give a right of action for the breach thereof, _And so in certain other cases. But wilful misre- presentation.or fraud taints the whole contract. Suppose

a coutract for the sale of goods between A and B. A, the vendor, makes statements relating to the contract which are not true. If the truth of the statements was made a con- dition of the contract, or if A warranted their truth, he would be responsible to B whether he in point of fact believed the statements to be true or not. In other cases he would be responsible if he knew the statements to be false or made them recklessly without any belief as to their truth or falsehood.

Statements, misrepresentations, or frauds, to be within the rule, must be such as are material to or such as have given rise to the contract. There must be dolus dans locum contractut. A fraudulent concealment or misrepresentation, which had no effect on the mind of the innocent party because the circumstances for which it was prepared did not arise, has no effect on the contract. And the fraud must be the fraud of one of the contracting parties or his agents. False or fraudulent statements, through which A is induced to enter into contract with B, have no effect on the contract if B was in no way privy to them. So also it has been held that the fraud must relate to the same transaction, e.g., a fraudulent misrepresentation made on a former occa- sion by one of the contracting parties has no effect on the contract, althougli in point of fact it was that which induced the other party to contract.

A contract vitiated by fraud is void at the option of the party injured. He may rescind the agreement if he chooses, or he may affirm it and require the other party to place him in the same position as if the false statement had in point of fact been true. This option he must exercise within a reasonable time after discovering the misrepresen- tation.

Apart from contract, fraud or misrepresentation may give a right of action to the party injured thereby. A typical case is where A is induced by the false representation of B to give credit to C. A has a right of action against B for any damage he may have sustained in consequence,

It may be expedient here to notice the Statute of Frauds (29 Charles II., c. 3)—perhaps the most important piece of legislation in the whole statute-book. Its object is stated to be the "prevention of frauds and perjuries," and its effect is to make writing essential to the validity of many transactions. The most important sections are those relating to contracts, viz., the 4th and

the 17th, almost every word of which has been the subject of numerous decisions. By the 4th section no action shall be brought on the contracts therein mentioned unless the agreement, or some note or memorandum thereof, shall be in writing and signed by the party to be charged therewith, or some other person there- unto by him lawfully authorized. The contracts referred to are the following :—(1) any special promise by an exe- cutor or administrator to answer damages out of his own estate; (2) any special promise to answer for the debt, default, or miscarriage of another person ; (3) any agree- ment made upon consideration of marriage; (4) any con- tract or sale of lands, tenements, or hereditaments, or any interest in or concerning them; and (5) any agreement that is not to be performed within the space of one year from the making thereof. It will be noticed that this section does not make the contract null and void, but only unactionable. The 17th section refers 'to sales of goods for the price (or value) of £10 and upwards, which are 'not allowed to be good" unless some memorandum of the bargain bas been made in writing (see ConTRact). Arrangements by which an insolvent debtor agrees to give to one of his creditors a prefereuce over the others without their knowledge or consent, are known as fraudulent pre- Jerences, and are null and void.

Fraud can hardly be said to be under that name an offence known to the criminal law; the vagueness of the

conception renders it impossible to treat fraud per se as a crime. But there are specific offences (both at common law and by statute) of which fraud is the gist, and in dealing with these the courts have had some little difficulty in drawing the line between criminal and non-criminal fraud. At common law it would appear that only those cheats or frauds are indictable which amount to " fraudulently obtain- ing the property of another by any deceitful and illegal practice or token (short of felony) which affects or may affect the public" (Russell On Crimes, vol. ii). Chief Justice Cockburn in one case stated, as the result of the authorities, that "if a person in the course of his trade, openly and publicly carried on, were to put a false mark upon an article so as to pass it off as a genuine one, when in fact it was only a spurious one, and the article was sold and money obtained by means of

that false mark or token, that would be a cheat at common law." On the other hand, cheats by means of a bare lie or false affirmation in a private transaction are not indictable at common law ; ¢.g., when a merchant falsely pretended that a certain parcel of gum was gum seneca, whereas it was an inferior and less valuable gum, the fraud was held not indictable. And in another case where the defendant was charged with obtaining money from another by a falseliood, Chief Justice Holt said, " Shall we indict one man for making a fool of another? Let him bring his action." Frauds affecting the crown would be indictable, and so would any cheat aimed at the general public, ¢.g., when an impostor maims himself to have a preteuce for asking charity. Russell considers that the publication of false news likely to produce any public detriment would be criminal.

The principal criminal enactment against frauds is 24 and 25 Vict., c. 96, §§75-90. By §88, '" whoever shall by any false pretence obtain from any other person any chattel, money, or valuable security, with intent to defraud, shall be guilty of a misdemeanour." Other sections deal with frauds by agents, bankers, or factors, by trustees, by directors of companies (keeping fraudulent accounts, pub- lishing false statements, &c.), Other enactments are the statutes of Elizabeth against fraudulent conveyances (13 Eliz., c. 5, and 27 Eliz.,c. 4); 9 Geo. IL, ¢. 5 (persons pre- tending to exercise witchcraft, tell fortunes, &c.) ; 25 and 96 Vict., c. 88 (forgery, trade marks, &ec.); the Debtors Act, 1869 (fraudulent debtors, é&c.).

The distinction between private aud public frauds does not hold in the law of Scotland. Thus if a person undertake to supply an article according to sample, or an article which has been inspected and ordered, and intentionally send a substance which is not the thing contracted for at all, or which, though containing some porportion of the article ordered, is an adulterated mixture, he is guilty of falseliood, fraud, and wilful imposition (Macdonald's Criminal Laaw of Scotland). This passage may be compared with the private frauds cited above. (E. R.)

FRAUENBURG, a town of Prussia, province of Hast Prussia, government district of Konigsberg, is situated on the Frische Haff, and at the mouth of the Baude, 41 miles S.W. of Konigsberg. It is the seat of the Roman Catholic bishop of Ermeland. The cathedral, which stands on an eminence, possesses

six towers, and forms a kind of fortress. The astronomer Copernicus was canon at V'rauen- burg, and there is a monument to him in the cathedral. He issaid to have constructed the tower containing ma- chinery for supplying the town and neighbourhood with water. The tower is no longer used for this purpose. The population of Frauenburg is about 2500.

FRAUENFELD, a town of Switzerland, capital of the canton of Thurgau (or Thurgovia), is situated in a beautiful and fertile district on the Murg, 23 miles N.E. of Zurich. It is the artillery depét for east Switzerland, and possesses

an old castle with a tower belonging to the 10th century, an old Capuchin monastery, a townhouse, an armoury, and a canton school. 'The chief industries are spinning and the manufacture of cotton cloth, but many of the inhabitants are engaged in agriculture. After the extinction of the countship of Alt-Frauenfeld, the town came into the pos- session of the counts of Kyburg, aud subsequently into that of Austria. In 1799 a battle was fought there between the French and Austrians. The population in 1870, includ- ing the adjoining villages of Kurzdorf and Langdorf, was

4261.

FRAUENLOB, the name by which a German poet of the 13th century is almost exclusively known, though his real name was Heinrich von Meissen. How he acquired tho sobriquet has not been decided,—whether it was from his song in honour of the Virgin (Die Heilige Jungfrau), or because in another of his pieces he defended the use of the word Frau instead of Weib, or simply because he sang much in praise of women. The last explanation is the one that has received the stamp of popular acceptance. Frauenlob was born in 1260 of a humble burgher family. His youth was spent in straitened circumstances, but he gradually acquired reputation as a singer at the various courts of the German princes. In 1278 we find him with Rudolph I. in the Marchfeld, in 1286 he was at Prague at the knighting of Wenceslaus IJ., and in 1311 he was present at a knightly festival celebrated by Waldemar of Brandenburg before Rostock. After this he settled in Mainz, and there, according to the popular account, founded the first school of Meister-singers. He died in 1318, and was buried in the cloisters of the cathedral at Mainz. His grave is still marked by a copy made in 1783 of the

original tombstone of 1818; and in 1842 a monument by Schwanthaler was erected by the ladies of the city in another part of the cloisters. Frauenlob's poems make a great display of learning, and their versification abounds in tricks of rhyme. Ettmiiller published a very full edition in 1843.

See Von der Hagen's Afinnesinger, 'vol. iv.; Bartsch, Meisterlieder der Kolmarer Handschrift; and Schréer in Bartsch's Germanist.

Studien. An English translation of Frauenlob's Cantica Canticorwm by A. E. Kroeger appeared in 1877 at St Louis, United States.

FRAUNHOFER, JosrpH von (1787-1826), a celebrated optician, was born at Straubing in Bavaria, March 6, 1787. His father, a poor glazier, having died in 1798, young Fraunhofer in August of the following year was apprenticed to Weichselberger, a glass-polisher and looking-glass maker. Having by day no time that he could call his own, he studied the few old books that he possessed during leisure snatched from sleep. On the 21st of July 1801 he nearly lost his life by the fall of the house in which he lodged, and the elector of Bavaria, Maximilian Joseph, who was present at his extricatiun from the ruins, gave him 18 ducats. With a portion of this sum he obtained release from the last six months of his apprenticeship, and with the rest he purchased a glass-polishing machine. He now employed himself in making optical glasses, and in engraving on metal, devoting his spare time to the perusal of works on mathematics and optics. In 1806 he obtained the place of optician in the mathematical institute which in 1804 had been founded at Munich by Joseph von Utzschneider, G. Reichenbach, and J. Liebherr; and in 1807 arrangements were made by Utzschneider for his instruction by Pierre Louis Guinand, a skilled optician, in the fabrication of flint and crown glass, in which he soon became an adept (see R. Wolf, Gesch. der Wissensch. in Deutschl., bd. xvi. p. 586). With Reichenbach and Utzschneider, Fraunhofer esta- blished in 1809 an optical institute at Benedictbeuern, near Munich, of which he in 1818 became sole manager. The institute was in 1819 removed to Munich, and on Fraunhofer's death came under the direction of G. Merz.

Amongst the earliest mechanical contrivances of Fraunhofer was a machine for polishing mathematically uniform spheri- cal surfaces. He was the inventor of the stage-micrometer, and of a form of heliometer; and in 1816 he succeeded in constructing for the microscope achromatic glasses of long focus, consisting of a single lens, the constituent glasses of which were in juxtaposition, but not cemented together. The great reflecting telescope at Dorpat was manufactured by Fraunhofer, and so great was the skill he attained in the making of lenses for achromatic telescopes that, in a letter to Sir David Brewster, he expressed his willingness to fur- nish an achromatic glass of 18 inches diameter. For his researches published in the Denkschriften der Munchener Akademie for 1814—15, by which he laid the foundation of solar and stellar chemistry, Fraunhofer is especially known. The dark lines of the spectrum of sunlight, earliest noted by Dr Wollaston (Phil. Zrans., 1802, p. 378) were inde- pendently discovered, and, by means of the telescope of a theodolite, between which and a distant slit admitting the light a prism was interposed, were for the first time care- fully observed by Fraunhofer, and have on that account been designated "Fraunhofer's lines." He constructed a map of as many as 576 of these lines, the principal of which he denoted by the letters of the alphabet from A to G; and by ascertaining their refractive indices he deter- mined that their relative positions are constant, whether in spectra produced by the direct rays of the sun, or by the reflected light of the moon and planets. The spectra of the stars he obtained by using, outside the object-glass of his telescope, a large prisin, through which the light passed to be brought to a focus in front of the eye-piece. He showed that in the spectra of the fixed stars many of the dark lines were different from those of the solar spectrum, whilst other well-known solar lines were wanting; and he hence concluded that it was not by any action of the ter- restrial atmosphere upon the light passing through it that the lines were produced. He further expressed his belief that the dark lines D of the solar spectrum coincide with the bright lines of the sodium flanie, a fact subsequently established by Brewster, Foucault, and Miller, and success- fully accounted for by Kirchhoff. Fraunhofer was a mem- ber of the Academy of Sciences at Munich, and of the university of Erlangen. In 1823 he was appointed conser- vator of the Physical Cabinet at Munich, and in the follow- ing year he received from the king of Bavaria the civil order of merit. He died at Munich, June 7, 1826, and was buried near Reichenbach, whose decease had taken place eight years previously. On his

tomb is the inscription " Approximavit sidera." His scientific papers were pub- lished in the Denkschriften der Miinchener Akademie, Gilbert's Annalen der Physik, and Schumacher's Astrono- mische Nachrichten.

See Optics; J. von Utzschneider, Kurzer Umriss der Lebens- geschichte des Herrn Dr J. von Fraunhofer, Munich, 1826; and Merz, Das Leben und Wirken Fraunhofers, Landshut, 1865.

FRAUSTADT, a garrison town, and the chief town of a circle in the government district of Posen, Prussia, is situ- ated in a flat sandy country 50 miles 8.8.W. of Posen. It has an orphanage, a reformatory, a royal real-school of the first class, a higher ladies' school, and an agricultural school. Its manufactures include woollen and cotton goods, hats, morocco leather, and gloves, and it has a considerable trade in corn, cattle, and wool. Fraustadt was founded by the Dutch, and until 1343 belonged to the principality of Glogau. Near the town the Swedish general Reenskiéld defeated the Saxons on the 13th of February 1706. The population in 1875 was 6435.

FRAYSSINOUS, Dents ANTOINE Luc, CoMTE DE (a a Gallican prelate and Bourbonist minister,

guished as an orator and asa controversial writer, was

born of humble parentage at Curiéres, in the department of Aveyron, on the 9th of May 1765. After a course of training, first at the diocesan seminary of Rodez and after- wards in Paris under the priests of Saint Sulpice, he was ordained priest in 1789. In 1801 he began to give private lectures on dogmatic theology in the Faubourg Saint Jacques, and at the same time to deliver, in the church of the Carmelites, a series of "catechetical lectures" which afterwards developed into the "conferences" of Saint Sulpice, to which admiring crowds were attracted by his lucid exposition and by his graceful and glowing oratory. The freedom of his language in 1809, when Napoleon had arrested the pope and declared the annexation of Rome to France, led to a prohibition of his lectures ; and the disper- sion of the congregation of Saint Sulpice in 1811 was fol- lowed by his temporary

retirement from the capital. He returned with the Bourbons, and resumed his conferences, in 1814; but the events of the Hundred Days again compelled him to withdraw into private life, from which he did not emerge until February 1816. As court preacher and almoner to Louis XVIII., he now entered upon the period of his greatest public activity and influence. His Panégy- rique de Saint Louis, his Oratson Funébre du Prince de Condé, and other orations are said to have profoundly im- pressed the public mind, and their effect was still further deepened by the publication of his Hssaz sur (Indifference en Matiére Religieuse (1818). In connexion with the cou- troversy which had been raised by the signing of the reac- tionary concordat of 1817, he published, also in 1818, a treatise entitled Vrais Principes de? Hglise Gallicane sur la Puissance Ecclésiastique, which though unfavourably criti- cized by the Ultramontane Lamennais, was received with favour by the civil and ecclesiastical authorities. The conse- cration of Frayssinous as bishop of Hermopolis "'in partibus," his election to the French Academy, and his appointment to the grand-mastership of the university, followed in rapid succession. In 1824, on the accession of Charles X., he became minister of public instruction and of ecclesiastical affairs under the administration of Villele ; and about the same time he was created a peer of France with the title of count. His term of office was chiefly marked by the recall of the Jesuits. In 1825 he published his conferences under the title Défense du Christianisme. The work passed . through 15 editions within 18 years, and was translated into several European languages. In 1828 he, along with his colleagues in the Villéle ministry, was compelled to resign office, and the subsequent revolution of July 1830 led to his retirement to Rome. Shortly afterwardshe became tutor to the duke of Bordeaux at Prague, where he continued to live until 1838. The remaining years of his life were passed in great privacy on his native soil. He died at St Géniez on the 12th of December 1841. His biography by Henrion was published in 1842, and a posthumous volume, contain- ing some of his earlier "conferences," appeared in 1843 (Conférences et Discours Inédits),

FREDERICIA, or Fripericia, a fortified town of Denmark, near the south-east corner of Jutland, on the shores of the Little Belt opposite the island of Funen, about 15 miles 8. of Veile. It has railway communication with both south and north, and steamboats ply regularly across the Belt. It is well

built, and possesses a handsome town- hall, four churches, and a synagogue. There is a consider- able shipping trade, and the industries comprise the manu- facture of tobacco, salt, and chicory, and of cotton goods and hats. The population in 1870 was 7186. A small fort was erected on the site of Fredericia by Christian IV. of Denmark, and his successor, Frederick III., determined about 1650 to make it a powerful fortress. Free exercise of religion was offered to all who should settle in the new town, which at first bore the name of Frederiksodde, and

FREDERICK

only received its present designation in 1664. In 1657 it was taken by storm by the Swedish general Wrangel, and in 1659, after the fortress had been dismantled, it was oc- cupied by Frederick William of Brandenburg. It was not till 1709-10 that the works were again put in a state of defence, and the place-even then continued to be of but little importance. In 1848 an attempt was made by the Danes to oppose the Prussians, who entered on May 3, and maintained their position against the Danish cannon- boats. During the armistice of 1848-9 the fortress was strengthened, and soon afterwards it stood a siege of two months, which was brought to a glorious close by a success- ful sortie. In memory of the victory several monuments lave been erected in the town and its vicinity, of which the most noticeable are the bronze statue of the Danish Land Soldier by Bissen (one of Thorwaldsen's best pupils), and the great barrow over 500 Danes in the cemetery of the Holy Trinity Church, with a bas-relief by the same sculptor. On the outbreak of the war of 1864, the fortress was again strengthened by new works and an entrenched camp; but the Danes suddenly evacuated it on 28th April after a siege of six weeks. The Austro-Prussian army partly destroyed the fortifications, and kept possession of the town till the conclusion of peace.

+ FREDERICK, in German Friepricu, the name, signi- fying Rich in Peace, borne by a considerable number,of European (principally German) sovereigns. The most important of these, including the compound names Fre- derick Augustus aud Frederick William, are noticed here in the following order:—the emperors, the electors of Brandenburg and kings of Prussia, the electors and kings of Saxony, and the electors palatine.

FREDERICK I. (1123-1190), surnamed by the Italians Barbarossa, Holy Roman emperor, aud one of the greatest of German sovereigns, was the son of Frederick the One-eyed of Hohenstaufen, duke of Swabia, and of Judith, daughter of Henry the Black, duke of Bavaria, and was boru most probably in 1123. He succeeded his father as duke of Swabia in 1147, and in the same year accompanied his uncle Conrad III. on his disastrous crusade. As in addition to his exceptional personal qualities Frederick possessed the advantage of uniting in himself the blood of the two great rival families, the Guelphine and the Ghi- belline, Conrad IIL, though possessing au infant son, nom- inated him as his successor. On the death of Conrad this choice was unanimously ratified by the assembly at Frank- fort, March 4 or 5, 1152, and on the 9th of the same month Frederick received the crown of Germany at Aix-la-Chapelle. During the reign of Conrad, the Italian and imperial rights claimed by the German kings had been almost in abeyance, and it was to establish their reality that Frederick devoted the chief energies of his life. After settling various dis- putes among the German princes, and making arrangements for an alliance with Manuel emperor of the East against King William of Sicily, he, in October 1154, descended with his army through the vale of Trent to hold the diet of his imperial feudatories on the plains of Roncaglia. Before this diet the Milanese had treated with contempt his messenger sent to warn them against continuing to oppress the citizens of Lodi; and when he witnessed after- wards, on his march to Piedmont, the desolation that had een caused by the Milanese, he began to sack and burn their dependencies, and after crossing the Po razed Tortona to the ground. Then having appeared, with the iron crown on his head, in the church of St Michael's, Pavia, he set out over the Apennines to receive the imperial crown at Rome. After apprehending Arnold of Brescia as an earnest of his intentions to support the papal cause, and adjusting certain ceremonial differences with the pope, he was crowned emperor June 18, 1155; but immediately after quelling

the insurrection in Rome which followed his coronation, he was compelled, by the sudden appearance of a pestilence in his army, to march towards Lombardy, and without accom- plishing more than the capture of Spoleto he disbanded his troops and returned home.

For the next three years a great variety of matters de- tained him in Germany. Immediately on his return from Italy he put vigorous measures into execution against the robber knights; and in September 1156 he reconciled Henry the Lion by the restoration of the duchy of Bavaria, while at the same time he pacified Henry Jasomirgott, his rival, by raising Austria to the rank of a duchy. Adelaide, whom he'married in 1147, he had divorced in 1153 on the pretext of kinship; and, having in 1156 married Beatrice, daughter of the count of Burgundy, he received at Besangon in 1157 the homage of the Burgundian nobles. In the same year he was successful in compelling King Boleslaus of Poland to acknowledge him as his feudal lord, obtained by persuasion the same allegiance from King Geisa of Hungary, and rewarded Duke Ladislaus of Bohemia for his faithful services by giving him the rank of a king. About this time he published a manifesto against the pretensions of the Pope to confer benejicia upon him; and when Frederick in the beginning of 1158 was preparing for a second campaign in Italy, the pope sent an embassy to explain that he did not use the word in its feudal sense.

Frederick's chief purpose in this expedition was to quell the pride of Milan. Descending into Italy by four different roads, with an army of 100,000 foot and 15,000 horse, he in 1158 laid siege to the city, which, after defying for a month his persistent and furious attacks, was compelled from scarcity of provisions to surrender, aud with humili- ating forms to take the oath of allegiance. He then held another diet at Roncaglia, at which, besides settling a number of standing disputes, he recovered the right of instituting podestas to administer justice in the cities, assumed the nomination of the consuls, and deprived the cities and barons of the right of going to war. The adoption of these regulations —which if within the legal prerogatives of the emperor had nevertheless fallen into abeyance, and were utterly opposed to the strong spirit of independence struggling into existence in the cities— may be said to mark the first stage of his waning influence in Italy. And a second stage was reached when, on the death of Pope Adrian IV. in 1159, he determined to support the anti-pope Victor IV.; for from that time he had to contend with the ceaseless opposition and intrigues of Pope Alexander III., who fulminated against him a sentence of excommunication, March 24, 1160. It is true that Frederick in 1162 was able to spread terror throughout Lombardy by the capture and demolition of Milan; but in 1164 the cities of

*Verona, Vicenza, Padua, Treviso, and Venice formed a defensive league, and expelled the podestas and other foreign op- pressors from their territories. In 1163 Frederick had punished the rebellion of Mainz against its archbishop by razing its walls and filling up its trenches ; but having, on the death of Victor IV., promoted the election of the new anti-pope*Pascal IIL, he was detained by fresh religious and political contentions in Germany till the end of 1166. Disregarding the embers of conflagration in the north of Italy, he now pushed on towards Rome, to which Alexander had returned the previous year. Doubtful as to the pro- priety of at once attacking the city, he laid siege to Ancona; but when he learned that the Roman citizens had rashly allowed themselves to be defeated at Tusculum, lie raised the siege, and going to Rome took forcible possession of part of the Leonine city, and attacked and captured the Vatican. On the following Sunday (August 1, 1167) the empress received in St Peter's the imperial diadem from Pascal III., and Frederick the circlet of gold IX. — 92*

which was the sign of patrician dignity. Meanwhile be- hind him the cities of Lombardy had formed their famous league ; even Lodi was forced to yield its assent to the alliance ; and Milan springing into existence almost as by the wand of an enchanter, gave evidence of its defiant and unquenchable hostility by the demolition of the castle of Trezzo, which contained the emperor's treasure. Even at Rome his position was far from enviable, for Alex- ander III, having taken refuge in the Colosseum, was prepared to offer a desperate resistance. Accordingly Frederick fell upon the curious expedient of proposing that both Alexander and Pascal should resign, and another pope be elected. 'The citizens clamorously supported the pro- posal, but Alexander prevented its accomplishment by sud- denly leaving Rome for Benevento. Immediately on his departure, and, to the superstitious fancies of the time, as if in token of the wrath of heaven at his expulsion, and at the sacrilegious violence done to the most sacred edifice of the holy city, suddenly, in the midst of a day of burning and sultry splendour, the whole German army with scarcely an exception was smitten by a pestilence of unexampled viru- lence, to which the terrors of superstition imparted both additional horror and a more deadly fatality. Frederick led the haggard and terror-stricken crowd of survivors with great

difficulty to Pavia, whence at the end of the year he set out for Germany attended by about 30 horsemen ; and at Susa he only saved himself from death at the hands of the citizens by escaping during the night on foot accompanied by two followers. For nearly seven years after this luckless flight he remained in Germany. On the death of Pascal III. in September 1168 he supported the new anti-pope Calixtus III., but by doing so he only lent additional vig- our to the Lombard league, who this year had founded the city which in honour of their patron Alexander III. they named Alexandria; and in 1173 they took an oath not to leave off waging war against the emperor till they drove him out of Italy. Resolved, however, on a final effort, Frederick, having collected an immense army, set out in October 1174 on his fifth and last Italian expedition. He burned Susa to the ground, and captured Asti; but failing in a treacherous attack on Alexandria, made after he had granted it a truce, he endeavoured to negotiate a peace with the League. Final terms could not, however, be agreed upon, and notwithstanding the crushing blow which his fortunes at this time sustained through the de- fection of Henry the Lion, he resolved when recruited by a new army from Germany to risk the battle at Lignano, which resulted in his total defeat, 29th May 1176. Having in this battle been crushed beneath his horse, he was believed to have fallen, either wounded or dead, into the hands of the confederates; but on the third day afterwards he arrived at Pavia unhurt, but so worn out by hunger and fatigue as to be scarcely recognizable. Finding his case now desperate, he at last agreed to acknowledge the ponti- ficate of Alexander, and also at Venice, 25th July 1177, concluded a truce of six years with the cities. He then turned his attention to Henry the Lion, who owned himself vanquished in 1181, and was banished to England. On the expiry of the treaty of Venice, the famous treaty of Con- stance was signed, 25th June 1183, by which, while the supremacy of the empire was formally recognized, the inde- pendent jurisdiction of the cities was substantially guaran- teed. Henceforth, Frederick resolved to rule Italy more by conciliation than by compulsion, and while re-establish- ing his influence in Lombardy by granting such favours to the Milanese as secured their lasting alliance and friendship, = virtually placed Sicily under his immediate government ice ng 2 marriage between Constance, heiress of that ae oe Henry his eldest son, who, having been

ing of the Romans in his infancy, received the

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crown of Italy on the day of his marriage, 27th June 1186, from the patriarch of Aquileia.

Having thus at last brought his long life-struggle to an honourable if not very triumphant close, it might have been expected that Frederick would now have been content to doff his armour, and to pass his remaining days in peace. But, hearing in 1187 of the victorious progress of Saladin against the Christians in Syria, his martial ardour was again kindled, and he resolved to enter the lists against the redoubtable Saracen conqueror. This purpose he was, however, unable to carry fully out, for after two successful battles in Asia Minor, he was drowned before reaching Syria while crossing a small river in Pisidia, June 10,

1130.

Frederick I. is said to have taken Charlemagne as his model; but the contest in which he engaged was entirely different both in character and results from that in which his great predecessor achieved such a wonderful temporary success. Though Frederick failed to subdue the republics, the failure can scarcely be said to reflect either on his prudence as a statesman or his skill as a general, for his ascendency was finally overthrown rather by the ravages of pestilence than by the might of human arms. In Ger- many his resolute will and sagacious administration sub- dued or disarmed all discontent, and he not only succeeded in welding tlie various rival interests into a unity of devotion to himself against which papal intrigues were comparatively powerless, but won for the empire a prestige such as it had not possessed since the time of Otto the Great. The wide contrast between his German and Italian rule is strikingly exemplified in the fact that, wlule ~~he endeavoured to overthrow the republics in Italy, he held in check the power of the nobles in Germany, by confer~~ ring municipal franchises and independent rights on the principal cities. Even in Italy, though his general course of action was warped by wrong prepossessions, he in many instances

manifested exceptional practical sagacity in deal- ing with immediate difficulties and emergencies. Possessing great physical beauty, frank and open manners, untiring and unresting energy, and a prowess which found its native element in difficulty and danger, he seemed the em- bodiment of the chivalrous and warlike spirit of his age, and was the model of all the qualities which then won highest admiration. Stern and ambitious he certainly was, but his aims can scarcely be said to have exceeded his prerogatives as emperor; and though he had sometimes recourse when in straits to expedients almost diabolically in- genious in their cruelty, yet his general conduct was marked by a clemency which in that age was exceptional. His quarrel with the papacy was an inherited conflict, not re- flecting at all on his religious faith, but the inevitable con- sequence of inconsistent theories of government, which had been created and could be dissipated only by a long series of events. His interference in the quarrels of the republics was not only quite justifiable from the relation in which he stood to them, but seemed absolutely necessary. From the beginning, however, he treated the Italians, as indeed was only natural, less as rebellious subjects than as conquered aliens ; and it must be admitted that in regard to them the only effective portion of his procedure was, not his ener- getic measures of repression nor his brilliant victories, but, after the battle of Lignano, his quiet and cheerful accept- ance of the inevitable, and the consequent complete change in his policy, by which if he did not obtain the great object of his ambition, he at least did much to render innoxious for the empire his previous mistakes.

The principal contemporary authorities for the reign of Frederick I. are the chronicle of Otto bishop of Freisingen, to which is pre- fixed a letter of Frederick containing a summary of the early events of his reign; the continuation of this chronicle from 1158 to 1160

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by Radevic, one of the canons of Otto ; the chronicle of Otto Morena of Lodi, continued from 1162 to 1167 by his son Acerbus ; and the life of Pope Alexander III. by the cardinal of Aragon. The chief modem writers are Muratori, Annali d Italia ; Sismondi, Histoire des Républiques Italiennes ; H. v. Biinau, Leben wnd Thaten Fried- riehs I., Leipsic, 1722; Cherrier,

[Histoire de la lutte des papes et des empereurs de la maison de Souabe, &c., 2d edition, Paris, 1856; F. von Raumer, Geschichte der Hohenstaufen und threr Zeit, 4th ed., Leipsic, 1871 ; P. Scheffer-Boichorst, Friedrichs letzter Streit mit der Curie, Berlin, 1866; K. Fischer, Der Kreuzzug Friedrichs I, Leipsic, 1870; H. Prutz, Kaiser Freidrich I, 3 vols., Dantzic, 1871-73; Fr. X. Wegele, Kaiser Friedrich I. Barbarossa, ein Vortrag, Nordlingen, 1871; Dettloff, Der erste Réimerzug Kaiser Friedrichs I. Gottingen, 1877; Bryce, Holy Roman Empire ; Milman, History of Latin Christianity , 0. Vignati, Storia diplo- matica della lega Lombarda, Milan, 1866; Teste, History of the Wars of Frederick I. and the Communes of Lombardy, English translation, 1877; and E. A. Freeman in his first series of Essays. (T. F. H.)

FREDERICK IL (1194-1250), Holy Roman Emperor, surnamed the Hohenstaufen, the most remarkable historic figure of the Middle Ages, grandson of the preceding, and son of Henry VI. and of Constance, heiress of the throne of Sicily, was born at Jesi, near Ancona, 26th December 1194. He was elected king of the Romans in 1196; and, his father having died 28th September 1197, he was in May 1198, crowned king of Sicily, his mother obtaining for him the recognition and support of Pope Innocent III by acknowledging the feudal supremacy of the papacy, by the sacrifice of certain ecclesiastical rights, and by the payment of a yearly tribute. Dying the same year, she bequeathed his guardianship to the pope ; but for some time after this, Sicily was the scene of hopeless political anarchy, and the custody of the young king at Palermo was the occasion of continual and complicated intrigues, and of a confused and protracted civil war which had very varying results. The pope could thus only fulfil his trust imperfectly, but the education of his ward, so far from suffering on this account, was exceptionally thorough and complete ; and the different nationalities with which he came into contact contributed each its quota to the instruction and development of his strong and many-sided character.

Though crowned in infancy king of the Romans, he actu- ally inherited from his father no other throne than that of Naples and Sicily. In 1208 he entered upon the per- sonal government of his kingdom, and in the following year he was married ~~to Constance of Aragon. About this time, Otto, second son of Henry the Lion, had, on account of the murder of Philip of Hohenstanfen~~

~~by Otto of Wittelsbach, obtained undisputed possession of the throne of Germany; but immediately after his coronation at Rome in 1209 the inevitable jealousy between pope and emperor led to the usual results, and when Otto was meditating the subjuga~~ tion of Naples and Sicily, he was met in 1211 by a bull of excommunication. At a diet held at Nuremberg in October of the same year it was resolved to offer the crown of Germany to the young king of Sicily. Innocent III. on certain conditions gave his sanction to the offer ; and to Frederick, even had he seen in it nothing to incite his imaginative ardour, it must have appeared almost in the form of an unexpected deliverance from impending rnin, Having therefore resolved to dispute his ancestral tlirone with his rival, he set out in the spring of 1212 on his romantic and hazardous quest. Landing at Genoa on the lst of May accompanied by only a few adherents, he made his way over the Alps by unfrequented passes to Coire, and learning at St Gall that Otto was about to occupy Constance, he by great good fortune was able to anticipate him by three hours, 'The town at once declared in Frederick's favour, and Otto, without seriously attempt- ing to resist his progress in southern Germany, retired to Saxony. In November of the same year Frederick

made a treaty with Philip of France, and in December he was elected king at Frankfort, and crowned at Mainz. By inherent force of character, aided by his unrivalled diplomatic skill and his bold and rapid movements, he had won success almost without striking a blow; and his task was at least denuded of all difficulty through Otto's disastrous defeat by Philip at Bouvines, near Tournay, 27th July 1214. Any further organized resistance was thus rendered impossible against the progress of the Hohen- staufen, who in July 1215 ascended the marble throne of Charlemagne at Aix-la-Chapelle, and received the silver crown. At a solemn ceremony which followed he took the cross; but even after the death of Otto in May 1218 he was fully occupied in establishing his influence in Germany. In 1220 he succeeded in obtaining the election of his son Henry to the German throne, but the favour was dearly rewarded by the charter which by the independent privi- leges it conferred upon the princes virtnally dissolved the unity of the kingdom. 'The election was contrary to a promise made to Pope Innocent III. to appoint Henry king of Sicily, but Pope Honorius IIL, anxious for the

success of the crusade, was pacified without much difficulty, and Frederick leaving Germany in the autumn of 1220 was crowned emperor at Rome on the 22d November, renew- ing at the same time his oath to set out on the crusade with all possible speed. His absence in Germany had permitted the growth of disorder and confusion in his southern king- dom ; and to restrain the licence of the Apulian nobles he now established at Capua a tribunal to revise their privileges, while, to deliver the Christians in Sicily from the attacks to which they were continually exposed from the Saracen niountain tribes, he transferred 2000 Saracens to Lucera, an expedient which also established in Italy a con- venient instrument of resistance to the papal power.

The departure of the crusade, at first fixed for 1223, was deferred till 1225, and even then it was found necessary to delay it for two years longer; but, his wife Constance having died in 1222, he gave a pledge that his ambition coincided with the papal wishes by marrying in 1225 Yo- lande, daughter of King John of Jerusalem ; and he also bound himself by heavy penalties to set out with a stipu- lated force in August 1227. The hostilities between him and the Lombard league, begun in 1226, were suspended through the intercession of Pope Honorius in February 1227, and the Lombards agreed to furnish a certain number of knights for the expedition. In March Honorius died, and was succeeded by Gregory IX., who on the very day of his accession addressed a new aud imperative warn- ing to the emperor against delay in the fulfilment of his

| oath. Frederick actually set out at the time agreed upon,

but returned three days afterwards, and, asserting as his reason a serious illness, permitted the armament to be dissolved, whereupon Gregory without further negotiation launched against him, September 30, the solemn bull of excommunication. The appeal to Christendom with which Frederick met the church's fulmination is remark- able in that, so far from contenting himself with defending his own conduct, he, besides denouncing the temporal pretensions of the pope as menacing the whole of Christen- dom with an "unheard-of tyranny," asserted that instead of rolling in wealth and aspiring to worldly influence the church's representatives ought to cultivate the simplicity and self-denial of the early Christians. In resolving to set out

on the crusade, notwithstanding his excommunication, Frederick was therefore actuated, not merely by the wish to take possession of a secular throne, or to demonstrate the sincerity of his purpose to keep his oath, but by the deter- mination to assert his right still to act as the temporal head of the church. His preparations were not delayed by the death of his wife Yolande in April 1228, and he set

sail from Otranto on the 29th June. Meanwhile, by securing the favour of the Frangipani and tle other Roman patricians, he procured the expulsion of Gregory from Rome; but the subtle spiritual influence of the papal ban was not affected by this seeming victory, and tidings of his excommunication reaching the Holy Land almost simul- taneously with his arrival, the Knights of the Temple and the Hospital refused to take part in the crusade. Frederick, however, by mere diplomatic tact succeeded in persuading the sultan of Egypt to agree to a treaty, by which the church obtained possession of Jerusalem and the holy places on granting to the Saracens, besides various other privileges, free access to Bethlehem; and on the 18th March 1229 he, without any religious ceremony, crowned himself with his own hands king of Jerusalem. Such a striking and unexpected success wrought almost imme- diately throughout Europe a complete revolution of opinion in his favour; and when shortly afterwards he succeeded in defeating the papal forces which had invaded his dominions, the pope deemed it expedient to come to terms, and released him from the ban of excommunication 28th August 1230.

In the interval of peace which followed, Frederick occupied himself in forming for his Sicilian kingdom a code of laws, the main features of which were the superseding of irresponsible feudal and ecclesiastical jurisdictions by a uniform civil legislation administered under direct imperial control ; the toleration extended to Jews and Mahometans, and the severe enactments against schismatics; the pro- visions for the emancipation of the peasants ; the regula- tions for the encouragement of commerce, which contain perhaps the first enunciation of the modern doctrine of free trade; and the establishment of annual parliaments, consisting of barons, prelates, and representatives from the towns and cities. He also devoted much of his

attention to the advancement of learning and of the arts and sciences. The university of Naples, founded in 1224, but whose operations had been for some time suspended, he now restored and liberally endowed ; at the medical schools of Salerno he provided Arab, Latin, Greek, and Hebrew teachers for the students of these different nationalities ; and he caused the translation into Latin of the works of Aristotle and of other philosophers both Greek and Arabic. He himself was leamed both in Mussulman arts and sciences and in Christian scholasticism and philo- sophy ; he knew Latin, Greek, French, German, Arabic, and Hebrew. He had a great interest in architecture, and he fostered the infaucy of Italian sculpture and painting; he and his minister Peter de Vinea were among the first culti- vators of Italian poetry; he also devoted much attention to natural history, and besides forming large collections of rare and curious avimals wrote a treatise on the art of falconry, which shows a minute acquaintance with the habits of birds. With the influences of Western civiliza- tion there was conjoined at his castles on the Apulian shore an Oriental luxury and splendour; and in the harem of the Christian emperor his accusers found a con- venient corroboration of their insinuation regarding his secret enmity to the Christian faith.

The short period of peaceful progress was broken in 1234 by the rebellion of Frederick's son Henry, whio, secretly instigated by the pope, joined the Lombard league. The revolt was, however, suppressed on the arrival of the emperor in Germany in 1235, and Henry was sent as a prisoner to the castle of San Felice in Apulia. In the same year oe married Isabella, sister of Henry III. of England. ie second son of the emperor, was chosen king by the appa in January 1237; and Frederick, after les ane defeat of the Lombards at Cortenuova,

er 27th of this year, appointed, in October 1238,

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his natural son Enzio king of Sardinia. Alarmed at the success of the imperial arms, Gregory, in March 1239, renewed against the emperor the ban of excommunication ; but the latter advancing into the states of the

church, cap- tured Ravenna, Faenza, and Benevento; and after gaining, through the help of Enzio, a brilliant victory over the Geu- oese fleet, was nearing Rome when Gregory died August 21,1241. After the short pontificate of Celestine IV. and an interregnum of eighteen mouths, Cardinal Sinibald Fiesco, up to this time one of the emperor's chief friends, became pope as Innocent IV. in June 1243. At once negotiations were entered into for an arrangement between them ; but the papal demands were too humiliating to per- mit of their acceptance ; and Innocent, suddenly making his escape to Lyons, not only renewed, July 17, 1245, the church's ban against the emperor, but declared his throne vacant. Henry Raspe of Thuringia, elected by the papal party king of the Romans in May 1246, gained a victory over Conrad at Frankfort on the 5th August, but, suffering a total defeat near Ulm, February 17, 1247, died shortly afterwards ; and between his successor William of Holland and Conrad the struggle was carried on with indecisive results. In this same year Peter de Vinea, the minister and most intimate friend of Frederick, was discovered plotting against his life; on 18th February 1248 Frederick's army in Italy was surprised and utterly routed by a sally of the citizens of Parma; in May 1249 his son Enzio was defeated and captured by the Bolognese; and, although in 1250 various successes in the north of Italy and the prospect of new and powerful alliances seemed to promise him a speedy and complete triumph, his strength had been so worn out by his arduous struggle, and his spirit so broken by such a succession of disasters that he died somewhat suddenly on the 13th December, at his hunting lodge of Fiorentino (also called Firenzuola), near Lucera.

The general contemporary opinion regarding Frederick II. is expressed in the words stupor mundi; and whatever amount either of approbation or censure may be bestowed upon his career, wonder and perplexity are the predominant sentiments which its contemplation even yet awakens. It was not merely that his mental endowments were excep- tionally great, but that, owing to his mingled German and Italian blood, the various influences to which he was sub- jected in his early years, the strange times in which he lived, and the events with which destiny had connected him, his character was exhibited in such multiform aspects and in such an individual and peculiar light that in history we look in vain for his parallel. As to the nature of his religious faith there are no data for arriving at a certain

conclusion. The theory of M, Huillard-Bréholles that he wished to unite with the functions of emperor those of a spiritual pontiff, and aspired to be the founder of a new religion, is a conjecture insufficiently supported by the isolated facts and statements and the general considerations on which it is made to rest. Iudeed the character of Frederick seems to have been widely removed from that of a religious enthusiast; and at every critical period of his life he was urged to daring and adventurous projects rather by external circumstances than by either the prompt- ings of ambition or the consciousness of any divine com- mission, On any theory his enactments in reference to religion are, however, somewhat enigmatical. His perse- cution of heretics may not have been entirely due to a desire to vindicate his orthodoxy before his Christian subjects; but although his ideas regarding freedom of conscience were either inconsistent or hampered in their action by a regard to expediency, his toleration of the Jews equally with the Mahometans prevents us ascrib- ing his toleration of the latter either to secret sym- pathy with that form of faith or wholly to political

considerations. He was in all probability a belicver in astrology, and he shared in many of the other super- stitious ideas of his time; but there is no indication that he dreaded any other than temporal consequences from the ban of the church; and if certain features of the Christian system had perhaps an attraction for him, yet both from his reported jests and serious conversation it is evident that his Christian belief, if he possessed one, bore little resemblance to that current in his age. In the ex- travagant accusations of cruelty, perfidy, and licentiousness with which the church has assailed his memory there is some nucleus of truth; but a candid judgment will arrive at the conclusion that few exposed to such pernicious influences have shown such a decided preference for goodness and truth, and that there have been almost none who against such immense difficulties have wrought to such wise pur- pose in behalf of human progress and enlightenment, or have fought such a resolute and advantageous battle in behalf of spiritual freedom.. In this contest he was not an immediate victor; and indeed the dissolution of the imperial power in Italy which followed bis death must be chiefly traced to the fact that his policy was governed by prin- ciples too much in advance of his age. But although the beneficial

*results of his reign are not at a first glance so pal- pable and undeniable as some of its injurious results, yet so far was he from being a mere untimely precursor of the new era which dawned in Europe more than two ccn- turies after his death that,*perhaps in a greater degree than any other, he was instrumental in hastening its arrival, both by sowing the first seeds of the Renaissance in Italy, and by giving to the old system of things a shock which was felt throughout Europe, and continued to work silently long after its reverberations had passed away.*

After the death of Frederick the followers of Abbot Joachim continued to assert that he was still alive, and both in Sicily and Germany impostors sprang up who attempted to personate him. The superstition that the emperor continued to haunt the castle of Kyffhauser," at one time thought to refer to Frederick Barbarossa, has now been shown to have had its origin in the tradition that Frederick II. still lived after he had ceased to exercise the functions of emperor.!

The contemporary documents bearing on the reign of Frederick are unusually numerous. Most of those not contained in the Federa of Thomas Rhymer, the Annales eceles. post Baronium of Raynaldus, or the historical collections of Muratori, Bouquet, Bohmer, or Pertz will be found in the great work of Huillard- Bréholles, Historia Diplomatica Frederiei Sceundi, 12 vols., Paris, 1852-1861. The principal ancient chronicles are the Historia Major Anglic of Matthew Paris ; the chronicle of the Franciscan monk Salimbene, first published in Monumenta ad provincias Parmensem et Plaeentinam spectantia, Parma, 1857; the Life of Gregory IX., by the Cardinal of Aragon ; the Annales Mediolanenses 1230-1402 ; the Chronicon Rerum per Orbem Gestarwm (1159-1242) of Richard de San Germano; and the Chrontcon Placentinum and Chronicon de rebus in Italia gestis, published in one volume by M. Huillard- Bréholles, Paris, 1856, the former printed from the copy in the Imperial Library, Paris, and the latter never before published, and printed from the copy in the British Museum. The chief modern authorities are Muratori, Cherrier, Von Raumer, Milman, Freeman as above under Freperick J.; Giannone, Storia del Regno dt Napoli, 1723 ; Hoeffer, Kaiser Frederich II., Munich, 1844 ; the great work of Huillard-Bréholles, and also his Vie et Correspondance de Pierre de la Vigne, Paris, 1866; T. L. Kington, History of Frederick the Second,

Emperor of the Romans, London, 1862; Schirrmacher, Kaiser Friedrich II., 4 vols., Gottingen, 1859 -65; Winkelmann, Geschiehte Kaiser Friedrichs II. und seiner Reiche, vol. i., Berlin, 1863, vol. ii., Revel, 1865, and a continuation for the years 1239-41 in the Forschungen zur deutschen eschichte, xi. 261-294, 521-566; A. del Vecchio, La legislazione di Federico Tl. Imperatore, Turin, 1874; and Reuter, Geschichte der religzisen Aufklérung im Méttelalter, vol. ii., Berlin, 1877. (T. F. B.) eee

1 Regarding the. Friedrichsage, see papers by C. Voigt, 5. Riezler, and M. Brosch, in the 26th, 32d, and 35th volumes of H. von Sybel's Historische Zeitschrift.

FREDERICK ITIL (1286-1330), surnamed the Fair,

son of King Albert I. of Germany, duke of Austria, and rival for the German crown with Louis IV. the Bavarian. See Louis IV.

FREDERICK IV. (1415-1493), German king, as em-

peror Frederick III., son of Duke Ernest of Styria, was born at Innsbruck, September 21, 1415. brother Albert the Prodigal he assumed in 1435 the govern- ment of Styria, Cariuthia, and Carniola, and, having been elected in 1440 to succeed Albert II. as king of Germany, he was crowned at Aix-la-Chapelle in 1442. his chief attention to the study of astrology, alehemy, and botany, and was so undecided in his purposes and so de- ficient in energy and force of character that he almost pas- sively submitted to the anarchy and petty external wars

Along with his

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which during the wholc of his reign disturbed the peace of the empire. At the beginning of his reign he was attacked

by his brother Albert, who reigned in Upper Austria, and he found it necessary to pacify him by the payment of a large sum of money; in 1443 he was attacked hy the Swiss,

and called to his aid the Armagnacs from France, who, how- ever, after their defeat by the Swiss at St Jakob in 1444,

joined his enemies against him, and in 1449 le was com- pelled to agree to an unfavourable treaty ; from 1445 to 1452

Austria was invaded by the Hungarians ; in 1447 Sforza successfully usurped the government of Milan; from 1449 to 1456 a war was carried on between Albert of Branden- burg and the city of Nuremberg assisted by the " Hidge- nossen ;" and from 1449 to 1462 a succession war raged in the Rhenish Palatinate. Frederick, who licped by cul- tivating the friendship of the Papacy to win back some of the ancient imperial rights, concluded in 1448 the con- cordat of Vienna with Pope Nicholas V., and was crowned emperor in 1452. On the death of Ladislaus duke of Austria in 1457, he laid claim to the whole of Austria, and also to the crown of Bohemia and Hungary ; but not enly was George Podiebrad made king of Bohemia and Matthias Corvinus king of Hungary, but Sigismund of Tyrol obtained part of Carinthia, and Frederick's brother Albert, besides seizing Upper Austria in 1462, took posses- sion of Vienna. Onthe death of Albert in 1463, Frederick obtained possession of the whole of Austria, with the exception of Carinthia. Notwithstanding that Frederick in 1468 went to Rome to concert measures with the pope against the Turks, they in 1469 penetrated without resist- ance to Carniola, and in 1475 advanced nearly to Salzburg. In 1473 he suddenly broke off a negotiation with Charles the Bold at Treves for the marriage of Charles's daughter with his son Maximilian, but the marriage finally took place after the death of Charles, and Maximilian thus be- came king of the Netherlands. The changefuland crooked policy of the emperor in reference to Poland and Hungary led the kings of both countries to turn their arms against him, and in 1485 Matthias of Hungary drove him from his hereditary dominions, of which he did not regain possession till after the death of Matthias in 1490. Frederick died in 1493.

See Chmel, Regesta Friderict IV., Vienna, 1838-40; Kurz, Ocsterreich unter Kaiser Friedrich IV., Vienna, 1812; Chmel, Geschichte Kaiser Friedrichs

IV., Hamburg, 1840; Arehiv fir

Ocsterr. Geschichtsquellen, vols. x. and xi.; Miller, Reiehstagsstaat unter Friedrich IIL, 3 vols.

FREDERICK WILLIAM (1620-1688), elector of Bran- denburg, was born in Berlin in 1620. He is usually called "The Great Elector," and next to Frederick the Great he was tlie chief founder of the power of Prussia. A man of immense energy and determination, he devoted himself to his country, missing no opportunity, whether by intrigue or by force of arms, of adding to its extent and its influence. When at the age of twenty (1640) he succeeded to the

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electorate, he found it almost ruined. His father, George | France; but he had ultimately to cultivate the friendship

William, being of feeble aud vacillating character, had been unable to prevent the inroads of the contending armies during the Thirty Years' War; and they had laid waste nearly the whole land, and treated the inhabitants with horrible cruelty. Frederick William, by skilful nianage- ment, succeeded in getting rid of these barbarous hordes, and by slow degrees collected an army of about 30,000 men, which very effectually secured for him the respect of his neighbours. It was universally admitted that he was the true heir of the dukes of Pomerania, whose line died out in 1637; but at the Peace of Westphalia the lion's share of their territory was ceded to Sweden, Frederick William receiving only the eastern half of the country, shorn of Stettin. But he also obtained the bishoprics of Halberstadt, Minden, and Camin, with a promise of the archbishopric of Magdeburg. In 1655 war broke out between Sweden and Poland. Charles Gustavus, king of Sweden, compelled Frederick William to join him, and to do homage for Prussia, which had formerly been held in fief of Poland. After a battle of three days at Warsaw, the Poles were defeated (1656). In the following year the elector turned round and concluded an alliance with the Poles, receiving, by the treaty of Wehlau, in return for the promise of his aid an

acknowledgment of the complete independence of Prussia. Charles Gustavus uttered fierce threats of vengeance, but was prevented by sudden death from attempting to execute them. Frederick William had much trouble in inducing the states of Prussia to do homage to him as their sole lawful sovereign ; but by a happy mingling of severity and kindness, he overcame in the end all opposition. As duke of Prussia he was now an absolutely independent sovereign, although still owing allegiance to the emperor for his other dominions. In 1666 he received, by the settlement of the Jiilich-Cleve dispute, the duchy of Cleve proper, and the counties of Mark and Ravenstein; while Jiilich and Berg were to fall to Brandenburg in the event of the Pfalz-Neuburg line dying out. When Louis XIV. invaded the Netherlands in 1674, Frederick William saw the danger which threatened Ger- many, and his own territories in particular; he therefore persuaded the emperor, various German princes, and the king of Denmark to form an alliance against the French. He soon withdrew from this contest, but in the war which began with the second French invasion of the Netherlands in 1674 he took a leading part. The Swedes sided with France, and were persuaded by Louis XIV. to invade Brandenburg, which they easily overran and devastated. The elector was unable to leave the seat of war for some time, but at last, in the summer of 1675, set out from Franconia, hastening forward with his cavalry, directing the infantry to follow as speedily as possible. Halting at Magdeburg, he heard that the Swedes were divided into tliree parties, and that the middle party was not more than forty miles off. Although overtaken only by a small body of his infantry, he rapidly advanced on this middle party, and on June 18, at Fehrbellin, after a severe struggle, de- cisively defeated it. The rest of the Swedes were then easily disposed of. He drove them not only from Brandenburg but from Pomerania, of which he became complete master. Between three and four years afterwards (abont Christmas, 1678) they invaded Prussia, threatening Konigsberg. In the dead of winter Frederick started from Berlin with a powerful force, and in the middle of January 1679 finally beat them, crossing the Frische Haff with 4000 men on sledges. After all, however, he did not obtain Pomerania, for when the peace of St Germain en-Laye was concluded in 1679, Louis XIV. insisted on its being restored to his ally, the king of Sweden. Frederick William, indignant at Austria for allowing this, maintained for a time an alliance with

of the emperor, from whom he hoped to obtain the Silesian principalities of Liegnitz, Brieg, and Woblau, which, after 1675, he claimed as his by inheritance. He received the circle of Schwiebus, in Silesia (1686), on condition that he should withdraw his claim and send 8000 men to the help of the emperor in his war with the Turks. Two years afterwards he died. Although famous as a soldier, he was even greater as an administrator. He was tle most econ- omical ruler of his age, yet did no injustice to any branch of the state service. Among the most important of his public works may be named the canal between the Oder and the Spree, which still bears his name. After the revocation of the edict of Nantes, he welcomed large numbers of French refugees to his dominions; and long before that time he had offered every encouragement to Flemish settlers, thus giving a powerful impulse to industry and commerce. He was twice married,—his first wife, Louise Henrietta, being a pious and energetic lady, endowed with so clear and pene- trating an understanding that her husband took no import- ant step without consulting her.

See Puffendorf, De rebus gestis Fridcrict Wilhelmi Magni (Berlin, 1695); Forster, Geschichte Friedrich Wilhelms (4th ed., Berlin,

1855); W. Pierson, Der Grosse Kurfiirst (Berlin, 1873); Carlyle, History of Friedrich II. of Prussia.

FREDERICK I. (1657-1713), the first king of Prussia, was born at Konigsberg, 1657. He was the son of the Great Elector by lis first marriage. In cousequence of a fall from the arms of his nurse his spine was so seriously injured that he was deformed for life. His stepmother intrigued against him incessantly in the interests of her children; and she succeeded in persuading her husband to make a will whereby Frederick should receive only the electoral title and the electoral lands, the remaining territories being divided among his half-brothers. On his accession in 1688 this will was set aside, with the sauction of the emperor, whose support he had obtained beforehand by signing away in his father's lifetime his rights in Schwiebus, a proceeding which, he afterwards maintained, restored his claim to the Silesian principalities. Frederick, having a strong love of pomp and show, strove hard to make his court an imitation of that of Louis XIV. Although without his father's firm- ness and energy, he seized every

occasion of increasing his dominions by purchase ; and he obtained, partly in virtue of certain claims inherited from lis mother, partly through the infinence of William ITI. of England, the principality of Neufchatel. It had been the intention of the Great Elector to give William III. vigorous support both in his struggle for the English crown and in the wars with France which were seen to be inevitable. Frederick gave effect to this purpose, and his troops played an important part in the battle of the Boyne. In the course of his reign he exercised considerable intluence on European politics by placing auxiliary forces at the disposal of friendly princes. The accession of Augustus the Strong of Saxony to the throne of Poland fired his ambition, and for years he endeavoured to induce the emperor Leopold I. to recognize him as king of Prussia. At last, in November 1700, the emperor con- sented, insisting, however, on various strict conditions, one of which was that in the approaching war of the Spanish succession Prussia should contribute a force of 10,000 men to the Austrian army. Immediately after receiving the im- perial sanction, Frederick started with his whole court for Konigsberg, where, on January 18, 1701, with much cere- mony he crowned himself. He sent 20,000 men into the war of the Spanish succession, and a portion of them did excellent service at the battle of Blenheim. In 1706 Prince Leopold of Dessau led 6000 Prussians to victory at Turin. Frederick died on the 25th February, 1713. By his extravagance he not only exhausted the treasure amassed

by his father, but burdened his country with heavy taxes. He was not, however, an unpopular sovereign, and by mak- ing Prussia a kingdom he undoubtedly advanced it several stages towards its future greatuess, He founded the uni- versity of Halle aud the Berlin Academy of Sciences, and was fond of protecting enlightened men who suffered per- secutiou. He was three times married, his second wife, Sophie Charlotte, sister of George I. of England, being well known as the friend of Leibnitz and as one of the most cultivated princesses of the age.

See Puffendorf, De rebus gestis Frideriet III. (Berlin, 1734); W. Hahn, Friedrich, der erste Kénig von Prewssen (3d ed., Berlin, 1876); Carlyle, History of Friedrieh IT. of Prussia.

FREDERICK WILLIAM I. (1688-1770), king of Prussia, son of Frederick I. by his second marriage, was born in 1688, He spent a considerable time in early youth at the court of his grandfather, the elector of Hanover. On his return to Berlin he was placed under General von Dohna, who trained him to the energetic and regular habits that ever afterwards characterized him. He was soon imbued with a passion for military life, and this was deepened by acquaintance with the duke of Marlborough and Prince Eugene, whom he visited during the siege of Tournay. In nearly every respect he was the opposite of his father, having frugal, simple tastes, a passionate temper, and a determined will. He intensely disliked the Freuch, and highly disapproved the imitation of their manners by Frederick I. and his courtiers. When he mounted the throne, his first act was to dismiss from the palace every unneces- sary official, and to regulate the royal household on prin- ciples of the strictest parsimony. In 1715 he was forced, in alliance with Russia, Saxony, and Denmark, into a war with Charles XII. of Sweden, in consequence of which, in return for two million thalers paid to Sweden, he obtained the islands of Wollin and Usedom, Stettin, and part of Swedish Pomerania. This was his only war. All through his reign he strenuously insisted on his right to Jiilich and Berg in the event of the Pfalz-Neuburg line dying out (which it seemed certain to do), and his anxiety respecting these duchies gives the key to most of his foreign policy. For some time he inclined to an understanding with Eng- land and Hanover; but in 1726 he formed an alliance with Austria, and in the Polish war of succession (1733-35) aided her with 10,000 men. Ultimately, however, he per- ceived that the emperor was not acting honourably by him, and withdrew fron the alliance, occupying himself solely with the internal affairs of hiskingdom. He despised many things which the modern world holds in high esteem, and was often coarse, violent, and fond of hideous practical jokes. Nevertheless Prussia profited immensely by his reign. He saw the necessity of rigid economy not only in his private life but in the whole administration of the state ; and the consequence was that he paid off the debts in- curred by his father, and left to his successor an overtlow- ing treasury. He did nothing for the higher learning, and even banished the philosopher Wolf at 48 hours' notice, "on pain of the halter," for teaching, as he believed, fatalist doctrines ; but he established many village schools, and he encouraged industry by every means in his power, particu- larly agriculture. Under him the nation flourished, and although it stood in awe of his vehement spirit, it

respected him for his firmness, his honesty of purpose, and his love of justice. He was devoted to his army, the number of which he raised from 48,000 to 83,500 ; and there was not in existence a more thorouglily drilled or better appointed force. The Potsdam guard, made up of giants collected from all parts of Europe, sometimes kidnapped, was a sort of toy with which he amused himself. The reviewing of his troops was his chief pleasure ; but he was also fond of meeting his friends in the evening in what he called his

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“tobacco college,” where he and they, amid clouds of tobacco smoke, discussed affairs of state. He died on the 3lst May 1740, leaving behind him his widow, Sophie Dorothea of Hanover, and a numerous family.

See Morgenstern, Ueber Friedrich Wilhelm I. (Brunswick, 1793); J. C. Droysen, Friedrich Wilhelm I., Kénig von Preussen (2 vols., Leipsic, 1869); Carlyle, History of Friedrich II. of Prussia.

FREDERICK II. (1712-1786), king of Prussia, born on the 24th January 1712, was the son of Frederick William I., and is usually known as Frederick the Great. He was brought up with extreme rigour, his father devising a scheme of education which was intended to make him a hardy soldier, and prescribing for him every detail of his conduct. So great was Frederick William’s horror of every- thing which did not seem to him practical, that he strictly excluded Latin from tle list of his son’s studies. Frederick, however, had free and generous impulses which could not be restrained by the sternest system. Encouraged by his mother, and under the influence of lis governess Madame de Roucoulle, aud of his first tutor Duhan, a French refugee, he acquired an excellent knowledge of French and a taste for literature and music. He even received secret lessons in Latin, which his father had invested with all the charms of forbidden fruit. As he grew up he became extremely dissatisfied with the dull and monotonous life he was com- pelled to lead; and his discontent was heartily shared by his sister, Wilhelmina, a bright and intelligent young princess for

whom Frederick had a warm affection. F’re- derick William, seeing the divergence of his son’s tastes from his own, gradually concejved for him an intense dislike, which often found expression in violent outbursts of anger. So harsh was lis treatment that Frederick frequently thought of running away aud taking refuge at the court of his uncle, George IL of England; and he at last resolved to do so during a journey which he made with the king to South Germany in 1730, when he was eighteen years of age. He was helped by his two friends, Lieutenant Katte and Lieutenant Keith; but by the imprudence of the former the secret was found out. Frederick was placed under arrest, and the kiug abused him sv cruelly on board a yacht at Frankfort that some courtiers had to interfere, and to separate them. Warned by Frederick, Keith escaped; but Katte delayed his flight too long, and a court martial decided that he should be punished with two years’ fortress arrest. The king changed this sentence into one of death, and the young soldier was executed outside the fortress of Ciistrin, in which Frederick was kept aclose prisoner. On the way to the place of execution Katte had to pass the crown prince’s window. ‘“ Pardonnez moi, mon cher Katte,” cried Frederick, who was broken-hearted at the fate he had brought upon his friend. ‘“ La mort est douce pour un si aimable prince,” replied Katte. The same court martial which had judged him decided that, as a lieutenant-colonel attempting to desert, the crown prince had incurred the legal penalty of death. For some time the king actually thought of giving effect to the sentence ; and he at last re- lented only in consequence of grave expostulations from the emperor and the kings of Sweden and Poland.

For about fifteen months Frederick now lived in the town of Ciistrin, having an establishment of his own, but serving as the-youngest councillor at the Government board there. He took great care not to offend his father, and was partially restored to favour. In 1732 he was made colonel commandant of a regiment in Ruppin, and in the following year he married, in obedience to the king’s orders, the Princess Elizabeth Christina, daughter of the duke of Bruuswick-Bevern. The palace of Rheinsberg in the neigh- bourhood of Ruppin was built for him, and there he lived until he succeeded to the throne. ‘These years were perhaps the happiest of lis life. He discharged his duties with so

much spirit and so conscientiously that he ultimately gained the esteem of Frederick William, who no longer feared that he would leave the crown to one uuworthy of wearing it. At the same time the crown prince was able to indulge to the full his personal tastes. He carried on a lively corre- spondence with Voltaire and other French men of letters, and was a diligent student of philosophy, history, and poetry. 'Two of his best known works were written at this time,—Considérations sur Vétat présent du corps politique de Europe and his Anti-Macchiavel. In the former he calls attention to the growing strength of Austria and France, and insists on the necesssity of some third power, by which he clearly means Prussia, counterbalancing their excessive influence. 'The second treatise, which was issued by Voltaire in Hague in 1740, contains a generous exposition of some of the favourite ideas of the 18th century philo- sophers respecting the duties of sovereigns.

In 1740 he became king. He maintained all the forms of governmeut established by his father, but ruled in a far more liberal and enlightened spirit ; he tolerated every forin of religious opinion, granted considerable freedom to the press even in political discussion, was most careful to secure an exact and impartial administration of justice, and allowed every one with a genuine grievance free access to his presence. The Potsdam regiment of giants was dis- banded, but the real interests of the army were as carefully studied by Frederick as by Frederick William. On the year of his accession, the emperor Charles VI. died. Frederick at once began to make extensive military prepara- tions, and it was soon clear to all the world that he intended to enter upon some serious enterprise. He had inade up lis mind to take possession of Silesia. For this resolution he is often abused still by historians, and at the time he had the approval of hardly any one out of Prussia. He himself, writing of the scheme in his A/émoires, laid no claim to lofty motives, but candidly confessed that "it was a means of acquiring reputation and of increasing the power of the state." He firmly believed, however, that he had in- herited lawful claims to the Silesian principalities ; and although his father had recognized the Pragmatic Sanction, whereby the hereditary dominions of Charles VI. were to descend to his daughter, Maria Theresa, Frederick iusisted that this sanction could refer only to lauds which rightfully belonged to the house of Austria. He could also urge that, as Charles VI. had not fulfilled the engagements by which Frederick

William's recoguition of the Pragmatic Sanction had been secured, Prussia was freed from her obligation. Frederick cannot fairly be charged with having let loose the elements of war which desolated Europe during the next few years, for, independently of him, the elector of Bavaria instantly protested against the Pragmatic Sanction, and there can be no doubt that in any case France would have taken advantage of so favourable a chance of breaking the power of Austria.

Frederick sent an ambassador to Vienna, offering, in the event of his rights in Silesia being conceded, to aid Maria Theresa against her enemies. The queen of Hungary, who regarded the proposal as that of a mere robber, haughtily declined ; whereupon Frederick immediately invaded Silesia with an army of 30,000 men. His first victory was gained at Mollwitz on the 10th of April, 1741. Under the im- pression, in consequence of a furious charge of Austrian cavalry, that the battle was lost, he rode rapidly away at an early stage of the struggle,—a mistake which gave rise for a time to the groundless idea that he lacked personal courage. A second Prussian victory was gained at Chotusitz, near Czeslau, on the 17th May 1742, by which time Frederick was master of all the fortified places of Silesia. Maria Theresa, in the heat of her struggle with France and the elector of Bavaria, now Charles VII., and

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pressed by England to rid herself of Frederick, concluded with him, on the 11th June 1742, the peace of Breslau, conceding to Prussia Upper and Lower Silesia as far as the Oppa, together with the county of Glatz. Frederick made good use of the next two years, fortifying his new territory, and repairing the evils inflicted upon it by the war. By the death of the prince of East Friesland without heirs, he also gained possession of that country. He knew well that Maria Theresa would not, if she could'help it, allow him to remain in Silesia; accordingly, in 1744, alarmed by her victories, he arrived at a secret understanding with France, and pledged himself, with Hesse-Cassel and the palatinate, to maintain the imperial

rights of Charles VIT., and to de- fend his hereditary Bavarian lands. Frederick began the second Silesian war by entering Bohemia in August 1744, and taking Prague. By this brilliant but rash venture he put himself in great danger, and soon had to retreat; but in 1745 he gained the battles of Hohenfriedberg, Sorr, and Hennersdorf; and Leopold of Dessau (" Der alte Dessauer") wou for him the victory of Kesselsdorf in Saxony. The latter victory was decisive, and the peace of Dresden (De- cember 25, 1745) assured to Frederick a second time the possession of Silesia.

Frederick bad thus, at the age of thirty-three, raised him- self to a great position in Europe, and henceforth he was tlle most conspicuous sovereign of his time. He was a thoroughly absolute ruler, his so-called ministers being mere clerks whose business was to give effect to his will, To use his own famous phrase, however, he regarded himself as but "'thefirst servant of thestate ;" and during thenext eleven years he proved that the words expressed his inmost con- viction and feeling. All kinds of questions were submitted to him, important and unimportant; and he is frequently censured for having troubled himself so much with mere details. But in so far as these details related to expendi- ture he was fully justified, for it was absolutely essential for him to have a large army, and with a small state this was impossible unless he carefully prevented unnecessary outlay. Being a keen judge of character, he filled the pub- lic offices with faithful, capable, energetic men, who were kept up to a high standard of duty by the consciousness that their work might at any time come under his strict supervision, The Academy of Sciences, which had fallen into contempt during his father's reign, he restored, infusing into it vigorous life; and he did more to promote elemen- tary education than any of his predecessors. He made canals between the Oder and the Elbe, and the Oder and the Havel, and all kinds of manufacture, particularly silk manufacture, owed much to his encouragement. To the army he gave unremitting attention, reviewing it at regular intervals, and sternly punishing negligence on the part of the officers. Its numbers were raised to 160,000 men, while fortresses and magazines were always kept in a state of readiness for war. The influence of the king's example was felt far beyond the limits of his immediate circle. The nation was proud of his genius, and displayed something of his energy in all departments of life. Lessing, who as a youth of twenty came to Berlin in 1749, composed enthusi- astic odes in his

honour, and Gleim, the Halberstadt poet, wrote of him as ofa kind of demi-god. These may be taken as fair illustrations of the popular feeling long before the Seven Years' War.

He despised Germau as the language of boors, although it is remarkable that at a later period, in a French essay on German literature, he predicted for it a great future. He habitually wrote and spoke French, and had a strong ambi- tion to rank as a distinguished Freuch author. Nobody can now read his verses, but his prose writings have a certain calni simplicity and dignity, without, however, giving evi- dence of the splendid mental qualities which he revealed in

practical life. To this period belongs his Alémotres pour servir & Vhistotre de Brandebourg, and his poem L'Aré de la Guerre. The latter, judged as literature, is intolerably dull; but the former is a narrative of seme value, throwing considerable light on his personal sympathies as well as on the motives of important epochs in his career. He con- tinued to correspond with French writers, and induced a number of them to settle in Berlin, Maupertuis being pre- sident of the Academy. In 1752 Voltaire, who had re-peatedly visited him, came at Frederick's urgent entreaty, and received a truly royal welcome. The famous Hirsch

trial, and Voltaire's vanity and caprice, greatly lowered him

in the esteem of the king, who, on his side, irritated his guest by often requiring him to correct bad verses, and by making him the object of rude banter. The publication of Doctor Akakia, which brought down upon the president of the Academy a storm of ridicule, finally alienated Fre- derick; while Voltaire's wrongs culminated in the famous arrest at Frankfort, the most disagreeable elements of which were due to the misunderstanding of an order by a subordinate official.

The king lived as much as possible in a retired mansion, to which he gave the name of Sanssvuci,—not the palace so called, which was built after the Seven Years' War, and was never a favourite residence. He rose regularly in summer at five, in winter at six, devoting himself to public business till

about eleven. During part of this time, after cotfee, he would aid his reflections by playing on the flute, of which he was passionately fond, being a really skilful performer. At eleven came parade, and an hour afterwards, punctually, dinner, which continued till two, or later, if conversation happened to be particularly attractive. After dinner he glanced through and signed cabinet orders written in accor- dance with his morning instructions, often adding marginal notes and postscripts, many of which were in a caustic tone. These disposed of, he amused himself for a couple of hours with literary work; between six and seven he would con- verse with his friends or listen to his reader (a post held for some time by La Mettrie); at seven there was a concert ; and at half-past eight he sat down to supper, which might go on till midnight. He liked good eating and drinking, although even here the cost was sharply looked after, the expenses of his kitchen mouuting to no higher figure than £1800 a year. At supper he was always surrounded by a number of his most intimate friends, mainly Frenchmen ; and he insisted on the conversation being perfectly free. His wit, however, was often cruel, and any one who responded with too much spirit was soun made to feel that the licence of talk was to be complete only on one side.

At Frederick's court ladies were seldom seen, a circum- stance that gave occasion to much scandal for which there seems to have been no foundation. The queen he visited only on rare occasions. She had been forced upon him by his father, and he had never loved her; but he always treated her with marked respect, and provided her with a generous income, half of which she gave away in charity. Although without charm, she was a woman of many noble qualities ; and, like her husband, she wrote French books, some of which attracted a certain attention in their day. She survived him by eleven years, dying in 1797.

Maria Theresa had never given up hope that she would re- cover Silesia; and as all the neighbouring sovereigns were bitterly jealous of Frederick, and somewhat afraid of hin, she had no difficulty in inducing several of them to form a scheme for his ruin. Russia and Saxony entered into it heartily; and France, laying aside her ancient enmity towards Austria, joined the empress against the common object of dislike. Frederick,

meanwhile, had turned towards England, which saw in him a possible ally of great importance against the French. A convention between

Prussia and Great Britain was signed in January 1756, and it proved of incalculable value to both countries, lead- ing as it did to a close alliance during the administration of Pitt. Through the treachery of a clerk in the Saxon foreign office, Frederick was made aware of the future which was being prepared for him. Seeing the importance of taking the initiative, and, if possible, of securing Saxony, he suddenly, on the 24th August 1756, crossed the frontier of that country, and shut in the Saxon army between Pirna and K6nigstein, ultimately compelling it, after a victory gained over the Austrians at Lowositz, to surrender. Thus began the Seven Years' War, in which, supported by England, Brunswick, and Hesse-Cassel, he had for a long time to op- pose Austria, France, Russia, Saxony, and Sweden. Virtu- ally, the whole Continent was in arms against a small state which, a few years before, had been regarded by most men as beneath serious notice. But it happened that this small state was led by a man of high military genius, capable of infusing into others his own undaunted spirit, while his subjects had learned both from him and his predecessors habits of patience, perseverance, and discipline. In 1757, after defeating the Austrians at Prague, he was himself de- feated by them at Kolin; and by the shameful convention of Closter-Seven, he was freely exposed to the attack of the French. In November 1757, however, when Europe looked upon him as ruined, he rid himself of the French by his splendid victory over them at Rossbach, and in about a month afterwards, by the still more splendid victory at Leuthen, he drove the Austrians from Silesia. From this time the French were kept well employed in the west by Prince Ferdinand of Brunswick, who defeated them at Crefeld in 1758, and at Minden in 1759. In the former year Frederick triumphed, at a heavy cost, over the Russians at Zorndorf ; and although, through lack of his usual foresight, he lost the battle of Hochkirchen, he pre- vented the Austrians from deriving any real advantage from their triumph, Silesia still remaining in his hands at the end of the year. The battle of Kunersdorf, fought on August 12, 1759, was the

most disastrous to him in the course of the war. He had here to contend both with the Russians and the Austrians ; and although at first he had some success, his army was in the end completely broken. “All is lost. Save the royal family,” he wrote to his minister [riesenstein ; “the consequences of this battle will be worse than the battle itself. I shall not survive the ruin of the Fatherland. Adieu for ever!” But he soon recovered from his despair, and in 1760 gained the important victories of Liegnitz and Torgau. He had now, however, to act on the defensive, and, fortunately for him, the Russians, on the death of the ezarina Elizabeth, not only withdrew in 1762 from the compact against him, but for a time became his allies. On October 29 of that year he gained his last victory over the Austrians at Freiberg. Europe was by that time sick of war, every power being more or less exhausted. The result was that, on February 15, 1763, a few days after the con- clusion of the peace of Paris, the treaty of Hubertusburg was signed, Austria confirming Prussia in the possession of Silesia.

It would be difficult to overrate the importance of the contribution thus made by Frederick to the politics of Europe. Prnssia was now universally recognized as one of the great powers of the Continent, and she definitely took her place in Germany as the rival of Austria. From this time it was inevitable that there should be a final struggle between the two nations for predominance, and that the smaller German states should group themselves around one or the other. Frederick himself acquired both in Germany and Europe the indefinable influence which springs from the recognition of great gifts that have been proved by great deeds.

His first care after the war was, as far as possible, to enable the country to recover from the terrific blows by which it had been almost destroyed ; and he was never, either before or after, seen to better advantage than in the measures he adopted for this end. Although his resources had been so completely drained that he had been forced to melt the silver in his palacesand to debase the coinage, his energy soon brought back the national prosperity. Pomer- ania and Neumark were freed from taxation for two years, Silesia for six months. Many nobles whose lands had been

wasted received corn for seed; his war horses were within a few months to be found on farms all over Prussia ; and money was freely spent in the re-erection of houses which had been destroyed. The coinage was gradually restored to its proper value, and trade received a favourable impulse by the foundation of the Bank of Berlin. All these matters were carefully looked into by Frederick himself, who, while acting as generously as his circumstances would allow, in- sisted on everything being done in the most efficient manner at the least possible cost. Unfortunately, he adopted the French ideas of excise, and the French methods of:imposing and collecting taxes,—a system known as the Regie. This system secured for him a large revenue, but it led to a vast amount of petty tyranny, which was all the more intolerable because it was carried out by French officials. It was con-tinued to the end of Frederick's reign, and nothing did so much to injure his otherwise immense popularity. He was quite aware of the discontent the system excited, and the good-nature with which he tolerated the criticisms directed against it and him is illustrated by a well known incident. Riding along the Jager Strasse one day, he saw a crowd of people. "See what it is," he said to the groom who was attending him. "They have something posted up about your Majesty," said the groom, returning. Frederick, riding forward, saw a caricature of himself: "King in very melancholy guise," says Preuss (as translated by Carlyle), "seated on a stool, a coffee-mill between his knees, dili- gently grinding with?the one hand, and with the other pick- ing up any bean that might have fallen. ' Hang it lower,' said the king, beckoning his groom with a wave of the finger ; 'lower, that they may not have to hurt their necks about it.' No sooner were the words spoken, which spread instantly, than there rose from the whole crowd one uni-versal huzzah of joy. They tore the caricature into a thousand pieces, and rolled after the king with loud 'Lebe Hoch, our Frederick for ever,' as he rode slowly away." There are scores of anecdotes about Frederick, but not many so well authenticated as this.

There was nothing about which Frederick took so much trouble as the proper administration of justice. He disliked the formalities of the law, and in one instance, "the Miller- Arnold case," in connexion with which he thought injustice had been done to a poor man, he dismissed the judges, con- demned them to a year's fortress-arrest, and compelled them to make good out of their own pocket the loss sustained by their supposed victim,—

not a wise proceeding, but one springing from a generous motive. He once defined him- self as ‘ avocat du pauvre,” and few things gave him more pleasure than the famous answer of the miller whose wind- mill stood on ground which was wanted for the king’s garden. The miller sturdily refused to sell it. ‘“ Not at any price?” said the king’s agent; “could not the king take it from you for nothing, if he chose?” ‘Have we not the Kammergericht at Berlin?” was the answer, which became a popular saying in Germany. Soon after he came to the throne Frederick began to make preparations for a new code. In the year 1749-51 his grand-chancellor, Von Cocceji, a man of wide knowledge and solid judgment, finished “The Project of the Corporis Juris Fridericiani,” which was afterwards made the basis of a legal system

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drawn up by the grand-chancellor Von Cramer—a system that came into operation in 1794 under Frederick’s suc- cessor.

Looking ahead after the Seven Years’ War, Frederick saw no means of securing himself so effectually as by cultivating the good will of Russia. In 1764 he accordingly concluded a treaty of alliance with the empress Catherine for eight years. Six years afterwards, unfortunately for his fame, he joined in the first partition of Poland, by which he received Polish Prussia, without Dantzic and Thorn, and Great Poland as far as the Netzefluss. Prussia was then for the first time made continuous with Brandenburg and Pomerania. Frederick would have run great risks had he refused to take part in this arrangement ; but it was none the less a shameful violation of international law, the full penalty for which has perhaps not even yet been paid.

The emperor Joseph IIL., being of an ardent and impul- sive nature, greatly admired Frederick, and visited him at Neisse, in Silesia, in 1769, a visit which Frederick returned, in Moravia, in the following year. The young emperor was frank and cordial; Frederick was more cautious, for he detected under the respectful manner of Joseph a keen ambition that might one day become dangerous to Prussia. Ever after these interviews a portrait

of the emperor hung conspicuously in the rooms in which Frederick lived, a circumstance on which some one remarked. 'Ah yes," said Frederick, "I am obliged to keep that young gentleman in my eye." Nothing came of these suspicions till 1777, when, after the death of Maximilian Joseph, elec- tor of Bavaria, without children, the emperor took posses- sion of the greater part of his lands. The elector palatine, who lawfully inherited Bavaria, came to an arrangement, which was not admitted by his heir, the duke of Zwei- briicken, afterwards King Maximilian I. of Bavaria. The latter appealed to Frederick, who, resolved that Austria should gain no unnecessary advantage, took his part, and brought pressure to bear upon the emperor. Ultimately, greatly against his will, Frederick felt compelled to draw the sword, and in July 1778, crossed the Bohemian frontier at the bead of a powerful army. No general engagement was fought, and after a great many delays, the treaty of Teschen was signed on the 13th May 1779. Austria received the circle of Burgau, and consented that the king of Prussia should take the Franconian principalities. Frederick never abandoned his jealousy of Austria, whose ambition he regarded as the chief danger agaiust which Europe had to guard. He seems to have had no suspicion that evil days were coming in France. It was Austria which had given trouble in his time; and if her pride were curbed, he fancied that Prussia at least would be safe. Hence one of the last important acts of? his life was to' form, in 1785, a league of princes (the " Fiirstenbund ") for the defence of the imperial constitution, believed to be imperilled by Joseph's restless activity. The league came to an end after Frederick's death ; but it is of considerable historical interest, as the first open attempt of Prussia to take the lead in Germany.*

Frederick's chief trust was always in his treasury and his army. By continual economy,he Jeft in the former the im- mense sum of 70 million thalers ; the latter, at the time of his death, numbered 200,000 men, disciplined with all the strictness to which he had throughout life accustomed his troops. He died at Sanssouci on the 17th August 1786 ; his death being hastened by exposure to a storm of rain, stoically borne, during a military review. He passed away on the eve of tremendous events, which for a time obscured his fame ; but now that he can be impartially estimated, he is seen to have been in many respects one of the greatest figures in modern history.

He was rather below the middle size, in youth inclined

to stoutness, lean in old age, but of vigorous and active habits. An expression of keen intelligence lighted up his features, and his large, sparkling, grey eyes darted pene- trating glances at every one who approached him. In his later years an old blue uniform with red facings was his usual dress, and on its breast was generally some Spanish snuff, of which he consumed large quantities. He shared many of the chief intellectual tendencies of his age, having no feeling for the highest aspirations of humau nature, but

submitting all things to a searching critical analysis. Of

Christianity he always spoke in the mocking tone of the "enlightened" philosophers, regarding it as the invention of priests ; but it is noteworthy that after the Seven Years' War, the trials of which steadied his character, he sought to strengthen the church for the sake of its elevating moral influence. He cannot be truly described as an atheist, for he regarded the world as probably the creation of a demi- urgus,—of a demiurgus, however, who could not be sup- posed to take interest in the petty affairs of men. In his judgments of mankind he often talked as a misanthrope. He was once conversing with Sulzer, who was a school in- spector, about education. Sulzer expressed the opinion that education had of late years greatly improved. " In former times, your Majesty," he said, "the notion being that man- kind were naturally inclined to evil, a system of severity prevailed in schools ; but now, when we recognize that the 'nborn inclination of men is rather to good than to evil, schoolmasters have adopted a more generous procedure." "Ah, my dear Sulzer," replied the king, "you don't know this damned race" ("Ach, mein lieber Sulzer, er kennt nicht diese verdammte Race"). This fearful saying unques- tionably expressed a frequent mood of Frederick's ; and he sometimes acted with great harshness, and seemed to take a malicious pleasure in tormenting his acquaintances. Yet he was capable of genuine attachments. He was beautifully loyal to his mother and his sister Wilhelmina ; his letters to the duchess of Gotha are full of a certain tender rever- ence ; the two Keiths found him a devoted friend. But the true evidence that beneath his misanthropical moods there was an

enduriug sentiment of humanity is afforded by the spirit in which he exercised his kingly functions. Taking his reign as a whole, it must be said that he looked upon his power rather as a trust than as a source of personal advantage ; and the trust was faithfully discharged accord- ing to the best lights of his day. He has often been con- demned for doing nothing to encourge German literature ; and it is true that he was supremely indifferent to it. Before he died a tide of intellectual life was rising all about him ; yet he failed to recognize it, declined to give Lessing even the small post of royal librarian, and thought Gotz von Berlichingen a vulgar imitation of vulgar English models. But when his taste was formed, German literature did not exist ; the choice was between Racine and Voltaire on thie one hand and Gottsched and Gellert on the other. He survived into the era of Kant, Goethe, and Schiller, but he was not of it, and it would have been unreasonable to ex- pect that he should in old age pass beyond the limits of his own epoch, As Germans now generally admit, it was better that he let their literature alone, since, left to itself, it became a thoroughly independent product. Indirectly he powerfully promoted it by deepening the national life from which it sprang, At a time when there was no real bond of cohesion between the different states, he stirred among them a comnion enthusiasm ; 4 great he laid the foundation of a genuinely united empire.

In 1846-57 Frederick William IV. caused a niagnificent

edition of Frederick's writings to be issued by the Berlin It is in 30

volumes, of which 6 contain verse, 7 are historical, 2 philo-

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sophical, and 3 military, 12 being made up of correspondence.

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See Carlyle, History of Friedrich II. of Prussia; Droysen, Fried- rich der Grosse (2 vols., Leipsic, 1874-6, forming Part v. of his Geschichte der Preussisehen Politik); ¥. Forster, Friedrich der Grosse, geschildert als Mensch, Regent, und Feldherr (4th ed., Berlin, 1860); Rigollot, Frédérie II., Philosophe (Paris, 187 5); Schroder, Friedrich der Grosse in seinen Schriften (8 vols., Leipsic, 1875-76). (J. SI.)

FREDERICK WILLIAM IL (1744-1797), king of Prussia, was the nephew of Frederick the Great. His father, Augustus William, the second son of Frederick William L., having died in 1757, Frederick William was nominated by the king successor to the throne. He was of an easy- going nature, fond of pleasure, and without the capacity for hard work that characterized his foremost predecessors. His loose mode of life alienated from him the sympathies of his uncle, into whose presence he was not admitted for several years. In the war of the Bavarian succession in 1778, however, he received an expression of approval from Frederick in consequence of an act of personal courage. When he mounted the throne, Prussia held a high place on the Continent ; her military fame was splendid ; and the national finances were in a flourishing condition. The young

‘king had some good impulses, and made himself popular for

a time by lightening a few of the burdens of the people, abolishing the tyrannical method of collecting taxes which Frederick had instituted, and encouraging trade. He gave himself up, however, to the advice of unworthy favourites, and soon lost the goodwill both of his subjects and of Europe. For a time he continued the decided policy of his uncle towards Austria, vigorously supporting Turkey against her in 1790. But in the same year he concluded the Reichenbach convention, whereby a nominally good understanding was effected between the two countries, various difficulties being removed during a personal inter- view of Frederick William with the

emperor Leopold II. at Pillnitz in 1791. In 1792, associating himself with the emperor in the war with France, Frederick William sent across the Rhine an army of 50,000 men under the duke of Brunswick. A separate peace was concluded by Prussia in 1795. The dilatoriness with which he prosecuted this war was due to jealousy respecting the policy of Austria and Russia towards Poland. He had formally recognized in 1790 the integrity of Poland ; but in 1793, after a vast amount of intrigue, he took part with Russia in the secoud partition, gaining thereby what is now called South Prussia, with Dantzic and Thorn. The following year brought the third partition, which extended Prussia from the Niemen to Warsaw. Some time before these partitions, in consequence of an understanding with the margrave, signed December 2, 1791, the king had gained possession of the principalities of Baireuth and Anspach. The size and population of Prussia were thus largely increased under Frederick William II.; but, except in the case of Baireuth and Anspach, he attained his aims by means which the more intelligent class of his subjects did not ap- prove, and by his vacillating policy he greatly lowered the state in the esteem of the world. He not only exhausted the resources accumulated by Frederick the Great, but im- posed on the country a burden of debt; and he excited much ill-feeling by introducing a severe censorship of the press, and by subjecting the clergy to laws conceived in a spirit of the narrowest orthodoxy. He died on the 16th November 1797. His first wife having been divorced in 1769, he married the Princess Louise of Hesse-Darmstadt, by whoin he had five sons.

FREDERICK WILLIAM IIT. (17 70-1840), king of Prussia, was the eldest sou of Frederick William II., and was born on the 3d August 1770. He was carefully trained under the supervision, in early. youth, of his grand-uncle, Frederick the Great. As crown prince he accompanied his father in 1791 to the interview with the emperor at Pillnitz, and in the following year visited with him

the army in the Rhine country which was making war with France. In 1793 he married the Princess Louise, daughter of the duke of Mecklenburg-Strelitz. She be- came a highly popular queen, and thoroughly deserved the

affection and respect with which she was regarded. Simple and unostentatious in manner, she was of a refined and gentle disposition, yet endowed with a quick and keen in- telligence, and with an heroic spirit which the greatest disasters could not break. Her husband's character was not nearly so interesting. He was rather dull and slow; but he had a sincere desire for the welfare of his people; was capable in emergencies of undertaking a great enter- prise, and allowed himself to be freely influenced by the loftier impulses of his wife. When he succeeded to the throne he at once removed the principal grievances due to the weakness of his father, and called to his aid capable and honest ministers. By the treaty of Lunéville, in 1801, he was obliged to concede to Napoleon his territory on the left bank of the Rhine; but he received some compensations. In 1805 he was brought for a short time into conflict with England for accepting Hanover from Napoleou in return for certain concessions. Up to this time he had remained at peace with France; but the formation of the Confedera- tion of the Rhine in 1806 filled him with alarm and in- dignation, and, giving way to a sudden impulse, he de- manded that all French troops should forthwith quit German soil, The result was the battles of Jena and Auerstidt, followed by those of Eylau and Friedland ; and on July 9, 1807, he had to sign the treaty of Tilsit, which deprived him of half his kingdom. Early in the war he had been obliged to leave Berlin with the queen, and not till the end of 1809 were they able toreturn. In 1810 the queen died. Meanwhile, under the guidance of the great minister Stein, who was succeeded by Hardenberg, he had begun thoroughly to reorganize the state; while, through the ex- ertions of Scharnhorst and Gneisenau, the army, in which the traditions of a past age had survived too long, was raised to a state of high efficiency. The king was forced in 1812 to conclude an alliance with Napoleon, aud to aid him with an auxiliary corps in his expedition to Russia ; but seeing the disastrous retreat of the French from Moscow, Frederick William appealed to the country to undertake a war of liberation. In due time the appeal was followed by the battle of Leipsic and the battle of Waterloo. After the conclusion of peace he laboured sincerely, with the aid of competent ministers, to undo many of the evils caused by the confusion of the previous years; but he forgot that in his time of need he had promised to set up a constitutional system of government. He only instituted (1817) provin- cial estates ; and after the July Revolution he proved him-

self an uncompromising and bitter opponent of liberal ideas. He died on the 7th of June 1840.

See W. Hahn, Frtedrich Wilhelm IIT. und Lowise (2d ed., Berlin, 1876); Duneker, Aus der Zeit Friedrichs des Grossen und Friedrich Withelms ITI. (Leipsic, 1876).

FREDERICK WILLIAM IV. (1795-1861), king of Prussia, the son of Frederick William ITIL , was born on the 15th October 1795. He took an active part in the War of Liberation, and in 1814 spent some time in Paris, in whose museums and picture galleries he acquired a warm love of art. On returning to Berlin he cultivated his artistic tastes under the guidance of Rauch and Schinkel, receiving at the Same time instruction in jurisprudence and finance from Savigny and other distinguished teachers. He married Princess Elizabeth of Bavaria in 1823, but had no children. As he was known to be cultivated, intelligent, and generous, high hopes were formed respecting his reign; and these hopes were fostered by his first acts as king, for he conceded ae freedom of the press than had been allowed under

is father, granted an amnesty to political prisoners, and

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invited to his capital some of the leading writers and artists of the day. He soon, however, disappointed popular expectations. He was a lover rather of large phrases than of great actions, being very willing to benefit his subjects, but on condition that they should accept what he offered them as the gift of an absolute ruler. In 1847 he assembled at Berlin a united diet, made up of representa- tives of the provincial diets established by his father, and created intense discontent by proclaiming that he would not allow a constitution to stand between him and his people. The revolutionary movement of 1848 took him wholly by surprise, and he was so alarmed that he not only promised to institute parliamentary government, but placed himself at the head of the agitation for the unity of Germany. When, however, in 1849 the national assembly at Frank- fort offered him the title of emperor, he declined it. He formed an alliance with Hanover and Saxony

for the pur- pose of creating a new German constitution, and summoned a national parliament at Erfurt. Austria insisted on the old Frankfort diet being re-established, and fora time war appeared to be imminent. Ultimately, by the treaty of Olmiitz (1850) Austria prevailed. In 1850 the Prussian constitution was proclaimed, but it was interpreted in a narrow sense, and under the reactionary ministry of Manteuffel some of its most essential provisions were soon changed. In 1848 Neufchatel had been incorporated with Switzerland, Certain royalists having attempted in 1856 to secure it again for the king of Prussia, they were seized by the Swiss authorities and accused of high treason. After some angry negotiations they were given up, and Frederick William then formally resigned all claims to the country. On his way back from Vienna in the summer of 1857 he had a stroke of paralysis in Dresden; in October of the same year he had a second stroke in Berlin. From this time, with the exception of brief intervals, his mind was clouded, and the duties of government were undertaken by his brother William, who on October 7, 1858, was formally recognized as regent. The king spent the winter of 1858- 59 in Rome, where his health occasionally improved, but when he returned to Berlin in November 1860, his end was seen to be near, and he died at Sanssouci on the night of January 2, 1861.

See Varnhagen von Ense's Bldtter aus der Preussischen Geschichte

(5 vols., Leipsic, 1868-69); and Briefwechsel Friedrich Wilhelms IV. mit Bunsen (Leipsic, 1878).

FREDERICK I. (1369-1428), elector and duke of Saxony, surnamed the Pugnacious, eldest son of Landgraf Frederick the Severe of Thuringia and of Catherine countess of Henneberg, was born at Altenburg, March 29, 1369. On the death of his father in 1381, he and his two brothers succeeded to the inheritance under the guardianship of their mother, but were compelled to grant a portion of it to their father's two brothers. The death of one of their father's brothers in 1407 occasioned a renewal of the inheritance dispute with the remaining brother, and an amicable settlement was not arrived at till 1410. Previous to this Frederick had distinguished himself in wars against the Lithuanians, Hungary, and King Wenzel of Germany ; and having in 1420 collected an army against the Hussites, he was for a

time so uniformly successful, that in 1423 the emperor Sigismund, in recognition of his valuable services, created him elector and duke of Saxony. With these honours, however, Sigismund also laid upon him the whole burden of the Hussite war; and the result was that, by an overwhelming defeat at Aussig in 1426, nearly all the Saxons capable of bearing arms were either killed or placed hors de combat. Frederick did not long survive this disaster, dying at Altenburg, 4th January 1428. The university of Leipsic was founded by Frederick in 1409.

See life by Spalatin in Mencke's Seriptores rerum Germ.;

and life by Horn, Leipsic, 1733.

OF SAXONY. |

FREDERICK II. (1411-1464), elector and duke of Saxony, surnamed the Meek, son of the former and of Yatherine of Brunswick, was born August 22, 1411, and succeeded his father in 1428. His reign is remarkable only for his long-continued dispute with his uncles and brothers regarding the partition of Saxony—a dispute which, though finally settled in 1451 by the interposition of the emperor in Frederick's favour, led, in 1455, to the famous attempt by a knight named Kunz von Kaufungen to abduct the two sons of Frederick, Ernst and Albert. A graphic description of the plot and its accidental frustration will be found in a paper on the "Prinzenraub" in Mr Carlyle's Miscellaneous Works. Frederick died at Leipsic, 7th September 1464.

For the literature connected with the " Prinzenraub," see W. Schiffer, Der Montag vor Kiliani, 1855; and J. Gersdorf, Hinige Actenstiieke zur Geschichte des Stiehsischen Prinzenraubes, 1855.

FREDERICK TII. (1463-1525), elector and duke of Saxony, surnamed the Wise, grandson of the preceding and son of Duke Ernst, was born at Torgau, January 17, 1463. Ou the death of his father in 1486, he succeeded him in the sole government of Saxony, but divided the other posses- sions of the Ernestine line with his brother John the Con- stant. Frederick founded the university of Wittenberg in 1502, and appointed Melancthon and Luther to two of its chairs. Though he never formally adopted the principles of the

Reformation, he granted to the Reformers his friendly countenance, and in 1521 he secured the safety of Luther during the diet of Worms, and afterwards sheltered him in the castle of Wartburg. In 1493 Frederick made a pilgrim- age to the Holy Land, and was made in Jerusalem a knight of the Holy Sepulchre. He was three times imperial vicar, and on the death of Maximilian I. he was offered the imperial throne but declined it, and, in accordance with his recominendation, it was bestowed on Charles V. Frederick died at Lochau, 5th May 1525.

See life published from Spalatin's manuscript by Neudecker and Preller, 1851, and another by Tutzschmann, 1848.

FREDERICK AUGUSTUS L., elector of Saxony. See Aveustus II., of Poland, vol. ili. p. 84. FREDERICK AUGUSTUS IL, elector of Saxony. See Avevstus III., of Poland, vol. ii. p. 85. FREDERICK AUGUSTUS I. (1750-1827), king of Saxony, son of Elector Frederick Christian, was born at: Dresden, 23d December 1750, succeeded his father, under the guardianship of Prince Xavier, in 1763, and was declared of age in 1768. Inthe following year he married Princess Maria-Amelia of Deux-Ponts. On account of the claims of his mother on the inheritance of her brother, the elector of Bavaria, he sided with Frederick the Great in the short Bavarian succession war of 1778 against Austria; and he afterwards joined the league of German princes formed by that monarch. In 1791 he declined the crown of Poland. He refused to join the league against France in 1792, but when war was declared his duty to the German empire necessitated his taking part in it. He maintained his neutrality during the war between France and Austria in 1805, but in the following year he joined Prussia against France. After the disastrous battle of Jena he concluded a treaty of peace with Napoleon at Posen, 11th November 1806, and, assuming the title of king, he joined the Rhenish confederation. Having taken part in the subsequent wars of Napoleon, he fell into the hands of the allies after the entry into Leipsic, 19th October 1813 ; and although he regained his freedom after the congress of Vienna, he was " compelled to give up the province of Wittenberg to Prussia. The remainder of his life was spent in developing the agri- cultural, commercial, and industrial resources of his king- dom, reforming the administration of justice, establishing hospitals and other charitable institutions, encouraging art

and science, and promoting education. He had a special interest in botany, and originated the beautiful botanical garden at Pillnitz. His reign throughout was characterized by justice, probity, moderation, and prudence. He died May

5, 1827

Sce lives by Weisse, Leipsic, 1811; Herrmann, Dresden, 1827; and Politz, Leipsic, 1830.

FREDERICK AUGUSTUS IT. (1797-1854), king of Saxony, eldest son of Prince Maximilian and of Caroline- Maria Theresa of Parma, was born May 18,1797. The unsettled times in which his youth was passed necessitated his frequent change of residence, but care was nevertlieless taken that his education should not be interrupted, and he also acquired through his journeys in foreign states and his intercourse with men of eminence, a special taste for art and for natural science. He was twice married—in 1819 to the Duchess Caroline, eldest daughter of the emperor Francis I. of Austria, and in 1833 to Maria, daughter of Maximilian I. of Bavaria. In 1830 arising in Dresden led to his being named joint regent of the kingdom along with King Antony ; and in this position his popularity and his wise and liberal reforms speedily quelled all discontent. On June 1, 1836, he succeeded his uncle on the throne. Though he administered the affairs of his kingdom with enlightened liberality, Saxony did not escape the political storms which broke upon Germany in 1848; and an in- surrection in Dresden in May 1849 compelled him to call in the help of Prussian troops. From that time, however, his reign was tranquil and prosperous. His death occurred accidentally through the upsetting of his carriage between Imst and Wenns, in Tyrol, 9th August 1854. Frederick devoted his leisure hours chiefly to the study of botany. He made botanical excursions into different countries, and Flora Marienbadensis, oder Pflanzen und Gebirgsarten gesammelt und beschrieben, written by him in conjunction with Goethe, was published at Prague in 1837,

FREDERICK I. (1425-1476), elector palatine, surnamed the Victorious, second son of Elector Louis III., was born in 1425. He inherited a part of the palatinate on the death of his father in 1439, but delivered it up to his brother Louis IV. On the death of Louis in 1449, he be- came guardian of the infant heir Philip, and administrator of the kingdom. In 1452, on account of the threatening relation in which the neighbouring princes stood to the palatinate, he resolved to assume the office of elector for life, on the understanding that his children should not hold the rank of princes, and that his nephew should be bis successor. This led to a combination against him headed by the em- peror Frederick III., but he managed to defend himself against all attacks, and in 1462 defeated at Seckenheim a combined army sent against him under the command of elector Albert Achilles of Brandenburg, after which lhe re- mained in undisturbed possession of his kingdom till his death, 12th December 1476. Under him the palatinate received an addition of more than 60 fortresses and towns. Through his marriage with the daughter of a citizen of Augsburg he had two sons, the elder of whom, Frederick, adopted the ecclesiastical profession, and the younger, Louis, was the founder of the family of the princes and counts of Léwenstein.

See lives by Kremer, in 2 vols., Frankfort and Leipsic, 1765 ; and by Meuzel, from 1454 to 1464, Munich, 1861.

FREDERICK II. (1482-1556), elector palatine, sur- named the Wise, fourth son of Philip the Noble-minded, was born in 1482, and succeeded his brother Louis as elector in 1544. During the siege of Vienna by Sultan Soliman IT. in 1529, he held the command of the army of the empire. In 1535 he married Dorothea daughter of Christian IT, ex-king of Denmark. Through the persuasion of Melanch- thon he embraced the principles of the Reformation and

joined the Smalkald League, but he afterwards signed the Augsburg Interim, and became reconciled with Charles V. He died in 1556.

FREDERICK III. (1515-1576), elector palatine, sur- named the Pious, eldest son of John II, palatine of Sim- mern, was born in 1515, succeeded

his father in 1556, and became elector palatine on the death of Otto Henry in 1559. On his marriage in 1537 to the Lutheran Princess Maria of Brandenburg-Baireuth, he adopted the Protestant faith, and in 1560 he replaced the Lutheran confession and worship by that of the Reformed or Calvinistic, on which account an unsuccessful attempt was made in 1566 by several of the Lutheran princes to obtain an imperial edict against him. He died 26th October 1575.

See Kluckhohn, Friedrich der Fromme, Nordlingen, 1878. volumes of his letters were previously edited by Kluckhohn.

FREDERICK IV. (1574-1610), elector palatine, sur- named the Upright, son of Elector Louis VI. and of Elizabeth of Hesse, was born in 1574, succeeded his father under the guardianship of his uncle John Casimir in 1583, and after the death of the latter in 1592 ruled as independ- ent governor. His reign is chiefly of importance for the steadfast and firm support he rendered to the Protestant cause. Under his auspices the Protestant union of Ger- many was formed in 1601. Mannheiin, which had greatly increased through the influx of Protestant refugees, was raised by him to the rank of a town. He died in 1610.

FREDERICK V. (1596-1632), elector palatine and king of Bohemia, son of Frederick IV. and of Louisa Julia, daughter of William of Orange, was born at Amberg in 1596, and succeeded his father in 1610, under the guar- dianship of Duke John of Deux-Ponts. In 1613 he married Elizabeth, daughter of James I. of England; and on undertaking the government of his palatinate two years afterwards, he became the head of the Protestant union of German princes, on which account, and because of his connexion with England, he was in 1619 chosen king of Bohemia. He shrank from this difficult position, but at last accepted it, partly owing to his wife's influence, but mainly in deference to the entreaties of a number of land- less princes who had great power over him. When his forces were confronted at Prague, November 8, 1620, by those of the emperor under Tilly, his courage so utterly forsook him that he fled in panic from the field before the battle had commenced, and ignominiously took refuge in Holland from the dangers and difficulties of his position— the general ridicule with which he was regarded being indicated by dubbing him with the title " Winter-King." The

remainder of his life was spent in vain endeavours to enlist the help of various European sovereigns to enable him to wrest his palatinate from Duke Maximilian of Bavaria, who had been invested with its sovereignty by the emperor. Frederick died at Mainz, November 19,

1632.

FREDERICK CITY, the capital of Frederick county, Maryland, U.S., is situated on Carroll's Creek, a tributary of the Monocacy, 45 miles N.W. of Washington. It is well and regularly built, and most of its houses are of brick or stone. It has a considerable agricultural trade, and its industries include iron, wood, leather, paper, and the pre- serving of fruit and vegetables. Among its educational institutions are the college established by the State in 1797, the female seminary, the academy connected with the convent of the visitation nuns, and the deaf and dumb institution. During the civil war the city was occupied on different occasions by the opposing armies. The popu- lation of Frederick in 1860 was 8142, and in 1870 8526, of whom 1822 were coloured.

FREDERICKSBURG, a city of Spotsylvania county, Virginia, U.S., on the 8. W. side of the Rappahannock river,

110 miles above its mouth in Chesapeake Bay, and 61 miles N. of Richmond. The river, which is tidal up to this point, is here closed by a dam 900 feet long. It supplies motive-power for flour and other mills, and affords faci- lities for transportation of grain, marble, and freestone. Near the city is an unfinished monument, begun in 1833, over the grave of the mother of Washington. At Fre dericksburg the Federal troops sustained a repulse by the Confederate forces, December 13, 1862. The population in 1860 was 5022, and in 1870 4046, of whom 1331 were coloured.

FREDERICKSHALD, or FREDERICcKSHALL, a maritime town of Norway, stift of Christiania, at the junction of the Iddefjord with the Tistedals, 57 miles §.8.E. of Christiania. It has an excellent harbour, and

considerable trade in to- bacco, sugar, iron, and wood. A regular line of steamers connects it with Christiania. Frederickshald is noted for its strong castle of Fredericksteen, which stands on a per- pendicular rock 350 feet high overhanging the sea, and is considered one of the strongest fortresses in Europe. It was at the siege of this fortress that Charles XII., king of Sweden, was killed on 11th December 1718. The town itself is not walled. Its old name was Halden, and it received the addition of Frederick from Frederick III. of Denmark:and Norway after its successful defence against the Swedes in 1665. It was almost totally destroyed by fire in 1759, and has since been rebuilt in a neat and regular manner. The castle surrendered to the Swedish crown- prince Bernadotte in 1814, and its capture was speedily followed by the conquest of the kingdom and its union with Sweden. The population in 1875 was 9956.

FREDERICKSTAD, a fortified town of Norway, stift of Christiania, is situated at the mouth of the Glommen, 48 miles 8.E. of Cliristiania. The principal buildings are the church, the town-hall, the arsenal, and the magazine. It has manufactures of hardware, pottery, and brandy, and a considerable shipping trade and commerce in wood. About a mile and a half distant is the fall of the Glommen known as Sarpfos. Frederickstad was founded by Fre- derick II. in 1567. It was for a long time strongly for- tified, and in 1716 Charles XII. of Sweden made a vain attempt to capture it. The population in 1875 was 9562.

FREDERICTON, a city and port of entry of New Brunswick, Canada, capital of the province, is situated on the St John river, 88 miles froin its mouth. It stands ona plain bounded on one side by the river, which is here three- fourths of a mile broad, and on the other by a range of hills which almost encircle the town. It is regularly built with long and straight streets, and contains some handsome public buildings, among which are the province hall, the government house, the county court-house, the cathedral church, the university, and several other educational esta- blishments. Fredericton is the principal commercial en- trepdt with the interior of the province, and has also a large trade in lumber. The river is navigable for large steamers up to the city, and above it transport is effected in vessels of lighter draughts. A steam-ferry across the river con- nects the city with the

town of St Mary. Fredericton was incorporated in 1849. Population in 1852, 4458, and in 1871, 6006.

FREE CHURCH OF SCOTLAND, Tuz, is the name of a well-known ecclesiastical organization which includes a considerable proportion of the inhabitants of Scotland. In one sense the Free Church dates its existence from the Dis- ruption of 1843, in another it claims to be the rightful re- presentative of the National Church of Scotland as it was reformed in 1560.1 In order to indicate the nature of the

1 "Tt is her being free, not her being established, that constitutes the

real historical and hereditary identity of the Reformed National Church of Scotland." See Act and Declaration, &c., of Free Assembly, 181.

grounds on which this claim is made, it will be necessary briefly to point out how the leading facts of the ecclesi- astical history of Scotland during the last 320 years are accentuated and construed by those who read them in a Free Church sense.

In that history the Free Churchman sees three great reforming periods. In his view these deserve to be called reforming on many accounts, but most especially because in them the independence of the church, her inherent scrip- tural right to exercise a spiritual jurisdiction in which she is responsitle to her Divine Head alone, was both earnestly asserted and practically maintained. The first reformation extended from 1560, when the church freely held her first General Assembly, and of her own authority acted on the First Book of Discipline, to 1592, when her Presbyterian order was finally and fully ratified by the parliament. Tbe second period began in 1638, when after 20 years of sus- pended animation, the Assembly once more shook off Epis- copacy, and terminated in 1649, when the parliament of Scotland confirmed the church in her liberties in a larger and ampler sense than before. The third period began in 1834, when the Assembly made use of what the church believed to be her rights in passing the Veto and Chapel Acts. It culminated in the Disruption of 1843.

The fact that the church, as led first by Knox and after- wards by Melville, claimed an inherent right to exercise a spiritual jurisdiction is notorious. More apt to be over- looked is the comparative freedom with which that right was actually used by the church irrespective of state recog. nition. That recognition was not given until after the queen's resignation in 1567 ;! but, for several years before it came, the church had been holding her Assemblies and settling all questions of discipline, worship, and administra- tion as they arose, in accordance with the first book of polity or discipline which had been drawn up in 1560. Further, in 1581 she, of her own motion, adopted a second book of a similar character, in which she expressly claimed an independent and exclusive jurisdiction or power in all matters ecclesiastical, " which flows directly from God and the Mediator Jesus Christ, and is spiritual, not having a temporal head on earth, but only Christ the only king and governor of his church ;" and this claim, though directly negatived in 1584 by the " Black Acts," which included an Act of Supremacy over estates spiritual and temporal, con- tinued to be asserted by the Assemblies, until at last it also was practically allowed in the Act of 1592.2 This legisla- tion of 1592, however, did not long remain in force. An Act of Parliament in 1606, which " reponed, restored, and reintegrated " the estate of bishops to their ancient dignities, prerogatives, and privileges, was followed by several Acts of various subservient assemblies, which, culminating in that of 1618, practically amounted to a complete surrender of jurisdiction by the church itself. For twenty years no Assemblies whatever were held. This interval must neces- sarily be regarded from the Presbyterian point of view as having been one of very deep depression. But a second re- formation, characterized by great energy and vigour, began in 1638. The proceedings of the Assembly of that year, afterwards tardily and reluctantly acquiesced in by the state, finally issued in the Acts of Parliament of 1649, by which the Westminster standards were ratified, lay-patronage was

. abolished, and the coronation oath itself framed in accord-

ance with the principles of Presbyterian church govern-

1 In the Act Anent the true and holy Kirk, and of those that are declared not to be of the same. This Act was supplemented by that of 1579, Anent the

Jurisdiction of the Kirk.

2 The Second Book of Discipline was not formally recognized in that Act; but all former Acts against " the jurisdiction and discipline of the true Kirk as the same is used and exercised within the realm" were abolished; and all 'liberties, privileges, immunitics, and free- doms whatsoever" previously granted were ratified and approved.

ment. Another period of intense reaction soon set in. No Assemblies were permitted by Cromwell after 1653 ; and, soon after the Restoration, Presbytery was temporarily over- thrown by a series of rescissory Acts. Nor was the Revolu- tion Settlement of 1690 so entirely favourable to the freedom of the church as the legislation of 1649 had been. Pre- lacy was abolished, and various obnoxious statutes were repealed, but the Acts rescissory were not cancelled; pres- byterianism was re-established, but the statutory recognition of the Confession of Faith took no notice of certain quali- fications under which that document had originally been approved by the Assembly of 1647 ;3 the old rights of patrons were again discontinued, but the large powers which had been conferred on congregations by the Act of 1649 were not wholly restored. Nevertheless the great principle of a distinct ecclesiastical jurisdiction, embodied in the Confession of Faith, was accepted without reserva- tion, and a Presbyterian polity effectively confirmed both then and at the ratification of the treaty of Union. This settlement, however, did not long subsist unimpaired. In 1712 the Act of Queen Anne, restoring patronage to its ancient footing, was passed in spite of tle earnest remon- strances of the Scottish people. For many years afterwards (until 1784) the Assembly continued to instruct each succeeding commission to make application to the king and the parliament for redress of the grievance. But mean- while a new phase of Scottish ecclesiastical politics com- monly known as Moderatism had been inaugurated, during the prevalence of which the church became even more indifferent than the lay patrons themselves to the rights of her congregations with regard to the "calling" of ministers. From the Free Church point of view, the period from which the secessions under Erskine and Gillespie are dated was also characterized by numerous other abuses on the Church's part which amounted to a practical surrender of the most important and distinctive principles of her ancient Presbyterian polity. Towards the beginning of the*

present century there were many cir- cumstances, both within and without the church, which conspired to bring about an evangelical and popular reaction against this reign of " Moderatism." The result was a protracted struggle, which is commonly referred to as the Ten Years' Conflict, and which has been aptly described as the last battle in the long war which for nearly 300 years had been waged within the church itself, between the friends and the foes of the doctrine of an exclusive ecclesiastical jurisdiction. That final struggle may be said to have begun with the passing in 1834 of the "Veto" Act, by which: it was declared to be a fundamental law of the church that no pastor should be intruded on a congregation contrary to the will of the people,> and by which it was provided that the simple dissent of a majority of heads of families in a parish should be enough to warrant a presbytery in rejecting a presentee. The question of the legality of this measure soon came to be tried in the civil courts ; and it was ultimately answered in a sense unfavourable to the church by the decision (1838) of the Court of Session in the Auchterarder case, to the effect that a presbytery had no right to reject a presentee simply because the parishioners protested against his settle-

3 The most important of these had reference to the full right of a constituted church to the enjoyment of an absolutely unrestricted freedom in convening Assemblies. This very point on one occasion at least threatened to be the cause of serious misunderstandings between William and the people of Scotland. The difficulties were happily smoothed, however, by the wisdom and tact of Carstares,

4 See Act and Declaration of Free Assembly, 1851.

5 This principle had been asserted even by an Assembly so late as that of 1736, and had been invariably presupposed in the "call," which had never ceased to be regarded as an indispensable pre-requisite for the settlement of a minister.

ment, but was bound to disregard the veto (see CHALMERS, vol. v. pp. 376, 377). This decision elicited from the Assembly of that year a new declaration of the doctrine of the spiritual independence of the church, The

“ex- clusive jurisdiction of the civil courts in regard to the civil rights and emoluments secured by law to the church and the ministers thereof” was acknowledged without quali- fication; and continued implicit obedience to their deci- sions with reference to these rights and emoluments was pledged. At the same time it was insisted on “ that, as is declared in the Confession of Faith of this National Esta- blished Church, ‘the Lord Jesus Christ, as King and Head of the church, hath therein appointed a government in the hand of church officers distinct from the civil magistrate ; and that in all matters touching the doctrine, discipline, and government of the church her judicatories possess an ex- clusive jurisdiction, founded on the Word of God, which power ecclesiastical” (in the words of the Second Book of Discipline) “ flows immediately from God and the Mediator the Lord Jesus Christ, and is spiritual, not having a tem- poral head on earth, but only Christ, the only spiritual King and Governor of His Kirk.” And it was resolved to assert, and at all hazards defend, this spiritual jurisdiction, and firmly to enforce obedience to the same upon the office- bearers and members of the church. ‘The decision of the Court of Session having been confirmed by the House of Lords early in 1839, it was decided in the Assembly of that year that the church, while acquiescing in the loss of the temporalities at Auchterarder, should reaffirm the principle of non-intrusion as an integral part of the constitution of the Reformed Church of Scotland, and that a committee should be appointed to confer with the Government with a view to the prevention, if possible, of any further collision between the civil and ecclesiastical authorities. While the conference with the Government had no better result than an unsuc- cessful attempt at compromise by means of Lord Aberdeen’s Bill, which embodied the principle of a dissent with reasons, still graver complications were arising out of the Marnoch and other cases, the nature of which has been briefly indicated in vol. v. as above! In the circumstances it was resolved by the Assembly of 1842 to transmit to the Queen, by the hands of the lord high commissioner, a “claim, declaration, and protest,” complaining of the en- croachments of the Court of Session,? and also an address

1 According to the Free Church “ Protest” of 1843 it was in these cases decided (1) that the courts of the church were liable to be com- pelled to intrude ministers on reclaiming congregations; (2) that the civil courts had power to interfere with and interdict the preaching of the gospel and

administration of ordinances as authorized and enjoined by the church; (3) that the civil courts had power to suspend spiritual censures pronounced by the courts of the church, and to interdict their execution as to spiritual effects, functions, and privileges; (4) that deposed ministers, and probationers deprived of their licence, could be restored by the mandate of the civil courts to the spiritual office and status of which the church courts had deprived them; (5) that the right of membership in ecclesiastical courts could be deter- mined by the civil courts; (6) that the civil courts had power to super- sede the majority of a church court of the Establishment in regard to the exercise of its spiritual functions as a church court, and to autho- rize the minority to exercise the said functions in opposition to the court itself and to the superior judicatories of the church; (7) that pro- cesses of ecclesiastical discipline could be arrested by the civil courts ; and (8) that without the sanction of the civil courts no increased provision could be made for the spiritual care of a parish, although such provision left all civil rights and patrimonial interests untouched.

? The narrative and argument of this elaborate and able document cannot be reproduced here. In substance it is a claim "as of right " on behalf of the church and of the nation and people of Scotland that the church shall freely possess and enjoy her liberties, goverument, discipline, rights, and privileges according to law, and that she shall be protected therein from the foresaid unconstitutional and illegal oe ae a of the said Court of Session, and her people secured in ' heir Christian and constitutional rights aud liberties. This claim is fol- ee by the declaration " that the Assembly cannot intrude ministers

alming congregations, or carry on the government of Christ's

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praying for the abolition of patronage. The home secre- tary's answer (received in January 1843) gave no hope of redress, Meanwhile the position of the evangelical party had been further hampered by the decision of the Court of Session declaring the ministers of chapels of ease to be unqualified to sit in any church court.

The first care of the voluntarily disestablished church was to provide incomes for her clergy and places of worship for her people. As early as 1841 indeed the leading principle of a "'sustentation fund" for the support of the ministry had been announced by Dr Candlish; and at "'Convocation," a private unofficial meeting of the mem- bers of the evangelical or non-intrusion party held in November 1842, Dr Chalmers was prepared with a care- fully matured scheme according to which "each con- gregation should do its part in sustaining the whole, and the whole should sustain each congregation." Between November 1842 and May 1848, 647 associations had been formed; and at the first Assembly it was announced that upwards of £17,000 had already been contributed. At the close of the first financial year (1843-44) it was reported that the fund had exceeded £61,000. It was participated in by 583 ministers; and 470 drew the full equal dividend of £105. Each successive year showed a

church subject to the coercion of the Conrt of Session; and by the protest" that all Acts of the Parliament of Great Britain passed without the consent of the Scottish church and nation, in alteration or derogation of the government, discipline, rights, and privileges of the church, as also all sentences of courts in coutravention of said government, discipline, rights, and privileges, "are and shall be in themselves void and null, and of no legal force or effect."

3 The Scottish members voted with the minority in the proportion of 25 to 12.

4 The number ultimately rose to 474.

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steady increase in the gross amount of the fund ; but owing to an almost equally rapid increase of the number of new ministerial charges participating in its benefits, the stipend payable to each minister did not for many years reach the sum of £150 which had been aimed at as a minimum.

Thus in 1844-45 the fund had risen to £76,180, but the ministers had also increased to 627, and the equal dividend therefore was only £122. During the first ten years the annual income averaged £84,057 ; during the next decade £108,643; and during the third £130,246. The mini- mum of £150 was reached at last in 1868; and since then the balance remaining after that minimum has been provided has been treated as a surplus fund, and distributed among those ministers whose congregations have contributed at certain specified rates per member. In 1878 the total amount received for this fund was up- wards of £177,000; in this 1075 ministers participated. The full equal dividend of £157 was paid to 766 ministers ; and additional grants of £36 and £18 were paid out of the surplus fund to 632 and 129 ministers respectively.?

To provide for the erection of the buildings which, it was foreseen, would be necessary, a general building fund, in which all should share alike, was also organized, and local duilding funds were as far as possible established in each parish, with the result that at the first Assembly a sum of £104,776 was reported as already available. By May 1844 a further sum of £123,060 had been collected, and 470 churches were reported as completed or nearly so, In the following year £131,737 was raised, and 60 additional churches were built. At the end of four years considerably more than 700 churches had been provided.

During the winter session 1843-44 the divinity students who had joined the Free Church continued their studies under Dr Chalmers and Dr Welsh; and at the Asscmbly of 1844 arrangements were made for the erection of suitable collegiate buildings) The New College, Edinburgh, was built in 1847 at a cost of £46,506 ; and divinity halls have subsequently been set up also in Glasgow and Aberdeen. In 1878 there were 13 professors of theology, with an aggre- gate of 230 students,—the numbers at Edinburgh, Glasgow, and Aberdeen respectively being 129, 69, and 32.

A somewhat unforeseen result of the Disruption was the necessity for a duplicate system of elementary schools. At the 1843 Assembly it was for the first time announced by Dr Welsh that "schools to a certain extent must be opened to afford a suitable sphere of occupation for parochial and still more for private teachers of schools, who are threatened with deprivation of

their present office on account of their opinions upon the church question." The suggestion was taken up with very great energy, and with the result that in May 1845 280 schools had been set up, while in May 1847 this number had risen to 513, with an attendance of upwards of 44,000 scholars. In 1869 it was stated in an authoritative document laid before members of parliament that at that time there were connected with and supported by the Free Church 598 schools (including two normal schools), with 633 teachers and 64,115 scholars. The school buildings had been erected at a cost of £220,000, of which the committee of privy council had contributed £35,000, while the remainder had been raised by voluntary effort. Annual payments made to teachers, &c., as at 1869, amounted to £16,000. The total sum expended by the Free Church since the Disruption for educational purposes has been notless than £600,000. In accordance with certain provisions of the Education Act of 1872 most of the schools of the Free Church were voluntarily transferred, without compensation, to the local school boards.

1 Congregations, it ought to be noted, are permitted, and indeed expected, by collections or otherwise, each to " supplement the in- come which its pastor derives from the general sustentation fund.

It has been already seen that during the period of the Ten Years' Conflict the non-intrusion party strenuously denied that in any one respect it was departing from ac- knowledged principles of the National Church. It con- tinued to do so after the Disruption. In 1846, however, it was found to have become necessary, "in consequence of the late change in the outward condition of the church," to amend the " questions and formula;" to be used at the licens- ing of probationers and the ordination of office-bearers. These were amended accordingly ; and at the same time it was declared that, " while the church firmly maintains the same scriptural principles as to the duties of nations and their rulers in reference to true religion and the Church of Christ for which she has hitherto contended, she disclaims intolerant or persecuting principles, and does not regard her Confession of Faith, or any portion thereof when fairly inter- preted, as favouring intolerance or persecution, or consider that her office-bearers by subscribing it profess any princi- ples inconsistent with liberty of

conscience and the right of private judgment." The main difference between the "formula" of the Free Church and that of the Established Church is that the former refers to the Confession of Faith simply as '"'approven by General Assemblies of this Church," while the latter describes it as "'approven by the General Assemblies of this National Church, and ratified by law in the year 1690, and frequently confirmed by divers Acts of Parliament since that time." The former inserts an addi- tional clause,—"I also approve of the general principles respecting the jurisdiction of the church, and her subjection to Christ as her only Head, which are contained in the Claim of Right and in the Protest referred to in the questions already put to me;" and also adds the words which are here distinguished by italics, —" And I promise that through the grace of God I shall firmly and constantly adhere to the same, and to the utmost of my power shall in my station assert, maintain, and defend the said doctrine, worship, dis- cipline, and government of this church by kirk-sessions, presbyteries, provincial synods, and general assemblies, to- gether with the liberty and exclusive jurisdiction thereof ; and that I shall, in my practice, conform myself to the said worship and submit to the said discipline [and] government, and exclusive jurisdiction, and not endeavour directly or indirectly the prejudice or subversion of the same."? In the year 1851 an Act and Declaration anent the publication of the subordinate standards and other authoritative docu- ments of the Free Church of Scotland was passed, in which the historical fact is recalled that the Church of Scotland had formally consented to adopt the Confession of Faith, catechisms, directory of public worship, and form of church government agreed upon by the Westminster Assembly; and it is declared that "these several formularies, as ratified, with certain explanations, by divers Acts of Assembly in the years 1645, 1646, and particularly in 1647, this church continues till this day to acknowledge as her subordinate standards of doctrine, worship, and government." —*

In 1858 circumstances arose which, in the opinion of many, seemed fitted to demonstrate to the Free Church that her freedom was an illusion, and that all her sacrifices had been made in vain. Mr John Macmillan, minister of Cardross, accused of immorality, had been tried and found guilty by the Free Presbytery of Dumbartou. Appeal having been taken to the synod, an

attempt was there made to revive one particular charge, of which he had been finally

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2 It may be added that, while the Free Church requires elders to subscribe the same formula as ministers, the Established Church re- quires them to sign an older and shorter one.

3 By this formal recognition of the qualifications to the Confession of Faith made _in 1647 the scruples of the majority of the Associate Synod of Original Seceders were removed, and 27 ministers, along with a considerable number of their people, joined the Free Church in the

following year. IX. — 94

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acquitted by the presbytery ; and this attempt was success- fulin the General Assembly. That ultimate court of review did not confine itself to the points appealed, but went into the merits of the whole case as it had originally come before the presbytery. 'The result was a sentence of sus- pension. Mr Macmillan, believing that the Assembly had acted with some irregularity, applied to the Court of Session for an interdict against the execution of that sentence ; and for this act he was summoned to the bar of the Assembly to say whether or not it was the case that he had thus appealed. Having answered in the affirmative, he was deposed on the spot. Forthwith he raised a new action (his previous application for an interdict had been refused) con- cluding for reduction of the spiritual sentence of deposition, and for substantial damages. The defences lodged by the Free Church were to the effect that the civil courts had no right to review and reduce spiritual sentences, or to decide whether the General Assembly of the Free Church had acted irregularly or not. Judgments adverse to the defenders were delivered on these points ; and appeals were taken to the House of Lords. But before the case could be heard there, the lord president took an opportunity in the Court of Session to point out to the pursuer that, inasmuch as the particular General Assembly against which the action was brought had ceased to exist, it could not therefore be made in any

circumstances to pay damages, aud that the action of reduction of the spiritual sentence, being only auxiliary to the claim of damages, ought therefore to be dismissed. He further pointed out that Mr Macmillan might obtain redress in another way, should he be able to prove malice against individuals. Very soon after this deliverance of the lord president, the case as it had stood against the Free Church was withdrawn, and Mr Macmillan gave notice of an action of a wholly different kind. But this last was not persevered in. The appeals which had been taken to the House of Lords were, in these circumstances, also departed from by the Free Church. It is perhaps to be regretted, from the legal point of view, that the case did not advance sufficiently to show how far the courts of law would be prepared to go in the direction of recognizing voluntary tribunals and a kind of secondary exclusive jurisdiction founded on con- tract.! But, whether recognized or not, the church for her part continued to believe that she had an inherent spiritual jurisdiction, and remained unmoved in her determination to act in accordance with that resolution " notwithstanding of whatsoever trouble or persecution may arise." 2

In 1863 a motion was made and unanimously carried in the Free Church Assembly for the appointment of a com- mittee to confer with a corresponding committee of the United Presbyterian Synod, and with the representatives of such other disestablished churches as might be willing to meet and deliberate with a view to an incorporating union. Formal negotiations between the representatives of these two churches were begun shortly afterwards, which resulted in a report laid before the following Assembly. From this document it appeared that the committees of the two churches were not at one on the question as to the relation of the civil magistrate to the church. While on the part of the Free Church it was maintained that he 'may law- fully acknowledge, as being in accordance with the Word of God, the creed and jurisdiction of the church," and that "it is his duty, when necessary and expedient, to employ the national resources in aid of the church, provided always that in doing so, while reserving to himself full coutrol over the temporalities which are his own gift, he abstain from all authoritative interference in the internal government of

1 See Ta

: ylor Innes, Law of Creeds in Scotland, p. 258 seq.

os a, language of Dr Buchanan, for example, in 1860 was (mutatis

a, is) the same as that which he had employed in 1838 in moving e Independence resolution already referred to.

the church," it was declared by the committee of the United Presbyterian Church that, "inasmuch as the civil magis-

trate has no authority in spiritual things, and as the employ- ment of force in such matters is opposed to the spirit and precepts of Christianity, it is not within his province to legislate as to what is true in religion, to prescribe a creed or form of worship to his subjects, or to endow the church from national resources." In other words, while the Free Church maintained that in certain circumstances it was lawful and even incumbent on the magistrate to endow the church and on the church to accept his endowment, the United Presbyterians maintained that in no case was this lawful either for the one party or for the other. Thus in a very short time it had been made perfectly evident that a union between the two bodies, if accomplished at all, could only be brought about on the understanding that the question as to the lawfulness of state endowments should be an open one, The Free Church Assembly, by increasing majorities, manifested a readiness for union, even although unanimity had not been attained on that theoretical point. But there was a minority which did not sympathize in this readiness, and after ten years of fruitless effort it was in 1873 found to be expedient that the idea of union with the United Presbyterians should for the time be abandoned. Other negotiations, however, which had been entered upon with the Reformed Presbyterian Church at a somewhat later date proved more successful ; and a majority of the ministers of that church with their congregations were united with the Free Church in 1876.

The total income of the Free Church for the year 1877- 78 was £575,718. This included (1) sustentation fund, £177,659 ; (2) local building fund,

£99,480 ; (3) mission- ary and educational, £91,895; (4) congregational and miscellaneous, £190,775. Since 1843 an aggregate amount of nearly £13,000,000 has been raised. In 1878 the num- ber of congregations was 997, with a total membership of 270,000. 1075 ministers participated in the equal divi- dend. There were also 59 missionaries employed at 21 prin- cipal mission-stations in India, Africa, Syria, and Polynesia.

Litcrature.—An authorized edition of the Subordinate Standards of the Free Church, including the Claim of Right and Protest, was published in 1851 in an easily accessible form, along with the Act and Declaration of that year. Of these "standards" (the Holy Scrip- tures being held supreme as the " rule of faith and manners") the most important is the Confession of Faith, which alone is imposed by subscription. The Catechisms (Larger and Shorter) are " sanctioned as directories for catechizing ;" and the Directory for Public Worship, the Form of Church Government, and the Directory for Family Worship are " of the nature of regulations rather than of tests." A practical application of the doctrine of the Confession, called the Sum of Saving Knowledge, is also included among the "standards." The general subject of Scottish church history is handled in a consider- able number of well-known works, which need not be enumerated here. Among books professedly dealing with the Free Church question, the most valuable are Sydow's Die Schottische Kirchen- frage (Potsdam, 1845), and The Scottish Church Question (London, 1845); Buchanan's Ten Years' Conflict (1849); Hanna's Life of Chalmers (1852); and Taylor Innes on The Law of Crceds in Scot- land (1867). See also Cockburn, Memorials of His Time (Continua- tion, 1874); Walker, Dr Robert Buchanan: an Ecclesiastical Bio- graphy (1877); Annals of the Disruption (published by authority of a committee of the Free Church, 1876-77). (J. S. BL.)

FREEHOLD, in the English law of real property, is an estate in land, not being less than an estate for life. An estate for a term of years, no matter how long, was con- sidered inferior in dignity to an estate for life, and unworthy of a freeman (see Estat). " Some time before the reign of Henry II., but apparently not so early as Domesday, the expression liberum tenementum was introduced to designate land held by a freeman by a free tenure. Thus freehold tenure is the sum of the rights and duties which

constitute the relation of a free tenant to his lord." In this sense freehold is distinguished from copyhold, which is a tenure*

3 Digby's Htstory of the Law of Real Property.

having its origin in the relation of lord and villain (see CopyHoLp). Freehold is also distinguished from leasehold, which is an estate for a fixed number of years only. By analogy the interest of a person who holds an office for life is sometimes said to be a freehold interest. The term customary frecholds is applied to a kind of copyhold tenure in the north of England, viz., tenure by copy of court-roll, but not, as in other cases, expressed to be at the will of the lord.

FREE IMPERIAL CITIES is the ordinary English translation of Frece Reichs-Stddte, a technical expression in German history. In Germany, as in other countries of Europe, a considerable number of towns succeeded, in the midst of the dynastic confusion of the Middle Ages, in main- taining or acquiring more or less complete independence of the state or sovereign within whose territory they were situated. This they effected partly by forming defensive leagues with each other, and partly by procuring, in return for service or money, privileges and protection from the successive occupants of the imperial throne. Of these free towus a certain proportion rose by commerce and industry to a position of great influence, and ultimately took rank along with kingdoms and principalities as integral menibers of the body politic of the empire. They first appear dis- tinctly in this character in the reign of Henry VII. (1308- 1313). Their number was continually fluctuating, for their liberties were almost as easily lost as they were with diffi- culty acquired. Most of them had to maintain a continual conflict by war or diplomacy with the ecclesiastical or secu- lar potentates of their district, and not unfrequently their interests were betrayed by the emperors themselves. Mainz, which in the 13th century was at the head of the Rhecnisches Stédtebund, or confederation of the cities of the Rhine, was conquered in 1462, and subjected to the bishop's see ; Zwickau, Altenburg, and Chemnitz, put in pawn first by Frederick II. aud afterwards by several of the later emperors, thus fell into the hands of the dukes of Saxony; other free cities placed themselves of their own accord under the control of prince

or bishop; some, as Donauworth, were deprived of their privileges by the emperors on account of real or alleged offences ; others again were separated from the empire by foreign conquest, as Hainault or Hagenau, Colmar, Schlett- stedt, Weissenburg, Landau, and Besangon by Louis XIV.; and Basel notably preferred to cast in its lot with the rising confederation of Switzerland. At the diet of Augsburg in 1474 the free imperial cities divided themselves for the first time into two benches, the Rhenish and the Swabian, the former also including those of Alsace, Wetterau, Thuringia, and Saxony, and the latter those of Franconia, They were formally constituted the third collegium of the diet by the peace of Westphalia in 1648. At the time of the French Revolution they still numbered 51,—the Rhenish bench comprising Cologne, Aix-la-Chapelle or Aachen, Liibeck, Worms, Spires, Frankfort-on-the-Main, Goslar, Bremen, Hamburg, Miihlhausen, Nordhausen, Dortmund, Friedberg, and Wetzlar; and the Swabian bench, Ratisbon or Regensburg, Augsburg, Nuremberg, Ulm, Esslingen, Reutlingen, Nordlingen, Rothenburg on the Tauber, Schwabisch-Hall, Rothweil, Ueberlingen, Heilbronn, Gmiind, Memmingen, Lindau, Dinkelsbiihl, Biberach, Ravensburg, Schweinfurt, Kempten, Windsheim, Kaufbeuern, Weil, Wangen, Isny, Pfullendorf, Offenburg, Leutkirchen, Wimpfen, Weissenburg in the Nordgau, Giengen, Gengen- bach, Zell on the Hammerbach, Buchhorn, Ahlen, Buchau, Bopfingen. A large proportion of these towns had then at least as little claim to their exceptional position as the pocket-burghs of England before'the passing of the Reform Act. By the decision of the imperial deputation of 1803 (Reichsdeputationshauptschluss) Cologne, Aix-la-Chapelle, Worms, and Spires were assigned to France ; only six, Hamburg, Liibeck, Bremen, Augsburg, Frankfort-on-the-

Main, and Nuremberg were allowed to retain their Rezchs- frethett, or, in other words, to hold directly of the empire. On the dissolution of the empire in 1806, Augsburg and Nuremberg were given to Bavaria, and Frankfort was made the seat of Count Dahlberg, the archbishop and electoral prince of Mainz, who was appointed primate of the confed- eration of the Rhine. On the establishment of the German confederation in 1815, Hamburg, Liibeck, Bremen, and Frankfort were recognized as free cities, and the first three still hold that position in the new German empire ; but Frankfort, in

consequence of the part it took in the war of 1866, has been degraded to the rank of an ordinary Prussian town.

In the earlier centuries of their existence the free cities of the empire were under the jurisdiction of two imperial officers, one of whom, the imperial advocate or Reichsvogt, took charge of criminal cases, and the other, the imperial procurator or Reichs-Schultheiss or Schuldheiss, dealt with the civil cases. As time went on many of the cities pur- chased the right of filling these offices with members of the principality ; and in several instances the imperial authority fell practically into desuetude except when it was roused into action by peculiar circumstances, such as a dispute between the citizens and their magistrates. The internal constitution of the cities was organized after no common type; but there were several of them whose privileges were drawn up in imitation of those of Cologne, which had been one of the very first to assert its independence. ~ See J. J. Moser, Reiehsstidtisehes Handbuch, Tiibingen, 1732; D. Hinlein, Anmerkungen iiber die Geschiehte der Reichsstidte, Uln, 1775; A. Wendt, Besehreibung der kaiserl. freien Ketchsstadte, Leipsic, 1804; G. W. Hugo, Die Mcdiatisirung der deutschen Reiehsstddte, Carlsruhe, 1838; Waitz, Deutsche Verfassungsgeschichte.

FREEMASONRY (fr. Franc-magonnerie, Ger. Frei- maurerei), is the name given to that system of ritual and rules which Freemasons observe. It may also be applied to the masonic art, or the practice of masonic ritual and rule. The institution is not older than the beginning of the 18th century, but it has been lately said to include more than 10,000 lodges and more than 1,000,000 members. Before considering the history and actual position of the modern society itself, however, a few words are due to the really interesting and much-debated question of its origin and antecedents. It is, of course, easy to pomt out vague analogies between Freeinasonry and the great secret organi- zations having social aims, which existed in antiquity. The Pythagoreans, the Eleusinians, the Essenes, and the Carmathites and Fedavi (the mystic Rationalists of Islam) have all been appealed to by uncritical masonic writers in the hope of giving to their craft the doubtful authority and prestige of ancient descent. If the resemblances were more numerous and striking than they are, they would not prove an historical connexion between organizations so widely removed from one another in

time, and they would admit of explanation by the general doctrine of psychical identity, one of the most important results of anthropological science. Besides this, the superficial resemblances are accompanied by radical differences. The mere conception of Freemasonry implies cosmopolitan brotherhood, and was therefore impos- sible in the ancient world. If indeed the genuine legends of the craft were followed, its origin would be traced to the creation, the flood, or at least the building of Solomon's temple. Accordingly, one of the most popular and volumin- ous masonic writers of the 19th century, the Rev. George Oliver, informs the world that Moses was a grand master, Joshua his deputy, and Aholiab and Bezaleel grand wardens. Again, a likeness, sometimes real and sometimes fanciful, between the sets of symbols and ceremonies used has led many writers to see an organic connexion between Freemasonry and the Assassins, the Rosicrucians, the Templars, the Illuminati, the Carbonari, and the Hetairia,

and other social and political secret societies, old and young, of the most widely differing aims. It is possible that Freemasonry copied an older ritual, which was again imitated by younger societies, who also endeavoured to utilize masonic lodges as stations for proselytizing work. But these facts themselves show discontinuity of life. The true historical precursors of the modern fraternity of Free- masons were the medizval building corporations. Of these the most distinctive type is to be found in the stone masons (Steinmetzen) of Germany. It is a further and more diffi- cult question what were the relations between these mediz- val societies and the Roman collegia not struck at by the law De Collegiis Illicitis, D. 47, 22. Krause in his Diedrei dltesten Kunsturkunden der Freimaurerbriiderschaft} points out that these collegia had an exchequer, an archive, patrons, religious ceremonies, an oath, a benefit and burial fund, and a register, They had such officers as magistri, decuriones, tabularii, censores, and they instructed their apprentices to a certain exteut in secret. No doubt such sodalitia existed for centuries in Gaul and Britain, and they may have deposited in the civilization of these countries some of their ideas and habits. Again, at a later period, there was a distinct invitation sent from the West to the building corporations of Byzantium ; the movement west- ward

was iucreased by the iconoclasm of Leo. But the European building societies were undoubtedly distinct growths. The cementari or libert muratores at first grouped themselves round the monasteries, especially of the Benedictine order. The abbots were in many cases the architects who employed the masons on ecclesiastical build- ings and repairs. As architecture developed, and with in- creasing wealth the church gradually undertook larger and nobler works, these societies of craftsmen also assumed a more definite and more durable form. The taste and science of Gothic architecture were to a large extent the possession of the Bawhiitten, or wooden booths where the stone-cutters during the progress of the work kept their tools, worked, held their meetings, and probably also took their meals and slept. In the 12th century there are distinct traces of a general association of Bauhiitten throughout Germany, ac- knowledging one set of Ordnungen or craft laws, one set of secret signs and ceremonies (Heimlichkeiten) and to a cer- tain extent one central authority in the Haupthtitte of Strasburg.? Albertus Magnus (1205-1280) is supposed to have introduced many of the Jewish and Arabian symbols which were popular in the craft. The privileges which a Bauhiitte was able to give to its masters, parlierer (speakers), and journeymen,.were chiefly 'a share in the adininistration of justice, in the election of officers, in the banquets, and in works of charity." The trade customs and symbolic forms of these associations have been described by Fallou in his Mysterien der Freimaurer (1859), Winzer in his Deutschen Briiderschaften des Mittelalters (1859), and Fort, arly His- tory and Antiquities of Freemasonry (Philadelphia, 1877). The initiation is said to be copied from a Benedictine conse- cration. Instruction was given to all apprentices in both architecture and its allegory. When he had served his time and finished his " Wanderjihre," every man was entitled, if of good character, to receive the Wortzeichen or der Gruss. He took the oath of secrecy on the Bible, the compass, and the square, and drank the Wellkommen. The three great lights,? the hammer or gavel, the gold, azure, and white

e See also Rebold, Hist. Gén. de la Franc-maconnerte, 1851, of which there is an American translation by Brennan, Cincinnati, 1868.

- *The importance of this was first pointed out in Abbé Grandidier's letter, which forms App. xvii. to De Luchet's Essai sur la Secte des*

Iituminés, Paris, 1789. , 3 These candles have been derived from the cabalistic triangle ae of the sephire, splendours or attributes proceeding from the

odh, the En-Soph, or central point of light (see Ginsburg On the Cubila). The masonic MS. attributed to Henry VI. refers to the

colours, the sacred numbers 3, 5, 7, and 9, and the interlaced cords, all had their traditional meaning. The obligation to secrecy, however, probably applied to the apprentice even before initiation. See the Constitutcons of Masonry (Halli- well's edition, 1. 279-282)— '¢ The prevystye of the chamber telle he no mon, Ne yn the logge whatsever they done ;

Whatsever thou heryst, or syste hem do, Tell hyt no mon, whersever thou go."

It has been observed by Brentano, that the working arrangemeuts of the building trades at this time differed when a cathedral or palace was being built, the architect being then master of the lodge with foremen under him; and when a dwelling-house was built, the owner then engaging both masters and workmen, There was thus a nearer approach to the modern factory system ; and in fact the well-known English statutes against combinations, congregations, and chapters of workmen (34 Edw. III. ce. 9,and 3 Hen. VI. c. 1) were directed against the ex- cessive wages of journeymen. 'The separate interests of this class tound expression in the contemporary French institution of Compagnonnage. The atmosphere of these societies seems, even at an early date, to have been favour- able to liberty of thought and religious toleration. Hence they were prohibited by the council of Avignon in 1326. The authority of the Haupthiitte was recognized at the great assemblies of Ratisbou and Strasburg in 1459, the statutes of which received imperial confirmation. It was legally destroyed by an edict of 1731, long before which time its practical vitality had ceased. England imported much of her lodge organization and learning from Germany, The York charter, on which she based her claim to a native system in the time of Athelstan, is a much later document. This charter contains the famous legend of the craft which derives the seven liberal*

sciences (masonry being a part of geometry) from the family of Lamech. This science, pre- served on a stone pillar from the flood, was taught by Euclid to the Egyptians, and carried by Israel to the build- ing of the temple. Maymus Grecus brought it to Charles Martel and to England. The early history of the English mason lodges has been illustrated by the works of Wm. J. Hughan,—Constitutcons of the Freemasons, History of Freemasonry at York, &c.6 The first instance of a gentle- man or amateur being "accepted" is that of the antiquary Elias Ashmole (afterwards Windsor Herald under Charles II.) who, along with Colonel Manwaring, was entered at Warrington in 1646. The causes which led to the intro- duction of a new class of members, and gradually converted operative into speculative masonry, are well stated by Findel, the learned editor of the German masonic journal Die Bauhiitte, whose History of Freemasonry (translated into English in 1869) is by far the most scientific and com- plete work upon the subject. In the first place the old secrets of Gothic masonry were rendered less valuable by the spread of Augustan and Renaissance architecture, which Inigo Jones and his patron Lord Pembroke had been study- ing on the Continent. Jones was patron of the Freemasons from 1607 to 1618. He invited several Italian artists to join the body. Then the disorder of the civil wars pre- vented meetings and broke up the masonic connexion. Again the growing spirit of the Reformation in religion gave men a freedom of speech which superseded the marks and caricatures in which the old masons exposed the vices of the church. Toleration was soon a political fact. Science, too,

faculty of Abrac,' 7.¢., of the adorable name worshipped by the Basilidian heretics.

4 History and Development of Guilds, London, 1870, p. 80.

5 C. G Simon, Mtude historique et morale sur le Compagnonnage, Paris, 1853.

6 See also Dallaway, Historical Account of Master and Freemason,

took a new departure from the time of Bacon. The inter- rogation of nature was preferred to legend and allegory. At the same time a perfectly distinct current of ideas was originated by the Arabian mysticism of Paracelsus and Rosenkreuz, which, after being popularized on the Continent by one of its most decided opponents, Valentine Andree, was preached to the people of England by Robert Fludd in his Z'ractatus Theologico-Philosophicus. Works like Bacon's New Atlantis and Dupuy's " History of the Condemnation of the Templars" (in his Z'rattez concernant l' Histoire de France, 1651) fostered the idea of a new humanitarian society, and at the same time suggested the adoption of ancient symbols of fellowship. The same thing is seen in the Pantheisticon of Toland. It was under the impulse thus communicated that a general assembly of masons was held in 1663, at which the old catechisms were revised, and a series of new statutes passed. The recunstruction of London after the fire, the building of St Paul's, and the patronage of Sir Christopher Wren, kept up the interest inthe move- ment; and at last a formal resolution was passed that the masonic privileges should no longer be coufined to operative masons.

*England.—Modern or speculative masonry may be said to have begun in London on June 24, 1717, "the high noon of the year, the day of light and of roses," when the four London lodges, having erected themselves into a grand lodge, named their first grand master. The leading spirits in this revival were Desaguliers, the well-known popularizer of natural science, and James Anderson, a Scotch Presbyterian minister, who compiled the Book of Constitutions, containing the ancient regulations and charges of the craft. This book is quite uncritical. It is said that the mechanical tastes and the Huguenot principles of Desaguliers are both traceable in the subsequent organization of the society. From this time new lodges could be formed only by warrant from the grand lodge, but they were empowered to create masters and fellow crafts. In 1721 the duke of Montagu was elected grand warden. He was the first noble who obtained that office, In the strange society of Gormogones, subject to the ** sub-cecumenical volgi" at Rome, it is supposed that the Jesuits made a final effort to secure English Freemasonry as a channel for their political influence, At this time, also, the committee of charity was formed, which has since raised and expended very large sums for the relief of distressed brethren, and built the boys' and girls' masonic schools at Battersea Rise and Tottenham. Provincial grand*

masters were appointed, and charters granted to many foreign lodges. In the latter part of the 18th century the ancieat York Lodge, backed by several old masons who had been indulging in irregular initiations, put forward a rival claim to be grand lodge or supreme authority. This claim was rested on the fable of an assembly at York in the year 926. The York people had also a new ritual, described in the Book of Laws or Ahiman Rezon, and also in Jachin and Boaz, The three distinct Knocks, and Iiram Adonham or the Grand Master Key! (1762). On the orthodox or London side appeared the well-known Jilustrations of Masonry, by Preston, the pupil of Ruddiman. The schis- matics introduced the red colour of the royal arch degree, which they represented as something more exalted than the blue degrees of St John. It belongs to the order of Templars, the legend referring to the second building of the temple. Another branch of Templarism, the grand chapter of Harodim, was founded in London in 1787. Just at the end of the century the publication of Abbé Barruel's Memoires pour servir & Vhistoire du Jacobinisme, translated into English by Clifford (who applied his author's principles

1 The Jewish legend of the assassination of and search for Hiram, which still appears in the business of a lodge, resembles the Scandina- vian stery of Baldur.

to the United Irishmen and other Cerresponding Societies of the time) and of Professor Robinson's Proofs of a Conspi- racy, translated into French and German, made Freemasonry the subject of considerable suspicion.? The Act of 1799 directed against seditious societies, however, makes an ex- ception in favour of the masonic lodges, which, according to the Act, meet chiefly for benevolent purposes. In 1813 a union was at last brought about by the dukes of Sussex, Kent, and Athole between the rival grand lodges of London and York, henceforth known as the United Grand Lodge of England. This patronage of aristocratic blood gave an im- petus to Freemasonry, and in 1832 Mr Crucefix, the editor of the Freemason's Quarterly Review, succeeded in founding the Freemason's Asylum. The brotherhood showed their good sense in deciding about this time that Jews might be- come members of the craft. They also built a hall, esta- blished

their archeological institute and "The London Literary Union," and started the Freemason's Magazine and the Hreemason, in which periodicals a record may be found of the most recent masonic opinion and history. Besides 60 provincial grand lodges and 1200 lodges, England has a grand chapter for the royal arch degree, a grand lodge for the mark masters, a grand conclave of the knights templars, and a superior grand council of the ancient and accepted rite of the 33 degrees.

Jreland.—The first Irish lodge of speculative masonry seems to have been opened at Dublin in 1730. The Eng- lish constitutions were adopted wholesale. Nothing of interest occurs in the Irish history. A characteristic liking is shown for the most sonorous of the high de- grees :—the knights of the sword, the east, and the sun, the rosicrucian or mason prince, the kadosh or philoso- phical mason, and the grand general inspector. Power to grant these degrees was absurdly enough obtained from 'Mother Kilwinning," a Scotch lodge which has always laid claim to a fabulous antiquity. The disputes between the grand chapter and grand consistory of Dublin have been frequent and violent. Ireland has now 350 lodges. The grand lodge, which supports two orphan schools, has an in- come of about £4000. A statement of the Ultramontane argument in modern Ireland will be found in Gargano's Trish and English Freemasons, Dublin, 1878, which is largely founded on Mgr. Dupanloup's Study of Freemasonry and Secret Warfare against Church and State. Gargano strongly urges the injustice done by the secret preference given by masons to one another in the ordinary civil and commercial relations of life. His book also contains an explanation of the pass-grip and real-grip for the three ordinary degrees, and for the mark master, the royal arch, and the knight templar, and a minute description of the modern initiation, with the text of the oaths. __

Scotland.—In Scotland the history of Freemasonry closely resembles what took place in England. Before the 16th century there is not much trace of special legislation about masons.° Like the other crafts they enjoyed, under the Act of 1424, the right of nomin- ating their own deacon or master-man. The deacon gave place to the warden, who represented rather the public than the trade interest. In 1493 the masons and wrights are denounced as oppressors of the lieges, because they had agreed that "they sall have fee alsweill for the halie day as for the wark day," and "that quair ony be-

giennis ane mannis warke ane uther sall not end it." A severe blow was struck against their privileges by an Act of 1540, which rendered legal the employment of unfree-

2 The earliest book of this class was Abbé Larudan's Frane-macon Ecrasé, 1746.

3 As may-be seen from the " marks" on Melrose Abbey, the older Scotch churches owe much to the skill of the Frenchman John Moreau and other foreign masons.

men builders, but Queen Mary restored the jurisdiction from the trade visitors to the deacons, and confirmed their ancient right of self-regulation. In 1598-9 we have the celebrated statutes and ordinances to be observed " by all master masons, set down by William Shaw, master of work to his majesty, and general warden of the craft." These documents, one of which was preserved in the charter chest of the Eglinton family, are printed in Mr Murray Lyon's learned History of Freemasonry in Scotland, Edin., 1873. They are confined to trade regulation, and do not deal with benefits. 'They fix the number of apprentices, the examina- tion on entrance, the subscription to the box, the election of officers, provision for the safety of craftsmen, &c. The "Old Buik" of the Kilwinning Lodge was not really a Scotch document. It was a version of the English masonic legend and charges. The ceremony of initiation was at this time very simple; but the speaking plack, the dinner, and the pitcher of ale were exacted. The system of de- grees was not developed. There was probably a pass-word, such as the squaremen word used in the "brithering" of the wrights and slaters. The individual "marks" chosen by entrants were carefully registered, but they did not in- dicate status. The mark degree, revived in 1869, and made the subject of a conference in 1871, was not known before 1789. In fact, the apprentices were originally present at and concurred in most of the business of the lodge. This word "lodge" occurs for the first time in a "statute anent the government of the master mason of the College Kirk of St Giles," 1491, which is to be found in the burgh records of Edinburgh. It would appear that the deacon of the civil trade incorporation was often ex officio head of the lodge. 'The quarter-master and the intender or instructor

were also officers in the old lodge. Cowans, i.e, strangers, werc stringently provided for in Shaw's Statutes. The traces of female membership are explained by the custom of the widows and daughters of freemen being admitted, at least to finish the contracts of the deceased. The Hay MSS. in the Advocates' Library contain two charters or letters of jurisdiction, dated in 1601 and 1628, by the freemen masons and hammermen in favour of the St Clairs of Rosslyn, in virtue of which the head of that family for a long time acted as the patron, protector, and judge of the early masonic lodges. This has sometimes been inaccurately re- presented as a heritable conveyance of a grand mastership. As in England, there are traces of amateurs or non-operative members being gradually admitted to full privileges even in the 17th century, though such persons were charged higher entrance fees. This was called the theoric or geomutic as opposed to the domatic or operative element. Boswell of Auchinleck was » member so early as 1600. The first years of the 18th century were marked by movements of insubordination among the journeymen, wlio considered themselves entitled to a larger share of control over the common purse. The original theory of the lodge was that only masters, and not fellowcrafts or apprentices, were members. In 1721 the enthusiastic Desaguliers appeared in Edinburgh ; and on November 30, 1736, the first gen- eral assembly of symbolical masons was held, and a grand lodge for Scotland formed. The representative of the St Clair family then resigned lis hereditary office and was elected first grand master. St Andrew's day was substituted for the day of 'St John the Baptist. Provincial grand masters were soon added, and there was a general adhesion of Scotch lodges to the new organization. The subsequent history of the brotherhood is not eventful. In Scotland they have been more remarkable for conviviality, or " re- freshment," as it is technically called, than for comprehen- sive charity. Their gloves, aprons, sashes, and jewels are well known in festival or funeral processions. Their poli- tical relations have been peaceful. In 1757 the Associate

' invented a Freemason's dance for six.

FREEMASONRY

Synod excommunicated all persons taking the secret oath, but this was only a part of the general defiance which Cameronianism gives to civil duty. In

1800, when inter- course with some Irish regiments had introduced the templar degrees to some of the Ayrshire lodges, an attempt was made by the law officers of the crown to convict certain templars at Maybole of sedition and the administration of unlawful oaths. The case only resulted in the disclosure of the extremely absurd ceremonies connected with the two degrees of this royal order, viz., Heredom of Kilwinning and Rosy Cross. One of them consisted in drinking porter out of a human skull. Again, when political feeling ran high at the beginning of the present century, the autliority of the grand lodge was seriously shaken by the revolt of the associated lodges headed by Canongate Kilwinning. The Court of Session, Lawson v. Gordon, July 7, 1810, F. C., refused to recognize a masonic lodge as a corporation, and in another case they rejected the argument that lodges certified by the grand lodge were alone entitled to the protection of the ex- cepting clause in the Act of 1799. The quarrel was speedily arranged. In 1811 a supreme grand royal arch chapter of Scotland was founded at Edinburgh, but its degrees were denounced and have never been recognized by the grand lodge. Scotland has altogether 400 lodges."

France.—The astronomer Lalande, in his article on this subject in the Hncyclopédie, says that the first masonic lodge in France was founded by Lord Derwentwater at Hurre's Tavern, Paris, in 1725. The movement was at first largely patronized by the nobility. Louis XV. attempted to suppress it in 1737, and next year Clement XII. issucd the bull In Eminenti, which denounces the liberi muratori and all

| secret societies, as the council of Trent had done before

(xxv. c. 20). It is amusing to trace through the later bulls the inflated phrase of papal indignation,—Prowidas issued by Benedict XIV. in 1751, which, oblivious for the moment of the Society of Jesus, says, " honesta semper publica gaud- ent;" Ecclesia a Jesu, by Pius VII. in 1814, which refers especially to the Carbonari ; Quo Graviora, by Leo XII. in 1826, which mourns over the corruption of the universities ; and Quanta Cura by Pius 1X. in 1864, which says, briefly but emphatically, damnantur clandestine societates. In France the tone of masonry was low. Admissions were sold at a fixed price without inquiry as to character. Salé The order of La Felicité was disorderly; and the Mopses was invented to evade the papal

prohibition. The Chevalier Ramsay in his Relation Apologique introduced the nonsensical hauts grades, with novices, profes, and parfaits, which he said were derived from the knights St John of Malta, and had been preserved by " Mother Kilwinning." All this was probably a Jacobite propaganda, 'The nine high degrees, including Irish architect and Scotch apprentice, though discounten- anced by the Grande Loge Anglaise de France in 1743, be- came very popular, The Parfait Magon was published in 1744, and next year the Magonnerie Adonhiranuque Devoilée disclosed the intricacies of the 'strict observance." There is a tradition that Prince Charles Edward himself founded the Chapitre Primordial de Rosecroix at Arras. The Clermont ritual, which was elaborated under Jesuit influence, added three French degrees, which were founded on the story of the templars having taken refuge from the persecution of Philip IV. in the island of Mull One of these degrees was Chevalier de VAigle Elu. In 1766, under the auspices of anew Grande Loge Nationale of France, afterwards called the Grand Orient, a representative system was at last ad- opted in which the " Souverain Conseil" was merged, and

1 An insight into the practical working of Freemasonry in Britain may be got trom Oliver's Jnstitutes of Masonic Jurisprudence, London, 1859, and from the other works of that prolific author. The Jree-

mason's Magazine and Masonic Mirror is published weekly.

some degree of subordination among tlie various lodges was obtained. The confusion at this time between Dresden and Scotch rituals, between the old and simple forms of St John and the wildest complications of Rosicrucian superstition, was increased by the appearance of Cagliostro and other systematic impostors. Cagliostro, as every one knows from Carlyle's famous essay, was the Grand Cophta' of the Egyptian system, a product of his own fertile brain, With the view of weeding the brotherhood of such rascals, the Grand Orient in 1777 introduced the Alot de Semestre, or biennial pass- word. The rivalry of such romantic systems as Martinism? was still, however, keenly felt, and in 1781] the Grand Orient adopted four of the higher degrees, viz., élu, chevalier d'orient, écossais, and chevalier rosecrov. All this while an active hostility was kept up between the Orient

and the original Grand Lodge, each of which was sup- ported by a separate Rosicrucian organization besides its own proper lodges. The work of both was suspended dur- ing the Revolution, but in 1799 a national union was effected by Roettiers. No sooner, however, was this done, and the statutes, originally based on the English constitu- tions, thoroughly revived, than French masonry again suffered from an invasion of mysticism,—first, in the form of the Scottish Philosophic Rite (including such profundi- ties as the luminous ring and the white and black eagle), and, secondly, iu the American Ancient aud Accepted Scotch Rite of 33 degrees, which the charlatan De Grasse-Tilly ex- pounded with great success, but which in 1804 was.amalga- mated with the Grand Orient, the great marshals Masséna and Kellermann being then the leading members of the two bodies. The union did not last, as Napoleon disliked the constitution of the Supréme Conseil, which was largely in- fluenced by the aristocracy. His brother Joseph, assisted by Murat and Cambacérés, was allowed to take office in the older organization. An order of templars appeared in 1804, and was followed by the absurd Rite israim, which contains 90 degrees of the most fantastic kind. The French clergy in their denunciations of Freemasonry set an ex- ample of bigotry, which the masons themselves followed in their treatment of Clavel, author of Histovre Pittoresque de la Franc-maconnerie, one of the few rational books on the subject in the language. During the reactionary Catholic policy of the grand master Murat the younger (1852-62), the liberties of the Orient were greatly interfered with and its funds almost exhausted. Since then it has slowly recovered. It hasnow 292 lodges; and the Supréme Consetl, which has become more democratic in constitution, has 50. The Grand Orient has lately ceased to require belief in a personal God as a test of membership.

Space does not admit of a detailed description of the advances of Freemasonry in other parts of Europe and in America. In Germany, where the chief lodge at Berlin is known as the grand royal mother lodge, Zu den dre« Welt- Kugeln, it was patronized by Frederick the Great, and op- posed by Maria Theresa. Its relations with the [luminati of Weishauptare of extremehistorical interest ; andthe question of the higher degrees was discussed at the great conference of Wilhelmsbad in 1782. The cause was helped by the ad- hesion of such great men as Lessing in his Hrnst und Falk, Gespriche fiir Freimaurer ; Herder in his Adrastea ; Fichte in his

Briefe an Constant and Eleusinians of the 19th Cen- tury ; and Goethe, who wrote several masonic songs, and whose Wilhelm Meister is a favourite book among the craft. Germany has now 314 lodges, some of them, however, un-

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1 See Goethe's comedy of this nae. :

4 Martin was connected with the Chevaliers Bienfaisants, Amis Réunis, and Philosophes Inconnus. He was a disciple of Jacob Boehme, and believed masonry to be divinely inspired. The system resembled that invented by the Philaléthes, of which Court de Gebelin, the Camisard historian, was a member.

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der the Swedish rite. The critical history of the institution

-and much of its general literature has been written there.

The chief historians are Schréder, Krause, Fessler, and Findel. Kloss has published a bibliography which is sup- plemented by the American Barthelmess and by Findel. Marbach, Ritterliaus, and Lowe are the poets of the order in Germany, as Morris is in America. One of the most recent German publications is Sarsena, oder der Vollkom- mene Baumeister, Leipsic, 1874. As regards America it is sufficient to refer to the great auti- masouic movement of 1826, which was caused by the kidnapping and supposed murder by masons of a man called Morgan of Batavia, and which continued for some time to influence the presidential elections. Convictions for abduction were obtained. There have for more than a century been negro lodges in the United States. In Brazil in 1876 the hostility between masonry and the Catholic Church was shown in the pro- duction of the play Os Jfason e os Jesuitas, in which the dishonesty of the priest is contrasted with the manly virtue of the mason.

As regards the future of Freemasonry, it is impossible, at least for outsiders, to say much. The celebration of the brotherhood of man, and the cultivation

of universal good- will in the abstract, seem rather indefinite objects for any society in this unimaginative age. There is, on the one hand, a tendency to degenerate into mere conviviality ; while, if schools, or asylums, or other charities are supported, to that extent of course the. society becomes local and even exclusive in its character. : In the meantime, masoury is to blame for keeping afloat in the minds of its members many of the most absolutely puerile ideas. A more accurate knowledge of its own singular and not undignified history would tend more than anything else to give woith and elevation to its aims. No oue now 'believes the stupid slander that freemasons are engaged in any definite con- spiracy against the state, religion, or social order. There is, however, something in their fundamental principles, the fraternity of men and their indifference to theological belief, and also in their recent movements, which perhaps justifies the suspicion, and even hatred, with which they are re- garded by the Ultramontane party. Masonry in each country of course takes its colouring from the state of thought and feeling by which it is surrounded. But it cannot be disputed that the German, Dntch, Belgian, and French magazines of the craft occasionally exhibit a tone which is not favourable to Christianity regarded as a special revelation. The tendency of political opinion in such an association is also necessarily democratic; and while it would be absurd to make the brotherhood answerable for the opinions of Mazzini or the outrages of the commune, and while the majority of brethren are loyal subjects, and pro- bably also orthodox Christians (in the theological sense), the institution itself undoubtedly "makes for" liberty in matters both civil and spiritual.

The singular myth that modern freemasonry is derived through Scotland from the historical order of the Templars has been treated in great detail and finally destroyed by Wilcke in his History of the Order, 2 vols., Halle, 1860. The claim was rested on (1) the Charta transmissionis or tabula aurea Larmenii, alleged to have been written in 1324 by Larmenius, the successor of grand-master Molay, who suffered in the persecution; (2) an old parchment copy of Templar statutes; (8) several alleged relics of the martyred "emplars—all preserved in the archives of the Masonic Templars at Paris. An abstract of the controversy will be found in the appendix to Findel's History, which also contains the form of examination of a German Steinmetz, the Constitutions of the Masons of Strasburg (1459), including

the Statutes of Parlirers and Fellows, and the Regulations of Apprentices; the Examination of the English Masons; a series of the old English Charges or Exhor- tations; the General Regulations of 1721; and the spurious Cologne Charter. The appendix of Mr Fort's work contains the Réglements sur les Arts et Métiers de Paris, of the 13th century, as collected by

tienne Boileau, provost under Louis 1X. The masonic legend of

Die heiligen vier Gekrénten is supposed to relate to the martyrdom, in the time of Dioclctian, of four stonecutters named Claudius, Nicostratus, Sinforiamus, and Simplicius, to whose memory the small church Quattro Santi Coronati at Rome was sacred. In the second part of Mr Fort's work will be found an accumulation of interesting facts relating to the early organization of masonic societies, their ceremonies, crypts and lodges, or places of meeting, and costumes; the payment of wages by warden, and the power of superintendence by master; the symbolic meaning of the hammer, the columns, the cord, the shoe; and the various uses of marks. The word freemason has been derived from the Norman French

Frére Macon, brother mason, and also from the expression freestone |

mason. The origin of the word mason is itself uncertain. The low Latin macio may be the German Metz; but Diez regards it as a modification of marcio, from marcus, a hammer. Littré suggests that the Latin muaceria, a stone wall, may contain a radical mace, from which macio has been formed. Thisis rendered more probable by the Italian macine or macigno, a stone lap mill, where the root idea of mace or hammer, used for pounding corn, is referred to. Tiler, the name of a masonic officer stationed at the door of the lodge, obviously comes from tadllewr de pierre, the lapidicine of several medieval charters. (W. C. 8.)

FREEPORT, a city of Illinois, United States, the capital of Stephenson county, is situated on the Pekatonica river, 110 miles W.N.W. of Chicago. It is a rapidly increasing town, and possesses woollen and carpet manu- factories, a foundry, a tannery, a beet-root sugar factory, and various kinds of agricultural instrument factories. The principal buildings are the court-

house and the Presbyterian college, which was instituted in 1872. The population in 1850 was 1436, and in 1870, 7889.

FREETOWN, a town of West Africa, capital of the British colony of Sierra Leone, stands on the south side of the estuary of the Sierra Leone river, about 5 miles from the cape of that name in 8° 29' N. lat. and 13° 10' W. long. It is situated on a plain which slopes up gradually from the river, and is closed in behind by a succession of wooded mountains. The town is divided into several quar- ters, the best of which is inhabited by Europeans, half- castes, and immigrants, who are either tradesmen or arti- ficers, and the remainder solely by the black population, who congregate together in separate tribes. From the fact that both the houses in the best quarter and also the negro huts are surrounded by a court-yard or garden, the town covers an unusually large amount of space for the number of its inhabitants. The decomposed vegetable matter which is carried down the river, and driven back to thie town by the tide, renders it very unhealthy, and unsuited for European residents, of whom there are ouly a small number. Freetown is the chief seat of the Sierra Leone trade, and a considerable sum of money has lately been expended on the construction of a new wharf. The prin- cipal buildings are the governor's residence and government offices, the barracks, the cathedral, the missionary institu- tions, and the grammar school. About two miles above Freetown, at Fourah Bay, the English Church Missionary Society has its principal West-African College, built in 1840, the ground having been purchased in 1827, and the work commenced in a temporary building. In 1876 the college was reorganized and affiliated to Durham university. The population is about 18,000.

FREE TRADE. This expression has been appropriated, in a somewhat technical manner, to denote an unimpeded in- tercourse between such manufacturing aud commercial com- munities as, having reciprocal interests, are under separate governments, and thereupon have separate financial systems. Thus the term is not applied to the facilities which town and country, labourer and capitalist, have obtained for reciprocal exchange, though these facilities have been acquired only in comparatively recent times. It is not used to describe the commercial intercourse of the three kingdoms, though restraints on the trade between Scotland and

Ireland on the one side and England on the other were remitted, long after a political union between the three kingdoms had been

effected, very grudgingly and very cautiously. Again, if we speak of free trade in land or free trade in banking, we use the term in a different sense froni that in which it has been employed since the time of Adam Smith. But the phrase is technically used to designate such a commercial inter-

| course between any particular country, its colonies, and

foreign countries, as gives the maximum of facilities for reciprocal exchange, and in the least degree attempts to make « fiscal system the means for stimulating and assist- ing domestic industry by protective enactments.

Free trade in the seuse given to it above is advocated on two principal grounds, the one economical, the other poli-

| tical; and all arguments alleged in favour of it can be

brought under one or other of these topics. It is re- sisted similarly for economical and political reasons, — uot, indeed, in contradiction to those which are adduced in its favour, for these are absolutely irrefragable, but on the grounds that the industries of a country ought not to be defined by merely economical reasons, and that there are political interests which will not indeed annul, but must materially modify the universal and undeviating application of the free-trade principle. It will be the object of the present article to give a brief account of the controversy between the advocates of commercial freedom and those of commercial restraint, and to show how events, due to opin- ions which have long become obsolete, have strengthened the position of those who urge that the restraint of trade is and should be part of the function of Government. It is per- haps necessary, however, to meet an objection at once which might be taken, if it were not anticipated. Every civilized Government rightly and properly undertakes

the supervision of contracts,—prohibiting sonie altogether, regulating others with less or greater strictness, and assuming the right to give an equitable interpretation to all; the application of the principles of equity to coutracts being the most important improvement which modern civilization has induced on jurisprudence. Thus the law of civilized nations forbids any coutract which would reduce one of the contracting parties to permanent slavery, though it compels the fulfil- ment of bargains which involve the temporary servitude of one of the parties. Again, it nullifies immoral bargains, though it does not profess to follow the consequences which a bargain that is prima facie innocent may have. Again, it subjects some callings to a police, either by exacting, in the case of certain professions, evidence of the individual's capacity, or by guarding continuously against any abuse which may arise from the exercise of a calling specially open to abuse, as in the case of houses for public entertainment, and the issue of paper money by banks. Furthermore, it subjects even simple contracts to revision,—as, for example, cases in which exorbitant charges are made for loans. In these instances, and in others like them, a Government is only carrying out its primary duty in protecting its people from force or fraud, ~~by controlling the free action of those who may inflict a serious injury on others. To define the extent indeed, to which such interference is necessary or desirable, is one of the hardest questions in what may be called the casuistry of politics. A country may be so over~~ governed by a watchful administration as to lose, to a greater or less extent, the spirit of enterprise or initiation, and thereby to be weakened in the legitimate rivalry of nations, But, on the other hand, it may be still more seriously weakened by the destruction of credit or confi- dence,—a result which is very likely to ensue when fraud is successful and unpunished.

Similarly a Governnient may control or prohibit inter- course between nations. If individuals have rights at all, one of the most obvious and important of these rights is that of choosing a market for their labour. But a Govern- ment would be admittedly justified in prohibiting the emi-

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gration of such artisans as are employed in the manufacture of munitions of war to a country with which itself was at war. It does more when it does not allow its harbours to be a refuge or a market for belligerents' ships, and prevents private individuals from supplying munitions of war to combatants. A fortiori, it would not allow its subjects to sell such goods to its enemies as might enable those enemies to protract their defence. It is a question whether it is not entitled to prohibit, or at least restrain, the exportation of that over which it is able to exercise a monopoly, though it is very seldom, if indeed it is ever the case, that any country is in so advantageous a position. And, lastly, it is allowed that a Government may make the conimercial intercourse of its subjects a matter of bargain with the Government of other countries, though such expedients, from an economical point of view, have been subjected to very adverse criticism. Free trade, then, must be innocuous and not hostile to the general public good.

Between nations, free trade represents the well-known principle of the Division of Employments. The advan- tages which result from the natural or spontaneous division of employments, and the loss which ensues from a forced division of employments, are the commonplaces of econo- mists. But the fact that exactly the same principle rules the distribution of production over such parts of the world as are occupied by industrial agents is not so frequently insisted on. That there are several commodities which a country cannot produce at all, or can only produce wnder circumstances so disadvantageous as to involve dispropor- tionate expense or loss, is admitted by every Government, however anxious it may be to develop native industry by protective regulations. No European Government, how- ever imperfectly civilized, would attempt to direct its home industries into the production of tea, coffee, and chocolate, or to domesticate elephants for the sake of their ivory, or to breed ostriches for the sake of their plumes, or to main- tain a race of wild hogs in order to obtain a due supply of bristles from native sources. But there are in most coun- tries a number of industries the continuity of which Govern- ments have attempted, and still attempt, to promote, by hindering the free entrance of foreign-made articles of the same kind. It will be found that, historically, this practice has had its origin in what is now understood to be a delu- sion as to the true functions of the currency.

The restraint of production and trade wasa policy which ancient civilization never adopted. The great statesman of Athens congratulates his audience on the fact that, thanks to the extended commerce of their country, they are as familiar with the use of foreign products as they are with those of domestic industry, and use them even as freely as the country of their origin does. The public opinion of Greece was profoundly shocked when, as a measure of poli- tical animosity, Athens excluded a Greek city, Megara, from its market. The oldest public document preserved in the Roman archives was a commercial treaty with Carthage (Polybius, xii. 22), in which Roman merchants are indeed restrained from traffic in certain districts, more, we may be certain, from fear of the Carthaginian occupation of Italy than for other reasons, for the treaty expressly exempts traffic from tolls, and prescribes that Carthage shall build no factoriesin Latium. Nor is there any record of restraint put upon the distribution of the precious metals, except in one oration of Cicero, where the orator, defending his client from a charge of extorting money from the Asiatic Jews, comments on the public policy of hindering this people from disturbing the money market by sending great remittances of specie to Jerusalem. ono

Perhaps the explanation of the fact that the civilization of antiquity did not interfere with the process of inter- national exchange is to be found in the prevalence of

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slavery. Setting aside for a moment the historical origin of modern protection, the influence and apparent truth of the mercantile system of which we shall speak im- mediately, there is a radical difference between ancient and modern civilization,—that in the former slavery was deemed natural, in the latter it has been seen to be mis- chievous and felt to be detestable. In modern societies, therefore, the free labourer is a factor in the interpretation of economical forces; in ancient ones, he counted for nothing, or next to nothing. To have prohibited free trade in the products of foreign labour at Athens would have been to give advantage to one class of slave-holders in opposition or in contrast to another class of slave-holders, and was not to be thought of. To prohibit free trade between England and France, or England and the United States, is, in appearance at least, to

assist the home labour of the country which adopts protection against the rivalry of free labour in an- other country which. might undersell its rivals. Protection in ancient times would have been seen to be naked selfish- ness ; in modern times, it may seem to be a genuine and dis- interested patriotism. And it may be observed that, for this and for other reasons, most slave-holding countries have been indifferent to protective regulations, or even unfriendly tothem. This fact is sufficiently illustrated by the contrast of opinion in the northern and southern States of the American Union before the war of secession.

The control of production and trade in modern Enrope is historically due to the development of what Adam Smith called the Mercantile System, z.¢., the effort of Government to secure as far as possible the largest possible amount of specie within the country whose affairs it administered. It is easy to discover the origin of this policy. Toa Govern- ment which spends, but does not produce, the possession of treasure is of the greatest utility and service. 'To an indi- vidual who produces and trades, still more to one who trades only, treasure is, as a rule, the least valuable instru- ment of traffic, as it is an article from which, as it is affected by the least possible variation in value, the least amount of profit can be anticipated by those who deal in it as an article of trade. A trader in the Middle Ages would have readily accepted the doctrine that money was wealth as far as regarded every one but himself; as far as he was con- cerned, he wished to get rid of his money as soon as he could, in exchange for goods, on which he might secure his profits. The doctrine that the machinery of international trade sup- plied the process by which the precious metals were dis- tributed, and that therefore, if trade were to exist, the attempts of Government to restrain the exportation of money were mischievous or nugatory, was argued as early as the middle of the 14th century by Sanuto the Venetian, and by Oresme the bishop of Lisieux, in language as precise as any used by Turgot or Adam Smith. The reasonings, however, by which protective theories were upheld, the mean and malignant arguments of restraint, as Adam Smith calls them, were always strengthened in England up to thirty years ago, by suggesting the hideous consequences which would come on the nation from a drain of gold. Protection had its origin in the reputed duty of Government towards the currency. Once established, it created artificial inte- rests whose existence was a loss to the whole community, but whose maintenance

seemed to be the satisfaction of a contract entered into between the Government and the in- dustry which the Goverument had called into being or had stimulated.

It will be clear that if any particular industry is of such a character as to be very conveniently carried out by the inhabitants of a particular community or district, if the producer fears no rival in the home market, and still more if he dreads no competition in a foreign market, any pro- tection accorded to his industry must be wholly superfluous.

He might even contemplate an export duty with equanimity, though of course an export duty would be destructive of his foreign market if he had real rivals, and he would generally find that such a duty would not only limit the consumptiou of his produce, but would call a rivalry into existence. It is equally clear that if a protective duty were imposed on the importation of foreign commodities into a country which has already a marked superiority over other countries in these commodities, the regulation would have no effect in increasing either the profits of the producer or the cost of the article to the consumer,—that, in short, the enactment would be absolutely nugatory. It will be also plain that, in every country, there are certain commodities which are effectually shielded from foreign rivalry by the cost of carriage, and that such commodities possess the superiority which other products enjoy from the peculiar facilities

which a particular country has in manufacturing them. A.

protective system then is inevitably concerned with such products as are liable to foreign rivalry, and a foreign rivalry can only be defeated at the cost of the consumer. But as the protective regulation can affect prices mn that country only which imposes the regulation, it is obvious that the only person who can be made to bear the in- creased cost whicli the protective restraint imposes will be the home consumer. If the produce could find a market at home, there would be no need of the assistance; if it cannot subsist at home without a machinery which guarantees the profit of the

producer, the domestic consumer is the only person who can be made to contribute the fund from which the profit is made.

The positions stated above receive a significant but com- plete illustration from the economical history of England. A century ago the English landowners were free traders, the English merchants protectionists. Adam Smith rested all his hopes of a better system on the former class, but despaired of any co-operation from the latter. Twenty years after the Wealth of Nations was published, the mer- cantile and manufacturing classes, with few exceptions, were free traders; the landowners, with few exceptions, were protectionists. The explanation of the change in sentiment is to be found in the change of interests. Up to the middle of the 18th century England exported considerable quan- tities of agricultural produce,—sometimes naturally, at other times under the wholly indefensible stimulus of a bounty on exportation. Now it needs very little intelli- gence to discover that the profits of an exporter, or at any rate the extension of his trade, depend largely on the variety of imports which he can obtain in exchange for his goods. A country which puts no hindrance on imports always deals to the greatest advantage, and the advantage decreases with restraint. Ifa country refused to admit any import but one, z.e., money, it would sell its exports in the worst possible market, and for the least possible value, re- ceiving in return an article which the machinery of its trade takes the most effectual possible means to depreciate. Hence the landowners of the 18th century, like the agricul- turists of the western and southern States of America now, were free-traders, because free trade was their best hope of profit. The manufacturers, on the other hand, were pro- foundly afraid of foreign rivalry, even the rivalry of the British colonies, even the rivalry of Ireland. Perhaps the most grotesque illustration of.this fear was the law which directed under strict penalties that the dead should be buried in woollen, in order to encourage the woollen manu- factures.

_ The change of sentiment was dne to the great mechanical industries of the 18th century. The discoveries of Ark- wright, of Watt, of Hargreaves, of Crompton, gave England a practical monopoly of textile fabrics, and subsequently of other products nearly as important. No doubt the Berlin

and Milan decrees interfered with the Continental trade of England, though it is well known that Napoleon's soldiers were clothed, in spite of these decrees, in the produce of north-eastern and west country looms. But in other parts of the world England had no rivals, while her supremacy on sea, after the great victory of Trafalgar, guaranteed her trafic. Hence, when the merchant and manufacturer, especially the latter, discovered that protection had ceased to be an advantage to them, and discovered also, for the reasons given above, that the restraint of imports was a disadvan- tage to production and exportation, the principles of free trade made rapid progress in the manufacturing districts of England. But on the other hand, the very reverse opinion influenced the minds of the landowners. Owing partly to the succession of late harvests, partly to the rapid growth of population consequent upon manufacturing enter- prise, partly to the restriction of Continental supply, the result of war, of the great drain which war made on the agricultural population of Europe, and of hindrances put on the import of food,—rents and farmers' profits rose with amuzing rapidity, and the Corn Law of 1815 was enacted in order to secure, if possible, the permanence of such rents and profits. The partisans of free trade and protection were only by accident allied to the great historical parties of English public life. The struggle for free trade was really one between town and country, as hereafter efforts in the same direction will get their advocates from the same classes.

It may be believed that, in England at least, the question of protection to manufactures is finally settled, though there are not wanting persons who advocate reciprocity, co-ordin- ate taxation on foreign products, retaliatory duties on re- puted bounties, and the like. But the traditions of legis- lation are too firmly fixed, and the benefits of free trade ex- perienced during the past thirty years are so generally admitted, that the advocacy of the exploded theory of pro- tection is looked on asa harmless whim which has no chance of popularity. It is not perhaps equally clear that the English people are quite safe against the revival of protec- tion to agriculture under the pretence of sanitary restraint, for that which is the inevitable result of protection to manufacture, the limitation of voluntary consumption, is not so markedly developed from the protection which may be accorded to articles of necessary consumption.

When trade is restrained in those articles of foreign origin which may be produced, though under less advan- tageous circumstances, at lome, and the product is an article in which the use may, to a limited extent only, be economized, the following results ensue :—Prices rise, and profits rise,—of course, at the expense of the consumer; wages, however, do not rise, for in so far as wages are determined by the competition of employers for services, the tendency is towards a reduction of wages, seeing tliat the use of the product is not increased but rather stinted. Now, the extra profits which protection accords might be secured to those who are already employed in the particular indus- try thus favoured only if the producers have a natural monopoly in the produce of their calling, as was practically the case with the English landowners during the existence of the corn laws, or if the law restrains other persons from competing against them, as was the case in England with Eastern produce during the continuance of the East India Company's chartered trade. If such an advantage be not accorded, capital makes its way to the favoured industry ; or, to be more accurate, an increasing number of employers compete for the exceptional profit. Such an operation may in some degree raise the rate of wages, though here again, unless the labour be protected by some arrangement, such as apprenticeship, or by the machinery of a strict trade union, the same cause which attracted the energies of the

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employer will rapidly, even more rapidly, supply what may be needed in the way of labour. Generally, indeed, the check to such a decline in wages is supplied by trades unions, which are, as the industrial experience of the United States has proved, the inevitable outcome of a protective system in a country where combinations of labour are not prohibited by law. In England up to 1824 they were pro- hibited.

In course of time then, and generally at an early period, the advantage which the protective system accorded to a special industry ceases, by being distributed among a larger number of producers. 'To this rule there is but

*one ex- ception, protection accorded to the produce of land. Here, if the commodity produced be one which cannot be dis- pensed with, and for which no substitute is found, the fact that the supply*procurable falls short of the demand may greatly increase the value of the article, and through the farmer's profits raise rents. But the advantage is soon found to be only partial. In civilized and fully settled countrics, agriculture is a complex process, in which success depends upon a just balance being struck between tillage proper and stock-keeping. An excessive price of corn, or rather of wheat, due to the machinery of a protective system, apart from the extraordinary fluctuations in price which it induces on the price of wheat, discourages the use of meat, and even of the inferior kinds of grain; for it is a law in prices that any notable exaltation in the value of one of the items which contribute to a joint product invariably de- presses the value of the other items ; just as it isan equally invariable law in prices that when there is a notable scarcity of any commodity the greatest rise in price always takes place in that form or quality of the article which was cheapest before. Hence there is always a natural remedy, though it is by no means a compensating one to the con- sumer, for any artificial exaltation in the value of agricultural produce. The principles referred to may be proved by the analysis of facts. Since the repeal of the English corn laws the price of agricultural land has steadily risen ; for though the average price of wheat has fallen, that of other kinds of grain, as is found by the tithe averages, has risen, while meat and dairy produce have much more than doubled in value since the period referred to.*

It is chiefly, however, in relation to manufactures that the operation of protective regulations is significant or im- portant, for most countries have abandoned all or nearly all restraint on the importation of food. The employer gets no advantage from the regulation, nor the labourer, and the consumer suffers a loss. But the removal of protection would, however great, in most cases be a benefit to the consumer, and inflict considerable loss on employers and labourers, since they would be subjected to a competition in which it is probable they would be worsted; for it may be concluded that the manufacturer cannot, or believes he cannot, subsist without protection, since he would re- pudiate it if he saw that it was superfluous. Hence it is excecdingly difficult and invidious to alter a system to which capital and labour have accommodated themselves ; and it may be

stated generally that all the arguments by which an existing protection is defended, however plausible and convenient they may be, are mere sophistry, though very often unconscious sophistry ; while the prospect that the sudden suspension of protection to manufactures would seriously disturb the relations of employers and labourers, and would very probably lead to a great destruction of property, points to a real difficulty, which the advocates of free trade will always find confronting them. In practical politics, in so far as they are connected with economical subjects, the difficulty is enormous, for the defence of 1m- perilled interests is always more watchful and energetic than attack on them, and can always count on a co-opera-

tion and concentration which is far less fully developed in those who criticize or challenge the privilege. There is a well-known passage in Mr Mill's political economy in which this author conceives it expedient that protection should be given to certain industries in new countries, pro- vided that the country had good natural resources for the suecessful prosecution of such an industry, and the protec- tion accorded be only temporary. But apart from the fact that new countries never possess a superfluity of capital and labour, and therefore are least of all well advised in direct- ing these elements of wealth into channels where they would be less advantageously employed than they would be in others; apart from the considerations that all countries have a natural protection in the cost of carriage, and in the comparative ease with which they can interpret demand ; and apart from the fact that good natural advantages for any particular industry are sure to suggest that industry at the very earliest time at which it will be expedient to un- dertake it,—the circumstances which invariably affect a protected industry render it impossible that Mr Mill's rule of a temporary protection should be applicable. Who is to determine at what time the protection should be removed ? Not the consumer, as represented in the legislature, for he would naturally object to the protection from the beginning, since the regulation inflicted a loss on him, at the very in- stant that it came into operation. Not the manufacturer, for until the time comes in which he dreads no rivalry, he believes that the regulation is the guarantee of his ordinary profit, and that its removal will expose him to certain loss, The

probability that he may come to such a state as to render the protection manifestly superfluous depends on his making some great, sudden, and lasting stride in the efficiency of the industry which he exercises. But protec- tion discourages all kinds of improvement, and indeed it does not appear that the phenomenon of sudden, vast, and permanent progress has ever becn witnessed in economical history except during the latter half of the 18th century in England. Not the labourer who is engaged in producing the favoured product, for the wages of labour are adversely affected, in the fall of prices, at an earlier stage than any other object into which gross value is distri- buted, and are advantageously affected, on the other hand, at a later period than that in which any other interest, other than that of manual labour, is benefited. Loaned or floating capital is most easily extricated from a declining trade, and most easily attracted to a growing trade ; fixed capital, and such capital as gives efficiency to fixed capital, is attracted less easily, and by parity of reasoning, is less easily accumulated or appropriated; while the supply of labour is decreased with the greatest Joss to the labourer, and increased with the smallest gain.

It may be concluded then that, while Mr Mill bas given a doubtful defence for the adoption of a temporary protec- tion, his limits to the protection so accorded will be found to be practically nugatory, and that in fact the adoption of the system will confer the minimum of good, while the abolition or abandonment of it will inflict the maximum of injury. This result then,—the creation of factitious in- dustries, which cannot be assisted by the operations of Government without loss to the consumer, but which cannot be abandoned by Government without ruin real or apparent to the consumers,—is substantially the apology and defence for the protective systems of Continental Europe. For there is nothing which characterizes modern systems of govern- ment more than the tenderness which all parties show towards imperilled interests. There is a growing disposition towards treating thei as vested,—that is, as equitably en- titled to compensation if their continuity is disturbed or even threatened. Of course there must be a limit to this con- sideration, for no Government has yet ventured on admitting,

however democratic may be its institutions, the vested interests of manual labour, or allowed that it should be compensated, if events required that a change be made in legislation which might interfere with the continuity of its wages. But if the project which is in favour with certain schools of socialism in France and Germany, that the state should assist labour (and of course it could assist only special kinds of labour) with Government subventions, the doctrine of vested interests would assuredly be applied to such assisted callings. It was, perhaps still is, a contention with some public men in England that poor-law relief is of the nature of a vested interest to labour, or that it is the indefeasible heritage of the poor.

It has been very fairly shown by Mr Faweett, in his re- cently published essay on free trade, that many circum- stances assisted towards making the acceptance of this great political change in the United Kingdom,—notwithstanding the vehement passions which were excited against those who earried on the struggle for the repeal of all taxes on food. Mr Fawcett has not by any means exhausted all the facts which aided the advocates of this change, nor has he enu- merated all the motives which influenced those who gradu- ally became reconciled to the change, and who even, from being opponents, were converted into partisans of the move- ment. For the principles of free trade had been accepted by Lord Liverpool in 1820, and had been cautiously tried by Mr Huskisson in certain directions and with marked success. In fact, the first modifications of the tariff were agreeable to the landowners and the farmers, were acceptable to the manufacturers and small traders, and were objected to, as similar reforms were objected to in Walpole's time, by the great mercantile houses, who were enabled by their capital to retain almost a monopoly of the wholesale trade as against less opulent dealers. But even here a significant law of prices, never indeed formulated, but recognized, effec- tively enough reconciled the great houses to the remission of taxation on raw materials and on those foreign products against which no home production competed. It is that a remission of taxation, in all consumable articles, and notably in those of extended demain, is followed by a rise in the price of the untaxed articles. This law is a constant refutation of the policy which imposes taxes on imports, and operates still more emphatically when taxes on exports are imposed, as they sometimes are by ignorant and needy Governments. Hardly a voice, therefore, was raised against the bold measures which Peel adopted

between 1842 and 1846. They could not possibly harm the landowners ; they were a positive boon to the mannfacturers and the consumers. So much was this the case that for some time, as has been already stated, the remission of a vast number of small taxes on consumption was made the apology for retaining the income tax.

But the case was very different when the taxes on food produced abroad, and in competition with that produced at home, and on sugar imported from other places than the British colonies, were assailed by the logic of the English free-traders. Here it was seen at once that the most power- ful interests were imperilled. For very obvious reasons, the landed interest in England has always wielded far more power, political and financial, than any other. During the Middle Ages it controlled the monarchy, deposed kings, altered the succession, till, up to the beginning of the 17th century, the general appellation which Continental nations gave the English was that of " disloyal." The landed gentry and free-holders fought the wars of the Long Parliament, and subverted the monarchy. The Restoration was a com- promise between them and the courtiers, and one of the first results of the Restoration was the enactment of strin- gent provisions against the importation of foreign food. For centuries the policy, the legislation, the finance of

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England had been defined by the interests, real or supposed, of the landed gentry, the yeomanry, and the tenant farmers. They were now threatened with a complete reversal of this traditionary policy, and such a reversal seemed to purpose their ruin. Those who lived through this time will easily recall to mind how violent were the passions which the anti-corn-law movement excited ; how Whigs of the Mel- bourne school denounced the free-trade movement as folly ; how such a man as Lord Brougham, who was conceived, ten years or more before, to have carried the reform agitation to the very verges of sedition, now declared, and perhaps with perfect good faith, that the movement in favour of free trade was unconstitutional ; how Sir Robert Peel believed that the opponents of protection were the instigators of a plot against his life; and how, long after the victory was won, it was a commonplace to accuse 'the leaders of the movement with the

most sinister designs against property. And yet the tax on food was in the last degree invidious. It was avowedly imposed in the interest of the landowners, and with a view to maintaining rents. It was allowed that free trade in the abstract was just, protection in the abstract indefensible. There were of course reasons alleged in favour of protection, analogous to those which are now current in the United States and elsewhere, as to the wisdom of a nation being self-supporting; as to the disturb- ance of the exchanges in the presence of bad harvests; as to the incapacity of domestic industry to compete against the low-priced labour of semi-barbarous countries; as to the destruction of national industries, and the extinction of the best and most patriotic of English craftsmen. But these alarms were either heedless or interested rhetoric, never put forward by really competent critics. Nearly thirty years ago, Mr Gladstone informed the writer of this article that he never had but one objection to the repeal of the corn law, during the early period of his connexion with Peel's Government, and that was the fear that he enter- tained as to the consequences which would ensue to an in- terest which seemed, and seemed naturally, to be the very centre of English national life. Statesmen may well be excused from venturing on economical changes of a vast and extended character, even though the propriety of the change may be proved to demonstration; for a period of change, however beneficent it may be in the end, is almost invariably accompanied by temporary and severe loss. Already, however, there were far-sighted men who pre- dicted that this loss, if loss did ensue from the change, would bea minimum. They discovered or anticipated this in pursuance of that other fundamental law of prices already hinted at. When the products of any industry are nume- rous, and all are in demand, such an alteration in the cost of producing one of these products as makes it, from being the most profitable branch of the calling, the least, is followed by an exaltation in the value of the other products. Thus it is constantly the case that the bye-products of a complex industry are found to be the sole source of business profits. Such at least is said to be the fact in the manufac- ture of gas and soda ash, and it is alleged that even if a substitute be found for gas as a means of lighting, the value of the bye-products in the manufacture is so great, and the use of them so indispensable in the economy of society, that the manufacture would still be necessary and profitable. But there is no illustration of the law which is so exact and invariable as that supplied by agriculture. During the existence of the corn laws, the profits of the farmer

and the rents of the landowner were estimated in wheat. It was from the probable decline in the value of wheat that all the sinister predictions as to the future of the landed interest were derived. So entirely did grain, especially wheat, form the measure of agricultural values that ten years before the repeal of the corn laws the com-

mutation of tithes took no account of any other kind of wgricultural produce than the three principal cereals, although in that commutation interests, lay and clerical, of not less, in capital value, than 150 millions sterling were involved. Even here, however, the tithe-owner has suffered no loss by the change, for though the price of wheat has fallen, the decline has been more than compensated by the upward movement in'the price of barley and oats. Since the repeal of the corn laws, the tithe rent charge has been 21 per cent. above par value. Far greater, however, has been the consequence of the change on the price of other agricultural products, especially meat and dairy produce, the value of which has nearly, if not quite, doubled during the last forty years. Now this result was anticipated in a rough manner by the shrewder heads among landowners and occupiers, and therefore reconciled many whose inte- rests might seem to be imperilled to a change which, while it threatened a superficial and temporary loss, might easily determine in a permanent and increasing profit. And finally, the farmers learnt by demonstration and experience that, whoever might gain by restrictions on the trade in food, they did not ; and that in some unexplained manner the machinery of a law which seemed to be intended for their profit either turned out to be a loss, or was wholly in- adequate to secure the results intended. And yet, though the people were starved, manufacture was unprofitable, foreign trade was declining, and the revenue had been con- stantly insufficient for the expenses of government, it needed the catastrophe of the Irish famine in order to give effect to an agitation more prolonged, more costly, and more popular than any which has happened in the history of a civilized nation, to effect a peaceful repeal of laws which did no person whatever any good, which were no advantage what- ever to the parties for whose special benefit they were enacted, and which inflicted prodigious losses on the two inost important classes in the community, the producer and the consumer.

The history of the movement which led to the repeal of the Englishcorn laws in 1846 has been sketched at some length, in order to show that if, ina case where the impolicy and the in- jury of the law was proved to demonstration, it was so arduous a task to effect a change, the difficulty is far greater in those countries where it is not possible to array such for- midable forces against the continuance of a protective sys- tem. It is easy to show that the law of prices above referred to applies with the same cogency to the collective industries of any country whatever as it does to such industries as necessarily supply varied products, and that any artificial attempts to direct the home and foreign trade of a country into special channels is sure to bring about a factitious ex- altation of one set of values, and a factitious depreciation of another set of values. Various Governments in Europe, in the New World, aud in the British colonies have striven to start special industries. They will succeed in the at- tempt, however injudicious the attempt may be, if there be a demand for the product which they determine to artificially foster. But from two consequences they cannot escape. The consumer of the produce thus stimulated into an un- natural or premature existence must pay for the policy of the Government in enhanced prices, and the producer of goods must offer more of his goods for sale in order to effect an exchange in that which the Government permits to be imported, but hinders either in kind or quality with a pro- tective tax. But it by no means follows that, when the consequence of this policy is exhibited, when its mischief is demonstrated, when its futility is exposed, nay, even when it is proved that, on pretence of doing a special service to the Government and the people which it is in- tended to aid, it deliberately gives the maximum of advan- tage to the foreign exporter, and inflicts the maximum of

loss on the domestic consumer, the country which makes the discovery will reverse its policy. For, apart from the considerations which have been dwelt on above, the fact, namely, that the revocation of a protective duty which is efficient in raising prices must be followed by a loss to the producer, the existing practice may always be defended by a number of plausible arguments, held, it should be admitted, with perfect good faith by those who promulgate them, however shallow and erroneous they may seem to others, whose passions and interests are not stimulated to defend such a practice.

With the same sincerity of convic- tion the defence may be further supplemented by appeals to an irrelevant patriotism, or by an imputation of sinister motives on the part of assailants, or by a bold assertion that the social condition of other countries differs radically from that of the district in which protection is maintained. And finally, in all political and economical movements, it must be repeated, the forces of defence are far more manageable than those of attack. For, as the defenders are in posses- sion. and the sentiment of civilized societies is always favour- able to existing interests, the defence can urge, if not with truth, at least with great effect, that it is dangerous to re- linquish what is actual, and under which society has long existed, for that which is hypothetical, problematical, experi- mental; and it can always threaten its assailants with the indefinite danger of the discontent which may come from a great and far-reaching change. Those who remember the history of the free-trade movement in England are well aware that all these expedients were used against the promoters of the movement, though the position which the defence occupied was singularly untenable. But it is certain that in countries which have adopted protection the defence will be more stubborn, and the struggle more protracted than it was in England more than thirty years ago. And in illus- tration of this fact, it may be observed that it took all the forces at the disposal of the personal Government of the second French empire, and all the threats of a power which was then at the. highest of its reputation for military prowess and domestic control, to impose upon the French manufacturers, even in view of great reciprocal advantages to the most important and natural among the domestic industries of France, the very moderate concessions of the commercial treaty with England. The Government of Napoleon actually went to the length of informing the iron manufacturers of France that they would be held personally responsible for the effects of any discontent that might arise by any act of theirs towards their workmen which might be taken in view of the contemplated changes ; and the menace was effectual, because it was not doubted that it would be followed by action, and that this action would be irresistible. :

As the origin of protective enactments was a desire that a nation should profit by the losses of another nation, and as the extension of this feeling is the primary motive of war, so a permanent or persistent division of international interests, with the object of sustaining or promoting muni-

cipal or rather particular interests, is a fruitful source of international difficulties. It is, in fact, what Thucydides calls, speaking of the caution with which commercial inter- course was carried on in the days which preceded the great Peloponnesian war, an unproclaimed war. Many forms of patriotism, falsely so called, have inflicted grievous and ineffaceable injuries on mankind. The war for empire be- tween the old and new notions of government, which was at the root of the Peloponnesian war, was the ruin of Greek civilization. But each of the conibatants appealed to the patriotism of race, and the defence of repugnant institutions. The Thirty Years' War threw back Europe for two centuries, and left behind it memories, jealousies, policies, the effects of which are even now dominant in the attitude of the great

Vuropean powers, and in the forms of European government. Still the Thirty Years' War was'a struggle between anarchy and despotism, interminable disunion and forcible unity, and could appeal to some noble passions in the midst of a mass of ignoble aims, to some generous purposes in the con- fusion of a host of sordid and mean impulses. But wars for the monopoly of trade and production have done nothing but mischief, have not been varied by any worthy purpose, have been, as Adam Smith described them with honest energy and undeniable truth, mean and malignant. Not much better is the temper which carries on a furtive war against the general industry and the general good of man- kind under the spurious name of a patriotic protection. But it must be admitted that no 'tendency of civilized societies is so inveterate, because none is defended with more ingenious and more unconscious sophistry, and none appears to be more necessary for the maintenance of existing interests.

Nations accommodate themselves, but with losses which may be easily described, though they cannot perhaps be numerically calculated, to protective restraints on trade. But it is a penalty on having been in the right that any depart- ure from the right into the wrong is more mischievous than it is to remain in the wrong. The people of England are, as far as manufactures and trade are concerned, fairly commit- ted tofree trade. The world admits that England has pros- pered under free trade; indeed, it is

difficult to deny the fact, and equally difficult to assert that the prosperity which the country has reached has been achieved in spite of free trade. It might be shown that the very circumstances which, thirty years ago or more, were adduced as condi- tions under which free trade would be ruinous to England have now been alleged in order to explain why it has been exceptionally beneficial. The growth of population has fiven a practical refutation to the alarms of Malthus, though it has not rebutted and could not rebut the abstract principles on which that theory was founded. The repeal of the corn laws has modified the Ricardian theory of rent, and has reduced it to the explanation of the cause which measures the difference between the rent paid for the same superficial extent in two pieces of ground. The same fact has been a cure for the currency crazes which the old sliding scale used to foster, for the notion that we might be im- poverished by a drain of gold, and for the dread that the country would be ruined if the balance value in the imports exceeded that of the exports. A thousand economical fallacies still dominant in the minds of those who are in the darkness of protection have been dissipated in the light of free trade. The English people were, as far as the funda- mental principles of social economy were concerned, in the cave of Plato, mistaking shadows for realities, and con- strained to get their impression of the shadow from the false mirror of an artificial system. But free trade has put English industry into the daylight, and with the daylight the country has gradually become familiar. More or less violent reconstructions of society, the socialism with which much of civilized Europe is pestered, the paternal theory of govern- ment in its most grotesque form under which the American republic attempts to control and distribute the occupation of

its free citizens, are to Englishmen as extinct as the animal

worship of Egypt, the nature worship of Greece, and the other strange beliefs which have been popular in the infancy of the world and of its knowledge. That English trade and manufactures are open to dangers which may clieck or diminish their prosperity must be admitted, but those dangers are of a totally different kind from those which menace the progress of such countries as imagine that protection is a safecuard.

The great advantage which free trade has bestowed on English manufacture consists in the fact that it has enabled

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the producer to interpret accurately the cost of production, and therefore to discover the prospect which his industry las of a remunerative market. It is superfluous to protect an industry which is strong enough to assert itself in the rivalry of competition. It is similarly superfluous to pro- tect an industry the products of which, by reason of their bulk and cheapness, are shielded from competition by the costs of carrying the same products from foreign parts, or even from remote districts within the same political system. It may be inferred, therefore, that protection is not demanded except in cases where the industry would be exposed to the dangerous or successful rivalry of the foreign manufacturer, and therefore is carried on under circumstances which, by increasing the cost of production, render the employment of labour and capital on the industry in question a less advantageous outlay than they could be in other objects. If it comes to pass that under favourable circumstances the protected industry can cope with unprotected rivals in a common market, it is clear that the necessity for protection has passed away, and that the existence of the restraint is needless and vexatious. Thus, for example, if it be true that American cotton cloth can successfully compete against Manchester goods in China, or Japan, or Central Africa, it can, a fortiort, compete successfully against Manchester goods in the United States themselves. But it also follows that, if this position be not attained, the existence of the restraint is a constant impediment to its being attained, because the industry, as estimated by the cost at which its product is attained, invariably accommodates itself to the circumstances which naturally or artificially control its pro- duction, especially in reference to the amount of capital and labour devoted to it, and the rate of profit which the manu- facturer enjoys. There is no reason to believe that in the protected manufactures of Germany, France, and the United States the profit of the manufacturers is greater than is de- rived from unprotected industries,—that, for example, the French ironmaster or cotton-spinner gains a greater advan- tage from his calling than the wine-grower does. On the contrary, the loudest complaints of declining trade, and the baneful influence of foreign rivalry, are heard from the in- dustries

which have successfully demanded tle assistance of protective duties. It is always the case, and it always will be the case, that the opulence and prosperity of a country will depend on the success with which its natural industries are prosecuted, and on the prudence which it shows in hitting the proper time in which other industries may be attempted with a reasonable prospect of remunera- tive profit. For just as weakly plants and animals are the first to succumb to those climatal or atmospheric conditions which are unfavourable to health and vigour, as in the struggle for existence feeble stocks disappear and more energetic forms occupy their place, so industries which need artificial support are the first to feel commercial adversity, and the last to recover from it. It is stated, and the state- ment is not seriously controverted, however much the true interpretation of the facts is disguised or resisted, that during the period of commercial depression which began after 1874 the countries in which the greatest efforts have been made to sustain artificial industries have suffered more than England, which has conceded no such assistance what- ever.

But it is not only in the fact that the producer is able in an atmosphere of free action to interpret the pros- pects of his own market best, and to solve most readily the problem as to what is the relation between cost of produc- tion and possible profit, that the value of free-trade prin- ciples is discerned. The same principles which in England have been happily recognized as fundamental have indirectly done more to soften the differences between employer and labourer than anything else. No civilized country has had

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more reason to fear the consequences of hostility between capital and labour than England has. For nearly five cen- turies the legislature of this country strove to regulate the rate of wages in the interest of employers. To the number- less and severe statutes of labourers, which began with 1350 and were continued in full force up to 1825, when they were relaxed rather than repealed, we owe the English poor law in the first place and the trade union in the second. It was natural, when the English Government had been attempting for so long a time to keep down wages by law, and looked with

so much hostility on any organization among the working classes which seemed likely to better their lot, that when the severity of these laws was relaxed the labourers should eagerly adopt the machinery from the use of which they had been so long debarred. But deplor- able as has been the combat between labour and capital, and blameworthy as many acts have been on both sides, no one who has given any attention to the subject can fail of noticing that the aims of the trade unions are simple and intelligible, that the representatives of these combina- tions court debate, criticism, and sympathy from the public to which they appeal, and that the struggle is carried on with increasing mildness and forbearance, The English unions do not aim at reconstructing society, nor demand subventions from the state as a means by which they may resist the power of the capitalist, nor adopt those projects which give from time to time such trouble to Continental Governments. The fact is, the English parliament has withdrawn all artificial aids from the capitalist, and the workman is content to stand on the same level with his employer as far as the state is concerned. But where, as in other parts of the civilized world, the state, for some reason or the other, has determined on fostering the existence of an industry which cannot exist without state help, or does not think it can, the workman is sure to attempt, with what success he can, either to appropriate a part of the ex- traordinary profit which the Government, in the early stages of its action, accords to the capitalist, or to demand that an analogous benefit should be conferred on him by the opera- tion of law. The protective system of Continental Europe is the source and the strength of European socialism, and is responsible for its fallacies and its excesses. Those Englishmen who lived through and watched the simultane- ous energies of the Chartist movement and the free-trade agitation had abundant opportunities for inferring what turned out to be the fact, that the success of the latter movement would be a death-blow to the former project. When at the outbreak of the civil war in the United States a rigidly protective tariff was imposed on the Union in lieu of a more moderate system, those who had busied themselves with the phenomena of production and the social relations of economical forces were able to predict that, apart from the more obvious evils which ensue from a false step in the political economy of a nation, the attitude of labour towards capital would be aggressive, distrustful, and menacing, and that the mischief, when once generated, would be growing and permanent. Government in England interferes very

little with the action of individuals, but this is possible because Government in England abstains as much as pos- sible from meddling with those relations which can be made to adjust themselves. In England the adage of Mr J. S. Mill, that "the best remedy for the evils of liberty is more liberty," may be a wise generalization, but when the liberty of labour is curtailed, it is not quite so clear that a Government can with safety to itself dispense with that control from which English social life is happily free.

The adoption of protectionist principles in civilized and industrial communities is undoubtedly an injury to such other communities as have adopted free-trade principles, because it curtails their market, and induces an uncertainty

as to whether the produce of their labour will find a sale. This mischief is exaggerated when the prohibitory or pro- tecting taxis a variableamount. Thus during the existence of the English corn laws the foreign agriculturist was un- able to foresee whether the demand for his produce in England, under the pressure of scarcity, would be admis- sible for him at remunerative rates, and he was consequently deterred from anticipating this demand. If indeed the de- mand did arise, his gains might be enormous, provided he had it in his power to satisfy the demand. For example, at one time the sliding scale was fixed so high that foreign corn was admitted duty free only when the market prices in England marked 84s. a quarter. If such a price were reached, and the importer was in possession of a considerable stock, which he had been able to store in bond at 35s., he could instantly take advantage of the situation, and greatly to his own advantage. It is true that such an occasional contingency did not compensate for the general insecurity of his industry, and the risk which he ran in waiting on a market into which he might never be able to enter. Hence the repeal of the English corn laws has given a very powerful stimulant to agricultural industry over the whole world.

Fixed duties do not operate so disastrously on foreign trade, even when the fixed duty is levied on such products as vary in quantity, and therefore in price, with the seasons. For in the vast majority of products values conform gene- rally to the cost of production, and even in those which, like food, are

determined also by the relations of demand and supply the wider the area is from which they are derived, the less are they liable to variation in supply, the element of demand being nearly a uniform quantity. Still it must be remembered that all duties on imports check consumption, and, by implication, discourage production. The proof of this is seen in the fact that the reduction of any duty on an article in general demand is always followed by a rise in price, which continues till supply corresponds to the new demand. If therefore duties levied for the purposes of revenue have this effect, then, a fortior?, duties designedly imposed for the sake of protection will have a similar effect. If the protective enactment has any force at all, it must diminish the market of the country against which it is levelled. It may not be wholly effective, but it must have some effect. Thus, when under the Berlin and Milan decrees the first Napoleon strove to expel all British manufactures, and all the produce of the British colonies, from such parts of Europe as he could control, it is unques- tionable that these decrees were a hindrance to British com- merce, though to a considerable extent English manufac- turers were able to elude them.

Still the country which adopts free trade has a great advantage in trade over such countries as adopt protection even in its commercial intercourse with them. There is no country which wishes to curtail the export of its raw materials, in the production of which it has natural advan- tages, and of course it is equally willing to export its pro- tected manufactures. Now it is plain that it would prefer to deal with a country which, unlike itself, imposes the least possible restraint on importation, and that the most advantageous market would be that in which no restraint at all was put. In order to use this market then, it will be content to offer its goods on the most favourable terms, and under the conditions of the strictest competition. It knows that a country which adopts free trade is best able to interpret its own demands, and its own power to satisfy the demand of other countries. Hence a free-trade country is a national entrepét, in which foreign goods are procurabls at the lowest rates. In addition, as has been stated before, the country which puts no artificial restraint on its power of general purchase has always a great advantage in all com-

mercial transactions over a country which does put such a restraint on itself.

Free trade then, as understood in England, means such a liberty of production and exchange as is unfettered by any of the restraints which have been imposed, in order that special industries may be artificially stimulated, by the machinery of a fiscal system. But there are other uses of the term which may be touched on, and in particular the application of it to labour and land. It was stated at the commencement of this article that Governments, in pursuance of their standing duty, taat of protecting the weak against the strong, may and should put limits on free action as regards labour, and it is alleged that the expression free trade in land is a mis-nomer. We shall attempt, in concluding this article, to give a brief explanation of the historical and other circum- stances which have brought about the present state of things in England, and to define the economical conditions under which the relations of labour to production, and land to agriculture, are capable of an economical estimate.

As the policy of ancient states did not attempt to control trade in the interest of their own citizens, so it did not hinder the individual in the prosecution of any industry. There is no evidence that the professions were practised by persons specially licensed for that purpose, and it is certain that the craftsmen of antiquity were not compelled to pass through a period of apprenticeship before they could follow their calling. In modern times, however, the practice of licensing the members of certain professions, and of exacting a period of servitude in all crafts and trades, under the name of apprenticeship, has been nearly universal. Up to comparatively recent times the same legal instrument was employed as a preliminary to the study of law and pliysic as was demanded from the trader and the artisan. 'The origin of the custom, which was assailed on principle by Adam Sniith, is to be found in the history of the charters which were obtained by towns. These charters were pur- chased from sovereigns or such lay and spiritual proprietors as possessed towns in fee. The privileges which such instruments conferred were considerable and valuable, were eagerly sought after and guarded with jealousy. Among the most important of these in England was the right of assuring, after a short uninterrupted residence within a walled town, the francliise of a free man to the resident serf. It was

therefore expedient, and in order to avoid arousing any suspicion that the franchises of the town were abused, that some significant limit should be put on the acquisition of these privileges by individuals. Hence, at a very early period, guilds were established in chartered towns; enrol- ment in some guild became a necessary prelude to sharing the franchises of the town ; and apprenticeship was made the condition under which persons could ordinarily enter the guild and practice the craft or trade. There is reason to believe that the customs of these trading companies put it into the power of those who administered the affairs of these companies to exercise a large and arbitrary control over all the members of the guild. The practice of apprenticeship began, in all likelihood, at an early date, but the earliest instruments which the writer has seen are of the 15th cen- tury. It is only, of course, by accident that any have been preserved, since they had only a temporary and personal interest. In course of time the legislature exacted the condition of apprenticeship from all artisans and traders, notably by the 6th of Elizabcth, for during a long period it was the policy of thc English parliament to put every pos- sible hindrance on the migration of the agricultural labourer to the towns, and the most successful expedient by which this migration could be checked was that of imposing the servitude of apprenticeship on every one besides the agri- cultural labourer. A custom then, which commenced with the interest which the trading company had in its chartered

monopoly, and which closely resembled the machinery of the regulated companies for foreign trade, was strengthened and finally enforced by the parliament itself. In course of time the legislature abandoned its ancient policy, except in so far as it exacted from certain professions the equivalent of apprenticeship, on the ground that by so doing it pro- tected the public against incompetence and fraud. The re- tention of apprenticeship in certain kinds of manual labour is due to the action of trade unions, voluntary associations which occupy a somewhat similar position to the guild com- panies of the Middle Ages, and which exercise an influence over a far larger number of persons than are formally con- taincd in the association. The object of apprenticeship in handicrafts is to maintain a high rate of wages by stinting the number of persons who are engaged in tle occupation. Hence, and for the same reason, artisans object to the im- portation of forcign labour, especially in such callings as are protected by

apprenticeship. On no other ground, at least, would it be consistent to acquiesce in the importation of the products of labour and, by free trade in food, of what may be called the raw material of labour, and to object to the free circulation of labour itself.

It is a question of merely speculative interest to ask whethcr a Government does wisely in restraining the prac- tice of certain callings to those who have been certified to have passed through a preparatory training for the calling. It is only a little over sixty years since it put the restraint on medical practice, and the limits which have similarly been imposed on the legal profession originated in the recognition of certain persons only in certain courts of law. But there is no theoretical defence for the privilege accorded to such certified persons, except it be that by these means the public is protected from the danger of employing in- competent practitioners, The police which the legislature exercises over unlicensed persons must not be supposed to be in the interests of those who are permitted to practice, but in that of those who employ professional services. There is, however, a tendency towards increasing the area over which this police is exercised, and latterly some public teachers, for example, who are employed in primary schools are made liable to the obligation of satisfying some public authority as to their competence for the work which they undertake. On the other hand, there are writers who argue that all such restraints are mischievous, not only because they control the choice of occupation, and are, theretore, invasions of natural aud innocent liberty, but because they do not and cannot supply any proof of practical ability on the part of those who are certified, and because they weaken the habit of caution and prudence which all per- sons should possess as far as possible in selecting those in whom they may place their confidence. Why, it may be asked, they say, should a lawyer be certified to carry on his calling on the ground that the trust reposed in him makes it expedient that the law should exercise a control over this calling, and a similar restraint be not extended over bankers, whose relations to their customers are even more delicate and confidential than those of lawyers ?

Again, there are callings in which no restraint is put on the choice of the calling, but an energetic control is exer- cised over the practice of the calling, a control which sometimes extends so far as to prohibit some

practices which are historically connected with the calling. Thus, since 1844, no new English bank is allowed to issue and circulate notes payable to bearer, such a note being vir- tually a cheque payable at sight, and drawn by the banker on his own assets. The motive for putting this dis- ability on bankers was to prevent the undue extension of a paper currency. But even though it may be doubted whether such a result was effected, or even that there was danger of such a result, the restraint on free action can be

defended on the ground that the acceptance of such a note puts a risk ou the holder to which he should not be sub- ject, and that the refusal to accept such notes suggests a suspicion that the issuing parties are of doubtful solvency. Again, there are certain callings over which a police is exercised in the interests of the revenue, as on those persons who are engaged in the manufacture of excisable articles. Tlere can be no doubt that such a supervision is a hind- rance to trade, and some persons who advocate direct tax- ation have alleged, as one of the strongest arguments in favour of their theory, that the abandonment of all excise and customs regulations would make England a free port for the whole world, would greatly extend its commerce and its manufacturing energy, and widen its markets. And lastly, there are certain callings which are permitted, but watched aud controlled in the interests of morality. Of these the most notable is the occupancy of houses where intoxicating liquors are sold, and of other places of public entertainment. Few persons doubt that an efficient and incessant supervision should be exercised over these places, though they differ widely as to the extent and character of the control, and the agencies by which the control should be put into operation. The regulation of public houses is the oldest form of domestic police over occupations in England, for it can be traced back to the manorial inspection which was general after the Conquest, even if it did not exist in the Anglo-Saxon village. Eng- lish law, therefore, exercises a control or restraint of trade over industries which are laudable, or innocent, or legal, because it is found, or is thought to be found, that they may be abused to serious public inconvenience or mischief. Some amusing illustrations of the extent to which the privilege of unlimited issue of bankers' paper may be abused are afforded in the history of what

was called ‘“ wild-cat banking” in the Western States of the American Union. It is remarkable that the United States, which have adopted, and to a great extent with evident sincerity, extreme views in favour of the policy of protection against foreign rivals, have also permitted from time to time, and with scarcely any check, extreme licence in the conduct of business within the limits of the Union itself.

With the exception of these and analogous instances,— when the safety and morals of the public justify, to a larger or smaller extent, the supervision of the state over the free choice of industry,~~—the concession of that free trade in labour which puts the minimum of hindrance on the field of employment and the character of employment which the producer selects is quite as important to the wellbeing of a state as the concession of a free agency to its capital and a free market for its products. For as all wealth is the pro~~ duce of labour, and as the efficiency of labour is the first and last condition of national progress, as the efficiency of labour is primarily brought about by the division of employ- ments, and as the division of employments knows no limit as long as the market of products is extended, so it is of the highest interest to the efficiency of labour that the field of its operations should be as open and free as possible. But here it is to the purpose to observe that the natural distri- bution of labour very often masks the effect of a mischiev- ous economical system. ‘There is no country in which this fact has been so systematically ignored as in the American Union. In the United States, economists who have steadily maintained, with the best arguments at their dis- posal, that the growth and progress of their country has been assisted by the adoption of a protective system, have omitted, in all their estimates of what constitutes the material progress of tlie Union, the fact that, in whatever other directious they have regulated industry and com- merce on a protectionist basis, they have always, and to an extent tliat no other country has done, accepted and

insisted on free trade in labour. They have not only welcomed all comers,— some little irritation at Irish labour, and a more serious objection to Chinese immigration excepted,—but they have imposed no tariff on the impor- tation of labour, nor even contemplated such an exten- sion of

protection to American industry. It would not, however, be difficult to show that, on the grounds ordi- narily taken by American statesmen and publicists, they would be consistent in denouncing the immigration of aliens, They have, however, with a happy inconsistency, not only; not taken this step, but they have wisely and advantageously insisted that the Old World notion of indefeasible allegiance shall be relaxed, at least on behalf of those who have made the United States their home. Here they have been free traders without stint. And it has been fortunate for America that they have not extended such prohibitions to alien humanity as they have to the products of that labour which alien humanity has offered them for sale. For several years the United States received about 200,000 emigrants annually from the Old World. It is a moderate estimate that each of these per- sons represented an outlay of at least £150 in his bringing up, or in other words that, had he been born in the United States, he would have cost at least as much as this sum to bring him into that state of efficiency which he carries to his new home. The Old World has tlierefore been bestow- ing a voluntary tribute of £30,000,000 annually on the United States, a contribution which is quite sufficient to balance the mischievous effects of economical fallacies, though it is possible that these fallacies may be so disas- trous as to neutralize the value of this branch of American imports, or even to check the importation altogether. Not, indeed, that the effects of unwise economical action are easily or rapidly discovered. The present advantage of re- straint for the benefit of the producer is obvious; the con- sumer is left out of sight, and is commonly unconscious of the process which is narrowing his powers. At last, when the consequences do come, sophistry and self-interest are both active in assigning the facts to other causes than those which are really dominant, and in resenting and resisting all change.

When it is said that the principles of free trade should be applied to land, it is meant that a natural object, the products of which are of supreme necessity to mankind, is not rendered accessible to purchasers, or not rendered so profitable to occupiers as the interest of the public requires. Land in populous countries is, relative to the community, very limited in amount, and as it is the locus standi of all industries, its distribution, as is alleged, should not be so restrained as to induce a restraint on the efficiency of industry. No economist worthy of the name has ever disputed the sacredness of private property. To do so would be to undermine the very foundations of his science. No economist, even though he may be betrayed into heresies as to the nature and extent of free exchange, has ever doubted that within certain geographical limits the fullest freedom of innocent production and trade should be accorded. No American protectionist has yet argued that it is expedient, in order to develop at the earliest period the possible manufactures of the Western States, that these States should be allowed to restrain by prohibitive duties the cotton and hardware of New England. All discussions therefore about free trade in any com- modity, and among others in land, must presuppose thiat property should be respected, and exchange should be free. If the so-called economist denies the name of property to that which must be secured to its owner, in order that industry may be exercised in the best possible way, he has abandoned the principles of his science. And if, on the other hand, it be insinuated that, while he is seeking to TX. — 96

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point out the manner in which industry may be most pro- ductive, he is assailing the ownership of that kind of pro- perty on which all industry is exercised, the criticism is invidious and unfair. It needs no proof that the success of industry and the material progress of society cannot be expected, except under the guarantee of private property in land, as well as in its products. And furthermore, there is no reason for objecting on economical grounds to the process by which the distribution of land in England is restrained, unless it can be shown that the existing system is a check to industry, or a hindrance to supply, or an im- pediment to the effective development of agricultural skill.

Tt cannot be denied that, if the claim to free trade in land is intended to imply that, under existing circum- stances, a very small portion of that which would be dis- tributed by sale is brought into the market, the fact cor- responds with the statement. The custom of primogeni- ture directly tends towards the restraint of distribution, and the power of settlement acts more energetically in the same direction. Nor can any one doubt that there are circumstances under which the custom and the power operate disadvantageously. When the owner of land is virtually bankrupt, it would clearly be far better if the estate which he cannot improve were in the hands of those who can improve it, for the misuse of a necessary industrial instrument has worse effects on the economy of society than the ill use of the products of industry. The one is the same as inducing artificial barrenness on a portion of that which is limited in amount and is of supreme utility, and the other is the waste of that which is practically unlimited, and which can be supplemented from other sources. Again, the ill use of land is a total loss; but the prodigality of one who squanders the produce of labour is only a partial waste, for much of the wealth which seems to be expended on the pleasures and follies of indi- viduals is really transferred to those who are capable of making a better use of it than its original possessor does. Hence, when land is in the hands of bankrupt proprietors to such an extent as seriously to hinder its adequate occupancy, it has not been thought a violation of the rights of property to dispossess the bankrupt owner by a compulsory sale, and to put a new and more competent proprietor in his place. Such a step was taken, and with very satisfactory results, in Ireland, and there is reason to believe that similar powers might on many occasions be exercised with advantage in England. In a minor degree charges on land are a hindrance to its adequate improve- ment, for the means of the proprietor of a burdened estate are diminished, while if the landiwere in other hands its resources would be developed. Analogous to these incon- veniences are the costs of conveyance, and the demand of superfluous guarantees of title.

But the phrase " free trade in land" has been obscured by its connexion with another aspect of the relations between the owner of land and its adequate cultivation, the inter- pretation, namely, which divers disputants give to the freedom which accompanies contracts for the occupancy of land. In England, as is well known, the owner and the occupant of land are,

unlike the case in most other countries, almost universally different persons. Such a difference began very early in English society, that is, to- wards the latter end of the 14th century, and has no doubt become more marked by the peculiar customs which affect the ownership of land in England. Now it is alleged that under existing circumstances no true freedom of contract exists on the part of the occupant,—that the power which custom has given to the owner, and which law has strengthened, is so great that the occupier is virtually help- less; that the legitimate progress of agriculture is checked; and that a supply which skill could make almost indefinite,

and which might be made to satisfy the wants of the pop- ulation, is wholly inadequate for the purpose, the deficiency being wastefully supplemented from foreign importations. For it is asserted that one of the contracting parties has it in his power, by the extent of his resources, to reduce the other party to the most disadvantageous terms of a precarious occupancy, and that, though the occupant may be blamed for submitting to such terms, or at least be held responsible for the bargain which he has voluntarily made, the public is interested to a very serious extent in a better and freer relation between owner and occupier. And it is further urged that freedom of contract is not to be limited to the moment in which the bargain is struck, but must in continuous relations be so continuously present that neither of the contracting parties should be able to inflict a permanent loss on the other,—or, in other words, that con- tracts cannot be called free unless they are constantly liable to an equitable revision. The controversy has been carried on in England and Scotland in the form of an attack in the latter kingdom on the local law of hypothec, in the for- mer, and to a less extent in the latter, under the claim of compensation for unexhausted improvements. As yet no legislation of a practical character has been the result of a controversy in which some intelligent tenant farmers on the one hand, and principally on the other the duke of Argyll, have been the disputants.

It is probable that on the whole successful agriculture, that is, the production of the largest quantity in value from the soil at the least cost, has made more progress in the United Kingdom than in any other country. This has been especially the case with stock breeding, the pre- eminence of the

United Kingdom being marked and ad- mitted in this department of agriculture. But this fact itself, as the occupier is less within the power of the owner as a stock-breeder than he is as a mere cultivator, seems to suggest that the relations of the two parties need a better understanding than they have yet received, or that their con- tracts will at some time or the other require the interpre- tation of law. The difficulties, however, of any question as to the limits and control of freedom in the contracts entered into between the subjects or citizens of the same Government are great and nice. There is but little difficulty in showing that the best interests of the whole human race are consulted when the fullest freedom is given to the exchange of products, however much the process is hindered by passion or self-interest, and however great may be the practical hindrances in the way of a principle which few men have the hardihood to deny in the abstract. But there are serious difficulties in interpreting the relations in which capitalist and labourer, owner and occupier, stand to each other, and in deciding how the just rights of property may be harmonized with the just claims of industry, and the paramount consideration of the public good. (J. #. T. R.)

FREEWILL BAPTISTS, a denomination of Baptists in the United States and Canada, holding similar doctrines to those of the General Baptists of England. Founded in 1780 by Benjamin Randall, a Baptist preacher, who had been censured for teaching anti-Calvinistic doctrines, it soon made considerable progress, and in 1827 a general conference, meeting every three years, was instituted. Besides erecting numerous schools of different grades, the Freewill Baptists have established three colleges, one at Lewiston, Me., one at Ridgeville, Md., and a third at Hilsdale, Mich., to which both sexes, and coloured people as well as whites, are admitted. A fourth college is being erected at Rio Grande, Ohio. In 1877 the denomination had 1464 churches in the United States, with 1295 preachers, and 74,651 communicants. In Nova Scotia and New Brunswick there is a separate conference, the membership connected with which is upwards of 9000.

FRE—FRE

FREIBERG, or FreyBere, a town of Saxony, is situated on the Miinzbach, not far from its confluence with the Mulde, and 19 miles S.W. of Dresden. It

is well built, and is still surrounded by its old walls. It is the seat of the general administration of the mines throughout the kingdom, and its celebrated academy of mines, founded in 1765, is frequented by students from all parts of Europe. Connected with the academy are extensive collections of minerals and models, a library of 18,000 volumes, and in a separate building laboratories for chemistry, metallurgy, andassaying. Among its distinguished scholars it reckons Werner (who was also a professor there), Hum- boldt, Mohs, and Jameson. Freiberg has extensive manu- factures of gold and silver lace, woollen cloths, linen and cotton goods, iron, copper, and brass wares, shot, gun- powder, and white-lead. It has also several large breweries. In the vicinity are numerous mines of silver, lead, copper, and cobalt, affording employment to about 6000 miners. The old castle of Freudenstein or Freistein, situated in one of its suburbs, is now used as acorn magazine. In the grounds of the castle a monument was erected to Werner in 1851, and one to those who fell in the Franco-German war was erected in 1874. The cathedral, an elegant Gothic edifice, founded in the 12th century and rebuilt in the 15th century, after its almost complete destruction by fire,

has a richly adorned portal in the Byzantine style, called — the Golden Gate. It contains numerous monuments, among | which is one in memory of Prince Maurice of Saxony, who In the lady | its cheese, of which upwards of 49,000 ewts. is produced

fell in the battle of Sievershausen in 1553. chapel adjoining are the remains of Henry the Pious and his successors down to John George IV., who died in

1694. Among the other public buildings are the old town _ number of people ; but there are glass works at Semsales,

hall, dating from the 15th eentury, the gymnasium, the real school, the female burgher school, the new law courts, the cavalry barracks, the antiquarian museum, and the natural history museum, Freiberg owes its rise to the discovery of its silver mines in the 12th century. The castle of Freudenstein was erected for its defence about 1175, and the town was surrounded by walls in 1187. It was a long time one of the summer residences of the Saxon princes. The population in 1875 was 23,559.

FREIBURG, or Frisoure (the French form of the name), a canton of Switzerland, is situated in the district to the 8.E. of the Lake of Neuchatel and the N.E. of the Lake of Geneva. At no point do its boundaries actually touch on the Lake of Geneva, but in two places they come within two or three miles of its shores, Owing to the refusal of the cantonal authorities in 1802 to incor- porate the Reformed districts of Payerne and Avenches, it has a very irregular outline towards the Lake of Neu- chatel, and indeed breaks up into enclaves which are com- pletely surrounded by the territory of Vaud or Waadt. The only other canton with which it is conterminous is Bern, which lies to the north and east. With very slight exceptions in the south the whole canton belongs to the basin not of the Rhone but of the Rhine, being traversed throughout its entire length from south to north by the Sarine or Saane, which rises in the Sanetsch in Bern and ultimately joins the Aar below Giiminen. The surface of the country has considerable variety of relief, but can hardly, in such a region as Switzerland, be described as mountainous. The canton, however, is the very heart of pastoral Switzerland, and the home of the "ranz des vaches." The southern portion is occupied with offshoots of the Ber- nese Alps, presenting such heights as the Moléson, 6578 feet ; the Dent de Viidetze or De Lys, 6609 feet ; the Vanil des Arzes, 6513; the Cape au Moine, 6376 ; the Dent de Broce, 5986; Brenleyre, 7724; Folliéran, 7680 ; andthe Vani! Noir, 7825. The last is the highest elevation in the canton, and

i3 situated in the south on the Bernese frontier to the right |

of the valley of the Sarine. The western and north-western districts belong to the system of the Jorat or Jurten, the most important massif being Mount Gibloux, which attains an altitude of 3945 feet. Besides the Sarine there are two considerable streams which flow partly through Freiburg territory,— the Singine or Sense, which, deriving one of its head streams from Freiburg and the other from Bern, forms throughout the greater part of its course the boundary between the two cantons, and the Broye or Brux, which rises in the south-west near Semsales, and after traversing the outskirts of Freiburg and Vaud enters the Lake of Morat or Murten, and thus finds its way to the Lake of Neuchatel. There are a few small lakes in the canton, the most note-

worthy being that of Seedorf, which was lowered about 11 feet by draining operations undertaken in 1871-73 for reclaiming the marshy land around it. Mineral waters occur at Lac Noir or Schwarzsee, at Wyler-vor-Bad, at Montbarry near Gruyére, and at Bonn not far from the town of Frei- burg. Out ofa total area of about 340,705 acres, about 9880 may be regarded as unproductive, 57,432 are occupied by forests, upwards of 84,100 furnish pasture, 91,876 are meadow land, 104,925 are arable fields, and 675 are vine- yards, The forests are of great value to the canton, firewood and timber being among its principal exports. Though the cereals are pretty extensively cultivated, the production of grain is far under the consumption. Tobacco is an important article in the commerce of the canton, and the manufacture of Kirschwasser is widely distributed. The district of Gruyére, extending from the Singine to the Veveyse, is famous for

annually. With the exception of tanning and straw plaiting there are no industries that give employment to any great

a paper mill at Marly, and kilns for hydraulic lime at Tour de Trame and Chatel, and watches are made at Morat and Montilier. The canton is divided into seven districts or prefectures, and there are 277 communes and 118 Catholic and 8 Protestent parishes. The district of the Sarine num- bers 25,544 inhabitants, and includes the capital of the canton; the district of the Singine, lying towards the east, numbers 16,375, and has its administrative centre at Tavers or Tafels; the district of the Gruyére, to the south of those already named, has 19,337 inhabitants, and includes the chief town Bulle, with the ancient palace of the bishops of Lausanne, Tour de Tréme, Vuadens, with a model cheese- dairy, Gruyére, with the old manor of its counts, Marsens, the seat of the cantonal lunatic asylum, the convent of Valsainte, the monastery of Pont-Dieu, and the castle and village of Corbieres ; the district of the Lake numbers 14,839 inhabitants, and its chief town is Morat, the scene of the famous battle of 1476 ; the district of the Glane has 13,176 inhabitants, and its chief town is Romont, with an ancient castle and ramparts and towers; the district of the Broye has 13,706 inhabitants, and its chief town is Estevayer, a busy little place on the Lake of Neuchatel, to which it some- times gives its name ; and lastly, in the far south the dis- trict of Veveyse numbers 7855, and besides its chief town, Chatel-St-Denis, contains the village of Semsales. The canton is traversed

from north-east to south-west by the railway from Bern to Lausanne; another line proceeds from the town of Freiburg westward by the Lake of Neuchatel, and a third unites Romont and Bulle. Freiburg returns, according to its population, six representatives to the national council of Switzerland. Its own administration consists of a great council, to which a member is furnished by every 1200 inhabitants, a state council of seven mem- bers, and a judicial council of nine. According to the census of 1870, out of a total population of 110,900, 94,000 were Catholics and 16,800 Protestants, the latter being most numerous in the district of the Lake. The Catholics

are under the jurisdiction of the bishop of Lausanne, who has his residence at Freiburg. Though the official language is French, which is generally spoken in the towns, public documents are also published in German, which holds its ground in the district of the Singine, in part of the district of the Lake, and in the commune of Bellegarde in Gruyeére. In the rest of Gruyére, as well as in the districts of the Veveyse, the Glane, the Sarine, and the Broye, a patois of the French stock is the prevailing speech.

History.—-The history of Freiburg practically begins with the counts of Zaihringen, who, under the emperors, held considerable possessions in this part of Switzerland. In 1179 Berthold IV. founded the town of Freiburg, as his uncle Berthold III. had already been the founder of Freiburg in the Breisgau, and as his son and successor was not long afterwards to be the founder of Bern. He not only bestowed on it all the territory which he held for three leagues round—a district afterwards known as the 'old lands," or the " twenty-four parishes," but he also, by a charter or Handfeste, granted a number of privileges similar to those of Cologne, which in that unsettled period soon attracted what was then a considerable population of artisans, peasants, and traders from the neighbouring countries. On the death of Berthold V., the last duke of Zahringen, in 1218, his possessions passed to his sister Anne, wife of Ulrich of Kyburg ; and the Kyburgs were accordingly lords of Freiburg till 1264, when they also became extinct in the male line. Anne of Kyburg, who had married Eberhard of Hapsburg, sold Freiburg to Rudolph of Hapsburg for 3000 marks; and thus the town

was subject to the house of Austria for 188 years. During that long period it had to fight many a battle for its existence, more especially against the neigh- bouring town of Bern and the counts of Savoy. At length aban- doned se Austria, it was obliged in 1452 to swear fidelity to Louis of Savoy, to whom it had become indebted for vast sums of money. In spite of all the difficulties of its position, it was in this first part of the 15th century that it maintained a considerable trade with France, Italy, and Venice in its leather and cloth. As many as 18,000 or 20,000 pieces of cloth were stamped with the town's seal in the course of a year. The reign of the Savoy dynasty was of short duration, for when Yolande, widow of Amadeus, entered into alliance with Charles the Bold of Burgundy, Freiburg joined Bern against the Burgundians, and took part in the battles of Morat and Grandson. Atlength, in the diet of Stanz in 1481—thanks mainly to the advocacy of Brother Claus (Nicholas von der Fliih)—it was admitted a member of the Swiss Confederation. Considerable additions of territory were effected in the 15th and 16th centuries. In 1475 Ilens, Planfayon, and the castle of Chenaux were acquired, and, along with the Bernese, the people of Freiburg wrested Morat from the house of Savoy. Iu 1478 the lordship of Montagny was purchased for 6700 florins, and in 1482 Farvagny and Pont. Bellegarde was added in 1502, Wallenbuch in 1504, Font in 1508, and in the course of 1536 Vuippens, Estevayer, Corserey, Bulle, Vuissens, Chatel St Denis, Bossonnens, Surpierre, Romont, Rue, La Molitre, and St Aubin. Corbiéres was bought for 8000 florins in 1553; and in 1555 Bern and Freiburg forced Michel, the last count of Gruyére, to abdicate, and paid 80,500 crowns for his countship, The people of Freiburg had to endure very heavy taxation to raise their proportion of the sum. Mean- while, in the 16th century, the original democratic government gave place to an exclusive oligarchy, which succeeded in maintain- ing its supremacy in spite of the pretensions of the papal power and the bishop of Lausanne on the one hand, and the dissatisfaction of the people on the other. The French occupation of 1798 brought its government to a close; but in 1814 it was partially restored, 108 of the 144 seats of the great council being assigned to members of the patrician families, On December 2, 1830, the people rose and demanded equality of rights for all the citizens of the canton; and in January 1831 a democratic constitution was drawn up, and a representative government established. In 1846 Freiburg joined the Sonderbund, and in the following year it was consequently invaded by

the federal forces, In 1848 the constitution was revised and rendered more liberal in regard to religious matters, Several attempts were made by the Catholic party to recover their supre- macy; but their efforts were defeated, and Bishop Marilley and other of their leaders were exiled. In 1857, however, the great council decided for another revision of the constitution in a reaction- ary sense, and their proposal was adopted by the people. Since then there has been no alteration of the general tendency, and the Catholic clergy are in possession of unbounded influence.

See Berchthold, Geschichte Freiburgs; Lalive a'Epinay, Etrennes Sribourgeoises pour les années 1806-1809, Freiburg, 1810: Sammlung der Gesetze, Decrete, &c., der Regierung des Cantons Freiburg, 1808-17; A. Bourqui, Notions sur la Con- stitution politique du pays; Alex. Daguet, Jilustrations JSribourgeoises; Nou- veaux Souvenirs de Frieburg, by F, P,, Freiburg, 1868; Géographie du Canton de Fribourg alusage des dcoles primatres, 1877; Recueil diplomatique du Canton de Fribourg, published by the Cantonal Histarical Society.

FrerpurG, the chief town of the above canton, with a station on the line between Bern and Geneva, occupies a highly picturesque situation in the valley of the Sarine, part of it lying in the bottom of the ravine and part of it climb- ing the irregular eminences on the left. It is divided into four districts —the Bourg or central town, the Quartier des Places or the upper town, and the districts of the Auge and the Neuveville, which, together with the Planche, constitute the lower town. The principal ecclesiastical building of Freiburg, the collegiate church of St Nicholas, commenced about 1283 and finished in the second half of the 15th century, is worthy of notice, not only for the noble belfry 245 feet in height, but also for the organ, which was constructed between 1824 and 1834 by Aloys Mooser, a native of the town, and is one of the most famous instru- ments of its kind. The various buildings belonging to the municipal and cantonal Governments, the conventual esta- blishments of the Cordeliers, the Ursuline nuns, and other fraternities and sisterhoods, the college of St Michel and the lyceum, with the cantonal museum, and the civic hospital and other beneficent institutions are the most important of the public edifices, In front of the town-hall grows a linden tree which is said to have been planted by a soldier from the battle of Morat, 22d June 1476. The ravine of the Sarine is

crossed by several bridges, of which the most notable is the suspension bridge constructed by

M. Challey about 1834, which has a span of 871 feet, and

consists mainly of four cables each composed of 1056 distinct wires, individually not more than a tenth of an inch in diameter. About 3 miles to the north of the town, the river valley is crossed by the great railway viaduct of Grandfey, which dates from 1862, is a girder structure 1095 feet in length and 260 feet high, contains about 3100 tons of metal, and cost 2,500,000 francs. Immediately above the town a vast dam was thrown across the river-bed by Ritter the en- gineer in 1871-3; and the fall thus obtained yields a water power of from 2600 to 4000 horse-power. A motive force of 600 horse-power secured by turbines in the stream is conveyed to the plateau of Pérolles by "telodynamic" cables more than 2295 feet in length, for whuse passage a tunnel has been constructed in the rock of the ravine. The indus- trial establishments are still comparatively few and unim- portant. Population in 1870, 10,904.

FREIBURG, or Freysure, usually distinguished as Freiburg in the Breisgau, is a city formerly of the Austrian dominions but now in the grand-duchy of Baden, about 12 miles E. of the Rhine, at the foot of the Schlossberg, one of the heights of the Black Forest range. It is one of the stations on the railway between Basel and Mannheim, and lies about 40 miles northwards from the former city. The town is for the most part well built, having several wide and handsome streets and a number of spacious squares. It is kept clean and cool by the waters of the Dreisam, which flow through the streets in open channels; and its old fortifications have been replaced by public walks, and, what is more unusual, by vineyards. Since 1827 Freiburg has been the seat of an archbishop who has authority over the bishops of Mainz, Fulda, Rottenberg, and Limberg ; and it possesses a famous Catholic university, the Ludovico Albertina, which owes its origin to Albert VIL, archduke of Austria, and dates from 1454, 1456, or 1457, This was at one time a very wealthy institution, having been endowed by its founder with extensive lands in the Breisgau, Upper Alsatia, and Wiirtemberg ; but since the French Revolution it has lost nearly all its estates, and the revenue derived from those still held in Baden is not sufficient for its expenses. In

1876 it had 41 professors, ordinary and ex- traordinary, and 9 privat-docenten, and the students num- bered 290, of whom 141 were foreigners. The library cou- tains upwards of 250,000 volumes; and among the other

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auxiliary establishments are an anatomical hall and museum and botanical gardens. The Freiburg minster is con- sidered one of the finest of all the Gothic churches of Ger- many, being remarkable alike for the symmetry of its pro- portions, for the taste of its decorations, and for the fact that it may more correctly be said to be finished than almost

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Plan of Freiburg in Baden.

1. Hospital. 11. Merchants’ Hall.

2, Evangelical Church. ie ee 12. Archbishop’s Palace, 3, Art Hall. 13. Grand-Ducal Palace. 4. Barracks. 14, Theatre.

5, St Martin’s Church. 15. Town Hall,

6. Franciscan Monastery. 16. Post Office.

7, Chemical Laboratory. 17. Barracks.

8. University. 18. Town Hospital.

9 Museum. 1 19, Rotteck’s Monumen. . 0, Cathedral or Minster, 20. Convent.

Gates—A. Martins Thor; B. Schwaben Thor; C. Breisacher Thor.

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any other building of the kind, The period of its erection probably lies for the most part between 1122 and 1252 ; but the choir was not built till 1513. The tower, which rises above the western entrance, is 386 feet in height, and it presents a skilful transition from a square base into an oc- tagonal superstructure, which in its turn is surmounted by a pyramidal spire of the most exquisite open work in stone. In the interior of the church are some beautiful stained glass windows, both ancient and modern, the tombstones of several of the dukes of Zahringen, statues of archbishops of Freiburg, and paintings by Holbein and by Hans Balding, surnamed Griin. Among the other noteworthy buildings of Freiburg are the palaces of the grand duke and the arch- bishop, the town-hall, the theatre, the Kaufhaus or merchants' hall, a 16th-century building with the front painted red, the Protestant church, formerly the church of the abbey of 'Thennenbach, removed thither in 1839, the hall of art and harmony, and the barracks, erected by the Austrian Govern- ment in 1776, and capable of containing 5000 men. The charitable institutions include a foundling hospital, an orphan asylum, a blind asylum, and a military hospital. In the centre of the fishmarket square is a fountain surmounted by a statue of Duke Berthold ITI. of Zabringen, the founder of the city ; in the Franciskaner Platz there is a monument to Schwarz, the traditional discoverer of gunpowder; the Rotteck Platz takes its name from the monument of Rotteck, the historian, which formerly stood on the site of the Schwarz statue; and in Kaiser Wilhelm Strasse a bronze statue was erected in 1876 to the memory of Herder, who in the early part of the 19th century founded in Freiburg an institute for draughtsmen, engravers, and lithographers, and carried on a famous bookselling business. On the Schlossberg above the town there are massive ruins of two castles which were destroyed by the French in 1744; and about two miles to the N.E. stands the castle of Zahringen,

the original seat of the famous family of counts. Situated on the ancient road which runs by the Héllenpass between the valleys of the Danube and the Rhine, Freiburg early acquired commercial importance, and it is stillthe principal centre of the trade of the Black Forest. It manufactures chicory,

chemicals, starch, leather, tobacco, silk thread, paper, and hempen goods, as well as beer and wine. The population is rapidly increasing. In 1864 it numbered 19,085, inclusive of the suburbs of Herdern and Wiehre, and in 1875 no less than 30,531. About a sixth of the whole are Protestants.

Freiburg was founded, as has been already stated, by Count Berthold III. of Zahringen. In 1120 it became a free town, with privileges similar to those of Cologne; but in 1219 it fell into the hands ofa branch of the family of Urach. After it had vainly attempted to throw off the yoke by force of arms, it obtained its freedom in 1366 for a sum of 20,000 silver marks; but as it was unable to reimburse the creditors who had advanced the money, it was, in 1368, obliged to recognize the supremacy of the house of Hapsburg. In the 17th and 18th centuries it played a considerable part as a fortified town. It was captured by the Swedes in 1632, 1634, and 1638; and in 1644 it was seized by the Bavarians, who shortly after, under General Marcey, defeated in the neighbourhood the French forces under Enghien and Turenne. The French were in possession from 1677 to 1697, and again in 1713-14 and 1744 ; and when they left the place in 1748, at the rv of Aix-la-Chapelle, they dismantled the fortifications. The Baden insurgents gained a victory at Freiburg in 1848, and the revolutionary Govern- ment took refuge in the town in June 1849, but in the following July the Prussian forces took possession, and did not leave till 1851.

See Schreiber, Geschichte und Beschreibung des Minster 2u Frei- burg, 1820 and 1825; Geschichte der Stadt und Universitat Frei- burgs, 1857-59; Der Schlossberg bei Freiburg, 1860.

FREIBURG, distinguished as Freiburg unter dem Fiirstenstein, a garrison town in the government district of Breslau, Silesia, is situated on the Polsnitz, 35 miles S. W. of Breslau. Its industries include the making of regulator watches, linen weaving, starch manufacture, and distilling. A higher burgher school was erected in 1874. In the neighbourhood are the old and modern castles of the Fiirstenstein family. At Freiburg on July 22, 1762, the Prussians defended themselves successfully against the superior forces of the Austrians. The population of the town in 1875 was 7853.

FREIDANK, Freicepank, or in Middle High German Vripanc, the name by which a certain German didactic poet of the 13th century is usually known.

It has been disputed whether the word, which is equivalent to freethought, is to be regarded as the poet's real family name or only as a pseudonym ; according to Pfeiffer the former is the case. Little is known of Freidank's life. He certainly accom- panied Frederick II. on his crusade to the Holy Land, where a portion at least of his work was composed ; and it is said that on his tomb (if indeed it was not the tomb of another Freidank) at Treviso there was inscribed, with allusion to the character of his style, "he always spoke and never sang." Wilhelm Grimm started the hypothesis that Freidank was to be identified with Walther von der Vogel- weide; but it found almost no acceptance from other German scholars, and was formally refuted by Franz Pfeiffer in his Zur Deutschen Literatur-Geschichte, Stuttgart, 1855, and his Germania, 1857, 2d vol.

Freidank's work bears the name of Bescheidenhcit, 1.e., Discretio, Correct Judgment, and consists of a collection of proverbs, pithy sayings, moral reflections, and stories arranged under general heads. Its popularity till the end of the 16th century is shown by the great number of MSS. still extant; and Sebastian Brandt published it again and again in modified forms. Wilhelm Grimm's edition of Vridances Beschcidenheit appeared at Gottingen in 1834, and Bezzinberger's at Halle in 1872; the old Latin translation, Fridangi Discretio, was printed by Lemcke at Stettin, 1868; and there are two translations into modern German, A. Bacmeister's, Reutlingen, 1861, and Simrock's, Stuttgart, 1867. Compare also H. Paul, Ueber die Urspriingliche Anordnung von Freidank's Bescheidenhett, Leipsic, 1870.

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FREILIGRATH, Frrpivann (1810-1876), a popular German poet, was born June 17, 1810, at Detmold, where his father was a teacher in the Stadtschule. He was edu- cated at the gymnasium of his native town, and at the age of fifteen was apprenticed to an uncle who kept a grocer's shop in Soest. Freiligrath had no great liking for trade. He was an insatiable reader, especially of books of travel and adventure, and from his childhood a scribbler of verse. At Soest he devoted some hours daily to the study of English, French, and Italian, and towards the end of his five years' apprenticeship was writing verses for several small Westphalian papers,

such as the G'unloda and Mindener Sonntagsblatt, Having spent other five years (1831-6) as clerk in a bank at Amsterdam, Freiligrath re- turned to Soest, published his trauslations of Victor Hugo's Odes and Twilight Songs (1836), and started, conjointly with his friends Ignaz Hub aud A. Schnezler, a journal, entitled Rheinisches Odeon (1836-8). In 1837 he went to Barmen as bookkeeper in a mercantile house, about which time also his fugitive pieces, still appearing in Westphalian papers, among which were the Morgenblatt and Deutscher Musenalmanach, had the good fortune to be praised by the poet Chamisso, A year later appeared his first volume of Gedichte, which became immediately and widely popular. Finding himself at the age of twenty-eight one of the favourite poets of his day, Freiligrath now gave up his situation of bookkeeper in Barmen, and spent the next year at Unkel on the Rhine, where he wrote his Roland's Album (1840), and in connexion with Tevin Schiicking compiled Das malerische und romantische Westfalen (1840-42). He married in 1841 Ida Melos, daughter of Professor Melos of Weimar, and removed first to St Goar, where, with his friends Simrock and Matzerath, he edited the Rheinisches Jahrbuch (1840-41), and in 1842 to Darmstadt, where he published, conjointly with Duller, a poem, Zum Besten des Ké6lner Doms, and endeavoured also to start a periodical, to be called Britannica: fiir Englisches Leben und Englische Literatur, for which Dickens and Bulwer had promised their assistance. This scheme, however, failed, and Freiligrath returned to St Goar, there to complete his Ka7/ Immermann, Llitter der Erinnerang an thn (1842). In the same year he received a pension of 300 thalers from King William IV. Up to this time, Freiligrath's poetry had borne no trace of the politician, Among the Gedichte, so popular in German households, were his Jfoos-thee, Die Auswanderer, Der Blumenrache, Prinz Hugen, Der Bider- bibel, Léwenritt, aud many others written before 1840, all purely imaginative in their character, and still, from a lite- rary point of view, unquestionably the poet's masterpieces. When, after his return to St Goar, Freiligrath was drawn irresistibly into the political controversies oi the day, he still endeavoured to keep clear of party feeling, declaring that the poet stood " auf emer héheren Warte als auf den Zinnen der Parter." But he was soon obliged to vacate this position and descend among the politicians; and in 1844 he threw up his royal pension, published his G'laubensbekennt- miss, and finally joined the democratic party. From this time forward he boldly proclaimed the democratic cause in verse, till, as the author of Z'rotz-alledem (a

translation of Burns's A Man's a Man fora that), Jacta est Alea, Die Fretheit ! Das Recht!, Hamlet, England an Deutschland, and other equally daring effusions, he was forced to seek safety in exile, and retired first to Belgium and then to Switzerland. There he prepared for press a volume of Englische Gedichte aus neuerer Zeit (1846), containing translations from Mrs Hemans, L. E. L., Southey, Tennyson, Longfellow, and others, and als» a volume of political songs entitled (a Ira/ The publication of this last led to his flight to England, and for the next two years he lived in London, as foreign correspondent to a mercantile

house. In 1848 he was on the point of emigrating with his family to America, there to join Longfellow and other literary friends, when the Revolution broke out, and the amnesty of March 19 allowed him to return to Germany. He now took up his post at the head of the democratic party at Diisseldorf, but was shortly afterwards imprisoned on account of his poem Die Zodten an die Lebenden. On being liberated by verdict of the jury, he removed to Co- logne, to assist in the management of the Neue Lheinische Zeitung. During this year also he published his Yebruar- kldnge and Die Revolution. Zwischen den Garben, eine Nachlese dlterer Gedichte, appeared in 1849, and Vewe polz- tische und sociale Gedichte in 1850. Fresh impeachments drove Freiligrath again to London in 1851, and he once more returned for a livelihood to the prosaic existence of the desk and office stool, still, however, devoting his leisure hours to literature, and specially to those translations from the English poets which in Germany have earned him a position equal to Riickert's as a translator of English verse, In 1854 he published a selection of translations from English, Scotch, and Irish literature, entitled Zhe Rose, Thistle, and Shamrock; also Dichtung und Dichter, eine Anthologie. His translation of Longfellow's Hiawatha appeared 1857. He also translated Cymbeline and the Winter's Tale for a German edition of Shakespeare, edited by Bodenstedt. In 1866 a national testimonial, which ultimately reached the sum of 60,000 thalers, was set on foot in Germany, for the purpose of providing a pension for the poet in his old age ; and when, two years later, a general amnesty was granted to political offenders, Freiligrath returned to his native country, and was received with public enthusiasm. He now settled in Stuttgart, where, at the beginning of the Franco- German war, he wrote some since popular songs, such as Hurrah Germania! and the Z'rompete von

Gravelotte. He removed to Cannstadt in 1875, and died there, March 18, 1876, An edition of his collected works was published at Stuttgart (6 vols. 1870, 2 vols. 1871, and since) and there is also a Tauchnitz edition, containing a selection of some of Freiligrath's best known poems, translated into English by various authors, aud edited by his daughter Mrs Freiligrath Kroeker (1869 and 1871).

Powerful as Freiligrath's poetry is, and masterly as his diction and rhythm are admitted to be, he is yet wanting in the tenderness of a Chamisso, or the exquisite subtlety of a Heine. The principal charm of his poetry lies in its entire originality. He came, belonging to no school of versifiers, at a time when old tastes were being cast off, and novelty was restlessly desired, and he has been fitly christened a bahnbrechendener Poet. He was original in style of thought and choice of subject, while in many of his poems, such as his Iceland Moss Tea, Skating Negro, Revenge of the Flowers, Lion's Ride, and many of his grim, revolutionary parables, there is even an element of the fantastic—the bizarre. And it was a part of this native originality of mind which made Freiligrath so eminently a cosmopolitan poet. He was no traveller, antl spent the greater part of his days in a dusty counting house ; yet, few as his sources of inspiration could have been,—he himself acknowledges the old Bilderbibel of his childhood as one, while others have traced them to the busy docks and strange cargoes of a seaport town,—his fancy was rarely contented with linger- ing among the scenery and legends at home, but branched rather into new paths, into the distant parts of the earth,— into the Weltferne. This love of the Weltferne, however, predominates only in his earlier Gedzchte, to which the intense patriotism of his later muse is a strange contrast. In England Freiligrath's political poetry is of secondary interest ; for to the British intellect it is scarcely compre- hensible how such effusions— grim, outspoken, as they are— should be a sufficient cause for imprisonment, or an almost

life-long exile ; and as poems of occasion—although that occasion was a revolution—they rank lower with the literary critic than the purely imaginative poetry of his youth. But by most Germans Freiligarth is best remembered as the political poet ; while among the countrymen of his own

party, old political friends and fellow exiles, he has been called a poet-martyr, the "bard of freedom," and " inspired singer of the revolution." (F. M.)

FREIND, Joun (1675-1728), English physician, was born in 1675 at Croton in Northamptonshire. He made great progress in classical knowledge under Dr Busby at Westminster, and at Christ Church, Oxford, under Dr Aldrich, and while still very young, produced, along with Foulkes, an excellent edition of the speeches of Auschines and Demosthenes on the affair of Ctesiphon. After this he began the study of medicine, and having proved his scientific attainments by various treatises was appointed professor of chemistry at Oxford in 1704. In the following year he accompanied the English army, under the earl of Peterborough, into Spain, and, on returning home in 1707, wrote an account of the expedition which attained great popularity. Two years later he published his Prelectiones Chimice, which he dedicated to Sir Isaac Newton. In 1711 he was elected fellow of the Royal Society. Shortly after his return in 1713 from Flanders, whither he had accompanied the British troops, he took up his residence in London, where he soon obtained a great reputation as a physician. In 1716 he became fellow of the college of phy- sicians, of which he was chosen one of the censors in 1718, and Harveian orator in 1720. In 1722 he entered parlia- ment as member for Launceston in Cornwall, but, being sus- pected of favouring the cause of the exiled Stuarts, he spent half of that year in the Tower. During his imprisonment he conceived the plan of his most important and valuable work, Lhe History of Physic, of which the first part appeared in 1725, and the second in the following year. In the latter year he was appointed physician to Queen Caroline, an office which he held till his death, 26th July 1728. A complete edition of his Latin works, with a Latin translation of the History of Physic, edited by Dr Wigan, was published in London in 1732, A monument was erected to Freind in Westminster Abbey.

FREIRE, Francisco Jozm (1713-1773), a Portuguese historian and philologist, was born at Lisbon in 1713. He belonged to the monastic society of St Philip Neri, and was a zealous member of the literary association known as the Academy of Arcadians, in connexion with which he adopted the pseudonym of Candido Lusitano. He contri- buted much to the improvement of the style of the Portu- guese prose literature, but his

endeavour to effect a reforma- tion in the national poetry by a translation of Horace's Ars Poetica was less successful. The work in which he set forth his opinions regarding the vicious taste pervading the current Portuguese prose literature is entitled Maximas sobre a Arte Oratoria, and is preceded by a chronological table forming almost a social and physical history of Portu- gal. His best known work, however, is his Vida do Infant D. Henrique, which has given him a place in the first rank of Portuguese historians. He also wrote an account of the great earthquake of 1775, and his Réflewions sur la Langue Portugaise was published in 1842 by the Lisbon society for the promotion of useful knowledge. He died in si 7a,

FREISCHUTZ is, in German folklore, a marksman who by a compact with the devil has obtained a certain number of bullets destined to hit without fail whatever object he wishes. As the legend is usually told, six of the Freikugeln or "free bullsts" are thus subservient to the marksman's will, but the seventh is at the absolute disposal of the devil himself. Various methods were adopted in order to procure possession of the marvellous missiles. According to one

the marksman, instead of swallowing the sacramental host, kept it and fixed it on a tree, shot at it, aud caused it to bleed great drops of blood, gathered the drops on a piece of cloth and reduced the whole to ashes, and then with these ashes added the requisite virtue to the lead of which his bullets were made. Various vegetable or animal sub- stances had the reputation of serving the same purpose. Stories about the Freischiitz were especially common in Germany during the 14th, 15th, and 16th centuries; but the first time that the legend was turned to literary profit is said to have been by Apel in the Gespensterbuch or " Book of Ghosts." It has become universally known as the basis of Weber's opera Der Freischiitz (1821), the libretto of which was written by Friedrich Kind, who had sug- gested Apel's story as an excellent theme for the composer. The name by which the Freisczhiitz is known in French is Robin des Bois, According to some mythologists, the legend is to be traced back to the great solar myth.

See Kind, Freyschiitzbuch, Leipsic, 1848; Revue des Deux Mondes, February 1855; Grasse, Die Quelle des Freischiitz, Dresden, 1875.

FREISING, Freystnc, or FreisIncen, a town of Bavaria, district of Upper Bavaria, is situated on the Isar, 20 miles N.N.E. of Munich. It has breweries, distilleries, dyeworks, sawmills, and machine factories. Among the principal buildings are the cathedral (famous for its crypt), erected in the end of the 12th century, the town-hall, the lyceum, and the gymnasium. Freising is a very ancient town, and is said to have been founded by the Romans. It at any rate existed as early as 444 s.p., and was made the seat of a bishop in 724. In 1802 the bishopric was united to the newly-created archbishopric of Munich, whose occupant bears the title of Freising as well as Munich. The population of Freising in 1875 was 8252.

FREIWALDAU, a town in Austrian Silesia, circle of Troppau, is situated in a pleasant valley 40 miles W.N.W. of Troppau. It was formerly a protection-town of the arch- bishopric of Breslau, and possesses an old castle and a large church. Its industries are lineu and cotton weaving, flax- spinning, and wax-bleaching. About a mile and a half distant is the well-known hydropathic establishment of Grifenberg, In 1869 the population of Freiwaldau, including suburbs, was 5242.

FREJUS, the ancient Morum Julii, a town of France, department of Var, about a mile from the Mediterranean, and 15 miles S.E. of Draguignan. It is the seat of a bishop, and has some handsome modern buildings, among which are the cathedral and the episcopal palace, both of Gothic architecture, and constructed partly of the remains of Roman edifices. It possesses manufactures of cork and soap, aud among the minerals of the neighbourhood are coal, pumice stone, porphyry, jasper, and amethyst. Fréjus took its name from Julius Czsar, who is said to have established a Roman colony there. It was improved by Augustus, and in the time of the subsequent emperors it became an important naval station. Among the remains of the ancient town are a triumphal arch, a ruined amphi- theatre, traces of two moles which formed the entrance of the port, and portions of a fine agueduct, which brought the waters of the Siagne into the town from a distance of 90 miles. 'Traces of the old walls of the town are also visible. The port, which communicated with the sea by means of a canal, has been dried up, and its site is now oc- cupied by gardens. At St Raphael, a fishing village about a mile and a half distant, Napoleon disembarked on his re-

‘tur from Egypt in 1799, and re-embarked for Elba in

1814. The population of Fréjus in 1876 was 2791. Texier, Mémoires sur la ville et le port de Fréjus, 1847. FREMONT, a city of the United States of America, capital of Sandusky, county Ohio, is situated on the San- dusky river at the head of navigation, 30 miles east of

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Toledo by rail. Steamers ply between the city and the principal ports of Lake Erie, and it has manufactories of woollens, sashes, and blinds, flour mills, and engineering works, The late Mr Burchard bequeathed to the city land for two public parks, and $50,000 for a public library, the building for which is to be erected on the Fort Stephenson property, the scene of the gallant and successful defence of General Crogher against a superior force of the British and Indians, August lst and 2d, 1813. The population of Fremont in 1870 was 5455.

FRENCH, Nicnotas (1604-1678), an Irish political pamphleteer, was born in Wexford in 1604. After receiv- ing ordination at Louvain, he became Roman Catholic priest at Wexford, and in 1643 he was appointed bishop of Ferns. Having taken a prominent part in the political disturbances of this period, he deemed it prudent, after the universal submission which followed the storming of Wex- ford by Oliver Cromwell, to retire to Brussels, where, in 1652, he published, his attack on Ormond, entitled Zhe Unkind Deserter of Loyal Men and True Friends, and shortly afterwards The Bleeding Iphigenia. The most im- portant of his other pamphlets is the Sale and Settlement of Ireland. Shortly before his death, which took place August 23, 1678, he was nominated coadjutor-archbishop of Ghent. The Historical Works of Bishop French, com- prising the pamphlets above named and several others, were published at London in 1846 in 2 vols., and a notice of him will be found in T. D. M‘Gee’s Jrish Writers of the 17th Century, London, 1846.

FRERE, Joun Hooxnam (1769-1841), an English diplomatist and author, was born in London, May 21, 1769. His father, John Frere, a gentleman of

a good Suffolk family, had been educated at Caius College, Cam- bridge, and would have been senior wrangler in 1763 but for the powerful competition of Paley; his mother, daughter of Mr John Hookham, a rich London merchant, was a lady of no small ability and culture, accustomed to amuse her leisure with the pleasures of versification; and his father's sister Ellinor was married to Sir Jolin Fenn, the learned editor of the Paston Letters, and contributed with her own pen to the formation of a library of fiction for children. Young Frere was sent to Eton in 1785, and there began that intimacy with Canning which so greatly affected his after life. From Eton he went to his father's college at Cambridge, and graduated B.A. in 1792 and M.A. in 1795. He entered public service in the foreign office under Lord Grenville, and sat from 1796 to 1802 as member of parliament for the close borough of Looe in Cornwall, From his boyhood he had been a warm admirer of Pitt, and along with Canning he entered heart and soul into the defence of his Government, and contributed freely to the pages of the Anti-Jacobin. On Canning's removal to the board of trade in 1799 he succeeded him as under secretary of state ; in October 1800 he was appointed envoy extraordinary and plenipotentiary to Lisbon; and on Sep- tember 1802 he was transferred to Spain, where he remained for two years. He was recalled on account of a personal disagreement he had with the "Prince of Peace," but his conduct was approved by the ministry, and in 1808 he was again sent out as plenipotentiary to Ferdinand VII. The condition of Spain rendered his position a very responsible and difficult one, but had it not been fur one unfortunate step he would have left the country with greatly increased reputation. When Napoleon began to advance on Madrid it became a matter of supreme importance to decide whether Sir John Moore, who was then in the north of Spain, should endeavour to anticipate the occupation of the capital or merely make good his retreat, and if he did retreat whether he should do so by Portugal or by Galicia. Frere was strongly of opinion that the bolder was the better course, and

he urged his views on Sir John Moore with an urgent and fearless persistency that on one occasion at least overstepped the limits of hiscommission. After the disastrous retreat to Corunna, the public accused

Frere of having by his advice endangered the British army, and though no direct censure was passed upon his conduct by the Government, he was called home, and the Marquis of Wellesley was appointed in his place. Thus ended Frere's publiclife. He afterwards refused to undertake an embassy to St Petersburg, and twice declined the honour of a peerage. In 1816 he married Elizabeth Jemima, dowager countess of Erroll, and in 1820, on account of her failing health, he went with her to the Mediterranean. There he finally settled in Malta, and though he afterwards visited England more than once, the rest of his life was for the most part spent in the island of his choice. In quiet retirement he devoted himself to various literary labours, studied his favourite Greek authors, and taught himself Hebrew and Maltese. His hospitality was well known te many an English guest, and his charities and courtesies endeared him to his Maltese neighbours ; and when he died in 1841, his loss was evidently regarded by rich and poor as a common calamity.

Frere's literary ability was early displayed. He wasa contributor at Eton to the school magazine known as the Merocosm, and gained the members' prize at Cambridge in 1792 by an essay on the strange question, " Whether it were possible to hope for improvement in morals and the cultivation of virtue in the rising republic of Botany Bay?" During the first period of his public life he was one of the chief writers in the Anti-/acobin, contributing, among other pieces, 'The Loves of the Triangles," a clever parody of Darwin's " Loves of the Plants," and sharing with Canning the honour of " The Needy Knife-Grinder" and "The Rovers." In 1817 he published a mock-heroic poem entitled, Prospectus and Speeimen of an intended National Work by William and Robert Whistleeraft, of Stow-Market, in Suffolk, Harness and Collar makers, intended to comprise the most interesting particulars relating to King Arthur and his Round Table. It attracted considerable attention at the time, and though it was afterwards comparatively forgotten, it served to bring again into fashion the octave stanza of the Italians, and formed, as far at least as its versification was concerned, the acknowledged model of Byron's Beppo. Much greater importance attached to the translations of Aristophanes, by which indeed Frere occupies an almost unrivalled position in English literature. The principles according to which he conducted his task were elucidated in an articleon Mitchell's Aristophanes, which he contributed to The Quarterly

Review, vol. xxii. The translations of Zhe Acharnians, The Knights, The Birds, and The Frogs were privately printed, and were first brought into general notice by Sir G. Cornewall Lewis in the Classical Museum for 1847. They were followed some time after by Theognis Restitutus, or the personal history of the poet Theognis, reduced from an analysis of his existing fragments. Frere's complete works were published in 1871, with a memoir by his nephews, W. E. and Sir Bartle Frere, and reached a second edition in 1874. Compare also an article in the North American Review, vol. evii., 1868.

FRERET, Nicozas (1688-1749), a French scholar, one of the most learned men of his age, was born at Paris, February 7 or 15, 1688. His father was procureur to the parliament of Paris, and destined him to the profession of the law. His passion for knowledge declared itself almost from his birth ; and so early did he apply himself to studies of the most diverse kind, and accumulate vast stores of in- formation, that he scarcely seemed to have any childhood. His precocity in learning and literary labour appears to rival even that of John Stuart Mill. He had for his tutors the historian Rollin and Father Desmolets. Amongst his early studies history, chronology, and mythology held a prominent place. To please his father he studied law and began to practice as a pleader; but the force of his genius soon carried him into his own path. At nineteen he was admitted to a society of learned men who sought more free- dom of discussion than was to be had within the Academy, and he read before them memoirs on the religion of the Greeks, on the worship of Bacchus, of Ceres, of Cybele, and of Apollo. The astonishing reputation which he gained for learning, and the influence of the eminent men whose friend- ship he enjoyed, opened the way for his recognition by the

Academy. He was hardly twenty-six years of age when he was admitted as pupil to the Academy of Inscriptions. One of the first memoirs which he read was a learned and criti- cal discourse Sur l'Origine des Francais. His views, well- grounded, unusual, and audacious, excited great indignation in the Abbé Vertot, who had written on the same subject in a manner more flattering to the vanity of Frenchmen, and he denounced Fréret to the

Government as a libeller of the monarchy. A lettre de cachet was issued, and Fréret was sent to the Bastille, He was thus silenced on the perilous subject, and his memoir even remained unpublished till nearly fifty years after his death. During his six months of confinement—"a solitude," he says, 'whose tranquillity there was nothing to disturb"—he devoted himself to the study of the works of Xenophon, the fruit of which appeared later in his memoir on the Cyropedia. The assertion, frequently repeated, that he was allowed to read nothing but Bayle's famous Dictionary, and that he nearly learnt it by heart and imbibed all its scepticism, is entirely untrue and unjust. From the time of his liberation in June 1715 his life was uneventful. It was a life of the most simple, pure, and complete devotion to knowledge, with absolute indifference to fame. In January 1716 he was received associate of the Academy, and in December 1742 he was made perpetual secretary. He lived and laboured without intermission for the interests and the honour of the Academy, not even claiming any property in his own writings, which almost all remained unpublished till after his death. The list of his memoirs occupies four columns of the Vouvelle Biographie Générale. They treat of a large variety of subjects, chiefly in the fields of history, chronology, geography, mythology, and religion. Through- out he appears as the keen, learned, and original critic ; examining into the comparative value and credibility of documents, distinguishing between the mythical and the historical, and separating traditions with an historical element from pure fables and legends. He rejected the extreme pretensions of the chronology of Egypt and China, and at the same time controverted the scheme of Sir Isaac Newton as too limited. He investigated the mythology not only of the Greeks, but of the Celts, the Germans, the Chinese, and the Indians, and was a vigorous opponent of " euhemeristic" interpretation, He was one of the first scholars of Europe to undertake the study of the Chinese language; and in this he was engaged at the time of his committal to the Bastille. In addition to these labours and acquirements Fréret made himself master of modern literature, and was intimately acquainted with the dramatic works of the French, Italian, English, and Spanish poets. His multi- farious pursuits left him no time for carrying on the pub- lication of the Mémoires of the Academy, an enormous arrear of which had to be made up by his successor. He died at Paris, March 8, 1749.

Long after his death several works of an atheistic character were falsely attributed to him, and were long believed to be his. These were the Hxamen critique des apologistes de la religion chrétienne (1766), Lettre de Thrasybule & Leucippe, printed in London about 1768, and a few others. They were republished under the title of Giuvres philosophiques in 1776. It is now believed that they were put forth in Fréret's name by Holbach, Naigeon, and Lagrange, and that Fréret had nothing whatever to do with them. A very de- fective and inaccurate edition of Fréret's works was published in 1796-1799. A new and complete edition was projected by Cham- pollion-Figeac, but of this only the first volume appeared (1825). His manuscripts, after passing through many hands, were deposited in the library of the Institute.

FRERON, Exre Catnerine (1719-1776), a French critic and controversialist, was born at Quimper in 1719. He was educated by the Jesuits, and made such rapid pro- gress in his studies that before the age of twenty he was appointed professor at the college of Louis-le-Grand. On resigning his connexion with the Jesuits in 1739, he was

*employed by the Abbé des Fontaines as a contributor to his Observations sur les Herits Modernes. After the death of the latter in 1746 he founded a similar journal of his own, en- titled Lettres de la Comtesse de * * *, It was suppressed in 1749, but he immediately replaced it by Lettres sur quel- ques écrits de ce temps, which, with the exception of a short suspension in 1752, on account of an attack on the charac- ter of Voltaire, was continued till 1754, when it was suc- ceeded by the more ambitious L'Année Littéraire. His death at Paris on the 10th March 1776 is said to have been hastened by the temporary suppression of this journal. Fréron is now remembered solely for his attacks on Voltaire and the Encyclopedists, and the fame of his criticisms is not due to their inherent merits, which, notwithstanding a certain clever malignity, are very slight, but to the retalia- tions they provoked on the part of Voltaire, who, besides attacking him in epigrams, and even incidentally in some of his tragedies, directed against him a virulent satire entitled Le Pawore Diable, and also made him the principal*

person- age in a comedy L'Hcossaise, in which the journal of Fréron is designated L' Ane Littéraire.

Besides conducting the serials already mentioned, Fréron is the author of Ode sur la bataille de Fontenoy, 1745; Histoire de Marie Stuart, 1742, in 2 vols.; and Histoire de Vempire d' Allemagne, 1771, in 8 vols. See Ch. Nisard, Les Ennemis de Voltaire, 1858; Despois, Journalistes et journaux du XVIIIe siecle; Barthélemy, Les Confessions deFréron; Ch. Mouselet, Fréron, ou Pillustre critique, 1864; Fréron, sa vie, souvenirs, &c., 1876.

FRERON, Lovis Stanisias (1765-1802), a French Re- volutionist, son of the preceding, was born at Paris in 1765. His name was, on the death of his father, attached to LD Année Littéraire, which was continued till 1790, and edited successively by the Abbés Royou and Geoffroy. On the outbreak of the Revolution, Fréron, who was a school- fellow of Robespierre and Camille Desmoulins, established the violent journal L'Orateur du Peuple. Commissioned along with Barras in 1793 to establish the authority of the Convention at Marseilles and Toulon, he distinguished him- self equally with his colleague in the atrocity of his re- prisals, but both afterwards joined the Thermidoriens, and Fréron became the leader of the Jeunesse Doreée. He then made his paper the official journal of the reaction- ists, and being sent by the Directory on a mission of peace to Marseilles he published in 1796 Mémozre historique sur la réaction royale et sur les malheurs du midi. He died in 1802 at St Domingo, where he was for a few months subprefect.

FRESCO. Fresco-painting is the art of mural painting upon freshly-laid plaster lime whilst it remains damp, with colours capable of resisting the caustic action of the lime with which they are mixed or brought into contact. Fresco- painting might be called lime-painting, lime being the vehicle with which the colours are fixed, but the term would not be sufficiently distinctive, because colours mixed with lime may be applied under certain conditions to plaster which has been allowed to dry, an art which the Italians call painting "a secco," to distinguish it from "a fresco" or painting on newly-laid and still wet plaster. The art of painting with colours mixed with lime is very ancient ; it was in use in Egypt from the remotest periods of the monumental history of that country ; but as it was carried to

perfection by the Italians, it is needless to trace its de- velopment elsewhere than in Italy, where the most primitive examples—those existing in Etruscan sepulchral chambers dug in tufa—are marked by technical peculiarities which survive in fresco-painting to this day. The walls of tufa were prepared by being whitewashed with lime,—a method revived in medizval mural pictures; and the outlines of the figures were drawn with a metal point or stylus, and subsequently coloured on the whitewash, which from the percolation of water through the tufa remained permanently

damp. In examples at Chiusi this outline is found limited exclusively to the external forms of the figures, a custom which reappears in medixval pictures of the school of the neighbouring Siena, whilst drawing on wet plaster with the stylus belongs to this art in every age. The colours used were earths, which were mixed with lime and laid on in flat tints, and earths for the most part are the colours still employed in fresco-painting. The Romans, probably owing to Greek influence and example, carried the art much further than their Etruscan predecessors, and established real fresco-painting in Italy. Vitruvius remarks, '" Colours when carefully applied on moist stucco do not therefore fade, but last for ever. Stuccoed walls, when well executed, do not easily become dirty, nor do they lose their colours when they require to be washed, unless the painting was carelessly done, or executed after the surface was dry." This is emphatically descriptive of fresco-painting. In this art it is essential that a given amount of plaster be laid for the painter at one time,—in modern practice only enough for a day's work,—and therefore frescos are readily recognized by the joinings in the plaster, most fre- quently following the outlines of the figures or other objects. These joinings vary in distinctness in different works accord- ing to the skill of the plasterer. Sometimes they are clearly perceptible, at other times they are only discoverable on minute examination. It has been observed on painted walls in Pompeii that such joinings exist, but they are further apart and less frequent than in modern works gene- rally, suggesting either that the ancient artists painted more rapidly, or that several worked together on the same sheet of plaster, or that they knew how

to keep the plaster fresh for more than one day, which, considering their great technical skill, is not improbable. Such wide divisions are found in the fragments of a mural painting of the 14th century existing in Sta Croce, and in others by Paolo Uccello, but this is explained by the completion of these pictures in distemper, whilst the Pompeian paintings are in fresco; for, besides the joinings, which are not incon- sistent with the presence of tempera, there are also marks showing the use of the stylus on damp plaster, and by experiments made by the late Sir Humphry Davy, it has been shown that all the colours employed contain lime ; therefore they are fresco and not tempera.

It may be doubted whether any works of art produced in later times could have withstood the trials to which the mural paintings of Pompeii have been subjected from the action of heat and damp, the latter for centuries, without serious damage. The expression of Vitruvius that they would last for ever has been so far justified. The processes of the ancients were not limited to fresco-painting ; they were familiar with others of great beauty and durability, but these do not enter within the scope of the present notice. The construction of the walls and the system of plastering then in use are more important subjects of inquiry in connexion with fresco. Those unsurpassed builders, the Romans, faced walls intended to be painted, with a lining of bricks set on edge, detached by a small space from the main structure to which it was secured with leaden clamps. This was a precaution against damp well worthy of imitation. Generally, three preparatory coats of plaster were laid on this brick facing or on any other description of wall, the first consisting of lime mixed with pounded brick and pozzolana, the other two with lime and pozzo- lana. The finishing coat was frequently composed of lime and pounded marble, which was susceptible of an exquisite polish, after which it was painted by durable processes, the secret of which is now lost. For fresco-painting the last coat or intonaco consisted of lime mixed with sand only. A long gap now occurs in the progress of mural painting. Its practice is feebly illustrated in tombs and catacombs,

interesting historically, but of little value technically. Finally it was displaced fora time by mosaic, but it was again revived in the 13th century, that great epoch of the resuscitation of the fine arts. The works of Giunta Pisano and some of his contemporaries in the upper church of St Francis at

Assisi, executed in the first half of the 13th century, clearly indicate a knowledge of a system of fresco. In a history of the practice of this art tliese mural paintings, with those of Cimabue and his colleagues or assist- ants, and those by Giotto and his followers, deserve special consideration. They illustrate the early processes of fresco and mural painting upon which all the methods subse- quently followed were based. It is evident from the structure of the interior of the beautiful upper church of St Francis that the architect did not provide for its being painted internally. It was complete in its admirable mas- onry, and when it was determined to paint it, the only preparatory process possible was to cover the aslar with a thin coat of intonaco about one-eighth of an inch in thick- ness. Any plan of preparatory coats of plaster in the Roman manner would have buried the string courses and other mouldings, and ruined the proportions of the piers. True fresco-painting under such conditions was consequently very difficult, for the thin intonaco, laid on a stone wall which could not be soaked with water, of necessity dried rapidly. The mixed art of fresco and distemper which was thus made imperative at Assisi prevailed in mural painting, with certain modifications, for a long period everywhere. The following isa brief statement of the methods of Giunta Pisano and Cimabue. Both artists practised, if they did not inaugurate, the system of outlining their subjects on the walls, which continued for two centuries, till it was abandoned for the better plan of preparing cartoons. A sketch was first made, and was squared in the usual manner with vertical and horizontal lines drawn to scale. The space to be painted was then squared proportionately, and, guided by the squares, the artist outlined his subject full size with charcoal on the wall. This done, with a hair pencil and some ochre mixed with water he passed over the general lines, and then brushed off the charcoal; he next marked in the entire composition with red " terra rossa" mixed with water only, this time entering more into detail, and even indicating the chiaroscuro. Where the ancient intonaco has fallen off, these red outlines are visible; they have a mysterious grandeur, and those by the hand of Cimabue prove the possession on his part of freedom and power of drawing. Over these outlines the intonaco was spread in portions, and on it the artist marked the squares once more, and drew the outlines of the figures he meant to paint. That the intonaco was prepared in sections is proved, not only by the visible lines in the plaster, but also by the falling off of the leg of a figure, showing the cut made by the artist when he had

finished his work. The cut follows the outline of the limb, and this process suffices to slow that fresco-painting was practised in the first half of the 13th century, if any doubt should be entertained. The intonaco being spread, the artist painted his subject in a slight manner with terra rossa, laying in tle chiaroscuro and details, after which the plaster was allowed to dry. The picture thus prepared was then coloured in distemper, and completed in every part. By the aid of Vasari and of Cennino Cennini a pupil of the school of Giotto, who completed his treatise on painting on the 31st July 1437, we have clear statements of the methods of mural painting followed by the Byzantine artists, and subsequently by the Italians. Cennino, in the most express terms, states that mural pictures, although commenced in fresco, were always finished in distemper. The distempers used were a mixture of egg, including both the albumen and the yolk, with the milky fluid which exudes from twigs of

the fig tree; size made from glue or from gum tragacanth is also mentioned. A list of the colours employed by Giotto and his pupils and successors is given below; and the same, there can be little doubt, were in use on the part of Giunta, of Cimabue, and their contemporaries. Amongst these white lead played an important part in painting on panels audon walls. All who are familiar with old pictures must have frequently seen those of black Madonnas and saints, held in especial veneratiou for their sanctity and antiquity. The colours with which they were painted were freely mixed with white lead and with the yolk and albumen of egg, which darkens whilst the white lead oxidizes ; hence their present state.

This partially explains the singular appearance presented by the mural pictures of Giunta at Assisi, in which the shadows are red executed in fresco, and the lights painted in distemper are black. The explanation is not entirely satisfactory, however, for the change is not universal, and in a considerable number of the pictures the colours have not changed ; but wherever damp has penetrated, the paintings lave become very dark; the microscope would probably show that this is due to the presence of fungus, the pro- duce of the egg disteniper. As the works attributed to Cimabue are for the most part in better preservation than those given to Giunta, they

suggest that this great artist, who did so much for design, also improved the technical processes of mural art. He undoubtedly carried fresco- painting further, although on thin intonaco; but he pre- pared for the finishing processes as his predecessors had done. 'This statement is based upon the examination of a Madonna and Child with Angels in the lower church of St Francis, which is executed in the same manner as the pictures in the upper church ascribed to Giunta. This fragment is so noble in design, the heads are so beautiful, the whole work is so much better than the picture of the Borgo Allegri, now in St Maria Novella Florence, that although in its method it is like the works of Giunta, in design it is far beyond his powers. Cimabue's method of outlining on the wall has been described; but there are traces of his use of the stylus, to which he had recourse when he wished to alter an outline after the work was begun, and it is therefore evident that the plaster was damp when he had recourse to this instrument. His pre- parations in fresco being dry, he proceeded to paint the shadows of flesh with terra vert in distemper, and then modelled the features with the requisite colours. That he heightened the lights with white lead is apparent, for these have become black even in places which damp did not reach. A glaring example of this is the table-cloth in a picture of the Marriage at Cana in Gallilee, which, once white, is now an intense black ; the plates, viands, and vases upon it are unchanged in colour ; these no doubt are in pure fresco, which explains the difference.

We can form no idea now of the splendid appearance which the paintings in the interior of St Francis presented when newly done. There are abundant traces of tlie use of a mordant for gilding, showing that the high lights upon dresses and the edges of folds were gilt, as well as embroideries on the borders, and on the aureoles of saints. It is obvious that such ideas were derived from mosaics, i which the lights sparkle with gold. Regarded simply as decorative art, these paintings at Assisi, with their clear bright colouring, the rich gilding, and with the windows filled with coloured glass, must have been magnificent. The art was very conventional, still the beginnings are perceptible of a higher imitative system, and of a growing appreciation of truth to nature. The heads of angels are characterized by expressive beauty; the bride in the Mar- riage at Cana has a very pleasing face, and even the idea of portraiture is observable; the look of surprise in the

Pi countenance of the husband is naturally expressed, and with good taste. Those who have not seen these paint- ings, and only judge of the merits of Cimabue by his altar- pieces at Florence, can have little conception of the ability of this remarkable artist.

Beneath the paintings of Cimabue, and under the gallery which represents a triforium, range the mural pictures of Giotto and his contemporaries or pupils. By Giotto the art of fresco received a new impetus; he continued the mixed method then prevalent, but with a more moderate use of distemper, and laid the foundation of the system carried to perfection by his greatest successors. The part of the wall which was assigned to him apparently admitted of thicker plastering, for he caused preparatory coats of plaster to be spread with due care; on the last of these, when dry, he no doubt made his outlines according to the manner of his predecessors, and over these the intonaco was distributed with singular dexterity. Plastering in his time was a branch of fine art, so that it is at all times difficult to discover the joinings in the werks of Giotto and his followers. An account of his method of mural painting will convey a clear idea of the technical processes improved by him and followed by other artists after him.

The lime prepared for the intonaco having been kept till it had parted with much of its caustic quality, was mixed with sand in the proportion of two of sand to one of lime. The pigments used were :~~—White—biancosangiovanni, or lime carefully ground with pure water and dried in the sun in the form of cakes ; black—charcoal of vinewood, a black chalk, or lamp black; red—cinabrese, a red earth of intense colour, and sinopia, a lighter red, also an earth, and burnt ochre; amatista—not now known by this name, but a fine purple red; green—terra vert; yellow—two qualities of ochre, dark and light, and giallolino, which resembled Naples yellow in tone. This is a very moderate palette, but it was supplemented by the colours subse~~ quently applied in distemper. These were orpiment, cin- abro (a red oxide), German blue (apparently a cobalt), verniilion, lake, verdigris, indigo, and white lead. When the picture was commenced in fresco, particular grounds were laid on the wet plaster in preparation for the colours which were to follow ; for instance, the sky to be painted blue in distemper was prepared with a deep red (cinabrese) in fresco. The virgin's blue robe was first grounded with black mixed with red, and then painted with blue mixed with size

prepared from glue, for red of egg would have made it green. The blue, however, has frequently become a bright green, spite of this care. There are numerous ex- amples of these methods in pictures, extending from the age of Giotto to that of Raphael. In a painting by Lippo Memmi at Assisi a dark rich red in distemper is laid over a preparation of light red in fresco. By Ghirlandajo a brown robe'has been coloured in tempera over pale grey in fresco. The dark purple robe of the Cardinal Bonaventura in the fresco called the Dispute on the Sacrament, by Raphael, is spread over a preparation of red. Many other cases might be cited were it necessary. The most singular of all was the preparation for painting trees and bushes by a ground in fresco of black, on which the leaves, branches, sprays, buds, and flowers were executed of the proper colours in distemper. Tlustrations of this custom are observable in pictures by Orcagna, Pietro Laurati, Simone Memnii, Masolino, Paolo Ucello, and many other artists ; it did not survive the 15th century, and it is due to Masaccio to point out that he appears to have been the first to escape from this commonplace conventionality.

The methods of mixing colours and tints and their use in painting were reduced to system, whether for painting drapery or the nude. It was usual to prepare three pots of each colour carefully graduated. Thus, for instance, in the

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preparation of a flesh tint, a certain quantity of lime, bianco- sangiovanni, was mixed with red; in another pot the same red, witli much more lime; two equal portions of these tints were mixed in the third pot: thus three equal gradations weresecured. A head, hand, or any part of the body being drawn on the wet plaster with fine lines with the brush, the shadows were painted with terra vert, then, the lightest flesh tint being taken, the lights were put in. This done, the middle tint was applied, the junctions between the two tints being carefully softened ; next the darker colour was laid in, all these tones being fused together in a proper way. The operations were repeated till sufficient solidity —impasto—was obtained. Another and much lighter tone served to mark the high lights, such as those on the nose, chin, and parts of the ears; lastly, the small and most brilliant points of light were touched with pure white, and the whites of the eyes were painted. The artist

next out- lined the nostrils, eyelids, and apertures of the ears with black, touched in the lower eyelids and the eyebrows with shades of sinopia, and with the same colour the nostrils, upper lip, and the line between the lips. The hair was broadly shaded with terra vert,and washed over with light ochre; then the locks were defined with dark ochre, and the lights pencilled with a much lighter tint of the same ; lastly, the outlines were strengthened with sinopia. Such usually were the methods pursued by Giotto and his fol- lowers, It is evident that painting thus, according to a fixed system, a master and his trained pupils could act together and harmonize their work in a manner otherwise unattainable, At the same time the. individuality of the artist was not obliterated by this prevalence of rule. In the frescos attributed to Giotto and his followers or com- peers, it is not difficult to distinguish the different handi- work. Jn some the green shadows are modified with a warmer tint; in others the results are cold and formal ; some paint witl soft gradations, others in a harder manner, but the difference between the artists is still more observ- able in the drawing and proportions of the figures. As guiding cartoons were not prepared by the master; pro- bably the assistants or pupils were only provided with his sketches, which they enlarged on the wall with such skill as they possessed ; hence the varieties of proportion which are so remarkable.

Draperies were painted with graduated colours prepared. in the same way ; the lights, according to the usage of the Tuscan school, were heightened with pure white, and the shadows were glazed with washes of unmixed colour, show- ing that the intonaco must have been damp when these were applied or they would not have adhered. Thus in these pictures the most important part of the work was pure fresco, whilst the tempera, although undoubtedly used, was less freely applied by Giotto than by his master Cimabue and his predecessors, judging from tle mural paintings at Assisi. To the taste and genius of Giotti was owing this great improvement in the technical pro- cesses of mural painting.

The architectural details, where they occur as accessories or backgrounds, are carefully drawn and painted with in- finite grace, and as architectural designs they are singularly beautiful, especially in the works of Giotto. It is true that they are invariably too small in proportion to the figures,— a peculiarity which they probably owe to the imitation of similar adjuncts in

ancient Roman bassi-rilievi. The con- ventional routine of thus designing backgrounds lasted for rather more than a hundred and fifty years. There is an appearance of perspective, showing observation, but no knowledge of optical laws. The method was in every re- spect analogous to that which regulated the drawing of very similar details in ancient Roman art.

These medizval mural pictures in Italy place painting

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much more upon an equality with the sister arts of archi- tecture and sculpture than was the case in other parts of Europe; they exhibit intense thought, sentiment, and as- cetic religious expression. They have not the weird gran- deur and sublimity of the designs of Cimabue, nor do they show efforts like his to represent ideal beauty; but they approach much more nearly towards the representation of familiar nature, and the expression of human emotion. Still this art was conventional; of the infinite and beautiful variety of inanimate nature, or of its effects of sunshine and shade, the artists had no perception whatever.

The idea that painting possessed such a power had not yet been awakened ; but at the beginning of the 15th cen- tury a genius was born who led it into new paths, and ex- ercised a good influence upon it, which produced the most beneficial results. Tommaso da San Giovanni, called Ma- saccio, was this great painter. Another artist, at the present time of a more widespread reputation, divides the honours of the first portion of the 15th century with Masaccio, to whom, however, he was far inferior in originality or per- ception of nature's variety and beauty. This was Fra Beato Angelico (see FimsoxE). He continued the technical pro- cesses of the artists of the preceding century, and in his work medieval painting culminated and became perfect technically ; but before he left the scene of his loving labours he was so far influenced by the rising wave of the revival that he abandoned Gothic forms in his accessories for timid imitations of classic architecture.

In practice Fra Beato adhered to the last to the precepts of the older school, but with a fresliness of colour, a beauty of form, and a grace of manipulation all his own. He finished his mural pictures with solid

distemper of such peculiar excellence—very probably employing gum traga- canth, so insoluble is the mixture—that it remains com- paratively unchanged ; and he transmitted to his successors the old schemes of preparatory grounds in fresco for the subsequent finishing coats in tempera, which for so long a period characterized monumental art. This is observable in many of his numerous works, and especially in his great mural painting of the Crucifixion in the chapter house of St Mark's, Florence. In conformity with traditional custom, he laid in the sky in deep red in preparation for blue, which, however, has never been applied. It is to be regretted that the pious artist did not finish this his most important work, but it illustrates in a very remarkable way how far he carried fresco before having recourse to distemper.

The great and gifted painter Masaccio relinquished the precepts which had guided his predecessors and were practised by his contemporary Fra Beato, as he departed from theirmethods of composition, drawing, and chiaroscuro. His insight into the true appearances of nature was that of genius, and he painted these with fidelity, and not con- ventionally, like the older masters. His art was a reve- lation : he burst through the routine by which painting had hitherto been bound ; it may be said that he anticipated all that was to be done after him, and that no artist, however great, of those who followed him could escape finding in the works of this wonderful originator anticipations of his own qualities as an artist. They were studied as models by the greatest artists of succeeding times, by Michelangelo, and by Raphael, who imitated him to the extent of plagi- arism. Standing before the frescos of Masaccio we are introduced to new rules destined at a future time to regu- late the practice of the art. No frescos hitherto painted had been so pure; they are not entirely free from retouch- ing in distemper, but this was reduced to a minimum, yet with tle attainment of a richness of colour and a force of chiaroscuro never surpassed. Masaccio could paint the effects of sunlight with extraordinary power and brilliancy ;

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when he chose he could rival the finish and refinement of Leonardo da Vinci; he created the art of characteristic portraiture, whilst he could rise to a lofty ideal. He shadowed forth the power of form of Michelangelo, the

natural dignity of Raphael, the brilliant chiaroscuro of Correggio, and the rich colour of Titian. He cast behind him the conventional pattern-like landscape of his prede- cessors, and hinted at a new and true idea of representing

master Masolino da Panicale, who had sufficient insight in moments of his existence to escape from formalism and to feel the influence of nature. It is not to be won- dered at that with such qualities as these Masaccio's frescos should have been objects of study and admiration to gen- erations of artists. An aberration in modern criticism and a fantastic and somewhat weak devotion to medieval forms gives a transieut preference to the works of his devout contemporary; but in those of Masaccio the great prin- ciples of the revival rise brilliantly above the horizon ; in those of Fra Beato the ideas of the Middle Ages set with pure and tranquil ray.

With the advancement of the art of painting we have a discreditable decline in the requisite structural preparations, which has produced disastrous effects on many noble works of art. Frescos were only too frequently painted upon ill-built rubble walls, with unequal surfaces, which were not brought to a level by careful preparatory coats of plaster. This is unfortunately exemplified in the frescos of Masaccio. The results of uneven surfaces are the ac- cumulation of dust on the pictures and of other impu- rities, seldom removed, and the removal of which is accompanied by a certain risk. The careful structure of the Romans was known to their Italian successors, and was described by Leon Battista Alberti and other architects, but apparently with little effect. It is absolutely necessary that walls intended to be painted upon should be very care- fully constructed ; the Pompeian system is excellent, and to it may be added thin beds of asphalt at the bases and summits of the stone or brick work. It must never be forgotten that damp is a deadly enemy to fresco-painting, and that unequal surfaces are unsightly as well as destructive.

The history of mural painting may next be illustrated by reference to the works of Benozzo Gozzoli. As a pupil of Fra Beato Angelico it might be expected that he would continue to use distemper painting extensively, and such was the case. (Greatly excelling his master in power of drawing, although with less sentiment, endowed with prolific fancy and capable of

unwearied exertion, he has left very important mural pictures, which were begun in fresco, but were so entirely finished with distemper as to be in fact distemper pictures. The joinings of the intonaco in his works present a somewhat unusual appearance. They are for the most part carefully concealed, but in one of his compositions at Pisa they are very observable, and they are invariably cut at some distance from the outlines of the figures; they are not unlike the joints between the polygons which form an Etruscan wall. Thus they include considerable portions of the background. Other artists, notably Masolino, and at a later period Michelangelo, fre- quently included parts of the background in the day's painting, which artists will readily recognize as, where . possible, important in principle. The objection, however, is'obvious. The joinings which do not follow the outlines disfigure the surface, unless carefully concealed by the help of distemper painting, which in modern times would be considered objectionable. When the paintings are so far from the eye that the joinings are invisible, as in the Capella Sistina, the method is valuable. Towards the close of the 15th century Filippino Lippi in his works

celled. scenery. 'Technically he painted with an impasto, and a freedom hitherto unthought of, except by his reputed |

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further illustrates the history of mural painting. He was employed to finish Masaccio's fresco in the Brancacci Chapel, representing the Ruising of the King's Son, and he showed himself to be in every respect worthy of the honourable commission. He painted in the centre of the picture a group of eight figures, the heads of which in truth to nature and refined execution literally never have been ex- He lacks the force of Masaccio; he did not see the effect of sunlight in the same way; he rather painted twilight; but he introduced into fresco a variety in the management of flesh tints and grace of technical execution which unfor- tinmately diminished in his later works. These were his characteristics when he painted in competition with Masaccio, His method was also to prepare the draperies of the figures in fresco, and then to glaze them copiously with dis- temper colour, Whilst Masaccio invariably painted hands in fresco, Fillippino as invariably painted them in tempera over the draperies. This may have saved trouble,

but was not otherwise commendable. It is to be remarked that apparently he first shaded them with terra vert like the medieval painters, subsequently adding the flesh tints. Domenico Ghirlandajo follows as an important and very able mural painter. He also commenced his works in fresco, in which he painted admirably with a large effective manner combined with finish. He used distemper exten- sively ; and as an unctuous glazing has been found upon frescos by his brother Rodolfo, it is possible that a new pro- cess of retouching was introduced by these brothers. It may have been in their studio that Michelangelo when a boy learnt to retouch fresco in tempera ; he undoubtedly retained in his method some impressions derived from his first teachers.

Pietro Perugino excelled in the art of fresco-painting as it was understood in his time. His works illustrate two very different methuds. He painted in pure fresco; and it may be observed that, whilst his oil pictures are marked by such rich and powerful colouring, some of his frescos are like delicate water-colour drawings. A glance at the wall paintings of Masaccio would have shown him how far colour can be obtained in fresco. No doubt he had his motives, and when he wished to produce force and colour, like all other artists of the time he had recourse to re- touching in distemper. His famous frescos in the Sala del Cambio at Perugia, are thus retouched all over, and consequently the usual and unequal darkening of the colours has taken place. They have force, but they have lost all brilliancy, and they illustrate in a remarkable way the inexpediency of a manner of painting which would suffer from the mephitic atmosphere of a crowded place of meeting. Pure frescos would have remained clear or could have been cleaned, whilst retouched frescos darkened with- out remedy.

Another remarkable contemporary artist, Bernardino Pinturicchio may be said to have carried distemper paintiug over fresco to the most extravagant degree of any master of his time. He fell back on the primitive conventions of gilt rilievo ornaments in stucco in his paintings, on hatch- ing with gold, and other barbaric splendours of early art. His mural pictures at Siena resemble illuminations in choral books. They are in excellent preservation, having escaped damp and bad air within the well-built library of the cathedral.

It is obvious that the progress made in oil-painting in the 15th century must have produced important effects upon fresco and ideas connected with it. Some oil painters transferred to their art the light brilliancy of wall painting, aud notably Michelangelo in his oil picture for Angelo Doni. Leonardo da Vinci estimated more justly the capabilities of the more powerful vehicle. Tempera, after a brief struggle, sank before it, and disappeared from amongst the

U4 FRE processes of art, whilst in mural painting the habits long prevalent of retouchingand glazing with strong distempers were confirmed for a time, and new methods were invented to make fresco rival the splendour and force of oil. It is to be regretted that it was not seen that this could be ade- quately attained, as had been demonstrated by Masaccio, with little aid from extraneous means. Leonardo da Vinci evidently thought that fresco- painting was unequal to pro- duce the effects which he desired, and he executed his great mural picture of the Battle of Anghiari in encaustic, and his still more celebrated work, the Last Supper, in oil, with what disastrous results need not be recorded here except as a warning to artists to avoid methods not sanctioned by experience and not tested by time.

A period is now reached, the close of the 15th and first years of the 16th centuries, when modifications were made in the technical preparations for fresco. Benozzo Gozzoli was probably one of the last of the artists who drew the outlines of his mural pictures upon the preparatory coat of plaster. Writers upon fresco have only noticed one illus- tration of this custom in the ruins of a fresco by Pietro di Orvieto at Pisa, but it was a generally established method from the 13th to the close of the 15th century.

The account which we have in Vasari of the preparation of the cartoons by Leonardo da Vinci and Michelangelo for their rival mural pictures in the hall of the municipal palace of Florence brings the history of fresco- painting to an important epoch. The execution of such full- size drawings, and of the previous sketches and studies requisite under the circumstances, involved an amount of thought and care hitherto little contemplated. The drawings in red on walls or rough plaster were freely executed with little study, and were not calculated to improve the artist's skill in the delineation of form; but the preparation of the cartoon was for art the most im- portant

step ever taken towards the cultivation of mastery in design, and to the acquisition of that profound know- ledge of form which characterized the great painters of the first part of the 16th century, the golden age of art. The cartoonist first prepared his sketch on a small scale, then made his studies from nature, either in separate drawings or in a general delineation of the entire composition. In like manner he considered accessories and details, and made careful studies of drapery. Some artists modelled the whole subject so as to observe the light and shade. This done, the paper for the cartoon was stretched and squared. Pupils were sometimes employed to transfer the sketches to this the working drawing. How carefully such cartoons were sometimes executed is described in the most interest. ing manner in the history of that famous one which Michelangelo drew with such infinite pains. The wall to be painted was then squared like the cartoon, which was cut into pieces of a convenient size, and so was fitted by the help of the squares to the freshly laid intonaco. The out- line was then transferred to the yielding plaster either by the help of the pounce bag, the cartoon having been pricked, or it was marked through the paper with the stylus. It is profoundly interesting to observe the different methods followed by the old masters in preparing the outline. The two greatest of all, Michelangelo and Raphael, were scrupu- lously careful. They transferred the forms to the wet in- tonaco with the pounce, after which Michelangelo marked them in some places with a very sharp cutting point. Sod- doma, a great painter, was on the contrary very careless in the preparation of his cartoon and its transfer to the plaster. He frequently altered the drawing whilst painting. Bernar- dino Luini was content with mere indications of the contours. Pordenone indicates a fiery spirit in his mode of dashing them in with any sharp instrument at hand.

The history of the practice of fresco-painting now reached

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its apex in the works of Michelangelo and Raphael ; those of a long line of great mural painters have illustrated in vari- ous ways most of the technical processes of this difficult but noble art. Michelangelo was unwilling to paint; he remarked to Pope Julius, “It is not my profession ;” yet his frescos may be taken as perfect types of what ought to be aimed at byevery

practitioner, so faras method is concerned, apart from the retouching in distemper. The following apparently was bis mode of painting. The local colour was laid on and modelled into the cool shadow—(the use of terra vert in shadow had now disappeared, and grey taken its place)—with that perfect kuowledge of form and truth of gradation habitual to Michelangelo, and observable in all his drawings. The lights were then painted with a full brush and softened into the half tints; then the darker parts of the shadows were added. It is observable in the execu- tion of this great artist that he modelled the colour in fresco with all the breadth and impasto which slow drying oil paint makes possible. This distinguishes at a glance his work from that of his assistants, which is laboriously stippled. It has been ascertained beyond a possibility of doubt that Michelangelo was not satisfied with pure fresco-painting ; but he did uot repaint with distemper,—he merely glazed with a thin coating of a blackish grey mixed with size, which he applied in some places with washes, in others with stippling. This is very different from the older methods of painting over the fresco with solid distemper colour.

In the celebrated mural paintings of Raphael in the Va- tican changes of method are very observable ; yet it may reasonably be inferred that the great artist's wish was to paint in pure fresco. A century before the execution of these works, Masaccio had shown what great results could be achieved without having recourse to extensive retouchings, and Raphael carefully studied his frescos. In his exquisite early fresco in San Severo in Perugia he showed that he adhered to these principles. In his famous Vatican frescos he at first partially adhered to the mixed method: besides moderate retouching in the usual manner, he prepared by a coat of red in fresco for painting blue in distemper; but when he executed the noble picture of the School of Athens, he evidently desired to get rid of this old system, and he painted the blues without preparation on the damp intonaco, It was well known from an early period of the art that ultramariue resisted the caustic action of lime. Whatever the blue which Raphael used on this occasion, it has faded more than the other colours in the picture, which is there- fore now out of harmony, and his experiment so far failed, At other times the contrary result is observable. In the Aurora by Guido it is the other colours which have faded, and the blues are now too strong, showing that ultramarine if carefully prepared stands better than other colours.

Guercino is the artist who has introduced blue in pure fresco with most technical skill, and consequently his works re- tain a harmony which is very rare. Raphael evidently

| almed at pure fresco-painting, but may have been dis-

satisfied with the results ; for he allowed the greatest lati- tude to his pupils, who employed distemper and apparently other vehicles copiously, when executing portions of their master's works. When he died, charged as they were with the completion of the Stanze, and provided with his designs, they at once commenced on one of the walls of the Hall of Constantine to paint in oil, as if they had been converted by their master's rival Sebastian del Piombo. Such was . the admiration excited by these works that Cardinal Dovizza da Bibbiena wrote,—" The pupils of Raphael have executed a specimen of a figure in oil on the wall, which was a beautiful work of art, so much so that no one would look at the rooms painted in fresco by Raphael."

These were idle discussions and idle experiments ; each branch of art has its field of operation, and it is to be re-

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gretted that the old masters generally were not satisfied with the effect of pure fresco-painting. Masaccio trium- phantly illustrated its true powers. In the Brancacci chapel at Florence the perfection to which the noble art mnay be carried without extraneous aid is amply illustrated. In the efforts made to give fresco the richness of colour and force of chiaroscuro of oil-painting, its finest qualities were in fact destroyed. In the attempt there isa manifest con- fusion of ideas. Fresco-painting is in a special manner the hand-maiden of architecture, with which it harmonizes and to which it adapts itself in a manner from which oil- painting seeks to escape. Oil-painting asserts itself, fresco aims rather to adorn and complete the architecture with which it is associated; but its history shows that not all artists understood its true limits or its real mission.

Some lessons taught us by the results now ascertainable of the technical processes of the old masters may be summed up. The importance of careful construction of the wall so as to prevent the action of damp is evident.

Undoubtedly the best walls are those of brick with-facings in the ancient Roman manner. The ruinous consequences of badly con- structed roofs have been shown by the state of the mural paintings at Assisi. That pure fresco is a much more durable art than the mixed method of fresco and distemper-painting is obvious. Of distempers used, those containing animal matter are the worst, especially that prepared from eggs, for when they are assailed by damp, black fungi spread over such pictures and ruin them. It is needless now to point to the disastrous results which must follow the use of white lead ; for as a pigment in tempera-painting its great defect is known to all artists. The employment of pozzolana in the preparatory coats of plaster may appear to be favourably supported by ancient examples. Pozzolana is a volcanic ash, which, mixed with lime, forms the famous Roman cement, and has admirable qualities ; but it must not be forgotten how Michelangelo suffered from using it, and how mould spread on his frescos. The ancient masters prepared intonaco in two ways,—with lime and sand, and with lime and marble dust. If the sand used is quartz, the mixture is insoluble, and the fresco painted upon it will be permanent. If marble dust, on the contrary, be preferred, asit was by many old masters from its beauty, it is soluble, and it facilitates the formation of sal nitre on the surface, a common enemy and a dangerous one of frescos, for it destroys the colours. It is important that lightning conductors should be provided ; as at Assisi the action of the electric fluid on the frescos of the vaults, where it has played over the surface, has blackened them.

The Germans, who have done mucli for the restoration of fresco in the present century, have added to the list of colours formerly in use, and in doing so have been aided by modern chemistry. They have also experimentally fixed the time requisite for the preparation of the lime for the intonaco, and have greatly improved the structure of walls intended to be painted. They have restored the ancient method of lining walls internally with brick ; they have in- terposed sheets of lead between the bases of those walls and the foundations, and prevent the descent of damp from above in the same way. They consider it enough to keep the lime to be used for from ten to twelve months, whether for the intonaco or for painting with; and the following is a list of the colours which they have added to those em- ployed by the old masters:—Raw and burnt terra di siena, all kinds of burnt ochres, a lake-coloured burnt vitriol, a purple burnt vitriol, raw and burnt

umber, Cologne earth burt forming an excellent black, chrome green, cobalt green, and for blue cobalt as now prepared, or imitations of it.

The frescos of the Venetian masters, and those of Antonio Allegri da Correggio, add little to our knowledge of the technical processes of mural painting. As might be ex-

pected, the works of the Venetians, which are compara- tively few in number, show more attention to colour than to form, and they are slight in execution. The most brilliant are those by Paul Veronese, whose ideas of colour and effect in a special manner fitted him to deal with the conditions of monumental art. Correggio illustrates, as might be expected, the magic effects of sunlight alternating with shade, and the beanty of form and feature which dis- tinguish the immortal artist. Technically, his processes resemble those of other Italian masters, and his works have suffered in the same manner and from the same causes. Enough, it is hoped, has been said to explain the pro- cesses of fresco-painting as practised by the greatest masters of the art. Some of these have led to their decay, but a combination of ignorance and carelessness on the part of the Italians themselves has been the chief cause of the widespread ruin of the greatest examples of the art of painting which the genius of any nation has produced.

Modern Fresco-Painting.—The practice of painting in fresco has been continued to the present time in Italy ; it has been employed not only for the decoration of churches, public buildings, and private residences, but also for painting exteriors. The traditional habit of painting the exteriors of houses prevalent in Genoa and its neighbourhood for centuries, and less frequently in other parts of Italy, still continues, although ina very inferior manner and by painters of a much more ordinary class than formerly. For the execution of interior work excellent fresco-painters are readily found, and the Italians of the present day are in no respect inferior to their predecessors in practical skill, however little they may equal them in the high characteristics of art. Modern Italian masters paint in pure fresco with much force of colour, satisfactory execution, and excellent finish; they repudiate the old system of retouching with distemper colours, whilst apart from the practice of fresco they are probably the best painters in distemper

in Europe. In this art they paint like the old masters with the egg vehicle, but as a separate art of mural painting, and never as an adjunct to fresco.

Towards the commencement of the present century several German artists resident in Rome studied the art of fresco with much zeal, and laid the foundation of the modern school of fresco-painters in Germany. Some of them acquired a great amount of technical skill, and followed the system of the old masters, by training pupils as assistants with satisfactory results, and thus were enabled to undertake public work with comparative facility and at a reasonable expense. As already noticed, they improved the art in important technical respects, as well as the structure of edifices to be painted, and settled the best methods for preparing the lime for plastering with, and for painting.

In France the art of fresco-painting has not been successfully developed. French artists who practice mural painting with great ability prefer oil or wax-painting, an ancient method which they as well as the Italians and Germans have with much care and ingenuity endeavoured to revive. They have not been able to restore the ancient encaustic, but they have devised useful and beautiful modes of mural painting and decoration.

A zealous attempt was made in England to promote the art of mural painting in fresco, in connexion with the decoration of the new Houses of Parliament in London. Careful inquiries were made in Germany and Italy, and a valuable amount of information was gathered and published; and, after various experiments, artists of distinction and ability were employed to paint in fresco in the House of Lords and in other parts of the new national edifice. Notwithstanding the difficulties which beset the artists in the practice of an art so new to their experience and so different from their usual habits and experience, a considerable amount of success was achieved, highly creditable to them and to their zeal and perseverance. But fresco-painting has not been domiciled in Great Britain, nor has any great school of mural painters been formed. The excellent artists employed did not form schools as in Germany or in Italy, or as in France in a different branch of art; and without the aid of trained assistants public painting is impossible at a cost which can be brought within reasonable limits.

Before the revival of fresco-painting in London, Mr Zephaniah Bell, a Scottish artist, who had studied the art in Italy, painted some clever and forcible frescos at Muirhouse, near Edinburgh, which after the lapse of about forty-five years are still, with the exception of the yellows, fresh and in excellent condition.

See Cennino Cennini, 7rattato della Pittura (English translation by Mrs Merrifield, 1844); Vasari, Le Vite det piu eccellentt Pittori, Scultort, e Architetti; Eastlake, Materials for a iistery of Oil Painting (containing a brief essay on fresco-painting), 1847; C. Heath Wilson, 'Report on Fresco-Painting," in the second Report of the Commissioners of the Fine Aris, London, 1843, and the same author's Life and Works of Michelangelo Buonarroti, 1876; also the Reports of the Commissioners on the Fine Arts, London, from 1842, (C. H. W.)

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FRESCOBALDI, Girotamo, a celebrated musical com- poser, was born at Ferrara in 1587. Little is known of his life except that he studied music at his birthplace under Alessandro Milleville, and owed his first reputation to his beautiful voice. According to one account he went to Belgium, at that time still a centre of the art, where he is said to have lived till 1608, after which period he appears to have settled in Italy, at first in Milan, and from 1627 in Rome, where three years later he obtained the office of organist of St Peter's Cathedral. At this period he had acquired great fame as a virtuoso on the organ, and according to Baini no less than 30,000 people flocked to St Peter's on his first appearance there. He also excelled as a teacher, Frohberger, the celebrated German organist and precursor of Bach, being the most distinguished of his pupils. Frescobaldi's compositions show the consummate art of the early Italian school, and his works for the organ more especially are full of the finest devices of fugal treat- ment. He also wrote numerous vocal compositions, such as canzone, motets, hymns, &c,, a collection of madrigals for five voices (Antwerp, 1608) being among the earliest of lis published works. The year of his death is not suffi- ciently established. Fetis conjectures 1654.

FRESNEL, Aucustin JEAN (1788-1827), an illustrious French physicist, the son of an architect, was born at Broglie, in the department of Eure, in France, May 10, 1788. His early progress in learning was slow, and when eight years old he was still, unable to read. At the age of thirteen he entered the Ecole Centrale in Caen, and at sixteen anda half the Ecole Polytechnique, where he acquitted him- self with distinction, Thence he went to the Ecole des Ponts et Chaussées. He served as an engineer successively in the departments of Vendée, Dréme, and Ille-et-Villaine ; but his espousal of the cause of the Bourbons in 1814 occasioned, on Napoleon's reaccession to power, the loss of hisappointment. On the second restoration he obtained a post as engineer in Paris, where much of his life from that time was spent. His researches in optics, continued until his death, appear to have been begun about the year 1814, when he prepared a paper on the aberration of light, which, however, was not published. In 1818 he read his celebrated memoir on diffraction, for which in the ensu- ing year he received the prize of the Academy of Sciences at Paris. He was in 1823 unanimously elected a member of the Academy, and in 1825 he became a member of the Royal Society of London, which in 1827, at the time of his last. illness, awarded him the Rumford medal. In 1819 he was nominated a commissioner of lighthouses, for which he was the first to construct compound lenses as substitutes for mirrors (see LIGHTHOUSES). Fresnel died of consumption at Ville-d'Avray, near Paris, July 14, 1827. The undu- latory theory of light enunciated by Hooke, and upheld by Huygens and Kuler, but first founded upon experimental demonstration by Thomas Young, was exteuded to a large class of optical phenomena, and permanently established, by the brilliant discoveries and the mathematical deductions of Fresnel. By the use of two plane mirrors of metal, forming with each other an angle of nearly 180°, he avoided the diffraction caused in Grimaldi's experiment on inter- ference by the employment of apertures for the transmission of the light, and was thus enabled in the most conclusive manner to account for the phenomena of interference in ac- cordance with the undulatory theory. With Arago he studied the laws of the interference of polarized rays, and discovered that though when similarly polarized they affect each other as do ordinary rays, yet when rectangularly polarized they have no power of interference. Circularly polarized light Fresnel obtained by means of a rhomb of glass, known as " Fresnel's

rhomb," having obtuse angles of 126°, and acute angles of 54°. His labours in the cause

of optical science received during his lifetime only scant public recognition, and some of his papers were not printed by the Academy of Sciences till many years after his de- cease. But, as he wrote to Young in 1824, in him " that sensibility, or that vanity, which people call love of glory " had been blunted. "All the compliments," he says, " that T have received from Arago, Laplace, and Biot never gave me so much pleasure as the discovery of a theoretic truth, or the confirmation of a calculation by experiment." For further details as to the scientific achievements of Fresnel see AnAco and Optics. His papers were published chiefly in the memoirs of the Academy of Sciences, the bulletins of the Société Philomatique, and the Annales de Chimie.

See Duleau, ' Notice sur Fresnel," Revue Ency., t. xxxix.; Arago, @uvres completes, t. i.; and Dr G. Peacock, Miseellaneous Works of Thomas Young, vol. i.*

FRESNILLO, a town of Mexico, in the state of Zacate- cas, is situated 30 miles N.W. of Zacatecas, on a branch of the Santiago river, in the plain which divides the moun- tains of Santa Cruz and Deganos from the Zacatecas range. It is well built, and its streets are clean and regular. The country in the immediate neighbourhood is pretty and fer- tile, and maize and wheat are cultivated. Fresnillo is noted chiefly for its silver mines situated at the adjacent knoll of Proafio. They were discovered in 1569, and for a long period have been the most productive in the country, the annual yield averaging more than £500,000. A school of mines was founded in 1853. Population about 15,000.

FRESNOY, Cuartes ALPHONSE DU (1611-1665), a painter and writer on his art, was born in Paris, son of an apothecary. He was destined for the medical profession, and well educated in Latin and Greek ; but, having a nat- ural propensity for the fine arts, he would not apply to his intended vocation, and was allowed to learn the rudiments of design under Perrier and Vouet. At the age of twenty- oue he went off to Rome, with no resources;

he drew ruins and architectural subjects. After two years thus spent, he re-encountered his old fellow-student Pierre Mignard, and by his aid obtained some amelioration of his professional pros- pects. He studied Raphael and the antique, went in 1633 to Venice, and in 1656 returned to France. During two years he was now employed in painting altar-pieces in the chateau of Raincy, landscapes, &c. His death was caused by an attack of apoplexy followed by palsy ; he ex- pired at Villiers le Bel, near Paris, Henever married. His pictorial works are few; they are correct in drawing, with something of the Caracci in design, and of Titian in colouring, but wanting fire and expression, and insufficient to keep his name in any eminent repute, He is remembered now almost entirely as a writer rather than painter. His Letin poem, De Arte Graphica, was written during his Italian sojourn, and embodied his observations on the art of painting; it may be termed a critical treatise on the practice of the art, with general advice to students. The precepts are sound according to the standard of his time ; the poetical merits slender enough. The Latin style is formed chiefly on Lucretius and Horace. This poem was first published by Mignard, and has been translated into several languages. In 1684 it was turned into French by Roger de Piles ; Dryden translated the work into English prose ; and a rendering into verse by Mason followed, to which Sir Joshua Reynolds added some annotations.

FREUDENSTADT, a town of Wiirtemberg, circle of the Black Forest, on the right bank of the Murg, 42 miles W.S.W. of Stuttgart. It has a large square, a town- house, and a Protestant church of later Gothic architecture, with two naves at right angles to each other, in one of which the male and in the other the female members of the congregation worship separately. The manufactures include woollen cloth, nails, white lead, potash, and Prussian

blue ; and there is some trade in corn, cattle, and wood. Freudenstadt was founded in 1599 by Protestant refugees from Austria, and at first it received from Duke Frederick the name of Frederickstadt, which on account of the peace- ful prosperity of the town was afterwards changed to Freu- denstadt. The population in 1875 was 5325.

FREUDENTHAL, a town of Austrian Silesia, circle of Troppau, on the Black Water, 22 miles W. of Troppau. It has a large castle, a Piarist college, an orphan asylum, a head real-school, and an under real-school. Its principal industries are linen and woollen weaving, and the manu- facture of leather, chemicals, and metal wares. The popu- lation in 1869 was 6243.

FREYA, in Teutonic mythology, one of the Vanen, or spirits of the breathing wind, which have their abode in Vansheim, or middle air between the upper and under world. Freya, or Fregga, becomes the wife of Odur or Woden (Odin), and the mother of Jérd, the earth, thus answering to the Greek Demeter. In the myth of Thor, whose hammer is stolen by the giant Thoym, Freya lends her feather-garment to Loki, and thus enables him to go in search of it. Thoym refuses to give it up, unless Freya will consent to be his wife; and as Freya will not go, Thor, on the advice of the Heimdall, descends to Jétunheim in the disguise of a bride, and Thoym, taking the god to be Freya, meets his doom at his hands at the moment of his fancied nuptials.

FREYCINET, Louis Craupz Disautses DE (1779- 1842), French navigator, was born at Montelimart in Dauphiny, August 7, 1779. In 1793 he entered the French navy. After taking part in several engagements against the English, he joined in 1800, along with his brother Henri Louis (1777-1840), who afterwards rose to the rank of admiral, the expedition sent out under Captain Baudin in the " Naturaliste" and '" Géographe" to explore the south and south-west coasts of Australia. Much of the ground already gone over by Flinders was revisited, and new names imposed by this expedition, which claimed credit for discoveries really made by the English navigator (see Fuinpers). In 1805 Louis returned to Paris, and was entrusted by Government with the work of preparing the maps and plans of the expedition. In 1817 he commanded the '"Uranie," in which Arago and others went to Rio de Janeiro, to take a series of pendulum measurements. This was only part of a larger scheme for obtaining observations, not only in geography and ethnology, but in astronomy, ter- restrial magnetism, and meteorology, and for the collection of specimens in natural history. For three years Freycinet ernised about, visiting Australia, the Marianne, Sandwich, and other Pacific islands, South America, and other places, returning to France, notwithstanding the loss of the "Uranie," with fine

collections in all departments of natural history, and with voluminous notes and drawings which form an important contribution to a knowledge of the countries visited. The results of this voyage were published under Freycinet's supervision, with the title of Voyage Autour du Monde, &e., in 1825-44, in 8 quarto volumes, and several folio volumes of fine plates and maps. It has not, however, been completed. Freycinet was ad- mitted into the Academy of Sciences in 1825, and was one of the founders of the Paris Geographical Society. He died August 18, 1842.

FREYTAG, Grore Witnetm Friepricu (1788-1861), Arabist, was born at Liineburg on the 19th of September 1788. After the usual preliminary training he entered the university of Géttingen as a student of philology and theo- logy. From 1811 to 1813 he acted as repetent or theo- logical tutor there, but in the latter year he accepted an appointment as sub-librarian, at Kénigsberg, unable, it is srid, any longer to witness the subjection of Hanover to the

French. In 1815 he became a chaplain in the Prussian army, and in that capacity visited Paris, where he had ample opportunities for the cultivation of his favourite Oriental studies. On the proclamation of peace he resigned his chaplaincy, but with the sanction and support of his Government continued his researches in Arabic, Persian, and Turkish at Paris, under De Sacy. In 1819 he was appointed to the professorship of Oriental languages in the recently established university of Bonn; and this post he continued to hold until his death, which took place on the 16th of November 1861. Besides publishing a compendium of Hebrew grammar (Kurzgefasste Grammatik der Hebréischen Sprache, 1835), and a treatise on Arabic versification (Darstellung der Arabischen Verskunst, 1838), he edited two volumes of Arabic songs (Zlamasee Carmina, 1828-52) and three of Arabic proverbs (Arabum Proverbia, 1838-43). But his principal work was the laborious and praiseworthy Lexicon Arabico-Latinum (1830-37), which rapidly super- seded the earlier lexicons, and which, though not to be compared with the magnificent torso of Lane, is likely to remain long in current use as embodying the best results of the labours of De Secy and his school. An abridgment of the larger work was published in 1837.

FRIAR, from the Latin frater through the French frére (Ital. frate or fra, Span. frayle or fray), a secondary form of a word which is common to all the Aryan languages, is a name commonly applied in English to any lay member of any mendicant order. One who has received ordination is usually dignified with the appellation of father. The church of Rome at present recognizes a considerable number of mendicant orders; but at the time when the word first became current in England, there were practically only four, namely, those which alone had been sanctioned by Pope Gregory X. at the second council of Lyons in 1274, They were the Ereinite or Austin Friars, the Carmelites or White Friars, the Dominicans or Black Friars (sometimes also called preaching friars), and the Franciscans, Minors, or Grey Friars. For some estimate of the influence of these begging friars on the intellectual and social life of England, see ENGLAND, vol. vill. 316, 317. They were first brought into Scotland during the reign of Alexander IT., but for many years afterwards were subject to the provincials in England. The "Trinity Friars" also had a monastery at Fail in Kyle (Ayrshire); and their provincial had at one time a seat, in virtue of his office, in the Scottish Parlia- ment, Members of the same order, popularly known as "crouched friars" or cross-bearers (fratres cruciferi), began to appear in England also about the year 1244, and occa- sional] reference is made to them in various ecclesiastical constitutions of that and of the following century ; but they never attained to any great importance. See Mon-

. ACHISM, CARMELITES, DoMINICANS, F'RANCISCANS,

FRIBOURG. See Freipure.

FRICTION is the resistance which every material surface presents to the sliding of any other such surface upon it. This resistance is due to the roughness of the surfaces; the minute projections upon each enter more or less into the minute depressions on the other, and when motion occurs these roughnesses must either be worn off, or continually lifted out of the hollows into which they have fallen, or both, the resistance to motion being in either case quite perceptible and measurable. Friction is preferably spoken of as "resistance" rather than " force," for a reason exactly the same as that which induces us to treat stress rather as molecular resistance (to change of

form) than as force, and which may be stated thus :—although friction can be utilized as a moving force at will, and is continually so used, yet it cannot be a primary moving force; it can transmit or modify motion already existing, but cannot in the first in- stance cause it. For this some external force, not friction,

is required. The analogy with stress appears complete ; the motion of the " driving link" of a machiue is communicated to all the other parts, modified or unchanged as the case may be, by the stresses in those parts; but the actual setting in motion of the driving link itself cannot come about by stress, but must have for its production force ob- tained directly from the expenditure of some form of energy. It is important, however, that the use of the term "resist- ance" should not be allowed to mislead. Friction resists the motion of one surface upon another, but it may and fre- quently does confer the motion of the one upon the other, and in this way causes, instead of resists, the motion of the latter. This may'be made more clear, perhaps, by an illus- stration. Suppose we have a leather strap A passing over a fixed cylindrical drum B, and let a'pulling force or effort be applied to the strap. The force applied to A can act on B only at the surfaces of contact between them. There it becomes an effort tending either to move A upon B, or to move the body B itself, according to the frictional condi- tions. In the absence of friction it would simply cause A to slide on B, so that we may call it an effort tending to make A slide or B. The friction is the resistance offered by the surface of B to any such motion. But the value of this resistance is not in any way a function of the effort itself, it depends chiefly upon the pressure normal to the surfaces and the nature of the surfaces. It may therefore be either less or greater than the effort. If less, A slides over B, the rate of motion being determined by the excess of the effort over the resistance (friction). But if the latter be greater, no sliding can occur, z.e., A cannot, under the action of the supposed force, move upon B. The effort between the surfaces exists, however, exactly as before,— and it must now tend to cause the motion of B. But the body B is fixed,—or, in other words, we suppose its resist- ance to notion greater than any effort which can tend

to move it,—hence no motion takes place, It must be specially noticed, however, that it is not the friction between A and B that has prevented motion, this only prevented A moving on B,—it is the force which keeps B stationary, whatever that may be, which has finally prevented any motion taking place. This can be easily seen. Suppose B not to be fixed, but to be capable of moving against some third body C (which might, e.g., contain cylindrical bear- ings, if B were a drum with its shaft), itself fixed,—and further, suppose the frictional resistance between B and C to be the only resistance to B's motion. Then if this be less than the effort of A upon B, as it of course may be, this effort will cause the motion of B. Thus friction causes motion, for had there been no frictional resistance between the surfaces of A and of B, the latter body would have remained stationary, and A only would have moved. In the case supposed, therefore, the friction between A and B is a necessary{condition of B receiving any motion from the external force applied to A.

Without entering here on the mathematical treatment of the subject of friction, some general conclusions may be pointed out which have been arrived at as the results of ex- periment. The "laws" first enunciated by Coulomb (1781), and afterwards confirmed by Morin (1830-34), have been found to hold good within very wide limits, These are— (1) that the friction is proportional to the normal pressure between the surfaces of contact, and therefore independent of the area of those surfaces (7.e., of the intensity of the pressure), and (2) that it is independent of the velocity with which the surfaces slide one on the other. For many practical purposes these statements are sufficiently accurate, and they do in fact sensibly represent the results of experi- ment for the pressures and at the velocities most commonly occurring. Assuming the correctness of these, friction is generally measured in terms simply of the total pressure

between the surfaces, by multiplying it by a " coefficient of friction" depending on the material of the surfaces and their state as to smoothness and lubrication. But beyond certain limits the "laws" stated are certainly incorrect, and are to be regarded as mere practical rules, of extensive

application certainly, but without any pretension to be looked at as really general laws.

Coulomb pointed out long ago that the resistance of a body to be set in motion was in many cases much greater than the resistance which it offered to continued motion; and since his time writers have always distinguished the "friction of rest," or static friction, from the "'friction of motion," or kinetic friction. He showed also that the value of the former depended often both upon the intensity of the pres- sure and upon the length of time during which contact had lasted, both which facts quite agree with what we should expect from our knowledge of the physical nature, already mentioned, of the causes of friction. It seems not unrea- sonable to expect that the influence of time upon friction should show itself in a comparison of very slow with very rapid motion, as well as in a comparison of starting (i.¢., motion after a long time of rest) with continued motion. That the friction at the higher velocities occurring in en- gineering practice is much less than at common velocities has been shown by several modern experiments, most re- cently hy those of Captain Douglas Galton (Brit. Assoc., Dublin Meeting, 1878, and Inst. Mech. Eng., Paris and Manchester Meetings, 1878) on the friction between brake- blocks and wheels, and between wheels and rails. Until quite lately, however, uo increase in the coefficient of friction had ever been detected at slow speeds, but the recent expe- riments of Prof. Fleeming Jenkin (Phil. Trans., 1877, pt. 2) have shown conclusively that at extremely low veloci- ties (the lowest measured was about '0002 feet per second) there is a sensible increase of frictional resistance in many cases, most notably in those in which there is the most marked difference between the friction of rest and that of motion, These experiments distinctly point' to the conclu- sion, although without absolutely proving it, that in such cases the coefficient of kinetic friction gradually increases as the velocity becomes extremely small, and passes without discontinuity into that of static friction. We know that both at very high and very low pressures the coefficient of friction is affected by the intensity of pressure, and that, just as with velocity, it can only be regarded as independent of the intensity and proportional simply to the total load within more or less definite limits. Recent experiments have not, however, been directed so much to this point as to the influence of velocity, which we have already men- tioned. (A. B. W. K.)

FRIEDLAND, a town of Bohemia, the chief town of a circle, is situated in the valley of the Wittich at the con- fluence of that river with the Rasnitz, 14 miles E. of Zittau. Besides the old town, which is still surrounded by walls, it contains three suburbs. The principal industry is the manufacture of woollen and linen cloth, Friedland is chiefly remarkable for its old castle, which occupies all imposing situation on a small hill commanding the town. The tower of this building was erected in 1014, and the whole structure was completed in 1551. It was several

times besieged in the Thirty Years' and Seven Years' Wars.

In 1622 it was purchased by Wallenstein, and his likeness, painted in 1626, is included in the list of portraits of former possessors of the castle which adorn its walls. The popu- lation in 1875 was 4482.

FRIEDLAND, a town of Germany, in the grand-duchy of Mecklenburg-Strelitz, circle of Stargard, is situated on the Miiblenteich, 35 miles N.E. of Strelitz. It is surrounded by walls, aud possesses a fine Gothic church and a gym- nasium. It has manufactures of woollen and linen cloths,

leather, and tobacco, Freidland was founded in 1244 by the margraves John and Otho III. of Brandenburg. The population in 1875 was 5086.

FRIEDLAND, a town of Prussia, in the government district of K6nigsberg, province of Prussia, is situated on the Alle, 27 miles S.E. of Kénigsberg. At Friedland Napo- leon gained a victory over the Russians under Bennigsen (June 14), which led to the peace concluded at Tilsit July 7, 1807. The population in 1875 was 3299.

FRIEDLAND, Vatentine. See Trorzenporr,

FRIENDLY ISLANDS, The group thus named by Captain Cook, and otherwise called after the name of its chief island Tonga, was discovered by Tasman in 1643. It lies in the South Pacific, on the S.W. limits of the area occupied by the Polynesian race, about 350 miles S.S.W. from Samoa, and 250 E.8.E. from Fiji. The long chain of islands, numbering about 150,

though with a collective area hardly exceeding 400 square miles, extends from 18° 5’ to 22° 29’8. lat., and 173° 52’ to 176° 10’ W. long., and is broken into three groups, viz., the Tonga tothe S., Habai (which again is divided into three clusters) in the centre, and Haafulahao or Vavau, to the N. Along the W. side of the N. half of this chain is a line of volcanic action, where the islands (of which three are active volcanoes) are high and wooded, one peak rising over 5000 feet. But the great majority of the islands are level, averaging 40 feet high, with hills rising to 600 feet ; their sides are generally steep; they are formed of coral limestone, in some places a compact white rock, and in Vavau occasionally crystalline, and containing stalactitic caves of great beauty. The surface is covered, which is unusual in coral islands, with a deep rich mould, mixed towards the sea with sand, and having a substratum of red or blue clay. The soil is thus very productive, although water is scarce and bad. Run- ning streams are very rare, but streams and basins of clear water occur in the limestone rock below the surface.

feefs.—Barrier reefs are rare ; fringing reefs are numer- ous, except on the E. side, which is nearly free, and there are many small isolated reefs and volcanic banks among the islands. If the reefs impede navigation they form some good harbours. The best is on the S.W. side of Vavau ; another is on the N. of Tonga at Bangaimotu.

Islands.—The most considerable island is Tonga, or Tonga-tabu (the Sacred Tonga), in the 8. group, about 21 by 12 miles, and 128 square miles in area, which contains the capital, Nukualofa. The vegetation is rich and beauti- ful, but the scenery tame, the land seldom rising above 60 feet. Hoa, 9 miles to the S.E. and nearly 12 by 5 miles, is 600 feet high, and much more picturesque, diversified by rocks and woods. Vavau, in the N. group, is next to Tonga in size, 42 miles in circumference and 300 feet high. Next to these come Nomuka and Lefuka in the Habai group, about 19 miles in circumference ; Jofua, 2846 feet, Late, 1820 feet, and Kao, 5080 feet high, which are volcanic, and smaller. Vavau and the neighbouring islands are higher and more varied in contour than those to the S. The islands of the central group are numerous and very fertile. Earthquakes are frequent; from 1845 to 1857 Volcanic eruptions were very violent, and islands once

fertile were devastated and nearly destroyed. A new island rose from the sea, and was at once named " Wesley," but disappeared again.

Climate.—The climate is enervating; it is damp, with heavy dews and frequent alternations of temperature, which averages 75°-77° F., though considerably higher in Vavau. Cool S.E. trade winds blow, sometimes with great violence, from April to December. During the rest of the year the winds blow from W.N.W. and N., with rain and occasional destructive hurricanes.

- Flora.—The vegetation is similar to that of Fiji, but

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more definitely Indo-Malayan in character ; it embraces all the plants of the groups to the E., with many that are absent there. Ferns abound, some of them peculiar, and tree ferns on the higher islands. Thereare 4 palms, among them the Kentia of Fiji. For the rest, Graminez, Rubi- aceze, Ficoidee, Myrtaceze, Euphorbizw, Malvacez, and Leguminose predominate. All the usual fruit trees and cultivated plants of the Pacific are found. The most valuable timber trees are the tamanu (Calophyllum Bur- manni), milo (Thespesia populnea), futu (Barringtonia speciosa), mohemohe, tavaki, and Caswarina or iron-wood.

Fauna.—The only indigenous land mammalia are a small rat, and a few curious species of bats. The dog and the pig were no doubt introduced by man. Sheep and cattle imported of late years by Europeans do not multiply, owing to insufficient space and pasture. Of birds some 30 kinds are known, an owl being the only bird of prey; parrots, pigeons, kingfishers, honey-suckers, rails, ducks, and other water birds are numerous. There are snakes and small lizards, but no frogs or toads. Of insects there are rela- tively few kinds; but ants, beetles, and musquitoes abound. The fishes, of an Indo-Malay type, are varied and numerous. Turtle and sea-snakes abound, as do mollusca, of which a few are peculiar, and zoophytes.

People.—The inhabitants are, intellectually, perhaps the most advanced of the Polynesian race, and exercise an influence over distant neighbours, especially in Fiji, quite out of proportion to their numbers, which do not

exceed 20,000 or 25,000. Their conquests have extended as far as Niue, or Savage Island, 200 miles to the E., and to various other islands to the N. In Cook's time Poulaho, the principal chief, considered Samoa to be within his dominions. This pre-eminence may perhaps be due to an early infusion of Fijian blood: Pritchard (Polynesian Me- miniscences) observed such crosses to be always more vigorous than the pure races in these islands; and this influence seems also traceable in the Tongan dialect, and appears to have been partially transmitted thence to the Samoan. Various customs, traditions, and names of places point to a former relation with Fiji, but Fijian influence in Tonga is insignificant compared with that of Tonga in Fiji (see Fry1), Their prior conversion to Christianity gave the people material as well as moral advantages over their neighbours, and King George, a very remarkable man, and far in advance of his people, has, during a long reign, made the most of these.

Until recently there were, as in Japan, two sovereigns ; the higher of these, called Tui Tonga (Chief of Tonga), was greatly reverenced, but for at least the last 200 years has enjoyed little power. The real ruler, and the chief officers of the state, were members of the Toubo family, from which also the wife of the Tui Tonga was always chosen, whose descendants through the female line had, under the title of "tamaha," special honours and privileges, recalling the "vasu" of Fiji! Below these came the Eiki or chiefs, and next to them the class called Matabulé. These were the hereditary counsellors and companions of the chiefs, and conveyed to the people the decisions formed at their assem- blies. They also directed the national ceremonies, and preserved the popular traditions. During the long civil wars in the early part of this century, the institution of Tui Tonga lapsed, and various chiefs became independent, but they were gradually subdued, and the whole group united by King George. He commuted for a money payment the service due from the common people to their chiefs, whom he assembles in a sort of parliament, having in 1862 esta- blished a "constitutional government." Taxation is heavy: a poll tax of 4 dollars is levied and strictly enforced.

1 A similar institution ("tamasa") exists at Samoa, 2

Defini- tion.

The limited extent and resources of the islands tend to minimize foreign settlement and interference, but missionary influence is, directly or indirectly, supreme, The régime is accordingly somewhat strained and severe, and restless spirits have to seek a vent for their energies in Fiji or elsewhere. Crime, however, is infrequent, and morality, always above the Polynesian average, is improving ; nearly every one can read, and there is a general appearance of order and comfort. The people have strict notions of etiquette and gradations of rank ; their natural independence and self-esteem is perhaps fostered by their frequent employment as the teachers of others, for which, however, they show much aptitude; other- wise they are amiable and (especially in the upper ranks) courteous, Theyare arrogant, lively, inquisitive, and inclined to steal,—their attacks, in earlier days, on Europeans, when not caused by misunderstandings, being due probably to their desire to obtain property which to them was of immense value. They are brave and not devoid of energy, though the soft climate and the abundance of food are against sustained exertion or great industrial progress. They value children, and seldom practise infanticide, and cannibalism only in exceptional cases. Their women are kindly treated, and only do the lighter work. Agriculture, which is well understood, is the chief industry. They are bold and skilful sailors and fishermen; other trades, as boat and house building, carving, cooking, net and mat making, are usually hereditary. Their houses are slightly built, but the surrounding ground and roads are laid out with great care and taste.

There are some ancient stone remains here, as in the Caroline Islands, burial places (feitoka) built with great blocks, and a remarkable monument consisting of two large blocks with a transverse one, containing a circular basin in the centre.

The principal diseases are leprosy and elephantiasis, tona (the thoko of Fiji), influenza, ulcers, scrofula, consumption, and ophthalmia. Owing to the absence of swamps, fever of a severe type is rare.

The chief articles of export are cocoa-nut oil and copra ; a little sugar, cotton, and coffee, the cultivation of which is encouraged by the king; and fresh provisions for ships, as yams, pigs, and poultry. The chief imports are

cloth, cotton prints, hardware, mirrors, &c., but these are not on the increase. Whale fishing (once extensive) is still carried on among the islands by European and American vessels.

See Cook's Voyages; Mariner's Account of the Natives of the Tonga Islands; Dumont d'Urville's Voyage de I' " Astrolabe"; West's Zen Years in South Central Polynesia; Brenchley's Jottings

during Cruise of H.M.S. "Curagoa," 1865; Meinicke, Die Inseln des Stillen Oceans ; Waldegrave in #. G. S. Journal, 1850. (C. T.)

FRIENDLY SOCIETIES, according to the compre- hensive definition of the Friendly Societies Act 1875, which now regulates such societies in Great Britain and Ireland, are "societies established to provide by voluntary subscrip- tions of the members thereof, with or without the aid of donations, for the relief or maintenance of the members, their husbands, wives, children, fathers, mothers, brothers or sisters, nephews or nieces, or wards being orphans, dur- ing sickness or other infirmity, whether bodily or mental, in old age, or in widowhood, or for the relief or mainten- ance of the orphan children of members during minority; for insuring money to be paid on the birth of a member's child, or on the death of a member, or for the funeral expenses of the husband, wife, or child of a member, or of the widow of a deceased member, or, as respects persons of the Jewish persuasion, for the payment of a sum of money during the period of confined mourning ; for the relief or maintenance of the members when on travel in search of employment, or when in distressed circumstances, or in case of shipwreck, or loss or damage of or to boats or

nets; for the endowment of members or nominees of members at any age; for the insurance against fire to any amount not exceeding £15 of the tools or implements of the trade or calling of the members "—and are limited in their contracts for assurance of annuities to £50, and for assurance of a gross sum to £200. They may be de- scribed in a more popular and condensed form of words as the mutual assurance societies of the poorer classes, by which they seek to aid each other in the emergencies aris- ing from sickness and death and other causes of distress. A phrase in the first

Act for the encouragement and relief of friendly societies, passed in 1793, designating them "societies of good fellowship," indicates another useful phase of their operations.

The origin of the friendly society is, probably in all Origin.

countries, the burial club. It has been the policy of every religion, if indeed it is not a common instinct of humanity, to surround the disposal of a dead body with circumstances of pomp and expenditure, often beyond the means of the surviving relatives. The appeal for help to friends and neighbours which necessarily follows is soon organized into a system of mutual aid, that falls in nat- urally with the religious ceremonies by which honour is done to the dead. 'Thus Archdeacon Gray tells us that in China there are burial societies, termed 'long-life loan companies," in almost all the towns and villages. Among the Greeks the %pavou combined the religious with the pro- vident element. From the Greeks the Romans derived their fraternities of a similar kind. The Teutons in like manner had their guilds. Whether the English friendly society owes its origin in the higher degree to the Roman or the Teutonic influence can hardly be determined. The utility of providing by combination for the ritual ex- penditure upon burial having been ascertained, the next step—to reuder mutual assistance in circumstances of distress generally—was an easy one, and we find it taken by the Greek gpavor and by our own guilds. Another modification—that the societies should consist not so much of neighbours as of persons having the same occupation— soon arises; and this is the germ of our trade unions and our city companies in their original constitution. The interest, however, that these enquiries possess is mainly antiquarian. 'The legal definition of a friendly society quoted above points to an organization more complex than those of the ancient fraternities and guilds, and pro- ceeding upon different principles. It may be that the one has grown out of the other. The common element of a provision for a contingent event by a joint contribution is in both ; but the friendly society alone has attempted to define with precision what is the risk against which it intends to provide, and what should be the contributions of the members to meet that risk.

It would be curious to endeavour to trace how, after the suppression of the religious guilds in the 16th century, and the substitution of an organized

system of relief by the poor law of Elizabeth for the more voluntary and casual means of relief that previously existed, the present system of friendly societies grew up. The modern friendly society, particularly in rural districts, clings with fondness to its annual feast and procession to church, its procession of all the brethren on the occasion of the funeral of one of them, and other incidents which are almost obviously sur- vivals of the customs of medizeval guilds. The last re- corded guild was in existence in 1628, and there are records of friendly societies as early as 1634 and 1639. The connecting links, however, cannot be traced. With the exception of a society in the port of Borrowstounness on the Firth of Forth, no existing friendly society is known to be able to trace back its history beyond a date late in the 17th century, and no records remain of any that

might have existed in the latter half of the 16th century or the greater part of the 17th. One founded in 1666 was extant in 1850, but it has since ceased to exist. This is not so surprising as it might appear. Documents which exist in manuscript only are much less likely to have been preserved since the invention of printing than they were before; and such would be the simple rules and records of any society that might have existed during this interval —if, indeed, many of them kept records at all. How usual is it for a voluntary society of any kind to die away with the generation of men among whom it was founded! On the whole, it seems probable therefore that the friendly society is a lineal descendant of the ancient guild—the idea never having wholly died out, but having been kept up from generation to generation in a succession of small and scattered societies,

At the same time, it seems probable that the friendly society of the present day owes its revival to a great extent to the Protestant refugees of Spitalfields, one of whose societies was founded in 1703, and has continued for 176 years among descendants of the same families, whose names proclaim their Norman origin. This society has distinguished itself by the intelligence with which it has adapted its machinery to the successive modifications of the law, and has very recently completely reconstructed its rules under the provisions of the Friendly Societies Acts, 1875 and 1876.

Another is the society of Lintot, founded in London in 1708, in which the office of secretary has for more than half a century been filled by persons of the name of Levesque, one of whom has published a translation of its original rules. No one was to be received into the society who was not a member, or the descendant of a member, of the church of Lintot, of recognized probity, a good Pro- testant, and well-intentioned towards the queen [Anne] and faithful to the Government of the country. No one was to be admitted below the age of eighteen, or who had not been received at holy communion, and become member of a church, A member should not have a claim to relief during his first year's membership, but if he fell sick within the year, a collection should be made for him among the members. This society has only 50 members, but its funds exceed £2000, The foreign names still borne by a large proportion of the members show that the connexion with descendants of the refugees is maintained.

The example of providence given by these societies was so largely followed that Sir George Rose's Act in 1793 re- cognized the existence of numerous societies, and provided encouragement for them in various ways, as well as relief from taxation to an extent which in those days must have been of great pecuniary value, and exemption from removal under the poor law. The benefits offered by this statute were readily accepted by the societies, and the vast number of societies which speedily became enrolled shows that Sir George Rose's Act met a real public want. In the county of Middlesex alone nearly a thousand societies were enrolled within a very few years after the passing of the Act, and the number in some other counties was almost as great. The societies then formed were nearly all of a like kind,— small clubs, in which the feature of good fellowship was in the ascendant, and that of provident assurance for sickness and death merely accessory. This is indicated by one pro- vision which occurs in many of the early enrolled rules, viz., that the number of members shal] be limited to 61, 81, or 101, as the case may be. The odd 1 which occurs in these numbers probably stands for the president or secretary, or is a contrivance to ensure a clear majority. Several of these old societies are still in existence, and can point to a prosperous career extending over (in some cases) more than 100 years—a prosperity based rather upon good

luck than upon scientific calculation. Founded among small tradesmen or persons in the way to thrive, the claims for sickness were only made in cases where the sickuess was accompanied by distress, and even the funeral allowance was not always demanded.

The societies generally not being established upon any Act of scientific principle, those which met with this prosperity 1819.

were the exception to the rule; and accordingly the cry that friendly societies were failing in all quarters was as great in 1819 asin 1869. A writer of that time speaks of the instability of friendly societies as "' universal"; and the general conviction that this was so resulted in the passing of tle Act of 1819, 59 Geo. IIL c. 128. It recites that "'the habitual reliance of poor persons upon parochiai relief, rather than upon their own industry, tends to the moral de- terioration of the people and to the accumulation of heavy burthens upon parishes; and it is desirable, with a view as well to the reduction of the assessment made for the relief of the poor as to the improvement of the habits of the people, that encouragement should be afforded to persons desirous of making provision for themselves or their families out of the fruits of their own industry. By the contributions of the savings of many persons to one common fund the most effectual provision may be made for the casualties affecting all the contributors ; and it is therefore desirable to afford further facilities and additional security to persons who may be willing to unite in appropriating small sums from time to time to a common fund for the purposes aforesaid, and it is desirable to protect such persons from the effects of fraud or miscalculation." This preamble went on to recite that the provisions of preceding Acts had been found insufficient for these purposes, and great abuses had prevailed in many societies established under their authority. By this statute a friendly society was defined as "an institution, whereby it is intended to provide, by contribution, on the principle of mutual insurance, for the maintenance or assistance of the contributors thereto, their wives or children, in sickness, infancy, advanced age, widow- hood, or any other natural statc or contingency, whereof the occurrence is susceptible of calculation by way of average." It will be seen that this Act dealt exclusively with the scientific aspect of the societies, and had nothing to say to the element of good fellowship. Rules and tables were to be submitted by the persons intending

to form a society to the justices, who, before confirming them, were to satisfy themselves that the contingencies which the society was to provide against were within the meaning of the Act, and that the formation of the society would be useful and bene- ficial, regard being had to the existeuce of other societies in the same district. No tables or rules connected with calcu- lation were to be coufirmed by the justices until they had been approved by two persons at least, known to be pro- fessional actuaries or persons skilled in calculation, as fit and proper, according to the most correct calculation of which the nature of the case would admit. The justices in quarter sessions were also by this Act authorized to publish general rules for the formation and government of friendly societies within their county. The practical effect of this statute in requiring that the societies formed under it should be established on sound principles does not appear to have been as great as might have been expected. The justices frequently accepted as " persons skilled in caleula- tion" local schoolmasters and others who had no real knowledge of the technical difficulties of the subject, while the restrictions upon registry served only to increase the number of societies established without becoming registered.

In 1829 the law relating to friendly societies was entirely Act of reconstructed by the 10 Geo. IV. c. 56, and a barrister was 1829.

appointed under that Act to examine the rules of societies, and ascertain that they were in conformity to law and to the

Acts of 18384 and

1846.

Act of

1850.

Act of

1855.

Act of

provisions of the Act. The barrister so appointed was Mr John Tidd Pratt; and no account of friendly societies would be complete that did not do justice to the remarkable public service rendered by this gentleman. For forty years, though he had by statute really very slight authority over the societies, his name exercised the widest influence, and the numerous reports and publications by which he endea- voured to impress upon the public mind sound principles of management of friendly societies, and to expose those which were managed upon unsound principles, made him a terror to evil doers. On the other hand, he lent with readiness the aid of his legal knowledge and great mental activity to assisting well-intentioned societies in coming within the provisions of the Acts, and thus gave many excellent schemes a legal organization.

By the Act of 1829, in lieu of the discretion as to whether the formation of the proposed society would be useful and beneficial, and the requirement of the actuarial certificate to the tables, it was enacted that the justices were to satisfy themselves that the tables proposed to be used might be adopted with safety to all parties concerned. This provision, of course, became a dead letter, and was repealed in 1834 by 4 and 5 Wm. IV. c. 40. Thenceforth, societies were free to establish themselves upon what conditions and with what rates they chose, provided only they satisfied the barrister that the rules were ‘ calculated to carry into effect the intention of the parties framing them," and were "in conformity to law." In 1846, by 9 and 10 Vic. c. 27, the barrister certifying the rules was constituted "‘ Registrar of Friendly Societies," and the rules of all societies were brought together under his custody. An actuarial certifi- cate was, to be obtained before any society could be regis- tered "for the purpose of securing any benefit dependent on the laws of sickness and mortality." In 1850 the Acts were again repealed and consolidated with amendments (13 and 14 Vic. c, 115). Societies were divided into two classes, "‘ certified " and "registered." The certified socie- ties were such as obtained a certificate to their tables by an actuary possessing a given qualification, who was required to set forth the data of sickness and mortality upon which he proceeded, and the rate of

interest assumed in the calcu- lations. All other societies were to be simply registered. Very few societies were constituted of the " certified " class. The distinction of classes was repealed and the Acts were again consolidated in 1855 by 18 and 19 Vic. ce. 63. Under this Act, which admitted of all possible lati- tude to the framers of rules of societies, 21,875 societies were registered, a large number of them being lodges or courts of affiliated orders, and the Act continued in force till the end of 1875.

The law which now regulates friendly societies in Great Britain was passed in 1875 (88 and 39 Vic. c. 60) and amended in 1876 (39 and 40 Vic. c. 32). It still bears the permissive and elastic character which marked the more successful of the previous Acts, but it provides ampler means to members of ascertaining and remedying defects of management and of restraining fraud. The business of registry is under the control of a chief registrar, who has an assistant registrar in each of the three countries, with an actuary. It is his duty, among other things to require from every society a return in proper form each year of its receipts and expenditure, funds, and effects; a return once every five years of the sickness and mortality it has experienced; and also once every five years a valuation of its assets and liabilities. Upon the application of a certain proportion of the mem- bers, varying according to the magnitude of the society, the chief registrar may appoint an inspector to examine into its affairs, or may call a general meeting of the members to con- sider and determine any matter affecting its interests.

-and the debates published in the newspapers, and the Order of } about 10 per cent. of their income.

SOCIETIES

These are powers which have been used with excellent effect. Cases have occurred in which fraud has been detected and punished by this means that could not probably have been otherwise brought to light. In others a system of misman- |

agement has been exposed and effectually checked. The power of calling special meetings has enabled societies to . remedy defects in their rules, to remove officers guilty of misconduct, &c., where the procedure prescribed

by the rules was for some reason or other inapplicable. Upon an application of a like proportion of members the chief regis- trar may, if he finds that the funds of a society are insuf- ficient to meet the existing claims thereon, or that the rates of contribution are insufficient to cover the benefits assured (upon which he consults his actuary), order the society to be dissolved, and direct how its funds are to be applied.

This legislation was the result of the labours of a Royal Royal Commission of high authority, presided over by Sir Stafford Commis: Northcote, which sat from 1870 to 1874, and prosecuted °°™ an exhaustive inquiry into the organization and condition of the various classes of friendly societies. Their reports occupy more than a dozen large bluebooks. They divide registered friendly societies into 13 classes.

The first class includes the affiliated societies or " orders," such as Classes of

the Manchester Unity of Odd Fellows, the Ancient Order of Foresters, societies.

the Rechabites, Druids, &c. These societies have a central body,

either situated in some large town, asin the case of the Manchester

Unity, or moving from place to place, as in that of the Foresters. . Under this central body, the conntry is (in most cases) parcelled

out into districts, and these districts again consist each of a number

of independent branches, called " lodges," " courts," " tents," or

' divisions," having a separate fund administered by themselves,*

but contributing also to a fund under the control of the central

body. The Manchester Unity has (1878) 456 districts, 4121 lodges,

526,802 members, and £4,325,000 funds; the Order of Foresters

287 districts, 4414 courts, 521,416 members, £2,497,000 funds. It may give an idea of the great utility of these societies to mention that the various courts of Foresters paid their members 3,197,366: days' sick pay in a single year, and paid burial money on 4666 deaths. Besides these two great ongat, there are about forty smaller affiliated bodies, each having more than 1000 members ; and the affiliated form of society appears to have great attraction. Indeed, in the colony of Victoria, Australia, all the existing friendly societies are of this class. The orders have their "secrets," but these, it may safely be said, are of a very innocent character, and merely serve the purpose of identifying a member of a distant branch by his knowledge of the " grip," and of the etirrent password, {&c. Indeed they are now so far from being ' secret societies" that their meetings are attended by reporters*

| Foresters has recently passed a wise resolution expunging from its

publications all affectation of niystery.

The second class is made up of " general societies," principally existing in London, of which the Commissioners enumerated 8 with nearly 60,000 members, and funds amounting to a quarter of a million ; these societies are managed at a cost, on the average, of

The third class includes the " county societies,"' of which there were 11, 10 of which had £221,955 funds and 29,036 members, and 30 others approaching that type. These societies have been but feebly supported by those for whose benefit they are instituted, having all exacted high rates of contribution, in order to secure financial soundness.

Class 4, "local town societies," is a very nunierous one. Among some of the larger societies may be mentioned the '¢ Chelmsford Provident," with £26,403 funds, and 2352 members ; the " Brighton and Sussex Mutual," with £35,752 funds, and 824 members; the " Cannon Street, Birmingham,"

with £66,780 funds, and 8847 members; the “ Birmingham General Provident,” £37,997 funds, and 3379 members. In this group might also be included the interesting societies which are established among the Jewish community. They differ from ordinary friendly societies partly in the nature of the benefits granted upon death, which are intended to compensate for loss of employment during the time of ceremonial seclusion enjoined by the Jewish law, which is called | “sitting shiva.” They also provide a cab for the mourners and rabbi, and a tombstone for the departed, and the same benefits as an ordinary friendly society during sickness. Some also provide a place of worship. Of these the “ Pursuers of Peace” (enrolled in | December 1797), the “Bikhur Cholim, or Visitors of the Sick” (April 1798), the “Hozier Holim” (1804), and nearly 50 others, of which 4 are courts of the Order of Foresters, are on the register for

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FRIENDLY

Middlesex. Mr Adler calculatcs that some 30 or 40 such societies are in existence in London. Two or three societies have been cer- tified (under the earlier Acts) for accumulating by weekly subscrip- tions a fund for the purchase of flour and the baking of passover cakes.

Class 5 is “local village and country socicties,”’ including the small public house clubs which abound in the villages and rural districts, a large proportion of which are unregistered.

Class 6 is formed of “particular trade societies.”

Class 7 is “ dividing societies.” These were before 1875 unauthor- ized by law, though they were very attractive to the members. Their practice is usually to start afresh every January, paying a subscription somewhat in excess of that usually charged by an or- dinary friendly society, out of which a sick allowance is granted to any member who may fall sick during the year, and at Christmas the balance not so applied is divided among the members equally, with the exception of a small sum left to begin the new year with. The mischief of the system is that, as there is no accumulation of funds, the seciety cannot provide for prolonged sickness or old age, and

must either break up altogether or exclude its'sick and aged members at the very time when they most need its help This, however, has not impaired the popularity of the societies, and the Act of 1875, framed on the sound principle that the protection of the law should not be withheld from any form of association, enables a society to be registered with a rule for dividing its funds, provided only that all existing claims upon the society are to be met before a division takes place.

Class 8, " deposit friendly societies," combine the characteristics of a savings bank with those of a friendly society. They were de- vised by the late Hon. and Rev. S. Best, on the principle that a certain proportion of the sick allowance is to be raised out of a member's separate deposit account, which, if not so used, is retained for his benefit. Their advantages are in the encouragement they offer to saving, and in meeting the selfish objection sometimes raised to friendly societies, that the man who is not sick gets nothing for his money; their disadvantage is in their failing to meet cases of pee so prolonged as to exhaust the whole of the member's own

eposit.

*lies 9, *'collecting societies," are sa called because their con- tributions are received through a machinery of house-to-house col: lection. These were the subject of much laborious investigation and close attention on the part of the Commissioners. They deal with a lower class of the community, both with respect to means and to intelligence, than that from which the members of ordinary friendly societies are drawn. The large emoluments gained by the officers and collectors, the high percentage of expenditure (often ex- ceeding half the contributions),and the excessive frequency of lapsing of insurances point to mischicfs in their management. " The radi- cal evil of the whole system (the Commissioners remark) appears to us to lie in the employment of collectors, atherwise than under the direct supervision and control of the members, a supervision and control which we fear to be absolutely unattainable in burial societies that are not purely local." On the other hand, it must be conceded that these societies extend the benefits of life insurance to a class which the other societies cannot reach, namely, the class that will not take the trouble to attend at an office, but must be induced to effect an insurance by a house-to-house canvasser,*

and be regularly visited by the collector to ensure their paying the contrj- butions. To many such persons these societies, despite all their errors of constitution and management, have been of great benefit. The great source of these errors lies in a tendency on thie part of the managers of the societies to forget that they are simply trustees, and to look upon the concern as their own personal property to be managed for their own benefit. These societies are of two kinds, local and general. The Commissioners enumerated 239 local societies, with over 680,000 members, and £203,777 funds ; and 20 of the more important general societies, with members estimated at 1,426,023, and funds at £461,605. For the general societies the Act of 1875 makes certain stringent provisions. Each member is to be furnished with a copy of the rules for one penny, and a signed policy for the same charge. Forfeiture of benefit for non-payment is not to be enforced without fourteen days' written notice. The transfer of a member from one society to another is not to be made without his written consent and notice to the society affected. No collector is to be a manager, or vote or take part at any meeting. At least one general meeting shall be held every year, of which notice is to be given either by advertisement or by letter or post card to each member. The balance sheet is to be open for inspection seven days before the meeting, and is to be certified by a public account- ant, not an officer of the society. Disputes may be settled by jus- tices, or county courts, notwithstanding anything in the rules of the society to the contrary. These provisions have certainly been found already very beneficial; but much more would be done for the benefit of the classes interested if the regulation which prevents the post office assuring less than £20 were abrogated, and if a general system of collection through the post office were established.

Closely associated with the question of the management of these

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soeieties is that of the risk incurred by infant life, through the fa- cilities offered by these societies for making insurances on the death of children. That this is a real risk is certain from the records of the assizes, and from many circumstances of suspicion; but the ex- tent of it eannot be measured,

and has probably been exaggerated. It has never been lawful to assure more than £6 on the death of a child under five years of age, or more than £10 on the death of one under ten. Previous to the Act of 1875, however, there was no machinery for ascertaining that the law was complied with, or for enforcing it. This is supplied by that Act, though still somewhat imperfectly. When the bill went up to the House of Lords, an amendment was made, reducing the limit of assurance on a child under three years of age to £3, but this amendment was unfor- tunately disagreed with by the House of Commons.

Class 10, annuity societies, prevail in the west of England. Six of these societies had, at the date of the last published returns, 719 members, and £79,136 funds. These societies are few, and their business is diminishing. Most of them originated at the time when Government subsidized friendly societies by allowing them £4, 11s. 3d. per cent. per annum interest. Now annuities may be purchased direct from the National Debt Commissioners. These societies are more numerous, however, in Ireland.

Class 11, female societies, are numerous. Manyof them resemble affiliated orders at least in name, calling themselves Female Foresters, Odd Sisters, Loyal Orangewomen, Comfarting Sisters, and so forth. In theiy rules may be found such a provision as that a member shall be fined who does not " behave as becometh an Orangewoman." Many areunregistered. In the northern countics of England they are sometimes termed "life boxes," doubtless from the old custom of placing the contributions in a box. The trustees, treasurer, and committee are usually females, but very frequently the secretary is a man, paid a small salary,

Under Class 12 the Commissioners included the societies for vari- ous purposes which were authorized by the secretary of state to be registered under the Friendly Societies Act of 1855, comprising working men's clubs, aud certain specially authorized societies, as well as others that are now defined to be friendly societies. Among these purposes are assisting members in search of employ- ment ; assisting members during slack seasons of trade ; granting temporary relief to members in distressed circumstances ; purchase of coals and other necessaries to be supplied to members ; relief or maintenance in case of lameness, dhitindes insanity,

paralysis, or bodily hurt through accidents; also, the assurance against loss by disease or death of cattle employed in trade or agriculture ; relief in case of shipwreck or loss or damage to boats or nets; and societies for social intercourse, mutual helpfulness, mental and moral improvement, rational recreation, &c., called working men's clubs.

Class 18 is cattle insurance societies.

These are the thirteen classes into which the Commissioners divided registered friendly societies. There were 26,034 societies enrolled or certified under the various Acts for friendly societies in force between 1793 and 1855; and, as we have seen, 21,875 societies registered under the Act of 1855 before the 1st January 1876, when the Act of 1875 came into operation. The total there- fore of societies to which a legal constitution had been given was 47,909. Of these 26,087 were presumed to be in existence when the registrar called for his annual return, but only 11,282 furnished the return required. These had3,404,187 members, and £9,336, 946 funds. Twenty-two societies returned over 10,000 members each ; nine over 30,000. One society (the Royal Liver Friendly Society, Liverpool, the largest of the collecting societies) returned 682,371 members. 'The next inorder was one of the same class, the United Assurance Society, Liverpool, with 159,957 members; but in all societies of this class, the membership consists very largely of in- fants. The average of members in the 11,260 societies with less than 10,000 members each is only 171, showing how small in reality the bulk of Friendly Societies are. There are 58 societies with more than £10,000 funds ; 18 with more than £30,000. In these again the Royal Liver heads the list with its £453,418 ; the next in succession being the Hearts of Oak, a society belonging to the Commissioners' second class, which has £179,995.

Such are the registered societies; but there remains be- Unregis- hiud a large body of unregistered societies, estimated by the tered

Commissioners to be in England nearly co-extensive with, in Scotland far to surpass in magnitude, the registered bodies. It is to be hoped that, as knowledge is spread of the advantages of registration,! and as the true principles

1 These may be briefly summed up thus:—(1) power to hold land and vesting of property in trustees by mere appointment; (2) remedy against misapplication of funds; (3) priority in bankruptcy or on death of officer; (4) transfer of stock by direction of chief registrar; (5) exemption from stamp duties; (6) membership of minors; (7) certi- ficates of birth and death at reduced cost; (8) investment with Na-

Societies, in Vic- toria.

Foreign Countries.

upon which friendly societies should be established become better understood, the number of unregistered societies, in comparison with} those registered, will become much less. It must be admitted, however, that at present progress is not being made in that direction. The classes among whom friendly societies are formed are greatly averse to any undertaking involving mental labour, and the idea of peri- odical returns and of the other requirements of the statute is more alarming to them than it need be. It will be the province of those charged with the administration of the statute to endeavour, as far as possible, to combat this tendency, and by wise use of the materials in their hands to seek to show the societies that the registry office is a ready and useful auxiliary to them, and that the trouble it gives them is more than met by compensating advantages.

The description we have given of the various classes of friendly societies, the number of their members, and the amount of their funds leads to the most hopeful conclusions as to their future. Though great loss has been occasioned by the failure of societies and by errors in their constitution and management, the provident habits of the people have survived all discouragement, and a fund has been accumu- lated which may be loosely estimated at nearly 15 millions sterling, contributed out of the savings of the flower of the working class. On every side there is displayed a desire by the societies to increase the soundness of their position, and to reform anything that may be wrong in their con- stitution.

The colonies, also, are follawing the same course. In that of Victoria, Australia, the report of the Government statist, Mr H. H. Hayter, shows that on the 31st Decem- ber 1876 there were 761 branches, belonging to 34 socie- ties, having 45,957 members, and assuring also sums at the death of 27,919 wives of members. The amount of con- tribution made by each member is, under ordinary circum- stances, 1s. weekly. The benefits consist of sick pay, medical attendance, and funeral allowances. The sickness experienced during the year was 52,817 weeks, or nearly 7 working days per member, the number of members sick having been 8,873. The usual sick pay is £1 per week for the first six months, reduced to 10s. or sometimes 13s, 4d. for the next six months, and to 5s. or sometimes 10s. for the remainder of sickness. The deaths were 452, or very nearly 10 in 1000. The amount paid on death of a mem- ber is usually £20, and of a member's wife £10. It will be seen that the benefits are greater in amount than is usual in societies in the mother country, The total income of the societies was £163,593, and their funds amounted to £351,284. The number of societies, members, and amount of income have about doubled during 10 years, the amount of funds having accumulated even more rapidly, It may be added that the report in question gives a more complete body of statistics relating to friendly societies than has ever been attempted to be collected elsewhere.

In foreign countries the development of friendly societies has been slow. Belgium has a commission royale perman- ente des sociétés de secours mutuel, originally presided over by M. Visschers, and since by M. T'Kint de Rooden- beke. In France, under the second empire, a scheme was prepared for assisting friendly societies by granting them collective assurances under Government security. The societies have the privilege of investing their funds in the Caisse des Dépéts et Consignations, corresponding to the

tional Debt Commissioners; (9) reduction of fines on admission to copyholds; (10) discharge of mortgages by mere receipt; (11) obliga- tion on officers to render accounts; (12) settlement of disputes; (13) insurance of funeral expenses for wives and children without insurable interest; (14) nomination at death; (15) payment without administra- tion; (16) services of public auditors and valuers; (17) registry of documents, of which copies may be put in evidence,

SOCIETIES

English National Debt Commission. In Germany a law was passed on the 7th April 1876 on registered friendly societies, It prescribes for societies many things which in England are left to the discretion of their founders; and it provides for an amount of official interference in their management that is wholly unknown here. The superintending autho- rity has a right to inspect the books of every society, whether registered or not, and tu give formal notice to a society to call in arrears, exclude defaulters, pay benefits, or revoke illegal resolutions. A higher authority may, in certain cases, order societies to be dissolved. These provisions relate to voluntary societies; but it is competent for communal authorities also to order the formation of a friendly society, and to make a regulation compelling all workmen not already members of a society to join it.

On the actuarial view of the management of friendly Actuarial societies the following remarks have been supplied by vemarks,

Mr William Sutton, actuary of the Friendly Societies' Registry. It is in the highest degree essential to the interests of their members that friendly societies should be financially sound,—in other words, that they should through- out their existence be able to meet the engagements into which they have entered with their members. For this purpose it is necessary that the members' contributions should be so fixed as to prove adequate, with proper manage- ment, to provide the benefits promised to the members. These benefits almost entirely depend upon the contingen- cies of health and life; that is, they take the form of pay- ments to members when sick, of payments to members upon attaining given ages, or of payments upon members' deaths, and frequently a member is assured for all, these benefits, viz., a weekly payment if at any time sick before attaining a certain age, a weekly payment for the remainder of life after attaining that age, and a sum to be paid upon his death. Of course the object of the allowance in sickness is to provide a substitute for the weekly wage lost in conse- quence of being unable to work, and the object of the weekly; payment after attaining a certain age, when the member will probably be too infirm to be able to earn a liviug by the exercise of his calling or occupation, is to pro- vide him with the necessaries of life, and so enable him to be independent of poor relief.

There is every reason to believe that, when a large group of persons of the same age and calling are observed, there will be found to prevail among them, taken one with another, an average number of days' sickness, as well as an average rate of mortality, in passing through each year of life, which can be very nearly predicted from the results furnished by statistics based upon observations previously made upon similarly circumstanced groups. Assuming, therefore, the necessary statistics to be attainable, the computation of suitable rates of contribution to be paid by the members of a society in return for certain allowances during sickness, or upon attaining a certain age, or upon death, can be readily made by an actuarial expert. To furnish these statistics the Friendly Societies Acts have since 1829 required registered societies to make, every five years, a return in prescribed form of their sickness and mortality experience for the previous five years; and other materials of the same nature have from time to time been collected and published.

An important provision in the Friendly Societies Act, 1875, is that which requires every registered society to make a return of its receipts and expenditure, funds and effects, in a prescribed form, to the registrar of friendly socie- ties every year. Particulars of the returns received will be found in the chief registrar's reports.

A still more important provision in the same Act is one which requires societies to have a valuation made once at least every five years of their assets and liabilities, including the estimated risks and contributions, and to furnish par-

ticulars thereof to the registrar in a prescribed form. The object of such valuation is to ascertain as far as can be estimated the financial position of a society,—in other words, whether the future contributions receivable, plus the money or funds in hand, will, according to the best estimate that can be formed, prove sufficient to enable the society to meet its engagements hereafter; and the valuation balance sheet, therefore, takes the following form: Valuation Balance Sheet of Friendly Society, as at (say) 31st December 1878.

Dip. Ze Or. sé To estimated present value By estimated present value of future benefits to ex-> ,, of future contributions > ,, isting members, . of existing members, », funds invested and in hand, a By balance (being deficiency) ,,

Balance (being surplus). _,,

It is confidently expected that this provision will, after it has been in operation some time, prove of enormous value, as it will in many cases have the effect of warning the members of societies, before it is too late, that certain steps are necessary to place the society in a sound financial condition, and in other cases to indicate unmistakably to the members that the society to which they belong cannot be trusted to meet its engagements in the future. (£. W. B.)

FRIENDS, Socrtety or. See QUAKERS.

FRIES, Extas Magnus (1794-1878), an eminent Swedish botanist, was born at Smaland, August 15, 1794. As his father, the pastor of the church at Femsjo, was a zealous and accomplished botanist, Fries during his walks with him early acquired an extensive knowledge of flower- ing plants ; and about the age of twelve he was led by the discovery of a remarkably brilliant Hydnwm to commence the study of the Agarics and other fungi. After attending school at Wexio, he in 1811 entered the university of Lund, where in 1814 he was elected docent of botany, and in 1824 professor. In 1834 he became professor of practical economy at Upsala, and in 1844 and 1848 he re- presented the university of that city at the Rigsdag. In 1851 he succeeded Wahlenberg as {emeritus professor of botany at Upsala, and there, on the 8th February 1878, he died, having only by a few days outlived the centenary of luis illustrious predecessor Linneus. Fries was admitted a member of the Swedish Royal Academy in 1847, and a foreign member of the Royal Society of London in 1875.

As an author on the Cryptogamia Fries occupies the first rank. He wrote Novitie Flore Suecice (1814 and 1823); Obdservationes Mycologice (1815); Flora Hollandica (1817-18); Systema Mycolo- gicum (1821-29), Systema Orbis Vegetabilis, not completed (1825); Elenchus Fungorum (1828); Lichenographia Europea (1831); Epri- cisis Systematis Mycologict

(18388; 2d ed., or Hymenomycetes Huropei, 1874); Summa Vegetabilium Scandinavie (1846) ; Sveriges dtliga och giftiga Svampar, with coloured plates (1860); Monographia Hymenomycctum Suecice (1863), with the Jcones Hymenomycetum, vol. i. (1867), and pt. i. vol. ii. (1877).

FRIES, Jacosp Friepricu (1773-1843), a distinguished post-Kantian writer on philosophy, was born at Barby, Saxony, August 23, 1773. He was educated in a com- munity of the Moravian brethren, and in their seminary was trained for theology. In 1795 he entered at the university of Leipsic, and for some years studied philosophy there and at Jena, In 1801, after having acted for atime as private tutor, he began to deliver courses of philosophical lectures at Jena. These he continued, with an interval of two years spent in travels in Germany, France, and Italy, till 1806, when he was called to Heidelberg as professor of philosophy and elementary mathematics. His philosophical position with regard to his contemporaries he had already made clear in the critical work Reinhold, Fichte, Schelling (1803), and in the more systematic treatises System der Philosophie als

evidenter Wissenschaft (1804), Wrssen, Glauben, Ahndung |

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(1805). Fries was an unusually prolific and somewhat hurried writer, and during the ten years he passed at Heidelberg he poured forth a variety of volumes, of very various value, on philosophy and theoretical physics, The most important treatise, and that by which he will always be remembered in the history of philosophy, was the Neue Kritik der Vernunft, 3 vols., 1807, an attempt to givea new foundation to the critical theory of Kant. In 1811 ap- peared his System der Logik, a very instructive work, and in 1814 Julius and Evagoras, a philosophical romance, In 1816 he was invited to Jena to fill the chair of theoretical philosophy, under which appear to have been included mathematics and physics, along with philosophy proper. In 1824 Fries was accused of democratic tendencies, and form- ally deprived of the right to deliver lectures on philosophical subjects, although he still retained his chair. He seems, however, towards the end of his life, to have resumed his philosophical teaching. He died on 10th August 1843. The most important of the many works written during his Jena professorate are the Handbuch der praktischen Philo- soplie (vol. i.,1818, and vol. ii., 1832), the

Handbuch der psychischen Anthropologie, 2 vols., 1820; Mathematische Naturphilosophie, 1822; System der Metaphysik, 1824 ; Geschichte der Philosophie, 1837 and 1840. Fries's point of view in philosophy may be described as a modified Kanti- anism. With Kant he regarded (ritzk, or the critical in- vestigation of the faculty of knowledge, as the essential preliminary to philosophy. But he differed from Kant both as regards the foundation for this criticism and as regards the metaphysical results yielded by it. Kant's analysis of knowledge had disclosed the a priort element as the neces- sary complement of the isolated a posteriori facts of experi- ence. But it did not seem to Fries that Kant had with sufficient accuracy examined the mode in which we arrive at knowledge of this a prior? element. According to him we only know these a priori principles through inner or psychical experience; they are not then to be regarded as transcendental factors of all experience, but as the necessary, constant elements discovered by us in our inner experience. They are, in fact, to Fries, as to the Scotch school, the re- siduum which resists analysis. Accordingly Fries, like the Scotch school, places psychology or analysis of conscious- ness at the foundation of philosophy, and called his criticism of knowledge an anthropological critique. It requires very little consideration to see that Fries's proposed amendment of Kantianism rests upon an altogether mistaken view of the transcendental element in knowledge. It is absurd to make the demand that what is a priori in cognition should be known by ana priori method. There is no such method. A second point in which Fries differed from Kant is the view taken as to the relation between immediate and mediate cognitions. According to Fries, the understanding is purely the faculty of proof; it is in itself void; immediate certitude is the only source of knowledge. Reason contains principles which we cannot demonstrate, but which can be deduced, and are the proper objects of belief. In this view of reason Fries approximates to Jacobi rather than to Kant. The Weue Kritik and the Psychische Anthropologie contain much that is admirable in the way of psychological analysis, but it cannot be thought that Fries has effected any real advance on the Kantian position. See Henke, J. &. Fries, 1867. FRIESLAND, or VrigsLAND, sometimes called West Friesland, to distinguish it from East Friesland in Hanover, is the most northerly province of the Netherlands, It is bounded on the 8.W., W., and N. by the Zuyder Zee and the North Sea, on the E. by the provinces of Groningen and Drenthe, and on the 8.E. by that of Overyssel. The area is 1281 English

square miles; and the population in 1875 was calculated at 317,405, being an increase since 1853 of 57,897. The chief town is Leeuwarden, a placé IX. — 99

of 27,085 inhabitants in 1876, and the province is divided into the three districts of Leeuwarden, Heerenveen, and Sneek. Other towns of importance are Harlingen, a sea- port with 11,043 inhabitants; Weststellingwerf, 13,969 ; Opsterland, 13,753; Schoterland, 12,893; Sneek, 9990 ; and Franeker, 6643, For history, &c., see FRISIANS.

FRIGATE-BIRD, the name commonly given by our siilors, on account of the swiftness of its flight, its habit of cruising about near other species and of daringly pursuing them, to a large Sea-bird'—the Fregata aquila of most ornithologists—the /regatte of French and the Labshorcado of Spanish mariners. It was placed by Linnzeus in the genus Pelecanus, and until lately its assignment to the family Pelecanide has hardly ever been doubted. Professor Mivart has, however, now declared (Z'rans. Zool. Soc., x. p. 364) that, as regards the postcranial part of its axial skele- ton, he cannot detect sufficiently good characters to unite it with that family in the group named by Professor Brandt Steganopodes. There seems to be no ground for disputing this decision so far as separating the genus Pregata from the Pelecanide goes, but systematists will probably pause before they proceed to abolish the Steyanopodes, and the result will most likely be that the Frigate-Birds will be con- sidered to form a distinct family (Fregatide) in that group. In one very remarkable way the osteology of Fregata differs from that of all other birds known. The furcula coalesces firmly at its symphysis with the carina of the sternum, and also with the coracoids at the upper,extremity of each of its rami, the auterior end uf each coracoid coalescing also with the proximal end of the scapula. Thus the only articula- tions in the whole sternal apparatus are where the coracoids meet the sternum, and the consequence is a bony framework which would be perfectly rigid did not the flexibility of the rami of the furcula permit a limited amount of motion. That this mechanism is closely related to the faculty which the bird possesses of soaring for a considerable time in the

air with scarcely a perceptible movement of the wings can hardly be doubted, but the particular way in which it works has yet to be explained.

Two species of /regata are considered to exist, though they differ in little but size and geographical distribution. The larger, /. aguila, has a wide range all round the world within the tropics, and at times passes their limits. The smaller, # minor, appears to be confined to the eastern seas, from Madagascar to the Moluccas, and south- ward to Australia, being particularly abundant in Torres Strait,—the other species, however, being found there as well. Having a spread of wing equal to a Swan's and a comparatively small body, the buoyancy of these birds is very great. It is a beautiful sight to watch one or more of them floating overhead against the deep blue sky, the long forked tail alternately opening and shutting like a pair of scissors, and the head, which is of course kept to windward, inclined from side to side, while the wings are to all appearance fixedly extended, though the breeze may be constantly varying in strength and direction. Equally fine is the contrast afforded by these birds when engaged in fishing, or, as seems more often to happen, in robbing other birds, especially Boobies, as they are fishing. Then the speed of their flight is indeed seen to advantage, as well as the marvellous suddenness with which they can change their rapid course as their victim tries to escape from their attack, Before gales Frigate-Birds are said often to fly low, and their appearance near or over land, except at their breeding-time, is supposed to portend a hurricane.2 Gene-

1 "Man-of-war-Bird" is also sometimes applied to it, and is perhaps the older name ; but it is less distinctive, some of the larger Albatrosses being so called, and, in books at least, has generally passed out of use.

2 Hence another of the names—" Hurricane-Bird'"—by which this species is occasionally known,

rally seen singly or in pairs, except when the prospect of prey induces them to congregate, they breed in large com- panies, and Mr Salvin has graphically described (Jdzs, 1864, p- 375) one of their settlements off the coast of British Honduras, which he visited in May 1862. Here they chose the highest mangrove-trees on which to build their frail nests, and seemed to prefer the leeward side. The single egg laid in each nest has a white and*

chalky shell very like that of a Cormorant's. The nestlings are clothed in pure white down, and so thickly as to resemble puff-balls. When fledged, the beak, head, neck, and belly are white, the legs and feet bluish-white, but the body is dark above. The adult females retain the white beneath, but the adult males lose it, and in both sexes at maturity the upper plum- age is of a very dark chocolate brown, nearly black, with a bright metallic gloss, while the feet in the females are pink, and black in the males—the last also acquiring a bright scarlet pouch, capable of inflation, and being percep- tible when on the wing. The habits of & minor seem wholly to resemble those of #. aquila. According to Bechstein, an example of this last species was obtained at the mouth of the Weser in January 1792, and it has hence been included by some ornithologists among European birds ! (A. N.

FRISCHLIN, Nicopemus (1547~-1590), scholar and poet, was born on the 22d of September 1547, at Balingen, Wiirtemberg, where his father was parish minister. He was educated at Tiibingen, and in 1568 was promoted to the chair of poetry and history. In 1575 for his comedy of Rebecca, which he read at Ratisbon before the emperor Maxmilian II, he was rewarded with the laureateship and with the honour of knighthood. Some time after- wards he was made a comes palatinus. In 1582 his un- guarded language and his reckless life had made it necessary that he should leave Tiibingen ; he accordingly accepted a quiet mastership at Laibach in Carniola, which he held for about two years. Shortly after his return to the university in 1584, he was threatened with a criminal prosecution on a charge of immoral conduct, to which, it was alleged, he had exposed himself some years previously, and the threat led to his withdrawal to Frankfort in 1587. Of the remaining four years of his life little is recorded. For eighteen months he taught in the Brunswick Gymnasium, and he appears also to have resided occasionally at Strasburg, Marburg, and Mainz. From the last-named city he wrote certain libellous letters, which led to his being arrested in March 1590 at the instance of the authorities of Wiirtemberg. He was imprisoned in the fortress of Hohennrach, near Reutlingen, where, on the night of the 29th of November 1590, he was killed by a fall in attempting to let himself down from the window of his cell. His prolific and versatile genius pro- duced a great variety of works, which entitle him to some rank both among poets and among scholars. In lis Latin verse he has often successfully imitated the classical models ; his comedies are not without freshness and

vivacity; and some of his versions and commentaries, particularly those on the Georgics and Bucolics of Virgil, though now well-nigh forgotten, were important contributions to the scholarship of his time.

No collected edition of his works has ever been published; to enumerate them exhaustively would be almost impossible. Among those most widely known may be mentioned the Hcbreis, a Latin epic based on the Scripture history of the Jews; the Hlegiaca, in twenty-two books; the Opera Scenica, consisting of six comedies and two tragedies; the Grammatica Latina; the versions of Callimachus and Aristophanes; and the commentaries on Persius

and Virgil. See the monograph of Strauss (Leben und Schriften des Dichters und Philologen Frischlen, 1855).

3 Capt. Taylor, however, found their nests as well on low bushes of the same tree in the Bay of Fonseca (Jbis, 1859, pp. 150-152).

FRI—FRI

FRISI, Paoto (1728-1784), a celebrated mathematician and astronomer, was born at Milan, April 13, 1728. At the age of fifteen he entered the monastery of the Barnabite friars, where, by self-instruction, he acquired a considerable knowledge of geometry. Under Professor Olivetano, at the university of Padua, he continued his mathematical studies. After a time he was sent to Lodi to give lectures on philo- sophy. When twenty-une years of age he composed a treatise onthe figure of the earth, and the reputation which he soon acquired led to his appointment by the king of Sardinia to the professorship of philosophy in the college of Casale. His friendship with Radicati, a man of liberal opinions, occasioned Frisi's removal by his clerical superiors to Novara, where he was compelled to do duty as a preacher. In 1753 he was elected a corresponding member of the Paris Academy of Sciences, and shortly afterwards he became professor of philosophy in the Barnabite College of St Alexander at Milan. An acrimonious attack by a young Jesuit, about this time, upon his dissertation on the figure of the earth laid the foundation of his animosity against the Jesuits, with whose enemies, including D'Alembert, Condorcet, and other Encyclopedists, he later closely associated himself. In 1756 he was

appointed by Leopold, grand-duke of Tuscany, to the professorship of mathematics in the university of Padua, a post which he held for eight years. He was made in 1757 an associate of the Imperial Academy of St Petersburg, and a foreign member of the Royal Society of London, and in 1758 a member of the Academy of Berlin, in 1766 of that of Stockholm, and in 1770 of the Academies of Copenhagen and of Bern. From several European crowned heads he received, at various times, marks of special distinction, and the empress Maria Theresa granted him a yearly pension of 100 sequins (£50). In 1764 he was created professor of mathematics in the Palatine, Schools at Milan, and obtained from Pope Pius VI. release from ecclesiastical jurisdiction, and authority to become a secular priest. In 1766 he visited France and England, and in 1768 Vienna, and thus formed the acquaintance of the leading men of science of his day. Frisi was in 1777 made director of a school of architecture at Milan. His knowledge of hydrau- lics caused him to be frequently consulted with respect to the management of canals and other water-courses in various parts of Europe. It was through his means that lightning-conductors were first introduced into Italy for the protection of buildings. He was a man not only of exten- sive learning, but of wide views and fearless spirit, and by lis lectures did much to dispel the popular superstitions of his fellow-countrymen concerning magic and witchcraft. He died November 22, 1784. He wrote—

Disquisitio mathematica in causam physicam figure et magnitu- dinis terre, Milan, 1751; Saggio della morale filosofia, Lugano, 1753; Nova clectricitatis theoria, Milan, 1755; Disscrtatio de motu diurno terre, Pisa, 1758; Dissertationes varie, 2 vols. 4to, Lucca, 1759, 1761; Del modo di regolarc 4 fiwmi e 7 torrentt, Lucca, 1762; Cosmographia physica et mathematica, Milan, 1774, 1775, 2 vols. 4to, his chief work; Dell architextura, statica e idraulica, Milan, 1777; and other treatises.

See Verri, Memorie… del signor dom Paolo Frisi, Milan, 1787, 4to; Fabbroni, Lloqj d'illustri Italiani Atti di Milano, vol. ii.

FRISIANS,—in classical Latin Frisiz, in medieval Latin Frisones or Frisiones, and on inscriptions of the later empire sometimes Friscevones,—a people of Teutonic stock, who, at their first appearance in history, are found in possession of the same district of Europe which they still, at least

partially, occupy. So far as can be judged they have never been of an aggressive disposition, and it is not improbable that at one time they may have possessed a much wider territory than history usually assigns them. The bound- aries of Frisia proper are the Scheldt towards the west, and the Weser towards the east, and it never extended far inland

from the coast of the German Ocean. But there is also a district of Schleswig in Denmark, extending along the west coast from the Hider northwards to Téndern, in which the common language still gives evidence of a Frisian popula- tion ; the same may be said of the neighbouring islands of For, Silt, Heligoland, &c.; and it is no improbable supposi- tion that not only the Ditmarsch district to the south of the Eider, but also the whole maritime country westward to the Weser, was at an earlier period in the hands of distinctly Frisian tribes. If the presence of geographical names end- ing in wm, the Frisian equivalent to the German heom aud the Saxon ham, may be taken as sufficient evidence of Frisian occupation, Dr Latham, in his notes to the Germania of Tacitus, has elaborately shown that there have been Frisian settlements as far north in Denmark as the Lijmfiord, and as far east as the islands of Funen and Zealand. By the older historians of Denmark and the countries of Lower Germany, the Frisian district in Denmark is frequently called Frisia Minor or Lesser Frisia, which, however, must not be confounded with the unex- plained distinction which Tacitus makes between Frisii Majores and Frisii Minores.

The history of the Frisians, in spite of the labours of a few investigators like Wiarda and Richthofen, has hitherto been left in many respects in a very fragmentary and un- trustworthy condition; and rash assertions of uncritical chroniclers have undisputed currency. For this neglect the principal reason is undoubtedly the fact that the people have, at least in modern times, displayed no strong political individuality, but have allowed themselves peacefully to be merged in more powerful nationalities. The reader who wishes may find the legendary history of the Frisian heroes traced from the 4th century B.c. in Furmius's Annaliwmn Phrisicorum Libri Tres, Franeker, 1699, or in the quaintly- illustrated volumes of Westphal's Scriptores rerum Dana- carum, which comprise Petrus Sax De praecipuis

rebus gestis Frisiorum septentrionalium breviter descriptis et iconice adumbratis libri sex; Suffridus Petri De antig. et org. Frisiorum; Antonins Heimreich, Supplementa ad Chronicon Frisice septentr., dc.

The Frisians were so far rendered tributary by Drusus that they continued to pay to the Romans a tax of ox hides until the foolish exactions of Olennius, who demanded that all the hides should be of a certain superlative quality, drove them to revolt in28 a.p. They defeated the Roman forces under Lucius Apronius, and though Corbulo obtained hostages for their future loyalty, and " gave them a senate, magistrates, and a constitution" (Tacitus, Ann. xi. 20), their subjugation was little more than nominal. About 57 A.D. a body of Frisians took possession of lands reserved for the Roman soldiers; and, instead of removing at the threat of the Roman governor, they sent their chiefs to Rome to obtain imperial sanction for their occupancy. In the 13th book of his Annals, Tacitus tells how the chiefs, Verritus and Malorix, as he calls them, excited the amusement and admiration of the people by taking, unasked, their seat among the senators in Pompey's theatre, when they heard that strangers from nations distinguished by their bravery and friendship to the Romans were advanced to that honourable position. Nero gave them both the Roman franchise, but refused to sanction the presumption of their tribe, who were afterwards expelled from the district which they had sought to colonize.

It is not till the new power of the Franks was begin- ning to lay the foundations of its empire that the Frisians again come prominently into notice; but it appears probable that in the meantime they had shared with their neighbours, the Angles and the Saxons, in the con- quest of England and Scotland, though to what extent it is impossible to ascertain. The Frankish king, Dagobert

I. (622-638), sought to secure a footing among them by erecting a mission church at Utrecht on the Frisian frontiers, but the Frisians captured the place and destroyed the church. The preaching of Amandus and Eligius had little effect, and the honour of being the first success- ful missionary among the Frisians was left to Wilfrid of York, who in 677-6738 was hospitably received by the king Aldegild (Adgillus or Aldgisl). Under Alde- gild's

successor Radbod a persecution of the new faith ensued, and though Radbod was driven from West Friesland by King Pippin, after the battle of Dorstadt in 689, he maintained his independence in Eastern Frisia, and Christianity was safe only as far as the wavering frontier of the Franks extended. On Pippin's death, Radbod not only recovered his western territory, but sailed up the Rhine as far as Cologne, and defeated Charles Martel. His successor, Aldegild I[., was again driven eastward; thte western districts fell finally into the power of the Franks ; and Willibrord, the missionary, who had begun his labours in the country about 700, obtained a permanent see at Utrecht. The last independent prince of the Frisians, Poppo, was defeated by Charles Martel in 754, and Charlemagne still further extended the Frankish authority. At the same time he granted the Frisians important priv- ileges, gave them the title of freemen, and allowed them to 'choose their own podestat (potestas), who should govern them under the protection of the empire. About this time the country of the Frisians was divided into tliree distinct districts :—Western Frisia, stretching from the Sincfal to the Fly or Flevum, that is, from the modern Zwin (a branch of the Scheldt northward of Bruges) to the Meuse ; Middle Frisia, from the Fly to the Laubach, that is, from the Meuse to the Zuyder Zee; and Eastern Frisia, from the Zuyder Zee to the Weser. At the treaty of Verdun (843) Frisia went with Lotharingia; at the treaty of Mersen (870) the district between the Laubach and the Weser was assigned to the kingdom of the Eastern Franks, while the rest, with Lotharingia, passed to the kingdom of the Western Franks; in 880 the whole country was again united with Germany; and in 911, when Lotharingia recognized Charles, the king of the West, Frisia adhered to Conrad, the king of the East. The history of West Frisia gradually loses itself in that of the bishopric of Utrecht and the conntship of Holland,—the first count of Holland, Thierry L, being the son of Gerulph, count of Frisia, and practically continuing the Frisian line. In 1248 William of Holland, having become emperor, re- stored to the Frisians in his country their ancient liberties in reward for the assistance they had rendered him in the siege of Aix-la-Chapelle; but in 1254 they revolted, and William lost his life in the contest which ensued. William IV. received a new donation of West Frisia in 1345. Meanwhile, the rest of the Frisians in the more eastern dis- tricts maintained their independence, and for a long time governed themselves after a very simple republican fashion. Each of the seven confederated Frisian maritime states

— “Sieben Friesischen Seelande ”—had its ownadministration, and consisted of a number of locally independent districts, For matters of general concern there was an annual assembly at the Upstalsbom, or “Tree of the Superior Court,” near ‘Aurich, According to Okko Leding, who in 1878 published at Emden an interesting study on Die Fretheit der Friesen om Mittelalter und ihr Bund mit den Versammlungen bei _Upstalsbom, it appears that these assemblies were allowed to fall into desuetude in the first half of the 13th century, were resumed from 1323 to 1327, anew discontinued, and again resumed in 1361. The counts disappear in East Frisia about the end of the 11th century, and in Middle Frisia after 1233. Though in religious matters nominally subject to the bishopric of Bremen, it was not till the crusade of

1234, and the famous defeat of the Stedingers (a people of the Weser marches) m the battle of Altenesch or Oldenesch, that the Frisians really recognized the authority of the Romish Church. In the course of the 14th century the whole country was in a state of anarchy; petty lordships

sprang into existence, the interests of the comnion weal .

were forgotten or disregarded, and district carried on hostilities against district. Thus the Fetkoopers or Fat- mongers, as they were called, of Ostergo, had endless feuds with the Schieringers or Eelfishers of Westergo.

This state of matters favoured the attempts of the counts of Holland to push their conquests further, but the main body of the Frisians were still independent when the countship of Holland passed into the hands of Philip the Good of Burgundy. Philip laid claim to the whole country, but the people appealed to the protection of the empire, and Frederick III. in August 1457 recognized their direct dependence on the empire, and called on Philip to bring forward formal proof of his rights. Philip’s successor, Charles the Rash, summoned an assembly of notables at Enckhuysen in 1469, in order to secure their homage ; but the conference was without result, and the duke’s attention was soon absorbed by other and more important affairs. In 1498 Maximilian detached the country between the Laubach and the Fly from the empire, and gave it as a fief to Albert of Saxony, but it was the Schieringers alone (the name had by tls time become the title of the popular faction) who submitted uncomplainingly to the

arrangement, and the Fetkoopers, or faction of the nobility, had to be put down by force of arms, This the duke did with the utmost severity, and his successors carried out lis despotic policy with only too faithful consistency.

In Eastern Frisia the anarchy was brought to a close by tle formation of a confederation established in 1430, and the election of Edzard Cirksena to the office of president. Ulrich, the successor of Edzard, was made count of the country between the Ems and the Weser by the emperor Frederick III. in 1454. In the early part of the 16th century the Reformation was introduced by Edzard I., who patronized the preaching of Meister Jérgen von der Diire, or Magister Aportanus, as he was called in Latin. Under the Countess Anna, who ruled during the minority of her son Edzard II., the conntship became, mainly through the agency of John a Lasco, the seat of a very flourishing Protestant church, and the refuge of the persecuted of many lands. Edzard II. proved an able ruler, published a body of laws for his people in 1515, introduced primogeni- ture into his family, extended his authority over Harlinger- land and Jever, and was appointed by Charles V. governor of Groningen. His successor, Edzard III., was made a prince of the empire by Ferdinand III. in 1654. By the death of Charles Edzard, in 1744, the male line of the dynasty came to an end, and the king of Prussia took pos- session of the countship, After various vicissitudes, it was ceded to Hanover, in 1815.

The Frisian language is a member of the Low German branch of the Teutonic, and presents special interest to the English philologist as the nearest of all extant forms to the Saxon basis of his own tongue. It is still spoken in the country districts of the present province of West Friesland; in a much more Germanized con- dition it still exists in Saterland, in East Friesland ; in strangely differentiated dialects it holds its own in many of the islands along the coast; and, in spite of the en- croachments of Low German on the one hand, and Danish on the other, it survives in the country between Husum and Téndern. Among its peculiarities may be mentioned the dropping of the final », which is such a favourite termination in German (thuseven ma for man, as in Halbertsma, the proper name); the use of sk for the

German sch and English sh, and of ¢ for the German £; ‘and, still more remarkable, the modification of & and g into ts when these letters precede ¢ or 2, as in tserke for kerke, z.c., kirk, church, The explanition of this last peculiarity may perhaps be found in the contact of the Frisian with Slavonic languages, in which the modification is sufficiently common.

A brief sketch of Frisian grammar was published along with the poems of Gysbert Japicx ; but the first separate treatment of the older forms of the language was by Rask, whose Frisisk Sproglare (Copenhagen, 1825; German translation by Buss, Freiburg, 1834) brought him into controversy with Grimm, who, in his Deutschen Grammatik, devoted some attention to the same subject. Moritz Heyne has also given a good treatment of Frisian in his Kurze Laut- wnd Flexionslehre der Aligermanischen Sprachstimme, 1874. Richthofen’s Altfriesisches Worterbuch, Gottingen, 1840, practically supplanted the older work of Wiarda (Aurich, 1786), and its position has not been affected by the publication of Haan Hattema’s Idioticon Frisicwm, Leeuwarden, 1874. Outzen’s Glossarium der Friesischen Sprache (unfortunately a posthumous publication from very illegible manuscripts), Copenhagen, 1837, deals mainly with North Frisian. For West Frisian we have the posthumous and incomplete Lexicon Frisicum (A-Feeor), by Justus Halbertsma, The Hague, 1874; and for East Frisian lexicography we have materials in Ehrentraut’s Friesisches Archiv, Oldenburg, 1847-54, 2 vols., Posthumus and Halbertsma’s Onze reis naar Sageltesland, Franeker, 1836, and J. Cadovius Miiller’s Memoriale lingua frisica, written in the early part of the 18th century, and published by Dr Kiikel- han, 1875. J. ten Doornkaat Koolman began in 1877 a Worter- buch der Ostfricsisehen Sprache, which, along with much irrelevant miatter, contains valuable contributions to the subject, The Ostfriesisches Worterbueh, by Sturenburg (1857), is a dictionary, not of Frisian, but of the Low German spoken in East Friesland, which has incorporated comparatively few Frisian words. A list of Frisian personal names forms an appendix to Outzen’s Glossarium ; and Bernhard Brons, in his Friesische Nanen und Mitthetlungen Dariiber, Emden, 1877, furnishes lists of East, West, and North Frisian Christian names, and a collection of Frisian family names, with the dates at which they make their first appearance in church books or other historical documents.

For the older forms of the language the sources are unfortunately scanty: no great literary monument like that of the Heliand or the Nibelunglied has been preserved, and the investigator has mainly to depend on the various legal codes or collections which were formed in the course of the 14th and 15th centuries, and have been pub- lished by Richthofen, Friesische Rechtsquellen, Berlin, 1840. The great Lex Frisionwm is composed in Latin, and only contains a few Frisian terms, of comparatively small linguistic importance. The date of its recension is also a matter of conjecture, as there is no contemporary evidence either internal or external, By the older investigators it was assigned a high antiquity; but. the more modern are for the most part of opinion that it is not earlier than the reign of Charlemagne. Haan Hettema in his Oude Friesche Wetten gives 802-804 as the probable date; while Richthofen thinks there are three portions, the first composed for use in Middle Frisia in the reign of Charles Martel or of Pippin, another for use in all Frisia, com- posed after Charlemagne's conquest in 785, and a third or supple- mentary and emendatory portion composed in 802, The first edition of the Lex Frisionum was published by B. J. Herold in his Originuin ac Germanicarum Antiquitatwm libri, Basel, 1557, but he gives no indication of the source of the manuscripts which he employed. Since his day there have been no fewer than than 13 editions—Lindenbrog, Codex legum Antiquarum, Frankfort, 1613 , Sibrand Siccama, Lex Frisionum, Franeker, 1617; Schotanus, Beschryvinge van de Heerlyckheit van Frieslandt, 1664; Gartner, Saxonum leges tres: accessit Lex Fris., Leipsic, 1730; Georgisch, Corpus juris Germanici, Halle, 1738; Schwartzenberg, Groot Placaat en Charterboek van Vriesland, Leeuwarden, 1768; Canciani, Barbarorum leges antique, Venice, 1781; Walter, Corpus juris Ger- man., Berlin, 1824; Gaupp, Lex Fris., Breslau, 1882 ; Richthofen, Friesische Rechtsquclicn, Berlin, 1840; De Wall, Lex Fris., &e., Amsterdam, 1850; Hettema, Oude Fr, Wetten, Leeuwarden, 1851; and, finally, Richthofen in Pertz's Mon. Germanic hist., vol. xv., Hanover, 1868. Though it has been supposed that Lindenbrog and Siccama may have had access to some manuscript authority in addi- tion to Herold's recension, there is no proof that such was the case; and the text still remains to all intents in the same state as when Herold left it. Some investigators have, owing to this absence of original evidence, even cast doubts on the authenticity of the code, but a comparison of the laws with undoubtedly genuine Frisian remains authorizes its acceptance. 'I am convinced," says Richt- hofen, " that no

man in the time of Herold, not to say in our ow® time, could have devised such a forgery as the Heroldian text. Among the minor collections of Frisian laws in Frisian, Low Ger- ian and Latin are the 'seventeen general acts or Kéiren," dating from the close of the 12th century, according to Richthofen, but of

much earlier origin according to Leding—the Upstalsbom laws of 1328, the local laws of Riistring, and of the Brockmannen or inhabitants of Brockmerland, published by Wiarda; the " Emsiger Domen," or Emsig decisions, published by Hettema, Leeuwarden, 1880; the Fivelgo laws, 'published by Hettema, Dokkum, 1841; and the Hunsingo Kiiren in the 2d volume of the Groningen trans- actions of the society " pro excolendo jure patrio," 1778. The title chosen by Wiarda for the laws of Riistring—the

' contains secular, and especially humorous, poems, fifty of the Psalms

of David and other religious pieces, a number of letters, one or two prose essays, and fragments of the " Customs" of Leeuwarden, A popular comedy called Waatze Gribbert's Brilloft, or Gribbert's Bridal, dates from the beginning of the 18th century. The first edition appeared in 1812, at Leeuwarden, and the second in 1820, and there have been several since. Among the writers who have published in West Frisian during the 19th century, it is sufficient to mention Salverda Posthumus, J, H. Halbertsma, Deketh, Windsma, Van der Veen, and Dykstra. A society for the study of Frisian was founded in 1829 at Franeker—" Friesch genootschap voor geschied- oudheid-en taalkunde," —and since 1852 it has published a journal called De vrije Fries. Other Frisian periodicals are Forjit my net, 'Forget me not;" the Swanne-blummen, a Leeuwarden annual; and De Byekocr. In North Frisian the most valuable literary monument is De gidishals, i.c., the Geizhals, or Curmudgeon, a comedy, composed by J, P. Huusen, in the Silt dialect. The minor remains have becn collected by De Vries, in his Nordfriesische Sprache nach der Moringer Mundart, Leyden, 1860; and by Johansen in Die Nordfriesische Sprache nach der Féhringer und Amrumer Mundart, Kiel, 1862.

There is one book which, more than any other, has attracted the attention of other than Frisian scholars. If the Oera Linda book, as it is called, could be accepted as genuine, it would be, after Homer and Hesiod, the oldest document of European origin ; but unfortunately it must be recognized as nothing more than a brilliant forgery. The first part of the manuscript, the book of the tollowers of Adela, professes to have been copied in 1256 from an ancient original, and gives an account of Neptune, Minerva, Minos, and other personages of classical antiquity, which would make them out to be of Frisian origin. According to J. Beckering Vinckers— who published De Onechtheid van het Ocra Linda b6k aangetoond uit de waartanl waarin het is gesehreven, in 1875, and Wie heeft het Ocra Linda Bock geschreven in 1877—the real author is Cornelis Over de Linden, a ship-carpenter in the Royal docks at Den Helder, who was born in 1811, and died in 1873, and who appears to have forged the document for the purpose of giving importance to his invectives against the church, and of shedding dignity on his family, which is traced by the book back for about two thousand years.

Besides the works indicated above the following may be men- tioned :— Ubbo Emmius, Rerwm Fristearumn historta, Leyden, 1616; Pirius Winsemius, Chronique… . van Vricsland, ¥raneker, 1622; Wiarda, Ostfrics. Geschichte, vols. 1-9, Aurich, 1791-1818, vol. 10, Bremen, 1817; Clement, Lebens-w. Letdensgeschiehte Frieslands der Friesen, Kiel, 1845; Suur, Gesehichtc dcr Hauptlinge Ostfrieslands, Kanden, 1846 ; Klopp, G@esch. Ostfrieslands, Weener, 1868-69 ; Kriedlinder, Ostfries. Urkundenbuch, Emden, 1874.

FRITH or FRYTH, Joun (cir. 1503-1533), an eminent pioneer of the Reformation in England, was born about the beginning of the 16th century at Westerham, Kent, where his father kept an inn. He was educated at Eton, and afterwards at King's College, Cambridge, where Gardiner, who subsequently became bishop of Winchester, was his tutor. Immediately after taking his B.A. degree, he trans- ferred his residence (December 1525) to the newly founded college of St Frideswide or Cardinal College (now Christ Church), Oxford, whither, along with other young men of distinguished talent, he had been invited by Wolsey. At

Oxford the sympathetic interest which he showed in the

Reformation movement in Germany soon caused him to be suspected as a heretic, and led to his imprisonment for some mouths. On being at the instance of Wolsey released from confinement, towards the close of 1526 or early in 1527, he fled to the Continent, where he appears to have resided chiefly at the newly founded Protestant university of Marburg, and to have been associated with Tyndal in many of the literary Jabours of the latter. At Marburg he became acquainted with several scholars and Reformers of note, and particularly with the famous Patrick Hamilton. Frith's first publication in fact was a translation of Hamilton's Places, made shortly after the martyrdom of their author; and soon afterwards the Revelation of Anti- christ, a translation from the German, appeared, along with A Pistle to the Christen Reader, by " Richard Brightwall " (supposed to be Frith), and An Antithesis wherein are com- pared togeder Christes Actes and our Holye Father the Popes, dated 'at Malborow in the lande of Hesse," 12th July 1529, His Disputacyon of Purgatorye, a treatise in three books, against Rastell, Sir T. More, and Fisher (bishop of Rochester) respectively, was published at the same place in 1531. In 1532, probably in July or August, he ventured back to England, apparently on some business to which he and Tyndal attached importance in connexion with the prior of Reading. Warrants for his arrest were almost imme- diately issued at the instance of Sir T. More, then lord chan- cellor. For some weeks Frith successfully evaded pursuit, but ultimately, in Decensber, he fell into the hands of the authorities at Milton Shore in Essex, as he was on the point of making his escape to Flanders. 'he rigour of his im- prisonment in the Tower was somewhat abated when Sir T. Audley succeeded to the chancellorship, and it was under- stood that both Cromwell and Cranmer were disposed to show great leniency. But the treacherous circulation of a manuscript "lytle treatise" on the sacraments, which Frith had written for the information of a friend, and without any view to publication, served further to excite the hos- tility of his enemies, and in a lent sermon preached against the "sacramentaries " before the king, special reference was made to some at that time in the Tower, "so bold as to write in defence of that heresy," and who seemed to be put there "rather for safeguard than for punishment." On this instigation, Henry ordered that Frith should be examined ; the result of a regular trial which followed was that he was found guilty of having

denied, with regard to the doctrines of purgatory and of transubstantiation, that they were necessary articles of faith. On the 23d of June 1533 he was handed over to the secular arm, and at Smith- field on the 4th of July following he was burnt at the stake. During his captivity he had been more than usually busy with his pen, and his writings belonging to this period in- clude, besides several letters of interest, a controversial work on the eucharist in reply to what Sir T. More had written against Frith's "lytle treatise"; also two tracts en- titled respectively A Mirror or Glass to know thyself, and A Mirror or Looking-glass wherein you may behold the Sacrament of Baptism. Apart from his ability, which seems to have been regarded by all his contemporaries as extra- ordinary, his acquirements, his piety, his early and tragic death, Frith is an interesting and so far important figure in English ecclesiastical history as having been the first to maintain and defend that doctrine regarding the sacrament of Christ's body and blood which ultimately came to be incorporated in the English communion oftice. Twenty- three years after Frith's death as a martyr to the doctrine of that office, that " Christ's natural body and blood are in Heaven, not here," Cranmer, who had been one of his judges, went to the stake for the same belief. Within three years more, it had become the publicly professed faith of the entire English nation.

See the Acts and Monuments of Foxe; the collected edition of the Works of Tyndal, Frith, and Barnes, by Foxe (1573); The IVorks of the English Reformers, edited by Russell, vol. iii.; British Re- formers, vol. viii.; Fathers of the English Church, vol. i.; Ander- son's Annals of the English Bible, vol. iii.

FRITZLAR, a town formerly of Electoral Hesse and now of Prussia, at the head of a circle in the district of Cassel, about 16 miles S.S.W. of Cassel, on the left bank of the Eder, a left-hand sub-tributary of the Weser. It is an old-fashioned place still surrounded with watchtowers, and it possesses a large number of churches, an Ursuline nunnery, and an old Franciscan monastery, now partly used as a Protestant church and partly as a poorhouse. Its inhabi- tants, who according to the census of 1875 numbered 2965, are mainly engaged in agriculture, but also manufacture considerable quantities of earthenware. As early as 732 Boniface, the apostle of Germany, established the church of St Peter's and a small Benedictine

monastery at Frideslar, “the quiet home” or “abode of peace.” Before long the school connected with the monastery became famous, and among its earlier scholars it numbered Sturm, abbot of Fulda, and Megingoz, bishop of Wiirzburg. When Boni- face found himself unable to continue the supervision of the society himself, he entrusted the office to Wigbert of Glastonbury, who thus became the first abbot of Fritzlar. In 774 the little settlement was taken and burnt by the Saxons; but it evidently soon recovered from the blow. For a short time after 786 it was the seat of the bishopric of Buraburg, or Biirberge, which had been founded by Boniface in 741. At the diet of Fritzlar in 919 Henry I. was elected by the Franks and Saxons. In the beginning of the 13th century the village received municipal rights ; in 1232 it was captured and burned by the landgrave, Conrad of Thuringia, and his allies; in 1631 it was taken by storm by William of Hesse ; in 1760 it was successfully defended by General Luckner against the French; and in 1761 it was occupied by the French and unsuccessfully bombarded by the allies. As a principality Fritzlar con- tinued subject to the archbishopric of Mainz till 1802, when it was incorporated with Hesse. From 1807 to 1814 it belonged to the kingdom of Westphalia; and in 1866 it passed with Hesse to Prussia.

FRIULI (in Italian, Friwd; in French, Priow ; in Ger- man, #7aul ; and in the local dialect, Furlanet), a district at thehead of the Adriatic,at present divided between Italy and Austria, the Italian portion being included in the province of Udine, and the Austrian comprising the countship of Gortz and Gradiska and the so-called Idrian district. In the north and east it is occupied by portions of the Julian and Carnian Alps, while the south is an alluvial plain richly watered by the Isonzo, the Tagliamento, and many lesser streams which, although of small volume during the dry season, come down in enormous floods after rain or thaw. The inhabitants known as Furlanians are probably in the main Latinized Celts, largely mingled with Italians on the one hand and Slovenians on the other. They speak a language much more akin to Latin than even Italian; details about which will be found in Pirona’s Adtenenze della lingua friulana date per chiosa ad una iscrizione del 1103, Udine, 1859, and Vocabulario friulino, Venice, 1869.

Friuli derives its name from the Roman town of Forum Julti, or Forojulium, which is said by Paulus Diaconus to have been founded by Julius Cesar. In the 2d century B.C. the district was subjugated by the Romans, and became part of Gallia Transpadana. During the Roman period, besides Forum Julii, its principal towns were Concordia, Aquileia, Vedinium, and Neria. On the con- quest of the country by the Lombards it was made one of their thirty-six duchies, the capital being Forum Julii or, as they called it, Civitas Austriz. It is needless to re- peat the list of dukes of the Lombard line, from Gisulf to

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Rodgaud, who fell a victim to his opposition to Charlemagne; their names and exploits may be read in Paulus Diaconus. The discovery, however, of Gisulf's grave at Cividale, in 1874, is interesting as proof of the historian's authenticity. Charlemagne naturally filled Rodgaud's place with one of his own followers, and the frontier position of Friuli gave the new line of counts, dukes, or margraves (for they are variously designated) the opportunity of acquiring import- ance by exploits against the Bulgarians, Slovenians, and other hostile peoples to the east. In the 11th century the ducal rights over the greater part of Friuli were bestowed by the emperor on the archbishop of Aquileia; but towards the close of the 14th century the nobles called in the assistance of Venice, which, after defeating the archbishop, afforded a new illustration of A%sop's well-known fable, by securing possession of the country for itself. The eastern part of Friuli was held by the counts of Gortz till 1500, when on the failure of their line it was appropriated by Maximilian I. By the peace of Campo Formio (1797) the Venetian district also came to Austria, and on the formation of the Napoleonic kingdom of Italy in 1805, the department of Passariano was made to include the whole of Venetian and part of Austrian Friuli, and a few years later the rest was added to the Illyrian provinces. The title of duke of Friuli was borne by Marshal Duroc. In 1814 the whole country was recovered by the emperor

of Austria, who himself assumed the ducal title and |

coat of arms; and it was not till 1866 that the Venetian portion was again ceded to Italy by the peace of Nikolsburg.

See H. Palladius, Rerum Foro-Juliensium Libri XTT., Udine, 1659 ; Palladio degli Olivi, Historia della provincia del Friuli, Udine,

1660; Memorie della geografia antica del Friuli, Udine, 1775-1778; |

Gio. Lirati, Notizie delle Cose del Friuli, Udine, 1776-1777 ; Bianchi, Documenti per la storia del Friuli, 1817-1332, Udine, 1844-45, 3 vols., and his Documenta historica Forojuliensia scewli XIII, Vienna, 1861; Czcernig " Ueber Friuli, seine Geschichte, Sprache, und Alterthiimer," in the Sitzwngsberichte der philos.-hist. Classe, Vienna, vol. x., 1853; EKoscolo, Relatione della patria del Friuli, Venice, 1856.

FROBEN, Joannzs (Latinized name /robenius),aGerman printer and scholar, was born at Hammelburg in Franconia about 1460. After completing his university career with great distinction at Basel, he established a printing office in that city about the year 1491, and was the first German who brought the art to anything like perfection. He was on inti- imate terms of friendship with Erasmus, who not only had his,own works printed by him, but superintended Frobenius's editions of St Jerome, St Cyprian, Tertullian, Hilary of Poitiers, and St Ambrose. It was part of Frobenius's plau to have printed also editions of the Greek Fathers. He did not live to carry out this project, but it was very creditably executed by his son Jerome and his son-in-law Bisschop or Episcopius. Frobenius died in 1527, in consequence of an accident which had befallen him some years before. An extant letter of Erasmus, written in the year of Frobenius's death, gives an epitome of his life and an estimate of his character ; and in it Erasmus mentions that his grief for the death of his friend was far more poignant than that which he had felt for the loss of his own brother. The epistle concludes with an epitaph in Greek and Latin.

FROBISHER, Str Martin (c. 1535-1594), English navigator aud explorer, was the fourth child of Bernard Frobisher, and was born, it is usually stated, at Doncaster, but more probably at Altofts in the parish of Normanton, Yorkshire, some time between 1530 and 1540. The family came originally from North Wales. Martin was sent to London to his mother's brother, Sir John York, and in 1554 went with a small fleet of merchant ships to Guinea under Admiral John Lock. We next hear of hira in 1565 as

Captain Martin Frobisher, and again in 1571 as superin- tending at Plymouth the building of a ship to be employed

against the Irish. As early as 1560 or 1561 Frobisher had conceived the idea of discovering a north-west passage to Cathay, a short route to which was the motive of most of the Arctic voyages undertaken at that period and for long after. For years he schemed and plotted, and solicited in all quarters, from the court downwards, to obtain means to carry his favourite project into execution ; and it was only in 1576 that, mainly by help of the earl of Warwick, he was put in command of two tiny barks, the ‘ Gabriel” and ‘“‘ Michael,” mere cockle shells of about 20 tons each, and a pinnace of 10 tons, with an aggregate crew of 35. On June 7 Frobisher left Blackwall, and having received a good word from Queen Elizabeth at Greenwich, the expedition, if we may apply to it so considerable a term, sailed north- wards to the Shetland Islands. Stormy weather had been met with, in which the pinnace was lost, and sometime after the “ Michael” deserted. After passing Greenland and being nearly wrecked, the “ Gabriel” reached the coast of Labrador on July 28. Some days later Hall’s Island, at the routh of Frobisher Bay, was reached, and a landing effected. Among the things hastily brought away by the men was some ‘black earth,” which played an important part in connexion with Frobisher’s further career. Sailing up Frobisher Bay, then thought to be a strait, they reached Butcher’s Island on August 18. Here some natives were met with, and intercourse carried on with them for some days, the result being that five of Frobisher’s men were decoyed and captured, and never more seen. After vainly trying to get back his men, Frobisher turned homewards, and reached London on October 9. It seemed as if nothing more was to come of this expedition, when it was noised abroad that the apparently valueless “ black earth” was really a lump of gold ore. It is difficult to say how this rumour arose, and whether there was any truth in it, or whether Frobisher was a party to a deception, in order to obtain meaus to carry out the great idea of his life. The story, at any rate, was so far successful; the greatest en- thusiasm was manifested by the court and the commercial and speculating world of the time; and next year a much more important expedition than the former was fitted out, the queen lending Frobisher from the royal navy a

ship of 200 tons. A Cathay company was established, with a charter from the crown, giving the company the sole right of sailing in every direction but the east; Frobisher was appointed high adiniral of all lands and waters that might be discovered by him. The queen her- self subscribed £1000, and the rest required was soon forthcoming. Ou May 26, 1577, the expedition, which, besides the royal ship, the "Aid" of 200 tons, consisted of the "Gabriel" and "Michael" of the previous year, with boats and pinnaces and an aggregate complement of 120 men, including miners, refiners, &c., left Blackwall, and sailing by the north of Scotland, arrived at Greenland early in July. Hiall's Island was reached on the 18th, and though no more "black earth" was found there, abundance of it was found on other islands, and the ships well loaded with it. The country around, under the name of Meta Incognita, was solemnly taken possession of in the yueen's name. Several weeks were spent in Frobisher Bay collecting ore, but very little was done in the way of discovery. There was much parleying and some skirmish- ing with the natives, and earnest but futile attempts made on the part of Frobisher to recover the men captured the previous year. The return was begun ou August 22, and the "'Aid" reached Milford Haven on September 20; the "Gabriel" and " Michael," having separated, arrived later at Bristol and Yarmouth. Frobisher was received and thanked by the queen at Windsor. Great preparations were made and considerable expense incurred for the assay- ing of the great quantity of "ore" brought home, in the

testing of which the queen manifested a strong personal interest. This took up much time, and led to considerable dispute among the various parties interested. Meantime the faith of the queen and others remained strong in thie productiveness of Meta Incognita, and it was resolved to send out a larger expedition than ever, with all neces- saries for the establishment of a colony of 100 men. 'The queen herself contributed two ships of 400 and 200 tons, manned with 150 men, and carrying 120 pioneers. Be- sides these the fleet contained other 13 vessels of various sizes, carrying other 250 mien, and the most elaborate and minute instructions were drawn up for the conduct of the expedition. Frobisher was again received by the queen at Greenwich, and her Majesty threw a fine chain of gold around his neck. On

May 31 the expedition left Harwich, and sailing by the English Channel, reached Greenland on June 19. This time Frobisher and some of his men managed to land, 'being the first known Christians that we have true nutice of that ever set foot upon that ground." In the first days of July Frobisher Bay was reached, but stormy weather aud dangerous ice drove the fleet south- wards, and unwittingly Frobisher entered what was after- wards known as Hudson Strait, up which he sailed about 60 miles. When he found that he was sailing away from his destination, he, with apparent reluctance, turned back, and after many buffetings part of the fleet managed to come to anchor in Frobisher Bay. Some attempt was made at founding a settlement, and immense quantities of ore were shipped. But, as might be expected, there was much dissension and not a little discontent among so hetero- geneous a company, and on the last day of August the fleet set out ou its return to England, which was reached in the beginning of October. Thus ended what was little better than a fiasco, though Frobisher himself cannot be held to blame for the result; the scheme was altogether chimerical, and the "ore" seems to have been not worth smelting. Between 1578 and 1585 we hear little of Frobisher, though he seems to have been doing service at various places, and steadily advancing in the good opinion of those in power. In 1580 he obtained the reversion of the clerkship of the royal navy, of no immediate value, In 1585 he comnianded in the " Primrose" in Sir F. Drake's expedition to the West Indies, in the large booty brought home from which he no doubt had a good share. For the next year or two he was employed in various responsible services against the designs of Spain, and in 1588 he did such excellent work in the "Triumph" against the Spanish Armada that he was rewarded with the honour of knighthood. He continued to cruise about in the Channel until 1589, when he was sent in command of a small fleet to the coast of Spain. In 1591 he visited his native Altofts, and there married_a daughter of Lord Wentworth. He had prospered during recent years and was able to become a landed proprieter in Yorkshire and Notts. But he found little leisure for a country life, and was soon on the seas again watching and cutting off the richly laden ships of Spain. In November 1594 he took part in the siege of Crozan, near Brest, and he received a wound from which he died at Plymouth on November 22. His body was taken to London and buried at St Giles's, Cripplegate. Frobisher was brave and skilful as a naval leader, and had the enthu- siasm of the true explorer, but was characterized by much of the coarseness, and probably some of the

unscrupulousness, of his time, and appears to have been somewhat rough in his bearing, and too strict a disciplinarian to be much loved. He justly takes rank among England's great naval heroes.

See Hakluyt's Voyages ; the Hakluyt Society's Three Voyages of Frobisher ; C. F. Hall's Life with the Esquimaux ; Campbell's Lives

of the Admirals ; Rev. F. Jones's Life of Frobi iti mentioned therein. a z ~—" ete

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FROEBEL, Friepricn WiLHELM Aucust (1782-1852), philosopher, philanthropist, and educational reformer, was born at Oberweissbach, a village of the Thuringian Forest, on the 21st April 1782. He completed his seventieth year, and died at Marienthal, near Bad-Liebenstein, on the 21st June1$852. Like Comenius, with whom he had much in com- mon, he was neglected in his youth, and the remembrance of his own early sufferings made him in after life the more eager in promoting the happiness of children. His mother he lost in his infancy, and his father, the pastor of Ober- weissbach and the surrounding district, attended to his parish but not to his family. Friedrich soon had a step- mother, and neglect was succeeded by stepmotherly atten- tion ; but a maternal uncle took pity on him, and gave him a home for some years at Stadt-Ilm. Here he went to the village school, but like many thoughtful boys he passed for adunce. Throughout life he was always seeking for hidden connexions and an underlying unity in all things. Nothing of the kind was to be perceived in the piecemeal studies of the school, and Froebel's mind, busy as it was for itself, would not work for the masters. His half-brother was therefore thought more worthy of a university education, and Fried- rich was appreuticed for two years to a forester (1797-1799), Left to himself in the Thuringian Forest, Froebel now began to study nature, and without scientific instruction he ob- tained a profound insight into the uniformity and essential unity of nature's laws. Years afterwards the celebrated Jahn (the "Father Jahn" of the German gymnasts) told a Berlin student of a queer fellow he had met, who made out all sorts of wonderful things from stones and cobwebs. This queer fellow

was Froebel; and the habit of making out general truths from the observation of nature, especially from plants and trees, dated from the solitary rambles in the Forest. No training could have been better suited to strengthen his inborn tendency to mysticism ; and when he left the Forest at the early age of seventeen, he seems to have been possessed by the main ideas which influenced him all his life. The. conception which in him dominated all others was the unity of nature ; and he longed to study natural sciences that he might find in them various applications of nature's universal laws: With great difficulty he got leave to join his elder brother at the university of Jena, and there for a year he went from lecture-room to lecture-room hoping to grasp that connexion of the sciences which had for him far more attraction than any particular science in itself. But Froebel's allowance of money was very small, and his skill in the management of money was never great, so his university career ended in an imprisonment of nine weeks for a debt of thirty shillings. He then returned home with very poor prospects, but much more intent on what he calls the course of "self-completion" (Vervollkommung meines selbst) than on "getting on" in a worldly point of view. He was soon sent to learn farming, but was recalled in con- sequence of the failing health of his father. In 1802 the father died, and Froebel, now twenty years old, had to shift for himself. It was some time before he found his true vocation, and for the next three and a half years we find him at work now in one part of Germany now in another,—sometimes land-surveying, sometimes acting as accountant, sometimes as private secretary ; but in all this his " outer life was far removed from his inner life," and in spite of his outward circumstances he became more and nore conscious that a great task lay before him for the good of humanity. The nature of the task, however, was not clear to him, and it seemed determined by accident. While

"studying architecture in Frankfort-on-the-Main, he became

acquainted with the director of a model school who had caught some of the enthusiasm of Pestalozzi. This friend saw that Froebel's true field was education, and he per-

. Suaded him to give up architecture and take a post in thé

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model school. In this school Froebel worked for two years with remarkable success, but he then retired and undertook the education of three lads of one family. In this he could not satisfy himself, and he obtained the parents' con- sent to his taking the boys to Yverdon, near Neuchatel, and there forming with them a part of the celebrated institution of Pestalozzii Thus from 1807 till 1809 Froebel was drinking in Pestalozzianism at the fountain head, and qualifying himself to carry on the work which Pestalozzi had begun. For the science of education had to deduce from Pestalozzi's experience principles which Pestalozzi liimself could not deduce. And "Froebel, the pupil of Pestalozzi, and a genius like his master, completed the re- former's system; taking the results at which Pestalozzi had arrived through the necessities of his position, Froebel de- veloped the ideas involved in them, not by further experi- ence but by deduction from the nature of man, and tlius he attained to the conception of true human development and to the requirements of true education" (Schmidt's Geschichte der Padagogtk).

Holding that man and nature, inasmuch as they proceed from the same source, must be governed by the same laws, Froebel longed for more knowledge of natural science. Even Pestalozzi seemed to him not to " honour science in her divinity." ~~He therefore determined to continue the uni~~ versity course which had been so rudely interrupted eleven years before, and in 1811 he began studying at Gottingen, whence he proceeded to Berlin. But again his studies were interrupted, this time by the king of Prussia's cele- brated call "to my people." Though not a Prussian, Froebel was heart and soul a German. He therefore responded to the call, enlisted in Liitzow's corps, and went through the campaign of 1813. But his military ardour did not take his mind off education, "' Everywhere," he writes, "as far as the fatigues I underwent allowed, I car- ried in my thoughts my future calling as educator; yes, even in the few engagements in which J had to take part. Even in these I could gather experience for the task I proposed to myself." Froebel's soldiering showed hiin the value of discipline and united action, how the individual belongs not to himself but to the whole body, and how the whole body supports the individual.

Froebel was rewarded for his patriotism by the friendship of two men whose names will always be associated with his, Langethal and Middendorff. These young men, ten years younger than Froebel, became attached to him in the field, and were ever afterwards his devoted followers, sacrificing all their prospects in life for the sake of carrying out his ideas.

At the peace of Fontainebleau (signed in May 1814) Froebel returned to Berlin, and became curator of the museum of mineralogy under Professor Weiss. In accept- ing this appointment from the Government he seemed to turn aside from his work as educator; but if not teaching he was learning. More and more the thought possessed him that the one thing needful for man was unity of develop- ment, perfect evolution in accordance with the laws of his being, such evolution as science discovers in the other organisms of nature. He at first intended to become a teacher of natural science, but before long wider views dawned upon him. Langethal and Middendorf were in Berlin, engaged in tuition. Froebel gave them regular in- struction in his theory, and at length, counting on their support, he resolved to set about realizing his own idea of "the new education." This was in 1816. Three years before one of his brothers, a clergyman, had died of fever caught from the French prisoners. His widow was still living in the parsonage at Griesheim, a village on the Im. Froebel gave up his post, and set out for Griesheim on foot, spending his very last groschen on the way for bread.

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Here he undertook the education of his orphan niece and nephews, and also of two more nephews sent him by another brother. With these he opened a school and wrote to Middendorf and Langetlial to come and help in the experi- ment. Middendorf came at once, Langethal a year or two later, when the school had been moved to Keilhau, another of the Thuringian villages, which became the Mecca of the new faith. In Keilhau Froebel, Langethal, Middendorff, and Barop, a relation of Middendorff's, all married and formed an educational community. Such zeal could not be fruitless, and the school gradually increased, though for many years its teachers, with Froebel at their head, were in the greatest straits for money, and at times even for food. After 14 years' experience he determined to

start other insti- tutions to work in connexion with the parent institution at Keilhau, and being offered by a private friend the use of a castle on the Wartensee, in the canton of Lucerne, he left Keilhau under the direction of Barop, and with Langethal he opened the Swiss institution. The ground, however, was very ill chosen. 'The Catholic clergy resisted what they considered as a Protestant invasion, and the experiment on the Wartensee and at Willisau in the same canton, to which the institution was moved in 1833, never had a fair chance. It was in vain that Middendorff at Froebel's call left his wife and family at Keilhau, and laboured for four years in Switzerland without once seeing them. The Swiss institu- tion never flourished. But the Swiss Government wished to turn to account the presence of the great educator; so young teachers were sent to Froebel for instruction, and finally Froebel moved to Burgdorf (a Bernese town of some importance, and famous from Pestalozzi's labours there thirty years earlier) to undertake the establishment of a public orphanage, and also to superintend a course of teaching for schoolmasters, The elementary teachers of the canton were to spend three months every alternate year at Burgdorf, and there conipare experiences, and learn of distinguished men such as Froebel and Bitzius. In his conferences with these teachers Froebel found that the schools suffered from the state of the raw material brought into them. 'Till the school age was reached the children were entirely neglected. Froebel's conception of harmonious development naturally led him to attach much importance to the earliest years, and his great work on Zhe Education of Man, published as early as 1826, deals chiefly with the child up to the age of seven, At Burgdorf his thoughts were much occupied with the proper treatment of young children, and in scheming for them a graduated course of exercises, modelled on the games in which he observed them to be most interested. In his eagerness to carry out his new plans he grew 1m- patient of official restraints ; so he returned to Keilhau, aud soon afterwards opened the first Atndergarten or " Garden of Children," in the neighbouring village of Blankenburg (1837). Firmly convinced of the importance of the Kinder- garten for the whole human race, Froebel described his system in a weekly paper (his Sonntagsblatt) which appeared from the middle of 1837 till 1840. He also lectured in great towns; and he gave a regular course of instruction to young teachers at Blankenburg. But although the prin- ciples of the Kindergarten were gradually making their way, the first Kindergarten was failing for want of funds. It had to be given

up, and Froebel, now a widower (he had lost his wife in 1839), carried on his course for teachers first at Keilhau, and from 1848, for the last four years of his life, at or near Liebenstein, in the Thuringian Forest, and in the duchy of Meiningen. It is in these last years that the man Freebel will be best known to posterity, for in 1849 he attracted within the circle of his influence a woman of great intellectual power, the Baroness von Marenholtz_ Biilow, who has given us in her Recollections of Friedrich Froebel the only lifelike portrait we possess. IX. — 100

These seemed likely to be Froebel's most peaceful days. He married again, and having now devoted himself to the training of women as educators, he spent his time in in- structing his class of young female teachers. But trouble came upon him from a quarter whence he least expected it. In the great year of revolutions 1848 Froebel had hoped to turn to account the general eagerness for improvement, and Middendorff had presented an address on Kindergar- tens to the German Parliament. Besides this a nephew of Froebel's published books which were supposed to teach socialism, 'True, the uncle and nephew differed so widely that the "new Froebelians" were the enemies of "the old." The distinction was overlooked, and Friedrich and Karl Froebel were regarded as the united advocates of some new thing. In the reaction which soon set in Froebel found himself suspected of socialism and irreligion, and in 1851 the "cultus-minister" Raumer issued an edict for- bidding the establishment of schools 'after Friedrich and Karl Froebel's principles" in Prussia. This was a heavy blow to the old man, who looked to the Government of the "Cultus-staat" Prussia for support,and was met with denun- ciation. Of the justice of the charge the miuister brought against Froebel the reader may judge from the account of his principles given below.

Whether from the worry of this new controversy, or from whatever cause, Froebel did not long survive the decree. His seventieth birthday was celebrated with great rejoicings in May 1852, but he died in the following month, and lies buried at Schweina, a village near his last abode, Mari- enthal.

“ All education not founded on religion is unproductive.” This conviction of Froebel’s followed naturally from his con- ception of the unity of all things, a unity due to the original Unity from whom all proceed and in whom all “live, move, and have their being.” ‘In Allem wirkt ‘und schafft Zin Leben, Weil das Leben all’ ein ein’ger Gott gegeben.” “All has cone forth from the divine, from God, and is through God alone conditioned. To this it is that all things owe their existence, to the divine working in them. The divine element that works in each thing is the true idea (das Wesen) of the thing.” ‘The destiny and calling of all things is to develop their true idea, and in so doing to re- veal God in outward and through passing forms,”

As man and nature have one origin they must be subject to the same laws. Hence Froebel did what Comenius had done two centuries before him, he looked to the course of nature for the principles of human education. This he de- clares to be his fundamental belief: “In the creation, in nature and the order of the material world, and in the pro- gress of mankind, God has given us the true type (Urdild) of education.”

As the cultivator creates nothing in the trees and plants, 30 the educator creates nothing in the children,—he merely superintends the development of inborn faculties. So far Froebel agrees with Pestalozzi; but in one respect he went beyond him, and has thus become, according to Michelet, tle greatest of educational reformers. Pestalozzi said that the faculties were developed by exercise. Froebel added that the function of education was to develop the faculties by arousing voluntary activity. Action proceeding from inner impulse (Selbstthdtigkeit) was the one thing needful. And here Froebel as usual refers to God. “God’s every thought is a work, a deed.” As God is the Creator so must man be a creator also. ‘He who will early learn to recognize the Creator must early exercise his own power of action with the consciousness that he is bringing about what 18 good, for the doing good is the link between the creature and the Creator, and the conscious doing of it is the conscious connexion, the true living union of the man with God, of the individual man as of the human race, and is tlierefore

at once the starting point and the eternal aim of all educa- tion.” Again he says: “The starting point of all that appears, of all that exists, and therefore of all intellectual conception, is act, action. From the act, from action, must

therefore start true human education, tlle developing educa- tion of the man; in action, in acting, it must be rooted and must springup….. Living, acting, conceiving, —these must form a triple chord within every child of man, though the sound now of this string, now of that, may preponder- ate, and then again of two together."

The prominence which Froebel gave to action, his doc- trine that man is primarily a doer and even a creator, and that he learns only through "self-activity," may produce great changes in educational methods generally, and not simply in the treatment of children too young for schooling. But it was to the first stage of life that Froebel paid the greatest attention, and it is over this stage that his influence is gradually extending. Froebel held with Rousseau that each age has a completeness of its own, and that the perfec- tion of the later stage can be attained only through the perfection of the earlier. If the infant is what he should be as an infant, and the child as a child, he will become what he should be as a boy, just as naturally as new shoots spring from the healthy plant. Every stage, then, must be cared for and tended in such a way that it may attain its own perfection. Impressed with the immense: importance of the first stage, Froebel like Pestalozzi devoted himself tu the instruction of mothers. But he would not, like Pestalozzi, leave the children entirely in the mother's hands. Pestalozzi held that the child belonged to the family ; Fichte, on the other hand, claimed it for society and the state. Froebel, whose mind like that of Frederick Maurice delighted in harmonizing apparent contradictions, and who taught that 'all progress lay through opposites to their re- conciliation," maintained that the child belonged both to the family and to society, and he would therefore have children spend some hours of the day in a common life and in well-organized common employments, These assemblies of children he would not call schools, for the children in them ought not to be old enough for schooling. So he in- vented the name Kzndergarten, garden of children, and called the superintendents "children's gardeners." He laid great stress on every child cultivating its own plot of ground, but this was not his reason for the choice of the name. It was rather that he thought of these institutions as enclosures in which young human plants are nurtured. In the Kindergarten the children's employment should be play. But any occupation in which children delight is play to them; and Froebel invented a series of employments, which, while they are in this sense play to the

children, have nevertheless, as seen from the adult point of view, a distinct educational object. This object, as Froebel himself describes it, is "to give the children employment in agree- ment with their whole nature, to strengthen their bodies, to exercise their senses, to engage their awakening mind, and through their senses to bring them acquainted with nature and their fellow creatures; it is especially to guide aright the heart and the affections, and to lead them to the original ground of all life, to unity with themselves."

At the end of the first quarter of a century since Froebel's death, the spread of his ideas, or at least of his methods, seems rapidly extending. Prophets are slowly recognized in their own country, and although he is so thoroughly Gernian in his mode of thought and exposition that, as Deinhardt says, no other nation could have produced such a man, the Germans as yet are not so ready to learn from Froebel as from the Swiss Pestalozzi. In Austria the Kindergarten has made more way than in Prussia, and it seems to prosper in America. But Froebel's influence is not limited to the Kindergarten. His conception of educa-

tion cannot but affect the thoughts and ultimately the practice of all teachers who will be at the pains to under- stand it.

Froebel's own works are—1. Mensehencrziehwng (there is a French translation by the Baronne de Crombrugghe); 2. Pédagogik. d. Kindergartens; 3. Kleinere Schriften, herausgegeben von Wichard Lange ; and 4, Mutter- wnd Koselieder. We have a lengthy but unsatisfactory life in A. B. Hanschmann's Friedrich Frobel. An unpretentious but useful little book is F. Froebel, a Biographical Sketeh, by Matilda H. Kriege, New York (Steiger). A very good account of Froebel's life and thoughts is given in Karl Schmidt's Gesehichte d. Pidagogik, vol. iv.; also in Adalbert Weber's Geschichte d. Volksschulpad. u. d. Klcinkindererziehung (Weber carefully gives authorities). For a less favourable account see I Strack's Geschichte d. deutsch. Volksschulwesens. The article '"'Probel" in K. A. Schmid's Eneyklopadie is by Deinhardt. Frau von Marenholtz-Biilow has published her Hrinnerungen an F. Frobel (a book which has been translated by Mrs Horace Mann). This Jady, who has been the chief interpreter of Froebel,

has expounded his principles in Das Kind u. scion Wesen, and Die Arbeit wu. die neue Erziehung. In England Miss E. Shirreff has published Principles of Frocbel's System, and a short sketch of Froebel's life. The late Joseph Payne advocated Froebelism in a pamphlet, Frocbel and the Kindergarten System; also in the book published since his death, A Visit to German Schools, In the United States, Miss E. E. Peabody, who has taken an active part in the spread of Froebel- ism, has written Moral Culture of Infancy (New York). W.N. Hailman treats of Froebel in his Zectwres and his Kindergarten Culture (Cincinnati). A. Kéhler's Prawis is the best known German work on the Kindergarten (it is translated as Kindergarten Eduea-tion, New York); and T. -F. Jacobs's Manuel is the best in French. @®. B.1Q4)

FROG, the common name of an extensive group of Batrachians forming, along with the toads, the amphibian order Anowra. 'They are divided into 9 families, containing 92 genera and 440 species, and are found in all quarters of the globe, being most abundant in the tropical and sub- tropical regions, but, also occurring within the Arctic circle. Most of the families have a very limited distribution, and only two of them, the true frogs (Ranida), of which there are 150 species, and the Polypedatide, a family of tree-frogs containing 124 species, can be regarded as almost cosmopolitan. The neotropical or South American region is richest in peculiar forms, while it possesses some only found beyond it in the widely remote Australian region ; thus the Pelodry- adc, a family of tree-frogs, is peculiar to the two; the genus Litoria is confined to Australia, with the exception of a single species occurring in Paraguay ; while the only frog known in New Zealand has its nearest allies in South America. Those regions bear also a negative resemblance in the total absence from both of the genus Rana, the 60 species of which are distributed throughout the other quarters of the globe. These facts, among others, have been adduced in support of the theory that at one time the continents of South America and Australia had aland connexion. Frogs are almost totally absent from oceanic islands, a single species (Liopelma Hochstettert) occurring in New Zealand, and one or two others in the Pacific islands, as far east as the Fijis, beyond which they are unknown. On the as- sumption that those islands obtained their present fauna from the nearest continental land, the absence of frogs can be

readily explained by the fact that salt water is alike fatal to the adult frog and to its spawn, and thus formed an insuperable barrier to their migration.

Frogs, as is shown by their wide distribution, are capable of enduring a considerable degree of both heat and cold ; they are, however, altogether intolerant of long-continued drought, a desert forming as certain a barrier to their migra- tion as an ocean. Both during their larval stage and after- wards, for the purpose of cutaneous respiration, abundant moisture is a necessity of their existence ; consequently, whether they live on the ground or on trees, they are never found far from rivers, marshes, or lakes. In winter the frogs of northern climates hibernate, burying themselves in the mud at the bottom of pools, and lying clustered together

in a state of complete torpidity. In hot climates they are said to go into a similar condition, known as " zstivation," during periods of exceptional heat and drought, in order to retard the dissipation of the moisture in their bodies. On reappearing from their long winter sleep the work of repro- duction is at once entered upon, the males making their presence known to the females by the vigorous exercise of their vocal organs. The croaking of the common frog can only be regarded as pleasant from its association with the welcome advent of spring ; still more unpleasant, however, is the much louder croak of the edible frog of the Continent, the species to which Horace probably refers_in the lines '"raneeque palustres Avertunt somnos."

The eggs of the frog, consisting of little black specks sur- rounded by an albuminous envelope, are fertilized during their extrusion from the body of the female, and are gen- erally deposited at the bottom of the water, ascending, how- ever, soon after to the surface, owing to the swelling and partial decomposition of the glairy substance surrounding the ova. There are several species known in which the eggs are deposited in an exceptional manner. Those of a small frog (Alytes obstetricans) found in France and Germany form a long chain, which the male twines round his thighs, retiring with them into seclusion until the young are ready to leave, when he enters the water, and the tad- poles immediately make their escape. The female of an American tree-frog (Nototrema marsupiatum) has a pouch

along the whole extent of its back for the reception of its eggs; and Professor Peters of Berlin has recently drawn attention to a tree-frog of the genus Polypedates found in tropical West Africa, in which the female, after depositing her eggs in the usual mass of albuminous jelly, attaches them to the leaves of trees overhanging a dry water-hole or pool. The albumen speedily dries and forms a horny coating on the leaf, under which lie the unimpregnated eggs. On the advent of the rainy season the albumen becomes softened, and the eggs are washed into the pool below, now filled with water, where they are fecundated by the male.

The development of the egg after impregnation proceeds more or less rapidly according to the temperature, the young of the common frog being hatched, according to Rusconi, in 4 days, in a temperature varying from 70° to 80° Fahr., while in the climate of England this does not take place in less than a month. The creature which emerges from the egg is altogether unlike a frog, consisting mainly of a bulky head and tail, and wholly destitute of limbs. This is the tadpole or larval stage in the development of the frog, when it is essentially a fish, capable only of exist- ing in water, breathing by gills, and having like a fish a two- chambered heart. At first the gills or branchize are ex- ternal, but they are soon withdrawn within the branchial cavity, and concealed by an opercular membrane. As the process of development proceeds, the limbs begin to bud forth, the posterior pair appearing first ; and with their growth the tail begins to dwindle, not falling off, but being gradually absorbed. At the same time vast changes are taking place in the blood-vascular system, the gills gradually disappearing, two lungs being developed, and the heart be- coming three-chambered as in reptiles. The young frog must now come to the surface to breathe, and soon leaves the water altogether. On emerging from the egg, the tad- pole at first feeds upon the gelatinous mass which before had formed a protective covering. It is unprovided with teeth, but has two minute horny jaws, which enable it to feed on decaying animal and vegetable matter. According to Bell (British Reptiles), tadpoles sometimes kill and feed upon each other. "T observed," he says, "that almost as soon as one had acquired its limbs it was found dead at the bottom of the water, and the remaining tadpoles feeding

upon it, This took place with all of them successively, ex- cepting the last, which lived on to complete its change." After leaving the water they feed almost entirely on insects and slugs.

The form of the frog is too well known to require de- scription, but there are many almost unique features in its organization that may be noticed. Respiration in the adult frog is partly pulmonary ; but as it is destitute of ribs, this operation in the frog cannot be performed by the alternate expansion and contraction of the chest, as in other air- breathing animals. The air has to be swallowed in order to be conveyed to the lungs, and the mechanism by which this operation is performed necessitates the closing of its mouth and the admission of air by the nostrils, so that a frog can be most readily suffocated by having its mouth gagged open. Respiration is also partly cutaneous, experi- ment having shown that the skin gives off carbonic acid gas in sufficient quantity to enable the creature to live for a very considerable time after pulmonary respiration has been stopped. Moisture is as necessary tu the skin in the performance of this function as it is to the gills 'of a fish; and in order to preserve to the utmost its humidity, frogs avoid as muchas possible the hot sunlight, sheltering them- selves beneath stones or under loose turf, aud reappearing on the advent of rain, sometimes in such numbers in a single locality as to have given rise to stories of frog showers. The skin of the frog, however, readily absorbs water ; and this it stores up in an internal reservoir, from which it can in seasons of drought moisten the surface of its skin, When a frog is suddenly caught it frequently ejects a quantity of water, and thus suddenly diminishes its volume. The water voided is not urine, nor is the recep- tacle containing it the urinary bladder, as was at one time supposed, The skin of frogs is perfectly smooth, having neither plates nor scales, except in the American genus Cera- tophrys (tig. 1), in certain species of which a few bony plates

Fia. 1.—Ceratophrys granosa.

are enclosed in the skin of the back. The tongue in frogs is probably employed more for the capture of its insect prey, than as the organ of taste. It is fixed in front of the mouth, and free behind, and in seizing its prey, the free end, which possesses a viscid secretion, is darted suddenly for- ward, the captured insect being as suddenly transported to the back part of the

mouth. Nothing can exceed the rapidity with which this motion is performed. Minute teeth are present in the upper jaw, and on the palate, in the true frogs. The vocal organs by which the characteristic croaking is produced differ somewhat in different species, a similar variety appearing in the quantity and quality of their song. The male of the edible frog is provided with bladder-like cheek pouches—the so-called vocal sacs—which it distends with air when in the act of croaking, an operation which it performs to such purpose as to have received the

name of " Dutch nightingale" on the Continent, and 'Cambridgeshire nightingale" in England. The bull-frog (Rana mugiens) has a laryngeal mechanism which Cuvier compared to a kettledrum, by which it produces a sound not unlike the bellowing of a bull. The sound produced by the tree-frogs is both loud and shrill, but in certain circum- stances it seems to be somewhat pleasing. Thus Darwin says, " Near Rio de Janeiro I used often to sit in the even- ing to listen to a number of little Zyla@, which, perched on blades of grass close to the water, sent forth sweet chirping notes in harmony." The voice of another tree-frog (Hyla crepitans) has been compared to the sound produced " by the cracking of a large piece of wood ;" while another, belonging to Surinam, has an extremely disagreeable voice, and unfortunately so much of it that, when a number of them combine, they at times drown the orchestra of the Paramaribo theatre. No frog, so far as yet known, pos- sesses any poison organs. A species found in France (Pelo- bates fuscus), when disturbed, emits a strong odour, some- what resembling garlic, and of sufficient pungency to make the eyes water ; another (Hyla micans) exudes from the surface of its body a slimy substance having luminous pro- perties, which probably acts as a defence by frightening its enemies. Many of the tree-frogs are of a green colour, while others are brown, '"'and these," says Mr Wallace (Tropical Nature, 1878), "usually feed at night, sitting quietly dur- ing the day so as to be almost invisible, owing to their colour and their moist shining skins so closely resembling vegetable substances." The majority of tree-frogs have their colour thus adapted to their surroundings, and are thus enabled the more readily to elude their enemies ; for, so far as yet known, all the species protectively coloured are edible, forming the chief food of many mammals,

birds, and reptiles. A few, however, are brilliantly and conspicu- ously coloured, as if courting observation ; and such species, there is reason to.believe (the reader will find evidence of this in Belt's Naturalist in Nicaragua), are rejected by frog-eating animals on account of their nauseous secretions, or some other unknown property which renders them un- palatable. The bright colours thus become directly useful to the species by making them readily recognizable as un- eatable,

The Common Frog (Rana temporaria) is the most widely distributed species of the group, occurring throughout the temperate regions of both hemispheres, including North Africa, and Asia as far east as Japan. It does not occur in Iceland. Both in Mngland and in Scotland it is abundant, nor is it uncommon in Ireland, although popularly supposed to be absent from that island. It varies very considerably in colour, being either a reddish, yellowish, or greenish- brown above, with irregular spots and fasciz, and of a lighter colour beneath, but having almost invariably an oblong patch of brown behind the eyes, by which it may be readily distinguished from other European species. Although not an article of human food, the'common frog in its various stages of growth forms the staple diet of many other animals. The tadpoles are eaten by newts and the smaller fishes, and frogs of all ages by weasels, waterfowl, pike, and snakes. By those agencies their numbers, which other- wise would be enormous, are greatly reduced. This species is said to take five years in attaining its full growth, and to live for about fifteen years. Like the toad it can be ren- dered tame and domesticated, having been known to take up its abode in a moist corner of a kitchen, and to come forth regularly at meal time to be fed. The Edible Frog (Rana esculenta) is very widely distributed throughout the temperate regions of the earth, but is not found in America, where, however, a closely allied species occurs (fig. 2). It is found in England, where it was first observed in a Cambridgeshire fen in 1843, to which probably it had

been introduced from the Continent. It has since been in- troduced into various parts of the south of England, but apparently without much success, the summer heat there being, it is said, insufficient to enable the tadpole to attain

Fie. 2,—Rana palusiris.

its full development before the advent of autumnal cold. It may be readily distinguished from the common species by the yellowish mesial line which runs down the whole length of its back, by the absence of the characteristic brown spot behind the eyes, and by the presence in the males of 'vocal sacs." It is also more aquatic than the common frog, seldom leaving the banks of its native pond or stream, into which it is always ready to dip on the slightest appear- ance of danger, It is very abundant throughout central and southern Europe, and forms, especially in France, a valued article of food, the hind legs when cooked being re- garded as a luxury. Regarding a dish of these, Mr F. Buckland says, " Most excellent eating they were, tasting more like the delicate flesh of the rabbit than any thing else I can think of." The edible frog has been lately intro- duced into Ireland. The Bull-frog (Rana mugiens} is one of the largest species, measuring sometimes 8 inches in length, exclusive of the hind legs, and having » gape snf- ficiently wide to swallow ducklings whole. It inhabits North America, where it is said to haunt the pools formed at the origin of springs, the waters of which it was supposed to keep pure—a belief which long afforded it considerable protection ; lately, however, the Americans have taken to frog-eating, and the bull-frog, in the absence of 2. esculenta, has been selected among others for this purpose.

The Tree-frogs (fig. 3) are readily distinguished from all others by having the ends of their toes dilated into knobs or

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Fia. 8.—Tree-frog (Hyla bicolor).

discs, generally provided with a sticky secretion, by means of which they can cling to the leaves and branches of trees. They are small, elegant, and exceedingly active creatures, the males possessing loud voices, of which they make copi- ous use during the breeding season and on the approach of

rain. Frogs have from remote times been regarded as weather prophets, and at the present day, in some parts of Germany, the European Tree-frog (4yla arborea) is used as a barometer. A few of them are placed in a tall bottle provided with miniature ladders, the steps of which they ascend during fine weather, seeking the bottom again on the approach of rain. All frogs, whether arboreal or not, have their hind feet webbed, and in at least one tree- frog (Rhacophorus) the webs on all the feet are so largely developed as to render it probable that by their means the frog is able to execute flying leaps. This "flying frog " was brought to Mr Wallace, while travelling in Borneo, by a Chinaman, who assured him "that he had seen it come down in a slanting direction as if it flew." Its body was about 4 inches in length, and the expanded webs of each hind foot covered a space of 4 square inches, while its fore- legs were bordered by a membrane—features highly sug- gestive of aerial locomotion.

Fossil remains of the frog do not occur in strata older than the Tertiary, being found in greatest abundance in the Miocene deposits. See AMPHIBIA. (J. GI.)

FROHLICH, Asranam Emanuset (1796-1865), a German-Swiss poet, was born February 1, 1796, at Brugg, in the canton of Aargau, where his father was a teacher. At the age of fifteen he was sent to study theology in the academy of Ziirich, In 1817 he was ordained, and returned as teacher to his native town, where he lived for ten years. He was then appointed professor of German language and literature in the canton-school at Aarau, which post he lost, however, in the political quarrels of 1830. He afterwards obtained the post of teacher and rector of the Bezirksschule, and wai also appointed Hiilfsprediger. He died December 1,1865. His works are—170 Fabeln (1825); Schweizerlveder (1827); Das Evangelium St Johannis, in Liedern (1830) ; Llegien an Wieg' und Sarg (1835); Die Epopien ; Ulrich Zwingli (1840)'; Ulrich von Hutten (1845); Auserlesene Psalmen und Geistliche Lieder fiir die Evangelisch-re- formirte Kirche des Cantons Aargau (1844); Ueber den Kirchengesang der Protestanten (1846); T'rostlieder (1852) ; Der Junge Deutsch-Michel (1846); Retmspriiche aus Staat, Schule, und Kirche (1820). An edition of his collected works, in 5 vols., was published in 1853. Frohlich is best known for his two heroic

poems, Ulrich Zwingli and Ulrich von Hutten, and especially for his fables, which have been ranked with those of Hagedorn, Lessing, and Gellert.

FROISSART, Jean (1337-14101). The personal history of Froissart, the circumstances of his birth and education, the incidents of his life, must all be sought in his own verses and chronicles. He possessed in his own lifetime no such fame as that which attended the steps of Petrarch; when he died it did not occur to his successors that a chapter might well be added to his Chronicle setting forth what manner of man he was who wrote it. The village of Lestines, where he was curé, has long forgotten that a great writer ever lived there. They cannot point to any house in Valen- ciennes as the lodging in which he put together his notes and made history out of personal reminiscences. It is not certain when or where he died, or where he was buried. One church, it is true, doubtfully claims the honour of holding his bones. It is that of St Monegunda of Chimay.

Gallorum sublimis honos et fama tuorum,

Hic Froissarde, jaces, st modo forte jaces, It is fortunate, therefore, that the scattered statements in his writings may be so pieced together as to afford a toler- ably connected history of his life year after year. The personality of the man, independently of his adventures, may be arrived at by the same process. It will be found that Froissart, without meaning it, has pourtrayed himself in clear and well-defined outline. His forefathers were jurés of the little town of Beaumont, lying near the river

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Sambre, to the west of the forest of Ardennes. Early in the 14th century the castle and seigneurie of Beaumont fell into the hands of Jean, younger son of the count of Hainault. With this Jean, sire de Beaumont, lived a certain canon of Liége called Jean le Bel, who, fortunately, was not content simply to enjoy life. Instigated by his seigneur he set himself to write contemporary history, to tell "la pure veriteit de tout li fait enti¢rement al manire de chroniques." With this view, he compiled two books of chronicles. And the chronicles of Jean le Bel were not the only literary monuments belonging to the castle of Beau- mont. A hundred years before him Baldwin d'Avernes, the then seigneur, had caused to be written a book of chronicles or rather

genealogies. It must therefore be remembered that when Froissart undertook his own chronicles, he was not conceiving a new idea, but only following along familiar lines.

Some 20 miles from Beaumont stood the prosperous city of Valenciennes, possessed in the 14th century of importaut privileges and a flourishing trade, second only to places like Bruges or Ghent in influence, population, and wealth. Beaumont, once her rival, now regarded Valenciennes as a place where the ambitious might seek for wealth or advance- ment, aud among those who migrated thither was the father of Froissart. He appears from a single passage in his son's verses to have been a painter of armorial bearings. There was, it may be noted, already what may be called a school of painters at Valenciennes. Among them were Jean and Colin de Valenciennes and André Beau-Neveu, of whom Froissart says that he had not his equal in any country.

The date generally adopted for his birth is 1337. In after years Froissart pleased himself by recaJling in verse the scenes and pursuits of his childhood, These are pre- sented in vague generalities. There is nothing to show that he was unlike any other boys, and, unfortunately, it did not occur to him that a photograph of a schoolboy's life amid bourgeois surroundings would be to posterity quite as inter- esting as that faitliful portraiture of courts and knights which he has drawn up in his Chronicle. As itis, we learn that lie loved games of dexterity and skill rather than the sedentary amusements of chess and drauglits, that he was beaten when le did not know his lessons, that with his companions he played at tournaments, and that he was always conscious—a statement which must be accepted with suspicion—that he was born

'" Loer Dieu et servir le monde."

In any case he was born in a place, as well as at a time, singularly adapted to fill the brain of an imaginative boy. Valenciennes, at the present day a dull town, was then a city extremely rich in romantic associations. Not far from its walls was the western fringe of the great forest of Ardennes, sacred to the memory of Pepin, Charlemagne, Roland, and Ogier. Along the banks of the Scheldt stood, one after the other, not then in ruins, but bright with ban- ners, the gleam of armour, and the liveries of the men at arms, castles

whose seigneurs, now forgotten, were famous in their day for many a gallant feat of arms. The castle of Valen- ciennes itself was illustrious in the romance of Perceforest: there was born that most glorious and most luckless hero, Baldwin, first emperor of Constantinople. All the splendour of medizval life was to be seen in Froissart's native city: on the walls of the Salle le Comte glittered—perhaps painted by his father—the arms and scutcheons beneath the banners and helmets of Luxembourg, Hainault, and Avesnes ; the streets were crowded with knights and sol- diers, priests, artisans, and merchants; the churches were rich with stained glass, delicate tracery, and precious carv- ing; there were libraries full of richly illuminated manu- scripts on which the boy could gaze with delight ; every year there was the féte of the puy d'Amour de Valenciennes,

at which he would hear thie verses of the competing poets ; there were festivals, masques, mummeries, and moralities. And, whatever there might be elsewhere, in this happy city there was only the pomp, and not the misery, of war; the fields without were tilled, and the harvests reaped, in secu- rity ; the workman within plied his craft unmolested for good wage. But the eyes of the boy were turned upon the castle and not upon the town ; it was the splendour of the knights which dazzled him, insomuch that he regarded and continued ever afterwards to regard a prince gallant in the field, glittering of apparel, lavish of largesse, as almost a god.

The moon, he says, rules the first four years of life; Mercury the next ten; Venus follows. He was fourteen when the last goddess appeared to him in person, as he tells us, after the manner of his time, and informed him that he was to love a lady, " belle, jone, et gente." Await- ing this happy event, he began to consider how best to earn his livelihood. They first placed hiin in some commercial position—impossible now to say of what kind—which he simply calls 'la marchandise." This undoubtedly means some kind of buying and selling, not a handicraft at all. He very soon abandoued merchandise—"'car vaut mieux science qu' argens "—and resolved on becoming a learned clerk. He then naturally began to make verses, like every other learned clerk. Quite as naturally, and still in the character of a learned clerk, he fulfilled the prophecy of Venus, and fell in love. He found one day a demoviselle reading a book of romances. He did not know who she was, but stealing gently towards her, he asked her what book she was

reading. It was the romance of Cleomades. He remarks the singular beauty of her blue eyes and fair hair, while she reads a page or two, and then—one would almost suspect a reminiscence of Dante—

‘ Adont laissames nous le lire.”*

He was thus provided with that essential for soldier, knight, or poet, a mistress,—one for whom he could write verses. She was rich and he was poor; she was nobly born and he obscure ; it was long before she would accept the devotion, even of the conventional kind which Froissart offered her, and which would in no way interfere with the practical business of her life. And in this hopeless way, the passion of,the young poet remaining the same, and the coldness of the lady being unaltered, the course of this passion ran on for some time. Nor was it until the day of Froissart’s de-parture from his native town that she gave him an interview and spoke kindly to him, even promising, with tears in her eyes, that ‘“Doulce Pensée” would assure him that she would have no joyous day until she should see him again.

He was eighteen years of age; he had learned all that he wanted to learn ; he possessed the mechanical art of verse ; he had read the slender stock of classical literature acces- sible ; he longed to see the world. He must already have acquired some distinction, because, on setting out for the court of England, he was able to take with him letters of recommendation from the king of Bohemia and the count of Hainault to Queen Philippa, niece of the latter. He was well received by the queen, always ready to welcome her own countrymen; he wrote ballades and virelays for her and her ladies. But after a year he began to pine for another sight of “la trés douce, simple, et quoie,” whom he loved loyally. Good Queen Philippa, perceiving his altered looks and guessing the cause, made him confess that he was in love and longed to see his mistress. She gave him his congé on the condition that he was to return. It is clear that the young clerk had already learned to ingratiate himself with princes.

The conclusion of his single love adventure is simply and unaffectedly told in his Trettie de’ Hspinette Amoureuse. It was a passion conducted on the well-known lines of conven-

tional love ; the pair exchanged violets and roses, the lady accepted ballads; Froissart became either openly or in secret her recognized lover, a mere title of honour, which conferred distinctiun on her who bestowed it, as well as upon him who received it. But the progress of the amour was rudely interrupted by the arts of ‘ Malebouche,” or Calumny. The story, whatever it was, that Malebouche whispered in the ear of the lady, led toa complete rupture. The damov- selle not only scornfully refused to speak to her lover or acknowledge him, but even seized him by the hair and pulled out a handful. Nor would she ever be reconciled to him again. Years afterwards, when Froissart writes the story of his one love passage, le shows that he still takes delight in the remembrance of her, loves to draw her por- trait, and lingers with fondness over the thought of what she once was to him.

Perhaps to get healed of his sorrow, Froissart began those wanderings in which the best part of his life was to be con- sumed. He first visited Avignon, perhaps to ask for a benefice, perhaps as the bearer of a message from the bishop of Cambray to pope or cardinal. It was in the year 1360, and in the pontificate of Innocent VI. From the papal city he seems to have gone to Paris, perhaps charged with a diplomatic mission. In 1361 he returned to England after an absence of five years. He certainly interpreted his leave of absence ina liberal spirit, and it may have been with a view of averting the displeasure of his kind-hearted protector that he brought with him as a present a book of rhymed chroni- cles written by himself. He says that notwithstanding his youth, he took upon himself the task “a rimer et a dicter”— which can only mean to “turn into verse”—an account of the wars of his own time, which he carried over to England in a book “ tout compilé,’—complete to date,—and pre- sented to his noble mistress Philippa of Hainault, who joy- fully and gently received it of him. Such a rhymed chronicle was no new thing. One Colin had already turned the battle of Crécy into verse. The queen made young Froissart one of her secretaries, and he began to serve her with “ beaux dittiés et traités amoureux.”

Froissart would probably have been content to go on living at ease in this congenial atmosphere of flattery, praise, and caresses, pouring out his

virelays and chansons accord- ing to demand with facile monotony, but for the instigation of Queen Philippa, who seems to have suggested to him the propriety of travelling in order to get information for more rhymed chronicles. It was at her charges that Froissart made his first serious journey. He seems to have travelled a great part of the way alone, or accompanied only by his servants, for he was fain to beguile the journey by compos- ing an imaginary conversation in verse between his horse and his hound. This may be found among his published poems, but it does not repay perusal. In Scotland he met with a favourable reception, not only from King David but from William of Douglas, and from the earls of Fife, Mar, March, and others. 'The souvenirs of this journey are found scat- tered about in the chronicles. He was evidently much im- pressed with the Scotch; he speaks of the valour of the Douglas, the Campbell, the Ramsay, and the Graham ; he describes the hospitality and rude life of the Highlanders ; he admires the great castles of Stirling and Roxburgh, and the famous abbey of Melrose. His travels in Scotland lasted for six months. Returning southwards he rode along the whole course of the Roman wall, a thing alone sufficient to show that he possessed the true spirit of an archeologist ; he thought that Carlisle was Carlyon, and congratulated himself on having found King Arthur's capital; he calls Westmoreland, where the common people still spoke the ancient British tongue, North Wales; he rode down the banks of the Severn, and returned to London by way of Oxford— Vescole d'Asque-Suffort."*

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In London Froissart entered into the service of King John of France as secretary, and yrew daily more courtly, more in favour with princes and great ladies. He probably ac- quired at this period that art, in which he has probably never been surpassed, of making people tell him all they knew. No newspaper correspondent, no American interviewer, has ever equalled this medizeval collector of intelligence. From Queen Philippa, who. confided to him the tender story of her youthful and lasting love for her great husband, down to the simplest knight—Froissart conversed with none beneath the rank of gentlemen—all united in telling this man what he wanted to know. He wanted to know every- thing: he liked the story of a battle from both sides and from many points of view; he wanted the details of every little

cavalry. skirmish, every capture of a castle, every gallant action and brave deed. And what was more remarkable, he forgot nothing. "I had," he says, " thanks to God, sense, memory, good remembrance of everything, and an intellect clear and keen to seize upon the acts which I could learn." But as yet he had not begun to write in prose.

At the age of twenty-nine, in 1366, Froissart once more left England. This time he repaired first to Brussels, whither were gathered together a great concourse of min- strels from all parts, from the courts of the kings of Denmark, Navarre, and Aragon, from those of the dukes of Lancaster, Bavaria, and Brunswick. Hither came all who could "rimer et dicter." What distinction Froissart gained is not stated ; but he received a gift of money as appears from the accounts, " uni Fritsardo, dictori, qui est cum regina Angliz, dicto die, vi. mottones."

After this congress of versifiers, he made his way to Brittany, where he heard from eye-witnesses and knights who had actually fought there details of the battles of

Yocherel and Auray, the Great Day of the Thirty and the heroism of Jeanne de Montfort. Windsor Herald told him something about Auray, and a French knight, one Antoine de Beaujeu, gave him the details of Cocherel. From Brittany he went southwards to Nantes, La Roclielle, and Bordeaux, where he arrived a few days before the visit of Richard, afterwards second of thatname. He accompanied the Black Prince to Dax, and hoped to go on with him into Spain, but was despatched to England on a mission. He next formed part of the expedition which escorted Lionel duke of Clarence to Milan, to marry the daughter of Galeazzo Visconti. Chaucer was also one of the prince's suite. Atthe wedding banquet Petrarch was a guest sitting among the princes.

From Milan Froissart, accepting gratefully a cotte hardve with 20 florins of gold, set out upon his travels in Italy. At Bologna, then in decadence, he met Peter, king of Cyprus, from whose follower and minister, Eustache de Conflans, he learned many interesting particulars of the king's exploits. He accompanied Peter as far as Venice, where he left him after receiving a gift of 40 ducats. With them and his cotte hardte, still lined we may hope with the 90 florins, Froissart betook himself to Rome. The city was then at its

lowest point : the churches were roofless ; there was no pope; there were no pilgrims ; there was no splendour ; and yet, says Froissart sadly,

‘Ce furent jadis en Rome,

Li plus preu et li plus sage homme Car par sens tons les arts passtrent.”

It was at Rome tliat he learned the death of his friend King Peter of Cyprus, and, worse still, an irreparable loss to him, that of the good Queen Philippa, of whom he writes, in grateful remembrance— « Propices li soit Diex & ’dme! J’en suis bien tenus de pryer,

Et ses larghesces escuyer, Car elle me fist et créa.”

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Philippa dead, Froissart looked around for a new patron. Then he hastened back to his own country and presented himself, with a new book in French, to the duchess of Brabant, from whom he received the sum of 16 francs, given in the accounts as paid unt Lrissardo dictator. The use of the word wnz does not imply any meanness of posi- tion, but is simply an equivalent to the modern French szewr. Froissart may also have founda patron in Yolande de Bar, grandmother of King René of Anjou. In any case he re- ceived a substantial gift from some one in the shape of the benefice of Lestines, a village some three or four miles from the town of Binche. Also, in addition to his cure, he got placed upon the duke of Brabant’s pension list, and was entitled to a yearly grant of grain and wine, with some smal] sum in money.

It is clear, from Froissart’s own account of limself, that he was by no means a man who would at the age of four or five and thirty be contented to sit down at ease to dis- charge the duties of parish priest, to say mass, to bury the dead, to marry the villagers, and to baptize the young, In these days, and in that country, it does not seem that other duties were expected. Preaching was not required, godli- ness of life, piety, good works, and the graces of a modern ecclesiastic were not looked for. Therefore, when Froissart complains to himself that the taverns of Lestines got 500 francs of his money, we need not at once set him down as either a bad priest, or

exceptionally given to drink. The people of the place were greatly addicted to wine; the taverniers de Lestines proverbially sold good wine; the Flemings were proverbially of a joyous disposition—

‘ Ceux de Hainaut chantent & pleines gorges.”’*

Froissart, the parish priest of courtly manners, no doubt drank with the rest, and listened if they sang his own, not the coarse country songs. Mostly he preferred the society of Gerard d’Obies, provost of Binche, and the little circle of knights within that town. Or, for it was not incumbent on him to be always in residence, he repaired to the court of Coudenberg, and became “ moult frére et accointé” with the duke of Brabant. And then came Gui de Blois, one of King John’s hostages in London in the old days. He had been fighting in Prussia with the Teutonic knights, and now, a little tired of war, proposed to settle down for a time in his castle of Beaumont. This prince was a member of the great house of Chatillon. He was count of Blois, of Soissons, and of Chimay. He had now, about the year 1374, an excellent reputation as a good captain. In him Froissart, who hastened to resume acquaintance, found a new patron, More than that, it was this sire de Beaumont, in emulation of his grandfather, the patron of Jean le Bel, who advised Froissart seriously to take in hand the history of his own time. Froissart was then in his thirty-sixth year. For twenty years he had been rhyming, for eighteen he had been making verses for queens and ladies. Yet during all this time he had been accumulating in his retentive brain the materials for his future work,

He began by editing, so to speak, that is, by rewriting with additions the work of Jean Je Bel; Gui de Blois, among others, supplied him with additional information. Tlis own notes, taken from information obtained in his travels, gave him more details, and when in 1374 Gui married Marie de Namur, Froissart found in the bride’s father, Robert de Namur, one who had himself largely shared in the events which he had to relate. He, for instance, is the authority for the story of the siege of Calais and the six burgesses. Provided with these materials, Froissart remained at Lestines, or at Beaumont, arranging and writing his chronicles. During this period, too, he composed his Hspinette Amoureux, and the Joli Buisson de

Jonesce, and his romance of Méliador. He also became chaplain to the count of Blois, and obtained a canonry of Chimay. After this appointment we hear nothing more of Lestines, which he probably resigned.

In these quiet pursuits he passed twelve years, years of which we hear nothing, probably because there was nothing to tell: In 1386 his travels began again, when he accom- panied Gui to his castle at Blois, in order to celebrate the mar- riage of his son Louis de Dunois with Marie de Berry. He wrote a pastouredle in honour of thé event. Then he attached himself for‘a few days to the duke of Berry, from whom he learned certain particulars of current events, and then be- coming aware of what promised to be the most mighty feat of arms of his time, he hastened to Sluys in order to be on the spot. At this port tne French were collecting an enormous fleet, and making preparations of the greatest magnitude in order to repeat the invasion of William the Conqueror. They were tired of being invaded by the English, and wished toturn the tables. The talk was all of conquering the country and dividing it among the knights, as had been done by the Normans. It is not clear whether Froissart intended to go over with the invaders; but as his sympathies are ever with the side where he happens to be, he exhausts himself in admiration of this grand gathering of ships and men. “ Any one,” he says, “ who had a fever would have been cured of his malady merely by going to look at the fleet.” But the delays of the duke of Berry, and the arrival of bad weather, spoiled everything. There was no invasion of England. In Flanders Froissart met many knights who had fought at Rosebeque, and conld tell him of the troubles which in a few years desolated that country, once so prosperous. He set himself to ascertain the history with as much accuracy as the comparison of various accounts by eye witnesses and actors would allow. He stayed at Ghent, among those ruined merchants and mechanics, for whom, as one of the same class, he felt a sympathy never extended to English or French, perhaps quite as unfortunate; and he devotes no fewer than 300 chapters to the Flemish troubles, an amount out of all proportion to the comparative importance of the events, This portion of the chronicle was written at Valenciennes. During this residence in his birthplace his verses were crowned at the “puys d’amour” of Valenciennes and Tournay.

This part of his work finished, he considered what to do next. There was small chance of anything important hap- pening in Picardy or Hainault, and he determined on mak- ing a journey to the south of France in order to learn some- thing new. He was then fifty-one years of age, and being still, as he tells us, in his prime, "of an age, strength, and limbs able to bear fatigue," he set out as eager to see new places as when, 33 years before, he rode through Scotland and marvelled at the bravery of the Douglas. What he had, in addition tostrength, good memory, and good spirits, was a manner singularly pleasing, and great personal force of character. This he does not tell us, but it comes out abund- antly in his writings ; and, which he does tell us, he took a singular delight in his book. 'The more I work at it," he says, "the better am I pleased with it."

On this occasion he rode first to Blois; on the way he fell in with two knights who told him of the disasters of the English army in Spain; one of them also informed him of the splendid hospitalities and generosity of Gaston Phebus, count of Foix, on hearing of which Froissart resolved to seek him out. He avoided the English provinces of Poitou and Guienne, and rode southwards through Berry, Auvergne, and Languedoc. Arrived at Foix he discovered that the count was at Orthez, whither he proceeded in company with a knight named Espaing de Lyon, who, Froissart found, had not only fought but could describe.

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The account of those few days' ride with Espaing de Lyon is the most charming, the most graphic, and the most vivid chapter in the whole of Froissart. Every turn of the road brings with it the sight of a ruined castle, about which this knight of many memories has a tale ora reminiscence. The whole country teems with fighting stories. Froissart never tires of listening vor the good knight of telling, " Sainte Marie!" cries Froissart in mere rapture. ' How pleasant are your tales, and how much do they profit me while you relate them! And you shall not lose your trouble, for they shall all be set down in memory and remembrance in the history which I am writing." Arrived at length at Orthez, Froissart lost no time in presenting his credentials to the count of Foix. Gaston Phoebus was at this time fifty-

nine years of age. His wife, from whom he was separated, was that princess, sister of Charles of Navarre, with whom

Guillaume de Machault carried on his innocent and poetical |

amour. The story of the miserable death of his son is well known, and may be read in Froissart. But that was already a tale of the past, and the state which the count kept up was that of a monarch. 'To such a prince such a visitor as Froissart would be in every way welcome. Mindful no doubt of those paid clerks who were always writing verses, Froissart introduced himself as a chronicler. He could, of course, rhyme, and in proof he bronght with him his rom- ance of JAféliador ; but he did not present himself as a wandering poet. The count received him graciously, speedily discovered the good qualities of his guest, and often

invited him to read his Méliador aloud in the evening, –

during which tine, says Froissart, "nobody dared to say a word, because he wished me to be heard, such great delight did he take in listening." Very soon Froissart, from reader of a romance, became raconteur of the things he had seen and heard ; the next step was that the count himself began to talk of affairs, so that the note-book was again in requisi- tion. There was a good deal, too, to be learned of people about the court. One knight recently returned from the East told about the Geneose occupation of Famagosta ; two more had been in the fray of Otterbourne ; others had been in the Spanish wars.

Leaving Gaston at length, Froissart assisted at the wed- ding of the old duke of Berry with the youthful Jeanne de Bourbon, and was present at the grand reception given to Isabeau of Bavaria by the Parisians. He then returned to Valenciennes, and sat down to write his fourth book. A journey undertaken at this time is characteristic of the thorough and conscientious spirit in which he composed his work ; it illustrates also his restless and curious spirit. While engaged in the events of the year 1385 he became aware that his notes taken at Orthez and elsewhere on the affairs of Castile and Portugal were wanting in completeness. He left Valenciennes and hastened to Bruges, where, he felt certain, he should find some one who would help him. There was, in fact, at this great commercial centre, a

colony of Portuguese. From them he learned that a certain Portuguese knight, Dom Juan Fernand Pacheco, was at the moment in Middelburg on the point of starting for Prussia. He instantly embarked at Sluys, reached Middelburg in time to catch this knight, introduced himself, and conversed with him uninterruptedly for the space of six days, getting his information on the promise of due acknowledgment. Dur- ing the next two years we learn little of his movements. He seems, however, to have had trouble with his seigneur Gui de Blois, and even to have resigned his chaplaincy. Froissart is tender with Gui's reputation, mindful of past favours, and remembering how great a lord he is. Yet the truth is clear that in his declining years the once gallant Gui de Blois became a glutton and a drunkard, and allowed his affairs to fall into the greatest disorder. So much was he crippled with debt that he was obliged to sell his castle

and county of Blois to the king of France. Froissart lays all the blame on evil counsellors. "He was my lord and master," he says simply, 'an honourable lord and of great reputation ; but he trusted too easily in those who looked for neither his welfare nor his honour." Although canon of Chimay and perhaps curé of Lestines as well, it would seem as if Froissart was not able to live without a patron. He next calls Robert de Namur his seigneur, and dedicates to hin, in a general introduction, the whole of his chronicles, We then find him at Abbeville, trying to learn all about the negotiations pending between Charles VI. and the English. He was unsuccessful, either because he could not get at those who knew what was going on, or because the secret was too well kept. He next made his last visit to England, where, after forty years' absence, he naturally found no one who remembered him. Here he gave King Richard a copy of his "'traités amoureux," and got favour at court. He stayed in England some months, seeking information on all points from his friends Henry Chrystead and Richard Stury, from the dukes of York and Gloucester, and from Robert the Hermit.

On his return to France, he found preparations going on for that unlucky crusade, the end of which he describes in his Chronicle. It was headed by the count of Nevers. After him floated many a banner of knights,

descendants of the crusaders, who bore the proud titles of duke of Athens, duke of Thebes, sire de Sidon, sire de Jericho. They were going to invade the sultan's empire by way of Hungary; they were going to march south; they would reconquer the holy places. And presently we read how it all came to nothing, and how the slaughtered knights lay dead outside the city of Nikopoli. In almost the concluding words of the Chronicle the murder of Richard II. of England is de- scribed. His death ends the long and crowded Chronicle, though the pen of the writer struggies through a few more unfinished sentences.

The rest is vague tradition. He is said to have died at Chimay ; it is further said that he died in poverty so great that his relations could not even afford to carve his name upon the headstone of his tomb ; not one of his friends, not even Eustache Deschamps, writes a line of regret in remem- brance; the greatest historian of his age had a reputation so limited that his death was no more regarded than that of any common monk or obscure priest. We would willingly place the date of his death, where his Chronicle stops, in the year 1400; but tradition assigns the date of 1410. What date more fitting than the close of the century for one who has made that century illustrious for ever ?

Among his friends were Guillaume de Machault, Eustache Deschamps, the most vigorous poet of this age of decadence, and Cuvelier, a follower of Bertrand du Guesclin. These alliances are certain. It is probable that he knew Chaucer, with whom Deschamps maintained a poetical correspond- ence; there is nothing to show that he ever made the acquaintance of Christine de Pisan. Froissart was more proud of his poetry than his prose. Posterity has reversed this opinion, and though a selection of his verse has been published, it would be difficult to find an admirer, or even a reader, of his poems. The selection published by Buchon in 1829 consists of the Dit dow Florin, half of which is a description of the power of money; the Débat dou Cheval et dou Levrier, written during his journey in Scotland ; the Dzttie de la Flour de la Margherite ; a Dittre d' Amour called L'Orlose Amoureus, in which he compares himself, the imaginary lover, with a clock ; the Hspinette Amoureuse, which contains a sketch of his early life, freely and pleasantly drawn, accompanied by rondeaux and vire- lays ; the

Buisson de Jonesce, in which he returns to the recollections of his own youth ; and various smaller pieces.

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The verses are monotonous; the thoughts are not without poetical grace, but they are expressed at tedious length. It would be, however, absurd to expect in Froissart the vigour and verve possessed by none of his predecessors. The time was gone when Marie de France, Rutebceuf, and Thibaut de Champagne made the 13th century language a medium for verse of which any literature might be proud. Briefly, Froissart's poetry, unless the unpublished portion be better than that before us, is monotonous and me- chanical. The chief merit it possesses is in simplicity of diction. This not infrequently produces a pleasing effect.

As for the character of his Chronicle, little need be said. There has never been any difference of opinion on the dis- tinctive merits of this great work. It presents a vivid and faithful drawing of the things done in the 14th century. No more graphic accouut exists of any age. No historian has drawn so many and such faithful portraits. They are, it is true, portraits of men as they seemed to the writer, not of menasthey were. Froissart was uncritical; he accepted princes by their appearance. Who, for instance, would recognize in his portrait of Gaston Phoebus de Foix the cruel voluptuary, stained with the blood of his own son, which we know him to have been? Froissart, again, lad no sense of historical responsibility ; he was no judge to inquire into motives and condemn actions ; he was simply a chronicler. He has been accused by French authors of lacking patriotism, Yet it must be remembered that he was neither a Frenchman nor an Englishman, but.a Fleming. He has been accused of insen- sibility to suffering.- Indignation against oppression was not, however, common in the 14th century ; why demand of Froissart a quality which is rare enough even in our own time? Yet there are moments when, as in describing the massacre of Limoges, he speaks with tears in his voice.

Let him be judged by his own aims. '" Before I com- mence this book," he says, "I pray the Saviour of all the world, who created every thing out of

nothing, that He will also create and put in me sense and understanding of so much worth, that this book, which I have begun, I may con- tinue and persevere in, so that all those who shall read, see, and hear it may find in it delight and pleasance." To give delight and pleasure, then, was his sole design.

As regards his personal character, Froissart depicts it himself for us. Such as he was in youth, he tells us, so he remained in more advanced life; rejoicing mightily in dances and carols, in hearing minstrels and poems; inclined to love all those who love dogs and hawks ; pricking up his ears at the uncorking of bottles,—" Car au voire prens grand plaisir ;" pleased with good cheer, gorgeous apparel, and joy- ous society, but no commonplace reveller or greedy volup- tuary,—everything in Froissart was ruled by the good mauners which he set before all else; and always eager to listen to tales of war and battle. As we have said above, he shows, not only by his success at courts, but also by the whole tone of his writings, that he possessed a singularly winning manner and strong personal character. He lived wholly in the present, and had no thought of the coming changes. Born when chivalrous ideas were most widely spread, but the spirit of chivalry itself, as inculcated by the best writers, in its decadence, he is penetrated with the sense of knightly honour, and ascribes to all his heroes alike those qualities which only the ideal knight possessed.

The first edition of Froissart was published in Paris. It bears no date; the next editions are those of the years 1505, 1514, 1518, aud 1520. The best and most complete edition is that of Buchon, 1824, which is a continuation of one commenced by Dacier. An abridg- ment was made in Latin, by Belleforest, and published in 1672. An English translation was made by Bourchier, Lord Berners, and published in London, 1525. The translation now in use is co made by Thomas Johnes, and originally published in 1802-

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FROME, a parliamentary borough and market town of Somersetshire, is situated on the small river Frome, an affluent of the Avon, 11 milesS. of Bath. It was formerly called Frome Selwood, from its situation on the

borders of the extensive forest of Selwood. 'The river is crossed at Frome by a stone bridge of five arches. The town is ir- regularly built on an acclivity, and the older streets, with the exception of the principal one, are somewhat narrow and irregular. The parish church is an elegant edifice in the later Gothic style, with a tower and a fine octagonal spire 120 feet in height, and the church of St Marys, a fine structure in the First Pointed style, was erected in 1864. The other public buildings of importance are the market-house, and the museum. Among the educational and charitable institutions are the free grammar school, founded in the time of Edward VI,, the national school, the asylum for the education and maintenance of 25 poor girls, the blue-coat school, and the almshouses for old men and women. Frome also possesses a literary institute, a mechanics' institute, and a school of art. The inhabitants are chiefly employed in the manufacture of broadcloth and other fine woollens, but there are also foundries, wire-card manufactories, and edge-tool works, and the town has been long noted for its ale. The vicinity is fertile and pictur- esque, and is ornamented with numerous fine mansions. Frome returns a member to parliament. The population in 1871 was 9753.

FROMENTIN, Evechne (1820-1876), French painter, was born at La Rochelle in December 1820. After leaving

school he studied for some years under Louis Cabat, the

landscape painter. Fromentin was one of the earliest pictorial interpreters of Algeria, having been able, while quite young, to visit the land and people that suggested the subjects of most of his works, and to store his memory as well as his portfolio with the picturesque and charac- teristic details of North African life. In 1849 he obtained a medal of the second class. In 1852 he paid a second visit to Algeria, accompanying an archeological mission, and then completed that minute study of the scenery of the country and of the habits of its people which enabled him to give to his after work the realistic accuracy that comes from intimate knowledge. In a certain sense his works are not more artistic results than contribu- tions to ethnological science. His first great success was produced at the Salon of 1847, by the Gorges de la Chiffa. Among his more important works are—La Placede la Bréche 4 Constantine, 1849 ; Enterrement Maure, 1853; Bateleurs Neégres

and Audience chez un Chalife, 1859; Berger Kabyle and Courriers Arabes, 1861; Bivouac Arabe, Chasse an Faucon, Faucounier Arabe (now at the Luxembourg), 1863 ; Chasse au Heron, 1865; Voleurs de Nuit, 1867; Centaurs and Arabes attaqués par une Lionne, 1868; Halte de Muletiers, 1869; Le Nil and Un Souvenir d'Esneh, 1875. Fromentin was much influenced in style by Eugéne Delacroix. His works are distinguished by striking com- position, great dexterity of handling, and brilliancy of colour. In them is given with great truth and refine- ment the unconscious grandeur of barbarian and animal attitudes and gestures. His later works, however, show signs of an exhausted vein, and of an exhausted spirit, accompanied or caused by physical enfeeblement. But it must be observed that Fromentin's paintings show only one side of a genius that was perhaps even more felicitously expressed in literature, though of course with less profu- sion. '" Dominique," first published in the Revue des Deux Mondes in 1862, and dedicated to George Sand, is remarkable among the fictions of the century for delicate and imaginative observation and for emotional earnestness. Fromentin's other literary works are—Visites Artistiques, 1852; Simples Pélerinages, 1856; Un Eté dans le Sahara,

1857; Une Année dans le Sahel, 1858; and Les Maitres dautrefois, 1876. In 1876 he was an unsuccessful candi- date for the Academy. He died suddenly at La Rochelle on the 27th August 1876.

FRONDE, War or THE (1648-1652). (p. 572) and ConDE.

FRONTINUS, Suxtrus Juxtus, a Roman soldier, and the author of some interesting works, was born of a patrician family at Rome about 40 a.p. Nothing is known of his early life or history till we find him acting as preetor urbanus, under Vespasian, in 70, an office from which he soon re- tired to make way for Domitian. Five years later he was sent into Britain to succeed Petilius Cerealisas governor of that islaud. He subdued the Silures, and held the other native tribes in check till 78, when he was superseded by Agricola. In 97 he was appointed curator aquarum at Rome, an office which was never conferred except upon persons of very high standing. He was also a member of the college of augurs, retaining the dignity till his death, which appears to have happened about 103, The later years of his

life were spent in studious retirement on the shores of Campania. Many works have been attributed to Frontinus, of which only two that are undoubtedly his are now extant. The first of these is a treatise on tactics entitled Strategematicon Libri IV., and the second is entitled De Aquis Urbis Rome Libri II. The latter conveys in a clear and terse style much valuable information on the manner in which ancient Rome was supplied with water, and on other matters of importance in the history of architecture. A large number of interpolations have been inserted into the Strategematicon by various writers. The two works have been translated into most of the languages of Europe.

The best editions of the Strategematicon are those of Oudendorp, Leyden, 1731, and Schwebel, Leipsic, 1772. The best editions of the De Aquis are those of Polenus, Pavia, 1722, and G. C. Adler, Altona, 1792.

FRONTO, Marcus Cornetivs, a Roman grammarian, rhetorician, and advocate, was born of an Italian family at Cirta in Numidia, a Libyan of the Libyans, as he calls himself, A(@us rOv ArBiwv. The date of his birth is unknown, but as he was questor in 138, it must have been before 113, and not improbably between 100and 110. He came to Rome in the reign of Hadrian, and sxon gained such renown as an advocate and orator as to be reckoned inferior only to Cicero, Antoninus Pius, hearing of his fame, appointed him tutor to his adopted sons Marcus Aurelius and Lucius Verus ; and Fronto, as appears from his surviving letters, completely gained the confidence and affection of both these pupils. He was proconsul of Asia for a few months in 143, and five years later he was of- fered the same post, but declined acceptance on the plea of bad health. He preferred to remain at Rome, where, by the practice of his profession, he amassed a very large fortune, which enabled him to purchase the famous gardens of Mzecenas, besides sumptuous villas in various parts of ltaly. In his old age, when confined to his house by the gout, he used to receive the leading literary men, who flocked to hear his unrivalled conversation. This exhibited the same qualities as his more formal orations, which were so much admired that a school of rhetoricians called itself after his name, having for its object the restoration to the Latin language of its ancient purity and simplicity. Fronto died at an advanced age, but the exact date of his death is not known, and it is even uncertain whether he survived or predeceased the emperor Marcus

Aurelius. Till 1815 the only work of Fronto's believed to exist was some disjointed fragments of his essay De Differentra Vocabulorum, and even this is more probably the produc- tion of a later grammarian who made use of Frontos

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works. In that year, however, Angelo Mai discovered in the Ambrosian library at Milan a palimpsest manuscript, on which had been originally written some of Fronto's letters to his royal pupils. These he deciphered and published with notes, Milan, 1815. On his removal to Rome he dis- covered in the Vatican some additional sheets of the same palimpsest, which, like the first, contained letters of Fronto to Aurelius and Verus, with their replies. These palimp- sests had originally belonged to the famous convent of St Columba at Bobbio, and had been written over by the monks with the acts of the first council of Chalcedon. All these letters were published by Mai, at Rome, in 1823, under the title of MW. Cornelii Frontonis et M. Aurelii imperatoris epistole; L. Veri et Antonini Pu e Apptant epistolarum reliquic ; Fragmenta Frontonis et scripta grammatica. The discovery excited intense interest among the scholars of Europe, but a certain amount of disappointment was felt when the contents of the letters were examined, The characters of the two emperors, indeed, are displayed in a very favourable light, especially in the affection which they both seemed to have retained for their old master; but the subject-matter of most of the letters is of such ephemeral interest as to throw little additional light on Roman antiquity. Not only have 146 of the leaves of the manu- script been lost, but hardly a half of the 194 still extant have been deciphered so as to furnish an intelligible con- text. A more careful examination of the palimpsest might possibly show good results.

A critical edition was published by Niebuhr, Buttmann, and Heindorf, Berlin 1826; a French translation of Mai's edition of 1828, by Armand Cassan, Paris, 2 vols. 8vo, 1830; and an edition based on a new examination of the MSS. by Du Rieu, by Naber, Leipsic,1867. Orelli published a selection of the letters or Chrestomathia Fron- tontand, asan appendix to his edition of the Dialogus de Oratoribus of Tacitus. Critical

observations on the remains have been published by L. Schopen (Bonn, 1830, 1841); Alan (Dublin, 1841); A. Philibert Soupé, De Frontonis reliquiis, Amiens, 18538; J. Mahly, in Philologus, xvii. and xix.; M. Haupt, De emendatione librorum Frontonis, Berlin, 1867; R. Ellis, in Journal of Philology, 1868 ; Eussner, in Lheinisehes Museum, Xxv.; Mommsen, in Hermes, 1874; Klussmann, Emendationes Frontoniane, Gottingen, 1871; enlarged, Berlin, 1874.

FROSINONE, a town of Italy, in the province of Rome, on the railway between Rome and Naples, about 62 miles from the former and 104 from the latier. It is situated in a rich vine-growing district, at the foot of a hill near the left bavk of the Cosa, an affluent of the Sacco or Trerus. Though a place of considerable size and great antiquity, it contains very little of interest either for the classical or medieval archeologist. Its principal buildings are the eight churches and a number of old convents. In the plain below there are some remains of an amphitheatre. Frosinone is easily identified with the ancient Frusino or Frusinum, a city of the Volscians which ultimately became a Roman municipium and received a colony of veterans. Previous to 1870 it was the head of a delegation of the papal states, and as such a place of some importance. The population in 1871 was 10,161. ,

FROST, Witt1am EpwaRrp (1810-1877), a painter of mythological and fanciful subjects, was born at Wandsworth, near London, in September 1810. He showed at an early age considerable talent for drawing, and his father placed him under as good instruction as was available in the neighbourhood. About 1825 he was introduced to Etty, who advised that he should attend a celebrated drawing school in Bloomsbury Street. After several years' study there, and in the sculpture rooms at the British Museum, Frost was in 1829 admitted as a student in the schools of the Royal Academy, where he was noted for steady and careful application, and for success in competition. He won medals in all the schools, except the antique, in which he was beaten by Maclise, During those years,

and indeed until the time when more imaginative work had brought, with fame, other means of subsistence, he maintained himself by portrait painting, He is said to have painted, about this time, over 300 portraits; but not one of them is now remembered as a work of any artistic value. In 1839 he obtained the gold medal of the Royal Academy for his picture of Prometheus bound by Force and Strength. At the cartoon exhibition at Westminster Hall in 1843 he was awarded a third-class prize of 100 pounds, for his cartoon of Una alarmed by Fauns and Satyrs. He ex- hibited at the Academy Christ crowned with Thorns (1843), Nymphs dancing (1844), Sabrina (1845), Diana and Acton (1846). In 1846 he was elected Associate of the Royal Academy. His Nymph disarming Cupid was exhibited in 1847; Una and the Wood-Nymphs of the same year was bought by the Queen. This was the time of Frost's highest popularity. Influences affecting the art of the country at the time led to the decline of his reputation after 1850; and opinion on his work so changed in later years that it was perhaps by courtesy only that he obtained the dignity of full membership of the Royal Academy. His later pictures are simply repetitions of earlier motives. Among them may be named Euphrosyne (1848), Wood-Nymphs (1851), Chastity (1854), Il Penseroso (1855), The Graces (1856), Narcissus (1857), Zephyr with Aurora playing (1858), The Graces and Loves (1863), Hylas and the Nymphs (1867). After being for some years at the head of the list of associates, Frost was elected to full member- ship of the Royal Academy in

December 1871. This dig- nity, however, he soon resigned, and his name appears in the lists issued during the last years of his life among those of honorary retired Academicians. There is some- thing very flimsy about the productions of this painter. In work after work is continued the same unvarying series of maidens and nymphs, having the same smiles, gestures, graces. There is in these paintings no spontaneity and little truth of feeling of any kind. Frost had no high power of desigu, though some of his smaller and apparently less important works are not without grace and charm. Technically, his paintings are, in a sense, very highly tinished, but they are entirely without mastery. The writings of Ruskin and the rise of the pre-Raphaelites changed the regard in which such productions as those of Frost were held ; and his career was practically at an end some years before his death. As a man he was highly esteemed by his friends for the gentleness and modesty of his disposition, He died on the 4th of June 1877.

FROSTBITE. See Mortirication.

FRUGONI, Canto Innocewzo (1692-1768), an Italian poet, was born at Genoa 21st November 1692. In accord- ance with the custom of the family to which he belonged, being destined, as the youngest son, for the ecclesiastical profession, he was, at the age of fifteen, in opposition to his strong wishes, shut up in a convent; and although in the following year he was induced to pronounce monastic vows, his sentiments continued to remain com- pletely at variance with the profession he had adopted. He, however, made so rapid progress in his studies that he soon acquired considerable reputation as an elegant writer both of Latin and Italian prose and verse; and from 1716 to 1724 he filled the chairs of rhetoric at Brescia, Rome, Genoa, Bologna, and Modena successively, attracting by his brilliant fluency a large number of students at each univer- sity. Through Cardinal Bentivoglio he was recommended to Antonio Farnese, duke of Parma, who appointed him his poet laureate ; and he remained at the court of Parma until the death of Antonio, after which he returned tu Genoa. Shortly afterwards, through the intercession of Bentivoglio, he obtained from the pope the remission of his monastic vows, and by eloquent representations he ultimately suc-

ceeded in recovering a portion of his paternal inheritance. After the peace of Aix-la-Chapelle, he returned to the court of Parma, avd there devoted the later years of his life chiefly to poetical composition. He died 20th December 1768. Frugoni holds a place in the first rank of the lyrical poets of his time, and his other compositions, which embrace almost every form of poetry, have in most cases consider- able merit, and are generally characterized by harmony of versification, elegance of language, and appositeness and great variety of imagery.

His collected works were published at Parma in 10 vols, in 1799, and a more complete edition appeared at Lucca in the same year in

15 vols. A selection from his works was published at Brescia in 1782, in 4 vols.

FRUMENTIUS, an early Christian missionary and bishop who is recognized by the Abyssinian church as its apostle and founder, and usually bears in Abyssinian litera- ture the title of Abba Salama or Father of Salvation. According to Rufinus, an ecclesiastical historian of the latter part of the 4th century, who gives Audesius himself as his authority, a certain Tyrian philosopher, accompanied by his kinsmen Frumentius and Aidesius, set out on an expedition to " India," but was murdered by the natives of a coast town which he visited by the way. The two young men, on the contrary, were taken under royal pro- tection, and ultimately became tutors of the heir apparent to the throne. On the succession of their pupil they returned home. Aidesius was made presbyter of Tyre, and Frumentius was consecrated bishop by Athanasius of Alexandria, and went back to propagate Christianity among the "Indians." This story is substantiated by the letters of Athanasius, who distinctly mentions the consecration of Frumentius, in 326, as bishop of Axum in Abyssinia, and gives some details of the history of his mission. The opinion of Thomas Wright (Harly Christianity in Arabia, 1855), that the scene of the labours of Frumentius was not Abyssinia but southern Arabia, appears quite irrecon- cilable with the direct testimony of Athanasius, whatever support it may find in the vaguer notices of ecclesiastical historians,

See Nicephorus, ix. 18; Rufinus, x. 9; Theodoret, i, 23; Atha- nasius, Epistola ad Constantinum.

FRUYTIERS, Puixip, a pupil of the Jesuits' college at Antwerp in 1627, entered the Antwerp guild of painters without a fee in 1631. He is described in the register of that institution as "illuminator, painter, and engraver," The current account of his life is that he worked exclu- sively in water colours, yet was so remarkable in this branch of his art for arrangement, drawing, and especially for force and clearness of colour, as to excite the admiration of Rubens, whom he portrayed with all his family." The truth is that he was an artist of the most versatile taleuts, as may be judged from the fact that in 1646 he executed an Assumption with figures of life size, and four smaller pictures in oil, for the church of St Jacques at Antwerp, for which he received the considerable sum of 1150 florins, Unhappily no undoubted production of his hand has been preserved, and hence we are at a loss surely to gauge his acquirements. All that we can point to with certainty is a series of etched plates, chiefly portraits, which are acknow- ledged to have been powerfully and skilfully handled. Tf, however, we search the portfolios of art collections on the Continent, we sometimes stumble upon miniatures on vellum, drawn with great talent, and coloured with extraordinary brilliancy. In form they quite recall the works of Rubens, and these, it may be, are the work of Philip Fruytiers, who died in 1666, and was buried on the 21st of June in the church of the Récollets at Antwerp.

FRY, or Gurney, Exvizaperu (1780-1845), an emi- nent philanthropist and, after Howard, the chief promoter

of prison reform in Europe, was born in Norwich on the 21st of May 1780. Her father, Jolin Gurney, afterwards of Earlham Hall, a wealthy merchant and banker, repre- sented an old family which for some generations had be- longed to the Society of Friends ; and her mother, Catharine Bell, was a great granddaughter of Robert Barclay, the friend and companion of George Fox. Elizabeth was the third daughter in a large family, which included Joseph John Gurney, whose name is intimately associated with those of Buxton, Wilberforce, aud other promoters of the anti-slavery cause. While still a girl, she gave many indi- cations of the benevolence of disposition, clearness and in- dependence of judgment, and strength of

purpose, for which she was afterwards so distinguished ; but it was not until after she had entered her eighteenth year that her religion assumed a decided character, and that she was induced, under the preaching of the American Quaker, William Savery, to become an earnest and enthusiastic though never fanatical " Friend." In August 1800 she became the wife of Joseph Fry, a London merchant, and had her home for some years in St Mildred's Court, City, and afterwards at Plashet House, Essex. Amid increasing family cares she was unwearied in her attention to the poor and the neglected of her neighbourhood ; and in 1811 she was ac- knowledged by her co-religionists as a " minister," an hon- our and responsibility for which she was undoubtedly quali- fied, not only by vigour of intelligence and warmth of heart, but also by an altogether unusual faculty of clear, fluent, and persuasive speech. Although she had made several visits to Newgate prison as early as February 1813, it was not until nearly four years afterwards, that the great public work of her life may be said to have begun. The " Asso- ciation for the Improvement of the Female Prisoners in Newgate," was formed in April 1817. Its aim was the much-needed establishment of some of what are now re- garded as the first principles of prison-discipline, such as entire separation of the sexes, classification of criminals, female supervision for the women, and adequate provision for their religious and secular instruction, as also for their useful employment. The ameliorations effected by this association, and largely by the personal exertions of Mrs Fry, soon became obvious, and led to a rapid extension of similar methods to other places. In 1818 she, along with her brother, visited the prisons of Scotland and the north of England ; and the publication (1819) of the notes of this tour, as also the cordial recognition of the value of her work by the House of Commons' committee on the prisons of the metropolis, led to a great increase of her correspond- ence, which now extended to Italy, Denmark, and Russia, as well as to all parts of the United Kingdom. Through a visit to Ireland, which she made in 1827, she was led to direct her attention to other houses of detention besides prisons ; and her observatious resulted in many important improvements in the British hospital system, and in the treatment of the insane. In 1838 she visited France, and besides conferring with many of the leading prison officials, she personally visited most of the houses of detention in Paris, as well as in Rouen, Caen, and some other places. In the following year she obtained an official permission to visit all the prisons in that country ; and her tour,

which extended from Beulogne and Abbeville to Toulouse and Marseilles, resulted in a report which was presented to the minister of the interior and the prefect of police. Before returning to England she had included Geneva, Zurich, Stuttgart, and Frankfort in her inspection. The summer of 1840 found her travelling through Belgium, Holland, and Prussia on the same mission; and in 1841 she also visited Copenhagen. In 1842, through failing health, Mrs Fry was compelled to forego her plans for a still more widely extended activity, but had the satisfaction of hearing from

almost every quarter of Europe that the authorities were giving increased practical effect to her suggestions. In 1844 she was seized with a lingering illness of which she died on the 12th of October 1845. She was survived by a numer- ous family, the youngest of whom was born in 1822. Two interesting volumes of Memoirs, with Huxtracts from her Journals and Letters, edited by two of her daughters, were published in 1847.

FUAD PASHA, Meumep (1814-1869), a Turkish statesman and author, was born at Constantinople in 1814. His father, Izzet-Fffendi Kitchegizadey, better known as Izzet-Mollah, was a man of wealth and position, and had a high reputation as a poet; but he fell into disgrace with the Turkish Government, and his estates were confiscated. Fuad being therefore compelled to adopt a profession chose that of medicine ; and after studying from 1828 to 1832 at Galata-Serai, he was appointed in 1834 physician to the adiniralty, and accompanied the expedition against Tripoli. On his return to Constantinople he quitted the medical service and entered the interpreters' office, with the view of qualifying himself for a diplomatic post. In 1840 he accompanied the Turkish embassy to London as first secre- tary, and in 1843 he was appointed to the office of second interpreter to the Turkish Government, and subsequently to that of director of the translation office. Shortly after he was sent to congratulate Isabella II. on her accession to the throne of Spain. In 1845 he was appointed chief inter- preter to the Porte; and in 1848, as grand-referendary of the imperial divan, he was named Ottoman commissioner, to settle the revolutionary disputes in the principalities of Moldavia and Wallachia. On his return from a special mission to Russia he was named minister of the interior, and

shortly afterwards minister of foreign affairs. In 1853 he published a pamphlet on the question of the holy sepul- chres, which greatly irritated the czar of Russia, and led Prince Menschikoff to act in such a manner that Fuad Pasha felt compelled, from self-respect, to tender his resignation to the Turkish Government. Shortly afterwards war was de- clared between Russia and Turkey, and he was appointed commissioner at the headquarters of Omar Pasha, In 1855 he resumed his duties of foreign minister, and he continued in that office till the close of the war. Iu i857 he became president of the council of tanzimat, in 1860 was appointed commissioner to Syria to settle the disputes be- tween the Druses and the Maronites ; shortly after his returu he was named grand vizier ; and in 1863 he became war minister, and a little later returned to his old post of foreign minister. In 1867 he accompanied the sultan to England and France. He died at Nice, whither he had gone for the benefit of his health, February 12,1869. Fuad Pasha was one of tle first members of the Turkish Imperial Academy of Sciences and Belles-Letters, founded in 1851. He is the author ofa poem entitled Alhambra, written after his sojourn in Spain, and of a Turkish grammar. The suave and genial manners of Fuad Pasha, and his diple- matic talents, stood Turkey in good stead in connexion with the Crimean war and the various negotiations in reference to Turkey's relation to her Christian subjects, and helped to inspire a faith in her capacity for reforms, which later events have shown to have been largely misplaced. He endeavoured to secure to his country the material ad- vantages to be derived from the adoption of European improvements, but his measures effected no lasting reform in her administration ; aud by the adoption of a heedless system of credit, he largely increased her financial diffi- culties.

FUCHS, JoHann JosepH. See Fux.

FUCHS, Jouann Nepomuxk von (1774-1856), an emi- nent chemist and mineralogist, was born at Mattenzell, near Bremberg, in the neighbourhood of the Baierischer

Wald, May 15, 1774. Having acquired a knowledge of medicine at Vienna and Heidelberg, he in 1801 turned his attention to chemistry and mineralogy, which he studied at Freiberg, Berlin, and Paris. In 1807 he

became professor of those sciences at the university of Landshut, and in 1823 conservator of the mineralogical collections at Munich, where, on the occasion of the removal thither of the uni- versity of Landshut, in 1826 he was appointed professor of mineralogy. In 1852 he retired from public life, and in 1854 he was raised to the nobility by the king of Bavaria. He died at Munich, March 5, 1856. Mineralogy and in- organic chemistry are indebted to Fuchs for numerous re- searches. He is more especially known for his discovery, in 1823, of a process for making a soluble glass, used for fixing fresco-colours, according to the method termed stereochromy. Among his works are—

Ueber den gegenseitigen Einfluss der Chemie und Mineralogie, Munich, 1824; Die Naturgesehichte des Mineralreiehs, Kempten, 1842; Ueber die Theorien der Erde, Munich, 1844; Bercitung, Higen- schaften, und Nutzanwendung des Wasserglasses, Munich, 1857, of which French translations appeared in 1861 and 1864. Tis col- lective works were published at Munich in 1856.

FUCHS, Leonnarp (1501-1566), a celebrated German physician, and one of the fathers of scientific botany, was born at Wembdingen in Bavaria, January 17, 1501. At the age of five years he lost his father, but under the care of his mother he early made great progress in learning. In his tenth year he was sent to school at Heilbronn, whence, a twelvemonth later, he was removed to Erfurt. After a year and a half he was admitted a student of the university of that town, which in 1821 conferred on him the degree of "baccalaureus." During the next 18 months he gave les- sons in Latin and literature in his native town. He then repaired to the university of Anspach, where in 1521 he was created a master of arts. About the same time he espoused the doctrines of the Reformation. Having in 1524 received his diploma as doctor of medicine, he practised for two years in Munich, He became in 1526 professor of medicine at Ingolstadt, and in 1528 physician to the mar- grave of Anspach. In Anspach he was the means of saving the lives of many during the epidemic locally known as thie " English sweating-sickness." By the duke of Wiirtemberg Fuchs was, in 1535, appointed to the professorship of medi- cine at tbe university of Tiibingen, a post held by him till his death, which took place May 10, 1566. Among his numerous writings are the following :—

Errata reeentiorum medicorum LX numero, adjectis eorum confu- tationibus, Haguenau, 1530, 4to; Cornarius Purens (an answer to a pamphlet by his medical opponent Coruarius, entitled Vulpecula Exeoriata), Basel, 1538, 8vo, Vienna, 1545, Paradoxorum medicine libri tres, Basel, 1535, fol., &c.; Tabwle aliquot wniverse medicine, Basel, 1538, 4to; De curandi ratione (Tiibingen, 1539)? 16mo, Leyd., 1548, 8vo, &c.; Medendi Methodus, Basel, 1541, fol., Lyous, 1541, and Paris, 1550, 8vo; De historia stirpiwm commentarit tn- siynes, Basel, 1542, fol., a work illustrated with more than 500 excellent outline illustrations, including figures of the common fox- glove, and of another species of the genus Digitalis, so named by him: it was several times re-edited, and was translated into most European languages; De sanandis totius human corporis . . . malis, Basel, 1542, 8vo, Paris, 1543, and Lyons, 1547, 16mo; Nicolat Myrepsi Medicamentorum Opus, .. . e greco in latinum conversum, 1549, fol.; Institutiones Medicine, Leyd. (2d ed.), 1560, 8vo; De componendorum miseendorumque medicamentorum ratione, Leyd., 1561, fol.; De compositione medicamentorum, Lyons, 1563, 12mo; Opera Didactica, a revised collection of various of his already pub- lished works, Frankf., 1566-and 1604, fol.: the latter edition has prefixed to it a life of the author by Hitzler. Fuchs was an advo- cate of the Galenic school of medicine, and published several Latin translations of treatises by its founder and by Hippocrates, besides controversial tracts against the opinions of H. Thriverius, G. Ryffins, C. Egenolphus, G. Rufinus, G. Puteanus, and 8. Montius.

FUCHSIA, so named by Plumier in honour of the bot- anist Leonhard Fuchs (v. supra), a genus of plants of the natural order Onagracece, characterized by entire, nsually opposite leaves ; pendent flowers ; a funnel-shaped, brightly

coloured, quadripartite, deciduous calyx ; 4 petals, alternat- ing with the calycine segments; 8, rarely 10, exserted stamens, a long and filiform style, and inferior ovary ; and fleshy, ovoid, many-seeded berries or fruit. All the members of the genus, with the exception of the New Zealand species, F. excorticata, I. .kirket, and I. procum- bens, are natives of Central and South

America,—occurring in the interior of forests, or in damp and shady niountainous situations. The various species differ not a little in size as well as in other characters; some, as J'. verrucosa, being dwarf shrubs; others, as /. arborescens and J'. apetala, attain- ing a height of 12 to 16 feet, and having stems several inches in diameter. Plumier, in his Mova Plantarwn Americanarum Genera, p. 14, tab. 14, Paris, 1703, 4to, gave a description of a species of fuchsia, the first known, under the name of Puchsia triphylla, flore coccineo, aud a some- what conventional outline figure of the same plant was pub- lished at Amsterdam, in 1757, by Burmann.! In the Hs- toire des Plantes Médecinales of the South American tra- veller Feuillée (p. 64, pl. xxvi1.), written in 1709-11, and published by him with his Jowrnal, Paris, 1725, the name Thilco is applied to a species of fuchsia from Chili, which is described, though not evidently so figured, as having a pentamerous calyx. The F. coccinea of Aiton (see Dr J. D. Hooker, J. Proc. Linnean Soc., Botany, vol. x. p. 458, 1867), the first species of fuchsia cultivated in England, where it was long confined to the greenhouse, was brought from South America by Captain Firth in 1788, and placed in Kew Gardens. Of this species Mr Lee, a nurseryman at Hammersmith, soon afterwards obtained an example, and procured from it by means of cuttings several hundred plants, which he sold at a guinea each, In 1823 /. ma- crustemon and F, gracilis, and during the next two or three years several other species, were introduced into England ; but it was not until about 1837, or soon aftér florists had acquired /'. fulgens, that varieties of interest began to make their appearance. The numerous hybrid forms now exist- ing are the result chiefly of the intercrossing of that or other long-flowered with globose-flowered plants. J. Venus wetria, raised by Mr Gulliver, gardener to the Rev. S. Marriott of Horsemonden, Kent, and sold in 1822 to Messrs Cripps, was the earliest white-sepalled fuchsia, and is one of the best of its kind for hybridization. The first fuchsia with # white corolla was produced about 1853 by Mr Storey. In some varieties the blossoms are variegated, and in others they are double. There appears to be very little limit to the number of forms to be obtained by careful cultivation and selection. To hybridize, the flower as soon as it opens is emasculated, and it is then fertilized with pollen from some different flower. As seed in the high-bred varieties of fuchsia is produced in but small quantity, it is worth, if it will germinate, at least 50 guineas an ounce (see H. Cannel, Gardener's fag., 1875, p. 251). To procure the seed, which when good is firm and plump, the

ripe pods are sun-dried for a few days, and tben crushed between the finger and thumb; the seed is next cleansed in water from the surrounding pulp, dried in saucers, and wrapped in paper for use. Itissown abont February or March in light, rich, well-drained mould, and is thinly covered with sandy soil, and watered. A temperature of 70°-75° Fahr. has keen found suitable for raising. The seedlings are pricked off into shallow pots or pans, and when 3 inches in height are transferred to 3-inch pots, and are then treated the same as plants from cuttings (v. if.). Fuchsias may be grafted as readily as camellias, preferably by the splice or whip method, the apex of a young shoot being employed asa Nile all! at i, le a

1 Plantarum Americanarum Faseieulus Sextus, Coutinens Plantas, quas olim Carolus Plumierius, Botanicorum Princeps, Deteait, Hruitque. J. Burmannus atque in Insulis Antillis ipse depinaxit, pp. 124, 125, . tab. exxxili.

scion ; but the easiest and most usual method of propagi- tion is by cuttings. As one of the most expeditious ways of procuring these, Loudon recommends to put plants in heat in January, and to take their shoots when three inches in length. For summer flowering in England they are best made about the end of August, and should be selected from the shortest-jointed young wood. Coarse brown sand inter- mixed with a little leaf-mould, with a surface-layer of silver- sand, affords them a good soil for striking. In from two to three weeks they may be put into 3-inch pots containing a compost of equal parts of rich loam, silver-sand, and leaf- mould. They are subsequently moved from the frame or bed, first to a warm and shady, and then to a more airy part of the greenhouse. In January a little artificial heat may be given, to be gradually increased as the days lengthen. The side-shoots are generally pruned when they have made three or four joints, and for bushy plants the leader is stopped soon after the first potting. Care is taken to keep the plantsas near the glass as possible, and shaded _ from bright sunshine, also to provide them plentifully with water, except at the time of shifting, when the roots should be tolerably dry. For the second potting a suitable soil is a mixture of well-rotted cow-dung or old hotbed mould with leaf mould and sandy peat, and to promote drainage a little

peat-moss may be placed immediately over the crocks in the lower part of the pot. Weak liquid manure greatly promotes the advance of the plants, and should be regularly supplied twice or thrice a week during the flowering season. After this, water is gradually withheld from them, and they may be placed in the open air to ripen their wood. The com- mon garden fuchsia, J'. fulgens, stands the winter in England if cut down and covered with 4—6 inches of dry ashes(Smee), and many other species may be grown in the open air if afforded a little protection from frosts. /. discolor, a native of the Falkland Islands, is a particularly hardy species (see Z'rans. Hort. Soc. Lond., 2d ser., ii. p. 284). The nectar of fuchsia flowers has been shown by Mr A. 8S. Wilson (Rep. Brit. Assoc., 1878) to contain nearly 78 per cent. of cane sugar, the remainder being fruit sugar. The berries of some fuchsias are subacid or sweet, and edible. From cer- tain species a dye is obtainable. The so-called " native fuchsias" of Southern and Eastern Australia are plants of the genus Correa, aud natural order Lutacece.

See J. C. Loudon, Arboretum, vol. ii. pp. 942-5; Félix Porcher, Histoire et Culture du Fuchsia, Paris, 1874; F. W. Burbidge, 7'he

Propagation and Improvement of Cultivated Plants, 1877; The Floral World, 1878, pp. 74-76, 253-4. (F. H. B.)

FUEL. Thisterm includes all substances that may be usefully employed for the production of heat by combustion with atmospheric air or oxygen. Any element or combin- ation of elements susceptible of oxidation, 7 ¢., any substance electro-positive to oxygen, may under particular conditions be made to burn; but only those that ignite by a moderate preliminary heating, and burn witli comparative rapidity, and, what is practically of equal importance, are obtainable in quantity and at a moderate price, come fairly within the category of fuels. Among elementary substances only hydrogen, sulphur, carbon, silicon, and phosphorus can be so classed, and of these the last two are only of special application. More important than the elements are, how- ever, the carbohydrates, or compounds of carbon, hydro- gen, aud oxygen, which form the bulk of the natural fuels, wood, peat, and coal, as well as of their liquid and gaseous derivatives, coal gas, coal tar, pitch, oil, &c., which are pos- sessed of great fuel value. Carbon in the elementary form has its nearest representatives in charcoal and coke.

In the determination of the value of fuel two principal factors are involved, namely, the calorific power, or the total amount of heat obtainable from the perfect combustion of its constituents, and the calorific intensity, or pyrometric

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effect which is the temperature attained by the gaseous pro- ducts of the combustion. The first of these is constant for any particular composition, and does not vary with the method of combustion, the quantity of heat developed by the combustion of a unit of carbon or hydrogen being the same whether it be burnt with oxygen, air, or a metallic oxide. The calorific intensity, on the other hand, being inversely pro- portional to the volume of gases produced, it is obvious that if the combustion is effected with pure oxygen the result- ing carbonic acid (in the case of carbon) may be very much hotter than when air is used, as the duty of heating up an additional quantity of nitrogen rather more than three times the weight of the oxygen isin the latter case imposed upon a similar weight of carbon.

Theoretically 1 unit of carbon combines with 2°67 units of oxygen to form 3°67 units of carbonic acid, whose specific heat is 0:216. The: resulting maximum temperature of tle gases produced therefore cannot exceed

8080 marci

3°67 × 0216 aE but when a similar weight of carbon is burnt with air, the gases are diluted with 8°88 units of nitrogen, whose speci- fic heat is 0:°244. The highest temperature possible in

the products of combustion in this case does not exceed 8080 ®

3°67 × 0°216+8°88 × 0°24 — ae

The calorific value of a fuel may be determined by direct experiment, either by complete combustion on the small scale in a calorimeter, or by practical experiment on a working scale, by ascertaining the effect of a weighed quantity in performing a particular kind of work, such as evaporating water in a steam boiler, the result being ex- pressed in the number of pounds of

water converted into steam per pound of fuel burnt. It may also be computed from an ultimate chemical analysis,—the carbon and so much of tle hydrogen as remains disposable for burning, after deducting sufficient to form water with the oxygen present, being credited with the full heating power deriv- able from their complete oxidation, according to the results found for these elements by the calorimeter.

The pyrometric effect, on the other hand, cannot be either computed or determined experimentally with complete ac- curacy, partly because the total combustion of a quantity of fuel in a given time at one operation is practically impossible, but more particularly from the fact that dis- sociation of the gaseous compounds produced in burning takes place to a greater or less extent at temperatures far below those indicated as possible by calculation based upon comparisons of the weight of the products of combustion and their specific heat with the calorific value of the sub- stance as found by experiment. According to Bunsen, Deville, Dewar, and others who have specially considered this subject, a temperature of about 3000° C. will be the maximum attainable from any fuel by any ordinary process of combustion. The calorific powers of the principal ele- mentary substances susceptible of use as fuels are given in the following table ; they are expressed in calories or heat units, signifying the weight of water raised, in temperature

~~1° C., by the combustion of one unit of the different sub~~

stances, and the corresponding weight of water converted into steam from a temperature of 100° C.

rant Water

- *evapo-*

Units. rice

Hydrogen….. Bint to. Water, Tes, cage. cerry 34,462 | 62°66

(arbor meene. 5 Carbonic acid, CO, ... 8,080 | 14°69 eb enls ri Carbonic oxide, CO…... 2,474} 4:50}

Silicon …..... 5 Siluciegacid) wStOoeer ee 7,830 | 14°24

Phosphorus … – Phosphorie acid, P,O;..) 5,747 | 10°45

Sulphur …..... ks Sulphurous acid, SQ,...| 2,140} 4:09

808 et

The corresponding values for the principal carbon com- pounds are—

a ht tant = on' Ss nos tod BRE z aas 3 Eau od =) = a

(14,675 | 26°68 11,849 | 21°55

Marsh gas, C,H, |}

Olefiant gas, C,H, Crude petroleum 10,190 | 18°53 Oil of turpentine 10,852 | 19°73 DE eee a cticiitlon Burnt tocarbonic acid,CO,,| | 10,496 | 19°04 Beate tceac aii oi and water, H,O]} 9,027 | 16°41 Palos. cic. +..0at- 9,000 | 16°37 MM CON OMe ia… cess 7,188 | 18°06 Methyl alcoliol

(wood spirit)...} J 5,807 | 9°65 Bisulphide _— of

carbon, CS,....| Burnt to CO, and SO,.... 3,400 | 6°18 Carbonic oxide…| Burnt to COy….....065 2,408 | 4°87

The fuels of the highest calorific value are, therefore, those containing the largest amount of disposable hydrogen. Such substances are, however, only of special application as being either gases, volatile liquids, or easily fusible solids ; they require special contrivances for their combustion in order to avoid an undue production of smoke, or the for- mation of vapours liable to become explosive when mixed with air. The ordinary solid vegetable and mineral fuels, — wood, peat, coal, &c.,—are, therefore, of more general in- terest economically considered.

Wood may be considered as having the following average composition when in the air-dried state :—Carbon, 39-6; hydrogen, 4'8; oxygen, 34°8; ash, 1:0; water, 20 per cent. When it is freshly felled, the water may be from 18 to 50 per cent. Air-dried or even green wood ignites readily when a

considerable surface is exposed to the kindling flame, but in large masses with regular or smooth surfaces it is often difficult to get it to burn. When pre- viously torrefied or scorched by heating to about 200”, at which part incipient charring is set up, it is exceedingly inflammable. The ends of imperfectly charred boughs from the charcoal heaps in this condition are used in Paris and other large towns in France for kindling purposes, under the name of fumerons. The inflammability, however, varies with the density, —the so-called hard woods, oak, beech, and maple taking fire less readily than the softer, and more especially the coniferous varieties rich in resin. The calorific power of absolutely dry woods may as an average be taken at about 4000 units, and when air-dried, 7.¢., con- taining 25 per cent. of water, at 2800 to 3000 units, and their evaporative value as 3°68 and 4°44 times their own weight respectively.

Wood being essentially a flaming fuel is admirably adapted for use with heat-receiving surfaces of large extent, such as locomotive and marine boilers, and is also very cleanly in use. The absence of all cohesion in the cinders or unburnt carbonized residua causes a large amount of ignited particles to be projected from the chimney, when a rapid draught is used, unless special spark-catchers of wire gauze or some analogous contrivance are used, When burnt in open fire places the volatile products given off in the apart- ment on the first heating have an acrid penetrating odour, which is, however, very generally considered to be agree- able. Owing tothe large amount of water present, no very high temperatures can be obtained by the direct combustion of wood, and to produce these for metallurgical purposes it is necessary to convert it previously either into charcoal, or into inflammable gas in a so-called gazogene or gas- producer, See CHaRcoaL and CARBON.

Peat includes a great number of substances of very unequal fuel value, the most recently formed spongy light

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brown kind approximating in composition to wood, while the dense pitchy brown compact substance, obtained from the bottom of bogs of ancient formation, may be compared with lignite, or even in some instances with coal. Unlike wood, however, it contains incombustible matter in variable

but large quantity, from 5 to 15 per cent., or even more. Much of this, when the amount is large, is often due to sand mechanically intermixed; when air-dried, the proportion of water is from 8 to 20 per cent. When these constituents are deducted, the average composition may be stated to be—carbon, 52 to 66; hydrogen, 4°7 to 7°4; oxygen, 28 to 39; and nitrogen, 1°5 to 3 percent. Average air-dried peat may be taken as having a calorific value of 3000-3500 units, and when freed from water by a heat of 100 degrees, and with a minimum of ash (4 to 5 per cent), at about 5200 units, or from a quarter to one third more than that of an equal weight of wood. The lighter and more spongy varieties of peat when air-dried are exceedingly inflammable, firing at a temperature of 200° C.; the denser pulpy kinds ignite less readily when in the natural state, and often require a still higher tem- perature when prepared by pulping and compression or partial carbonization, Most kinds burn with a red smoky flame, developing a very strong odour, which, however, has its admirers in the same way that wood smoke has. This arises from the destructive distillation of imperfectly carbonized organic matter. The ash, like that of wood, is light and powdery, except when much sand is present, when it is of a denser character.

Peat is principally found in high latitudes, on exposed high table-lands and treeless areas in more temperate climates, and in the valleys of slow-flowing rivers,—as in Ireland, the west of Scotland, the table-land of Bavaria, the North-German plain, and parts of the valleys of the Somme, Oise, and a few other rivers in northern France. In the last-named country it is dredged from the bottom of ponds, and in the summer time moulded into bricks, which are dried by exposure to the sun. A principal objection to its use is its extreme bulk, which for equal evaporative effect is from 8 to 18 times that of coal. On the railways in Bavaria and Oldenburg, where peat is burned, the tenders, in order to have the necessary fuel capacity, are made of equal dimensions with the largest goods waggons, and the water reservoir is placed below the axles, nearly down to the level of the rails, "Various methods have been proposed, and adopted more or less successfully, for the purpose of increasing the density of raw peat by com-pression, either with or without pulping; the latter process gives the heaviest products, but the improvenient is scarcely sufficient to compensate for the cost.

Lignite or brown coal is of intermediate character between peat and coal proper. 'The best kinds are undis- tinguishable in quality from free-burning coals, and the lowest earthy kinds are not equal to average peat. When freshly raised, the proportion of water may be from 45 to 50 per cent. and even more, which is reduced from 28 to 20 per cent. by exposure to dry air. Most varieties, how- ever, when fully dried, break up into powder, which con- siderably diminishes their utility as fuel, as they cannot be consolidated by coking. Lignite dust may, however, be compacted into serviceable blocks for burning, by pressure in machines similar to those used for brick-making, either in the wet state as raised from the mines, or when kiln-dried at 200° C. This method, adopted to a very large extent in Prussian Saxony, is noticed in Ure's Dictionary, vol. iv. p. 530, and described in detail in Zeztschr. fiir Berg-, Hiitten-, u. Salinen-wesen, xxiv. p. 234. The calorific value, as far as it can be expressed by averages, varies between 3500 and 5000 units, and the evaporative factor from 2°16 when freshly raised to 5°84 for the best kinds of lignite when perfectly dried.

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The manner of estimating the heating power of coal has already been considered (vol. vi. p. 80).

The heating effect of fuels obtained in practice is always considerably less than that indicated by theory, as the latter supposes complete combustion, a result which cannot be attained in the ordinary system of burning upon a grate of bars with spaces between them for the admission of air, as a certain proportion of unconsumed particles when suffi- ciently reduced in size to pass through the grate bars fall through with the ashes, forming cinders which represent so much of the useful fuel lost, at any rate for the time. This proportion varies very considerably with the state of the fuel and its proportion of ash. A summary of the dif- ferent observations upon this point made by Hartig, Play- fair, Johnson, and Brix gives the total loss in ash and cinders observed in the coal trials of various countries as follows :—

American Coals), ...060..0c0+0 5°0 to 18°5 per cent. English He GS ee cee DOm 5. 2a op PEGSSIaiige. ggaasceeneetees ate Ome eles 59 Saxon sy

gemma esac GUNN, Getke! 5

In one of the latest researches upon the heating power and other properties of coal for naval use, carried out by the German Admiralty, the following results were obtained with coals from different localities.

Slag left } Ashes in Soot in | Water eva- in grate ash-pit flues porated by per cent.| percent. | per cent. | 1 Ib of coal. Westphalian gas coals.….....| 0°33-6°42 | 2°83- 6°53 | 0:32-0:46 | 6°60-7:45Ib Do. bituminous coals.….....| 0°98-9‘10 | 1:97- 9°63 | 0°24-0°88 | 7°30-8°66 IDG. GTY COIS i.e .ssisccsessesees 1:98-5°70 | 437-10°63 | 0°24-0°48 | 7:03-8°51 SLIGSVANECOMIS) ceseccescc-sreiverersn 0°92-1°30 | 3°15-— 3°50 | 0°24-0°30 | 6°73-7°10 Welsh steam coals.. seoeee| 1°20-4:07 | 4:07 0°32 8:41 Newcastle coals.….....eese.| 1°92 2°57 0°35 7°28

The evaporative power in these experiments is referred to water at the freezing point, while in the results given in article Coat, vol. vi. p. 81, it is computed from the boiling point. The latter quantities therefore require to be re- duced by about one-seventh to bring them into com- parison.

In many cases, however, the evaporative factor found by practical experiment in a steam boiler is from a third to nearly a half less than that indicated by theory, the differ- ences covering waste by imperfection of combustion and losses by radiation, &c., in the furnace and flues.

Of the other natural fuels the most important is so- called vegetable refuse, such as cotton stalks, brushwood, straw, and the woody residue of sugar cane after the ex- traction of the saccharine juice known as megasse or cane trash. These are extensively used in countries where wood and coal are scarce, usually for providing steam in the manufactures where they arise, ¢.g., straw for thrashing, cotton stalks for ploughing, irrigating, or working presses, and cane trash for boiling down sugar or driving the cane mill. According to Mr J. Head (Proc. Inst. of Civil En- gineers, vol. xlviii. p. 75), the evaporative values of 1 ib of these different articles when burnt in a tubular boiler are— coal, 8 Ib; dry peat, 4 lb; dry wood, 3°58-3°52 tb; cotton stalks or megasse, 3°2-2°7 Ib; straw, 2°46—-2°30 tb. In burning straw it is found most convenient to use a pair of toothed rollers, which pass it continuously into the fire box in a thin layer. Owing to the siliceous

nature of the ash, it is also desirable to have a means of clearing the grate bars fronr slags and clinkers at short intervals, and to use a steam jet to clear the tubes from similar de- posits,

The common fuel of India and Egypt is derived from the dung of camels and oxen, moulded into thin cakes, and dried in the sun. As might be imagined it has a very low heating power, and in burning gives off acrid ammoniacal smoke and vapour.

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Somewhat similar to these are the tan cakes made from spent tanners' bark, which are used to some extent in eastern France and in Germany. They are made by moulding the spent bark into circular cakes, which are then slowly dried by exposure to the air. Their effect is about equivalent to 80 and 30 per cent. of equal weights of wood and coal re- spectively. The same class of fuel made from exhausted dye-wood is considered to be equal to two-thirds of its weight of coal.

Liquid fuel in the form of natural petroleum, and the heavy or so-called dead or creosote oil obtained in coal: tar distilleries, have recently been used to some extent both for heating steam boilers and welding iron. In England the former cannot be used from its high price, apart from the danger caused by the irregular volatility of its constituents; the latter, however, is perfectly man- ageable when blown into a heated combustion chamber as a fine spray by means of steam jets, where it is inime- diately volatilized and takes fire. The heating power is very great, one ton of creosote oil being equal to 2 or 24 tons of coal in raising steam.

Natural gases, consisting principally of light hydro- carbons, have at different times been used as fuel, but the examples of their application are necessarily rare. The most conspicuous example at the present time is afforded by the Iron City and Siberia Iron Works, near Pittsburg, in Pennsylvania, where puddling and welding furnaces, as well as steam boilers, are entirely fired by the gas from a well bored for oil, 1200 feet deep, which is brought to the works through a pipe several miles in length, and arrives with a pressure of two atmospheres. Ordinary coal gas, such as: is used for illuminating, can also be applied for heat- ing purposes, but it is,

in spite of its very high calorific power, too expensive for general use. A cheaper material obtained by the distillation of lignite at a high tempera- ture has been tried to some extent in Berlin. The average composition of this is—hydrogen, 42°36; carbonic oxide, 40; marsh gas, 11°37; nitrogen, 3°17; carbonic acid, 2°01; and condensable hydrocarbons, 1°09 per cent. Ac- cording to Ziurek, a thousand cubic feet of such gas cor- responds in heating power to 30 or 33 fb of coal.

Sulphur, phosphorus, and silicon, the other principal com- bustible elements, are only of limited application as fuels. The first is used in the liquation of sulphur-bearing rocks. The ore is piled into large heaps, which are ignited at the bottom, a certain proportion, from one-fourth to one-third of the sulphur contents, being sacrificed, in order to raise the mass to a sufficient temperature to allow the remainder to melt, and run down to the collecting basin. Phosphorus, which is of value from its low igniting point, receives its only application in the manufacture of lucifer matches,—the heat generated by friction against a roughened surface being suffi- cient to start the flame, which is ultimately communicated to the dry wood, by means of a somewhat less inflammable sub- stance, such as sulphur or paraffin. The high temperature produced by burning phosphorus is due to the product of combustion (phosphoric acid) being solid, and therefore there is less heat absorbed than would be the case with a gaseous product. The same effect is observed in a still more striking manner with silicon, which in the only special case of its application to the production of heat, namely, in the Bessemer process of steel-making, gives rise to an enormous in- crease of temperature in the metal, sufficient indeed to keep the softest iron melted. The absolute calorific value of silicon is rather less than that of carbon, but the product of combustion (silicic acid) being fixed at all furnace tem- peratures, the whole of the heat developed is available for heating the molten iron, instead of a considerable part being consumed in the work of volatilization, as is the case with carbonic acid. (H. B.)

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FUENTE DE CANTOS, a town of Spain in the pro- vince of Badajoz, and midway between the cities of Badajoz and Seville. It has some trade in the

produce of the sur- rounding district, which is fertile; and there are important copper mines in the vicinity. Almost its only manufacture is a coarse sort of frieze. Francisco Zurbaran, the painter, was born there in 1598. Population upwards of 6000.

FUENTE DEL MAESTRE, a town of Spain in the pro- vince of Badajoz, about 25 miles 8.S.W. of Merida. Its manufactures are insignificant, but it has some trade in corn, wine, oil, garbanzos, and other produce of the broad and fertile plain on which it is situated. Population, 5869.

FUENTERRABIA, an ancient town and frontier fortress of Spain, in the province of Guipuzcoa and bishopric of Pamplona, 11 miles E.N.E. of San Sebastian and 2 miles from Irun. It stands on the slope of a hill on the west bank of the Bidassoa, and near the point where its estuary begins. At one time it possessed considerable strategic im- portance, and it has frequently been taken and retaken in wars between France and Spain. The "dolorous rout" of Charlemagne, however, which has been associated by Milton with Fontarabia, is generally understood to have taken place not here but at Roncesvalles, which is nearly 40 miles distant. Unsuccessful attempts to seize Fuenterrabia were made by the French troops in 1476 and again in 1503, Ina subsequent campaign (1521) these were more successful, but it was retaken in 1524. The prince of Condé sustained a severe repulse under its walls in 1638, and it was on this occasion that the town received from Philip IV. the rank of city (muy noble, muy leal, y muy valerosa ciudad). After a severe siege it surrendered to the duke of Berwick in the English war of 1719 (18th June); and in 1794 it again fell into the hands of the French, who so dis- mantled it that it has never since been reckoned by the Spaniards among their fortified places. It was by the ford opposite Fuenterrabia that the duke of Wellington, on the 8th of October:1813, by "one of the most daring exploits of military genius," successfully forced a passage into France in the face of an opposing army commanded by Soult. Severe fighting also took place here during the Carlist war in 1837. The town is now considerably dilapidated and decayed. Its inhabitants are employed chiefly in salmon and other fisheries. Population, 772. See Palafox, Sitzo y Socorro de Fuente-rabia, Madrid, 1639.

FUERO. The Castilian use of this Latin word (forum) in the sense of a right, privilege, or charter is most pro- bably to be traced to the Roman conventus juridici, other- wise known as jurisdictiones, or fora, which in Pliny's time were already numerous in the Iberian peninsula. In each – of these provincial fora the Roman magistrate, as is well known, was accustomed to pay all possible deference to the previously established common law of the district ; and it was the privilege of every free subject to demand that he should be judged in accordance with the customs and usages of his proper forum. This was especially true in the case of the inhabitants of those towns which were in possession of the jus italicum. It is not, indeed, demonstrable, but there are many presumptions, besides some fragments of direct evidence, which make it more than probable, that the old administrative arrangements both of the provinces and of the towns, but especially of the latter, remained practi- cally undisturbed at the period of the Gothic occupation of Spain.1 The Theodvsian Codex and the Breviarium Alari- cianum alike seem to imply a continuance of the municipal system which had been} established by the Romans; nor does the later Lex Visigothorum, though avowedly designed In some points to supersede the Roman law, appear to have

? The nature of the evidence ma i > may be gathered from Savigny, Gesch. d. Rim. Rechts. See especially i. p. 154, 259 seg, on

contemplated any marked interference with the former fora, which were still toa large extent left to be regulated in the administration of justice by unwritten, immemorial, local custom. Little is known of the condition of the subject populations of the peninsula during the Arab occupation ; but we are informed that the Christians were, sometimes at least, judged according to their own laws in separate tribu- nals presided over by Christian judges ;? and the mere fact of the preservation of the name alcalde, an official whose functions corresponded so closely to those of the judex or defensor civitatis, is fitted to suggest that the old municipal fora, if much impaired, were not even then in all cases wholly destroyed. At' all events when the word forum? begins to appear for the first time in documents of the 10th century in the sense of a liberty or privilege, it is generally implied that the

thing so named is nothing new. The earliest extant written fuero is probably that which was granted to the province and town of Leon by Alphonso V. in 1020. It emanated from the king in a general council of the kingdom of Leon and Castile, and consisted of two separate parts ; in the first 19 chapters were contained a series of statutes which were to be valid for the kingdom at large, while the rest of the document was simply a muni- cipal charter. But in neither portion does it in any sense mark a new legislative departure, unless in so far as it marks the beginning of the era of written charters for towns. The "fuero general" does not profess to supersede the consuetudines antiquorum jurium or Chindaswint's codification of these in the Lex Visigo- thorum; the 'fuero municipal" is really for the most part but a resuscitation of usages formerly established, a recognition and definition of liberties and privileges that had long before been conceded or taken for granted. The right of the burgesses to self-government and self-taxation is acknowledged and confirmed, they, on the other hand, being held bound to a constitutional obedience and subjec- tion to the sovereign, particularly to the payment of definite imperial taxes, and the rendering of a certain amount of military service (as the ancient municipia had been). Al- most contemporaneous with this fuero of Leon was that granted to Najera (Naxera) by Sancho el Mayor of Navarre (ob. 1035), and confirmed, in 1076, by Alphonso VI.® Traces of others of perhaps even an earlier date are occa- sionally to be met with. In the fuero of Cardefia, for ex- ample, granted by Ferdinand I. in 1039, reference is made to a previous forum Burgense (Burgos), which, however, has not been preserved, if, indeed, it ever had been reduced to writing at all. The phraseology of that of Sepulveda (1076) in like manner points back to an indefinitely remote antiquity.© Among the later fueros of the 11th century, the most important are those of Jaca (1064) and of Logrofio (1095). The former of these, which was dis- tinguished by the unusual largeness of its concessions, and by the careful minuteness of its details, rapidly extended to many places in the neighbourhood, while the latter charter was given also to Miranda by Alphonso VI., and was further extended in 1181 by Sancho el Sabio of Navarre to Vitoria, thus constituting one of the earliest written fora of the " Provincias Vascongadas." In the

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2 Compare Lembke u. Schiifer, Geschichte Spaniens, i. 314; ii. 117.

3 Or rather forus. See Ducange, s. ».

4 Cap. xx. begins :—Constituimus etiam ut Legionensis civitas, que depopulata fuit a Sarracenis in diebus patris mei Veremundi regis, repopulatur per hos foros subscriptos.

5 Mando et concedo et confirmo ut ista civitas cum sua plebe et cum omnibus suis pertinentiis sub tali lege et sub tali foro maneat per sx- cula cuncta. Amen. Isti sunt fueros que habuerunt in Naxera in diebus Sanctii regis et Gaitiani regis.

6 Ego Aldefonsus rex et uxor mea Agnes confirmamus ad Septem- publica suo foro quod habuit in tempore antiquo de avolo meo et in tempore comitum Ferrando Gonzalez et comite Garcia Ferdinandez et comite Domno Santio. ;

course of the 12th and 13th centuries the number of such documents increased very rapidly; that of Toledo espe- cially, granted to the Mozarabic population in 1101, but greatly enlarged and extended by Alphonso VII. (1118) and succeeding sovereigns, was used as a basis for many other Castilian fueros. Latterly the word fuero came to be used in Castile in a wider sense than before, as meaning a general code of laws; thus about the time of Saint Ferdinand the old Lex Visigothorum, then translated for the first time into the vernacular, was called the Fuero Juzgo, a name which was soon retranslated into the barbar- ous Latin of the period as Forum Judicum ;! and among the compilations of Alphonso the Learned in like manner were an Espejo de Fueros and also the Fuero de las leyes, better known perhaps as the wero Real. The famous code known as the Ordenamiento Real de Alcald, or Fuero Viejo de Cas- tilla, dates from a still Jater period. As the power of the Spanish crown was gradually concentrated and consolidated, royal pragmaticas began to take the place of constitutional laws; the local fueros of the various districts slowly yielded before the superior force of imperialism ; and only those of Navarre and the Basque provinces have had sufficient vitality to enable them to

survive to comparatively modern times. While actually owning the lordship of the Castilian crown since about the middle of the 14th century, these provinces, until quite recently, rigidly insisted upon com- pliance with their consuetudinary law, and especially with that which provided that the sefior, before assuming the government, should personally appear before the assembly and swear to maintain the ancient constitutions. Each of the provinces mentioned had distinct sets of fueros, codified at different periods, and varying considerably as to details ; the main features, however, were the same inall. In the province of Biscay, the most democratic of the group, the management of public affairs was vested in the junta or assembly of popular representatives, chosen by household suffrage. Its functions included the collec- tion of taxes, the protection and defence of the terri- tory, and the nomination of all the officers of government except the corregidor. The inhabitants of the province were exempt from all imposts except the self-imposed ones of their own locality, and from all duties on imported merchandise. They claimed the privileges of Spanish nobility on merely proving their descent from pure Biscayan blood. They were not obliged to appear before

any tribunal beyond the bounds of their own lordship, or

to tolerate any royal intendant or comptroller within the province, or to allow any royal monopoly as in the rest of Spain, or have any royal establishment except the post-office, or admit royal troops within the territory, or furnish re- eruits for the royal army. They were privileged to defend their territory with their own means and their own blood, and, moreover, to visit with summary punishment every attempt to interfere with these their constitutional rights, These rights, after having been recognized by successive Spanish sovereigns from Ferdinand the Catholic to Ferdin- and VII., were, at the death of the latter in 1833, set aside by the Government of Castafios. The result was a civil war, which terminated in ’a renewed acknowledgment of the fueros by Isabel II. (1839). The provisional Government of 1868 also promised to respect them, and similar pledges were given by the Governments which succeeded. In con- sequence, however, of the Carlist rising of 1873-76, the Basque fueros were finally extinguished in 1876. The his-

1 This Latin is later even than that of Ferdinand, whose words are: "Statuo et mando quod Liber Judicum, quo ego misi Cordubam, translatetur in vulgarem et vocetur forum de Corduba . . . . et quod per secula cuncta sit pro foro et nullus sit ausus istud forum aliter appellare nisi forum de Corduba, et jubeo et mando quod omnis morator et populator . . . veniet ad judicium et ad forum de Corduba.

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tory of the Foraes of the Portuguese towns, and of the Fors du Béarn, is precisely analogous to that of the fueros of Castile. '

Among the numerous works that more or less expressly deal with this subject, that of Marina (Lnsayo Historieo-eritico sobre la antigua Legislacion y prineipales Cuerpos Legales de los Reynos de Leon y Castilla) still continues to hold a high place. Reference may also be made to Colmeiro's Curso de Derecho Politico seqgun la historia de Leon y de Castilla (Madrid, 1873); to Schafer's Geschichte von Spanien, ii. 418-428, ili. 293 seg.; and to Hallam's Middle Ages, Cc. LV.

FUGGER, the name of a Swabian family which, by re- markable energy in industry and commerce, acquired enor- mous wealth, and rose to high rank in the state. The founder of the family was John Fugger, a respectable master-weaver at Graben, near Augsburg. His eldest son, John, associated trade in linen with weaving in Augsburg, of which he became a citizen by marriage in 1370. Here he rose to an honourable position, being one of the twelve councillors of the guild of weavers, and an assessor of the Fehmgericht, the much dreaded secret tribunal of West- phalia. He died in 1409, leaving a fortune of 3000 florins. His eldest son, by a second marriage, Andrew, was known as "the rich Fugger," and became the founder of a noble line, Fugger vom Reh, which died out in 1583. Jacob Fugger, the second son of John, was the first of the family who possessed a house in Augsburg, where he greatly ex- tended the business he inherited, and was made head of the guild of weavers. After his death in 1469, his three sons, Ulrich, George, and Jacob, who were men of unusual re- source and industry, added immensely to the riches he had left them. Ulrich devoted himself to trade, and his opera- tions were so varied that even the works of Albert Direr reached Italy by his means. Jacob worked the mines

of Tyrol, and his profits were vast enough to enable him, without difficulty, to lend the archduke of Austria 150,000 florins, and to build (in Tyrol) the splendid castle of Fug- gerau. 'The three brothers married ladies of noble families, and were themselves raised to noble rank by the emperor Maximilian, who, being always in need of money, was de- lighted to honour subjects whose power of aiding him was so extensive. In return for 70,000 gulden he mortgaged to them the county cf Kirchberg and the lordship of Weissen- horn ; and afterwards, in carrying on war with Venice, he received from them, at the request of Pope Julius IL, a subsidy of 170,000 ducats. An evidence of the generous use to which they put their wealth still survives in the Fuggerei at Augsburg,—a collection of more than 100 small houses built by the brothers and let by them at low rents to poor tenants. Jacub and the two sons of Ulrich died without heirs, so that the possessions of the family descended to the sons of George. Of these the eldest, Marcus, became a priest, and died in 1511. His two brothers, Raimund and Antonius, then represented the house, and their names were soon well known far beyond the limits of Germany, for they had commerical relations with nearly every part of the civilized world. They were vehement opponents of the Reformation, and freely spent money in support of the church. During the famous diet of Augsburg in 1530, Charles V. enjoyed the splendid hos- pitality of Antonius in his house in the Weinmarkt ; and there is a story that the merchant astonished the emperor by lighting a fire of cinnamon with an imperial bond for money due tohim. According to another anecdote, Charles remarked at a later time, when the treasury of the king of France was being shown to him, 'There is a linen-weaver in Augsburg who could pay all that out of his own purse." Whether these things are true or not, the emperor was cer- tainly impressed by the extraordinary resources of the two citizens. He not only made over to them the mortgaged properties of Kirchberg and Weissenhorn, but created them

counts and invested them with princely privileges. In re- turn for the help they gave him in his expedition against the pirates of Algiers in 1535, he conferred on them the right of issuing a gold and silver coinage of their own ; and the right was repeatedly exercised, Their princely rank did not prevent them from continuing their mercantile career, and when Antonius

died in 1560 he left six million gold crowns, besides a vast amount of property of various kinds in Europe, Asia, and America. He and his brother Raimund (who died in 1535) were the founders of two great lines which are still continued. The privileges conferred on the family by Charles V. were confirmed and increased by Ferdinand IL; and since that time, although no member either of the Raimund or the Antonius line has risen to the highest distinction in any department, many of them have done honourable service to the state, and have been famous for their liberality. The fortunes of the family are often cited in evidence of tlie prosperity of Germany before the country was nearly ruined by the Thirty Years' War. In 1593 a collection of portraits of the chief representatives of the Fugger race, engraved by D. Custos of Antwerp, was issued at Augsburg. Editions with 127 portraits appeared at Augsburg in 1618 and 1620, the former accompanied by a genealogy in Latin, the latter by one in German. An edition which was published at Ulm in 1754 includes 139 portraits.

FUH-CHOW, more usually Foo-Cuow, and in German Fu-TscHav, a city of China, capital of the province of Fuh-keen, and one of the principal ports open to foreign commerce. In the local dialect it is called Hokchin. It is situated on the river Min, about 35 miles from the sea, in 26° 5' N. lat. and 119° 20' E. long. 140 miles N. of Amoy, and 280 8. of Hang-Chow. The city proper, lying nearly three miles from the north bank of the river, is surrounded by a wall about 30 feet high and 12 feet thick, which makes a circuit of upwards of five miles and is pierced by seven gateways surrounded by tall fantastic watch-towers. The whole district between the city and the river, the island of Nantai, and the southern banks of the Min are occupied by extensive suburbs; and the river itself bears a large floating population. Communication from bank to bank is afforded by a long stone bridge sup- ported by forty solid stone piers in its northern section and by nine in its southern. The most remarkable establish- ment of Fuh-Chow is the arsenal situated about three miles down the stream at Pagoda Island, where the sea-going vessels usually anchor. It was founded in 1867, and is conducted under the direction of French engineers according to European methods. In 1870 it employed about 1000 workmen besides fifty European superintendents. The port was opened to European commerce in 1842; and in 1853 the firm of Russell and Co, shipped the first cargoes of tea from Fuh-Chow to Europe and America. The Euro- pean firms now number

thirteen; and the tea trade is second in importance only to that of Shanghai. In 1867 550,239 piculs of tea were exported; in 1869, 581,003 piculs; in 1872, 642,841 piculs; in 1875, 723,732 piculs; and in 1876, 617,579. The total trade in foreign vessels in 1876 was imports to the value of £1,531,617 and exports to the value of £3,330,489. The number of vessels that entered in the same year was 275, and of these 211 were British, 27 German, 11 Danish, and 9 American. A large trade is carried on by the native merchants in timber, paper, woollen and cotton goods, oranges, and olives; but the foreign houses mainly confine themselves to _ Spium and? tea. Commercial intercourse with Australia

and New Zealand is on the increase. The principal imports, besides opium, are shirtings, T cloths, lead and tin, medicines, rice, tobacco, and beans and pease. Two steamboat lines afford regular communication with Hong-

Kong twice a month. The town iz the seat of several important missions, of which the first was founded in 1846. That supported by the American Board had already in 1876 issued 1,300,000 copies of Chinese books and tracts. The population of Fuh-Chow is stated by the Boston Missionary Herald, Feb. 1872, at about 4,000,000; but A. E. Hippeslay in Handelsstatistek der Vertagshdfen von China, Vienna, 1874, the Overland China Mail, June 1872, and the Church Missionary Record, Sept. 1872, are all quoted by Behm and Wagner, Bevilkerung der Erde, 1875, as giving the number 600,000.

FUHRICH, JosepH von (1800-1876), a painter and contemporary of Cornelius and Overbeck, was born at Krat- zau in Bohemia in 1800. Deeply impressed as a boy by rude pictures adorning the wayside chapels of his native country, his first attempt at composition was a sketch of the Nativity for the festival of Christmas in his father's house. He lived to see the day when, becoming celebrated as a composer of scriptural episodes, his sacred subjects were transferred in numberless repetitions to the roadside churches of the Austrian state, where humble peasants thus learnt to admire modern art reviving the models of earlier ages. Fiihrich has been fairly described as a " Nazarene," a romantic re- ligious artist whose pencil did more than any other to re- store the old spirit of Diirer and give new shape to count-

less incidents of the gospel and scriptural legends. Without the power of Cornelius or the grace of Overbeck, he com- posed with great skill, especially in outline. His mastery of distribution, form, movement, and expression was con- siderable. In its peculiar way his drapery was perfectly cast. Essentially creative as a landscape draughtsman, he had still no feeling for colour; and when he produced monu- mental pictures he was not nearly so successful as when designing subjects for woodcuts. That such a man as Fiihrich should have lived and prospered in 'the same city as Rahl and Makart proves that Vienna had room for every form of artistic development. But Fiihrich's fame extended far beyond the walls of the Austrian capital ; and there are few in Germany who are not acquainted with his illustra- tions to Tieck's Genofeva, the Lord's Prayer, the Triumph of Christ, the Road to Bethlehem, the Succession of Christ according to Thomas 4 Kempis, the Prodigal Son, and the verses of the Psalter. His Prodigal Son, especially, is re- markable for the fancy with which the spirit of evil is embodied in a figure constantly recurring, and like that of Mephistopheles exhibiting temptation in a human yet demoniacal shape. Fiihrich became a pupil of Bengler in the Academy of Prague in 1816. His first inspiration was derived from the prints of Diirer and the Faust of Cornelius, and the first fruit of this turn of study was the Genofeva series. In 1826 he went to Rome, where he added three frescos to those executed by Cornelius and Overbeck in the Palazzo Massimi. His subjects were taken from the life of Tasso, and are almost solitary examples of his talent in this class of composition. In 1831 he finished the Triumph of Christ now in the Raczynski Palace at Berlin. In 1834 he was made custos and in 1841 professor of com- position in the Academy of Vienna. After this he com- pleted the monumental pictures of the church of St Nepomuk, and in 1854-61 the vast series of wall paintings which cover the inside of the Lerchenfeld church at Vienna. In 1872 he was pensioned and made a knight of the order of Franz Joseph ; 1875 is the date of his illustrations to the Psalms. He died on the 13th of March 1876.

FULDA. The monastery of Fulda occupies the place in the ecclesiastical history of mid Germany which Monte Cassino holds in Italy, St Galle in south Germany, Corvey in north Germany, Tours in France, and Jona in Scotland. It was the centre of a missionary work, both of conversion and reformation, organized on monastic principles, The monastery

of Fulda was only one of several founded by Boniface, the so-called "apostle of Germany," but it was specially fav- oured by its founder, who selected it for his burying place, and it was by far the most important. The first abbot was Sturmius, the son of noble Christian parents in Noricum, who along with several other youths left their homes to follow Boniface, and were trained by him for missionary work. Boniface, notwithstanding his intense hatred of the Celtic missionaries, the true apostles of Germany, was con- tent to imitate their mode of evangelical work; and the monastery of Fulda, though under Benedictine rule, in almost all respects resembled the great missionary institu- tions of Tours and Iona. Sturmius was sent by his master to seek for a convenient place for the monastery, and after two unsuccessful efforts he at length found a spot on the banks of the Fulda which Boniface approved of. A grant of the site, with four miles of surrounding demesue, was obtained from Carloman, Boniface himself superin- tended the clearing of the forest and ,the erection of the building. He sent Sturmius for a year to Italy to visit monasteries, and especially to study the mode of Jife in the great Benedictine convent of Monte Cassino. The Bene- dictine rule was adopted, and Sturmius with seven com- panions began their work of preaching, education, and civilization. They taught the rude tribes agriculture, masonry, and the other arts of peace. Soon a school was formed, and the educational organization seems to have re- sembled in the closest way that of the great Celtic monas- teries. The school at Fulda speedily became the most famous portion of the monastery, and was the centre of the earlier medizval theological learning. Rabanus Maurus, the first of the schoolmen, was a teacher'in' the convent school, and many of the most famous princes of the times were educated in the lay-school. When Alcuin laid the basis of the university system of medizeval Europe, it was to Fulda as well as to Durham and Scotland that he looked for help in carrying out his designs. Fulda became the parent of many other missionary monasteries, the most famous of these being Hirsgau in Swabia. In 968 the abbot of Fulda was recognized as primate of the other abbeys of Germany ; but wealth and power brought corruption. In the beginning of the 11th century the monastery had to be reformed, and this was done by turning out the old monks, bringing a number of new ones from Scotland, and re- establishing in all its strictness the old Benedictine rule. The later

history of Fulda has merely an antiquarian and local interest. Its practical work was done when the evangelization of Germany was complete; for Fulda, like the Celtic monasteries, was fitted for missionary work and little else. Investigations have shown curious sympathies with the Reformation of the 16th century among the abbots and monks of Fulda.

See the life of Sturmius in Pertz's Monwmenta Germ., ii.; Rett- berg's Kirchen-Gesch. Deutschlands; Milman'siLatin Christianity, bk. ii. 5; and for the reformed tendencies of Fulda an interesting article in Niedner's Zettsch. fiir Hist. Theologie, 1846.

FULHAM, a suburb of London, in the county of Middlesex, is situated on the Thames, 53 miles S.W. of St Paul's, and opposite Putney, with which it is connected by a curious old wooden bridge erected in 1729. In 1642 a bridge of boats was constructed across the river at this point by the earl of Essex, in order to convey his army into Surrey. Fulham has been connected with the see of London from a period long anterior to the conquest. The village is irregularly built, and has a somewhat old-fashioned and antique appearance, It contains an orphanage, a re- formatory, and other charitable institutions, In the neigh- bourhood there are a number of gentlemen's seats, and of old mansions which have been occupied by persons of celebrity. There are extensive nurseries and market

gardens in the parish, and in the village there is a large pottery. The parish church, in the Decorated English style, possesses a picturesque tower 95 feet in height. In the church and churchyard there are a number of fine monu- ments of distinguished persons, including those of the bishops of London. 'The Palace has been the summer resi- dence of the bishops of London since the time of Henry VIL, with the exception of the period of the Common- wealth when it was sold to Colonel Edmund Harvey. It is a large brick structure of various dates and of small architectural merit. The grounds, which are surrounded by a moat, are 40 acres in extent. They are remarkable for the beauty of their arrangements, and contain many rare plants and shrubs. Fulbam is included in the parliamen- tary borough of Chelsea. The population of the parish in 1871 was 23,350.

FULLER, Anprew (1754-1815), a distinguished preacher and theological writer of the Baptist denomination, was born on the 6th of February 1754, at Wicken, in Cambridgeshire, where his father was a small farmer, and received the rudiments of his education at the free school of Soham to which place his parents had removed abcut 1760. Early in life he began to assist in the work of the farm, and he continued to do so till he was twenty years of age. In his seventeenth year he became a member of the Baptist church at Soham, and soon afterwards began to ex- ercise his gifts as an exhorter with so great approval that, in the spring of 1775, he was called and ordained as pastor of that congregation. In 1782 he removed to Kettering in Northamptonshire, where, besides other advantages, he en- joyed that of frequent intercourse with some of the most eminent ministers of the denomination, such as Ryland, Sutcliff, and the Halls. About that time the Calvinism prevalent among the Baptists of England had come to be mingled and overlaid with many crudities which the Genevan Reformer would have disowned as foreign to his system ; and for many years Fuller's intellectual and spiri- tual development had been much impeded, not only by the narrowness of his outward circumstances, and by the defects of his early education, but also by the contracted religious views of those to whom he had been accustomed to look for guidance. Even before leaving Soham, however, he had written the substance of a treatise, in which he had sought to counteract that hyper-Calvinism which, " admitting nothing spiritually good to be the duty of the unregenerate, and nothing to be addressed to them in a way of exhortation excepting what related to external obedience," had so long perplexed his own mind. This work he published, under the title Zhe Gospel worthy of all Acceptation, soon after his settlement in Kettering ; and although it immediately in- volved him in a somewhat bitter controversy which lasted for nearly 20 years, it was ultimately successful, as from its ability and force it deserved to be, in considerably modify- ing the views prevalent among English Dissenters with regard to the matters of which it treats. In 1793 he pub- lished a treatise in which the Calvinistic and Socinian systems were examined and compared as to their moral tendency. This work, which, along with another against Deism, entitled The Gospel its own Witness, is regarded as the production on which his reputation as a theologian mainly rests, was attacked by Toulmin and Kentish, to whom he replied in a supplementary pamphlet in which the weak side of Socinianism was still furtherexposed. Fuller also published an

admirable Memoir of the Rev. Samuel Pearce, of Birmingham, and a volume of Lxpository Lectures in Genesis, besides a considerable number of smaller pieces, chiefly sermons and pamphlets, which have been issued in a collected form since his death, and like everything he did gave evidence of great intellectual vigour and acuteness as well as of deep religious convictions. Perhaps the most

important services of his life, however, were those rendered in connexion with the Baptist Missionary Society, which was formed at Kettering in 1792, and of which he was secretary until his death ou the 7th of May 1815. The correspond- ence he maintained, the journeys he undertook, the pam- phlets he wrote in defence of the society, and the discourses he preached on its behalf, imply an amount of work which few men could possibly have overtaken, and which ulti- mately proved too heavy even for his naturally powerful constitution. Several editions of his collected works have appeared, and a Memoir, principally compiled from his own papers, was published about a year after his decease by Dr Ryland, his most intimate friend and coadjutor in the affairs of the Baptist mission. There are also biographies by his son, the Rev. A. G. Fuller, and by the Rev. J. W. Morris.

FULLER, Saran Marcaret. See Ossori.

FULLER, Tomas (1608-1661), the witty divine and historian, eldest son of a father of the same name who was rector of Aldwincle St Peter's, Northamptonshire, was born at the rectory house of that country parish in the year 1608, and was baptized on 19th June in that year. Dr Robert Townson and Dr John Davenant, bishops of Salisbury, were his uncles and godfathers. The boy's training was influ- enced by the position of these prelates and of other friends of his father, who was B.D., and had held the position of lector primarius in Trinity College, Cambridge. The youth studied under the care of the Rev. Arthur Smith, and of his cousin Dr Edward Davenant, the mathematician. Accord- ing to Aubrey, Fuller was "a boy of pregnant wit." At an early age he was admitted of Queen's College, Cambridge, then presided over by Dr John Davenant. He was apt and quick in study ; and in Lent 1624-5 he became~B.A., and in July 1628 M.A. Being overlooked in an election of fellows of his college, he was

removed by Bishop Davenant to Sidney Sussex College, November 1628. In 1630 he received from Corpus Christi College, in the same university, the curacy of St Benet's, which he held for a short time, and where he had for a parishioner the celebrated carrier Hobson. Fuller's quaint and humorous oratory, as dis- played in his sermons on Ruth, soon attracted attention. He also attained a certain fame in the university as a writer of verses, and as the author of a poem, 1631, on the subject of David and Bathsheba. In June of the same year his uncle gave him a prebend in Salisbury, where his father, who died in the following year, held a canonry. The rectory of Broadwindsor, Dorsetshire, then in the diocese of Bristol, was his next preferment (1634) ; and 11th June 1635 he proceeded B.D, For about six years he devoted himself to his rustic flock, and meanwhile compiled The Holy War, being a history of the crusades (published in 1640), and The Holy and Prophane States, being a book of character biography (1642), both which deservedly popular works went through several editions. At this time Fuller was well known as a man of engaging manners, of good connexions, and of literary tastes. Being, moreover, a cordial lover of the Church of England, and of its discipline as fixed by the canons of 1603, he was in 1640 elected proctor for Bristol in the memorable convocation of Canter- bury, which assembled with the Short Parliament. On the sudden dissolution of the latter, he united himself to those who urged that convocation should likewise dissolve as usual. That opinion was overruled; and the assembly coutinued to sit by virtue of a royal writ, and to frame, amongst its canons, the much-ridiculed Etcetera Oath. Fuller has left a valuable account of the proceedings of this synod, for sitting in which he was fined £200, but was never pressed to pay it. Meanwhile he preached in some of the " voiced pulpits " of London, and was followed for his excellent gifts. His first published volume of sermons

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appeared in 1640 under the title of Joseph's parti-coloured Coat, 4to, which contains many of his quaint utterances and odd conceits. His grosser mannerisms of style, derived from the divines of the former generation, disappeared for the most part in his subsequent discourses. About 1640 he married Eleanor, daughter of Hugh Grove of Chisenbury co., Wilts. Their eldest child, John, baptized at Broadwindsor by his father, 6th June 1641,

was afterwards of Sidney Sussex College, edited the Worthies of Hngland, 1662, and became rector of Great Wakering, Essex, where he died in 1687. At Broadwindsor, early in the year 1641, Thomas Fuller, his curate Henry Sanders, the church wardens, and others, nine persons altogether, certified that their parish, represented by 242 grown-up male persons, had taken the Protestation ordered by the Speaker of the Long Parliament. Again Fuller is met with in London, interested in the com- ing strife. He is said to have foreseen whither the com- motions were tending ; and he directed his efforts, as events developed, in advocacy of peace and in preservation of the interests of his order, For a short time he preached with success at the Inns of Court, and thence removed, at the invitation of the master of the Savoy (Dr Balcanqual) and the brotherhood of that foundation, to be lecturer at their chapel of St Mary Savoy. Certain of the parishioners would have elected one Thomas Gibbs, whose claims were put forward in the House of Commons by Sir Robert Harley ; but the greater number earnestly desired Fuller, whose better title was upheld in the House by Sir John Northcote, M.P. for Ashburton. Some of the best dis- courses of the witty preacher were delivered at the Savoy to audiences which extended into the chapel-yard. In one, he set forth with searching and truthful minuteness the hindrances to peace, and urged the signing of petitions to the king at Oxford, and to the parliameut, to continue their care in advancing an accommodation. In his intercourse with persons of influence who attended upon his ministry, or who resided in the neighbourhood of his cure, Fuller, with all the earnestness of Lord Falkland in that direction, laboured to promote the same peaceful views. With these honourable efforts an historic circumstance of some signifi- cance counects itself. With Sir Edward Wardour, clerk of the pells, Dr Dukeson, and four or five others, Fuller was deputed to take an influential peace-petition to the king, emanating from the city of Westminster and the parishes contiguous to the Savoy. To carry it with fitting circum- stance, a pass was granted by the House of Lords, 2d January 1643, for an equipage of two coaches, four or six horses, and eight or ten attendants. On the arrival of the deputation at Uxbridge, 4th January, officers of the Parlia- mentary army stopped the coaches and searched the gentle- men; and they found upon the latter "two scandalous books arraigning the proceedings of the House," and letters with ciphers to Lord Viscount Falkland and the Lord Spencer. A message was then sent to acquaint the House of Commons with the matter, and it was complained

that the Lords had given the pass. Ultimately a joint order of both Houses remanded the party; and Fuller and his friends suffered a brief imprisonment. The Westminster Petition, notwithstanding, reached the king's hands; and it was pub- lished with the royal reply. When it was expected, three months later, that a favourable result would attend the nego- tiations at Oxford, Fuller preached a remarkable sermon in the old abbey of Westminster, 27th March 1643, on the text 2 Sam. xix. 30, the occasion being the anniversary. of Charles I.'s accession, and the subject, his return to 'our English Zion," This loyal discourse, in accord with the loyal text, brought the preacher into disfavour in the city. Domestic trouble likewise overtook him in the death of his wife. On 19th April the Lords gave him a pass to and from Salisbury to carry her remains thither, to be

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buried, as it seems, amongst her own kin. He returned to London, and on Wednesday, 26th July, he preached on church reformation, satirizing the religious reformers, and maintaining that only the Supreme Power could initiate reforms. The storm which this sermon aroused in the metropolis, then well-nigh abandoned by the active royalists, brought about Fuller's secret flight to Oxford, and the loss of all his preferments and property. He lived in a hired chainber at Lincoln College for 17 weeks. Thence he put forth a witty and effective reply to John Saltmarsh, who had attacked his views on ecclesiastical reform. Fuller subsequentiy published by royal request a fast sermon preached 10th May 1644, at St Mary's, Oxford, before the king and Prince Charles, called Jacob's Vow. In this dis- course which, it is supposed, had relation to the king's pro- posed restoration of the church lands, the preacher referred to some religious exercise then being observed every Tuesday by Charles I., all record of which has been omitted in the pages of history. The spirit of Fuller's preaching, always characterized by calmness and moderation, gave offence to the high royalists, who charged him with lukewarmness in their cause. To silence unjust censures, he became chaplain to the regiment of the excellent Lord Hopton. For the first five years of the war, as he said, when excusing the non- appearance of his Church-History, "I had little list or leisure to write, fearing to be made a history, and shifting daily for my safety. All that time I could not live to study, who did only study to live." After the defeat of

Hopton at Cheriton Down, Fuller retreated to Basing House. He took an active part in its defence, and was once incited by the noise of the enemy's artillery, which disturbed him at his books, to head a sally upon the trenches. His life with the troops caused him to be after- wards regarded as one of "' the great cavalier parsons." In his marches with his regiment round about Oxford and in

the west, he devuted much time to the collection of details, }

from churches, old buildings, and the conversation of ancient gossips, for his Church-History and Worthies of England. His patriotism in the national crisis was evi- denced in many ways. For the soldiers and the more re- ligious of the royalist party he compiled, 1645, a small volume of prayers and meditations,—the Good Thoughts in Bad Times,—which, set up and printed in the besieged city of Exeter, whither he had retired, was called by himself "the first fruits of Exeter press." It was inscribed to Lady Dalkeith, governess to the infant princess, Henrietta Anne, who was born at Exeter, 16th June 1644. Fuller was by the king placed in the household of the princess through the influence of Lady Dalkeith. In this city, as elsewhere, he attracted to himself a circle of friends. The corporation gave him the Bodleian lectureship, 21st March 1645-6, and he held it until 17th June following, soon after the surrender of the city to the Parliament. Zhe Fear of losing the Old Iaght, 4to, 1646, was his farewell discourse to his Exeter friends. Under the Articles of Surrender Fuller made his composition with the Government at London, his " delinquency " being that he had been present in the king's garrisons. In a characteristic petition to compound, dated ist June 1646, he acquainted the committee that he was then lodging at "the Crown" in St Paul's Church-yard (the sign of his bookseller, Williams); and the word Crown is written in large letters and designedly falls in the centre ofgthe document, in which, moreover, there are traces of the disagreeable position in which he was placed. In a life of Andronicus, 1646, partly authentic and partly fictitious, he satirized the leaders of the Revolution ; and more than one edition of this little book was called for. For the comfort of sufferers by the war he issued, 1647, a second devotional manual, entitled Good Thoughts in Worse Tvmes, abounding, like its predecessor and its successor, 1n

‘ Christ until the year 1648. no slight degree by his connexion with Sion College, London,

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fervent aspirations, and drawiug moral lessons in beautiful language out of the events of his life, or the circumstances of the time. In grief over his losses which included his library and manuscripts (his “ upper and nether millstone ”), and over the calamities of the country, he wrote his work on the Wounded Conscience, 1647. It was prepared at Boughton House in his native county, where, in a penni- less, feeble, and exiled position, he and his little son were entertained by Edward Lord Mountagu, his patron, and where, as he says, he was restored to his former self. For the next few years of his life, Fuller was mainly dependent upon his dealings with booksellers, of whom he asserted that none had ever lost by him. Amongst other minor produc- tions of his pen at this time he seems to have made con- siderable progress in an English translation of the Annales of his friend Archbishop Ussher from the MS. of that great work. Amongst his benefactors it is curious to find Sir John Danvers of Chelsea, afterwards the regicide. Under the countenance of citizens whose names are perpetuated in the dedications in his books, Fuller in 1647 began to preach at St Clement’s, East Cheap, and elsewhere, in the capacity of lecturer. While at St Clement’s he was suspended ; but speedily recovering his freedom, he preached wherever he was invited. His connexion with the church named has recently been recognized by the erection of a fine memorial window in which, clad ina doctor’s gown, he stands holding in his hand his best gift to the universal church. At

| Chelsea, where also he occasionally officiated, he covertly | preached a sermon on the death of Charles I.,—an event

which he deeply deplored. Amongst Fuller’s noble patrons was the earl of Carlisle, who made him his chaplain, and

| presented him to the curacy of Waltham Abbey. To

this kind patron he dedicated his bistory of that foundation ; and on the title-page placed the words— ‘ Patria est ubicunque est bene; Bene vixit*

qui bene latuit." His possession of the living was in jeopardy on the appoint- ment of Cromwell's "Tryers"; but he evaded the inquisi- torial questions of that dreaded body by his ready wit.

He had, however, the good sense to fortify himself under this ordeal with the counsel of the catholic-minded John

Howe, to whom he went, saying, "Sir, you may observe that I am a pretty corpulent man, and I am to go through

/a passage that is very straight; I beg you would be so good as to give me a shove and help me through." Nor was | Fuller disturbed at Waltham in the " dangerous year" 1655,

when the Protector's edict prohibited the adherents of the late king from preaching. Moreover, Lionel, third earl of Middlesex, who lived in the parish, gave him what remained of the books of the lord treasurer his father; and through the good offices of the marchioness of Hertford, part of his own pillaged library was restored to him. Under such

circumstances Fuller actively prosecuted bis literary labours, | producing successively, at great cost, his survey of the Holy | Land, called A Pisgah-Sight of Palestine, 1650; and his

Church-History of Britain, 1655, from the birth of Jesus These works were furthered in

where he had a chamber, as well for the convenience of the press as of his city lectureships. The Church-History was angrily attacked by Dr P. Heylin, who, in the spirit of High- Churchmanship, wished, as he said, to vindicate the truth, the church, and the injured clergy. About 1652 Fuller married into the noble and loyal family of Roper. By his wife (Mary, youngest sister of Thomas, Viscount Baltinglass) he had several children. At the Oxford Act of 1657, the celebrated Robert South, who was 7erre filius, lampooned Fuller for his frequent puns and other peculiarities. He described him in this Oratio as living in London, ever scribbling, and each year bringing forth new folia like a

tree. Atlength, continues South, the Church-History came forth with its 166 dedications to wealthy and noble friends ; and with this huge volume under one arm, and his wife (said to be little of stature) on the other, he ran up and down the streets of London, seeking at the houses of his patrons invitations to dinner, to be repaid by his dull jests at table. This speech, although 'exaggerated, throws light upon the social qualities of Fuller, who had many kind friends amongst the nobility. His last and best patron was the Hon. George Berkeley of Cranford House, Middlesex, whose chaplain he was, and who gave him Cranford rectory, 1658. To this nobleman Fuller's reply to Heylin, called The Appeal of Injured Innocence, 1659, was inscribed. This remarkable and instructive book embraces, as its editor, Mr James Nichols, has remarked, "almost every topic within the range of human disquisition, from the most sublime mysteries of the Christian religion, and the great antiquity of the Hebrew and Welsh languages, down to Z'he Tale of a Tub, and criticisms on Shakespeare's perversion of the character of Sir John Falstaff." At the end of the Appeal is an elegant epistle 'to my loving friend Dr Peter Heylin," conceived in the admirable Christian spirit which characterized all Fuller's dealings with controversialists. "Why should Peter," he asked, "fall out with Zhomas, both being disciples to the same Lord and Master? I assure you, sir, whatever you conceive to the contrary, I am cordial to the cause of the English Church, and my hoary hairs will.go down to the grave in sorrow for her sufferings." The only other important works issued by Fuller in his lifetime were connected with the Restoration. The revived Long Parliament, December 1659, proposed an oath of fealty to the Commonwealth, and the abjuration of Charles II. and his family. The matter was much debated ; and in an able letter published in February 1660, which went into a third edition, called An Alarum to the Counties of England and Wales, Fuller discussed the proposal. His arguments tended to swell the cry for a free and full parlia- ment,—free from force, as he expressed it, as well as from abjurations or previous engagements. In anticipation of the meeting of the new parliament, 25th April, and as if foreseeing the unwise attitude of those in power in relation to the reaction, Fuller put forth his IZixt Contemplations in Better Times, 1660, dedicated to Lady Monk. It tendered advice in the spirit of its motto, " Let your moderation be known to all men;

the Lord is at hand." There is good reason to suppose that Fuller was at the Hague immediately before the Restoration, in the retinue of Lord Berkeley, one of the commissioners of the House of Lords, whose last service to his friend was to interest himself in obtaining him a bishopric. A Panegyrick to His Majesty on his Happy Return was the last of Fuller's verse-efforts. On 2d August, by royal letters, he was admitted D.D. at Cambridge, as a scholar of integrity and good learning, who had been hindered in the due way of proceeding to his degree. His former preferments were restored tohim. At the Savoy Pepys heard him preach; but he preferred his conversation or his books to his sermons. Fuller's last pro- motion was that of chaplain in extraordinary to Charles II. In the summer of 1661 he visited the west in connexion with the business of his prebend, and upon bis return he was seized with a kind of typhus-fever called the "new disease." On Sunday, 12th August, while preaching a marriage sermon at the Savoy, he was disabled from pro- ceeding ; and at the close of the serviee he was carried home in a sedan to his new lodgings in Covent-Garden, where he expired, Thursday, 16th August, aged 54. On the following day 200 of his brethren attended his corpse to its resting place in the chancel of Cranford Church, where Dr Hardy preached a funeral sermon. A mural tablet was afterwards set up on the north side of the

chancel with an epitaph, which, though perhaps longer than Fuller's essay on tombs might allow him to approve, con- tains a conceit worthy of his own pen, to the effect that while he was endeavouring (viz., in Zhe Worthies) to give immortality to others, he himself attained it, It is said that the thought of that unfinished work troubled him upon his deathbed, and that he often incoherently called out to his attendants for pen and ink, as if to complete it.

Dr Fuller was in stature somewhat tall, ' with a propor- tionable bigness to become it," and his gait was graceful. He was of a sanguine temperament, and had a ruddy countenance and light curled hair. Some of these features are pleasingly depicted in his portrait at Cranford House. His personal character was admirable. The charm of his manners was felt by all, his deportment being "' according to the old English guise." His disposition

was genial, lead- ing him to embrace goodness wherever he found it. To these fine qualities of mind he added prudence. 'By his particular temper and management," said the' historian Echard, "he weathered the late great storm with more suc- cess than many other great men." He had many of the peculiarities of scholars. He was known as "a perfect walking library." The strength of his memory was pro- verbial, and some amusing anecdotes are connected with it.

His writings were the product of a highly original mind, and their moral tone was excellent. He had a fertile im- agination and a happy faculty of illustration, His diction in tle main was elegant, and more idiomatic than that of Taylor or Browne. Antithetic and axiomatic sentences abound in his pages, embodying literally the wisdom of the many in the wit of one. He was "quaint," and something more. " Wit," said Coleridge, in a well-known eulogy, "wit was the stuff and substance of Fuller's intellect. It was the element, the earthen base, the material which he worked in; and this very circumstance has defrauded him of his due praise for the practical wisdom of the thoughts, for the beauty and variety of the truths, into which he shaped the stuff. Fuller was incomparably the most sen- sible, the least prejudiced, great man of an age that boasted a galaxy of greatmen." This opinion was formed after the perusal of the' Church-{Tistory. That work and The

_Worthies of England are unquestionably Fuller's greatest

efforts. They embody the collections of an entire life; and since his day they have been the delight and the solace of their readers, and the incentive which has directed or allured many English scholars into historical and topo- graphical studies. The Holy State has taken rank amongst the best books of characters. Fuller's works, according to Charles Lamb, were, in the early portion of this century, scarcely perused except by antiquaries ; but since that time, mainly through the appreciative criticisms of Coleridge, Southey, Crossley, and others, they have received more general attention ; and nearly the whole of his extant writ- ings have been reprinted of late years. (Som B.) FULLER'S EARTH (Germ. Walkererde, Fr. Terre & foulon, Argile smectique), so named from its use by fullers as an absorbent of the grease and oil of cloth, is an earthy hydrated silicate of aluminium,

containing, according to one analysis, silica 53°0, alumina 10, ferric oxide 9°75, magnesia 1:25, lime °5, sodium chloride -1, water 24 per cent., and a trace of potash. It has a specific gravity of 1‘7-2°4, and a shining streak ; is unctuous to the touch; is commonly greenish-brown or greenish-grey, sometimes bluish-grey, whitish, or red-brown in colour; adheres but slightly to the tongue; becomes translucent in water, and falls to powder; and before the blowpipe gives a porous slag, melting event- ually to a white glass. Among the localities where fuller’s earth isfound are Nutfield near Reigate in Surrey, Renton in Yorkshire, Quarry Wood in Morayshire, Rosswein in Saxony, and Zwikowetz in Bohemia. Fuller’s or ‘ Walker’s” earth is

found between the Aymestry limestone and the underlying lower Ludlow beds, rendering the former particularly liable to slides or subsidences (see Murchison, Stluria). From the presence in it of beds of the mineral, a thick deposit of blue and yellow clays with bands of rubbly limestone in the Oolitic or Jurassic series of rocks in England has received the name of Fuller’s Earth (see Gzonocy). The consump- tion of fuller’s earth has fallen off considerably, owing to the employment of other substances for the cleansing of cloth. It was in past times largely mined in the Downs, south of Bath, for use in the cloth-mills of Bradford-on-Avon, Frome, and Gloucestershire.

FULMAR, from the Gaelic Fulmaire, the Pulmarus glacialis of modern ornithologists, one of the largest of the Petrels (Procellariidw) of the northern hemisphere, being about the size of the Common Gull (Larus canus) and not unlike it in general coloration, except that its primaries are grey instead of black, This bird, which ranges over the North Atlantic, is seldom seen on the European side below lat. 53° N., but on the American side comes habitually to lat. 45°, or even lower. It has been commonly believed to lave two breeding places in the British Islands, namely, St Kilda and South Barra; but, according to Mr Robert Gray (Birds of the West of Scotland, p. 499), it has abandoned the latter since 1844, while he is assured of its now breed- ing in Skye. Northward it established itself about

1838 on Myggenzs Holm, one of the Faroes, while it has several stations off the coast of Iceland and Spitsbergen, as well as at Bear Island. Its range towards the pole seems to be only bounded by open water, and it is the constant atten- dant upon all who are employed in the whale and seal fisheries, shewing the greatest boldness in approaching boats and ships, and feeding on the offal obtained from them. By our seamen it is commonly called the " Molly Mawk " ? (cor- rupted from the Dutch Jfallemuck), and is extremely well known to them, its flight, as it skims over the waves, first with a few beats of the wings and then gliding for a long way, being very peculiar. It only visits the land to deposit its single white egg, which is laid on a rocky ledge, where a shallow nest is made in the turf and lined with a little dried grass. Many of its breeding-places are a most valuable property to those who live near them and take the eggs and

young, which, from the nature of the locality, are only to —

be had at a hazardous risk of life. In St Kilda it is said that from 18,000 to 20,000 young are killed in one week of August, the only time when, by the custom of the com- munity, they are allowed to be taken. These, after the oil is extracted from them, serve the islanders with food for the winter. This oil, says Mr Gray, having been chemically ex- amined by Mr E. C. C. Stanford, was found to be a fish-oil, and to possess nearly all the qualities of that obtained from the liver of the cod, with a lighter specific gravity. It, however, has an extremely strong scent, which is said by those who have visited St Kilda to pervade every thing and person on the island, and is certainly retained by an egg or skin of the bird for many years. Whenever a live example is seized in the hand it ejects a considerable quantity of this oil from its mouth. The Fulmar is said by Mr Darwin (Origin of Species, ed. 4, p. 78) to be the most numerous bird in the world; but on whose authority the statement 13 made does not appear, and to render it probable we should have to unite specifically with the Atlantic bird, not only its Pacific representative, F. pacijicus, which some ornitho- logists deem distinct, but also that which replaces it in the Antarctic seas and is considered by most authorities to be a perfectly good species, 1". glacialioides. The differences between them are, however, exceedingly slight, and for Mr | eee

1 A name misapplied in the southern hemisphere to Divmedea melanophrys, one of the Albatrosses.

Darwin's purpose on this particular occasion it matters little how they are regarded. It is a more interesting question whether the statement is anyliow true, but one that can hardly be decided as yet. (A. N.) FULTON, Ropert (1765-1815), an American engineer and mechanician, was born in 1765 at Little Britain in Pennsylvania. At the age of seventeen he adopted the profession of a portrait and landscape painter, but he also, even then, devoted a considerable portion of his time to mechanical pursuits. In his twenty-second year he visited England, with the view of improving himself in art by the instructions of his countryman West. There he made thie acquaintance of the duke of Bridgewater, Karl Stanhope, and Watt; and partly by their influence he was led to devote his attention more exclusively to mechanical en- gineering. In 1793 he had conceived the design of pro- pelling vessels by steam, but did not at that time find a suitable opportunity for putting his views into practice. His time was also much engrossed in devising a method of superseding the locks on canals by a plane of double incline for which he obtained a patent from the British Govern- ment in 1794. In the same year he obtained patents for flax-spinning and rope-twisting machines, and various other mechanical inventions, bearing chiefly upon the construc- tion of canals, on which latter subject he published a trca- tise. In 1797 he removed to Paris, and remained for seven years in the house of Joel Barlow, the American minister at the court of France, prosecuting his scientific studies. During that period he projected the first pano- rama ever exhibited in Paris, and made important experi- ments on submarine explosives. These experiments were further continued in America, but although Congress voted him 5000 dollars for prosecuting them, his plans were finally declared impracticable. It was also at Paris that he first succeeded, after repeated trials, in propelling a boat through the water by the aid of steam. In 1806 he returned to America and repeated the experiment on a larger scale and with more decided success. In 1809 he took out his first patent, but his rights were disputed, and after protracted legislation a compromise was effected. In 1814 Fulton constructed the first United States' war

steamer, and he was engaged upon an improvement of his

submarine torpedo when he died, February 24, 1815.

See Life of Robert Fulton, by C. D. Colden, 1817, and the bio- graphy by James Renwick in Spark's Americun Biography.

FUMITORY, or Fumaria, Linn, (Germ. Erdrauch, Fr. Fumeterre), a genus of annual, rarely perennial, herbs of the natural order /umariacece, with stems usually branched and straggling, often climbing by means of tlicir petioles ; lcaves alternate and decompound, with narrow segments ; flowers in racemes, small, tubular, and purple or whitish, with purple tips ; sepals 2, and deciduous; petals 4, and connl- vent, the upper one saccate or spurred at the base, the two inner cohering at the apex; stamens 6, and in two bundles opposite the outer petals ; style deciduous ; and capsule one-seeded aud indehiscent. There are several British species of the genus. The Common Fumitory, /. officinalis (Germ. Taubenkropf), called by Shakespeare the "rank fumitory or "fumiter" (Henry V., V- OF 07; iv. 4), is a plant in- digenous to Europe, North Africa, and Asia, and is found as an introduced species in the United States. It has glane- ous leaves and pale or dark rose-purple flowers, which bloom throughout the summer, and grows to a height of one or two feet. It is « common weed in corn-fields, and like other members of the genus flourishes best in rich cultivated ground. In past times it was in esteem for its reputed cholagogue and other medicinal properties, and in England, boiled in water, milk, or whey, it was used as a cosmetic. The herbage of J. officinalis and /, racemosa 1s used in China under the name of np as an application

for glandular swellings, carbuncles, aud abscesses, and was | formerly valued in jaundice, and in cases of accidental swallowing of the beard of grain (see F. Porter Smith, Contrib. towards the Mat. Medica… of China, p. 99, 1871). The name fumitory, Latin fumus terre, has been supposed to be derived from the fact that its juice irritates the eyes like smoke (see Fuchs, De Historia Stirpium, p. 338, 1542); but Zhe Grete Herball, cap. clxix.,

1529, fol., following the De Simplici Medicina of Platearius, fo. xciii. (see in Vicolat Prepositi Dispensatorium ad Aromatarios, 1536), says: "It is called Fumus terre. fumie or smoke of the erthe bycause it is engendred of a cours fumosyte rys-

ge frome the erthe in grete quantyte lyke smoke: this grosse or cours fumosyte of the erthe wyndeth and wryeth out; aud by workynge of the ayre and sonne it turneth into this herbe."

For figures of various specics of fumitory, see J.T. Boswell Syme, English Botany, vol. i., 1868.

FUNCHAL. See Mapzrra.

FUNCTION. Functionality, in Analysis, is depend- ence on a variable or variables; in the case of a single variable #, it is the same thing to say that v depends upon u, or to say that v is a function of w, only in the latter form of expression the mode of dependence is embodied in tue term "function." We have given or known functions such as w? or sin w, and the general notation of the form gu, where the letter @ is used as a functional symbol to denote a function of w, known or unknown as the case may be: in each case w is the independent variable or argu- ment of the function, but it is to be observed that if v be a function of w, then v like w is a variable, the values of v regarded as known serve to determine those of «; that is, we may conversely regard w as a function of v. In the case of two or more independent variables, say when w depends on or is a function of w, v, &c., or w= p(t, v%,..), then w, v,.. are the independent variables or arguments of the function; frequently when one of these variables, say w, is principally or alone attended to, it is regarded as the independent variable or argument of the function, aud the other variables v, d&c., are regarded as parameters, the values of which serve to complete the definition of the function. We may have a set of quantities w, ¢,.. each of them a function of the same variables u, v, . .; and this relation may be expressed by means of a single functional symbol ¢, (wv, t, . .)=(u, v. .); but, as to this, more hereafter.

The uotion of a function is applicable in geometry and mechanics as well as in analysis; for instance, a point Q, the position of which depends upon that of a variable point P, may be regarded as a function of the point P; but here,

substituting for the points themselves the coordinates (of any kind whatever) which determine their positions, we may say that the coordinates of Q are each of them a function of the coordinates of P, and we thus return to the analytical notion of a function. And in what follows a function is regarded exclusively in this point of view, viz., the variables are regarded as numbers; and we attend to the case of a function of one variable v=fu. But it has been remarked (see Equation) that it is not allowable to confine the attention to veal numbers ; a number w must in general be taken to be a complex number w=a+7y, and y being real numbers, each susceptible of continuous variation between the limits —©, +o, and ¢ denoting ,/-1. In regard to any particular function, fu, although it may for some purposes be sufficient to know the value of the function for any real value whatever of w, yet to attend only to the real values of u is an essentially incomplete view of the question; to properly know the function it is necessary to consider w under the aforesaid imaginary or complex form u=a-+4y,

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To a given value «+7y of uw there corresponds in general for v a value or values of the like form v=.' + iy/, and we obtain a geometrical notion of the meaning of the functional relation v=fu by regarding x, y as rectangular coordinates of a point P in a plane I, and a', y' as rectangular coordinates of a point P' in a plane (for greater convenience a different plane) II'; P, P' are thus the geometrical representations, or representative points, of the variables w=a+iy aud u'=x2'+7y' respectively; and, according to a locution above referred to, the point P' might be regarded as a function of the point P; a given value of w=x+7y is thus represented by a point P in the plane II, and corresponding hereto we have a point or points P' in the plane II', representing (if more than one, each of them) a value of the variable v=z'+7y'. And, if we attend only to the values of « as corresponding to a series of positions of the representative point P, we have the notion of the "path" of a complex variable «=a + dy.

Known Functions.

1. The most simple kind of function is the rational and integral functiou. We have the series of powers w?, w3,. each calculable not only for a real but also for a complex value of uw, (x + iyP= x? — ty + Qiny, (2 + ty)® = x8 — Bay? + 1(8a%) — 3), &e., and thence, if a, 6,.. be real or complex numbers, th gencral form a+ bu +cu2… + ku™, of a rational and integral function of the order m. And taking two such functions, say of the orders m and n respectively, the quotient of one of these by the other represents the general form of a rational functiou of w.*

The function which next presents itself is the algebraical function, and in particular the algcbraical function expressible by radicals. To take the most simple case, suppose (2 being a positive integcr)

t

that o = w; v is here the irrational function = u™. Obviously, if

wu is real and positive, there is always a real and positive value of v,

calculable to any extent of approximation from the equation

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v™ = u, which serves as the definition of uw"; but it is known (see

Equation) that as well in this case as in the general case where w

is a complex number there are in fact m values of the fuuction

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w™ ; and that for their determination we require the theory of the so-called circular functions sine and cosine ; and these depend on the exponential function exp w, or, as it is commonly written, c, which has for its inverse the logarithmic function log w; these are all of them transcendental functions,*

2. In a rational and integral function a+bu+oa®... + ku, the number of terms is finite, and the coefficients a, b,:.. & may have any values whatever,

but if we imagine a like series a+ bu+cu2+... extending to infinity, non constat that such an expression has any calculable value,—thatis, any meaning at all ; the coefficients a, b, ¢... must be such as, either for every value whatever of w (that is, for every finite value) or for values included within certain limits, to make the series convergent. It is easy to see that the valucs of a, 6, ¢. . may be such as to make the series always convergent ; for instance, this is the case for the exponential function,

expos tty@ a awe, tee ae , taking for the moment w to be real and positive, then it is cvident that however large « may be, the successive terms will become ultimately smaller and smaller, and the series will have a determi- nate calculable value. A function thus expressed by mcans of a convergent infinite series is not in general algebraical, and when it is not so, it is said to be transcendental (but observe that it is in nowise truc that we have thus the most general form of a transcen- dental function); in particular, the exponential function above written down is not an algebraical function.

By forming the expression of exp v, and multiplying together the two series, we derive the fundamental property

exp uexpv—exp (u-+ 0); whetice also

exp x exp dy = exp («+ ty), so that exp (x + zy) is given as the product of the two series exp x and exp ty. As regards this last, if in place of w we actually write the value zy, we find

P 2 4 : ys expty=(1-fo+ygg3a777+) té(v-agg te)

where obviously each series is convergent and actually calculable for any real value whatever of y, calling the two series cosine y and sine y respectively, or in the ordinary abbreviated notation cos y and sin y, the equation is

FUNCTION

exp ty=cos y-+-tsin ys and if we herein for y write z, and multiply the two expressions together, observing that the produet will be = exp7(y + 2), we

obtain the fundamental equations cos (y+ 2)=cos y cos z—sin y sin 2; sin (y+z) =sin y cosz-+ sinz cosy, for the funetions sine and cosine.

Taking y as an angle, and defining as usual the sine and cosine as the ratios of the perpendicular and base respeetively to the radius, the sine and eosine will be funetions of y; and we obtain geometrically the foregoing fundamental equations for the sine and cosine; but in order to the truth of the foregoing equation exp ty=cos y +7 sin y, it is further neeessary that the angle should be measured in eircular measure, that is by the ratio of the ar to the radius; so that denoting as usual the number 3°14159. ., the measure of a right angle is =47. And this being so, the func- tions sine and eosine, obtained as above by eonsideration of the exponential funetion, have their ordinary geometrical significa- tions.

8. The foregoing investigation was given in detail in order to the

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eompletion of the theory of the irrational funetion w. We hence- forth take the theory of the eireular functions as known, and speak of tan 2, &c., as the oecasion may arise. We have a+ 7iy=r(cos 6 +7¢sin 6),

where, writing ,/a? + y? to denote the positive value of the square root, we have

Sy ma = @ ae y r= /xi+y?, cos = je sind ae and therefore also tan 6= “ .

Treating x, yas the rectangular coordinates of a point P, 7 is the distanee (regarded as positive) of this point from the origin, and 6 is the inelination of r to the positive part of the axis of a; to fix the ideas @ may be regarded as lying within the limits 0, 2, or 0,-7, according as y is positive or negative ; 6 is thus eompletely determinate, except in the case, 2 negative =0, for which 0 is = w or — 7 indifferently. And if w = a + 7y, we henee have

es a es 6 + 237 6 +283 25 By NOL (coy IS sy Meet u™ =@+iy™ arm m ne, m):

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where 7™ is real and positive and s has any positive or negative ul

integer value whatever, but we thus obtain for w™ only the m values eorresponding to the values 0,1,2…m-—lofs. More

generally we may, instead of the index —, take the index to be any

rational fraction —. Supposing this to be in its least terms, and m to be positive, the number of distinet values is always=m. If

: n : instead of — we take the index to be the general real or complex

quantity m, we have w™, no longer an algebraical funetion of u, and having in general an infinity of values.

4. The foregoing equation exp (w+ y)=exp x. exp y is in fact the equation of indices, a#+¥=a. a¥; exp a is thus the same thing as e*, where ¢ denotes a properly determined number, and putting ¢* equal to the series, and then writing z=1, we have e ltitintiss + &c., that is, ¢=2°7128… But as well theoretically as for eonvenience of printing, there is considerable advantage in the use of the notation exp 1.*

From the equation, exp iy = cosy +1 sin y, we deduee exp (-%y) =eosy — isiny, and thenee

cos y= 5 fexp (iy) + exp (—in)} ’ sin = – exp (iy) — exp (— ink ; if we write herein tz instead of y we have eos we {exp a+ exp (—2) ‘i

sin i § fexp ¢ — exp (- ay} ’ viz., these values are

2 4

medias) ees eee Celtis esa” i aP 3 = n ae a ae git? “ins T

each of them real when z is real; the functions in question

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gee z ., regarded as func-

x ratposg t+: mdet+rogt-::

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tions of a, are termed the hyperbolie cosine and sine, and arc repre-

sented by the notations eosh # and sinh « respectively; and simi- larly we have the hyperbolie tangent tanh x, &c. : although it is

easy to remember that eos iz, — sin 7a, are in faet real functions of x,

4

and to understand accordingly the formule wherein they oceur, yct the use of these notations of the hyperbolic functions is often con- venient.

5. Writing w= exp v then »v is conversely a funetion of « which is called the logarithm (hyperbolie logarithm, to distinguish it from the tabular or Briggian logarithm), and we write v= log wu, or what is the same thing, we have w= exp (log 2) (and.it is clear that if uw be real and positive there is always a real and positive value of log #, in particular the real logarithm of ¢ is=1); it is however to be observed that the logarithm is not a one-valued funetion, but has an infinity of values corresponding to the different integer values of a constants; in faet, if log w be any onc of its values, then log u + 2s7i is also a value, for we have exp (log u + 2smi) = exp log w exp 2Qsmi, or since exp 2sri is=1, this is=w; that is, log w+ smi is a value of the logarithm of w ~

'We have

*uv= exp (log wv) =cxp log u. exp logy, and hence the equation whieh is coimmonly written log wv =log u+logv, but whieh requires the addition on one side ofa term 2smi. And reverting to the equation x + iy =r (cos 6 +7 sin 6), or as it is eon- venient to write it, z+7y=*7 exp 76, we hence have*

log (a+ ty) =log r + 7(8 + 2s7r),

where log 7 may be taken to denote the real logarithm of the real positive quantity 7, and the completely determinate angle defined as already mentioned. : Reverting to the funetion w, we have w=exp log w, and thence wu = exp (m log wv), which, on account of the infinity of values of log u, has in general (as before remarked) an infinity of values ; ifu =e, then e, = exp (m log e), has in general in like manner an infinity of values, but in regarding eas identical with the one-valued funetion exp m, we take log ¢ to be = its real value, 1. The inverse functions cos-!, sin-! a, tan-1, are in fact logarith- mie funetions ; thus in the equation exp 7x = cos + @ *sin a, writing*

first eos z =u, the equation becomes exp 4% eos-lu =u + i/1-w?,

1 =

or we have eos“u= } log (wu + i71 – u?), and from the same equa-

‘ 1 — 3 1 tion, writing secondly sin v=, we havesin~ w= 7 log (71 – wu? + %).

But the formula for tan-w is a more elegant one, as not involving

the radieal 71-1; we have exp 7@-¢xp (-ir) _ exp 2iz—-1

itana>=

exp i+ exp (—tr)? ~ exp 2ix+1' and thence pipe 1+ tana exp aie 7 tian 2' that is,

zl 147 tana & = 5; 108 TF tan &

*or if tan z=, then 1 1+ tu me ples oe saan tan7*w= Di log are The logarithm (or inverse exponential function) and the inverse circular functions present themselves as the integrals of algebraic*

funetions dz 10 = BL,

cog l+a27 2%

rh #@_=sin-1z. 1 —ax?

6. Each of the funetions exp , sin wu, cos u, tan w, &c., as a one- valued function of 2, is in this respect analogous to a rational func- tion of w: and there are further analogies of exp u, sin 2, cos w, to a rational and integral funetion; and of tan 1, see %, &e., to a rational non-integral function. ;

'A rational and integral function has a eertain number of roots; or zeros, each of a given multiplicity, and is completely deter- mined (exeept as to a constant factor) when the several roots and the multiplicity of caeh of them is given; te, if a,b,c… be

whence also ce UZ art — tan! 7, 8 {ix : and

the roots, p, g, 7… their multiplicities, then the form is a\? u\? , ' ,

Agiele— den ZF) eres a rational (non-integral) function has a

a certain number of infinities, or poles, each of them of a given multiplicity, viz., the infinities are the roots or zeros of the rational and integral funetion which is its denominator.

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The fuuction exp uw has no finite roots, but an infinity of roots

each = —« ; this appears from the equation exp w=(1 tf – ,

where 7 is indefinitely large and positive. The function sin 2 has the roots sm whcre s is any positive or negative integer zero included; or what is the same thing, its roots are 0 and x sm, s now denoting any positive integer from 1 to o ; each

uw Similarly the roots of cos w are (s + 4) m, s denoting any positive

or negative integer, zero included, or what is the same thing, they are + (s + 4) 7, snow denoting any positive integer from 0 to o ;

of these isa simple root, and we in fact have sin 2 = a n(4 –

uw each root is simple, and we have cos 4#=M{ 1— —-~—-) . oi (s+ 4)?

Obviously tan w, as the quotient sin «—-cos w, has both roots and infinities, its roots being the roots of sin wu, its infinities the roots of cos 7%; sec was the reciprocal of cos w has infinities only, these being the roots of cos u, &e. : uw

=

In the foregoing expression sin u = WIT (1-) the product

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oe]

uw 5 ieee

= for an inde- Sr

must be understood to mean the limit of ny (

finitely large positive integer value of n, viz., the product is first to be formed for the values s=1, 2,3…up to a determinate number 7, and then » is to be taken indefinitely large. If, separating the positive and the negative values of s, we consider the product wi}(1 + =) ie (1 ==

81 ST dnet s has all the positive integer values from 1 to m, and in the second product s has all the positive integer values from 1 to 7), then by making m and » each of them indefinitely large, the function does not approximate to sin wu, unless m:2 be a ratio of equality.! And similarly as regards cos uw, the product

m (1 ieee

, (where in the first pro-

(8-+-4)a not approximate to cos w, unless m :7 be a ratio of equality. 7. The functions sin w, cos w, are pertodic, having the period 2m, sin sill ? sin =. ; -period (u m) ies uw + Qn) cos (%) 5 and the half-pe » oon CO a – w; the periodicity may be verified by means of the fore- going fractional forms, but some attention is required; thns ae ; {1(w + sz) writing, as we may do, sin w= Tse? where s cxtends from -n ton, n ultimately infinite, if for «w we write 7+, each factor of the numerator is changed into the following one, and the uimerator is unaltered, save only that there is an introduced factor w+ (n+1)x at the superior limit, and an omitted factor «w-mz at the inferior limit; the ratio of these (w+n+1r)+(u-mm), for n infinite is = —1, and we thus have, as we should have, sin (w+) = —sin uw, The most general periodic function having no infinities, and each root a simple root, and having a given period a, has the form 7 ‘ : sin / 2ru A sin2™ + Beos ull or, what is the same thing, L~ (——+a }. a a cOSs\ a 8. We come now to the Elliptic Functions; these arose from the

cE), m and » indefinitely large, does

2

consideration of the integral [, Where R is a rational function

of a, and X is the general rational and integral quartic function ax+ 6×24 -yx2+5x+e; a form arrived at was*

a — dp

Vi -a2l ka? “SV 52 sind’

on putting therein =sin ¢, and this last integral was represented by #¢, and called the elliptic integral of the first kind. In the

particular case k=0, the integral is y. oa = sin-‘z, and it thus

—- 7 appears that 4 is of the nature of an inverse function; for passing to the direct functions we write /’@=2, and consider ¢ as hereby drtermined as a function of uw, @ = amplitude of w, or for shortness

am uw. And the functions sin ¢, cos o, and V1—k?sin2 were then considered as functions of the amplitude, and written sin am 2, cos am w, A am w; these were afterwards written sn w, cn w, dn w, which may be regarded either as mere abbreviations of the former functional symbols, or (in a different point of view) as functions, no longer of am w, but of 2 itself as the argument of the functions; sn 1s thus a function in some respects analogous to a sine, and cn and dn functions analogous to a cosine; they have the correspond-

ee ee

1The value of the function in question um, (1 + mS nm” (1 eg)s s7r 1 rig

u m ; Wa. —not=1,is= ae sill 2%. n m

when m, 2 are each indefinitely large, but

Mw ec Til Om

ing property that the three functions of «+ are expressible in terms of the functions of w and of 7 The following formule may be

mentioned : en? w= 1-sn? u, dn? w= 1-42 sn2 x, sn' wu=cnudna, en' w= -snednu, dn'u=—k2 sn zu cn uz,

(where the accent denotes differentiation in regard to wu); aud the addition-formule :

sn (u-+-v) = snucnudnv+snvenu dnu, (+) en (u-+¢) = cnucnv—snudnwsnv dny, (|) dn(u-+v) = dnudnv—k2snuenesnv cnr, (-+)

cach of the expressions on the right-hand side being the numerator of a fraction of which

Denom, = 1-2 sn? u sn2 »,

It may be remarked that any one of the fractional expressions, differentiated in regard to w and to v respectively, gives the same result ; such expression is therefore a function of u+v, and the addition-formule can be thus directly verified.

9. The existence of a denominator in the addition-formule sug- gests that sn, cn, dn are not, like the sine and cosine, functions having zeros only, without infinities ; they are in fact functions, having each its own zeros, but having a common set of infinitics ; moreover, the zeros and the infinitics are simple zeros and infinities respectively. And this further suggests, what in fact is the case, that the three functions are quotients having each its own numerator but a common denominator, say they are the quotients of four 6-functious, each of them having zeros only (and these simple zeros) but no infinities,

The functions su, cn, dn, but not the 6@-functions, are moreover doubly periodic ; that is, thereexist values 2w, 2vu (=4K and 4(K+7K') in the ordinary notation), such that the sn, cn, or dn of w+2o, and the sn, cn, and dn of w+2v are equal to the sn, en, and dn respectively of w ; or say that (wu +2w)=o(w+2v)= ou, where ¢ is any one of the three functions,

As regards this double periodicity, it is to be observed that the equa- tions ¢ (u+2w)= pu, o(w+2v)= pu, imply p(w +2mw+2nv) =u, and hence it easily follows that if w, v were commensurable, say if they were multiples of some

quantity a, we should have (w+ 2a)= ou, an equation which would replace the original two equations o(u+2w)=ou, o(uw+2v)= qu, or there would in this case be only the single period a; w and v must therefore be incom- mensurable. And this being so, they cannot have a real ratio, for if they had, the integer values m, 7 could be taken such as to make 2mw+2nu == k times a given real or imaginary value, & as small as we please; the ratio w:v must be therefore imaginary (as is in fact the case when the values are 4K and 4(K+7K')).

10. The function sn «has the zero 0 and the zeros mw+v, m and any positive or negative integers whatever, and this suggests that the numerator of sn wu is equal to a doubly infinite product (Cayley, "On the Inverse Elliptic Functions," Camb. Math. Jour., t. iv., 1845; and " Mémoire sur les fonctions double- ment périodiques," Liouville, t. x., 1845). The numerator is equal to

Uu ae

m and having any positive or negative integer values whatever, including zero, except that m, 2 must not be simultaneously =0, these values being taken account of in the factor w outside the product. But until further defined, such a product has no definite value, nor consequently any meaning whatever. Imagine 2, » to be coordinates, and suppose that we have surrounding the origin a closed curve having the origin for its centre (7.e., the curve is such that if a, 8 be the coordinates of a point thereof, then —a, – B are also the coordinates of a point thereof); suppose further that the form of the curve is given, but that its magnitude depends upon a parameter /, and that the curve is such that, when h is indefinitely large, each point of the curve is at an indefinitely large distance from the origin; for instance, the curve might be a circle or cllipse, ora parallelogram, the origin being in each case the centre. Then if in the double product, taking the value of A as given, we first give to m, m all the positive or negative integer values (the simultaneous values 0, 0 excluded) which correspond to points within the curve, and then make A indefinitely large, the product will thus have a definite value ; but thts value will still be dependent on the form of the ewrve. Moreover, varying in any manner the form of the curve, the ratio of the two values of the double product will be = exp Bu, where 8 is a*

determinate value depending only on the forms of the two curves; or what is the same thing, if we first give to the curve a certain form, say we take it to be a circle, and then give it any other form, the product in the latter case is equal to its former value into exp. Bu, where 8 depends only upon the form of the curve in the latter case.*

Considering the form of the bounding curve as given, and writing the double product in the form

ee) :

- Ese

ulltl (1+

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the simultaneous values m=0, n=0 being now admitted in the numerator, although still excluded from the denominator, then if we write for instance u+2w instead of wu, each factor in the numerator is changed into a contiguous factor, and the numerator remains unaltered, except that we introduce certain factors which lie outside the bounding curve, and omit certain factors which lie inside the bounding curve ; we in fact affect the result by a singly infinite series of factors belonging to points adjacent to the bounding curve; and it appears on investigation that we thus introduce a constant factor exp y(w+w). The final result thus is that the product

u does not remain unaltered when w is changed into w+2w, but that it becomes therefore affected with a constant factor, exp y(u+w). And similarly the function does not remain unaltered when % is changed into w+ 2u, but it becomes affected with a factor, exp 6(u + v). The bounding curve may however be taken such that the function is unaltered when w is changed into u+2w, this will be the case if the curve is a rectangle such that the length in the direction of the axis of m is infinitely great in comparison of that in the direction of the axis of 2; or it may be taken such that the function is unaltered when w is changed into «+ 2u, this will be so if the curve be a rectangle such that the length in the direction of the axis of 2 is indefinitely great in comparison with that in the direction of the axis of m.;

but the two conditions cannot be satisfied simultaneously. _11. We have three other like functions, viz., writing for shortness m,n to denote m+4%, n+4% respectively, and (m, m) to denote mo-+ iv, then the four functions are u ub u wT (146,55), HM (14+Gq, g))» (tee, 5): H+ &, ‘): the bounding curve being in each case the same; and, dividing the first three of these eacli by the last, we have (except as to constant factors) the three functions sn w, cn w, dn 2; writing in each of the four functions «+ 2w or u+2u in place of w, the functions acquire each of them the same exponential factor exp y(w +), or exp 5(w + v), and the quotient of any two of them, and therefore cach of the functions sn u, en u, dn w, remains unaltered.

It is easily scen that, disregarding constant factors, the four 9-functions are in fact one and the same function, with different arguments, or they may be written 6@u, O(u+4w), O(wt du), 6(u + 40+ 4v); by what precedes the functions may be so determined that they shall remain unaltered when w is changed into w+2w (that is, be singly periodic), but that the change w into w+ 2v shall affect them each with the saine exponential factor exp 8(1u +).

12. Taking the last-mentioned property as a definition of the function 6, it appears that 6 may be expressed as a sum of exponentials

Ou = AS exp a (vm2—um) ,

where the summation extends to all positive and negative integer values of m, including zero. In fact, if we first write herein w+ 2 instead of w, then in each term the index of the exponential is

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altered by a 2wm, =2mmi,and theterm itself thus remainsunaltered ; that is, 0(u+2w)=0u. But writing w+ 2u in place of , each term is changed into the succecding term, into the factor exp Ce +);

in fact, making the change in question u into w+ 2uv, and writing alsom—1 in place of m, vm? + um becomes v(m — 1)?+ (w+ 2u)(m – 1),

== ym? +um— Uu— v,andwethus have 6(u + 2v) = oxp{ – E(u + »} 2.

In order to the convergency of the series it is necessary that wiv

exp should vanish for indefinitely large values of m, and

this will be so if = be a complex quantity of the form a+ fi, a nega-

tive; for instance, this will be the case if w be real and positive and v be = 7 into a real and positive quantity. The original definition of `as a double product scems to put more clearly in evidence the real nature of this function, but the new definition has the advantage that it admits of extension to the` *-functions of two or morc variables.*

The elliptic functions sn w, cn uw, dn uw, have thus been expresscd each of them as the quotient of two 6-functions, but the question arises to express conversely a 6-function by means of the clliptic functions; theformis found to be ¢u=C exp (Au? +B yf, he sn? u du?) ; viz., @w is expressible as an exponential, the index of which depends on the double integral y, I, sn? wu du'. a

The object has been to explain the general nature of the elliptic functions sn uw, cn u, dn w, and of the @-functions with which they are thus intimately connected; it would be out of place to go into the theories of the multiplication, division, and transformation of the elliptic functions, or into the theory of the elliptic integrals,

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aud of the application of the 6-functions to the representation of the elliptic integrals of the second and third kinds.

13, The reasoning which shows that for a doubly periodic fune- tion the ratio of the two periods 2w, 2v is imaginary shows that we cannot have a function of @ single variable, which shall be triply periodic, or of any higher order of periodicity. For if the periods of a triply periodic function o(#) were 2w, 2u, 2x, then m, n, p being any positive or negative integer valucs, we should have o(u+2mw + 2nv + 2x) =u; w, v, x must be incommensurable, for if uot, the three periods would really reduce themselves to two periods, or a single period; and being incommensurable,

it would be possible to determine the integers m, n, p in such manner that the real part and also the coefficient of ¢ of the expression mw+nu+px shall be each of then as small as we please, say o(u+e)=ou, and thence o(w+ke) —qu (& an integer), and xe as near as we please to any given real or imaginary value whatever. We have thus the nugatory result gw =a constant, or at least the function if not a constant is a function of an infinitely and perpetually discontinuous kind, a conception of which can hardly be formed. But a function of two variables may be triply or quadruply periodic—viz., we may have a function ¢(u, v) having for wu, v the simultaneous periods 2w, 2w'; 2uv, 2u'; 2x, 2x'; QW, 2W'; or what is the same thing, such that m, n, p, ¢ being any integers whatever, we have (w+ 2mw+2nu+ 2px + 2qy, u+2Qinw' + Qnv' + 2px' + 2g') = p(u, v); and similarly a function of 2n variables may be 2n-tuply periodic.

It is in fact in this manner that we pass from the elliptic functions aud the single @-functions to the hyperelliptic or Abelian functions and the multiple 6-functions ; the case next succeeding the elliptic functions is when we have X, Y the same rational and integral sextic functions of x, y respectively, and then writing

dx dx

we regard certain symmetrical functions of x, y, in fact the ratios of (28=) 16 such symmetrical functions as functions of (u, ¥); say we thus have 15 hyperelliptic functions f(u, v) analogous to the 8 elliptic functions sn u, cn u, dn w, and being quadruply periodic. And these are the quotients of 16 double 6-functions 6(u, v), the general form being

6(u, 0) = ABS exp {x(a, h,byXm, nye-+-mu-tno}y

where the summations extend to all positive and negative integer values of (m, n); and we thus see the form of the 6-function for any number of variables whatever. The epithet "hyperelliptic" is used in the case where the differentials are of the form just mentioned

Fe where X is a rational and integral function of x; the epithet ' Abelian" extends to the more general case where the differential involves the*

irrational function of x, determined by any rational and integral equation ¢ (z, y)=0 whatever. — ;

As regards the literature of the subject, it may be noticed that the various memoirs by Riemann, 1851-1866, are republished in the collected edition of his works, Leipsic, 1876 ; and shortly after his death we have the Theorie der Abelschen Funetionen, by Clebsch and Gordan, Leipsie, 1866. Preceding this we have by MM. Briot and Bouquet, the Théorie des Fonetions doublement périodiques et en particulier des Fonetions Elliptiques, Paris, 1859, the results of which are reproduced and developed in their larger work, Zhéorte des Fonetions Elliptiques, 2 ed., Paris, 1875. j

14. It is proper to mention the gamma (T) or 1 function, P(n + 1)=TIn, =1.2.3… %, when 2 is a positive Integer. In the case just referred to, a positive integer, this presents itself almost everywhere in analysis,—for instance, the binomial coefficients, and the coefficients of the exponential series are expressible by means of such functions of a number x. The definition for any

© nle—ty.. 4 3 real positive value of 7 was taken to be I'n =/o eo & "da; 1 is

then shown that, » being real and tai F(a +1) =2Fa, and by assuming that this equation holds good for positive or negative real values of m, the definition is extended to real negative values ; the equation gives Tl = OFd, that is TO=%, and_ similarly I(—n)=0, where—» is any negative integer. The definition by the definite integral has been or may be extended to imaginary values of n, but the theory is not an established one. A definition extending to all values of 2 is that of Gauss Tn = init a ae a ee eT le DAO gs Be being = «©; but the function is chiefly considered for real values of the variable.

A formula for the calculation when « has a large real and

kn, the ultimate value of k

_ 1

positive value is Ilz =N Om att exp (-« +ioynt +++), Oras this may also be written (neglecting the negative powers of 2)

Te= 20 exp {(a+4) log aa}.

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Another formula is [vf (1-x)=

Sinwa? OF 88 this may also be written, M(#-1)M(-a)= cae

It is to be observed that the function I serves to express tlic product of a set of factors in arithmetical progression, we have

(w+a) (+20)... (o-+ma)=a”(2+1) (2+2) ri (E+ m)=

antl = + m +I. We can consequently express by means of

it the product of any number of the factors which present them- selves in the factorial expression of sin wu. Starting from the form

*wat(i+—) ot (1— *) , where IT is here as before the sign of 1 ST su*

1

a product of factors corresponding to the different integer values of s, this is thus converted into

nlt(Z+m) 11(~~F+n) + n(7) 1(~~%) Hntn, or as this may also be written—

wII(2-+m) n(- itn) +n(z- 1) m(- =) Hmtn , which in virtue of . wv m(-1) m1(~2) = aan*

= sin ult(%+m) m1(~ “+n —+-TimIIn.

becomes

mand are here large and positive, and calculating the second factor by means of the formula for Mz, in this case we have the before-mentioned

formula

we u U_(2\e um” (14+5)0” (1-3)=(F T sin w. The gamma or TI function is the so-called second Eulerian integral ; the first Eulerian integral / x?-\(1 —2)t-1du, = Iplg +F (p + 9),*

0

is at once expressible in terms of I, and is therefore not a new function to be considered.

15. We have the function defined by its expression

5 aat+l1.p.

geometric series I’.(a, B, y, u)=1 + ub +e a pi? + &e., i.¢., this expression of the function serves as a definition, if the series be finite, or if being infinite it isconvergent. The function may also be defined as a definite integral; in other words, if in the integral

feu-oF 11 — suze) ~ Vo

,

we expand the factor (1- ux) 7 in powers of ux, and then integrate each term separately by the formula for the second Eulerian integral, the result is

Te’Ip’ a’+1).re’ »’ “Hechter 2 which is Ta’.rp’ ay’ a atl. xy’. y’+1 ‘ } Ta’ B) 1 art Bui oth eal F, es aia ee.

or writing a’, pf’, y =

=e I-(a, B, y, 4), 8o that the new definition is I (a, B, y, v)=

2, tac = = rena) a=” Gee Ph) (nem) Fae; but tits is in like

)

manner only a definition under the proper limitations as to the values of a, 8, y, u. It is not here considered how the definition is to be extended so as to give a meaning to the function Ia, B, y, w) for all values, say of the parameters a, B, y, and of the variable w. There are included a large number of special forms which are either algebraic or circular or exponential, for instance I (a, B, B, v)=

a, y — a, B respectively, this is =

(1 – uw) —%, &¢., or which are special transcendents which have been separately studied, for instance Bessel's functions, the Legendrian functions X, presently referred to, series occurring in the develop-

ment of the reciprocal of the distance between two planets, &c.

16. There is a class of functions depending upon a variable or variables x, y .. and a parameter n, say the function for the para- meter m is X, such that the product of two functions having the

Same variables, multiplied it may bo by a given function of the variables, and integrated between given limits, gives a result =0or not=0, according as the parameters are unequal or equal ;

J UX,, X, dedy.. =0; but /UX2de not =0; the admis- sible values of the parameters being either any integer values, or it may be the roots of a determinate algebraic or transcendental

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equation; and the functions X, may be either algebraical or transcendental.; For instance, such a function is cos nx;

wT and m being integers, we have ¥ A cos mx. cos nz dx = 0, but

- .

cos? nx dz=4ne- Assuming the existence of the expansion

of a function fx, in a series of multiple cosines, we thus obtain at once the well-known Fourier series, wherein the coefficient of

wv cos mx is=4$r cos ma. fx dx. The question whether the pro-

0

cess is applicable is elaborately discussed in Riemann's memoir (1854), Ueber die Darstellbarkeit einer Function durch eine trigono- metrische Reihe, No. xii. in the collected works. And again we have the Legendrian functions, which present themselves as the coefficients of the successive powers of a in the development of (1-ax+a?)~3, X)=1, X, =a, X, =} (x?-4), &e.: here m, a ' Bing 1 te go,

being any positive integers be XnXndx=0, bat /- pende= Sat And we have also Laplace's functions, &c.

Functions in General.

17. In what precedes a review has been given, not by any means an exhaustive one, but embracing the most important kinds of known functions; but there are questions to be considered in regard to functions in general.

*A function of « + ¢y has been built up by means of analytical operations performed upon x + ty, (x + ty)? = x? + y? + 1.2ay, &c., and the question next referred to has not arisen. But observe that, knowing w + ty, we know x and y, and therefore any two given functions ¢ (x, y), y (x, y) of x and y: we therefore also know (x, y) +i (x, y), and the question is, whether such a function of x, y (being known when x+y is known) is to be regarded as a function of x+y; and if not, what is the condition to be satisfied in order that ¢ (x, y) +7 (x, y) may be a function of x + dy. Cauchy at one time considered that the general form was to be regarded as a function of x+y, and he introduced the expression '*fonction monogene," monogenous function, to denote the more restricted form which is the proper function of # + dy.*

Consider for a moment the above general form, say w+%y/= > (uw, y)+t wp (x, y), where , y are any real functions of the real variables (x, y) ; or

what is the same thing, assume w'=@ (2, y), y' =w (x, y); if these functions have each or either of them more than one value, we attend only to one value of each of them. We may then as before take x, y to be the coordinates of a point P in a plane Il, and 2', y to be the coordinates of a point P' in a plane rm'. If for any given values of x, y the increments of 9 (2, y), w(x, y) corresponding to the indefinitely small real increments h, k of x, y be Ah + Bk, Ch + Dk, A,B,C,D being functions of x, y, then if the new coordinates of P are x+h, y + k, the new coordinates of P' will be 2'+Ah+ BA, y'+Ch+Dk; or P, P' will respectively describe the indefinitely small straight paths at the

Ch+Dé +, the axes of x, a respect-

Ah+ Bk ively; calling these angles 6, 6', we have therefore tan @= C+D tan 6 N : dias Chek ok, ick b d

AyBtan 6° ow in order that x + ty' may be = p(x + ty), a function of x+y, the condition to be satisfied is that the incre- ment of x 7 shall be proportional to the increment A<7k of x+y, or say that it shall be=(A+7%u)(A+7k), A, w being functions of z, y, but independent of A, k; we must therefore have Ah+ Bh, Ch + Dk = ah = uk, ph + ak respectively, that is A, B,C, D = A, —M, My A Yespectively, and the equation for tan 6' thus becomes +A tan 6

A—pm tan 6 ;

inclinations tan – 1s » tan-1

hence writing 3 = tan a, where a is a func-

: , tan a + tan 6 tion of z, y, but independent of h, &, we have tan &' = {=ton alten

that is &'=a + 6; or for the given points (x,y), (2', y'), the path of P being at any inclination whatever 6 to the axis of «, the pe of P' is at the inclination + constant angle a to the axis of 2' ; also (AR — pk)? + (uh +ak)?=(a?+p?) (A? +h"), .¢., the lengths of

the paths are in a constant ratio. The condition may be written 3(x' + ty)= (A+%p) (8u+ ty) 5 or

' : dae! dy'

what is the same thing (= 74 #) dx , ' . ae ty (A%u) (8u+75y), that is, Fe + 4G.

tan @° =

*dy * * ay } U™ da! ad (ae ; P =14(A+tu); consequently 7 — ie =4 (= ++ ist); thatis, da! dy' a da : wt ' ay ~~ de? i = 7 as the analytical conditions in hess that a + dy may be a function of x+ty: they obviously imply*

d2: , Baal d? rh] ar + ot = 0, = + a 0; and if 2' be a function of 2, y,

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dat satisfying the first of these conditions, then — a dx + = dy is a

dat ie complete differential, and =f (– ae da + 7 ay)

18. We have in what just precedes the ordinary behaviour of a function ¢(z+

a-+iya single finite value, is continuous in the neighbourhood ot |

this point, when the point «+7) ; or what is really the same thing, when the function (7y) has at the point 7+ vy a differential coefficient.

19. It would doubtless be possible to give for the continuity of a function ¢ (z+7y) a less stringent definition not implying the existence of a differential coefficient ; but we have this theory only in regard to the functions ga of a real variable in memoirs by Riemann, Hankel, Dubois Reymond, Schwarz, Gitbert, Klein, and Darboux. The last-mentioned geometer, in his " Mémoire sur les fonctions discontinues," Jour. de ?Hcole Normale, t. iv. (1875) pp. 57-112, gives (after Bonnet) the following definition of a continuous function (observe that we are now dealing with real quantities only):—the function f(x) is continuous for the value "=a when h and ¢ being positive quantities as small as we please, and any positive

quantity at pleasure between 0 and 1, we have for all the values of f(2%)+0h)—f(x) less in absolute magnitude than e¢; and moreover f(z) is continuous through the interval Wy, Wy (2, > %, that is, nearer+oo) when f(x) is continuous for every value of x between x) and a, and, / tending to zero through positive values, f(z) +h) and (xy-) tend to the limits /(x), f () respectively. It is possible, consistently with this definition, to form continuous functions not having in any proper sense a differential coefficient, and having other anomalous propertics ; thus if , ,@3… be an infinite serics of real positive or negative quantities, such that the series Xa, is absolutely con-

vergent (z.¢., the sum %- @,, cach term being made positive, is

convergent), then the function %e,(sin nme) is a continuous func- tion actually calculable for any assumed value of x; but it is shown

in the memoir that, taking « = any commensurable value % whatever, and then writing a +h, h indefinitely small, the

increment of the function is of the form (4+.e) ne, ie finite, ¢ an indefinitely small quantity vanishing with 4; there is thus no term varying with h, nor consequently any differential co-efficient. See also Riemann's Memoir Ucher die Darstellbarkcit, &c. (No. xii. in the collected works) already referred to.

20. It was necessary to allude to the foregoing theory of (as they may be termed) infinitely discontinuous functions; but the ordinary and most important functions of analysis are those which are continuous, except for a finite number (or it may be an infinite number) of points of discontinuity. It is to be observed that a point at which the function becomes infinite is ¢pso facto a point of discontinuity ; a value of the variable for which the function becomes infinite is, as already mentioned, said to be an " infinity" (or a "pole") of the function ; thus, in the case of a rational function expressed as a fraction in its least terms, if the denomina-

tor contains a factor (x—a)", @ a real or imaginary value, m a positive integer, then a is said to be an infinity of the m-th order (andin the particular case m=1, it is said to be a simple infinity). The circular

functions tan x, sec x are instances of a function having an infinite number of simple infinities.

A rational function is a one-valued function, and in regard to a rational function the infinities arc the only points of discontinuity ; but a one-valued function may have points of discontinuity of a character quite distinct from an infinity: for instance, in

theexponential function exp where a is real or imaginary,

U-a the value w(=«+ty)=a, is a point of discontinuity but not an infinity ; taking u=a+pe™, where p is an oh ey small real

positive quantity, the value of the function is exp sew =

exp | (cos a-7 sim a), which is indefinitely large or indefinitely small according as cos a is positive or negative, and in the eeyenaling case cosa=0, and therefore sin a= +1, it is = Cos aa a sin

which is indeterminate, If instead of exp 5 we consider a linear

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, then writing

function A+B depp | = C + Dexp il

U-a as before w=a + pe™, the value is = A - C, or=B- D, accordin, as cos a is negative or positive. As regards the theory of one-value functions in general, the memoir by Weierstrass, " Zur Theoric der eindeutigen analytischen Functionen," Berl. Abh. 1876, pp. 11-60, may be referred to.

21. A one-valued function ex vi termini cannot have a point of discontinuity of the kind next referred to ; if the representative point P, moving in any manner whatever, returns to its original position, the corresponding point P' cannot but return to its original position. But consider a many-valued function, say an n-valued function x' +%y', of z + ty; to each position of P' there correspond positions, in general all of them different, of P". But the point P may be such that (to take the most simple case) two of the

corresponding points P' coincide with each other, say such a position of P is at V, then (using for greater distinctness a different letter W' instead of V') corresponding thereto we have two coincident points (W'), and n-2 other points W'; V is then a branch-point (Verzweigungspunkt). Taking for P any point which is not a branch-point, then in the neighbourhood of this value each of the n functions x +7y/ is a continuous function of x+y, and by what precedes, if P describing an infinitely small closed curve (or oval) return to its original position, then each of the corresponding points P' describing a corresponding indefinitely small oval will return to its original position. But imagine the oval described by P to be gradually enlarged, so that it comes to pass through a branch-point V; the ovals described by two of the corresponding points P' will gradually approach each other, and will come to unite at the poit (W'), each oval then sharpening itself out so that the two form together a figure of eight. And if we imagine the oval described by P to be still further enlarged so as to include within it the point V, then the figure of eight, losing the crossing, will be at first an hour-glass form, or twice-indented oval, and ultimately in form an ordinary oval, but having the character of a twofold oval; i.c., to the oval described by P (and which surrounds the branch-point V) there will correspond this twofold oval, and n-2 onefold ovals, in such wise that to a given position of P on its oval there correspond two points, say P,', P,', on the twofold oval, and n-2 points Py', . . . Px', each on its own onefold oval. And then as P describing its oval returns to its original position, the point P,' describing a portion only of the twotold oval, will pass to the original position of P,', while the point P,' describing the remaining portion of the twofold oval will pass to the original position of P,'; the other points P,',. . P,', describing each of them its own onefold oval, will return each of them to its original position. And it is easy to understand how, when the oval described by P surrounds two or more of the branch-points V, the corresponding curves for P' may be a system of manifold ovals, such that the sum of the manifoldness is always=", and to con- ceive in a general way the behaviour of the corresponding points P and P.

Writing for a moment # + ty=u, 2 +7%'=, the branch-points are the points of contact of parallel tangents to the curve p(w, v)= 0, a line through a cusp (but not a linc through a node), being reckoned as a tangent ; that is, if this be a curve of the order 7 and class m, with 8 nodes and « cusps, the number

of branch- points is=m-+x«, that is, it is = n?—-n—28-2x, or if p,= 4 (n—1)(n—2)-8-K, be the deficiency, then the number is = 2n~- 2+ 2p. ; .

To illustrate the theory of the n-valued algebraical function a' + iy' of the complex variable x+ty, Riemann introduces the notion of a surface composed of coincident planes or sheets, such that the transition from one sheet to another is made at the branch- points, and that the m sheets form together a multiply-connected surface, which can be by cross-cuts (Querschnitte), converted into a simply-connected surface ; the n-valued function x' +ty' becomes thus a one-valued function of x+y, considered as belonging to a point on some deterininate sheet of the surface : and upon such considerations he founds the whole theory of the functions which arise from the integration of the,differential expressions depending on the n-valued algebraical function (that is, any irrational algebraical function whatever) of the independent variable, establishing as part of the investigation the theory of the multiple @-functions. But it would be difficult to give a further account of these investi- gations, '

The Calculus of Functions.

922. The so-called Calculus of Functions, as considered chiefly by Herschel and Babbage and De Morgan, is not so much a theory of functions as a theory of the solution of functional equations ; or, as perhaps should rather be said, the solution of functional equations by means of known functions, or symbols,—the epithet known being here used in reference to the actual state of analysis. Thus for a functional equation ga + ¢y=¢(xy), taking the logarithm as a known function the solution is ¢v=c log x; or if the logarithm is not taken to be a known function, then a solution may be obtained

, E : dit ae. by means of the sign of integration gr=c / >; but the esta-

blishment of the properties of the function logaritlun (assumed to be previously unknown) would not be considered as coming within the theory. A class of equations specially considered is where ax, Bx, .. . being given functions of x, the unknown function is to be determined by means of a

given relation between x, ox, pax, pBz, . .; in particular the given relation may be between 2, ox, pax; this can be at once redueed to equations of finite differences ; for writing z= u,, ax=u,1,, We have ae au, giving u,, and therefore also x, each of them as a function of x ; and then writing pz=v,, pax will be the same funetion of n+1, =V,,,, and the given relation is again an equation of finite differences in v,,,, ¥,, and n; we have thus v,, = 9%, as a function of n, that is, of x. As regards the equation w,,, = aw, eonsidered in itself apart from what precedes, observe that this is satisfied by writing u,=a”(x), or the question of solving this equation of finite differences is in fact identieal with that of finding

the n-th function a” (x), where a(z) is a given function of x. It of course depends on the form of a(x) whether this question admits of solution in any proper sense ; thus, for a function such as log x,

the n-th logarithm is expressible in its original function log”z, (=log log… x), and uot in any other form. But there are a + be

forms, for instance ax= , where the n-th function a”# is a

: z A+Be , ; function of the like form a”z” = as , in which the actual value

can be expressed as a funetion of ”; ifa be such a form, then gap-!, whatever » may be, is a like form, for we obviously have (pap -!)” = pa”p-1. The determination of the n-th function is in facet a leading question in the ealeulus of functions.

It is to be observed that considering the case of two variables, if for instance a(x, y) denote a given function of xz, y, the notation a(z, y) is altogether meaningless; in order to generalize the question we require an extended notation wherein a single func- tional symbol is used to denote two funetions of the two variables, thus ¢(x, y)=a(z, y), B(x, y), a and B given funetions ; writing from shortness 2,=a(x, y), y;=A(x, y), then ?(x, y) will denote (2%, y,), that is, two funetions a(2,, y,), B(x,4,), say these are Ly Yo; P(x, y) Will denote (x, y2), and soon, so that o”(x, y) will havea determinate meaning. And the like is obviously the ease in regard to any number of variables, the single functional symbol denoting in each case a set of functions eqnal in number to the variables. (A. CA.)*

FUNDS, FUNDING SYSTEM. See Nationa Dest.

FUNEN. See DenMaRK.

FUNERAL RITES, ceremonies attending the burial, burning, or disposal otherwise of the dead.

The prevalent modes of disposal are very various. The rudest is that of certain nomadic tribes, who, from the exi- gency of their wandering life, simply expose their dead, un- less the custom of some tribesin modern Guinea be still ruder, who, like the ancient Ichthyophagi, throw their dead into the sea, and think they have thus got rid of corpse and ghost to- gether. In exposing the dead, various rules prevail: some leave them where they die and move their own camp on to other hunting grounds; others, like the Wanyamwesi, carry them a little distance into the forest and leave them to be devoured by beasts of prey; while otliers still, like the Kamtchadales, refine upon this practice, and keep. special dogs for the purpose of consuming the dead, reconciling themselves to this custom by the doctrine that they who are eaten by dogs here will drive fine dogs in the other world. Probably the straits of war explain the practice of the Latookas of Zanzibar, who bury their dead, but make it a rule to leave those slain in battle to be devoured by wild beasts where they lie. The custom of exposure has survived among cultured nations in the case of the Parsees, who bring their dead to certain round towers, called towers of silence, to be eaten by vultures which make these towers their dwelling-places. There is evidence that a more startling mode of disposal still is sometimes practised. Certain tribes of the ancient Scythians are said to have eaten their dead, and Burton says that at Dahomey the body of a person killed by lightning is not buricd like others, but is hacked

| in pieces and eaten by the priests.

Skertchley says they do not actually eat it, but only make believe to do so; but the make-believe is probably a survival of what was onc the reality.

Next to exposure, burial is the simplest method of dis- posal, and it is the most widespread, being common alike to the lowest aud the highest forms of culture. Burial likewise lias its varying customs, from laying the body in natural holes or caves to erecting over it majestic tem- ples. A common practice is simply to lay the body out on the ground and pile stones, or, as among the Moors, prickly thorns, over it, to keep off beasts. The use of the coffin is no sure test of culture, for wlule some of the rudcst peoples lay the dead in a hollowed trunk or a boat, the Mahometan nations use nothing of the kind. Nor is the possession of fixed burying places a better index to the stage of develop- ment, for while many primitive tribes have stated burial places, the more advanced Mexicans had none. Some American tribes bury their children in a separate graveyard from adults, and others bury them by the wayside that their souls may enter into persons passing by.

Refinements upou ordinary burial are the practices of first burning the dead, or embalming them, or drying them on trees or artificial scaffolds, before burying them. That plain burial is the earlier custom, and that these other more elaborate and costly fashions are later en- graftments upon it, seems to be proved by the fact that nlany nations adupt more than one custom, and that, while they only bury their women, they first burn or dry their men. The ancient Colchians suspended the corpses of men in trees, but their women they buried. The Gonds and Bhils of India, who have adopted under Hindu influ- ences the practice of burning, still bury their women, while the Todas burn all now, except children the victims of in- fanticide, whom they bury. The Muddikers, who bury, burn lepers, probably from sanitary reasons ; and certain tribes who burn bury the lightning-struck on the spot where they fall. The Kalmucks follow all modes: their usual custom is exposure; but they also burn, or bury, or throw the corpse into the water, or under a heap of stones, or build a hut over it, according to what the priest declares to be most suitable to the condition of the deceased.

Another point of intercst in burying is the position of the body in the grave. Some bury their dead lying, others sitting, and there is a remarkable consensus of custom for the practice of laying the body east and west, sometimes with the head to the east and sometimes tothe west. This custom is evidently due originally to solar symbolism, and the head is turned to the east or to the west, according as the dead are thought of in counexion with

the sunrise, the reputed home of dcity, or witli the sunset, the reputed region of the dead. This practice, however, though nearly universal, is not absolutely so, for some tribes lay their dead

| north and south; and others, like the Bongos, bury men with

the face to the north and women with the face to the south ; while if one of the Wanyamwesi in Africa happens to dic abroad, he is buricd facing his native village.

The necessary act of disposing of tle corpse has always been accompanied by ceremonies expressive (1) of affection for the deceased or grief for his loss ; (2) of present interest in and solicitude for his welfare ; (3) of a certain mysteri- ous fear of him in his present state; and (4) of affectionate remembrance of him. These ceremonies vary mucli under different changes of culture, yet have all the same central elements.

Among primitive nations the most common ceremonial expressions of grief are simple exaggerations of the natural expressions of the emotions,—a carelessness as to usual com- forts, and a positive distracting agony. Fasting, neglecting the hair, wearing rags or sackcloth, sitting in ashes, daubing

oneself with mud or pigment, are almost universal examples of the one; while wringing the hands, tearing the hair, shaving the head, beating the breast, are common examples of the other. 'The New Zealanders daub themselves with red pigment and gash their bodies with broken shells. The Hawaians gash themselves, knock out front teeth, cut off a finger joint or an ear, and on the death of a king the nation feigns universal madness, and murders, robs, and commits all manner of crimes, as a ceremonial expression of a sorrow which has driven them frantic. Singing laments, playing plaintive music, dancing funeral dances, are not unusual expressions of grief, though it is probable that the music continuously kept up at the wakes of the Celts and other nations was meant to ward off evil spirits. The most interesting funeral rites, however, are those which express men's ideas of the present state, and their solicitude for the present welfare,

of the deceased. There is no nation which does not believe that the soul continues to exist after its separation from the body, in another world like the present, but invisible. Many of the funeral rites of the nations are determined by the belief that death is a journey of the soul from this world to that other, and are meant to provide necessary entertainment for the dead on the way, or even after arrival. Meat, drink, weapons, light, musical instruments, horses, money, servants. wives, are among the most usual things buried with the body. The Gonds even leave toothpicks with it. The Aztecs laid a waterbottle beside the dead to be used on the way to Mictlan, the land of the dead. The North American Indian buries with the dead a kettle and provisions, bow and arrows, a pair of moccasins, with a spare piece of deerskin to patch them if they wear out, and sinews of deer to sew the patches on with. The Laplanders lay beside the corpse flint, steel, and tinder to supply light for the dark journey. The Chippewas light fires on the grave for four nights after the funeral, for guidance on the journey, which they think lasts four days. The Karens give the deceased at the grave explicit instructions as to the relations of things in space being reversed in the next world. Taking a stick, they throw it to the north and say that is the south, and taking another, they throw it to the south and say that is the north. The Mexicans gave several slips of paper to the deceased, to serve as passports, taking him in succession past a precipice, a serpent, and a crocodile. The obolus which the Greeks put in the dead man's mouth to pay Charon, and the coin the Irish place in his hand, are well known. It is a fine touch of the Greenlanders to bury with a child a dog to guide him, for they say a dog will find his way anywhere. The North American Indian buries his " medicine" with him to take him to the happy hunting- grounds. The Norse warrior had his horse and armour

laid in the grave with him that he might ride to Valhalla |

in full panoply.

Graver sacrifices, of animals, wives, and slaves, for the permanent use of the deceased in the next world, have pre- vailed at one period or another among most nations of Asia, Africa, and America. They are conspicuously absent from the Semitic peoples, though even among them a trace is found in the Arab custom of leaving the dead man's camel to die on his grave. Of

human funeral sacrifices, Hindu suttee is the best known instance. The Fijians strangle wives, slaves, and friends to attend the deceased. The Dyaks of Borneo make head-hunting a main business of this life, under the impression that every person whose head they secure will serve them in the next. A kind of suttee by symbol still survives in certain nations when the sacrifice itself is abolished. The Chinese make paper images of sedan bearers and the like, and fly them in the wind over the grave, thus despatching them after the dead man to serve him ; and the Japanese, with whom at one time 1b was

the custom for 20 or 30 slaves to kill themselves by " hari- kari" with the dead, substitute images in modern times; and the Quakeolths of North America rested the widow's head on the burning corpse, and then dragged her out half dead. Treasure buried with the dead was meant also for their use. In Madagascar as much as 11,000 dollars were laid in the tomb of a prince. The principle that lies at the root of those sacrifices is the prevalent belief in object souls as well as animal souls. The soul of the warrior rode upon the soul of his horse, and wielded the soul of bis weapon.

Many of the primitive funeral rites seem dictated by a certainawe or fear of the ghost, anda wish to get it well away. Lane mentions a practice among modern Egyptians of turn- ing the corpse round and round so as to make it giddy, that it might not know where it was going. For the same end, apparently, the Santals carry the body three times round the pile. The Karens walk round the bier in opposite directions three times, each time exchanging candles they have in their hands, and then bid the ghost depart in peace, and to make more sure of his departure, destroy the village where the death occurred. From a similar desire to cou- fuse the ghost, the Greenlanders take the body out by a window instead of the door, and the Siamese break out a new opening in the wall to take it through, and then carry it three times round the garden. The Siberians fling a red- hot stone after the corpse, and the Brandenburg peasants pour out a pail of water after it, to prevent it returning. The Pomeranians leave some straw behind in the graveyard that the soul may rest contented there ; while the Bongos on leaving the burial place shoot arrows at a votive stake they erect on the

grave, and leave the arrows sticking in the wood, The Australians take off the nails of the corpse and tie its hands, lest it scrape its way out again.

The affectionate commemoration of the deceased takes many forms, from simply mourning for a definite period up to periodical funeral feasts, the erection of memorial images, the preservation of the relics as instruments of super- human power, and the worship of the Manes. The natives of Dahomey keep up intercourse with the departed by killing a slave from time to time, whose soul is supposed to go to the dead with the news of the living. The Guinea negroes used to keep the bones of their friends in chests and go occasionally and hold conversation with them. The Mandan women in North America take food year by year to their dead kinsfolk, whose skulls have been preserved in circles of 100 on the prairie. Funeral feasts prevail exten- sively in America, Africa, and Asia, and arise partly, like our own anniversary dinners, from a simple desire to do honour to the dead, but partly also from the belief that the dead participate in the good cheer. They are not merely commemorative but communion meals. Funeral games were probably, like the elaborate dressing of the dead in Brazil and other places in the robes of their patron saints or deities, merely designed to show respect.

To come now to the more cultured peoples, the Greeks either buried or burnt their dead. The body was anointed, crowned with flowers, dressed handsomely and usually in white, laid out ina bed of state with an obolus in its mouth for Charou and a honeycake for Cerberus. These offices were performed by the female relations. The kinsfolk gathered round the bed, and lamented and tore their clothes and hair. On the third day after death the body was carried out by the friends in a coffin, usually of earthen ware, before sunrise,—men walking before it, women, at- tended by the hired mourners, behind,—and was buried out- side the town. A monument with inscription was raised over the grave. All who took part in the funeral needed to be purified before they could again enter the temple of the gods. Funeral sacrifices were offered on the third, ninth, and thirtieth days after. On the last of these days stated

mourning ended, and the relatives might appear in public again. It was customary afterwards to visit the tomb and leave garlands, and burn meals as offerings to the dead.

The Roman ceremonies were analogous. Burial was the earlier custom. Burning was not general till the republic, but was universal under the empire ; the preparation of the body for burial or cremation was performed by a hired body called pollinctores. The corpse was dressed in its best,—if a magistrate, in official robes; and if he had while alive been crowned, then wearing the crown. In early times the burial took place at night, but in later times this was the practice only of the poor who could not afford a funeral display. On the eighth day the body was carried to the grave in a stone coffin on a wooden, or in some cases a golden, bier, amid music and lamentation, and sometimes mimic repre- sentations of the life and merits of the deceased by profes- sional players. The sons of the deceased went veiled, and the women beat their breasts. When the body was burned, oil, perfumes, ornaments, and everything supposed to be agree- able to the deceased were thrown into the fire. On returning from the funeral friends were purified by sprinkling them- selves with water or stepping over a fire. Mourning lasted nine days, and on the ninth a funeral sacrificial feast was celebrated, sometimes with games and gladiatorial combats.

The funeral rites of ancient Egypt were too elaborate to be described here. Their chief peculiarities were the em- balming of the body and the judgment of the dead before burial. It is an error to suppose the embalming took place in order to preserve the body for a future state, for there is no evidence that the Egyptians believed in the resurrec- tion of the body, and embalming could not have reference to that belief if they did, for the whole body was not pre- served, but some of the most important internal parts were taken out first; besides, they embalmed not only men, but the lower animals also. The mummy was often kept in the house a whole year before being buried, and during that interval feasts were held in honour of the dead, and the tomb was being prepared. Then the case was taken out, set on a hearse, taken by a sledge to the sacred lake of the nome, across which it was carried in a boat by a boatman called Charon, and then deposited in the tomb on the other side. Before being allowed to cross, however, the judgment of the dead took place before forty-two judges summoned for the

purpose ; any one was allowed to bring forward any accusation against the deceased, and if he had led an evil life burial was refused. If there was no accusation, then the relatives ceased lamenting and pronounced encomiums, enlarging not on his descent, as among the Greeks, but on his personal merits. The denial of burial was not per- petual, however, its duration being measured by the extent of the crimes of the deceased. A gold or silver plate was put into the mouth of the mummy, not asa fee to the ferry- man, but as a passport or certificate of good character.

The Russians have a similar custom of putting a passport (in their case a paper one) into the hand of the deceased as a testimonial of his virtue, to be shown to Peter at the gate of heaven. More curious still are the custom of the Badages of the Nilgherry Hills, who let loose a scape calf at the grave to take away the dead man's sins, and the practice men- tioned by Brand as prevailing in Wales at one time, of em- ploying sin-eaters, men who receive a loaf over the corpse, and eating it take upon them all the sins of the deceased.

The Mahometans bury their dead usually on the day of death. The prophet forbade wailing, but this prohibition 1s generally neglected. Even hired wailing women are employed by some, who wail during all the time the corpse is in the house and on the way to the grave; parts of the Koran are recited by religious officials in the house. In the funeral procession the male relatives go in front of the bier, and are preceded by four or six poor old men, mostly blind,

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who chant the profession of faith, and followed by four or six schoolboys who chant passages from a poem descriptive of the last judgment; while the female relatives come behind the bier, accompanied by the wailing women with their tambourines, and cry and shriek, and celebrate the praises of the deceased. If the dead man was rich, then several camels follow bearing bread and water to give the poor at the tomb, and last of all comes a buffalo to be slaughtered there for the same purpose. The bier is then brought to the mosque, laid in the usual place of prayer, with the right side towards

Mecca; and the imam standing at its left side, with the people behind him, recites the funeral service, after which he calls upon those present to give their testimony respecting the dead, and they reply, "' He was of the virtuous." The body is then laid in the tomb, and is there instructed in the answers to be given to ques- tions, such as Who is God, and who is his apostle? which the angels are expected to put.

Christian rites are marked by high reverence for the body, due to the belief in its future resurrection. Under Christian influence cremation gradually disappeared from Europe, northern and southern alike, and burial became universal, as being more expressive of the truth held so precious. Christians bury in separate places of their own, which, ex- cept among Presbyterians and otlier sections of Protestants, have been usually consecrated for the purpose by a special ceremony. Interment in churches of favourite martyrs and apostles was at one time much sought after, and had to be repeatedly forbidden by ecclesiastical councils. Bishops and distinguished churchmen or laymen were some- times allowed to be buried in the church, only not near the altar. Among the early Christians the washing and anoint- ing ot the body for the burial were not done by hired persons, but were counted a work of love, done by friend for friend, and by the charitable for the poor and the stranger. The body was swathed in white, decked some- times with the insignia of office or personal ornaments, placed in a coffin and laid out in the church or in the chamber of death for friends to come and take a last look atit. Three or four days usually elapsed between the death and burial, and vigils were held with prayers and hymn- singing. Hired mourners were forbidden. The funeral took place by day, for, Christian death being a victory, it was meant to give the procession the aspect of a triumph ; for which reason those who took part in it carried branches, not of cypress, as among the Romans, but of palm and olive. Evergreen leaves were strewn on the coffin, but the practice of crowning the head with wreaths was forbidden, as savouring of idolatry. Lamps and torches, however, were sometimes carried. The body was borne on a bier, and covered with a pall costly in proportion to the rank of the deceased. It was laid in the grave with face upward and feet to the east, in token of the resurrection at the coming again of the Sun of Righteousness. A service took place at the grave, and, as a rule, does so still among most Christians. In Scotland this was abolished at the Reforma- tion, as being liable to be mingled with

superstitious ideas, and a service and exhortation in the church were recom- mended instead, but this is seldom practised. Christian burial in consecrated ground, and with a religious service, was denied by canon law to all who were not Christians, to excommunicated persons, suicides, criminals, usurers, schis- matics, heretics, and, among Roman Catholics, even un- baptized children of Christian parents. The eucharist was celebrated at the grave as early as the 4th century; and for some centuries, in spite of repeated prohibition by ecclesiastical councils, the practice prevailed in West Africa, Gaul, and the East, of placing the consecrated bread itself, steeped in wine, in the lips of the dead. An- other practice, which has indeed the sanction of Basil,

was not uncommon, that of burying the eucharistic bread with the dead. Special prayers were offered for the soul of the departed, and the priests, and afterwards other friends, gave the corpse the last kiss of peace. See CREMATION. For descriptions of the funeral rites of different nations the reader may be referred to general works on ethnography, such as Dr Robert Brown's Races of Mankind ; Herbert Spencer's Deseriptive Sociology ; Prichard's Researches into the Physieal History of Man; Fr. Miiller's Allgemeine Ethnographie ; Waitz's Anthropologie der Natur-Volker; Klemin's Allgemeine Oulturgeschichte der Mensehhett , and more particularly to Porcacchi, Funerali antiehi di diversi populi e nationi, Ven. 1754; Muret, Cérémonies funébres de toutes nations, Paris, 1677 (English translation by Lorrain, 1683); Fey- deau, Hist. générale des usages funébres et des sépultwures des peuples aneiens, Paris, 1858, 3 vols.; De Gubernatis, Storia popolare degli usi funebri Indo-Europei, 1873; Tegg, The Last Aet, London, 1876; and Sonntag, Die Todtenbestattung, Halle, 1878. For the funeral customs of the Bengal tribes reference may be made to Dal- ton's Ethnology of Bengal; for those of the American races, to Bancroft's Native Races of the Pacifie States of America; aud for interpretations of funeral rites, to Tylor's Primitive Culture, vol. ii., and Spencer's Principles of Sociology. Spencer not only treats of the origin and meaning of funeral rites, but strives to deduce all religious ideas and institutions out of those rites as their original source. For classical rites see Guichard, Funérailles . . . des Romains, Grecs, &c., Lyons, 1581; Meursius,

De funere Grecorwm et Romanorum, Hague, 1604; Gutherius, De Jure Maniwm, Paris, 1618; Kirchmann, De funeribus Romanorum, Hamburg, 1605 ; Stackelberg, Die Graber der Hellenen, Berlin, 1837; and Becker's Charicles and Gallus; and for early Christian rites, Gretscr, De Funere Christiano, Ingoldst., 1611; Durand, Rationale Divinorum Oficiwm, composed in the 13th century, and first published at Mainz, 1459 ; Bingham's Antiquities of the Christian Chureh, book xxiii. ; and Augusti's Christliche Archwologie, Bd. ix. For English cere- monies see Agard, Dethick, Holland, &c., 'On antiquity of ceremonies used at funerals," in Hearne's Collection ; Brand's Popu- lar Antiquities; Strutt's Manners and Customs. Weiuhold has treated of early German customs in Die heidnische Todtenbestat- tung in Deutschland, Vienna, 1859. (J. R.)

FUNFHAUS, Finrxavset, formerly HANGENDENLIS- SEN, a flourishing and populous suburb to the south-west of Vienna, forming, along with Sechshaus proper and Rudolfsheim, the commissariat of Sechshaus, and trending ina westerly direction towards Schénbrunn. The principal manufactures are silk, satin, velvet, and cotton fabrics. Hangendenlissen was a village belonging to the Barnabite college of St Michael at Vienna. The population, which in 1869 numbered 27,065, had increased in 1872 to

36,388.

FUNFKIRCHEN, Hung. Pécs, a royal free city of Hun- gary, capital of the varmegye or county of Baranya, is situ- ated on the declivity of Mount Mecsek, and on the railway to Mohacs, 105 miles 8.8. W. of Buda, 46° 6'N. lat., 18° 13° E. long. It is one of the oldest and finest towns in Hungary, and is the seat of a bishop and of the county administration. It consists principally of a public square, and a main street extending about five miles in length. Amongst the note- worthy buildings are the cathedral, said to have been founded by St Stephen of Hungary in 1009, and reputed to be the oldest church in the kingdom, the bishop's palace, the county and town halls, several churches and monasteries, a public hospital, the theatre, an ecclesiastical seminary, a high-class gymnasium, and other educational establish- ments. Fiinfkirchen has manufactories of woollen-cloth, flannels, rosoglio, oil, leather, and paper, and also carries on a considerable trade in tobacco, gall-nuts, and wine. The population in 1870 amounted to 23,863,

chiefly Catholics ; by nationality the greater number are Magyars, the remainder Germans and Croatians. In former times Fiinf- kirchen was of much greater relative importance than at present. According to tradition it existed in the time of the Romans. In the Frankish-German period it was known under the name of Quinque Ecclesiz ; its bishopric was founded in 1009; in 1543 it was taken by the Turks, who retained possession of it till 1686. On the 18th June 1849 it was occupied by the Austrians under General Nugent.

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FUNGUS (Gr. puns, whence are derived mycetes, employed as a termination to the names of certain orders of fungi, and also the term mycetology, or more commonly mycology, the science of fungi) is the name applied to a distinct class of cellular cryptogams or Thallophyta. Though as plants the class is well marked by the invariable absence of chlorophyll, and consequently of the physio- logical phenomena attending its presence and action, it is not so at some points, where a dubious border exists between it and the lower members of the animal kingdom.

The vegetative body or thallus of fungi consists of fili- form, cellular elements called hyphe. In one group, the Phycomycetes, the hypha usually consists of a single densely branching cell; but in most cases it is composed of a series of cells placed end on end. These hyphe ramify laterally much more frequently than dichotomously, and the usual mode of growth is by an apical cell which divides transversely ; but in the bodies of the larger fungi inter- calary growth also occurs (as in Rhizomorpha subterranea). A single hypha forms the complete thallus of the simpler fungi called Hyphomycetes, Haplomycetes, &c., but the bodies of the larger (compound) fungi are composed of a colony of hyphz, usually densely interwoven, more rarely running in parallel lines, but always more or less firmly adhering together. In many fungi (as in the stalk of the Phalloidee, the pileus of ussula,and Lactarius, in Sclerotia, and in the peridia of the Lycoperdacee) the fully developed tissue consists of polyhedral cells, closely packed, and bear- ing resemblance to parenchyma. ‘This texture, however, consists of ordinary hyphe, which, through pressure from adjacent parts, have been forced to assume this form. It bears the name of pseudo-parenchyma.

The Myxomycetes are the only large group of organisms usually classed with fungi which cannot be described as consisting of hyphe. These differ inso many ways and so widely from any fungal or indeed vegetable structures that a separate consideration of their position is necessary (see Order V.). Other exceptions of a minor nature have been made of such organisms as Hormiscium, Cryptococcus, &e., but it is now the general belief that these are merely repro- ductive bodies of more perfect fungi. The cells of fungal hyphee are of many shapes, but the usual one is long and cylindrical, and the other shapes are more or less modifica- tions‘of this. The structure and growth of the fungal cell agree in general with those of the vegetable cell as it occurs elsewhere. At the same time no group in the vegetable kingdom exhibits so many minor divergent histological characters—a condition which serves to mark its boundaries as a class of vegetables with great distinctness.

The Cell-Membrane.—In the numerous fungi which de- velop rapidly and have a short existence in the adult state, the cell-wall is thin, tender, and structureless ; but when a plant of this kind is accidentally checked in its expansion, the result is the production of thick, homo- geneous, unstratified membranes. On the other hand, the cell-wall of the more persistent species early acquires con- siderable thickness, which, in the adult state, often so increases that the cell has the appearance of a solid cylinder. These thick membranes vary from a woody to a gelatinous consistency, and are composed sometimes of more than one layer. In the Polypore, Thelephora, Bovista, Geaster, Tulostoma, &e., the cell-walls often exhibit (either after simple immersion in water or on the application of chemical reagents) at least two layers, the outer firmer and often coloured, the inner softer and clearer. The cohesion of the filaments in these larger plants is brought about by their being densely interwoven, and also by the firm union and

to a certain extent the amalgamation of the outer layers of

the membranes. Spiral and ring-shaped thickenings are to be found in the capillitium cells of Batarrea and Podaxon

carcinomatis, and pits are of constant occurrence in corre- sponding cells of the Lycoperdacee, and in the filaments which bear the fructification of Dactylium.

Chemical analyses of the cell-membrane show that it possesses the elementary constituents of cellulose ; but since the uncoloured and unthickened membrane does not com- monly exhibit the characteristic reaction of cellulose to- wards iodine (neither simply nor after treatment with potash or Schultz's mixture), nor towards many of the reagents commonly employed in testing typical cellulose, it is neces- sary to apply to it the special term fungal cellulose. In several special cases, however, typical cellulose is known to exist. The membranes of old cells frequently undergo a kind of lignification, and in this condition offer extra- ordinary resistance to such treatment as that with concen- trated sulphuric acid,

The Cell-Contents.—The protoplasm of fungal cells has no special quality of importance to distinguish it from that of other vegetable cells. Professor Sachs states (Bot. Ztg., 1855) that under his observation the apices of growing hyphz seemed to consist of one mass, in which the mem- brane could not be distinguished from the protoplasm ; but Professor De Bary (Morp. u. Physiol. der Pilze, &c.), on the other hand, finds that the same conditions as exist in similar situations in other plants obtain here, viz., a dense mass of protoplasm enclosed by a tender membrane—an experience endorsed by most mycologists. The existence of a nucleus was long denied, and indeed its presence in the cells of the thallus has not yet been proved; but in the reproductive organs, where it had long been overlooked, its occurrence is not uncommon. Attempts to prove its existence in the cells of the thallus have not been wanting, but as yet with apparently no success: Schacht's observations on this head are notably untrustworthy, since there is no doubt that he confounded the true nucleus in other fungal cells with drops of oil and such bodies. The formation of vacuoles takes place as in other vegetable cells. Oleaginous matter is present, often abundantly, in nearly all fungi, in the form of drops of various sizes. Water (cell-sap) is necessarily present, though the quantity varies considerably without serious injury to the plant. A good proof of this variation is to be found in the expansion or contraction of the fila- ments of many Myphomycetes according to the supply of water. In fungi with firmer cell-membranes, air-

bubbles take the place of the water which has evaporated, and the contraction of the hyphe is very inconsiderable.

The fungal cell is wholly destitute of chlorophyll, and, it may be safely stated, of starch also, Schlossberger and Dépping record their detection of starch granules in the extracted sap of Cantharellus cibarius; but from their method of investigation it is highly probable that these were accidentally present.

The pigments of various colours to be found in many fungi are perhaps in most cases properties of the cell- membrane. Another class of them is peculiar to the cell- contents, and a third seems to pervade both membrane and contents, Those peculiar to the contents are mostly of an oleaginous or resinous nature, and their occurrence is in the form either of minute particles distributed throughout the protoplasm, or of larger drops or granules scattered irregu- larly among the contents. From the pigments peculiar to the fungal cell there are to be distinguished those absorbed in an unaltered state from the substratum. An instance of this is to be found in Peztza eruginosa, which owes its colour to the abnormally greenish wood on which it grows. It was long thought that the Peziza was the cause of the green colour, but a sufficient proof is contained in the facts that the wood is more frequently found green without any trace of thie fungus than with it, and that the upper part of the fungus is sometimes uncoloured when

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the lower portion has become green. Moulds, and other fungi usually colourless, are occasionally stained with the colour of an unusual substratum. The subject of the pigments of fungi is one of which our knowledge is very incomplete.

Crystals of calcium oxalate are to be met with on the surfaces and in the intercellular spaces of many of the larger fungi; but in only two cases have they been found in the interior of the cell (Phallus caninus and Russula adusta). Cell-division takes place in the same way as in other plants.

The mycelium is the part of the thallus devoted to the functions of absorbing and storing nutriment. It consists of hyphz developed directly from the

germinating fila- ments, but often on further growth intricately bound up (fre- quently anastomosing) with each other, usually in amorphous masses, but sometimes in more or less definite bodies. In the larger fungi a number of hyphe (in which case they run parallel to each other) are sometimes associated into bundles, like rootlets. The mycelium not unfrequently persists for several years. Mycelia in general bear so strong a resem: blance to each other that it is usually impossible to determine the species to which they belong on their own characters.

A number of parasitic fungi possess peculiar organs called haustoria, which perform the function of extracting nourish- ment, and when necessary retaining the plant in its posi- tion. These are lateral branches of the mycelial hyphz of various shapes and sizes. In Zrysiphe, the mycelium of which creeps over the surface of its host plant, the haustoria are emitted abundantly from the side of the hyphe next the epidermis, into which they penetrate and cause decay. They are in this case small andirregularin shape. On the Peronosporee, the mycelium of which inhabits usually the intercellular spaces of living plants, haustoria are frequently present. In some cases, as in Cystopus candidus, they have the form of minute stalked globules, but in most other Peronosporee they are irregular filamental protuberances, frequently branching to such an extent as almost to fill the affected cell.

Sclerotia are tuberous bodies composed of densely inter- woven mycelial hyphz enclosed by a layer of pseudo-paren- chyma. They are specific in occurrence, like the bulbs and tubers of phanerogams, and are situated on or beneath the surface of the substrata—the ground or parts of plants. They were long regarded as independent forms of fungi, but it has been discovered that they are only resting states in which nourishment is stored up. They vary much in size.

The [veceptacle—On the mycelium there arises a body called the receptacle, the function of which is to bear the reproductive bodies, the spores. It varies much in size in different fungi; in most cases it forms the greater part of the whole thallus, and in others it consists of a simple or branched hypha. The same species of fungus may possess more than one kind of receptacle, either in different genera- tions, or arising subsequently

from the same mycelium. According to their structure receptacles may be divided into two groups, viz., those which consist of one hypha, and those which, composed of aggregated hyphae, form a com- pound body. In certain cases the receptacle is entirely sup- pressed (as in the interstitial oogonia of the Peronosporec). When the receptacle consists of a simple or branched hypha, the spores are borne terminally. The sporophorous hyphz are branches of the mycelium, rising usually vertically from it, and themselves frequently so characteristically branched as to afford means of generic and specific distinction. After bearing the first spore, the sporophore may again grow for a short space before bearing another. In compound recep- tacles the fructiferous hyphe form together expansions

called Aymenia, from which the individual fertile branches arise. If the hymenium is formed upon the exterior surface of the receptacle it is termed gymnocarpous, and if within the receptacle angiocarpous. The hymenium never pro- duces any but asexual spores.

Reproduction.—The reproduction of fungi is effected by both sexual and asexual means—the latter being far the more frequent of the two, No one species is known to possess more than one form of sexual reproduction, though it is frequently the case that more than one kind of asexual reproduction belongs to it. In many fungi no sexual re- production is known to exist, but it is generally believed that in such cases the plants are merely members of a cycle of generations, the other stages in their life-history being unknown or unrecognized. ‘fhe term spore is applied to all reproductive bodies, whether asexual or the product of the union of sexual cells. Discussion has frequently been engaged in as to the propriety of employing the same term to denote both kinds of bodies; but though in isolated

cases the use of new terms has been advised, no satisfactory

system of nomenclature has been established. There is, however, no doubt that some distinction ought to be made.

Sexual reproduction is effected by the union of two cells

of different nature, which in themselves are incapable of

further development. In the usual forms these cells are apparently of different nature, but in the phenomenon of conjugation the difference in the sexual elements is not de- terminable, though doubtless existing within the molecular sphere. The product of the union of sexual cells is de- veloped into au organ of reproduction which, at the proper time, fulfils its office by giving rise either to a new mycelium directly or to a receptacle. These organs of reproduction bear names more or less expressive of their nature, such as zygospore, oospore, &c. .

In those fungi of which the life-cycle is known, several different kinds of asexually produced spores have been observed. In only one group, the Phycomycetes, are motile spores (zoospores) knuwn. In all other cases they are produced either at the apex of a basidiwm (basidio- spores) or similar sporophore (conidia, é&c.), by cell-division, or within an ascus by free cell-formation (ascospores). In compound or septate spores, which are multicellular, each separate secondary cell is termed a 'merispore. Gemme are produced by the breaking up (by cell-division) of hyph into series of cells capable of germinating. The germination of spores is dependent chiefly on moisture, but to their farther development specific conditions are necessary, a description of which is beyond the scope of this article. The dissemination of spores is effected chiefly by the agency of the atmosphere and of water, and it is probable that insects or other animals have very little to do with it.

In their mode of life fungi are controlled by the absence of chlorophyll. Without it they cannot assimilate, and are therefore driven to obtain their nourishment by taking up the carbon compounds assimilated by other organisms. Their modes of life are either parasitic or saprophytic. As parasites they inhabit the bodies of living plants and ani- mals, and even of other fungi. In some cases they kill their hosts, and in others encourage growth, as in the case of the Lichenes; and between those two extremes various degrees of parasitism occur. As saprophytes they promote the decomposition of dead organic bodies, and thus aid in the production of carbonic acid, water, and ammonia, the elements of which return to the course of organic life. Jodin states that some fungi absorb as much as 6 per

cent. of their nitrogenous contents in the form of nitrogen gas from the atmosphere. In the decomposition of fungi am- monia is formed from the nitrogenous compounds. As parasites and saprophytes their influence as regulators in the

economy of nature may be compared with that of the lower animals living the same mode of life.

Though the ravages of parasitic fungi are mostly confined to the vegetable kingdom, it is weil known that many animals suffer from their attack. 'The occurrence of para- sitic fungi on insects and fish is common; more rarely do they attack the higher animals or man. It has been strongly contended that the minute fungi play very import- ant parts in many diseases of man, but this has usually been much exaggerated. The occurrence of Bacteria on the mucous surfaces of living bodies and on wounds has given rise to much discussion; and there is no doubt that insufficient knowledge of these organisms has often led to error, the observers not unfrequently mistaking the products of the decomposition of organic bodies, crystalline precipitations, dsc., for Bacteria. It may safely be maintained that these are oftener the concomitants than the causes of disease in man.

'A considerable number of fungi have also been described as

playing active parts in various skin-diseases, but very little trustworthy information about their life-history has ever been gained.

The economic properties ot fungi are of an unimportant character. A great number are poisonous, and many are edible ; a few are used for medicinal purposes. Many ot those described as edible, though they can be eaten without any serious consequence, are certainly not likely to become articles of food. At the same time it may be mentioned that much valuable food is annually lost through ignorance of the excellent esculent qualities of a few common fungi.

The phosphorescence or luminosity observed in several fungi has given rise to many absurd conjectures, This phenomenon depends on the respiration of

oxygen, those fungi which exhibit luminosity ceasing to do so when the oxygen is extracted.

Geographical Distribution.—From the extreme poverty of our knowledge of the geographical distribution of fungi no general estimate can be even outlined. Of the fungi of by far the greater portion of the world we have no account, or at the best the meagre collections of passing explorers. Of even the European mycologic flora our knowledge is far from complete, Russia, Turkey, Spain, Portugal, and even Ireland, being only partially examined. Of countries in which the surveys have been more complete, only England, Scotland, Wales, Germany, France, and large districts of Austria, Italy, and Switzerland can be pointed to. Of the whole American continent the Carolinas alone are tolerably well known, and though collections have been made in Mexico, Texas, the island of Cuba, and a few tracts of South America, the examination of these countries has not been thorongh. China, Japan, Siberia, and Further India are totally unexplored; but, on the other hand, Ceylon and the northern part of India are perhaps as well known as any other extra-European district save Carolina. From the Himalayas and northern India there are the collection and notes of Sir Joseph Hooker. In Africa, Algeria and the Cape have been examined, but from the tropical parts of that continent we have only the collection and notes of Dr Welwitsch, which are, however, of great value so far as the district he explored extends.

Any attempted scheme of geographical distribution would, therefore, be not only incomplete but open to great error, from the very partial accounts from the most of those dis- tricts which have been examined. As in other vegetables, heat and moisture necessarily exert the greatest influence on growth, and therefore on distribution. The character of the trees composing the forests of different countries, and the amount of cultivated land, subordinately affect the nature, if not the numbers, of the fungi inhabiting them. One broad principle, however, seems apparent, viz., that the large

fleshy fungi, like the Agarzcini, affect temperate countries

more than tropical, and that those of a woody texture, like the Polypore, inhabit tropical in preference to temperate countries. In the Arctic regions fungi are represented almost solely by the Lichenes. Of the distribution of micro- scopic fungi nothing of any value is known. Classification. —Fungi are divided into orders and sub- orders as follows :-— I. Phycomycetes. 1. Saprolegniez. 2. Peronosporee. 8. Mucorini. Il. Hypodermic. 1. Uredines. 2. Ustilagineze. Ill. Basidiomycetes. 1. Tremellini. 2. Hymenomycetes. 3. Gasteromycetes.

The above classification is broadly the same as that pro- posed by Professor De Bary. The principal characters of these orders and suborders are described below.

Order J.—PuycomyceTes.—The Phycomycetes possess both sexual and asexual organs of reproduction. The sexually produced reproductive body gives rise to a genera- tion bearing first asexual and then sexual organs, and the asexually produced reproductive body gives rise to a similar generation. The mycelium in this order consists of long densely-ramifying tubes or hyphz, on which the repro- ductive organs are borne.

Suborder I.—Saprolegniee.—In this order the male organs are called antheridia and the female organs oogonia. In the moncecious forms these arise beside each other on the same plant. The oogonia are usually to be found at the end of short branches of the mycelium—very rarely sessile or intercalary. They are globular cells with one enclosing membrane containing dense protoplasm. In some cases (as in Saprolegnia monoica) the cell-wall soon becomes resorbed at various places, and the protoplasm divides into several globular bodies, which float in a watery fluid, the whole enclosed by the wall of the oogonium. In Aphanomyces, Pythium, and several species of Saprolegnia, only one globe is formed in the oogonium. The fluid in which these globes float is part of the watery contents of the globes ex- pelled when the contraction took place. While these altera- tions are proceeding in the oogonia, the antheridia grow out from the same or some adjoining branch of the mycelium. These are thin, crooked hyphe, which frequently entwine the stalks of the oogonia in their growth; the tips of the tubes, however, on reaching the wall of the oogonium ad- here, and the upper part becomes separated from the rest by a septum. This process is

usually contemporary with the contraction or separation into globules of the contents of the oogonia. The antheridia tlen push through the walls one or more tubes, which discharge from the points minute motile spermatozoids (about ~4, millim. in size), and these fertilize the globules. The globules then assume a cellulose membrane and are called oospores.

The oogonia are formed in the dicecious as in the mone- cious species, but the antheridia in a totally different way. They arise within bladder-like protuberances of the mycelium, which are divided by transverse septa into a series of cells, each of which i3 an antheridium. In Sapro- legnia dioica, the antheridium breaks up into numerous spermatozoids; but in Achlya dioica a preliminary division of the antheridium into several portions precedes the forma- tion of the spermatozoids. When free these spermatozoids move actively by means of one long cilium. Fertilization, and the consequent formation of oospores, are effected in a similar way to that described as occurring in the moucecious forms. Doubt has been expressed as to the described moncecious fertilization, but on the whole it may be re- garded as generally true. The oospores of the Saprolegniece

IV. Ascomycetes. 1. Discomycetes. 2. Erysiphce. 3. Tuberacez. 4, Pyrenomycetes. 5. Lichenes.

V. Myxomycetes. VI. Schizomyectes.

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are double-coated. After a long period of rest they emit germ-tubes, but it has been recorded that they sometimes produce zoospores, when the resting state is shorter.

The zoosporangia or asexually-produced organs of repro- duction are terminal cells (very rarely intercalary), some- times irregularly cylindrical, sometimes ovoid, of a constant form in some genera (Saprolegnia, Achlya) but variable in others (Pythium, Monoblepharis).

The reproduction by means of the zoosporangia is much more extensive than that by means of the oospores. Each zoosporangium contains a great

number of zoospores. The mycelium is composed of long ramifying tubes, of consider- able diameter, and nearly always aseptate.

The Saprolegniee grow for the most part in water, chiefly on the dead bodies of insects. One species, Saprolegnia ferax, is notable on account of its extensive ravages on the bodies of fishes (especially salmon) and other water animals,

Suborder II.—Peronosporee.—The Peronosporece are very closely allied to the Saprolegniece—the modes of repro- duction both sexual and asexual being similar to those of the moncecious forms of the latter suborder. The oogonia are terminal as a rule, and the protoplasmic contents contract always into one central globule. Two forms of germination have been observed in the oospores. In Cystopus they burst

Fia. 1.—Cystopus candidus. A. a, conidia; 6, conidiophores; c,conidium emitting zoospores; d, free zoospore. B. og, oogonium; os, oosphere; an, antheridium. C. Formation of zoospores by oospores. z, free zoospores. (After De Bary.) (x 400.)

and produce zoopores, and in Peronospora the usual mode of germination is by the emission of ahypha. As regards the asexually-produced spores the same rule holds. In Cystopus and Phytophthora they are zoosporangia, producing in the former case each the same number of zoospores as the oospores; and in Peronospora they are usually contdia, emitting hyphe on germination. Both zoospores and hyphe produce mycelia directly.

The zoosporangia of C'ystopus are borne in vertical series on short, club-shaped filaments ; the conidia of Peronospora in most cases, and the zoosporangia of Phytophthora, on branching, tree-like sporophores. The mycelium, which is usually septate and ramifies densely, possesses frequently haustoria of various shapes.

The Peronosporee are parasitic on living phanerogams, the tissues of which they penetrate and destroy. The most notable example is the well-known potato-disease, Phyto- phthora infestans, the ravages of which are too well known to need description.

Suborder III.—Mucorini.—Sexual reproduction in this

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suborder is effected by means of the conjugation of two apparently similar sexual cells, which asa result of their union form a zygospore. It will be sufficient to describe one typical case, viz., that of Rizopus nigricans. The con- jugating cells of this fungus are elongated, stout tubes. Where two meet, each pushes against the other a protuber- ance, at first cylindrical and of equal thickness. They re- main closely adhering, and soon grow considerably, chiefly in thickness. At the end of each a separate cell is formed by the growth of a partition, These two cells are usually of unequal size, one as long as it is broad, the other only half as long as its breadth. The membrane which originally separated them is now perforated in the middle, and soon vanishes altogether ; the two conjugating cells thus unite and form the zygospore, which increases rapidly, usually attaining a diameter of over 3 millim. It is, as a rule, drum-shaped, the ends smooth, and the free surface clothed with wart-like protuberances. The contents are coarsely granular protoplasm, in which float drops of oil. On germination the zygospore produces a hypha (as observed in Syzygites), which by repeated dichotomous branching soon forms a new mycelium.

Asexual reproduction is accomplished by sporangia similar in function, and in some degree in structure, to the corre- sponding organs of the two preceding suborders. They are borne terminally on special branches of the mycelial hyphe, which, like the mycelium, are aseptate up to the time of fructification. The spores produced in the sporangia ger- minate by the emission of a filament, which, like that pro- duced by the zygospore, forms by dichotomous branching a new mycelium. This was the only mode of reproduction known in the Mucorini, until the researches of Professor De Bary and others brought to light the sexual form, which, however, has not yet been observed in all the species.

The Mucorini are usually to be found growing on excre- ment and on decaying substances ; none of the species are known to cause any important disease to plants or animals,

Order II.—HyropErmMiz.—-No mode of sexual repro- duction is known to belong to the plants of this order. They are (so far as is known) reproduced wholly by asexual spores arising by cell-division. All the species inhabit the parenchyma of living plants, through the epidermis of which the receptacles burst.

Suborder I.—Uredinew.—The life-history of the Uredinew consists of a cycle of three generations, the transition in each case being effected (so far as is at present known) by asexual spores. The cycle begins in spring with the ger- mination of thick-walled spores, called telewtospores, borne usually in pairs at the end of sterigmata. Germination takes the form of the emission of a hypha, which rapidly (usually in two or three hours) forms a pro-mycelium, bear- ing three or four sporidia. These sporidia become detached, and on finding a suitable host-plant penetrate the epidermis cells by means of a germinating filament, and form a new mycelium within the parenchyma. After a few days this mycelium begins to form receptacles under the epidermis of the host, on which are borne ecidia and spermogonia. The latter appear before the former. They are small, narrow-necked sacs, in which are found minute spore-like bodies, called spermatia by Tulasne, who believed them to be male organs, partly ow comparative grounds and partly because he found them incapable of germinating. No female organs have been found; though it was suggested that the spermatia stood in sexual relations to the xcidia beside which they are constantly found. Professor De Bary, however, found that the spores of ecidia, on a plant on which no trace of spermo- gonia or spermatia could be found, germinated exactly as under other circumstances. The ecidia are at first round or oval but on bursting basin-shaped receptacles of pseudo-parenchyma, at the base of each of which a circular,

flat hymenium is formed. From this hymenium there rise erect basidia bearing in vertical series a number of spores of a round polyhedral form, and filled with protoplasm coloured red or yellow by oil. These spores on being liber-

Fig. 2.—Puccinia graminis, A. Mass of teleutospores (t) on a leaf of couch-grass; e, epidermis ruptured ; 6, sub-epidermal fibres. (After De Bary.) B.

Part of

vertical section through leaf of Berberis vulgaris, with a, scidium fruits, p, peridium, and sp, spermogonia. (After Sachs.) C. Mass of uredospores (ur), with one teleutospore (/); sh, sub-hymenial hyphe. (After De Bary.)

ated produce germ-tubes which penetrate the stomata of the next host-plant (one of the same species as that on which the teleutospores were found), and soon form another mycelium in the intercellular spaces. Again, ina few days, this mycelium forms a new kind of receptacle, the wredo. This receptacle is flat and circular, and is situated immedi- ately under the epidermis. On it basidia bearing round or oval uredospores arise and break through the epidermis. The uredospores constantly reproduce the uredo, which is the cause of the extensive ravages of this form of the disease ; on the same mycelium which produces the uredo, teleutospores are ultimately formed. These hibernate, and when spring arrives again germinate, and start the same cycle of generations. Teleutospores

secidium-spores (accompanied by spermatia)

uredospores, and later on the same mycelium teleutospores ; again.

This cycle of generations is carried out on two different host plants. The uredospores and teleutospores affect the Graminee chiefly, but the ravages of zecidia, though not so severe in their nature, extend over many species of Com- posite, Ranunculacee, Leguminose, and Labiate.

Suborder II.—Ustilaginee.—The life-history of this sub- order, so far as yet known, consists in the formation of asexual spores, either singly, in series, or in masses, on very slender sporophores ; these germinate, and form a promy- celium bearing sporidia (as in the case of the teleutospores of the Uredinee), which in turn germinate and form a mycelium bearing the same kind of spores as those with which we started. This life-history, it will be seen, is, so far as it goes, similar to that of the Uredinee. The present order resembles the preceding one also in the habit

of life. They are very injurious, especially to the Graminee. The power of producing many sporidia in succession, pos- sessed bythe promycelium, tends to the pleatiful distribution of the disease. 'These sporidia usually attack the axis of germinating plants, in which a mycelium is then developed and carried up with the growth of the plant, ultimately pro- ducing spores in the fruit and causing its destruction.

Order III. —Basipiomycetes.—The only form of repro- duction known in this order is by asexual spores borne at the apex of erect basidia. 'These spores reproduce the plant directly without the intervention of another generation. The receptacle of the hymenium consists of interwoven hyphe, and is gelatinous, fleshy, or woody in consistency ; it sometimes attains great size. The mycelium is compara- tively small and floccose.

Suborder I.—Tremellint.—The hymenium vf this sub- order bears two different kinds of basidia in different genera. In the genus 7'remella the basidia are at first subglobose or quite spherical, and divided from top to bottom into four equal parts. These segments either remain united, or diverge, while they grow out to the margin of the fungus in the form of long hyphe bearing kidney-shaped spores. In Dacrymyces and Guepinia the basidia are at first clavi- form then divergent into two arms, bearing one reniform spore each.

Spermatia are often met with abundantly in many of the Tremellint. They are produced in regular spermatophorous apparatus, and are very minute and spherical or ovoid, Like the spermatia of the Uredinec, their function is unknown.

The consistence of these plants is gelatinous, with, in some cases, a denser nucleus. 'They are usually to be found growing on stumps of trees and on the ground, Their shape, when they have one, is usually more or less cup- like.

Suborder IT.—-Hymenomycetes.—The Ilymenomycetes is the most widely- known group of fungi. It includes the com-

Fic. 8.—Agaricus muscarius. A, the young plant; B,ihe mature plant; C, lon- gitudinal section of mature plant. p, the pileus; g, the gills; a, the

annulus, oe of velum parittale, v, remains of volva or velum universale; s the

mon mushroom, to which all the species bear more or less

resemblance. The familiar form is that of a pileus raised upon a stalk and bearing on its under surface the hymenium extended over gills or /amellee (Agaricint), pores (Potyporet), or teeth (Hydnacet). From the hymenium rise the basidia, at the apex of which are usually four sterigmata bearing the spores. These spores are asexually produced, and on germinating, by emitting a hypha, give rise to a new mycelium on which the receptacle is again borne. The question of the existence of a form of sexual reproduction in the Hymenomycetes has been fought over many times, as yet with no certain result. Among the basidia are to be seen other cells of similar shape, but of greater dimensions,

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called cystidia;} it has been contended that these are male organs. The mycelium is nearly always underground. The Agaricint possess au inferior hymenium spread over

‘lamelle or gills radiating from the stalk. These are some-

times simple aud sometimes branched, and attached to or distinct from the stalk. The spores vary much in colour, one colour being constant to a genus or toasubgenus. On the stems of some genera an annulus or ring may be found, as a remnant of a veil (velum partiale) which united that part of the stem with the outer edge of the cap or pileus, but was ruptured on the expansion of the latter. In certain subgenera of Agaricus (e.g., Volaria, Amanita) the whole

Fie 4—Agaricus mucidus, Portion of hymenium (x 350). s, sporidias st, sterig- mata, g, sterile cells; c, cystidium, with operculum o.

plant is, when young, enclosed ina volva (velum universale), the remains of which may be seen in mature plants adhering to the base of the stem. In some genera, asin Amanita, both forms of veil are found together. When the

stem is lateral, as in Plewrotus, it is usually very much suppressed. The species of Agarcint are usually terrestrial, many of them are edible, and a few are deadly poisons.

The Polypore? are distinguished by the hymenium (some- times inferior, sometimes superior) extending over the sur- faces of cavities or pores. In the genus Boletus the habit of an Agaric is assumed—the stem usually central, the tex- ture almost always soft. In Polyporus the stem is usually lateral and the texture woody. The hymenophore is not easily separable, In some cases the habit of Polyporus is crust-like, the pores opening upwards, when it is called resupinate. Polypori grow usually on stumps of trees.

The Aydnacet possess an inferior or an amphigenous hymenium spread over teeth or spines. Some of the species have the form of a stalked pileus with the teeth inferior, while others resemble the resupinate Polypore. They are fleshy or corky in texture.

In the Auricularint the hymenium is confluent with the hymenophore. In form they resemble the Polyporei.

The Clavarinei are distinguished by an amphigenous hymenium, scarcely distinct from the hymenophore, and reaching to the apex of the plant, which is club-shaped, or in the form of upright spines. The species are gelatinous in consistence, but become horny when dry. The surface is usually smooth at first but afterwards assumes an in- dented or wrinkled appearance.

1 Mr W. G. Smith, who has examined a large number of cystidia, especially among the Agaricini, states that they all normally open by an orifice capped by a minute operculum at the top. In Coprinus the cystidia are unusually large, with at first a rounded top, which at length is capped by a nipple-like protuberance, After the careful examina- tion of a large number of specimens Mr Smith has convinced himsclf that the apex of each cystidium is furnished with a minute operculum, which is burst off in the discharge of the liquid or granular contents of the cystidium. In Zactarius the operculum is tall and cap-like. The liquid secreted ty the cystidia of. the Agaricini is sometimes granular before liberation, but in other cases not until after. When this granular matter is ripe, the grains revolve and move freely about, and if the operculum do not readily open this motion is increased until an

opening is forced. Mr Smith looks on these granular bodies as analogues of antherozoids.

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Suborder III.—Casteromycetes.—The receptacles of the |

Gasteromycetes are angiocarpous. They consist of an outer peridium enclosing masses of tissue which bear the hymenia. The basidia often bear as many as eight spores, which are ultimately liberated by the bursting of the peridium, either simply or by the development of special masses of tissues. The peridium of Phallus resembles the velum universale of the Agaricini in its mode of enveloping the receptacle, and the appearance it presents after bursting. Within this volva is a gelatinous stratum, then an inner peridium, then the hymenium. The bursting of the peridium or volva is caused by the elongation of a stalk on which the hymenium is elevated in a kind of pileus—as in the Agaricini. In Batarrea there also occurs a universal volva, and the hymenium is similarly elevated, but the plant in this case is of a woody consistence, and spiral vessels are found in the stalk. In Clathrus the receptacle is in the form of a globular net.

In Lycoperdon, Hymenogaster, and Nidularia the hyme- nium remains unelevated, and the spores are liberated by the simple bursting of the peridium.

Order J V.—Ascomycetxs.— The characteristic form of re- production of the Ascomycetes is by ascospores formed within asct by free cell-formation. Other generations in the cycle of development form stylospores in special conceptacles called pycnidia, and conidia borne on conidiophores. The receptacles on which the ascospores are produced arise as the result of the union of sexual organs, which takes place on the mycelium. The receptacles vary very much in size and form throughout the order.

Suborder I.—Duscomycetes.—The sexual organs of this suborder are formed on the mycelium and are called the carpogonium (female) and the pollinodium (male). As typical of the rest of the order the life-history of Ascobolus Ffurfuraceus, as described by Janczewski may be chosen. The pollinodium and carpogonium are both composed of a series of . short

crooked cells, in the former case much thinner than in the latter. The pollinodium em- braces the more remote end of the carpogonium, which is at this stage sausage-shaped, and so fertilizes it. After fer- tilization one of the cells of the carpogonium (usu- ally near the middle) increases and becomes globular. It is called the ascogonium. From it pro- ceed ascogenous hyphe on which the asc: arise. The asci are flask-shaped, the base being the narrow portion, and within them the asco- spores, 8 in number, are formed by free cell-formation. Between the asci, and borne on the ascogenous hyphe, are more or Jess numerous paraphyses which are generally regarded as abortive asci, but may serve (as Boudier affirms they do) to assist in some way the dehiscence of the asci. The hyphee of the mycelium on which the sexual organs are borne produce a dense mass of pseudo-parenchyma, which surrounds the carpogonium and forms the sterile part of the fructification.

Sexuality was first discovered in the Discomycetes by Professor De Bary in the case of Peziza confluens, which, though it differs in details from that described as occurring in Ascobolus, agrees in all essential details with. it.. –

Fig. 5.—Ascobolus furfuraceus. Diagrammatic section of the fructification (after Jan- ezewski). m, mycelium; c, carpogonium ; 7, pollinodium ; s, ascogenous filaments; @, asci; 7, p, the sterile tissue from which the paraphyses ” spring.

Certain species of Pezizw, the mycelium of which is ex- tensively reproduced by conidia, undergo a resting state in the form of a sclerottwm. This was first observe in Peziza Fckeliana by Professor De Bary. In it conidia are pro- duced by the mycelium before the sclerotia, The sclerotia, which are formed without the occurrence of any sexual pro- cess, 80 far as has been observed, consist of densely packed hyphze enclosed by a pseudo-parenchymatous rind. Some- times these germinate shortly after their formation, and produce a mycelium which bears conidia again; but if germination be delayed for a month or two, the character- istic basin-shaped hymenium of Peziza, with asci and asco- spores, is formed.

Spermatia are found in this as in other orders. They are borne in spermogonia, similar to those of the Uredinee, and were long believed to be incapable of germination. M. Cornu, however, has recently stated that he caused them to germinate under artificial conditions, and to produce a mycelium like the conidia.

In Peziza and the genera closely allied to it, the asco- genous receptacle is basin-shaped, with the hymenium on the inner surface of the basin; but in other genera it takes the form of clubs or stalks of considerable size with the hymenium on the outer surface (as in Geoglossum, Spathu- laria, Helvella, Morchella, &c.).

The species of Morchella and Helvella are, as a rule, esculent ; but none of the other Discomycetes have ever ob- tained any reputation in this direction.

Suborder II.—Erysiphee.—In this suborder the species follow two types in their mode of sexual reproduction, viz., Erysiphe and Eurotium.

Fic. 6.—Development of Zurotium repens (after De Bary). A, small portion of mycelium with conidiophore c, and young ascogonium as. B, the spiral asco- gonium (as), with the antheridium (p). D, the same, beginning to be sur- rounded by the hyphe forming the perithecium wall. D, the perithecium. E,F, sections of young perithecia: w, parietal cells; f pseudo-parenchyma; as, ascogonium. G, an ascus. H, an ascospore.

The mycelium of Hrysiphe creeps over the surface of its host plant, through the epidermis of which it sends down numerous haustoria. Both the conidia and the sexually produved fruits are borne on the same mycelium. The conidia occur in vertical order at the end of unbranched conidiophores. These conidia reproduce the niycelium directly. The mode of sexual reproduction resembles that of the Discomycetes. The carpogonium is more or less globular in shape, and is fertilized by a pollinodium of one or more branches. The carpogonium is at first represented

by one cell, but after fertilization a transverse wall divides it into two cells, the inferior one of which must be regarded as an ascogenous hypha. The superior one becomes the ascus, which in most cases contains 8 spores. In a few other forms several asci are formed by the carpogonium.

The species of Hurotiwm—e.g., E. repens and H, (Asper- gillus) glaucus—agree in the more striking details of their life-history with those of Hrys¢phe. The mycelium may be found as a fine flocculent mass on the surfaces of most putrefying organic matter. The usual and most extensive mode of reproduction is by the conidia, which are formed in great abundance at the apex of the conidiophores. These germinate and grow under most varied conditious, which fact, coupled with their plentiful production, explains the general distribution of the fungus. Subsequently the sexual organs arise on the same mycelium. The carpo- gonium is the end of a mycelial hypha wound up in the form of a corkscrew, with a tranverse septum at each turn of the screw. From the lowest turn two tubes sprout aud grow up on the outside of the carpogouium; one always grows more rapidly than the other, and reaches the top of the carpogonium, which it fertilizes. This is the pollinodium. Other cells then grow out from the bases of both organs and envelop them. After fertilization the carpogonium divides into several cells from which the ascogenous hyphee arise. The asci contain ascospores which germinate as in the other Erysiphee. The whole fructification is called the pers- thecium.

Suborder III,—Tuberacece.—The mycelium of the Tuber- acece is in most cases small in comparison with the fructi- fication, This fructification consists usually of a large sub- terranean tuberous body, possessing a thick wall of pseudo- parenchyma, and enclosing a dense mass of hyphz, amoung which the ascogenous filaments produce the asci embedded in sterile paraphyses. Conidia are known only in the case of Penicillium glaucum, a fungus which, from its common occurrence, and its being well-known in all its stages, may be chosen as a type of the suborder. Its mycelium inhabits almost any organic substance, and produces on erect coni-. diophores long chains of conidia in very great abundance. It is only in darkness that (as in the other Zuberacee) the sexually produced form of fructification arises. The sexual organs resemble in a very high degree those of Huroteum (see preceding suborder), but the development of the fructi- fication after the

ascogonium has been fertilized is totally different from the corresponding process. After the asco- gonium has begun to germinate, the growth of the envelop- ing hyphee so hinders this process that it is forced to rest in a sclerotioid state. If germination, however, be en- couraged by artificial means, the ascogenous hyphe force their way out and form asci, in each of which there are 8 ascospores. These spores, on germinating, produce a mycelium which bears conidia. If the germination of the sclerotia be delayed so long that the ascogenous hyphe lose the power of producing asci, the enveloping filaments give rise to the conidial form of fructification. The structure of these sclerotia is so similar to that of the well-known tuberous fructifications of the Zwheracec, that Brefeld, who discovered them, classes Penicillium with this suborder, in spite of the very strong resemblance of the sexual organs to those of Hurotium. In no other species of Z'uberacece has this life-history been observed.

Suborder IV.—Pyrenomycetcs.—The Pyrenomycetes pro- duce their asci within round or flask-shaped perithecia, with walls of pseudo-parenchyma, The asci contain, as a rule, 8 spores, In some cases the perithecium is open at first, but in others the neck, closed during the earlier stage, forms subsequently a canal through which the spores escape. In the case of the Spheriw simplices, the perithecia arise on a very fine mycelium, and according to Woronin and others

are the result of a sexual act. In YXylarza and allied genera, however, the perithecia are formed on sometimes very large club or basin shaped bodies, consisting of dense masses of tissue, which, according to some, are simply the receptacles, and according to others, bearers of sexual organs, the union of which gives rise to the perithecia. Analogy leads to regarding them as receptacles. Conidia are formed not only on the mycelium but also on the stroma, and even . occasionally on the hypha: composing the wall of the peri- thecium. Spermogonia and pycnidia are other conceptacles which give rise to asexual organs of reproduction, called re- spectively spermatia and stylospores. It was urged with much show of probability that these were parasitic bodies ; but the recent researches of Dr Bauke on the pycnidia and M. Cornu on the spermatia seem to disprove this view. M. Cornu states that

he caused spermatia to germinate and reproduce the mycelium of the species to which they be- longed. It will be seen, however, that in the next suborder (Lichenes) the analogous spermatia act as male organs,—a function which not only precludes the possibility of their parasitic nature, but does not agree well with M. Cornu's (so far as we know) unconfirmed views. In Claviceps pur- purea (ergot), which attacks the young ovary of rye, the mycelium first bears conidia embedded in a imucous secre- tion; this is called the sphacelia stage. The mycelium, however, soon permeates the ovary and forms a hard sclerotium—the ergot stage. After undergoing a period of rest, usually from summer to spring, but varying in length, the sclerotium on falling on damp ground pushes out small stalks with a rounded head in which numerous flask-shaped, wall-less perithecia arise. These perithecia bear as usual asci containing ascospores. Theascospores, on germinating, and finding their usual host—the rye, or some nearly related grass, give rise again to the sphacelia, which closes the cycle.

This suborder, like the Discomycetes, contains a great number of forms, inany of which are known in only one, viz., the perithecium-bearing stage, —the other phases probably being known by other names as distinct genera and species. The Pyrenomycetes grow either on dead organic matter or on the bodies of living plants.

Suborder V.—Lichenes.—U ntil recently, and before their true nature was understood, the Lechenes were treated as constituting a separate class of cellular cryptogams or Thallophyta. The researches of Schwendener, Stahl, De Bary, Bornet, and others have proved that these consist of a fungal Ascomycetous element parasitic on an algal element. The algal element belongs to the lower orders of Algc and acts as the nourisher of the fungal element. The fungal element is reproduced by Ascomycetous reproductive organs, and the algal element, which in a free state is capable of independently subsisting, is reproduced in the manner characteristic of the order of Alge to which it belongs. We have to do here with the life-history of the fungal por- tion only, but illustration will be given of its relations with its host.

Though sexuality is not known to exist generally in the Lichenes, it has been so satisfactorily proved in the case of the Collemacce by Dr Stahl that it

may be concluded that investigation only is necessary to bring fresh cases to light. In the Collemacee the male organs of reproduction (the spermatia) are formed within receptacles called spermogonic (similar organs have been described "as occurring in the Uredinew, &c.), and though not possessing the power of spontaneous motion, reach the female organ (érichogyne) by the agency of water or the atmosphere. The spermatia consist of one simple minute cell ; the trichogynes are of a more complicated structure, and may be described as con- sisting of a unicellular organ of conception, a conductive canal, and an ascogonium, consisting of a coiled hypha of several cells. The point of the trichogyne emerges from the

surface of the thallus, and the spermatia on coming in con- tact become united with it by a small tube through which the contents of the male organs fertilize the trichogyne. After fertilization the cells of the ascogonium increase in

Fic. 7 —A, transverse section through the thallus of Collema microphyllum, with g, gonidia, and a, the point of trichogyne (350); a,b, the point of trichogyne with spermatium attached (x750). B, spores of Thelidium minutulum, the germinating filaments of which enclose the (g) hymenial gonidia of Lndocarpon. (After Stahl.)

number and size, and the ascogenous hyphe spring from

the original coil and bear the characteristic asci in which the

ascospores are formed. © The relations between the fungal and the algal elements

may be illustrated by the following instance from Dr Stahl's Bettrdge zur Entwickelungsgeschichte der Plechten. The Alga were formerly considered organs of the fungal portion, and received the name of gonidia. A smaller form of gonidia, called the hymenial-gomdia, occurs in interstitial spaces of the apothecia of many Lichens; these hymenial-gonidia are the offspring of the ordinary gonidia (the thallus-gonidia), and have been carried up in the

hymenium by the growth of its hyphae. When the asco- spores are emitted from the apothecia, the hymenial-gonidia are cast out also, and falling in the neighbourhood of the ascospores are, many of them, enveloped by the germinating filaments proceeding from the spores, when the conditions are favourable for growth. Along with the growth of the hyphae, these hymenial-gonidia increase in size, and ultim- ately act as the thallus-gonidia of the new Lichen. This process has been observed in Dermatocarpon Scherert and Polyblastia rugulosa. When this discovery was made by Dr Stahl, he found growing beside the Dermatocarpon a species of Thelidiwm, the gonidia of which appeared to belong to the same species of Alga as those of the Dermato- carpon. He isolated, under favourable conditions for growth, the spores of Thelidiwm and the hymenial-gonidia of Dermatocarpon, and soon obtained the thallus of Z'helz- dium complete as regards gonidia and fructification. This experiment, by proving that the same species of Alga (in this case a species of Plewrococcus) served as the gontdea of two totally different fungi, also strongly supports the above views as to the dual nature of the elements composing the Lichen. These views, though supported by the most eminent botanists and backed by incontestable facts, are still occasionally the subject of attack by lichenologists.

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The suborder Zichenes contains a greater number of species than any other suborder or order of fungi, but it is probable that excessive subdivision has given rise to many. Lichens grow chiefly in exposed situations, such as the bark of trees and rocks, and are very generally distributed throughout the globe. They vary much in size and form, but are generally of a foliaceous or encrusting habit. They form a large proportion of the vegetation of alpine and polar regions. Their economic and medicinal properties are in many cases of importance.

Order V.i-Myxomycetes.—In the first stage of their life-history the Myxomycetes are mobile organisms, differing so strongly from any state of any other vegetable that it was proposed by Professor De Bary to place them among amoeboid animal organisms. In this stage, where one would expect a thallus of hyphae, a mobile plasmodium is found, which in habit of

life greatly resembles animal organisms. In appearance it is slimy or creamy, and con-

sists of numerous anastomosing net-like channels, through which there is conducted with more or less rapidity a cur- reut of protoplasmic matter containing many foreign bodies, such as particles of colouring matter of different natures, starch granules, diatoms, spores of fungi, &e.

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(After Clenkowski. 350.) B,

Fic. 8.—A, plasmodium of Didymium leucupus. (After De Bary. x 20.)

closed sporangium of Arcyria incarnata.

channels are not bounded by any definite membrane, and the direction is frequently changed, probably for the pur- pose of gathering nourishment. Where one or more indi- viduals are situated near each other these plasmodia occa- sionally unite (this has been observed between two different species). These mobile masses ultimately, usually after undergoing division, are transformed into motionless fruits, in some cases of regular form (sporangia), and in others of irregular (plasmodiocarp). Compound fruits called ethalia, of regular or irregular form, either naked or enclosed by a membrane (cortex), are produced externally on definite sporophores by cell-division, or within the fruit by free-cell formation. On germinating, the contents of the spores escape either in the form of a zoospore with a nucleus, vacuole, and long cilia, or of an amceboid, and these zoo- spores or amceboids soon aggregate and form mobile plas- modia.

Taking the two generations in their life-history, it will be found that the fructification has probably greater claims to a fungal nature than the plasmodium has to an animal. They have, therefore, been retained in the vegetable king-

dom by the majority of botanists,——whether justly or not re- mains to be determined by future research.

Order VI.—Scuizomycertes.—In the Schizomycetes, the usual and apparently most common form of reproduction is by simple segmentation. In several forms, however, repro- duction of a higher type has been observed. An instance of this is to be found in Bacillus anthracis—the cause of splenic fever—the life-history of which, according to Ewart, Koch, and others, is as follows. At first the Bacill: con- sist of motionless hyaline rods capable of segmentation, which after a short time pass through a motile phase lasting usually several hours. After settling down these rods elongate considerably in a short time; if the temperature be favourable a rod may increase in five hours to from 80 or 100 times its original length. The filaments usually be- come interwoven like mycelial hyphs, and are in most cases irregular in their course. Within tlem spores are soon formed by free cell-formation, each spore being separated from its neighbour by a transverse septum. At this stage the filaments decay more or less rapidly and set free the oval spores, which are, from Coln's measurement, not more than 34°59 to se57 inch in their greatest diameter. According to Koch these spores directly elongate into fila- ments, but Ewart has more recently observed that they divide into four sporules, each of which germinates by the production of a filament. These filaments become motion- less rods such as those from which we started.

In the classification of this order uch confusion exists from the meagreness of our knowledge of the life-history of its members.

phases of the same life-history. Mucli attention has been paid to their influence on diseases of men and animals, from their frequent occurrence on mucous surfaces, on wounds, and elsewhere. An extensive literature has arisen on this subject, but its interest is far more medical than botanical. Whether these organisms are the concomitants or the causes of diseases in men and animals has not often been decided, and is still much debated,—a source of frequent error being the confusion of debris of various kinds with Bacteria, &c. "Spontaneous generation " has also been attributed to them,

but there has certainly not been anything like proof to sup- port this assertion.

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FUR. Certain animals, which inhabit the colder climates, have a covering upon the skin called fur, lying alongside of another and longer covering, called the over- hair. The fur differs from the overhair in that it is soft, silky, curly, downy, and barbed lengthwise, while the over- hair is straight, smooth, and comparatively rigid. These properties of fur constitute its essential value for felting purposes, and mark its difference from wool and silk; the first, after some slight preparation by the aid of hot water, readily unites its fibres into a strong and compact mass ; the others can best be managed by spinning and weaving.

On the living animal the overhair keeps the fur filaments apart, prevents their tendency to felt, and protects them from injury—thus securing to the animal an immunity from cold and storm ; while, as a matter of fact, this very overhair, though of an humbler name, is most generally the beauty and pride of the pelt, and marks its chief value with the furrier. We arrive tlius at two distinct and opposite uses and values of fur. Regarded as useful for felt it is denominated staple fur, while with respect to its use with and on the pelt it is called fancy fur. For the one purpose the Russian hare skin is more valuable than the Russian sable, while for the other the sable may be valued at one thousand times the former.

History.—The manufacture of fur into a felt is of com- paratively modern origin, while the use of fur pelts as a covering for the body, for the couch, or for the tent is coeval with the earliest history of all northern tribes and nations. They were not simply a barbarous expedient to defend man from the rigours of an arctic winter; woven wool alone cannot, in its most perfect

form, accomplish this. The pelt or skin is requisite to keep out the piercing wind and driv- ing storm, while the fur and overhair ward off the cold; and they are as much a necessity to-day among more northern peoples as they ever were in the days of barbarism. With them the providing of this necessary covering became the first purpose of their toil; subsequently the article grew into an object of barter and traffic, at first among themselves, and afterwards with their neighbours of more temperate climes ; and with the latter it naturally became an article of fashion, of ornament, and of luxury. This, in brief, has been the history of its use in China, Tartary, Russia, Siberia, and North America, and at present the employ- ment of fancy furs among the civilized nations of Europe and America has grown to be more extensive than at any former period. The supply of this demand in earlier times led to such severe competition as to terminate in tribal pillages and even national wars ; and in modern times it has led to commercial ventures on the part of individuals and companies, the account of which, told in its plainest form, reads like the pages of a romance. Furs have constituted the price of redemption for royal captives, the gifts of emperors and kings, and the pecular badge of state function- aries. At the present day they vie with precious gems and gold as ornaments and garniture for wealth and fashion ; but by their abundance, and the cheapness of some varieties, they have recently come within the reach of men of moderate incomes. The history of furs can be read in Marco Polo, as he grows eloquent with the description of the rich skins of the khan of Tartary; in the early fathers of the church, who lament their introduction into Rome and Byzantium as an evidence of barbaric and debasing luxury ; in the political history of Russia, stretching out a powerful arm over Siberia to secure her rich treasures ; in the story of the

French ozcupation of Canada, and the ascent of the St Lawrence to its source in Lake Superior, and the subsequent contest to retain possession against England ; in the early settlements of New England, New York, and Virginia; in Irving's Astoria; in the records of the Hudson's Bay Company ; and in the annals of the fairs held at Nijui- Novgorod and Leipsic. Here it may suffice to give some account of the present condition of the trade in fancy furs. The collection of skins is now chiefly a matter of private

enterprise. Few, if any, monopolies exist. The Alaska Commercial Company, now about ten years old, enjoys some special privilege for the taking of seal skius on the Pribiloff Islands, and some peculiar restrictions exist in Russia in relation to certain peltries, but beyond this, the trade in furs is a free one the world over. Individual enterprise, skill, forecast, and capital, have an open field.

in kind, and limited in quantity, one might fear the extine- tion of the several choice varieties through the persistent energy of the trapper. But here the fickleness of fashion steps in, and does for the fur trade what the law of supply and demand does for the more staple articles of commerce. Fashion, fastidious and fickle, neglects the use of certain kinds for a season ; the market price of the pelt no longer repays the outfit of the trapper; the hunt is intermitted, and in two or three years the animal regains its numbers and strength. The annual collection of furs is thus a matter of ceaseless change; but the following may be relied on as an estimate correct enough for all practical purposes :—

Average Annual Collection. (Biswe 721?" Gaapanoearogacude INTTSTENGS, cay sooqsnnensaacnondaoccodoavonde 5,000

The Hudsou's Bay Company, with its chief officein London, | po'? 700) Ameen secon 18000 still maintains its organization, but conducts its affairs in Bees oes sks BaropevandeAsiies…...0. ieee ers 4,000 North America under no special or royal grant, and com- | Beaver…..... Mi wouter 20,000 petes in tlie open market with individual traders throughout 92 teeter eee ene ee ees America Drala aicharicera(eieteincafatacelate) ocersierecelefeltisisc008 200,000 Canada, Labrador, Manitoba, and Columbia, Its en Buffalo …....sceeeeeees AMETICA .....eeeeceeceeeeeeeteeeeeeeees 100,000 eae ' ? : . ; : @limmehiblar…. 0.0.0.0 Tete eho18) (C)nbis conpnnnooneooonoo ann 100,000

of peltries is offered to the highest bidder at public auction | Cat, Wild…....ccccecseessnecsseessecesseersessseetenseneeeeees 10,000 in London, in January, March, and September of each year. By HOUSG rer socenczeesee fincas ssstaemgmeticts nto aederssinee 1,000,000 Private collectors and dealers throughout Canada and the oe Pc tica ss ee and MELO MO ca sje sn eaeeneaenanees eu United States forward their furs to

the soaboard, chiefly to | itch 0000000) Bmope yep nesses. 600,000 New York, for sale there, or for consignment principally | Fox, SHIMEL. ,MOND sete aes: < a a lacrrSeatenertiocneemonneonnanon: peas important fair for eastern Siberia is held at Kiachta, om | jyrg c … Asia and Europe… cr nocesesees 4,600,000 the borders of China, where an extensive exchange of furs is | Kolinsky ….....0++.) RARE ae Me CeO eS cecess 80,000 carried on with the Celestials. Japan has added but little | Lamb… eerie caccesycassmomens waemeoensv ee 100,000 to the activity or extension of the fur trade, though her Fase Scaasenn sk oe JN Sitie ERT gegonbosn ooadesoeoden oadonoua: ‘ pe northern shores have furnished many a fine furseiland sea | ji) 7 cals Acai Maar oe A EA otter to the hardy navigator. Staple furs, or those used | Lyme… sss. sscsssssgressseseessssseecnsnescessssssecstensass 50,000 chiefly in the manufacture of hats, are those of the hare | Marten….....008 AGIAN soa. Fiseavetdcnsonesceeee 130,000 and the rabbit, collected mainly in Russia, Germany, France, PS ys reer ace WYOPEs. «ccs cece es Ani ease 150,000 a 3 Bamti. 0.60… Europes. .c.ceesceesenseescseeereeneeeeees 60,000

and England, dressed, carroted, and cut from the skin in | =” Russian Sable oa… sees: ih AL: eae 100,000 western Germany, France, Belgium, and England, and | wink… EEPROM ae x ostencace 250,000 thence distributed to the manufacturing centres of the | ,, wcrc Russia …..sscscessnergirvesvceserecneens 50,000 world; and here it may be added that the clippings and MOTKCY.....00000c0e000- APTICD ...esessseeeseenseteenneeneeseeeens 40,000 i c Musk Raty…....:...- PAMICTICA) . seueisicnir ons Pico auoreecra one 3,000,000 cuttings of fancy furs from the workshops of furriers are all Pe Ro 100,000 saved, and find their way to the machinery which utilizes | yatifa,..000001 South Ametiea ces 3,000,000 the waste and transforms them into hatters’ furs. But of | Opossum…..... .... INT CTACON ee ee oer 250,000 all these fur marts that of London is the chief, for thither | Otter, 1.010 ene cs ae ao eet ae tend by the laws of trade, not only much of the produce of |.ppg” Murope wsvcnn nuns sven 8,000,000 Asia and Europe, but also the fine peltries of Chili and Rt Bote… ca i. America ….. ee eta <. 500,000 Peru, the nutria from Buenos Ayres, the fur seal of Cape | Seal, Hair..... PO IAMEMG cde) cssocceecesersvortoeenant 1,000,000 Horn and South Shetland, the hair seal from Newfoundland, sje tie eee

PACHIC.....ceseerecresseersestscnetscesees a as well as the inferior peltries of Africa, To prepare fur | Somat vi Sr a gas eee skins in a way to endure this long transportation is asimple Tieer CO ince, Bengal and North China…..... 500 and easy matter. When stripped from the animal the flesh | Wolf. .....cccccceseeesescecceeeeneeeeene eeseeeceeeeesaneanauaeoneees 25,000 and fat are carefully removed, and the pelts hung in a GOO] | Wolverin…....sseccessererorneresscceenenraanennee seevesennanes 8,500

place to dry and harden ; nothing is added to protect them, Care is taken that they do not heat after packing, and that they are occasionally beaten to destroy worms. A marked exception is the case of the fur seal, which is best preserved by liberal salting and packing in hogsheads. All other raw furs are marketed in bales.

Kinds and Quantities. —Few kinds of animals furnish a pelt of suitable weight and pliability, and all of them differ widely in elegance of texture, delicacy of shade, and fineness of overhair, and it is these differences which determine their place in the catalogue of merchandise. These few animals are not very prolific, and many of them attain their greatest beauty in wild and uncultivated regions. To this remark there are some notable exceptions. Being thus few

For the habits of these animals, and their modes of life, reference must be made to the separate articles, and to such works as those of Cuvier and Brehm. But a brief account may be given here of the different qualities of the pelts, with some general remarks as to their average value and their customary uses,

Badger.—Size, 2 by 8 feet; overhair coarse, 3 to 4 inches long, black with silver spots. The German are the best. Fur woolly. American have softer overhair. Used for robes, military trappings, and brushes. Value of prime, from 2s. to 6s. per skin.

Bear, Black.— Size, 8 by 6 feet; overhair 6 to 8 inches long, fine, flowing, and glossy; fur thin. Best are American. Used for robes, military caps, and mats, The finest are the cubs. Value of

prime, from £1 to £4. , Bear, Brown.—Same size as the black, and very fine in overhair.

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Found only in the Hudsons Bay territory. Uscd for muffs and garniture. Value of best prime, £15. Quantity very small.

Bear, Grizely.—Larger than the black; coarse hair; thick heavy pelt. Only found in western part of United States. Used as robes. Value, £1 to £2.

Bear, White.—Largest of the bear family; hair short and rigid; pelt thick. Found only in the Arctic regions. The best pure white are uscd for robes. Value from £10 to £20.

Beaver.—Size, 2 by 8 feet; overhair 3 inches long, coarse and brown in colour; fur thick, fine, and dark grey. Best are from Labrador and Moon Fort. Used in every form and fashion in all northern countrics; highly prized in Russia and China. Value from 4s, to 12s. per pound in the raw parcliment state.

Buffalo.—Size, 8 to 12 fect long; hair coarse, colour dun brown. Only found on the western and northern American prairies. Best are froin the region of the Saskatchewan river. Prime are used as robes; coarse and unprime as leather for moccasins. Value 12s. to £2.

Chinehilla.—Two kinds, real and bastard. Size of real, 8 by 12 inches; overhair and fur of equal length—about 14 inches long, very fine, and like wool may be spun and woven; colour silver grey and dark. Best are from Peru. Used for muffs, boas, and borders on garments; value from 4s. to 12s, The bastard are from Chili (chinchilla means the Chilian skin), short in fur, sinall in size, weak in pelt, and are worth from 5d. to 10d.

Cat, Wild.—Overhair and fur thin and coarse; colour grey; value and uses very limited. Civet cats are sometimes admired for their singular marks, but are in poor deinand. House cats are too well known to require a description. Their colours are black, grcy, red, and mottled. Best come from

Holland; the poorest from Russia. Used very generally for fur work. Price of best black 4s. to 8s.; other sorts nominal.

Ermine.—Size, 4 by 10 inches; overhair and fur fine, soft, and close; pelt thin and tough; colour pure white, the tip of the tail black. Best are from Barabinsk and Ischim, in Siberia. Used for muffs, garments, and linings. Value variable; the best have been as high as 6s., and as low as 7d.

Fisher.—Size, 15 by 30 inches; overhair very fine, glossy, dark, and durable, 2 inches long; fur close; tail 12 inches long, bushy, and dark. A right noble skin. Best from British America. Value from £2 to £4.

Fitch. —Size about that of the American mink; overhair fine, 1} inches long, with dark points; fur a golden yellow. Best from Germany, Holland, and Denmark; smallest from Russia. Used for ladies' furs according to the prevalent fashion. Value from 2s. to 6s.

Fox, Silver,—Size, 2 by 4 feet; overhair thick and fine, 3 inches long, varied in colour from palc silver to a brilliant blue black; fur fine and curly; its beauty places it at the head of all fancy furs; the tail is a royal brush. he choicest are from Labrador and Moon Fort; those of Russia are more woolly and less valuable. Used for inuffs, boas, and linings of robes. Price from £10 to £40.

Fox, Cross. —Not quite so large as the silver, with fine overhair, but a shade of red at the points, and from the palencss of the fur making a distinct dark cross at the shoulders. Best are from the Hudson's Bay territory, and valued from £2 to £8.

Fox, Blue.—Size the same as the cross, with grey-blue overhair, and a woolly fur. The finest are from Archangel ou the White Sea, and from Greenland. Value from £2 to £4.

Fox, White.—Size the same as the cross, with pure white over- hair and fur. The best are from Labrador, the poorest from Asia. Value from 4s. to 12s,

Fox, Red.—Well known to all northern nations; abundant in Europe, but in size and beauty inferior to the Amcrican family, 'The former fetch 4s., while

those from Labrador are valued at 16s.

Fox, Grey.—Only found in the United States. Overhair is grey, sprinkled with silver on the back, the sides are yellow, and the tail an ashen grey. Value from 4s. to 8s.

Fox, Kitt.—Found in north-west America and in Tartary. Over- hair fine; the back is a pure grey, the sides yellow, and the belly white. In size it is the smallest of the foxes, ° Priee from 1s. to 3s.

Hamster.—Size, 3 by 5 inches; hair short and close, back grey and the sides yellow.

Hare.—Overhair fine; fur very long, fine, abundant, and strong; pelt weak; colour grey and white. Best are from Russia. This skin is largely used by furriers, but its fur is among the best for hatters' purposes. Value from 5d. to 1s.

Kolinsky.—¥Found only in Asia, and attains the size of the Aimerican mink; overhair a golden red, 14 inches long, The tails make excellent pencils for painters. Value from 2s, to 4s.

Lamb.—The finest, dark. close curled skins come from Persia ; the next grade from the Crimea, and are grey in colour; inferior skins from Astrakhan. All these are used by furriers for caps, borders, and garments. The finest Persian are worth 12s, to £1, the

Crimean 6s., and the Astrakhan from 1s. to 2s. The lamb- skins of western Europe are used for lining gloves, Angora sheep

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are sometimes in demand, and are coloured red, blue, grey, and orange to suit the fashion for fringes and borders. Their value is from 12s. to £2.

Lion.—The finest from Asia. variable.

Lyme.—Size, 2 by 34 feet; overhair fine and flowing, of a clear silver blue shade, sprinkled with black; length of overhair 8 to 4 inches. Best are from

Sweden and Labrador. Value from 8s. to £1.

Marten, American.—Size trom 5 by 15 inches to 8 by 20 inches; overhair fine and flowing, 1 to 2 inches long; fur close and thick;

Specimens are rare, and price

colour of best a dark coffee brown, of poorest a pale yellow. The finest are from the Great Whale River and Labrador. Always a choice and valued pelt. Price of best £5, of poorest 2s. The

tips of the tails are highly prized for artists' brushes.

Marten, Stone.—¥ound in Europe; the best from Hungary and Turkey. Colonr a dull grey, overhair coarse, and fur woolly. Value of best prime, 8s. to 12s.

Marten, Bawm.—Found in Europe and Asia, of fine overhair, but woolly fur, of a brownish colour, approaching that of the American marten, and furnished with a long and bushy tail. Value from £1

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Marten, Russian Sable.—These skins are in the highest cstima- tion with furriers, Size about the samc as the American marten, but the overhair is much more fine and flowing, of a rich bluish dark shade, and from 14 to 24 inches long; the pelt is very soft, tough, and durable. The best are from Yakutsk in Siberia, the next from the Lena river, and the poorest from the lowcr Amoor. Very choice grades, but of a browner shade, are furnished by Kamchatka. Value of the poor Saghalien from 4s. to 8s.; while the darkest from Okhotsk will command £80.

Mink, Ameriean.—This valuable skin has ncarly the size of the size of the marten, with an overhair that is shorter and slightly more rigid, but vies with the marten in elegance of lustre, the choicest having a dark blue shade that is always admired in furs. The best are from Nova Scotia, the State of Maine, and the Labrador coast. It is most abundant in the middle and north-western States. Value of the best, froni 12s. to £2.

Mink, Russian.—Of smaller size than the American, and infcrior in all other respects, but still a valuable pelt. Price of prime, from 2s. to 6s.

Monkey.—From the west coast of Africa; has a long, thin, flowing hair; of various colours, chiefly black and duu grey. Has a limitcd use with furriers, fetching from 2s. to 6s.

Musk-Rat.—A well-known fur in North America. Size 8 by 12 inches; averhair coarse and light brown; fur fine, thick, and silky; in genera] favour with furriers, and available for a great variety of

urposes. Best are from New England and New York; very prolific in cultivated regions. The price is very fluctuating, and as the annual collection varics from three to five millions of skins, it is difficult to forccast the market value. Price for prime, from 6d. to 3s.

Nutria.—From the La Plata, South America; in size and value between the beaver and the musk-rat; overhair coarse and rigid; fur short and fine; pelts too often unsound, and hence the value of the fur is chiefly for hats, Price of dry skins from 1s. to 2s per pound.

Opossum.—Chiefly from the United States, but some also from Austialia. Overhair long, coarse and whitish grey; fur woolly. Best from Ohio. Value from 5d, to 2s,

Otter.—Comes from all northern countries. Size of best, 2 by 5 feet; overhair thick and close; colour brown black. Best are from Labrador and Canada. The skin is in high reputation and general use with furriers. Value of best, £1, 10s. to £3.

Otter, Sea.—Found only in the North Pacifie Ocean, on the coasts of Alaska, Kamchatka, and Japan. Size, 2 by 6 feet; overhair exceedingly fine. and extending but little beyond the fur, which itself is very thick, close, fine, and silky; colour dark brown, occasionally with silver points regularly interspersed; pelt pliable and firm. The poorest skins are not more valuable than those of the beaver; but the fine choice specimens command from £20 to £100. They are in high repute with the Russians and Chinese.

Rtabbit.—Size, 10 by 16 inches; fur thick and fine; pelt weak; colour all shades from black to white. Best are found in England, but the purest come from Poland. The best coloured skins are used by furriers, but much the larger portiou is cut for hatters' fur. The animal is largely bred in warrens, and its flesh used as food; the pelts thus become of secondary importance, and, being abundant, supply a cheap fur, ;

faecoon.—One of the peculiar and valuable pelts of the United States, and flourishing best in cultivated regions, Size, 1 by 2 feet; overhair not fine, but bright in colour, 3 inches long, thick, and flowing; fur resembling that of the beaver; colour from silver blue to grey brown and coffee brown. Best are from Michigan and Ohio. Average value of prime, 4s. Some specimens vie with the fisher in its peculiar shade, and some even with the silver fox, and such rare skins bring from £1 to £4.

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Seal, Hair.—Chiefly from the North Atlantic. Size from 3 to 10 feet; hair coarse and rigid; no fur; divided into white coats, blue backs, mottled, and ordinary. Used for saddlery and military purposes. Average price, 2s.

Seal, Fur.—Found only in the Pacific and in the South Atlantic. Size of the wigs, 4 by 8 fect; of the large, 3 by 6 feet; middling, 23 by 5 feet; small, 2 by 4 feet; the pups vary in length from 2 to 4 feet. Overhair coarse and rigid; fur fine, thick, silky, and very uniformly distributed. Pelt thin, pliable, and of light weight. The largest number come from Alaska, whence 100,000 are allowed by law to be brought annually. The best of these are the prime middling pups. Value varies from £1 to £8 in the salted state. A few fine skins come from the coast of British Columbia, and being caught in winter are in prime condition. The choicest skins are taken on the South Shetland and South Georgia Islands in the Antarctic Ocean. Fur fine beyond comparison; pelt very pliable, light, and thin and firm. Value salted, from £2 to £10.

'Seunk.—Another peculiar production of North America. Size, 10 by 16 inches long; overhair fine, 3 inches long, dark blue and coffee brown, thick, glassy, and flowing. Many have two white stripes, more or less broad, extending from the head to the tail. It is now easy to deodorize the skin, and

the fur is a popular one in all countries. The best are from New York and Ohio; valuc of best prime black, from 4s. to 10s.

Squirrel.—Only those of northern Europe and Asia have a value a3 merchandise. American are worthless. Size, 3 by 6 inches; overhair and fur equally fine; colour from pale blue to clear dark blue; best are from eastern Siberia; palest and poorest from European Russia; bellies white; tails long and bushy. This fur is in universal demand among furriers for muffs and linings, as well as for large garments. Pelt pliable and tough; fur durable, close, and fine. The tails are made into boas and brushes.

Tiger.—Specimens are rare. Those from Bengal are large and short in hair, but well marked; while those from northern China have hair 2 to 3 inches long, and frequently measure 10 to 14 feet in length. Value of the lattcr, from £10 to £20.

Wolf.—The largest are from Labrador, measuring from 4 to 6 feet long, chiefly grey-brown in colour, with long, owing, coarse overhair, The finest are from Fort Churchill, and fetch a high price. The American prairie wolf is a variety inferior in every respect. Price of best, £2; of the inferior, 4s. The wolf is very destructive of the fur-bearing animals, and is an object of extermina- tion with all trappers.

Wolverin. —From Russia, Norway, and Hudson's Bay. Colour a clear dark brown, overhair coarse, 24 inches long. Value from 12s, to 24s.

Of the fur-bearers, those that seek their food in water have their finest but shortest fur on the belly, and longer fur upon the back ; while those that avoid the rivers have their longest and finest fur upon the back, and their bellies clothed with fine, long, flowing overhair. .

Dressing.—Raw furs are made ready for use by softening tle pelt with pure butter or sweet oil, trampling them in tubs filled with fine hardwood sawdust at about blood heat, drawing the pelt over a sharp knife to remove every particle of flesh, and finally trampling them again in clean sawdust. The pelt thus becomes soft and pliable like the fine kid used for gloves. They are then ready for the furrier, who asgorts the skins as to colour and overhair, and cuts them in various ways to bring them to the pattern of the

article required. Having been sewed together with a close, fine overseam, the article is damped, and stretched upon a smooth pine board after a pattern marked, then nailed along its edges and left to dry. After removal from the board the article is trimmed, and softened by rubbing, and is then ready for the liner. The skill of the furrier lies in the taste exhibited in the arrangement of the furs, and in the economy of use of material. ;

Dyeing.—Furs are dyed ina variety of ways to make them uniform in colour, and adapt them to the fashion and taste of the time. Ordinarily this is a cheap and ready process, and only becomes an art when employed upon fine skins, from which the overhair has been first removed by plucking, leaving the fur alone to receive the dye-stuff. Among these are the skins of the musk rat, beaver, otter, and especially the fur seal; the last has received very careful attention, as its entire value depends upon the perfection and success of the process. Unprime fur seals part with their overhair very reluctantly, while the seasoned

| tions.

skins are very readily unhaired, leaving the fur in all its smoothness; thus the best grades are likely to be very good, while the rest rank only from ordinary to very com- mon, A subsequent process is the removal of all grease from the fur, which is effected by repeated washings in softened water; if this is imperfectly done, the colour will be uneven and not permanent. The final work is to prepare a dye of suitable strength, and apply it ina suitable way, to infuse the colouriug matters into the fur, without suffering too much of it to reach the pelt, whereby its durability might be ruined. London claims to have accom- plished this for the sealskin in a manner that distances all competition ; and it certainly enjoys a wide popularity, as well as the substantial fruits of the sale of its production of coloured seals. But America also has its successful dyers of seals, one of the most important of the results they have achieved being the giving to the fur seal a fine deep brown colour, without injuring or burning the fur, while leaving the peit soft, light, and durable.

Prices of Fancy Furs.—The market value of dressed and manufactured furs is at the mercy of fickle fashion and the weather. The production of any one variety is very limited, and consequently those that are in fashion during a cold winter command full and even extravagant prices, while others, of equal intrinsic merit, have a merely nominal value. The consumer is not more responsible for this than are the furrier and the fur merchant. It was the remark of an old and successful fur dealer that "furs when wanted are diamonds, when not wanted are char- coal." This fact renders the trade an extremely hazardous one, and tends to make the venture in it a matter of specu- lation rather than of provident enterprise ; and while the consumer occasionally may have to pay a very extravagant price for some few varieties of furs for a short period, it happens far more frequently that the fur dealer is a severe sufferer by reason of sanguine anticipations of advance in values, which in nine cases out of ten are doomed to disappointment. (M. M. B.)

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FUREEDPORE. See FARIDPUR.

FURETIERE, AnTorne, best known as the author of a Dictionnaire Universel de la Langue Frangaise, was born at Paris in 1620, and died 14th May 1688. He first studied law, and practised for a time as an advocate, but finally entered the church and became abbé of Chialivoy. In his leisure moments he devoted himself to letters, and in virtue of his satires —Vowvelle Allégorique ou Histoire des dermera troubles arrivés au royaume Wéloquence, 1658; Voyage de Mercure, 1659, &c.—he was admitted a member of the French Academy in 1662. That learned body had long promised to the world a complete dictionary of the French tongue ; and when they heard that Furetiére was on the point of issuing a work of a similar nature, they inter- fered, alleging that he had purloined from their stores, and that they possessed the exclusive privilege of publish- ing such a book. After much bitter recrimination on both sides the offender was expelled in 1685; but for this act of injustice he took a severe revenge in his satire Couches de V Académie. The reply which he made to the Academi-

cian Charpentier, entitled Factwms, ran through four edi- His dictionary was published at Rotterdam two years after his death. Tt was afterwards revised and im- proved by Basnage, who published his edition in 1701 and again in 1725; and it continued to enjoy a high reputa- tion till the appearance of the Dictionnaire de Trévoux, for which indeed it furnished the basis. Furetiére's other works do not possess any great literary merit; but one of them, Le Roman Bourgeois, is of interest as descriptive of

the every-day life of his times, and has been reprinted in 1855 under the editorship of Ed. Fournier and Ch. Asse- lineau. The Fureteriana, which appeared in Paris eight years after Furetiére's death, is a collection of but little value.

FURIES (Furza, also called Dir) are not native to Latin mythology, but adopted and modified from the Greek Lrinyes (see ExinyEs). Originally denoting the avenging power exerted by nature against all transgressors of its regular order, and spoken of by older poets (Homer, faschylus, &c.) either simply in the singular or in the plural as an indefinite number, the Erinyes assumed later a more rigid and methodical form, As the conception of a future life grew, they were invested with the duty of punishing sinners, and were settled in Tartarus (Virgil, in, vi.) ; their number was fixed down to the sacred three (a number mentioned so early as Eurip., Orestes), and indi- vidual names, Allecto, Tisiphone, and Megzera, occur first in the Alexandrian poets and are adopted in Latin. But besides this, Virgil, and the later poets in imitation of him, frequently employ the Furiz in another way which is also suggested by a Greek original, The Erinyes are said to madden the transgressor and lead him into further crimes which work their own punishment (//. xix, 87; Od. xv. 234) ; and Aischylus by a strong metaphor calls Helen an Erinys, as it were, a scourge of men (Agam. 729). Virgil develops this thought so as to make the Furie the agents employed by the higher gods to stir up all mischief and strife and hatred on the earth. They sit close by the throne of Jupiter, ready to execute his errands of ill (Zn. xii.); Allecto is sent by Juno to raise the war against Aineas (so also Ovid, Met. iv. 473; Statius, heb. i., &c.); they are the pronube of an unhappy marriage (Lucan, viii. 90). Without regard to ethical propriety, they are

employed as a convenient poetic machinery. The free, fluid conception of the Greek myth, hiding in it the deepest truth and capable of infinite growth, was in this case, as so often among the Latins, either hardened into a stiff, lifeless morality, or altered into a fanciful device to suit a capricious and arbitrary system of divine action. There are also some relics of an ancient Italian conception akin to the Erinys. Goddesses named Furinz were powerful in the underworld ; they had their own flamen Furinalis, their festival Furi- nalia on July 25th, their grove across the Tiber, where C. Gracchus was slain. Like Erinys the word is used both in singular and in plural; and both Furina (root bhur) and Lrinys (root sar) mean.“ the rapidly moving ” (see Kuhn in Zatschrift, i.). At a very early period this genuine native idea disappeared before the Grecizing tendency, and was in the time of Varro almost forgotten (Varro, Z.L. vi.

19).

1m the artistic representation see Buttiger, Furienmaske,

FURNACE. Under this name are included all con- trivances for the production and utilization of heat by the combustion of fuel.

The word is common to all the Romance tongues, appear- ing in more or less modified forms of the Latin fornax. But in all those languages the word has a more extended meaning than in English, as it covers every variety of heating apparatus; while here, in addition to furnaces proper, we distinguish other varieties as ovens, stoves, and kilns. The first of these, in the form Ofen, is used in German as a general term like the French four; but in English it has been restricted to those apparatus in which only a moderate temperature, usually below a red heat, is produced in a close chamber, Our bakers’ ovens, hot-air ovens or stoves, annealing ovens for glass or metal, &c., would all be called fours in French and Oefen in German, In common with furnaces of all kinds. Stove, an equi- valent of oven, is from the German Stube, z.c., a heated

room, and is commonly so understood; but is also applied to open fire-places, which appears to be somewhat of a departure from the original

signification,

Furnaces are constructed according to many different patterns with varying degrees of complexity in arrange- ment ; but all may be considered as combining three essen- tial parts,—namely, the fire-place in which the fuel is con- sumed, the heated chamber, laboratory, hearth, or working bed, as it is variously called, where the heat is applied to the special work for which the furnace is designed, and the ap- paratus for producing rapid combustion by the supply of air under pressure to the fire. In the simplest cases, the functions of two or more of these parts may be combined into one, as in the smith's forge, where the fire-place and heating chamber are united, the iron being placed among the coals, only the air for burning being supplied under pressure from a blowing engine by a second special con- trivance, the tuyere, tuiron, twyer, or blast pipe; but in the more refined modern furnaces, where great economy of fuel is an object, the different functions are distributed over separate and distinct apparatus, the fuel being con- verted into gas in one, dried in another, and heated in a third, before arriving at the point of combustion in the working chamber of the furnace proper.

The most obvious distinction that can be used in the classification of furnaces is founded on the method adopted for supplying air, which may either be blown into the fire, under a pressure above that of the atmosphere sufficient to overcome the resistance presented by the packed columns of fuel and other materials to its free passage, or be drawn through it by a partial vacuum in a chimney formed by the heated gases on their way to the atmosphere. The former are known as blast furnaces, and the latter as chimney draught, air, or wind furnaces,

Stack and Blast Furnaces.—The blast furnace in its simplest form is among the oldest, if not the oldest, of metallurgical contrivances. In the old copper smelting district of Arabia Petreea, clay blast pipes dating back to the earlier dynasties of the ancient empire of Egypt have been found in great numbers, buried in slag heaps; and in India the native smiths and iron workers continue to the present day the use of furnaces of similar primitive types. These, when reduced to their most simple expression, are mere basin-shaped hollows in the ground, containing ignited charcoal and the

substances to be heated, the fire being urged by a blast of air blown in through one or more nozzles from a bellows at or near the top. This class of furnace is usually known as an open fire or hearth, and is represented in a more advanced stage of development by the Catalan, German, and Walloon forges formerly used in the production of malleable iron, and still current to some extent in Sweden, Corsica, and a few places in central Europe. Figs. 1 and 2 represent a Catalan forge in use a few years since at Mont- gaillard, in Ariége, then one of the few localities in which the process survived. It is now probably com- pletely abandoned. In all of these the parts are essentially the same: the cavity in the ground is represented by a pit of square or rectangular sec- es e i AeA ot vealtls Fra. 1.—Elevation of Catalan Forge, acted on by heat, about 14 or 2 feet deep, usually some- ‘ what larger above than below, witha tuyere or blast pipe of copper penetrating one of the walls near the top, with a considerable downward inclination, so that the air meets

the fuel some way down. In the work of iron-smelting, the ore is laid in a heap upon the. fuel (charcoal) filling up the hearth, and is gradually brouglit to the metallic state by the reducing action of the carbonic oxide formed at the tuyere. The metal sinks through the ignited fuel, forming, in the hearth, a spongy mass or ball which is lifted out by the §jj; smelters at the end of each Lh operation, and carried to the { forge hammer. The earthy | t matters form a fusible glass or slag melt, and collect at the fill lowest point of the hearth, yy whence they are removed by & opening a liole pierced through the front wall at the bottom. The active portion of such a furnace is essentially that above the blast pipe, the function of the lower part being merely the collection of the reduced metal; the fire may therefore be regarded as burning in an unconfined space, with the waste of a large amount of its heating power. By continuing the walls of the hearth above the tuyere, into a shaft or stack either of the same or some other section, we obtain a furnace of increased capacity, but with no greater power of consuming fuel, in which the material to be treated can be heated up gradually by load- ing it into the stack, alternately with layers of fuel, the charge descending regularly to the point of combustion, and absorbing a proportion of the heat of the flame that went to waste in the open fire. This principle is capable of very wide extension, the blast furnace being mainly limited in height by the strength tle column of materials or "burden" lias to resist crushing, under the weight due to the head adopted, and the power of the blowing engine to supply blast of sufficient deusity to overcome the resistance of the closely packed materials to the free passage of the spent gases. The consuming power of the furnace or the rate at which it can burn the fuel supplied, is measured by the number of tuyeres and their section. In the largest modern blast furnaces used for smelting iron ores, they may be as many a3 six or eight, but as a rule the smaller number of from three to five of larger area is adopted, and with these there is no difficulty experienced in burning from 80 to 100 tons of coke per day in hearths of 5 to 7 feet in diameter.

The profile adopted for blast furnaces has been very much varied at different times. The earliest examples were invariably square or rectangular in horizontal section, and the same class of form has been retained in many instances up to the present time; but the general tendency of modern

practice is to substitute round sections, their construction being facilitated by the use of specially moulded bricks which lave entirely superseded the sandstone blocks formerly used. The vertical section, on the other hand, is subject to considerable variation according to the work to which the furnace is applied. Where the operation is simply one of fusion, as in the iron-founder's so-called cupola, in which there is no very great change in volume in the materials on their descent to the tuyeres, the stack is nearly or quite straiglit-sided, but when, a3 is the case with the smelting of iron ores with limestone flux, a large proportion of vola- tile matter has to be removed in the process, a wall of varying inclination is used, so that the body of the furnace is formed of two dissimilar truncated cones, joined by their bases as in fig, 3, the lower one passing downwards into a short, nearly cylindrical, position. 'The upper cone DC is known as the stack proper, the lower one, from the broadest part C to the tuyeres B, as the boshes, and the lower cylin- drical part AB as the hearth. The further consideration of this subject belongs, lowever, more particularly to the

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Fia. 2.—Elevation of Catalan Forge.

article Iron. It may be sufficient to say that all blast fur- naces of large size are more or less reducible to this pattern.

The use of bellows or of analogous con- trivances is not essen- tial to the working of stack furnaces; as the supply of air may, in furnaces of small size, be equally well ob- tained by thie draught of a chimney, or a steam jet aspirator. The former plan is adopted in the so- called economic fur- nace (horno economico) of the Cartagena lead district in Spain, used in re-smelting old slags and waste pro- ducts of the Roman mines, and the latter

in Woodward's and Treland's cupolas for iron foundries, In either case numerous holes representing tuyeres are provided around the lower part of the furnace, often in two rows at different heights. These furnaces have not, however, been very generally adopted; and even in Spain the chimney draught has in many instances been replaced by a fan blower.

A more primitive form of the same contrivance is still in use in Burmah,—the furnace, about 5 or 6 feet high, being placed on the side of a bank facing the prevailing wind, which enters through a series of small round tuyere holes. Similar contrivances were used by the ancient Celtic inhabitants of the Rhine valley,—the ruins of furnaces and slag heaps being found in the Nassau and Eifel hill countries, in high exposed situations far away from streams, whiere water power for bellows could have been obtained.

Reverberatory Furnaces.—Blast furnaces are, from the intimate contact between the burden to be smelted and the fuel, the least wasteful of heat; but their use supposes the possibility of obtaining fuel of good quality and free from sulphur or other substances likely to deteriorate the metal produced. In all cases, therefore, where it is desired to do tlie work out of contact with the solid fuel, the operation of burning or heat-producing must be performed in a special fire-place or combustion chamber, the body of flame and heated gas being afterwards made to act upon the surface of the material exposed in a broad thin layer in the work- ing bed or laboratory of the furnace by reverberation from the low vaulted roof covering the bed. Such furnaces are known by the general name of reverberatory or reverbatory furnaces, also as air or wind furnaces, to distinguish them from those worked with compressed air or blast.

Originally the term cupola was used for the reverberatory furnace, but in the course of time it has changed its mean- ing, and is now given to a small blast furnace such as that used by iron-founders,—reverberatory smelting furnaces in the same trade being called air furnaces.

Figs. 4, 5, and 6 represent a reverberatory furnace such as is nsed for the fusion of copper ores for regulus, and may be taken as generally representing its class. The fire- place A is divided from the working bed B by a low wall C known as the fire bridge, and at the opposite end there is sometimes, though not invariably, a second bridge of less

IX. — 106

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FURNACHE

height called the flue bridge D, A short diagonal flue or | takes the form of a sliding plate in the mouth of the con- up-take E conveys the current of spent flame to the chimney | necting flue, so that the draught in one may be modified

’ ¥id. 4.—Longitudinal section of Reverberatory Furnace.

¥ which is of square section diminishing by steps at two or three different heights, and provided at the top with

Fia. 5.—Reverberatory Furnace (horizontal section).

a covering plate or damper G, which may be raised or lowered by a chain reaching to the ground, and serves for

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Fie. 6.—Reyerberatory Furnace (elevation at flue end). regulating the speed of the exhaust gases, and thereby the draught of air through the fire.

Where several furnaces

without affecting the others. The fire bridge is partially protected against the intense heat of the body of flame issuing through the fire arch by a passage to which the air has free access. The material to be melted is introduced into the furnace from the hoppers HH through the charging holes in the roof. When melted the products separate on the bed (which is made of closely packed sand or other infusible substances), according to their density ; the lighter earthy matters forming an upper layer of slag are draw out by the slag hole K at the flue end into an iron waggon or bogie, while the metal subsides to the bot- tom of the bed, and at the termination of the operation is run out by the tap hole L into moulds or granulated into water. The opposite opening M is the working door, through which the tool for stirring the charge is introduced. It is covered by a plate suspended to a lever, similar to that seen in the end elevation (fig. 6) in front of the slag hole.

According to the purposes to which they are applied, reverberatory furnaces may be classed into two groups, namely, fusion or melting furnaces, and calcining or wasting furnaces, also called calciners. The former have a very extended application in many branches of industry, being used by both founders and smelters in the fusion of metals; in the concentration of poor metallic compounds by fusion into regulus; in the reduction of lead and tin ores; for refining copper and silver; for making malleable iron by the puddling processes and welding; and for the manufacture of carbonate from sulphate of sodium in chemical works, &c. Calcining furnaces have a less extended application, being chiefly employed in the conversion of metallic sulphides into oxides by continued exposure to the action of air at a temperature far below that of fusion, or into chlorides by roasting with chloride of sodium. As some of these substances (for example, sulphide of lead and copper pyrites) are readily fusible. when first heated, but become more re- fractory as part of the sulphur is dissipated and oxygen takes its place, it is important that the heat should be very carefully regulated at first, otherwise the mass may become clotted or fritted together, and the oxidizing effect of the air soon ceases unless the fritted masses be broken small again. This is generally done by making the bed of the furnace very long in proportion to its breadth and to

the fire grate area, which may be the more easily done asa not inconsiderable amount of heat is given out during the oxida- tion of the ore, —such increased length being often obtained by placing two or even three working beds one above the other, and allowing the flame to pass over them in order from below upwards. Such calciners are used especially in roasting zinc blende into oxide of zinc, and in the con- version of sulphides of copper into chlorides in the wet ex- traction process, In some processes of lead smelting, where the minerals treated contain sand, the long calciner is pro- vided with a melting bottom close to the fire-place, so that the desulphurized ore leaves the furnace as a glassy slag or silicate, which is subsequently reduced to the metallic state by fusion with fluxes in blast furnaces.

Muffle Furnaces.—A. third class of furnaces are so ar- ranged that the work is done by indirect heating; that is, the material under treatment, whether subjected to calcina- tion, fusion, or any other process, is not brought in contact either with fuel or flame, but is raised to the proper tem- perature by exposure in a chamber heated externally by the products of combustion. These are known as muffle or chamber furnaces; and by supposing the crucibles or retorts to represent similar chambers of only temporary duration, the ordinary pot melting air furnaces, and those for the reduc-

are connected with the same chimney stack, the damper tion of zinc ores or the manufacture of coal gas, may be in:

FURNACE

cluded in the same category. These are almost invariably air furnaces, though sometimes air under pressure is used ; as for example in the combustion of small authracitic coal, where a current of air from a fan- blower is sometimes blown under the grate to promote combustion.

Crucible Melting Furnaces.—Figs. 7 and 8 represent a series of one of the simplest furnaces of this class, the ordi- nary crucible air furnace, or pot c melting hole, according to the Sheffield term used in cast-steel works, Itis a chamber of brick- work a, either straight in the sides or more generally some- what barrel-shaped, with a grate at the bottom, and cf sufficient capacity to hold one or two crucibles b, containing from 50 { /qing to 70 ib

weight of steel each, [| enough room being left around them for coke to bring the con- tents up to the melting point in five or six hours. The crucibles) are supported upou disks, or) “cheeses” of fire-brick, placed upon the grate; the draught is (= eae . maintained by a chimney ¢ about “SSS SES 30 feet high, communicating Fic. 7.—Crucible Melting Fur- with the furnace by a short flue “°° (longitudinal section).

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near the top of the latter. The furnace is placed nearly or quite level.with the floor of the casting shop f, and covered with a square fire tile or quarry g, set in an iron frame with a projecting handle, the fire grate being accessible from the

cellar below.

Assayers’ Muffle Furnace.—The construction of a mufile ‘furnace as used by assayers has already been described in

the article ASSAYING, vol, il. p. 726. Itis simply a small square air furnace with a D-shaped chamber of fire- clay fixed in the middle, ¢ so as to be surrounded with incandescent fuel, a current of air being drawn through: it by a series of draught holes or slits in the roof or sides. Larger-sized muffles are used by enamellers and painters, and in the production of enamelled iron goods, as Fic. 8, —Crucible Melting Furnace well as for calcining minerals (transverse section). containing arsenic where it is to be collected for sale, and in the production of metallic colours where the material has to be kept free from the influence of flame and smoke, Furnace Materials.—The materials used in the construc- tion of furnaces are divisible into two classes, namely, ordinary, and refractory or fire-resisting. The former are used principally as casing, walls, pillars, or other supporting parts of the structure, and includes ordinary red or yellow bricks, clay-slate, granite, and most building stones ; while the latter are reserved for the parts immediately in contact with the fuel and flame, such

as the lining of the fire-place, the arches, roof, and flues, the lower part if not the whole of the chimney lining in reverberatory furnaces, and the whole of the internal walls of blast furnaces.' Among such substances are fire-clay and fire-bricks, certain sand- stones, silica in the form of ganister, and Dinas stone and bricks, ferric oxide and alumina, carbon (as coke and

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1 In the figures fire-brick work is represented by closer, and casing walls in ordinary bricks by more open shading.

graphite), magnesia, lime and oxide of chromium,—their relative importance being indicated by their order, the last two or three indeed being only of limited use.

The most essential point in good fire-clays, or in the

bricks or other objects made from them, is the power of re-. sisting fusion at the highest heat to which they may be exposed. This supposes them to be free from metallic ox- ides, forming easily fusible compounds with silica, such as lime or iron, the presence of the former even in compara-

tively small proportion being very detrimental, As clays they must be sufficiently plastic to be readily moulded, but at the same time possess sufficient stiffness not to contract too strongly in drying, whereby the objects produced would be liable to be warped or cracked before firing. In most cases, however, the latter tendency is guarded against, in making up the paste for moulding, by adding to the fresh clay a certain proportion of burnt material of the same kind, such as old bricks or potsherds, ground to a coarse powder. Coke dust or graphite is used for the same pur- pose in crucible making.

The most highly valued fire-clays are derived from the Coal Measures, Among tite chief localities are the neighbour- hood of Stourbridge in Worcestershire and Stannington near Sheffield, which supply most of the materials for crucibles used in steel and brass melting, aud the pots for

glass houses; Newcastle-on-Tyne, and Glenboig near Glasgow, where heavy blast furnace and other fire-bricks, gas retorts, &c., are made in large quantities. Coarse-grained but very strong fire-bricks are also made of the waste of the china clay works at Lee Moor, Devon. See Frre-Ciay.

In Belgium, the clay raised at Andenne is very largely used for making retorts for zinc furnaces, not for local use alone, as it is exported for the same purpose to England and other countries. The principal French fire-clays are derived from the Tertiary strata in the south, and more nearly resemble porcelain clays than those of the Coal Measures. They give wares of remarkably fine texture and surface, combined with high refractory character. The principal centre of manufacture is in Paris, where small crucibles, tubes, furnaces, and other articles for the use of assaying and chemical laboratories, as well as for gold and silver refining, are produced in large quantities.

In Germany, Ips and Passau on the Danube, and Gross Almerode in Hesse, are the best known localities producing fire-clay goods, the crucibles from the last-mentioned place, known as Hessian crucibles, going all over the world. These, though not showing a great resistance to extreme heat, are very slightly affected by sudden alternations in heating, as they may be plunged cold into a strongly heated furnace without cracking, a treatment to which French and Stourbridge pots cannot be subjected with safety. The Cornish crucibles used in copper assaying, made at Redruth, are generally similar in quality and behaviour to the Hessian, but are not quite so rapidly perforated by corrosive fluxes.

Plumbago or graphite is largely used in the production of crucibles, not in the pure state but in admixture with fire-clay ; the proportion of the former varies with the quality from 25 to nearly 5U per cent. These are the most enduring of all crucibles, the best lasting out 70 or 80 meltings in brass foundries, about 50 with bronze, and 8 to 10 in steel melting. The most important manufactory ‘5 that of the Patent Plumbago Crucible Company, Batter- sea, on the Thames, where the best Ceylon graphite is the basis of the composition employed. They are also made in all the principal crucible works of the continent of Europe and in the graphite-producing localities of Canada and the United States.

Silica is used in furnace-building in the forms of sand, ganister, a finely-ground sandstone from the Coal Measures

of Yorkshire, and the analogous substance known as Dinas clay, which is really nearly pure silica, containing at most about 24 per cent. of bases, Dinas clay is found at various places in the Vale of Neath in South Wales, in the form of a loose disintegrated sandstone, which is crushed between rollers, mixed with about 1 per cent. of lime, and moulded into bricks that are fired in kilns at a very high tempera- ture. These bricks are specially used for the roof, fire arches, and other parts subjected to intense heat in reverbera- tory steel melting furnaces, and, although infusible under Cedinary conditions, are often fairly melted by the heat without fluxing or corrosion after a certain amount of ex- posure. Ganister, a slightly plastic siliceous sand, is simi- larly used for the lining of Bessemer steel converters 3 it is found in the neighbourhood of Sheffield,

Alumina as a refractory matcrial is chiefly used in the form of an hydrated aluminous iron ore known as bauxete, found in the south of France, in Carniola, and in Antrim ; but its applications are somewhat special, It has been found to stand well for the linings of rotatory puddling furnaces, where, under long-continued heating, it changes into a substance as hard and infusible as natural emery. In the Paris Exhibition of 1878 bricks very hard and dense in character, said tobe of pure alumina, were exhibited by Muller & Co. of Paris, as well as bricks of magnesia, tle latter being specially remarkable for their great weight. They are intended for use at the extreme temperatures obtainable in steel fur- xian naces, or for the melting of platinum (.— before the oxy-hydrogen blowpipe. For the latter purpose, however, lime is generally used ; but as this substance has only small stability, it is usually bedded in a casing of fire-brick, Fig. 9 is a section of a lime furnace as used for platinum melting, The flame of the gis jet is introduced through the hole at the top, and plays over the surface of the metal in the hollow below. Oxide of chromium and chromic iron ore have been proposed as refractory crucible materials by Andouin of Paris. The former may be used as a bed for melting platinum in the same way as lime or magnesia, without affecting the quality of the metal.

Ferric oxide, though not strictly infusible, is largely used as a protecting lining for furnaces in which malleable iron is made, a portion of the ore being reduced and recovered in the process. In an oxidizing atmosphere it is indifferent to silica, and therefore siliceous bricks contain- ing a considerable proportion of ferric oxide, when used in flues of boilers, brewers' coppers, &c., and similar situations, are perfectly fire-resisting go long as the heated gas con- tains a large proportion of unconsumed air. The red fire- bricks known as Windsor bricks, which are practically similar in composition to soft red sandstone, are of this character.

Furnace Construction.—In the construction of furnaces provision lias to be made for the unequal expansion of the different parts under the effect of heat, This is especially necessary in the case of reverberatory furnaces, which are es- sentially weak structures, and therefore require to be bound together by complicated systems of tie rods and uprights or buck staves, The latter are very commonly made of old flat bottom rails, laid with the flat of the flange against the wall. Puddling furnaces are usually cntirely cased with iron plates, and blast furnaces with hoops round each course of the stack, or in those of thinner constructions the fire- brick Work is entirely enclosed in a Wrought iron casing Or Jacket. Such parts as may be subjected to extreme heat and the fretting action of molten material, as the tuyere and slag breasts of blast furnaces, and the fire

Lime Furnace,

FURNACE

bridges and bed plates of reverberatory furnaces, are often made in cast iron with double walls, a current of water or air being kept circulating through the intermediate space. In this way the metal, owing to its high con- ductivity and low specific heat as compared to that of water, is kept at a temperature far below its melting point if the water is renewed quickly enough, It is of course necessary in such cases that the circulation shall be perfectly free, in order to prevent the accumulation of steam under pressure in the interior of the casting, 'This method has received con- siderable extension of late years, notably in furnace-smelting of iron ores containing manganese, where the entire hearth is often completely water-cased, und in some lead furnaces Where no fire-brick lining is used, the lower part of the

furnace stack being a mere double iron box cooled by water sufficiently to keep a coating of slag adhering to the inner shell which prevents the rnetal from being acted upon,

Furnaces with special Methods of Firing.—In the examples litherto noticed, the use of solid fuel has alone been con- sidered, whether in admixture with the charge in blast furnaces or burnt upon a grate in reverberatory furnaces, In either case the useful heating effect realized is consider- ably below that indicated as possible by theory, and for the same reason, namely, that the carbon factor of the fuel is to a considerable extent only partially oxidized, producing carbonic oxide CO, instead of carbonic acid CO,, as it should do if the combustion were complete, This is attended with great loss of heat, unless steps be taken to ensure the sub- sequent combustion of the carbonic oxide, by bringing it into contact with more air at an appropriate temperature, The production of carbonic oxide is a necessary consequence where coal is used in large masses, the carbonic acid in the gases resulting from complete combustion at any spot being reduced more or less completely to carbonic oxide by contact with the ignited carbon immediately adjacent. To obtain the most perfect combustion it is, therefore, essential that the layer of fuel upon the bars in a grate fire should be as thin as is consistent with preventing the passage of an undue amount of air, which is attended with a strong cooling effect. This condition is, however, only possible in such furnaces as require an oxidizing atmosphere, as, for example, boiler fires and the different forms of calciners,

Coal-Dust Furnace. —A special method of providing more intimate contact between air and fuel has been adopted in a furnace designed by Mr T. R. Crampton, who grinds the whole of the coal toa fine powder in a flour mill, and pro- pels a current of coal dust and air, mixed in the right pro- portion for burning, into the combustion chamber represent- ting the fire-place of an ordinary furnace, either by a fan blower or by chimney draught. ° In the special application of welding iron considerable economy has been obtained with this furnace over ordinary coal-firing, but its use has up to the present time been exceedingly limited.

Gas Furnaces.—A more general remedy has been found in what is known as gas-finng, where the whole of the fuel is of design first imperfectly

burned, 7.e., converted into car- bonic oxide or rather into a mixture of carbonic oxide and nitrogen, by reducing the supply of air through the grate to a minimum and completing the combustion on the fire bridge by a further supply of air introduced through special channels either at ordinary atmospheric temperature or artificially heated. In this case, the fire-place proper is replaced by a gas-producer or gazogene, which may either form one construction with the other parts of the furnace or be separated from them. Fig. 10 represents a gas-producer intended for heating retort furnaces in gas works, The coal is charged into a deep barrel-shaped stack a, terminated below by a small inclined grate 6, with flat bars placed edge-wise, like the steps of a ladder or the laths of a Venetian blind, allowing suflicient.air to pass between for a smothercd

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combustion, the gases produced passing out by the large flue c. 'The charging hole d is covered by a closely fitting valve making a gas-tight joint, the escape of gas being prevented by the great thickness of coal above the

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Gas-producer (transverse section).

flue and the strong draught in the latter. From the ex- ceedingly poisonous nature of carbonic oxide it is of the utmost importance to prevent the issue of unburnt gas; and if this cannot be prevented, the escape must be fired when the charging hole is opened. This is regularly done in blast furnaces working with gas-collecting flues, and even the native iron-smelters of India, in starting their small furnaces with stacks only a few feet high, observe the same precaution. Another point of equal importance is to pre-vent the access of air to the gas anywhere except at the point of ignition. Any leakage of air into the gas flues must as a rule produce explosion, An ingenious and efficacious method of establishing the draught in gas-

producers is adopted by Dr C. W. Siemens. The gas delivery tube rises to a certain height, is then laid horizontal for a short distance, and finally descends verti- cally to the original level. The gas in passing along the horizontal tube loses heat by radiation, and on arriv- ing at the downward tube is sensibly denser than when it started, so that the second vertical tube acts as siphon and maintains constant exhaust on the producer. In some cases the gases from the fuel are modified in composition by an injection of steam from a pipe below the grate e (fig. 10), which, impinging upon ignited coal, is decomposed into hydrocarbon and carbonic oxide gases. This transforma- tion is necessarily attended with considerable cooling effect, from the large amount of heat expended in the decomposi- tion of water, so that the method is only of limited appli- cation; but the "richness" or fuel value of the gases is very considerably increased by its use. It is more particularly of value with dry or anthracitic coals. The gas-producer is used with advantage with very inferior fuels, such as peat, lignite, sawdust, &c., containing much ash and water, and if the latter be removed by passing the crude gas through a condenser, according to the method adopted by Lundin in Sweden, the poorest material, such as wet sawdust, may be employed for puddling and steel melting, operations that require the highest attainable temperatures.

Mechanical Furnaces.—The introduction and withdrawal of the charges in fusion furnaces is effected by gravitation, the solid masses of raw ore, fuel, and flux being thrown in at the top, and flowing out of the furnace at the taphole

or slag run at the bottom. Vertical kilns, such as those used for burning limestone and iron ores, are worked in a similar manner,—the raw stone going in at the top, and the burnt product falling through holes in the bottom when allowed to do so. With reverberatory calciners, however, where the work is done upon a horizontal bed, a consider- able amount of hand labour is expended in raking out the charge when finished, and in drawing slags from fusion furnaces; and more particularly in the puddling process uf refining iron the amount of manual exertion required is very much ercater. To diminish the item of expenditure on this head, various

kinds of mechanical furnaces have been adopted, all of which canbe classified under three heads of gravitating furnaces, mechanical stirrers, and revolving furnaces.

1. In grauitating furnaces the bed is laid at a slope just within the angle of repose of the charge, which is introduced at the upper end, and is pushed down the slope by fresh material, wlien necessary, in the contrary direction to the flame which enters at the lower end. This method is used in Styria for burning the dust of spathic iron ore which cannot be put into the kilns with the large lumps. The fuel used is blast furnace gas, the calciuers being directly over the furnace top. Gerstenhofer's pyrites burner, another furnace of this class, has a tall, vertical chamber heated from below, and traversed by numerous narrow horizontal cross bars at different heights. The ore in fine powder is fed in at the top, through a hopper, in a regular thin stream, by a pair of rollers, and in falling lodges on the flats of the bars, forming a talus upon each of the height corresponding to the angle of rest of the material, which is, however, at short intervals removed to lower levels by the arrival of fresh ore from above. In this way a very large surface is exposed to the heat, and the ore, if containing sufficient sulphur to maintain the combustion, is perfectly burned when it arrives at the bottom ; if, however, it is imperfectly sized or damp, or if it contains much earthy matter, the result is not very satisfactory. Stetefeld's furnace, used for the conversion of sulphuretted silver ores into chlorides, is of a somewhat similar character. It is now largely used in the silver mines of the western States of America.

2. Mechanical stirrers constitute a second division of mechanical furnaces, in which the labour of rabbling or stirring the charges is performed by combinations of levers and wheel-work taking motion from a rotating shaft, and more or less perfectly imitating the action of hand labour. They are almost entirely confined to puddling furnaces, and have not been very generally adopted for these.

8. Revolving furnaces, the third and most important division of mechanical furnaces, are of two kinds. The first of these resemble an ordinary reverberatory furnace by having a flat bed which, however, has the form of a circular disk mounted on a central shaft, and receives a slow movement of

rotation from a water-wheel or other motor, so that every part of the surface is brought succes- sively under the action of the fire, the charge being stirred and ultimately removed by passing under a series of fixed scraper arms placed above the surface at various points. Brunton's calciner, used in the "burning" of the pyritic minerals associated with tin ore, is the most familiar example of this type. The revolving hearth is also repre- sented in Pernot and Pousard's steel-melting furnaces. In these, however, the hearth rotates on an inclined axis, so that the path of its surface is oblique to that of the flame. In the second class of revolving furnaces the working part is a hollow cylinder, between the fireplace and flue, with its axis horizontal or nearly so, whose inner surface represents the working bed. It is mounted upon friction rollers, and reccives motion from a special steam

engine by meansofacentr elt of spur gearing. Furnaces of this kind were first used in alkali works for the conversion of sulphate into carbonate of sodium in the process known as black ash fusion, but have since been applied to puddling in America and elsewhere by Danks and others; but for the latter purpose they are still to some extent in the experi- mental stage. As calciners they are used in tin mines and for the chlorination of silver ores.

Use of Heated Air.—The calorific intensity of fuelis found to be very considerably enhanced, if the combustion be ef- fected with air previously heated to any temperature between that of boiling water and a dull red heat, the same effect being observed both with solid and gaseous fuel. The latter, especially when brought to the burning point at a high temperature, produces a heat that can be resisted by the most refractory substances only, such as silica, alumina, and magnesia, This is attained in the regenerative furnace of Siemens, detailed consideration of which belongs more properly to the subject of iron.

Economy of Waste Heat and Gas.—In every system of artificial heating, the amount of heat usefully applied is but a small proportion of that developed by combustion. Even under the most advantageous application, that of evaporation of water in a steam boiler where the gases of the fire have to travel through a great length of flues bounded by thin iron surfaces of great

heat-absorbing capacity, the tempe- rature of the current at the chimuey is generally much above that required to maintain an active draught in the fire-place; and other tubes containing water, often in considerable numbers, forming the so-called fuel economizers, may often be interposed between the boiler and the chinmcy with marked advantage as regards saving of fuel. In re- verberatory and air furnaces used in the different operations of iron manufacture, where an extremely high temperature has to be maintained in spaces of comparatively small extent, such as the beds of puddling, welding, and stcel-melting furnaces, the temperature of the exhaust gases is exceedingly high, and if allowed to pass directly into the chimney they appear as a great body of flame at the top, It is now general to save a portion of this heat by passing the flame through flues of steam boilers, air-heating apparatus, or both—so that the steam required for the necessary operations of the forge and heated blast for the furnace itself may be obtained without further expenditure of fuel. perfect method of utilizing the waste heat hitherto applied is that of the Siemens regenerator, in which the spent gases are made to travel through chambers, known as regenerators or recuperators of heat, containing a quantity of thin fire-bricks piled into a cellular mass so as to offer a very large heat-absorbing surface, whereby their tem- perature is very considerably reduced, and they arrive at the chimney at a heat not exceeding 300 or 400 degrees, As goon as the bricks have become red hot, the current is diverted to an adjacent chamber or pair of chambers, and the acquired heat is removed by a current of cool gas or air passing towards the furnace, where it arrives at atemperature sufficiently high to ensure the greatest possible heating effect in combustion. This system being alternative, four regene- rators, two for air and two for gas, are required for each furnace ; but in some of the newer French patterns of so- called recuperative furnaces, a system of tubular bricks is adopted in the chambers and only the air is heated, the gas being brought hot from the producer to the furnace instead of cooling it first by atmospheric exposure in a long tube in the manner adopted by Siemens. This allows a consider- able simplification in the apparatus; only a single regene- rator is required working continuously, the flame travelling outwards though one set of passages in the bricks and the air inwards through another ; and as the former consists only of burnt gases, no explosion can take place if a comimuni-

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cation be established between the two currents through a leaking joint or broken brick.

escaping at as high sensible temperatures as those of the fur- naces previously considered, are of considerable fuel value, and may render important services if properly applied. Owing to the conditions of the work, which require the maintenance of a sensibly reducing atmosphere, they contain a very notable proportion of carbonic oxide, and are drawn off by large wrought-iron tubes near the top of the furnace and conveyed by branch pipes to the different boilers and air-heating apparatus, which are nowas arule entirely heated by the combustion of such gases. allowed to burn to waste at the mouth of a short chimney place above the furnace top, forming a huge body of flame, which was one of the most striking features of the Black

than formerly, Perhaps the greatest number of flaming fur-

The most |

In iron-smelting blast furnaces the waste gases, though not

Formerly they were

Country landscape at night, but is now less commonly seen

naces to be seen at present are those of the Scotch founding iron district about Gartsherrie, Coatbridge, &c.

Figs. 11, 12, and 13 represent a modern furnace heated by gas burnt with hot air as applied to heating

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Fic. 11.—Gas-heated Retort Furnace-(transverse section on A B fig. 18).

gas retorts. The retorts of fire clay r r 7, seven in number, are mounted upon supports at both ends in

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\ \’WEELEEEE 57 SE EELLL EE y; Zs 277 Sell NN ve meal <—e GN f VY OR a rnc Facies 20% ALL Yr Yy Y —Wo0 Yl Yj} Fig. 12,—Gas-heated Retort Furnace (longitudinal section on C D fig. 11).

an arched chamber having a long flue running along the centre line at thé bottom, covered with bricks pierced at

FU R—

intervals by narrow slits aa a, which form the gas admission passages from the gas-producer flue /, the supply being regu- lated by a valve v. These alternate with similar slits 6 6 of less depth, communicating with a lateral flue, supplying

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Fria. 18.—Gas-heated Retort Furnace (horizontal section on E F fig. 11).

heated air ; the mixture being effected at a great number of points ensures uniformity of combustion along the whole length of thefurnace. The flame, after heating the retorts, descends ~~by passages under the ends of the side retorts in the lower series toa number of arched divisions in the sub~~ structure containing the air-heating pipes, which are of cast iron in horse-shoe coils. By this means the temperature of the gases is considerably reduced by the time they reach the chimney flue, the heat intercepted being returned by the air to the combustion chamber.

Laboratory and Portable Furnaces,—Small air-furnaces with hot plates or sand bath flues were formerly much employed in chemical laboratories, as well as small blast furnaces for crucibles heated with charcoal or coke. The use of such furnaces has very considerably diminished, owing to the general introduction of coal gas for heat- ing purposes in laboratories, which has been rendered possible by the invention of the Bunsen burner, in which the mixture of air and gas giving the least luminous but most powerfully heating flame is effected automatically by the effluent gas. These burners, or modifications of them, have also been applied to muffle furnaces, which are convenient when only a few assays have to be made — the furnace being a mere clay shell and soon brought to a working temperature; but the fuel is too expensive to allow of their being used habitually or on a large scale. Petroleum, or rather the heavy oils obtained in tar refineries, having an equal or superior heating power to coal gas, may also be used in laboratories for producing high temperatures. The oil is introduced ina thin stream upon a series of inclined and channelled bars, where it is almost im- mediately volatilized and burnt by air flowing in through parallel orifices. Furnaces of this kind may be used for melting

cast-iron or bronze in small quantities, and were employed by M. St Claire Deville in experiments in the metallurgy of the platinum group of metals.

Sefstrom's blast furnace, used in Sweden for the assay of iron ores, is one of the most convenient forms of portable furnaces applied to melting in crucibles. It consists of a sheet-iron cylinder about 8 or 9 inches in diameter, within which is fixed one of smaller size lined with fire-clay, as shown in part section in fig. 14. The space between the two cylinders serves as a heater and distributor for the blast, which is introduced through the nozzle at the bottom, and enters the furnace through a series of several small tuyeres

eu 847 arranged round the inner lining. Charcoal is the fuel used, and the crucibles stand upon the bottom of the clay lining. When a large body of fuel is required, the cylinder can be lengthened by an iron hoop which fits over the top ring. Deville's portable blast furnace is very similar in principle to the above, but the body of the furnace is formed of a single cast-iron cylinder lined with fire-clay, closed below by a cast-iron plate perforated by a ring of small holes—a

Fia. 14.—Sefstrom's Portable Blast Fur- nace,

'| hemispherical basin below forming the air-heating chamber.

The literature of furnaces is co-extensive with that of metallurgy. Most of the different patterns in use will be found described and fully illustrated in Percy's and Phillip's Metallurgy, Jordan's Album du Cours de Métallurgie,&c. The atlas to Karsten's great work, and the plates in the Eneyclopédie Méthodique, are also of much interest, but the types of apparatus represented are chiefly antiquated and out of use. (H. B.)

FURNITURE is the name, of obscure origin, used to describe the chattels and fittings required to adapt houses, churches, ships, &c., for use. The sculptures, paintings, and metal work of antiquity, of the Middle Ages, and of the Renaissance, now kept in museums and private collections, have, with few exceptions, formed part of decorations or of furniture made for temples, churches, or houses. Most of our ancient bronzes, if not images taken from ancient shrines, are pieces of mirrors, tripods, altar vessels,

even the dishes and pans of the kitchen. Wood, ivory, precious stones, bronze, silver, and gold have been used from the most ancient times in the construction or for the decoration of seats, chests, tables, and other furniture, and for the shrines and altars of sacred buildings.

The kind of objects required for furniture have varied according to the changes of manners and customs, as well as with reference to the materials at the command of the workman, in different climates and countries. Of the furniture of the ancient Egyptians there remain several examples. The British Museum contains six chairs, about the same in height as those now used. One is of ebony, turned in the lethe and inlaid-with collars and dies of ivory. It is low, with a back ; and both back and legs are strengthened with rails of cane. The seat is of plaited cane slightly hollowed. Another is shaped out of two frames of four pieces of wood each, hinged in the centres of the longer sides, the lower ends carved into the form of the heads of animals; the seat has been made of skin or other flexible material so as to fold flat. Some Egyptian couches and seats had the legs carved like those of panthers ; some had the arms or seat supported by fignres representing slaves or captives taken in war. They were upholstered with rich stuffs and are accurately represented in wall paintings (see the great French work, Description de Egypte). Workmen's tables, massive blocks of wood with four plain legs, and head rests hollowed out, standing 9 or 10 inches high, are preserved in the British Museum,— some being of alabaster, probably for the sake of coolness. Painted wooden chests, with convex lids (not hinged), and mummy cases can be seen both in the British Museum and in the Louvre in Paris.

The excavations of Nineveh have brought to light sculp- tured representations of Assyrian seats. They were mas- sive, the ends of the seat frame projected in the shape of rams' heads ; in some instances figures of captives support the arms; in one described by Sir H. A. Layard, two horses resting on the lower bars from front to back support the seat. The seats were cushioned or upholstered with rich materials. An elaborate piece of carved ivory, with depressions to hold coloured glass, agate, &c., from Nineveh, now in the British Museum, has been inlaid into a throne,

—showing that such objects were sometimes richly deco- rated. The carving is apparently of Egyptian origin. The furniture of the Assyrians was more massive, and less varied and elegant in execution, than that of the Egyptians.

Greek seats(thronoz) are sculptured in the Parthenon frieze now in the British Museum. They resemble turned wood structures, though perhaps representing bronze. The arms are low and straight, and the backs upright. A curious chair of this kind is represented on one of the bas reliefs from Xanthus (British Museum). In the same collection will be seen statues seated in chairs framed in square bars, the horizontal pieces morticcd into the upright, and these details are carefully represented in marble. Certain far- famed gold and ivory statues of colossal size, at Olympia and other places, werc represented seated. The bars and frames of the chairs, and of the footstools and pedestals, were constructed of cedar wood, coloured and inlaid with plates of seulptured ivory, and of gold and other precious materials. A sacred chest with carved lid, a table covered with ivory carvings, and other objects in these shrines are described by Pausanias. Unfortunately we have but his verbal accounts of them (see Q. de Quincy, Jupiter Olympien, in which careful engravings are given of their probable shapes). Chairs of the shape in general use forty or fifty years ago (the front and back legs curved outwards, with a plain piece of wood curved to fit the shoulders for the tap rail of the back) are not uncommon in paintings on vases. The vase rooms of the British Museum and the Louvre give frequent illustrations of chairs, couches, &c, as well as of the stuffs used in upholstering them. Sumptuous Greek furniture, during the last two centuries B.c., was made of bronze, damascened with gold and silver.

The Romans employed Greck artists and workmen. Their chairs, couches, and seats were of similar shape to those of the Greeks. During meals men reclined on couches each made to hold three persons; a low rail protected the back ; three of these couches surrounded the table at entertain- ments, leaving the fourth side open for service. The de- coration consisted of rich coverings, constantly changed to suit the season, or in honour of the gnests. Wonien sat during meals. The sed/a curults, a folding cross-shaped seat, was carried in the chariot, and used in the forums, baths, lecture halls, &c. It was often inlaid with ivory. Sela, square seats of bronze, were also often

carried about, as well as footstools, the former raising the sitter above the heads of humbler persons. Couches, covered with tilts and curtains, could be carried by slaves, and used as litters. Four silver figures of the 4th century, representing the capital cities of the empire, now in the British Museum, are considered to have ornamented the ends of the poles or shafts of a litter. Tables were of marble, resting on sphinxes or other animals. Dining tables were of wood, curiously veneered, to which a high value was often attached, They rested on tripods or frames of four or of six legs, ornamented with figures, busts, animals, &c., in bronze. Tables were changed with each course. Tables were sometimes protected by rims or borders, sometimes rested on feet of carved ivory. Books and other property were kept in scrinia, round chests that could be fastened. Clothes and provisions had special rooms to hold them. In the later ages of the empire, in Rome, and afterwards in Constantinople, gold and silver were plentiful for furniture; even cooking and common house vessels were occasionally made in those metals.

The chair of St Peter in Rome, a solid square scat, with pedimental back and panelled with carved ivory, that of St Maximian in the cathedral of Ravenna, round backed, with arms also panelled with carved ivory, and many re- presentations on carved ivory diptychs or tablets, will give the student a correct notion of the furniture of the divided empire. he character of the enrule chair

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survived and may be recognized in the Bayeux tapestry (St Edward's scat), and in many medieval paintings. The architectural features so prominent in much of the medieval furniture begins in these Byzantine and late Roman thrones. These features became paramount as Pointed architecture became general in Europe, and scarcely less so during the Renaissance. Most of the medieval furniture, chests, seats, trays, &c., of Italian make were richly giltand painted, In northern Europe carved oak was more generally used. The coronation chair in Westminster Abbey, made for Edward I. in the 13th century, has a gabled and crocketed back, is panelled with tracery work,

-and rests on carved lions,—the whole gilt and painted.

State seats in feudal halls were benches with ends carved in tracery, backs panelled or hung with cloths (called cloths of estats), and canopies projeeting above. Bed- steads were square frames, the testers of panelled wood, and resting on carved posts. Chests of oak carved with panels of tracery, or of Italian cypress (when they could be imported), were used to hold and to carry clothes, tapestries, &e., to distant castles and manor houses; for house furniture had to be moved from place to place. A chest of the reign of John is kept in the castle of Roekingham. Many can be seen in old parish churches, and in the South Kensington Museum, the Louvre, and many other Continental galleries. Jarved stalls covercd by elaborate tabcrnacle work remain in many cathedrals and churches. The Hotel de Cluny in Paris contains numerous examples of this kind of wood work. Altars were backed by paintings in canopied frames, closed by shutters, which werealso painted insideand outside. In some German churches, ¢.g., the cathedrals of Hildesleim and of Miister in Westphalia, the entire picture (as well as the shutters) was made to open out, showing ingenious receptaclesfor reliquaries within, Copes and other vestments were kept in semicircular chests with ornamental lock plates and iron hinges; an example is preserved in Wells cathe- dral. The splendour of most feudal houses depended on pictorial tapestries which could be packed and carried from plaee to place. Wardrobes were rooms fitted for the recep- tion of dresses, as well as for spices and other valuable stores. Excellent carving in relief was executed on caskets, which were of wood or of ivory, with painting and gilding, and decorated with delieate hinge and lock metal work. The general subjects of sculpture were taken from legends of the saints or from metrical romances.

Renaissance art made a great change in architecture, aud this change was exemplified in fnrniture. Cabinets and panelling took the ontlines of palaces and temples ; sometimes they were actually constructed in perspective, e.g.,asmall theatre front at Vicenza, the work of the younger Palladio. Curious internal fittings were arranged in cabinets, still following the details of architectural interiors, In Florence, Rome, Venice, Milan, and other capitals of Italy, sumptuous cabinets, tables, chairs, chests, &c., were made to the orders of the native princes. Vasari (Lives of Painters) speaks of scientific diagrams and mathe- matical problems illustrated in costly materials, by the best artists of the day, on furniture niade for the Medici

family. The great extent of the rule of Charles V. helped to give a uniform training to artists from various countries resorting to Italy, so that cabinets, &c., which were made in vast numbers in Spain, Flanders, and Germany, can hardly be distinguished from those executed in Italy. Francis I, and Henry VIII. encouraged the revived arts iu their respective dominions, Examples of 16tli-centery chests, cabinets, tables, seats, sideboards, &c., can be seen in museums, and in many private houses. Petra dura, or inlay of hard pebbles, agate, lapis, lazuli, and other stones, ivory carved and inlaid, carved and gilt wood, marquetry or venesring with thin woods, tortoiseshecll, brass, dc., were

FURNITURE

used in making sumptuous furniture during the first period of the Renaissance. A folding chair of wrought iron (made at Augsburg), with numerous groups of figures in complete relief, is preserved at Longford Castle, Wiltshire. Mirrors, caskets, and other objects in damascened iron (Milan) are shown in the South Kensington Museum. Subjects of carving or relief were generally drawn from the theological and cardinal virtues, from classical mythology, from the seasons, months, &c. Carved altarpieces and woodwork in churches partook of the change instyle. The stalls of the cathedral of Amiens, of the Certosa of Pavia, the cathedral of Siena, and a great number of churches in Venice, Florence, Rome, Perugia, and other Italian cities, illustrate first the transition, then the full change from Gothic to classic detail in ecclesiastical furniture.

The elegance of form and perfection of detail, which are noticeable in the furniture of the 16th century, declined during the 17th all over Europe. The framework became bulky and heavy, and the details coarse. Silver furniture was made in considerable quantities by the Spaniards in Spain and Italy, and it was used in the courts of the French and English kings. A few examples of silver tables, mirrors, &c., now in Windsor Castle and at Knole, in Kent,

are reproduced in electrotype in the South Kensington »

Museum. To this period belongs the name of André Charles Boule, who furnished the palace of Versailles. He invented or perfected a beautiful

system of veneering with brass and tortoiseshell, brass and ebony, occasionally using white metal besides. Examples of this buhl or boule are shown in the Apollo gallery of the Louvre.

The system of veneering, or coating common wood with slices of rare and costly woods, fastened down with glue by screw presses made to fit the surface to be covered, came into general use in the 18th century. Marquetry is veneer of different woods, forming a mosaic of pictorial or orna- mental designs. In Italy, in Spain, and throughout the dominions of Charles V. and his successors, figure subjects, architectural views, and quaint interiors were represented in these materials. Usually two or three woods were employed ; they were tinted by means of heated sand in iron frames, and the tints graduated to the utmost nicety. Sometimes these effects were produced by splitting and laying slices of the same wood with the grain running in different directions. The fine marquetry of the last cen- tury was made of tulip wood or mahogany, with lime, pear, holly, beech, and other light-coloured woods ; sometimes in ebony and ivory, in Italy particularly ; or ebony and mother- of-pearl, the latter in Holland. Woods were occasionally stained green, blue, and other colours, but these tints were sparingly employed by the more fainous makers. Curiously grained specimens of mahogany, known as letter wood and by other names, were used for veneering late in the century by the ciselewrs or makers of rich brass and gilt metal edgings, which that wood shows off to perfection. The golden-coloured satin wood, which was imported towards the end of the last century, was much used as a ground in English marquetry.

Looking-glasses in large sheets began to be exported from Venice at. the end of the 17th century; some were engraved with figures on the backs. The manufacture was established at Tourlaville, then in Paris, and about the same time at Battersea on the Thames—under Govern- ment protection in both countries. The light fantastic frames which came into fashion in France were called rococo (from roguaille, coquaille, rock and shell work). Carved and gilt furniture was made in Italy, where it was best designed, and all over Europe till late in the 18th century. Robert Martin, who used fine lac polish, gave the name of " Vernis Martin" to painted and polished furniture of all. kinds, from carriages and wardrobes

to faus and snuff-boxcs. He died in 1763. The dis- covery of Herculaneum and Pompeii about the middle of the last century turned attention to the elegant designs of the Greco-Roman period. Jiesener, David Roentgen (known as David), and the ciselewr Gouthiére are well known names of French cabinetmakers; Chippendale,

-Lock, Sheraton, and Heppelwhite were Englishmen of

the same period—the last half of the 18th century. James and Robert Adam designed beautiful satin wood and other furniture at that date. Medallions of porcelain were sometimes inlaid in cabinet fronts. Most of these manufactures came to an end during the French Revolu- tion and the long war. The "empire" style, a" stiff, affected classicalism, prevailed in France during the reign of Napoleon. It is shown in the metal mounts of veneered mahogany furniture, and in the carvings of chair legs and backs.

A return has been made during recent years to medieval designs. In England there is a going back to the fashions prevalent during the first fifty years of the last century. The elegant Louis XVI. style is more popular in France.

As regards furniture of the day, and the proprieties which ought to be observed in form and decoration, it is a matter of regret that no definite style is recognized in Europe ; there cannot but be some consequent waste of power and uncertainty of aim. A few general principles, however, are held to be applicable to the shape and arrangements of furniture of whatever style.

Bedsteads are now very generally made of iron in most countries of Europe. They are plain; the portions not covered with hangings are made in brass, or coated with enamelled paint. In most cases no attempt is made to de- corate them. They are clean, and easily taken to pieces and moved. They need no criticism. Bedroom furniture is no longer as rich or costly as when it was the fashion to include state bed-chambers among suites of rooms thrown open for the entertainment of guests. Wardrobes, chests of drawers, toilet tables, are only required to be of suitable size, and as conveniently

arranged inside as possible, in order that light and heavy objects may be put away so as to be got at with the least possible exertion. Such pieces of furni- ture should have no projections of cornices or ornaments which do but take up space. Light-coloured woods, with the simplest decorations, are preferred, on account of their freshness and cheerfulness. Common timber, such as pine, ash, oak, maple, &c., French polished, with coloured lines sparingly employed, are much used by London makers for bedroom furniture; but they are less durable than maho- gany. Imitations of graining are general—indeed the prac- tice was common even in ancient Rome. But the Japanese methods of staining, powdering with gold dust, and polish- ing common timber without hiding the grain, deserve adoption; and efforts have latterly been made in London to bring them into use.

Chairs.—The good construction of chairs is a test of workmanship. Ifthe wood is well seasoned, the tenons and mortices cut with exactness, the glue hot and good, and proper pressure used in putting them together, the various parts of chairs should be as perfectly united as if the wood had grown in the form required. Sir G. Wilkinson speaks of the admirable skill of the makers of Egyptian chairs, which required no cross bars to the legs. Lightness is another requisite. Very light chairs made of white wood with plaited grass seats are made at Chiavari in Italy. Large manufactories of chairs are carried on at High Wycombe, and other places where beech timber is easily obtained. If chairs are carved, the carving should be so subordinate to the outline and the comfort of the sitter as not to interfere with the dress, or be. liable to breakage from having salient points, masses, or ornaments, The

mahogany carved chairs of Chippendale and Sheraton are often copied, but the repetitions have not the spirit of the originals. The slight irregularities and variations made by carvers, who never absolutely repeat themselves in a series or set of such pieces, save them from the monotony so often seen in copies.

Couches.—In ancient tines couches were used as actual beds, A cast of an antique bronze couch can be seen in the South Kensington Museum. The general shape has not changed in modern times. It is the chair without arms elongated or the arm chair widened. The proprieties ob- served in such furniture are such as are applicable to chairs. If parts of the furniture of state rooms, they are generally framed in wood, carved and gilt or painted. The seats, backs, and ends are stuffed and upholstered with rich materials, like the chairs,—the most costly material being tapestry, formerly woven in fanciful designs after Boucher, Fragonard, and other "genre" painters, in the looms of Beauvais, or, in England, of Mortlake and Soho. Such tapestries can seldom be procured now. Inferior imita- tions of these designs are still produced. Couches or sofas of this kind are made for conversation rather than repose, and admit of the backs being shaped in curves or carved at the top, provided that the inequalities are but slight (a rule often violated in cheap modern furniture), and the carvings so arranged as not to interfere with the comfort of sitters, or of those who may occasionally lean on them, The ends should generally be square. In rooms not intended for receptions shallow couches, with rounded ends, and awk- ward showy carvings on the backs, are out of place. Another kind of couch, thickly stuffed on the back, ends, and seat, may be considered as the Oriental divan raised on legs. It is practically a framework of fixed cushions, in- tended for repose. Its excellence depends on the uphol- stery, as does that of the modern stuffed arm chair.

Tables. —Good workmanship and careful regard for com- fort and use are absolutely uecessary in making tables. They are to be firm, and easily moved, and the legs or sup- ports out of the way of persons sitting at them; their proper ornamentation is veneer of fine grained wood, split and arranged in patterns or buhl and other marquetry. Carved and gilt tables with marble tops, made as ornaments to galleries and halls, should have the carvings so arranged as not to interfere with the general look of support, or be too liable to breakage. The same may be said of side- boards. Much skilful carving on such pieces is either too close an imitation of nature, and looks as if it were hung on, not part of, the structure, or is crowded and not ar- ranged in parts in which it would be subordinate to lead- ing lines of division, panels, borders, &c.

Cabinets. —Cabinet fronts are flat, with metal edgings, or shallow and delicate carvings; or they are subdivided by architectonic members, columns, deep mouldings, &c. In divisions protected by these salient features carvings of regular figure compositions are in place. The interiors may be subdivided into any varieties of quaint and ingenious drawers and receptacles. It is to cabinets that the greatest skill is devoted. The perfect fitting of small interior drawers, é&c., is a test of excellence in workmanship. On cornices, brackets, and other projections, busts, figures, and carving of the finest kind can be placed effectively,—great care being taken not to break up running mouldings, cor- nices, and other members that mark the structure, or form lines of division. The French, and after them the Italians, are the first masters of this kind of carving. London cabinetmakers rarely attempt the figure. A cabinet by Fourdinois (No. 721°69) in the South Kensington Museum, purchased from the exhibition of 1867, may be referred to for careful observation of these proprieties; even the mould- ings of the panelling are covered with carving, but so delicate

as not to interfere with their general outlines or surfaces. An example of flat carving may also be seen in a Flemish

17th century ebony cabinet in the same collection (No. 1651‘56). As to the proper arrangements and colours of

marquetry decoration, there also the masses of the design should be symmetrical, or balanced by compensating parts

where absolute symmetrical arrangement is not suitable.

In marquetry, as in carving, there ought to be agreeable

dispositions of lines and masses of ornament, such as will look in proportion at distances at which details are not distinguishable. The colours should be few and harmoni- ous, even when the materials are contrasted as decidedly as ebony with ivory, or satin wood with mahogany. We may compare the crowded patterns and the garish contrasts of colour of much modern marquetry with the work of Riesener. His marquetry is laid

out with diapers of two woods, or with medallions and pattern work,—much space being left plain. A good example is in the large secrétaire now in the Louvre, signed and dated 1769. The same may be said of Chippendale's furniture, and of that in satin wood designed by the brothers Adam in the last century.

The manufacture of furniture is, to a great extent, in the hands of large factories both in England and on the Con- tinent. Owing to the necessary subdivision of labour in these establishments, each piece of furniture passes through numerous distinct workshops. The master and a few work- men formerly superintended each piece of work, which, therefore, was never far removed from the designer's eye. Though accomplished artists are retained by the manufac- turers of London, Paris, and other capitals, there can no longer be the same relation between the designer and his work. Many operations in these modern factories are carried on by steam. Even the carving of copies and repetitions of busts, figures, and ornaments 1s done in some instances by a special machine. This, though an economy of labour, entails loss of artistic effect. The chisel and the knife are no longer in such cases guided and controlled by the sen- sitive touch of a human hand.

Collections of Furniture.—1. Antique.—British Museum; Louvre; Vatican; Royal Museum, Naples. 2. Mediceval and 16th century.— Musée de Cluny, Paris; S. Kensington Museum; Sauvageot Collection, Louvre; National Museum, Nuremberg ; Museum of Madrid. 3. 18¢h centwry.—Louvre Galleries; collection of Sir R. Wallace, Manchester Square, London. Fine examples have been exhibited from Windsor Castle. Carriages, in the royal palaces at Lisbon and Vienna.

Books. —Description de V Egypte; Wilkinson, Ancient Egyptians , Layard, Nineveh, &c.; Hamilton's Vases ; Wright's Homes of our

Forefathers; Agincourt, Histoire de V Art; Du Sommerard, Arts Somptuatres; Viollet-le-Duc, Dictionnaire du Mobilier; Jacque- mart, History of Furniture; Pollen, Furniture and Woodwork, where references to books will be found, and notes on materials and construction. (J. H, P.)

FURRUCKABAD. See FarrakHsan.

FURST, Juzres (1805-1873), Orientalist, was born of Jewish parents at Zerkowo in Posen, 12th May 1805. His friends designed him for the rabbinical profession, and at a very early age he had gained an extensive acquaintance both with Biblical and with Talmudical Hebrew. In his fifteenth year he entered the Berlin gymnasium, whence he passed to the university in 1825; but straitened cireum- stances compelled his return to Posen, long before the com- pletion of his studies, He then tanght for some time in the Jewish school at his native place, with the result that he experienced a growing feeling of repugnance to what was then regarded as rabbinical orthodoxy. In 1827 he was able to resume a university career at Breslau, where he studied theology and Oriental philology; and in 1831 he removed to Halle, where he heard the lectures of Gesenius, Wegscheider, and Tholuck. He ultimately fixed his resi- dence in Leipsic, where, after having taught privately for some years, he obtained an appointment as lecturer in the

university in 1839. From the year 1864 till his death, which occurred on the 9th of February 1873, he held the rank of professor. In 1835 he published the first part of the Lehrgebiiude der aramdischen Fdiome, a work which he did not live to complete; and from 1837 to 1840 he was

engaged upon his Concordantie, an admirable edition of

Buxtorf's Hebrew and Chaldee Concordance, with valuable appendices, in the preparation of which he was largely as- sisted by Delitzsch. In 1851 appeared the Hebréivsches u. Chaldéisches Handworterbuch, which reached a third edition in 1876, and which has been translated into English by Dr Samuel Davidson (4th edition, 1871). Though a work of considerable merit, this cannot on the whole be said to have superseded that of Gesenius. In particular its philological theories, and its method of reducing triliteral to biliteral roots, are not likely to meet with general acceptance among scholars. His Geschichte des Karderthums appeared in 1865; and the Geschichte der Bublischen Interatur und des jiidisch-hellenischen Schriftthums, begun in 1867, was com- pleted in 1870. Friirst also edited a valuable Bibliotheca Judaica (1849-1863), and was the author of some other works of minor importance. From 1840 to 1851 he was also editor of

Der Orient, a journal devoted to the language, literature, history, and antiquities of the Jews.

FURSTENBERG, the name of two noble houses of Germany.

I. The more important is in possession of a mediatized principality in the district of the Black Forest and the Upper Danube, which comprises the countship of Heilegen- berg, about 7 miles to the N. of the lake of Constance, the landgravates of Stiihlingen and Baar, and the lordships of Jungnau, Trochtelfingen, Hausen, and Moéskirch or Mess- kirch. The territory is discontinuous ; and as it lies partly in Baden, partly in Wirtemberg, and partly in the Prussian province of Sigmaringen, the head of the family is an here- ditary member of the first chamber of Baden and of the chamber of peers in Wirtemberg and in Prussia. The relations of the principality with Baden are defined by the treaty of May 1825, and its relations with Wiirtemberg by the royal declaration of 1839. The Stammort or ancestral seat of the family is Fiirstenberg in the Black Forest, about 13 miles N. of Schaffhausen, but the principal residence of the present representatives of the main line is at Donaueschingen. The Fiirstenbergs are descended from the counts of Urach, in the valley of the Ems, to the east of Tiibingen,—Henry I., the youngest son of Egon VI. of Urach, ranking as the founder of the family. He was born about 1215, signalized himself as a supporter of the house of Hapsburg (which in the person of Rudolf, a relative of his own, ascended the throne in 1273), and died in 1284. On the death of Frederick III. in 1559, the family broke up into two lines, the Heiligenberg and the Kinzigerthal. To the former, which became extinct in 1716, belonged the well-known William Egon of Fiirstenberg, who, in spite of his elevation to the rank of elector by the emperor Leo- pold, played into the hands of the French, had to leave Germany, and as a reward for his services was made arch- bishop of Strasburg in 1682. The latter furnished a large number of military and diplomatic servants to the German states. 'The various possessions of the family were united in 1744 under Joseph William Ernest, who was born in 1699 and died in 1762; and to him his descendants were indebted for the right that they all possess of taking the title of prince. On the failure of the male issue of his elder son in 1804, the inheritance passed to the representative of a younger Bohemian branch, Charles Egon, a prince memorable for the liberal spirit by which he was

actuated, and for the number of his benevolent and scientific founda- tions, such as the infirmary at Donaueschingen and the plind asylum at Neidingen. The family is at present

(1879) represented by his son Charles Egon. There are two subordinate branches, the Piirglitz with its chief residence at Lana in Bohemia, and the Konigshof with its chief residence at Konigshof in Boheinia.

II. The second Fiirstenberg family has its possessions in Westphalia and the country of the Rhine, and takes its nanie from the castle of Fiirsteuberg on the Ruhr, which is said to have been built by count Dietrich or Theodoric of Oldenburg, in the 11th century. The two most remarkable men whom it has produced are Francis Frederick William and Francis Egon. The former (1729-1811) became ulti- mately minister of the prince-bishop of Miinster, and effected a great number of important reforms in the admini- stration of the country ; the latter (1797-1859) was an enthusiastic patron of art, zealously advocating the comple- tion of the Cologne cathedral, and erecting the beautiful church of Apollinaris, near Remagen on the Rhine.

See (for the first family) Miinch's Geschichte des Hauses und Landes Fiirstenberg, Aix-la-Chapelle, 1880-1832, and Riezler, Furst- enbergisehes Urkundenbuch, hrsggbn von dem firstlichen Hanpt- archiv in Donaueschingen, 1877, 1878.

FURSTENWALDE, a town in the Prussian province

of Brandenburg, government of Frankfort, on the right bank of the Spree, and on the railway between Berlin and Frankfort-on-the-Oder, 28 miles E. of the former city. Its beautiful cathedral church contains a good many old monuments. The town possesses manufactures of linen and woollen goods, breweries, meal-mills, tile-works, and a chemical work. Fiirstenwalde is one of the oldest towns of Brandenburg. Since 1385 it was the seat of the bishop of Lebus, whose bishopric was incorporated with the duchy of Brunswick in 1595. The town was taken by the Swedes in 1631, and burned by the imperialists in 1633, The population in 1875 was 9688. FURTH, an important manufacturing town of Bavaria, circle of Middle Franconia, at

the confluence of the Pegnitz with the Rednitz, 5 miles N.W. of Nuremberg, with which it is connected by railway. It is largely indebted for its importance to the industry and perseverance of the Jews, who at the beginning of the present century composed nearly one-half of the whole population, aud now ainount to about 3600. They have a college, a separate court of justice, several schools and synagogues, and two Hekrew printing establishments. The principal building of the town is the new town-house, with a tower 215 feet high, The manufactures include mirrors, jewellery, lacquered wares, chandeliers, spectacles, machines of various kinds, turnery wares, surgical instruments, lead pencils, artificial flowers, liqueurs, tobacco, leather, and woollen and cotton goods. There are also several breweries. A large annual fair is held at Michaelmas, which lasts for fourteen days. The population in 1875 was 27,360.

In 1632 Gustavus Adolphus was defeated near Fiirth, in attempt- ing to carry the intrenchments of Wallenstein; and in 1634 the town was burned down by the Croats. It was originally under the protection of the burggrafs of Nuremberg, but in 1806 it came into the possession of Bavaria. In the latter half of the 18th century it rose rapidly in importance through its manufactures, but it was not raised to the rank of a town till 1818.

FURZE, Gorst, or Wun, Ulex, Linn. (German, Stech- ginster ; French, A jonc), a genus of thorny papilionaceous shrubs, of few species, confined to west and central Kurope and north-west Africa. The leaves, except those of seedling plants, which are trifoliate, are exstipulate, and have the form of prickles; the flowers are axillary, yellow, and sweet- scented, and have a coloured calyx deeply divided into two concave segments, the upper bi-serrate and the lower tri- serrate at the apex, the carina and ale obtuse, stamens united into a sheath, style smooth, and stigma capitale. The pods are few-seeded; their crackling as they burst may often be heard in hot weather. Common furze, U. europeus,

Linn., is found on heaths and commons in western Europe from Denmark to Italy, and in the Canaries and Azores, and is abundant in nearly all parts of the British Isles. It grows toa height of 2-6 feet; it has hairy stems, and the smaller branches end each in a spine ; the leaves, some- times lanceolate

on the lowermost branches, are mostly represented by spines from 2 to 6 lines loug, and branching at their base; and the flowers, about ?-inch in length, have a shaggy, yellowish-olive calyx, with two small ovate bracts at its base, and appear in early spring and late autumn. This species comprises the varieties U. vulgaris, or U. europoeus proper, which has spreading branches, and strong, many-ridged spines, and JU. sérictus (Irish furze), with erect branches, and slender 4-edged spines. Its seeds, according to Babington (Man. Brit. Bot., p. 80, 6th ed., 1867), pro- duce either U. ewropweus or U. strictus. The other British species of furze is U. nanus, Forst., an inmate of Belgium, Spain, and the west of France; it is a procumbent plant, less hairy than U. ewropeus, with smaller and more orange- coloured flowers, which spring from the primary spines, and have a nearly smooth calyx, with minute basal bracts. From U. nanus have been formed the subspecies U. eu- nanus (Dwarf Furze), common in the south of England, and U. Galli, of Planchon, confined in Britain to the western counties, with the exception of Northumberland. During the winter of 1837-38 the furze perished wholly above ground, not only around London, but even in South Wales, Cornwall, and Devonshire ; the double U. europaeus was observed to be more hardy than the wild species, and U. strictus suffered more than either. (See Zrans, Hort. Soe. Lond., 2d ser., ii. p. 225.) Furze, or gorse, is sometimes employed for fences. On its use as a forage-plant see AGRICULTURE, vol. i. p. 378. In various parts of England it is cut for fuel. The ashes contain a large proportion of alkali, and are a good manure, especially for peaty land.

See Morton, Cyclopedia of Agriculture, 1855; J. T. Boswell Syme, Sowerby's English Botany, vol. iii. pp. 3-7, 1864; Bentham, Handbook of British Flora, vol. i., 1865; J. D. Hooker, The Stu- dent's Flora,

FUSELI, Henry (1741-1825), an eminent painter and writer on art, was born at Zurich in Switzerland on the 7th February 1741; he himself asserted, in 1745, but this appears to have been a mere whim. He was the second child in a family of eighteen. His father was John Caspar Fiissli, of some note as a painter of portraits and landscapes, and author of Lives of the Helvetic Painters. This parent destined his son for the church, and with this view sent him to the Caroline college of his native town, where he re- ceived an excellent classical education. One of his school- mates there was

Lavater, with whom he formed an intimate friendship. After taking orders in 1761, Fuseli was obliged to leave his country for a while in consequence of having aided Lavater to expose an unjust magistrate, whose family was still powerful enough to make its ven- geance felt. He first travelled through Germany, and then, in 1763, visited England, where he supported him- self for some time by miscellaneous writing; there was a sort of project of promoting through his means a regular literary communication between England and Germany. He became in course of time acquainted with Sir Joshua Reynolds, to whom he showed his drawings. By Sir Joshua's advice he then devoted himself wholly to art. In 1770 he made an art-pilgrimage to Italy, where he remained till 1778, changing his name from Fiissli to Fuseli, as more Italian-sounding. Early in 1779 he returned to England, taking Zurich on his way. He found a commission await- ing him from Alderman Boydell, who was then organizing his celebrated Shakespeare gallery. Fuseli painted a num- ber of pieces for this patron, and about this time published an English edition of Lavater's work on physiognomy, He

likewise gave Cowper some valuable assistance in preparing the translation of Homer. In 1788 Fuseli married Miss Sophia Rawlins (who it appears was originally one of his models, and who proved an affectionate wife), and he soon after became an Associate of the Royal Academy. 'Two years later he was promoted to the grade of Academician. In 1799 he exhibited a series of paintings from subjects furnished by the works of Milton, with a view to forming a Milton gallery corresponding to Boydell's Shakespeare gallery. 'The number of the Milton paintings was forty- seven, many of them very large; they were executed at in- tervals within nine years. This exhibition, which closed in 1800, proved a failure as regards profit. In 1799 also he was appointed professor of painting to the Academy. Four years afterwards he was chosen keeper, and resigned his professorship ; but he resumed it in 1810, and continued to hold both offices till hisdeath. In 1805 he brought out an edition of Pilkington's Lives of the Painters, which how- ever, did not add much to his reputation. Canova, when on his visit to England, was much taken with Fuseli's works, and on returning to Rome in 1817 caused him to be elected a member of the first. class in the Academy of St Luke. Fuseli, after a life of uninterrupted good health, died at Putney Hill, 16th

April 1825, at the advanced age of eighty-four, and was buried in the crypt of St Paul's Cathedral. He was comparatively rich at his death, though his professional gains had always appeared to be meagre. As a painter, Fuseli had a daring invention, was original, fertile in resource, and ever aspiring after the highest forms of excellence. His mind was capable of grasping and real- izing the loftiest conceptions, which, however, he often spoiled on the canvas by exaggerating the due proportions of the parts, and throwing his figures into attitudes of fan- tastic and over-strained contortion. He delighted to select from the region of the supernatural, and pitched everything upon an ideal scale, believing a certain amount of exag- geration necessary in the higher branches of historical painting, ' Damn Nature! she always puts me out," was his characteristic exclamation. In this theory he was confirmed by the study of Michelangelo's works and the marble statues of the Monte Cavallo, which, when at Rome, he used often to contemplate in the evening, relieved against a murky sky or illuminated by lightning. But this idea was by him carried out to an excess, not only in the forms, but also in the attitudes of his figures ; and the vio- lent and intemperate action which he often displays de- stroys the grand effect which many of his pieces'would other- wise produce. A striking illustration of this occurs in his famous picture of Hamlet breaking from his Attendants to follow the Ghost: Hamlet, it has been said, looks as though he would burst his clothes with convulsive cramps in all his muscles. 'This intemperance is the grand defect of nearly all Fuseli's compositions. On the other hand, his paintings are never either languid or cold. His figures are full of life and earnestness, and seem to have an object in view which they follow with rigid intensity. Like Rubens he excelled in the art of setting his figures in motion. Though the lofty and terrible was his proper sphere, Fuseli had a fine perception of the ludicrous, The grotesque humour of his fairy scenes, especially those taken from the ILdsummer Night's Dream, is in its way not less remarkable than the poetic power of his more ambitious works. As a colourist Fuseli has but small claims to dis- tinction. He scorned to set a palette as most artists do; he merely dashed his tints recklessly over it. Not unfre- quently he used his paints in the form of a dry powder, which he rubbed up with his pencil with oil, or turpentine, or gold size, regardless of the quantity, and depending for accident on the general effect. This recklessness may per-

| haps be explained by the fact that he did not paint in

oil till he was twenty-five years of age. Despite these drawbacks, he possessed the elements of a great painter.

Fuseli painted more than 200 pictures, but he exhibited ouly a minority of them. His earliest painting represented Joseph interpreting the Dreams of the Baker and Butler ; the first to excite particular attention was The Nightmare, exhibited in 1781. He produced only two portraits. His sketches or designs numbered about 800; they have admirable qualities of invention and design, and are fre- quently superior to his paintings.

His general powers of mind were large. He was a thorough master of French, Italian, English, and German, aud could write in all these tongues with equal facility and vigour, though he preferred German as the vehicle of his thoughts. His writings contain passages of the best art-criticism that English literature can show. The prin- cipal work is his series of Lectures in the Royal Academy, twelve in number, commenced in 1801. –

Many interesting anecdotes of Fuseli, and his relations to contemporary artists, are given in his Life by John Knowles, who also edited his works in 3 vols. 8vo, London, 1831. He was a man of abrupt temper, sharp of tongue, energetic in all his ways, in stature short, but robust, with a head full of fire and character.

FUSEL OIL, the name applied to the volatile oily liquids, of a nauseous fiery taste and smell, which are obtained in the rectification of spirituous liquors made by the fermentation of grain, potatoes, the marc of grapes, and other material, and which, as they are of higher boiling- point than ethylic alcohol, occur in largest quantity in the last portions of the distillate. Besides ethylic or ordinary alcohol, and amylic or pentylic alcohol, which are present in them all, there have been found in fusel oils several other bodies of the C,Hon4,-OH series, also certain ethers, and members of the C,,H,,O, series of fatty acids. Normal propylic alcohol, C,H,.OH, is contained in the fusel oil of the mare brandy of the south of France, and isoprimary butylic alcohol, CH (CH;)..CH,.OH, in that of beet-root

molasses. The chief constituent of the fusel oil procured in the manufacture of alcohol from potatoes and grain, usually known as fusel oil and potato-spirit, is isoprimary amy- lic alcohol, or isobutylearbinol, CH(CH,),.CH,,CH,.OH, boiling at 129°-130° C., and inactive as regards polarized light. Ordinary fusel oil yields besides another isomeric amylic alcohol, boiling at about 128°, and levorotatory. The formation of antylic alcohol is stated by Liebig (Hamiliar Letters on Chemistry, p. 217, 4th ed., 1859) never to take place in fermenting fluids in the presence of tartar, of racemic, tartaric, or citric acid, or of certain bitter substances, as hops. It is produced principally in alkaline or neutral liquids, and in such as contain lactic or acetic acid. Schorlemmer (Proc. Roy, Soc., xv., 1866, p. 131) has shown that amyl-compounds prepared from fusel oil and from American petroleum agree in specific gravity and boiling point, and are therefore to be regarded as identical. Variable quantities of fusel oil, less or greater according to the stage of ripening, exist in commercial spirits. Administered in small amount, it exercises a poisonous action, causing thirst and headache, with furred tongue (Brit. and For, Med.~~Chir, Kev, xXvili., 1861, p. 101). In crude spirit made from potatoes, after its purification in the cold from noxious gases by means of cliarcoal, M. Rabuteau found 50 per cent. of ethylic, and 1°5 per cent. of isopropylic alcohol, and traces of propylic, and of ordi~~ nary and a more complex amylic alcohol. He discovered that in 1; aqueous solution ethylic alcohol was not in- jurious to frogs, isopropylic alcohol killed after some hours, and propylic alcohol in a single hour, whilst the vapours of a similar solution of amylic alcohol were instantaneously fatal to them, and even diluted to as much as 500 times

its bulk that body exercised on them a poisonous influence. The widely different actions of common alcohol and of such compounds as the potato-oils in intoxicating drinks, he points out, render it necessary to distinguish between the excitable ethylism produced by the former, and the dull and heavy amylism, or more properly polyalcoholism of the latter. (See Le Progrés Médical, 1878, p. 979, "Société de Biologie.") To remove fusel oil from spirits, a matter of prime importance to the distiller, a great number of methods have been resorted to. A practically pure spirit can be ob- tained

by rectification several times after dilution with water, or by the use of specially constructed stills, as Coffey's (see DISTILLATION, vol. vii. pp. 265-6). Among the materials which have been employed for the complete defuselation of spirit are the powder of freshly burnt charcoal, which acts best when the vapour of the liquid is passed through it, and charcoal with manganese peroxide, with slaked lime, and with soap-boilers' lye; also saturated solution of chloride of lime, alone or with zinc chloride ; and calcium chloride, olive oil, soda-soap, and milk. The presence of fusel oil in spirit may be suspected when the addition of four parts of water causes milkiness. It is detected by its odour when the spirit is diluted with warm water, or when its ethylic alcohol has been allowed to evaporate. To remove the last-named body and water from fusel oil calcium chlo- ride has been employed. The estimation of the alcohols of fusel oil may be effected by Dupré's process, in which their corresponding acids are obtained by oxidizing with sulphuric acid and potassium dichromate, and eventually the quantity of barium in the barium salts of the purified acids is determined (see Analyst, Mar. 31, 1871). Fusel oil is employed in the arts as a source of amylic alcohol. FUST, Jonann (1… . —1466), often considered as the inventor or one of the inventors of printing, belonged to a rich and respectable burgher family of Mainz, which is known to have flourished from 1423, and to have held many civil and religious offices, but was not related to the patrician family Fuss. The name was always written Fust, until in 1506 Johann Schéffer, in dedicating the German translation of Livy to the emperor Maximilian, called his grandfather Faust. After that the family called themselves Faust, and the Fausts of Aschaffenburg, an old and quite distinct family, placed John Fust in their pedigree as one of their most dis- tinguished ancestors. John's brother Jacob, a goldsmith, was appointed baumeister of the town in 1445, and was first burgomaster in 1462, when Mainz was stormed and sacked by the troops of Count Adolf of Nassau. There is no evidence that, as is commonly asserted, John Fust was him- self a goldsmith. He appears to have been a money-lender or banker and speculator, better known for prudence than for uprightness and disinterestedness. His connexion with Gutenberg, who is now generally, though not uni- versally, admitted to be the real inventor of printing, has been very variously represented, and Fust has been put forward by some as the inventor of typography, and the instructor as well as the partner of Gutenberg, by others as his patron and benefactor, who saw the value of his

discovery and had the courage to supply him with means to carry it out. This view has been the most popular; but during the present century Fust has been frequently painted as a greedy and crafty speculator, who took advantage of Gutenberg's necessity and robbed him of the fruits of his invention. Gutenberg, many years resident in Strasburg, where he was long engaged in the experiments and attempts which re- sulted in his discovery of typography, is not known to have been there after 1444. His uncle Henne (or Johann) Gutenberg, senior, on 28th October 1443 took the house in Mainz called Zum Jungen, where Gutenberg afterwards carried on printing. Having already exhausted his own resources in his long-continued and costly experiments,

Gutenberg, through his cousin Albrecht Gelthuss zum – Echtzeller, borrowed 150 florins in Mainz 6th October 1448. This sum was quite insufficient for his purposes, and on 22d August 1459, as appears from the amount of interest after- wards claimed, he made an agreement with Fust, who was to advance him 800 gold florins to make and procure his tools and materials, which were to be security for the loan. Fust was also to give him 300 florins a year for expenses, wages, house rent, parchment, paper, ink, &c. They were to divide the profits equally, and if they wished to separate, Gutenberg was to return the 800 florins, and the materials were to cease to be security. Fust was to have half the profits, being both holder of a mortgage and partner in the firm. Gutenberg carried on the business at Zum Jungen, where he lived, It is difficult to ascertain precisely what books were printed while the partnership lasted. They first printed, says Trithemius, a vocabulary called Catholicon. This was not the Catholicon of Johannes de Janua, a folio of 748 pages, 66 lines to a full page, printed in 1460, and now considered to be the work of Gutenberg alone, but was pro- bably a small glossary for children, now lost ; they also printed Donatus de octo partibus orationis, 27 lines to a page, of which two leaves were discovered in Mainz in the original binding of an account book of 1451. Their greatest work was the Latin Bible known as the Beble of 42 lines, because a page contains 42 lines, and also as the Mazarin Bible, because the first copy described was found in the library of Cardinal Mazarin. It was finished at latest in 1455, and is a folio of 1282 printed pages, with

spaces left for the illumination of initials, and is in much smaller type than the famous and much-disputed Bible of 36 lines, also called the Bamberg Bible, because nearly all the known copies were found in the neighbourhood of Bamberg. It is also called Schelhorn's Bible, because Schelhorn described it in 1760 as the oldest printed Latin Bible, and Djister's Bible, because ascribed to Albert Pfister, a printer of Bamberg, who used the samie type for printing many small German books, the chief of which is Boner's Ededsteim, 1461, 4to, 88 leaves, 85 woodcuts, a book of fables in Ger- man rhyme. But many eminent bibliographers believe this Bible to have been printed by Gutenberg, who used the same type in the Letters of Indulgence of 1454, and in the 27-line Donatus of 1451. The types used by Pfister are evidently old and worn, except those of the additional letters required for German, 4, w, 2, which are clear and sharp like the types used in the Bible. Ulric Zell states, in the Cologne Chronicle of 1499, that Gutenberg and Fust printed the Bible in large type like that used in missals. It has been said that this description applies to the 42-line Bible, as its type is as large as that of most missals earlier than 1500, and that the size now called missal type (double pica) was not used in missals until late in the 16th century. This is no doubt true of the smaller missals printed before 1500, some of which are in even much smaller type than the 42-line Bible. But many of the large folio missals, as that printed at Mainz by Peter Schoffer in 1483, the Carthusian missal printed at Spires by Peter Drach about 1490, and the Dominican missal printed by Andrea de'Torresanis at Venice in 1496 are in as large type as. the 36-line Bible. It required scarcely less than such a work, says Madden, to induce Fust to advance such large sums of money. Some other smaller works were printed by the partners, as the Papal Letters of Indulgence of 1454-5, granted 12th April 1451 by Nicolas V., in aid of John IL, king of Cyprus, against the Turks, and probably many now lost. Peter Schéffer of Gernsheim, between Mainz and Mannheim, who was a copyist in Paris in 1449, and who is called by Fust his servant (famulus), is said by Trithemius to have discovered an easier way of founding characters. Lambinet and others have concluded from this

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that Schéffer invented the punch. Schoffer himself, in the colophon of the Psalter of 1457, a work which probably was planned and partly printed by

Gutenberg, claims only the mode of printing rubrics and coloured capitals. Didot believes that Schoffer discovered the movable mould, and that Gutenberg alludes to this discovery and to Schéffer's youth when he says in the colophon of the Catholicon of 1460 that God reveals to babes what He hides from the wise. Fust, quite unexpectedly as it seems, and before the profits of the undertaking could be realized, brought a suit against Gutenberg to recover the money he had lent, claiming 2026 florins for principal and interest. He had made a second loan of 800 florins in 1452, but had not paid the 300 florins a year, and, according to Gutenberg, had said that he had no intention of accepting interest. 'The suit was decided in Fust's favour, 6th November 1455, in the great refectory of the Barefooted Friars of Mainz, when Fust made oath by all the saints that he had borrowed 1550 florins and given them to Gutenberg. Fust removed the portion of the printing materials covered by his mortgage, which did not include the types of the 36-line Bible, to a house belonging to him called Zum Humbreicht, where he carried on printing with the aid of Peter Schéffer, to whom he gave his only daughter Dyna or Christina in marriage about 1465. Their first publication was the Psalter, 14th August 1457, a folio of 350 pages, the first printed book with a complete date, and remarkable for the beauty of the large initials printed each in two colours, red and blue, from types made in two pieces, a method patented in England by Solomon Henry in 1780, and by Sir William Congreve in 1819. The Psalter was reprinted with the same types, 1459 (August 29), 1490, 1502 (Schéffer's last publica- tion), and 1516. Fust and Schéffer's other works are given below.! In 1464 Adolf of Nassau appointed for the church of St Quintin three baumeisters, who were to choose twelve chief parishioners as assistants for life. The first of these " Vorvaren," who were named on May-day 1464, was Johés Fust, and in 1467 Adam von Hochheim was chosen instead of Johannes Fust. Fust is said to have gone to Paris in 1466, and to have died of the plague, which raged there in August and September. He certainly was in Paris on 4th July, when he gave Louis de Lavernade, a distinguished. gentleman of the province of Forez, then chancellor of the Duc de Bourbon and first president of the parliament of Toulouse, a copy of his second edition of Cicero, as appears from a note in Lavernade's own hand at the end of the book, which is now in the library of Geneva. But Fust pro- bably did not die until 30th October, on which day, pro- bably in 1471,

an'annual mass was instituted for him by Peter Schéffer and Conrad Henlif in the church of St Victor of Paris, where he was buried.

Fust has been often confounded with the famous magi- cian Dr Johann Faust, no doubt a real person, though the fables gradually gathered round his name have formed a regular mythical saga. Trithemius speaks in 1507 of Magister Georgius Sabellicus, who called himself Faustus Junior. Conradus Metianus Rufus (Conrad Mudt) in 1513 calls him "quidam chiromanticus Georgius Faustus." But Melanchthon (Manlius, Collectanea communium Locorum, a

1 3, Durandus, Rationale divinorum oficiorum, 1459, folio, 160 leaves; 4. the Clementine Constitutions, with the gloss of Johannes Andree, 1460, 51 leaves; 5. Biblia Sacra Latina, 1462, fol., 2 vols., 242 and 239 leaves, 48 lines to a full page; 6. the Sixth Book of Decretals, with Andrew's gloss, 17th December 1465, fol., 141 leaves ; 7. Cicero De Officiis, 1465, 4to, 88 leaves, the first edition of a Latin classic, the first book containing Greek characters, while in the colo- phon Fust first calls Schéffer "puerum suum ". 8. the same, 4th February 1466; 9. Grammatica rhytmica, 1466, fol., 11 leaves. ¢They also printed in 1461-2 several papal bulls, proclamations of Adolf of Nassau, &c. Nothing is known to have appeared for three years after the storming of Mainz, 8th October 1465.

1568, p. 39) and the author of the oldest popular history of Faust call the magician John, which name has been adopted in the popular books and generally accepted. This change of name, which has been variously explained, allowed the confused traditional remembrance of the printer to be worked into the Faust saga, perhaps the more readily as in his colophons Fust said that his books were not made with pen or pencil, 'sed arte quedam perpulchra." The confusion has been much assisted by the story of Fust's supposed prosecution for magic, which, widely credited, and frequently repeated as an authentic anecdote, seems to have been first mentioned by Johannes Walchius in his Decas fabularum humani generis, Argentorati, 1610, fol. 181. He states on the authority of Hendrik van Schore or Schorus, a Flemish author, then an old man and provost of Surburg, that when Fust sold his Bibles in Paris, the purchasers, surprised

to find all the copies agree exactly in every letter, complained of deception ("a Fausto falsos ac deceptos se clamabant"), and bringing back their books demanded their money, and pursued him even in Mainz, so that to escape he removed to Strasburg. Johann Courad Diirr, professor of theology at Altdorf, wrote an Hpistola de Johanne Fausto, dated 18th July 1676, which Schelhorn printed in 1726, in his Amenitates Literarie, vol v. pp. 50-80. Diirr (after relating from Emmanuel van Meteren the tale of Koster's types being stolen on Christmas eve by John Fust his workman, who fled to Amsterdam, then to Cologne, and lastly to Mainz) says that, on showing his books, Fust was suspected of magic, as he could print in one day as much as several men could write in a: year, and as the monks and nuns, who had long made great pro- fits by copying, found their kitchens grow cold, and their 'bright fires extinguished, Fust incurred their hatred and calumny, and was transformed into a magician; and this opinion was confirmed by his printing the Doctrinale Alex- andri (t.¢., Doctrinale Alewandri Galli, a most popular medieval Latin graminar), which gave rise to the story that Faust had caused Alexander the Great to appear to Charles V. Lacaille (ZZistoire de l' Imprimerie, Paris, 1689, p. 12) repeats the story of Fust selling his Bibles in Paris, and adds, as Marchand (Hist. de l' Imprimerie, La Haye, 1740, p. 27) says, out of his own head ("'avance de son chef"), that the. purchasers brought a suit against Fust accusing him of magic, so that he had to escape to Mainz, but the parliament of Paris made a decree discharging Fust of all prosecutions as to the sale of his Bibles. The whole story, as Bernard says, is very improbable and scarcely deserves a serious refutation. There is no proof that the monks were hostile to printing, or that it interfered with the profits of the copyists. On the contrary many books were printed by monks, the early printers often set up their presses in monasteries, and Gutenberg, Fust, and Schoffer were on friendly terms with many conventual houses. Diirr himself quotes from the Chronicle of Aventinus a statement that, if printing had not been discovered, the old books would have been lost, as they would no longer write in the monasteries. Printing did the mechanical work, and multiplied the material for calligraphy and illumina- tion, and therefore did not at first interfere with the profits of the scribes or excite their hostility. The learned men who bought books in 1463 cannot have been ignorant of the invention of printing, which the colophon of the Bible of 1462 expressly mentions. No trace of a suit against Fust has been found in the registers of the parliament

of Paris. Shortly before his death Fust was known in Paris to Louis de Lavernade, a magistrate of the highest rank, who could have had no intercourse with a man accused of magic. The confusion is especially seen in the German puppet plays even now placing Dr Faust in Mainz, while the popular histories make him dwell in Wittenberg, the birthplace of

Protestantism, where Marlowe's Tragical History of Dr Faustus, founded on the prose history, places him. Many writers have accepted Diirr's error (see Ristelhuber, /aust dans Vhistoire et la legende, Paris, 1863, p. 173); thus Chasles (Htudes sur le moyen dge, p. 398) calls Fust "magicien & barbe blanche," and Victor Hugo's introduc- tion to Marlowe's play is based on this error, which, says Heine (Ueber Deutschland), "is widely spread among the people. Theyidentify the two Fausts because they perceived indistinctly that the mode of thought represented by the magicians found its most formidable means of diffusion in the discovery of printing. This mode, however, is thought itself as opposed to the blind Credo of the Middle Ages."

Authorities. —Schaab, Die Geschichte der Erfindung der Buch- druekerkunst, Mainz, 1830-81, 8vo, 8 vols.; De Vinne, The Inven- tion of Printing, New York, 1876, 8vo; Bernard, De lorigine et des. débuts de l Imprimerie en Europe, Paris, 1853, 8vo, 2 vols.; Madden, Lettres d'un Bibliographe, Versailles, 1868-75, 8vo, 2 vols.; Falken- stein, Geschichte der Buchdruckerkunst, Leipzig, 1840, 4to; Van der Linde, The Haarlem Legend, translated by J. H. Hessels, London, 1871, 8vo; Kéhler, Hochverdiente wnd aus bewahrten Urkunden wohlbeglaubte Ehrenrettung Johann Gutenbergs, Leipzig, 1748, 4to ; Wurdtwein, Bibliotheca Moguntina, August. Vindelicorum, 1787, 4to; Schwartz, Primaria quedam documenta de origine typographic, Altorf, 1740, 8vo; Schelhorn, De antiquissima Latinor. Bibliorum editione, Ulme, 1760, 4to; Beitrdge zur Geschichte des Buehhandels, Leipzig, 1864, 4to; Trithemius, Annales Hirsaugienses, Typis Monasterii S. Galli, 1690, fol., 2 vols.; Cronica van der Hilliger Stat. van Coellen, Cologne, 1499, fol.; Joannis, Rerum Moguntia- carum, Francofurti ad Mcenum, 1722-27, fol., 3 vols. (P. A. L.)

FUSTIAN, a term which includes a variety of heavy woven cotton fabrics, chiefly prepared for men's wear. It embraces plain twilled cloth called jean, and cut fabrics similar to velvet, known as velveteen, moleskin, corduroy, &c. The operations connected with the finishing of cut fustian (cutting, brushing, and singeing, &c.) are conducted under unhealthy conditions. The name is said to be derived from El-Fustat, a suburb of Cairo (see vol. vii. p. 769), where it was first made; and certainly a kind of cloth has been long known under that name. In a petition to parliament, temp. Philip and Mary, " fustian of Naples" is mentioned, and in books of a later time this term was abridged to fustiananapes, whence arose an obvious cor- ruption fustian and apes.

FUSTIC, or Yetuow Woop, also known as old fustic (Germ. Gelbholz, Fr. Bois jaune), is a dye-stuff consisting of the wood of Maclura tinctoria, Don, a large tree of the natural order Moracew, growing in the West Indies and tropical America, and having oblong, taper-pointed leaves, and an edible fruit, Fustic occurs in commerce in blocks, which are brown without, and of a brownish-yellow within. It is sometimes employed for inlaid work. For its use in the dyeing of yellow and other colours, see vol. vii. pp. 578, 579. The dye-stuff termed young fustic or Zante fustic, and also Venetian sumach, is the wood ofgRhus Cctinus, Linn., a southern European and Asiatic shrub of the natural order Anacardiacee, called by Gerarde "red sumach," and apparently the " coccygia" and "cotinus" of Pliny (Nat. Ilst., xiii. 41, xvi. 30). Its leaves are deciduous, stiff, smooth, obovate, simple, and rounded at the apex, with long petioles; the blossoms are small, pale-purplish or flesh-coloured, and in loose panicles, and their pedicels, after the flowering is over, become long and hairy, forming together, as Gerarde remarks, "a most fine woollie or stockie tuft, crisped and curled like a curious wrought silken fleece " (The Herball, p. 1293, 1597). The plant in its native habitats is used both for dyeing and tanning, and by Loudon (Arboretum, vol. ii. p. 550) it is recommended for ornamental purposes.

FUTTEHPOOR. See Fataipur.

FUX, Jonann Josepa (1661-1741), the composer of more than 400 works of various kinds and dimensions, but chiefly remembered as the author of a theoretical work on music.

He was born in 1660 at Marein in Styria, probably of poor parents. Of his youth and early training nothing is known. All we can ascertain is that in 1696 he was organist at one of the principal churches of Vienna, and in 1698 was appointed by the emperor Leopold I. as his " imperial court-composer," with the by no means inconsiderable salary of about £6 a month. At the court of Leopold and of his successors Joseph I. and Charles VI., Fux remained for the rest of his life. To his jvarious court dignities that of organist at St Stephen's cathedral was added in 1704. As a proof of the high favour in which he was held by the art- loving Charles VL, it is told that at the coronation of that emperor as king of Bohemia in 1723 an opera, La Con- stanza e la Fortezza, especially composed by Fux for the 6ccasion, was given at Prague. The performance took place in an open-air theatre, and the mise-en-scéne is said to have been of great splendour. Fux at the time was suffering from gout, but in order to enable him to be present at the performance, the emperor had him carried ina litter all the way from Vienna, and a seat in the imperial box was re- served for the composer. Fux died at Vienna in 1741. His life, although passed in the great world, was eventless, and his only troubles arose from the intrigues of his Italian rivals at court. Of the numerous operas which Fux wrote for the amusement of his imperial patrons it is unnecessary to speak. They do not essentially differ from the style of the Italian opera seria of the time. Of greater importance are his sacred compositions, psalms, motets, oratorios, and masses, the celebrated Missa Canonica amongst the latter. It is an all but unparalleled tour de force of learned musicianship, being written entirely in that most difficult of contrapuntal devices—the canon. As a contrapuntist and musical scholar generally, Fux was unsurpassed by any of his contemporaries, and it is owing to these qualities that his great theoretical work, the Gradus ad Parnasswm, has pre- served its importance to the present day. For a long time it remained by far the most thorough treatment of counter- point and its various developments. The title of the original Latin edition may be given :—G'radus ad Par- nassum sive manuductio ad compositionem musice regularem, methoda nova ac certa nondum ante tam exacta ordine in lucem edita, elaborata a Joanne Josepho Fux (Vienna, 1725), It was translated into most European languages during the 18th century, and is still studied by musicians interested in the history of their art. The expenses

of the publication were defrayed by the emperor Charles VI., to whom the musical world most probably owes the survival of the im- portant work. Fux's biography, a book full of minutest original research, and trustworthy in every respect, has re- cently been published by Ludwig von Kéchel (Vienna, 1871). It contains, amongst other valuable materials, a complete catalogue of the composer's numerous works. (F. H.) FYT, Jonannes (1609-1661), the best painter of animals and game after Franz Snyders, was born at Antwerp and

christened August 19, 1609. He was registered apprentice to Hans van den Berghe in 1621. That he should have been placed thus early under the tuition of a man who held but a humble station amongst his artist contemporaries can only be explained by stating that Van den Berghe was the friend of Fyt's father and had already taught Jacques Fyt, Johannes's brother. Professionally Van den Berghe was a restorer of old pictures rather than a painter of new ones. Attwenty Johannes Fyt entered the guild of St Luke as a master, and from that time till his death in 1661, he pro- duced a vast number of pictures in which the bold facility of Snyders is united to the powerful effects of Rembrandt, and harmonies of gorgeous tone are not less conspicuous than freedom of touch and a true semblance of nature. There never was such a master of technical processes as Fyt in the rendering of animal life in its most varied forms. He may have been less correct in outline, less bold in action than Snyders, but he was much more skilful and more true in the reproduction of the coat of deer, dogs, greyhounds, hares, and monkeys, whilst in realizing the plumage of peacocks, woodcocks, ducks, hawks, and cocks and hens, he had not his equal, nor was any artist even of the Dutch school more effective in relieving his composi- tions with accessories of tinted cloth, porcelain ware, vases, and fruit. He was not clever at figures, and he sometimes trusted for these to the co-operation of Cornelius Schut or Willeborts, whilst his architectural backgrounds were some- times executed by Quellyn. Silenus amongst Fruit and Flowers, in the Harrach collection at Vienna, Diana and her Nymphs with the Produce of the Chase, in the Belve- dere at Vienna, and Dead Game and Fruit in front of a Triumphal Arch, belonging to Baron Anselm von Rothschild at Vienna, are specimens of the co-operation respectively of Schut, Willeborts, and

Quellyn. They are also Fyt's masterpieces, The earliest dated work of the master is a cat grabbing at a piece of dead poultry near a hare and birds, belonging to Baron Cetto at Munich, and executed in 1644. The latest is a Dead Snipe with Ducks, of 1660, sold with the Jager collection at Cologne in 1871, Great power is shown in the bear and boar hunts at Munich and Ravensworth castle. A Hunted Roedeer with Dogs in the Water, in the Berlin Museum, has some of the life and more of the roughness of Snyders, but lacks variety of tint and finish. A splendid specimen is the Page and Parrot near a table covered with game, guarded by a dog staring at a monkey, in the collection of Sir Richard Wallace. It is curious that Antwerp should possess only two examples of Fyt. The Madrid Museum contains 11, the Lichtenstein Gallery at Vienna 8, the Berlin, Vienna, and Dresden Museums 5 each, the Louvre 3, and the London National Gallery 1. With the needle and the brush Fyt was equally clever. He etched 16 plates, and those representing dogs are of their kind unique. Gg, &,)) FYZABAD, another name for FaIzABAD (q.v.).

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ENCYCLOPADIA BRITANNICA

DICTIONARY

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME X

EDINBURGH: ADAM AND CHARLES BLACK

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ENCYCLOPEDIA BRITANNICA.

G

G represents the sound of Gamma, the third letter of the

Greek alphabet ; but in the Latin alphabet, and in the alphabets derived from the Latin (including our own), it holds the place which Z held in the different Greek alphabets. The history of this remarkable change is well known. It has been already stated (see letter C) that in the 5th century before our era, the distinction between the &-sound and the g-sound became lost at Rome : apparently the surviving sound was g ; but, at all events, the syinbol K went out of use, being retained only in a few familiar abbreviations, and C (which was the Latinized form of the Greek I') remained. Thus in the column of Duillius we find C representing the original surd in castreis, cepet, &c., but the sonant in macistratos, leciones, ceset (2.e., gessit), &e. When, in the 3d century, the two sounds were again dis- tinguished, two symbols were again required; but the K was not taken again to represent the surd; C, the old symbol for the sonant, was put to that use. A new symbol was therefore necessary for the sonant g-sound, and it was found by modifying C into G. This G should then have replaced C as the third letter of the alphabet, where it would have stood, as before, between B and D, the sonants of the labial and dental classes respectively. But this was not done. The symbol C was left in its old place with its new value of k. The new symbol G was set in the seventh place of the alphabet, which had been vacated by Z, the representative of a sound not used by the Romans of that day. G is found for the first time in the inscription on the tomb of Scipio Barbatus. Its invention is attributed to Spurius Carvilius.

There can be no doubt that the sound of G in Latin, as of T in Greek, was always the sonant guttural—which we hear in gate, &c. It was not the sonant palatal, which it represents in gem or gin. This sound began to supplant it about the 6th century of our era, but only when it preceded e or i —the two vowels which require a position of the tongue nearer to the palatal than to the guttural consonants. We find this change of sound in French and in Italian. In the Latin part of our vocabulary there is naturally

the same weakening ; whereas, in words of English origin, the original guttural is generally preserved, even before e or +, aS In get and give. Sometimes it has been weakened at the end of a word, as in bridge and ridge,

|

originally brigg and rigg, and are still so in the north of England.

It is noteworthy how a g-sound made its appearance in French at the beginning of words which originally began with the w-sound. An example is guerre, a borrowed word from the Teutonic; we see it in Old High German as werra, a quarrel, The Gauls apparently found a difficulty in producing the initial German sound, and (there being no difference in the position of the back of the mouth for g and w, except that the passage between the back-palate and the tongue is entirely closed for g, but left slightly open for w) they did not keep the w pure, but sounded ag before it by unintentionally closing the oral passage for a moment. The same thing is seen in guérir, which corresponds to Gothic varjan; in garant, which we have in English war- rant; garnir corresponds to Anglo-Saxon warnian. In a few instances the word so modified seems to have been originally Latin, as gatne, a sheath, the Latin vagina.

This French change has led to a curious result in England. Many words were introduced by the Normans into England in their French form, which were already existent there in their Teutonic form. Thus we have such pairs as wile and guile, wise aud guise, warranty and guarantee, wager and gage, and many others. It is strange that in so many cases each of the pair of words should have remained in use, and with so little change of meaning.

GABELENTZ, Hans Conon von per (1807-1874), a distinguished linguist and ethnologist, born at Altenburg, October 13, 1807, was the only son of Hans Karl Leopold von der Gabelentz, chancellor and privy-councillor of the duchy of Altenburg. From 1821 to 1825 he attended the gymnasium of his native town, where he had Matthiz (the eminent Grecist) for teacher, and Hermann Brockhaus and Julius Lébe for schoolfellows. Here, in addition to ordinary school-work, he carried on the private study of Arabic and Chinese ; and the latter language continued especially to engage his attention during

his undergraduate course, from 1825 to 1828, at the universities of Leipsic and Gottingen. In 1830 he entered the public service of the duchy of Altenburg, where he attained to the rank of privy-councillor in 1843. Four years later he was chosen to fill the post of “Jandmarschall” in the grand-duchy of Weimar, and in

which were | 1848 he attended the Frankfort parliament, and represented

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the Saxon duchies on the commission for drafting an im- perial constitution for Germauy. In November of the same year he becaine president of the Altenburg ministry, but he resigned office in the following August. From 1851 to 1868 he was president of the second chamber of the duchy of Altenburg; but in the latter year he withdrew entirely from public life, that he might give undivided attention to his learned researches. He died on his estate of Lemnitz, in Saxe-Weimar, on the 3d of September 1874. In the course of his life he is said to have learned no fewer thau eighty languages, thirty of which he spoke with fluency and elegance. ;

acquisition than for the higher talent which enabled him to turn his knowledge to the genuine advancement of linguistic science. Immediately after quitting the unl- versity, he followed up his Chinese researches by a study of the Finno-Tataric languages, which resulted in the pub- lication of his Hlémens de la Grammaire Mandchoue in 1832. In 1837 he became one of the promoters, and a

GAB—GAB

| principal relic of the ancient city is a ruined temple (pro-

But he was less remarkable for his power of |

bably of Juno) on a hill now crowned by the ruins of the medizxval fortress of Castiglione. It is a hexastyle struc- ture of uncertain date, uniting the characteristics of Greek and Italian architecture ; but the fraginents of the

pillars are not sufficient to show whether it belonged to the lonic or the Corinthian order. Its length is about 48 English feet. Since 1792, when explorations were commenced by the Prince Borghese, a large number of minor antiquities have been discovered at Gabii, and the sites of the forum

and a theatre have been ascertained. The statues and

busts are especially numerous and interesting; besides tle

deities Venus, Diana, Nemesis, &c., they comprise Marcus Agrippa, Tiberius, Germanicus, Caligula, Claudius, Nero,

joint-editor, of the Zeitschrift fiir die Kunde des Morgen-

landes, and through this medium he gave to the world hus Versuch einer mordwinischen Grammatrk and other valuable contributions. His Grundziige der syrjdnischen Grammatek appeared in 1841. friend, Julius Lobe, the Germanist, he brought out a com- “plete edition, with translation, glossary, and grammar, of Ulfilas’s Gothic version of the Bible (Leipsic, 1843-46); and from 1847 he began to contribute to the Zertschrift der dentschen morgenlindischen Gesellschaft the fruits of his researches into the languages of the Suahilis, the Samoyeds, the Hazaras, the Aimaks, the Formosans, and other widely- separated tribes. 1852) contain Dyak, Dakota, and Kiriri grammars; to these were added in 1857 a Grammattk u. Worterbuch der Kassiasprache, and in 1860 a treatise in universal gram- mar (Ueber das Passivum). In 1864 he edited the Manchou translations of the Chinese Sse-shu, Shu-king, and Shi-king, along with a dictionary ; and in 1873 he completed the work which constitutes his most important contribution to philology, Dze melanesischen Sprachen nach threm grammatischen Ban und threr Verwandschaft unter sich und mut den malausch-polynesischen Sprachen untersucht (Leipsic, 1860-73). It treats of the language of the Fiji Islands, New Hebrides, Loyalty Islands, New Caledonia, a“ and shows their radical affinity with the Polynesian class. in Pierer’s Conversations-Lexicon.

GABII, an old, and at one time important, city of Latium, on the Via Prenestina, or road to Praeneste, between 12 and 13 miles E. of Rome. Long before the foundation of Rome, Gabii appears to have been one of the

largest of the Latin cities ; and, according to an old tradition noticed by Dionysius and Plutarch, Romulus and Remus were educated there, During the greater part of the regal period of Rome Gabii maintained its ground, and it only fell into the hands

of Tarquin the Proud through a stratagem contrived by his |

son Sextus, who was afterwards slain by the inhabitants when, on the expulsion of his family from Rome, he sought refuge in the town. After this period Gabii always appears in history as the ally or dependent of its more powerful neighbour, and it gradually fell into sucli a state of decay as to become a proverb of desolation—Gabiis desertior. The fame of its cold sulphurous waters gave new life to the place in the reign of Tiberius; and the emperor Hadrian one of whose favourite residences was not far distant, at Tivoli, appears to have been a very liberal patron, building a town-house (Curia Alia Augusta) and an aqueduct. After the 3d century Gabii practically disappears from history, though its “ bishops ” continue to be mentioned in

In conjunction with his old school | | girding the toga, with one end thrown over the lead and

The Beitrdge zur Sprachenkunde (Leipsic,

He also contributed most of the linguistic articles |

Trajan and Plotina, Hadrian and Sabina, Aurelius An- toninus, L. Septimius Severus, Septimius Geta, Gor- dianus Pius, &. The inscriptions relate mainly to local and municipal matters. In the neighbourhood of Gabii were valuable and extensive quarries of an excellent build- ing stone, known as thie lapis Gabinus, which was largely used by the Romans. It was a hard and compact variety

| of voleanic tufa, and closely resembled the lapes Albanus,

to which, however, it was superior. The name of cenctus Gabinus was given by the Romans to a peculiar method of

the other fastened round the waist, which was employed by the founder of a new town, or by the consul when he “ declared war in the name of the Roman people, or devoted himself to death for his country. ’

See Ciampini, Monwmenta Vetera (which contains a plan and elevation of the temple); Gallatti, Gabi antica citta di Sabina

scoperta, 1757; Fea, Lettcre sopra la scoperta delle rovine della citta di Gabio, 1792; Visconti, Monumenti Gabini della villa Pinciana,

| Rome, 1797, new edition, Milan, 1835; Gell, Rome and its vicinity

| Roma antica.

_ one of the masters in the gymnasium at Baircuth.

Nibby, Contorni di Roma; and Canina, Storia e topographia di An interesting comparison of the temple of Juno with the similar building at Aricia was contributed by Abeken to the Annali dell. instit. di corr. arch., Rome, 1841.

GABLER, Grorc AnpRrEAs (1786-1853), a German philosophical writer of the school of Hegel, was born at Altdorf, in Bavaria, where his father was professor, on the 30th of July 1786. In 1804, when his father was translated to Jena, he accompanied him to that university, where he completed his studies in philosophy and law, and became one of the most enthusiastic of the hearers and disciples of Hegel. After holding successive educational appointments at Weimar, Nuremberg, and Ansbach, he, in 1817, became In 1821

he was appointed rector, and in 1830 general superintend-

ent of schools. In 1827 he brought out the first volume of a Lehrbuch der philosophischen Propddeutik als Hinleitung

zur Wissenschaft, in which his design was to give a popular

exposition of the Hegelian philosophy, which he himself regarded as fitted to give “absolute satisfaction to the faculties of thinking and knowing.” In

1835 he succeeded Hegel in the Berlin chair. His other works were a treatise De vere philosophie erga religionem Christianam pretate (1836), and Die ILegel'sche Philosophie, a defence of the

| Hegelian philosophy against Trendelenburg, which was

published in 1843.

1853.

GABLER, Jouann Puripe (1753-1826), a learned Protestant theologian of the school of Griesbach and Eich- horn, was born at Frankfort-on-the-Main, June 4, 1753.

He died at Teplitz, September 13,

He had already acquired an extensive acquaintance with

the ancient languages and their literatures, as well as with the philosophy of Wolf and the theology of Baumgarten, when, in his nineteenth year, he entered the university of Jena as a divinity student. In 1776 he was on the point of abandoning theological pursuits, when the arrival of

ecclesiastical documents till the close of the 9th. The | Griesbach inspired him with new ardour. After having

peen successively repetent in Gittingen and teacher in the public schools of Dortmund (Westphalia) and Altdorf (Bavaria), he was, in 1793, appointed second professor of theology in the university of the last-named city, whence he was translated to a chair in Jena in 1804. At Altdorf he published (1791-93) a new edition, with introduction and notes, of Eichhorn's Urgeschichte; this was followed, two years afterwards, by a supplement entitled Mewer Versuch tiber die mosaische Schipfungsgeschichte. He was also the author of several original works which were charac- terized by much critical acumen, and which had consider- able influence on the course of German thought on theo- logical and biblical questions. From 1798

to1811 he was editor of the Theologisches Journal, first conjointly with Hanlein, Ammon, and Paulus, and afterwards unassisted. He died at Jena, February 17, 1826.

GABLONGZ, the chief town of a circle in Bohemia, is situated in a hilly country on the river Neisse, about 6} miles §.E. of Reichenberg. It possesses a Catholic and a Protestant church, a city school, a hospital, and a fine new town-house. Its principal industry is the manufacture of glass, the export of which reaches an annual value of over 6 million guilders. It has also net and cloth factories. The population in 1869 was 6752.

GABOON RIVER, or Rio pe Gapio, called Olo' Mpongwe by the Mpongwe natives, and Aboka by the Fan, is, in reality, not a river but an estuary on the west coast of Africa. boguing in 0° 21' 25' N. lat. and 9° 21' 23" W. long. At the eutrance, between Cape Joinville, or Santa Clara, on the N., and Cape Pangara, or Sandy Point, on the &., it has a width of about 18 English miles. It maintains a breadth of about 7 miles for a distance of 40 miles inland, when it contracts into what is known more correctly as the Rio Olambo, which is not more than 2 or 3 miles from bank to bank. Tworivers, the Nkomo or Como and the Mbokwa or Bokoe, discharge into the upper portion of the Rio Olaimbo, both taking their rise in the country of the Sierra dal Crystal. The former, which far exceeds the other in the length of its course, has its head waters, according to M. Genoyer (1862), in that part of the range which is known to the natives as Anenguenpala, or tlie '" Water-jug." Mr Winwood Reade reached the rapids in 1862, and Mr R. B. N. Walker, one of the traders in the Gaboon, has ascended for about 30 miles up the river, which had still 2 fathoms of water. Captain Burton, who in 1870 sailed up the Mbokwa as far as Tippet Town or Mayyan, a little way beyond tlie confluence of the Londo, found it there "some 50 feet broad," with a tidal rise of nearly 7 feet. There are a great number of other streams that fall into the Gaboon, but only two are worthy of special mention,—tlhe Remboa, which, rising like the Nkomo and Mbokwa in the Sierra dal Crystal, enters the estuary at its south-east corner, and the Eko or Cohit, which is the largest of the right hand affluents, Though the whole estuary is studded with islands, reefs, and shoals, none of the islands are of great extent except Coniquet, or King's Isle, at the mouth of the Cohit, and Embeneh, or Parrot Island, in the middle of the channel,

The four principal tribes in the country of the Gaboon are the Mpongwa, the Fan, the Bakalai, and the Boulous. The first of these tribes, usually called Gabons or Gabonese by French writers, is distributed along both banks of the ‘‘river,” occupying the villages of Kringcr, Quaben, Louis, Libreville, and Glass on the right side, and those of George Town and Denis on the left. According to Cuptain Burton, they are now one of the most civilized of African tribes, displaying a keen interest in trade, and great ease and urbanity of manner. There are three grades or quasi-castes among them—lIst, those of pure blood, who re- joice in the title of Ongwa Ntye or ‘‘sons of the soil”; 2d,

the children of freemen by slaves; and, 3d, the slaves themselves. Marriage is by purchase, and polygamy is the rule, but the women

It lies immediately north of the equator, disem-

hold a position of considerable social influence, and maintain a secret society of their own. The men are excellent makers of canoes, and, within the present generation, they have learned to build boats of considerable size after the European model. From childhood both sexes are habitual smokers of tobacco or hemp—the tobacco being imported from America, although it might be readily cultivated in the country. A baptismal rite, almost identical with the Christian ceremony, is administered to the new-born child. The language of the Mpongwa has been reduced to writing by the American mis- sionaries. As early as 1847 they published a grammar and vocabu- lary at New York; and in 1859 the American Bible Society brought out a Mpongwa translation of the books of Proverbs, Genesis, part of Exodus, and the Acts. The language belongs to the same family as the Sechwana, the Zulu, &c., and is characterized, says Captain Burton, by inflexion, by systematic prefixes, a complex alliteration, and the almost unparalleled flexibility of the verb, which can be modified in several hundred different ways. M. Catteloup describes it as ‘‘riche, criard, imagé, et compliqué.” It has been adopted by the Pahouins, the Bakalai, and the Boulous as a kind of commercial lingua franca, and bids fair to become the dominant language of the coast, if it does not give way before English or French, which have both become familiar in a corrupted form to a large number of the maritime population.

The Fan, whose name appears under the various forms of Fanwe, Panwe, Phaouin,. and Paouen, are new comers to the Gaboon district, having, it is said, appeared there for the first time in 1842. They are described as of mean height, chocolate complexion, and remarkably regular features. Their reputation as cannibals is evi- dently well founded; but they seem to partake of human flesh rather as a ceremonial observance than as an ordinary means of nowrish- ment, and both Winwood Reade and Captain Burton speak in , favourable terms of their general characteristics. They are skilful workers in iron, and manufacture cross-bows which discharge poisoned darts 40 or 50 yards. ‘Tattooing is practised by both sexes, and the women often stain the whole body red or yellow. The tribe has come very little into contact with Europeans, but it is moving towards the coast, and will probably before long be the dominant race in the Gaboon.

The Gaboon was early visited by the Portuguese explorers, and it became one of the chief seats of the slave trade. It was not, how- ever, till well on in the present century that Europeans made any more permanent settlement than was absolutely necessary for the Maintenance of their commerce. In 1839 Captain Bouet of the ‘** Malouine ” obtained for France the right of residence on the left bank, and in 1842 he secured better positions at Louis and Quaben on the right bank. The chief establishment, called Le Plateau, at Libreville, was founded in 1845, and gradually acquired consider- able importance. In 1867 the troops numbered about 1000, and the civil population about 5000, while the official reports about the same date claimed for the whole colony an area of 8000 square miles, and a population of 186,000. A large building with arcades at Libre- ville served as Government house, and there were pretty extensive warehouses, a hospital, and a small dockyard, as well as gardens, and a nursery for coffee plants and fruit trees. At some little distance off a convent was founded in 1844 by Mgr. Bessieux. In consequence of the war with Germany the colony was practically abandoned in 1871, and the establishinent at Libreville is now maintained only as a coaling depét. There are numerous English trading ports along the shores of the estuary, as at Glass ‘Town and Olemi; and even when the French influence was at its greatest almost the whole commerce of the Gaboon was in English hands. The chief articles of export are ivory and beeswax; to which may be added caoutchouc, ebony,

and camwood. Mission stations are maintained by French, English, American, German, and Portuguese societies.

Sce Bowditch, Mission from Cape Coast Castle io Ashaniee, &c., 1819; E. Bouet- Willaumez, Descr. nautiques des cotes de ! Afrique Occidentale, 1846; Pigeard “ Rapport addressé a M. Montagnies de la Roque,” in Annales maritimes, 1847; J. L. Wilson, Western Africa, 1856; Winwood Reade, Savage Africa, 1863; Annales des Voyages, 1866; Du Chaillu, Journey to Askangoland, 1867, ‘‘ Notice dune Carte,” in Bull. de la soc. géog. 1869; Catteloup, in Revue maritime et coloniale, 1874; Burton, Two Trips to Gorilla Land, 1876; Coello’smap in Boletin de la soc. geogr. de Madrid, 1878.

GABRIEL (N13 ic, man of God, TaBpud) is the name of the heavenly messenger (see ANGEL) who was sent to Daniel to explain the vision of the ram and the he-goat, and to communicate the prediction of the Seventy Weeks (Dan. viii. 16; ix. 21). He was alsoemployed to announce the birth of John the Baptist to Zechariah, and that of the Messiah to the Virgin Mary (Luke i. 19, 26). Both Jewish and Christian writers generally speak of him as an archangel—a habit which is readily accounted for when Luke i. 19 is compared with Rev. viii. 2, and also with Tobit xii. 15. In the apocryphal Book of Enoch (c. ix.) he is spoken of as one of “the four great archangels,” Michael,

+t GA D>=Cc AD

Uriel, and Suriel or Raphael being the other three. His name frequently occurs in the Jewish literature of the later post-Biblical period. Thus, according to the Chaldee para- phrase of Pseudo-Jonathan, the man who showed the way to Joseph (Gen. xxxvii. 15) was no other than Gabriel in human form; and in Deut. xxxiv. 6 it is affirmed that he, along with Michael, Uriel, Jophiel, Jephephiah, and the Metatron, buried the body of Moses. In the Targum on 2 Chr. xxxil. 21 he is named as the angel who destroyed the host of Sennuacherib ; and in similar writings of a still later period he is spoken of as the spirit who presides over fire, thunder, the ripening of the fruits of the earth, and similar processes. In the Koran great prominence is given to his function as the medium of divine revelation, and, according to the Mahometan interpreters, he it is who is referred to by the

appellations “ Holy Spirit” and “Spirit of Truth.” He is specially commemorated in the calendars of the Greek, Coptic, and Armenian churches.

GAD (73) in Hebrew and Chaldee means “luck” ; hence, in the Phoenician and Babylonian cultus, the god of luck, who is mentioned in Isa. lxv. 11 (where for ‘that troop” should be read “ Gad”), and whose name appears in several names of places, such as Baal-Gad (Josh. xi. 17, xii. 7); possibly also in Dibon-Gad, Migdol-Gad, and Nahal-Gad. Gad was the name given by Leah, the wife of Jacob, to the patriarch’s seventh son, the first-born of Zilpah, her maid; see Gen. xxx. 11, where the Hebrew K’tib is 733, and the Kri 74 83. The former is adopted by the LXX., and rightly rendered év rixn (Vulgate feliciter); the latter reading is adopted in the Targums and Peshito, which translate “luck is come,” and by the Samaritan and Ven., which interpret the expression as mean- ing “a troop (or army) is come.” This last rendering has doubtless been influenced by Gen. xlix. 19, where the name is played on as if it were 7173, “a plundering troop”; ‘Gad, a plundering troop shall plunder him, but he shall plunder at their heels.” Of the personal history of Gad ‘ nothing is related. According to Gen. xlvi. 16, he had seven sons when he went down to Egypt along with Jacob ; and in Num. xxvi. 15 these appear as seven families, one of the names, however, being changed (Ozni for Ezbon), At the Exodus the tribe numbered 45,650 fighting men (Num. i, 25); but they declined to 40,500 during the forty years’ wandering in the wilderness (Num. xxvi. 18). During the subsequent period the fortunes of this tribe were very closely connected with those of the tribe of Reuben. At the division of the country a portion in the trans-Jordanic territory was, at their special request, allotted to them by Moses (Num. xxxii. 33), and this arrangement was carried out by Joshua; but considerable difficulty arises when the attempt is made to define the precise limits of the district thus assigned. It is certain that Gad never extended further west than the Jordan; but in different passages we find its northern, eastern, and southern boundaries stretched as far as to the Sea of Galilee, Salkah in the clesert, and the river Arnon respectively. In the book of Numbers (xxxii. 34) the cities of Gad appear to lie chiefly to the south of Heshbon ; in Joshua xiii. 24-28 they lie almost wholly to the north; while other texts present discrepancies that are not easily reconciled with either passage. That Gad, at one time at least, held territory as far south as Pisgah and Nebo would

follow from Deut. xxxiii. 21, if the rendering of the Targums, revived by Ewald and Diestel, were to be accepted —“ and he looked out the first part for himself, because there was the portion of the buried law- giver ;” it is certain, however, that, at a late period, this tribe was localized chiefly in Gilead, in the district which now goes by the name of Jebel Jilad. Possibly some cities were common to both Reuben and Gad, and perhaps others more than once changed hands.

and warlike ; but the latter seems to have excelled in bravery and force of character, and indeed there are indications that the tribe of Reuben had been absorbed, or become ex- tinct, at a somewhat early date. David’s men of Gad (1 Chr. xii. 8) are famous, and Jephthah and Elijah seem to have belonged to that tribe. It followed Jeroboam in the great revolt against the house of David; and a genealogy, as at the time of Jeroboam IL, is given in1 Chr. v. 11-16, where the names are in every case different from those in Numbers. The tribe was “‘carried into captivity” by Tiglath Pileser in the 8th century B.c. (1 Chr. v. 26; comp. 2 Kings xv. 29), aud at this point it wholly disappears from history.

GAD is also the name of a “ prophet” or “seer,” who was probably a pupil of Samuel at Naioth, and a companion of David, to whom he early attached himself. It is not known to which tribe he belonged. He is first mentioned in 1 Sam. xxii. 5 as having joined David while he was “‘in the hold ;” and he afterwards became a member of his regal court, where he seems to have held an official position, being occasionally designated as “the king’s seer.” He assisted in organizing the musical service of the “house of of God” (2 Chr. xxix. 25), and also wrote a “ book of the acts of David,” which is referred toin 1 Chr. xxix. 29.

GADAMES, Guapdmes, or RuApDAmgs, the chief town of an oasis of the same name, in that part of the Sahara which belongs to the regency of Tripoli, not far from the frontier of Algeria. According to Dr Rohlfs, the last form of the word niore correctly represents the Arabic pronunciation ; but the other forms are more usual in European books. The whole oasis is surrounded by a dilapidated wall varying in height from 12 to 20 feet, and it requires about an hour and a half to make the circuit of the enclosure at an ordinary walking space. In the town proper the streets are narrow and

tortuous, and they are usually covered in overhead to keep out the heat. Its _ public buildings comprise six mosques and seven schools ; and it is worthy of note that all the inhabitants can read and write, and that those who cannot pay for their children are allowed to send them to school free of charge. The Gadamsi merchants have been known for centuries as keen and adventurous traders, and their commercial esta- blishments are to be found in many of the more important cities of northern and central A frica,such as Kano, Katsema, Timbuctoo. Gadames itself is the centre of a large num- ber of caravan routes, and it is calculated tliat, on an average, about 30,000 laden camels enter its markets every year. At the time of Richardson's visit in 1845 the total population was estimated at 3000, of whom about 500 were slaves and strangers, and upwards of 1200 children; but it now amounts in round numbers to 7000 or even 10,000. The natives are mainly of Berber descent, although their blood has from generation to generation been mingled with that of Negro slaves from various parts of Africa. It is evident, from the remains that are still extant, that the oasis of Gadames was formerly inhabited by people whose architecture was of Roman origin; and it is not unlikely that the Romans themselves may have been attracted to the spot by the presence of the warm springs which still rise in the heart of the town, and spread fertility in the sur- rounding gardens. An identification has been made with Cydamus, a town mentioned by Pliny. See Largeau in Bull. de la soc. géogr. de Paris, 1877.

GADARA, an ancient city of Syria, in the Decapolis, about 6 miles S.E. of the Sea of Galilee, on the banks of the Hieromax. The site, now called Um Keis, is marked by extensive ruins, which are quite in keeping with the statements of Josephus and Polybius that Gadara was the capital of Persea, and one of the most strongly fortified

Both tribes were pastoral | places in the country. The walls can still be traced in a

circuit of about 2 miles; one of the principal streets—a via recta, or straight street—has evidently been bordered on both sides by colonnades; and two theatres are the must noticeable of the ruined edifices. The cliffs round the town are full of tombs excavated in the limestone rock, and by a curious

irony of fate these chambers of the dead are the only places where a living inhabitant of Gadara is to be found. According to Josephus, Gadara was a Greek city, and it appears at least not improbable that it was a foreign settlement. The name does not occur in the Scriptures ; but in the New Testament, the phrase “ the country of the Gadarenes” is used more than once, and there is no reason to doubt that the vicinity of the town was the scene of the healing of the demoniacs by the Saviour, recorded in Matt. vill, Mark v,, and Luke viii. Josephus informs us that Gadara was captured by Antiochus in 218 B.c., and, about 20 years afterwards, stood a ten months’ siege by Alexander Janneus. It was twice taken by Vespasian, though, on the first occasion, the Jewish inhabitants offered a stout resistance, At a later period it recovered from the injuries he inflicted, and was one of the most beautiful and flourish- ing cities of Syria; and it was not till after the Mahometan conquest that it fell again into decay. Its archon or prefecture is mentioned in the Midrash Rabba (circa 278) and other Jewish writings. According to Dr O. Blau the town was also known as the Arabian Antioch. To the literary student it is interesting as the birthplace of Meleager the anthologist.

See Porter in Journ. of Saered Literature, vol. vi.; Journ. Asia- tique, 1867, p. 191; Zeitsch. d. D. Morg. Ges., 1869.

GADDI. Four painters of the early Florentine school— father, son, and two grandsons—bore this name.

1, Gappo Gappi (1239 to about 1312) was, according to Vasari, au intimate friend of Cimabue, and afterwards of Giotto. He was a painter and mosaist, is said to have executed the great mosaic inside the portal of the cathedral of Florence, representing the coronation of the Virgin, and may with more certainty be credited with the mosaics inside the portico of the basilica of 8, Maria Maggiore, Rome, re- lating to the legend of the foundation of that church ; their date is probably 1368. In the original cathedral of St Peter in Rome, he also executed the mosaics of the choir, and those of the front, representing on a colossal scale God the Father, with many other figures ; likewise an altarpiece in the church of S. Maria Novella, Florence; these works no longer exist. It is ordinarily held that no picture (as distinct from mosaics) by Gaddo Gaddi is now extant. Messrs Crowe & Cavalcaselle,

however, consider that the mosaics of S. Maria Maggiore bear so strong a resemblance in style to four of the frescos in the upper church of Assisi, representing incidents in tlie life of St Francis (frescos 2, 3, 4, and especially 5, which shows Francis stripping him- self, and protected by the bishop), that those frescos like- wise may, with cousiderable confidence, be ascribed to Gaddi. Some other extant mosaics are attributed to him, but with- ont full authentication. This artist laid the foundation of a very large fortune, which continued increasing, and placed his progeny in a highly distinguished worldly position.

2. Tappxo Gappr (about 1300-1366, or later), son of Gaddo, was born in Florence, and became one of Giotto's most industrious assistants for a period (as usually stated) of 24 years, This can hardly be other than an exaggera- tion; it is probable that he began painting on his own account towards 1330, when Giotto went to Naples. Taddeo also traded as a merchant, and had a branch esta- blishment in Venice. He was a painter, mosaist, and archi- tect. He executed in fresco, in the Baroncelli (now Giugni) chapel, in the Florentine church of 8. Croce, the Virgin and Child between Four Prophets, on the funeral monument at the entrance, and on the walls various incidents in the

legend of the Virgin, from the Expulsion of Joachim from the Temple up to the Nativity. In the subject of tle Pre- sentation of the Virgin in the Temple are the two heads traditionally accepted as portraits of Gaddo Gaddi and Andrea Tafi ; they cannot, at any rate, be portraits of those artists from the life. On the ceiling of the same chapel are the Eight Virtues. In the museum of Berlin is an altar- piece by Taddeo, the Virgin and Child and some other sub- jects, dated 1334 ; in the Naples Gallery, a triptych, dated 1336, of the Virgin enthroned along with Four Saints, the Baptism of Jesus, and his Deposition from the Cross; in the sacristy of S. Pietro a Megognano, near Poggibonsi, an altarpiece dated 1355, the Virgin and Child enthroned amid Angels, A series of paintings, partly from the life of S. Francis, which Taddeo executed for the presses in S. Croce, are now divided between the Florentine Academy and the Berlin Museum; the compositions are taken from or founded on Giotto, to whom, indeed, the Berlin authorities have

ascribed their examples. Taddeo also painted some frescos still extant in Pisa, besides many in 8. Croce and other Florentine buildings, which have perished. He deservedly ranks as one of the most eminent successors of Giotto ; it may. be said that he continued working up the material furnished by that great painter, with comparatively feeble inspiration of his own. His figures are vehement in action, long and slender in form; his execution rapid and somewhat conventional. To Taddeo are generally ascribed the celebrated fresecos—those of the ceiling and left or western wall—in the Cappella degli Spagnuoli, in the church of 8. Maria Novella, Florence ; this is, however, open to considerable doubt, although it may perhaps be conceded that the designs for the ceiling were furnished by Taddeo. Dubious also are the three pictures ascribed to him in the London National Gallery. As a mosaist, he has left some work in the baptistery of Florence. As an archi- tect, he supplied in 1336 the plans for the present Ponte Vecchio, and tliose for the original (not the present) Ponte S. Trinita ; in 1337 he was engaged on the church of Orsan-’ Michele ; aud he carried on after Giotto’s death the work of the unrivalled Campanile.

3. AGNoLO GappI, born in Florence, was the son of Taddeo; the date of his birth has been given as 1326, but possibly 1350 is nearer the mark. He was a painter and mosaist, trained by his father, and a merchant as well; in middle age he settled down to commercial life in Venice, and he added greatly to the family wealth. He died in October 1396, His paintings show much early promise, hardly sustained as he advanced in life. One of the earliest, at S. Jacopo tra’ Fossi, Florence, represents the Resurrection of Lazarus. Another probably youthful per- formance is the series of frescos of the Pieve di Prato— legends of the Virgin and of her Sacred Girdle, bestowed upon St Thomas, and brought to Prato in the 11th century by Michele dei Dagomari; the Marriage of Mary is one of the best of this series, the later compositions in which have suffered much by renewals. In §. Croce he painted, in eight frescos, the legend of the Cross, beginning with the Archangel Michael giving Seth a branch from the tree of knowledge, and ending with the Emperor Heraclius car- rying the Cross as he enters Jerusalem; in this picture is a portrait of the painter himself. Agnolo composed his subjects better than Taddeo; he had more dignity and individuality in the figures, and was a clear and bold colourist ; the general effect is laudably decorative, but the drawing is poor, and the works show

best from a distance, Various other productions of this master exist, and many have perished. Cennino Cennini, the author of the celebrated treatise on painting, was one of his pupils.

4, GIovANNI GappI, brother of Agnolo, was also a painter of promise. He died young. (W. Bi)

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GADIATCH, a town of Russia, at the head of a district in | the government of Poltava, situated on the elevated banks of the Grun and the Psel, 73 miles N.N.W. of Poltava, in “50° 29’ N. lat. and 34° 0’ E. long. It is a plain wood-built town, with four Greek churches and two synagogues, deriv- ing its main importance from its four annual fairs, one of which, lasting for three weeks, was, up to 1857, held at the Hermitage of the Transfiguration (Skeet Preobrazhenskt). In 1860 the population was 7263, 1213 of the number being Jews, According to W. Struve’s Calendar for 1878, +t was 8425. Gadiatch was the place where the assembly was convoked by the hetman Vigofski in 1658, for the publication of the treaty contracted between the Ukrainians and the Poles. During the hetmanate it had fortifications of which traces are still extant, ranked as a garrison town, and was the residence of the hetman. At first it was included in the military district of Luben, but after 1650 in the district to which it gaveits name. Along with 13 large villages it was bestowed by the empress Elizabeth on Count Razumofski, but it was afterwards purchased from him by the empress Catharine If, In 1771 the town and district were incorporated with the province of Kieff, and in 1802 they obtained their present position in the government of Pultowa.

GADWALL, a word of obscure origin,’ the conmon English name of the Duck, called by Linnzeus Anas strepera, but considered by many modern ornithologists to require removal from the genus Anas to that of Chauwlelasmus or Ctenorhynchus, of either of which it is not only the typical but the sole species. Its geographical distribution is almost identical with that of the common Wild Duck or Mallard (see Duck, vol. vii. p. 505), since it is found over the greater part of the Northern Hemisphere; but, save in India, where it is said to be perhaps the most plentiful species of Duck during the cold weather, it is hardly any- where so numerous, and both in

the eastern parts of the United States and in the British Islands it is rather rare than otherwise. Its habits also, so far as they have been observed, greatly resemble those of the Wild Duck ; but its appearance on the water is very different, its small head, flat back, elongated form, and elevated stern rendering it recognizable by the fowler even at such a distance as hinders him from seeing its very distinct plumage. In coloration the two sexes agree much more than is the case with any of the European Freshwater Ducks (Anatinw)— one only, the Anas marmorata, excepted ; but on closer inspection the drake exhibits a delicate ash-coloured breast, ‘ and upper wing-coverts of a deep chestnut, which are wholly wanting in his soberly clad partner. She, however, has, in common with him, some of the secondary quills of a pure white, presenting a patch of that colour which forms one of the most readily-perceived distinctive characters of the species. The Gadwall is a bird of some interest, since it is one of the few that have been induced, by the protection afforded them in certain localities, to resume the indigenous position they once filled, but had, through the draining and | reclaiming of marshy lands, long since abandoned. In regard to the present species, this fact is due to the efforts of the late Mr Andrew Fountaine, on whose property, in

1 Webster gives the etymology gad well=go about well. Dr R. G. Latham suggests that it is taken from the syllables quedul, of the Latin guerquedula, a Teal. The spelling ‘‘ Gadwall” seems to be first found in Willughby in 1676, and has been generally adopted by later writers ; but Merrett, in 1667, has ‘‘Gaddel” (Pinaz Rerum naturalium Britannicarum, p. 180), saying that it was so called by | bird-dealers, The synonym ‘‘ Gray,” given by Willughby and Ray, is doubtless derived from the general colour of the species, and has its | analogue in the Icelandic Grdénd, applied almost indifferently, or with some distinguishing epithet, to the female of any of the Freshwater Ducks, and especially to both sexes of the present, in which, as stated , in the text, there is comparatively little difference of plumage in Drake and Duck.

& A D—

| erudition, and the sound judgment it displays.

one on each side, the territory occupied by the Celt.

West Norfolk and its immediate neighbourhood, the Gadwall has now, for nearly thirty years, annually bred in constantly increasing numbers, so that it may again be accounted, in the fullest sense of the word, an inhabitant of England; and, as it has been always esteemed one of the best of wild fowl for the table, the satisfactory result of its encouragement by this gentleman is not to be despised. A. N.. GAELIC LANGUAGE AND LITERATURE. Until recently there was doubt as to the family of languages to which the Gaelic belonged ; indeed, with many scholars the impression existed that it belonged to the Semitic branch, and that its relations must all be traced among some one or other of its varieties. This view arose very 1nuch from the neglect with which the language had been treated by scientific men. Comparative philology is itself a modern subject of study. Naturally, in its progress, the more prominent languages came first, while the more obscure were passed over as of comparatively subordinate importance. The study is one so comprehensive, and requiring so large an amount of acquirement of various kinds, that it is no real reproach to modern scholarship that the study of such languages as the latter should have been postponed in favour of that of languages more generally known. Their turn, however, gradually came, and no one can complain now that they have not received the attention of very com- petent scholars. It is doubtful whether a higher class of scholarship has been nurtured anywhere than in the study of the Celtic languages, as exhibited by such men as Zeuss, Dieffenbach, Ebel, Whitley Stokes, the Chevalier Nigra, Henri Gaidoz, and others who have devoted their strength to their exposition. The result has been the complete establishment of the fact that this class of languages belongs to the Indo-European or Aryan stock, and is closely related to the classical branch of those tongues. . The first who brought real scholarship to bear upon the question of the family to which the Celtic dialects belonged was Dr Cowles Pritchard. His Hastern Origin of the Celtic Nations is a work of the highest value, distinguished by its He was one of the most remarkable men whom Britain has produced in the field of comparative philology. No doubt it is with the Welsh he chiefly dealt, but, in discussing such questions as he had to deal with, it mattered little which of the Celtic tongues was made use of. Many writers followed Dr Pritchard, and there is now, as has been said, no question about the Aryan source of the Celtic languages. It is not that the

words are to a large extent analogous, but the grammatical structure and the idioms correspond to such an extent that the question is put beyond adoubt; while, with the exception of a few common vocables, there is little

-that is analogous between the Celtic and the Semitic

languages.

The territory once occupied by the Celtic race is a ques- tion of much interest. Now they are confined within well- known limits. On the European continent they occupy that part of France usually called Brittany, the most westerly portion of the country terminating in Cape Finisterre. They occupied this territory so early as the days of Julius Cesar, although it has been said that they were emigrants from Britain at a later period. The topographical terms given by Cesar in describing the Roman invasion all indicate that the language of the natives of Brittany used then, and for a long time before, was as much Celtic as it is now. Opposite to Brittany lies British Cornwall, a region with a Celtic tongue until about 100 years ago. The two Corn- walls—one in Britain and the other in France—terminated, The dialects spoken in these stood in the closest relationship. To the north of this lies the greatest of all the modern sec-

tions of the Cimbrian Celts. Wales, occupied by about a million inhabitants, is nearly Celtic, and uses the ancient tongue of Wales, Cumbria, and Strathclyde. Across the sea from Wales lies the Isle of Man, where the Gaelic branch of the Celtic held sway, and does to some extent still. In Ireland the Gaelic also prevailed, and is still spoken by about a million people. And lastly, in the. Scottish Highlands about 300,000 people still use, less or more, the old Gaelic tongue of Scotland. Thus Brittany, Wales, Man, western Ireland, and the Scottish Highlands are now the territory of the Celtic languages. That they once occupied a wider sphere is beyond a doubt. There are traces of the tongue, in one form or other, to be found all along southern Europe. Topography is a valuable source of evidence, and one that will be made to serve pur- poses it has never served as yet; and it furnishes us—in Italy, France, Switzerland, Spain, and Portugal—with relics which, like animal fossils dug from the depths of the earth, speak

unmistakably of what formerly existed there. How far the Gaelic form of Celtic speech prevailed it is difficult to say, or whether it existed alongside of the Cimbric on the continent of Europe. But the name Gallia is significant as applied to France; and it is a suggestive fact that, to this day, the Bretons call France Gaul, as distinguished from their own country, and in like manner call the French language Gallic, as distinguished from the Breton. In

Scotland the Gaelic and Cimbric races long dwelt together,

distinct and yet nearly related. When they separated, either as to race or language, is not easily settled. There are indications on the Continent which rather throw doubt on the idea maintained by some writers that the divergence took place after the settlement of the race in Britain, and farther inquiry as to these indications is essential ere a satisfactory conclusion can be reached. But within the his- toric period the two races existed side by side in Scotland, the Cimbric occupying the region called Strathclyde, with their separate government and laws, and the Gael at least occupying the Dalriadic kingdom of Argyll. The people called by the Romans Picts occupied the north and east of Scotland. ‘That these were the same people with the Dalriadic Scots is somewhat questionable. That they were closely related to them is beyond doubt, but that they had linguistic and other peculiarities is manifest. Their topo- graphy proves it, being different from that of either Ireland or Argyll, and, so far as the historic relations of both are concerned, they indicate a state of chronic war. Fer centuries there were mutual raids of Scots on Picts, and Picts on Scots, until finally, under Kenneth MacAlpine, king of Dalriada, the Picts were overcome in the year 843, and they and the Scots became united under one monarchy. The tradition is that the Picts were annihilated,—meaning, in all likelihood, their power,—and there arose one great united kingdom. The united people are the ancestors of the present Scottish Highlanders, and the Gaelic language has come down from them to us, influenced as to structure by the dialect spoken and written by the victors,

The Gaelic language, as now in use in Scotland, resembles closely in its structure both the Irish and the Manx. They form one family, and yet it has its own distinctive features. Irish scholars maintain that it is a modern and

corrupt offshoot of the Irish, and account in this way for these peculiarities. They say, for example, that the absence of the present tense in the Gaelic verb is a mere instance of decay, and proves the modern character of the dialect. But the Welsh is no modern and corrupt form of Irish, but an ancient distinct tongue, so far back as history carries us. And yet it wants the present tense, indicating that this peculiarity is distinctive of some of the Celtic tongues, and that what is cited as a proof of recency may in reality be a proof of priority. The present tense may be called an

Irish addition made to the verb in the process of culture. At the same time it must be allowed that there is a diffi- culty in proving from any literary remains existing that the present Scottish form of the language is of great antiquity. All the literary relies that have come down to us are written in what is usually called the Irish dialect. The present tense is in universal use, as well by Scottish as by Irish writers. This arose from the identity of the Irish and Scottish churches. The dialect in which all theological treatises were written was one, and this dialect extended from the clergy to bards, and sennachies, and medical men. There is not a page of Gaelic written in any other dialect before the middle of last century. But as in other coun- tries there was both a spoken and a written dialect in use, so in both Scotland and Ireland there appears to have been a dialect in use among the people as their common speech, and another used by their scholars,—the former varying according to locality, and the latter being identical through- out. Some of the features that distinguish the Gaelic language, partly in common with the other Celtic tongues, and partly not, are the following :—

1. The aspiration of consonants. This is accomplished by the change of m into v, of b into v, of d into y, of g into a broad y, of p into f,andsandtintoh. As appearing in the initial articula- tions this presents a peculiar difficulty to the learner of Gaelic. He has been accustomed, in learning other tongues, to observe the changes required by inflexion, and other requirements of correct grammatical structure. But he has not been familiar with changes in the initial letters of words. In English these letters never undergo any change; but in Gaelic he meets with such changes at once. He finds mac, a son, becoming in certain circumstances VAC, and he is ready to doubt whether both forms belong to the sameword. To make the difficulty as little formidable as possible to the reader, the authors of the Gaclic orthography

fell upon the method of using the letter h,which, though hardly a letter in Gaelic, and never used to begin a word, is now used more than any other letter. The Irish use adot. The use of the h serves to preserve to the reader the original form of the word. Hence mac becomes by aspiration, or adoucisscment as the French call it, mhac, pronounced vac. These initial changes of certain consonants are made for the purpose of euphony, to which Gaelic makes large sacrifices, and also for the purpose of distinguishing gender. An aspiration converts the feminine into the masculine, and, vicc versa. An ceannis the head, masculine, «’ chos the foot, feminine. So a chos is his foot, a cos is her foot; a chcann is his head, a ceann is her head, the pronoun undergoing no change, although its gender is indicated by the change. There are other purposes served by aspiration of consider- able importance. The Gaclic learner makes a large acquisition when he masters the principles of aspiration, and inquirers into the characters of the language will cease to blame the frequency with which h appears in Gaelic writing when they come to see how im- portant a purpose it serves.

2. Another peculiarity of the Gaelic language is to be found, as already said, in the want of a present tense in the verb. The verb “‘to do” is dean, the theme of the verb being in the impera- tive mood, There is no tense expressing simply 1 do, the form in use being I am doing, tha mia’ deanamh. The Irish say deanaim, I do, but that is not the Scottish form of the expression. In this Gaelic is not only at one with several of the Celtic branches, but with some of the Semitic tongues. And it has this further in common with these last, that the future is used to express present time. This occurs frequently in the Gaelic version of the Bible, where we have an ti a chreideas anns @’ Mhac, he that will believe in the Son, for he that believeth, And yet occasionally a true present tense appears in Gaelic:—an eluinn thu sin? Do you hear that? cluinnidh, I do hear it; am Jaie thu sin? Do you sce that? chi, I do see it. In those cases and some others: there is no doubt a distinct present tense. The cases are, however, few, and occur in peculiar circumstances.

3. Another feature peculiar to Gaelic is that there is no real infinitive in the verb. The infinitive in use is a noun which may appear either in the form of a participle or an infinitive, according to the effect of the preceding

preposition. I am going to strike, tha mi dol do bhualadh, I am going to striking; I am striking, tha mi a bualadh, I am at striking,—the preposition do, to, in the one case giving the noun the force of an infinitive, and the preposition ag or @’, at, giving the same noun the force of a participle. _ The Gaelic infinitive is thus identical with the Latin gerund, and is one of the points where the classical and the Celtic tongues meet and touch.

In the article Certic Literature reference is mede to some of those cases in which the Irish dialect of the

Celtic differs from some of the others. It is unnecessary here to go over the same groundagain. What is distinctive of the Irish is, for the most part, distinctive of the Scottish Gaelic. The Gaelic retains the hard or & sound of c¢. There is not an instance of a purely Gaelic word in which the cis pronounced soft. There are dialects of Gaelic, how- ever, in which the c becomes aspirated in the middle or at the end ofa word. ‘Thus mac, a son, is pronounced machd ; | peacadh, sin, is pronounced peachdadh. This peculiarity does not exist in the counties of Sutherland and Caithness, where the hard sound of c is retained. The Scottish Gaelic, in like manner, in common with Sanskrit, Latin, German, and Slavonian, retains the sibilant s, where other dialects have discarded it. Many words beginning in Gaelic with s have A as the initial letter in Welsh. It is worthy of | observation, however, that, in the aspirated form of the s used in inflexion or as indicative of gender, the s assumes the sound of # in Gaelic. In like manner, words in Gaelic, as in Irish, can end ins, 7, and x. The instances of these are numerous. So also does the Gaelic, like Irish, retain a harder form of the articulation than the British, but not to the same extent; for hwvel, low, in Irish humal, is in Gaelic wnhal, approaching in this, as in many other cases, nearer to the British form. So the Gaelic preserves letters where the British loses them, but not to the same extent as the Irish. For when the Irish has tech, a house, and the British t, the Gaelic has both teach and tigh, and for the most part uses the latter. In addition to this, the Gaelic, like the Irish, has preserved the declension of its noun, which cannot be said of tlie British. Four of the cases are in constant use, the nominative, the genitive, the dative, and the vocative in both numbers, the dative plural alone having

almost disappeared from common speech. In the singular number these cases are distinctly marked—cos, a foot, gen. coise, dat. cots, voc. achos. Wherever tlie language is well spoken these cases are in daily use, and are lost only when the language is far on in the process of decay. Difference between Gaelic and Irish.—The differences between the Gaelic and the Irish are considerable, and, though Irish writers maintain the contrary, are not to be taken as indications of the modern origin of the former. Without entering on that question, we find a marked dis- tinction in the use by the Irish of what is called eclipsis,— that is, the use of other and softer articulations to eclipse the harder in the beginning of a word, in some cases, as, for instance, in the genitive plural of nouns, The object aimed at would seem to be euphony, and in seeking this object the Irish and the Scottish ear did not altogether correspond, In Irish, the law as given by O'Donovan is that m eclipses 6, as ar m-bo, our cow.; g eclipses ¢, as ar g-ceart, our right ; " eclipses d, bh eclipses f, n eclipses g, b eclipses p, d eclipses ¢,¢ eclipses s. This system of eclips- | ing runs through the nouns and verbs. It is unknown in Gaelic, if we except the eclipsing of s by ¢, as an t-siuil, the | eye, an t-slat, the rod, and certain words which, in some districts of the Highlands, suffer eclipse. In Skye the ex- | pression for the number of men is direamh nan n-daoine, the n eclipsing the d, Other instances may be found along the | west coast of Scotland. But eclipsis is, for the most part distinctive of the Irish dialect, The Gaelic is further marked by a greater tendency to aspiration than the Irish. The sentence cionnas ta tu? how art thou? in Irish, is in| Gaelic ctounns tha thu 1 the verb and the pronoun being both | aspirated. Other differences might be referred to, but one is prominent, the difference of accent or emphasis. The | tendency of the Irish is to emphasize the final syllable, that of the Gaelic to emphasize the penultimate. Thus salach, dirty, in Irish, is in Gaelic saldch; Oisin, Ossian, is in

Gaelic Ozsidn. This makes a striking difference in the spoken tongues, and occasions one of the main difficulties

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Trish and Scottish Celts have in understanding each others' speech.

Advantages and Defects of Gaelic.—The Gaelic Jan- guage, as now existing, has its advantages and its corre- sponding defects. It isadmirably adapted for the purposes of the poet. In descriptive poetry few languages excel it. There are some pieces of ancient, authentic, Ossianic poetry existing that are equal in power and beauty to the composi- tions of any age or country. Such are the description of Cuchullin's chariot and horses, and the description of the swords of the Ossianic heroes. The same is true of more modern poetic compositions. Macintyre of Glenorchy's Beinn Douran and Coire Cheathaich are fine specimens of descriptive poetry—poetical in conception throughout, couched in the choicest language, and with rhythm of un- failing accuracy. The same may be said of Macdonald's Oran an t-samhraidh, or Ode to Summer, which is a remarkable specimen of what the Gaelic is capable of when used for the description of nature. Other lyrical composi- tions are also of a high order of merit. Love-songs and boat-songs abound, and are in many cases full of life and force; and the numerous songs expressive of clan affections and animosities display the same characteristics. No lan- guage is more capable of expressing both love and hate, and there seems to have been ample scope for both in the past history of the Highland clans. Within certain limits then, Gaelic is the language of poetry, extending from the epic of the Ossianic bards down to the lyric or less aspiring efforts of lesser bards.

The language is also admirably fitted for the communica- tion of religious knowledge. It is in its structure meta- phorical and emotional, and renders with wonderful pre- cision and effect the statements of Scripture. The saying attributed to one of the dukes of Argyll is well known, that if addressing his sovereign he would choose English, if addressing the lady of his affections he would choose French, but if he was addressing his God he would choose Gaelic. Few of those whose calling it is to teach reli- gious truth, and who know how to handle the language with effect, have failed to feel and own that it is iIncompar- able for conveying the knowledge of the truth with power. Perhaps no preachers have surpassed the Welsh in real elo- quence, and yet some of the Gaelic preachers have not been behind them, The language has served a great purpose in the Highlands in connexion with the religious life of the

eople,

The defects of the language are to be found chiefly in the departments of philosophy, science, and art. There it has either to be rejected or to be supplied from foreign sources.

Indeed in this field it seems to have deteriorated during

the course of several centuries. There are MSS. of the 14th and 15th centuries in existence, in which terms are employed in connexion with discussions in philosophy, theology, and medicine that could not now be understood. The philosophy of Aristotle is well rendered, as are also the theology of the fathers and the medical disquisitions of the Arabic writers on medicine. But when modern science and philosophy, and even theology in some of its depart- ments, have to be dealt with, the lack of terms renders tlie task a difficult one. It is here that, in the progress of education, the difficulty of preserving the language lies. The effect of this want is traceable in common speech, when English words have of necessity to be used in connexion with objects of everyday use. Steamer, train, boiler, engine, railway, quay, &c., have just to be introduced from the Saxon, and presented with a little of the Gaelic tone in them to suit the Celtic ear. Some writers and speakers do try to invent Gaelic terms to represent all these and similar

objects, but popular usage rejects them and prefers the foreign words,

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GaELic LireRaATuRE.—The literature of the Scottish Highlands may be divided into several branches. The following outline comprehends more perhaps than is usually included under that term; in particular, it appears necessary to give here some account of topographical and personal names.

Mythology.We have first the mythology of the race.

Little of this now exists, and it is difficult to piece the.

seattered fragments together. We find the mythology of the older faith or faiths interwoven in some cases with the mythology of the Northmen. The mythology of the East appears at some points, and we have giants, fairies,

and witches, some of them firmly believed in to the present day. Adamnan, in his life of Columba, refers to the magi who were in the palace of the Pictish king whom the missionary sought to convert. Who these were, and what was their creed, is not clearly stated, but all we read of that early faith, and all that tradition brings down to us, would seem to indicate that their worship was a form of sun worship. The words applied to the cardinal points of the compass con- vey this impression, the fear shown in many ways of going against the course of the sun, and certain festivals in which fire was and is used, would seem to confirm it. The bodies of the dead are in some cases carried sunwise round certain objects on their way to the burial ground; in fact, words and practices crop up in several parts of the country serving to show that the sun was worshipped. Rath, a circle, is used in Gaelic toexpress good fortune :—cha-n'ed rath air, there is no circle on him,—he is not fortunate,—referring, no doubt, to the course of the sun. There was a Gaelic mythology connected with the Fingalian heroes. Whether they themselves were mythical or not is debated, but there was a mythology connected with them. Fingal had a sword that never required to be used twice ; the Vulcan of the race could cross a glen with a stride ; Manannan, son of Lir, from whom the Isle of Man is named, could clothe himself in a fog, and so hide himself from his enemy. The story of Diarmad and the boar and the story of Fraoch and the beast are mythological, the former being the Celtic story of Achilles, and the latter the Celtic version of the Garden of the Hesperides. Then there were giants called Na Fiantaichean, men of colossal mould. Dun Fhian, the giant's castle, is a common topographical term. Here is the description (with English translation) of one of these heroes :-— ** Tamhull mdr, mac sheann Tamhuil, Cha ruigeadh a' mhuir mhor a ruinnse, Cha tharadh e mach, 's cha thiradh e steach,

'Us 'n uair a bhitheadh e 's a bheul fodha, Bhitheadh a dhruim a' sgriobadh an athar."

Great Taval, son of old Taval,

The great sea wouldn't reach his middle; He couldn't get out and he couldn't get in; And when he lay down on his face,

His back would be scratching the sky.

Some of these tales of the giants attribute to them a great age. There is one tale in which five generations in succession are said to exist at the same time, and the youngest of them a very aged man. The traditional tales taken down by Mr J. F. Campbell, from oral tradition in the Highlands are full of mythology. Animals in these play an important part, and are endowed with remarkable powers. How far this mythology is original, or is borrowed from the East, is an interesting question. In some of the Western Isles, the Scandinavian god Odin enters into the popular mythology, a relic, no doubt, of the Norse occupa- tion of the territory. Fairies, or the daoine sithe or sith-echean, fill an important place in the mythology of the Highlands, The name of these imaginary beings is derived from their supposed habits. Sh is a common name in Gaelic for a hill of a peculiar form, As a diminutive it is

. head at a certain moment.

sithean, the word used for green hillocks, which abound throughout the Highlands. These hills are supposed to be the abodes of fairies, who, in consequence, are called daoine sithe, or the men of the hillocks. Sih, peace, has no part in forming the designation, although often said to have. These beings were the very opposite of peaceful in the popular belief. It is impossible here to give an account of the common belief in the Highlands regarding fairies, but there is a great deal of popular literature taken up with descriptions of it, and with stories regarding these mis- chievous and meddling beings. They were fond of carrying away young children, and substituting young fairies in their place, to the grief and harassment of the mother. Nor did they confine their assaults to children, but sometimes carried men and women to their underground abodes, where they passed through extraordinary scenes. The Rev. Robert Kirke of Balquhidder wrote an account of the fairies which awakened their anger, and they spirited him away to fairy- land. He was able to appear in the room at the baptism of a child born after his removal, when it was arranged that for his deliverance a knife was to be thrown over his The hour came, but through some infatuation the party entrusted with the duty failed in the performance. Mr Kirke was not delivered, and is believed to be in fairyland to this day. Similar stories are

| without number, and show how widely extended the belief

in fairies was.

Witchcraft had a large place in the popular beliefs, and has not lost it:altogether at the present day. It was supposed possible for a person endowed with this power to inflict great damage upon an adversary. Milk could be abstracted from the cows of a neighbour and brought to swell the pro- duce of the party abstracting it. This belief has been the source of much animosity and strife among neighbours down to the present time. Clay bodies stuck over with pins could be formed representing an adversary, and could be laid in a stream, and as the clay wasted, the body of the man represented pined until he died. This afforded ample room for the exhibition of party or personal hatred, and is not altogether unknown now. The literature of witchcraft is of considerable extent, and consists in tales and forms of exorcism which are very various, and some of them very curious, The forms are all in rhyme, and do not display much of the genius of poetry; they are usually made up of appeals to saints and apostles, with the occasional introduction of the Virgin Mary. Several of these have been handed down by tradition, and are scat- tered through various works devoted to Highland lore. Near the valley of the Spey there recently lived a noted wizard, who possessed a charmed bridle which exercised a most powerful influence over all forms of bewitchment. A clergyman, not far from the residence of this man, was on one occasion much disturbed by the state of his cows, which had suddenly ceased to give milk. The neigh- bours assured the minister that it was witchcraft, and that he ought to send for the man with the charmed bridle, which, very much against his will, he was induced to do. The wizard came, and was told by the clergyman that he had no faith in his witchcraft, but he should very much like to have his counsel asa man of skill. The so-called wizard, understanding with whom he had to deal, at once laid aside all pretension to superhuman power, and asked the minister where his cows usually fed, saying that they would go and take a look at the grass. They did so, when the wizard pointed out a plant, then in flower, which he said was, in that condition, most injurious to cows yielding milk. He advised the minister to keep the cows away from that piece of pasture for a fortnight. This was done, and the cows recovered. The wizard got his fee and a promise

that nothing should be said to affect the “ confidence .—2

in his power. This is the kind of witchcraft that has existed all along, and which has cost many poor helpless creatures their lives at the stake. ;

Topography,—In dealing with the literature of the Highlands we cannot overlook the topography of the country. It is to be regretted that in Scotland we have no such MS. remains, containing topographical terms with their origin, as are to be found in Ireland, nor have we any work on the subject of topography possessed of the slightest authority. But we have numerous ancient charters con- taining names of places, and we have what are called the retours, connected with the succession to property through- out the country, and these contain extensive lists with the spelling adopted for the names at different periods. These names belong to different languages. There 1s apparently an original language, if not more than one, which is now lost. Without this assumption there is no accounting for many of the names applied to natural objects. Then there is the old Norse and the Anglo-Saxon, the one using wick for a bay, as in Caithness, and the other for a town, as in Roxburghshire ; then there is the British, as in the old Strathclyde territory, and the Gaelic. The Gaelic, in its topographical distribution, does not occupy the same field with that occupied by it as a spoken tongue. The spoken language and the topography of Galloway are quite at variance ; so with Lewis and others of the Western Isles. The spoken language of Galloway is Scottish, the topography is almost wholly Gaelic. The spoken language of Lewis, Harris, Skye, &c., is Gaelic, the topography is almost wholly old Norse. But one thing is manifest, that Gaelic names are distributed over the whole surface of Scotland, although not in equal proportions. These names contain a history, could it be evolved. They speak of races distinct and successive, although their testimony as to dates is difficult to read. The county names of Scotland in Gaelic are suggestive :—

Shetland…..... Sialtuinn. Wife: fyy.ccaeree Fiu.

Orkney …..... Arcaibh. Relig ber! Geennaopec Srutleadh. Caithness…..... Gallthaobh. Galloway …..... Gallthaobh. Sutherland ….. Cataobh. Dumfries …..... Dunphris HOSS ic anscajes tee cr Ros. TInantankees.. cos Lanerch Cromarty …..... Crombadh. AT OVA sarees Araghael. Inverness …....

Inbhearnaoise. | Dumbarton…... Dunbhreatuinn. UNIT M ss oeeees: a: Inbhearnarwan. | Bute ….....6+ Botte. INIORER.s.6. 45.556 Morthaobh. Linlithgow…... Lanneuthaich. AME Sees senensce Banabh. Lothian, M. & HK. Loudaidh. Aberdeen …..... Abaircadhain. } Renfrew…..... Renfreudh. Kincardine…... Cinnechardainn. i. Storramachd Horlar 22a… Farfair. Pe nciiae Adhar. BGnthe… .ennees Peart. Kirkeudbright Cillechudbeirt.

This list does not include Peebles (which is probably Celtic), Selkirk, Roxburgh, and Berwick, as there are no Gaelic terms for them, but in the other cases it will be seen to what an extent the county names are really Gaelic. The same is true of names of parishes, which are, to a large extent, Gaelic both in the north and in the south.

_Itis to be observed that the Gaelic topography of Scotland differs widely from that of Ireland, The Irish sliabh, for a mountain, rarely occurs in Scotland, where the word in use chiefly is beimn. It does occur, but the instances are few, while the Scottish ben is as rare in Ireland. Baile, a township, is sufficiently frequent in Scotland, but not “0 much so as the Irish bally, The word strath, for a great valley, occurs but rarely in Ireland ; in Scotland it abounds over the whole kingdom. The aders and pits and invers of Scotland are rare in Ireland, or altogether unknown, while there is little resemblance in the names of rivers. – These two systems of topography may have originated with the same people, but in one of the sections there were influences manifestly at work which were unknown in the other Even in the Dalriadic kingdom of Argyll there are features which indicate a marked distinction between the topography

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and that of Ireland. The study of this subject is full of interest, and is capable of producing important results both linguistic and historical. The field is as yet unoccupied, and affords much to encourage the judicious and painstak- ing student.

Names of Persons.—The literature of the Highlands may be held further to include the names of persons as well as those of places. Indeed some of the older MSS. are filled with pedigrees, sometimes of kings, sometimes of lesser persons. Many of these ascend up to Noah, and even to Adam,

showing at least that they date since the conversion of the Gael to Christianity. There are several interesting genealogical lists in the volume of transactions published by the Iona Club, and there are MSS. in the Advocates' Library, Edinburgh, which contain several lists of a similar kind. The descent of family representatives is in these traced up to the original source, which in many cases is found among the ancient Scottish kings. The preparing and continuing of these pedigrees was one of the duties of the ancient bards and sennachies, who transmitted their knowledge of family history from generation to generation. It may be believed that these officials would have a measure of bias in favour of their own patrons, and this may have, in some cases, influenced their accounts of family history ; but, upon the whole, there seems to be a large amount of truth in what they have transmitted to us, back to a certain date. 'The rest is pure fiction. A specimen may be given, extracted from the genealogy of the family of Argyll.

Genelach mac Cailin Gillespic mac Cailin anann mac Gillespic mac Donch anagha mac Cailin mac Gillespie ruoidh mac Cailin oig mac Neill mac Cailin moir mac Gillespic mac Dubgaill, &c., and so on through King Arthur up to Seth, the son of Adam, the son of God. In English this is—The genealogy of Mac Cailin: Gillespick, son of Colin, son of Gillespick, son of Duncan the fortunate, son of Colin, son of Gillespick thered, son of Colin the young, son of Neil, son of Colin the great, son of Gillespick, son of Dougal, &. So far the genealogy corresponds nearly with the usual genealogies of the family historians of the house of Argyll. Similar pedigrees are furnished of most of the Highland clans.

The names of persons among the Gaelic races are for the most part patronymic.

The first name in its earlier form is usually descriptive, as Donnghal, Dubhghal, Donnachadh, Gillespwig,—Donald, Dougal, Duncan, Gillespick, —the brown man, the black man, the brown-faced man, the servant of the bishop; often it is taken from the Scriptures, as Eoin John, Seumas James, Tomas or Tabhas Thomas, Peadar Peter, &c.; some of the names come from the Norse, as Torcuil Tor- quil, Tormaid Norman, Aulaidh Olave, Leod Leod, and some are borrowed from the Normans, as UVilleam William,

Eanraic Henry, &c. The surnames are for the most part patronymics, as Eoin Mae Neill, John the son of Neil; and in case there should be another John M‘Neil, another step is introduced, as Hoin Mac Neill mhic Dhomhnaill, and perhaps a third until the person is thoroughly identified. Sometimes there is a reduplication of the sonship, as Mac Mhic Alasdair, Mac Mhic Ailein, the son of the son of Alexander or Allan, names of important Highland chiefs. In other cases the surname is descriptive, as Dubh black, Loin dubh Black John, Beag little, Mor big, Buidh yellow, Crom bent, Ruadh red, &c., whence many well known English names are derived. A large number of Highland names and surnames are ecclesiastical, as those derived from St John, St Columba, St Cattan, St Bridget, and others, and thus become helps to historical inquiry. One thing is somewhat remarkable, that there is not an O’, in accord- ance with Irish nomenclature, among the Scottish Celts. The old Q’Duinn of Argyle is lost, and the patronymic of the Celt is marked by the uniform use of mac, representing a son, as O’ does a grand- son. The age of fixed family names seems no older than the age of charters. Previous to that patronymics universally prevailed, but when charters were taken fixed names were essential to their value.

Proverbs.—From names of persons we may pass to pro- verbs as a part, and a very curious part, of Gaelic literature. Few languages so abound in proverbs, and proverbs of a very clever and popular caste. A Highlander seldom gives expression to an important sentiment without backing it with a proverb, and these give force and pungency to what he says. A collection of these proverbs was made, in the

year 1819, bythe Rev. Donald Mackintosh, and, to form some idea of the number of them, it is only necessary to observe that, under the letter ‘‘I” alone, they reach the number of 382 in the first edition of the book. A large number of these proverbial sayings escaped the notice of Mr Mackintosh, and additions were made in the second edition, while some of the very best are not recorded even yet. Prover- bial sayings in English are represented by sayings of a different kind in Gaelic, having the same meaning. “There is many a slip between the cup and the lip” is represented by Zs le duine an ni

a shlurgeas e, ach cha leis an nia chagaineas e, “ What a man swallows is his own, but not what he chews.” “It never rains but it pours ” is represented by An uair a thed a’ chailleach ’n a ruith, theid i ’n @ deann-ructh, ‘When the old woman takes to running, sheruns with a will.” ‘Sour grapes ””—MMionnan a’ bhaird ris a chaisteal, cha téid mi fhéin do’n chaisteal bhreun, cha teid, cha leig iad ann mi, “The bard’s oath to the castle, ‘T wont go to the vile castle; no, they won’t let me in.’” The Gaelic proverbs are full of interest, and add much to the power of either speech or writing when skilfully used.

Sgeulachdan, or Tales of Fiction.—These at one time abounded in the Highlands, and had much in common with the tales collected and published by Grimm and Dasent, from the German and the Norse. Until lately, these tales were entirely oral, and were little known beyond certain portions of the West Highlands. Recently they have been collected, translated, and edited, with peculiar care and skill, by Mr J. F. Campbell, in four 8vo volumes. This is a real addition to Gaelic literature, and Mr Campbell has laid every friend of that literature under obligation. One real service it has done in preserving for us admirable specimens of the most idiomatic and popular forms of the Gaelic language. We have it there as used by the tellers of popular tales among the people for generations. Whence many of these tales have come it is hard to say, but tales have been collected in the small islands south of Barra, where the people seldom tread the soil of even their main island, containing ideas and forms of thought which never could have originated there, and the preservation of which, in such a locality, is a remarkable fact. Are they relics of a higher civilization existing in ages long gone by? It is remarkable that the Thomas the Rhymer of Lowland tradition is well known in the traditions of the Highlands, and that stories of him related on the borders in broad Scotch are related in the Highlands in Gaelic as tales of great antiquity.

Clan History.—A portion of the literature of the Gaelic Celt consists of clan history. The clan system does not seem to be very ancient. In all probability it dates from the period when the Gaelic kingdom of Scotland ceased to exist. It has been already said to date from the era of charters. But the two eras are pretty nearly identical. Down to the reign of Malcolm III. the Gaelic kingdom appears to have been to a large extent homogeneous. There

were no elements in it but what were Celtic, as it never really embraced within it the Scandinavian sections, Then the land was governed by its maormors and tocseachs, men who represented the central governing power. It would seem that when, in the reign of David I., the kingdom became largely Anglo-Saxon and Anglo-Norman, the Gaelic people became estranged from their native kings, and gathered themselves in sections under the sway of their own chiefs ; and hence came chiefs and clans, instead of a king and his subjects forming a united nation. The change was a serious one for the Gaelic people, as they never became again what they had been before. Clan names appear at an early period, and in some form or other must have existed before the time of the Saxonized kings; but not one of the great clans of Highland history—the Macdonalds,

the Macleans, the Campbells, the Macleods, tlie Mackenzies, the Mackintoshes, or otlers—appears at all. In the book of Deer, supposed to be of the 11th or 12th century, the names of two clans—the clan Morgan and the clan Canan— appear ; but it is very questionable whether these represent any clan existing now, although clan Morgan is said to be the old name of the Mackays of Strathnaver. But the names in that interesting record are for the most part purely patronymic, and do not indicate any connexion with existing clans. The fact is that, till very recently, the clan name was confined to the chief, as records of old deeds and processes at law serve to show.

The Gaelic historical literature of one kind or another is of considerable extent, and consists of relics, written and traditional, of the old sennachies or family historians. In certain sections of the country the local traditions are full of the stories of old feuds, and, though not to be implicitly relied on, contain usually an element of truth. In Suther- land the feuds of the Sutherlands and the Mackays, in Lewis those of the Mackenzies and Macleods, in Skye the feuds of the M‘Leods and the Macdonalds, in eastern Inverness- shire those of the Mackintoshes and Cummings, in Lochaber those of the Mackintoshes and the Camerons, in Perthshire those of the Campbells and tle Macgregors, and others in other quarters are largely related. Native accounts of the clans were sometimes committed to writing,

a specimen of which appears in the transactions of the Jona Club. For a good deal of what is historical regarding the Highlands, recourse must be had to the Irish Annals, which occasionally refer to events occurring in Scotland.

MS. Interature.—The written Gaelic literature was at its earlier period so mixed up with that of Ireland that it is not easy in every instance to distinguish them. The early church of both countries was one, and the early litera- ture was the offspring of the early church. The very first notices we have of the church, whether among the mission institutes of Ireland or in Iona, indicate the existence and extensive cultivation of a native literature. The transcrip- tion or translation of portions of the Scriptures is shown to have been one of the frequent exercises of the early mis- sionaries, and they all learned to write the same dialect and make use of the same letters, Many of the MSS. written in Iona may be credited to Ireland, and vice versa; and writings found in Continental libraries may be presumed to have been the work of Scottish as truly as of Irish writers. The early treatises, and glosses upon Latin treatises, on theological and other subjects still existing in the early Gaelic dialect are numerous, and have afforded materials for the' acute and masterly criticism of Zeuss, De Nigra, Stokes, and others ; and these are accompanied by treatises on grammar, history, medicine, astrology, metaphysics, poetry, and similar subjects, which are of much interest. Most of these remains are found in the collections in Trinity College, Dublin, and in the library of the Irish Royal Academy; but there are numerous remains in the Edinburgh Advocates' Library, which prove at least that there were in Scotland persons who valued and collected this literature. There can be no doubt that there were many contributors to it as well.

The earliest specimen of Gaelic writing, which can be pronounced to be Scottish beyond any question, is the Book of Deer, said already to be a work of the 11th or 12th century. The book itself consists of portions of the New Testament written in Latin. The Gaelic portion consists of historical references, with notices of grants of land bestowed on the old monastery of Deer, in Aberdeenshire. These references and notices are, for the most part, written on the margin. They show that, at the time the book was written, the

Gaelic language was used, both for speaking and writing, in the district around Deer, where it is now un-

known except in the topography. There is not a shade of difference between the language of the Book of Deer and the language of the Irish writings of the same age. The following specimen of the notices of grants of land may be interesting :—Donchad mac mec bead mec hided dorat achad madchor docrist acus drostan acusdocholuimcille insbre gobrad maleché acuscémgell acusgille crist mac fingtini inndienast intestes, &c. ‘“ Duncan, son of MacBeth, son of Idid, gave Achad Madchor to Christ, and to Drostan, and to Columcille, in freedom for ever; Malechi, and Comgall, and Gilchrist, son of Fingon, witnesses in proof of it.” The notice of grants continue in similar form, being records kept within the monastery of what had been given. The Book of Deer is a work of much interest to the Gaelic scholar, and his best thanks are due to the Spalding Club and the late Dr John Stuart for the excellent volume they have published, containing all that is interesting in the original, with a full and learned account of it.

Of the period immediately after the Book of Deer there are several MS. remains of Scottish Gaelic writing in existence. There is the Glenmasan MS. in the Edinburgh Advocates’ Library, inscribed with the date 1238, and con- taining several interesting fragments. Here we find the famous lay of Deirdre or Darthula, connected with the story of the sons of Usnoth. The whole character of this MS. is identical with that of the Irish MSS., and yet it is mant- festly a Scottish work. There are lives of saints preserved ; one of these, in the Advocates’ Library, is the life of St Findchua. Mr Skene, in his Chronicles of the Picts and Scots, gives transcripts of several important MSS., as the Duan Albanach, or poetical accounts of the Scottish kings, recited by the royal bard at the coronation of Malcolm Kenmore. ‘This was copied from an Irish MS., but is manifestly a Scottish composition. The bards of “both Ireland aud Scotland often crossed the Irish Channel, and their works were well known on both sides of it.

The 14th and 15th centuries were a period of revival of literature over the whole continent of Europe, and the Celts of Great Britain and Ireland felt the impulse. This was a period of much writing both in Ireland andin

Scotland. The remains that exist are of a varied kind, and are numerous, especially those of the 15th century. Of this century is the only Gaelic charter that we possess, which is printed, with a translation, in the National Records of Scotland. Of this age also are numerous medical MSS. Some of these belonged to the famous family of Beatons, hereditary physicians to the Lords of the Isles, and contain accounts of such remedies as were believed at the time to have efficacy in the cure of disease. Others are metaphysical treatises, while others deal with what were looked upon as the great and important mysteries of astrology. Of this period also are most of the written genealogies that remain. The remarkable thing is the extent to which the Gaelic language bears the marks of cultivation at the time. In both medicine and metaphysics words are found to express the most abstract ideas, which could not be understood by the modern Highlander. As has already been said, some of these writings are translations from Arabic writers, as Averroes, Avicenna, Jacobus de Forlivio, and others. The state of learning at the time in the Highlands was not behind that in the rest of the kingdom. The clergy and the physicians, and even the bards, were possessed of real learning, and have left evidence of it.

The 16th century was the period of two important addi- tions to Gaelic literature. The first of these was what is called “Tne Dean of Lismore’s book,” a collection of poetical pieces, and- an obituary, chiefly of the M‘Gregor chiefs, made about the year 1512. The work has recently been transcribed, translated, and edited, with notes by the Rev, Dr M‘Lauchlan, and an introduction and additional

notes by Mr W. F. Skene. The work is one which has helped to settle several interesting quéstions connected with Gaelic literature. It makes clear that, down to the period of the dean of Lismore of 1512, there was much in common between the Celtic scholars and bards of Ireland and those of Scotland, while the latter were striking out a course for themselves, in laying aside the Irish letter and orthography, and in using the Saxon letter and an ortlio- graphy almost purely phonetic. The dean of Lismore’s book is a substantial addition to the literature of the Gael. The same century furnished us with another important addition in the translation of the prayer-

book usually called “¢ John Knox’s Liturgy ” into Gaelic, by John Carswell, the bishop of the Isles. This is the first Gaelic book that ever was printed, and bears the date of 1567. There was till very recently only one complete copy of this work in exist- ence, that in the library of the duke of Argyll; but now the book has been reprinted, edited by Dr M‘Lauchlan, who has given an English translation, and such notices of the life of Carswell as very scanty materials would permit. This book is printed in the Roman letter. The publication of Carswell’s Gaelic prayer-book would seem to indicate that at the time of its publication the Highlanders could read Gaelic, and that they were familiar with the dialect then in use among scholars both in Scotland and Ireland.

Of the 17th century not many remains exist. Calvin’s Catechism was published about the beginning of the century, probably translated by Carswell, and published long after his death. A copy is now hardly to be found. But two important contributions were made towards the close of the century. The one of these was the metrical translation of the Gaelic Psalms, executed both by the synod of Argyll and the Rev. Robert Kirke of Balquhidder ; and the other was an edition, in the Roman letter, of Bedell’s Irish Bible for the use of the Highlanders of Scotland. The first fifty of the psalms by the synod were published in 1659, and thie whole psalter was completed in 1694. Kirke published his version in 1684. Both are highly creditable performances, and Kirke is entitled to special commendation, inasmuch as the Gaelic language was acquired by him after he was settled in the Highlands. Kirke’s version of the Irish Bible for the use of the Highlanders was published in 1690. The New Testament is that of O’Donnell. This work is accom- panied by a glossary including the words in the Irish Bible not generally in use in the Highlands. The book was for a time used in Highland churches, but the Irish Bible, in the Irish letter, was well known and read in the Highlands— both in churches and in families.

The 18th century was productive of large additions to Gaelic literature, partly due to an awakening of religious life, partly to the Jacobite rising, and partly to the progress of literary culture. In the beginning of the century Lhuyd produced his Vocabulary, accompanied by a few interesting Gaelic compositions from the Higlilands. About the same time, the synod of Argyll executed a translation of the Confession of Faith and Larger and Shorter

Catechisms. These were published in 1725. M‘Donald’s Vocabulary appeared in the year 1741. It is the first attempt at any- thing like a vocabulary of the Gaelic. It is of little value except as being the first book in which the orthography approached to that of the modern Gaelic. During this century several famous Gaelic bards flourished. M‘Donald, the author of the Vocabulary, filled the country with Jacobite and other songs. The former are of a violent character, indicating keen partisanship with the exiled Stuarts. M‘Intyre of Glenorchy, commonly called Duncan Ban, flourished about the same period, and, though he was a Jacobite at first, this appeared less in his compositions than inM‘Donald’s. His hunting and other descriptive songs are admirable, M‘Kay or Calder, usually called Rob Donn,

the Reay bard, flourished about the same time, and has left numerous admirable pieces of Gaelic poetry. Others were also successful composers, such as William Ross of Gairloch, and the religious poet of the Highlands, Dougal Buchanan. And towards the close of the century was published Gillies’s Collection of Gaelic Poetry, one of the best collections we possess, containing, as it does, many authentic pieces of Ossianic poetry taken down when the old clan system was still in force in the Highlands to a larger extent than now. But the 18th century was distinguished by two works of special interest, in different departments. The first of these was the Gaelic translation of the Bible, and the second was Macpherson’s Ossian. The former was executed chiefly by the Rev. James Stewart, of Killin, and his son the Rev. Dr John Stewart, of Luss,—two eminent scholars, who had all the soundness of judgment necessary for such a work. This translation of the Bible has been most popular in the High- lands and throughout the British colonies where the Gaelic is still spoken. The Gaelic learner cannot do better at the outset than master the Gaelic Bible. Macpherson’s Ossian appeared about the same time, but not in Gaelic. It appeared first in English dress. This was the only mode of making the general public acquainted with it. Mac- pherson’s first small volume of fragments appeared alto- gether in English; it would have been well if both the original and the translation had been published simultane- ously. The only part of the Gaelic that was published before 1818 was what is called a “ Specimen of the Original of

Temora," given with the other poems in English in 1762. The opinions with regard to the authenticity of Macpherson's Ossian are as various as ever, and yet considerable progress has been made in the discovery of truth, which all parties are prepared to acknowledge. It has been established that poems ascribed to Ossian have been known and written down in the Highlands for 300 years, that many of them have been handed down by tradition, that these were fragments referring to certain important events in the history of the Gaelic race, and that there was nothing to make it improbable that such poems as those translated by Macpherson could have existed. Further, it is clear that the Highlanders at once, whether they knew the pieces or not as given by Macpherson, recognized them as in a style familiar to them, and as relating to persons and events with which they were familiar. That Macpherson found materials for his work in the Highlands is beyond a donkt, and it seems quite as manifest that he used very considerable liberties with them in order to serve his object of producing a great Gaelic epic poem or poems. In 1818 the full Gaelic version was printed, long after the death of James Macpherson. he Poems of Ossian, as collected, and trans- lated, and edited by Macpherson, are a valuable and inter- esting addition to Gaelic literature, and enter largely into the history of the modern literature of Europe. The Saxon may have his doubts about Ossian, and may have little scruple or delicacy in stating them, but the Gael knows more about Ossian than he does about Milton, and is more familiar with his heroes than with those of Homer.

The 19th century has seen many large contributions to the literature of the Gaelic Celt. It has shared in the general progress of learning, and with this it has risen in the estimation of the scholars of Europe. Grammars and dictionaries have been compiled; magazines of various kinds have been started and carried on for a time with much vigour ; collections, such as Mackenzie's Beauties of Gaelic Poetry, have been made; and such provisions have been laid up for the future as to secure an ample supply of materials for the scholars of a coming age. That appears to be the special work laid upon the scholars of the present time. They have to collect materials and commit them to writing, and to describe the peculiarities that are distinctive

of a living language, for the use of those who hereafter can only study it as existing in books, where emphasis, and tone, and accent are altogether unknown, and where the com- ments and expositions of living men, familiar with the language and the literature from their childhood, are altogether awanting. For that the Gaelic language is ina state of decay is manifest to the most ordinary observer. And the decay is twofold, being both within and without. Within, the vocabulary is waning, and English words are coming into use. Gaelic idioms are in like manner disap- pearing, and English idioms replacing them; while from without, under the influence of education, immigration, steamboats, railways, and other modern devices, English is rapidly finding its way into the land, and pushing the ancient tongue out of it. When this process is completed, a change will befall the people too, for there is no doubt that there is a close relation between the character of a language and the character of the people who use it; so that, when the Gaelic disappears, many of the features dis- tinctive of the Highland character will disappear along with it. In some respects this will be cause of regret ; in others perhaps it will not.

At the close of the article Cettic LrreRATURE a list is given of the existing MS. remains of Gaelic literature. It may interest readers and aid students of Gaelic to furnish here a list of some of

the more important printed books in the language. They are as follows :—

Fragments in Report of Highland Society on Ossian; Fragments in Chronicles of Picts and Scots; The Book of Deer; The Book of the Dean of Lismore; Carsewell's Prayer Book; Bedell's and O'Donell's Bible; The Gaelic Psalter, various editions; The Con- fession of Faith, and Catechisms; Lhuyd's Vocabulary; M'Donald's Vocabulary; Ossian's Poems; Smith's Sean Dana; Gillies's Collection of Poems; Macdonald's Poems; M'Intyre's Poems; Rob Donn''s Poems; Dougal Buchanan's Hymns; M'Callum's Collection of Poetry; The Gaelic Bible; Stewart's Collection of Poems; Turner's Collection of Poems; Sacred Poetry of the North, edited by Rose; The Beauties of Gaclie Poetry, M'Kenzie; Grant's Hymns; M'Intosh's Gaelic Proverbs; Stewart's Gaelie Grammar; Munro's Gaelie Gram- mar; Highland Society's Gaelie Dictionary; Armstrong's Gaelic Dietionary; M'Alpin's Gaelie Dietionary; Highland Tales, collected and edited by J. F.

Campbell; Lcabhar na Feinn, by J. ¥. Campbell; .4n Duanaire, by D. C. M‘Pherson; An Teachdatre Gaelach, by Rev. Dr M‘Leod; An Fhiauis, by Rev. Dr Mackay; An Gaidheal, a magazine; numerous translations from the English, chiefly religious works; Connell’s Astronomy; M‘Kenzie’s History of Scotland ; besides many others. (Ly MET)

GAETA, at one time the “ Gibraltar of Italy,” a strongly- fortified seaport town in the province of Caserta, at the ex- tremity of a peninsula forming the N.W. boundary of the Gulf of Gaeta, with a station on the railway 40 miles N.W. of Naples. The citadel occupies the heights of the pen- insula, and the town stretches below in a long thin line. To the east lies the harbour, one of the safest on the whole coast, with a depth of about 15 feet. The principal build- ings are the cathedral, the churches, the conventual build- ings (of which the most noteworthy are those of the Fran- ciscans and the Benedictines), the hospital, and the found- ling asylum. In the cathedral, which was founded or partially built by Barbarossa, are several objects of historical interest :—the body of St Erasmus (the St Ermo or Elmo, whose “fires” are familiar to the Mediterranean sailor); the standard presented by Pope Pius V. to Don John of Austria, the hero of the battle of Lepanto; and a baptismal font from the ruins of Formie, which had formerly been an altar to Bacchus, and still bears the Greek inscription SaAriwv A@nvatos éroinoe. Among the larger remains of Roman Gaeta are a temple and an aqueduct ; and the circular Zorre @ Orlando, which crowns the height above the citadel, is, in reality, the sepulchre of L. Munatius Plancus, as is distinctly proved by a well-preserved inscription. The suburbs of Gaeta, called Castellona, Mola di Gaeta, and Del Borgo, are larger than the town itself, and form a separate commune under the name of Formia (see Form1a). The population

of the town in 1871 was 7193, and of the commune, which includes Anatola, 18,385.

Gaeta is identified with Caieta, a town of great antiquity, about whose origin and name very different accounts are offered by the various Greek and Roman writers. Virgil makes it the burial-place of Caieta the nurse of Aineas, while Strabo connects the name with a Laconian word signifying a

cavern. In Cicero's time the harbour of Caieta was a portus celcberrimus et plenissimus naviwm, and it was afterwards greatly improved by Antoninus Pius. As a town, the Roman Caieta does not appear to have attained to any great development or importance. On the fall of the Western empire it 'became a republic, or free town, under the Byzantine government, and it was also the residence of the imperial pretor for Sicily. A considerable increase of its population and power resulted from the destruction of the neighbouring town of Formize by the Arabs, in 850. In the 9th century Pope John VIII. bestowed the fief on Pandolf, count of Capua; but in 877 Duke Docibilis called in the assistance of the Arabs against the Capuans, and in the course of the 11th century we find the people of Gaeta exercising their rights for the election of their dukes. Ata later period the fief became an apanage of the princes of the successive dynasties of Naples. The capture of the town by Pedro, brother of the king of Aragon, in 1435, was followed by the erection of the fortress to which so much of its subsequent importance was due. Ferdinand the Catholic and Charles V. both added to the strength of its defences. In 1707 the citadel was taken by storm by the Austrian general, Daun, after a three months' siege; and in 1734 it was forced to capi- tulate, after a five months' siege, by the allied army under Charles, afterwards king of Naples. In 1806 it was brilliantly defended against the French, under Masséna, by Prince Louis of Hessen- Philippsthal, who was, however, severely wounded and obliged to leave the fortress toits fate. Pope Pius IX. found an asylum in the governor's palace at Gaeta in 1848, and remained there till Sep- tember 1849. In 1861 it afforded a last point of defence for Francis II. of Naples, who capitulated to the Piedmontese on 13th February. Gaeta has given the name of Gaetani to a famous Italian family, about whose original connexion with the town there are, however, various accounts; and Antonio di Gaeta, one of the great Benedictine missionaries to Africa in the 17th century, bears the mark of his origin.

See Rosetto, Breve descrizione delle cose pit notadili di Gaeta, reprinted by Antonio Bulifone, at Naples, in 1690; '' Geschichte von Gaeta," in Oester. milit. Zettschrift, 1823.

GATULIA, or the land of the Getuli, an ancient district of somewhat uncertain limits in northern Africa. It may be roughly said to have been bounded on the N. by Mauretania and Numidia, E. by the country of the

Gara- mantes, 8. by the basin of the Niger, and W. by the Atlantic; but the frontiers must have been of a very un- certain and shifting character. The Geetulians, who, accord- ing to a tradition mentioned by Sallust, were one of the two great aboriginal races of northern Africa, appear to have retreated inland before the encroachments of the Numidians and Mauretanians, but continued to make incursions over a wide stretch of country. Ethnographically, they were quite distinct from the negro races, and indeed probably belonged to the great Berber race, which still forms so important an element in the population of North Africa. Their southern tribes having mingled with negro tribes, acquired the distinctive title of Melano-Getuli or Black Geetulians, A warlike, roving people, they bestowed great attention on the rearing of horses, and, according to Strabo had 100,000 foals in the course of ayear. They were clad in skins, lived on flesh and the milk of their cows, mares and camels, and took almost no advantage: of the valuable productions of their country. It was not till the J ugurthine war that they became familiar to the Romans ; but after- wards their name occurs with great frequency in Latin poetical literature, and, indeed, the adjective Gzetulian be- came little more than a synecdoche for African. Allusions are more particularly made to Geetulian purple, which was obtained from the murex of the African coast. In the Jugurthine war some of the Getulian tribes assisted the Numidian king with a contingent of horse; but during the civil war Cesar found among them very serviceable allies in his contest with Juba. Augustus, having made Numidia a Roman province, affected to assign a portion of the Getulian territory to Juba as a compensation; but the

Gzetulians rose in revolt and massacred the Roman residents, and it was not till a severe defeat had been inflicted on them by Cossius Lentulus that they consented to recognize their gratuitous sovereign. By his victory Lentulus acquired the title of Gzetulicus. Ibn Said in the middle of the 13th century, Ibn Khaldun at the end of the 14th, Leo Afri- canus in the beginning of the 16th, and Marmol about sixty years later, are all quoted by M. Vivien de St Martin in his Le Word de lAfrique, 1863, as mentioning a mountainous country called Gozulé, Gutzula, or Guézula in the south of Morocco. He is disposed further to iden- tify the Geetulians with the Godala, who, according to Ibn Said, occupied the maritime portion of the great desert,

and are referred to by other Arabian geographers as the Djoddala ; and it is even possible, he thinks, that their name survives in that of the Ghedala between Cape Blanco and the Lower Senegal on the one hand, and that of the Beni Guechtula in the Algerian province of Bougie on the other.

GAGE, Tuomas (1720-1787), governor of Massachusetts, second son of the first Viscount Gage, was born in England in 1720. He entered the army at an early age, became lieu- tenant-colonel of the 44th regiment of foot in 1750, was made major-general and governor of Montreal in 1761, and in 1763 succeeded Amherst in the command of the British forces in America. In 1774 he was appointed governor of Massachusetts, and in that capacity was entrusted with carrying into effect the Boston Port Act. In this political crisis, by his hesitancy in adopting measures against the leaders of the insurrectionary party, and contenting him- self with fortifying Boston, he enabled the Americans to mature their plans in comparative security. The battle at Lexington, in which a detachment sent by him, on the 18th April 1775, to destroy the cannon and ammunition at Concord was defeated, inaugurated the American revolu- tionary war. On the 12th June he proclaimed martial law, and proscribed Samuel Adams and John Hancock, offering pardon to all the other rebels who should return to their allegiance ; but the result of these measures was at once to exasperate and encourage the Americans. Although Gage gained the nominal victory of Bunker's Hill (June 17), he was unable to raise the siege of Boston ; and being shortly afterwards superseded by General Howe, he sailed for England. He died in 1787.

GAGERN, Hans CuristopH Ernst, Baron von (1766-1852), a German statesman and political writer, was born at Kleinniederheim, near Worms, January 25, 1766. After completing his studies at the universities of Leipsic and Gottingen, he entered the service of the prince of Orange-Nassau, whom in 1791 he represented at the im- perial diet. He was afterwards appointed ambassador to Paris, where he remained till the decree of Napoleon, for- bidding all persons born on the left side of the Rhine to serve any other power than France, compelled him to resign his office. He then retired to Vienna, and in 1812 he endeavoured to promote insurrection against Napoleon in Tyrol. On the failure of this attempt he left Austria and joined the headquarters of the Prussian army. When the prince of Orange

became king of the Netherlands, Baron Gagern was appointed his prime minister, and in 1815 he represented him at the congress of Vienna, and succeeded in obtaining for the Netherlands a considerable aggrandise- ment of territory. From 1816 to 1818 he continued to be Netherland ambassador at the German diet, where, while endeavouring to promote German unity, he also advocated the adoption of measures which should secure the independ- ence of the individual states. In 1820 he retired with a pension to his estate of Hornau, in Hesse-Darmstadt ; but, as a member of the first chamber of the states of the grand duchy, he continued to take an active share in the promo:

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tion of measures for the welfare of hiscountry. He retired from public life in 1848, and died at Hornau, 22d October 1852. Three of the sons of Baron Gagern have attained considerable eminence—one as a soldier, and two, who are still living (1879), as politicians.

His principal works arc—Die Resultate der Sittengeschichte, 6 vols., 1808-1822; Die Nattionalgeschichte der Deutschen, Vienna, 1812; 2d ed. in 2 vols., Frankfort, 1825-26; Mein Antheil an der Politik, 4 vols., Stuttgart, 1823-33; Kritik des Volkerrechts, Leipsic, 1840; and Civilisation, Leipsic, 1847.

GAILLAC, the capital of an arrondissement in the department of Tarn, France, is situated on the right bank of the Tarn, 12 miles W. of Albi. It possesses two churches of the 13th century, a communal college, a hospital, a theatre, and a military prison. Its industries include the manufacture of wine casks, leather, brandy, bricks, and various kinds of coarse cloth; and it has a con- siderable trade in corn, vegetables, dried plums, and wine, the white and red wines of the arrondissement having a high reputation. Gaillac was in existence in the 7th century. lt was captured by the English in 1280, and its archives were taken to London. Even at that time it was famed for its wines, which, under the name of Vin du Cog, were exported to England and Holland. The population in 1876 was 6099.

GAILLARD, Gasrie, Henri (1726-1806), a Frenck historian, was born at Ostel, Picardy, in 1726. He was educated for the bar, but after finishing his

studies adopted the literary profession, ultimately devoting his chief attention to history. In 1801 he was chosen a member of the French Academy, and he was also one of the original members of the Institute. For forty years he was the intimate friend of the minister Malesherbes. He died at St Firmin, near Chantilly, 13th February 1806. Gaillard is painstaking and impartial in his statement of facts, and his style is correct and elegant, but the unity of his narra- tive is somewhat destroyed by digressions, and by his method of treating war, politics, civil administration, and ecclesiastical affairs under separate heads.

His most important work is his Histoire de la rivalité de la France et de V Angleterre, in 11 vols., 1771-1777; and among his other works may be mentioned Essai de rhétorique francaise, & Pusage des jeunes demoiselles, 1745, often reprinted, and in 1822 with a life of the author; Wistoire de Marie de Bourgogne, 1757; Histoire de Frangois I., 7 vols. 1776-1779; Histoire des grandes querelles entre Charles V. et Frangois I., 2 vols., 1777; Histoire de Charlemagne, 2 vols., 1782; Histoire de la rivalité de la France et de V Espagne, 8 vols., 1801; Dictionnaire historique, 6 vols., 1789-1804, making part of the Encyclopédie méthodique; and Mélanges littératres, containing éloges on Charles V., Henry IV., Descartes, Corneille, La Fontaine, Malesherbes, and others.

GAINSBOROUGH, a market-town and port of Lincoln- shire, is situated on the right bank of the Trent, 21 miles above its junction with the estuary of the Humber, and 16 miles N.W. of Lincoln. It consists chiefly of one long well-paved street running parallel to the river, which is here crossed by a fine stone bridge of three arches. ‘The parish church, a fine building in the Grecian style, was rebuilt in 1748, with the exception of the old tower, which belongs to the 12th century. Holy Trinity church, built in 1843, has annexed to it an ecclesiastical district taken out of the old parish of Gainsborough. ‘The old hall, supposed to have been partly built by John of Gaunt, is a curious oak- timber framed building, forming three sides of a quadrangle, and having a tower 78 feet high. It has been restored, and part of it converted intoa corn exchange and assembly rooms. Gainsborough possesses a grammar school (founded in 1589 by a charter of Queen Elizabeth) and other schools, a town-hall, a county court-house, a literary institute, a temperance hall, a savings-bank, and a provident dispensary.

Ship-building is carried on, and there are manufactories of linseed cake, ropes, malt, and tobacco, with breweries and

iron and brass foundries. Vessels of 200 tons burden can come up to the town, The population in 1871 was 7564, and since that date has been rapidly increasing.

GAINSBOROUGH, Tuomas (1727-1788), a painter famous for the truth and elegance of his portraits, and for the simple beauty of his landscapes, was born at Sudbury, Suffolk, in the year 1727. His father, who carried on thie business of a woollen crape-maker in that town, was of a respectable character and family, and was noted for his skill in fencing ; his mother excelled in flower-painting, and encouraged her son in the use of the pencil. There were nine children of the marriage. At ten years old, Gains- borough had sketched every fine tree and picturesque cottage near Sudbury, and at fifteen, having filled his task- books with caricatures of his schoolmaster, forged his father's handwriting to get a holiday, and sketched the portrait of a man whom he had detected in the act of rob- bing his father's orchard, he was allowed to follow the bent of his genius in London, under such advantages as Hayman, the historical painter, and the academy in St Martin's Lane, could afford. Three years of study in the metropolis were succeeded by two years of idleness in the country. Here he fell in love with Margaret Burr, a young lady of many charms, including an annuity of £200, married her after a short courtship, and, at the age of twenty, became a householder in Ipswich, his rent being £6 a year. The annuity was reported to come from Margaret's real (not her putative) father, who was one of the exiled Stuart princes, or else the duke of Bedford. At Ipswich, Gainsborough tells us, he was " chiefly in the face-way," though his sitters were not so numerous as to prevent him from often rambling with his friend Joshua Kirby (president of the Society of Artists) on the banks of the Orwell, from painting many landscapes with an attention to details which his later works never exhibited, or from joining a musical club, and enter- taining himself and his fellow-townsmen by giving concerts. But as he advanced in years he became ambitious of advancing in reputation. Bath was then the general resort of wealth and fashion, and to that city, towards

the close of the year 1759, he removed with his wife and two daughters, the only issue of their marriage. His studio in the circus was soon thronged with visitors; he gradually raised his price for a half-length portrait from 5 to 40 guineas, and for a whole-length from 8 to 100 guineas. Among his sitters at this period were the authors Sterne and Richardson, and the actors Quin, Henderson, and Garrick. Meanwhile he contributed both portraits and landscapes to the annual exhibitions in London. He indulged his taste for music by learning to play the viol-di-gamba, the harp, the hautboy, the violoncello. His house harboured Italian, German, French, and Eng- lish musicians. He haunted the green-room of Palmer's theatre, and painted gratuitously the portraits of many of the actors. He gave away his sketches and landscapes to any one who had taste or assurance enough to ask for them; and in the summer of 1774, having already attained a position of great prosperity, he took his depar- ture for the metropolis, and fixed his residence at Schomberg House, Pall Mall, a noble mansion still standing, for which the artist paid £300 a year.

Gainsborough had not been many months in London ere he received a summons to the palace, and to the end of his career he divided with West the favour of the court, and with Reynolds the favour of the town. Sheridan, Burke, Clive, Blackstone, Hurd, were among the number of those who sat to him. But in London as in Bath his landscapes were exhibited, were commended, won the good opinion of Walpole the fastidious and Wolcot the surly, and were year after year returned to him, "till they stood," says Sir William Becchey, "ranged in long lines from his hall to his

painting-room." Gainsborough was a member of the Royal Academy, but in 1784, being dissatisfied with the position assigned on the exhibition-walls to his portrait of the three princesses, he withdrew that and his other pictures, and he never afterwards exhibited there. In February 1788, while witnessing the trial of Warren Hastings, he felt an extra- ordinary chill at the back of ~~his neck ; this was the begin~~ ning of a cancer (or, a8 Some say, a malignant wen) which proved fatal on 2d August of the same year.

Gainsborough was tall, fair, and handsome, generous, impulsive to the point of capriciousness, easily irritated, not of bookish likings. The property

which he left at his death was not large. One of his daughters, Mary, had married contrary to his wishes, and was subject to fits of mental aberration.

Gainsborough and Reynolds rank side by side as the greatest portrait painters of the English school, It is difficult to say which stands the higher of the two, although Reynolds may claim to have worked with a nearer approach to even and demonstrable excellence. | In grace, spirit, and lightness of insight and of touch, Gainsborough is peculiarly eminent. His handling was slight for the most part, and somewhat arbitrary, but in a high degree masterly ; and his landscapes and rustic compositions are not less gifted than his portraits. Among his finest works are the likenesses of Lady Ligonier, the duchess of Devonshire, Master Buttall (the Blue Boy), Mrs Sheridan and Mrs Tickell, Orpin the parish-clerk (National Gallery), the Hon. Mrs Graham (Scottish National Gallery), his own portrait (Royal Academy), Mrs Siddons (National Gallery) ; also the Cottage Door, the Market Cart, the Return from Harvest, the Woodman and his Dog in a Storm (destroyed by fire), and Waggon and Horses passing a Brook (National Gallery). He madea vast number of drawings and sketches.

In 1788 Philip Thicknesse, lieut.-governor of Landguard Fort, who had been active in promoting Gainsborough’s fortunes at starting, but was not on good terms with him when he left Bath, gave to the world 4 Sketch of the Life and Paintings of Thomas Gainsborough ; in 1829 Allan Cunningham published a memoir of him in his Lives of the Painters; and in 1856 there appeared 4 Life of Thomas Gainsborough, R.A., by G. W. Fulcher.

GAISSIN, Gaicyn, or Hatscrn, a town of Russia, at the head of a district in Podolia, 178 miles E, of Kamenetz Podolski or Podolian Kamenetz, in 48° 39’ N. lat. and 29° 23’ E. long.; near the river Sop, a tributary of the Bug. With few exceptions, the houses are built of wood, and the inhabitants are mainly supported by agriculture. Among the publie buildings are an orthodox church, a synagogue | and four Jewish chapels, and a town hospital. In 1860 the population was 10,106, of whom 1863 were Jews. In the St Petersburg Calendar for 1878 the total is given as 9417. Gaissin dates from about 1600: in one of the Acts of 1615 it is stated that Heyszyn or Gaissin was founded with royal privilege by the ban Swierski about 15

years before. In 1659 King John Casimir of Poland bestowed it on Maximus Buliga the Zaporogian chief. It obtained Magdeburg rights in 1744 or 1745; and in 1796, after the incorporation of Podolia with Russia, it was made a district town.

GAIUS, a celebrated Roman jurist. Of his personal history very little is known. It is impossible to discover even his full name, Gaius or Caius being merely a personal name (przenomen) very common in Rome, From internal evidence in his works it may be gathered that he flourished in the reigns of the emperors Hadrian, Antoninus Pius, Marcus Aurelius, and Commodus. His works were thus composed between the years 130 and 180, at the time when the Roman empire was most prosperous, and its government the best. Most probably Gaius lived in some provincial town, and hence we find no contemporary notices of his life or works. After his death, however, his writings |

were recognized as of great authority, and the emperor

Valentinian named him, along with Papinian, Ulpian, Medestin, and Paulus, as one of the five jurists whose opinions were to be followed by judicial officers in deciding cases. The works of these jurists accordingly became most important sources of Roman law.

Besides the Institutes, which are a complete exposition of the elements of Roman law, Gaius was the author of a treatise on the dicts of the Magistrates, of Commentaries on the Twelve Tables, and on the important Lex Papia Poppea, and several other works. His interest in the anti- quities of Roman law is apparent, and for this reason his work is most valuable to the historian of early institutions. In the disputes between the two schools of Roman jurists he generally attached himself to that of the Sabinians, who were said to be followers of Ateius Capito, of whose life we have some account in the Azxnals of Tacitus, and to advo- cate a strict adherence as far as possible to ancient rules, and to resistinnovation. Many quotations from the works of Gaius occur in the Digest of Justinian, and so acquired a permanent place in the system of Roman law; while a comparison of the Jnstitutes of Justinian with those of Gaius shows that the whole method and

arrangement of the later work were copied from that of the earlier, and very numerous passages are word for word thesame. Probably, for the greater part of the period of three centuries which elapsed between Gaius and Justinian, the Jnstetutes of the former had been the familiar text-book of all students of Roman law.

Unfortunately the work was lost to modern scholars, until, in 1816, a manuscript was discovered by Niebuhr at Verona, in which certain of the works of St Jerome were written over some earlier writings, which proved to be the lost work of Gaius. The greater part of the palimpsest has, however, been deciphered by various German scholars, and the text is now fairly complete.

This discovery has thrown a flood of light on portions of the history of Roman law which had previously been most obscure. Much of the historical information given by Gaius is wanting in the compilations of Justinian, and, in particular, the account of the ancient forms of procedure in actions. In these forms can be traced “survivals” from the most primitive times, which provide the science of compara- tive law with valuable illustrations, which may explain the strange forms of legal procedure found in other early systems. Another circumstance which renders the work of Gaius more interesting to the historical student than that of

| Justinian, is that Gaius lived at a time when actions were

tried by the system of formule, or formal directions given by the praetor before whom the case first came, to the judex to whom he referred it, Without a knowledge of the terms of these formulz it is impossible to solve the most interest- ing question in the history of Roman law, and show how the rigid rules peculiar to the ancient law of Rome were modified by what has been called the equitable jurisdiction of the prators, and made applicable to new conditions, and

brought into harmony with the notions and the needs of a

more developed society. It is clear from evidence of Gaius that this result was obtained, not by an independent set of courts administering, as in England until recently, a system different from that of the ordinary courts,

but by the mani- pulation of the formule. In the time of Justinian the work was complete, and the formulary system had disap- peared.

The Institutes of Gaius are divided into four books—the

| first treating of persons and the differences of the status they

may occupy in the eye of the law; the second of things, and the modes in which rights over them may be acquired,

including the law relating to wills; the third of intestate

succession and of obligations; the fourth of actions and their forms.

There are several carefully prepared editions of the Institutes; the first was that of Géschen, published in 1820. During the next fifty years more than twenty new editions appeared. A list of these, and of the various treatises on Gaius, is given in the preface to Bocking's edition. The most complete English edition is that of Mr Poste, which includes beside the text an English translation and copious commentary. A comparison of the early forms of actions mentioned by Gaius with those used by other primitive societies will be found in Sir H. Maine's Early Institutions, cap. 9. For further information see M. Glasson, Etude sur Gaius ct sur le jus respondcndt.

GALABAT, Gatiapat, or MetemMeE, a town in the frontier district of Egypt and Abyssinia, near one of the western sub-tributaries of the Atbara, about 100 miles W. of Gondar, in 13° N. lat. and 36° E. long. Most of the houses are built in the Abyssinian style, with conical roofs of grass, and the place would be of little importance if it were not the staple market for the exportation of Abyssinian produce across the Egyptian frontier. Beeswax, coffee, cotton, and hides are the principal articles of legitimate trade ; but as recently at least as 1873 the traffic in slaves was quite as important a department of its commerce. The town and district form a small ethnographical island, being peopled by a colony of Tokrooris from Darfur, who, finding the spot a convenient resting-place for their fellow-pilgrims on

their way to Mecca and back, obtained permission from the king of Abyssinia to make a permanent settlement. They are an industrious race, and grow a considerable quantity of cotton. When Sir Samuel Baker was at Galabat in 1862, the sheikh refused to recognize the authority of the viceroy of Ezypt; but when De Cosson passed through in 1873,

the Egyptians had a camp, with a strong stone wall, on the.

top of a hill commanding the town, and acted as masters of the place. The population of the town and district, which have an area of about 40 square miles, is estimated at 20,000. Galabat is the proper name, and Metemme is really the native word for a capital.

GALANGAL, formerly written “galingale,” and some- times “garingal,” riizoma galange (Arabian, Kholinjan ;} German, Galgantwurzel; French, Racine de Galanga), is an aromatic stimulant drug. Lesser galangal root, radix galange minoris, the ordinary galangal of commerce, is the dried rhizome of Alpinia officinarum, Hance, a plant of the natural order Zingiberacee, growing in the Chinese island of Hainan, where it is cultivated, and probably also in the woods of the southern provinces of China. The plant is regarded by Dr Hance as closely allied to, but as perfectly distinct from, the Alpinia calcarata of Roscoe, the rhizome of which is sold in the bazaars of some parts of Iudia as a sort of galangal. Its stems attain a length of about 4 feet, and its leaves are slender, lanceolate, and light green, and have a hot taste; the flowers are ebracteate, white with red veins, and in simple racemes ; the roots form dense masses, sometimes more than a foot in diameter ; and the rhizomes grow horizontally, and are ? inch or less in thickness. The drug occurs in short, cylindrical, or some- what tuberous, often forked pieces, which have a fibrous Structure, and externally are reddish-brown and marked with fine longitutional striations, and with transverse rings showing the points of attachment of scales or leaves, and internally are of a light-brown, becoming darker at the centre. It has a warm, aromatic taste, resembling that of mingled ginger and pepper. On analysis it yields, among other constitutents, much starch, an essential oil of the composition C,,H,,,H,O (Vogel), and a crystalline body, kampferid (Brandes). Greater or Java galangal, radix galangee majoris (French, Galanga de U’ Inde), the rhizome i

;. Apparently derived from the Chinese Kau-liang-Kiang, i.e., Kau-liang ginger, the term applied by the Chinese to galangal, after the prefecture Kau-chau fu in Canton province, formerly called Kau-

liang (see F. Porter Smith. Contrib. to the Materia Mcdica .. . of China, p. 9, 1871).

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of Alpinia Galanga, Willd., is a drug rarely now imported into Europe. It is mentioned by Marco Polo (ed. Yule, ii. p. 217) and Garcias da Horta as a product of Java, and the latter distinguishes it from the Chinese or lesser galangal, from which it is known by its larger size, orange-brown exterior, and feebler and less aromatic odour. The seed- capsules of Alpinia Galanga.are believed to be what are termed “galanga cardamoms,” which have the properties of cardamoms and ginger combined, and in China are used for various medicinal purposes. (See Hanbury, Science Papers, pp. 107-9, and 252, 253, 1876; and F. P. Smith, op. cit.) Galangal seems to have been unknown to the ancient Greeks and Romans, and to have been first intro- duced into Europe by Arabian physicians. It is mentioned in the writings of Ibn Khurdadbah, an Arabian geographer who flourished in the latter half of the 9th century, and “ gallengar ” (galingale or galangal) is one of the ingredients in an Anglo-Saxon receipt for a “wen salve” (see O. Cockayne, Saxon Leechdoms, vol. iii. p. 13). In the Middle Ages, as at present in Livonia, Esthonia, and central Russia, galangal was in esteem in Europe both as a medi- cine and a spice, and in China it is still employed as a therapeutic agent. Its chief consumption is in Russia, where it is used as a cattle-medicine, and as a flavouring for liqueurs. By the Tartars it is taken with tea (see Hanbury, op. cit., p. 374). The exports of galangal from Shanghai, in China, amounted in 1869 to 870,000 ib, value £3046, 16s. 9d. Chinese or lesser galangal was in past times commonly known as “Cyperus Babylonicus,” from its resemblance to the tubers of plants of the genus Cyperus, which apparently served as a substitute for it? (cf, Fuchs, Op. Didactica, pars ii p. 28, 1604, fol.; and Avicenna, ed. Plempii, lib. ii. p. 297, 1658, fol.). Gerarde (Zhe Herball, p. 28, 1597) terms the species Cyperus longus “ English galingale.”

See Pharm. Journ., ser. i., vol. xiv. p. 241, and ser. iii., vol. ii, p. 248; Pereira, Matcria Medica, ii, pt. i., p. 257, 4th ed., 1857; O. Berg, Anatomischer Atlas zur Pharmazcutischen Waaren- kunde, p. 37, taf. xix., Berlin, 1865; H. Yule, The Book of Ser Marco Polo, vol. ii. pp. 181, 182, &c., 1871; H. F. Hance, ‘On the Source of the Radix Galange minoris of Pharmacologists,” Journ. Linn. Soc., Botany, vol. xiii., 1878, p. 1; Flickiger and Hanbury, Pharmacographia, 1874, and the above quoted Sctence Papers of the latter author, pp. 370-875; Bentley and Trimen,

Medicinal Plants, pt. xxxi., tab. 271; and Histoire des Drogues, vol. ii., 7th ed., 1876.

GALAPAGOS ISLANDS, an archipelago of five larger and ten smaller islands, situated in the Pacific Ocean exactly under the equator, about 500 or 600 miles W. of Ecuador. They were discovered about the beginning of the 16th century by the Spaniards, who gave them their present name from the numerous galdpago or giant tortoises they found there. The larger members of the group, several of them attaining an elevation of 3000 to 4000 feet, are Albemarle (75 miles long and 15 broad), Narborough, Indefatigable, Chatham, and James Islands. The total area is estimated at 2250 square miles.

The extraordinary number of craters, a few of them still active, “in size from mere spiracles to huge caldrons several miles in circumference,” to be found throughout the islands, gives evidence that the archipelago has been the result of voleanic action. It stands in very deep water, and Mr Darwin thinks that it has never been nearer to the mainland than it is now, nor have its members been at any time closer together. None of the islands are inhabited, with the exception of Charles, Chatham, and Albemarle, which, since 1829, have been used by the Government of Ecuador

? Alexander Neckam, an English author (1157-1217), says of “*cyperus,” in his poem De Laudibus Divine Sapientie (see Wright’s edition of his works, p. 478, London, 1863) —

‘* Hydropicus laudat cyperum, vulnus, stomachusque, Humor siccandus, calculus, atque lien.” x -— 3

as a penal settlement for political offenders, who find, an easy subsistence on the bananas, Indian corn, and sweet potatoes which readily grow in the black fertile mud of the higher parts, and on the large herds, now become wild, of cattle, swine, and goats. The principal settlement, founded by General Vilamil in 1832, is situated in Charles Island, and bears the name of La Floreana, in honour of Floris, the president of Ecuador. At one time it contained 200 or 300 inhabitants; but when the United States steamer ‘‘ Hassler”

visited the Galapagos in 1871, there were little more than |

a dozen. In 1872 about 2000 cattle had perished in the island. The archipelago was formerly a frequent resort of vessels in quest of turtle; and it is still visited by parties from Guayaquil in quest of a species of moss, which is sent to the English market under the name of orchella. :

Though the islands are under the equator, the climate is not intensely hot, as it is tempered by cold currents from the

Antarctic Sea, which, having followed the barren coast of |

Peru as far as Cape Blanco, bear off to the N. W. towards and through the Galapagos. Very little rain falls, except

during the short season from November to January. The |

33 miles south of Edinburgh.

clouds indeed hang low, and the nights are misty, but this | benefits those districts only which attain a height of over | water as a motive power; and from this time forward the there alone, and chiefly on the side from which the winds»

800 or 1000 feet and enter the moist upper air; so that

oftenest blow, is there anything like a luxuriant vegetation. The low grounds are entirely parched and rocky, present- ing merely a few thickets of Peruvian cactus and stunted shrubs, and a shore as uninviting as it well can be.

The greatest interest attaches to the study of all the oceanic islands, for the elucidation of the origin and development of their fauna and flora has an important bear- ing on the question of the genesis of species. The Galapagos archipelago possesses in this respect a rare advantage from its isolated situation, and from the fact that its history has never been interfered with by any aborigines of the human race, and that it is only very lately that the operation of man or of animals introduced by his means

have disturbed, and that to a very limited extent only, the |

indigenous life. Many of the more remarkable animal and

vegetable forms are confined to one islet of the group, and |

are represented on the others by allied but different species. Of the indigenous gigantic tortoises there are five species at present known, each of which is an inhabitant ‘of a different island, and it is believed that many others have become extinct. There are two species, one terrestrial, the other marine, of a peculiar genus of lizard. Nearly all the land birds are peculiar to the archipelago, and of these more than half belong to peculiar genera. The flora of the Galapagos is most remarkable ; it differs by upwards of one

half of its species from that of the rest of the globe. Both the fauna and flora indicate affinity with the South American continent ; and the peculiarities of their distribu- tion can be explained only by the supposition that species were transported to the islands by some accident at very rare and remote intervals, and have become changed through natural selection under the new conditions to which they have beeu exposed. That there should be so few species common to the different islands is accounted for by their separation from each other by deep channels scoured by rapid currents, the direction of which, and of the winds rarely violent in this region, does not favour inter-migration. Many of the islands are yet but imperfectly known ,

For more detailed information the followin , sulted :—Darwin, Voyage of the Beagle; O. fauna of the Galapagos Archip.,” Trans. Zool. Soe. part ix., 1876 p. 447; Sir J. D. Hooker, “On the Vegetation of the Gal. Arch..” Prans, Lin. Soe., vol. Xx. p. 235; Dr A. Giinther, Description of the living and extinct races of Gigantic Tortoises of the Gala- pagos Islands,” Phil. Trans., vol. clxv. p. 251; A. R. Wallace, te Bore at meer tors og Animals; Villavicencio, Geografia de

g works may be con- | Salvin, ‘On the avi- |

| to the production of tweeds. | have long been united in a corporation called by their name,

in the centre, and the Tolistobogii in the west.

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GALASHIELS, a parliamentary burgh and manufactur- ing town of Scotland, built on both sides of the river Gala, about a mile above its confluence with the Tweed, and It is situated partly in Roxburghshire and partly in Selkirkshire, but for all judicial purposes it is held, by special Act of Parliament passed in 1867, as entirely within the county of Selkirk. The “‘forest-steading of Galashiels” is first mentioned in history shortly after the beginning of the 15th century, when it was the occasional residence of the Douglases, who at that time held the office of keeper of Ettrick forest. In 1599 it was erected into a burgh of barony, when it con- tained 400

inhabitants. For the next 200 years Galashiels remained a mere village, as the population in 1778 had only

grown to 600. At that time, however, we find its inhab- _itants engaged—though in a limited way—in those manu-

factures by whicli it has since so greatly prospered. There were 30 looms and 3 waulk (or fulling) mills; and the cloth manufactured was a coarse woollen texture which sold

-at from ls. 6d. to 2s. a yard. In 1790 the quantity of

wool used annually was 2916 stones, and the value of goods manufactured was about £1000. In the same year the first factory was erected, and advantage taken of the Gala

woollen trade in Galashiels underwent steady progress, until, in 1879, the town contains about 20 factories with 100 sets of carding engines, using annually 220,000 stones of wool,

| and producing goods to the value of £750,000.

The wool chiefly used is imported from Australia and the Cape of Good Hope. The manufacture was at one time of a more diversified character than now, aud embraced tweeds, shawls, tartans, &c., but it is now almost exclusively devoted The Galashiels manufacturers

which was instituted in 1777, and of which the minutes during the whole intervening period are still preserved. In addition to its woollen trade Galashiels has also a large skinnery, capable of manufacturing into leather 35,000 skins per week. In recent years the external aspect of the town has been very much improved by the erection of several handsome public buildings, and the introduction of a better style of architecture for shops and dwelling-houses. It was made a parliamentary burgh in 1868, and unites with Hawick and Selkirk in returning a member to parliament. Municipally, it is governed by a provost, four bailies, and ten councillors. In 1876 an Act was passed for the exten- sion of the burgh and the introduction (since effected) of a water supply. As significant of the rapid growth of

Galashiels it may be mentioned that, while in 1851 the _ population was only 5921, in 1871 it was 9678, and that

of the extended burgh is now estimated to be nearly 15,000 ; while the annual assessable rental, which in 1864 was £21,000, is now £49,000.

GALATIA, afterwards called also GALLO-GRAcIA, in ancient geography, an inland division of Asia Minor,

bounded on the N. by Bithynia and Paphlagonia, E, by

Pontus, S. by Cappadocia and Lycaonia, W. by Phrygia. These boundaries, however, varied at different periods in the history of Galatia. The river Halys flowed in a northerly direction through the centre of the province, the eastern half of which was watered by tributaries of that stream, while the Sangarius and its affluents traversed the western half. Galatia originally formed a part of the extensive province of Phrygia ; after its separation it was occupied by three Gallic tribes, who still continued distinct in the time of Strabo—the Trocmi, who dwelt in the east, the Tectosages Each of these tribes was subdivided into four parts, and these were tuled over each by a tetrarch of its own. The power of the tetrarchs was limited by a senate of 300, before which

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also all capital cases were tried. Minor offences came under the cognizance of the tetrarchs and special judges appointed by them. The three tribes all spoke the same tongue; and though in course of time they became Hellenized, their original language was still in use among them as late as the time of Jerome.

The physical characters of Galatia are in great measure similar to those of the adjoining provinces of Phrygia and Lycaonia, the whole region being an elevated plateau or table-land, no part of which is less than 2000 feet above the sea, while the greater part exceeds 3000 feet in elevation. The southern portion, towards Lycaonia, is the most level, and is an almost perfect plain,

passing gradually into the expanse of salt desert which occupies the frontier lands of the two provinces. The rest of the country consists for the most part of vast undulating downs, affording excellent pasture for sheep and goats, and capable of producing good crops of corn, though at present in great part uncultivated, and almost wholly devoid of wood. Towards the frontiers of Bithynia it becomes more broken, and is intersected by numerous valleys, as well as by several detached ranges of hills, none of them, however, attaining to any considerable height or importance. The lofty range of the Ala-dagh (6000-7000 feet), though frequently termed the Galatian Olympus, is not properly included within the limits of the province, but forms in part the natural boundary which separates it from Bithynia, From its elevated position, the climate of Galatia is naturally one of considerable extremes of heat and cold ; and while the summers are burning hot, the winters at Angora are more severe than at Paris, and the snow often lies on the ground for a month together.

The only towns of importance in Galatia were Tavium, the capital of the Trocmi, a small town which speedily fell into decay; Ancyra, the capital of the Tectosages, which under the Romans became the capital of the country, and has ever since retained its importance as one of the principal cities of Asia Minor (see ANcorA); and Pessinus, the chief town of the Tolistobogii, where a splendid temple was conse- crated to Agdistis, the mother of the gods, the divinity who was worshipped at Rome under the title of Rhea or Cybele.

Galatia took its name from a body of Gauls who invaded Asia Minor about the year 277 n.c._They had formed part of the army which invaded Greece under Brennus, but having quarrelled with that commander, had left his standard, and marching into Thrace under generals of their own choice, advanced to Byzantium, whence they were invited by Nicomedes, king of Bithynia, to cross into Asia, and help him in his struggle against his brother Zipetes. After performing the required services, they turned their arms against their employer, and ravaged the western half of Asia Minor. Their success allured other hordes of their countrymen, who readily took service with the Asiatic kings in their wars against each other. No Oriental prince was found able to check them, until Attalus, king of Pergamus, defeated them in a great battle, 239 B.c., and compelled them to settle in that part of

the country which after them was called Galatia. They still remained independent, how- ever, and proved a formidable foc to the Romans in their wars with Antiochus. It was found necessary to direct a special army against them, under Cn. Manlius, and the result of the campaign (189 B.c.) was their complete subjugation to the power of Rome. Galatia was not at this time reduced to a Roman province, but the Gauls were still allowed to retain their own government under their tetrarchs. This system, however, gradually gave way, and the whole country passed under the authority of one ruler. The first of these sole tetrarchs was Deiotarus, a contemporary of Cicero and Cesar, who, in return for the assistance which he gave the Romans in their wars against Mithridates, was rewarded with a part of Pontusand Armenia Minor, and was styled king by the senate. It was afterwards united with Lycaonia, Isauria, and several adjoining districts, under a king named Amyntas, at whose death, in 25 b.c., Galatia became a Roman province. Theodosius the Great subdivided it for pur- poses of government into Galatia Prima, of which Ancyra was the capital, and Galatia Secunda, with Pessinus for its chief town.

The antiquities of Galatia have in recent times been made the subject of special investigation by a French commission composed of MM. Perrot, Guillaume, and Delbet, and the result of their labours published in 2 vols. fol., Paris, 1872; but with the exception of those of Angora, they are not of much general intcrest.

GAL 19

GALATIANS, Epistir To THE. Origin.—Although “Galatia,” as a united kingdom under Amyntas, included Pisidia, as well as portions of Lycaonia and Pamphylia, and when constituted a Roman province was further enlarged so that itextended from Taurus to the Euxine (Ptol.,v. 1), it may with safety be taken for granted that the name is never used in the New Testament except in its older colloquial sense as equivalent to “ Gallogreecia” or “Eastern Gaul” (Tarria éwa, Appian, De Bell. Civ., ii. 49), the country of those Galli (PAjjres, Paddror, KéArav) whose migrations and final terri- torial limits have already been indicated in the preceding article.1 On this assumption, the history of the formation of the Christian

“churches of Galatia” is very obscure. It is obvious enough, from the epistle itself, that they had been

‘planted by Paul; but when, or under what circumstances,

we are nowhere explicitly informed. In the Acts of the Apostles we read that, accompanied by Silas, he set out on what is generally known as his second missionary journey soon after the council of Jerusalem, which may be dated approximately as having occurred about the year 52 A.p.2 After having traversed “Syria” and “ Cilicia,” strengthen- ing the churches, they “ passed through Phrygia and the region of Galatia (tiv Tadarucyy xdpav), being forbidden of the Holy Ghost to preach the word in Asia; and after they were come to Mysia, they assayed to go into Bithynia, but the Spirit of Jesus suffered them not.”? The language here employed, even if, as Wieseler argues, it implies that preaching was engaged in, can hardly be said to suggest of itself that churches had been formed on the route, but rather appears to hint at a forced and rapid marcel. Acts xviii. 23, however, indicates that “disciples” at least had been made, and it is well known that in the narrative of the Acts many important passages in the eventful public life of the apostle have been passed with even less explicit allusion. Combining then the meagre facts which that narrative in this instance affords with inferences derived from incidental expressions made use of in the epistle itself, we conjecture the apostle to have been detained by ill-health (see Gal. iv. 13, “because of bodily weakness”), probably in the western district of Galatia (that of the Tolistobogii), though not at the capital Pessinus itself, but nearer the borders of Asia and Mysia; and there, in the mpocevyai or synagogues, to have addressed his message to Jews,* proselytes, and as many of the native

1 See Strabo, xii. p. 566 (where the words are thy viv Tadarlay kal Taraoypaxlay Aeyouevny); and compare Pliny (H. W., v. 25), who continues to distinguish Lycaonia from Galatia. The later historian Memnon also incidentally mentions that the Galate had taken possession of thy viv Tadattay kadovuéevny. Renan (Saint Paul, p. 48) and, latterly, Hausrath (NUtliche Zeitgeschichte, ii. 258), however, uphold the theory that Paul when he uses the word Galatia intends the Roman province, and that by the Galatians we are to understand chiefly the Christians of Antioch, Iconinm,

Derbe, and Lystra. Their arguments are drawn from the ordinary usus loquendi of Paul (by Asia, Macedonia, Achaia he invariably mcans the provinces bearing these names); from the analogy of 1 Pet. i. 1, where all the districts mentioned happen to be ‘‘ provinces” ; from such can- siderations as the inaccessibility of Galatia proper; from inferences based on Acts xviii. 28, Gal. ii. 5, and other texts; and from the admittedly perplexing fact that unless the churches of Derbe, Lystra, &c., be regarded as Galatian, we are left in ignorance of the names, localities, and histories of the churches addressed. But, as has been seen, the ancient usus loguendi appears on the whole to have dis- regarded the Roman division of provinces in this case at least; more- over, Iconium was never a part of the Roman Galatia; and in any case there would have been an inappropriateness in addressing Lycaonians and Pisidians by a title so rich in ethnological and historical suggestion as that of ‘‘ Galatians” is.

? The full consideration of the chronology of this period of sacred history must be postponed to the article PAUL.

3 So Acts xvi. 6, 7, according to the oldest texts. Tischendorf, Tregelles.

- For the fact of the prevalence of Jews in Galatia reference may be made to the Monumentum Ancyranum (Joseph., Ant., xvi. 6. 2; @f xii. 3, 4); compare 1 Pet. i. 1.

See Lachmann,

pagan population as could be induced to hear. The Galatians, although in their intercourse with one another they still continued to make use of their ancient dialect, were quite able to understand the then almost universally diffused Greek;! and some of them, both Jews and Gentiles,? almost immediately began to recelve Paul’s doctrine with favour and even with enthusiasm (Gal. iv. 14). How long this visit continued we are not told; but most of the chronological evidence goes to show that it cannot have lasted more than six months, and that it pro- bably came to an end within a much shorter interval. Resuming the journey by Mysia and the Troad, Paul and his companion proceded to “ Macedonia” and “ Achaia,” spending in the

latter province at least eighteen months, and finding no opportunity of revisiting Galatia for a space of at least three years. During this interval several causes must have been quietly but constantly working with a tendency to alienate the Galatian converts from the new " gospel of the uncircumcision" (edayyéhov THs axpoBvorias, ii 7), and induce them to that conformity with certain parts of Jewish ceremonial which was even at that time described by the word " Judaizing" (iovdaifew, Gal. ii, 14). Even among those whose leanings were towards the spiritual religion of the Old Testament, Jewish habits of thinking and feeling could never fail to assert themselves with con- siderable strength; and there were also elements peculiar to the old pagan religion of the district which were fitted to pre-dispose even the heathen mind towards that ceremonialism and "making a fair show in the flesh" (eitpoowrpoa ev capi) which the apostle deprecated.? How or when these tendencies had first begun to manifest themselves in the way of deliberate rebellion against the teachings which Paul had left behind him, can only be a matter of pure conjec- ture; but it would appear that, even if the revolt had been originated by Palestinian Jews, it had at least been fomented by other agitators who were Gentiles by birth (v. 12; vi. 13); nor does it seem improbable that they had begun their work very soon after the time of the apostle's first visit. The second visit, mentioned in Acts xviii. 23, which must have taken place about 55 a.p., and have occupied very little time, appears to have been on the whole a pleasant one; the apostle was still received with due respect (iv. 12, 18), and may well have left Galatia with the impression that the disciples had been "strengthened" by him, and that they "were running well" (v. 7). But shortly after his departure tidings reached him that, though the influence of the Judaizers had for the time been neutralized by his presence, it had begun to reassert itself with greater force than ever almost immediately after he had gone, and ee disciples had been' so "bewitched" that, after ing begun in the spirit," they were now endeavouring to be "made perfect by the flesh." He also learned that the reactionary doctrines had been supported by a suggestion that he himself was n0 teacher of independent authority, but merely a subordinate, and that a treacherous one, of the original apostles and pillars of the church, whose " gospel " was emphatically "of the circumcision." Immediately on receipt of this intelligeuce, he wrote the present epistle, Contents.—It consists of three parts, in which the personal, the doctrinal, and the practical elements respect-

1 See Jerome's often-quoted Prol. in Epist. Gal., ' Galatos excepto sermone Greco quod omnis oriens loquitur, propriam linguam eandem habere quam Treviros." Philologists have hardly any doubt of the essentially Celtic character of this dialect; though many German theologians still maintain it to have been Teutonic. See Lightfoot (Galatians), and Grimm in the Studien u. Kritiken for 1876.

2 That there were any Jews among Paul's converts here has some- times been doubted, but unreasonably. See Gal. iii, 23, 25; iv. 3 It seems probable, however, that the Gentiles were in the 'majority. ,

3 Galatia, and particularly Pessinus, was famed for its worship of Cybele. See Livy, xxxviii. 18; Strabo, xii. p. 567.

ively predominate. (1.) After an expression of surprise at the instability displayed by his Galatian converts, the author proceeds to establish the divineness of his message by an historical proof of the wholly divine character of his commission to be its messenger. He urges that he had received his apostleship directly from God; and that, far from proceeding from men, it had been tardily, and so far reluctantly, acknowledged by them only after it had become an altogether patent and undeniable fact. His first visit to Jerusalem had been three years after his conversion. If it had not resulted in his recognition as on a footing of equality with the apostles, it at least had not led to his taking any position of subordination ; while on his second visit to Jerusalem he had met the apostles and deliberated with them on terms of undisputed parity. On the third oc- casion of his coming into contact with an apostolic person so distinguished as Peter, he had openly withstood him and vanquished him in argument, thereby even establishing a superiority. (2.) He proceeds to state and defend the doctrine of justification by faith in the crucified Christ. After alluding to it as a truth already established in their Christian consciousness (iii. 1-5), he proceeds to show that the 'same truth had been embedded in the whole Old Testament revelation, and was capable of being deduced from the entire course of the past history of the church. The religion of Abraham had been a religion of faith, and his justification had not been a justification by works (iii. 6-18). The law which came later is misunderstood if it be regarded as superseding

the promise which had been the foundation of the religion of the patriarch. Its relation to the promise was manifestly of a subordinate and tem- porary kind. ‘To regard it as having been otherwise would be as absurd as to suppose that a Hagar and an Ishmael could ever have taken that place in the family which belonged of inalienable right to Sarah and to Isaac (iit. 19—iv. 31). (3.) He exhorts to a continuance in the life of faith which is also the life of freedom, and warns against any relapse under the yoke of Judaism (v. 1-12). He explains that Christian freedom is a freedom conditioned by morality (v. 13—vi. 10), and concludes with a recapitula- tion and the benediction.

Genuineness, Date, and Place,—The genuineness of this epistle has never been disputed. The external evidence is remarkably clear and continuous, while the internal has been such as to satisfy even the most negative school of modern criticism.t Its autographic character, also, is inferred by many, including Hilgenfeld, Holzmann, and otlier moderns, from the expression used in vi. 11; but it is at least possible that the word éypaya may refer only to vi. 11-18. The question as to its date has given occasion for considerable diversity of opinion. It has been seen that the apostle wrote immediately after he had heard of the change that had come over the Galatian churches, and that this change occurred “soon” (raxéws) after his secoud visit. These facts favour a date not much later than 55 A.D. Further, a comparison of the epistle to the Galatians with those to the Romans and Corinthians results, on the whole, in favour of the opinion that it was the earliest of the four, or at all events not much later than the latest, in other words, not later than 59 a.p. It is probably idle to attempt to fix the date much more precisely. The reference in 1 Cor. xvi. 1, which may mean either that friendly rela- tions with the Galatians had been until then uninterrupted, or that they had been already restored, have determined the critics, according to the interpretation adopted, in placing it either early in the Ephesian sojourn or late in the Corinthian. The majority of the moderns is in favour of the former date (55-57 a.D.), but the latter still continues

4 The only dissenting voice has been that of Bauer (1851).

to find supporters. Reference has already been made to the theory of Renan and Hausrath, which leads them to assign this epistle to the period of the second missionary journey, Apart from the considerations which have been indicated in a preceding note, this view is open to the objection that it raises new and gratuitous difficulties in connexion with the history and chronology of the Acts; it has accordingly met with comparatively little acceptance. According to some older writers, such as Michaelis, Koppe, Borger, the supposed absence of any reference to the council of Jeru- salem implies a very early date; English readers, on the other hand, are familiar with the statement derived from some of the later Greek MSS., and supported by the Syriac and Arabic versions, as well as by the weighty authority of Eusebius, Jerome, and Theodoret, that the epistle was "written from Rome." This view has been advocated in modern times also by C. Schrader; but the general verdict will probably continue to be, as it has for some time been, adverse to a theory which would group this among the letters of the captivity rather than among those of an earlier period.

On the relation of Galatians to the book of the Acts of the Apostles, see vol. i, pp. 124, 125.

Literature.—For an interesting and detailed account of the patristic commentaries on this epistle reference may be made to an excursus by Bishop Lightfoot (Saint Paul's Epistle to the Galatians, 1865, 2d ed. 1874). Those belonging to the Reformation period are sufficiently well known, particularly Luther's, Calvin's, and Beza's. Of modern English commentaries the most exhaustive is that of Dr Lightfoot, already referred to; but those of Ellicott (1854), Jowett (1855), and Alford (1857) are also of great value. In Germany onc of the latest is that of Wieseler (Commentar tiber den Galaterbrief, 1859); and among those who preceded him in this

field, Winer (Pauli ad Galatas Epistola lat. versa et perpetua anno- |

tutione illustrata, 1829, 4th ed. 1859), Usteri (Comm. i. d. Galater- brief, 1888), Riickert (1883), Olshausen (1840), De Wette (1845, 3d ed. 1864), Meyer (1851, 5th ed. 1870), Hilgenfeld (1852), and Ewald (Die Sendschreiben des Apostels Paulus iibersetzt und erkliirt, 1857) are all worthy of particular mention. |Windischmann's Commentar (1843) is an able and learned exposition from the Roman Catholic point of view. Sce

also Holsten (Inhalt u. Gedan- kengang des Br. a. d. Galater, 1859), Hofmann (Die heilige Schrift Neuen Testaments zusammenhingend ausgelegt, 1868), Brandes (D. Ap. P. Sendschreiben a. d. Galater, 1869), Sanday (in vol. iii. of the Speaker's Commentary), and Venn (On the Epistle to the Gala- ttans, 1878). Much help in the interpretation of the epistle is to be derived from the various works on the apostle Paul and the apostolic period of church history; also from those on New Testa- ment Introduction, such as Hilgenfeld's (Hini., 1875) and Bleek's (Hinl., 1875). 1S. SBLy) GALATINA, a town of Italy, in the province and circondario of Lecce, on the road from Otranto to Taranto. It still preserves its ancient walls and towers, and possesses an interesting Franciscan church and monastery (St Catharine's), founded in the 14th century by Raimondo Orsini del Balzo, prince of Taranto. The frescos with which the church is richly decorated are of no small his- torical value. Fora long time the inhabitants were attached to the Greek Church. In 1871 they numbered 7873. GALATZ, or Gatacz, a town and port of Roumania, principality of Moldavia, chief town of the district of Covurlin, on the left bank of the Danube (there 2000 feet wide), between the mouths of the Pruth and Sereth, about 85 miles from the Sulina mouth of the Danube, and 130 miles N.E. of Bucharest, with which it is connected by rail, lat. 45° 26' 12" N., long. 28° 3' E. Galatz is said to have got its name from a colony of the same Galatians who invaded Asia Minor in 278 3.c., though this seems doubt- ful. The town stands on a level plateau, and consists of two portions, an old and a new, The former, which 18 nearest to the river, is irregularly and badly built, with crooked streets paved with wood, some of them being regular sewers. This part of the town is liable to be flooded, and, as in the greater part of Roumania, the sanitary con- ditions are bad. The new town, which has rapidly extended

during the past few years, is built on the rising ground towards the north-west. It is partly paved, is much more open and comfortable than the old town, and contains most of the public buildings, consulates, &c. Galatz is now to a considerable extent lighted with gas, and some time ago a regular system of water-works was commenced to supply the town with purified and filtered water. There are several Roman Catholic and Greek churches, educa- tional institutions, a hospital, a quarantine building, &e. In the

church of St Mary is the tomb of Mazeppa, said, however, to have been rifled of its contents by the Russians. Galatz is the seat of the international com- mission instituted by the treaty of Paris, 1856, to insure the free navigation of the mouths of the Danube; and by the treaty of Berlin, 1878, Roumania is to be repre- sented on this commission, which exercises its duties as far as Galatz independently of all territorial rights. Galatz has been a favourite place for crossing the Danube with military expeditions since the time of the Roman emperors, though during the war of 1877-78 the Russians did not adopt it except for parties of réconnaissance. There are very few strictly Roumanian industries carried onat Galatz. There are several flour-mills, saw-mills, and breweries, extensive cooperage works, and soap and candle manufactories to a small extent ; light wines are also made. Galatz is an important free port, and shares with Ibraila most of the trade of the lower Danube. The navigation of the Sulina mouth of the river has so improved that steamers of 850 tons can sail up to Galatz. There are French, Austrian, Russian, and British steamboat companies that carry on a regular trade with Galatz, and attempts have been made by the municipality to construct solid stone wharfs. For the traffic generally much inconvenience is felt from want of adequate quay and warehouse accommoda- tion; but now that Roumania is an independent state, im- provements may be made in this and other directions. A considerable proportion of ships unload at Sulina and send their cargoes up to Galatz in lighters. The river is gene- rally frozen over for a few weeks during winter.

The staple article of export from*Galatz is grain of various kinds, of which large quantities are grown in all the districts situated on the Danube. In 1876 281 sailing ships, 157 steamers, and 873 lighters, of an aggregate tonnage of 258,391 tons, cleared from the port of Galatz. The lighters had a total of 102,564 tons, while of the remainder 18 sailing ships and 70 steamers of 49,779 tons were British. In the same year the principal articles of export were—wheat, 313,673 qrs.; maize, 428,775 qrs.; barley, 160,448 qrs.; oats, 421,457 qrs.; rye, 167,840 qrs.; flour, 391,657 cwt.; fir planks, 766,869; besides considerable quantities of linseed, rape seed, beans, and small quantities of millet, wool, hides, cheese, and dried prunes. Of wheat 8000 qrs. went to Britain and 19,549 to Holland; maize, 71,500 qrs. to Britain, 21,000 to Malta; rye, 58,485 qrs. to Holland; barley, 37,347 qrs. to Britain. The total value of exports from Galatz in 1876 was £1,215,621,

being a con- siderable increase over 1875. There does not seem to be any return of exports by rail, though Galatz is now connected with the general European railway system. The imports for 1876 were valued roughly at £1,750,000, among which manufactured goods figured at £354,000; sugar, £117,000; coal, £112,000; iron, £80,000; caviare, £66,000; oil, £65,000; rice, £58,000; coffee, £382,000; leather, £28,000; sacking, £29,000; soap, £26,000. Galatz is to cease to be a free port on 13th January 1880, after which import duties will be imposed. Constant steam communication is main- tained between Galatz and Constantinople, and regular lines of steamers sail from London, Liverpool, and Hull. There isa British consulate at Galatz. The population in 1873 was estimated at 80,000; if this is correct, it has more than doubled itself in ten years ; it was only 8000 in 1835.

GALBA, Servius Sutpicius (3 3.c.-69 A.p.), a Roman emperor. He came of a noble family, being sixth in direct descent from the great orator of the same name, though unconnected either by birth or adoption with the line of the first six Caesars. He owed his elevation to the growing power of the pretorians and the discontent of the provincials, weary of Nero’s rule, and beginning to assert

their independence. As Tacitus justly remarks, the death of Nero divulged that secret of the empire, that emperors could be made elsewhere than at Rome. From the little we know of his earlier years he appears as a young man of remarkable gifts and even fascination—a strange contrast to his weak and unlovable old age. His biographer, Suetonius, relates that both Augustus and Tiberius pro- phesied to him his future rise. The story is improbable, though in part borne out by Tacitus, and rests on the authority of a credulous gossip, who inserts an omen or a prodigy at every turn of his hero’s fortunes; but it helps to show, what we learn from other sources, that while still a youth he was regarded as one who was capable of great things. He resisted the solicitations of the empress Agrippina, and refused the rich legacy of Livia Augusta. Rising through the various grades of office to the consulship in 33 a.p., he acquired a high and well-merited reputation both as a general and an administrator in the provinces of Gaul, of Africa, and of Spain, which he successively held. For the first half of Nero’s reign he lived

in retirement, till, in 61, the emperor bestowed on him the province of Hispania Tarraconensis.

The first years of his rule were marked by rigorous dis- cipline and strict justice, which sometimes degenerated into cruelty. We are told how he nailed the hand of a cheating money-changer to his bench, and how, when a guardian who had murdered his ward appealed to his Roman citizen- ship, he allowed him the honour of a higher gallows. It is true that during the later period of his administration he was indolent and apathetic, whether it was that he sought to elude the jealousy of Nero, or, as is more probable, felt the growing infirmities of age. Yet his career, taken as a whole, shows the justice of the common judgment, as reported by Tacitus, that all would have pronounced him fit for empire had he uot beenemperor indeed, In the spring of 68 Galba was holding an assembly at New Carthage when the news reached him of the insurrection in Gaul. The appeal of Vindex urging him to assume the championship of the oppressed human race placed Galba in an awkward dilemma, and his decision was prompted not so much by ambition as by fear of Nero, whom he kuew to be plotting his death. The fall and suicide of Vindex renewed his hesitation, when the news that Nymphidius Sabinus, the prefect of the pretorians, had declared in his favour, and by large promises in his name carried the troops with him, revived his spirits. Before, he had only dared to call him- self the minister of the senate and Roman people; he now assumed the title of Czesar, and marched straight for Rome.

At first he was welcomed by the senate and the party of order, but he was never popular with the soldiers or the people, and he soon forfeited the regard even of his few sup- porters. He was ruined by his virtues no less than by his vices. To the preetorians who claimed their promised largess he replied that he chose his soldiers and would not buy them. The mob was disgusted at the moroseness and niggardliness of a prince who hated all display, and rewarded a popular singer with a paltry present of five denarii. But the respectable classes had graver causes of discontent. They soon found that the government was wholly in the hands of three favourites—two of them officers, and one a freedman who had followed Galba from Spain. Thus the worst abuses of the last reign were revived without any of its brilliance and gaiety.

Galba was first made aware of the general discontent by an outbreak among the legions of Germany. He sought to avert the rising storm by an act which, if better timed and performed in a more popular way, might have saved him, He adopted as his coadjutor and successor Piso Frugi

_Licinianus, a man in every way worthy of the honour. The speech in which he announced to Piso his election has a

genuine ring, and convinces us that his choice was wise and patriotic ; but by the populace it was attributed solely to fear, and the preetorians were indignant at it because un- accompanied with the usual donative. When the elements of a revolution are all in train a leader is not far to seek. Salvius Otho, a disappointed candidate for the office of Piso, entered into communication with the discontented pre- torians, and was by them adopted as their emperor. ‘lwo soldiers from the ranks undertook to transfer the empire of Rome, and actually transferred it. Galba, on his way to meet the rebels, was met by a troop of cavalry and butchered near the Lacus Curtius. A common slave severed the bald head from the body, and thrusting it inside his toga presented the bloody offering to Otho. Thus perished, unwept and unpitied, a man who, had he died a proconsul instead of an emperor, would have left as fair a fame as any Roman of the first century.

GALBANUM (Hebrew, Chelbenah; Greek, xadBdvy), a gum-resin, believed to be the product of Ferula galbanijlua, Boiss. et. Buhse, and /. rubricaulzs, Boiss., indigenous to Persia, and perhaps also of other umbelliferous plants. From the stems of these it is said to exude as a milk-white juice, which is rendered yellow by exposure to light and air. It occurs usually in hard or soft, irregular, more or less translucent and shining lumps, composed of agglutinated drops or tears, or occasionally in separate tears, aud is of a light-brown, yellowish, or greenish-yellow colour, and has a disagreeable bitter taste, a peculiar, somewhat musky odour, and a specific gravity of 1°212. Exposed to cold, it becomes brittle, and may be reduced to powder (Pereira). To separate the vegetable and other impurities commonly present in it, galbanum is melted at 100° C., and strained. On analysis 100 parts yield about 65 of resin soluble in ether and alkaline liquids, 20 to 25 of gum, and about 7 of volatile oil. The last furnishes a colourless

crystallizable substance, wmbelliferone, CgyH,O3, which may be recognized by its formation of a blue colour with ammonia, destroyed by acids. Galbanum oil has been shown by J. Kachler (see Journ. Chem. Soc., xxiv., 1871, p. 258) to contain a colourless limpid oil, boiling at 160° to 165° C., and a blue oil, of boiling point 240° to 250° C., varying in quantity with the temperature of distillation, which is isomeric with oil of turpentine, and identical with the oil of A/atricaria Chamomilla, l. Galbanum is one of the oldest of drugs. In Exodus xxx. 34 it is mentioned as a sweet spice, to be used in the making of a perfume for the taber- nacle. Hippocrates employed it in medicine, and Pliny (Nat. Hist., xxiv. 13) ascribes to it extraordinary curative powers, concluding his account of it with the assertion that “the very touch of it mixed with oil of spondylium is sufficient to kill a serpent.” By Arabian and Persian authors it was termed barzud, the plants producing it being known as kinneh and nafeel (Royle, Man. of Mat. Med.). Avicenna extols the drug for its emmenagogue, diuretic, and various other virtues, and as an antidote “for all poisons.” In Chinese writings galbanum, O-yi, is not met with as a distinct drug (F. Porter Smith). It is now administered for its antispasmodic, expectorant, and stimulant properties. As an antispasmodic it is considered inferior to asafcetida, but superior to ammoniacum, which, however, is more effi- cacious as an expectorant inasthma. Galbanum (German, Mutterharz) has been supposed to have a stimulating effect upon the uterus, and has been given, combined with salts of iron, in amenorrhcea, and also is recommended in hysteria and neuralgia accompanied by uterine affections. It is an ingredient in the pilula asafectide composita of pharmacy, and in a plaster, emplastrum galbani, which has been found serviceable in cases of indolent tumours and chronic arthritic swellings. Galbanum is imported to some extent from the Levant, but chiefly from India, through Bombay.

Sce Waring, Manual of Practical Therapeuties, 3d ed., 1871,.p. 311; Fliickiger and Hanbury, Pharmacographia, p- 285, 1874; Bentley and Trimen, Medicinal Plants, No. 128.

GALE, Tuzopuinus (1628-1678), a distinguished divine, was born in 1628 at King’s Teignmouth, in Devon- shire, of which place his father was vicar.

In 1647 he was entered at Magdalen College, Oxford, where he took his B.A. degree in 1649, and M.A. in 1652. In 1650 he was made fellow and tutor of his college. He remained five years at Oxford, discharging actively the duties of tutor, and was then appointed to a church at Winchester, After the restoration he refused to submit to the Act of Unifor- mity, and was cjected from his parish. In 1662 he accepted the post of tutor tv the sons of Lord Wharton, whom he accompanied to the college of Caen, in Normandy. He re- turned to England in 1665, and spent some years in literary work. ‘The latter portion of his life he passed in London as assistant to the Rev. John Rowe, a dissenting minister, who had charge of an important church in Holborn. Gale succeeded Rowe in 1677, and died in the following year.

His principal work, The Court of the Gentiles, which appeared in parts in 1669, 1671, and 1676, is a strange storehouse of miscellaneous philosophical learning. It resembles the Intellectual System of Cudworth, though very inferior to that work both in general con- struction and in fundamental idea. Gale’s endeavour is to prove that the whole philosophy of the Gentiles is a distorted or mangled reproduction of Biblical truths. Just as Cudworth referred the Democritean doctrine of atoms to Moses as the original author, so Gale tries to show that the various system: of Greek thought may be traced back to Biblical sources. Like most of the learned works of the 17th century, the Court of the Gentiles is chaotic and unsys- tematic, while its erudition is rendered almost valueless by the complete absence of any critical discrimination. The other writings of Gale are—The Idea of Jansenism, 16v9 ; Theophilus, or a Dis- cowrse of the Saint’s Amity with God in Christ, 1671 ; Anatomy of Infidelity, 1672 ; Idea Theoloyie, 1678 ; Philosophia Generatis, 1676.

GALE, THomas (1636-1702), an eminent. classical scholar, was born at Scruton, Yorkshire, in 1636. He was

educated at Westminster School and at Trinity College, Cambridge, of which he became a fellow. In 1666 he was appointed regius professor of Greek, in 1672 head- master of St Paul’s School, in 1676 a fellow of the Royal Society, and also prebendary of St Paul’s, and in 1697 dean of York. He died at York in 1702. Gale published a collection of Opuscula Mythologica, Ethica, et Physica, and editions of several Greek and Latin

authors, but his fame rests chiefly on his collection of old works bearing on early English history, entitled Historie Anglicanee Scriptores and Mistoricee Britannic, Saxonice, Anglo-Danice, Scriptores AV. He is the author of the inscription on the London Monument in which the Roman Catholics are accused of having originated the great fire.

GALEN, Curistovp BernuarpD vAN (1600-1678), prince-bishop of Miinster, was descended from a noble family in Westphalia, and was born 15th October 1600. After attending the Jesuit college at Miinster, and the universities of Cologne, Mainz, Louvain, and Bordeanx, he was engaged in several diplomatic missions, Subsequently he became colonel in the army of the elector Ferdinand of Bavaria, and took part in campaigns against the French and Swiss. On the death of Ferdinand he was chosen prince- bishop of Miinster, but scarcely had he succeeded in restor- ing the internal prosperity of his territories, and freeing them from foreign invaders, when an insurrection arose in the city which he was unable com pletely to subdue till 1661. In 1664 he was chosen, along with the margrave Frederick of Baden, joint administrator of military affairs of the Rheuish alliance in its war against the Turks. After the peace that followed the victory of St Gotthard, he concluded an alliance with Charles II. of England against the Nether- lands; but through the intervention of Louis XIV. an arrangement was.made in 1666 by which the king of the Netherlands vacated all the territories of Galen, with

the exception of the town of Borkelo. In 1672, in con- junction with France, Galen renewed hostilities against the Netherlands, but in the same year suffered a severe defeat at Coevorden, and although, along with the French general Turenne, he afterwards obtained several successes, he concluded a peace in 1674, by which he resigned all the advantages he had gained. In the following year he entered into an alliance with the king of Denmark and the clector of Brandenburg against Charles XI. of Sweden, and in 1676 captured Stade, the capital of the duchy of Bremen, after which he took possession of that duchy and of several places in the duchy of Verden. Subsequently he became involved in a war with East Friesland, and only consented to evacuate that territory on payment of a large

sum of money. He died at Ahaus, 19th September 1678.

The Vie de Christophe Bernard de Galen, évéque de Miinster, was published at Rouen in 1679; J. Ab. Alpen's De vita et rebus gestis Ch. Bern. de Galen appeared at Koesfeld in 2 vols. in 1694, an abridgment of this work at Miinster in 1790, and a more extended abridgment at Ulm in 1804; and Tucking's Geschichte des Stifis Minster unter Galen was published at Miinster in 1865.

GALEN, or Gatenus, CLavuprus, called Gallien by Chaucer and other writers of the Middle Ages, the most celebrated of ancient medical writers, was born at Pergamus, in Mysia, about 130 a.p. His father Nicon, from whom he received his early education, is described as remarkable both for excellence of natural disposition, and for mental culture; his mother, on the other hand, appears to have been a second Xanthippe. In 146 Galen commenced the study of medicine, and in about his twentieth year he left Pergamus for Smyrna, in order to place himself under the instruction of the anatomist and physician Pelops, and of the peripatetic philosopher Albinus. He subsequently visited other cities, and in 158 returned from Alexandria to Pergamus. In 164 he went for the first time to Rome. There he healed Eudemus, a celebrated peripatetic philo- sopher, and other persons of distinction; and ere long, by his learning and unparalleled success as a physician, earned for himself the titles of ' Paradoxologus," the wonder-speaker, and " Paradoxopceus," the wonder-worker, thereby incurring the jealousy and envy of his fellow-practitioners. Leaving Rome in 168, he repaired to his native city, whence he was soon sent for to Aquileia, in Venetia, by the emperors Lucius Verus and Marcus Aurelius. In 170 he returned to Rome with the latter, who, on departing thence to conduct the war on the Danube, having with difficulty been persuaded to dispense with his personal attendance, appointed him medical guardian of hisson Commodus. Tn Rome Galen remained for some years, greatly extending his reputation as a physician, and writing some of his most important treatises. It would appear that he eventually betook himself to Pergainus, after spending some time at the island of Lemnos, where le learned the method of preparing a certain popular medicine, the "terra lemnia" or ''sigillata." Whether he ever revisited Rome is un- certain, as also are the time and place of his death. Ac- cording to Suidas, he died at the age of seventy, or in

the year 200, in the reign of Septimius Severus. If, however, we are to trust the testimony of Abul-faraj, one of his Arabian biographers, his decease took place in Sicily, when he was in his eightieth year. Galen was one of the most versatile aud accomplished writers of his age. He com- posed, it is said, nearly 500 treatises on various subjects, including logic, ethics, and grammar. Of the published works attributed to him 83 are recognized as genuine, 19 are of doubtful authenticity, 45 are confessedly spurious, ° 19 are fragments, and 15 are notes on the writings of Hippocrates. .

Galen, who in his youth was carefully trained in the Stoic philosophy, was an unusually prolific writer on logic. Of the numerous commentaries and original treatises, a

catalogue of which is given in his work De Proprivs Labris, oue only has come down to us, the treatise on Fallacies 77 dictione (wept trav Kara THY deEw copurpdruv). Many points of logical theory, however, are discussed in his medical and scientific writings. His name 1s perhaps best known in the history of logic in connexion with the fourth syllogistic figure, the first distinct statement of whicli was ascribed to him by Averroes. ‘There is no evidence from Glalen’s own works that he did make this addition to the doctrines of syllogism, and the remarkable passage quoted by M. Minas from a Greek commentator on the Analytrics, referring the fourth figure to Galen, clearly shows that the addition did not, as generally supposed, rest on a new principle, but was merely an amplification or alteration of the indirect moods of the first figure already noted by Theophrastus and the earlier Peripatetics.

In 1844 M. Minoides Minas published a work, avowedly from a MS. with the superscription Galenus, entitled Tadnvod Hioaywyi Avadexrexn. Of this work, which con- tains no direct intimation of a fourth figure, and which in general exhibits an astonishing mixture of the Aristotelian and Stoic logic, Prantl speaks with the bitterest contempt. He shows demonstratively that it cannot be regarded as a writing of Galen’s, and ascribes it to some one or other of the later Greck logicians. A full summary of its contents will be found in the lst vol. of the Geschichte der Logik (591-610), and a notice of the logical theories of tlie true Galen in the same work, pp. 559-577.

There have been numerous issues of the whole or parts of Galen's works, among the editors or illustrators of which may be mentioned Jo. Bapt. Opizo, N. Leonicenus, L. Fuchs, A. Lacuna, Ant. Musa Brassavolus, Aug. Gadaldinus, Conrad Gesner, Sylvius, Cornarius, Joannes Montanus, Joannes Caius, Thomas Linacre, 'Theodore Goulston, Caspar Hoffman, René Chartier, Haller, and Kiihn. Of Latin translations Choulant mentions one in the 15th and twenty- two in the following century. The Greek text was edited at Venice, in 1525, 5 vols. fol.; at Basel, in 1538, 5 vols. fol.; at Paris, with Latin version by René Chartier, in 1639, and in 1679, 13 vols. fol.; and at Leipsic, in 1821-33, by C. G. Kiihn, considered to be the best, 20 vols. 8vo. An epitome in English of the works of Hippocrates and Galen, by J. R. Coxe, was published at Philadelphia in 1846.

Further details as to the life and an account of the anatomical knowledge of Galen will be found in the art. ANATOMY, vol. i. pp. 802-804. See also René Chartier's Life, in his edition of Galen's works; N. F. J. Eloy, Dictionnaire Historique de la Médecine, s. v. ' Galien," tom. i.,1778; F, Adams's ''Commentary" in his Medical Works of Paulus Afgincta, London and Aberdeen, 1834; J. Kidd, '' A Cursory Analysis of the Works of Galen, so far as they relate to Anatomy and Physiology," Trans. Provincial Med. and Surg. Assoc., vi., 1837, pp. 299-336; C. V. Daremberg, Ex- position des Connaissanecs de Calien sur l Anatomie, la Physiologie, et la Pathologie du Systeme Nerveuw (These pour le Doctorat en Médecine), Paris, 1841; and J. R. Gasquet, ''The Practical Medicine of Galen and his Time," The British and Foreign Medico- Chirurgical Rev., vol. xi., 1867, pp. 472-488.

GALENA, a city of the United States, the capital of Jo Daviess county, Illinois, is situated on the Fever or Galena river, 6 miles above its junction with the Mississippi, and on the northern division of the Illinois Central Railroad, 180 miles W.N.W. of Chicago. The city winds around the base of rocky limestone bluffs, which spring rather abruptly from the river on both sides, and the streets rise above one another, and are connected by flights of steps. It is the commercial depdt of an extensive and fertile dis- trict, but owes its prosperity chiefly to the species of lead from which it takes its name, and the mines of which sur- round it in all directions, underlying, more or less densely

a : an area of over 1,500,000 acres. In these mines copper is also found in combination with the galeua. In the earlier years the produce of the mines found its way by water to St Louis, but in 1829 the first load, 3000 tb, was conveyed overland to Chicago. In 1846 the yield reached its highest

in 1877 only 3,300,000. ‘This diminution is due to the absence of the expensive appliances necessary for dcep

| eminent F rriters. point of 50,000,000 1; in 1852 it was 40,000,000; and | posterit ee

mining. Meanwhile zinc ore has been discovered, of which 12,000,000 ib were mined in 1877. The lumber produce is also considerable, averaging 7,000,000 feet annually. The principal buildings are the German-English normal school, the high school, and the building in which are included the custom-house and post-office. Galena has an iron-foundry, flour-mills, woollen mills, saw and planing mills, besides furnaces and manufactories for lead, zine, cop- . per, and furniture. Mining commenced in 1820, and in 1822 the United States began to grant leases of the mineral lands. The first street was laid out in 1826; village government was legalised in 1837, and a city charter granted in 1839. Population in 1850, 6004; in 1860, 8196; and in 1870, 7019, of whom 2473 were foreigners.

GALESBURG, a city of the United States, the capital of Knox county, Illinois, is situated at the junction of the Burlington and Peoria branches of the Chicago, Burling- ton, and Quincy Railroad, 163 miles W.S.W. of Chicago, and is the centre of a farming district of great fertility. It has several extensive manufactories of agricultural im- plements, besides carriages and waggons, and also contains the machine-shops and car-works of the railroad com- pany. It is the seat of two colleges, Knox College (Cou- gregational), founded in 1841, and Lombard University (Universalist), founded in 1852, to both of which female students are admitted. Population in 1860, 4953; and in 1870, 10,158, of whom 3136 were foreigners.

GALIANI, Ferprnanvo (1728-1787), one of the most celebrated, if not one of the soundest, political economists of Italy, was born at Chieti on the 2d

of December 1728. For his early education and opportunities of advancement in life he was less indebted to his parents than to his uncle, Monsignor Celestino Galiani. By his care, and at his expense, Galiani received the best education which Naples and Rome could then furnish, becoming qualified for an ecclesiastical career at a time when a clever abbé might hope to fill with profit and reputation important offices in the state as well as in the church. Galiani gave early promise of distinction as an economist, and even moreas a wit. At the age of twenty-two he had produced two works by which his name became widely known far beyond the bounds of his own Naples. His taste for economic studies had been developed in the society of such men as Genovesi and Intieri, and prompted the composition of his Zrattato della Moneta, in which many aspects of the question of exchange are set forth, always with a special reference to the state of confusion then presented by the whole monetary system of the Neapolitan Government. Galiani's fame as a humorist dated from the appearance of the Raccolta in Morte del Bora, a work as popular in Italian literary circles during the last century as the Rejected Addresses and Bon Gaultier Ballads have been in our own. In this volume Galiani parodied with exquisite felicity, in a series of discourses on the death of the public hangman, the style of the most pompous and pedantic Neapolitan writers of the day. Galiani's political knowledge and social qualities now pointed him out to the discriminating eye of Charles III., and his liberal minister Tanucci, as one eminently fitted to serve the Government as a diplomatist in France. He was therefore attached in the character of secretary to the Neapolitan embassy at Paris. Thither he repaired in 1759, at a time when a change in the relations between the courts of Paris and Vienna was about to exercise an influence on the course of the Seven Years' War, when the different Bourbon courts were engaged in a common action against the Jesuits, and when economic science held a foremost place in the speculations of the most Galiani is chiefly remembered by posterity by the part which he took in these economic dis- cussions. His Dialogues sur les blés, though published after

_his return to Naples, produced on its appearance a great

impression, aud has again and again furnished to future controversialists arguments more specious than solid against the liberty of exporting corn. The criticism of Voltaire, that Galiani's volume united the wisdom of Plato and the wit of Moliére, will not be accepted asa decisive judgment on the merits of the treatise; but it may be viewed as a tolerably fair test of tle regard in which it was held by Galiani's contemporaries. Galiani returned to Naples after a ten years' residence in Paris, where his reputation as a wit had long surpassed that of an economist or a statesman. Until his death at Naples, on October 30, 1787, he kept up with his old Parisian friends a correspondence, of which the tone on his side can only be compared to the wailing and howling sent forth by Ovid during his banishment to the shores of the Euxine. Absence from Paris was with him the synonym of social and literary death.

To the common editions of Galiani which are found in great public libraries must be added the essay recently published at Naples, L' Abate Galiani, by Alberto Marghieri, 1878, and the copious extracts from his correspondence with. Tanucci, likewise

published very recently in the new series of Viesseux's L' Archivio Storico, Florence, 1878.

GALICIA, in German Galizien, and in Polish Halicz, a crown-land of Austria which comprises the old kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand-duchy of Cracow. Towards the N. and E. it has an extensive and irregular frontier conterminous with the Russian empire; in the §.,W. it meets the Hungarian territory along the ridge of the Carpathian Mountains; its western borders, which are of small ex- tent, touch both Austrian and Prussian Silesia; and in the 8. it is bounded by the province of Bukowina, which was separated from it in 1849. As its area is 30,299 square miles, or more than 10,000 square miles greater than that of Bohemia, it is the largest of all the crown-lands of Austria. The population in 1869 was 5,418,016, which showed an increase since 1857 of 785,150. Of the whole 2,660,518 were males, and 2,757,498 females, The density was greatest in the circles of Biala, Tarnow, and Cracow, and least in the circle of Radworna. In 1876 the total was 6,000,326.

About a third of the whole area of Galicia is occupied by the Carpathians, and the greater proportion of the remainder consists of the terraces by which the mountain system gradually sinks down to the great eastern plains of Russia. Only a very small district near the Vistula can properly be described as lowland. The two most prominent summits of the Galician Carpathians are the Babia Gora or Women's Mountain, 5648 feet above the level of the sea, and the Waxmundska, 7189. Of the famous massif of the Tatra, hardly a fourth is within the Galician bound- aries.

By its rivers Galicia belongs partly to the basin of the Baltic and partly to the basin of the Black Sea, The Dunajec, the San, and the Premsza, tributaries of the Vistula, are the navigable streams of the western region ; and the Dniester, which is the principal river of the east, is navigable as faras Czartoria. There are few lakes in the country except mountain tarns ; but considerable morasses exist about the Upper Dniester, the Vistula, and the San, and the ponds or dams in the Podolian valleys are estimated to cover an area of 208 square miles. Of the 35 mineral springs which can be counted in Galicia, the most fre- quented are Konopowka, south of Tarnopol, and Lubian and Sklo, west of Lemberg. The last is a good example of the intermittent class. The Galician climate is exceedingly severe, the range of temperature being nearly 145°. In July and August the mean temperature is 66° or 67° Fahr.; in March it is 32° or 33°. Winter is long, and the snowfall, which oftens begins in the early part of October, is very abundant, At Cracow the annual precipitation is

about 23 inches, and at Lemberg about 28, Rather more than 6 per cent. of the surface of Galicia is unproductive. Forests occupy upwards of 4 million acres, but they are so badly managed that in some districts straw has to be used as fuel; 1,550,128 acres are devoted to pasture, 8,486,358 are under tillage, and 3,007,024 are under gardens and meadows. Barley, oats, and rye, are the prevailing cereals ; but wheat, maize, and leguminous plants are also cultivated, and hemp, flax, tobacco, and hops are of considerable im- portance. In 1873 the whole crop of cereals amounted to 9,878,563 bushels ; and there were 2,016,326 bushels of pulse, and 65,581,331 bushels of potatoes. In 1869 the num- ber of horses in the crown-land was 695,610; of

asses and mules, about 2000 ; of cattle, 2,070,572 ; sheep, 966,763 ; goats, 35,825 ; and swine, 734,572. The stocks of bees were upwards of 257,490, and the yearly produce of honey and wax is about 18,300 and 7166 cwt. respectively. In West Galicia there are mines of coal, ironstone, and zinc ore ; and in Eastern Galicia a certain quantity of lignite is obtained. The iron ore is poor, containing only 10 or 11 per cent. of metal; and in 1873 the out-put did not exceed 108,546 cwt. Salt is procured both from mines and from salt-springs in sufficient abundance to make it an article of export to Russia. The great factory at Kalusz for the making of potash was closed in 1875, the company having failed; and the exploitation of the rich petroleum springs of East Galicia languishes for lack of capital. Cracow is the centre of the iron manufacture, but it is of compara- tively small development. Tile works are very numerous ; stoneware is produced in a few establishments; and the glass works number about 15. In 1874 there were 237 breweries, 598 distilleries, and 3746 mills,—no fewer than 3524 of the mills being driven by water and 172 by wind. Cigars are manufactured at Monasteryska and Winniki, Cracow, Jupielnica, and Zablotow. The textile industries are for the most part very slightly developed, but the linen trade employs 11,255 looms. Railway traffic is rapidly increasing. There is a large transit trade down the river Dniester to Russia by means of light boats built at Zuravero, Halicz, Marianpol, &c., which are usually broken up for firewood when they reach Odessa; and all the navigable streams, both north and south, are used for the transport of wood from the forests. Large quantities of Galician timber thus find their way to Dantzic, Stettin, Hamburg, and Berlin. The country is divided into the eight districts of Lemberg, Zloczow, Tarnopol, Stanislawow, Sambor, Przemysl, Tarnow, and Cracow, which altogether comprise 74 administrative circles. There are in all 83 towns, 230 market villages, and 11,000 hamlets, the most populous places being Jemberg, 87,109 ; Cracow, 49,835 ; Tarnow, 21,779; Tarnopol, 20,087; Brody, 18,890; Kolomiya, 17,679 ; Drohibiez, 16,888 ; Przemysl, 15,185 ; Stanislau, 14,479; Sambor, 11,749, Jaroslau, 11,166 ; Rzesznow, 10,090 ; and Sniatyn, 10,305. The chief town is Lemberg, which is the seat of the royal imperial lieuten- ancy or K. K. Statthalterei. According to the laws of 1861 the diet of Galicia consists of the three archbishops (those of the Roman Catholic, the Greek Catholic, and Armenian Catholic Churches), the three Roman Catholic bishops, the rectors of the universities of Lemberg and Cracow, 44 representatives of the larger landowners, 4 representatives

of the capital, 3 representatives of the chambers of trade and industry, 16 from the towns and industrial centres, and 74 from the rural communes. Sixty- three members are sent to the imperial diet, of whom 20 represent the landowners, 13 the towns, 27 the rural com- munes, and 3 the chambers of trade, &e. The two principal nationalities in Galicia are the Poles and the Ruthenians— the former predominating in the west and the latter in the

east. The Poles who inhabit the ona. are distin- a)

guished as Goralians (from gor, a mountain), and those of the lower regions as Mazures and Cracoviaks, The Ruthenian highlanders bear the name of Huzulians.

icia (or Halicz) took its rise along with the neighbouring aoe of es (or Vladimir) in the course of the century—the seat of the ruling dynasty being Halicz or Halitch, a town in the present district of Stanislawow at the confluence of the Lukev with the Dniester. Disputes between the Galician and Lodomerian houses led to the interference of the king of Hungary, Bela IIL, who in 1190 assumed the title of Rew Galatie, and appointed his son Andreas lieutenant of the kingdom. Polish assistance, however, enabled Vladimir the former possessor to expel Andreas, and in 1198 Roman, prince of Lodomeria, made himself master of Galicia also. On his death in 1205 the struggle between Poland and Hungary for supremacy in the country was resumed ; put in 1215 it was arranged that Daniel, son of Roman, should be invested with Lodomeria, and Koloman, son of the Hungarian king, with Galicia. Koloman, however, was expelled by Mstislaff of Novgorod; and in his turn Andreas, Mstislaff’s nominee, was expelled by Daniel of Lodomeria, a powerful prince, who by a flexible policy succeeded in maintaining his position. Though in 1235 he had recognized the overlordship of Hungary, yet, when he found himself hard pressed by the Mongolian general Batu, he called in the assistance of Innocent IV. and accepted the crown of Galicia from the hands of a papal legate; and again, when Inno- cent disappointed his expectation, he returned to his former con- nexion with the Greek Church. On the extinction of his line in 1340 Casimir III. of Poland incorporated Galicia and Lemberg; on Casimir’s death in 1377 Louis the Great of Hungary, in accordance with previous

treaties, became king of Poland, Galicia, and Lodo- meria; and in 1382, by the marriage of Louis's daughter with Ladislaus II., Galicia, which he had regarded as part of his Hun- garian rather than of his Polish possessions, became definitively assigned to Poland. On the first partition of Poland, in 1772, the kingdom of Galicia and Lodomeria came to Austria, and to this was added the district of New or West Galicia in 1795; but at the peace of Vienna in 1809 West Galicia and Cracow were surrendered to the grand-duchy of Warsaw, and in 1810 part of Kast Galicia, in- cluding Tarnopol, was made over to Russia. This latter portion was recovered by Austria at the peace of Paris, and the former came back on the suppression of the independence of Cracow in 1846. Within the short period since 1860 great advances have been made in many ways in the development of the natural resources of the country and in the education of the people; and the general prosperity of the kingdom is evidenced by the rapid growth of several of its larger towns.

See Litl de Lilisnbach, " Description du bassin de la Galicic et de la Podolie," in Mémotres de la société géologique de France, tome i., mém. iv., 1833-34; Schmedes, Geogr.~~statist. Uebersicht Galiziens, Lemberg, 1869; Lipp, Verktehrs~~ und Handelsverhdltnisse Galiziens, Praguc, 1870; Zehlicke, ''Die polit. und socialen Zustande Galiziens," in Unsere Zeit, 1870; '" Dic Ruthener in Galizien," in Die Globus, 1870; Piiat, Statist. Mittheil. tiber die Verhdlinisse Galiziens, Lemberg, 1874; Ortsrepertorium des Kénigretchs Galizien und Lodomerten (official), Vienna, 1874; Zelicke, " Die deutschen Kolonien in Galizien," in Jm Neuen Reich, 1876; Kelb in Jahrbericht der K. Geol. Retchs-Anstalt, 1876; " Culturfortschritte in Galizien," in Das Ausland, 1876. Remarkable sketches

of Galician life have been given by Sacher-Masoch, whose works are well known in France and Germany. A rich literature on the subject exists in Polish.

GALICIA (Gallecia or Callecia, Ka\Aakia, Kadarxia), an ancient kingdom, countship, or province in the N.W. angle of Spain, now divided into the provinces of Corufia, Jiugo, Orense, and Pontevedra, lies between 41° 51' and 43° 47' N. lat., 6° 50' and 9° 16' W. long., and is bounded on the N. and W. by the Bay of Biscay and the Atlantic, on the S. by the Portuguese

provinces of Entre Douro e Minho and Traz os Montes, and on the E. by Leon and the Asturias, The greatest length is about 125 miles, greatest breadth 115 miles; area, 11,222 square miles ; population (1867), 1,937,792. Galicia is traversed from E. to W. by a continuation of the great Pyrenean and Cantabrian chain : and its surface is further broken by two spurs from that system, which, running in a south-westerly direction, en- close the basin of the Mifio. The average elevation of the province is considerable, and the maximum height (6593 feet) is reached in the Pefia Trevinca on the east border of Orense. The principal river is the Miiio (Portuguese Minho; Latin Minius; so named, it is said, from the minium or vermilion found in its bed), which, rising near Mondofiedo, within 20 miles of the northern coast, after a course of 170 miles in a south and south-west direction, enters the Atlantic near the port of La Guardia. It is navigable by small vessels on the lower part of its course.

GALICIL @®

Of the numerous affluents of the Miiio, the most important are—on the left the Sil, which rises among the lofty moun- tains between Leon and Asturias, and on the right the Tea, which rises on the eastern flank of Monte Fano. Among other rivers having a westerly direction may be mentioned the Tambre, the Ulla, and the Lerez or Ler, which fall into the Atlantic by estuaries or rzas called respectively Ria Muros y Noya, Ria Arosa, and Ria Pontevedra. The rivers of the northern versant, such as the Eume, the Juvia, and the Mero, are, like those of the Asturias, for the most part short, rapid, and subject to violent floods. The coast-line of Galicia, extending to about 240 miles, is everywhere bold and deeply indented, presenting a large number of secure harbours, in this respect forming a marked contrast to the neighbouring province. The Eo, which bounds Galicia on the east, has a deep estuary, the Rivadeo, which offers a safe and commodious anchorage in 3 fathoms water at ebb- tide. Further to the west is Vivero Bay, 1 mile wide and 3 in length, affording good anchorage throughout, with from 6 to.8 fathoms of water. The Ria del Varquero y Vares is of a similar character ; while the harbour of Ferrol (see FERROL) ranks among the best in Europe. On the opposite side of Betanzos Bay (the péyas Awww or Portus Magnus of the ancients) is the great port of Coruiia (see CoruNNA). The principal port on the western coast of Galicia is that formed by the deep and

sheltered bay of Vigo, which is navigable for vessels of 500 tons to a distance of 16 miles from the ocean; but there are also good roadsteads at Corcubion under Cape Finisterre, at Marin, and at Carril. The climate of the Galician coast is mild and equable, but the interior, owing to the great elevation (the town of Lugo is upwards of 1900 feet above the sea level), has a wide range of temperature. The rainfall is exceptionally large, aud snow lies on some of the loftier elevations for a considerable portion of the year. The soil is on the whole fertile, and the produce very varied. A considerable quantity of timber is grown on the high lands, and the rich valley pastures support large herds of cattle, while the abundance of oak and chestnut favours the rearing of swine. In the lowland districts good crops of maize, wheat, barley, oats, and rye, as well as of turnips and potatoes, are obtained. The fruit also is of excellent quality and in great variety, although the culture of the vine is limited to some of the warmer valleys in the southern districts. The dehesas or moorlands abound in game, and fish are plentiful in all the streams. The mineral resources of the province, which are considerable, were known to some extent to the ancients. Strabo speaks of its gold and tin, and Pliny mentions the gemma Gallaica. Mines of lead, tin, copper, and iron pyrites continue to be wrought, though under considerable disadvantages, and chiefly by foreign capitalists, Galicia is also remarkable for the number of its sulphur and other warm springs, the most important of which are those at Lugo and those from which Orense is said to take its name (Aquee urentes).

Ethnologically the Galicians (Gallegos) are allied to the Portuguese, whom they resemble in dialect, in appearance, and in habits more than the other inhabitants of the peninsula. The men are well known all over Spain, and also in Portugal, as hardy, honest, and industrious, but for the most part somewhat unskilled, labourers ; indeed the word Gallego has come to be almost a synonym in Madrid for a “ hewer of wood and drawer of water.” Agriculture engages the greater part of the resident population, both male and female; other industries are little developed, and the fisheries are not extensive. There are a few linen and cotton factories in the larger towns, The principal exports are live cattle, preserved meats, eggs, bones, mineral ore, fish oil, salt fish (especially sardines), chestnuts and other nuts, grain (especially maize), and potatoes. The first-men-

tioned item is the most considerable; the exports to England from Corufia alone having mounted in 1875 to 17,000 head, at an average value of £15. The chief im- ports are coal, iron, tobacto, and manufactured goods. Apart from the few carreteras reales or royal roads, which are, as elsewhere in the Peninsula, unexceptionable, the means of internal communication in Galicia are decidedly defective. The only railways are those betwixt Lugo and Corufia (61 miles), and betwixt Santiago and Carril (244 miles). Another line, from Vigo. to Orense, has been in course of construction for some time, and it is also proposed to connect Lugo with Astorga. Galicia has 10 cities and 115 towns. The capital is Santiago, which is also an arch- bishopric, with a population of 29,000. Lugo, Tuy, Mon- doiiedo, Orense, are also episcopal sees. The largest city is Coruiia, the seat of the audiencia (population about 40,000). The others are Ferrol, Vigo, Betanzos, and Pontevedra.

Gallecia, the country of the Callaici or Gallaici, seems to have been very imperfectly known to the earlier geographers. Accord- ing to Eratosthencs the entire population of the peninsula were at one time called Galate. The region properly called by their name, bounded on the S. by the Douro and on the E. by the Navia, was first entered by the Roman legions under Decius Junius Brutus in 137-6 B.c. (Livy, lv., lvi., Hpot.); but the final subjugation cannot be placed earlier than the time of Augustus. Under the Antonines,

ossibly even under Hadrian, Gallecia and Asturia were erected into a separate Provincia Cesaris, having been regarded previously as mcrely a portion of Lusitania. On the partition of Spain, which followed the successful invasions of the Sucvians, Alans, and Van- dals, Gallcia fell to the lot of the first-named (411 A.p.), After an independent subsistence of nearly 200 years, the Suevian kingdom was annexed to the Visigothic dominions under Leovigild in 590. In 713 it was occupied by the Moors, who in turn were driven out of it about the year 734 by Alphonso I. of Asturias and his brother Froela. During the 9th and 10th centuries it was the subject of dispute between more than one count of Galicia and the suzerain, and its coasts were repeatedly ravaged by the Norsemen. When Ferdinand I.

divided his kingdom among his sons in 1063, Galicia was the portion allotted to Garcia, the youngest of the three. Ten years afterwards it was forcibly reannexed by Garcia's brother Alphonso, and thenceforward it remained an integral part of the kingdom of Castile or of Leon. The honorary title of count of Galicia has frequently been borne by younger sons of the Spanish sovereign. In the patriotic struggles of 1808 the junta of Galicia took an important part. For administrative purposes the ancient province has since 1833 been divided into four, namely, Corufia, Lugo, Orense, and Pontevedra.

GALILEE (PadAa/a, 9°23), the most northerly of the three provinces into which Palestine was at the Roman period divided, was bounded on the E. by the Jordan, on the 8. by Samaria, on the W. by the Mediterranean, on the N.W. by Phoenicia, and on the N. by the Leontes, the extreme length being about 60 miles, the extreme breadth 30, and the area 1000 square miles. The Galilee thus defined, however, though doubtless the Galilee of Herod's tetrarchy and of later centuries, was hardly that of ordinary parlance at the beginning of the Christian era. Josephus himself, while substantially giving these boundaries (B. J., lii, 3, 1, and elsewhere), yet incidentally in one place speaks of Upper Galilee as constituting the whole of Galilee proper (Ant. xx. 6, 1), and elsewhere in giving Xaloth (Iksal) and Dabaratta (Debirieh) as boundary towns, seems to exclude from Galilee the plain of Esdraelon, In the early period of the history of Israel, the word bibs or 12°23, meaning a circle, was hardly a proper name at all, but was applied to Several districts with considerable generality. Thus in Josh. xiii, 2 and Joel iv. 4 reference is made to the "borders" or "coasts" (Geliloth) of the Philistines. In Josh. xxii. 10, 11, however, the "Geliloth" of Jordan means the plain of Jordan referred to in Ezekiel xlvii. 8 as "the eastern Gelilah" (compare Josh. xviii. 7); while in Josh, xx. 7, xxi, 32, hag-Galil denotes the north portion of the territory of Naphtali westward of Merom, where Kadesh, one of the six cities of refuge, lay. Here were situated the twenty " worthless" cities which Solomon gave

to Hiram (1 Kings ix. 11; 2 Chr. viii. 2); and here, not- withstanding the conquests made successively by Joshua, several of the judges, David, and

Solomon, the population seems to have retained a prevailingly ethnic character ; for even in Isaiah's time "the land of Zebulun and the land of Naphtali" is called " Galilee of the Gen- tiles" (Isa. ix.1). After the deportation by Tiglath Pileser (2 Kings xv. 29), in which it is to be presumed that chiefly Israelites were carried away, this ethnic character would most probably be intensified and extended rather than diminished cither in area or in amount; and already in the time of the Maccabees, accordingly, we find the word appar- ently used in a considerably wider sense than in earlier times (1 Mace. v. 14, 15, x. 30; cf. Tob. i. 2). The later extension of the designation cannot be more particularly traced, but we know with considerable exactness what the limits were at the time of the Talmudists. The southern boundary was defined by the towns of Bethshean (Beis4n), Ginza (Jenin), Caphar Utheni (Kefr Adan), and by the ridge of Carmel; on the east the Jordan formed the limit ; while on the west and north the line ran from Carmel to Accho (Akka), and thence ascended eastwards by a great valley just south of Achzib (ez Zib) extending 8 miles, past Kabartha (el Kabry), Gathin (J'athin), and Beth Zanita (Zueinita), to Gelila (Jelil), where it turned north near M'alia, probably the Melloth which Josephus notices as on his boundary (B. J., iii. 8, 1). From Melloth it ran 12 miles north 'to Kania and Aiya (probably Kanah and 'Aiya), and then appears to have run east along a high ridge by Berii and Tirii (Beriés and Tireh), and thence, after a course of 5 miles, it trended north-east by Tifni (Tibnin), Sifneta (Safed el Battikh), Ailshitha 'Atshith), and Aulam (Almén), arriving thus at the deep gorge of the Leontes, Turning east it passed Migdol Kherub (el Khurbeh) and the "hollow of Ayun" (Merj 'Aytin), past Takra (unknown) to Tortalga (''the snowy mountain," or Hermon), and to Kisrin and the bounds of Iitir—-that is, to Ceesarea Philippi (now Banias), and thus to beyond Jordan. The boundary between Upper and Lower Galilee was natural, being marked on the east by the town of Caphar Hananya (Kefr 'Anan), situated at the foot of the high ridge which formed the actual line; Bersobe, on the same boundary (Josephus, ZB, J., ili. 3, 1), is not as yet known.

Lower Galilee—The whole of Galilee presents country more or less disturbed by voleanic action. In the lower division the hills are all tilted up towards the east, and broad streams of lava have flowed over the plateau above the sea of Galilee. In this district the highest hills are only about 1800

feet above thesea. Theridge of Nazareth rises north of the great plain of Esdraelon, and north of this again is the fertile basin of the Buttauf, separated from the sea- coast plains by low hills. East of the Buttauf extends the basaltic plateau called el Ahma (‘the inaccessible”), rising 1700 feet above the sea of Galilee. North of the Buttauf is a confused hill country, the spurs falling towards a broad valley which lies at the foot of the mountains of Upper Galilee. This broad valley, running westwards to the coast, is the old boundary of Zebulun—the valley of Jiphthah-el (Josh, xix. 14), The great plain of Esdraelon is of trian- gular form, bounded by Gilboa on the east and by the ridge which runs to Carmel on the west. It is 14 miles long from Jenin to the Nazareth hills, and has a mean measure- ment of 9 miles east and west. It rises 200 feet above the . sea, the hills on both sides being some 1500 feet higher. The whole drainage is collected by the Kishon, which runs through a narrow gorge at the north-west corner of the plain, descending beside the ridge of Carmel to the sea. The broad valley of Jezreel on the east, descending towards the Jordan valley, forms the gate by which Palestine 1s entered from. beyond Jordan. Mount Tabor stands isolated

in the plain at the north-east corner, and rather further | south the conical hill called Neby Duby rises between Tabor and Gilboa. The whole of Lower Galilee is well watered. The Kishon is fed by springs from near Tabor and from a copious stream from the west side of the plain of Esdraelon. North-west of Nazareth is WAdy el Melek, an open valley full of springs. The river Belus, just south of Acre, rising in the sea-coast marshes, drains the whole valley of Jiphthah- el. On the east the broad valley of Jezreel is full of magnificent springs, many of which are thermal. The plains of Esdraclon, and the Buttauf, and the plateau of el Ahma, are all remarkable for the rich basaltic soil which covers them, in which corn, cotton, maize, sesame, tobacco, millet, and various kinds of vegetable are grown, while indigo and sugar-cane were cultivated in former times. The Nazareth hills and Gilboa are bare and white, but west of Nazareth is a fine oak wood, and another thick wood spreads over the northern slopes of Tabor. The hills west of the great plain are partly of bare white chalk, partly covered with dense thickets. The mountains north of the Buttauf are rugged and covered

with scrub, except near the villages, where fine olive groves exist. The principal places of importance in Lower Galilee are Nazareth (10,000 inhabitants), Sepphoris (now Sefffirich), a large village standing above the Buttauf on the spurs of the southern hills, and Jenin (En Gannim), a flourishing village, with a palm garden (3000 inhabitants). The ancient capital, Jezreel (Zerin), is now a miserable village on a precipitous spur of Gilboa ; north of this are the small mud hamlets, Solam (Shunem), Endér (Endor), Nein (Nain) ; on the west side of the plain is the ruin of Lejjin (the Legio of the 4th century, which was then a place of importance). In the hills north of the Buttauf is Jefat, situated on a steep hill- top, and representing the Jotapata defended by Josephns. Kefr Kenna, now a flourishing Christian village at the foot of the Nazareth hills, south of the Buttauf, represents the probable site of Cana of Galilee, and the ruin Kana, on the north side of the same plain, represents the site pointed out to the pilgrims of the 12th and 138th centuries.

Upper Galilee.—The mountains are tilted up towards the sea of Galilee, and the drainage of the district is towards the north-west. On the south the rocky range of Jebel Jermak rises to 4000 feet above the sea; on the east a narrow ridge 2800 feet high forms the watershed, with steep eastern slopes falling towards Jordan. Immediately west of the watershed are two small plateaus, covered with basaltic debris, near el Jish and Kades. On the west are rugged mountains with deep intricate valleys. The main drains of the country are—first, WAdy el ’Ayiin, rising north of Jebel Jermik, and running north-west as an open valley, and secondly, Wady el Ahjar, a rugged precipitous gorge running north to join the Leontes. The district is well provided with springs throughout, and the valleys are full of water in the spring time. Though rocky and difficult, Upper Galilee is not barren, the soil of the plateaus is rich, and the vine flourishes in the higher hills, especially in the neighbourhood of Kefr Birim. The principal town is Safed, perched on a white mountain 2700 feet above the sea. It has a population of about 9000, including Jews, Christians, and Moslems. It is one of the four sacred cities in Pales- tine revered by the Jews, to which nationality the majority of the inhabitants belong. Among the smaller towns we may notice Meirfin, near Safed, a place also much re- vered by the Jews as containing the tombs of Hillel, Shammai, and Simon bar Jochai. A yearly festival of most curious character is here celebrated in honour of these rabbis. The site of Hazor, one

of the chief towns of Galilee in Bible times, has also been lately recovered. It was situated, according to Josephus, above the Lake Semechonitis (Bahr el Haleh), and the name Hudireh, identical with the Hebrew |

Hazor, has been found by the survey party in 1877 apply- ing to a mountain and plain, near an ancient ruin, in the required position. The little village of Kades represents the once important town of Kadesh Naphtali (Josh. xix. 37). The ruins are here extensive and interesting, but belong apparently to the Greek period.

The population of Galilee is mixed. In Lower Galilee the peasants are principally Moslem, with a sprinkling of Greek Christians round Nazareth, which is a Christian town, In Upper Galilee, however, there is a mixture of Jews and Maronites, Druses and Moslems (natives or Algerine settlers), while the slopes above the Jordan are inhabited by wandering Arabs. The Jews are engaged in trade, and the Christians, Druses, and Moslems in agricul- ture ; and the Arabs are an entirely pastoral people.

The principal products of the country are corn, wine, oil, and soap (from the olives), with every species of pulse and gourd.

The antiquities of Galilee include cromlechs and rude stone monuments, rock-cut tombs, and wine-presses, with numerous remains of Byzantine monasteries and fine churches of the time of the crusades. There are also re- mains of Greek architecture in various places, but the most interesting buildings are the ancient synagogues. These have not been found in other parts of Palestine, but in Galilee eleven examples are now known. They are rectangular, with the door to the south, and three rows of columns forming four aisles east and west. The architecture is a peculiar and debased imitation of classic style, attributed by architects to the 2d century of ourera. The builder of the examples at Kefr Birim, el Jish, and Meirfin is known to have been the famous Simeon bar Jochai, who lived about 150 «.p., and built 24 synagogues in Galilee, The similarity of style renders it probable that the other examples at Tell Him, Kerazeh, Nebartein, Umm el ’Amed, and Sufsaf were also his work. Both at el Jish and at Kefr Birim there are two synagogues, large and small. At Irbid, above Tiberias, is

another synagogue of rather different character, which is said to have been built by Rabbi Nitai. Traces of syna- gogues have also been found on Carmel, and at Tireh, west of Nazareth. It is curious to find the representation of various animals in relief on the lintels of these buildings, Hebrew inscriptions also occur, and the carved work of the cornices and capitals is very rich. These synagogues were erected at a time when the Galilean Jews were flourishing under the Roman empire, and when Tiberias was the central seat of Jewish learning and of the Sanhedrin.

In the 12th century Galilee was the outpost of the Chris- tian kingdom of Jerusalem, and its borders were strongly protected by fortresses, the magnificent remains of which still crown the most important strategical points. Toron (now Tibnin) was built in 1104, the first fortress erected by the crusaders, and standing on the summit of the mountains of Upper Galilee. Beauvoir (Kaukab, built in 1182) stood on a precipice above Jordan south-west of the Sea of Galilee, and guarded the advance by the valley of Jezreel; and about the same time Chateau Neuf (Huntin) was erected above the Haleh lake. Belfort (esh Shukif), on the north bank of the Leontes, the finest and most important, dates somewhat earlier ; and Montfort (Kalat el Kurn) stood on a narrow spur north-east of Acre, completing the chain of frontier fortresses. The town of Banias, with its castle, formed also a strong outpost against Damascus, and was the scene, in common with the other strongholds, of many desperate encounters between Moslems and Christians. Lower Galilee was the last remaining portion of the Holy Land held by the Christians. In 1250 the knights of the Teutonic order owned lands extending round Acre as far east as the Sea of Galilee, and including Safed. These possessions were lost in 1291, on the fall of Acre. (c. RB. ©.)

GABILEE

GALILEE, Tue Sza or, with its surrounding shores, de- gerves a more special description than that given of the rest of the district, as being the part of Palestine which most interests modern students and travellers. The lake was also called the Sea of Chinnereth or Chinneroth, and the Lake of Gennesaret or Tiberias ; and by Pliny it is said to have been once called Lake of Tarichez. In form it is pear-

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Sea of Galilee.

shaped, 12} English miles in length, and 74 at its greatest width. The level is now known to be 682°5 feet below the Mediterranean. The water is fresh and clear, and large shoals of fish abound init. The formation of the lake basin occurred later than the Chalk period, and was due toa subsidence of the strata, which appears to have been sud- den and violent, and probably accompanied by extensive volcanic eruptions from three centres east, west, and north of the lake. The district has always been liable to volcanic disturbance and to earthquakes. In 1837 Safed and Tiberias were destroyed by earthquake, and the tempera- ture of the hot springs round the lake was then observed to rise considerably for a time,

The Sea of Galilee is best seen from the top of the western precipices, and presents a desolate appearance. On the north the hills rise gradually from the shore, which is fringed with oleander bushes and indented with small bays. The ground is here covered with black basalt. On the west the plateau of el Ahma terminates in precipices 1700 feet above the lake, and over these the black rocky tops called “the Horns of Hattin ” are conspicuous objects. On the south is a broad valley through which the Jordan flows. On the east are furrowed and rugged slopes, rising to the great plateau of the Jaulan (Gaulonitis), The Jordan enters the lake through a narrow gorge between lower hills. A marshy plain, 24 miles long and 14 broad, called el Batihah, exists immediately east of the Jordan inlet. There is also on the west side of the lake a small plain called el Ghuweir, formed by the junction of three large

valleys. It measures 3} miles along the shore, and is 1 mile wide. This plain, naturally fertile, but now almost uncul- tivated, is recognized to be the plain of Gennesareth, described by Josephus (B, J., iii. 10, 8). The shores of the lake are of fine shingle. On the east the hills approach in one place within 40 feet of the water, but there is generally a width of about # of a mile from the hills to the beach. On the west the flat ground at the foot of the hills has an average width of about 200 yards. A few scattered palms dot the western shores, and a palm grove is to be found near Kefr Harib on the south-east. Thermal springs are found on each side of the lake, with an average temperature of about 80° Fahr. The hot baths south of Tiberias include seven springs, the largest of which has a temperature of 137° Fahr. The plain of Gennesareth, with its environs, is the best watered part of the lake-basin. North of this plain are the five springs of et Tabghah, the largest of which was enclosed about a century ago by Aly, son of Dhahr el ’Amr, in an octagonal reservoir, and the water led off by an aqueduct 52 feet above the lake. The Tabghah springs, though abundant, are warm and brackish. At the north end of the plain is ’Ain et Tineh (“spring of the fig-tree ”), also a brackish spring with a good stream; south of the plain is ’Ain el Bardeh (“the cold spring”), which is sweet, but scarcely lower in temperature tlian the others. The most important spring remains still to be noticed, namely, ’Ain el Madawerah (“ the round spring”), situated 1 mile from the south

end of the plain and half a mile from the shore. The water rises in a circular well 32 feet in diameter, and is clear and sweet, with a temperature of 73° Fahr. The bottom is of loose sand, and the fish called coracinus by Josephus (B. J., iii. 10, 8) is here found in abundance. Dr Tristram was the first explorer to identify this fish, and points out that it could not exist in the other springs. We are thus able to identify the "'round spring " with the fountain of Capharnaum, which, according to Josephus, watered the plain of Gennesareth.

The principal sites of interest round the lake may be enumerated from north to west and from south to east. Kerazeh, the undoubted site of Chorazin, stands on a rocky spur 900 feet above the lake, 2 miles north of the shore. Foundations and scattered stones cover the slopes and the flat valley below. On the west is a rugged gorge. In the middle of the ruins are the remains of a synagogue of richly ornamental style built of black basalt. A small spring occurson the north, Tell Hfim is an important ruin on the shore south of the last mentioned site. The remains consist of foundations and scattered stones (which in spring are concealed by gigantic thistles) extending about half a mile along the shore. The foundations of a fine synagogue, measuring 75 feet by 57, and built in white limestone, have been excavated. A conspicuous building has been erected close to the water, from the fragments of the Tell Him syna- gogue. Since the 4th century Tell Hfiim has been pointed out by all the Christian writers as the site of Capernaum, but the fatal objections to such an identification are—(1) the great distance from the fountain of Capharnaum, and (2) the fact that Jewish tradition preserves another site. The ruins at Tell Hfim are not of necessity as old as the time of Christ. The name Him means "black," and is probably connected with the surrounding black basalt. The place seems to be mentioned in the Talmud under the titles Caphar Ahim and Caphar Tanhumin (see Neubauer's Geog. Tal., p. 220). Minyeh is a ruined site at the north end of the plain of Gennesareth, 24 miles from the last, and close to the shore. There are extensive ruins on flat ground, consisting of mounds and foundations, with traces of a wall once surrounding the site. Masonry of well-dressed stones has also been here discovered in course of excavation. Near the ruins are remains of an old khan, which appears to have

been built in the Middle Ages ; and above this a curious hillock, with an artificial rock-platform, called el ’Oreimeh, “the little knoll.” Immediately to the north-east a preci- pice projects to the lake, and the aqueduct from the Tabghah spring is led to an ancient rock-cut channel, which seems to have been once intended for a road in the face of the cliff, In the 17th century Quaresmius speaks of this place, Minyeh, as the site of Capernaum. In the 14th Isaac Chelo was apparently shown the same site as containing the tomb of Nahum, and as being the “city of the Minai.” The “ Minai,” or “sorcerers,” are mentioned in the Talmud, and by this title the Jews stigmatized the early Christians; and these “ Minai” are called in one passage of the Talmud “sons of Capernaum.” There is thus a close connexion between this Minyeh—named from the Minai—and the town of Capernaum. The position of the site is also suitable for that of Capernaum, being in the plain of Gennesareth, two miles from the ‘round spring,” or fountain of Capharnaum.. No otlier site of any importance exists in the plain of Gennesareth. See CAPERNAUM.

South of the plain of Gennesareth is the undisputed site of the New Testament town of Magdala. A few lotus trees aud some rock-cut tombs are here found beside a miserable mud hamlet on the hill slope, with a modern tomb-house or kubbeh. Passing beneath rugged cliffs a recess in the hills is next reached, where stands Tabariya, the ancient Tiberias or Rakkath, containing 3000 inhabitants, more than half of whom are Jews. The walls, flanked with round towers, and now partly destroyed by the earthquake of 1837, were built by Dhahr el Amr, as was the serai or court-house. The two mosques, now partly ruinous, were erected by his sons, There are remains of a crusading church, and the tomb of the celebrated Maimonides is shown in the town, while Rabbi Akiba and Rabbi Meir lie buried outside. The ruins of the ancient city, including granite columns and traces of a sea-wall with towers, stretch southwards a mile beyond the modern town, An aqueduct in the cliff once brought water a distance of 9 miles from the south,

Kerak, at the south end of the lake, is an important site on a peninsula surrounded by the water of the lake, by the Jordan, and by a broad water ditch, while on the north-west a narrow neck of land remains. The plateau thus euclosed is partly artificial, and banked up 50 or 60 feet above the

water. A ruined citadel remains on the north-west, and on the east was a bridge over the Jordan ; broken pottery and fragments of sculptured stone strew the site. The ruin of Kerak answers to the description given by Josephus of the city of Tarichez, which lay 30 stadia from Tiberias, the hot baths being between the two cities. Tariches was situated, as is Kerak, on the shore below the cliffs, and partly surrounded by water, while before the city was a plain (the Ghér). Pliny further informs us that Tarichese was at the south end of the Sea of Galilee. Sinnabreh, a ruin on a spur of the hills close to the last- mentioned site, is undoubtedly the ancient Sinnabris, where Vespasian (Joseph., B. J., iii. 9, 7) fixed his camp, advanc- ing from Scythopolis (Beisin) on Taricheze and Tiberias, Sinnabris was 30 stadia from Tiberias, or about the dis- tance of the ruin now existing.

The eastern shores of the Sea of Galilee have been less fully explored than the western, and the sites are not so perfectly recovered. The town of Hippos, one of the cities of Decapolis, was situated 30 stadia from Tiberias, and 60 stadia from Gadara (Umm Keis). It is conjectured that the town Susitha, mentioned in the Talmud, is the same place, and the name Susyeh seems to have existed east of the Sea of Galilee at a late period. Susitha from ets," meaning "horse," is, etymologically at least, suggestive of the Greek "hippos." The site is at present unknown. Kalat el Hosn ("castle of the stronghold") is a ruin on a

rocky spur opposite Tiberias, Two large ruined buildings remain, with traces of an old street and fallen columns and capitals. A strong wall once surrounded the town; a narrow neck of land exists on the east where the rock has been scarped. Rugged valleys enclose the site on the north and south; broken sarcophagi and rock-cut tombs are found beneath the ruin, This site answers to the de- scription Josephus gives of Gamala, an important fortress besieged by Vespasian (Bell. Jud., iv. 1,1). Gersa, an insignificant ruin north of the last, is thought to represent the Gerasa or Gergesa of the 4th century, situated east of the lake ; and the projecting spur of hill south of this ruin is conjectured to be the place where the swine "ran violently down a steep place" (Matt. viii. 32). The site of Bethsaida Julias, east of Jordan, is also unknown. It has been supposed (and the theory is

supported by even so important an authority as Reland) that two separate places named Bethsaida are mentioned in the New Testa- ment. The grounds for this conclusion are, however, very insufficient ; and only one Bethsaida is mentioned by Josephus. It was near the Jordan inlet, on the east side of the river, and under its later Greek name of Julias, it is mentioned, with Hippos, by Pliny. The site usually pointed out is the ruin of et Tell, north of the Batihah plain; the remains are, however, modern and insignificant. Just south of the same plain isa ruined village called Mes'aidiyeh, the name of which approaches Bethsaida in sound but not in meaning. This is the site pointed out by Vandevelde, and it is possible that the course of Jordan has shifted west- wards, and that the old mouth is marked by the two creeks running into the shore on the east, in which case the site of Mes'aidiyeh might be accepted as the Bethsaida of the gospels, which appears to have been east of Jordan.

Literature.—The most important works on the subject of Galilee and the Sea of Galilee are the following:—Robinson's Biblical Researches; Stanley's Stnat and Palestine; Tristram's Land of Israel; Warren and Wilson's Recovery of Jerusalem; Conder's Lent Work in Palestine; and the Memoirs of the Survey of Palestine (sheets 1-6, 8, 9). (C. R. C.)

GALILEO, Galileo Galilei (1564-1642), one of the earliest and greatest of experimental philosophers, was born at Pisa, February 18, 1564. His father, Vincenzo, was an impoverished descendant of a noble Florentine house, which had exchanged the surname of Bonajuti for that of Galilei, on the election, in 1343, of one of its members, Galileo de' Bonajuti, to the college of the twelve Buonuomini. The family, which was fifteen times represented in the signoria, and in 1445 gave a gonfalonier to Florence, flourished with the republic and declined with its fall. Vincenzo Galilei was a man of better parts than fortune. He was a com- petent mathematician, wrote with considerable ability on the theory and practice of music, and was especially dis- tinguished amongst his contemporaries for the grace and skill of his performance upon the lute. By his wife, Giulia de' Ammannati of Pistoja, he had two sons, Galileo and Michelangiolo, and two daughters, Virginia and Livia. From his earliest childhood Galileo was remarkable for intellectual aptitude, as well as for mechanical invention. His favourite pastime was the construction of toy-machines, not the less original and

ingenious that their successful working was usually much hindered by the scarcity of suit- able materials. His application to literary studies was equally conspicuous, In the monastery of Vallombrosa, near Florence, where his education was principally con- ducted, he not only made himself acquainted with the best Latin authors, but acquired a fair command of the Greek tongue, thus laying the foundation of the brilliant and elegant style for which his writings were afterwards dis- tinguished. From one of the monks he also reccived Instruction in logic, according to the system then in vogue; but the futilities of the science revolted, while its subtleties

failed to interest lis understanding, and he was soon permitted to abandon a study so distasteful to him A document published by M. Selmi in 1864 proves that he was at this time so far attracted towards a religious life as to lave joined the novitiate of the order; but his father, who had other designs for him, seized the opportunity of an attack of ophthalmia to withdraw him permanently from the care of the monks, Having had personal experience of the unremunerative character both of music and of mathe- matics, he desired that his son should apply himself to the more profitable study of medicine, and, not without some straining of his slender resources, placed him, before he had completed his eighteeuth year, at the university of Pisa. He accordingly matriculated, November 5, 1581, and im- mediately entered upon attendance at the lectures of the celebrated physician and botanist, Andrea Cesalpino.

The natural gifts of the young student, not less multi- farious tlian those of an earlier Tuscan prodigy, Leonardo da Vinci, seemed at this time equally ready to develop in any direction towards which choice or hazard might incline them. In musical skill and invention be already vied with the best professors of the art in Italy ; his personal taste would have led him to choose painting as his profession,

and one of the most eminent artists of his day, Lodovico Cigoli, owned that to his judgment and counsel he was mainly indebted for the success of his works; his wit and eloquence gave promise that he would one day add to the literary glories of his country ; while his mathematical and mechanical genius only awaited a suitable opportunity for In 1583, while watching the

vibrations of the great bronze lamp still to be seen swinging from the roof of the cathedral of Pisa, he observed that, whatever the range of its oscillations, they were The experimental verification of this fact led him to the important discovery He at first applied the new principle to pulse-measurement, and more than fifty years later turned it to account in the construction of an astronomical clock. Up to this time he was entirely ignorant of mathematics, his father having carefully held

full display and development,

invariably executed in equal times.

of the isochronism of the pendulum.

him aloof from a study which he tiglitly apprehended would lead to his total alienation from that of medicine. Acci. dent, however, frustrated this purpose,

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undying hostility of the bigoted Aristotelians of that day. From the leaning tower of Pisa he afforded to all the pro- fessors and students of the university ocular demonstration

of the falsehood of the Peripatetic dictum that heavy bodies

fall with velocities proportional to their weiglits, and with unanswerable logic demolished all the time-honoured maxims of the schools regarding the motion of projectiles, and elemental weight or levity. But while he convinced, he failed to conciliate his adversaries. The keen sarcasm of his polished rhetoric was not calculated to soothe the susceptibilities of men already smarting under the depriva- tion of their most cherished illusions. He seems, in addi- tion, to have compromised his position with the grand-ducal family by the imprudent caudour with which he condemned a machine for clearing the port of Leghorn, invented by Giovanni de’ Medici, an illegitimate son of Cosmo I. Princely favour being withdrawn, private rancour was free to show itself. He was publicly hissed at his lecture, and found it prudent to resign his professorship and withdraw to Florence in

1591. Through the death of his father in July of that year family cares and responsibilities devolved upon him as eldestson, and thus his nomination to the chair of mathematics at the university of Padua, secured by the in- fluence of the Marchese Guidubaldo with the Venetian senate, was welcome, as affording a relief from pecuniary embarrass- ment, no less than as opening a field for scientific distinction.

His residence at Padua, which extended over a period of eighteen years, from 1592 to 16]0, was a course of unin- terrupted prosperity. His appvintment was three times renewed, on each occasion with expressions of tlie highest esteem on the part of the governing body, and his yearly salary was progressively raised from 180 to 1000 florins, His lectures were attended by persons of the lughest dis- tinction from all parts of Europe, and such was the charm of his demonstrations that a hall capable of containing 2000 people had eventually to be assigned for the accommodation of the overflowing audiences which they attracted. His ingenious invention of the proportional compasses—an instrument still used in geometrical drawing—dates from 1597 ; and about the same time he constructed the first thermometer, consisting of a bulb and tube filled with air and water, and terminating in a vessel of water. In this instrument, the results of varying atmospheric pressure were not distinguishable from the expansive and contractive effects of heat and cold, and it became an efficient measure of temperature only when Rinieri, in 1646, introduced the improvement of hermetically sealing the liquid in glass, The substitution, in 1670, of mercury for water completed the modern thermometer.

Galileo seems, at an early period of his life, to have adopted the Copernican theory of the solar system, and was deterred from avowing his opinions—as is proved by his letter to Kepler of August 4, 1597—by the fear of ridicule rather than of persecution. The appearance, in September 1604, of a new star in the constellation Serpentarius, afforded him indeed an opportunity, of which he eagerly availed himself, for making an onslaught upon the Aristo- telian axiom of the incorruptibility of the heavens ; but he continued to conform his public teachings in the main to Ptolemaic principles, until the discovery of a novel and potent implement of research placed at his command start- ling and hitherto unsuspected evidence as to the constitu-

tion and mutual relations of the heavenly bodies. Galileo was not the original inventor of the telescope! ‘That a cc ect gr

? The word telescope, from THAre, far, oxowéw, to view, was invented by Demiscianus, an eminent Greek scholar, at the request of Prince Cesi, president of the Lyncean Academy. It was used by Galileo as early as 1612, but was not introduced into English until much later. In 1655 the word telescope was inserted in Bagwell’s Mysteries of Astronomy, as a term requiring explanation, trunk or cylinder being commonly used instead.

lionour must be assigned to Hans Lippershey, an obscure optician of Middleburg, who, on the 21st of October 1608, offered to the states of Holland three instruments by which the apparent size of remote objects was increased. But here his glory ends, and that of Galileo begins. The rumour of the new invention, which reached Venice in April or May 1609, was sufficient to set the Italian philo- sopher on the track; and after one night’s profound meditation on the principles of refraction, he succeeded in producing a telescepe of threefold magnifying power. Upon this first attempt he rapidly improved, until he attained to a power of thirty-two, and his instruments, of which he manufactured hundreds with his own hands, were soon in request in every part of Europe. Two lenses only—a plauo-convex andaplano-concave—were needed for the composition of each, and this simple principle is that still employed in the construction of opera-glasses. Gralileo’s direction of his new instrument to the heavens formed an era in the history of astronomy. Discoveries followed upon it with astounding rapidity and in bewildering variety. The Sidereus Nuncius, published at Venice in the early part of 1610, contained the first-fruits of the new mode of investigation, which were sufficient to startle and surprise the learned on both sides of the Alps. The mountainous configuration of the moon’s surface was there first described, and the so- called “phosphorescence” of the dark portion of our satellite attributed to its true cause—namely, illumination by sun-light reflected from the earth. All the time-worn fables and conjectures regarding the composition of the Milky Way were at once dissipated by the simple statement that to the eye, reinforced by the telescope, it appeared as a congeries of lesser stars, while the great nebule

were equally declared to be resolvable into similar elements. But the discovery which was at once perceived to be most important in itself, and most revolutionary in its effects, was that of Jupiter's satellites, first seen by Galileo January 7, 1610, and by him named Sidera Medicea, in honour of the grand-duke of Tuscany, Cosmo II., who had been his pupil, and was about to become hisemployer. An illustration is, with the general run of mankind, more powerful to convince than an argument; and the cogency of the visible plea for the Copernican theory offered by the ininiature system, then for the first time disclosed to view, was recognizable in the triumph of its advocates, as well as in the increased acrimony of its opponents.

In September 1610 Galileo finally abandoned Padua for Florence. His researches with the telescope had been re- warded by the Venetian senate with the appointment for life to his professorship, at an unprecedentedly high salary. His discovery of the " Medicean Stars" was acknowledged by his nomination (July 12, 1610) as philosopher and mathematician extraordinary to the grand-duke of Tuscany. The emoluments of this office, which involved no duties save that of continuing his scientific labours, were fixed at 1000 scudi; and it was the desire of increased leisure, rather than the promptings of local patriotism, which induced him to accept an offer, the first suggestion of which had indeed come from himself. Before the close of 1610 the memorable cycle of discoveries begun in the previous year was completed by the observation of the ansated or, as it appeared to Galileo, triple form of Saturn (the ring-formation was first recognized by Huygens in 1655), of the phases of Venus, and of the spots upon the sun. Although his priority in several of these discoveries has been contested, inquiry has in each case proved favourable to hisclaims. In the spring of 1611 he visited Rome, and exhibited in the gardens of the

1 Leonardo da Vinci, more than a hundred years earlier, had come to the same conclusion.

Quirinal Palace the telescopic wonders of the heavens to the most eminent personages at the pontifical court. En- couraged by the flattering reception accorded to him, he ventured, in his Letters on the Solar Spots, printed at Rome in 1613, to take up a more decided position towards that doctrine on

the establishment of which, as he avowed in a letter to Belisario Vinta, secretary to the grand-duke, “all his life and being henceforward depended.” Even in the time of Copernicus some well-meaning persons had sus- pected a discrepancy between the new view of the solar system and certain passages of Scripture—a suspicion strengthened by the anti-Christian inferences drawn from it by Giordano Bruno ; but the question was never formally debated until Galileo’s brilliant discoveries, enhanced by his formidable dialectic and enthusiastic zeal, irresistibly challenged for it the attention of the authorities. Although he earnestly deprecated the raising of the theological issue, and desired nothing better than permission to pursue un- molested his physical demonstrations, it must be admitted that, the discussion once set on foot, he threw himself into it with characteristic impetuosity, and thus helped to pre- cipitate a decision which it was his ardent wish to avert. In December 1613 a Benedictine monk named Benedetto Castelli, at that time professor of mathematics at the uni- versity of Pisa, wrote to inform Galileo of a recent discus- sion at the grand-ducal table, in which he had been called upon to defend the Copernican doctrine against theological objections. This task Castelli, who was a steady friend and disciple of the Tuscan astronomer, seems to have discharged with moderation and success. Galileo’s answer, written, as he said himself, currente calamo, was an exposition of a formal theory as to the relations of physical science to Holy Writ, still further developed in an elaborate apology ad- dressed by him in the following year (1614) to Christina of Lorraine, dowager grand-duchess of Tuscany. Not satisfied with explaining adverse texts, he met his oppon- ents with unwise audacity on their own ground, and endea- voured to produce scriptural confirmation of a system which to the ignorant many seemed an incredible paradox, and to the scientific few was a beautiful but daring innovation. The rising agitation on the subject which, originating pro- bably with the sincere upholders of the integrity of Scerip- ture, was fomented for their own purposes by the rabid Aristotelians of the schools, was heightened rather than allayed by these manifestoes, and on the fourth Sunday of the following Advent found a voice in the pulpit of Santa Maria Novella. Padre Caccini’s denunciation of the new astronomy was indeed disavowed and strongly condemned by his superiors; nevertheless, on the 5th of February 1615, another Dominican monk named Lorini laid Galileo’s letter to Castelli before the Inquisition.

Cardinal Robert Bellarmine was at that time by far the most influential member of the Sacred College. He was a man of vast learning and upright piety, but, although: per- sonally friendly to Galileo, there is no doubt that he saw in his scientific teachings a danger to religion. The year 1615 seems, however, to have been a period of suspense, Galileo received, as the result of a conference between Cardinals Bellarmine and Del Monte, a semi-official warning to avoid theology, and limit himself to physical reasoning. “Write freely,” he was told by Monsignor Dini, “but keep outside the sacristy.” Unfortunately, he had already com- mitted himself to dangerous ground. In December he re- paired personally to Rome, full of confidence that the weight of his arguments and the vivacity of his eloquence could not fail to convert the entire pontifical court to his views. He was cordially received, and eagerly listened to, but his imprudent ardour served but to injure his cause. On the 24th of February 1616 the consulting theologians of the Holy Office characterized the two propositions—that the sun

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is immovable in the centre of the world, and that the earth has a diurnal motiou of rotation—the first as “absurd in philosophy, and formally heretical, because expressly con- trary to Holy Scripture,” and the second as “open to the same censure in philosophy, and at least erroneous as to faith.” Two days later Galileo was, by command of the pope (Paul V.), summoned to the palace of Cardinal Bellarmine, and there officially admonished not thenceforward to “hold, teach, or defend” thecondemned doctrine. This injunction he promised to obey. On the 5th of March the Congrega- tion of the Index issued a decree reiterating, with the omission of the word “heretical,” the censure of the theo- logiaus, suspending, wsyue corrigatur, the great work of Copernicus, De Revolutionibus orbium colestium, and ab- solutely prohibiting a treatise by a Carmelite monk named Foscariui, which treated the same subject from a theological point of view. At the same time it was given to be under- stood that the new theory of the solar system might be held ex hypothest, and the trivial verbal alterations introduced into the Polish astronomer’s book in 1620, when the work of revision was completed by Cardinal Gaetani, confirmed this interpretation. This edict, it is essential to observe, of which the responsibility rests with a disciplinary

con- gregation in no sense representing the church, was never confirmed by the pope, and was virtually repealed in 1757 under Benedict XIV.

Galileo returned to Florence three months later, not ill- pleased, as his letters testify, with the result of his visit to Rome. He brought with him, for the refutation of calumnious reports circulated by his enemies, a written certificate from Cardinal Bellarmine, to the effect that no abjuration had been required of or penance imposed upon him. During a prolonged audience, he had received from the pope assurances of private esteem and personal protec- tion; and he trusted to his dialectical ingenuity to find the means of presenting his scientific convictions under the transparent veil of an hypothesis. Although a sincere Catholic, he seems to have laid but little stress on the secret aduionition of the Holy Office, which his sanguine tempera- nent encouraged him gradually to dismiss from his mind. He preserved no written memorandum of its terms, and it was represented tc him, according to his own deposition in 1633, solely by Cardinal Bellarmine's certificate, in which, for obvious reasons, it was glossed over rather than ex- pressly recorded. Fr seven years, however, during which he led a life of studious retirement in the Villa Segni at Bellosguardo, near Florence, he maintained an almost un- broken silence. At the end of that time he appeared in public with his Saggéatore, a polemical treatise written in reply to the Libra Astronomica of Padre Grassi (under the pseudonym of Lotario Sarsi), the Jesuit astronomer of the Collegio Romano. The subject in debate was the nature of comets, the conspicuous appearance of three of which bodies in the year 1618 furnished the occasion of the controversy. Galileo's views, although erroneous, since he held comets to be mere atmospheric emanations reflecting sunlight after the evanescent fashion of a halo or a rainbow, Were expressed with such triumphant vigour, and embel- lished with such telling sarcasms, that his opponent did not venture upon areply. The Saggtatore was printed at Rome in October 1623, by the Academy of the Lincei, of which

alileo was a member, with a dedication to the new pope, Urban VIIL, and notwithstanding some passages containing a covert defence of Copernican opinions, was received with acclamation by the ecclesiastical, no less than by thie scien- tific authorities, Everything seemed now to promise a close of unbroken prosperity to Galileo's career. Maffeo Barberini, his warmest

friend and admirer in the Sacred College, was, by the election of August 8, 1623, seated on the pontifical throne; and the marked distinction with

which he was received on his visit of congratulation to Rome in 1624 encouraged him to hope for the realization of his utmost wishes. He received every mark of private favour. The pope admitted him to six long audiences in the course of two months, wrote an enthusiastic letter to the grand-duke praising the great astronomer, not only for his distinguished learning, but also for his exemplary piety, and granted a pension to his son Vincenzo, which was after- wards transferred to himself, and paid, with some irregu- larities, to the end of his life. But on the subject of the decree of 1616, the revocation of which Galileo had hoped to obtain through his personal influence, he found him in- exorable. Nevertheless, the sanguine philosopher trusted, uot without reason, that it would at least be interpreted in a liberal spirit, and his friends encouraged his imprudent confidence by eagerly retailing to him every papal utterance which it was possible to construe ina favourable sense. To Cardinal Hohenzollern Urban was reported to have said that the theory of the earth’s motion had not been and could not be condemned as heretical, but only as rash; and in 1630 the learned Dominican monk Campanella wrote to Galileo that the pope had expressed to him in conversation his disapproval of the prohibitory decree. Thus, in the full anticipation of added renown, and without any misgiving as to ulterior consequences, Galileo set himself, on lis re- turn tc Florence, to complete his famous but ill-starred work, the Dialogo dei due Massimi Sistemi del Mondo. Finished in 1630, it was not until January 1632 that it emerged from the presses of Landiniat Florence. The book was orginally intended to appear in Rome, but unexpected obstacles interposed. The Lyncean Academy collapsed with the death of Prince Federigo Cesi, its founder and presi- dent; an outbreak of plague impeded communication between the various Italian cities; and the imprimatur was finally extorted, rather than accorded, under the pres- sure of private friendship and powerful interest. A tumult of applause from every part of Europe followed its publica- tion; and it would be difficult to find in any language a book in which animation and elegance of style are so hap- pily combined with strength and clearness of scientific ex- position. Three interlocutors, named

respectively Salviati, Sagredo, and Simplicio, take part in the four dialogues of which the work is composed. The first-named ex- pounds the views of the author ; the second is an eager and intelligent listener; the third represents a well-meaning but obtuse Peripatetic, whom the others treat at times with undisguised contempt. Salviati and Sagredo took their names from two of Galileo's early friends, the formeralearned Florentine, the latter a distinguished Venetian gentleman; Simplicio ostensibly derived his from the Cilician com- mentator of Aristotle, but the choice was doubtless insti- gated by a sarcastic regard to the double meaning of the word. There were not wanting those who insinuated that Galileo intended to depict the pope himself in the guise of the simpleton of the party ; this charge, however, was not only preposterous in itself, but wholly unsupported by intrinsic evidence, and Urban was far too sagacious to give any permanent credit to it.

It was at once evident that the whole tenor of this re- markable work was in flagrant contradiction with the edict passed sixteen years before its publication, as well as with the author's personal pledge of conformity to it. The ironical submission with which it opened, and the assumed indetermination with which it closed, were hardly intended to mask the vigorous assertion of Copernican principles which formed its substance. It is a singular circumstance, however, that the argument upon which Galileo mainly relied as furnishing a physical demonstration of the truth of the new theory rested on a misconception. The ebb and flow of the tides, he asserted, were a visible a of the terres-

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trial double movement, since they resulted from the ine- quality of the absolute velocities through space of the various parts of the earth's surface, produced by the motion of rotation. To this notion, which took its rise 11 a con- fusion of thought, he attached capital importance, and he treated with scorn Kepler's suggestion that a certain occult attraction of the moon was in some way concerned in the phenomenon. The theological censures which the book did not fail to incur were not slow in making themselves felt. Towards the end of August the sale was prohibited ; on the Ist of October

the author was cited to Rome by the Inquisition. He pleaded his age, now close upon seventy years, his infirm health, and the obstacles to travel caused by quarantine regulations ; but the pope was sternly indig- nant at what he held to be his ingratitude and insubordina- tion, and no excuse was admitted. At length, on the 13th

of February 1633, he arrived at the residence of Niccolini, |

the Tuscan ambassador to the pontifical court, and there abode in deep dejection for two months. From the 12th to the 30th of April he was detained in the palace of the Inquisition, where he occupied the apartments of the fiscal, and was treated with uuexampled indulgence. On the 30th he was restored to the hospitality of Niccolini, his warm and generous partisan. The accusation against him was that he had written in contravention of the decree of 1616, and in defiance of the command of the Holy Office communicated to him by Cardinal Bellarmine; and his defence consisted mainly in a disavowal of his opinions, and an appeal to his good intentions. On the 21st of June he was finally examined under menace of torture; but he continued to maintain his assertion that, after its con- demuation by the Congregation of the Index, he had never held the Copernican theory. Since the publication of the documents relating to this memorable trial, there can no longer be any doubt, not only that the threat of torture was not carried into execution, but that it was never intended that it should be. On the 22d of June, in the church of Santa Maria sopra Minerva, Galileo read his recantation, and received his sentence. He was condemned, as “ vehe- mently suspected of heresy,” to incarceration at the pleasure of the tribunal, and by way of penance was enjoined to recite once a week for three years the seven penitential psalms, This sentence was signed by seven cardinals, but did not receive the customary papal ratification, The legend according to which Galileo, rising from his knees after repeating the formula of abjuration, stamped on the ground, and exclaimed, “/ pur si muove/” is, as may readily be supposed, entirely apocryphal, The earliest ascertained authority for it is the seventh edition of an Historical Dictionary, published at Caen in 1789. It seems probable that Galileo remained in the custody of the Iuguisition from the 21st to the 24th of June, on which day he was relegated to the Villa Medici on the Trinita de’ Monti. Thence, on the 6th of July, he was permitted to depart for Siena, where he spent several months in

the house of the archbishop, Ascanio Piccolomini, one of his numerous and trusty friends. It was not until December that his earnest desire of returning to Florence was realized and there, in the Villa Martellini at Arcetri, he spent the remaining eight years of his life in the strict retirement which was the prescribed condition of his comparative freedom.

Domestic afflictions combined with numerous and painful infirmities to embitter his old age. His sister-in-law and her whole family, who came to live with him on his return from Rome, perished shortly afterwards of the plague ; and on the Ist of April 1634 died, to the inexpressible grief of her father, his eldest and best-beloved daughter, a nun in the convent of San Matteo at Arcetri. Galileo was never married; but by a Venetian woman named Marina Gamba

he had three children—a son who married aud left descend- ants, and two daughters who took the veil at an early age.

| Notwithstanding this stain on the morality of his early life,

which was in some degree compensated by the regularity of his subsequent conduct, Galileo’s general character was one which commanded the respect of all who approached him. His prodigious mental activity continued undimin- ished to the last, nor were his latter years the least profit- able to science of his long and eventful career. In 1636

“he completed his Dialoghi delle Nuove Scienze, in which he

recapitulated the results of his early experiments and mature meditations on the principles of mechanics. This, in many respects his most valuable work, was printed by the Elzevirs at Leyden in 1638, and excited admiration equally universal and more lasting than that accorded to his astronomical treatises. His last telescopic discovery— that of the moon’s diurnal and monthly librations—was made in 1637, only a few months before his eyes were for ever closed in hopeless blindness, It was in this condition that Milton found him when he visited him at Arcetri in 1638. But the fire of his genius was not even yet extinct. He continued his scientific correspoudence

with unbrcken interest and undiminished logical acumen ; he thought out the application of the pendulum to the regulation of clock- work, which Huygens successfully realized seventeen years later ; and he was engaged in dictating to his disciples, Viviani and Torricelli, his latest ideas on the theory of impact when he was seized with the slow fever which in two months brought him to the grave. On the 8th January 1642 he closed his long life of triumph and humiliation, and the coincidence of the day of his birth with that of Michelangelo's death was paralleled by the coincidence of the year of his death with that of the birth of Isaac Newtou.

The direct services which Galileo rendered to astronomy are virtually summed up in his telescopic discoveries. To the theoretical perfection of the science he contributed little or nothing. He pointed out indeed that the so-called "third motion," introduced by Copernicus to account for the constant parallelism of the earth's axis, was a superfluous complication. But he substituted the equally unnecessary hypothesis of a magnetic attraction, and failed to perceive that the phenomenon to be explained was, in relation to absolute space, not a movement, but the absence of move- ment. The circumstance, however, which most seriously detracts from his scientific reputation is his neglect of the discoveries made during his life-time by the greatest of his contemporaries. Kepler's first and second laws were published in 1609, and his third ten years later. By these momentous inductions the geometrical theory of the solar system was perfected, and a hitherto unimagined symmetry was perceived to regulate the mutual relations of its mem- bers. But by Galileo they were passed over in silence. In his Dialogo dei Massimi Sistemi, printed not less than thirteen years after the last of the three laws had been given to the world, the epicycles by which Copernicus, adhering to the ancient postulate of uniform circular motion, had endeavoured to reduce to theory the irregularities of the planetary movements were neither expressly adopted nor expressly rejected ; and, after exhausting all the apologies offered, the conclusion seems inevitable that this grave defection from the cause of progress had no other motive than the reluctance of the Florentine astronomer to accept discoveries which he had not originated,—this not througli vulgar jealousy, of which he was incapable, but through a certain unconscious intellectual egotism, not always un- known to the greatest minds. His name, however, is justly associated with that vast extension of the bounds of the visible universe

which has rendered modern astronomy the most sublime of sciences, and his telescopic observations

are not less remarkable for the sagacity which directed, than for the inspiration which prompted them. With the sure instinct of genius, he seized the characteristic features of the phenomena presented to his attention, and his inferences, except when distorted by polemical exigencies, have been strikingly confirmed by modern investigations. Of his two capital errors, regarding respectively the theory of the tides and the nature of comets, the first was insidi- ously recommended to him by his passionate desire to find a physical confirmation of the earth's double motion; the

second was adopted for the purpose of rebutting an anti- |

Copernican argument founded on the planetary analogies of those erratic subjects of the sun. Within two years of their first discovery, he had constructed approximately accurate tables of the revolutions of Jupiter's satellites, and he proposed their frequent eclipses as a means of determin- ing longitudes, not only on land, but at sea. This method, on which he laid great stress, and for the facilitation of which he invented a binocular glass, and devised some skilful mechanical contrivances, was offered by him in 1616 to the Spanish Government, and afterwards to that of Tuscany, but in each case unsuccessfully ; and the close of his life was occupied with prolonged but fruitless negotia- tions on the same subject with the states-general of Holland. The idea, though ingenious, has been found of little practical utility at sea, where the method founded on the observed distance of the moon from a known star is that usually employed.

A series of careful observations made him acquainted with the principal appearances revealed by modern instru- ments in the solar spots. He pointed out that they were limited to a certain defined zone on the sun's surface 3.he noted the jaculce with which they are associated, the penumbra by which they are bordered, their slight proper motions, and their rapid changes of form. He inferred from the regularity of their general movements the rotation of the sun on its axis in a period of little less than a month (the actual period is 25d. 7h. 48m.) ; and he grounded on the varying nature of

the paths apparently traversed by them a plausible, though inconclusive, argument in favour of the earth's annual revolution. Twice in the year, he observed, they seem to travel across the solar disk in straight lines; at othcr times, in curves. These appear- ances he referred with great acuteness to the slight inclina- tion of the sun's axis of rotation to the plane of the ecliptic. Thus, when the earth finds herself in the plane of the sun's equator, which occurs at two opposite points of her orbit, the spots, travelling in circles parallel with that plane, necessarily appear to describe right lines; but when the earth is above or below the equatorial level, the paths of the spots open out into curves turned downwards or up- wards, according to the direction in which they are seen. The explanation, however, of this phenomenon is equally consistent with the geocentric as with the heliocentric theory of the solar system. The idea of a universal force of gravitation seems to have hovered around the borders of this great man's mind, without ever fully entering it. He perceived the analogy between the power which holds the moon in the neighbourhood of the earth, and compels Jupiter's satellites to circulate round their primary, and the attraction exercised by the earth on bodies at its surface . but he failed to conceive the combination of central force with initial velocity, and was disposed to connect the revolu-

4 The passage is sufficiently remarkable to deserve quotation in the original:—" Le parti della Terra hanno tal propensione al centro di essa, che quando ella cangiasse luogo, le dette parti, benché lontane dal globo nel tempo delle mutazioni di esso, lo seguirebbero per tutto; esempio di cid sia il seguito perpetuo delle Medicee, ancorché separate

continuamente da Giove. L'istesso si deve dire della Luna, obbligata

& seguir la Terra."—Diologo dei Massimi Sistemi, Giornata terza, p. 36] of Alvin's edition, , "e

5)

tions of the planets with the axial rotation of the sun. This notion, it is plain, tended rather towards Descartes's theory of vortices than towards Newton's theory of gravita- tion, More valid instances of the anticipation of modern discoveries may be found in his prevision that a small annual parallax would eventually be found for some of the fixed stars, and that extra-

Saturnian planets would at some future time be ascertained to exist, and in his conviction that light travels with a measurable although, in relation to terrestrial distances, infinite velocity.

The invention of the miscroscope, attributed to Galileo by his first biographer, Vincenzo Viviani, does not in truth belong to him. Such an instrument was made as early as 1590 by Zacharias Jansen of Middleburg ; and although Galileo discovered, in 1610, a means of adapting his tele- Scope to the examination of minute objects, he did not become acquainted with the compound microscope until 1624, when he saw one of Drebbel's instruments in Rome, and, with characteristic ingenuity, immediately introduced some material improvements into its construction.

The most substantial, if not the most brilliant part of his work consisted undoubtedly in his contributions towards the establishment of mechanics as a science. Some valu- able but isolated facts and theorems were previously dis- covered and proved, but it was he who first clearly grasped the idea of force as a mechanical agent, and extended to

the external world the conception of the invariability of the

relation between cause and effect. From the time of Archimedes there had existed a science of equilibrium, but the science of motion began to exist with Galileo. It is not too much to say that the final triumph of the Copernican system was due in larger measure to his labours in this department than to his direct arguments in its favour. The problem of the heavens is essentially a mechanical one; and without the mechanical conceptions of the dependence of motion upon force which Galileo familiarized to men's minds, that problem might have remained a sealed book even to the intelligence of Newton. The interdependence of motion and force was not indeed formulated into definite laws by Galileo, but his writings on dynamics are every- where suggestive of those laws, and his solutions of dyna- mical problems involve their recognition. The extraor- dinary advances made by him in this branch of knowledge were owing to his happy method of applying mathematical analysis to physical problems. As a pure mathematician he was, it is true, surpassed in profundity by more than one among his pupils and contemporaries; and in the wider imaginative grasp of abstract geometrical principles he cannot be compared

with Fermat, Descartes, or Pascal, to say nothing of Newton or Leibnitz. Still, even in the region of pure mathematics, his powerful and original mind left notable traces of its working. He studied the proper- ties of the cycloid, and attempted the problem of its quadrature earlier than Mersenne; and in the “infinitesi- mals,” which he was one of the first to introduce into geo- metrical demonstrations, was contained the fruitful germ of the differential calculus. But the method which was peculiarly his, and which still forms the open road to dis- coveries in natural science, consisted in the combination of experiment with calculation—in the transformation of the concrete into the abstract, and the assiduous comparison of results. The first fruits of the new system of investigation was his determination of the laws of falling bodies. Con- ceiving that the simplest principle is the most likely to be true, he assumed as a postulate that bodies falling freely towards the earth descend with a uniformly accelerated motion, and deduced thence the principal mathematical con- sequences, a3 that the velocities acquired are in the direct, and the spaces traversed in the duplicate ratio of the times, counted from the beginning of motion; finally, he proved,

by observing the times of descent of bodies falling down long inclined planes, that the postulated law was the true law. Even here, he was obliged to take for granted that the velocities acquired in descending from the same height along planes of every inclination are equal; and it was not until shortly before his death that he found the mathe- matical demonstration of this not very obvious principle.

The first law of motion—that which expresses the prin- ciple of inertia—is virtually contained in the idea of uni- formly accelerated velocity. The recognition of the second—that of the independence of different motions—must be added to form the true theory of projectiles. This was done by Galileo. Up to his time it was universally held in the schools that the motion of a body must cease with the impulse communicated to it, but forthe “ reaction of the medium” which helps it forward. Galileo showed, on the contrary, that the nature of motion once impressed is to continue indefinitely in a uniform direction, and that the effect of the medium is a retarding, not an impelling one. Another commonly received axiom was

that no body could be affected by more than one movement at one time, and it was thus supposed that a cannon ball, or other projectile, moves forward in a right line until its first impulse is ex- hausted, when it falls vertically to the ground. In the fourth of Galileo's dialogues on mechanics, he demonstrated that the path described by a projectile, being the result of the combination of a uniform transverse motion with a uniformly accelerated vertical motion, must, apart from the resistance of the air, be a parabola. The establishment of the principle of the composition of motions formed a con- clusive answer to the most formidable of the arguments used against the rotation of the earth, and we find it accordingly triumphantly brought forward by Galileo in the second of his dialogues on the systems of the world. It was urged by anti-Copernicans that a body flung upwards or cast downwards would, if the earth were in motion, be left behind by the rapid translation of the point from which it started ; Galileo, however, proved that the reception of a fresh impulse in no way interfered with the movement already impressed, and that the rotation of the earth was insensible, because shared equally by all bodies at its sur- face. His theory of the inclined plane, combined with his satisfactory definition of " momentum," led him towards the third law of motion. We find Newton's theorem, that "action and reaction are equal and opposite," stated witli approximate precision in his treatise Della Scienza Meccanica, which contains the substance of lectures de- livered during his professorship at Padua; and the same principle is involved in the axiom enunciated in the third of his mechanical dialogues, that "the propensity to fall of a body is equal to the least resistance which suffices to support it." The problems of percussion, however, did not receive a definitive solution until after his death.

His services were no less conspicuous in the statical than in the kinetical division of mechanics. He gave the first direct and entirely satisfactory demonstration of equilibrium on an inclined plane, reducing it to the lever by a sound and ingenious train of reasoning; while, by establishing the theory of ' virtual velocities," he laid down the fundamental principle which, in the opinion of Lagrange, contains the general expression of the laws of equilibrium. He studied with attention the still obscure subject of molecular co- hesion, and little has been added to what he ascertained on the question of transverse strains and the strength of beams, brought by him for the first time within the scope of mechanical theory. In his Discorso

intorno alle cose che stanno su Cacqua, published in 1612, he used the principle of virtual velocities to demonstrate the more important theorems of hydrostatics, deducing from it the equilibrium of fluid in a siphon, and proved against the Aristotelians

that the floating of solid bodies in a liquid depends not upon their form, but upon their specific gravities, relative to such liquid,

in order to form an adequate estimate of the stride made by Galileo in natural philosophy, it would be necessary to enumerate the confused and erroneous opinions prevailing on all such subjects in his time. His best eulogium, it has been truly said, consists in the fallacies which he exposed. The scholastic distinctions between corruptible and incor- ruptible substances, between absolute gravity and absolute levity, between natnral and violent motions, if they did not wholly disappear from scientific phraseology, ceased thence- forward to hold the place of honour in the controversies of the learned. Discarding these obscure and misleading notions, Galileo taught that gravity and levity are relative terms, and that all bodies are heavy, even those which, like the air, are invisible; that motion is the result of force, instantaneous or continuous; that weight is a continuous force, attracting towards the centre of the earth; that, in a vacuum, all bodies wonld fall with equal velocities; that the “inertia of matter” implies the continuance of motion, as well as the permanence of rest; and that the substance of the heavenly bodies is equally “ corruptible” with that of the earth. These simple elementary ideas were emin- ently capable of development and investigation, and were not only true, but the prelude to further truth ; while those they superseded defied inquiry by their vagueness, and baffled it with their obscurity. Galileo was a man born in due time. He was superior to his contemporaries, but not isolated amongst them. He represented and intensified a growing tendency of the age in which he lived. It was beginning to be suspected that from Aristotle an appeal lay to nature, and some were found who no longer treated the apse dixit of the Stagirite as the final authority in matters of science. A vigorous but ineffectual warfare had already been waged against the blind traditions of the schools by Ramus and Telesius, by Patricius and Campanella, and the

revolution which Galileo completed had been prepared by his predecessors. Nevertheless, the task which he so effectually accomplished demanded the highest and rarest quality of genius. He struck out for himself the happy middle path between the a priori and the empirical systems, and exemplified with brilliant success the method by which experimental science has wrested from nature so many of her secrets. His mind wasan eminently practical one. He concerned himself above all with what fell within the range of exact inqniry, and left to others the larger but less fruitful speculations which can never be brought to the direct test of experiment. Thus, while far-reaching but hasty generalizations have had their day and been forgotten, his work has proved permanent, because he made sure of its foundations. His keen intuition of truth, his vigour and yet sobriety of argument, his fertility of illustration and acuteness of sarcasm, made him irresistible to his antag- onists ; and the evanescent triumphs of successful contro- versy have been succeeded by the lasting applause of posterity.

The first complete edition of Galileo's writings was published at Florence (1842-1856), in 15 8vo vols., by the Societa Editrice Fior- entina, under the able supervision of Signor Eugenio Albéeri. Besides the works already enumerated, it contains the hitherto inedited Sermones de Motu Graviwm, composed at Pisa between 1589 and 1591; his letters to his friends, with many of their replies, as well as several of the essays of his scientific opponents; his private com- ments on the Orlando Furioso, of which he was an enthusiastic admirer, and on the Gerusalemme Liberata, of which he was an equally persistent depreciator; some stanzas and sonnets of no great merit, together with the sketch of a comedy; finally, a reprint of Viviani's Life, with valuable notes and corrections. The original documents from the archives of the Inquisition, relating to the events of 1616 and 1633, recovered from Paris in 1846 by the efforts

of Count Rossi, and now in the Vatican Library, were to a limited extent made public by Monsignor Marino-Marini in 1850, and

more unreservedly by M. Henri de |'Epinois, in an essay entitled "Galilée, son Procés, sa Condemnation," published in 1867 in the Revue des

Questions Historiques. He was followed by M. Karl von Gebler, who, in an able and exhaustive but somewhat pre- judiced work, Galileo Galilei und die Rémisehe Curie (Stuttgart, 1876), sought to impeach the authenticity of a document of prime importance in the trial of 1683. He has, however, been victoriously answered by Signor Domenico Berti, in Il Proeesso originale di Galileo Galilei (Rome, 1876), and by M. de l'Bpinois, with Les Piéces du Proeés de Galilée (Rome, Paris, 1877). The touching letters of Galileo's eldest daughter, Sister Maria Celeste, to her father were printed in 1864 by Professor Carlo Arduini, in a pub- lication entitled La Primogenita di Galileo Galilei, See also M. Th. Henri Martin's excellent biography, Galiléc, les Droits de la Scienee et la Méthode des Sciences Physiques, Paris, 1868 ; and the anonymous Private Life of Galileo, London, 1870. (A. M. C.)

GALITCH, or Haticz, a town of Russia, at the head of a district in the government of Kostroma, 80 miles N.E. of Kostroma, in 57° 15' N. lat. and 42° 56' E. long., on the low south-eastern shore of Galitch Lake. Among its public buildings are a hospital, a poorhouse opened in 1855, about 15 churches, and a convent of the third class. The chief occupation of the inhabitants is the manufacture of leather and gloves ; and the fisheries of the lake yield about 30,000 rubles per annum, and give employment to about 400 fishermen, whose rights are secured by ancient charters. At the annual fair a considerable trade is done in woollen and cotton goods, earthenware, and miscellaneous articles. In 1860 the population was 6536 ; butin the S¢ Petersburg Calendar for 1878 it is given at 5620.

GALL, Franz Josep (1758-1828), anatomist, physio- logist, and founder of phrenology, was born at Tiefenbrunn near Pforzheim, Baden, on the 9th of March 1758. After completing the usual literary course at Baden and Bruchsal, he began the study of medicine under Hermann at Strasburg, whence, attracted by the names of Van Swieten and Stoll, le removed to Vienna in 1781. Having received his diploma, he began to practise as a physician there in 1785 ; but his energies were mainly devoted to the scientific investigation of problems which, even from boyhood, had been occupying his attention. Ata comparatively early period he had formed a generalization which he believed to be a sound one, that in the human subject at least a powerful memory is invariably associated with prominent

eyes; and further observation had enabled him, as he thought, also to define the external characteristics indicative of special talents for painting, music, and the mechanical arts. Following out these researches, he gradually reached the strong personal conviction, not only that the talents and dispositions of men are dependent upon the functions of the brain, but also that they may be inferred with perfect exactitude and precision from the external appearances of the skull. Gall's first appearance as an author was made in 1791, when he published the first two chapters of a (never completed) work entitled Philosophisch-medicinische Untersuchungen tiber Natur u. Kunst im kranken u. gesunden Zustande des Menschen. The first public notice of his inquiries in cranioscopy, however, was in the form of a familiar letter addressed to a friend, which appeared in Wieland's Deutscher Mercur in 1798; but two years before this Gall had commenced giving private courses of phreno- logical lectures in Vienna, where his doctrines soon attracted general attention, and met with increasing success until, in 1802, they were interdicted by the Government on the ground that they were dangerous to religion. This step on the part of the authorities had the effect of greatly stimu- lating public curiosity and increasing Gall's celebrity. In March 1805 he finally left Vienna, in company with his friend and associate Spurzheim, and made a tour through Germany, in the course of which he lectured in Berlin, Dresden, Magdeburg, and several of the university towns. These expositions, which he knew how to make popular and attractive, were much resorted to by the public, and

excited considerable controversy in the scientific world. He had almost reached the zenith of his fame when, in 1807, he repaired to Paris and established himself there as a medical practitioner, at the same time continuing his activity as a lecturer and writer. In 1808 appeared his Introduction au cours de physiologie du cerveau, which was followed in 1809 by the Recherches sur le systéme nerveux en général, et sur celui du cerveau en particulier (originally laid before the Institute of France in March 1808), and in 1810 by the first instalment of the Anatomie et Physiologie du systéme nerveux en général, et du cerveau en particulier, avec des observations sur la possibilité de reconnattre plusiers dispositions intellectuelles et morales de Vhomme et des animaux par la configuration

de leurs tétes. The Recherches, and the first two volumes of the Anatomie, bear the conjoint names of Gall and Spurzheim. The latter work was completed in 1819, and appeared in a second edition of six 8vo volumes shortly afterwards (1822-25). In 1811 he replied to a charge of Spinozism or atheism, which had been strongly urged against him in certain quarters, by a treatise entitled Des dispositions innées de U'dme et de Vesprit, which he afterwards incorporated with his greater work. In 1819 he became a naturalized French subject, but his efforts two years afterwards to obtain admission to the Academy of Sciences, although supported by Geoffroy St Hilaire, were unsuccessful. In 1823 he visited London with the intention of giving a series of phenological lectures, but was dis- appointed of the reception he had anticipated, and speedily abandoned his plans. He continued to lecture and practise in Paris until the beginning of 1828, when he was disabled by an apoplectic seizure. His death took placeat Montrouge near Paris, on the 22d of August 1828. The Anatomie has been translated into English by Lewis (Boston, U.S., 1835). GALLAND, Antorne (1646-1715), Orientalist and archeologist, the first European translator of the Arabian Nights, was born in 1646 at Rollot, in the department of Somme. The completion of his school education at Noyon was followed by a brief apprenticeship to a trade, from which, however, he soon escaped, to pursue his linguistic studies at Paris. After having been employed for some time in making a catalogue of the Oriental manuscripts at the Sorbonne, he was, in 1670, attached to the French embassy at Constantinople; and in 1673 he also accom- panied his chief (De Nointel) to Syria and the Levant, where he availed himself of the opportunity to copy a great number of inscriptions, and also to sketch, in some cases even to remove, historical monuments. After a brief visit to France, where his collection of antiquities attracted some attention, Galland returned to the Levant in 1676; and in 1679 he undertook a third voyage, being commissioned by the French East India Company to collect for the cabinet of Colbert ; on the expiry of this commission he was instructed by the Government to continue his researches, and had the title of "' antiquary to the king " conferred upon him. During his prolonged residences abroad he acquired a thorough knowledge of the Arabic, Turkish, and Persian languages and literatures, whicli, on his final return to France, enabled him to render valuable assistance to Thevenot, the keeper of the royal library, and to D'Herbelot. After their deaths he lived for some time at Caen under the roof of Foucault

the intendant, himself no mean archeologist ; and there he began the publication (1704-17) of Les Mille et Une Nuts, a trans- lation which excited immense interest during the time of its appearance, and which is still the standard French translation (last edition 1872). In 1701 Galland had been admitted into the Academy of Inscriptions, and in 1709 he was appointed to the chair of Arabic in the Collége de France. He continued to discharge the duties of this post until his death, which took place February 17, 1715.

Besides a number of meritorious archeological works, especially in the department of numismatics, he also published a compilation from the Arabic, Persian, and Turkish, entitled Paroles remar- quables, bons mots et maximes des Orientaux (1694), and a translation from an Arabic manuscript, De Vorigine et du progres du Caffé (1699). The former of these works appeared in an English trans- lation in 1795. His Contes et Fables Indiennes de Bidpai et de Lokman was published after his death (1724), Among his numier- ous unpublished manuscripts are said to be included a translation of the Koran and a Turkish dictionary.

GALLARATE, a flourishing town of Italy, the head of a circle in the province of Milan, situated on the railway 23 miles N.W. of Milan at thejunction of the line running N. to Varese. It has a teclinical school, and carries on the manufacture of cotton and linen. In the Middle Ages it is mentioned as Galaratum and Glareatum, and especially in the 10th century it appears to have been a strongly fortified and important place. Population in 1871, 7576.

GALLAS, or more correctly Gata, a powerful race of eastern Africa, scattered over the wide region which extends for about 1000 miles from the interior of Abyssinia to the neighbourhood of the river Sabacki, in 3° 12’ of S. latitude. Almost nothing has been de- finitely ascertained about the early homes and migrations of the race; but it appears to have occupied the southern portion of its present territory for nearly four centuries at least. According to Ludolf and Bruce, the Galla invaders first crossed the Abyssinian frontiers in the year 1537. The Gallas of Gojam (a district along the northern side of the river Abai) tell how their savage forefathers came

from the south-east from a country on the other side of a bahr (lake or river), and the Yedju and Raia Galla also point towards the east and commemorate the passage of a bahr. Among the southern Gallas tradition appears to be mainly concerned with the expulsion of the race from the country now occupied by the Somali. It is usually maintained that the Gallas are ethnographically of Semitic affinity, and find their nearest kinsmen in the Somali, the Dankali, and the Abyssinians; but M. Lejean is of opinion that they rather belong to the Aryan race, and this is so far supported by their physiological characteristics. One thing is certain, that they have nothing in common with the negro type; the “musculation” of the arms, thighs, and calves is altogether different, and they have none of the fetor developed by the negro skin ; their frame is large and powerful, their complexion a very dark brown, their brow broad and lofty, their eyes deep-sunk and lively, and their features not unfrequently of a regular and finely-shaped description. Of the Semitic affinity of the language their is no question, and according to the usual classification it belongs to the same Semitico-Hamitic group as the Somali, the Saho, and the Dankali.}

The Gallas are for the most part still in the nomadic and pastoral stage ; though, as we advance northwards into Abyssinia, we find them more and more assimilated to the settled and agricultural in- habitants of that kingdom. Among the southern tribes it is said that about 7 or 8 head of cattle are kept for every man, woman, and child ; and among the northern tribes, as neither man nor woman ever thinks of going any distance on foot, the number of horses is very large. The ordinary food consists of flesh, blood, milk, butter, and honey, the last being considered of so much importance by the southern Gallas that a rude system of bee-keeping is in vogue, and the husband who fails to furnish his wife with a sufficient supply of honey may be excluded from all conjugal rights. This last fact is one of those which indicate the comparatively high position occu- pied by the Galla women, who, moreover, have the right, but rarely granted in a savage state of society, of refusing an unacceptable offer of marriage. In the south monogamy is the rule, but in the north the number of a man’s wives is limited only by his wishes and his wealth. Each tribe has its own heiitch or sultan, who enjoys

1 The similarity to the Semitic was pointed out by Benfey in Gotting. Gelehrte Anzeigen, 1846, ina review of Tutschek's lexicon and grammar (1844, 1845). Further details in regard to its vocabu- lary and structure will be found in Lottner's paper in the Transactions of the Philologieal Society, London, 1860-61, and in the Novara Reise, 1867. Krapf had published a grammar as early as 1840.

the strange privilege of being the only merchant for his people, but in all public concerns must take the advice of the fathers of families assembled in council. The greater proportion of the tribes are still pagan, worshipping a supreme god Waka, and the subordinate god and goddess Oglia and Atilia, whose favour is secured by sacrifices of oxen and sheep. With a strange liberality of sentiment, they say that at a certain time of the year Waka leaves them and goes to attend to the wants of their enemies the Somali, whom also he has created. Some tribes, and notably the Wollo-Galla, have been converted to Mahometanism, and very bigoted adherents of the prophet they are. In the northa kind of superficial Christianization has taken place, to the extent at least that the people are familiar with the names of Maremma or Mary, Balawold or Jesus, Girgis or St George, &c.; but to all practical intents paganism is still in force. The serpent is a special object of worship, the northern Gallas believing that he is the author of the human racc. A con- siderable number of the men find employment in the Abyssinian armies, and in comparison with their neighbours are brave and war- like. The total number of the Gallas was estimated by Krapf at from six to eight millions, and Plowden mentions individual tribes that could bring into the field 20,000 or 80,000 horse. Among the more important tribes in the south (the name in cach instance being compounded with Galla) are the Ramatta, the Kukatta, the Badle, the Aurova, the Wadjole, the Tani, the Arrar, and the Kanigo Galla ; the Borani, a very powerful tribe, may be considered to mark the division between north and south; and in the north we find the Amoro, the Jarso, the Toolama, the Wollo, the Ambassil, the Aijjo, and the Azobo Galla.

See Beke, 'On the Origin of the Gallas," in Trons. of Brit. Assoc., 1847; Krapf., Travels . . «|. in Eastern Afriea, 1860; D'Abbadie, Dowze Ans en

Haute-Ethiopie, 1868; Brenner, ‘¢ Forschungen in Ost-Afrika,” in Petermann’s Afitthetlungen, 1868; Plowden, Z’ravels in Abyssinia and the Galla Country, 1868 ; and a paper by Louis Lande in Revue des Deux M ondes, 1878.

ALBERT GALLATIN* Copyright, 1879, by Henry Cabot Lodge. AMILY pride led the Gallatins to boast a descent from A. Atilius Callatinus, the Roman consul (4. v. ¢. 494 and 498). A gap of fifteen hundred years between the consul and the first appearance of the name in European history tends to invalidate this rather splendid bit of genealogy, but there can be no doubt that the Gallatins were both an old and noble family. They are first heard of in Savoy in the year 1258, and more than two centuries later they came to Geneva (1510), united with Calvin in his opposition to Rome, and associated their fortunes with those of the little Swiss city. Here they remained, and with one or two other great families governed Geneva, and sent forth many representatives to seek their fortune and win distinction in the service of foreign princes, both as soldiers and ministers. On the eve of the French Revolu- tion the Gallatins were still in Geneva, occupying the same position which they had held for two hundred years. They were republican nobles, simple in their manners, frugal and unostentatious in their habits of life, but genuine aristocrats of high breeding and cultivated minds. They numbered among their friends such widely different persons as Voltaire and the landgrave of Hesse, and, although not wealthy, had everything that could reasonably be desired both socially and politically.

Albert Gallatin, the most famous of the name, was born in Geneva on the 29th of January 1761. His father died in 1765, his mother five years later, and his only sister in 1777. Although left an orphan at nine years old, Albert Gallatin was by no means lonely or unprotected. His grand-parents, a large circle of near relations, and Mlle. Pictet, an intimate friend, cared for him during his boyhood. He was thoroughly educated at the schools of Geneva, and graduated with honour from the college or academy in 1779. His grandmother then wished him to enter the army of the landgrave of Hesse, but he declined to serve “a tyrant,” and a year later slipped away from Geneva and * This is reprinted here, with the consent of Mr Henry Cabot Lodge, of Massachusetts, from his work entitled Albert Gallatin,

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embarked for the United States. No man ever had less reason to emigrate. A competent fortune, good prospects, social position, and a strong family connexion, were all thrown aside in order to tempt fate in the New World. His relations very properly opposed his course, but they nevertheless did all in their power to smooth his way, and continued to treat him kindly, and he himself in after-life always admitted the justice of their opinions. The temper of the times, a vague discontent with the established order of things, and some political enthusiasm imbibed from the writings of Rousseau, are the best reasons that can now be assigned for Gallatin's ill-considered desertion of home and

friends.

In July 1780 Gallatin and his friend Serre landed in Massa- chusetts. They brought with them youth, hope, courage, and a little money, and at once entered into business. The times were unfavourable. The great convulsion of the Revolution was drawing to a close, and everything was in an unsettled condition. The young Gencvans failed in business, passed an aimless and severe winter in the wilds of Maine, and returned to Boston penniless. Gallatin tried to earn a living by teaching French in Harvard College, apparently not without success, but the cold and rigid civilization of New England repelled him, and he made his way to the South. In the backwoods of Pennsylvania and Virginia there seemed to he hetter chances for a young adventurer. Gallatin engaged in land speculations, and tried to lay the foundation of his fortune in a frontier farm. In 1789 he married Sophia Allegre, and every prospect seemed to be brightening. But clouds soon gathered again. After only a few months of wedlock his wife died, and Gallatin was once more alone. The solitary and desolate frontier life became now more dreary than ever; he flung himself into politics, the only outside resource open to him, and his long and eventful public career began.

The constitution of 1787 was then before the people, and Gallatin, with his dislike of strong government still upon him, threw him- self into opposition

and became one of the founders of the Anti-

Federalist, or, as it was afterwards called, the Republican party. | Elections followed to State conventions and legislatures, and | Gallatin rose with surprising rapidity. Despite his foreign birth | and his inability to speak English with correctness or fluency, he | suececded wonderfully. He was helped, of course, by his sound |

education ; but the truc cause of his success lay in his strong sense, untiring industry, courage, clear-sightedness, and great intellectual force. In 1793 he was chosen United States Senator from Penn- sylvania by the votes of both political parties. No higher tribute was ever paid to character and ability than that conveyed by this election. Pennsylvania to prevent Gallatin's election, the staunch Federalists of the Senate, who had begun to draw the party lines rather sharply, found the presence of the young Genevan highly distaste- ful. -They disliked his French origin, and suspected him to be a man of levelling principles. His seat was contested on account of a technical flaw in regard to the duration of his citizenship, and the Senate annulled the election and sent him back to Pennsylvania with all the glory of political martyrdom.

The part he had already taken in the exciting scenes to which he

now returned had without doubt been an efficient cause in his re- |

jection by the Senate. The success of the new scheme of national government turned at the outset upon the re-establishment of sound finances. To carry out the great plans which he had set on foot, Hamilton had found it necessary to lay an excise on domestic spirits. This tax bore hardly upon the western counties of Pennsylvania, Virginia, and North Carolina, where the people worked many small stills, and were thus able to get their grain to market in a port- able form. Strong opposition was manifested. Hamilton and lis party modified the original excise law, and partly by their action, partly through the influence of Washington, the murmurs in the two Southern States died away. But in Pennsylvania con-cession proved fruitless, and hostility became daily more active and dangerous.

In this resistance to the excise, which was peculiarly odious to the people among whom he lived, Gallatin took a leading part. Hc intended fully to restrain opposition within legal bounds, but he made the great mistake of embarking upon the stormy sea of resist- ance to law without snfficiently allowing for the character of the population. The frontiersmen of the Alleghanies were a rough and sturdy Tace, with a large and unfortunate admixture of wild Irish. The law-abiding American spirit was by no means supreme. Legal resistauce soon developed into insurrection. Houses were burned, revenue officers assaulted and driven from the country, and the United States mai] was stopped and the letters seized by the rioters.

The people began to arm and associate, thus preparing forcible

resistance to the Government. Gallatin did his best to retrieve his error and prevent open

But although party feeling did not run high enough in |

war. With fine courage he faced the excited bands of riflemen who gathered at Redstone Old Fort on the 20th of August 1794, and opposed with vigorous eloquence the use of force against the Government. He checked the excitement sufficiently to prevent bloodshed ; but he was only just in

time. Washington and Hamilton had at last determined to test the strength of the new Government, and were moving with an overwhelming force upon the western counties. Gallatin had blundered in exciting and leading opposition to law among so rude a people, but he had also interposed with sufficient effect to stop desperate measures, and the whisky rebellion faded away helplessly before the national power.

Of all the men who took part in this opposition to the excise, Gallatin alone came out with credit. He was at once elected to Congress, and took his seat as a member of the Lower House in the autunin of 1795. A foreigner, still young, and speaking English with a very defective pronunciation, he nevertheless by sheer force of ability and industry wrested from all competitors the leadership of the Republicans in the house, and almost at once became the most dangerous opponent whom the Federalists had ever en- countered in Congress. That great party, by simple weight of ability, generally in a minority, and never in full sympathy with the mass of their countrymen, maintained their power unbroken for the first twelve years of the Government. They had established and organized that Government, and in so doing had borne down opposition with a high hand. They were as domineering as they were able, and inflamed with hatred of France, just then rising to the dignity of a party principle, they found in Gallatin an enemy

tho was both by origin and opinion peculiarly obnoxious to them. They attacked him unsparingly, but in vain. His perfect com- mand of temper, and moderation of specch and action, in a bitterly

ersonal age, never failed, and were his most effective weapons ; fae he made his power felt in other ways. His clear mind and industrious habits drew him to questions of finance. He became the financier of his party, and preached unceasingly his cardinal doctrines of simplicity and economy, and was an effective critic of the measures of Government. Cool and temperate, Gallatin, when following his own theories, was usually in the right, although accused by his followers of trimming. Thus, in regard to the Jay treaty, he defended the constitutional right of the house to consider the treaty, but he did not urge rejection in this specific case. On the other hand, when following a purely party policy, he generally erred. He resisted the

navy, the mainspring of Washington’s foreign policy and the chief glory of the Federalists. Hc opposed commercial treaties and diplo- matic intercourse in a similar fashion. On all these points he was grievously wrong, and on all le changed his views after a good deal of bitter experience. The greatest period of Gallatin’s career in Congress was in 1798, after the publication of the famous X. Y.Z. despatches, The insults of Talleyrand, and his shameless attempts to extort bribes from the American commissioners, roused the dee anger of the people against France. The Federalists swept all before them, and the members of the opposition either retired from Philadelphia or went over to the Government. Alone and single- handed, Gallatin carried on the fight in Congress, The Federalists bore down on him unmercifully, and even attempted a constitu- tional amendment in regard to citizenship, in order to drive him from office. Still he held on, making a national struggle in the national legislature, and relying very little upon the rights of States so cagerly grasped by Jefferson and Madison. But even then the tide was turning, The strong measures of the Federalists shocked the country ; the leaders of the dominant party quarrelled fiercely among themselves ; and the Republicans carried the elec- tions of 1800.

Jefferson and Burr obtained an equal number of votes, and as the constitution then stood either was entitled to the presidency, although no one questioned that it had been intended for Jefferson. The election was thrown into the house, and the Federalists, maddened by defeat, strove to give the presidency to Burr. They fortunately failed, but it was Gallatin who led the Republicans, prevented rash measures, retained the sympathy of the country, and had a careful plan prepared for any emergency,

When, after this exciting contest, Jefferson took possession of the White House (1801), there were two men, and two only, whose com- manding abilities marked them for the first places in the cabinet. James Madison became secretary of state, and Albert Gallatin secre- tary of the treasury. Wise, prudent, and conservative, Gallatin made few changes in Hamilton’s arrangements, and for twelve years administered the national finances with the greatest skill. He and Jefferson were both imbued with the idea that government reduced to the lowest possible point could be carried on upon @ priori prin- ciples resting on the assumed perfectness of human nature,

and that, if this were done honestly, its authors would be implicitly trusted, and a political millennium would surely ensue. The chief burden of carrying out this theory fell upon Gallatin. His guiding prin- ciples still were simplicity of administration and_speedy extinction of all debt, and everything bent to these objects. Fighting or bribing

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the Barbary pirates was a merc question of expeuse. It was cheaper to seize Louisiana than to await the settlement of doubtful points. Commercial warfare was to be avoided because of the cost. All wars were bad, but if they could not be evaded it was less extrava- gant to be ready than to rush to arms unprepared. Amid many difficulties, and thwarted even by Jefferson himself in the matter of the navy, Gallatin pushed on ; and after six years the debt was as far as possible paid, a large surplus was on hand, a compre- hensive and beneficent scheme of internal improvements was ready for execution, and the promised land seemed in sight. Then came the stress of war in Europe, a wretched neutrality at home, fierce outbreaks of human passions, aud the fair structure of government by a priori theories based on the goodness of unoppressed humanity came to theground. Gallatin was thrown helplessly back upon the rejected Federalist doctrine of government according to circum- stances. He uttcred no vain regrets, but the position was a trying one. The sworn foe of strong government, he was compelled, in pursuance of Jefferson’s policy, to put into execution the embargo and the most stringent measures ever taken by an American legislature. He did his best, but all was in vain. Commercial warfare failed, the embargo was repealed, and Jefferson, having hopelessly entangled foreign relations and brought the country to the verge of civil war, retired to private life defeated and broken, and leaving to his suc- cessor Madison, and to Gallatin, the task of extricating the nation from its difficulties. From 1809 the new administration, drifting steadily towards war, struggled on from one abortive and exasper- ating negotiation to another. It wasa period of sore trial to Gallatin. The peace policy had failed, and nothing else replaced it. He had lost his hold upon Pennsylvania and his support’ in the House. while a cabal in the senate, bitterly and personally hostile to the treasury, crippled the administration and reduced every Govern- ment measure to mere inanity. At last, however, one of their blun- dering acts struck

Napoleon iu a vital spot. To escape its effects, he set himself to hoodwink the administration and trick the United States into war with England. ‘The deception was successful, aud was powerfully aided by a war party, violent and ignorant, but with plenty of fresh ability, full of the new spirit of nationality, and determined to fight at all hazards. The result was inevitable, and Madison was forced to take the lead in June 1812, in declaring war against England.

Gallatin never wasted time in futile complaints. His cherished schemes were shattered. War and extravagant expenditure had come, and he believed both to be fatal to the prosperity and pro-

ress of America.

obtaining an early peace. With this end in view he grasped eagerly at the proffered mediation of Russia, and without resigning the treasury sailed for Europe in May 1813.

Russian mediation proved barren, but Gallatin persevered, catcli- ing at every opportunity for negotiation. In the midst of his labours came the news that his old foes in the senate had refused to coufirm his appointment. He still toiled-on unofficially until, Madison having filled the treasury, his nomination for the second time met the approval of the senate, and he was able to proceed with direct negotiations. The English and Anicrican commissioners finally met at Ghent, and in the tedious and irritating discussions which ensued Gallatin took the leading part. He dealt easily with his antagonists, who were all second-rate and obstinate persons, and drove them by quiet persistence and firmness from their first arrogant and impossible demands. His great difficulty lay in man- aging his own colleagues, who were, especially Henry Clay and John Quincy Adams, able men of strong wills and jarring tempers. He succeeded in preserving harmony, and thus establislicd his own reputation as an able diplomat. Peace was his reward, and, after visiting Geneva for the first time since his boyhood, and nego- tiating a commercial convention with England, Gallatin returned to America.

He received an immediate offer of the treasury, which he declined but accepted the mission to France (1816), where he remained for the next

seven years, which were in all probability the pleasantest of his life. He passed his time in thoronghly congenial society, seeing everybody of note or merit in Europe. He did not neglect the duties of his official position, but strove assiduously and with his wonted patience to settle the commercial relations of his adopted country with the uations of Europe.

In 1823 he resigned his post and returned to the United States whien he found himself plunged at once in the bitter struggle then in progress for the presidency. His favourite candidate was his personal friend William H. Crawford, whom he regarded as the true heirand represeutative of the old Jeffersonian principles. With these feelings he consented to run for the vice-presidency on the Crawford ticket. But Gallatin had come home to new scenes and uew actors, and he did not fully appreciate the situation. The contest was bitter, personal, factious, and full of intrigue. Vau Buren, then in the Crawford interest, came to the conclusion that the candidate for the second place, by his foreign origin, weakened the ticket, and Gallatin therefore withdrew his name aud

| and a daughter, all of whom survived him.

He therefore put the finances in the best order | 1e could, and set himself to mitigate the evil effects of the war by |

retired from the contest without reluctauce. The election, unde- cided by the popular vote, was thrown into the house, aud resulted in the choice of J. Quincy Adams, who in 1826 drew Gallatin from his retirement and sent him as minister to England to conduct another complicated and arduous negotiation with that power, Gallatin worked at his new task with his usual industry, tact, and patience, but the results were meagre, although an open breach was successfully avoided. In 1828 he once more returned to the United States, and bade farewell to public life.

Accepting a business position in New York which gave him a snffi- cient income, Gallatin turned his attention to the congenial pursuits of science and literature. In both fields he displayed great talent, and his book upon Indian languages laid the foundations of the etlinology of the American

aborigines. He continued, of course, to interest himself in public affairs, although no longer an active participant, and in all financial questions, especially in regard to the bank charter, the resumption of specie payments, and the panic of 1837, he exerted a wide and beneficial influence. The rise of the slavery question touched him nearly. Gallatin had always been a consistent opponent of slavery, and in the early days of the Government had boldly attacked that institution when unable to find a dozen inen of any party to side with him. He felt keenly, therefore, the attempts of the South to extend the slave power and confirm its existence, and the remnant of his strength was devoted in his last days to writing and distributing two able pamphlets against the war witli Mexico. Almost his last public act was a speech against the annex- ation of Texas; and, although more tlian eighty years old, he con- fronted a howling New York mob with the same cool, unflinclin courage which he had displayed half a century before when he fone the armed frontiersmen of Redstone Old Fort.

During the winter of 1848-9 his health failed, and on the 12th of August 1848, he passed peacefully away.

Gallatin was twice married. His second wife was Miss Hannah Nicholson, of New York, by whom he-had three children, two sons In personal appearance he was above iniddle height, with strongly-marked features, indi- cating great strength of intellect and character. He was rescrved and extremely reticent, cold in manner and not sympathetic. There was, too, a certain Calvinistic austerity about him, but he was much beloved by his family. He was never a popular man, nor did he ever have a strong personal following, or many attached friends.

| He stood with Jefferson and Madison at the head of his party, and

won his place by force of character, courage, application, and great intellectual power. His eminent aud manifold services to his adopted country, his great abilities and upright character, assure

_ him a high position in the history of the United States,

GALLE, or Point pE GaLz, a town and port in the southern province of Ceylon, on the south-western coast, about 72 miles S. of Colombo, with

which it is connected by a good carriage road. It was made a municipality in 1865, and divided into the five districts of the Fort, Callowelle, Galopiadde, Hirimbure, and Cumbalwalla. The fort, which is more than a mile in circumference, commands the whole harbour, but is commanded by a range of hills. Within its enclosure are not only several Government buildings, but an old church erected by the Dutch East India Company, a mosque, a Wesleyan chapel, a hospital, and a considerable number of houses occupied by Europeans. The old Dutch building known as the queen's house or governor's residence, which dated from the year 1687, was in such a dilapidated state that it was sold by Governor Gregory in 1873. Elsewhere there are few buildings of individual note, but the general style of domestic architecture is pleasant and comfortable, though not pretentious. One of the most delightful features of the place is the profusion of trees, even within the town, and along the edge of the shore—suriyas, palms, cocoa-nut trees, aud bread-fruit trees. The ramparts towards the sea furnish fine promenades. In the harbour deep water is found close to the shore, and the outer roads are spacious ; but the south-west monsoon renders entrance difficult, and not unfrequently drives vessels from their moorings. Galle is an important point on the lines of communication between Calcutta and Australia, and between Suez and Singapore. The Peninsular and Oriental Steam Navigation Company, the Messageries Maritimes, and the British India Steam Navigation Company have agencies at the port. The trade is mainly in the productions of the surrounding country, of which in 1873 there was shipped 11,477 cwts.

of cocoa-nut oil, 10,083 ewts. of cinnamon, 23,377 ewts. of plumbago, and 22,932 ewts. of coir. Cotton goods are the principal import, 143,410 pieces being the amount for 1873. The inhabitants of Galle are of very mingled origin, com- prising not only Singhalese European residents and Eurasian half-castes, who are locally denominated " Burghers," as being mainly the descendants of the old Dutch settlers, but also "Moors" or " Moormen"' (that is, Arabians or semi-Arabians), Hindus, Parsees, people from the Coro- mandel coast, and Maldivians. The Moors are largely engaged as lapidaries and workers in tortoise-shell; and the urgency of the itinerant vendors is one of the inevitable plagues of the European visitor to the town.

According to the returns of 1871, the total population of the munici- pality was 47,059, distributed in 8979 families, occupying 7496 houses, and consisting of 24,294 males and 22,765 females.

Galle, according to SirJ. E. Tennent, is the Tarshish of Solomon; but of this opinion there is no proof, even if it were certain that the Jewish fleets visited the island of Ceylon at all. The placc is mentioned by none of the Greek or Latin geographers, unless the identification with Ptolemy's Avium Promontorium or Cape of Birds be a correct one. It is hardly mentioned in the native chronicles before 1267, and Ibn Batuta, in the middle of the 14th century, distinctly statcs that Kali,—that is, Galle,—was a small town. It was not till the period of Portugucse occupation that it rose to im- portance. When the Dutch succeeded the Portuguese they greatly strengthened the fortifications, which had been vigorously defended against their admiral, Kosten; and under their rule the place had the rank of a commandancy. In the marriage treaty of the infanta of Portugal with Charles I]. of England it was agreed that if the Portuguese recovered Ceylon they were to hand over Galle to the English ; but as the Portuguese did not recover Ceylon the town was left to fall into English hands at the conquest of the island in 1796. The name Galle is derived from the Singhalese galla, equivalent to rock; but the Portuguese and Dutch settlers, being bettcr fighters than philologists, connected it with the Latin gallus a cock, and the image of a cock was carved as a symbol of the town in the front of the old Government house.

GALLIC ACID, trioxybenzoic acid, or dioxysalicylic acid, O;H,O;+H,O or C,H,(OH),.CO(OH) +H,0, the acidum gallicum of pharmacy, is a substance discovered by Scheele, which exists as such in the leaves of the bearberry, in pomegranate root-bark, and in tea, in gall-nuts to the ex- tent of about 3 per cent., and in other vegetable productions. It may be prepared by keeping moist and exposed to the air for from four to six weeks, at a temperature of 20° to 25° C., a paste of powdered gall-nuts and water, and removing from time to time the mould which forms on its surface; the paste is then boiled with water for twenty minutes to obtain a solution of the gallic acid; this is filtered through calico, and the deposit of acid it affords on cooling is drained by pressure between folds of bibulous paper, and purified by dissolving in boiling water, by re- crystallization at about 27° C., and washing of the crystals with ice-cold water. 'he production of the acid

appears to be due to the presence in the galls of a ferment. This is not contained in Chinese gall-nuts, which consequently require the addition of yeast or of common galls to deter- mine the decomposition of their tannin necessary for the formation of gallic acid (see C. H. Viedt, Dingler's Polyt. Journ., cexvi., 1875, p. 454). Powdered gall-nuts, contain- ing 43 per cent, of tannic acid, were found by M. Sace to yield 50°4 per cent. of pure dry gallic acid (Compt. Rend., Ixxii., 1871, p. 766), Gallic acid is most readily obtained by boiling with weak solution of acids the tannin procured from oak-galls by means of alcohol andether. The changes Which take place in this, as in the first described mode of preparation, apparently consist in the splitting up of tannin, or gallo-tannic acid, which, according to some experiments, is a glucoside of tannic acid, of the formula Cy, HogO55,, to give with two molecules of water two molecules of digallic or tannic acid, C,,H,O,, and glucose, C,H,,0,. The former body, which may be represented as an etheric anhydride

of gallic acid, C,H,(OH),.CO(OH).O.CO.(OH),O,H,,

by the assimilation of a molecule of water is then con- verted into two molecules of gallic acid (see Armstrong, Orgame Chemistry, p. 304, 1874). Gullic acid may be produced by heating an aqueous solution of diiodo-salicylic acid with excess of alkaline carbonate, by acting on dibromosalicylic acid with moist silver oxide, and by other chemical methods. It crystallizes in white or pale fawn-coloured acicular prisms or silky needles, and is soluble in alcohol and ether, and in 100 parts of cold, and 3 of boiling water, is without odour, and has an astringent, acidulous taste, and an acid reaction. Dried at 100° OC. it loses 95 per cent. of its weight of water ; at about 200°C. it melts; and at 210 to 215° it is resolved into carbon dioxide and pyrogallol, C,H,(OH),. With ferric salts its solution gives a deep blue colour, and with ferrous salts, after exposure to the air, an insoluble, blue-black, ferroso-ferric gallate. Bases of the alkali metals give with it four series of salts; these are stable except in alkaline solutions, in which they absorb oxygen and turn brown. Solution of acid calcium carbonate becomes with gallic acid, on exposure to the air, of a dark blue colour, Unlike tannic acid, gallic acid does not precipitate albumen or salts

of the alkaloids, or, except when mixed with gum, gelatin, Salts of gold and silver are reduced by it, slowly in cold, instantaneously in warm solutions, hence its employment in photography. With phosphorus oxychloride at 120°C. gallic acid yields tannic acid, and with concentrated sulphuric acid at 100°, rujfigallic acid, C,,H,O3. Phos- phorus perchloride, and also, after several hours, solution of arsenic acid near the boiling point (J. Lowe, quoted Chem. News, xix., 1869, p. 41), convert it into ellagic acid, C,,H,O,+H,O, a substance which occurs in gall-nuts, in the external membrane of the episperm of the walnut (T. L. Phipson, Chem. News, xx. p. 116), and probably many plants, and composes the “bezoar stones” found in the intestines of Persian wild goats. Cfallic acid may be esti- mated, after removal of tannic acid by gelatin, by means of permanganate of potassium, with which it evolves carbon dioxide, and (F. Jean, Compt. Rend., Ixxxii., 1876, pp. 982-4), by means of iodine in the presence of an alkaline carbonate.

Gallic acid has been advantageously employed as an internal medicinal agent in scarlatinal albuminuria, in which its effect appears to be due to an astringent and tonic action on the inflamed capillaries of the kidneys ;! in other forms of albuminuria ;? in cases of chyluria, in which, as not causing nausea and headache, it is preferable to tannic acid ;? and in pyrosis, diarrliea, some forms of dysentery, and tabes and rickets, and atonic states of the alimentary canal and of the body generally. In checking the night-sweats of phthisis it has been found of especial service.* Asa hemostatic, when administered internally, it has proved of value in hematemesis, epistaxis, fungus heematodes,> menorrhagia,® and more particularly in hematuria. Gallic acid has been highly recommended in hemoptysis,’ in which, however, ergot, from its not oc- casioning griping and constipation, or interfering with a liberal use of milk, has been found a better remedy. It may be given in considerable quantities without any evil consequences. The effects of too large a dose are to render

1 Braithwaite’s Retrospect, \xxiii., 1876, 114. j

2 Lancet, 1878, ii. 580; Med. Times, 1858, ii. 55, and 1854, i. 594; according to Parkes (i., 1854, ii, pp. 28, 29), ferric chloride is superior to it as a means of reducing the albumen in nephritis.

3 Bence Jones, Med. Times, 1852, ii. 653, and 1858, ii. 494.

4 Ib., 1854, i. 594; and Brit. and For. Med.-Chir. Rev., 1862, i, 194. – 5 Med. Times, 1858, ii. 373.

6 Jb., 1862, i. 49; and Lancet, 1860, ii. 254. ¥

7 Williams, Ranking's Abstracts, 1862, i 73; and_ Waters, %., 1871, i. 56. 8 Williamson, ee 1876, ii. 696.

the pulse hard and wiry, and to produce pallor, a whizzing sound in the ears, dizziness, and faintuess. Its administra- tion in a case of Bright's disease described by Dr Bence Jones was followed by epilepsy (see Med. is ie) 1853, Lg 495). As a topical styptic application, gallic 1s inferior to tannic acid.! With glycerin it is combined to form the harmaceutical preparation glycerinum acidi gallice.

GALLIENUS, P. Licinius (218-268), Roman emperor, son of the emperor Valerian, was born about 218 From 253 to 260 he reigned conjointly with his father, and gave proof of both bravery and ability, especially in the defeat near Milan of 300,000 Alemanni, with a force of only 10,000 Romans. When, however, his father was defeated and taken prisoner by Sapor, king of Persia, in 260, Gallienus niade no effort to obtain his release, or to with- stand the incursious of the invaders who threatened the empire from all sides. He occupied part of his time in dabbling in literature, science, and various trifling arts, but gave himself up chiefly to excess and debauchery. His generals rebelled against him in almost every province of the empire, and this period of Roman history came to be called the reign of the thirty tyrants, although in reality the usurpers numbered only nineteen. Gallienus was killed at Milan in 268 while besieging Aureolus, who had been pro- claimed emperor by the Illyrian legions.

GALLINULE. See MoorHeEn,

GALLIO, Junius ANN&vsS, proconsul or " deputy" of Achaia at tlie time of the apostle Paul's first visit to Corinth (53 .p.), was the son of M. Annzus

Seneca, a Roman eques and rhetorician, and was born at Cordova about the beginning of the Christian era. His mother’s name was Helvia; and L. Anneus Seneca, the philosopher, and L. Annzeus Mela, the geographer, were his full brothers, his own proper name being Marcus Annus Novatus. After he had received a careful education from his father at Cordova, he went to Rome, wlhiere he attracted the notice of L. Junius Gallio, a rhetorician of some repute, who ulti- mately adopted him, thus conferring the name by which he is usually known. The terms on which he lived with his kindred and with the world are well illustrated in the epithet “dulcis” applied to him by Statius (Silv., ii. 7, 32), and by Seneca (Wat. Qu., 4 pref. —‘ nemo mortalium uni tam dulcis est quam hic omnibus”). It is probable that Gallio shared the misfortunes of his brother when the latter, having incurred the enmity of Messalina, was banished to Corsica ; and that both returned together to Rome when Agrippina had selected Seneca to be tutor to Nero. To- wards the close of the reign of Claudius, Gallio received the proconsulship of the newly constituted senatorial province of Achaia (Acts xviii. 12), but seems to have been com- pelled by ill health to resign the post within a few years (Pliny, 4. W., xxxi, 33 ; Seneca, Zp. civ.). In the fifth year of N ero we hear of him as having been again in Rome (Dio Cassius, lxi. 20, 21), and on the same authority we learn that he finally became one of the last victims of that emperor (Ixii. 25). The statement of Jerome in the chronicle of Eusebius, that Junius Gallio “ frater Senecze egregius declamator, propria se manu interfecit,” ap am to be founded on a confusion of names. Seneca’s en i Ira and De Vita Beata, are dedicated to Gallio, wlio ey oe. oot 73; xvi. 17; Dio Cassins, lx. 35. : at od Miata ee of Edirneh, at the north- ; en gre oe

) east extremity of the Straits of ee ee eee

1 On the therapeutics of gallic aci gallic acid see further R. Neale, ‘Clini notes upon the use of gallic acid in various diseases,” Medical Times, >

1855, i. 458 sq.; and W. Bayes, “On Galli id.” ate Medkeal Journal, 1854, 4 at 9 n Gallic Acid,” Association

GAL—-GAL

Dardanelles, on a narrow peninsula 130 miles S.W. of Constantinople, and 90 miles due S. of Adrianople, in 40° 24’ N. lat. and 26° 40’ 30” KE. long. Nearly op- posite is Lapsaki on the Asiatic side of the channel, which is here about 2 miles wide. The town of Gallipoli presents a miserable aspect; the streets are narrow, the houses mostly of wood and ill built, though there are a few better structures near the harbour, and the Anglo- French occupation of 1853-6 led to some improvements. The only noteworthy buildings are the large, crowded, and well-furnished bazaars, with leaden domes. ‘There are several mosques, none of them remarkable, and many interesting Roman and Byzantine remains, especially a magazine of the emperor Justinian, a square castle and tower attributed to Bajazet I., and some tumuli on the south, said to be the tombs of the Thracian kings. The lighthouse, built on a cliff, has a fine appearance as seen from the Dardanelles. Gallipoli is the residence of a captain-pasha and the seat of a Greek bishop. It has two good harbours, and is the principal station for the Turkish fleet. From its position as the key of the Dardanelles, it was occupied by the allied French and English armies in 1854. Then the isthmus a few miles to the north of the town, between it and Boulair, was fortified with strong earthworks by English and French engineers mainly on the lines of the old works constructed in 1357, when the Turks first crossed over into Europe, nearly 100 years before they gained possession of Constantinople. These fortifications were renewed and enlarged in January 1878, on the Russians threatening to take possession of Constantinople. The peninsula thus isolated by the fortified positions has the Gulf of Saros on the N.W., and extends some 50 miles to the S.W. The guns of Gallipoli command the Darda- nelles just before the strait joins the Sea of Marmora. The town itself is not very strongly fortified, the prin- cipal fortifications being further down the Dardanelles, where the passage is narrower. The district of Gallipoli is exceedingly fertile and well adapted for agriculture ; a great variety of crops are raised, but, previous to the war of 1877-8, nearly all progress was stopped on ac- count of the maladministration of the Turkish authorities. Nevertheless considerable quantities of the various cereals were exported, besides wiue, oil, skins, cotton, sheep, &c., much of the trade being transit. The principal imports are manufactured goods, coal, sugar, coffee, rice, soap, iron. The line of railway between Adrianople and the Egean Sea has been prejudicial to the transit trade of Gallipoli, and several attempts have been made to obtain concessions for the con- struction of a

railway that would connect this part with the Turkish railway system. There is little industry in Gallipoli, though previous to the war attempts had been made to extend and improve the manufacture of silk thread and silk goods, and some little business was done in the construction of coasting vessels, Steamers to and from Constantinople call regularly at Gallipoli Widely different estimates have been given of the population of the town; it is probably somewhere about 25,000 or 30,000. GALLIPOLI, an important seaport town of Italy, in the province of Lecce, and about 25 miles N.E. of the city of that name, beautifully situated on a rocky islet on the east shore of the Gulf of Taranto, and connected by a long stone bridge of twelve arches with the suburb of Lizza on the mainland. The town is well built and fortified, and has a castle erected by Charles I. of Anjou, a large cathedral, a gymnasium, and an episcopal seminary. It is chiefly noted for its extensive cisterns cut in the solid rock for containing the olive oil collected from all parts of Puglia; but it has be- sides a productive tunny fishery, and manufactures muslins, cotton stockings, and woollen goods. The harbour has been improved since 1855 by a new mole, but the entrance is still

somewhat dangerous. In 1873 there entered 350 vessels with a total tonnage of 66,652 tons, 281 being Italian and 29 British. The principal exports are oil (of which 9628 tons were shipped in 1875), wine, oats, and cotton seed; and the imports, fish from Norway, manufactured goods from France, petroleum from the United States, staves from Austria, and wheat and barley from Greece and Turkey. The popu- lation of the town in 1871 was 7578, and of the commune 9951. Gallipoli preserves the name and almost certainly occupies the site of the ancient Callipolis, the “ Beautiful City,” founded, according to Dionysius, by a Spartan named Leucippus and a number of the citizens of Tarentum. GALLIUM, so called in honour of France (Gallia), symbol Ga, atomic weight 69-9, a metal discovered, August 27, 1875, by M. Lecog de Boisbaudran, in the spectroscopic examination of zinc-blende from Pierrefitte in the valley of Argeles, Hautes Pyrénées, and since found to exist in blende from several other localities, notably in that of the mines of Liidrich and Apfel at Bensberg, on the Rhine, which contains nearly 16 milligrammes per kilogramme. Its density and approximate atomic weight, and other of its characters, were predicted

by Mendeljeff, in accordance with his law that the properties of the elementary bodies, as also the constitution and properties of their combinations, are periodic functions of their atomic weights (see article CHEMISTRY, vol. v. p. 543, col. 2). Gallium may be pre- pared by a process the chief features of which are the treat- ment of the ore, which contains the metal in only very minute quantity, with zinc; the removal, from a hydro- chloric acid solution of the gelatinous precipitate thereby produced, of various foreign metals by means of hydrogen sulphide ; the fractionation of the residual liquid with sodium carbonate, gallium being thrown down before zinc by that reagent; the formation of a sulphate from the re- sultant precipitate ; and, lastly, the electrolysis of a potash solution of the purified oxide obtained therefrom, the metal appearing on the negative platinum electrode. Solid gallium is greyish-white, of octahedral crystallization, and remarkably hard and resistant even at a temperature little below its melting point, and is but slightly malleable and flexible, though thin plates of it will bear bending several times without breaking. It melts when held in the fingers, its point of fusion being 30°15 C. (86°27 Fahr.). The liquid metal is of a silvery white colour, and adheres to glass, forming a mirror resembling that of mercury. It exhibits in a remarkable degree the phenomenon of super- fusion, but when some degrees below its melting point crystallizes immediately if a small fragment of the solid metal attached to a platinum wire be inserted into it. At 24°5 C. (76°1 Fahr.) the specific gravity of the solid metal is 5-956, and of the liquid 6-069; the specific heat of the former between 12° and 23° ©, is 0-079, giving atomic heat 5:52, and that of the latter between 119° and 106° ©. is 00802 (Berthelot, Compt. Rend., lxxxvi. 786-7). At ared heat in air gallium is not perceptibly volatilized. It is little affected by cold nitric acid, but dissolves readily in hydrochloric acid; with potash solution It liberates hydrogen. It furnishes a deliquescent and very soluble chloride, GaCl, or Ga,Cl,, a corresponding bromide and iodide, and an ammonio-gallic alum. Its oxide is more soluble in ammonia than is alumina. In basicity it holds a place intermediate between aluminium and indium. It 18 precipitated by alkaline carbonates and barium carbonate, but not by hydrogen sulphide and ammonium sulphide in the absence of zinc. Gallium affords two brilliant lines in the violet part of the spectrum. See L. de Boisbaudran, in Chemical News, 1877, i. pp. 148, 157, 167; also L. de Boisbaudran and E.

Jungfleisch, Compt. Rend., Ixxxvi., pp. 475-478 and 577-579, and Journ. Pharm. Chim., ser.

4, xxvii. pp. 338-340—quoted in Phil. Mag., 1878 é Cp p. 319, and Journ. Chem. Soc., “* Abstracts,” 1878, pp. 556 and 837.

GAL 43 | GALLOWAY, Tromas (1796-1851), a Scottish mathe-

matician, was born at Symington, in the upper ward of Lanarkshire, 26th February 1796. After receiving such education as the schools of his own and adjoining parishes could give, he entered in 1812 the university of Edinburgh, where he distinguished himself specially in mathematics. In 1823 he was appointed one of the teachers of mathe- matics at the military college of Sandhurst, and on the death of Sir John Leslie in 1832 he was an unsuccessful candidate for the vacant chair of natural philosophy in Edinburgh. In the following year he was appointed actuary to the Amicable Life Assurance Office, the oldest institution of that kind in London, and in this situation he remained till his death, November 1, 1851. Galloway was a voluminous thongh, for the most part, an anonymous writer, and took a leading part in the proceedings of the principal scientific societies of London. He contributed largely to the seventh edition of the Encyclopedia Britan- mica, and also wrote several scientific papers for the Edinburgh and Foreign Quarterly Reviews. His Encyclo- pedia article “ Probability ” was published separately. GALLS. In animals galls occur mostly on or under the skin of living mammals and birds, and are produced by Acaridea, and by dipterous insects of the genus Wstrus. Signor Moriggia! has described and figured a horny excres- cence, nearly 8 inches in length, from the back of the human hand, which was caused by Acarus domesticus. What are commonly known as galls are vegetable deformities or excrescences, due to parenchymatous hypertrophy, and, according to the definition of Lacaze-Duthiers, comprise “all abnormal vegetable productions developed on plants by the action of animals, more particularly by insects, what- ever may be their form, bulk, or situation.” For the larve of their makers the galls provide shelter and sustenance. The exciting cause of the hypertrophy, in the case of the typical galls, appears to be a minute quantity of some irritating fluid, or virus, secreted by the female insect, and deposited with her egg in the puncture made by her ovi- positor in the cortical or foliaceous

parts of plants. This virus causes the rapid enlargement and subdivision of the cells affected by it, so as to form the tissues of the gall. Oval or larval irritation also, without doubt, plays an im- portant part in the formation of many galls. Though, as Lacaze-Duthiers remarks, a certain relation is necessary between the “stimulus” and the “supporter of the stim- ulus,” as evidenced by the limitation in the majority of cases of each species of gall-insect to some one vegetable structure, still it must be the quality of the irritant of the tissues, rather than the specific peculiarities or the part of the plant affected, that principally determines the nature of the gall. Thus the characteristics of the currant-gall of Spathegaster baccarum, L., which occurs alike on the leaves and on the flower-stalks of the oak, are obviously due to the act of oviposition, and not to the functions of the parts producing it; the bright red galls of the saw-fly Vematus gallicola are found on four different species of willow, Salix Sragilis, S. alba, S. caprea, and 8. cinerea ;2 and the galls of a Cynipid, Biorhiza aptera, usually developed on the rootlets of the oak, have been procured also from the deodar.$ Often the gall bears no visible resemblance to the struc- tures out of which it is developed; commonly, however, outside the larval chamber, or gall proper, and giving to the gall its distinctive form, are to be detected certain more or less modified special organs of the plant. The gall of Cecidomyia strobilina, formed from willow-buds, is mainly a rosette of leaves the stalks of which have had their growth arrested. The small, smooth, seed-shaped gall of the

1 Quoted in Zoological Record, iv., 1867, p. 192. 2 P. Cameron, Scottish Naturalist, ii. pp. 11-15. 3 Entomologist, vii. p. 47.

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American Cynips seminator, Harris, according to Mr W. F. Bassett,) is the petiole, and its terminal tuft of woolly hairs the enormously developed pubescence of the young oak-leaf. The moss-like covering of the “bedeguars” of the wild rose, the galls of a Cynipid, Rhodztes rose, represents leaves which have been developed with scarcely any parenchyma between their fibro-vascular bundles ; and the “ artichoke-galls ” or “oak-strobile,” produced by Aphilothrix gemme, L., which insect arrests the development of the acorn, consists of a cupule to which more or less modified leaf-scales are attached, with a peduncular, oviform, inner gall?

Mr E. Newman held the view that many oak-galls are pseudobalani, or false acorns: “to produce an acorn has been the intention of the oak, but the gall-fly has frustrated the attempt.” Their formation from buds which normally would have yielded leaves and shoots is explained by Parfitt as the outcome of an effort at fructification induced by oviposition, such as has been found to result in several plants from injury by insect-agency or otherwise? Galls vary remarkably in size and shape according to the species of their makers. The polythalamous gall of Aphilothria radicis, found on the roots of old oak-trees, may attain the size of a man’s fist ; the galls of another Cynipid, Andricus occultus, Tschek,* which occurs on the male flowers of Quercus sessiliflora, is 2 millimetres, or barely a line, in length. Many galls are brightly coloured, as, for instance, the oak-leaf hairy galls

of Spathegaster tricolor, which are of a crimson hue, more |

or less diffused according to exposure to light. The variety of forms of galls is very great. Some are like urns or cups, others lenticular. The “knoppern” galls of Cynips polycera, Gir., are cones having the broad, slightly convex, upper surface surrounded with a toothed ridge. Of the Ceylonese galls “some are as symmetrical as a composite flower when in bud, others smooth and spherical like a berry; some protected by long spines, others clothed with yellow wool formed of long cellular hairs, others with regularly tufted hairs.” The characters of galls are constant, and as a rule exceedingly diagnostic, even when, as in the case of ten different gall-gnats of an American willow, Salix humilis, it is difficult or impossible to tell the full-grown insects that produce them from one another. In degree of complexity of internal structure galls differ considerably. Some are monothalamous, and contain but one larva of the gall-maker, whilst others are many-celled, and numerously inhabited. The largest class are the unilocular, or simple, external galls, divided by Lacaze-Duthiers into those with and those without a superficial protective layer or rind, and composed of hard, or spongy, or cellular tissue. In a common gall-nut that authority distinguished seven constituent portions :— an epidermis ; a subdermic cellular tissue ; a spongy and a hard layer, composing the parenchyma proper; vessels which, without forming a complete investment, underlie the parenchyma ; a hard protective layer; and lastly, within that, an alimentary central mass inhabited by the growing larva.®

Galls are formed by insects of several orders. Among the Hymenoptera are the gall-wasps (Cynips and its allies) which infect the various species of oak. They are small insects, having straight antenne, and a compressed, usually very short abdomen, with the second, or second and third segments greatly developed, and the rest imbricated, and concealing the partially coiled ovipositor. The transforma-

i al 1 See in Proc. Entom. Soc. of London for the year 1873, p. xvi. 2 See A. Miiller, Gardener's Chronicle, 1871, pp. 1162 and 1518; and E. A. Fitch, Entomologist, xi. p. 129. ' 3 Entomologist, vi. pp. 275-8, 339-40. 4 Verhandl. d. zoolog.-bot. Ges. in Wien, xxi. p. 799. > Darwin, Variations of Animals and Plants under Domestication ii. p. 282. / 6 «* Recherches pour servir 4 l'Histoire des Galles," Ann. des Sci. Nat., xix. pp. 298 sqq.

tions from the larval state are completed within the gall, out of which the imago, or perfect insect, tunnels its way,— usually in autumn, though sometimes, as has been observed of some individuals of Cynips Kollart, after hibernation.

The phenomena of development in Cynips and associated genera present many features of interest. Not fewer than 12,000 living specimens of C. Kollari, Gir. (C. lignicola, Hart.), from Devonshire galls, were examined by the late Mr Frederick Smith,' of the British Museum, and proved to be all females, as also were the flies obtained in two successive years from some of these by breeding on isolated oak trees in the neighbourhood of London. The same observer detected among about 1200 flies of the gregarious species Aphilothria (Cynips) radicis not a single male. In many thousands of Cynipids, representing 28 species, Hartig failed to discover any male. Von Schlectendal, on the other hand, between 24th April and 1st May 1871, from three galls of Rhodites rosw, L., obtained in the pre- vious year, bred only 2 females and 32 males. These males were of the normal coloration and shape; but some which appeared in the latter part of May, when the females were in larger numerical pro- portion, were varieties of three kinds, partly resembling the females in coloration.® Walsh® ascertained with respect to the galls of the American Black Oak, that their growth commences in May, and is completed in a few weeks, and that near the

middle of June about a fourth of them yield both male and female fully developed gall- flies of the species Cynips spongifica, Osten-Sacken. In the re- mainder of the galls the larve do not attain their pupal condition till more than two months later, and the flies they produce, which appear about October, are all females. This autumnal brood has been experimentally ascertained to cause the generation of oak- apples in the following spring on trees not previously infected. Mr W. F. Bassett! considers that most, if not all, species of Cynips are double-brooded, and that one of the two broods consists of females only. ‘‘There are,” he remarks, ‘‘so many one-gendered species, that we may reasonably suppose each to be the progenitor of the equally numerous double-gendered species, whose relation- ships have not yet been observed.”

Among the commoner of the galls of the Cynipide are the “oak-apple” or “‘oak-sponge” of Andricus terminalis, Fab.; the “currant” or “berry galls” of Spathegaster baccarum, 1, above mentioned ; and the “oak-spangles” of Neuroterus lenticularis, Oliv., generally reputed to be fungoid growths, until the discovery of their true nature by Mr Frederick Smith ;!2 and the succulent “ cherry-galls” of Dryophanta scutellaris, Oliv. The “marble” or “‘ Devon- shire woody galls” of oak-buds, which often destroy the leading shoots of young trees, are produced by Cynaps Kollari,? already alluded to. They were first introduced into Devonshire about the year 1847, had become common near Birmingham by 1866, and two or three years later were observed in several parts of Scotland. They contain about 17 per cent. of tannin.!® On account of their regular form they have been used, threaded on wire, for making ornamental baskets. The large purplish Mecca or Bussorah galls,!° produced on a species of oak by Cynips insand, Westw., have been regarded by many writers as the Dead Sea fruit, mad-apples (mala insana), or apples of Sodom (poma sodomitica), alluded to by Josephus and others, which, however, are stated by E. Robinson (Bibl. Researches in Palestine, vol. i. pp. 522-4, 3d_ed., 1867) to be the singular fruit called by the Arabs ’Osher, produced by the Asclepias gigantea or procera of botanists. What in Cali- fornia are known as “flea seeds” are oak-galls made by a

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7 Zoologist, xix., 1861, pp. 7330-3.

8 Jahresber. des Vereins f. Naturk. zu Zwickau, 1871, p.

® American Entomologist, i., 1868, p. 103.

10 Proc. Entom. Soc. of London for the year 1873, p. xv.

11 According to: Dr Adler, alternation of generations takes place be- tween WV. lenticularis and Spathegaster baccarum (see E. A. Ormerod, Entomologist, xi. p. 34).

Be. Westwood, Introd. to the Mod. Classif. of Insects, ti., 1840, p. }

_ 78 For figures and descriptions of insect and gall, see Entomologist, IV.) Da l/s evil pe 24 ixet pap oi mexienroemliale

14 Scottish Naturalist, i., 1871, p. 116, &e.

4 3 Vinen, Journ. de Pharm. et de Chim., xxx., 1856, p. 2905

English Ink-Galls," Pharm. Journ., 2d ser., iv. p. 520.

16 See Pereira, Materia Medica, vol. ii. pt. i. p. 347; Pharm. Journ., 1st ser., vol. viii. pp. 422-4.

GALLS

species of Cynips; in August they become detached from the leaves that bear them, and are caused to jump by tlie spasmodic movements of the grub within the thin-walled gall-cavity.?

Fia. 1.—a, Aleppo " blue" gall; 8, ditto in section, showing central cavity for grub; c, Aleppo "white" gall, perforated by insect; @, the same in section (natural size).

Common gall-nuts, nut-galls, or oak-galls, the Aleppo, Turkey, or Levant galls of commerce (German, Galldpfcl, Levantische Gallen; French, MNoix de Galle), are produced on Quercus in- fectoria, a variety of Q. Lusitanica,

Webb, by Cynips (Diplolepis, Latr.) tinctoria, L., or C. galle tinctoriw, Oliv. Aleppo galls (gallce halepenses) are brittle, hard, spherical bodies, —-inch in diameter, ridged and warty on the upper half, and light brown to dark greyish-yellow within. What are termed ‘‘ blue, ” black,” or “green” galls contain the insect; the inferior ‘‘ white” galls, which are lighter coloured, and not so compact, heavy, or astringent, are gathered after its escape (see fig. 1). Less valued are the galls of Tripoli (Taraplus or Tarabulus, whence the name ‘Tarablous galls”). The most esteemed Syrian galls, according to Pereira, are those of Mosul on the Tigris. Other varieties of nut-galls, besides the above mentioned, are employed in Europe for various purposes. Commercial gall-nuts have yielded on analysis from 26 (H. Davy) to 77 (Buchner) per cent. of tannin (see Vinen, Joc. cit.), with gallic and ellagic acids, ligneous fibre, water, and minute quantities of proteids, chlorophyll, resin, free sugar, and, in the cells around the inner shelly chamber, calcium oxalate. Oak-galls are mentioned by Theophrastus, Dioscorides (i. 146), and other ancient writers, including Pliny (Nat. Hist., xvi. 9, 10; xxiv. 5), according to whom they may be produced ‘“‘in a single night.” Their insect origin appears to have been entirely unsuspected until within comparatively recent times, though Pliny, indeed, makes the observation that a kind of gnat is produced in certain excrescences on oak leaves. Bacon describes oak-apples as “an exudation of plants joined with putrefaction.” Pomet? thought that gall-nuts were the fruit of the oak, and a similar opinion obtains among the modern Chinese, who apply to them the term Mu-shih-tszc, or ‘‘ fruits for the foodless.’’ Hippo- crates administered gall-nuts for their astringent properties, and Pliny (Nat. Hist., xxiv. 5) recommends them as a remedy in affections of the gums and uvula, ulcerations of the mouth, and some dozen more complaints. The drug has been used in the treatment of intermittent fevers,4 but appears to be adapted only for their mildest phases.> In India it is given also in chronic diarrhoea, dysentery, gonorrhea, and several other diseases.® In British pharmacy gall-nuts are used in the preparation of the two astringent ointments unguentwm galle and unguentum gallee cum opto, and of the tinctura gall, and also as a source of tannin and of gallic acid (g.v.). They have from very early times been resorted to as a means of staining the hair of a dark colour, and they are the base of the tattooing dye of the Somali women.” On the Continent they are employed in tanning. With respect to the technical appli- cation of gall-nuts, see further BLASTING, vol. iii. p. 808, DYEINe, vol. Vii. p. 579, andInx.

In consequence of the increased consump- tion in dyeing of sumach, myrobalans, and new chemical sub-

1 See R. H. Stretch and ©. D. Gibbes, Proc. California Acad. Nat. Sciences, iv. pp. 265 and 266.

: A Complete History of Drugs (translation), p. 169, Lond., 1748.

F. Porter Smith, Contrib. towards the Mat. Medica… of China,

100, 1871. ; * Cullen, Mat. Med., ii. p. 46, 1789.

3 “4 im Sean eo of India, p. 463, 1868.

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Lond, 3d ed, on arks on Bazaar Medicines of India,

R. F. Burton, First Footsteps in BE, Africa, p. 178, 1856.

stances, the British importations of gall-nuts have on the whole declined considerably.

The quantities and values of galls imported into the United Kingdom in 1877 were as follows :—From Germany, 1968 cwts., £7759 ; Turkey, 6420 ewts., £20,712; Egypt, 1702 ewts., £6244; China, 11,748 ewts., £32,715; British India (Bombay and Scinde), 2181 cwts., £2230; other countries, 2411 cwts., £7176; total, 26,425 cwts., of the value of £76,834, against 25,884 cwts., value £64,704, in 1876.

The gall-making Hymenoptera include, besides the Cyni- pide proper, certain species of the genus Hurytoma (Iso- soma, Walsh) and family Chalcidide, e.g., EH. hordei, the “‘joint-worm” of the United States, which produces galls on the stalks of wheat ;® also various members of the family Z’enthredinide, or saw-flies. The larve of the latter usually vacate their galls to spin their cocoons in the earth, or, as in the case of Athalia abdominalis,

Klg., of the clematis, may emerge from their shelter to feed for some days on the leaves of the gall-bearing plant.

The dipterous gall-formers include the gall-midges, or gall-gnats (Cecidomyide), minute slender-bodied insects, with bodies usually covered with long hairs, and the wings folded over the back. Some of them build cocoons within their galls, others descend to the ground to become pupz. The true willow-galls are the work either of these or of saw- flies. Their galls are to be met with on a great variety of plants of widely distinct genera, e.g., the ash, maple, horn- beam, oak,° grape-vine,!° alder, gooseberry, blackberry, pine, juniper, thistle, fennel, meadowsweet,!! common cabbage, and cereals. In the northern United States, in May, “legions of these delicate minute flies fill the air at twilight, hovering over wheat-fields and shrubbery. A strong north- west wind, at such times, is of incalculable value to the farmer.”!2 Other gall-making dipterous flies are members of the family 7’rypetide, which disfigure the seed-heads of plants, and of the family Mycetophilide, such as the species Sciara talicola,® Léw, the cause of the oblong or rounded green and red galls of the young shoots and leaves of the lime.

Galls are formed also by hemipterous and homopterous insects of the families Zingide, Psyllidw, Coccidw, and Aplude. Coccus pinicorticis causes the growth of patches of white flocculent and downy matter on the smooth bark of young trees of the white pine in America.4 The galls of examples of the last family are common objects on lime- leaves, and on the petioles of the poplar. An American Aphid of the genus Pemphigus produces black, ragged, leathery, and cup-shaped excrescences on the young branches of the hickory.

The Chinese galls of commerce (Woo-pet-tsze) are stated to be produced by Aphis Chinensis, Bell, on Rhus semialata, Murr. (R. Bucki-amela, Roxb.), an Anacardiaceous tree indigenous to N. India, China, and Japan. They are hollow, brittle, irregularly pyriform, tuberculated or branched vesicles, with thin walls, covered externally with a grey down, and internally with a white chalk-like matter, and insect-remains (see fig. 2). The escape of the insect takes place on the spontaneous bursting of the walls of the vesicle,

probably when, after viviparous (thelytokous) reproduction for several generations, male winged insects are developed. The galls

8 A. 8. Packard, jun., Guide to the Study of Insects, p. 205, Salem,

1870.

® On the Cecidomyids of Quercus Cerris, see Fitch, Entomologist, xi. p. 14,

10 See, on Cecidomyia oenephila, Von Haimhoffen, Verhandl. d. zoolog.-bot. Ges. in Wien, xxv., 801-10.

1 See Entomologist's Month. Mag., iv., 1868, p. 288; and for figure and description, Entomologist, xi. p. 18.

2 A. 8. Packard, jun., Our Common Insects, p. 208, Salem, U.S., 1873. On the Hessian fly, Cecidomyia destructor, Say, the May brood of which produces swellings immediately above the joints of barley attacked by it, see Asa Fitch, The Hessian Fly, Albany, 1847, re- printed from Trans. New York State Agric. Soc., vol. vi.

18 J, Winnertz, Beitrag zu einer Monographie der Sciarinen, p. 164, Vienna, 1867.

14 Asa Fitch, First and Second Rep. on the Noxious. . of the State of New York, p. 167, Albany, 1856.

. « Insects

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are gathered before the frosts set in, and are exposed to steam to kill the insects.* : é :

Chinese galls examined by Viedt® yielded 72 per cent. of tannin, and less mucilage than Aleppo galls. Several other varieties of galls are produced by Aphides on species of Pistacia.

M. J. Lichtenstein has established the fact that from the egg of the Aphis of Pistachio galls, Anopleura lentisci, is hatched an apterous insect (the gall-founder), which gives birth to young Aphides (emigrants), and that these, having acquired wings, fly to the roots of certain grasses (Bromus sterilis and Hordeum vulgare), and by budding underground give rise to several generations of

Fia. 2.—a, Chinese gali (half natural size), 0, ditto, broken, showing thin-walled cavity; c, Japanese gall (natural size).

apterous insects, whence finally comes a winged brood (the pupi- fera). These last issuing from the ground fly to the Pistachio, and on it deposit their pupe. From the pu e, again, are developed sexual individuals, the females of which lay fecundated eggs pro- ductive of gall-founders, thus reeommencing the biological cycle (see Compt. Rend., Nov. 18, 1878, p. 782, quoted in Ann. and Mag. Nat. Hist., 1879, p. 174).

Of other insects which have been recognized as gall- makers there are, among the Coleoptera, certain Curculionids (zgall-weevils), and species of the exotic Sagridew and Lamiade, and an American beetle, Saperda inornata (Cerambycide), which forms the pseudo-galls of Salix lougifolia and Populus angulata, or cottouwood. Among the Lepidoptera are gall-forming species belonging to the Tineide, Lgeriide, Tortricide, and Pterophoride. The larva of a New Zealand moth, Morova subfasciata, Walk. (Cacoécia gallicolens), of the family Drepanulide, causes the stem of a creeping plant, on the pith of which it apparently subsists, to swell up into a fusiform gall.3

Mite-galls, or acarocecidia, are abnormal growths of the leaves of plants, produced by microscopic Acaridea of the genus Phytoptus (gall-mites), and consist of little tufts of hairs, or of thickened portions of the leaves, usually most hypertrophied on the upper surface, so that the lower is drawn up into the interior, producing a bursiform cavity. Mite-galls occur onthe sycamore, pear, plum, ash, alder, vine, mulberry, and many other plants; and formerly, e.g., the gall known as Hrineum quercinum, on.the leaves of Quercus Cerris, were taken for cryptogamic structures. The lime-leaf “nail-galls” of Phytoptus tilie closely resemble the “trumpet- galls” formed on American

vines by a species of Cecidomyia.4 Certain minute Nematoid worms, as Anguillula scandens, which infests the ears of wheat, also give rise to galls.

Besides the larva of the gall-maker, or the householder, galls usually contain inquilines or lodgers, the larvae of what

1 See E. Doubleday, Pharm. Jowrn., 1st ser., vol. vii. p. 810; and Pereira, 70., vol. iii. p. 377.

2 Dingler's Polyt. Journ., ccxvi. p. 453; cf. supra Gatic Acrp.

8 For figure and description see Zoology of the Erebus and Terror, ii, pp. 46, 47, 1844-75.

- On the mite-galls and their makers, see F. Liw, ‘‘ Beitrage zur Naturgesch. der Gallmilben (Phytoptus, Duj.),” Verhandl. d. 200109.-bot. Ges. in Wien, xxiv., 1874, pp. 2-16, with plate ; and “‘ Ueber Milbengallen (Acarocecidien) der Wiener-Gegend,” 72., pp. 495-508 ; Andrew Murray, Economic Entomology, Aptera, pp. 331-374, 1876 ; and F, A. W. Thomas, Aeltere und neue Beobachtungen iiber Phytopto- Cecidien, Halle, 1877.

are termed guest-flies or cuckoo-flies. Thus the galls of Cynips and its allies are inhabited by. members of other cynipideous genera, asSynergus, Amblynotus, and Synophrus; and the pine-cone-like gall of Salix strobilotdes, as Walsh has shown,° is made by a large species of Cecidomyia, which inhabits the heart of the mass, the numerous smaller ceci- domyidous larvee in its outer part being mere inquilines, In niany instances the lodgers are not of the same order of insects as the gall-makers. Some saw-flies, for example, are inquilinous in the galls of gall-gnats, and some gall-gnats in the galls of saw-flies. Again, galls may afford harbour to insects which are not essentially gall-feeders, as in the case of the Curculio beetle Conotrachelius nenuphar, Hbst., of which one brood eats the fleshy part of the plum and peach, and another lives in the “black knot” of the plum-tree, re- garded by Walsh as probably a true cecidomyidous gall. The same authority (loc. ct., p. 550) mentions a willow-gall which provides no

less than sixteen insects with food and pro- tection ; these are preyed upon by about eight others, so that altogether some twenty-four insects, representing eight orders, ate dependent for their existence on what to the com- mon observer appears to be nothing but “an unmeaning mass of leaves.” Among the numerous insects parasitic on the inhabitants of galls are hymenopterous flies of the family Proctotrypide, and of the family Chalcidide, e.g., Callimome regius, the larva of which preys on the larvee of both Cynips glutinosa and its lodger Synergus facialis. The oak-apple often contains the larve of Braconide and Ichneumonide, which Von Schlechtendal (loc. sup. cit., p. 33) considers to be parasites not on the owner of the gall, Audricus termin- alts, but on inquilinous Zortricide. Birds are to be in- cluded among the enemies of gall-insects. Oak-galls, for example, are broken open by the titmouse in order to obtain the grub within, and the “button-galls” of Meuroterus numismatis, Oliv., are eaten by pheasants,

On galls and their makers and inhabitants see further—J. T. C. Ratzeburg, Die Forst-Insecten, Th. iii. pp. 53 sq., Berlin, 1844; T. W. Harris, Insects injurious to Vegetation, Boston, U.S., 2d ed., 1852; C. L. Koch, Die Pflanzenliiuse Aphiden, Nuremberg, 1854; T. Hartig, Die Familien der Blattwespen und Holzwespen, Berlin, 1860; Walsh, ‘‘ On the Insects, Coleopterous, Hymenopterous, and Dip- terous, inhabiting the Galls of certain species of Willow,” Proc. Ent. Soe. Philadelphia, iii., 1863-4, pp. 548-644, and vi., 1866-7, pp. 228-288; T. A. Marshall, ‘‘ On some British Cynipide,” Ht. Month. Mag., iv. pp. 6-8, &c.; H. W. Kidd and Albert Miiller, ‘© A List of Gall-Bearing British Plants,” 7d., v. pp. 118 and 216 ; G. L. Mayr, Die mitteleuropiischen Eichengallen in Wort und Bild, Vienna, 1870-71, and the translation of that work, with notes, in the Entomologist, vols. vii. sq.; also, by the same author, ‘‘ Die Ein- miethler der mitteleuropaischen Eichengallen,” Verhandl.d. zoolog.- bot. Ges. in Wien, xxii. pp. 669-726; and ‘ Die europaischen Torymiden,” 7b., xxiv. pp. 58-142 (abstracted in Cistwla Entomo- logica, i., Lond., 1869-76); F. Low, ‘‘ Beitriige zur Kenntuiss der Gallmiicken,” 2d., pp. 148-162, and 321-328; J. E. von Bergen- stamm and P. Low, ‘‘ Synopsis Cecidomyidarum,” 7b., xxvi. pp. 1-104; Perris, Ann. Soe. Entom. de France, 4th ser., vol. x. pp. 176-185; R. Osten-Sacken, ‘‘On the North American Cecidomyide,” Smithsonian Miscellaneous Collections, vol. vi., 1867, p. 173; E. L. Taschenberg,

Entomologie fiir Gartner wnd Gartenfreunden, Leipsic, 1871; J. W. H. Traill, “Scottish Galls,” Scottish Natu- ralist, i., 1871, pp. 128, &c.; Albert Miiller, ‘‘ British Gall Insects,” The Entomologist’s Annual for 1872, pp. 1-22; B. Altum, Forst- zoologie, iii., ‘ Insecten,” pp. 250 sg., Berlin, 1874; J. H. Kalten- bach, Die Planzen Feinde aus der Classe der Insecten, Stuttg., 1874; A. d’Arbois de Jubainville and J. Vesque, Les Maladies des Plantes Cultivées, pp. 98-105, Paris, 1878. (F. H. B.)

GALLUPPI, Pasquate (1770-1846), a distinguished Italian philosopher, was born on 2d April 1770, at Tropea, in Calabria. He was of good family, and after completing his education at the academy of Tropea and the university of Naples he entered the public service, and was for many years employed in the office of the administration of finances. Altogether apart from academic influences he pursued his favourite studies, and it was not till he had reached the age

5 Proc. Entomol. Soc. Philadelphia, iii., 1864, p. 549.

_ Was made prefect of Egypt. afterwards brought him into disgrace with Augustus, and

_ cruelty, he put an end to his _ his sword, in the year 26 Bc. | Teputation among

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of sixty, and had become widely known by his writings on philosophy, that he was called to a chair in the university of Naples. This chair he held till his death in November 1846. Galluppi’s first work was an essay on analysis and synthesis (Swl/’ Analisa e sulla Sintest) published in 1807. This was followed by the important Saggio filosofico sulla critica della conoscenza, in 6 volumes, published from 1819 to 1832. In the Lettere filosofiche sulle vicende della

Jilosofia relativamente ai principit delle conoscenze humana,

da Cartesio sino a Kant, 1827, by which, through the trans- lation into French (by M. Peisse, 1844), he is best known to foreigners, Galluppi traces his own philosophical de- velopment from the empiricism of the 18th century writers through the Kantian criticism to his final speculative view, one in many respects resembling the doctrines of the Scotch school as amended by Hamilton. His systematic work, Hlementi di filosofia (4 vols, 1832), was long used as a text- book for instruction in the Italian colleges. Of other writings may be mentioned the Lezioni di logica e di metafisica (1832-3, 5 vols., 1842); the Filosofia della Volonta (3 vols., 1832-1842, incomplete); and the Storia della Filosofia (1842), of which only the first volume was published. Galluppi, though in many respects Kantian, can hardly be said to have taken up fully the speculative significance of thle Critique of Pure Reason. He accepts the

Kantian demonstration of the necessary unity of conscious- ness as the indispensable factor in knowledge, regards our

knowledge of the ego as knowledge of substance, maintains that in external perception, or, as he puts it, in sensation, we are directly cognizant of the real thing, and holds that the existence of the unconditioned is given in knowledge as the necessary correlate of the conditioned, but rejects en- tirely the a prior' element which is the distinguishing characteristic of the Kantian doctrine of cognition, All Judgments, according to him, are ultimately identical—a relic of the empiricism of Condillac which ig totally irre- coucilable with the fundamental principles of his philosophy. On the other hand, Galluppi exaggerates the place and im- portance of the moral reason ; with Kant he finds objective trath in the ideas of desert and duty, and admits that ethical judgments are a priori, without endeavouring to explain, in accordance with his theoretical views, how such judgments are at all possible.

A good view of Galluppi's place in Italian philosophy is given in Ferri, Essai sur U'Histoire de la Phil. en Italic au XIXme Siecle, vol. i., Paris, 1869. See also V. Botta, in Ueberweg's History of Phil. (Eng. transl., vol. ii., appendix ii.); Prof. Barzellotti, "' Philo- sophy in Italy," in Mind, October 1878.

GALLUS, C. Cornetius, a Roman poet, orator, and politician, was born of humble parents at Forum Julii (Fréjus), in Gaul, about the year 66 Bc. At an early age he removed to Rome, where he was taught by the same master as Virgil and Varius. In political life he espoused the cause of Octavianus, and as a reward for his services His conduct in this position

dreading the exposure of his arrogance, extortion, and life by throwing himself on Gallus enjoyed a high his contemporaries as a man of intellect, He associated on terms of equality with Virgil, Ovid, Varius, Asinius Pollio, and others, and on account of his

four books of elegies Ovid claimed for him the first place _ among the elegiac poets of Rome, | was hardly inferior to his renown as a poet; but as not

His fame as an orator

a fragment of his composition has descended to our times, we have no means of judging the worth of his literary pretensions, and have to content ourselves with the some- what partial estimate of his personal friends,

See Ch. C. Volker, Commentatio de C. Galli Vita e Scripts, part 1,. Bonn, 1840 , part ii,. Elberfeld, 1844,

Jrom the Levant, the Life

GALT, Joun (1779-1839), a Scottish novelist, was born at Irvine, in Ayrshire, on May 2, 1779. He received his early education at Irvine and Greenock, and read largely from one of the public libraries while serving as a clerk in a mercantile office. His first compositions appeared in the Greenock Advertiser and the Scots Magazine. In 1804 he went to settle in London, where he continued to work at a poem on the Battle of Largs, which was published anony- mously. After unsuccessful attempts to succeed in business, Galt left for the Continent, and met Byron and Sir John Hobhonse at Gibraltar, with whom he had a tour in the Mediterranean. He remained abroad for three years, and then returned to London. Hig early

works are the Life and Administration of Wolsey, Voyages and Travels, Letters of Benjamin West, Historical Pictures, the Wandering Jew, and a volume of dramas ; but he first showed his real power in The A yrshire Legatees, which appeared in Blackwood's Magazne in 1820. This was followed in 1821 by his masterpiece—7he Annals of the Parish ; and, at short intervals, Sir Andrew Wylie, The Entail, The Steam-Boat, and The Provost were published. These are all in his happiest inanner, aud are unsurpassed as Studies of Scottish character. His next works were Ringan Gilhaize, a story of the Covenanters 3 The Spaewife, which relates to the times of James I. of Scotland ; Rothelan, a novel founded on the reign of Edward ITI. 3 Lhe Omen, which was favourably criticized by Sir Walter Scott; and Lhe Last of the Lairds, another picture of Scottish life. In 1826 he visited America for the second time, in con- nexion with the establishment of the Canada Company—an undertaking which involved him in great difficulties, and ultimately proved disastrous to his worldly prospects. It is pleasant to remember that, although Galt's connexion with Canada was unfortuate for himself, his youngest son, Sir Alexander Galt, has had a distinguished career there, and was, for some time, finance minister of the colony. In 1827 Galt founded Guelph in Upper Canada, passing on his way the township of Galt on the Grand River, named after him by the Hon. William Dixon. In 1829 he re- turned to England commercially a ruined man, and devoted himself with great ardour to literary pursuits, of which the first fruit was Lawrie Todd—one of his best novels. Then came Southennan, a tale of Scottish life in the times of Queen Mary. In 1830 he was appointed editor of the Courter newspaper—a post he soon relinquished. Tlis untiring industry was seen in the publication, in rapid suc- cession, of a Life of Byron, Lives af the Players, Bogle Corbet, Stanley Buxton, The Member, The Radical, Eben Erskine, The Stolen Child, his Autobiography, and a collec- tion of tales entitled Stories of the Study. In 1834 appeared his Literary Life and Miscellanies, dedicated by permission to William IV., who sent the author a present of £200. As soon as this work was published Galt retired to Greenock, where he lingered on in bad health till his death on the 11th of April 1839.

Galt, like almost all voluminous writers, was unequal. His masterpieces are The Ayrshire Legatees, The Annals of the Parish, Sir Andrew Wylie, The Entail, The Provost, and Lawrie Todd. The Ayrshire Legatees gives, in the

form of a number of exceedingly diverting letters, the adventures of the Rev. Dr Pringle and his family in Londou. The letters are made the excuse for endless tea- parties and meetings of kirk session in the rural parish of Garnock. The Annals of the Parish are told by the Rev. Micah Balwhidder, Galt's finest character. This work is a splendid picture of the old-fashioned Scottish pastor and the life of a country parish; and, in rich humour, genuine pathos, and truth to nature, it is unsurpassed even by Scott. Like his other Scotch novels, it is a fine specimen of the homely graces of the Scottish dialect, and preserves much

exceedingly

vigorous Doric phraseology fast passing out of use even 10 country districts. In this novel Mr Galt used, for the first time, the term " Utilitarian," which has since become so intimately associated with the doctrines of John Stuart Mill and his followers (see Annals of the Parish, chap. XXXV., and a note by Mr Millin Utilitarianism, chap. ii.). In Sr Andrew Wyle the hero entered London as a poor lad, but achieved remarkable success by his shrewd business quali- ties. 'The character is somewhat exaggerated, but exces- sively amusing. Zhe Entail was read thrice by Byron and Scott, and is the best of Galt's longer novels. Leddy Grippy is a wonderful creation, and was considered by Byron equal to any female character in literature since Shakespeare's time. Zhe Provost, in which Provost Pawkie tells his own story, portrays inimitably the jobbery, bicker- ings, and selfseeking of municipal dignitaries in a quaint Scottish burgh. In Lawrie Todd Galt, by giving us the Seot in America, has accomplished a feat which Sir Walter never attempted. This novel exhibits more variety of style and a greater love of nature than his other books. The life of a settler is depicted with unerring pencil, and with an enthusiasm and imaginative power much more poetical than any of the author's professed poems.

Calt's humour is broader aud more contagious than Scott's ; and his pictures of the sleepy life of old Scottish towns are unrivalled in literature. He is generally called an imitator of Scott; but the Annals of the Parish existed in MS. before Waverley was published. As Galt is pre- eminently an illustrator

of west-country Scottish life, his range may be said to be narrower than Scott's ; but within it he is supreme. It would be difficult to overrate the immense services which Galt has rendered alike to the history of the manners and to the history of the language of the Scottish people.

For farther information about Galt, see his Autobiography; The Literary Life of John Galt; and a biographical memoir by his friend the late Dr Moir of Musselburgh, prefixed to The Annals of the Parish. (T. GI.

GALOIS, Evariste (1811-1832), an eminently original and profound French mathematician, born 26th October 1811, killed in a duel May 1832. A necrological notice by his friend M. Auguste Chevalier appeared in the Mevue Encyclopédique, September 1832, p. 744; and his collected works are published, Lionville, t. xi. (1846), pp. 381-444, about fifty of these pages being occupied by researches on the resolubility of algebraic equations by radicals. But these researches, crowning as it were the previous labours of Lagrange, Gauss, and Abel, have in a signal manner advanced the theory, and it is not too much to say that they are the foundation of all that has since been done, or is doing, in the subject. The fundamental notion consists in the establishment of a group of permutations of the roots of an equation, such that every function of the roots invariable by the substitutions of the group is rationally known, and reciprocally that every rationally determinable function of the roots is invariable by the substitutions of the groups; some further explanation of the theorem, and in connexion with it an explanation of the notion of an adjoint radical is given under Equation, No. 32. As part of the theory (but the investigation has a very high independent value as regards the Theory of Numbers, to which it properly belongs), Galois introduces the notion of the imaginary roots of an irreducible congruence of a degree superior to unity; @.¢., such a congruence, F(x) =0 (mod. a prime number p), has no integer root; but what is done is to introduce a quantity 2 subjected to the condition of verify- ing the congruence in question, F(z)=1 (mod. p), which quantity 7 is an imagiuary of an entirely new kind, occupy-

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GALUPPI, BatpassarreE (1706-1785), a musical com- poser, was born in 1706, in the island of Burano, near Venice. His father, a barber by

profession, was a musical amateur, and prepared his son for the music school of Venice called Conservatorio degl' Incurabili, where the great Lotti became his master. His first opera, written at the age of sixteen, wasa failure ; but his comic opera named Dorinda, produced seven years later, was a great success, and laid the founda- tion of the youthful composer's fame. He was a prolific writer, and no less than seventy of his operas are enumer- ated, none of which, however, have kept the stage. Some of these were written for London, where Galuppi resided between 1741 and 1744, but his masterpiece in tragic opera was produced at St Petersburg in 1766. The composer had been induced by liberal offers to accept a position as imperial conductor of music, and to leave his native country for Russia, where he lived in high honour at the court of the czar, and is said to have in return done much for the progress of his art in Russia by introducing amongst other things Italian church-music. In 1768 he left Russia, and resumed his position as organist of the cathedral of St Mark at Venice, to which he had been appointed in 1762, and which had been kept open for him during his absence. He died in 1785, and left 50,000 lire to the poor of Venice. His best comic opera bears the title J2 mondo della luna. The libraries of Dresden and Vienna preserve several of his operas in MS. At Vienna also some of his works of sacred music may be found. Others are in Paris and Rome.

GALVANI, Luier (1737-1798), an eminent Italian physiologist, after whom galvanism received its nanle, was born at Bologna, September 9, 1737. It was his wish in early life to enter the church, but by his parents he was educated for a medical career. At the university of Bologna, in which city he practised, he was in 1762 appointed public lecturer in anatomy, and soon gained repute asa skilled though not eloquent teacher, and, chiefly from his researches on the organs of hearing and genito-urinary tract of birds, as a comparative anatomist. His celebrated theory of animal electricity he enunciated in a treatise, "' De viribus electricitatis in motu musculari commentarius," published in the 8th volume of the memoirs of the Institute of Sciences at Bologna in 1791, and separately at Modena in the follow- ing year, and elsewhere subsequently. The statement has frequently been repeated that, in 1786, Galvani had skinned some frogs to make broth for his wife, who was in delicate health ; that the leg of one of these, on being accidentally touched by a scalpel which had lain near an electrical machine,

was thrown into violent convulsions ; and that it was thus that his attention was first directed to the relations of animal functions to electricity. From documents in the possession of the Institute of Bologna, however, it appears that twenty years previous to the publication of his Com- mentary Galvani was already engaged in investigations as to the action of electricity upon the muscles of frogs. The observation that the suspension of certain of these animals on an iron railing by copper hooks caused twitching in the muscles of their legs led him to the invention of his metallic are, the first experiment with which is described in the third part of the Commentary, wherein it is registered September 20, 1786. The are he constructed of two different metals, which, placed in contact the one with a nerve and the other with a muscle of a frog, caused contraction of the latter. In Galvani's view the motions of the muscle were the' result of the union, by means of the metallic are, of its exterior or negative electrical charge with positive electricity which proceeded along the nerve from its inner substance. Volta, on the other hand, attributed them solely to the effect of electricity having its source in the junction of the two dis

ing in the theory of numbers a position analogous to that ; similar metals of the are, and regarded the nerve and muscle

of — J =1 in algebra.

simply as conductors. Galvani in one of his memoirs

recorded the observation that muscular contractions may be caused in a prepared frog merely by bending back the legs and bringing them into contact with the lumbar nerves, as also when a nerve is touched at two different points with a morsel of muscle taken from a living frog, phenomena not satisfactorily explicable on the theories of Volta; but after the death of the Bologna professor very little was heard of animal electricity till, in 1827, the study of the subject was resumed by Nobili. On Galvani's refusal, from religious scruples, to take the oath of allegiance to the Cisalpine re- public on its establishment, he was removed from his pro- fessorship. Deprived thus of the means of livelihood, he retired to the house of his brother Giacomo, where he soon fell into a feverish decline. The

republican Government, in consideration of his great scientific fame, eventually, but too late, determined to reinstate him in his chair at the university of Bologna. He died December 4, 1798. A quarto edition of his works was published at Bologna in 1841-42, by the Academy of Sciences of the Institute of that city, under the title Opere edite ed inedite del professore Luigi Galvant.

See Volta, ‘‘An Account of some Discoveries made by Mr Gal- vani, of Bologna,” in Phil. Trans., 1793, pp. 10-44; J. L. Alibert, Elogio Storico di Luigi Galvani, Traduzione dal Francese, Bolog., 1802, fol.; Arago, in “‘ Alexandre Volta,” (uvres Completes, ed. Barral, t. i. p. 242, 1854; and H. M. Noad, Manual of Electricity, chap. x.; also ELECTRICITY, vol. viii. p. 9, col. 1, and VourTa.

GALVANISM. See Exucrricrry and Puystobocy.

GALVANOMETER, an instrument used for indicating or

measuring currents of electricity, wherein advantage is taken

of the force exerted by such currents on movable magnets | : . We 7 S _have to be wound. After the wire has reached a certain

for indicating merely, without measuring, it is sometimes | fineness the proportion of space occupied by insulating 6 y 7 | Imatter is so great that further reduction of the section of

in their neighbourhood.!_ When a galvanometer is used called a galvanoscope. If we consider only such instruments as have come into actual use, this definition is strict enough for practical purposes. If we were to consider all the instruments that have been or might be made, some would come under the definition whose resemblance to the modern galvanometer would not at first sight be apparent. Such, for instance, is the electromagnetic balance of Becquerel,? which consists of two bar magnets hung from the scale pans of a delicate balance each in the axis of a cylindrical bobbin of wire—one being over, the other under its corresponding bobbin (see fig. 1). The north poles of both magnets hang

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Fig. 1.

downwards, and the current to be measured is sent round the bobbin, so that each of the magnets is repelled. Weights are put into the left-hand scale until equilibrium in the original position is restored, The weight thus added 18 proportional to the current strength, so long as the Induced magnetism of the magnets can be neglected. This instrument has fallen into disuse.

In @ complete galvanometer of modern construction the following parts may occur :—(1) the coil or multiplier, (2)

1 oa For another definition see the article ELECTROMETER.

or a brief history of the construction of alvanometric apparatus see art. ELxctRicrry, vol. viii, p. 18. ; sey

the needle or movable magnet or magnets, (3) the astatizing apparatus, (4) the deflecting or adjusting magnet, (5) the graduation or reading apparatus, (6) the damping apparatus, (7) accompanying the galvanometer, as a piece of auxiliary apparatus, we may also have a box of shunts. It would be easy to make a more minute enumeration of parts, but the above will serve our present purpose. On the other hand, it is not always that each of the above organs is represented separately ; some may be wanting in certain cases, and the functions of two or more may be combined.

1, The multiplier or coil consists of a ring-shaped channel of elliptical, rectangular, or circular shape—usually the last, the cross section being in general rectangular. Into this is wound, as closely and regularly as possible, a quantity of silk-covered wire. The material chosen for the wire is usually copper, which should be as soft as possible in order to secure high conductivity, White silk is preferred for the insulating covering, on account of its freedom from iron, though this is for most purposes a needless refinement. Great care should be taken that the wire is dry when it is wound, It is usual, in order to secure and render perman- ent the insulation, to steep the whole coil in melted paraffin ; after this has been done, there is little risk of loss of insula- tion, provided the layers have been carefully tested during the winding. The idea of the multiplier in sensitive galvanometers is to bring the greatest number of coils of wire within the least possible distances of the magnet. It is evident, therefore, that the insulating covering should be as thin as is consistent with good insulation; this considera- tion assumes great importance when coils of very fine wire

the wire simply increases the resistance without enabling us to pack more turnsinto the same space. In general the section of the wire ought to be chosen with reference to the use which the galvanometer is intended to serve. The following ideal case will enable the reader to comprehend the principle which regulates the clioice of multiplier under given circumstances. Suppose the dimensions of the channel, and the whole space which the wire is to fill, to be given, and the whole external resistance also given, then it may be shown that the section of the wire? ought to be chosen so that the resistance of the galvanometer shall be equal to the external resistance. The case contemplated here is that where we have a simple external circuit; many cases can be reduced to this at once, and we shall consider below a more complicated case of considerable practical importance. Theoretically the section of the wire ought to vary with the distance of the winding from the axis of the coil, The law is that the diameter of the wire in each layer ought to be proportional to the linear dimension of that layer. This is sometimes roughly carried out in practice by winding the outer layers of thicker wire than the inner.4 The proper form of the longitudinal section of the coil depends on the use for which the instrument is destined, aud will be more properly discussed when we describe particular instruments. In a certain class of galvanometers called

differential, the wire on the coil is wound double, so that two currents can be sent through side by side in the same or in opposite directions.

2. The needle consists of a piece of magnetized steel,

3 In this and all that follows the silk covering is either neglected or is supposed to vary in thickness as the diameter of the wire.

‘The cross section of the coil is not a matter of indifference in sensitive galvanometers ; but the question is hardly of sufficient importance to need discussion here. Information on the subject will be found in W. Weber’s Electrodynamische Maasbestimmungen, Thi. ii; H. Weber, Pogg. Ann., 1869; Maxwell’s Electricity and Magnetism, vol. ii. secs. 716 sgg.: Jenkin’s Electricity and Mag- netism, cap. xiii. sec. 9.

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which should be as hard as possible. Watch-spring steel is sometimes used, and file steel is recommended by some authorities. The hardness is important for two reasons,— in the first place, to ensure that the permanent magnetism of the needle shall not alter. This is of small importance where permanent deflections are to be observed, provided we can be sure that the direction of the magnetic axis does not alter. In the second place the induced magnetism is less in hard than in soft steel, though not so much less as some writers would lead us to suppose. The best way of avoiding induced magnetism would be to make the needle spherical in form; the advantage thus gained, however, would in most cases be counterbalanced by other defects.

The form of the needle has been much varied by different constructors. In the earlier instruments they were made very long, and were suspended like compass needles by means of a jewelled cup playing on a steel point. We have heard on good authority that for some purposes, such as mounting tangent galvanometer needles, this method of suspension, if carefully carried out, really answers very well. By far the most usual mode of suspension, however, is by means of a raw silk fibre, or by a bundle of such

fibres. Weber in- troduced the use of heavy magnets whose moment of inertia and time of oscillation were great. For many purposes such needles have great advantages—where, for instance, the time of oscillation, the logarithmic decrement, or the extent of swing of the needle has to be observed. Where, on the contrary, the galvanometer is to be used merely as an indicator, particularly in detecting transient currents, a light needle of small moment of inertia should be used. Continental constructors, no doubt unduly influenced by a reverence for Weber's methods, have failed to realize this ; and we have seen few, if indeed any, instruments by them really well suited for measuring resistances with the Wheatstone's bridge. This principle has been carried farthest in the galvanometers of Sir William Thomson, in some of which the needle with all its appurtenances weighs little over a grain.

In some galvanometers (e.g., certain telegraphic reading instruments) the needle is movable about a horizontal axis, and is weighted so as to be vertical in its undisturbed posi- tion. Owing to the friction at the points where the axis is supported, this method of suspension is useless for sensi- tive instruments.

3. When, as is usual, the galvanometer magnet is mov- able in a horizontal plane, the force which balances the electromagnetic force of the current in the multiplier is the horizontal component of the earth's magnetic force. Each of these forces is proportional to the magnetic moment of the galvanometer needle, and consequently the ratio of the forces, on which depends the magnitude of the deflexion of the needle, is independent of the magnetic moment of the needle. We cannot therefore increase the sensitiveness of the galvanometer by simply increasing the magnetic moment of the needle. The action of the earth can, how- ever, be counteracted, and the needle rendered more or less astatic in one or other of two ways.

One way is to fix on the same axis of suspension two parallel magnets, whose magnetic moments are as nearly as possible equal, and which are turned opposite ways. The whole system is suspended so that one of the magnets swings inside the multiplier and the other over it, as in fig. 2. In more modern instruments, such as those constructed by Messrs Elliot

Brothers, the multiplier consists of two equal coils placed one vertically over the other, each enclosing one of the magnets of the astatic system, asin fig. 3. Another method is to place a magnet, or a system of magnets, in the neighbourhood of the galvanometer, so as to counteract the earth's force. In general, one magnet will suffice, placed vertically under or over the galvanometer, in the magnetic

meridian, its north pole of course pointing north. For convenience this magnet should be mounted on a vertical graduated rod, with a rough and a fine adjustment.

In adjusting the sensi- tiveness of the galvano- meter, it will be useful to recollect that the couple tending to bring the needle back to its posi- tion of equilibrium varies directly as the square of the number of oscilla- tions which the needle executes in a given time when no current is pass- ing through the multi- plier! As the astatizing magnet is brought nearer and nearer to the galvanometer, the oscillations of the needle will be seen to become slower and slower, till at last the equilibrium becomes unstable, and the needle turns round through 180°; after which, on causing the magnet to approach still farther, the rapidity of oscillation increases. If the damping be very strong, and the mirror very light, an intermediate stage called the aperiodic state is passed through.

4, The normal position of the magnetic axis of the needle, when no current is passing, is parallel to the windings of the multiplier. It is particularly neces- sary that it should be in this position when the galvanometer is being used as a measuring instrument, and it is advisable in any case, since this is the position in which for a given current the electromagnetic action on the needle is greatest. The final adjustment might of course be made by moving the multi- plier, but it is far more convenient to move the needle, a magnet being used for the purpose. Sometimes the astatiz- ing magnet is used, but it is better to have a much weaker magnet for the fine adjustment, suspended like the astatizer on a vertical axis, having a vertical motion anda motion of rotation. It is better still to use a magnet placed with its axis in the axis of the multiplier, so that it can be slid backwards and forwards at pleasure. We have seen two such magnets placed side by side, with their north and south

and their south and north poles together ; this gives a differential adjustment which is very convenient. The main advantage of placing magnets in this way is that we can alter the direction of the lines of force with a minimum effect on the strength of the magnetic field.

5. The graduation or reading apparatus in the older instruments consisted of a pointer or index fixed to the magnet (very often it was the magnet itself), playing over a circular graduation centred as nearly as possible in the axis of rotation of the needle. The mirror method of read- ing which prevails in most modern instruments was origin- ally suggested by Poggendorff, and carried out in practice by Gauss and Weber. A mirror is rigidly attached to the magnet, so that the reflecting face passes as nearly as pos sible through the vertical axis of rotation of the needle. The glass of the mirror should be very thin, otherwise 4 greater or less correction for its thickness will be necessary. In the subjective method of reading, a scale is fixed before the mirror, which is usually plane (it must be well made to

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Fig. 2.

1 This is not exactly true where there is damping: but the rule is sufficient for ordinary purposes. ‘

be of any use), and the image of the scale is observed by means of a telescope fixed over or under the centre of the scale. The scale divisions are seen to pass the wires of the telescope, and if a circular scale be used, whose centre is in the axis of suspension of the mirror, the difference between the numbers on the cross wires in any two positions of the magnet is a measure of twice the deflection of the magnet. A correction is necessary when a straight scaleis used. The reader who has occasion to use the method will find prac- tical instructions, with tables of corrections, in Wiedemann’s Galvanismus, Bd, ii. sec. 181 sqg.; Maxwell’s Electricity and Magnetism, vol. ii. sec. 450 sgg. In the objective method, which is more usually practised in this country, the mirror is concave, and reflects the image of a fixed illumin- ated slit (often furnished with a vertical wire

where greater accuracy is desired) upon a graduated scale. The readings are proportional to double the deflexion of the needle, or to the tangent of the double deflexion, according as the scale is circular or straight.

6. By damping is meant the decrease of the extent of the oscillations of the galvanometer needle arising from the dissipation of energy through the resistance of the air, the action of currents induced in neighbouring metallic circuits, the viscosity of the suspension fibre, and so on. There is always more or less damping owing to the first two causes, and possibly the third; but in many cases, where it is de- sirable that the oscillations should subside very quickly, the damping is purposely increased. In the older instruments the damping arrangement consisted of masses of copper surrounding the magnet. This is carried to the extreme in Wiedemann's tangent galvanometer, where the needle is ring-shaped, and swings in a ring-shaped cavity not much larger than itself, in the heart of a mass of copper. In the dead-beat galvanometers of Sir William Thomson the magnet with its attached mirror is enclosed in a flat cell, in which it can just move freely to the required extent. The damping, due to the pumping of the air backwards and forwards round the edges of the mirror, is so great that the needle swings off to its position of equilibrium, and remains there without oscillating at all. Thesame result is attained in Varley's construction by immersing the needle in a cell filled with liquid.

7. The box of shunts is simply a set of resistances ; generally there are three, —t}th, jth, and ;1,th of the resistance of the multiplier. When it is required to reduce the sensibility of the galvanometer, the terminals of one of these, say the ;,th, are connected with the terminals of the multiplier; we thus have a multiple are in place of the galvanometer, and the current is divided between its branches in the ratio of their conductivities, so that one-hundredth! of the whole current flows through the galvano- meter. By means of such a box as we have described, we can therefore send through the galvanometer the whole of any current, or the tenth, hundredth, or thousandth part. It must not be forgotten that the introduction of the shunt diminishes the whole resistance of the galvanometer circuit. In most cases, however, this is of little moment; where necessary, the alteration may be either compensated? or allowed for.

Sensitive Galvanometers.—In galvanometers of this class everything is disposed so as to bring the greatest possible number of turns of wire into the neighbourhood of the needle, The needle is therefore made as small and compact as possible, and the windings embrace it as closely as pos- sible, the opening in the centre of the coil being reduced to a minimum. The astatic multiplier (fig. 4) is an instru- ment of this kind which was formerly much used. The

‘ See art. ELEctriciry, p. 43.

8 é : ae / ee above case by introducing into the galvanometer circuit Toths, Pyoths, °9°,ths, respectively of the resistance of the multiplier.

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coil is of flat, rectangular shape, with a narrow central opening just large enough to allow one of the magnets of the astatic system =

to swing freely. = The other magnet | swings over a gra- duated circle placed on the top of the coil, and serves also asan index. Some- times a mirror and scale are substituted for the index and graduated circle. The sole on which the coil stands is movable on a fixed piece which can be levelled by means of three screws. A fi=< graduation is often furnished to mea- sure the angle of

rotation of the coil oe

about a vertical Fig. 4.—Astatic multiplier.

axis; this is useful when the galvanometer has to be graduated or corrected for the torsion of the fibre.

In the galvanometers of Sir William Thomson, which are the most sensitive hitherto constructed, the ceutral opening of the coil is circular, being just large enough to allow free play to a small concave mirror a centimetre or so in diameter. Usually the coil is wound in two halves, which can be screwed together with a septum between them, in which is placed the arrangement for suspending the mirror and magnets. In dead-beat instruments the coil is

often wound in a single piece, and the mirror is arranged ina cell,? glazed back and front, and fitted into a tube which slides into the core of the coil.

Fig. 5 represents a very convenient form of Thomson’s

Fig. 5,—Form of Thomsen’s Galvanometer.

galvanometer, the only specimen of its kind we have seen. The peculiarity of its construction consists in the connexion between the scale and the galvanometer, which saves much trouble in adjusting the instrument. It was constructed by Elliot Brothers for the British Association Committee on Electrical Standards. Such a galvanometer as this, pro- vided with a high and low resistance coil, would meet all the wants of most laboratories.

In another form called the marine galvanometer, the mirror is strung on a fibre stretched between two fixed points. In order to keep the needle from being influenced

- This arrangement is that adopted by White of Glasgow in the galvanometers made by him after Sir Wm. Thomson’s pattern.

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by the roliing of the ship, its centre of gravity is carefully adjusted so as to be in the axis of suspension. The mirror is enclosed in a narrow cell which just allows it room to deflect to the required extent, and damps the oscillation sO effectually that the instrument is “dead beat. 1 In order to destroy the directive action of the earth, the inconveni- ence of which in a galvanometer for use on board ship is obvious, the case of this galvanometer is made of thick soft iron, which completely encloses the whole, leaving only a small window for the ingress and egress of the ray of light by means of which the motions of the mirror are read ; a flat horse-shoe magnet placed on the top of the case still farther overpowers the earth’s force and directs the mirror.

All these galvanometers may, of course, be wound double and used differentially. When this is the case, a small auxiliary compensating coil is often used to correct the inequality of the magnetic fields due to the two

sets of windings. This auxiliary coil is usually mounted on a spindle in the axis of the main coil, and can be moved backwards and forwards till a current passing through it and one set of windings in one direction, and through the other set of windings in the other direction, does not sensibly deflect the mirror.

The astatic arrangement described above (p. 51, fig. 4) is often adopted. A galvano- 9 meter of this construction by Elliot Brothers is shown in fig. 6. It may be questioned, how- ever, whether for ordinary purposes the additional sensi- bility thus gained compensates for the increased complexity and cost of the instrument.

Standard Galvanometers.— When galvanometers are iu- tended for measuring currents, there must be some law con- necting the indications of the needle with the strength of the current in the multiplier. It is therefore of great importance that slight variations in the position of the magnet should not introduce large or irregular (incalculable) variations into the indications of the instrument. Accordingly in standard instru- ments the windings are much farther removed from the mag- net than in sensitive galvanometers, and in the best forms the multiplier is so disposed that it produces a uniform field of magnetic force around the needle.

The earliest forms of standard galvanometer were the tangent and sine compasses invented by Pouillet. The first of these consists simply of a single vertical coil of wire, with a magnet suspended at its centre, whose deflexion may be read in any of the various ways already described. If the length of the magnet be very small, the magnetic field in its neighbourhood may be regarded as uniform, and the electromagnetic couple will be propor- tional to cos 6, @ being the deflexion from the plane of the windings. If the windings be arranged so as to be in the magnetic meridian,! the couple due to the earth’s action tending to bring the magnet back to its position of equilibrium will be proportional to sin 6, hence the current strength will be proportional to tan 6.

Fia. 6.—Elliot’s Astatic Galvanometer.

1 This can be done most easily by means of a mirror attached to the multiplier and adjusted so as to be parallel to the windings.

GALVANOMETER

Tf the multiplier be movable about a vertical axis through angles which can be measured in any way, the instrument may be used as a sine compass. The current is applied and the multiplier turned round after the magnet until the axis of the latter is again parallel to the windings. The current strength is now clearly proportional to sin 6, where @ is the deflexion of the multiplier from the mag- netic meridian. When the instrument is used in this way, the needle being always brought into the same position relative to the windings, the uniformity of the magnetic field is a matter of indifference, and there is no necessity for the needle to be short.

Gaugain attempted to improve the tangent galvanometer by suspending the magnet ex- centrically at a point in the {EE} axis of the coil distant from the centre by half the radius of the coil. This, however, is in reality the reverse of an im- provement."

A real advance, however, was made by Helmholtz, who placed two equal parallel and vertical coils, one on each side of the magnet, each at a distance from it equal to half the common radius. In fig. 19, at the end of his second volume, Maxwell gives a diagram of the lines of force due to two equal parallel circular circuits, from which it will be seen that the magnetic field at the centre of such an __ arrangement of currents is very approximately uniform. This approximation may be carried ss still farther by adding a third Fic. 7.—Galvanometer designed

coil parallel to the two others, and equidistant from In some examples of Helm- holtz's galvanometer the wind- ings are arranged on a conical surface, so that the ratio of the radius of each to the distance of its plane from the centre of the magnet shall be 2:1. In reality this is unnecessary, pro- vided the ratio of the depth and breadth of the usual rect- angular channel be properly adjusted (see Maxwell, vol. ii. sec. 713), Fig. 7 represents a galvanometer of the kind described.

by Professor Maxwell.

them, The wire is wound in two parallel

channels cut in a cylindrical block of hard wood, cach an inch broad and an inch deep. The radius of the bottom of each channel is one inch, and the distance between them is half aninch. The cylin- drical perforation in the core of the multiplier is 1 inch in dia- meter—large enough to allow the needle to swing freely without causing irregular air currents, &c. Into the ends of the core are screwed two caps containing a piece of plane parallel glass and a plano-convex lens respectively, the former for subjective, the latter for objective reading. By means of a slit and screw in the stem which supports the instrument, a horizontal bar can be fixed parallel to the axis of the multiplier. On this a deflecting magnet can be mounted, so that the galvanometer can be used as a magnetometer.

Reduction of Galvanometer Indications.—When the position of every layer of wire in the multiplier is known with sufficient accuracy, and the multiplier arranged so as to produce a sensibly uniform field, the electromagnetic action per unit of current can be calculated for every position of the magnet. In this case the galvanometer is an absolute instrument. When we possess one absolute instrument it is easy to evaluate the indications of any other in absolute measure by means of it; we have only to pass the same current through both galvanometers in series and compare the readings. The best way, however, to construct a standard galvano- meter 1s to provide for uniformity of field in the core of the multiplier, and find the resultant electromagnetic force for unit current, or, as it is called, the constant of the instrument, by comparison with a pair of equal standard coils of large diameter (18 in. to 24 in.), These are arranged vertically on the same axis, the distance between them being equal to the mean radius, just as in Helmholtz’s galvanometer. The galvanometer to be tested is placed symmetrically between the

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- See Maxwell, Electricity and Magnetism, vol. ii. secs. 712, 713.

standard coils, the centre of its multiplier being near the centre of the whole arrangement, and the axes of all the coils coincident. A multiple arc is then formed, one branch of which contains the coils and the other the

galvanometer, so that the magnetic actions oppose each other. ‘The resist- ances of the two branches are then adjusted till the gal- vanometer needle gives no indication when a current is sent through the multiple are. The whole arrangement will be understood from fig. 8. If Rand S be the resistances in the branches containing the galvanometer and coils respectively, then the constant of the galvanometer is to that of the coils as R: S; so that when the latter is calculated! the former is known.

The constant of the galvanometer G being known, the value of a current producing a deflexion @ is given in absolute measure by

oe G H being the horizontal component of the earth’s magnetic force.

In many cases it is necessary to correct for the torsion of the sus- pending fibre. The value of this correction is easily found by turning the multiplier? through 90° either way, and observing how far the necdle follows it. The reader will find all necessary details in Maxwell, vol. ii., secs. 452, 742.

In all cases where great accuracy is required it is advisable to gradwate, or, as it is sometimes said, to calzbrate the galvanometer, that is, to compare the electromagnetic couple exerted by the multi- plier when the needle is deflected through an angle @ with that when the needle is parallel to the windings. It is easy to see that this may be done by means of the arrangement described above for finding the constant of a galvanometer. If the object simply is to calibrate the galvanometer without reducing its indications to absolute measure, the standard coils may be replaced by a single coil of sufficient magnetic moment placed in the axis of the multi- plier. Another method of calibration, which is simpler, and in some respects more satisfactory, although possibly more laborious, will be understood from fig. 9. The resistance a is equal to the

Fig. 8.

tan @,

Fig. 9.

resistance of the galvanometer, and they can be rapidly inter- ehanged. By adjusting f the ratio of the currents in the branches of the multiple arc may be varied as we please, and by varying ¢ the current in one of the branches can always be brought to a standard strength, say that which produces unit deflexion of the

galvanometer needle. We can thus, by repeatedly interchanging a and b, compare the deflexions produced by a series of currents whose strengths are given multiples of the standard strength. If the experimenter has two galvanometers at his disposal the interchanges may of course be avoided.

On the Use of the Galvanometer.—We may add a few remarks on the different uses to which a galvanometer may be put.

Detection of Currents.—One of the commonest of all the uses of a galvanometer is to indicate the currents sent through telegraph wires or cables. In the case of submarine cables, where the eurrents are often very feeble, dcad-beat galvanometers of Thomson's or Varley's construction are used.

When a current is to be detected which produces a very sniall or quite insensible permanent deflexion, the following process, called the inethod of multiplication, is sometimes used. The period of oscilla- tion of the needle is first found ; then, the needle being at rest or only swinging through a very small arc, the current is applied ni

1 Sce for such calculations Maxwell, vol. ii., chaps. xiv. and xv.

- Or the piece to which the fibre is attached, if it is not rigidly attached to the multiplier.

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through half the period of oscillation so as to urge the needle in the direction in which it is going, then intermitted for half a period, then applied again, and so on. If a current in the supposed direction really exist, the oscillations of the magnet will gradually increase, until the energy supplied

by the intermittent action of the current is equal to that wasted by the damping of the needle.

It is obvious that this process is more effective the smaller the damping of the needle; it leads to no advantage whatever with a dead-beat instrument.

Resistance Measwring.—In comparing resistances, sensitive gal- vanometers of Sir William Thomson’s construction? are by far the most convenient ; the dead-beat arrangement is essential for rapid work.

If a differential galvanometer of given dimensions be used (see art. ELECTRICITY, p. 44), and if the resistance of the battery is negligible compared with the other resistances used, the wire with which it is wound should be chosen so that its resistance is one- third of the resistance to be measured.4

It is shown in the art. Execrrictty (p. 44) that, in arranging a Wheatstone’s bridge to measure a given resistance, all the arms of the bridge and the battery and galvanometer should have equal resistances. As a rule, all these are not at our disposal. If the resistances of the arms and of the battery are given, and the resist- ance of the galvanometer (of given dimensions) is at our disposal, then the resistance of the galvanometer ought to be equal to that of the multiple are which remains between the terminals of the galvanometer when the battery is discounected from the bridge.5 This may be deduced at once from the expression given in vol. viii. p. 44.

Again, the resistance to be measured and the battery and galva- nometer resistance being given, we may inquire what is the best arrangement of the arms of the bridge.

Differentiating the expression given in vol. viii. p. 44 with respect to y and z, we get

BG—y%2R?=2{y%R+G)R—G(R+B)} 5 BG—y%22R2=y { 2™(R+4B)R —B(R+ G)} g the solution of which is obviously

= , /QR+B) poe, R(R+G)’ R(R+B)’ whence we have s— wh RG-RT a i a RB+Rty) and U=yvBG—

determining the resistances of the disposable arms.

It appears that, when B and G are given, the resistance of the arm opposite to the resistance to be measured ought always to be the geometric mean between B and G.®

In a certain class of observations a needle with large moment of inertia is used. The methods in use are mostly due to Gauss and Weber. For an account of these methods the reader is referred to Maxwell, chap. xvi. He should also consult a paper by Du Bois Reymond in Monatsber. d, Berl. Acad., 1869-70, (G. CH.)

GALVESTON*

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Cra a. , a city and port of entry on the coast of

Texas, United States of North America, situated about 340 miles to the westward of the mouth of the South Pass of the Mississippi River, on the south side of the entrance into Galveston Bay, in 29° 18’ N. lat. and 94° 47’ long. west from Greenwich. It is the principal port and the largest city in the State, is the seat of justice of Galveston County, and is located on the inner shore of Galveston Island, about 2 miles from its most north-easterly point, known as Fort Point. The city therefure faces the main Texas shore, being separated from it by West Bay, lying between the island and the mainland. The principal portion of the county lies on the mainland fronting the two bays above named, its general surface, like that of the island, being low and level, and the soil sandy.

Galveston Island is a low sandy island, about 28 miles long and 14 to 34 miles wide, stretching along the coast of Texas in a north-easterly and south-westerly direction, and forming the gulf coast-line throughout its entire length.

3 See Sir W. Thomson on resistance measurement, Proc. R. S., 1862, p. 318.

4 Schwendler, Phil, Mag., 1872.

§ Heaviside, ibid., 1873.

- This is reprinted here from the work entitled Galveston, by Maj.-Gen. Q. A. Gillmore, U. S. Engineers. New York, Charles Scribner’s Sons, 1879. Copyright, 1879, by A. & C. Black.

5 Id., ibid., 1866.

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Its surface, which has an average height of 4 to 5 feet above tide level, is diversified by a number of freshwater ponds and intersected by several creeks and small bayous. The beach, on the Gulf side, furnishes a smooth and pleasant drive during low-water stage, and excellent surf-bathing at all times. ‘To the northward of the entrance into the har- bour, the coast-line is continued in the same general direc- tion to the north-east by Bolivar Peninsula, a low, narrow sand-strip of the mainland, the width of the throat of the harbour between Fort Point and Bolivar Point being about 2 miles. There is a lighthouse on Bolivar Point.

Galveston Harbour is the finest in the State @ and the bay of the same name, including certain outlying portions of it known severally as East Bay, West Bay, and Turtle Bay, covers an area of upwards of 450 square miles of tidal water. At the head of the bay, about 35 miles from the city in a northerly direction, it receives Trinity River, its largest tributary, while San Jacinto River and Buffalo Bayou enter it from the west 18 miles lower down. :

The mean rise and fall of tide at Galveston is 1,45 feet, but spring- tides occasionally rise more than 8 feet above, and fall nearly 2 feet below the plane of mean low water, and fluctuations between much wider limits are not uncommon under the influence of heavy winds. During a storm which occurred in October 1867 the water rose 67° feet above mean low-water stage, and in September 1875 it rosc in some portions of the bay 7 feet, and in others 94 feet above the same level. Two years later there was a rise of 5;% feet, produced by an onshore wind which reached a maximum velocity

of 60 miles per hour. The lowest tide of which we have any record fell 3;; feet below mean low-water level, thus giving a difference of 127 feet between the highest and the lowest recorded tides.

A sand bar, produced and maintained by the joint action of waves and currents, stretches across, bow-shaped, in front of the entrance into the bay, restricting the draught of vessels entering the harbour to from 124 to 18 feet. The United States Government has undertaken the improvement of this entrance by msans of tivo jetties, one starting from Fort Point and the other from near Bolivar Point, having an aggregate length of about 7 miles. It is the intention to carry them out to and beyond the crest of the bar on converging lines, so that their sea ends, resting in about 18 feet water on the outer slope of the bar, will be about 1 mile apart. It is expected that these jetties will cost about $2,000,000, and that they will produce and maintain a practicable channel depth of 18 to 19 feet at mean low-water. Once inside this bar a draught of fully 20 feet can be carried to the wharves of the city. The Bolivar Point Jetty in August 1879 had reached a length of 8,000 feet from the shore. That from Fort Point had not been carried out so far. The peculiar mode of construction adopted for these works by the superintending engineer, Major C. W. Howell, United States Corps of Engineers, merits some notice here. The jetties are formed with large gabions, or basket-work cylinders, plastered inside and out with hydraulic cement, so as to give a thickness of 5 to 6 inches to the cylindrical wall. The gabions are either circular, with a diameter of 6 feet, or of an oval cross section, with diameters of 6 feet and 12 feet respect- ively. They are closed at the bottom, and are also provided with a tight-fitting wooden cover. After being sunk to their proper positions in the work, on their ends, arranged in a single or double row, they are filled with sand pumped up from the bottom and passed in through a hole left in the gabion cover. At first these g@bions were placed directly upon the bottom, but the action of the sea and currents caused so much underscour and settlement, that a foundation of fascines formed into a mattress and weighted with stones was resorted to. On the most exposed portions of the works about one-sixth of the number of gabions put into position have been destroyed by heavy storm-waves, so that this method of con- struction cannot as yet be regarded as past the experimental stage

Galveston was first settled in 1837. It is handsomely laid oa upon ground elevated from 64 to 10 feet above ordinary tide level has wide and straight streets, and has several public squares parks, and gardens. The streets running parallel to West Bay are known as avenues, and are designated by the letters of the alphabet. beginning at the bay, while those at right angles to the water are numbered. Special names are assigned to some of the streets Avenue A, parallel and next to the wharf or channel front is mostly occupied by wholesale houses. Next comes Avenue B. or

‘The Strand,” and then Avenue C, or Mechanic Street both devoted largely to the wholesale business. Avenue D, or Market Street. for a distance of seventeen squares, is occupied by retail stores shops restaurants, hotels, banks, &o. This is the main shopping street. Avenues E and F are of the same character. The post-office and United States court-house are at the intersection of Avenue F and 20th Street, and the custom-house is near by. Avenue J, or Broadway, is regarded as the most desirable locality for residences It is 150 feet wide, including an esplanade 36 feet wide through the middle and a 16-foot sidewalk on either side. Bath Avenue

at right angles to Broadway, is 120 feet wide. Fremont, or 23d Street, is the principal drive in the city, and is maintained as a shell road from ‘‘The Strand” to the Gulf beach. With the excep- tions named, the streets are 80 feet and the avenues 70 feet wide, including 16 feet sidewalks, and the blocks or squares are uniformly 260 wide and 300 fect long, with an alley 20 feet wide running lengthwise through the middle, along the rear of the lots. The por- tion of the city built over extends from about 6th to 40th Streets, and from Avenue A south to within two to three blocks of the Gulf beach. The only streets paved are four or five blocks on Avenues B, C, and D. They are paved with blocks of heart cypress. The same avenues are shelled from between 10th to 32d Streets, or thereabouts, with clam shells from 18 to 30 inches deep. Trees are planted very generally on the outer edge of the sidewalks, the oleander being the chief growth. It frequently attains a height of 20 to 25 feet, and grows rapidly from slips with great luxuriance, blooming the year round. The fig, orange, the black Hamburg and other kinds of grape, and many varieties of flowers and evergreen

shrubbery, thrive and flourish. Throughout the most thickly- settled portions of the city the sidewalks are paved with either asphaltum, concrete, brick, or German or English tiles. Oleander Park embraces 80 acres, and the city park about 25 acres, and there are three public gardens and six public squares. The business por- tion of the city is built up mostly with brick, and within certain defined fire limits the erection of wooden buildings is prohibited.

Among the public buildings, other than churches, are a post-office, custom-house, United States court-house, a county court-honse, a county and city prison, a city hall, an opera house, 7 public halls, 2 libraries, 2 theatres, 13 hotels of different grades, and 3 market houses. ‘There are 30 schools of all kinds, 15 church edifices, a Roman Catholic university or college (St Mary’s), a medical school, a convent, a house of refuge, an orphan asylum, and 3 hospitals. The St Mary’s university was founded in 1854, and in 1872 had 8 professors and 35 collegiate and 115 preparatory students. The medical school, founded in 1864, had ten years thereafter 6 pro- fessors. The convent (Ursuline) has 25 nuns and a female academy connected with it. There are two other female academies in the

lace. There are published in the town a number of daily, tri- weekly, and weekly papers, Galveston is a bishop’s see of the Roman Catholic Church. The city is well connected by railroad with different parts of the State, and by regular steamship lines with Liverpool, New York, Havana, New Orleans, and the ports of Texas, The Galveston, Houston, and Henderson Railroad crosses West Bay on a wooden bridge 2 miles long, and by means of the Galveston Wharf Railroad delivers and receives freight at the several wharves of the city. The Gulf, Colorado, and Santa Fé Railroad, now building from Galveston to Belton, in Bell County, a distance of 220 miles, is fnished (September 1879) as far as Richmond, a dis- tance of 68 miles, and 57 miles more to Brenham will be finished by January 1, 1880. The entire road to Belton is to be completed by September 1881. This road crosses the Brazos River, below Rich- mond, on an iron bridge, and has a wooden bridge of its own across West Bay. There are no highway bridges connecting Galveston Island with the mainland.

The cotton business of the place is represented by six cotton presses and many immense brick warehouses, furnishing storage- room for nearly 200,000 bales of cotton, and covering an area of more than 50 acres. There are two national banks, with an autho- rized capital of $800,000, and a paid-up cash capital of $300,000,— the aggregate paid-up capital of all the banks being upward of $2,000,000. The assessed value of real estate in 1878 was over $20,000,000, and the bonded debt $1,200,000.

Galveston is a healthy city, possesses a delightful climate, and has not been afflicted with an epidemic disease since 1867.

The following table, giving the temperature, the barometric pres- sure, and the rainfall at this place for five years ending June 30, 1878, has been compiled from the reports of the Chief Signal Office, United States Army : —

Temperature Fahr. Year ending : Mean Annual Anni

June 80. Barometric IL Highest. | Lowest. saul Pressure. Rainfa Inches.

1874 98°5° 72:8° 30051 54-49 1875 98°5° 69°6° 30-068 46°66 1876 97°0° 70°9° 30°050 70°59 1877 96°0° 68-7″ 30-078 42-99 1878 97°02 70°2° 29‘997 67-47

There was only one occasion during the five years, and that occurred on the 10th of January 1875, when the temperature fell below 30° F,

The population of the city was more than trebled during the twenty years ending in 1870, and the local authorities claim that Since 1870 the rate of increase has been more rapid still, and that in 1874 the popnlation had reached between 25,000 and 30,000. A municipal census taken in 1876 made the population 35,000,

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which is believed to be too high.

The past and estimated present population are given below :—

Year. White. Coloured.

708 1,180 3,008

Unlted States Census of 1850 3,469

6,127

10,810

United States Census of 1860 United States Census of 1870……..
Estimated for 1879

In the business of receiving and shipping cotton, the leading pro- duction of the Southern States, Galveston ranks third in importance among the ports of the United States, New Orleans and Savannah standing before it, and Charleston, Norfolk, and Mobile after it in the order named. More than one-tenth of the cotton crop of the country finds a market through the port of Galveston. The follow- ing table shows the yearly receipts of bales of cotton at the six ports above named, for five years ending September 1, 1879 :—

5 | 1878-79. 1877-78, | 1876-77. 1875-16. | 1874-75.

baisiedes | 1,175,415 | 1,391,555 | 1,182,357 | 1,401,563 | 982,198

eT se eee 690,901 | 597,449 | 477,477 | 521,437 | 605,566

573,274 | 454,187 | 491,980 | 465.529 | 354.997

oak 442,458 | 425,214 | 505,932 | 469,997 | 382387 Charleston …. 449,888 | 423,128 | 442.515 | 389,698 | 413,101 Mobile 362,522 | 414,832 | 357,879 | 371.298 | 319,263

The value of imports from foreign countries for the two years ending July 31, 1878, was as follows:—

1876-77.

Imports of free commodities ….....scccceeesceee $952,713 $1,155,808
Imports of dutiable commodities …....c000se. 194.615 201,680 sain
(enges eee CueusnisaveNeess seus 1,147,328 1,357,488

The leading importations comprise coffee from Brazil and Mexico, and manufactured cotton, woollen, and iron goods. The duties collected during the year ending July 31, 1878, amounted to $62, 352.73, as against $95,980.49 during the previous ycar.

The value of domestic commodities, consisting largely of cotton, oil-cake, cattle, preserved meats, bone dust, cotton seeds, and lumber, exported to foreign countries during the year ending July 31, 1878, amounted to $11,963,132, as against $15,242,747 for the previous ycar.

The number and tonnage of vessels entered and cleared at the port of Galveston annually, for the six fiscal years ending June 30, 1878, are shown in the following tables :-—

Coasting Trade. Entered. Cleared. ee ee | Number of Vessels,

Number of Vessels,

198

Tonnage. Years. Tonnage.

192,114 407,382 435,535 428.334 450,830 1873-4 274,919

569,206 1872-3 424,848

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Foreign Trade,

1877-8 1876-7 1875-6 1874-5

291,264 263,792 290,956 285,970

1877-8 1876-7 1875-6 1874-5 1873-4

79,170 1872-3

92,998

_ The decrease in the number of coasting vessels entered and cleared is accounted for in part by the fact that the Morgan line of steamers from New Orleans, which formerly entered here, now proceed up the bay to Clinton with original manifest, and make the entry there, merely touching at Galveston to land freight, passengers, and mails.

The number of documented vessels owned in the customs district of Galveston during the year ending June 30, 1878, was 197, with an aggregate tonnage of 9310 tons; built during the year, 9, with an aggregate tonnage of 239 tons; and lost at sea, wrecked, or abandoned, 16, with a total tonnage of 387 tons.

GALWAY, a maritime county in the province of Connaught, in the extreme west of Ireland, between 52° 54 and 53° 43’ N, lat., and 7° 57’ and 10° 20’ W. long. It is bounded on the N, by Mayo and Roscommon; E. by Roscommon, King’s County, and Tipperary ; 8. by Clare and the Bay of Galway; and W. by the Atlantic Ocean. The area comprises 2447 square miles, or

1,566,354 acres, of which 90,230 are under water. — Surface,

—The county is naturally divided by Lough |

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Corrib into two great divisions. The eastern, which com- prehends all the county except the four western baronies, rests on a limestone base, and is, generally speaking, a level champaign country, but contains large quantities of wet bog. Its southern portion is partly a continuation of the Golden Vale of Limerick, so celebrated for its fertility, and partly occupied by the Slievebaughty Mountains, The northern portion of the division contains rich pasture and tillage ground, beautifully diversified with hill and dale. Some

of the intermediate country is comparatively uncultivated, but forms excellent pasturage for sheep. The western division of the county has a substratum of granite, and is barren, rugged, and mountainous. It is divided into the three districts of Connemara, Jar-Connaught, and Joyce's Country; the name of Connemara is, however, often applied to the whole district. Its highest mountains are the grand and picturesque group of Binabola, or the Twelve Pins, which occupy a space of about 25 square miles, the highest elevation being about 2490 feet. Much of this district is a gently sloping plain, from 100 to 300 feet above sea-level, Joyce's Country, further north, is an elevated tract, with flat-topped hills of from 1300 to 2000 feet high, and deep narrow valleys lying between them.

Coast.—Galway enjoys the advantage of a very extended line of sea-coast, indented by numerous harbours, which, however, are rarely used except by a few coasting and fishing vessels. Commencing at the coast of Mayo in the north are the Killeries, two bays which separate the counties of Galway and Mayo. The first bay on the western coast capable of accommodating large ships is Ballynakill, sheltered by Freaghillaun or Heath Island. Next in succession is Cleggan Bay, having Iuishboffin in its offing. Streamstown is a narrow inlet, within which are the inhabited islands of Omey, Tur- bot, and Inishturk. Ardbear harbour divides itself into two inlets, the northern terminated by the town of Clifden, with excellent anchorage opposite the castle ; the southern inlet has also good anchorage within the bar, and has a good salmon-fishery. Mannin Bay, though large, is much exposed, and but little frequented by shipping. From Slyne Head the coast turns eastward to Round- stone Bay, which has its entrance protected by the islands of Inishnee and Inishlacken. Next in order is Birterbuy Bay, studded with islets and rocks, but deep and sheltered. Kilkerrin Bay, the largest on this coast, has a most productive kelp shore of nearly 100 miles ; its mouth is but 8 miles broad. Between Gorumna Island and the mainland is Greatman's Bay, and close to it Costello Bay, the most eastern of those in Connemara. The whole of the coast from Greatman's Bay eastward is comprehended in the Bay of Gal- way, the entrance of which is protected by the three limestone islands of Aran—Inishmore (or Aranmore), Inishmann, and Inisheer.

Kivers.—The rivers are few, and, except the Shannon, are of small extent. The Suck, which forms the eastern boundary of the county, rises in

Roscommon, and passing by Ballinasloe, unites with the Shannon at Shannon bridge. The Shannon, which rises at the foot of Cuilcagh in the county of Cavan, forms the south-eastern boundary of the county, and passing Shannon Harbour, Banagher, Meelick, and Portumna, swells into the great expanse of water called Lough Derg, which skirts the county as far as the village of Mount Shannon. The Claregalway flows southward through the centre of the county, and enters Lough Corrib some 4 miles above the town of Galway. The Ballynahinch, considered one of the best salmon-fishing rivers in Connaught, rises in the Twelve Pins, passes through Ballynahinch Lake, and after a short but rapid course falls into Birturbuy Bay.

Lakes.—The Lakes are numerous. Lough Corrib extends from Galway town northwards over 30,000 acres, with a coast of 50 miles in extent. Ithas now been made navigable to Lough Mask (which lies chiefly in Mayo county) and to the sea at Galway. The lake is studded with many islands, some of them thickly inhabited. Near it is Lough Ross, which receives a large supply of water from streams, but has no visible outlet. The district to the west of Lough Corrib contains in all about 130 Jakes, about 25 of them more than a mile in length. Lough Rea, at the town of the same name, is more remarkable for scenic beauty than for extent. Besides these perennial lakes, there are several low tracts, called turloughs, which are covered with water during a great part of the year.

Geology and Minerals. —The boundary line between the limestone and granitic district is easily discernible by the diminution of the verdant hue which distinguishes the latter. The high road from Galway to Oughterard nearly marks the division. All the country to the north and east of this limit is limestone, all to the south and west granite, excepting some detached masses of primitive limestone between Oughterard and Clifden, and some scattered portions of

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other minerals, of great variety of appearance. The component ae of Binabolais ent in el distinctly stratified, or at least schistose. The position of its beds is various. Towards the west- ern shore they are vertical, easily splitting by intervening mica plates, and affording good building stone.

Limestone occurs e some places along the foot of these mountains. Round the base o

this group are also gneiss and mica slate, with bands of hornblende and primitive mica. Along the north side of Lough Corrib to Ballynakill the mica slate and hornblende rise into mountains, and the limestone disappears. From Lough Mask to the Killeries is a transition country of greenstone and grauwacke slate covered by the Old Red Sandstone or conglomerate. The hill of Glan, on the shore of Lough Corrib, exhibits, in a small compass, all the for- mations which occur in the district. The western end Is quartz, the north-eastern side mica slate ; the middle is penetrated by beds of mica slate, containing hornblende and granular mica covered by thick beds of pyritous greenstone. On the south and east are granite and syenite, which runs under the sandstone conglomerate towards Oughterard, and this again passes under the flotz lime- stone, which, beyond Lough Corrib, occupies the greater part of Connaught and Leinster. Along the borders of the flétz limestone is a series of vast caverns, usually traversed by subterranean rivers. A fine gritstone, highly valued for making millstones, is raised near Dunmore. Crystalline sand, of a superior quality for scythe boards, occurs at Lough Coutra. Lead, zinc, copper, sulphur, and bismuth have been discovered in various parts of the western division of the county. Iron was raised at Woodford, and smelted until the timber was exhausted. The mountains of Slievebaughty, which separate Galway from Clare, are siliceous. In Connemara there is abundance of green variegated marble called serpentine ; and a beautiful black marble, without spots or flaws, and susceptible of a high polish, is obtained near Oughterard. Mineral spas, mostly chalybeatc, are abundant.

Climate and Agricultwre.—The climate is mild and salubrious, but variable, and violent winds from the west are not uncommon. Frost or snow seldom remains long on the western coast, and cattle of every description continue unhoused during the winter. The eastern part of the county produces the best wheat. Oats are fre- quently sown after potatoes in moorish soils less adapted for wheat. The flat shores of the bays afford large supplies of seaweed for man- ure. Limestone, gravel, and marl are to be had in most other parts. When a sufficient quantity of manure for potatoes cannot be had, the usual practice is to pare and burn the surface. In many places on the

sea-shore fine early potatoes are raised in deep sea-saud, man- ured with sea-weed, and the crop is succecded by barley. Those parts of the eastern district less fitted for grain are employed in pasturage. Heathy sheep-walks occupy a very large tract between Monivea and Galway. An extensive range from Athenry, stretch- ing to Galway Bay at Kinvarra, is also chiefly occupied by sheep.

The total area under crop in 1878 was 214,685 acres, as compared with 235,168 in 1853. The following tables show the acres under the principal crops, and also the numbers of the different domestic animals, during those years :—

Barle Other | Meadow Wheat. | Oats. Pauee (a Potatoes.| Turnips.| Green and aes Crops. | Clover.

1878 4,416 53,205 8,095 50,604 14,041 8,910 75,333 1853 16,817 83,840 15,751 46,134 18,788 10,764 45,780

Horses, | Asses. Cattle. | Sheep. Pigs. Poultry.

1878 1853

28,538 25,916

14,384 13,714

169,002 139,497

652,778 466,430

57,814

751,116 41,403

410,199

According to the returns or 1875-6, the total value of land exclusive of the town of Galway, was £437,686, 15s., and the aver- age value per acre was 5s. 112d., as compared with 6s. 9d. for the province, and 18s. 3d. for the

whole of Ireland. The coullty was divided among 1235 proprietors, of whom 332, or 27 per cent., held less than one acre. The following possessed more than 20,000 acres viz :—Richard Berridge, 159,898 ; Marquis of Clanricarde, 49,025 ; Lord Dunsandle, 33,543 ; Allan Pollok, 29,366 ; Lord Clonbrock' 28,246; Sir Thomas J. Burke, 25,258 ; Earl of Clancarty, 23,896.

Manufactures.— Manufactures are not carried on beyond the de- mand caused by the domestic consumption of the people. Coarse friezes, flannels, and blankets are made in all parts, aud sold largely in Galway and Loughrea. Connemara has been long celebrated for its hand-knit woollen stockings. Coarse linen, of a narrow breadth called bandle linen, is also made for home consumption. A linen- weaving factory has been established at Oughterard. The manufac- ture of kelp, formerly a great source of profit on the western shores is still carricd on to some extent. Feathers and sea-fowls' eges are brought in great quantities from the islands of Aran, the pro- duce of the puffins and other sea-fowl that frequent the cliffs. Fish-

ing affords occupation to many of the inhabitants, but from want of capital is not prosecuted with sufficient vigour. In 1877 the number of vessels engaged was 451, with 1104 men and 58 boys.

Population.—The county includes one parliamentary borough, Galway ; and three townships, Ballinasloe (part of which is, how- ever, in the county of Roscommon), 4159; Loughrea, 3072; and Tuam, 4223. The largest of the villages are Gort, 1773; Clifden, 1318; Athenry, 1194; Headford, 870; Oughterard, 861; and Hyre- court, 747. The population in 1831 was 414,684; in 1851, 321,684 ; and in 1871, 248,458, of whom 122,496 were males and 125,962 females. In 1871 the number of Catholics was 239,902, and of Protestants 8556, of whom 7464 were Episcopalians and 615 Presbyterians. Of persons five years and upwards 173,361 were illiterate, a proportion of 56°9 per cent.; and 30,239 could speak Erse only, as compared with 41,572 in 1861. Emigration from this county has drafted off a very large number of its inhabitants. From the Ist of May 1851 to 31st December 1877 there were 104,691 emigrants, or an annual average of 3950.

Representation and Administration.—Two members of parliament are returned for the county, and two for Galway borough. There are in the county 35 petty-sessions districts, and part of another. Quarter-sessions are held at Ballinasloe, Clifden, Galway, Gort, Loughrea, Oughterard, Portumna, and Tuam. There are five poor-law unions wholly within the county, Galway, Loughrea, Mount Bellew, Portumna, and Tuam ; nearly the whole of Clifden, Gort, and Oughterard ; and parts of five others—Ballinasloe, Ballin- robe, Glennamaddy, Roscommon, and Scarriff. The county is within the Dublin military district, and there are barrack stations at Loughrea, Dunmore, Portumna, Galway, Gort, and Oughtcerard. It is divided into 18 baronies.

Antiquities.—Amongst these are the round towers of Ardrahan, Ballygaddy, Kilbannon, Kilmacduagh, Meelick, and Murrough. Raths are numerous, and several cromleclis are still to be seen in good preservation. Theruins of monastic buildings are also numer- ous. That of Knockmoy, about 6 miles from Tuam, said to have been founded in 1180 by Cathal O'Connor, was adorned with rude fresco paintings, still discernible, which were considered valuable as being the best autlicntic representations existing of ancient Irish costumes. Ancient castles and square towers of the Anglo-Norman settlers are frequently met with ; some have been kept in repair, but the greater number are in ruins. The castle of Tuam, built in 1161 by Roderick O'Counor, king of Ireland, at the period of the English invasion, is said to have been the first building of this de- scription of stone and mortar in Ireland. The remains of a round castle, a form of building very uncommon in the military architec- ture of the country, are to be scen between Gort and Kilmacduag.

Ga.way, the county town, and a parliamentary borongh, is also a county in itself, with an exclusive jurisdiction extending two miles on every side except the south. It stands on the northern shore of the Bay of Galway, on both sides of the river Corrib, which connects Lough Corrib with the sea. The space within the walls formed an oval of about 3426 square perches. Some of the streets are very narrow, and contain several curious specimens of old buildings, chiefly in the antique Spanish style, being square, with a court in the centre, and a gateway opening into the street. The finest of these is the pile of buildings known as Lynch's Castle. During the last few

years many large shops have been built in the principal streets, and several handsome residences have been erected in the suburbs. St Nicholas church is the most remarkable building in the town. It is cruciform, 152 feet long by 126 broad, with a steeple rising over the nave, and the side aisles separated from the centre by Gothic pillars. It contains several antique monuments. The exchange, near the church, con- sists of an open corridor, 90 feet long by 28 broad, with a front of arches supporting an upper story, in which are apartments for holding the local courts, and for other public purposes. St Augustine's church (Roman Catholic), an edifice in the First Pointed style, was erected in 1859. The county court-house is an elegant and commodious building ; near it are the county and town prisons. The town also contains a county infirmary, a union workhouse, a fever hospital, three monasteries, five nunneries, and two barracks. A grammar-school is in the immediate neighbourhood of the town. Queen's College, built of beautiful grey limestone, 18 an elegant and extensive quadrangular structure in the Tudor Gothic style. Near the college is a national school. The

shipping trade of Galway has for some time been gradually

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increasing. In 1877 the number of British vessels that entered the port was 153, with a tonnage of 30,034 ; of foreign vessels 33, with a tonnage of 16,166. The number of British vessels that cleared was 136, with a tonnage of 29,827 ; of foreign vessels 27, with a tonnage of 13,225. The chief articles exported are agricultural produce, wool, and marble. There are a brewery, a distillery, a paper mill, a tannery, and several flour mills ; and a company has recently been formed for the purpose of extracting iodine and marine salts from seaweed. 'The salmon fishery is of considerable value. Galway is divided into the old and new towns, and the maritime suburb of Claddagh, inhabited almost entirely by fishermen and their families, who have acquired or re- tained certain peculiar usages and habits of their own,

Little is known of the history of Galway until after the arrival of the English, at which time it was under the pro- tection of O'Flaherty, who possessed tlie adjoining district to the west. On the extinction of the native dynasty of the O'Connors, the town fell into the hands of the De Burgos, tle head of a branch of which, under the name of M'William Eighter, long governed it by magistrates of lris own appoint- ment. After it had been secured by walls, which began to be built in 1270, it became the residence of a number of enterprising settlers, through whom it attained a position of much commercial celebrity. Of these settlers the principal families, fourteen in number, were known as the tribes of Galway. They were of Norman, Saxon, or Welsh descent, and became so exclusive in their relationships that dispen- sations were frequently requisite for the canonical legality of marriages among them. The town rapidly increased from this period in wealth and commercial rank, far surpassing in this respect the rival city of Limerick. Richard IT. granted it a charter of incorporation with liberal privileges, which was confirmed by his successor. It had the right of coinage by Act of Parliament, but there is no evidence to show that it exercised the privilege. Another charter, granted in 1545, extended the jurisdiction of the port to the islands of Aran, permitted the exportation of all kinds of goods except linens and woollens, and confirmed all the former privileges. Large numbers of Cromwell's soldiers are said to have settled in the town ; and there are many traces of Spanish blood among the population. Its municipal privileges were ex- tended by a charter from James I., whereby tle town, and a district of two miles round in every direction, were formed into a distinct county, with exclusive jurisdiction and a right of choosing its own magistrates. During the civil wars of 1641 the town took part with the Irish, and was surrendered to the Parliamentary forces under Sir Charles Coote; after which the ancient inhabitants were mostly driven out, and their property was given to adventurers and soldiers, chiefly from England. On the accession of James II. the old inhabitants entertained sanguine hopes of re- covering their former rights. But the successes of King William soon put an end to their expectations; and the town, after undergoing another siege, again capitulated to the force brought against it by General Ginkell. In the beginning of the present century the walls were thrown down, and buildings erected on their site.

Galway is governed by a high sheriff, a recorder, local magistrates, and a board of 24 commissioners elected triennially. The area of the municipal borough is 955 acres. ‘The population in 1861 was 16,967, and in 1871 15,597, of whom 14,424 were Roman Catholics. The parliamentary borough has an area of 22,493 acres, and a population of 19,843.

GAMA, Vasco pa (c. 1460-1524), the celebrated Portu- guese navigator and discoverer, was born at Sines, a small sea-town in the province of Alemtejo. No one will deny that his name deservedly stands high in the roll of naval heroes ; yet it cannot be doubted that he owes

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the brilliancy of his reputation to his country’s illustrious poet, Luiz de Camoens, by whom his discoveries in India and their results have been assigned the foremost place in the great national epic Os Lusiadas. Of Vasco’s early history little is known. His descent, according to the Vobiliario of Antonio de Lima, is derived from a noble family which is mentioned in the year 1166; but the line cannot be traced without interruption farther back than the year 1280, to one Alvaro da Gama, from whom was descended Estevio da Gama, Alcaide Mér of Sines, whose third son, the subject of this notice, was born probably about the year 1460, About this period died Prince Henry the Navigator, son of Jodo I, who had spent his life in fostering the study of navigation, and to whose intelligence and foresight must be traced back all the fame that Portugal gained on the seas in the 15th and 16th centuries. Ex- plorers sent out at his instigation discovered the Western Isles, and unknown regions on the African coast, whence continually came reports (which by and by affected Da Gama’s history) of a great monarch, “who lived east of Benin, 350 leagues in the interior, and who held both temporal and spiritual dominion over all the neighbouring kings,” a story which tallied so remarkably with the accounts of “ Prester John” which had been brought to the Peninsula by Abyssinian priests, that Joio II. steadfastly resolved that both by sea and by land the attempt should be made to reach the country of this potentate. In the hope of making this discovery, Pedro Covilham and Affonso de Payva were despatched eastward by land; while Bartho- lomeu Dias, in command of two vessels, was sent westward by sea. Neither of the landward travellers

ever returned to his country; but Covilham, who, in his fruitless search for a mythical sovereign, reached the Malabar coast and the eastern shores of Africa, sent back to Lisbon, along with the tales of the rich lands he had visited, this intelligence, “that the ships which sailed down the coast of Guinea ought to be sure of reaching the termination of tle continent by persevering in a course to the south.” King Joio was now seized with an ardent desire of reaching these eastern countries by the route indicated by Covilham. Thiat there was in truth such an ocean highway was confirmed by Dias, who shortly after returned (in 1487) with the report that when sailing southward he was carried far to the east by a succession of fierce storms, past—as he dis- covered only on his return voyage—what he perceived to be the southern extremity of the African continent, and to which, on account of the fearful weather he had encountered, he gave the name of the Cape of Storms, an appellation which to the king, who was then elated with high hopes of enriching his kingdom by the addition of eastern posses- sions, appeared so inauspicious that he changed it to that of Cape of Good Hope. The state of Jo&o’s health, how- ever, and concerns of state, prevented the fitting out of the intended expedition ; and it was not till ten years later, when Manoel had succeeded to the throne, that the pre- parations for the great voyage were completed,—hastened, doubtless, by Columbus’s discovery of America in the mean- while. For the supreme command of this expedition the king selected Vasco da Gama, who had in his youth fought in the wars against Castile, and in his riper years gained dis- tinction as an intrepid mariner. The fleet, consisting of four vessels specially built for this mission, sailed down the Tagus on the 8th July 1497, after prayers and confession made by the officers and crews in the presence of the king and court, in a small chapel on the site where now stands the church of S. Maria de Belem, afterwards built to com- memorate the event. Four months later it cast anchor in St Helena Bay, South Africa, rounded the Cape in safety, and in the beginning of the next year reached Melinda.

Thence, steering eastward, under the eae ak e a pilot

obtained from Indian merchants met with at this port, Gama arrived at Calicut, on the Malabar coast, on the 20th May 1498, and set up, according

to the custom of his country, a marble pillar as a mark of conquest and a proof of his dis- covery of India. His reception by the zamorin, or ruler of Calicut, would have in all probability been favourable enough, had it not been for the jealousy of the Moorish traders who, fearing for their gains, so incited the Hindus against the new comers that Gama, after escaping from enforced detention on shore, was obliged to fight his way out of the harbour. Having seen enough to assure him of the great resources of this new country, he returned home in September 1499 with a glowing description of it. The king received him with every mark of distinction, created him a noble, and ordered magnificent fétes to be held in his honour in the principal towns of the king- dom, “for he had brought back (not without severe loss in ships and in men) the solution of a great problem, which was destined to raise his country to the acme of prosperity.” In prosecution of Gama’s discoveries another fleet of 13 ships was immediately sent out to India by Manoel, under Alvarez Cabral, who, in sailing too far west- ward, by accident discovered Brazil, and on reaching his destination established a factory at Calicut. The natives, again instigated by the Moorish merchants, rose up in arms, and murdered all whom Cabral had left behind. To avenge this outrage a powerful armament of ten ships was fitted out at Lisbon, the command of which was at first given to Cabral, but was afterwards transferred to Gama on his urgent petition ; for, “Sire,” he said, “the king of Calicut arrested me and treated me with contumely, and because I did not return to avenge myself of that injury he has again committed a greater one, on which account I feel in my heart a great desire and inclination to go and make great havoc of him.” In the beginning of 1502 the fleet sailed, and on reaching Calicut Gama immediately bombarded the town, enacting deeds of inhumanity and savagery too horrible to detail, and equalled only by the tortures of the Inquisition, Gama was naturally “very disdainful, ready to anger, and very rash ;” but no peculiarities of disposi- tion—nothing whatever—can excuse such acts as his, which have justly left a stain on his character that neither time nor the brightness of his fame as a navigator can in the slightest degree obliterate. From Calicut he proceeded in November to Cochin, “doing all the harm he could on the way to all that he found at sea,” and having made favourable trading terms with it and with other towns on the coast, he returned to Lisbon in September 1503, with richly laden ships. He and his captains were welcomed with great rejoicings ; “but to Dom Vasco the king gave

great favours, and all his goods free and exempt; he granted him the anchorage dues of India, made him admiral of its seas for ever, and one of the principal men of his kingdom," Soon after his return Vasco retired to his residence in Evora, – for twenty years took no part in public affairs, either — a at not obtaining, as is supposed by some, so high rds as he expected, or because he had in some way offended Manoel. During this time the Portuguese con- quests Increased in the East, and were presided over by Gerth wurde fos haters : clusion by Manoel's suc-

cessor, Jo&o ITL., created count of Vidigueira, and nominated Viceroy of India, an honour which in April 1524 he left Lisbon to fill. Arriving at Goa in September of the same year, he immediately set himself to correct, with vigour and firmness, the many abuses and evil practices which had crept In under the rule of his predecessors. He was not destined, however, to prosecute far the reforms he had inaugurated, for, on the Christmas-eve following his arrival he died, while at Cochin, after a short illness, and was

buried in the Franciscan monastery there. In 1538 his body was conveyed to Portugal and entombed in the town of Vidigueira, of which he was count, with all the pomp and honour due to one who had been the king's representative,

The important discoveries of Vasco da Gama had the immediate result of enriching Portugal, and raising her to one of the foremost places among the nations of Europe, and by degrees the far greater one of hastening the coloni- zation and civilization of the East by ovening its commerce to the great Western powers.

For further information the following works may be consulted:— The Three Voyages of Vaseo da Gama and his Viceroyalty, by Gaspar Correa (Hakluyt Society); Caleoen (i.e., Caliewt), A Dutch Narrative of the Third Voyage of Vaseo da Gama, written by some unknown seaman of the expedition, printed at Antwerp about 1504, reprinted in facsimile, with introduction and translation, by J. Ph. Berjeau, London, 1875; Discoveries of Prince Henry of Portugal, by R. H. Major; Zhe Lusiads of Camoens; Cooley, History of Maritime Discovery; Barros, Decades; Alvaro Velho,

Roteiro da viagem que em descobrimento da India pelo cabo de Boa Esperanca fez dom Vaseo da Gama em 1479, the manuscript of which is pre- served at Coimbra, and a translation of which by Ferdinand Denis may be found in E. Charton's Voyageurs Anciens el Modernes, vol, 1i1.,1855 ; Castan Leda, Historia do Deseobrimento da India, Coimbra, 1551 (largely based on Alvaro Velho's MSS.). (H. O. F.)

GAMALIEL (28°9103, i.e. God is a rewarder, Papadufd), a Hebrew proper name, which occurs more than once in the Old Testament (Numb. i. 10; il, 20), is repeatedly met with in the history of later Judaism. Of the persons designated by it the most important are enumerated below :—

1, GAMALIEL, or Rabban Gamliel the elder, as he is invariably called in the Talmud to distinguish him from his grandson, Rabban Gamaliel or Gamliel of Jabneh (Jamnia), was the son of Rabbi Simeon, and the grandson of Rabbi Hillel. Of his biography little is known beyond the facts that, early in the 1st century, he lived and taught in Jerusalem, where Saul of Tarsus was for some time his pupil; and that he was a member of the Sanhedrim, which body he successfully counselled to moderation in their treatinent of the followers of Jesus! He appears to have died before the destruction of the city. The Talmudists speak of him as having enjoyed the confidence of Cypros, the wife of Agrippa, and as having been president of the Sanhedrim during the reigns of Tiberius, Caligula, and Claudius; but the latter representation at least is cer- tainly unhistorical, as may be learned from the New Testa- ment and from Josephus, where it is invariably the high priest who presides over the council. Gamaliel the elder is also represented by Jewish tradition as having in some respects modified the provisions of the law with respect to divorce and marriages of widows, and as having made some new arrangements with regard to the calendar; but there is reason to believe that in this last statement he has been mistaken for Gamaliel of Jabneh. The fact that he is spoken of in the records of Judaism as having been the first of the seven " rabbans" (rabban being a honorific form of the title rabbi) is of itself alinost conclusive against the late and otherwise improbable Christian tradition to the effect that he ultimately became a Christian and received baptism at the hands of Peter and John (Clem. Recog., 1. 65; Photius, cod. 171, p. 199). Compare Ewald, Gesch. d.

V. Isr., vi. 256 sq.; Derenbourg, Hist. de Palestine, p- 239 sqq.; Schiirer, NT'liche Zeitgesch., p. 458.

2. GamaLieL of Jabneh ranks with his grandfather, Gamaliel the elder, as one of the seven great rabbans of the Talmudists. His father also was named Simeon. On the death of Rabbi Johanan ben Zacai, Gamliel was chosen to succeed him as head of the famous school a ee lm

1 The criticisms of Baur and others upon the speech, as recorded in Acts v. 84-39, do not affect the general fact as now stated.

which had transferred itself to Jamnia or Jabneh shortly

period after that event Jabneh became in some sense the metropolis of Judaism, and Gamliel, as head of the supreme judicial and legislative body which sat there, may be said to have been the first nasi or " prince" of the

rabbinical period, An interesting account of his position |

as legislator will be found in chapter xx. of Derenbourg's Histoire de Palestine. As representing the Jewish nation aud the Jewish faith, he visited Rome in the autumn of 95 A.D., and the Talmud abounds with references to the inci- dents of that journey. Gamliel was the friend of Rabbi Akiba, and the master of Aquila (the "Onkelos" of the Babylonian Talmud). He died about 115 a.p. (see Ewald, Gesch. d. V. Isr., vii. 388).

3. A third GAMALIEL, son of Jehudah-ha-Nasi, is men- tioned in Aboth, ii. 2, as laving specially insisted on the necessity of combining with the study of the law some active employment in order to the maintenance of a healthy moral tone.

GAMBIA, Gampra, Ba Dia, or Fura, an important river of Western Africa, which enters the Atlantic about 13° 50' N. lat. Its sources are in the central plateau of the Futa Jallon highlands, a tract of country about 240 miles inland, which also contains the head waters of the Senegal, the Faleme, the Rio Grande, and some tributaries of the Niger. Flowing almost due N. for

the first 200 miles of its course, it turns somewhat abruptly to the W., and con- tinues in that direction through a country of great fertility. Steamers can proceed up the river as far as Yaba Tenda : the channel remains navigable for boats 300 miles from the mouth to the falls of Barraconda ; and above the falls it is again navigable, as was shown by Governor Macdonnell's expedition in 1851, for at least 160 miles farther. The principal affluent is the Neries, which, coming from the north, joins the main stream about 30 or 35 miles above the falls. At Fattatenda, a short distance below the falls, the river has a breadth, even in the dry season, of about 320 feet, with a depth of from 13 to 20 feet. In the rainy season it rises from 20 to 50 feet, and the whole country downwards to the sea is laid under water, and receives a rich alluvial deposit.

The British colony of Gambia comprises @ considerable territory mainly on the left bank at the mouth of the river, Elephant's Island about 100 miles from the sea, and Macarthy's Island still further inland. The whole area under British authority is 21 square miles, The popula- tion in 1851 was stated at 5693, in 1861 at 6939, and in 1871 at 14,190 (7306 males and 6884 females). In the 15 years from 1860 to 1874 the total gross revenue was £268,232, making an annual average of £17,802; and the gross amount of public expenditure in the same period was £255,291, making an annual average of £17,019, or a total surplus of revenue over expenditure of £2941. In 1862, 1863, and 1864 the liabilities exceeded the assets by £3638, £4817, and £5492 respectively, but there is no funded debt. The Gambia settlement, which formerly cost the imperial revenue from £20,000 to £25,000 per annum, now provides for its own defence,—an armed police force, recruited mainly from the Mahometan tribe of the Houssas, having been substituted since 1869 for the im- perial troops. The parliamentary grant, which had averaged about £4200 per annum from 1860 to 1867, was re- duced to £1500 in 1868, and finally withdrawn in 1871, and all expenses are met by the local revenue. The Gambia district was originally united with Sierra Leone on the dissolution of the African Company in 1822; in 1843 it was made a separate colony, the first governor being Henry Frowd Seagram; in 1868 it was reunited to Sierra Leone; and it is now governed by an adminis-

| trator. before the destruction of Jerusalem. For a considerable |

G AM og The capital of the colony is Bathurst, a town on the eastern side of St Mary's Island.

St Mary's Island lies at the mouth of the river on the south side, close to the mainland, from which it is sepa- rated by a stretch of mangrove swamp and a narrow arm of the river called Oyster Creek. It is about 15 miles in length by less than a mile in breadth, and consists of a slightly elevated plain of sandy soil, which in the dry season becomes a bed of hot and shifting dust. There are natur- ally not many trees on the island, though a few cocoa-nuts, palms, papaws, willows, bananas, oleanders, and guavas manage to maintain a precarious existence. The Barbados pride, however, flourishes luxuriantly (Captain Hewitt). Bathurst is on the whole a well-built town, the principal material employed being a dirty red sandstone coated with whitewash. It lies about 12 or 14 feet above the level of the river. The market house is built of iron, and the market place was planted with trees in 1869. Besides the Government house and the barracks, there is a hospital founded by General Macdonnell, a court-house, and an Episcopal church completed about 1869. The population of the town is of a very motley description, including, besides the white officials, and traders to the number of about 50, half-castes of all shades, liberated negroes, Jolloffs, Barras, and other local tribes. The part of the mainland immediately contiguous to St Mary's is known as British Combo, an area of about 6 miles long by from 2 to 3 miles broad having been secured by treaty with the king of Combo in 1853.

M'Carthy's Island lies about 180 or 200 miles above St Mary's. It is about 5} miles in length and 1 in breadth. There are two or three "factories," a considerable trading town, peopled partly by liberated Africans, a fort, a Meth- odist church, and a schoolhouse. Though this was the last spot actually in British possession, it was long understood by Gambia traders that they were under British protection

| much farther up the stream; but, according to the de-

spatches of Lord Carnarvon in 1877, they must proceed at their own risk as soon as they advance beyond British territory. St James's Island, which was the seat of the British factory in the 18th century, is about 17 miles from St

Mary’s. It still bears traces of European occupation, but is graduaily being washed away by the river.

The chief exports are ground nuts, wax, hides, ivory, gold dust, palm oil, and gum arabic; but even these are obtained in quantities that look ridiculously small when the natural richness of the country through which the Gambia flows is considered. At the close of the 18th century only two or three ships were employed in the trade ; in 1839 no fewer than 239 merchant vessels visited the river; and in 1871 75 British and 154 foreign vessels entered, with a total tonnage of 51,853 tons. During the four rainy months, from July to October, the native trader conveys his employer’s rice or corn up the river, and receives in exchange the pagnes or country cloths ; in November he barters these same cloths for ground nuts, hides, and wax ; and for the rest of the year, till the rainy season comes round again, he supplies the natives with arms, powder, rum, Madras handkerchiefs, and other European productions. The French traders, however, who are gradually getting a large share of the commerce into their hands, have introduced the custom of money transactions, and the innovation is well received by the natives,

The trade in ground nuts is of comparatively recent development. In 1836 the value exported was only £838; in 1887 it reached £8053, and in 1840 no less than £15,209. In 1860 the value was £79,611, and in 1861 £101,060. The average quantity betwecn 1850 and 1860 was 11,196 tons; between 1870 and 1877 it was 14,000 tons. The supply is greatly affected by the political state of the country in which the nuts are grown. Most of the necessary tillage is performed by the tribe of the Sera-Woullis, who come down from the interior in great numbers, and return home when they have earned what they desire. The French markets are the principal destination of the nuts. American traders deal mainly in hides, horns, and beeswax; and the honey is chiefly purchased for the German market. The Roman Catholics maintain a mission and a small convent in the Gambia, and the Wesleyans have long had a

| number of stations. The latter have done great service to education

in the colony,—their 10 schools, as far back as 1860, being attended by 1273 scholars. It was not till 1869 that, even at Bathurst, a Government school was established ; but there are now several schools in connexion with the Episcopal church. The Roman Catholics began the erection of a large schoolhouse in 1873.

The Gambia was visited by the Carthaginian explorer Hanno, and it became early known to the Portuguese discoverers ; but it was not till 1618 that English traders began to turn their atten- tion to this quarter. In that year a company was formed for the exploration of the river. Richard Thompson was sent out in the ‘‘Cgtherine,” and succeeded in reaching Kassan, a Portuguese trading town, but he never returned, and his fate is not known. ‘Two years afterwards, Richard Jobson advanced beyond the falls of Barraconda ; and he was followed, about 40 years later, by Vermuyden, a Dutch merchant. In 1723 Captain Stibbs was sent out by the African Company to verify Vermuyden’s reports of gold ; he proceeded 60 uniles above the falls. The treaty of Versailles in 1783 assigned the right of trade in the Gambia to Britain, reserving the single port of Albreda for the French ; while at the same time it assigned the Senegal to France, and reserved the port of Portendic for the British. By the treaty of Paris in 1851 this arrangement was re-established, and it remained in force till 1857, when an exchange of possessions was effected, and the Gambia became a purely British river. In 1870 there was a proposal to transfer the colony to the French ; but it led to nothing more than a voluminous diplomatic correspondence.

See Astley’s Collection, vol. ii.; R. R. Madden’s Report to the Government in 1841; T. E. Poole, Life in Sierra Leone and the Gambia, 1850; L. Borel, Voyage a la Gambie, 1865; and the Parlia- mentary Papers relating to Her Majesty’s Colonial Possessions.

GAMBIER, Gampir, or PALE Catecuu. See CATECHU.

GAMBIER, Jamss, Baron (1756-1833), English ad- miral, was born on the 13th October 1756, at the Baliamas, of which his father, John Gambier, was at that time lieu- tenant-governor. He entered the navy in 1767 as a mid- shipman on board the ‘“‘ Yarmouth,” under the command of his uncle; and, his family interest obtaining for him rapid promotion, he was raised in 1778

to the rank of post- captain, and appointed to the ‘ Raleigh,” a fine 32-gun frigate. At the peace of 1783 he was placed on half-pay ; but, on the outbreak of the war of the French Revolution, he was appointed to the command of the 74-gun ship “Defence,” under Lord Howe; and in her he had an honourable share in the action off Ushant, on the Ist June 1794. In recognition of his services on this occa- sion, Captain Gambier received the gold medal, and was made a colonel of marines; the following year he was advanced to the rank of rear-admiral, and appointed one of the lords of the Admiralty. In this office he continued for six years, till, in February 1801, he, a vice-admiral of 1799, hoisted his flag on board the “ Neptune,” of 98 guns, as third in command of the Channel Fleet under Admiral Cornwallis, where, however, he remained for but a year, when he was appointed governor of Newfoundland and commander-in-chief of the ships on that station. In May 1804 he returned to the Admiralty, and, with a short inter- mission in 1806, continued there during the naval adminis- tration of Lord Melville, of his uncle, Lord Barham, and of Lord Mulgrave. In November 1805 he was raised to the rank of admiral; and in the summer of 1807 whilst still a lord of the Admiralty, he was appointed to the com- mand of the fleet ordered to the Baltic, which, in concert with the army under Lord Cathcart, reduced Copenhagen and enforced the surrender of the Danish navy, consisting of nineteen ships of the line, besides frigates, sloops, gunboats and naval stores. This service was considered by the Government as worthy of special acknowledgment; the naval and military commanders, officers, seamen ” and soldiers received the thanks of both Houses of Parliament and Admiral Gambier was rewarded with a peerage.

In the spring of the following year he gave up his seat at the Admiralty on being appointed to the command of the Channel Fleet; and in that capacity he witnessed the partial, and prevented the total, destruction of the French

fleet in Basque Roads, on the 12th April 1809. It is in |

connexion with this event, which might have been as memorable in the history of the British navy as it is in the life of Lord Dundonald (see Dunponaxp), that Lord Gambier’s name is now best known. A court-martial, assembled by order of a friendly Admiralty, and presided over by a

warm partisan, “ most honourably acquitted” him on the charge “that, on the 12th April, the enemy’s ships being then on fire, and the signal having been made that they could be destroyed, he did, for a considerable time, neglect or delay taking effectual measures for destroying them;” but this decision was in reality nothing more than a party statement of the fact that a commander-in-chief, a supporter of the Government, is not to be condemned or broken for not being a person of brilliant genius or dauntless resolution. No one now doubts that the French fleet should have been reduced to ashes, and might have been, had Lord Gambier had the talents, the energy, or the experience of many of his juniors. He continued to hold the command of the Channel Fleet for the full period of three years, at the end of which time—in 1811—he was superseded. In 1814 he acted in a civil capacity as chief commissioner for negotiating a treaty of peace with the United States; for his exertions in which business, he was honoured with the Grand Cross of the Bath. In 1830 he was raised to the high rank of admiral of the fleet, and he died 19th April 1833.

Although he had the good fortune to attain the very highest service rank, Lord Gambier is assuredly not one of those admirals whose memory the British navy treasures or idolizes. His predilection was for a life on shore; and during the great war he so utilized his family interest that he remained for nearly half the time a member of the Admiralty. And whether afloat or ashore, he had neither the genius nor the strength of mind fitted for high command or high office. Personally he was a man of earnest, almost morbid, religious principle, and of undoubted courage ; but the administration of the Admiralty has seldom given rise to such flagrant scandals as during the time when Lord Gambier was a member of it ; and through the whole war, the self-esteem of the navy suffered no such wound as during Lord Gambier’s command in the Bay of Biscay.

The so-called Memorials, Personal and Historical, of Admiral Lord Gambier, by Lady Chatterton (1861), has no historical value. The life of Lord Gambier is to be read in Marshall’s Royal Naval Biography, in Ralfe’s Naval Biography, in Lord Dundonald’s

Autobiography of a Seaman, in the Minutes of the Courts-Martial, and in the general history of the period.

GAMBOGE, the drug Cambogia, a gum-resin procured from Garcinia Morella, Desrous., var. pedicellata, a dicecious tree with leathery, laurel-like leaves, small yellow flowers, and usually square-shaped and four-seeded fruit (see R. Jamie, Pharm. Journ., 3d ser., vol. iv. p. 802), a member of the natural order Guttifere, and indigenous to Camboja (see Campop1a, vol. iv. p. 725), and parts of Siam and of the south of Cochin China, formerly comprised in Cam- bojan territory. The juice, which when hardened constitutes gamboge, is contained in the bark of the tree, chiefly in numerous ducts in its middle layer, and from this it is procured by making incisions, bamboo joints being placed to receive it as it exudes. Gamboge occurs in commerce in cylindrical pieces, known as pipe or roll gamboge, and also, usually of inferior quality, in cakes or amorphous masses. It is of a dirty orange exter nally ; is hard and brittle, breaks with a conchoidal and reddish-yellow, glistening fracture, and affords a brilliant yellow powder ; is odourless, and has a taste at first slight, but subsequently acrid ; forms with water an emulsion; and consists of from 20 to 25 per cent. of gum soluble in water, and from 70 to 75 percent. of a resin, gambogic acid, soluble in alcohol and ether, and, according to Johnston,

of the formula C,,H,,0,, together with moisture about 5 per cent., and a trace of ligneous fibre. Its commonest adulterations are rice-flour and pulverized bark. Some quantity of gamboge is shipped from Kampot in Camboja, but the principal places of export are Bangkok in Siam, and Saigon in Cochin China. Gamboge is a powerful hydra- goguc purgative, less drastic only than elaterium and croton vil. Like aloes, it appears to exert its chief influence on the lower bowel (Brit. and For. Med.-Chir. Rev., i., 1853, p 128), and in combination with compound colocynth pill it has been recommended by Dr Symonds as one of the most efficient purgatives in torpor of the colon. The researches of Christison, Pabo, and Daraszkiewicz go to prove that gambogic acid alone is less cathartic than the same weight of gamboge ; according to the last-mentioned experimenter and Schaur, the presence of bile in theintestines is requisite for the development of its action. In cerebral affections, as apoplexy, when great debility is not present, gamboge has proved to be a valuable counter-irritant purgative. It is sometimes employed as an anthelmintic, but appears to be devoid of any

specific influence on entozoa. Some authorities regard it as decidedly diuretic in action. By Christison and others it has been found highly serviceable in dropsy. Abeille (quoted in Brit. and For, Med.~~Chir, Rev., 1853, ii. p. 279) administered it for that disease, in alcoholic solution, in divided doses of 6 grains per diem, increased by 2 grains daily, and given two hours prior or subsequent to meals. With the relief of the dropsy he observed that the patient's toleration of these large quantities ceased. As gamboge is apt to occasion vomiting and grip~~ ing, it is usually administered in combination with milder remedies. It is an ingredient of the pilula cambogice com- posita of pharmacy. In overdoses it acts as an acrid poison, provoking violent emesis and catharsis, and abdominal pain, coldness of the extremities, and ulceration and morti- fication of the intestines, eventuating in death. Gamboge is used as a pigment, and as a colouring matter for varnishes. It appears to have been first brought into Europe by merchants from the East, at the close of the 16th century. Bontius, writing in the year 1658, mentions it under the name of guttagemou, a word derived by Rost from the Malay gutdéh, gum, and Javanese jamu, medicinal. By the Chinese gamboge (¢ang-hwang and shié-hwang) is understood to be 'serpent-bezoar," a substance vomited up by serpents, or the product of a species of ratan, analogous to the tabasheer of the bamboo (I. P. Smith, Contrib. to- wards the Mat. Med. . . of China, 1871). Varieties of gamboge are yielded by Garcinia Morella, Desrous., a native of §. India and Ceylon, and by the Indian species G. pictoria, Roxb., and G, travancorica, Beddome.

Sce Christison, ''Obs. on a new variety of Gamboge from Mysore," Pharm. Jowrn., ser. i. vol. vi. pp. 60 69, and 'On the Gamboge Tree of Siam," 7d., vol. x. p. 285; F. Mason, " On the Gamboge of the Tenasserim Provinces," 7b., vol. vii. p. 398 ; Pereira, Materia Medica, vol. ii. pt. ii; D. Hanbury, ''On the Species of Garcinia which affords Gamboge in Siam," Trans. Linn. Soc., xxiv., 1864, 487-490; E. J. Waring, Man. of Pract. Thera- peutics, 3d ed., 1871; J. I. de Lanéssan, "Etude sur le Genre Garcinia (Clusiacées) et sur l'Origine et les Propriétés de la Gomme Gutte," Coll. des Theses soutenucs & la Faculté de Médecine de Paris, 1872, vol. x., No. 63; Fliickiger and Hanbury, Pharmacographia, 1874; H. ©. Wood, A Treatise on Therapeutics, 1874; Bentley and Trimen, Medicinal Plants, pt. xxx., pl. 38.

GAME LAWS. This expression is applied in England to a series of statutes of modern date, establishing a peculiar kind of property in wild animals. These statutes, it is well known, are regarded with great dislike by a large and important section of the people—partly on account of their alleged injurious economic effects, and partly on account of their harsh and exceptional character. It will be well to state first the principles of the common law, and then to show how far they have been superseded by recent legislation.

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By the very nature of the case, wild animals cannot be made the subject of that absolute kind of ownership which is generally signified by the term property. The substan- tial basis of the law of property is physical possession, the actual power of dealing with things as we see fit, and we can have no such power over animals in a state of nature. Accordingly, the common law recognized nothing like pro- perty in wild animals, until they had, as it were, been re- duced into possession. Wild animals reclaimed or confined become property, but the moment they escape from con- finement the property is gone, and the rights of the owner are lost. Even bees, which might well be described as domesticated and not wild animals, do not become property until they are hived. ‘Though a swarm lights on any tree,” says Bracton, ‘Ihave no more property therein than I have in the birds which make their nests thereon.” The owner of a confined animal which escapes does indeed retain his property while he is in pursuit of the fugitive ; z.¢., no other person can, in the meantime, establish a right of pro- perty against him by capturing the animal, just as a swarm of bees “which fly from and out of my hive are mine so long as I can keep them in sight, and have power to pursue tllem.” Again, the law recognized a right in wild animals propter impotentiam, t.e., when they were young and unable to move from place to place. With these exceptions wild animals were ves nullius, capable of being made tlie pro- perty of any person reducing them into possession. A prior right to acquire property in such animals was, however, allowed to the owner (or occupier) of the soil. Thus it is said that ‘‘if A starts a hare in the ground of B, and hunts it and kills it there, the property continues all the while in B.” Bigs said to have a right of property in the wild animals on his land ratione sold. But “if A starts a hare on the

ground of B, and hunts it into the ground of C and kills it there, the property is in A, and not in B or C.” That is to say, the so-called property in wild animals ratione solt consists in this, that if one of them is started and killed by a trespasser it belongs to the owner (or occupier) of the soil. If the animal goes to another man’s land this inchoate right is transferred to the other man. And the inchoate right of the owner becomes an actual right of pro- perty only when the animal is both started and killed by the trespasser on the same man’s land. Such right as the owner has belongs to the occupier when the land is given without reserve to a tenant for a term.

These principles, it will be observed, apply to all wild animals, and no distinction is made between game and other animals. The laws of the forest, however, established in derogation of the common law a different kind of property in certain classes of wild animals, For an account of these see Forest Law (vol. ix. p. 408). The forest code affected definite districts of the country, and the right which they protected was the exclusive right of hunting the animals of the forest within those districts.

The game laws as above defined have virtually taken the place of the forest laws. The latter protected the privilege of the king and his favourites to hunt certain animals in certain districts; the former have extended and protected the right of an owner of the soil to the chase of certain ani- mals on his own estate. The means adopted have been to make trespass (in itself only a civil wrong) a criminal offence punishable with great severity, and to restrict, by a system of licences, the right as well of killing as of selling game. The principal Acts are 1 & 2 William IV. c. 32 (the Game Act), 9 Geo. IV. c. 69 (the Night Poaching Act), 23 & 24 Vict. c. 90 (Game Licences Act), and the Hares Killing Act, 11 & 12 Vict, c. 29. The Game Act repeals a large number of statutes on the subject, most of them passed inthe 18th century. Game is defined to include “hares, pheasants, partridges, grouse, heath or moor game, black game, and

bustards,” and the same definition is found in the Night Poaching Act. A close time is fixed for certain birds of game :—for partridges from 1st February to Ist September ; pheasants, Ist February to Ist October; black game, 10th December to 20th August ; grouse, 10th December to 12th

August ; bustard, 1st March to Ist September ; and the possession of such game after 10 days in dealers, and 40

days in other persons, from the expiration of the season is | The Act makes no difference in the effect of | a game certificate (now “game licence”); that is to say, |

made illegal.

the licence authorizes the holder to kill game, subject to the law of trespass as modified by this Act. A temporary section reversed, as to all existing leases, the presump- tion of law that the game, unless specially reserved, be-

longs to the tenant; but the presumption remains as to _

all future leases. But when the game has been reserved to

the landlord, or any assignee of his, then the occupier shall |

be punished for killing it, or for authorizing any other person to do so. Tent necessary by the fact that the law of trespass, which is the pivot of the Game Act, could not be made to include the case of a farmer shooting game on his own ground; but it is open to the remark that in effect it converts a mere breach of contract intoa crime. Persons holding game certificates (licences) may sell game to persons licensed to deal therein. Various sections of the Act define the penalties to which persons killing or sclling game without a licence shall be subject, and it should be noticed that it is a punishable offence even to buy game except from a licensed dealer. The section relating to trespass (§ 30 of the Game Act) enacts that, “if any person whatsoever shall commit any trespass by entering or being in the day time upon any land in search or pursuit of game, or woodcocks, snipes, quails, landrails, or conies,! such person shall, on conviction thereof before a justice of the peace, forfeit and pay such sum of money, not exceeding two pounds, as to the justice shall seem meet, together with the costs of the conviction ;” and that if any persous, to the number of five or more together, shall commit any trespass by entering or being in the day time upon any land in search of or pursuit of game or woodcocks, &ec, “ each

shall, on conviction, forfeit a sum not exceeding five pounds. The leave of the occupier shall be no defence when the game belongs to the landlord or other persons ; and by § 31, trespassers in pursuit of game, &c., may be required to leave the land, to tell their names and abodes, and if they refuse may be arrested. The owner of the right of shooting may take from them any game found in their possession. The sections against trespassers, however, do not include any person hunting or coursing

upon any land with hounds or greyhounds." This act applies only to England. The Poaching Acts are still more severe, The Night

Poaching Act enacts that, "if any person shall, after the passing of this Act, by night unlawfully take er destroy any game or rabbits in any land, whether open or enclosed, or shall by night unlawfully enter or be on any land, whether open or enclosed, with any gun, net, engine, or other instrument for the purpose of destroying game, such offender shall, upon conviction thereof before two justices of the peace, be committed for the first offence to the common gaol or house of correction for any period not excceding three calendar months, there to be kept to hard labour, and at the expiration of such period shall find sureties" for his not so offending again. For a second offence the punishment is six months with hard labour, &c., with one year's further imprisonment in default of sureties 5 a third offence is a misdemeanour, and the punishment is penal servitude for

1 These animals, although not included in the statutory definition

of game, are by this section partially admitted to the benefit of the Act.

This section no doubt was rendered |

not more than seven years, or imprisonment for not more than two years. A later Act, 7 & 8 Vict. c. 29, §1, applies the penalties to the unlawful taking or destroying game on a highway by night. '' Night" is declared to commence at the expiration of the first hour after sunset and to conclude at the beginning of the last hour before sunrise. Finally, the Poaching Prevention Act (25 & 26 Vict. c. 114) gives power to a constable, "on any

highway, street, or public place, to search any person whom he may have good cause to suspect of coming from any land where he shall have been unlawfully in search or pursuit of game, or any per- sons aiding or abetting such person, and having in his possession any game unlawfully obtained, or any gun, part of gun, or nets or engines used for the killing or taking game ; and also to stop and search any cart or other con- veyance in or upon which such constable or peace officer shall have good cause to suspect that any such game, or any such article or thing, is being carried by any such person." If any such thing be found the constable is to detain it, and apply for a summons against the offender, summoning him to appear before two justices, where, on couviction, he

_may be fined not more than £5, and shall forfeit the game,

guns, &c., found in his possession. This Act is available by night as well as day. It should be noted in all cases where the unlawful taking or destroying of game is men- tioned, that such taking is made unlawful only by the pro- visions of the Acts relating to certificates, or by the law relating to trespass. A person provided with a certificate can still kill game where he pleases, unless he commits a trespass—the only exception being that of the tenant whose landlord has reserved the game in his lands. Thus it may be inferred that a poacher provided with a certificate could not be brought within the limits of the Act relating to poaching on highways.

Game certificates are now regulated by 23 & 24 Vict. c. 90. Section 4 enacts that 'any person, before he shall in Great Britain take, kill, or pursue, or aid or assist in any manner in the taking, killing, or pursuing, by any means whatever, or use any dog, gun, net, or other engine for the purpose of taking, killing, or pursuing any game, or any woodcock, snipe, quail, landrail, or any coney, or any deer, shall take out a proper licence to kill game under this Act "—subject toa penalty of £20. There are, however, certain excep- ticns and exemptions, As to licences to deal in game, any person who shall have obtained a licence to deal in game from the justices of the peace under the provisions of 1 & 2 Will. IV. c. 32, and 2 & 3 Vict. ¢. 35, shall annually and during the continuance of such licence, and before he shall be empowered to deal in game under such licence, obtain a further licence to deal in game under this Act, and only those who have obtained

licence from the justices shall be licensed under the Act, 2.¢., by the Inland Revenue. By 11 & 12 Vict. c. 29 any occupier or owner having the right of killing game may, by himself or by any person author- ized by him in writing, kill hares without paying duty or taking out licence,

Most of the Acts cited above apply to Scotland as well as England, and when they do not there are special enactments for Scotland having substantially the same effect. The more important statutes specially affecting Scotland are the 13 Geo. IIL. c. 54, which fixes a close time for killing, selling, buying, &c., muirfowl, heathfowl, partridge, and pheasant ; the 2 & 3 Will. IV. c. 68 (the Tres- pass Act); the 11 & 12 Vict. c. 30 (Hares Killing Act); and the 40 & 41 Vict. c. 28. The last is to some extent a departure from the general policy of the game laws, being an attempt to provide compensation to tenants for damage caused by game, In effect it will be found to belong to the

class of " permissive" statutes. The important section is the 4th :—

"Where, under any lease made subsequently to the commence- |

ment of this Act, or where, by presumption of common law, upon any land occupied undcr a lease made subsequently to the com- meucement of this Act, the lessor shall reserve or retain the sole right of hunting, killing, or taking rabbits, hares, or other game, or any of them, the lessce shall be entitled to compensation for the damage done to his crops in each year by the rabbits and hares, or

other game, to which the lessor may have reserved or retained the |

whole right, in excess of such sum as may have been set forth in the lease as the amount of annual damage for which it is agreed no compensation shall be due; and if no such sum shall be set forth, then in excess of the sum of forty shillings."

Scotch law, differing in this respect from English law, infers that, when the lease contains no stipulations as to game, the landlord reserves the right of

killing game to himself, The Act contains provisions for settling claims of damage either by arbitration or by action at law. Leases made before the Act are not to be affected thereby. The old Act of 1621, “anent hunting and haulking, ” is cited in the schedule of the last-mentioned Act ; it “ordaines that

no man hunt nor haulk at any time hereafter who hath not a plough of land in heritage, under the pain of £100.” It is, of course, practically obsolete. (E. R.)

GAMES. ‘The public games of Greece and Rome were athletic contests and spectacles of various kinds, generally connected with and forming part of a religious observance. Probably noinstitution exercised a greater influence in mould- ing the national character, and producing that unique type of physical and intellectual beauty which we see reflected in Greek art and literature, than the public contests of Greece. For them each youth was trained in the gymnasium, they were the central mart whither poet, artist, and merchant each brought his wares, and the common ground of tmion for every member of the Hellenic race, It is to Greece then that we must look for the earliest form and the fullest development of ancient games, and we propose in the present article to treat principally of the Greek dydves. The shows of the Roman circus and amphitheatre were at best a shadow, and in the later days of the empire a travesty, of the Olympia and Pythia, and require only a cursory notice. “ Corruptio optimi fit pessima.” From the noblest spectacle in the world, the Greek Olympia, the downward course of public games can be traced, till we reach the ignoblest, the Roman amphitheatre, of whose horrors we may still form a faint picture from its last sur- vival, the Spanish bull-fight.

The earliest games of which we have any record are those

- at the funeral of Patroclus, which form the subject of the

twenty-third Iliad. They are noticeable both as showing that the belief that the dead would be appeased or gratified by the same exhibitions which pleased them in life was a common heritage of Greeks and Romans from their Aryan progenitors, and as already including all the distinctive competitions which we find in historical times, —the chariot- race, archery,

boxing, wrestling, and putting the weight. Kach of the great Grecian games was held near some shrine or consecrated spot, and is connected by myth or legend with some hero, demigod, or local deity,

The Olympian games were the earliest, and to the last they remained the most celebrated of the four national festivals. Olympia was a naturally enclosed spot in the rich plain of Elis, bounded on the N, by the rocky heights of Kronos, and on the S. and W. by the Alpheus and its tributary the Kladeus. There was the greve of Altis, in which were ranged the statues of the victorious athletes, and the temple of Olympian Zeus with the chryselephantine statue of the god, the niasterpiece of Phidias. There Hercules (so ran the legend which Pindar has introduced in one of his finest odes), when he had conquered Elis and slain its king Augeas, conse- crated a temenos and instituted games in honour of his vic- tory. A later legend, which probably embodies historical | fact, tells how, when Greece was torn by dissensions and |

ravaged by pestilence, Iphitus inquired of the oracle for help, and was bidden restore the games which had fallen into de- suetude ; and there was in the time of Pausanias, suspended in the temple of Hera at Olympia, a bronze disk wh2reon were inscribed, with the regulations of the games, the names of Iphitus and Lycurgus. From this we may safely infer that the games were a primitive observance of the Eleians and Pisans, and first acquired their celebrity from the powerful coucurrence of Sparta. In 776 8.c. the Eleians engraved the name of their countryman Corcebus as victor in the foot race, and thenceforward we have an almost un- broken list of the victors in each succeeding Olympiad or fourth recurrent year. For the next fifty years no names occur but those of Eleians or their next neighbours. After 720 B.c. we find Corinthians and Megareans, and later still Athenians and extra-Peloponnesians. Thus what at first was nothing more than a village bout became a bond of union for all the branches of the Doric race, and grew in time to be the high feast to which every Greek gathered, from the mountain fastnesses of Thessaly to the remotest colonies of Cyrene and Marseilles. It survived even the extinction of Greek liberty, and had nearly completed twelve centuries when it was abolished by the decree of the

Christian emperor Theodosius, in the tenth year of his reign. The last Olympian victor was a Romanized Armenian named Varastad.

Let us attempt to call up the scene which Olympia in its palmy days must have presented as the great festival approached. Heralds had proclaimed throughout Greece the truce of God, which put a stop to all warfare, and ensured to all a safe conduct during the sacred month. So religiously was this observed that the Spartans chose to risk the liberties of Greece, when the Persians were at the gates of Pyle, rather than march during the holy days. Those white tents which stand out against the sombre grey of the olive groves belong to the Hellanodice, or ten judges of the games, chosen one for each tribe of the Eleians.

They have been here already ten months, receiving instruc-

tion in their duties. All, too, or most of the athletes must have arrived, for they have been undergoing the indispens- able training in the gymnasium of the Altis. But along the “holy road” from the town of Elis there are crowding a motley throng. Conspicuous in the long train of pleasure-seekers are the Oewpoi or sacred deputies, clad in their robes of office, and bearing with them in their carriages of state offerings to the shrine of the god. Nor is there any lack of distinguished visitors. It may be Alcibiades, who, they say, has entered no less than seven chariots ; or Gorgias, who has written a famous éiSevéis for the occasion ; or the sophist Hippias, who boasts that all he bears about him, from the sandals on his feet to the dithyrambs he carries in his hand, are his own manufacture ; or Aetion, who will exhibit his picture of the Marriage of Alexander and Roxana—the picture which gained him no less a prize than the daughter of the Hellanodices Praxonides; or, in an earlier age, the poet-laureate of the Olympians, Pindar himself. Lastly, as at the medieval tournament, there are “store of ladies whose bright eyes rain influence a matrons, indeed, are excluded on pain of death, but maidens, in accordance with Spartan manners, are admitted to the show.

At daybreak the athletes presented themselves in the Bouleuterion, where the presidents were sitting, and proved by witnesses that they were of pure Hellenic descent, and had no stain, religious or civil, on their character. Laying their hands on the bleeding victim, they swore that they had duly

qualified themselves by ten months' continuous training in the gymnasium, and that they would use no fraud or guile in the sacred contests, Thence they pro- ceeded to the stadium, where they stripped to the skin and

anointed themselves. A herald proclaimed—" Let the |

runners put their feet to the line," and called on the spectators to -challenge any disqualified by blood or character, If no objection was made, they were started by the note of the trumpet, running in heats of four, ranged in the places assigned them by lot. The presidents seated near the goal adjudged the victory. The footrace was only one of twenty-four Olympian contests which Pausanias enumerates, though we must not suppose that these were all exhibited at any one festival. Till the 77th Olympiad all was concluded in one day, but afterwards the feast was extended to five. The order of the games is for the most part a matter of conjecture, but, roughly speaking, the historical order of their institution was followed. We will now describe in this order the most important.

(1.) The foot-race. For the first 13 Olympiads the Spoos, or single lap of the stadium, which was 200 yards long, was the only contest. The d/avdos, in which the course was traversed twice, was added in the 14th Olympiad, and in the 15th the SdArxos, or long race, of 7, 12, or, according to the highest computation, 24 laps, over 3 miles in length. We are told that the Spartan Ladas, after winning this race, dropped down dead at the goal. There was also, for a short time, a race in heavy armour, which Plato highly commends as a preparation for active service. (2.) Wrestling was introduced in the 18th Olympiad. The importance attached to this exercise is shown by the very word pulestra, and Plutarch calls it the most artistic and cunning of athletic games. The practice differed little from that of modern times, save that the wrestler's limbs were anointed with oil and sprinkled with sand. The third throw, which decided the victory, passed into a proverb, and struggling on the ground, such as we seein the famous statue at Florence, was not allowed, at least at the Olympia. (3.) In the same year was introduced the wévraOAov, a com- bination of the five games enumerated in the well-known pentameter ascribed to Simonides :—

dAma, wodwxelnv, Sickov, &kovra, waAny.

Only the first of these calls for any comment. The only leap practised seems to have been the long jump. The leapers increased their momentum by means of dArfjpes or dumb-bells, which they swung in the act of leaping. By the help of them, and of the spring-board, euormous dis- tances were covered, though the leap of 55 feet with which Phayllus is credited is simply incredible. It is disputed whether a victory in all tive contests, or in three at least, was required to win the wévra@Aov. (4.) Boxing was added in the 23d Olympiad. The rules were much the same as those of the modern ring, except that the boxer's fists and wrists were armed with straps of leather. The force of the blow was thereby increased; but no arm so terrible as the cestus of the Romans can ever have been admitted in Greek contests, seeing that the death of an antagonist not only disqualified a combatant, but was severely punished. In the pancratiwm, a combination of wrestling and boxing, the use of these Straps, and even of the clenched fist, was disallowed. (5.) The chariot-race had its origin in the 23d Olympiad. It was held in the hippodrome, a race-course 1200 feet long by 400 broad, laid out on the left side of the hill of Kronos. The whole circuit had to be traversed twelve times, In the centre near the further end was the pillar or goal (the spina of the Romans), round which the chariots had to turn. "To shun the goal with rapid wheels" has been well selected by Milton as the most graphic feature of the Olympian games. So dangerous indeed was the mancuvre that, according to Pausanias, a mysterious horror attached to the spot, and horses when they passed it would start in terror without visible cause, upsetting the chariot and wounding the driver.

GAMES

The number of chariots that might appear on the course at once is uncertain. Pindar (Pyth., v. 46) praises Arcesilaus of Cyrene for having brought off his chariot uninjured in a contest where no fewer than forty took part. The large outlay involved excluded all but rich competitors, and even kings and tyrants eagerly contested the palm. Thus in the list of victors we find the names of Cylon, the would-be tyrant of Athens, Pausanias the Spartan king, Archelaus of Macedon, Gelon and Hiero of Syracuse, and Theron of Agrigentum. Chariot-races with mules, with mares, with two horses in place

of four, were successively introduced, but none of these present any special interest. Races on horseback date from the 33d Olympiad. As the course was the same, success must have depended on skill as much as on swiftness. Lastly, there were athletic con- tests of the same description for boys, and a competition of heralds and trumpeters, introduced in the 93d Olympiad.

The prizes were at first, as in the Homeric times, of some intrinsic value, but after the 6th Olympiad the only prize for each contest was a garland of wild olive, which was cut with a golden sickle from the kallistephanos, the sacred tree brought by Hercules “from the dark fountains of Ister in the land of the Hyperboreans, to be a shelter common to all men and a crown of noble deeds” (Pindar, Ol., iii. 18). Greek writers from Herodotus to Plutarch dwell with com- placency on the magnanimity of a race who cared for no- thing but honour and were content to struggle for a corrup- tible crown. But though the Greek games present in this respect a favourable contrast to the greed and gambling of the modern race-course, yet to represent men like Milon and Damoxenus as actuated by pure love of glory is a pleasing fiction of the moralists. The successful athlete received in addition to the immediate honours very substantial rewards. A herald proclaimed his name, his parentage, and his country ; the Hellanodice took from a table of ivory and gold the olive crown and placed it on his head, and in his hand a branch of palm; as he marched in the sacred revel to the temple of Zeus, his friends and admirers showered in his path flowers and costly gifts, singing the old song of Archilochus, ryvehAa kaAAivixe, and his name was canonized in the Greek calendar. Fresh honours and rewards awaited him on his return home. If he was an Athenian he received, according to the law of Solon, 500 drachme, and free rations for life in the Prytaneum ; if a Spartan, he had as lis prerogative the post of honour in battle. Poets like Pindar, Simonides, and Euripides sung his praises, and sculptors like Phidias and Praxiteles were engaged by the state to carve his statue. We even read of a breach in the town walls being made to admit him, as if the common road were not good enough for such a hero; and there are well- attested instances of altars being built and sacrifices offered to a successful athlete. No wonder then that an Olympian prize was regarded as the crown of human happiness. Cicero, with a Roman’s contempt for Greek frivolity, observes with a sneer that an Olympian victor receives more honours than a triumphant general at

Rome, and tells the story of the Rhodian Diagoras, who, having himself won the prize at Olympia, and seen his two sons crowned on the same day, was addressed by a Laconian in these words :— “Die, Diagoras, for thou hast nothing short of divinity to desire.” Alcibiades, when setting forth his services to the state, puts first his victory at Olympia, and the prestige he had won for Athens by his magnificent display. But perhaps the most remarkable evidence of the exaggerated value which the Greeks attached to athletic prowess is 4 casual expression which Thucydides employs when describ- ing the enthusiastic reception of Brasidas at Scione. The Government, he says, voted him a crown of gold, and the multitude flocked round him and decked him with garlands, as though he were an athlete.

GAMES

The above description of the Olympian games will serve generally for the other great festivals of Greece. entering on any detailed account of these, it will be suffi- cient here to glance at the most prominent characteristics of each.

The Pythian games, secoud only to the Olympian in im- portance, were founded after the first Sacred War out of the spoils of Cirrha, 595 B.c. held every eighth year in honour of the Delphic god, with no other contests but in the harp and the pean—in fact a sort of Greek Eisteddfod—they developed into a common dywv for all Greece (so Demosthenes calls them),

with all the games and races of Olympia, from which they |

were distinguished only by their musical and poetical com- petitions. They were held under the superintendence of the Amphictyones in the autumn or first half of every third Olympian year. The prizes were a wreath of laurel and a palm.

The Vemean games, originally a warlike gathering and review, were held in honour of Nemean Zeus at the grove of Nemea, between Cleon and Phlius, in the second and fourth year of each Olympiad. They date from about 570 B.C, The prize was a chaplet of parsley.

The Isthmian games, founded a little earlier than the Nemean, partook at first of the nature of mysteries. They were lield on the narrowest part of the Isthmus of Corinth in honour of Poseidon in the first and third year of each Olympiad. Their prize was a wreath of pine leaves. The importance of the Isthmian games in later times is shown by the fact that Flamininus chose the occasion for proclaim- ing the liberation of Greece, 196 Bc. That at a later anuiversary (67 A.D.) Nero repeated the proclamation of Flamininus, and coupled with it the announcement of his own infamous victory at Olympia, shows alike the hollow- ness of the first gift and the degradation which had befallen the Greek games, the last faint relic of Greek worth and independence.

The Ludi Publici of the Romans included feasts and theatrical exhibitions as well as the public games with which alone we are concerned. As in Greece, they were intimately connected with religion. year it was the duty of the consuls to vow to the gods games for the safety of the commonwealth, and the expenses were defrayed by the treasury. Thus, at no cost to them-

Without |

Originally a local festival |

selves, the Roman public were enabled to indulge at the |

same time their religious feelings and their love of amuse- ment. Their taste for games naturally grew till it became a passion, and under the empire games were looked upon by the mob as one of the two necessaries of life. The gdiles who succeeded to this duty of the consuls were ex- pected to supplement the state allowance from their private purse. Political adventurers were not slow to discover so ready a road to popularity, and what at first had been ex- clusively a state charge devolved upon men of wealth and ambition. A victory over some barbarian horde or the death of a relation served as the pretext for a magnificent display. But the worst extravagance of private citizens was eclipsed by the reckless prodigality of the Cesars, who squandered the revenues of whole provinces in catering for the mob of idle sight-seers on whose favour their throne depended. But though public games played as important a part in Roman as in Greek history, and must be studied by the Roman historian as an integral factor in

social and political life, yet, regarded solely as exhibitions, they are comparatively devoid of interest, and we sympathize with Pliny, who asks his friend how any man of sense can go

day after day to view the same dreary round of fights and |

races,

It is easy to explain the different feelings which the games of Greece and of Rome excite.

| Classes, after them the athletes,

_ best were actors, the Romans from first to last were specta- tors. It is true that even in Greek games the professional element played a large and ever-increasing part. As early as the 6th century B.c. Xenophanes complains that the _ wrestler's strength is preferred to the wisdom of the philo- | sopher, and Euripides, in a well-known fragment, holds up to scorn the brawny swaggering athlete. But what in Greece was a perversion and acknowledged to be such, the Romans not only practised but held up as their ideal. No Greek, however high in birth, was ashamed to compete in person for the Olympic crown. The Roman, though little inferior in gymnastic exercises, kept strictly to the privacy of the palestra ; and for a patrician to appear in public as a charioteer is stigmatized by the satirist as a mark of shameless effrontery.

Roman games are generally classified as Jixed, extra- ordinary, and votive; but for our present purpose they may be more conveniently grouped under two heads according to the place where they were held, viz, the circus or the amphitheatre.

For the Roman world the circus was at once a political club, a fashionable lounge, a rendezvous of gallantry, a betting ring, and a playground for the million. Juvenal, speaking loosely, says that in his day it held the whole of Rome ; and there is no reason to doubt the precise statement of P. Victor, that in the Circus Maximus there were seats for 350,000 spectators. Of the

various Ludi Circences it may be enough here to give a short account of the most important, the Ludi Magni or Maximi.

Initiated according to legend by Tarquinius Priscus, the Ludi Magni were originally a votive feast to Capitoline J upiter, promised by the general when he took the ficld, and performed on his return from the annual campaign. They thus presented the appearance of a military spectacle, or rather a review of the whole burgess force, which marchied in solemn procession from the Capitol to the forum and thence to the circus, which lay between the Palatine and Aventine, First came the sons of patricians mounted on horseback, next the rest of the burghers ranged according to their military naked save for the girdle round their loins, then the company of dancers with the harp and flute players, next the priestly colleges bearing censers and other sacred

‘ | Instruments, and lastly the simulacra of the gods, carried aloft on At the beginning of each civil |

their shoulders or drawn in cars. The games themselves were four- fold :—(1) the chariot race ; (2) the Iudaus Troie ; (8) the military review ; and (4) gymnastic contests. Of these only the first two call for any comment, (1.) The chariot employed in the circus was the two-wheeled war car, at first drawn by two, afterwards by four, and more rarely by three horses. Originally only two chariots started for the prize, but under Caligula we read of as inany as twenty-four heats run in the day, each of four chariots. The distance traversed was fourteen times the length of the circus or nearly five miles, The chariotcers were apparently from the first professionals, though the stigma under which the gladiator lay never attached to their calling. Indeed a successful driver may compare in popularity and fortune with a modern jockey. The drivers were divided into com- panies distinguished by the colours of their tunics, whence arose the faction of the circus which assumed such importance under the later emperors. In republican times there were two factions, the white and the red; two more, the green and the blue, were added under the empire, and for a short time in Domitian’s reign there were also the gold and the purple. Even in Juvenal’s day party spirit ran so high that a defeat of the green was looked upon as a second Canne. After the seat of empire had been transferred to

Constantinople these factions of the cireus were made the basis of political cabals, and frequently resulted in sanguinary tumults,

| such as the famous Nika revolt (532 a.p.), in which 30,000 citizens

lost their lives. (2.) The Ludus Troie was a sham fight on horse- back in which the actors were patrician youths, A spirited description of it will be found in the 5th Aneid. See also Circus.

The two exhibitions we shall next notice, though occasionally

_ given in the circus, belong more properly to the amphitheatre.

Venatio was the baiting of wild animals who were pitted either with

| one another or with men—captives, criminals, or trained hunters

called bestiarit. The first certain instance on record of this amuse- ment is in 186 B.c., when M. Fulvius exhibited lions and tigers in the arena. The taste for these brutalizing spectacles grew apace, and the most distant provinces were ransacked by generals and

The Greeks at their ; Proconsuls to supply the arena with rare animals—giraffes, tigers,

A. ag

66

and crocodiles. Sulla provided for a single show 100 lions, and Pompey 600 lions, besides elephants,

which were matched with Getulian hunters.

Julius Cesar enjoys the doubtful honour of inventing the bull-fight. At the inauguration of the Colosseum

: i te 5000 wild and 4000 tame beasts were killed, and to commemora Tere Dacian victories there was a butchery of 11,000 beasts. The nawmachia was

a sea fight, either in the arena, which was flooded for the occasion by a system of pipes and sluices, or on an artificial lake. The rival fleets were manned by prisoners of war or criminals, who often fought till one side was exterminated. : In the sea fight on Lake Fucinus, arranged by the emperor Claudius, 100 ships and 19,000 men were engaged.

But the special exhibition of the amphitheatre was the munus gladiatoriwm, which dates from the funeral games of Marcus and Decimus Brutus, given in honour of their father, 264 B.c. It was probably borrowed from Etruria, and a refinement on the common savage custom of slaughtering slaves or captives on the grave of a warrior or chieftain. Nothing so clearly brings before us the vein of coarseness and inhumanity which runs through the otherwise noble character of the Roman, as his passion for gladiatorial shows. We can fancy how Pericles, or even Alcibiades, would have loathed a spectacle that Augustus tolerated and Trajan patronized. Only after the conquest of Greece we hear of their introduction into Athens, and they were then admitted rather out of compliment to the conquerors than from any love of the sport. In spite of numer- ous prohibitions from Constantine downwards, they continued to flourish even as lateas St Augustine. To a Christian martyr, if we may credit the story told by Theodoret aud Cassiodorus, belongs the honour of their final abolition. In the year 404 Telemachus, a monk who had travelled from the East on this sacred mission, rushed into the arena and endeavoured to separate the combatants. He was instantly despatched by the pretor's orders; but Honorius, on hearing the report, issued an edict abolishing the games, which were never afterwards revived. See GLADIATORS. (F. 8.)

GAMES, GAMING. Looking here at these in their legal aspects, it will be seen that from very early times the law of England has attempted to exercise some control over the sports and pastimes of the people—particularly those involving an element of gambling. Certain games were either prohibited altogether, or reserved for people of some position in society. The Act 33 Henry VIII. c. 9, increasing the severity of still older enactments, deals with the whole subject in great detail, and it is interesting to notice that the reason assigned for prohibiting unlawful games was that they interfered with other exercises more useful to the state. The Act is entitled a "Bill for the maintaining artillery and the debarring unlawful

games ;” and it recites that, since the last statutes, “crafty persons have invented many and sundry new and crafty games and plays, as loggetting in the fields, slide-thrift, otherwise called shove-groat, as well within the city of London as elsewhere in many other and divers parts of this realm, keeping houses, plays, and alleys for the maintenance thereof, by reason whereof archery is sore decayed, and daily is like to be and more minished, and divers bowyers and fletchers,

pie of a gone and inhabit themselves in Scotland an te ler places out of this realm, there working and teach- ing their science, to the pursuance of the same, to the great comfort of estrangers and detriment of this realm.” oy a a cs declared against all persons keep-

8 ‘houses tor unlawful games, and all persons resorting thereto. It is further provided that “no manner of artificer or craftsman of any handicraft or occupation \eabenr divans apprentice labourer, servant at husbandry, journeyman Or servant of artificer, mariners, fishermen, watermen, or an serving man, shall play at the tables, tennis, dice, eat bowls, clash, coyting, loggetting, or any other unlawful ame out of Christmas under the pain of xxs, to be forfeit for every time : and in Christmas to play at any of the said games in their masters’ houses or in their masters’ presence : and also that no manner of person shall at any time play at any bowl or bowls in open places out of his pest 4 orchard’ (§ 16), The social evils of gambling (impover- ishment, crime, neglect of divine Service) are incidental alluded to in the preamble, but only in connexion with hs main purpose of the statute—

the maintenance of archery. |

GAMES

Blackstone, commenting on this and subsequent statutes, declares that “ the principal ground of modern complaint is the gambling in high life” (vol. iv. c. 13), and he cites the various statutes which, up to his time, had been passed against this pernicious vice. Some of these went so far as to make the mere winning or losing of money at play a criminal offence. By the Act 18 Geo. II. c. 34 (repealed by 8 and 9 Vict. c. 109), if any man be convicted upon information or indictment of winning or losing at play or by betting at

any one time £10 or £20 within 24 hours, he shall be fined five times the sum for the benefit of the poor of the parish. And the evil of gambling, z.e., betting or wagering, is the ostensible object against which the later statutes on gaming are directed, A bet or wager was, however, at common law as valid as any other kind of contract, and the distinction between bets depending on gaming and bets depending on other contingencies was long retained, and has, in fact, not yet entirely disappeared. Besides the Act last mentioned, the Acts 9 Anne c. 14, 2 Geo. IT. c. 28, and 13 Geo. II. «. 34 prohibited particular games.

The modern statutes are the following—8 and 9 Vict. c. 109, 16 and 17 Vict. c. 119, and 17 and 18 Vict. c. 38.

The 8 and 9 Vict. c. 109 (Act to amend the law relating to games and wagers) repeals, inter alia, so much of the old law of Henry VIIL as makes it unlawful to play at any mere games of skill. And it provides that, to prove any house to be acommon gaming-house, it “shall be sufficient to show that it is kept or used for playing therein at any unlawful game, and that a bank is kept there by one or more of the players exclusively of the others, or that the chances of any game played therein are not alike favourable to all the players, including among the players the banker or other person by whom the game is managed, or against whom the other players stake, play, or bet.” Gambling, it will be noticed, is still in this definition connected with some kind of game; the later Act, 16 and 17 Vict c. 119 (for the suppression of betting-houses), enacts that any house used for the purpose of “ betting with persons resort- ing thereto” shall be deemed to be a common gaming-house. To return to the former Act, it provides that proof that the gaming was for money shall not be required, and that the presence of cards, dice, and other instruments of gaming shall be prima facie evidence that the house was used as a common gaming-house. The keeping of houses for the game of billiards is to be authorized under licence from the justices to be granted at the general licensing sessions, and the conditions are in general the same as to time of opening, &c., as those of the victuallers’ licences. Any persons winning money by cheating at any game or wager shall be deemed guilty of obtaining money by false pretences. The 16 and 17 Vict. c. 119, besides bringing betting-houses within the statutory definition of gaming- houses, makes it a specific offence to publish advertisements,

handbills, placards, &c., showing that any house is kept or opened for the purpose of betting. With reference to the definition of betting-house in this statute, “a place opened, kept, or used for the purpose of the owner, occupier, &t., thereof, betting with persons resorting thereto,” it may be mentioned that it was avowedly framed for the purpose of hitting houses open to all and sundry, as distinguished from large but legally private betting-clubs like Tattersall’s. The reason for this distinction, of course, is that the former are frequented mainly bya poorer class of persons, who cannot afford the luxury of gambling, and will be tempted by their losses to defraud their employers. The Act of 17 and 18 Vict. gives additional facilities for enforcing the preceding Acts, and increases the severity of the penalties. The keeper of a gaming-house may be fined up to £50 and costs, and on default of payment may be sent to gaol for twelve

_ tunities,

|

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‘ unlawful means. ‘| Was against public policy, (condition of the king’s revenue to all the world. A bet

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months. Finally, the Vagraut Act, 1873 (36 and 37 Vict,

c. 38), contains the following clause: “Every person play-

ing or betting by way of wagering or gaming on any street,

road, highway, or other open and public place, or in any open place to which the public have, or are permitted to

have, access, at or with any table or instrument of gaming,

or any coin, card, token, or other article used as an instru-

ment or means of gaming, at any game or pretended game of chance, shall be deemed a rogue and vagabond.” The original Act of 1868, of which this is an amendment, was passed to repress the practice of playing pitch and toss in the streets, which, it seems, had grown to the dimensions of a nuisance. in the colliery districts.

The general result of all these enactments may be briefly stated thus. Apart from statute, no games are unlawful in themselves. Games were originally made unlawful in the interest of the more useful military exercises which they threatened tosupplant. The prohibition has been retained and extended on account of the vice of gambling, and severe penalties have been enacted against houses at which persons can play unlawful games. Betting-houses in general were brought within the definition of gaming-houses, and finally hetting or gaming was prohibited in any public place. It must be admitted that these distinctions are

based on a most invidious principle. Practically gambling

is forbidden to the poor and connived at in the rich.

It may be asked, What games, as such, are lawful under these various statutes, and what are unlawful? The author of an excellent and amusing little work on Gaming and Gamesters’ Law,’ gives the following as the result of a The following are

careful examination of all the Acts. lawful games :—backgammon, bagatelle, billiards, boat-races, bowls, chess, cricket, croquet, curling, dominoes, draughts, fives, football, foot-races, golf, knurr and spell, putting the

stone, quoits, rackets, rowing, skittles, tennis, whist, wrest-

ling. The following are doubtful—boxing, cudgel-playing,

and single-stick. The following are absolutely unlawful—

ace of hearts, basset, dice (except backgammon), hazard, lotteries (except art-union lotteries), Pharaoh (or faro), boulet (or roly poly). An Act of Geo.

IL, which pro- hibited horse-racing for prizes under £50 value, has since been repealed.

To turn now to the civil aspects of the case. Gambling apart from gaming, 7.c., simple wagering or betting, was notat common law illegal, and the Act of Anne did not affect wagers other than gaming wagers. In fact, the courts were con- stantly being called upon to enforce contracts by way of Wagers, and were as constantly exercising their ingenuity to discover excusesforrefusing, A writer onthelaw of contracts? discovers here the origin of that principle of “public policy” which plays so important a part in Englishlaw. Wagering contracts were rejected because the contingencies on which they depended tended to create interests hostile to the common weal.

Was declared void because it gave one of the parties an

interest in keeping the king’s enemy alive, and also because it gave the other an interest in compassing his death by A bet as to the amount of the hop-duty because it tended to expose the

between two hackney coachmen, as to which of them should be selected by a gentleman for a particular journey, was void, because it tended to expose the customer to their impor- When no such subtlety could be invented, the law, however reluctantly, was compelled to enforce the fulfilment of a wager. Now, however, by the Act 8 and 9 Vict. c. 109, cited supra, all agreements by way of wager

: By F. Brandt, London, 1872. F. Pollock, Principles of the Law of Contract.

consideration. Thus a third person,

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are void, and money lost on them cannot be recovered by action at law. There still remains, as hinted above, a dis- tinction between gaming and other wagers. The 5 and 6 Will. IV. c. 41 treats securities (e.g., promissory notes) given for money lost at gaming as being given for an illegal consideration ; under the 8 and 9 Vict. c. 109, securities given for betting are held to be given for a void, or for no coming into possession of a note

given for a bet, would have to prove that he gave value for it if the bet was a gaming bet under the statute of Anne; if it was not a gaming bet, he would be presumed to have given consideration for it until it was actually proved that he had not.

The 8 and 9 Vict. c. 109 exempts all subscriptions, or contributions, or agreements to subscribe or contribute towards any plate, prize, or sum of money to be awarded to the winner of any lawful game. (E. BR.)

GANDERSHEIM (in Eberhard's Chronicle, Gandersem), a town of Germany at the head of a circle in the duchy of Brunswick, situated on the Gande, a sub-tributary of the Weser, about 48 miles S.W. of Brunswick. It is a small place numbering, according to the census of 187 5, only 2454 inhabitants ; but it carries on the manufacture of linen, cigars, beet-root sugar, and beer, and possesses not only an old palace built by the dukes of Brunswick in the 16th century, but an abbey which ranks among the most famous in Germany.

The abbey of Gandersheim was founded

. in 856, according to Eberhard’s Chronicle, b

the duke Ludolf of Saxony and his wife Oda, who removed to the new domicile the nuns whom they had shortly before established at Brunshausen. Their own daughter Hathumoda was the first abbess, who was succeeded on her death by her sister Gerberga. Under Gerberga’s government King Louis III. granted a privilege, by which the office of abbess was to continue in the ducal family as long as any member was found competent and willing to accept the same. Otto III. gave the abbey a market, a right of toll, and a mint; and after the bishop of Hildesheim and the archbishop of Mainz had long contested with each other about its supervision, Pope Innocent III. declared it altogether independent of both. The abbey was ultimately recognized as holding directly of the empire, and the abbess had a vote in the diet as a member of the Rhenish bench of bishops. ‘The conventual estates were of great extent, and among the feudatories who could be summoned to the court of the abbess were the elector of Hanover and the king of Prussia. Protestantism was introduced in 1568, and Magdalena, the last Koman Catholic abbess, died in 1589; but Protestant abbesses were appointed to the foundation, and continued to enjoy their imperial privileges till 1802, when Gandersheim was incorporated with Brunswick. The last abbess was a princess of the ducal house, and kept her rank till her death. The memory of Gandersheim will long be preserved by its literary memorials. “Hroswitha, the author of the famous ecclesiastical dramas, was a member of the sisterhood in the 9th century; and the rhyming Chronicle of Eberhard of Gandersheim ranks as in all probability the earliest historical work composed in Low German. The Chronicle, which contains an account of the first period of the monastery, is edited by Wieland, in Monumenta Germ. historica (Vernacular section, vol. ii., 1877), and has been the object of a special study by Paul Hasse, Gottingen, 1872. See also ‘‘Agii vita Hathumodex abbatisse Gandershemensis prime,”’ in J. G. von Eckhart’s Veterwm monwmentorum quaternio, Leipsic, 1720; and Hase, Mittelalterliche Baudenkméiler Nicdcrsachsens,

1870.

GANDIA, an ancient wall-encircled city of Spain, in the province and archbishopric of Valencia, is beautifully situated in the fertile huerta or garden of Gandia, about 3 miles from the mouth of the river Alcoy. Its most promi- nent buildings are a large collegiate church, a college of the Escuelas Pias, and a palace of the dukes of Gandia. There is some trade in the produce of the district, especially in fruit; and linen and silk are manufactured to a limited extent. St Francis de Borgia or Borja, third general of the

Jesuit order, was duke of Gandia, and spent some years

of his life there. Population about 7000.

GANDO, a kingdom of north-western Africa in the Sudan, comprising that part of the territory watered by the Quorra or Niger which extends from the Birni and Say in the N.

to Idda in the S. It was established by the Fulah or Fulatah on the dissolution of the Houssa kingdom of Katchena by the death in 1817 of Sheik Othman dan Foddie. The political unity of the various parts of the kingdom is with difficulty maintained, and the process of disintegration has begun. Among the separate districts or provinces are Libtako in the north, Yaga, Saberma, Gurma, Dendima, a great part of Yoruba with the town of Ilori, Yauri, part of Nupe or Nyffe, and part of Borgu. The chief town is Gando, situated on the Sokoto, the first con- siderable affluent of the Niger from the east, not far from the town of Sokoto, which is the capital of the powerful kingdom of that name. Rabba, Egga, Busah, Igbegbo, aud Bida are among the more important towns. The whole Gando territory is estimated at 81,500 square miles, and its population at 5,800,000. See Barth’s Travels in Central Africa, and Baikie, “ Journey from Bida to Kano,” in Journ. Roy. Geog. Soc., 1867.

GANGANELLI. See Crement XIV.

GANGES, a river of northern India, formed by the drainage of the southern ranges of the Himélayas. This mighty stream, which in its lower course

supplies the great river system of Bengal, rises in the Garhwal state, and falls into the Bay of Bengal after a course of 1500 miles. It issues, under the name of the Bhagirathi, from an ice cave at the foot of an Himalayan snow bed near Gangotri, 10,300 feet above the level of the sea. During its earlier passage through the southern spurs of the Himalayas, it receives the Jahnavi from the north-west, and subseqnently the Alaknanda, after which the united stream takes the name of the Ganges. Deo Praydg, their point of junction, is a celebratzd place of pilgrimage, as is also Gangotri, the source of the parent stream. At Sukhi it pierces through the Himalayas, and turns south-west to Hardwar, also a place of great sanctity. It proceeds by a tortuous course through the districts of Dehra Dun, Saharanpur, Muzaff-arnager, Bulandshahr, and Farrukhabad, in which last dis- trict it receives the Ramgangé. Thus far the Ganges has been little more than a series of broad shoals, long deep pools, and rapids, except, of course, during the melting of the snows and throughout the rainy season. At Allahdbdd, how-ever, it receives the Jumna, a mighty sister stream, which takes its rise also in the Himalayas to the west of the sources of the Ganges. The combined river winds eastwards by south-east through the North-Western Provinces, receiving the Gumti and the Gogra. The point of junction of each of these streams has more or less pretension to sanctity. But the tongue of land at Allahabéd, where the Jumna and the Ganges join, is the true Praydg, the place of pilgrimage, to which hundreds of thousands of devout Hindus repair to wash away their sins in the sacred river. Shortly after passing the holy city of Benares, the Ganges enters Behar, and after receiving an important tributary, the Son, from the south, passes Patnd, and obtains another accession to its ee from the Gandak, which rises in Nepal. Further

0 the east, it receives the Kusf, and then, skirting the Raéjmahal hills, turns sharply to the southward passing near the site of the ruined city of Gaur. By this time sii has approached to within 240 miles, as the crow flies, from the aoe seo st os it begins to branch out

’ pot marks the commence- ment of the delta, 220 miles in a straight line, or 300 by the windings of the river, from the Bay of Bengal. The main channel takes the name of the Padma or Padda, and proceeds in a south-easterly direction, past Pabné to Goalanda, above which it is joined by the Jamund or main stream of the Brahmaputra. The vast confluence of waters rushes

towards the sea, receiving further additions from the hill country on the east, and forming a broad estuary known under the name of the Meghna, which enters

the Bay of Bengal near Noakhali. This estuary, however,

is only the largest and most easterly of a great number of

mouths or channels, The most westerly is the Hugli or

Hooghly which receives the waters of a number of distribu-

tary channels that start from the parent Ganges in the neigh-

bourliood of Murshid4bad. Between the Hugli on the west

and the Meglind on the east lies the delta. The upper

angle of it consists of rich and fertile districts, such ag

Murshidabad, Nadiyd, Jessor, and the 24 Parganas. But towards its southern base, resting on the sea, the country sinks into a series of great swamps, intercepted by a net- work of innumerable channels, This wild waste is known as the Sundarbans, from the sundari tree, which grows in

abundance in the sea-board tracts. ‘The most important. channel of the Ganges for commerce is the Hugli, on which stands Calcutta, about 90 miles from the mouth.

Beyond this city, the navigation is conducted by native craft,—the modern facilities for traffic by rail, and the increasing shoals in the river, having put an end to the previous steamer communication, which plied until about 1860 as high up as Allahabéd. Below Calcutta im- portant boat routes through the delta connect the Hugli with the eastern branches of the river, both for uative craft and steamers. The Ganges is essentially a river of great cities: Calcutta, Monghyr, Patna, Benares, and Allahabad, all lie on its course below its junction with the Jumna; and the ancient capitals, Agra and

Delhi, are on the Jumna, higher up. The catchment basin of the Ganges is bounded on the N. by a length of about 700 miles of the Himalayan range, on the S. by the Vindhyd mountains, and on the E. by the ranges which separate Bengal from Burmah. ‘The vast river basin thus enclosed embraces 432,480 square miles. The flood discharge of the Ganges at Réjmahal, after it has received all its important tribu- taries, was formerly estimated at 1,350,000 cubic feet per second. According to the latest calculations, the length of main stream of Ganges is 1540 miles, or with its longest affluent, 1680; breadth at true entrance, 20 miles; breadth of channel in dry season, 1} to 24 miles; depth in dry season, 30 feet; flood discharge, 1,800,000 cubic feet per second; ordinary discharge, 207,000 cubic feet ; longest duration of flood, about 40 days. The average descent of the river from Allahabad to Benares is 6 inches per mile; from Benares to Calcutta, between 4 and 5 inches; from

Calcutta to the sea, 1 to 2 inches. Great changes take place from time to time in the river bed, which alter the

face of the country. Extensive islands are thrown up, and

attach themselves to the mainland, while the river deserts

its old bed and seeks a new channel, it may be many miles

off. Such changes are so rapid and on so vast a scale, and

the corroding power of the current on the bauk so irresis-

tible, that in Lower Bengal it is considered perilous to build

any structure of a large or permanent character on the

margin. Many decayed or ruined cities attest the changes

in the river bed in ancient times; and within our own

times the main channel which formerly passed Rajmabal

has turned away from it, and left the town high and dry,

7 miles from the bank.

GANGI, a town of Italy, in the province of Palermo, and circondario of Cefalu, about 22 miles inland from the town of Cefalu. It occupies the slope of a hill on the southern flanks of the Nebrode or Monte Marone, and the ridge of the hill is crowned by a striking fortress with three towers, only one of which, however, is entire. The inhabitants, who in 1871 numbered 12,921, cultivate grain and manu- facture cheese in sufficient quantities to maintain a moder- ate trade. Gangi Vetere or Old Gangi, in the vicinity, is identified, according to a conjecture of Cluverius, with the ancient Enguium or Engyum. The foundation of Enguium was ascribed by Diodorus Siculus and Plutarch to a Cretan

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settlement, and Plutarch relates that relics of Meriones and Ulysses were exhibited in his time in the town. Having sided with the Carthaginians in the Second Punic War, it was saved from the vengeance of Marcellus by the entreaties of a certain Nicias. At the close of the republic it was a municipal town, with considerable celebrity on account of the temple of the Great Mother, as Cicero calls her. GANGOTRI, a celebrated place of Hindu pilgrimage, situated among the Himalaya Mountains, iu the state of Garhwal, on the Ganges, which is here not above 15 or 20 yards broad, with a moderate current, and not in general above 3 feet deep. The course of the river runs N. by K.; and on the bank near Gangotri there is a small temple .about 8 or 10 feet high, in which are two images represent- ing the Ganges and Bhagirathi rivers. The bed of the river adjoining the temple is divided off by the Brahmans into three basins, where the pilgrims bathe. One of these portions is dedicated to Brahma, another to Vishnu, and the third to Siva. The pilgrimage to Gangotri is considered efficacious in washing away the sins of the devotee, and ensuring him eternal happiness in the world to come. The water taken from this sacred spot is exported by pilgrims to India, and sold at a high price. It is drawn under the inspection of a Brahman, to whom a trifling sum is paid for the privilege of taking it, and the vessels are then sealed. _ The elevation of the temple above the sea is 10,319 feet. Long. 78° 59’ E., lat. 30° 59’ N. GANGPUR, a tributary state

of Chutid Nagpur, Bengal, _ situated between 21° 47’ 5” and 22° 32’ 20” N. lat., and | 85° 10’ 15” and 85° 34’ 35” BE, long. It is bounded on the

N. by Lohardagé district and Jashpur state; on the E. by _Singbhum district; on the S. by Bondi and BAmra states

and Sambalpur district ; and on the W. by Raipur district.

Gangpur state consists of a long undulating table-land about

700 feet above the sea, sloping downwards from the higher

plateau of Chutid Nagpur to the N., and dotted with de-

tached ranges and isolated peaks rising to a height of 2240 feet. The area is 2484 square miles. The chief products are rice, sugar-cane, oil-seeds, and tobacco, besides lac, tasar silk, resin, and catechu, yielded by the jungles. Diamonds and gold are occasionally found in the bed of the river Ib. Coal is known to exist, but is not worked. The population in 1872 numbered 73,637, viz., 37,751 males and 35,886 females. Of the total population 45,208, or 61:3 per cent., belong to various aboriginal hill tribes, such as Bhuiyas, Urdons, &c.; | 9843, or 13-4 per cent., are semi-Hinduized aborigines ; | 18,349, or 24°9 per cent., are Hindus; and 231 are Ma-hometans. The state yields the r4jA an estimated annual revenue of £2000, and pays an annual tribute to the British Government of £50.

GANGRENE. See Mortiricarion.

GANILH, Cuartes (17 58-1836), a distinguished | political economist, was born at Allanche in Cantal, on the | 6th January 1758. He was educated for the profession of | law, and practised as avocat. During the troubled period which culminated in the taking of the Bastille on 14th | July 1789, he came prominently forward in public affairs, | and was one of the seven members of the permanent Com- | mittee of Public Safety which sat at the Hotel de Ville. i He was imprisoned during the Reign of Terror, and was | only released by the counter-revolution of the 9th Ther-

midor. During the first consulate he was called to the tribunate, but was excluded in 1802. In 1815 he was elected deputy for Cantal, and finally left the chamber on | its dissolution in 1823. He died in 1836. Ganilh is best } known as the most vigorous defender of the mercantile

school in opposition to the views of Adam Smith and the _ English economists, His works, though interesting from the clearness and precision with which these peculiar opinions are presented, do not now possess much value for

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the student of political economy. The most important are the treatises, Des Systemes d'Economie Politique (1st ed., 1809; 2d ed., 1821, 2 vols.), in which the rival doctrines of economics are stated and compared, and Théorie de ? Economie Politique, fondé. sur les fais, which introduces largely the element of statistical detail. Other works are— Essai politique sur le revenu public des peuples de Pantiquité et du moyen dge (2 vols., Ist ed., 1806; 2d ed. 1823); De la Législation (1817); and Dictionnaire Analytique ad' Economie Politique (1st vol., 1826)—a work," says Blanqui, "unworthy of him." A considerably higher estimate of Ganilh's merits than that given by Blanqui will be found in Kantz's laborious Geschichtliche Entwick. d. National-Gkonomik (sec. 85, pp. 598, 599).

GANJAM, a district of Madras, situated between 18° 18' and 19° 40' 30" N. lat., and between 83° 51' 30" and 19° 40' 30" E. long, bounded on the N. by Puri district in Orissa ; on the E. by the Bay of Bengal, on the S. by Vizagapatam district, and on the W. by the estates of Kalahandi, Patna, and Jaipur. The district is exceedingly mountainous and rocky, but is interspersed with open valleys and fertile plains. Pleasant groves of trees in the plains give to the scenery a greener and less Indian appear- ance than is usually met with in the districts to the south, The mountainous tract known as the Maliyds, or chain of the eastern ghdts, has an average height of about 2000 feet, —its principal peaks being Singhdraj (4,976 feet), Mahen-

dragiri (4923), and Deodanga (4534). The chief rivers are the Rushikuliy4 (with its tributary the Mahanadi), the Vamsadari, and the Languliyd ; besides numerous mountain streams and torrents. The sea and river fisheries afford a livelihood to a considerable section of the population, The hilly region abounds in forests consisting principally of saJ, with satin-wood, ebony, and sandal-wood in smaller quanti- ties. The district abounds in game both large and small.

Ganjam formed part of the ancient kingdom of Kalinga. Its early history is involved in obscurity, and it was not till after the Gajapati dynasty ascended the throne of Orissa, that this tract became even nominally a part of their dominions, Owing to the nature of the country, the rising Mahometan power was long kept at bay ; and it was not till nearly a century after the first invasion of Orissa that a Mahometan governor was sent to govern the Chikakol Sarkars, which included the present district of Ganjam. In 1753 Chikakol, with the Northern Sarkars, were made over to the French by Salabat Jang for the maintenance of his French auxiliaries. In 1759 Masulipatam was taken by an English force sent from Bengal, and the French were compelled to abandon Ganjam and their other factories in the north. In 1765 the Northern Sarkars (including Gan- jam) were granted to the English by imperial firman, and in August 1768 an English factory was founded at Ganjam, protected by a fort. The present district of Ganjam was constituted in 1802. In the earlier years of British rule considerable difficulty was experienced in administering the district. The country was continually in a state of con- fusion and disturbance ; and on more than one occasion, the refractory large landholders had to be coerced by means of regular troops. In 1816 Ganjam was overrun by the Pindaris ; and in 1836 occurred the Gumsur campaign, when the British first came into contact with the aboriginal Kandhs, the suppression of whose practice of liuman sacri- fice was successfully accomplished. A petty rising of a section of the Kandhs occurred in 1865, which was, how- ever, suppressed without the aid of regular troops.

The census of 1872 gives the area at 8500 square miles, including 3359 square miles occupied by the Maliya or mountain region, and the population at 779,112 males and 740,976 females, —total, 1,520,088 (with 4562 villages, and 341,404 houses), classified thus according to religion :—

Hindus, 1,513,673; Mahometans, 4826 ; Christians, 1043; Buddhists or Jains, 45; ‘‘ others,” 501. The

nd Sauras are the aboriginal tribes inhabiting the moun- a Of ie plains population two-thirds are estimated as belong- ing to the Uruga race, the remainder being mostly Telegus. Of the plains country, with an area of 5141 square miles, or 3,290,240 acres, about one-third is under cultivation, one-third cultivable, and one-third waste. A considerable extent of land is under culti- vation in the Maliyas, but no revenue 1s derived from this tract. Rice forms the staple product, and is largely exported. The other crops are cereals of various sorts, pulses and oilseeds, fibres, sugar- cane (said to be the best in India), tobacco, indigo, chilies, &e. Holdings are small, and the peasantry are generally poor and in debt to the village money-lender. Five towns contain a population exceeding 5000 :—Berhampur, 21,670; Parla Kimidi, 15,958; Chi- kakol, 15,587; Baruva, 6739; Takkali Raghunandapuram, 5206. Ganjam town, the former administrative headquarters of the dis- trict, has a population of only 4163. The means of internal com- munication consist of 661 miles of road in the plains, and 323 miles of hill roads, besides a short tidal canal 9 miles long, connect- ing the Chilké lake with the Rushikuliya river. Salt manufacture is a Government monopoly, yielding about £200,000 annually. The revenue has rapidly increased of late years, having advanced from £216,196 in 1860-61 to £338,705 in 1875-76. The chief receipts are the salt and land revenue, which yielded £196,396 and £117,348 respectively in 1875-76. The expense of administering the district amounted to £23,970 in 1860-61, and to £28,123 in 1875-76. For the protection of person and property there were, in 1875-76, 27 magisterial and 13 civil and revenue courts. Murder is unusually prevalent in Ganjam, no less than 26 cases having occurred in 1875. Education is backward, only about 3°3 per cent. of the population of the plains being able to read and write. In 1875 there were 334 Government or aided schools in the plains, attended by 6909 pupils, besides 17 schools in the hills, with 860 pupils.

GANNAL, Jean Nicozas (1791-1852), a distinguished French technical chemist, was born at Sarre-Louis, July 28, 1791. Atthe age of fourteen he

was placed ina druggist’s establishment, where he acquired a knowledge of chemical manipulation. In 1808 he entered the medical department of the French army, and in the campaign of 1812 he witnessed the disastrous retreat from Moscow. After the downfall of the empire he obtained a situation at the Ecole Polytechnique in Paris, and subsequently acted as chemical assistant to Thénard. Having commenced research in industrial chemistry, he devised a method for the refining of borax, by which the price of that salt was reduced from 6 francs to 60 centimes per ib. He was the first to intro- duce into printing the use of elastic rollers, which he formed of a mixture of gelatin and sugar, and his process for the melting of tallow and hardening it with acids prepared the way for the manufacture of wax-candles. In 1823 he took out a patent for the making of glue and gelatin. His | experiments with the latter substance demonstrated the incorrectness of the opinion, held by Darcet and others, that it possessed highly nutritive properties. He obtained one of the Montyon prizes of the Institute in 1827 for the em- ployment of chlorine in the treatment of catarrh and phthisis, and again in 1835 for his discovery of the efficacy of injec- tions of solutions of acetate and chloride of aluminium in preserving anatomical preparations. Turning his attention next to embalmment, he showed thatit could be accomplished without mutilation of the body, and with greater economy than after the old methods, by injecting into one of the

carotid arteries solutions of aluminium salts. Gannal died at Paris in 1852. The following are among his works :—

Du Chlore employé comme Reméde contre la Phihise pulmonat 1832, 8vo , Sur la Gélatine, 1834 and 1836, 2 pts. oe Sot I Conservation des Parties animales, 1836, 8vo ; Mémoire f 2 SUR U Application Pun nouveau Systeme d’Inhumation dans les Cimi- tieres, 1842, 4to; Histoire des Embawmements et de la Préparation des Pieces d’ Anatomie normale, 1837 and 1341, 8vo; Mf. Gannal et M. le Docteur Pasquier,—a pamphlet relative to the embalmment of the duke of Orleans, in which Gannal’s process was not employed. 1842, 8vo; and Lettre a Institut, 1843 and Nouvelle Lettre auc

Médecins, 1844, on embalming, 8vo.

GANNAT, a town of France, capital of an arrondisse- ment in the department of Allier, is situated on the Andelot, an affluent of the Allier, 33 miles §, by W. of Moulins.

The vicinity is very pleasant, but the town is badly built |

and the streets are crooked and narrow. It possesses a tribunal of primary instance, a hospital, and a secondary school. There are limeworks, tanneries, cutleries, and some trade in corn, fruits, wine, and cattle. The town was formerly surrounded by walls, and what remains of its old castle is now used as a prison. The church of Sainte-Croix possesses a choir in the pure Auvergne style of the llth century, and also some fine paintings. The population in 1876 was 5042.

GANNET (Anglo-Saxon, ganot) or Soran Gooss,! the Pelecanus bassanus of Linneeus and the Sula bassana of

‘modern ornithologists, a large sea-fowl long known as a

numerous visitor, for the purpose of breeding, to the Bass Rock at the entrance of the Firth of Forth, and to certain other islands off the coast of Britain, of which four are in Scottish waters—namely, Ailsa Craig, at the mouth of the Firth of Clyde; the group known collectively as St Kilda ; Suleskerry, some 40 miles north-east of the Butt of Lewis ; and the Stack and Skerry, about the same distance west- ward of Stromness. It appears also to have two stations off the coast of Ireland, the Skellig Islands and the Stags of Broadhaven, and it resorts besides to Lundy Island in the Bristol Channel—its only English breeding-place. Further to the northward its settlements are Myggenees, the most westerly of the Faroes, and various small islands off the coast of Iceland, of which the Vestmannaeyjar, the Reykjanes Fuglaskér, and Grimsey are the chief. On the western side of the Atlantic it appears to have but five stations, one in the Bay of Fundy, and four rocks im the Gulf of St Lawrence. On all these seventeen places the bird arrives about the end of March or in April and departs in autumn when its young are ready to fly; but even during the breeding-season many of the adults may be seen on their fishing excursions at a vast distance from their

home, while at other times of the year their range is greater still, for they not only frequent the North Sea and the English Channel, but stray to the. Baltic, and, in winter, extend their flight to the Madeiras, while the members of the species of American birth traverse the ocean from the shores of Greenland to the Gulf of Mexico.

Apparently as bulky as a Goose, and with longer wings and tail, the Gannet weighs cousiderably less. The plum- age of the adult is white, tinged on the head and neck with buff, while the outer edge and principal quills of the wing are black, and some bare spaces round the eyes and on the throat reveal a dark blue skin. The first plumage of the young is of a deep brown above, but paler beneath, and each feather is tipped with a triangular white spot. The

1 The phrase ganotes bed (Gannet's bath), a periphrasis for the sea, occurs in the Anglo-Saxon Chroniele, in reference to events which took place 975 A.D., as pointed out by Prof. Cunningham, whose learned treatise on this bird (Jdis, 1866, p. 1) nearly exhausts all that can be said of its history and habits. A few pages further on (p. 18) this writer remarks:—'' The name Gannet is intimately con- nected with our modern English Gander, both words being modifica- tions of the ancient British 'gan' or ' gans,' which is the same word with the modern German 'Gans,' which in its turn corresponds with the old High German ' Kans,' the Greek xfv, the Latin anser, and the Sanskrit ' hansa,' all of which possess the same signification, viz., a Goose. Theorigin of the names Solan or Soland, Sulan, Sula, and Haf-sula, which are evidently all closely related, is not so obvious. Martin [Voy. St. Kilda] informs us that ' some imagine that the word Solan comes from the Irish Souler, corrupted and adapted to the Scottish language, gui oculis irretortis e longinguo respiciat proedam. The earlier writers in general derive the word from the Latin solea, in consequence of the bird's supposed habit of hatching its egg with its foot; and in a note intercalated into Ray's description of the Solan Goose in the edition of his Itineraries published by the Ray Society, and edited by Dr Lankester, we are told, though no authority for the statement is given, that 'the Gannet, Sula alba, should be written Solent Goose, i.¢., a channel goose.'" Hereon an editorial note remarks that this last statement appears to have been a suggestion of

Yarrell’s, and that it seems at least as possible that the “Solent took its name from the bird.

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nest is a shallow depression, either on the ground itself or on a pile of turf, grass, and seaweed—which last is often conveyed from a great distance. The single egg it contains has a white shell of the same chalky character as a Cor- morant’s (vol. vi, p. 407). The young are hatched blind and

Gannet, or Solan Goose.

_ naked, but the slate-coloured skin with which their body is

covered is soon clothed with white down, replaced in due time by true feathers of the dark colour already mentioned. The mature plumage is believed not to be attained for some three years. Towards the end of summer the majority of Gannets, both old and young, leave the neighbourhood of their breeding-place, and, betaking themselves to the open sea, follow the shoals of herrings and other fishes (the presence of which they are most useful in indicating to fishermen) to a great distance from land. Their prey is almost invariably captured by plunging upon it from a height, and a company of Gannets fishing presents a curious and interesting spectacle. Flying ina line, each bird, when | 1€ comes over the shoal, closes its wings and dashes per- _ pendicularly into the waves, whence it emerges after a few I seconds, and, shaking the water from its feathers, mounts in | 8 wide curve, and orderly takes its place in the rear of the | string, to repeat its headlong plunge so soon as it again _ finds itself above its prey.!

‘ J The large number of Gannets, and the vast quantity of fish they | take, has been frequently animadverted upon, but the computations | on ~ last point are perhaps fallacious. It seems to be certain that | ot aoe days fishes, and herrings in particular, were at least as | ae ut 8s now, if not more so, notwithstanding that Gannets were | iN numerous. Those frequenting the Bass were reckoned by Mac- i ia rab at 20,000 in 1831, while in 1869 they were computed at 1889 fein. a decrease of two-fifths in 88 years. On Ailsa in

aaa ere were supposed to be as many as on the Bass, but their Fishorles on Po el a at 10,000 in 1877 (Report on the Herring oneaieee if Scotland, 1878, pp. xxv. and 171),—being a diminution of

sixth In eight years, or nearly twice as great as on the Bass.

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GAN 71

Structurally the Gannet presents many points worthy of note, such as its closed nostrils, its aborted tongue, and its toes all connected by a web—characters which it pos- sesses in common with most of the other members of the group of birds (Steganopodes) to which it belongs. But more remarkable still is the system of subcutaneous air-cells, some of large size, pervading almost the whole surface of the body, communicating with the lungs, and capable of being inflated or emptied at the will of the bird. This peculiarity has attracted the attention of several writers— Montagu, Professor Owen (Proc. Zool. Soc., 1831, p. 90), and Macgillivray ; but a full and particular account of the anatomy of the Gannet is still to be desired.

In the southern hemisphere the Gannet is represented by two nearly allied but somewhat smaller forms—one, Sula capensis, inhabiting the coast of South Africa, and the other, S. serrator, the Australian seas. Both much resemble the northern bird, but the former seems to have a perman- ently black tail, and the latter a tail the four middle feathers of which are blackish-brown with white shafts,

Apparently inseparable from the Gannets generically are the smaller birds well known to sailors as Boobies from the extraordinary stupidity they commonly display. They differ, however, in having no median stripe of bare skin down the front of the throat; they almost invariably breed upon trees, and are inhabitants of warmer climates. One of them, S. cyanops, when adult has much of the aspect of a Gannet, but S. piscator is readily distinguishable by its red legs, and S. lewcogaster by its upper plumage and neck of deep brown. These three are widely distributed within the tropics, and are in some places exceedingly abundant. The fourth, S. variegata,

which seems to preserve through- out its life the spotted suit characteristic of the immature S. bassana, has amuch more limited range, being as yet only known from the coast of Peru, where it is one of the birds which contribute to the formation of guano. (A. N.)

GANS, Epwarp (1798-1839), a distinguished jurist, was born at Berlin, on the 22d March 1798. His father, a banker in Berlin, was of Jewish descent. He was educated first at Berlin, then at Gottingen, and finally at Heidelberg, where he met Thibaut, the celebrated lawyer, and Hegel, by whom he was much attracted. He attended Hegel's lectures at Berlin and became thoroughly imbued with the principles of the Hegelian philosophy. In 1825 he travelled for some months in England and France, and on his return was named professor extraordinarius at Berlin. At this period the historical school of jurisprudence was coming to the front, and Gans, already, from his Hegelian tendencies, predisposed to treat law historically, applied the method to one special branch of legal relations—the right of succession. His great work, Hrbrecht in weltgeschichtlichen Entwicklung (4 vols. 1825, 1825, 1829, and 1835), is still of permanent value, not only on account of its extensive survey of facts, but through the admirable manner in which the general theory of the slow evolution of legal relations is presented. In 1830, and again in 1835, Gans visited Paris, and formed an intimate acquaintance with the knot of brilliant writers and lecturers, Cousin, Villemain, Michelet, and Quinet, who then made Paris the centre of literary culture and criticism. The liberality of his views, especially on political matters, drew upon Gans the displeasure of the Prussian Government, and in 1835 his course of lectures on the history of the last fifty years, afterwards published (Vorlesungen tiber d. Geschichte d. letzten fiinfzig Jahre), was prohibited. He died at Berlin in 1839. In addition to the works above mentioned, there may be noted the treatise on the right of possession (Ueber die Grundlage des Besitzes, 1829), a portion of a systematic work on the Roman civil law (System der Rémischen Civil-rechts, 1827), and a collection of his miscellaneous writings (Vermischte Schriften, 1832). Gans

edited the Philosophie der Geschichte in Hegel's Werke, and

contributed an admirable preface. See on the life and works of Gans, Revwe de Deux Mondes, Dec.

1839.

GANSBACHER, Jonann Baptist (1778-1844), a/

musical composer of repute, was born in 1778 at Sterzing in Tyrol. His father, a schoolmaster and teacher of music, undertook his son's early education, which the boy con- tinued under various masters till 1802, when he became the pupil of the celebrated Abbate Vogler. 'To his con- nexion with this artist and with his fellow pupils, more perhaps than to his own merits, Gansbacher's permanent

place in the history of music is due ; for it was during his | stay with Vogler, then (1810) living at Darmstadt, that he became acquainted with Weber and Meyerbeer, who |

second

had also been attracted by the abbate's reputation, and the close friendship which sprang up among the three young musicians, and was dissolved by death only, has become celebrated in the history of their art.

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But although |

Giinsbacher owes the greater part of his reputation to this —

circumstance, he was himself by no means without merit. He creditably filled the responsible and difficult post of

director of the music at St Stephen's Cathedral, Vienna,

from 1823 till his death (July 13, 1844); and his composi- |

tions betray the musician of high gift and accomplishment. They consist chiefly of church music, not less than 17

masses, besides litanies, motets, offertories, dc., being |

amongst the number. He also wrote several sonatas, a symphony, and one or two minor compositions of a dramatic kind.

GANYMEDE (Greek, Tavvpdys, Latin, Ganymedes)

affords a typical example of the manner in which myth- inaking continued as a living process through the whole of Greek history. In the thought of the primitive Indo- Germanic race, occupied with the simplest cares of living, a very frequent subject was naturally the rain; and their thought has been preserved to us in the form of mythology.

As the rain descends to earth it is the chief blessing to |

men, while in the clouds it gladdens the dwellers there. Hence arises the idea of a drink for the gods—the soma of

the Hindus, the meth of the Norsemen, and the nectar of |

the Greeks—which plays such an important part in the Tig Veda, the Hdda, and the Homeric poetry. The guardian and giver of the divine drink occurs in many forms, sometimes as a bird, sometimes as a divine being. Just as the eagle brings nectar to Zeus in Crete, so Odin takes the fori of an eagle to steal the meth from Guttung for the use of the gods. The same divinity that in heaven distributes the drink to the gods is on earth the genius that presides over the due supply of water. Hence among the Greeks Ganymede, as this genius is called, exists in heaven as the Aquarius of the zodiac (Hyginus, fab, 224), while on earth he is, as Pindar (fr. 267 [110]) tells us, the genius of the fountains of the Nile, which was par excel- lence the life-giving and fertilizing river of the earth.

But the form under which the Ganymede myth most commonly appears has its origin in Asia Minor and in Crete. Homer (J/., xx. 232) says that Ganymede was a son of Tros, and that the gods on account of his beauty carried him off to heaven to dwell among the immortals and pour out the wine for Zeus, The Little Iliad again makes him the son of Laomedon, and says that Zeus gave his father a golden vine in exchange for him. In the

Trojan Ganymede there is not much trace left of the old kindly genius who distributes the blessing out of the clouds. We may indeed, when we remember that the Greeks admired personal beauty as almost divine (cf. Hdt. v. 47), be able to see in this translation the good genius returning alive to heaven after his sojourn on earth, an idea

that occurs in the mythology of almost every race. But |

| becomes a favourite subject.

now he seems rather to represent the everlasting youth and beauty that attend on the gods, and to be tlie male counter. part of Hebe, who was worshipped in Phlius under the name Ganymeda (Pausanias, li. 13). More and more the myth grows away from its earliest form, and as Greek manners altered the darkest side of their social system attached itself to it. Through the Jonian Greeks the Asiatic custom of secluding women had spread to the mother country aud superseded the old heroic manners. The presence of women at meal-times, customary in the time of Homer (0d, iv. 221), was now discontinued. Beautiful young male slaves waited at banquets, and the feeling grew that the gods also observed this custom. Ganymede was now conceived as the favourite of Zeus. So early as the Hymn to Aphrodite, Zeus himself carries off Ganymede on account of his beauty; and Theoguis (about 500 B.c.) speaks of the love of Zeus for Ganymede as a well-known tale. In Crete especially, where the love of boys was systematized and legalized, and from which the habit spread over the whole of Greece, does the myth find nourishment and growth. On the one hand, Zeus was represented to have himself, in the form of an eagle, carried off Ganymede; on the other hand, it was said that Minos, the primitive ruler and lawgiver of Crete, had been the ravisher of Ganymede. In this way it was attempted to give dignity and antiquity to a borrowed and loathsome custom. The rapidity with which the habit spread all over Greece makes the mythical embodiment of it fill an important place in the painting, sculpture, and literature of Greece in its decline. Thus it comes that

| the name which once denoted the good genius that gives

the best gifts to man was adopted in the vulgar Latin under the form Catamitus to signify the most degraded of men (on this subject v. Béttiger,

Kwnst-Mythol., ii. 35, 61). It is significant that in Greek art not one very early re- presentation of the myth occurs (Overbeek, Kwnst-Mytho- logie, p. 515); but in the middle and later periods it Two moments especially are represented—(1) Ganymede carried off by the eagle, where the eagle is sometimes Zeus's messenger, but at other times obviously Zeus himself, as is shown by the sensual passion apparent in both figures (Jahn, Archwolog. Beitrige, p. 20), and (2) Ganymede feeding or caressing the eagle. Besides Preller's and Jacobi's elaborate works, see Kuhn, Herab- kunft des Feuers; Braun, Naturgeseh. der Sage ; Hartung, Religion

u. Myth. der Griechen ; Schwartz, Ursprung der Myth.; and on the derivation of the name see Kuhn's Zeitseh., ii. and v.

GAP (the ancient Vapincwm), a town of France, capital of an arrondissement and also of the department of Hautes Alpes, is situated on the right bank of the Luye, 46 miles S.E. of Grenoble. It stands in a wide valley about 2400 feet above sea-level, and is surrounded by an amphitheatre of hills, over which tower the snow-covered mountains of the Alps. In the vicinity are fine walnut avenues and vine yards, but the town, with the exception of a few modem

_ houses, is badly built and has a somewhat miserable appear

ance. The chief public buildings are the Gothic cathedral, containing the tomb of the celebrated Constable de Lesdi- guiéres, the court-house, the town-hall, the bishop's palace, the barracks, and the theatre. In 1866 a statue in black marble was erected in front of the barracks to Baron de Ladoucette, a former prefect of the Hautes Alps. Gap 1s the seat of a court of primary jurisdiction, and has a com- munal college, a diocesan seminary, a public library, and 4 museum of antiquities, natural history, botany, and geology. The manufactures comprise woollen, linen, and silk goods, leather, and dressed skins. In the vicinity are some marble quarries, which were known to the Romans. The town became the seat of a bishopric in the 4th century, and ms bishops were for a long period styled princes and counts 0 Gap. In former times it suffered greatly from the devasta

tions of the Lombards and Moors, from the plague, and (from earthquakes ; and in 1692 it was almost burned to the jground by Duke Victor Amadeus

of Savoy. The population in 1876 was 7249,

GARAT, Dominique Josepy (1749 — 1833), was born at Bayonne, 8th September 1749. After receiving a good ducation under the direction of a relation who was a curé, he came to Paris, where he obtained introductions to the most distinguished writers of the time, and became a con- hributor to the Hncyclopédie Méthodique and the Mercure ile France. He gained considerable reputation by an éloge on L'Hépital in 1778, and was afterwards three times jerowned by the Academy for éloges on Suger, Montausier, nd Fontenelle. In 1785 he was named professor of juistory at the Atheneum, where his lectures enjoyed an Pqual popularity with those of Laharpe on literature. Being chosen a deputy to the states-general in 17 89, he

4 mild and irresolute character, and indefinite and change- ble convictions, he played a somewhat undignified part in he great political events of the time, and became a pliant 'ool in carrying out the designs of others. He succeeded Janton as minister of justice in 1792, and in this capacity iad entrusted to him what he called the commission affreuse 'f commnuicating to Lonis XVI. his sentence of death. In 793 he became minister of the interior, and during the teign of Terror he was imprisoned, but he received his liberty ifter the revolution of the 9th Thermidor, and was named jinister of public instruction. In 1798 he was appointed mbassador to Naples, and in the following year he became member of the Council of the Ancients. After the revolu- fon of the 18th Brumaire, he was chosen a senator by Vapoleon and created a count. Duriug the Hundred Days € was a member of the chamber of representatives, and }rongly opposed the recall of the Bourbons. In 1803 he vas chosen a member of the Institute of France, but after the »storation of Louis X VILL. his name was, in 1816, deleted yom the list of members. After the revolution of 1830 he fas named a member of the new olitical Science.

e states-general.

The works of Garat include, bnsidérations sur la Révolution r la Révolution,

besides those already mentioned, Jrangaise, Paris, 1792; Mémoires ou Exposé de ma condutte, 1795 ; Alémotres sur

Dges on Joubert, Kléber, and Desaix ; several notices of distin- ‘shed persons ; and a large number of articles in periodicals, |GARAT, Prerre-Jzan (1764-1823), one of the most Mlous singers of his time, nephew of the former, was born i Ustaritz, 25th April 1764. Gifted with a voice of ex- »ptional timbre and compass, he devoted himself, from an py age, to the cultivation of his musical talents. On ‘count of his manifesting a distaste for the legal profession, ‘ which his father wished him to study, he was deprived i his allowance, but he obtained through the patronage of a tend the office of Secretary to Comte d’Artois, and was terwards engaged to give musical lessons to the queen of rance. After the Revolution he became a professional hger, and on account of a song which he had composed in ; ference to the misfortunes of the royal family he was ‘rown ito prison. On regaining his liberty he went to amburg, where he at once achieved extraordinary success .

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- | he resigned that post.

vie de M. Suard, sur ses écrits, et sur le XVII[me stéele, 1820 ; |

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GA RB and by his subsequent appearances in Paris, and his visits to Italy, Spain, Germany, and Russia, he made for himself a reputation as a singer unequalled by any other of his own time. He was a keen partisan of the composer Gluck in | opposition to Handel. On the institution of the Conserva- toire de Musique, he became its professor of singing. He is also the composer of a number of songs, many of which have considerable merit. He died 1st March 1823.

GARAY, JAnos (1812-1853), Hungarian poet and author, was born 10th October 1812, at Szegszird, in the county of Tolna. From 1823 to 1828 he studied at Fiinfkirchen, and subsequently, in 1829, at the university of Pesth. Here, having become acquainted with the works of the best German authors, he devoted himself to literary pursuits, and in 1834 brought out an heroic poem, in hexameters, under the title Csatér. After this he issned in quick succession various historical dramas, among which the most

successful were Arbécz, Orszdgh Ilona, and Bathort Lrzsébet,—the first two published at Pesth in 1837, and the last in 1840. From 1833 to 1836 Garay was, moreover, associated with the literary journal Regéls (Taleteller), and in 1837 assisted in the editorship of the periodical Rujzo-latok (Sketches). At the beginning of 1838 he removed to Presburg, where he was for some time engaged in editing the political journal Wirndk (Herald). He returned to Pesthi in 1839, when he was elected a corresponding member of the Hungarian Academy of Sciences. In 1842 he was admitted into the Kisfaludy Society, of which he became second secretary. Garay enriched Hungarian literature with numerous lyrical poems, ballads, and tales. The first collection of his poems was published at Pesth in 1843; and his prose tales appeared in 1845, under the title of Tollrajzok (Sketches with the Pen). His historical ballads and legends, styled Arpdédok Pesth, 1847 (2d ed. 1848), showed him to be a master in the art of ballad writing. Some of his lyrical poems also are excellent, as, for example, Balatoni Kagylék (Shells from the Balaton Lake), Pesth, 1848, His legend Bosnydk Zséfia, Pesth, 1847, as also his poetical romance Frangepdn Kristofné (Christopher Frange- pan's Wife), Pesth, 1846, gained the prize of the Kisfaludy Society. His last and most famous work was an historical poem in 12 cantos, with the title Szent Lészl6 (Saint Ladis- Jaus), Eger, 1852 (2d ed. Pesth, 1853, 3d ed. 1863). In 1848 Garay was nominated professor of Hungarian language and literature to the university of Pesth, but in the following year In 1850 he became enfeebled in health, and at length unfit for further literary efforts. | After about four years' illness, he died on the 5th Novem- | ber 1853, in great want, in the forty-second year of his age. A collective edition of his poems was published at Pesth the year after his death by F. Ney (2d ed. 1860), and several of his poems have been translated by Kertbeny.

See Garay Jénos dsszes kilteményei, 2d ed., Pesth, 1860; and Dichtungen von Johann Garay, 2d ed., Vienna, 1856.

GARBO, RaFFaELLIno DEL (1466-1524), a Florentine painter. His real name was Raffaello Capponi; Del Garbo Was a nickname, bestowed upon him seemingly from the graceful nicety (garbo) of his earlier works.. He was a scholar of Filippino Lippi, with whom he remained till 1490, if not later. He showed great facility in design, and excited hopes which the

completed body of his works fell short of. He married and had a large family ; embarrass- ments and a haphazard manner of work ensued ; and finally he lapsed into a very dejected and penurious condition. Three of his best tempera pictures are in the Berlin Gallery ; one of the Madonna standing with her Infant between two musician-angels, is particularly attractive. We may also name the oil-painting of the Resurrection done for the church of Monte Oliveto, Florence, now in the academy of the same city, ordinarily reputed to be a anemia inaster- X. — 10

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piece ; the ceiling of the Caraffa Chapel in the church of the Minerva, Rome; and a Coronation of the Virgin – the Louvre, which is a production of much merit, thoug: with somewhat over-studied grace. Angelo Allori was his

PO ARG AO, Prpro ANTONIO CorRREA (1724-1772), Portuguese lyric and dramatic poet, was born 1n the neigh- bourhood of Lisbon on the 24th of April 1724. Almost nothing of his biography is known except that he lived a life of quiet domesticity and learned leisure, in rural retreatat Fonte-Santa near the capital, till about his thirty- sixth year, when he was imprisoned on an obscure charge which is believed to have arisen out of some expressions 10 his writings that had given offence to a despotic Government. After languishing in confinement for eighteen months, he was released by death on the 10th of November 1772. His works, which include sonnets, odes, satires, and epistles, as well as dramatic pieces, were published for the first time ‘n a collected form in 1778 (Obras poeticas de P. A.C. Garcao), and are regarded by the Portuguese as having marked a period of revival in their national literature. While, however, in an age of great degeneracy he succeeded. in exhibiting purity and refinement of taste, he cannot be said to lave given any indications of an original or power- ful genius. His dramas are confessedly imitations from foreign models; while his odes, epistles, and satires, which have earned for him the title (shared by

Ferreira) of “the Portuguese Horace,” at once reveal the source of their inspiration. His endeavour, moreover, occasionally to ap- proach the classic style more nearly by substituting quantity for rhyme can hardly be regarded as very successful. GARCIA, Manor (1775-1832), or, in full, Manoel Garcia del Popolo Vicente, was born in 1775 at Seville. He began artistic life as chorister at the cathedral of Seville, and simultaneously studied music under the best masters of his native city. At the age of seventeen he made his début on the stage at Cadiz, in an operetta of his own composition. Soon afterwards he appeared at Madrid in his twofold capacity of singer and composer. His reputation being thus established, he proceeded to Paris, where he appeared for the first time, in 1808, in Paer’s opera Griselda. Here also he was received with great applause, his style of sing- ing being especially appreciated. This he further im- proved by careful study of the Italian metliod in Italy itself, where he continued his successes. His opera, Zhe Culiph of Bagdad, was favourably received at Naples in 1812, but his chief successes were again due to his perfection as a vocalist. In 1824 he went to London, and thence proceeded to America (1825) with a company of excellent artists, amongst whom were his son Manoel and his daughter Maria, better known under her subsequent name of Malibran. He extended his artistic tour as far as Mexico and was on the point of returning to Europe in order to retire from public life, when he was robbed of his well- earned wealth by brigands on his way to Vera Cruz. Settled again in Paris he soon retired from the stage, and devoted himself exclusively to teaching. He died - 1839 His method.of teaching f ching was unsurpassed, and some of the most celebrated singers of the early part of the century were amongst his pupils. He also wrote an excellent book on the art of singing called Metodo di canto. Amongst =e Ih eee Ona (already mentioned), who, as well as his daughter Paulin i : in the musical Srila i GARCILASO DE LA VEGA (1503-1536), soldier and poet, was born at Toledo in 1503. His father, Garcilaso (Garcias Laso or Garcilasso) de la Vega, was ihnséllor f state to Ferdinand and Isabella, and et some time ise

ambassador at the court of Rome; by his mother he was descended from the illustrious house of Guzman. At the

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age of seventeen he received a military appointment ag q “contino” or guardsman to Charles V., and in that capacity took part in the war against the insurgent comuneros, having been present at the battle of Olias near Toledo, where id received a wound in the face. He afterwards served in the north of Italy, and gained great distinction by his brayery particularly at the battle of Pavia in 1525. His marriage with a lady of the household of Queen Eleanor, which took place in the following year, suspended only for a very short time his activity in military and diplomatic employments; he took part in the repulse of the Turks from Vienna in 1529, was present at the splendid ceremonial connected with the coronation of tle emperor at Bologna in 1530, and was charged with a secret mission to Paris in autumn of the same year. In 1531 he accompanied the duke of Alva to Vienna, where, for having been in some way privy to the clandestine marriage of his nephew to one of the ladies of the court, he was imprisoned for some months on an island in the Danube. It was during this captivity that he composed the fine “cancion” commencing “Con un manso ruido de agua corriente y clara.” Released and restored to favour in June 1532, he at once went to Naples on the staff of Don Pedro de Toledo, the newly-appointed viceroy, by whom he was twice sent on public business of importance to Barcelona, in 1533 and in 1534. After having accom- panied the emperor on his Tunis expedition in 1535, where he fought bravely and received two severe wounds, he was employed as a confidential agent at Milan and Genoa in negotiations connected with the proposed invasion of Pro- vence, and afterwards joined the expedition itself when it took the field. Being with Charles in the neighbourhood of Fréjus during the retreat from Marseilles, Garcilaso de la Vega was ordered to silence a small fort at the village of Muy, which had been harassing the movements of the army, In the successful discharge of this duty he received a wound on the head which, twenty-one days afterwards, at Nice, proved fatal (October 14, 1536). His literary remains, few in number, but destined to exert a powerful influence on the subsequent

development of the poetry and genenl literature of his native country, were committed to the charge of his friend Boscan, who was preparing them for publication along with his own when death overtook him in 1540. The volume ultimately appeared at Barcelona in 1543, and has often been reprinted. Garcilaso's share in it consists principally of three eglogas or pastorals, which the Spaniards regard as among tlie finest works of the kind in their language, and which for sweetness of versification and delicacy of expression take a high rank in modern European literature. In addition to the pastorals, there are thirty seven sonnets, five canciones, two elegies, and an epistle mn versi sciolti, in all of which the influence of Boscan is plainly felt, as well as that of the Italian models whom both poets avowedly imitated, Petrarch, Bembo, Ariosto, and Sannazate, The poems rapidly gained a wide popularity ; and within a century of their appearance they had been edited and commented on as classics by Sanchez, Herrera, and Tamay? de Vargas. "Imitated by Lope de Vega in every possible way, praised more and cited oftener than any other poet by the genius of Cervantes, Garcilaso de la Vega has come down to us enjoying a general national admiration such as is given to hardly any other Spanish poet, and to none that lived before his time" (Ticknor). An English translation 0 his works was published by Wiffen in 1823. GARCILASO INCA DE LA VEGA (1540-1616) historian of ancient Peru, was born at Cuzco in 1540. His father was a cadet of the illustrious family of La Vegas who had gone to Peru in the suite of Pedro de Alvarcdo, 002 after the conquests of Pizarro; his mother was of Peruvian blood-royal, a cirenmstance of which he was not a little proud, as giving aright to the title which he claine

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In 1560 he removed to Spain, and, having entered the military service, was engaged in the wars against the Moors and Turks, Disappointed in the inadequate recognition of his services by the crown, he retired while still a young man into private life at Cordova, where he gave himself to literature, and produced the learned historical work by which he is now known, the Comentarios Lteales que tratan del Origen de los Yneas, reyes que fueron del Peru, de su Idolatria, Leyes, &c. ; The first part was pub- lished in 1609,

and the second within a few months of his His thorough acquaintance with the language and traditions of his maternal ancestors It is, accord- ingly, the source from which all subsequent writers on the subject have most largely drawn, and still continues to be An inac- curate English translation was published by Sir Paul Rycaut There is alsoa French translation, which was

by invariably subscribing himself “Inca.”

con la Historia general de Peru. death, which occurred in 1616.

zave his work an altogether peculiar value.

she chief original authority upon ancient Peru.

jn 1688. published in 1727.

GARD, a department in the south of France, consisting of part of the old province of Languedoc, is bounded N. by he departments of Lozére and Ardéche, E. by the Rhone,

which separates it from Vaucluse and Bouches-du-Rhéne, S. ry Hérault and the Mediterranean, and W. by Aveyron.

-t lies between 43° 27’ 25” and 44° 27’ 20” N. lat., and The western ‘ud northern districts of the department are occupied by he range of the Cévennes, which on the frontier of Lozdre The whole of this region is elebrated for its fruitful valleys, its gorges, its beautiful treams, its vines, and its chestnut, mulberry, and other

vetween 3° 15’ 39” and 4° 50’ 44” E. long.

ittain a height of 5120 feet.

ruit trees, with which the mountains are often clothed to

heir summits. From the Cévennes the land gradually

-eclines to the Rhone and Mediterranean. The southern sortion, which extends to the sea, and was probably at one ime covered by it, is a low plain

with numerous lakes and aarshes. Besides the Rhone, which bounds the department wn the E., and the Arddche, the lower portion of which rns part of its boundary on the N., the principal rivers re the Odze, Gard, Vidourle, and Hérault. The most Jorthern of these is the Céze, which rises in the Cévennes, nd after a course of about 50 miles in an E.S.E. direction ills into the Rhone below Bagnols. The Gard, or Gardon, “om which the department takes its name, is also an ‘fluent of the Rhone, and rising in the Cévennes from 2veral sources, traverses the centre of the department, having

length of about 60 miles. In the upper part of its course flows through a succession of deep mountain gorges, and ‘om the melting of the snows on the Cévennes is subject > iuundations, which often cause great damage. Its waters ot unfrequently rise 18 or 20 feet in a few hours, and its ed is sometimes increased in width to nearly a mile. The idourle flows in a S.S.E. direction from its source near ie Vigan, and after a course of about 50 miles falls into the *a. Below Sommitres it forms the western boundary of 1e department, The Hérault has its source and part of its ourse in this department. The Canal de Beaucaire extends om the Rhone at the town of that name to Aigues Mortes, ‘hich communicates with the Mediterranean by means of 1e Grand-Roubine canal. The climate is generally very uild but is rather changeable, and cold and violent storms {wind are not uncommon. The department is rich in tnerals, which constitute one of the chief sources of its | ae Tron, coal, and argentiferous lead mines are ex- susively worked; and manganese, zinc, and antimony are ound. Great quantities of salt are obtained from the salt larshes along the coast, The gypsum and other quarries mploy a considerable number of workmen, The fisheries ‘Te very productive. The manufactures are extensive, and

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include silk, cotton, and woollen fabrics, ironware, hats, gloves, paper, leather, earthenware, and glass. The chief grain crops are wheat, oats, rye, and barley. Lentils, pease, and potatoes are also grown. Gard is famed for its cattle, its breed of small horses, and its sheep, the wool of which is of a very fine quality. The principal truit trees are the olive and mulberry. The vine is extensively cultivated, and yields excellent red and white wines. Card is divided into the arrondissements of Nimes, Alais, Uzés, and Le

Vigan, with 38 cantons and 347 communes. The chief town is Nimes. The total area is 2256 Square miles, and the population in 1866 was 429,747, and in 1876 423,804.

GARDA, Laxe or, the Italian Laco pr GaRDA and ancient Benacus, the largest and most eastern of the great lakes of northern Italy. It is enclosed by Alpine ridges on both sides, except towards the south, where it widens out into the Lombard plain. ‘The northern extremity belongs to the Austrian district of Tyrol, while the remainder is divided between the two old Italian pro- vinces of Venetia and Lombardy. The length of the lake is about 38 miles ; its width varies from 2 or 3 miles in the north to 11 or 12 in the south ; and its area is esti- mated at 135 square miles. The ordinary elevation of the surface above the level of the sea is 320 feet, but this is increased by 3 or 5 feet by the melting of the Alpine snows at the beginning of summer. The greatest depths are about 900 or 1000 feet. At the northern extremity it receives the waters of the Sarca, a comparatively small Tyrolese stream, and at the south-eastern corner, at Peschiera, its surplus is conveyed by the Mincio to the Po. Navigation on the one hand is frequently rendered dangerous by sudden bursts of storm, while on the other hand it is facilitated by the two regular winds called the Ora or Andar and the Sover, of which the former blows from the south from midday to midnight, and the latter from the north from midnight to midday. Especially in its southern quarters, the lake is very rich in fish, the more important species being the salmon-trout, the carpione (Salmo punctatus), the trout, the sardina (Alausa vulgaris), the eel, and the arvole. The principal towns and villages along the Riviera or western side of the lake are—Desenzano, in the south ; Salo, with 4500 inhabitants; Maderno, with 1500 inhabitants ; Tos- colano, with 2000, famous for its paper-mills, introduced in 1386; Gargnano, with 4000; Limone; and Riva, at the northern extremity, with about 6000. Proceeding south along the eastern side we find Torbole, Malcesine, Torri, Garda, which gives its name to the lake, Lacize, and Peschiera. Desenzano and Torri are the chief seats of the fish trade. Steamers ply regularly from Desenzano to Riva, and from Riva to Peschiera. The scenery of the Garda is not so fine as that of the Lake of Como, but it is remarkable for the luxuriance of the vegetation, especially on the beautiful promontory of Sirmione, which projects from the southern shore, and still contains the ruins of the villa once inhabited by Catullus. The lemon ripens its fruit at

several places round the lake, though the trees require to be carefully covered, and even artificially warmed, during the frosts. The whole number is estimated at about 18,000, and each may produce about 1000 lemons,

The lake was well known to the Romans as Benacus (Bhvaxos), and its storms are described by Virgil in the familiar line—

“‘ Fluctibus et fremitu assurgens, Benace, marino.”

In several ancient inscriptions the name Benacenses occurs; and some antiquaries on no more authority have supposed that there must have been a town of its own name on the lake. ; According to a not improbable hypothesis there was formerly a navigable channel from the Adriatic to the Benacus; and we know from inscribed stones preserved in the Museo Filarmonico of Peschiera (the ancient Ardelica) that a rich corporation of shipowners existed in the town (Collegium navicularioruin Ardelicensium). If such 4

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5 available in the later Roman period, it must on Hest ee ie tered before the end of the 15th century ; M, when +n 1438 the Venetians wished to bring their vessels from the Adige to the lake they conveyed them overland from the neighbour- hood of Mori to Torbole. This Herculean undertaking was proposed by Blasio de Arboribus and N icolo Sorbolo, and it was successfully potoraliotied at a cost of 15,000 ducats. As early as 1827 a steam- boat of 28 horse-power, the “ Arciduca Ranieri,” was launched on the lake at Desenzano by a Milan company ; and in 1834 it was superseded by another of 18 horse-power. | In 1830 Francesco Montagni of Riva built a boat, the ‘* Manubrio,” the machinery of which was moved by 8 horses going round and round on the deck ; but in 1839 he gave it up as unprofitable. In 1873 there were four steamboats on the lake in the service of the railway company of Upper Italy, besides thirty-one vessels with a total tonnage of about 400 tons, aud about 600 fishing boats. | The Italian Govern- ment also maintained four gunboats at Peschiera.

See Dal Pozzo, Lago, Fortezza, ¢ Rocca di Garda e Gardesana, Verona, 1678; Volta Serafino, Descrizione del Lago di Garda, Mantua, 1828; Ercolani, Guida al Lago di Garda, Milan, 1846 ; Bignami, I2 Lago di Garda, Milan, 1878.

GARDAIA, or Guarpaya (in the local documents Taghardeit), a town of North Africa in the Algerian Sahara, situated on a hill in the middle of the Wadi Mezab, on the route between Morocco and Tripoli, about 36 miles W.N.W. of Wargla, in 32° 28’ N, lat, and 4° 39’ E. long., at a height of 1755 feet above the sea-level. Gardaia is well built of limestone, and defended by a bastioned wall pierced with seven gates. There is a Jewish quarter inhabited by

about 200 families who hold a large part of the industry |

of the town in their hands; but the principal inhabitants are the Beni Mezab, who speak the awal domsab, a dialect of the Berber language slightly modified by Arabic. According to native accounts the town was founded in 952 of the Hegira. In modern times the Turks under Raiss Salah Bey attempted to subjugate the inhabitants, but their invasion was successfully repulsed, Aghrem Baba Saad, a small ruined town to the west of Gardaia, is the fortified post in which the Beni Mezab took refuge. At the time of Duveyrier’s visit in 1859, Gardaia paid a tribute of 45,000

francs to the French. The population is estimated at froin |

13,000 to 14,000.

GARDELEGEN (formerly GARDELEBEN and GARDLE- BEN), the chief town of a circle in the government district of Magdeburg, Prussian Saxony, is situated on the right bank of the Milde, 28 miles N.N.W. of Magdeburg. ‘The in- habitants are employed in agriculture, linen and woollen manufacture, button-making, calico-printing, and brewing.

The chief buildings are the hospital founded in 1285, and |

the higher borough school.

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Gardelegen is a place of great antiquity. In 633 it was destroyed by Dervan, duke of the Wends, ae is rebuilt in 924 by Kae Henry J. For a long time it was the seat of a line of margrave princes. It remained a free town until 1478. It suffered consider- ably in the Thirty Years' War, and in 1775 it was burned by the French. On the neighbouring heath Margrave Louis I. gained in 1343 a victory over Otto the Wild of Brunswick. .

GARDENING. See Horricutrure.

GARDINER, a city of the United States in Kennebec county, State of Maine, is situated at the junction of the Kennebec and Cobosse rivers, 10 miles S. by E. of Augusta The water-power of the Cobosse river is much utilized for manufactures, and the town has saw-mills, paper-mills, iron foundries, a woollen factory, a tannery, a pottery, and manufactories of sashes aud blinds, and is the headquarters iM the ice-business on the Kennebec.

ittston, on the other side of the river, by a bridg feet in length. The population in 1870 was ad ine

GARDINER, Cotonen Jamus (1687-1745), a Scottish soldier, was born at Carriden in Linlithgowshire, J anuary 10, 1687. At the age of fourteen he entered a Scottish regiment in the Dutch service, and was afterwards present

The population in 1875 was

at the battle of Ramillies, where he was wounded. He

It is connected witli |

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subsequently served in different cavalry regiments, and jn 1730 was advanced to the rank of lieutenant-colonel, and in 1743 to that of colonel.

He fell at the battle of Prestoupans, September 1, 1745. The circumstances of his death are described iu Sir Walter Scott's Waverley. In his early years he was distinguished for his recklessness and profligacy, but, in 1719, a supernatural vision, as he re. garded it, led to his conversion; and from that time he lived a life of great devoutness and of thorough cop. sistency with his Christian profession. His life was written by Dr Philip Doddridge.

GARDINER, SterHen (1483-1555), bishop of Win. chester and lord chancellor of England, was born at Bury St Edmunds in 1483. He is believed to have been the illegitimate son of Dr Woodville, bishop of Salisbury, brother of Elizabeth Woodville, queen of Edward IV, If so, he lost his father when he was only one year old; but his education seems to have been carefully provided for. He was seut to Cambridge aud studied at Trinity Hall, where he greatly distinguished himself in the classics, especially in Greek, He afterwards devoted himself to the canon and civil law, in which subjects he attained so great a proficiency that no one could dispute his pre-eminence. He received the degree of doctor of civil law in 1520, and of canon law in the following year. Ere long his abilities attracted the notice of Cardinal Wolsey, who made him his secretary, and in this capacity he is said to have been with him at More Park in Hertfordshire, when the conclusion of the celebrated treaty of the More brought Henry VIII and the French ambassadors thither. It is stated, and with great prob bility, that this was the occasion on which he was first in- troduced to the king's notice, but he does not appear to have been actively engaged in Henry's service till three years later. In that of Wolsey, he undoubtedly acquired a very intimate knowledge of foreign politics, and in 1027 he and Sir Thomas More were named commissioners on the part of England in arranging a treaty with the French ambassadors for the support of an army in Italy against the emperor. That year he accompanied Wolsey on his important diplomatic mission to France, the splendour and magnificence of which are so graphically described by Cavendish. Among the imposing train who went with the cardinal—including, as it did, several noblemen and privy councillors—Gardiner alone seems to have been acquainted with the real heart of the matter which made this embassy a thing of such peculiar moment. Henry was then part cularly anxious to cement his alliance with Francis I, and gain his co-operation as far as possible in the object o which he had secretly set his heart—a divorce from Catherine of

Aragon. In the course of his progress through France he received orders from Henry to send back his secretary Gardiner, or, as he was called at court, Master Stevens, for fresh instructions; to which he wis obliged to reply that he positively could not spare him as he was the only instrument he had in advancing the king's "secret matter." Next year Gardiner, though stil nominally in the service of Wolsey, was sent to Italy along with Edward Fox, provost of King's College, Cambridge, pope. His de spatches on this occasion are still extant, and whatever W may think of the cause on which he was engaged, they cr tainly give a wonderful impression of the zeal and ability with which he discharged his functions. Here his perfect familiarity with the canon law gave him an advantage ov" all with whom he had to negotiate. Clement VII, who was then at Orvieto, and had just recently escaped from captivity at St Angelo at the hands of the imperialists, © not wish to offend the king of England, but was still mor in dread of the emperor. He only desired to temporlze

| But Gardiner would not allow him to take refuge 1 ™

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evasive policy. What was to be thought, he said, of a spiritual guide who either could not or would not show the wanderer his way? The king and lords of England would be driven to think that God had taken away from the Holy See the key of knowledge, and that pontifical laws which were not clear to the pope himself might as well be com- mitted to the flames.

In short, it was owing to Gardiner's vigorous advocacy that the celebrated cominission was issued to Cardinals Wolsey and Campeggio to try the cause in England. After obtaining it he was recalled, but early in the following year, 1529, as Campeggio delayed proceeding, he was sent once more to Rome. 'This time, however, his efforts were un- availing. The pope would make no further concessions, and would not even promise not to revoke the cause to Rome, as he did very shortly after. Gardiner's services, however, were fully appreciated. He was appointed the king's secretary. He had been already some years arch- deacon of Taunton, and the archdeaconry of Norfolk was added to it in March 1529, which two years later he re-

signed for that of Leicester. In 1530 he was sent to Cambridge to procure the decision of the university as to the uulawfulness of marriage with a deceased brotlier's wife, in accordance with the new plan devised for settling the question without the pope's intervention. In this he succeeded, though not without a good deal of artifice, more creditable to his ingenuity than to his virtue. In November 1531 the king rewarded him for his services with the bishopric of Winchester, vacant by Wolsey's death. The promotion was unexpected, and was accompanied by ex- pressions from the king which made it still more honour- able, a3 showing that if he had been in some things too subservient, it was from no abject, self-seeking policy of his own. Gardiner had, in fact, ere this remonstrated boldly with his sovereign on some points, and Henry now reminded him of the fact. "I have often squared with you, Gardiner," he said familiarly, "but I love you never the worse, as the bishopric I give will convince you." It must be owned, however, that his next distinguished service was not a very creditable one; for he was, not exactly, as is 1s often said, one of Cranmer's assessors, but, according to Cranmer's own expression, "assistant" to him as counsel for the king, when the archbishop, in the absence of Queen Catherine, pronounced her marriage with Henry null and void on the 23d May 1533. Immediately afterwards he was sent over to Marseilles, where an interview between thie pope and Francis I. took place in September, of which event Heury stood in great suspicion, as Francis was ostensibly

his most cordial ally, and had hitherto maintained the |

justice of his cause in the matter of the divorce. Here he intimated the appeal of Henry VIII. to a general council in case the pope should venture to proceed to sentence against him. He also made a like appeal in behalf of Cranmer. Next year he and other bishops were called upon to vindi- cate the king's new title of " Supreme Head of the Church of England." The result was his celebrated treatise De Vera Obedientia, the ablest, certainly, of all the vindications of royal supremacy. In 1535 he had an unpleasant dispute with Cranmer about the visitation of his diocese. During the next few years he was engaged in various embassies in France and Germany. He was indeed so much abroad that he had little influence upon the king's councils. But In 1539 he was much concerned in the drawing up and passing through

the House of Lords of the severe statute of ~ Six Articles, which led to the resignation of Bishops te and Shaxton and the persecution of the whole

rotestant party. In 1540, on the death of Cromwell, earl a Essex, he was elected chancellor of the university of

a ae A few years later he attempted, in concert with others, to fastena charge of heresy upon Archbishop

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Cranmer in connexion with the Act of the Six Articles ; and but for the personal intervention of the king he would probably have succeeded. He was, in fact, though he had supported the royal supremacy, a thorough opponent of the Reformation in a doctrinal pomt of view, and it was suspected that he even repented his advocacy of the royal Supremacy. He certainly had not approved of Henry's general treatment of the church, especially during the ascendency of Cromwell, and he was frequeutly visited with storms of royal indignation, which he schooled himself to bear with patience. In 1544 a relation of his own, named German Gardiner, whom he employed as his secretary, was put to death for treason in reference to the king's supremacy, and his enemies insinuated to the king that he himself was of his secretary's way of thinking. But being warned of his danger he sought an interview with Henry, in which he

| succeeded in clearing himself of all injurious imputatious.

That he was party to a design against Queen Catherine Parr, whoni the king was at one time on the point of com- mitting to the Tower, rests only upon the authority of Foxe, and seemsa little doubtful. It is certain, however, that his name was omitted at the last in Henry VIII.'s will, though the king was believed to have intended making him one of his executors.

Under Edward VI. Gardiner was completely opposed to the policy of the dominant party both in ecclesiastical and in civil matters. The religious changes he objected to both on principle and on the ground of their being moved during the king's minority, and he resisted Cranmer's project of a general visitation. His remonstrances, however, were met by his own

committal to the Fleet, and the visitation of his diocese was held during his im- prisonment. Though soon afterwards released, it was not long before he was called before the council, and, refusing to give them satisfaction on some points, was thrown into the Tower, where he continued during the whole remainder of the reign, a period slightly over five years. During this time he in vain demanded his liberty, and to be called before parliament as a peer of the realm. His bishopric was taken from him and given to Dr Poynet, a chaplain of Cranmer's who had not long before been made bishop of Rochester. At the accession of Queen Mary, the duke of Norfolk and other state prisoners of high rank were in the Tower along with him; but the queen, on her first entry into London, set them all at liberty. Gardiner was restored to his bishopric and appointed lord chancellor, and he set the crown on the queen's head at her coronation. He also opened her first parliament, and for some time was her leading councillor. He was now called upon, at the age of seventy, to undo not a little of the work in which he had been instrumental in his earlier years,—to vindicate the legitimacy of the queen's birth and the lawfulness of her mother's marriage, to restore the old religion, and to recant what he himself had written touching the royal supremacy. At least this, it may be presumed, was the time when he wrote, if, as we are told, he really did write, a Palinodia or retractation of his book De Vera Obedientia, which, however, does not seem to be now extant, so that how far he had changed his sentiments we cannot very well judge. That he should have really changed them to some extent is not at all unnatural; and in relation to the divorce of Catherine of Aragon, we may well believe that it was his earlier and not his later action that ever troubled his conscience. Yetas to the royal supremacy, it seems that he would have advised Queen Mary to retain it; but her own desire was so great to give up ecclesiastical jurisdiction to the pope that he could not press the matter. A less agreeable task which fell to him was the negotiation of the queen's marriage treaty with Philip, to which he shared the general repugnance, though he could uot oppose her will.

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In executing it, however, he took care to make the me as advantageous for England as possible, and to eer express provision that the Spaniards should in nowise be allowed to interfere in the government of the country. After

the coming of Cardinal Pole, and the reconciliation of the realm to the see of Rome, his influence suffered some eclipse, though he still remained in high favour. How far he was responsible for the persecutions which afterwards arose is a debated question. There is no doubt that he eat in judgment on Bishop Hooper, and on several other Pro- testants whom he condemned to the flames. But being placed on a commission along with a number of other bishops to administer a severe law, it does not appear that he could very well have acted otherwise. On the bench he is said to have used every effort to induce the accused to make concessions and accept a pardon ; and a remarkable instance of his clemency is recorded by the church historian Fuller, who, notwithstanding his prejudices, acknowledges a debt of gratitude to him for preserving one of his own ancestors from the persecuting zeal of others. It would seem, moreover, that when he saw the results of the cruel

proceedings against heretics, he very soon got tired of them. |

The persecutions raged with the greatest vehemence during his absence at the Calais peace conferences in 1555, and when he came back he declared he would have no further nand in them, so that those afterwards apprehended in his diocese were removed into that of London in order to be adjudged to the flames. In October 1555 he again opened parliament as lord chancellor, but towards the end of the month he fell ill and grew rapidly worse till the 12th November, when he died about the age of seventy-two. Perhaps no celebrated character of that age has been the subject of ‘so much ill-merited abuse at the hands of popular historians. That his virtue was not equal to every trial may be admitted, but that he was anything like the morose and narrow-minded bigot he is commonly represented there is nothing whatever toshow. He has been called ambitious, ’ turbulent, crafty, abject, vindictive, bloodthirsty, and a good many other things besides, not quite in keeping with each other; in addition to which it is roundly asserted by Bishop Burnet that he was despised alike by Henry and by Mary, both of whom made use of him as a tool. How stich a mean and abject character submitted to remain five years in prison rather than change his principles is not very clearly explained ; and as to his being despised, we have seen already that Henry VIII., at least, did not consider him despicable. The truth is, there is not a single divine or statesman of that day whose course

throughout was so thoroughly consistent. He was no friend to the Reformation, it is true, but he was at least a conscientious opponent. In doctrine he adhered to the old faith from first to last, while as a question of church polity, the only matter for consideration with him was whether the new laws and ordinances were constitutionally justifiable. _ His merits as a theologian it is unnecessary to discuss; it 1s as a statesman and a lawyer that he stands conspicuous. But his learning even in divinity was far from commouplace. The manual set forth in 1543 by royal and parliamentary authority, entitled A necessary Doctrine and Erudition jor any Christian Man, was chiefly from his pen; and at a later date he was the author of various tracts in defence of the Real Presence against Cranmer, some of which written in prison, were published abroad under a fe name. Controversial writings also passed between him and Bucer, with whom he had several interviews in German when he was there as Henry VIII.'s ambassador. : _ He was a friend of learning in every form, and took great interest especially in promoting the study of Greek at Cambridge. He was, however, opposed to the new method of pronouncing the language introduced by Sir John Cheke,

being igned

and wrote letters to him and Sir Thomas Smith upon the subject, in which, according to Ascham, his opponents showed themselves the better critics, but he the superior genius. In his own household he loved to take in young

university men of promise; and many whom he thus

encouraged became distinguished in after life as bishops, ambassadors, and secretaries of state. His house, indeed, was spoken of by Leland as the seat of eloquence and the special abode of the muses.

He lies buried in his own cathedral at Winchester, where his effigy is still to be seen. (J. GA.)

GARE-FOWL! (Icelandic, Gez-fugl ; Gaelic, Gearbhul), the Anglicized form of the Hebridean name of a large sea-bird, formerly a visitor to certain

remote Scottish islands, the Great AuK of most English book-writers, and the Alca impennis of Linneeus. Of this remarkable creature mention has been already made at some length (Birps, vol. iii. pp. 734, 735), but since the species has a mournful

Gare-Fowl, or Great Auk.

history and several egregious misconceptions prevail con- cerning it, a few more details may not be unacceptable, particularly as many of them have been hitherto confined to works not easily accessible to the general reader, and the presumed extinction of the bird gives it especial interest, In size it was hardly less than a tame Goose, and in appear ance it much resembled its smaller and surviving relative the Razor-bill (Alca torda) ; but the glossy black of its head was varied by a large patch of white occupying nearly all the space between the eye and the bill, in place of the Razor- bill's thin white line, while the bill itself bore eight or more deep transverse grooves instead of the smaller number and the ivory-like mark possessed by the species last named. Otherwise the coloration was similar in both, and there 1s satisfactory evidence that the Gare-fowl's winter-plumag? differed from that of the breeding-season just as is ordinarily

1 The name first appears, and in this form, in the Account of Huta [St Kilda] and Rona, &c., by the Lord Register, Sir George M 'Kenzie, of Tarbat, printed by Pinkerton in his Collection of Voyages and Travels (iii. p. 730), and then in Sibbald's Scotia Tllustrata (1684). Martin soon after, in his Voyage to St Kilda, spelt it " Gairfowl. Prof. Owen has adopted the form " Garfowl," without, as would seem, any precedent authority.

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the case in other members of the family Aleide to which it belongs. The most striking characteristic of the Gare- fowl, however, was the comparatively abortive condition of its wings, the distal portions of which, though the bird was just about twice the linear dimensions of the Razor-bill, were almost exactly of the same size as in that Species—proving, if more direct evidence were wanting, its inability to fly. The most prevalent misconception concerning the Gare- fowl is one which has been repeated so often, and in books of such generally good repute and wide dispersal, that a

successful refutation seems almost hopeless. This is the notion that it was a bird possessing a very high northern range, and consequently to be looked for by Arctic explorers. How this error arose would take too long to tell, but the fact remains indisputable that, setting aside general asser- tions resting on no evidence worthy of attention, there is but a single record deserving any credit at all of a single example of the species having been observed within the Arctic Circle, and this, according to Prof. Reinhardt, who has the best means of ascertaining the truth, is Open to grave doubt.! It is clear that the older ornithologists let their imagination get the better of their knowedge or their judgment, and their statements have been blindly repeated by most of their successors. Another error which, if not so widely spread, is at least as serious, since Prof, Owen (Hneycl. Brit. ed. 8, xvii. p. 176 ; Paleontology, p. 400) has unhappily given it countenance, is that this bird " has not been specially hunted down like the dodo and dinornis, but by degrees has become more scarce." Now, if any reliance can be placed upon the testimony of former observers, the first part of this statement is absolutely untrue, Of the Dodo all we know is that it flourished in Mauritius, its only abode, at the time the island was dis- covered, and that some 200 years later it had ceased to exist—the mode of its extinction being open to conjecture, and a strong suspicion existing that though indirectly due to man's acts it was accomplished by his thoughtless agents (Phil. Z'rans., 1869, p. 354). The extinction of the Dinorms lies beyond the range of recorded history. Sup- posing it even to have taken place at the very latest period as yet suggested—and there is much to be urged in favour of such a supposition—tittle but oral tradition remains to tell us how its extirpation was effected. That it existed after New Zealand was inhabited by man is indeed certain, and there is nothing extraordinary in the proved fact that the early settlers (of whatever race they were) killed and ate Moas. But evidence that the whole population of those birds was done to death by man, however likely it may seem, is wholly wanting. The contrary is the case with the Gare-fowl. In Iceland there is the testimony of a score of witnesses, taken down from their lips by one of the most careful naturalists who ever lived, the late John Wolley, that the latest survivors of the Species were caught and killed by expeditions expressly organized with the view of supplying the demands of caterers to the various museums of Europe. In like manner the fact is incontestable that its breeding-stations in the western part of the Atlantic were for three centuries regularly visited and devastated

with the combined objects of furnishing food or bait to the fishermen from very early days, and its final extinction, according to Sir Richard Bonunycastle (Newfoundland in 1842, i. p, 232) was owing to “the ruthless trade in its eggs and skin.” No doubt that one of the chief stations of this Species in Icelandic waters disappeared, as has been before said (Brrps, loc. cit.), through voleanic action—

GN land, of old upheaven from the abyss By fire, to sink into the abyss again?— 1 The Specimen is in the Museum of Copenhagen; the doubt lies as to the locality where it was obtained, whether at Disco, which is within, or at the Viskerniis, which is without, the Arctic Circle.

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and that the destruction of the old Geirfuglaskér drove some at least of the birds which frequented it to a rock nearer the mainland, where they were exposed to danger fron which they had in their former abode been comparatively free; yet on this rock (Eldey = fire-island) they were “specially hunted down” whenever opportunity offered, until the stock there was wholly extirpated in 1844, and whether any remain elsewhere must be deemed most doubtful,

A third misapprehension is that entertained by Mr Gould who, in his Birds of Great Britain, says that “formerly this bird was plentiful in ail the northern parts of the British Islands, particularly the Orkneys and the Hebrides. At the commencement of the present century, however, its fate appears to have been sealed; for though it doubtless existed, and probably bred, up to the year 1830, its numbers annually diminished until they became so few that the species could not hold its own.”

Now of the Orkneys, we know that Low, who died in 1795, says in his postlumously-published Fauna Orcadensis that he could not find it was ever seen there 3 and on Bullock’s visit in 1812 he was told, says Montagu (Orn. Dict. App.), that one male only had made its appearance for along time, This bird he saw and unsuccessfully hunted, but it was killed soon after his departure, while its mate had been killed just before his arrival, and none have been seen there since. As to the Hebrides, St Kilda is the ouly locality recorded for it, and the last example known to have heen obtained there, or

in its neighbourhood, was that given to Fleming (Ldinb. Phil. Journ., x. p, 96) in 1821 or 1822, having been some time before captured by Mr Maclellan of Glass. That the Gare-fowl was not plentiful in either group of islands is sufficiently obvious, as also is the impos- sibility of its continuing to breed “up to the year 1830.”

But mistakes like these are not confined to British authors. As on the death of an ancient hero myths gathered round his memory as quickly as clouds round the setting sun, so have stories, probable as well as impossible, accumulated over the true history of this species, and it behoves the conscientious naturalist to exercise more than common caution in sifting the truth from the large mass of error. Americans have asserted that the specimen which belonged to Audubon (now at Vassar College) was obtained by him on the banks of Newfoundland, though there is Macgillivray’s distinct statement (Brit. Birds, v. p. 359) that Audubon procured it in London. The account given by Degland (Orn. Zurop., ii. p. 529) in 1849, and repeated in the last edition of his work by M. Gerhbe, of its extinction in Orkney, is so manifestly absurd that it deserves to be quoted in full :— Tl se trouvait en assez grand nombre il Vv a une quinzaine d’années aux Orcades; mais le ministre presbytérien dans le Mainlind, en offrant une forte prime aux personnes qui lui apportaient cet oiseau, a été cause de sa destruction sur ces fles.” The same author claims the species as a visitor to the shores of France on the testimony of Hardy (Annuacre Normand, 1841, p. 298), which he grievously misquotes both in his own work and in another place (Waumannia, 1855, p. 423), thereby misleading an anonymous English writer (Vat. Hist. Rev., 1865, p. 475) and numerous German readers.

Since the former notice of this species in the general article Brrps (wt supra), the only important contribution to our knowledge of it that has appeared is a paper by Mr John Milne, published in The Fveld newspaper, and since reprinted for private circulation, This gentleman visited Funk Island, one of the former resorts of the Gare-fowl, or “Penguin,” as it was there called, in the Newfoundland seas, a place where bones had before been obtained by Stuvitz, and natural mummies so lately as 1863 and 1864. Landing on this rock at the risk of his life, he brought off a rich cargo of its remains, belonging to no fewer than fifty

birds, some of them in size exceeding any that had before been known. His collection has since been dispersed, most of the specimens finding their way into various public

museums in this country. ~~ 7 ‘terature by no means inconsiderable has grown up respec ing iret a veglecting works of general bearing, few of which are without many inaccuracies, the following treatises may be especially menticned :—J. J. S. Steenstrup, ‘Et Bidrag til Gelr- fuslens Naturhistorie og serligt til Kundskaben om dens tidligere Udbredningskreds,” Naturh. Foren. Vidensk. Meddelelser [Copen- hagen], 1855, p. 33; KE. Charlton, “On the Great Auk, Trans. Tyneside Nat. Field Club, iv. p. 111; ‘‘ Abstract of Mr J. Wollcy’s Researches in Iceland respecting the Gare-fowl,” Jbis, 1861, p. 374; W. Preyer, ‘‘ Ueber Plautus impennis,” Journ. fiir Orn., 1862, pp- 110, 337 ; K. E. von Baer, ‘‘ Ueber das Aussterben der Thierarten in physiologischer und_ nicht physiologischer Hinsicht,” Bull. de LY Acad. Imp, de St Pétersb., vi. p. 513; R. Owen, ‘‘ Description of the Skeleton of the Great Auk,” Zrans. Zool. Soc., v. p. 317; ‘The Gare-fowl and its Historians, Nat. Hist. Rev., v. p. AGT sd. Tt: Gurney, jun., ‘On the Great Auk,” Zoologist, 2d ser. pp, 1442, 1639 ; H. Reeks, ‘‘ Great Auk in N ewfoundland,” &c., op. cit., p. 1854; V. Fatio, ‘Sur l’Alca impennis,” Bull. Soc. Orn, Suisse, ii. pp. 1, 80, 147; ‘On existing Remains of the Gare-fowl,” Ibis, 1870, p. 256; J. Milne, ‘‘ Relics of the Great Auk,” Field, oi March, 3 and 10 April 1875. Lastly, reference cannot be omitted to the happy exercise of poetic fancy with which the late Prof. Kingsley was enabled to introduce the chief facts of the Garcfowl’s extinction (derived from one of the above-named papers) into his charming Water Babies. (Gok

GARESSIO, Garesso, or GArezzo, in Latin Garexium, a town of Italy about 18 miles S.E. of Mondovi, in the valley of the Tararo. The Roman remains which are dis-

covered from time to time bear witness to its high antiquity ; |

during the Middle Ages it was the seat of a marquisate, which in 1509 was sold to the Spinola family, and its double walls gave it some importance as

a defensible posi- tion. Besides a castle, it possesses three old monastic buildings, one of which, the Carthusian convent of Casotto, is an edifice of much magnificence. Population in 1870 nearly 7000.

GAR-FISH is the name given to a genus of fishes (Belone) found in nearly all the temperate and tropical seas, and readily recognized by their long, slender, com- pressed and silvery body, and by their jaws being pro- duced intoa long, pointed, bouy, and sharply-toothed beak. About fifty species are known from different parts of the globe, some attaining to a length of 4 or 5 feet. One species is common on the British coasts, and is well known by the names of “ long-nose,” “ green-bone,” &c. The last name is given to those fishes on account of the peculiar green colour of their bones, which deters many people from eating them, although their flesh is well flavoured and perfectly wholesome. The Skipper (Scomberesox) and Half- beak (Hemirhamphus), in which the lower jaw only is prolonged, are fishes nearly akin to the gar-pikes. See IcutTHyoLoey, GARGANEY ! (North-Italian, Garganello), or SuMMER- TEAL, the Anas querquedula and A. circia of Linnzus (who made, as did Willughby and Ray, two species out of one) and the type of Stephens’s genus Querquedula. This bird is one of the smallest of the Anatide, and has gained its common English name from being almost exclusively a summer-visitant to this country, where nowadays it onl regularly resorts to breed in some of the East-Norfolk Late called Broads, though possibly at one time found at the same season throughout the great Fen-district. About the same size as the common Teal (A. crecca), the male is readily distinguished therefrom by its peculiarly-coloured head, the sides of which are nutmeg-brown, closely freckled

(Orn., lib. a seems never to glish, the bird being in- island where it is indigenous as

1 The word was introduced by Willughby from Ce see i S iii. p. 127), but, though generally balepied e authors ps have become other than a book-name in En : variably known in the parts of this ** Summer-Teal.””

_ among 3944 villages and 57,293 houses. : | 308,208, or no less than 99°3 per cent. of the population, the

with short whitish streaks, while a conspicuous white curved —

line descends backwards from the eyes. The upper wing- coverts are bluish-grey, the scapulars black with a white shaft-stripe, and the wing-spot (speculum) greyish-green bordered above and below by white. ‘The female closely resembles the hen Teal, but possesses nearly the same wing- spot as her mate. In Ireland or Scotland the Garganey is very rare, aud though it is recorded from Iceland, more satisfactory evidence of its occurrence there is needed. It has not a high northern range, and its appearance in Norway and Sweden is casual. Though it breeds in many parts of Europe, in none can it be said to be common ; but it ranges far to the eastward in Asia—even to Formosa, according to Swinhoe—and yearly visits India in winter. Those

| that breed in Norfolk arrive somewhat late in spring and

make their nests in the vast reed-beds which border the Broads—a situation rarely or never chosen by the Teal, The labyrinth or bony enlargement of the trachea in the male Garganey differs in form from that described in any

other Drake, being more oval and placed nearly in the

median line of the windpipe, instead of on one side, as is usually the case.

GARUWAL, a district of British India, in the Kumaon division, under the jurisdiction of the lieutenant-governor of the North-Western Provinces, situated between 29° 16’ 15” and 31° 5’ 30” N. lat., and 78° 18’ 45” and 80° 8’ E.

‘long, and bounded on the N. by Chinese Tibet, on the E.

by Kumdon district, on the 8. by Bijnor district, and on the W. by Independent Garhwal or Tehri. Garhwal dis-

trict consists almost entirely of rugged mountain ranges

running in all directions, and separated by narrow valleys, which may almost be described as gorges or ravines. The only level portion of the district consists of a narrow strip of waterless forest, between the southern

slopes of the hills and the fertile plains of Rohilkhand. The highest mountains are in the north of the district, the principal peaks being Nand4 Devi (25,661 feet), Kamet (25,413), Treoul (23,382), Dunagiri (23,181), Badrinath (22,901), and Kedarnath (22,853). The Alaknanda, one of the main sources of the Ganges, receives with its affluents the whole drainage of the district. The river is regarded as of peculiar sanctity, and is annually resorted to by thousands of devout Hindus. At Deoprayég the Alaknandé joins the Bhagirath{, and thenceforward the united streams bear the name of the Ganges, Navigation is impracticable in all the rivers, owing to the velocity of their currents, and the existence of shoals and rapids. Cultivation is princi pally confined to the immediate vicinity of the rivers, which are employed for purposes of irrigation ; but out of a total estimated area of 5500 square miles in 1872, only 209 were returned as under cultivation. Agriculture, however, is carried on with great skill and industry, by terracing out the hill sides. Wheat, rice, and mandud are the staple crops, the surplus produce being exported to Tibet. Tea planting is also carried on under European supervision.

The census of 1872 disclosed a

opulation in the Garhwal dis- trict of 310,288 (115,745 males mel

154,537 females), distributed The Hindus numbere Hindu

Mahometans 1799, and Christians 85. The two great

_ temples of Badrinath and Kedarnath, which lie hidden among the

recesses of the snowy range, attract large numbers of pilgrims, who considerably add to the prosperity of the district. No place in Garhwdl contains as many as 5000 inhabitants, Srinagar 8

the largest town, but the administrative headquarters is at Pauni.

| Trade is principally carried on with Tibet, by way of the Mana

and Niti passes, sheep and goats being used as beasts of burden. The chief exports are grain, gur, cloth, and tobacco; the imports salt, borax, wool,

gold, and precious stones. Good hill roads, from 10 to 12 feet in width, intersect the district in every direction, the total length being about 1000 miles. The land revenue in 187; amounted to £9555. Only a small force of regular police © stationed at headquarters, and tlre is little crime of any kin

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Kducation has made greater progress among than in the plain districts beneath them. afforded education to 3609 pupils.

Garhwai originally consisted of 52 petty chieftainships, each chief with his own independent fortress (garh). Between 400 and 500 years ago, one of these chiefs, Ajai Pal, ruler of Chandpur, reduced all the minor principalities under his own sway, and founded the Garhwal kingdom. He and his ancestors ruled over Garhwal and the adjacent state of Tehri, in an uninterrupted line till 1808, when the Gurkhas invaded Kumdon and Garhwal driving Prithiman Sah, the Garhwal chief, into the plains. For twelve years the Gurkhas ruled the country with a rod of iron, until a series of encroachments by them on British territory, led to the war with Nepal in 1814. At the termination of the eampaign, Garhwal and Kumdon were converted into British districts, while the Tehri principality was restored to Pridhimdn Sah, whose grandson still holds it. Since the annexation, Garhwal has rapidly advanced in material prosperity. Cultivation has rapidly increased, and the spread of tea-culture has opened the country to British capital and enterprise, which are converting this long harassed tract into an important and wealthy district,

GARLIC (Greek, oxdpodoy ; Latin, Allium ; Italian, Aglio; French, Az/ ; German, Knoblauch), Allium sativum, Linn., a bulbous perennial plant of the tribe ITyacinthinece of the natural order Liliacew, indigenous apparently to the south of Europe and to the East, having entire, obscurely keeled leaves, a deciduous spathe, a bulbiferous globose umbel, and whitish flowers, with exsert pistil and stamens, The bulb, which is the only part eaten, has membranous scales, in the axils of which are 10 or 12 cloves, or smaller bulbs. From these new bulbs can be procured by planting out in February or March. The bulbs are best preserved hung ina dry place. If of

fair size, twenty of them weigh about 1 Ib. To prevent the Pliny (Wat. ITist., xix. 34) advises to bend the stalk down- ward, and cover with earth ; seeding, he observes, may be prevented by twisting the stalk. Glarlic is cultivated in the same manner as the SHALLOT (7. v.). It is stated to

these mountain valleys In 1875 73 schools

have been grown in England before the year 1548. The

percentage composition of the bulbs

is given by Mr FE. Solly (7rans, Hort. Soe. Lond., new

ser, ili, p. 60) as

water 84:09, organic matter 13°38, and inorganic matter |

1:53,—that of the leaves being water 87°14, organic matter _ 11:27, and inorganic matter 1°59. ‘ and characteristic odour, and an acrid taste, and yields an | offensively smelling oil, essence of garlic, identical with allylic sulphide (C,H,),S (see Hofmann and Cahours, | Journ, Chem. Soc., x. p. 820). This, when garlic has been eaten, is evolved by the excretory organs, the activity of which it promotes. From the earliest times garlic has been used as an article of dict. It formed part of the food of the Israelites in Egypt (Numb. xi. 5), and of the labourers employed by Cheops in the construction of , DIS pyramid, and is still grown in Egypt, where, however, ithe Syrian is the kind most esteemed (see Rawlinson’s | Herodotus, ii, 125). It was largely consumed by the ancient Greek and Roman soldiers, sailors, and rural classes (of Virg., Ecl., ii. 11), and, as Pliny tells us (MN. Timi. | 32), by the African peasantry. Galen eulogizes it as the rustic’s theriac (see F. Adams’s Paulus digineta, p. 99), and Alexander N eckam, a writer of the 12th century (see Wright’s edition of his works, p. 473, 1863), recommends it a8 palliative of the heat of the sun in field labour. “The people In places where the simoon is frequent,” says Elphinstone (An Account of the Kingdom of Caubul, p. | 140, 1815), “eat garlic, and rub their lips and noses with it, when they go out in the heat of the summer, to prevent their suffering by the simoou.” “O dura /Messorum ilia,” exclaims Horace (Epod., iii.), as he re- [one his detestation of the popular esculent, to smell

of which was accounted a sign of vulgarity (cf. Shakespeare, Coriol., iv. 6, and Meas. Sor Meas,, iii. 2). In England garlic is seldom used except as a seasoning, but in the ‘Southern countries of Europe it is a common ingredient in

plant from running to leaf, |

The bulb has a strong |

dishes, and is largely consumed by the agricultural popu- lation. Garlic was placed by the ancient Greeks on the piles of stones at cross-roads, as a supper for Hecate (Theophras- tus, Characters, Acordatpovias) ; and according to Pliny garlic and onions were invocated as deities by the Egyptians at the taking of oaths. The inhabitants of Pelusium in Lower Egypt, who worshipped the onion, are said to have held both it and garlic in aversion as food. Garlic possesses stimulant and stomachic properties, and was of old, as still sometimes now, employed as a medicinal remedy. Pliny (NV. H., xx. 23) gives an exceedingly long list of complaints in which it was considered beneficial Dr Sydenham valued it as an application in confluent smallpox, and, says Cullen (Mat. Med., ii. p. 174, 1789), found some dropsies cured by it alone. The volatile oi] has proved efficacious in in- digestion, and in some stages of bronchitis, especially in the acute form of the disease in infants, also in chronic colds, and as arubefacient and nervine tonic > and poultices of the pounded pulp are recommended for the convulsions and suffocative catarrh of infants (Wood, Z’reat. on Therapeutics, p. 451, 1874). With lemon-juice garlic has also been re- sorted to for the cure of diphtheria (Lrit. and For. Med.- Chir, Rev., 1860, i. p. 281). The wild “Crow Garlic” and “Field Garlic” of Britain are the Linnean species Allium vineale and A. oleraceum respectively.

See Phillips, Hist. of Culinary Vegetables, vol. ie Materia Medica, vol, ii. pt. i.; M‘Intosh, The Book of the vol. ii., 1855, p. 29.

GARNET (German, Granat; French, Grenat), a mineral the name of which is derived from the Latin granatum, the pomegranate, or, as Lydgate calls it, “ garnet appille ” (see Halliwell, Déct., i. p. 392), on account of the

resemblance of its granular varieties to the seeds of that fruit, Several sorts of garnets, with other stones, seem to have been in- cluded under the terms avOpaé and carbunculus, employed by Theophrastus and Pliny. Garnet occurs in crystals, mostly dodecahedral or trapezohedral, very rarely octahedral,! of the isometric, regular, or cubical system, also in pebbles and grains (as in alluvial deposits), and massive, with a granular or coarse lamellar structure. It varies in diaphaneity from transparent to nearly opaque; is red, red-brown, or black in colour, less frequently white, yellow, pink, or green ; has a vitreous to resinous lustre, a white streak, dodeca- hedral cleavage, hardness of 6°5 to 7 ‘5, specific gravity of 3°15 to 4°30,? and an uneven sub-conchoidal fracture 3 and is brittle and sometimes friable, or, in the compact crypto- crystalline varieties, tough. Before the blowpipe it gives a brown, green, or black (often magnetic) glass, which hydro- chloric acid decomposes, with the separation of gelatinous silica, Previous to melting, the mineral is but little affected by the acid. The least fusible forms are the lime-iron garnets. It has been shown by Professor Church that, although unaffected by exposure to a full red heat for a quarter of an hour, iron garnet may by fusion have its specific gravity lowered from 4:059 to 3:204, By almost complete fusion a specimen of almandine garnet examined by him had its specific gravity increased from 4-103 to 4°208. Long-continued ignition effected only a slight increase in the density of various specimens of lime garnet (see Journ. Chem. Soc., vol. xvii. p. 888). Garnets, which through the isomorphism of their constituents are extrem ely variable in chemical composition, are silicates of the general formula R”,R,.Si,0,., or 3R”O,R”,0,.38i0,, in which R’=calcium, magnesium, iron, and manganese, and Ri” = aluminium, iron, and chromium. Occasionally rarer metals i ee es

1 See Max Bauer, ‘‘ Ueber die selteneren Krystallformen des Gra- nats,” Zeitschr. der deut. geolog. Ges., Bd. xxvi., 1874, pp. 119-37, plas 2 On the specific gravity of several varieties of garnet, see Prof. A. H. Church, Geological Mag., new ser., vol. — 2 p. 321.

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Pereira, Garden,

are present ; yttrium, for instance, has been found i garnets from Brevig, Norway. _ Three principal groups have been recognized, called, according to their chief sesquioxide basic components, alumina, iron, and chrome garnets, which have the general formula R’,Al,Si,0,2, B gk’ ey.81g0j9 and R’,CreSiz0 12 respectively. These are further classed, by the predominance of one or other of their contained pro- toxides, into numerous subordinate groups, as lime-alumina garnet, Ca,Al,.Siz019, &9-s grossularite, — topazolite, and essonite; magnesia-alumina garnet, comprising pyrope, the typical specimens of which contain a small percentage of chromium ; iron-alumina garnet, ¢9-; almandite, common garnet in part, and allochroite ; manganese-alumina garnet, as spessartite and romanzovite ; lime-iron garnet, which includes andradite, melanite, or black garnet, which may be titaniferous, as at Frascati, and pyreneite, aplome, and common garnet in part; lime-magnesia-iron garnet (CaMg),Fe,.SigOi., oF predbergite; and lime-chrome garnet, or ouvarovite. Colophonite, a yellow-brown to honey-yel- low or almost pitch-black mineral, with a resinous lustre, commonly considered to be a lirne-iron garnet, according to Wichmann and Des-Cloiseaux must be regarded as for the most part granular vesuvian.

Garnet is a wide-spread mineral, and is found in micaceous, talcose, chloritic, and hornblendic schists, and in syenitic gneiss, syenite, granite, dolomite, and crystalline limestone ; sometimes as pyrope, in serpentine ; also in felspar-porphyry, and in volcanic rocks, In Cornwall it is met with chiefly in greenstone, or in close proximity thereto. Itis an essential ingredient of the rock eklogite. Grossularite, a greenish to grey-green garnet, is found at Rezbanya in Hungary, and the Wilui river, Siberia ; topazolite and essonite at Mussa, Piedmont, the latter also in Ceylon, Pied-mont, and Elba; pyrope in Bohemia, and at Zoblitz in Saxony; and almandite in Ceylon, Pegu, Brazil, and Greenland. Spessartite +s obtained at Haddam, Ct., and elsewhere ; melanite in Vesuvian and other lavas; aplome at Breitenbrunn and Schwarzenberg in Saxony; the fine green garnet ouvarovite chiefly at Saranovskaja, 14 versts from Bissersk in the Urals, and at New Idria in California ; and white garnet in the Urals. Numerous other localities for garnet might be mentioned. Precious garnet, almandite or alman- dine (so termed, it is said, from being cut at Alabanda in Caria whence the appellation alabandicus employed by Pliny), essonite or cinnamon-stone, grossularite, grossularia, or gooseberry stone, and

pyrope or Bohemian garnet are the varieties of the mineral employed as gems. They are shaped by means of garnet powder or emery on a copper wheel, and polished on lead with tripoli. Carbuncles are almadine garnets cut cn cabochon; when of large size, and free from black spots, they may be worth as much as £20 apiece. The deep red or precious garnet often has a density close to that of the ruby, for which stone it has been sold. The Syriam or Pegu garnets, possibly the amethystizontas of Pliny (Nat. Hist xxxvil. 25), commonly designated amethystine or oriental garnets, vary in colour from a deep red to a violet-purple, and may occur 3 inches in diameter. They are usually cut with four large and four small facets, and may fetch very high prices, a single speci- men, of a fiery-red hue, measuring 1 ineh by 3°; inch having been sold for £40, and another, of octagonal form, for £140. Pyrope is a dark hyaeinth-red_to blood-red gem, much esteemed in Austria Transylvania, and Turkey. Viewed by transmitted light it appears of a yellowish-red tint, more especially at theedges. Kssonite ; ellow to hyacinth-red in colour, is a softer and more fusible net than the other kinds used in jewellery. It is commonly salted hyacinth and has frequently been mistaken, as also sold for true h wee 9 r jacinth, which is a zirconium silieate, and may be distin ciel . its density of 4°05-4°75, that of essonite being about 3-60-3°66, The garnet was much used as a jewel in ancient tim Antique intaglios on garnet are recognized by their usuall fit aes ectie seue % their brittleness, and by a scfieae. of een ned

arted to them by time, which defies imitati fblaat artists (Castellani), The bust of Hadrian a tee Odesonlcht oom the Venus Genetrix in the cabinet of Abbé Pullini at T fie 963 ed en iain of Sirius on the celebrated Te ig ey

e amo ing j a, Be : iy a of engraving in garnet. Garnet,

ere » has been used in the smelting of iron ores. F polishing purposes it is sometimes substituted for emery. The large dull-coloured ‘‘carbunculus of India,’’ sisson Ge Pli ue 0 ” eae tps beret out into vessels that would hold ‘s ae |

int. Garnet las been obtained as a furnace-prod otherwise arti ’ i i Pee a ee ay — ; What is known as ‘‘ white garnet” is the

See Bischof, Chemical Geology, vol. ii. chap, xxxiii., and vol.

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iii, p. 348; C. E. Kluge, Hdb. d. Edelsteinkunde, Leipsic, 1860”: Emanuel, Diamonds and Preeious Stones, 3d ed., 1867; A. Schranf, Hab. d. Edelsteinkunde, Vienna, 1869; A. Castellani, Gems, 187]: 5. D. Dana, A System of Mineralogy, 5th ed., pp. 265-72, New York, 1874; C.F. Naumann, Elemente der Mineralogie, 10th ed., by Dr F. Zirkel, pp. 582-5, Leipsic, 1877. On so-called garnets from the river Bobrowska, Urals, see Church, Mineralog. Mag. ii., 1879, p. 191. (F. H. B)

GARNIER, Germain (1754-1821), an able writer on political economy, was born at Auxerre, on 8th November 1754. He was educated for the law, and obtained when young the office of procureur at Chatelet. He acted for some time as secretary to Mme. Adelaide, aunt of Lonis XVL, and by his fine presence and maliners acquired con- siderable reputation and power at court. On the calling of the states-general he was named as deputy for Chatelet, and in 1790 he appears to have been a member of the mon- archical club in Paris. After 1792 he withdrew to the Pays de Vaud, and did not return till1795. In public life, however, he seems to have been singularly fortunate. In 1797 he was on the list of candidates for the Directory ; in 1800 he was prefect of Seine et Oise ; in 1804 he was made senator; and from 1809 to 1811 he acted as president of the senate. After the restoration he obtained a peerage, and on the return of Louis XVIIL, after the Hundred Days, he became minister of state and member of privy council. He died at Paris, 4th October 1821. Garnier was somewhat advanced in years before he began to take any interest in political economy ; his previous efforts in literature had been of an altogether different kind. At court he was, when young, noted for his facile power of verse-writing, and he translated Mrs Radcliffe and Mrs Montague.

Garnier is best known by his admirable translation, with notes and introduction, of Smith’s Wealth of Nations (1st ed 1805, 2d ed. 1822), and by his Histoire de la Monnaie (2 vols., 1819), which contains much sound and well-arranged material. His Abrégé des Principes de V Econ. Polit. (1796) is_a very clear and instructive manual. Of high value also is the Description géographique, phy- sique, et politique du départe ment de

Seine-ct- Oise (1822), drawn u fyom his instructions. Other works are De la Propriété (1792), an Histoire des Banques d’ Escompte (1806).

GARNIER, Marie JoserH FRANQOIS (1839-187 3), usually called Francis Garnier, a French officer and explorer, was born at St Ktienne, July 25,1839, and perished by assas- sination in Tong-king, December 7, 1873, He entered the navy, and after voyaging in Brazilian waters and the Paeific he obtained a post on the staff of Admiral Charner, who from 1860 to 1862 was campaigning in Cochin-China. After some time spent in France he returned to the East, and in 1852 he was appointed inspector of the natives in Cochin-China, and entrusted with the administration of the town of Cho-len or Sho-len. It was at Garnier’s suggestion that the Marquis de Chasseloup-Laubat determined to send a mission through Laos to Tibet, but as he was not con- sidered old enough to be put in command, the chief authority was entrusted to Captain Doudart de Lagrée. In the course of the expedition—to quote the words of Sir Roderick Murchison addressed to the youthful traveller when, 1870, he was presented with the Victoria Medal of the Royal Geographical Society of London—from Cratieh in Cam bodia to Shanghai 5392 miles were traversed, and of these 3625 miles, chiefly of country unknown to European geography, were surveyed with care, and the positions fixed by astronomical observations, nearly the whole © the observations being taken by Garnier himself. Volun- teering to lead a detachment to Talifu the capital of Sultan Suleiman, the sovereign of the Mahometan rebels in Yunnan, he successfully carried out the more than adventurous enterprise. When shortly afterwards Lagrée died, Garmer naturally assumed the command of the expedition, and he conducted it in safety to the Yang-tze-Kiang, and thus to the Chinese coast. On his return to France he was recelvé with enthusiasm. The preparation of his narrative W4

«difficult. _ Cordouan, which dates

_ tinuous with Spain along the line of the Pyrenees.

interrupted by the Franco-German war, and during the siege of Paris he served as principal staff officer to the admiral in command of the eighth "sector." His experiences during the siege were published anonymously in the feuil- leton of Le Temps, and appeared separately as Le Siége de Paris, journal d'un officier de marine, 1871. Returning to Cochin-China he found the political circumstances of the country unfavourable to further exploration, and accordingly he went to China, and in 1873 followed the upper course of the Yang-tze-Kiang to the waterfalls. He was next commissioned by Admiral Dupré, governor of Cochin-China, to Tong-king to found a French protectorate or a new colony. On November 20, 1873, he took Hanoi, the capital of Tong-king, and on December 7th he was slain.

The narrative of the principal expedition appeared in 1873, as Voyage @cxploration en Indo-Chine effectwé pendant les années 1866, 1867, ef 1868, publié sous la direction de M. Francis Garnier, avee le concours de M. Delaporte et de MM. Joubert et Thorel, 2 vols. An account of the Yang-tze-Kiang from Garnier's pen is given in the Bulletin de la Soe. de Géog., 1874. His Chronique royale du Cambodje was reprinted from the Jowrnal Asiatique in 1872. See Ocean Highways, 1874, for a memoir by Colonel Yule.

GAROFALO, Benvenuto. See Tisio.

GARONNE, the ancient Garumna, a river of southern France, which rises in the Spanish Pyrenees not far from the massif of Maladetta, flows through the fine gorge called the Val d'Aran, partly loses itself under the calcareous rocks that form the gulf of Clédes, enters France near the Pont du Roi, and proceeds in a general north-west direction till it falls into the Bay of Biscay. Rafts can be sent down the river from the Spanish frontier ; boats can pass with the stream from the confluence of the Salat to Toulouse ; from Toulonse downwards regular navigation with boats can be maintained; and seafaring vessels can sail up as far as Castets, 32 miles above Bordeaux. At Bec d'Ambes, near the confluence of the Dordogne, the river widens out to a breadth of from 2 to 4 miles, and takes the name of the Gironde. This estuary presents an almost uninterrupted succession of islands and banks, which divide it into two nearly equal branches, and render the navigation somewhat At the mouth stands the famous tower of from 1584-1610, and

ranks as one of the finest lighthouses on the coast of France. The current at Toulouse, when the water is at its lowest, amounts to 1271 cubic feet per second, but in the ordinary state of the river it is 5297 cubic feet. During ordinary flood it rises about 25 feet; but in exceptional cases, as in 1855 and 1856, this increases to 28 or even 30 feet, and as the banks of the river are low the inunda- tions are very extensive. The principal affluents on the right are the Salat, the Ariége, the Tarn, the Lot, the Dropt, and the Dordogne; and on the left the N este, the Bouge, the Save, the Gimoné, the Gers, the Baise, and the Ciron.

GARON NE, Havute-, or Upper Garonnz, is one of the frontier departments in the south of France, being con- C To the N. lies the department of Tarn-et-Garonne, to the E. are those of Tarn, Aude, and Ariége, and to the W. those of Gers and Hautes-Pyrénées. The form of the department ‘S very itregular. Its greatest length is 99 miles from N.E. to S.W., and its greatest breadth about 56 miles ; but its area only amounts to 629,000 hectares, or 2428 English square miles. The northern portion is a fertile but mountainous stretch of country, with coutinual interchange of hill and valley nowhere thrown into striking relief ;

| While towards the south the land rises gradually to the

Pyrenees, which there attain a height of upwards of 11,000 feet. All the streams by which the department is Wwatered—the Neste, the Salat, the Lers, the Logue, the Touche, &c.—belong to the system of the river from which It takes its name, Except in the mountainous region the

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climate is mild, the mean annual temperature being rather higher than that of Paris. The rainfall, which aver- ages 23 inches at Toulouse and 26 at St Gandens, is distributed over 125 days. The winds are often violent. Thick forests of oak, fir, and pine exist in the mountains, and furnish timber for shipbuilding. The arable land (360,241 hectares, or 890,207 acres) is well adapted for the cultivation of wlieat, maize, and other grain crops; and the produce of cereals is generally. much more than is required for the local consumption. Oats, buckwheat, barley, flax, colza, and potatoes are all grown; fruit is plentiful, and about 54,000 hectares, or 133,441 acres, are

occupied by vineyards, though the wine is only of medium quality. As pasture land is abundant, a good deal of atten- tion is given to the rearing of cattle and sheep ; and owing to themountainous character of the southern region asses and mules are favourite beasts of burden, and may be estimated at 24,000 in number. Iron, lead, copper, and coal are among the mineral productions, as well as marble, both white and variegated, granite, freestone, lime, and slate. The manu-

-factures are various though not individually extensive, and

include iron and copper utensils, earthenware, woollen, cotton, and linen goods, leather, paper, watches, mathe- matical instruments, &c. Railway communication is fur- nished by the line from Bordeaux to Cette which passes by Toulouse, and there sends off branch lines leading to Albi, Auch, Foix, St Giron, and Bagnéres de Luchon. The Canal du Midi traverses the department for 32 miles. There are four arrondissements—Toulouse, Villefranche, Muret, and St Gaudens, subdivided into 39 cantons and 585 com- munes. The chief town, Toulouse, contained 120,208 in 1875; but there is no other town of even 5000 inhabi- tants in the department, the largest being St Gaudeus with 4087. The population of Haute-Garonne in 1801 was 405,574, including the arrondissement of Castel- sarrasin with 60,545 inhabitants, which was detached in 1806 ; in 1851 it was 481,610, and in 1875, 477,730. GARRICK, Davin (1716-1799), the greatest actor of his age, and the most successful of English theatrical managers, was descended from a good French Protestant family of Bor- deaux which had settled in England on the revocation of the edict of Nantes. His father, Captain Peter Garrick, was on a recruiting expedition when his celebrated son was born at Hereford on February 19, 1716-17. The captain usually resided at Lichfield on half pay, but, in order to benefit his large family, he accepted an offer to proceed on service to Gibraltar, in place of a brother officer who was desirous of returning to England. This kept him many years absent from home, and the letters written to him by “little Davy,” acquainting him with the doings at Lichfield, are highly interesting memorials of the future Roscius. In his nine- teenth year, after receiving a good education at the grammar school of Lichfield, David was sent to the establishment at Edial, opened in June or July 1736 by Samuel Johnson, his senior by seven years. The Edial academy was shut in about six months,

and on the 2d of March 1736-7 master and pupil, Johnson and Garrick, left Lichfield for London, the one to commence the study of the law, and the other to try his tragedy of Jrene—Johnson, as he afterwards said, “with twopence halfpenny in his pocket,” and Garrick ‘“‘with three-halfpence in his.” Seven days afterwards, however, Garrick was entered of Lincoln’s Inn, but after remaining for a few months in London, he resided for some time with Mr Colson, a distinguished teacher at Rochester afterwards Lucasian (professor at Cambridge). Captain Garrick, who had returned from Gibraltar, died about a month after his son’s arrival in London. Soon afterwards a rich uucle, a wine merchant at Lisbon, in his will left David a sum of £1000, and he and his brother entered into partnership as wine merchants in

London and Lichfield. The concern was not prosperous— though Foote’s assertion that he had known Garrick with three quarts of vinegar in the cellar calling himself a wine merchant need not be taken literally—and before the end of 1741 he had spent nearly hatf of his £1000. His passion for the stage completely engrossed him ; he tried his hand both at dramatic criticism and at dramatic authorship, and made his first appearance on the stage late in 1740-1, ¢ncognito, as harlequin at Goodman’s Fields, where Woodward, being ill, allowed him to take his place during a few scenes. When the manager of the same theatre, Giffard, took a party of players to Ipswich, Garrick accompanied them, and there made his first essay as an actor under the name of Lyddal, in the part of the black Aboan (in Southerne’s Oroonoko). His success on the pro- vincial boards determined his future career. On the 19th of October 1741 he made his appearance at Goodman’s Fields in the character of Richard III., and gained the most enthusiastic applause. His staid and sedate brother, and his sisters at Lichfield, were scandalized at this derogation from the provincial dignity of the family ; and Garrick, greatly distressed at the shock they had received by the intelligence (which, however, he expected), hastened to give up his interest in the wine company. Each night added to his popularity on the stage. He was received by the best company in town. While his Richard was still calling forth general admiration, he won new ap plause in Lear and Pierre, as well as in several comic characters (including that of Bayes). Glover (“ Leonidas”) attended every performance ; Lyttelton, Pitt, and

several other members of parliament had shown him the greatest civility. From December 2d he appeared inhis own name. Pope went to see him thrice during his first performances, and pronounced that " that young man never had his equal as an actor, and. he will never have arival." Before next spring he had supped with "the great Mr Murray, counsellor," and hoped to do so with Mr Pope through Murray's introduction, while he was dining with Halifax, Sandwich, and Chesterfield. 'There are a dozen dukes of a night at Goodman's Fields," writes Horace Walpole. The Lying Valet being at this time brought out with success, the honours of dramatic author were added to those of the stage. His fortune was now made, and while the managers of Covent Garden and Drury Lane resorted to the law to make Giffard close his little theatre, Garrick was engaged by Fleetwood for Drury Lane for the season of 1742. In the meantime, having very advantage- ous terms offered him for performing in Dublin during part of the summer, he went over to that city, where he found the same homage paid to his merit which he had received from his own countrymen. From September 1742 to April 1745 he continued at Drury Lane, after which he again went over to Ireland, and remained there the whole season, as joint-manager with Sheridan, in the direction and profits of the theatre-royal in Smock Alley. From Dublin = Roe to England, and fulfilled a short engagement —7 with Rich at Covent Garden. This was his last series of performances as a hired actor; for in the close of that season Fleetwood's patent for the management of Drury Lane expired, and Garrick, in conjunction with Lacy. purchased the property of the theatre, together with the renovation of the patent, and in the winter of 1747 opened it with a strong company of actors, the prologue for the occasion being written by his old preceptor Johnson.

_For a time, at least, 'the drama's patrons " were content with the higher entertainment furnished them ; in the end Garrick had to "please" them, like most other managers, by gratifying their love of show. Garrick was surrounded by many players of eminence; and he had the art, as he was told by Miss Clive, "'of contradicting the proverb that

infinitely more difficult, making actors and actresses without genius." The naturalness of lis own acting was its great charm. As Churchill says in the Rosciad, which remains the chief literary monument of Garrick's pre-eminence among his fellows, he who is "pleased with Nature, must be

pleased with thee.” Booth, Quin, and the old tragedians were remarkable for a style of stately declamation, sonorons, and often graceful and impressive, but wanting the versa- tility and rapid changes of passion that, when exhibited by Garrick, at once captivated the audience. ‘‘It seemed,” said Richard Cumberland, ‘‘as if a whole century had been stepped over in the passage of a single scene; old things were done away, and a new order at once brought forward, bright and luminous, and clearly destined to dispel the barbarisms of a tasteless age, too long superstitiously devoted tothe illusions of imposing declamation.” Garrick’s French descent and his education may have contributed to give him the vivacity of manner aud versatility of concep- tion which distinguished him as an actor ; and nature had given him an eye, if not a stature, to command, and a mimic power of wonderful variety. The list of his charac- ters in tragedy, comedy, and farce is large, and would be extraordinary for a modern actor of high rank ; it includes not less than seventeen Shakespearean parts. As a manager, though he committed some grievous blunders, he did good service to the theatre and signally advanced the popularity of Shakespeare’s plays, of which not less than twenty-four were produced at Drury Lane under his man- agement. Many of these were not pure Shakespeare ; but not every generation has the same notions of the way in which he is best honoured. He purified the stage of much of its grossness, and introduced a relative correctness of costume and decoration unknown before.

After, about the year 1745, escaping from the chains of an unreturned passion for the beautiful but reckless actress “Peg” Woffington, Garrick had, in 1749, married Made- moiselle Violette (Eva Maria Veigal), a German lady who had attracted the admiration of the court of Vienna as a dancer, and was patronized in England by the countess of Burlington. This lady Garrick called “the best of women and wives,” and he lived most happily with her in his villa at Hampton (acquired by him in 1754, and adorned by the famous Shakespeare temple), whither he was glad to escape from his house in Southampton Street. Their union was childless, and Mrs Garrick survived her husband, living in great respect until 1822. Having sold the moiety of his theatre for £35,000, Garrick took leave of the stage by playing a round of his favourite characters—Hamlet, Lear, Richard, Lusignan, and Kitely, as the graver ; Archer, Abel Drugger, Sir John Brute, Benedick, Leon, and J)on Felix, as those of a lighter cast. He ended the

series with Don Felix (in Zhe Wonder) on June 10, 1776. But he was not long to enjoy his opulent and well-earned repose, for he died in London on the 20th of January 1779. He was buriedin Westminister Abbey withimposing solemnities, and amidst an unexampled concourse of people of all ranks. Johnson, whose various and not always consistent criticisms on Garrick are scattered through the pages of Boswell, spoke warmly of the elegance and sprightliness of his friend's conversation, as well as of his liberality and kindness of heart ; and his death, which came upon him unexpectedly, "eclipsed," Johnson said, "the gaiety of nations, and impoverished the public stock of harmless pleasure." But the most accurate and discriminating character of Garrick, slightly tinged with satire, is that drawn by Goldsmith in his poem of Retaliation. As a literary man Garrick was very happy in his epigrams and slight occasional poems. He had the good taste to recognize, and the spirit to make public his recognition of, the excellence of Gray's Odes at a

one cannot make bricks without straw, by doing what is | time when they were either ridiculed or neglected. His

dramatic pieces (The Lying Valet, Lethe, The Guardian, Miss in her Teens, Irish Widow, &c.), and his alterations and adaptation of old plays, which together fill four volumes, evinced his knowledge of stage effect and his appreciation of lively dialogue and action; but he cannot be said to have added one new or original character tothe drama. He was joint author with Colman of Zhe Clandestine Marriage, in which he is said to have written his famous part of Lord Ogleby. 'The excellent farce, High Life below Starrs, appears to have been wrongly attributed to Garrick, and to be by Townley, a clergyman. As a matter of course he wrote many prologues and epilogues.

Garrick's correspondence (published, with a short memoir by Boaden, in 2 vols. 4to), and the notices of him in the memoirs of Hannah More and Madame D' Arblay, and above all in Boswell's. Life of Johnson, bear testimony to his general worth, and to his many fascinating qualities as a friend and companion. The earlier biographies of Garrick are by Arthur Murphy (2 vols. 1801) and by the bookseller Tom Davies (2 vols., 4th ed.,

1805), the latter a work of some merit, but occasionally inaceurate and confused as to dates. Mr Percy Fitzgerald's Life (2 vols. 1868) is full and spirited. A charming essay on Garrick appeared in the Quarterly Review, July 1868. (R. CA.—A. W. W.)

GARRISON*

AN OUTLINE OF HIS LIFE. Copyright, 1879, by Charles Scribner's Sons.

ILLIAM LLOYD GARRISON, the founder and leader of the movement for the abolition of slavery

in the United States of America, was born in Newburyport, Massachusetts, December 10, 1805. His parents were from the British province of New Brunswick. The father, a sea- captain, went away from home when William was a child, and it is not known whether he died at sea or on the land.

The mother is said to have been a woman of high character,

charming in person, aud eminent for piety. For her William had the deepest reverence, and he is supposed to have inherited from her the moral qualities that specially fitted him for his career. She was entirely dependent for the support of herself and children upon her labours as a nurse. She was able to give William but a nieagre chance for an education, but he had a taste for books, and made the most of his limited opportunities. She first set him to learn the trade of a shoemaker, and, when she found this did not suit him, let him try his hand at cabinet- making. But the latter pleased him no better than the former. In October 1818, however, when he was in his fourteenth year, he was made more than content by being indentured to Ephraim W. Allen, proprietor of the Vew- buryport Herald, to learn the trade of aprinter. He found in this occupation a happy stimulus to his literary taste and ambition, as well as some available opportunities for mental culture. He soon became an expert compesitor, and after a time began to write anonymously for the Herald. His communications won the commendation of the editor, who had not at first the slightest suspicion that he was the author. He also wrote for other papers with equal success. A series of political essays, written by him for the Salem Gazette, was copied by a prominent Philadelphia journal, the editor of which attributed them to the

Hon. Timothy Pickering, a distinguished statesman of Massachusetts. His skill as a printer won for him the position of foreman, while his ability as a writer was so marked that the editor of the Herald, when temporarily called away from his post,

left the paper in his charge.

The printing-office was for him, what it has been for many another poor boy, no mean substitute for the academy and the eo!- lege. He was full of enthusiasm for liberty ; the struggle of the Greeks to throw off the Turkish yoke enlisted his warmest sym-

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pathy, and at one time he scriously thought of entering the West Point Aeademy and fitting himself for a soldiers career. His apprenticeship ended with his minority in 1826, when he began the publication of a new paper, the Free Press, in his native place. This paper was full of spirit and intellectual force, but Newbury- port was a sleepy place and did not appreciate a periodical so fresh and free ; and so the enterprise failed. Myr Garrison then went to Boston, where, after working for a time as a journeyman printer, he beeame the editor of the National Philanthropist, the first journal established in America to promote the cause of total abstin- ence from intoxicating liquors. His work in this paper was highly appreciated by the friends of temperance, but a ehange in the pro- prietorship led to his withdrawal before the end of a year. In 1828 he was indueed to establish the Journal of the Times at Ben- nington, Vermont, to support the re-election to the presidency of the United States of John Quiney Adams. The new paper, though attractive in many ways, and full of force and fire, was too far ahead of public sentiment on moral questions to win a large sup- port. Whether or not it would have lived if he had continued to be its editor, it is impossible to say; but the time had come at last when he was to enter upon the work with whieh his name will be for

ever associated. In Boston he had met Benjamin Lundy, a Quaker philanthropist, who had been for years engaged in an effort to eonvince the people of the United States that they ought to do something to promote the abolition of slavery. Mr Garrison had been deeply moved by Mr Lundy's appeals, and after going to Vermont he showed the deepest interest in the slavery question. Mr Lundy was then publishing in Baltimore a small monthly paper, entitled Genius of Universal Emancipation, and he resolved to go to Bennington and invite Mr Garrison to join him in the editorship. With this object in view he walked from Boston to Bennington, through the frost and snow of a New England winter, a distance of 125 miles. His mission was successful. Mr Garrison was deeply impressed by the good Quaker's zeal and devotion, and he resolved to join him and devote himself thereafter to the work of abolishing slavery.

In pursuance of this plan he went to Baltimore in the autumn of 1829, and thenceforth the Genius was published weekly, under the joint editorship of the two men. It was understood, however, that Mr Garrison would do most of the editorial work, while Mr Lundy would spend most of his time in lecturing and procuring subscribers. On one point the two editors differed radically, Lundy being the advocate of gradual, and Garrison the champion of im- mediate emancipation. The former was possessed with the idea that the negroes, on being emancipated, must be colonized some- where beyond the limits of the United States ; the latter held that they should be emancipated on the soil of the country, with all the rights of freemen. In view of this difference it was agreed that each should speak on his own individual responsibility in the paper, appending his initial to each of his articles for the information of the reader. 1t deserves nention here that Mr Garrison was then in utter ignorance of the change previously wrought in the opinions of English abolitionists by Elizabeth Heyrick's pamphlet in favour of immediate, in distinetion from gradual emancipation. The sinful- ness of slavery being admitted, the duty of immediate emaucipation to his elear ethieal instinct was perfeetly manifest. He saw that it would be idle to expose aud denounce the evils of slavery, while responsibility for the system was placed upon former generations, and the duty of abolishing it transferred to an indefinite future. His demand for immediate emancipation fell like a tocsin upon the ears of slaveholders. For general talk about the evils of slavery they cared little, but this assertion that every slave was

entitled to in- stant freedom filled them with alarm and roused them to anger, for they saw that, if the conseience of the nation were to respond to the proposition, the system must inevitably fall. The Genius, now that it had become a vehicle for this dangerous doctrine, was a paper to be feared and intensely hated. Baltimore was then one of the centres of the domestic slave trade, and upon this traffic Mr Garrison heaped the strongest denunciations. A vessel owned in Newbury- port having taken a cargo of slaves from Baltimore to New Orleans, he characterized the transaction as an act of ‘‘domestie piracy,” and avowed his purpose to ‘‘cover with thick infamy” those engaged therein. He was thereupon proseeuted for libel by the owner of the vessel, fined in the sum of fifty dollars, muleted in costs of court, and, in default of payment, committed to jail. His imprisonment ereated much exeitement, and in some quarters, in spite of the pro- slavery spirit of the time, was a subject of indignant comment In public as well as private. The exeitemeut was fed by the publiea- tion of two or three striking sonnets, instinet with the spirit of liberty, whieh Mr Garrison inseribed on the walls of his eell. One of these, Freedom of Mind, is remarkable for freshness of thought and terseness of expression, and will probably hold a permanent place in American literature. ; .

John G. Whittier, the Quaker poet, interceded with Henry Clay to pay Mr Garrison’s fine and thus release him from prison. To the eredit of the slaveholding statesman it must be said that he

| responded favourably, but before he had time for the requisite pre-

Satna Tappan, a philanthropic merchant of New ee eg the seis me and set Vhe prisoner free after an incarceration of seven weeks. — The partnership between = Garrison and Mr Lundy was then dissolved by mutual consent, an the former resolved to establish a paper of his own, in which, upon his sole responsibility, he could advocate the doctrine of immediate emancipation and oppose the scheme of African colonization. ot was sure, after his experiences at Baltimore, that a movemen against slavery resting upon any less radical foundation than this would be inefficacious. He first proposed to establish his paper at Washington, in the midst of slavery, but on returning to New England and observing the state of public opinion

there, he came to the conclusion that little could be done at the South while the non- slaveholding North was lending her influence, through political, commercial, religious, and social channels, for the sustenance of slavery. He determined, therefore, to publish his paper in Boston, and, having issued his prospectus, set himself to the task of awak- ening an interest in the subject by means of lectures in some of the principal cities and towns of the North. It was an up-hill work. Contempt for the negro and indifference to his wrongs were almost universal. In Boston, then a great cotton mart, he tried in vain to procure a church or vestry for the delivery of his lectures, and thereupon announced in one of the daily journals that if some suitable place was not promptly offered he would speak on the common. A body of infidels proffered him the use of their small hall; and, no other place being accessible, he accepted it gratefully, and delivered therein three lectures, in which he unfolded his prin- ciples and plans. He visited privately many of the leading citizens of the city, statesmen, divines, and merchants, and besought them to take the lead in a national movement against slavery ; but they all with one consent made excuse, some of them listening to his plea with manifest impatience. He was disappointed, but not dis- heartened. His conviction of the righteousness of his cause, of the evils and dangers of slavery, and of the absolute necessity of the contemplated movement, was intensified by opposition, and he re- solved to go forward, trusting in God for success.

On the Ist of January 1831, without a dollar of capital save in hand and brain, and without a single subscriber, he and his partner issued the first number of the Liberator, avowing their ‘‘ determi- nation to print it as long as they could subsist on bread and water, or their hands obtain employment.” Its motto was, ‘‘ Our country is the world—our countrymen are mankind ;” and the editur, in his address to the public, uttered the words which have become memor- able as embodying the whole purpose and spirit of his life:—‘‘I am in earnest—I will not equivocate—I will not excuse—I will not retreat a single inch—and I will be heard.” Help came but slowly. For many months Mr Garrison and his brave partner, Mr Isaac Knapp, who died long before the end of the conflict, made their bed on the floor of the room, ‘‘dark, unfurnitured, and mean,” in which they printed their paper, and where the mayor of Boston, in compliance with the request of a distinguished magistrate of the South, ‘“‘ferreted them out,” in ‘‘an

obscure hole," "their only visible auxiliary a negro boy." But the paper founded under such inauspi- cious circumstances exerted a mighty influence, and lived to record not only President Lincoln's proclamation of emancipation, but the adoption of an amendment to the constitution of the United States for ever prohibiting slavery. It was the beginning and the nucleus of an agitation that eventually pervaded and filled every part of the country, and that baffled alike the wiles of politicians and parties and the devices of those pulpits and ecclesiastical bodies which for- got that Jesus came to preach deliverance to the captives and the opening of the prison to them that are bound. Other newspapers were afterwards established upon the same principles; anti-slavery societies, founded upon the Adria of immediate emancipation, sprang up on every hand ; the agitation was carried into political parties, into the press, and into legislative and ecclesiastical assem- blies ; until in 1860 the Southern States, taking alarm from the election of a president known to be at heart opposed to slavery though pledged to enforce all the constitutional safeguards of the system, seceded from the Union and set up a separate government In the struggle that ensued slavery was abolished by an exercise of the powers of War, as a necessary means of restoring the Union.

Mr Garrison sought the abolition of slavery by moral means alone. He knew that the national Government had no power over the system in any State, though it could abolish it at the national capital, and prohibit it in the inchoate States, called Territories He thought it should, by the exercise of such limited powers as it possessed, bring its moral influence to bear in favour of abolition ; but neither he nor his associates ever asked Congress to exercise any unconstitutional power. His idea was to combine the moral influence of the North, and pour it through every open channel upon the South. To this end he made his appeal to the Northern churches and pulpits, beseeching them to bring the power of Christianity to bear against the slave systern, and to advocate the right of the slaves to immediate and unconditional freedom. He thought that, under the moral pressure thus created, and which would be re-enforced by the civilization and Christianity of the

foremost nations of the world, the South would speedily give way and proclaim freedom to her bondmen. He was a man of peace, hating war not

less than he did slavery; but he warned his countrymen that if they refused to abolish slavery by nioral power a retributive war must sooner or latcr ensue. The conflict was irrepressible. Slavery must be overthrown, if not by peaceful means, then in blood. ‘The first society organized under Mr Garrison’s auspices, and in accordance with his principles, was the ‘“‘New England Anti-Slavery Society,” which adopted its con- stitution in January 1832. In the spring of this year Mr Garrison issued his work entitled Thoughts on African Colonization, in which he showed by ample citations from official documents that the American Colonization Society was organized in the interest of slavery, and that in offering itself to the people of the North as a practical remedy for that system it was guilty of deception. His book smote the society with a paralysis from which it has never recovered. Agents of the American Colonization Society in England having succeeded in deceiving leading abolitionists there as to the character and tendency of that Society, Mr Gar- rison was deputed by the New England Anti-Slavery Society to visit that country for the purpose of counteracting their in- fluence. He went in the spring of 1833, when he was but twenty-seven years of age, and was received with great cordiality by British abolitionists, some of whom had heard of his bold assaults upon American slavery, and secn a few numbers of the Liberator. The struggle for emancipation in the West Indies was then at the point of culmination ; the leaders of the cause, from all parts of the kingdom, were assembled in London, and Mr Garrison was at once admitted to their councils and treated with distin- guished consideration. He formed the acquaintance of Wilberforce, Clarkson, Buxton, O’Connell, George Thompson, and many others, aud was greatly cheered by what he saw and heard. He was thoroughly successful in his efforts to undeceive the people of England in respect to the character and designs of the American Colonization Society, and took home with him a “ Protest” against it, signed by Wilberforce, Zachary Macaulay, Samuel Gurney, William Evans, S. Lushington, T. Fowell Buxton, James Cropper, Daniel O’Connell, and others, in which they declared their delibe- rate judgment that ‘‘its precepts were delusive,” and ‘‘its real effects of the most dangerous nature.” He also received assurances of the cordial sympathy of British abolitionists with him in his efforts to abolish American slavery. He gained a hearing before a large popular assembly in London, and won the confidence of those whom he addressed by his evident earnestness, sincerity, and ability.

Sir Thomas Fowell Buxton, before he had an opportunity of meeting him, invited him to breakfast at his house. Mr Garrison presented himself at the appointed time ; but Mr Buxton, instead of coming forward promptly to take his hand, scrutinized him from head to foot, and then inqnired, somewhat dubiously, ‘‘Have I the pleasure of addressing Mr Garrison, of Boston, in the United States ?” Being answered in the affirmative, he lifted up his hands and exclaimed, ‘‘ Why, my dear sir, I thought you were a black man, and I have consequently invited this company of ladies and gentlemen to be present to welcome Mr Garrison, the black advo- cate of emancipation, from the Unitcd States of America.” Mr Garrison often said that, of all the compliments he ever received, this was the only one that he cared to remember or repeat ; for Mr Buxton had somehow or other supposed that no white American could plead for those in bondage as he had done, and that therefore he must be black. Mr Garrison’s visit to England enraged the pro-slavery people and press of the United States at the outset, and when he returned home in September with the ‘‘ Protest”’ against the Colonization Society, and ennounced that he had engaged the services of George Thompson as a lecturer against American slavery, there were fresh outbursts of rage on every hand. The Amcriean Anti-Slavery Society was organized in December of that year, put- ting forth a masterly declaration of its principles and purposes from the pen of Mr Garrison. This added fresh fuel to the public excitement, and when Mr Thompson came over in the next spring, the hostility to the cause began to manifest itself in mobs organized to suppress the discussion of the slavery question. Now began what Harriet Martineau called ‘‘the martyr age in Ameriea.” Mr Thompson gained a favourable hearing in a few places, but his appearance in any town or city became at length the signal of a mob, and in the fall of 1835 he was compelled, in order to save his life, to embark secretly for England. Just before his departure, the announcement that he would address the Woman’s Anti- Slavery Society of Boston created ‘‘a mob of gentlemen of property and standing,” from which, if he had been present, he could hardly have escaped with his life. The whole city was in an up- roar, Mr Garrison, almost denuded of his clothing, was dragged through the streets by infuriated men with a rope around his body, by which they doubtless intended to hang him. He was rescued with great difficulty, and consigned to the jail for safety, until he could be secretly removed from the city. For

two or three years these attempts to suppress the anti-slavery movement by violence

were persisted in, but it was like attempting to extinguish a fire by | and that the Union thenceforth, instead of being ‘a covenant with

pouring oil upon the flames, or like an effort to stop the roar of Niagara by increasing the volume of its waters.

Anti-slavery societies were greatly multiplied throughout the North, and many men of influence, both in the church and in the state, werc won to the cause. Mr Garrison, true to his original purpose, hever faltered or turned back. Other friends of the cause were sometimes discouraged—he, never. The abolitionists of the United States were a united body until 1839-40, when divisions sprang up among them. Mr Garrison countenanced the activity of women in the cause, even to the extent of allowing them to vote aud speak in the anti-slavery societies, and appointing them as lecturing agents. To this a strong party was opposed upon social and religious grounds, Then there were some who thouglit Mr Garrison dealt too severely with the churches and pulpits for their complicity with slavery, and who accused him of a want of religious orthodoxy. He was, moreover, a non-resistant, and this to many was distasteful. The dissentients from his opinions determined to form an anti-slavery political party, while he believed in working by moral rather than political party instrumentalities, These differences led to the organization of a new National Anti-Slavery Society in 1840, and to the formation of the ‘‘ Liberty Party” in politics. The two societies sent their delegates to the World’s Anti-Slavery Convention in London in 1840, and Mr Garrison refused to take his scat in that body, because the women delegates from the United States were excluded. The discussions of the next few years served to make clearer than before the practical workings of the constitution of the United States as a shield and support of slavery ; and Mr Garrison, after long and painful reflexion, came to the conclusion that its pro-slavery clauses were immoral, and that it was therefore wrong to take an oath for its support. The Southern States had a greatly enlarged representation in Congress on account of their slaves, and the national Government was con- stitutionally bound to assist

in the capture of fugitive slaves, and to suppress every attempt on their part to gain their freedom by force, In view of these provisions, Mr Garrison, adopting a bold scriptural figure of speech, denounced the Union as ‘‘a covenant with death and an agreement with hell,”’ and adopted as his motto the legend, ‘* No ynion with slaveholders,”’ His argument on this question, in the light of ethical principles generally admitted to be sound, could not easily be answered, and many men, who shrauk from the conclusion tliat followed therefrom, were held by it as in a vice. His exposures of the character and practical working of the pro-slavery clauses of the constitution, in spite of the im- patience with which they were regarded in some quarters, made a deep impression upon the national conscicnce, and served to abate that undiscriminating and idolatrous reverence for the Union, upon which the slavcholders had so long relied for the protection of their system,

One class of abolitionists sought to evade the difficulty by strained interpretations of the clauses referred to, while others, admitting that they were immoral, felt themselves obliged, not- withstanding, to support the constitytion in order to avoid what they thought would be still greater evils. The American Anti- Slavery Society, of which Mr Garrison was the president from 1848 to the day of cmancipation, was during all this period the nucleus of an intense and powerful moral agitation, which was greatly valued by the soundest and most faithful workers in the field of politics, who greatly respected him for his fidelity to his convictions, On the other hand, Mr Garrison always had the highest respect for every earnest and faithful opponent of slavery, however far he might be from adopting his special views. He was intolerant of nothing but conscious treachery to the cause. When in

1861 the Southern States seceded from the Union and took uparms |

against it, he saw elcarly that slavery would perish in the struggle, that the constitution would be purged of its pro-slavery clauses,

death and an agreement with hell,” would rest upon the sure foundations of liberty, justice, and equality to all men. He there- fore ceased from that hour to advocate disunion, and devoted him- self to the task of preparing the way for and hastening on tlie incvitable event. His services at this period were

recognized and honoured by President Lincoln and others in authority, and the whole country knew that the agitation which made the abolition of slavery feasible and necessary was due to his uncompromising spirit and indomitable courage. He lived to witness the re- demption of his country from the curse of human bondage, not indeed by the means which he preferred, and which he hoped would prove sufliciently potent, but by the bloody arbitrament of war. None the less, however, did le see in the great event the hand of that Divine Providence on which he had always relied for support in the great struggle to which his life was devotcd. In 1865, at the close of the war, he declared that, slavery being abolished, his earecr as an abolitionist was ended. He counselleda dissolution of the American Anti-Slavery Society, insisting that it had become functus oficits, and that whatever needed to be done for the protection of the freedmen could best be accomplished by new associations formed for that purpose. ‘The Liberator was discon- tinued at the end of the same year, after an existence of thirty-five years. He visited England for the second time in 1846, and again in 1867, when he was received with distinguished honours, public as well as private. In 1877, when he was there for the last time, he declined every form of public recognition. He died in New York, May 24, 1879, in the seventy-fourth year of his age, and was buried in Boston, after a most impressive funeral service, May 28. In 1843 a small volume of his Sonnets and other Poems was published, aud in 1852 appeared a volume of Selections from his Writings and Speeches. His wife, Helen Eliza Benson, died in 1876. Four sons and one daughter survive them.

GARTER, OrpeEr or THE. See KNIGHTHOOD.

GARTH, Sir Samvet (16702-1719), a physician and poet of the age of Anne, was born of a good Yorkshire family, in 1670, it is said, but more probably at an earlier date. He was a student of Peterhouse, Cambridge, where he resided until he was received into the College of Physicians in 1691. In 1696 he became a prominent supporter of the new scheme of providing dispensaries for the relief cf the sick poor, as a protection against the greed of the apothe- caries. This labour having exposed him to the animosity of many of his own profession, and especially of the last- named body, he published in 1699 a mock-heroic poem, Z’he Dispensary, in six cantos, which had an instant success, passing through three editions within

the year. Garth became the leading physician of the Whigs, as Radcliffe was of the Tories. In 1714 he was knighted by George L., and he died on the 18th of January 1718-19. Garth was a wealthy man, leaving estates in Warwickshire, Oxford- shire, and Buckinghamshire. He wrote little besides his best-known work Zhe Dispensary, and Claremont, a moral evistle in verse. In 1717 he edited a translation of Ovid's Metamorphoses, himself supplying the fourteenth and part of the fifteenth book. The subject of his mock- heroic epic is treated in a cumbrous style ; and even in his own day Garth was accused of flatness and poverty of thought.

GAS AND GAS-LIGHTING

hy artificial light is obtained as a result either of com- bustion or of incandescence ; or it might be more accurate to classify illuminating agents as those which emit light asa result of chemical action, and those which glow, from the presence of a large amount of heat, without thereby giving rise to any chemical change. The materials whence artificial light of the nature of flame has been derived are principally bodies rich in carbon and hydrogen. Wax, fats, and oils, on exposure to a certain amount of heat, undergo destructive distillation, evolving inflammable gases; and it is really such gases that are consumed in the burning of lamps and candles, the wicks bringing small proportions of the substances into a sufficient heat.

Wood and coal also, when distilled, give off combustible gases ; and ordinary gas-lighting only differs from illumina- tion by candles and lamps in the gas being stored up and consumed at a distance from the point where it is generated.

Inflammable gas is formed in great abundance within the earth in connexion with carbonaceous deposits, such as coal and petroleum ; and similar accuinulations not unfre- quently occur in connexion with deposits of rock-salt ; the gases from any of these sources, escaping by means of fis- sures or seams to the open air, may be collected and burned in suitable arrangements. Thus the " eternal fires" of Baku, on the shores of the Caspian Sea, which have been known as burning from remote ages, are due to gaseous

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hydrocarbons issuing from and through petroleum Nene In the province of Szechuen in China, gas 18 obtaine rom beds of rock-salt at a depth of 1500 or 1600 feet: being brought to the surface, it is conveyed in bamboo tubes and used for lighting as well us for evaporating brine ; and it is asserted that the Chinese used this naturally evolved gas as an illuminant long before gas-lighting was introduced among European nations. At a salt mine in the comitat of Marmaro in Hungary, gas is obtained at a depth of about 120 feet, aud is used for illuminating the works of the mine. Again at Fredonia (New York State) a natural emission of gas was discovered in a bituminous limestone, over the orifice of which a gasholder has been erected, and thus about 1000 cubic feet of a gas composed of marsh gas and hydride of ethyl has been made available for illumination. — In the city of Erie (Pa.) there are 13 gas-wells, each yielding from 10,000 to 30,000 feet per day, the gas escaping from one of them at a pressure of 200 tb per square inch. At Bloomfield, Ontario co., New York, there is a spring which yields daily no less than 800,000 feet of gas of an illumin- ating power equal to 14} candles. The city of East Liverpool (Ohio) is entirely illuminated, and to a large extent heated, by gas-wells which exist in and around the town. The light is of extraordinary brilliancy, and is so abundant and free that the street lamps are never extin- guished, and much of the manufacturing steam-power of the town, which embraces 22 potteries, giving employment to 2000 hands, is derived fromthe gas. The first “ well,” 450 feet deep, was opened in 1859, and up to the present year (1879) neither it nor any of those tapped at later dates show any sign of failing, In many other parts of America similar gas-wells exist ; and several such natural jets of gas have been observed in England.

By general consent the merit of the discovery and appli- cation of artificial gas belongs to Great Britain, and the name most honourably connected with the beginning and early stages of gas-lighting is that of a Scotchman—Robert Murdoch. But previous to Murdoch’s time there occur numerous suggestive observations and experiments as to inflammable air and its sources. In the Phdlosophical Transactions of the Royal Society for 1667 the existence of a “burning spring” in the coal district of Wigan is noticed by Thomas Shirley, who traced its origin to the underlying coal. In the same

7’ransactions for 1739 is printed a letter addressed to the Hon. Robert Boyle, who died in 1691, in which the Rev. John Clayton details a series of experiments he made in distilling coal in a retort, showing, uot only that he had observed the inflammable gases evolved, but that he collected and stored them for some time in bladders. In Dr Stephen Hales’s work on Vegetable Staticks, published in 1726, more precise state- ments are made as to the distillation of coal, he having obtained from 158 grains of Newcastle coal 180 inches of inflammable air. In 1787 Lord Dundonald, in working a patented process for obtaining coal-tar, experimented with the gas evolved in the process, and occasionally used it for lighting up the hall of Culross Abbey. None of these observations, however, led to distinct practical results; and it was not till the year 1792 that Robert Murdoch “eter residing at Redruth in Cornwall, began the investigations into the properties of gases given off by various substances which eventuated in the establishment of coal-gas as an illuminating agent. In 1797 he publicly showed the system he had matured, and in 1798, being then employed in the famous Soho (Birmingham) workshop of Boulton & Watt, he fitted up an apparatus for the manufacture of gas in that establishment, with which it was partly lighted. Thereafter the apparatus was extended, and the gas manufactured by it was introduced to other neighbouring workshops and factories. Among others who helped most materially to

develop the infant art in England were Dr Henry of Manchester, and Mr Clegg, who, succeeding Mr Murdoch at Boulton & Watt’s, introduced many improvements in gas manufacture, and ultimately became the most skilful and famous gas engineer in the United Kingdom.

In 1801 M. Lebon introduced gas distilled from wood into his own house in Paris, and the success of his experi- ment attracted so much notice and comnient as to give rise to an impression that he is entitled to the credit of the invention. Lebon’s experiment came under the notice of Mr F. A. Winsor, who took up the subject with a zeal and unwearying patience which led to a recognition of the advantages of the system, and the breaking down of the powerful prejudice which existed in England against the innovation. In 1803, through Winsor’s efforts, the Lyceum Theatre was lighted with

gas; but it was not till 1810 that he succeeded in forming a public company for manufacturing gas, and in obtaining an Act of Par- liament for the Gas-Light and Coke Company. In 1813 Westminster Bridge was first lighted with gas, and in the following year the streets of Westminster were thus illuminated, and in 1816 gas became common in London. So rapid was the progress of this new mode of illumination that in the course of a few years after its introduction it was adopted by all the principal towns in the kingdom, for lighting streets as well as shops and public edifices. In private houses it found its way more slowly, partly from an apprehension of danger attending its use, and partly from the annoyance which was experienced in many cases through the careless and imperfect manner in which the service-pipes were at first fitted up.

Sources or Gas,

Artificial gas is now distilled from a variety of substances, among which are coal, shale, lignite, petroleum, turf, wood, resins, oils, and fats; and it is also prepared by carburetting or impregnating with volatile hydrocarbons other non- luminiferous gases. Of the very numerous systems of gas- making which have been proposed since the early part of the century, none can compete for general purposes with the ordinary coal-gas process, when a supply of the raw material can be obtained at a moderate expeuse.

Coal-Gas.—Coals, varying greatly as they do in chemical constitution, differ also, as might be expected, as widely in their value and applicability for the manufacture of gas, Taking the leading varieties of coal to be included under anthracite, bituminous coal, and lignite or brown coal, we find that it is the class bituminous coal alone that yields varieties really serviceable for gas-making. Anthracitemay” be regarded as a natural coke from which the volatile con- stituents have been already driven off, and the more anthracitic any coal is, the less is it capable of yielding gas. Lignite also is rarely used for distillation, owing to the large proportion of oxygen and the amount of water in its com- position. Of the bituminous coals again, it is only the caking or pitch coals, and the canne] or parrot coals, that are in practice used in gas-works. These also vary within very wide limits in their gas-making value, not only from the great difference among them in yield of gas, but alsosin the illuminating value of the gas they evolve. As a rule

the coals which yield the largest percentage produce also the most highly illuminating qualities of gas. The cannel coals, which are specially recognized as “ gas-coal,” are most abundantly developed in Scotland and in Lanca- shire, and the fact of the unequalled qualities of Scotch cannel and of the allied substance, bituminous shale, for gas- making, has had the effect of rendering illumination by gas much more general and satisfactory in Scotland than in any other country. It is only a very imperfect valuation of any

gas-coal that can be made from chemical analysis, the really satisfactory test being actual experiment. According to H. Fleck, the coal most available for gas-making should contain to every 100 parts of carbon 6 parts of hydrogen, of which 4 parts are available for forming hydrocarbon compounds. It is desirable that coal used for distillation in gas retorts shonld be as far as possible free froin sulphur, that in the case of coking coal the amount of ash should be small, and the proportion of oxygen should also be low, since that ele- iment abstracts hydrogen to form injurious watery vapour. The amount of ash present, however, in the best forms of Scotch cannel is large ; and consequently the resulting coke, if the residue can be so called, is of comparatively little value. Unless coal can be stored in sheds which protect it from the weather, it ought to be used as soon as possible after being raised, rain aud sunshine being detrimental to its gas-mak- ing qualities. The following table exhibits the chemical analysis and gas-yielding properties of a few of the principal and typical examples of coal for gas-making :—

Composition of Coals used in Gas-Making.

a3 : a 3 a g ¢ 5 a Variety of Coal. S £ 3 ° $0 5 2, os |e | & Bl ep | 2 acti S&S |#e#l|e2/a)6 | 4 Newcastle Peareth Gas-Coal | ... | 82°42 | 482] ... 0°86 | 11:11 | 0°79 Blaydon Main, Tyneside …... 6°88 | 78°06 | 5°80 | 1:85 | 2°22 | 3:12) 894 eel, Ashton-under-}) ¢-19 | 83-25 | 5-75 | ... | 086 | 506) 348 Wigan Cannel…....000e-| 5°65 84°07 | 571 one aa 7°82 | 2°40 Mold-Leeswood Green Cannel) ... | 77°81 | 8:47 aoe 0-71 | 632 ce Boghead Cannel…... Scot- 12°68 |}63°10 |} 8°91) ... 0°96 | 7°25 |“19°78 Methil

Brown Shale ira d 9°33 | 66:44 | 7:54 | 1:36 | 0°84 | 10°84 | 12°98 Kelty Gin Seam…... i Jes, (CODO | BOS) oss 0°94 | 11°68 | 2°25

Products of the Distillation of 1 ton of Coal.

i: iro Tlluminat- bs. of | Lbs. 0 .. | ing power : Tar | A 0 A Coke. Tar. Lita ie a Bi Neweastle Cannel…) 9,883 | 1,426 | 98°38 60°0 25°2 Wigan Cannel…....| 10,850 1,332 | 218°3] 161°6 19°4 Boghead Cannel ….| 18,334) 715 | 733°3| nil. 462

When the bowl of an ordinary clay pipe is filled with small fragments of bituminous coal, luted over with clay and placed in a bright fire, immediately smoke is seen to issue from the stalk which projects beyond the fire. The smoke soon ceases, and if a light is then applied to the orifice of the stalk, the issuing gas burns with a bright, steady flame, while a proportion of a black, thin, tarry liquid oozes out from the stalk. After the conibustion ceases there is left in the bowl of the pipe a quantity of char or coke. This simple operation is, on a small scale, an exact counter- part of the process by which the destructive distillation of coal is accomplished in the manufacture of gas. The pro- ducts of the distillatory process classed in the gas-works as gas, tar, and ammoniacal liquor, with a solid residue of

- coke, are in themselves mixtures of various definite chemical

compounds ; and as may be evident from the following list, these substances are very numerous and complex :—

Products of the Distillation of Coal at high-red heat. Il. Components of Tar.

BenZol, Cglyg …..00se0e

Toluol, C;Hg…. te Liquid Cumol, CgHy. – .. { hydrocarbons. Cymol, CoH aescccces

Naphthalin, CjoHg …

Anthracene, C,4Hyo..- Solid Pyrene, CygHyq.-..<u>. hydrocarbons. Crysene</u>, <u>C</u>)g<u>H</u>y<u>9 «</u>...

Carbolic acid, CgH,¢0. Cresylic acid, C7H,0 Rosolic acid, CooH 603. Pyridine, CsH3N. Aniline, CgH;N. Picoline, CgH;N. Lutidine, C7HgN. Collidine, CgH,,N. Leucoline, CoH7N.

Bisulphide of carvon, CS, ... Im- purities.

89

Ammonium sulphocyanate, NHy.NCS. a cyanide, NH4.NC, on chloride, NH4.Cl.

Ill. Ammoniacal Liquor. Ammonium carbonate, 2N14.CO3. a sulphydrate, NH4.Us.

- . : IV. Coke and Ash in Retort.

The proportiors in which coal yields these products may be indicated by the case of a cannel giving off 11,000 feet per ton of gas of a density of 0600. From 100 parts of such a coal there would be yielded—

Gas .. 202225 Teac. ae 250 Ammonia water . ... 9°50 GONG fare vsisisningns cos Seuaapaa sacs oteanieaserentietaascacestine 59:75

The proportions, however, and even the nature of these pro- ducts of distillation are greatly modified by the temperature at which the distillation is effected, a low red heat yield- ing a small proportion of non-condensible gas but a large amount of heavy hydrocarbon oils, whence the distillation of shales and coal in the paraffin manufacture is conducted at a low red heat. By excessive heat, on the other hand, the compounds evolved become simpler in their chemical constitution, carbon is deposited, pure hydrogen is given off, and the gain in amount of gas produced is more than counterbalanced by its poverty in illuminating properties.

Of the gases and vapours which pass out of the retorts in a highly heated condition, some portion, consisting of tarry matter and ammoniacal liquor, precipitates almost immedi- ately by simple cooling, and other injurious constituents must be removed by a system of purification to which the gaseous products are submitted. What thereafter passes on as ordinary gas

for consumption still contains some percentage of incombustible matters—aqueous vapour, oxygen, nitrogen, and carbonic acid. The combustible portion also is separable into two classes, viz., non-luminous supporters of combustion, and the luminiferous constitu- ents,-—the former embracing hydrogen, marsh gas (light carburetted hydrogen), and carbonic oxide, while the latter includes the hydrocarbon gases acetylene, ethylene (olefiant gas or heavy carburetted hydrogen), propylene, butylene, and vapours of the beuzol and naphthalin series.

Formerly it was the habit to regard the proportion of heavy carburetted hydrogen (ethylene and its homologues) as the measure of the illuminating power of a gas. It has, however, been pointed out by Berthelot that the proportion of such compounds in some gas of good luminous qualities is exceedingly small; and in particular he cites the case of Paris gas, which, according to his analysis, contains only a

“mere trace of acetylene, ethylene, and other hydrocarbons,

with 3 to 3°5 per cent. of benzol vapours. Subsequent ex- ° periments of Dittmar have proved that a mixture of pure ethylene and hydrogen burnt in the proportion of 3 volumes of hydrogen to 1 of ethylene yields little more light than ordinary marsh gas, while benzol vapour to the extent of only 3 per cent. in hydrogen, gives a brilliantly luminous flame. Frankland and Thorne have more recently deter- mined the illuminating power of a cubic foot of benzol vapour burnt for 1 hour in various combinations, with the following results :—

With hydrogen it gave the light OM dedtctes dist oxetelte eet 69°71 candles. ,, carbonic oxide Pe ice menoeneina see enters (DISS, as jo SE ag 8 ap Eee 92°45,

39

a5 ,, (Second series) ,, 0 seeeeseessseseeeteees 93°94 =;

Thus it is highly probable that the illuminating value of coal-gas depends much more on the presence of benzol vapour than on the proportion of the heavy gaseous hydro- carbons, and the estimation of benzol in the gas is a

point which has hitherto been comparatively neglected. In view of the inference that the presence of benzol vapour 1S 80 intimately related to illuminating power, the fact observed by Dittmar that water readily and largely dissolves 16 out of any gas mixture is of great consequence. When ben- zolated hydrogen containing 6 per cent. of benzol vapour was shaken up with water, the percentage of the vapour

was found on analysis to be reduced to than 2. xX. — 12

iti lied to London The average composition of the gas supp is, on the ahaa of the late Dr Letheby, thus stated :—

ee ee

Ordinary Gas, Cannel Gas, 12 Candles. 20 Candles. 460 27°7 FLydrogen ciccecceeces cere en ene cee nen enen ee : Light carburetted hydrogen…..... 89°5 50 ‘8 Condensible hydrocarbons….....+ 3°8 13° GambonicuOXIdO..n.areanes coven eree inn 75 68 Carbonic acid ….....ccsecvenccreseseeeee 0°6 01 AQUCOUS VAPOUL .....eceeeseeseeeeerne ees 2‘0 2°0 ORF POD ss skienn ith Here’s denidtensa ont veg (ORE 0-0 NitrOQOD occ ccrecnedensenbeserenseenennees 0°5 0°4

RR en re ee rr

Cannel gas is now, however, supplied only to the Houses of Parliament and to certain of the Government offices.

MANUFACTURE OF CoAL-Gas.

The series of operations connected with the preparation and distribution of coal-gas embrace the processes of dis- tillation, condensation, exhaustion, scrubbing or washing, purification, measuring, storing, and distribution by the governor to the mains, whence the consumers’ supply is drawn. In connexion with consumption, pressure of the gas, measurement of the amount consumed, and the burners and other arrangements for lighting are the most important considerations.

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Site and Arrangement of Works.—The choice of a site for a gas establishment is necessarily conditioned by local circumstances ; but the facts that a considerable area is re- quired, and that, at best, the works do not improve the amenity of any neighbourhood, are important considerations, A central position with respect to the area to be supplied is certainly desirable, but in the circumstances it is seldom to be obtained. Of even greater consequence for a large work is ready access to a railway or other means of trans- port ; and most of the great establishments are now con- nected by sidings with lines of railway, whereby coals, &c,, are delivered direct from the waggons to the store or retort- house, and in the same way the coke and residual products are removed. Where the arrangement is practicable, it is also desirable that the works should be erected at the lowest level of the area to be supplied, since coal-gas, being speci- fically lighter than atmospheric air, acquires a certain amount of pressure as it rises in pipes, which pressure facilitates its distribution, and it is much easier to control than to beget pressure. In the planning of works, regard must be given to economy of space and to labour-saving arrangements, so that the cost of manual labour may be minimized, and operations proceed in an orderly, methodical, and easily-controlled manner. The accompanying ground plan of gas-works (fig. 1) has been kindly furnished by Mr James Hislop of Glasgow, a gas engineer of known skill

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Fie. 1.—Ground-Plan of Gas-Works.

ggon weighing machine; C, the coal store; D, retort house: E, chimney: F, coke yard: G, condensers; H scrubbers; I, tar tank; J, exhauster house: ump room; L, store room (water “4s ple ra KL) +f of 4 lime ee : houace avs talgere , o’ pre Seseerps 2 | I ; L, ste (water tank is placed above K L); M, purifier house; N, lime store; 0, meter

A, a line of rails leading into the works; B, wa

shop; X, smith’s shop; Y, engine boiler,

and experience; and while it shows arrangements of the most approved character, it will also enable the reader to recognize the position of the various erections and apparatus as they follow each other, and as they will now be described.

Retorts.—Retorts for destructive distillation of coal are formed of cast iron, clay, brick, or wrought iron. Various shapes have been adopted in the construction of these vessels ; nor have their forms been more varied than the modes in which they have been disposed in the furnaces. In many mstances they have been constructed of a cylindrical shape varying in length and diameter, Those first employed were of iron, with the axis vertical but experience soon showed that this position was extremely inconvenient, on account of the difficulty which it occasioned in removing the coke.

The retorts were therefore next placed in a horizontal position, as being not only more favourable to the most economical distribution of the heat, but better adapted to

hotometer room; S, board room; T, office ; U. weighing machine ; V, superintendent’s house; W, joiner’s

the introduction of the coal and the subsequent removal of the coke. At first the heat was applied directly to the lower part of the retort ; but it was soon observed that the high temperature to which it was necessary to expose it, for the perfect decomposition of the coal, proved destructive to the lower side, and rendered it useless long before the upper part had sustained much injury. The next improvement was, accordingly, to interpose an arch of brickwork between It and the furnace, and to compensate for the diminished intensity of the heat by a more equally diffused distribution of it over the surface of the retort. This was effected by causing the flue of the furnace to return towards the mouth of the retort, and again conducting it in an opposite direc- tion, till the heated air finally escaped into the chimney. This

arrangement was continued so long as iron retorts were In use, but on the general adoption of clay retorts

the furnaces were constructed to allow the fire to play freely around them.

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The cylindrical form of retort a (fig. 2) was long in favour on account of its great durability, but it is not so well fitted for rapidde- composition of the coal as the ellip- tical 6, or Fig. 2. the flat-bottomed or D-shaped. retorts d, which are now principally in use. Retorts are also made of a rectangular section with the corners rounded and the roof arched. Elliptical retorts are varied into what are called ear-shaped or kidney-shaped c, and it is not unusual to set retorts of different forms in the same bench, for the convenience of filling up the haunches of the arch which encloses them. The length of single retorts varies from 6 to 9 feet, but they are now in some cases made 194 feet in length and 124 inches in internal diameter, these being charged from both ends.

Every retort is furnished with a separate mouthpiece, usually of cast iron, with a socket 6 (fig. 3) for receiving the stand-pipe orascen- sion-pipe, and there is a movable lid

attached to the mouth, together with an ear-box

cast on each side of the retort for re- ceiving the cars which support the lid. Fig. 3 shows a form of mouth- piece attached to the retort a, and also the method of Fig. 8.

screwing the lid to the mouthpiece. That part of the lid which comes in contact with the edge of the mouthpiece has applied to it a lute of lime mortar and fire clay, and when the lid is screwed up, a portion of this lute oozes out round the edges and forms a gas-tight joint.

Except for small works, where the manufacture is inter- mittent, and where, consequently, the retort heat has to be got up frequently, iron retorts are now

little used. Clay retorts, which at present are in most general use, wear out quickly ; they very frequently crack so seriously on the first application of heat that they must be removed from the bench before being used at all, and in scarcely any case are they in action perfectly free from cracks. Numerous attempts have been made to introduce retorts built of brick ; but the difficulty of making and keeping the joints air- tight has proved a serious obstacle to their use. In the

Fria. 4,—Hislop's Brick Retort.

brick retort made of Glenboig Star fire-clay, according to the plan of Mr James Hislop, it is claimed that the difficulty is surmounted, and that both the retort and its Setting present great advantage and economy. These brick retorts (fig. 4) are Q-shaped, 9 feet long and with lameters of 22 and 134 inches, set four in an oven to one unarched furnace, asin fig. 7. Each retort will, it is affirmed,

carbonize 500 tons cannel coal, or 2000 tons per oven of four, without any repairs whatever. Decayed bricks may be removed from these retorts and new ones inserted, and when thoroughly repaired they are again equal to new. Thus the durability of each retort is so great that they are calculated to cost about {th of a penny per 1000 cubic feet of gas generated, as against 1d. in the case of moulded retorts, and 7d. with iron retorts, for the same production of gas. Inthe Hislop retort the arched bricks are made plain, without groove or rebate joints—being thus stronger, more readily put together, and also cheaper. Carbon does not collect so rapidly on brick retorts as on those of clay, the bricks being harder pressed and better burned. On first lighting brick retorts, a charge of coke, breeze, and tar mixed makes them perfectly gas-tight.

Retort Setting.—A furnace or bed of retorts is composed of a group or setting, heated by a separate fire. The furnace is lined with the most refractory fire-bricks, and while the whole brickwork is made of such strength and solidity as ensures the safety of the retorts, the internal construction is so planned that the heat has the utmost possible amount of direct play on the retorts. The number of retorts to one furnace varies from

1 to 15, from 4 to 7 being the number most commonly adopted; and these are variously arranged to bring them all as close to the furnace heat as practicable. In some retort-houses the furnaces are built in two stages or stories, from the upper of which the retorts are charged and drawn, while at the lower level the glowing coke is removed and quenched. The whole range of furnaces constitutes the retort bench, having a common flue which leads to the chimney shaft by which the products of combustion are carried away. The gas-coal for charging the retorts is broken into fragments about 1 tb in weight or

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Fic. 5.—Elevation of Hislop’s Gas Retort Furnace.

retort setting and arrangement of furnace and flues adopted by Mr Hislop for his brick retorts, in which, by the use of centre blocks, as seen in the open front illustration (fig. 7), the necessity for internal arching is avoided. ; Retort furnaces are commonly fired or heated with a portion of the coke which forms one of the bye-products of

the gas manufacture ; but in works where shale and rich cannel coals are distilled, common coal must be used in the

furnaces. At the Ivry Gas Works of the Compugnie iN ae) o 98, o 9° i Sx WS SSS | : NS SS s \ SSNGS N SS | il SSSDAMPE XS S MW MQ“ _°Q°“~ S . = oy eee — TLt CT : ESS == = EN ! Til) LT a eet Le et hg Biss , aN T SS a0 UF SSS =e I “ee, Ti TITTTTITTIT TT = TITI pore ia 5 EO a LJ Tt: Lio a WH Uy Yj Yy 4 E4008 fy L me wize6sio tae REY 6 > e 10 Fo

Fic. 6.—Section of Retort Bed on line A A of fig. 5.

Parisienne @Eclairage et de Chauffage par le Gaz, the retorts are heated by gas on a method modified from the Siemens regenerative gas furnace. Sectional illustra-

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Fic. 7.—Retort Setting in Hislop’s Furnace.

tions of a retort setting on this plan, and a description of the various arrangements connected with the regenerators and the controlling of the air and gas currents, will be found in the article FurNacs, vol. ix. pp. 846 847 Ordinarily the work of charging and drawing the retorts is accomplished by manual labour, by means simpl of shovels for charging, and long iron rakes for drawing the spent charge. In the larger works it is usual to charge the retorts with a scoop semi-cylindrical in form, made a little shorter than the retort, and of such a diameter that it can

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with ease be pushed in and overturned within the retort, The scoop deposits the coal neatly over the sole of the retort, and of course the lid is much more quickly replaced than can be done with shovel charging. Numerous attempts have been made to introduce purely mechanical means of feeding retorts, hitherto with indifferent success,— such devices as a travelling endless sole and a rotating sole having been tried without good effect. A charging machine and a drawing machine, worked by hydraulic power, have been introduced by Mr Foulis, the engineer of the Glasgow Corporation Gas Works, but after prolonged trial both in Glasgow and in Manchester, these have not yet proved satis- factory in action. In West’s patent the charging is effected by the introduction of a small waggon within the retort, which distributes the charge evenly and uniformly, Neither has it, however, met general acceptance.

The retorts are kept at a bright red heat, and for coal with a high percentage of volatile matter a higher tempera- ture is requisite than is needed for coal less rich in gas. As the retorts in one setting are necessarily subject to some- what different amounts of heat, the charges in those nearest the furnace fire, and consequently most highly heated, must be drawn more frequently than

the others, as otherwise the quality of the gas would be deteriorated, and a large pro- portion of sulphur compounds would he given off from the overburnt coke.

In drawing a charge the lid is first slightly opened and the escaping gas lighted, to prevent an explosion or “rap” that would otherwise ensue. The gas is prevented from escaping outward by the ascension pipe dipping into the hydraulic main as afterwards explained ; but in some cases special valves are fitted on the ascension pipe to prevent a back rushing of the gas. A carbonaceous deposit forms on the sides of the retorts, which requires to be periodically removed by “scurfing ” with chisels, or burning it off with free admission of air or steam.

The Hydraulic Main.—From the retorts the gas, after its production, ascends by means of pipes called ascension- pipes B (figs. 5 and 6) into what is termed the condens- ing or hydraulic main HH, which is a large pipe or long reservoir placed in a horizontal position, and supported by columns in front of the brick-work which contains the re- torts A. This part of a gas apparatus is intended to serve a twofold purpose :—first, to condense the tar and some ammoniacal liquor, and secondly, to allow each of the re- torts to be charged singly without permitting the gas pro- duced from the others, at the time that operation is going on, to make its escape. ‘To accomplish these objects one end of the hydraulic main is closed by a flange ; and the other, where it is connected with the pipes for conducting the gas towards the tar vessel and purifying apparatus, has, crossing it in the inside, a partition occupying the lower half of the area of the section, by which the condensing vessel is always kept half full of liquid matter. The stand-pipes are con- nected by a flange with a dip-pipe C, arising from the upper side of the condensing main HH, and as the lower end of it dips about 2 inches below the level of the liquid matter, it is evident that no gas can return and escape when the

) mouthpiece on the retort is removed, until it has forced the

liquid matter over the bend, a result which is easily pre- vented by making it of a suitable length. The tar which is deposited in the hydraulic main overflows at the partition, and is carried by a pipe to the tar well. Condensation.—The gas as it passes on from the hydraulic main is still of a

temperature from 130° to 140° Fahr., and consequently carries with it heavy hydrocarbons, which, as its temperature falls, would be deposited. It is therefore

a first consideration in ordinary working to have these

condensable vapours at once separated, and the object of the condenser is to cool the gas down to a temperature

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nearly that of the surrounding atmosphere. The first con- trivances employed for the purpose of condensation were all constructed on the supposition that the object would be best attained by causing the gas to travel throngh a great extent of pipes surrounded by cold water, and winding through it like the worm of a still, or ascending upwards and downwards in a circuitous manner. An improvement on this form of condenser, and one now in general use, is represented in fig. 8. It consists of a series of upright

Fig. 8. pipes connected in pairs at the top by semicircular pipes e, e, and terminating at the bottom in a trough X Y con- taining water, and divided by means of partitions in such a way that, as the gas enters the trough from one pipe, it passes up the next pipe and down into the next partition,

and so on to the end of the condenser. The cooling power of this air condenser, as it is called, is sometimes assisted by allowing cold water to trickle over the outer surface of the pipes. Annulur tubes for condensing are also used, in which the gas is exposed to a much greater cooling surface, and in some large works the condensers are cooled by a current of water. In passing through the pipes the gas is considerably reduced in temperature, and the tar and am- moniacal liquor condense, the tar subsiding to the bottom of thetroughs, and theammoniacal liquor floating on thesurface. In course of time the water in the trough is entirely displaced by these two gaseous products, and as they accumulate they pass off into the tar-tank, from which either liquor can be removed by means of a pump adapted to the purpose. The New York Gas Lighting Company employ a multitubular condenser, consisting of two sets of eight boxes, each con- taining 100

tubes 3 inches diameter by 15 feet long. Through each set of tubes, up one and down another, the gas travels, cooled by an external stream of water, while it traverses the 240 feet of piping in the condenser.

The practice of condensation and separation of tarry matter by rapid cooling is condemned by Mr Bowditch and many eminent authorities, on the ground that thereby a proportion of light lrydrocarbons are thrown down with the heavier deposit, which on another method of treatment would form part of the permanent gas and materially enrich its quality. A system of treating gas has accordingly been introduced by Messrs Aitken & Young, in which the gas, kept at a high temperature, is carried from the retorts into an apparatus termed an analyser, which consists of an enclosed series of trays and chambers arranged in vertical series, in principle like a Coffey still, the lower portion of which is artificially heated. In action the analyser separates the heavier carbonaceous part of the tarry matter in the lower part or chambers, and as the gas gradually ascends from one tray or tier to another, it is at once cool- ing and depositing increasingly lighter fluids, while it is meeting and being subjected to the purifying action of the light hydrocarbons already deposited. Thus on entering the analyser it meets, at a high temperature, heavy tar deposits, and it passes out of the apparatus cooled down to nearly atmospheric temperature after being in contact with the lightest fluid hydrocarbons.

Exhaustion.—To the subsequent progress of the gas con- siderable obstructions are interposed in connexion with its further purification and storing in the gas-holders, and the result of which would be that, were it not artificially pro- pelled, there would be a pressure in the retort equal to the amount of the resistance the gas meets with in its onward pro- gress. The relief of this back pressure not only improves the quality of the gas, but also increases its amount by about 10 per cent. Among the numerous methods of exhaustion which have been proposed since the operation was first introduced in 1839, there are several rotary exhausters, hav- ing more or less of a fan action, and recently an apparatus on the principle of a Giffard’s injector has been intro- duced, chiefly in Continental works. A most efficient form is found in the piston exhauster, a kind of pumping engine

with slide valves, which exhausts the gas in both the upward and the downward strokes of its piston. The actionof the exhauster is controlled by a governor, which passes back a proportion of the gas when the apparatus is working too fast for the rate of production in the retorts ; and “ pass by” valves are arranged to carry the gas onward without passing through the exhauster should it cease to work from accident or any other cause.

Purification.—The operations embraced under this head have for their object the removal from the gas of am- monia, sulphuretted hydrogen, and carbonic acid as the main impurities, with smaller proportions of other sulphuric and of cyanogen compounds.

The agencies adopted are partly mechanical and partly chemical, the separation of the ammonia being first effected in the “scrubber,” from which the gas passes on to complete its purification in the “ purifiers.” In early times the purify- ing was performed in a single operation by the use of milk of lime in the wet purifier, a form of apparatus still in use where wet purifying is permissible.

The Wet Purifier.—This apparatus was supplied with a cream of lime and water, but, although it was a most efficient purifying agent, the ammonia now of so much value was lost by its use, and the “ blue billy,” as the saturated liquid holding the impurities was termed, created an intol- erable nuisance, and could be in no harmless way got rid of. Except in small works, wet purifying 1s not now practised. ; ;

The Scrubber.—The object sought in an ordinary scrubber is to cause a large amount of gas to come in con- tact with the smallest possible quantity of water, so as at once to dissolve out ammoniacal gases, which are exceedingly

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soluble in water, to obtain a strong ammoniacal liquor from the scrubber, and at the same time, as far as possible, to

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Fig. 9.—Hislop’s Scrubber—Sectional Elevation.

prevent the heavy hydrocarbons from being acted on,—they being also soluble in water. The ordinary form of scrubber

=) DISCHARGE

Fig. 10.—Bislop’s Scrabber—Plan. consists of a tower or hollow column, vertically divided into two, and filled with coke, &. The gas passes up one side

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and down the other, and from the top a constant small] stream of weak ammoniacal liquor trickles down. Such a scrubber, it is stated, is subject to clogging by deposits of tar, and equally efficieut work is done without that draw- back by an apparatus in which perforated iron plates occupy the place

of the coke, and in the Livesey scrubber layers of thin deal boards are employed. These boards are set in tiers perpendicularly, slightly crossing each other, with about 4 of an inch between each tier. Anderson's washer is a form of scrubber recently introduced, in which the interior is occupied with a series of rotating whalebone brushes, which dip into troughs of ammoniacal liquor, and in their revolution meet and agitate the gas in its passage upwards through the tower or column. The scrubber shown in section and plan in figs. 9 and 10 is a form introduced by Mr James Hislop. It contains 10 tiers of trays of cast iron, perforated with ~~inch holes at a distance of 2 inches from centre to centre. The gas passes upwards through these, meeting in its course a shower of ammoniacal liquor pumped up and distributed by the rose arrange~~ ment shown in fig. 9. The bottom part of the scrubber, to the height of the first course of plates, is filled with liquor, which is repumped till it reaches the strength de- sired for the nianufacturer of ammonia sulphate.

The Purifiers—The ordinary lime purifier, by which sulphuretted hydrogen and carbonic acid are abstracted from the gas, consists of a large rectangular vessel seen in section in fig. 11. Internally it is occupied with ranges

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Fia. 11.—Section of Lime Purifier,

of wooden trays or sieves A, made in the form of grids of ~~inch wood, with about half an inch between the bars. These are covered with slightly moistened slaked lime B to the depth of about 6 inches, and from three to six . tiers of such sieves are ranged in each purifier. The gas enters at the bottom by a tube C, the mouth or inlet being protected from lime falling into it by a cover D, and it forces its way upward through all the trays till, reaching the lid or cover E, it descends by an internal pocket F to the exit tube G, which leads to the next purifier. The edges of the lid dip into an~~

~~external water seal or lute H whereby the gas is prevented from escaping. The purifiers are generally arranged in sets of four, three being in use, through which the gas passes in succession while the fourth is being renewed; and to control the course of the gas current among the purifiers, the following ingenious arrange~~ ment of centre valves and pipes was devised by Mr Malam

| (fig. 12),

It has a cover fitting within it in such a way as to communicate with the pipe @ and either of the four inlet pipes, and also to com- municate between one of the outlet pipes and the pipe 2, which carries off the purified gas. The inlet pipes, b, d, f, admit the gas from the central case to the bottom of the purifiers; and the outlet pipes, ¢, ¢, g, return the gas from the purifiers back to the case, after it has passed up through the layers of lime, and descended at the back of a partition plate in each purifier to the outlet pipes at the bottom. a is the main inlet pipe for conveying the gas from the scrubber or the condenser, and 4 is the main outlet pipe for Conveying the gas to the gasholder. The central cylinder contains water to the depth of 10 inches, and the ten Pipes rise up through the bottom to the height of 12 inches, so that the mouth of each is

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2 inches above the surface of the water. The cover which fits into the cylinder is 4 feet 3 inches in diameter, and is divided into five parts, the first of which, 1, fits over the inlet pipe a, and over either of the inlet pipes leading to the purificrs. The partitions 2,

Fig. 12. 3, and 5 fit each over an inlet and an outlet pipe, while one parti- tion, 4, fits over one outlet pipe from one purifier, and over the

pipe A, which leads to the gas-holder. In fig. 12 the arrangement is such as to open a communication between the inlet pipe a and the purifier A. Now supposing the gas to have passed from the scrubber into the centre of the cylinder, its only means of escape is to pass down the pipe } into the purifier A, where it ascends through the layers of lime, and passing over the top of a dividing plate, descends and escapes from the bottom of the purifier by the pipe c back to the cylinder. Here its only means of escape is by the pipe d, which conducts it to the purifier B, in which it ascends and descends as before, returning by the pipe e to the cylinder, whence it proceeds by the pipe f into the purifier C, then along the Pipe g, which is shut off from communication with any pipe except h, by which it is conveyed away to the gas-holder. By this arrangement the three purifiers A BC are being worked, while a fourth purifier D is being emptied and recharged with lime. When it is found, on testing the gas, that the lime is unfit for its office, the purifier A is thrown out of work, and D is brought in. The frame is then shifted so as to bring the triangular division 1 over d, by which means B C D will be the working purifiers, and A will be thrown out of use. In this way, by shifting the frame round its centre over each of the four outlet pipes, any three of the purifiers can be brought into action.

_ The “oxide” method of purifying the gas, originally introduced by M. Laming, and shortly afterwards patented by Mr Hills, is now largely usod in ordinary gas-works. It 18 based upon the property of the hydrated oxide of iron to decompose sulphuretted hydrogen, a portion of the sulphur forming a sulphide with the iron. Quicklime is also used to separate carbonic acid, and the oxide of iron is mixed with sawdust or cinders (breeze) for the purpose of increas- ing the surfaces of contact, and this mixture is placed in the purifiers. When a sufficient quantity of gas has passed through it, the purifiers are opened, and the mixture is exposed to the air, under which new condition it combines with oxygen, and again becomes fitted for use in the puri- fiers. The chemical changes which occur in these opera- tions are thus stated. The mixture of hydrated oxide of iron, ce. absorbs sulphuretted hydrogen, forming ferrous sulphide and water, and liberating sulphur, thus : — $FeO, + 3H,S = 2FeS +S + 3H,O$. The ferrous sulphide, by exposure to the air, absorbs oxygen, and its sulphur is

separated in an uncombined form, 2FeS + 30 = Fe,0, + 28. The mixed material can be again employed in the purifica- tion of the gas, and the process may be repeated until the accumulation of sulphur mechanically impairs the absorbent powers of the mixture. The sulphocyanogen which accom- panies the gas is retained by the oxide of iron, and gradually accumulates in the mixture. For the separation of the carbonic acid, which is unaffected by this treatment, the gas next passes on to a dry lime purifier.

The gas is now ready for use, and it is passed on through the station meter to register the amount made and stored in the gas-holders. At this stage it may be interest- ing to compare the composition of the gas as it exists at different stages of the manufacture, as these show the result of the successive purifying processes. Taking 1000 cubic feet, the figures are—

From Purifiers.

From From

Condenser.) Scrubber.

Tron. Lime.

380

394

30

Heavy hydrocarbons 48

Nitrogen 100 Oxygen. 6 Carbonic acid 4 Sulphuretted hydrogen…

Ammonia

STORING AND DISTRIBUTION.

The Gas-holder.—This, which is frequently designated the gasometer, though incorrectly, since it does not in any way measure gas, but simply stores it for consumption, con- sists of two portions—the “tank” T (fig. 13)

and the “holder” G. The tank is a cylindrical pit, surrounding a central core, which is usually covered with concrete c at top, and has its sides built of masonry or brick-work, p, 0. The tank is water-tight, and is filled to a high level with water, above which project two tubes mm, one being the inlet and the other the supply pipe which leads to the main governor. :

Formerly gas-holders were made of heavy plate iron, strengthened by angle-iron and stays, and of so great a

Fia. 13.—Section of Gas-holder.

weight as to require a complex system of equilibrium chains and counterbalancing weights to relieve the gas from – great pressure to which it would otherwise be po ee? They are now made so light that they require to be loade

+n order to supply the requir an Oe iayleted bs means of guide-rods 2 2 round the tank.

For economy of space holders in which different segments “ telescope” over each other are now much employed. This form of holder consists of two or even three separate parts,—the upper having the form of the common gas- holder, and the other being open at the top as well as the bottom. They are connected by the recurved upper edge of the lower fitting into a channel which runs round the bottom

of the upper, whereby the entire structure is rendered air- Holders of great capacity

tight at the line of junction. | are now erected in connexion with large works. The Imperial Company in London possesses two, at Bromley and Hackney, telescopic iu form,—the outer segment measuring 200 feet in diameter by 35 feet deep, and the inner 197 feet by 35. ¢ storing 2 million cubic feet of gas, which at sp. gr. 480 would weigh 73 tons. A still larger holder is at the Fulham station of the Gas Light Company, 1t being 223 feet in diameter and rising 66 feet, with a capacity equal to 3 million cubic feet.

The Governor.—An efficient control of the pressure of the gas, along its whole course from the gas-holder to the point of consumption, is an object of great importance for the avoiding of leakage, for equal distribution, and for supply- ing the burners at that pressure which yields the largest illuminating effect. Uncontrolled pressure may supply certain levels in a proper manner, but will leave low- lying districts insufficiently supplied, while the pressure in high districts will be excessive. The variations from simple difference of level may be very great. Thus, with a pressure of 1‘7 inch at the Leith works, the gas would be delivered in some parts of Edinburgh at a pressure of 4°5 inches. The varying consumption from dusk onwards also greatly affects unregulated pressure. ‘l’o control and correct these and other irregularities and disturbances governors are now used,—at the works or station for delivering the yas to the mains, in districts to correct variations owing to level, and beyond the consumers’ meters for controlling house supply ; while in certain forms of burners a regulat- ing apparatus is also inserted. The principle on which all governors are based consists in causing the gas by its own pressure to act on some form of sensitive surface which opens or closes a valve or aperture iu proportion to the variations of pressure exerted on it. Fig. 14 is a dia- grammatic section of the common form of station governor.

The course of the gas is indicated by arrows, d being the inlet and ¢ the outlet pipe; ¢ is a valve of conical form fitted to the seat é and raised or depressed by the weight f working by a cord over a pulley; 60 1s the bell or holder,—a cylindrical vessel of sheet iron which rises and falls in the exterior vessel aa, in which water is contained to the level represented. The gas, entering at d, passes through the valve, fills the upper part of the inverted vessel bb, which it thus partially raises, and escapes bye. If the pressure from the holder be unduly increased or di- minished, the buoyancy of bd will be in- creased or diminished in like proportion and the valve being by this means more or less closed, the quantity of gas escap- ing at e will be unaltered. And not only will the governor accommodate itself to the varying pressure of the holder, but also to the varying quantities of gas required to escape at e for the supply of the burners. Thus, if it were necessary that less gas should pass through e, iN consequence of the extinction of a portion of the lights, holder would raise the governor leaving just sufficient aperture for

- Fig. 14.—Section of Governor.

the increased pressure thus produced at the

» and partially shut the valve the requisite supply of gas.

Numerous improvements have been made on the ordinary

ed pressure, and their rise and

These holders are each capable of

GAS

station governor. In the form invented and manufactured by D. Bruce Peebles, the bell or holder is enclosed in a gas-tight case or chamber, and a small portion of the inlet gas flows in and out of this chamber above the holder. The pressure of this small quantity of gas is regulated by passing it through a small separate governor; and, acting on the outer surface of the holder, this, in a very delicate and sensitive manner, performs the duty of weights in the older forms of governor. An arrangement similar in principle is applied to the district governor by Bruce Peebles, the minimum day pressure being secured by means of a stopcock or screw-valve on the apparatus, and the maximum night pressure is controlled by a small subsidiary governor. The principle of the small governor, which thus plays an im- portant part in regulating large flows of gas, will be ex- plained under consumers' governors, the apparatus being shown in section in fig. 18 below.

Supply Pipes.—The street main aud service pipes are tubes of malleable or of cast iron, the gauge of which must be arranged according to the quantity of gas to be supplied, the length it has to travel, and the pressure under which it is carried forward. Practical gas-engineers possess elaborated tables of data for the regulation of the size of their various supply pipes. Notwithstanding the utmost care and accuracy in the laying and fitting of street mains, leakage at joints is a constant source of annoyance. Under the most favourable conditions there is a discrepancy of from 7 to 8 per cent. between the gas made and the amount accounted for by consumpticn, and the greater part of that loss is due to leakage in street pipes. To convey the gas from the main pipes and distribute it in houses, pipes of lead or of block tin are generally used.

Consumers' Meters.—Of these there are two forms in actual use, the "wet" and the "dry." The former, the invention of Mr Clegg, is represented in the two sections (figs. 15 and 16), where ce represents the outside case, having the form

Fig. 15.

Fig. 16.

of a flat cyclinder; a is the inlet tube and b the outlet pipe; 9, g are two pivots, and ha toothed wheel fixed upon the pivots and connected with a train of wheel-work to register its revolutions. The pivots are fixed to and support a cylindrical drum-shaped vessel ddd, having openings & % e, ¢, internal partitions ef, ef, ef, ef, and a centre piece f/ff- The machine is filled with water, which is poured in at

up to the level of 7; and, on gas being admitted under a small pressure at a, it enters into the upper part of the centre piece, and forces its way through such of the openings f as are from time to time above the surface of the water. By its action upon the partition which curves over the opening a, a rotatory inotion is communicated to the cylinder,—the gas from the opposite chamber being at the same time ex- pelled by one of the openings e, and afterwards escaping at 6, as already mentioned. Wet meters work

easily, and, when well set and properly supplied with water, measure the gas with much accuracy. But excess or deficiency

of water impairs their measuring power, which may also he affected by the meter being lifted off the level. The freezing of the water also frequently occasions trouble, and the action of the water on the gas passing through it by dissolving out part of the valuable illuminating hydrocar- bons on the one hand, and diffusing watery vapour through it on the other, doubly affects its illuminating power.

The dry meter is free from the defects just. mentioned, but does not pass the gas with such steadiness as the wet meter. The ordinary dry meter consists of an oblong box enclos- ing two measuring cylinders, with leather sides which con- tract and expand as they are being emptied and filled, on the principle of ordinary bellows. The pressure of the gas entering this meter is sufficient to keep it in operation, and by a system of valves the one cylinder is in process of filling as the other is being emptied through the service pipe. The chambers communicate by means of lever arms with a crank which turns a train of wheels in connexion with the indicator dials on the face of the machine.

Consumers' Governor.—In order to consume gas in a perfectly uniform and economical manner, it is essential that the pressure at the burners should be always in- variably the same. That pressure is liable, however, to variation from a number of causes, such as fluctuation in the number of lights in use, either in the house or in the neighbourhood, or the application or withdrawal of pressure at the works' governor. And as all good burners are fitted with regard to a fixed standard quality and pressure of gas to be consumed, if this is not maintained the conditions of maximum illuminating power are lost. A consumers' governor secures uniformity of pressure at all the burners supplied by the pipe on which it is placed. The prin- ciple of the governor is identical with that of the station governor already described, increased pressure in both cases causing the orifice through which the gas escapes to be contracted. The mechanical arrangements by which this contraction of orifice is effected are various. In some instances they are in direct contact with the separate burners, while other governors are applied

to the supply pipes of a whole establishment. They are separable into pressure governors, which, like the station governors, give a constant or uniform pressure under all variations of con- sumption, and volumetric governors which pass a constant volume or amount of gas under all variations of pressure.

Of pressure governors the forms devised by Sugg and Bruce

Peebles are in extensive use, the latter especially being much applied to street lamps. In Sugg's consumers' governor (fig. 17)

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"E CNX : im a al et

(=

Es

Fic. 17,—Suge's Consumers' Governor.

the gas enters at the inlet, and, following the course indicated by the arrows, passes through the regulating plate of the governor into the gas-holder, and thence, by the opening provided for it, it Teaches the outlet. The gas-holder has suspended from a dise in the crown a half-ball valve, which closes or opens the opening in the regulating plate as the gas-holder rises or falls. A weight placed on the top of the holder fixes the pressure required to raise it. As & consequence, if the pressure of the gas on the inlet is greater than be required to lift the holder, then the latter rises, carrying the vlf-ball valve with it, till such time as the opening left between the sides of the valve of the regulating plate is sufficient to allow

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the passage of the necessary quantity of gas to balance the holder. On the other hand, if the pressure at the inlet falls below that required to lift the holder, the full opening of the regulating plate allows all the gas there is to

pass through the governor to the burners. Where a very perfect control is desirable, the parts of the governor are made in duplicate, and a double control is thus established. With certain structural differences the action of the Bruce Peebles governor (fig. 18) is the same. The gas enters at 1,

Fig. 18.—Consumers' Governor (Peebles),

and passes out at 2 into the pipe leading to the burners. To adjust

the governor the brass cap 8 is unscrewed, and the weights 4 taken

of say 5-tenths, at the

again screwed to its AES

off or put on until the desired pressure, burners is obtained, when the brass cap is place. The weights now keep the valve 6 open so long as 5-tenths pressure is not ex- ceeded in the main; but any variations in the main above that pressure act at once on the diaphragm 5, and partly close or open the valve, thus maintaining under all cir- cumstances a steady outlet pressure.

Of volumetric governors the best known is Giroud's glycerin rheometer, which consists of a closed cylindrical casing containing a very light metal dome or ball dipping into a circular channel filled with glycerin. In the upper part of the dome is a small orifice through which the gas passes, and on its top is fixed a conical valve which works in a seat at the top of the casing. As the pressure from the supply side rises or falls, the bell responsively moves up or down, opening or closing by the conical valve the orifice by which the gas passes outward ; and so deli cately is this compensation adjusted that the gas passed is the same in amount however different the pressure. Bruce Peebles hag invented a simple and jnexpensive form of volumetric governor (fig. 19), in which the use of glycerin is dispensed with. It consists of a conical dome resting on a needle-pointed stud, the cone having an orifice at C, and there is besides a variable consumption ; ehannel at the side A B A, which can be Fic. 19.— Volumetric eontrolled by the external screw. As soon "Governor (Peebles). as the stopcock is opened the gas fills the interior of the cone, and momentarily closes the valve; but, finding its way: by the vertieal passage,

or through the hole C, in the cone, it reaches the chamber above the cone. The cone is therefore now surrounded by gas at the same pressure, and, having nothing to support it, falls, and lets gas pass to the burner. But this only takes place to an extent that allows a differential pressure to be established suffi- cient to support the cone, which is then equilibriated between two pressures ; and the difference between these two pressures remains constant, however much the initial pressure of the gas may vary, unless, of course, it gets so low as not to be able to raise the cone.

Burners. —The question of the arrangements by which the maximum illuminating power may be developed in the consumption of gas, being one which principally affects individual consumers, has not received the attention which their importance merits. As a rule, gas-fitters are ignorant of the principles involved in the economical use of gas, and are often prejudiced by the assertions of certain inventors; and thus it happens that, owing to defective fittings, unregulated pressure, and imperfect burners, an enormous loss of illuminating power is suffered. In their report to the Board of Trade in 1869, the referees under the City of London Gas Act state, of a large number of burners

examined by them, that xX. — 13

‘¢ The diversity as to illuminating power was surprisingly io and such as will appear incredible to any one who has not ascer- tained the facts by careful experiment. They also found the kinds of burners in common use are extremely defective, thereby entailing upon the public a heavy pecuniary loss, as well as other dis- advantages. In order to examine this important matter more fully, the referees, with the ready permission of the proprietors, inspected several large establishments in the city, where, owing to the preval- ence of night work, an unusually large amount of gas was consumed. The inspection in every case confirmed the apprehensions which the referees had formed from their examination of the burners which they had procured from the leading gas-fitting establishments. In the offices of two of the leading daily newspapers (establishments which consume more gas than any other), they found that the burners principally in use gave only 55 per cent. of light compared with the Sugg-Letheby burner, or with

Leoni’s Albert Crutch buruer, and yet the price of the last-named burner is alinost identical with that of the very bad burners employed in these offices. Tested by the Bengel burner, or by Sugg’s new burner, the amount of light given by these imperfect burners is only between 47 and 49 per cent. of what is obtainable from the gas.”

In a communication tothe Philosophical Society of Glasgow +n 1874 Dr Wallace, the official gas examiner of that city, dealing with the rich cannel gas of a minimum illuminating power of 25 candles there supplied, estimated that there is in ordinary consumption a loss of 40 per cent. of illuminat- ing power which, under favourable circumstances, might be obtained, and that in practice, while not more than 16- candle power is procured, from 20 to 93-candle illumination ought to be readily obtainable.

This universal wasteful misuse of gas is not merely a question of economy, although the aggregate pecuniary loss must be very great. It affects in no small degree the health and comfort of the consumers of gas; the products of combustion of the purest gas vitiate the atmosphere, and overheat the apartments in which it is burned. Moreover, the light from gas properly burned is much steadier and purer, and less trying to the eyesight, than that wastefully consumed.

The principal circumstances which demand attention in the fitting of burners are the average pressure and illumin- ating power of the gas to be consumed. How pressure may be controlled has already been shown in connexion with governors. The quality or illuminating power of gas has a most important bearing ou the nature of burners proper for use, so that a clear distinction must be drawn between common coal-gas and cannel-gas, the burners for the one kind being quite unsuited for the other variety. The maximum amount of light is obtained from any gas just at that point where the flame is on the verge of smoking, and the conditions under which 14-candle gas would be per- fectly consumed would, with 26 or 30-candle gas, produce a large amount of smoke. Indeed, the richer gas is, the greater is the difficulty in developing its full illuminating power, and at all times it must be burned in a much thinner sheet or stream than is proper in the case of poor gas, Plata dee Jen access of air for its complete lumini- a soa oo The opening or slit in burners used for

gas is therefore much larger than in those devoted to the consumption of cannel-gas. Si Gc etetrarga “Abehepeud baler icon tages ee ae a ers. e Argand burner in its usual form ; 1 only for common or low illuminating power gas, and it has, in the hands of various inventors, especiall by M Wiitade Giga th Lacon, kuson 0) improved thes for exact and steadiness of light it] or ane re ees een: epi boptiitor Bee it leaves little further improvement a fel oe : common Argand consists of an annular of small holes pierced in the end of the ring. It thus produces a circular or tubular flame, which ie kein 1k ge Lie a glass chimney, by which the a gulated. The burner made by Sugg in 1869, known as the Sugg-Letheby, or Suge’s No. 1, is the standard burner adopted for the United ‘Kingdom in Acts of Parliament, and the same standard has been

fittings This is drilled through its length, aud slightly trumpeted at the top so as to fit the cone- shaped piece of metal projecting from the roof of the inlet cham- ber B. The outside of the upper portion of the nose-piece A is screwed to fit the inside of the inlet chamber B, and thus, by

means of paper washers put on the shoulder at AB, itis possible to enlarge or decrease the area of three tubes (two of which, C and

ing), by which it is further con-

ber E. This chamber is made

gas the burner is required to

GAS

adopted in the United States, in Canada, and in various European states. 1 was esteemed the best known burner, but since that time Mr Sugg has perfected his London Argand, whereby with London gas results equal to about 2 candles better than the standard are obtained. Fig. 20 is a sectional view of Sugg’s London Argand with the latest improvements.

At the time it was made, the Sugg No,

At the point at which the gas enters is a brass nose-piece A,

screwed to fit the usual three-eighth thread, intended by the manu- facturers of all kinds of gas = :

to receive the burner.

an adjustment of this screw by

the passage through which the gas has to passin order to supply

D, only are shown in the draw- « ducted to the combustion cham-

of steatite, a material which is capable of resisting the corroding action of heat or damp, and is a good non-conductor of heat. It is pierced with a number of holes, so arranged as regards size and number that the quantity of

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Fic. 20.—Sugg’s London Argand Burner.

consume shall pass out at an inap reciable or the least possible pressure. This is in order that the oxygen of the atmosphere, slowly ascending through the centre opening F, the annulus formed by the edge of the air cone G, and the outside of the coms bustion chamber E, shall combine with the burning gas by natural affinity only, leaving the nitrogen to pass freely out at the top of — the flame. His one of the three springs which are intended to keep the chimney glass steady in its place. JJ are two of three stubs or rests for a screen, globe, or moon, and K is a peg to steady the current of air which passes up the centre opening F.

With the view of competing in illuminating power with the electric light, Mr Sugg has recently devised a modified form of Argand burner calculated to yield a large illuminat- ing power by increased but still economical consumption of gas. These burners are made of two or more coucentric Argand rings, the outer being of large diameter, and in operation they give out a large solid, white, steady flame. With London gas, a two-ring burner consuming 19 feet per hour yields 80-candle light; 3-ring burners which

consume 23 feet give 100 candles; 4-ring burners fed with 45 feet of gas gave an illumination equal to 200 candles.

As regular pressure is essential for the proper use of these burners, a self-acting governor is frequently fitted to them. The pressure at which the best results are obtained with London gas is about ‘7 inch. In a series of experiments with Argand burners made by Mr John Pattinson of Newcastle-on-Tyne the following results were obtained:—

; Tiuminating Mluminating ower per

Burner. ee cubic tea per

ae a Sugg-Letheby Standard 50 14°10 14°10 Suse’s aie a 5:0 15°90 15°90 uge’s Improved Lon- 4 ,

ae komen Wag eco onc as ms i Silber’s Argand …..... 5:0 17°80 17°80 Common Argand…..... 5°0 11°20 11°20 Do. aS 7:0 17°80 12°70

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GAS

Flat-flame burners, or burners which spread their flame ina broad thin sheet, are of two principal kinds known respectively as “ fishtail” (fig. 21) and “ batwing” (fig. 22) burners. ‘The fishtail or union burner has two orifices drilled in its surface, which are inclined to- wards each other at an angle of 90°, so that the issuing cur- rents impinge and spread the flame in a broad sheet. The gas in the batwing issues from a narrow i| slit cut right across um , the surface. In the Figs. 21, 22.—Flat-flame Burners. best forms of all kinds of burners now in use steatite or adamas (pottery) tops areemployed. In Sugg’s Christiania burner the slit is circular, and the light issues in two thin sheets which coalesce in their upper luminiferous part, pro- ducing a most beneficial result when common gas is con- sumed, The common metal and steatite-tipped burners in use permit the current of gas to strike against their orifices without any control or regulation, but in the numerous pitented

forms of both fishtail and batwing jets certain mechanical obstructions, or small governors, are inserted, which break or retard the current. Screws, wire gauze, calico, cotton wool, iron filings, and constriction of the lower part of the burner are all devicesin use. Of all these one of the simplest and most effective is the plan on which the Brénner burner is constructed, which is simply to have the opening at the lower part of the burner smaller than the upper orifice. For different qualities and pressures of gas the Brénner burner presents a great variety of combina- tions by having several distinct sizes of lower constriction which can be adjusted to a large number of tip orifices. Thus, with six distinct openings at each end, 36 combina- tions can be made. As Argand burners are not suited for measuring the illuminating power of rich cannel-gas, flat flame-burners have to be employed; and in the Act of Parliament under which the Glasgow Corporation supplies gas, it is provided that "all the gas supplied by the corpora- tion shall be at least of such quality as to produce from a union jet burner, capable of consuming 5 cubic feet of gas per hour under a pressure equal to a column of water '5 of an inch in height, a light equal in intensity to the light produced by 25 sperm candles of 6 ia the pound, burning 120 grains per hour."

_ _ Dr Wallace, in a communication on the «¢ Rconomical Combus- tion of Coal-Gas" (Proc. Phil. Soc. Glasgow, vol. ix.), tabulates an extensive series of experiments made with flat-flame burners of Various sizes with about 28-candle gas at different degrees of pressure. The general result of these experiments shows that, to obtain the highest luminiferous effect with burners of small aperture, a low pressure of gas (not more than.*5 inch) must be maintained, although, as the size of the jet increases within certain limits, the pressure may be increased with favourable results. With 9 sizes of Bray's regulator fishtail (a burner having an obstruction consisting of a double fold of cotton cloth) Dr Wallace obtained the following results, calculated to 5 cubic feet per hour :— |

4 if 8 At 4-inch pressure…... ' 'I 3 '6 | 25:0 | 26°15} 27-0 | 28°16! 28°08 ve CH ese | sean Y 7 "6 | 23°6 | 26°2 | 28°7 | 30°2 | 32:0 tldinch 4, sseaee 8 19°4 | 23°7 | 25:9 gas |blows.

The standard, for the 1-inch series it was 29°05, and for the 14-inch

as used in the 4-inch experiments was 27°72-candle set it was 28°61-caudle. With 30 combinations of Bronner burners Dr Wallace obtained from 28°2-candle gas at 1 inch pressure an average of 25-7, and at 14-inch 25°8-candle power, most of the combinations giving fairly equal results.

Of all burners the ordinary fishtails, and they are the most fre- quently used, give the most inferior results when used for burning common coal-gas, The results tabulated below are derived from

the series of experiments by Mr Pattinson of Newcastle already quoted. The experiments were made with 14°10-candle gas, from which it must be remembered 17°86-candle power was developed in Sugeg's improved London Argand :—

Illuminating power at 5 ft. per hour.

Cubic feet | Dluminating per hour. power.

Fishtail, No. 3, steatite top…) 4 3°0 3°75 An oy , metal top)... 3°5 4°10 5°85 pf No. 4, steatite top….| 4°9 5°20 5°31 » Nod, ote AOR 7°80 7°80

Batwing, metal top…..... 5:0 9°26 9°26

Fishtail, Bray's, No. 4…..... 4:0 5°02 6:28 2 Se MG Bcc BO 11°80 11:80 a a nse) 70 14°21 10°15

Batwing, Bronner's, No. 4….| 40 10°10 12°62 * si a cae 5-0 11°60 11°60 er Suge's, Ro Moca ths 4:0 8°40 10°50 '3 el ee 50 10:90 10°90

From these experiments it appears that there are burners in com- mon use which, consuming the same amount of gas, differ in light- giving effect from 3°75 to 12°62-candles, one giving more than three times as much light as the other; and if we take the best Argand burner into account, the range of variation is from 3°75 to 17°80, or as one to five nearly. Another important deduction from these observations is that large-sized burners as a rule give much more illuminating power than the smaller sizes. Thus a

burner passing 7 feet of gas per hour will almost invariably distribute more light than two each burning 3°5 feet.

Gas Testing.—The universally recognized and practised method of valuing gas is by comparing its light with that yielded by a standard light, which can be obtained as nearly as possible of an unvarying intensity. In making such a photometric comparison it is essential that the conditions under which the lights to be compared are burned shall be uniform, and that the materials be consumed at a definite rate. The standard recognized by legislative authority in Great Britain and Ameriéa is the burning of a sperm candle 6 to the ib. consuming at the rate of 120 grains of sperm per hour, compared with gas burning at the rate of 5 cubic feet per hour. The burner prescribed for common gas is the Sugg-Letheby-Argand, in Acts of Parliament defined as a 15-holed Argand with a 7-inch glass chimney ; and for rich cannel-gas a union or fishtail jet passing 5 feet per hour is employed. The apparatus employed for making the com- parison is generally the Bunsen photometer, or some modi- fication of that instrument; and the ratio of comparative illumination is established by the well-known principle that the intensity of light diminishes in inverse proportion to the square of the distance from its source. The Bunsen photo- meter consists of a bar of wood 98 inches long, with a candle holder at one end and at the other the standard gas burner. A balance for weighing the candle as it burns, an indexed meter for the gas, and a clock are also provided, The bar is graduated from the centre to each end, and on it is set a sliding holder into which a screen of prepared paper is placed. The screen is so prepared that a spot or disc is more opaque than the remainder of the paper, so that when light passes through it from one side, that particular spot is seen distinctly darker than the rest. When, how- ever, equal amounts of light fall on it from both sides the spot disappears, and the whole surface presents a uniform appearance. ‘Therefore, with both candle and gas burning under the stipulated conditions in a darkened chamber, by moving the screen on the graduated bar from the one light and towards the other till the dark spot on the paper dis- appears, the comparative illuminating power of the light 1s ascertained by the position of the screen on the graduated bar, or by a simple arithmetical calculation. Thus, the lights being 100 inches apart, if at the conclusion of ss experiment the screen is 20 inches from the candle ray from the gas jet, since 80? is 16 times 202, the gas 1s 10- candle power.

Comparisons of the quality of gas are also ta by the jet photometer, an apparatus which aa _ e ee ciple that gas of uniform quality burned a ae through a small orifice, yields a flame of uniform If the flame is to be maintained at a uniform height the pressure in the pipes must increase as the quality of the gas decreases. The jet photometer forms a ready and convenient means of ascertaining any _Variations in tlie quality of gas supply ; but it is not available for purposes of comparison. ; ; .

Analysis of gas does not yield so satisfactory evidence of its illuminating value as photometric comparisons, but various methods of ascertaining the proportion of lumini- ferous olefines contained in any gas are occasionally prac- tised. The absorption of the heavy hydrocarbons by chlorine or by bromine, and Dr Fyfe's durability test, are of theoretical rather than practical importance.

Residual Products.—Under this term are embraced coke, ammoniacal liquor, and gas-tar, all of which are sources of income in the gas mannfacture. Indeed the value of these products has increased so rapidly of late years, and they now form the basis of manufactures of such consequence, that the residual products can scarcely be regarded as of secondary importance, and they will certainly play no small part in determining the future maintenance of gas-lighting in the face of other competing systems, The change in thie valuation of ammonia and tar liquors is well illustrated by the circumstance that, during the year 1878, the corpora- tion of Bradford was offered £10,000 per annum for these products, which about eight years previously had been disposed of for a yearly payment of £800.

Coke is a substance which varies much in value, according to local circumstances, and the nature of the coal distilled. When shale is used, there remains in the retorts an ashy residue which is absolutely worthless; and the coke of cannel coal is also comparatively of little value, owing to the amount of ash it yields. Indeed, in Scotch works where ashy cannel alone is distilled, the retorts have to be partly fired with common coal. The coke obtained from the distillation of caking coal, on the other hand, is of high value, and after a supply is set aside for heating the retorts there generally

remains from 65 to 85 per cent. of the whole amount to be disposed of by sale.

Ammoniacal liquor is more abundantly produced by the distillation of cannel than by common coal, from 18 to 22 tb of ammonia, as sulphate, being obtained from each ton of cannel distilled, as against about 16 tb derived from ordinary coal. Gas liquor is now almost the sole source of ammonia, which, among other purposes, is very largely employed as an agricultural fertilizer,

Tar liquor yields by destructive distillation a wide range of products possessing a great and increasing industrial value. The cannel coals, and other varieties rich in volatile matter, are also the kinds which yield the largest propor- tion of tar. In the distillation of coal-tar, after some am- moniacal and watery vapours have been given off, there is distilled over a proportion of highly volatile fluid hydro- carbons which consist principally of benzol; and afterwards a large amount of a light oil, known as coal naphtha (also a mixture of various hydrocarbons), is obtained. At this

pressure, height.

point the residue in the retort is called artificial asphalt, | b i ° e . | = B ‘ (and as such is a commercial article; but if the heat is ome | n from his’ predct am Medinatice fo A

and the distillation continued, a large amount of “heavy ” or “ dead oils” is obtained, and the mass left in the still ig “hard pitch.” The heavy oils are a mixture of naphthalin,

we. The benzol obtained in the first stage of the distilla. tion is the basis of aniline and its various dyes ; naphtha is used as a solvent, and for lighting and other purposes ;

carbolic acid, in addition to its employment as an anti- ; Wood-gas making in which the products of the low-heat

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phenol (carbolic acid), cresol (cresyiic acid), and anthracene, |

GAS

septic, is the basis of many valuable dyes; anthracene forms tlie source of the now most important dye, artificial alizarin ; and most of the substances have other applica- tions of minor importance.

The relative position and value of the various products of the gas manufacture is exhibited by the following con- densed statement of the position and operations of the various London gas companies during the year 1875 -— Total capital of the compatiies:.....4.:0.00s:0.5:000 ee £12,516,009

Capital called Wpis..5…..s0svenmsaee sens.) one 11,005,589 Total gas remtal. .....252.+ cesses snes cnet eee 2,606, 818

Coat: ofiCOall sscicias tous ceeameeseec seen ieee ne eee ee 1,455,407 Receipts for coke and breezc…….....:..cceseceeeceeaveses 492,997 RR (0): 7) OnaMRR Gane neato cnucadodooddoonone of ao000- one 162,151 »» HOP OMMNMIONIA «0.2… (nee eee TI So Gas produced: ..4.:. ee. cere 14,888,133 thousand fect. Gasisoldl ……cccseues cancartene Meee een 138,622,639

Coal carbonized (4 per cent. cannel) if

Coke produced, 34 bushels per ton ……. Coke used as fuel in retorts, 31 per cent., Goke sold, “69. percent. wiv… au nets Average yield of gas per ton of coal

1,505,000 tons. 1,417,654 chaldrons.,

440,685

976,969 ,,

9,892 cubic feet.

beoves

GaAs FROM SOURCES OTHER THAN COAL.

Petrolewm-Gas.—Petroleum being a substance obtained in great abundance, notably in America, is used, not only directly as an illuminating agent, but also for the production of gas ; and as an enricher of common coal-gas it is applied at several works in New York and Brooklyn. Its prepara- tion is effected by distilling it first at a low temperature into a rich vapour, which, when passed into highly heated retorts, is converted into permanent gas: of an illuminating power about five times greater than common gas, and which is, moreover, absolutely free from ammonia, sulphur com- pounds, and carbonic acid. On account of its great rich- ness, petroleum-gas must be consumed in special burners of very fine aperture, at a rate varying from 5 to 2 feet per hour.

Oul-G'as.—In the early stages of gas manufacture many attempts were made to substitute gas distilled from inferior oils for coal-gas. The oil was distilled by allowing it to percolate into highly heated retorts, in which a quantity of coke or a like porous solid was placed, and the distillate was a richly luminiferous gas free from hurtful impurities. Although oil in this form yields a convenient and powerful illuminant, its direct combustion is much more economical; and as all oils and fats are highly valuable for many purposes besides illumination, they cannot compete with gas coal as a source of gas. Nevertheless the New York Gas Light Company manufactured oil-gas exclusively from 1824 till 1828, and sold their product at $10 per 1000 feet. The distillation of suint from wool washing, and of re- covered spent soap, are examples of the application of oleaginous substances for gas-making.

Resin-G'as.—In its treatment and results resin, as a source of gas, is very similar to oil. It yields a pure gas of great illuminating power, and for twenty years (1828-48) it was supplied in New York at $7 per 1000 feet. Previous to the civil war of 1861-65 it was a good deal used on the European continent.

Wood-Gas.—The original experiments of Lebon, it will

| obtain from his product an illuminating power that would

compare with that of coal-gas. Lebon's failure was in later years shown to arise from distilling at a temperature which gave off chiefly carbonic acid with non-luminous carbonic oxide and light carburetted hydrogen, leaving in the retort a tar which the application of a higher heat would have resolved into highly luminiferous gases and vapours. Pettenkofer, who pointed out the fact, devised a system of

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distillation were volatilized by passing through a range of red-hot pipes; but now it is found that ordinary retorts, properly heated and fed with small charges, answer perfectly well for the operation. Wood-gas, owing to its high specific gravity and the proportion of carbonic oxide it contains, must be burned at considerable pressure, in specially con- structed burners with a large orifice. It is largely used in Germany, Switzerland, and Russia, where wood is more easily obtained than coal. It was used at Philadelphia gas-works in 1856, where it was affirmed to be cheaper and of greater luminosity than coal-gas.

Peat-Gas is evolved under circumstances the same as oecur in connexion with the wood-gas manufacture, but the amount of moisture contained in peat is a serious obstacle to its successful use in this as in most other directions. Earnest and persistent efforts have been made to use peat as a source of gas, but these have met but little commercial success, 'To a limited extent it is used in various German factories which happen to be situated in the immediate neighbourhood of extensive peat deposits.

Carburetted Gas.—Under this head may be embraced all the methods for impregnating gaseous bodies with vapours of fluid or solid hydrocarbons. The objects aimed at in the carburetting processes are—(1) to increase the illuminat- ing power of ordinary coal-gas ; (2) to render non-luminous combustible gases, such as water-gas, luminiferous; and (3) so to load non-combustible gases with hydrocarbon vapour as to make the combination at once luminiferous and a supporter of combustion. The plans which have been proposed, and the patents which have been secured for processes of carburetting, coming under one or other of these heads, have been almost

endless ; and while the greater part of them have failed to obtain commercial suc- cess, they are sufficient to indicate that there is still a pos- sibility of doing much to increase the effect and cheapen the cost of production of gas. Further, although for ex- tensive use none of the gas-making plans can compete with coal-gas manufacture, some of them are of much value for private establishments, country houses, factories, and similar places, where connexion with coal-gas works cannot be obtained,

The carburetting of common coal-gas with the vapour of benzol obtained by the distillation of gas-tar was originally suggested by Lowe as early as 1832, and subsequently by the late Charles Mansfield, who showed that by passing gas over sponge saturated with benzol a very great addition was made to the illuminating power ; and he introduced an apparatus by which common gas could thus be benzolized at a point very near the burner. The facts, however, that benzol is a highly inflammable liquid, that the benzolized gas varied in richuess owing to the gas taking up mucli more benzol when the carburetter was newly charged than it did afterwards, and consequently that it often produced a smoky flame,andthat sulphur compounds accumulated in the carburetter, as well as the trouble connected with charging the apparatus, all combined to prevent the extensive intro. duction of the process. In later times the value of benzol for aniline manufacture and other purposes would have been ® serious bar to its use. Mr Bowditch introduced the use of a heavier hydrocarbon—a mixture of naphthalin with cymol—which he called carbolin, and which possesses thie advantage of giving off no inflammable vapour at ordinary temperatures, and is, moreover, a substance for which no commercial demand exists. The carburetting appliance had to be placed in immediate proximity to the burners, and either heated by them direct, or by a small subsidiary jet, as the vapour of naphthalin solidifies on a very small fall of temperature and chokes up pipes. Carburetting by means of a solid block of naphthalin introduced into a gas-tight

the burner flame into the box, has recently been proposed, – and is now being carried into effect with every prospect of great increase of

illuminating power, and consequent economy, by the Albo-Carbon Light Company.

The efforts to introduce carburetted water-gas have been numerous and persistent; and the sanguine statements of the various inventors have led to the loss of much capital through experiments undertaken on a great scale which have always resulted unfavourably. The whole of the proposed processes depended on the decomposition of water by passing it over highly-heated surfaces in pre- sence of glowing charcoal, whereby free hydrogen, carbonic oxide, and carbonic acid gases are produced, the carbonic acid being eliminated by a subsequent process of purifi- cation. The combustible gas so obtained was in earlier experiments charged with luminiferous hydrocarbons by being passed into a retort in which coal, resin, or oil was being distilled, as in Selligue's and other processes; or, as in White's hydrocarbon process, both steam and coal were treated togetlier in a special form of retort. Since the introduction of American petroleum, however, most methods of carburetting water-gas have been by impregnat- ing it with the vapour of gasolin, the highly volatile portion of petroleum which comes over first in its distilla. tion for the preparation of "kerosene" lamp oil. Water-gas: has been proposed, not only as an illuminating agent, but at least as much asa source of heat; but the heat expended in the decomposition of water is much greater than can in practice be given out by the resulting gases.

Several of the processes introduced for rendering ordinary atmospheric air at once combustible and luminiferous, by saturating it with the vapour of gasolin, have been so satis- factory that this air-gas is now largely used both in America and Europe for lighting mansions, churches, factories, and small rural districts. The general principle of the air- machines will be understood from the following description of the "sun auto-pneumatic" apparatus (Hearson's patent), which is in extensive use throughout Great Britain. Hearson's machine is cylindrical in form (fig. 23), and is

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Fira. 23.—Sun Auto-Pneumatic Apparatus.

surmounted by two turrets. Internally the cylinder is divided into two compartments by a transverse portion, one being occupied by a rotary blower, an apparatus similar in construction to the drum of a water-meter, and the other by an elevator or dipper wheel, the function of which ss raise gasolin into the blower chamber, where the gasolin

box, and partly volatilized by a strip of copper passing from | must be maintained at a constant level. The blower and ONAL gas . oh

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the elevator mechanism are set in operation by being mounted on a spindle which passes through and outside the cylinder, and is turned either by a weight attached to a length of steel wire or, where convenient, by hydraulic power. ‘The turrets contain (1) a gas-holder which sup- plies gas while the machine is being wound up, should any light be then burning, and (2) a governor to regulate the pressure of the issuing gas. The apparatus works only when gas is being burned, and moves in proportion to the demand on it up to its limit of production. There is therefore no necessity for storing, as indeed would be im- practicable with this form of carburetted gas. The function of the blower is not only, by its revolution, to press forward the gas into the supply pipes, but also to carburet the air by exposing continually renewed thin films of the liquids to its influence on the moist metallic surfaces. The revolu- tion of the blower, moreover, maintains an unceasing agitation in the gasolin, vaporizes the liquid in an equal and uuiform manner, and keeps the entire volume at the same temperature throughout. The quantity of gasolin operated on being comparatively large, the tempera- ture of the liquid decreases only slowly, and is in ordinary conditions sufficiently recouped from the external air to keep it in good working order throughout any length of time.

M. Tessie du Motay, who for many years advocated a modified system of lime-light, latterly abandoned that system in favour of a form of carburetted gas. His system necessitates two sets of pipes and a special form of burner,

— one pipe supplying ordinary coal-gas or highly carburetted hydrogen, and the other leading in a supply of oxygen, whereby a powerful, steady, white light is maintained at the burner. Philipps of Cologne has also utilized oxygen in a comparatively pure state for burning in a lamp with a wick a mixture of heavy hydrocarbons, which in common air would burn with a very smoky flame.

Other sources of gas, such as tar, and even faecal matters, have been proposed ; and many modified forms of gaseous illumination have been brought forward which, even to name here, would occupy space out of proportion to their importance.

Tue Future oF Coat-Gas.

The processes involved in the preparation, distribution, and consumption of coal-gas still remain. essentially the same as when the system was first elaborated ; but in all details of the industry numerous improvements have been introduced, resulting in marked economy and efficiency of the system. In the meantime new applications of import- ance have been found for coal-gas in connexion with heating and cooking, and as a motive power in gas-engines. Further, collateral industries have been superadded to the gas manufacture, which in themselves are of such value and importance that, were the distillation of coal as a source of artificial light to cease, it would certainly continue to be practised as a source of the raw materials of the coal-tar colours, and of carbolic acid, &c, Were coal-gas to cease to be made primarily and principally for artificial illumina- tion, and to become more a heating and cooking agent, or were it to fall into the position of being a mere collateral product of the manufacture of tar, it is certain that the manufacturing processes would be very materially modified Costly cannel-gas, with its high illuminating power, is no better suited for a gas engine than common gas ; aid for heating purposes a much greater yield of gas might be obtained, which, in burning, would evolve more heat than is sought in making illuminating gas. But as matters now stand, the fact that illumination, heat, motive power, and dye-stuffs are all obtained by means of the manufacture as

at present conducted is a consideration of much weight in dealing with rival systems of artificial lighting. Throughout the whole experience of gas manufacture the efforts of inventors have been directed, not only to improve the manufacture of coal-gas, but also to supersede its ordi- nary processes, and to supplant it by gas yielded by other raw materials or by new systems of illumination. The persistent efforts which have been made to improve coal-gas, and the success which many of the plans exhibit in their experimental stage, warrant the conclusion that the pro- cesses and results of the manufacture are still susceptible of much improvement. When it is considered how exceed- ingly small is the total proportion of illuminants in coal-gas to the bulk of the materials dealt with, it is not difficult to imagine that modifications of processes may be devised whereby a great increase of lighting effect might be practi- cally available, and at the same time a greater percentage of the total heat-giving power of the coal secured for domestic and manufacturing purposes. Notwithstanding the confessed imperfections of the system of coal gas-mak- ing,—the evil odours which attach to the works, the yet more offensive exhalations given off from streets through which the main-pipes are led, the destructive accidents which occasionally occur from gas explosions, and the heat and sulphurous fumes evolved during its combustion,—not one of the numerous substitutes which have been proposed has been able to stand in competition against it in any large town or city where coal is a marketable commodity. As against the system of electric lighting, which is now being brought into competi- tion with it, the ultimate fate of gas may be different. It may be regarded as already demonstrated that for busy thoroughfares—almost, it may be said, for open-air lighting generally—and for large halls and enclosed spaces, electric lighting will, in the near future, supersede gas. The advantages of the electric light for such positions in bril- liancy, penetration, and purity are so manifest that its use must ultimately prevail, irrespective of the question of com- parative cost, and of the fact that municipalities and wealthy corporations have an enormous pecuniary stake in gas- property. That the electric light will be equally available for domestic illumination is, however, not yet so certain; and until it is demonstrated that a current may be sub- divided practically without limit, that the supply can adapt itself to the demand with the same ease that the pressure of gas is regulated, and that the lights can be raised and lowered equally with gas-lights—till these and other con- ditions are satisfied, the disuse of gas-lighting is still out of sight.

Should these conditions, however, be satisfied, there can be little doubt that gas-lighting will enter on a period of severe competition and struggle for existence; and in the end the material which at one time was regarded as a most troublesome and annoying waste— the gas-tar—will, in all probability, exercise a decisive influence on the continuance of the gas manufacture. Bibliography.—Clegg, A Praetical Treatise on the Manufacture and Distribution of Coal-Gas, new edition, London, 1869; Hughes, A Treatise on Gas- Works and Manufacturing Coal-Gas, 5th edition by Richards, London, 1875; Richards, 4 Practical Treatise on the Manufacture and Distribution of Coal-Gas, London, 1877 ; Accum, Practical Treatise on Gas-Light, 4th ed., 1818 ; Jowrnal for Gas- Lighting, London ; Bowditch, The Analysis, Technical Valuation, and Purifieation of Coal-Gas, London, 1867; Banister, Gas Mani- pulation, new ed. by Sugg, London, 1867 ; Servier, Traité pratique dela fabrication ct de la distribution du gaz d'éclatrage, Paris, 1868; Payen, Préeis de Chemie industrielle, 6th edition, Paris, 1877; Schilling, Handbuch der Steinkohlen-Gas-Beleuchtung, Munich, 1860; Dieh] and Illgen, Gasbeleuchtung und Gasverbrauch, Iserlohn, 1872; ligen, Die Gasindustrie der Gegenwart, Leipsic, 1874; Bolley, Technologie, vol. i., Brunswick, 1862; Wagner's Jahresbericht der ehemisehen Technologie, Leipsic; Journal fiir Gasbeleuchtung

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GASCOIGNE, Gzorcs (c. 1535-1577), one of the great

pioneers of Elizabethan poetry, was born about 1535—as is believed, in Westmoreland. He was the son and heir of Sir JohnGascoigne. He studied at Cambridge, and was admitted to Gray's Inn in 1555. His youth was unsteady, and his futher disinherited him. In 1565 he had written his tragi-comedy of The Glass of Government, not printed unti] 1576. In 1566 his first published verses were prefixed to a book called The French Littleton, and he brought out on the stage of Gray's Inn two very remarkable dramas, Supposes, the earliest existing English play in prose, aud Jocaséa, the first attempt to naturalize the Greek tragedy. Of the latter only the second, third,

and fourth acts were from lis hand. Soon after this he married. In 1572 there was published A Hundred sundry Flowers bound up in one small Posy, a pirated collection of Gascoigne's lyrics, he having started in March of that year to serve as a volunteer under the Prince of Orange. He was wrecked on the coast of Holland and nearly lost his life, but obtained a captain's commission, and acquired considerable military reputation. An intrigue, however, with a lady in the Hague, nearly cost him his life. He regained his position, and fought well at the siege of Middleburg, but was captured under the walls of Leyden, andsent back to England after an imprisonment of four months. In 1575 he issued an authoritative edition of his. poems under the name of Posies. In the summer of the same year he devised a poetical entertainment for Queen Elizabeth, then visiting Kenilworth ; this series of masques was printed in 1576 as The Princely Pleasures. Later on in 1575 he greeted the queen at Woodstock with his Zale of Hemetes, and presented her on next New Year's day with the MS. of the same poem, which is now in the British Museum. He completed in 1576 his two most important works, The Complaint of Philomene, and The Steel Glass, the first of which had occupied him since 1562; they were printed in a single volume. Later on in the same year he published A delicate Diet for dainty-mouthed Drunkards. He fell into a decline and died at Stamford on the 7th of October 1577. We are indebted for many particulars of his life to a rare poem published in the same year by teorge Whetstone, and entitled A Itemembrance of the Well- employed Life and Godly End of George Gascoigne, Hsquire. In his poem of The Steel Glass, in blank verse, Gascoigne introduced the Italian style of satire into our literature. He was a great innovator in point of metrical art, and he prefixed to the work in question a prose essay on poetry, which contains some very valuable suggestions. His great claim to remembrance was well summed up in the next generation by Thomas Nash, who remarked in his preface to Greene's Menaphon, that ‘‘ Master Gascoigne is not to be abridged of his deserved esteem, who first beat the path to that perfection which our best poets aspired to since his departure, whereto he did ascend by comparing the Ttalian with the English.” The works of Gascoigne were collected in 1587, and partly republished in 1810 and 1821. The best modern edition of the principal poems is that edited, with full bibliographical notes, by E. Arber in 1868.

GASCOIGNE, Sir WILLIAM, was chief-justice of England in the reign of Henry IV. Both history and tradition testify to the fact that he was one of the great lawyers who in times of doubt and danger have asserted the principle that the head of the state is subject to law, and that the traditional practice of public officers, or the expressed voice of the nation in parliament, and not the will of the monarch or any part of, the legislature, must guide the tribunals of the country. The judge was a descendant of an ancient Yorkshire family. The date of his birth is uncertain, but it appears from the Year Books that he practised as an advocate in the reigns of Edward IIL and Richard II. On the banishment of Henry of

Lancaster, Gascoigne was appointed one of his attorneys, and soon after Henry's accession to the throne was made chief-justice of the Court of King's Bench. After the suppression of the rising in the north in 1405, Henry eagerly pressed thejudge to pronounce sentence upon Scrope, the archbishop of York, and the earl marshal Thomas Mowbray, who had been implicated in the revolt. The judge absolutely refused to do so, asserting the right of the prisoners to be tried by their peers. Although both were afterwards executed, the chief-justice had no part in the transaction. The often told tale of his committing the Prince of Wales to prison has of course been doubted by modern critics, but it is both picturesque and characteristic. The judge had directed the punishment of one of the prince's riotous companions, and the prince who was present and enraged at the sentence struck or grossly insulted the judge. Gascoigne immediately committed him to prison, using firm and forcible language, which brought him to a more reasonable mood, and secured his voluntary obedi- ence to the sentence. The king is said to have approved of the act, but there appears to be good ground for the supposition that Gascoigne was removed from his post or resigned soon after the accession of Henry V. He dicd in 1419, and was buried in the parish church of Harewood in Yorkshire. Some biographies of the judge have stated that he died in 1412, but this is clearly disproved by Foss in his Lives of the Judges; and although it is clear that Gascoigne did not liold office long under Henry V., it is not absolutely impossible that the scene in the fifth act of the second part of Shakespeare's Henry IV. has some historical basis, and that the judge's resignation was voluntary.

GASCONY, an old province in the S.W. of France, nearly identical with tlie Novempopulania or Aquitana Tertia of the Romans. Its original boundaries cannot be stated with perfect accuracy, but it included what are now the departments of Landes, Gers, and Hautes-Pyrénées, and parts of those of Haute-Garonne and Ariége. Its capital was Auch. About the middle of the 6th century there was an incursion into this region of Vascons or Vasques from Spain, but whether of a hostile kind or not is uncertain ; but as the original inhabitants, in common with those of the rest of Aquitaine were also Vasques, it is probable that the province owes its name Gascony less to this new incursion than to the fact that its inhabitants continued so long to maintain their independence. In 602 they suffered defeat from the Franks and were compelled to pay tribute, but they continued to be governed by their own hereditary dukes, and gradually extended the limits of their dominions to the Garonne. The province was overrun by Charlemagne but never completely subdued, and in 872 it formally renounced the authority of the French kings ; but through the extinction of the male line of hereditary dukes of Gascony in 1054 it came into the possession of the dukes of Guienne (or Aquitaine), with which province its history was from that time identified (see AQUITANIA and GUIENNE).

GASKELL, ExizaBpeTH CLEGHORN (1810-1865), one of the most distinguished of England’s women-novelists, was born at Cheyne Row, Chelsea, September 29, 1810. She was the second child of William Stevenson, of whom an account is given in the Annual Biography and Obituary for 1830. Mr Stevenson, who began life as classical tutor +n the Manchester Academy, and preached also at Doblane, near that town, afterwards relinquished his ministry and became a farmer in East Lothian; and later, on the failure of his farming enterprises, he kept a boarding-house for students in Drummond Street, Edinburgh, where he also became editor of the Scots Magazine, and contributed largely to the Edinburgh Review, At the time of his daughter’s birth Mr Stevenson had been appointed Keeper

of the Records to the Treasury, and was living in Chelsea, still a diligent contributor to various periodicals of the day. Mrs Stevenson, Mrs Gaskell’s mother, was a Miss Holland, of Sandlebridge in Cheshire, an aunt of the

late Sir Henry Holland. She died at the birth of her daughter, who was in a manner adopted, when she was only a month old, by her mother's sister, Mrs Lumb. 'This lady had married a wealthy Yorkshire gentleman, but a few months after her marriage, and before the birth of her child, discovered that her husband was insane, and fled from him to her old home in the little market town of Knutsford, in Cheshire. Mrs Lumb's own daughter having died, she transferred all her affection to the little Elizabeth, between whom and her there existed through life the strongest bond of affection, During Elizabeth's childhood at Knutsford she was visited now and then by her sailor-brother ; but while she was still a girl he went to India, where he somewhat mysteriously, and without any apparent motive, disappeared, and all further trace of him was lost. She was afterwards sent for about two years to a school kept by a Miss Byerley at Stratford-on-Avon, and on leaving school went for a time to live with her father, who had married again. Under his guidance she continued her studies, reading with him in history and literature, and working, chiefly by herself, at Latin, Italian, and French, in all of which she was in later life proficient. Having tenderly nursed her father in his last illness, she returned to her aunt at his death in 1829; and, with the exception of one or two visits to Newcastle, London, and Edinburgh, she continued to live at Knutsford till her marriage. She had at this time a reputation for great beauty; and even in later life her exquisitely-shaped soft eyes retained their light, and her smile its wonderful sweetness. Her marriage to the Rev. William Gaskell, M.A., of Cross Street Chapel, Manchester, took place August 30, 1832, at Knutsford church; and during the earlier years of her married life Mrs Gaskell lived very quietly in Manchester, surrounded by a few intimate and cultured friends, and devoting all her time and abilities to the cares of a necessarily frugal household. Among these friendships, that with Miss Catherine Winkworth and her sisters was perhaps the longest and most cherished. From the first, although she never visited the poor as a member of any organized society, she sought by all means in her power to relieve the misery which, in a town like Manchester, she was constantly witnessing, She gave the most devoted help and tender sympathy to such cases of individual distress as came under her notice, She assisted Mr Travers Madge in his missionary work amongst the poor, and was the friend and helper of Thomas Wright, the prison philanthropist. She also made several individual friendships among poor people, and knew personally one or two types of the Chartist working-man.

She was specially interested in the young working-women of Manchester, and for some years held a weekly evening class at her own house for talking with them and teaching them. Of Mrs Gaskell's seven children, two were still-born, and another, her onl

son, born between the third and fourth of her four ee daughters, died at the age of ten months. The death of this baby 1s sald to have been the cause of Mrs Gaskell's beginning to write, when she was urged by her husband to do so, in order to turn her thoughts from her own grief She began by writing a short paper called " An Aare of Clopton Hall," for William Howitt's Visits to Remarkabl

Places. This was followed by one or two short stories sa6 as the "Sexton's Hero," for the People's Journal ; and et she wrote Mary Barton, a Tale of Manchester ae On its completion, she sent it to one publisher in Tega who rejected it unread, and then to Messrs Chapman and Hall

who, after keeping the manuscript for a year without acknowledgment, wrote to her accepting the novel for

publication, and offering the authoress £100 for the copy. right. The appearance of Mary Barton in 1848 caused great excitement in Manchester, and a strong partisanship was felt for and against its anonymous author. After its publication Mrs Gaskell paid several visits in London, where she made many friends, among whom we may men. tion Dickens, Forster, Mrs Jameson, Lord Houghton, Mrs Stowe, Ruskin, and Florence Nightingale. Her friendship with Charlotte Bronte also dates from about this time, when the two authoresses met at the house of Sir James and Lady Kay Shuttleworth, near Bowness, in Westmore- land, and Mrs Gaskell received her first impressions of the shy "little lady in a black silk gown," who afterwards be- came personally her dear friend,—although, from a literary point of view, they could hardly help being rivals,—and the story of whose life, when it was ended, Mrs Gaskell was destined to write with such consummate care and tender appreciation. But dary Barton was to prove only the first of a series of scarcely less popular publications, which appeared either independently or in periodicals such as Household Words. It

was followed in 1850 by The Moor. land Cottage. Cranford and Ruth appeared in 1853; North and South, in 1855 ; The Life of Charlotte Bronte, in 1857 ; Round the Sofa, in 1859; Right at Last, in 1860; Sylvia's Lovers, in 1863 ; and Cousin Phillis and Wives and Daughters, in 1865.

During these years—years of increasing worldly pro: sperity and literary distinction—Mrs Gaskell often went abroad, chiefly to Paris and Rome, but once for a long visit to Heidelberg, and once also to Brussels, to collect infor- mation about Charlotte Bronte's school-days. In Paris her genius was warmly appreciated ; and, while she was a guest among them, Guizot, Montalembert, and Odillon Barrot vied in doing her honour. Of her visits in England some of the pleasantest were to Oxford, where she counted among her friends Mr Jowett and Mr Stanley (dean of Westminster), At other times, when she was busy writing one of her novels, she would leave home with one or two of her children, and oarry her manuscript to some quiet country place, where she could write undisturbed. When she was at home, although she was enthusiastically interested in the political questions of the day, and her warm, impulsive nature made her ready at any time to give personal help and sympathy where it seemed to be needed, Mrs Gaskell refrained from taking active part in public movements or social reforms, if we except, indeed, the great sewing-school movement in Manchester at the time of the cotton famine in 1862. Her life was thoroughly literary and domestic. She read much: Goldsmith, Pope, Cowper, and Scott were the favourite authors of her girlhood; in later life she admired Ruskin and Macaulay extremely, and delighted in many old French memoirs of the time of Madame de Sévigné, whose life she often planned to write. It is remembered of her that one day, when she was reading George Eliot's first and anonymous story Amos Barton, she looked up and said, ''T prophesy that the writer of this will be a great writer some day." The prospect of the awful cotton famine in Manchester in 1862 set Mrs Gaskell anxiously thinking what could be done to relieve the coming distress, and she decided, 'without any suggestions from others, on a plan of giving relief and employment together to the women mill-hands, which was an exact prototype of the great system of relief afterwards publicly adopted, namely, the sewing-schools," When these were formed, Mrs Gaskell 'merged her private scheme in the public one, and worked most laboriously in the sewing-school nearest her home." This was but three years before her death.

Still busy writing her novel Wives and Daughters, she was staying with her children at Holybourne, Alton, in Hampshire, & house which she had just purchased as a surprise and

gift to her husband, when she died suddenly of heart disease, about 5 o’clock on Sunday evening, November 12, 1865. Her remains were carried to the churchyard of the Old Presbyterian Meeting-house at Knutsford, where her childhood and girlhood had been spent, and which she had left as a bride, three-and-thirty years before. A memorial tablet in memory of Mrs Gaskell was erected by her husband’s congregation, in Cross Street Chapel, Manchester—a tribute not only to her genius, and the spirit in which it was exercised, but to the “ tenderness and fidelity” of the wife and mother who had lived long amongst them.

With this knowledge of the facts of Mrs Gaskell’s life, it is not difficult to trace the sources of her inspirations, Some of her shorter tales, it is true, seem to have heen suggested merely by her readings; and, carefully as she collected their materials, these are the least satisfactory of her writings. But by far the most of what she wrote was founded on observation and experience. Mrs Gaskell has reproduced, with slight variations, in her novel orth and South, the incident in her father’s youth, when he and his friend and fellow-student, the Rev. George Wicke of Monton, believing it wrong to be “‘hired teachers of re- ligion,” resigned their ministries and sought a livelihood otherwise. The beautiful story in ‘“ Mary Barton” of the two working-men who brought the baby from London to Manchester is a version of an anecdote about Mrs Gaskell’s own infancy, of her being taken to Knutsford, after her mother’s death, by a friend who chanced to be travelling that way. The little county town of “ Cranford’—with its population of widaws and maiden ladies, and its horror of the masculine portion of society—is Knutsford, so long Mrs Gaskell’s liome. In Cranford every character, if not every incident, is real; and thie pathetic little story of Poor Peter can have been suggested only by the disap- pearance of that sailor brother who used to visit Mrs Gaskell in her girlhood, and whose mysterious loss also must have interested her always afterwards in ‘“ disappear- ances ”—the title of one of her papers in Household Words,

dale initiated her in the mysteries of rural and farm life. Her visits to France were the origin of her tales of the Huguenots and the French refugees at the time of the Revolution. The Edinburgh of her girlhood appears in one or two of her stories, briefly but vividly sketched. Her schooldays at Stratford-on-Avon are remembered in Lois the Witch; and, if only in a little story like the visit to Heppenheim, we can trace her excursions from Heidelberg along the broad, white Bergstrasse. But it is most of all in Mary Barton, a story of the trials and sorrows of the poor in Manchester, whom she had had so many oppor- tunities of observing, that Mrs Gaskell gave her personal knowledge and experience to the world. Her severest critic, Mr W. R. Greg, admits Mrs Gaskell's knowledge of her subject, but objects to the impression left by the novel on the mind of the reader as inaccurate and harmful. "Were Mary Barton," he says, "to be only read by Man- chester men and master manufacturers, it could scarcely fail to be serviceable, because they might profit by its Suggestions, and wauld at once detect its exaggerations and mistakes ;" but on the general public he fears its effect will be* "mischievous in the extreme." One doubts whether a calm solution of a great economic diffi- culty, such as that which Mrs Gaskell treats of, could ever be given in a novel; and certainly the warm-hearted, mpulsive authoress of Mary Barton had no such aim m view. It is probable that she wrote without any distinct economic theories. Earnest, benevolent intentions she no doubt had, but she was far more of an artist than a reformer. Had it not been so, Mary Barton would not

rank so high in the literature of fiction as it does. It is no work of occasion, the chief interest of which departs when the occasion itself is over. It is a thoroughly artistic production, and for power of treatment and intense interest of plot has seldom been surpassed. It is as the authoress of Mary Barton that Mrs Gaskell will be remembered. Of her other works, 2uth is singularly inferior to its predeces- sor ; but Worth and South, which takes the side of the master manufacturers, as Afary Barton did that of the men, has been scarcely less popular with the public. Perhaps the two best of Mrs Gaskell's productions, each in its own way, are the exquisitely humorous

Cranford and Cousin Phillis, which has been fitly called an idyll in prose. Wives and Daughters, even in its uncompleted state, is artistically almost faultless, and full of a quiet restful beauty entirely its own. George Sand was a great admirer of this novel, and Mrs Gaskell's family still cherish a saying of hers about it :—''It is a book," she once said to Lord Houghton, "that might be put into the hands of an inno- cent girl, while at the same time it would rivet the attention of the most b/asé man of the world." Her one work which is not a novel—her Life of Charlotte Bronte—it is difficult to praise toa highly, either as a biography proper, or as a narrative written with the consummate skill of the novelist. Some people, indeed, have thought that Mrs Gaskell transgressed the bounds of the biographer in pub- lishing so many details of Miss Bronte's domestic and private life; but the ease was a peculiar one. The char- acter of Charlotte Bronte's writings made it advisable that her reader, in order properly to understand her, should be admitted to some of the hitherto hidden facts of her short, sad life. Mrs Gaskell, knowing and esteeming Charlotte Bronte in the character of friend, daughter, and wife, hoped in some degree to justify to the world the morbid, unhealthy tone which pervaded her genius; and surely, if any hand was to draw the curtain, none could have done it more tenderly than that of her friend. (F. M.)

GASSENDI, Prerre (1592-1655), one of the most eminent French philosophers, was born of poor but respect- able parentage at Champtercier, near Digne, in Provence, on the 22d January 1592. Ata very early age he gave indications of remarkable mental powers, and at the instance of his uncle, the curé of his native village, he was sent to the college at Digne. He made rapid progress in his studies, showing particular aptitude for languages and mathematics, and it is said that at the age of sixteen he was invited to lecture on rhetoric at the college, He cannot have retained this post forany length of time, for soon afterwards he entered the university of Aix, to study philosophy under Fesaye. In 1612 he was called to the college of Digne to lecture on theology. Four years later he received the degree of doctor of theology at Avignon, and in 1617 he took orders as a priest. In the same year he was called to the chair of philosophy at Aix, and seems gradually to have withdrawn from theological study and teaching.

At Aix he lectured principally on the Aristotelian philo- sophy, conforming as far as possible to the orthodox methods, At the same time, however, he prosecuted his favourite studies, physics and astronomy, and hy the dis- coveries of Galileo, Kepler, and others became more and more dissatisfied with the Peripatetic system. It was, indeed, the very period of violent revolt against the autho- rity of Aristotle, and Gassendi shared to the full the practical and empirical tendencies of the age. He, too, began to draw up in form his objections to the Aristotelian philosophy, but did not at first venture to publish them. The portion shown to his friends Peirese and Gautier, however, was so vehemently approved by them that in 1624, after he had left Aix for a canonry at Grenoble, jhe printed the first part of his Oe a i ani

adversus Aristoteleos. A fragment of the second book was published later (1659), but the renlaining five, requisite to complete the work, were never composed, Gassendi appar- ently thinking that after the Duscusseones Peripatetic: of Patricius little field was left for his labours. The Exercitationes on the whole seem to have excited more attention than they or nothing beyond what

Valla and Vives, by Ramus and Bruno. The first book expounds clearly, and with much vigour, the evil effects of the blind acceptance of the Aristotelian dicta on physical and philosophical study ; but, as is the case with so many of the anti-Aristotelian works of this period, the objections do not touch the true Aristotelian system, and in many snstances show the usual ignorance of Aristotle’s own writings. The second book, which contains the review of Aristotle’s dialectic or logic, is throughout Ramist in tone and method.

‘After a short visit to Paris in 1628, Gassendi travelled for some years in Flanders and Holland with his friend Luillier, During this time he wrote, at the instance of Mersenne, his examination of the mystical philosophy of Robert Fludd (Hpistolica dissertatio im qua preecipua prin- cipia philosophic Ro, Fluddi deteguntur, 1631), an essay on parhelia (Hpistola de Parheliis), and some valuable observa- tions on the transit of Mercury which had been foretold by Kepler. He returned to France in 1631, and two years later received the appointment of provost of the cathedral church at

Digne. Some years were then spent 1n travelling through Provence with the duke of Angouléme, governor of the department. The only literary work of this period is the Life of Peiresc, which has been frequently reprinted, and was translated into English. In 1642 he was again engaged by Mersenne in controversy, on this occasion against the celebrated Descartes. His objections to the fundamental propositions of Descartes were published in 1642; they appear as the fifth in the series contained in the works of Descartes. In these objections Gassendi's already great tendency towards the empirical school of speculation appears more pronounced than iu any of his other writings. In 1645 he was invited by the archbishop of Lyons, brother of Cardinal Richelieu, to the chair of mathematics in the Collége Royal at Paris. He accepted this post, and lectured for many years with great success. In addition to some controversial writings on physical questions, there appeared during this period the first of the works by which he is best known in the history of philo- sophy, He evidently found himself more in harmony with Epicurus than with any other philosopher of antiquity, and had collected much information regarding the Epicurean system. In 1647 Luillier persuaded him to publish some of his works, which took the form of the treatise De Vita, M oribus, et Doetrina Epicuri libri octo. The work was well received, and two years later appeared his commentary on the tenth book of Diogenes Laertius (De Vita, Moribus, et Placitis Epicurt, sew Animadversiones in X. libr Di Laer.). Inthe sam i rs

er.) J _same year the more important Syntagma philosophie Epicurt was published.

_In 1648 Gassendi had been compelled from ill-health to give up his lectures at the Collége Royal. He travelled for some time in the south of France, spending nearly two years at Toulon, the climate of which suited him. In 1653 he returned to Paris and resumed his literary work, pub- lishing in that year his well-known and popular ieee of Copernicus and Tycho Brahe. The disease from which he suffered, lung complaint, had, however, established a firm hold on him. His strength gradually failed, and he died

at Pari th i i i u eg e 24th October 1655, in the sixty-third year

deserved. They contain little had been already advanced against Aristotle by the more vigorous of the Humanists, by

GASSENDI

His collected works, of which the most important is the Syntagma Philosophicum (Opera, i. and ii.), were published in 1655 by Montmort (6 vols. fol., Lyons), Another edition, also in 6 folio volumes, was published by Averanius in 1727. These volumes sufficiently attest the wide extent of his reading and the versatility of his powers. The first two are occupied entirely with his Syntagma Philosophicum ; the third contains his critical writings on Epicurus, Aristotle, Descartes, Fludd, and Lord Herbert, with some occasional pieces on certain problems of physics ; the fourth, his /ustztutio Astronomica, and his Commentarit de Rebus Celestibus; the fifth, his commentary on the tenth book of Diogenes Luertius, the biographies of Epicurns, Peiresc, Tycho Brahe, Copernicus, Peurbach, and Regio-montanus, with some tracts on the value of ancient money, on the Roman calendar, and on the theory of music, to all which is appended a large and prolix piece entitled Notitia Ecclesice Diniensis; the sixth volume contains his corre- spondence. The Lives, especially those of Copernicus, Tycho, and Peiresc, have been justly admired. That of Peiresc has been repeatedly printed; it has also been translated into English. Gassendi was one of the first after the revival of letters who treated the /¢terature of philosophy in a lively way. His writings of this kind, though too laudatory and somewhat diffuse, have great merit; they abound in those anecdotal details, natural yet not obvious reflexions, and vivacious turns of thought, which made Gibbon style him, with some extravagance certainly, though it was true enough up to Gassendi's time—'"'le meilleur philosophe des littera- teurs, et le meilleur litterateur des philosophes."

Gassendi will always retain an honourable place in the history of physical science. He certainly added little original to the stock of human knowledge, but the clearness of his exposition and the manner in which he, like his greater contemporary, Bacon, urged the necessity and utility of experimental research, were of inestimable service to the cause of science. 'To what extent any place can be assigned him in the history of philosophy is more doubtful. His anti-Aristotelian writing has been already noticed.

The objections to Descartes—one of which at least, through Descartes's statement of it, has become famous—have no speculative value, and in general are the outcome of the crudest empiricism. His labours on Epicurus have a certain historical value, but the inherent want of consistency in the philosophical system raised on Epicureanism is such as to deprive it of all genuine worth. Along witli strong expres- sions of empiricism (nihil in intellectu quod non prius fuerit in sensw) we find him holding doctrines absolutely irrecon- cilable with empiricism in any form. For while he main- tains constantly his favourite maxim "that there is nothing in the intellect which has not been in the senses," and while he contends that the imaginative faculty, "phan- tasia," is the counterpart of sense, that, as it has to do with material images, it is itself, like sense, material, and essen- tially the same both in men and brutes, he at the same time admits that the intellect, which he affirms to be im- material and immortal—the most characteristic distinction of humanity—attains notions and truths of which no effort of sensation or imagination can give us the slightest ap- prehension (Op., ii. 383). He instances the capacity of forming "general notions ;" the very conception of uni- versality itself (¢b., 384), te which he says brutes, who partake as truly as men in the faculty called "phantasia," never attain; the notion of God, whom he says we may imagine to be corporeal, but understand to be incorporeal ; and lastly, the reflex action by which the mind makes its own phenomena and operations the objects of attention.

The Syntayma Philosophicum, in fact, is one of the eclectic systems which unite, or rather place in juxtaposi-

tion, irreconcilable dogmas from various schools of thought,

It is divided, according to the usual fashion of the Epicure- ans, into logic (which, with Gassendi as with Epicurus, is truly canonic), physics, and ethics. The logic, which con- tains at least one praiseworthy portion, a sketch of the history of the science, is divided into theory of right appre- hension (bene imaginari), theory of right judgment (bene proponere), theory of right inference (dene colligere), theory of right method (dene ordinare). The first part contains the specially empirical positions which Gassendi

afterwards neglects or leaves out of account. The senses, the sole source of knowledge, are supposed to yield us immediately cognition of individual things; phantasy (which Gassendi takes to be material in nature) reproduces these ideas; understanding compares these ideas, which are particular, and frames general ideas. Nevertheless, he at the same time admits that the senses yield knowledge—unot of things—but of qualities only, and holds that we arrive at the idea of thing or substance by induction. He holds that the true method of research is the analytic, rising from lower to higher notions; yet he sees clearly, and admits, that inductive reasoning, as conceived by Bacon, rests on a general proposition not itself proved by induction. He ought to hold, and in disputing with Descartes he did apparently hold, that the evidence of the senses is the only convincing evidence; yet he maintains, and from his special mathematical training it was natural he should maintain, that the evidence of reason is absolutely satis- factory. The whole doctrine of judginent, syllogism, and method is a mixture of Aristotelian and Ramist notions.

In the second part of the Syntagma, the physics, there is more that deserves attention ; but here, too, appears in the most glaring manner the inner contradiction between Gassendi's fundamental principles. While approving of the Kpicurean physics, he rejects altogether the Epicurean negation of God and particular providence. He states the various proofs for the existence of an immaterial, infinite, supreme Being, asserts that this Being is the author of the visible universe, and strongly defends the doctrine of the foreknowledge and particular providence of God. At the same time he holds, in opposition to Epicureanism, the doctrine of an immaterial, rational soul, endowed with im- mortality and capable of free determination. It is alto- gether impossible to assent to the supposition of Lange (Gesch. des Materialismus, 3d ed., i. 233), that all this portion of Gassendi's system contains nothing of his own opinions, but is solely introduced from motives of self- defence. The positive exposition of atomism has much that is attractive, but the hypothesis of the calor vitals, a species of anima mundi which is introduced as physical explanation of pliysical phenomena, does not seem to throw much light on the special problems which it is invoked to solve. Nor is his theory of the weight essential to atoms as being due to an inner force impelling them to motion im any way reconcilable with his general doctrine of me- chanical causes.

In the third part, the ethics, over and above the discussion on freedom, which on the whole is indefinite, there is little beyond a milder statement of the Epicurean moral code. The final end of life is happiness, and happiness is harmony of soul and body, tranquillitas animi et indolentia corporis. Probably, Gassendi thinks, perfect happiness is not attain- able in this life, but it may be in the life to come.

The Syntagma is thus an essentially unsystematic work, and clearly exhibits the main characteristics of Gassendi's genius. He was critical rather than constructive, widely read and trained thoroughly both in languages and in science, but deficient in speculative power and original force.

ven in the department of natural science he shows the Sime inability steadfastly to retain principles and to work from them; he wavers between the systems of Brahe and

Copernicus. That his revival of Epicureanism had an im- portant influence on the general thinking of the 17th century may be admitted ; that it las any real importance in the history of philosophy cannot be granted.

Gassendi's life is given by Sorbiére in the first collected edition of the works, by Bugerel, Vie de Gassendi, 1737 (2d ed., 1770), and by Damiron, Mémoire sur Gassendi, 1839. An abridgment of his philosophy was given by his friend, the celebrated traveller, Bernier (Abrégé de la Philosophie de Gassendt, 8 vols., 1678 ; 2d ed., 7 vols., 1684). The most complete surveys of his work seem to be those of Buhle (Geschichte der neuern Philosophic, iii., 1, 87-222), and Damiron (Mémoires pour servir & UV Histoire de Philosophie au l7me Steele.) See also Ritter, Geschichte der Philosophie, x. 5438-571; Feuerbach, Gesch. d. new. Phil. von Bacon bis Spinoza, 127-150. '* (R. AD.)

GASTEIN, a beautiful and picturesque valley in the Austrian duchy of Salzburg, celebrated for its mineral springs. It is a side valley of the upper Salzach valley, and is about 25 miles long and 14 miles broad. It has an elevation of between 3000 and 3500 feet. Behind it, to the south, tower the mountains Malnitz or Nassfeld-Tauern, 7820 feet high, and the Ankogel,

10,700 feet high, and from the right and left of these mountains two smaller ranges run northwards forming its two side walls, The river Ache traverses the valley, and near Wildbad-Gastein forms two magnificent waterfalls, the upper, the Kesselfall, 200 feet, and the lower, the Barenfall, 280 feet in height ; and near these falls another called the Schleierfall, 250 feet high, is formed by the stream which drains the Pockhart-See. The principal villages are Bockstein, Hof-Gastein, and Wildbad- Gastein, and the population of the whole valley is about 3800. Hof-Gastein, with a population of about 1000, possesses gold and silver mines which in the 16th century yielded 1180 Ib of gold and 9500 tb of silver annually. They are now, however, much neglected and many of the old mines are covered by glaciers. The village contains a military hospital, and in the open platz there is a bust of the emperor Francis I. who, in 1828, caused a conduit of upwards of 5 miles long to be constructed for the purpose of conveying the mineral waters thither from Wildbad. Wildbad, the principal watering-place, is visited by upwards of 3000 persons annually, and among its visitors is the pre- sent emperor of Germany. The thermal springs, which were known as early as the 7th century, issue from the granite mountains, and have a temperature of 117° Fahr. They are made use of in cases of nervous affections, general debility, and skin diseases ; but the reason of their efficacy is somewhat mysterious, as chemical analysis discovers only a slight difference in the ingredients from those of ordinary spring water. The village is formed chiefly of wooden houses rising above one another in terraces. A number of stone houses have, however, been built of late ; and there are several fine villas, one of which was con- structed by the archduke John of Austria, and has a botanical garden.

The baths of Gastein first came into fame through a successful visit paid to them by Duke Frederick of Austria in 1436. The valley from the 11th century belonged to the dukes of Peilstein, and on the extinction of their line in 1219 it came into possession of Bavaria, whence it passed in 1297 by purchase to Salzburg. A convention was held at Wildbad-Gastein in August 1865, between the emperor Francis Joseph of Austria and King William of Prussia, at which an arrangement was signed in reference to the relations of Austria and Prussia to Schleswig-Holstein and Lauenburg (see AUSTRIA).
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The principal books on Gastein are Reissacher, Der Kurort W id bad-Gastein, 1865 ; Bunzel, Bad-Gastein, 1872 ; Honigsberg, Gasteim, 1873; and A Month at Gastein, London, n.d. ;

GATAKER, THomas (1574-1654), a learned English divine, was born in London in 1574, and tag ri St John's College, Cambridge. From 1601 to pee he held the appointment of preacher to the society 0

Lincoln's Inn, which he resigned on obtaining the ee ttl of Rotherhithe. In 1642 he was chosen a member of the

esembly of Divines at Westminster. The parts of the fais annotations upon the Bible which were executed by him are those on Isaiah, Jeremiah, and the Lamenta- Hons. At Westminster he disapproved of the introduction of the Covenant, and declared himself in favour of Episco- pacy. He was also one of the forty-seven London clergymen who disapproved of the trial of Charles I. He died in 1654. His principal works, besides some volumes of sermons, are On the Nature and Use of Lots, 1616, a curious treatise which gave rise to much controversy ; Dissertatio de Stylo Novi Testamenti, 1648; Cinnus, sive Adversarra Miscel- lanea, in quibus Sacre Scripture primo, deande aliorum Scriptorum, locas aliquam multis lux redditur, 1651, to which was afterwards subjoined Adversaria Posthuma ; and his edition of Jarcus Antoninus, which, according to Hallam, is the "earliest edition of any classical writer pub- lished in England with original annotations," and for the period at which it was written possesses remarkable merit. The best edition of his works is that published at Utrecht in 1668.

GATCHINA, a town of Russia, in the government of St Petersburg and district of Tsarskoselo, 29 miles W. of St Petershurg, in 59° 34' N. lat, and 30° 6' E. long. It is situated in a flat, well-wooded, and partly marshy district, and on the south side of the town are two lakes, distin- guished as the White and the Black. Among its more im- portant builings are the imperial palace, which was founded in 1770 by Prince Orloff, and executed according to the plans of the Italian architect Rinaldi, the four Greek churches, the Protestant church, a foundling asylum, a military orphanage founded in 1803 by Maria Feodorina, a school for horticulture, a public

hospital for 1500 patients, founded by Paul I., an asylum for the families of twenty blind men, and another for fifty poor peasants. In one of the Greek churches are preserved several relics originally brought from Rhodes to Malta by the grand-master Lille Adam ; and the so-called priory is shown where the knights of Malta assembled under the mastership of the emperor Paul I. Gatchina is a junction on the railway between St Petersburg and Warsaw, but its trade is of no great development. Among the few industrial establishments is a porcelain factory. The inhabitants in 1860 num- bered 9184, of whom 2255 were members of the National Church, 1431 Protestants, 182 Catholics, and 50 Jews. By 1867 the total had sunk to 8337; but according to one ee Petersburg Calendar for 1878 it has again risen to

GATES, Horatio (1728-1806), an American general, was born at Maldon in Essex, England, in 1728. He entered the English army at an early age, and soon obtained considerable promotion. He was severely wounded while accompanying General Braddock in his unfortunate expedi- tion against the French settlements on the Ohio in 1755, and he took part in the expedition against Martinico in January 1762. After the peace of 1763 he purchased an estate in Virginia, where he resided till the commencement of the revolutionary war in 1775, when he was named by congress adjutant-general. In 1776 he was appointed to command the army on Lake Champlain ; but, his conduct there not having been approved of, he was superseded inthe following spring; yet in August he was sent to oppose General Burgoyne, whom he totally defeated on the 16th of October, and compelled to surrender his whole army,— an achievement which was, however, largely due to the previous manceuvres of Schuyler, whom Gates superseded. After obtaining the chief command in the southern districts Gates was totally defeated at Camden, in South Carolina. by Lord Cornwallis, on the 16th of August 1780. On oan account he was superseded by General Greene; but an investigation into his conduct terminated in acquitting him

fully and honourably of all blame, on the ground that his defeat had been unavoidable in the disorganized state of the army under his command. After

this he again retired to his Virginian estate, whence he removed to New York in 1800. On his arrival he was immediately admitted to the freedom of the city, and then elected a member of the State legislature. Before his departure from Virginia he granted emancipation to his slaves, accompanying their manumission with a provision for those wlio needed assist- ance. He died on the 10th of April 1806.

GATESHEAD, a municipal and parliamentary borough and market-town of England, county of Durhan, is situated on the right bank of the Tyne, opposite Newcastle, of which it practically forms a part, being united with it by three bridges. ‘The town consists of two principal and nearly parallel streets, from which others diverge in various direc- tions, A great fire which occurred in 1854 was taken ad- vantage of for the carrying out of improvements in the old part of the town, and it is now much less crowded than for- merly. In the suburbs there are a considerable number of fine mansions. The parish church, recently restored, is an ancient cruciform edifice surmounted by a lofty tower; and several of the other churches and chapels are handsome buildings. The Wesleyan and Primitive Methodists, the Congregationalists, Baptists, Presbyterians, and Roman Catholics are all represented. The town possesses a fine cemetery, a well laid out public park, a new town-hall, a grammar school, a hospital (St Edmund’s) for fifteen in- digent persons, a reformatory, a mechanics’ institute, and a dispensary. There are large iron works (including foundries and factories for engines, boilers, chains, and cables), shipbuilding yards, glass manufactories, chemical, soap, and candle works, brick and tile works, breweries and tanneries. ‘The town also contains the principal depot of the North-Eastern Railway, with large stores and loco- motive works. Extensive coal mines exist in the vicinity; and at Gateshead Fell are large quarries for grindstones, which are much esteemed and are exported to all parts of the world.

The large number of Roman relics found at Gateshead _would seem to indicate that it was originally an outwork of the Roman station at Newcastle. The name is mentioned as early as 1080, and in 1164 the bishop of Durham granted to its burgesses equal privileges with those of Newcastle. On the dissolution of the see of Durham in 1552, an Act was passed for uniting the town to the borough of Newcastle, but on the

restoration of the rights of the bishopric it was again placed under that jurisdiction, being governed, from 1317 to 1695, with the exception of that short intermission, by a bailiff nominated by the bishop. From 1695 to 1826, when it became a municipal borough, it was governed by two stewards, elected by the inhabitants. Gateshead returns one member to parliament. The popnlation of the municipal borough. which in 1861 was 88,587, was 48,627 in 1871.

GATH, one of the five chief cities of the Philistines. Its site appears to have been known in the 4th century, but the name is now lost. Eusebius (in the Onomasticon) places it near the road from Eleutheropolis (Beit Jibrin) to Diospolis (Ludd) about 5 Roman miles from the former. The Roman road between these two towns is still traceable, and its milestones remain in places. East of the road at the required distance rises a white cliff, almost isolated, 300 feet high, and full of caves. On the top is the little mud village of Tell-es-Safi (“the shining mound”), and round it are the mounds which mark the site of the crusading castle of Blanchegarde (Alba Custodia), built in 1144, Tell- es-Safi was known by its present name as far back as the 12th century, but it appears probable that the strong site here existing represents the ancient Gath. The cliff stands on the south bank of the valley of Elah, and Gath appears to have been near this valley (1 Sam. xvii. 2,52). The name Gath, meaning a “ winepress,” designates several other places in Palestine.

GAT—GAU

GATTY, Mrs Atrrep (1809-1873), daughter of the Nev. Dr Scott, chaplain to Lord Nelson, was born at Burnham, Essex, in 1809. In 1839 Margaret Scott was married to the Rev. Alfred Gatty, D.D., vicar of Ecclesfield near Sheffield, sub-dean of York cathedral, and the author of various works both secular and religious. In 1842 she published in association with her husband a life of her father, the Rev. Dr Scott ; but her first independent work was The Fairy Godmother and other Tales, which appeared in 1851. This was followed in 1855 by the first of five volumes of Parables from Nature, the last being published in 1871. Itis under the nom de plume of Aunt Judy, as a pleasant aud instructive writer for children, that Mrs Gatty is most widely known. Previous to commencing Aunt Judy’s Magazine in May 1866, she

had brought out Aunt Judy's Tales and Aunt Judy's Letters; and among the other children's books which she subsequently published, were Aunt Judy's Song Book for Children and The Mother's Book of Poetry. Besides other excellences her children's books are specially characterized by wholesomeness of sentiment and cheerful humour. Her miscellaneous writ- ings include, in addition to several volumes of tales, 7'he Old Folks from Home, an account of a holiday ramble in Ireland; Zhe Z'ravels and Adventures of Dr Wolff the Missionary, in which she was assisted by her husband ; British Sea Weeds; Waifs and Strays of Natural History; A Book of Emblems; and The Bock of Sun-Dials. She died October 3, 1873.

GAUDEN, Joun (1605-1662), the reputed author of the Hikon Basilike, was born in 1605 at Mayfield in Essex, of which parish his father was vicar, Hc was educated at sury St Edmunds, and afterwards at St John's College, Cambridge. He obtained about 1630 the vicarage of Chippenham in Cambridgeshire, and the rectory of Bright- well in Berkshire. At the breaking out of the civil war le was domestic chaplain to Robert Rich, second earl of Warwick, one of the parliamentary leaders, and, being selected to preach before the House of Commons in 1640, was presented with a silver tankard for his discourse. In 1641 he was appointed by the parliament to the deanery of Bocking, in Essex. He became master of the Temple in 1659, in succession to Dr Ralph Brownrigg, bishop of Exeter, and aftcr the Restoration in November 1660 was appointed to the same diocese. Between 1642, the date of his first printed work, and 1660 he published some thirteen or more books, of which number, however, only one appeared prior to the exccution of the king, Soon after his appointment to the sec of Exeter, he privately laid claim to the euthorship of the Hikon Basilike, a work com- monly attributed at the time to Charles I. This claim Gauden put forth in a correspondence with the Lord Chancellor Hyde, earl of Clarendon, and the earl of Bristol, from 21st December 1660 to 31st March 1662. The letters

of Gauden among them have been published in Dr Maty's | Kevew in 1782, and again in the Appendix to vol. iii. of | In the year 1693 a Mr Arthur |

the Clarendon Papers. North of London, who had married a sister of Dr Gauden's daughter-in-law, published a series of letters which he had

found among his sister-in-law’s papers, aud which added |

materially to the strength of the bishop’s claim. They consisted of the other side of the correspondence referred to above, viz., a letter from Secretary Sir Edward Nicholas to Gandenin January 1660-1, two from the bishopto Chancellor Hyde in December 1661 and the duke of York in January 1661-2, and one from Hyde to the bishop in March 1661-2. These letters, however, have been regarded with consider- able suspicion by late writers on the subject, and have even

een pronounced to be forgeries by some, who have pointed out that the two letters written by Gauden himself to Clarendon and the duke of York were found in the bishop’s

house, not among the papers of the persons to whom they were directed. The letter also from Clarendon to Gauden, though written nine months after his obtaining his earldom, is signed Edward Hyde, a blundering anachronism which points to the unskilful hand of a forger. The whole ques- tion of the claims of Charles I. and Dr Ganden was dis- cussed at great length and with considerable ability and ingenuity from 1824 to 1829 by Dr Christopher Words- worth, master of Trinity College, Cambridge, on behalf of the king, and the Rev. H. J. Todd on the side of Dr Gauden. Fresh evidence, however, has lately turned up in the shape of letters and papers of Charles II. and his ministers, written soon after the execution of the king, which go far to invalidate if not entirely destroy the claim of Dr Gauden, and prove that those persons to whom he most confidently appealed in support of his pretensions were the strongest upholders of the king’s authorship at the time immediately subsequent to the appearance of the work. In 1662, on the death of Brian Duppa, bishop of Winchester, Dr Gauden applied to be translated from Exeter to that see, but his claims were set aside in favour of George Morley, bishop of Worcester, and the vacancy thus created was filled by the bishop of Exeter. He only lived four months after this last promotion, and dying on 20th September 1662, was buried in Worcester Cathedral. His will is preserved in the Prerogative Office of Canterbury.

He left a widow, the daughter of Sir William Russell of Chippenham, who after her husband's death wrote a letter to her son John on the subject of the king's book, and enclosed in it a narrative of the whole claim. This was published with the correspondence mentioned above by Mr North in 1693. She also erected a monument to the bishop's memory in Worcester Cathedral, representing him with the Zvkon Basilike in his hand.

GAUDICHAUD-BEAUPRK, Cuarzus (1789-1854), a French botanist, was born at Angouléme, September 4, 1789. He studied pharmacy first in the shop of a brother- in-law at Cognac, and then under Professor Robiquet at Paris, where from Desfontaines and L. C. Richard he acquired a knewledge of botany. In April 1810 he was appointed dispenser in the military marine, and from July 1811 to the end of 1814 he served at Antwerp. In September 1817 he joined the corvette " Uranie," as phar- maceutical botanist to the circumpolar expedition com- manded by De Freycinet (see vol. ix. p. 777). The wreck of the vessel on the Falkland Isles, at the close of the year 1819, deprived him of more than half the botanical collec- tions he had made in various parts of the world. In 1830-33 he visited Chili, Peru, and Brazil, and in 1836- 37 he acted as botanist to "La Bonite" during its circum- navigation of the globe. His theory accounting for the growth of plants by the supposed coalescence of elementary "phytons" involved him, during the latter years of his Jife, in much controversy with his fellow-botanists, more espe- cially M. de Mirbel. He died January 16, 1854,

Besides his Rotanique du Voyage autour du Monde, exéeuté pendant les Années 1836-1837, 4 vols. fol., with plates, which included several previous works, Gaudichaud-Beaupre wrote " Lettres sur l'Organographie et la Physiologie," Arch. de Botanique, ii., 1833; '' Recherches générales sur l'Organographie, &c. (prize essay, 1835), Mfém. de ? Académie des Sciences, t. vill., and kindred treatises, besides memoirs on the potato- blight, the multiplication of bulbous plants, the increase in diameter of dicoty- ledonous vegetables, and other subjects ; and Réfutation de toutes les Objcetions contre les nowveaua Principes Physiologique, 1852. See Biographie Universclic, t. xvi. 1856. ;

GAUERMANN, Friepricn (1807-1862), an Austrian painter, son of the landscape painter J acob Gauermann (1773-1848), was born at Wiesenbach

near Gutenstein, In Lower Austria, 20th September 1807. Tt was the intention of his father that he should devote himself to agriculture, but the example of an elder brother, who, however, died

early, fostered his inclination towards art, and though had enjoyed no special instruction his first — . copying nature were 80 successful that his father ‘we persuaded to permit him to choose a profession which seemed so much to accord with his natural bent. Under his father’s direction he began studies in landscape, and he also diligently copied the works of the chief masters in animal painting which were contained in the academy and court library of Vienna. In the summer he made art tours in the districts of Styria, Tyrol, and Salzburg. ‘Two animal pieces which he exhibited at the Vienna Exhibition of 1824 were regarded as remarkable productions for his years, and led to his receiving commissions in 1825 and 1826 from Prince Metternich and Caraman, the French ambassador. His reputution was greatly increased by his picture The Storm, exhibited in 1829, and from that time his works were much sought after and obtained correspondingly high prices. His Field Lubourer was regarded by many as the most noteworthy picture in the Vienna exhibition of 1834, and his numerous animal pieces have entitled him toa place in the first rank of painters of that class of subjects. The peculiarity of his pictures is the representation of human and animal figures in connexion with appropriate landscapes and in characteristic situations so as to manifest nature as a living whole, and he particularly excels in depicting the free life of animals in wild mountain scenery. Along with great mastery of the technicalities of bis art, his works exhibit patient and keen observation, free and correct lhand- ling of details, and bold and clear colouring. He died at Vienna, 7th July 1862. Many of his pictures have been engraved, and after his death a selection of fifty-three of his works was prepared for this purpose by the Austrian Awnst- veretn (Art Union).

GAUGE, in the mechanical arts, is the name applied to a great variety of instruments, of which the object may be broadly stated to be the affording of in- creased facilities for comparing any two dimensions or distances. Wherever it is necessary for this to be done with a degree of accuracy

unattainable by such means as the ordinary measuring rule affords, or for the same dimensions to be frequently measured with a maximum of speed and certainty, there will the hand-craftsman at once avail himself of some form of gauge. At the present day a due appreciation of the value of gauges is of growing importance to the mechanician, since they enable him greatly to improve the “ fit” of the several portions of his machinery, whilst at the same time the labour expended in fitting is materially reduced. Indeed the system of making all similar parts “ to gauge,” so that in any number of machines they are interchangeable, is now effecting more than any other single cause for the improvement and cheapen- ing of mechanical substitutes for manual labour.

The gauges which come within the province of this article differ in two maiu particulars, according as they refer the measurements which can be made by them to some definite and established standard of length, or take cognizance only of an arbitrary or haphazard one. The obvious advantage of being able to record, and at any time again obtain with certainty, the thickness of a plate of metal, or any other gauged dimension, would have led one to sup- pose that for all except mere temporary purposes the gauges used would invariably be of the first kind—Standard Gauges, as we shall distinguish them. But the fact is un- happily far otherwise, at least as regards the important manufactures of sheet metal and wire (which cannot be easily measured without some form of gauge), the result being that the thickness and diameters of these are expressed by vari- ous complicated and irregular series of numbers and letters which have no reference either to each other or to any standard system of measurement. Of these arbitrary

series the B.W.G. or Birmingham Wire Gauge may be taken as the type. The largest size of which it takes account is known as No. 0000, after which come 000, 00, 0, and then the numerals from 1 to 36, which last is the smallest size. It is frequently used for gauging the thick. ness of sheet metal as well as for wire, in spite of the ex. istence of the Birmingham Plate Gauge, which has an equally arbitrary series of its own, consisting of the same numbers (from 1 to 36) used in the reverse manner, the low numbers being the small sizes. Other arbitrary wire gauges also tend to add to the

general confusion, amongst which may be mentioned the Lancashire Gauge, which takes an alphabet and a half, in addition to the numerals up to 80, for expressing the sizes of steel wire which are referred to it, but which nevertheless does not apply to “ music wire,” or “needle-wire,” or sundry other special kinds of wire, which are favoured with separate gauges of their own. Of late years careful comparisons have more than once been independently made with a view to ascertaining the standard value of these incongruous systems, but the discrepancies in the results only prove what might have been predicted, viz., that errors have crept in, and that those which profess to be alike differ amongst themselves, whilst there exists no satisfactory means of rectifying these errors. Their gradual and entire abolition therefore seems to be the only chance of real improvement, and it is earnestly to be hoped that the Standard Gauge originally suggested by Sir J. Whitworth, which is now largely employed, may soon entirely supersede them. In this system the sizes are directly referred to the English imperial standard of length, each being expressed by the number of thousandth parts of an inch which it contains. Tlius No. 36 wire means wire ‘036 of an inch in diameter. Under the old systems this might have been either No. 20, No. 62, No. 3, or No. 18. .

Examples of some of the usual forms of gauges are given below. For wire the simplest gauge consists of a steel plate with a series of holes drilled through it, each hole being numbered according to the series to which the gauge re- fers. By means of the Notched Gauge (fig. 1) sheet metal can be gauged by a similar mode of obtaining a more or less accurate fit. Rough gauges on the same principle are constantly employed also in workshop practice for conipar- ing together internal or external diameters, &c.; and

they serve the purpose well enough so long as the object is a mere comparison, without taking account of the amount of any minute difference which may exist. When a measure ment of such differences is required, or direct reference to a standard system, recourse must be had to some form of gauge provided with means for enlarging them sufficiently te be readily recognizable. Sliding or Calliper Ganges, such as fig. 3, fulfil this requirement by having

the graduated scale affixed to one of their arms and a }

yernicr in connexion with the other. A V-gauge, which, instead of a series of notches round its edge, has only one long tapering notch, by the graduations of which the diameter of any wire that will enter it can be read off, is simple and tolerably efficient. So also is the kindred arrangement (fig. 5), in which a wire or plate can be inserted between a fixed pin and the edge of a revolving cam with graduated face. But perhaps on the whole the best and handiest form is the Micrometer Gauge (fig. 2), which, by means of a micrometer screw with a divided head, measures to the one-thousandth part of an inch, and in careful hands. can render visible even smaller fractions, Gauges consisting of two arms jointed together like pincers are also used in certain trades, minute differences in the width of the jaws being magnified and rendered visible on a, graduated arc at the opposite ends of the arms.

For special purposes gauges of many other forms are employed, some of which are of much greater delicacy, but these cannot be described here. The only others which remain to be mentioned are those of which the Plug and Collar Gauges (fig. 4) are the type, sets of which are now to be found in almost all mechanical workshops where the value of standard dimensions is recognized. Each gives ouly the one external or internal dimension for which it is made, but it gives that with the highest attainable accuracy, so that by carefully preserving a comparatively small uum- ber of these for reference, and using them in conjunction with measuring machines, the most minute differences can be measured and noted in terms of the standard, so that exact sizes can at any future time be again obtained with- out appreciable error. (Car. B.S)

GAUHATI, a town in Kamrup district, Assam, the chief town of the province, situated on the left or south bank of the Brahmaputra, lat. 26° 11′ 18” N., long. 91° 47’ 26” E. Gauhati, which is the most populous town in the Brahmaputra valley, was the seat of the British administra- tion of Assam up to 1874, when the headquarters were removed to Shillong in the Khasi hills, 67 miles distant, with which it is connected by an excellent cart road. Gauhdta is an important centre of river trade, and the largest seat of commerce in Assam. A regiment of native infantry is permanently cantoned there. Two much fre- quented places of Hindu pilgrimage are situated in the

immediate vicinity, the temple of Kamakhyd on a hill 2 miles west of the town, and tlie rocky island of Umananda in the mid-channel of the Brahmaputra. Population (1872), 11,492; municipal revenue, £2727.

GAUL, the name given by the Romans to the country lying between the Rhine and the Pyrenees. When the Greeks first became acquainted with the south-west of Europe they applied to the whole of it, in a somewhat vague sense, the term Celtice (7 KeArixy), calling its inhabitants Celts (KeAroi). Later we find Galatia (aAaria) and Gallia (Tarra), with the corresponding Galati (I'aAdroc) and Galli ([‘dXou), used as nearly synonymous with the earlier name. The shorter of these two forms the Romans adopted ; and in the opening chapter of Czesar's well-known Commentaries, we have our first definite account of the limits of the country and its divisions, as then understood. According to this authority, Gaul was in his day divided among three peoples, more or less distinct from one another, the Aquitani, the Gauls, who called themselves Celts, and the Belge, The first of these extended from the Pyrenees to the Garumna (Garonne) ; the second from that river to the Sequana (Seine) and its chief tributary the Matrona (Marne), reaching eastward presumably as far as the Rheuus (Rhine) ; and the third from this bounding line to the mouth of the last-named river, thus bordering on the Germans. By im- plication Cesar recognizes a fourth division, the Provincia,

lying to the south in the basin of the Rhodanus (Rhone), and stretching westwards as far as Tolosa (Toulouse) in the basin of the Garonne—a portion of Gaul that had been subdued aud made a Roman province about fifty years before Ceesar entered on his career of conquest there. By far the greater part of the country was a plain watered by numerous rivers, the chief of which have already been nientioned, with the exception of its great central stream, the Liger or Ligeris (Loire). Its principal mountain ranges were Cebenna or Gebenna (Cevennes) in the south, and Jura, with its continuation Vosegus or Vogesus (Vosges), in the east. The tribes inhabiting Gaul in Cesar's time, and belonging to one or other of the three races distinguished by him, were numerous. Prominent among them, and dwelling in the division occupied by the Celts, were the Helvetii, the

Sequani, and the A‘dui, in the basins of the Rhodanus and its tributary the Arar (Saéne), who, he says, were reckoned the three most powerful nations in all Gaul ; the Arverni in the mountains of Cebenna; the Senones and Carnutes in the basin of the Liger; the Veneti and other Armorican tribes between the mouths of the Liger and Sequana. The Nervii, Bellovaci, Suessiones, Remi, Morini, Menapii, and Aduatici were Belgic tribes; the Tarbelli and others were Aquitani; while the Allobroges inhabited the north of the Provincia, having been conquered in 12 iene:

The ethnological relations of Cesar’s three great Gallic races have given rise to much discussion. Greek writers, who, in consequence of the planting of the colony of Massilia (Marseilles) on its southern coast at so early a period as 600 B.c., had gained some knowledge of Gaul before the Romans, speak of its inhabitants as Ligurians ; and it is certain that a people of this name occupied at one time the coast-line of Europe from the western slopes of the maritime Alps to the Rhone. By many these Ligurians are regarded as having once spread then:- selves over a much wider area, peopling extensive tracts of Europe as well as Northern Africa, Subsequently, another race, coming probably across the Pyrenees from Spain, subdued south-western Gaul and ruled as far north as the Garonne—the Basques of the two slopes of these mountains remaining to our own day their lineal represen- tatives. Later still, but at a date which history does not venture to fix, one of those great waves of population that are believed to have rolled in succession from east to west brought into northern and central Gaul, it may be at an interval of centnries, the two great branches of the Celtic race, the Gadhelic or Gaelic and the Cymric—the one re- presented in Britain by the Irish and Scottish Highlanders, the other by the Welsh. Reading Cexsai’s brief statements by the light thus afforded, ethnologists now generally hold that his Aquitani were Iberians, largely intermingled with intrusive Gauls ; that his Gauls belonged to the Gaelic division of the Celtic race, and his Belge to the Cymric (both of them, however, being affected by the presence of races whose territory they had overrun, and the latter by the addition of a German element derived from their prox- imity to the Rhine); and that the natives of the Provincia were Ligurians, with so large an intermixture of Celts as to make the latter the dominant: race. Neither the Greek colony of Massilia, nor those colonies sent out by it, can be supposed to have seriously affected the Gaulish nation from the point of view we are

now discussing. It was in a different manner, as a civilizing agency, that they made their presence felt. ;

Such, it would appear, was Gaul ethnologically when made a part of the Roman empire by Julius Cesar shortly before the commencement of the Christian era ; and, as has often been remarked, such in the main it is still. Some recent scientific inquirers find grounds, however, for con-

cluding that the opinion, so prevalent not only in England but in France itself, that the physical and mental character- istics of the modern Frenchman are chiefly derived from the ancient Gauls, is only in part well founded. The Gauls, they say, like the Romans after them, were strong enough to impose their language on a race or races they had sub- jugated ; but in the attempt to absorb them they themselves have suffered and continue to suffer so much tliat the day may yet come when the older race will all but regain its superiority. Slowly but surely, according to the researches of M. Roget, Baron de Belloguet, the blue-eyed, fair-haired, long-headed Celt has for many generations been giving place throughout France, in a direction proceeding from south to north, to a more ancient, dark-eyed, black-haired, round- headed man—a similar phenomenon being also noticeable among the Germans.

Nortliern Italy, in consequence of an intrusion of Gauls at some early date, received from the Romans the name of Gallia Cisalpina or Citerior, to distinguish it from Gaul proper, called also Gallia Transalpina or Ulterior. After- wards when the Roman element gained the upper hand, Togata was sometimes substituted for Cisalpina ; while in contradistinction, Gallia Braccata was applied to the Pro- vincia from the dracce or trousers worn by the natives, and Gallia Comata to the rest of the country, from the inhabi- tants wearing their hair long. The Gaulish emigrations into Spain on the one hand, and into Britain on the other, scarcely come under the present article; still less can we refer here to the inroads of that restless race into various parts of eastern Europe and western Asia. But it may be remarked in passing that so extensive were the con- quests of the Gauls that, in the beginning of the third century before our era, their empire, if much less

com- pact, was scarcely less extensive than that of Rome in lier palmiest days.

For some time after the death of Cesar little attention could be paid to Gaul by the ruling powers at Rome; but in 27 B.c. Augustus, now master of the Roman world, took measures to Romanize it thoroughly. The old division into four provinces was retained, and made subservient to ad- ministrative purposes, The Provincia, however, received the name of Gallia Narbonnensis, from the Roman town of Narbo (Narbonne); the boundaries of Aquitania were extended to the Liger ; what remained of Cesar's Gauls were constituted the province of Gallia Lugdunensis, so named from its capital, the new settlement of Lugdunum (Lyons); and the northern division was called Gallia Belgica. This arrangement remained nearly unchanged till the 4th century, when the four provinces were broken up into seventeen, each with a capital and a number of other towns of more or less importance, the names of which may be found in the larger geographical and historical works that treat of the period. While an integral part of the Roman empire Gaul often played no mean part in the con- tests that took place for the imperial purple; and it was oun one of these that Claudius Civilis, a Romanized rit. et a en om attempt to achieve the independence = me Be hi is st however, were not supported md Ves Ss of the people, and the movement was crushed

y Vespasian. Perhaps the most noteworthy event of those centuries was the insurrection of the Bagaudee or peasant fm ie Teen of Diodetan | Ruined and driven

a of the imperial treasury, men scoured the country in marauding bands, plundering whole- sale. Though the revolt was suppressed, the lesson it ought to have taught Rome was unheeded, and thus the seeds of future troubles remained in the soil. Jn the declining days of the empire Gaul became a prey to the Visigoths in the south, the Burgundians in the east, and the Franks in the north-east. When order had arisen out of the confusion

that ensued, the country was found to have taken under a new name a still more conspicuous place in the political system of Kurope.

What is known of the ancient religion of the Gauls will befound under Drurvism (vol. vil. p. 477), and brief notices of their institutions and customs, as well as some particulars regarding the introduction of Christianity among them, are given in the article FRANCE (vol. ix. p. 527).

See Dom Martin, La Religion des Gaulots, Paris, 1727, 2 vols. 4to; Pelloutier, Hist. des Celtes, Paris, 1771, 2 vols. 4to; D, Schepflinus, Vindiciwe Celtice, Strasburg, 1754, 4to; Amédée Thierry, Hist. des Gaulois, Paris, 1828, 3 vols. 8vo; Henri Martin, Hist. de France, vol. i., Paris, 8vo; Walckenaer, Géographie An- eienne historique et conparée des Gaules Cisalpine et Transalpine, Paris, 1839, 3 vols. 8vo; Ukert, Geographie der Griechen und Rimer, vol. ii., pt. ii, Weimar, 1832; Holtzman, Kelten und Germanen, Heidelberg, 1855, 8vo; Article "' Gallia" (by G. Long), in Dr W. Smith's Dictionary of Greek and Roman Geography, vol. i., London, 1869, 8vo; Roget, Baron de Belloguet, Ethnogénic Gauloisc, Paris, 1868-1875, 4 vols. 8vo; E. Desjardins, Géographie historique et administrative de la Gaule Romaine, Paris, 1877, 4 vols, 8vo. (J. M'D.)

GAUNT, Joun or. See Lancaster, DUKE or.

GAUR, or, more commouly, Gour, the name of a medi- wval city in Bengal, of which the scattered relics cover a large area in the district of Malda, commencing not far south of the modern civil station of that name.

The name Gaur is a form of the ancient Gauda (meaning the country "of sugar"), a term which was applied toa large part of modern Bengal, and specifically to that part in which these remains lie. We have the names of dynasties, and partial lists of the kings of these dynasties, which bore the title of Gaureshara, lord of Gaur, or Gauda, before the first Mahometan invasion. The last of these dynasties, that of the Senas, or of the Vaidyas, superseded its pre- decessor, the dynasty of the Palas, about the middle of the 11th century. The most eminent of this dynasty, by name Lakshmanasena, who flourished at the end of the century, is alleged in inscriptions to have extended his conquests to Kanauj (in the Doab), to Nepaul, and to the shores of Orissa ; and this king is said by tradition to have founded the royal city in Gauda which in later days reverted toa form of tllis ancient name (Gaur), but which the founder called after his own name Lakshmanavati, or as it sounded in the popular speech Lakhnaote.

The fifth from tlus king, according to Lassen's (more or less imperfect) list, Laksh- maniya (c. 1160-1198), transferred the royal residence to Navadvipa, hod. Nadiya (on the Hoogly river 70 miles above Calcutta), possibly from apprehension of the rising tide of the Mahometan power; but here it overtook him. Nadiya was taken about 1198-99 (the precise date is dis- puted) by Mahommed Bakhtiyar Khilji, the general of the slave king Kutbuddin Aibak of Delhi, who became esta- blished as governor of Bengal, and fixed his capital at Lakhnaoti. Here lie and his captains are said to have founded mosques, colleges, and monasteries. Lakhnaoti continued for the most part to be the seat of the rulers who governed Bengal and Behar, sometimes as confessed dele- gates of the Delhi sovereigns, sometimes as practically independent kings, during the next 140 years, From about the year 1338, with the waning power of the Delhi dynasties, the kingdom of Bengal acquired a substantive independence which it retained for more than two centuries. One of the earliest of the kings during this period, by name lliyés (Elias) Shah, whose descendants reigned in Bengal with brief interruptions for nearly 150 years, transferred the seat of government to Pandua (c. 1350), a place about 16 miles N. by E. of Gaur, and to the neighbouring fortress of Ekdala, a place often named in Mahometan notices of the history of Bengal down to the 16th century. At Pandua several kings in succession built mosques and shrines, which still exhibit architecture of an importance

unusual in Bengal proper. After some occasional oscilla- tion the residence was again (c. 1446) transferred to Gaur, by which name the city is generally known thenceforward, that of Lakhnaoti disappearing from history. The 24th and last of those wliom history recognizes as independent kings of Bengal was Mahmud Shah (1533-4 to 1538-9). In his time the city more than once changed hands, during the struggles between the Afghan Sher Shah and the (so-called)

" Great Moghul" Humayun, son of Baber; and on one occa- |

sion (1537-8), when Sher Shah was operating against Gaur, we first hear of the Portuguese in the inner waters of Bengal. A party of that nation, who had been sent with presents to the court of Gaur, had been detained as

prisoners by the suspicious Mahmud. But in the straits arising during his resistance to Sher Shaéh, the Frank prisoners were able to render him good service.

Mahmud was followed by several Pathan adventurers, who temporarily held the provinces of the delta with more or less assertion of royal authority. Onv of these, Suleiman Kirani (1564-5), abandoned Gaur for Tanda, a place some- what nearer the Ganges. It is mentioned by Ralph Fitch, the earliest of English travellers in India, who calls it ‘Tanda in the land of Gouren,” standing a league from the Ganges. Mu’nim Khan, Khankhandn, a general of Akbar’s, when reducing these provinces in 1575, was attracted by the old site, and resolved to re-adopt it as the seat of local government, But a great pestilence (probably cholera) broke out at Gaur, and swept away thousands, the general- in-chief being himself among the victims. On his death the deprived Pathdn prince, Daud, set up his standard again. But he was defeated by the forces of Akbar ina battle at Rajmahl, and taken prisoner. After him no other assumed the style of king of Bengal. Tanda continued for a short time to be the residence of the governors under the “Great Moghuls,” but this was transferred successively to Rajmahl and Dacca, in repeated alternation, and finally to Moorshedabad. Gaur cannot have been entirely deserted, for the Nawab Shuja-uddin, who governed Bengal 1725-1739, built a new gate to the citadel. Butin history Gaur is no longer heard of, till its extensive remains attracted the curiosity of the English,—the more readily as the northern end of the site approaches within 4 miles of the important factory that was known as English Bazar (among the natives as AngrezAbad), which is said to have been built of bricks from the ruins, and which is now the nucleus of the civil station of Malda.

The first specific notice of the city of Gaur, from actual knowledge, is contained in the Persian history called Tabagdt-t-Nasirt, which has been partially translated in Elliot’s History of India (ed. by Dowson), and is in course of complete translation by Major H. G. Raverty. The author, Minhaj-i-Sardj, visited Lakhnaoti in 1243, but the only particular regarding the city that he mentions is that Ghiyds-uddin “Iwaz, the fourth Mahometan ruler of Lakhnaoti (who called himself sultan, and according to this writer, struck coin in his own name), besides found- Ing mosques, &c., carried embanked roads across the low couutry east and west of the city for a space of ten

days’ journey. These works in part still exist. “Radiating north, south, and east of the city,. . . . embankments are to be traced running through the suburbs, and extending in certain directions for 30 or 40 miles” (Ravenshaw, p. 3).

The extent of ground over which the remains of Gaur are spread is astonishing; and a large part of it would appear to be still, as when described a century ago, covered with dense wood or with rank jungle of grass and reeds, though in later years cultivation has somewhat extended over the site. What may be called the site of Gaur proper 18 @ Space of an oblong form, extending from north to south 74 miles, with a breadth varying from 14 to 2 miles, This

‘been well protected by the Ganges .. .

area is washed on one of its long sides (the western) by a stream called the Bhagirathi, which undoubtedly occupies a former bed of the Ganges (not to be confounded with the Bhagirathi further south, contributing to form the Hoogly on which Calcutta stands). Roughly parallel to the eastern side, but at a distance varying from 2 to 6 miles, runs the

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Chart of Gaur and its Environs.

river Mahdnanda, whilst extensive swamps and sheets of water are interposed between this river and the city. The extensive area of which we speak has been defended on north, west,! and south, by a rampart and ditch, whilst on the east side there is a double embankment of great size, with two ditches of immense width, and in some parts three. It is not quite clear from the descriptions in what degree these latter great works were intended respectively for defence or for protection from floods; but the latter must have been the main purpose. The Ain-i-Akbari (c. 1590) alludes to the fact that “ if the earthen embankment broke, the town was under water.” The position of the city, midway between two rivers of deltaic character, is low, and any rise in those rivers would raise the level of the marshes. Still the mass of these banks, as much as 200 feet thick at base, and 40 feet in height, is greater than any present exposure to flood seems sufficient to explain. It

has sometimes been supposed that the Ganges, since the

foundation of Gaur, has flowed to the eastward, in what is now the bed of the Mahdnanda. If this were so, the massive character of the embankments would be more intelligible. It would appear, however, that the positive

testimony to this circumstance, which was at one time sup- posed to exist, depended on a mistaken reading of the pass- age, referred to above, of the Zabaqdt-r-N dsit. i 1 This was so according to Buchanan ; ‘but Mr Ravenshaw says

“the western face is now open, and probably always was 80, having . which ran under its walls.

The plans ald show an embankment on this side, and Creighton gives a section of it, 30 feet high. X. — 15

These great embankments have been originally faced throughout with masonry, whilst the crest shows numerous traces of edifices; but the whole of the earthworks are now overgrown with dense jungle. The Ganges now flows at a distance varying between 5 and 12 miles to the west of the enclosed area of the city, but there seems to be no doubt than in the earlier centuries of its occupation the great river washed its western wall, where now the Bhagirathi flows.

On this side, near the southern end, stood the citadel or royal fortress, stretching for a mile along the river bank, and marked out by the remains of a huge rampart of irregular trace, 180 feet wide at the base, and once faced with masonry, with numerous circular bastions. Shapeless masses of ruin fill the interior. The palace itself formed a rectangular inuer enclosure of 2100 feet by 750, girt by a splendid brick wall, 18 feet thick at bottom, 84 feet thick at top, and 42 feet in height. To the northward the western embankment is prolonged far beyond the northern limit of the city, and about 3 miles north of the latter we encounter a vast line of earthwork stretching from the prolongation just mentioned, in an irregular curve eastward and then south-eastward to the vicinity of the Mahdnanda river, in all for more than 6 miles. This also was probably intended chiefly as a defence against inundation of the suburbs. A huge excrescence protruding from the line, and overgrown with forest trees, encloses an area of nearly a square mile, which tradition points out as the palace of one of the Senakings. Still north of this, and extending to the banks of the Kalindri river, some 3 miles further, are found traces of ancient Hindu buildings.

Turning again to the southern extremity of Gaur, for 6 or 7 miles to the south of the city there seems to have ex- tended, still under the protection of a western embankment, a continuous chain of suburbs. Inthe northern portion, at least, of these, “prostrate domes, mingled with carved lintels and innumerable bricks, are seen lying in confusion on all sides, and show how dense has been the population” (Ravenshaw, p. 26). Thus from north to south, the whole extent of ground bearing indications of urban occupancy is hardly less than 20 miles. We may, however, feel confident that, as in the case of Delhi, these traces comprehend a space within which the royal city

occupied various localities in various ages. ‘Traditions, collected by Dr Francis Buchanan, placed the residence of the older Sena kings on the sites at the extreme north near the Kalindri. The southern part of the fortified area of Gaur, with the citadel and palace, was evidently, as we shall see from the dates of the buildings, the seat of the later kings who immediately preceded the absorption of Bengal into the Moghul empire in the last half of the 16th century. The exact side oceu- ae by Mahommed Bakhtiydr Khilji and his successors

oes not seem to have been determined.

Throughout the interior length of Gaur run embanked roads, whilst the whole area is thickly dotted with excavated ta all sizes, up to the great Sdégar Dighé (or “ Ocean

), @ rectangular sheet of water measuring little short of a mile by half a mile, This vast work is probably to be referred to the Hindu age. The former existence of six ghauts of masonry can be traced on its banks, which are densely wooded to the water’s edge. Numerous excavated channels also run in every direction, the earth from seth appears to have served to raise the inhabited surface. The remaining buildings of importance are scattered at wide intervals over the area, but the soil is throughout covered with fragments of brick, &c., in a manner which leaves i doubt of the former density of population. But Gaur fe repeatedly been a quarry of building material. The old Lakhnaoti was robbed to build the mediaval capital of Pandua, and the later Gaur probably to build Rajmahl,

whilst in more recent times their brick and stone were transported as merchandise to Malda, Moorshedabad, Hoogly, Rungpore, and even (as regards the more valuable kinds of stone) to Caleutta, In the revenue returns of Bengal, at the time of its transfer to the Company, there was an entry of an annual levy of 8000 rupees, as “ Gaur brick royalty,” from landholders in the neighbourhood of Gaur who had the exclusive right of dismantling its remains. The bricks of Gaur, Rennell says, are of extraordinary solidity of texture and sharpness of edge. The facilities which the site affords for water carriage during tlie rainy season greatly aided this systematic spoliation,

That no Hindu buildings remain from the earlier cities is probably to be accounted for by this process of destruction.

We have quoted a Mahometan visitor to Gaur in the middle of the 13th century. The next such mention per- haps occurs in the travels of the Venetian Nicolo Conti, who somewhat early in the 14th century ascended the Ganges 15 days' voyage to a city of great size and wealth called Cernove. On both banks of the stream were most charming villas, and plantations, and gardens. The name looks like Shahr-i-nao, which we know from coins to have been the name of a royal city of Bengal about 1380-85, and which Mr Ed. Thomas believes to have been merely that given to one of the re-foundations of Gaur. A more detailed and certain account is given by De Barros, when describ- ing the adventures of the Portuguese party in 1537-38, to which allusion has been made above (dee. iv. liv. ix. cap. i.):—

''The chief city of this kingdom (of Bengala) is called Gouro. It is situated on the waters of the Ganges, and is said to be three of our leagues in length, and to contain 200,000 inhabitants. Ou the one side it has the river for its defence, and on the landward faces a wall of stone and lime of great height, besides having, where the river comes not, a great ditch full of water, in which great boats can swim. The streets are broad and straight, and the main streets have trees planted in rows along the walls, to give shade to the passengers. And the population is so great, and the streets so thronged with theconcourse and traffic of people, especially of such as come to present themselves at the king's court, that they cannot force their way past one another, and thus such as hap to fall among the horsemen, or among the elephants which are ridden by the lords and noblemen, are often killed on the spot, and crushed under the feet of those beasts. A great part of the houses of this city are stately and well wrought buildings."

The earliest detailed notice of the ruins that we hear of isa MS. one, by Mr Reuben Burrows, the mathematician (1787), which is quoted by the editor of Creighton's drawings as being in the India Library. Rennell gives some account of the ruins in his Memoir of a Map of Hindustan (1788), and the plan of them is roughly laid down, ona small scale, in his Bengal Atlas (No. 15). Mr Henry Creighton, who for many years managed an indigo factory among the ruins (1786-1806), made many drawings of them, with notes and

a detailed map, on a large scale. Dr Buchanan states that engravings from Creighton's drawings had been published by a Mr Moffat in Calcutta before the compilation of his own statistical work. Of this we have seen no copy. It is probably the same as "the set of eight views of the ruins of Gour and Rajmehal," which is advertised in the Calcutta Gazette, 6th December 1798 (see Seton-Karr's Selections, vol, iii, p. 529). A work, however, was published in London in 1817, from the materials left by Mr Creighton, called the Ruins of Gour Described, &c.; and this contained the most accessible data on the subject till Mr Ravenshaw's work. There is in the India Office a MS. volume (1810) by Major William Francklin of the Bengal army, containing notices of the remains and translations of a good many

F 1 So in De Barros, Lisbon edition of 1777, vol. viii. p. 458,

duzentos mil vizinhos." But in the English version of Faria y Sousa's Asia Portuguesa by Stevens (1695), i. p. 417, a passage abridged from De Barroshas ''one million and two hundred thousand families." 'The last word is probably a mistranslation, but the milion seems required,

Cea

inscriptions. The MS. purports to have been accompanied by maps and drawings, but these are not now forthcoming. Dr Francis Buchanan has described the remains, with his usual somewhat dry precision, in his statistical survey of northern Bengal and Behar, executed between 1809 and 1816, but only published, with a title-page that bears the name of Montgomery Martin, and no reference to the real author, in 1838 (astern India, &c., vol. ili. pp. 68 sq.).

MrJames Fergusson has a short chapter, containing the only

critical account of the architecture of Gaur, in his Hzstory of Indian Architecture. Lastly, since the greater part of this article was compiled, there has been published a splendid volume (Gaur: tts Ruins and Inscriptions, 4to) from the photographs and notes of the late J. A. Raven-shaw of the Bengal Civil Service.

Before concluding we may indicate a few of the most notable remaining buildings.

1. One of the most pleasing remains, as regards architectural design, is a minaret or tower of stone and brick, standing imme- diately west of the citadel, It is 84 feet in height and 21 in diameter at the base. For two-thirds of the height the form is that of a 12-sided polygon, and above that circular, the two forms being divided by a bold cornice. There is now no inscription attached, but tradition assigns it to Firoz Shah, and a native history of Bengal compiled in the last century attributes it specifically to a king of that name, who reigned 1488-1490. Mr Fergusson indeed considers the architecture to belong to an earlier period; and it is remarkable that the researches of Mr E. Thomas in coins, and of the late Mr Henry Blochmann in lapidary inscriptions, have recently established the existence of a King Shamsuddin Firoz, whose coinage at Lakhnaoti shows his reign to have extended from, 1302to 1318. Ifthe work be really due to this prince, it is by much the oldest building of importance now remaining at Gaur. But the point is very doubtful.

2. The Ddkhil Darwdza, or Gate of Entrance, is the northern gate of the citadel. It isa noble structure, though entirely built of small bricks. The tunnel under the rampart is 112 feet long by 14 wide, and the height of the archway is 34 feet. An inscription copied by Francklin ascribes the work to Barbak Shah, and the erection to 1466. The grandiose palace wall is believed to be of the same period.

3. The Lattan(?), or the Painted Masjid, a quadrangular edifice in the southern part of the city, cased inside and out with bricks beautifully enamelled in blue, green, and white. It is covered by one large dome. The work is ascribed to 1470-1481.

4, The Ténti-Pdra Masjid, or Mosque of the Weaver’s Quarter. This is now much dilapidated, but Ravenshaw’s photograph indicates it to have been one of the most beautiful buildings in Gaur. The niched panels in carved brickwork which adorn its piers are very rich and delicate. It is also, if an inscription given ae be justly assigned to it, the work of Yusuf Shah,

5. The Sona Masjid, or Golden Mosque. This is probably the most important structure remaining at Gaur. It stands in the city to the north of the citadel, within a spacious court enclosed by a stone wall. The matcrial is described as a dark grey stone, approaching to black, with sculpture in beautiful flower-work The mosque measures 180 feet. by 80, and the interior architecture consists of massive intersecting arcades, each intersection being covered by a dome, of which domes there were 44 altogether. In spite of the extraordinary solidity of the building it appears to have suffered greatly since Francklin described it in 1810. The date is fixed by aninseription which existed in his time to 1525.

6. Tombs of Shah Husain (d. 1521), and of his son Nasrat Shah, the builder of No. 5 (d. 1533-34). Of the tombs themselves nothing remains, and their materials are said to have been carried, to Fort William in the last century. In Creighton's time, though the tomb of Husain Shah was already gone, there remained a beautiful edifice which had formed the gateway of the enclosure, faced with brick-work richly moulded, and glazed with blue and White. Of Shah Husain (reigned 1494-1521) Dr Blochmann says,

Whilst the names of other Bengal kings scarcely ever occur in legends, and remain even unrecognized in the geographical names of the country, the name of 'Husain Shah the Good' is still remembered from the frontier of Orisa to the Brahmaputra"" (Proc. As. Soc. Bengal, 1873, p. 291).

7. The mosque of the Qadam Rasul, or Footstep of the Prophet, so named from a representation of Mahomet's footmark in stone

Hein was formerly eushrined there. 'The work of Nasrat Shah,

We thus see that all the buildings, with the very doubtful exception of the minaret, go back no further than the last half

of the 15th century. If the age of the architecture is dis- appointing, the better knowledge of details which we derive from Mr Ravenshaw's book enhances our appreciation of it. The buildings are in brick, in stone, and in both combined. Excepting the great gateways, they lack height enough for

stateliness; the character is rather decorated solidity. The facades generally present a series of pointed arches, with very massive piers between, which are sometimes compli- cated polygons, but more usually rectangular; the mould- ings have little relief, but the surfaces are adorned with panels filled with beautiful ‘embossed brick-work.” These seem to be rich floral patterns moulded in terra cotta, and probably finished with the chisel. The curvilinear roof, imitated from the use of the bamboo, of which Mr Fergusson speaks as an unpleasing characteristic of architecture in Bengal, is little seen in Gaur,—almost the only indication of it being a slight upward camber in the upper lines of the facade, in which the versed-sine is about »\5th of the chord. In some of the buildings great brilliance has been produced by the profuse use of encaustic tiles in bright colours. The art of making these exists now in India nowhere nearer than in Sind; but indeed the manufacture of terra cotta, or of ordinary brick of the superior character which Reunell attributes to Gaur, is equally a lost art in Bengal. Where the facing is entirely of stone, as in the Great Golden Mosque, and in a smaller one bearing the same name, the ornamentation seems imitated from the terra-cotta work ; the relief, however, is much less, owing probably to the hardness of the material. What this material is, or whence, is not quite clear. The older accounts speak of black and other marbles; Buchahan and later writers of “black hornblende,” ‘potstone,” and what not; Mr Ravenshaw, in the case of one building, of “granite and marbles.” The black stone is probably basalt from the Rajmahl hills, but more precise information is desirable,

In conclusion, we may notice briefly the other neighbour- ing sites occupied as capitals, which may be regarded as appendages of Gaur.

Pandua, commonly called Parruah or Porruah, was so occupied, with occasional intervals, for nearly acentury. Its ruins and tanks extend over a narrow area of nearly 6 miles in length, which is now more of a wilderness than even the site of Gaur. The high road from Malda to Dinajpore passes through it from end to end, but the forest which besets the ruins is so dense on both sides, and so infested with tigers, that single travellers shun the road by night. Mr Ravenshaw employed a gang of 200 men to clear the jungle for his photographs, but even then could only get partial views. The buildings exhibit the same general character as at Gaur, but most of them

are older, and seem (for most of them are absolutely overgrown and penetrated by jungle-growth) to showthe style in afreer and purer form. Many of them also contain fragments of older Hindu build- ings, very probably pillaged from old Lakhnaoti. By far the finest and most important building in the whole Gaur group of cities, and indeed in Bengal, is the Adina mosque at Pandua, standing close to the high road. Itis a quadrangular cloister of two stories, measur- ing externally 500 feet by 300, of brickwork faced throughout with ‘black hornblende.” The cloisters are divided by pillars into inter- secting aisles, and each intersection has been covered by a dome. Of these domes there have been originally 375, but most have fallen. According to Buchanan’s description the carved windows have been borrowed from Buddhist structures, but judging from the poor draw- ings which he gives,and from the photographsof Mr Ravenshawmade under great difficulties, the combination has been carried out with good artistic effect. The edifice must no doubt be monotonous, but from what we can see is far from deserving the condemnation which Buchanan passes on it. The Adina is the work of Sikandar Shah, the son of Iiyds (1858-1890), and his tomb is in an adjunct of the mosque. There isa curious notice of it in Valentijn’s (Dutch) East Indies (v. p. 169). ,

Ekddlah, which was the fortified retreat of the kings who ruled at Pandua, has been lately identified by Mr E. Vv. Westmacott, as still bearing the name, near Chiramon, in the Dinajpore district, about 20 miles north of Pandua. It stands on high ground rising like an island out of the inundated plain; it exhibits traces of embankments and buildings, and is about 5 miles distant from one of the ancient embanked roads running towards Pandua and pa Tanda, the last city of the Gaur group occupied as a capital, stoo

i rest of the citadel of Gaur, as may be gathered from ee at Dr Hunter (New Statist. Acc. of cad eurg vii. p. 65) says its very site has not been accurately SE It is possible that it may have been cut away by the waters of ! f Ganges, a branch of which has flowed near; but 1 oe ed a evidently visited it, and Creighton marks the rampart roughly in his map of Gaur. Jannatdbdd was a name given by Humayun to Gaur : and other names of royal cities appear on coins, such as Firuzdbad, Husaindbdd, Shahr-t-nao, &e., which are

probably names officially attached to new foundations of portions of the great Gaur group of cities, but which gained no popular currency.

In addition to the works quoted in this article, the papers of Mr E. Thomas and Mr H. Blochmann in the journals of the Royal and Bengal Asiatic Societies have been consulted. (H. Y.)

GAUSS, Cart Frrepricu (1777-1855), an eminent German mathematician, was born of humble parents at Brunswick, April 23, 1777, and was indebted for a liberal education to the notice which his talents procured him from the reigning duke. His name became widely known by the publication, in his twenty-fifth year (1801), of the Dis- quisitiones Arithmetice. In 1807 he was appointed director of the Géttingen observatory, an office which he retained to his death: it is said that he never slept away from under the roof of his observatory, except on one occasion, when he accepted an invitation from Humboldt to attend a meeting of natural philosophers at Berlin. In 1809 he published at Hamburg his Zheoria Motus Corporum Ceeles- tinm, a work which gave a powerful impulse to the true methods of astronomical observation ; and his astronomical workings, observations, calculations of orbits of planets and comets, &c., are very numerous and valuable. He continued his labours in the theory of numbers and other analytical subjects, and communicated a long series of memoirs to tlie Royal Society of Sciences at Gottingen. His first memoir on the theory of magnetism, Jntensitas ws magnetice terrestris ad mensuram absolutam revocata, was published in 1833, and he shortly afterwards proceeded, in conjunction with Professor Wilhelm Weber, to invent new apparatus for observing the earth's magnetism and its changes; the in- struments devised by them were the declination instrunient and the bifilar magnetometer. With Weber's assistance he erected in 1833 at Gottingen a magnetic observatory free from iron (as Humboldt and Arago had previously done on a smaller scale), where he made magnetic observations, and from this same observatory he sent telegraphic signals to the neighbouring town, thus showing the practicability of an electromagnetic telegraph. He further instituted an asso- ciation (Magnetische Verein), composed at first almost en- tirely of Germans, whose continuous observations ou fixed term-days extended from Holland to Sicily. The volumes of their publication, Mesultate aus der Beobachtungen des Magnetischen Vereins, extend from 1836 to 1839; and

in those for 1838 and 1839 are contained the two important memoirs by Gauss, Allgemeine Theorie der Erdmagnet- amus, and the Allgemeine Lehrsdtze—on the theory of forces attracting according to the inverse square of the distance, The instruments and methods thus due to him are substantially those employed in the magnetic observa- tories throughout the world. He co-operated in the Danish and Hanoverian measurements of an are and trigonometrical operations (1821-48), and wrote (1843, 1846) the two memoirs Veber Gegenstinde der héhern Geodésie, Connected with observations in general we have (1812-26) the memoir Theorva combinationis observationum erroribus minimis obnoxia, with a second part and a supplement. Another memoir of applied mathematics is the Dioptrische Unter- suchungen, 1840. Gauss was well versed in general litera- ture and the chief languages of modern Europe, and was a member of nearly all the leading scientific societies in Enrope. He died at Gottingen early in the spring of 1855,

The centenary of his birth was celebrated (1877) at his native place, Brunswick.

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Gauss's collected works have been recently published by the Royal Society of Gottingen, in 7 vols. 4to, Gott., 1863-71, edited by E. J. Schering,—(1) the Disquisitiones Arithmeticee, (2) Theory of Numbers, (3) Analysis, (4) Geometry and Method of Least Squares, (5) Mathematical Physics, (6) Astronomy, and (7) the Theoria Motus Corporum Ceelestium. They include, besides his various works and memoirs, notices by him of many of these, and of works of other authors in the Gottingen gelehrte Anzeigen, and a con- siderable amount of previously unpublished matter, Nach- lass. Of the memoirs in pure mathematics, comprised for the most part in vols. ii., iii, and iv. (but to these must be added those on Attractions in vol. v.), it may be safely said there is not one which has not signally contributed to the progress of the branch of mathematics to which it belongs, or which would not require to be carefully analysed ina history of the subject. Running through these volumes in order, we have in the second the memoir, Swmmatio quarun- dam serierum singularvum, the memoirs on the theory of bi- quadratic residues, in which the notion of complex numbers of the

form a+07 was first introduced into the theory of numbers; and included in the Wachlass are some valnable tables. That for the conversion of a fraction into decimals (giving the complete period for all the prime numbers up to 997) isaspecimen of the extraordinary love which Gauss had for long arithmetical calculations; and the amount of work gone through in the construction of the table of the number of the classes of binary quadratic forms must also have been tremendous. In vol. ili. we have memoirs relat- ing to the proof of the theorem that every numerical equa- tion has a real or imaginary root, the memoir on the Hypergeometric Series, that on Interpolation, and the memoir Determinatio Attractionis—in which a planetary mass is considered as distributed over its orbit according to the time in which each portion of the orbit is described, and the question (having an implied reference to the theory of secular perturbations) is to find the attraction of such a ring. In the solution the value of an elliptic function is found by means of the arithmetico-geometrical mean. The Nachlass contains further researches on this subject, and also re- searches (unfortunately very fragmentary) on the lemniscate- function, &c., showing that Gauss was, even before 1800, in possession of many of the discoveries which have made the names of Abel and Jacobi illustrious. In vol. iv. we have the memoir Allgemeine Auflésung, on the graphical representation of one surface upon another, and the Dis- quisitiones generales circa superficies curvas. And in vol. v. we have a memoir On the Attraction of Homogeneous Ellip- soids, and the already mentioned memoir Allgemeine Lehr- sdtze, on the theory of forces attracting according to the inverse square of the distance, A. CA.)

GAUSSEN, Francors SamueL Rosert Louis (1790- 1863), a Protestant theological writer of some repute, was born at Geneva on the 25th of August, 1790. His father Georges Marc Gaussen, a member of the council of two hun- dred, was descended from an old Languedoc family which lad been scattered at the time of the religious persecutions in France. At the close of his university career, Louis was ordained in 1816 to the ministry of the Swiss Reformed Church at Satigny near Geneva, where he formed intimate relations with J. E. Cellérier, who had preceded him in the pastorate, aud also with the members of the dissenting con- gregation at Bourg-de-Four (Kglise du temoignage), which had been formed under the influence of the preaching of the Haldanes in 1817. In 1819 he published in

conjunc- tion with Cellérier a French translation of the Second Helvetic Confession, with a preface expounding the views he had reached upon the nature, use, and necessity of con- fessions of faith; and in 1830, for having discarded the official catechism of his church as being insufficiently

explicit ou the divinity of Christ, original sin, and the doctrines of grace, he was censured and suspended by his ecclesiastical superiors. In the following year, for having taken part in the formation of a Société Evangélique, which contemplated, among other objects, the establishment of a new theological hall, he was finally deprived of lis charge. After some time devoted to travel in Italy and England, he returned to Geneva and ministered to an independent con- gregation until 1836, when he became professor of syste- matic theology in the college which he had helped to found. This post he continued to ocenpy until 1857, when he retired from the active duties of the chair, His death occurred at Les Grottes, Geneva, on the 18th of June 1863. His best known work, entitled La Théopneustie ow Pleine

Inspiration des Saintes Ecritures, an elaborate defence of the |

doctrine of “plenary inspiration,” was originally published at Paris in 1840, and rapidly gained a wide popularity in France, as also, through translations, in England and America. It was followed in 1860 by a supplementary treatise on the canon (Le Canon des Saintes Ecritures au double point de vue de la Science et dela For), which, though also popular, has hardly been so widely read. Gaussen was also the author of two published series of sermons, of an exposition of Daniel, and of a variety of occasional publi- cations of a missionary or polemical character. His lectures on Genesis, Exodus, Joshua, Jonah, and Luke were pub- lished posthumously.

GAUTIER, Trioruice (1811-1872), was born at Tarbes in the year 1811. He was educated at the grammar school of that town, and afterwards at the Collége Charle- magne in Paris, where it does not appear that he particu- larly distinguished himself, though in later life his remark- able literary faculty and instinct enabled him to give to much of his work an air of scholarship and almost of erudition. He very early devoted himself to the

study of the older French literature, especially that of the 16th and the early part of the 17th century. This study qualified him well to take part in the romantic movement, and enabled him to astonish Sainte-Beuve by the phraseology and style of some literary essays which, when barely eighteen ycars old, he put into the great critic's hands. In conse- quence of this introduction he at once came under the in- fluence of the great romantic cénacle, to which, as to Victor Hugo in particular, he was also introduced by his gifted but ill-starred schoolmate Gérard de Nerval. With Gérard, Petrus Borel, Corot, and many other less known painters and poets whose personalities he has delightfully sketched in the articles latterly collected under the titles of Hustovre du Romantisme, &c,, he formed a minor romantic clique who were distinguished for a time by the most extravagant eccentricity. A flaming crimson waistcoat and a great mass of waving hair were the outward signs which qualified Gautier for a chief rank among the enthusiastic devotees who attended the rehearsals of Hernani with red tickets marked '"'Hierro," performed mocking dances round the bust of Racine, and were at all times ready to exchange word or blow with the perrugues and grisdtres of the classical party. In Gautier's case, however, whatever they might be in others, these freaks were not inconsistent with real genius and real devotion to sound ideals of literature. He began (like Thackeray, to whom he presents in other ways some striking points of resemblance) as an artist, but soon found that his true powers lay in another direction. His first considerable poem, Albertus (1830), displayed a good deal of the extravagant character which accompanied rather than marked the movement, but also gave evidence of uncommon command both of language and imagery, and in particular of a descriptive power hardly to be excelled. The promise thus given was more than fulfilled in his subsequent poetry, which, in consequence of its small bulk, may well be

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noticed at once and by anticipation. The Comédie de la Mort, which appeared soon after (1832), is one of the most remarkable of French poems, and though never widely read has received the suflrage of every competent reader. Minor poems of various dates, published in 1840, display an almost unequalled command over poetical form, an advance even over Albertus in vigour, wealth, and appro- priateness of diction, and abundance of the

special poetical essence which is so often absent in the most finished poetical work, All these good gifts reached their climax in the Lmaux et Camées, first published in 1856, and again, with additions, just before the poet's death in 1872. These poems are in their own way such as cannot be surpassed. Gautier's poetical work contains in little an expression of his literary peculiarities. There are, in addition to the peculiarities of style and diction already noticed, an extra- ordinary feeling and affection for beauty in art and nature, and a strange indifference to anything beyond this range—an indifference nearly absolute, and which has doubtless injured the popularity of his work to almost as great a degree as that in which it has increased its special excel- lence and its charm to those who have a taste for it.

But it was not, after all, as a poet that Gautier was to achieve either profit or fame. Thrown as he was into circles which were nothing if not literary, it was natural tliat le should attempt all literary forms, aud certain, considering his powers, that he should be successfulin all. For the theatre, however, he had but little gift, and his dramatic efforts (if we except certain masques or ballets in which his exuberant aud graceful fancy came into play) are by far his weakest. For a time he acted as secretary to Balzac, but found thus occupation uncongenial enough, though it left some traces iu his independent work. His first novel of any size, and in many respects his most remarkable work, was J/ade- moiselle de Maupin (1835). Unfortunately this book, while it establishes his literary reputation on an imperishable basis, was unfitted by its subject, and in parts by its treat- ment, for general perusal, and created even in France a prejudice against its author which he was very far from really deserving. Duriug the years from 1833 onwards, his fertility in novels and tales was very great, France (1833), which may rank as a sort of prose Albertus in some ways, displays the follies of the youthful romantics in a vein of humorous and at the same time half-pathetic satire. Jortunio (1838) perhaps belongs to the same class. Jettatura, written somewhat later, is less extravagant and more pathetic. A crowd of minor tales display the highest literary qualities, and rank with Mérimée's at the head of all contemporary works of the class. First of all must be mentioned the ghost story of La Morte Amoureuse, a gem of the most perfect workmanship. For many years Gautier continued to write novels. La Belle Jenny (1864) is a not very successful attempt to draw on his English

experience, but the earlier Ifiditona (1847) is a most charming picture of Spanish life. In Spirite (1866) he endeavoured to enlist the fancy of the day for supernatural manifestations, and a Roman de la Momie (1856) is o learned study of ancient Egyptian ways. His most remarkable effort in this kind, towards the end of his life was Le Capitaine Fracasse (1863), a novel of the school of Dumas projected nearly thirty years before. This book contains some of the finest instances of his literary power.

It was, however, neither in poems nor in novels that the main occupation of Gautier as a literary man consisted. He was early drawn to the more lucrative task of feuilleton writing, and for more than thirty years he was among the most expert and successful practitioners of this art. Soon after the publication of Afademoiselle de Maupin, in which he had not beén too polite to journalism, he became 1rre- vocably a journalist. The rest of his life was spent either

i ris or in travels of considerable extent to Spain, the Fai aflSt, Italy, Turkey, England, Algeria, ance all undertaken with a more or less definite purpose of book making. Having absolutely no political opinions, he hae no difficulty in accepting the second empire, and receive from it considerable favours, in return for which, however, he in no way prostituted his pen, but remained a literary man pure and simple. He died in October 1872. Accounts of his travels, criticisms of the theatrical and literary works of the day, obituary notices of his contem- poraries, and above all art criticism, occupied him in turn. In the last department he has never had a superior, nor perhaps, except in the cases of Diderot and a great living English critic, an equal. It has sometimes been deplored that this engagement in journalism should have diverted Gautier from the performance of more capital work in literature. Perhaps, however, this regret springs from a certain misconception, Gautier’s power was literary power pure and simple, and it is as evident in his slightest sketches and criticisms as in Hmaua et Camées or La Morte Amoureuse. On the other hand, his weakness, if he had a weakness, lay in his almost total indifference to the matters which usually supply subjects for art and therefore for literature. He was neither immoral,

irreligions, nor unduly subservient to despotism, but morals, religion, and politics (to which we may add science and material progress) were matters of no interest to him. He was to all intents a humanist, as the word was understood in the 15th century. But he was a humorist as well, and this combination, joined to his singularly kindly and genial nature, saved him from some dangers and depravations as well as some absur- dities to which the humanist temper is exposed. As time goes on it may be predicted that, though Gautier may not be widely read, yet his writings will never cease to be full of indescribable charm and of very definite instruction to men of letters. Besides those of his works which have been already cited, we may notice Une larme du Diable (1839), a charming mixture of humour and tenderness; Les Grotesques, a volume of early criticisms on some oddities of 17th century literature; Cuprices et Zigzags, miscellanies dealing in part with English life; Constantinople, Voyage in Russie, Voyage in Espagne, brilliant volumes of travel ; Meénagerie Intume (1869), and Tableaus de Siege (1872), his two latest works, which display his incomparable style in its quietest but not least happy form. (G. SA.) GAUZE, a light, transparent, silken fabric, woven in an open manner with very fine yarn. It is said to have been originally made at Gaza in Palestine, whence the name. In the weaving of gauze the warp threads, in addition to being crossed as in plain weaving, are twisted in pairs from left to right and from right to left alternately, after each shot of weft, thereby keeping the weft threads at equal distances apart, and retaining them in their parallel position. The textures are woven either plain, striped, or tigured; and the inaterial receives many designations, according to its appear- ance and the purposes to which it is devoted. A thin cotton fabric, woven in the same way, is known as leno, to distinguish it from niuslin made by plain weaving. Silk gauze was & prominent and extensive industry in the west of Scotland during the second half of the 18th century, but

on the introduction of cotton weaving it greatly declined.

Tn addition to its use for dress purposes silk gauze is much

employed for bolting or sifting flour and other finely ground substances. The term gauze is applied generally to trans- parent fabrics of whatever

fibre made, and to the fine woven wire-cloth used in safety-lamps, sieves, window-blinds, &¢

GAVARNIT, French caricaturist, was born at Pais in 1801, and died in 1866. His true name was Chevalier (Sulpice Guillaume), and he is said to have taken the nom de plwine under which he is known from the place where he

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made his first published sketch. His parents were poor, and lhe started in life as a workman in an engine-building factory. At the same time he attended the free school of drawing, Here his natural talent was developed, and he acquired that training of the hand without which an artist is unable to work up his best inspirations. In his first attempts to turn his abilities to some account he met with many disappoint- ments, but was at last entrusted with the drawing of some illustrations for a journal of fashion, Gavarni was then thirty-four years of age. His sharp and witty pencil gave to these generally commonplace and unartistic figures a life. likeness and an expression which soon won for him a name in fashionable circles, Gradually he gave greater attention to this more congenial work, and finally ceased working as an engineer to become the director of the journal Les Gens du Monde. His ambition rising in proportion to his suc- cess, Gavarni from this time followed the real bent of his inclination, and began a series of lithographed sketches, in which he pourtrayed the most striking characteristics, foibles, and vices of the various classes of French society. The letterpress explanations attached to his drawings were always short, but were forcible aud highly humorous, if sometimes trivial, and were admirably adapted to the particular subjects. The different stages through which Gavarni’s talent passed, always elevating and refining itself, are well worth being noted. At first he confined himself to the study of Parisian manners, more especially those of the Parisian youth. To this vein belong es Lorettes, les Actrices, les Coulisses, les Fashionables, les Gentilshommes bourgeois, les Artistes, les Débardeurs, Clichy, les Etudiants de Paris, les Baliverneries Parisiennes, les Plaisirs Champétres, les Bals masqués, le Carnaval, les Sowvenirs du Carnaval, les Souventrs du Bal Chicard, la Vie des jeunes hommes, les Patois de Paris, He had now ceased to be director of

Les Gens du Monde; but he was engaged as ordinary caricaturist of Le Chartvart, and, whilst making the fortune of the paper, he made hisown. His name was exceedingly popular, and his illustrations for books were eagerly sought for by publishers. Le Juif EFrrant, by Eugene Sue (1843, 4 vale 8vo), the French translation of Hofi- man's tales (1843, 8vo), the first collective edition of Balzac's works (Paris, Houssiaux, 1850, 20 vols. 8vo), Le Diable & Paris (1844-46, 2 vols. 4to), Les Frangais peints par eux-mémes (1840-43, 9 vols. Svo), the collection of Physiologies published by Aubert in 38 vols. 18mo (1840-42),—all owed a great part of their success at the time, and are still sought for, on account of the clever and telling sketches contributed by Gavarni. A single frontispiece or vignette was sometimes enough to secure the sale of a new book. Always desiring to enlarge the field of his observations, Gavarni soon abandoned his once favourite topics. He no longer limited himself to such types as the Jorette and the Parisian student, or to the description of the noisy and popular pleasures of the capital, but turned his mirror to the grotesque sides of family life and of humanity at large. Les Enfants terribles, les Parents terribles, les Fourberies de femmes, la Politique des femmes, les Maris vengés, les Nuances du sentiment, les Réves, les Petits Jeux de Société, les Petits malheurs du bonheur, les Impressions de ménage, les Interjections, les Traductions en langue vulgaire, les Propos de Thomas Vireloque, &e., were composed at this time, and are his most elevated productions. But whilst showing the same power of irony as his former works, enhanced by a deeper insight into human nature, they generally bear the stamp of a bitter and even sometimes gloomy philosophy. This tendency was still more strengthened by a visit to England in 1849. He returned from London decply impressed with the scenes of misery and degradation which he had observed among the lower classes of that city. In the

midst of the cheerful atmosphere of Paris he had been struck chiefly by the ridiculous aspects of vulgarity and vice, and he had laughed at them. But the debasement of human nature which he saw in London appears to have affected him so forcibly that from that time the cheerful caricaturist never laughed, or made others laugh again. What he had witnessed there became the almost exclusive subject of his drawings, as powerful, as impressive as

ever, but better calculated to be appreciated by cultivated minds than by the public, which had in former years granted him so wide a popularity. Most of these last compositions appeared in the weekly paper LP? Illustration. In 1857 he published in one volume the series entitled Masques and Visages (1 vol. 12mo), and in 1869, about two years after his death, his last artistic work, Les Dowze Movs (1 vol. fol.), was given to the world. Gavarni was much engaged, dur- ing the last period of his life, in scientific pursuits, and this fact must perhaps be connected with the great change which then took place in his manner as an artist. He sent several communications to the Académie des Sciences, and till his death, which happened on the 23d of November 1866, he was eagerly interested in the question of aerial navigation, It is said that he made experiments on a large scale with a view to find the means of directing balloons; but it seems that he was not so successful in this line as his fellow-artist, the caricaturist and photographer, Nadar.

Gavarni's Q@uvres chotsics were edited in 1845 (4 vols. 4to) with letterpress by J. Janin, Th. Gautier, and Balzac, followed in 1850 by two other volumes named Perles et Parwres; and some essays in prose and in verse written by him were collected by one of his biographers, Ch. Yriarte, and published in 1869. The book written by E, and J. de Gonwurt, Gavarni, homme et Vewvre (1878, 8vo), must be mentioned here. J. Claretie has also de voted to the great French caricaturist a curious and interesting

essay. A catalogue raisonné of Gavarni's works has been published by J. Armelhault and E. Bocher, Paris, 1873, 8vo.

GAVELKIND is a peculiar system of tenure prevailing chiefly in the county of Kent, but found also in other parts of England. In Kent all land is presumed to be holden by this tenure until the contrary is proved. It is more cor- rectly described as socage tenure, subject to the custom of gavelkind. 'The chief peculiarities of the custom are the following. (1.) A tenant can aliene his lands by feoffment at fifteen years of age. (2.) There is no escheat on attainder for felony, or as it is expressed in the old rhyme—

'The father to the bough, The son to the plough." (3.) Generally the tenant could always dispose of his lands by will. (4.) In case of intestacy the estate descends not to the eldest son but to all the sons inequal shares. '' Every son

is as great a gentleman as the eldest son is.” It is to this remarkable peculiarity that gavelkind no doubt owes its local popularity. The 4 & 5 Vict. c. 35, for commuting manorial rights in respect of lands of copyhold and custom- ary tenure, contains a clause specially exempting from the operation of the Act “the custom of gavelkind as the same now exists and prevails in the county of Kent.” Gavelkind 1s One of the most interesting examples of the customary law of England, and it is no doubt correctly traced to the Saxon land-law prevailing before the Conquest. Its sur- vival in this instance in one part of the country is regarded as & concession extorted from the Conqueror by the superior bravery of the men of Kent.

GAVIAL. See Crocopie.

GAY, Joun (1688-1732), one of the most eminent of the secondary English poets, was a native of Devonshire, born in 1688 at Frithelstock, near Torrington, where his family had been long settled. His father dying when the | future poet was only about six years of age, and leaving | four children, the prospects of the family were unpromising ;

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and John, after receiving his education at the grammar school of Barnstaple, was put apprentice to a silk mercer in London. He disliked the employment, obtained his discharge, and embarked in a literary life, varied only by incessant efforts to obtain the patronage of the great. How he lived up to his twenty-second year is not stated. In 1710 he published his puem of Were, an enumeration of the charms of the “‘ enlivening grape,” written in the grave, mock-heroic, and minutely descriptive style, which he after- wards displayed with greater power in his Z’rivia. In 1712 he was received into the household of the duchess of Monmouth in the capacity of secretary. Next year he published his Aural Sports, inscribed to Pope; and this seems to have led toa friendship between the poets uninterrupted and sincere. The superiority of Pope was freely conceded. There could be no rivalry on the part of Gay, and Pope appears to have exerted himself on every occasion to serve his friend. Gay’s ambition was limited to a life of ease, fine-dressing, and a luxurious table, in all of which he had marvellous success, but little content- ment. In the years 1713 and 1714, besides the Rural Sports, he produced a comedy, The Wife of Bath, which was acted only three nights;

Zhe Faun, a poem; and The Shepherd's Week, a series of six pastorals drawn from English rustic life. Pope is believed to have incited his friend to this task in order to cast ridicule on the Arcadian pastorals of Ambrose Philips, who had been lavishly praised in the Guardian (ignoring the claims of Pope) as the first pastoral writer of the age, and the true English Theocritus. The malicious wit was completely successful, but Gay's ludicrous pictures of the English swains and their loves were found to be interesting and amusing without reference to their sarcastic origin. The poem was popular, and the author's reputation considerably advanced. In this fortu- nate year Gay was appointed secretary to the earl of Clarendon, ambassador to the court of Hanover; but the death of Queen Anne, August 1, 1714, soon put an end to his hopes of permanent official employment. He then tried the drama, and produced his farce of What dye Call at? which was acted with little success in February 1714-15. In 1716 appeared his Trivia, or the Art of Walking the Streets of London, a poem in three books, for which he ac- knowledged having received several hints from Swift. It is an excellent town poem, containing graphic and humorous descriptions of the London of that period. In January 1716-17 the comedy of Three Hours after Marriage was brought on the stage, and emphatically condemned. In this piece Gay was assisted by Pope and Arbuthnot. Pope is distinctly visible in his allusions to Dennis the critic ; and it is remarkable that three such men should have pro- duced a play so dull, unnatural, and gross. Gay was taken to Aix by Mr Pulteney in 1717. In 1720 he collected his poems and published them by subscription, by which he is said to have realized £1000. Secretary Craggs also pre- sented him with some South Sea stock ; and Gay called in his friends to advise as to the investment of his riches. Erasmus Lewis, according to Johnson, advised him to in- trust his money to the funds, and live upon the interest ; Arbuthnot bade him intrust it to Providence, and live upon the principal ; while Pope directed him, and was seconded by Swift, to purchase an annuity. This was Pope's own prudent system ; but Gay, like many others who ask advice, followed none, but took his own way. He embarked all in South Sea stock ; and, refusing to sell out before the bubble burst, he lost the actual principal as well as the anticipated profit. The calamity overwhelmed him ; his life was despaired of ; but his friends exerted themelves to cheer and

succour the desponding bard. Lord Burlington entertained

him for months in his princely house at Chiswick ; and

Pope, Arbuthnot, and the other members of the circle were

unceasing in their attentions. By tlie beginning of 1724 he had a new play ready, a tragedy called the Captives, which was patronized by the Princess (afterward Queen) Caroline aud the Prince of Wales. In 1726 he published his famous [ifty-one Fables in Verse. His next work was the Beggar's Opera, performed in 17 27, written in ridicule of the Italian Opera, which for a time 1t drove off the English stage. Swift suggested the subject, and Pope is believed to have added some poignancy to the satirical songs ; but Gay's own bonrhomie and voluptuous style colour the whole. The play ran to the end of the season, sixty- two nights, four of which were for the benefit of the author, and produced to him the handsome sum of £693, 13s. 6d. The same year he sold his copyright of the Opera, with that of the Fables, for 90 guineas. The success of 7'he Beggar's Opera induced Gay to attempt a continuation of the operatic style. He wrote another piece, Polly, with no satirical design, as he states ; but the lord chamberlain pro- hibited its representation. The poet then resorted in 1729 to publication by subscription ; his friends were again active —the duchess of Queensberry even bearding royalty in resentment of the refusal of the licence; and Gay must have cleared above £1000 by what was deemed his oppres- sion. The duke of Queensberry received Gay into his house, and tlie duchess treated him with equal respect for his talents and character. This clever, beautiful, and eccen- tric woman—the idol of the poets—appears nowhere to more advantage than in her affectionate patronage of Gay, and her long-cherishcd regret for his loss, The poet died, after a short illness, December 4, 1732, and the duke and duchess of Queensberry honoured his remains with a splen- did funeral and monument in Westminster Abbey. A week before his death another opera, Achzlles, had been brought out with applause, and this, with a new volume of Fables, was published in 1733, the profits going to his sisters, two widow ladies, who inherited by the poet's death no Jess than £6000. As late as 1743 appeared the posthumous comedy of The Distrest Wefe, and the farce of The Rehearsal at Gotham in 1753. Pope and Swift—always ready to blame tle court and courtiers, though far from averse to

their society—have censured Mrs Howard, afterwards countess of Suffolk, for not more zealously promoting the interests of Gay by her supposed influence with the king. One offer was made to the poet,—the situation of gentleman-usher to the Princess Louisa, a child,—but he declined it on account of his being, as he writes to Swift, so far advanced in life. He was only thirty-nine; but all Gay's friends seem to have treated the offer as an indignity. When the queen's establishment was made up in 1727, they expected some more important office for their favourite associate, though it is not easy to discover what appointment about the court could have been better adapted to one so easy, sO natural, and helpless. Mrs Howard, it is now known, had very little influence with her royal master. The real power was in the hands of the queen, and the philosophical Caroline was content that his Majesty (who hated bhoetry and bhainting, and looked upon poets as mechanics) should possess what mistresses he pleased, provided that the state power and patronage continued with herself and Walpole. But it may be safely said that no man could have acquired such a body of great and accomplished friends as those which rallied round Gay and mourned his loss, without the possession of many valuable and endearing qualities. His poetry is neither high nor pure; but he had humour a fine vein of fancy, and powers of observation and local painting which bespeak the close poetical student and the happy literary artist. (R. CA.) GAY, Marre Francotsz Soputr, MADAME (1776-1852) daughter of M. Nichault de Lavalette (who was attached to the household of Monsieur, afterwards Louis XVIII.), and

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of Francesca Peretti, a Florentine lady, was born at Paris Ist July 1776. Under the gnidance of her father, a man of taste and culture, she received a very careful education. In 1793 she was married to M. Liottier, an exchange broker, but she was divorced from him in 1799, and shortly afterwards was married to M. Gay, receiver-general of the department of the Roér or Ruhr. This union brought her into more intimate relations with many distinguished per- sonages whom she had previously known; and her circle of acquaintanceship gradually extended, until her salon came to be frequented by all the distinguished litterateurs, musicians, actors, and

painters of the time, among whom she made herself remarked by her beauty, her vivacity, and her sprightly wit tempered by fine tact and genuine amia- bility. Her first literary production was a letter written in 1802 to the Journal de Paris, in defence of Madame de Stael's novel Delphin; and in the same year she published anonymously her first novel Laure d'Estell. Léome de Montbreuse, which appeared in 1813, is cousidered by Sainte-Beuve her best work ; but Anatolie, which appeared in 1815, has perhaps a higher reputation. These and several of her other works, amongst which may be specially named Les Salons célébres, possess an interest beyond their intrinsic merits—chief of which are purity and elegance of style—for their portraitures of French society especially during the period of the directory and the consulate, and of many of the distinguished personages whose intimacy she enjoyed. Madame Gay wrote several theatrical pieces which had considerable success, She was also an accom- plished player on the pianoforte and harp, and composed both the words and music of a number of romances, For an account of her daughter Delphine Gay, Madame de Girardin, see GIRARDIN.

Besides the works already mentioned, she is the author of Les Malheurs un amant hewreux, 1818; Théobald, épisode de la guerre de Russie, 1828; Le Moqueur amoureux, 18380; Un Mariage sous VEmpire, 1832 ; Seenes du jewne Age, 1833 ; Physiologie du ridicule, 1883 ; La Duehesse de Chateauroux, 1834; Souvenirs dune vieille femme, 1834; La Comtesse d'Egmont, 1836; Marie de Maneini, 1840; Jlarie-Louise Orléans, 1842; Hilénore, 1844-46; Le Fawn Frere, 1845; Le Comte de Guiche, 1845; and Le Mari confident,

1849. See Theophile Gautier, Portraits Contemporains ; and Sainte- Beuve, Causeries du Lwndi, vol. vi.

GAYA, a district of British India in the Patné division, under the lieutenant-governor of Bengal, situated between 24° 17' and 25° 19' N. lat., and between 84° 4' and 86° 5' E. long. It is bounded on the N. by Patna, on the E. by Monghyr, on the S.E. and S. by Hazdribagh, and on the W. by Shéhdbad districts. Generally speaking, Gayd consists of a level plain, with a ridge of prettily wooded hills along the southern boundary, whence the country falls with a gentle slope towards the Ganges. Rocky hills

occasionally occur, either detached or in groups, the loftiest being Maher hill about 12 miles S.E. of Gayd town, with an elevation of 1620 feet above sea-level. The eastern part of the district is highly cultivated; the portions to the north and west are less fertile; while in the south, the country is thinly peopled, and consists of hills, the jungles on which are full of wild animals. The principal river is the Son, which marks the boundary between Gayd and Shab- dbad, navigable by small boats throughout the year, and by craft of 20 tons burden in therainy season. The other rivers are the Pimpun, Phalgu, and Jamn4, and a number of smaller streams, 'Two branches of the Son canal system, the eastern main canal and the Patnd canal, intersect the district.

The census of 1872 takes the area of Gayd district at 4718 square miles, and returns the population at 954,129 males and 995,621 females,—total, 1,949,750, residing in 6530 villages or towns, and 327,845 houses. Classified according to religion, there are 1,729,890 Hindus, 219,382

Mahometans, 203 Christians, and 316 "others," Amongst the higher castes there is an unusually large proportion of Brahmans, a circumstance due to the number of sacred places which the district contains. The Gaydwéls, or priests in charge of the holy places, are held in high esteem by the pilgrims ; but they are not pure Brahmans, and are looked down upon by those who are. They live an idle and dis- solute life, but are very wealthy, from contributions extorted from the pilgrims. The ruined city of Buddh Gaya, about 6 miles south of Gaya town, marks the residence of Sakya Sinha, the founder of the Buddhist religion, who flourished in the 6th century B.c., and an ancient tree is pointed out as the identical fig tree under which the sage sat in abstrac- tion for five years, until he attained to the state of Buddha. Another place of religious interest is a temple of great antiquity, which crowns the highest peak of the Baraber hills, and at which a religious fair is held each September, attended by from 10,000 to 20,000 pilgrims. At the foot of the hill are numerous rock caves excavated about 200 B.C, ;

Seven towns in Gay4 district contain upwards of 5000 inhabitants, viz., Gayd, 66,848 ; Jahandbad, 21,022, Daudnagar, 10,058 ; Tikari, 8178; Sherghati, 7033; Hasta, 6119; and Rajauli, 5012. About four-fifths of the

surface is cultivated. Rice forms the great agri- cultural staple, the area under cultivation being estimated at about 900,000 acres, yielding an outturn of over 400,000 tons. Wheat occupies about 170,000 acres, producing a crop of 60,000 tons, of which one-half is exported. Oil seeds are grown on about 35,000 acres, and opium on between 60,000 and 70,000 acres. Cotton, sugar-cane, chilies, and vegetables are also grown. Droughts are common, and in the famine of 1866 Gaya suffered severely. The scarcity of 1873-74 did not affect the district to any great extent. Manufactures consist of common brass utensils, black stone orna- ments, pottery, tasar silk cloth. Formerly cloth-weaving and paper-making were important manufactures in the district, but these industries have now almost entirely died out. The chief exports are food grains, oil seeds, indigo, crude opium (sent to Patna for manu- facture), saltpetre, sugar, blankets, brass utensils, &c. The imports are salt, picce goods, cotton, timber, bamboos, tobacco, lac, iron, spices, and fruits. The principal trade route is along the Patna branch road. The total net revenue of the district in 1876-77 was £188,426, of which £136,692 was derived from the land; the net. civil expenditure, £23,878. The district and municipal police of all ranks numbered 923, besides a rural force of 6790 men paid by the landholders and villagers. The number of schools in 1873-74 was 446, attended by 8139 pupils. The climate of Gaya is dry and healthy,—the average annual temperature being about 80° F., and average annual rainfall 85°59 inches.

GayA, the chief town and administrative headquarters of the above district, situated on the bank of the Phalgu river, lat. 24° 47° 15” N., long. 85° 3’ 10” E. The population in 1872 numbered 66,843 :—Hindus, 52,265; Mahometans, 14,444; Christians, 134, The municipal income in 1871 was £2716, and the expenditure £2351. The town con- sists of two distinct parts, adjoining each other; the part containing the residences of the priests is Gay& proper ; and the other, which is the business quarter, is called Sahibganj, The civil offices and residences of the European inhabitants are situated here. Gayd derives its sanctity from incidents in the life of Buddha connected with the adjoining district. Buta local legend also exists concern- ing a pagan monster of great sanctity, named Gayd, who wickedly tried to save sinners from deserved perdition. Brahina in order to get rid of Gay4 induced him to lie down in order that a feast might be held on his body ; and once down, he placed a large stone on him to keep him there. The

tricked demon struggled violently, and, in order to pacify him, Brahma promised that the gods should take up their permanent residence in him, and that any one a made a pilgrimage to the spot were he lay should be peo from the terrors of the Hindu place of torment. i fo. may possibly be a Brahmanic rendering of Buddha's ite and work. There are forty-five sacred spots in and

around town, which are visited by from 100,000 to 200,000 pilgrims annually,

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GAY-LUSSAC, Josepu Louis (1778-1850), one of the most distinguished of modern physicists and chemists, was born at St Léonard, in the department of Haute Vienne, on the 6th of December 1778. His father, Antoine Gay, who was procureur du roi and judge at Pont-de-Noblac, had added to the common family name the distinctive title Lussac, from a small property he had in the neighbourhood of St Léonard. The family consisted of two sons, of whom Joseph Louis was the elder, and three daughters. Intended for the bar, young Gay-Lussac prosecuted his early studies in Latin aud other elementary subjects at home, under the superintendence of the Abbé Bourdeix and other masters, until 1794, when he was sent to Paris, where he worked very hard for three years preparing for admission to the Ecole Polytechnique. After a brilliant examination he was received into this institution on December 27, 1797, whence on the 22d of November 1800 he was transferred to the school Des Ponts et Chaussées. Shortly afterwards he wasassigned to Berthollet, whohadreturned from Napoleon's Egyptian expedition, and, who was desirous of having an able student from the Ecole Polytechnique to aid bim in his researches. The results expected by the author of the Statique Chimique were not verified by his assistant's experiments, which seem to have been recorded without any consideration of the theorizer's feelings, It was on this occasion, according to Arago, that Berthollet, at first nettled to find that his ideas were not confirmed, delivered himself as follows: 'Young man, it is your destiny to make discoveries. You shall be henceforth my companion. I wish—it is a title of which I am sure I shall have cause some day to be proud—I wish to be your father in science."

Gay-Lussac accordingly entered on a long series of re- searches upon certain physical phenomena, which though of constant recurrence in experimental inquiries, had up to this time been very imperfectly examined. In his first memoir (Ann. de Chimie, t. xiii, 1802) he shows that different gases are dilated in the same proportion when heated from 0° to 80° (Réaumur). He does not seem to have been aware of Dalton's experiments on this subject, which were indeed very far from being accurate; but he states in a footnote that "le cit. Charles! avait remarqué depuis 15 ans la méme propriété dans ces gaz; mais, n'ayant jamais publié ses résultats, c'est par le plus grand hasard que je les ai connus." In return for his having thus rescued from oblivion the remark which his fellow- citizen, probably wisely, did not think werth recording, some recent authors have changed the title of the law from that of Gay-Lussac to that of Charles. The investigations re- corded in this memoir were followed by experiments on the improvementsof thermometersand barometers, on the tension of vapours, their mixture with gases, and the determination of their density, evaporation, hygrometry, and capillarity. In course of these researches, which engaged him for a couple of years, he acquired not only dexterity in manipulation and the contrivance of experiments, but a great deal of valuable knowledge of physics. During the interval, in the year 1802, he had been nominated Fourcroy's demonstrator at the Ecole Polytechnique, and as he had in this capacity to lecture frequently for the professor, he was beginning to acquire reputation as a teacher and expounder of chemistry and physics, by the clearness, precision, and care which his lectures evinced. In 1803-4 certain results respecting terrestrial magnetism had been obtained during two balloon ascents, which appeared of so much interest that the French Academy was desirous of having them repeated. Through Berthollet and Chaptal the balloon which had been used wD Egypt was obtained, and fitted up with various instruments ; the observations were entrusted to Gay-Lussac_and Prot,

1 The inventor of the " Charliére,"' or ie balloon.

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who made their first ascent from the garden of the Conser- vatoire des Arts et Metiers, on August 24, 1804. In this

ascent an altitude of 4000 metres was attained, but unex- pected difficulties were encountered, and the results were not decisive. Not satisfied with the expedition, Gay-Lussac got a larger balloon provided with every requisite, and made an ascent by himself on September 16 of the same year. On this occasion the balloon rose toa height of 7016 metres, an altitude greater than any which had been formerly reached, and surpassed only by a few later ascents. At this great elevation of nearly 23,000 feet, and with the thermo- meter at 94° O. below freezing, Gay-Lussac remained for a considerable time making observations on temperature, on the moisture of the air, on magnetism, and other points. He observed particularly that he had considerable difficulty in breathing, that his pulse was quickened, and that by the absence of moisture in the air his mouth and throat became

so parched that it was painful to swallow even a piece of bread. The experiments on magnetism for which the ascent was primarily made were imperfect, but they led him to the

conclusion that the magnetic effect at all attainable elevations above the earth’s surface remains constant.! Having col-

lected samples of air at different elevations he, on his return

to Paris, proceeded to analyse them; and in conjunction with Alexander von Humboldt, whom he had associated with himself in this investigation, he puklished several papers on eudiometric analysis and related topics. The memoir, which was read to the Institute on October 1, 1804, con- tained the germ of what was afterwards Gay-Lussac’s most important generalization, The authors observed that when oxygen and hydrogen combine together by volume, it is in the proportion of one volume of the former to two volumes of the latter. Prior to this the numerous experiments on the volume composition of water had always brought out various complicated ratios, though approaching the simple one more or less closely. It was not, however, till 1808, that Gay-Lussac announced the law of combination by volume in its general form. Shortly after these investiga- tions were completed, Gay-Lussac got leave of absence to accompany Von Humboldt

on a scientific journey to Swit- zerland, Italy, and Germany. Provided with physical and meteorological instruments, they left Paris March 12, 1805, and travelled by Lyons, Chambery, and Mont Cenis to Genoa, and thence to Rome, where they arrived on July 5. After a short stay at Rome in the residence of William von Humboldt, during which Gay-Lussac made a few chemical analyses, they departed for Naples in company with Leopold von Buch, afterwards so eminent as a geologist. During this visit Gay-Lussac had the opportunity of study- ing on the spot volcanic eruptions and earthquakes. Vesuvius, which was in violent action, he ascended six times. After this the party went back to Rome, and then started for Florence on September 17, 1805. A few days having been spent there, they went on to Bologna and thence to Milan, which they reached on October 1, and there they had the pleasure of meeting Volta. The party crossed the St Gotthard on October 14-15, in the midst of a storm which prevented their seeing anything, and after some delay reached Gottingen, where they were received with much attention by Blumenbach, the famous naturalist On November 16 they arrived at Berlin, where the winter and the following spring were spent. In this way Gay-Lussac became acquainted with the best society in Berlin, and was especially intimate with Klaproth and Erman. In spring he hurriedly returned to Paris. The death of an Acade- mician had left a vacant place, and he was hopeful that he might be elected to fill it. Arago remarks that it is curious SE eee

1 The numerous observations made in both § ascents are recor j the Journal de Physique for 1804, vol. 59. ee

that Gay-Lussac should have found it necessary to be on the spot to ensure success. What he had already done for science might have been considered sufficient, apart from personal considerations, but there were prejudices which might have acted unfavourably, if ke had not been present to meet them. These were, however, success- fully overcome, and he entered the Academy in 1806. In the following year was inaugurated the Société d’Arcueil, a small group of scientific men wlio used to assmble at Berthollet’s house. Gay-Lussac was an original member of this society, which is of interest chiefly on account of its having been the means of

publishing some papers which have since proved of great historical interest. The results of his magnetic observations made along with Humboldt were published in vol. i. of its Jfémotres (1807); and vol. ii. (1809) contains the important memoir on gaseous com- bination, in which he pointed out that, when gases combine with one another by volume or by measure, they do so in the very simplest proportions, 1 to 1, 1 to 2, 2 to 3, and so on, and that the volume of the product in the gaseous state bears a very simple ratio to that of the constituents. This law, which, along with Humboldt, he had shown to be true of water, he extended to several other gases, and he even deduced from the vapour density of compounds that of certain elements, more particularly, carbon, mercury, and iodine, which had not been ascertained by direct experiment. It would take too much space to give in detail the criti- cism which the enunciation of the principle evoked, more particularly from Dalton, who would not accept Gay- Lussac's position, and affirmed his belief that '" gases do not unite in equal or exact measures in any one instance ; when they appear to do so, it is owing to the inaccuracy of our experiments." There was at that time the difficulty that the specific gravity of gases and vapours had been imper- fectly determined, and the necessary consequence of Gay- Lussac's law, that the specific gravity and combining weight of elements should be expressed by the same number, could not be experimentally confirmed. Moreover, Dalton rested combination on atomic and not on combining weights, and the numbers he employed were in almost every instance very different from those which more accurate analysis has since determined. But the imperfect character of the then available data, and the amount of seemingly adverse experimental evidence, only throw a stronger light on the genius of Gay-Lussac in divining a law which, as science has progressed, has been duly confirmed, and which not only forms the most important control of the combin- ing weight of chemical substances, but, when interpreted by the kinetic theory of gases, shows that the physical mole- cules (that is to say, the portions of the A ie which are not broken up into smaller parts during the motion which we call heat) exist in equal numbers in equal volumes of different gases at the same temperature and pressure, This law, which has as high a claim as the other to bear the name of Gay-Lussac, is also sometimes deprived of that honour, and called the law of Avogadro, who, long afterwards, by his more extended researches, caused the importance of the law to be recognized by chemists. The next events in Gay-Lussac's scientific career

are con- nected with what may be called his rivalry with Davy, who in matter of age (b. December 17, 1778) was almost exactly his contemporary. In 1808 when Davy, having isolated potassium and sodium, was awarded Napoleon's prize for the most important discovery in voltaic electricity, the emperor is said to have asked how it was that these discoveries were made abroad and French prizes were carried away. Having

Fei System of Chemicul Philosophy, Manchester, 1810, part ii, p. vod.

been informed that there was no battery of power equal to that used by Davy, he caused a very large one to be made, and presented it to the Keole Polytechnique. While waiting for it, Gay-Lussac and Thénard succeeded in preparing potassiuin by a direct chemical action, in which fused potash was brouglit in contact with red-hot iron. This method enabled chemists to prepare the alkali metals in quantity, and Gay-Lussac and Thénard availed themselves of it to examine the properties of potassium very completely, and not only so, but also to use it as a means of decomposing other substances. It was in this way that they separated boron from boracic acid, an element which was also prepared by Davy with the same materials. It is worth notice that Davy admitted the advantage of the method of Gay-Lussac and Thénard, though he seems to have subsequently re- garded their appropriation of the newly-discovered metal as not altogether warranted.!| The researches with the great battery after it was made did not come up to their expecta- tions; the power fell far short of what had been anticipated, and they confined themselves rather to an examination of the phenomena presented by the apparatus itself, than to using itas an engine for effecting important decompositions.

In 1809 was published the second investigation parallel to one by Davy, namely, upon hydrochloric (or, as it was then called, muriatic) acid, and chlorine, then called oxymuriatic acid. This memoir was read to the Institute, and was also published in the second volume of the A/émoires d'Arcueil. Gay-Lussac and Thénard describe a crowd of reactions they had tried for determining the characters of these bodies. 'They pointed out differences between the muriatic and other acids, and indicated that the anomalies which it presented were explicable either on the hypothesis of

water being an essential constituent of the acid, or on that of the oxymuriatic acid being a simple gas. At the end of their memoir, however, they decided in favour of oxymuriatic acid being compound, although they had failed to get oxygen from it by heating it with carbon. The ex- planation of this decision seems to be that, while they themselves were influenced to some extent by Lavoisier's oxygen theory of acids, some of the other members of the Arcueil Society, such as Laplace and Berthollet, were keen Lavoisierians, and were prepared to oppose any criticism which might lead to a modification of the great Frenchman's opinion on so vital a point. To admit the existence of an acid without oxygen might have led to a loss of the whole scientific position which France had gained by Lavoisier's defeat of phlogiston. Davy, who was not under the same influence, declared, as the result of his inquiries, that oxy- muriatic acid gas was simple, and that therefore there may be acids without oxgyen. Sometime after, Gay-Lussac and Thénard agreed with this view, which they could do with less hesitation, as they had themselves indicated it in their own memoir.

Among the investigations which Gay-Lussac under- took with Thénard in the years 1810-1811, and which ultimately yielded most valuable results, must be men- tioned those upon organic chemistry, and especially upon the analysis of fixed organic compounds. Before this time

the only way of determining the composition of organic substances was to explode them with oxygen, and as this method was practicable only in the case of bodies which were gaseous, or could be readily volatilized, the great majority of fixed organic substances still remained unex- amined. Gay-Lussac and Thénard introduced the plan of adding some oxidizing agent to the substance and burning itin a tube. They used chlorate of potassium, and the products of combustion were collected over mercury. The results obtained were in some cases very accurate, but the process was difficult of execution, and it is singular that the authors should have preferred it to combustion with oxide of copper, which they also tried. In 1815, however, Gay- Lussac employed the latter agent for the examination of cyanogen, and the other metliod was abandoned. The final improvements were made some years later by Liebig, when working in Gay-Lussac's laboratory. By their original method Gay-Lussac and Thénard determined the composition of fifteen organic substances, including sugar, starch, gum, wax, oil, various

woods, resin ; mucic, oxalic, tartaric, citric, and acetic acids; and albumen, fibrin, gelatin, and casein. Gay-Lussac succeeded also, in 1811, in obtaining pure hydrocyanic acid. He described its physical properties, but did not announce anything about its composition till 1815, when he published his celebrated memoir in which he described cyanogen as a compound radical, prussic acid as a compound of this radical with hydrogen alone, and the prussiates as compounds of the radical with metals. He also showed how to prepare free cyanogen, and explained Berthollet's oxyprussic acid to be really chloride of cyanogen. The proof that prussic acid contains hydrogen and no oxygen was a most important support to the hydrogen acid theory, while the isolation of the radical cyanogen was of equal importance for the subsequent epoch of compound radicals in organic chemistry.

In 1813-14 Gay-Lussac published his memoirs on iodine. This was the third investigation which involved a rivalry with Davy, and it was also that about which there was most feeling. Courtois had discovered the substance in 1811, and had given some of it for examination to Clément-Désormes. He had only published a brief notice of it when Davy arrived in Paris, having obtained express permission of Napoleon to pass through France on his way to Italy. 'Davy got a few fragments of this curious substance, and after a brief examination with a very limited portable laboratory which he had with him, perceived its analogy to chlorine,and drew the conclusion that it must be a simple body of similar character. Gay-Lussac, it is said, having heard of Davy's making experiments with it, went off to Courtois, got a specimen, and proceeded to examine it. He also saw its likeness to chlorine, but his previous decision respecting that body hampered him, and it was with some hesitation that he ultimately acknowledged its elemental character. Whether or not Gay-Lussac was actuated by the motive ascribed to him by Arago—that it would be a reflexion on French science were the settlement of the characters of this substance to be left to a foreigner visiting Paris—it is not necessary to enquire; but Davy seems to have felt that Gay- Lussac was competing, and not altogether fairly, with him. In a letter to Clément he gives a brief account of his work, and lays claim to the first revelation of the elemental char- acter of iodine, and again in a subsequent letter to his brother, which contains a short review of the Parisian chemists and their reception of him, the only complaint he makes is that Gay-Lussac had played him a trick in trying to appropriate the discovery of the character of

iodine and of hydriodic acid. Quite apart, however, from this claim on Gay-Lussac's part, the menioirs remain models of po tigation and description. Davy quite freely admitted t "4 full light might be expected on the subject from 1

? Gay-Lussac and Thénard made no claim, of course, to the dis- covery of potassium and sodium, though several important discoveries followed from their experiments. Thus, in addition to boron, they" got also the fluoride of boron; and by the rapid combustion of the alkali metals in dry oxygen they got their peroxides, by means of which Thénard subsequently prepared the peroxide of hydrogen. At first, however, they seem to have thought that the alkali wnetals contained hydrogen, and it was not for a couple of years that they accepted Davy's view of their simplicity. Indeed, about this time there appears to have been considerable uncertainty about the elemental character of the metals, it being thought that they contained hydrogen, an idea

which, on account of its retrogr itici grade nature, was criticized by Davy as a kind of phlogistic revival.

having been taken in land by so able and accurate a shemi ray-Lussac.

ae 1815 saw the completion of the research a cyanogen already referred to, and with it conshaess the period of Gay-Lussac's most important discoveries. Having now attained a leading if not the foremost place among the scientific men in the French capital, his advice was often required on important questions. His attention was thus turned in part from purely scientific subjects to points of practical interest. In these new fields, however, he dis- played the same powers which he had exercised so sedu- lously in the pursuit of scientific truth; in fact he was now to introduce and establish scientific accuracy where there had been previously only practical approximations. The most important of these later discoveries were the method of estimating the amount of real alkali in potash and soda by the volume of standard acid required for neutralization ; the method of estimating the amount of available chlorine in bleaching powder by a solution of arsenious acid ; direc- tions for the use of the centesimal alcoholometer, published in 1824, and specially commended by the

commission of the Institute appointed to report onit, as displaying all the accuracy and exhaustive treatment of the author; and lastly, the perfecting of the method of assaying silver by a standard solution of common salt, a volume on which was published in 1833. This last has superseded the old method of assaying silver by cupellation, as being more rapid, more accurate, and easier of execution; and indeed all these processes are so complete and satisfactory, and are besides so identified with their author's name, that his reputation is secured by them, quite independently of his earlier work. In what has been said above, only the more important of Gay-Lussac's discoveries have been alluded to. To enter into an account, however brief, of all his labours, would occupy more space than can be allowed here. Indeed the list of his papers in the Royal Society's catalogue amounts to 148, besides those of which he was joint-author with Von Humboldt, Thénard, Welter, and Liebig; and they embrace every department of the science as cultivated fifty years ago. Among his later researches may be mentioned those on fermentation, and those executed by Liebig in conjunction with him, after the young German chemist had gained the coveted admission to Gay-Lussac's private laboratory during the years 1823- 24. The latter include improvements on organic analysis, and the examination of fulminic acid. Gay-Lussac con- tinued his work, and published the results in the Annales de Chemie, of which he had been joint-editor for some thirty years, up till almost his death, which took place at Paris on May 9, 1850.

Some of the appointments he held have been already referred to, After having acted as Fourcroy's demon- strator, he was made professor of chemistry at the Ecole Polytechnique. From 1808 to 1832 he was professor of physics at the Sorbonne, and he only resigned that office when he was made professor of chemistry at the a res Besides being on the commission of

ufactures, and the "administration" of gun- powder and nitre, he was appointed assayer for the mint in 1829. In 1831 he was elected to the chamber of deputies = member for Haute Vienne, and finally, in 1839, entered

e chamber of peers.

_ Gay-Lussac’s scientific work is remarkable not only for its range but for its intrinsic worth, its accuracy of detail its experimental ingenuity, its descriptive clearness, and the soundness of itsinferences, He did not hesitate to criticize his own results, and replace them by others more accurate either of his own or of another’s discovery ; he improved and invented physical and chemical apparatus: the baro. meter, thermometer, cathetometer, alcoholometer, and the

burette, which still bears his name, all bear witness to his ingenuity and practical skill. He devised new analytical methods ; he discovered new substances, such as fluoride of boron, aud iodic, hydrosulphocyanic, dithionic, and hyposulphurous acids; he enlarged and corrected the knowledge of those already discovered; he examined the physical conditions of chemical action; he searched into the causes of chemical combination and chemical change, That he had the power of grasping the law underlying a few facts is nowhere more evident than in the memoir on gaseous combination, his most important contribution to science. That he missed the opportunity of assigning the chief limit to Lavoisier’s hypothesis, must be ascribed partly at least to the influence of others. Authority decided it, perliaps against his secret convictions.

From Arago’s and other notices one gathers that Gay- Lussac was reticent, patient, persevering, accurate to punctiliousness, perhaps a little cold and reserved, and not unaware of his great ability. But he was also bold and energetic, not only in his work, but equally so in defence and support of his friends. His earliest childish adven- tures, as told by Arago, herald the fearless aeronaut and undaunted investigator of volcanic eruptions. The en- durance he exhibited under the laboratory accidents which befell hint shows the power of will with which he could face tle prospect of becoming blind and useless for the prosecution of the science which was his very life, and of which he is one of the most distinguished orna- ments. It was only at the very end, when the disease from which he suffered left him no hope, that he complained with some bitterness of the hardship of leaving this world when so many discoveries were making, and when so many more were likely to be made.

The more important of Gay-Lussac’s papers are scattered through journals difficult of access. ‘lhe most complete list of them is con- tained in the Royal Society’s catalogue of scientific papers ; lists arc also given at the end of Hoefer’s article in the Biographie Générale, and in Poggendorfi’s Btographisch-literarisches Hand- worterbuch, Leipsic, 1868. Accounts of various portions of Gay- Lussac’s discoveries and views will be found in such works as Thomson’s History of Chemistry, vol. ii., London, 1830; Kopp’s Geschichte der Chemie, Brunswick, 1843-47; Kopp’s Hntwickel- ung der Chemie, Munich, 1871; Dumas, Legons sur la Philosophie Chimique, Paris, 1837, and reprinted Paris, 1878; Ladenburg, Vortrige tiber die Entwickelungsgeschichic der Chemie, Brunswick, 1869; Forbes, A Review of the Progress of Mathematical and Physical Science in more recent times, Edinburgh, 1858. The chief authorities for the life of Gay-Lussac are Arago (uvres, Paris, 1855, t. ili.); Biot (Abstracts, Royal Soctety, vol. v., 1843-50, p. 1013); P. A. Cap (Le Muséum d’ Histoire Naturclle, Paris, 1854, pt. 1, p. 137). (J. F.)

GAZA, an ancient city of Philistia, close to the sea and to the south boundary of the Holy Land. The Hebrew is more correctly rendered in English as Azzah (Deut. ii. 23), and means “‘strong.” The modern Arabic form of the name is Ghazzeh. The town stands on an. isolated hill about 100 feet high, and has now a population of 1800 souls. It is divided into four quarters, the eastern suburb consisting entirely of mud houses. A magnificent grove of very ancient olives forms an avenue 4 miles long north of the city. On the south-east are a few palms. There are many lofty minarets in various parts of the town, and a fine mosque built of ancient materials. A 12th century church towards the south side of the hill has also been converted into a mosque. On the east is shown the tomb of Samson (an erroneous tradition dating back to the Middle Ages). The ancient walls are now covered up beneath green mounds of rubbish, The water supply is from wells sunk through the sandy soil to the rock; of these there are more than twenty—an unusual number for a Syrian town. The land for the 3 miles between Gaza and the sea consists prit- cipally of sand dunes. There is no natural harbour, but traces of ruing near the shore mark the site of the old

Majuma Gaze or Port of Gaza, now called el Mineh, which in the 5th century was a separate town and episcopal see, under the title Constantia or Limena Gaza. In the 7th century there were numerous families of Samaritans in Gaza, but they became extinct at the commencement of the

present century. Hashem, the father of Mahomet, lies |

buried in the town. On the east are remains of a race-

course, the corners marked by granite shafts with Greek |

inscriptions on them. ‘To the sonth is a remarkable hill, quite isolated and bare, with a small mosque and a grave- yard, It is called el Muntar, “the watch tower,” and is supposed to be the mountain ‘before (or facing) Hebron,” to which Samson carried the gates of Gaza (Judg. xvi. 3). The bazaars of Gaza are considered good. An extensive pottery exists in the town, and black earthenware peculiar to the place is manufactured there. The climate is dry and comparatively healthy, but the summer temperature often exceeds 110° Fahr. The surrounding country is partly cornland, partly waste, and is inhabited by wander- ing Arabs. From the 5th to the 12th century Gaza was an episcopal see of the Latin Church, but even as late as the 4th century an idol named Marnas was worshipped in the town.

GAZA, THroporus (c. 1400-1478), one of the leaders of the revival of learning in the 15th century, was born at Thessalonica about the year 1400. On the capture of his native city by the Turks in 1430 he removed to Mantua, where he rapidly acquired a competent knowledge of Latin under the teaching of Victorino de Feltre, supporting himself meanwhile by giving lessons in Greek, and by copying manuscripts of the ancient classics. About 1440 he became professor of Greek in the newly founded univer- sity of Ferrara, to which students in great numbers from all parts of Italy were soon attracted by his fame as a teacher. Hehad taken some part in the councils which were held in Ferrara (1438), Florence (1439), and Siena (1440), with the object of bringing about a reconciliation between the Greek and Latin Churches; and in 1450, responding to the invitation of Pope Nicholas V., he went to Rome, where he was for some years employed by his patron in making Latin translations from Aristotle and other Greek authors. From 1456 to 1458 he lived at Naples under the patronage of Alphonso the,

Magnanimous; and shortly after the latter date he was appointed by Cardinal Bessarion to a benefice in the south of Italy, where the later years of his life were spent, and where he died at an advanced age in 1478. Gaza stood high in the opinion of most of his learned con- temporaries, but still higher in that of the scholars of the succeeding generation. His Greek grammar, in Greek (ypopparikns eicaywyis BiBAa §), first printed at Venice in 1495, and afterwards partially translated by Erasmus in 1521, although in many respects defective, especially in its syntax, has done good service in the cause of sound learning, His translations were very numerous, including the Pro- blemata, De Historia Animalium, De Partibus Animalium, and De Generatione Animalium of Aristotle, the Historia Plantarum and De Causis Plantarum of Theophrastus, the Problemata of Alexander Aphrodisias, the De Instruendis Aciebus of Ailian, and some of the Homilies of Chrysostom. He also turned into Greek Cicero's De Senectute and Somnium Scipionis,—with much success, in the opinion of Erasmus ; with more elegance than exactitude, according to the colder judgment of modern scholars. He was the author also of two small treatises entitled De Mensibus and De Origine Turcarum.

GAZELLE. See Anrenorn.

GAZETTE, Tax Lonvon, is the official newspaper of the Government, and is published every Tuesday and Friday. It contains proclamations, orders, regulations, and other acts of state, and is received as evidence thereof in legal

proceedings. It also contains notices of proceedings in bankruptcy, dissolutions of partnership, &. The Bank- ruptcy Act, 1869, requires the order of adjudication to be published in the Gazette, and makes the Gazette conclusive evidence of adjudication. Other statutes, dealing with special subjects, have similar provisions. Unless by virtue of such statutes, the Gazette is not evidence of any- thing but acts of state. The Scotch law of evidence would appear not to be so stringent. Gazettes are also published in Edinburgh and Dublin.

GEBER. After all the research and criticism that have been expended on this the first and most interesting personage in the modern history of chemistry, little is definitely known about him, and about the origin of the works which pass under his name. It has been a very general tradition to regard Geber as an Arabian, but until the publication in recent years by European scholars of the works of Arabian historians and bibliographers, the pro- bable source of the tradition has not been known. It seems to be pretty generally believed that the Geber of Western Europe is the same as the person who is called in full Abu Musa Dschabir (or Jabir) Ben Haijan Ben Abdallah el-Sufi el-Tarsusi el-Kufi, who was reckoned the most illustrious of the alchemists by the Arabs, and who is mentioned in the Kitab-al-Fhrist (10th cent.), by Ibn Khallikan (13th cent.), by Haji Khalfa (17th cent.), and other writers. If this be correct, Geber must have flourished in the 8th century, for, according to Haji Khalfa, Dschabir Ben Haijan died in the 160th year of the Hegira, which corresponds with the year beginning October 19, 776 a.p. This date is incidentally confirmed by other writers, though there are difficulties arising from the date of his teacher Kalid Ben Jezid, and his patron Dschaafar ess-Sadik. His birthplace was Tarsus, or, as others say, Kufa; and he is said to have resided at Damascus and at Kufa. This account, though apparently the most trustworthy, does not agree with the statements of D'Herbelot, quoted seemingly from native sources, that Geber was born at Harran in Mesopotamia, was a Saban Dy religion, and lived in the 3d century of the Hegira. Nor does it agree with that of Leo Africanus, who in 1526 gave a description of the Alchemical Society of Fez, in Africa, and told how the chief authority of that society was a certain Geber, a Greek, that had apostatized to Mahometanism, and lived a century after Mahomet. Leo's story has circulated very widely, but its accuracy has been impugned by Reiske and Asseman, and the works of both Leo and D'Herbelot have been rejected as autho- rities by Wiistenfeld. Other writers have tried to show that Geber was a native of Spain, or at least lived at Seville, but this has probably arisen from confusing Geber the chemist with other persons of the same or similar name, From the doubt encircling the personality of Geber, some have gone the length of questioning whether such a person ever existed but in name, and this view has been again expressed by Steinschneider, who mentions "Abu Musa Dschabir Ben Haiyan, commonly called Geber, an almost mythical person of the earliest period of Islam,

renowned as an alchemist.” While Steinschneider here ex- hibits notable scepticism with respect to Dschabir’s very existence, he exhibits equal credulity in his belief that this mythical Dschabir is identical with Geber. In the present state of the question there is no alternative but to accept the account given in the Fihrist, and admit the possibility of Dschabir and Geber being one and the same. Con- firmation of this view is to be sought in a comparison of the works ascribed to Geber with those bearing the name of Dschabir. The latter are divisible into two classes, those mentioned in Arabic bibliographies, ei those existing in manuscript in European libraries. to Dschabir is assigned the authorship of an immense

number of works on chemistry and many other topics besides. ‘Titles of 500 of these are given In the Fihrist, and have been reproduced by Hammer-Purgstall, but nothing else is known about them. Haji Khalfa also enu- merates the titles of several alchemical works by Dschabir, and other works are mentioned by other writers. Again Arabic MSS. on alchemy bearing the name of Dschabir Ben Haijan exist at Leyden, at Paris, in the British Museum, and elsewhere ; but these have not been critically examined as to their date, age, authenticity, contents, &e. It is not known if they correspond with the lists already mentioned, or with the Latin MSS. or the printed versions. The Latin MSS. are contained in the Vatican, at Leyden, Oxford, and other places. Of these the Vatican MS. is the alleged basis of some of the printed editions; and the Bodleian MSS. have been described by W. H. Black, but no collation of the text of these writings for critical pur- poses has as yet been made. The oldest of the MSS. dates from the 14th century ; but if the works ascribed to Roger Bacon, Albertus Magnus, and others be genuine, Geber’s name and writings must have been known and esteemed at a still earlier period. The works which purport to have been written by Geber, and which have been printed, bear the following names :—Summa perfectionis ; Liber investi- gationis, or De investigatione perfectionis; De inventione veritatis ; Liber Fornacum ; Testamentum. None of the editions appear to contain the whole of these tractates ; there are usually found only two or three of them, but the English translation contains them all except the Zestament, which is considered spurious by some writers. The printed editions of these works are very numerous, but they are all uncommon, aid

some of them are exceedingly rare. No approximately complete list is contained in any biblio- graphy, and very few writers have seen more than half a dozen at most. The most complete catalogue from personal inspection is given by Beckmann. It contains twelve editions, but that does not comprise nearly all those which are known. While some of the editions correspond exactly, being merely reprints, there are important differences among others, What light these variations may throw upon the origin of the text has never been investigated. A critical edition of the works with the various readings would ke necessary before deciding that what is found in them is really Geber's, and dates back eleven centuries. It may be that some of the knowledge of chemistry credited to Geber was really interpolated at a later date, It is quite. possible that the account given of the various acids, salts, and metals, and of the apparatus and operations, may have been modified or extended. But, on the other hand, the general theory that runs through the whole of the writings is in all probability original. The theory is that the metals are composed of the same elements, and that by proper treatment the less perfect can be gradually developed into the more perfect metals. This theory is very clearly, and one may even say logically, worked out and it was the leading idea in chemistry down to the 16th century at least. In carrying out this theory prac- tically, certain materials were employed and were subjected to operations, and the knowledge acquired about them took shape by degrees. Though subsequent workers added to what was known, Geber's reputed works are so clear, so precise, so complete, that they differ in a most striking manner from the works of even the best writers in the later alchemical period, and make it difficult to account for their existence at all. Older writings there are none; subsequent writings as clear as Geber's do not appear until far more was known; the unsolved problem therefore remains, Who was Geber, and how does

it happen that bis works stand quite alone in chemical literature ?

GEB—GEC

The following are a few of the authorities which may be con- sulted :—Abulfeda, Annales Moslemici, Copenhagen, 1790, with Reiske's note; Beckmann, Gresehiehte der Erfindungen, 1803, v. 272; Black, Catalogue of MISS. bequeathed to the University of Oxford by Elias Ashmole, 1845 ;

D’Herbelot, Bibliotheque Orientale Paris, 1697 ; Haji Khalfa, Lexicon, ed. Fluegel, London, 1835-58 = Hammer-Purgstall, Literaturgeschiehte der Araber, Vienna, 1850 : Ibn-Khallikan, Biographical Dietionary, by De Slane, Paris, 1843, vol. i. pp. 800-1; Kitab-al-Fihrist, ed. Fluegel, 1871-72; Kopp, Beitrége zur Geschichte der Chemie, Brunswick, 1875, part i Laboratory, 1867, vol. i. pp. 71-76; Leo Africanus, Afriew De. seriptio, Leyden, 1632; Steinschneider, ‘‘ Die toxicologischen Schriften der Araber,” in Virchow’s Archiv, Berlin, 1871, Bd. 52; Wiistenfeld, Geschichte der Arabischen Aerzte, Gottingen, 1840. See also article ALCHEMY. (J. F.)

GEBWEILER, in French Guebwiller, a town of the German imperial province of Alsace-Lorraine, in the district of Upper Alsace, situated about 13 miles south of Colmar, at the mouth of the Blumenthal or “ Vale of Flowers.” It communicates by a branch line with the railway between Strasburg and Basel. Among the principal buildings are the Roman Catholic church of St Leodgar, dating from the 12th century, the Evangelical church, the synagogue, the town-house, and the old Dominican convent now used as a market and concert-hall. The spinning, weaving, bleaching, and dyeing of cotton is the chief industry, but woollen goods and silk ribbons, as well as machinery, are also manu. factured. Gebweiler is mentioned as early as 774. It belonged to the religious foundation of Murbach, and in 1759 the abbots chose it for their residence. At the French Revolution of 1789, however, the chapter house was laid in ruins, and though the archives were rescued and

»removed to Colmar, the library perished in the devastation.

Population in 1871, 11,104; in 1875, 11,622.

GECKO, the common name applied to all the species of Geckotidee, an extensive family of lizards belonging to the Pachyglosse, or “ thick-skinned” sub-order of Gray. The geckoes are small creatures, seldom exceeding 8 inches in

Leaf-tailed Gecko (Phyllurus platurus).

length including the tail, With the head considerably flattened, the body short and thick, the legs not high enough to prevent the body dragging

somewhat on the ground, the eyes large and almost destitute of eyelids, and the tail short and in some cases nearly as thick as the body, the geckoes altogether lack the litheness and grace characteristic of most lizards. Their colours also are dull, and to the weird and forbidding aspect thus produced the general prejudice against those creatures in the countries where they occur, which has led to their being classed with toads and snakes, 18 no doubt to be attributed. Their bite was supposed to be venomous, and their saliva to produce painful cutaneous eruptions ; even their touch was thought sufficient to convey a dangerous taint. It is needless to say that in this instance the popular mind was misled by appearances. The geckoes are not only harmless, but are exceedingly useful creatures, feeding on insects and worms, which, owing to the great width of their cesophagus, they are enabled to

swallow whole, and in pursuit of which they do not hesitate to enter human dwellings, where they are often killed on suspicion. The structure of the toes in those lizards forms their most characteristic anatomical feature. These organs are flattened out into broad discs, and are furnished with transverse lamellar plates, by means of which the geckoes sre enabled to run with ease on the smoothest surface, and to imitate the fly in remaining suspended on ceilings or on the under surfaces of leaves. Most of the species have nails to their toes, and these in their sharpness and retrac- tility bear considerable resemblance to the claws of feline animals. They are nocturnal in their habits ; but when not exposed to the hot sunshine they are able to pursue their prey by day. They hibernate; and two fatty masses in front of the pubis are supposed to furnish the means of nourishment during this period. Many of the species possess to a limited extent the chameleon faculty of chang- ing colour, while their colouring generally may be regarded as protective; a few Indian forms are said to become luminous in the dark. The geckoes form an extensive family, including 60 genera and 200 species, found through- out the warmer regions of the earth, two only being inhabitants of Europe, and even these occur also in the north of Africa. Unlike most lizards, they are found in the remotest oceanic islands, a fact which leads Mr Wallace (Geographical Distribution of Animals) to suppose that they possess exceptional means of distribution.

GED, Wittram (? -1749), the inventor of the art of stereotyping, was born at Edinburgh about the beginning of the 18th century. In 1725 he first put in practice the art which he had discovered; and some years later he entered into a partnership with a London capitalist, with a view to employing it on a great scale. The partnership, however, turned out very ill; and Ged, broken-hearted at his want of success, died at London, October 19, 1749. The only books which he produced by means of stereotyp- ing were two prayer-books for the university of Cambridge, and an edition of Sallust. See Life by Nichols, 1781.

GEDDES, Atexanper (1737-1802), a learned theo- logian, biblical critic, and miscellaneous writer, was born at the farm of Arradoul, in the parish of Rathven, Banff- shire, Scotland, on the 14th of September 1737. At the age of fourteen he entered the small Roman Catholic semi- nary at Scalan in a remote glen of the Banffshire highlands, where he remained till October 1758, when he was sent to the Scottish College in Paris for the further prosecution of his studies, Here to considerable acquirements in biblical philology and school divinity he succeeded in adding a good knowledge of most of the literary languages of Europe. Returning to Scotland after an absence of six years, he for a short time officiated as a priest in Dundee, but in May 1765 received and accepted an invitation to become resident in the family of the earl of Traquair, where, with abund- ance of leisure and the free use of an adequate library, he made further progress in his favourite biblical studies. After a second visit to Paris which extended over some months, and which was employed by him in reading and inaking extracts from rare books and manuscripts in the public libraries, he in 1769 was appointed to the charge of the Catholic congregation of Auchinhalrig in his native county. During the period of a ten years' incumbency there he displayed a liberality of spirit which caused con- siderable scandal to his stricter brethren; and the freedom with which he fraternized with his Protestant neighbours once and again called forth the rebuke of his bishop (Hay), Ultimately, on account of his occasional attendance at the parish church of Cullen, where his friend Buchanan was minister, he was deprived of his charge and forbidden the exercise of ecclesiastical functions within the diocese. This happened in 1779; and in 1780 he went with his friend

Lord Traquair to London, where he spent the rest of his life, with the exception of a few weeks devoted to travel on the Continent. Before leaving Scotland he had received the honorary degree of LL.D. from the university of Aberdeen, a compliment seldom before paid to any Catholic, and had been made an honorary member of the Society of Antiquaries, in the institution of which he had taken a very active part. Shortly after his arrival in London Geddes received an appointment in connexion with the chapel of the imperial ambassador, which he held until the chaplaincy was suppressed some years afterwards, Having been intro- duced to Lord Petre, to whom he broached his long-cherished scheme for the publication of a new Catholic version of the Scriptures on the basis of the Vulgate, he met with every encouragement from that nobleman, who assigned to him an annual salary of £200, and, moreover, undertook to provide the needful books. Supported also by such scholars as Kennicott and Lowth, Geddes in 1786 published a Pro- spectus of anew Translation of the Holy Bible, from corrected Texts of the Originals, compared with the ancient Versions, with various Readings, explanatory Notes, and critical Observations, a considerable quarto volume, in which the defects of previous translations were fully pointed out, and tlie means were indicated by which these might be removed. It attracted considerable notice of a favourable kind, and led to the publication in 1788 of Proposals for Printing, with a specimen, and in 1790 of a General Answer to Queries, Counsels, and Criticisms. The first volume of the translation itself, which was entitled Zhe Holy Bible; or the Books accounted sacred by Jews and Christians ; otherwise called the Books of the Old and New Covenants ; faithfully translated from corrected Teuts of the Originals, with various Readings, explanatory Notes, and critical Remarks, appeared in 1792, and was the signal for a storm of hostility on the part of both Catholics and Protestants. It was obvious enough—no small offence inthe eyes of some—that as a critic Geddes had identified himself with Houbigant, Kennicott, and Michaelis; but others did not hesitate to stigmatize him as the would-be “corrector of the Holy Ghost.” Three of the vicars-apostolic almost immediately warned all the faithful against the “use and reception ” of his translation, on the ostensible ground that it had not been examined and approved by due ecclesiastical authority ; and by his own bishop (Douglas) he was in 1793 suspended from the exer- cise of his orders in the London district. The second volume of the translation, completing the historical books, published in 1797, found no more friendly

reception ; but this circumstance did not discourage him from giving forth in 1800 the volume of Critccal Remarks on the LHebrew Scriptures, corresponding with a New Translation of the Bible, containing the Pentateuch, of which it is enough to say that, while fully saturated with all the best learning of its time, it presented in a somewhat brusque and injudicious manner the then novel and startling views of Eiclhorn and his school on the primitive history and early records of mankind. Dr Geddes was engaged on a critical translation of the Psalms, which he lad completed down to the 118th, when he was seized with a lingering and painful illness which ultimately proved fatal on the 26th ot February 1802. Although for many years he had been under ecclesiastical censures, he had never for a moment swerved from a consistent profession of faith as a Cathuolic ; and on his deatli-bed he duly received the last rites of his communion. It would appear, however, that the report which gained currency that betore his death he had made recantation of his “errors” was entirely destitute of foundation in fact. In his lifetime he enjoyed the friendship of several eminent Continental scholars, and his death was noticed as being a loss to science in the Gelehrte Zeotung of Gotha and in other foreign journals.

Besides pamphlets on the Catholic and slavery questions, as well

as several fugitive jeux desprit, and a number of unsigned articles

; 7 Review, Geddes also ublished a metrieal trans- ae ee ee ok Select Seer of Horace (1779), and a verbal rendering of the First Book of the Iliad of Homer (1792). The Memoirs of his life and writings by his friend Dr Mason Good appeared in 1803, and his unfinished work on the Psalms in 1807.

GEELONG, one of the leading towns in Victoria, coeval with Melbourne in the history of Australian settlement, 1s pleasantly situated on Corio Bay, an extensive western arm of Port Phillip, 45 miles 8.W. of Melbourne, in 39° 8’ S. lat, and 144° 21’ E. long. The town slopes to the bay on the north side and to the Barwon river on the south, and its position in this respect, as well as the shelter it obtains from the Bellarine range of hills, renders it the healthiest town in the colony. Its streets are wide and laid out at right angles, and there are many handsome public and private buildings. It hasa

botanical garden, and two parks inaintained by the municipality. The public buildings comprise a mechanics' institute (with a library containing nearly 12,000 volumes), a public library, a town hall, a fire- brigade establishment, a handsome and commocious hospital, a supreme court, and orphan and benevolent asylums. The town is supplied with water from large state-constructed reservoirs in the Brisbane ranges, some 25 miles distant. As a manufacturing centre Geelong is of con- siderable importance. It contains extensive woollen mills and tanneries on the Barwon river, and paper of good quality is largely made in the neighbourhood. Geelong harbour has area and depth enough to hold all the navies of the world. The bar at the entrance has been cut (at an expense of £6000) to admit vessels of heavy draught, and some of the largest wool ships are able to load at the wharves, which are connected by railway with all parts of the colony. The population of the city proper is a little over 12,000, but with the adjacent boroughs of Geelong West, Chilwell, and Newtown the total is increased to 24,000.

GEESTEMUNDE, a seaport in the Prussian pro: vince of Hanover, in the district or Landdrostei of Stade, situated, as the name indicates, at the mouth of the Geeste, a right-hand affluent of the estuary of the Weser. It lies about 32 miles N. of Bremen, and is the terminus of a railway from that city. Theinterest of the place is purely naval and commercial, its origin dating no further back than 1857, when the construction of the harbour was commenced. The great basin opened in 1863 has a length of 1785 English feet, a breadth of 410, and a depth of nearly 23, and can accommodate 24 or 25 of the largest ships of the line ; and the petroleum basin opened in 1874 has a length of 820 feet and a breadth of 147. To the left of the great basin lies'a canal, which has a length of 13,380 feet and a breadth of 155; and from this canal there strikes off another of similar proportions. The whole port is protected by powerful fortifications, and it lies outside of the limit of the German customs. Since 1864 the trade has been almost trebled, the number of vessels being 617 sea-going ships entering in 1875 and upwards of 2000 river craft. Among the industrial establishments of the town are ship- building yards, foundries, engineering works, and steam mills. The population, exclusive of the garrison, was 3218 in 1871, and 3436 in 1875; and if the neighbouring commune of Geestendorf be included, the total for 1871 was 9148, and for 1875 10,425.

GEFLE, Latinized as Gevalia, a seaport town of Sweden at the head of the Gefleborglin, about a mile from the shore of the gulf of Bothnia, near the mouth of the Gefle-A, 50 miles E. of Fahlun, and about the same distance N. of Upsala. With the former city it has been connected by railway since 1859, and with the latter and Stockholm since 1874. As the river at that place is divided into three channels, the town consists of four portions, communicating

‘ jects connected with the fortunes of his people.

with each other by wooden bridges. In 1869 it was almost destroyed by fire, but it has been rebuilt, and may still be reckoned one of the prettiest, as it is certainly one of the busiest, of Swedish towns. The principal buildings are the castle, originally founded in the 16th century by King John IIL, but rebuilt since its destruction by fire in 1727; a beautiful council-house erected by Gustavus IIL., who held a diet in the town in 1792; a hospital, an exchange, and a freemason’s lodge in the Gothic style. An orphan asylum, a gymnasiuin, removed to Gefle from Stockholm in 1668, and a public library may also be mentioned. Pos- sessing an excellent harbour, and recently restored wharves to which large vessels have easy access, Gefle is the great port for the Dalecarlian district, and thus ranks in Sweden next to Stockholm and Gottenburg. It has about 100 ships of its own, and carries on a good trade in the export of timber, tar, flax, and linen, and in the import of grain, salt, coal, &c. The manufactures of the town include gailcloth and linen, tobacco, Jeather, iron wares, and machinery. In 1873 the population was 16,265. GEIGER, Asranam (1810-1874), one of the ablest leaders of the modern Jewish school of theology and criticism, was born at Frankfort-ou-the-Main, May 24, 1810. After receiving from his father and uncle the elements of an ordinary rabbinical education, he was in his eleventh year sent to the gymnasium, whence in 1829 he passed to the university of Heidelberg, which he soon after- wards exchanged for that of Bonn. As a student he greatly distinguished himself both in philosophy and in philology, and at the close of his course wrote on the relations of Judaism and Mahometanism a prize-essay which was after- wards published, in 1833, under the title Was hat Mohammed aus dem Judenthum

aufgenommen? In November 1832 he went to Wiesbaden as rabbi of the synagogue there, and, still pursuing the line of scientific study upon which he had entered during his undergraduate course, became in 1835 one of the most active promoters of the Zeitschrift fiir Jtidische Theologie, which appeared from 1835 to 1839, and again from 1842 to 1847. In 1838 he removed to Breslau, where he continued to reside for the next twenty-five years, and where he wrote some of his most important works, including his Lehr- wnd Lesebuch aur Sprache der Mischna (1845), his Studien from Maimonides (1850), his translation into German of the poems of Juda ha-Levi (Abu'l Hassan) in 1851, and the Urschrift und Uebersetzungen der Bibel in threr Abhéngigkeit von der innern Entwickelung des Judenthums (1857). The last- named work especially attracted much attention at the time of its appearance, and may be said to have marked a new departure in the methods of studying the records of Judaism. In 1863 Geiger became head of the synagogue of his native town, whence he removed in 1870 to Berlin, where, in addition to his duties as chief rabbi, he took the principal charge of the newly established seminary for Jewish science. The Urschrift was followed by a more exhaustive handling of one of its topics in Die Sadducder und Pharisder (1863), and by a more thoroughgoing application of its leading principles in an elaborate history of Judaism (Das Juden-thum u. seine Geschichte) in 1865-71. Geiger also contr buted frequently on Hebrew, Samaritan, and Syriac sub- jects to the Zeitschrift der deutschen morgenldndischen Gesellschaft, and from 1862 until his death (which occurred on the 23d of October 1874) he was editor of a periodical entitled Jiidische Zeitschrift fiir Wissenschaft und Leben. He also published a Jewish prayer-book (Israelitisches Gebetbuch) which is well known in Germany, besides @ variety of minor monographs on historical and literary 7 An All-

gemeine Hinleitung and five volumes of WVachgelassene

| Schriften were edited by his son L. Geiger in 1875.

GEHEI—GETI GEIJER, Ertx Gustar (1783-1847), Sweden's greatest

historian, was born at Ransiiter in Virmland, January 12, 1783, of a family that had immigrated from Austria in the At sixteen he ieft Carlstad gymnasium for the university of Upsala, where in 1803 he carried off the

Swedish Academy's great prize for an Areminne ofver Riksforstandaren Sten Sture. He graduated in 1806, and in 1810 returned from a year's residence in England to become "docent" in his university. Soon afterwards he accepted a post in the public record office at Stockholm, where, with eleven friends, he founded the 'Gothic Society," to whose organ Jduna he contributed a

time of Gustavus Adolphus.

number of prose essays and the songs Mankem, Vikingen, Den siste kampen, Den siste skalden, Odalbonden, Kolar- gossen, and others, whose simplicity and earnestness, warm feeling, and strong patriotic spirit are dearer to his nation for the fine melodies to which he set them. About the same time he issued a volume of hymns (1812), of which several are inserted in the Swedish Psalter. Geijer's lyric muse was soon after silenced by his call to be assistant to Fant, professor of history of Upsala (1815), whom he succeeded in that chair in 1817. In 1824 he was elected to the Swedish Academy. A single volume of a great pro- jected work, Svea Rikes Hafder, itself a masterly critical examination of the sources of Sweden's legendary history, appeared in 1825. Gieijer's researches in its preparation had severely strained his health, and he went the same year on a tour through Denmark and part of Germany, his impressions from which are recorded in his Minnen (1834). In 1832-36 he published three volumes of his Svenska folkets historia, a clear view of the political and social development of Sweden down to the close of Queen Christina's reign. The acute critical insight, just thought, and finished his- torical art of these two incamplete works of Geijer entitle him to the first place among Swedish historians. His chief other historical and political writings are his Kort teckning af Sveriges tillstand och af de forndmste handlande personer under tiden fran Karl XTI.'s dod till Gustaf LII.'s antrdde af regjeringen (Stockh. 1838), and Feodalism och republi- kanism, ett bidrag till Samhdllsforfattningens historia (1844), which led toa controversy with the historian Fryxell regarding the part played in history by the Swedish aristo- cracy. Geijer also edited, with the aid of Schréder, a con- tinuation of Fant's Scriptores svecicarum medii cevt (1818- 25), and, by himself, Thorild's Samlade skrifter (1819-25), and Konung Gustaf III.'s efterlemnade Papper (3 vols. 1843-45). Geijer's academic lectures, of which the last three,

published in 1845, under the title Om var tids inre samhillsforhallanden, i synnerhet med afseende pa Fadernes- landet, involved him in another controversy with Fryxell, exercised a great influence over his students, who especially testified to their attachment after the failure of the prosecu- tion for alleged anti-Trinitarian heresies in his Thorid, tillika en philosophisk eller ophilosophisk bekdénnelse (1820). A number of his extempore lectures, recovered from notes, were published by Ribbing in 1856. Failing health forced Geijer to resign his chair in 1846, after which he removed to Stockholm for the purpose of completing his Svenska folkets historia, and died there 23d April 1847. His Samlade skrifter (13 vols. 1849-55; new ed. 1873-75) include a large number of philosophical and political essays contributed to reviews, particularly to Literaturbladet (1838-39), a periodical edited by himself, which attracted great, attention in its day by its pronounced liberal views on public questions, a striking contrast to those he had defended in 1828-30, when, as again in 1840-41, he re- presented Upsala university in the Swedish diet.

Geijer's style is strong and manly. His genius bursts out in sudden flashes that light up the dark corners of history. A few strokes, and a personality stands before us

instinct with life. His language is at once the scholar's and the poet's; with his profoundest thought there beats in unison the warmest, the noblest, the most patriotic heart. Geijer came to the writing of history fresh from researches in the whole field of Scandinavian antiquity, researches whose first-fruits are garnered in numerous articles in [duna, aud his masterly treatise Om den gamla nordiska folk- visan, prefixed to the collection of Svenska folkvisor which he edited with A. A. Afzelius (3 vols. 1814-16). The development of freedom is the idea that gives unity to all his historical writings. This idea is not subjective; he traces it in the darkest annals of his country. Sweden, he repeats, is the only European land that has not been trod by foreign armies, that has never accepted the yoke of serfdom. There, on the whole, the king has ever been the people's faithfullest ally, and all his great designs for the country's external and internal gain have been carried out "by the help of God and Sweden." Throughout life Geijer was

what he professed to be, a seeker; and to no philosophic system did he yield absolute allegiance. Yet his writings mark a new era in Swedish history, the rise of a “critical school” whose aim is to draw the truth without distortion, and present reality without a foil.

For Geijer’s biography, see his own Minnen (1834), which contains copious extracts from his letters and diaries; Malmstrém, Min- nestal éfver E. G. Geijer, addressed to the Upsala students, June 6, 1848, and printed among his Tal och esthetiska afhandlingar (1868), and Grunddragen af Svenska vitterhetens hifday (1866-68); and S. A. Hollander, Minne af E. G. Geijer (1869).

GEIKIE, Watter (1795-1837), a Scotch subject- painter, was born at Edinburgh, November 9, 1795. In his second year he was attacked by a nervous fever by which he permanently lost the faculty of hearing, but through the careful attention of his father he was enabled to obtain a good education. His artistic talent was first manifested, while he was still very young, by attempts to cut out representations of objects in paper, and to draw figures with chalk on floors and walls. Before he had the advantage of the instruction of a master, he had attained considerable proficiency in sketching both figures and landscapes from nature, and in 1812 he was admitted into the drawing academy of the board of Scotch manufactures, where he made very rapid progress in the use of the pencil. He first exhibited in 1815, and was elected an associate of the Royal Scottish Academy in 1831, and a fellow in 1834. He died on the 1st August 1837, and was interred in the Greyfriars Churchyard, Edinburgh. Owing to his want of feeling for colour Geikie was not a successful painter in oils, but he sketched in India ink with great truth and humour the scenes and characters of Scottish lower-class life in his native city. The characteristics he depicts are somewhat obvious and superficial, but his humour is never coarse, and he is surpassed by few in the power of representing the broadly ludicrous and the plain and homely aspects of humble life, A series of etch- ings which exhibit very high excellence were published by him in 1829-31, and a collection of eighty-one of these was republished posthumously in 1841, with a biographical introduction by Sir Thomas Dick Lauder, Bart.

GEILER, or GEYLER, von KAISERSBERG, JOHANN (1445-1510), one of the greatest of the popular preachers of the 15th century, was born at Schaffhausen, March 16, 1445, but from 1448 passed his childhood and youth at Kaisersberg in Upper Alsace, from which place his Sp designationis derived. In 1460 he entered the a Freiburg in Baden, where, after graduation, he lectured for some time on the Sentences of Petrus Lombardus, the et mentaries of Alexander Halensis, and several of the be: : of Aristotle. A living interest in theological subjects, W. a had been awakened within him by the study of Gerson, Je

‘n 1471 to his removal to the university ot ee at that

period a centre of attraction to some of the most earnest

spirits of the time. Made a doctor of es a he received a professorship at ‘Freiburg in the fo aia ing year; but his tastes began to incline him more abe y to the vocation of a preacher, while his fervour. and elo- quence soou led to his receiving numerous invitations to the larger towns. Ultimately he accepted in 1478 a call to the cathedral of Strasburg, where he continued to work with few interruptions until within a short time of his death, which occurred on the 10th of March 1510. The beautiful pulpit erected for him in 1481 in the nave of the cathedral, when the chapel of St Lawrence had proved too small, still bears witness to the popularity he enjoyed as a preacher in the immediate sphere of his labours, and the testimonies of Sebastian Brandt, Beatus Renanus, Reuchlin, Melanchthon, and others who survived him, abundantly show how power- ful, how healthy, and how widespread had. been the influ- ence of his personal character. His sermons —bold, incisive, abounding in quaint illustrations, nor altogether wanting in instances of what would now be called bad taste—taken ’ down as he spoke them, and circulated (sometimes without his knowledge or consent) by his friends, told perceptibly on the German thought as well as on the German speech of his time.

Among the many volumes published under his name only two appear to have had the benefit of his revision, namely, Der Seelen Paradies von waren und volkomnen Tugenden, and that entitled. Das irrig Schaf. Of the rest,

probably the best known is a series of lectures on his friend Seb. Brandt's well-known work the Navicula or Speculum Fatuworwm, of which an edition was pub- lished at Strasburg in 1511 under the following title :— Navicula sive speculum fatuorum prestantissimt sacrarum literarwm doetoris Joannis Getler Keysersbergu concionatoris Argentinensis in sermones juata turmarum seriem divisa; suis figuris jam signita; atque a Jacobo Othero diligenter collecta. Compendiosa vite: ejusdem de- seriptio per Beatum Rhenanum Selestatinwm.

See Von Ammon, Geyler's Leben, Lehren, und Predigten (1826); Stéber, Bssat Historique et Litiéraire sur la Vie et les Sermons de Getler (1834); and C. Schmidt in Herzog's Real-Encycl., iv. 714 (1855).

GEISSLER, Hetnricu (1814-79), a distinguished prac- tical physicist, was born at the village of Igelshieb in Saxe-Meiningen, Germany, where he was educated as a glass-blower. After many years spent in travelling from

city to city in the exercise of his craft, he settled at Bonn,

where he speedily gained a high reputation, not only for his surpassing skill and ingenuity of conception in the fabrica- tion of physical apparatus, but for his comprehensive know- ledge, acquired chiefly in later life, of the natural sciences. With Pliicker, in 1852, by means of an ingeniously con- trived instrument, in which mercury wags made to compen- sate for the expansion of the glass, he ascertained the Maximum density of water to be at 3°8°C. He also de- termined the coefficient of expansion for ice between — 24° and — 7°, and for water freezing at 0°. In 1869, in conjunc- tion with Vogelsang, he proved the existence of liquid carbon dioxide in cavities in quartz and topaz, and later he obtained amorphous from ordinary phosphorus by means of the electric current. He is best known as the inventor of the sealed glass tubes which bear his name, by means of which are exhibited the phenomena accompanying the discharge of electricity through highly rarefied vapours and gases (see ELectricity, vol. viii. p. 64). Among other apparatus contrived by him are his vaporimeter, mercury air- pum balances, normal thermometer, and areometer. From the university of Bonn, on the occasion of its jubilee, he re- ceived the honorary degree of doctor of philosophy. He oat ae 24th of January 1879, in the sixty-fifth year ae ' he A. W. Hofmann, Ber. d, deut. chem. Ges., _ GELA, an ancient city

on the south coast of Sicily, on a river of the same name, near the site of the ndaeitn Terranuova, between Girgenti and Camerina. Founded b a Joint colony of Cretans and Rhodians (the latter pole

from the city of Lindus), it soon rose to wealth and power, and by 582 B.c. it was able to become the mother-city of Agrigentum, by which it was however destined before long to be surpassed. The most important among its rulers were the following :—Cleander, who subverted the oligarchy and made himself despot (505-498 B.c.); Hippocrates, his brother, who raised Gela to its highest pitch of emi- nence (498-491 B.c.) ; Gelon, who immediately succeeded Hippocrates, and rapidly pursued the same career of aggran. dizement till in 485 B.c. he got possession of Syracuse, and gave the first blow to his native city by removing the seat of government to his new conquest ; and finally Hiero, the brother of Gelon, who succeeded to the sovereignty in 478 B.c. The decadent Gela was laid waste by Phalaris of Agrigentum, and in the time of Strabo it was nothing more than a heap of ruins. Auschylus died at Gela in 456 B.c.;‘and it was the birthplace of Apollodorus, a comie poet of note.

GELASIUS, the name of two popes.

Geuastus I. succeeded Felix IIL in 492, and confirmed the estrangement between the Eastern and Western Churches by insisting on the removal of the name of Acacius, bishop of Constantinople, from the diptycls, He was also the first decidedly to assert the supremacy of the papal over the imperial power, and the superiority of the pope to the general councils. He is the author of De duabus in Christo naturis adversus Eutychen et Nestorium, Five of his letters have also come down to us, and he is most probably the author of Liber Sacrementorum, pub- lished at Rome in 1680; but the so-called Decretum Gelasit de libris recipiendis et non reciprendis is evidently a forgery. Gelasius died in 496, and was canonized, his day being the 18th November.

Gexasius I]. (Giovanni da Gaeta) was of noble descent, and was born at Gaeta about 1050. He received his theo- logical education in the abbey of Monte Casino, and after- wards held the office of chancellor under Urban

II., and of cardinal-deacou under Pascal II. On the death of Pascal II. he was elected pope by the cardinals, 18th January 1118, and when his person was seized by Cencius Frangi- pani, a partisan of the emperor Henry V., he was almost immediately set at liberty through the general uprising of the people in his behalf. The sudden appearance of the emperor, however, compelled him to leave Rome for Gaeta, and the imperial party chose an anti-pope, Burdinus, arch- bishop of Braga, under the name of Gregory VIII. Gelasius, at a council held at Capua, fulminated bulls of excommunication against his ecclesiastical rival and the emperor; and under the protection of the Norman princes he was able to return to Rome, where he stayed for a time in partial concealment, but having barely escaped capture by the Frangipani while celebrating mass in the church of St Praxede, he left the city, and after wandering through various parts of Italy and France died in the abbey of Clugny, January 19, 1119.

GELATIN. When intercellular connective tissue, as met with in skin, tendons, ligaments, and the fasciee of the muscles, of which it forms the basis, is treated with water, preferably hot, or in presence of dilute acids, for some time, a solution is obtained which in cooling solidifies to a jelly. The dissolved substance bears the name of Gelatin or Glutin.

_ The same substance is obtained when the matrix of bones 1s submitted to similar treatment, after previous removal, of the lime salts by means of mineral acids. Again, when unossified cartilage, as for instance the bone-cartilages of the vertebrate foetus, is treated with water or dilute acids, a solution is obtained which also gelatinizes on cooling. The coagulation in this case, however, is due, not to gelatin, but to a closely allied substance called choudrin, At one

time it was supposed that in each of these three cases the gelatinizing materials obtained were formed by the hydra- tion or by 2 physical metamorphosis of a different substance pre-existing in the respective tissues, to which the names collagen, ossein, and chondrogen were given respectively— the two former yielding gelatin, and the last chondrin.

Further experiments have made it more probable that gelatin and chondrin do not differ essentially from their parent tissues, analyses of tendons and of gelatin or isinglass (a very fine form of gelatin obtainable from the sturgeon) agreeing within the range of experimental error. At the sume time, as Foster observes in the case of chondrin, the fact that its extraction from cartilage requires an amount of boiling with water, much more than would be necessary to dissolve the same amount of dried product, points rather the other way. Most probably the change which occurs is of a purely physical character.

True gelatigenous tissue occurs in all mature vertebrates, with the single exception, according to HoppeSeyler, of that in other respects anomalous vertebrate, Amphioxus lanceolatus. In the embryo it does not appear till late in fostal life, chondrin being found instead ; and the change which brings gelatin into the place of chondrin is effected, not by a metamorphosis of the latter, but by its removal, and the independent formation of gelatin. The tissue in question was believed to be peculiar to Vertebrata until Hoppe-Seyler discovered it in the bodies of Octopus and Sepiola. By boiling these cephalopods with water he obtained large quantities of gelatin free from chondrin, but in an extension of his experiments to other invertebrates, as cockchafers and Anodon and Unio, no such tissue could bedetected. Gelatin, as such, is not met with in any of the normal fluids of the body, but occurs in the blood in cases of leukhoemia.

Various qualities of impure gelatin are prepared on the large scale by boiling up the hides of oxen, skins of calves, and spongy parts of horns; from any of the crude gelatins the pure substance may be obtained by bleaching with sulphurous acid and steeping repeatedly in warm water, when in the state of soft jelly.

Pure gelatin is an amorphous, brittle, nearly transparent substance, faintly yellow, tasteless, and inodorous, neutral to vegetable colours, and unaltered by exposure to dry air. Submitted to analysis it exhibits an elementary composi- tion agreeing closely with that of chondrin, containing in round numbers (50, H 7, N18, O+S 24 per cent.; whilst chondrin contains about 3 per cent. less nitrogen and more oxygen.

Nothing is known with any certainty as to its chemical constitution, or of the mode in which it is formed froin albuminoids. Besides a similarity in elementary constitu- ents, it exhibits in a general way a connexion with that large andimportant class of animal substances called proterds, being, like them, amorphous, soluble in acids and alkalies, and giving in solution a left-handed rotation of the plane of polarization. Nevertheless, the ordinary well-recognized reactions for proteids are but faintly observed in the case of gelatin, and the only substances which at once and freely precipitate it from solution are corrosive sub- lunate, strong alcohol, and tannic acid.

According to Wanklyn, gelatin is distinctly differentiated from such substances as casein and albumin by a marked difference in behaviour when treated successively with boil- ing potash and alkaline permanganate. All nitrogenous organic substances yield large quantities of ammonia when decomposed by boiling with these solutions ; but whereas albuminoids give up their ammonia at two successive stages, one of which is achieved by the action of potash alone, the other on the subsequent addition of permanganate, gelatin yields the same amount after the action of permanganate

alone, as the total obtainable by the successive actions of the two reagents. Now, as there appear to be good grounds for believing the molecule of albuminoids to con- tain one or more urea-residues, and as urea, and presumably therefore a urea-residue, would yield its ammonia to potash alone, Wanklyn concludes that gelatin differs in constitution from albuminoids by containing no urea. On the other hand, as Foster observes, the behaviour of gelatin as a food (see below), in diminishing the amount of fat used by an animal fed partly on it, as well as the quantity of nitro- gen abstracted from other sources, is readily intelligible on the hypothesis that it splits into a urea and a fat moiety.

Although gelatin in a dry state is unalterable by exposure to air, its solution exhibits, like all the proteids, a remark- able tendency to putrefaction ; but a characteristic feature of this process in the case of gelatin is that the solution assumes a transient acid reaction. The ultimate products of this decomposition are the same as are produced by pro- longed boiling with

acid (see below). It has been found that oxalic acid, over and above the action common to all dilute acids of preventing the solidification of gelatin solu- tions, has the further property of preventing in a large measure this tendency to putrefy when the gelatin is treated with hot solutions of this acid, and then freed from adhering acid by means of carbonate of lime. Gelatin so treated has been called metagelatin.

Strange to say, in spite of the marked tendency of gelatin solutions to develop ferment-organisms, and under- go putrefaction, the stability of the substance in the dry state is such that it has even been used, and with some success, as a means of preserving perishable foods. The process, invented by Dr Campbell Morfit, consists in im- pregnating the foods with gelatin, and then drying them till about 10 per cent, or less of water is present. Milk gelatinized in this way is superior in several respects to the products of the ordinary condensation process, more especially in the retention of a much larger proportion of albuminoids.

Gelatin has a marked affinity for water, abstracting it from admixture with alcohol, for example. Solid gelatin steeped for some hours in water absorbs a certain amount and swells up, in which condition a gentle heat, as that of the water-bath, serves to convert it into a liquid; or this may be readily produced by the addition of a trace of alkali or mineral acid, or by strong acetic acid. In the last case, however, or if we use the mineral acids in a more con- centrated form, the solution obtained has lost its power of solidifying, though not that of acting as a glue. By pro- longed boiling of strong aqueous solutions at a high, or of weak solutions at a lower temperature, the characteristic properties of gelatin are impaired and ultimately destroyed. After this treatment it acts less powerfully as a glue, loses its tendency to solidify, and becomes increasingly soluble in cold water; nevertheless the solutions yield on precipitation with alcohol a substance identical in composi- tion with gelatin. /

By prolonged boiling in contact with hydrolytic agents, such as sulphuric acid or caustic alkali, it yields quantities of leucin and glycocoll (so-called “sugar of gelatin,” this being the method by which glycocoll was first prepared), but no tyrosin, In this last respect it agrees with its near allies, chondrin and elastin, and differs from the great body of proteids, the

characteristic solid products of the decom- position of which are leucin and tyrosin. At the same time the formation of glycocoll differentiates it from chondrin, from. which, moreover, it can be pee distinguished by its non-precipitability by acetate of lead. ‘

When it 4 eed with copper sulphate a bright green liquid is formed, from which the copper cannot be pia down free of organic matter. Addition of potash to the

liquid merely changes the colour from green to violet, which |

‘ling is further transformed into a pale red, but without Braet tiation of hydrate. Hence the ee 2 Trommer’s sugar test In presence of gelatin, the cupro oxide being soluble in gelatin solutions. PN ae

Treated with strong oxidizing agents, such as a mixture of sulphuric acid and bichromate of potash, or binoxide of manganese, it exhibits a close resemblance in behaviour to casein, formic and valerianic acids being the principal pro- ducts, along with a small quantity of benzoic aldehyde. When solution of gelatin is mixed with chromate of potash alone, it forms a medium very sensitive to light, which con- verts it into an insoluble yellow mass. ;

As bones are capable of yielding one-third of their weight of solid gelatin, it follows that, if gelatin had a value equivalent to albuminoids, the bones of an animal would contain one-fifth of the total nutritive material in its body. Accordingly, at a time when gelatin was in high esteem for its food-value, recourse was had largely to this source, more especially in France, for a cheap nutritive soup for soldiers, pauper establishments, and hospitals. To prepare such a soup the bones may be either simply boiled in water under pressure, as in a Papin’s digester, or without pressure, or they may be previously freed from salts of calcium by treatment with dilute hydro-chloric acid. On the large scale the crushed bones are submitted to the combined action of steam at high pressure and a current of water percolating through the fragments. The bones, preferably in a fresh condition, or preserved by thorough drying or by antiseptic agents such as

brine, are crushed by passing them between solid iron cylinders grooved longitudinally and kept revolving. They are then packed into a cylindrical cage, which can be lowered into a cylindrical jacket of rather larger diameter than itself, the whole closing with a well-fitting lid. A pipe for the en- trance of water, regulated by a stopcock, projects from the top of the outer cylinder, and is connected before the lid is put on with an adjustable nozzle, through which the water trickles down among the caged bones. Another pipe is connected with the bottom of the apparatus for the pas- sage of high-pressure steam. The gelatin solution may be removed at intervals by means of a stopcock at the bottom. The quantity of water percolating through the bones is carefully regulated in accordance with the varying

pressure of the steam, so as to produce a soup of nearly uniform consistence.

As to the nutritive value of such a sou very different opinions have been entertained at different times. Tt was at the time of the first French Revolution, when the question of the improvement of the diet of soldiers and people was much discussed, that attention began to be directed to gelatin as a cheap and useful food ; and at that time such men as Proust and D'Arcet were trying improved methods of extracting it from bone. The discovery of nitrogen as a constituent of foods generally led to its being regarded as the special criterion of food-value, and, as this element was found to exist in large proportion in gelatin, the percentage of gelatin extractable from any substance was held as determining its worth as food.

In 1802 a commission appointed by the Academy to i i the question reported that, though it might to " oe replace flesh in soups, yet it could not be taken as the measure of food-value. Meanwhile experiments on men and dogs, especiall by Donné, Gannal, Edwards, and Balzac, ulong with the results of hospital rations at St Antoine and St Louis, showed the impossi- bility of feeding upon gelatin alone, and in general its unsatisfactory

character as a food. Accordingly, a second commission was i

by the Academy in 1841, who reported very strongly eee use of gelatin at all as an article of diet, alleging that, besides bein, valueless itself, it actually diminishes the value of otherwise ied tious food; but this latter part

of the indictment was overturned by the N etherlands' commission (Compt. Rend., 1844). It ended b the Academy In 1850 declaring that gelatin was positively cnjarictts to the digestive organs; and the natural result of this extreme reaction was of course a complete cessation of its use as food.

In Germany, Liebig had declared, in his Thierchemie (1843), that

gelatin, being a product of the decomposition of albumen, could not take the place of albumen as food, though it might be conceived to be useful for the growth of gelatinous tissue. Boussingault's experiments on ducks (Ann. Chem. Phys., 1846) showed that, con. trary to what should happen if the report of the French Academ were true, gelatin did not pass unaltered into their feeces, but that a large increase of uric acid was found in their urine, a result which was confirmed by Frerichs and Rischoff, who found in the urine of dogs fed on gelatin large amounts of urea—uric acid in birds and urea in mammals being the characteristic forms in which nitrogen is eliminated from the system of these animals. The conclusion they arrived at was that the use of gelatin as a food was limited to its power of undergoing decomposition in the body, like the carbo. hydrates, to yield heat, but that it cannot replace the other nitro- genous constituents of the body. In 1858 Dr Donders of Utrecht published a treatise on foods, in which he dealt with gelatin, and expressed opinions that have pretty much held their ground since, and only been confirmed in detail by subsequent investigators, Large quantities of gelatin, he says, are detrimental to digestion. In moderate quantity it gets decomposed in the body, and acts as a food probably by diminishing the otherwise necessary amount of albumen, the sole use of which, he remarks, is not merely to form tissues. In 1860 Bischoff and Voit published the result of their experiments on the subject, which completely established the fact that gelatin can take the place of albumen to a limited extent, in a way that fat cannot, so that the body-weight maintains itself on a smaller supply of albumen, and that gelatin has a function therefore of a higher character than a mere heat-produeer like starch and sugar. In a more recent memoir by Voit, from which the previous historical sketch is mostly borrowed (Zeitschrift fir Biologie, viii., 1872), the results of an extensive series of careful experiments are given, in which the same conclusion

comes out. He finds, moreover, that the saving of albumen is even more marked when a moderate amount of fat accompanies the gelatin, but that no combination of fat and gelatin can replace albumen or prevent the animal from losing flesh; but, on the contrary, when a og was fed on equal parts of gelatin and fat it lost more flesh than when fed on gelatin alone. Fed on gelatin alone, it after a time evinced such a repugnance to the food that it would rather starve than feed; and, if it was induced to eat, vomiting and diarrhea were the results. The time which gelatin takes for its complete metamorphosis in the body is far less than in the case of albumen, never exceeding 24 hours, in the course of which time all its nitrogen may be found in the urine and feces,

_ A parallel series of experiments to determine how far gelatin could replace fats or carbohydrates in food showed that, though it could not be substituted for them to any large extent, it does somewhat diminish the amount of fat used up. As Voit puts it at the end of his paper, gelatin cannot, any more than fats or carbohydrates, take the place of that moiety of albumen which he calls the organic albumen,—the part which goes to build the organs and tissues; it cannot produce new blood-corpuscles to replace those that are worn out, or form muscles or any tissues, not even the gelatigenous. What it is capable of doing is to act as a substi- tute to some extent for that other and far larger part of the albumen of food which, never at any time forming part of any organ, cir- culates in the blood, and is carried to all the tissues, undergoing continual metamorphoses.

A later series of experiments by Etzinger, a pupil of Voit, was undertaken in order to elucidate the action of the digestive fluids on gelatin or gelatigenous tissue. Direct experiments showed that these substances are scarcely altered by prolonged contact with a dilute (0°3 per cent.) solution of hydrochloric acid at the ordinary temperature of the body. But when gelatin or tissues yielding it, such as ligamentum nuche, tendons, and bones werc treated at the same temperature with an artificial gastric juice made by acidifying with acid of the above strength glycerin extract of pigs’ stomach, a large quantity of these substances speedily disappeared to form a solution which did not gelatinize. The solution thus obtained exhibits physical and chemical characters so analogous to those of the peptones formed by a

similar process from albuminoids that it has been called by some authors gelatin-peptone.

In a quite recent research by Hofmeister (Zeitschrift fiir Physiol. Chem., ii. [5] 299, 1878) an attempt has been made to study the pro- duct formed in this digestion transformation. Taking the soluble gelatin obtained by prolonged boiling of gelatin in water to be the same material as is produced by the action of gastric juice, the author found that from the solutions so obtained two distinct sub- stances could be separated, one precipitable by perchloride of platinum, which he calls semiglutin, and the other not so precipit- able, and also more soluble in alcohol, which he calls hemécollin. Semiglutin forms definite salts with platinum and copper, analyses of which agree pretty well with the formula C,,H»,N17Oo9 a8 the simplest expression for the substance. Similarly the copper-salt of hemicollin gave results indicating for hemicollin a formula CyrH79N},0y9. Both of these substances yield leucin and glycocoll When treated by boiling with hydrochloric acid and stannous

we

‘ gelatin (see above), has greatly inferior power of adhesion.

Gc ff i aT’ NN

chloride. Further, this author states that, according to his analyses, collagen differs from gelatin by one molecule of water, and from the sum of the molecules of semiglutin and hemicollin by three molecules of water, so that a probable empirical formula for gelatin would be CyogHi5:N 51059, agreeing pretty fairly with the percentage numbers given in an earlier part of this article.

See Hoppe-Seyler, Medicintsch-Chemische Untersuchungen, 1866 and 1871, and his Phystologische Chemie, just being published; Gmelin’s Handbook, vol. xviii., 1871; Watts’s Dictionary of Chemistry, vol. ii. For the digestion of gelatin, see Carl Voit, Zeitschrift fir Biologie, viii, 297, 1872; Etzinger, same work, x. 84, 1874; and for constitution of collagen, Hofmeister, Zeitsch. far Physiol. Chemie, ii. [5] 299, 1878. (D.C. R.)

Industrial Relations of Gelatin.

Glue.—Glue is a form of gelatin, which, on account of its impure condition, is employed only as an adhesive medium for wood, leather, paper, and like substances. There is, however, no absolute distinction between glue and gelatin, as they merge into each other by impcrceptible degrees; and although the dark-coloured varieties of gelatin which are known as ordinary glue are in uo case treated as food, yet for several purposes the fine transparent kinds, prepared chiefly for culinary use, are employed also as adhesive agents. Neither again, except in respect of its source, is there any chemical or physical distinction between these two sub- stances aud isinglass or fisli glue, and therefore the prepara- tion and industrial applications of these three varieties of commercial gelatin—glue, gelatin, and isinglass—will be here noticed,

The gelatin-yielding substances in the animal kingdom are very numerous, comprising the skins of all animals, tendons, intestines, bladders and fish sounds, bones, horns, and hoofs. Choudrin, the snbstance yielded by carti- laginous tissue, which is simply an impure variety of

In the preparation of ordinary glue the materials used are

the pariugs and cuttings of hides from tan-yards, the ears ‘

of oxen and sheep, the skins of rabbits, hares, cats, dogs,

aud other animals, the parings of tawed leather, parchment, | and old gloves, and many other miscellaneous scraps of ‘ Taking tan-yard refuse to be the principal , material, it is first steeped for some weeks ina pit with |

animal matter. lime water, and afterwards carefully dried andstored. The

which may be attached to the skin, and to forma lime soap with the fatty matter it contains. So prepared the “scrows” or glue pieces, as they are termed, may be kept a long time without undergoing change,

then placed in hemp nets and introduced into an open boiler, which has a false bottom, and a tap by which liquid

may berun off. The boiler is heated by direct firing, a series | of boilers being arranged in the manner best fitted to obtain As the ‘

the greatest possible heating effect from one fire. boiling proceeds test quantities of liquid are from time to time examined and when a sample is found on cooling to

form a stiff jelly, it is ready to draw off. Usually the first’

boiling occupies about eight hours, and when the liquid has been drawn off, more water is added and the boiling process repeated. In this way the gelatinous matter is only ex- hausted after six separate boilings, occupying about two days, the last boiling yielding a darker-coloured glue than the first. It is essential that the boiling out of a charge should not be continued longer than is necessary for yielding a sufficiently stiff gelatinous solution, as it is found that, when the liquid is long exposed to a heat ator above boiling point, the gelatin loses its power of congealing. From the boiler the sufficiently concentrated solution is run toa tank or

setting back,” in which a temperature sufficient to keep it fluid is maintained, and in this way any impurity is per- nutted to subside. The glue solution is then run into wooden troughs or coolers about 6 feet long by 2 feet broad and 1 foot deep, in which it sets to a firm jelly. When

; Before being. boiled, the glue pieves are thoroughly washed. They are |

set, a little water is run over its surface, and with knives of suitable form it is detached from the sides and bottom, cut into uniform slices about an inch thick, and squares of these are placed on nets stretched between upright wooden frames or hurdles for drying. The drying operation, whicli requires very special care, is best done in the open air; the plastic masses must, however, be protected from rain. Frost and strong dry heat are equally injurious, and the best results are obtained in spring and autumn weather, when the glue dries in from twelve to eighteen days. When the pieces have become quite hard and sonorous, they are – washed to remove dust from their surface, and to give them a glazed or polished appearance. A good

quality of glue should be free from all specks and grit, and ought to have a uniform, light brownish-yellow, transparent appear- ance, and it should break with a glassy fracture. Stecped for some time in cold water it softens and swells up without dissolving, and when again dried it ought to resume its original properties. Under the influence of heat it entirely dissolves in water, forming a thin syrupy fluid with a not disagreeable smell. The adhesiveness of different qualities of glne, on which quality its value depends, differs con- siderably ; and there are several methods of measuring the comparative value of commercial samples, the most reliable of which are based on actual experiment Glue is also made from bones by first boiling them to remove the fatty matter they contain, and then treating them with strong hydrochloric acid till they become quite soft and transIncent. In this condition, after they are washed and the acid neutralized, they are enclosed in a covered vessel and sub- mitted to the action of steam, by which a concentrated gelatinous solution is first obtained. At a subsequent stage the whole mass is boiled by direct heat, and a further quantity of glue is so procured, The glue yielded by bones has a milky hue, owing to the phosphate of lime it carries with it

Commercial Gelatin. —Gelatin, as a commercial product, is prepared in a manner similar to that followed in the manufacture of glue; but the materials used are selected

| with great attention to purity, and the various operations object of the lime steeping is to remove any blood and flesh :

are carried out with the most scrupulous care and cleanlines. In the manufacture of the well-known spark- ling gelatin of Messrs Cox of Gorgie, near Edinburgh, the following is the process followed, according to their patent obtained in 1844, The shoulders and cheeks of ox-hides are preferred, but other parts may be used. The hide and skin pieces are cleansed in water, cut in small ieces by a machine, and reduced to pulp in a pulp mill. The pulp is pressed between rollers, mixed with water, and then subjected to heat varying from 150° to 912° F., whereby gelatin is produced. When a very pure quality is required, liquid gelatin is mixed with a small quantity of ox blood at a temperature not exceeding 160° or 170°, and further heated. ‘The albumen of the blood becomes coagulated, and

rises as a scum; the heat is then withdrawn, after which the scum is removed and the purer liquor allowed to settle, and afterwards it is run into coolers to congeal and dry. The gelatin is evaporated we vacuo to avoid the injury caused by long subjection to heat; but it may also be dricd on a steam-heated surface. In Nelson's process the gelatin is extracted by steam heat from hide pieces which have been submitted to the bleaching action of sulphurous acid. The strained and purified product is spread in a thin layer on a marble slab till it partly solidi- fies, when it is cut up and washed to free it from all traces of acid. It is again redissolved at the lowest possible tem- perature, then resolidified and dried in thin sheets on nets. Heuze of Berlin prepares. a pure transparent gelatin, having a fine meaty flavour, from very impure materials, by aan mately mixing with the hot solution of impure dark-

coloured gelatinous material a mixture of wood charcoal and animal charcoal, leaving the whole together for some hours, then redissolving and straining off the clarified gelatin.

Tsinglass.—Isinglass or fish glue, in its raw state, is the swimming-bladder or sound of various species of fish. The sounds undergo no other preparation than careful dry- ing, but in the drying they are variously treated and made up, so that the isinglass comes into commerce under the names of "leaf," "staple," "book," "pipe," "Jump," 66 honey- comb," .and other designations, according to its form. The finest isinglass, which comes from Russia, 1s prepared by cutting open the sounds, steeping them in water till the outer membrane separates from the: inner, then washing the latter and exposing it to dry in the air. Russian isinglass is obtained from several species of sturgeon (A cipenser), found in the Volga and other tributaries of the Caspian Sea, in the Black Sea, and in the Arctic Ocean. Brazilian isinglass, obtained from Brazil.and Guiana, is the produce of a large fish, Silurus parkerii, and probably some other species; and Manila and East Indian isinglass are yielded by species of fish not yet satisfactorily determined. The sounds of the common cod, the hake, and other Gadidw are also used as a kind of isinglass. The principal uses to which isinglass is applied are for jellies and confections, and as a clarifying or filtering

medium for wine, beer, and other liquids. When used for culinary and confectionery purposes, isinglass is rolled into thin sheets and cut into fine shreds to facilitate its solution. For clarifying liquids its fibrous structure is of great value, as it forms a fine network in the liquid in which it is disseminated, and thereby mechanically carries down all the minute particles which render the liquid thick and turbid. Isinglass dissolved in strong acetic acid forms a powerful cement, much used for repairing glass, pottery, and similar small objects.

Uses of Gelatin.—The gelatin derivable from bones enters very largely into human food, in the stock for soups, &e,, and as prepared gelatin, “calves foot jelly,” and isin- glass. In addition to the uses already alluded to, gelatin has many other applications in the arts. It isemployed as a sizing agent in paper-making, and by painters it is also used for sizing or priming, and for preparing tempera colours. Further, it is used in the preparation of elastic moulds of undercut work, and in the manufacture of inking rollers for printing. Gelatin treated with bichromate of potash, under the influence of light, undergoes a remarkable chemical and physical change, whereby it is rendered en- tirely inabsorbent of and insoluble by water. The change is due to the oxidizing effect of the bichromate; and the circumstance has given rise to the numerous so-called carbon-processes introduced into photography by Swan, Johnson, Woodbury, Albert, Edwards, and others, in all of which an image is produced in gelatin oxidized by chromium compounds, An insoluble glue may be prepared by adding to dissolved glue, just before using, a proportion of a solu- tion of bichromate of potash, and such a preparation forms a useful waterproofing medium. Glue may be kept liquid at ordinary temperatures by the addition of concentrated acetic acid or of weak nitric acid. Dumoulin’s liquid glue, which possesses powerful adhesive properties, is composed of glue in the proportion of 2 tb dissolved in 1 quart of water with 7 oz. of nitric acid (sp. gr. 1°335) added. Mouth or lip glue is prepared by adding 4% or thereby of sugar to each pound of dissolved glue. It forms solid but easily

dissolved cakes, and as it can be sufficiently softened by the tongue, it is for many purposes extremely convenient. Transparent gelatin, brightly coloured by dyeing substances, and cast in excessively thin sheets, is largely used for orna- mental wrappings for bon-bons, &c.

Various adhesive but non-gelatinous substances are, on account of their properties, known commercially as glue, and

_Ehre Gottes aus der Natur.”

are used as substitutes for ordinary glue. Thus marine glue, employed in shipbuilding and for other purposes, is a compound of india-rubber and shell-lac dissolved in coal-tar naphtha. Glue substitutes are also prepared from the albuminoids casein and gluten, but they are not likely to become substances of any considerable commercial importance. (3. Pa.)

GELDERLAND, GrLpERN. See GUELDERLAND, GueL- DERS. :

GELEE, Craupr, See Craups or Lorratne,

GELL, Srr Witt1am (1777-1836), classical scholar and antiquarian, was born at Hopton in Derbyshire in 1777. After the usual preliminary education, he entered Emmanuel College, Cambridge, taking his B.A. degree in 1798, and afterwards becoming a fellow. About the be- ginning of the century he was sent on a diplomatic mission to Greece ; and on his return in 1803 he was knighted. In the following year he published his Topography of Troy and ats Vicinity, illustrated and explained by drawings and descriptions. His Geography and Antiquities of Ithaca was published in 1807. In 1810 appeared The Itinerary of Greece, with a Commentary on Pausanias and Strabo, and © an account of monuments of antiquaty existing in that country, This was followed in 1816 by the Jtinerary of the Morea, being a description of the routes of that peninsula, a new edition of which was published in 1823, under the title of Narrative of a Journey in the Morea. His best known work is Pompeiana, or Observations on the Topography, Lidifices, and Ornaments of Pompei, in which he was assisted by Mr J. P. Gandy. The first part of this was published in 1817-19, and was translated into French in 1828; the second part appeared in 1830-31. It was followed in 1834 by the Yopography of Rome and its Vicinity. In Italy, whither he had retired on account of his health, he became acquainted with Queen Caroline, and his noble and disinterested behaviour during her trial ex- hibits his moral character in a very favourable light. The queen showed

her sense of his co-operation in her defence by appointing him one of her chamberlains in 1820. He died at Naples in 1836. His drawings, representing a very large series of views of classical ruins and localities, and executed, if not with much artistic skill, yet with great detail and exactness, are now in the print room of the British Museum.

GELLERT, Cartstran Fiircarecorr (1715-1769), German fabulist, hymn-writer, and moral philosopher, was born 4th July 1715 at Hainchen, in the Saxon Erzgebirge. He was educated at the university of Leipsic, where in 1751 he was appointed an extraordinary professor of philo- sophy, a position which he occupied till his death, 13th December 1769. He wrote a romance, Leben der schwed. Grdfin von G . . . (2 vols., Leipsic, 1746), of little value, and several pastorals and comedies of, if possible, even less. His best works were his Fabeln und Eredihlungen and Geistliche Oden und Lieder. Both are marked by a simple and easy directness of style. The latter express the maxims of a liberal piety, and were received by Catholics and Pro- testants with equal favour. They are still widely popular in Germany. The best known is the hymn entitled “Die Not a little of Gellert’s fame is due to the time when he lived and wrote. The German literature of the period was dominated by the pedant Gottsched and his school. A band of high-spirited youths, of whom Gellert was one, resolved to free themselves from the conventional trammels of such dictators, and began that revolution which was finally consummated by Schiller and Goethe. Gellert’s share in the attempt was enhanced by the excellence of his personal character, his gentle piety, and his singular knack of gaining the reverence and love of young people. Part of his influence was also doubtless

attributable to his position as a professor, and to his widely opular lectures. :

See Gellert’s Stimmtliche Werke (first edition, 10 vols., Leipsic, 1769-74, last edition, Berlin, 1867). His Sdnuntliche Fabeln und Erzihlungen and his Geistliehe Oden und Lieder have often been published separately ; the latest editions being those of Leipsic, 1874, and Berlin, 1878. See translation by J. A. Murke, Gellert’s Fables and other Poems (London, 1851). Lives of Gellert have been written by J. A. Cramer (Leipsic, 1774) and by Doring (2 vols., Leipsic, 1833).

G@ELLIUS, Autus, author of the Woctes Atticw, was born in the first half of the 2d century of the Christian era, most probably in Rome, and died about 180. Nothing is known of his personal history except from incidental notices in his own book. He studied grammar and rhetoric at Rome and philosophy at Athens, after which he returned to Rome, and held there a judicial office, His only work, the Woctes Attice, takes its name from having been beguu during the long nights of a winter which he spent in Attica. He afterwards continued it at Rome It is compiled out of an " Adversaria," or common-place book, in which he had jotted down everything of unusual interest that he heard in conversation or read in books, and it com- prises notes on grammar, geometry, philosophy, history, and almost every other branch of knowledge. The work, which is utterly devoid of sequence or arrangement, is divided into twenty books. All these lave come down to us except the eighth, of which nothing remains but the index. The Noctes Attice is valuable for the insight it affords into the nature of the society and pursnits of those times, and for the numerous excerpts it contains from the works of lost ancient authors.

The editio prineeps of Aulus Gellius appeared at Rome in 1469, and was speedily followed by many others in various cities of Italy, especially Venice. The best editions are those of Gronovius (Leyden, 1706), Lion (Gottingen, 1824-1825), and Hertz (Leipsie, 1853). Aulus Gellius has been translated into English by Beloe (London, 1795); into French by the Abbé de Verteuil (Paris, 1776~- 89), aud by Victor Verger (Paris, 1820-30); into German by Walter- stern (Lemberg, 1785), and by Weiss, 2 vols. (Leipsic, 1875-76).

GELON, succeeded Hippocrates as tyrant of Gela in 491 B.c., and, by supporting the plebs of Syracuse in their quarrels against the aristocracy, became tyrant also of that city in 485 s.c. He used his power so discreetly that

under him Syracuse attained an extraordinary degree of.

wealth and influence. The great event in Gelon's sub- sequent history was his defeat of the Carthaginians under Hamilear at Himera, according to tradition on the same day that the Greeks defeated Xerxes at Salamis, 480 B.c., the result of his victory being that he obtained the lord- ship of the

whole of Sicily. After Gelon had thus estab- lished his power, he made a show of resigning it; but his proposal was rejected by the multitude, and he reigned without opposition till his death 478 p.c. His memory was held in such respect that, 150 years after his death, when Timoleon was erasing from Sicily every vestige of the tyrants that had once reigned there, he spared the statues of Gelon. See SyRacusE.

GELSEMIUM, a drug, consisting of the root of Gelse- mum (or as sometimes less correctly called Gelseminum) sempervirens, a climbing shrub of the natural order Loganiaceee, having a milky juice, opposite, lanceolate shining leaves, and axillary clusters of from one to five large, funnel-shaped, very fragrant yellow flowers, whose perfume has been compared to that of the wallflower. The fruit is composed of two separable jointed follicles, containing numerous flat-winged seeds. The stem often Tuns underground for a considerable distance, and indis- criminately with the root it is used in medicine. The plant 18 a native of the United States, growing on rich clay soil by the side of streams near the coast, from Virginia to the south of Florida. In the United States it is commonly known as the wild, yellow, or Carolina jessamine, although

in no way related to the true jessamines, which belong to the Oleacece. It was first described in 1640 by John Parkinson, who grew it in his garden from seed sent by Tradescant from Virginia; at the present time it is but rarely seen, even in botanical gardens, in Great Britain.

The root, on analysis by Kollock in 1855, was found to contain an alkaloid (now called Grelsemine or Gelsemia), a dry acrid resin, } per cent. of a volatile oil heavier than water, fatty resin, fixed oil, yellow colouring matter, gallic acid, starch, albumen, gum, pectic acid, extractive matter, lignin, and 3°17 per cent. of mineral matter, consisting chiefly of salts of potassium, calcium, magnesium, iron, and silica. The leaves and flowers were found to contain the same ingredients in less quantity. Eberle, who examined the root in 1869, states that the central woody portion of the root does not contain any alkaloid, and that therefore the bark is the physiologically active portion. Tn addition to the above, Wormley, in 1870, discovered in the root a crystalline substance named by him gelseminic

acid, whose solution in alkalies exhibits a powerful blue fluorescence. It has, however, since been shown by Sonnenschein to be identical with esculin, a crystalline glucoside found in the bark of the horse chesnut, &sculus Hippocastanum. The active properties of gelsemium root have been proved by Wormley and Bartholow to depend upon the alkaloid gelsemine (C,,H,)NO,), which in the pure state is a colourless, odourless solid, not yet obtained in a crystalline form, readily soluble in ether and chloroform, less so in alcohol, and very sparingly in water, except in the presence of hydrochloric acid, and having an intensely persistent bitter taste, perceptible in a solution containing only zo'ygth part of it by weight.

The readiest and best test for gelsemine, detecting the smallest traces, appears to be the cherry-red colour developed when ceroso-ceric oxide is added to its solution in concen- trated sulphuric acid. The dose of the alkaloid is fron goth to A;th of a grain; larger quantities are poisonous, ith of a grain having proved fatal in an hour and a half to a strong cat.

The pharmaceutical preparation known as gelsemin con- sists chiefly of the resin, combined with uncertain propor- tions of the other constituents of the root, and is prepared by precipitation with water from the strong tincture.

The medicinal properties of the root were discovered by accident, the infusion having been administered instead of that of some other root, with the result of curing the fever for which it was taken. It was then experimented upon by the American eclectic practitioners. In 1852 Professor W. Proctor called the attention of the medical profession to its valuable properties; and in 1864 it was placed on approval in the secondary list, and in 1873, so rapidly had it risen in favour, in the primary list of remedies of acknow- ledged value in the United States pharmacopceia. It has latterly attracted considerable attention in England as a remedy for certain forms of facial neuralgia, especially those arising from decayed teeth, or involving branches of the fifth nerve. Inthe United States it is more particularly valued for controlling nervous irritability in fevers of a malarial type, in which it is said to excel every other known agent. The physiological action of the drug has been care- fully examined by Bartholow, Ott, and Ringer and Murrell, from whose investigations it appears that it has a paralysing action on the motor centres, affecting successively the third,

fifth, and sixth nerves, its fatal action being due to its caus- ing paralysis of the respiratory muscles, and thus producing death by asphyxia. In large doses it produces alarming symptoms, which occasionally terminate fatally. These appear to vary slightly in different cases, but the oe minent are pain in the forehead and in the eyeballs, a i ness, ptosis, a feeling of lightness in the tongue slurre

Plate I.

pronunciation, laboured respiration, wide dilatation of ne pupils, and impossibility of keeping an erect posture. e mind in most cases remains clear until shortly before death. The earliest and most prominent symptom of a fatal or dangerous dose is the drooping of the eyelids, which indi- cates the immediate administration of stimulants, for when the paralysis of the tongue which ensues extends _to the epiglottis, deglutition becomes impossible, and the epiglottis is apt, unless the sufferer be placed in a forward position to flap back and close the windpipe. The antidotes which have been found the most successful are carbonate of am- monia, brandy, aromatic spirits of ammonia, and morphia. It has been found that death may be averted by keeping up artificial respiration until the poison is eliminated by the kidneys.

See Eelectic Dispensatory, p. 186 ; Pharm. Journ., 3d ser., vol. vi.; by Ringer and Murrell, &. in Laneet, 1878, 1875-78 ; Hales, New Remedies, p. 890; Bartholow, Materia Medica, p. 380; American Journ. Pharm., 1855, 1870; Proc. Amer. Pharm. Assoc., 1878, p. 652; Practitioner, 1870, p. 202; Grover Coe, Positive Medical Agents, p. 114; Hughes, Pharmacodynamy, vol. i, p. 872; Sonnenschein, Berichte der deutsch. chem. Ges., Xl. 1182; Bentley and Trimen, Med. Plants, pt. Sab, IMO, ile

GEMINIANI, Francesco (¢. 1680-1762), a celebrated violinist, born at Lucca about 1680. He received lessons in music from Alessandro Scarlatti, and studied the violin under Lunati, and afterwards under Corelli. In 1714 he arrived in London, where his performance and compositions attracted much attention. He was taken under the special protection of the earl of Essex. After visiting Paris and residing there for some time, he returned to England in 1755. In 1761 he went to Dublin, where a servant robbed him of a musical manuscript on which he had bestowed much time and labour. His vexation at this loss is said to have hastened his death, which took place at Dublin on 17th September 1762. He appears to have been a first-rate violinist, but most of his compositions are dry and deficient in melody. His Art of Playing the Violin is a good work of its kind, but his Guide Armonica is a, miserable production. He published a number of solos for the violin, three sets of violin concertos, twelve violin trios, The Art of

Accompaniment on the Harpsichord, Organ, &c., Lessons for the Harpsichord, and some other works. fis musical opinions had no foundation in truth or principle.

GEMISTUS, or PLETHO, Groretvs, held high office under the Byzantine emperors during the first half of the 15th century, and derived his name, which signifies the Replete, from the extraordinary amount of his erudition. He is, however, chiefly memorable for having been the first person who introduced Plato to the Western world. This took place upon his visit to Florence in 1438, as one of the deputies from Constantinople on occasion of the general council. Cardinal Bessarion became his disciple ; he produced a great impression upon Cosmo de' Medici; and though not himself making any very important contribution to the study of Plato, he effectually shook the exclusive domination which Aristotle had exercised over European thought for eight centuries. He promoted the union of the Greek and Latin Churches as far as possible, but his efforts in this direction bore no permanent fruit. He probably died before the capture of Constantinople. The most important of his published works are a treatise on the distinction between Plato and Aristotle as philosophers, and one on the religion of Zoroaster. In addition to these he compiled several volumes of excerpts from ancient authors, and wrote a number of works on geography, music, and other subjects many of which still exist in MS. in various European libraries.

GEMS (yor, gemmee), engraved with designs, whether adapted for sealing (cdpayis, sigillum, intaglio), or mainly for artistic effect (imagines ectypse, cameo), cxist in a very

large number of undoubtedly genuine examples, extending from the mists of Babylonian antiquity to the decline of Roman civilization, and again starting with a new but un- natural impulse on the revival of art. Apart from work- manship they possess the charms of colour deep, rich, and varied, of material unequalled for its endurance, and of scarcity which in many instances has been enhanced by the strangeness of the lands whence they came, or the fortuity of their occurrence. These qualities united within the small coinpass of a gem were precisely such as were required in a seal as a

thing of constant use, so malienable in its posses- sion as to become naturally a personal ornament and an

| attractive medium of artistic skill, no less than the centre

of traditions or of religious and legendary associations. As regards the nations of classical antiquity all seals are classed as gems, though in many cases the material is not such as would strictly come under that heading. On the other hand, gems properly so called were not always seals. Many of the Babylonian cylinders could not have been so em- ployed without great difficulty, and when Herodotus (i. 195) speaks of every Babylonian wearing a seal (oppyyis), it may have been in most cases no other than a talisman having an inherent power derived from the subject of its design, consisting perhaps mostly of figures of protecting deities, He adds that every Babylonian carried also a staff on which it was unlawful for him not to have the figure of an apple, a rose, a lily, an eagle, or something else, as his badge or érionov, from which it may perhaps be inferred that having selected some such badge for his staff he would necessarily have the same for the seal with which he attested his name. But if that had been the case, then the great mass of exist- ing cylinders could not have been seals in the ordinary sense, In Greece and Rome within historic times, gems were worn engraved with designs to show that the bearer was an adherent of a particular worship, the follower of a certain philosopher, or the attached subject of an emperor. It cannot be said that these gems may not have been used systematically as seals, but it is clear that they primarily served a different purpose. Again, when the sense of personal ornament naturally attaching to a seal increased, and the resources both of material and skill were enlarged, the process of engraving gems in cameo, that is, with the design in relief mostly in such stones as by their differently colourcd layers could be made to present a variety of sur- faces, came largely into fashion (see article CAMEO, and figs. 18,19in Plate I.). Asa rule these cameos are of a date sub- sequent to that of Alexander the Great; but there are excep- tions in an Egyptian cameo in the Louvre, said to belong to the 12th dynasty, about 3000 3.c., and in some few Etruscan scarabs, which having designs in intaglio on the face have also reliefs engraved on the back, apparently in the same archaic manner of art as the intaglios. Such a scarab in carnelian was found at Orvieto in 1874 in a tomb along with vases dating

from the beginning of the 5th century B.c., and it will be seen from the engraving of this gem (Archdol. Zeit, 1877, pl. xi, fig. 3, compare figure of Siren on back of scarab engraved in Wieseler, Denkmdiler der alten Kunst, No. 752) that, while the design on the face presents evidently the same subject which occurs on a scaraboid found in the treasury of Ourium in Cyprus by General Cesnola (see his Cyprus, pl. xxxix., fig. 5, p. 381), the half-length figure of a Gorgon on the back seems to be the same in subject and treatment as a carnelian fragment, apparently cut from the back of a scaraboid, now in the British Museum. As further examples of the same rare form of cameo, the following scaraboids in the British Museum may be men- tioned :—(1) a carnelian cut from back of a scaraboid, with head of Gorgon surrounded by wings ; (2) carnelian scare boid : Gorgon running to left, on face of gem an intaglio of Thetis giving armour to Achilles; (3) carnelian scaraboid :

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head of negro in profile, on face an intaglio of a harp ; (4) steatite scaraboid: head of Achelous, full face, with intaglio of citharist (Plate I., No. 13); (5) searaboid in burnt car- nelian: head of Achelous, full face, with intaglio of Ajax carrying body of Patroclus; and four porcelain scaraboids from Camirus, each with a negro's head in re'ief on the back.

In gem engraving the principal modern implement is a wheel or minute copper disc, driven in the manner of a lathe, and moistened with olive oil mixed with emery or diamond dust. There is no proof of its use among the ancients, but M. Soldi, a practical authority on the subject, believes (Revue Arch, 1874, xxviii. p. 147) that it was known before the time of Pliny, whose expression fervor terebrarum, as applied to the cutting of very hard stones, would fittingly characterize the rapid movement of the wheel. At the game time these words, apparently the only ancient state- ment on the question, may equally refer to the motion of the drill, an instrument of constant use in antiquity, which in this case was employed to drive an iron tool fitted with a diamond point or splinter. In intaglios, when the larger spaces had been sunk with the drill, the design was worked out in detail by a tool with a diamond point, and finally polished, but not, it would appear, to the extent to which polishing is carried in modern work, for this reason,

no doubt, that their finer tools left less of roughness to be smoothed away. Stilla gem highly polished in the interior of the design need not he taken to be modern on that account, since it is known that many genuine ancient gems have been repolished in modern times, and since it is not known whether ancient engravers may not sometimes have resorted to excess of this process ; while on the other hand an intaglio dim in the surface of its design is not necessarily antique, since modern engravers have observed this peculi- arity, and have imitated it with a success which, were there no other suspicions, might escape detection. Except in the hardest stones, much of the ancient gem engraving seems to have been done bya simple copper tool duly moistened and supplied with emery (cpipis or opuvpis, naxium). The Ethiopians in the time of Xerxes employed a flint instru- ment, if that is what Herodotus means (vii. 69) when he says that their arrows were tipped “not with iron but with a sharp stone, with which they also engrave their seals.” With such a tool steatite could be easily engraved, and it should be remembered that among very early gems this material is of frequeut occurrence, while in the later art of Greece aud Rome it can scarcely be said to exist; and the inference is that, when processes had been invented to cut harder stones, the softer substances were discarded. Still it would not be correct to found more than a general argu- ment as to the comparative ages of gems on the different degrees of resistance in the stones themselves, even when dealing with the works of one nationality, much less so in a review of ancient gems as a whole, for this reason, among others, that the decline of art is in technical matters often very like its infancy. It would be easy to show from pub- lished criticisms how certain classes of rude intaglios have been regarded now as the very earliest efforts of the art, how as debased; and at times it is difficult to choose between these Judgments, In the present state of knowledge it may scem idle to inquire where the infancy of the art was passed. One thinks in Egypt, which otherwise is known for its Iutimate skill in working hard stones. Another says Assyria, which doubtless had a civilization as remote as that of Egypt, but has left no similar evidence of the mastery of obdurate substances. The architectural and the artistic Temains of the two nations present this broad distinction, that they are of much harder material in the one case than in the other, whence it would be reasonable to expect that at least the invention of the pointed tools had proceeded

from Egypt, though of course if the idea of engraving gems originated with soft stones and simple implements such as flints, that origin may well have been in Assyria. Possibly the marked difference in the shape of the gems peculiar to these two nations bespeaks little contact between them in this matter. The favourite shapes in Assyria were the cylinder pierced lengthways, and sometimes fitted with a swivel so as to he used as a seal, and the cone also pierced but not requiring a swivel, since the design was cut on its base. When inscribed, a cylinder generally states three things,—the name of the owner, luis father's name, and the name of his protecting deity. But there are exceptions, as for example, a cylinder in the Bibliotheque at Paris in- scribed, ' Alchaloum, servant of Jehastukur," which from the Semitic form of name "Alchaloum" has been thouglit to have belonged to a Jewish captive in Babylon. A cylinder supposed to be the scal of Sennacherib, in the British Museum, is not inscribed. Another, purporting to be the seal of Igli, son of Uruck, the oldest king of Assyria, is re- jected by M. Oppert as not having any such antiquity. An agate seal from Khorsabad reads, '' Nipishi, of King Tiglath Pileser, king of Assyria, son of Haou Liklikhus, king of Assyria." But, as has already been said, many of the cylinders could not have been employed as seals without difficulty, and it appears to result from the most recent study of the designs on them that frequently their main function was to act as talismans in the system of magic generated among the Chaldzans. In what seeins to be the oldest examples the design issunk by a pointed tool pushed backward and forward in long straight lines. In the next stage round cavities are sunk here and there in the design by means of a drill, when greater depth is required, while the shallow parts are worked out with the pointed imstru- ment. By practice in utilizing both methods the Assyrians reached whatever skill they could boast in this branch of art. 'The materials are hematite, jasper, caleedony, sard, basalt, agate, lapis lazuli, rock crystal, alabaster, por- celain, quartz, glazed clay. Mr King classes them under four periods, beginning as early as 2234 B.c.

In Egypt the favourite form of gem was a scarab (beetle), having a flat surface underneath, on which was engraved a hieroglyphic design. The common materials are green jasper and porcelain. From the soft nature of

the porcelain, and from the strict adherence to the scarab shape, it may be inferred that they were used much less as seals than as a sort of badges or ornaments, and this is confirmed by the finding of large numbers of them in foreign countries, as at Camirus in Rhodes and in Etruria, where the hieroglyphics could not have been understood. No doubt it may be true that these specimens had been manufactured by Phoenicians for export to these countries merely as articles of ornament, but had the originals been strictly held by the Egyptians to be seals, it would have been the height of dishonesty in the Pheenicians to reproduce them in this way. In Egypt, however, the art of gem engraving was not confined alto- gether to scarabs, as may be seen among other interesting exceptions in the oblong intaglio of green Jasper in the Louvre (Gazette Archéol., 1878, p. 41) witha design on both sides, representing on the obverse, as known from the cartouche, Thothmes IT. (1800 s.c.) slaying a lion, and on the reverse the same king drawing his bow against his enemies from a war chariot. In the Louvre also is an Egyptian gem, said to belong to the 12th dynasty, 3000 z.c. But uninteresting in themselves as are the scarabs of Egypt, they have this accidental importance 1n the Sle of gem engraving that they furnished the Phoenicians bes 1 a model which they first improved as regards the intag 4 by a freer spirit of design, gathered partly from Hoye an partly from Assyria (see the Phoenician scarabs from Tharras

in Sardinia and from Cyprus). The cl thus iia _—!I

they communicated to the Etruscans, under whose skilful hands it received often a degree of delicacy in the work- manship which has not been equalled in the gems of any other country. The best specimens are due to the influence of Greek art in the 6th century B.C. or somewhat later. The subjects engraved are Greek in origin, and the habit of inscribing the names of the subjects is an early Greek habit, but with this difference, that the Greeks would be correct in the naming, while the Etruscan artists are perhaps as often wrong as right. The name of Tydeus, for instance (TYTE), is assigned in one case to a figure scraping himself with a strigil, and in another to a fallen warrior, who other- wise would be identified as Capaneus. Again a figure washing his hair is called Peleus, and Achilles

sulking becomes Theseus, to the exercise of much ingenuity in times past. With these and other examples it should no longer be necessary to cast about for an unusual form of the legend of the Seven against Thebes, when five only of their names are found beside five figures on what is the most celebrated of existing scarabs—a carnelian in the Berlin Museum (Winckelmann, Alte Denkmdiler, No. 105). Another scarab of first importance is a banded onyx in Florence represent- ing the Salii carrying their shields, inscribed Angils and Alce. For Etruscan scarabs see Errurta, vol. viii. p. 640.

While the Phoenicians have left actual specimens to show with what skill they could adopt the systems of gem en- graving prevailing at their time in Egypt and Assyria, the Israelites, on the other hand, have left records to prove, if not their skill, at least the estimation in which they held engraved gems. “The sin of Judah is written with a pen of iron and with the point of a diamond” (Jerem. xvii. 1). To pledge his word Judah gave Tamar his signet, bracelets, and staff (Gen. xxviii. 18); whence, if this passage be com- pared with the frequent use of “seal” in a metaphorical sense in the Bible, and with the usage of the Babylonians already cited from Herodotus, it may be concluded that among the Israelites also every man of mark at least wore asignet. Their acquaintance with the use of seals in Egypt and Assyria is seen in the statement that Pharaoh gave Joseph his seal as a badge of investiture (Gen. xli. 42), and that the stone which closed the den of lions was sealed by Darius with his own signet and with the signet of his lords (Daniel vi. 17). Then as to the stones which were most prized, Ezekiel (xxviii. 13), speaking of the prince of Tyre, mentions the sardius, topaz, and diamond, the beryl, onyx, and jasper, the sapphire, emerald, and carbuncle, stones which again occur in that most memorable of records, the description of the breastplate of the high priest (Exodus xxvili. 16-21, and xxxix. 8). Twelve stones grouped in four rows, each with three specimens, may be arranged on a square, measuring a palm, not a span, so as to have the rows placed either vertically or horizontally. If they are to cover the whole square, then they must be cut in an oblong form, and if the names engraved on them are to run lengthwise, as is the manner of Assyrian cylinders, then the stones, to be legible, must be grouped in four horizontal rows of three each. There is in fact no reason to suppose that the gems of the breastplate were in any other form than that of cylinders such as abounded to the

knowledge of the Israelites, with this possibility, however, that they may have been cut lengthways into half-cylinders like a frag- mentary one of sard in the British Museum, which has been mounted in bronze, and, as a remarkable excep- tion, has been set with three small precious stones now missing. It could not have been a seal, because of this setting, and because the inscription is not reversed It reads: “ Nabu…. [son of] Iddina-Nergal Gh de » am of Nabu-zira-iddin…. Khi(?)-su-ba…. ,” according to Mr Pinches. The names of the twelve tribes, not their standards, as has been thought, may have been engraved

in this fashion, just as on the two onyx stones in the pre- ceding verses (Exodus xxviii. 9-11), where there can be no question but that actual names were incised. On these two stones the order of the names was according to primogeni- ture, and this, it is likely, would apply to the breastplate The accompanying diagram will show how the stones,

also.

Jewish High Priest’s Breastplate.

supposing them to have been cylinders or half cylinders may have been arranged consistently with the descriptions of the Septuagint. In the arrangement of Josephus the jasper is made to change places with the sapphire, and the amethyst with the agate, while our version differs partly in the order and partly in the names of the stones, but probably in all these accounts the names had in some cases had other meanings than those which they now carry. From the fact that to each tribe was assigned a stone of different colour, it may be taken that in each case the colour was one which belonged prescriptively to the tribe and was symbolic, as in Assyria, where the seven planets appropriated each a special colour (see Brandis in the Berlin Hermes, 1867, p. 259 sq., and De Sacy, Revue Archéologique, 1869, and compare Re- velation xxi. 13, where the twelve gates are grouped i four threes, and 19, 20, where the twelve precious stones of the walls are given). The precious stones which occur among the cylinders of the British Museum are sard, emerald, lapis lazuli (sapphire of the ancients), agate, onyx, jasper, and rock crystal. Both Ailian (Var. Hist., iv. 34) and Diodorus

(i. 75) speak of an object known as an image of truth worn round the neck of the judge, who of course was a priest, in ancient Egypt; but how far this may have suggested or corresponded with the J ewish breastplate 1s not to be made out.

The records of gem engravers in Greece begin in the island of Samos, where Mnesarchus, the father of the philo- sopher Pythagoras, earned by his art more of praise than of wealth. ‘Thence also came Theodorus, who made for Poly- crates the seal of emerald (Herodotus, iii. 41), which, ac cording to the curious story, was cast in vain into the deep sea on purpose to be lost. That the design on it was a lyre, as is stated in one authority, is unlikely, now that Benndorf’s ingenious reading of Pliny (Mat. Hust., Xxx1. 83) has shown that the portrait statue of Theodorus made by himself was in all probability a figure holding in one hand a graving tool, and in the other, not, as previously supposed, a quadriga so diminutive that a fly could cover it with its wings, but a scarab with the engraving of a

quadriga on its face (Zeitschrift fiir die Oesterreich. Gym- nasien, 1873, pp. 401-411), whence it is not unreason- able to conclude that this scarab in fact represented the famous seal of Polycrates. Shortly after 600 B.c. there was a law of Solon’s forbidding engravers to retain impressions of the seals they made, and this date would fall in roundly with that of Theodorus and Mnesarchus, as if there had in fact been just about then a special activity and unusual skill, That the art had been practised perhaps for several centuries before in Greece is probable from the general usage of sealing implied in Solon’s law, from the extraordinary degree to which it obtained soon after bis time, and from the influence which was exercised on the Greeks in such matters by the Phcenicians, Egyptians, and Assyrians. Yet it is singular to find, as Pliny points out (xxxiii. 4), no direct mention of seals in Homer, not even in the passage (dad, vi. 168) where Bellerophon himself carries the tablets on which were written the orders against his life. Then as regards the rings or seals of Prometheus, of Midas, of Minos (which like that of Polycrates was thrown into the sea in vain), of Phocus, and of Orestes, the legends may not all have come down from a very early period, but that of Phocus can at least be traced back to the time of Polygnotus,

while that of Prometheus may be taken to have inspired the seal (engraved Rev, Arch., 1878, pl. xx.) on which the Titan is seen bound and submitting to the vulture. Or, conversely, sucha gem: may have sug- gested the legend of the ring which he bore as proof of his former punishment. ‘There is no need to put it much later than 600 B.c., and it isa specimen ofa class of lentoid gems which of late years have been found in small numbers chiefly in the Greek islands. Two more of them from the British Museum collection are engraved in Pl. I, figs. 2 and 3, Asarule the materials are comparatively soft, most fre- quently steatite and hematite, while the designs consist mainly of animals so turned and twisted as to cover almost the entire surface of the gem. Certain exceptional cases, where the design is taken from legend or mythology, may be seen in the Revwe Archéologique, 1878, pl. xx., Nos. 1-3; for the ordinary subjects see Revue Arch, 1874, pl. xii; Schliemann, J/ycencee, pp. 112, 202, 362; Cesnola, Cyprus, pl. xxxvii. 9, and pl, xxxviil. 21, 23; and for gold signets with designs in this stage of art see Schliemann, Mycene, p. 223; Cesnola, Cyprus, pl. xxxiv. 2; and Revue Arch., 1874, pl. iv., No. 44, in which volume is an interesting article on early engraved gems by Count Gobineau. In most cases the designs though heraldic rather than natural, with a prevalence of animal forms perhaps due to notions of heraldry, are yet so singularly free from Egyptian or Assyrian influence that they must be assigned as essentially Greek productions, possibly from a period when Oriental examples had lost sway. ‘“‘ Not to carry the image of a god on your seal” was a saying of Pythagoras; and, whatever his reason for it may have been, it is interesting to observe him founding a maxim on his father’s profession of gem engraving (Diogenes Laert., viii. 1, 17).

From the time of Theodorus to that of Pyrgoteles in the 4th century B.c. is a long blank as to names, but not alto- gether as to gems, the production of which may be judged to have been carried on assiduously from the constant necessity of seals for every variety of purpose. The refer- ences to them in Aristophanes, for example, the lists of them in the ancient inventories of treasures in Athens, and the number of them found by General Cesnola in the treasure chambers of Curium in Cyprus confirm this fre- quent usage during the period in question. To it belong in particular the inscribed gems mentioned in ARCH ZOLOGY (vol. ii. p. 353), including the Woodhouse intaglio there figured (p. 358), which may be referred to as perhaps the

very finest example of Greek gem engraving that lias come down to us. It would stand early inthe 5th century B.c,, a date which would also suit the head of Eos from Ithome in Messenia (Pl. I., fig. 14), the head (fig. 5), the citharist (fig. 9), while the scarabs (figs. 6, 7), though apparently of Etruscan origin, obvicusly reflect the character of archaic Greek art, as far as concerns the shallow cutting and the delicate execution of minute details. The touch which isolates a design and literally arrests the eye they do not possess, but by comparison they render it more distinct as it exists in the Woodhouse gem already mentioned, and in figs. 8, 10-13, and 15 in Plate I., all of which may be assigned to the end of the 5th century 3.c. Singularly beautiful in this class are the two Cesnola gems (Cyprus, pl. xxxix. figs. 1, 2), the latter, simple and even awkward in parts, yet on the whole conceived by a Greek mind imbued with the poetry of art, while the former is rather a triumph of faultlessness, delicate as the colour of the stone on which it is engraved.

By the beginning of the 4th century B.c. every element of archaism had vanished; but gems of this period are scarce, except in the collection of St Petersburg, which has obtained them exclusively from tombs in the Crimea. Foremost among them are the two by Dexamenus of Chios, the one, a calcedony with the figure of a stork flying, and inscribed in two lines, the letters carefully disposed above each other, AEZRAMENOS EILOIE XIOX (Compte-rendu de la Commiss. Arch. St Petersburg, 1861, pl. vi. fig. 10), and the other, an agate with a stork standing on one leg, inscribed AEZAMENOS simply (Compte-rendu, 1865, pl. iii, fig. 40). A third gem, apparently by the same Dexamenus, is a carnelian belonging to Admiral Soteriades in Athens, and has a portrait head, bearded and inscribed AEZAMENOS, EMOTE (Compte-rendu, 1868, pl. i. fig. 12). Apart from the splendour of their workmanship, those three gems are interesting for the variety of their inscriptions. Thus a name standing alone in the nominative case, when it does not describe the subject of the design, will indicate the artist. Again, when the nationality of the artist is added it should follow the verb as a rule, which, however, is not without exceptions, EIIOIE for EIIOJEI is an archaism. The design of a stork flying occurs on an agate scarab in the British Museum from the old Cracherode collection, and

therefore beyond all suspicion of having been copied from the more recently discovered Kertch gem. The condition of the surface and the skill of execution are both interesting. Reckoned among the best of the Crimea gems, and that is equivalent to saying among the best of all gems, are the following:—(1) a burnt scaraboid with an eagle carrying off a hare ; (2) a gem with scarab border and the figure of a youth seated playing on the trigonon, very much resembling the Woodhouse intaglio (both engraved, Compte- rendu 1871, pl. vi. figs. 16, 17); (3) a searaboid with border and the design of a horse running at speed, with which may be compared a carnelian scaraboid in the British Museum from the old Hamilton collection, and again ou this account above suspicion, if the great beauty of the work were not alone convincing ; the horse is here stung by a gadfly ; (4) an ovoid calcedony, mounted on a chain to be worn as a collar, with an intaglio of a Gorgon (3 and 4 en- graved, Compte-rendu, 1860, pl. iv. figs. 6 and 10). In these, and in almost all Greek gems belonging to this period of excellence, the material is of indifferent quality, consisting of agate, calcedony, or carnelian, Just as 1n the older specimens, Brilliant colour and translucency are as -et not a necessary element, and accordingly the design 1s worked out solely with a view to its own artistic merit.

At this stage appears the name of Pyrgoteles, of whom 1t is said that he alone was permitted to engrave the portrait head of Alexander the Great. The portrait head of

lexander given in Pl. 1, fig. 16, is not likely to represent a art of fis time, but more probably belongs to the age of Augustus who used this design as a seal. On the other hand the ancient pastes (figs. 20-22) will couvey a notion of the gem engraving of the time of Alexander. – Still it should be observed that one of the special difficulties of the subject is to account for the scarcity of gems from this period of wealth, luxury, and artistic activity in all direc- tions. Possibly not a few belong to it which it is thought safer to class as Roman. This much at least is certain, that Roman art altogether was a prolongation, hardly a development, of the Macedonian art. Those Roman en- gravers may have been conscious of this who boldly placed on their productions the names of celebrated Greek artists, as for instance on a

garnet in the British Museum, having a figure perhaps of Jason and inscribed with the name of Phidias (PEIAIAS EIOET) ; others elsewhere profess to be the work of Polycletus or of Scopas. The same effrontery was seen in sculpture, and unfortunately has revived again in the gem engraving of comparatively recent times, as may be seen in a calcedouy intaglio of the head of Alexander the Great in the British Museum, which, though clearly modern, claims to be the work of Pyrgoteles.

From literary sources are known the engravers Apolloni- des, Chronius, Tryphon, Satyreius, and Dioscurides, but the date of the last-mentioned only is certain. He lived in the time of Augustus, whose portrait he executed, and did not, it may be supposed, inscribe his own name on it in full, On the other hand, if, as Pliny states, it became a custom afterwards to seal with this portrait of Augustus, it would be natural enough to place on the copies of it made for that purpose the name of Dioscurides. With this view of the case may be reconciled two gems bearing his signature in the British Museum—the one a jacinth, the other a sard—and both obviously portraits which, though more resembling Julius Cesar than Augustus, might yet be re- garded as unsuccessful portraits of the latter. Of the two the jacinth, which is from the Blacas collection, is doubted by Brunn; the other is a higher class of work, and yet even it presents some difficulties that require the theory of an imitator, most probably a Roman one. The obtrusive display of the wreath and the fringe of drapery round the bust are details which, apart from the style of workmanship, are objectionable. That the name of this engraver has been often added to modern gems is true enough, and in some cases also it may have been in modern times inscribed on perfectly ancient gems. Even among those which appear to be in all respects antique there are differences in the spelling and form of the letters not to be accounted for if they had come from his hand, but intel- ligible if they had been made by ancient copyists, Abbre- viations such as AIOSK for Dioscurides, or EMIT for Epitynchanus, are always suspicious. EITYIXA, on a beautiful cameo of the young Marcellus, might seem to have been abbreviated by the accident which broke off tle lower part of the gem, but the inscription does not bear examina- tion except as the work of a modern hand. Not necessarily modern is the inscription AIOZKOYPIA, on a fragmentary amethyst, with a head which may perhaps have been meant for Alexander the Great, whose portrait, as has been said, was used as a seal by

Augustus, and may have been exe- cuted for him by Dioscurides. It is possibly an ancient copy of this seal, with the addition of the name of the original artist to show that it isso. With regard to the question whether a name standing in the genitive case may indicate the engraver, the evidence is affirmative, if for no other reason than that the names are most frequently Greek, while the owners or collectors of gems in Italy were Romans. Collecting was a passion with wealthy Romans but their names have not survived on genis. Names like

Aulus or Guseus, written in Greek letters, cannot indicate a Roman of position, but on the contrary show that it wag to the naturalized Greeks that the Romans looked for their engravers. When, for instance, one gem reads SOAQNOS and another SOAQN EIIOIEI, it is fair to conclude that we have to do in both with an engraver named Solon, if the inscriptions are genuine. The former occurs on a gem found with jewellery at Pompeii (Bullet, d'Inst. Arch., 1863 p. 91), so that if the other examples of it, ¢.g., on the Strozzi Medusa in the British Museum, and on the so-called head of Mzcenas, be inventions of the 16th or 17th centuries, they are at least correct in reproducing a name which is now seen on one undoubtedly ancient intaglio. Obviously one or more gems so inscribed must have existed in the 16th or 17th centuries, aud this fact alone of the existence of several gemy with the same name would suggest if not actually prove that it was the name of an engraver, The other inscription, SOAQN EIJIOIEI, on an intaglio of Diomedes carrying off the Palladium, though known since the year 1660, has not always passed unchallenged. The Medusa just mentioned is a gem of extraordinary pre- tensions, but very unsatisfactory when compared with good Greek work. In the matter of names the evidence as to the Greek usage, though very slight, is not at variance with what may be gathered from the coins where the names of the die-sinkers appear either in the nominative or genitive case.

In the discussions as to what is or is not proper in the way of engravers' signatures, frequent reference is made to the inscription EYTYXHS AIOSKOYPIAOY AITEATOS EU, which occurs twice—on a pale amethyst said last century to belong to the prince of Avella, and on an

amethyst in the Marlborough collection. The design on the two is identical, consisting of a helmeted bust of Minerva in full face. Unless what was formerly the Avella gem is now the gem belonging to the Marchese Strozzi of Florence, then this again must be a third example. Professor Maskelyne in his Catalogue quotes Mr King as agreeing with him that the Marlborough gem (No. 81) is not a copy as Brunn supposed, but may be regarded as an original work of Eutyches till the Avella gem be proved to exist elsewhere. But Stephani insists on the inscription being a modern pro- duction, especially on account of the contraction EII for EDIOIEI, which he says had arisen through the last letters OIEI being hidden from the modern copyist, either owing to the setting, or from some other cause. The gem which Cyriacus of Ancona and a contemporary of his saw and described in the early part of the 15th century had the full inscription, and possibly it was from an inexact impression of it that the Marlborough gem was made (Compte-rendu, 1861, p.157). Another celebrated Marlborough gem with the head of the dog-star Sirius, inscribed TAIOS EMOIEI, is condemned by Professor Maskelyne in his Catalogue (No. 270), as it deserves to be. Apparently meant for the same engraver, though written differently, is the T'NAIOS on the beryl in the British Museum with the head of Hercules, as to which Kéhler's adverse judgment appears to be entirely just. SKYAAZ, which is found on an amethyst head of Pan in the British Museum exeented with wonderful exact- ness of detail, is not disputed, except as to whether it is the name of the engraver or the owner. Among the other names which have been more or less the subject of discus: sion are those of Hyllus, who also claims to be a son 0 Dioscurides, Epitynchanus, Agathopus, Euodus, Felix, Mycon, Allion, Admon, Onesas, Protarchus, and Alexas.

The habit of gem collecting is recorded first in the instance of Ismenias, a musician of Cyprus, who appears to have lived in the 4th century B.c. But though individual collectors are not again mentioned till the time of Mithradates, whose cabinet was carrie off to Rome by Pompey, still it is to be inferred that they existed, if not pretty generally, yet in such places as Cyrene, where the

sion for gems was so great that the poorest person owned one worth 10 minas, and where, according to Alian (Var. Hist., xii. c. 30), the skill in engraving was astonishing. The first cabinet (dactyliotheca) in Rome was that of Scaurus, a step-son of Sulla, Cesar is said to have formed six cabinets for public exhibition, and from the time of Augustus all men of refinement were supposed to be judges both of the art and the quality of the stones. To this pretension is doubtless due most of the existing gems engraved on large beautiful jacinths, garnets, sards, beryls, and amethysts, leaving, as regards purely technical skill, nothing to be desired. Except in portraiture, and in grylli or conceits, in which various things are combined into one, often with much skill, the subjects were as a rule only variations or adaptations of old types handed down from the Greeks. When new and distinctly Roman subjects ocenr, such as the finding of the head on the Capitol, or Faustulus, or the she-wolf with the twins, both the stones and the work- manship are poor. In such cases, where the design stirs a genuine national interest, it may happen that very little of artistic rendering will be acceptable rather than otherwise, and much more is this true when the design is a symbol of some article of faith, as in the early Christian gems. There both the art and the material are at what may be called the zero of engraving; that is to say, it has reached the point beyond which barbarousness or folly sets in. The usual subjects on the early Christian gems are the fish, anchor, ship, dove, the good shepherd, and, according to Clemens, the lyre. Under the Gnostics, however, with whom there was more of specu- Jation than of faith, symbolism was developed to an extent which no art could realize without the aid of writing. A gem was to them a talisman more or less elaborate, and the difficulty is to make out how they carried them. Many specimens exist, but none show signs of mounting. The materials are usually hematite or jaspar. As regards the designs, it is clear that Egyptian sources have been most drawn upon. But the symbolism 1s also largely associated with Mithraic worship. ‘The name Abraxas or Abrasax, which, from its frequency on these gems, has led to their being called also ‘‘ Abraxas gems,” is, when the Greek letters of which it is composed are treated as Greck numerals, equal to 365, the num- ber of an in a year, and the same is the case with MEI@PA2.

More interesting, from the occasionally forcible portraiture and the splendour of some of the jacinths employed, are the Sassanian gems, which

as a class may be said to represent the last stage of true gem engraving in ancient times. In the middle ages and onwards metal stamps were found more serviceable for the purpose of sealing, and though engraved gems still continued to be a luxury |} of the great, the old traditions were broken through, as may be seen, for example, in the large crystal in the British Museum repre- senting Susanna and the Elders, made by order of the French king Lothair, 954-986. With the revival of classical tastes under the patronage of popes and princes in the Cinquecento period, it was natural that this branch of art should have a new career of activity, which, after a lapse during the 17th century, again during the last century revived under an even greater amount of encour- agement from men of wealth and rank. In this last period the names of engravers who succceded best in imitating classical designs were Pichler (P1.I., fig. 28), Natter, andthe Englishmen Marchant (fig. 29) and Burch. Compared with the Greek gems on the same plate, it will be seen that what at first sight is attractive as refined and delicate is after all mere pretence of refinement, and entirely devoid of the ancient spirit. The success with which modern engravers imposed on collectors is recorded in many instances, of which one may be taken as an instructive type. In the Bibliothéque in Paris (Chabouillet's catalogue, No. 2337) is a gem familiarly known as the signet of Michelangelo, the subject being a Bacchanalian scene. So much did he admire it, the story says, that he copied from it one of the groups in his paintings in the Sistine chapel. The gem, however, is evidently in this part of it a mere copy from Michelangelo's group, and altogether is a later production.

The gems engraved in Plate I. show a progressive develop- ment of the art from the earliest times down to last century. They are all in the British Museum, and are enlarged to about a half more than their real size. No. 1, Porcelain scarab, from Camirus in Rhodes; No. 2, Carnelian, lentoid gem, from Ialyssus, in Rhodes; No. 8, Crystal, lentoid, also from Ialyssus ; No. 4, Paste scaraboid, from Tharras, in Sardinia ; No. 5, Carnelian, head ofa king ; No. 6, Crystal scarab, Gorgon ; No.7, Carnelian scarab, Citharist ; No. 8, Sard, female figure with water jar; No. 9, Steatite scaraboid, Citharist; Nos. 10-13, Four sides of an amethyst, Menads; No. 14, Agate, Eos ; No, 15, Carnelian, unknown ; No. 16, Carnelian, head of Alexander the Great, as Helios ; No. 17, Sard, head of Zeus; No. 18, Sardonyx cameo, Actéon ; No. 19, Sardonyx cameo, head of Athena; No. 20, Paste, Victory ; No. 21, Paste,

Menad; No. 22, Paste, Victory sacrificing bull; No. 23, Agate scaraboid, Priest ; No. 24, Amethyst, head of Brutus (2) from Rhodes, inscribed C. I. Q.; No. 25, Jacinth, Sassanian per- trait; No, 26, Gnostic gem ; No. 27, Christian gem, the Good Shepherd; No. 28, Modern gem, by Pichler; No. 29, Modern gem, by Marchant.

Literature.—SeeM. A. Levy, Siegel und Gemmen, with three plates of gems having Pheenician, Aramaic, and old Hebrew inscriptions, Breslau, 1869; and, on the same subject, De Vogué, in the Revue Archéologique, 1868 (xvii.), p. 482, pl. 14-16; De Saulcy, in the Rev. Arch., 1869 (xx.), p. 101, "' Recherches sur le costume chez les Juifs;" Victor Ancessi, L' Egypte et Moise, Paris, 1875, giving on plate 7 a fanciful restoration of an Egyptian breastplate ; Soldi, in the Rev. Arch., 1874 (xxviii.), p. 147, on Babylonian cylinders ; Count Gobineau, in the Rev. Arch., 1874 (xxvii.), p. 111 and p. 179, on early Oriental gem engraving. Fr. Lenormant, in the Rev. Areh., 1874 (xxviii.), pl. 12, gives five examples of early lentoid gems, and seven more gems of the same class are given by A. S. Murray in the Rev. Arch., 1878, pl. 20. On Greek and Roman gems the principal authorities are Kohler, Gesammelte Schriften, iii. and v., and Stephani, in his notes to these volumes, and in the Compte- rendu de la Commission Imperiale de St Petersbourg, 1870-1, p. 215 and pp. 221-224. Opposed to them is Brunn, in his Geschichte der Griechischen Kiinstler (1859), ii. p. 443, where a full discussion of Greek and Roman gems will be found. See also Krause, Pyrgoteles, Halle, 1856, and Bollettino dell?' Inst. Rom., 1881, p. 105 1884, p. 116; and 1839, p. 99. In England the autho- rity is C. W. King, Antique Gems, 2d edit., London, 1866 ; Handbook of Engraved Gems, 1866; Precious Stones, 1865; Gnostic Gems, 1864; and appendix on ancient gems in Cesnola's Cyprus, which gives 11 plates of gems. Of special interest as regards the stones used by ancients, and valuable as a criticism of a single collection, is Prof. Maskelyne's Catalogue of the Marl- borough Collection, privately printed in 1870, This collection is now the property of Mr Bromielow. On Abraxas gems see Barzilai, Gli Abraxi, Trieste, 1878, and Matter, Histoire du Gnosticisme. An indispensable book of reference is Raspe's Catalogue of Tassie's large series of Sulphur Casts. Among catalogues of public collec- tions are Tolken's Verzeichniss d. preuss. Gemmen, 1835; Chabouillet's Catalogue des Camées et Pierres Gravées de la Bibliotheque Imperiale, Paris, 1856; and Jansson's Nederlandsch-Rom.

Daktyliotheek, Ley- den, 1844. Older works are generally of small critical value, but the following may be mentioned :—Winckelmann, Description des Pierves Gravées du Feu Baron de Stosch, Florence, 1760; Visconti, Opere Varie, ii. p. 115-386; Mariette, Traité des Pierres Gravées ; Millin, Pierres Gravées, and Introduction d& U Htude des Pierres Gravées, Paris, 1796. (A. 8. M.)

GEMSBOK (Ory gazella, Gray), a species of antelope, abounding on the dry yet fertile plains of South Africa, where it feeds on the bulbs of water-root and other kinds of succulent vegetation, by means of which the antelopes

of those regions are able to subsist without water for

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: ‘nal months together. It is a large and powerful anima’, measuring about 5 feet in length and over 3 feet in — at the shoulders. ts horns, situated on the same a with its forehead, exceed 2 feet in length, a ee straight, and are obscurely ringed throughout their

half. The colour of the upper part of the body is a oar grey, and of the under part white, while these are separate from each other by a well-defined black band on each side. These bands unite on the breast, and are continued as a single black band until reaching the lower jaw, when they again divide and form two traisverse bands on the head, termin- ating at the base of the horns. The head otherwise is white, as also are the limbs, with the exception of the thighs, which are black. The striking appearance presented by this antelope is in great part due to the absence of any blending in the different colours of its body. The gems- bok avoids tle woods, living on the open plains in pairs or in small groups of four or five. Possessing powerful weapons of attack in its long spear-like horns, and with ample courage to use them, this animal, especially when wounded, is a formidable antagonist both to man and to the numerous beasts of prey which are attracted to the karroos of the Cape by the presence of this and other ruminant species. It is

said to defend itself not unfrequently with success against thelion. Its flesh is esteemed as a delicacy, and its hide forms a valuable leather.

GENDARMERIE, a body of troops or police in France, composed of gendarmes, or men-at-arms. In the days of chivalry they were mounted and armed cap-a-pie, and attended ‘each by five soldiers of inferior rank and more lightly armed. They were then furnished by the fiefs, and marched in the train of the knights and esquires. In 1439 this feudal gendarmerie was replaced by the compagnies @ordonnance which Charles VII. formed when the English were driven out of France, and which were distributed throughout the whole extent of the kingdom for preserving order and maintaining the king’s authority. These com- panies, fifteen in number, were composed of 100 lances or gendarmes fully equipped, each of whom was attended by at least three archers, one coutillier (soldier armed with a cutlass) and one zarlet (soldier’s servant). The states- general of Orleans (1439) had voted a yearly subsidy of 1,200,000 livres in perpetuity to keep up this national soldiery, which replaced the bands of mercenaries who for about a century had made France their prey. The number and composition of the compagnies d’ordonnance were changed more than once before the reign of Louis XIV. This sovereign on his accession to the throne found only eight companies of gendarmes; but after the victory of Fleurus (1690), which had been decided by their courage, he increased their number to sixteen. The four first companies were designated by the names of Gendarmes écossais, Gendarmes anglais, Gendarmes bourguignons, and Gren- darmes flamands, from the nationality of the soldiers who had originally composed them ; but at that time they con- sisted entirely of French soldiers and officers. These four companies had a captain-general, who was the king. The fifth company was that of the queen; and the others bore the name of the princes who respectively commanded tliem. This organization lasted till 1787, when Louis XVI. dis- solved it, only retaining the Gendarmes écossais in his body- guard. The great Revolution swept away all these institu- tions of the monarchy, and, with the exception of a short revival of the Gendarmes dela garde at the Restoration, the word gendarmerie had thenceforth an altogether different meaning. It has been since that time employed to denote a military police, whose duties are to watch over the public safety, keep order, and enforce the execution of the laws This police force superseded the old maréchaussée.

The law of the 28th Germinal i the royal ordinance of the 29th Dee donee sey an darmerie, and laid down the general rules that are still in force dividing it into legions and companies, and the latter into brigades, In time of war a colonel of gendarmerie, with the title of grand-

prévot, is attached to the army with a detachment of gendarmes for maintaining discipline among the soldiers, Though placed

under the control of the niinister of war, the gendarmerie is also at the disposal of the minister of the interior as a police force, of the minister of justice as agents to secure the execution of judicial sen- tences and police regulations, and also of the minister of marine and colonies for enforcing his authority over marines and sailors in the colonies and sea-towns of France. The gendarmerie of Paris constitutes a special corps established first in 1802, and successively called Gendarmerie de Paris, Garde royale, and Garde municipale, Suppressed by the provisional Government in 1848, the Garde de Paris was soon reorganized. It is now composed of 6 squadrons of cavalry and 24 companies of infantry, and is officially styled Garde républieaine de Paris. Both in the Garde républicaine and in the légions, the gendarmes consist for the most part of deserving soldiers of the regular army, who have been drafted into this ser- vice, where, with other privileges, they have a much higher rate of pay than the soldiers of the line. ‘Their total numbers are about 40,000, made up of the Garde de Paris as above, 31 pro- vincial legions, 1 legion of gendarmerie mobile, and the Gendarmerie coloniale.

Russia also has a gendarmerie, a secret police appointed in all towns of the empire to watch over Russian subjects of all ranks and classes, aud to report to the chancery office such information as they receive from their detectives and secret agents.

For the history of the old French gendarmerie before 1789 see Chéruel, Dictionnaire historique des institutions de la France, 2 vols., and Lacroix, Vie militaire et religieuse au moyen dge et a [époque de la Renaissance; and for the present gendarmerie, Réorganisation de la Gendarmerie, 1871, and Annuaire militaire, 1877.

GENEALOGY. Biblical—The word “genealogy” (yeveadoyia), which occurs twice in the New Testament (1 Tim. i. 4; Tit. iii, 9; compare also Heb. vii. 3, 6) in the ordinary concrete sense of ‘“ pedigree” or “list of ancestors,” is of somewhat frequent occurrence in the authorized version of the Old Testament scriptures, but only in Chronicles- Fizra-Nehemiah, where the words “MD! and ’N!ni, which are peculiar to that work, are invariably rendered “ genealogy” and “to reckon by genealogy.” This translation, however, is of somewhat doubtful accuracy; for, whatever the original meaning of the root “DN? may have been,’ there seems to be no room for doubt that the noun and the verb connected with it were used in later Hebrew simply to denote respectively the roll and the act of registration; and that the “book” alluded to in Neh. vii. 5 (in A. V. “register of the genealogy”) was genealogical only in so far as the individuals registered in it were classified according to their “houses,” “families,” and “tribes.” While a catalogue of this sort was admirably fitted to be a permanent record of tribal relations in Israel, as these subsisted at the time of its compilation, there is not any reason to suppose that it made any attempt to trace them through

previous generations.2_ The scripture genealogies, properly

1 According to Ewald (Geseh. d. V. Isr. i. 261, of. Alt. 363), it meant properly ‘‘to count.” In the LXX. the Hithpael is rendered differently in each passage where it occurs; éyeveadoynén is only once given. In Ezra ii, 62 the translation is ypaphy abray ot peOweretp (Vulg., scripturam genealogie sux); in Neh. vii, 64 it is ypabny éauraév THs cuvodtas (scripturam suam in censu), It may be added that the habit of taking a written census of sections of the population, or even of the entire nation, was obviously not unfamiliar to the Jews. This appears from numerous indications in the earlier historical books,

e.g., Num. i. 18, where the word (used here only) is STM, as well

as in Chronicles-Ezra-Nehemiah. Compare also Ezek, xiii. 9 and Ps. Ixxxvii. 6.

2 When, for example, we read in 1 Chr. vii. 6, 7 that Benjamin had three sons (Bela, Becher, and Jediael); in viii. 1, 2 that he had five (Bela, Ashbel,

Aharah, Nohah, and Rapha); in Numb. xxvi. 38 again that he had five, but that their names were Belah, Ashbel, Ahiram, Shu- pham, and Hupham; and, finally, in Gen. xlvi. 21 that they numbered ten ‘‘souls” (Bela, Becher, Ashbel, Gera, Naaman, Ehi, Rosh, Muppim, Huppim, and Ard); or when the descendants of Bela are variously given, in 1 Chr. vii. 7 as Ezbon, Uzzi, Uzziel, Jerimoth, and Iri; m 1 Chr. viii. 83-5, as Addar, Gera, Abihud, Abishua, Naaman, Ahoah, Gera, Shephuphan, and Huram; and in Numb. xxvi. 40 as Ard and Naaman, the simple explanation (after all due allowance for corrup- tions in the text has been made) seems to be, that in the course of a long history the Benjamite tribe included a varying number of families or clans with varying names. Similar instances might be indefinitely multiplied. It ought to be added, however, that criticism has not yet by any means completed its task on the book of Chronicles in its genea- logical bearings. See Wellhausen, Geschichte Israels, i. 280 sg, 1878.

GENEALOGY

so called, are rather to be sought for in these nindin

Gv” generations ;” Gen. ii, 4; v. vid oc lace, Hix

vi. 16, 19, &e.; Num. iii. 1) so frequently met with in some other canonical books, and so specially characteristic

of the first book of the Pentateuch as apparently to have suggested tc the Alexandrian translators its distinctive name of yéveots. indeed with “the generations (or genealogy) of the heavens and of the earth.” through the lines of Cain and of Seth respectively to the seventh and to the ninth generation. In the two lists the

frequent similarity of the names has not escaped observa-

tion; nor has the symmetry of the numbers (in one case, a series of seven, the seventh branching into three; in the other a series of ten, in which the seventh is peculiarly

prominent, while the tenth branches into three). The very

ancient tradition which they embody is not at present so generally believed to convey actual personal history as once

it was, but by those who view them as more or less ideal

in their character their significance has been very variously

estimated,—some seeing in them the survival of ancient myths, perhaps solar in their character ; others interpreting

them as representing successive dynasties, or immigrations,

orstages of culture within a given area in prehistoric times ; while such interpreters as Philo allegorize them in a purely

spiritual sense. The same differences of view find expres- sion when the genealogies of the immediately post-diluvian period come to be considered. In Gen. xi. a series of nine generations (or, according to the LXX., ten) from Shem to Abraham is given; the symmetrical number again attracts notice, and in the list some names at least can be identified as having belonged to special nationalities ; Arphaxad, for example, is probably equivalent to the Arrhapachitis of Ptolemy (vi. 1). That this “genealogy” was in intention ethnographical rather than personal finds confirmation from the expansion which it receives in the very interesting sketch of a genealogia universalis in Gen. x., where the sons of Shem, besides Arphaxad, are said to have been Elam, Asshur, Lud, and Aram, while from Aram were descended Uz, Hul, Gether, and Mash or Meshech (compare 1 Chron. i. 17); and again, among the sons of Joktan, the (younger) brother of Peleg, are found Hazarmaveth, Sheba, Ophir, and Havilah. Throughout Gen. x., indeed, a thorough con- sciousness of a purely ethnographical purpose is manifest, and in many instances the device of using personal names to convey ethnological statements is entirely dropped (Gen. x. 13, 14, 16-18). Historians and critics are not yet entirely at one as to the view which ought to be taken of the genealogies which begin with Abraham. As is well known, these follow the line of Isaac, but give also thie collateral lines of Ishmael and of the children of Keturah, and again trace the desccndants not only of Jacob but also of Esau ; and so much at least is unanimously held that, even if strictly historical so far as the children of Israel are concerned, they cannot be

supposed to be complete for the centuries of the sojourn in Egypt. There seems no reason to doubt, however, that the distribution into tribes (MB or DIY) families (MINBY) and houses (M2¥“M3) lay at the basis of the organization of the Israelites from the earliest period of their independent national life, so that at any given time each man would be able to tell what house he belonged to, what other houses belonged to the same family, and what other families belonged to the same tribe with himself. There are indications of repeated censuses, in which the people were systematically eurolled

for fiscal and military purposes ; but, on the other hand, it

must be said that there seems to be no adequate evidence that the DIY, or “ officers,” so frequently mentioned in the

Pentateuch, had functions at all corresponding to those of

a heralds’ college, if indeed it can be regarded as made out

These begin with the antediluvian period, and

The descendants of Adam are traced

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that they were scribes at all. The statements which are continually made as to the unbroken continuity and exhaus- tive fulness of the genealogical records of the twelve tribes of Israel are not borne out by any sober reading of the facts of history, as these have come down to us; and, even in the case of the Aaronic and Davidic families, there are some circumstances that warn against too absolute confidence in the strict literality of the lists which have reached our hands. It is certain, indeed, that from the beginning of the post-exile period (Ezr. ii. 62, Neh. vii. 64) great im- portance was attached to purity of lineal descent in the case of priests ; and even in the time of Josephus (Cont. Ap., i. 7) members of the priestly caste were in the habit of prov- ing their legitimacy by means of public documents, which he refers to as dynuooia déA7ro. But a comparison of the pedigree (whether official or personal) of Jehosadak (1 Chir. vi. 3-15; of. Ezra vii. 1) with the

enumeration of Aaron's successors in the high priesthood, as given by Josephus and repeated in the Seder Olam, suggests that, for the period preceding the captivity at least, the materials for a com- plete list must have been somewhat defective. That in the case of the house of David, in like manner, some real uncer- tainty existed would seem to be a legitimate inference, not only from the Chronicler's obscurity, but also from the not easily reconcilable discrepancy between the genealogies given in Mat. i. and in Luke iii. And this is not inconsistent with the fact, of which there are many indications in the New Testament (and even, though more faintly, in the Mishna), that among the Jews the consciousness of tribal distinctions disappeared very slowly. When Anna is repre- sented as belonging to the tribe of Asher and Elizabeth as a daughter of Aaron, Paul as a Benjamite and Barnabas as a Levite ; or when, as is vouched for by a not very late tradition, the "desposyni" in the time of Domitian claimed to have the royal blood of David in their veins, it would ob- viously be just as rash to infer (as Jerome seems to have done) that every successive link in the long series of their genealogies was accurately known to the persons themselves, or recognized by their contemporaries, as it would be unscientific altogether to ignore the presumption arising out of the very fact that tribal distinctions were asserted. With reference even to the most undisputed of the Biblical genealogies, it is important to remember, in the first place, that in them phrases implying sonship are not to be interpreted so strictly as they would be with us; and, secondly, that, in order to aid the memory by means of successions of symmetrical numbers, it was quite usual to manipulate a long list by dropping or even by introducing names at discretion. . Classical. —A. passing reference only is needed to the intricate genealogies of gods and sons of gods which form so conspicuous a feature in classical literature. In every one of the numerous states into which ancient Greece was divided there were aristocratic families who were accustomed to claim descent, through eponymous heroes, from the primitive deities. Many of these families were, as families, undoubtedly of great antiquity even at the beginning of the historical period ; and in several instances they con- tinued to maintain a conspicuous and separate existence for centuries. The element of family pride is prominent in the poetry of the Megarian Theognis ; and in an in- scription belonging to the 2d century B.c. we find a member of the Spartan family of Gytheates represented as the thirty-ninth in direct descent from the Dioscuri and the forty-first from Hercules. Even in Athens, long

after the constitution had become thoroughly democratic, some of the clans continued to be known as eérarpida: ; and Alcibiades, for example, as a member of the phratria of the Eurysacide, traced his origin through many generations to Eurysaces, is “ean dee

who was represented as having been the first of the AZaci

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to settle in Attica. — such pedigrees as this

It is very doubtful, however, whether were very seriously put forward by those who claimed them ; and it is certain that, almost along the whole line, they were unsupported by evidence. We have the authority of Pollux (viii. 111) for stating that the Athenian yéveo, of which there were thirty in cach pparpia, were organized without any exclusive regard being had to blood-relationship; they were constantly receiving accessions from without; and the public written registers of births, adoptions, and the like do not appear to have been preserved with such care as would have made it possible to verify a pedigree for any considerable portion even of the strictly historical period (see Schoemann, Griechische Alterthiimer, i. 137, 338). 2

The great antiquity of the early Roman (patrician) gentes is indisputable ; and the rigid exclusiveness with which each preserved its hereditates gentilitiw or sacra gentilitia is sufficiently illustrated by the fact that towards the close of the republic there were not more than fifty patrician families (Dionys., i. 85). Yet even in these it is obvious that, owing to the frequency of resort to the well-recognized practice of adoption, while there was every guarantee for the historical identity of the family, there was none (documents apart) for the personal genealogy of the indivi- dual. There is no evidence that sufficient records of pedi- gree were kept during the earlier centuries of the Roman commonwealth. In later times, it is true, even plebeian families began to establish a prescriptive right (known as the jus imaginum) to preserve in their halls the busts of those of their members who had attained to curule officc, and to exhibit these in public on appropriate occasions. Under these imagines majorum? it became usual to inscribe on the wall their respective tituli, the relationship of each to each being indicated by means of connecting lines ; and thus arose the stemmata

gentilitia, which at a later time began to be copied into family records. In the case of plebeian families (whose stemmata in no case went farther back than 366 B.c.), these written genealogies were probably trustworthy enough ; but in the case of patricians who went back to AMneas,? so much cannot, it is obvious, be said; and from a comparatively early period it was clearly recognized that such records lent themselves too readily to the devices of the falsifier and the forger to deserve much confidence or reverence (Pliny, H. WV., xxxv. 2; Juv. viii 1). The many and great social changes which marked the closing centuries of the Western empire almost invariably militated with great strength against the maintenance of an aristocracy of birth ; and from the time of Constantine the dignity of patrician ceased to be hereditary.*

Modern.—The passion for geuealogizing, which has been and is a marked characteristic of all the aristocracies of

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1 All the earlier Greek historians appear to have constructed their narratives on assumed genealogical bases. The four books of Hecatmus of Miletus dealt respectively with the traditions about Deucalion, about Hercules and the Heraclidx, about the early settlements in Pelopon- nesus, and about those in Asia Minor. The works of Hellanicus of Lesbos bore titles (Aeviadrdvera and the like) which sufficiently explain their nature; his disciple, Damastes of Sigeum, was the author of genealogical histories of Trojan heroes; Apollodorus Atheniensis made use of three books yeveadoyindy by Acusilaus of Argos ; Pherecydes of Leros also wrote - yeveadoyla:. See Nicolai, Griechische Literaturgeschichte, i. 254 sq.; Schubart, Questt. geneal. historice 1832; Marckscheffel, De Genealogica Greecorum pocst, 1840.

> The chief authority on this subject is Polybius (vi. 53).

3 At the funeral of Drusus the iniages of Aineas, of the Alban kings of Romulus, of the Sabine nobles, of Attus Clausus, and of “the rest of the Claudians” were exhibited.—Tac., Ann. iv. 9.

4 The Roman stemmata had, as will be seen afterwards, great interest for the older modern genealogists. Reference may be made to Glandorp's Descriptio Gentis Antonie (1559) ; to the Descriptio Gentis Julie (1576) of the same author; end to Hiibner's Tabellen See also Ruperti's Tabule Genealogice sive stemmata nobiliss, gent. Rom. (1794, 1811); Drumann's Geschichte Roms (1834); and Becker's Handbuch d. rim. Alterthiimer, vol. ii.

modern Europe, can be directly traced to the influence of feudalism and the principles of hereditary privilege which that system, in its later phases at least, so peculiarly en- couraged. Along with the sharp separation of those families which alone were regarded as capable of holding real property or filling the higher offices of state, or indeed of en- gaging in any of what were reckoned as the more ennobling pursuits of life, arose the necessity for being able to determine with accuracy who werc and who were not the persons entitled by birth to take a place within the privileged caste. When, for example, the practice arose of holding tournaments, in which no one was allowed to take part who could not give evidence of gentle descent, the necessity for the professional genealogist became at once apparent. It was not, however, until about the end of the 15th century that the vanguard of the great army of writers upon this fertile subject began to appear. It was perhaps natural that, finding as they did the gulf of separation between noble and base to be so great as it was, they should have leapt to the conclusion that it had existed from the first; at all events their knowledge and their ignorance combined to support them in their con- jecture. As they forced their way up the stream of time, indeed, they were met at a comparatively early stage by a great barrier—consisting less in the paucity and inaccessi- bility of authentic documents than in what one might almost call the fatal fact of the absence of family names. Prior to the middle of the 11th century these were entirely unknown; the documents speak merely of Eberhardus, Fridericus, Ernestus, and the like, with at most the addition of the title. About 1050 began the custom of using sur- names, but it made way so very slowly that, even at the close of the 12th century, it had not diffused itself beyond the ranks of the higher nobility, and throughout the 1 3th the old habit of self-designation by the Christian name merely was still

exemplified in a vast number of instances.> The diffi- culty, however, in an age when the laws of evidence were so imperfectly understood, did not count for much with the courtly genealogists of the 15th and following centuries. The insuperable obstacle which barred their advance along the path of sober research only furnished them with a pre- text for all the sooner making their escape into the region of imagination and conjecture, where no impediments occurred in tracing the ascending series until the name of the first created person was reached. The appended bibliography will help to make clear the degrees by which genealogists have gradually been brought to confine themselves to tle limits of the verifiable. At present, if we understand by a genealogy a tabulated and, as far as possible, an exhaustive statement of all the ramifications of a series of human generations, and by genealogical science that branch of history which aims at securing fulness and accuracy in the accounts men give of the antecedents of families which have attained to distinction, the modern gene- alogist cannot but be conscious that he occupies @ compara- tively narrow field, and one from which the larger interests of mankind are daily further receding. In the more ancient meaning of the word genealogy indeed, when it is used to denote that grander task of the historian which consists in tracing the origin, not of privileged families or castes merely, but of races and groups of races, and even of the species itself, the subject is one that has an ever widening and deepening significance; but in this sense it does not call for treatment apart from the biological sciences.

Among the earliest of the genealogists of modern times may be

mentioned Benvenuto de San Georgio (Montisferrati Marchionum et Principum regia propaginis succcssionumque series, 1515), Phili-

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® Gatterer, Abriss der Genealogie, sec. 41 (1788). According te this author, there is only one class of cases in which it is possible to trace a pedigree beyond the 11th century,—those cases, namely, where a family happens to have established a fund for the deliverance of the souls of certain ancestors (Christian names spceified) from purgatory. –

bert Pingonius (Arbor gentilitia Sabaudic Saxonieque Domus, 1521), Gebwiler (Epitome vegii ac vetustissimi ortus Caroli V. et Ferdinandi I. omniumque Archiducum Austric et Comitum Habs- burgensium, 1527), Meyer (Flandricarum rerum tomi X. de origine, antiquitate, nobilitate, ac genealogia Comitum Flandrice, 1531), and Du Boulay (@énéalogies des tres illustres et tres putssants Princes les Dues de Lorrwine, 1547). Georg Riixner's Anfang, Ursprung, und Herkommen des Thurnicrs in Teutscher Nation (1532) was also genealogical in its character. Later in the same century several works of a much wider scope than any of the preceding appeared, the list being headed by Reineccius or Reineck of Helmstadt, whose voluminous compilations include a Syntagma de familiis que in monarchiis tribus prioribus rerum potite sunt (4 vols. fol., 1574-80), and an Historia Julia seu Syntagma heroicum (3 vols. fol., 1594-97); this writer was followed by Henninges (Genealogie Sawonicw, 1587, and Theatrum genealogicum ostentans omnes omnium cetatum familias Monareharum, Regum, Ducun, Marchionum, Principum, Comitum, atquc illustrium Heroum et Heroinarum,; item Philo- sophorum, Oratorum, Historicorum quotquot a condito mundo usque ad heee nostra tempora vixerunt, 1598), Reusner (Opus genealogiciun catholicum de preecipuis familiis Imperatorum, Regum, Principum, Comitum, &c., 1589-92, and Stemma Wittichindeum, 1592), Eytzing or Aitsingerus (Paralipomena quibus Bavarica, T'urcica, Anglica, Belgica, et Bohemica imperatorum, regum, ducum, marchionwm, comtum, altorumque Hurope procerum atque heroum stenmata continentur, 1592), and others. In 1580 Francois de Rosiéres

. published at Paris the Stemmata Lotharingiv ac Barri ducum, in

which he professed to have proved the direct descent of the princes of Lorraine from Charlemagne; for having in this instance indulged in inconvenient as well as unscrupulous falsehood, he was arrested by the parliament of Paris, and thrown into the Bastille, from which he was not released till 1583, the book meanwhile having been suppressed. The 17th century was extraordinarily prolific in genealogical literature; in England it produced, amongst many similar works, Milles's Catalogue of Honor (1610) and Dugdale's Baronage (1675-76); of Continental writers the following are pro- bably the most worthy of notice :—Emmius (Gencalogia Universalis, 1620), Andre Duchesne (whose writings include an Histoire

Généa: logique de la Maison de Montmorency et de Laval, 1624, and an Histoire Généalogique de la Maison de Vergi, 1625), Pierre d' Hozier (Généalogie de la Maison de la Rochefoucauld, 1654), Ritters- husius (Genealogi« Imperatorum, Regum, Ducum, Comitwm, alior- umque Procerum ab anno MCCCC, 1658, and Brevis Exegesis Historica genealogiarum preecipuorum orbis Christiani procerum, 1674, continued by Imhoff in the Spicilegiwm Rittershusianum, 1683), Spener (Theatrum nobilitatis Hurapew, 1668, and Insignium Theoria, 1690), Lohmeicr (Historische Stammtafeln der 'kaiser- lichen, kiniglichen, und fiirstlichen Geschlechten, 1690), Anselme de Sainte Maric (Histoire Généalogique de la Maison de France, 1694); but these, along with those of Bucelin, Dangeau, Francois Duchesne, Le Laboureur, Menestricr, Morgan, are only a few of the names which during the 17th century became associated more or less worthily with this branch of research. The pedigree of the Urquharts of Cromartie given by Sir T. Urquhart in his Promp- tuary of Time (1652)-may perhaps be called an extreme specimen of the uncritical methods that characterized too much of the work 'of the genealogists of the period. Full bibliographies down to this date are given by J. F. Reimmann, Historia litteraria de fatis studit genoulogict apud Hebrocos, Groecos, Romanos, et Germanos, in qua seriptores harum gentium potissimi enumerantur et totus Geneas logic ewrsus ab orbe condito ad nostra usque tempora deducitur (1702), and Historie litterwrice cxotertcee et acroamatice particula, 3. de libris genealogicis vulgatioribus et rarioribus commentatio,; wocedit disquisitio historica de necessitate Scepticismi in studio genealogico (1710); also by Joh. Hiibner, Bibliotheca genealogica cin Veracichniss aller alten u. neuen genealogischen Biicher von allen Nationen in der Welt (1729). To the 18th century belong the Peerage (1709) and Baronetage (1720) of Collins, the Gencalogische Pabellen (1725-1733) of Hiibner, which in part were further elnci- dated by Lenzen (Historisch-genealogische Untersuchungen und Erlinterungen der ersten 34 Hiibnerischen Tabellen, 1756), the works of J. L. L. Gebhandi, especially his continuation of Lohmeier and Der Mohammedanischen und Heidnischen hohen Héuser historische be gencalogische Erldénterung (1731), and those of Gatterer (Hand- ee der Gonealogie und Heraldik, 1761, and Abriss der Genealogie, Fr 88), the latter being the first and still a useful manual upon the leory of genealogy. Of works belonging to the present century, be of the earliest was the Atlas historique, généalogique, chrono- 9 igue, et géographique (1803-

4) of Le Sage; and one of the ee bearing upon the general snbject, was the famous Beue- ae pit Art de verifier les dates (1820-38). During recent years d fall nicter principles of criticism which have become characteristics i modern historical imvestigation have made themselves felt in ie a marked manner in the field of genealogical research. A wise pa! re! has been increasingly shown with regard to all assertions ‘ch had not the support of adequate ‘‘diplomatic ” evidence;

and with the increased desire have come enlarged facilities for con-

sulting ancient documents, either directly or by means of authentic reprints. So far as England is concerned, the improved arrange- ments with regard to the public records, and the various publica- tions of the record commissioners, have brought the materials for a successful prosecution of this and cognate branches of antiquarian science within the reach of every zealous student; and although, in current Pecrages, assertious which probably had no origin but in vanity, and certainly have no evidence except that of long unques- tioned tradition, are still perpetuated, such statements can inislead none except the very unsophisticated. ‘The principal and almost the only sources from which authentic family history can be drawn are such documents as the Domesday books; the chartularies, leiger books, registers, necrologies, calendars, and chronicles of the various monasteries, records which convey both directly and indirectly a vast amount of information as to the pedigrees of founders and patrons; also the tournament and crnsade rolls some- times found in these establishments; the various sorts of Chart Antique, such as title deeds and enrolments in Chancery and other courts of justice; the books and rolls which record the returns to the successive inquisitions made into the state of the ‘ Knights’ Fees” which were granted at the time of the Norman Conquest; the Placita, in which are recorded decisions of parliament and other courts; the Rotuli, including charter rolls, patent rolls, pipe rolls, and many others; the Inquisitiones post mortem, sometimes inaccurately termed escheats; the records of heralds’ visitations ; monumental inscriptions, coats of arms, seals, &c, These sources are indicated with considerable fulness and discrimination in Grimaldi’s Origines Genealogice, or the Sources where English

Genealogies may be traced from the Conquest to the Present Time (1828), and, after him, by Sims in the Manual for the Gencalogist, Topographer, Antiquary, and Legal Professor, 1856.+

The earliest printed ‘‘ British Peerage” was that of Milles, en- titled Catalogue of Honor, published in folio in 1610; but Camden’s Britannia (1586) also contained many genealogies. Among recent works the best known are those of J. andJ. B. Burke (.4 Genealogical and Heraldic Dictionary of the Pecrage and Baronetage of the United Kingdom, 1822; 40th ed., 1877), of Lodge (The Genealogy of the Existing British Peerage, 1832-33; 48th ed., 1879), of Dod, and of Debrett; but the number of publications (inclusive of those of the London Genealogical and Historical Society) which have been, and continue to be, issued on this attractive subject is very great. For a bibliography approaching to completeness reference may be made to the privately printed Catalogue of Works on the Peerage and Baronetage of England, Scotland, and Ireland, prepared by Sir C. G. Young (1827), to Moule’s Bibliotheca Heraldica (1822), or to Sims’s Manual for Genealogists. In any list, however bricf, the names of Dugdale (Zhe Baronaga of England, 1675-76) and of Collins (4 Peerage of England, 1709; The English Baronage, of which only the first volume was ever completed, 1727) deserve a special place. The works of Sir R. Douglas on The Peerage of Scotland and The Baronage of Scotland appeared respectively in 1764 and 1796; that of John Lodge, on The Peerage of Ireland, in 1754. On the knightage of Great Britain and Ireland the most accessible writers are again Burke and Dod; but the work of Sir N. H. Nicolas (A History of the Orders of Knighthood of the British Empire, 4 vols. fol., 1842) is of more importance. As being some- what of an innovation in genealogical literature, Burke’s work on the commoners of Great Britain and Ireland may be mentioned here (4 Genealogical and Heraldic History of the Commoners of Great Britain and Ireland enjoying territorial possessions or high special rank but uninvested with heritable honours, 1833-38).

For the purposes of genealogical research in the United States of America one society at least has been formed, ‘f The New England Historical and Genealogical Society,” under the auspices of which an annual Register is published, Among numerous other publica- tions bearing upon this subject

may be mentioned J. F. Holgate's American Genealogy (1851), Whitmore's American Genealogy (1868), Webster's Genealogy (1877), and Thomas's Genealogical Notes (1878). (J. S. BL.)

GENELLI, Giovannt BuonaventuRA (1798-1868), was born at Berlin, September 28, 1798, and died at Weimar, November 13, 1868. He was the son of Janus Genelli, a painter whose landscapes are still preserved in

1 According to Grimaldi, in 1828 there were 294 peers, exclusive of the royal family. Of these thirty-five claimed to have traced their descent to beyond the Conquest, forty-nine to a date prior to the year 1100, twenty-nine to the 12th century, thirty-two to the 13th, baa six to the 14th, seventeen to the 15th, twenty-six to the 16th, an thirty to the 17th. In the case of forty-five noblemen no satisfactory conclusion could be drawn as to the commencement of their pee The pedigree of the Percys is one of the most full and conn ce genealogies of the kingdom. In Scotland the house of Mar is a He 3) that which can at once carry its nobility to the remotest period ('

i it by the best evidence. and authenticate it by ——s

the Schloss at Berlin, and grandson to Joseph Genelli, a Roman embroiderer employed to found a school of gobelins by Frederick the Creat, Buonaventura Genelli first took lessons from his father and then became a student of the Berlin Academy. After serving his time in the guards he went with a stipend to Rome, where he lived ten years a friend and assistant to Koch the landscape painter, a colleague of Hahnel, Reinhard, Overbeck, and Fiibrich, all of whom made a name in art. In 1830 he was commissioned by Dr Hartel to adorn a villa at Leipsic with frescos, but quarrelling with this patron he withdrew to Munich, where he earned a scanty livelihood at first, though he succeeded at last in acquiring repute as an illustrative and figure draughtsman. In 1859 he was appointed a professor at Weimar, where he ended his days. Genelli painted few pictures, and it is very rare to find his canvasses in public galleries, but there are six of his compositions in oil in the Schack collection at Munich. These and numerous water- colours, as well as designs for engravings and lithographs,

reveal an artist of considerable power whose ideal was the antique, but who was also fascinated by the works of Michelangelo. Though a German by birth, his spirit was unlike that of Overbeck or Fiihrich, whose art was reminis- cent of the old masters of their own country. He seemed to hark back to the land of his fathers and endeavour to revive the traditions of the Italian Renaissance. Subtle in thought and powerfully conceived, his compositions are usually mythological, but full of matter, energetic and fiery in execution, and marked almost invariably by daring effects of foreshortening. Impeded by straitened means, the artist seems frequently to have drawn from imagination rather than from life, and much of his anatomy of muscle is in consequence conventional and false. But none the less Genelli merits his reputation as a bold and imaginative artist, and his name deserves to be remembered beyond the narrow limits of the early schools of Munich and Weimar.

GENERATION, a term in general biology or physiology synonymous with the Greek Buoyéveors and the German Zeugung, may comprehend the whole history of the first origin and continued reproduction of living bodies, whether plants or animals; but it is frequently restricted to the sexual reproduction of animals, The subject, in its most comprehensive aspect, would naturally be divided into the following branches, viz. :—(1) the first origin of life and living beings, (2) non-sexual or agamic reproduction, and (3) gamic or sexual reproduction. The first two of these topics have already been shortly treated of in the articles ABIOGENEsISs and Biotocy; the third and more extensive division, including (1) the formation and fecundation of the ovum, and (2) the development of the embryo in different animals, it has been deemed expedient to refer to the heading REPRODUCTION.

GENESIS. See Pentarevcu.

GENET (Genetta), a genus of carnivorous mammals belonging to the Viverride or family of civets. It contains Six species, all of which are found exclusively in Africa, with the exception of the common genet (Genetta vulgaris) which occurs also throughout the south of Europe and in 9) 7 ® ° Palestine, where Tristram notes it as occurring on Mount Carmel. The fur of this species is of a dark grey colour thickly spotted with black, and having a

dark streak along the back, while the tail, which is nearly as longas the body, is prettily ringed with black and white. The genet – abundant in the south of France and in Spain, where it fre- quents the banks of streams, and feeds on the ‘amallen mam- mals and on birds. In the vertically slit pupil of its eyes and in the complete retractility of its claws, it approximates, along with the other species, to the cats, and corresponding] differs from the true civets, while the anal pouch aati so fully developed in the civet exists as a mere depression

in the present genus, and contains only a faint trace of the highly characteristic odour of the former. In south-western Europe and in Africa it is sought after for its soft and

Genet.

beautifully spotted fur, while in Constantinople it has been tamed and kept like a cat for destroying mice and other vermin.

GENEVA (in French Genéve, in German Genf, in classi- cal Latin Geneva, and in Low Latin, by metathesis, Gebenna or Gevenna), a city and canton of Switzerland,—the can- ton being, with one exception, the smallest, and the city, without exception, the largest within the limits of the confederation. /

The canton of Geneva has an area of 279°4 square kilo- Canton

metres, or 107°8 square miles, considerably less than that of Rutland, the smallest of the English counties, and this includes 114 square miles of water-surface belonging to the lake, The greater part of its frontier is conterminous with France, the department of Haute-Savoie lying to the south, and that of Ain to the west and north; while it is con nected with the Swiss canton of Vaud (Waadt) along a line of not more than 34 miles, The area belongs to the basin of the Rhone, which flows for about 4 miles through the canton, and then for nearly 2 miles forms the boundary towards France. With the exception of the Arve, the Rhone tributaries are mere mountain streams, of which the largest is the London in the extreme west.

Market gardens, orchards, and vineyards occupy a large pro portion of the soil, whose apparent fertility, however, is due not so much to its natural qualities as to the noble industry of the cultivators. Besides building materials such as sandstone, slate, &c., the only mineral to be found within the canton is bituminous shale, the products of which can be used for petroleum and asphalte (see Les Gisements bitumineux du canton de Geneve, Paris, 1877). While Geneva is, as has been stated, almost the smallest of

the Swiss cantons, the size of the city makes the density of

its population far greater than that of any other. In 1870 it had, inclusive of strangers, 93,239 inhabitants, or 871 to the square mile; and this had increased by 1876 to 99,352 inhabitants, or 921 to the square mile. At the earlier date, 43,639 were Protestants and 47,868 Roman Catholics,—the remaining fraction comprising 961 Jews, and 771 of various Christian sects. The prevailing language is French; but

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GENEVA

the German element, represented in 1870 by 978 house- holds, is on the increase. a,

The city of Geneva 1s situated at the south-western extremity of the beautiful lake of the same name, whence the noble current of the Rhone flows westward under | the five bridges by which the two halves of the town com- municate with each other. To the south lies the valley of the Arve, which unites with that of the Rhone a little dis- tance further down; and behind the Arve the grey and barren rocks of the Lesser Saléve rise like a wall, which in turn is overtopped by the distant and ethereal snows of Mont

Blane. To the north-west the eye takes in the long line of the Jura, with a pleasant stretch of country between it and the lake. The actual site of the town, apart from

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the river and the lake, is not so picturesque as that of many other places in Switzerland. Though the central plateau, crowned as it is by the cathedral, gives a certain relief to the general view from the water, a large proportion of the town is built on the alluvial flats along the river. But what Geneva lacks in picturesqueness it now makes up in an appearance of prosperity and comfort, —presenting fine quays, well-ordered pleasure grounds, good streets, and substantial houses, and, in the number and extent of its modern suburbs, giving evidence that its prosperity is not a thing of the past. Since the demolition of the fortifications in 1848, it has pushed eastward to Eaux Vives, and westward into Plain- palais, and an almost continuous succession of houses links it on the south with the village of Carouge beyond the Arve,

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Plan of Geneva.

In the strict sense of the words, Geneva is not a city of great buildings. It possesses, indeed, a great many edifices, both public and private, which may fittingly be described

i as handsome, elegant, or even beautiful, but it has almost Bi dings. nothing to which the memory reverts as to a masterpiece of

architectural art. Being a favourite resort for wealthy foreigners from many lands, it has been enriched with a countless variety of hotels and villas, many of which are palatial in their dimensions, their construction, and their environment, and its principal institutions have been in- stalled in buildings not unworthy of a modern capital ; but none. of these things compensate for the absence of the grander and more characteristic legacies of the Middle Ages and the Renaissance. The artistic blight of that Calvinism which was too sternly enamoured with the beauty of holi-

ness to be mindful of any other beauty has left indelible effects on the central city of the creed; though it 1s pro- bable that all the blame does not lie at the door of Calvinism, which certainly did not find in the Genevese a people whose esthetic faculties had been too strongly developed in the previous periods of their history. The cathedral itself is a second-rate building; and though, as Mr Freeman remarks, “it is an excellent specimen of a small cathedral whose style and plan are peculiarly its own, and which has undergone only very few alterations,” its mai interest 18 moral and historical. According to a tradition, at least as likely to be true as false, it occupies the site of a — of Apollo; and the present building 1s the third ¢ ae

of St Peter which has been erected on the spot. As @

foundation the cathedral is said to date from the middle of

Benevolent

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Education.

the 10th century; but (even apart from documents still extant which relate to the works) the transition from the Romanesque to the Gothic style is sufficient evidence that it belongs architecturally to the 12th and the 13th. The most glaring alteration to which it has been subjected is the substitution for the original fagade (1749-1756) of a portico

with Corinthian pillars, copied after the Pantheon at Rome,

which, while effective and simple enough in itself, is alto- gether out of keeping with the rest of the design. In its general plan the church is a Latin cross, having a width of about 65 feet and a length of 187. It is lighted by 86 windows,—those of the choir still preserving painted glass of the 15th century, and some of the others being filled with modern work. in commemoration of the jubilee of 1835. Of the internal decorations, the little that has been left comprises portions of the carved stalls, and a few sepulchral monuments—most of them removed from their original sites—Agrippa d'Aubigné's, Michel Roset's, Theodore de Beza's, the duke and duchess of Rohau's, &c. Among the older secular buildings in Geneva are the Hétel de Ville, the court-house, and the arsenal. The first, which is popu- larly called the Maison de Ville, or Town House, is situated to the west of St Peter's. It is first mentioned in 1448, but most of the structure dates from the 16th and 17th centuries. There is nothing remarkable, except their plainness, about the several halls or chambers—the hall of the lost footsteps, the chamber of the great council, d&e. The Salle des Festins is now known as the Alabama Chamber, in memory of the arbitration decided within its walls in 1872. To the historian the building is interesting, not only for its associations, but for the magnificent series of archives which it contains. It was in front of the house that the works of Rousseau were publicly burned in 1762. (See Nouv. Deser. du Hotel de Ville, 1877.) The court-house was formerly a hospital, and has been appro- priated to ifs present purpose only since 1858. As a building it dates from 1709, and is a good specimen of the Mansard style in vogue at the time. Among the structures of modern date the most noteworthy are the academic or university buildings, the Athénée, the Rath museum, the conservatorium, the electoral palace, the new theatre, the hall of the reformation, and the Russian church. The first stone of the academic buildings was laid in 1868. They consist of three blocks forming three sides of a square, and occupy an excellent position near the botanic gardens in the Promenade of the Bastions. The Athénée, a highly orna. mental building, was founded for the accommodation of the old society of the arts by the wealthy Genevese, J. G. Kynard (1775-1863), well known for his generous devotion to the cause of Greek independence, It was in 1824 and 1826 that, in accordance with his wishes, the sisters of the deceased Simon Rath (1766-1819), a general in the

Russian service, devoted a large part of their fortune to the erection of the museum which preserves the name of the family. The building is in the Greek style, with a Corinthian portico and a flight of steps, and it contains a collection of copies of the cardinal masterpieces of ancient art and valuable “i % ae modern Swiss school, The conservatorium, ee hae D $ a musical schoo

moe a cine The Fol museum, Goats Rie te xreek an ruscan vases, occupi

buildings in the Grand’ ae BS ee eee

Among the larger benevolent institutions are the civi i with an endowment of 34 million francs, a Teas pene eae and duinb institute, and an orphanage ; and upwards of 200 dis- tinct societies for philanthropic purposes are at work in the state

From a comparatively early date the Gencvese have given consi- derable attention to education. In 1429 Frangois Versonnex endowed and restored the ‘‘ great school,” which continued to flourish till the Reformation, and was attended by numerous foreign pupils. An

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academy and college were established by Calvin and Beza in 1558, and soon became famous. Since 1875 the academy has ranked ee a university, having five faculties, —a scientific, a literary, a legal, a theological, and a medical. Though medical teaching was long practised in Geneva by its more eminent physicians, according ag circumstances suggested, there was no regular provision for this department till 1874, when a staff of 18 professors and 10 privat. docents was instituted. An anatomical theatre has been erected by the cantonal hospital, and a maternity hospital and a policlinique or dispensary are supported by the property of the suppressed religious corporations. In the winter session of 1876-7 the university had 142 regularly enrolled students and 182 unattached auditors ; and in the summer session the students numbered 155 and the auditors 147. Of the 297 regular students, no fewer than 126 were foreigners and only 106 were Genevese proper, while among the auditors the proportion of foreigners was still greater, or 187 as compared with 95. he canton of Geneva has no

normal school, but there are two colleges (one in the town and one at Carouge), a gymnasium, and a high school for girls, and in those iustitutions the training of teachers is an object of attention. The Genevese college had 1134 pupils in 1876-7,—309 being foreigners, and of these 1389 French. In all the primary schools, with the exception of those of Carouge, Plainpalais, and Eaux Vives, the mixed system is in vogue, Nearly all the communes, from Lancy in 1848 to Plainpalais in 1877, have been provided with educational libraries, the total number of the books in 1867 being upwards of 20,000. The ‘public library,” formerly located in the Rue Ardaine and now in the university buildings, is an admirable institution, thoroughly deserving the title of public, as its books, without any needless formality, are at the service of even the casual reader. The first nucleus of the collection, which now numbers about 75,000 volumes, was Bonivard’s bequest in 1568.

As early as the 14th century, Geneva was the seat of a flourishing Industri

silk trade, and its woollen fabrics were largely exported. Four times a year the streets of the town were filled with the traffic of its fairs, which were visited by the merchants of Venice, Florence, and Genoa, of France and German Switzerland. In the 16th century hats, ribbons, velvets, woollens, and gold and silver plate, were among the principal products of Genevesc industry; the guild of armourers or heaunviers was a powerful corporation; and watchmaking was already carried to a high degree of perfection, under the influence of Charles Cusin, who had settled in the town in 1587. By 1685 there were 100 master watchmakers with 800 workmen, and 80 master jewellers with 200 workmen. In the 17th century the silk trade made great pro- gress, and towards its close calico-printing was introduced by the Fazy family. During the 18th century the number of wealthy im- migrants from Italy gave an impetus to the various architectural industries, but at the same time the political troubles tended toscatter the industrial population. Voltaire introduced a number of Gene- vese watchmakers to Ferney ; the French sought to make Versoix a manufacturing centre; and the Governinent of Savoy established a royal watch factory at Carouge. Since the restoration of Genevese independence in 1818 the principal industries of the city and canton have steadily developed. According to the census of 1860, there were 515 master watchmakers and jewellers in the can- ton, and

the number of workers in the trade was 4876, of whom 4004 were men and 872 women. As early as 1827, about 240 per- sons were employed in the manufacture of musical boxes, and this number had by 1878 increased to at least 1080 of both sexes, cap- able of turning out 18,000 boxes in a year. Among the minor in- dustries are wood and ivory carving, the making of tools and scientific instruments, iron-smelting and engineering, and the manufacture of tobacco, soda water, and various chemical stuffs. Banking operations are conducted on a large scale, and printing and publishing have long been of prime importance to the city. Print: ing was introduced in 1478 by Steinschaben of Schweinfurth ; and by 1568 there were 20 printing establishments in the city. Robert Stephen, having fled from Paris, was received a citizen of Geneva in 1556; but his son Henry found that the attentions of the consis- tory could be nearly as offensive and dangerous as those of the Sorbonne, and the great printing establishment over which he pre- sided came to an untimely end. For details on the contributions made by Genevese inventors to the progress of the various arts, the reader may refer to Elie-Frangois Wattmann's interesting brochure, Notice historique sur les inventions faits & Genéve, Geneva, 1878.

It would be hard to find a city of the same size as Geneva which Distin could claim the honour of being the birthplace of a greater number guishe | of eminent men; and still harder perhaps to find one that had ex- Genev

tended its hospitality to so many foreigners of distinction. 1m the roll of its celebrities the first place is due to Jean Jacques Rousseau, who, in spite of its treatment of him, retained considerable affection for ''ma république." The house in which he was born occuplt

the site of No. 69 of the present Rue Rousseau. Though M. Mare Monnier, himself a Genevese, has found materials fora volume on Les poetes de Genéve, such names as Mulhauser (1806-71), author of the dramatic poems Sempach and Philibert Berthelicr, or Petit Senn (1792-1870), whose Bluettes et Boutades (1846) has gone through

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story.

a number of editions, have hardly more than local reputation. Rodolphe Toepfter, the humoristic novelist, has attained a wider popularity, which may almost be called European. But the really famous Genevese are mostly men who have devoted themselves to the sciences, or to the more utilitarian forms of literature. Among the theologians are Mestrezat, the opponent of the Jesuits ; Diodati, the translator of the Bible; the T'ronchins, the Turrettines (Fr. and J. A.), Ed. Diodati, Felix Neff, Cesar Malan, and Gaussen. Among the historical writers may be mentioned Baulacre, Mallet (of Seandinavian celebrity), De Lolme, Grénus, Sismondi, Picot, Cherbuliez, Sayous, Blavignac, and Galiffe ; and among the philo- logists, Cramer, Leclere, Casaubon, and Spanheim. To the medical sciences belong the names of Jean de Carro, Espine, and Charles de la Rive; and to the physical sciences Bonnet, Huber, De Luc, De Saussure, De Candolle, and Pictet. Pradier, the sculptor of the statue of Rousseau on the island in the Rhone, Chapponniére, Hornung, and Calame are the best known of the modern artists.

As far back as 1356 the town of Geneva is said to have contained 5800 inhabitants, and this by 1404 had increased to 6490, exclusive of the Bourg de Four and St Gervais outside of the fortifications. In 1545 the number is given as 12,500, but the plague and other causes had reduced it to 11,000 by 1572. After the revocation of the edict of Nantes it rose to 16,934 in 1698, no fewer than 3000 refugees having sought shelter within its walls. The 18th century was marked by a steady increase: 18,500 in 1711, 24,712 in 1782, and 26,140 in 1789. In 1850 the total was 31,288, of whom 5717 were from other parts of Switzerland, and 6513 froin other parts of the world. The census of 1870 gave 46,783, or including the suburbs of Eaux Vives and Plainpalais, 61,486. The noteworthy fact about this increase is that it is due solely to immigration, for the Genevese fainilies are far from prolific, and indeed have an in- dubitable tendency to die ont (Galiffe, Genéve historique, 1869).

According to a well-known passage in Cesar's Commentarics, he found Geneva the frontier town of the Allobroges, and when he evossed the bridge which even then spanned the river, he was no longer in the territory of the

Allobroges but in that of the Helve- tians. How long the little oppidwm had been in existence before that time it is impossible even to conjecture : that the spot had in far earlier days been occupied by a cluster of crannogs may be ac- cepted as rather inore than a conjecture, though the extensive formation of new land within the historic period has completely buried whatever archeological evidence might otherwise have been available. There wasa time clearly when the site of the present lower town was entirely submerged, and the waters of the ihe and river found their shores along the edge of the rocky plateau of the upper town. The Allobroges were, it would appear, a Celtic people, anid the name Geneva, according to the favourite etymology of modern investigators, has its explanation in the words gen and ev, the “tissue” of the ‘‘waters.” For several centuries of the Christian era the history of Geneva remains a blank, but remains of substrnctions, aqueducts, canals, inscriptions, statues, pottery, bronzes, arms, coins, &¢., show that during the Roman period the town must have been a large and flourishing place, extending, if M. Galiffe is right, over the plateau of the ‘I’ranchées. Christianity must have been early introduced, the traditional apostles being Dionysius and Paracodus, In 456 the Celtic town passed under the dominion of the German Burgundians, and in 534 it was incorporated with the kingdom of the Franks. T’o Charles the Fat it was indebted for the right, sanctioned by Pope John VIII., of electing its bishops from among its own clergy. Optandus, the bishop whose election led to the decision of this point, was a supporter of Rodolph 1., founder of Transjuran Burgundy; and it was at Geneva that Conrad the Salie caused himself to be crowned king of Burgundy in 1033. This accession of Conrad proved in several ways of moment to the town ; for to him was due the first aggrandizement of the house of Savoy, and from him was derived the temporal sovereignty of its bishops. The counts of Genevois—a district to the south of the Genevan territory, now included in the French department of Haute Savoie— were partly reconciled to the loss of the authority they had previ- ously had over the city when in 1070 they saw Guy of Faucigny Genevois, a member of their own family, elected to the episcopal see. The next bishop, however, Hubert or Humbert of Grammont, laid claim to all the rights and possessions alienated by Guy; and at length, in 1124, by the ‘‘ Accord of Seyssel,” the count of Genevois recognized the bishop as his superior under the emperor. Bishop Ardutius (1185-1185) had again to oppose the encroachments of the counts; but the emperor Barbarossa, to

whom he appealed at the diet of Spires (1153), not only upheld his claims, but made him prince of the empire. As the bishops could not always attend i person to the civil concerns of his jurisdiction, a vidom or Vidomne (vice dominus) was appointed, who had to judge according to the customs and usages of the city, and in difficult matters Was assisted by the advice of three or four citizens, two canons of Geneva, and two nobles of the church. During the bishopric of Robert of Genevois (1277-1288), the Genevese sought protection from the encroachments of his family at the hands of the count of Savoy,

Amadeus V.; and on Robert's death a contest for possession of the

city took place between the count and the new bishop, William of Conflans (1288-1294), Inthe resulting anarchy the citizens learned to act for themselves, and in 1289 and 1291 we find the bishop com- plaining of certain procurators, syndics, or agents of the city who ad acted as chief magistrates in peace and war. In 1293, however, the syndicate was (for the time) abolished. Between the count of Genevois, who held the castle at Bourg de Four, at the corner of the city, and the count of Savoy, who by the peace of Asti in 1290 had secured the office of vidonime, and now held the castle of the Island, both citizens and bishop were hard bestead. In 1820 the castle of Bourg de Four was demolished by Edward and Aymon, sons of the count of Savoy. When the emperor Charles IV. visited Geneva. on his way to Avignon (1365), Amadeus V., the ''Green Count," obtained the rank of imperial vicar over the old kingdom of Burgundy and over the city of Geneva; but William of Mar- cossay, who was bishop from 1366 to 1377, persuaded the emperor to abolish the vicariate by a bull at Frankfort (1866), and by a second bull at Prague (1367) to cancel all rights granted to the counts of Savoy over Geneva and its territory; and in 1871 Pope Gregory XI. caused the count to witldraw from the city his castellan and judges. The year 1387 is a memorable one in Genevese history, as the date of the publication by Bishop Adhémar Fabri (1885-1888) of the franchises which served for centuries as the Magna Charta of the city.! By the purchase of the countship of Genevois, Amadeus VIII. became possessor of all the country round the city; and although he accepted investiture from the bishop and

took the oath of fealty, his ambition was simply biding its time. On the visit of Sigismund in 1455, he was raised to be duke of Savoy; and when Pope Martin V. shortly afterwards passed through the district, he sought to obtain complete jurisdiction over thecity. Jean de Pierrescise, however, appointed bishop at the suggestion of the duke, who hoped to find in him an easy tool, was no sooner occupant of the see than he appealed to the people, obtained their vote against the alienation of the temporal rights of his predecessors, and swore in return for their support to maintain their liberties. In 1420 a bull of the emperor Sigismund formally declared that the city held directly of the empire. But by a strange turn of events, the indefatigable Amadeus did ultimately become master of Geneva, ~~—not, indeed, by way of conquest or through the degradation of its bishopric, but by himself succeeding to_the bishop's see. During the greater part of his pontificate as Felix V. he resided in Geneva; and on his resignation the council allowed him the administration of the bishoprics of Geneva and Lausanne. In the latter part of the 15th century, amid the dis~~ sensions of the house of Savoy, two facts deserve special notice for their effect on Geneva, The duke Louis, irritated against the Gene- vese because they had admitted his rebellious son Philip of Bresse within their walls, caused the king of France, his son-in-law, to es- tablisha fair at Lyous, which withdrew the greater part of its traffic from the city of Lake Leman; aud Bishop John Louis forming an alliance with Charles the Bold, the Swiss (for Geneva was still the last town of the Allobroges) inflicted a ransom of 20,000 crowns. The beginning of the 16th century brought the long contest be- tween Savoy and Geneva to a climax and a close. Into the struggle, interesting as it is, between the Mamelukes (Mamelus) or ducal party and the Eidgnots (Eidgenossen) or patriots, it 1s impossible to enter. The great heroes of the city are Philibert Berthelier, Pierre Lévrier, Francois of Bonivard, the prior of St Victor, and Besangon Hugues. To their patriotic devotion it owed its ultimate liberty, and the alliances with Freiburg and Bern, which, first formed in 1519 and 1526, were solemnly renewed in 1531. Meanwhile the Reformation was advancing in Switzerland. In 1532 Farel entered the city, and in 1535 the reformed doctrine was officially recognized as the religion of the state. In October 1536 a new actor appeared on the scene-~ John Calvin, then about 25 years of age. By force of intellect and strength of will he soon made himself the leader of the Protestant party, and proceeded to work out his ideal of government and society. While it rendered homage to many of the

noblest elements of human nature, to purity, to honesty, to industry, to benevolence, this ideal had grievous defects ; it forgot especially that all healthy moral action must be spontaneous, and that in regard to deeds as well as men it isa dangerous thing to confound the innocent with the guilty. The moral dictates of the sternest conscience of the community were to be the binding laws of every citizen. Religious observances were no longer to be the outcome of individual piety, but part of the inevitable routine of daily life. The chureh became the state; breach of ecclesiastical discipline was crime; innovation in dogma was treason. The Genevese as a people appear to have been naturally religious: in the old pre-Reformation times they had vee distinguished for their liberality and kindness to the clergy, them appreciation of a good preacher, the abundance of their contributions re guid of Calvin, this religt- for masses and prayers. Under the guidance o , waeeae osity took a newand sterner cast. Buta certain part of ee to were not so willing to relinquish their liberty, and, under the na ee eee

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published by Montyon, 8vo, 1607,

of Libertins or Liberty men, they contended earnestly against the

‘chment of the new régime. In 1588 they were so powerful pee syndics were Sosa from their ranks ; and they had the satisfaction of seeing Calvin and Farel, on 23d April, expelled from the city by order of the little council, confirmed by the council of the two hundred and the council-general. But the Libertins did not know how to rule; anarchy and hence got possession of the city ; the Catholic party recovered ground. Calvin was recalled, and, re-turning on 3d September 1541, at once re-established his system in all its vigour. The Libertin party again revolted ; sixty of their num- ber were condemned to death, and four who failed to make their escape were beheaded. In 1547 Jacques Gruet was executcd as an utterer of threats against the dictator and a possessor of impious books ; and in 1553 Michel Servctus was burned alive. To the historian of Geneva it is of comparatively little importance whether or not the main guilt of this too famous crime fell

directly and solely on Calvin himself; it is condemnation enough that such a deed was possible within the walls of a city where his fiat and his veto were equally supreme. And on the other hand, it must never be forgotten that the very reason why the faggot fire in which Servetus perished has become such a beacon to after times, whilc the smouldering embers round a Dolet or a Vanini are only now and then stirred toa fitful glare, is that Calvin had made Geneva a city set upon a hill, and that the lurid smoke and flame showed doubly dark against the clear light of his wonderful intellect and his noble life. In some re- spects Geneva was never greater than under his dictatorship. It was at once the moral capital of the half of Christendom and the great frontier fortress against the invasions of Rome. Like every fortress city, it had to pay the penalty of its position, and the penalty was none the less because its garrison fought with spiritual weapons, and its martial law interfered with the liberties of the mind. In 1564, after twenty-three years of such labours as few men could rival, Calvin died, and his body was laid in the cemetery of Plainpalais; but his spirit continued to live in the constitution he had founded. The milder character of his successor, Theodore Beza, allowed free scope to the othcr members of the Government, and the democratic element obtained greater prominence. About 1564 Geneva appcared for a time in danger from its Catholic neighbours, and especially from the duke of Savoy; but though this prince recovered possession of the Chablais, the Genevois, and the country of Gex, and appointed Francis of Sales titular bishop of Geneva, no direct attempt was made against the independence of the city. The year 1568 is of note for a revision of the constitution, drawn up by Germain Colladon, which, while retaining in the main the Calvinistic framework, practi- cally placed political power in the hands of a few principal families. The administration nominally consisted of the syndicate and four councils—the council of the twenty-five, the council of the sixty, the council of the two hundred, and the council general ; but the council of the twenty-five, usually called the ‘‘little” or ‘‘ narrow council,” managed in the long run to arrogate the direction of all public affairs. During the 16th century, both before and after the Colladon revision, the variety of affairs which were considered under its jurisdiction is sufficiently amusing. It was at once the foreign office of the republic and the high court and the police court combined; and it accordingly passed, as matter of course from the consideration of matters of state, in which the potentates of Europe were parties, to the squabbles of

markct women, the use of bad eggs in cakes, or the length of a minister's sermon.) Its private deliberations were kept strictly secret: in 1491 the betrayer of any of its transactions was judged '" infamous," and in 1580 it was added that his tongue should be pierced. Torture was still retained as a legal instrument of investigation, and the penal enactments against heresy and witchcraft remained unre- pealcd. In 1579 the city was taken under the protection of Bern and Soleure, and in 1584 it formed an alliance with Zurich: but these agresments proved of little advantage, and in the conflicts whieh Si always being eg with the duke of Savoy, Geneva was

eft to her own resources, and the acci sj i Sidbagiand or Henry Vv cs eee assistance of Elizabeth gon on in 1602, Charles Emmanuel of Savoy determined to seize

y by a coup de main, and on the night of the 11th and 12th December (0.8.) an army of 8000 men were despatched against it As no declaration of war had been made, the citizens were taken by surprise ; and the enemy had fixed their scaling ladders and ef already mounting the walls before the alarm was given. But once aroused, the Genevese were not long in turning this 'success into Tae and rout, and when mornin . more safe, and a joyous crowd heard the voi i cathedral read at tie grand old Palin, ee esl ae ae the Lord had not been with us." Such is the famous * soaleels ae the Bannockburn of the Genevese, which has since been celebrated with all possible forins of celebration.2 By the treaty of St Julian in the following year the duke of Savoy granted the Geuevese freedom of

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1 See " Le Petit Conseil" in £trennes genevoises, Geneva, 1877.

2 See H. Hamman, Les Représentations i y , Les f graphiques de l' Escalad y 39; and the drama of Mulhauser, the national peek 1865. — ee

| fortifications carried out by the councils.

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trade, restored the lands of St Victor and St Peter, and promised to build no fortress and assemble no troops within four leagues of the city ; but the ambitious prince made one iore attack before hig death in 1620. During the rest of the 17th century the history of Geneva consists mainly of dissensions between different councils, and between the governing bodies and the people ; but amid them all the city advanced in prosperity, especially after the accession to its popu- lation occasioned by the revocation of the edict of Nantes. The 18th century brought the political contest to a head. In 1707 Fatio

advocate and member of the two hundred, was appointed president of a cominission charged to formulate the grievances of the people, In the document which he drew up he maintained the sovereignty of the people, the equality of all citizens, and the subordination of the magistracy as mere executive functionaries; and at the sametime demandcd that the council-general should meet at least once a year, and not only when the syndics chose. The councils appeared to yield, but shortly afterwards, supported by confederates from the oligarchical cities of Bern and Zurich, they crushed the popular party, and caused Fatio to be shot. How sternly they were dis- posed to resent interference wus shown in 1731 by their sentence of perpetual imprisonment passed on Micheli Du Crest for merely giving expression to the popular opposition to the new system of The party of which he was so far a spokesman—known as the representants—at length, in 1734, gained a decided victory in the general council of 1734. By the edict of 1738, though the whole initiative in matters of legisla- tion was left in the hands of the lesser councils, the actual passing of laws and fixing of taxes were entrusted to the general council, and thirty years later the people obtained the right of naming the half of the council of the two hundred. There was an important class of the inhabitants, however, who were still excluded from political rights—the so-called ‘‘natives”’ or descendants of the aliens who had settled in the city; and this class continued to make known its discontent. At length, in 1782, Bern, Sardinia, and France interfered in favour of the aristocratic party, and by the Act of Pacification the most important reforms in a liberal sense were

| again abolished. A few years later, and France was under a

different régime. The Revolution at Paris was followed by a revolution at Geneva. A new constitution, accepted by the National Assembly in 1794, declared the political equality of all the Genevese ; but, by a curious inconsistency, the national committee of finances divided them again into aristocrats, the englués, and the patriots, taxing the last class much less heavily than the others. In March 1798 it was agreed that Geneva should become a part of the French republic, and on 18th June the French authorities entered the city. By the treaty of Paris its independence was restored, and it became one of the cantons of the Swiss confedera- tion. A new constitution declared all the citizens equal, and placed the legislative power in the hands of a representative council. As no one, however, could be an elector who paid less than 20 Swiss livres, or about 28 shillings, of direct taxes, the democratic character of the system was considerably modified. It was not till 1841 that any great change was effected. In the early part of that year the 'Third of March Society" was formed to watch over the interests of the citizens, and in October the Government was forced by a popular demonstration to summon a constituent assembly.

The legislative power for the canton was now placed in a grand council, consisting of representatives elected in the ratio of 1 to every 333 inhabitants ; and the executive power in a council of state consisting of 18 members chosen by and from the grand council. At the same time the city received a communal council of 81 mem- bers, and an administrative council of at most 11 members. But the new constitution was not allowed to work long. The radical party had been gathering strength, especially in St Gervais, and in 1846 the Government, finding that the attempt to suppress its opponents by force of arms was of doubtful result, gave in its re- signation. A provisional Government, under the leadership of the democrat James Fazy, drew up a constitution, which was accepted by the people on 24th May 1847. The franchise was bestowed even on the pauper class of prolétaires, and the election of the council of state was eutrusted to the council general or collective assembly of citizens, Thc old Protestant church of Geneva was abolished, anda

_new and almost creedless church established, the government of

which was vested in a consistory elected by the universal suffrage of

_ Protestantsin the canton. For nearly fifteen years the radical party

ile tour continued in power ; and under its hands the physical condition of as once

Geneva was rapidly transformed, and, for good or evil, the city was brought as much as possible into the general current of European progress. ‘On voudrait faire de Genéve,” sighed the conservative De le Rive, ‘‘la plus petite des grandes villes, et pour moi je prefere quelle reste la plus grande des petites villes.” Unfortunately forits permanence the radical Government was lavish in its expenditure, and the finances of the canton and city got into a dangerous condi- tion. In November 1861 Fazy was not returned to the council of state; in 1862 the conservative party obtained a majority in the great council; and in 1868, though all the other radical candidates for the council of state were carried, Fazy himself was rejected. The attempt

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to invalidate the election of his opponent Cheneviére led to a conflict between the parties, in which some blood was shed ; and the city was consequently occupied by federal forces, and the matter sub- mitted to the federal council. As the decree was in favour of Cheneviére, Fazy retired from public life. The ‘‘ independents,” as the opponents of the radicals are called, came into power in 1865, and for a number of years they fully maintained their position, in spite of the difficulties thrown in their way by the Ultramontane party. Their principal antagonist was Mermillod, the vicar of the bishop of Freiburg, who was declared bishop of Geneva by the pope, and insisted on exercising his episcopal functions without regard to theGovernment. In February 1873 Mermillod was banished by the federal council of Switzerland, and in the same year the grand coun- cil of Geneva deprived all Roman Catholic priests who refused to take the oath of allegiance to the state. Fazy’s bill for the sepa- ration of church and state was rejected in June 1876; religious cor- porations were abolished on 28d August, and, on the 26th of the same month, ail public ecclesiastical services outside of the churches were forbidden. The cathedral of Geneva was handed over to the Old Catholics. On the 6th of November 1878 Fazy died, and two days after the ‘“‘conservative-democrat”” party gained a victory in the elections for the great council. The expelled curés were now

allowed to return, and in December the council accepted the prin- ciple of the separation of church and state.

Besides the older works of Spon, Béranger, Picot, &c., and the Mémoires et documents de la soc. genevoise @hist. et d'archéol., see Senedier, Hist, litt. de Geneve (1786); J. A. Galiffe, Matériaux pour Uhist. de Genéve (1829-30), and Notices généalogiques (3 vols., 1819-6); Rigaud, Renseignements rel. a la culture des beaux-arts & Geneve (1849, new ed. 1876); Archinard, Geneve ecclés, ou Livre des spectables pasteurs (1861), and Les edifices religieux de Vancienne Geneve (1869); J. B. G. Ggliffe, Geneve hist. et archéol. (1869); Blavignac, Armorial gene- vois (1819), and Ptudes sur Geneve (1872-74); Thourel, Mist. de Genéve (1833); Pictet de Sergy, Geneve, origine, &e. (1843-47), and Geneve ressuscitde (1869) ; Cherbuliez, Genéve, ses institutions, &c. (1868); Roget, Mist. du peuple de Geneve (1876); Thorens, Abrégé de U hist. de Genéve (1878); Albert de Montet, Dict. brogr. des Genevois et des Vaudois (1878). (H. A. W.)

GENEVA, Tae Lake or (the Latin Lacus Lemanus or Lake Leman, also known in the Middle Ages as Lac Losaunete or Lake of Lausanne, and as Mer du Rhéne or Sea of the Rhone), is the largest of the Swiss lakes, having an area of 578 sq. kil. or 223 sq. miles. Its general form is that of a crescent, the northern shore being almost the arc of a circle, with a radius of 214 miles. The eastern end of the crescent is broad and rounded, while the western tapers towards Geneva, Its maximum breadth, between Morges and Amphion, is 8} miles. Itis divided into two portions, the Great and Little Lake, by the strait of Promonthoux, which is not much more than 2 miles across. The Great Lake is 39 miles long, with a mean breadth of 6 miles, and the Little or Western Lake

is 14 miles long, with a mean breadth of rather more than — The bottom of the larger basin forms a wide valley, which gradually deepens from 200 to 325 feet at | the foot of the slopes toa maximum of 1095 feet, which it —

2 miles,

attains between Ouchy and Evian. The mean level of the surface of the lake is 1230 feet above the level of the sea. According to the elaborate soundings made in 1873 by M. Gosset, engineer of the Federal Topographic Depart-

ment, the bottom is remarkably free from inequalities, almost all traces of rocks, erratic blocks, or moraines, having been covered over by a regular bed of extremely fine argillo-caleareous mud, which can be moulded and baked like potter's clay. Between the basin of the Great Lake and that of the Little Lake there runs a ridge or bar not very strongly marked, 200 feet from the surface. The maximum depth of the lesser basin is only 71 metres or 233 feet. The bottom is apparently level, but it presents numerous erratic blocks, and in one place rises to a con- siderable eminence, known to the Genevese fishers as the Hauts Monts.1 The unusual blueness of the waters of the Leman has long been remarked. According to M. Forel,? _ si". i i lel il anes leaned

- Further details on the conformation of the lake will be found in De la Beche's letter to Professor Pictet, published in Bibliotheque Universelle : Sciences et Arts, t. xii,, 1817; in M. Gosset's Carte Hydrogr, du Lac Léman, issued as part of the Topog. Atlas der Schaceiz, and described in Bibl. Un. (Sci. et Arts), t. lii., 1875, and in a Note ~~ la Carte du Lac, by Ed. Pictet, in the same number,

; Btvdes sur les variations de la transparence des eaux du lac Leman," in Bibl. Un. (Sc. et Arts), 1877.

the transparency is very much greater in winter than summer, the extreme limit of visibility of a white disk on an average for the seven winter months from October to April being 41 feet, and for the five summer months 21°6. This arises from the thermal stratification of the water keeping in suspension a greater quantity of dust and organic particles during summer. It is generally in August that the level of the lake reaches its highest limit, between 4 and 5 feet on an average above its lowest limit, which is usually reached in March. Besides this seasonal change, due to differences of influx and removal of water, several disturb:nces of level of a less obvious kind have attracted the attention of the Swiss physicists. Most remarkable are the seiches, or "movements of steady uninodal oscillation," in which the whole mass of water in the lake rhythmically swings from shore to shore. According to M. Forel,' there are both longitudinal and transverse seiches. Their effect is most distinctly seen at Geneva, where they sometimes raise

the level of the water from 4 to 5 feet. They are not improbably due to several distinct causes, but the most efficient would appear to be a difference of barometric pressure in different parts of the

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ENGLISH MILES

Lake of Geneva.

lake. In the eastern portion of the lake there is an irregular but violent current during spring and autumn, called Lardeyre or La Ditre, which is supposed to be due to subterranean affluents. The principal winds are the Bise from the north-east, the stormy Bornand that rushes from the ravines of Savoy, and the dry south wind, known as the Séchard. Less use is made of the lake as a means of communication since the opening of the railway along the Swiss shore, but the lateen sails of the minor craft still brighten the landscape, and an excellent steam service is maintained by a company formed in 1873. The first steamboat, the “ William Tell,” was introduced on the lake in 1823; and the first saloon steamboat, the “Mont Blanc,” dates only from 1876.

Tlie Lake of Geneva is not so rich in fish as many of the smaller lakes of Switzerland. Comparatively small success has attended the attempts of Professor Chavannes of Lausanne to introduce the salmon, which, like many other fishes, finds the Perte du Rhéne a barrier between

3 M. Forel’s numerous studies on the subject will be found in the Bibliotheque Universelle, and the Bulletin de la soc. vaud. (Lausanne).

4 According to G. Lunel, whose Histoire naturelle des poissons du bassin du Léman, (Geneva, 1874) has superseded the valuable memoir of Professor Jurine in the Memoires de la Sociétré de physique, tome iil. (1825), there gre 21 species :—Perca Jluviatilis, L.; Cottus gobio, ie Lota vulgaris, Cuv.; Cyprinus carpio, L.; Cyprinopsis orn: aa Tinca vulgaris, Cuv.; Gobio fluviatilis, Cuy.; Alburnus a us, Heckel; Alb. bipunctatus, L.; Scardinius erythrophthaimus, peas Leuciscus rutilus, L.; Squalius cephalus, Boneap. ; rig vi Ag.; Codttis barbatula, Lin.; Coregonus jera, Jurine ; bet a

hiemalis, Jurine; Thymallus vulgaris, Nilsson ; Salmo v oie Trutta variabilis, G.L.3 Eso luctus, L. 3 Anguilla vulgarts, :

the sea aud the lake. The “fera” (Coregonus fera) is economically the most important species. In the mud at the bottom of the lake there exists an interesting fauna, of about 40 species, mainly belonging to the lower orders. Several of the species, as Gammarus cwcus, are found 1000 feet below the surface, in the reign of perpetual darkness. Two species of gastropods of the genus Limneus are worthy of special note as possessing developed lungs, though they live at a depth of from 150 to 300 feet.}

See Rodolphe Rey, Geneve et les rives du Léman, 3d cd. (Geneva, 1875); Egli, Taschenbuch Schweizerischen statistiks (Zurich, 1875); Herbst, Der Genfer See und seine Umgebung (Weimar, 1877).

GENEVA, a post village of Ontario county, New York, U.S., is beautifully situated at the north end of Seneca Lake, on the New York central railway and at the terminus of the Ithaca branch railway, 52 miles E.S.E. of Rochester. One of its chief features is the terraced gardens, which extend from the principal street to the shore of the lake ; and there are also two fine parks, Geneva is the seat of Hobart Free College, which is under Episcopalian management, and has 9 professors and about 50 students. It has also a graded union school, attended by upwards of 1000 pupils. The prosperity of the town depends chiefly on the nurseries in the neighbourhood, which extend to nearly 10,000 acres, and from which plants to the value of more than 1,000,000 dollars are shipped annually. There are also marble-works, benching-works, and iron-works. A daily line of steamers plies between Geneva and Watkins at the head of the lake. The population in 1870 was 5521.

GENEVA CONVENTION, an agreement concluded at an international conference which was held at Geneva in 1864, under the presidency of General Dufour the Swiss plenipotentiary, for the purpose of ameliorating the condi- tion of the sick and wounded in time of war. The credit of originating this conference must be given to two citizens cf Geneva, Dunant, a physician, who published a startling account of what he had seen

in two military hospitals on the field of Solferino, and his friend Moynier, chairman of the Geneva society of public utility, who took up the idea of “neutralizing the sick waggons,” formed associations for its agitation, and at length pressed it upon the Govern. ments of Europe, most of which sent representatives to the conference, The convention was drawn up and signed by them on the 22d August, and since then it has received the adherence of every European power, and one Asiatic (viz, Persia), The convention consists of ten articles, of which the last two are formal.

‘The others provide (1) for the neutrality of ambulanccs and military hospitals as long as they contain any sick; (2) for that of their staff ; (3) that the neutrality of these persons shall continue after occupation of their hospitals by the enemy, so that they may stay or depart, as they choose ; (4) that if they depart, they can take only their private property with them, except ao of ambulances, which they may remove entire ; (5) that a sick soldier

in a house shall be counted a protection to it, and entitle j : tle its occupant to exemption from the quartering of troops and eect of the war requisitions ; (6) that wounded men shall, when cured oa sent back to their own country on condition of not bearing arms uring the rest of the war ; (7) that hospitals and ambulances shall carry, in addition to the flag of their nation, a distinctive and uniform flag bearing a red cross on a white ground, and that their staff shall wear an arm-badge of the same colours : (8) that th details shall be left to the commanders. : A second conference was held at Geneva on the same subject in 1868, anda supplementary convention drawn out which, though not formally signed, has been acquiesced in by all the signatories of the original convention, except the pope, and which, while still unratified, was adopted pro- visionally by France and Germany in their war of 1870

It consists partly of interpretations of the former conven-

5 For details see Forel’s contributions to doise des se, nat., t. xiii., &c.

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tion, and partly of an application of its priuciples to maritime wars. Its main provisions are these :—

That, when a person engaged in an ambulance or hospital occupied by the enemy desires to depart, the commander-in-chief shall fix the time for his departure, and, when he desires to remain that he be paid his full salary; that account shall be taken in exacting war requisitions not only of actual lodging of wounded men but of any display of charity towards them; that the rule which permits cured soldiers to rettun home on condition of not serving again shall not apply to officers, for their knowledge might be useful; that hospital ships, merchantmen with wounded on board, and boats picking up wounded and wrecked men, shall be neutral; that they shall carry the red-cross flag and their men the red-cross armlet ; that hospital ships belonging to Government shall be painted white with a green strake, those of aid societies white with a red strake ; that in naval wars any strong presumption that the convention is being abused by one of the belligerents shall give the other the right of suspending it towards that power till the contrary is proved, and, if the presumption becomes a, certainty, of suspending it to the end of the war.

GENEVIEVE, or Grnovera, St, patroness of Paris, flourished during the latter half of the 5th century. She was born about 425 at Nanterre near Paris, or according to another tradition at Montriere; her parents were called Severus and Gerontia, but accounts differ widely as to their social position. According to the legend, she was only in her seventh year when she was induced by Bishop (after- wards Saint) Germain d’Auxerre to dedicate herself to the religious life. On the death of her parents she removed to Parjs, where she distinguished herself by the activity of her benevolence, as well as by the austerity of her sanctity, She is said to have been the recipient of supernatural re- velations, and to have predicted the invasion of the Huns; and when Attila with his army was threatening the city, she gave courage to the panic-stricken inhabitants by an assurance, justified by subsequent events, to the effect that the attack would come to nothing (451). In the year 460 she caused a church to be built over the tomb of St Denis, where the abbey was afterwards raised by Dagobert I. Her death occurred in

500, or according to another account in 512, and her remains were ultimately laid in the chapel bearing her name, which has now become merged in the Pantheon or Eglise St Genevitve. Charpentier pub- lished in 1687 a life of the saint based upon the statements of an anonymous author who is alleged to have written her biography only eighteen years after her death. The legends, miraculous and other, are also given in the Bollandist Acta Sanctorum and in the great work of Tillemont. Her festival is celebrated on the 3d of January.

The ‘f Canonici of St Genevibve,” or ‘‘ Canonici of the congre- gation of France,” constitute a religious order dating from 1614, in which year they were organized by Charles Faure, a reforming monk belonging to the abbey of St Vincent at Senlis. They Tp came into considerable repute ; and for a considerable period the chancellor of the Sorbonne was invariably chosen from their order. The ‘‘ daughters of St Geneviéve” were constituted in 1636 at Paris, at the instance of a pious nun of the name of Blosset, but since their union, in 1665, with the order ‘‘ of the Holy Family,” whose lady-foundress was called Miramion, they have been best known as Miramiones. They find their chief employment in tending the sick, and in the education of girls.

GENGA, Grrotamo (c. 1476-1551), a painter and archi- tect, was born in Urbino towards 1476. At the age of ten he was apprenticed to the woollen trade, but showed so much inclination for drawing that he was sent to study under an obscure painter, and at thirteen under Luca Signorelli, with whom he remained a considerable while, frequently painting the accessories of his pictures. He was afterwards for three years with Pietro Perugino, in company with Raphael, and he developed asimilar style of painting. He next worked in Florence and Siena, along with Timoteo della Vite ; and in the latter city he painted various com- positions for Pandolfo Petrucci, the leading local statesman of the time. Returning to Urbino, he was employed by Duke Guidobaldo in the decorations of his palace, and showed

extraordinary aptitude for theatrical adornments. Thence he went to Rome; and in the church of S. Caterina da Siena, in that capital, is one of his most distinguished works, The Resurrection, remarkable both for design and for

colour- ing. He studied the Roman antiquities with zeal, and measured a number of edifices; this practice, combining with his previous mastery of perspective, qualified him to shine as an architect. Francesco Maria, the reigning duke of Urbino, recalled Genga, and commissioned him to execute works in connexion with his marriage-festivities. This prince being soon afterwards expelled by Pope Leo X., Genga followed him to Mantua, whence he went for a time to Pesaro. The duke of Urbino was eventually restored to his dominions ; he took Genga with him, and appointed him the ducal architect. As he neared the close of his career, Genga retired to a house in the vicinity of the city, continuing still to produce designs in pencil; one, of the Conversion of St Paul, was particularly admired. Here he died on the 11th of July 1551. Genga was a sculptor and musician as well as painter and architect; and he wrote various essays, as yet unpublished, on the arts. He was jovial, an excellent talker, and kindly to bis friends. His principal pupil was Francesco Menzocchi. His own son Bartolommeo, (1518-1558), also a pupil, became an architect of celebrity. In Genga's paintings there is a great deal of freedom, and a certain peculiarity of character consonant with his versatile, lively, and social temperament. One of his leading works is in the church of St Augustine in Cesena, —a triptych in oil-colours, repre- senting the Annunciation, God the Father in Glory, and the Madonna and Child. Among his architectural labours are the church of the Baptist in Pesaro, one of the finest edifices in that neighbourhood; the bishop's palace at Sinigaglia; the facade of the cathedral of Mantua, ranking high among the productions of the 16th century ; anda new palace for the duke of Urbino, built on the Monte Imperiale. He was also concerned in the fortifications of Pesaro,

GENGIS KHAN. See Juncuiz Kuan.

GENLIS, SrepHanie-Fiticrrh Ducrest DE SAINT- Aupin, Comrnsse DE (1746-1830), a voluminous French writer, was born of a noble but impoverished Burgundian family, at the Chatcau de Champcery, near Autun, on the 25th of January 1746, When six years of age, she was received as a canoness into the noble chapter of Alix, near Lyons, with the title of Madame la Comtesse de Lancy, taken from the town of Bourbon-Lancy, of which her father was at that time superior. Her entire education, however, was con- ducted at home under the eye of her mother by an

accom- plished governess. In 1758 she removed along with her mother to Paris, where her skill in music and her vivacious wit speedily attracted attention and admiration. Her marriage with the Comte de Genlis, a colonel of grenadiers, who afterwards became marquis of Sillery, took place in her sixteenth year, but was not suffered to interfere with a rapidly developing taste for acquiring and imparting knowledge. Some years later, through the influence of her aunt, Madame de Montesson, who had been clandestinely married to the duke of Orleans, she entered the Palais Royal as lady-in-waiting to the duchess of Chartres (1770) ; and, after having acted with great energy and zeal as gover- ness to the daughters of the family, she was in 1781 appomted by the duke to the responsible office of “ gouver- neur ” of his sons, a bold step which, though it led to the resignation of all the tutors as well as to much social scandal, can hardly in fairness be held to have seriously prejudiced the intellectual interests at least of those com- mitted to her charge. The better to carry out her theory of education, she wrote several works for the use of her royal pupils, the best known of which are the 7hédtre @ Ldueation (1779-80), a collection of short comedies for

young people, and Les Annales de la Vertu (1781). When the Revolution of 1789 occurred, Madame de Genlis showed herself not unfavourable to the movement, and is said to have had considerable influence on the conduct of the duke of Orleans ; but the fall of the Girondins in 1793 compelled her to take refuge in Switzerland along with her pupil Mademoiselle d’Orleans. It was in this year that her husband, the marquis of Sillery, from whom she had been separated since 1782, perished on the scaffold. An

adopted” daughter, Pamela Berkley or Simms, had been married to Lord Edward Fitzgerald in the preceding December (see Sir Bernard Burke’s Rise of Great Families, 1872). In 17 94 Madame de Genlis fixed her resi- dence at Berlin, but having been expelled by the orders of King Frederick William, she afterwards settled in Hamburg, where she supported herself for some years by writing and painting. After the revolution of 18th Brumaire (1799) she was permitted to return to France, and was reccived with favour by Napoleon, who gave her apartments at the arsenal, and afterwards assigned her a pension of 6000 francs. During this period she

wrote largely, and produced what is generally considered to be her best romance, entitled Mademoiselle de Clermont. At the restoration she succeeded in adjusting herself once more to the new state of things, and continued to write with all her former diligence. Her later years were occupied largely with literary quarrels, notably with that which arose out of the publication of the Diners dw Baron dHolbach, a volume in which she set forth with a good deal of sarcastic cleverness the intolerance, the fanaticism, and the eccen- tricities of the “philosophes” of the 18th century. Madame de Genlis before her death, which occurred on the 31st of December 1830, had the satisfaction of seeing her former pupil, Louis Philippe, seated on the throne of France.

The numerous works of Madame de Genlis (which considerably exceed eighty), comprising prose and poetical compositions on a vast variety of subjects and of various degrees of merit, owed much of their succcss to adventitious causes which have long ceased to operate, and they are now but little read. The swiftness with which they were written, their very multiplicity, and their diffusc- ness, all forbid us to look in them for thought of perennial value or literary art of any high order. They are useful, however (especially the voluminous Jfémoires), as furnishing material for history ; and she herself can hardly pass altogether uunoticed in the crowd which thronged the stage of public life in the confused and busy time of the French Revolution. Most of her writings were translated into English almost as soon as they were published.

GENNADIUS. Georgius Scholari or Scholarius, better known as Gennadius, a learned Greek and for some time patriarch of Constantinople, obtains a place in history through the important part played by him in the contest between Platonism and Aristotelianism which marks the transition from medieval to modern thought. Extremely little is known of his life, and so contradictory are some of the accounts bearing on detached facts in it that it has often been supposed there were two writers of the same name living at the same period. The researches of Renaudot seem, however, to render it approximately certain that all the historical notices we possess relate to one Scholarius, and that the apparent inconsistency in the accounts is due largely to a real change in that writer’s views. Scholarius first appears in history as assisting at the great council held in 1438 at Ferrara and

Florence with the object of bringing about a union between the Greek and Latin Churches (see Evczntus IV., Brssarron). At the same council was present the celebrated Platonist, George Gemistus Pletho, the most powerful opponent of the then dominant Aristotelianism, and consequently the special object of reprobation toGennadius. In church matters, oi in philosophy, the two were opposed,—Pletho eer strongly the principles of the Greek Church, and being

unwilling to accept union through sai mai Gennadius, — 20

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more politic and cautious, pressing the necessity for union, and instrumental in drawing up 4 form which from 16s vagueness and ambiguity might be accepted by both parties. It would seem that at Florence Pletho published the work on the difference between Aristotle and Plato (see Gumistus) which afterwards called forth a reply from Gennadius. Of this reply only the fragments quoted by Pletho in his ccunter-argument (Contra Gennadium) have been preserved. They show that Gennadins, though Aris- totelian throughout, had an accurate knowledge of Aristotle, and was more moderate than some of his contemporaries, e.g. George of Trebizond. The next appearance of Gennadius isin 1453. After the capture of Constantinople by the Turks, Mahomet, finding that the patriarchal chair had been vacant for some time, resolved to elect some one to the office. The choice fell on Scholarius, who is de- scribed as a layman. While holding the episcopal office Gennadius drew up, apparently for the use of Mahomet, a symbol or confession of faith, which is very valuable as the earliest expression of the principles of the Greek Church. He also at this time had the pleasure of condemning to the flames the great work of his old opponent Pletho, the treatise on Laws (Néuou), of which considerable fragments have come down to us. The character of this work was accurately apprehended by Gennadius (see his Letter to the Exarch Joseph, in Gass, as below), and his opposition to it is intelligible. After a short period of office at Constanti- nople Gennadius is said to have resigned the episcopal dignity and to have retired into a convent. The date of his death is unknown.

The fullest account of his writings is given in Gass (Gennadius and Pletho, 1844), the second part of which contains Pletho’s Contra Gennadium. See also F. Schultze, Gesch. der Phil. d. Renaissance, i., 1874. A list of the known writings of Gennadius is given in Fabricius, Bibliotheca Grreeea, ed. Harless, vol. xi.

GENOA, in literary Italian Genova, in the local dialect Zene, in Latin and German Genua, in medieval Latin Janua, and in French Génes, one of the most important cities of Italy, is situated in what was formerly known as Liguria, on the northern coast of the Mediterranean near the middle of the Gulf of Genoa. The latitude of its lighthouse is 44° 24’ 16” N., and its longitude 8° 54° 15” E. Byrail Genoa is 115 English miles N.E. of Nice and 119 miles N.W. of Leghorn. The city, as seen from the sea, is “built nobly,” and deserves the title it has acquired or assumed of the Superb. Finding only a small space of level gronnd along the shore, it has been obliged to climb the lower hills of the Ligurian Alps, which afford many a coign of vantage for the effective display of its architectural magnificence. The original nucleus of the city is that portion which lies to the east of the port in the neighbourhood of the old pier (Molo Vecchio). In the 10th century it began to feel a lack of room within the limits of its fortifications; and accordingly, in the middle of the 12th century, it was found necessary to extend the line of circumvallation. Even this second circuit, however, was of small compass, and it was not till 1320-30 that a third line took in the greater part “ the modern site of the city proper. This presented a a 3 miles of rampart towards the land side, and can = : =) traced from point to point through the city, is ae Lee tate especially towards the east, have been

é e present line of circumvallation dates from 1626-1632, the period when the independence of Genoa was threatened by the dukes of Savoy. From the mouth of the Bisagno in the east, and from the lighthouse point in the west, it stretches inland over hill and dale to the great fort of Sperone, a.¢e., the Spur, on the summits of Monte Peraldo at a height of 1650 feet,—the circuit being little less than 12 miles, and all the important points along the line being defended by forts or batteries. Of course a large ‘portion of the enclosed area is open country, dotted only

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here and there with houses and gardens. There are eight gates in all,—the more important being Porta Pila and Porta Romana towards the east, and the new Porta Lanterna or Lighthouse Gate to the west.

The irregular relief of its site, and its long confinement within the limit of fortifications which it had outgrown, have both contributed to render Genoa a picturesque con- fusion of narrow streets, lanes, and alleys, which it would almost require the delicate diminutives of Italian to name, varied with stairways climbing the steeper slopes, and bridges spanning the deeper valleys. As there are large portions of the town which are quite inaccessible to ordinary carriages, and many even of the more important streets have very little room for traffic, porters and chairs take to a con- siderable extent tlie place of cabs, and goods are largely transported by means of mules. Inthe middle of the 16th century the Government gave commencement to a system of more spacious thoroughfares than had previously been in vogue by laying out the street which still bears the name of Via Nuova; in 1606 the Via Balbi, as it was ultimately called from the palaces of the Balbi family, began to stretch westwards; and at length, about 1778, a connexion between these two streets was effected by the opening up of Via Nuovissima. The line thus produced, extending as it does from the Piazza Fontane Morose westward for about a mile to the Piazza Verde is still the route most in favour with the fashionable world of Genoa. As early as the middle of the 17th century the Via Giulia was driven through the midst of the small streets between the ducal palace and the Porta d'Arco ; but it was not till about 1825 that the Via Carlo Felice gave free route between the palace and the Piazza Fontane Morose. The Via Lorenzo and the long line of street which, under the names of Carlo Alberto, 8. Benedetto, and Milano, runs round the port to its western extremity, also belong to this century. The spacious Via Roma, running east from Via Carlo Felice to meet the Via Assarotti, has been built since 1870; and the area of the Piazza Cavour was only about the same time cleared of the old houses, The great public promenade of Acquasola already mentioned was laid out by the architect Carlo Barabino between 1821 and 1837; and it has been connected with the gardens of the Villetta di Negti, pur- chased by the municipality about 1865.

Of the churches of Genoa, which number upwards of Cathe: eighty, the principal is the cathedral of St Laurence (il duomo di San Lorenzo).

Tradition makes its first founda- tion contemporary with St Laurence himself ; there 18 distinct historic mention of a church on the site in the latter part of the 9th century; and a document of 987 m- plies that it was even then the metropolitan church. Re- constructed about the end of the 11th and beginning of the 12th century, it was formally consecrated by Pope Gelasius IL, 18th October 1118; and since then it has undergone a large number of extensive though partial renovations. In the facade the lower part, with its three elaborate doorways in the Gothicu-Moorish style, dates from the 12th century; the upper part belongs to the 14th; and the belfry which rises above the right-hand doorway was erected about 1520 by the doge, Ottaviano da Campo- fragoso. To the 13th century is assigned the central nave, which was, however, both lengthened and heightened in the 14th; and the cupola was erected after the designs of the architect Galeasso Alessi invited to Genoa about 1550. Among the artists who have coh tributed to the internal decoration the most noteworthy are Damiano of Bergamo, who represented the Slaughter of the Innocents and the Martyrdom of St Laurence 12 the woodwork of the choir; Iazzaro Tavarone, who painted the roof about 1622; G. B. Bianco, who furnished the bronze statue of the Madonna of the city in 1652;

Gian Giacomo della Porta, the sculptor of the statues of Mark.and Luke in the presbyterium ; and Giovanni Maria Passalo aud Giovanni Angelo Montorsoli, the sculptors of the corresponding statues of Matthew and John. The stained glass windows of the choir, represeuting the four patron saints of the city, are the work of Giovanni Bertini. To none of the chapels in the cathedral, rich as several of them are in works of artistic value, can a higher rank be assigned than to the chapel of St Jolin the Baptist. The main design, with its elaborate detail of columns and arab- esques, and foliage and statues, was due to Pio Domenico da Bissone, who from 1450 was engaged for ten years on the work. Statues by Matteo Civitali of Lucca and Andrea Contucci of Monte San Savino, a rich and costly baldachin presented by Count Filippino Doria, and stained glass windows designed by Ulisse de' Mattei, are among the later additions to its decoration. On one day only in the course of the year are women allowed to enter the chapel ; for was it not

a woman who procured the death of the Baptist ? Amid the profusion of ecclesiastical bric-a-brac in the nooks

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and niches of the cathedral, there are objects enough of considerable interest. Here, bound together by craft of goldsmith, is an octagonal bowl, brought from Cesarea in 1101, which corresponds to the descriptions given of the Holy Grail, and was long regarded as an emerald of match- less price, but which turned out, when broken by its French purloiners, to be only a remarkable piece of ancient glass.

Of older date than the cathedral is the church of St Other Ambrose and St Peter, if its first foundation be correctly churches,

assigned to the Milanese bishop Honoratus of the 6th century ; but the present edifice is due to the Society of Jesus, who obtained possession of the church in 1587, and employed the skill of Pellegrino Tebaldi in its restoration, Among the paintings of this church the first place is naturally given to the Circumcision and St Ignatius by Rubens, and to the Assumption of Guido Reni. The Annunziata del Guastato is one of the largest and wealthiest churches in the city. It owes its first foundation to the order of the Humiliati, but S. Marta, as it was originally

RAILWAY > STATION

Plan of Genoa.

1, Royal Palace. 9, Palazzo Spinola. 17, Church of San Siro. — Es pene me sa House, l ee ee iL 7 — io. i. S Filippo de Nerf. 28. Conservatorio delle Fiesehine. | i es ae 12. Villetta di Negro. 20. Cathedral. 29. ie and aie

Institution, 5. : Briqnote 13. Pesehicre Pallavicini. 21. Church of ST a de Carigno. – Pagan’ eens ~ 7 – i. 15. Sg te et 93, Gime. i 32. Andrea Doria Signs | s i Adoraa, 16, Church of the ‘Annunziata. : 24, Ducal Palace. 34. Hospital of Sant’ Andrea,

called, ass small building till it passed about 1505 into | The campanile, however, is a remarkable work of the

the hands of the Conventuals of St Francis, by whom the present gigantic structure was planned and partly erected. The rest of the main edifice was due to the Observartines of the same order, who came into possession in 1537, and gave the church its modern name; and the necessary funds were largely supplied by the Lomellini family. The church is a cruciform structure, with a dome, and the central nave is supported by fourteen columns in the Corinthian style. To the unfinished brick facade an incongruous portal with marble columns was added about 1843, after the plans of Carlo Barabino. Santa Maria delle Vigne probably dates from the 9th century, but the present structure was erected towards the close of the 16th.

13th century. San Siro, originally the “Church of the Apostles” and the cathedral of Genoa, was rebuilt by the Benedictines in the 11th century, and restored and enlarged by the Theatines in the 16th. Santa Maria di Carignano, or more correctly Santa Maria Assunta e SS. Fabiano e Sebastiano, belongs mainly to the _16th century, and was designed by Galeazzo Alessi, in aes tion of Bramante’s plan for St Peter’s at Rome. “ – expense was borne by the Sauli family. From the ere gallery of the dome—368 feet above the sea-level, an ee feet above the ground—a magnificent view 1s Pia? the city and the neighbouring coast. 8. sain ee a 969, and keeps its ancient campanile, but 1

Talaces.

Benevo- lent insti- tutions,

several times rebuilt. Tne famous painting of the martyr- dom of St Stephen, by Giulio Romano, carried off by Napoleon in 1811, was restored to the church in 1815. The Madalena, as it now stands, was built by Andrea Vannone about the close of the 16th century; and San Filippo Neri was rebuilt in the close of the 17th century at the expense of the Pallavicinl family. S. Matteo, the church of the D'Oria or Doria family, was founded in 1126 by Martino Doria, and the present edifice, after the designs of Montorsoli, dates from 1543. In the crypt 1s the tomb of Andrea Doria the Great by the same Montor- soli, and above the main altar hangs the dagger presented to the doge by Pope Paul HL ad

The palaces of the Genoese patricians are famous for their sumptuous architecture and their artistic collec- tions. The Palazzo Rosso, or Red Palace, erected in the middle of the 17th century, was in 1874 presented to the city by Maria, the wife of Raffaele de Ferrari, duke of Galliera, and her son Filippo de Ferrari, along with its library and picture gallery. The old palace of the doges, now the seat of the prefecture, was rebuilt in the 16th century, and again restored after a great fire in 1777; the neighbouring tower, from which the magis- trates were summoned by toll of bell, dates from the beginning of the 14th century. A sixteenth century palace, formerly the property of the dukes of Turin, is now occupied by the municipality, and contains among its more curious treasures a bronze tablet (117 A.D.), with an inscription relating to a dispute between Genoa and a neighbouring castle, two autograph letters of Columbus, and Paganini's violin. The inscription, dis- covered in 1506, was printed for the first time in 1520 by Brucelli, whose works form part of Grevius's Thesaurus, and among its modern commentators are Serra in the Transactions of the Imperial Academy of Genoa, and Simoni and Grassi in the Transactions of the Ligurian Society of Native History. The palace which was pre- sented in 1528 by the republic to Andrea Doria is a large building of the 15th century, restored and extended under the doge's direction, and decorated with frescos by Perino del Vaga. The royal palace, built in the middle of the 16th century for the Durazzo family, was acquired by Victor Emmanuel in 1817. Among other buildings of the same class, the Durazzo palaces in the Via Nuovissima, and the Via Balbi, the Balbi Senarega in the Via Balbi, the Sarra palace in the Via Nuova, and the Pallavicino in the Piazza Fontane Morose are worthy of note.

Of most historical interest among the benevolent institutions of Genoa is the hospital of Pammatone (Ospedale civile di Pammatone) a vast edifice contiguous to the public park of Acquasola, It owes its origin to the bequest in 1429 of Bartolommeo Bosco; and the ex- cellence of the infirmary thus established caused the citizens to procure permission from Sixtus V. to divert the funds of all similar minor foundations to its support. New buildings were erected in 1626 by Giacomo Saluzzo, and still larger additions were made in

1758, under the superintendence of Andrea Orsolino,

sane committee with the general hospital is the teaiisltiet ie curables (Ospedale dei Cronici, originally Ridotto degli Incurabili) instituted towards the end of the 15th century by Ettore Vernazza, and taken under the direct control of the civil authorities in 1500. The great poorhouse (Albergo dei Poveri), dating from about 1665, – a vast building, aftcr designs by Stefano Scaniglia, covering no Jess than 215,280 square fect, and accommodating 1400 inmates, who manufacture cotton and woollen cloth, furniture embroidery &e The so-called Conservatorio delle Fieschine was founded in 1763, in accordance with the will of Domenico Fieschi, as an asylum ‘for destitute girls ; and in 1783 his widow left 80,000 lire to provide a dowry of 500 lire for any of the inmates leaving the institution to be married or to take the veil. A considerable reputation has been oe by i a poe of this institution.

The sums bequeathed for charitable purposes during amounted to 3,798,106 francs, in additien fb the ue ee Le (about thirty millions of francs) of the deceased duke of

alliera,

The highest educational institution in Genoa is the royal univer-

sity, which occupies a palace in the Via Balbi, originally built Un}. about 1623 for the Jesuit fathers entrusted by the magistrates with the supervision of education in 1572. The republic had received the right of conferring degrees from Pope Sixtus IV. as early ag 1471, a privilege confirmed by the emperor Maximilian I. in 1496, On the dissolution of the Jesuits the administration of the college passed into the hands of the republic, and the provisional Govern. inent of 1797 reinaugurated it asa university in 1803. In 1808 during the French occupation, it was assimilated to the other ne perial academies, so that its present organization may be said to date only from 1812. It numbers about 400 students, who have the advantage of a physical and a natural history museum, an anatomical cabinet, a meteorological

observatory, a botanical garden, and a library. The library, originated by the Jesuits, numbers about 80,000 volumes, among which none is considered of greater value by the Genoese than the manuscript collection of the laws and enactments of their republic, Liber jurium communis Schools Januensis. In Genoa, as clsewhere in Italy, great advance has been made both in secondary and primary cducation since 1867:

in 1877 the city possessed two gymnasiums, a lyceum named after Christopher Columbus, three technical schools, a high school for female education opened by the municipality in 1874, a female normal school dating from 1859, a teachers' training school founded

in 1861, and upwards of 40 infant schools (Asili d' Infanzia), of which the first was opened in 1840. The royal technical institute Jpstity. comprises three distinct sections—a professional industrial institute, tions for au institute of mercantile marine, and a system of evening classes arts an} in mathematics, chemistry, mechanics, &c.; and a royal naval gojence college was opened 'in 1873. The Ligurian academy of the fine arts owed its origin in 1751 to Francesco Maria Doria, and the palazzo

in which its museums and galleries are situated was erected in 1831

by Carlo Barabino. A inusical institute, founded by Antonio Costa

aud maintained by the municipality, has rooms in the convent of

St Philip Neri. A society for the promotion of the fine arts dates

from 1849, the Ligurian socicty of native history from 1857, and a society for the arts and industries of Liguria from 1871, Besides Libratie the university library there are four public librarics—the Biblioteca Civico-Beriana (40,000), presented to the municipality by Victor Emmanuel J,, to whom it had been bequeathed ; the Biblioteca

della Missione Urbana (40,000), a noble collection rich in manu- oe of Ligurian history and Greek codices, which owes its origin

to the legacy of Gerolamo Franzone in 1727 ; the Biblioteca Fran- zoniana (12,000), due to the same G. Franzone, and administered

by the congregation of ‘‘ Evangelical Workmen ”; and, lastly, the

fine library which forms part of the great legacy in the Palazzo Rosso. A museum of natural history (Museo Civico di St. Nat.), opened in the Villetta di Negro in 1878, is worthy of special note

for the collections made by Giacomo Doria, Beccari, D’Albertis,

and Antinori. Picture galleries are to be found in many of the Picture ancient palaces, and in two at least, the Palazzo Rosso and the gallerie Palazzo Bianco, the collections are of gréat value. An excellent

law forbids the removal from the city or province of any object of ancient art without the sanction of a commission under the presi- dency of the prefect. In 1877 the Genoese had a choice of about a Theatre dozen theatres, small and great, inclusive of those in Sampierdarena.

Of these the greatest is the Carlo Felice, erected in 1826-28 under

the patronage of the king whose name it bears. The National Theatre, rebuilt in 1790, dates originally from 1702, and it has an

oldcr rival in the Teatro del Falcone, which is associated with the

life of Goldoni, and now serves us court theatre.

The mountainous character of the surrounding country has Comm rendered it a difficult task to supply Genoa with sufficient means cation. of railway communication ; in the 20 miles, for example, between the city and Arquata there are eleven tunnels, that of Giovi being upwards of 2 miles long. The line to the north through the valley of the Polcevera, which joins the general Italian system at Ales- sandria, was opened about 1858; but it was not till 1870 that the western line was completed so as to give a continuous route from France, and it was November 1874 before the eastern section be- tween Sestri di Levante and Spezia established a connexion with the lines

along the western coast of Italy. Since that date, how- ever, passengers and goods can be conveyed by rail from Calais to Otranto. There are two stations in the city,—one for the west and north, and the other for the east and south, —connected since 1871 by a tunnel 7518 feet in length.

; Though its existence as a maritime power was originally due to Harbo its port, Genoa has only begun since 1870 to construct the con- veniences necessary for the modern development of its trade. AS carly as 11384 the old pier (Molo Vecchio) was in existence, streteh- ing westward into the gulf; and in 1639 the new pier (Molo Nuovo) from the other side of the gulf was commenced, after the plans of Ansaldo de Mari. Up to 1878 the former had a length of 2800 feet, and the latter was only slightly longer. The harbout thus formed was in some respects a good one; the bottom being of clay furnished excellent anchorage, and within the new pier there was depth for the largest class of vessels, But a swell was always felt whenever the wind was at any point between S.W. and 8.E.

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GENOA

The vast bequests of the duke of Galliera have enabled the autho- tities to undertake (1878) an elaborate scheme for the extension andimprovement of the port, including, not only a great addition of the harbour area, but also the construction of a system of wharves and warchouscs, which have hitherto been surprisingly insufficient. It is difficult to believe that in one of

the greatest harbours of Europe the goods should be ‘discharged into lighters, slowly towed by rowing boats to the side of the quays, removed by hand labour from the lighters to uncovered quays, and again trans- ferred by hand labour te the railway.” In spite of all these dis- advantages the shipping trade of Genoa has rapidly increased since the consolidation of Italy. From 1815 to 1825 there was a large trade in grain, with a corresponding expansion of other branches. A sudden change was produced by a system of differential duties in favour of native grain; instead of 1000 foreign vessels with a tounage of 95,000 as in 1821-5, there were only 760 vessels on an average in the three years 1825-8 ; and there was no corresponding inerease in native shipping, which rose only from 55 to 70 vessels. ‘he more liberal tariffs attached to the commercial treaties, con- cluded about 1852 with Francc, England, and Germany, gave a new impulse to foreign trade, and this was followed up by Count Cavour’s law exempting all foreign grain from duty. The prin- cipal imports are petroleum, raw cotton, wool, grain, coal, metal goods, hides, tobacco, and English-cured fish, The total value imported in 1876 was £14,324,347, and in 1877 £12,066,911, while the exports for the same years amounted to £2,088,578 and £1,968, 508—exclusive in both cases of goods merely in transit. During the five years 1878-7 the total number of vessels arriving at Genoa was on an average 2683 pcr annum, with an annual ton- nage of more than 1,000,000 tons. Of these vessels about 1510 per annum sailed under the Italian flag with 533,900 tons ; 421 were English with 284,890 tons, and 320 French with 105,945 tons. The opening of the St Gotthard Railway is expected to give a great impulse to Genoese trade.

The local industry devotes itself mainly to the manufacture of cotton and silk, gold, silver, ivory, and coral, paper and leather goods, macaroni and vermicelli, sugar, and preserved fruits. The coarser cottun cloths or bordatti are the favourite wear of the Ligurian population. Iron-founding and shipbuilding are carried on in the district, and there is a growing export trade in all articles of market gardening and floriculture.

In Michelet’s phrase, it may almost be said that Genoa was a bank before it was a city, and its money business is still greater than that of any other town in Italy. The Bank of St George, founded in 1407, was “one of the most ancient and celebrated banks of circulation and deposit in Europe,” but it

never recovered from the damage done to its credit by the appropriation of its trea- sure, first by the Austrians in 1740, and again by the French in 1800. 1tno longer exists, and the famous building of the 13th century in which it was accommodated is now used as a customs house. A new bank was founded at Genoa in 1844, which, since its union in 1855 with a similar institution at Turin, bears the name of the National Bank. It has branches at Turin, Florence, Milan, and Naples. Up till 1871 its only important rival was the Cassa di Sconto, but about this time the Genoese, in the words of the British consul, ‘‘ went mad on the subject of new companies, and in a single year they started not Icss than thirty-three banking, trading, mining, shipping, and manufacturing concerns.” The result was a series of bankruptcies. Bank after bank failed ; and criminal proceedings were in several cases instituted against the bank directors. The only notes current in Genoa in 1875 were those of the National Bank and the Tuscan National Bank.

The Genoese have long been known asa hard-working and frugal people; and the lower classes of the whole Ligurian coast are inured to privation and hardships. Since about 1850 there has been a strong current of emigration to South America. About 1858 the Ligurian settlers in Moute Video, Buenos Ayres, Rio de la Plata, Rio Janeiro, Lima, and Valparaiso were estimated at 60,000; and since that date the number of emigrants leaving northern Italy by way of Genoa has increased to 80,000 or 90,000 perannum.

According to the returns of 1876, the income of Genoa was 6,343,175 franes, including octroi dues for 4,326,000 francs. The ordinary, extraordinary, and casual expenscs for 1875 were—for municipal administration, 608,461 francs ; local police and sanitary expenses, 1,038,418; administration of law, 227,376; public Works, 2,312,470 ; education, 692,662 ; religious worship, 12,117 ; and pnblic charities, 648,468 francs. The debt of the city in 1876 was 36,731,457 francs.

The council directing the local government of the city is chosen Vy 2 body, according to the last returns, of 41,984 electors, every citizen paying 40 franes of taxes being entitled to vote, and every Voter being eligible as a councillor. The head of the council is the

syndic or mayor, chosen by the king from the 12 members of the

giunta or administrative committee, who are themselves ap ointed

from the entire body of the 60 municipal councillors. esides possessing this municipal council, Genoa is also the seat of the provincial council, elected in the same way, but presided over by

the prefect, or representative of the Government.

_ In 1848 the population of the city was 100,382; by 1862 it had Popula- increased to 127,986, but a careful census undertaken by the muni- tion. cipality in 1871 found no more than 120,595, exclusive, however, both of resident strangers and absent natives. The principal causes which had tended to retard the natural growth of the oe tion were the cholera of 1866-67, and the small-pox of 1870,—the latter having actually occasioned an excess of 1178 deaths over the births for the year. To this must be added the removal of the Government arsenal to Spezia in 1870-1, and the tendency, which has gradually made itself felt since the opening of the railways, to settle in the suburban towns, The stretch of coast for miles along the gulf is an almost continuous line of country houses and mansions, and indeed, to quote the words of M. Reclus, the whole riviera from Ventimiglia to Spezia assumes more and more the aspect of a single town where the populous quarters alternate with groups of villas and gardens. Proceeding westwards we are no sooner beyond the fortifications than we find ourselves in the flourishing town of Sampierdarena, that is, San Pier d’Arena, or St Peter of the Sands. Down to the middle of last century it was mainly inhabited by the wealthier classes, but has since become the seat of great industrial and commercial activity, Its population, which in 1814 was only 53845, was upwards of 17,000 in 1877. From Sampierdarena a stone bridge of the 16th century, memorable as the spot when Masséna signed the capitulation of Genoa, leads across the Polcevera to Corneliano, a market-town with 2698 in- habitants at the census of 1871 ; and Corneliano in its turn connects itself with Sestri Ponente, a busy place of from 9000 to 10,000 inhabitants, with a large shipbuilding trade. Towards the east there is a similar succession of villages and towns.

History.—The early importance, both political and commercial, of Genoa is attested by the part which it played in the Second Punic War. Its supremacy amongst the neighbouring munici- palities and populations is not less evident from the inscription on the bronze table still to be seen in the council-hall of the city. Its history during the dark ages, throughout the Lombard and Carol- ingian periods, is but the repetition of the general history of the Italian communes, which succeeded in snatching from contending princes and barons the first charters of their freedom. The patriotic spirit and naval prowess of the Genoese, developed in their defensive wars against the Saracens, led to the foundation of a popular con- stitution, and to the rapid growth of a powerful marine. From the necessity of leaguing together against the common Saracen foe, Genoa united with Pisa in expelling the Moslems from the island of Sardinia; but the Sardinian territory thus acquired soon fur- nished occasions of jealousy to the conquering allies, and there commenced between the two republics the long naval wars des- tined to terminate so fatally for Pisa. With not less adroitness than Venice, Genoa saw and secured all the advantages of the great carrying trade which the crusades created between Western Europe and the Kast. The seaports wrested at the same period from the Saracens along the Spanish and Barbary coasts became important Genoese colonies, whilst in the Levant, on the shores of the Black Sea, and along the banks of the Euphrates were erected Genoese fortresses, of which the strength some 40 years ago commanded the admiration of the young traveller Moltke. No wonder if these conquests generated in the minds of the Venetians and the Pisans fresh jealousy against Genoa, and provoked fresh wars; but the struggle between Genoa and Pisa was brought to a disastrous con- clusion for the latter state by the battle of Meloria. The commer- cial and naval successes of the Genoese during the Middle Ages were the more remarkable because, unlike their rivals, the Venetians, they were the unceasing prey to intestine discord—the Genoese commons and nobles fighting against each other, rival factions amongst the nobles themselves striving to grasp the supreme power in the state, nobles and commons alike invoking the arbitration and rule of some foreign captain as the sole means of obtaining a temporary truce. From these contests of rival nobles, in which the names of Spinola and Doria stand forth with greatest prominence, Genoa was soon drawn into the great vortex of the Guelph and Ghibelline factions ; but its recognition of foreign authority—suc- cessively German,

Neapolitan, and Milanese—gave way toa state of greater independence in 1389, when _ the government assumed a more permanent form with the appointment of the first doge, an office held at Genoa for life, in the person of Simon Boccanera. Alternate victories and defeats of the Venetians and Genoese—the most terrible being the defeat sustained by the —_ a Chioggia in 1380—ended by establishing the great ellis te ority of the Genoese rulers, who fell under the power now 0 . ai now of the Visconti of Milan, until the national spirit appeared

oe : é ee then Andrea Doria succeeded in regain its ancient vigour in 1528, when An : he old form of throwing off the French domination and restoring the o

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is ri the 15th and government. It was at this very period, pak ~ Eianteet commencement of the 16th century, that the gen Baral a Genoese mariner, Christopher Columbus, gave es eae a te world, which might have become the possession of Le native – i ; had Genoa been able to supply him with the ships an mage Ww ue he so earnestly entreated her to furnish. The government as ; stored by Andrea Doria, with certain modifications tending to mad to it a more conservative character, remained unchanged until the outbreak of the French Revolution and the ereation of the Ligurian republic. During this long period of nearly three oe li which the most dramatic incident is the conspiracy of Fieschi, the Genoese found no small compensation for their lost traffic in the East in the vast profits whieh they made as the bankers of the Spanish crown and outfitters of the Spanish armies and fleets both in the Old World and the New. _ ae

The short-lived Ligurian republic was soon swallowed up in the French empire, not, however, until Genoa had becn made to experl- ence, by the terrible privations of the siege when Masséna held the city against the Austrians (1800), all that was meant by a partiei- pation in the vicissitudes of the French Revolution. In 1814 Genoa rose against the French, on the

assurance given by Lord William Bentinck that the allies would restore to the republic its independ- ence. It had, however, been determined by a secrot clause of the treaty of Paris that Genoa should be incorporated with the dominions of the king of Sardinia. The discontent created at the time by the provision of the treaty of Paris as confirmed by the congress of Vienna had doubtless no slight share in keeping alive in Genoa the republican spirit which, through the influence of a young Genoese eitizen, Joseph Mazzini, assumed forms of permanent menace not only to the Sardinian monarchy but to all the established Govern- ments of the peninsula, Even the material benefits accruing from the union with Sardinia and the constitutional liberty accorded to all his subjects by King Charles Albert were unable to prevent the republican outbreak of 1850, when, after a short and sharp struggle the city, momeutarily seized by the republican party, was recovered by General Alfonzo La Marmora. The most important of the later events in the history of Genoa has been the seizure within its port of the five Neapolitan brigands, Cipriano La Gala and his accom- plices, who travelling with papal passports were arrested on board the French passenger steamer, the ‘‘Aunis,” by orders of the Marquis Gualterio prefect of Genoa. Though the event threatened at first to create a rupture between the French and Italian Govern- ments, the diplomatic discussions which it called forth, and the impression generally produced throughout Europe, had no slight share in weakening the political ties which had hitherto existed between the Papal Government and France.

Among the ‘earlier Genoese historians the most important are Bartolommeo Fazio and Jacopo Bracelli, both of the 15th century, and Paolo Partenopeo, Jacopo Bonfadio, Oberto Foglietta, and Agostino Giustiniano of the 16th. Paganetti wrote. the ecelesiastical history of the city; and Accinelli and Gaggero collected material for the ecclesiastical archeology. The memoirs of local writers and artists were treated by Soprani and Ratti. Among more general works are Bréquigny, Histoire des Revolutions de Génes jusqu’en 1748; Serra, La Storia dell antica Liguria e di Genova (Turin, 1834); Varesi, Storia della republica di Genova sino al 1814 (Genoa, 1835-39); Canale, Storia det Genovest (Genoa, 1844-54), Nuova istoria della repubblica di Genova (Florence, 1858), and Storia della rep. di Genova dall’ anno 1528 al 1550 (Genoa, 1874); Blumenthal, Zur Verfassungs- und Verwaltungsgeschichte Genua’s im 12 Jahrhundert (Kalbe an der Saale,

1872); Mallison, Studies from Genoese History (London, 1875). The Liber jurium reipublice Genuensis was edited by Ricotti in the 7th, 8th, and 9th volumes of the Monumenta historic patrice (Turin, 1854-1857). A great variety of interesting matter will be found in the Atti della Societa Ligure di Storia patria (13 volumes, from 1861-1878), and in the Giornale Ligustico di Archeo- logia, Storia, ¢ Bell' Arti. The history of the university has becn written by Lorenzo Isnardi, and continued by Em, Celesia (2 vols, Genoa). Belgrano, Della vita privata dei Genovest, P. M. Garibaldi, Stato meteorologico per la citta de Genova (for 1870, &c.), and Rocca, Pest e misure anticht di Genova, may

also be mentioncd. A Vocabulario tascabile genovese-italiano compiled by P. F B. is published by the deaf-mute publishing department. 7 7.

GENOVA, Lucusrto pa (1527-1585). This is the familiar name given to the painter Luca Cambiasi (written also Cambiaso or Cangiagio), who was born at Moneglia in the Genoese state, son of a painter named Giovanni Cam- biasi. He took to drawing ata very early age, imitating his father, and developed great aptitude for foreshortening. At the age of fifteen he painted, along with his father, some subjects from Ovid's AZetamorphoses on the front of a house in Genoa, and afterwards, in conjunction with Calvi, a ceiling showing great daring of execution, in the Palazzo Doria. He also formed an early friendship with Giambat- tista Castello; both artists painted together, with so much similarity of style that their works could hardly be told apart; from this friend Cambiasi learned much in the way of perspective and architecture. Luchetto's best artistic period lasted for twelve years after his first successes ; from that time he declined in power, though not at once in re- putation, owing to the agitations and vexations brought

upon him by a passion which he conceived for his sister-in- law. His wife having died, and the sister-in-law having taken charge of his house and children, he endeavoured to procure a papal dispensation for marrying her ; but in this he was disappointed. In 1583 he accepted an invitation from Philip II. to continue in the Escorial a series of frescos which had been begun by Castello, now deceased ; and it is said that one principal reason for his closing with this offer was that he hoped to bring the royal influence

to bear upon the pope, but in this again he failed. Worn out with his disquietudes, he died in the Escorial in the second year of his sojourn. Cambiasi had an ardent fancy, and was a bold designer in a Raphaelesque mode. His extreme facility astonished the Spanish painters ; and it is said that Philip JI., watching one day with pleasure the offhand zest with which Luchetto was painting a head of a laughing child, was allowed the further surprise of seeing the laugh changed, by a touch or two upon the lips, into a weeping expression, The artist painted sometimes with a brush in eacli hand, and with a certainty equalling or transcending that even of Tintoret. He made a vast number of drawings, and was also something of a sculptor, executing in this branch of art a figure of Faith. Altogether he ranks as one of the ablest artists of his day. In personal character, notwith- standing his executive energy, he is reported to have been timid and diffident. His son Orazio became likewise a painter, studying under Luchetto.

The best works of Cambiasi are to be seen in Genoa. In the church of St George—the martyrdom of that saint; in the Palazzo Imperiali, Terralba, a Genoese suburb—a fresco of the Rape of the Sabines; in S. Maria da Carignano—a Pieta, containing his own portrait and (according to tradition) that of his beloved sister-in- law. In the Escorial he exccuted several pictures: one is a Para- dise on the vaulting of the church, with a multitude of figures. For this picture he received 12,000 ducats, probably the largest sum that had, up to that time, ever been given for a single work.

GENOVESI, Antonio (1712-1769), an Italian writer on philosophy and political economy, was born in November 1712, at Castiglione, near Salerno. At an early age he was destined by his father for the church and began the study of philosophy and theology. He distinguished himself highly by his acuteness and diligence, and after some struggles, caused. by his disinclination for an ecclesiastical life, he took orders at Salerno in 1736. He had not been long in this position when the archbishop of the town, re- cognizing his rare abilities, nominated him to the chair of rhetoric in the theological seminary. During this period of his life Genovesi began the study of philosophy as it ex- isted outside the limits of theology. He read with eager- ness the works of the chief modern philosophers, and was particularly attracted by Locke.

Apparently still dissatisfied with ecclesiastical life, Genovesi, resigning his post at Salerno, proceeded to Rome, undertook the study of law, and qualified as an advocate. The details of legal practice, however, proved as distasteful as theology, and for some years he gave himself entirely to the study of philosophy, attending most of the distinguished lecturers at the university of Naples. At this place, after having obtained the appointment of extraordinary professor of philosophy, he opened a seminary or private college for students. His reputation asa teacher was increased by the publication in 1743 of the first volume of his Zlements of Metaphysics, and in 1745 of his Logic. Both works are imbued with the spirit and principles of the empirical school of philosophy, and the latter, an eminently practical treatise, had long a recognized position as one of the best logical text-books written from the point of view of Locke. On account of the accusations of infidelity and heresy naturally excited by his discussion of metaphysical prin- ciples, he had some difficulty in obtaining the professor- ship of moral philosophy, and failed to be appointed to the

chair of theology; but this did not prevent him from following out lis philosophical studies. He published a continuation of his Hlements of Metaphysics; but with every new volume he experienced fresh opposition from the par- tisans of scholastic routine. Among these were Cardinal Spinelli, archbishop of Naples, and an Abbé Magli, whom Genovesi covered with ridicule in his work entitled Lettere ad un Amico Provinciale. In spite of this, Genovesi ob- tained the approbation of Pope Benedict XIV., of several cardinals, and of most of the learned men of Italy. Of this number was Intieri, a Florentine, who founded at his own expense, in the university of Naples, the first Italian chair of political economy, under three conditions —namely, that the lectures should be in Italian, that Genovesi should be the first professor, and that, after his death, no ecclesiastic should succeed him.

Genovesi commeuced his first course of lectures on the 5th of November 1754 with great success,—the novelty and the interest of the subject, and the eloquent style and agreeable manner of the professor, attracting a crowd of auditors. He afterwards published his Lectures on Com- merce, aud Carey’s Account of the Trade of England, trans- lated inte Italian by his

brother, with notes by himself. The Lezioni di Commercio is the first complete and system- atic work in Italian on the science which Italians have done much to advance. On the whole it is to be included among works of the Mercantile school, but in treatment of fundamental problems, such as labour and money, it is distinguished by fairness and breadth of view. Specially noteworthy are the sections on human wants as foundation of economical theory, on labour as the source of wealth, on personal services as economic factors, and on the united working of the great industrial functions. Gioja's more important treatise owes much to Genovesi's lectures.

Till his death in 1769 Genovesi continued his labours at the university of Naples, which owes much of its celebrity to the solidity and excellence of his teaching. It cannot be said that Genovesi takes a high rank in philosophy, but he did much to introduce into Italy the new order of ideas, and his exposition of philosophical doctrines is fair and lucid, His work on Metaphysics, divided into the four rubrics, Ontosophy, Cosmosophy, Theosophy, Psychosophy, distingnished by its solid erudition, is an excelleut specimen of the precritical or dogmatic method of handling specula- tive problems. His merits in political economy have been indicated above. (For list of works see Fabroni's Lives.)

GENSERIC, or Gensericu, king of the Vandals, and the most formidable of the Gothic invaders of the Roman em- pire, was the natural son of Godegiselus the founder of a Vandal kingdom in Spain, and was born at Seville about 406. Though he was only of middle stature, and had a lameness of one leg, such was his renown as a warrior that on the death of his brother Gonderic in 427 he was chosen to succeed him on the throne. At the invitation of Boniface, the Roman general in Africa, who wished to revolt against Valentinian III, Genseric in 429 crossed into Africa, and took possession of Mauretania. Soon after- wards he besieged Boniface in Hippo Regius, and com- pelled him after a defence of fourteen months to seek safety by a precipitate embarkation, leaving his soldiers and their families to the ruthless cruelty of the Vandals. In 435 Genseric concluded a treaty with the Romans by which he retained possession of western Numidia and Mauretania; but peace was not of long dura- tion, and in October 439 he captured Carthage, which he made the capital of his kingdom. Genseric was

an Arian, and cruelly persecuted the ortliodox Catholics in Africa. In 455 at the invitation of Eudocia, who wished . be revenged on Maximus the murderer of her husband Valentinian, he fitted out an expedition against Rome,

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and after storming the city, gave it up during four. teen days to be pillaged by his soldiers. Eudocia and her daughters he carried captive to Carthage, where she was retained in prison till 462. Two attempts were made by the Romans to avenge themselves on the barbarians,—the first by Majorian, emperor of the West, in 457, and the second by Leo, emperor of the East, in 468. Both attempts, however, signally failed, and in 475 Leo's successor Zeno concluded a truce. Genseric's dominion ultimately included Sicily, Sardinia, Corsica, and the Bal- earic isles ; and. he even extended his conquests to Thrace, Egypt, and Asia Minor. He died in 477. He was cruel to blood-thirstiness, cunning, unscrupulous, and grasping ; but he possessed great military talents, and his manner of life was austere. Though the effect of his victories was neutralized by the subsequent successes of Belisarius, his name long remained tlie glory of the Vandal tribes.

GENTIAN, botanically Gentiana, a large and typical genus of herbaceous plants forming the type of the natural order Gentianacew. The genus comprises about 180 species, —most of them perennial plants growing in hilly or moun- tainons districts, chiefly in the northern hemisphere, some of the blue-flowered species ascending to a height of 16,000 feet in the Himalaya mountains. The leaves are opposite, entire, and smooth, and often strongly ribbed. The flowers are furnished with a persistent calyx and corolla, which is usually 4- or 5-parted, but occasionally 10-parted; the stamens are equal in number to the lobes of the corolla. The ovary is one-celled, with two stigmas, either separate

W) gmas, Pp

and rolled back or contiguous and funnel-shaped. The fruit when ripe separates into two valves, and contains numerous small seeds. The majority of the genus are remarkable for the deep or brilliant blue colour of their

blossoms, comparatively few having yellow, white, or more rarely red flowers; the last are almost exclusively found in the Andes.

Only a few species occur in Britain. G. Amarella and G. cam- pestris are small annual species growing on chalky or calcareous hills, and bear, in autumn, somewhat tubular pale purple flowers ; the latter is most easily distinguished by having two of the lobes of the calyx larger than the other two, while the former has the parts of the calyx in fives, and equal in size. Some intermediate forins between these two species occur, although rarely, in England ; one of these, G. germancia, Willd., has larger flowers of a more blue tint, spreading branches, and a stouter stem. Some of these forms flower in spring. G. Pneumonanthe, the Calathian violet, is a rather rare perennial species, growing in moist heathy places from Cumberland to Dorsetshire. Its average height is from 6 to 9 inches. It has linear leaves, and a bright blue corolla 14 inches long, marked externally with five greenish bands, is without hairs in its throat, and is found in perfection about the end of August. It is the handsomest of the British species ; two varieties of it are known in cultivation, one with spotted and the other with white flowers. G. verna and G. nivalis are small species with brilliant blue flowers and small lcaves. The former is a rare and local perennial, occurring, however, in Teesdale and the county of Clare in Ireland in tolerable abundance. It hasa tufted habit of growth, and each stem bears only one flower. It is sometimes cultivated as an edging for flower borders. G. nivalis in Britain occurs only on a few ot the loftiest Scotch mountains. It differs from the last 1 being an annual, and having a more isolated habit of growth, and in the stem bearing several flowers. On the Swiss mountains these beautiful little plants arc very abundant ; and the splendid blue colour of masses of gentian in flower is a sight which, when once seen, can never be forgotten. For ornamental purposes several species are cultivated. The great difficulty of growing them suc- eessfully renders them, however, less common than would otherwise be the case; although very hardy when once established, they are very impatient of removal, and rarely flower well until. the third year after planting. Of the ornamental species found in British gardens some of the prettiest are G. acaulis, Gt. verna, G. pyrenmen, G. bavarica, G. septemfida, and G. gelida, Perhaps the handsomest and most easily grown is the first named, often called Gentianella, which produces its large intensely blue flowers early in the spring.

All the species of the genus are remarkable for possessing an intense but pure bitter taste and tonic ew About forty species are used in medicine in different parts

of the world. The name of felwort given to G. Amarella, but occasionally applied to the whole genus, is stated by Dr Prior to be given in allusion to_these properties—fel meaning gall, and wort a plant. In the same way the Chinese call the @. asclepiaderi, and the Japanese the G. Buergeri, “ dragon’s gall plants,” in common with several other very bitter plants whose roots they use in medicine. G. campestris is sometimes in Sweden and other northern countries a substitue for hops. y ; am

By far the most important of the species used in medicine is the G. lutea, a large handsome plant 3 or 4 feet high, growing in open grassy places on the Alps, Apennines, and Pyrenees, as well as on some of the mountainous ranges of France and Germany, extending as far east as Bosnia and the Danubian principalities. It has large oval strongly- ribbed leaves and dense whorls of conspicuous yellow flowers. Its use in medicine is of very ancient date. Pliny and Dioscorides mention that the plant was noticed by Gentius, a king of the Illyrians, living 180-167 B.c., from whom the name Gentiana is supposed to be derived. During the Middle Ages it was much employed in the cure of disease, and as an ingredient in counter-poisons. In 1552 Tragus mentions the use of the root as a means of dilating wounds.

The root, which is the part used in medicine, is tough and flexible, scarcely branched, and of a brownish colour and spongy texture. It has a pure bitter taste and faint distinctive odour. On account of its porous nature it has been used in modern surgery, as in the time of Tragus, as a substitute for sponge tents. The root has been several times analysed with varying results, but Kromayer in 1862 first obtained the bitter principle in a state of purity. This substance, to which the bitterness of the root is due, he called gentioprcrin (Cy)H, 0,.). It is a neutral glucoside, crystallizing in colourless needles,‘and is contained in the fresh root in the proportion of about 3/5th per cent., but has not been obtained in a crystalline state from the dried root. It is soluble in water and spirit of wine, but it does not dissolve in ether. It is easily decomposed, dilute mineral acids splitting it up into glucose and

gentiogenin, the latter being an amorphous yellowish-brown neutral substance. It is not precipitated by tannin or subacetate of lead. A solution of caustic potash or soda forms with gentiopicrin a yellow solution, and the tincture of the root to which either of these alkalies has been added loses its bitterness in a few days. Gentian root also contains gentianic acid (C,,H,)0;), which is inert and tasteless. It forms pale yellow silky crystals, very slightly soluble in water or ether, but soluble in hot strong alcohol and in aqueous alkaline solutions. This substance, which is also called gentianin, gentisin, and gentisic acid, has been shown by Ville to partake of the nature of tannin, giving the reactions of that substance with ferric chloride, gelatin, and albumen. On this account he proposes to change the name to gentiano-tannic acid.

_ The root also contains 12 to 15 per cent. of an uncrystal- lizable sugar, of which fact advantage has long been taken in Switzerland and Bavaria, for the production of a bitter cordial spirit called Linzianbranntwein. The use of this spirit, especially in Switzerland, has sometimes been followed by poisonous symptoms, which have been doubtfully attri- buted to inherent narcotic properties possessed by some species of gentian, the roots of which may have been indis- criminately collected with it; but it is quite possible that it may be due to the contamination of the root with that of Veratrum album, a poisonous plant growing at the same altitude, and having leaves extremely similar in appearance and size to those of G. lutea. Gentian is considered by therapeutists to be one of the most efficient of the simple bitter tonics, that is, of that class of substances which act upon the stomach so as to invigorate digestion and thereby

increase the general nutrition, without exerting any direct influence upon any other portion of the body than the alimentary canal. It is used in dyspepsia, chlorosis, anemia, and various other diseases, in which the tone of the stomach and alimentary canal is deficient, and is sometimes added to purgative medicines to increase and improve their action. In veterinary medicine it is also used as a tonic, and enters into a well-known compound called diapente as a chief ingredient.

See Sowerby, English Botany, 3d edit., vol. vi. p. 74-81; Hems- ley, Handbook of Hardy Trees, Shrubs, and Herbaceous Plants, ~. 308; Journal of Botany, 1864, p. 65; 1872, p. 166; 1878, p. 265; Pharmacographia, p. 389; Pharmaceutical Journal (1), vol. xii. p. 871; (3) vol. iti, p. 42; (3) vol. vi. p. 90; (3) vol. viii. p. 182; Wood and Bache, United States Dispensatory, 14th edit., p. 438; Porter Smith, Chinese Materia Medica, p. 102. (E. M. H.)

GENTILESCHI, Artemisia and ORAZIO DE, painters. Orazio (1565-1646) is generally named Orazio Lomi de' Gentileschi; it appears that De' Gentileschi was his correct surname, Lomi being the surname which his mother had borne during her first marriage. He was born at Pisa, and studied under his half-brother Aurelio Lomi, whom in course of time he surpassed. He afterwards went to Rome, and was associated with the landscape-painter Agostino Tasi, executing the figures for the landscape backgrounds of this artist in the Palazzo Rospigliosi, and it is said in the great hall of the Quirinal Palace, although by some authori- ties the figures in the last-named building are ascribed to Lanfranchi. His best works are Saints Cecilia and Valerian, in the Palazzo Borghese, Rome; David after the death of Goliath, in the Palazzo Doria, Genoa; and some works in the royal palace, Turin, noticeable for vivid and uncommon colouring. At an advanced age Gentileschi went to England at the invitation of Charles I., and he was em. ployed in the palace at Greenwich. Vandyck included him in his portraits of a hundred illustrious men. His works generally are strong in shadow and positive in colour. He died in England in 1646. Anrremisia (1590-1642), Orazio's daughter, studied first under Guido, acquired much renown for portrait-painting, and considerably excelled her father's fame. She was a beautiful and elegant woman; her likeness, limned by her own hand, is to be seen in Hampton Court. Her most celebrated composition is Judith and Holofernes, in the Pitti palace; certainly a work of singular energy, and giving ample proof of executive faculty, but repulsive and unwomanly in its physical horror. She accompanied her father to England, but did not remain there long; the best picture which she produced for Charles I. was David with the head of Goliath. Artemisia refused an offer of marriage from Agostino Tasi, and bestowed her hand on Pier Antonio Schiattesi, continuing however to use her own surname. She settled in Naples, whither she re- turned after her English sojourn; she lived there in

no little splendour, and there she died in 1642. She hada daughter and perhaps other children.

GENTILI, Ausertco (1552-1608), may fairly be called the founder of the science of international law. He was the second son of Matteo Gentili, a physician of noble family and scientific eminence, and was born 14th January 1552 at Sanginesio, a small town of the march of Ancona which looks down from the slopes of the Apennines upon the dis- tant Adriatic. After taking the degree of doctor of law at the university of Perugia, and holding a judicial office at Ascoli, he returned to his native city, and was entrusted with the task of recasting its statutes, but, sharing the Protestant opinions of his father, shared also his flight to Carniola, where Matteo was appointed physician to the duchy. The Inquisition condemned the fugitives as col tumacious, and they soon received orders to quit the dominions of Austria. Alberico set out for England, travelling by way of Tiibingen and Heidelberg, and every-

where meeting with the reception to which his already high reputation entitled him. He arrived at Oxford in the autumn of 1580, with a commendatory letter from the earl of Leicester, at that time chancellor of the university, and was shortly afterwards qualified to teach by being admitted to the same degree which he had taken at Perugia. His lectures on Roman law soon became famous, and the dia- logues, disputations, and commentaries, which he published henceforth in rapid succession, established his position as an accomplished civilian, of the older and severer type, and secured his appointment in 1587 to the regius professorship. of civil law. It was, however, rather by an application of the old learning to the new questions suggested by the modern relations of states that his labours have produced their most lasting result. In 1584 he was consulted by Government as to the proper course to be pursued with Mendoza, the Spanish ambassador, who had been detected in plotting against Elizabeth. He chose the topic to which his attention had thus been directed as a subject for a dis- putation when Leicester and Sir Philip Sidney visited the schools at Oxford in the same year; and this was six months later expanded into a book, the De legationibus libri tres. In 1588

Alberico selected the law of war as the subject of the law disputations at the annual “ Act ” which took placein July; and inthe autumn published in London the De Jure Belli commentatio prima. A secoud and a third Commentatio followed, and the whole matter, with large additions and improvements, appeared at Hanau, in 1598, as the De Jure Belli libri tres. It was doubtless in consequence of the reputation gained by these works that Gentili became henceforth more and more engaged in forensic practice, and resided chiefly in London, leaving his Oxford work ta be partly discharged bya deputy. In 1600 he was admitted to bea member of Gray’s Inn, and in 1605 was appointed standing counsel to the king of Spain. He died 19th June 1608, and was buried, by the side of Dr Matteo Gentili, who had followed his son to England, in the churchyard of St Helen’s, Bishopsgate. By his wife, Hester de Peigni, he left two sons and a daughter. His notes of the cases in which he was engaged for the Spaniards were posthumously published in 1613 at Hanau, as Jis- panew advocationis libri duo. This was in accordance with his last wishes ; but his direction that the remainder of his MSS. should be burnt was not complied with, since fifteen volumes of them found their way, at the beginning of this century, from Amsterdam to the Bodleian library.

The true history of Gentili and of his principal writings has ouly been ascertained quite recently, in consequence of a revived appreciation of the services which he rendered to International law. The movement ta do him honour, which originated four or five years since, has in spreading through Europe encountered two curious cross-currents of opinion,—one the ultra-Catholic, which three centuries ago ordered his name to be erased from all public docu- ments and placed his works in the Zndex; another the narrowly-Dutcb, which is, it seems, needlessly careful of the Supremacy of Grotius. Preceding writers had dealt with various international questions, but they dealt with them singly, and with a servile submission to the deci- Sions of the church. It was left to Gentili to grasp as a whole the relations of states one to another, to distinguish International questions from questions with which they are more or less intimately connected, and to attempt their solution by principles entirely independent of the authority Rome. He uses, without yielding to them implicit ee the reasonings of the civil and even the canon aw, but he proclaims as his real guide the Jus Nature, the highest common sense of mankind, by which historical

ee are to be criticized, and, if necessary, set Ide,

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His faults are not few, His style is prolix, obscure, and to the modern reader pedantic enough; but a comparison of his greatest work with what had been written upon tho same subject by, for instance, Belli, or Soto, or even Ayala, will show that he greatly improved upon his predecessors, not only by the fulness with which he has worked out points of detail, but also by clearly separating the law of war from martial law, and by placing the subject once for all upon a non-theological basis. If, on the other hand, the same work be compared with De Jure Belli ec Pacis of Grotius, it is at once evident that the later writer is in- debted to the earlier, not only for a large portion of his illustrative erudition, but also for all that is commendable in the method and arrangement of the treatise.

The following is probably a complete list of the writings of Gentili, with the places and dates of their first publication :—De Juris interpretibus dialogi sex, Lond., 1582; Leetionwin et epist. que ad jus eivile pertinent libri tres, Lond., 1588-4: De divers. temp. appellationtbus, Hanau, 1584; De Legationibus libri tres, Lond,, 1585; Legal. comitiorwm Oxon. actio, Lond. , 1585-6 ; De naseendt tempore disputatio, Witteb., 1586; Disputationum decas prima, Lond., 1587 ; Conditionwm liber singularis, Lond., 1587 ; De Jure Belli comm. prima, Lond., 1588 ; secunda,

Authorities. —Several tracts by the Abate Benigni in Colucci, Antichita Picene, 1790 ; a Dissertation by W. Reiger annexed to the Program of the Groningen Gymnasium for 1867; an Inaugural Lecture delivered in 1874 by T. E, Holland, and the preface to a new edition of the Jus Belli, 1877, by the same; works by Valdarnini and Foglietti, 1875 ; Speranza and De Giorgi, 1876 ; Fiorini (a translation of the Jus Belli, with essay), 1877; A. Saffi, 1878. See also E. Comba, in the Rivista Christiana, 1876-7 ; and Sir T. Twiss, in the Law Review, 1878. (T. B. H.)

GENTILLY, a town of France, in the department of the Seine, is situated on the Bievre, a short distance south of the fortifications of Paris. Its manufactures include biscuits, soap, vinegar, mustard, wax candles, buttons, leather, and pottery wares. It possesses a church of the 13th century, a

lunatic asylum, a convent, a monastery, and several charitable institutions. The population in 1876 was

10,378.

GENTZ, Frieprica von (1764-1832), born at Breslau, May 2, 1764, aptly and accurately described by his dis- tinguished friend Varnhagen von Ense as a writer-states- man (Schriftsteller Staatsmann). He was more than a publicist or political writer. His position was peculiar, and his career without a parellel, It is believed that no other instance can be adduced of a man exercising the same amount of influence in the conduct of public affairs, without rank or fortune, without high office, without being a member of a popular or legislative assembly, without in fact any ostenible means or instrumentality besides his pen. Born in the middle class in an aristocratic country, he lived on a footing of social equality with princes and ministers, the trusted partaker of their counsels and the chosen exponent of their policy. ; ao ante

His father heldan employment in the Prussian civil Jae his mother was an Ancillon distantly related to the states-

man of that name. On his father’s praminen 2 me mint.

directorship at Berlin and consequent removal to the capital, he was sent to a gymnasium there, and in due course com- pleted his education at the university of Frankfort-on-the- Oder. He is said to have shown neither liking nor aptitude for intellectual pursuits till after his attendance on the lectures of Kant at Kénigsberg, in his twentieth or twenty- first year, when, suddenly lighted up as by inspiration, he set to work in right earnest, mastered the Greek and Latin languages, acquired as perfect a knowledge of French as could well be attained by one who was not a Frenchman, and a sufficient familiarity with English to enable him to translate from it with clearness and fluency. He also managed to gain an intimate acquaintance with English commerce and finance, which he afterwards turned to good account. The extent of his acquirements was rendered, more remarkable by his confirmed habits of dissipation; for from the commencement to the

conclusion of his career he was remarkable for the manner in which, in the midst of the gravest occupations, he indulged his fondness for female society and a ruinous passion for play. In 1786 he was appointed private secretary to the royal general directory, and was soon afterwards promoted to the rank of Kriegsrath (war-councillor). Like Mackintosh, he was fascinated by the French Revolution at its dawn, and, like Mackintosh, was converted to a sounder estimate of its then pending results by Burke. He broke ground in literature in 1794, by a translation of the celebrated Hssay on the French Revolution, followed in 1794 and 1795 by translations from Mallet du Pan and Mounier. In 1795 he founded and cdited a monthly journal which soon came to an untimely end. In November 1797 he published a pamphlet under the title of a Sendscreiben or Missive addressed to Frederick William III. of Prussia on his accession, pointing out the duties of the new sovereign and especially recommending the complete freedom of the press. In the course of the next three years he contributed to the Historisches Journal a series of articles "On the Origin and Character of the War against the French Revolution," with express reference to Great Britain. These led to his visiting England, where he formed intimate relations with Mackintosh, Lord Gren- ville, Pitt, and other eminent men, which proved lasting, flattering, and remunerative. 'The first entries in his pub- lished diary, beginning April 14, 1800, and continued (with breaks) to the end of 1828, run thus :—

"(On the 14th of April, an agreeable surprise. The Jew elder, Hirsch, brought me 50 thalers for drawing up I know not what representation (Vorstellung). May 28.—Received through Baron Kriidener a watch set with (small) brilliants, a present from the emperor of Russia. June 1.—Received through Garlicke a letter

from Lord Grenville, together with a donation of £500, the first of its kind."

The last entry for this year, 1800, is :—" At the end of the year

great pecuniary embarrassment. Received £100 from Garlicke and negotiated with Carysfort."

The diary for 1801 begins :—"" February.—Very remarkable that on the one side Lord Carysfort charged me with the translation into French of the

English Notes against Prussia, and shortly after-

wards Count Haugwitz with the translation into German of the Prussian Notes against England.”

Frequently recurring entries of this kind illustrate his position through life. He was to all intents and purposes a mercenary of the pen, but he was so openly and avowedly and he was never so much as suspected by those who knew him best of writing contrary to his own convictions at the time. This is why he never lost the esteem or confidence of his employers,—of Prince Metternich, for example, who when he was officially attached to the Austrian Government, was kept regularly informed of the sources from which the greater part of his income was derived. Embarrassments of all sorts, ties and temptations from which he was irre- sistibly impelled to tear himself, led to his change of country ; aud an entry for May 1802 runs :—“ On the 15th I take leave of my wife, and at three in the morning of the 20th

desire to secure his services.

GENTZ

T leave Berlin with Adam Miiller, never to see it again’

It does not appear that he ever saw his wife again either; and his intimacies with other women, mostly of the highest rank, are puzzling from their multiplicity. He professes

himself unable to explain the precise history of his settle- ment in Vienna.

AJl he remembers is that he was received with signs of jealousy aud distrust, and that the emperor, to whom he was presented by Count Colloredo, showed no Many years were to elapse before the formation of the connexion with Metternich, the most prominent feature and crowning point of his

career,

Before entering into any kind of engagements with the

Austrian Government he applied to the king of Prussia for

a formal discharge, which was granted with an assurance that his Majesty, “in reference to his merits as a writer, coincided in the general approbation which he had so honourably acquired.” A decisive proof of the confidence placed in him was his being invited by Count Haugwitz to the Prussian headquarters shortly before the battle of Jena, and commissioned to draw up the Prussian manifesto and the king’s letter to Napoleon. It was in noticing this letter that Napoleon spoke of the known and avowed writer as ‘Ca wretched scribe named Gentz, one of those men without honour who sell themselves for money.” In the course of 1806, he published War between Spain and England, and Fragments upon the Balance of Power in Europe, on receiv- ing which (at Bombay) Mackintosh wrote :—‘‘ I assent toall you say, sympathize with all you feel, and admire equally your reason and your eloquence throughout your masterly fragment.” The bond of union between him and Metter- nich was formed in 1840. This was one reason, joined to his general reputation, for his being named first secretary to the congress of Vienna in 1814, where, besides his regular duties, he seems to have made himself. useful to several of the plenipotentiaries, as he notes in his diary that he re ceived 22,000 florins in the name of Louis XVIII from Talleyrand, and £600 from Lord Castlereagh, accompanied by “les plus folles promesses.” He acted in the same capacity at the congress or conference of Paris in 1815, of Aix in 1818, Karlsbad and Vienna in 1819, Troppau and Laybach in 1820 and 1821, and Verona in 1822. The following entry in his diary for December 14, 1819, has ex- posed him to much obloquy as the interested advocate of reactionary doctrines :—‘“ About eleven, at Prince Metter- nich’s: attended the last and most important sitting of the commission to settle the 13th article of the Bundes-Akt, and had my share in one of the greatest and worthiest results of the transactions of our time. A day more important than that of Leipsic.” The 13th article provides that in all states of the Bund the constitutional government shall be by estates

| instead of by a representative body in a single chamber: “ in

allen Bundestaaten wird eine landstindische Verfassung stattfinden.” Remembering what ensued in France from the absorption of the other

estates in the Tiers Etat, it would have been strange if Gentz had not supported this 13th article. He was far from a consistent politician, but he was always a sound Conservative at heart; and his reputation rests on his foreign policy, especially on the courage, elo- quence, and efficiency with which he made head against the Napoleonic system till it was struck down.

The most remarkable phase of Gentz's declining years was his passion, in his sixty-seventh year, for Fanny Elssler, the celebrated danseuse, which forms the subject of some very remarkable letters to his attached friend Rahel (the wife of Varnhagen von Ense) in 1830 and 1831. He died June 9, 1832. There is no complete edition of his works. The late Baron von Prokesch was engaged in pre paring one when the Austrian Government interfered, and the design was perforce abandoned. (a. H)

GHEODESY

EODESY (yj, the earth, daiw, to divide) is the science G of surveying extended to large tracts of country, having in view not only the prvduction of a system of maps of very great accuracy, but the determination of the curva- ture of the surface of the earth, and eventually of the figure and dimensions of the earth. This last, indeed, may be the sole object in view, as was the case in the operations conducted in Peru and in Lapland by the celebrated French astronomers Bouguer, La Condamine, Maupertuis, Clairaut, and others; and the measurement of the meridian arc of France by Mechain and Delambre had for its end the determination of the true length of the "metre" which was to be the legal standard of length of France.

The basis of every extensive survey is an accurate tri- angulation, and the operations of geodesy consist in—the measurement, by theodolites, of the angles of the triangles ; the measurement of one or more sides of these triangles on the ground ; the determination by astronomical observations of the azimuth of the whole network of triangles ; the de- termination of the actual position of the same on the sur- face of the earth by observations, first for latitude at some of the stations, and secondly for longitude.

To determine by actual measurement on the ground the length of a side of one of the triangles, wherefrom to infer the lengths of all the other sides in the triangulation, is not the least difficult operation of a trigonometrical survey. When the problem is stated thus—To determine the num- ber of times that a certain standard or unit of length is contained between two finely marked points on the surface of the earth at a distance of some miles asunder, so that the error of the result may be pronounced to lie between certain very narrow limits,—then the question demands very serious consideration. ‘The representation of the unit of length by means of the distance between two fine lines on the surface of a bar of metal at a certain temperature is never itself free from uncertainty and probable error, owing to the difficulty of knowing at any moment the precise temperature of the bar; and the transference of this unit, or a multiple of it, to a measuring bar, will be affected not only with errors of observation, but with errors arising from uncertainty of temperature of both bars. If the measuring bar be not self-compensating for temperature, its expansion inust be determined by very careful experiments. The thermometers required for this purpose must be very care- fully studied, and their errors of division and index error determined.

The base apparatus of Bessel and that of Colby have been described in Figure of THE EARTH (vol. vii. p. 598). The average probable error of a single measurement of a base line by the Colby apparatus is, according to the very elab- orate investigations of Colonel Walker, C.B., R.E., the Sur- veyor-General of India, + 1°54 (4 meaning “one millionth”). W. Struve gives +084 as the probable error of a base line measured with his apparatus, being the mean of the probable errors of seven hases measured by him in Russia ; but this estimate is probably too small. Struve’s appa- ratus is simple ; there are four wrought iron bars, each two toises (rather more than 13 feet) long; one end of each bar is terminated in a small steel cylinder presenting a slightly convex surface for contact, the other end carries a contact lever rigidly connected with the bar. The shorter arm of the lever terminates below in a polished hemisphere, the upper and longer arm traversing a vertical divided are. In measuring, the plane end of one bar is brought into contact with the short arm of the contact lever (pushed forward by a weak spring) of the next bar. Each bar has

two thermometers, and a level for determining the inclina- tion of the bar in measuring. The manner of transferring the end of a bar to the ground is simply this: under the end of the bar a stake is driven very firmly into the ground, carrying on its upper surface a disk, capable of movement in the direction of the measured line by means of slow-motion screws. A fine mark on this disk is brought vertically under the end of the bar by means of a theodolite which is planted at a distance of 25 feet from the stake in a direction perpendicular tothe base. Struve investigates for each base the probable errors of the measurement arising from each of these seven causes: — alignment, inclination, comparisous with standards, read- ings of index, personal errors, uncertainties of temperature, and the probable errors of adopted rates of expansion.

The apparatus used in the United States Coast Survey consists of two measuring bars, each 6 metres in length, supported on two massive tripod stands placed at one quarter length from each end, and provided, as in Colby's apparatus, with the necessary mechanism for longitudinal, transverse, and vertical adjustment. Each measuring rod is a compensating combination of an iron aud a brass bar, supported parallel to one another and firmly connected at one end, the medium of connexion between the free ends being a lever of compensation so adjusted as to indicate a constant length independent of temperature or changes of temperature. The bars are protected from external influ- ences by double tubes of tinned sheet iron, within which they are movable on rollers by a screw movement which allows of contacts being made within 5395 of an inch. The abutting piece acts upon the contact lever which is attached to the fixed end of the compound bar, and carries a very sensitive level, the horizontal position of which de- fines the length of the bar. It is impossible here to give a full description of this complicated apparatus, and we must refer for details to the account given in full in the United States Coast Survey Report for 1854, This appa- ratus is doubtless a very perfect one, and the manipulation of it must offer great facilities, for it appears to be possible, under favourable circumstances, to measure a mile in one day, 1:06 mile having been measured on one occasion in eight and a half hours. In order to test to the utmost the apparatus, the base at Atalanta, Georgia, was measured twice in winter and once in summer 1872-73, at tempera- tures 51°, 45°, 90° F. ; the difference of the first and second measurements was +0°30 in., of the

second and third + 0°34 in.,—the actual length and computed probable error expressed in metres being 9338°4763 40-0166. It is to be noted that in the account of a base recently measured in the United States Lake Survey, some doubt is expressed as to the perfection of the particular apparatus of this de- scription there used, on account of a liability to permanent changes of length.

The last base line measured in India with Colby's com- pensation apparatus had a length of 8912 feet only, and in consequence of some doubts which had arisen as to the accuracy of this compensation apparatus, the nieasurement was repeated four times, the operations being conducted in such a manner as to indicate as far as possible the actual magnitudes of the probable errors to which such measures are liable. 'The direction of the line (which is at Cape Comorin) is north and south, and in two of the measure- ments the brass component was to the west, 1n the other two it was to the east. The differences between the indi- vidual measurements and the mean of the four are 0017, — 0049, —:0015, ~~0045 in feet. The measure~~

ments occupied from seven to ten days each,—the average rate of such work in India being about a mile in five days.

The method of M. Porro, adopted in Spain, and by the French in Algiers, is essentially different from those just described. The measuring rod, for there is only one, is a thermometric combination of two bars, one of platinum and one of brass, in length 4 metres, furnished with three levels and four thermometers. Suppose A, B, C three micrometer microscopes very firmly sup- ported at intervals of 4 metres with their axes vertical, and aligned in the plane of the base line by means of a transit instrument, their micrometer screws being in the line of measurement. The measuring bar is brought under say A and B, and those micrometers read ; the bar is then shifted and brought under B and C. "By repetition of this process, the reading of a micrometer indicating the end of each position of the bar, the measurement 1s made.

The probable error of the central base of Madridejos, which has a length of 14664'500 metres, is estimated at + 0°17p. This is the longest base line in

Spain; there are seven others, six of which are under 2500 metres in length ; of these one is in Majorca, another in Minorca, and a third in Ivica. ‘The last base just measured in the province of Bar- celona has a length of 2483-5381 metres according to the first measurement, and 2483°5383 according to the second.

The total number of base lines measured in Europe up

to the present time is about eighty, fifteen of which do not’

exceed in length 2500 metres, or about a mile and a half, and two—one in France, the other in Bavaria—exceed 19,000 metres. The question has been frequently discussed whether or not the advantage of a long base is sufficiently great to warrant the expenditure of time that it requires, or whether as much precision is not obtainable in the end by careful triangulation from a short base. But the answer cannot be given generally ; it must depend on the circum- stances of each particular case.

It is necessary that the altitude above the level of the sea of every part of a base line be ascertained by spirit levelling, in order that the measured length may be reduced to what it would have been had the measurement been made on the surface of the sea, produced in imagination. Thus if 7 be the length of a measuring bar, / its height at any given position in the measurement, 7 the radius of the earth, then the length radially projected on to the level

of the sea is?-” 2. In the Salisbury Plain base line the

r reduction to the level of the sea is — 0-6294 feet.

In working away from a base line ab, stations ¢, d, ¢, f are carefully selected so as to obtain from well-shaped tri- angles gradually increasing sides, Before, however, finally leaving the base line it is usual to verify it by triangulation thus: during the measurement two or more points, as p, q (fig. 1), are marked in the base in positions such that the lengths of the different segments of the line are known; then, taking suitable external stations, as h, k, the angles of the triangles bhp, phq, hak, kga are measured. From these angles can be com- puted the ratios of the seg- ments, which must agree, if

all Operations are correctly _ per- formed, with the ratios resulting from the measures. Leaving the base line, the sides increase up

Fig. 1. to ten, thirty, or fifty miles; occasionally, but seldom, reach-

ing a hundred miles. The triangulation points may either

be natural objects presenting themselves in suitable posi- tions, such as church towers; or they may be objects specially constructed in stone or wood on mountain tops or other prominent ground. In every case it is necessary that the precise centre of the station be marked by some permanent mark. In India no expense is spared in making permanent the principal trigonometrical stations—costly towers in masonry being erected. It is essential that every trigonometrical station shall present a fine object for ob- servation from surrounding stations,

Horizontal Angles.

In placing the theodolite over a station to be observed from, the first point to be attended to is that it shall rest upon a perfectly solid foundation. The method of obtain- ing this desideratum must depend entirely on the nature of the ground; the instrument must if possible be supported on rock, or if that be impossible a solid foundation must be obtained by digging. When the theodolite is required to be raised above the surface of the ground in order to command particular points, it is necessary to build two scaf- folds, —the outer one to carry the observatory, the inner one to carry the instrument,—and these two edifices must have no point of contact. Many cases of high scaffolding have occurred on the English Ordnance Survey, as for instance at Thaxted Church, where the tower, 80 feet high, is sur- mounted by a spire of 90 feet. The scaffold for the ob- servatory was carried from the base to the top of the spire; that for the instrument was raised from a point of the spire 140 feet above the ground, having its bearing upon timbers passing through the spire at that height. Thus the instru- ment, at a height of 178 feet above the ground, was insulated, and not affected by the action of the wind on the observatory.

At every station it is necessary to examine and correct the adjustments of the theodolite, which are these:—the line of collimation of the telescope must be perpendicular to its axis of rotation; this axis perpendicular to the vertical axis of the instrument ; and the latter perpendicular to the plane of the horizon. The micrometer microscopes must also measure correct quantities on the divided circle or circles. The method of observing is this. Let A,B,C…. be the stations to be observed taken in order of azimuth; the telescope is first directed to A and the cross-hairs of the telescope made to bisect the object presented by A, then the microscopes or verniers of the horizontal circle (also of the vertical circle if necessary) are read and recorded, The telescope is then turned to B, which is observed in the same manner; then C and the other stations. Coming round by continuous motion to A, it is again observed, and the agree- ment of this second reading with the first is some test of the stability of the instrument, In taking this round of angles—or ‘‘arc,” as it is called on the Ordnance Survey— it is desirable that the interval of time between the first and second observations of A should be as small as may be consistent with due care. Before taking the next are the horizontal circle is moved through 20° or 30°; thus a dif ferent set of divisions of the circle is used in each are, which tends to eliminate the errors of division.

It is very desirable that all arcs at a station should contain one point in common, to which all angular measure- ments are thus referred,—the observations on each are com-

| mencing and ending with this point, which is on the Ord-

nance Survey called the “referring object.” It is usual for this purpose to select, from among the points which have to be observed, that one which affords the best object for precise observation. For mountain tops a “referring ob-

ject ” is constructed of two rectangular plates of metal in

the same vertical plane, their edges parallel and placed ab such a distance apart that the light of the sky seen through

appears as a vertical line about 10” in width. The best distance for this object isfrom one to two miles.

It is clear that no correction is required to the angles measured by a theodolite on account of its height above the sea-level; for its axis of rotation coincides with the normal to the surface of the earth, and the angles measured between distant points are those contained between the vertical planes passing through the axis of the instrument aud those points.

The theodolites used in geodesy vary in pattern and in size—the horizontal circles ranging from 10 inches to 36 inches in diameter. In Ramsden’s 36-inch theodolite the tulescope has a focal length of 36 inches and an aperture of 2°5 inches, the ordinarily used magnifying power being 54; this last, however, can of course be changed at the requirements of the observer or of the weather. The pro- bable error of a single observation of a fine object with this theodolite is about 0’*2.

Fig. 2 represents an altazimuth theodolite of an im- proved pattern now used on the Ordnauce Survey. The

aah os

rd ba » SSS =F.

Fia. 2.—Altazimuth Theodolite.

horizontal circle of 14 inches diameter is read by three mutcrometer microscopes ; the vertical circle has a diameter of 12 inches, and is read by two microscopes.

In the Great Trigonometrical Survey of India the theo- dolites used in the more important parts of the work have been of 2 and 3 feet diameter,—the circle read by five Hh oy microscopes. Every angle is measured twice ar position of the zero of the horizontal circle, of Ich there are generally ten; the entire number of neasures of an angle is never less than 20. An examin- ation of 1407 angles showed that the probable error of an observed angle is on the average + 0°28.

For the observations of very distant stations it is usual

| in seconds of angle, omitting smaller terms. | symbol 8 is the star’s declination, z its zenith distance. The

| description. | used on the Ordnance Survey, the uprights carrying the tele-

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to employ a heliostat. In its simplest form this is a plane mirror 4, 6, or 8 inches in diameter, capable of rotation round a horizontal and a vertical axis. This mirror is placed at the station to be observed, and in fine weather it is kept so directed that the rays of the sun reflected by it strike the distant observing telescope. To the observer the heliostat presents the appearance of a star of the first or second magnitude, and is generally a pleasant object. for observing.

Astronomical Observations.

The direction of the meridian is determined either by a theodolite or a portable transit instrument. In the former case the operation consists in observing the angle between a terrestrial object—generally a mark specially erected and capable of illumination at night—and a close circumpolar star at its greatest eastern or western azimuth, or, at any rate, when very near that position. If the observation be mace ¢ minutes of time before or after the time of greatest azimuth, the azimuth then will differ from its maximum value by

asoran re, sln 2

Here the

collimation and level errors are very carefully determined

| before and after these observations, and it is usual to arrange

the observations by the reversal of the telescope so that collimation error shall disappear. If 6, ¢ be the level and

| collimation errors, the correction to the circle reading is

b cot zc cosec 2, b being positive when the west end of the axis is high. It is clear that any uncertainty as to the

| real state of the level will produce a corresponding uncer- | tainty in the resulting value of the azimuth,—an uncer-

tainty which increases with the latitude, and is very large in high latitudes. This may be partly remedied by observ-

| ing in connexion with the star its reflexion in mercury.

In determining the value of “one division” of a level tube,

| it is necessary to bear in mind that in some the value varies

considerably with the temperature. By experiments on the

| level of Ramsden’s 3-foot theodolite, it was found that | though at the ordinary temperature of 66° the value of a | division was about one second, yet at 32° it was about five | seconds.

The portable transit in its ordinary form hardly needs in a very excellent instrument of this kind

scope are constructed of mahegany, each upright being built

| of several pieces glued and screwed together ; the base,

which is a solid and heavy plate of iron, carries a reversing

| apparatus for lifting the telescope out of its bearings, | reversing it, and letting it down again. Thus is avoided

the change of temperature which the telescope would incur by being lifted by the hands of the observer. Another

| form of transit is the German diagonal form, in which the

rays of light after passing through the object glass are

| tumed by a total reflexion prism through one of the trans-

verse arms of the telescope, at the extremity of which arm is the eye-piece. The unused half of the ordinary telescope being cut away is replaced by a counterpoise. In this in- strument there is the advantage that the observer without moving the position of his eye commands the whole meridian, and that the level may remain on the pivots whatever be the elevation of the telescope. But there is the disadvantage that the flexure of the transverse ax! causes a variable collimation error depending on the zenith distance of the star to which it is directed ; and moreover it has been found that in some cases the personal error of an observer is not the same in the two positions of the

telescope.

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To determine the direction of the meridian, it is well to erect two marks at nearly equal angular distances on either side of the north meridian line, so that the pole star crosses the vertical of each mark a short time before and after attaining its greatest eastern and western azimuths.

If now the instrument, perfectly levelled, is adjusted to lave its centre wire on one of the marks, then when ele- vated to the star, the star will traverse the wire, and its exact position in the field at any moment can be measured by the micrometer wire. Alternate observations of the star and the terrestrial mark, combined with careful level readings and reversals of the instrument, will enable one, even with only one mark, to determine the direction of the meridian in the course of an hour with a probable error of less than a second. ‘The second mark enables one to com- plete the station more rapidly, and gives a check upon the work, As an instance, at Findlay Seat, in latitude 57° 35’, the resulting azimuths of the two marks were 177° 45′ 37°29 + 0-20 and 182° 17’ 1561 + 0°13, while the angle between the two marks directly measured by a theodolite was found to be 4° 31’ 37-43 + 0°23.

We now come to the consideration of the determination of time with the transit instrument. Let fig. 3 repre- sent the sphere stereographi- cally projected on the plane of the horizon,—ns being the meridian, we the prime verti- cal, Z, P the zenith and the pole. Let p be the point in which the production of the axis of the instrument meets the celestial sphere, S the posi- tion of a star when observed on a wire whose distance from the collimation centre isc Leta

Fig. 3. be the azimuthal deviation, namely, the angle wZp, 6 the

level error so that Zp=90°-6, Let also the hour angle corresponding to p be 90°—™, and the declination of the same =, the star's declination being 6, and the latitude ¢. Then to find the hour angle ZPS=7 of the star when observed, in the triangles pPS, pPZ we have, since pPs =90+7-2, —Sin c=sin m sin 6+cosm™ cos 6 sin (n-7), Sinm=sin 0 sin @¢-cos dD cos ¢ sin a,

Cos m sin n=sin 6b cosp+cos b sin > sina. And these equations solve the problem, however large be the errors of the instrument. Supposing, as usual, a, 6, m, n to be small, we have at once r=" c sec 8 m tan 8, which is the correction to the observed time of transit. Or, eliminating m and » by means of the second and third equations, and putting zfor the zenith distance of the star ¢ for the observed time of transit, the corrected time is asin +b cos z+c¢ ~ et

Real very convenient form for stars near the zenith is is—

t+

T=b sec c sec 8 (tan 5—tan 9).

Suppose that in commencing to observe at a station the error of the chronometer is not known; then having se- cured for the instrument a very solid foundation, removed as far as possible level and collimation errors, and placed it by estimation nearly in the meridian, let two stars dif- fering considerably in declination be observed—the in- strument not being reversed between them. From these two stars, neither of which should be a

close circumpolar star, a good approximation to the chronometer error can be obtained ; thus let ¢,, «, be the apparent clock errors given

by these stars, if 6,, 8, be their declinations the real error is

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tan »—tan 6,

si Male ite 8, —tan 3,

Of course this is still only approximative, but it will enable the observer (who by the help of a table of natural tangents can compute e in a few minutes) to find the meridian by placing at the proper time, which he now knows approxi- mately, the centre wire of his instrument on the first star that passes—not near the zenith.

The transit instrument is always reversed at least once in the course of an evening's observing, the level being frequently read and recorded. It is necessary in most iustruments to add a correction for the difference in size of the pivots.

The transit instrument is also used in the prime vertical for the determination of latitudes. In the preceding figure let g be the point in which the northern extremity of the axis of the instrument produced meets the celestial sphere. Let »Zq be the azimuthal deviation=a, and 6 being the level error, Zg= 90° —8; let also nPg=rand Pg=y. Let S' be the position of a star when observed on a wire whose distance from the collimation centre is c, positive when to the south, and let 2 be the observed hour angle of the star, viz., ZPS'. Then the triangles gPS', gPZ give

—Sinc = sin § cos y—cos 8 sin p cos (h+7), Cos py = sin dD sin ¢ + cos b cos $ cos a, Sin py sin + = cos 6 sin a.

Now when a and 2 are very small, we see from the last two equations that y= o-0, a=r sin y, and if we caleu- late # by the formula cot ¢'=cot 6 cos h, the first equa- tion leads us to this result—

j asin +b cosz+e COs 2 ‘

e=¢ the correction for instrumental error being very similar to that applied to the observed time of transit in the case of meridian observations. When a is not very small and z is small, the formule: required are more complicated.

The method of determining latitude by transits in the prime vertical has the disadvantage of being a somewhat slow process, and of requiring a very precise knowledge of the time, a disadvantage from which the zenith telescope is free. In principle this instrument is based on the proposi- tion that when the meridian zenith distances of two stars at their upper culminations—one being to the north and the other to the south of the zenith—are equal, the latitude is the mean of their declinations ; or, if the zenith distance of a star culminating to the south of the zenith be Z, its de clination being 8, and that of another culminating to the north with zenith distance Z’ and declination 6, then clearly the latitude is 4(8+8)+4(Z-Z’). Now the zenith telescope does away with the divided circle, and sub- ey the measurement micrometrically of the quantity

‘-Z.

The instrument (fig. 4) is supported on a strong tripod, fitted with levelling screws ; to this tripod is fixed the azt muth circle and a long vertical steel axis. Fitting on this axis is a hollow axis which carries on its upper end a short transverse horizontal axis. This latter carries the telescope, which, supported at the centre of its length, is free to rotate in a vertical plane. The telescope is thus mounted excentrically with respect to the vertical axis around which it revolves. An extremely sensitive level is attached to the telescope, which latter carries a micrometer in its eye- piece, with a screw of long range for measuring differences of zenith distance. For this instrument stars are selected in pairs, passing north and south of the zenith, culminating within a few minutes of time and within about twenty minutes (angular) of zenith distance of each other. When a pair of stars is to be observed, the telescope is set t0 the mean of the zenith distances and in the plane of the

meridian. The first star on passing the central meridional wire is bisected by the micrometer ; then the telescope is rotated very carefully through 180° round the vertical axis, and the second star on passing through the field is bisected

by the micrometer on the centre wire, The micrometer has thus measured the difference of the zenith distances, and the calculation to get the latitude is most simple. Of course it is necessary to read the level, and the observations are not necessarily confined to the centre wire. In fact if n, s be the north and south readings of the level for the south star, n’, s’ the same for the north star, J the value of one division of the level, m the value of one division of the micrometer, 7, 7’ the refraction corrections, H, 4 the micrometer readings of the south and north star, the micrometer being supposed to read from the zenith, then, Supposing the observation made on the centre wire,— P=H(5 +9) + 4(u— wrt Hnt+n’—s—s’\l+h(r—-7’).

It is of course of the highest importance that the value m of the screw be well determined. This is done most effectually by observing the vertical movement of a close circumpolar star when at its greatest azimuth.

In a single night with this instrument a very accurate result, say with a probable error of about 0”°3 or 0’°4, could be obtained for latitude from, say, twenty pair of rey me when the latitude is required to be obtained with . ighest possible precision, four or five fine nights are

ccessary. The weak point of the zenith telescope lies in

the circumstance that its requirements prevent the selection of stars whose positions are well fixed; very frequently it is necessary to have the declinations of the stars selected for this instrument specially observed at fixed observatories. The zenith telescope is made in various sizes from 30 to 54 inches in focal length; a 30-inch telescope is sufficient for the highest purposes, and is very portable. The zenith telescope is a particularly pleasant instrument to work with, and an observer has been known (a sergeant of Royal Engineers, on one occasion) to take every star in his list during eleven hours on a stretch, namely, from 6 o’clock P.M. until 5 a.M.,

and this on a very cold November night on one of the highest points of the Grampians. Observers accustomed to geodetic operations attain considerable powers of endurance. Shortly after the commencement of the observations on one of the hills in the Isle of Skyea storm carried away tle wooden houses of the men and left the observatory roofless. Three observatory roofs were sub- sequently demolished, and for some time the observatory was used without a roof, being filled with snow every night and emptied every morning. Quite different, however, was the experience of the same party when on the top of Ben Nevis, 4406 feet high. For about a fortnight the state of the atmosphere was unusually calm, so much so, that a lighted candle could often be carried between the tents of the men and the observatory, whilst at the foot of the hill the weather was wild and stormy.

Calculation of Triangulation.

The surface of Great Britain and Ireland is uniformly covered by triangulation, of which the sides are of various lengths from 10 to 111 miles. The largest triangle has one angle at Snowdon in Wales, another on Slieve Donard in Ireland, and a third at Scaw Fell in Cumberland ; each side is over a hundred miles, and the spherical excess is 64”.

The more ordinary method of triangulation is, however, that of chains of triangles, in the direction of the meridian and perpendicular thereto. The principal triangulations of France, Spain, Austria, and India are so arranged, Oblique chains of triangles are formed in Italy, Sweden, and Nor- way, also in Germany and Russia, and in the United States. Chains are composed sometimes merely of con- secutive plain triangles; sometimes, and more frequently in India, of combinations of triangles forming consecutive polygonal figures. In this method of triangulating, the sides of the triangles are generally from 20 to 30 miles in length—seldom exceeding 40.

The inevitable errors of observation, which are insepar- able from all angular as well as other measurements, in- troduce a great difficulty into the calculation of the sides of a triangulation. Starting from a given base in order to get a required distance, it may generally be obtained in several different ways—that is, by using different sets of triangles. The results will certainly differ one from another, and probably no two will agree. The experience of the computer will then come to his aid, and enable him to say

which is the most trustworthy result ; but no experi- ence or ability will carry him through a large network of triangles with anything like assurance. The only way to obtain trustworthy results is to employ the method of least squares, an explanation of which will be found in FIcuRE or THE Earra (vol. vii. p. 605). We cannot here give any illustration of this method as applied to general triangula- tion, for it is most laborious, even for the simplest cases. We may, however, take the case of a simple ogee' mencing with the consideration of a single triangle in whic all three angles have been observed.

Suppose that the sum of the observed angles exceeds the proper

i Ame : i er cor- amount by a small quantity e: it is required to assign prop rections – the sicilies so as to cause this error to disappear. To

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i ust be guidec by the weight of the determinations of are F When 2 series Mf direct and independent observations is made, under similar circumstances, of any measurable magnitude —as an angle—the weight of the result is equal to half the square of the number of observations divided by the sum of the squares of the differences of the individual measures from the mean of all. Now let h, &, J be the weights of the three measured angles, and let x, y, # be the corrections which should be applied to them. We know that cky? lz a minimum. Here we arrive at a simple definite problem, the result of which is ha=ky=/z, showing that ¢ has to be divided into three parts which shall be proportional to the reciprocals of the weights of the corresponding angles. In what follows we shall, for simpli- city, suppose the weights of the observed angles to be all equal.

Suppose now that A, B, C are the three angles of a triangle, and that the observed values are A+¢,, B+eé,, C+eg; then, although £1, C99 3) the errors of observation, are unknown, yet by adding up the observed angles and finding that the sum is in excess of the truth by a small quantity ¢, we get ¢;+¢,¢,=¢ Now, according to the last proposition, if we suppose the angles to be equally well observed, we have to subtract 4¢ from each of the observed values, which thus become A $¢,— $¢,— $¢3, B – $e, + 3¢q —

S¢35 C— he, — 4¢,+ $3. Then to obtain a and 6 by calculation from the known side ¢, we have

a@ sin (C— §¢, — 4, + 3¢3)=¢ sin (A + $e, — $49 — $25), with a similar expression for the relation between b andc. Put a, B, y for the cotangents of A, B, C, then the errors of the computed values of a and 6 are expressed thus—

Ba= ha{e,(2at-y)+e(-at-y)+e5(-a-2y)}

Bb = 4b {e,(— B+) +e4(2B-+y) + ey – B- 2y)} * Now these actual errors must remain unknown; but we here make use of the following theorem, proved in the doc- trine of probabilities. The probable error of a quantity which is a function of several independently observed ele- ments is equal to the square root of the sum of the squares of the probable errors that would arise from each of the observed elements taken singly. Now suppose that each angle in a triangle has a probable error e, then we replace €15 ys €g by €, and adding up the squares of the coefficients find for the probable error of a, + ae ./6 ,/(a?+ay+y’), and for that of 6, + tbe /6 /(8?+By+y?). Suppose the triangle equilateral, each side eiglit J miles, and the probable error of an observed angle 0’“3; then the probable error of either of the computed sides will be found to be 0°60 inches.

Take a chain of triangles as indi- cated in the diagram (fig. 5); suppose all the angles measured, and that the sides MN, HJ are measured bases; it is required to investigate the neces- sary corrections to the observed angles in order not only that the sum of the three angles of each triangle fulfil the necessary condition, but that the length / ac, of HJ, calculated from that of MN, 4 shall agree with the measured length.

Let X,, Y;, Z, &c., be the angles as observed, x &

‘ ? ’ 1 4 a ’ ” th required ereevens then each “triangle on adding ap ie ipahe gives an equation %+%4,+%+¢€,=0. Let the c ees ye te, ve ig. e corrected angles be

HJ _ sin X} sin X} sin X} sin X}

MN sin Y} sin Y} sin Y? sin No

sin X, sin X, sin X, sin X =5 . a 4 ‘ sin Y, sin Y, sin Y; sin yt ah set a, By, Y,- « . be the cotangents of the angel Let]) gles, so that sin X! =sin X(1+a2x), then w in this last equation is easily seen to be the right hand member of the equation P= 02 = ByYfy + 19%q— BoYot Here f is known numerically, for the ratio of the j measured b

known, and the product of the ratios of the sines of the Si angles is known by computation. 1, Yj, %,---. are those which make the sum 3(x2+4 424 22 ini mum, or, as we may write it, pater ee

P= Xx? + 424 (e+e+y)%)

Fig. 5. N

The most probable values of

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a minimum. This, and the previous equation in /, determine al] the corrections. Differentiate both and multiply the former bya multiplier P, then

Qe:yit e+ Pai=0,

QYi FBG Ps,=0 ‘

8xi= — P(2a,+ B:)-4,

8y’= Plart+28:)—e.

| Now, substitute these values in the f equation, and P becomes _ known; then follow at once all the corrections from the two last ‘ written equations. | angles, every side in the triangulation has a definite value, whieh | is obtained by the ordinary method of calculation.

These corrections being applied to the observed

A spheroidal triangle differs from a spherical triangle, not only in that the curvatures of the sides are different one

‘ from another, but more especially in this that, while in the

spherical triangle the normals to the surface at the angular points meet at the centre of the sphere, in the spheroidal

triangle the normals at the angles A, B, C meet the axis of

revolution of the spheroid in three different points, which we may designate a, B, y respectively. Now the angle A of the triangle as measured by a theodolite is the inclination of the planes BAa and CAa, and the angle at B is that contained by the planes ABB and CBP. But the planes ABa and ABf containing the line AB in common cut the surface in two distinct plane curves, In order, therefore, that a spheroidal triangle may be exactly defined, it is necessary that the nature of the lines joining the three vertices be stated. Ina mathematical point of view the most natural definition is that the sides be geodesic or shortest lines. Gauss, in his most elegant treatise entitled Disquisitiones generales circa superficies curvas, has entered fully into the subject of geodesic triangles, and has in- vestigated expressions for the angles of a geodesic triangle whose sides are given, not certainly finite expressions, but approximations inclusive of small quantities of the fourth order, the side of the triangle or its ratio to the radius of the nearly spherical surface being a small quantity of the first order. ‘The terms of the fourth order, as given by Gauss for any surface in general, are very complicated even when the surface is aspheroid, If we retain small quanti- ties of the second order only, and put A, %, & for the angles of the geodesic triangle, while A, B, C are those of a plane triangle having sides equal respectively to those of the geodesic triangle, then, g being the area of the triangle and u, b,c the measures of curvature at the angular points,

=k a. ©

a= +5 (2Qat+b+¢),

%=B+-7(a+2b+ ia!)s =0 4+ 7(44+b+4+2t).

a@=C (a+b + 2c)

The geodesic line being the shortest that can be drawn on any surface between two given points, we may be con- ducted to its most important characteristics by the follow- ing considerations : let p, g be adjacent points ou a curved surface ; through s the middle point of the chord pq imagine a plane drawn perpendicular to pg, and let S be any point in the intersection of this plane with the surface; then pS + Sq is evidently least when sS is a minimum, which is when sS isa normal to the surface ; hence it follows that of all plane curves on the surface joining p, g, when those points are indefinitely near to one another, that is the shortest which is made by the normal plane. That is to say, the osculating plane at any point of a geodesic line contains the normal to the surface at that point, Imagine nowthree points in space, A, B,C, such that AB = BC=c; let the direction cosines of AB be d, m,n, those of BC U’,m’,n’, then x, y,2 being

the coordinates of B, those of A and C will be respectively—

w-cl :y-—em :2-en ete’ sytem :z+en,

Hence the coordinates of the middle point M of AC are

a+ he(l’-1), y+ 4c(m’ — m), 2+ he(n’ — 2), and the direction

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cosines of BM are therefore proportional to l’-1: m’’-—m: ni—n. If the angle made by BC with AB be indefinitely small, the direction cosines of BM are as &: dm: dn. Now if AB, BC be two contiguous elements of a geodesic, then BM must be a normal to the surface, and since o/, dm, dn dz

are in this case represented by 3c 3%, oe we have d*x d?y Geez af de = ds a du’ de dy dz

which, however, are equivalent to only one equation. In the case of the spheroid this equation becomes

ax d’y

C) oc) ace gee

which integrated gives yda—ady=Cds. This again may be put in the form 7 sin a=C, where a is the azimuth of the geodesic at any point—the angle between its direction and that of the meridian—and , the distance of the point from the axis of revolution.

From this it may beshown that the azimuth at A of the geodesic joining AB is not the same as the astronomical azimuth at A of B or that determined by the vertical plane AaB. Generally speaking, the geodesic lies between the two plane section curves joining A and B which are formed by the two vertical planes, supposing these points not far apart. If, however, A and Bare nearly in the same latitude, the geodesic may cross (between A and B) that plane curve which lies nearest the adjacent pole of the spheroid. The condition of crossing is this. Suppose that for amoment we drop the consideration of the earth's non-sphericity, and draw a perpendicular from the pole C on AB, meeting it in S between A and B. Then A being that point which is nearest the pole, the geodesic will cross the plane curve if AS be between JAB and 3AB. If AS lie between this last value aud 4AB, the geodesic will lie wholly to the north of both plane curves, that is, supposing both points to be in the northern hemisphere.

The circumstance that the angles of the geodesic triangle do not coincide with the true angles as observed renders it Inconvenient to regard the geodesic lines as sides of the triangle. A more convenient curve to regard as the side of the spheroidal triangle is this: let L be a point on the curve surface between A and B, X the point in which the normal at L intersects the axis of revolution, then if L be subject to the condition that the planes ALA, BLA coincide, it traces out a curve which touches at A and B the two plane curves before specified. Joining A, B, C by three such lines, the angles of the triangle so formed coincide with the true angles,

Let the azimuths (at the middle point, say) of the sides BC, CA, AB ofa spheroidal triangle be a, 8, y, these being measured from 0° to 360 continuously, and the angles of the triangle lettered in ts same cyclical direction, and let a, 6, ¢ be the lengths of the sides. a there be a sphere of radius 7, such that r is a mean proportional

ee the principal radii of curvature at the mean latitude of the spheroidal triangle, and on this sphere a triangle having a equal respectively to a, b,¢. If A’, B’, C’ be the angles of the spheroidal triangle, A, B, C those of the spherical triangle, then

3

A’-As= oo cos *(b? sin 28 – ¢? sin 2+) ,

@ a , B= 8B = Toye 08 2b(c? siu 2y — a? sin 2a),

/ e . ae = Comtior cos *¢(a? sin 2a — 6? sin 28) . es these together, it appears that, to the order of terms ential ae the sum of the angles of the spheroidal triangle is oiled Ap sum of the angles of the spherical triangle. The Spherical excess of a spheroidal triangle is therefore obtained by lultiplying its arca by 5 , Gauss’s measure of curvature.

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Further, let Aj, B,, C, be the angles of a planc triangle having

still the same sides a, b, e, then it may be shown by spherical trigo- nometry that, 7 being the radius of the sphere as before,

A-Aya B+) .

37″ 1207?

A 7427 +02 + 7e B-Bage(+g) C= Ce A (gy (01 Oe

: sal + “F9008 ;

It is but seldom that the terms of the fourth order are required. Omitting them, we have Legendre’s theorem, viz., “If from each of the angles of a spherical triangle, the sides of which are small in comparison with the radius, one-third of the spherical excess be deducted, the sines of the angles thus diminished will be proportional to the length of the opposite sides, so that the triangle may be computed as a plane triangle.” By this means the spherical triangles which present themselves in geodesy are computed with

very nearly the same ease as plane triangles. And from the expressions given above for the spheroidal angles A’, B’, C’ it may be proved that no error of any consequence can arise from treating aspheroidal triangle as a spherical, the radius of the sphere being as stated above.

When the angles of a triangulation have been adjusted by the method of least squares, the next process is to calcu- late the latitudes and longitudes of all the stations starting from one given point. The calculated latitudes, longitudes, and azimuths, which are designated geodetic latitudes, longitudes, and azimuths, are not to be confounded with the observed latitudes, longitudes, and azimuths, for these last are subject to somewhat large errors. Supposing the latitudes of a number of stations in the triangulation to be observed, practically the mean of these determines the posi- tion in latitude of the network, taken as a whole. So the orientation or general azimuth of the whole is inferred from all the azimuth observations. The triangulation is then supposed to be projected on a spheroid of given elements, representing as nearly as one knows the real figure of the earth, Then, taking the latitude of one point and the direc- tion of the meridian there as given—obtained, namely, from the astronomical observations there —one can compute the latitudes of all the other points with any degree of precision that may be considered desirable. It is necessary to employ for this purpose formule which will give results true even for the longest distances to the second place of decimals of seconds, otherwise there will arise an accumulation of errors from imperfect calculation which should always be avoided. For very long distances, eight places of decimals should be employed in logarithmic calculations ; if seven places only are available very great care will be required to keep the last place true. Now let ¢, ¢’ be the latitudes of two stations A and B; a, a’ their mutual azimuths counted from north by east continuously from 0° to 360°; w their difference of longitude measured from west to east ; and s the distance AB.

First compute a latitude g, by means of the formula

$= $+ cos a, where p is the radius of curvature of the

meridian at the latitude ¢; this will require but four places of logarithms. Then, in the first two of the following, five places are sufficient—

Sales: Ca sinc OSie/, 2pn $2 a) n=—— sin *e tan ¢,, 2pn

co) ~~g=+ cos (a~~ fe) -7 ,

o eo sin (a ~ $e) — i) Sy a Pn A a cos (p’ + $n)

a’ ~a=w sin (@’ + 3n)— € +180”. See aap:

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Here n is the normal or radius of curvature perpendicular to the meridian; both 2 and p correspond to latitude 4, and p, to latitude 4(p+¢’’). For calculations of latitude and longitude, tables of the logarithmic values of p sin ils nsin 1”, and 2npsin 1” are necessary, The following table contains these logarithms for every ten minutes of latitude from 52° to 53° computed with the elements a= 20926060 and a:¢= 295 : 294 :—

1 .

igs: p sin 1” is nsin 1” Ene 2onsin 1” 7’°9939434 7°9928231 0°37181

9309 8190 29 9185 81 28 9060 810, 26 8936 8065 24 8812 8024 23 8688 7982 22

The logarithm in the last column is that required also for the calculation of spherical excesses, the spherical excess of a triangle ab sin C

i id by: == =. being expressed by a

It is frequently necessary to obtain the coordinates of one point with reference to another point; that is, let a perpendicular arc be drawn from B to the meridian of A meeting it in P, then, a being the azimuth of B at A, the coordinates of B with reference to A are

AP=s cos (a— $e),

BPs sin (a— $e), where ¢ is the spherical excess of APB, viz., s*sinacosa multiplied by the quantity whose logarithm is in the fourth column of the above table.

Trregularities of the Harth’s Surface.

In considering the effect of unequal distribution of matter in the earth’s crust on the form of the surface, we may simplify the matter by disregarding the considerations of rotation and excentricity. In the first place, supposing the earth a sphere covered with a film of water, let the density p be a function of the distance from the centre so that surfaces of equal density are concentric spheres. Let now a disturbance of the arrangement of matter take place, so that the density is no longer to be expressed by p, a function of 7 only, but is expressed by p+p’, where p’ is a function of three coordinates 6,¢,7. ‘Then p’ is the density of what may be designated disturbing matter ; it is positive in some places and negative in others, and the whole quan- tity of matter whose density is p’ is zero, The previously spherical surface of the sea of radius a now takes a new form. Let P be a point on the disturbed surface, P’ the corresponding point vertically below it on the undisturbed surface, PP’=u, The knowledge of w over the whole sur- face gives us the form of the disturbed or actual surface of the sea; it is an equipotential surface, and if V be the

potential at P of the disturbing matter p’, M the mass of the earth,

As far as we know, w is always a very small quantity, and ‘

we have with sufficient approximation w = = where 6 is TOA

the mean density of the earth. Thus we have the disturb. ance in elevation of the sea-level expressed in terms of the |

potential of the disturbing matter. If at any point P the value of w remain constant when we pass to any adjacent point, then the actual surface is there parallel to the ideal spherical surface; as a rule, however, the normal at P is in- clined to that at P’, and astronomical observations have

shown that this inclination, amounting ordinarily to one or two seconds, may in some cases exceed 10, or, as at the foot of the Himalayas, even 30 seconds. By the expression ‘¢ matheniatical figure of the earth” we mean

the surface of the sea produced in imagination so as to percolate the con- tinents. We see then that the effect of the uneven distri. bution of matter in the crust of the earth is to produce small elevations and depressions on the mathematical sur- face which would be otherwise spheroidal. No geodesist can proceed far in his work without encountering the irre- gularities of the mathematical surface, and it is necessary that he know how they affect his astronomical observations, The whole of this subject is dealt with in his usual elegant manner by Bessel in the Astronomische Nachrichten, Nos. 329, 330, 331, in a paper entitled ‘‘ Ueber den Einfluss der Unregelmassigkeiten der Figur der Erde auf geodi- tische Arbeiten, &c.” But without entering into further details it is not difficult to see how local attraction at any station affects the determinations of latitude, longitude, and azimuth there.

Let there be at the station an attraction to the north-east throwing the zenith to the south-west, so that it takes in the celestial sphere a position Z’, its undisturbed position being Z. Let the rectangular components of the displace- ment ZZ’ be € measured southwards and y measured west- wards. Now the great circle joining Z’ with the pole of the heavens P makes there an angle with the meridian PZ=vy cosec PZ’ = sec $, where ¢ is the latitude of the station. Also this great circle meets the horizon in a point whose distance from the great circle PZ is nsec gsingd =ntangd. That is, a meridian mark, fixed by observa- tions of the pole star, will be placed that amount to the east of north. Hence the observed latitude requires the correc- tion €; the observed longitude a correction y sec ¢; and any observed azimuth a correction 7 tan¢. Here it is supposed that azimuths are measured from north by east, and longitudes eastwards.

The expression given for « enables one to form an ap- proximate estimate of the effect of a compact mountain in raising the sea-level. Take, forinstance, Ben Nevis, which contains about a couple of cubic miles ; a simple calculation shows that the elevation produced would only amount to about 3 inches. In the case of a mountain mass like the Himalayas, stretching over some 1500 miles of country with a breadth of 300 and an average height of 3 miles, although it is difficult or impossible to find an expression for V, yet we may ascertain that an elevation amounting to several hundred feet may exist near their base. The geodetical operations,

however, rather negative this idea, for it is shown in a paper in the Philosophical Magazine for August 1878 by Colonel Clarke that the form of the sea-level along the Indian arc departs but slightly from that of the mean figure of the earth. If this be so, the action of the Himalayas must be counteracted by subterranean tenuity.

Suppose now that A, B,C,.... are the stations of a net- work of triangulation projected on or lyiug on a spheroid of semiaxis major and excentricity a, e, this sphervid having its axis parallel to the axis of rotation of the earth, and its surface coinciding with the mathematical surface of the earth at A, Then basing the calculations on the observed elements at A, the calculated latitudes, longitudes, and directions of the meridian at the other points will be the true latitudes, ésc., of the points as projected on the spheroid. On comparing these geodetic elements with the correspond- ing astronomical determinations, there will appear a system of differences which represent the inclinations, at the varl- ous points, of the actual irregular surface to the surface of the spheroid of reference. These differences will suggest two things,—first, that we may improve the agreement of the two surfaces, by not restricting the spheroid of refer-

if

ence by the condition of making its surface coincide with the mathematical surface of the earth at A; and’secondly, by altering the form and dimensions of the spheroid. With respect to the first circumstance, we may allow the spheroid two degrees of freedom, that is, the normals of the surfaces at A may be allowed to separate a small quantity, ecom- pounded of a meridional difference and a difference per- pendicular to the same. Let the spheroid be so placed that its normal at A lies to the north of the normal to the earth’s surface by the small quantity € and to the east by the quantity 7. Then in starting the calculation of geodetic latitudes, longitudes, and azimuths from A, we must take, not the observed elements ¢, a, but for ¢, 6+, and fora, a+y tan 4, and zero longitude must be replaced by y sec ¢. At the same time suppose the elements of the spheroid to be altered from a, e to a+da,e+de. Confining our attention at first to the two points A, B, let (¢’), (a’), (w) be the numerical elements at B as obtained in the first calcu- lation, viz.,

before the shifting and alteration of the spheroid ; they will now take the form (P+ fE+ ont hda +kde, (a) fE gnth'da +k'de, (w) +f"E+g'n+h'da+k'de, where the coefficients f,g,... &c. can be numerically calcu- lated. Now these elements, corresponding to the projection of B on the spheroid of reference, must be equal severally to the astronomically determined elements at B, corrected for the inclination of the surfaces there. If &', y' be the components of the inclination at that point, then we have P=(b)-o + fet ont hda+ kde, n tan p= (a') – a f'E g'nt h''da+ kde, n' sec f= (w)- wt f"§Et+g'nth'da+k'de, where ¢', a', w are the observed elements at B. Here it appears that the observation of longitude gives no ad- ditional information, but is available as a check upon the azimuthal observations.

If now there be a number of astronomical stations in the triangulation, and we form equations such as the above for each point, then we can from them determine those values of &, », da, de, which make the quantity ¢? + 7+ S7py24+ ,... a minimum. Thus we obtain that spheroid which best represents the surface covered by the triangulation.

In the Account of the Prineipal Triangulation of Great Britain and Ireland will be found the determination, from 75 equations, of the spheroid best representing the surface of the British Isles. Its elements are a = 20927005 + 295 feet, b:a—b=280+8; and it is so placed that at Green- wich Observatory = 1'°864, y= —0°546.

Taking Durham Observatory as the origin, and the tan- gent plane to the surface (determined by = — 0-664, 7= – 4117) as the plane of « and y, the former measured northwards, and z measured vertically downwards, the equation to the surface is

"995249532″ + °99288005y? + (9976305227 ~ 0:00671003a2z — 416550702 =0.

Altetudes.

The precise determination of the altitude of his station 18 a matter of secondary importance to the geodesist ; never- theless it is usual to observe the zenith distances of all trigo- nometrical points. The height of a station does indeed influence the observation of terrestrial angles, for a vertical line

at B does not lie generally in the vertical plane of A, but the error (which is very easily investigated) involved in the neglect of this consideration is much smaller than the errors of observation. Again, in rising to the height h above the surface, the centrifugal force is increased and the magnitude and direction of the attraction of the

ar earth are altered, and the effect upon the observation i latitude is a very small error expressed by the formula oe – sin 24, where g, g’ are the values of gravity at

the equator and at the pole. This is also a quantity which

| may be neglected, since for ordinary mountain heights it

amounts to only a few hundreths of a second.

The uncertainties of terrestrial refraction render it im- possible to determine accurately by vertical angles the heights of distant points, Generally speaking, refraction is greatest at about daybreak ; from that time it diminishes, being at a minimum for a couple of hours before and after mid-day ; later in the afternoon it again increases. This at least is the general march of the phenomenon, but it is by no means regular. The vertical angles measured at the station on Hart Fell showed on one occasion in the month of September a refraction of double the average amount, lasting from 1 p.m. to 5 p.m. The mean value of the co- efficient of refraction & determined from a very large num- ber of observations of terrestrial zenitli distances in Great Britain is ‘0792 + ‘0047 ; and if we separate those rays which for a considerable portion of their length cross the sea from those which do not, the former give &=-0813 and the latter k=:0753. These values are determined from high stations and long distances; when the distance is short, and the rays graze the ground, the amount of refrac- tion is extremely uncertain and variable. A case is noted in the Indian Survey where the zenith distance of a station 10°5 miles off varied from a depression of 4’ 52’°6 at 4.30 P.M. to an elevation of 2’ 24’°0 at 10.50 p.m.

If h, h’ be the heights above the level of the sea of two stations, 90°+6, 90° +06 their mutual zenith distances (8 being that observed at h), s their

distance apart, the earth being regarded as a sphere of radius=a, then, with sufficient precision,

h’-h=s tan (s5>- 3) >

20

h-h’=s tan (3? =e v) : 2a If from a station whose height is / the horizon of the sea

be observed to have a zenitli distance 90° + 6, then the above formula gives for h the value

Suppose the depression 6 to be » minutes, then h= 1:054n? if the ray be for the greater part of its length cross- ing the sea ; if otherwise, h = 1‘040x%, To take an example : the mean of eight observations of the zenith distance of the sea horizon at the top of Ben Nevis is 91° 4’ 48”, or d= 64:8; the ray is pretty equally disposed over land and water, and hence h=1‘047n?=4396 feet. The actual height of the hill by spirit-levelling is 4406 feet, so that the error of the height thus obtained is only 10 feet.

Longitude.

The determination of the difference of longitude between two stations A and B resolves itself into the determination of the local time at each of the stations, and the eompari- son by signals of the clocks at A and B. Whenever tele- graphic lines are available these comparisons are made by electro-telegraphy. A small and delicately-made apparatus introduced into the mechanism of an astronomical clock or chronometer breaks or closes by the action of the clock a galvanic circuit every second. In order to record the minutes as well as seconds, one second in each minute, namely that numbered 0 or 60, is omitted. The seconds are recorded on a chronograph, which consists of a cylinder re- volving uniformly at the rate of one revolution per minute

covered with white paper, oll which a pen having slow movement in the direction of the axis of the cylinder de- scribes continuous spiral. This pen 1s defiected through the agency of an electromagnet every second, and thus the seconds of the clock are recorded on the chronograph by offsets from the spiral curve. An observer having his hand on a contact key in the same circuit can record in the same manner his observed times of transits of stars. The method of determination of difference of longitude is, therefore, virtually as follows. After the necessary observations for ‘nstrnmental corrections, which are recorded only at the station of observation, the clock at A is put in connexion with the circuit so as to write on both chronographs, namely, that at A and that at B. Then the clock at B is made to write on both chronographs. It is clear that by this double operation one can eliminate the effect of the small interval of time consumed in the transmission of sig- nals, for the difference of longitude obtained from the one chronograph will be in excess by as much as that obtained from the other will be in defect. The determination of the personal errors of the observers in this delicate operation is a matter of the greatest importance, as therein lies pro- bably the chief source of residual error.

GEO—GEO

Since the article FicurE oF THE EARTI was written, consider. able additions to the data for the determination of the semiaxeg of the earth have been obtained from India, viz., a new meridian are of 20°, the southern point of which is at Mangalore, together with several arcs of longitude, the longest of which, between Bombay and Nizagapatam, extends over 10° 30’. The effect of the accession of these new measures is to altcr the figure previously given to the following : the semiaxes of the spheroid best representing the large ares now available are

a@=20926202; c=20854895; ¢:a—292°465 : 293-465, This value of the major semiaxis exceeds that previously given by 140 feet, whereas the new polar semiaxis is less than the old by 226 feet. If we admit that the figure may possibly be an ellipsoid (not of revolution), then the investigation leads us, through the solution of 51 equations, to these values of the semiaxes—

a= 20926629, b=20925105, c= 20854407.

The greater axis of the equator lies in longitude 8° 15’ west of Greenwich, a meridian which passing through Ireland and Portugal cuts off a portion of the north-west corner of Africa, and in the opposite hemisphere cuts off the north-east corner of Asia. The apparent ellipticity of the equator is much reduced by the addition of the new data, and it would not be right to put too much confi- dence in the ellipsoidal figure until many more arcs of longitude shall have furnished the means of testing the theory more decisively than can be done at present. (See Philosophical Magazine, August 1878.) (A. R. C.)

GEOFFREY OF MONMOUTH (11102-1154), one of the most famous of the Latin chroniclers, was born at Mon- mouth early in the 12th century. Very little is known of his life. He became archdeacon of the church in Monmouth,

and in 1152 was elected bishop of St Asaph. He died in-

1154. Three works have beenattributed to him—the Chroni-

con sive Historia Britonum; a metrical Life and Prophecies of

Merlin; and the Compendium Gaufredi de Corpore Christi et Sacramento Eucharistie. Of these the first only is genuine ; internal evidence is fatal to the claims of the second ; and the Compendiwm is known to be written by Geoffrey of Auxerre. The Historia Britonwm appeared in 1147, and created a great sensation. Geoffrey professed that the work was a translation of a Breton work he had got from his friend Walter Calenins, archdeacon of Oxford. It is highly probable that the Breton work never existed. The plea of translation was a literary fiction extremely common among writers.in the Middle Ages, and was adopted to give a mysterious importance to the communications of the author and to deepen the interest of his readers. We may compare with this Sir Walter Scott’s professed quota- tions from “Old Plays,” which he wrote as headings for chapters in his novels. If Geoffrey consulted a Breton book at all, it would probably be one of the Arthurian romances then popular in Armorica, His history isa work of genius and imagination, in which the story is told with a Defoe-like minuteness of

detail very likely to impose on a credulous age. It is founded largely on the previous histories of Gildas and the so-called Nennius; and many of the legends are taken direct from Virgil. The history of Merlin, as embodied in the Historia, is found in Persian and Indian books. Geoffrey's imagination may have been greatly stimulated by local Mnglish legends, especially in the numerous stories he gives in support of his fanciful derivations of names of places. Whatever hints Geoffrey may have got from popular tales, and whatever materials he may have accumulated in the course of his reading, the Historia is to be thought of as largely his own creation and as forming a splendid pcetical whole. Geoffrey, at all events, gave these stories their permanent place in litera- ture. We have sufficient evidence to prove that in Wales the work was considered purely fabulous. (See Giraldus Cambrensis, Itinerariwm Cambrie, lib, i., c. 5, and Cam- brie Descriptio, c. vii.) And William of Newbury says

"that fabler (Geoffrey) with his fables shall be straightway spat out by us all." Geoffrey's Astoria was the basis of a host of other works. It was abridged by Alfred of Beverley (1150), and translated into Anglo-Norinan verse, first by Geoffrey Gaimar (1154), and then by Wace (1180), whose work, Zi Romans de Brut, contained a good deal of new matter. Early in the 13th century was published Layamon's Brut; and in 1278 appeared Robert of Gloucester's rhymed Chronicle of England. These two works, being written in English, would make the legends popular with the common people. The same influence continued to show itself in the works of Roger of Wendover (1237), Matthew Paris (1259), Bartholomew Cotton (1300)), Matthew of Westminster (1310), Peter Langtoft, Robert de Brunne, Ralph Higden, John Harding, Robert Fabyan (1512), Richard Grafton (1569), and Raphael Holinshed (1580), who is especially important as the immediate source of some of Shakespeare's dramas. A large part of the introduction of Milton's History of England consists of Geoffrey's legends, which are not accepted by him as his- torical. The stories, thus preserved and handed down, have had an enormous influence on literature generally, but especially on English literature. They became familiar to the Continental nations; and they even appeared in Greek, and were known to the Arabs. With the exception of the translation of the Bible, probably no book has furnished so large an amount of literary material to English writers. The germ of the popular nursery tale, Jack the Giant-Killer, is to be found in the

adventures of his Corineus, the com- panion of Brutus, who settled in Cornwall, and had a desperate fight with giants there. Goémagot, one of these giants, is said to be the origin of Gog and Magog—two effigies formerly exhibited on the Lord Mayor's day m London, which are referred to in several of the English dramatists, and still have their well-known representatives in the Guildhall of the city. Chaucer gives Geoffrey @ place in his 'House of Fame," where he mentions "Englyssh Gaunfride" (Geoffrey) as being "besye for to bere up Troye."

Meanwhile the Arthurian romances had assumed a unique place in literature. The Arthur of later poetry is a grand ideal personage, seemingly unconnected with either space or time, and performing feats of extraordinary and super human valour. The real Arthur—if his historical existence is to be conceded—was most probably a Cumbrian oF

Strathclyde Briton; and Geoffrey is responsible for tlie blunder of transferring him to South Wales. So intimately is Geoffrey connected with Arthur's celebrity, that he is often called Galfridus Arturus. Altliough the wondrous eyele of Arthurian romances scarcely originated with Geoffrey, he made the existing legends radiant with poetic colouring. They thus became the common property of Europe; and, after being modified by the trouvéres in France, the minnesingers in Germany, and by such writers as Gaimar, Wace, Mapes, Robert de Borron, Luces de Gast, and Hélie de Borron, they were converted into a magnificent prose poem by Sir Thomas Malory, in 1461. Malory's Morte Darthur, printed by Caxton in 1485, is as truly the epic of the English mind as the Ziad is the epic of the Greek mind.

The first English tragedy, Gorboduc, or Ferrex and Porrex (1565), which was written mainly by Sackville, is founded on the Historia Britonum. John Higgins, in The Mirror for Magistrates (1587), borrows largely from the old legends. This work was extremely popular in the Elizabethan period, and furnished dramatists with plots for their plays. Spenser's Faérie Queene is saturated with the ancient myths; and, in his Arthur, the poet gives us a

noble spiritual conception of the character. In the tenth canto of Book ii. there is—

“‘ A chronicle of Briton kings, From Brut to Uther’s rayne.

Warners lengthy poem entitled Albion’s England (1586) is full of legendary British history. Drayton’s Polyolbion (1613) is largely made up of stories from Geoffrey, begin- ning with Britainfounding Brute. Geoffrey’s good faith and historic accuracy are warmly contended for by Drayton, in Song x. of his work.

In Shakespeare’s time Geoffrey’s legends were still im- plicitly believed by the great mass of the people, and were appealed to as historical documents by so great a lawyer a3 Sir Edward Coke. They had also figured largely in the disputes between the Edwards and Scotland. William Camden was the first to prove satisfactorily that the Historia was a romance. Shakespeare’s King Lear was preceded by an earlier play entitled Zhe Chronicle History of King Lear and his Three Daughters, Gonorill, Ragan, and Cordelia, as tt hath been divers and sundry times lately acted, Shakespeare’s immediate authority was Holinshed ; but the later chronicles, in so far as they were legendary, were derived from Geoffrey. The story of Cymbeline is another illustration of the fascination these legends exercised over Shakespeare. An early play, ascribed by some to Shakespeare, on Locrine, Brutus’s eldest son, is a further example of how the dramatists ransacked Geoffrey’s stores. The Historia was a favourite book with Milton; and he once thought of writing a long poem on King Arthur, whose qualities he would probably have idealized, as Spenser has done, but with still greater moral grandeur. In addition to the evidence afforded by the in- troduction to his History of England, Milton shows in Many ways that he was profoundly indebted to early legendary history. His exquisite conception of Sabrina, in Comus, is an instance of how the original legends were not only appropriated but ennobled by many of our writers. Tn his Latin poems, too, there are some interesting passages pertinent to the subject.

Dryden once intended to write an epic on Arthur’s ex- ploits; and Pope planned an epic on Brutus. Mason’s Caractucus bears witness to Geoffrey’scharm for poetic minds. Wordsworth has embalmed the beautiful legend of Pious Elidure in his own magic verse. In chapter xxxvi. of tlie

Pickwick Papers Dickens gives what he calls ‘The True Legend of Prince Bladud,” which is stamped through- out with the impress of the author’s peculiar genius, and

lit up with his sunuy lumour. Alexander Smith has a poem treating of Hdwin of Deira, who figures towards the close of Geoffrey’s history. And Tennyson’s [dylls of the King furnish the most illustrious example of Geoftrey’s influence ; although the poet takes his stories, in the first instance, from Malory’s Morte Darthur. The influence the legends have had in causing other legends to spring up, and in creating a love for narrative, is simply incalculable. In this way Geoffrey was really, for Englishmen, the in- ventor of a new literary form, which is represented by the romances and novels of later times.

There are several MSS. of Geoffrey’s work in the old Royal Library of the British Museum, of which one formerly belonging to Margan Abbey is considered the best. The titles of the various editions of Geoffrey are given in Wright’s Biog. Brit. Lit., in the volume devoted to the Anglo-Norman period, which also contains an excellent notice of Geoffrey. The work compiled by Bale and Pits gives a mythical literary history, corresponding to Geoffrey’s mythical political history. Of the Life and Prophecies of Merlin, falsely attributed to Geoffrey, 42 copies were printed for the Roxburghe Club in 1830. The Historia was translated into Eng- lish by Aaron Thompson (London, 1718); and a revised edition was issued by Dr Giles (London, 1842), which is to be found in the volume entitled Six Old English Chronicles in Bohn’s Antiquarian Library. A discussion of Geoffrey’s literary influence is given in *‘Legends of Pre-Roman Britain,” an article in the Dublin Uni- versity Magazine for April 1876. The latest instance of the interest in Geoffrey is the publication of the following work :—Der Miinchener Brut Gottfried von Monmouth in franzds. Versen des zwilften Jahr- hunderts, herausgeg. von R, Hofmann und K. Vollmoller, Halle, 1877.

For further information about Geoffrey, consult Warton’s English Poetry; Morley’s English Writers; Skene’s Four Ancient Books of Wales; and a valuable paper on ‘‘ Geoffrey of Monmouth’s History of the Britons,” in the

Ist vol. of Mr Thomas Wright’s Essays on Archeological Subjects (London, 1861). (T. GI.)

GEOFFROY SAINT- HILAIRE, Errennz (1772-1844), a celebrated French naturalist, was the son of Jean Gérard Geoffroy, procurator and magistrate of Ktampes, Seine-et- Oise, where he was born, April 15, 1772. His early education was carefully superintended by his mother and paternal grandmother, and when still a boy he had already become acquainted with the masterpieces of the literature of the ancients, and of the age of Louis XIV. Destined by his friends for the church, he entered, as an exhibitioner, the college of Navarre, in Paris, where he studied natural philosophy under Brisson; and in 1788 he obtained one of the canonicates of the chapter of Sainte Croix at Ktampes, and also a benefice. Science, however, offered to him a career more congenial to his tastes than that of an ecclesiastic, and, after some persuasion, he gained from his father permission to remain in Paris, and to attend the lectures at the Collége de France and the Jardin des Plantes, on the condition that he should likewise read law. _He accordingly took up his residence at Cardinal Lemoine’s college, and there became the pupil and soon the esteemed associate of Brisson’s friend, Hatiy, the eminent mineral- ogist, under whose guiding influence his passion for the natural sciences daily deepened. Having, before the close of the year 1790, taken the degree of bachelor in law, he became a student of medicine, but the lectures of Fourcroy at the Jardin des Plantes, and of Daubenton at the Collége de France, and his favourite scientific pursuits gradually came to occupy his almost exclusive attention. His studies at Paris were at length suddenly interrupted, for, on the 12th or 13th of August 1792, Haiiy and tle other profes- sors of Lemoine’s college, as also those of the college of Navarre, were arrested by the revolutionists as priests, and confined in the prison of St Firmin. Through Daubenton and other persons of distinction with whom he a acquainted, Geoffroy on the 14th August obtained ae i for the release of Haiiy in the name of the eg te ; a tlie other professors of the two colleges, save oa = who had been rescued by his pupil Tallien, ae confinement. Geoffroy, foreseeing their certain aes

if they remained in the hands of the revolutionists, deter- mined if possible to secure their liberty by stratagem. | By bribing one of the officials at St Firmin, and disguising himself as a commissioner of prisons, he gained admission to his friends, and entreated them to effect their escape by following him. All, however, dreading lest their deliver- ance should render the dooin of their fellow-captives the more certain, refused the offer, and one priest only, who was unknown to Geoffroy, left the prison. Already on the night of the 2d of September the massacre of the pro- scribed had begun, when Geoffroy, yet intent on saving the life of his friends and teachers, repaired to St Firmin. At 4 o'clock on the morning of the 3d Sept., after 8 hours' waiting, he by means of a ladder assisted the escape of twelve ecclesiastics, not of the number of his acquaintance, and then tle approach of dawn and the discharge of a gun directed at him warned him, his chief purpose unaccom- plished, to return to his lodgings. Leaving Paris he retired to Etampes, where, in consequence of the anxieties of which he had lately been the prey, and the horrors which he had witnessed, he was for some time seriously ill. At the beginning of the winter of 1792 he returned to his studies in Paris, and in March of the following year Daubenton,. through the interest of Bernardin de Saint Pierre, procured him the office of sub-keeper and assistant demonstrator of the cabinet of natural history, vacant by the resignation of Lacépéde. By a law passed June 10th, 1793, Geoffroy was appointed one of the twelve professors of the newly constituted museum of natural history, being assigned the chair of zoology. In the same year he busied himself with the formation of a menagerie at that institution. On the 6th May 1794 commenced his opening course of lectures, and on December Ist he read to the society of natural history his first paper, on the subject of the Aye-aye. It was in 1794, also, that through the introduction of Tessier he entered into correspondence with Georges Cuvier, to whom, after the perusal of some of his manuscripts, he wrote: " Venez jouer parmi nous le réle de Linné, d'un autre législateur de Vhistvire naturelle." Shortlyafter theappoint- ment of Cuvier as Mertrud's assistant (see vol. vi. p. 740), Geoffroy received him into his house. The two friends wrote together five memoirs on natural history, one of which, on the classification of mammals, puts forward the idea of the subordination of characters upon which Cuvier based his zoological system. It was in a paper entitled " Histoire des Makis, ou singes de Madagascar," written in 1795, that Geoffroy first gave expression to his views on "the unity of organic

composition," the influence of which is percep- tible in all his subsequent writings: nature, he observes, presents us with only one plan of construction, the same in principle, but varied in its accessory parts.

In 1798 Geoffroy was chosen a member of the great scientific expedition to Egypt. With Delile and Larrey, on the capitulation of Alexandria in August 1801, he re- sisted the claim made by the British general Hutchinson to the collectious of the expedition, sending him word that, were his demand persisted in, history would have to record of him that he also had burnt a library in Alexandria. Early anny 1802 Geoffroy returned to his accustomed labours in Paris. He was elected a member of the academy of sciences of that city in September 1807. In March of the following year the emperor, who had already recognized his national services by the award of the cross of the legion of honour, selected him to visit the museums of Portugal for the purpose of procuring from them collections, and these, though in the face of considerable opposition oth the British, he eventually was successful in retaining as a permanent possession for his country. In 1809, the year after his return to France, he was made professor of zoology of the faculty of sciences at Paris, and from that period he

devoted himself more exclusively than before to the stud

of anatomical philosophy. In 1815 he was elected political representative for his native town. 'Three years later he gave to the world the first part of his celebrated Philosophie Anatomique, the second volume of which, published in 1829 and memoirs subsequently written account for the forma. tion of monstrosities on the principle of arrest of develop- ment, and of the attraction of similar parts. When, in 1830, Geoffroy proceeded to apply to the invertebrata his views as to the unity of animal composition, he found a vigorous opponent in Georges Cuvier, and the discussion between them, continued up to the time of the death of the latter, soon attracted the attention of the scientific throughout Europe. Geoffroy, a synthesist, contended, in accordance with his theory of unity of plan in organic com- position, that all animals are formed of the same elements, in the same number, and with the same connexions: homo- logcus parts, however they differ in form and size, must remain associated in tlie same invariable order.

With Goethe he held tliat there is in nature a law of compensation or balancing of growth, so that if one organ take on an excess of development, it is at the expense of some other part (cf. Darwin, Origin of Species, 5th ed., p. 182); and he maintained that, since nature takes no sudden leaps, even organs which are superfluous in any given species, if they have played an important part in other species of the same family, are retained as rudiments, which testify to the per- manence of the general plan of creation. It was his con- viction that, owing to the conditions of life, the same forms had not been perpetuated since the origin of all things, although it was not his belief that existing species are becoming modified (see Darwin, op. cit., p. xvi.). Cuvier, who was an analytical observer of facts, admitted only the prevalence of ‘“‘laws of coexistence” or “harmony” in animal organs, and maintained the absolute invariability of species, which he declared had been created with a regard to the circumstances in which they were placed, each organ contrived with a view to the function it had to fulfil, thus putting, in Geoffroy’s consideration, the effect for the cause. In July 1840 Geodroy became blind, and some months later he had a paralytic attack. From that time his strength gradually failed him. He resigned luis chair at the museum in 1841, and on the 19th June 1844, at the age of 72, he died.

Geoffroy wrote—Catalogue des Mammiferes du Muséwm national @ Histoire naturelle, 1818, not quite eompleted ; Philosophie anato- migue,—t. i., Des organes respiratoires, 1818, & t. ii., Des Monstruo- sités humaines, 1822; Systeme dentaire des Mammiferes et des Oiseaux, 1st pt., 1824; Sur le Prineipe de Unité de Composition organique, 1828; Cours de Ul’ Histoire naturelle des Mamm<éferes, 1829; Prineipes de Philosophie zoologique, 1880; Etudes progressives dun Naturaliste, 1885; Fragments bioyraphiques, 1832; Notions synthétiques, historiques, et phystologiques de Philosophie naturelle, 1888; and other works; also part of the Description de U’ Egypte par la Commission des Seiences, 1821-30; and, with F. Cuvier, Histoire naturelle des Mammiferes, 4 vols., 1820-42; besides very numerous papers published in the Annales du Muséum, the Ann. des Set. nat., the Bulletin philomatique, La Décade égyptienne, La Déeade philosophique, the Rev. encyclopédique, Mém. del Acad. des Sciences, and elsewhere, among the subjects of whieh are the anatomy ©: marsupials, ruminants, and electrical fishes, the vertebrate theory of the skull, the opercula of fishes, teratology,

paleontology, and the influence of surrounding eonditions in modifying animal forms.

See Vie, Travaux, et Doctrine Scientifique d@ Etienne Geoffroy Saint-Hilaire, par son fils M. Isidore Geoffroy Saint-Hilaire, Paris and Strasburg, 1847, to which is appended a list of Geoffroy's works; and Joly, in Biog. Universelle, t. xvi., 1856, (F. 11. B.)

GEOFFROY SAINT-HILAIRE, Isrpore (1805-61), a French zoologist, son of the preceding, was born at the Jardin des Plantes, Paris, December 16, 1805. In lus earlier years he showed an aptitude for mathematics, but eventually he devoted himself to the study of natural his- tory and of medicine, and in 1824 he was appointed assist- ant naturalist to his father. On the occasion of his taking the degree of doctor of medicine, September 8, 1829, he

read a thesis entitled Propositions sur la monstruosité, con- sidérée chez Vhomme et les animaux; and in 1832-37 was published his great teratological work, Histoire générale et particuliére des anomalies de Vorganisation chez homme et les animaux, 3 vols. 8vo, with 20 plates. In 1829 he delivered for his father the second part of a course of lectures on ornithology, and during the three following years he taught zoology at the Athénée, and teratology at the Ecole pratique. He was elected a member of the academy of sciences at Paris on April 15, 1833, was in 1837 appointed to act as deputy for his father at the faculty of sciences in Paris, and in the following year was sent to Bordeaux to organize a similar faculty there. He became successively inspector of the academy of Paris (1840), professor of the museum on the retirement of his

father, inspector general of the university (1844), a mem- ber of the royal council for public instruction (1845), and, on the death of Blainville, professor of zoology at the faculty of sciences (1850). In 1854 he founded thie Acclimatization Society of Paris, of which he was president. He died at Paris, November 10, 1861.

Besides the above-mentioned works, he wrote—Essais de Zoologie générale, 1841; Vic. ... d'Etienne Geoffroy Saint-Hilatre, 1847 ; Acclimatation et Domestication des Animaux utiles, 1849, 4th ed., 1861; Lettres sur les substances alimentaires et particuliéremcnt sur la viande de cheval, 1856; and Histoire naturelic générale des regnes organigues, 3 vols., 1854-62, which was not completed, chap. xx. of tome iii. being unfinished. He was the author also of various papers on zoology, comparative anatomy, and palxontology, pub- lished for the most part in the Annales dw Muséum, the Mémoires des Savants étrangers, the Comptes rendus, and the Dict..des Sciences naturelles.

GHEOGRAPHY

INTRODUCTION.

EOGRAPHY is the science which describes the earth,

the term being derived from two Greek words yj, the earth, aud ypddw, to write. By means of geography the surface of the earth is delineated and described, boundaries are defined, areas are exactly measured, and the relative positions of places are determined. Geography thus em- braces a wide range of subjects, and it has been found necessary to divide its study into several distinct sections.

I. Comparative Geography traces the history of discovery, and records the changes which have taken place in land and sea in historic times.

II. Mathematical Geography explains the figure, magni- tude, and motion of the earth, teaches how to determine the positions of places on its surface, and shows how the whole or any portion of the earth may, on the principles of projection, be delineated on a map or chart.

IIT. Physical Geography is the description of the actual state of the earth's surface in its three great divisions—land, sea, and air.

IV. Political Geography describes the earth as divided into countries, occupied by various nations, and improved by human art and industry.

The following article is limited to a view of the progress of geographical discovery, an explanation of the principles of mathematical geography, and a synopsis of physical geography. For details relating to political geography the reader must consult the descriptive articles under their particular headings.

I. View oF THE ProcREss oF GEOGRAPHICAL DISCOVERY.

Four main causes have led to geographical discovery and exploration, namely, commercial intercourse between dif- ferent countries, the operations of war, pilgrimages and missionary zeal, and in later times the pursuit of knowledge for its own sake, which is the highest of all motives.

The Pheenicians are the earliest commercial people of whose discoveries we have any correct accounts. They first explored the shores of the Mediterranean, and eventually exteuded their voyages through the Straits of Gibraltar, and visited the western shores of Spain and Africa, planting colonies and opening wider fields for their commerce by instructing the natives in their arts and improvements. They also monopolized the trade with India ; and their chief €mporiuin, the rich city of Tyre, was the centre whence the products of the East and West were distributed. The trade of the West was brought from the port called Tarshish in Scripture, which is probably identical with Carthage, where the ships arrived from Spain, Africa, and distant Britain. Concerning the far eastern land reached by the Pheenicians,

called Ophir in Scripture, there has been much dispute. The voyage to Ophir, we are told, occupied three years thither and homeward, and the cargo consisted of gold, ivory, apes, peacocks, and “algum” wood (1 Kings ix. 26, and x. 11). The following reasons lead to the conclusion that Ophir was the Malabar coast of India. Inthe Hebrew the word for apes is koph (without any etymology in Semitic tongues), in Sanskrit kafi. Ivory in Hebrew is shen-habbim ; in Sanskrit 2bha is an elephant. Peacocks is in Hebrew tokki-im from togei, the name still used on the Malabar coast, derived from the Sanskrit. Algum wood, or almug, is corrupted from valyw (ka), sandal wood from Malabar. Thus the Phoenicians were the first great carriers of the ancient world, extending their commercial operations from

their central mart of Tyre ou the Syrian coast to the tin- yielding isles of the Cassiterides in the far west, and to the ports of India in the east.

The great Phoenician colony of Carthage retained in full Carthage.

vigour the conimercial spirit of the parent state. The Carthaginians traded on the coasts of Spain and Gaul, aud exteuded their discoveries southwards along the coast of Africa, and to the Fortunate Islands, now known as the Canaries. Herodotus relates how the Pheenicians, setting sail from the Red Sea, made their way to the south, and wheu autumn approached they drew their vessels to land, sowed a crop, and waited till it was grown, when they reaped it and again put tosea. Having spent two years in this manner, iu the third year they reached the pillars of Hercules and returned to Egypt. But the most celebrated voyage of antiquity, undertaken for the purpose of discovery, was the expedition under Hanno, fitted out by the senate of Carthage with the view of attempting the complete survey of the western coast of Africa. Hanno is said, in the Periplus Hannonis, to have set sail with a fleet of 60 vessels, and the extent of his voyage has been variously estimated as reaching to the river Nun, to a little beyond Sierra Leone, and even as far as the Gulf of Benin. Auother famous navigator, who sailed from the Carthaginian colony of Massilia (Marseilles) in about 320 B.c., was Pytheas. He steered northwards along the coasts of Spain and Gaul, sailed round the island of Albion, and stretching still further to the north, he discovered an island known to the ancients as Ultima Thule, which may possibly have been the Shetland Isles.

The conquests of Alexander the Great, by making known Alexan-

the vast empire of Persia, materially enlarged the bounds of geographical knowledge. Although the course of his expedition was mainly by land, the mind of the conqueror was also intent on commerce and maritime discovery. In 327 3c. Alexander led an army of Greeks down the valley of the Cabul river into the Punjab, and his expedition

der the Great.

Ptolem- ies.

we learn from Strabo that the veteran explorer made at |

Romans.

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resulted in a voyage of discovery from the mo i Indus to that of the Tigris, and in cpening direct inter- course between Grecian and Hindu civilization. The Greeks who accompanied Alexander were accurate ob- servers, and described the towns and villages, the products and the aspect of the country, with care. The con- queror resolved to return through Gedrosia (the modern Baluchistan), but he also intended to open the trade by sea between Europe and India, and his general Nearchus, a native of Crete, volunteered to lead this famous voyage of discovery. His fleet consisted of 30 galleys con- taining 2000 men. On October 2, 326 B.c., the fleet of Nearchus left the Indus, and the anchorages each night are carefully recorded. On the 17th of December Cape Jask was doubled and the fleet entered the Persian Gulf, and on the 9th of February it was at the mouth of the Kartin. Nearchus rejoined Alexander at Susa; and the conqueror himself embarked in the fleet and ascended the Tigris to Opis, above Baghdad. He then ordered his successful admiral to prepare another expedition for the circumnaviga- tion of Arabia; but unfortunately the great conqueror died at Babylon in 324 B.c., and the fleet was dispersed.

The dynasties founded by Alexander’s generals, Seleucus, Antiochus, and Ptolemy, encouraged the same spirit of enterprise which their master had so carefully fostered, and extended geographical knowledge in several directions. Seleucus Nicator established the Greco-Bactrian empire, and continued the intercourse with India. The most authentic information respecting the Gangetic valley was supplied by Megasthenes, an ambassador sent by Seleucus, who reached the remote city of Patali-putra, the modern Patna, on the Ganges.

mouth of the

The Ptolemies of Egypt showed equal anxiety to extend –

the bounds of geographical knowledge. Ptolemy Euergetes sent an expedition which discovered Abyssinia, and fitted out a fleet under Eudoxus to explore the Arabian Sea. After two successful voyages, Eudoxus left the Igyptian service, and proceeded to Cadiz with the object of fitting out au expedition for the purpose of African discovery ; and

least two voyages southward along the coast of Africa. The Ptolemies sent fleets annually from their Red Sea ports of Berenice and Myos Hormus to Arabia, as well as to ports on the coasts of Africa and India.

The Romans did not encourage navigation and commerce with the same ardour as their predecessors ; still the luxury of Rome, which gave rise to demands for the varied pro- ducts of all the countries of the known world, led to an active trade both by ships and caravans. But it was the military genius of Rome, and the ambition for universal empire, which led not only to the discovery but also to the survey of nearly all Europe, and of large tracts in Asia and Africa. Every new war produced a new survey and itinerary of the countries which were conquered. In the height of their power the Romans had surveyed and ex- plored all the coasts of the Mediterranean, Italy, Greece, the Balkan peninsula, Spain, Gaul, western Germany ‘and Britain; but the eastern parts of Germany, Denmark Sweden, and Russia were still unknown regions. In Africa

their empire included Egypt, Carthage, Numidia, and |

Mauritania. In Asia they held Asia Minor and Syria, had sent expeditions into Arabia, and were acquainted with the more distant countries formerly overrun by Alexander namely, Persia, Scythia, Bactria, and India. Roman inter- course with India especially led to the extension of geo- graphical knowledge. : The first Roman who undertook a journey to India was solely influenced by the desire to acquire a knowledge of the people and their doctrines, This was Apollonius, a resident at Antioch, who set out towards the close of the

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[PROGRESS OF DISCOVERY,

first half century of our era. He and his attendants, Damis and Philostratus, reached the Indus, and journeying across the Punjab, came to a bronze pillar with the inserip- tion ‘Here Alexander halted”; but it is doubtful whether the party advanced as far the Ganges. It was, however, in the reigns of Severus and his immediate successors that Roman intercourse with India was at its height.

In all time, while warriors and explorers extended the Atten : p

area of geographical knowledge, there have been students atsyste

who have striven to systematize and put into due form the *zing.

accumulated information. From the first it was perceived that a knowledge of localities could not be attained without some notion of their relative positions, and their distances from each other. Consequently the attempts to establish fixed principles on which the surface of the earth, or any portion of it, could be delineated, were almost coeval with the earliest voyages of discovery.

The first attempt made to determine the position of places appears to have depended on the division of the earth into “climates,” distinguished by the species of animalsand plants produced in each. This method, however, was soon aban- doned for another, which consisted in observing at places

the length of the longest and shortest days by means of a

“onomon.” An upright pillar of a known height being erected on a level pavement, by observing the lengths of the meridian shadows the progress of the sun from tropic to tropic was traced, The most ancient observation with the gnomon is that of Pytheas, in the days of Alexander the Great, who observed at the summer solstice at Massilia that the length of the meridian shadow was to the height of the cnomon as 2134 to 600, an observation which makes the meridian altitude of the sun at Marseilles on that day 70° 27’, The merit of the invention of the gnomon in Greece is ascribed to the astronomical school of Miletus ; but there is reason to believe that this method of observation was invented in Egypt, and that Thales carried the knowledge of it into Greece. This was the first step towards connect- ing

geography with astronomy; and little further advance was made until the establishment of the famous astrono- mical school of Alexandria,

Eratosthenes (276-196 B.c.) was the first who reduced Brio. geography to a regular system, and laid its foundations on stheve

clear and solid principles. Under the patronage of the Ptolemies lie had access to all the materials collected by Alexander and his generals, The doctrine of the sphericity of the earth had by this time becn adopted, and the aim of his labours was to delineate, in conformity with this prin- ciple, the known parts of the earth's surface. Founding his system on the use of the gnomon, he supposed @ line to be traced through certain places, in all of which the longest day was known to be exactly of the same length. Such a line would evidently be a parallel to the equator. This first parallel passed through Rhodes, and was ever afterwards adopted as the basis of ancient maps. Eratosthenes con- tinucd his work by tracing other parallels at certain intervals from the first, one through Alexandria, another through Syene, a third through Meroe. He also traced, at right angles to these, a meridian passing through Rhodes and Alexandria, southwards to Syene and Meroe. As the pro- gress which he thus made towards tlhe completion of what he had so skilfully conceived naturally tended to enlarge his ideas concerning geographical science, he attempted next to determine the circumference of the globe by the actual measurement of a segment of one of its great circles.

Posidonius made another measurement of an arc of the in meridian between Rhodes and Alexandria about 170 years

afterwards ; but the amount of error in the calculations of Eratosthenes and Posidonius is uncertain, for want of 4 knowledge of the true length of the stadium in which their results are expressed. The ancients made their 'first met

dian at the sacred pronrontory of Iberia, and their longitu- dinal error increased rapidly as they advanced eastwards. This is no doubt due to their longitudes being based en- tirely on distances calculated in the itineraries of travellers. Such data of course produced very great distortions in the

representations given of the countries on the surface of the lobe. : The improvements introduced by Eratosthenes were per- fected in principle by Hipparchus, who flourished from 160 to 135 B.c. He was the first astronomer who undertook the arduous task of making a catalogue of the stars and fixing their relative positions. His object was to transmit to posterity a knowledge of the state of the heavens at the period of his observations. The extremities of the imagi- nary axis round which the heavens perform their diurnal revolutions suggest two fixed points by which tlie position

of the great circle of the celestial sphere, called the celestial.

equator, is determined. If a great circle be supposed to pass through these points and any star, the position of the star will be ascertained if we measure in degrees and parts of a degree the arc of the meridian circle intercepted be-

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rar into one work of four volumes by Hudson, and published between 1698 and 1712, with notes by Dodwell. From the days of Ptolemy to the revival of letters in Europe, little was done towards the scientific improvement of geographical science, though military and commercial enterprise led to a great extension of knowlege of the earth’s surface.

After the dissolution of the Roman empire, Constan- tinople became the last refuge of arts, taste, and elegance ; while Alexandria continued to be the emporium whence were imported the commodities of the East. The em peror Justinian sent two Nestorian monks to Clina, who returned with eggs of the silkworm concealed in a hollow cane, and thus silk manufactures were established in the Peloponnesus and the Greek Islands. It was also in the

reign of Justinian that Cosmas Indicopleustes, an Egyptian Cosmas.

merchant, made several voyages, and afterwards composed his Tapographia Christiana, containing a particular descrip- tion of India. The great outburst of Mahometan conquest was followed by an Arabian civilization, having its

centres at Cordova and Baghdad, in connexion with which gco- graphy again received a share of attention.

From the 9th to the 13th century intelligent Mahometan Mahome- travellers wrote accounts of what they had seen and heard tan tre- in distant lands, which have been landed down to us; V@llers-

tween th: star and the equator, and also the are of the equator intercepted between a given point in it and the Upon this prin-

omy.

meridian circle passing through, the star. ciple Hipparchus arranged the stars according to their places in the heavens ; and the great improvement which he introduced into geography consisted in this, that he applied to the determining of the position of any point on the surface of the earth the same rule which he had intro- duced in the arrangement of the constellations. Thus he furnished the means of ascertaining the relative positions of places with far greater accuracy than could be obtained from itinerary measurements. He made a considerable number of observations for latitude, and pointed out how longitudes might be determined by observing the eclipses of the sun and moon.

The most ancient maps that have reached modern times are those which illustrate Ptolemy’s geography, but an earlier map made for Aristagoras, king of Miletus (500 B.c.), is minutely described by Herodotus. Ptolemy composed his system of geography in the reign of Antoninus Pius, about 150 a.p. His materials consisted of all the itineraries prepared by the Romans, proportions of the height of the gnomon and its shadow at the time of the equinoxes and solstices taken by different astronomers, calculations founded on the length of the longest days, and various reports of travellers and navigators. Ptolemy undertook the task of comparing and reducing this mass of crude material into one system, following the principles laid down by Hippar- chus, but which had been neglected during the two centuries and a half since his time, even by such men as Strabo and Pliny. In Ptolemy’s work we find for the first time the mathematical principle of the construction of maps, as well as of several projections of the sphere.

The errors of Ptolemy arose from defective information, and the want in many instances, and especially as regards the remote parts of the then known world, of astronomical observations. He adopted the measure of a degree at 500 stadia ; and the latitudes along the chief parallel of Rhodes, as first laid down by Eratosthenes, are tolerably correct. But the elements for determining the longitudes were still derived from itineraries, and errors in latitude accumulated to the north and south of the central parallel.

Although Ptolemy was the first scientific geographer Whose work has come down to us in a complete form, the earlier labours of Strabo, who lived in the reigns of Augustus and Tiberius, are of equal value, and we fortunately possess the whole of his 17 books. Pliny also devoted two books of his extensive work to geography ; and the scattered geographical notices of other ancient writers were collected

while the caliphs of Baghdad encouraged the study of geographical science.

The caliph Al-Mamf{in, the worthy son and successor of Hardin er-Rashid, caused an Arabic version of Ptolemy's great astronomical work (Svvragis jeyiorn) to be made, which is known as the Almagest, the word being nothing more than the Greek peyiarn with the Arabic article al prefixed. The geograpliy of Ptolemy is also constantly referred to by Arab writers. The learned men under Al-Mamiin began to apply themselves to astronomy in 813 A.D., following the system of Ptolemy ; and the first obser- vations that are properly their own were made by El-Bathany in Mesopotamia, of the vernal and autumnal equinoxes, in 882 a.p. The Arab astronomers also measured a degree on the plains of Mesopotamia, and Ibn Ytinus observed three eclipses at Cairo, The caliph's librarian, Abu Jafar Muhammad Ben Musa, wrote q geographical work, now unfortunately lost, entitled Rasm el Arsi (" A Description of the World"), which is often referred to by subsequent writers as having been composed on the model of that of Ptolemy.

The earliest Arabian traveller whose observations have come down to us is the merchant Sulaiman, who embarked in the Persian Gulf and made several voyages to India and China, in the middle of the 9th century. Sulaiman's infor- mation was supplemented by that collected by another. writer named Abn Zaid ; and, so far as India is concerned, this work is the

most important that we possess before the grand epoch of the discoveries of Marco Polo, Next to Sulaiman followed the voyages of Sindbad the Sailor, whose narrative, though inserted in the Arabian Neghts, also forms a distinct and separate work, which was translated into French by M. Langlésin 1814. Baron Walckenaer ascribes to the voyages of Sindbad a date about coincident with those of Sulaiman. Ibn Khurdadyra, a fire-worshipper con- verted to Islam, who died in 912 a,p., also wrote an account of India. Al Masudi, a great traveller who knew all the countries between Spain and China, described the plains, mountains, and seas, the dynasties and peoples, in his Muriju-l Zahab (“ Meadows of Gold”). He died in 956. His contemporaries were Al Istakhri, who travelled through all the Mahometan countries, and wrote his Book of Climates in 950, and Ibn Haukal, whose Book of Roads and King- doms was written in976. Al Idrisi was born at Ceuta, and after travelling far and wide, settled in Sicily, where he was

induced by Roger IL, the Norman king, to me his book X. — 23

Mongol tables.

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on geography. ane Who sete wander through the Regions of the World. Finally Al Kazwini, who was a compiler from the works of Istakhri and Ibn Haukal in about 1263, brings us down to the times when the Italian explorers began to make known the vast realms of Asia to the people of Europe.

The Mongol and Turkish dynasties, which succeeded each other after the fall of the Arabian caliphs, also produced rnlers who encouraged geographical science. Philosophers assembled at the court of Hulaku Khan (1253-1264) at Maraghab in the north of Persia; and his friend Nasiru-’d-

Din was the most famous astronomer of the age. He con- structed the tables known as the Tables of the Ilkhany, which corrected some important errors in the former mode of adjusting the commencement of the new year. Nearly two centuries later, in 1446, Ulugh Begh, of the house of Timur, succeeded to the throne of Samarkand, and under his auspices the famous tables called “ Zij Ulugh Begh” were composed. They continued to be authorities for long afterwards, and even Kinneir, in determining the latitudes of places in Persia, often quotes the tables of Ulugh Begh.

The Nortlimen of Denmark and Norway, who were the terror of all the coasts of Europe, and who established themselves in England and Ireland, in France and Sicily, were also great promoters of geographical discovery during the darkest period of the Middle Ages. The Northmen were far from being always vikings, bent only on rapine and plunder. They were very often peaceful merchants. King Alfred sent Ulfsten and the Norwegian Ottar on voyages of discovery towards the White Sea; and the Scandinavian merchants brought the products of India to England and Ireland. From the 8th to the llth century a commercial route from India passed through Kharism and Novgorod to the Baltic, and immense quantities of Arabian coins have been found in Sweden, and particularly in the island of Gothland, which are preserved at Stockholm. Five-sixths of them were from the mints of the Samanian dynasty, which reigned in Khorasan and Transoxiana from about 900 to 1000 a.p. It was the trade withthe Kast that originally give importance to the city of Visby in Gothland.,

In the end of the 9th century Iceland was colonized from Norway; and in 985 the intrepid viking Erik, surnamed the Red, discovered Greenland, and induced some of his Icelandic countrymen to settle on its inhospitable shores. In 986 young Bjorni, son of one of Erik’s comrades, sailed from Iceland to join his father in Greenland, but shaped his course too far to the south, and was the discoverer of America. He sailed along the coasts of Connecticut, Massachusetts, and Nova Scotia, before he eventually found the fjord on the Greenland coast where his father dwelt. Then Leif, the son of Erik, bought the ship from young Bjorni and made another voyage of discovery, and once more the eoast of America was visited. Other expeditions were undertaken by his two brothers, intercourse was kept up between Greenland and Norway, and the saga of Thor- finn tells us of other

voyages to America. The last that was heard of the Norwegian colonies in Greenland was in a brief of Pope Nicolas V. in 1448, where it is stated that 30 years before, the settlements had been destroyed by the attacks of savages. Two noble Venetians, Nicolo and Antonio Zeno, who were in the service of the prince of the Faroe Islands in the end of the 13th century, recorded their observations respecting the Norse colonies. Antonio actually went to Greenland, and heard of the visits of fishermen to two parts of North America called Estotiland and Drogeo,

At length the long period of barbarism which accompanied and followed the fall of the Roman empire drew to a close in Europe. The crusades had a very favourable influence

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on the intellectual state of the Western nations. Interest. ing regions, known only by the scant reports of pilgrims, were made the objects of attention and research; while religous zeal, and the hope of gain, combined with motives of mere curiosity, induced several persons to travel by land into remote regions of the East, far beyond the countries to which the operations of the crusaders extended, Among these was Benjamin of Tudela, who set out from Spain in 1160, travelled by land to Constantinople, and having visited India and some of the eastern islands, returned to Europe by way of Egypt after an absence of 13 years, Christian missionary zeal was another motive for explora- Franci tion, John of Plano Carpini in Perugia, a Franciscan can mi: monk, was the bead of one of the missions despatched by sionari Pope Innocent to call the chief and people of the Tatars to a better mind. He reached the headquarters of Batu, on the Volga, in February 1246 ; and, after some stay, went on to the camp of the great khan near Karakorum, . and returned safely in the autumn of 1247. A few years . afterwards, a Fleming named Rubruquis was sent by &t Louis on a mission to the Tatar chiefs, and wrote a very interesting narrative. He entered the Black Sea in May 1253, visited Batu and the court of the great khan Mangu . near Karakorum, and got back to Antioch about the end of June 1255. Rubruquis

had the merit of being the first . modern traveller who gave a correct account of the Caspian Sea. He ascertained that it had no outlet. At nearly the | | ’

same time Hayton, king of Armenia, made a journey to Karakorum in 1254, by a route far to the north of that followed by Carpini and Rubruquis. He was treated with honour and hospitality, and returned by way of Otrar, Samarkand, and Tabriz, to his own territory. The curious narrative of King Hayton was translated by Klaproth.

While the republics of Italy, and above all the state of Marco Venice, were engaged in distributing the jewels, the spices, Polo. and the fine cloths of India over the Western world, it was impossible that motives of curiosity, as well as a desire of commercial advantage, should not be awakened to such a degree as to impel some to brave all the obstacles and dangers to be encountered in visiting those remote countries. Among these were Nicolo and Maffeo Polo, two brothers who traded with the East and visited Tatary. The recital of their travels fired the youthful imagination of young Marco Polo, the son of Nicolo, and he set out for the court of Kublai Khan, with his father and uncle, in 1265. After a journey of three years and a half they reached Yeu-king, near the spot where Peking now stands, and young Marco was enrolled among the attendants of honour of the Grand Khan. During the seventeen years that he remained in this service, Marco Polo was employed on important missions ; and besides what he learnt from his own observation, he collected from others much information concerning countries which he did not visit. He returned to Europe possessed of a vast store of knowledge respecting the eastern parts of the world, and, being afterwards made a prisoner by the Genoese, he dictated the narrative of his travels during his captivity. The work of Marco Polo is the most valuable narrative of travels that appeared during the Middle Ages, and its latest and ablest editor truly says, “All other travellers of that time are but stars of a low magnitude beside the full orb of Marco Polo.”

Still these minor orbs continued to do useful geographical work, while striving to spread the truths of the Gospel. Among them were John of Monte Corvino, a Franciscan monk, Andrew of Perugia, John Marignioli, and Friar Jordanus, who visited the west coast of India, and above all Friar

Odoric of Pordenone. Odoric set out on bis travels in about 1318, and was in western India and northern China between 1321 and 1328, dying in 1991. He went by Constantinople to Trebizond, thence through

Persia to Ormuz, where he embarked for Tana in Salsette. He then went to Malabar, Sumatra, and Java, and by the ports of China to Cambaluc or Peking, where he remained for three years. ‘Turning westward he journeyed by Shensi into Tibet, and was the first European to visit Lassa. His homeward journey led him by Cabul and Khorasan to Tabriz, and thence to Venice. His companion was an Irish- man named Friar James.}

Ibn Batuta, the great Arab traveller, is separated by a

. wide space of time from his countrymen already mentioned,

and he finds his proper place in a chronological notice after the days of Marco Polo—for he was not born at Tangier until 1304. He began his wanderings in 1325, his career thus coinciding in time with that of Sir John Mandeville (1322-1356), but the Moor was more trustworthy than the Englishman. Ibn Batuta went by land from Tangier to Cairo, then visiting Syria, and performing the pilgrimages to Medina and Mecca. After exploring Persia, and again residing for some time at Mecca, he made a voyage down the Red Sea to Yemen, and travelled through that country to Aden, which remarkable place he correctly describes. Thence he visited the African coast, touching at Momboas and Quiloa, and then sailed across to Ormuz and the Persian Gulf. He crossed Arabia from Bahreyn to Jiddah, traversed the Red Sea and the desert to Syene, and descended the Nile to Cairo. After this he revisited Syria and Asia Minor, crossed the Black Sea to Caffa, and proceeded to the camp of the khan of Kipchak at the foot of the Caucasus. Ibn Batuta crossed the desert from Astrakhan to Bokhara, and went over the Hindu Kush to Cabul, reaching the Indus somewhere below Larkhana, in 1333. He gives an interesting account of Muhammad Tughluk, then ruler of Delhi, in whose service the great traveller remained for about eight years. He was sent on an embassy to China in 1342, travelling by land from Delhi to the seaport ; whence the ambassadors sailed down the west coast of India to Calicut, and then visited the Maldive Islands and Ceylon.

He made a voyage through the Islands to China, and on his return he proceeded from Malabar to Baghdad and Damascus, where he got his first news from home and heard of his father's death. Finally he reached Fez, the capital of his native country, in November 1349, after an absence of twenty-four years, and came to the conclusion that there was no place like home. After a journey into Spain, he set out for Central Africa in 1352, and reached Timbuctoo and the Niger, returning to Fez in 1353. He had travelled over a length of at least 75,000 English miles. His narra- tive was committed to writing from his dictation, by order of the sultan of Fez, and the work was completed in December 1355. Ibn Batuta died at the age of seventy- three, in the year 1377. His whole work was carefully edited in the original, with a translation into French under the auspices of the Asiatic Society of Paris, and published in 1858. Colonel Yule has given us an English version of the portion relating to China.

Ibn Batuta was certainly the greatest of Arab travellers, and soon after his death in the kingdom of Fez, the opposite realm of Spain began to send forth explorers to distant

turned in 1406, and died soon after, but not before he had written a most valuable and interesting narrative of his travels from Constantinople through Persia and Khorasan to the Oxus, and thence by the Iron Gates to Samarkand.

Several Italians continued to make important journeys iv Italian the East during the 15th century. Among them was travellers.

Nicolo Conti, who passed through Persia, sailed along the coast of Malabar, visited Sumatra, Java, and the south of China, returned by the Red Sea, and got home to Venice in 1444, after an absence of twenty-five years. He related his adventures to Poggio Bracciolini, secretary to Pope Eugenius IV. ; and the narrative contains much interesting information. 'Towards the end of the same century, the Venetians sent several embassies to Uzun Hassan, the ruler of Persia, and to Shah Ismail, his successor; and the narra- tives of

the envoys furnish some new geographical informa- tion. The first of these was Caterino Zeno, who induced Uzun Hassan to make war on the Turks in 1472; and he was followed by Josafat Barbaro and Ambrogio Contarini. Another Venetian traveller of this period, whose narrative has been preserved, was Giovan Maria Angiolello. He was in the service of the Turks, and was present in their campaign against the Persians. One of the most remarkable of the Italian travellers was Ludovico di Varthema, whose insatiable desire to see foreign countries induced him to leave his native land in the year 1502. He went to Egypt and Syria, and for the sake of visiting the holy cities became a Mahometan. After many ex- traordinary adventures he got on board a ship at Aden. Varthema is the first European who gave an account of the interior of Yemen. He afterwards visited and described many places in Persia, India, and the Eastern Archipelago, returning to Europe in a Portuguese ship after an absence of five years.

In mentioning Varthema we have anticipated events ; but Mariner’s in the 15th century the time was approaching when the compass.

discovery of the Cape of Good Hope was almost indefinitely to widen the scope of geographical enterprise. The great event was preceded by the discovery of the polarity of the magnetic needle, and the consequent construction of the mariner’s compass. This most important discovery appears to have been made in China, and it is uncertain when the compass was first used by Western nations. Its introduc- tion has been attributed to Flavio Gioia, a citizen of Amalfi, in the kingdom of Naples, about the year 1307. Encour- aged by the possession of this sure guide, by which at all tines and in all places he could with certainty steer his course, the navigator gradually abandoned the method of sailing along the shore, and boldly committed his bark to the open sea. Navigation was then destined to make rapid progress. The growing spirit of enterprise, combined with the increasing light of science, prepared the states of Europe for entering upon that great career of discovery, of which the details constitute the materials for the history of modern geography. Portugal took the lead in this new and brilliant path, and foremost in the front rank of the worthies of this little hero-nation stands the figure of Prince Henry the Navigator.

The work of Prince Henry is well defined by his bio- Prince grapher, Mr Major. Until his day the pathways of the es : human race had been the mountain, the river, and the plain, pate sail the strait, the lake, and the inland sea. It was he who first : conceived the thought of opening a road through the unex- plored ocean,—a road replete with danger but abundant in promise. Born on March 4, 1394, Prince Henry was a younger son of King Joao of Portugal and of Philippa of Lancaster, the grandchild of Edward TIL; so that he was half an Englishman. Prince Henry relinquished the pleasures of the court, and took up his abode on the inhos- pitable promontory of Sagres, at the extreme south-western

lands. The peaceful reign of Henry III. of Castile is famous for the attempts of that prince to extend the diplo- matic relations of Spain to the remotest parts of the earth. Mariana tells us that he sent embassies to the princes of Christendom and to the Moors. In 1403 the Spanish king sent a knight of Madrid, named Ruy Gonzalez de Clavijo, to the court of the mighty Timur, at Samarkand. He re-

. Sir John Mandeville copied largely from Odoric, and the substance of his travels to the Indies and Cathay is entirely stolen from the Italian traveller, though amplified with fables from Pliny and other ancients, as well as from his own imagination. See Colonel Yule in his account of Odoric (Cathay, and the Way Thither, i. p. 27).

angle of Europe, To find the sea-path to the * thesauris Arabum et divitis Indie” was the object to which he devoted his life. He collected the information supplied by ancient geographers, unweariedly devoted himself to the study of navigation and cartography, and invited, with princely liberality of reward, the co-operation of the boldest and most skilful navigators of every country. The prince’s motto was ‘‘ Talent de bien faire,”—the word “ talent,” in those days, conveying not the idea of power or faculty, but of desire. Having acquired military renown by the capture of Ceuta in 1415, he set his mind upon the con- quest of Guinea, and sent every year two or three vessels to examine the coasts beyond Cape Nun, which was then the limit of exploration. Yet none of lis ships for many years had the hardihood to round Cape Bojador.

The first fruit of Prince Henry's explorations was the rediscovery of Madeira and Porto Santo, in 1418 and 1420. The truth of the romantic story of the first dis- covery of Madeira by two English lovers named Robert Machim and Anna d'Arfet, in the time of Edward III., has been demonstrated by Mr Major. Madeiraand Porto Santo were granted to Prince Henry by his brother, King Duarte, in 1433. In the same year one of the prince's ships, com- manded by Gil Eannes, at length doubled Cape Bojador. In 1435 Affonso Gonsalves Baldaya, the prince's cup-bearer, passed 50 leagues beyond the cape ; and eight years after- wards Nuiio Tristam got to a point 25 miles beyond Cape Blanco. But it was not until 1445 that the mouth of the Senegal was reached by Diniz Dias; and in those days the Portuguese gave the name of Guinea to the country com- mencing at Cape Nun. In 1481 the king of Portugal assumed the title of lord of Guinea. Up to 1446 there had been 51 caravels to the Guinea coast, and almost every year some new advance was made. Meanwhile the Canaries and Azores were brought within the realms of Spain and Portugal. In 1402 a Norman named Jean de Bethencourt, accompanied by Gadifer de la Salle, had landed on the island of Langarote, and with reinforcements from Spain he subjugated Forteventura and Ferro, and received the sovereignty of the Canaries from the king of Castile. But he returned to his lands in Normandy in 1406, and died there in 1425. Gomera, Palma, Teneriffe, and the Great Canary were still unconquered. Prince Henry made several attempts to establish Portuguese rule on these islands ; the right was long disputed with Spain ; and it was not until 1479 that the treaty of Alcagora provided for the concession of the sovereignty of the Canaries to Spain, Prince Henry, however, successfully colonized the Azores, and in 1444 St Michael's was discovered, the settlement of the other islands following soon afterwards.

In 1455 an important expedition was despatched by Prince Henry, under the command of a young Venetian adventurer named Alvise Cadamosto. Touching at Madeira and the Canaries, Cadamosto made his way to Cape Blanco on the African coast, and thence to Senegal and the Gambia. He returned with a full report of all he had seen, and in the following year he again sailed from Lagos direct for Cape Blanco, with three ships, and discovered the mouth of a

river which he named the Rio Grande (Jeba'). In 1457 Diogo Gomez sailed with orders to proceed as far as he could, and made his way to the Gambia, The Cape Verd

Islands were discovered and colonized about 1462.

Prince Henry the Navigator died on the 13th of November 1460, and was buried near his father and mother in the monastery of Batalha. In 1839 a monunient to his memory was erected at Sagres. During the long period in which the prince was continuing his maritime explorations he did not cease to cultivate the science of cartography. The geographer Jayme of Majorca superintended his school of navigation at Sagres, and at the prince's instance the

GEOGRAPHY

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finest. specimen of medieval map-making that has been preserved was prepared at Venice under the superintendence of Fra Mauro of the Camaldolese convent of San Miecuel de Marano, The geographical knowledge of the 15th cen- tury is also shown by the famous Borgia map (see PlateII.), a bronze planisphere which came into the possession of Cardinal Borgia about 1794, and was published in 1797 by the cardinal's nephew. 'The Borgia map, however, is of the very beginning of the 15th century.

The progress of discovery for a time received a check from the death of Prince Henry, but only for atime, Tp 1462 Pedro de Cintra extended Portuguese exploration 600 miles beyond the furthest point reached by Cadamosto, and discovered Sierra Leone. Fernan Gomez followed in 1469, and opened the trade with the Gold Coast; and in 1484 Diogo Cam discovered the mouth of the Congo. The king of Portugal next despatched two vessels of 50 tong in August 1486, under the command of Bartholomeu Dias, to continue discoveries southwards; while, in the following year, he sent Pedro de Covilham and Affonso de Payva to discover the country of Prester John. Dias succeeded in rounding the southern point of Africa, which he named Cabo Tormentoso ; but king Joao IL, foreseeing the

realiza- tion of the long-sought passage to India, gave it the endur- ing name of the Cape of Good Hope. Dias returned to Lisbon in December 1487; meanwhile Payva had died at Cairo; but Covilham, having heard that a Christian ruler reigned in the mountains of Ethiopia, penetrated into Abyssinia in 1490. He delivered the letter which Joao II. had addressed to Prester John to the negds Alexander of Abyssinia, but he was detained by that prince and never allowed to leave the country.

The results westward and eastward of the exertions of Prince Henry were the discovery of America by Columbus and of the Cape route to India by Vasco da Gama,

Christopher Columbus was born at Genoa about 1435, His name in Italian was Colombo, and in Spain he is known as Cristoval Colon. The fame of the Portuguese discoveries attracted strangers from all parts of the world, and in 1470 Columbus arrived at Lisbon. He was in Portugal from 1470 to 1484, during which time lie made several voyages to the coast of Guinea in the Portuguese service. He married a daughter of Bartholomeu Perestrello, to whom Prince Henry had granted the commandership of Porto Santo, and lived for some time on that island. He learned, from many pilots experienced in the western voyages to the Azores, facts and signs which convinced him that there was an unknown land towards the west. Columbus also studied the Zmago Mundi of Cardinal Pierre d'Ailly, whence he culled all he knew of Aristotle and Strabo ; and he read the narrative of Marco Polo. By 1474 his grand project of discovery was established in his mind, and nothing after- wards could divert him from the pursuit of it. On the re- fusal of the king of Portugal to entertain his proposal, Columbus left Lisbon with his son in 1484, and he spent the interval until 1492 in appeals to the Spanish court. At length, having overcome all obstacles, he set sail witha fleet of three ships from Palos, on the 3d of August 1492, on his unprecedented and perilous voyage. On the 12th of October, having crossed the Atlantic, Columbus sighted land, which was named San Salvador. Mr Major has re- cently proved that this island is one of the Bahamas, now known as Watling Island. After discovering Ouba, His- paniola, and many small islands, Columbus set sail on his return voyage on January 16, 1493, and arrived at Palos on tle 15th of March. His reception in Spain was enthusiastic, and commensurate with the grandeur of his achievement ; and

on the 25th of September 1493 he sailed from Cadiz on his second voyage, with a fleet of three large ships and fourteen caravels. On the 3d of November he discovered the

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ery of America.

FIFTEENTH CENTURY. |

island of Dominica, and during the voyage his discoveries included the Windward Islands and Jamaica. He returned to Cadiz on June 11, 1496; and it was not until May 30, 1498, that he set sail on his third voyage. The first land he came to formed a new discovery, which he named the island of Trinidad, and it was in this voyage that he reached the mainland of South America, and discovered the islands of Cubagua and Margarita. A colony had been formed on Hispaniola, and soon afterwards a judge named Francisco de Bobadilla arrived from Spain, having been sent, at the instigation of the great discoverer’s enemies, to inquire into his conduct, Bobadilla seized upon the government, and sent Columbus home in chains. Ferdinand and Isabella were overwhelmed with shame, and the people with astouish- ment, on his arrival. He was at once released, and false promises of restitution and reward were profusely made. But Bobadilla was superseded, not by Columbus, but by Nicolas de Ovando. On the 9th of May 1502, however, Columbus was allowed to sail on a fourth and last voyage of discovery. He reached the island of Martinique on the 13th of June, and touched at Dominica and Hispaniola. Thence he sailed westward, discovering the coast of Veragua and the harbour of Porto Bellu. After a stay in Jamaica, he sct sail for Spain ou the 12th of September 1504, and arrived at San Lucar on the 7th of November. He lived for two years longer, experiencing the blackest ingratitude from the Spanish court. At length, in debt and poverty, and bowed down by disappointment, this great man died

May 20, 1506. His body was buried at Valladolid, and removed in 1513 to Cartuja de las Cuevas near Seville. A monument was erected over his grave, with the inscription— A Castilla y Leon, Nuevo Mundo did Colon.

In 1536 the bodies of Columbus and his son Diego were transported to St Domingo; and thence they were removed to Havana in 1795. The ashes of the immortal discoverer now repose in the cathedral of Havana.

While Columbus was discovering a new world, the Por- tuguese continued their persevering efforts to reach India by sea. Vasco da Gama sailed from Lisbon on the 8th of July 1497 with four vessels built expressly for the voyage, the largest not exceeding 120 tons, and called the “Sam Gabriel” His brother Paolo commanded the “Sam Raphacl,” and the “Berrio” was under Nicolas Coelho, On November 22, with a fair wind, Da Gama rounded the Cape of Good Hope, aud anchored in the bay named San Bras by Bartholomeu Dias, on the 25th. On Christmas Day he sighted land, which, on that acconnt, he named Natal. He reached Mombas on the 7th of April, and on the 20th of May 1498 he anchored before Calicut. Da Gama returned to Lisbon in August 1499; and at his re- commendation another fleet was fitted out, consisting of thirteen well-armed ships, under Pedro Alvarez Cabral, with Bartholomeu Dias and Nicolas Coelho under his orders. The expedition sailed on the 9th of March 1500; and on the 22d of April Cabral discovered the coast of Brazil, and took formal possession for the king of Portugal. Resuming his voyage to the East, he reached Calicut in September, and obtained permission to build a factory, establishing friendly relations also at Cananor and Cochin. He returned to Lisbon in J uly 1501. Vasco da Gama set sail, with a much larger fleet, on his second voyage in 1502. He visited several ports on the west coast of India, engaged in war as Well as in commerce, and returned in September 1503. In 1503 Antonio da Saldanha and Affonso de Albuquerque sailed for India, and made terms of friendship with the chief of Quilon. Dom Francisco de Almeida, the first viceroy of the Indies, was sent out in 1505. He founded the ports of the Angediva and Cananor, and his son Laurengo

Albuquerque under his orders, was sent to occupy Socotra, and in 1506 Albuquerque came to India as second viceroy. He explored the coasts of Arabia aud Persia, made the king of Ormus tributary to Portugal, and sent embassics to Abyssinia. In 1509 (1) a factory was established at Malacca ; and on November 25, 1510, the great Albuquerque con- quered Gua, and established the seat of his government there. In 1512 the Moluccas were discovered ; and in 1517 Fernam Peres de Andrade reached China, and entered into commercial relations with the governor of Canton, In 1524 Vasco da Gama arrived in India for a third time, as viceroy, and landed at Goaon the 11th of September. He died at Cochin on the 24th of December 1524, and in 1538 his body was transported to Portugal, and buried in his tomb at Vidigueira, of which town he was count.

The voyages of Vasco da Gama revolutionized the com- Eastern Until then the Venetians held the trade.

merce of the East. carrying trade of India, which was brought by the Persian Gulf and Red Sea into Syria and Egypt, the Venetians re- ceiving the rich products of the East at Alexandria and Beyrout, and distributing them over Europe. This com- merce was a great source of wealth to Venice ; but after the discovery of the new passage round the Cape, and the con- quests of the Portuguese, the trade of the East passed into other hands.

The achievements of Columbus and Da Gama are im- The measurably enhanced when we consider the inadequate astrolabe.

means at their disposal, their small and ill-formed ships, and their defective knowledge of navigation. The mariner’s compass had been in use for nearly two centuries, and it was Columbus himself who first observed the phenomena of variation. But the compass and rough sea-card were tlie only appliances, until the learned Nuremberger, Martin Behaim, invented the application of the astrolabe to pur- poses of navigation, which enabled mariners to ascertain their latitude. This was in the year 1480. The astrolabe was used by Vasco da Gama on his first voyage round the Cape of Good Hope; but the movement of a ship rendered accuracy impossible, and the liability to error was increased by the necessity for three observers. One held the astrolabe by a ring passed over the thumb, the second measured the

altitude, and the third read off. The astro- labe was a metal circle graduated round the edge, with a

‘ limb called the alhidada fixed to a pin in the centre, and

working round the graduated circle. The instrument had two sights fitted upon it, one at each end, and was suspended by a ring so as to hang vertically on one hand, while the alhidada was worked up and down until the sun could be seen through both the sights. It then gave the zenith distance. The Ordenanzas of the Spanish council of the Indies record the conrse of instruction prescribed for pilots, which included the De Sphera Mundi of Sacrobosco, the spherical triangles of Regiomontanus, the Almagest of Ptolemy, the use of the astrolabe and its mechanism, the adjustments of instruments, cartography, and the methods of observing the movements of heavenly bodies. The only observations employed by the ancients for finding the longi- tude were those of the eclipses of the moon, and it was not until 1610 that Galileo discovered another method by observation of Jupiter’s satellites.

The discoveries of Columbus awakened a spirit of enter- prise in Spain which continued in full force for a century ; adventurers flocked eagerly across the Atlantic, aud dis- covery followed discovery in rapid succession. Many of the companions of Columbus continued his work. Pinzon m 1499 reached the mouth of the Amazon; and in the same year Alonzo de Ojeda, accompanied by a Florentine named Amerigo Vespucci,

somewhere near Surinam, following the shore as far as

discovered Ceylon. Tristam da Cunha, with Affonso de , Gulf of Maracaibo. Vespucci afterwards made three voyages

prise.

outh America Amerigo touched the coast of S ae

Ojeda.

Balboa.

to the Brazilian coast; and in 1504 he wrote an account of his four voyages, which was widely circulated, and became the means of procuring for its author the high honour of giving his name to the whole continent. Mr Major has discussed the hitherto obscure question of the way in which the name " America" originated, in a paper distinguished for great learning and very able criticism. He has shown that the word "America" first appeared on the Mappe Monde drawn by Leonardo da Vinci, and he explains the chain of circumstances which led to itsadoption. The first map known to exist with America delineated upon it is that drawn by Juan de la Cosa, the pilot of Columbus in his second voyage, which is dated 1500. Juan de la Cosa was with Ojeda and Vespucci, and afterwards with Ojeda in his last ill-fated expedition. In May 1507, just a year after the death of Columbus, one Martin Waldseemiiller (Hyla- comulus) wrote a work called Cosmographice Introductio, to which was appended a Latin edition of the four voyages of Vespucci. In this book, which was printed at St Dié in Lorraine, he proposed that the name of America should be given to the New World. In 1508 the first engraved map containing the New World appeared, in an edition of Ptolemy printed at Rome, but it does not bear the name of America. But in 1509 the name " America," proposed by Hylacomu- lus in 1507, appears, as if it was already accepted as a well- known denomination, in an anonymous work entitled Globus Mundt, published at Strasburg. This was three years be- fore the death of Vespucci. The Afappe Monde of Leonardo da Vinci, to which Major assigns the date of 1514, has the name of America across the South American continent.

In 1508 Ojeda obtained the government of the coast of South America from Cabo dela Vela to the Gulf of Darien; and at the same time Diego Nicuesa was appointed governor of Veragua from the Gulf of Darien to Cape Gracias a Dios. The two adventurers arrived at Hispaniola together; but Ojeda set out first for his government, landed at Carthagena in 1510, and sustained a bloody defeat from the natives, in which his lieutenant, Juan de la Cosa, was killed. Ojeda then embarked, and eventually selected a site on the east side of the Gulf of Darien for his seat of government. Here he was again defeated by the natives, and, returning to Hispaniola for aid, he died there in extreme poverty. Nicuesa was still more unfortunate, and died at

sea. The Spaniards in the Gulf of Darien were left by Ojeda under the command of Francisco Pizarro, the future conqueror of Peru. After suffering from famine and disease, Pizarro embarked the survivors in small vessels, but outside the harbour they met a ship which proved to be that of the bachiller Martin Fernandez Enciso, Ojeda's partner, coming with provisions and reinforcements, They all returned to their settlement called San Sebastian, but found that the Indians had destroyed the fort, and Enciso determined to abandon it. One of the crew of Enciso's ship, Vasco Nufiez de Balboa, the future discoverer of the Pacific Ocean induced his commander to form a settlement on the otkier side of the Gulf of Darien. The soldiers became discon- tented and deposed Enciso, when Vasco N uilez, a clever and courageous adventurer, took command of the Darien settle- ment in March 1511. Enciso was a man of learning and an accomplished cosmographer. His work Swna de G'eo- grafia, which was printed in 1519, is the first Spanish book which gives an account of America. Vasco Nujiiez, the new commander, entered upon a career of conquest in the neigh- bourhood of Darien, which ended in the discovery of the Pacific Ocean on the 25th of September 1513. In 1514 Pedrarias de Avila, an old man of rank and some reputation but with no ability, and of a malicious disposition oe appointed to supersede Vasco Nuiiez as governor of Dasien and the bachiller Enciso came out in his fleet, Pedrarias, on a false pretext, beheaded Vasco Nuiiez in 1517, which

was one of the greatest calamities that could have happened to South America at that time ; for the discoverer of the South Sea was on the point of sailing with a little fleet into liis unknown ocean, and a humane and judicious nan would have been the conqueror of Peru, instead of the cruel and ignorant Pizarro, In the year 1519 Panama was founded by Pedrarias ; and the conquest of Peru by Pizarro followed a few years afterwards. Hernan Cortes overran and con- quered Mexico from 1518 to 1521, and the discovery and conquest of Guateniala by Alvarado, of Florida by Hernando de Soto, and of Nueva Granada by Quesada, followed in rapid succession. The first detailed account of the west coast of South America was written

by that keenly obser- vant old soldier, Pedro de Cieza de Leon, who was travel- ling in South America from 1533 to 1550, and published his story at Seville in 1553.

But the great anxiety of the Spanish Government at that time was to find a westward route to the Moluccas. For this purpose Juan Diaz de Solis was despatched in October 1515, and in January 1516 he discovered the mouth of the Rio de la Plata. He was, however, killed by the natives,

and his ships returned. In the following year Magellan Magellan,

laid before Charles V., at Valladolid, a scheme for reaching the Spice Islands by sailing westward. He had already served with his own countrymen, the Portuguese, on the coast of Indiaand at the taking of Malacca, and he was an accomplished and resolute seaman. With a fleet of five ships, and the rank of captain-general, Magellan sailed from San Lucar on the 21st of September 1519. After touching on the coast of Brazil, at the Rio de la Plata, and at the ports on the east coast of Patagonia, Magellan entered the straits which bear his name in October 1520. In conse- quence of many fires being seen on the southern shores of the strait, he named that country Tierra del Fuego, The fleet, now consisting of the “Trinidad,” “ Vittoria,” and “Concepcion,” emerged from the strait and entered the Pacific Ocean on the 27th of November 1520, They then steered north-west, crossed the line on the 13th of February 1521, and on the 6th of March reached the Ladrone Islands. Thence Magellan proceeded to the Philippines. He was killed in an attack on the island of Matan, which he made in order to bring it under subjection to his ally the king of Zebu, on the 26th of April 1521, Thus fell this great navigator, who was second only to Columbus in the his- tory of nautical exploration. His brother-in-law, Duarte Barbosa, was selected to succeed Magellan in command of the fleet, with Jo&o Serrao as his colleague, They were both killed in battles with the natives, and eventually a Biscayan named Sebastian del Cano, sailing home by way of the Cape of Good Hope, reached San Lucar in command of the “ Vittoria” on the 6th of September 1522, with eighteen survivors. Del Cano was received with great distinction by the emperor, who granted him a globe for his crest, and the motto ‘“ Primus circumdedisti me.”

While the Spaniards were circumnavigating the world and completing their knowledge of the coasts of Central and South America, the Portuguese were actively engaged on similar work as regards Africa and the East Indies.

In Abyssinia the mission of Covilham led to further pxplom the tion of

intercourse. In April 1520 the Portuguese viceroy of Indies took a fleet into the Red Sea, and landed an embassy consisting of Dom Rodriguez de Lima and Father Francisco Alvarez, a priest whose detailed narrative is the earliest and not the least interesting account we possess of Abyssinia. It was not until 1526 that the embassy was dismissed ; and not many years afterwards the negtis entreated the help of the Portuguese against Mahometan invaders, and the Viceroy sent an expeditionary force, commanded by his brother Cristoforo da Gama, with 450 musketeers. Da Gama was taken prisoner and killed, but his Portuguese

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enabled the Christians of Abyssinia to regain their power, and a Jesuit mission remained in the country. While Abyssinia was thus opened to the enterprise of the Portu- guese on the east side of Africa, they also established a close connexion with the kingdom of Congo on the west side, and obtained much information respecting the interior

SIXTEENTH CENTURY. | 183 2 examination of the straits which lead into the Sea of

ara.

The French followed closely on the track of Jolin Cabot, French and the hardy Norman and Breton seamen frequented the enter- banks of Newfoundland at the commencement of the 16th Prise century. In 1524 Francis I. sent Giovanni da Verazzano

el- Lapland coast.

of the continent. Duarte Lopes, a Portuguese settled in the country, was sent on a mission to Rome by the king of Congo, and Pope Sixtus V. caused him

to recount to his chamberlain, Felipe Pigafetta, all he had learned during the nine years he had been in Africa, from 1578 to 1587. This narrative, under the title of Description of the King- dom of Congo, was published at Rome by Pigafetta in 1591. A map was attached ou which the two equatorial lakes, Victoria and Albert Nyanza, and Lake Tanganyika are shown, and the empire of Monomoezi or Uniamuezi is laid down. The most valuable work on Africa during the 16th century is, however, that written by Leo Africanus. This famous traveller was born at Granada, and retired into Africa when his native town was captured by the Spaniards. He travelled extensively in the north and west of Africa, and was eventually taken by pirates and sold to a master who presented him to Pope Leo X. At the pope's desire he translated his work on Africa into Italian, and died in about the year 1526.

In the East Indies the Portuguese acquired predominating influence at sea, establishing factories on the Malabar coast, 'in the Persian Gulf, at Malacca, and in the Spice Islands, and extending their commercial enterprises from the Red Sea to China. Their missionaries were received at the court of Akbar, and Benedict Goes, a native of the Azores, was despatched on a journey overland from Agra to China. He started in 1603, and, after traversing the least known parts of Central Asia, he reached the confines of China. He appears to have ascended from Cabul to the plateau of the Pamir, and thence onwards by Yarkand, Khotan, and Aksu. He died at a place called Socieu in March 1607; and thus, as one of the brethren pronounced his epitaph, "seeking Cathay he found heaven."

The activity and love of adventure, which became a passion for two or three generations in Spain and Portugal, spread to other countries. It was the spirit of the age ; and England, Holland, and France soon began to enter upon the same glorious career. English enterprise was first aroused by John and Sebastian Cabot, father and son, who came from Venice and settled at Bristol in the time of Henry VII. The Cabots received a patent, dated March

ts. 5, 1496, empowering them to seek unknown lands; and

John Cabot discovered Newfoundland and part of the coast of America. Sebastian afterwards made a voyage to Rio de la Plata in the service of Spain, but he returned to England in 1548, and received a pension from

Edward VI. “in consideration of the good and acceptable services done and tobe done.” He was placed at the head of the Society of Merchant Adventurers, and, by his knowledge and ex- perience, he was the means of keeping alive the spirit of enterprise in England, and of extending her foreign com- merce, At his suggestion a voyage was undertaken for the discovery of a north-east passage to Cathay, with Sir Hugh – Willoughby as captain-general of the fleet, and Richard Chancellor as pilot-major. They sailed in May 15538, but Willoughby and all his crew perished in a harbour on the Chancellor, however, was more fortunate. He reached the White Sea, performed the journey overland to Moscow, where he was well received, and may be said to have been the founder of the trade between Russia and England. He returned to Archangel and brought his ship back in safety to England. On a second voyage, in 1556, Chancellor was drowned 3 and three subsequent voyages, led by Stephen Burrough, Pet, and Jackman, effected

of Florence on an expedition of discovery to the coast of North America; and the details of his voyage were em- bodied in a letter addressed by him to the king of France from Dieppe, in July 1524. On April 20, 1534, Jacques

Cartier sailed fromm St Malo with two vesscls of 60 tons Cartier.’

each, for the purpose of continuing the discoveries of Verazzano, aud he visited Newfoundland and the Gulf of St Lawrence, In the following ycar he made another voyage, discovered the island of Anticosti, and ascended the St Lawrence to a place called Hochelaga, now Montreal. He returned, after passing two winters in Canada; and on another occasion he also failed to establish a colony. Admiral de Coligny made several unsuccessful endeavours to form a colony in Florida under Jean Ribault of Dieppe, René de Laudonniére, and others, but the settlers were furiously assailed by the Spaniards and the attempt was abandoned.

The reign of Elizabeth is famous for the gallant enter- Age of prises that were undertaken by sea and land to discover and Elizabeth,

bring to light the unknown parts of the earth. The great promoter and father of English geographical discovery was Richard Hakluyt, who was born near

London in 1553. was at Westminster School, and when quite a boy he imbibed a love for cosmography and maritime discovery. At Oxford he read all the narratives of voyages and travels that came within his reach, and delivered lectures on carto- graphy. In 1585 he was at Paris, as chaplain to the English embassy, and in 1605 he became a prebendary of Westminster. He was the chief promoter in the formation of the two companies for colonizing Virginia in 1606 ; and he devoted his life to the encouragement of similar nnder- takings, and to their record. Hakluyt died in 1616, and was buried in Westminster Abbey. He was incessantly employed in the collection, examination, and translation of accounts of voyages and travels, and of charters, letters, and other documents bearing on the subject, and in correspondence with men eager either to impart or receive information. Sir Philip Sidney, Sir Francis Walsingham, Lord Thomas Howard, and Sir Francis Drake were among those who supported and encouraged him, and Ortelius and Mercator were his correspondents. His first work was the Dvvers Voyages touching the Discoverie of America; and the second was brought out while he was in Paris in 1586, entitled A Notable Historie containing Foure Voyages made by French Captaynes unto Florida. In 1587 he published at Paris a revised edition of the De Orbe Novo of Peter Martyr Anghiera. His Principal Navigations was published in folio in 1589, and dedicated to Sir Francis Walsingham ; and the new edition, in three volumes, appeared in 1598. Hakluyt also got translations made of Leo Africanus, of Mendoza's History of China, and of Galvano's Dzscoveries of the World, which were'published. His last publication was a translation of Hernando de Soto's discoveries in Florida. He left many valuable papers at his death, most of which, together with a vast number of other narratives, were pub-

lished in 1622 in the great work of the Rev. Samuel Purchas.

Purchas, entitled "Hakluytus Posthumus, or Purchas his Pilgrimes." .

It is from the rich treasure-house of Hakluyt and Purchas that our knowledge of the gallant deeds of the English and other explorers of the Elizabethan age is mainly derived. The great collections of voyages and travels of De Bry and Hulsius served a similar useful purpose on tke continent of Europe. One important object of English maritime adven-

He Hakluyt.

North- west passage.

Frobisher.

Davis.

Baffin.

turers of those days was to discover a route to Cathay by the north-west, a second was to settle Virginia, and a third was to beat up the Spanish settlements in the Indies. Nor was the trade to Muscovy and Turkey neglected ; while latterly a resolute and successful attempt was made to establish commercial relations with East India.

Martin Frobisher led the way in the direction of the north-west, sailing from the Thames in 1576, and sighting the southern part of Greenland on the 11th of July. In this voyage he discovered a part of the coast of Labrador, and the strait (now known to be a deep bay) which bears his name. He brought home some stones which were believed to be gold, and the consequence was that there arose an eager desire to obtain more. Many speculators subscribed, and Frobisher was sent out on a second voyage, “more for the searching of this gold ore than for the searching any further discovery of the passage.” He left Gravesend on May 27, 1577, wasted his time in picking up stones on the shores of Frobisher’s Strait, and returned on the 22d of August. The excitement about the gold ore still continued. The queen gave the name of Meta Incog- nita to the newly discovered country ; and on May 21, 1578, Frobisher set out on a third voyage with a fleet of fifteen ships. After touching at Greenland, they made for the opposite shore through an ice-encumbered sea, and the fleet was separated during a heavy gale. They reached various ports in England during October, and by that time the bubble about the gold ore had burst, and tlie enterprise was considered a failure. The first of the three voyages alone was a voyage of discovery.

In 1585 John Davis, an admirable seaman and most re- solute explorer, was employed by some merchants, chief among whom was Mr William Sanderson of London, to take up the glorious work where Frobisher had left off. He sailed from Dartmouth on the 7th of June 1585, and, reaching the south-west coast of Greenland, he called it the “ Land of Desolation.” He then stood over to the opposite coast, which he examined in the neighbourhood of Cape Walsingham, returning to Dartmouth on September 30. In 1588 he sailed on the 7th of June and coasted along Greenland, having friendly intercourse with the Eskimo. He also examined part of the Labrador coast. Jn his third voyage he sailed from Dartmouth on the 17th of May, and sighted Greenland on the 14th of June. On this occasion he went as far north as 72° 12’, naming the great island bluff—which is now so well known to voyagers up Baffin’s Bay—‘ Sanderson his Hope of a North-West Passage.” Crossing over Davis Strait, the bold explorer discovered the strait which now bears the name of Hudson. Davis was followed in his northern voyages by Waymouth, Hall, and Knight; and in 1607 Henry Hudson was despatched on a voyage of discovery in a small vessel of 80 tons. He sighted the east coast of Greenland in 73° N., examined the north-west end of Spitzbergen, as far as a point which he named Hakluyt Headland, and reached 80° 23’N. In 1608 he made a second voyage, during which he examined the edge of the ice between Spitzbergen and Greenland. In his third voyage, in 1609, he was employed by the Dutch, and discovered the Hudson River. In 1610 he was again employed by English merchants, and entered Hudson’s Bay but was infamously abandoned in an open boat by his erew, Z ae wy anne Button continued the exploration of

Tudson’s Bay, which was completed by Thom Luke Fox in 1631. ‘ ent

In 1616 the little bark “ Discovery,” of 35 tons, was fitted out by those persevering adventurers Sir ‘Thrones Smith, Sir Dudley Digges, John Wolstenholme, and Alderman Jones, for another attempt in the icy seas. This was the most successful Arctic voyage of the 17th century. Robert Bylot was appointed master of the “ Discovery,” and

William Baffin was pilot. They sailed from Gravesend with 17 souls on board, on the 26th of March, and were off Hope Sanderson, the extreme

point of Davis, on the 30th of May. The “Discovery” reached what is now called “the north water” of Baffin’s Bay on the 1st of July, and after discovering the head of the great bay which bears his name, the pilot Baffin returned by sailing down the west side of it. On August 30 the “Discovery” was again safely anchored in Dover roads. It was exactly 200 years before any other vessel followed in her track, and reached “the north water.” Both Davis and Baffin afterwards served and were killed in the East Indies.

The Dutch emulated the English in the Arctic seas pyig, during this period, Their merchants opened a trade with explon. Kola and Archangel as early as 1578, but the difficulty of tion. penetrating into the Sea of Kara led them to try the possi- bility of finding a passage round the northern end of Novaya Zemlya. The credit of the conception of this voyage is due to the great cosmographer Peter Plancius, and the mer- chants of Amsterdam adopted the idea, and despatched a vessel of 100 tous called the “ Mercurius,” under the com- mand of William Barents, He sailed from the Texel on Barents, June 4, 1594, and sighted Novaya Zemlya on the 4th of July. Sailing northwards along the coast he rounded Cape Nassau and reached the edge of the ice. For many days he perseveringly sought for a passage through it. In his second voyage he merely went to the entrance of the Sea of Kara. But his third voyage was the most important, Heemskerk was the commander, Barents was pilot, and the mate, Gerrit de Veer, was the historian of the voyage. They sailed from Amsterdam on May 18, 1596. OnJune 19, Spitzbergen was discovered, and the whole western coast and part of the northern examined. The record of the subsequent proceedings of Barents and his crew, of their famous voyage round the north-western end of Novaya Zemlya, and of their terrible sufferings in the first Arctic winter ever faced by Europeans, is deeply interesting as it is told in the simple narrative of Gerrit de Veer. Barents had long been ill, and when they set sail from their dismal winter harbour on June 14, 1597, in open boats, he was too weak to stand, and was carried from the house. He died on the 19th, and found a grave in the midst of his discoveries.

The maritime enterprise of England, in the days of Buglish Elizabeth, was mainly directed towards the discovery of a alm north-west passage ; but many voyages were also made to aa Guinea and the West Indies, and twice

English vessels followed in the track of Magellan, and circumnavigated the globe.

In 1577 Francis Drake, who had previously served with Drake Hawkins in the West Indies, undertook his celebrated voyage round the world. His fleet consisted of three ships and two pinnaces, which were broken up during the voyage. The ships were the “Pelican” of 100 tons, on board of which Drake himself embarked, the * Elizabeth ” of 80, and the “Marigold” of 30 tons, After some stay at Port San Julian on the coast of Patagonia, the fleet entered the Straits of Magellan on the 20th of August 1578, when Drake changed the name of his ship to the “Golden Hind.” They reached the western entrance on the 6th of September, and soon afterwards the “ Marigold” parted company in a gale of wind, and was never heard of again, while the “ Eliza- beth” basely deserted her consort and returned to England. Drake, in the “ Golden Hind,” continued the voyage alone. At first he was driven to the southernmost point of Tierra del Fuego, and thus discovered that there was a passage, though he did not round Cape Horn. He then proceeded northward along the west coast of America, touching at the island of Mocha off the Chilian coast, at Valparaiso, Coquimbo, Tarapaca, Arica, Callao, and Payta. Off Cape

San Francisco, nearly on the equator, he captured a very rich Spanish treasure-ship called the ‘ Cacafuego”; and it is right to observe that England was then at peace with Spain. Drake resolved to attempt the discovery of a passage from the Pacific to the Atlantic, and with this object he continued to shape a course northwards along the American continent.

On the 5th of June 1579 the “Golden Hind” reached her !

most northern point in 48°, when the attempt was aban- doned, and Drake put into a harbour to refit, named Port Drake, which appears to have been the modern harbour of San Francisco, on the coast of California. The coast from the southern extremity of the Californian peninsula to Cape Mendocino was discovered by Juan Rodriguez Cabrillo and Francisco de Ulloa in 1539. Drake’s discoveries extend from Cape Mendocino to 48° N.

Leaving California, Drake sailed across the Pacific and reached the Philippine Islands in October. He touched at Ternate and Java, and rounded the Cape of Good Hope on June 15, 1580. The “Golden Hind” anchored safely at Plymouth on the 26th of the following September. Drake was graciously received and knighted by the queen, and the “ Golden Hind,” the first English ship that circum- navigated the globe, was preserved for many years at Deptford. Wheu at last she was broken up, a chair was made from one of her planks and presented to the uni- versity of Oxford.

Mr Thomas Cavendish, a gentleman of Suffolk, emulous of Drake’s example, fitted out three vessels for an expedition to the South Sea, and sailed from Plymouth on July 21, 1586. Cavendish passed through Magellan’s Straits in January 1587, and, taking the same route as Drake along the west coast of America, he reached Mazatlan in Septem- ber. A rich Spanish treasure-ship was captured off Cape San Lucas, the southern extremity of California, on the 4th of November, and Cavendish then steered across the Pacific, seeing no land until he reached the Ladrone Islands. He arrived safely at Plymouth on the 9th of September 1588. The third English voyage into the Pacific was not . So fortunate, Sir Richard Hawkins sailed from Plymouth on the 12th of June 1593 in the good ship “ Dainty,” passed through Magellan’s Straits, and all went well until they reached the bay of Atacames, 57 miles north of the equator, in June 1594. Here the English were attacked by a Spanish fleet, and, after a desperate naval engagement, Hawkins was forced to surrender. Hawking declared his object to be discovery and the survey of unknown lands, and his voyage, though terminating in disaster, bore good fruit. The Observations of Sir Richard Hawkins in his Voyage into the South Sea, published in 1622, are very valuable, and form the most charming work of the kind which was written during that period. It was long before another English ship entered the Pacific Ocean, Sir John Narborough took two ships through the Straits of Magellan 1n 1670 and touched on the coast of Chili; but it was not until 1685 that Cook and Dampier sailed over the part of the Pacific where, nearly a century before, the “ Dainty ” had to strike her flag to the Spaniard.

The exploring enterprise of the Spanish nation did not wane after the conquest of Peru and Mexico, and the acquisition of the vast empire of the Indies. It was rather Spurred into renewed activity by the audacity of Sir

John Hawkins in the West Indies, and by the appearance of Drake, Cavendish, and Richard Hawkins in the Pacific.

In the interior of South America the Spanish conquerors had explored the region of the Andes from the isthmus of Panama to Chili ; and in 1541 Francisco de Orellana dis- covered the whole course of the Amazon from its source in the Quitenian Andes to the Atlantic. A second voyage down the great river was made in 1561 by the mad pirate Lope de Aguirre; but it was not until 1639 that a full

account was written of the mighty stream by Father Cristoval de Acufia, who ascended it from its mouth to the city of Quito. The voyage of Drake across the Pacific was preceded by that of Alvaro de Mendafia, who was des- patched from Peru in 1567 to discover the Australian land which was believed to exist in the South Sea. After a voyage of eighty days across the Pacific, Mendafia discovered the Salomon Islands ; and the expedition returned in safety to Callao. The appearance of Drake on the Peruvian coast led to an expedition being fitted out at Callao, to go in chase of him, under the command of Pedro Sarmiento. He sailed from Callao in October 1579, and made a careful survey of the Straits of Magellan, with the object of forti- fying that entrance to the South Sea, The colony which he afterwards took out from Spain was a complete failure, and isonly remembered now fromthe name of “Port Famine” which Cavendish gave to the site at which he found the starving remnant of Sarmiento’s settlers. In June 1595 Mendafia sailed from the coast of Peru in command of a second expedition to colonize the Salomon Islands. After discovering the Marquesas, he reached the island of Santa Cruz of evil memory, where he and many of the settlers died. His young widow took command of the survivors and brought them safely to Manila, The viceroys of Peru still persevered in their attempts to plant a colony in Australia, Pedro Fernandez de Quiros, who was pilot under Mendafia and Luis Vaez de Torres were sent in command of two ships to continue the work of exploration. They sailed from Callao on December 21, 1605, and dis- covered several islands of the New Hebrides group. They anchored in a bay of a large island which Quiros named

“Australia del Espiritu Santo.” From this place Quiros returned to America, but Torres continued the voyage, passed through the strait between Australia and New Guinea which bears his name, and explored and mapped the southern and (as has recently been proved) also the eastern coast of New Guinea,

The Portuguese, in the early part of the 17th century Pportu- (1578-1640), were under the dominion of Spain, and their guese ex- enterprise was to some extent damped ; but their mission- Plorers.

aries extended geographical knowledge in Africa. Father Francisco Paez acquired great influence in Abyssinia, and explored its highlands from 1600 to 1622. Fathers Mendez and Lobo traversed the deserts between the coast of the Red Sea and the mountains, became acquainted with the shores of Lake Tsana, and discovered the sources of the Abai or Blue Nile in 1624-1633.

But the attention of the Portuguese was mainly devoted to vain attempts to maintain their monopoly of the trade of India against the powerful rivalry of the English and Dutch. The English enterprises were persevering, continuous, and successful. James Lancaster made a voyage to the Indian Ocean from 1591 to 1594; andin 1599 the merchants and adventurers of London resolved to form a company, with the object of establishing a trade with the East Indies. On the 31st of December 1599 Queen Elizabeth granted the

charter of incorporation to the Hast India Company, and Rast Sir James Lancaster, one of the directors, was appointed India

general of their first fleet. He was accompanied by John Davis, the great Arctic navigator, as pilot-major. voyage was eminently successful, The ships touched at Achin in Sumatra and at Java, returning with full ladings of pepper in 1603. The second voyage was commanded by Sir Henry Middleton ; but it was in the third voyage, under Keelinge and Hawkins, that the mainland of India was first reached in 1607. Captain Hawkins landed at Surat and travelled overland to Agra, passing some time at the court of the Great Mogul. In the voyage of Sir Edward Michelborne, John Davis of Arctic fame lost his life in a

fight with a Japanese junk on December — The

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English in Persia.

Dutch enter- prise.

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i age. led by Captain Saris, extended the operations .. to J ‘tee and in 1613 the Japanese Govern- ment granted privileges to the Company ; but the English retired in 1623, giving up their factory. The chief result of this early intercourse between England and Japan was the interesting series of letters written by William Adams from 1611 to 1617. Adams, however, though an English- man, went to Japan in a Dutch ship. From the tenth voyage of the Kast India Company, commanded by Captain Best, who left England in 1612, dates the establishment of permanent English factories on the coast of India. It was Captain Best who secured a regular firman for trade from the Great Mogul. From that time a fleet was despatched every year, and the Company’s operations greatly increased geographical knowledge of India and the Eastern Archi- pelago.

The visits of Englishmen to Eastern countries, at this time, were not confined to the voyages of the Company. Journeys were also made by land, and, among others,

Thomas Coryat, of Odcombe in Somersetshire, walked from

France to India, and died in the Company’s factory at Surat. In 1561 Mr Anthony Jenkinson arrived in Persia with a letter from Queen Elizabeth to the shah. He travelled through Russia to Bokhara, and returned by the Caspian and Volga. In 1579 Christopher Burroughs built a ship at Nijni Novgorod and traded across the Caspian to Baku ; and in 1598 Sir Anthony and Robert Shirley arrived in

Persia, and Robert was afterwards sent by the shah to

Europe as his ambassador. He was followed by a Spanish mission under Garcia de Silva, who wrote an interesting account of his travels; and to Sir Dormer Cotton's mission, in 1628, we are indebted for Sir Thomas Herbert's charm- ing narrative. In like manner, Sir Thomas Roe's mission to India resulted not only in a large collection of valuable reports and letters of his own, but also in the detailed account of his chaplain Mr Terry. But the most learned and intelligent traveller in the East, during the 17th century, was the German Koeempfer, who accompanied an embassy to Persia in 1684, and was afterwards a surgeon in the service of the Dutch East India Company. He was in the Persian Gulf, India, and Java, and resided for more than two years in Japan, from 1690 to 1692. His History of Japan was published in England in 1727, Kcempfer himself having died in 1716. From these various sources a considerable increase was made in the knowledge of India, Persia, and the further East.

The Dutch nation, as soon as it was emancipated from Spanish tyranny, displayed an amount of enterprise which, for a long time, was fully equal to that of England. The memorable Arctic voyages of Barents were quickly followed by the establishment of a Dutch East India Company ; and Holland, ousting the Portuguese, not only established factories on the mainland of India and in Japan, but acquired a preponderating influence throughout the Eastern Archipelago. In 1583 Jan Hugen van Linschoten made a voyage to India with a Portuguese fleet, and his full and graphic descriptions of India, Africa, China, and the Eastern Archipelago must have been of no small use to his countrymen in the commencement of their distant voyages. The first of their Indian voyages was performed by ships which sailed from Holland in April 1595, and rounded the Cape of Good Hope. A second large Dutch fleet sailed in 1598 ; and, so eager was the young republic to extend her commerce over the world that another fleet, consisting of five ships of Rotterdam, was sent in the same year by way of Magellan's Straits, under Jacob Mahu as admiral, with William Adams as pilot. Mahu died on the passage out and was succeeded by Simon de Cordes, who was killed on the coast of Chili. In September 1599 the fleet had entered the Pacific. The ships were then steered direct

for Japan, and anchored off Bungo in April 1600. In the very same year, 1598, a third expedition was despatched under Oliver van Noort, a native of Utrecht. The flee; left Holland in September 1598, and entered the South Sea, through the Straits of Magellan, in February 1600, after a tedious, and in truth unskilful, navigation of nearly a year and a half from the time of leaving Holland. After keeping along the west coast of America nearly as far as the line, Van Noort shaped a course for the Ladrone Islands, and arrived off Manila. In August 1601 he anchored in front of Rotterdam, after an absence of three years, but the voyage contributed nothing to geography. The Dutch Company in 1614 again resolved to send a fleet to the Moluccas by the westward route, and Joris Spilbergen was appointed to the command as admiral, with a commission from the States-General. He was furnished with 4 ships of Amsterdam, 2 of Rotterdam, and 1 from Zeeland. On May 6, 1615, Spilbergen entered the Pacific Ocean, and touched at several places on the coast of Chili and Peru, defeating the Spanish fleet in a naval engagement off Chilca, After plundering Payta and makingrequisitions at Acapuleo, the Dutch fleet crossed the Pacific and reached the Moluccas in March 1616. Atthat time the Dutch Company had 37 sail of European shipping and 3000 troops in the East Indies.

The Dutch now resolved to discover a passage into the Pacific to the south of Tierra del Fuego, the existence of which was ascertained by Sir Francis Drake. The vessels fitted out for this purpose were the “ Hendracht,” of 360 tons, commanded by Jacob le Maire, and the “Horn,” of 110 tons, under Jan Schouten, They sailed from the Texel on June 14, 1615, and by the 20th of January 1616 they were south of the entrance of Magellan’s Straits. Passing through the strait of Le Maire they came to the southern extremity of Tierra del Fuego, which was named Cape Horn, in honour of the town of Horn in West Friesland, of which Schouten was a native. They passed the cape on the 31st of January, encountering the usual westerly winds. The great merit of this discovery of a second passage into the South Sea lies in the fact that it was not accidental or un- foreseen, but was due to the sagacity of those who designed the voyage. On March 1 the Dutch fleet sighted the island of Juan Fernandez; and, having crossed the Pacific, the explorers sailed along the north coast of New Guinea, and arrived at the Moluccas on September

17, 1616. In 1623 the Dutch sent expeditions against Brazil and Peru, which, however, did little to advance geographical knowledge, except that the Brazilian invasion resulted in the valuable

work of Nieuhof.

There were several early indications of the existence of the great Australian continent, which have been very ably discussed by Mr Major; and the Hollanders endeavoure to obtain further knowledge concerning the country and its extent ; but only its northern and western coasts had been visited before the time of Governor Van Diemen. Dirk Hartog had been on the west coast in latitude 26° 30′ 8. in 1616. Pelsert struck on a reef called “ Houtmans Abrolhos” on June 4, 1629. In 1697 the Dutch captain Vlamingh landed on the west coast of Australia in 31° 43 S., and named the Swan River, where he saw some black swans. In 1642 the governor and council of Batavia fitted out two ships to prosecute the discovery of the south land, and entrusted the command to Captain Abel Jansen Tasman. This voyage proved to be the most important to geography that had been undertaken since the first circum navigation of the globe. Tasman sailed from Batavia It the yacht “Heemskirk” on the 14th of August 1642, and from Mauritius on the 8th of October. On November 24 high land was sighted in 42° 30’ S., which was named Van Diemen’s Land, and, after landing there, sail was aga?

Cape Horn rounded,

Explora- tion of

| Australia

SEVENTEENTH CENTURY. |

made, and New Zealand (at first called Staten Land) was discovered on the 14th of December. Tasman communi- cated with the natives and anchored in what he called Murderer’s Bay. From New Zealand it was resolved to steer eastward to longitude 220°, and then north. On this course the ships arrived at Tongatabu, one of the Friendly Islands of Cook; in April 1643 they were off the north coast of New Guinea; and on June 15 Tasman

returned to Batavia. In 1644 Tasman made a second voyage to effect a more full discovery of New Guinea.

The French directed their enterprise more in the direction of North America than of the Indies. One of their most distinguished naval worthies was Samuel Champlain, a native of Brouage in Saintonge, whose friend and patron was Aymar de Chastes, governor of Dieppe, a devoted – follower of Henry IV. Champlain after the close of the war with the League in Brittany, in which he served, made a remarkable journey through Mexico and the West India Islands from 1599 to 1602, and on his return he found that M. de Chastes was, undeterred by previous failures, resolved to undertake the establishment of a colony in Canada. Champlain was sent on a voyage of reconnaissance, and on his return he found that the Sieur de Chastes was dead. In 1603 the Sieur de Monts was named vice-admiral of

time, and the astrolabe for high altitudes. With the inven- tion of these instruments came instructions for their use, and for working out observations. In England the first of these was The Old Rutter of the Sea, printed in 1490. Then followed the Seaman’s Scerets of John Davis, and A Regiment of the Sea, containing very necessary Matters, with a perfect Sea Card, by Thomas Hood, published in 1596. Hood also sold compasses constructed on Mr Norman’s principle, near the Minories. These manuals contained definitions, treatises on the use of the sea card and com pass, tables of declination and rules for applying it, rules for dead reckonings and longitude, and instructions in the use of instruments. Latitude was obtained by observation, but

longitude had usually to be reckoned on the chart from the Finding meridian of Grand Canary, which in those days was used longitude

by all civilized countries. The differences of time between the eclipses of the moon at the place of the observer and the place for which it was calculated in the ephemerides for that day was anothcr method in use of finding the differ- ence of longitude. Mariners were also provided with

tables giving the number of miles in a degree of longitude for every degree of- latitude. Much attention was bestowed upon the phenomena of the variation and dip of the magnetic needle. Robert Norman, the hydrographer, dis-

the coasts of Acadia, and Champlain sailed with him from Dieppe. He was for some years engaged in surveying all the coasts of Acadia and Cape Breton, and in 1607 he re-

covered the dip or inclination of the needle in 1576, and in Variation 1581 he observed the variation of the compass at London, of com- and found it to be 11° 15’ KE, In the same year his Dés- P#5S:

turned to France with De Monts. In the following year another attempt was made. Champlain, with a colleague named Du Pont Gravé, sailed to the St Lawrence, and on July 3, 1608, they first arrived at Quebec. In 1609 Champlain ascended the Iroquois to the lake which still bears hisname. By 1611 aregular colony was established at Quebec; and in 1620 Champlain was installed as governor, He died towards the end of the year 1635. Champlain was an able navigator and a resolute explorer, and he made a very large addition to the knowledge of Canada and Acadia (Novia Scotia).

The last expedition of the 17th century was purely scien- . tific. In 1699 Edmund Halley, the astronomer-royal, in command of the “ Paramour Pink,” undertook a voyage to improve the knowledge of longitude, and of the variation of the compass. The results of his voyage were the con- struction of a variation chart, and proposals for finding the longitude by occultations of fixed stars.

During the 17th century very considerable progress was made in the art of navigation, and in systematizing and delineating the vast mass of material that was accumulated by the ceaseless activity of explorers. The Dutch took the lead as map-makers. Mercator invented the useful projec- tion which bears his name; and Ortelius, Hondius, and Hulsius compiled a series of valuable maps. In finding the latitude at sea, the astrolabe very generally gave place to the cross-staff, because the graduation of the latter was larger and more easily read off. The cross-staff was a very simple instrument, consisting of a graduated pole with cross pieces, called transversaries (of

which there were four used according to the altitude), also graduated, which were fitted to work on it. The bearings of the sun were taken by com- pass, to ascertain when it was near the meridian ; then the end of the long staff was placed close to the observer's eye, and the transversary moved until one end exactly touched the horizon, and the other thesun's centre. This was con- tinued until the sun dipped, when the meridian altitude was obtained, The back-staff was an improvement on the ctoss-staff, invented by the great Arctic navigator John Davis. It was fitted with a reflector, and it was thus the first rough idea of the principle of the quadrant and sextant. The cross-staff was used for low altitudes, because both ends of the transversary could easily be seen at the same

course of the Magnet or Loadstone was published by Ballard. In 1580 Mr Borough, comptroller of the navy, found the variation of the compass at Limehouse to be 11°19' E. It may be observed here that in 1657 there was no variation at London, and that it moved westerly until 1815, when it was 24°27' W. It is now returning eastwards.

By means of these rough instruments and calculations our Elizabethan navigators and their contemporaries suc- ceeded in delineating the vast regions that were discovered. Thus the sum of human knowledge was augmented, while men's minds were enlarged, and the wealth and prosperity of nations were increased, through the provision of safe guides by which lands and seas could be traversed, and distant countries visited.

In the 18th century, toa far greater extent than had ever been the case before, geography began to be cultivated for its own sake, and expeditions were fitted out with the objects of discovery and of acquiring knowledge. The same objects also generally formed part of those enterprises which were avowedly undertaken for conquest, in the search of wealth, or from motives of religious zeal.

The improvement of scientific apparatus naturally went Board of hand in hand with the progress of discovery. The great Longitude.

desideratum was the means of finding the longitude; and it was the creation of a commission for the discovery of longitude in 1713 which, so far as England is concerned, gave the greatest stimulus to inventions connected

with geographical research. To the Board of Longitude is due the conception of the Mautical Almanac, and the establish- ment of a surveying branch of the naval service. The

Nautical Almanac first appeared in 1767, under the auspices Nautical of Dr Maskelyne, the astronomer-royal, who, by furnishing Almanac.

tables of lunar distances, supplied another means of finding the longitude. The invention by Hadley, in 1731, of the quadrant for use at sea, which entirely superseded the astrolabe and cross-staff, was a still greater improvement ; and it was soon followed by better instruments on the same principle—the sextants of Dollond and Troughton. work of travellers on land also became more accurate in proportion as instruments and maps were improved. Early explorers by land were content with itinerarles and on which only indicated distances. The introduction 0 observations by compass bearings was an important improve-

The Sextant.

Survey of China.

Missions to Tibet.

Van de Putte.

Persia.

India.

ment ; and after the invention of Hadley’s quadrant, these rough route surveys began to be checked and verified by astronomical observations. wat

The most remarkable example of the early application of these improvements is to be found in the survey of China by the Jesuit missionaries. They first prepared a map of the country round Peking, which was submitted to the emperor Kang-hi, and, being satisfied with the accuracy of the European method of surveying, he resolved to have a

survey made of the whole empire on the same principles. This great work was commenced in July 1708, and the com- pleted maps were presented to the emperor in 1718. The records preserved in each city were examined, topographical information was diligently collected, and the Jesuit fathers checked their triangulation by meridian altitudes of the sun and pole star, and by a system of remeasurements. The result was a more accurate map of China than existed, at that time, of any countryin Europe. Kang-hi next ordered a similar map to be made of Tibet, the survey being exe- cuted by two lamas who were carefully trained as surveyors by the Jesuits at Peking. From these surveys were con- structed the well-known maps which were forwarded to Du- halde, and from which D'Anville constructed his atlas.

Several European missionaries had previously found their way from India to Tibet. Antonio Andrada, in 1624, was the first European to enter Tibet since the visit of Friar Odoric in 1325, The next journey was that of Fathers Grueber and Dorville about 1660, who succeeded in pass- ing from China, through Tibet, into India. In 1715 Fathers Desideri and Freyre made their way from Agra,

.across the Himalayas, to Lassa, the capital of Tibet ; and

the Capuchin Friar Orazio della Penna resided at Lassa from 1735 until 1747. But the most remarkable journey in this direction was performed by a Dutch traveller named Samuel Van de Putte. He is the only European who has ever completed the journey from India, through Lassa, to China, and returned to India by the same route. He left Holland in 1718, went by land through Persia to India, and eventually made his way to Lassa, where he resided for a long time. He went thence to China, returned to Lassa, and was in India in time to be an eye-witness of the sack of Delhi by Nadir Shah in 1737. In 1748 he left India, and died at Batavia on the 27th of September 1745. 'The pre- mature death of this illustrious traveller is the more to be lamented because his vast knowledge died with him. Two English missions sent by Warren Hastings to Tibet, one led by Mr George Bogle in 1774, aud the other by Captain Turner in 1783, completes the list of Tibetan explorers in the 18th century. From Persia much new information was supplied by Chardin, Tavernier, Hamilton, Thevenot, and Krusinski, and by English traders on the Caspian. In 1738 John Elton traded between Astrakhan and

the Persian port of Enzelt on the Caspian, and undertook to build a fleet for Nadir Shah. Another English merchant, named Jonas Hanway, arrived at Astrabad from Russia, and travelled to the camp of Nadir at Kazvin. One lasting and valuable result of Hanway's wanderings was a most charming book of travels, The extension of the dominions of the Company largely increased the knowledge of India In 1700 Guillaume Delisle, the principal creator of the modern system of geography, published his map of the con- tinents of the Old World ; and his successor D'Anville pro- duced his map of India in 1752. D'Anville's map contained all that was then known, but ten years afterwards Major Rennell commenced his surveying labours, which extended over a period from 1763 to 1782. His survey covered an area 900 miles long by 300 wide, from the eastern confines of Bengal to Agra, and from thie Himalayas to Calpi Rennell was indefatigable in collecting geographical infor- mation ; his Bengal atlas appeared in 1781, his famous

map of India in 1788, and the memoir in 1792. Surveys were also made along the Indian coasts, and the charts of Huddert, Ritchie, and M'Cluer were the forerunners of the more accurate and elaborate productions of the succeeding century.

Arabia received very careful attention, in the 18th Amis —

century, from the Danish scientific mission, which included Carsten Niebuhr among its members. Niebuhr landed at Loheia, on the coast of Yemen, in December 1762, and went by land to Sana. All the other members of the mission died, and he proceeded from Mocha to Bombay, He then made a journey through Persia and Syria to Constantinople, returning to Copenhagen in 1767. His invaluable work, the Description of Arabia, was published in 1772, and was followed in 1774-78 by two volumes of travels in Asia. The great traveller survived until 1815, when he died at the age of eighty-two. Kinnaird, the contemporary of Niebuhr, was equally devoted to Eastern travel, After studying Arabic and Geez for some years, he went out as consul to Algiers, and resided there from 1762 to

1765, exploring and sketching the Roman ruins in Algiers and Tunis. In 1765 he travelled by land from Tunis to Tripoli, and then took a passage for Candia, but was shipwrecked near Bengazi, and had to swim on shore. He eventually reached Candia, and, sailing thence to Sidon, travelled through Syria. In June 1768 he landed at Alexandria in the dress of an Arab, and soon afterwards we hear of him at Jiddah, the port of Mecca, in the dress of a Turkish sailor. He had resolved to attempt the dis- covery of the source of the Nile; and in 1769 he landed at Massowah, on the Abyssinian coast. He then penetrated to Axum and Gondar, and in November 1770 he reached the source of the Abai, then supposed to be the main stream of the Nile. He thus attained the great object of his ambition. Returning by the desert into Egypt, Bruce reached England in 1774, and settled once more at his old home at Kinnaird after an absence of ten years. Urged by his old friend, Mr Daines Barrington, the great traveller at length published his Zravels to Discover the Source of the Nile in the Years 1768-73 (5 vols. 4to) in 1790. Bruce, like many other conscientious and deserving explorers, was assailed by calumny and detraction. But every succeeding year has added to the high estimation in which his labours are held, and to the reverence with which his memory 1s cherished. He died at Kinnaird House, Stirlingshire, im

1794.

James Bruce of Bruce,

Before the death of Bruce an African Association was Afric formed, in 1788, for collecting information respecting the As”

interior of that continent, with Major Rennell and Sir Joseph Banks as leading members, and Bryan Edwards as secretary. The association first employeda Mr Ledyard to cross Africa from east to west on the parallel of the Niger, and Mr Lucas to cross the Sahara to Fezzan, Ledyard, who had previously made a most extraordinary journey into Siberia, died at Cairo in 1788. Lucas went from Tripoli to Mesurata, obtained some information respecting Fezzan, and returned in 1789. One of the chief problems the Association wished to solve was that of the existence and course of the river Niger, which Maxwell believed to be

tion,

identical with the Congo. Mungo Park, then au assistant Mungo

surgeon of an Indiaman, volunteered his services, which were accepted by the Association, and in 1795 he arrived at the English factory of Pisania, 200 miles up the Gambia. Leaving this station in December he reached Ludamar, where a Moorish chief imprisoned him until the followimg July. He then crossed a mountainous tract toa Mandingo town called Kamalia. Quite destitute, and suffering from fever, he remained there for several months, but finally found his way back to Pisania, and returned to England. The interesting narrative of his adventures, with a ge

Park.

graphical memoir by Rennell, was publishedin 1799. Five years afterwards he accepted an offer from the Government to command an expedition into the interior of Africa, the plan being to cross from the Gambia to the Niger, and descend the latter river to the sea. Park left the factory of Pisania, on the Gambia, on the 4th of May 1805, accom- panied by Lieutenant Martyn and 35 soldiers, besides guides, All died but four during the rainy season, and the rest, including Mungo Park, perished in a rapid on the Niger, having been attacked from the shore by order of a chief who thought he had not received suitable presents. Park was only thirty-five at the time of his death. The details respecting the fate of the ill-fated explorer and his party were obtained from the guide.

While the English were at work in the direction of the Niger, the Portuguese were not unmindful of their old ex- ploring fame. In 1798 Dr Lacerda, an accomplished astronomer, was appointed to command a scientific expedi- tion of discovery to the north of the Zambesi. He started in July, crossed the Muchenja Mountains, and reached the capital of the Cazembe, where he died of fever. Dr Lacerda left a valuable record of his adventarous journey ; but with Mungo Park and Lacerda the history of African exploration in the 18th century closes,

In South America scientific exploration was busily at work during this period. The great event of the century, as regards that continent, was the

measurement of an arc of the meridian, The undertaking was proposed by the French Academy, and a commission left Paris in 1735, con- sisting of La Condamine, Bouguer, and Godin. Spain appointed two accomplished naval officers, the brothers Ulloa, as coadjutors. The operations were carried on during eight years on a plain to the south of Quito; and, in addition to his memoir on this memorable and most iaportant measurement, La Condamine collected much valuable geographical information during a voyage down the Amazon. The arc measured was 3° 7’ 3” in length; and the work consisted of two measured bases connected by a series of triangles, one north and the other south of the equator, on the meridian of Quito. Contemporaneously, in 1738, M. Maupertuis of St Malo measured an arc of the meridian in Lapland. Another result of this expedition a the publication of a valuable work by the brothers

0a.

The English and French Governments despatched several expeditions of discovery into the Pacific and round the world during the 18th century. They were preceded by those wonderful and romantic voyages of the buccaneers, of such men as Woodes Rogers, Davis, Shelvocke, Clap- perton, and Dampier, which can never fail to interest, while they are not without geographical value. The works of Dampier are especially valuable, and the narratives of William Funnell and Lionel Wafer furnished the best accounts then extant of the isthmus of Darien. Dampier’s literary ability eventually secured for him a commission in the king’s service ; and he was sent on a voyage of dis- covery, duriug which he explored part of the coasts of Australia and New Guinea, and diseovered the strait which bears his name between New Guinea and New Britain, re- turningin 1701. In 1721 Jacob Roggewein was despatched on a voyage of some importance across the Pacific by the Dutch West India Company, during which he discovered Easter Island on April 6, 1722.

The voyage of Lord Anson to the Pacific in 1740-44 was of a predatory character, and he lost more than half his men from scurvy ; while it is not pleasant to reflect that at the very time when the French and Spaniards were measuring an are of the meridian at Quito, the English under Anson were

pillaging along the coast of the Pacific, and burning the town of Payta. But a romantic interest

attaches to the wreck of the “Wager,” one of Anson’s fleet, on a desert island near Chiloe, for it bore fruit in the charming narrative of Byron, which will endure for all time. In 1764 Captain Byron himself was sent on a voyage of discovery round the world, which led immediately after his return, to the despatch of another to complete his work, under the command of Captain Wallis.

The expedition, consisting of the “ Dolphin” commanded Polyne- by Captain Wallis, and the “Swallow ” under Captain sian ex-

Carteret, sailed in September 1766, but the ships were Pl separated on entering the Pacific from the Straits of Magellan. ‘Wallis discovered Tahiti on June 1%, 1767, of which island he gave a detailed account, and Sir Charles Saunders’s Island ; he returned to England on May 17, 1768. Carteret discovered the Charlotte and Gloucester Islands, and Pitcairn Island on July 2, 1767; revisited the Santa Cruz group, which was discovered by Mendaiia and Quiros ; and discovered the strait separating New Britain from New Ireland. He reached Spithead again on February 20, 1769. Wallis and Carteret were followed very closely by the French expedition of Bougainville, which sailed from Nantes in November 1766. Bougainville had first to perform to him the unpleasant task of delivering up the Falkland Islands (Malouines), where he had encouraged the formation of a French settlement, to the Spaniards. He then entered the Pacific, and reached Tahiti on April 2, 1768. Passing through the New Hebrides group he touched at Batavia, and arrived at St Malo after an absence of two years and four months.

The three voyages of Cook form an era in the history of Cook.

geographical discovery. All his work was thoroughly and completely done. He systematically surveyed every land he discovered, collecting

information touching every branch of inquiry, so that his labours form a very large addition to geographical knowledge. James Cook was born near Whitby, Yorkshire, in 1728, and had been marine surveyor of Newfoundland and Labrador from 1763 to 1767, In the latter year he commissioned the “ Endeavour” and sailed for Tahiti, with the object of observing the transit of Venus, accompanied by Sir Joseph Banks and Dr Solander, a pupil of Linneus. The transit was observed at Tahiti on June 3, 1769. After exploring Tahiti and the Society group, Cook was six months surveying the two islands of New Zealand, and the coast of New South Wales from latitude 38°S. to the northern extremity. Passing through Torres Strait, he touched at Batavia, and arrived in England on June 12, 1771.

Cook’s second voyage was mainly intended to explore the region round the Antarctic Circle ; and it may be mentioned that meanwhile a French ship, commanded by M. Kerguelen, had sailed southwards in 1771, and discovered the island which bears his name. Captain Cook was provided with two vessels built at Whitby, the ‘ Resolution,” which he himself commanded, and the ‘‘ Adventure” under Captain Furneaux, who had been with Wallis. After rounding the Cape the two vessels reached a south latitude of 57° 15’. On March 26, 1773, Captain Cook arrived at New Zealand and proceeded to the Society Islands, whence he made another voyage southwards between the meridians of 170° E, and 106° 54’ W. Onthis occasion he was stopped by ice in71°10’S. During the second voyage Cook visited Easter Island, discovered several islands of the New Hebrides and New Caledonia; and on his way home by Cape Horn, in March 1774, he discovered the Sandwich Island group. Arrived at Spithead on July 30,1774, The account of the second voyage was written by the young a George Forster, whose subsequent work was so pad eulogized by Humboldt. The third voyage was inten 3 to attempt the passage from the Pacific to the Atlantic by

the north-east. The ‘‘ Resolution” and “ Discovery ” sailed

La Per- ouse, |

Bligh.

Austra- lian colo- nization.

in 1776, and Cook again took the route by the Cape of Good Hope. In 1777 he was at the Friendly group, and on January 18, 1778, he discovered the Sandwich Islands. He then proceeded to the North American coast, and, after a stay of a nionth in Nootka Sound, he proceeded north- wards, fixed the position of the western extremity of America, and surveyed Behring Strait. On August 17, 1778, he was stopped by the ice in 70° 41’ N., and named the farthest visible point on the American shore Icy Cape. He then visited the Asiatic shore and discovered Cape North, bearing up on August 29 when he was in the 180th degree of lovgitude. Returning to the Sandwich Islands, Captain Cook was murdered by the natives of Hawaii. On Febru- ary 14, 1779, his second, Captain Clerke, took the com- mand, and proceeding to Petropaulowski in the following summer, he again examined the edge of the ice, but only got to 70° 33’ N. ‘The ships returned to England in October 1780.

In 1785 the French Government fitted out a very carcfully-prepared expedition of discovery at Brest, which was placed under the command of La Perouse, an accom- plished and experienced officer. After touching at Con- cepcion in Chili, and at Easter Island, La Perouse proceeded to the Sandwich Islands, and thence to the coast of California, of which he has given a very interesting account. He then went across the Pacific to Macao, and in July 1787 he proceeded to explore the Gulf of Tartary and the shores of Saghalien, remaining some time at Castries Bay, so named after the French minister of marine. Thence he went to the Kurile Islands and Kamchatka, and sailed from the far north down a meridian to the Navigator and Friendly Islands. He wasin Botany Bay in January 1788; and sailing thence, the explorer, his ship, and crew were never seen again. Their fate was long uncertain. In September 1791 Captain D’Entrecasteaux sailed from Brest with two vessels, to seek for tidings. He visited the New Hebrides, Santa Cruz, New Caledonia, and Salomon Islands, and made careful thongh rough surveys of the Louisiade Archipelago, islands north of New Britain, and part of New Guinea. D’Entrecasteaux died on board his ship on July 20, 1793, without ascertaining the fate of La Perouse. It was Captain Peter Dillon who at length ascertained, in 1828, that the ships of La Perouse were wrecked on the island of Vanikoro during a hurricane.

The work of Captain Cook bore fruit in many ways. His master, Captain Bligh, was sent in the “Bounty” to convey breadfruit plants from Tahiti to the West Indies. He reached Tahiti in October 1788, and in April 1789 a mutiny broke out, and he, with several officers and men, was thrust into an open boat in mid-ocean. During the remarkable voyage he then made to Timor, Captain Bligh passed amongst the northern islands of the New Hebrides, which he named the Banks Group, and made several run- ning surveys. He reached England in March 1790. The “‘ Pandora,” under Captain Edwards, was sent out in search of the “ Bounty,” and discovered the islands of Cherry and Mitre, east of the Santa Cruz group, but she was eventually lost on a reef in Torres Strait. In 1796-97 Captain Wilson, in the missionary ship “Duff,” discovered the Gambier and other islands, and rediscovered the islands known to and seen by Quiros, but since called the Duff Group. Another result of Captain Cook’s work was the colonization of Australia. On January 18, 1788, Admiral Phillip and Captain Hunter arrived in Botany Bay in the “Supply” and “ Sirius,” followed by six transports, and established a colony at Port Jackson. Surveys were “then undertaken in several directions. In 1795 and 1796 M. Flinders and G. Bass were engaged on exploring work in a small boat called the “Tom Thumb.” In 1797 Bass, who had been a surgeon, made an expedition southwards,

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[PROGRESS OF Discovery.

continued the work of Cook from Ram Head, and explored the strait which bears his name, and in 1798 he and Flinders were surveying the east coast of Van Diemen’s Land. The planting of a colony at Port Jackson led to the despatch of an expedition to complete the exploration of the Australian coasts. The command was given to Captain Matthew Flinders. vessel called the “ Investigator,” and sailed from England ou July 18, 1801. Commencing from King George’s Sound, Captain Flinders discovered and made a preliminary survey of all the south coast of Australia to Bass Strait, and the east coast from the barrier reef to Torres Strait, as well as the east coast of the Gulf of Carpentaria. Flinders met the French expedition under Baudin and Freycinet with the two ships ‘“ Géographe” and ‘“ Naturaliste,” which

was en- gaged upon the same work. He was taken prisoner by the French in 1804 and detained until 1810, so that lis work did not appear before 1814.

Yet another out-come of Captain Cook's work was the Van. voyage of George Vancouver, who had served as a midship- couver

man in Cook's second and third voyages. The Spaniards under Quadra had commenced a survey of north-western America and occupied Nootka Sound, which their Govern- ment eventually agreed to surrender. Captain Vancouver was sent out to receive the cession, and to survey the coast from Cape Mendocino northwards. He commanded the old "Discovery," and was at work during the seasons of 1792, 1793, and 1794, wintering at the Sandwich Islands. Re- turning home in 1795, he completed his narrative and very valuable series of charts, and died in 1798.

The 18th century saw the Arctic coast of North America Hudson's

He was furnished with & Flinders,

reached at two points, as well as the first scientific attempt BayCom |

to reach the North Pole. The Hudson's Bay Company had

been incorporated in 1670, and its servants soon extended their operations over a wide area to the north and west of Canada. In 1741 Captain Christopher Middleton was ordered to solve the question of a passage from Hudson's Bay to the westward. Leaving Fort Churchill in July 1742 he stood northwards and discovered the Wager River and Repulse Bay, bearing up again on August 9. He was followed by Captain W. Moor in 1746, and Captain Coats in 1751, who examined the Wager Inlet up to the end. On November 6, 1769, Samuel Hearne was sent by the Hudson's Bay Company to discover the sea on the north side of America, but was obliged to return. On February 23, 1770, he set out again from Fort Prince of Wales ; but, after great hardships, he was again forced to return to the fort. He started once more on December 7,1771, and at length reached the Coppermine River, which he surveyed to its mouth, but his observations are very unreliable. With the same object of reaching the sea, Alexander Mackenzie, with a party of Canadians, set out from Fort Chepewyan on June 3, 1789,

and descended a river which bears the explorer’s name. His account of the journey 1s even more unsatisfactory than that of Hearne.

In February 1773 the Royal Society submitted a proposal Polares

to the king for an expedition to try how far navigatio was possible towards the Pole. The “Racehorse” a0 “Carcass” bombs were selected as best adapted for the service, and Captains Phipps and Lutwidge were appointe

tocommand them. The expedition sailed on June 2, 1773, and sighted the coast of Spitzbergen on the 28th. Captain Phipps stood into every opening he could find in the 1e, but was invariably stopped by a solid barrier, He ex amined a line extending over twenty degrees of longitude, and found no opening in the heavy polar pack in ay direc: tion. After a very careful and persevering exanination of the ice, the expedition returned to England in September. The highest latitude reached was 80° 48’ N. But the most important Arctic work in the 18th century was performe

n p orae d tion.

by the Russians, for they succeeded in delineating the whole of the northern coast of Siberia. Some of this work, indeed, was done at a still earlier date. The Cossack Deschneff made au extraordinary voyage, in tle summer of 1648, from the river Kolyma, through Behring Strait to Anadyr, a performance which has never since been equalled. Between 1738 and 1750 the mates Manin and Sterlegoff made their way in small sloops from the mouth of the Yenisei as far north as 75° 15′ N. The land from Taimyr to Cape Chelyuskin, the most northern extremity of Siberia, was mapped by the mate Chelyuskin, who discovered the extreme point in May 1742. To the east of Cape Chelyus- kin the Russians encountered greater difficulties. They built small vessels at Yakutsk on the Lena, 900 miles from its mouth, whence tlie first expedition was des- patched under Lieutenant Prontschicheff in 1735. He sailed from the mouth of the Lena to the mouth of the Olonek, where he wintered, and ou September 1, 1736, he got as far as 77° 29’ N., within five miles of Cape Chelyuskin, which is in 77° 34’ N. Both he and his young wife died of scurvy, and the vessel returned. A

second expedition, under Lieutenant Laptieff, started from the Lena in 1739, but encountered masses of drift ice in Chatanga bay, and with this ended the voyages to the westward of the Lena. Several attempts were also made to navigate the sea from the Lena to the Kolyma. In 1736 Lieutenant Laptieff sailed, but was stopped by the drift ice in August, and in 1739, during another trial, he reached the mouth of the Indigirka, where he wintered. In the season of 1740 he continued his voyage to beyond the Kolyma, wintering at Nijni Kolymsk, In 1725 Vitus Behring, a Dane in the Russian service, received his instructions from Peter the Great a few days before the czar's death. Two vessels were built for Behring at Okhotsk, and sailing in July 1728, he ascertained the existence of tlie strait between Asia and America which bears his name. In September 1740 Behring again sailed from Okhotsk, with Steller on board as naturalist. In June 1741 Commodore Behring named the magnificent peak on the coast of North America Mount St Elias, and explored the Aleutian Islands, In November the ship was wrecked on Behring Island; and the gallant Dane, worn out with scurvy, died there on the 8th of December 1741. In March 1770 a merchant named Liakhoff saw a large herd of reindeer coming from the north to the Siberian coast, which induced him to start in a sledge in the direction whence they came. 'Thus the New Siberian Islands were discovered, and for years afterwards the seekers for fossil ivory resorted to them. The Russian Captain Vassili Tchitschakoff in 1765 and 1766 made two persevering attempts to penetrate the ice north of Spitz- bergen, and reached to 80° 30' N., and Russian parties twice wintered at Bell Sound. But the result was the same as all others have obtained before aud since; the Spitz- bergen route is evidently not the way to the Pole.

The 18th century caw great progress in the collection and arrangement of geographical material, and in the work of surveying and map-making, Collections of voyages and travels were brought together in the four quarto volumes of Astley (1745) and the two folios of Harris (1764) ; while Dr Hawkesworth edited the Government voyages to the Pacific in 1773. Sir J oseph Banks was the great patron of geography in England, aided by the indefati- gable labours of such critical geographers as Rennell, Dalrymple, and Barrington ; ,while in France the great cartographer D'Anville introduced a habit of critical ac- curacy, and caused a complete revolution in the art of map- laking,

Towards the close of the century it was recognized that Se0graphy served more extensive and important uses than had ever before been supposed. The route survey .was

sufficient for the traveller or soldier, while accurate charts guided the mariner across the ocean. the basis of statistics and of administration, and rigorous accuracy became necessary. Surveys on a trigonometrical basis, which have been proceeding in all the countries in Europe (except Turkey) and in India during the present, were commenced in the last century. In Great Britain the Ordnance Survey was begun in April 17 84, when General Roy measured a base line on Hounslow Heath. The triangulation of the British Isles was commenced in 1784 and completed in 1852.

aspect of the whole globe, but at present they are neces- sarily confined to those nations which are in the front rank of civilization. Countries which are not so advanced are still obliged to be content with such maps as sufficed for all the world in the last century, before the results of trigonometrical surveys were available. These secondary maps are adapted for the requirements of the countries which use them, being based on positions fixed by astro- nomical observations, on cross bearings, and often on chained distances. The third class of maps includes the work of explorers of unknown or little known regions, and of geo- graphers who delineate the features of such regions by compilation and by intelligent collation of the work of travellers. There are thus three grand divisions in the character and uses of maps. There are first those which aim at minute accuracy, and which are intended as docu- ments for administrative purposes, and in pursuing exact statistical investigations. Secondly, there are maps which are based on less accurate surveys of countries less populous or less advanced in civilization; these are useful for political, geographical, and military purposes, but are not to be relied on to the same extent or in the same way as is the case with those based on trigonometrical surveys. Thirdly, there are the roughly compiled maps of little known regions, which are constantly in course of improve- ment, and which do the work of pioneers.

In treating here of the progress of geographical discovery in the present century, it is to those who prepare the last class of maps, to the pioneers—the discoverers—that we must mainly, though not exclusively, confine our attention. We propose to review the work of discoverers and explorers of the 19th century in two sections as regards time,—first during the first thirty, and secondly during the last forty- eight years, The Royal Geographical Society was founded in 1830, and forms a landmark. In each period we shall take first the work done in Asia, then Africa, then America, then Australia, then Polynesia, and finally the Arctic and Antarctic regions.

At the beginning of the century British rule in India was Workin

extended over the plains of the Ganges almost to the Sutle}j, and the attention of explorers was drawn to the mighty mass of the Himalayas. Captain Herbert, in 1818, at- temped to give a general view of the physical character of this great range, and Moorcroft reached the Mansarowa lake, and the upper courses of the Indus and Sutlej ; while Mr Manning, in 1811, was the only Englishman who ever visited Lassa, the capital of Tibet. The mission of Sir John Malcolm to Persia in 1808 led to much geographical work being achieved. On his staff was Macdonald Kinneir, who wrote a valuable memoir on the geography of Persia ; while at the same time Lieutenant J. Macartney, under Mountstuart Elphinstone, was collecting materials for a map of Afghanistan. In 1810 Pottinger and Christie made an important journey through Baluchistan by different routes, Christie afterwards visiting Herat and Yezd; and in 1827 Mr Stirling of the Bengal Civil Service crossed the Hazairah

mountains. a” The close of the war in 1815 led to numerous ellorts

But surveys are also Surveys.

Maps based on trigonometrical Classes of surveys may eventually explain and illustrate the physical maps.

Africa,

South America.

Hum- boldt.

Arctic discovery.

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the furtherance of geographical discovery, especially m Africa and the far north. In 1818 to 1820 Captain Lyon, R.N., and Mr Ritchie landed at Tripoli, and penetrated as far as Mourzouk; and this led to the more important ex- pedition of Major Denham and Captain Clapperton, R.N., which was despatched by the Government. They landed at Tripoli in 1823, and advanced into the interior as far as the east coast of Lake Tchad, of which they gave a most interesting account, obtaining latitudes by meridian alti- tudes and longitudes by lunar observations. Clapperton's furthest point was at Saccatoo, westward of the lake, and here he was forced to turn back. But in 1825 he was again employed to explore the interior of Africa, and this time he started from the Atlantic side with his faithful servant Richard Lander. Landing in the Bight of Benin, he succeeded in reaching Saccatoo from the west side, thus completing a route from Tripoli on the Mediterranean to the coast of Guinea. But at Saccatoo the gallant sailor suc- cumbed at last, dying on the 13th of April 1827. His faithful servant Lander returned to the coast ; aud in 1830 he and his brother were employed to explore the course of the Niger or Quorra. They embarked on the river near Boossa, passed through the Yorriba country, and came out at the mouth of the Nun.

The Admiralty also considered that a river of such magnitude as the Zaire or Congo ought to be explored. Captain Tuckey, R.N., was selected to conduct the Congo expedition, and received command of a steamer called the " Congo," with a crew of 49 officersand men. The expedi- tion reached the mouth of the great river on July 5, 1816, and proceeded up to the foot of the falls of Yellala, the farthest point hitherto reached. Captain Tuckey, with 15 of his party, landed on the north shore on the 14th of August; and, after travelling for about 40 miles over a hilly country, he reached the head of the falls and the banks of the upper river. He had explored the river for a distance of 280 miles from the sea. But death overtook the com- mander of the expedition and several officers, and the "Congo" returned in command

of the master, Mr Fitz- maurice, after executing the survey from the foot of the falls to Embomma.

South America had produced two eminent physical geo- graphers, naniely, Caldas of Bogota and Unanue of Lima, before the scenery of the Orinoco and the Andes became familiar to Europe through the charming narratives of Humboldt. It was in 1799 that the great Prussian natu- ralist embarked at Corufia, and landed at Cumana on the coast of Venezuela, His observant eye and bright imagina- tion, combined with habits of scientific thought, produced pictures of the physical aspects of the regions he explored Which are quite unequalled. What he said of George Forster is even more true of himself: “He depicted in pleasing colours the changing stages of vegetation, the rela- tions of climate and articles of food in their influence on the civilization of mankind. All that can give truth, indi- viduality, and distinctiveness to the delineation of exile nature is united in his work.” The Orinoco and Cassiquiari the falls of Tequendama, the mountains of Quindiu, Chimborazo, and Quito, Cajamarca, and the upper Amazon, and the varied scenery of Mexico, are imprinted on the imagination with life-like form and colouring by this great — a ore: His service to geography was far greater than that of any mere disc the New World in 1804. lk nate

The greatest and most important enterprise, after the peace of 1815, was the renewal of Arctic exploration under the auspices of Sir John Barrow. To the great work of Scoresby, and to the careful observations of himself and his father, we are indebted for the most exhaustive account of the Spitzbergen seas, and of the ice which encumbers them,

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When the Government expeditions were undertaken, the volumes of Scoresby formed a storehouse of useful and well-digested information. The true object of modern Arctic enterprise has been the advancement of science, a noble and sufficient reason for incurring expenditure and facing dangers and hardships. In consequence of Sir John Barrow’s representations, orders were given in 1818 for the preparation of four vessels for Arctic service,—two to attempt the passage from the Atlantic to

the Pacific, and two to attempt an approach to the North Pole. But, as Sir John Barrow himself explained, the main objects were not the accomplishment of voyages by these routes, but the acquisi- tion of useful knowledge. Sir John Ross, who commanded one of the two expeditions, circumnavigated Baffin's Bay on the track of that great navigator, and re-established his fame. Captain Buchan, who led the other, battled with the impenetrable pack to the north of Spitzbergen, like Phipps before him, and then returned. There can be no great success without continuity of effort and perseverance, and the early voyages of this century achieved lasting results, because those who sent them out were endowed with tenacity of purpose. No sooner had Ross returned than Parry was appointed to command two strongly built vessels, the ' Hecla" and " Griper," and to proceed on the same service. on the 1st of August he entered the portals of Lancaster Sound, and commenced the discovery of a new region. He succeeded in sailing for 300 miles along the southern shores of the islands which now bear his name, among ice floes of moderate thickness, until he reached the edge of the im- penetrable polar pack at the western extreme of Melville Island. He went as far as it will ever be possible for any vessel to go in this direction, and then wintered in a harbour of Melville Island. In 1820 he returned witha rich harvest of scientific observations, and of valuable in- formation in all branches of inquiry. This first expedition was most successful. Parry's second voyage was into Hudson's Bay in search of @ passage westward in that direc: tion. He discovered a strait (that of "Fury and Hecla"), and passed two winters 1821-23 on the coast of Melville Peninsula. The third voyage (1824-25) was again up Baffin's Bay ; but it was unsuccessful, and one of his vessels, the "Fury," was lost. Still every voyage, whether success- ful or not in its main object, brought back valuable results. Meanwhile the " Griper," commanded by Captain Clavering, had, in 1823, penetrated through the ice to the east coast of Greenland in 76° N., to enable Captain Sabine to take pendulum observations in that position. The Russian Captain Lutke had also surveyed the west coast of Novaya Zemlya from 1821 to 1824. Parry, after his return from the third voyage, proposed an attempt to reach the Pole by travelling over the ice during the summer, on the Spitzbergen meridians. He sailed on this service in the "Hecla" on the 3d of April 1827, and, after placing her in a secure harbour in Spitzbergen, he began his bold and interesting attempt with two boats, fitted with runners for being dragged over the ice. But the

whole mass of ice was drift ing south faster than Parry's men, with all their efforts, could advance north. However, on July 23, 1827, he attained the latitude of 82° 45' N., which continued to be the highest parallel ever reached by man until Captain Markham went beyond it in 1875. Parry returned to England in October. Another expedition of a private character left England in June 1829 under the command of Sir John Ross, who was accompanied by his distin- guished nephew James C. Ross. In August they reached Lancaster Sound, and then proceeded southwards down Regent's Inlet, wintering on the most northern peninsula of America, to which Ross gave the name of Boothia. Here they passed three winters, while, during the intervening

On the 11th of May 1819 Parry sailed, and Pay, |

summers, some exploring work was accomplished, and James Ross planted the Union Jack on the North Magnetic Pole on the Ist of June 1831. At last they were forced to abandon their little vessel the "' Victory," and make their way to the whalers in Baffin's Bay in open boats. They were picked up and arrived in England after an absence of four years.

While these bold and perilous voyages were being con- ducted in the Arctic seas, a series of land journeys completed the delineation of the northern coast of America, which had just been touched at two points in the last century, by Hearne and Mackenzie. From 1819 to 1823 the gallant Sir John Franklin, with Dr Richardson and George Back, were struggling to explore the Arctic coast eastward from the mouth of the Coppermine River. After great sufferings they embarked on the river on June 30, 1820, reaching the mouth on July 18, and exploring 550 miles of coast line to the eastward, as far as Point Tumagain. On the return journey across the barren lands, the party escaped death from starvation almost by a niiracle. Un- daunted by this terrible experience, Franklin, Richardson, and Back started on another expedition in 1825, this time by descending the Mackenzie River. Reaching its mouth on July 7, Franklin aud Back discovered 374 miles of coast to the westward, as far as Return Reef ; while Richardson explored the space between the mouths of the Mackenzie and Coppermine. In 1833 Back undertook a third journey with the object of succouring the Rosses, who had

long been missing. He discovered and explored the Back or Great Fish River for 530 miles, and in July 1834 reached its mouth in the Arctic Ocean. ‘The gaps on the north coast, which were left by Franklin and Back, were subsequently filled in by servants of the Hudson’s Bay Company. In 1837 Messrs Simpson and Dease, in a boat, connected Return Reef with Cape Barrow. In 1839 the same ex-

plorers went from Cape Turnagain to the mouth of Back’s ‘

River, and still further eastward to Castor and Pollux River. On August 26, 1839, Simpson built a cairn at Cape Herschel, on King William Island, separated by a strait ten miles wide from the mainland. Dr Rae was sent in 1846 to winter in Repulse Bay, and in 1847 he travelled round the Gulf of Akkoolee and connected the work of Ross in Boothia with that of Parry during his second voyage. In 1854 he united the work of Ross with that of Simpson, and ascertained that Boothia was connected with the mainland of America by an isthmus, Thus the whole northern coast of America was explored and delineated without a break. The Russians were engaged on daring Arctic exploration at thesame time. In 1809 to 1812a Russian officer named Hedenstrom surveyed the New Siberia Islands 3 and in 1821 Lieutenant Anjou made further investigations respect- Ing the state of the ice to the northward. Baron Wrangell prosecuted similar researches from his headquarters at Nijni Kolymsk, near the mouth of the Kolyma. He made four sledge journeys over the Polar Sea from 1820 to 1823, ex- ploring the coast from the Kolyma to Cape Chelagskoi, and making several attempts to advance northwards, but always encountering weak ice. Wrangell’s interesting narrative is an important addition to Arctic literature. _ The Russians, as well as the French, sent several voyages into the Pacific during the first half of the 19th century. In 1804 Admiral Krusenstern made a voyage round the world, and his pupil, Otto von Kotzebue, son of the dramatist, commanded the “ Rurick” from 1815 to 1818 On @ voyage of discovery. He discovered the great bay known as Kotzebue Sound, sounded in Behring Strait, and made careful observations of the currents. Wintering in California he returned to the Aleutian Islands in the follow- 0 Spring’; and during the voyage homewards he dis- covered several new islands in the Pacific, especially

Romanzoff aud Krusenstern in the Dangerous Archipelago. During another Russian voyage, commanded by Billing- hausen, Lazareff and other coral islands in the Dangerous Archipelago were discovered, and in 1828 Captain Lutke, in the “ Seniavine,” surveyed the Caroline group. Captain Freycinet, the officer who served with Baudin and edited his work, also examined the Caroline Islands in the “Uranie” in 1849, but his voyage was mainly in the interests of natural history. Duperry in 1822-23 did some surveying work on the coast of New Ireland. But the most important French voyage was that of Dumont D’Urville, who was sent out to seek for traces of La Perouse in 1828. He visited Tecopia and other islands in the “ Astrolabe,” and was nearly a month at Vanikoro collecting relics of the ill- fated expedition. The voyage of D’Urville contributed largely to the advancement of science, and resulted in the publication of a magnificent work in 1830,

The only English scientific voyage to. the Pacific in this period was sent out mainly to co-operate with Parry in his third voyage, and Franklin in his second journey. It was commanded by Captain Beechey, who had been first lieu- tenant with Parry during his first Arctic voyage, and on May 19, 1825, he sailed from Spithead in H.M.S. “ Blos- som.” After visiting Easter, Gambier, Pitcairn, and other islands, the “ Blossom” arrived at Honolulu on May 20, 1826, and in July she was in Behring Strait, entering Kotzebue Sound on the 22d. Proceeding along the north coast of America, the ship’s, barge got as far as 156° 21’ W. to a low cape called Point Barrow, at the very time when Franklin and Back were at Return Reef. The accurate ex- amination of the coast was made under circumstances which demanded great fortitude and perseverance, and reflects credit on the officers and crew. The ‘ Blossom” returned to Honolulu in January 1827, and arrived at Macao on the 12th of April. Captain Beechey next proceeded to survey the Loo Choo and Bonin Islands, and, after another visit to the far north, and the coasts of California and Mexico, he returned home by Cape Horn and arrived at Woolwich on October 12, 1828. His valuable and interesting narra- tive, in two volumes, was published in 1831. Mr James Weddell, a

master in the navy, made a voyage to the Antarctic Ocean in 1822-24, and went as far south as 74°.

The Royal Geographical Society was founded in 1830, Royal and forms a landmark in the history of discovery. The Geogra-

men who initiated the idea and gave it shape were Sir John s Barrow, Sir John Cam Hobhouse, Sir Roderick Murchison, Mr Robert Brown (Princeps Botanicorum), and Mr Bartle Frere. They formed the Foundation Committee. The first president was Lord Goderich, and the vice-presidents Sir John Barrow, Colonel Leake, Sir John Franklin, and Mr Greenough. Through this organization explorers and students were encouraged and assisted, information was systematically collected and arranged, and the work of dis- covery was advanced. A similar society in Paris preceded that of London in point of time, and now every civilized country has established a Geographical Society.

Our rapid review of the progress of discovery since the Asia.

foundation of the Geographical Society will commence with the continent of Asia, where there were and still are vast and most interesting unexplored regions. In British India the Trigonometrical Survey has been proceeded with, and is now approaching completion. During its progress the

Himalayan peaks were measured, and in 1848 Sir Andrew Himé-

. ° .] Waugh fixed the height of the loftiest, which sec vie

Mount Everest, at 29,002 feet above the sea, 4n Humboldt published his Asie Centrale, which, with the Erdkunde von Asien of Carl Ritter, gave new and cleare1 ideas of the orography of Central Asia. fey explored the remoter parts of the Himalayan chain ; while,

in 1848, Dr Hooker in Sikkim, and Dr angpentie Ladak,

Ne

summits of the passes leading ay ie relations with Afghanistan led to further exploration. In 1840 Lieutenants Abbott, Conolly, and Shakespear visited Khiva, and in 1841 Colonels Stoddart and Conolly were murdered at Bokhara, while Eldred Pottinger gallantly defended Herat. Sir Alexander Burnes had previously made his remarkable journey from Cabul to Bokhara and back through Persia, and in 1838 Lieutenant Wood of the Indian Navy discovered the source of the Oxus. Butakoff and other Russian officers, in 1848 and subsequent years, surveyed the sea of Aral, and Middendorf made ex- tensive explorations and discoveries in Siberia. After the Afghan war it was long before auy progress was made in the exploration of Central Asia, but through the opening of the treaty ports in China and the navigation of the Yangtsze a considerable increase was made in our knowledge of the Celestial Empire. In 1869 Mr R. B. Shaw and Mr Haywood reached the cities of Yarkand and Kashgar, and Mr Shaw published a most graphic account of the physical aspects of Fastern Turkestan. In the previous year Mr Ney Elias surveyed the Yellow River of China, and afterwards made a journey through a previously unknown portion of western Mongolia; and during 1866-68 the distinguished French geographer Jieutenant Garnier surveyed the course of the great Cambodian river. The Russians, meanwhile, in their advance into Central Asia, had enabled scientific travellers like Fedchenko and others to explore Khokand and the northern part of the Pamir, and the more adventurous Prjewalski made important journeys through Mongolia and to the frontiers of Tibet. Colonels Walker and Mont- gomerie, of the great Trigonometrical Survey of India, organized a system of training native explorers, who inade journeys across the Pamir and to the upper waters of the Oxus, as well as through the previously unknown parts of Tibet. In the last mission of Sir Douglas Forsyth to Kashgar, Captain Trotter of the Trigonometrical Survey of India formed one of the staff. He did much valuable ex- ploring work on the Pamir table-land, and verified the work of Lieutenant Wood at the source of the Oxus. In 1846 MM. Hue and Gabet travelled through Tibet; and in western China the French missionaries have since done use- ful geographical work. English diplomatic officers have found their way from the south-western provinces of China into Burmah, and Baron Richthofen has made very exten- sive exploring journeys through the Chinese empire. The most important journey across Arabia in the present cen- tury was made by Mr W. Gifford Palgrave in 1863. Geographical discoverers of the 19th century have had a

great work to do in Africa. D'Anville and his successors cleared off all that was uncertain on the map, all that had come from the information given by Duarte Lopez to Pigafetta, and from Leo Africanus, and left a great blank. James Bruce and Mungo Park, Clapperton and Tuckey, Hogge touched the edges or penetrated in single lines oe the vast unknown area. But they have been ollowed by many others, and now great progress has been made. In 183] Monteiro and Gamitta were sent by the Portuguese Government, in the footsteps of La Cerda, to the capital of Cazembe; while, in 1849 and 1843-47 gt Magyar and Graga explored some of the southern uents of the Congo. Riippell (1838), Harris (1843) and Dr Beke (1840), Lefebvre and Dillon (1839-43), Ferret and Galinier (1847) improved the existing how. ledge of Abyssinia, to which a further important contribu- tion was made by the expeditionary field force sent in 1867— 68 to enforce the release of English captives ; and progress was made, under the auspices of the Egyptian Government in exploring the White Nile above Khartoum. In 1849 the discoveries of Denham and Clapperton were followed up by Richardson, Overweg, and Barth, who, like their pre-

decessors, went from Tripoli to Mourzouk, the capital of Fezzan. The two first died in Africa, but Dr Barth returned home with a rich harvest of results. He reached Kouka the capital of Bornou, on Lake Tchad, and in 185] he visited the south side of that lake, and advanced some distance to the eastward. In 1852 he was at Saccatoo where Clapperton died, whence he crossed the Niger and eventually reached Timbuctoo. After a stay of some months Dr Barth left Timbuctoo in March 1854, and got back to Tripoli in the end of 1855, being the sole survivor of his party. Dr Vogel, in 1853-57, followed up the dis. coveries in the direction of Lake Tchad, and fell a victim to science; and the researches of Dr Baikie in 1854 sup- plemented the work of the Landers in the lower part of the course of the Niger. Dr Baikie also explored 250 miles of the river Chadda or Benue.

On the eastern coast of Africa, the missionaries Rebmann and Krapf ascertained the existence of the snowy peaks of Kenia and Kilimanjaro near the equator, and collected reports touching the equatorial lakes in the interior. This

led to the expedition of Captain Burton in 1857, who, ac-Burto, |

companied by Captain Speke, landed opposite to Zanzibar, and, advancing westward, discovered Lake Tanganyika, Captain Burton's admirable description of the region between the coast and the great lake he had discovered is one of the most valuable contributions to African descriptive

geography. His companion, Captain Speke, made an ex- gpcke, |

cursion northwards to the southern coast of a lake which he judged to be a main source of the Nile. In this belief he again set out in 1860 to attempt the achievement ofa journey from Bagamoyo, opposite Zanzibar, to the Nile. This great enterprise was crowned with success. Speke traced out the western shore, and visited the northern outlet, of the Victoria Nyanza, the main reservoir of the White Nile. He then marched northwards to Gondokoro and descended the Nile. He had heard of a second great Nile reservoir, which Sir Samuel Baker discovered in 1864, and named the Albert Nyanza. The Bahr el Ghazal and other western feeders of the Nile were visited by Consul Petherick, and explored in 1868-71 by Dr Schweinfurth, whose work ranks with that of Burton asa record of African discovery.

The travelg of Dr Livingstone in Southern Africa also Living added considerably to our knowledge of the geography of stone. |

that continent. In 1848 he started from Cape Colony, visited Lake Ngami in 1849, and eventually reached the Portuguese town of St Paul Loanda in 1855. Thence he marched across the continent, discovering the great falls and a considerable part of the course of the Zambesi, In his second expedition he proceeded up the Zambesi and its tributary the Shire, and discovered the Lake Nyassa. On his third and last expedition he landed on the east coast at the mouth of the Rovuma, and made his way thence to Lake Nyassa. The great traveller then followed in the foot- steps of Dr

Lacerda and Monteiro to the Cazembe’s capital, and thence to Lake Tanganyika. From Ujiji, on that lake, he made his way westward to the river Lualaba (the upper course of the Congo), and returning in a destitute condition to Ujiji, he was there succoured by Mr Stanley. Finally he once more started, and died in the midst of his dis- coveries among the remoter sources of the Congo. Y ant Cameron’s expedition in 1873 had for its main object the succour of Livingstone, but the news of the great traveller’s death was received at Unyanyembe. Camerol then continued his march by a new route to Ujyy and completed the survey of the southern half of Lake Tan- ganyika, discovering the Lukuga outlet. Thence he ad: vanced westward across the Manyuema country to Living stone’s furthest point at Nyangwe, crossed the Lualaba, and traversed the whole width of the African continent,

Lieuten- Camé | |

Stary.

1830-1878.]

reaching St Paul Loanda on the west coast. Mr Stanley followed in 1874. He circumnavigated and fixed the out- line of the Victoria Nyanza, followed Cameron across Lake Tanganyika to Nyangwe, and then descended the great tiver Congo, discovering its course, and connecting the work of Livingstone with that of Tuckey. Mr Young has since completed the survey of Lake Nyassa; Nachtigal has sup- plemented the work of Barth and Vogel in the Tchad region ; while Duveyrier and other French explorers have examined the region of the Sahara. In the far south the Limpopo basin, and the country intervening between the Limpopo and Zambesi, have been made known to us by St Vincent Erskine and Elton, Car] Mauch and Baines. Thus the extent of the unknown parts of Africa has been rapidly curtailed, while our knowledge has been widened during the last half century.

On the American continent scientific progress has been made in the United States and the dominion of Canada,

’ where, within the last half century, boundary commissions

and surveys have fixed positions and described previously unknown regions of great extent. In South America there

‘are vast unexplored regions to the eastward of the Andes,

and in the basins of the great rivers. Sir Robert Schom- burgk did much valuable work in Guiana, and explored the

delta of the Orinoco in 1841; while Spix and Martius,

Poeppig and Castelnau, Maw and Smyth, Herndon and Gibbon, Spruce and Bates, Wallace and Chandless, and others, explored the basin of the Amazon. ‘The labours of Pissis in Chili, of Raimondi and Werthermann in Pern, of Codazzi in Colombia and Venezuela, and of Morales and others in the Argentine Republic, have been most valuable to geographical science. In Patagonia, Fitz Roy and King explored the Santa Cruz river, Cox and Morales have since added to our knowledge, and Commander Musters, R.N., was the first traveller who traversed the whole of Patagonia from south to north, 960 miles of latitude, of which 780 were previously unknown to Europeans.

The difficulty of exploring the interior of the Australian continent was caused by the scarcity of water, and the immense distances it was necessary to cross without supplies of any kind. Hence the work of exploration has required and called forth high and noble qualities in a degree quite equal to any that have been recorded in any other part of the world, ‘The names of Sturt and Leichhardt, of Eyre and Grey, of Macdouall Stewart and Burke, of Gregory, of Forrest and Warburton, will be handed down as those of intrepid and courageous explorers who laid open the secrets of the interior of Australia.

The Pacific Ocean was explored by numerous expeditions during the 18th and early part of the 19th centuries. Still

much remained to be done in the way of verification and,

more complete survey. From 1826 to 1836 Captain Vitzroy, with the naturalist Darwin, surveyed Magellan’s Strait and the west coast of South

America; and further important surveys in the Pacific were afterwards executed by Captain Wilkes of the United States Navy, and by Belcher, Kellett, and Denham.

But the great geographical work of the present century inust be the extension of discovery in the Arctic and Antarctic regions. Progress has been made in both direc- tions, and in both much remains to be done. It is this polar work which calls forth the highest qualities of an ex- plorer; it is here that the greatest difficulties must be overcome; and it is here that the most valuable scientific results are to be obtained.

Between the years 1830 and 1843 much was done in the Antarctic regions. In 1830-32 Mr John Biscoe, R.N., made a voyage in a brig belonging to Messrs Enderby, and discovered " Enderby Land" and "Graham Land" in 67° S.; and from 1837 to 1840 Dumont @'Urville discovered

"La Terre Adéle" and "Coté Clarie," going as far south as 66° 30'. Auckland Island was discovered by Bristow in 1806. In 1839 Balleny, in another vessel belonging to Messrs Enderby, discovered the Balleny Islands in 66° 44' 8, ; and Sabrina Island in 65° 10'S. The Antarctic expedition

of Sir James Ross sailed from England in 1839. In 1840 Ross,

Sir James explored Kerguelen Island, and wintered at Hobart Town. He then visited the Auckland Islands, and, crossing the Antarctic Circle, reached the great icy barrier, and discovered Victoria Land, with its lofty volcanoes, in January 1841. He gained the latitude of 78° 4' S, in 187° E., and established the continuity of the southern continent from 70° to 79° 8. In 1841 Ross again wintered at Van Diemen's Land, and in January 1842 crossed the Antare- tic circle in 156° 28' W. He was once more stopped by the great icy barrier in 78° 10' S., after having penetrated through ice floes of more than 1000 imiles in width. Extra- ordinary dangers were éncountered in the ice, many valuable observations were taken, and in 1842 the expedition wintered at the Falkland Islands. In the following season

another exploring voyage was made beyond the Antarctic Circle, and in September 1843 this most important expedi- tion returned to England.

On the return of Sir James Ross attention was once more turned to the Arctic regions; and in the spring of 1845

Sir John Franklin’s Arctic expedition, consisting of the Franklin.

“Erebus ” and “Terror,” sailed from Woolwich. His in- structions were to make the North-West Passage, but the main object of the expedition was the advancement of science, and to secure it the most accomplished officers in the navy were appointed, as well as the eminent naturalist Dr Goodsir. It is now known that, in the first and second seasons, the expedition was very successful. In 1845 Sir John Franklin made a remarkable run up Wellington Channel to 77° N.; in 1846, proceeding south, he had almost achieved the North-West Passage when his ships were permanently beset to themorth of King William Island in 70° 5’ N. and 98° 23’ W. Here the veteran explorer died on June 11, 1847; and all his companions perished in the attempt to reach one of the Hudson’s Bay Company’s settlements in the summer of 1848. Those among them who reached Cape Herschel, and it is certain that some did reach that point, undoubtedly discovered the North-West Passage. The expeditions which were sent out in search of Sir John Franklin’s ships did much important geographical work; but their principal use was the establishment, through their means, of the truemethod of extensive Arctic exploration. The grand object of the officers and men em- ployed on this service was the relief of their missing country- men, and their utmost efforts were devoted to the examina- tion of the largest possible extent of coast-line. Hence the discovery of the modern system of Arctic sledge travelling, the only efficient means of exploring the icy regions around the North Pole. In 1848-49 Sir James Ross discovered the western side of North Somerset, and Sir Leopold M‘Clintock served his first apprenticeship in the ice under that veteran explorer. Austin’s expedition sailed in 1850, and wintered nearly in the centre of the region discovered by Parry during his first voyage. It was then that M‘Clintock developed and put in practice the system of Arctic sledge- travelling which has since achieved such grand results; and Captain Ommanney, M‘Clintock, and his colleagues Sherard Osborn, Frederick Mecham, Robert Aldrich, and Vesey Hamilton made

what were then unparalleled journeys 1m various directions. In December 1849, also, Captains Collinson and M‘Clure weut out to conduct further ager by way of Behring Strait. The former made the on. remarkable voyage on record along the north me America, while M‘Clure took his ship between the

Spitz- bergen eX- plored,

coast of Banks Island and the tremendous polar pack, until he was within sight of the position attained by Parry in his first voyage from Baftin’s Bay. Here M‘Clure’s ship was finally iced up in the Bay of God’s Mercy. On the return of Austin’s expedition, the same ships were again sent out under Captains Belcher and Kellett by Baffin’s Bay ; and M‘Clintock, Osborn, Mecham, and Hamilton, who were ouce more in the front rank of searchers, sur- passed even their former efforts. Mecham discovered a record left by M‘Clure on Melville Island which revealed his position, and thus he and his officers and crew, by marching from their abandoned ship to the “ Resolute ” and returning to England with the expedition of Belcher and Kellett, were enabled to make the North-West Passage partly by ship and partly sledging over the ice. They all returned in 1854. But the concluding search was made by Sir Leopold M‘Clintock in the “Fox” from 1857 to 1859, when he found the record on King William Island, and thus discovered the fate of Franklin. These search expeditions added immensely to our knowledge of the Arctic regions, and established the true method of explora- tion. Sea voyages in the summer season are useful for re- connaissances, but efficient polar work can only be achieved by wintering at a point beyond any previously reached, and sending out extended sledge parties in the spring.

After the return of M‘Clintock, England neglected the great work of Arctic exploration for fifteen years 5 but a deep interest was taken in the discovery of the unknown polar regions by other nations, and numerous efforts to explore them were made in the interval. In 1853-55 Dr Kane, with the American brig “Advance,” wintered just within the entrance of Smith Sound, and sent an exploring party for some distance up the east side of the channel; and in 1860-61 Dr Hayes wintered near the same spot, and made a sledge journey up the west side. Ten years afterwards Captain Hall,

accompanied by Dr Bessels, a German scien- tific explorer, sailed in the “ Polaris” in August 1871, and succeeded in making his way up the channels leading north from Smith Sound for 250 miles, wintering in 81° 38’ N. Captain Hall unfortunately died in the autumn of 1871, and his comrades returned after suffering great hardships, The “Polaris” was abandoned, but she had attained the highest latitude ever reached by any vessel up to that date. In the direction of Spitzbergen and Novaya Zemlya the Norwegian walrus hunters made many daring vovages. They circumnavigated both those masses of Arctic land, and yearly frequented the hitherto closed Sea of Kara. The Swedes, under the lead of the accomplished and indefati- gable Nordenskidld, have made voyage after voyage to Spitzbergen, and afterwards to the north-east. The first Swedish expedition to Spitzbergen was in 1857, the second in 1861, the third in 1864, the fourth in 1868, consisting of the steamer ‘ Sophia,” which reached the highest latitude ever attained by a vessel trying the Spitzbergen route, namely, 81° 42’N. In 1872 a fifth expedition started, and N ordenskiold then passed his first winter in the Arctic regions, and gained experience of sledge-travelling in the Spring, exploring a large area of North-East Land. Ex- perience also proved that the Spitzbergen route was not one by which large results could be secured, although the scientific researches of the Swedes in Spitzbergen itself were most valuable. In 1875 therefore Professor Nordenskiéld made his first attempt towards the north-east, reaching the mouth of the Yenisei; and in 1876 he made‘an equally successful voyage in the same direction. The Germans also entered the field of Arctic enterprise. In 1868 Captain Koldewey made a summer voyage to Spitzbergen, and in 1869-70 he went in the “ Germania” to the east Const of Greenland, accompanied by Lieutenant Payer, wintered at the Pendulum Island, discovered by Clavering in 1823,

| cans, Swedes, Norwegians, Germans, Austrians, and English

these principles, the Smith Sound route was selected, and

whence they made a sledge journey to the northward ag far as 77°, and explored a deep fjord in about 73° 15’ N, during the navigable season. English yachtsmen, notably Lamont and Leigh Smith, were also in the field; and the latter made important corrections of the charts of North. | East Land. But by far the most important and successful Ausiye, | voyage in this period was that of Lieutenants Weyprecht expedi.) and Payer in the Austrian steamer ** Tegethoff.” Sailing tion, in 1872, they were beset in the ice to the north of Novaya Zemlya during the winter of 1872-73, and were drifted northwards until, on August 31, 1873, they sighted a pre- viously unknown country, It proved to be very extensive, and was named Franz Josef Land. In March 1874 Lieutenant Payer started on an extended sledge journey, in the equipment of which he closely followed M‘Clintock’s system. He discovered a great extent of coast-line, and attained a latitude of 82° 5’ N. at Cape Fligely. The Austrian explorers were eventually obliged to abandon the “Tegethoff,” reaching Norway in September 1874; but their expedition was a great success, and they added an ex- tensive region to the map of the known world.

In England the very important branch of geographical English | research relating to the Arctic regions was neglected by the Artie { Government during this interval of fifteenyears, while Ameri- P|

yachtsmen were making praiseworthy efforts with more or less success. The resumption of English Arctic research on an adequate scale is due to the exertions and arguments of Admiral Sherard Osborn from 1865 until 1875, He set forth the valuable results to be obtained, and the means of success. Basing his arguments on long experience, he showed that it was necessary for success that an expedition should follow a coast-line, that it should pass beyond any point previously reached and there winter, and that the work should be completed by extended sledge parties in the spring. At length an expedition was fitted out om

in May 1875 the “Alert” and “Discovery” sailed from Portsmouth under the command of Captain Nares. As Naws regards the ice navigation the success of the expedition was complete. Captain Nares, in the face of unparalleled difit culties, brought the ships to a point farther north than any vessel of any nation had ever reached before, wintered the “ Alert” in 82° 27’ N., and, in

the face of still greater difficulties, brought both vessels safely home again. ‘The extended sledge-travelling called forth an amount of heroic devotion to duty, and of resolute perseverance in spite of greater obstacles than had ever been encountered before, which add a proud page to the history of English naval enterprise. The exploring parties were led by Commander Markham and Licutenants Aldrich and Beaumont, Ad- Mark vancing over the great frozen Polar Sea, Markham reached ee 83° 20’ 26” N., the highest latitude ever attained by any Wie human being. He thus won the blue ribbon of Arctic dis- covery. Aldrich discovered 200 miles of coast to the west- ward, while Beaumont added to our knowledge of the north coast of Greenland. ‘The results of the Arctic expedition of 1875-76 were the creation of a young generation of ex- perienced Arctic officers, the discovery of 300 miles of new coast-line and of a large section of the Polar Ocean, the attainment of the highest latitude ever reached by man, 4 year’s magnetic and meteorological observations at two stations both further north than any before taken, tidal observations, the examinatior of the geology of a vast region and the discovery of a fossil forest in 82° N., and large natural history collections representing the fauna and flora of a new region.

The return of this memorable expedition again incited Dutch our neighbours to further efforts. In the summer of 1878 An the Dutch entered the field, and the schooner “ William

Barents,” under Lieutenants de Bruyne and Koolemans Beynen, made a useful reconnaissance of the Barent’s Sea ; while Professor Nordenskidld left Sweden in July 1878, in the well-equipped steamer ‘“‘ Vega,” to achieve the North- East Passage. In August he rounded Cape Chelyuskin, the most northern point of the Old World, and reached the mouth of the Lena. But much work remains to be done in the polar regions, in order to complete the connexion between Aldrich’s furthest in 1876 and M‘Clintock’s in 1854, to complete the discovery of the north side of Greenland, to explore the northern bounds of Franz Josef Land, and to discover lands north of Siberia.

There is one great branch of physical geography which has only been effectively studied within the last thirty years, namely, the physical geography of the sea. Mathew Fontaine Maury, by his wind and current charts, by his trade wind, storm, rain, and whale charts, and above all by his charming work The Physical Geography of the Sea, gave the first impulse to this study. It was Captain Maury who organized the first deep-sea soundings in the North Atlantic, which up to that time was deemed to be unfathomable; and when his work was published, the illustrious Humboldt declared Maury to be the founder of a new and important science-—the meteorology of the sea. He first took charge of the Washington Observatory in 1842 ; he resigned that post under a deep sense of duty in April 1861, afteracareer of great usefulness ; and he ended a noble and well-spent life in 1872. The investigations into the physical geography of the sea, which were com- bined into a system by Maury, have since been ably and zealously continued by others, among whom the names of Dr Carpenter, Sir Wyville Thomson, and Professor Mohn of Christiania are pre-eminent, The voyage of the “ Chal- lenger” from 1873-1876, under Captains Nares and Thomson, with Sir Wyville Thomson as chief of the scien- tific staff, was organized with the object of examining and mapping the bottom of the ocean, of describing the fauna of the great depths, of ascertaining the temperatures at various depths, and of solving questions relating to oceanic circulation. The area thus explored in the Atlantic, Antarctic, Pacific, and Indian Oceans is of vast extent, and the researches, ably and zealously conducted, have resulted in an important addition to geographical knowledge.

In this rapid sketch of the history of geographical dis- covery, the labours of numerous explorers during many generations have been enumerated ; but its perusal will show that, notwithstanding all this work, there is much remaining to be done, Vast areas round both poles, and in the interior of Asia, Africa, South America, and New Guinea, are still unknown, even more extensive regions have only been partially explored, and millions of square Iniles remain to be surveyed, before the work of geographers 1s complete. (c. R. M.)

Il. MatHematicaL GrocrapHy.

All our knowledge of the planet on which we live, whether obtained from the explorations of travellers, the voyages of navigators, or the discoveries of astronomy in modern times, goes to confirm the doctrine held and taught by philosophers in a remote antiquity that the earth is ‘spherical. What is spherical, however, is not the actual surface of the earth, but rather that of the sea produced in Imagination to pass through the continents. That the surface of the sea is convex any one may—at a seaside station where there is a high cliff—convince himself, by noting with a telescope at the top of the cliff the exact appearance of a ship in, or slightly beyond, the horizon, and then, immediately after, repeating at the foot of the cliff the same observation on the same ship. By a more

precise observation of the sea horizon from a known alti- tude one may even calculate the radius of the earth.

Let m (fig. 1) be a point on the top of a mountain; hak a portion of the earth’s surface; mnv a line drawn from m towards the centre of the earth; Z mh a tangent from m to the spheri- cal surface ; and md a horizontal line > J through m, that is, ml is perpen- “nr : . dicular to mv. Then by the mere si measure of the angle dmh, or the Fig. 1. depression of the sea horizon, one can, knowing mn, calculate very simply the radius of the earth. Let the height mn=h, the angle Imh=8, and the radius of the earth=r; then since the angle subtended at the earth’s centre by kn is 6, it is clear that (h+7) cos8=r, which gives r in terms of h and 6, known quantities. In fact, since A and 8 are both small, 7=3h+ sin?48. But here we have assumed that the ray of light proceeding from 2 to m takes a rectilinear course ; this is not true however, for the path is curved, its concavity being turned towards the earth —-a consequence of terrestrial refraction, From the laws of terrestrial refraction, which have been very minutely studied, we know that the formula last written down should be r=‘422h+sin?}8. Now to take an actual case—the depression of the sea horizon at the top of Ben Nevis is 64’ 48” (this is the mean of several observations, taken with special precautions for the express purpose of this experimental calculation), and the height of the hill is 4406 feet, or ‘8345 of a mile. The formula gives at once r=3965

miles, which is remarkably near the truth. But this method is not capable of precision on account of the variableness of terrestrial refraction. In connexion with the appearance of the sea horizon from a height the following formule are useful :—’ being the height in feet, 6 the depression or dp of the horizon in minutes, s the distance of the horizon in miles, then

“7 8 oT ae s-(1 5)N Bs s=3Vh.

Thus, for instance, to a spectator on the top of Snowdon, which is 3590 feet in height, the distance of the sea horizon is about 80 miles.

The first great fact in the description of the earth being that it is spherical (or at any rate so nearly so that, were a perfect model of it constructed, no one could, by unaided vision, discover that it is not spherical), the next points to be noted are,—secondly, that the earth rotates uniformly round an axis passing through its centre, and fixed, or very nearly fixed as to direction, in space; and thirdly, that its figure is not spherical but spheroidal, the surface being that found by the revolution of an ellipse round its minor axis, the axis of figure corresponding with the axis of diurnal rotation. The spheroidal figure is a necessary consequence of the rotation. The rotation of the earth once in 24 hours, although made evident by the rising and setting of the heavenly bodies, is rendered pcrhaps more distinctly visible by Foucault’s pendulum experiment. Let a heavy ball be suspended by a fine thread, free from tension, from a fixed point. Let it be drawn aside from the position of equili- brium and then dropped so that it commences to oscillate in a vertical plane passing through the point of suspension. Then a careful observation of the pendulum will show that its plane of oscillation is not fixed, but has a uniform rota- tion in a direction opposite to that of the earth’s rotation. Suppose, for instance, that the pendulum were suspended at the north pole and that it were set oscillating in a plane passing through any one fixed star, then it will continue to oscillate in that same plane notwithstanding the earth’s rotation, Consequently, to the observer there the plane of the pendulum’s oscillation will appear to rotate through 360° in 24 hours. At the equator, since there is

Lie

no component of rotation there, the pendulum would con- tinue to move in oneand the same plane. At intermediate stations the rate of rotation is easily calculated ; and obser- vations confirm the calculations, and have made the earth’s ion actually visible. : ‘ roThe poll of the earth are the points in which the axis of rotation, or of figure, meet the surface ; and the equator is the circle in which the surface is intersected by a plane through the earth’s centre, perpendicular to the axis of rotation. Every point of the equator is therefore equidis- tant from the poles. ;

To determine the position of a point in space three co-ordinates or measurements are necessary ; they may be three lines, or two lines and one angle, or two angles and one line. Thus, to define the precise position of a point on the earth’s surface, we express it by latitude, longitude, and altitude; the first two are angular measures, the third a linear magnitude, namely the height above the surface of the sea.

The line in which the surface of the earth is intersected by a plane through the axis of rotation is called a meridian, and all meridians are evidently similar curves. A line perpendicular to the surface at any point is called a vertical line ; it corresponds with the direction of gravity there ; being produced outwards, that is, away from the earth’s centre it meets the heaveus in the zenith; and produced downwards it intersects the axis of revolution; it would of course pass through the earth’s centre were it a sphere ; as it is, it passes xear the earth’s centre.

The angle between the meridian planes of two stations as A and B is called the difference of longitude of A and B, or the longitude of B with reference to A. In British maps the longitudes of all places are expressed with reference to the Royal Observatory of Greenwich.

The latitude of any point is the angle made by the vertical line there with the plane of the equator, or the co-latitude is the angle between the vertical line and the axis of rotation. The surface of the earth being one of revolution, any intersecting plane parallel to the equator cuts it in a circle. If we imagine the vertical lines drawn at any two points, as Pand Q, in such a circle it is evident from the symmetry of the surface that these verticals make the same angle with the equator; in other words, the latitudes of all

points on this circle are equal. Such circles are called parallels ; they intersect meridians at right angles.

If we suppose that at any point Q of the surface the meridian, or a small bit of it, is actually traced on the surface, and also a portion of the parallel through the same point, then these lines, crossing at right angles in Q, mark there the directions which we call north and south, east and west—the meridian lying north and south, the parallel east and west. Planes containing the vertical line at Q are vertical planes there, A vertical plane is defined by its azimuth, which is the angle it makes with the meridian plane ; the azimuth at Q of any object (or point) celestial hates ze the angle which the vertical plane passing se em yh) Aes omy — the meridian. The south Sialidatal Waning Gitubdeiecd Gar ae

g surface at Q is the visible horizon there—a plane parallel to this through the centre of the earth being called the rational horizon. The altitude at Q of a heavenly body, as a star, is the angle which the line drawn from Q to the star makes with the plane of the horizon,-—the zenith distance of the same star being the angle between its direction and the vertical at 2 >

By a degree of the meridian is meant this: if E F are points on the same meridian such that the directions of their verticals make with each other an angle of one degree— a ninetieth part ofa right angle—then the distance between E and F measured along the meridian is a degree of the

meridian. As the radius of curvature of an ellipse ig variable, increasing from the extremity of the major axis to the extremity of the minor axis, so on the earth’s surface a degree of the meridian is found by geodetic measurement to increase from the equator to the poles,

The actual length of a degree of the meridian at the equator is 3627464 feet; at either pole it is 366479-8 feet. The length of one degree of the equatorial circle ig 365231°1 feet. ,

With regard to the figure of the earth as a whole, the polar radius is 3949-79 miles, and the radius of the equator 3963°3C miles; the difference of these, called the ellip- ticity, 1s gs}, of the mean radius, A spheroid with these semiaxes is equivalent in volume to a sphere having a radius of 3958-79 miles. Without referring further here to the spheroidal figure, we shall now, having given the precise dimensions, regard the earth as a sphere whose radius is 3959 miles. On such a sphere one degree is 69:09 miles, From the definitions given above it appears that the radius of the parallel which corresponds to all points whose latitude is @ is 3959cosd; and that one degree of this circle, z.e., one degree of longitude in the latitude ¢ is 69:09 cos expressed in miles.

In the representation of the spherical earth (fig, 2) P is the pole, QQ the equator, E,F any two points on the surface, PEe, PF/ the meridians of those points intersecting the equator in e and f Join EF by a great circle; then in the spherical triangle PEF the angle at P is the difference of longitude of E and F, PE is the colatitude of E, and PF \S the co-latitude of F, the latitudes being . eH and fF respectively. The angle at nN E, being that contained between the Fig. 2. meridian there and a vertical plane passing through F, is the azimuth of F (measured in this case from the north), while the angle at F is the azimuth of E. If, then, there be given the latitudes and longitudes of two places, to find their distance apart, and their relative bearings, it becomes necessary to calculate a spherical triangle (PEF) in which two sides and the included angle are given,—the caleulation bringing out the third side, which is the required distance, with the adjacent azimuthal angles.

The latitudes and longitudes of places on the earth’s surface are determined by observations of the stars, of the sun, and of the moon. As the earth rotates, the zenith of any place (not being on the equator) traces out among the stars a small circle having for centre that point in which the axis of rotation meets the heavens. If there were 4 star at this last point it would be apparently motionless, having always the same altitude and azimuth. The pole star, though very conveniently near the north pole of the heavens, and without perceptible motion to the unaided eye, is in reality moving in a very small circle, The zenith of a point on the equator traces out in the heavens a great circle, namcly, the celestial equator.

As the positions of points on the earth are defined with reference to the equator and a certain fixed meridian, 8° the positions of stars are defined by their angular distance from the celestial equator, called in this case esr and by their right ascension, which corresponds to terrestria longitude. Stars which are on the same meridian plane (extended to the heavens) have the same right ascension. Right ascension is expressed in time from 0″ to 24°. sidereal clock, going truly, indicates 24″ for every _— tion of the earth: at every observatory, the sidereal cloc there shows, at each moment, the right ascension of the stars which at that moment are on the meridian. hus the right ascension of the zenith is the sidereal time.

In the left hand circle of the diagram (fig. 3) t¥°

concentric small circles are drawn such that the sum of their radii is a right angle or 90°. Let the inner circle be that traced among the stars by the zenith of any given place, say Q, then the outer circle encloses all those stars

Fig. 3.

which are circumpolar at Q, that is, whose entire course is performed above that horizon; for clearly the zenith distance of none of these can exceed 90° at Q. Or if the outer circle be that described by the zenith of Q, then the inner circle encloses all those stars which are circumpolar at Q. The second circle in the diagram shows the diurnal paths of stars with reference to the horizon.

If we consider in the first circle the changes of distance between any one star and the zcnith of Q as the latter traces out its path in the heavens, we see that the distance becomes alternatelya maximum and a minimum every twelve hours, namely, when the meridian of Q passes through the star. This is called the star’s culmination or meridian transit. It will be clear from an inspection of the figure that, if for instance the star culminate to the south of the zenith, the star’s declination plus its zenith distance at cul- mination is equal to the latitude of the zenith, that is, of Q. A corresponding rule is easily made for a northern transit. Thus the simplest manner of determining

the latitude is to measure the zenith distance of a known star at its meridian transit,

‘The position of the zenith at any moment may be deter- mined by simultaneous observation of the zenith distance of two known stars. For these distances clearly determine a point in the heavens (two points rather, which however need not be confounded) whose declination and right ascen- sion can be computed by spherical trigonometry, Thus, at the same time, are obtained both the time aud the latitude. For the success of this method, which is suitable for travellers exploring an unknown country, it is desirable that the stars should differ in azimuth by about a right angle.

If the path of the zenith, that is, the latitude, be known, then clearly a single observation of the zenith distance of a known star, which should be towards the east or west, not towards the north or south, will fix the place or right ascension of the zenith, that is, the sidereal time, at the moment of observation. Here the pole, the zenith, and the star are the angular points of a spherical triangle, of Which the three sides are known : the angle at the pole, being computed, is the difference of right ascension of the star and the zewith. Thus the sidereal time is found.

The determination of the difference of longitude of the two stations AB on the earth’s surface requires that the true time be kept at each. All that is necessary is a com- parison of these times at any instant. For instance, the time at B may, by the transport of chronometers, be brought to A, and thus the difference of the local times be ascer- tained, or the indications of the clock at A may be con- aunt by electro-telegraphy to B. The difference of the ocal times at A and B is the time a star takes to pass from the meridian of the one to that of the other; and this is the difference of longitude which may be converted ito angle at the rate of 360° to 24h.

But the traveller in unknown lands, who seeks to fix astronomically his position, has no telegraph to count on and his expectations for longitude depend chiefly on obser- vations of the moon. In the Nautical Almanac are

pub- lished the angular distances of the moon from certain stars in its path for every three hours of Greenwich time. Therefore, by actually observing the distance of the moon from one of these stars, one can infer the corresponding Greenwich time at the moment of observation, The com. parison of this with the local time gives the longitude.

Observations on the sun have shown that it traces out amongst the stars in the course of a year a great circle,

| inclined to the equator at an angle of 234°; at midsummer

it attains a maximum northern declination of 234°, and at midwinter a maximum southern declination of the same amount, Hence it is.infcrred that the earth moves round the sun in a plane, completing one orbital revolution yearly, the axis of the earth's diurnal rotation being inclined to this plane at an angle of 663°. Upon this angle of inclina- tion depend the seasons, and in great measure the climates of the different portions of the earth's surface.

It is usual to draw on globes and in maps a circle or parallel at the distance of 234° from the equator on either side; of these circles the northern is called the Tropic of Cancer, the southern is the Tropic of Capricorn. A circle drawn with a radius of 233° from the North Pole as centre is the Arctic Circle ; a similar and equal circle round the South Pole is the Antarctic Circle.

When the sun is in the equator~ which it crosses from north to south in September, and from south to north in March—it is in the horizon of either pole. When the sun has northern declination, the North Pole is in constant day- light and the South Pole in darkness. When the sun has southern declination the North Pole on the contrary is in constant darkness while the South Pole is illuminated by sunshine. At midsummer in the northern hemisphere the whole region within the Arctic Circle is in constant day-light, and that within the Antarctic Circle is in darkness; at midwinter this state of things is exactly reversed. The portion of the globe lying between the Tropic of Cancer and the Arctic Circle is called the North Temperate Zone; that between the Tropic of Capricorn and the Antarctic Circle is the South Temperate Zone. In the former the sun is always to the south of the zenith; in the latter it is always to the north.

In the Torrid Zone, which lies between the Tropics, the sun, at any given place, passes the meridian to the north of the zenith for part of the year, and to the south for the remainder.

When the sun is to the north of the equator the days are longer than the nights in the northern hemisphere, while in the southern hemisphere the nights are longer than the days; when the sun has southern declination this condition isreversed. As the sun increases his north declination from 0° to 234°, not only do the days increase in length in the northern hemisphere, but the rays of the sun—in the Temperate and Arctic regions—impinge more perpendi- cularly on the surface; hence the warmth of summer. Even in summer the rays of the sun in the Arctic regions strike the surface very obliquely ; this, combined with the protracted season of darkness, produces excessive cold. Summer in the northern hemisphere is thus contemporanc- ous with winter in the southern; while winter in the northern hemisphere is simultaneous with summer in the southern,

The length of the day at any place at any season of the year is easily ascertained from the following considerations. Let ns (fig. 4) be the axis of rotation, ¢g the He HS orthographically projected on a meridian plane, ab Ps : parallel of the given place; draw the diameter /y making

the angle nog equal to the sun’s declination, which we suppose to be north, then the hemisphere graef 1s m sunshine, while the hemisphere gbqsf ng

is in darkness. As the earth rotates, a point which is at a at midday is carried from a towards 6, which it reaches at midnight; / is reached at 6 o’clock p.m. and & at sunset. Now if ¢ be the latitude of the place and 6 the sun’s declination 2k = sin ¢ tan 4; this in the parallel whose radius is 77s cos@ corresponds to an angle whose ge £ sine is tang tand. Call this angle 7; x the time taken to rotate through it is py; hence the length of the daylight is 125+ ?;y, and the length of night 125-7».

Now 7 vanishes when either ¢ or 6 is zero; that 1s, at the equator the nights and days are equal in length throughout the year; and again when the sun is in the equator, that is, at the equinox, the nights and days are equal in all latitudes, When the sun’s declination is equal to the co-latitude, 7 is a right angle, and the sun does not actually set; this can only happen at places within the polar circle. The longest day at Gibraltar is 14″ 27™, at Falmouth 16″ 11™, and in Shetland 18 14™; while in Iceland it is 20″ on

the south coast and 24″ on the north. At Washington the longest day is 145 44™, and at Quebec 155 40™,

All this, however, is on the supposition that day ends with sunset; but the length of apparent day is increased by atmospheric refraction and reflection. When the disk of the setting sun first seems to touch the horizon it is in reality wholly below it and is only seen by refraction. After the sun has wholly set at any given place his light still continues to illuminate the upper portion of the atmosphere there, so that, instead of ending abruptly, day-light gradually fades away until the sun is 18° below the horizon.

In a diagram (fig. 5) similar to the last draw mz parallel to gf, and at a distance from it equal to the sine of 18°; then gf being the hemisphere unenlightened by the direct rays of the sun, gmzf will re- present the twilight zone. A point in the latitude of a describing the parallel ab loses sight of the sun at 4, and is in twilight untilit reaches the small circle mz, when the sun’s zenith distance is 108°. The duration of twi-

Fig. 5. light corresponds then to the portion i of ab, the angle rotated through being

sin (hl: hb)-sin~1(hk: hb);

i converted into time gives the duration of twilight. ere

hk=sin ptané ; kl=sin18° secs.

At any given latitude the twilight is shortest when the great circle passing through & and J passes also through the sun, Expressed algebraically, if + be the duration of the

shortest twilight in angular measure and 8 the sun’s declination at the time, then

—sin 3 = sin ¢ tan 9°

sin £7 = sec @ sin 9°,

Suppose in the last diagram the sun to be at his greatest northern declination, then ng = 233°, gm = 18°, and mq = 483”. Hence a place whose latitude is 484° N. has at midsummer, twilight lasting from sunset to midnight and continuing from midnight to sunrise, that is, fora few days there is no absolute darkness. A little further south this twilight is interrupted by a short period of darkness,

GEOGRAPHY

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Since ts = 234° – 18°=5}”, we see from the diagram that the South Pole is at this time in total darkness, which ex. tends to all places within 54° of it. When the sun’s declination is 9° south, the North Pole is in the centre of the twilight belt; thus all places whose latitude is greater than 81° then move in continual twilight, alternating between clearness and dimness, never attaining either day- light or total darkness, ‘The actual period during which either pole is in total darkness is about two and a half months.

At the equator, the shortest twilight occurs at the equinox, when it is 15 12™; the longest when the gun is in the tropics, being 1″ 18”. At London, in latitude 51}°, twilight continues all night from May 22 to July 21; it is shortest about three weeks after the autumnal and three weeks before the vernal equinox, when its duration ig]> 50™, At Washington the shortest twilight (being 1 33™) occurs on the 6th of March and 7th October; at Quebec the shortest is 1 46™, falling on the 3d March and 10th October.

At page 205, fig. 19 is a perspective representation of the earth—of more than a hemisphere, in fact—namely, the segment mgnafi in fig. 5. It exhibits all those regions of the earth which at Greenwich apparent noon at midsummer are in sunshine and twilight. It is very re- markable how Asia and America, but especially the former, just escape going into darkness.

Construction of Maps.

In the construction of maps, one has to consider how a portion of spherical surface, or a configuration traced on a sphere, can be represented on a plane. If the area to be represented bear a very small ratio to the whole

surface of the sphere, the matter is easy: thus, for instance, there is no difficulty in making a map of a parish, for in such cases the curvature of the surface does not make itself evident. If the district is larger and reaches the size of a county, as Yorkshire for instance, then the curvature begins to be sensible, and one requires to consider how it is to be dealt with. The sphere not being a developable surface cannot be opened out into a plane like the cone or cylinder, con- sequently in a plane representation of configurations on a sphere it is impossible to retain the desired proportions of lines or areas or equality of angles. But though one cannot fulfil all the requirements of the case, we may fulfil some by sacrificing others; that is to say, we may, for instance, have in the representation exact similarity to all very small portions of the original, but at the expense of the areas, which will be quite misrepresented. Or we may retain equality of areas if we give up the idea of similarity. It is therefore usual, excepting in special cases, to steer a middle course, and, by making compromises, endeavour to obtain a representation which shall not offend the eye.

A globe gives a perfect representation of the surface of the earth ; but practically, the necessary limits to 1ts size make it impossible to represent in this manner the details of countries. A globe of the ordinary dimensions serves scarcely any other purpose than to convey a clear conception of the earth’s surface as a whole, exhibiting the figure, extent, position, and general features of the continents an’ islands, with the intervening oceans and seas ; and for this purpose it is indeed absolutely essential and cannot be re- placed by any kind of map. ‘

The construction of a map virtually resolves itself into the drawing of two sets of lines, one set to represent meridians, the other to represent parallels. These being drawn, the filling in of the outlines of countries presents no difficulty. The first and most natural idea that occuls to one as to the manner of drawing the circles of latitude and longitude is to draw them according to the laws of

perspective. But, as Lagrange has remarked, one may regard geographical maps from a more general point of view as representations of the surface of the globe, for which purpose we have but to draw meridians

and parallels according to any given law; > “4

then any place we have to fix must take 7

that position with reference to these lines dD that it has on the sphere with reference to

the circles of latitude and longitude. Let R [s the law which connects latitude and longi- ae

tude, @ and w, with the rectangular co-

ordinates # and y in the representation

be such that dx = mdb+x2do, and /P Q dy = m’dp + n’dw. In fig. 6 let the lines Fig. 6. intersecting in the parallelogram PQRS be the repre- sentations of the meridians rp, sg and parallels rs, pq in- tersecting in the indefinitely small rectangle pgrs on the surface of the sphere. The coordinates of P being # and y, while those of p are # and w the coordinates of the other points will stand thus.

Pern. wot+dw

rT ..4:O0+d¢ a)

s …o+d¢ wtdw Q…a%+ndw y+n’de R…x+md¢ y+mdd S…e@+mdd+ndw yt+m’dd+nde.

Thus we easily see that PR=(m?+m’2)\kdé; and PQ = (n?+n)tdw ; also the area of the parallelogram PQRS is equal to (m’n—mn’)dpdw. If 90°+w are the angles of the parallelogram, then

mn+m’n’

tan y= -—~———_… ¥ mn — mn!

If the lines of latitude and of longitude intersect at right angles, then mn-+m’n’=0. Since the length of pr is=d¢, its representation PR is too great in the proportion of (m?+m’)t : 1; and pq being in length cosdu, its repre-

sentation PQ is too great in the ratio of (x? +2’2)t : cos¢. Hence the condition that the rectangle PQRS is similar to the rectangle pars is (m? +m’) cos’ = n2 +n, together with mn + m’n’=0; or, which is the same, the condition of similarity is expressed by -n’ =m cos 6; n=m’’ cos ¢.

Since the area of the rectangle pgrs is cosddddw, the exaggeration of area in the representation will be expressed by mn —mn’: cos¢. Thus when tho nature of the lines representing the circles of latitude and longitude is defined Wwe can at once calculate the error or exaggeration of scale at any part of the map, whether measured in the direction of a meridian or of a parallel; and also the misrepresenta- tion of angles.

The lines representing in a map the meridians and par- allels on the sphere are constructed either on the principles of true perspective or by artificial systems of developments. The perspective drawings are indeed included as a particu- lar case of development in which, with reference to a certain point selected as the centre of the portion of spherical sur- face to be represented, all the other points are represented in their true azimuths,—the rectilinear distances from the centre of the drawing being a certain function of the cor- responding true distances on the spherical surface. For simplicity we shall first apply this method to the projection or development of parallels and meridians when the pole is the centre. According to what has been said above, the Meridians are now straight lines diverging from the pole, dividing the 360° into equal angles ; and the parallels are represented by circles having the pole as centre, the radius of the parallel whose co-latitude is u being p, a certain func- tion of w The particular function selected determines the nature of the development.

Let Ppg, Prs (fig. 7) be two contiguous meridians crossed by parallels 7p, sq, and Op’g’, Or’s’ the straight lines representing these meridians. If the angle at P ig du, this also is the value of the angle at O. Let the co-latitude

Pp=u, Pg=u+du; Op’=p, Od =p+dp,

the circular ares p’r’, 9’s representing the

parallels pr, gs. If the radius of the ©

sphere be unity, < tf vg =dp ; p'r' =pdp, s

=du: =si i va] u; vr =sinudu. a a a ena? 9 ana? 4% then p’q’=opgq and pr =o’pr. That is to ? say, o, o may be regarded as the relative Fig. 7. scales, at co-latitude u, of the represen- tation, « applying to meridional measurements, o’ to measurements perpendicular to the meridian. A small square situated in co- latitude w, having one side in the direction of the meridian—the length of its side being i—is represented by a rectangle whose sides are to and to’; its area consequently is 0’.

If it were possible to make a perfect representation, then we should have o=1, o’=1 throughout. This, however, is impossible. We may make o=1 throughout by taking p=u. This is known as the Lguidistant Projection, a very simple and effective method of representation,

Or we may make o’=1 throughout. This gives p=sin x, a perspective projection, namely, the Orthographic. Or we may require that areas be strictly represented in the de- velopment. This will be effected by making oo’ =1, or pdp =sin udu, the integral of which is p=2 sin4u, which is the Hawivalent Projection of Lambert, sometimes referred to as Lorgna’s Projection. In this system there is misrepre- sentation of form, but no misrepresentation of areas, Or we may require a projection in which all small parts are to be represented in their true forms. For instance, a small square on the spherical surface is to be represented as a small square in the development. This condition will be

é : i dp du attained by making o=a’, or reer which is, c being an arbitrary constant, p=ctan}u. This, again, is a perspective projection, namely, the Stereo- grapluc, In this, though all small parts of the surface are represented in their correct shapes, yet, the scale varying from one part of the map to another, the whole is not a similar representation of the original. The scale, c= $c sec*4u, at any point, applies to all directions round that

oint. These two last projections are, as it were, at the extremes of the scale; each, perfect in its own way, is in other re- spects very objectionable. We may avoid both extremes by the following considerations. Although we cannot make o=1 and o’=1, so as to have a perfect picture of the spherical surface, yet considering o-1 and o’—1 as the local errors of the representation, we may make (a — 1)? + (o’~1)? a minimum over the whole surface to be repre- sented. To effect this we must multiply this expression by the element of surface to which it applies, via, sinududp, and then integrate from the centre to the (circular) limits

» the integral of

of the map. Let @ be the spherical radius of the segment

to be represented, then the total misrepresentation is to be

taken as ry ~ :

–

0 i(z 1)+(

which is ta he made a minimum, Putting p=uw+y, and giving to y only a variation subject to the condition dy = 0 when w= 0, the equations of solution—using the ordinary notation of the calculus of variations—are

dP). Bee

‘aallet 1)’ sinudu,

sin

Pg=9,

Pe being the value of 2psinw when u=f. This = m

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‘ d*y P dy = , 24% + sinucosu ——-Yy=uU-sM U, sin*w d me au y

ua es, ne u B

This method of development is due to Sir George Airy, whose original paper—the investigation is different in form from the above—will be found in the Philosophical Magazine for December 1861. The solution of the differ- ential equation leads to this result—

U

uw uw p=2 cot 5 log, sec 5 + Ctan ;

B.

2

The limiting radius of the map is R=2C tan3@. In this system, called by the Astronomer-Royal the “« Projection by balance of errors,” the total misrepresentation is an absolute ininimum.

Returning to the general case where p is any function of u, let us consider the local misrepresentation of direc- tion. Take any indefinitely small line, length =2, making an angle a with the meridian in co-latitude «. Its projec- tions on a meridian and parallel are ¢cos a, ¢sina, which in the map are represented by to cosa, zo’sina. If then a’ be the angle in the map corresponding to a,

2

C=2 cot £ log. sec

,

tan a’= tan a, o Put o sin udp and the error a’ —a of representation =«, then

(3-1) tan a

tan «= ; eT FS tan? a

Put %= cot? Z, then ¢ is a maximum when a=, and the corresponding value of « is

me OC. i: ¢

For simplicity of explanation we have supposed this method of development so applied as to have the pole in the centre. There is, however, no necessity for this, and any point on the surface of the sphere may be taken as the centre. All that is necessary is to calculate by spherical trigonometry the azimuth and distance, with reference to the assumed centre, of all the points of intersection of meri- dians and parallels within the space which is to be repre- sentedinaplane. Then the azimuth isrepresented unaltered, and any spherical distance w is represented by p. Thus we get all the points of intersection transferred to the repre- sentation, and it remains merely to draw continuous lines through these points, which lines will be the meridians and parallels in the representation.

The exaggeration in such systems, it is important to re- member, whether of linear scale, area, or angle, is the same for a given distance from the centre, whatever be the azimuth ; that is, the exaggeration is a function of the dis- tance from the centre only.

_ We shall now examine and exemplify some of the most important systems of projection and development, commen- cing with

Perspective Projections.

Tn perspective drawings of the sphere, the plane on which the representation is actually made may generally be any plane perpendicular to the line joining the centre of the sphere and the point of vision. If V be the point of vision P any point on the spherical surface, then p, the point in which the straight line VP intersects the plane of the representation, is the projection of P.

_ In the orthographic projection, the point of vision is at an infinite distance and the rays consequently parallel ; in this

case the plane of the drawing may be supposed to pass through the centre of the sphere. Let the circle (fig, 8) represent the plane of the equator on which we propose to make an orthographic representation of meridians and

parallels, The centre of this circle is et clearly the projection of the pole, and ae the parallels are projected into circles ASTD, having the pole for a common centre. Wh Os

The diameters aa’, 00’ being at right angles, let the semicircle bab’ be- divided into the required number of equal parts; the diameters drawn through these points are the projec- tions of meridians. The distances of c, of d, and of e from the diameter aa’ are the radii of the successive circles representing the parallels. It is clear that, when the points of division are very close, the parallels will be very much crowded towards the outside of the map; so much go, that this projection is not much used.

For an orthographic projection of the globe on a meridian plane, let gms (fig. 9) be the meri- dian, ns the axis of rotation, then gr is the projection of the equator. The parallels will be represented by straight lines passing through the ¢ ” points of equal division; these lines are, like the equator, perpendicular to ns. The meridians will in this case be ellipses described on xs as pe.

a common major axis, the distances Fig. 9. of ¢, of d, and of e from ms being the minor semiaxes.

Let us next construct an orthographic projection of the sphere on the horizon of any place. Set off the angle aop (fig. 10) from the radius oa, equal to the latitude. Drop the perpendicular pP on oa, then P is the projection of the pole, On ao produced take ob=pP, then ob is the minor semi- axis of the ellipse representing the equator, its major axis being gr at right angles to ao. The points in which the meridians meet this ellip- tic equator are determined by lines drawn parallel to aod through the points of equal subdivision cdefgh. Take two points, as d and g, which are 90° apart, and let ck be their projections on the equator; then 2 Fig. 10. is the pole of the meridian which passes through & This meridian is of course an ellipse,

and is described with refer- ence to 7 exactly as the equator was described with refer- ence to P. Produce zo to J, and make Jo equal to half the shortest chord that can be drawn through a; then lo is the semi- axis of the elliptic meridian, and _ the major axis is the dia- meter perpendicular to tol.

For the parallels: let it be required to describe the parallel whose co-latitude is u; take pm =pn=u, and let m’n’ be the projections of m and nonoPa; then m’n’ is

2-\ Sit

Vase,

Fig. 8.

c S\d

é

Fic. 11.—Orthographic Projection.

the minor axis of the ellipse representing the parallel. Its centre is of course midway between m’ and nm’, and the

greater axis is equal to mn. Thus the construction is ob- vious. When pm is less than pa, the whole of the ellipse

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isto be drawn. When pm is greater than pa, the ellipse touches the circle in two points; these points divide the ellipse into two parts, one of which, being on the other side of the meridian plane agqr, is invisible.

Stereographic Projection.—In this case the point of vision is on the surface, and the projection is made on the plane of the great circle whose pole is V. Let kp/V (fig. 12) be a great circle through the point of vision, and ors the trace of the plane of projection. Let ¢ be the centre of a small circle whose radius is cp=cl; the straight line p/ repre- sents this smail circle in orthographic Vv projection. Fig. 12.

We have first to show that the stereographic projection of the small circle pl is itself a circle; that is to say, a straight line through V, moving along the circumference of pl, traces a circle on the plane of projection ors. This line generates an oblique cone standing on a circular base, its axis being cV (since the angle pVc=angle eV) ; this cone is divided symmetrically by the plane of the great circle kpl, and also by the plane which passes through the axis Ve, perpendicular to the plane kpl. Now Vr-Vp, being = VoseckVp-Vk cos kVp = Vo-Vk, is equal to Vs- V2; there- fore the triangles V7s, Vip are similar, and it follows that the section of the cone by the plane rs is similar to the section by the plane pi. But the latter is a circle, hence also the projection is a circle; and since the repre- sentation of every infinitely small circle on the surface is itself a circle, it follows that in this projection the represen- tation of small parts is (as we have before shown) strictly similar, Another inference is that the angle in which two lines on the sphere intersect is represented by the same angle in the projection. This may otherwise be proved by means of fig. 13, where Vok is the diameter of the sphere passing through the point of vision, /gh the plane of projection, A¢ a great circle, passing of course through V, and ouv the line of intersection of these two planes, A tangent plane to the surface at ¢ cuts the plane of projection in the line rvs perpendicular to ov; tv is a tangent to the circle k¢ at ¢, ¢r and ¢s are any two tangents to the surface at ¢. Now the angle otw (u being the projection of t)is90° — ofV = 90° — oVt=ouV = tun, therefore tv is equal to w; and since ¢vs and wvs are right angles, it follows that the angles vis and vws are equal. Hence the angle ris also ig equal to its projection rus; that is, any angle formed by two intersecting lines on the surface is truly represented in the stereographic projection.

We have seen that the projection of any circle of the sphere is itself a circle. But in the case in which the circle to be projected passes through V, the projection becomes, for a great circle, a line through the centre of the sphere ; otherwise, a line anywhere. It follows that meridians and parallels are represented in a projection on the horizon of any place by two systems of orthogonally cutting circles, one system passing through two fixed points, namely, the poles; and the projected meridians as they pass througlt the poles show the proper differences of longitude.

To construct a stereographic projection of the sphere on the horizon of a given place. Draw the circle olkr (fig. 14) with the diameters kv, ir at right angles ; the latter is to represent the central meridian. Take koP equal to the co-latitude of the given place, say «; draw the diameter

Fig. 13.

PoP’, and oP, vP’ cutting dr in pp’: these are the projections of the poles, through which Ee 3 all the circles representing

meridians have to pass, All their centres then will be in a line smn which crosses pp at v right angles through its middle point m. Now to describe the meridian whose west longitude is w, draw pn making the angle opn = 90° — w, then x is the centre of the required circle, whose direction as it passes through p Bp will make an angle opg=w with pp. The lengths of the several lines are op =tangu; op’=cothu; om=cotu; mn=cosec ucotw. Again, for the parallels, take Pb = Pe equal to the co-latitude, say ¢, of the parallel to be projected ; join vb, ve cutting Ur in ¢,d. Then ed is the diameter of the circle which is the required projection ; its centre is of course the middle point of ed, and the lengths of the lines are od = tan 3(u —c); ‘oe-= tan d(w+ce). The line sz itself is the projection of a parallel, namely, that of which the co-latitude c= 180° — u, a parallel which passes through the point of vision.

A very interesting connexion, noted by Professor Cayley, exists between the stereographic projection of the sphere on a meridian plane (ze, when a point on the equator occupies the centre of the drawing) and the projection on the horizon of any place whatever. The very same circles that represent parallels and meri- dians in the one case represent them in the other case also. In fig. 15, abs being a_ projection in which an equatorial point is in the centre, draw any chord ab per- pendicular to the centre meridian cos, and on ab as diameter describe a circle, when the property referred to will be observed. This smaller circle is now the stereographic pro- jection of the sphere on the horizon of some place whose co-latitude we may call vw. The radius of the first circle being unity, let ac=sinw, then by what has been

proved above co=sinx cotu=cosx; therefore w=x, and ac=sinuw. Although the meridian circles dividing the 360° at the pole into equal angles must be actually the same in both systems, yet a parallel circle whose co-latitude is ¢ in the direct projection abs belongs in the oblique system to some other co-latitude asc. To determine the connexion between c and c’, con- sider the point ¢ (not marked), in which one of the parallel circles crosses the line soc. In the direct system, p being the pole,

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— —_ Oh… a ea pt=1-tan 4(90°—c) Ti eek be

and in the oblique, pt=ae (tan 4u – tan }(u-c’)),

which, replacing ac by its value sin w, becomes 2 sin $a sin $c’ _ 2 ; cos 4(u-c) 1+ cot 4u cot dc

thererore tandc = tan 4c’ tandw is the required relation.

Notwithstanding the facility of construction, the es graphic projection is not much used in ie uN ont = it may be made very useful as a means of graphica inter- polation for drawing other projections in which re ay represented in their true azimuths, but with an arbitrary

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law of distance, as p=/(u). We may thus avoid the calcu- lation of all the distances and azimuths (with refereuce to the selected centre point) of the intersections of meridians and parallels. Construct a stereographic projection of the globe on the horizon of the given place ; then on this pro- jection draw concentric circles (according to the stereo- graphic law) representing the loci of points whose distances from the centre are consecutively 5°, 10°, 15°, 20, &c., up to the required limit, and a system of radial lines at inter- vals of 5°. Then to construct any other projection,— com- mence by drawing concentric circles, of which the radii are

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Fra. 16..—Stereographic Projection.

previously calculated by the law p=/(u), for the successive values of w, 5°, 10°, 15°, 20°, &., up to the limits as before, and a system of radial lines at intervals of 5°. This being completed, it remains to transfer the points of intersection from the stereographic to the new projection by graphic interpolation.

We now come to the general case in which the point of vision has any position outside the sphere. Let abcd (fig. 17) be the great circle section of the sphere by a plane passing through c, the central point of the por- tion of surface to be represented, and V the point of vision. Let ay perpendicular to Ve be the plane of representation, join mV cut- ting pj inf, then f is the projec- tion of any point m in the circle abe, and ef is the representation of cm. Let the angle com=u, then, since ef :eV=mg: gV,

_ ksin w ~h+cos wu’

which gives the law connecting a spherical distance w with its rectilinear representation p. The relative scale at any point in this system of projection is given (keeping to our previously adopted notation) by ; oak ithcosu — h+cos wv’

~ (h+cos w)? ’ the former applying to measurements made in a direction which passes through the centre of the map, the latter to the transverse direction. The product co’ gives the exaggera- tion of areas. With respect to the alteration of angles we

have = h+cos u 1+h cos wu’ and the greatest alteration of angle is – —1f/h- 1 u =< =o otene = |). sin eS an 2)

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This vanishes when / = 1, that is, if the projection be stereo- graphic; or for w=0, that is, at the centre of the map, At a distance of 90° from the centre, the greatest alteration is 90°—2 cot? /h. (See Philosoph. Mag., April 1862.)

The constants A and & can be determined, so that the total misrepresentation, viz.,

B M ey i {(o- 1)? + (0-1)? }sinudu, shall be a minimum, f being the greatest value of w, orthe spherical radius of the map. On substituting the expres- sions for o and a’ the integration is effected without diffi- culty. Put

t< =e ; v=(h-l)a,

H=v-(h+1) log. (A+1), H’= 740 —v+ dv’). Then the value of M is ; M=4 sin? 36-+2kH + 12H’. When this is a minimum, aM =0; ‘al

.. &H’+H=0; HT

Therefore M = 4 sin? $8 – i

as to make H2: H’a maximum. In any particular case this maximum can only be ascertained by trial, that is to say, log H?~log H’ must be calculated for certain equidistant values of 4, and then the particular value of f which cor- responds to the required maximum can be obtained by interpolation. Thus we find that if it be required to make the best possible perspective representation of a hemisphere, the values of & and & are h= 1°47 and k= 2-034; so that in this case

and A must be determined so

_ 2°034 sin w

Pe 147 +08 & For a map of Africa or South America, the limiting radius B we may take as 40°; then in this case _ 2°548 sin P1626 + cos wb For Asia, @=54 , and the distance / of the point of sight

Fig. 18. , in this case is 1°61. Fig, 18 is a map of Asia having the meridians and parallels laid down on this system.

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Figure 19 is a perspective representation of more than a hemisphere, the radius 8 being 108°, and the distance h of the point of vision, 1-40,

The co-ordinates zy of any point in this perspective may be expressed in terms of the latitude and longitude of the corresponding point on the sphere in the following manner,

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The co-ordinates originating at the centre, take the central meridian for the axis of yand a line perpendicular to it for the axis of x Let the latitude of the point G, which is to occupy the centre of the map, be y; if ¢, w be the latitude and longitude of any point P (the longitude being reckoned

| from the meridian of G), ~ the distance PG, and pu the

Fie. 19.—Twilight Projection.

azimuth of P at G, then the spherical triangle whose sides | for a map of Africa, which is included between latitudes 40°

te) . : are 90° -y, 90°— d, and u gives these relations— sin u sin h=Ccos ¢ sin w, SiN % Cos “= Cos + sin –sin y Cos ¢ COS w, COs % =s1n y S1n + COs y COS g COS w. T . cl Now x=psin p, y=p cos p, that is, e cos sin w & h+sin y sin $+cos y cos ¢ cos w’ ¥Y_ cos y Sin —sin y cos ¢ cos w

k h+sin y sin ¢+ cos y cos ¢ cos w’

by which « and y can be computed for any point of the sphere. If from these equations we eliminate w, we get the equation tothe parallel whose latitude is # ; it is an ellipse whose centre is in the central meridian, and its greater axis perpendicular to the same. The radius of curvature of this ellipse at its intersection with the centre meridian is k cos } Asin y+sin ¢°

The elimination of ¢ between x and y gives the equation of the meridian whose longitude is w, which also is an ellipse whose centre and axes may be determined.

The following table contains the computed co-ordinates

north and 40° south, and 40° of longitude east and west of a central meridian.

Values of a and y.

p w=0° @=10° | w=20° | w=30°

go |= 0°00 9°69 19°43 | 29°25 y= 0°00 0°00 0:00 1} 0°00

10° z= 0°00 9°60 19°24 28°95 y= 969 | 9°75 | 9-92 | 10-21

99° | 2= 0:00 9°32 18°67 28°07 y=19‘43 19°54 19°87 20:48

39° | 2= 0:00 8°84 17°70 26°56 y= 29°25 29°40 29°87 80°67

40° | 2= 0:00 8:15 16°28 24°39 y=39‘17 39°36 89°94 40:93

Conical Development.

The conical development is adapted of maps of tracts of country of no grea

to the construction t extent in latitude

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but any extent in the direction of a parallel. Selecting the mean parallel, or that which most nearly divides the area to be represented, we have to consider the cone which touches the sphere along that parallel. In fig. 20, which is an orthographic projection of the sphere on a meridian plane, let Pp be the 4 parallel of contact with the

cone. ON being the axis of

revolution, the tangents at P H

and p will intersect ON pro- duced in V. Let Qg be a parallel to the north of Pp, Rr « another parallel the same dis- tance to the south, that is, PQ=PR. Take on the tan- gent PV two points H, K such that PH =PK, each being made equal to the are PQ. It is clear, then, that the surface generated by HK is very nearly coincident with the surface generated by RQ when the figure rotates round ON through any angle, great or small, The approximation of the surfaces will, however, be very close only if QR is very small. Suppose, now, that the paths of H and K, as described in the revolution round ON, are actually marked on the surface of the cone, as well as the line of contact with the V

sphere. And further, mark the surface Ae

of the cone by the intersections with it fi) of the meridian planes through OV at the required equal intervals, Then let the cone be cut along a generating line and opened out into a plane, and we shall have a representation as in fig. 21 of the spherical surface con- tained between the latitudes of Q and

Fig. 20.

Fig. 21. R. The parallels here are represented by concentric circles, the meridians by lines drawn through the common centre

of the circles at equal angular intervals. Taking the radius of the sphere as unity, and ¢ being the latitude of P, we see that VP= cot ¢, and if w be the difference of longitude between two meridians, the corresponding length of the are Pp is wcos¢. The angle between these meridians them- selves is w sin .

Suppose, now, we require to construct a map on this prin- ciple for a tract of country extending from latitude 4 —m to +m, and covering a breadth of longitude of 2n, m and 2 being expressed in degrees. In fig. 21 let HK&A be the quadrilateral formed by the extreme lines, so that HK =hk= 2m; then the angle HVA is 2nsin expressed in degrees. Now, taking the length of a degree as the unit, VP= 57-296 cot ¢, and VH =57-296 cot 6—m. It may be

convenient in the first instance to calculate the chords Hh Kk, and thus construct the rectilinear quadrilateral HK&h. The lengths of these chords are

Hh=2(57°296 cot @—m) si i

Kk=2(57 :296 cot iret a ae and the distance between them is 2m cogs (n sin $). inclined sides of this trapezoid w point at V, whose distance from P and p must corre- spond with the calculated length of VP. Now with this centre V describe the circular ares representing the parallels through H, K, P. Also if the parallels are te be drawn at every degree of latitude, divide HK into parts, and through each point of division describe are from the centre V. Then divide Pp into and draw the meridian lines through each of division and the centre V.

If the centre V be inconveniently far off, it may be necessary to construct the centre parallel by points, that is by calculating the coordinates of the various points a division. For this purpose, draw through the intersection

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ill then meet in a

2m equal a circular 2n equal parts, of these points

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of the centre meridian and centre parallel a line perpendi- cular to the meridian and therefore touching the parallel, Let the coordinate x be measured from the centre alon this line, and y perpendicular to it. Then the coordinates of a point whose longitude measured from the centre meridian is w are

x= cot ¢ sin (wsin ¢),

y =2cot $ sin? 4(w sin ¢)=2 tan 4(w sin ¢), the radius of the sphere being the unit; if a degree be the unit, these must be multiplied by 57°296,

The great defect of this projection is the exaggeration of the lengths of parallels towards either the northern or southern limits of the map. Various have been the devices to remedy this defect, and amongst these the following is a system very much adopted. Hav- ing subdivided the central meridian and drawn through the points of division the parallels precisely as described above, then the true lengths of degrees are Fig, 22. set off along cach parallel; the meridians, which in this case become curved lines, are drawn through the corre- sponding points of the parallels (fig. 22).

This system is that which was adopted in 1803 by the “Dépdt de la Guerre” for the map of France, and is there known by the title “Prejection de Bonne.” It is that on which the Ordnance Survey map of Scotland on the scale of one inch to a mile is constructed, and it is frequently met with in ordinary atlases. It is ill-adapted for countries having great extent in longitude, as the intersections of the meridians and parallels become very oblique—as will be seen on examining the map of Asia in most atlases. If ¢, be taken as the latitude of the centre parallel, and co-ordinates be measured from the intersection of this parallel with the central meridian, as in the case of the conical projection, then, if p be the radius of the parallel of latitude ¢, we have p=cot d,+,-¢. Also, if S be a point on this parallel whose co-ordinates are 2, y, so that VS=p, and 6 be the angle VS makes with the central meridian, then pO = w cos ¢; and

x=psind, y=cot d, – pcos 4 Now, if we form the differential coefficients of # and y with respect to ¢ and w, the latitude and longitude of S, we get m’n — mn’ = cos }, erie cos $(cos ¢ — psin ¢) ;

the first of which equations proves that the areas are truly represented. Moreover, if 90° + w be the angles of interseo- tions of meridians and parallels,

tan ~=0@- sin ,

which indeed might have been more easily obtained. In the case of Asia, the middle latitude 4, = 40°, and the ex- treme northern latitude is 70°. Also the map extends 90° of longitude from the central meridian; hence, at the north-west and north-east corners of the map the angles of inter- section uf

meridians and parallels are 90° + 33°54’. But for comparatively small tracts of country, as France or Scot- land, this projection is very suitable. ‘

Another modification of the conical projection consists in taking, not a tangent cone, but a cone which, having its vertex in the axis of revolution produced, intersects the sphere in two parallels, —these parallels being approximately midway between the centre parallel of the country and the extreme parallels. By this means part of the error is thrown on the centre parallel which is no longer represente by its true length, but is made too small, while the parallels forming the intersections of the cone are truly re- presented in length.

The exact position of these particular parallels may be

determined so as to give, upon the whole, the least amount of exaggeration for the entire map. This idea of a cutting cone seems to have originated! with the celebrated Gerard Mercator, whoin 1554 made a map of Europe on this prin- ciple, selecting for the parallels of intersection those of 40° and 60°. The same system was adopted in 1745 by De- lisle for the construction of a map of Russia, Euler in the Acta Acad. Imp. Petrop., 1778, has discussed this pro- jection and determined the conditions under which the errors at the northern extremity, at the centre, 6 and at the southern extremity of a map so con- structed shall be severally equal. Let c, c’ be plip the co-latitudes of the extreme northern and southern parallels, y, y’ those of two intermediate ¢l\m parallels, which are to be truly represented in the G projection. Let OC’, Om’ (fig, 23) be two cousecu- tive meridians, as represented in the developed cone; the difference of longitude being w, let the @/747 angle at O be hw. The degrees along the meri- c’l_|,,/ dian being represented by their proper lengths, CC’=c’~e; and P corresponding to the pole, let Fig. 23. OP=z, then OC=z+c; and so for G,G’,C’. The true lengths of G’n’ and Gu, namely, w sin y’ and wsiny, are equal to the represented lengths, namely, hw (2+) and hw (2+) respectively, whence y and y’ are known when hand z are known. Comparing now the represented with the true lengths of parallel at the extremities and at the centre, if ¢ be the common error that is to be allowed, then

c=ha(z+c)-w sinc,

e= ~ha(z+hcet+he)+w sin d(ctc’),

C=ha(z +c’) ~@ sin o’,

The difference of the first and third gives 2, and then sub- tracting the second from the mean of the first and third, we get

@+9(c+c’)=4(c’—c) cot i(c/—c) tan 4(c’ +c). Thus z being known, the common centre of the circles re- presenting the parallels is given. The value of & is given by the equation A(c’ ~~¢)=sin c’—sin c, and y and y’ can be easily computed. But there is no necessity for doing this as we may construct the angles at O, which represent~~ ing a difference of longitude w are in reality equal to ho.

For instance,.to construct a map of Asia on this system, having divided the central meridian into equal spaces for degrees, 2 must be calculated, Here we have c= 20°, c’= 80°, whence z+50°= 15° tan 50° cot 15° = 667. Hence in this case the centre of the circles is 16°:7 beyond the north pole ; also A = 6138, so that a difference of longitude of 5° is represented at O by anangle of 3° 4’ 9”. The de- grees of longitude in the parallel of 70° are in this map re- presented too large in the ratio of 1:150:1 ; those in the mid- latitude of 40° are too small in the ratio of 0°933 : 1; —_ those in 10° latitude are too large in the ratio of 1:05

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Gauss’s Projection

may be considered as another variation of the conical system of development. Meridians are represented by lines drawn through a point, and a difference of longitude w is represented by an angle hw, as in the preceding case. The parallels of latitude are circular arcs, all having as centre the point of divergence of the meridian lines, and the law of their formation is such that the representations of all small parts of the surface shall be precisely similar to the parts 80 represented. Let 1 be the co-

latitude of a parallel, and p, a function of u, the radius of the circle representing this parallel. Consider the infinitely small space on the

- See page 178 of Traité des Projections des Cartes Géographiques, by A. Germain, Paris, an admirable and exhaustive essay. See also the work entitled Coup d'ceil historique sur la Projection des Cartes de Géographie, by M. d'Ayezac, Paris, 1863.

sphere contained by two consecutive meridians the differ- ence of longitude of which is du, and two consecutive

parallels whose co-latitudes are ~ and u+du. The sides of this rectangle (fig. 24) are pg=du, pr=sinudp, whereas in the representation pq'r's', PY =dp, p'r'=phdy, the angle atO P being = Ad. Now, as the represen- wea tation is to be similar to the original, 3 Ee oe ee "hed pr sinudy ' , o p fs in pi Ps) db a whence > =he «4 oti Integrating , re s? p=h(tan s). Fig, 24,

where the constant / is to be determined according to the requirements of each individual case. This investigation was first made in 1772 by the German mathematician J. H. Lambert,? but in 1825 it was again brought forward by Gauss in an essay written in answer to a prize question pro- posed by the Royal Society of Sciences at Copenhagen. A translation of this essay is to be found in the Philosophical Magazine for 1828 (see page 112), where Lambert's projec- tion comes out as a particular solution of the general pro- blem, Again, in a general investigation of the problem of "similar representation," Sir John Herschel, in the 30th volume of the Journal of the Royal Geographical Society (1860), deduced as a particular case this same projection. A large map of Russia was constructed and published on this system by the Geographical Society of St Petersburg in 1862. The relative scale in this development is—

dp hk (tan$,

dua” sinw where a is the radius of the sphere. It isa minimum when w=cos!%. This minimum should occur in the vicinity of the central parallel of the map; if w, be the co- latitude of this parallel, we may put

p=k (tan a es

Or if we agree that the scale of the representation shall be the same at the extreme co-latitudes ¢, c’, then

__ log sin c’— log sin ¢

~ Tog tan $c’ log tan 4c

To construct a map of North America extending from

10° latitude to 70°, we may take h = 2, and & such as shall make the difference of radii of the extreme parallels = 60, namely &=104‘315, The scales of the representation at the northern and southern limits are 1:116 and 1-096 respect- ively, The radii of the parallels are these—

70″ 2 « B20″ 80°. , . 72°828 60°. . . 48°356 20°... 82°255 50” os » OBZ 1D? pea 9OQPBOL 40°. . . 62°728 O°... » 1043

Having drawn a line representing the central meridian, and selected a point on it as the centre of the concentric circles, let arcs be described with the above radii as parallels, For meridians, in this system a difference of longitude of 10° is represented by an angle of two-thirds that amount, or 6° 40’. The chord of this angle on the parallel of 10°, whose radius is 92°801, is easily found to be 10792. Now stepping this quantity with a pair of com- passes along the parallel, we have merely to draw lines through each of the points so found and the comnion centre of circles. The points of division of the parallel may be checked by taking the chord of 20°, or rather of 13° 20,

2 Beitriige zum Gebrauche der Mathematik und deren Anwendung, vol. iii. p. 55, Berlin, 1772.

which is 21‘547. The map of N orth America so found (fig. 25) shows small portions of country in strictly correct forms ; but the areas are slightly too great at the extreme lati- tudes and too small in the centre. At |, any part of the map a degree of latitude may be used as the true scale in any di- rection.

The value h=}, as suggested by Sir John Herschel, is admirably suited for a map of the world. |, The representation is fan-shaped, with remarkably _little ; distortion (fig. 26). Fig. 25.

It follows from what has been said above that the con- dition that the scale is true at the equator is hk=a, which

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Fig, 26.—Fan-shaped Map of the World.

of small parts of the surface. In Mercator’s chart the equator is represented by a straight line, which is crossed at right angles by a system of parallel and equidistant straight lines representing the meridians, The parallels are straight lines parallel to the equator, and the distance of the parallel of latitude # from the equator is, as we have seen above, r=a@ log, tan (45° +4¢). In the vicinity of the equator, or indeed within 30° of latitude of the equator the representation is very accurate, but as we proceed northwards or southwards the exaggeration of area becomes larger, and eventually excessive,—the poles being at infinity. This distance of the parallels may be expressed in the form r=a (singt+4 sin’d+s sin’St+....), showing that near the equator r is nearly proportional to the latitude As a consequence of the similar representation of small parts, a curve drawn on the sphere cutting all meridians at the same angle—the loxodromic curve—is projected into a straight line, and it is this property which renders Mercator’s chart so valuable to seamen. For instance: join by a straight line on the chart Land’s End and Ber. muda, and measure the angle of intersection of this line

jection it is clear that it retains the characteristic property

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determines & when f is given. The radius of the parallel

whose co-latitude is « being p, let 7 be the distance of that

parallel from the equator ; then, keeping to the condition

that the scale is true at the equator, U

a h p=z tan z?

a aw Eee ~ t a

r 5 ans

When ’ is very small, the angles between the meridian lines in the representation are very small; and proceeding to the limit, when 4 is zero the meridians are parallel, that is,

the vertex of the cone has removed to infinity. And at the limit when & is zero we have

r= loge cot F ‘ which is the characteristic equation of Mercator’s Projection.

From the manner in which we have arrived at this pro-

of Gauss’s projection,—namely, similarity of representation

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with the meridian. We get thus the bearing which a ship has to retain during its course between these ports. This is not great-circle sailing, and the ship so navigated does not take the shortest path. The projection of a great circle (being neither a meridian nor the equator) is a curve which cannot be represented by a simple algebraic equation.

If we apply Mercator’s system of projection along 4 meridian, as proposed by Lambert, we have the represen tation of all possible great circles. The

diagram (fig. 27) gives the projection. The two vertical bounding liaes are the equator—crossed at right angles by the initial meridian passing through one of the poles. From the form of the representations of parallels round the pole it is clear that the distortion up to a distance of 30° or 40° from the initial meridian is not at all great. The representation extends to infinity upwards and downwards, and the left and right half are interchangeable ; if interchanged the in igi te is on a meridian extending from pole to pole.

The meridian Mercator drawn as described in the last paragraph—with the meridians and parallels rather close—

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may be made to serve the important purpose of enabling one to trace on the ordinary Mercator's chart the track of a great circle joining any two places, and of indicating at the same time the distance of the two places. For this

Fig. 27. purpose the two charts must be on the same scale, one of

them being on tracing paper or tracing linen. The trans- parent chart being placed over the other, the equator in the ordinary chart must coincide with the initial meridian in the meridian Mercator. Retaining this relative position, let the upper chart be moved until the two points (the pro- jection of the great circle joining which is required) on the ordinary Mercator are found to lie on a great circle of the meridian Mercator.

The curvatures of the meridians and parallels in the meridian Mercator are expressed by very simple formule. Let #, ybe the coordinates, measured from the pole along and perpendicular to the initial meridian, of any point S of the representation,—w corresponding to an arc of the sphere = #, and y to an arc 7 which is on the sphere the distance of S from the initial meridian. Then if 2', y' be the centre of curvature of the parallel at S, x", y' the centre of curvature of the meridian at §, ,

1

tan «

1

sin 7

The corresponding radii of curvature are sin @ + cos x, Where 8 is the spherical radius of the small circle, and 1+sin x sin y, where y is the longitude of the great circle, counted from the initial meridian.

e=e-tanz, x”=a2+

>

y=y-singn, y’=y-

Polyconice Development. Imagine a hollow globe formed of a mere surface of paper,

to be cut by a system of parallel planes along equidistant |

parallels of latitude ; let also one meridian be cut through, from north pole to south pole, 180°. In this state let the whole be opened out into a plane from the meridian exactly opposite to the one cut through, and the previously spherical surface is converted into a number of strips of paper, each of which is part of a circular belt, with the ex- ception of the equator, which will be straight. All points which lay on the parallel whose co-latitude is « now lie on an arc of a circle whose radius is tanw and length 2rsinw; moreover, the centres of these arcs lie in the same straight line, which is the central meridian produced, The parallels being now defined, we must define meridians. These may be formed by laying off on each parallel the degrees of longitude according to their true lengths, which is the system adopted in the maps of the United States Coast Survey. Or we may take for meridians that system of lines which cuts the parallels at right angles, forming the rectangular poly- conic system.

In this case, let P (fig. 28) be the north pole, CPU the central meridian, U, U’ points in that meridian whose co-latitudes are u and w+du, so that

UU’=du. Make PU=u, UC=tan u, U’C’=tan(w+du); and with CC’ as centres describe the arcs ; UQ, U’Q’, which represent the parallels of Fig. 28, co-latitude wu and w+du. Let PQQ’ be part of a meridian curve cutting the parallels at right angles. Join CQ, (’Q’; these being perpendicular to the circles will be tangents to the curve. Let UCQ=2¢, UC’Q’=2(p+d¢), then the small angle CQC’, or the angle between the tangents at QQ’, will=2d¢. ow

CC’=C’U’ – CU – UU’ = tan (w+du) — tan u —du=tan 2u du ;

and in the triangle CO’Q the perpendicular from C on 0’Q’ is equal to either side of the equation tan?u du sin 26= —tan u dd,

2dp sin 2o ’ which is the differential equation of the meridian: the integral is tan ¢=w cos u, where w, a constant, determines a particular meridian curve. The distance of Q from the central meridian, tan «sin 2¢, is equal to

—tan wu du=

Qw sin Ww 1+? cos?u

2 tan u tan d – 1+tan’¢

At the equator this becomes simply 2. Let any equatorial point whose actual longitude is 2w be represented by a point on the de- veloped equator at the distance 2w from the central meridian, then we have the following very simple con- struction (due to Mr O’Farrell of the Ordnance Survey Office). Let P (fig. 29) be the pole, U any point in the central meridian, QUQ’ the re- presented parallel whose radius CU=tanu. Draw SUS’ perpen- dicular to the meridian through U; then to determine the point Q, whose longitude is, say, 3°, lay off : 5 US equal to half the true length of e: 96

the are of parallel on the sphere, Fig. 29. ;

i.e. 1° 80’ to radius sin w, and with the centre S and radius SU describe a circular arc, which will intersect the parallel in the required point Q. For if we suppose 2w to be the longitude of the required point Q, US is by construction=w sin w, and the angle subtended by SU at C is

and therefore UCQ=2¢, as it should be. The advantages of this method are that with a remarkably simple and convenient mode of construction we have a map in which the parallels and meridians intersect at right angles.

The following table contains the lengths of the — for describing parallels, and also the lengths of pe . via gitude for every 5° of latitude,—the radius of the sp being 57:296. x” — 2

Degree of Longitude.

Radius for

Degree of || a Parallel.

Radius for Longitude.

Parallel.

7071 6428 5736 *5000 “4226 *3420 2588 1736 0872

57°30 48°08 40°12 33°08 26°72 20°85 15°35 10°10

5°01

ee) 1:0000 654°89 324 °94

“9962 9848 9659

‘9397

9063 8660

Goplal

*7660

21383

157°42 122°87 99°24 81°83 68°28

With regard to the distortion involved in this system of development, consider a small square described on the sur- face of the sphere, its sides being parallel to and perpendicu- lar to the meridian. Let wand 2w define its position, and let ¢ be the length of its side. If we differentiate the equa- tion tang =o cosw, w being constant, sec? h dh = cos wd. But the representation of 2dw is 2tanudd, which is equal to sinwcos’fd.2w ; hence that side of the square which is parallel to the equator is represented by zcos’, And similarly the meridional side is represented by

4 cos’p(1 + w+ w? sin®w). Therefore the square is represented by a rectangle whose sides are in the proportion of 1 :1+4+?+ w? sin, and its area is increased in the proportion of 1+ 2+? sin : (1+? cos®w)?.

Fig. 30 is a representation on this system of the con- tinents of Europe and Africa, for which it is well suited. For Asia this system would not do, as in the northern latitudes, say along the par- allel of 70°, the representation is much cramped.

With regard to the distor- tion in the map of Africa as thus constructed, consider a small square in latitude 40° and in 40° longitude east or west of the central meridian, the square being so placed as to be transformed into a rect- angle. The sides, originally unity, become 0°95 and 1°13, and the area 1:08, the diagon- als intersecting at 90° + 9°56’, In the perspective projection ~ a square of unit side occu-

J ff

LEP S

Fig. 30.

pying the same position, when transformed to a rect- angle, has its sides 1°02 and 1°15, its area 1°17, and its

diagonals intersect at 90°+7° 6’. The latter projection is therefore the best in point of “similarity,” but the former represents areas best. This applies, however, only to a par- ticular part of the map; along the equator towards 30° or 40° longitude, the polyconic is certainly inferior, while along the

meridian it is better than the perspective—ex- cept, of course, near the centre. Upon the whole, the more even distribution of distortion gives the advantage to the perspective system. The system of lines ordinarily used for the map of Africa is objectionable, and has scarcely the excuse of facility of construction, since the perspective co- ordinates given above are so easily computed.

Ordnance Survey Maps. .

The method of development used in the Ordnance Survey maps of England on the scale of one inch to a mile, as also in the county maps of England, Scotland, and Ireland, on the 6-inch scale is this. A central meridian having been selected. let a perpendicular arc be drawn from any trigono-

metrical station p to the meridian, meeting it ing. § being a point of reference selected in the central meridian, make Sqg=y, py=x. Then in the development, a straight line drawn to represent the central meridian is the axis of y, aud a line at right angles to this is the axis of x. The point whose coordinates are «=pg, y=Sq is the representation of ». Supposing the earth spherical, if d, w be the latitude and longitude of p, then, being small, that is, only a few degrees, dx= -—xtan¢ddd+cos (1 — 4a? tan’¢)dw, dy= (1+42?-4ha* tan*¢)d@ + x sindde, from which the distortion can be computed. It principally consists in the exaggeration of the scale in a north-and-south direction at the extreme longi- tudes, where o =sec 2,

Contours.

In maps of a large scale, it is usual to show the relief of the ground by contour lines, which are the intersections with the actual surface of a system of equi- distant horizontal planes. Con- tours indicate not only the height of the ground but its slope. Fig. 31 shows a piece of contoured country, including two summits and a ‘‘col” between them.

The dotted lines, which, how- ever, are not shown in maps, are lines of greatest slope, cutting contours at right angles, At each summit, supposing the contours there to be ellipses (Dupin's in- dicatrices), there is an infinity of steepest lines having a common

Fig. 31.

tangent there, At the col, where the indicatrix is an hyper- bola, there are two steepest lines intersecting at right angles, of which one is the " water-shed" joining the sum-

mits. (A. RB. C.)

III. Puysicat Groorarny.

This term in its ordinary acceptation means a description of the physical features of the earth. It includes an account of the phenomena of the atmosphere ; of the composition, distribution, and movements of the sea; of the forms of the land, with its water circulation, earthquakes, and volcanoes ; of the distribution of plaut and animal life. Its object, however, is not to present a mere bald enumeration of facts, but to group the facts together in such a way as to bring before the mind a luminous picture of the whole structure and working of the earth as a habitable planet. Physical geography is not so mucli a science or branch of science a8 a collection of the data ascertained, and probable conclusions arrived at, by different sciences, in so far as these bear upon its own subject. Accordingly, it culls from all departments of inquiry whatever helps to give additional distinctness aud vividness to that broad conception of the daily economy of the globe which it is its aim to form and develop.

So vast a subject, if treated in its entirety, would demand a very large allotment of space for its adequate discus- sion. Some of its branches have, during the last few years, received so much development that in the present edition of this work it has been considered more expedient to make them the subject of special articles; and here, therefore, to avoid the repetition which a general article on physical geography would involve, there will be given, instead of a formal essay, a mere outline or synopsis of the branches

of knowledge embraced in the subject, with references to the other parts of the work where detailed

information may be looked for. In the first three parts of the article GroLocy, a large section of what is usually included under physical geography will be found.

1. The Earth in tts Cosmical Relations.—F rom astronomy we learn the shape and size of the earth, its motions of rotation round its axis and of revolution in an elliptical orbit round the sun, the origin of day and night, and of the seasons. Speculating on the original condition of the whole solar system, we may regard it as having been in the condition of a nebula, gradually contracting, con- densing, and leaving behind successive rings, which on disruption and reaggregation formed planets. Hence the primitive condition of our globe as a separate mass must have been gaseous or fluid. Since that time the earth has been cooling and contracting, but still retains a high resi- dual temperature in its interior. This original condition, and the internal heat of the earth, must be constantly kept in view as.an explanation of many of the features of its outer surface. See GEOLOGY, part i; AsTRONoMY, chapter 1.; GrocraPHy (MATHEMATICAL); GEODESY.

2. The Atmosphere or Gaseous Envelope of the Harth.— The solid planet is covered by two envelopes, one of gas which completely surrounds it, and one of water, which occupies about three-fourths of its surface. In studying the atmosphere we have to consider its height, its composition, its temperature, its moisture, and its pressure (see ATMo- SPHERE, METEOROLOGY). Its height must be at least 40 or 50 miles. This deep gaseous ocean consists of a mixture of the two gases, oxygen (21 parts by weight) and nitrogen (79 parts), with a minute proportion of carbonic acid (004) and of aqueous vapour. The physical geographer takes note of the manifold importance of oxygen, not only in supporting animal life, but in the general oxidation of the earth's outer crust. He recognizes the atmospheric car bonic acid as the source of the carbon built up into the structure of plants. He cannot contemplate without ever- increasing wonder and delight the coming and going of the water-vapour in the air, as it rises incessantly from every sea and Jand, and after condensation into visible

form courses over the land as rain, brooks, rivers, and glaciers (see GEOLOGY, part iii.). The consideration of the tempera- ture of the atmosphere elicits the facts that temperature falls as we rise above the sea-level, and as we recede from the cquator to the poles, and that it is profoundly affected by the relative positions of sea and land. The want of strict dependence upon latitude in this distribution of temperature is strikingly brought out by the contrast be- tween the mean temperature of Labrador and Ireland on the same parallels (see CLIMATE, IsoTHERMS). In dealing with the moisture of the air we have to consider the phenomena of evaporation and condensation, the formation of dew, clouds, rain, snow, and hail, the distribution of rain, the position of the snow-line, the occurrence of deserts, &c. (see MeETEoroLoGy). The study of the pressure of the atmo- sphere, which appears to vary with variations in temperature and amount of vapour, brings before us the cause of the constant acrial movements. The law has now been well established that air always flows out from tracts where the barometric pressure is high into those where it is low. A knowledge of the distribution of pressure over the globe furnishes the key to the great movements of the atmo- spheric circulation. The trade winds, for example, blow constantly from a belt of high pressure towards the equator, where the pressure remains low. Periodic winds, like the monsoons and land and sea breezes, shift with the changes In atmospheric pressure. Thus Asia during winter is a vast region of high pressure; the winds round its margin therefore flow out towards the sea. In summer, on the other hand, it becomes a region of low pressure, and the winds consequently blow inland from the sea. Sudden and

violent atmospheric movements, such as tempests and hurri- canes, are illustrations of the same law, the force of the wind being always proportional to the shortness of the space between great extremes of pressure (see ATMOSPHERE).

3. Lhe Ocean or Water-Envelope of the Larth, from the point of view of physical geography, presents for considera- tion the form of the basins in which it is contained, the shape and nature of their bottom, their submarine

ridges and islands, the density and composition of the water, the distribution of marine temperature, the ice of the sea, and the movements of the ocean due to cosmical causes as in the tides, to the effects of winds as in surface drifts, currents, and waves, and to differences of temperature. The largest additions in recent years to our knowledge of the earth have been made in the ocean, notably by the different expeditions and cruises equipped for the purpose by the British Govern- ment. The climates of the sea have been systematically determined, and the extraordinary fact has been brought to light that the great mass of the ocean water is cold, or below 40° Fahr. Even in the equatorial parts of the ATLANTIC and PactFic OcEANs (q.v.), though the upper layers of water partake in the heat of the intertropical latitudes, a temperature of 40° is found within 300 fathoms of the surface, while at the bottom, at depths of 2500 or 3000 fathoms, the temperature (32°-4 to 33° Fahr.) is very little above that of the freezing-point of fresh water. It has been proved that the bottom temperature of every ocean in free communication with the poles has a temperature little different from that of the water in polar latitudes. Between Scotland and the Faroe Islands a sounding was obtained giving even a temperature of 29°‘6, or 2:4 degrees below the freezing-point of fresh water, and very little above that of salt water. These observations warrant the conclusion that a vast system of circulation takes place in the ocean. The cold heavy polar water creeps slowly towards the equator under the upper lighter water, which moves away towards the poles. .

4. The Land.—We have to consider the distribution of the land over the face of the globe, the grouping of the con- tinents, the forms and trend of the great terrestrial ridges, the relation of coast-line to superficial area, the contours of the land, as mountains, table-lands, valleys, and plains, the re- lation of the continents to each other as regards general mass (see GEOLOGY, part 11; Arrica, AMERICA, Asia, EUROPE). Over this framework of land there is a ceaseless circulation of water. ‘The vapour raised by the sun’s heat from every ocean and surface of water on the land, after being con- densed into clouds and rain, falls in large measure upon the land, and courses over its surface from mountain to shore in brooks and rivers, which again have their own distinguish- ing phenomena, such as the formation of terraces, deltas, &c. Part of the water performs an underground circulation and returns to the surface in springs. Another portion falls as

snow upon the mountains and descends into valleys in the form of glaciers. In this ceaseless flow of water from the summits to the sea we must recognize one of the great agencies by which the present contour of the land lias been moulded (see GEOLOGY, part iii., section ii.).

The physical geographcr cullects, moreover, data which show the reaction of the earth's interior upon its surface, — proofs from bores and mines of a progressive increase of temperature downwards, the evidence of hot springs, and of earthquakes and volcanoes. He finds proofs of oscilla- tions in the level of the land, some regions having been raised and others depressed within the times of human history. From the geologist he learns that such instability has characterized the outer crust of the planet from very ancient times, and that indeed it is to the results of ter- restrial movements that we owe the existence of mountain ranges and even the dry land itself (see GEOLOGY, part 1,

section i., and part vii.). He perceives that the present area of land on the earth's surface is the result of the balance of two antagonistic processes — the destruction caused by superficial agents on every portion of land ex- posed to their influence, and the periodic elevation, by sub- terranean action, of the land so wasted, or of new land rom beneath the sea. 5. Distribution of Animal and Vegetable Infe.—lt is usual to include in treatises on physical geography an out- line of the distribution of plants and animals, with an account of the great regions or provinces into which zoolo- gists and botanists have divided the continents. The question naturally arises why the distribution should be as it is. Two answers obviously suggest. themselves—Ist, climate, and 2d, the power possessed by plants and animals of diffusing themselves. Yet climate only explains a part of this problem, and it is evident that migration cannot

possibly account for the diffusion of innumerable organ- isms. There is a large residuum of unexplained phenomena on which much light is thrown

by geological inquiry. Thus, for example, the presence of living Arctic forms of vegetation on the mountains of central Europe can be con- nected with the occurrence of the remains of Arctic animals in the superficial deposits of that region, and with other facts which make it clear that at no very distant date an Arctic climate prevailed over most of Europe, that at that time a northern vegetation spread southwards and covered the plains and heights of Europe even as far south as the Alps aud Pyrenees, and that as the climate gradually ameli- orated the northern vegetation was extirpated from the low grounds by the advance of plants better suited to the milder temperature, but continued to maintain its ground amid the congenial frosts and snows of the mountains, where to this day it still flourishes (see DisTRIBUTION). (A. GE.)

GEOLOGY

EOLOGY is the science which investigates the history

the task of the geologist to group these elements in such a

of the earth. Its object is to trace the progress of | way that they may be made to yield up their evidence as our planet from the earliest beginnings of its separate ex- | to the march of events in the evolution of the planet. He istence, through its various stages of growth, down to the | finds that they have in large measure arranged themselves

present condition of things. It seeks to determine the manner in which the evolution of the earth’s great surface features has been effected. It unravels the complicated processes by which each continent has been built up. It follows, even into detail, the varied sculpture of mouutain and valley, crag and ravine. Nor does it confine itself merely to changes in the inorganic world. Geology shows that the present races of plants and animals are the descend- ants of other and very different races which once peopled the earth. It teaches that there has been a progress of the inhabitants, as well as one of the globe on which they dwelt; that each successive period in the earth’s history, since the introduction of living things, has been marked by characteristic types of the animal and vegetable kingdoms; and that, however imperfectly they have been preserved or may be deciphered, materials exist for a history of life upon the planet. The geographical

distribution of existing faunas and floras is often made clear and intelligible by geological evidence ; and in the same way light is thrown upon some of the remoter phases in the history of man lumself. A subject so comprehensive as this must require a wide and varied basis of evidence. It is one of the characteristics of geology to gather evidence from sources which at first sight seem far removed from its scope, and to seek aid from almost every other leading branch of science. Thus, in dealing with the earliest conditions of the planet, the geologist must fully avail himself of the labours of the astronomer. Whatever is ascertainable by telescope, spectroscope, or chemical analysis, regarding the coustitution of other heavenly bodies, has a geological bearing. The experiments of the physicist, undertaken to determine con- ditions of matter and of energy, may sometimes be taken as the starting-points of geological investigation, The work of the chemical laboratory forms the foundation of a vast and increasing mass of geological inquiry. To the botanist the zoologist, even to the unscientific, if observant, traveller by land or sea, the geologist turns for information and assistance.

But while thus culling freely from the dominions of other sciences, geology claims as its peculiar territory the rocky framework of the globe. In the materials composing that framework, their composition and arrangement, the pro- cesses of their formation, the changes which they have undergone, and the terrestrial revolutions to which they bear witness, lie the main data of geological history. It is

in chronological sequence,—the oldest lying at the bottom and the newest at the top. Relics of an ancient sea-floor are overlaid by traces of a vanished land-surface ; these are in turn covered by the deposits of a former lake, above which once more appear proofs of the return of the sea, Among these rocky records lie the lavas and ashes of long- extinct volcanoes, The ripple left upon the shore, the cracks formed by the sun’s heat upon the muddy bottom of a dried-up pool, the very imprint of the drops of a pass- ing rain-shower, have all been accurately preserved, and yield their evidence as to geographical conditions widely different from those which exist where such markings are now found.

But it is mainly by the remains of plants and animals imbedded in the rocks that the geologist is guided in un- ravelling the chronological succession of geological changes. He has found that a certain order of appearance characterizes these organic remains, that each great group of rocks is marked by its own special types of life, and that these types can be recognized, and the rocks in which they occur can be correlated even in distant countries, and where no other means of comparison would be possible. At one moment he has to deal with the bones of some large mammal scattered through a deposit of superficial gravel, at another time with the minute foraminifers and ostracods of an upraised sea-bottom. Corals and crinoids crowded and crushed into a massive limestone where they lived and died, ferns and terrestrial plants matted together into a bed of coal where they originally grew, the scattered shells of a submarine sand-bank, the snails and lizards which lived and died within a hollow tree, the insects which have been imprisoned within the exuding resin of old forests, the footprints of birds and quadrupeds, the trails of worms left upon former shores—these, and innumerable other pieces of evidence, enable the geologist to realize in some measure what the faunas and floras of successive periods have been, and what geographical changes the site of every land has undergone. :

It is evident that to deal successfully with these varied materials, a considerable acquaintance with different branches of science is needful. Especially necessary 18? tolerably wide knowledge of the processes now at work 1n changing the surface of the earth, and of at least those forms of plant and animal life whose remains are apt to be preserved in geological deposits, or which in their structure

and habitat enable us to realize what their forerunners were. It has often been insisted upon that the present is the key to the past ; and in a wide sense this assertion is eminently true. Only in proportion as we understand the present, where everything is open on all sides to the fullest investi. gation, can we expect to decipher the past, where so much is obscure, imperfectly preserved, or not preserved at all. A study of the existing economy of nature ought thus to be the foundation of the geologist’s training.

While, liowever, the present condition of things is thus employed, we must obviously be on our guard against the danger of unconsciously assuming that the phase of nature's operations which we now witness has been the same in all past time, that geological changes have taken place in former ages in the manner and on the scale which we behold to-day, and that at the present time all the great geological pro- cesses, which have produced changes in the past eras of the earth's history, are still existent and active. Of course we may assume this uniformity of action, and use the assump- tion as a working hypothesis. But it ought not to be allowed any firmer footing, nor on any account be suffered to blind us to the obvious truth that the few centuries wherein man has been observing nature form much too brief an interval, by whieh to measure the intensity of geological action in all past time. For aught we can tell the present is an era of quietude and slow change, compared with some of the eras which have preceded it. Nor can we be sure that, when we have explored every geological process now in progress, we have exhausted all the causes of change which, even in comparatively recent times, have been at work.

In dealing with the Geological Record, as the accessible solid part of the globe is called, we cannot too vividly realize that at the best it forms but an imperfect chronicle. Geological history cannot be compiled from a full and con. tinuous series of documents. From the very naturc of its origin the record is necessarily fragmentary, and it has been further mutilated and obscured by the revolutions of suc- cessive ages. And even where the chronicle of events is continuous, it is of very uncqual value in different places. In one case, for example, it may present us with an un- broken succession vf deposits many thousands of feet in thickness, from which, however, only afew meagre facts as to geological history can be gleaned. In another instance it brings before us, within the compass of a few yards, the evidence of a most varied and complicated series of changes in physical geography, as well as an abundant and interest- ing suite of organic remains. These and other character- istics of the geological record will become morc apparent and intelligible as we proceed in the study of the science.

In the systematic treatinent of the subject the following arrangement will here be followed :—

1. The Cosmical Aspects of Geology.—Under this head we may consider the evidence supplied by astronomy and physics regarding the form and motions of the earth, the composition of the sun and planets, and the probable history of the solar system.

2. Geognosy,—an I. nguiry into the Materials of the Earth's Substance.—In this division we deal with the parts of the earth, its envelopes of air and water, its solid crust, and thie probable condition of its interior. Especially, we have to Study the more important minerals of the crust, and the chief rocks of which that crust is built up. In this way we lay a foundation of knowledge regarding the nature of the materials constituting the mass of the globe, and may hext proceed to investigate the processes by which these materials are produced and altered.

3. Dynamical Geology embraces an investigation of the various agencies whereby the rocks of the earth's crust are formed and metamorphosed, and by which changes are

effected upon the distribution of sea and land, and upon the forms of terrestrial surfaces. Such an inquiry neces- sitates a careful study of the existing geological economy of nature, and forms a fitting introduction to the investi- gation of the geological changes of former periods. This and the previous section include most of what is embraced under Physical Geography; and for the reason stated under that heading the subject will here be treated more in detail than is usual in geological treatises.

4. Structural Geology, or the Architecture of the Earth.— We now advance to consider how the various materials composing the crust of the earth have becn arranged. We learn that some have been formed in beds or strata on the floor of the sea, that others have been built up by the slow aggregation of organic forms, that others have been poured out in a molten condition or in showers of loose dust from subterranean sources. We further find that, though origin- ally laid down in almost horizontal beds, the rocks have subsequently been crum pled, contorted, and dislocated, that they have been incessantly worn down, and have often been depressed and buried beneath later accumulations.

5. Paleontological Geology.—This branch of the subject deals with the organic forms which are found preserved in the crust of the earth. It includes such questions as the relations between extinct and living types, the laws which appear to have governed the distribution of life in time and in space, the relative importance of different genera of animals in geological inquiry, the nature and use of the evidence from organic remains regarding former conditions of physical geography. This subject will be more properly discussed in the article PaLmonroLocy, and will therefore be only cursorily treated in the following pages,

6. Stratigraphical Geology.—This section might be called geological history. It works out the chronological succes- sion of the great formations of the earth's crust, and endeavours to trace the sequence of events of which they contain the record. More particularly it determines the order of succession of the various plants and animals which in past time have peopled the earth, and thus ascertains what has been the grand march of life upon the planet.

7. Physiographical Geology, starting from the basis of fact laid down by stratigraphical geology regarding former geographical changes, embraces an inquiry into the origin and history of the features of the earth's surface—contin- ental ridges and ocean basins, plains, valleys, and moun- tains. It explains the causes on which local differences of scenery depend, and shows under what very different cir. cumstances, and at what widely separated intervals, the hills and mountains, even of a single country, have been produced.

PART IL—COSMICAL ASPECTS OF GEOLOGY.

Before geology had attained to the position of an induc- tive science, it was customary to begin all investigations into the history of the earth by propounding or adopting some more or less fanciful hypothesis in explanation of the origin of our planet, or even of the universe. Such pre- liminary notions were looked upon as essential to a right understanding of the manner in which the materials of the globe had been put together. To the illustrious James Hutton (1785) geologists are indebted for strenuously up- holding the doctrine that it is no part of the province of geology to discuss the origin of things. He taught them that in the materials from which

geological evidence is to be compiled there can be found “no traces of a beginning, no prospect of an end.” In England, mainly to the influence of the school which he founded, and to the subse- quent rise of the Geological Society (1807), which resolved to collect facts instead of fighting over hypotheses, is due

the disappearance of the crude and unscientific cosmologies by which the writings of the earlier geologists were distin- SF Ne can now be little doubt that in the reaction against those visionary and often grotesque speculations, geologists were carried too far in an opposite direction. In allowing themselves to believe that geology had nothing to do with questions of cosmogony, they gradually grew up +n the conviction that such questions could never be other than mere speculation, interesting or amusing as a theme for the employment of the fancy, but hardly coming within the domain of sober and inductive science. Nor would they soon have been awakened out of this belief by anything in their own science. It is still true that in the data with which they are accustomed to deal, as comprising the sum of geological evidence, there can be found no trace of a beginning. The oldest rocks which have been discovered on any part of the globe have probably been derived from other rocks older than themselves. Geology by itself has not yet revealed, and is little likely ever to reveal, a trace of the first solid crust of our globe. If then geological history is to be compiled from direct evidence furnished by the rocks of the earth, it cannot begin at the beginning of things, but must be content to date its first chapter from the earliest period of which any record has been preserved among the rocks.

Nevertheless, though geology in its usual restricted sense has been, and must ever be, unable to reveal the earliest history of our planet, it no longer ignores, as mere specula- tion, what is attempted in this subject by its sister sciences. Astronomy, physics, and chemistry have in late years all contributed to cast much light on the earlier stages of the earth’s existence, previous to the beginning of what is commonly regarded as geological histury, But whatever extends our knowledge of the former conditions of our globe may be legitimately claimed as part of the domain of geology. If this branch of inquiry therefore is to continue worthy of its name as the

science of the earth, it must take cognizance of these recent contributions from other sciences. It must no longer be content to begin its annals with the records of the oldest rocks, but must endeavour to grope its way through the ages which preceded the formation of any rocks. Thanks to the results achieved with the tele- scope, the spectroscope, and the chemical laboratory, the story of these earliest ages of our earth is every year becoming more definite and intelligible.

RELATIONS OF THE EARTH IN THE SOLAR SysTEM.

Before entering upon the study of the structure and luistory of the earth, we may with advantage consider the general relations of our planet to the solar system, especially in view of its origin and history. It isnow regarded as in the highest degree probable that all the members of that system have had a common origin. The investigations of recent years have revived and given a new form and meaning to the well-known nebular hypothesis, in which Laplace sketched the progress of the system from the state of an original nebula to its existing condition of a central incandescent sun with surrounding cool planetary bodies. He supposed that the nebula, originally diffused at least as far as the furthest member of the system began to condense towards the centre, and that in so doing it threw off or left behind successive rings which on disruption and further condensation assumed the form of planets, some- times with a further formation of rings, which in the case of Saturn remain, though in other planets they have broken up and united into satellites.

According to this view we should expect that the matter composing the various members of the solar system should

be everywhere nearly the same. The fact of condensation round centres, however, indicates at least differences of density throughout the nebula. Mr Lockyer has, indeed, suggested that the materials composing the nebula arranged themselves according to their respective densities, the lightest occupying the exterior and the heaviest the interior of the mass. And if we

compare the densities of the various planets, they certainly seem to support this sugges- tion. These densities are shown in the following table, that of the earth being taken as the unit :—

Density of Whee Wm. .....0…0..01e.en eee ee 0°25 AS IMIGHEUTY. o… crcc cesses co sseer een ente tena 112 i Viens: 00 on Pe one) fonosonen 1:03 sty RATED, 4..6e000e000.00cenn eee ete 1:00 . Mars… .ceeesssesescegeenecescnnterseeteons 0°70 A TMP UET ok… c0ssresescen seen 0°24 a SEIUUG lle! i Witte: .. Tees edocs eere cere 0-17 Ps IN GPPWMNC ca… s:085 ssi00 esse seecrnnaga eterna 0-16

There is not indeed a strict progression in the diminu- tion of density, but the fact remains that, while the planets near the sun are about twice as heavy as they would be if they consisted of such a substance as granite, towards the outer limits of the system they are composed of matter as light as cork. Again, in some cases, a similar relation has been observed between the densities of the satellites and their primaries, The moon, for example, has a density little more than half that of the earth. The first satellite of Jupiter is less dense, though the other three are found to be more dense than the planet. Further, in the condition of the earth itself, a very light gaseous atmosphere forms the outer portion, beneath which lies a heavier layer of water, while within these two envelopes the materials form- ing the solid substance of the planet are so arranged that . the outer layer or crust has only about half the density of the whole globe. Mr Lockyer finds in the sun itself evidence of the same tendency towards a stratified arrange- ment in accordance with relative densities, as will be im- mediately further alluded to.

There seems therefore to be much probability in the hypothesis that, in the gradual condensation of the original nebula, each successive mass left behind represented the density of its parent layer, and consisted of progressively heavier niatter. The remoter planets, with their low density and vast absorbing atmospheres, may be supposed to consist of metalloids like the outer parts of the sun’s atmosphere, while the interior planets are no doubt mainly metallic. The rupture of each planetary ring would, it is conceived, raise the temperature of the resultant nebulous planet to such a height as to allow the vapours to rearrange themselves by degrees in

successive layers, or rather shells, according to density. And when the planet gave off a satellite, that body would, it might be expected, have the composition and density of the outer layers of its primary.

For many years the only evidence available as to the actual composition of other heavenly bodies than our own earth was furnished by the aerolites, meteorites, or falling stars, which from time to time have entered our atmo sphere from planetary space, and have descended upon the surface of the globe. Subjected to chemical analysis these foreign bodies show considerable diversities of composition ; but in no case have they yet yielded a trace of any element not already recognized among terrestrial materials. Up- wards of twenty of our elements have been detected in aerolites, sometimes in the free state, sometimes combine with each other. More than half of them are metals, In cluding iron, nickel, manganese, calcium, sodium, and potas

1 Mr Lockyer communicated some of his views to Professor Prest- wich, who gave them in his interesting Inaugural Lecture at Oxford, in 1875. He has further stated them in his Manchester Lectures, Why the Harth's Chemistry is as it is.

 oxygen, nitrogen, and hydrogen,

of the earth. inetallic nickel. Thus we have such minerals as pyrite,

augite, hornblende, and labradorite,

inaterials as compose the earth.

But in recent years a far more precise and generally applicable method of research into the composition of the heavenly bodies has been found in the spectroscope. By means of this instrument, the light emitted from self-luminous bodies can be analysed in such a way as to show what elements are present in their intensely hot luminous vapour. When the light of a burning metal is examined with a properly-arranged prism, it is seen to give a dark band or spectrum which is traversed by certain vertical bright lines. This is termed a radiation-spectrum. Each element appears to have its own characteristic arrange- ment of lines, which retain the same relative

position, Moreover, gases and the vapours of solid bodies are found to intercept those rays of light The spectrum of burning sodium, for example, shows two bright yellow lines. If therefore white light from some other source passes through the vapour of sodium, these two bright lines become dark lines, that portion of the light being exactly cut off which would have been given out by the sodium itself. This is

intensity, and colours.

which they themselves emit.

called an absorption-spectrum.

By this method of examination it has been ascertained that many of the elements of which our earth is composed exist in the state of incandescent vapour in the atmosphere Among these are some of our most familiar

of the sun. metals—iron, zine, copper, nickel, with sodium, magnesium, barium, calcium, and vast quantities of free hydrogen. Moreover, as Mr Lockyer has pointed out, these elements appear to succeed each other in relation to their respective densities, Thus the coronal atmosphere which, as seen in

total eclipses, extends to so prodigious a distance beyond

the orb of the sun, consists mainly of sub-incandescent hydrogen and another element which may be new. Beneath this external vaporous envelope lies the chromosphere where the vapours of incandescent hydrogen, calcium, and magnesium can be detected. Further inward the spot-zone shows the presence of sodium, titanium, &c.; while still lower, a layer (the reversing layer) of intensely hot vapours, lying probably next to the inner brilliant photosphere gives spectroscopic evidence of the existence of incandescent iron, Manganese, cobalt, nickel, copper, and other well-known terrestrial metals,

The spectrosope has likewise been successfully applied by Mr Huggins and others to the observation of the fixed stars and nebuls, with the result of establishing a similarity of elements between our own system and other

bodies in sidereal space. In the radiation spectra of nebule Mr Huggins finds the hydrogen lines very prominent; and he conceives that they may be glowing masses of that element. Sir Wiliam Thomson and Professor Tait have suggested, on the other hand, that they are more probably clouds of stones in rapid motion, perhaps in an atmosphere of hydrogen, Among the fixed stars absorption spectra have

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2 On the constitution of the sun see Roscoe's Spectrum Analysis ; Lockyer's Solar Physics, 1873; and memoirs in Proc. of Roy. Soc., by B. Stewart, Loewy, and-De la Rue.

sium. There occur also carbon, silicon, phosphorus, sulphur, ~~In some of their com~~ binations these elements, as found in the meteoric stones, differ from their mode of occurrence in the accessible parts Tron, for example, occurs as native metal, alloyed with a variable proportion (6 to 10 per cent.) of But in other respects they closely resemble some of the familiar materials of the earth's rocky crust. apatite, olivine, No more reliable proof could be desired that some at least of the other members of the solar system are formed of the same

been recognized, pointing to a structure resembling that of our sun, viz., a solid or liquid incandescent nucleus, sur- rounded with an atmosphere of glowing vapour.? Accord- ing to Mr Lockyer, those stars or nebule which have the highest temperature have the simplest spectra, and in pro-, portion as they cool their materials become more and more ditferentiated into what we call elements, He remarks that the most brilliant or hottest stars show in their spectra only the lines of gases, as hydrogen. Cooler stars, like our sun, give indications of the presence, in addition, of the more stable metals—magnesium, sodium, calcium, iron. A still lower temperature he regards as marked by the appearance of the other metals, metalloids, and compounds, so that the older a star or planet is the more will it lose free hydrogen, till, when it comes to the condition of our earth, all its free hydrogen will have

disappeared. According to this view the atoms of all the elements existed originally in the nebula dissociated from each other by reason of the intense heat, As the nebula gravitated towards its nucleus and cooled, the atoms came together, and the elements appeared in a certain order, beginning with hydrogen, and passing on through the metals and metalloids into compounds such as we find on our globe. The sun would thus be a star considerably advanced in the process of differentiation or association of its atoms. It contains, so far as we know, no metalloids or compounds, while stars like Sirius show the presence only of hydrogen, with but a feeble proportion of metallic vapours ; and on the other hand, the red stars indicate by their spectra that their metallic vapours have entered into combination, whence it is inferred that their temperature is lower than that of our sun.

Further confirmation of these views as to the order of planetary evolution is furnished by the form and structure of the earth, Reference has already been made to the fact that the outer crust of our planet possesses ouly about half the density of the whole mass, It consists largely of metalloids—oxygen, silicon, carbon, sulphur, chlorine. On the other hand, lavas and mineral veins, which are believed to have been supplied from some considerable depth, con- tain abundance of metallic ingredients,

The form of the globe likewise points to a former fluid condition. As the result of computations from ten measured ares of the meridian made by different observers between tle latitudes of Sweden and the Cape of Good Hope, Bessel obtained the following data for the dimensions of the earth :—

Equatorial diameter…..... 41,847,192 feet, or 7925°604 miles.

Polar diameter…..... 41,707,314 = ,, 7899-114 ,,

Amount of polar flattening, 139,768 % 26°471 ~~,

The equatorial circumference is thus a little less than 25,000 miles, and the difference between the polar and equatorial diameters (nearly 264 miles) amounts to about sooth of the equatorial diameter. More recently, however, it has been shown that the oblate spheroid indicated by these measurements is not a symmetrical body, the equa- torial circumference being an ellipse instead of a circle. The diameter of which the vertices touch the surface of

the globe in longitudes 14° 23’ E. and 194° 23’ E. of Greenwich is nearly two miles longer than that at right angles to it.5

In obedience to the influence of rotation on its axis, our planet would tend to assume exactly such a flattening at the poles as it has been proved to possess. This was dis- covered and demonstrated by Newton, and the amount of

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- Huggins, Proc. Roy. Soc., 1863-66, and Brit. Assoc. Lecture (Nottingham, 1866); Huggins and Miller, Phil. Trans., 1864.

® Lockyer, Comptes Rendus, Dec. 1873.

4 Herschel, Astronomy, p. 139.

5A. R. Clarke, Mem. Roy. Astron. Soc., xxix.; Herschel, Astron. , p. 691. See also a more recent paper by Colonel Clarke, Phil. Mag., August 1878,

the ellipticity was actually calculated by him, long before any measurement had confirmed such a conclusion.

The tendency of modern research is thus to give proba- bility to the conception that not only in our own solar system, but throughout the regions of space, there has been a common plan of evolution, and that the matter diffused through space in stars, nebulz, and systems 1s substantially the same as that with which we are familiar. Hence the study of the structure and probable history of the sun and the other heavenly bodies comes to possess an evident geological interest, seeing that it may yet enable us to carry back the story of our planet far beyond the domain of ordinary geological evidence, and upon data not less reliable than those furnished by the rocks of the earth’s crust.

TL Tue Movements or THE EARTH IN THEIR GEOLOGICAL RELATIONS.

We are here concerned only with those aspects of the earth’s motions which materially influence the progress of geological phenomena.

1. Rotation.—In obedience to the impulse communicated to it at its original separation, the earth rotates on its axis. This movement is completed in about 24 hours, and to it is due the succession of day and night. So far as observa- tion has yet gone, this movement is uniform, though recent calculations of the influence of the tides in retarding rota- tion tend to show that a very slow diminution of the angular velocity is in progress. This velocity varies relatively in different places, according to their position on the surface of the planet. At each pole there can be no velocity, but from these two points towards the equator there is a continnally increasing rapidity of motion, till at the equator it is equal to a rate of 507 yards in a second,

To the rotation of the earth are due certain remarkable influences upon currents of air, which circulate either towards the equator or towards the poles. Currents which move from polar latitudes travel from parts of the eartl’s surface where tlie velocity of rotation is small to others where it is great. Hence they lag behind, and their course is bent more and more westward. An air current quitting the north polar or north temperate regions as a north wind is deflected out of its course and becomes a north-east wind. On the opposite side of the globe a similar current setting out straight for the equator is changed into a south-east wind. This is the reason why the well- known trade-winds have their characteristic westward de- flexion. On the other hand, a current setting out northwards or southwards from the equator passes into regions having a less velocity of rotation than it possesses itself, and hence it travels on in advance and is gradually deflected eastward. The aerial currents blowing steadily across the surface of the ocean produce currents in its waters which have a westward tendency communicated to them indirectly from the effect of rotation. A certain deflexion is said to be experienced by such rivers as flow in a meridional direction like the Volga. Those which flow polewards are asserted to press upon their eastern rather than their western banks while those which run in the opposite direction are stated to be thrown more against the western than the eastern The reality of this action may be doubted. ,

2. Revolution.—Besides turning on its axis the globe performs @ movement round the sun, termed revolution This movement is accomplished in rather more than 365 days. It determines for us the length of our year, which is in fact, merely the time required for one complete reyollu- tion. The path or orbit followed by the earth round the sun is not a perfect circle but an ellipse, with the sun in one of the foci, the mean distance of the earth from the sun

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[1. cosmrcat,

being 92,400,000 miles. By slow secular variations the form of the orbit alternately approaches and recedes from that of a circle. At the nearest possible approach between the two bodies, owing to change in the ellipticity of the orbit, the earth is 14,368,200 miles nearer the sun than when at its greatest possible distance. These maxima and minima of distauce occur at vast intervals of time. The last considerable eccentricity took place about 200,000 years ago, and the previous one more than half a million of years earlier. Since the amount of heat received by the earth from the sun is inversely as the square of the distance eccentricity must have had in past time much effect upon the climate of the earth, as will be pointed out further on (section 7, p. 218).

3. Precession of the Equinoxes,—If the axis of the earth were perpendicular to the plane of its orbit, there would be equal day and night all the year round. But it is really inclined to that plane at an angle of 234°. Hence our hemisphere is alternately presented to and turned away from the sun, and in this way brings us the familiar alter- nation of the seasons—the long days of summer and the short days of winter. Again, were the earth a perfect sphere of uniform density throughout, the position of its axis of rotation would not change. But owing to the pro- tuberance along the equatorial regions, the attraction chiefly of the sun and moon tends to pull the axis aside, or to make it describe a conical movement like that of the axis of a top round the vertical. Hence each pole points succes- sively to different stars. This movement, called the preces- sion of the equinoxes, in combination with other planetary movements, completes its cycle in 21,000 years. At present the winter in our northern hemisphere coincides with the earth’s approach to

the sun, or perthelion. In 10,500 years hence it will take place when the earth is at tle farthest part of its orbit from the sun, or in aphelion. This movement acquires great importance when considered in connexion with the secular variations in the eccentricity of the orbit (see section 7).

4, Change in the Obliquity of the Ecliptic.—The angle at which the axis of the earth is inclined to the plane of its orbit does uot remain strictly constant. It oscillates through long periods of time to the extent of about a degree and a half, or perhaps a little more, on either side of the mean. According to Dr Croll,! this oscillation must have consider- ably affected former conditions of climate on the earth, since,' when the obliquity is at its maximum, the polar regions receive about eight and a half days more of heat than they do at present—that is, about as much heat as lat. 76° enjoys at this day. This movement must have augmented the geological effects of precession, to which reference has just been made, and which are described in section 7.

5. Stability of the Earth's Awis,—That the axis of the earth's rotation has successively shifted, and consequently that the poles have wandered to different points on the surface of the globe, has been maintained by geologists as the only possible explanation of certain remarkable condi- tions of climate, which can be proved to have formerly obtained within the Arctic Circle. Even as far north as lat. 81° 45' abundant remains of a vegetation indicative of a warm climate, and including a bed of coal 25 to 30 feet thick, have been found in situ. It is contended that where these plants lived the ground could not have been per manently frozen or covered for most of the year with thick snow. In explanation of the difficulty, it has been sug gested that the north pole did not occupy its present post tion, and that the locality where the plants occur lay ® more southerly latitudes. Without at present entering ?

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1 Croll, Trans. Geol. Soc. Glasgow, ii, 177.

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the discussion of the question whether the geological evi- dence requires necessarily so important a geographical change, let us consider how far a shifting of the axis of rotation has been a possible cause of change during that

section of geological time for which there are records among.

the stratified rocks.

From the time of Laplace' astronomers have strenuously denied the possibility of any sensible change in the position of the axis of rotation. It has been urged that, since the planet acquired its present oblate spheroidal form, nothing but an utterly incredible amount of deformation could overcome the greater centrifugal force of the equatorial protuberance. It is certain, however, that the axis of rota- tion does not strictly coincide with the principal axis of inertia. Though the angular difference between them must always have been small, we can, without having recourse to any extra-mundane influence, recognize two causes which, whether or not they may suffice to produce any

change in the position of the main axis of inertia, un-

doubtedly tend to doso. In the first place a widespread upheaval or depression of certain portions of the surface to a considerable vertical amount might shift that axis. In the second place an analogous result might arise from the

denudation of continental masses of land and the consequent

filling up of sea-basins. Sir William Thomson freely con- cedes the physical possibility of such changes. not merely admit," he says, " but assert as highly probable, that the axis of maximum inertia and axis of rotation, always very near one another, may have been in ancient times very far from their present geographical position, and

may have gradually shifted through 10, 20, 30, 40, or more

degrees, without at any time any perceptible sudden dis- But though, in the

turbance of either land or water,’”? earlier ages of the planet’s history, stupendous deformations may have occurred, and the axis of rotation may have often shifted, it is only the alterations which can possibly have occurred during the accumulation of the stratified rocks that need to be taken into account in connexion with former changes of climate. If it can be shown therefore that the geographical revolutions necessary to shift the axis are incredibly stupendous in amount, improbable in their distribution, and completely at variance with geological evidence, we may reasonably withhold our belief from this alleged cause of the changes of climate during geological history.

It has been estimated by Sir William Thomson “ that an elevation of 600 feet, over a tract of the earth’s surface 1000 miles square and 10 miles in thickness, would only alter the position of the principal axis by one-third of a second, or 34 feet.” Mr George Darwin has shown that on the supposition of the earth’s complete rigidity no redistribution of matter in new continents could ever shift the pole from its primitive position more than 3°, but that, if its degree of rigidity is consistent with a periodical re- adjustment to a new form of equilibrium, the pole may have wandered some 10° or 15° from its primitive position, or have made a smaller excursion and returned to near its old place. In order, however, that these maximum effects should be produced, it would be necessary that each elevated area should have an area of depression corresponding in size and diametrically opposite to it, that they should lie on the same complete meridian, and that they should both be situated in lat. 45°, With all those coincident favourable circumstances, an effective elevation of 54, of the earth’s surface to the extent of 10,000 feet would~shift the pole 11}; a similar elevation of go Would move it 1° 464’; of ee

? Mécanique Céleste, tome v. p. 14.

> Brit. Assoc. Rep. (1876), Sections, p. 11. * Trans. Geol. Soc. Glasgow, iv.

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“We may

zo 8°17’; and of $, 8° 44’. Mr Darwin admits these to

be superior limits to what is possible, and that, on the sup- position of intumescence or contraction under the regions in question, the deflexion of the pole might be reduced to a quite insignificant amount.‘

Under the most favourable conditions, therefore, the possible amount of deviation of the pole from its first posi- tion would appear to have been too small to have seriously influenced the climates of the globe within geological history. If we grant that these changes were cumulative, and that the superior limit of deflexion was reached only after a long series of concurrent elevations and depres- sions, we must suppose that no movements took place elsewhere to counteract the effect of those about lat, 45° in the two hemispheres. But this is hardly credible. A glance at a geographical globe suffices to show how large a mass of land exists now both to the north and south of that latitude, especially in the northern hemisphere, and that the deepest parts of the ocean are not antipodal to the greatest heights of the land. These features of the earth’s surface are of old standing. There seems, indeed, to be no geological evidence in favour of any such geographical changes as could have produced even the comparatively small displacement of the axis considered possible by Mr Darwin,

In an ingenious suggestion Dr John Evans contended that, even without any sensible change in the position of the axis of rotation of the nucleus of the globe, there might be very considerable changes of latitude due to disturbance of the equilibrium of the shell by the upheaval or removal of masses of land between the equator and the poles, and to the consequent sliding of the shell over the nucleus until the equilibrium was restored. This hypothesis starts on the assumption of a thin crust enclosing a liquid or viscous interior—an assumption which, as will be shown in subse- quent pages, is negatived by considerations in physics. The Rev. O. Fisher has suggested that the almost universal traces of present or former volcanic action, the evidence from the compressed strata in mountain regions that the crust of the earth must have a capacity for slipping towards certain lines, the great amount of horizontal compression of strata which can be proved to

have been accomplished, and the secular changes of climate—notably the former warm climate near the north pole—furnish grounds for in- quiry "whether a fluid substratum over a rigid nucleus would not be compatible with mechanical considerations, and whether, under those circumstances, changes in lati- tude would not result from unequal thickening of the crust.''5

6. Changes of the Harth's Centre of Gravity.—Though no known geological operation seems to have been capable of pro- ducing an effective change in the position of the axis of rota- tion of the earth, there may have been variations in the posi- tion of its centre of gravity. Any change of that kind must affect the ocean, which of course adjusts itself in relation to the earth's centre of gravity. The enormous accumulation of ice at one pole during the maximum of eccentricity will dis- place the centre of gravity, and, as the result of this change will raise the level of the ocean in the glacial oreo Dr Croll has estimated that, if the present mass of ice in the southern hemisphere is taken at 1000 feet thick extending down to lat. 60°, the transference of this mass to the northern hemisphere would raise the level of the sea 80 feet at the north pole. Other methods of calculation give different results. Mr Heath puts the rise at 128 feet; Archdeacon Pratt makes it more; while the Rev. O. Fisher gives it at

4 Phil. Trans., November 1876.

5 Geol. Mag., 1878, p. 552.

6 Adhemar;, Revolutions de la Mer, — ; Xo = &

409 feet.1 More recently, in returning to this question, Dr Croll remarks "that the removal of two miles of ice from the Antarctic continent [and at present the mass of ice there is probably thicker than that] would displace the centre of gravity 190 feet, and the formation of a mass of ice equal to the one-half of this, on the Arctic regions, would carry the centre of gravity 95 feet farther, giving in all a total displacement of 285 feet, thus producing a rise of level at the north pole of 285 feet, and in the latitude of Edinburgh of 234 feet." A very considerable additional displacement would arise from

the increment of water to the mass of the ocean by the melting of thie ice. Supposing half of the two miles of Antarctic ice to be replaced by an ice-cap of similar extent and one mile thick in the northern hemisphere, the other half being melted into water and increasing the mass of the ocean, Dr Croll estimates that from this source an extra 200 feet of rise would take place in the general ocean level, so that there would be a rise of 485 feet at the north pole, and 434 feet in the latitude of Edinburgh.? There must thus have been an alternate sub- mergence and emergence of the low polar lands due to the alternate shifting of the centre of gravity.

7. Influence of the Harth's Movements upon Climate.— Although the treatment of this subject involves a reference to questions which must be discussed in their poper place in subsequent parts of this article, it will be most appropri- ately inserted here as a distinct and most important branch of the astronomical relations of geology. In later pages it will be shown that the climate of the earth has undergone many great vicissitudes during geological history,—for example, that a warm and genial temperature has once prevailed in arctic latitudes, while at another time snow and ice extended far down into the heart of Europe. Of this latter change, which took place within a comparatively recent geological period, the traces still remain remarkably fresh, and have excited great interest and discussion. It is known as the Glacial Period or Ice Age. But we now know that other similar periods of great cold probably preceded it at widely separated intervals.

Various theories have been proposed in explanation of such. striking variations in climate. Some of these have appealed to a change in the position of the earth's axis relatively to the mass of the planet (p. 216). Others have been based on the notion that the earth may have passed through hot and cold regions of space. Others, again, have called in the effects of terrestrial changes, such as the dis- tribution of Jand and sea, on the assumption that elevation of land about the poles must cool the temperature of the globe, while elevation round the equator would raise it. But as the changes of temperature have affected vast areas of the earth's surface, while there is a total absence of all proof of any such enormous vicissitudes in physical geography as would be required, and since there is accumu- lating proof in favour of periodic alternations of climate, there is a

growing conviction that no mere local changes could have sufficed, but that secular variations in climate must be assigned to some general and probably recurring cause.?

By degrees geologists accustomed themselves to the belief that the cold of the glacial period was not due to mere terrestrial changes, but was to be explained somehow as the result of cosmical causes. Among the various suggestions one deserves careful consideration—change in the eccen-

1 Croll, in Reader for 2d Sept. 1865, and Phil. Mag., April 1866 ; Heath, Phil. Mag., April 1869; Pratt, Phil. Mag., March 1866; Fisher, Reader, 10th February 1866. d 2Croll, Geol. Mog., new series, i. (1874), p. 847; Climate and Time, chaps. xxiii. and xxiv. 3 In Lyell's Principles of Geology the dcctrine of the influence of geographical changes is maintained.

tricity of the earth's orbit. Sir John Herscliel* pointed out many years ago that the direct effect of a high condition of eccentricity is to produce an unusually cold winter followed by a correspondingly hot summer on the hemi- sphere whose winter occurs in aphelion, while an equable condition of climate will at the same time prevail on the opposite hemisphere. But both hemispheres rust receive precisely the same amount of solar heat, because the deficiency of heat resulting from the sun's greater distance during one part of the year is exactly compensated by the greater length of that season, Sir John Herschel even considered that the direct effects of eccentricity must thus be nearly neutralized.® As a like verdict was afterwards given by Arago, Humboldt, and others, geologists were satisfied that no important change of climate could be attri- buted to change of eccentricity.

It is to the luminous memoirs of Dr James Croll that geology is indebted for the first fruitful suggestion in this matter, and for the subsequent elaborate development of the whole subject of the physical causes on which climate depends. He has been so good as to draw up for this article the following summary of his views (taken chiefly from his paper in the Phil. Mag. for

February 1870). The reader will find the subject fully worked out in Dr Croll's work, Climate and Time, 1875.

''Assuming the mean distance of the sun to be 92,400,000 miles, then when the eccentricity is at its superior limit, 07775, the distance of the sun from the earth, when the latter is in the aphelion of its orbit, is no less than 99,584,100 miles, and when in the perihelion it is only 85,215,900 miles. The earth is, therefore, 14,368,200 miles farther from the sun in the former than in the latter position. The direct heat of the sun being inversely as the square of the dis- tance, it follows that the amount of heat received by the earth in these two positions will be as 19 to 26. The present eccentricity being '0168, the earth's distance during our northern winter is 90,847,680 miles. Suppose now that, from the precession of the equinoxes, winter in our northern hemisphere should happen when the earth is in the aphelion of its orbit, at the time that the orbit is at its greatest eccentricity; the earth would then be 8,736,420 miles farther from the sun in winter than it is at present. The direct heat of the sun would therefore, during winter, be one-fifth less and during summer one-fifth greater than now. This enormous difference would necessarily affect the climate to a very great extent. Were the winters undcr these circumstances to occur when the earth was in the perihelion of its orbit, the earth would then be 14,368,200 miles nearer the sun in winter than in summer. In this case the difference between winter and summer in our latitudes would be almost annihilated. But as the winters in the one hemi- sphere correspond with the summers in the other, it follows that while the one hemisphere would be enduring the greatest extremes of summer heat and winter cold, the other would be enjoying per- petual summer.

'It is quite true that whatever may be the eccentricity of the earth's orbit, the two hemispheres must receive equal quantities of heat per annum; for proximity to the sun is exactly compensated by the effect of swifter motion. The total amount of heat received from the sun between the two equinoxes is therefore the same in both halves of the year, whatever the eccentricity of the earth's orbit may be. For example, whatever extra heat the southern hemisphere may at present receive per day from the sun during its summer months, owing to greater proximity to the sun, is exactly compensated by a corresponding loss arising from the shortness of the season ; and, on the

other hand, whatever deficiency of heat we in the northern hemisphere may at present have per day during our summer _half- year, in consequence of the earth’s distance from the sun, is also exactly compensated by a corresponding length of season.

“It is well known, however, that those simple changes in the sun’s summer and winter distances would not alone produce a glacial epoch, and that physicists, confining their attention to the purely astro- nomical effects, were perfectly correct in affirming that no increase of eccentricity of the earth’s orbit could account for that epoch. But the important fact was overlooked that, although the glacial epoch could not result directly from an increase of eccentricity, it might nevertheless do so indirectly from physical agents that were brouglit into operation as a result of an increase of eccentricity. The follow- ing is an outline of what these physical agents were, how they were brought into operation, and the way in which they may have led to the glacial epoch.

4 Trans. Geol. Soe, vol. iii. p. 293 (2d series). 5 Cabinet Cyclopedia, sec. 315; Outlines of Astronomy, sec. 368.

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MOVEMENTS OF THE EARTH. |

‘With the eccentricity at its superior limit and the winter occur- ring in the aphelion, the earth would, as we have seen, be 8,736, 420 miles farther from the sun during that season than at present. The reduction in the amount of heat received from the sun, owing to his increased distance, would lower the midwinter temperature to an enormous extent. In temperate regions the greater portion of the moisture of the air is at present precipitated in the form of rain, and the very small portion which falls as snow disappears in the course of a few weeks at most. But in the circumstances under consider- ation, the mean winter temperature would be lowered so much below the freezing-point that what now falls as rain during that season would then fall assnow. This is not all; the winters would then not only be colder than now, but they would also be much longer. At present the winters are nearly eight

days shorter than the summers; but with the eccentricity at its superior limit and the winter solstice in aphelion, the length of the winters would exceed that of the summers by no fewer than thirty-six days. The lower- ing of the temperature and the lengthening of the winter would both tend to the same effect, viz., to increase the amount of snow accumu- lated during the winter ; for, other things being equal, the larger the snow-accumulating period the greater the accumulation. Tt may be remarked, however, that the absolute quantity of heat received during winter is not affected by the decrease in the sun's heat,+ for the additional length of the season compensates for this decrease, As regards the absolute amount of heat received, increase of the sun's distance and lengthening of the winter are compensatory, but not so

in regard to the amouut of snow accumulated. The consequence of

this state of things would be that, at the commencement of the short summer, the ground would be covered with the winter's accuinu-

lation of snow. Again, the presence of so much snow would lower

the summer temperature, and prevent to a great extent the melting of the snow.

'There are three separate ways whereby accumulated masses of

snow and ice tend to lower the summer temperature, viz. :— ''First, By means of direct radiation. No matter what the

intensity of the sun's rays may be, the temperature of snow and ice

can never rise above 32°. Hence the presencc of snow and ice tends

by direct radiation to lower the temperature of all surrounding bodies

to 82°. In Greenland, a country covered with snow and ice, the pitch has been seen to melt on the side of a ship exposed to the

direct rays of the sun, while at the same time the surrounding air

was far below the freezing-point; a thermometer exposed to the direct radiation of the sun has been observed to stand above 100°, while the air surrounding the instrument was actually 12° below the freezing-point. on the snow-fields of the Alps. These results, surprising as they no doubt appear, are what we ought to expect under the cireumstances,

Perfectly dry air seems to be nearly incapable of absorbing radiant heat. The entire radiation passes through it almost without any Consequently the pitch on the side of the ship

sensible absorption.

may be melted or the bulb of the thermometer raised to a high

temperature by the direct rays of the sun, while the surrounding

air remains intensely cold. The air is cooled by contact with the snow-covered ground, but is not heated by the radiation from the sun.

effect also takes place, but in a slightly different way. Air charged with aqueous vapour is a good absorber of radiant heat, but it can only absorb those rays which agree with itin period. It so happens that rays from snow and ice are, of all others, those which it absorbs best. ‘The humid air will absorb the total radiation from the snow and ice, but it will allow the greater part of, if not nearly all, the sun’s rays to pass unabsorbed. But during the day, when the sun is shining, the radiation from the snow and ice to the air is negative ; that is, the snow and ice cool the air by radiation. The result is, the air is cooled by radiation from the snow and ice (or rather, we should say, ¢o the snow and ice) more rapidly than it is heated by the sun; and, as a consequence, in a country like Green- land, covered with an icy mantle, the temperature of the air, even during summer, seldom rises above the freezing-point. Snow is a good reflector, but as simple reflection does notehange the character of the rays they would not be absorbed by the air, but would pass into stellar space. Were it not for the ice, the summers of North Greenland, owing to the continuance of the sun above the horizon, Would be as warm as those of England; but, instead of this, the Greenland summers are colder than our winters. Cover India with an ice sheet, and its summers would be colder than those of England.

“Second, Another cause of the cooling effect is that the rays which fall on snow and ice are to a great extent reflected back into space. But those that are not reflected, but absorbed, do not raise the tem- perature, for they disappear in the mechanical work of melting the ice, For whatsoever may be the intensity of the sun’s heat the

4 When the eccentricity is at its superior limit, the absolute quantity of heat received by the earth during the year is, however, about one three-hundredth part greater than at present. But this does not atfect the question at ssue,

A similar experience has been recorded by travellers

“When the air is charged with aqueous vapour, a similar cooling

surface of the ground will be kept at 32° so long as the snow aud ice remain unmelted.

“Third, Snow and ice lower the temperature by chilling the air and condensing the vapour into thick fogs. The great strength of the sun’s rays during summer, due to his nearness at that season, would, in the first place, tend to produce an increased amount of evaporation. But the presence of snow-clad mountains and an icy sea would chill the atmosphere and condense the vapour into thick fogs. The thick fogs and cloudy sky would effectually prevent the sun’s rays from reaching the earth, and the snow, in consequence, would remain unmelted during the entire summer. In fact, we have this very condition of things exemplified in some of the islands of the Southern Ocean at the present day. Sandwich Land, which is in the same parallel of latitude as the north of Scotland, is covered with ice and snow the entire summer; and in the island of South Georgia, whieh is in thesame parallel as the centre of England, the perpetual snow descends to the very sea-beach. Captain Sir James Ross found the perpetual snow at the sea-level at Admiralty Inlet, South Shetland, in lat. 64°; and while near this place the thermo- meter in the very middle of summer fell at night to 23° F. The re-

duction of the sun’s heat and lengthening of the winter, whieh would take place when the eccentricity is near to its superior limit and the winter in aphelion, would in this country produce a state of things perhaps as bad as, if not worse than, that which at present exists in South Georgia and South Shetland.

“The cause which above all others must tend to produce great changes of climate, is the deflexion of great ocean currents. A high condition of eccentricity tends, we have seen, to produce an accumu- lation of snow and ice on the hemisphere whose winters occur in aphelion. The accumulation of snow in turn tends to lower the summer temperature, cut off the sun’s rays, and retard the melting of the snow. In short, it tends to produce on that hemisphere a state of glaciation. Exactly opposite effects take place on the other hemisphere, which has its winter in perihelion. There the short- ness of the winters, combined with the high temperature arising from the nearness of the sun, tends to prevent the accumulation of snow. The general result is that the one hemisphere is cooled and the other heated. This state of things now brings into play the agencies which lead to the deflexion of the Gulf-stream and other great ocean curreuts.

“Owing to the great difference between the temperature of the equator and the poles, there is a constant flow of air from the poles to the equator. It is to this that the trade-winds owe their exist- ence. Now, as the strength of these winds will, as a general rule, depend upon the difference of temperature that may exist between the equator and higher latitudes, it follows that the trades on the cold hemisphere will be stronger than those on the warm. When the polar and temperate regions of the one hemisphere are covered to a large extent with snow and ice, the air, as we have just seen, is kept almost at the freezing-point during both summer and winter. The trades on that hemisphere will, of necessity, be exceedingly powerful; while on the other hemisphere, where there is coinpara- tively little snow or ice, and the air is warm, the trades will consequently be weak. Suppose now the northern hemisphere to be theeold one. Thenorth-east trade winds of this hemisphere will far exceed in strength the south-cast trade winds of the southern hemisphere. The median line between the trades will consequently lie to a very considerable distance to the south of the equator. We have a good example of this at the present day. The difference of temperature between

the two hemispheres at present is but trifling to what it would be in the ease under consideration; yet we find that the south-east trades of the Atlantic blow with greater force than the north-east trades, sometimes extending to 10° or 15°N. lat., whereas the north-east trades seldom blow south of the equator. The effect of the northern trades blowing across the equator to a great distance will be to impel the warm water of the tropics over into the Southern Ocean. But this is not all; not only would the median line of the trades be shifted southwards, but the great equatorial currents of the globe would also be shifted south. wards.

‘‘Let us now consider how this would affect the Gulf-stream. The South American continent is shaped somewhat in the form of a tri- angle, with one of its angular corners, called Cape St Roque, pointing eastwards, The equatorial current of the Atlantic impinges against this corner ; but as the greater portion of the current lies a little to the north of the corner, it flows westwards into the Gulf of Mexico and forms the Gulf-stream. A considerable portion of the water, however, strikes the land to the south of the cape, and is deflected along the shore of Brazil into the Southern Ocean, forming what is known as the Brazilian current. N ow, it is obvious that the shift- ing of the equatorial current of the Atlantic only a few degrees to the south of its present position—a thing which would certainly take place under the conditions which we have been detailing— would turn the entire current into the Brazilian branch, and instead of flowing chiefly into the Gulf of Mexico, as at present, it would all flow into the Southern Ocean, and the Gulf-stream would con-

/ Sequently be stopped. The stoppage of the Gulf-stream, combined

with all those causes which we have just been considering, would place Europe under a glacial condition, while at the same time the temperature of the Southern Ocean would, in consequence of the enormous quantity of warm water received, have its temperature (already high from other causes) raised enormously. And what holds true in regard to the currents of the Atlantic holds also true, though perhaps not to the same extent, of the currents of the Pacitic.

“Ifthe breadth of the Gulf-stream be taken at 50 miles, its depth at 1000 feet, its mean velocity at 2 statute miles an hour, the temperature of the water when it leaves the Gulf at 65°, and the return current at 40° F.,! then, as has been shown in Climate and Time, chapter ii., the quantity of heat conveyed into the Atlantic by this stream is equal to one-fourth of all the heat received from the sun by that ocean from the Tropic of Cancer to the Arctic Circle.2 From principles discussed at considerable length in the chapter referred to, it is shown that, but for the Gulfstream and other currents, London would have a mean annual temperature 40° lower than at present.

“But there is still another cause which must be noticed :—a strong undercurrent of air from the north implies an equally strong upper enrrent fo the north: Now if the effect of the undercurrent would be to impel the warm water at the equator to the south, the effect of the upper current would be to carry the aqueous vapour formed at the equator to the north; the upper current, on reaching the snow and ice of temperate regions, would deposit its moisture in the form of snow; so that it is probable that, nowithstanding the great cold of the glacial epoch, the quantity of snow falling in the northern region would be enormous. This would be particularly the case during summer, when the earth would be in the perihelion and the heat at the equator great. The equator would be the fur-

nace where evaporation would take place, and the snow and ice of

temperate regions would act as a condenser.

‘The foregoing considerations, as well as many others which might be stated, lead to the conclusion that, in order to raise the mean temperature of the globe, water should be placed along the equator, and not Zand, as was contended by Sir Charles Lyell and others. For if land be placed at the equator, the possibility of conveying the sun’s heat from the equatorial regions by means of ocean currents is prevented.”

Inter-Glacial Periods.—Allusion has already been made to the fact that there is accumulating evidence to show that changes of climate have been recurrent, and that this alternation or periodicity goes far to prove them to be due to some general or cosmical cause. Dr Croll has in- geniously shown

that every long cold period in each hemisphere must have been interrupted by several shorter warm periods, and “when the one hemisphere,” he says, “is under glaciation, the other is enjoying a warm and equable climate. But, owing to the precession of the equinoxes, the condition of things on the two hemispheres must be reversed every 10,000 years or so. When the solstice passes the aphelion, a contrary process commences ; the snow and ice gradually begin to diminish on the cold hemisphere and to make their appearance on the other hemisphere. The glaciated hemisphere turns by degrees warmer, and the warm hemisphere colder, and this continues to go on for a period of ten or twelve thousand years, until the winter solstice reaches the perihelion. By this time the conditions of the two hemi- spheres have been reversed ; the formerly glaciated hemi- sphere has now become the warm one, and the warm hemisphere the glaciated. The transference of the ice from the one hemisphere to the other continues as long as the eccentricity remains at a high value. It is probable that, during the warm inter-glacial periods, Greenland and the Arctic regions would be comparatively free from

snow and ice, and enjoying a temperate and equable climate.”

1 Sir Wyville Thomson states that in May 1873 the C expedition found the Gulf-stream, at the pauls where it irae to be about 60 miles in width, 100 fathoms deep, and flowing at the rate of 3 knots per hour. This makes the volume of the stream one- fifth greater than the above estimate.

2 The quantity of heat conveyed by the Gulf-stream for dis- tribution is equal to 77,479,650,000,000,000,000 foot-pounds per day. The quantity received from the sun by the North Atlantic is 310,923, 000,000,000,000,000 foot-pounds,

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PART II.—GEOGNOSY :

AN INVESTIGATION OF THE MATERIALS OF THE EARTH’S SUBSTANCE.

Before we enter upon any discussion of the geological changes which our planet has undergone, it is needful first of all to study the materials of which the planet consists, It is from the evidence furnished by the nature and arrange- ment of these materials that geological history must be compiled.

Viewed in a broad way then, the earth may be con- sidered as consisting of (1) two envelopes,—an outer one of gas completely surrounding the planet, and an inner one of water covering about three-fourths of the globe ; and (2) a globe cool and solid on its surface but possessing a high internal temperature.

I, THe ENVELOPES,

1. The Atmosphere.—The gaseous envelope to which the name of atmosphere is given extends at least to a distance of 40 or 45 miles from the earth's surface, perhaps in a state of extreme tenuity to a much greater height. But its thickness must necessarily vary with latitude and changes in atmospheric pressure; the layer of air lying over the poles is not so deep as that which surrounds the equator.

Geologically considered, the atmosphere presents itself as an agent of change by virtue of its composition and the — chemical reactions which it effects, its varying temperature and consequent influence in expanding and contracting rocks, and its movements.

Many speculations have been made regarding the chemical composition of the atmosphere during former geological periods. There can indeed be no doubt that it must originally have ditfered very greatly from its present condition. The oxygen which now forms fully a half of the outer crust of the earth was originally doubtless part of the atmosphere. So, too, the vast beds of coal found all over the world, in geological formations of many different ages, represent so much carbonic acid once present in the air. The chlorides in the sea likewise were probably carried down out of the atmosphere in the primitive con- densation of the aqueous vapour. It has often been sug- gested that during the Carboniferous period the atmosphere must have been warmer and with more aqueous vapour and carbonic acid in its composition than at the present day, to admit of so luxuriant a flora as that from which

the coal seams were formed. There seems, however, to be at present no method of arriving at any certainty on this subject.

As now existing, the atmosphere is considered to be normally a mechanical mixture of nearly 4 volumes of nitrogen and 1 of oxygen, with a minute proportion of car- bonic acid, and still smaller quantities of other substances. Expressed in a tabular form this composition is as follows :—

Nitra gGtiwies. 1.00.00 c0ccesceeersocseees cae 79°00 ONG POH, steagaisr ones 5 aupne seta anne sence 20°96 Carbonic acid, ...ccnencdersres one 0°04

These quantities are liable to some variation according to locality. On the sea, for example, the proportion of carbonic acid is said to average about 0°03. In the air of streets and houses the proportion of oxygeu diminishes, while that of carbonic acid increases, According to the minute researches of Dr Angus Smith, very pure air should contain not less than 20-99 of oxygen, with 0-030 of carbonic acid ; but he found impure air in Manchester to have only 20°21 of oxygen, while the proportion of carbonic acid in that city during fog was ascertained to rise sometimes to 0:0679, and in the pit of the theatre to the very large amount of 0:2734. Small as the percentage of carbonic acid in ordi- nary air may seem, yet the total amount of this gas in the

whole atmosphere probably exceeds what would be disen- gaged if all the vegetable and animal matter on the earth’s surface were burnt.

The other substances present in much more minute quantities are gases, vapours, and solid particles. Of these by much the most important is the vapour of water, which is always present, but in very variable amount according to temperature, ranging from about 4 to a maximum of 16 grains in 1000 grains of air.! It is this vapour which con- denses into dew, rain, hail, and snow. In assuming a visible form, and descending through the atmosphere, it

takes up a minute quantity of air, and of the different sub-

stances which the air may contain. Being caught by the rain, and held in solution or suspension, these substances can be best examined by analysing rain-water. In this way ammonia, nitric, sulphurous, and sulphuric acids, chlorides, various salts, solid carbon, inorganic dust, and organic matter have been detected. M. J. J. Pierre found as the result of his analysis that in the neighbourhood of Caen, in France, a hectare of land receives annually from the atmosphere, by means of rain— Chloride of sodium….....6….

potassium…..... 82 ii 43 miagnesium…..... 2°5 AA 3 CPN EIUIM cata esendessnss 18 . Sulphate of soda…..... .e.ceecceeeeee 8‘4 55 Hp Le Maia «us: aay 8-0 ss A MERIC as vi’ns se reesenen 6°2 5 MAQNESIA.. .....cscsceeee 59 A

To these ingredients must be added traces of ammonia, various salts, and organic substances, besides others still undetermined.? The powerful oxidizing agent ozone is present in variable but always minute quantities in the air.

The comparatively small but by no means unimportant proportions of these various components of the atmosphere are much more liable than the more essential gases to great variations. Chloride of sodium, for instance, is, as might be expected, particularly abundant in the air border- ing the sea. Nitric acid, ammouia, and sulphuric acid appear in the air of towns most conspicuously. The organic substances present in the air are sometimes living germs, such as probably often lead to the propagation of disease, andl sometimes mere fine particles of dust derived from the bodies of living or dead organisms.

2. The Oceans.—About three-fourths of the surface of the globe (or about 144,712,000 square miles) is covered by the irregular sheet of water known as the sea. Within the last ten years much new light has been thrown upon the depths, temperatures, and biological conditions of the ocean-basins, more particularly by the “ Lightning,” “Porcupine,” and “Challenger” expeditions fitted out by the British Govern- ment. It has been ascertained that few parts of the Atlan- tic Ocean exceed 3000 fathoms, the deepest sounding ubtained there being one taken about 100 miles north from the island of St Thomas, which gave 3875 fathoins, or rather less than 44 miles. The Atlantic appears to have an average depth in its more open parts of

from 2000 to 3000 fathoms or from about 2 to 34 miles. In the Pacific Ocean the “Challenger” got soundings of 3950 and 4475

1 The quantity of aqueous vapour depends upon the temperature, warm air being able to retain more than cold air. Air at a tempera- ture of 10° U, is saturated when it contains 9°362 grammes of vapour in a cubic metre of air.

2 Chimie Agricole, quoted by Dr Angus Smith, Air and Rain, p. 232.

3 The air of towns is peculiarly rich in impurities, especially in manufacturing districts, where much coal is used. These impurities, however, though of serious consequence to the towns in a sanitary point of view, do not sensibly affect the general atmosphere, seeing that they are probably in great measure taken out of the air by rain, even in the districts which produce them. They possess, however, a special geological significance, and in this respect, too, have important economic bearings. See on this whole subject Dr Angus Smith’s work already cited,

fathoms, or about 44 and rather more than 5 miles. But these appear to mark exceptionally abyssal depressions, the average depth being, as in the Atlantic, between 2000 and 3000 fathoms. We inay therefore assume, as probably not far from the truth, that the average depth of the ocean is about 2500 fathonis, or nearly 3 miles,

The water of the oceans is distinguished from the ordinary terrestrial waters by a higher specific gravity, and the presence of so large a proportion of saline ingredients as to impart a strongly salt taste. The average density of sea- water is about 1-026, but it varies slightly in different parts even of the same ocean. According to the recent observa- tions of Mr J. Y. Buchanan during the “Challenger ” expedi- tion, some of the heaviest sea-water occurs in the pathway of the trade-winds of the North Atlantic, where evaporation must be comparatively rapid, a density of 1:02781 being registered, Where, however, large rivers enter the sea, or where there is much melting ice, the density diminishes ” Mr Buchanan found among the broken ice of the Antarctic Ocean that it had sunk to 1-:02418,4

The greater density of sea-water depends of course upon the salts which it contains in solution. There seems no reason to doubt that these salts are, in the main, parts of the original constitution of the sea, and thus that the sea has always been salt. It is algo probable that, as in the case of the atmosphere, the composition of the ocean water has in former geological periods been very different from what it is now, and that it has acquired its present character only after many ages of slow change, and the abstraction of much mineral matter originally contained in it, There is evidence indeed among the geological formations that large quantities of lime, silica, chlorides, and sulphates have in the course of time been removed from the sea.

But it is evident also that, whatever may have been the original composition of the oceans, they have for a vast section of geological time been constantly receiving mineral matter in solution from the land. Every spring, brook, and river removes various salts from the rocks over which it moves, and these substances, thus dissolved, eventually find their way into the sea. Consequently sea-water ought to contain more or less traceable proportions of every substance which the terrestrial waters can remove from the land, in short, of probably every element present in the outer shell of the globe, for there seems to be no constituent of this earth which may not, under certain circumstances, be held in solution in water. Moreover, unless there be some counteracting process to remove these mineral ingredients, the ocean water ought to be growing, insensibly perhaps, but still assuredly, salter, for the

supply of saline matter irom the land is incessant. Ithas been ascertained indeed, with some approach to certainty, that the salinity of the Baltic and Mediterranean is gradually increasing.é

The average proportion of saline constituents in the water of the great oceans far from land is about three and a half parts in every hundred of water, But in enclosed seas, receiving much fresh water, it is greatly reduced, while in those where evaporation predominates it is correspondingly augmented. Thus the Baltic water contains from ono-seventh to nearly a half of the ordinary proportion in ocean water, while the Mediterranean contains sometimes one- sixth more than that proportion. The mineral constituents include the following average ratios of salts7;— ee

- Buchanan, Proc. Roy. Soc. (1876), vol. xxiv.

> Dr Sterry Hunt even supposes that the saline waters of Canada

and the northern States derive their mineral ingredients from the salts still retained among the sediments and precipitates of the ancient sea

in which the earlier Palsozvic rocks were deposited.— Geological and

Chemical Essays, p. 104. 6 Paul, in Watts’s Dictionary of Chemistry, v. 1020. 7 Bischof, Chemical Geology, i. 379.

Doe

Percentage.

Chloride of sodium (common salt) .....0… 75°786

Chloride of magnesiUM …....eseeeeeernee cee ees 9°159

Chloride of potassiUMl. .....-sseccreerertereesertnens 3°657

Sulphate of lime (GyPSUM).....s1eeseesereerees 4°617

Sulphate of magnesia (Epsom Sallis) neeeeawenes 5597

Bromide Of SOdUM,.....eceeee weeateeeneneeee ees 1°184

100-000

Total percentage of salts in sea-water….. 3°527

Besides these chief ingredients, sea-water has yielded minute traces of iodine, fluorine, silica, phosphoric acid, carbonate of lime and magnesia, silver, lead, copper, arsenic, Doubtless more perfect analysis will greatly increase this list.

In addition to its salts sea-water always contains dissolved atmospheric gases. From the researches conducted during the voyage of the “ Bonité” in the Atlantic and Indian Oceans it was estimated that the gases in 100 volumes of sea-water ranged from 1°85 to 3°04, or from two to three per cent. From observations made during the “ Porcu- pine” cruise of 1868 it was inferred that the proportion of oxygen was greatest (25°1 per cent.) in the surface water, and least (19°5) in the bottom water, while that of carbonic acid was least at the top (20°7) and greatest (27:9) at the bottom, and that the action of the waves was partially to eliminate the latter gas and to increase the amount of oxygen. More recently, however, during the voyage of the “Challenger,” Mr J. Y. Buchanan ascertained that the proportion of carbonic acid was always nearly the same for similar temperatures, the amount in the Atlantic surface water, between 20° and 25° C,, being 0:0466 gramme per litre, and in the surface Pacific water 0:0268. He points out the curious fact that, according to his analyses, sea-water contains sometimes at least thirty times as much carbonic acid as an equal bulk of fresh water would do, and he traces the greater power of absorption to the presence of the sulphates.

II. THE Sorip GLoBE.

1. General Considerations.—Within the atmospheric and oceanic envelopes lies the inner solid globe. Reference has already been made to the comparative density of the planet amoug the other members of the solar system. In all speculation about the history of the earth, the density of the whole mass of the planet as compared with water— the staudard to which the specific gravities of terrestrial bodies are referred—is a question of

prime importance. Various methods have been employed for determining the earth's density, The deflexion of the plumb-line on either side of a mountain of kuown structure and density, the time of oscillation of the pendulum at great heights, at the sea-level, and in deep mines, the comparative force of gravitation as measured by the torsion balance—each of = processes has been tried with the following various results :-—

Plumb-line experiments on Schichallien (Maskelyne and Playfair) gave as the mean density of the earth….. Do. on Arthur's Seat, Edinburgh, (James).....0.. Pendulum experiments on Mont Cenis (Carlini and Giulio). 4°950

Do. in Harton coal-pit, Newcastle (Airy). ..... 6° Torsion balance experiments (Cavendigh). 2h eS a sae Do. do. (ea atte accatens. sc osamnacess 5660

Though these observations are somewhat discrepant, we may feel satisfied that the globe has a mean density neither much more nor much less than 55; that is to say, it is five and a half times heavier than one of the same dimensions formed of pure water. Now the average density of the materials which compose the accessible portions of the earth is between 2°5 and 3; so that the mean density of the whole globe is about twice as much as that of its outer part. We might therefore infer that the inside consists of

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much heavier materials than the outside, and consequently that the mass of the planet must contain at least.two dis- similar portions—an exterior lighter crust or rind, and an interior heavier nucleus. But the effect of pressure must necessarily increase the specific gravity of the interior as will be alluded to further on.

2. The Crust.—It was formerly a prevalent belief that the exterior and interior of the globe diffcred from each other to such an extent that, while the outer parts were cool and solid, the vastly more enormous inner part being intensely bot was more or less completely fluid. Hence the term

“crust” was applied to the external rind in the usual sense of that word. This crust was variously computed to be 10, 15, 20 or more miles in thickness. For reasons which will be afterwards given, the idea of internal liquidity has been opposed by eminent physicists and is now abandoned by most geologists. The term “crust,” however, continues to be used as a convenient word to denote the cool, upper, or outer layer of the earth’s mass, accessible to human observation. It is in the structure and history of this crust that the main subjects of geological investigation are contained. It will therefore be fully treated of in the following parts of this article.

There are, however, some general views as to its composi- tion and the arrangement of its materials, which may appropriately find a place in this preliminary section. Evidently our direct acquaintance with the chemical con- stitution of the globe must be limited to that of the crust, though by inference we may eventually reach highly pro- bable couclusions regarding the coustitution of the interior. Chemical research has discovered that sixty-four simple or as yet indecomposable bodies, called elements, in various proportions and compounds, constitute the accessible part of the crust. Of these, however, the great majority are comparatively of rare occurrence. The crust, so far as we can examine it, is mainly built up of about sixteen elements,

| which may be arranged in the two following groups, the

most abundant bodies being placed first in each list :—

Metalloids. Metals.

Atomic Atomic

Weight. Weight ORO, cscs es cvecrmwaameeer 15496 |PAlumimitiminewa….020.cees 27°30 STUN ONN ggenparananoonce cog coonot PAV || (CEM tube paanonadecoonconsneco0 39°90 (O}710 ovs} Nigga aneonnecnooscodocoo0n 11°97 | Magnesium …... .....-.0am 23°94 ST, ese eee eee pls O Oe Mia Creare TUNE rere eet tosttectersetacise 39:04 Hydrogen (really a metal) 1°00 | Sodium ….....:eeereey 22°99 (Clilkoyn Gg eonanconcedgnoesGe0 « Site ye || OKO Apne npemeepodbocc ocogbbco: 55°90 Phosphorus …...sscsseeseeers 30:06 |

Manganesecsorssaennawins 54°80 JI R@OMN go ynorcnoconaoanonoAHec WEI) |) [Bean spogaoneoopDponGroouDAc: 136°80

By far the most abundant and important of these elements is oxygen. It forms about 23 per cent. by weight of air, 88°88 per cent. of water, and about a half of all the rocks which compose the visible portion or “crust” of the globe. Another metalloid, silicon, comes next in abundance. It is always united with oxygen, forming the mineral silica which, either alone or in combination with various metallic bases as silicates, constitutes a half of all the known mass of the globe. Of the remaining metalloids carbon and sulphur sometimes occur in the free state, but usually in combination with oxygen or some base or metal. Chlorine and fluorine are found associated with metallic bases. Hydrogen is properly a metal, and occurs chiefly in combination with oxygen as the oxide, water. Phosphorus occurs with oxygen principally in phosphate of lime.

Of the metals by far the most important in the architec- ture of the exterior of the earth is aluminium. In con- junction with oxygen and silicon it forms the basis of most crystalline rocks. Calcium, magnesium, potassium, and sodium, combined with oxygen, enter largely into the com- position of rocks. Iron is the great colouring material in nature, most of the yellow, brown, red, and green hues of

rocks being due to some of its combinations. elements mentioned in the foregoing lists form about ninety-nine parts of the earth’s crust; the other elements constitute only about a hundredth part, though they include gold, silver, copper, tin, lead, and the other useful metals, iron excepted.

It is clear then that, so far as accessible to our observa- planet consists mainly

tion, the outer portion of our of metalloids, and its metallic constituents have in great part entered into combination with oxygen, so that the atmosphere contains the residue of that gas which has not

yet united itself to terrestrial compounds, In a broad view

of the arrangement of the chemical elements in the external crust, the suggestive speculation of Durocher deserves attention. He regarded all rocks as referable to two layers or magmas co-existing in the earth's crust the one beneath the other, according to their specific gravities, The

upper or outer layer, which he termed the acid or siliceous

magma, contains an excess of silica, and has a mean density of 2°65. The lower or inner layer, which he called the

basic magma, has from six to eight times more of the earthy

bases and iron oxides, with a mean density of 2:96. To the former he assigned the eatly plutonic rocks, granite, felsite, &c,, with the more recent trachytes; to the latter he relegated all the heavy lavas, basalts, diorites, &c. The ratio of silica is 7 in the acid magma to 5 in the basic. Though the proportion of this acid or of the

earthy and metallic bases cannot be regarded as any cer-

tain evidence of the geological date of rocks, nor of their probable depth of origin, it is nevertheless a fact that (with many important exceptions) the eruptive rocks of the older geological periods are very generally super-silicated and of lower specific gravity, while those of later time are very frequently poor in silica but rich in the earthy bases and in iron and manganese, with a consequent higher specific gravity. The latter, according to Durocher, have been forced up from a lower zone through the lighter siliceous crust.

3. The Interior or Wucleus.—Though we cannot hope ever to have direct acquaintance with more than the mere out- side skin of our planet, we may be led to infer the irregular distribution of materials within the crust from the present distribution of land and water, and the observed differences in the amount of deflexion of the plumb-line near the sca and near mountain-chains, The fact that the southern hemisphere is almost wholly covered with water appears explicable only on the assumption of an excess of density in

the mass of that portion of the planet. The existence of such a vast sheet of water as that of the Pacific Ocean is to be accounted for, says Archdeacon Pratt, by the presence of “some excess of matter in the solid parts of the earth between the Pacific Ocean and the earth’s centre, which retains the water in its place, otherwise the ocean would flow away to the other parts of the carth.”2 The same writer points out that a deflexion of the plumb-line towards the sea, which has in a number of cases been observed, indicates that “ the density of the crust beneath the moun- tains must be less than that below the plains, and still less than that below the ocean-bed.”3 Apart therefore from the depressions of the earth’s surface in which the oceans lie, we must regard the internal density, whether of crust or uucleus, to be somewhat irregularly arranged,—there being an excess of heavy materials in the water hemisphere and beneath the ocean-beds as compared with the continental lasses,

In our ignorance regarding the chemical constitution of the nucleus of our planet, an argument has sometimes been

? Translated by Haughton in his Manual af Geology, 1866, p. 16.

2 Figure of the Earth, 4th edit., p. 236,

2’Op. Cit., p. 200. See also Herschel, Phys. Geog.; and O. Fisher, Cambridge Phil. Trans., xii., part ii.

based upon the known fact that the specific gravity of that nucleus is about double that of the crust. This has been held by some writers to prove that the interior must con- sist of much heavier material, and is therefore probably metallic, But in so reasoning they forget that the effect of pressure ought to make the density of the nucleus much higher, even if the interior consisted of matter no heavier than the crust. In fact, we might argue for the probable comparative lightness of the substance composing the nucleus.

That the total density of the planet does not greatly exceed its observed amount seems only explicable on the supposition that some antagonistic force counteracts the effects of pressure. The only force we cau suppose capable of so acting is heat. But how and to what extent this counterbalancing takes place is still unknown.

If we regard the question from another point of view, however, the idea of a metallic nucleus seems not improbable. When the materials of the globe existed in a fluid condition, as they are usually supposed to have done, they would doubtless arrange themselves in accordance with their relative specific gravities. The denser elements would sink towards the centre, the lighter would remain outside. That this distribution has certainly taken place to some extent is evident from the structure of the envelopes and crust. It is what might be expected if the constitution of the globe resembles on a small scale the larger planetary system of which it forms a part, The existence of a metallic interior has always been inferred from the metalliferous veins which traverse the crust, and which are commonly supposed to have been filled from below. ‘

Admitting the possibility or even probability of a metallic nucleus, in spite of the comparatively low density of the globe as a whole, we might speculate further as to the arrangement of the denser internal materials, The late Mr David Forbes suggested that the planet might be sup- posed to consist of three layers of uniform densities, enclosed one within the other, the density increasing towards the centre in arithmetical progression. Allowing 2°5 as the specific gravity of the crust or outer laycr, he assigned 12:0 or thereabouts as that of the middle layer, and supposed that the inner nucleus might possess one averaging 20°0.4 Materials do not yet exist for any satisfactory conclusions on this subject.

In the evidence obtainable as to the former history of the earth, no fact is of more importance than the existence of a high temperature beneath the crust, which has now been placed beyond all doubt. This feature of the planet’s organization is made clear by the following proofs :—

(1.) Volcanoes,—In many regions of the earth’s surface openings exist from which steam and hot vapours, ashes and streams of molten rock are from time to time emitted. The abundance of these openings seems mexplicable

by any mere local causes, but must be regarded as indicative of a very high internal temperature. If to the still active vents of eruption we add those which have formerly becn the channels of communication between the interior and the surface, there are probably few large regions of the globe where proofs of volcanic action cannot be found, Every- where we meet with masses of molten rock which have risen from below as if from some general reservoir.

(2.) Hot Springs.—Where volcanic eruptions have ceased, evidence of a high internal temperature is still often to be found in springs of hot water which continue for centuries to maintain their heat. Thermal springs, however, are not confined to volcanic districts, They sometimes rise even in regions many hundreds of miles distant from any active volcanic vent. The hot springs of Bath (temp. 120 Fahr.) and Buxton (temp. 82° Fahr.) in England are ee es sl UU

4 Popular Science Review, April 1869.

fully 900 miles from the Icelandic volcanoes on the one side, and 1100 miles from those of Italy and Sicily on the other.

(3.) Borings, Wells, and Mines.—The influence of the seasonal changes of temperature extends downward from the surface to a depth which varies according to latitude, to the thermal conductivity of the soils and rocks, and per- haps to other causes. ‘The cold of winter and the heat of summer may be regarded as following each other in suc- cessive waves downward, until they disappear along a limit at which the temperature remains constant. This zone of invariable temperature is commonly believed to lie some- where between 60 and 80 feet down in temperate regious. At Yakutsk in eastern Siberia (lat. 62° N.), however, the soil is permanently frozen to a depth of about 700 feet. In Java, on the other hand, a constant temperature is said to be met with at a depth of only 2 or 3 feet.?

It is a remarkable fact, now verified by observation all over the world, that below the limit of the influence of ordinary seasonal changes the temperature, 80 far as we yet know, is nowhere found to diminish

downwards. It always rises; and its rate of increment never falls much below the average. The only exceptional cases occur under cir- cumstances not difficult of explanation. On the one hand, the neighbourhood of hot-springs, of large masses of lava, or of other manifestations of volcanic activity, may raise the subterranean temperature much above its normal condition ; and this augmentation may not disappear for many thousand years after the voleanic activity has wholly ceased, since the cooling down of a subterranean mass of lava would necessarily be a very slow process. On the other hand, the spread of a thick mass of snow and ice over any considerable area of the earth's surface, and its continuance there for several thousand years, would so depress the subterranean iso- thermals that for many centuries afterwards there might be a fall of temperature for a certain distance downwards. At the present day, in at least the more northerly parts of the northern hemisphere, there are such evidences of a former more rigorous climate, as in the well sinking at Yakutsk already referred to.? Sir William Thomson' has calculated that any considerable area of the earth's surface covered for several thousand years by snow or ice, and retaining, after the disappearance of that frozen covering, an average surface temperature of 13° C., "would during 900 years show a decreasing temperature for some depth down from. the surface, and 3600 years after the clearing away of the ice would still show residual effect of the ancient cold, in a half rate of augmentation of temperature downwards in the upper strata, gradually increasing to the whole normal rate, which would be sensibly reached at a depth of 600 metres." But beneath the limit to which the influence of the changes of the seasons extends, observations in most parts of the globe show that the temperature invariably rises as we penetrate towards the interior of the earth. According to present knowledge the average rate of increase amounts to 1° Fahr. for every 50 or 60 feet of descent, and this rise is found whether the boring be made at the sea-level or on elevated ground. The subjoined table

gives the results of temperature observations at widely separated localties® :—

1 Helmersen, Brit. Assoc. Report, 1871.

2 Junghuhn's Java, ii. p. 771.

3 Professor Prestwich (Inaugural Lecture, 1875, p. 45) has suggested that to the more rapid refrigeration of the earth’s surface during this cold period, and to the consequent depression of the subterraneous isothermal lines, the alleged present comparative quietude of the voleanic forces is to be attributed, the internal heat not having yet recovered its dominion in the outer crust.

Nee Reports, 1876, Sections, p. 3.

ee “ Reports of Committee on Underground Tempera ” Bri Assoc. Rep. from 1868 to 1877. 4 pee ee

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Dukinfield, near Manchester (2040 ft., coal measures)

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Feet, 1° Fahy. for every 83:2 Rose Bridge, Wigan (2445 ft., coal MeAaSUTeS) .--.---seseeveee 54:3

7 ”

South Balgray, Glasgow (525 ft., coal measures) ... 41

”

Kentish Town, London (1100 ft., London clay, chalk, gault, &c.) ,, oy 54°6 La Chapelle, Paris (660 metres, Chalk, GC.) cerseeeeceeeeecseeee an na 84 Grenelle Well, Paris (1795°6 ft., d0.).....see eee 7 nf 56°9 St André, do. (263 metres, dO.) ....+.0+4- ; a 56°4 Neu Salzwerk boring, Westphalia (2281 ft.) .. op “5 54°68 Mendorff bore, near Luxembourg (2394 fit. ap AS 570 Bore NAY GeNCVA…..sscessscescsnseeeceeenceessescecansesessueseeeseees ee 55 Mont Cenis tunnel (5280 ft. below summit of Mount Frejus,

metamorphic LOCKS) .....-.sevesesceeseseresreescasrasearesoanenees a) » (2) 81 Yakutsk, Siberia, (656 ft., limestone, &c., and granite) ..... a a 60

(4.) Irregularities in the Downward Increment of Heat.—

While these examples prove a progressive increase of temperature, they show also that this rate of increase is uot strictly uniform. The more detailed observations which have been made in recent years have brought to light the important fact that considerable variations in the rate of increase take place even in the same bore.

If, for instance, we examine the temperatures obtained at different depths in the Rose Bridge colliery shaft cited in the foregoing list, we find them to read as in the following columns :—

Depth in Temperature Depth in Temperature Yards. (Fahr.). Yards. (Fahr.). SENG aesictarsehletastaalaates 78 LOM eapaucaren 89 ; 80 re 904 Re a 83 tee dicks 914 GOS”. sicserenres 85 713) po neEORBOReeAD 92 Cal sets Rae 86 CUM Gggtongooaneenn 93 i a 87 BOS csc Oh sc mee. 934 (a 88% ite sare. cena a 94

At La Chapelle, in an important well made for the water- supply of Paris, observations have been taken of the tempera- ture at different depths, as shown in the subjoined table® :—

Depth in Temperature Depth in Temperature Metres. (Fahr.). Metres. (Fahr.). 100 ..ecsecreeeeees 59°5 BOO ...cceseeeeeens 72°6 ZOO oo. cceeaeneres 61°8 600 oo. ceeeeee evens 75°0 SX0 Gapousedodso oo: 65°5 B60 ….ceereee eres 76°0 BOO cevcaeseeves 69°0

In drawing attention to the temperature-observations at the Rose Bridge colliery—the deepest mine in Great Britain—Professor Everett points out that, assuming the surface temperature to be 49° Fahr., in the first 558 yards the rate of rise of temperature is 1° for 57-7 feet; in the next 257 yards it is 1° in 48-2 feet; in the portion between 605 and 671 yards—a distance of only 198 feet—it is 1° in 33 feet ; in the lowest portion of 432 feet it is 1° in 54 feet.’? When such irregularities occur in the same vertical shaft, it is not surprising that the average should vary so much in different places.

There can be little doubt that one main cause of these variations is to be sought in the different thermal conduc- tivities of the rocks of theearth’s

crust. The first accurate measurements of the conducting powers of rocks were made by the late Professor J. D- Forbes at Edinburgh (1837-1845). He selected three sites for his thermometers, one in “trap-rock ” (a porphyrite of Lower Carboniferous age), one in loose sand, and one in sandstone, each instru- ment being sunk to a depth of 24 French feet from the surface. He found that the wave of summer heat reached the first instrument on 4th January, the second on 25th December, and the third on 3d November, the trap-rock being by far the worst conductor, and the solid sandstone by far the best.®

The British Association has recently appointed a com- mittee to investigate this subject in greater detail. Already some important determinations have been made by it re- garding the absolute conductivity of various rocks. As a rule the lighter and more porous rocks offer the greatest

6 *‘ Report of Committee on Underground Temperature,” Brit. Assoc. Rep., 1873, p. 254.

7 “Report of Committee on Underground Temperature,” Brit. Assoc. Rep. for 1870, p. 31.

8 Trans, Roy. Soc. Edin., xvi. 180.

resistance to the passage of heat, while the more dense and crystalline offer the least resistance. The resistance of opaque white quartz is expressed by the number 114, that of basalt by 273, while that of cannel coal stands very much higher at 1538, or more than thirteen times that of quartz!

It is evident also that, from the texture and structure of most rocks, the conductivity must vary in different directions through the same mass, heat being more easily conducted along than across the “ grain,” the bedding, and the other numerous divisional surfaces, Experiments have been made to determine these variations in a number of rocks. Thus, the conductivity in a direction transverse to the divisional planes being taken as unity, the conductivity parallel with these planes was found in a variety of magnesian schist to be 4028. In certain slates and schistose rocks from central France

the ratio varied from 1: 2°56 to 1: 3-952. Hence in such fissile rocks as slate and mica-schist heat may travel four times more easily along the lines of cleavage or foliation than across them.?

In reasoning upon the discrepancies in the rate of increase of subterranean temperatures, we must also bear in mind that certain kinds of rock are more liable than others to be charged with water, and that, in almost every boring or shaft, one or more horizons of such water-bearing rocks are met with. The effect of this interstitial water is to diminish thermal resistance. Dry red brick has its resist- ance lowered from 680 to 405 by being thoroughly soaked in water, its conductivity being thus increased 68 per cent. A piece of sandstone has its conductivity heightened to the extent of 8 per cent. by being wetted.?

Mr Mallet has contended that the variations in the amount of increase in subterranean temperature are too great to permit us to believe them to be due merely to differences in the transmission of the general internal heat, and that they point to local accessions of heat arising from transformation of the mechanical work of compression, which is due to the constant cooling and contraction of the globe.4 But it may be replied that these variations are not greater than, from the known divergences in the conduc- tivities of rocks, they might fairly be expected to be.

(5.) Probable Condition of the Larth's Interior.~~—Various theories (mostly fanciful) have been propounded on this subject. There are only three which merit serious con~~ sideration. (1.) One of these supposes the planet to consist of a solid crust and a molten interior. 2.) The second holds that, with the exception of local vesicular spaces, the globe is solid and rigid to the centre. (3.) The third con- tends that, while the mass of the globe is solid, there lies a liquid substratum beneath the crust,

1. The arguments in favour of internal liquidity niay be summed up as follows. (a.) The ascertained rise of tem- perature inwards from the surface is such that, at a very moderate depth, the ordinary melting point of even the most refractory substances would be reached. At 20 miles the temperature, if it increases progressively, as it does in the depths accessible to observation, must be about 1760° Fahr, ¢ at 50 miles it must be 4600°, or far higher than the fusing- point even of so stubborn a metal as platinum,

which melts at 3080° Fahr. (6.) All over the world volcanoes exist from which steam and torrents of molten lava are from time to time erupted. Abundant as are the active volcanic vents, they form but a small proportion of the whole which have been in operation since early geological time. It has been inferred therefore that these numerous funnels of 5 ee aati

1 Herschel and Lebour, Brit. Assoc. Rep., 1875, p. 59.

- Jannettaz, Bull. Soc. Géol. de France (April-June, 1874), tom. ii. Pp. 264; “* Report of Committee on Thermal Conductivities of Rock,” Brit. Assoc. Rep., 1875, p. 61.

3 Herschel and Lebour, Brit. Assoc. Rep., 1875, p. 58.

4 “Volcanic Energy,” Phil. Trans., 1875.

communication with the heated interior could not have existed and poured forth such a vast amount of molten rock, unless they drew their supplies from an immense internal molten nucleus. (c.) When the products of volcanic action from different and widely-separated regions are compared and analysed, they are found to exhibit a remarkable uni- formity of character. Lavas from Vesuvius, from Hecla, from the Andes, from Japan, and from New Zealand present such an agreement in essential] _particulars as, it is contended, can only be accounted for on the supposition that they have all emanated from one vast common source.5 (d.) The abundant earthquake shocks which affect large areas of the globe are maintained to be inexplicable unless on the supposition of the existence of a thin and somewhat flexible crust. These arguments, it will be observed, are only of the nature of inferences drawn from observations of the present constitution of the globe. They are based on geological data, and have been frequently urged by geologists as supporting the only view of the nature of the earth’s interior compatible with geological evidence.

2, The arguments against the internal fluidity of the earth are based on physical and astronomical considerations of the greatest importance, They may be arranged as follows :—

(a.) Argument from precession and nutation.—The pro- blem of the internal condition of the globe was attacked as far back as the year 1839 by the late Mr Hopkins of Cambridge, who endeavoured to calculate how far the planetary motions of precession and nutation would be influenced by the solidity or liquidity of the earth's interior. He found that the precessional and nutational movements could not possibly be as they are if the planet consisted of a central ocean of molten rock surrounded with a crust of 20 or 30 miles in thickness, that the least possible thick- ness of crust consistent with the existing movements was from 800 to 1000 miles, and that the whole might even be solid to the centre, with the exception of comparatively small vesicular spaces filled with melted rock.6

M. Delaunay, in a paper on Zhe Hypothesis of the Interior Fluidity of the Globe," threw doubt on Hopkins's views, and suggested that, if the interior were a mass of sufficient viscosity, it might behave as if it were a solid, and thus the phenomenon of precession and nutation might not be affected. ° Sir William Thomson, who had already arrived at the conclusion that the interior of the globe must be solid, and acquiesced generally in Hopkins's conclusions, pointed out that M. Delaunay had not worked out the problem mathematically, otherwise he could not have failed to see that the hypothesis of a viscous and quasi-rigid interior "breaks down when tested by a simple calculation of the amount of tangential force required to give to any globular portion of the interior mass the precessional and nutational motions which, with other physical astronomers, he attributes to the earth as a whole."8 Sir William, in making this calculation, holds that it demonstrates the earth's crust down to depths of hundreds of kilometres to be capable of resisting such a tangential stress (amounting to nearly z/jth of a gramme weight per square centimetre) as would with great rapidity draw out of shape any plastic substance which could properly be termed a viscous fluid. "' An angular distortion of 8" is produced ina cube of glass by a distorting stress of about ten grammes weight per square centimetre. We may therefore safely conclude that the rigidity of the earth's interior

substance could not be less than a millionth of the rigidity of glass without very sensibly augmenting the lunar nineteen-yearly nutation.”

<= =a St ane enemies ° See D. Forbes, “On the Nature of the Interior of the Earth,” Popular Science Review, April 1869. 8 Phil. Trans., 1889; Researches in Physical Geology, 18389-1842 ; Brit. Assoc. Rep., 1847. ’ 7 Comptes Rendus, July 138, 1868. 8 Nature, February 1, 1872. ee cit., p. 258. — eG

In Hopkins’s hypothesis he assumed the crust to be infinitely rigid and unyielding, which is not true of any material substance. Sir William Thomson has recently returned to the problem, in the light of his own researches in vortex-motion. He now argu ment against a thin crust and vast liquid interior 1s still invincible, the phenomena of precession and nutation do not decisively settle the question of internal fluidity, though the solar semi-annual and lunar fortnightly nutations absolutely disprove the existence of a thin rigid shell full of liquid. If the inner surface of the crust or shell were rigorously spherical, the interior mass of supposed liquid could experience no precessional or nutational influ- ence, except in so far as, if heterogeneous in composition, it might suffer from external attraction due to non-sphericity of its surfaces of equal density. But “a very slight devia- tion of the inner surface of the shell from perfect sphericity would suffice, in virtue of the quasi-rigidity due to vortex- motion, to hold back the shell from taking sensibly more precession than it would give to the liquid, and to cause the liquid (homogeneous or heterogeneous) and the shell to have sensibly the same precessional motion as if the whole con- stituted one rigid body.”?

The assumption of a comparatively thin crust requires that the crust shall have such perfect rigidity as is possessed by no known substance. The tide-producing force of the moon and sun exerts such a strain upon the substance of the globe that it seems in the highest degree improbable that the planet could maintain its shape as it does unless the supposed crust were at least 2000 or 2500 miles in thickness.2 That the solid mass of the earth must yield to this strain is certain, though the amount of deformation is ‘go slight as to have hitherto escaped all attempts to detect it. Had the rigidity been

even that of glass or of steel, the deformation would probably have been by this time detected, and the actual phenomena of precession and nutation, as well as of tlie tides, would then have been very sensibly diminished.' The conclusion is thus reached that the mass of the earth "is on the whole more rigid certainly than a continuous solid globe of glass of the same diameter."*

(b.) Argument from the tides,—The phenomena of the oceanic tides are only explicable on the theory that the earth is either solid to the centre, or possesses so thick a crust (2500 miles or more) as to give to the planet practical solidity. Sir William Thomson remarks that, '' were the crust of continuous steel, and 500 kilometres thick, it would yield very nearly as much as if it were india-rubber to the deforming influences of centrifugal force, and of the sun's and moon's attractions." It would yield, indeed, so freely to these attractions "that it would simply carry the waters of the ocean up and down with it, aud there would be no sensible tidal rise and fall of water relatively toland."®> Mr George H. Darwin has recently investigated mathematically the bodily tides of viscous and semi-elastic spheroids, and the character of the ocean tides on a yielding nucleus.° His results tend to increase the force of Sir William Thonison's argument, since they show that "no very considerable portion of the interior of the earth can even distantly approach the fluid condition," the effective rigidity of the whole globe being very great.

(c.) Argument from relative densities of melted and solid rock.—The two preceding arguments must be considered decisive against the hypothesis of a thin shell or crust covering a nucleus of molten matter. It has been further urged, however, as an objection to this hypothesis, that cold

1 Sir W. Thomson, Brit. Assoc. Rep., 1876, Sections, p. 5.

2 Thomson, Proc. Roy. Soc., April, 1862. 3 'Fhomson, loc. cit. 4 Thomson, Trans. Roy. Soc. Hdin., xxiii. 157.

5 Thomson, Brit. Assoc. Rep., 1876, Sections. p. is

6 Proc. Roy. Soc., No. 188, 1878.

finds that, while the argu-.

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solid rock is necessarily more dense than hot melted rock, and that even if a thin crust were formed over the central molten globe it would immediately break up and the frag- ments would sink towards the centre.’ Undoubtedly this would happen were the material of the earths mass of the same density throughout. But, as has been already pointed out, the specific gravity of the interior is at least twice as much as that of the visible parts of the crust. If this difference be due, not merely to the effect of pressure, but to the presence in the interior of intensely heated metallic substances, we cannot suppose that solidified portions of such rocks as granite and the various lavas could ever have sunk into the centre of the earth, so as to build up there the honey-combed cavernous mass which might have served as a nucleus in the ultimate solidification of the whole planet.

From the considerations above advanced we have seen that

the earth’s central mass may be plausibly conjectured to be metallic. Into this dense central mass the comparatively light crust could not sink, though its earliest formed portions would no doubt descend until they reached a stratum with specific gravity agreeing with their own, or until they were again melted.8

3. The ing2nious suggestion of Mr Fisher, already cited (ante, p. 217), in favour of the existence of a possible fluid or viscous substratum between the flexible outer shell and an inner rigid nucleus, is made with the view of reconciling the requirements of physics with those facts in geology which seem to demand the existence of a mobile mass of intensely hot matter at no great depth beneath the surface. Whether it does so must be left for physicists to decide. But, on geo- logical grounds, it may be questioned whether such a fluid substratum is needed. We must bear in mind that the land

of the globe, regarding the geological structure of which

alone we know anything, covers but a small part of thie whole surface of the planet; that the existing continents seem from earliest times to have specially suffered from the reaction between the heated interior and the cooled exterior, forming, as it were, lines of relief from the strain of compression ; and that along such lines, if the substance of the interior be everywhere just about the melting point, relief from pressure by corrugation would cause liquefaction of the matter so relieved, and its ascent towards the surface ; so that evidences of volcanicaction on the terrestrial ridges might be expected to occur, and to be referable to all ages. Mr Fisher assumes the contraction of rock in cooling to be ‘000007 linear for one degree Fahr.; and he argues that, as this amount would not account for the observed contraction in the crust, we must have recourse to some additional explanation, such as the escape of steam and vapours from volcanic orifices. The validity of the asser- tion that the amount of horizontal compression of the superficial strata is greater than the cooling of a solid earth can account for may be questioned. ‘The violently coutorted rocks indicative of great horizontal compression occur chiefly along the crests of the great terrestrial ridges where the maximum effects of corrugation were to be looked for, To the argument from climate it may be replied on the other hand, with great plausibility, that secular changes may be accounted for by the effect of the variations in the eccentricity of the earth’s orbit combined with the pre- cession of the equinoxes, as already described.

(6.) Age of the Earth and Measures of Geological Time.— The age of our planet is a problem which may be attacked either from the geological or physical side.

1. The geological argument rests chiefly upon the observed rates at which geological changes are being effected at the

7 This objection has been repeatedly urged by Sir William Thomson. See Trans. Roy. Soc. Edin., xxiii. 157; and Brit. Assoc. Lep., 1870, Sections, p. 7.

8 See D. Forbes, Geol. Mag., vol. iv. p. 485.

present time, and is open to the obvious preliminary objection that it assumes the existing rate of change as the measure of past revolutions,—au assumption which may be entirely erro- neous, for the present may be a period when all geological events march forward more slowly than they used to do. The argument proceeds on data partly of a physical and partly of au organic kind. (a) The physical evidence is derived from such facts as tle observed rates at which the surface of a country is being lowered by rain and streanis, and new sedimentary deposits are formed. These facts will be more particularly dwelt upon in later portions of this article. Ifwe assume that the land has been worn away, and that stratified deposits lave been laid down nearly at the same rate as at present, then we must admit that tlie stratified portion of the crust of the earth must represent a very vast period of time, Dr Croll puts this period at not less, but possibly much more, than 60 million years. (5) On the other hand, human experience, so far as it goes, warrants the belief that changes in the organic world proceed with extreme slow- ness. Yet in the stratified rocks of the earth's crust we have abundant proof that the whole fauna and flora of the earth's surface have passed through numerous cycles of re- volution,—species, genera, families, appearing and disappear- ing many times in succession. On any supposition it must be admitted that these vicissitudes in the organic world can only have been effected with the lapse of vast periods of time, though no reliable standard seems to be available whereby these periods are to be measured. The argument from geological evidence is strongly in favour of an interval of probably not much less than 100 million years since the earliest form of life appeared upon the earth, and the oldest stratified rocks began to be laid down,

2. The argument from physics as to the age of our planet is based by Sir William Thomson upon three kinds of evi- dence:—(1) the internal heat and rate of cooling of the earth; (2) the tidal retardation of the earth's rotation ' and (3) the origin and age of the sun's heat.

(1.) Sir William Thomson, applying Fourier's theory of thermal conductivity, pointed out some years ago (1862) that in the known rate of increase of temperature down- ward and beneath the surface, and the rate of loss of heat from the earth, we have a limit to the antiquity of the planet. He showed, from the data available at the time, that the superficial

consolidation of the globe could not have occurred less than 20 million years ago, or the underground heat would have been greater than it is 3 hor more than 400 million years ago, otherwise the underground teniperature would have shown no sensible increase downwards. He

admitted that very wide limits were necessary. In more

recently discussing the subject, he inclines rather towards the lower than the higher antiquity, but concludes that the limit, from a consideration of all the evidence, must be placed within some such period of past time as100 millions of years,}

(2.) The argument from tidal retardation proceeds on the admitted fact that, owing to the friction of the tide- wave, the rotation of the earth is retarded, and is therefore much slower now than it must have been at onetime. Sir William Thomson coutends. that had the globe become solid some ten thousand million years ago, or indeed any high antiquity beyond 100 million years, the centrifugal force due to the more rapid rotation must have given the. planet @ very much greater polar flattening than it actually pos- sesses. He admits, however, that, though 100 million years ago that force must have been about 3 per cent. greater than now, yet “nothing we know regarding the figure of the earth and the disposition of land and water would justify us in saying that a body consolidated when there was more ca a ee

‘ Trans, Roy. Soc. Edin., xxiii. 157; Trans. Geol. Soc. Glasgow, iii, 25.

centrifugal force by 3 per cent. than now night not now be in all respects like the earth, so far as we know it at present.”? Professor Tait, in repeating this argument, con- cludes that, taken in connexion with the previous one, “ it probably reduces the possible period which can be allowed to geologists to something less than ten millions of years. “3 He does not state, however, on what grounds he so reduces the available period, nor does he notice the objection urged by Dr Croll that, granting the gradual submergence of the polar lands owing to the slackened speed of rotation, the subaerial

denudation of the rising equatorial land might well keep pace with the effects of the oceanic subsidence, so that we cannot infer froin the present form of the earth what may have been its precise amount of polar compression at the time of solidification.4

(3.) The third argument, based upon the age of the sun's heat, is confessedly less reliable than the two previous ones. It proceeds upon calculations as to the amount of heat which would be available by the falling together of masses from space, which gave rise by their impact to our sun. The vagueness of the data on which this argument rests may be inferred from the fact that in one passage Professor Tait places the limit of time during which the sun has been illuminating the earth as, "on the very highest computation, not more than about 15 or 20 millions of years," while, in another seutence of the same volume, he admits that, " by calculations in which there is no possibility of large error, this hypothesis [of the origin of the sun's heat by the fall- ing together of masses of matter] is thoroughly competent to explain 100 millions of years solar radiation at the pre- sent rate, perhaps more."® One hundred millions of years is probably amply sufficient for all the requirements of geology.

ITI. Composition or tur Eartn's Crust. MINERALS AND ROCKS.

The visible and accessible portion of the earth is formed of minerals and rocks. A mineral may be classified as an inorganic body distinguished by a more or less definite chemical composition, and usually a characteristic geo- metrical form. A rock is an aggregate mass, sometimes of one, more commonly of two or more minerals, Upwards of 800 species of minerals and a vast number of varictics have been described. A very large proportion of these occur but rarely, and, though interesting and important to the mineralogist, do not demand the special attention of the geologist. While almost every mineral may be made to yield data of more or less geological significance, only those which enter into the composition of rock masses, or which are of frequent occurrence as accessories there, require to be familiarly known by the student of geology.

1. Rock-Forming Minerals.

The following are the more important minerals which enter into the composition of rocks :—

Quartz (SiO,) occurs either crystallized as rock-crystal, or non- erystalline as calcedony. In the former condition it is an essential constituent of granite, felsite, and many othcr igneous rocks, as well as of sandstone and numerous aqueous rocks. The non-crys- tallized or colloid quartz is chiefly met with in cavities and fissures of rock where it has been slowly deposited from aqueous solution. Numerous varieties of caleedony occur, as agate, carnelian, jasper, flint, chert, Lydian-stone, &c.

felspars (silicates of alumina, with potash, soda, or lime) consti- tute the most abundant group of rock-forming minerals. For the purposes. of the petrographer they are conveniently divided into two series—(1) the Monoclinic or Orthoclase felspars (with cleavage angles of 90°), containing from 4 to 16 per cent. of potash and

2 Trans. Geol. Soc. Glasgow, iii. 16.

3 Recent Advances in Physical Science, p. 174. 4 Quart. Jour. Science, July 1877.

Op. Cit. np. 168, lifer

usually more or less soda, sometimes as much as 10 per cent., and (2) the Triclinic or Plagioclase felspars (with oblique cleavage angles, or less than 90°), including a soda group with 8 to 12 per cent. of soda, and a lime group with 6 to 20 per cent. of lime. The felspars form a large part of most igneous rocks. By their decay they form elay, and in that condition enter largely into the composition of the argillaceous stratified rocks, such as shale, mudstone, slate, &e.

Hornblende is a meta-silicate of magnesium, with lime, iron, or mnanganese, and frequently alumina. The white non-aluminous varieties (tremolite, actinolite, anthophyllite, asbestos) chiefly occur as constituents of such metamorphic rocks as crystalline limestone, gneiss, &c. The black

or dark green aluminous varieties enter as essential constituents into the composition of many rocks, as diorite and hornblende slate. “mah eee t

Augite (resembling hornblende in composition) is divisible into two groups. The pale non-aluminous varieties (diopside, sahlite, coccolite, &c.) occur under conditions like those of the pale horn- blendes. The dark aluminous or common augite 1s abundant as an ingredient of some igneous rocks, as basalt. Allied to augite are diallage (important as a constituent of diallage-rock or gabbro), hypersthene, and bronzite. Uralite is the name of a mineral of fre- quent occurrence among Paleozoic rocks, having the external form of augite and the cleavage of hornblende. ‘

Olivine (an ortho-silicate of magnesium, with part of the mag- nesium replaced by iron or manganese) is a conspicuous ingredient among the basalt rocks. It appears also to have been the original magnesian constituent of many rocks now altered into serpentine.

Nephelinc (a silicate of alumina and soda with a little potash) takes the place of felspar in some lavas. It likewise occurs among the ejected blocks of Somma, and, in the form of eleolite, among the ancient crystalline rocks of Norway. : ; ;

Leucite (K,Al,Si,0,) is a characteristic ingredient of many Tertiary and recent lavas. the Paleozoic or Secondary igneous rocks, nor ever in association with quartz. ;

Haiiyne and Nosean are two minerals allied to garnet, found in some Tertiary lavas.

Mica.—Under this general term are included several species of

minerals distinguished by their basal cleavage into thin lamine and by their splendent or silvery lustre. The non-magnesian micas include muscovite or potash-mica, the most abundant of all, and lepidolite or lithia-mica; of the magnesian micas the most important is biotite. Muscovite enters into the composition of granite, gneiss, mica-seliist, micaceous sandstone, and many other rocks. Biotite is likewise abundantly distributed among the older crystalline rocks. Lepidomelane is a black mica often found in fine-grained

granites, ijser species are margarodite—an abundant constituent of many unctuous schists formerly called tale-schists, and haughtonite— which, according to Heddle, is the common nica of the granites in the Scottish Highlands.

Garnet (an aluminous ortho-silicate with lime, magnesia, iron, or manganese) occurs in rhombic dodecahedrons or allied forms, and also massive in many metamorphic rocks, as mica-schist, eclogite, &c.

Epidote (a variable silicate of lime, alumina, iron, or manganese) occurs in yellow or greenish translucent crystals or crystalline masses in many of the older erystalline rocks, though seldom as an abundant constituent. It is probably always an alteration-product,

Tourmaline, in its common black variety, schorl, forms with quartz the rock known as schorl-rock, and occurs in some granites, gneisses, schists, and other erystalline rocks.

Zireon (silicate of zirconium) is found as a constituent of zircon- syenite, and more sparingly in other crystalline rocks.

The hydrous silicates have resulted from the alteration of the anhydrous forms. As constituents of rocks they may be grouped into two series:—(1) the aluminous, including the zeolites, and (2) the magnesian, embracing tale, chlorite, serpentine, and their allies.

Zeolites form a numerous genus of minerals distinguished usually by their boiling up before the blowpipe, owing to the escape of their water of crystallization, by their frequent pearly lustre, inferior hardness, and their occurrence in cavities and veins where they have been deposited from solution. They are found as abundant secondary products in many amygdaloids, also in altered limestones and other metamorphic rocks.

Serpentine (SiO,,44°14 ; MgO, 42°97; H,O, 12°89) isa dull impure, usually green, granular to compact, more rarely foliated, mineral, with a hardness of 3 to 4 or even sometimes 5. Like the other hydrous magnesian silicates it has a soapy or greasy feel. It occurs abundantly in many altered rocks as a pseudomorph after some of the anhydrous magnesian silicates, also as a

massive rock forming huge beds often associated with metamorphosed limestones. 2

Chlorite is a general term including several minerals which agree in possessing a greenish colour, soapy feel, hardness of only 2 to 2°5, and specific gravity of 2°65 to 2°85. It occurs in chlorite slate and in many rocks as an alteration-product.

Tale (Si0,,59 to 68; MgO,30 to 38; H,0, from a trace up to7 per cent.) occurs in hexagonal plates or scales, cleaving readily into flexible non-elastic lamine, but most commonly granular and

It has not been met with among any of

massive, white to pale leek or apple-green, with marked pearly lustre on cleavage-planes. It is met with in talc-slate, also fre- quently in crystalline rocks as a result of the alteration of horn- blende, augite, or other anhydrous magnesian silicate.

Delessite and Saponite are soft green hydrous magnesian silicates found as products of alteration in basalt-rocks.

Carbon occurs chiefly as beds in the form of coal, lignite, peat, &c. Graphite, however, is often met with in black or steel-grey splendent scales and granular masses in metamorphosed rocks. Anthracite also takes sometimes the form of black glancing grains or of a diffused fine black dust through certain paleeozoic formations.

Carbonates play an important part both as individual minerals and as rock-masses. The three most important are calcite, dolo- mite, and siderite.

Caleite (carbonate of lime) is one of the most abundant minerals. It occurs crystallized as a secondary product in most rocks which have undergone decomposition, especially where they contain sili- cates into the

composition: of which lime enters. It is also found massive as limestone, forming beds having sometimes an aggregate thickness of many hundred feet and an extent of thousands of square miles.

Dolomite (carbonate of lime and magnesia) is likewise both a product of alteration and an original formation. In the former condition it is met with crystallized as bitter-spar in many meta- morphic rocks as well as in veins and cavities of unaltered forma- tions. It occurs also as an amorphous granular substance, some- times replacing calcite, and sometimes in vast beds or masses of original deposit.

Siderite, Chalybite, or Spathic Iron (carbonate of iron) occurs both crystallized and massive. In the crystallized form it is compara- tively unimportant as a constituent of rocks, being then found chiefly in veins and cavities where other alteration-products have been deposited. But in its massive condition it is found mixed with clay and other impurities, and forming beds and nodules which are among the most important ores of iron.

Sulphur, though seldom occurring in large masses, is widely diffused as an accessory ingredient of rocks. It occurs crystallized or finely granular in mineral veins, in nodules of limestone, and other concretions, and in beds of limestone and marl. It also takes the form of a crust in the sublimations of voleanic vents. Its fre-

uent association in Tertiary strata with the remains of lacustrine shells, insects, and plants shows that it has in these cases been formed at ordinary temperatures from aqueous solutions.

Sulphides, combinations of sulphur with the metals, iron, copper, lead, zine, and a few others, havea wide distribution among rocks. Where aggregated into masses they form mineral veins. It is the iron sulphides which deserve chiefly the attention of the petrographer. ‘They occur in two varieties—pyrite, crystallizing in isometric forms, and marcasite, in rhombic forms. The former has a remarkably extensive diffusion throughout rocks of all ages, usually as minute crystals and thin streaks, but often in conerctions and more massive veins. Marcasite also is abundantly distributed though less so than pyrite. From its greater liability to oxidation the strata through

eich it is diffused are apt to yield rapidly to the action of the weather, sulphuric acid and different alum com- pounds being produced.

Sulphates.—The most generally occurring sulphates in rocks are gypsum and barytes. Gypswm (hydrous sulphate of lime) in minute monoclinic prisms and macles may be obtained by the evaporation of sea-water, and in larger crystals of the same form it is found in many stratified formations. It likewise occurs as a secondary product in laminar or fibrous veins through rocks of igneous origin. Beds of gypsum, resulting from aqueous deposition, frequently appear interstratified with rock-salt and the associated products of evaporation. The anhydrous sulphate, anhydrite, like- wise occurs among rock-salt deposits, but has a much more limited diffusion than gypsum. Barytes (sulphate of baryta) almost always occurs in veins or threads running through rocks. It is a common vein-stone in association with metallic ores.

Halite or Rock-salt (chloride of sodium) is more. widely diffused than was formerly supposed. Microscopic research has shown its presence in the form of cubes in the minute cavities in the quartz of granite and other rocks. It occurs as scattered crystals, generally replaced by clay or some other substance, in many stratified formia- tions. Its chief habitat, however, is in the various saliferous deposits where it takes the form of solid beds of salt.

Fluorite or Fluor-spar (fluoride of lime) is essentially a vein-stone, associated with metallic ores, especially with sulphides of lead and zinc. It occurs also in scattered cubes through various crystalline rocks, such as granite, gneiss, porphyrite.

Apatite (phosphate of lime, vith uorine and often chlorine) has becn shown by microscopic investigation to have a very wide dis- tribution among crystalline rocks. It occurs in fine needles or stouter hexagonal prisms in a large number of crystalline rocks, as granite, quartz-trachyte, syenite, diorite, basalt, and many others. It also oc- curs massive as beds among the more ancient geological formations.

Iron oxides. —These are abundantly distributed through rocks of

all ages. Hematite (peroxide of iron) occurs crystallized in veins through crystalline rocks, also massive and earthy in beds, and sometimes in minute scales (rubin-glimmer) disseminated throuch the minerals of many crystalline rocks. Magnetite (Fe,0,) has an extensive diffusion in the form of minute octohedra or grains through crystalline rocks. In some of these rocks indeed, as in basalt, it plays the part of a chief constituent. It also occurs in many metamorphic rocks both scattered in detached crystals and segregated into veins or beds. Titanoferrite or titaniferous iron is likewise found as a plentiful ingredient in many erystalline rocks, particularly among the older basalts and dolerites. Hydrous iron oxide or limonite is diffused through almost all rocks, It is the usual brown or yellow colouring substance of minerals, and may be looked for wherever rocks containing iron have been exposed to the weather. It occurs also mixed with clay and other impurities in beds, as in the bog-iron-ore of lakes and marshes.

2. Rocks. I. General Characters.

A rock may be defined as a mass of mineral matter, composed of one, more usually of several, kinds of mine- rals,—having, as a rule, no definite external form, and liable to vary considerably in chemical composition. The crust of the earth is built up of rocks, including under this term, not only hard solid masses like granite and limestone, but even all loose incoherent deposits such as mud, soil, peat, and blown sand.

Rocks may be distinguished by external and internal characters.

i. Laternal Characters.

1. Structure, or the manner in which the component particles have been built up into the mineral masses called rocks, is the fundamental character. Viewed broadly, there are two leading types of structure among rocks—crystalline or massive, and fragmental,

(a.) Crystalline—consisting of a network of interlaced crystals and crystalline particles. Sometimes those crystals are large (half an inch or more in length), as in many granites, when the texture is called coarse or macro- crystalline ; in other cases they are so minute as not to be discernible with the naked eye, wlien the texture is micro- crystalline or

compact. While the crystalline structure is particularly characteristic of rocks which have crystallized from igneous fusion, it is not altogether peculiar to them. It may be produced by cliemical deposit from aqueous solutions, or it may be developed in rocks previously granular by chemical infiltration and metamorphism.

Under the head of crystalline it is usual to include the glassy or vitreous structure. Rocks possessing this character are natural glasses produced by igneous fusion, such as obsidian and pitchstone. In most of these rocks, however, the process of devitrification may be observed ; the glass has evidently become more and more stony as it cooled, by the appearance in it of small spherules, or hairs, or crystals, until in some cases it hag become entirely lithoid. ‘These Stages are best studied with the microscope, and belong to the internal rather than the external characters.

When larger crystals than those of the compact base are scattered through a rock, the texture is said to be porphyritic. Many rocks, when in a melted condition, have had a cellular texture given to them by their imprisoned steam, like the open, cavernous texture of ill-baked bread. Several varieties of this texture are distinguished,—as vesicular, when there are comparatively few and small holes; scoriaceous, when the cavities occupy about as mugh space as the solid part, and are of very unequal sizes and forms; pumiceous, when the cells are much more numerous than the solid portion, and when, consequently, a piece of the rock may even float in water; amygdaloidal, when by subsequent infiltration the cells have been filled up with concretions of calcite, calcedony, zeolite, d&c., which, from the elongated flattened form of the cells, are frequently almond-shaped.

Holiated rocks have their crystalline ingredients arranged in more or less defined layers, which usually inosculate. Schistose rocks are those where the foliated arrangement has been so produced that the rock splits into rude rough laminee or plates.

Most of the crystalline rocks have resulted from igneous fusion. Some, like limestone, have been formed as deposits in water. The foliated rocks are generally believed to have acquired their peculiar character from the re-crystallization of their ingredients along original divisional planes, such as the lines of deposit.

(6.) Fragmental or Clastic.—These are all derivative from previously formed masses. They vary in texture from coarse masses consisting of accumulated blocks, several feet or even yards in length, to such fine aggregates as only show their secondary origin by microscopic investigation. They are said to be conglomeratic when they consist of beds of rounded water-worn pebbles like compacted gravel ; agglomeratic, when the blocks are large, rounded, or sub- angular, and tumultuously thrown together ; brecciated, when the fragments are angular and not water-worn. Most clastic rocks are bedded, that is, arranged in beds or layers. Each bed may consist of many thin layers or laminee, which, when they enable the rock to split up into thin leaves, give what is called a shaly or fissile structure. Many fragmental rocks show a concretionary structure, When the concretions are like the roe of a fish, and of a calcareous nature, they form the oolitic structure ; when of larger size, like peas, they give the pisolitic structure. There is often also a crystalline structure developed in rocks originally quite fragmental; many limestones, for example, made up originally of water-worn fragments of shells, corals, é&c., slowly acquire a crystalline character from the action of percolating and slightly acidulous water. The action of rain on the exposed parts of a recent coral reef produces this change in the dead coral.

2. Colour.—~~This character varies so much even in the same rock, according to the freshness of tle surface ex~~ amined, that it possesses but a subordinate value as a means of discriminating rocks. Nevertheless, when cautiously used, it may be made to afford valuable indications as to the probable nature and composition of rocks. It is in this respect always desirable to compare a freshly-broken with a weathered piece of the rock. Waite indicates usually the absence or comparatively small amount of the metallic oxides, especially iron, It may either be the original colour of the rock, as in chalk and calc-sinter, or may be developed by weathering, as the white crust on flints and on many porphyries. Black seldom occurs on a weathered surface

of rock. Its existence may be due either to the presence of carbon, when weathering will not change it much, or to some iron-oxide (magnetite chiefly), or some silicate rich in iron (as hornblende and augite). Many rocks (basalts and dolerites particularly) which look quite black on a fresh surface, become red, brown, or yellow onexposure. Y. ellow, as a dull earthy colouring matter, almost always indicates the presence of hydrated peroxide of iron. Bright, metallic, gold-like yellow is usually that of iron-sulphide. Brown occurs as the original colour in some carbonaceous rocks (lig- nite), and ferruginous beds (bog-iron-ore, clay-ironstone, &e.). It very generally, on weathered surfaces, points to the oxida- tion and hydration of minerals containing iron. Red, in the vast majority of cases, is due to the presence of granular peroxide of iron. This mineral gives dark blood-red to pale flesh-red tints. As it is liable, however, to hydration, these hues are often mixed with brown and yellow. Green, as the prevailing tint of rocks, occurs among metamorphic schists, when its presence is usually due to some of the hydrous magnesian silicates (chlorite, talc, serpentine). It occurs also among the igneous rocks. especially those of older

geological formations, where some of the hornblende, olivine, or other similar silicates have been altered. Among the sedimentary rocks it is principally due to the proto-silicate of iron in glauconite. Carbonate of copper colours some rocks a bright emerald or verdigris green. The mottled character so common among many stratified rocks is fre- quently traceable to unequal weathering, some portions being more oxidized than others ; while some, on the other hand, become deoxidized from the reducing action of decay- ing organic matter. To the latter cause may be attributed the circular green spots so often found among red strata.

3. Lustre, as an external character of rocks, does not pos- sess the value which it has among minerals. In most rocks the granular texture prevents the appearance of any distinct lustre. Where a rock shows acompletely vitreous lustre itwill usually be found to consist of a volcanic glass, A splendent semi-metallic lustre may often be observed upon the fuliation planes of schistose rocks and upon the laminz of micaceous sandstones. As this silvery lustre is almost invariably due to the presence of mica, it is

commonly called distinctively micaceous. A metallic lustre is met with sometimes in beds of anthracite ; more usually its occurrence among rocks indicates the presence of metallic oxides or sulphides.

4, Hardness and Frangibility.—A rock which can easily be scratched with thenail is almost always much decomposed, though some chloritic and talcose schists are soft enough to be thus affected. Compact rocks which can easily be scratched with the knife, and are apparently not decomposed, may be limestones, or other fragmental masses. Crystalline rocks, as a rule, cannot be scratched with the knife unless considerable force be used. The ease with which a rock may be broken is the measure of its frangibility. Most rocks break most easily in one direction ; attention to this point will sometimes throw light upon their internal structure.

5. Fracture is the surface produced when a rock is split or broken, and depends for its character upon the texture of the mass. Finely granular compact rocks are apt to break with a splintery fracture where wedge-shaped plates adhere by their thicker ends to, and lie parallel with, the general surface. When the rock breaks off into concave and convex rounded shell-like surfaces, the fracture is said to be conchoidal, as may be seen in obsidian and other vitreous rocks, and in exceedingly compact limestones. The fracture may also be foliated, slaty, or shaly, according to the structure of the rock, Many black, opaque, compact rocks are translucent on the thin edges of fracture, and afford there, with the aid of a lens, a glimpse of their internal composition.

6. Feel.—Practice enables a geologist to discriminate some rocks by the feel of their weathered or fresh surfaces. The hydrous magnesian silicates, as already mentioned, have a marked soapy or greasy feeling under the fingers. Some micaceous schists, with margarodite or an allied mica, likewise exhibit the same character.

_ 7. Smell.—Many rocks when freshly broken emit dis- tinctive odours. ‘Those containing volatile hydrocarbons give sometimes an appreciable bitwminous odour, as is the case with some of the dolerites, which in central Scotland have been intruded through coal-seams and carbonaceous shales. Limestones have often a fetid odour; rocks full of decomposing sulphides are apt to give a sulphurous odour ; those which are highly

siliceous yield, on being struck, an em- pyreumatic odour. It is very characteristic of argillaceous rocks to emit a strong earthy smell when breathed upon.

8. Specific gravity is an important character among rocks as among minerals. It varies from 0°6 among the hydro- carbon compounds to 3°] among the basalts, As already stated, the average specific gravity of the rocks of the earth's crust may be taken to be about 2°5, or from that to 30.

and some metamorphic rocks. such development as powerfully to affect the magnetic needle, so that observations with that instrument among rocks of this character are deceptive. more sparingly present, the existence of magnetic iron in a rock may be shown by reducing the rock to powder in an agate mortar, washing carefully the triturated powder, and drying the heavy residue, from which grains of magnetite

[1I. GEOGNOSY.

9. Magnetism is a distinguishing feature of many igneous In some cases it exists in

But even when much

may be extracted with a magnet. This may be done with

any basalt

ii. Internal Characters.

These are revealed chiefly by the microscope and chemical analysis, By the former we learn what are the component

minerals of a rock, how they are built up into its mass, and

what changes they have undergone. By the latter we are taught the chemical constitution of rocks, and are enabled to bring into close relations rocks

which have externally no resemblance to each other, or, on the other™ hand, to show that rocks externally similar are chemically very distinct.

1. Microscopic Examination.—This method of inquiry has made great advances during the last 20 years, especially from the labours of German petrographers. Slices are cut from the rocks to be examined, and after being polished on one side with great care, are cernented by that' side with Canada balsam to glass, and are then ground down until they attain the requisite transparency. In this way the minutest features in the structure of a rock can be leisurely studied. By the application of polarized light to these thin slices a marvellously delicate method of petrographical analysis is afforded.

Among the igneous rocks three leading types of micro- scopic structure have been established, chiefly through the researches of Professor Zirkel of Leipsic :—(1.) Purely-crystalline.—Granite (fig. 1) is a good example, consisting, as it does, en- tirely of crystals interlaced with each other. (2.) Half- crystalline.—In this divi- sion, which embraces most of the eruptive masses, the rocks consist of a non-crys- talline amorphous matrix with crystals scattered through it. This matrix may be either (a) entirely glassy (figs. 2 and 3); (0) partly devitrified through separation of peculiar little granules and needles. which are not ‘‘microlites” of the com- ponent parts of the rock; (c) an aggregation of such little granules, needles, and hairs, between which no glass, or almost none, ap- pears (microcrystallitic) ; or (d) microfelsitic, nearly re- lated to the two previous groups, and consisting of an amorphous mass marked usually with indefinite or Fs. 2.—Microscopic Structure of Obsi-

Fic. 1.—Microscopic Structure of Rocks— Purely crystaliine—Section of Granite (X% 18 diameter). The white mineral is quartz; that with shading, ortho- clase. Some flakes of mica are shown as striated forms.

microlites, which have been drawn out linc. —Rocks of this class are (x 18 diameter.)

dian. A volcanic glass, with numerous

half-effaced granules and fila- h t : : _ in a general direction during the flow ments. (3.) Non crystal of the melted rock (fluia-structure). much less common than those of the other two. In their most typical condition they consist entirely of a non-

crystallized or amorphous (nicht individualisirten) substance, sometimes glassy and sometimes microfelsitic.

Rocks really formed of compacted sediment become sometimes so close-grained that their origin may not be apparent to the naked eye. Their truly derivative char- acter is well brought out by the microscope. In fig. 4, for example, the structure of a piece of fine greywacke is shown. It will be observed tlat the component particles are not crystals, but broken and more or less rounded fragments of different mine- rals. The larger white pieces are quartz, the darker por- Fie. 3.—Microscopic Structure of Pitch- tions consist of granules of fenthered and ‘ncedlc-shaped mon slate, felspar, and other _ lites, und a sanidine crystal, substances, with a little siliceous ferruginous cement. Many exceedingly compact and even flinty argillaceous rocks are in this way shown by microscopic examination to be formed of water-worn particles.

Rocks which have been so affected by subsequent changes as to acquire a new crystalline character, and to receive the name Meta- morphic, exhibit many char- acteristic features of struc- ture under the microscope. Limestones, for example, which have been altered into saccharoid marble are found to consist of crystalline grains of calcite, showing the charac- teristic cleavage of that mine- ral (fig. 5). The foliated rocks (schists) show a curious blending of the characters of igneous and sedimentary rocks. Thus they have often a distinctly granular structure, resembling that of sedimentary deposits, with, at the same time, an arrange- ment of the micaceous folia reminding us of the fluid structure of igneous rocks. In fig. 6, for instance, the quartz-grains are to be ob- served in layers separated by folia of mica which curve and twist like the microlites in an obsidian (compare fig. 2).

Much light has been cast on the origin and history of igneous rocks by microscopic example, to see in what order the several mineral compon- ents have crystallized out of the original glass. Thus in basalt the magnetite has ap- peared before the augite, in which it has been abundantly enclosed. Again, the move- ment of the still liquid or viscid rock, when many of its crystals had already been pro- duced, is beautifully shown by the “fluid structure ” (fig. 2), where minor crystals and particles are drawn into curving lines which bend round

Fic. 4.—Microscopic Structure of a fragmental rock. Greywacke.

Fie.5.—Microscopic Structure of Saccha- roid white Marble (Carrara),

investigation. It is easy, for

Fig. 6.—Microscopic Structure of Mica- schist.

the large crystals, and also by the frequent fracture of the larger crystals and the insertion of portions of the general ground-mass of the rock between the separated pieces, That intensely saline water was present during the forma- tion of many crystalline rocks is proved by the presence in their crystals of minute cavities filled with fluid and containing cubes of halite (common salt). Liquid carbonic acid has been observed in such cavities,

Most interesting and important information is likewise afforded by the microscope regarding the subsequent changes which rocks have undergone through the influence chiefly of percolating water, Every gradation of alteration from the fresh mineral to its complete pseudomorph may be observed. In this way many serpentines have been shown to have been originally olivine rocks. It can be seen, t00, how certain minerals decay, and to what products their alteration gives rise, even when the general mass of the rock looks to the eye still tolerably fresh. There can be little doubt that the application of microscopic analysis is destined to throw much light upon both the formation and the subsequent history of the sedimentary rocks.

These have not yet been so sedulously explored as the igneous groups. The obscure subject of metamorphisni is especially open to elucidation by the microscopic method.!

2. Chemical Analysis.—This method of investigation must supplement the work of the microscope. A mere chemical analysis gives the ultimate chemical constitution of a rock, but may afford little clue to its mineral structure, which can only be thoroughly examined by means of the microscopic method. On the other hand, many rocks do not allow of satisfactory determination of their constitution by means of the microscope. For these chemical analysis is, of course, indispensable. But our knowledge of no rock can be considered complete until the rock has been sub- jected to both processes of investigation.

IL, Classification and Description.

A precise yet convenient classification of rocks is still required. We may adopt chemical characters as the basis of arrangement, and group rocks according as they may be sulphates, carbonates, silicates, écc.; but in so doing we place together rocks which, from a geological point of view, have no real affinity. Again, we may select mineralogical composition as the groundwork of the classification ; but in this case also great violence may be done in the geological relationships of the rocks. In many respects the long estab- lished geolugical arrangement according to manner of pro- duction is a useful one—igneous, aqueous, and metamorphic rocks. There is, of course, the obvious objection to it that it starts upon a preconceived theory of the origin of the rocks, and this objection must be admitted to be serious. Every year, however, is diminishing its force by making us more certain of the mode of formation of different rocks ; and, probably, some modification of it will in the end be very generally adopted. In the meantime the most eligible course seems to be to choose a scheme of arrangement which, confessedly imperfect and temporary, shall recognize at once the mineralogical, chemical, and geological relations of the rocks. With this object the following classification will be adopted here.

I. Crystalline and Glassy Non-Fragmental Rocks,

1. Simple Rocks (composed of one mineral substance), —chiefly of aqueous rocks formed from chemical precipitates,

1 The reader will find this subject fully treated in Zirkel's Mikro- skopische Beschaffenheit der Mineralien und Gesteine (1873); Rosen- busch's Mikroskopische Physiographe der 'Mineralien und Gesteine (1873-7), Vogelsang's Krystalliten (1874), and Dela Vallée and Renard, Sur les roches plutoniennes de la Belgique (Acad. Royale de Belgique,

1876).

2. Compound Rocks (composed of two or more mine- rals), including («) Massive series, embracing the various igneous rocks, as granite and lava, and (0) Schistose series, including all thecrystallineschists and most of the so-called metamorphic rocks.

Il. Fragmental or Clastic Rocks, including (a) Gravel and Sand Rocks, (4) Clay Rocks, (c) Plant-formed Rocks, (d) Rocks formed from animal remains, (e) Volcanic Agglomerates and Tufis.

L. Crystalline and Glassy or Non-Fragmental Rocks.

The great majority of these rocks are original formations ; that is, they have not been palpably derived from the destruction of pre-existing rocks, asin the case of the frag- mental series. They include aJl chemical precipitates, whether these possess a distinctly crystalline or a dull granular texture, all rocks which have consolidated from igneous fusion, and all the schistose and metamorphic rocks which, whatever may have been their original character, now possess a crystalline or foliated structure.

1. Simple Rocks.

Limestone is a mass of carbonate of lime, either nearly pure or mixed with clay or other impurity. Few rocks vary more in texture and composition. It may be a hard flinty close-grained mass, breaking with a splintery or conchoidal fracture; or a crystal- line rock built wp of fine crystals of calcite

and resembling loaf sugar in colour and texture (fig. 5); ora dull earthy friable chalk-like deposit; or a compact massive finely-granular rock resembling a close-grained sandstone or freestone. The colours, too, vary exten- sively, the most common being shades of blue-grey and cream-colour passing into white. Some limestones are highly siliceous, the calcareous matter having been accompanied with silica in the act of deposition ; others are argillaccous, sandy, ferruginous, dolo- mitic, or bituminous. To some of these varieties particular names have been assigned:—Oolite, a granular limestone built up of small roe-like grains, each of which consists of concentric coats of lime; Pisolite, an oolitic or pisolitic limestone where the grains are as large as peas ; Travertine (calearcous tufa), the material deposited by calcareous springs, usually white or yellowish, varying in texture from a soft chalk-like substance or marl to a compact building-stone ; Stalactite, the calcareous pendant deposit formed on the roofs of caverns, vaults, bridges, &. The water from which the hanging lime-icicles are derived drips to the floor, and on further evaporation there gives rise to the crust-like deposit known as stalagmite. Hydraulic limestone contains sufficient silica (and usually alumina) that, when it is burnt and subsequently mixed with water, a compound containing silicate of calcium is formed, which has the property of ‘‘ setting” or hardening under water. Limestones containmg perhaps as much as 25 per cent. of silica, alumina, iron, &c., which in themselves would be unsuitable for many of the ordinary purposes for which limestones are used, can be used for making hydraulic mortar. These limestones occur sometimes in beds like those in the Lias of Lyme Regis, sometimes in nodules like those of Sheppey, from which Roman cement is made. Cement-stone is the name given to many pale dull ferruginous lime- stones, which contain an admixture of clay, and some of which can be profitably used for making hydraulic mortar or cement. etid limestone (stinkstein, swinestone) gives off a fetid smell, like that of sulphuretted hydrogen gas, when struck with a hammer. In some cases, as in that at North Berwick, the rock seems to have been deposited by volcanic springs containing decomposable sulphides as well as lime. In other instances the odour may be connected with the decomposition of organic matter. In some quarries in the Car- boniferous Limestone of Ireland, as mentioned by Mr Jukes, the

freshly broken rock may be smelt at a distance of a hundred yards when the men are at work, and occasionally the stench becomes so strong that the workmen are sickened by it and require to leave off work for a time. Oornstone is an arenaceous or siliceous limestone particularly characteristic of some of the Palsozoic red sandstone for- mations. ottenstone is a decomposed siliceous limestone from which most orall of the lime has been removed, leaving a siliceous skeleton of the rock. A similar decomposition takes place in some ferrugin- ous limestone with the result of leaving a yellow skeleton of Belts

Marble is limestone which has acquired a granular crystalline structure. Ordinary statuary marble is a familiar example of this rock. It is white, fine-grained, composed of minute crystalline granules of calcite, and resembles loaf-sugar, whence the term *“‘saccharoid ” often applied to it (fig. 5). or tale may often be noticed even in the purest marble. Some lime- stones associated with gneiss and scliust are peculiarly rich in

Fine silvery scales of mica, |

minerals,—tremolite, actinolite, anthophyllite, zoisite, and many other species occurring there, often in great abundance. Many varieties of colour and texture occur among these limestones, as may be seen in the numerous kinds of ornamental marble.

Dolomite (Magnesian Limestone) is a massive formation of the car- bonates of lime and magnesia, commonly associated with gypsum, rock-salt, and other results of the evaporation of saturated saline waters. It is dull granular to finely crystalline in texture, somctimes full of cavities lined with crystals of dolomite, sometimes aggregated into botryoidal, mammillated, and other concretionary forms. Dolomite also occurs as the result of a chemical transforma- tion of ordinary limestone, carbonate of magnesia replacing carbon- ate of lime. ‘This process, known as dolomitization, was largely insisted on by Von Buch and has been discussed by Bischof. The metamorphic variety of the rock is generally quite crystalline, resembling

saccharoid marble in texture, and sometimes even in colour, though yellowish tints are apt to predominate. As a proof of the dolomitization or conversion of limestone into dolomite the fact may be noticed that fossil shells, and other organisms consisting originally of calcite, have been altered into dolomite. On a small scale a similar change may be observed in a limestone where it is traversed by some igneous dyke. Even along the vertical joints of limestone where no igneous matter has penetrated, and where percolating water has probably been the only agent of change, the limestone is changed for some distance on either side into a dull yellow dolomite, locally termed ‘‘ dunstone.”

Gypsum occurs as a rock in the form of beds and concretions as well as in strings and veins. It is associated with red strata, often with dolomite, rock-salt, and anhydrite.

Rock-salt, massive chloride of sodium, occurs in beds some- times 60 to 90 feet in thickness, rudely crystalline, usually stained red from an admixture of red sediment, like that of the red clays and sandstones among which the salt-beds occur.

Ironstone.—Besides the iron ores met with in veins associated with other accompaniments of metalliferous lodes, there are many which were doubtless formed as chemical precipitates on the floors of lakes and other sheets of water. Some of sheet deposits (either peroxide or carbonate of the protoxide of iron) arise from pre- cipitation in water or on moist ground where organic matter, espe- cially of vegetable. origin, has decomposed. The hard crust of hydrous peroxide of iron which forms under wet or boggy soil (moor- band pan, bog-tron-ore) is an example of such a deposit now in course of formation. Where the peroxide has been reduced and become carbonate, it occurs in beds or nodules usually mixed with a variable proportion of clay (elay ironstone), and sometimes with a good deal of carbonaceous matter from associated vegetation (black- band ironstone). Clay iron-ore is one of the most valuable ores of the metal, and occurs largely in beds and nodules in the Carboni- ferous system, as well as in parts of the Jurassic series in Britain. In some of the oldest geological formations extensive beds occur of hematite and magnetite.

Serpentine.—This mineral occurs massive, forming large bands of rock. In some places it may have been an original deposit from oceanic water, comparable to the glauconite found filling the chambers of Foraminifera, and occurring extensively both in old geological formations and on the present ocean-floor. The serpen- tines associated with the gneisses and other crystalline rocks have had this origin assigned to them by Sterry Hunt. There can be no doubt, however, that many, probably most, scrpentines are the results of the alteration of pre-existing rocks. Tschermak pointed out that much serpentine has been produced by the hydration and alteration of olivine, and this view has been confirmed by illustra- tions from all parts of the world. In many serpentines the forms of the original crystals of olivine may still be detected. Hence the difficulty in understanding how there could be intrusive masses of serpentine—a hydrated magnesian silicate—is now removed, for we see that the original olivine-rocks may have been intruded as molten masses which would preserve their external characters as eruptive rocks though undergoing an internal conversion into serpentine. With many Paleozoic limestones, and more particularly with the crystalline beds which occur among the schistose rocks, serpentine is frequently associated. Some of this may represent the result of an alteration of dolomite, though, as above stated, it may with more probability be connected with some original oceanic deposit of a magnesian silicate.

2. Compound Rocks.

Nearly the whole of the rocks in this division consist of two or more minerals. A few examples occur, however, where, at least in some parts of their mass, the rocks are formed of only one mineral. Strictly speaking, these excep- tions should be placed among the simple rocks. But they are so closely linked with the compound masses that to separate them would do much more violence to geological continuity than any harm likely to arise from the present

atrangement. Besides, a rock which, like obsidian, may appear quite simple at one place may, at a short distance, show the presence of other minerals entitling it to a place among the compound rocks.

(a.) Massive Rocks.—This important division consists almost entirely of rocks which have resulted from igneous fusion. Considered from a chemical point of view, these rocks may be described as mixtures in different proportions of silicates of alumina, magnesia, lime, potash, and soda, usually with magnetic iron and phosphate of lime, and, in a great group of rocks, with an excess of silicic acid, existing as free quartz. Taking this last feature as a basis of arrangement, some petrographers have proposed to divide the igneous rocks into an acid group, including such rocks as granite, quartz-porphyry, and quartz-trachyte, where the percentage of silica ranges from 60 to 75, and a basic group, typified by such rooks as leucite-lava and basalt, where the proportion of silica is only about 50 per cent,

In the vast majority of igneous rocks the chief silicate is a felspar,—the number of rocks where the felspar is repre- sented by another silicate (as leucite or nepheline) being comparatively few and unimportant. As the felspars group themselves into two great series, the monoclinic or orthoclase, and the triclinic or plagioclase, the former with, on the whole, a preponderance of silica, and as the minerals occur under tolerably distinct and definite conditions, it has been proposed to divide the felspar-bearing massive rocks into two series,—(1) the orthoclase rocks, having orthoclase as their chief silicate, and often with free silica in excess, and (2) the plagioclase rocks, where the chief silicate is some species of triclinic felspar. The former series corresponds generally to the acid group above mentioned, while the plagioclase rocks are on the whole decidedly basic, It has been objected to this arrangement that the so-called plagioclase felspars are in reality very distinct minerals, with proportions of silica, ranging from 43 to 69 per cent. ; soda from 0 to 12; and lime from 0 to 20, But in the state of minute subdivision in which the minerals occur in many igneous rocks, it is often scarcely possible to determine the species of felspar.

Without attempting here any formal classification, accord- ing either to relative proportion of silica or to the distin- guishing felspar, it may be sufficient to arrange the following description of the massive rocks in a continuous series, with the most typical acid or orthoclase rocks at the beginning, and the basio felsparless rocks at the end,

Granite is a thoroughly erystalline-granular admixture of felspar, mica, and quartz. ‘he felspar is chiefly orthoclase, but striated triclinic felspars (as oligoclase and albite) may often be observed in smaller quantity. The mica in most granites seems to be the potash or muscovite variety, usually of a white silvery aspect; sometimes it is dark brown or black, and belongs to biotite (mag- hesian mica) or lepidomelane. Dr Heddle finds the common mica of the granites in the Scottish Highlands to be a new variety, which he has called haughtonite. The quartz may be observed to form a kind of paste or magma wrapping round the other ingredients (see fig. 1). It is only in cavities of the granite that the component minerals occur as independent well-formed crystals, and there too the aecessory minerals are chiefly found, such as beryl, topaz, tour- maline, &c.

Microscopic examination of

granite by Sorby and other later observers has shown that the

J quartz is full of cavities containing liquid, sometimes in such numbers as to amount to a thousand millions in a cubie inch. The liquid in these cavities appears usually to be water containing chlorides of soda and potash, with sulphates of potash, soda, and lime.

Granites vary in texture from extremely coarse crystalline masses, with crystals an inch or more in length, to fine granular rocks which pass into elvanite or felsite. They are sometimes porphyritie, with large seattered orthoclase crystals. The variety known as graphic granite is distinguished by the way in which the quartz is erystal- lized through the felspar in imperfect or hemihedral shells arranged with their longer axes generally parallel, so as to produce on cross fracture the appearance of Hebrew charaeters.

The mean of eleven analyses of granites made by Dr Haughton

gave the following average composition :—Silica, 72:07; alumina, 14°81; peroxide of iron, 2°22; potash, 511; soda, 2°79; lime, 1°63; magnesia, 0°38 ; loss by ignition, 1-09; total, 100°05,—with a mean specific gravity of 2°66.

Granite occurs (1) as an eruptive rock, forming huge bosses, which rise through other formations both stratified and unstratified, and sending out veins into the surrounding and overlying rocks, which usually show evidence of much alteration as they approach the' granite ; (2) connected with true voleanic rocks, and forming pro- bably the lower portions of masses which flowed out at the surface as lavas; and (8) in the heart of mountain chains and elsewhere, so intimately connected with metamorphic rocks as to suggest that it is itsclf a final stage of the metamorphism of rocks. Granite is thus a deeidedly plutonic rock; that is, it has consolidated at some depth beneath the surface, and in this respect differs from the superficial volcanic rocks, such as lavas, which have flowed out above ground from voleanic orifices.

Quartz-porphyry, Helsite-porphyry, Felstone, Felsite. —These names are given to different conditions under which orthoclase and quartz unite to form a massive ernptive rock. When the quartz forms well-marked grains, blebs, or crystals, the rock is a quartz-porphyry; when the felspar and quartz are so intimately mixed as to appear to the eye as a homogeneous matrix, the rock is called by one of the other epithets. .

The base of the rock, whether in the form of quartz-porphyry or felstone, is usually exceedingly compact or even flinty in texture. Under the microscope it shows the microfelsitic character, the true nature and origin of which is still the subject of much discussion among petrographers. When the quartz occurs in forms visible to the naked eye it usually appears as round or irregular grains, varying in size from mere specks up to pieces as large as a pea or larger. Less frequently it occurs definitely crystallized, and some- times in perfect doubly terminated pyramids. ;

Besides the othoclase of the diffused matrix, this mineral occurs in crystalline fragments and crystals, which sometimes reach to the length of an inch or more, so as to give a markedly porphyritic character to the rock. Triclinic felspars usually occur, though perhaps not so commonly as in

granite. Mica and hornblende are among the most frequent of the minerals which accompany the two essential constituents, while apatite, magnetite, and pyrite are not infrequent accessories.

The eolours of quartz-porphyry and felstone depend chiefly upon those of the felspar,—flesh-red, reddish-brown, purple, yellow, bluish or slate-grey, and even white, being in different places eharacteristic. The presence of much mica or hornblende gives dark grey, brown, or greenish tints. It will be observed in this, as in other rocks containing much felspar, that the oolour, besides depending on the hue of that mineral, is greatly regulated by the nature and stage of decomposition. A rock weathering externally with a pale yellow or white crust may be found to be quite dark in the central un-decayed portion.

The flesh-red quartz-porphyry of Dobritz, near Meissen, in Saxony, was found by Rentzsch to have the following chemical composition :—Silica, 76:92; alumina, 12°89; potash, 4°27; soda, 0°68; lime, 0°68; magnesia, 0°98; oxide of iron, 1°15; water, 1-97 ; total, 99°54,—specifie gravity, 2°49.

Besides the differences of colour already referred to, minor varieties in composition are produced by the relative abundance and size of the felspar crystals, and by the presence of mica (micaccous quartz- porphyry, micaceous felstone, or felsite), hornblende (hornblendic quartz-porphyry or felstone), or other accessory ingredient. The variety called minette consists of a felsite base with crystals of orthoclase and dark mica, and may be regarded as a micaecous fel- stone, bearing the same relation to the acid felspar-roeks (felstones) that mica-porphyrite does to the more basic forms (porphyrites). When the base is very compact, and the felspar-erystals well defined and of a different colour from the base, the rock sometimes takes a good polish, and may be used with effect as an ornamental stone. In ordinary language such a stone is elassed with the « marbles,” under the name of * porphyry.”

Closely related to the quartz-porphyries and felstones, of which, indeed, it can be regarded only as a variety, comes the rock known as elvan or elvanite. This isa Cornish term for a erystal- line-granular mixture of quartz and o1thoclase, forming veins whieh proceed from granite, or occur only in

its neighbourhood and are evidently associated with it. It forms an immediate stage between granite and quartz-porphyry.

Quartz-porphyry and the other varieties included under this species occur (1) with plutonic rocks, as eruptive bosses or veins, often associated with granite, from which, indeed, the elvanite, as just stated, may be seen to proceed directly; of frequent oeenrrenee also as veins and irregularly intruded masses among highly con- voluted rocks, especially when these have been more _or less meta- morphosed ; (2) in the chimneys of old voleanie orifices, forming there the ‘‘neck” or plug by whieh the vent is filled up; and (3) as truly voleanic rocks which have been erupted at, the surface in the form of flows of lava, either (a) submarine, as – the felstones ot

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Wales, associated with the marine Lower Silurian rocks, or (0) subaerial, as probably in the quartz-porphyry of Arran, and perhaps in the series of the ‘‘ green-slates and porphyries” of the Silurian

system in Cumberland, which Professor Ramsay has conjectured to |

be the produets of a subaerial volcano, ‘ Pitehstone (Retinite) is a glassy rock, having a pitch-like or resinous

lustre, and a black or dark-green colour ranging through shades of |

green, brown, and yellow to nearly white. It is essentially an srthoelase rock, and may be regarded as the natural glass of many of the more granular or crystalline orthoclase rocks, such as the quartz- porphyries or felsites. Examined microscopically, it is found to consist of glass in which are diffused, in greater or less abundance, hair-like microlites, angular or irregular grains, ov more definitely formed crystals. ‘The pitchstone of

Corriegills, in the island of Arran, presents abundant green, feathery, and dendritic microlites of a pytoxenic character (see fig. 3). on ;

According to Durocher the mean composition of pitchstone is— silica, 70°6; alumina, 15°0; potash, 1°6; soda, 2°4; lime, 1°2; magnesia, 0°6; oxides of iron and manganese, 2°6 ; loss by ignition, 60. The mean specific gravity is given as 2°34.

Pitchstone is found either as intrusive dykes, veins, or bosses, probably in close connexion with former voleanic activity, or In sheets which, like the porphyritic pitchstone of the Isle of Higg, flowed out at the surface as lava-streams.

Liparite (Rhyolite, Quartz-trachyte) is an orthoelase rock con- taining an cxcess of silica which usually appears in distinct grains or in doubly terminated pyramids. The orthoclase, which is of the variety termed sanidine, is sparingly accompanied with triclinic felspar. Other frequent ingredients are magnesia-mica, hornblende, augite, apatite, and magnetite. Considerable diversity exists in the texture of this rock. Some varieties are coarse and granitoid in character, and are regarded by some petrographers as the equiva- lents in Tertiary times of the granite of older geological periods. From this crystalline aspect intermediate varieties may be obtained like the quartz-porphyries, passing by degrees into more or less distinctly vitreous rocks. Throughout all these gradations, how- ever, a charactcristic ground mass can be seen under the microscope having a glassy, enamel-like, or porcellanous character. An analysis by Vom Rath of a rhyolite from the Euganean Hills gave—silica, 76°03; alumina, 13°32; soda, 5°29; potash, 3°83; protoxide of iron, 1:74; magnesia, 0°30; lime, 0°85; loss; 0°32; total, 101°68,— specific gravity, 2°553. eal date occurring in the form of erupted lavas.

Obsidian is a volcanic glass representing the vitreous condition of |

a highly silicated sanidine-rock, such as liparite. It resembles bottle glass, having a perfect conchoidal fracture, and breaking into sharp splinters, semi-transpavent or translucent at the edges. The colours of the rock are black, brown, or greyish-green, rarely yellow, blue, or red, but not infrequently streaked or banded with paler and darker lines. . When a thin

slice of obsidian is prepared for the microscrope it is found to be very pale yellow, grey, or nearly colourless. On being magnified it shows that the usual dark colours are almost always produced by the presence of minute crys- tals, needles, and black hair-like bodies. In rare examples the obsidian appeavs as a perfect glass without any foreign admixture. The minute crystals and hair-like bodies sometimes so increase in abundance as to make the rock lose the aspect of a glass and assume that of a dull flint-like or enamel-like stone. This devitrification can only be properly studied with the microscope. Again little granules (spherulites) of a dull grey enamel (pearlstone) appear, and in some parts of the rock so abundantly as to alter its character and convert it from obsidian into pearlstone. The average chemical composition of the rock is—silica, 71°0; alumina, 13°8; potash, 4:0; soda, 52; lime, 1°1; magnesia, 0°6; oxides of iron and man- ganese, 3‘7; loss, 0°6; total, 100°0,—mean specific gravity, 2°40. Li occurs as a product of the volcanoes of late geological eriods. ‘ Pearlstone (Perlite) is another vitreous condition of sanidine lava, As its name denotes, it consists of vitreous or enamel-like globules, occasionally assuming polygonal forms by mutual pressure. These globules sometimes constitute the entire rock, their outer portions shading off into each other so. as to form a compact mass ; in other eases they are separated by and eemented in a compact glass or enamel. They consist of successive very thin shells, which, in a transverse section, are seen as concentric rings, usually full of the game kind of hair-like crystallites and crystals as in obsidian. Occasionally there are found among them true spherulites where the internal structure is radiating fibrous. When such spherulites occupy the main mass they give rise to spherulite-rock.

Pumice is a general term for the cellular and filamentous or froth-like parts of lavas. In the great majority of cases it is a form of the obsidians, showing under the microscope the usually vitreous characters, and possessing a specific gravity of 2°0 to 2°53, though,

owing to its porous nature, it possesses great buoyancy and readily |

floats on water. At Hawaii, however, some of the pyroxenic or olivine lavas give rise to a pumiceous froth which has the usual outward characters of ordinary pumice.

Liparite is a voleanic rock of late geologi-: |

- geological date.

[11. GEOGNOSY.

The roeks enumerated up to this point arc all orthoclase-rocks, and markedly siliceous, frequently showing their exeess of silica in the form of quartz grains or erystals. In the succeeding group free quartz is not found as a marked constituent, although occasionally it occurs in some quantity. In this series syenite may be regarded as the equivalent of granite in the quartzose series, ovthoclase por- phyry of quartz-porphyry and felstone, and trachyte of liparite.

Syenite.—According to the modern nomenclature, this name,. which was formerly given in England to a granite with horn- blende replacing mica, is now restricted to a rock consisting essen-

_ tially of a mixture of orthoclase and hornblende, to whieh plagio-

elase, quartz, and miea arc occasionally added. The name syenite, first used by Pliny in reference to the roek of Syene, was introduced by Werner as a scientific designation, and applied to the rock of the Plauenscher-Grund, Dresden. Werner afterwards, however, made that rock a greenstone. The base of all syenites like that of granites is crystalline, without a trace of any amorphous substance between the erystals, such as most igneous rocks contain. Hence the texture is of that crystalline kind commonly known as granitic.

The typical syenite of the Plauenscher-Grund, formerly described as a coarse-grained mixture of fiesh-colonred orthoclase and black hornblende, containing no quartz, and with no indication of plagioclase, was regarded as a normal orthoclase-horublende rock. Microscopical research has, however, shown that well-striated tri- clinic felspar, as well as quartz, occurs in it. Its composition is shown by the following analysis:—silica, 59°83; alumina, 16°85; protoxide of iron, 7°01; lime, 4°48; magnesia, 2°61; potash, 6°57 ;, soda, 2°44; water, &c., 1°29; total, 101°03. The average specific gravity of syenite is from 2°75 to 2°90.

_ Syenite occurs under conditions similar to those in which granite is found; it has been erupted in large irregular masses, especially among metamorphic rocks, as well as in smaller bosses ‘and veins,

Orthoclase Porphyry (Quartzless Porphyry) is an orthoelase rock containing no quartz, or a very sparing admixture of that mineral, but with a little plagioclase, and not unfrequently with some horn- blende and dark biotite, It contains from 55 to 65 per cent. of silica, It differs thus from quartz-porphyry and felstone in its smaller. pro- portion of silica, but the distinction is one which, except by chemical or microscopical analyses, must often be difficult to estab- lish between the fine compact felstones and the orthoclase por- phyries, especially when the latter contain free quartz, This rock is sometimes termed syenite-porphyry, since it is associated with syenite much in the same way that elvanite is with granite. It is like syenite a plutonic rock, and oecurs in veins, dykes, and in- trusive sheets. Probably, however, many of the so-called ‘‘fel- stones” which occur as lavas, contemporaneously ejected with the older Paleozoic formations, are really orthoclase-porphyries.

Traehyte, a term originally applied to a large series of modern voleanic rocks possessing a charaeteristic roughness (rpax¥s) under the finger, is now restricted to roeks consisting cssentially of sanidine, with more or less triclinic felspar, usually with hom- blende, biotite, or augite, and sometimes with magnetite and apatite. In microscopic structure the rock is distinguishable from the quartz-trachytes or liparites by the absenee or feeble development of any microfelsitic ground-mass, and in general by the presence of a porphyritic base, consisting either of a pure glass or of one with de- vitrification products. The average composition of trachyte may be stated thus :—silica, 60°0; alumina, 17:0; protoxide of iron, 8:0; magnesia, 1°0; lime, 3°5; soda, 4:0; potash, 50; loss by ignition, 1°5. Average specific gravity, 2°65. Trachyte is a vol- eanic rock of Tertiary and post-Tertiary date. ‘

Phonolite (Clinkstone), a term suggested by the metallic ringing sound emitted by the compact varieties when struck, is applied to a mixture. of sanidine felspar and nepheline with hornblende and usually nosean. An average specimen contained silica, 57°7; alu- mina, 20°6; potash, 6°0; soda,

7°0; lime, 1°5; magnesia, 0°5; oxides of iron and manganese, 8°5; loss by ignition, 3°2 per cent, The specific gravity may be taken as about 2°58. Phonolite is sometimes found splitting into thin slabs which can be used for roofing pur- poses. Occasionally it assumes a porphyritic texture from the presence of large crystals of sanidine or of hornblende. When the roek is partly decomposed and takes a somewhat porous texture, it resembles trachyte in appearance.

Like trachyte, phonolite is a thoroughly volcanic rock and of late It occurs sometimes filling the pipes of volcanic orifices, sometimes as sheets which have been poured out in the form of lava-streams, and sometimes as dykes and veins.

ln the rocks enumerated up to this point the essential felspar

| constituent is orthoclase; in the felspar rocks now to be described

the corresponding ingredient is nearly always some triclinic form. In the voleanie voeks of this scries there is usually some mineral of the hornblende or augite family present in such quantity as to give a green or even black colour to the mass.

Porphyrite may be used as the designation of rocks which consist essentially of some triclinic felspar, and show a glassy or partially devitrified ground-mass containing abundant crystals of plagioclase

with magnetite or titaniferous iron, and sometimes hornblende, augite, or mica, These rocks include many varieties which have not yet been thoroughly examined. The texture varies from coarse erystalline-granular to exceedingly close-grained, and passes oc- casionally even into vitreous. Porphyrite is a volcanic rock very characteristic of the later palewozoic formations, occurring there as interstratified lava:beds, aud in eruptive sheets, dykes, veins, and irregular bosses.

Dorite (Greenstone in part) is a crystalline- mixture of oligoclase or some allied felspar and hornblende with magnetic iron and apatite. Where free

quartz occurs the rock is called quartz-diorite, The more compact dark varieties have been termed aphanite, The average chemical composition of this rock may be taken to be— silica, 53°2; alumina, 16:0; potash, 1°3; soda, 2°2; lime, 63; magnesia, 6°0 ; oxides of iron and manganese, 14:0; loss by ignition, 1:0. The mean specific gravity is about 2°95. Diorite occurs as an eruptive rock under conditions similar to those of quartz-porphyry and syenite. It is found in paleozoic volcanic regions, as in North Wales, in ‘‘neck”-like masses which may mark the position of some of the voleanic orifices of eruption.

Propylite is a name given to certain Tertiary volcanic rocks consist- ing of a plagioclase felspar and hornblende in a fine-grained ground- mass. They are subject to considerable alteration, the hornblende being converted into epidote. Some quartziferous propylites have been described by Zirkel from Clarence King’s Survey of the 40th Parallel, wherein the quartz abounds in liquid cavities containing briskly moving bubbles, and sometimes double enclosures with an interior of liquid carbonic acid.

Hornblende- Andesite is a rock of late geological date consisting of a plagioclase felspar and hornblende on with a little sanidine. The ground-mass is frequently quite crystalline, or shows a small proportion of a felsitic nature, with microlites and granules. When the rock contains free quartz it is called Dactte,

In the next series of rocks augite plays a similar part to that taken by hornblende in the foregoing species,

Diabase,—This name has been given to certain dark green or black eruptive rocks found in the older geological formations and consist- ing essentially of a triclinic or plagioclase felspar, augite, magnetic or titaniferous iron, sometimes olivine, and usually with more or less of a diffused greenish substance which has resulted from the altera- tion of the augite or olivine. The texture is sometimes quite crys- talline; in other cases it shows a felsitic ground-mass, Except that the so-called diabases are confined to Paleozoic rocks and the basalis to Tertiary and post-Tertiary formations, therc seems no essential dis- tinction between these two groups, though, of course, as the diabases are much older and have been far longer exposed to metamorphic processes, they are in general less fresh than the basalts,

Melaphyre is a term which has been so variously used that the sense in which it is taken must always be explained. Thus Seuft described it as a rock having an indistinctly mixed character, with colours ranging from dirty greenish-brown, or reddish-grey, or greenish black-brown, to a complete black; hard and tough when fresh, and then showing crystals of reddish-grey labradorite, with magnetic titaniferous iron, and usually with carbonates of lime and iron, and ferruginous chlorite (delessite), in crystalline grains ; com- pact or earthy, or sometimes porphyritic or amygdaloidal. Naumann defines melaphyre as a close-grained rock, very often amygda- loidal, composed essentially of labradorite, with an undetermined silicate, some titaniferous iron, carbonates of lime and of iron, and sometimes crystals of augite, tubellan, and mica. Zirkel called it generally crypto-crystalline, sometimes porphyritic, very often amygdaloidal rock, consisting of a mixture of oligoclase and augite with magnetic iron. Lastly, Rosenbusch proposes to restrict it to those plagioclase-augite rocks which contain olivine, and possess a distinct porphyry ground-mass. There can be littlé doubt that, like the so-called diabases, the melaphyres are merely older forms of the great basalt-family, –

Augite- Andesite is the name given to certain dark eruptive rocks of Tertiary and post-Tertiary date which consist of a triclinic felspar (oligoclase, or some species rather richer in silica than labradorite) and augite, with sometimes sanidine, hornblende, biotite, magnetite, or apatite, and in some varieties quartz. The composition of an example from Santorin, erupted in the year 1866, was found to be as follows :—silica, 67°35; alumina, 15°72; magnesia, 1°16; lime, 3°60; soda, 5°04; potash, 1 ‘86; oxides of iron, 1:94; loss by ignition, 0°36 ; total, 101:06. Mean specific gravity, 2°75.

Basalt.—Under this term are included those widespread and im- portant voleanic rocks which consist of a triclinic felspar, probably always labradorite, augite, olivine, and magnetic or titaniferous iron, with apatite, and sometimes sanidine or nephcline. The more coarsely crystalline varieties are known as dolerite, while those of in- termediate texture have been termed anamesite, the more close-grained black heavy kinds being distinctively basalts, The chemical com- position of an average variety may

be set down as silica, 45:0; alumina, 15-0; magnesia, 6°5; lime, 10°5; soda, 3°5; potash, 15; oxides of iron and Manganese, 150; loss by ignition, 3°0. Mean Specific gravity, 2°95.

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Zirkel has described under the name of basalt certain roeks in which the part of the felspar is played by another mineral, in some cases nepheline, in others leucite,

Basalt occurs as dykes and veins, intrusive bosses and sheets, and suecessive contemporaneous flows. It often presents a columnar structure, as at Staffa and the Giant's Causeway, whence the structure has been popularly termed basaltic.

Lachylite is a black voleanic glass often found in association with basalt, of which indeed it is merely the vitreous condition. Thusa basalt-dyke sometimes shows a thin crust of this pitch-like substance on its walls, where the molten rock was first suddenly cooled.

Palagonite is a voleanic glass related to basalt, and found in fragments in some tuffs,

Gabbro (Diallage-rock) is a compound of a triclinic felspar and diallage often with olivine, and also very generally with magnetic or titaniferous iron and apatite, more rarely with hornblende, biotite, or quartz. An average chemical composition is silica, 50°0; alumina 15°0; magnesia, 7:0; lime, 10:0 ; soda, 2°5 ; potash, 0°5; oxides of iron and manganese, 12°5; loss by ignition, 2°5. Mean specific gravity, 2°95.

A very few crystalline massive rocks occur without felspar as an essential constituent; but they are of comparatively little importance as rock-masses, though interesting in themselves and sometimes of considerable beauty,

Pikrite is a rock rich in olivine, usually more or less serpentinized,

with augite, magnetite, or ilmenite, and a little brown biotite, horn-

blende, or apatite. Eulysite is a mixture of olivine, augite, and red garnet. Garnet-olivine-rock is composed of olivine, diallage, and garnet. Enstatite-olivine-rock consists of olivine and enstatite (bronzite or hypersthene) with magnetite or chromite. Lherzolite is a mixture of olivine, pyroxene, picotitc, and usually some magnetite,

Eclogite is a compound of ‘garnet and omphacite, or smaragdite (hornblende),

Dunite is a mixture of olivine and chromite, found with serpentine,

Limburgite is composed of erystals of olivine, augite, and mag- netite, in a base more or less vitreous, y

(2.) Schistose or Foliated Rocks.—These form an exceed- ingly well-defined characteristic series, They are distin- guished from the massive rocks by the possession of an internal arrangement into more or less closely ~~parallel layers or folia, consisting of materials which have assumed a crystalline character along these layers. The layers may be composed of only one mineral, but are usually of two or more, which occur either in distinct, often alternate, lamin or intermingled in the same layer. More~~ over, the layers are not usually continuous for more than a short space. As a rule they are strikingly lenticular, thickening out and then dying away, and reappearing after an interval on the same or a different plane. They are likewise characteristically welded, as it were, into each other, the crystalline particles of one lamina being so inter- mingled with those of the layers above and below it that the whole coheres as a tough not easily fissilemass. Though arranged in distinct layers, a schistose rock is usually dis- tinguished from an ordinary sedimentary one by the irregu- larity of its lamination, and by a remarkable and eminently distinctive puckering or crumpling of the folia. The vast plications which can“be seen from a distance running up the face of a mountain are repeated on a smaller scale in hand specimens, and even down to such proportions as can only be seen with a microscope. As already stated, the origin of these rocks has been the subject of much discussion. That they are metamorphosed sediments, and

not original chemical precipitates, is the general opinion of geologists. See part iv,

A foliated rock showing this characteristic irregular fissility in a marked degree is termed a ‘schist.’ This word, placed after the distinguishing mineral of the rock, is used as the name of the rock, as mica-schist, chlorite-schist, hornblende-schist. If the mass loses its fissile tendency owing to the felting together of the component mineral into a tough coherent whole, the word rock is usually sub- stituted for schist, as in hornblende-rock, actinolite-rock, and soon. ‘There are thus three kinds of fissility among rocks: —(1) that of original deposit, as in sliale,—this is termed

lamination ; (2) that of cleavage, as in clay slate ; (3) that of foliation, as in the schists. There is a fourth kind of divisional planes, that of joints, sometimes so closely placed together as almost to rival the others, as will be pointed out

in part iv.

Mica-sehist (Mica-slate) is a schistose aggregate of quartz and mica. The relative proportions of the two minerals vary widely even in the same mass of rock. Each is arranged in lenticular wavy lamine. The quartz shows greater inconstancy in the number and thickness of its folia. Frequently a layer of this mineral may often be seen to swell out to a thickness of an inch or more, and, dwindling rapidly down toa mere thread, disappear. The quartz may often be ob- served to retain a granular character like that of quartz-rock, no doubt indicative of its originally sedimentary origin (see fig. 6). The mica lies in thin plates, sometimes so dovetailed into each other as to form long continuous irregular crumpled folia, separating the quartz layers, and often in the form of thin spangles and mem- branes running in the quartz. Among the accessory minerals, garnet, felspar, and hornblende are not infrequent. Mica-schist forms extensive regions in Norway, Scotland, the Alps, and other parts of Europe, in connexion with other members of the schistose family of rocks. It is also found encircling granite masses in Scot- land and Ireland as a metamorphic zone a milc or so broad, which shades away into the unaltered strata of greywacke or slate outside.

Though the possession of a fissile structure, showing abundant divisional surfaces covered with glistening mica, is characteristic of mica-schist, we must distinguish between this structure and that of many inicaceous sandstones which can be split into thin seams each splendent with the sheen of its mica-flakes. A little examination will show that in the latter case the mica has not crystallized in situ, but exists merely in the form of detached worn scales, which, though lying on the same general plain, are not welded into each other as in a schist; also that the quartz does not exist in folia but in rounded separate grains.

Gneiss is a crystalline schistose aggregate of the same minerals as in granite —felspar, quartz, and mica. The relative proportions of these minerals, and the manner in which they are grouped with each other, give rise to numerous varieties of the ree As a rule the folia are coarser and the schistose character less perfect than in niica-schist. Sometimes the quartz lies in tolerably pure bands a foot or even more in thickness with plates of mica scattered through it. These quartz layers may be replaced by a crystalline mixture

of quartz and felspar, or the felspar will take the form of independent lenticular folia, while the mica runs abundantly through the rock, and by its own ready cleavage imparts a fissile structure to the whole. Sometimes the mica is mostly or wholly replaced by hornblende, in other cases by tale (protogine-gneiss). Like mica-schist, gneiss occupies a large space in regions where the older geological forma- tions come to the surface. Varietics of it are also found in the metamorphic zone encircling some masses of granite. So coarse is — the texture of many gneisses that they cannot, in hand-specimens nor even in large blocks, be certainly discriminated from granite. In such eases it is only by examination in the field and the detection of clear evidence of foliated structure that their true character can be determined.

An interesting and important variety is met with in some regions of gneiss and schist, viz., conglomerate bands in which pebbles of quartz and other

materials from less than an inch to more than a foot in diameter are imbedded in a foliated matrix. Examples of this kind are found in the pass of the Téte Noir between Martigny and Chamouni, in N. W. Ireland, in the islands of Bute and Islay, and in different parts of Argyllshire. These enclosures arc not to be dis- tinguished from the ordinary water-worn blocks of true conglomer- ates; but the original matrix which encloses them has been so altcred as to acquire a micaceous foliated structure, and to wrap the pebbles round as with a kind of glaze. These facts are of considerable value in regard to the theory of the origin of the crystalline schists.

Granulite (Leptynite) is a crystalline schistose aggregate of orthoclase and quartz, with some garnct and kyanite. .

Chlorite-schist (or Chlorite-slate) is a schistose aggregate of green chlorite, often with some quartz, felspar, mica, or tale. The morc massive forms (Japis ollaris, potstone) can be cut as building stouc, or for the manufacture of articles for domestic use.

Talc-schist is a schistose aggregate of whitish-grcen or yellowish tale often combined with felspar or quartz. Dr Heddle has recently shown that many so-called talc-schists contain no talc, but owe their unctuous character to a variety of mica (margarodite).

Hornblende-sehist is a schistose mass of black or dark-green horn- blende, but often interleaved with felspar, quartz, or mica. When the schistose character disappears, the mass becomes a hornblende roek (amphibolite). When the variety actinolite occurs instcad of common hornblende it forms actiuolite-schist.

Numerous other varieties of schists have been described, but they occupy very subordinate places among the foliated rocks. The following analyses show the chemical, composition of the more important of those which have been enumerated :—

dog | Protoxide — Silica. | Alumina. yy of Man- Magnesia.| Lime. | Soda. | Potash.| Water. ee ganese, eee | 2 = Mica-schist SOOO oR Can are 65°13 | 18°16 5:27 0°51 2°70 | 0°32 | 0°53 | 2:99 Sone TiO, 1°54 =100‘88 | 2°773 MOMACAVOTICISS, ... es cesaeiceeisls | 70°20 | 14:04 | 6°84 eee 0°80 {|

2°03 | 0:91 | 2°98 | 1°67 1 Ou | = 00c19) | an Hornblende gneiss……..... 56°83 | 19°68 | 8°64] tracc 3:28 | 1°89 | 3°14 | 2°34 | 2°69 cud oe = 99°05 | 2°80 Granulite be eeeeeenaneeeseueeeees 73°47 | 14°86 3‘28 ace 0°67 1°62 | 1°80 | 3°95 0°57 a = IX), on Chlorite-schist BS otoenaToGoubs 42°08 | 3°51 | 26°85} 0°59 17:10 | 1:04 ee af 11°24 An =102°41 | 2°75 MALCSSCLUS tess eaecammcsccecmcnes | 50°81 4°53 | 7°58 31°55 na ao Aa 4°42 Mie =-98‘89; ... Horublende-rock ……..... 49°42 | 18°12 | 15°01 3°16 8°65 | 2:57 | 1°27.| 1°80 loss =100‘00} .

As the disappearance of the schistose structure produces a crystalline amorphous compound like that of a massive or ordinary igneous rock, we are brought at last round again to rocks which we cannot distinguish from those to which elsewhere an igneous origin is assigned. In gneiss, for example, the same minerals occur which form graulite, and possess a crystalline character. Any process, such as irregular internal motion of the mass, which could destroy the schistose structure and produce a thoroughly ‘granite-like texture, would give rise to a rock which, what- ever its previous history might have been, could not be dis- tinguished from granite. That such internal transforma- tions have taken place among the crystalline gneissose masses can hardly be doubted. And thus, at the one end

of the schistose series, we may have ordinary unaltered sedi-

ment; at the other, after many intermediate stages, a thoroughly crystalline amorphous rock like granite or syenite.

II. Fragmental (Clastic) Rocks.

‘ticles which had previously existed on the surface of the

earth in another form, and the accumulation and consoli- dation of which gave rise to new compounds. Some of these rocks have been produced by the mechanical action of running water, such as gravel, sand, and mud; others have arisen from the gathering together of the remains of once living plants or animals; others have been formed by the consolidation of the loose debris thrown out by volcanoes, (a.) Gravel and Sand Rocks.—Ordinary gravel and sand are produced by the action of running water on every sea-coast and river-course. These sedimentary materials, being mere mechanical

formations, vary indefinitely in composition, according to the nature of the source from which they are derived. Asa rule they consist of the detritus of siliceous rocks, these being among the most durable materials. Quartz, in particular, enters largely into the composition of sandy and gravelly detritus. Fragmentary materials tend to group themselves according to their size and relative density. Hence they are apt to occur in layers, and to show the elaracteristic stratified arrangement of sedimentary rocks.

This great series embraces all rocks of a secondary or | They may enclose the remains of any plants or animals derivative origin; in other words, all formed of par- | entombed on the same sea-floor, river-bed, or lake-bottom.

FRAGMENTAL ROCKS. |

Blown sand is sand which has been produced by previous wave- action, and is blown into long ridges or dunes by prevailing winds, It varies in composition as ordinary sandstones do, being sometimes entirely siliceous, sometimes calcareous where derived from triturated shells or other calcareous organisms. Layers of finer and coarser particles often alternate as in water-formed sandstone, Grasses and other plants bind the surface of the shifting sand, but are apt to be covered by fresh encroachments of the loose material, and then by their decay they give rise to dark peaty layers in the sand. Calcareous blown sand is compacted into hard stone by the action of rain-water which alternately dissolves a little of the lime and re-deposits it on evaporation as a thin crust cementing the grains of sand to-

ether.

: Clif-debris consists of angular rubbish disengaged by frost and ordinary atmospheric waste from the ace of cliffs, crags, and steep slopes. It slides down the declivities of hilly regions, and accumu- lates at the base of slopes and precipices, until washed away by rain or by brooks. It naturally depends for its composition upon the nature of the solid rocks from which it is derived. The material constituting glacier moraines is of this kind.

Kain-wash is a loam or earth which accumulates on the lower parts of slopes or at their base, and is due to the gradual descent of the finest particles of disintegrated rocks by the transporting action of vain. Brick-

earth is the name given in the south-east of England to thick masses of such loam which are extensively used for making bricks.

Subsotl is the broken-up part of the rocks immediately under the soil. Its character of course is determined by that of the rock out of which it is formed by subaerial disintegration.

Soil is the product of the subaerial decomposition of rocks and of the decay of plants and animals. Primarily the character of the soil is determined by that of the subsoil, of which indeed it is merely a further disintegration. The formation of soil is treated in part ili., pages 265, 269.

Conglomerate (Puddingstone) is aname given to any rock formed of consolidated gravel or shingle. The component pebbles are rounded and water-worn. They may consist of any kind of rock, though usually of some hard and durable sort, such as quartz or quartz-rock. A special name may be given according to the nature of the pebbles, as quartz-conglomerate, limestone-conglomerate, granite- conglomerate, &c. The paste or cementing matrix may consist of a hardened sand or clay, and may be siliceous, calcareous, argillaceous, or ferruginous. In the coarser conglomerates, where the blocks may exceed 6 feet in length, there is often very little indication of Stratification. Except where the flatter stones show by their general parallelism the rude lines of ep otlls it may be only when the mass of conglomerate is taken asa whole, in its relation to the rocks below and above it, that its claim to be considered a stratified rock will be conceded.

Breccia is a rock in which the stones are angwar and not rounded, and usually with less trace of stratification than in conglomerate. Intermediate stages between this rock and the receding, where the stones are partly angular and partly subangular and rounded, are known as brecciated conglomerate,

Sandstonc is a rock formed of consolidated sand. The component grains are for the most part of quartz—a most durable mineral, which must here be regarded as the residue left after all the more decomposable niinerals of the original rocks have been carried away In solution or in suspension as fine mud. The colours of sand- stones arise, not so much from that of the quartz,

which is com- mouly white or grey, as from the film or crust which often coats the grains and holds them together as a cement. As already stated iron is the great colouring ingredient of rocks, In sandstones it gives rise to red, brown, yellow, and green liues, according to its degree of oxidation and hydration. In ordinary red sandstones, for example, each grain of sand is coated with red earthy hematite. In yellow sandstone the oxide has become hydrous in the form of limonite.

There is as much variety of composition aniong sandstones as among conglomerates. Though they consist for the most part of siliceous grains, they include others of clay, felspar, mica, or other miueral ; and these may increase in number so as to give a special character to the rock. “Thus sandstones may be argillaceous, fels- pathic, micaceous, ealcareous, &c. By an increase in the argillaceous constituents, a sandstone may pass into one of the clay-rocks, just as modern sand on the sea-floor shades imperceptibly into mud. On the other hand, by an augmentation in the size of the grains a sandstone may becomea grit, ora pebbly or conglomeratic sandstone, and pass into a fine conglomerate. A piece of fine-grained sand- stone seen under the microscope looks like a coarse couglomerate, so that the difference between the two rocks is little more than one of relative size.

Among the varieties of sandstones may be mentioned Flagstone, a thin-bedded sandstone capable of being split into slabs or flags ; Freestonc, a sandstone which can be cut freely in any direction (the term is popularly applied to some limestones and other rocks); and Buhrstonc, a highly siliceous, exceedingly compact, though cellular,

rock (with Chara seeds, &c.), found alternating with unaltered Tertiary strata in the Paris basin, and forming from its hardness and roughness an excellent material for the grindstones of flour-mills,

Greywacke is a compact aggregate of rounded or subangular grains of quartz, slate, felspar, or other minerals or rocks cemented by a paste which is usually siliceous but may be argillaceous, felspathic, or calcareous. Grey,

as its name denotes, is the prevailing colour f but it passes into brown, brownish-purple, and sometimes, where anthracite occurs, into black. The rock is distinguished from ordinary sandstone by its darker hue, its hardness, the variety of its component grains, and above all by the compact cement in which the grains are imbedded. In many varieties so pervaded is the rock by the siliceous paste that it possesses great toughness, and its grains seem to graduate into each other as well as into the surrounding matrix. Such rocks when fine-grained can hardly, at first sight or with the unaided eye, be distinguished from some compact igneous rocks, though a microscopic examination at once reveals their frag- mental character. In other cases, where the greywacke has been formed mainly out of the debris of granite, quartz-porphyry, or other felspathic masses, the grains consist so largely of felspar, and the paste also is so felspathic, that the rock might be mistaken for some close-grained granular porphyry. Greywacke occurs exten- sively among the Paleozoic formations in beds alternating with shales and conglomerates. It represents the sand of the Paleozoie sea-floor, retaining often its ripple-marks and sun-cracks. The metamorphism it has undergone has generally not been great, and for the most part is limited to induration, partly by pressure and partly by permeation of a siliceous cement.

Quartz-rock (Quartzile) is a close-grained granular aggregate of quartz cemented by a highly siliceous matrix. Originally it con- sisted of a tolerably pure quartz-sand, which has been metamor- phosed by pressure and the transfusion of a siliceous cement into an exceedingly hard mass, This cement was probably produced by the solvent action of heated water upon the quartz grains, which very generally seem to shade off into each other, or into the intervening silica. It is owing no doubt to the putely siliceous character of the grains that the blending of these with the swrounding cement 1s more intimate than in greywacke,’so much so that the rock often assumes an almost flinty homogeneous texture, That quartz-rock as here described is an original sedimentary rock and not a chemical deposit is shown, not only by its granular texture, but by the exact resemblance of all its leading features to ordinary sandstone—false-bedding, alternation of coarser and finer layers, worm-burrows, and fucoid-casts. It occurs in the form of large masses interstratified with limestones, slates, and schists. It is also met with locally as an altered form of

sandstone, where this rock is traversed by igneous dykes and indurated into quartz-rock for a distance of a few inches or feet from the intrusive mass. Bands of highly silicated sandstones, having the lustrous aspect, fine grain, and great hardness of uartz-rock, occur among the unaltered shales and other strata of the Carboniferous system. In such cases, the supposition of any general metamorphism being inadmissible, we must suppose either that these quartzose bands have been indurated, for example, by the passage through them of thermal silicated water, or that the quartz-rock is there an original formation. :

(6.) Clay-rocks.—-These are composed of the finer argil- laceous sediments or muds derived from the waste of pre- viously formed rocks. Perfectly pure clay, hydrated silicate of alumina, may be seen where some granites and other felspar-bearing rocks decompose. But, as a rule, the clay is mixed with various impurities.

Pipe-clay is white, nearly pure, and free from iron. Fire-clay is a deposit largely found in connexion with coal-seams, contains little iron, and is nearly free from lime and alkalies, Some of the most typical fire-clays are those long used at Stourbridge, Worcestershire, for the manufacture of pottery. The best glass- house pot-clay, that is, the most refractory, and therefore used for the construction of pots which have to stand the intense heat of a glass-house, has the following composition :—silica, 73°82 ; alumina, 15°88; protoxide of iron, 2°95 ; lime, trace; magnesia, trace ; alkalies, 90 ; sulphuric acid, trace; chlorine, trace ; water, 6°45 ; specific gravity, 2°51. A very siliceous close-grained or flinty variety, termed Gannister, occurs in the Lower Coal-measures of the north of England, and is now largely ground down as a material for the hearths of iron furnaces. brick-clay is properly rather an industrial than a geological term, since it is applied to any clay, loam, or earth, from which bricks or coarse pottery are made. It is an impure clay, containing a good deal of iron, with other ingredients. An analysis gave the following composition of a brick-clay :—silica, 49°44; alumina, 34°26; sesquioxide of iron, 7°74; lime, 1°48 ; magnesia, 5‘14; water, 1:94. ;

Mudstone is a fine, usually more or less sandy, argillaceous rock, having no fissile character, and of somewhat greater hardness than any form of clay.

The term C/ay-rock has been applied by some

writers to an indurated clay requiring to be ground and mixed with water before it acquires plasticity. ;

When clay has been deposited intermittently so as to assume a thinly stratified or fissile structure, it receives the general name of Shale. Under this term are included all laminated and indurated clays which are capable of being split along the lines of deposit into hard leaves. They present almost endless varieties of texture and composition, passing on the one hand into clays, on the other into flagstones and sandstones, or again, through calcareous grada- tions into limestone, or through ferruginous varieties into clay- ironstone, and through bituminous kinds into coal. An important variety, known as Oil-shale, aud containing so much bituminous matter that it is now extensively used as a source for the manufac- ture of solid paraffin and mineral oils is described in the next section.

Flinty-slate (Lydian-stone, Hornstone) is siliceous shale or mud- stone which has been indurated into an exceedingly compact flinty mass, breaking with a conchoidal or splintery fracture, and usually of dark colours, black, brown, and red, more rarely white.

Clay-shate is a compact close-grained, very hard, fissile argillaceous rock, dull lead-blue, grey, green, red, purple, or black in colour, splitting into thin leaves which are not those of original deposit but those produced by a superinduced cleavage. In this case the rock has been affected by great lateral pressure, whereby its particles have been forced to adjust themselves with their longer axes perpendicular to the direction of pressure. This rearrange- ment has imparted to the rock a fissility wholly independent of original lamination. The possession of this cleavage is the distine- tive character of a true slate.

(c.) Rocks formed of the Debris of Plants.—These have sometimes been produced by the decay and entombment of vegetation on the spot where it grew, sometimes by the drifting of the plants to a distance and their

consolidation there. In the latter case, they may be mingled with inorganic sediment, so as to pass into carbonaceous shale.

Peat is vegetable matter, more or less decomposed and chemically altcred, found in boggy places and elsewhere where marshy plants grow and decay. It varies from a pale yellow or brown fibrous substance, like turf or compressed hay, in which the plant remains are abundant and conspicuous, to a compact dark-brown or black material, resembling black clay when wet and some varieties of lignite when dried. The nature and proportions of the constituent elements of peat, after being dried at 100° C., are illustrated by the analysis of an Irish example which gave—carbon, 60°48 ; hydrogen, 6°10; oxygen, 32°55; nitrogen, 0°88; while the ash was 3°30.

There is always a large proportion of water which cannot be driven off even by drying the peat. In the manufacture of com- pressed peat for fuel this constituent, which of course greatly lessens the value of the peat as compared with an equal weight of coal, is driven off to a great extent by chopping the peat into fine picces, and thereby cxposing a large surface to evaporation. The ash varies in amount from less than 1:00 to more than 65 per cent., and consists of sand, clay, ferric oxide, sulphuric acid, and minute proportions of lime, soda, potash, and magnesia.

Lignite is compressed and chemically altered vegetable mattcr, often retaining a lamellar or ligneous texture, and stems with woody fibre crossing each other in all directions. It varies from pale brown or yellow to deep brown or black. Some shade of brown is the usual colour, whence the name brown coal, by which it is often known. It occurs in beds chiefly among the Tertiary strata, under conditions similar. to those in which coal is found in older forma- tions. It may be regarded as a stage in the alteration and mincral- ization of vegetable matter intermediate between peat and true coal.

Coal, the most completely mineralized form of vegetable matter, occurs as a black (sometimes dark-brown), brittle, usually lustrous substance, intercalated in beds between-strata of sandstone, shale, fireclay, &c., in geological formations of Paleozoic, Secondary, and Tertiary age. The word coal is rather a popular than a scienific term, as it is indiscriminately applied to any mineral substance capable of being used as fuel. Strictly

employed it ought only to be used with reference to beds of fossilized vegetation, the result pees of the growth of plants on the spot or of the drifting of them

ither.

The following analyses show the’ chemical constituents in some of the principal varieties of coal :—

*|\Caking Coal.| Splint Coal. ‘Cannel Coal,} Anthracite.

GATED OME aunies since scenes

86°75 79°58 664 91°44 Li lyyge bitayaaSi0) Sopennanmpeone 5°24 5°50 7°54. 3°46 Oxygen — 8°33 10°84 2°58 INMETOSenIn) ee 1:13 1°36 0°21 Earthy substances … 1°40 5°46 13°82 2°31 Specific gravity…..... 1:28 fea 127 1:39

GHOL

ou F

Diatom-earth is a siliceous deposit formed chiefly of the frustulcs of diatoms. It is laid down both in salt and in fresh water. Wide ° tracts of it are now being deposited on the bed of the South Pacific. In Virginia, United States, an extensive tract occurs covered with diatom-earth to a depth of 40 feet. It is used as a polishing or tripoli powder.

Oil shale (Brandschicfer) is shale eontaining such a proportion of hydrocarbons as to be capable of yielding mineral oil on slow distil- lation. This substance occurs as ordinary shales do, in layers or beds, interstratified with other aqueous deposits, as in the Scottish coal-fields. It is in a geological sense true shale, and owes_jits peculiarity to the quantity of vegetable (or animal) matter which has been preserved among its inorganic constituents, It consists of

[11, GEOGNOSY.

fissile argillaceous layers, highly impregnated with bituminous

matter, passing on one side into common shale, on the other into cannel or parrot coal. The richer varieties yield from 80 to 40 gallons of crude oil to the ton of shale. They may be distinguished from non-bituminous or feebly bituminous shales (throughout the shale districts of Scotland) by the peculiarity that a thin paring curls up in front of the knife, and shows a brown lustrous streak. Some of the shales in the Lothians are crowded with the valves of ostracod crustaceans, besides scales, corprolites, &c., of ganoid fishes (Palaon- iscus, Amblypterus, Megalichthys, &c.); and it is possible that the bituminous matter may in some cases have resulted from animal organisms, though the abundance of plant remains indicates that it is probably in most cases of vegetable origin: Under the name ‘“‘pyroschists” Sterry Hunt classes the clays or shales (of all gco- logical ages) which are hydrocarbonaceous, and yield by distillation volatile hydrocarbons, inflammable gas, &c.

(d.) Rocks formed of Animal Remains.—These may be formed on land, as in bone caves, but most abundantly under water, as on the bottom of lakes and of the sea. They may be calcareous, siliceous, or phosphatic.

Limestone.—Besides the limestones resulting from the deposition of chemical precipitates of carbonate of lime, there is another important serics derived from the remains of organisms, either by growth on the spot, or by accumulation as mechanical sediment. Limestone so originating has often been so altered that it cannot always be distinguished from that which has been chemically pro- duced, especially when it has been exposed to the action of per- colating acidulated water, for in that case a crystalline texture is gradually superinduced, by which the original organic structures in the mass are wholly or in great part obliterated. Limestone com- posed of the remains of living organisms forms thin layers and massive beds. In some instances, as in that of the English and Irish Mountain Limestone, it occurs in masses several thousand feet thick, which extend for hundreds of square miles, and form the rock out of which picturesque valleys, gorges, hills, and table-lands have been excavated. Limestone may be either of fresh watcr or of marine origin. Some of the more common and important varieties may be here enumerated :—

Coral-rock is limestone formed by the continuous growth of coral- building polyps. This substance affords an excellent illustration of the way in which organic structure may be effaced from a limestone entirely formed from the remains of once living animals. Though the skeletons of the reef-building corals remain distinct on the upper surface, those of their predecessors beneath them are gradually obliterated by the passage through them – of percolating water dissolving and redepositing carbonate of lime. This same action may be observed among the stalactites of a damp vault, in which, though the successive rings of growth are preserved, a crystalline divergent structure is superinduced, which traverses these rings from the centre outward. We can thus understand how a mass of crystalline limestone may have becn produced from one formed out of organic remains without the action of any subterranean heat, but merely by the permeation of water from the surface. Crinoidal (Encrinite) Limestone is a rock com- posed in great part of joints of encrinites, with Foraminifera, corals, and mollusks. It varies in colour from white or pale grey, through shades of bluish-grey (sometimes yellow or brown, less commonly red) to a dark-grey or even black colour. It is abundant among Paleozoic formations, being especially characteristic of the lower part of the Carboniferous system. Chalk as a lithological term is applied to a white soft rock, mcagre to the touch, soiling fhe fingers, formed of a finc calcareous flour derived from the remains of Fora- minifera, echinoderms, mollusks, and other marine organisms. It occurs in massive beds, and covers a great part of the south-east and east of England. In Ireland and elsewhere it assumes a firmer grain and various colours, so as to pass into some of the numerous varieties of compact white limestone. Shcll-Marl, a soft white, — earthy, or crumbly deposit, is formed in lakes and ponds by the accu- mulation of the remains of shells and Entomostraca on the bottom. When such calcareous deposits become solid compact stone they are known as fresh-water (lacustrine) limestone. These arc generally of a

smooth, texture, and either dull white or pale grey, their fracture only slightly conchoidal, rarely splintery. Ooze is a mud of organic origin found covering vast areas of the floor of the Atlantic and other oceans. Some of it is caleareous and formed wholly or mostly of the remains of Foraminifera,

particularly of forms of the genus Globiger- ina; hence this deposit has been termed foraminiferal or globigerina ooze. Sometimes it is mainly siliceous, consisting of the remains of Kadiolaria (Radiolarian ooze) or of diatoms (Diatom ooze). These de- posits are further referred to in the section of this article which treats of the geological aspects of the ocean… Shell-sand is a sand com- posed in great measure or wholly of comminuted shells, found com- monly on a low shelving coast exposed to prevalent on-shore winds. This deposit when thrown above the reach of the waves and often wetted by rain, or by trickling runnels of water, is apt to become consolidated into a mass, owing to the solution and redeposit of lime round the grains of shell. ,

Flint and Chert are siliceous rocks (which, though not strictly fragmental, may be conveniently placed here) found in nodules and layers in limestones of many different geological ages, Flint is a dark horny substance, breaking with a splintery to conchoidal fracture. Itis particularly abundant in the chalk formation, ; Chert is an impure flint, containing more clay or lime with the silica, These substances seem in some cases to have had a directly organic origin, having been secreted from sea-water by the living organisms ; in other cases, where for example ave find a calcareous shell, or echinus, or coral, converted into silica, it would seem that the sub- stitution of silica for lime has been effected by a process of chemical pseudomorphism either after or during the formation of the lime- stone,?

(e.) Volcanic Fragmental Rocks form an interesting group composed of the loose materials ejected from volcanic vents, In their typical condition they consist merely of consolidated volcanic debris, including bombs, scori, ejected blocks, sand, lapilli, and dust. It is evident, however, that, when these materials were deposited in water, there would neces- sarily be a limit beyond which they would not extend, and Where they would be mingled with and would insensibly pass into ordinary non-volcanic sediment. Hence we may expect to find transitional varieties between rocks formed directly from the results of volcanic explosion and ordinary sedimeutary deposits. Moreover, as these fragmental vol. canic masses usually consist almost wholly of the detritus of different lavas, which have been blown into fragments in the volcanic chinmeys, we may expect to find, on the other hand, a passage from them into rocks derived from consolidated lava-beds by ordinary aqueous erosion. (See: part iv.)

Voleante Conglomerate is a rock composed mainly or wholly of rounded or subangular fragments of any voleanic rocks in a paste derived chiefly or wholly from the same materials, usually exhibiting a stratified arrangement, and often found intcrealated between suc- cessive sheets of lava. In most cases conglomerates of this kind have been formed by the accumulation of materials ejected from vol. canic vents ; occasionally, as justremarked, they may have resulted from the aqueous erosion of previously solidified lavas, or from a combination of both these processes. There does not appear at present to be any satisfactory method of always determining the exact mode of formation, except that well-rounded and smoothed stones will almost certainly indicate long-continued water-action rather than trituration in a volcanic vent.

The volcanic conglomerates may receive different names according

to the nature of the component fragments: thus we have basalt-con-

glomerates, where these fragments are wholly or mainly of basalt, trachyte-conglomerates, porphyrite-eonglomerates, phonolite-conglo- merates, &e.

Volcanie Breccia resembles volcanic conglomerates, except that the stones arc angular. This angularity indicates an absence of aqueous erosion, and, under the circumstances in which it is found, usually points to volcanic explosions. There is a great variety of breccias, as basalt-breceia, diabase-breeeia, &e.

Volcanic Agglomerate is the name given to a tumultuous assem- blage of blocks of all sizes up to masses several yards in dia- meter. It is met with in the “necks” or pipes of old voleanice ori- fices. he stones and paste are commonly of one or more voleanic rocks, such as basalt or porphyrite, but they include also fragments of the surouuding rocks, whatever these may be, through which the voleanic orifice has been drilled. As a rule agglomerate is devoid of stratification; but sometimes it includes portions which

have a more or less distinct alrangement in beds of coarser-and fincr

detritus, often placed on end or inclined in different directions at

high angles.

1 Hull and Hardman vol. i. 71, 1878.

on Chert, Trans. Roy. Dub. Soe., new ser. ,

the earth,

Voleantie Tuff.—This general term may be made to include all the finer kinds of volcanic detritus, ranging on the one hand through coarse gravelly deposits into conglomerates, and on the other into exceedingly compuct fine-grained rocks formed -of the finest and most impalpable kind of voleanic dust. Some tuffs are full of inicrolites or imperfect forms of crystallization derived from the lava which has blown into dust. — Others are formed of small rounded or angular grains of different lavas with fragments of various rocks through which the voleanic funnels have been drilled. Minutely cellular grains, as if derived from the ebullition of very fluid glassy lava like palagonite, constitute much of the tuff in some of the volcanic necks of Carboniferous age in central Scotland. Some tuffs have consolidated under water, others on dry land. As a rule they are distinetly stratified. Near the original vents of eruption they commonly present rapid alternations of finer and coarser detritus indicative of successive phases of volcanic activity.

The tuffs may be subdivided according to the nature of the lava from the disintegration of which they have been formed. ‘Thus we have felsite-tuffs, trachyte-tuffs, basalt-tuffs, pumiecc-tuffs, porphyrite- tuffs, palagontte-tuffs. Some varieties have received special names, Trass (Duckstein, Tuffstein) is a compact yellow pumiceous tuff which has filled up some of the valleys of the Eifel region and is largely quarried as an hydraulic mortar, Peperino is an Italian tuff of late geological date, full of separate crystals of augite and other minerals,

Under this section is included the investigation of those processes of change which are at present in progress upon whereby modifications are made on the structure and composition of the crust, on the relations between the interior and the surface, as shown by volcanoes, earthquakes, and other terrestrial disturbances, on the distribution of oceans and continents, on the outlines of the land, on the form and depth of the sea-bottom, on climate, and on tlie races of plants and animals by which the earth is tenanted. It brings before us, in short, the whole range of activities which it is the province of geology to study, and leads us to precise notions regarding their relations to each other, and the results which they achieve. A knowledge of this branch of the subject is thus the essential groundwork ofa true and fruitful acquaintance with the principles of geology, seeing that it necessitates a study of the present order of nature, and thus provides a key for the interpretation of the past.

The whole range of operations included within the scope of inquiry in this branch of the science may be regarded as a vast cycle of change, into which we may break at any point, and round which we may travel, only to find our- selves brought back to our starting-point. It is a matter of comparatively small moment at what part of the cycle we begin our inquiries. We shall always find that the changes we see in action have resulted from some that preceded, and give place to others which follow them.

At an early time in the earth’s history, anterior to any of the periods of which a record remains in the visible rocks, the chief sources of geological action probably lay within the earth itself. The planet still retained a great store of its initial heat, and in all likelihood was the theatre of great chemical changes, giving rise, perhaps, to manifesta- tions of volcanic energy somewhat like those which have so marvellously roughened the surface of the moon. As the outer layers of the globe cooled, and the disturbances duc to internal heat and chemical action became less marked, the influence of the sun, which must always have operated, would then stand out more clearly, giving rise to that wide: cirele of superficial changes wherein variations of tempera- ture and the circulation of air and water over the surface of the earth come into play.

In the pursuit of his inquiries into the past history and into the present régime of the earth, the geologist must needs keep his mind ever open to the reception of evidence

for kinds and especially for degrees of action which he had

not before imagined. Human experience has been too short

to allow him to assume that all the causes and modes of geo- logical change have been definitively ascertained. On the earth itself there may remain for future discovery evidence of former operations by heat, magnetism, chemical change, or otherwise, which may explain many of the phenomena with which geology has to deal. Of the influences, so many and profound, which the sun exerts upon our planet, we can as yet only dimly perceive alittle. Nor can we tell what other cosmical influences may have lent their aid in the cvolution of geological changes. ;

In the present state of our knowledge, all the geological energy upon and within the earth must ultimately be traced back to our parent sun. There is, however, a certain pro- priety and convenience in distinguishing between that part of it which is due to the survival of some of the original energy of the planet, and that part which arises from the present supply of energy received day by day from the sun. In the former case we have to deal with, the interior of the earth and its reaction upon the surface} in the latter we deal with the surface of the earth, and to some extent with its reaction on the interior. This distinction allows of a broad treatment of the subject under two divisions :—

I. Hypogene or Plutonic Action—the changes within the earth caused by original internal heat and by chemical action. S

IL. Hpigene or Surface Action—the changes produced on the superficial parts of the earth, chiefly by the circulation of air and water set in motion by the sun’s heat.

DIVISION I.—HYPOGENE ACTION.

An Inquiry into the Geological Changes in Progress beneath the Surface of the Larth.

Tn the discussion of this branch of the subject we must carry in our minds the conception of a globe still intensely hot in its interior, radiating heat into space, and conse- quently contracting in bulk. Portions of molten rocks from inside are from time to time poured out at the surface. Sudden shocks are generated by which destructive earth- quakes are propagated to and along the surface. Wide geographical areas are pushed up or allowed to sink down. In the midst of these movements very remarkable changes are produced upon the rocks of the crust; they are shat- tered, fractured, squeezed, crumpled, rendered crystallme, and even fused.

Section, I.—Volcanoes and Volcanic Action.

The term volcanic action (vulcanism or vulcanicity) embraces all the phenomena connected with the expulsion of heated materials from the interior of the earth to the surface. Among these phenomena there are some of an evanescent character, while others leave permanent proofs of their existence. It is naturally to the latter that the geologist gives the chief attention, for it is by their means that he can trace the former phases of volcanic activity in regions where, for many ages, there lave been no volcanic eruptions. In the operations of existing volcanoes he can observe only the superficial manifestations of volcanic action. But, examining the rocks of the earth’s crust, he discovers that in the lapse of ages, amid the many terrestrial revolu- tions which geology reveals, the very roots of former voleauoes have been laid bare, displaying subterranean phases of vulcanism which could not be studied in any modern volcano. Hence an acquaintance only with active volcanoes will not give us a complete knowledge of volcanic action. It must be supplemented and enlarged by an investigation of the traces of former volcanoes preserved in the crust of the carth.

The openings by which the heated materials from the interior reach the surface include volcanoes (with their

accompanying orifices), hot-springs, and gas-springs. A volcano may be defined as a conical eminence, composed wholly or mainly of materials which have been ejected from below, and which have accumulated at the surface round” the vent of eruption. As arule it presents at its summit a cup-shaped cavity termed the crater, at the bottom of which is the top of the main funnel or pipe whereby the communication is maintained with the heated interior. A volcano, when of small size, may consist merely of one diminutive cone; when of the largest dimensions, it forms a huge mountain, with many subsidiary cones and many lateral fissures or pipes, from which the heated volcanic products are given out.

Volcanoes may break through any kind of geological formation, In Auvergne, in the Miocene period, they. burst through the granitic and gneissose plateau of central France. In Lower Old Red Sandstone times they pierced contorted Silurian rocks in central Scotland. In late Tertiary and post-Tertiary ages they found their way through soft marine strata, and formed the huge piles of Etna, Somma, and Vesuvius. On the banks of the Rhine, at Bonn and elsewhere, they have penetrated some of the older alluvia of that river. In many instances, also, newer voleanoes have appeared on the sites of older ones. In Scotland the Carboniferous volcanoes have risen on the sites of those of the Old Red Sandstone, those of the Permian period have broken out among the earlier Carboniferous eruptions, while the Miocene lavas have been injected into all these older volcanic masses, Again, the newer puys of Auvergne were sometimes erupted through much older and already greatly denuded basalt-streams. Somma and Vesuvius have arisen out of the great Neapolitan plain of marine tuff. In central Italy, also, newer cones have been thrown up upon the great Roman plain of more ancient volcanic debris.

Tt is usual to class volcanoes as active, dormant, and extinct. This arrangement, however, often presents con- siderable difficulty in its application. An active voleano cannot of course be mistaken, for even when not in actual eruption it shows, by its abundant evolution of steam and. hot vapours, that it might break out into activity at any moment. But it is in many cases impossible to decide whether a volcano should be called extinct

or only dormant. The volcanoes of Silurian age in Wales, of Carboniferous age in Ireland, of Permian age in the Hartz, of Miocene age in the Hebrides, are certainly all extinct. But the Miocene volcanoes of Iceland are still represented there by Skaptar- Joékull, Hecla, and their neighbours. Somma, in the first century of the Christian era, would have been naturally regarded as an extinct volcano. Its fires had never been known to have been kindled within human tradition ; its vast crater was a wilderness of wild vines and brushwood, haunted, no doubt, by wolf and wild-boar. Yet in a few days, in the autumn of the year 79 the half of the crater walls was blown out by a. terrific series of explosions, the present Vesuvius was then formed within the limits of the earlier crater, and since that time volcanic action has been intermittently exhibited up to the present day. Some of the intervals of quietude, however, have been so consider- able that the mountain might then again have been claimed as an extinct volcano, Thus, in the 131 years between 1500 and 1631, so completely had eruptions ceased that the crater had once more become choked with copsewood. A few pools and springs of very salt and hot water remained as memorials of the former condition of the mountain. But this period of quiescence closed with the eruption of 1631, —the most powerful of all the known explosions of Vesu- vius, except the great one of 79.

In the island of Ischia, Mont Epomeo was last in eruption in the year 1302, its previous outburst having taken place,

it is believed, about 17 centuries before that date. From the craters of the Hifel, Auvergne, the Vivarais, and central Italy, though many of them Jook as if they had only re- cently been formed, no eruption has been known to come during the times of human history or tradition, From these examples it is clear that no real distinction can be drawn between dormant and extinct volcanoes. Also, from the fact above mentioned, that volcanoes have often appeared on areas occupied by those of previous geolo- gical periods, it is equally evident that volcanic action is apt to show itself again and again even at vast intervals within the same regions and over the same sites,

§ 1. Volcanic Products.

The materials erupted from volcanic vents may be classed as (1) gases and vapours, (2) lavas, (3) fragmentary sub- stances. A brief summary under each of these heads may be given here; the mode and order of appearance of the several products will be stated in § 2. :

1. Gases and Vapours.—These play an important part in volcanic avtivity; they show themselves in the earliest stages of a volcano's history, and continue to appear for centuries after all the other evidences of subterranean action have ceased to be manifested. By much the most abundant of them allis steam. It has been estimated to form yoooths of the whole cloud which hangs over an active voleano. In great eruptions it rises in prodigious quantities, and is rapidly condensed into a heavy rainfall. M.

Fouqué calculated that during 100 days Etna had ejected vapour enough to form, if condensed, 2,100,000 cubic

metres of water. But even from volcanoes which, like the

Solfatara near Naples, have been dormant for many cen-

turies it sometimes still rises without intermission and in considerable volume. Jets of vapour rush out from clefts

in the sides and bottom of a crater with a noise like

that made by the steam blown off by a locomotive. The number of these funnels is often so large, and the amount of vapour so abundant, that only now and then, when the wind blows the dense cloud aside, can a momen. tary glimpse be had of a part of the bottom of the crater ' while at the same time the rush and roar of the escaping steam remind one of the din of some vast factory. Aqueous vapour rises likewise from rents on the outside of the volcanic cone. It issues go copiously froin the molten lava which pours down the slopes of the cone that the stream of rock is almost concealed from view by the cloud ; and it continues to escape from fissures of the lava, far below the point from which the molten matter proceeded, for a long time after the rock has solidified and come to rest. So saturated, as it were, are many crystalline lavas with the vapour of water that Mr Scrope even suggested that they derive their mobility from this cause,

Probably in no case is the steam mere pure vapour of water. It is associated with other vapours and gases dis- engaged from the potent chemical laboratory underneath. Of these probably the most abundant is sulphuretted-hydrogen, readily traceable by its characteristicodour, Its liability to decomposition leads to the deposition of a yellow crust of sulphur about the orifices from which it rises ; perhaps, also, in great part to the alteration of this gas must we attribute the sulphuric acid so frequently observed at volcanic vents. Another gas especially abundant at Vesuvius, but not detected in all volcanoes, is hydrochloric acid, which comes away with the steam, and gives it its pungent suffocating fumes. Carbonic acid appears in most volcanoes, partly as one of their usual products, but chiefly given off during the feebler conditions of activity and in the last stages of vulcanism. After an erup- tion of Vesuvius this gas has sometimes been discharged So copiously that hundreds of hares, pheasants, and part-

ridges have been suffocated by it. In the ancient volcanic regions of the Eifel and Auvergne, it still rises in pro- digious quantities. Bischof estimates that the quantity of carbonic acid evolved in the Brohl Thal amounts to five millions of cubic feet, or 300 tons of gas in one day. Nitrogen, derived doubtless from the decomposition of atmospheric air dissolved in the water which penetrates into the volcanic foci, has been frequently detected among the gaseous emanations.

With these gases and vapours are associated many sub- stances which, sublimed by the volcanic heat, appear as deposits along crevices and surfaces wherein they reach the air and are cooled. Besides sulphur, which has been already mentioned, there are several chlorides (particularly that of sodium, and less abundantly those of iron, copper, and lead), sal-ammoniac, specular iron, oxide of copper (tenorite), boracic acid, and other substances. Sodium chloride sometimes appears so abundantly that wide spaces of a volcanic cone, as well as of the newly erupted lava, are crusted with salt, which can even be profitably removed by the inhabitants of the district. Considerable quantities of these chlorides may thus be buried between successive sheets of lava, and in long subsequent times may give rise to

mineral springs, as has been suggested with reference to the saline waters which issue from volcanic rocks of Old Red Sandstone and Carboniferous age in Scotland. The iron- chloride forms a bright yellow and reddish crust on the crater walls, as well as on loose stones on the slopes of the cone. Specular iron forms abundantly as thin lamelle in the fissures of Vesuvian lavas. Tenorite may be seen at the edge of the crater of Vesuvius, condensing into fine filaments which are blown away by the wind. An order of succession has been observed to take place in the ap- pearance of the different volcanic gaseous discharges.

In connexion with the aqueous vapour of volcanoes, reference may be made here to the abundant discharges of water which accompany volcanic explosions. Three sources of this water may be assigned :—(1) from the melting of snow by a rapid accession of temperature previous to or during an eruption,—this takes place from time to time on Etna, and still more markedly in Iceland and among the showy ranges of the Andes; (2) from the condensation of the vast clouds of steam which are discharged during an eruption,—this undoubtedly is the chief source of the destructive torrents so frequently observed to form part of the phenomena of a great volcanic explosion ; and (3) from the disruption of reservoirs of water filling subterranean cavities, or of lakes occupying crater-basins,—this has several times been observed among the South American volcanoes, where immense quantities of dead fish, which inhabited the water, have been swept down with the escap- ing torrents. The volcano of Agua, in Guatemala, has never been known to discharge anything but water. In the large crater of Idjén, one of the volcanoes of J ava, lay a hot steaming lake of acid water, Inthe beginning of the year 1817 an eruption took place, by which the water was discharged with frightful destruction down the slopes of the mountain. After the explosion the basin filled again with water, but its temperature was no longer high.

In many cases the water rapidly collects volcanic dust as it rushes down, and soon becomes a pasty mud, or it issues at first in this condition from the volcanic reservoirs, from which, after violent detonations, it is discharged. Hence arise what ate termed mud-lavas or aqueous lavas, which in many respects behave like trne igneous lavas. This mud eventually consolidates into one of the numerous forms of tuff,—a rock which, as has been already

stated (p. 239); varies greatly in the amount of its coherence, in its composition, and in its internal arrangement. Obviously, unless where subsequently altered, it can possess none on the crystalline Xx. — 31

structure of true lavas. AS a rule it betrays its aqueous origin by more or less distinct evidence of stratification, by the multifarious pebbles, stones, blocks of rock, tree-trunks, branches, shells, bones, skeletons, which it has swept along in its course and preserved within its mass. Sections of this compacted tuff may be seen at Herculaneum. The trass of the Brohl Thal and other valleys in the Hifel district, referred to on p. 239, is another example of an ancient volcanic mud.

9. Lavas.—The term lava is applied generally to all the molten rocks which flow out from volcanoes!' The behaviour of the lava as it issues and flows down the volcanic cones will be described in the next sub-section. It will be sufficient to refer here to some of the leading pecu- liarities of the lavas viewed as volcanic products. 1.) Their specific gravity ranges between 2°37 and 3:22, (2.) The heavier varieties contain much magnetic or titani- ferous iron, with augite and olivine, their composition being basic, and their proportion of silica averaging about 45 or 50 percent. In this group come the basalts, dolerites, nepheline-lavas, and leucite-lavas. The lighter varieties contain commonly a minor proportion of metallic bases, but are rich in silica, their percentage of that acid ranging between 60 and 80. They are thus not basic but acid rocks. Among their more important species, trachyte, rhyolite, obsidian, pitchstone, and pumice may be enu- merated. (3.) They differ much in texture. (a) Some are entirely crystalline, consisting of nothing but an interlaced mass of crystals and crystalline particles, as in some dolerites. (0) Some show more or less of a half-glassy or stony matrix, in which the constituent crystals are imbedded ; this is the most common arrange- ment. (c) Others are entirely vitreous, such crystals or crystalline particles as occur in them being quite subordi- nate, and, so to speak, accidental enclosures in the main glassy mass. Obsidian or volcanic glass is the type of this group. (d) They further differ in the extent to which their mass has been affected by the interstitial steam at the time of their eruption. Some show no outward signs of any influence from that cause ; in

others, however, the expansion of the imprisoned steam has been such as to expand the still molten stone into an open cellular texture, somewhat like that of open ill-baked bread. Such a vesicular arrange- ment very commonly appears on the upper surface of a lava current. (4.) They vary greatly in colour and general external aspect. The heavy basic lavas are usually dark-grey, or almost black, though, on exposure to the weather, they usually acquire a brown tint from the oxidation and hydration of their iron. Their surface is commonly rough and rugged, until it has been sufficiently decomposed by the atmosphere to crumble into excellent soil which, under favourable circumstances, supports a luxuriant vegetation. The less dense lavas, such as phonolites and trachytes, are frequently paler in colour, sometimes pale yellow or buff, and decompose into light soils; but the obsidians present rugged black sheets of rock roughened with ridges and heaps of froth-like pumice.

3. Fragmentary Materials.—Under this title we include all the substances which, driven up into the air by volcanic explosions, fall in solid form to the ground—the dust ashes, sand, cinders, and blocks of every kind which are projected from a volcanic orifice. These materials must obviously differ greatly in composition, texture, and appear- ance, even during a single eruption, and still more in suc- cessive explosions of the same volcano. For the sake of convenience separate names are applied to some of the more oo ee ee ere

1 «¢ Alles ist lava was im Vulkane fliesst und durch seine Fliissigkeit neue Lagerstatter einnimmt” is Leopold Von Buch’s comprehensive definition.

distinct varieties. Of these the more important are the following. (1.) Ashes and Sand.—In many eruptions vast quantities of an exceedingly fine light grey powder are ejected. As this substance greatly resembles what is left after a piece of wood or coal is burnt in an open fire, it has been popularly termed ash, and this name has been adopted by geologists. If, however, by the word ash the result of combustion is implied, its employment to denote any pro- duct of volcanic action must be regretted as apt to convey a wrong

impression. The fine ashlike dust ejected by a volcano is merely.lava in an extremely fine state of com- minution, So minute are the particles that they find their way readily through the finest chinks of a closed room, and settle down upon floor and furniture as ordinary dust does when a house is shut up for a short time. From this finest form of material gradations may be traced through what is termed volcanic sand into the coarse varieties of ejected matter. In composition the ash and sand vary necessarily with the nature of the lava from which they are derived. (2.) When the fragments range from the size of a pea to that of a walnut they are called /apill:. These are pieces of lava, round, subangular, or angular in shape, and having the same indefinite range of composition as the finer dust, Asa rule, the coarse fragments fall nearest the focus of eruption. Sometimes they are solid fragments of lava, but more usually they have a cellular texture, while some- times they are so light and porous as to float readily on water, and, when ejected near the sea, to cover its surface over a large area, (3.) Volcanic Blocks are large pieces of stone, often angular in shape. In some cases they appear to be fragments loosened from already solidified rocks in the chimney of the volcano, Hence we find among them pieces of older tuffs, and of Javas recognizably belonging to early eruptions. But in other and numerous instances they are not volcanic rocks at all, but belong to earlier forma- tions through which the volcanic chimney has been drilled. Blocks of a coarsely crystalline granitoid lava have been par- ticularly observed both on Etna and Vesuvius. In the year 1870 a mass of that kind weighing several tons was to be seen lying at the foot of Vesuvius, within the entrance to the Atrio del Cavallo. Similar blocks occur among the Car- boniferous volcanic pipes of central Scotland. In the older tuffs of Somma, blocks of altered limestone form the chief repositories of the Vesuvian minerals, (4.) Volcanic Bombs and Slags.—These have originally formed portions of the column of lava ascending the pipe of the voleano, and have been detached and hurled into the air by the successive explosions of steam. In the case of a bomb, we have a round, elliptical, or pear-shaped and often discoidal mass of lava, from a few inches to several feet in diameter. Sometimes it is tolerably solid throughout, more usually vesicular. Not unfrequently it consists of a hollow interior, with a shell which is vesicular towards the centre and becomes more close-grained towards the outside. There can be no doubt that, when torn by eructations of steam from the surface of the boiling lava, the material of these bombs was in as

thoroughly molten a condition as the rest of the mass. From the rotatory motion imparted by its ejection, it took a circular form, and in proportion to its rapidity of rotation and fluidity would be the amount of its “ flattening at the poles.” The centrifugal force within would allow the expansion of the interstitial vapour, while the outer surface would rapidly cool and solidify ; hence the solid crust, and the porous or even cavernous interior. Such bombs, varying from the size of an apple to that of a man’s body, were found by Mr Darwin abundantly strewed over the ground in the island of Ascension.2. They have been found likewise in the tuff of

2 Geological Observations on Volcanic Islands, 2d edit., p. 42.

Lower Carboniferous date at Dunbar, in Scotland. When the ejected fragment of lava has a rough irregular form, and a porous structure like the clinker of au iron-furnace, it is known as a slag.

The fragmentary materials erupted by a volcano and deposited around it acquire by degrees more or less con- solidation, partly from the mere pressure of the higher upon

the lower strata, partly from the influence of infiltrating

water. It has been already stated (part ii., p. 239) that different names are applied to the rocks thus formed. The coarse, tumultuous, unstratified accumulation of vol- canic¢ debris within a crater or funnel is called agglomerate, When the debris, though still coarse, is more rounded, and is arranged in a stratified form, it is a volcanic con- glomerate. and lapilli, are included in the general designation of tufts, These are usually pale-yellowish, greyish, or brownish, some- times black rocks, granular, porous, and often incoherent in texture. Organic remains sometimes occur in tuff. Where the volcanic debris has accumulated over the floor of a lake, or of the sea, the entombing and preserving of shells and other organic objects must continually take place. But even in the tuffs of a volcanic-cone traces of animals and plants may be preserved. Professor Guiscardi of Naples has found about 100 species of marine shells of living species in the old tuffs of Vesuvius. Marine shells have been picked up within the crater of Monte

Nuovo, and have been frequently observed in the old or marine tuff of that district, The showers of ash which fall on the outer slopes of a volcano, or the sheets of mud which sometimes are spread out there, cover over and often preserve the land-shells, insects, and vegetation living on the area at the time. The older tuffs of Vesuvius have yielded many remains of the shrubs and trees which at successive periods have clothed the flanks of the mountain.

§ 2. Volcanic Action.

We have now to consider the circumstances under which the various solid, liquid, and gaseous products of a volcano are emitted. Volcainic action may be either constant or periodic. Stromboli, in the Mediterranean, so far as we know, has been uninterruptedly emitting hot stones, steam, and lava, from the earliest period of history. Among the Moluccas the volcano Sioa, and in the Friendly Islands that of Tofua, have never ceased to be in eruption since their first discovery. The lofty cone of Sangay, among the Andes of Quito, is always giving off hot vapours ; Cotopaxi, too, is ever constantly active. But, though examples of unceasing action may thus be cited from widely different quarters of the globe, they are nevertheless exceptional, The general rule is that a volcano breaks out from time to time with greater or less fury, and after longer or shorter intervals of quiescence. .

To what particular cause or series of causes any special eruption may be due is a question to which at present no definite answer can be given. An attempt has been made to show that the explosions of a volcano are to some extent regulated by the conditions of atmospheric pressure over the area at the time. In the case of a volcanic funnel like Stromboli, where, as Mr Scrope pointed out, the expansive subterranean force within, and the repressive effect of atmospheric pressure without, just balance each other, any serious disturbance of that pressure might be expected to make itself evident by a change in the condition of the volcano. Accordingly, it has long been remarked by the fishermen of the Lipari Islands that in stormy weather there is at Stromboli a more copious discharge of steam and stones than in fine weather. They make use of the cone as a weather-glass, the increase of its activity indicating a falling, and the diminution a rising barometer. In like

The finer-grained varieties, formed of dust |

manner Etna, according to S. von Waltershausen, is most active in the winter months. When we remember the con- nexion now indubitably established between a more copious discharge of fire-damp in mines and a lowering of atmo- spheric pressure, we may be prepared to find a similar influ- ence affecting the escape of vapours from the upper surface of the lava column of a volcano ; for it must not be forgotten that it is not so much to the lava itself as to the expansive vapours accompanying it that the manifestations of volcanic activity are due. Among the Vesuvian eruptions since the middle of the 17th century, the number which took place in winter and spring was to that of those which broke out in summer and autumn as 7 to 4. But there may be other causes besides atmospheric pressure concerned in these differences ; the preponderance of rain during the winter and spring may be one of these. At present we must wait for further data.

Kluge has sought to trace a connexion between the years of maximum and minimum sun-spots and those of greatest and feeblest volcanic activity, and has constructed lists to show that years which have been specially characterized by terrestrial eruptions have coincided with those marked by few sun-spots and diminished magnetic disturbance.!- Such a connexion cannot be regarded as having yet been satis. factorily established. Again, the same author has called attention to the frequency and vigour of volcanic explosions about the middle of August, at or near the time of the yearly meteoric shower. But in this case, likewise, tlie cited examples can hardly yet be looked upon as more than coincidences.

The case of Kilauea, in Hawaii, seems to show a regular system of eruptive periods. Dana has pointed out that outbreaks of lava have taken place from that volcano at intervals of from eight to nine years, this being the time required to fill the crater up to the point of outbreak, or to a depth of 400 or 500 feet. But the great eruption of 1868 did not occur until after an interval of 18 years. The same author suggests that the missing eruption may have been submarine.

The approach of an eruption is not always indicated by any premonitory symptoms, for many tremendous explosions are recorded to have taken place in different parts of the world without any perceptible warning. Much in this respect would appear to depend upon the condition of liquidity of the lava, and the amount of resistance offered by it to the passage of the escaping vapours through its mass. In Hawaii, where the lavas are remarkably liquid, vast out- pourings of lava have taken place quietly without earth- quakes during the present century. But even there the great eruption of 1868 was accompanied by tremendous earthquakes,

The eruptions of Vesuvius are often preceded by a failure or diminution of the wells and springs in the district. But more frequent indications of an approaching outburst are conveyed by sympathetic movements of the ground beneath. Rumblings and groanings from a subterranean source are heard ; slight tremors succeed, increasing in frequency and violence till they become distinct earthquake shocks. ‘The vapours from the cratér rise more abundantly into the air. All this time the Java column in the pipe or funnel of the volcano has been slowly ascending, forced upward and kept in perpetual agitation by the passage of the elastic vapours through its mass. If a long previous interval of quiescence has elapsed, there may be much solidified lava towards the top of the vent which will restrain the ascent of the still molten portion underneath. A vast pressure is thus exercised on the sides of the cone. Should these be too weak to resist, they will open in one or more rents, and the Se —“—Cs—sS—OCS nc

1 Ueber Synchronismus und Antagonismus, p. 72.

liquid lava will issue from the outer slope of the mountain ; or the energies of the volcano will be directed towards clearing the obstruction in the chief throat, until, with tremendous explosions, and the rise of a vast cloud of dust

and fragments, the bottom and sides of the crater are finally

blown out, and the top of the cone disappears. The lava may now escape from the lowest part of the lip of the crater, while, at the same time,

immense numbers of red-hot bombs, scorize, and stones are shot up into the air, most of them falling back into the crater, but many descending upon the outer slopes of the cone, and some even upon the country beyond the base of the mountain. The lava rushes down at first like one or more rivers of melted iron, but, as it cools, its rate of motion lessens. Clouds of steam rise from its surface, as well as from the central crater. Indeed, every successive paroxysmal convulsion of the mountain is marked, even at a distance, by the rise of huge ball-like wreaths or clouds of steam, mixed with dust and stones, forming a vast column which towers sometimes a couple of miles above the summit of the cone. By degrees these diminish in frequency and intensity. The lava ceases to flow, the showers of stones and dust dwindle down, and after a time, which may vary from hours to days or months, even in the régime of the same mountain, the volcano be- comes once more tranquil.

Let us now consider some of the aspects of this action which have more particular geological interest from the permanent changes with which they are connected, or from the way in which they enable us to detect and realize con- ditions of volcanic energy in former periods.

Fissures.—During the convulsions which culminate in the formation of a volcano, as well as in the subsequent progress of the mountain so formed, the ground at and around the focus of action is liable to be rent open by fissures. These tend to diverge from the focus; but around the vent where the rocks have been most exposed to con- cussion the fissures sometimes intersect each other in all directions. In the great eruption of Etna, in the year 1669, a series of six parallel fissures opened on the side of the mouutain. One of these, with a breadth of two yards, ran for a distance of 12 miles, ina somewhat winding course, to within a mile of the top of the cone. Similar fissures, but on a smaller scale, have often been observed on Vesuvius; aud they are recorded from many other volcanoes.

Two obvious causes may be assigned for the production of fissures :—(1) the enormous expansive force of the im- prisoned vapours acting upon the walls of the funnel and convulsing the cone by successive explosions ; and (2) the liydrostatic pressure of the lava-column in the funnel, amounting to

about 125 Ib per square inch, or 8 tons on the square foot, for each 100 feet of depth. Both of these causes may act simultaneously.

Into the rents thus formed the molten lava naturally finds its way. Itis indeed forced into them, and solidifies there like iron in a mould. The cliffs of many an old crater show how marvellously they have been injected by such veins or dykes of lava. Those of Somma, andthe Val del Bue on Etna, have long been known. The dykes project now from the softer tutfs like great walls of masonry. Such wedges of solid rock driven into the cone must widen its dimensious, and at the same time from their leugth and ramifications must bind the substance of the cone together, and thus strengthen it against the effects of future convulsions. We can understand, therefore, how there should be for a time an alternation in the character of the eruptions of a volcano, depending in great measure upon the relation between the height of the cone on the one hand and the strength of its sides on the other. When the sides have been well braced together by interlacing dykes, and further thickened by the spread of volcanic materials

all over their slopes, they may resist the effects of explosion and of the pressure of the ascending lava-column. In this case the voleano may find relief only from its summit, and if the lava flows forth it will do so from the top of the cone. As the cone increases in elevation, however, the pressure from within upon its sides augments. Eventually egress is once more established on the flanks by means of fissures, aud a new series of lava-streams is poured out over the lower slopes.

Though lava very commonly issues from the lateral fissures on a volcanic cone, it may sometimes approach the surface without actually flowing out. The great fissure on Etna in 1669, for example, was visible even from a distance by the long line of vivid light which rose from the incan- descent lava within. Again, it frequently happens that minor volcanic cones are thrown up on the line of a fissure. This may arise either from the congelation of the lava round the point of emission, or from the accumulation of ejected scoriz round the fissure-vent. Of the former

structure examples occur in Hawaii, where the Java is remarkably liquid, and rapidly hardens into tears or drops, like wax down the sides of a candle. Where in viscid lavas the steam tears off and throws up many scoriz and bombs, a cone of such loose materials will naturally form round the orifice by which the lava escapes from the flank of the mouutain.

Explosions. —Although volcanic materials may be erupted to a large extent without the appearance of visible fissures, they cannot in such cases reach the surface without some explosive action, and the consequent displacement and removal of previously existing rock. Vents are thus blown out of the solid crust, the volcanic energy being, as it were, concentrated on a given point, which we may suppose must usually be the weakest in the structure of that part of the crust. The operation has often been observed in volcanoes already formed, and has even been witnessed on ground previously unoccupied by a volcanic veut. The history of the cone of Vesuvius brings before us a long series of such explosions, beginning with that of 79—the greatest which has occurred within the times of human history—and coming down to the present day. Even now, in spite of all the lava and ashes poured out during the last eighteen centuries, it is easy to see how stupendous must have been that earliest explosion, by which the southern half of the ancient crater was blown out. At every successive important eruption, a similar but minor operation takes place within the present cone. The hardened cake of lava forming the floor is burst open, and with it there usually disappears much of the upper part of the cone, and some- times, as in 1872, a large segment of the crater-wall. In the year 1538 a new volcano, Monte Nuovo, was formed in 24 hours on the margin of the Bay of Naples. A cavity was drilled by successive explosions, and such quantities of stones, scorive, and ashes were thrown out from it as to form a hill 440 English feet above the sea-level, and more thana mile and a half in circumference. Most of the fragments now to be seen on the slopes of the cone and inside its beautifully perfect crater are of various volcanic rocks, many of them being black scoriz; but pieces of Roman pottery, together with fragments of the older underlying tuff, and some marine shells, have been obtained; and these doubtless formed part of the soil and subsoil dislocated and ejected during the explosions.

It is not necessary, and it does not always happen, that auy actual solid or liquid volcanic rock is ejected even when explosions of considerable violence take place, whereby the rocks through which the funnel rises are much shattered. Thus among the coues of the extinct volcanic tract of the Eifel, some occur consisting entirely, or nearly so, of com- minuted debris of the Devonian greywacke and slate which

form the prevailing rocks there, and through which the various volcanic vents have been opened. Evidently in these cases elastic vapours only forced their way to the surface ; and we see what probably often takes place in the early stages of a volcano's history, though the frag- ments of the underlying disrupted rocks are in most instances buried and lost under tlie far more abundant sub- sequent volcanic materials. Sections of ancient volcanic necks or pipes sometimes afford an excellent opportunity of observing that these orifices were originally opened by the blowing out of the solid crust and not by the forma- tion of fissures. Many examples occur in Scotland among volcanic rocks of Old Red Sandstone, Carboniferous, and

Permian age. The orifices are there filled with fragmentary –

materials wherein portions of the surrounding and underly- ing rocks form a noticeable proportion.

Showers of Dust and Stones. —A communication having been opened, either by fissuring or explosion, between the heated interior and the surface, fragmentary materials seldom fail to be ejected from it. These may consist at first mainly of the rocks through which the orifice has been opened, as has just been explained. But if eruptive energy continues, they soon appear in larger quantities, and consist of thoroughly volcanic substances. In a great eruption vast numbers of red-hot stones are shot up into the air, and fall back partly into the crater and partly on the outer slopes of the cone. But instances are known where large stones, ejected obliquely, have described huge parabolic curves in the air, and fallen at a great distance. Stones 8 tb in weight occur among the ashes which buried Pompeii. The

volcano of Antuco in Chili is said to send stones flying to a distance of 36 miles, and Cotopaxi is reported to have hurled 2 200-ton block 9 miles.

But in many great eruptions, besides a constant shower of stones and scoriz, a vast column of exceedingly fine dust rises out of the crater, sometimes to a height of more than « mile, and then spreads outwards like a sheet of cloud. So dense sometimes is this dust-cloud that the sun is obscured, and for days together the darkness of night reigns for miles around the volcano. In 1822 this was the case at Vesuvius, the ashes not only falling thickly on the villages round the base of the mountain, but travelling as far as Ascoli, which is 56 Italian miles distant from the volcano on one side, and as Casano, 105 miles on the other. But probably the most stupendous outpouring of volcanic ashes on record was that which took place, after a quiescence of 26 years, from the Volcano Coseguina, in Nicaragua, during the early part of the year 1835. On that occasion utter darkness prevailed over a circle of 35 miles radius, the ashes falling so thickly that, even 8 leagues from the mountain, they covered the ground to a depth of about 10 feet. It was estimated that the rain of dust and sand fell over an area at least 270 geographical miles in diameter. Some of the finer materials, thrown so high as to come within the influence of an upper air-current, were borne away eastward, and fell four days afterwards at Kingston, in Jamaica—a distance of 700 miles.

An inquiry into the origin of these showers of fragmentary materials brings vividly before us some of the essential features of volcanic action. We find that bombs, slags, and lapilli may be thrown up in comparatively tranquil states of a volcano, but that the showers of fine dust are discharged with violence, and only appear when the volcano becomes more energetic, Thus, at the constantly, but quietly, active volcano of Stromboli, the column of lava in the pipe may be watched slowly rising and falling with a slow rhythmical movement. At every rise the surface of the lava swells up Into blisters several feet in diameter, which by and by burst with a sharp explosion that makes the walls of the crater vibrate. A cloud of steam rushes out, carrying with

it hundreds of fragments of the glowing lava, sometimes to a height of 1200 feet. It is by the ascent of steam through its mass that a column of lava is kept boiling at the bottom of a crater, and by the explosion of successive larger bubbles of steam that the various bombs, slags, and fragments of lava are torn off and tossed into the air. It has often been noticed at Vesuvius that, after each great concussion, a luge ball-like cloud of steam rushes up from the crater. Doubt- less it is the sudden escape of that steam which causes the explosion. The violence of the explosion will depend greatly upon the viscidity of the lava, and the consequent resistance offered to the upward passage of tle steam. Explosions and accompanying scorise are abundant at Vesuvius, where the lavas are comparatively viscid; they are almost unknown at Kilauea, where the lava is remark- ably liquid.

The steam, collecting into larger or smaller vesicles, works its way upward through the substance of the molten lava, As the elasticity of this compressed vapour overcomes the pressure of the overlying lava, it escapes at the surface, and there the lava is thus kept in ebullition. But this com- paratively quiet operation, which may be watched within the craters of manyactive volcan oes, does not produce clouds of fine dust. The friction of the millions of stones ascend- ing and descending through the air in the dark column above the crater, though it must doubtless cause much dust and sand, can give rise to but an insignificant proportion of what is actually reduced to the condition of extreme subdi- vision necessary to produce widespread darkness and a thick far-reaching deposit of ashes. The explanation now. ac- cepted calls in the explosive action of steam as the imme- diate cause of the trituration. A sudden and powerful explosion of steam, it is maintained, will blow the top of the lava column into dust, like water shot out of a gun. We must remember that the aqueous vapour by which many lavas are so largely impregnated must exist inter- stitially far down in the lava-column, under an enormous pressure, and at a white heat. The sudden ascent of lava so constituted will relieve the pressure rapidly without sensibly affecting the temperature of the mass. Conse- quently the white-hot steam will at length explode, and reduce the molten mass containing it to the finest powder.

Evidently no part of the operations of a volcano has greater geological significance than the ejection of such enormous quantities of fragmentary

matter. In the first place, the fall of these loose materials round the orifice of discharge is one main cause of the growth of the volcanic cone. The heavier fragments gather around the vent, and there too the thickest accumulation of finer dust takes place. Hence, though successive explosions may blow out the upper part of the crater-walls, and prevent the mountain from growing so rapidly in height, every eruption must add to the diameter of the cone. In the second place, as every shower of dust and sand adds to the height of the ground on which if falls, thick volcanic accumulations may be formed far beyond the base of the mountain. In these are entombed trees and other kinds of vegetation, together with the bodies of many animals, as well as the works of man, Hence new geological formations arise which, in their component materials, not only bear witness to the volcanic eruptions which produced them, but preserve a record of the land-surfaces over which they spread. In the third place, besides the distance to which the fragments may be hurled by volcanic explosions, or to which they may be diffused by the ordinary aerial movenients, we have to take into account the vast spaces across whicli the finer dust is Sometimes borne by upper currents in the atmosphere. An instance has already been cited where ashes from Coseguina fell 700 miles away, having been carried all that long distance by a high counter-current of air, moving apparently

at the rate of about 7 miles an hour in an opposite direction to that of the wind which blew at the surface. On several oceasions ashes from one of the Icelandic voleanves have fallen so thickly between the Orkney and Shetland Islands that vessels passing there have had the unwonted deposit shovelled off their decks in the morning. In the year 1783, during an eruption of Skaptar-Jékull, so vast an amount of fine dust was ejected that the atmosphere over Iceland con- tinued loaded with it for montlis afterwards. It fell in such quantity over parts of Caithness—a distance of 600 miles—as to destroy the crops; that year is still spoken of by the inhabitants as the year of “the ashie.” Traces of the same deposit were observed even as far as Holland. Hence it is evident that volcanic deposits may be formed in regions many hundreds of miles distant from any active voleano. A single thin layer of volcanic detritus in a group of sedimentary strata would thus not of itself prove the existence of contemporaneous volcanic action in its

neigh- bourhood. It might be held to have been wind-borne from a volcano in a distant and separate region.

Lava-streams.—A. microscopic examination of their in- timate structure shows that lavas have been truly molten rocks. They usually consist fundamentally of a glass through which are diffused, in greater or less abundance, various microlites and crystals. Their degree of liquidity, at the time of emission, seems to depend on the extent to which the rock remains in the condition of glass, viscidity increasing with the development of the microlites and crystals out of the glassy menstruum in which, no doubt, originally their component molecules were diffused. The fluidity may also be governed in no small degree by the amount of vapour existing interstitially in the molten mass. Mr Scrope indeed contended that aqueous vapour was the main cause of the mobility of such crystalline lavas as those of Vesuvius. But even where the lava pours forth with a liquidity like that of melted iron, it speedily assumes a more viscid motion, as the process of devitrification advances and the rock is exposed to the chilling effects of radiation and of contact with air and soil. An interesting fact, admirably shown by the micro- scope, but often easily observable with the naked eye, is that in lava still liquid and mobile well-defined crystals make their appearance. These sometimes are broken during the continued niovement of the surrounding mass, the separated fragments becoming involved in the general glassy base or portions of that base, are injected into the fractures of the crystals. Well-defined crystals of leucite may be seen in specimens of Vesuvian lava, which has been ladled out from a white-hot stream, impressed with a stamp, and thus suddenly congealed. On the other hand, the obsidians have solidified in the condition of complete glass, often without any trace of devitrification. The green pyroxenic lava of Hawaii exhibits so extreme a degree of fluidity that, during its ebullition in pools of the crater, jets not more than a quarter of an inch in diameter are tossed up, and, falling back on one another, make “a column of hardened tears of lava,” while, in other places, the jets thrown up and blown aside by the wind give rise to long threads of glass which lie thickly together like mown grass, and are known by the natives under the name of Pele’s Hair, after one of their divinities.}

It would be of the highest interest and importance to know accurately the temperature with which a lava stream issues. The difficulty of making any direct observation at the point of outflow has hitherto been insuperable. Measurements have been taken at various distances below

the point where the moving lava could be safely approached ;

but these are not satisfactory, seeing that the outer crust of

1 Dana, Geol. U.S. Explor. Exped., p. 179.

the lava cools rapidly, and gives no measure of the tempera- ture even a short way underneath. Experiments made by Scacchi and Sainte-Claire Deville on the Vesuvian lava erupted in 1855, by thrusting thin wires of silver, iron, and copper into the lava, indicated a temperature of scarcely 700° C. Earlier observations of a similar kind, made in 1819, when a silver wire ;4,th inch in diameter at once melted in the Vesuvian lava of that year, gave a greatly higher temperature. Evidence of the high temperature of lava has been adduced from the alteration it has effected upon refractory substances in its progress, aS where, at Torre del Greco, it overflowed the houses, and was after- wards found to have fused the fine edges of flints, to have decomposed brass into its component metals, the copper actually crystallizing, and to have melted silver, and even sublimed it into small octohedral crystals. But such facts, though full of interest and importance, give us no clue to the absolute initial temperature of the lava, which must be greatly higher than that of the stream after several miles of descent on the mountain slopes, and after some hours or days of cooling.

In spite of this very high temperature, however, the lava issues abundantly charged with aqueous vapour, to the expansion of which, as we have seen, its ebullition and ex- pulsion are mainly due. As this vapour at once begins to escape when the lava issues into the air, it shows itself by a dense white cloud hanging over the moving mass. The lava streams of Vesuvius sometimes appear with as large and dense a steam cloud at their lower ends

as that which escapes at the same time from the main crater. Even after the molten mass has flowed several miles, steam continues to rise abundantly both from its end and from numerous points along its surface.

From the wide extent of basalt dykes, such as those of Britain, some of which rise to the surface at a distance of 200 miles and upwards from the main voleanic regions of their time, it is evident that the molten lava may sometimes occupy a far greater superficial area under- neath than the mere circumference of the actual pipe or of the voleanic cone. We must conceive of a vast reser- voir of melted rock impregnated with superheated steam, and impelled upwards by the elastic force of the vapour. The lava may be regarded rather as the sign than as the cause of volcanic action. It is the pressure of the impris- oned vapour, and its struggles to get free, which produce the subterraneau earthquakes, the explosions, and the outpour- ing of lava. As soon as the vapour finds relief, the terres- trial commotion calms down again, and the quiescence con- tinues until another accumulation of vapour demands a re- petition of the same phenomena.

It is evident that the vapour may succeed in effecting its escape without driving molten rock up to the surface. There may be tremendous explosions without an actual outcome of lava. But, in most cases, so intimately are vapours and lava commingled in the subterranean reservoirs that they rise together, and the explosions of the one lead to the outflow of the other. The first point at which the lava makes its appearance at the surface will largely de- pend upon the structure of the ground. Two causes have been assigned in a foregoing section (p. 244) for the fissur- ing of avoleanic cone. As the molten mass rises within the chimney of the volcano, continued explosions of vapour take place from its upper surface, the violence of which may be inferred from the vast clouds of steam, of ashes, and of stones which are hurled to so great a height into the air. These explosions must at the same time powerfully affect the sides of the funnel, exposed as these are to the enormous pressure exerted by the imprisoned vapour. We cannot therefore be surprised that, when a volcano experiences shocks of such intensity as to be felt over a radius 100

miles or more, its sides should at last give way, and large divergent fissures should be opened down its cone. Again, the hydrostatic pressure of the column of lava must have a potent influence. At a depth of 1000 feet below the top of the column the pressure exerted on each square foot of the surrounding walls must amount to more than 80 tons. We may well believe that such a force, acting upon the walls of a funnel already shattered by a succession of terrific explosions, will be apt to prove too great for their resistance. When this happens, the lava pours forth from the outside of the cone, times that the lava issues freely from many points. A voleano so affected has been graphically described as “sweating fire.” More usually the lava issues only from one ortwo points. Should these lie well down ou the cone, far below the summit of the lava-column, the lava, on its first escape, driven by hydrostatic pressure, will sometimes spout up high into the air—a fountain of molten rock. This was observed in 1794 on Vesuvius, and in 1832 on Etna. In the eruption of 1852 at Mauna Loa, an unbroken fountain of lava, from 200 to 700 feet in height and 1000 feet broad, burst out at the base of the cone. Similar “geysers” of molten rock have subsequently been noticed in the same region. fiery fountains, throwing the lava to heights varying from 500 to 1000 feet, continued to play for several weeks,

In a lofty volcano, therefore, the chances are always

rather against the lava rising to the lip of the crater and

flowing out there. It does so now and then ; but more fre- quently it escapes from some fissure or orifice in a weak part of the cone. In minor volcanoes, on the other hand, where the explosions are less violent, and where the thickness of the cone in proportion to the diameter of the funnel is often greater, the lava very commonly rises in the crater. Should the crater walls be too weak to resist the pressure of the molten mass, they will give way, and the lava will rush out from the breach. ‘This is seen to have happened in several of the puys of Auvergne, so well figured and described by Mr Scrope. But if the crater be massive enough to with- stand the pressure, the lava, if still impelled upward by thie struggling vapour, will at last flow out from the lowest part of the rim,

It was at one time supposed that lava beds could not consolidate on such steep slopes as those of most voleanoes, and that their present inclined position was to be attributed to a central upheaval of each mountain. Thisidea formed the subject of the famous theory of elevation-craters (Erhebungskratere) of L. von Buch, E. de Beaumont, and other geologists. It was a matter of prime importance in the interpretation of volcanic action to have this question settled. To Constant Prevost belongs the merit of having completely exposed the fallacy of this theory. He pointed out that there was no more reason why lavas should not consolidate on steep slopes than that tears or drops of wax should not doso. Mr Poulett Scrope also showed conclusively that the Steep slope of the lava-beds of a volcanic cone was original, Sir Charles Lyell and Mr Hartung subsequently obtained abundant additional evidence from the Canary Islands, Etna, and other volcanic districts, to disprove the elevation theory. Geologists are now agreed that thick sheets of lava, with all their characteristic features, can consolidate on slopes of even 35° and 40°. The lava in the Hawaii Islands has cooled rapidly on slopes of 25°, that from Vesuvius, in 1855, is here and there as steep as 80°. On the east side of Ktna, a cascade of lava, which poured, in 1689, into the vast hollow of the Cava Grande, has an in- clination varying from 18° to 48°, with an average thickness of 16 feet. On Mauna Loa some lava-flows are said to have congealed on slopes of 49°, 60°, and even 80°, though in these cases it could only be a layer of rock stiffening and

So fissured is the cone some-’

Thus, in March and April 1868, four

adhering to the surface of the steep slope. Even when it consolidates on a steep slope, a stream: of lava forms a sheet with parallel, upper, and under surfaces, a general uniformity of thickness, and often greater evenness of surface than where the angle of descent is low.

At its first appearance, where it issues from the mountain, the lava glows with a white heat, and flows with a motion which has been compared to that

of honey or of melted iron. It soon becomes red, and, like a coal fallen from a hot fireplace, rapidly grows dull as it moves along, until it assumes a black, cindery aspect. At the same time the surface congeals, and soon becomes solid enough to support a heavy block of stone. Its aspect depends, not merely on the composition and fluidity of the lava, but on the point of egress, whether from the crater or from a fissure, on the form of the ground, the angle of slope, and the rapidity of flow. Lavas which have been kept in ebullition within the central chimney are apt to acquire a rough cellular texture. The surface of the moving stream breaks up into rough brown or blaek cinder-like slags, and irregular rugged cakes, which, with the onward motion, grind and grate against each other with a harsh metallic sound, sometimes rising into rugged mounds or getting seamed with rents and gashes, at the bottom of which the red-hot glowing lava may be seen, When lava escapes from a lateral fissure it may have no scoriz, but its surface will present froth-like, curving lines, as in the scum of a slowly flowing river, or will be arranged in curious ropy folds, as the layers have successively flowed over each other and congealed. These and many other fantastic coiled shapes were exhibited by the lava which flowed from the side of Vesuvius in 1858. A large area which has been flooded with lava is perhaps the most hideous and appalling scene of desolation anywhere to be found on the surface of the globe.

A lava stream at its point of escape from the side of a voleauic cone occupies a comparatively narrow breadth ; but it usually spreads out as it descends, and moves more slowly. The sides of the moving mass look like huge em- bankments, or like some of the long mounds of “ clinkers ” one sees in a great manufacturing district. The advancing end of the mass is often much steeper, creeping onward like a great wall or rampart, down the face of which the rough blocks of hardened Java are ever rattling.

The rate of movement is regulated by the fluidity of the lava, by its volume, and by the form and inclination of the ground. Hence, as a rule, a lava-stream moves faster at first than afterwards, because it has not had time to stiffen, and its slope of descent is considerably steeper than further down the mountain. One of the most fluid and swiftly flowing lava-streams ever observed on Vesuvius was that erupted on 12th August 1805. It is said to have rushed down a space of 3 Italian (32 English) miles in the first four

minutes, but to have widened out and moved more slowly as it descended, yet finally to have reached Torre del Greco in three hours. A lava erupted by Mauna Loa in 1852 went as fast as an ordinary stage-coach, or 15 miles in two hours. Long after a current has been deeply crusted over with slags and rough slabs of lava it continues to creep slowly forward for weeks or even months,

It happens sometimes that, as the lava moves along, the pressure of the still molten mass inside bursts through the outer hardened and deeply seamed crust, and rushes out with, at first, a motion much more rapid than that of the main stream; but such an offshoot rapidly congeals and comes to rest, though sometimes not before doing much damage to vineyards, gardens, houses, or other property in its course. Any sudden change iu the form or slope of the ground, too, will affect the flow of the lava. Thus, should the stream reach the edge of a steep defile or cliff, it will pour over it in a cataract of glowing molten rock, with

clouds of steam, showers of fragments, and a noise utterly indescribable. Or if, on the other hand, the current should encounter a ridge or hill across its path, it will accumulate in front of it until it either finds egress round the side or actually overrides and entombs the obstacle. The hardened crust or shell within which the still fluid lava moves serves to keep the mass from spreading. We often find, however, that the lava has subsided here and there inside its crust, and has left curious cavernous spaces and tunnels. Into these, when the whole is cold, we may creep, and may find them sometimes festooned and hung with stalactites of lava.

Asa rule a lava-stream shows three component layers. At its bottom lies a rough, slaggy mass, produced by the rapid cooling of the lava, and the breaking up and continued onward motion of the scoriform layer. The central and main portion of the stream consists of solid lava, often, however, with a more or less carious and vesicular texture. The upper part, as we have seen, is a mass of rough broken- up slags, scorie, or clinkers. The proportions borne by these respective layers to eacli other vary continually. Some of the more fluid ropy lavas of Vesuvius have an inconstant and thin slaggy crust; others may be said to consist of little else

than scorie from top to bottom. ‘These diver- gences in texture seem to depend largely upon the amount of interstitial steam imprisoned within the lava, and the conditions under which it can effect its escape. Throughout the whole mass, but more especially along its upper surface, the steam under its diminished pressure expands, and push- ing the molten rock aside, segregates into small bubbles or irregular cavities. Hence, when the lava solidifies, these steam-holes are seen to be sometimes so abundant that a detached portion of the rock containing them will float in water. They are often elongated in the direction of the motion of the lava-stream. .

But, besides producing a general vesicular texture in the upper parts of the lava-stream, the aqueous vapour gives rise to much more striking features on the surface of the lava. If the outburst takes place from an orifice or fissure on the exterior of the volcanic cone, so vast an amount of steam will rush out there, with such boiling and explosion of the lava, that a cone of bombs, and slags, and irregular lumps of lava, will probably form round the spot—in fact a miniature or parasitic volcano, which will remain as a marked cone on its parent mountain long after the eruption which gave it birth has ceased. Moreover, even after such abundant discharge of steam, the lava-stream continues to exhale it, as it were, from every pore. Here and there on the .surface of the moving mass a fissure opens, and a column of roaring hissing vapours rushes out from it, accompanied as before by an abundant discharge of lava- fragments, or even by the rise and outflow of the lava from beneath. Some lava-streams are thus dotted over with small cones a few feet or yards in height. Besides the steam which, in condensing, makes its presence so con- spicuous, many other vapours entangled in the pores of the lava escape from its fissures. The points at which vapours are copiously disengaged are termed fumarole. Among the exhalations, chlorides may be mentioned as particularly prominent ; chloride of sodium frequently shows itself, not only in fissures, but even over the cooled crust of the Java, in small crystals, in tufts, or as a granular and even glassy incrustation. Chloride of iron is deposited as a yellow coating at the fumarole, where also bright emerald green films and scales of chloride of copper may be more rarely observed. Many chemical changes take place in the escape of the vapours through the lava. Thus specular-iron, probably the result of the mutual decomposition of steam and iron chloride, forms

abundant scales, plates, and small crystals in the fwmarole and vesicles of the lava. Sal- ammoniac also appears in large quantity on many lavas, not

merely in the fissures, but also on the upper surface of the current. ‘This salt is not directly a volcanic product, but results from some decomposition, probably from that of the aqueous vapour, whereby a combination is formed with atmospheric nitrogen.

The hardened crust of a lava-stream is a bad conductor of heat. Consequently, when the surface of the mass has become cool enough to be walked upon, the red hot mass may be observed through the rents to lie only a few inches below. Many years therefore may elapse before the temperature of the whole mass has fallen to that of the sutrounding soil. Eleven months after an eruption of Etna, Spallanzani could see that the lava was still red hot at the bottom of the fissures, and a stick thrust into one of them instantly took fire. The Vesuvian lava of 1785 was found by Breislak seven years afterwards to be still hot and steaming internally, though lichens had already taken root on its surface. The ropy lava erupted by Vesuvius in 1858 was observed in 1870 to be still so hot, even near its termination, that steam issued abundantly from its rents, many of which were too hot to allow the hand to be held in them. Hoffmann records that the lava which flowed from Etna in 1787 was still steaming in 1830. But still more remarkable is the case of Jorullo, in Mexico, which sent out lava in 1759. Twenty-one years later a cigar could still be lighted at its fissures ; after 44 years it was still visibly steaming ; and even in 1846, that is, after 87 years of cooling, two vapour columns were still rising from it.’

This extremely slow rate of cooling has justly been re- garded as a point of high geological significance in regard to the secular cooling and probable internal temperature of our globe. Some geologists have argued indeed that, if so . comparatively small a portion of molten matter as a lava stream can maintain a high temperature under a thin, cold crust for so many years, we may, from analogy, feel little hesitation in believing that the enormously vaster mass of the globe may, beneath its relatively thin crust, still continue

in a molten condition within. More legitimate deductions, however, might be drawn, if we knew more accurately and precisely in each case the rate of loss of heat, and how it varies in different lava-streams.. Sir William Thomson, for instance, has suggested that, by measuring the temperature of intrusive masses of igneous rock in coal-workings and elsewhere, and comparing it with that of other non-volcanic rocks in the same regions, we might obtain data for calcu- lating the time which has elapsed since these igneous sheets were erupted.

In its descent a stream of lava may reach a water-course, and, by throwing itself as a great embankment across the stream, may pond back the water and forma lake, Such is the origin of the picturesque Lake Aidat in Auvergne. Or the molten current may usurp the channel of the stream, and completely bury the whole valley, as has happened again and again among the vast lava-fields of Iceland. No change in physiography is so rapid and so permanent as this. The channel which has required, doubtless, many thousands of years for the water laboriously to excavate, is sealed up in a few hours under 100 feet or more of stone, and a still longer interval may elapse before this newer pile is similarly eroded.

By suddenly overflowing a brook or pool of water, molten lava sometimes has its outer crust shattered to fragments by a sharp explosion of the generated steam, while the fluid mass within rushes out on all sides. Numerous instances have occurred where the lavas of Etna and Vesuvius have pro- truded into the sea. Thus a current from the latter moun- tain entered the Mediterranean at Torre del Greco in 1794, and pushed its way for 360 feet outwards, with a breadth of

1 E, Schleiden, quoted by Naumann, Geol., i. p. 160.

1100 and a height of 15 feet. So quietly did it advance that Breislak could sail round it in a boat and observe its progress.

In passing from a fluid to a solid condition, and thus contracting, lava acquires different structures, Lines of divisional planes or joints traverse it, especially perpendi- cular to the upper and under surfaces of thesheet.

These lines at various irregular distances cross each other so 98 to divide the rock into rude prisms. Occasionally another series of joints at a right angle to these traverses the mass parallel with its bounding surfaces, and thus the rock acquires a kind of fissile or bedded appearance. The most characteristic structure, however, among volcanic rocks is the prismatic, or, as it is incorrectly termed, “ basaltic.” Where this arrangement occurs, as it does so commonly in basalt, the mass is divided into tolerably regular pentagonal, hexagonal, or irregularly polygonal prisms or columns, set close together at a right angle to the main cooling sur- faces. These prisms vary from 2 or 3 to 18 or more inches in diameter, and range up to 100 or even 150 feet in length.

Considerable discussion has arisen as to the mode in which this columnar structure has been produced. The experiments of Mr Gregory Watt were supposed to explain it by the production of a number of spherical concretions in the cooling mass, and the gradual pressure of those soft balls into hexagonal columns, as the mass contracted in cooling. He melted a mass of basalt, and on allowing it to cool observed that, when a small portion was quickly chilled, it took the form of a kind of slag-like glass, not differing much in appearance from obsidian ; larger’ mass, more slowly cooled, returned to a stony state. He remarked that during this process small globules make their appear- ance, which increase in size by the successive formation of external concentric coats, like those of an onion. And he supposed, as each spheroid must be touched by six others, the whole, if exposed to the same pressure acting in every direction, must be squeezed into a series of hexagons. To account, however, for a long column of basalt, we should have to imagine a pile of balls standing exactly centrically one upon the other, an arrangement which seems hardly possible. The prismatic structure is a species of jointing, due to the contraction of the rock as a whole, and not to the production of any internal peculiarities of texture. The concretionary structure associated with the columnar arises from a common tendency to weather out into nodular forms, and may be observed even where the rock is not columnar. Prismatic forms have been superinduced upon rocks by a high temperature and subsequent cooling, as where coal and sandstone have been invaded by basalt. They may likewise be observed to arise during the consolidation of a substance, as in the case of starch. In

that substance the columnar structure is apt to radiate from certain centres, as ae also be seen sometimes in basalt and other igneous rocks,

Mr Mallet has recently investigated this subject, and con- cludes that “ all the salient phenomena of the prismatic and jointed structure of basalt can be accounted for upon the admitted laws of cooling, and contraction thereby, of melted rock possessing the known properties of basalt, the essential conditions being a very general homogeneity in the mass cool- ing, aud that the cooling shall take place slowly, principally from one or more of its surfaces.”!

In the more perfectly columnar basalts the columns are Sometimes articulated, each prism being separable into vertebrae, with a cup and ball socket at each articulation. This peculiarity is traced by Mr Mallet to the contraction of each prism in its length and in its diameter, and to the ee ee

? See an abstract of his paper, Proc. Roy. Soc., January 1875.

consequent production of transverse joints, which, as the resultant of the two contracting strains, are oblique to the sides of the prism, but, as the obliquity lessens towards the centre, assume necessarily, when perfect, a cup-shape, the convex surface pointing in the same direction as that in which the prism has grown. This explanation, however, will hardly account for cases, which are not uncommon, where the convexity points the other way, or where it is sometimes in one direction, sometimes in the other.2 The remarkable spheroids which appear in many weathered igneous rocks besides basalts may probably be due to some of the conditions under which the original contractions took place. They are quite untraceable on a fresh fracture of the rock. It is only after some exposure to the weather that they begin to appear, and then they gradually crumble away by the successive formation and disappearance of external weathered crusts or coats, which fall off into sand and clay. Almost all augitic or hornblendic rocks, even granite, exhibit the tendency to decompose into rounded spheroidal blocks.

By the outpouring of lava two important kinds of geo- logical change are produced. In the first place, the surface of a country is thereby materially changed. Stream-courses, lakes, ravines, valleys, in short all the minor features of a landscape, may be completely overwhelmed under a sheet of lava, 100 feet or more in thickness, The drainage of the district is thus effectually altered, and all the numerous changes which flow from the operations of running water over the land are arrested and made to begin again in new channels. In the second place, considerable altcrations may likewise be caused by the effects of the heat and vapours of the lava upon the subjacent or contiguous ground. Instances have been observed in which the lava has actually melted down opposing rocks, or masses of slags, on its own surface. Interesting observations, already referred to, have been made at Torre del Greco under the lava stream which overflowed part of that town in 1794. It was found that the window-panes of the houses had becn devitrified into a white, translucent, stony substance, that pieces of lime-stone had acquired an open, sandy, granular texture, with- out loss of carbonic acid, and that iron, brass, lead, copper, and silver objects had been greatly altered, some of the metals being actually sublimed. We can understand therefore that, retaining its heat for so long a time, a mass of lava may induce many crystalline structures, rearrange- ments, or decompositions in the rocks over which it comes to rest, and proceeds slowly to cool. This is a question of considerable importance in relation to the behaviour of ancient lavas which have been intruded among rocks beneath the surface, and have subsequently been exposed, as will be referred to in the sequel.

But, on the other hand, the exceedingly trifling change produced even by a massive sheet of lava has often been remarked with astonishment. On the flank of Vesuvius we may see vines and trees still flourishing on little islets of the older land-surface completely surrounded by a flood of lava. Professor Dana has given an instructive account of the descent of a lava-stream from Kilauea in June 1840. Islet-like spaces of forest were left in the midst of the lava, many of the trees being still alive. Where the lava flowed round the trees the stumps were usually consumed, and cylindrical holes or casts remained in the lava, either empty or filled with charcoal. In many cases the fallen crown of the tree lay near, and go little damaged that the epiphytic plants on it began to grow again. Yet so fluid was the

- Mr Scrope pointed this out (Geol. Mag., September 1875), though Mr Mallet (Zbid., November 1875) replied that in such cases the articulations must be formed just about the dividing surface aoe the part of the rock which cooled from above, and that which coole from below. X. — 32

Java that it hung in pendent stalactites from the branches, which nevertheless, though clasped round by the molten rock, had barely their bark scorched. Again, for nearly 100 years there has lain on the flank of Etnaa large sheet of ice which, originally in the form of a thick mass of snow, was overflowed by the molten flood, and has thereby been protected from the evaporation and thaw which would certainly have dissipated it long ago, had it been exposed to the air. The heat of the lava has not sufficed to melt it. There seems reason to suspect, however, that in other cases snow and ice have been melted in large quantities by over- flowing lava. The great floods of water which rushed down the flank of Etna, after an eruption of the mountain in the spring of 1755, have been thus explained.

One further aspect of a lava-stream may be noticed here—the effect of time upon its surface. While all kinds of lava must, in the end, crumble down under the influence of atmospheric waste and, where other conditions permit, become coated with soil and support some kind of vegeta- tion, yet extraordinary differences may be observed in the facility with which different lava-streams yield to this change, even on the flank of the same mountain. Every one who ascends the slopes of Vesuvius remarks this fact. After a little practice it is not difficult there to trace the limits of certain lavas even from a distance, in some cases by their verdure, in others by their barrenness. Five hundred years have not sufficed to clothe with green the still naked surface of the Catanian lava of 1381; while some of the lavas of the present century have long given footing to bushes of furze. Some of the younger lavas of Auvergne, which certainly flowed in times anterior to those of history, are still singularly bare and rugged. Yet, on the whole, where lava is directly exposed to the atmosphere, without receiving protection from occasional showers of volcanic ash, or being liable to be washed bare by heavy torrents of rain, its surface decays in a few years

sufficiently to afford soil for a few plants in the crevices. When these have taken root they help to increase the disintegra- tion. At last, as a more or less continuous covering of vegetation spreads over the rock, the traces of its volcanic origin one by one fade away from its surface. Some of the Vesuvian lavas of the present century already support vineyards.

Torrents of Water and Mud.—We have seen that large quantities of water accompany many volcanic eruptions. In some cases, where ancient crater-lakes or internal reser- voirs have been shaken by repeated detonations, and finally disrupted, the mud which has thus been produced issues at once from the mountain. Such “ mud-lavas,” on ac- count of their liquidity and swiftness of motion, are more dreaded for their destructiveness than even the true melted lavas. On the other hand, rain or melted snow, rushing down the cone and taking up loose volcanic dust, is con- verted into a kind of mud that grows more and more pasty as it descends. The mere sudden rush of such large bodies of water down the steep declivity of a volcanic cone cannot fail to effect much geological change. Deep trenches are cut out of the loose volcanic slopes, and some- times large areas of woodland are swept away, the debris being strewn over the plains below.

During the great Vesuvian eruption of 1622 a torrent of this kind poured down upon the villages of Ottajano and Massa, overthrowing walls, filling up streets, and even burying houses with their inhabitants. It was by similar streams from the same volcano that some of the Roman cities on its flanks were overwhelmed in the first century. Many of the volcanoes of Central and South America discharge large quantities of mud directly from their craters. Thus in the year 1691 Imbaburu, one of the Andes of Quito, emitted floods of mud, so largely charged with dead fish that pesti-

lential fevers arose from the subsequent effluvia. Seven years later (1698), during an explosion of another of the same range of lofty mountains, Carguairazo (14,706 feet), the summit of the cone is said to have fallen- in, while torrents of mud, containmg immense numbers of the fish Pymelodus Cyclopum, poured forth and covered the ground over a space of four square

leagues. The carbon- aceous mud (locally called moya) emitted by the Quito volcanoes sometimes escapes from lateral fissures, sometimes from the craters. Its organic contents, and notably its siluroid fish, which are the same as those found living in the streams above ground, prove that the water is derived from the surface, and accumulates in craters or underground cavities until discharged by volcanic action. Similar but even more stupendous and destructive outpourings have taken place from the volcanoes of Java, where wide tracts of luxuriant vegetation have at different times been buried under masses of dark grey mud, sometimes 100 feet thick, with a rough hillocky surface from which the top of a submerged palm-tree might have been seen pro- truding.

Between the destructive effects of mere water-torrents and that of these mud-floods there is, of course, the notable difference that, whereas in the former case a portion of the surface is swept away, in the latter, while sometimes con- siderable demolition of the surface takes place at first, the main result is the burying of the ground under a new tumultuous deposit by which the surface is greatly changed, not only as regards its temporary aspect, but in its more permanent features, such as the position and form of its water-courses.

Mud-voleanoes.—Though probably seldom if ever strictly volcanic in the proper sense of that term, certain remark- able orifices of eruption may be noticed here to which the names of mud-volcanoes, salses, air-volcanoes, and maca- lubas have been applied. These are conical hills formed by the accumulation of fine and usually saline mud, which, with various gases, is continuously or intermittently given out from the orifice or crater in the centre. They occur in groups, each hillock being sometimes less than a yard in height, but ranging up to elevations of 100 feet, or even sometimes, as in the plains of the lower Indus, to 400 feet. Like true volcanoes, they have their periods of repose, when either no discharge takes place at all, or mud oozes out tranquilly from the crater, and their epochs of activity, when large volumes of gas, and sometimes columns of flame, rush out with considerable violence and explosion, and throw up mud and stones to a height of several hundred feet.

The gases play much the same part therefore in these phenomena that steam does in those of true volcanoes. They consist of carbonic acid gas, carburetted hydrogen, sulphuretted hydrogen, and nitrogen. The mud is usually cold, In the water occur various saline ingredients, among which common salt generally appears. Naplitha is likewise frequently present. Large pieces of stone, differing from those in the neighbourhood, have been observed among the ejections, indicative doubtless of a somewhat deeper source than in ordinary cases, Heavy rains may wash down the minor mud cones and spread out the material over the ground, but gas-bubbles again appear through the sheet of mud, and by degrees a new series of mounds is once more thrown up.

There can be little doubt that these phenomena are to be traced to chemical changes in progress underneath. Dr Daubeny explained them in Sicily by the slow combustion of beds. of sulphur. The frequent occurrence of naphtha and of inflammable gas points, in other cases, to the dis-engagement of hydrocarbons from subterranean strata.

Mud volcanoes occur in Iceland, in Sicily (Macaluba), in

the globe. Gaseous Discharges.—Some of

mud-volcanoes, dormant or extinct. The gas either comes out directly from

fissures of the rock, or rises dissolved in the water of springs. The old voleanic districts of Europe furnish many exaniples,

Thus on the shores of the Laacher See—an ancient crater

lake of the Hifel—carbonic acid gas issues from numerous openings called moffette, round which dead insects, and occasionally mice and birds may be found. In the? same region occur hundreds of springs more or less charged with the gas. The famous Valley of Death in Java contains one of the most remarkable gas-springs in the world. It isa deep, bosky hollow, from one small Space on the bottom of which carbonic acid issues so copiously as to form the lower stratum of the atmosphere, Tigers, deer, and wild-boar,

enticed by the shelter of the spot, descend and are speedily

suffocated. Many of their skeletons, together with those of man himself, have been observed.

In the second class of gas-springs we may group the emanations of carburetted hydrogen, which, when they take fire, are known as Fire-wells, They occur in many of the districts where mud-volcanoes appear, as in northern Italy, on the Caspian, in Mesopotomia, in southern Kurdistan, and in many parts of the United States. It has been observed that they rise especially in regions where beds of rock-salt lie underneath, and as that rock has been ascertained often to contain compressed carburetted hydrogen, the solution of the rock by subterranean water, and the consequent liberation of the gas, has been offered as an explanation of these fire-wells,

Geysers.—In various regions where volcanic action still continues, or where it has long been dormant, there occur eruptive fountains of hot water and steam, to which the general name of geysers is given, from the- well-known examples in Iceland, which were the first to be seen and described. Besides the Great and Little Geysers, the Strokkr, and other minor springs of hot water in Iceland, other, perhaps still more striking, examples have in recent years been brought to light in that tract of the western territories of the United States set aside as the “ Yellow- stone National Park,” and good illustrations are also found in New Zealand A geyser possesses a vertical pipe in the ground, terminating at the surface in a basin which is formed of siliceous sinter, and may rise some feet or yards above the general level. At more or less regular intervals rumblings and sharp detonations occur underneath, followed by an agitation of the water in the basin, and then by the Violent expulsion of a column of water and steam to a con- siderable height in the air. The hot water contains silica in solution, which, on cooling and evaporating, is deposited at the surface; and thus the geyser builds up its basin, Sometimes raising it into a long, solitary, finger-like pillar.

Bunsen and Descloiseaux Spent some days experimenting at the Icelandic geysers, and ascertained that in the Great Geyser, while the surface temperature is about 212° Fahr, that of the lower portions of the tube is much higher—a ther- mometer giving as high a reading as 266° Fahr. The

water there must Consequently be 48° above the normal boiling- point, but is kept in the fluid state by the pressure of the overlying column. At the basin, however, the water cools quickly, After an explosion it accumulates there, and eventually begins to boil, The pressure on the column below being thus relieved, a portion of the superheated

many districts of northern Italy, at Tamar and Kertch, at Baku on the Caspian, over an area of about 1000 square miles near the mouth of the Indus, and in other parts of

these belong to true volcanic phenomena, others are closely associated with the To the former class we may assign the copious emanations of carbonic acid which so frequently take place in districts where volcanic activity has been long

water flashes into steam, and as the change passes down the pipe, the whole column of water and steam rushes out with great violence. The water thereafter gradually collects again in the pipe, and after an interval of some hours the opera- tion is renewed. The experiments made by Bunsen proved the cause of the eruption to lie in the high temperature of a portion of the pipe. He hung stones by strings to different depths in the funnel of the geyser, and found that only those in the higher part were cast out by the rush of water, Sometimes to a height of 100 feet, while at the same time the water at the bottom was hardly disturbed at all. These observations give an additional interest and im- portance to the phenomena of geysers in relation to those of volcanic action. They show that the eruptive force is steam ; that the water column, even at a comparatively small depth, has a temperature considerably above 212°; that this high temperature is local ; and that the eruptions of steam and water take place periodically, and with such vigour as to eject large stones to a height of 100 feet.

§ 3. Structure of Volcanoes,

It is now admitted that a voleano is due to the accumu- lation of material round the vent. of eruption, and not to any blister-like expansion of the ground, The structure of a volcanic cone necessarily depends in great measure upon the nature of the substances ejected. The following are the more important and interesting types of this kind of structure :—

(1.) Cones of Non-voleanic Materials.—These are due to the discharge of steam or other aeriform product through the solid crust without the emission of any true ashes or lava. The materials ejected from the cavity are wholly, or almost wholly, parts of the surrounding rocks through which the volcanic pipe has been drilled. Some of the cones sur- rounding the crater-lakes or maare of the Eifel consist chiefly of fragments of the underlying Devonian slates,

(2.) Lug-Cones, Cinder-Cones,—Successive eruptions of fine dust and stones, often rendered pasty by getting mixed with the water so copiously condensed during an eruption, form a cone in which the materials are solidified by pres- sure into tuff. Sometimes the cones are made up only of loose cinders, like Monte Nuovo in the Bay of Baiz. Cones consisting entirely of loose volcanic materials often arise on the flanks or round the roots of a great volcano, as happens to a small extent on Vesuvius, and on a larger scale upon Etna. They likewise occur by themselves apart from any lava-producing volcano, though usually they afford indications that columns of lava have risen in their funnels, and even now and then that this lava has reached the surface. Admirable examples are furnished by the cones of the Phlegrean fields near Naples. Ancient cones of a similar character occur among the Carboniferous rocks of Scotland. The materials of the cone are arranged in more or less regular beds which dip away from the funnel, their inclination corresponding with that of thecone. Inside the crater they slope steeply inward towards the crater-bottom,

(3.) Mdud-Cones or Salses are formed by the accumulation and consolidation of mud round the vents of mud-volcanoes. They sometimes reach a height of 400 feet.

(4.) Lava-Cones.—These are comparatively rare, since, in most cases, the emission of lava is accompanied by the discharge of ashes. Owing to its liquidity, the lava flows off quickly, and the cones have very gentle slopes.

The most remarkable examples are those in the Hawaii Islands described by Professor Dana, They attain a great height, but so small is their angle of inclination, that they may be described as only gently-sloping mounds, and their craters have been compared to vast open quarries on a hill or moor.

? Bunsen, Ann. der Chemie und Pharmacie, lxii. (1847), p. 1.

(5.) Cones of Tuffand Lava.—These are by far the most frequent. They may be taken, indeed, as the typical form of volcanoes. Around the central vent the successive showers of scorize and ashes gather, with occasional streams of lava, which from time to time descend different sides of the growing cone. The component strata have thus the usual inclination outwards, though, when seen in section along the crater-walls, they look approximately horizontal. By continued explosions fissures are formed in the sides of the cone. These are injected with lava, producing a net- work of dykes which strengthen the cone, or they serve as channels of escape for lava, and give rise to lateral erup- tions and minor or parasitic cones. As the main cone increases in diameter by the accumulation of fragmentary and molten ejections, it rises also in height, until at last few or no eruptions take place from its summit, but only from openings on its flanks.

(6.) Submarine Voleanoes.—It is not only on the surface of the land that volcanic action shows itself. It takes place likewise under the sea, and as the geological records of the carth’s past history are chiefly marine formations, the characteristics of submarine volcanic action have no small interest to the geologist. Unfortunately, the phenomena of recent volcanic eruptions under the sea are for the most part inaccessible. Here and there, as among the islands of the Greek Archipelago and at Tahiti, elevation of the sea- bed has taken place, and brought to the surface beds of lava, which had been erupted and had consolidated under water. There does not appear to be any appreciable difference either in external aspect or in internal structure between such submarine lavas and those erupted on the land. Some of them are highly scoriaceous. There is no reason indeed why slaggy lava and loose scoriz should not accumulate under the pressure of a deep column of the ocean. At the Hawaii Islands, on 25th February 1877, masses of pumice, during a submarine volcanic explosion, were ejected to the surface, one of

which struck the bottom of a boat with con- siderable violence and then floated. At the same time, when we reflect to what a considerable extent the bottom of the great ocean basins is dotted over with volcanic cones, rising often solitary from profound depths, we can under- stand how large a proportion of the actual eruptions may take place under the sea. The foundations of these volcanic islands doubtless consist of submarine lavas and fragmentary materials, which, in each case, continued to accumulate to a height of two or three miles, until the pile reached the surface of the water and the phenomena became subaerial. The immense abundance and wide diffusion of volcanic detritus over the bottom of the Pacific and Atlantic Oceans, even at distances remote from land, as has been made known by the voyage of the ‘‘ Challenger,” may indicate the prevalence and persistence of submarine volcanic action, though, at the same time, it must be admitted that an ex- tensive diffusion of volcanic debris from the islands is effected by winds and ocean-currents.

4. Geographical Distribution of Volcanoes.

The chief facts under this head may thus be summar- ized. (1.) Volcanoes occur along the margins of the ocean basins, particularly along lines of dominant mountain ranges. The vast hollow of the Pacific is girdled with a wide ring of voleanic foci. (2.) They rise as astriking feature in the heart of the ocean basins. Most of the oceanic islands are vol- canic. Even the coral islands have in all likelihood been built upon the tops of submarine volcanic cones. (3.) Volcanoes are thus situated, as a rule, close to the sea. When they occur inland they sometimes appear in the neighbourhood of a large sheet of water. Yetso many instances have been observed where volcanoes have appeared at great distances from any sheet of water that the proximity of a lake or of

the sea cannot be regarded as necessary for the evolution of volcanic phenomena. (4.) The dominant arrangement of volcanoes is in lines along subterranean lines of weakness, as in the chain of the Andes, the Aleutian Islands, and the Malay Archipelago. (5.) Where the linear arrangement does

not hold, it gives place to one in groups, as in Italy, Iceland, and the volcanic islands of the great oceans.

§ 5. Distribution of Volcanic Action in Time.

Besides the existence of what are called extinct volcanoes, the geologist can adduce proofs of the former presence of active volcanoes in many countries where cones and craters and all ordinary aspects of voleanic mountains have long disappeared. Sheets of lava, beds of tuff, dykes, and necks representing the sites of volcanic vents have been recog- nized abundantly. These manifestations of volcanic action, moreover, have as wide a range in geological time as they have in geographical area. Every great geological period, back at least as far as the Lower Silurian, has had its volcanoes. In Britain, for instance, there were active volcanic vents in the Lower Silurian period, whence the lavas and tuffs of Snowdon, Aran Mowddwy, and Cader Idris were ejected. The Lower Old Red Sandstone epoch was one of prolonged volcanic activity in central Scotland. The earlier half of the Carboniferous period likewise witnessed the outburst of innumerable small volcanoes over the same region. During the Permian period a few scattered vents existed in the south-west of Scotland, and in the time of the New Red Sandstone some similar points of eruption appeared in the south of England. The older Tertiary ages were distinguished by the outpouring of the enormous basaltic plateaus of Autrim and the Inner Hebrides.

Thus it can be shown that, within the same comparatively limited geographical space, volcanic action has been rife at intervals during a long succession of geological ages. The existing active volcanoes of Iceland rise from amid Tertiary lavas and tuffs, which form part of a great volcanic ridge, extending down through the Faroe Islands into the west of Britain. Volcanic action, which now manifests itself so conspicuously along certain lines, seems to have continued in that linear development for protracted periods of time. The actual vents have changed, dying in one place and breaking out in another, yet keeping on the whole along the same lines.

§ 6. Causes of Volcanic Action.

Volcanoes depend, of course, upon the internal heat of the planet as their prime source of energy. But the modus operandi whereby that internal heat

manifests itself in volcanic action is a problem by no means of easy solution. Were this action merely an expression of the intensity of the heat, we might expect it to have manifested itself in a far more powerful manner in former periods, and to exhibit a regularity and continuity commensurate with the exceed- ingly slow diminution of the earth's temperature. But there is no geological evidence in favour of greater volcanic intensity in ancient times than in more recent periods ; on the contrary, it may be doubted whether any of the Palzozoic volcanoes equalled in magnitude those of the Tertiary period, or whether any of the latter ever produced such stupendous changes as have been effected by modern volcanoes still active. On the other hand, no feature of volcanic action is more conspicuous than its spasmodic fitfulness.

The mere presence of a high internal temperature, there- fore, would probably not of itself produce the phenomena of volcanoes, at least in the present condition of the planet. There can be no doubt that one essential exciting cause of voleanic action is the descent of water from the surface. It has already been pointed out how invariably steam plays

a chief part in volcanic eruptions, how it issues in vast clouds from the crater, and continues to rise copiously from the lava even after the molten rock has travelled for some miles, and has assumed a solid surface, The quantity of water which descends into the interior must be enormous. The floor of the sea, the beds of rivers and lakes, are all leaky. Of the annual rain which sinks beneath the surface of the land, we cannot tell what proportion is detained and prevented from rising again in springs. Not only does this subterranean water percolate down cracks and joints, it infiltrates through the very pores of the rocks, and can do So even against the pressure of steam on the further side,

Accordingly, there has arisen a very prevalent belief among

geologists, that it is to the enormous expansive force of perhaps white-hot water finding access to, and imprisoned in, some of the heated empty spaces at the roots of volcanoes that the explosions of a crater and the subsequent rise of a lava-column are due. It has been Supposed that,

somewhat like the reservoirs in which the hot water and steam accu- mulate under the Icelandic geysers, these volcanic spaces receive a constant influx of water from the surface, which cannot escape by other channels, but is in great part con- verted into vapour or retained in the fluid state at an enor- mously high temperature and under vast pressure. In the course of time, the materials filling up the chimney are unable to withstand the upward expansion of this imprisoned vapour and water, so that, after some premonitory rumb- lings, the whole opposing mass is blown out, and the vapour rushes up in the well-known iasses of cloud. Meanwhile, the removal of the overlying column relieves some of the pressure from the water-charged lava, which therefore begins to rise in the funnel until it forces its way through some weak part of the cone, or pours over the top of the crater. After a time the vapour is expended, the energy of the voleano ceases, and there comes a variable period of repose, until a renewal of the same phenomena brings on another eruption. By such successive paroxysms it is supposed that the form of the internal reservoirs and tunnels become changed ; new spaces for the accumulation of superheated water are formed, whence in time new volcanic vents issue, while the old ones gradually die out.

As physical considerations negative the idea of a com- paratively thin crust surmounting a molten interior whence volcanic energy might be derived, geologists have found themselves involved in great perplexity to explain volcanic phenomena for the production of which a source of no great depth would seem to be necessary. They have supposed the existence of pools or lakes of liquid lava lying beneath the crust, and at an inconsiderable depth from the surface. They have sometimes appealed to the influence of the con- traction of the earth’s mass, assuming that the contraction is greater in the outer than in the inner portions, and that the effect of this must be to Squeeze out some of the internal molten matter through weak parts of the crust. Cordier, for example, calculated that a contraction of only a single millimetre (about ;1;th of an inch) would suffice to force out to the surface lava enough for 500 eruptions, allowing 1 cubic kilometre (about 1300 million cubic yards) for each eruption.

The influence of contraction as the grand source of volcanic energy hag recently been insisted upon on quite different grounds by Mr Mallet, who

has developed the theory that all the present manifestations of hypogene action are due directly to the more rapid contraction of the hotter internal mass of the earth, and the consequent crushing in of the outer cooler shell. He points to the admitted difi- culties in the way of connecting volcanic phenomena with the existence of internal lakes of liquid matter, or of a central ocean of molten rock. Observations made by him, on the effects of the earthquake shocks accompanying the

volcanic eruptions of Vesuvius and of Etna, showed that the focus of disturbance could not be more than a few miles deep,—that, in relation to the general mass of the globe, it was quite superficial, and could not possibly have lain under a crust of 800 miles or upwards in thickness. The occurrence of volcanoes in lines, and especially along some of the great mountain-chains of the planet, is likewise dwelt upon by him as a fact not satisfactorily explicable on any previous hypothesis of volcanic energy. But he contends that all these difficulties disappear when once the simple idea of cooling and contrac- tion is adequately realized. “The secular cooling of the globe,” he remarks, “is always going on, though in a very slowly descending ratio. Contraction is therefore con- stantly providing a store of energy to be expended in crush- ing parts of the crust, and through that providing for the volcanic heat. But the crushing itself does not take place with uniformity ; it necessarily acts per saltwm after accumu- lated pressure has reached the necessary amount at a given point, where some of the pressed mass, unequally pressed as we must assume it, gives way, and is succeeded perhaps by a time of repose, or by the transfer of the crushing action elsewhere to some weaker point. Hence, though the magazine of volcanic energy is being constantly and steadily replenished by secular cooling, the effects are intermittent.” He offers an experimental proof of the sufficiency of the store of heat produced by this internal crushing to cause all the phenomena of existing volcanoes. The slight com- parative depth of the volcanic foci, their linear arrangement, and their occurrence along lines of dominant elevation become, he contends, intelligible under this hypothesis. For, since the crushing in of the crust may occur at any depth,

the volcanic sources may vary in depth indefinitely ; and as the crushing will take place chiefly along lines of weakness in the crust, it is precisely in such lines that crumpled mountain-ridges and volcanic funnels should appear. Moreover, by this explanation it is sought to harmonize the discordant observations regarding the varia- tions in the rate of increase of temperature downward within the earth. In some parts of the crust the crushing must be much greater than in other parts; and since the heat “is directly proportionate to the local tangential pres- sure which produces the crushing and the resistance there- to,” it may vary indefinitely up to actual fusion. So long as the crushed rock remains ont of reach of a sufficient access of subterranean water, there would, of course, be no disturbance. But if, through the weaker parts, water enough should descend and be absorbed by the intensely hot crushed mass, it would be raised to a very high tem- perature, and, on sufficient diminution of pressure, would flash into steam and produce the commotion of a volcanic eruption.

This ingenious theory requires the operation of sudden and violent movements, or at least that the heat generated by the crushing should be more than can be immediately conducted away through the crust. Were the crushing slow and equable, the heat developed by it would doubtless be tranquilly dissipated through the crust, the temperature of which might not be sensibly affected in the process, or not to such an extent as to cause any appreciable molecular re- arrangement of the particles of the rock. Moreover, as the action is general throughout the whole mass of the outer shell, there does not seem in the theory any valid reason why volcanic action should be limited to particular lines, and why it should continue so long persistently on these lines. The existence of weak parts of the crust is postu- lated ; but the successive crushings and consequent fusions might be expected to strengthen these weaker parts and to make volcanic conditions less easy.

It cannot indeed be denied that there exists the most

convincing gcological evidence in favour of the sécular con- traction of the globe, that during the process masses of sedimentary strata, many thousands of feet in thickness, have been crumpled and crushed, and that the

crnmpling has often been accompanied by such an amount of heat and evolution of chemical activity as to produce a movement and rearrangement of the elements of the rocks,—this change sometimes advancing to the point of actual fusion. There ‘s reason to believe that some at least of these periods of intense terrestrial disturbance have been followed by periods of prolonged volcanic action in the disturbed areas. Mr . Mallet’s theory is thus, to some extent, supported by inde- pendent geological testimony. The existence, however, of large reservoirs of fused rock, at a comparatively small depth beneath the surface, may be conceived as probable, apart altogether from the effects of the subsidence of the outer shell upon the inner nucleus. The connexion of volcanoes with lines of elevation, and consequent weakness in the earth’s crust, is precisely what might have been anticipated on the view that the nucleus, though practically solid, is at such a temperature and pressure that any diminution of the pressure, by corrugation of the crust or otherwise, will cause the subjacent portion of the nucleus to melt. It is along the lines of elevation that the pressure must be relieved, and it ig there that the consequent melting willtake place. On these lines of tension and weakness, therefore, the conditions for volcanic excitemcut must be best developed. Water is there able soonest to reach the intensely-heated materials underneath the crust, and to give rise to the volcanic ex- plosions. The periodicity of eruptions will thus depend upon the length of time required for the storing up of sufficient steam, and on the amount of resistance in the crust to be overcome. In some cases the intervals of activity, like those of the geysers, return with considerable regularity. In other cases, the shattering of the crust, or the upwelling of vast masses of lava, or the closing of sub- terranean passages for the descending water, or other causes may vary tlie conditions so much, from time to time, that the eruptions may follow each other at very unequal periods, and with very discrepant energy. Each great ontburst exhausts for a while the vigour of the volcano, and an interval is needed for the renewed accumulation of vapour.

Section II.—Earthquakes.

The phenomena of earthquake-motion having been dis- cussed in the article EARTHQUAKES, we shall notice here only those which have a marked geological importance from the way in which they affect the crust or

surface of the earth, briefly describing the effects of earthquakes upon the surface of the land, and upon terrestrial and oceanic waters, the permanent changes of level occasioned by them, their distribution and geological relations, and their causes.

1. fects upon the Soil and General Surface of a Country.—The earth-wave or wave of shock under- neath a country may traverse a wide region and affect it violently at the time without leaving any trace of its passage. Loose objects, however, are apt to be displaced. Thus blocks of rock, already disengaged from their parent masses, may be rolled down into the valleys below. Large landslips are thus produced, and these may give rise to very considerable subsequent changes in the drainage of the localities where they take place. It has often been observed that the soilis rent by the passage of the earthquake. Fissures appear, varying in size from mere cracks, like those due to desiccation, up to deep and wide chasms. Where these cracks are numerous, and where, consequently, the ground has been much disturbed, permanent modifications of the landscape may be produced. ‘Trees are thrown down and buried, wholly or in part, inthe rents, These superficial

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effects may, in a few years, be effaced by the gradual levelling power of the atmosphere. Where, however, the chasms are wide and deep enough to intercept any rivulets, or to serve as channels for heavy rain-torrents, they are sometimes further excavated, so as to become gradually enlarged into ravines and valleys. As a rule, each rent is only a few yards long. Sometimes it may extend for half a mile or even more. In the earthquake which shook the South Island of New Zealand in 1848, a fissure was formed averaging 18 inches in width and traceable for a distance of 60 miles parallel to the adjacent axis of the mountain-chain. The subsequent earthquake of 1855, in the same region, gave rise to a fracture which could be traced along the base of a line of cliff for a distance of about 90 miles.

Remarkable circular cavities are sometimes formed in the ground during the passage of the earth-wave. In many cases these holes serve as funnels of escape for an abundant discharge of water, so that when the disturbance

ceascs they appear as pools, They are believed to be caused by the sudden collapse of subterranean water-channels and tle consequent forcible ejection of the water to the surface,

2, Effects upon Terrestrial Waters.—Springs are tem- porarily affected by earthquake movements, becoming greater or smaller in volume, sometimes muddy or dis: coloured, and sometimes increasing in temperature. Brooks and rivers have been observed to flow with an interrupted course, increasing or diminishing in size, stopping in their flow so as to leave their channels dry, and rolling forward with increased rapidity. Lakes are still more sensitive to the tremors of the ground beneath. Their waters occasionally rise and fall for several hours, even at a distance of many hundred miles from the centre of disturb- ance. Thus, on the day of the great Lisbon earthquake, many of the lakes of central and north-western Europe were so affected as to maintain a succession of waves rising to a height of 2 or 3 fect above their usual level. Cases, how. ever, have been observed where, owing to excessive sub- terranean movement, lakes have been emptied of their contents and their beds left permanently dry. On the other hand, areas of dry ground have been depressed, and have become the sites of new lakes.

Some of the most important changes in the fresh water of a region, however, are produced by the fall of masses of rock and earth. Landslips, by damming up a stream, may go arrest its water as to form alake. The barrier, if of sufficient strength, may be permanent, and the lake will then remain. Owing, however, to the usually loose, inco- herent character of its materials, the dam thrown across the pathway of a stream runsa great risk of being undermined by the percolating water. When this is the case, a sudden giving way of the barrier will allow the confined water to rush with great violence down the valley, and produce perhaps tenfold more havoc tliere than may have been caused by the original earthquake. When the landslip is of sufficient dimensions to divert the stream from its previous course, the new channel thus taken may become permanent, and a valley may be cut out or widened.

3. Effects wpon the Sea.—The great sea-wave propagated outward from the centre of a snb-oceanic earthquake, and reaching the land after the earth-

wave has arrived there, gives rise to much destruction along the maritime parts of the disturbed region, As it approaches the shore, the littoral waters retreat seawards, sucked up, as it were, by the advancing wall of water, which, reaching a height of some- times 60 fect, rushes over the bare beach and sweeps inland, carrying with it everything which it can dislodge and bear away. Loose blocks of rock are thus lifted to a consider- able distance from their former position, and left at a higher level. Deposits of sand, gravel, and other superficial

strewn with debris.

tion, 4, Permanent Changes of Level.—It has been observed,

after the passage of an earthquake, that the level of the Thus after the

disturbed country has been changed. terrible earthquake of 19th November 1822 the coast of Chili for a long distance was found to have risen from 3 to

4 feet, so that along the shore the littoral shells were ex-

posed adhering still to the rocks amid multitudes of dead fish. ‘The same coast-line has since been further upraised by subsequent earthquake shocks, On the other hand, many instances have been observed whire the effect of the earthquake has been to depress permanently the disturbed ground. For example, by the Bengal earthquake of 1762 an area of 60 square miles on the coast, near Chittagong, suddenly went down beneath the sea, leaving only the top of the higher eminences above water, eartliguakes which in the years 1811 and 1812 devastated the basin of the Mississippi gave rise to widespread de- pressions of the ground, over some of which the river spread so as to form new lakes, with the tops standing above the surface of the water,

5. Distribution and Geological Relations of LEarth- quales.—While no large space of the earth’s surface seems of earthquake- more especially liable to the

to be free from at least some degree movement, there are regions visitation. As a rule, eartliquakes are most frequent in voleanic districts, the explosions of a volcano being very

generally preceded or accompanied by tremors of greater or less intensity. In the Old World the great belt of earthquake disturbance stretches in an east and west direction, alorg

lying

that tract of remarkable depressions and elevations between the Alps and the mountains of northern Africa, and spreading eastward so as to enclose the basins of the Mediterranean, Black Sea, Caspian, and Sea of Aral, and to rise into the great mountain-ridges of Central Asia. In this zone lie numerous voleanic vents, both active and extinct or dormant, from the Azores on the west to the basaltic plateaus of India on the east. The Pacific Ocean is surrounded with a vast ring of volcanic vents, and its borders are likewise subject to frequent earthquake shocks, Some of the most terrible earthquakes within human ex- perience have been those which have affected the western seaboard of South America,

6. Causes of Harthquakes,—An earthquake shock has been defined by Mr Mallett as the transit of a wave of elastic compression through the crust and surface of the earth, generated by some sudden irapulse within the crust. The passige of such a wave has been imitated experi- mentally, and some of its characteristic features have been illustrated by accidental explosions at powder-works, But though the phenomena point to some sudden and violent blow inflicted upon the solid crust, it is impossible to do more than speculate on the probable nature of this blow. In some cases it may arise from the sudden flashing Into steam of water in the spheroidal state, from the sudden condensation of steam, from the explosions of a Volcanic orifice, from the falling in of the roof of a sub- terranean cavity, or from the sudden snap of subterranean rocks subjected to prolonged and intense strain. But we are still in ignorance as to the actual immediate cause of any earthquake in regions remote from active volcanoes, So much, at least, is certain, that the shock must arise from some sudden and violent impulse, whereby a wave or un-

dulation is propagated in all directions through the solid substance of the crust,

accumulations are torn up and Swept away, while the surface of the country, as far as the limit reached by the wave, is If the district has been already shattcred by the passage of the earth-wave, the advent of the great sea-wave augments and completes the devasta-

The succession of

of the trees still

Section III.—Secular Upheaval and Depression.

Besides the sudden movements due to earthquake-shocks, the crust of the earth undergoes in many places oscillations of an extremely quiet and uniform character, sometimes of an elevatory, sometimes of a subsiding nature. So tranquil are these chauges that they produce from day to day no appreciable alteration in the aspect of the ground affected. Ouly after the lapse of several generations, and by means of careful measurements, can they really be proved. In- deed, in the interior of a country nothing but a series of accurate levellings from some unchanged datum-line might detect the change of level, unless the effects of this terres- trial movement showed themselves in altering the drainage. It is only along the sea-coast that a ready nieasure is afforded of any such movement, In popular language it is

usual to speak of the sea as rising or sinking relatively to

the land. But so long as the volume of the ocean remains the same, the general sea-level can neither rise nor fall, un- less by some movement of the solid globe underneath it, And, as we cannot conceive of any possible augmentation of the oceanic waters, nor of any diminution save what may be due to the extremely slow process of abstraction by tlic hydration of minerals, or absorption into the earth’s in- terior, we are compelled to

regard the sea-level as _practi- cally a constant datum-line, any deviation from which, in the apparent heights of sea and land, must be due to movement of the land and not of the sea.

There are indeed certain cosmical causes which may affect the relative levels of sea and land. Thus the accumu- lation of large masses of snow and ice as an icc-cap at one of the poles would, as has been above pointed out (ante, p. 217), tend to displace the earth's centre of gravity, and as @ consequence to raise the level of the ocean in the hemi- sphere so affected, and to diminish it in a corresponding measure elsewhere. The return of the ice into the state of water would produce an opposite effect. Dr Croll has also drawn attention to the fact that, as a consequence of the diminution of centrifugal force owing to the retardation of the earth's rotation caused by the tidal wave, the sea-level must have a tendency to subside at the equator and rise at the poles. A larger amount of land need not ultimately be laid bare at the equator, for the change of level resulting from this cause would be so slow that the general degrada- tion of the surface of the land might keep pace with it, and diminish the terrestrial area as much as the retreat of the ocean tended to increase it. Dr Croll has further pointed out that the waste of the equatorial land, and the deposition of the detritus in higher latitudes, must still further counteract the effects of retardation and the consequent change of ocean-level.!

Such widespread general causes of change must produce equally far-reaching effects. But in examining the changes of level between land and sea, we find them to be eminently local and variable in character, pointing to some local and unequally acting cause,—so that, while admitting these cosmical and widespread influences to be part of the general system of geological change, we must yet hold the sea- level, for all practical purposes, to be invariable, any apparent oseillations of that level upon the land being due to terrestrial movements,

§ 1. Movements of Upheaval.

Various maritime tracts of the land have been ascertained to have undergone in recent times, or to be still undergoing, a gradual elevation above the sea. Thus, the coast of Siberia, for 600 miles to the east of the river Lena, the

western tracts of South America, and the Scandinavian peninsula, with the exception of a small aren at its southern

- Croll, Phil. Mag., 1868, p. 382; Sir W. Thomson, Trans. Geol. Soc. Glasgow, iii, 228,

apex, have been proved to have been recently upheaved. The proofs of this change of level chiefly to be relied on are the following! :—

(1.) The position of rocks covered with barnacles or other littoral adherent animals, or pierced by lithodomous shells. A single stone with these creatures on its surface would not necessarily prove anything, for it might be cast up by a storm; but a line of large boulders, which had evidently not been moved since the cirripedes and molluses lived upon them, and still more a solid cliff with these marks of littoral or sub-littoral life upon its base, now raised above high- water mark, would be sufficient to demonstrate a rise of land. The amount of the upheaval might be pretty accurately determined by measuring the vertical distance between the upper edge of the barnacle zone upon the upraised rock, and the limit of the same zone on the present shore.

(2.) A line of sea-caves, now standing at a distance above high water-mark beyond the reach of the sea, would afford evidence of recent uprise, since caves of this kind are only hollowed out by the waves between tide-marks.

(3.) One of the most striking proofs of upheaval is furnished by what are termed ravsed beaches. A beach is the space between tide-marks, where the sea is constantly busy producing sand and gravel, mingling with them tle remains of shells and other organisms, sometimes piling the deposits up, sometimes sweeping them away out into opener water. The terrace or platform thus formed is a well- marked feature of coast-lines skirting tidal seas. When the land rises with sufficient rapidity to carry up the line of littoral deposits above the reach of the waves, the flat terrace thus elevated is known as a raised beach. The former high-water mark then lies inland, and while its sea-worn caves are in time hung with ferns aud mosses, it furnishes itself an admirable platform, on which meadows, fields, and

gardens, roads, houses, villages, and towns spring up, while a new beach is made below the margin of the uplifted one. Raised beaches abound round many parts of the coast-line of Britain. Some excellent examples occur in Cornwall and Devon. The coast-line on both sides of Scotland is fringed with raised beaches, sometimes four or five occurring above each other, at heights of 25, 40, 60, 75 and 100 feet above the present high-water mark. Eacli terrace marks a former lower level of the land with regard to the sea, and probably a lengthened stay of the land at that level, while the intervals between them represent the vertical amount of each successive uplift of the land, and show that the land in its upward movement did not remain long enough at intermediate points for the formation of terraces. A succession of raised beaches, rising above the present sea-level, may therefore be taken as pointing to a former prolonged upheaval of the country, interrupted by long pauses, during which the general level did not materially change.

(4.) Any stratum of rock containing marine organisms, which have manifestly lived and died where their remains now lie, must be held to prove upheaval of the land. In this way it can be shown that most of the solid land now visible to us has once been under the sea. Even high on the peaks of the cliffs and the flanks of the Himalaya mountains, undoubted marine shells occur in the solid rocks.

(5.) In countries which lave been long settled by a human population, it is sometimes possible to prove, or at least to render probable, the fact of recent uprise of the land by reference to tradition, to local names, and to works of human construction. Piers and harbours, if now found to stand above the upper limit of high-water, furnish indeed indisputable evidence of a rise of land since their erec- tion.

1“ Warthquakes and Volcanoes,” by A. Geikie, Chambers’s Mis cellany of Tracts.

GHROLOGY

(111, DYNAMICAL.

§ 2. Movements of Subsidence.

It is more difficult to trace the downward movement of the land, for the evidence of each successive sea-margin Is carried down and washed away or covered up. Neverthie- less, the fact of subsidence can be satisfactorily established by the following kinds of proof? :—

(1.) The results of mere erosion by the sea and those of actual depression of the level of the land cannot always be distinguished without some care. The encroachment of the sea upon the land, involving, it may be, the disappear- ance of successive fields, roads, houses, villages, and even whole parishes, does not necessarily indicate a sinking of the land. Such destruction of the coast-line may, indeed, be in progress without any actual change of level. Should the sea, however, rise to the level of roads and buildings which it never used to touch, should former half-tide rocks cease to show even at low water, and should rocks, previously above the reach of the highest tide, be turned first into shore reefs, then into skerries and islets, we infer that the coast-line is sinking. Such kind of evi. dence is found in Scania, the most southerly part of Sweden. Streets, built of course above high-water mark, now lie below it, with older streets lying beneath them, so that the subsidence is of some antiquity. A stone, the position of which had been exactly determined by Linnzeus in 1749, was found after 87 years to be 100 feet nearer the water's edge. The west coast of Greenland, for a space of more than 600 miles, is perceptibly sinking. It has there been noticed that, over ancient buildings on low shores, as well as over entire islets, tlle sea has risen. The Moravian settlers have been more than once driven to shift their boat-poles inland, some of the old poles remaining visible under water.

(2.) As the land is brought down within reach of the waves, its characteristic surface-features are, of course, apt to be effaced, so that the submerged area which passes down beneath the sea may retain little or no evidence of its having been a land-surface. It will be covered, as a rule, with sea-worn sand or silt. Hence, no doubt, the reason why, among the marine strata which form so large a part of the stratified portion of the earth's crust, and where there are many proofs of depression, actual traces of land- surfaces are comparatively rare. It is only under very favourable circumstances, as, for instance, where the area is sheltered from prevalent winds and waves, and where, therefore, the surface of the land can sink tranquilly under the sea, that fragments of that surface may be completely preserved under overlying

marine accumulations. It is in such places that “submerged forests” occur. These are stumps or roots of trees still in their positions of growth in their native soil. Beds of peat, full of tree-stumps, hazel- nuts, branches, leaves, and other indications of a terrestrial surface, are often found in similar situations. Sir Henry de la Beche has described, round the shores of Devon, Cornwall, and western Somerset, a vegetable accumulation, consisting of plants of the same species as those which now grow freely on the adjoining land, and occurring as a bed at the mouths of valleys, at the bottoms of sheltered bays, and in front of and under low tracts of land, the seaward side of which dips beneath the present level of the sea. Over this submerged land-surface sand and silt containing estuarine shells have generally been deposited, whence we may infer that in the submergence the valleys first became estuaries, and then sea-bays. If now, in the course of ages, a series of such submerged forests should be formed one over the other, and if, finally, they should, by upheaval of the sea-bottom, be once more laid dry, so as to be capable of examination by boring, well-sinking, or otherwise, they ee

2 Ibid.

would prove a former long-continued depression, with intervals of rest. In such a case, the intervals of pause would be marked by the buried forests, and the progress of the depression by the strata of sand and mud lying between them. In short, the evidence would be strictly on a parallel with that furnished by a succession of raised beaches as to a former protracted elevation with long pauses.

(3.) An interesting kind of proof of an extensive depres- sion of the north-west of Europe is furnished by the deep fjords or sea-lochs by which that region is indented. A fjord is a long, narrow, and often singularly deep inlet of the sea, which terminates inland at the mouth of a glen or valley. The word is Norwegian, and in Norway fjords are characteristically developed. The English word “firth,” however, is the same, and the western coasts of the British Isles furnish many excellent examples of fjords. In Scotland they are usually called lochs, as Loch Hourn, Loch Nevis, Loch Fyne, Gareloch; in Ireland they are sometimes known by the name of loughs, as Lough

Foyle, but more commonly by that of bays, as Dingle Bay, Bantry Bay. There can be little doubt that, though now filled with salt water, fjords have been originally land valleys. The long inlet was first excavated as a land-valley or glen. This valley exactly corresponds in form and' character with the hollow of the fjord, and must be regarded as merely its inland prolongation. That the glens have been exca- vated by subaerial agents is a conclusion borne out by a great weight of evidence. If, therefore, we admit the subaerial origin of the glen, we must also grant a similar origin to its seaward prolongation. Every fjord will thus mark the site of a submerged valley. This inference is confirmed by the fact that fjords do not, as a rule, occur singly. Like the glens on the land they lie in groups; so that when they are found intersecting a long line of coast like that of the west of Norway, or the west of Scotland, we conclude that the land has there sunk down so as to permit the sea to run far up and fill the submerged glens.

(4.) Evidence of widespread depression over the area of the Pacific Ocean is furnished by the numerous atolls or coral islands scattered throughout that vast expanse of water. Mr Darwin ascertained that the reef-building corals do not live at a greater depth than about 15 or 20 fathoms. Yet reefs and circular islets of coral rise with nearly per- pendicular sides from a depth of 2000 feet and upwards, until they reach the surface of the sea, As the corals could not have begun to grow upward from such vast depths, Mr Darwin first suggested that thie sites of these coral reefs had undergone a progressive subsidence, the rate of upward growth of the reefs keeping pace, on the whole, with the depression. A fringing reef would first be formed fronting the land within the limit of the 20 fathom line. Growing upward until it reached the surface of the water, it would be exposed to the dash of the waves, which would break off pieces of the coral and heap them upon the reef. In this way islets would be formed which, by successive accumula- tions of materials thrown up by the breakers or brought by winds, would remain permanently above water. On these islets palms and other plants, whose seeds might be drifted from the adjoining land, would take root and flourish, Inside the reef there would be a shallow channel of water, communicating, through gaps in the reef, with the main ocean outside. Fringing reefs of this character are of common occurrence at the present time. In the case of a continent they front its coast for a long distance, but they -may entirely surround an island. If the site of a fringing

reef undergoes depression at a rate sufficiently slow to allow the corals to keep pace with it, the reef will grow upward as the bottom sinks downward. The lagoon channel inside will become deeper and wider, while, at the same time, the

depth of the water outside will increase. In this way a barrier reef will be formed. Continued slow depression must continually diminish the area of the land enclosed within one of these rings of coral-reef, while the reef itself retains much the saine size and position. At last the final peak of the original island disappears under the lagoon, and an atoll or true coral island is formed. Should any more rapid or sudden downward movement take place, it might carry the atoll down beneath the surface, as seems to have happened at the Great Chagos bank in the Indian Ocean, which isa submerged atoll. It has recently been suggested that barrier reefs do not necessarily prove subsidence, seeing that they may grow outward from the land upon the top of a talus of their own debris broken down by the waves, and may thus appear to consist of solid coral which had grown upward from the bottom during depression, although only the upper layer, 20 fathoms or thereabouts in thick- ness, is composed of solid, unbroken, coral growth. The explanation may doubtless account for some barrier-reefs, and for the way in which the steep seaward face of all such reefs is formed and maintained. But it does not elucidate the existence of submerged atolls, the presence of gaps in atolls answering to gaps in the fringing reefs opposite to the mouths of rivers ; and the difficulty of supposing that, ina coral archipelago, there should have been scores of sub- merged peaks so nearly of the same height as to rise within 20 fathoms of the surface, and yet so seldom actually to tower above it. According to the simple and luminous theory of Mr Darwin, every stage in the progress of the changes is open to observation, from the incipient fringing reef to the completed and submerged atoll. Every observed fact fits in harmoniously with the others, and we reach the impres- sive conclusion that a vast area of the Pacific Ocean, fully 6000 geographical miles from east to west, has undergone a recent subsidence, and may be slowly sinking still.

It by no means follows, however, as some writers have imagined, that the present Pacific Ocean occupies the site of a vast submerged continent. All the coral islands seem to have been built on volcanic peaks. Wherever any non- calcareous rock appears it is of volcanic origin. We must therefore conceive of these oceanic islands as detached volcanic eminences rising out of a wide area of subsidence, and doubtless as deriving their existence from the results of that subterranean movement.

§ 3. Causes of Secular Upheaval and Depression.

These movements, without question, we must again trace back to consequences of the original internal heat of the earth. There are various ways in which the heat may have acted. ‘Thus a considerable accession of heat expands rocks, and, on the other hand, a loss of heat causes them to con- tract, We may suppose therefore that, during the sub- terranean changes, a great extent of the crust underneath a tract of land may have its temperature slowly raised. The effect of this increment would be to cause a slow uprise of the ground above. The gradual transference of the heat to another quarter might produce a steady subsidence. Such variations in subterranean temperature, however, could give rise at the most to but very insignificant elevations or depressions.

A far more important and generally effective cause is to be sought in the secular contraction of the globe. If our planet has been steadily losing heat by radiation into space, it must have progressively diminished in volume. The cooling implies contraction. According to Mr Mallet, the diameter of the earth is less by at least 189 miles since the time when the planet was a mass of liquid.!. But the con- traction has not manifested itself uniformly over the whole

? Phil. Trans., 1873, p. 250. __ X. — 33

surface of the planet. The crust varies much in structure, in thermal resistance, and in the position of its isogeo- thermal lines. As the hotter nucleus contracts more rapidly by cooling than the cooled and hardened crust, the latter must sink down by its own weight, and in so doing requires

to accommodate itself to a continually diminishing diameter. The descent of the crust gives rise to enormous tangential pressures. The rocks are crushed, crumpled, and broken in many places. Subsidence must have been the general rule, but every subsidence would doubtless be accompanied with upheavals of a more limited kind. The direction of these upheaved tracts would largely depend upon the original structure of the crust. It would be apt to occur in lines which, once taken as lines of weakness or relief from the intense strain, would probably be made use of again and again at successive paroxysms or more tranquil periods of contraction. Mr Mallet, in the paper already cited, has ingeniously connected these movements with the linear direction of mountain chains, volcanic vents, and earthquake shocks.

Though the origin of the present surface configuration of the land will be more conveniently discussed in a subse- quent part of this article, after the structure of the earth's

crust has been described, a few words may be inserted here, '

where some allusion to the subject might be looked for. Mountains may arise from three causes—(1) from the cor- rugation of the earth's crust dne to the effects of secular contraction ; (2) from the accumulation of materials poured out of volcanic orifices; aud (3) from the isolation of elevated masses of ground, owing to the removal, by denudation, of the materials originally connecting them, and to the consequent formation of valleys. Mountains formed inthe volcanic way are almost always conical, and are either solitary, as Etna, or occur in linear groups, like the volcanoes of Java. Those formed by denudation are of minor dimensions, and rather deserve the name of hills. Mountain-chains, on the other hand, which are the dominant features of the earth's surface, though they may have lines of volcanic vents along their crests, are not formed essentially of volcanic materials, but of the sedi- mentary and crystalline rocks of the crust which have been ridged up into vast folds, If the continental lands may be compared to great undulations of the solid surface of the globe, the mountain-chains may be likened to the breaking crests of such wave-like undulations, In their internal structure mountail-chains bear witness to the intense crumpling of the rocks during the process of upheaval. As a

consequence of the uprise of two or more parallel ranges of mountain, lines of longitudinal valley must be produced. But no sooner is a mass of land raised above the sea than it is exposed to the attacks of air, rain, frost, springs, glaciers, or other meteoric agents of disintegration. Its surface is then worn down, the flow of water down its slopes cuts out gulleys, ravines, and valleys, so that eventually a very rugged surface is produced, on which, probably, no portion of the original surface of upheaval may remain, but where new lines of minor ridge and valley may appear as the combined result of internal geological structure and atmospheric denudation. The reader, however, is referred to part vii. of this article for a fuller treatment of this interesting subject.

During the movements by which mountain masses have been upheaved, the stratified rocks have been so compressed as to occupy, In many cases, but a small proportion of the horizontal extent over which they originally extended. They have adjusted themselves to this diminished area by undergoing intense plication, and thus acquiring a much greater verticaldepth. On the other hand, they have been abundantly fractured, some portions of their mass being pushed up, others being let’ down, so that the crust is

| traversed with a kind of complicated network of fissures.

The discussion of these features of geological structure, however, must likewise be postponed to part iv., where the facts regarding their occurrence will be described.

Section IV._Hypogene Causes of Changes in the Tex- ture, Structure, and Composition of Rocks.

The phenomena of hypogene action hitherto under con- sideration have related almost wholly to the effects produced at the surface. It is evident, however, that these phenomena must be accompanied by very considerable changes in the rocks which form the earth’s outer crust. These rocks, as just

stated, have been subjected to enormous pressure; they have been contorted, crumpled, and folded back upon themselves, as if thousands of feet of solid limestones, sandstones, and shales had been merely a few layers of carpet; they have been shattered and fractured everywhere ; they have in one place been pushed far above their original position, in another depressed far beneath it: so great has been the compression which they have undergone that their component particles have in many places been rearranged, and even crystallized. They have here and there actually been reduced to fusion, and have been abundantly invaded by masses of molten rock from below.

In the present section of this article we shall consider chiefly the nature of the agencies by which such changes have been effected; the results achieved, in so far as they constitute part of the architecture or structure of the earth's crust, will be discussed in part iv. At the outset, it is evident that we cau hardly hope to detect many of these processes of subterranean change actually in progress and watch their effects. The very vastness of some of them places them beyond our direct reach, and we can only reason regarding them from the changes whicli we see them to have produced. But a good number are of a kind which we can in some measure imitatc in our laboratories and furnaces, It is not requisite, therefore, to speculate wholly in the dark on this subject. Since the original and classic researches of Sir James Hall, the founder of experimental geology, great progress has been made in the investigation of hypogene proccsses by experiment, The conditions of nature have been imitated as closely as possible, and varied in different ways, with the result of giving us an increas- ingly clear insight into the physics and chemistry of sub- terranean geological changes. The succeeding portions of this section of the article will therefore be chiefly devoted to an illustration of the nature of hypogene action, in so far as that can be inferred from the results of actual experiment. The subject maybe conveniently treated under three heads— (1) the effects of heat ; (2) the effects of pressure and con- traction ; (3) the influence of water in effecting changes in minerals and rocks,

§ 1. Lffects of Heat.

The iniportance of heat among the transformations of the rocks has been fully admitted by geologists, since it used to be the watchword of the

Huttonian or Vulcanist school at the end of last century. Two sources of subterranean heat may have at different times and in different degrees co-operated in the production of hypo- gene changes—(1) the internal heat of the globe, of which some account has already been given, and (2) the heat due to the transformation of mechanical energy in the crumpling, fracturing, and crushing of the rocks of the crust, as these have been from time to time compelled to adjust themselves to the diminishing diameter of the more rapidly cooling and contracting interior. From which of these two sources, or from what combination of them, the heat was derived by which any given change in the rocks was produced, is a problem which admits

in the meantime of only very partial solution.

which are clearly referable to the influence of heat.

It is evident that the conditions under which these effects are produced must vary almost infinitely. We have to consider (1) the temperature, from the lowest at which any change is possible up to that of complete fusion 3 (2) the nature of the rock operated upon, some materials being of change from heat than others : (3) the pressure under which the heat acts, the potency of this agency being much increased with increase of pressure ;

much more susceptible

(4) the presence of water, whereby chemical changes take place which would not be possible in dry heat.

In an interesting series of experiments the illustrious De Saussure (1779) fused some of the rocks of Switzerland and France, and inferred from them, contrary to the opinion pre- viously expressed by Desmarest,! that basalt and lava have not been produced from granite, but from hornstone (pierre de corne), varieties of “ schorl,” calcareous clays, marls, and micaceous earths, and the cellular varieties from different kinds of slate? He observed, however, that the artificial products obtained by fusion were glassy and enamel-like, and did not always recall volcanic rocks, though some exactly resembled porous lavas. .

Sir James Hall, about the year 1790, began an important investigation, in which he succeeded in reducing various ancient aud modern voleanic rocks to the condition of glass, and in restoring them, by slow cooling, to a stony state.

Since that time many other researches of a more complicated

kind have been undertaken, especially by Delesse, Daubrée, Deville, Bunsen, Bischof, H. and W. Rogers. By these observations it has been abundantly proved that all rocks undergo molecular changes when exposed to high tempera- ture, that when the heat is sufficiently raised they become fluid, that if the glass thus obtained is rapidly cooled it remains vitreous, and that, if allowed to cool slowly, a more or less distinct crystallization sets in, the glass is devitrified, and a lithoid product is the result.

Illustrations of the influence of different degrees of heat upon rocks of different kinds may often be very instruct- ively observed at lime-kilns, especially those roughly-built kilns or pits which may still be met with in outlying dis- tricts. Some of the stones lining such cavities will be found with no sensible change, others show a somewhat cellular texture, others have acquired a rudely prismatic structure, while some have had their surfaces fused into a rough glaze orenamel. The bricks or stones used for lining furnaces present similar illustrations, the columnar or prismatic structure being occasionally very perfectly developed in these materials. Mere contact with a highly-heated surface, and subsequent gradual cooling, have often produced this prismatic arrangement in rocks of the most diverse kinds. Thus, in Scotland, beds of sandstone and seams of cecal have acquired the most perfect prismatic structure from the intrusion of basalt dykes or sheets through them.. To these and other effects of intruded igneous rocks reference will be made in the sequel. In these cases the alteration is merely local, and has obviously been produced by contact with a highly heated surface. But, besides such minor effects due merely to contact, others of a more general kind affect large masses of rock or whole districts of country.

When rocks are exposed to temperatures as high as their melting-points, they fuse into glass which, in the great majority of cases, is of a bottle-green or black colour, thie depth of the tint depending mainly on the proportion of

iron. In this respect they resemble the natural glasses— pitclistones and obsidians. They almost always contain

ee 1 Mem. Acad. Scien., 1771, p. 273. * De Saussure, Voyages dans les Alps, edit. 1803, tome i. p. 178.

Leaving this question for the present, let us examine the effects

minute cells or bubbles, arising prcbably from the disen- gagement of water or of oxygen during the fusion. But after the most thorough fusion which has been found possible, minute granules usually appear in the solidified glass. Sometimes these consist of specks of quartz, which is especially apt to remain unmelted when the rock is very siliceous, or of other minerals of the original rock, Buta microscopic investigation of fused rocks shows that, even in what seems to be a tolerably homogeneous glass, there are abundant minute hair-like, feathered, needle-shaped, or irregularly-aggregated bodies diffused through the glassy paste. These crystallites are in some cases colourless silicates, in others they are opaque metallic oxides, particu- larly oxides of iron. They precisely resemble the crystal- lites which are observed in many volcanic rocks, such ag obsidian, pitchstone, and basalt. They may be obtained even from the fusion of a granitic or granitoid rock, as in the well-known case of the Mount Sorrel Syenite near Leicester, which, being fused and slowly cooled, yielded abundant crystallites, including exquisitely grouped octo- hedra of magnetite. 7

According to the observations of Delesse, volcanic rocks, when reduced to a molten condition, attack briskly the sides of the Hessian crucibles in which they are contained, and even eat them through. This is an interesting fact, for it helps to explain how some intrusive igneous rocks have come to occupy positions previously filled by sedi- mentary strata, and why, under such circumstances, the composition of the same mass of rock should be found to vary considerably from place to place,’

It would appear that, in passing from a crystalline into a vitreous condition, rocks undergo a diminution of density, which, on the whole, is greater the more silica and alkali are present, and is less as the proportion of iron, lime, and alumina increases. According to Delesse, granites, quartzi- ferous porphyries, and such highly silicated rocks lose from 8 to 11 per cent. of their density when they are reduced to the condition of glass, basalts lose from 3 to 5 per cent., and lavas, including the vitreous varieties, from 0 to 4 per cent. This diminution of density (and consequent increase of volume) may account for minor oscillations of the ground so often observed in volcanic regions. If we suppose a sub- terranean mass of lava 500 feet thick to pass from the fluid to the crystalline condition, this might cause a subsidence of the ground above to the extent of about 20 or 25 feet, The transition of a similar mass of rock from the solid to the fluid condition would cause an uprise to a like amount.

So far as experiments have yet been conducted, it has been found impossible to obtain from a piece of fused rock a crystalline substance exactly resembling the original mass. Externally it may appear quite stony, but its internal structure, as revealed by the microscope, shows it to be essentially a slag or glass, and not a truly crystalline rock. There is another fundamental difference between the natural and artificial products. When a compound containing sub- stances of different fusibilities is artificially melted, and allowed thereafter to coolin such a way that the various in- gredients may separate from each other, they appear in their order of fusibility, the most refractory coming first, and the most fusible being the last to take asolid form. But in rocks which have crystallized naturally from a fluid condition, it is often to be observed that the component minerals have been far from obeying what might have been supposed to be their invariable law. Thus, in all parts of the world, granite presents the very striking fact that its quartz, which we call an infusible mineral, has actually solidified after the more fusible felspar. In the Vesuvian lavas the

3 Bull. Soc. Géol. France, 2d ser., iv. 1882.

difficultly fusible leucite may be seen to have enclosed crystals already formed of the fusible augite. In many ancient crystalline rocks the

pyroxenic constituents, which offer a less resistance to fusion, have assumed a crystalline form before the more refractory triclinic felspars. From these facts it is clear that, in the fusion of rocks and in their subsequent consolidation, there must have been con- ditions under which the normal order of appearance of the minerals was disturbed or reversed. be mentioned to show further the difference between the kind of fusion which has frequently obtained in nature and that of the ordinary operations of a glass-work or iron- furnace. As far back as the year 1846 Scheerer showed that there exist in granite various minerals which could not have consolidated save at a comparatively low tem- perature. He instanced especially several gadolinites, orthites, and allanites, which cannot endure a higher tem- perature than a dull-red heat without altering their physical characters; and he concluded that.granite, though it may have possessed a high temperature, cannot have solidified from simple igneous fusion.

We may conclude, therefore, that the manner in which rocks have been melted within the crust is not that mere simple fusion which we can accomplish artificially, but that it has involved conditions which have not been successfully imitated in any laboratory or furnace. Two obvious differences must occur to the reader between the natural and artificial operations. In the first place, rocks which have undoubtedly once been in a fluid or at least pasty con- dition, and which have been injected as veins and dykes into previously consolidated masses, contain water imprisoned within their component crystals. This is not water which has been subsequently introduced. It is contained in minute cells, which it usually does not now completely fill, but which it no doubt did occupy completely at the time and temperature at which the rock was consolidated. We have seen (ante, p. 250) howabundant are the discharges of water- vapour from volcanic fires, how the molten lava-streams issue from their vents, saturated, as it were, with steam, and how the steam continues to rise from them long after they have congealed and come to rest. In the solid crystals of lava which were erupted only recently, as well as in those of early geological periods, the presence of water in minute cavities may be readily detected. It is in the quartz of such rocks, and still more in that of granite, that the detection of water-cavities is most easily made. The quartz of granite is usually full of them. .“ A thousand millions,” says Mr J. Clifton Ward, “might easily be con- tained within a cubic inch of quartz, and sometimes the contained

water must make up at least 5 per cent. of the whole volume of the containing quartz.” Thus microscopic investigation confirms the conclusion arrived at by Scheerer in the memoir already cited, that at the time of its eruption granite must have been a kind of pasty mass containing a considerable proportion of water. It is common now to speak of the “ aquo-igneous” origin of some eruptive rocks, and to treat their production as a part of whatis termed the

‘hydro-thermal ” operations of geology. We may conclude that, while some rocks, like obsidian and pitchstone, which so closely resemble artificial glasses, may have been derived from a simple igneous fusion such as can be imitated in a furnace (though even in these the presence and influence of water may be traced), the great majority of rocks have had a more complex origin, and in a great number of cases can be proved to have been mingled with more or less water while they were still fluid.

In the second place, there can be no question that, in the great hypogene laboratory of nature, rocks have been softened and fused under enormous pressure. Besides the pressure due to their varying depth from the surface, they

Yet another fact may |

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must have been subject to the enormous expansion of the superheated water or vapour which filled all their cavities. Mr Sorby bas ingeniously estimated the probable pressure under which granite consolidated by taking the ratio between the size of the liquid cavities in the quartz and that of the contained bubble or vacuity. Assuming the temperature of consolidation to have been 680° Fahr. (360° Cent.), or a dull-red heat, he inferred that in many cases the pressure under which the granite consolidates must have been equal to that of an overlying mass of rock 50,000 feet, or more than 9 miles, in thickness. It is not probable that any such thick overlying mass ever did cover the granite ; the pressure, even if it be allowed to have been so great,

must have been due partly to other causes, such as the compression due to secular contraction.

It would appear therefore that perfect anhydrous fusion, or the reduction of a rock to the state of a completely homogeneous glass, has been a comparatively rare process in nature, or at least that such glasses, if originally formed, have in the vast majority of cases undergone devitrification and crystallization, until the glassy base has been reduced to a smaller or larger fraction of the total mass of the rock, or has entirely passed into a stony condition. In many voleanic rocks the original vitreous base or ground-mass can be readily observed with the microscope between the definitely-formed crystals. Crystallites, or arrested stages in the crystallization of iron oxides and of silicates, can often be detected in these rocks, more ‘especially where it is evident that they must have cooled with comparative rapidity, as where they have been thrust into narrow fissures to form dykes. But in rocks such as granite, where no glass exists, but where the mineral constituents are all crystalline, no trace of the crystallites occurs. Doubtless such differences point to original distinctions in the kind and degree of fusion of the rocks. It seems reasonable to suppose that those rocks which showa glassy ground-mass, , and the presence of crystallites, have. been fused under conditions more nearly resembling those of the simple igneous fusion of experiment.

It has long been known that many mineral substances can be obtained in a crystalline form from the condensation of vapours. ‘This process, called sublimation, may be the result of the mere cooling and reappearance of bodies which. have been vaporized by heat and solidify on cooling, or from the solution of these bodies in other vapours or gases, or from the reaction of different vapours upon each other. These operations are of common occurrence at volcanic vents, and in the crevices of recently erupted and still hot lava-streams. They have been successfully imitated by experiment. In the early researches of Sir James Hall on the effects of heat modified by compression, he obtained by sublimation “ transparent and well-defined crystals,” lining the unoccupied portion of a hermetically-sealed iron tube, in which lie had placed and exposed to a high temperature some fragments of limestone (Zrans. Roy. Soc. Hdin., vi. 110). Numerous experiments have been made by Messrs Delesse, Danbrée, and others, in the production of

minerals by sublimation. ‘Thus many of the metallic sulphides found in mineral veins have been produced by exposing to a comparatively low temperature (between that of boiling water and a dull-red heat) tubes containing metallic chlorides and sulphide of hydrogen. By varying the materials employed, corundum, quartz, apatite, and other minerals have been obtained. It is not difficult, therefore, to understand how, in the crevices of lava-streams and volcanic cones, as well as in some mineral veins, sulphides and oxides of iron and other minerals may have been formed by the ascent of heated vapours. Superheated steam is endowed with a remarkable power of dissolving that intractable substance, silica ; artificially heated to the tem-

silica, and deposits the mineral in snow-white crystals as it cools. , § 2. Hfects of Pressure and Contraction.

Besides the influence of pressure in raising the melting point of subterranean rocks, and in permitting water to remain fluid among them at temperatures far above the

boiling-point, even at a red or perhaps a white heat, we

have to consider the effects produced by the same cause upon rocks already solidified. The simplest and most obvious result of pressure upon such rocks is their consoli-

dation, as where a mass of loose sand is gradually compacted

into a more or less coherent stone, or where a layer of vegetation is compressed into peat, lignite, or coal. In many cases the cohesion of a sedimentary rock is due merely to the pressure of the superincumbent strata. But it usually happens that some cementing material has contri- buted to bind the component particles together. Of these natural cements the most frequent are peroxide of iron, silica, and carbonate of lime.

Pressure equally distributed over a rock presenting every- where nearly the same amount of resistance will promote consolidation, but may produce no

further internal change. If, however, the pressure becomes extremely unequal, or if the rock subjected to it can find escape from the influence

in one or more directions, there will be a disturbance or

rearrangement of the particles, which by this means are made to move upon each other. Five consequences of these movements may be noticed here.

(1.) Cleavage.—When a inass of rock, owing to subsidence or auy other cause, is subjected to powerful lateral compres-

sion, its innate particles, which in all rocks have almost invariably a longer and shorter axis, tend, under the intense strain, to rearrange themselves in the line of least resist. ance, that is, with their long axes perpendicular to the direction of the pressure. The result of this readjustment is that the rock affected by it acquires a facility for splitting along the lines in which its component particles have placed themselves. Fine-grained argillaceous rocks show most characteristically this internal change; but in coarse materials it becomes less conspicuous, or even disappears. Rocks which have been thus acted on, and have acquired this superinduced fissility, are said to be cleaved, and the fissile structure is termed cleavage. This has been proved experimentally by Sorby, who produced perfect cleavage in Pipeclay through which scales of oxide of iron had previously been mixed. Dr Tyndall superinduced cleavage on bees-wax and other substances by subjecting them to severe pressure. Cleavage among rocks occurs on a great scale in countries where the strata have been greatly plicated, that is, where they now occupy much less horizontal surface than they once did, and consequently where, in accommodating themselves to their diminished area, they have had to undergo much powerful lateral compression. The structure of districts with cleaved rocks is described in part iv.

(2.) Further evidence of the compression to which rocks have been subjected is furnished by the way in which con- tiguous pebbles in a conglomerate may be found to have been squeezed into each other, and even sometimes to have been elongated in a certain general direction. It is doubt- less the coarseness of the grain of such rocks which permits the effects of compression to be so readily seen, Similar effects must take place in fine-grained rocks, though they escape observation. Organic remains

both of plants and animals may often be found to have undergone considerable distortion from this cause. M. Daubrée has imitated experimentally the indentations produced by the con- tiguous portions of conglomerate pebbles.?

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’ Comptes Rendus, xliv. 823,

perature of the melting point of cast-iron, it rapidly attacks

(3.) The ingenious experiments of M, Tresca on the flow of solids have proved that, even at ordinary atmospheric temperatures, solid resisting bodies like lead, cast-iron, and ice, may be so compressed as to undergo an internal motion of their parts which is closely analogous to that of fluids, Thus, a solid jet of lead has been produced by placing a piece of the metal in a cavity between the jaws of a power- ful compressing machine. Iron, in like manner, has been forced to flow in the solid state into cavities and take their shape. On cutting sections of the metals so compressed, their particles or crystals are found to have ranged them- selves in lines of flow which follow the contour of the space into which they have been squeezed. Such experiments are of considerable geological interest, for they show that in certain circumstances, under great pressure, the unequally mixed particles of rocks within the earth’s crust may have been forced to move upon each other, and thus to acquire a “‘ fluid-structure ” resembling that which is seen in rocks which have possessed true liquidity. No large sheet of rock can be expected, however, to have undergone this internal change; the effects could only be produced excep- tionally at places where there was an escape from the pres- sure as, for instance, along the sides of fissures, or in other cavities of rocks. The explanation cannot be applied to the case of rocks like schists, which display a kind of rude foliation or fluid-structure over areas many thousands of square miles in extent.

(4.) Plication.~-Reference has already been made to the fact that, owing to the more rapid contraction of the inner portion of the globe, the outer layer or crust is from time to time forced to adjust itself to this change by subsiding, As a consequence of the subsidence, the descending area requires to occupy less horizontal space, and must therefore suffer powerful lateral compression. The rocks are thus crumpled up, as, in the classic experiment of Sir James Hall, folds of cloth are folded when a weight is placed upon them and they are squeezed from either side. The mere subsidence of such a curved surface as that of our globe must thus necessarily produce much lateral compres- sion. Mr J. M. Wilson has calculated that, if a tract of the earth's surface, 345 miles in breadth, be depressed one mile, it will undergo compression to the extent of 121 yards ; at two miles the compression will be 189 yards ; at eight miles 598 yards. The observed amount of com- pression in districts of contorted rocks, however, far exceeds these figures. Another cause of the compression and contortion of rocks is the injection into them of igneous masses from below, but this is probably a minor source of disturbance. The character of plicated rocks is described in part iv. p. 300.

(5.) Haults.—Closely connected with the disturbances which have produced contortions come those by which the crust of the earth has been fractured. But in this case the movement is one of elevation rather than of subsidence Pelor, instead of having to oceupy a diminished diameter, the rocks get more room by being pushed up, and as they cannot occupy the additioual space by any elastic expansion of their mass, they can only accommodate themselves to the new position by a series of dislocations. Some portions will be pushed up farther than others, and this will happen more particularly to those which have a broad base. These will rise more than those with narrow bottoms, or the latter will seem to sink relatively to the former. Each broad- bottomed segment will thus be bounded by two sides slop- ing towards the upper part of the block, This is‘ found to be almost invariably the case in nature. A fault or dis- location is nearly always inclined from the vertical, and the side to which the inclination rises, and from which it "hades," is the upthrow side. The details of these features of geological structure are discussed in part iv., section v.

§ 3. Influence of Water.

In the great geological contest fought at the beginning of the century between the Neptunists and the Plutonists, the two great battle-cries were, on the one side, Water, on the other, Fire. The progress of the science since that time has shown that each of the parties had truth on its side, and had seized one aspect of the problems touching the origin of rocks, If subterranean heat has played a large part in the construction of the materials of the earth's crust, water, on the other hand, has performed a hardly less im- portant share of the task. They have often co-operated together, and in such a way that the result must be re- garded as their joint achievement, wherein the respective share of each can hardly be exactly apportioned. In the following brief réswmé of this subject we shall consider the changes produced by pure water, by water charged with substances in solution, and by water raised above ordinary temperatures,

By numerous observations it has been proved that all rocks within the accessible portion of the earth's crust contain interstitial water, or, as it is sometimes called, quarry-water (eau-de-carriére). This is not chemically combined with their mineral constituents, but merely re- tained in their pores. Most of it evaporates when the stone is taken out of the parent rock and freely exposed to the atmosphere. The absorbent powers of rocks vary greatly, and chiefly in proportion to their degree of porosity. Gypsum absorbs from about 0°50 to 1°50 per cent. of water by weight; granite, about 0°37 per cent.; quartz from a vein in granite, 0°08; chalk, about 20:0; plastic clay, from 19°5 to 24:5, These amounts may be increased by exhausting the air from the specimens and then immers- ing them in water.

The water enclosed within the interstices and crystals of igneous rocks may be either an original constituent, deriving its origin, like any of the component minerals,

from molten reservoirs within the earth's crust, or it:

may have descended from the surface to the incandescent rocks, Many facts may be adduced in support of the greater probability of the second view. Besides the general proximity of volcanic orifices to large sheets of water, we have abundant evidence of the actual descent of water from the surface,

both through fissures, and also by permeation through the solid substance of rocks. All surface rocks contain water, and no mineral substance is strictly impervious to the passage of liquid. The well- known artificial colouring of agates proves that even the mineral substances apparently most homogeneous and im- pervious can be traversed by liquids. M. Daubrée has instituted a series of experiments to illustrate the power possessed by water of penetrating rocks, in virtue of their porosity and capillarity, even against a considerable counter- pressure of vapour; and, without denying the presence of original water, he concludes that the interstitial water of igneous rocks may all have been derived by descent from the surface.

The presence of interstitial water must affect the chemical constitution of rocks. It is now well understood that there is probably no terrestrial substance which, under proper conditions, is not to some extent soluble in water. By an interesting series of experiments, made many years ago by Messrs Rogers, it was ascertained that many of the ordinary mineral constituents of rocks could be dis- solved to an appreciable extent even by pure water, and that tle change was accelerated and augmeuted by the presence of carbonic acid.! Silica, alkaliferous silicates, and iron oxides can be taken up and held in solution by pure water, even at ordinary temperatures, in considerable quantities.

1 American Journ. Sctence (2), v. 401.

The mere presence of pure water therefore within the pores of subterranean rocks cannot but give rise to changes in the composition of these rocks. soluble materials must be dissolved, and, as the water eva- porates, must be redeposited in a new form.

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Some of the more

But water in a natural state is never chemically pure.

In its descent through the air it absorbs oxygen and carbonic acid, besides other impurities (see p. 267), and as it filters through the soil it abstracts more carbonic acid, as well as other results of decomposing organic matter. Tt is thus enabled to effect numerous decompositions of the rocks underneath. inferred from the composition of spring water, to which

The nature of these changes may be

reference will subsequently be made (p. 270). For the present it will be sufficient to remark that two important kinds of chemical decomposition must evidently arise from the action of such infiltrating water. (1.) The presence of the organic matter must exercise a reducing power on oxides. This will be more especially the case with those of iron, the nearly insoluble hematite being reduced to the protoxide, which, converted into carbonate, is readily removable in solution. There can be little doubt that by this means a vast amount of ferruginous matter is extracted from subterranean rocks and carried to the surface. (2.) The presence of carbonic acid enables the water to attack vigorously the mineral constitu- ents of rocks. Alkaline carbonates, with carbonates of lime and magnesia, and protoxides of iron and manganese, are produced, and these substances borne onward in solution give rise to further reactions aiong the rocks through which they are carried. “In the decomposition of rocks,” says Bischof, “carbonic acid, bicarbonate of lime, and the alkaline carbonates bring about most of the decompositions and changes in the mineral kingdom.”

The microscopic study of rocks has thrown much light upon the mineralogical alterations in rocks due to the influence of percolating water. Even the most solid-looking, unweathered rocks, are found to have been affected by such metamorphism. Their hydrous mag- nesian silicates, for example, are partially or wholly con- verted into such hydrous forms as serpentine, chlorite, or delessite. The process of conversion may often be watched. It can be seen to have advanced along the fissures or cleavage-planes of the minerals leaving the intervening sections still fresh; or it may be observed to have proceeded in such a way that diffused alteration-pro- ducts are dispersed in filaments or irregular patches through the base of the rock, or gathered together and even re- crystallized in cavities; or the whole rock, as in many serpentines, has undergone an entire transformation. Much

information regarding such internal alterations of rocks may be obtained from the study of pseudomorphs, that is, crystals having the external form of the mineral of which they originally consisted, with the internal structure and composition of the mineral which has replaced it. Serpen- tine representing olivine, clay taking the place of rock-salt, silica that of wood, and marcasite that of molluscan shell, are familiar examples. There is no reason to doubt that these changes may, in the course of ages, have been effected at ordinary temperatures by water descending from the surface of the ground.

But two other considerations require to be taken into account in the discussion of the internal transformations of rocks by subterranean water. (1.) In the first place, the water has often been at a high temperature. Mere descent into the crust of the earth will raise the temperature of the water until, if this descent be prolonged, a point far above 212° Fabr. may be reached. Experiments have shown that the chemical action of water is vastly increased by heat. Thus M. Daubrée exposed a glass tube containing about half

its weight of water to a temperature of about 400° C. At the end of a week he found the tube so entirely changed into a white, opaqne, powdery mass as to present not the least resemblance to glass. The remaining water was highly charged with an alkaline silicate containing 63 per cent. of soda and 37 per cent. of silica, with traces of potash and lime. The white solid substance was ascertained to be composed almost entirely of crystalline materials. These consisted partly of minute perfectly limpid bipyramidal crystals of quartz, but chiefly of very small acicular prisms of wollas- tonite. It was found, moreover, that the portion of the tube which had not been directly in contact with the water was as much altered as the rest, whence it was inferred that at these high temperatures and pressures the vapour of water acts chemically like the water itself. (2.) In the second place, the effect of pressure must be recognized as most important in enabling water, especially when heated, to dissolve and retain in solution a larger quantity of mineral matter than it could otherwisedo. In M. Daubrée’s experi- ments just cited, the tubes were hermetically sealed and secured

against fracture, so that the pressure of the greatly super-heated vapour had full effect. By this means, witli alkaline water, he not only produced the two minerals above mentioned, but also felspar and diopside,

It is important to observe that the three conditions required for these changes—the presence of alkaline water, a high temperature, and considerable pressure——are precisely those which it can be affirmed must exist abundantly within the crust of the earth, We must admit the possibility of rocks originally at the surface being depressed so as to come within the influence of internal heat, and to contain within their pores abundant interstitial water more or less charged with alkaline carbonates. Rocks under these conditions, so far as we can judge, can hardly escape internal decom- position and recomposition. Mere descent to a great depth beneath the surface will not necessarily result in metamorphism, as has been shown in the case of the N ova Scotiau and of the South Welsh coal-field, where sand- stones, shales, clays, and coal-seams can be proved to have been once depressed 14,000 to 17,000 feet below the sea- level, under an overlying mass of rock, and yet to have sustained no serious alteration, Perhaps the failure of change may be explicable on the supposition that these Carboniferous strata were comparatively dry. But where rocks possess sufficient interstitial water, and are depressed within the crust so as to be exposed to a considerable temperature and to great pressure, they must be metamor- phosed,—the extent of the metamorphism depending partly upon the vigour of the attack made upon them by the water, partly on their own composition and proneness to chemical change, and partly upon the length of time during which the process is continued,

A metamorphosed rock must thus be one which has suffered a mineralogical rearrangement of its substance, It may or may not have been a crystalline rock originally. Any rock capable of alteration (and all rocks must be so in Some degree) will, when subjected to the required conditions, become a metamorphic rock. The resulting structure, however, will, in most cases, bear witness to the original character of the mass. A sedimentary rock, for example, consisting of alternate layers of different texture and com. position, will doubtless retain, even in its metamorphosed condition, traces of that fundamental structure. The water will travel more easily along certain layers than along others ; some laminz will be more readily affected,

or will give rise to a set of reactions different from those of con- tiguous layers. Hence the rearrangement and recrystalliza- tion due to metamorphism will take pace along the prede- termined lines of stratification, so long as these lines have not been effaced or rendered inoperative by any other gea-

the influence of water

fusibilities. have shown how the presence of a comparatively small

of fusion, granite after the crystallization of the silicates, which would

becomes explicable.

on their work under our very eyes. its stages, measure its progress, and mark in many ways how accurately it represents similar changes which for long ages previously must have been effected by the same means. encounter a difficulty of another kind. while the operations to be discussed are numerous and often

logical structure. It is doubtless to this cause that the

foliated character of gneiss, mica-schist, and so many other metamorphic rocks is to be ascribed.

In the process of metamorphism, therefore, as well as in that of fusion, to which reference has already been made, would seem to have been always

conspicuous. Indeed, as will be shown in part iv., it is

extremely difficult in many cases to draw a line between the results of metamorphism and igneous fusion, or to decide whether a rock should be called igneous or metamorphic. It has been pointed out above, for example, that in rocks which have undoubtedly been in a fluid condition, as

many

proved by their injected veins and dykes, the constituent minerals have not appeared in the order of their respective Scheerer, Elie de Beaumont, and Daubrée

quantity of water in such rocks has contributed to suspend their solidification, and to promote the crystallization of their silicates at temperatures considerably below the point In this way the solidification of quartz in be unintelligible on the supposition of mere dry fusion, The phenomena of metamorphism in the architecture of the earth's crust are discussed in part iv,

DIVISION II—EPIGENE OR SURFACE ACTION.

Tt is on the surface of the globe and by the operation of agents working there that at present the chief amount of visible geological change ig effected. In considering tliis branch of inquiry, we are not involved in the same prelim- inary difficulty regarding the very nature of the agencies as we found to be the case in the investigation of plutonic action, On the contrary, the surface agents are carrying We can watch it in all

But in the systematic treatment of this subject we We discover that

complex, they are so interwoven into one great network that any separation of them under different subdivisions

is sure to be more or less artificial, and to convey an erroneous impression.

While, therefore, under the una- voidable necessity of making use of such a classification of

subjects, we must bear always in mind that it is employed

merely for convenience, and that in nature superficial geological action must be continually viewed as a whole, since the work of each agent has constant reference to that of the others, and is not properly intelligible unless that connexion be kept in view.

The movements of the air; the evaporation from land and sea; the fall of rain, hail, and snow ; the flow of rivers and glaciers ; the tides, currents, and waves of the ocean ; the growth and decay of organized existence, alike on land and in the depths of the sea ;—in short, the whole circle of movement, which is continnally in progress upon the surface of our planet, are the subjects now to be examined, Tt would be desirable to adopt some general term to embrace the whole of this range of inquiry. For this end the word epigene may be suggested as a convenient term, and anti- thetical to hypogene or subterranean action.

The simplest arrangement of this part of Geological Dynamics will be into three sections :—

I. Atr.—The influence of the atmosphere in destroy- ing and forming rocks. ; Il, Warer.—The geological functions of the circula- tion of water through the air and between sea and land, and the action of the sea.

III. Lirv.—The part taken by plants and animals in preserving, destroying, or reproducing geological formations.

The words destructive, reproductive, and conservative, employed in describing the operations of the epigene agents, do not necessarily imply that anything useful to man is destroyed, reproduced, or preserved. On the

contrary, the destructive action of the atmosphere may turn barren rock into rich soil, while its reproductive effects sometimes turn rich land into barren desert. Again, the conservative influence of vegetation has sometimes for centuries retained as barren morass what might otherwise have become rich meadow or luxuriant woodland. ‘The terms, therefore, are used in a strictly geological sense, to denote the removal and re-deposition of material, and its agency in preserving what lies beneath it.

Section I.—Air.

Its composition having been already treated of (ante, p. 220), we shall consider here (1) the motions, and (2) the geological action of the air, which arises partly from its composition, and partly from its movements.

TI. MovEeMENTS OF THE AIR.

These are due to differences in the pressure or density of the atmosphere, the law being that the air always moves from where the pressure is high to where it is low. Atmospheric pressure is understood to be determined by two causes, temperature and aqueous vapour.

1. Temperature.—Warm air, being less dense than cold air, ascends, while the latter flows in to take its place. The unequal heating of the earth’s surface, by causing upward currents from the warmed portions, produces horizontal cur- rents from the surrounding cooler regions inwards to the central ascending mass of heated air. To this cause the trade winds and the familiar land and sea breezes are due.

2. Aqueous Vapour.—In proportion as the quantity of watery vapour increases, the density of the air lessens. Consequently moist air tends to rise as warmed air does, with a corresponding but often very violent inflow of the drier and consequently heavier air from the surrounding tracts. The ascent of the moist air lessens the atmospheric pressure, which is indicated by the fall of the barometer. When the up-streaming vapour rises into the higher regions of the atmosphere, it expands and cools, condensing into visible form, and descending in copious showers to the earth. Unequal and rapid heating of the air, or accumulation of aqueous vapour in the air, and possibly some other influ- ences not yet properly understood, give rise to

extreme dis- turbances of pressure, and consequently to storms and hurricanes. For instance, tle barometer sometimes indi- cates in tropical storms a fall of an inch and a half in an hour, showing that somewhere about a twentieth part of the whole mass of the atmosphere has in that short space of

time been displaced over a certain area of the earth's sur-

face. No such sudden change can occur without resulting in the most destructive tempest or tornado. In Britain the tenth of an inch of barometric fall in an hour is regarded asa large amount, such as only accompanies great storms. When the pressure of the air at one place is shown by the barometer to differ from that at a neighbour- ing locality at the same time, the wind will be observed to move on the whole from the area of high to the area of low pressure ; and if the difference be great or sudden, the movement of the air may rise to the force of a hurricane until the equilibrium of pressure is restored,

The meteorological conditions of the atmosphere do not

1 Buchan's Meteorology, p. 266.

belong to the scope of this article (see ATMOSPHERE, Curate, Merzorotocy). The reader, however, may note as of interest from a geological point of view the ascertained velocity and pressure exercised by the air in motion across the surface of the earth as expressed in the subjoined table :-—

Velocity in miles Pressure in pounds

per hour. per square foot. 8. hi ye eR RERRRR coco occctmancccre Light breeze…….....scceensees 14 1 Strong breeze…....s.sesceeeereee 42 © Strome, Gales. .s.01..ccesersseenes 70 25 PLWPYG ies. sc neceserenearsanmers 84 36

TI. GronocicaL INFLUENCES OF THE ATR.

The paramount importance of the atimosphere as the. vehicle for the circulation of temperature and moisture over the globe, and consequently as powerfully influ- encing the distribution of climate and the growth of plants and animals, must be fully recognized by the geologist. Attention will be confined at present to the direct changes produced on the surface of the earth by the air—(1) on land, and (2) on water.

1, ts Influence an Land.

I Destructive InriuENcrs.—These are either (a) chemical or (8) mechanical, though in nature the two kinds of action are often inseparably interwoven.

(a) Under the denomination of chemical changes we in- clude the oxidation of those minerals which can contain more oxygen, as in the peroxidation and precipitation of protosalts of iron ; likewise the absorption of carbonic acid by rocks, and the production of alkaline and earthy carbon- ates and bicarbonates, which still further promote the process of decomposition. In the one case the active agent of change is the oxygen of the air, or rather of the aqueous vapour in the air, for perfectly dry air seems to have little or no oxidizing effect. A familiar illustration is afforded by the rust, or oxide, which forms on iron when exposed to moisture, though this iron may be kept long bright if allowed to remain screened from moist air. In the other case, the active agent is the carbonic acid of the air, though . here again it appears to be requisite that moisture should intervene as the medium of introducing the acid to the sub- stance which is to be altered by it. The occurrence of sulphuric and nitric acids in the air, especially noticeable in large towns, likewise leads to considerable corrosion of metallic surfaces, as well as of stones and lime. The mortar of walls may often be observed to be slowly swelling out and dropping off, owing to the conversion of the lime into sulphate. Great injury is likewise done from a similar cause to marble monuments in exposed graveyards.

As a rule, the changes effected by the air lead to many subsequent transformations. For example, the oxidation of the bisulphide of iron produces sulphuric acid, which de- composes silicates, carbonates, and

other compounds with which it comes in contact. These changes, however, are more appropriately noticed under the head of rain (p. 267).

(8) Among the more recognizable mechanical changes of a destructive kind, brought about by the atmosphere, we may notice the following influences : —

1. Expansion and Contraction.—The effect of heat is to expand rocks, of cold to contract them. Strictly speaking, these results on the surface of the earth are due, not to the air, but to the heat-rays of the sun which reach the rocks through the air. In countries with a great annual range of temperature considerable difficulty is sometimes experl- enced in selecting building materials liable to be little affected by the alternate expansion and contraction which prevents the joints of masonry from remaining close and

tight. thermometric range of more than 90° Fahr, this

In the United States, fur example, with an annual difficulty

led to some experiments by Colonel Totten on the amount of expansion aud contraction in different kinds of building-

stones, caused by variations of temperature. It was found that in fine-grained granite the rate of expansion was

‘000004825 for every degree Fahr. of increment of heat ;

in white crystalline marble it was (000005668 3 and in red sandstone 000009532, or about twice as much as in granite. If the daily variations in temperature are large, the effects

are still more striking. In tropical climates with intensely

hot days and extremely cold nights, the rapid nocturnal contraction produces sometimes a strain so great as to rival frost in its influence upon the surface of exposed rocks, disintegrating them into sand, or causing them to crack or peel off in skins or irregular pieces. Dr Livingstone

found in Africa (12° 8. lat., 34° E. long.) that surfaces of

rock which during the day were heated up to 137° Fahr.

cooled so rapidly by radiation at night that, unable to sus-

tain the strain of contraction, they split and threw off sharp

angular fragments from a few ounces to 100 or 200 tb in

weight.! 2. Frost.—Though properly belonging to the subject of

the geological behaviour of water to be afterwards described

in more detail, the disintegrating action of frost noticed here. exerts an enormous strain upon any enclosed cavities or walls which may confine it, is that in countries exposed to frost a continual disinteg- ration of the surface of rocks goes on. decay combines with the chemical and mechanical opera- tions of the atmosphere to produce considerable modifica- tions in the forms of rocks and cliffs.

3. Wind.—By driving loose sand over rocks, prevalent winds produce on them a scratched and polished surface, as has happened with ancient monuments buried in the sands of the African deserts.? It is said that at Cape Cod holes have even been drilled in window glass by the same agency.® Cavities are now and then hollowed out of rocks by the gyration in them of little fragments of stone or grains of sand kept in motion by the wind. Hurricanes form important geological agents upon land in uprooting trees, aud thus sometimes impeding the drainage of a country, and giving rise to the formation of peat mosses.

Weathering of Rocks.—Under the term “ weathering ” are included all the superficial changes which rocks undergo in consequence of the action of atmospheric processes upon them. The nature and rapidity of the disintegration depend partly on the one hand upon the climate, aud partly on the other upon the composition, texture, and exposure of the rocks.. In very dry countries, where the range of tempera- ture is not extreme, weathering is reduced to a minimum. But even if the climate be dry, considerable

disintegration may be caused, as lias been already explained, by rapid changes of temperature between day and night. It is where moisture prevails, however, that weathering chiefly takes place. The nature of the changes will be more pro- perly considered in the section which is devoted to the action of rain.

II. Repropuctive IneivuEnces,—These arise partly from the result of the chemical and mechanical disintegration involved in weathering, and partly from the transporting power of winds and aerial currents. Under the former head is the formation of soil ; under the latter may be noticed the production of sand-hills, the fall of dust-showers and coloured rain, and the transport of seeds.

may be

1 Livingstone’s Zambesr, pp. 492, 516.

- For an account of this action of drifting sand in North America see Blake in Pacific Railroad Report, v. 92, 230.

3 Dana’s Manual, p. 631.

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In freezing water expands, and thereby The consequence of this action

This superficial

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Sovl.—Of the detritus produced by the action of the air on rocks, and washed away by rains and streams, part remains on the land and forms soil, All soil may be considered as the result of the decomposition of rocks, mingled with de- cayed vegetable and animal matter. Were it not for the action of rain in washing the loose materials to a greater or less distance from their source, the soil of every locality ought to be merely the decayed upper surface of the rocks underneath. But wherever rain falls, the soil is moved from higher to lower levels. Hence in some cases a good soil is laid

down upon rocks which of themselves would only produce a poor one. This action of rain in the formation of soil is further alluded to on p. 270, and the innate influence of plant and animal life on p. 289.

Sand-hills or Dunes. —Winds blowin g continuously upon loose materials, such as sand, drive them onward, and pile them into irregular heaps and ridges, called “dunes.” This takes place more especially on windward coasts either of the sea or of large inland lakes, where the shores are sandy; but similar effects may be seen even in the heart of a continent, as in the sandy deserts of the Sahara and of Arabia. The dunes travel inland in parallel, irregular, and often confluent ridges, between which rain-water is sometimes arrested to form pools (étangs of the French coasts), where formations of peat occasionally take place. On the coast of Gascony the sea for 100 miles is so barred by sand- dunes that in all that distance only two outlets exist for the discharge of the drainage of the interior. As fast as one ridge is driven away from a beach another forms in its place, so that a series of huge sandy billows, as it were, is continually on the move from the sea margin towards the interior. A stream or river may temporarily arrest their progress, but eventually they pnsh the obstacle aside or in front of them. In this way the river Adour, on the west coast of France, has had its mouth shifted two or three miles. Occasionally, as at the mouths of estuaries, the sand is blown across so as gradually to exclude the sea, and thus to aid the fluviatile deposits in adding to the breadth of the land.4 The coast of Norfolk is fringed with sand-hills 50 to 60 feet high. On parts of the coast of Cornwall, the sand consists mainly of fragments of shells and corallines, and through the action of rain becomes sometimes indurated into a compact stone by carbonate of lime or oxide of iron. Long tracts of blown sand are likewise found along many parts of the Scottish and Irish coast-lines,

On the western border of the European continent exten- sive sand-dunes exist. They extend for many leagues along the French coast, and thence, by Flanders and Holland, round to the shores of Cotrland and Pomerania. In Den- mark they are said to cover an area of 260 square miles. On the coast of Holland they are sometimes, though rarely, 260 feet high,—a common average height being 50 to 60 feet. The breadth of this maritime belt of sand varies considerably. On the east coast of Scotland it ranges from afew yards to 3 miles; on the opposite side of the North Sea it attains on the Dutch

coast sometimes to as much as 5 miles. The rate of progress of the dunes towards the interior depends upon the wind, the direction of the coast, and the nature of the ground over which they have to move. On the low and exposed shores of the Bay of Biscay, when not fixed by vegetation, they travel inland at arate of about 164 feet; in Denmark at from 3 to 24 feet perannum. In the course of their march they envelop

4 For accounts of sand-dunes, their extent, progress, structure, and the means employed to arrest their progress, the reader may consult Andersen's Klitformationem, 1 vol. 8vo, Copenhagen, 1861 ; Laval in Annales des Ponts et Chaussées, 1847, 2me sem. ; and Marsh's Man and Nature, 1864, and the works cited by him. See also Hlie de Beaumont, Lecons de Géologie, vol. i.

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houses aud fields ; even whole parishes and districts o1lce populous have been overwhelmed by them.'

Along the margins of large lakes and inland seas many | of the phenomena of an exposed sea-coast are repeated, and on no inferior scale. Among these must be included sand- dunes, such as occur: at the south-eastern end of Lake Michigan and on the eastern borders of the Caspian Sea. The shifting of vast waves of sand by the wind is exempli- fied on the grandest scale in the saudy deserts of Africa, Arabia, and Central Asia. Such arid wastes of loose sand, | situated far inland and far distant from any sheet of fresh water, suggest curious problems in physical geography. Their sites may have been at a comparatively recent geo- logical period covered by the sea; or, lying in rainless climates and having their surfaces exposed to the disinte- grating effects of great extremes of temperature, the tracts may have become sandy and barren through atmospheric disintegration. The desert of the Sahara furnishes a good illustration of a dried-up sea-bed. In the rainless tract to the cast of the Red Sea lie the great sandy deserts and hills of Arabia, of which Mr Palgrave has given so graphic a narrative. Captain Sturt found vast deserts of sand in the interior of Australia, with long lines of dunes 200 feet high, united at the base and stretching in straight lines as

far as the eye could reach. In the south-east of Europe great tracts of sandy desert occur in Poland, and run through the southern provinces of Russia.

Dust-showers, Blood-rain.—In tropical countries, where | great droughts are succeeded by violent hurricanes, the dust or sand of dried lakes or river-beds is some- | times borne away into the upper regions of the atmo-— sphere, where, meeting with strong aerial currents which transport it for hundreds and even thousands of miles, it may descend again to the surface, in the form of | "red-fog," "sea-dust," or '"'sirocco-dust." This trans-_ ported material, usually of a brick-dust or cinnamon | colour, is occasionally so abundant as to darken the air and obscure the sun, and to cover the decks, sails, and rigging of vessels which may even be hundreds of miles from land. — Rain falling through such a dust-cloud mixes with it, and | descends either on sea or land as what is popularly called "blood-rain." This is frequen' on the north-west of Africa, about the Cape Verd Islands, in the Mediterranean, and over the bordering countries. A microscopic examination of this dust by Ehrenberg led him to the belief that it contains numerous diatoms of South American species; and he inferred that a dust-cloud must be swimming in the atmosphere, carried forward by continuous currents of air in the region of the trade-winds and anti-trades, but suffering partial and periodical deviations. But much of the dust must come from the sandy plains and desiccated pools of the north of Africa. Daubrée recognized in 1865 some of the Sahara sand which fell in the Canary Islands. On tlie coast of Italy a film of sandy clay, identical with that in parts of the Libyan desert, is occasionally found on windows after rain. In the middle of last century an area of northern Italy, estimated at about 200 square leagues, was covered with a layer of dust which in some places | reached a depth of one inch. Should the travelling dust encounter a cooler temperature, it may be brought to the | ground by snow, as has happened in the north of Italy, and more notably in the east and south-east of Russia, where the snows are sometimes rendered dirty by the dust raised by the winds on the Caspian steppes. It is easy to sce that a prolonged continuance of this action must give rise to widespread deposits of dust, mingled with the soil of the land, and with the silt and sand of lakes, rivers,

1 This destruction has heen, during the last quarter of a century, averted to a great extent by the planting of pine forests, the turpen- tine of which has

become the source of a large revenue.

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(111. DYNAMICAL.

and the sea; and that the minuter organisms of tropical regions may thus come to be preserved in the same forma- tions with the terrestrial or marine organisms of temperate latitudes,?

Transportation of Seeds.—Besides the transport of dust and minute organisms for distances of many thousands of miles, the same agency may come into play also in the

_ transport of living seeds, which, finally reaching a congenial

climate and soil, may take root and spread. We are yet, however, very ignorant as to what extent this cause has actu- ally operated in the establishment of any given local flora.

_ With regard to the minute forms of vegetable life, indeed,

there can be no doubt as to the efficacy of the wind to transport them across vast distances on the surface of the globe. Upwards of 300 species of diatoms have been found in the deposits left by dust-showers. Among thie millions of organisms thus transported it is hardly conceiv- able that some should no fall into a fitting locality for their continued existence and the perpetuation of their species.

2, Influence of the Air on Water.

The action of the air upon water will be more fitly noticed in the section devoted to water (p. 285). Tt will be enough to notice here—

1. Ocean Currents. —The in-streaming of air from cooler latitudes towards the equator causes a drift of the sea-water in the same direction. Owing to the rotation of the earth,

| these aerial currents tend to take a more and more westerly

trend as they approach the equator. This they communi- cate to the marine currents, which, likewise moving into regions having a greater velocity of rotation than their own, are all the more impelled in tlie same westerly direction. Hence the westerly belt or equatorial current, which flows across the great ocean. Owing to the position of the con- tinents across its path, this great current cannot move ull- interruptedly round the earth. It is split into branches which turn to right and left, and, bathing the shores of the land, carry some of the warmth of the tropics into more temperate latitudes.

2. Waves.—The impulse of the wind upon a surface of

water throws that surface into pulsations which range in

size from mere ripples to huge billows. Long-continued

gales from the seaward upon an exposed coast indirectly

effect much destruction, by the formidable battery of billows which they bring to bear upon the land. Wave-action is likewise seen in a marked manner when wind blows strongly across a broad inland sheet of water, such as Lake Superior. (See p. 279.)

3, Alteration of the Water-level.—When the wind blows

freshly for a time down a lake or into a bay or arm of the sea, it drives the water before it, and keeps it temporarily

at a higher level, at the further or windward side. In a tidal sea, such as that which surrounds Great Britain, aud which sends abundant long arms into the land, this action can often be studied. It is no infrequent occurrence that a high tide and a gale should happen at the same time. Whenever that takes place, then at those bays or firths which look windward the high tide rises to a greater height than elsewhere. With this conjunction of wind and tide, con- siderable damage to property has sometimes been done by the flooding of warehouses and stores, while even a sensible

destruction of cliffs and sweeping away of loose materials -may be chronicled by the geologist.

On the other hand, a wind from the opposite quarter will drive the water out of the inlet, and thus make the water-level lower than it should otherwise be.

2 See Humboldt on dust whirlwinds of the Orinoco, Aspects of Nature; also Maury, Phys. Geog. of Sea, chap. vi.; and Ehrenberg's Passat-Staub und Blut-Regen, 1847.

WATER. |

Section II.— Water.

Of all the terrestrial agents by which the surface of the earth is geologically modified, by far the most importaut is water. When following hypogene changes in a foregoing part of this article, we found how large a share is taken by water in the phenomena of volcanoes and other subterranean movements. When we returned to the surface of the earth and began to watch the operations of the atmosphere, we saw how impossible it is to consider these apart from the action of the aqueous vapour by which the atmosphere is pervaded. We must now study in detail the working of this wonderful geological agent itself.

The substance which we term water exists on the earth in three well-known forms—(1) gaseous, as invisible vapour; (2) liquid, as water; and (3) solid, as ice. The gaseous form has already been noticed in our inquiry into the geological characteristics of the air. Itis in the air that this condition of the water-substance prevails, By the sun's heat vast quantities of vapour are con- tinually raised from the surface of the seas, rivers, lakes, suow-fields, aud glaciers of the world. This vapour remains invisible until the air containing it is cooled down to below its dew-point, or point of saturation, —a result which follows upon the union or collision of two aerial currents of differ- ent temperatures, or the rise of the air into the upper cold regions of the atmosphere, where it is chilled by expansion, by radiation, and by contact with cold mountains. At first minute particles appear, which either remain in the liquid condition, or, if the temperature is sufficiently low, are at once frozen into ice. As these changes take place over considerable spaces of the sky, they give rise to the pheno- mena of clouds. Further condensation augments the size of the cloud-particles, and at last they fall to

the surface of the earth, if still liquid, as rain ; if solid, as snow or hail ; and if partly solid and partly liquid, as sleet. As the vapour is largely raised from the ocean-surface, so in great measure it falls back again directly into the ocean. A con- siderable proportion, however, descends upon the land, and it is this part of the condensed vapour which we have now to follow. Upon the higher elevations it falls as snow, and gathers there into snow-fields, which, by means of glaciers, send their drainage down towards the valleys and plains. Elsewhere it falls chiefly as rain, some of which sinks underground to gush forth again in springs, while the rest pours down the slopes of the land, feeding brooks and torrents, which, swollen further by the springs, gather into broader and yet broader rivers, whereby the drainage of the land is carried out to sea. Thence once more the vapour rises to reappear in clouds, and feed the innumer- able water-channels by which the land is furrowed from mountain-top to sea-shore.

Here then is a vast system of circulation, ceaselessly re- newed. And in that system there is not a drop of water which is not busy with its allotted task of changing the face of the earth. When the vapour ascends into the air it is almost chemically pure. But when, after being con- densed into visible form, and working its way over or under the surface of the land, it once more enters the sea, it ig no longer pure, but more or less loaded with material taken by it out of the air, rocks, or soils through which it hag travelled. Day by day the process is advancing. So far as we can tell, it has never ceased since the first shower of rain fell upon the earth. We may well believe, therefore, that it must have worked marvels upon the surface of our planet in past time, and that it may effect vast transforma- tions in the future. Asa foundation for such a belief let us now inquire what it can be proved to be doing at the present time.

The subject of the geological operation of water upon

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land. sinking under ground continues, as we shall find, a great

kept rain water gives out. i sub ject may consult the elaborate tables of analyses in Dr Angus Smith’s

the globe may be conveniently studied under the following

subdivisions :—

A. TERRESTRIAL WATERS.—Under this head are to be considered—(1) the liquid state, including rain, under- ground water, brooks, rivers, and lakes; and (2) the solid state—tfrost, river-ice, snow, hail, glaciers.

B, Ocranic Waters.—Including the influence of marine currents, tides, and waves, and the part taken by the sea in the general geological régime of the earth,

A. TERRESTRIAL WaTERs, I. IN THE LIQUID STATE. § 1. Rain. Rain effects two kinds of changes upon the surface of the (1.) It acts chemically upon soils and stones, and

(2.) It acts mechanically, and thus powerfully

series of similar reactions there. by washing away loose materials, affecting the coutours of the land.

I. Curemtcat Action.—This depends mainly upon the nature and proportion of the substances abstracted by rain from the air in its descent to the earth. Rain always absorbs a little air, and as we have already seen (p. 220) air always contains carbonic acid as well as otlier ingredi- ents, in addition to its nitrogen and oxygen. If rain be regarded as an agent washing the air and taking impurities out of it, we may the better realize how by means of these it is enabled to work many chemical changes which, were it to reach the earth as pure water, it could not accomplish,

Composition of Rain-Water.—Numerous analyses of rain-water show that it contains in solution about 25 cubic centimetres of gases per litre. An average pro- portional percentage is by measure—nitrogen, 66:4 ; oxygen, 31:2; carbonic acid, 2:4,—the oxygen being in greater proportion than in air, owing to its greater solu- bility in water. Common salt, ammonia, sulphates, nitric acid, inorganic dust, and organic matter are usually present

in minute quantities in rain water. So far-as we know at present, the three ingredients which are chiefly effective in the chemical reactions due to rain are the oxygen, carbonic acid, and organic matter.}

Permeability of all Rocks by Water.—Though minerals and rocks differ vastly in their degree of porousness, there is uone known which is not in some degree permeable by water. Even such hard and apparently impenetrable sub- stances as flint and agate are found to be permeable. For, in fact, rocks and minerals when examined with the micro- scope are seen to be made up of variously-shaped grains, crystals, or particles, and it is in the minute channels and interstices between these particles, or even through the particles themselves, that the water works its way. Evi- dently, the smaller the interstices the less easily will the water force a passage into or through the stone. This per- meability, though well marked upon the surface of the land, becomes still more so underground, where the rocks are sometimes quite saturated with water,

Liability of all Rocks to alteration by Water.—There is probably no known substance which is not, under some condition, soluble in water containing carbonic acid or other natural reagent, Rain-water, descending with the gases, acids, and organic matter it has abstracted from the air and soil, effects a chemical disintegration of the rocks, This action was referred to in the description of the air as

1 The organic matter is revealed by the putrid smell which long- The reader who wishes to pursue this sub-

« . a5 9 Airy and Rain. See also the section on air, ante, p. 220.

partly due to atmospheric moisture, but it is chiefly carried on by rain. And as rain is 80 widely and almost un1-

versally distributed over the globe, this chemical action |

must be of very general occurrence. : :

Nature of the Changes effected—Confining our attention to its three chiefly active ingredients, we find that rain water reacts chemically upon rocks by —1. O.ridation.—The prominence of oxygen in rain-water, and its readincss to unite with any substance which can contain more of it, render this a marked feature of the passage of rain over rocks. A thin oxidized pellicle is formed on the surface, and this, if not at once washed off by the rain, sinks deeper until a crust is formed over the stone. As already remarked, this process is simply a rusting of those minerals which, like metallic iron, have no oxygen, or have not their full complement of it. 2. Deowidation.—Organic matter having an affinity for more oxygen decomposes peroxides by depriving them of some part of their share of that ele- ment, and reducing them to protoxides. These changes are especially noticeable among the iron oxides so abundantly diffused among rocks. Hence rain-water, in sinking through soil and obtaining such organic matter, becomes thereby a reducing agent. 3. Solution.—This may take place either by the simple action of the water, as in the solution of rock- salt, or by the influence of the carbonic acid present in the rain. Of the latter (Carbonation) a familiar example is the corrosion of marble slabs down which rain has trickled for a time. The carbonic acid dissolves some of the lime, which as a bicarbonate is held in solution in the carbonated water, but is deposited again when the water loses its carbonic acid or evaporates. not merely carbonates, however, which are liable to this kind of destruction. Even silicates of lime, potash, and soda, combinations existing abundantly as constituents of rocks, are attacked; their silica is liberated, and their alkalies or alkaline earths, becoming carbonates, are removed in solution, 4. HydrationSome minerals, containing little or no water, and therefore called anhydrous, when exposed to the action of the atmosphere, absorb water, or become hydrous, and are then usually more prone to further change. Hence the rocks of which they form part become disintegrated.

Weathering.—The weathering of rocks is dependent upon two sets of conditions—(1) meteorological, as the range of temperature, abundance of moisture, height above the sea, and exposure, and (2) lithological,—the composition and texture of the rocks themselves. As regards the composi- tion of rocks, those which consist of particles liable to little chemical change from the influence of moisture are best fitted to resist weathering, provided their particles have sufficient cohesion to withstand the

mechanical processes of disintegration. Siliceous sandstones are excellent examples of this permanence. Consisting wholly or mainly of the durable mineral quartz, they are sometimes able so to with- stand decay that buildings made of theni still retain, after the lapse of centuries, the chisel-marks of the builders. Some rocks which yield with comparative rapidity to the chemical attacks of moisture show no marks of disintegration on their surface, which remains clean and fresh. This is particularly the case with limestones, The reason lies obviously in the fact that limestone when pure is wholly soluble in acidulous water. Wain falling on this rock removes some of it in solution, and will continue to do so until the rock is dissolved away. It is only where the limestone contains impurities that a weathered crust of more or less insoluble particles remains behind, Hence the relative purity of limestones may be roughly determined by comparing their weathered surfaces, where, if they contain much sand, the grains will be seen pro-

jecting from the calcareous matrix, and where should the |

rock be very ferruginous, the yellow hydrous peroxide or ochre will be found as a powdery crust. In limestones containing abundant encrinites, shells, or other organic re- mains, the weathered surface commonly presents the fossils standing out in relief. This seems to arise from the crys- talline arrangement of tlie lime in the organic structures, whereby they are enabled to resist disintegration better than the general mechanically aggregated matrix of the rock. An experienced fossil collector will always search well those weathered surfaces, for he often finds there, delicately picked out by the weather, minute and frail fossils which are wholly invisible on a freshly broken sur- face of the stone. Many rocks weather with a thick crust or even decay inwards for many feet or yards. Basalt, for example, often shows a yellowisli-brown ferru- ginous layer on its surface, formed by the conversion of its felspar into kaolin and the removal of its silicate of lime as

carbonate, by the hydration of its olivine and augite and their conversion into serpentine, saponite, or sone other hydrous magnesian silicate, and by the conversion of its magnetite into limonite. Granite sometimes shows in a most remarkable way the distance to which weather- ing can reach. It may often be dug into for a depth of 20 or 30 feet, the quartz crystals and veins retaining their original positions, while the felspar is completely kaolinized.

It is to the effects of weathering that the abundant fan- tastic shapes assumed by crags and other rocky masses are due. Most varieties of rock have their own characteristic modes of weathering, whereby they may be recognized even from a distance. To some of these features reference will be made in a subsequent section.

II. Mecuanicat Action.—When a rock has been so corroded by weathering that the cohesion of the particles on its exposed surface is destroyed, these particles are washed off by rain. his detritus is either held in suspension in the little runnels into which the rain-drops gather as they begin to flow over the land, or is pushed by them along the surface. In this way the rain carries off by mechanical movement what it has already loosened by chemical action.

III. Resutts or Rain-Action.—It is evident that the general result of the fall of rain upon a land-surface must be a disintegration and consequent lowcring of that surface. At first we may be inclined to imagine that this waste must be so slow and slight as to be bardly appreciable. But a little observation will suffice to furnish many proofs of its existence and compara- tively rapid progress in some places. We are familiar, for example, with the pitted channelled surface of the ground lying immediately under the drip of the eaves ofa house. We know that the fragments of stone and gravel are left sticking up prominently because the earth around and above them has been washed away, and because, being hard, they resist the action of the falling drops and screen the earth below them. On a far larger scale we may notice the same kind of operation in districts of conglomerate, where the larger blocks, serving as a protection to the rock underneath, come to form as it were the capitals of slowly-deepening columns of rock. In the same way in certain valleys of the Alps a stony clay is cut by the rain into pillars, each of which is protected by, and

indeed owes its existence to, a large block of stone which lay originally in the heart of the mass. These columns are of all heights, according to the positions in which the stones may have originally lain. There are instances, however, where the disintegration has been so complete that only a few scattered fragments remain of a once extensive stratum, and where it may not be easy to realize that these fragments are not transported boulders. In Dorsetshire and Wiltshire, for

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example, the surface of the country is in some parts so thickly strewn with fragments of sandstone and conglomer- ate “that a person may almost leap from one stone to another without touching the ground. The stonés are fre- quently of considerable size, many being four or five yards across, and about four feet thick.” 1 They have been used for the huge blocks of which Stonelienge and other of the so-called druidical circles have been constructed, hence they have been termed Druid Stones. Other names are Sarsen Stones (supposed to indicate that their accumulation has been popularly ascribed to the Saracens), and Grey Wethers, from their resemblance in the distance to flocks of (wether) sheep. They are found lying abundantly on the chalk, suggestive at first of some former agent of transport by which they were brought from a distance, It is now, liow- ever, generally admitted that they are simply fragments of some of the sandy Tertiary strata which once covered the districts where they occur, and that while the softer por- tions of these strata have been carried away, the harder parts (their hardness perhaps increasing by exposure) have remained behind as Grey Wethers, and have subsequently

suffered from the inevitable splitting and crumbling action |

of the weather.

But it is not from any single example, however strik- ing, that the real importance of rain as a geological agent cin be adequately realized. To form a true conception of this iomentous action, we need to watch what takes place over a wide region. The whole land-surface over which rain falls is exposed to waste. As Hutton long ago insisted, the superficial covering of decayed rock or soil is constantly, though slowly, travelling outward and

downward to the sea. In this ceaseless transport rain acts as the great carrying agent. The particles of rock loosened by atmospheric waste, by frost or the chemical disintegration of the rain itself, are washed off to form new soil. But they as well as the particles of the soil are step by step moved downward over the face of the land till they reach the nearest brook or river, whence their seaward progress may be rapid. A heavy rain discolours the water-courses of a country, because it loads them with the fine debris which it re- moves from the general surface of the land. In this way rain serves as the means whereby the work of the other disintegrating forces is made conducive to the general degradation of the land. ‘The decomposed crust produced by weathering, which would otherwise accumulate over the solid rock and protect it from further decay, is removed by rain so as to expose a fresh surface to further decomposition. This decay is general and constant, but not uniform. In some places, from the nature of the rock, from the flatness of the ground, or from other causes, rain works under great difficulties. There the rate of waste must consequently be extremely slow. In other places, again, the rate may be rapid enough to be readily appreciable from year to year. A survey of this department of geological activity shows how the unequal wasting by rain has helped to produce the details of the present relief of the land, those tracts where the destruction has been greatest forming hollows and valleys, others, where it has been less, rising into ridges and hills,

Rain-action is not always merely destructive. Usually it is accompanied by reproductive effects, and, as already remarked, the mouldered rock which it washes off furnishes materials for the formation of soil. In favourable situations it has gathered together accumulations of loam and earth from neighbouring higher ground—the * brick-earth,” “head,” and “ rain-wash” of the south of Fngland—earthy

1 See Descriptive Catalogue of Rock Specimens in Jermyn Strect Museum, 3d ed. ; Prestwich, Quart. Journ. Geol. (Shy 28 Th UB e Whitaker, Geological Surecy Memoir on parts of Middlesex, &c., p. 71. ‘

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deposits, sometimes full of angular stones, derived from the subaerial waste of the rocks of the neighbourhood.?

§ 2. Underground Water.

When rain falls upon the land its further progress becomes twofold. The greater part of it sinks into the ground and apparently disappears 3 the rest flows off into runnels, .brooks, and rivers, avd in this Way moves down-ward to the sea. It is most convenient to follow first the course of the subterranean water.

We have seen that all rocks are more or less porous. They are moreover traversed by abundant joints and cracks, Hence, from the bed of the ocean, from the bottoms of lakes and rivers, as well as from the surface of the land on which rain falls, water is continually filtering downward into the rocks beneath. To what depth this descent of the surface water may go is not known. It may reach as far as the intensely heated interior of the planet, for, as the researches of M. Daubrée have shown, capillary water has the capacity of penetrating rocks even against a high counter-pressure of vapour. The water at extreme depths may be under such pressure as to retain its liquid condition asa red or even at a white heat, Probably the depth to which the water descends varies indefinitely according to the varying nature of the rocky crust. Some shallow mines are practically quite dry, while others of great depth require large pumping engines to keep them from being flooded by the water which pours into them from the surrounding rocks. As a rule, however, the upper layers of rock are fuller of moisture than those deeper down,

The water which in this way sinks into the earth is not permanently removed from the surface, though there may perhaps be a slight loss due to absorption and chemical alteration of the rocks. It accumulates underneath, until by the pressure of the descending column it is forced to find a passage through joints or fissures upward to the surface. The points at which it issues are termed springs. In most districts the rocks underneath are permeated with water below a certain limit which is termed the water-level. This line is not a strictly horizontal one like that of the surface ofa lake.

Moreover, it is liable to rise and fall according as the seasons are wet or dry. In some places it lies quite near, in others far below, the surface. A well is an art}- ficial hole dug down below the water-level, into which the water percolates. Hence, when the water-level happens to be at a small depth the wells are shallow, when at a great depth they require to be deep.

Since the rocks underneath the surface vary greatly in porosity, some contain far more water than others. It often happens that, percolating along some porous bed, the subterranean water finds its way downward until it passes under some more impervious? rock. Hindered in its pro- gress, it acenmulates in the porous bed, from which it may be able to find its way up to the surface again only by a tedious circuitous passage. If, however, a bore-hole be sunk through the upper impervious bed down to the water-charged stratum below, the water will eagerly avail itself of this artificial channel of escape, and will rise in the hole, or even rush up and gush out as a jet d'eau above ground. Wells of this kind are now largely employed. They bear the name of Artesian, from the old province of Artois in France, where they have long been in use.

That the water really circulates underground, and passes

2 See Austen, Quart. Journ. Geol. Soc., vi. 94, vii. 121; Foster and Topley, Quart. Journ. Geol. Soc., xxi. 446.

3 This term ¢mpervious must evidently be used in a relative and not in an absolute sense. A stiff clay is practically impervious to the trickle of underground water ; hence its employment as a material for puddling (that is, making water-tight) canals and reservoirs. But it contains abundant interstitial water, on which indeed its characteristic plasticity depends.

not merely between the pores of the rocks but in crevices and tunnels which it has no doubt to a large extent opened for itself along numerous natural joints and fissures, | is proved by the occasional rise of leaves, twigs, and cven live fish, in the shaft of an Artesian well. Such evidences are particularly striking when found in districts without surface waters, and even perhaps with little or ho rain. They have been met with, for instance,

in sinking wells in some of the sandy deserts on the southern borders of Algeria. In these and similar cases it is clear that the water may, and sometimes does, travel for many leagues underground away from the district where it fell as rain or suow, or where it leaked from the bed of a river or lake.

The temperature of springs affords a convenient but not always quite reliable indication of the relative depth from which they have risen, Some springs are just one degrec or less above the temperature of ice. Others in volcanic districts issue with the temperature of boiling water. Between these two extremes every degree may be registered. Very cold springs may be regardedas probably deriving their supply from cold or even snow-covered mountains. Certain exceptional cases, however, occur where ice forms in caverns (glaciéres) even in warm and comparatively low districts. Water issuing from these ice caves is of course cold.!. On the other hand, springs whose temperature is much higher than the mean temperature of the places at which they emerge must have descended far enough to be warmed bythe interual heat of the earth. The hottest springs are found in volcanic districts. But even at a great distance from any active volcano, thermal springs, as they are called, appear with a temperature of 120° Fahr. (which is that of the Bath springs) or even more. These have pro- bably risen from a great depth. If we could assume a pro- gressive increase of 1° Fahr. of subterranean heat for every 60 feet of descent, the water at 120° issuing at a locality whose ordinary temperature is 50°, should have been down at least 4200 feet below the surface. But from what has been stated in a previous section (p. 224) regarding the irregular stratification of temperature within the earths crust, such estimates of the probable depth of the sources of springs are liable to various errors.

Apart from its vast importance in a social point of view, the underground circulation of water has a profound in- terest for the geologist, from the light which it affords as to the changes that rocks undergo, and the manner in which these changes are effected. For, like all the other geologi- cal agents, it does not move on its course without doing work. We have now to inquire what is the nature of that work. A convenicnt arrangement will be to group its study under two heads—(1) chemical action, and (2) mechanical action.

(1.) Every spring, even the most clear and sparkling, contains mineral matter in chemical solution, obtained from the rocks through which the water travels in its journey from the surface into the interior, and back to the surface again. The nature of the mineral ingredi- ents depends partly upon the composition of the rocks traversed, partly upon the gases, acids, or other reagents which may have been present in the rain, or may have heen obtained by the water in its subterranean journey, and partly upon the depth to which the water may have reached and the temperature to which it may have been raised.

We have already (ante, p. 267) considered the substances extracted by rain from the air and used by it in the disin- tegration of rocks. The same reagents are of course carried

1 The most remarkable example of a glaciére yet observed is that of Dobschau, in Hungary, of which an account, with a series of interest- ing drawings, was published in 1874 by Dr J. A. Krenner, keeper of the national museum: in Buda-Pesth.

underneath tle ground, when the rain-water sinks out of sight, and continue there the processes of decomposition and alteration which they are seen to effect at the surface. But other sources are open to the subterranean water for the augmentation of its chemical reagents. (1.) In de- scending through the soil the meteoric water encounters abundant organic matter, which abstracts its oxygen and replaces it by carbonic acid. This interchange probably in many cases far more than compensates for the expendi- ture of these gases employed in subaerial disintegration. In so far as the water carries down from the soil any oxidizable organic substance, its action mnst be to reduce the oxides it encounters among rocks. It is remarkable that ordinary vegetable soil possesses the power of remov- ing from the watcr which permeates it potash, silica, phosphoric acid, ammonia, and organic matter, elements which had been already in great measure abstracted from it by living vegetation, and which are again taken up by the same organic agents, (2.) Carbonic acid gas is some- times largely evolved within the

earth’s crust, especially in regions of extinct or ‘dormant volcanoes. Subterranean water coming in the way of this gas greedily dissolves it, and thereby obtains an enormously increased power of attacking even the most obdurate rocks. (3.) Whenever the water has its temperature. considerably raised, its solvent capacity, especially for silica, is largely augmented. Hot springs often contain a large proportion of that sub- stance in solution. (4.) The production of some of the compounds which are due to decompositions effected by the water, and are carried along with it in solution, increases its ability to accomplish further decompositions. Thus the alkaline carbonates, which are among the earliest products of the action of the water, enable it to dissolve silica and decompose silicates.

The study of these altcrations belongs to the subject of Metamorphism, of which some account has already been given (ante, p. 262), Let us look at the results achieved by them, as shown in the composition of the water which issues from different springs. Considered from this point of view, springs may be treated as (1) common or ordinary springs, that is, those which contain only such average proportions of mineral matter as occur in ordinary potable water, and (2) mineral springs, or those where the proportion of foreign ingredients is large enough to give a marked character to the water. These two groups, however, merge insensibly into each other.

Common Springs.—The materials ordinarily present in common spring water are, besides atmospheric air and its gases, carbonate and sulphate of lime, common salt, with chlorides of calcium and magnesium, and sometimes organic matter. The amount of dissolved contents in ordinary drinking water does not exceed ‘5 or at most 1:0 gramme per litre ; the best waters contain even less. ool

Mineral Springs These may be roughly but con- veniently classified according to the prevailing mineral sub- stance contained in them, which may range in amount | from 1 to 300 grammes per litre.”

Caleareous—containing so much lime that it is deposited as a white crust as the water evaporates. Spring water when saturated with carbonate of lime contains about 105 parts in 100,000. Springs of this kind are common iu limestone countries. As the water flows away from its point of exit, it throws down a deposit of calcareous tufa or travertine, which, as it encrusts

moss, twigs, and other objects, gives them the appearance of having been turned into stone, whence the springs are popularly termed ‘‘ petrifying.” Enormous accumulations of this kind have been formed in some parts of Italy, where the rock so produced is extensively quarried asa building material.

Ferruginous or Chalybeate—containing a large proportion of iron

in the total mineral ingredients. Such waters have an inky taste, and often deposit along their course a yellow, brown, or red ochry ree oe ee eee

2 Paul, in Watt’s Chem. Dict., v., 1016.

deposit, consisting mainly of hydrated peroxide of iron. They may be frequently observed in those distriets where beds or veins of ironstone oceur, or where the roeks contain mueh iron in combina- tion.

Siliceous—depositing silica or flint. Although siliea may be dissolved and retained in solution even in cold water, it is in the hot water issuing in voleanie countries that it oceurs most abund- antly, and where true siliceous springs exist. The geysers of Iceland, New Zealand, the Yellowstone region, and other distriets are illustrations. When the heated water of these thermal springs cools and evaporates, the silica is deposited as siliceous sinter round their basins, or in pieturesque mounds at the point of eseape. One of the sinter beds in the geyser region of Iceland is said to be two leagues long, a quarter of a league wide, and a hundred feet thick. As already stated (ante, p.263), the effect of pressure is to enable water at great depths to retain a larger amount of mineral matter in solu- tion. Henee, when the water ascends, it deposits its mineral eon- tents, not only because it cools, but because the pressure is removed. There must in many cases be a copious deposit along the walls of the fissures up which the water flows on its way to the surfaee. Doubtless in this way many mineral veins have received their sue- cessive coatings of quartz, jasper, gypsum, calcite, and other minerals,

Brine—bringing to the surface a solution, more or less nearly saturated, of elloride of sodium. Springs of this kind appear where beds of solid rock-salt

exist underneath. The water in its passage encounters the salt, dissolves it, and brings it to the surface. The brine springs of Cheshire in England, the Salzkammergut in Austria, Bex in Switzerland, &e., have long been well known. Some of the English brines eontain about one per eent. of salts, of which the chloride of sodium may vange from a half to three-fourths or more. Other brines, however, yield a far larger amount; one at Clemenshall, Wiirtemburg, gave upwards of 26 per cent. of salts, of which almost the whole was chloride of sodium. The other sub- stanees contained in solution in the water of brine springs are usually such as exist also in sea-water, sueh as sulphate and ecar- bonate of line, chlorides of magnesium and potassium, &e.

Medieinal—a vague term applied to mineral springs whieh have or are believed to have curative effeets in different diseases. Medical men recognize various qualities, distinguished by the par- ticular substance most conspicuous in each—as Alkaline Waters, containing lime or soda and carbonic acid, as those of Viehy or Saratoga; Bitter Waters, with sulphate of magnesia and soda— Sedlitz, Kissingen; Salt or Murtated IW, aters, with common salt as the leading mineral eonstituent— Wiesbaden, Cheltenham; Zurthy Waters, lime, either a sulphate or carbonate, being the most marked ingredient— Bath, Lueea; Sulphurous We aters, with sulphur as sulphuretted hydrogen and in sulphides—Aix-la-Chapelle, Harro- gate.

Owl.—Mineral oil is carried up by some ordinary springs, and floats in dark drops on the surface of the water. But in some parts of the world, as in a wide region in the Ameriean Union and in Canada, the oil aseends with little or ho water, and forms the oil-springs whieh in recent years have become so remarkable and abundant a souree of illuminating oils, paraffin, and other hydroearbon eompounds.

Ltesults of Chemical Action of Underground Water.— Since every spring is busily engaged in brmging mineral substances from below ground to the surface, there must evidently be a vast amount of subterranean waste, and many tnnnels, channels, and caverns must in consequence be formed. ‘To take one illustration: the warm springs of Bath, with a mean temperatnre of 120° Fahr., are impreg- nated with sulphates of lime and soda, and chlorides of sodium and magnesium. Professor Ramsay has estimated their annual

discharge of mineral matter to be equal toa Square column 9 feet in diameter and 140 feet in height. It isin calcareous regions that the extent of the subter- ranean loss can be most strikingly seen. Sometimes a dis- trict of limestone is drilled with vertical cavities (swallow- holes or sinks) formed by the solution of the rock by the descent of carbonated rain-water. Surface-drainage is there intercepted, and passes at once under ground, where, in course of time, an elaborate system of channels may be dis- solved ont of the solid rock. Such has been the origin of the Peak caverns of Derbyshire, the intricate grottoes of Antiparos and Adelsberg, and the vast labyrinths of the Mammoth Cave of Kentucky. In the course of time the underground rivers open out new courses, and leave their old ones dry. By the falling in of the roofs of caverns near the surface,

brooks and rivers are occasionally en-

gulphed, which, after a long subterranean course, may issue to the surface again in a totally different surface area of drainage to that in which they took their rise, and sonie- times, as in Florida, with volume enongh to be navigable almost up to their outflow. In such circumstances lakes may be formed over the sites of the broken-in caverns ; and valleys may thus be deepened, or perhaps even formed. Mud, sand, and gravel, with the remains of plants and animals, are swept below ground, and sometimes accumulate in deposits there. This has been the origin of ossiferous caverns, and of the loam and breccia so often found in them.

These wonderful results of the subterranean circulation of water appeal to the imagination, and are those usually most dwelt upon as evincing the potency of this kind of geological agency. And yet the thoughtful observer who reflects upon this subject will perhaps be led to perceive that even more important than these visible caverns and grottoes are the silent unobtrusive changes so constantly in progress in the solid heart of rocks. As far down as percolating water reaches there is not a particle of mineral

matter safe from its attacks. And as we have seen, it is hardly possible to find any rock which does not bear throughout its minute grains and pores evidence that water has filtered throngh it, removing some substances and put- ting others in their place.

(2.) Results of Mechanical Action.—In its passage along fissures and channels of the rocks, the underground water not merely dissolves materials chemically and removes them in solution, it likewise loosens some of the finer particles from the sides of these subterranean conduits and carries them along in mechanical suspension. We may occasionally observe, where a spring gushes forth atthe surface, that grains of sand are brought up in the clear sparkling water. This removal of material sometimes produces remarkable surface changes when it takes place along the side of a steep slope or cliff, such as occur in river valleys, or by the sea-coast, Let us suppose a thin layer of some porons material, like loose sand or ill-compacted sandstone to lie between two more impervious rocks such as masses of clay or limestone, and that this porous stratum sloping down from higher ground comes out to the surface near the base of a line. of abrupt cliff. The water which finds its way down into this layer will use it as its channel of escape, and travelling along its course will issue in springs or in a more general oozing forth along its outcrop at the foot of the declivity. Under these circnmstances the support of the overlying mass of rock is apt to be loosened. The water not only removes piece-meal the sandy layer on which that overlying mass rests, but as it were lubricates the rock underneath. Consequently at intervals portions of the upper rock may break off and slide down into the valley or plain below. Such dislocations are known as landslips, Many illustrative examples might be cited. Thus in the year 1839 a mass of chalk on the Dorsetshire coast slipped over a bed of clay into the sea, leaving arent three-quarters of a mile long, 150 feet deep, and 240 feet wide. The shifted mass, bearing with it houses, roads, and fields, was cracked, broken, and tiltedin various directions, and was thus prepared for further attack and removal by the waves. On many parts of the coasts of Britain there are landslips on a large scale which doubtless took place many centuries ago, or even in some cases beyond the times of human history. The -undercliff of the Isle of Wight, the cliffs west of Brandon Head, county Kerry, the basalt escarpments of Antrim, and the edges of the great volcanic plateaus of Mull, Skye, and Raasay furnish illustrations of

such prehistoric landslips. Of Continental examples, the well-known fall of the Rossberg, behind the Righi in Switzerland, is one of the most memorable. After a rainy summer in 1806 a large

part of one side of the mountain, consisting of sloping beds of hard red sandstone and conglomerate, resting upon soft sandy layers, gave way. Thousands of tons of solid rock suddenly swept across the valley of Goldau, burying four villages, with about 500 of their inhabitants. In 1855 a mass of debris, 3500 feet long, 1000 feet wide, and 600 feet high, slid into the valley of the Tiber, which, dammed back by the obstruction, overflowed the village of San Stefano to a depth of 50 feet, until drained off by a tunnel.

§3. Brooks and Rivers.

These will be considered under four aspects:—(1) their sources of supply, (2) their discharge, (3) their flow, and (4) their geological action.

I. Sources or SuppLy.—Rivers are the natural drains of a land surface. They carry out to sea the surplus water after evaporation, and not watcr only, but a vast and almost incredible amount of material annually worn off the land. ‘Their contents are derived partly from rain (including mist and dew) and melted snow, partly from springs. Ina vast river system like that of the Mississippi, the area of drainage is so extensive as to embrace many different climates and varieties of rainfall, so that on the whole the amount of discharge, being in a great measure in- dependent of local variationsin the weather, remains tolerably uniform. But in smaller rivers, such as those of Britain, whose basins lie in a region having the same general features of climate, the quantity of water is regulated by the local rainfall. A wet season swells the streams, a dry one diminishes them. Were rivers entirely dependent, however, upon direct supplies of rain, they would only flow in rainy seasons, and disappear in dry weather. This does not happen, because they derive a great deal of their water not directly from rain, but indirectly through the inter- mediate agency of springs. Hence they continue to flow even in very dry weather, because, though the superficial supplies have failed, the underground sources still continue available. In a long drought, however, the latter begin to fail, the surface springs ceasing first, and

gradually drying up in their order of depth, until at last only deep-seated springs furnish a perhaps daily diminishing quantity of water, It is a matter of great economic as well as scientific interest to know how long any river would con- tinue to yield a certain amount of water during a prolonged drought. So far as we can tell, no rule could possibly be laid down for a generally applicable calculation, every area having its own peculiarities of underground drainage. Mr Joseph Lucas gives some particulars which show what may happen in a chalk district. The river Wandle drains an area of 51 square miles of the chalk downs in the south- east of England. For eighteen months, from May 1858 to October 1859, as tested by gauging, there was very little absorption of rainfall over the drainage basin, and yet the minimum recorded flow of the Wandle was 10,000,000 gallons a-day, which, Mr Lucas says, represents not more than *4090 inch of rain absorbed on the 51 square miles of chalk, The rock is so saturated that it can continue to supply a large yield of water for eighteen months after it has ceased to receive supplies from the surface, or at least has received only very much diminished supplies.

Il. Discuarcz.—As the natural drains of the land, rivers carry the surplus moisture out to sea. What proportion of the total rainfall is thus discharged by them isa question of great geological and industrial interest. From the very moment that water takes visible form as mist, cloud, dew, rain, snow, or hail, it is subject to evaporation. When it reaches the ground, or flows off into brooks, rivers, lakes, or

1 Lucas, Horizontal Wells, London, 1874, pp. 40, 41. See also Braithwaite, ‘‘On the Rise and Fall of the Wandle,” Minutes Proc. Inst. C.H., Xx.

the sea, it undergoes continual diminution from this cause. Hence in regions where rivers receive no tributaries, they grow smaller in volume as they move onward, till they some- times even disappear. Apart from temperature, the amount of evaporation is very largely regulated by the nature of the surface from which it takes place, one soil or rock differing from another, and all of them probably from a surface of water. There is no

question in meteorology where full and detailed observations are more wanting than in the deter- mination of the relation of evaporation to rainfall and river discharge. During severe storms of rain, the water dis- charged over the land of course to a very large extent finds its way at once into brooks and rivers, where it causcs floods, and whence it reaches the sea. Mr David Steven- son remarks that, acccording to different observations, the amount carried off in floods varies from 1 to 100 cubic feet per minute per acre. But though floods cannot be deemed exceptional phenomena, forming as they do a part of the regular system of water circulation over the land, they do not represent the ordinary proportions between rainfall and river discharge in such a climate as that of Britain, where the rainfall is not crowded into one season, but is spread more or less equally throughout the year. According to Beardmore's table,* the Thames at Staines has a mean annual discharge of 32°40 cubic inches per minute per square mile, equal to a depth of 7°31 inches of rainfall run off, or less than a third of the total rainfall. 'The most carefully collected data at present available are probably those given by Humphreys and Abbot for the basin of the Mississippi and its tributaries as shown in the subjoined

table :— Ratio of Drainage to Rainfall.

Oho WR. Gt cP eee oe eee 0°24 MLISSOUN] URIVGD:...0ce.s-.0-. PP Od DIanInDOSOGSOCAOCECS HOSmAO 0°15 Wiper Ua estsstpype tIVel, ..5.<<5000 cance csecsesabones 0°24 Suallttuillubamesme reese cscccs corns tos seeemees 0°90 Arkansas and WlntemRivier).....2… c0cecsesdseesees 0°15 Jixedl JavinereSasannocanncses er ete oe gidichn ee eee 0:20 OE CIEAOTE | Ail bass Bh oa peneconedinicanic aeRenenaddsbesadsnoconcnoased 0:90 St WGranGiSPRaviclit.assssneeesens «con caeeeeer eres 0°90 Entire Mississippi, exclusive of Red River…..... 0°25

Perhaps in Great Britain not more than a fourth part of the total moisture deposited on the land from the atmo- sphere is carried out to sea by streams.> But this is a point on which, until far more facts have been gathered, no definite statement can be accepted as at all trustworthy.

III. FLow.—Rivers, in obedience to the law of gravita- tion, always move from a higher to a lower level. Where the channel of a river becomes

vertical, or nearly so, a water-

2 In the present state of our information it seems almost useless to state any of the results already obtained, so widely discrepant and irre- concilable are they. In some cases the evaporation is given as usually three times the rainfall! and that the evaporation always exceeded the rainfall was for many years the belief among the French hydraulic engineers. (See Annales des Ponts et Chaussées, 1850, p. 383.) Observations on a larger scale, and with greater precautions against the undue heating of the evaporator, have since shown, as might have been anticipated, that as arule, save in exceptionally dry years, the eva- poration .s lower than the rainfall. As the average of ten years from 1860 to 1869 Mr Greaves found that at Lea Bridge the evaporation from a surface of water was 20°946, while the rainfall was 25°534 (Symons's British Rainfall for 1869, p. 162). But we need a vast accumulation of observations, taken in many different situations and exposures, in different rocks and soils, and at various heights above the sea. (For a notice of a method of trying the evaporation from soil, see British Rainfall, 1872, p. 206.)

3 Reclamation and Protection of Agricultural Land, Edin., 1874, Wh JU

4 Hydrology, p. 201.

5 In mountainous tracts having a large rainfall and a short descent to the sea, the proportion of water returned to the sea must be very much greater than this. Mr Bateman's observations for seven years in the Loch Katrine district gave a mean annual rainfall of 874 inches at the head of the lake, with an outflow equivalent to a depth of 81°70 inches of rain removed fron the drainage basin of 714 square miles.

fall is formed ; a steep rocky declivity in the channel gives rise to rapids; a fiat plain allows the stream to linger with a seareely perceptible current; while a lake renders the flow nearly or altogether imperceptible. Thus the rate of flow is regulated in the main by the angle of inclination and form of the channel, but partly also by the volume of water, an increase of volume

in a narrow channel increasing the rate of motion even without an increase of slope.

The course of a great river may be divided into three parts:—1. Zhe Mountain Lrack,—where, amidst the clouds and snows it takes its rise as a mere brook, and, fed by imnumerable similar torrents, dashes rapidly down the steep sides of the mountains, leaping from crag to crag in endless cascades, growing every moment in volume, until it enters lower ground. 2. The Valley Track.—It now flows through the lower hills or undulations which traverse or flank a great mountain chain, and is found at one time in a wide fertile valley, then in a dark gorge, now falling headlong in a cataract, now expanding into a broad lake. This is the part of its career where it assumes the most varied aspects, receives most characteristically the various conditions which are present to our minds in the idea of a river. 3, Z'he Plain Lrack.—Having quitted the undulating region, it finally emerges upon broad plains, probably wholly, or in great part, nade by itself. Here it winds sluggishly in wide curves, perhaps divides so as to enclose tracts of flat meadow or marsh, and finally, amid banks of mud and sand, passes out into the great ocean. In Europe the Rhine, Rhone, and Danube, in Asia the Ganges aud Indus, in America the Mississippi aud Amazon, in Africa the N ile, more or less fully illustrate this typical course of a great: river.

If we draw a longitudinal section of the course of any such river from its source, or from the highest peaks around that source to its mouth at the sea, we find that the line forms a concave curve, Steep at first, where it slopes from the mountain crests down into the valleys, the curve grows less and less through the middle portion, until it finally can hardly be distinguished from a horizontal line. Though characteristic of great rivers, this feature is not confined to their courses, but belongs to the architecture of the continents.

It is evident that a river must flow, on the whole, fastest in the first portion of its course, and slowest in the last. The common method of comparing the fall or slope of rivers is to divide the difference of height between their source and the sea-level by their leugth, so as to give the declivity per mile. This mode, however, often fails to bring out the real resemblances and differences of rivers, even in regard to their angle of slope. For example,

two streams rising at a height of 1000 feet, and flowing 100 miles, would each hive an average slope of 10 feet per mile ; yet they might be wholly unlike each other, one making its descent almost entirely in the first or mountain part of its course, and lazily winding for most of its way through a vast low plain, the other toiling through the mountains, then keeping among hills and table-lands, so as to form on the whole a tolerably equable and rapid flow. The great rivers of the globe have probably a less average slope than 2 feet per mile. The Missouri has a descent of 28 inches per mile. The average slope of the channel of the Thames is 21 inches per mile ; of the Shannon about 11 inches per mile, but between Killaloe and Limerick about 63 feet per mile; of the Nile, below Cairo, 3-25 to 5-5 inches per mile ; of the Doubs and Rhone, from Besangon to the Mediterranean, 24°18 inches per mile ; of the Volga, from its source to the sea, a little more thau 3 inches per mile. Higher angles of descent are those of torrents, as the Arve, with a slope of 1 in 616 at Chamounix, and the Durance, whose angle varies from 1 in 467 to 1 in 208 The slope of a navigable river

the largest tributaries, and fulfils

ought not, if possible, to exceed 10 inches per mile, or 1 in 6336.1

But not only does the rate of flow of aYiver vary at dif- fereut parts of its course, it is not the same in every part of the cross section of the river taken at any given point. The sidesand bottom, being retarded by friction against the channel, move less rapidly than the centre. The central piers of a bridge have thus a greater velocity of river current to bear than those at the banks. It follows that whatever ‘tends to diminish the friction of the moving current will increase its rate of flow. The same body of water, other conditions being equal, will move faster through a narrow gorge with steep smooth walls than over a broad rough rocky bed. For the same reason, when two streams join, their united current, having in many cases a channel not much larger than that of one of the single streams, flows faster, because the water encounters now the friction of only one channel. The average rate of flow of rivers is mucl1 less than might be supposed, even in what are

termed swift rivers. A moderate rate is about 1} mile in the hour; even that of a torrent does not exceed 18 or 20 miles in the hour.2 Mr D. Stevenson states that the velocity of such rivers as the Thames, the Tay, or the Clyde may be found to vary from about one mile per hour as a minimum to about three miles per hour as a maximum velocity.®

It may be remarked, in concluding this part of the sub- ject, that elevations and depressions of the land must have a powerful influence upon the slope of rivers. The uprais- ing of the axis of a country must increase the slope, and consequently the rate of flow which, on the contrary, will be diminished by a depression of the axis or by an elevation of the maritime regions. :

IV. Gzotoeican Actioy.—Like all the other forms of moving water, the streams which traverse a country have both a chemical and mechanical action. The latter receives most attention, as it undoubtedly is the more important ; but the former ought not to be omitted in any survey of the general waste of the earth’s surface.

i. Chemical.—The water of rivers must possess the powers of a cheinical solvent like rain and springs, though its actual work in this respect can be less easily measured, seeing that river water is directly derived from rain and springs, and necessarily contains in solution mineral substances supplied to it by them and not by its own oper- ation. Nevertheless, it is sometimes easy to prove that Streams dissolve chemically the rocks of their channels, Thus in limestone districts the base of the cliffs of river ravines may be found eaten away into tunnels, arches, and overhanging projections, presenting in their smooth surfaces a great contrast to the angular jointed faces of the same rock where exposed to the influence only of the weather on the higher parts of the cliff.

The composition of the river waters of western Europe is well shown by numerous analyses. The substances held in solution include variable proportions of the carbonates of lime, magnesia, and soda; silica ; peroxides of iron and manganese ; alumina; sulphates of lime, magnesia, potash, and soda; chlorides of sodium, potassium, calcium, and mag- nesium ; silicate of potash ; nitrates; and organicmatter. The minimum proportion of mineral matter among the analyses collected by Bischof was 2:61 in 100,000 parts of water in a mountain stream 3800 feet above the sea. On the other hand as

much as 54°5 parts in the 100,000 were obtained in the waters of the Beuvronne, a tributary of the Loire above Tours. The average of the whole of these analyses is about 21 parts of mineral matter in 100,000 of water, whereof carbonate of lime usually forms the half, its mean quantity

1 D. Stevenson, Canal and River Engineering p. 224. 2 Contjean, Géologie, p. 225. 3 Reclamation of Land, p. 18.

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ing 11:34. Bischof calculated that, assuming the mean ee of carbonate of lime in the Rhine to be 9°46 in 100,000 of water, which is the proportion ascertained at Bonn, enough carbonate of lime is carried into the sea by this river for the annual formation of three hundred and thirty-two thousand millions of oyster shells of the usual size. The mineral next in abundance is sulphate of lime, which in some rivers constitutes nearly half of the dissolved mineral matter. Silica amounting to 4°88 parts in 100,000 of water has been found in the Rhine, near Strasburg. The largest amount of alumina was 0°71 in the Loire, near Orleans. The proportion of mineral matter in the Thames, near London, amounts to about 33 in 100,000 parts of water, 15 of which (nearly half of the whole) consist of car- bonate of lime.

It requires some reflection properly to appreciate the

aniount of solid mineral matter which is every year carried in solution from the rocks of the land and diffused by rivers into the sea. According to recent calculations by Mr T. Mellard Reade, C.E., a total of 8,370,630 tons of solids in solution is every year removed by running water from the rocks of England and Wales, which is equivalent to a general lowering of the surface of the country from that cause alone at the rate of 0077 of a foot in a century or one foot in 12,978 years. The same writer computes the annual discharge of solids in solution by the Rhine to be equal to 92°3 tons per square mile, that of the Rhone at Avignon 232 tons per square mile, and that of the Danube at 72°7 tons per square mile ; and he supposes that on an average over the whole world there may be every year dissolved by rain about 100 tons rocky matter per English square mile of surface.!

ii. Jechanical.—The mechanical work of rivers is three- fold :—(1) to transport mud, sand, gravel, or blocks of stone from higher to lower levels; (2) to use these loose mate- rials in eroding their channels; and (3) to deposit these materials where possible, and thus to make new geological formations.

1. Transporting Power.—It is one of the distinctions of river water, as compared with that of springs, that, as a rule, it is less transparent, that is, it contains more or less mineral matterin suspension. The same stream differs much at successive intervals in the amount of material thus trans- ported. In dry weather whien the water is low it may be tolerably clear; but a sudden heavy shower or a season of wet weather will render it turbid. The mud thus so fre- quently noticeable in rivers is partly derived from the sur- face of the ground on either side, whence it is washed into the main streams by rain and brooks, but partly also by the abrasion of the water-channels through the operations of the streams themselves. In the mountain tributaries of a river we find the channels choked with large fragments of rock disengaged from the cliffs aud crags on either side. Traced downwards the blocks are seen to become gradually smaller and more rounded. They are ground against each other and upon the rocky sides and bottom of the channel, getting more and more reduced as they descend, and at the same time abrading the rocks over or against which they are driven. Hence a great deal of debris is pro- duced, and is swept along by the onward and downward movement of the brooks and rivers. The finer portions, such as mud and fine sand, are carried in suspension, and impart the characteristic turbidity to rivers; the coarser sand and gravel are driven along the river bottom.

The transporting capacity of a stream depends (a) on the the volume and velocity of the current, and (>) on the size, shape, and specific gravity of the sediment. (a) According to the calculations of Hopkins, the capacity of transport eS Eee eee

1 Address to Liverpool Geological Society, 1877.

increases as the sixth power of the velocity of the current; thus tlle motive power of the current is increased 64 times by the doubling of the velocity, 729 times by trebling, and 4096 times by quadrupling it. It has been found by experiment that “ ordinary sandy soil is moved by a cur- rent having a velocity of about half a mile an hour, and that a current of about one mile per hour will move fine gravel, while heavy gravel resists a current of upwards of two miles per hour.” Mr David Stevenson? gives the subjoined table of the power of transport of different velocities of river currents.

In. per Mile per Second. Hour.

3 = 0°170 will just begin to work on fine clay.

6 = 0°340 will lift fine sand.

8 = 0°4545 will lift sand as coarse as linseed. 12 = 0°6819 will sweep along fine gravel. 24 = 1°3638 will roll along rounded pebbles 1 inch in diameter. 36 = 2°045 will sweep along slippery angular stones of the size

of an egg.

We must never lose sight, however, of the fact that it is not the surface velocity, nor even the mean velocity, of a river which can be taken as the measure of its power of transport, but the bottom velocity—that is, the rate at which the stream overcomes the friction of its channel. (b) The average specific gravity of the stones in a river ranges between two and three times that of pure fresh water ; hence these stones lose ffom a half to a third of their weight in air when borne along by the river. Huge blocks which could not be moved by the same amount of energy applied to them on dry ground are swept along with ease when they have found their way into a strong river current. The shape of the fragments greatly affects their portability, when they are too large and heavy to be carried in mechanical suspension. Rounded stones are of course most easily moved ; flat and angular ones are moved with comparative difficulty.

Besides their ordinary powers of transport, rivers gain at times considerable additional force from several causes. Those liable to sudden and heavy falls of rain acquire by flooding an enormous increase of transporting and

excavating power. More work may thus be done by a stream in a day than could be accomplished by it during years of its ordinary condition. Another source of increase to the action of rivers is provided when, from landslips, formed by earthquakes, by the undermining influence of springs, or otherwise, a stream is temporarily dammed back, and the barrier subsequently gives way. The bursting out of the arrested waters produces great de- struction in the valley. Blocks as big as houses may be set in motion, and carried down for considerable distances, Again, the transporting power of rivers is greatly augmented in countries where they freeze in winter. As the ice gathers along the banks it encloses gravel, sand, and even large blocks of rock, which, when thaw comes, are lifted up by the ice and carried down the stream. Ground-ice likewise appears in cold latitudes on the bottoms of the rivers, whence, rising in cakes to the surface, it carries with it sand, mud, or stones lying on the bottom, which are then swept seaward. When rivers such as those of northern Russia and Siberia, flowing from south to north, have the ice thawed in their higher courses before it breaks up farther down, much disaster is sometimes caused by the piling up of the ice, and then by the bursting of the impeded river through the temporary ice-barrier. In another way ice sometimes vastly increases the destructive

2 Canal and River Engineering, p. 315.

3 The extent to which heavy rains can alter the usual characters of rivers is forcibly exemplified in the graphic account of The Moray- shire Floods, by the late Sir T, Dick Lauder. Inthe year 1829 the rivers of that region rose 10, 18, and in one case even 50 feet above their common summer level, producing almost incredible havoc.

powers of small streams where avalanches or an advancing glacier cross a valley and pond back its drainage. The valley of the Dranse, in Switzerland, has several times suffered from this cause. In 1818 the glacier barrier ex- tended across the valley for more than half a mile, with a breadth of 600 and a height of 400 feet. The waters above the ice-dam accumulated into a lake containing 800,000,000 cubic feet. By a tunnel driven through the ice, the water was drawn off without desolating the plains below.

That rivers differ vastly from each other in the amount of material they transport is made evident by the great diver- sities in their relative muddiness. It should be borne in mind that the actual amount of sediment borne downwards by a river is not necessarily determined by the carrying power of the current. The swiftest streams are not always the muddiest. The proportion of sediment is partly dependent upon the hardness or softness of the rocks of the channel, the number of tributaries, the nature and slope of the ground forming the drainage basin, the amount and distribution of the rainfall, the size of the glaciers (where such exist) at the sources of the river, &c. A rainfall spread with some uniformity throughout the year may not sensibly darken the rivers with mud, but the same amount of fall crowded into a few weeks or months may be the means of sweeping a vast amount of earth into the rivers, and send- ing them down in a greatly discoloured state to the sea Thus the rivers of India during the rainy season become rolling currents of mud.

In his journeys through equatorial Africa Livingstone came upon rivers which appear usually to consist more of sand than of water. He describes the Zingesi as “a sand rivulet in flood, 60 or 70 yards wide, and waist-deep. Like all these sand-rivers it is for the most part dry ; but, by digging down a few feet, water is to be found, which is per- colating along the bed on a stratum of clay. In trying to ford it,” he remarks, “I felt thousands of particles of coarse sand striking my legs, which gave me the idea that the amount of matter removed by every freshet must be very great…. These sand rivers remove vast masses of disin- tegrated rock before it is fine enough to form soil. In most rivers where much wearing is going on, a person diving to the bottom may hear literally thousands of stones knocking against each other. This attrition, being carried on for hundreds of miles in different rivers, must have an effect greater than if all the pestles and mortars and mills of the world were grinding and wearing away the rocks.”

The amount of mineral matter transported by rivers can be estimated by examining their waters at different periods and places, and determining their solid contents. A com- plete analysis should take into account what is chemically dissolved, what is mechanically suspended, and what is driven or pushed along the bottom. We have already dealt with the chemically dissolved ingredients. In determin- ations of the mechanically mixed

constituents of river water, it is most advantageous to obtain the proportion first by weight, and then from its average specific gravity to estimate its bulk as an ingredient in the water. ‘The Ganges, according to Everest, contains during the four months of flood earthy matter in the proportion of the by weight or 54, by volume,—the mean average for the year being sty by weight or >js by volume. According to Mr Login, the waters of the Irrawaddy con- tain zA5q by weight of sediment during floods, and se during a low state of the river. The most elaborate measure- ments and calculations yet made regarding this aspect of the operations of a river are those by Messrs Humphreys

and Abbot on the Mississippi, who found, as the mean of .

many observations carried on continuously at different parts of the river for months together, that the average

proportion of sediment contained in the water of the Mississippi is 755 by weight, or spov by volume. But besides the matter held in suspension, they observed that a large amount of coarse detritus is constantly being pushed along the bottom of the river. They estimated that this moving stratum carries every year into the Gulf of Mexico about 750 million cubic feet of sand, earth, and gravel. Their observations led them to conclude that the annual discharge of water by the Mississippi is 19,500,000 million cubic feet, and consequently that the weight of mud annually carried into the sea by this river must reach the sum of 813,500 million bb, Taking the total annual contributions of earthy matter, whether in suspension or moving along the bottom, they found them to equal a prism 268 feet in height, with a base of one square mile.

2. Excavating Power.—In transporting its freight of sediment a river performs a vast amount of abrasion. In the first place it rubs the loose stones against each other, breaks them into smaller pieces, rounds off their edges, reduces them to rounded pebbles and finally to sand or mud. In the next

place by driving these loose materials over the rocks it wears down the sides and bottom of its channel which is thereby widened and deepened.

The familiar effect of running water upon fragments of rock, in reducing them to smoothed rounded pebbles, is expressed by the common phrase “ water-worn.” Every stream which descends from high rocky ground may be compared to a grinding mill; large boulders and angular blocks of rocks, disengaged by frosts, springs, and general atmospheric waste, fall into the upper end, and only fine sand and silt are discharged into the sea. M. Daubrée has instituted some ingenious experiments for ascertaining the circumstances under which angular fragments are converted into rounded pebbles with the production of sand and mud. Using fragments of granite and quartz, he caused them to slide over each other in a hollow cylinder partially filled with water, and rotating on its axis with a mean velocity of 0°80 to 1 metre in a second. He found that after the first 25 kilometres (about 153 English miles) the angular fragments of granite had lost 34 of their weight, while in the same distance fragments already well-rounded had not lost more than y}5 to zt>. The fragments rounded by this journey of 25 kilometres in a cylinder could not be distinguished either in form or in general aspect from the natural detritus of a river bed. A second product of these experiments was an extremely fine impalpable mud, which remained sus- pended in the water several days after the cessation of the movement. During the production of this fine sediment the water acted chemically upon the granite fragments, for after a day or two it was found, even though cold, to have dissolved a very sensible proportion of silicate of potash. After a journey of 160 kilometres, 3 kilogrammes (about 65 lb avoirdupois) had yielded 3°3 grammes (about 50 grains) of soluble salts consisting chiefly of silicate of potash. A third product was an extremely fine angular sand consisting almost wholly of quartz, with scarcely any felspar, almost the whole of the latter mineral having passed into the state of clay. The sand grains, as they are con- tinually pushed onward over each other upon the bottom of a river, become rounded as the larger pebbles do. But, as M. Daubrée points out, a limit is placed to this attrition by the size and specific gravity of the grains. So long as they are carried in suspension they will not abrade each other, but remain angular ; for he found that the milky tint of the Rhine at Strasburg in the months of J uly and August was due not to mud but to a fine angular sand (with grains about zo millimetre in diameter)

which constitutes roooot Of the totalweight of water. Yet this sandhad travelled in arapidly flowing tumultuous river from the Swiss mountains, and had

been tossed over waterfalls and rapids in its journey. He ascertained also that sand with a mean diameter of grain of jy mm. will float in feebly agitated water ; so that all sand of finer grain must remain angular. The same observer has noticed that sand composed of grains with a mean diameter of 4 mm., and carried along by water moving at a rate of 1 metre per second, gets rounded, and loses about 35397 of its weight in every kilometre travelled.

The effects of abrasion upon the loose materials on a river bed are only a portion of the erosive work performed by the stream. Where the bottom is covered with a layer of debris only the upper portion of which is pushed onward by the current, the solid rock of the river channel is there protected from waste. But this protection is only local, and is apt to be swept away from time to time by violent floods. In those parts of a river channel where the current 1s strong enough to keep gravel and boulders moving along, these loose materials rub down the rocky bottom over which they are driven. As the shape and declivity of the channel vary constantly from point to point, with at the same time frequent changes in the nature of its rocks, this erosive action is liable to continual modifications. While there is a gene- ral abrasion of the whole bottom over which loose detritus is rolled, the erosion goes on most briskly in the numerous hollows and grooves along which chiefly these loose materials travel. Wherever an eddy occurs in which gravel is kept in gyration, erosion is much increased. The stones in their movement excavate a hole in the channel, while, as they themselves are reduced to sand and mud, or are swept out by the force of the current, their places are taken by fresh stones brought down by the stream. Such pot-holes, as they are termed, vary in size from mere cup-like depressions to huge cauldrons or pools. As they often coalesce by the giving way of the intervening walls between two or more of them they materially increase the deepening of the river bed.

The shape of a river channel at any given point in its course depends mainly upon the nature and structure of the material out of which it has been eroded. One of the most characteristic features of streams, whether large or small, is the tendency to wind in serpentine curves when the angle of declivity is low and the general surface of the country tolerably level. This peculiarity may be observed in every stream which traverses a flat alluvial plain. Some slight weakness in one of its banks enables the current to cut away a portion of the bank at that point. By degrees a concavity is formed, whence the water is deflected to the opposite side, there to break with increased force against the bank. Gradually a similar concavity is cut out on that side, and so, bending alternately from one side to the other, the stream is led to describe a most sinuous course across the plain. By this process, however, while the course is greatly lengthened, the velocity of the current pro- portionately diminishes, until it may, before quitting the plain, become a lazy, creeping stream, which in England is bordered perhaps with sedges and willows. Such meandering courses are most frequent in soft alluvial plains, but they may also be found in solid rock if the original form of the surface was tolerably flat. The windings of the gorges of the Moselle and Rhine through the table-land between Treves, Mainz, and the Siebengebirge form a notable illustration.

Abrupt changes in the geological structure or lithological character of the rocks of a river-channel may give rise to waterfalls. In many cases waterfalls have originated in lines of escarpment over which the water at first found its way, or in the same geological arrangement of hard and soft rocks by which the escarpments themselves have been produced. In the case of the falls of Niagara, for example, the stream may have fallen over the Queenstown cliff when the river first sought its way to the sea. But

much more probably the escarpment and waterfall began to arise simultaneously and from the same geological structure. As the escarpment grew in height, it receded from its start- ing pot. The river-ravine likewise crept backward, but at a more rapid rate, and the result has been that at present the cliff worn down by atmospheric causes stands at Queenstown,

while the ravine extends 7 miles further inland, witha width of from 200 to 400 yards, and a depth of from 200 to 300 feet. In this as in other cases the waterfall has cut its way backward up the course of its stream, and will continue to do so as long as the structure of the gorge continues as it is now —a, thick bed or beds of limestone resting horizontally upon soft shales. The softer strata at the base are undermined, and slice after slice is cut off from the cliff over which the cataract pours. It has been estimated that at their present rate of recession the Niagara Falls must have taken about 35,000 years to cut their way backward and excavate the gorge between their present position and Queenstown. In other cases waterfalls have been produced by the existence of a harder and more resist- ing band or barrier of rock crossing the course of the stream, as, for instance, where the rocks have been cut by an intru- sive dyke or mass of basalt. In these and all other cases the removalof the harder massdestroysthe waterfall, which, after passing into a series of rapids, is finally lost in the general abrasion of the river-channel. The most marvellous river gorges in the world are those of the Colorado region in North America. The rivers there flow in ravines thousands of feet deep and hundreds of miles long, through vast table- lands of nearly horizontal strata. The Grand Caiton (ravine) of the Colorado river is 300 miles long, and in some places more than 6000 feet in perpendicular depth. The country is hardly to be crossed except by birds, so profoundly has it been trenched by these numerous gorges. Yet the whole of this excavation has been effected by the erosive action of the streams themselves.

In the excavation of a ravine, whether by the recession of a waterfall or of a series of rapids, the action of the river is more rapid than that of the atmospheric agents. The sides of the ravine consequently retain their vertical char- acter. But where, from the nature of the ground, the denuding action of rain, frost, and general weathering is more rapid than that of the river, a wider and opener valley is hollowed out, through which the river flows, and from which it carries away the materials discharged into it from the surrounding slopes by the rain and brooks,

3. Reproductive Power.—Every body of water which when in motion carries along sediment drops it when at rest. The moment a current has its rapidity checked it is deprived of some of its carrying power, and begins to

lose hold upon its sediment, which tends more and more to sink and halt on the bottom the slower the motion of the water. In the course of every brook and river there are frequent checks to the current. If these are examined, they will usually be found to be each marked by a more or less conspicuous deposit of sediment. We may notice seven dif- ferent situations in which stream deposits or alluvium may be accumulated.

(a.) Aé the foot of Mountain Slopes.—When a runnel or torrent descends a steep declivity it tears down the soil and rocks, cutting a deep gash out of the side of the mountain, On reaching the level ground at the base of the slope the water, abruptly checked in its velocity, at once drops its coarser sediment, which gathers in a fan-shaped pile or cone, with the apex pointing up the water course. Huge accumu- lations of boulders and shingle may thus be seen at the foot of such torrents,—the water flowing through them often in several channels which re-unite in the plain beyond.

(0.) In River-beds,—This is characteristically shown in

| many of the rivers of Britain, by the accumulation of a bed

RIVERS. |

of sand or shingle at the concave side of each sharp bend of the river course. While the main current is making a great sweep round the opposite bank, the water lingers along the inner side of the curve and drops there its freight of loose detritus, which, when laid bare in dry weather, forms the familiar sand-bank or shingle beach. Again, when a river, well supplied with sediment, leaves rough ground where its course has been rapid, and enters a region of level plain, it begins to drop its burden on its bed, which is thereby heightened, till sometimes, as in parts of the courses of the Po, Adige, and Brenta across the plains of Lombardy, it is higher than the surrounding level region. This could not happen were it not that in floods a river deposits sediment along its banks, which are thus also heightened so as to retain the river in its ordinary state. But in such cases, if man lives along the margin of thie river, he needs all his skill and labour to keep the banks secure. And even witli his utmost efforts the river will now and then break through, sweeping down the barrier which it has itself made, as well as any additional embankments constructed by him, and carrying its flood

far and wide over the plain. Left to itself, the river would incessantly shift its course, until in turn every part of the plain had been again and again traversed. It is indeed in this way that a great alluvial plain is gradually levelled and heightened.

(c.) On River-banks and Flood-plains.—This deposit is partly implied in the action described in the foregoing paragraph. It is laid down on the level tracts or flood- plain over which a river spreads in flood, and consists usually of fine silt, mud, earth, or sand, though close to the river it may be partly made up of much coarser materials, When a flooded river overflows, the portions of water which spread out on the plains, by losing velocity and consequently power of transport, are compelled to let fall some or all of their mud and sand. If the plains happen to be covered with woods, bushes, scrub, or even tall grass, the vegetation acts the part of a sieve, und filters the muddy water, which may rejoin the main stream comparatively clear. Every flood increases the height of the plain, until, partly from this cause and partly, in the case of a ‘rapid stream, from the erosion of its bed, the river can no longer overspread it. As the channel is more and more deepened, the river continues, as before, to be liable from inequalities in the material of its banks, sometimes of the most trifling kind, to be turned from side to side in wide curves and loops, and cuts into its old alluvium, mak. ing eventually a newer plain at a lower level, Continued erosion carries the channel to a still lower level, where the stream can attack the later alluvial deposit, aud form a still lower and newer one, The river comes by this means to be fringed with a series of terraces, each of which repre- sents a former flood-level of the stream. In Britain it is common to find three such terraces, but sometimes as many a8 Six or seven or even more may occur. In North America the river terraces exist on so grand a scale that the geo- logists of that country have named one of the later periods of geological history, during which those deposits were fornied, the Terrace Epoch. In the attempt to reconstruct the history of the old river-terraces of a country, we have to consider whether they have been entirely cut out of older alluvium (in which case, of course, the valleys must have been as deep as now before the formation of the terraces); whether they afford any indications of having been formed during a period of greater rainfall, when the rivers were larger than at present ; whether they point to any upheaval of the interior of the

country which would accelerate the erosive action of the streams, or to any depression of the

1 It is in the north of Italy that the struggle between man and

nature in this department has been most persistently waged. See on this subject Lombardini in Ann. des Ponts et Chaussées, 1847.

interior or rise of the seaward tracts, which would diminish that action and increase the deposition of alluvium. Pro- fessor Dana has connected those of America with the ele- vation of the axis of that continent.

(.) In Lakes.—When a river enters a lake its current is at once checked, and its sediment begins to gather over the lake bottom. If thelake be long enough in proportion to the volume of the river, the whole of the detritus may be deposited, so that, at its outflow, the river becomes as clear as when its infant waters began their course from the springs, snows, and mists of the far monntains, Thus the Rhone enters the Lake of Geneva turbid and impetuous, but it escapes at Geneva as blue translucent water. Its sediment is laid down on the floor of the lake, and chiefly at the upper end. Hence, lakes act as filters or sieves to intercept the sediment which is travelling in the rivers from the high grounds to the sea. If we look down froma height even upon a small lake among mountains, we observe that at the mouth of each torrent or brook which enters it there lies a little tongue of flat land (a true delta), through which the streamlet winds in one or more branches before ming- ling its waters with those of the lake. Each of these tongues consists of alluvinm, laid down in obedience to the same law which governs the formation of river alluvium elsewhere, and continually creeping further out from the land as the deposit of sediment advances. Two streams entering a lake from opposite sides may join their alluvia so as to divide the lake into two, like the once united lakes of Thun and Brienz at Interlaken. Or the lake may be finally filled up altogetlier, as has happened in innumerable cases in all mountainous countries; the hilly tracts of Britain, for example, furnish abundant illustrations of every stage in this process.

Where a large river with abundant sediment enters an important lake (as the Rhone at the head of the Lake of Geneva), the accumulation of its alluvium or delta may quite rival that of a great river in the sea, as described in paragraph (I.) below.

e.) Bars and Lagoon-Barriers. —If we take a broad view of the degradation of the land, we must admit that the deposit of any sediment on the land is only temporary ; the inevitable destination of all this material is the ocean. Most rivers which enter the sea have their mouths crossed by a bar of gravel, sand, or mud. The formation of this barrier results from the conflict between the river and the ocean. Although the niuddy fresh water floats on the leavier salt water, its current is lessened, and it can no longer push along the mass of detritus on its bed. It has been ascertained, moreover, that, though fresh water can retain for a long while fine mud in suspension, this sediment is rapidly thrown down when the fresh is mixed with saline water. Hence, apart from the necessary loss of transporting power by the checking of the river current at the mouth, the mere mingling of a river with the sea must of itself be a cause of the deposit of sediment. But a large body of fresh water may float for a long dis- tance before it is thoroughly mingled with the heavier water of the ocean. Ultimately, however, the fine detritus dropped by a river, together with the coarser materials on the bottom, are arrested by the sea. Moreover, in many cases the sea itself piles up great part of the sand and gravel of the bar. Heavy river-floods push the bar farther to sea, or even temporarily destroy it ; storms from the sea, on the other hand, drive the bar farther up the stream. Another remarkable illustration of the contest between the alluvium-carrying streams and the land-eroding ocean is shown by the vast lines of bar or bank which, both in the Old World and the New, stretch along the coast. The streams do not flow straight into the sea, but run sometimes for many miles parallel to the coast, accumulating behind the barriers into broad

and long lagoons, but eventually breaking through the barriers of alluvium and entering the sea. The lagoons of the Italian coast and of the Baltic near Dantzic are familiar examples. A conspicuous series of these alluvial bars fronts the American mainland for many hundred miles round the Gulf of

Mexico and the shores of Florida, Georgia, and North Carolina. A. space of several hundred miles on the east coast of India is similarly bordered. M. E. de Beaumont, indeed, has estimated that about a third of the whole of the coast-lines of the continents is fringed with such alluvial bars. .

(f.) Deltas in the Sea.—The tendency of sediment to accumulate in a tongue of flat land when a river loses itself in a lake is exhibited on a far vaster scale where the great rivers of the coutinents enter the sea. It was to one of these maritime accumulations, that of the Nile, that the Greeks gave the name Delta, from its resemblance to their letter A, with the apex pointing up the river, and the base fronting the sea. This shape being the common one in all such alluvial deposits at river mouths, the term delta has come to be always applied to them. A delta therefore consists of successive layers of detritus, brought down from the land and spread out in the sea at the mouth of a river until they reach the surface, and then, partly by growth of vegetation and partly by flooding of the river, forma plain, of which the inner and higher portion comes eventually to be above the reach of the floods. Large quantities of drift- wood are often carried down, and bodies of animals are swept off to be buried in the delta, or even to be floated out to sea. Hence, in deposits formed at the mouths of rivers, we may always expect to find terrestrial organic remains.

When a river enters upon the delta-portion of its course it assumes a new character. In the previous parts of its journey it is always being augmented by tributaries ; but now it begins to split up into branches, which wind to and fro through the flat alluvial land, often coalescing and thus enclosing insular spaces of all dimensions. The feeble current, no longer able to bear along all its weight of sedi- ment, allows much of it to sink to the bottom and to gather over the tracts which are from time to time sub- merged, Hence many of the channels get choked up, while others are opened out in the plain, to be in turn abandoned, and thus the river restlessly shifts its channels, The sea- ward ends of at least the main channels grow outwards by the constant accumulation of detritus pushed into the sea, unless this growth chances to be checked by any marine current sweeping past the delta.

The European rivers furnish many excellent illustra- tions of delta-growth. Thus the Rhine, Meuse, Sambre, Scheldt, and other rivers have formed the wide mari- time plain of Holland and the Netherlands. The Rhone has deposited an important delta in the Mediterranean Sea. ‘The upper reaches of the Adriatic Sea are being rapidly shallowed and filled up by the Po, Adige, and other streams. Thus Ravenna, originally built in a lagoon like Venice, is now 4 miles from the sea. The port of Adria, so well known in ancient times as to have given its name to the Adriatic, is now 14 miles inland, while in other parts of that coast-line the breadth of land gained within the last 1800 years has been as much as 20 miles. On the opposite side, also, of the Italian peninsula, great additions have been made to the coast-line within the historical period. It is computed that the Tuscan rivers lay down as much as 12 million eubic yards of sediment every year within the marshes of the Maremma. The “yellow” Tiber, as it was aptly termed by the Romans, owes its colour to the abundance of the sediment which it carries tosea. It has long been adding to the coast-line at its mouth at the rate of from 12 to 13

feet perannum. Hence the ancient harbour of Ostia is now more than 3 miles inland. Its ruins are at present (1879) being excavated, but every flood of the river leaves a thick deposit of mud on the streets and on the floors of the un- covered houses. Whence it would seem that the Tiber has not only advanced its coast-line, but has raised its bed on the plains by the deposit of alluvium, so that it now over- flows places which, 2000 years ago, could not have been so frequently under water.1 In the Black Sea a great delta is rapidly growing at the mouths of the Danube. At the Kilia outlets the water is shallowing so fast that the lines of soundings of 6 feet and 30 feet are advancing into the sea at the rate of between 300 and 400 feet per annum.?

The typical delta of the Nile has a seaward border 180 miles in length, the distance from which to the apex of the plain where the river bifurcates is 90 miles. That of the Mississippi contains an area of 40,000 square miles. The united delta of the Ganges and Brahmaputra covers a space of between 50,000 and 60,000 square miles, and has been bored through to a depth of 481 feet.

(g.) Sea-borne Sediment.—Although more properly to be noticed under the section on the sea, the final course of the materials worn by rains and rivers from the surface of the land may be referred to here. By far the larger part of these materials sinks to the bottom close to the land. It is only the fine mud carried in suspension in the water which is carried out to sea, the distance depending on the velocity of the stream, the specific gravity and shape of the particles of the mud, and the help or hindrance given by marine currents. The sea fronting the Amazon is dis- coloured for 300 miles by the mud of that river. The soundings taken by the ‘ Challenger” brought up land- derived detritus from depths of 1500 fathoms,—several hundreds of miles distant from the nearest shores.

The amount of material carried by a river into the sea may be taken as the measure or gauge of the general lower- ing of the surface of the basin drained by theriver. If we ascertain the annual quantity of mineral matter

thus de- livered into thesea,and know the superficial extent of ground from which it has been derived, the one sum divided by the other gives the extent by which the mean level of thecountry is reduced in one year. Both the fine mud mechanically suspended in the water and the salts dissolved in it should be taken into account, as well as the coarser detritus pushed along the bottom. It is the mechanically suspended mud which has generally been measured. According to the data of Messrs Humphreys and Abbot, already cited, the propor- tion of sediment in the Mississippi is z459 by weight, or zag «by volume. The annual discharge of sediment 1s 7,459,267,200 cubic feet, and the drainage basin 1,147,000 square miles. This is equal to a loss of gggq of a foot of rock from the general surface of the drainage basin in 1 year, or 1 foot in 6000 years. Other rivers work faster than this rate. The Gauges has been estimated to remove 1 foot of rock from its drainage area in 2358 years, and the Po 1 foot in 729 years. Such computa- tions are at the best only approximations to the truth, but they are useful in showing how great an amount of change must be effected even within comparatively short geological periods by the various agents which are disintegrating the surface of the land.

1 See an interesting article by Professor Charles Martins on the Aigues-Mortes, in Revue des Deux Mondes, 1874, p. 780. The present writer accompanied the distinguished French geologist on the occasion of his visit to Ostia in the spring of 1873, and was much struck with the proofs of the rapidity of deposit in favourable situations. In the article just cited some valuable information is given regarding the progress of the delta of the Rhone in the Mediterranean.

2 Hartley, Alin. of Proc. Inst. Civ. Engin., xxxvi. 216.

LAKES. |

§ 4. Lakes.

Depressions filled with water on the surface of the land, and known as lakes, occur abundantly in the northern parts of both hemispheres, and more sparingly, but often of large They do not belong to the nor- mal system of erosion in which running water is the prime agent, and to which the excavation of valleys and ravines

size, in warmer latitudes,

must be attributed. On the contrary, they are exceptional

to that system, and the constant tendency of running water is to fill them up. Their origin, therefore, must be sought

among some of the other geological processes. See part vii. Lakes are conveniently classed as fresh or salt, which possess an outlet contain in almost all cases fresh water; those which have none are usually salt. 1. Fresh-water Lakes. —These, ina vast number of cases, are simply depressions or expansions of the valleys in which

they lic.- They receive a river at the upper end, together

probably with many minor tributaries from the sides, and let the accumulated waters overflow at the lower end. In all these cases, they act as filters for the river water, allowing its sediment to settle, and discharging it purified at the outflow, to continue its course of erosion and mud- making down the valley. A river which flows through a succession of lakes cannot carry much sediment to the sea, unless it has a long course to run after it has passed the lowest lake, and receives one or more muddy tributaries. But the sediment which would have reached the sea and gone to form a delta or deposit on the sea-bed serves its purpose in contributing to fill up the lakes. Hence it is

rare to find any lake with an inflowing and outflowing

river, where proofs of the gradual encroachment of the land upon the water may not be gathered.

In other cases lakes do not lie in the natural drainage lines of a country, but are scattered apparently at random

over the surface, fed by springs, rains, and streamlets from

the slopes, or, if of large size, lying as great basins, receiving the collected waters of a wide region, and forming in this way the source out of which

full-formed rivers emerge. From the little tarns of Wales and the lochans of Scotland a series may be traced, through innumer-

able grades of size and form, in Scandinavia, Finland, and Canada, till we reach such vast shects of inland water as Lakes Huron, Erie, and Superior, and the great equatorial In lakes of this kind also the process of

lakes of Africa. filling up may often be traced. Each tributary stream pushes its delta into the water. Where the lakes are shallow, and lie in temperate countries, vegetation comes in to aid in the conversion of the water, first into marsh, then into ‘ peat-bog, the last few centuries great changes of this kind have been going on.

On large lakes the wind throws the water into waves which almost rival those of the ocean insize and destructive

power. Beaches, sand-dunes, shore-cliffs, and the other familiar features of the meeting line between land and sea

reappear along the margins of such great fresh-water seas as Lake Superior.

Three geological functions of lakes are (1) to arrest and equalize the drainage by regulating the outflow and pre- venting or lessening the destructive effects of floods!; (2) to filter river water and permit of the undisturbed accumu- lation of new deposits, which in some modern cases may cover thousands of square miles of surface, and might attain

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1 Winds, by blowing strongly down the length of a lake, sometimes considerably increase for the time being the volume of the outflow. If this takes place coincidently with a heavy rainfall, the flood of the river is greatly angmented. These features are noticed in Loch Tay (D. Stevenson, Reclamation of Land, p. 14). Hence, though, on the whole, lakes tend to moderate floods in the outflowing rivers, they may by a combination of eireumstances sometimes increase them.

GEOLOGY

Those

and finally into dry ground. In Scotland during

a thickness of nearly 3000 fect (Lake Superior hasan area of 32,000 square miles ; Lago Maggiore is 2800 feet deep) ; (3) to furnish an abode for a lacustrine fauna and flora, to receive the remains of the plants and animals washed down. from the surrounding country, and to entomb all these or- gauisms in the growing deposits, so as to preserve a record of the terrestrial life of the period. The deposits in lakes consist of alternations of sand, silt, mud, and gravel, with occasional irregular seams of vegetable matter, and layers of calcareous marl formed from the accumulation, of lacustrine shells, Entomostraca, &. In a lake receiving much sedi- ment there will be little or no marl formed, at least not during the time when the sediment ig being deposited. In clear lakes, on the other hand , Where there is very little sedi- ment or where it only comes occasionally at wide intervals of flood, beds of white marl, formed entirely of organic re- mains, may gather on the bottom toa depth of many yards.

2. Salt Lakes may be divided into two classes—(a) those which owe their saltness to the evaporation and con- centration of the fresh water poured into them by their feeders ; and (b) those which were originally parts of the ocean, Salt lakes of the first kind are abundantly scattered over the inland areas of drainage in the heart of cont}- nents, as in the great Lake of Utah, and numerous other minor lakes in North America, and the abundant salt lakes of the great plateau of Central Asia. These sheets of water were doubtless fresh at first, but they have progressively in- creased in salinity, because though the water is evaporated as fast as it is received, there is no escape for the dissolved salts, which consequently remain in the increasingly concen- trated liquid. Salt lakes of the second class are compara- tively few in number. In their case portions of the sea have been isolated by movements of the earth’s crust, and these detached areas, exposed to evaporation, which is only partially compensated by inflowing rivers, have shrunk in level, and at the same time have sometimes grown mucli salter than the parent ocean. The Caspian Sea, 180,000 Square miles in extent, and with a maximum depth of from 2000 to 3000 feet, is a

magnificent example. The shells are chiefly the same as those still living in the Black Sea. Banks of them may be traced between the two seas, with salt lakes and marshes and other evidence to prove, not only that the Caspian was once joined to the main ocean, but that a great firth ran up between Europe and Asia, and possibly stretched completely across what are now the steppes and plains of the Tundras till it merged into the Arctic Sea. Even at present, by means of canals connect- ing the rivers Volga and Dwina, vessels can pass from the Caspian into the White Sea. But the surface of the Caspian is now more than 80 feet below that of the Black Sea. At present the amount of water supplied by rivers to the Caspian just balances that removed by evaporation, so that the level appears to be no longer sinking. But though, owing to the enormous volume of fresh water poured into it by these rivers, the Caspian is not as a whole so salt as the main ocean, and still less so than the Mediterranean, nevertheless the inevitable result of evaporation is there manifested. Along the shallow pools which border this sea a constant deposition of salt is taking place, forming sometimes a pan or layer of rose-coloured crystals on the bottom, or gradually getting dry, and covered with drift sand. This con- centration of the water is still more marked in the great offshoot called the Karaboghaz, which is connected with the middle basin of the Caspian by a channel 156 yards wide and ® feet deep. Through this narrow mouth there flows from the main sea a constant current, which Von Baer estimated to carry daily into the Karaboghaz 350,000 tons of salt. An appreciable increase of the saltness of that gulf has been noticed : seals, which once frequented it, have forsaken its barren shores. Layers of salt are gathering on the mud at

the bottom, and the sounding-line, when scarcely out of the water, is covered with saline crystals.1 These facts furnish an illustration of the circumstances under which the rock- -salt deposits in the New Red Sandstone and other geological formations were probably accumulated.

The following table shows the proportion of the saline materials in the waters of some salt lakes :—

Caspian Sea. (Gubel.)

Elton Lake, Kirghis Steppe, in Summer, (Erdmann.) (Goébel.) Dead Sea, (C. G. Gmelin.)

Chloride of Sodium …..... HA Magnesium 7 Calcium ny Potassium …..... | ate Manganese…..... | ~ Aluminium …... Bromide of Magnesium …..... 7 Potassium …..... Sulphate of Calcium…..... Potassium …....

~ | Indertsch Lake.

0°3673

0:0632

00013 Biearb. Magn.

00076

traee

0-0490

00171 Biearb. Lime.

01259

+ 2. Sevier ess 2 oO: Re DAINHOe

Magnesium …..:.

99°3806

100°0000

II. FRESH WATER IN THE SOLID STATE—ICE.

Fresh water under ordinary circumstances, when it reaches a temperature of 32° Fahr., passes into the solid state by crystallizing into ice. In this condition it performs a series of important geological operations before being again melted and relegated to the general mass of liquid terrestrial

waters. ive conditions under which ice occurs on the land deserve notice, viz. frost, frozen rivers and lakes, hail, snow, and glaciers,

1. Frost.—Water in freezing expands. If it be confined in such a way that expansion is impossible, it remains liquid even at temperatures far below the freezing point; but the instant that the pressure is removed this chilled water becomes solid ice. There is a constant effort on the part of the water to become solid, and very considerable pressure is needed to counterbalance its expansive power. The lower the temperature the greater this exerted pressure becomes. At a temperature of 30° Fahr. the pressure must amount to 146 atmospheres, or the weight of a column of ice a mile high, or 138 tons on the square foot. Consc- quently when the water freezcs at a lower temperature its pressure on the walls of its enclosing cavity must exceed 138 tons on the square foot. Bomb-shells and cannon filled with water and hermetically sealed have been burst in strong frosts by the expansion of the freezing water within them. It is easy to see, therefore, that we have here a geological agent of great potency. It is true that in nature the enormous pressures which can be obtained arti- ficially occur rarely or not at all, because the spaces into which water penetrates can hardly ever be so securely closed as to permit the water to be cooled down very con- siderably below 32° Fahr. before freezing. Still ice form- ing at even two or three degrees below the freezing point exerts an enormous disruptive force.

Soils and rocks are all porous, and usually contain a good deal of moisture. When frost congeals this interstitial water, the particles of the soil or rock are pushed asunder by the expanding ice; their cohesion is loosenedor destroyed so that when a thaw comes, they seem as if they have been ground down in a mortar. Water lodges also in the numer- ous joints and crevices of rocks. Freezing there, it exerts great pressure upon the walls between which it lies, pushing them asunder as if a wedge were driven between them.

1 Carpenter, Journ. Geog. Soc., vol. xviii., No. 4, quoting from

ie 8 “‘Kaspische Studien,”’ in Bull. Acad. Sct. St Petersburg, —6.

CPO LOGE

-sundered masses fall apart.

[111. DYNAMICAL,

When this ice melts, the separated masses do not return to their original position. Their centre of gravity in succes- sive winters becomes more and more displaced, until the In mountainous districts, where the winters are severe, and in high latitudes, a great deal of waste is thus produced on exposed cliffs and loose blocks of rock. Some measure of its magnitude may be seen in the heaps of angular rubbish which in these regions are so frequently to be met with at the foot of crags and steep slopes; At Spitzbergen and on the coast of Greenland the amount of destruction caused by frost is enormous. The short and warm summer, melting the snow, fills the pores and joints of the rocks with water, whicli when it freezes splits off large blocks of rock from the hills, and sends them to the base of the declivities, where they are further broken up by the same cause. ;

2. Frozen Rivers and Lakes.—In countries where the winter temperature falls considerably below 32° Falr., the lakes and rivers become solidly frozen over. The amount of geological change effected during the process is probably lardly appreciable. But when the ice breaks up in spring its power as a geological agent becomes apparent. In lakes, such as Lake Superior, the ice in forming encloses beachi- pebbles and boulders, and when thaw sets in, floats these off, so as either to drop them in deeper water or to strand them on some other part of the coast. Shoulda gale arise during the breaking up of the ice, vast piles of the latter, with mingled gravel and boulders, may be driven ashore and pushed up the beach. By this means blocks of stone, even of considerable size, are sometimes forced to a great height inland on some of the Canadian lakes, tearing up the soil on their way, and helping to form a bank above the water level. It has been observed that during a severe frost ice occasionally forms on the bottoms of rivers where it encloses stones and large boulders. ‘These are borne up to the sur- face in cakes of ground-ice to join the rest of the super- ficial ice-borne detritus. Great damage is frequently done to quays and bridges in Canada by masses of river-ice driven against them on the arrival of spring. Reference has already been made to tlie increased power of transport and erosion acquired by

rivers liable to be frozen over, and especially when their ice is broken up in the higher parts of their courses, before it gives way in the lower.

3. Hatl.—When rain or aqueous vapour is cooled down in the atmosphere to the freezing point of water, it is frozen, and falls to the earth as hail or snow. The forma- tion of hail is not yet well understood. It is chiefly in summer and during thunderstorms that hail falls. When the pellets of ice are frozen together so as to reach the ground in lumps as large as a pigeon's egg, or larger, great damage is often done to cattle, flying birds, and vegetation. Trees have their leaves and fruit torn off, and farm crops are beaten down.

4, Snow.—In those parts of the earth's surface where, either from geographical position or from elevation into the upper cold regions of the atmosphere, the mean annual temperature is below the freezing point, the condensed moisture falls chiefly as snow, and remains in great measure unmelted throughout the year. A line can be traced below which the summer heat suffices to cause the disappearance of the snow, but above which the snow continues to cover the whole or great part of tle surface. This line has received the name of the snow-line, or line of perpetual snow. It comes down to the sea within the polar circles. Between these limits it rises gradually in level till it reaches its highest elevation in tropical latitudes. In northern Scandi- navia it is less than 3000 feet above the sea. None of the British mountains quite reach it. In the Alps it stands at 8500 feet, on the Andes at 18,000 feet, and on the northern slopes of the Himalayas at 19,000 feet.

ICE. |

Snow exhibits two different kinds of geological behaviour, one conservative, the other destructive. Lying stationary and unmelted it exercises a protective influence on the face of the laud, shielding rocks, soils, and vegetation from the effects of frost. On low grounds this is doubtless its chief function. When snow falls in a partially melted state it is apt to accumulate on branches and leaves, until by its weight it breaks them off, or even bears down entire trees. Snow which falls thickly on steep mountain slopes is fre- quently during spring and summer detached in large sheets. These rush down the declivities as avalanches, and often create much destruction of trees, soil, crops, and houses in their course, Another

indirect effect of snow is seen in the sudden rise of the rivers when warm weather rapidly melts the mountain snows. Many summer floods are caused in this way in Switzerland.

5. Glaciers.—(1.) Nature and Origin.—A glacier is a river of ice formed by the slow movement and compression of the snow which by gravitation creeps downward into a valley descending from a snow-field. The structure and physics of glaciers are described elsewhere (see GLACIERS). From a geological point of view these ice-rivers may be re- garded as the drainage of the snow-fall above the snow-line, as rivers are the drainage of the rainfall. In a mountainous regiou, such as the Alps, or a table-land like Scandinavia, where a considerable mass of ground lies above the snow-line, three varieties of glaciers have been observed. (a.) Glaciers of the first order, where the ice-river comes down well below the snow and extends into the valley, even it may be far below the upper limits of cultivation, or in uorthern regions approaches or even reaches the sea. In the Alps such glaciers may be 20 or 30 miles long, by a mile or more wide, and 600 feet or more deep. (4.) Glaciers of the second order, which hardly creep beyond the high recesses wherein they are formed, and do not therefore reach as far as the nearest valley, Many beautiful examples of this type may be seen along the steep declivities which intervene between the snow-covered plateau of Arctic Nor- way and the sea. (c.) Re-cemented glaciers, consisting of fragments which fall from an ice-cliff crowning preci- pices of rock, and are re-frozen at the bottom into a solid mass, creeping downward as a glacier usually of the second order. Probably the best illustrations in Europe are fur- nished by the Nus Fjord, and other parts of the north of Norway. In some cases a cliff of blue ice appears at the top of the precipice, —the edge of the great “ snee-fond,” or snow-field,—while several hundred feet below, in the corrie or cwm at the bottom, lies the re-cemented glacier (glacier remaneé of the Swiss), white at its upper edge, but acquir- ing somewhat of the characteristic blue gleam of compact ice as it moves towards its lower margin.

But itis in high Arctic, and still more in Antarctic, latitudes that land-ice, formed from the drainage of a great snow-field, attains its greatest dimensions. The land in these regions is completely buried under an ice-cap, which ranges in thickness up to a depth (in the South Polar circle) of

10,000 feet (2 miles) or even more. Greenland lies under such a pall of snow that all its inequalities, save the mere steep mountain peaks, are concealed. The snow creeping down the slopes, and mounting over the minor hills, passes beneath by pressure into compact ice. From the main valleys great glaciers like vast tongues of ice, 2000 or 3000 feet thick, and sometimes 50 miles or more in breadth, push out to sea, where they break off in huge fragments, which float away as icebergs.

A glacier, like a river, is always in motion, though so slowly that it seems to be solid and stationary. The motion also, like that of a river, and for the same reason, is unequal in the different parts, the centre moving faster than the sides and bottom. This important fact was first ascertained

through accurate measurement by J. D. Forbes, who found that in the Mer de Glace of Chamouni, the mean daily rate of motion in the summer and autumn was from 20 to 27 inches in the centre, and from 13 to 193 near the side. The consequence of this differentia] motion is seen in the arrangement of the lines of rubbish thrown down at the end of a glacier, which often present a horse-shoe shape, corresponding to that of the end of the ice by which they were discharged.

There are some features of geological importance also in the behaviour of the ice as it descends its valley. When it has to travel over a very uneven floor, some portions may get embayed, while overlying parts slide over them. A massive ice-sheet may thus have many local eddies in its lower portions, the ice there even travelling for various distances, according to the nature of the ground, obliquely to the general flow of the main mass. In descending by a steep slope from an upper to a lower and more level part of its course, a glacier becomes a mass of fissured ice in great confusion. It descends by a slowly creeping ice-fall, where a river would shoot over in a rushing waterfall. A little below the fall the fractured ice is pressed together again into a solid mass as before. ‘The body of the glacier throughout its length is traversed by a set of fissures called crevasses, which, though at first as close-fitting as cracks in a sheet of glass, widen by degrees as the

glacier moves on, till they form wide yawning chasms, reaching, it may be, to the bottom of the ice, and travelling down with the glacier, but apt to be effaced by the pressing of their walls together again as the glacier winds down its valley. The glacier continues to descend until it reaches that point where the supply of ice is just equalled by the liquefaction. There it ends, and its place down the rest of the valley is taken by the tumultuous river of muddy water which escapes from under the melting extremity of the ice. A prolonged augmentation of the snow-fall will send the foot of the glacier further down the valley; a diminution of the snowfall with a general rise of temperature will cause it to retreat farther up.

(2.) Work done by Glaciers.—Glaciers have two import- ant geological tasks to perform,—(1) to carry the debris of the mountains down to lower levels; and (2) to erode their beds.

a. Transport.—This takes place chiefly on the surface of the glacier. Descending its valley, the glacier receives and bears along on its margin the earth, stones, and rubbish which, loosened by frost, or washed down by rain and rills, slip from the cliffs and slopes to the level of the ice. In this part of its work the glacier resembles a river which carries down branches and leaves from the woods on its banks. Most of the detritus rests on the surface of the ice. It includes huge masses of rock, sometimes as big as a large cottage, all which, though seemingly at rest, are slowly travelling down the valley with the ice, and liable at any moment to slip into the crevasses which may open below them. When they thus disappear they may descend to the bottom of the ice, and move with it along the rocky floor, which is no doubt the fate of the smaller stones and sand, Bnt the large stones seem sometimes at least to be cast up again by the ice to the surface of the glacier at a lower part of its course. Whether, therefore, on the ice, in the ice, or under the ice, a vast quantity of detritus is con- tinually travelling with the glacier down towards the plains. The rubbish lying on the surface is called moraine stuff, Naturally it accumulates on either side of the glacier, where it forms the so-called Jateral MOraines. When two glaciers unite, their two adjacent lateral moraines are brought together, and travel thereafter down the centre of the glacier as a medial moraine. A glacier, formed by the union of many tributaries in its BEPC parts, Pa have

many medial lines of moraine, so many indeed as some- times to be entirely covered with debris to the complete concealment of the ice. At such parts the glacier resembles a bare field or earthy plain rather than a solid mass of clear ice of which only the surface is dirty with rubbish. At the point where the glacier ends, the pile of loose materials is tumbled upon the valley in what is called the terminal moraine. ;

In snch comparatively small and narrow ice-sheets as the present glaciers of Switzerland, the rock-bottom on which the ice moves is usually, as far as it can be examined, swept clean by the trickle or rush of water over it from the melt- ing ice. But when the ice does not flow in a. mere big drain (which, after all, the largest Alpine valley really is), but overspreads a wide area of uneven ground, there cannot fail to be a great accumulation of rubbish here and there underneath it. Wheu the broad central plain of Switzer- land between the Alps and the Jura was filled with ice, the latter certainly pushed a vast deal of mud, sand, and stones over the floor of the valley. This material is known to Swiss geologists as the moraine profonde or Grundmordne.

When from any cause a glacier diminishes in size, it may drop its blocks upon the sides of its valley, and leave them there sometiines in the most threatening positions. Such stranded stones are’ known as perched blocks. They abound in the Swiss valleys, extending even across the great plain of Switzerland, and appearing in numbers high upon the flanks of the Jura. Since the latter moun- tains consist chiefly of limestone, and the blocks are of various crystalline rocks belonging to the higher parts of the Alps, the proof of transport is irrefragable. The agent of removal is now recognized to have been an enormous ex- tension of the glacier system of the Alps, whereby the whole country was buried under snow and ice. Similar evidence abounds in the valleys among the mountainous parts of Britain, as well as in other parts of Europe and America, no longer the abode of glaciers.

6. Lrosion.—The manner in which glacier ice erodes its channel differs in many respects from that in use by any other geological agent, and forms therefore one of tlie dis- tinguishing features of ice-action. This erosion is effected not by the mere contact and pressure of the ice upon the rocks, though undoubtedly fragments of rock must now and then be detached from this cause. It is by means of the fine sand, stones, and blocks of rock, which fall between the ice and the rocks on which it moves, that the grinding work of the glacierisdone, These materials, held by the ice as it creeps along, are pressed against the rocky sides and bottom of the valley so firmly and persistently as to descend into each little hollow and mount over each ridge, yet all the while moving along steadily in one domi- nant direction with the general movement of the glaciers, As a result, the most compact resisting rocks are ground dowu, smoothed, polished, and striated. The stric vary from such fine lines as may be made by the smallest grains of quartz up to deep ruts and grooves, They sometimes cross each other, one set partially effacing an older one, and thus pointing to shiftings in the movement of theice. On the retirement of the glacier, hummocky bosses of rock having smooth undulating forms like dolphins' backs are conspicuous. These have received the name of roches moutonnées, The stones by which this scratching and polishing are effected suffer in exactly the same way. They are ground down and striated, and since they must move in the line of least resistance, or "end on," their

1 The present writer examined in 1869 a characteristic section of it near Solothurn, full of scratched stones, and lying on the striated pavement of rock to be immediately described as further characteristic of ice-action.

strie run in a general sense lengthwise. It will be seen, when we come to notice the traces of former glaciers, how important is the evidence given by these striated stones.

As rocks present great diversities of structure and hard- ness, and consequently vary much in the resistance they offer to denudation, they are necessarily worn down unequally. The softer, more easily eroded portions

are scooped out by the grinding action of the ice, and basin-shaped or various irregular cavities are dug out below the level of the general surface. Similar effects may be produced by an augmented excavating power of a glacier, as where the ice is strangled in some narrow part of a valley, or where, from change in declivity, it is allowed to accumulate in greater mass as it nloves more slowly onward. Such hollows, on the retirement of the ice, become receptacles for water, and form pools, tarns, or lakes, unless indeed they chance to have been already filled up with glacial rubbish. It is now some years since Professor A. C. Ramsay drew attention to this peculiar power of land-ice, and affirmed that the abundance of ex- cavated rock-basins in northern Europe and America was due to the fact that these regions had been extensively eroded by sheets of land-ice. This glaciation was due not to independent glaciers but to the pressure and grinding' power of vast masses of continental ice. In short the more northern parts of Europe and North America must have been in a condition like that of North Greenland at the present day. Itis therefore among the ice-fields of Green-land rather than among the valley glaciers of isolated mountain-groups that we ought to look for analogies to the operations which produced the widespread general glacia- tion of the period of the rock-basins. A single valley- glacier retires towards its parent snow-field as the climate ameliorates, leaving its roches moutonnées, moraine-mounds, and rock-basins, yet at times discharging its water-drainage in such a way perhaps as to sweep down the moraine-mounds, fill up the basins, bury the ice-worn hummocks of rock, and strew the valley with gravel, earth, sand, and big blocks of rock. Hence the actual floor of the glacier is apt to be very much obscured. But in the case of a vast sheet of land-ice covering continuously a wide region, tbere can be but little superficial debris. When such a mass of ice retires it must leave behind it an ice-worn surface of country more or less strewn with the subsoil which accumulated under the ice and was pushed along by it. This infra-glacial detritus forms the Grundmoriine (moraine profonde) or bottom moraine. We know as yet very little regarding its formation in Greenland. Most of our knowledge regarding it is derived from a study of the till or boulder-clay of Britain, which is believed to represent the bottom moraine of an ancient ice-sheet. In countries where true boulder- clay occurs, numerous rock-basins are commonly to be met with among the uncovered portions of the rocks.

The abundant fine sediment which gives the character- istic milky turbidity to all streams that escape from the melting ends of glaciers is an index of the amount of erosion unceasingly effected by the ice. From the end of the Aar glacier, for example, though by no means one of the largest in Switzerland, it has been estimated that there escape every day in the month of August 2 million cubic metres (440 million gallons) of water, containing 284,374 kilogrammes (280 tons) of sand.

B. OcEANIC WATERS.

The area, depth, temperature, density, and composition of the sea have been already treated of in partil, Viewed as a dynamical agent in geology, the ocean may be studied

under two aspects—(1) its movements, and (2) its geological work,

OCEAN MOVEMENTS. |

I, Movements oF tHE Ocray,

These may be grouped as—(1) tides, (2) currents, and (3) waves.

1, Trdes.—These are oscillations of the mass of the oceanic waters caused by the attraction of the sun and moon. We have at present to deal with them merely in so far as their geological bearings are concerned. In a wide deep ocean the tidal elevation probably produces no perceptible geological change. It passes at a great speed; in the Atlantic its rate is 500 geographical miles an hour. But as this is merely the passing of an oscillation whereby the particles of water are gently raised up and let down again, there can hardly be any appreciable effect upon the deep ocean bottom. When, however, the tidal wave enters a narrow and shallow sea, it has to accommodate itself to a smaller channel, and encounters more and more the friction of the bottom, Hence, while its rate of motion is dimin- ished, its height and force are increased. It is in shallow water and along the shores of the land that the tides acquire their main geological importance. They there show them- selves in an alternate advance upon and retreat from the coast. Their upper limit has received the name of high- water mark, their lower that of low-water mark, the space between being termed the beach. If the

coast is precipitous, a beach can only occur in the shelving bays and creeks, since elsewhere the tides will rise and fall against a face of rock, as they do on the piers and bulwarks of a port. On such rocky coasts the line of high water is sometimes ad. mirably defined by the grey crust of barnacles adhering to the rocks. Where the beach is flat, and the rise and fall of the tide great, an area of several hundred Square miles of sand or mud may be laid bare in one bay at low-water,

The height of the tide varies from zero up to 60 or 70 feet. It is greatest where, from the form of the land, the tidal wave is cooped up within a narrow inlet or estuary. Under such circumstances the advancing tide sometimes gathers itself into oue or more large waves, and rushes furiously up be- tween the converging shores. This is the origin of the “bore” of the Severn, which rises to a height of 9 feet, while the rise and fall of the tide there amounts to 40 feet. In like manner the tides which enter the Bay of Fundy, between Nova Scotia and New Brunswick, get more and more cooped up as they ascend that strait, till they reach a height of 70 feet.

While the tidal swelling is increased in height by the shallowness and convergence of the shores, it gains at the same time force and rapidity. No longer a mere oscillation or pulsation of the great ocean, the tide acquires a true movement of translation, and gives rise to currents which rush past headlands and through narrows in powerful currents and eddies. The rocky and intricate navigation of the west of Scotland and Scandinavia furnishes many admirable illustrations of the rapidity of these tidal currents. The famous whirpool of Corryvreckan, the lurking eddies in the Kyles of Skye, the breakers at the Bore of Duncans- bay, and the tumultuous tideway, grimly named by the northern fishermen the Merry Men of Mey, in the Pentland Firth, bear witness to the strength of these sea rivers. At the last-mentioned strait the current at its strongest runs at the rate of 10 miles an hour, which is fully three times the speed of most of our larger rivers,

2. Currents.—Recent researches in ocean temperature have disclosed the remarkable fact that beneath the surface layer of water affected by the temperature of the latitude there lies a vast mass of cold water, the bottom tempera- ture of every ocean in free communication with the poles being little above and sometimes actually below the freezing point of fresh water.

Inthe North Atlantic a temperature of 40° Fahr. is reached at an average depth of about 800 fathoms, all beneath that depth being progressively colder.

In the equatorial parts of the same ocean the same tempera: ture comes to within 300 fathoms of the surface, In the South Atlantic, off Cape of Good Hope, the mass of cold water (below 40°) comes likewise to about 300 fathoms from the surface. This distribution of temperature proves that there must be a transference of cold polar water towards the equator, for in the first place the temperature of the great mass of the ocean is much lower than that which is normal to each latitude, and in the second place it is lower than that of the superficial parts of the earth's crust underneath. On the other hand, the movement of water from the poles to the equator requires a return movement of compensation from the equator to the poles, and this must take place in the superficial strata of the ocean. Apart therefore from those rapid river-like streams which traverse the ocean, and to which the name of currents is given, there must be a general drift of warm surface water towards the poles, This is doubtless most markedly the case in the North Atlantic, where besides the current of the Gulf-stream there is a prevalent set of the surface waters towards the north- east. As the distribution of life over the globe is everywhere so dependent upon temperature, it becomes of the highest interest to know that a truly arctic submarine climate exists everywhere in the deeper parts of the sea. With such uniformity of temperature we may anticipate that the abyssal fauna will be found to possess a corresponding Sameness of character, and that arctic types may be met with even on the ocean-bed at the equator.

But besides this general drift or set, a leading part in oceanic circulation is taken by the more defined streams termed currents. The tidal wave only becomes one of translation as it passes into shallow water, and is thus of but local consequence. But a vast body of water, known as the Equatorial Current, moves in a general westerly direction round the globe. Owing to the way in which the continents cross its path, this current is subject to consider- able deflexions. Thus that portion which crosses the Atlantic from

the African side strikes against the mass of South America and divides, one portion turning towards the south and skirting the shores of Brazil, the other bend- ing north-westward into the Gulf of Mexico, and issuing thence as the well-known Gulf-stream. This equatorial water is comparatively warm and light. At the same time the heavier and colder polar water moves towards the equator, sometimes in surface currents like those which skirt the eastern and western shores of Greenland, but more generally as a cold under-current which creeps over the floor of the ocean even as far as the equator.

Much discussion has arisen in recent years as to the cause of oceanic circulation. Two rival theories have been given. According to one of these the ‘circulation entirely arises from that of the air. The trade-winds blowing from either side of the equator drive the water before them until the north-east and south-east currents unite in equatorial lati- tudes into one broad westerly-flowing current, Owing to the form of the land portions of this main current are deflected into temperate latitudes, and, as a consequence, portions of the polar water require to move towards the equator to restore the equilibrium. According to the other view the currents arise from differences of temperature (and according to some, of salinity also); the warm and light equatorial water is believed to stand at a higher level than the colder and heavier polar water; the former, therefore, flows down as it were polewards, while the latter moves as a bottom inflow towards the equator; the cold bottom water under the tropics is constantly ascending to the sur- face, whence, after being heated, it drifts away towards the pole, and on being cooled down there, descends and begins another journey to the equator. There can be no doubt that the winds are directly the cause of such currents as

the Gulf-stream, and therefore, indirectly, of return cold currents from the polar regions. It seems hardly less certain that, to some extent at least, differences of tempera- ture, and therefore of density, must occasion movements In the mass of the oceanic waters. The discussion of this subject, however, belongs to another part of this work.? The main facts for the geological reader to grasp are—that a system of circulation exists in the

ocean; that warm currents move round the equatorial regions, and are turned now to the one side now to the other by the form of the

continents along and round which they sweep; that cold

currents sct in from poles to equator; and that, apart from actual currents, there appears to be an extremely slow “creep” of the polar water under the warmer upper layers towards the equator.

3. Waves and Ground-Swell.—A gentle breeze curls into ripples the surface of water over which it blows. A strong gale or furious storm raises the surface into waves. The agitation of the water in a storm is prolonged to a great distance beyond the area of the original disturbance, and then takes the form of the long heaving undulations termed ground-swell. called breakers, and the same name is applied to the ground-swell as it bursts into foam and spray upon the rocks. The concussion of earthquakes sometimes gives rise to very disastrous earthquake-waves, as already explained.

The height and force of waves depend upon the breadth and depth of sea over which the wind has driven them, and the form and direction of the coast-line. The longer the “fetch,” and the deeper the water, the higher the waves. A coast directly facing the prevalent wind will have larger waves than a neighbouring shore which preseuts itself

at an angle to this wind or bends round so as to forma: The highest waves in the narrow British seas ‘ probably uever exceed 15 or 20 feet, and usually fall short |

lee-shore.

of that amount. The greatest height observed by Dr Scoresby among the Atlantic waves was 43 feet.? Ground-swell propagated across a broad and deep ocean produces by far the most imposing breakers. So long as the water remains deep and no wind blows, the only trace of the passing ground-swell on the open sea is the huge broad heaving of the surface. But when the water shallows,

the superficial part of the swell travelling faster than the

bottom begins to curl and crest as a huge billow or wall of

water, which finally bursts with enormous force against the .

shore. Such billows, even when no wind is blowing, often

cover the cliffs of the north of Scotland with sheets of :

water and foam up to heights of 100 or even nearly 200 feet. At Dunnet Head during north-westerly gales the windows of the lighthouse, at a height of upwards of 300 feet above high-water mark, are said to be sometimes broken by stones swept up the cliffs by the sheets of sea water which then deluge the building.

A single roller of the ground-swell 20 feet high falls, according to Mr Scott Russell, with a pressure of about a ton onevery square foot. Mr Thomas Stevenson conducted some years ago a series of experiments on the force of the breakers on the Atlantic and North Sea coasts of Britain. The average force in summer was found in the Atlantic to be 611 tb per square foot, while in winter it was 2086 Ib or more than three times as great. But on several occa. sions, both in the Atlantic and North Sea, the winter breakers were found to exert a pressure of three tons per

1 The reader may consult Maury's Physical Geography of 'the Sed, but more particularly Dr Carpenter's papers in the Proceedings of the Royal Society for 1869-73, and Journal of R. Geographical Society for 1871-77, on the side of temperature; and Herschel's Physical Geography, and Dr Croll's Climate and Time, on the side of the winds,

- Brit. Assoc. Rep., 1850, p. 26. The reader will find a table of the observed heights of waves round Great Britain in Mr T. Stevenson's treatise on Harbours, p. 20.

Cc§HOLOGY

Waves which break upon the land are :

[111. DYNAMICAL.

square foot, and at Dunbar as much as three tons and a half.2 Besides the waves produced by ordinary wind action, others of au extraordinary size and destructive power are occasionally caused by a violent cyclone-storm. The mere diminutiou of atmospheric pressure in a cyclone must tend to raise the level of the ocean within the cyclone limits. But the further furious spiral in-rushing of the air towards the centre of the low pressure area drives the sea onward, and gives rise to a wave or succession of waves having great destructive power. Thus, on 5th October 1864, during a great cyclone which passed over Calcutta, the sea rose in some places 24 feet, and swept everything before it with irresistible force, drowning upwards of 48,000 people.

4, Ice on the Sea.—In this place may be most con-

| veniently noticed the origin and movements of the ice which

in circumpolar latitudes covers the sea. This ice is derived from two sources —(1) the freezing of the sea itself, and (2) the seaward prolongation of land-ice.

1. Three chief types of sea-ice have been observed. (a.) In the Arctic sounds and bays the littoral waters freeze along the shores aud form a cake of ice which, upborne by the tide and adhering to the land, is thickened by successive additions below, as well as by snow above, until it forms a shelf of ice 120 to 130 feet broad and 20 or 30 feet high. This shelf, known as the ice-foot, serves as a platform on which the abundant debris luosened by the severe frosts of an arctic winter gathers at the foot of the cliffs. Itis more or less completely broken up in summer, but forms again with the early frosts of the ensuing autumn. (0.) The sur- face of the open sea likewise freezes over into a continuous solid sheet which in summer breaks up into separate masses sometimes of large extent. This is what navigators term floe-cce, and the separate floating cakes are known as jloes. Ships fixed among these floes have been drifted with the ice for hundreds of miles until at last liberated by its disrup- tion. (c.) In the Baltic Sea, off the coast of Labrador and elsewhere, ice has been observed to form on the sea-bottom. It is known as ground-ice or anchor ice. In the Labrador fishing-grounds it forms even at considerable depths. Seals caught in the lines at those depths are brought up sometimes solidly frozen.

2. In the Arctic regions the vast glaciers which drain the snow-fields and descend to the sea extend for some distance from the land until large fragments break off and float away seawards. These detached masses are icebergs. Their shape and size greatly vary, but lofty peaked forms are common, and they sometimes rise from 200 to 300 feet above the level of the sea. As only about a ninth part of the ice appears above water, these larger bergs must some- times be from 2000 to 3000 feet thick from base to top. They consequently require water of some depth to float them, but they are often seen aground. In the Antarctic regions, where one vast sheet of ice envelops the land and extends into the sea as a high rampart of ice, the detached icebergs often reach a great size, and are charac- terized by the frequency of a flat tabular form.

II. GrEoLocicaAL WokK OF THE SEA.

I, INFLUENCE on CiimatTE.—Were there no agencies in nature for distributing temperature, there would be a regu- lar and uniform diminution in the mean annual tempera- ture from equator to poles, and the zsothermal lines, or lines of equal heat, would coincide with lines of latitude. But no such general correspondence actually exists. If we look at a chart of the globe with the isothermal lines drawn across it, we shall find that their divergences from the parallels are striking, and most so where they approach and cross the ocean. Currents from warm regions raise the

3 Trans. Roy. Soc. Edin., xvi. 25 ; treatise on Harbours, p. 42.

temperature of the tracts into which they flow 3 those from cold regions lower it. The ocean, in short, is the great distributor of temperature over the globe. As an illustra- tion the two opposite sides of the Atlantic may be taken. The cold arctic current flowing southward along the north-east coast of America reduces the mean annual tem- perature of that region. On the other hand, the Gulf-stream brings to the shores of the north-west of Europe a tempera- ture much above what they would otherwise enjoy. Dublin and the south-eastern headlands of Labrador, lie in the same parallel of latitude, yet differ as much as 18° in their mean annual temperature, that of Dublin being 50°, and that of Labrador 32° Fahr. Dr Croll has calculated that the

Gulf- stream conveys nearly half as much heat from the tropics as is received from the sun by the entire Arctic regions,}

II. Eroston.—The chemical action of the sea upon the rocks of its bed and shores has not yet been properly studied.? It is evident, however, that changes analogous to those effected by fresh water on the land must be in pro- gress. Oxidation, and the formation of carbonates, no doubt continually take place. We may judge indeed of the nature and rapidity of some of these changes by watching the decay of stones and material employed in the construction of piers. At the Bell Rock lighthouse, twenty-five different kinds and combinations of iron were exposed to the action of the sea, and all yielded to corrosion. Mr Mallet—as the result of experiments with specimens sunk in the sea—cou- cluded that from ths to =4;ths of an inch in depth in iron castings 1 inch thick, and about <%;ths of an inch of wrought iron, will be destroyed in a century in clear salt water. Mr Stevenson, in referring to these experiments, remarks that he has in his possession specimens of iron which show even a more rapid rate of decay. In castings used at the Bell Rock the loss has been at the rate of an inch in a century. “One of the bars which was free from air holes had its specific gravity reduced to 5°63, and its transverse strength froma 7409 to 4797 ib, and yet presented no external appearance of decay. Another apparently Sound specimen was reduced in strength from 4068 Ib to 2352 lb, having lost nearly half its strength in fifty years,” Similar results were recently ob- served by Mr Grothe, resident en- gineer at the railway bridge across the Firth of Tay. A cast-iron cylin- der which had been below water for only sixteen months was found to be so corroded that a penknife could be stuck through it in many places.

An examination of the shore wild sometimes reveal a good deal of quiet chemical change on the outer crust of rocks exposed to the waves. Such rocks as basalt have their felspar decomposed, and show the presence of carbonates by effervescing briskly with acid. One of their minerals, augite, is ‘occasionally replaced by pseudo- morphs of carbonate of iron.

It is mainly by its mechanical action that the sea accom~ plishes its erosive work. This can only take place where the water is in motion, and, other things being equal, is greatest where the motion is strongest. Hence we

cannot suppose that erosion to any appreciable extent can be effected in the abysses of the sea, where the only motion possible is that slow creeping of the polar water along the bottom already referred to. But where the currents are powerful enough to move grains of sand and gravel,

1 See papers by Dr Croll on “ Gulf-stream and Ocean-currents,” in Geol. Mag. and Phil. Mag. for 1869, 1870-74, and Climate and Time.

? See Bischof’s Chemical Geology, vol. i. chap, vii,

3 T. Stevenson on Harbours, p. 47.

very slow erosion may take place even at considerable depths. It is in the upper portions of the sea, however, whiere, owing to currents, tides, and waves, the water suffers most disturbance, that the main mechanical erosion goes on. The depth to which the influence of waves and ground-swell may extend seems to vary greatly according to the situation. The astronomer-royal states that ground- swell may break in 100 fathoms water.t It is common to find boulders and shingle disturbed at a depth of 10 fathoms, and even driven from that depth to the shore, and waves may be noticed to become muddy from the working up of the silt at the bottom when they have reached water of 7 or 8 fathoms in depth.> Gentle movement of the bottom water is said to be sometimes indicated by ripple-marks on the fine sand of the sea-floor at a depth of 600 feet. A good test for the absence of serious abrasion is furnished by the presence of fine mud on the bottom. Wherever that is found, we may be tolerably sure that the bottom at that place lies beyond the reach of ordinary breaker action.® From the upper limit at which the accumulation of mud is possible to high-water mark, and in exposed places up to 100 feet or more above high-water mark, lies the zone within which the sea does its work of abrasion, To this zone, even where the breakers are heaviest, a greater extreme vertical range can hardly be assigned than 300 feet, and in most cases it probably falls far short of that extent.

The mechanical work of erosion by the sea is done in four ways :—(1) the enormous force of the breakers suffices to tear off fragments of the solid rocks ; (2) the alternate compression and expansion of the air in the crevices of rocks exposed to theavy breakers dislocates rocks even above the limits of wave-action; (3) the hydraulic pressure of those portions of large waves which enter fissures and cavities forces asunder masses of rock; (4) the waves make use of the loose fragments within their reach in battering down the cliffs exposed to their fury.

(1.) Abundant examples of the dislodgement of huge blocks of rock from their parent masses are furnished by

the precipitous shores of Caithness, and of the Orkney and Shetland Islands.

It sometimes happens that demonstra-

50 t) 100

200 FEET

Fres. 7 and 8.—Scctions of the Bound Skerry of Whalsey, Shetland (from Stevenson's Harbours, p. 82) ;

a, b, ¢, and @, positions ot bloeks moved-by the sea.

tion of the height to which the effective force of breakers may reach is furnished at lighthouses built on exposed parts of the coast. Thus, at Unst, a door was broken open at a height of 195 feet above the sea, and at the Bishop Rock lighthouse a bell was wrenched off at a level of 100 feet above high-water mark.? Some of the most remark- able instances of the power of breakers have been observed by Mr Thomas Stevenson among the islands of the Shetland group. On the Bound Skerry he found that blocks of rock up to 94 tons in weight had been washed together at a height of tiearly 60 feet above the sea, that blocks weighing from 6 to 134 tons had been actually quarried out of their original bed, at a height of from 70 to 75 feet, and that a

4 Encyclopedia Metropolitana, art. ‘‘ Waves.”

5 T. Stevenson on Harbours, p. 15. 6 Ibid. 7 Ibid., p. 31.

block of nearly 8 tons had been driven before the waves at the level of 20 feet above the sea, over very rough ground, to a distance of 73 feet (figs. 7 and 8). He likewise records the moving of a 50-ton block by the waves at Barrahead, in the Hebrides! At Plymouth also, blocks of several tons in weight have been known to be washed about the breakwater like pebbles." (2.) But, besides their mechanical force, waves acquire a singular and most effective aid from the air. It is a fact familiar to engineers that, even from a vertical and appar- ently perfectly solid wall of well-built masonry exposed to

heavy seas, stones will sometimes be started out of their.

places, and that when this happens a rapid enlargement of the cavity may be effected, as if the walls were breached by a severe bombardment. At the Eddystone lighthouse, during a storm in 1840, a door which had been securely fastened against the force of the surf from without, was

actually driven outward by a pressure acting from within |

the tower, in spite of the strong bolts and hinges, which were broken. We may infer that, by the sudden sinking of a mass of water hurled against the building, a partial vacuum was formed, and that the air inside forced out the door in its efforts to restore the equilibrium.? This explana- tion may partly account for the way in which the stones are started from their places in a solidly built sea-wall. But besides this cause we must also consider a perhaps still more effective one in the condensation of the air driven before the wave between the joints and crevices of the stones, and its subsequent instantaneous expansion when the wave drops, During gales when large waves are driven to shore, many tons of water are poured suddenly into each cleft and cavern within reach. These volumes of water, as they rush in, compress the air into every joint and pore of the rock at the further end, and then quickly retiring, exert such a suction as from time to time to bring down part of the walls or roof. The sea may thus gradually form an inland passage for itself to the surface above, in a ‘‘ blow-hole" or " puffing-hole,"

through which spouts of foam and spray are in storms shot high into the air. On the more exposed portions of the west coast of Ireland numerous examples of such blow-holes occur. In Scotland, likewise, they may often be observed, as in the Bullers (boilers) of Buchan on the coast of Aberdeenshire, and the Geary Pot near Arbroath. Magnificent instances occur among the Orkney and Shetland Islands, some of the more shattered rocks of these northern coasts being, as it were, honeyconibed by sea-tunnels, many of which open up into the middle of fields or moors.

(3.) The sea-water which, as part of an inrushing wave, fills the gullies and chinks of the shore-rocks exerts the same pressure upon the walls between which it is confined as the rest of the wave is doing upon the face of the cliff. Each cleft so circumstanced becomes a kind of hydraulic press, the potency of which is to be measured by the force with which the waves fall upon the rocks outside—a force which often amounts to three tons on the square foot. There can be little doubt that by this means considerable pieces of a cliff are from time to time dislodged.

1 Stevenson, op. eit., pp. 21-37. _ ? The reader will bear in mind that the Specific gravity of bodies is greatly reduced when in water, and still more in sea-water. The

ne examples will illustrate this fact (Stevenson on Harbours, p. —

Spec. | No. of cub. feet to | No. of feet to a ton ray. a ton in air. in sea-water of sp. grav. 1-028. RAOUL Meccecersessssccccsesisse| 2009 11:9 IRCORSTANTEC screens] 2°71 13-2 21°30 SAnNGSiONGeriecescceec-s-:|| 24] 148 26°00 Cannelfcoali.- ÷-<.|| 1s54 23°3 70°00

3 Walker, Proc. Inst. Civ. Engin.,i. 15; Stevenson’s Harbours, p. 10,

GEOLOGY

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(4.) But probably oy far the largest amount of erosion accomplished by the sea is due not to its own direct mechanical impetus, but to the blows dealt by the boulders, gravel, or sand which it hurls against the shores. This

action was aptly compared by Playfair to a kind of artil- lery.* During a storm upon a shingly coast we may hear, at a distance of several miles, the grind of the stones against each other, as they are dragged back by the secoil of the waves which had launched them forward. In this tear and wear the loose stones are ground smaller, and acquire the smooth round form so characteristic of a surf- beaten beach. At the same time they bruise and wear down the solid cliffs against which they may be driven. Wherever the rock is much jointed, or from any cause presents less resistance to attack, it is excavated into gullies, creeks, and caves; its harder parts standing out as promontories are pierced; gradually a series of detached buttresses and sea-stacks appears as the cliff recedes, and these in turn are wasted until they become mere skerries and sunken surf-beaten reefs. Of this progress of destruc-

_ tion the more exposed parts of the British coast-line furnish

many admirable examples. The west coast of Ireland, ex- posed to the full swell of the Atlantic, is in innumerable localities completely undermined by caverns, into which the sea enters from both sides. In many places the cliffs are as vertical as walls, this feature depending upon their juints, which enable slice after slice to be undermined and removed. The precipitous coasts of Skye, Sutherland, Caithness, Forfar, Kincardine, and Aberdeenshire abound in the most impressive lessons of the waste of a rocky sea-margin ; while the same picturesque features are prolonged into the Orkney and Shetland Islands, the magnificent cliffs of Hoy towering as a vast wall some 1200 feet above the Atlantic breakers, which are tunnelling and fretting their base.

If such is the progress of waste where the materials con- sist of the most solid rocks, we may expect to meet with at least equally impressive proofs of decay where the coast-line can oppose only soft sand or clay to the march of the breakers. Again, the geological student in Britain can examine for himself many illustrations of this kind of de- struction around the shores of these islands. Within the last few hundred years entire parishes with their towns and villages have been washed away, and the tide now ebbs and flows over districts which in old times were cultivated fields and cheerful hamlets. The coast of Yorkshire between Flamborough Head and the mouth

of the Humber, and also that between the Wash and the mouth of the Thames, sutfer at a specially rapid rate, for the cliffs in these parts consist in great measure of soft clay. In somie places this loss is said to amount to 3 feet per annum.

While investigating the proofs of decay along the shore, the geologist endeavours to ascertain to what extent the action of the waves is assisted by that of rain, springs, frosts, and general atmospheric disintegration. He often finds that the progress of the waves depends not so much upon their own labours as upon thiose of the terrestrial agencies already described. A crumbling cliff, battered and wasted by the breakers, will yield to him abundant evidence of the manner in which the other agents of destruction prepare the way for its final demolition and removal by the sea; and he will learn that the very blocks of stone which give the waves so much of their efficacy are in great measure furnished to them by these co-operating agents. If the cutting back of a cliff were mainly the work of the sea, we ought to find the cliff overhanging, because the sea acts only at its base. But the fact that in the vast majority of cases sea-cliffs, instead of overhanging, slope backward, at a greater or less angle, from the sea, shows that the waste from subaerial action is

4 Illustrations of the Huttonian Theory, sec. 97.

really greater than that from the action of the breakers, What the sea chiefly does is to break down and wash away the rubbish that falls from the cliffs, and thus to leave an ever fresh surface for renewed denudation.

(5.) Among the erosive operations of the sea must be in-

cluded what is performed by floating ice. Along the margin of arctic lands a good deal of work is done by the broken up floe-ice and ice-foot. These cakes of ice, driven ashore by storms, tear up the soft shallow-water or littoral deposits,

rub and scratch the rocks, and push gravel and blocks of

rock before them as they strand on the beach, also, when they get aground in deep water, must disturb the sediment accumulating there, and must grind down any submarine rock on which they grate as they are driven along.

The general result of the erosive action of the sea on the land is the production of a submarine plain. As the sea advances by cutting slice after slice away from the coast, successive lines of beach pass under low-water mark. The whole of the littoral belt, as far down as wave action has influence, is continually being ground down by the moving detritus. If no change of level between sea and land should take place, the sea might conceivably eat its way slowly far into the land, and produce a gently sloping yet almost horizontal selvage of plain covered perman- ently by the waves. In such a submarine plain the influ- ence of geological structure, and notably of the relative powers of resistance of different rocks, would make itself conspicuous. The present Promontories caused by the superior hardness of their component rocks would no doubt be represented by ridges on the subaqueous plateau, while the existing bays and creeks worn out of softer rocks would be niarked by lines of valleys or hollows,

III. Transport.—The sea by means of its surface-drifts and currents carries sedimentary material to great distances and strews them over its floor. Near land, where the movements of the water are active, much coarse detritus is transported along shore or swept farther out to sea. A prevalent wind, by creating a current in a given direction along a coast-line, will cause the shingle to travel coast- wise, the stones getting more and more rounded and reduced in size as they recede from their sources. The Chesil Bank, which runs as a natural breakwater 16 miles long connecting the Isle of Portland with the mainland of Dorsetshire, consists of rounded shingle which is constantly being driven westwards. On the Moray Firth the reefs of quartz-rock about Cullen furnish abundance of shingle, which moves westwards along the coast for more than 15 miles. The coarser sediment probably seldom goes much beyond the littoral zone. Fine gravel, however, is pushed along the bottom by currents even at 600 fathoms ; for at that depth in the North Atlantic between the Faroe Islands and Scotland small pebbles of volcanic and other rocks are dredged up which have probably been carried by an arctic under-current from the north, At greater depths the force of currents at the bottom must be too feeble to push along any detritus. But

much fine sediment is carried in suspension by the sea for long dis- tances from land. Some rivers, as the Amazon, pour so much silt into the sea as to discolour its water for several hundred miles away from land. After wet weather the coast-waters round the shores of the British Islands are some- times made turbid from the quantity of mud brought down from the land. Dr Carpenter found the bottom waters of the Mediterranean to be everywhere permeated by an ex- tremely fine mud, derived no doubt, from the rivers and shores of that sea, borne away out far from land, ‘and settling slowly down upon the bottom. He remarks that the characteristic blueness of the Mediterranean may be explained, like that of the Lake of Geneva (as shown by Dr

greatly

Tyndall), by the diffusion of those exceedingly minute sedimentary particles through the water.

But the most startling evidence of the wide extent to which transport takes place in the ocean is that supplied by the observations made during the voyage of the “Challenger.” From the abysses of the Pacific Ocean, at the furthest distances from land, the dredge brought up bushels of rounded pieces of pumice of all sizes up to blocks a foot in diameter. These fragments were all evi- dently water-worn, and almost certainly were derived from the land. Some small pieces indeed were taken on the surface in the tow-net. Round volcanic islands, and off

the coasts of volcanic tracts of the mainland, the sea is

sometimes covered with floating pieces of water-worn pumice Swept out by tlooded rivers. These fragments drift away for hundreds or even thousands of miles until, becoming water-logged, they sink to the bottom. Their universal distribution was one of the most noticeable features in the

dredgings of the “ Challenger.” The clay which is found on the bottom of the ocean at the greatest distances from any shore may be partly due to its transport in that condi- tion from land, but more probably to the decomposition of the drifted pumice.!

Another not unimportant process of marine transport is that performed by floating ice. Among the arctic glaciers moraine stuff is of rare occurrence 3 but occasional blocks of rock and heaps of earth and stones fall from the cliffs which rise above the getieral waste of snow. Hence on the icebergs that float off from these glaciers, rock debris some- times may be observed, It is transported southward for hundreds of miles until, by the shifting or melting of the bergs, it is dropped into deep water. The floor of certain portions of the North Atlantic in the pathway of the bergs must be plentifully strewn with this kind of detritus. By means of the ice-foot also, an enormous quantity of earth and stones is every year borne away from the shore as the ice breaks up, and strewn over the floor of the sounds, bays, and channels.

IV. Repropuction.—The sea being the receptacle for the material worn away from the land must receive and store up in its depths all that vast amount of detritus by the re- moval of which the level and contours of the land are in the course of time so greatly changed. The deposits which take place within the area covered by the sea may be divided into two groups-—the inorganic and organic. It is the former with which we have at present to deal; the latter will be discussed with the other geological functions of plants and animals, The inorganic deposits of the sea- floor are partly (a) land-derived or terrigenous, partly (0) abyssal.

(a.) Land-derived or Terrigenous.—These may be con- veniently grouped according to their relative places on the sea-bed.

(1.) Shore Deposits.:—The most conspicuous and familiar are the layers of gravel and sand which accumulate between tide-marks. As a rule, the coarse materials are thrown up abont the upper limit of the beach. They seem to remain stationary there; but if watched and examined from time to time, they will be found to be continually shifted by high tides and storms, so that the bank or bar of shingle retains its place though its component pebbles are being constantly moved. Below the limit of coarse shingle upon the beach

lies the zone of fine gravel, and then that of sand. These zones are far from being constant ; yet when they all occur – on the same beach, they tend to range themselves according to their relative coarseness, the rougher detritus lying at the upper, and the finer towards the lower edge of the shore, The nature of the littoral accumulations on any

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1 Murray, Proc. Roy. Soc. Edin., 1876-7, p. 247.

given part of a coastline must depend either upon the character of the shore-rocks which at that locality are broken up by the waves, or upon the set of the shore-cur- rents and the kind of detritus they bear with them. Coasts exposed to heavy surf, especially where of a rocky charac- ter, are apt to present beaches of coarse shingle between their projecting promontories. Sheltered bays, on the other hand, where wave action is comparatively feeble, afford a gathering ground for fine sediment such as sand and mud. Estuaries and inlets into which rivers enter frequently show wide muddy flats at low water. The mud brought down by the fresh water is allowed to sink to the bottom when the motion of the current is checked as it enters the sea.

(2.) Infra-Littoral and Deeper-Water Deposits.—These extend from below low-water mark to a depth of sometimes as much as 2000 fathoms, and reach a distance from land varying up to 200 miles or even more. Near land, and in comparatively shallow water, they consist of banks or sheets of sand more rarely mixed with gravel. The bottom of the North Sea, for example, which between Britain and the continent of Europe lies at a depth never reaching 100 fathoms, is irregularly marked by long ridges of sand en-closing here and there hollows where mud has been deposited. In the English Channel large banks of gravel extend through the Straits of Dover as far as thé entrance to the North Sea. These features seem to indicate the line of the chief mud-bearing streams from the land, and the general disposition of currents and eddies in the sea which covers that region, the gravel ridges marking the tracks of the more rapidly moving currents, while the muddy hollows point ta the eddies where the fine sediment is permitted

to settle on the bottom. It is possible, how- ever, that the inequalities on the floor of the North Sea, and their peculiarities of sediment, may not be due wholly to modern accumulations, but partly to the contour of the ground before it was submerged and the land connexion between Britain and Europe was destroyed

During the course of the voyage of the “Challenger,” the approach to land could always be foretold from the character of the bottom, even at distances of 150 and 200 miles from land. The deposits were found to consist of blue and green muds derived from the degradation of older crystalline rocks. At depths of 100 to 700 fathoms they are often coloured green by glauconite. At greater depths they consist of blue or dark slate-coloured mud with a thin upper layer of red or brown. Throughout these land-derived sediments particles of mica, quartz, and other minerals are distributed, the materials becoming coarser towards land. Pieces of wood, portions of fruits, and leaves of trees occur in them, and further indicate the reality of the transport of material from the land. Shells of pteropods, larval gastero- pods, and lamellibranchs are tolerably abundant in these muds, with many infra-littoral species of Foraminifera, and diatoms. Below 1500 or 1700 fathoms pteropod shells seldom appear, while at 3000 fathoms hardly a foraminifer or any calcareous organism remains (Murray, Proc. Roy. Soc. Edin., 1876, p. 519). Round volcanic islands the bottom is found to be covered with grey mud and sand derived from the degradation of volcanic rocks. These deposits can be traced to great distances, as at Hawaii for 200 miles or more. Pieces of pumice, scoriz, &c., occur in them, mingled with marine organisms, and more particularly with abundant grains, incrustations, and nodules of an earthy peroxide of manganese. Near coral-reefs thie sea-floor is coated with a white calcareous mud derived from the abrasion of the coral. The east coast of South America supplies a peculiar red mud which is spread over the Atlantic slope down to depths of more than 2000 fathoms.

(b.) Abyssal.—Passing over at present the organic de- posits which form so characteristic a feature on the floor

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of the deeper and more open parts of the ocean, we come to certain red and grey clays found at depths of more than 2000 fathoms down to the bottoms of the deepest abysses. These consist of exceedingly fine clay, coloured sometimes red by iron-oxide, sometimes of a chocolate tint from manganese oxide, with grains of quartz, mica, puntice, scorize, peroxide of manganese, and other mineral substances, together with foraminifera, and in some regions a large proportion of siliceous Jtadiolaria, Mr Murray has shown the-high probability that these clays result from the decom- position of pumice and fine volcanic dust transported from volcanic islands into mid-ocean, The extreme slowness of their deposit is strikingly brought out in the tracts farthest removed from land. From these localities great nunibers of sharks' teeth, with ear-bones and other bones of whales, were dredged up in the " Challenger " expedition,—some of them quite fresh, others partially crusted with peroxide of manganese, and some completely and thickly surrounded by that substance. We cannot suppose that sharks and whales so abound in the sea as to cover the floor of the ocean with a continuous stratum of their remains. No doubt each haul of the dredge which brought up so many bones represented the droppings of many generations. The successive stages of manganese incrustatiou point to a long, slow, undisturbed period, when so little sediment accumu- lated that the bones dropped at the beginning remained at the end still uncovered, or only so slightly covered as to be easily scraped up by the dredge. In these deposits, moreover, Mr Murray has found numerous minute spherular particles of metallic iron which there.is every reason to believe are of cosmic origin—portions of the dust of meteo- rites which in the course of ages have fallen upon the sea- bottom. Such particles no doubt fall all over the ocean; but it is only on those parts of the bottom which, by their distance from any land, receive accessions of deposit with extreme slowness, and where therefore the present surface may contain the dust of a long succession of years, that it has been possible to detect them.

The abundant deposit ot peroxide of manganese over the floor of the deep sea is one of the most singular features of recent discovery. It occurs as an earthy incrustation round bits of pumice, bones, and other objects. The nodules possess a concentric arrangement of lines not unlike those of urinary calculi. That they are formed on the spot, and not drifted from a distance, was made abundantly clear from their containing abyssal

organisms, and enclosing more or less of the surrounding bottom, whatever its nature might happen to be. Mr Murray refers their origin to the decom- position of the manganese-bearing minerals in the univer- sally diffused volcanic detritus. Quite recently Mr J. Y. Buchanan has dredged similar manganese concretions from some of the deeper parts of Loch Fyne. In connexion with the chemical reactions indicated by these nodules as taking place on the sea-bottom, reference may be made to a still more remarkable but yet unpublished discovery made by Mr Murray in the course of his examinations of the materials brought up from the same abyssal deposits, He has detected abundant minute concretions or bundles of crystals which on analysis are found to resemble olivine in composition. These silicates (there may be several of them) have certainly been formed directly on the sea-bottom, for they are found gathered round abyssal organisms. It is difficult to overestimate the importance of this fact in re- ference to the chemistry of marine deposits.

From a comparison of the results of the dredgings made in recent years in all parts of the oceans, it is impossible to resist the conclusion that there is nothing in the character of the deep-sea deposits which finds a parallel among the marine geological formations visible to us on the land. It is onlyamong the comparatively shallow water accumulations

of the existing sea that we cncounter analogies to the older formations. And thus we reach by another and a new approach the conclusion which on very different grounds has been arrived at, viz., that the present continental ridges have existed from the remotest times, and that the marine strata which constitute so large a portion of their mass have been accumulated not as deep water formations, but in com- paratively shallow water along their flanks.

Section III.—Life.

Among the agents by which geological changes are carried on upon the surface of the globe living organisms must be enumerated. Both plants and animals co-operate with the inorganic agents in promoting the degradation of the land ; and in some cases, on the other hand, they protect rocks from

‘decay. Again by the accumulation of their remains they form extensive formations both upon the land and in the sea. Their operations may hence be described as alike destructive, conservative, and reproductive. Under this heading also we may notice the influence of man as a geological agent.

I. Destructive Action.—Plants aid in the general pro- gress of disintegration in various ways. 1. By keeping the surfaces of rocks moist, and thus promoting both the inechanical and chemical dissolution of the rocks, This action is especially shown by liverworts, mosses, and other plants which only thrive in copious moisture. 2. By producing through their decay carbonic and other acids, which, with decaying organic matter taken up by passing ‘moisture, become potent in effecting the chemical decomposition of rocks, and in promoting the disintegration of soils. 3. By inserting their roots or branches between joints of rock, which are thereby loosened, so that large slices may be eventually wedged off. On the sides of wooded hills and cliffs this process may often be seen ; even among old ruins an occasional sapling ash or elm may be found to have cast its roots round a portion of the masonry and to be slowly detaching it from the rest of the wall. 4. By attracting rain, as thick woods, forests, and mosses do, and thus accelerating the general scouring of a country by running water. The indiscriminate de- struction of the woods in the Levant has been assigned with much plausibility as the main cause of the present desicca- tion of that region. 5. By promoting the decay of dis- eased and dead plants and animals, as when fungi over- spread a damp rotting tree or the carcase of a dead animal.

Of the destructive influences of animal life numerous illustrations might be given. 1. The composition and arrangement of soil are affected. Worms are continually engaged in bringing up the lower portions of the soil to the surface, and thus increase its fertility and its capability of being washed away by rain, Burrowing animals, by throw- ing up the soil and subsoil, expose these to be dried and blown away by the wind. At the same time their subter- ranean passages serve to drain off the superficial water and to injure the stability of the surface of the ground above them. In Britain the mole and rabbit are familiar ex- amples, In North America the prairie dog has undermined extensive tracts of pasture land in the west. In Cape Colony wide areas of open country seem to be in a constant state of eruption from

the burrowing operations of multi- tudes of Bathyergi and Chrysochloris—small mole-like animals which bring np the soil and bury the grassy vegeta- tion under it. 2, The flow of streams is sometimes inter- fered with, or even diverted, by the operations of animals. Thus the beaver, by constructing dams, checks the current of water-courses, intercepts floating materials, and sometimes even diverts the water into new channels. This action is typically displayed in Canada and other parts of North America, The embankments of the Mississippi are some- times weakened to such an extent by the burrowings of the

cray-fish as to gave way and allow the river to inundate the surrounding country. Similar results have happened in Europe from the subterranean operations of rats. 3. Some Mollusca (Pholas, Saxicava, Teredo, &c.) bore into stone or wood, and by the number of contiguous perforations greatly weaken the material. Pieces of drift-wood are soon riddled with long holes by the teredo ; while wooden piers, aud the bottom of wooden ships, are often rapidly perfor- ated. The saxicavous shells, by piercing rocks and leaving open cavities for rain and sea water to fill, promote the decay of the-stone. 4, Many animals exercise a ruin- ously destructive influence upon vegetation. Of the many insect plagues of that kind it will be enough to enumerate the locust, phylloxera, and Colorado beetle. The pasture in some parts of the south of Scotland has in recent years been much damaged by mice, which have increased in numbers owing to the indiscriminate shooting and trapping of owls, hawks, and other predaceous creatures. Grass- hoppers cause the destruction of vegetation in some parts of Wyoming and other western territories of the United States. The way in which animals destroy each other, often on a great scale, may likewise be included among the geological operations now under description.

Il. CoNsERvaTIVE AcTion.—This is admirably shown by many kinds of vegetation. 1. The formation of a stratum of turf protects the soil and rocks from being rapidly disintegrated and washed away by atmospheric action, Hence the surface of a district so protected is denuded with extreme slowness except along the lines of its water-courses. 2. Many plants, even

without forming a layer of turf, serve by their roots or branches to protect the loose sand or soil on which they grow from being removed by wind. The common sand-carex and other arenaceous plants bind the loose sand-dunes of our coasts, and give tlem a permanence which would at once be destroyed were the sand laid bare again to storms. In North America the sandy tracts of the western territories are in many places protected by plants known as sage-brush and grease-wood. The growth of shrubs and brushwood along the course of a stream not only keeps the alluvial banks from being so easily undermined and removed as would otherwise be the case, but serves to arrest the sedi- ment in floods, filtering the water, and thereby adding to the height of the flood plain. On some parts of the west coast of France extensive ranges of sand-hills have been gradually planted with pine woods which, while preventing the destructive inland march of the sand, also yield a large revenue in timber, and have so improved the climate as to make these districts a resort for pulmonary invalids. In tropical countries the mangrove grows along the margin of the sea, and not only protects the land, but adds to its breadth, by forming and increasing an alluvial belt along the coast. 3. Some marine plants likewise afford protec- tion to shore rocks. This is done by the calcareous nulli- pores, which form upon them a hard incrustatiou ; likewise by the tangles and smaller fuci which grow abundantly on the littoral zone and break the force of the waves, or diminish the effects of ground swell. 4. Forests and brush. wood protect the soil, especially on slopes, from being washed away by rain. This is shown by the disastrous results of the thoughtless destruction of such woods. According to Reclus (Za Terre, p. 410), in the three centuries from 1471 to 1776, the “vigueries,” or provostry-districts of the French Alps, lost a third, a half, and even three-fonrths of their cultivated ground, and the population has diminished in somewhat similar proportions. From 1836 to 1866 the departments of Hautes and Basses Alpes lost 25,000 in- habitants, or nearly one-tenth of their population—a diminution which has with plausibility been assigned to the reckless removal of the pine forests, Me the steep

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mountain sides have been washed bare of their soil. The desiccation of the countries bordering the eastern Mediter- ranean has been ascribed to asimilar cause. 5. In mountain districts pine forests exercise also an important conservative function in preventing the formation or arresting the pro- gress of avalanches. In Switzerland some of the forests which cross the lines of frequent snow-falls are carefully preserved.

Animals do not exert any important conservative action upon the earth's surface, save in so far as they form new deposits, as will be immediately referred to. In the prairie regions of Wyoming and other tracts of North America, some interesting minor effects are referable to the herds of roving animals which migrate over these territories. Pro- fessor Comstock describes the trails made by the bison, the elk, and the big-horn or mountain-sheep as firmly-trodden tracks on which vegetation will not grow for many years. All over the region traversed by the bison numerous circular patches of grass are to be seen which have been formed on the hollows where this animal haswallowed. Originallythey are shallow depressions formed in great numbers where a herd of bisons has rested for a time. On the advent of the rains they become pools of water ; thereafter grasses spring up luxuriantly, and so bind the soil together that these grassy patches, or " bison-wallows," may actually become slightly raised above the general level if the surrounding ground becomes parched and degraded by the winds (/e- connaissance of N.W. Wyoming, 1875, p. 175).

Til. Rerropuctive Action.—Both plants and animals contribute materials towards new geological formations, Their remains are enclosed in deposits of sand and mud and there preserved. But they form of themselves not unimportant accumulations. Of plant formations the following illustra- tive examples may be given. (1.) Peat-Mosses.—These are accumulations of marshy vegetation which occur in tem- perate and arctic latitudes, sometimes toa depth of 40 feet or more. In Europe they have been largely formed by plants of the genus Sphagnum, which, growing as a spongy fibrous mass over wet ground, die in their lower parts and send out new fibres above. It is this lower decaying stratum which forms the peat. Every stage of the process may be seen in a large moss, from the green living plants at the top, through fibrous brown turf full of the scarcely decayed rootlets of the Sphagnum, down to the compact brown or almost black peat

at the bottom. Many peat- mosses were at one time lakes which have been gradually filled up by the accumulation of marsh-plants. Peat pos- sesses a great antiseptic power ; the bodies of animals which have been entombed in it are sometimes preserved for many centuries, (2.) Mangrove Swamps.—On the low moist shores and river mouths of tropical countries, the mangrove tree plays an important geological part. It grows in such situations in a dense jungle, sometimes 20 miles broad, which fringes the coast as a green selvage, and runs up if it does not quite occupy creeks and inlets. The mangrove flourishes in sea-water even down to low-water mark, form- ing there a dense thicket which, as the trees drop their radicles and take root, grows outward into the sea. It is singular to find terrestrial birds nestling in the branches above and crabs and barnacles living among the roots below. By this network of subaqueous radicles and roots the water is filtered of its sediment, which, retained among the vegeta- tion, helps to turn the spongy jungle into a firm soil. On the coast of Florida the mangrove swamps stretch for long distances as a belt from 5 to 20 miles broad, which winds round the creeks and inlets. At Bermuda the mangroves co-operate with grasses and other plants to choke up the creeks and brackish lakes. In these waters calcareous alow abound, and as their remains are thrown up amidst the sand and vegetation they form a remarkably calcareous soil. (3.) Diatom Mud or Harth.—As the minute siliceous plants

called diatoms occur both in fresh and salt water, the de- posit formed from their congregated remains is found both on the sites of lakes and on the sea-floor. “ Infusorial ” earth and “tripoli powder” consist mainly of the frustules and fragmentary debris of diatoms which have accumulated on the bottoms of lacustrine areas. Towards the Antarctic circle the ‘‘ Challenger” met with Diatomacec in abundance, both in the surface waters of the ocean and on the bottom. They form at depths of from 1260 to 1975 fathoms a pale straw-coloured deposit, which when dried is white and very light.

Animal formations are chiefly composed of the remains of the lower grades of the animal kingdom, especially of Mollusca, Actinozoa, and

Foraminifera. (1.) In some cases they are calcareous. Lime, chiefly in tle form of carbonate, is the mineral substance of which the solid parts of animals are mainly built up. Hence the great majority of the accum- ulations formed of animal remains are calcareous. In fresh water they are represented by the marl of lakes—a white, chalky deposit consisting of the mouldering remains of Mollusca, Entomostraca, and partly of fresh-water alge. On the sea-bottom in shallow water they consist of beds of shells, such asthe oyster-banks of English seas. The fringing, barrier, and atoll coral-reefs of warm seas are conspicuous examples of wide and thick masses of rock formed from the accumulated growth of animal organisms. The great reef of Australia, for example, is 1250 miles long, from 10 to 90 miles broad, and more tlian 1800 feet thick. The coral rock, though formed by the continuous growth of the polyps, gradually loses any distinct organic structure, and acquires an internal crystalline character owing to the infiltration of water through its mass, whereby carbonate of lime is carried down and deposited in the pores and crevices as in a grow- ing stalactite. Great quantities of calcareous mud are pro- duced by the breakers which beat upon the outer edge of the reefs. This mud is partly washed up upon the reefs and aids in their consolidation, but in great measure it is swept away by the ocean currents and distributed over many thousands of square miles of the sea-floor. In deep water over the bed of the Atlantic and other oceans a remarkable calcareous ooze occurs which is formed of the remains of Koraminifera, and chietly of species of the genus Globigerina. It is next in abundance to the red and grey clays of the deep sea. It is a pale-grey marl, sometimes red from peroxide of iron, or brown from peroxide of manganese; and it usually contains more or less clay, even with occasional fragments of pumice. (2.) Siliceows deposits formed from animal exuviz are illustrated by another of the deep-sea formations brought to light by the “ Challenger” researches. In certain regions of the western and middle Pacific Ocean, the bottom was found to be covered with an ooze consisting almost entirely of Radiolaria. These minute organisms occur, indeed, more or less abundantly in almost all deep oceanic deposits. From the deepest sounding yet taken (4575 fathoms, or more than 5 miles) a radiolarian ooze was obtained. The spicules of sponges likewise furnish materials towards these siliceous accumulations, (3.) Phosphatic deposits, in the great majority of cases, betoken some of the vertebrate animals, seeing that phosphate of lime enters largely into the composition of their bones and

occurs in their excrement. The most typical modern accumu- lations of this nature are the guano beds of rainless islands off the western coasts of South America and Southern Africa. In these regions immense flocks of sea-fowl have in the course of centuries covered the ground with an accumulation of their droppings to a depth of sometimes 30 to 80 feet, or even more. This deposit, consisting chiefly of organic matter and ammoniacal salts, with about 20 per cent. cf phosphate of lime, has acquired a high value as a manure, and is being rapidly cleared off. It could only have been

preserved in a raiuless or almost rainless climate. west of Europe isolated stacks and rocky islands in the sea are often seen to be white from the droppings of clouds of sea birds ; but itis merely a thin crust, which is not allowed to grow thicker in a climate where rains are frequent and heavy.

IV. Maw as a Geronocican AcGEntT.-—-No survey of |

the geological workings of plant and aniimal life upon the surface of the globe can be complete which does not take account of the influence of man —an influence of enormous and increasing consequence in physical geo- graphy, for man has introduced, as it were, an element of antagonism to nature. Not content with gathering the fruits and capturing the animals which she has offered for his sustenance, he has, with advancing civilization, engaged in a contest to subdue the earth and possess it. His war- fare indeed has often been a blind one, successful for the moment, but leading to sure and sad disaster. He has, for instance, stripped off the woodland from many a region of hill and mountain, gaining his immediate object in the possession of their stores of timber, but thereby laying bare the slopes to parching droughts or fierce rains. Countries once rich in beauty, and plenteous in all that was needful for his support, are now burnt and barren, or washed bare of their soil. It is only in comparatively recent years that he has learnt the truth of the aphorism—“Homo Nature minister et tnterpres,”

But now, when that truth is coming more and more to be recognized and acted on, man’s influence is none the less marked. His object still is to subdue the earth, and he attains it, not by setting nature and her laws at

defiance, but by enlisting her in his service. Within the compass of this article it is impossible to give more than merely a reference to this vast subject. The action of man may be witnessed on climate, on the flow of water, on the charac- ter of the terrestrial surface, and on the distribution of life.?

1. On Climate.—Human interference affects meteoro- logical conditions—(1) by removing forests and laying bare to the sun and winds areas which were previously kept cool and damp under trees, or which, lying on the lee side, were protected from tempests; as already stated, it is – supposed that the wholesale destruction of the woodlands formerly existing in countries bordering the Mediterranean has been in part the cause of the present desiccation of these districts; (2) by drainage, the effect of this opera- tion being to remove rapidly the discharged rainfall, to lessen the evaporation, and thereby to diminish the rainfall and somewhat increase the general temperature of a country ; (3) by the other processes of agriculture, such as the transformation of moor and bog into cultivated land, and the clothing of bare hillsides with green crops or plantations of coniferous and hardwood trees,

2. On the Flow of Water.—1. By increasing or diminish- ing the rainfall man directly affects the course of the waters over the land. 2. By his drainage operations he makes the rain to run off more rapidly than before, and thereby increases the floods in the rivers. 3. By wells, bores, mines, or other subterranean works he interferes with the underground waters and consequently with the dis. charge of springs. 4, By embanking rivers he confines them to narrow channels, sometimes increasing their scour, and enabling them to carry their sediment further seaward, sometimes causing them to deposit it over the plains and raise their level.

3. On the Surface of the Land.—Man’s operations alter

1 The reader will find much suggestive matter in Marsh’s Man and Nature, a work which, as its title denotes, specially treats of this subject. A new and enlarged edition of this volume was published in 1874 under the title of The Earth us Modified by Human Aetion,

the aspect of a country in many ways :—(1) by chang- ing forest into bare mountain, or clothing bare mountains with forest ; (2) by promoting the growth or causing the removal of peat-mosses ; (3) by heedlessly uncovering sand- dunes, and thereby setting in motion a process of destruc- tion which may convert hundreds of acres of fertile land into waste sand, or by prudently planting the dunes with sand- loving vegetation or pines, and thus arresting their landward progress ; (4) by so guiding the course of rivers as to make them aid him in reclaiming waste land, and bringing it under cultivation; (5) by piers and bulwarks, whereby the ravages of the sea are stayed, or by the thoughtless re- moval from the beach of stones which the waves had themselves thrown up, and which would have served for a time to protect the land; (6) by forming new deposits either designedly or incidentally, The roads, bridges, canals, railways, tunuels, villages, and towns with which man has covered the surface of the land will in many cases form a permanent record of his presence. Under his hand the whole surface of civilized countries is very slowly covered by a stratum, either formed wholly by him, or due in great measure to his operations, and containing many relics of his presence. The soil of old cities has been increased to a depth of many feet by the rubbish of his buildings ; the level of the streets of modern Rome stands high above that of the pavements of the Cwsars, and that again above the roadways of the early republic. Over cultivated fields his potsherds are turned up in abundance by the plough. The loam has risen within the walls of his graveyards, as gene- ration after generation has mouldered there into dust.

4. On the Distribution of Infe.—It is under this head, perhaps, that-the most subtle of human influences come. Some of man’s doings in this domain are indeed plain enough, such as the extirpation of wild animals, the diminution or destruction of some forms of vegetation, the introduction of plants and animals useful to himself, and especially tle enormous predominance given by him to the cereals and to the spread of sheep and cattle. But no such extensive disturbance of the normal conditions of the distri- bution of life can take place without carrying with it many secondary effects, and setting

in motion a wide cycle of changeand of reaction inthe animaland vegetable kingdoms. For example, the incessant warfare waged by man against birds and beasts of prey in districts given up to the chase leads sometimes to unforseen results. The weak game is allowed to live, which would otherwise be killed off and give more room for the healthy remainder. Other animals which feed perhaps on the same materials as the game are by the same cause permitted to live unchecked, and thereby to act as a further hindrance to the spread of the protected species. But the indirect results of man's interference with the régime of plants and animals still require much pro- longed observation,

From this brief and imperfect outline the reader may perceive that mau takes an important place as a geological agent, and that in future ages the traces of his interference will introduce a new element of difficulty into the study of geological phenomena,

PART IV.—STRUCTURAL GEOLOGY, OR THE ARCHITECTURE OF THE EARTH'S CRUST.

Having considered the nature of the materials constitut- ing the crust of the earth, and the operation of the different agencies by which these materials are produced, arranged, and modified, we may now proceed to examine the structure of the crust itself with the view of marking how its com- ponent parts have been put together. Since by far the largest portion of the crust consists of sedimentary or

aqueous rocks, it will be of advantage to treat of them first, noting, in the first place, their original characters as result- ino from the circumstances under which they were formed, and afterwards, the modifications subsequently effected upon them. Many of these superinduced structures, which are not peculiar to sedimentary, but occur more or less markedly in all rocks, may be conveniently described to- gether. The distinctive characters of the igneous or eruptive rocks, as portions of the architecture of the crust will then be described; and lastly, those of the crystalline schists and other associated rocks to which the name of metamorphic is usually applied.

J. STRATIFICATION AND ITS ACCOMPANIMENTS.

The term “stratified,” so often applied as a general designation to the aqueous or sedimentary rocks, expresses their leading structural feature. They are arranged in layers or strata, an arrangement characteristic of them alike in hand-specimens and in the cliffs of mountains. Not that every morsel of aqueous rock exhibits evidence of stratifica- tion. But it is this characteristic which is least frequently absent. The general aspects of stratification will be best followed in an explanation of the terms by which they are expressed.

Lamine are the thinnest paper-like layers of deposit in a stratified rock. Such fine layers only occur where the material is fine-grained, as in mud or shale, or where fine scales of some mineral have been plentifully deposited, as in micaceous sandstone. In some laminated rocks the laminz cohere so firmly that they can hardly be split open, and the rock will break more readily across them than in their direction. More usually, however, the planes of lamination serve as convenient divisional planes by means of which the rock can be split open. The frequency with which laminz can be separated from each other, indicating, as it does, a failure of coherence between the layers of deposit, may probably be taken as a proof that these layers were originally laid down at intervals of sufficient duration to admit of a considerable amount of consolidation of one layer before the deposition of the next. It is quite possible that in many, if not in most cases, these intervals were of longer duration than those required for the successive deposit of the laminw. In estimating therefore the length of time represented by say one foot of such finely Jami- nated rock, we might reasonably regard the actual time occupied in deposition as only a small fraction of the whole interval.

The existence of laminz points to tranquil conditions of slow intermittent deposit. The sediment has been borne at intervals and fallen over the same arca of undisturbed water. Regularity of thickness and persistence of litho- logical character among the lamine may be taken to indi- cate periodic currents, of approximately equal force, from the same quarter. In some cases successive tides in a sheltered estuary may have been the agent of deposition. In others the sediment was doubtless brought by recurring river-

floods. A great thickness of laminated rock, like the massive shales of Paleozoic formations, points to a prolonged period of quiescence, and probably, in most cases, to slow, tranquil subsidence of the sea-floor. On the other hand the alternation of thin bands of laminated rock with others coarser in texture and non-laminated suggests consider- able oscillation of currents from different quarters bearing different qualities and amounts of sediment.

Strata or Beds are layers of rock varying from an .nch or less up to many feet inthickness. A stratum may be made up of many lamina, if the nature of the sediment and mode of deposit have favoured the production of this structure This has very commonly been the case where the sediment

has been exceedingly fine-grained. Where the materials are of coarser grain, the strata, as a rule, are not laminated, but form the thinnest parallel divisions of the mass of rock. Strata, like lamine, may eitlier cohere firmly, or, as more usually happens, be separable with more or less ease from each other. In the former case we may suppose the upper to have followed the lower bed without the lapse of an interval long enough to allow of the consolidation of the latter. The common merging of a stratum into that which overlies it must no doubt be regarded as evidence of more or less gradual change in the conditions of deposit. Where the overlying bed shows no cohesion with that below it, the interval was probably of some duration. A stratum may be one of a series of similar beds in the same mass of rock. Thus a thick sandstone consists of many individual strata, varying it may be very considerably in their respective- thicknesses. Ora stratum may be complete and distinct in itself, as where one of limestone or ironstone runs through the heart of a series of shales. As a general rule we may conclude that wherever among sedimentary accu- mulations stratification is exceedingly well-marked the rocks were formed rather slowly, and that where it is weak or absent the conditions of deposit were more rapid, with- out the intervals and changes necessary for the production of the distinctly stratified structure.

False-bedding, Current-bedding.—Some strata, particu- larly sandstones, are marked by an irregular lamination, wherein the laminz, though for short distances parallel to each other, are oblique to the general stratification of the mass, at constantly varying angles and in different direc- tions. The accompanying section (fig. 9) illustrates this

Fig 9.—Section of false-bedded strata on the coast of Waterford.!

structure, which is known by the name of false-bedding or current-bedding. The finer lines in this drawing represent the laminz of deposit, the stronger lines mark successive surfaces on which these laminee were laid down. Such a structure points to frequent clianges in the direction of the currents by which the sediment was carried along and de- posited. Sand pushed over the bottom of a sheet of water by varying currents tends to accumulate irregularly in bands and ridges, which often advance with a steep slope in front. The upper and lower surfaces of the bank or bed of sand may remain parallel with each other as well as with the underlying bottom, yet the successive laminze composing it may lie at an angle of 30°or even more. We may illustrate this structure by the familiar formation of a railway em- bankment. The top of the embankment on which the permanent way is to be laid is kept level, but the advancing end of the earth-work shows a steep slope over which the

1 The woodcuts in this Part are (with the exception of Nos. 20 and 31) from the article GroLocy in the last edition of the Ency. Brit, written by the late J. B. Jukes, F.R.S.

workmen are constantly discharging waggon-loads of rubbish. Hence the embankment, if cut open longitudinally, would present a “ false-bedded ” structure, for it would be found to consist of many irregular layers inclined at a high angle in the direction in which the formation of the mound had advanced. In the accompanying figure (fig. 10) the water

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Fra. 10.—Section illustrating the production of false-bedding.

moving in the direction of the arrow may drop sand at 6, which will correspond in lamination with the general stratification of the locality ; but when the current reaches the steep front of one of the advancing sand sheets it will allow the sand to roll down the slope, and may continue to bring fresh supplies of sediment until the slope is gradually effaced. Now and then, however, instead of laying down sediment, a current of greater strength than usual may appear and sweep away portions of the sediment already deposited.

Irregularities of Bedding due to Inequalities of Deposition or of Erosion,—A sharp ridge of sand or gravel may be laid down under water by current-action of some strength. Should the motion of the water diminish, finer sediment may be brought to the place and be deposited around and above the ridge. In such a case the stratification of the later accumulation will end off abruptly against the flanks of the older ridge, which will appear to rise up through the overlying bed. In fig. 11, for example, the lower bed

Fie. 11.— Mound of clay with ironstone balls (a), covered by beds of coal (dd).

seems to have been locally heaped up into the shape of a mound or ridge before the coal was accumulated over it, Appearances of this kind are not uncommon in some coal- fields, where they are known to the miners as *rolls," "swells," or 'horses' backs." A structure exactly the reverse of the preceding occurs where a stratum has been scooped out before the deposition of the layers which cover it, This has often been observed in mining for coal. Channels have been cut out of a coal-seam, or rather out of the bed of vegetation which ultimately became coal, and these channels, ramifying and winding sometimes like tliose of streamlets on flat ground, have been filled up with sandy

Fic. 12.—Section of New Red Sandstone road-cuttin | – g near Wolverhampton. 1, Red and white clay or marl; 2, Brown sandstone with irregular pen of marl; 3, Red marl, partially eroded before the deposition of 4, Brown sand- stone eroded before the formation of 5, Calcareous sandstone or cornstone, remarkable series of such erosions, where beds of

clay and sandstone have been extensively denuded in the intervals or muddy sediment. In fig. 12 a section is given of a

the course of movement.

between the deposit of the successive beds. In these and similar cases it is evident that the erosion took place con- temporaneously with the accumulation of the deposits as a whole. We cannot tell, of course, how long an interval elapsed between the formation of a given stratum and that of the next stratum which lies upon its eroded surface, nor how much depth of rock may have been removed in the erosion. When, however, as in the instances with which we are dealing, the structure occurs among conformable strata, evidently united as one lithologically continuous series of deposits, we may reasonably infer that the missing por- tions are of small moment and that the erosion was merely due to the irregular and more violent action of the very currents by which the sediment of the successive strata was supplied.

The case is very different when the eroded strata are inclined at a different angle to those above them, and are strongly marked off by lithological distinctions. In some of the coal-mines in central Scotland, for instance, deep channels have been met with entirely filled with sand, gravel, or clay belonging to the general superficial drift of the country. These channels have evidently been water- courses worn out of the coal-measure strata at a compara- tively recent geological period, and subsequently buried under the glacial accumulations. There is a complete dis- cordance between them and the Paleozoic strata below, pointing to the existence of a vast interval of time.

Lipple-mark.—The surface of many beds of sandstone is marked with lines of wavy ridge and hollow, such as may be seen on any shore from which the tide has retired. This kind of surface is known as “ripple-mark.” It may be formed on dry blown sand by the action merely of the wind, and it is of everyday occurrence under shallow water, not merely on sea-shores, but on

the floors of lakes and of river-pools. The water, gently agitated by the wind in a given direction, throws the surface of the underlying sediment into ripples which tend to run at right angles to But as the wind veers from point to point, producing corresponding changes in the direction of the water-currents, the ripples on the bottom are not strictly parallel, but often coalesce, intersect, and undulate in their course. Their general direction, however, suffices to indicate the quarter whence the chief movement of the water has come. No satisfactory inference can be drawn from the existence of a rippled surface as to the depth of water in which the sediment was accumulated. As a rule it is in water of only a few feet or yards in depth that ripple-mark is formed. But it may be produced at any depth to which the agitation caused by wind on the upper waters may extend.

On an ordinary beach each tide usually effaces the ripple- marks made by its predecessor, and leaves a new series to be obliterated by the next tide. But where the markings are formed in water which is always receiving fresh accumula- tions of sediment, a rippled surface may be gently over-spread by the descent of a layer of sediment upon it and may thus be preserved. Another series of ripples may theu be made in the overlying layers, which in turn may be buried and preserved under a renewed deposit of sand. In this way a considerable thickness of such ripple-marked strata may be accumulated, as has frequently taken place among geological formations of all ages.

An examination of any sandy beach from which the sea has recently retired brings before us many modifications of the perfect ripple-mark. The ridges may be seen to grow more and more notched and irregular, until at last the beach seems to be dotted over with little, flat, dome-shaped mounds, or as if the ridges of the ripple-mark had been furrowed across. These modifications are doubtless due to the partial effacement of the ridges by subsequent action

of the water agitated by wind from a different quarter. Such indications of shallow-water conditions may often be observed among old arenaceous deposits, as in the Cambrian and Silurian rocks. In like manner we may frequently detect, among these ancient formations, small isolated or

connected linear ridges directed from some com- mou quarter, like the current-marks frequently to be found behind projecting fragments of shell, stones, or bits of sea-weed on a beach from which the tide has just retired.

Sun-cracks, Rain-pittings, &c.—Proofs may not infre- quently be found that during deposition aqueous strata have been laid bare to air and sun. The nature and validity of this evidence will be best ascertained by observations made at the margin of the sea, or of any inland sheet of water, which from time to time leaves tracts of mud or fine sand exposed to sun and rain. The way in which the muddy bottom of a dried-up pool cracks into polygonal cakes when exposed to the sun may be illustrated abundantly among geological formations of all ages, These desiccation-cracks, or sun-cracks, could not have been produced so long as the sediment lay under water. Their existence therefore among any strata proves that the surface of rock on which they lie was exposed to the air and dried before the next layer of water-borne sediment was deposited upon it.

With these markings are not infrequently associated prints ofrain-drops. The familiar effects of a heavy shower upon a surface of moist sand or mud may be witnessed aniong rocks even as old as parts of the Cambrian system. In some cases the rain-prints are found to be ridged up ou one and the same side in such a manner as to indicate that the rain-drops as they fell were driven along in a slanting direction. The prominent side of the markings therefore indicates the side towards which the wind blew.

Numerous proofs of shallow shore-water, and likewise of exposure to the air, are supplied by markings left by ani- mals. Castings and trails of wornis, tracks of mollusks and crustaceans, fin-marks of fishes, footprints of birds, reptiles, and mammals, may all be preserved and give their evidence regarding the physical conditions under which sedimentary formations were accumulated. It may frequently be noticed that such impressions are associated with ripple-marks, rain- prints, or sun-cracks ; so that more than one kind of evi- dence may be gleaned from a locality to show that it was sometimes laid bare of water.

Gas-spurts.—The surfaces of some strata, usually of a dark colour and containing much organic matter, may be observed to be raised into little heaps of various indefinite shapes, not, like the heaps associated with worm

burrows, connected with pipes descending into the rock, nor composed of different material from the surrounding sandstone or shale. These may be conjectured to be due to the inter- mittent escape of gas from the decomposing organic matter in the original sand or mud, as we may sometimes witness in operation among the mud flats of rivers and estuaries. On asmall scale these protrusions of the upper surface of a deposit may be compared with the well-known mud-lumps at the mouths of the Mississippi, where the muddy bottom rises Into mounds sometimes to a height of several yards above the water, from the top of which great quantities of carburetted hydrogen gas make their escape, together with water and mud.

Concretions.—Many sedimentary rocks are marked by the occurrence of concretions in them, either distinct in aspect and composition from the general mass of the rock, or forming really part of that mass, though separated from the rest by their being agglutinated into concretionary forms. Such concretions, where they differ in petrographical characters from the surrounding matter, are almost invari- ably of original or contemporaneous formation, that is, were formed at the same time as the strata among which they

lie. Where, however, they appear to be merely com- pacted portions of the stratum, they may be regarded as —- due to some subsequent change effected upon the rock,

Contemporaneous concretions most commonly consist of carbonate of iron, carbonate of lime, or silica. Many clay- ironstone beds assume a nodular form, and this mineral occurs abundantly in the shape of separate nodules in shales and clay-rocks. The nodules have frequently formed round some organic body such as a fragment of plant, a shell, bone, or coprolite. That the carbonate of iron was slowly precipitated during the formation of the bed of shale in which its nodules lie may often be satisfactorily proved by the lines of deposit passing continuously through the nodules. In many cases the internal first-formed parts of a nodule have contracted more than theouterand more compact crust ; and have cracked into open polygonal

spaces which are commonly filled with calcite. Similar concretions of carbonate of lime occur in some clays and in connexion with limestones. Concretions of silica occur in limestone of many geological ages (see ante, p. 239). The flints of the

English chalk are a familiar example, but similar siliceous The

concretions occur even in Lower Silurian limestones.

Fig. 13.—Sketch of limestone-beds, with concretions of white chert, Middleton Moor, Derbyshire. silica in these cases has not infrequently been deposited round organic bodies such as sponges, sea-urchins, and mollusca, which are completely enveloped in it and have even themselves been silicified. Iron-bisulphide (pyrite or marcasite) often assumes the form of concretions, more

Fie, 14.—Sketch of part of a block of black chert in the limestone near Dublin. °

particularly among clay-rocks, and these, though presenting many eccentricities of shape, round like pistol-shot or cannon-balls, kidney-shaped, botryoidal, &c., agree in usu- ally possessing an internal fibrous radiated structure. Phosphate of lime is found as concretions in formations – where the coprolites and bones of reptiles and other animals have been collected together.

Coneretions produced subsequently to the formation of the rock may be observed in some sandstones, which, when exposed to the weather, decompose into large round balls. Some shales exhibit this structure in a still more striking manner, inasmuch as the concretions consist of the general mass of the laminated shale, and the lines of stratification pass through them and mark them out distinctly as super- induced upon the rock. Some magnesian limestones are

so concretionary as to resemble masses of conglomerate; yet the concretions, among all their fantastic shapes and with their acquired

crystalline texture, may often be found to retain traces of the original stratification of the rock. Beds of rock-salt may likewise be observed to be marked with traces of a concretionary arrangement.

Order of Superposition—the Foundation of Geological Chronology.—As sedimentary strata are laid down upon one another in a more or less nearly horizontal position, the underlying beds must be older than those which cover them. This simple and obvious truth is termed the law of super- position, It furnishes the means of determining the chronology of rocks, and though other methods of as- certaining this point are employed, they must all be based originally upon the observed order of Superposition. The only case where the apparent superposition may be decep- tive is where the strata have been inverted. In the Alps, for example, the rocks composing huge mountain masses have been so completely overturned that the highest beds appear as if regularly covered by others which ought pro- perly to underlie them. But these are exceptional occur- rences, where the true order can usually be made out from other sources of evidence.

Alternations of Strata.—Though great variations occur in the nature of the strata composing a mass of sediment- ary rocks, it may often be observed that certain repe- titions occur. Sandstones, for example, are found to be interleaved with shale above, and then to pass into shale; the latter may in turn become sandy at the top and be finally covered by sandstone, or may assume a calcareous character and pass up into limestone. Such alternations bring before us the conditions under which the sedimentation took place. A sandstone group indicates water of comparatively little depth, moved by changing currents, bringing the sand now from one side now from another. The passage of such a group into one of shale points to a diminution in the motion and transporting power of the water, perhaps to a sinking of the tract, whereby only fine mud was then intermittently brought into it, The advent of a limestone above the shale serves to show that the water cleared, owing to a deflexion of the sediment-carrying currents, or to continued and perhaps more rapid subsidence, and that Foraminifera, corals, crinoids, Mollusca, or other lime-secreting organisms, established themselves upon the spot. Shale overlying the limestone would tell of fresh inroads of mud, which destroyed the animal life that had been flourishing on the bottom ; while a return of sandstone beds would mark how, in the course of time, the

original conditions of troubled currents and shifting sandbanks returned. Such alterna- ting groups of sandy, calcareous, and argillaceous strata are well illustrated among the Jurassic formations of England.

Associations of Strata,—Certain kinds of strata very con- monly occur together, because the conditions under which they were formed were apt to arise in succession. One of the most familiar examples is the association of coal and fireclay. A seam of coal is almost invariably found to lie on a bed of fire-clay, or on some argillaceous stratum, The reason of this union becomes at once apparent when we learn that the fire-clay formed the soil on which the plants grew that went to form the coal. Where the clay was laid down under suitable circumstances vegetation sprang up upon it. Again conglomerate and sandstone occur together rather than conglomerate and shale, because the agitation of the water which could form and deposit coarse detritus, like that composing conglomerate, was too great to admit of the accumulation of fine silt. For a similar reason we may look for shale or clay rather than sandstone as an accompaniment of limestone.

Kelative Persistence of Strata.—Observation of what takes place on any lake bottom, estuary, or sea-margin

teaches that some kinds of sediment are much more widely spread than others, and prepares us to find that the same has been the case in past time, and therefore that some kinds of sedimentary rocks possess far greater persistence than others. As a general rule it may be said that the coarser the grain the more local the extent of a rock. Conglomerates are thus by much the most variable and inconstant of all sedimentary formations. They suddenly sink down from a thickness of several hundred feet to a few yards, or die out altogether, to reappear perhaps further on, in the same wedge-like or len- ticular fashion. Sandstones are less liable to such extremes of inconstancy, but they too are apt to thin away and to swell out again. Shales are much more persistent, the same zone being often traceable for many miles. Limestones sometimes occur in thick local masses, as among the Silurian formations of Wales and Scotland, but they often also display

remarkable continuity. Three thin limestone bands, each of them only 2 or 3 feet in thickness, and separated by a considerable thickness of intervening sand- stones and shales, can be traced through the coal-fields of central Scotland over an area of at least 1000 square miles, Coal-seams also possess great persistence. The sanie seams, varying slightly in thickness and quality, may often be traced thoughout the whole of an extensive coal-feld. What is thus true of individual strata may be affirmed also of groups of such strata. A thick mass of sandstone will be found as a rule to be more continuous than one of con- glomerate, but less so than one of shale. A series of lime. stone-beds will usually be found to stretch further than either of them. But even to the most extensive stratum or group of strata there must be a limit. Itmust end off and give place to others, either suddenly, as a bank of shingle is succeeded by the sheet of sand heaped against its base, or very gradu- ally, by insensibly passing into other strata on all sides. Great variations in the character of stratified rocks may frequently be observed in passing from one part of a country to another along the outcrop of the same rocks, Thus at one end we may meet with a thick series of sand- stones and shales which, traced in a certain direction, may be found passing into limestones. A group of strata may consist of massive conglomerates at one locality, and may graduate into fine fissile flagstones in another. A thick mass of clay may be found to alternate more and more with shelly sands as it is traced outward, until it loses its argillaceous nature altogether. No difficulty need be felt in admitting the strict contemporaneity of these diverse layers of sediment. At the present time we see how cvarse shingle may be formed along the beach at the same time that the finest mud is being laid down on the same seca- bottom further from land. Could we raise up that bottom, we should doubtless find as gradual a passage from the littoral to the deeper water deposits as we do among the geological formations of the earth’s crust. The existing differences of character between the deposits of the shore aud of the opener sea would no doubt continue to be main- tained, with slight geographical displacements, even if the whole area were undergoing subsidence, giving rise toa thick group of littoral beds in one tract and of deeper-water ac- cumulations at another. In like manner among the forma- tions of former geological periods the same conditions of de- posit appear sometimes to have continued for a considerable period. Hence the thick Mountain or Carboniferous Lime- stone of Derbyshire is gradually replaced northwards by the thick sandstoneshales, ironstones, and coal-

seams of Scotland. Overlap.—When strata have been laid down in a subsid- ing region wherein the area of deposit gradually increased, the sediment must have spread over a progressively augment- ing surface. By this means the later portions of a sedi- mentary series will extend beyond the limits of the older

parts, and will repose directly upon the shelving bottom, with none of those oldcr strata underneath them. This relation is called Overlap (see fig. 59). The higher or newer members are said to overlap the older. This strncture may often be detected among formations of all geological ages. It brings before us the shore line of ancient land-surfaces, and shows how, as these sank under water, the gravels, sands, and silts gradually advanced and covered them. Relative Lapse of Time represented by Strata and by the

Intervals between them.—Of the absolute length of time |

any strata or groups of strata we can

represented by Certain general conclu-

form no satisfactory estimates. sions may indeed be drawn, and comparisons may be made between different series of rocks. Sandstones full of false-bedding were probably accumulated more rapidly than finely- laminated shales or clays. It is not uncommon in certain Carboniferous formations to find huge coniferous trunks imbedded in an inclined position in sandstone. ‘These trees seem to have been carried along and to have sunk, their heavier or root-end touching the bottom, and their upper end pointing upward in the direc- tion of the current, exactly as in the case of the snags of the Mississippi. The continuous deposit of sand at last

rose above the level of the trunks and buried them. It |

is clear then that the rate of deposit must have been sufficiently rapid to have allowed a mass of 20 or 30 feet of sand to accumulate before the decay of the wood; though modern instances are known where, under certain circumstances, submerged trees may last for some centuries. Continuous

layers of the same kind of deposit suggest a persistence of geological conditions; numcrous alterna- tions of different kinds of sedimentary matter point to ‘vicissitudes or alternations of conditions. As a rule, we should infer that the time represented by a given thickness of similar strata was less than that shown by the same thickness of dissimilar strata, because the changes needed to bring new varieties of sediment into tle area of deposit would usually require the lapse of some time for their completion. But this conclusion miglit often be erroneous. It would be best supported when, from the very nature of

the rocks, wide variations in the character of the water- |

bottom could be established. Thus a group of shales followed by a fossiliferous limestone would almost always mark the lapse of a much longer period than an equal depth of sandy strata. JLimestones made up of organie remains which lived and died upon the spot, and whose remains are crowded together generation above generation, must have demanded many years for their formation.

But in all speculations of this kind we must bear in mind that the length of time represented by a given depth of strata is not to be estimated merely from their thickness or lithological characters. It has already been pointed out that the interval betwcen the deposit of two successive laminz of shale may have been as long as, or even longer than, that required for the formation of one of the lamina. In like manner, the interval needed for the transition from one stratum or kind of strata to another may often have

of the strata on either side. But the relative chronological importance of the bars or lines in the geological record can

grounds. This must mainly be decided on the evidence of organic remains, as will be shown in part v. By this kind of evidence it can be made nearly certain that the intervals represented by strata were in many cases much shorter than those not so represented,—in other words, that the time during which no deposit of sediment went on was longer than that wherein deposit did take place.

Groups of Strata.—Passing from individual strata to large masses of stratified rock, the geologist finds it needful

- another.

[1v. STRUCTURAL.

for convenience of reference to subdivide these into groups. He avails himself of two bases of classification—(1) litho- logical characters, and (2) organic remains.

1. The subdivision of stratified rocks into groups accord- ing to their mineral] aspect is an obvious and easily applied classification. Moreover, it often serves to connect together rocks formed continuously in certain circumstances which differed from those under which the strata above and below were laid down,—so that it expresses natural and original subdivisions of strata. In the middle of the English Car-

| boniferous system of rocks, for example, a zone of sandy

and pebbly beds occurs, known as the Millstone Grit. No abrupt and sharp line can be drawn between these strata and those above and below them. They shade upward and downward into the beds between which they lie. Yet they form a conspicuous belt, traceable for many miles by the scenery to which it gives rise. The red rocks of central England, with their red sandstones, marls, rock-salt, and gypsum, form likewise a well-marked group or rather series of groups. It is obvious, however, that characters of this kind, though sometimes wonderfully persistent over wide tracts of country, must be at best but local. The physical conditions of deposit must always have been limited in ex- tent. A group of strata showing great thickness in one region will be found to die away as it is traced into Or its place is gradually taken by another group which, even if geologically contemporaneous, possesses totally different lithological characters. Just as at the present time a group of sandy deposits gradually gives place along the sea-floor to others of mud, and these to others of shells or of gravel, so in former geological periods contemporaneous deposits were not always

lithologically similar, Hence mere resemblance in mineral aspect usually cannot be regarded as satisfactory evidence of contem- poraneity except within comparatively contracted areas. The Carboniferous Limestone of Ireland is a thick cal-

careous group of rocks, full of corals, crinoids, and other

organisms, which bear witness to the formation of these rocks in the open sea. But if these limestones, with their characteristic marine fossils, are traced into the north of England and Scotland, they are found to pass into sand- stones and shales, with numerous coal-seams, and only a few thin beds of limestone. The soft clay beneath the city of London is represented in the Alps by hard schists and contorted limestones. We conclude therefore that litho- logical agreement when pushed too far is apt to mislead us, partly because contemporaneous strata often vary greatly in their lithological character, and partly because the same lithological characters may appear again and again in dif- ferent ages. By trusting too implicitly to this kind of evidence, we may be led to class together rocks belonging to very different geological periods, and on the other hand to separate groups which really, in spite of their seeming distinction, were formed contemporaneously.

2, It is by the remains of plants and animals imbedded

among the stratified rocks that the most satisfactory sub- divisions of the geological record can be made, as will be been more than equal to the time required for the formation |

: : : | the earth’s crust. – seldom be satisfactorily discussed merely on lithological |

more fully stated in parts v. and vi. A chronological suc- cession of organic forms can be made out among the rocks of A certain common facies or type of fossils is found to characterize particular groups of rock, and to hold true even though the lithological constitution of the strata should greatly vary. Moreover, though comparatively few species are universally diffused, they possess remarkable persistence over wide areas, and even when they are re- placed by others, the same general facies of fossils remains. Hence the stratified formations of two countries geographi-

cally distant, and having little or no lithological resemblance

to each other, may be compared and paralleled zone by zone, simply by means of their enclosed organic remains.

JOINTS. |

IT, Joints.

All rocks are traversed more or less distinctly by vertical or highly inclined divisional planes termed Joints. Soft rocks indeed, such as loose sand and uncompacted clay, do not show these lines ; but wherever a mass of clay has been subjected to somie pressure and consolidation, it will usually be found to have acquired them. It is by means of the intersection of joints that rocks can be removed in blocks ; the art of quarrying consists in taking advantage of these natural planes of division. Joints differ in character accord- ing to the nature of the material which they traverse ; those in sedimentary rocks are usually distinct from those in crystalline masses.

1. In Sedimentary Rocks.—Joints vary in sharpness of definition, in the regularity of their perpendicular and horizontal course, in their lateral pe rsistence, in number, and in the directions of intersection. As a rule, they are most sharply defined in proportion to the fineness of grain of the rock. In limestones and close-grained shales, for example, they often occur so clean-cut as to be invisible until revealed by fracture or by the slow disintegrating effects of the weather. The rock splits up along these con- cealed lines of division whether the agent of demolition be the hammer or frost. In coarse-textured rocks, on the other hand, joints are apt ta show themselves as irregular rents along which the rock has been shattered, so that they present an uneven sinuous course, branching off in different directions. In many rocks they descend vertically in straight lines at not very unequal distances, so that the spaces between them are thus marked off into so many wall- like masses. But this symmetry often gives place to a more or less tortuous course with lateral joints in various random directions, more especially where the different strata vary considerably in lithological characters, A single joint may be traced sometimes for many yards, or even for several miles,.more particularly when the rock is fine- grained, as in limestone. But where the texture is coarse and unequal, the joints, though abundant, run

into each other in such a way that no one in particular can be identi- fied for so great a distance. The number of joints in a mass of stratified rock varies within wide limits. Among strata which have undergone little disturbance the joints may be separated from each other by intervals of several yards. But in other cases where the terrestrial movement appears to have been considerable, the rocks are so jointed as to have acquired therefrom a fissile character that has nearly or wholly obliterated their tendency to split along the lines of bedding.

An important feature in the joints of stratified rocks is the direction in which they intersect each other. As the result of observation we learn that they possess two domi- nant trends, one coincident in a general way with the direction in which the strata are inclined to the horizon, and the other running transversely at a right angle or nearly so. The former set is known as dip-joints, because they run with the dip or inclination of the rocks, the latter is termed strike-joints, inasmuch as they conform to the general strike or mean outcrop. It is owing to the existence of this double series of joints that ordinary quarrying opera- tions can be carried on. Large quadrangular blocks can be wedged off, which would be shattered if exposed to the risk of blasting. A quarry is usually worked to the dip of a rock, hence the strike-joints form clean-cut faces in front of the workmen as they advance. These are known as “backs,” and the dip joints which traverse themas “cutters.” The way in which this double set of joints occurs in a quarry may be seen in fig. 15, where the parallel lines which traverse the shaded and unshaded faces mark the successive strata. The broad white spaces running along the length

of the quarry behind the seated figure are strike-joints or “backs,” traversed by some highly inclined lines which mark the position of dip-joints or “cutters.” The shaded

Fig. 15.—Joints in limestone quarry near Mallow, co. Cork. (@. V. Du Noyer.)

ends looking towards the spectator are “cutters” from which the rock has been quarried away on one side.

In some conglomerates the joints may be seen traversing the enclosed pebbles as well as the surrounding matrix. Large blocks of hard quartz are cut through by them as sharply as if they had been sliced in a lapidary’s machine, and the same joints can be traced continuously through many yards of the rock. Such facts show that the agency to which the jointing of rocks was due must have operated with considerable force.!_ Further indication of movement is often supplied by the rubbed and striated surfaces of joints. These surfaces, termed slickensides, have evidently been ground against each other. They are often coated with hematite, calcite, chlorite, or other mineral, which has . taken 4, cast of the stria and then seems itself to be striated.

Joints form natural lines for the passage downward and upward of subterranean water. They likewise furnish an effective lodgment for surface water which, frozen by a lowering of temperature, expands into ice, and wedges off blocks of rock in the manner already described. As they serve, in conjunction with bedding, to divide stratified rocks into large quadrangular blocks, their effect on cliffs and other exposed masses of rock is seen in the apparently splintered, dislocated aspect so familiar in mountain scenery.

Occasionally a prismatic or columnar form of joints may be observed among stratified rocks. When this occurs among unaltered strata it is usually among those which have been chemically formed, as in gypsum, where, as observed by Mr Jukes in the Paris Basin, some beds are divided from top to bottom by vertical hexagonal prisms. A columnar structure has often been superinduced upon stratified rocks by contact with intrusive igneous masses. Sandstones, shale, and coal may be observed in this condition. The columns diverge perpendicularly to the surface of the injected and altering substance, so that when the later is vertical the columns are horizontal, or when it undulates the columns follow its curvatures, Beautiful examples of this character occur among the coal-seams of Ayrshire.

2. In Crystalline (Igneous) Rocks,—While in stratified rocks the divisional planes consist of lines of bedding and of joint, cutting each other usually at a high if not a right angle, in massive igneous rocks they include joints only ; and as these do not as a rule present the same parallelism as lines of bedding, unstratified rocks, even though as full of joints, have not the same regularity of arrangement as in the stratified formations, Granite, for example, is traversed by two sets of chief or “ master-joints,” cutting each other somewhat obliquely. Their effect is to divide the rock into long quadrangular, rhomboidal, or even polygonal columns.

1 See an interesting series of experiments by M. Daubrée (Comptes Rendus, \xxxvi., 1878) on the production of = and ae ; a

But a third set may usually be noticed cutting across the columns, though less continuous and dominant than the others. When these transverse joints are few in number or occasionally absent, columns many feet in length can be quarried out entire. Such monoliths have been from early times employed in the construction of obelisks and pillars.

In rocks of finer grain than granite, such as many diorites and dolerites, the numerous perpendicular joints give the rock a prismatic character. The prisms however are unequal in dimensions, as well as in the number and pro- portions of their sides, a frequent diameter being 2 or 3 fect, though they may sometimes be observed three times thicker, and extending up-the face of a cliff for 300 or 400 feet. It is by means of joints that precipitous faces of rock are produced and retained, for, as in the case of those in stratified masses, they serve as openings into which

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Hill, Dublin, (G. V. Du Noyer.) frost drives every year its wedges of ice, whereby huge slices are stripped off. They likewise give rise to the formation of those fantastic pinnacles and fretted buttresses so generally to be observed among igneous rocks in which they occur. But undoubtedly the most striking series of joints to be found among igneous rocks is in the regularly columnar, or as it is often called, basaltic structure. This structure has been already (ante, p. 249) described in connexion with modern volcanic rocks. It may be met with in rocks of all ages. It is as well displayed among the felsites of the Lower Old Red Sandstone, and the basalts of the Carboni- ferous Limestone in central Scotland, as among the Tertiary lavas of Auvergne or the Vivarais. _ 3. In Foliated Rocks.—The schists likewise possess their joints, which approximate in character to those among the massive igneous rocks, but they are on the whole less dis- tinct and continuous, while their effect in dividing the rocks into oblong masses is considerably modified by the trans- verse lines of foliation. These lines play somewhat the same part as those of stratification do among the stratified rocks, though with less definiteness and precision.

Fie. 16.—Joints in granite, Killiney

III. Inctination or Rooks.

The most casual observation is sufficient to satisfy us that the rocks now visible at the earth’s surface are seldom in their original position. We meet

with sandstones and conglomerates composed of water-worn particles, yet form-

ing the angular scarps of lofty mountains ; shales and clays full of the remains of fresh-water shells a

: nd land-plants, yet covered by limestones made up of marine organisms, and

these limestones rising into great ranges of hills, or undu- lating into fertile valleys, and passing under the streets of busy towns. Such facts, now familiar to every reader, and even to many observers who know little or nothi systematic geology, point unmistakably to the conelusion that the rocks have in many cases been formed under water sometimes in lakes, more frequently in the sea, and that they have been elevated into land. /

But further examination discloses other and not less

ng of |

convincing evidence of movement. Judging from what takes place at the present time on the bottoms of lakes and of the sea, we confidently infer that when the strata now constituting so much of the solid framework of the land were formed, they were laid down either horizontally or at least at low angles. When, therefore, we find them in- clined at all angles, and even standing on end, we conclude that they have been disturbed. Over wide spaces they have been upraised bodily with little alteration of their original horizontality ; but in most places some departure from that original position has been effected.

The inclination thus given to rocks is termed their dip. Its amount is expressed in degrees measured from the plane of the horizon. Thus a set of rocks half-way between the horizontal and vertical position would be said to dip at an angle of 45°, while if vertical they would be marked with the

angle of 90°. Theedges of strata, where they come up to the surface, are termed their outcrop or basset. When they crop out, that is, rise to the surface, along a perfectly level piece of ground, the outcrop runs at a right angle to the dip. But any inequalities of the surface, such as valleys, ravines, hills, and ridges will cause the outcrop to describe a circuitous course, even though the dip should remain perfectly steady all the while. If a line of precipit- ous gorge should run directly with the dip, the outcrop will there be coincident with the dip. The occurrence of a

gently shelving valley in that position will cause the out- crop to descend on one side and to mount in a correspond- ing way on the other, so as to form a V-shaped indentation in its course. A ridge, on the other hand, will produce a deflexion in the opposite direction. Hence a series of parallel ridges and valleys running in the same direction as the dip of the strata underneath would cause the outcrop to describe a widely serpentinous course. Again, should the rocks be vertical, the outcrop will necessarily correspond with the dip, and continue to do so irrespective altogether of any irregularities of the ground. The lower therefore the angle

upon the line of outcrop; the higher the angle the less is that influence, till when the beds stand on end it ceases. A line drawn at a right angle to the dip is called the strike of the rocks. From what has just been said this line must coincide with outcrop when the surface of the ground is quite level, and also when the beds are vertical. At all other times they are not strictly coincident, but the outcrop wanders to and fro across the strike according to the changes in the angle of inclination and in the form of the ground. The strike may be a straight line or may curve rapidly in every direction, according to the behaviour of the dip. If, for instance, a set of beds dips for half a mile continuously to the north, the strike will ran for that distance as a straight east and west line. Ifthe dip gradu- ally changes to north-west and west, and then by south- west to south, it is obvious that the strike must curve round by north-east, north, and north-west till it once more

becomes parallel with its former course. Both of the parallel lines of strike run in an east-and-west direction, but in the one the dip is to the south, and in the other to the north.

The strike may be conceived as always a level line on the plane of the horizon, so that no matter how much the ground may undulate, or the outcrop may vary, or the dip may change, the strike will remain level. Hence in mining operations it is commonly spoken of as the Jeve-

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GEOLOGY

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course or level-bearing. A level or underground rvad-way, driven through a coal-seam at right angles to the dip, will undulate in its course if the dip changes in direction, but it may be made perfectiy level and kept so throughout a whole coal-field so long as it is not interfered with by any ni ig or other disturbances of the regularity of the rocks.

The accompanying figures (figs. 18 and 19) will serve to show some of these terms as expressed on maps and

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Fria. 18.—Geological map of a portion of a rocky coast-line, and the country inland. (J. B. Jukes.)

sections. Fig. 18 represents a geological map in which a series of strata dipsin a south-south-easterly direction (8. 28° E.). The angle of inclination increases from 35° at the northern to 50° at the southern end of the beach. On the flat shore (AA) outcrop and strike coincide, but along the inner margin, where the ground ascends in a line or

cliff (BB) to the inland country (CC), the outcrop is seen to be deflected a little so as to cross the plateau along a slightly more northerly line than on the beach. A section drawn at a right angle to the strike along the line DD would show the structure represented in fig. 19. Such a section, expressing graphically the result of careful measure-

Fic. 19.—Section along the line DD on fig. 18.

ment in the field, would give not only the order of succes- sion of beds at the surface, but their actual depth at any point beneath it. Thus a bore or shaft sunk at the point marked d on the map would have to pass through rather more than 425 feet of rock before reaching the stratum 0.

The total thickness of rock measured at right angles to the dip in fig. 19 is somewhat more than 850 feet. These various strata, if restored to their original position, would lie one over the other to that depth. If they were on end they would occupy exactly that breadth of ground. But

the inclined position of strata makes them cover more horizontal space; in the present instance it increases that space to 1200 feet.

A convenient rule was given many years ago by the late Mr Charles Maclaren of Edinburgh for estimating the thickness of strata inclined at

angles of less than 45°. The real thickness of a mass of inclined strata is ;/,th of its ap- parent thickness for every 5° of dip. Thus if a set of beds dip steadily in one direction at 5° for a horizontal space of 1200 feet measured across the strike, their actual thickness

will be ;1,th or 100 feet. If the dip be 15°. the true thick- |

ness will be ;3,ths or 400 feet, and so on.

TV. CuRVATURES OF Rocks.

A little reflexion will show that though, so far as regards the trifling portions of the rocks visible at the surface, we might regard the inclined surfaces of the strata as parts of straight lines, they must nevertheless be parts of large curves, ‘Take, for example, the section given in fig. 19. At the north end of that section we observe the beds to plunge one after another into the earth at an angle of 35°. By degrees the inclination increases until it reaches 50°. As there is no dislocation or abrupt change of angle, but a gradual transition, it is evident that the beds at the north end cannot proceed indefinitely downward at the same angle which they have at the surface, but must bend round to accommodate themselves to the higher inclination which sets in southwards. By prolonging the lines of the beds for some way beneath the sea-level, we can show graphically the nature of the curve. In every instance therefore where, in walking over the surface, we traverse a series of strata which gradually, and without dislocations, increase or diminish in inclination, we cross part of a great curva- ture in the strata of the earth’s crust.

Such foldings, however, can often be distinctly seen,

either on some cliff or coast-line, or in the traverse of a piece of hilly or mountainous ground. The observer can-

not long continue his researches in the field without dis- covering that the rocks of the earth’s crust have been almost everywhere thrown into curves, usually so broad and gentle as to escape observation except when specially looked for. The outcrop of beds at the surface is commonly the trunca- tion of these curves. The strata must once have risen above the present surface,

and in many cases may be found descending to the surface again with a contrary dip, the intervening portion of the undulation having been worn away.

If then the inclination of rocks is so closely connected with their curvature, a corresponding relation must hold between their strike and curvature. In fact, the prevalent strike of a region is determined by the direction of the axes of the great folds into which the rocks have been thrown. If the curves are gentle and inconstant there will be a cor- responding variation in the strike. But should the rocks be strongly plicated, there will necessarily be the most thorough coincidence between the strike and the direction of the plication.

The curvature occasionally shows itself among horizontal or gently inclined strata in the form.of an abrupt inclina- tion, and then an immediate resumption of the previous flat or sloping character. The strata are thus bent up and continue on the other side of the tilt at a higher level. Such bends are called monoclines or monoclinal folds, because they present only one fold, or one half of a fold, instead of the two which we see in an arch or trough. The most notable instance of this structure in Britain is that of the Isle of Wight, of which a section is given in fig. 20. The Cretaceous rocks on the south side of the island rapidly rise in inclination till they become nearly vertical.

The Lower Tertiary strata follow with a similar steep dip, but rapidly flatten down towards the north coast. Some

Fie. 20.—Section of the Isle of Wight—a monoclinal curve.

; a, Chalk; 6, Wool- wich and Reading beds; c, London clay; d, Bagshot series; e, Headon series; J; 9, OSborne and Bembridge series.

remarkable cases of the same structure have been brought to light by Mr J. W. Powell in his survey of the Colorado region.

It much more frequently happens that the strata have been bent into arches and troughs, so that they can be seen dipping under the surface on one side of the axis of a fold, and rising up again on the other side. Where they dip away from the axis of movement the structure is termed an anticline or anticlinal fold; where they dip towards the

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TT aS I Fie. 21.—Plan of anticlinai and synclinal folds.

axis, it is a syncline or synclinal fold. The diagram in fig.

21 may be taken to represent a series of strata (1-17)

thrown into an anticline (AA') and syncline (BB'). A sec-

tion drawn across these folds in the line CD would show

wo Section on line C D. <<

Fia, 22.—Seetion of anteilinal and synclinal folds on the line CD (fig. 21).

the structure given in fig. 22. Here we see that, at the part of the anticlinal axis (A) whére the section crosses, bed No. 4 forms the crown of the arch, Nos. 1, 2, and 3 being concealed beneath it. On the east side of the axis the strata follow each other in regular succession as far as No. 13, which, instead of passing here under the next in order, turns up with a contrary dip and forms the centre of a trough or syncline (B). From underneath No. 13 on the east side, the same beds rise to the surface which passed beneath it on the west side. The particular bed marked EF has been entirely removed by denudation from the top of the anticline, and is buried deep beneath the centre of the syncline.

Such foldings of strata must always die out unless they are abruptly terminated by dislocations. In the cases given in fig. 21, both the arch and trough are represented as diminishing, the former towards the north, the latter towards the south. The observer in passing northwards

along the axis of that anticline finds himself getting into progressively higher strata, as the fold sinks down. On the other hand, in advancing southwards along the synclinal axis, he loses stratum after stratum and gets into lower portions of the series. When a fold diminishes in this way it is said to “nose ont.” In fig. 21 there is obviously a general inclination of the beds towards the north, besides the outward dip from the anticline and the inward dip from the syncline. Hence the anticline noses out to the north and the syncline to the south.

Tt occasionally happens that the maximum movement either of upheaval or subsidence has taken place not along a line of axis but at some one point. Hence arise, on the one hand, dome-shaped elevations of strata where the dip i3 outward from a centre (quaquaversal), round which the beds are disposed in successive parallel layers or rings, and, on the other hand, circular basin-shaped depressions, towards the centre of which there is a general inclination of the rocks,

So great has been the compression to which rocks have been subjected during the process of curvature that the folds may often be found inverted. This has taken place

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Fie. 23.—Section of inclined axes, showing consequent inversion of strata.

abundantly in regions of great plication. The Silurian up- lands of the south of Scotland, for instance, have the arches and troughs tilted in one direction for miles together, so that in one half of each of them the strata lie bottom upwards, It is in large mountain-chains, however, that inversion can be seen on the grandest scale. The Alps furnish numerous striking illustrations. On the north side of that chain the older Tertiary rocks have been so completely

turned over for many miles that the lowest beds now form the tops of the hills, while the highest lie deep below them. Indivi- dual mountains, such as the Glirnisch, present stupendous examples of inversion, great groups of strata being folded over and over above each other as we might fold carpets.

Fia. -4.—Curved and contorted rocks, near Old Head of Kiusale. (Du Noyer.)

Where curvature has been carried so far, we may nearly always discover localities at which it has been so intensified that the strata have been corrugated and crumpled till it becomes almost impossible to follow out any particular bed through the disturbance. Ona small scale instances of such extreme contortion may now and then be found at landslips, where fissile shales have been pressed forward by advancing heavy masses of more solid rock. But it is of course among the more plicated parts of mountain-chains that the strac. ture receives it best illustrations. Few travellers who have passed the upper end of the Lake of Lucerne can have failed to notice the remarkable cliffs of contorted rocks near Fluelen. But innumerable examples of equal or even

superior grandeur may be observed among the more precipit- ous valleys of the Swiss Alps. No more impressive testi- mony could be given to the potency of the force by which mountains were upheaved.

V. Distocations or Rocks,

The movements which the crust of the earth has under- gone have not only folded and corrugated the rocks, but have fractured them in all directions. These dislocations may be either simple fissures, that is, rents without any vertical displacement of the mass on either side, or faults, that is, rents where one side has been pushed up or has sunk down. It is not always possible in a shattered rock to discriminate between joints and true fissures. The joints indeed have sometimes served as lines along which fissuring has taken place. It is common to meet with traces of fric. tion along the walls of

fissures even when no proof of actual vertical displacement can be gleaned. The rock is more or less shattered on either side, and the contiguous faces present numerous slickensided surfaces. Mineral deposits may also commonly be observed encrusting the cheeks of a fissure, or filling up, together with broken fragments of rock, the space between the two walls.

In a large proportion of cases, however, there has been

| displacement as well as fracture, and the rents have become

faults as well as fissures. Faults on a small scale are sometimes sharply-defined lines, as if the rocks had been

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(Fie. 25.—Section of clean-cut-tault.

sliced through and fitted together again after being shifted (fig. 25). In such cases, however, the harder portions of the dislocated rocks will usually be found slickensided. More frequently some disturbance has occurred on one or both sides of the fault. Sometimes in aseries of strata the beds on the side which has been pushed up are bent down

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Fie. 26.—Section of strata, bent at a line of fault.

against the fault, while those on the opposite side are bent up (fig. 26). Most commonly the rocks on both sides are considerably broken, jumbled, and crumpled, so that the line of fracture is marked by a belt or wall-like mass of fragmentary rock. Where a dislocation has occurred through materials of very unequal hardness, such as solid

limestone bands and soft shales, or where its course has been undulating, the relative shifting of the two sides has occa- sionally brought opposite

prominences together so as to leave wider interspaces, as in fig. 27. The actual breadth

Fig. 27.—Section of fault, showing the alternate expansions and contractions due to the shifting of one side of a sinuous fissure.

of a fault may vary from a mere chink into which the point of a knife could hardly be inserted up to a band of broken rock many yards wide. But in these latter cases we may usually suspect that so great a breadth of fractured materials has been produced. not by a single fault but by a series of closely adjoining and parallel faults.

Faults are sometimes vertical, but are generally inclined. The largest faults, that is, those which have the greatest

Fia. 28.—Section of a vertical and inclined fault.

vertical displacement, slope at high angles, while those of only a few feet or yards may be inclined as low as 18° or

20°. The inclination of a fault from the vertical is called its hade. In fig. 28, for example, the fault between A and C being vertical has no hade, but that between C and B hades at an angle of 70° from the vertical to the right hand. The amount of displacement is represented as the same in both instances, so that the level of the bed a is raised between the two faults at C above the uniform horizon which it retains beyond them.

That faults are vertical displacements of parts of the earth's crust is most clearly shown when they traverse stratified rocks, for the regular lines of bedding and the originally flat position of these rocks afford a measure of the disturbance. Accordingly we may consider here the effects of faults as they traverse (1) horizontal, (2) inclined, or (3) undulating strata.

1. In the above section (fig. 28) two faults are supposed to traverse a set of horizontal strata, and to displace them in opposite directions. Hence the portion between them appears as if it had been pushed up, or as if the part on either side had slipped down. The amount of vertical dis- placement is measured from the end of any given stratum, say a, on one side of the fault,

to its corresponding end on the other side. Suppose, for example, that the black band in fig. 29 represents a known stratum such as a seam of coal, which, having been explored in underground operations, is known to be cut by a fault at a depth of a hundred yards below the surface at A, and to lie 200 yards deep on the other side of the fault below B. Theamount of displacement is the vertical distance between the two severed ends a and b. This is termed the throw of a fault. From these two sections (figs. 28 and 29) we see that the horizontal distance to which the two ends of a faulted stratum may be separated does not

depend upon the amount of throw but upon the angle of the hade. In the left-hand fault in fig. 28 there is no hade,

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Fria. 29.—Measurement of the throw of a fault.

for the fault is vertical; consequently there is no lateral displacement. In fig. 29, however, where the fault hades considerably, there is a lateral shift of the bed, the end a being 150 yards to the left of 6. In this example the lateral shift is half as much again as the vertical. It is obvious that a fault of this kind must seriously affect the value of a coal-field; for while the coal-seam might be worked up to a on the one side and to 0 on the other, there would be a space of 150 yards of barren ground between these two points where the seam never could be found. The lower the angle of hade the greater the breadth of such barren ground. Hence the more nearly vertical the lines of fault, the better for the coal-fields.

In the vast majority of cases faults hade in the direction of downthrow, in other words, they slope away from the side which has risen. Consequently the mere inspection of a fault in any natural or artificial section suffices in most cases to show which side has been elevated. In mining operations the knowledge of this rule is invaluable, for it decides whether a coal seam, dislocated by a fault, is to be sought for by going up or down. In fig. 29, for

example, a miner working from the right and meeting with the fault at b, would know from its hading towards him that he must ascend to find the coal. On the other hand were he to work from the left and catch the fault at a, he would see that it would be necessary to descend. According to this rule a normal fault never brings one part of a bed below another part, so as to be capable of being pierced twice by the same vertical shaft. Exceptional cases, however, where the hade is reversed, do occasionally appear. In fig. 30 a series of strata, 1 to 11, are represented as folded in an inverted anticline, and broken through by a fault along the axis, the portion on the right side having been pushed up.

Fia. 30.—Inverted anticline and reversed fault.

The effect of the movement has been to make the ends of the beds on that side overlie higher beds on the other side. A shaft would thus pierce the same stratum twice. In- stances of reversed faults are chiefly met with in much dis- turbed districts, such as mountain chains, where the rocks have been affected. by great undulations and corrugations. But instances on a small scale, like that in fig. 31, may now and then be encountered even in lowland districts, where no great disturbance has taken place.

2, Faults traversing inclined strata usually group them-

selves into two series, one running in the same general direction as the dip of the strata, the other approximating

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Fic. 31.—Reversed fault, Liddesdale.

to the trend of the strike. They are accordingly classified as dip-faults and strikefaults. They are not always to be sharply marked off from each other,

for the dip-faults will often be observed to deviate considerably from the normal direction of dip, and the strike-faults from the prevalent strike, so that in such cases they pass into each other.

A dip-fault produces at the surface the effect of a lateral shift of the strata. This effect increases in proportion as the angle of dip lessens. It ceases altogether when the beds are vertical, Fig. 32 may be taken as a plan of a dip-fault

Fia, 32.—Plan of strata cut by a dip-fault.

traversing a series of strata which dip northwards at 25°. The beds on the east side look as if they had been pushed horizontally southwards. That this apparent horizontal displacement is due really to a vertical movement, and to the subsequent planing déwn of the surface by denuding agents, will be clear if we consider what must be the effect of the vertical ascent or descent of the inclined beds on one side of a dislocation. Take the bed a in fig, 32, and suppose it to be still unbroken by the fault. It will then run in a straight east and west line. When the fault takes place, the part on the west side is pushed up, or, what comes to the same, that on the east sideis let down. A horizontal plane cutting the dislocated stratum will show the portion on the west side lying to the north of that on the east side of the fracture. The effect of denudation has usually been practically to produce such a plane, and thus to exhibit an apparently lateral shift. This surface displace- ment has been termed the heave ofa fault. Its dependence upon the angle of dip of the strata may be seen by a com- parison of figs. 33 and 34. In the former figure the bed a, once prolonged above the present surface (marked by the horizontal line), is represented as having dropped from db to ec, the angle of inclination being 25°. The heave amounts to the horizontal distance between and e, But if the angle should rise to 60°, as in fig, 34, though the amount of throw or vertical displacement remains the same, we see that the heave or horizontal shift diminishes to about a quarter of what it is in fig. 33, This diminu-

tion would continue with every increase of inclination in the strata till among vertical beds there would be no heave at all,

Fig. 83.—Section along the line of a fault in strata dipping at 25°.

Strike-faults, where they exactly coincide with the strike, may sometimes remove the outcrop of some strata by never

Fra. 34.—Section along the line of a fault in strata dipping at 60°.

allowing them to reach the surface. Fig, 35 shows a plan of one of these faults (FF), having a downthrow to the north. Jn crossing the ground from north to south we pass successively over the edges of all the beds, except Nos. 3

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South Fia. 85.—Plan of a strike-fault. and 4, which are cut out by the fault as shown in fig. 36, which is a section drawn across the ground at a right angle to the strike, Itseldom happens, however, that such strict coincidence between faults and strike continues for

Fic. 36.—Section across the plan, fig. 35.

more than a short distance. The dip is apt to vary a little even among comparatively undisturbed strata, and every such variation causes the strike to undulate and thus to be cut more or less obliquely by the line of dislocation, which may nevertheless run quite straight. Moreover, any 1n-crease or diminution in the throw of a strike-fault will of

course have the effect of bringing the dislocated ends of the | left hand. We have seen that a dip-fault always shifts the

beds against the line of dislocation. In fig. 37, for in-

Fig. 37.—Plan of strata traversed by a diminishing strike-fault.

stance, which represents in plan another strike-fault, we see that the amount of throw is diminishing towards the left so as to allow lower beds to successively appear, until, at the extreme left side of the ground, the fault merely brings one part of the same bed (No. 5) against another part.

3. Their effects become more complicated where faults traverse undulating and contorted strata. Sometimes wecan distinctly trace an undulation as the result of a fault. In the flat limestone beds shown in fig. 38, for example,

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there can be no doubt that the gentle depression from d to ¢ would not have taken place but for the existence of the fault ab. But in all countries where the rocks have been thrown into folds and corrugations these structures are tra- versed by faults. It then often happens that the same fault appears to be alternately a downthrow on opposite sides. Let us suppose.a series of gently rolling strata to be cut by a transverse fault as in the diagram in fig. 39.

Fic. 89.—Diagram of gently undulating strata cut by a fault, with alternate throw in opposite directions,

At each of the two ridges on the near side of the fault the effect is an upthrow, while in the intervening valley it is a downthrow. On the opposite side of the fault each of these effects is reversed. It rarely happens, however, that a fault makes any such visible crack at the surface. The rocks have all been worn down so much that it is usually only by careful examination of their dip that the existence of faults can be determined.

The influence of faults upon curvatures may be illustrated by a plan and sections of a dislocated anticline and syncline, which will also show clearly how the apparently lateral dis- placement of outcrop produced by dip-faults is due to vertical movement. Fig. 40 represents a plan of strata thrown into an anticlinal fold AA and a synclinal fold SS, and traversed by a fault FF, which is an upthrow to the

outcrop to the dip on the upthrow side, and this will be

Fic, 40.—An anticline (A) and syncline (8), dislocated by a fault.

observed to be the case here. Beginning at the upper side of the diagram, which may be called north, we notice that the bed aa, dipping towards the lower side or south at 60°, is truncated by the fault at w, and that the portion on the upthrow side is shifted forwards or southward. Crossing the syncline we meet with the same bed, and as the upthrow of the fault still continyes on the same side we must go some way southwards on the downthrow side before we meet with its continuation, On the southern slope of the anticline the same bed once more appears, and again is

Fig. 41.—Section alang the upcast side of the fault in fig. 40,

shifted forwards as before. A section along the left or upcast side (ww) of the fault would give the structure re- presented in fig. 41; while one along the downcast side

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Fig. 42.—Section along the downcast side of same fault.

(dd) would be as in fig. 42. These two sections clearly prove that the shifting of the outcrops at the surface can

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Fic. 43.—Plan of single fault.

be simply explained by a mere vertical movement. They also show that faults which cross anticlinal and synclinal

folds narrow the anticlines but widen the synclines on the downthrow side, while they widen the anticlines and narrow the synclines on the upthrow side.

Dislocation may take place either by a single fault or as the combined effects of two or more. Where there is only one fault, as in fig. 43, one of its sides may be pushed up or let down, or there may be a simultaneous opposite movement on either side. In such cases, there must be a gradual dying out of the dislocation towards either end; and there will usu- ally be oneor more points where the displacement has reached a maximum. Sometimes, as shown in fig. 44, a fault with a considerable maximum throw (35 feet, yards, or fathoms, in the drawing) splits into minor faults at the terminations. Examples of this kind occur not infrequently in coal-work-

Fria. 44.—Plan of a fault splitting into minor faults.

ings. In other cases the offshoots take place along the line of the main fissure (fig. 45). Exceedingly complicated

Fie, 45.—Plan of main fault, with branches.

examples occur in some coal-fields, where the connected faults become so numerous that no one of them deserves to be called the main or leading dislocation.

The subsidence or elevation of a large mass or block of rock has more usually taken place by a combination of faults. If we suppose two fissures to meet at a point, as at b in fig. 46, and to die out respectively at a and c, the

a

Fig. 46.—Plan of two fissures.

intervening triangular mass ed may be moved upwards or downwards, or it may remain stationary while the surround-

ing ground is displaced. The maximum displacement in such an instance would be sought for towards 3 in the direction ¢ there would be no displacement at all.

It often happens that, by a succession of parallel and adjoining faults, a series of strata is so dislocated that a given stratum which may be near the surface on one side is carried down by a series of steps to some distance below. Excellent examples of these step-faults (fig. 47) are to be

Fia. 47.—Section of strata cut by step-faults.

seen in the coal-fields on both sides of the upper part of the estuary of the Forth. Instead, however, of having the same downthrow, parallel faults frequently show a move- ment in opposite directions. If the mass of rock between them has subsided relatively to the surrounding ground, they are trough-faults (fig. 48). They enclose wedge-shaped masses, of which the apices, formed by the junction of two

Fic. 48.—Trough-faults.

faults, point downwards. In the accompanying section (fig. 49) of a portion of the thick coal of South Stafford- shire, drawn to scale by Mr Johnson of Dudley (Records of Geol. Survey, vol. i. part 2, p. 313), the commencement of a trough-fault is shown in the centre of the figure.

The late Mr Jukes carefully described this interesting section, and showed that the coal must once have been more arched than now, and that on the cessation of the elevatory process the fractured pieces adjusted themselves to their new position by means of disloca- tions. The mass of higher beds (A) driven asa wedge into the coal, has hindered the bed from regaining its horizontality, and at the same time has caused the adjacent parts of the coal (BB) to be so crushed by the enormous pressure as to have been reduced to ‘‘a paste of coal dust and very small coal” (Memoir on South Stafford- shire Coal-field, 2d ed., p. 194).

It will be observed that the hade of the faults is towards

Fia. 49.—Section of a faulted part of the thick coal of South Staffordshire.

the downthrow side, and that the wedged-shaped masses with broad bottoms have risen, while those with narrow bottoms and broad tops have sunk.

It has been already (ante, p. 261) pointed out that faults are traceable to the effects of elevation. The general hade or inclination of faults towards the side of downthrow was satisfactorily explained by the late Mr Jukes in the last edition of the present work.

- Suppose," he says, " that in diagram fig. 50 we have a portion of the earth's crust, of which AB is the surface, and CD a plane acted on by some widespread force of expansion tending to bulge upwards the part ABCD. If then a fracture takes place along the line EF, it is obvious that the expanding force will, on the side of AC, have the widest base CF to act upon, while it will have a pro- portionately less mass to move in the part AECF, which grows gradually smaller towards the surface, than on the other side of the fault, where, with the smaller base FD, the mass FDBE continually grows larger towards the surfacc. The mass G Si consequently be

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uch more easily raised into the position AeC/, than the mass H into the position Dy Be, the elevation of which could hardly take

Fig. 50.

place without leaving a great open gap along the line of fault between FE and /’e’, and, moreover, without leaving the projecting piece e’ overhanging without any support.

‘* This is yet more clearly perceptible if we suppose two such fissures, as in fig. 51, inclining towards each other, since, if we sup-

dl

c EF

Fig. 51.

pos the included piece I to be elevated into the position indicated y the dotted lines, it becomes utterly unsupported unless we sup- ose huge dykes or ejections of igneous rock to issue out along each ault, But this would remove the case from the class of fractures we are at present considering.”

Trough-faults offer at first some difficulty. In fig. 48, for example, it is evident that in both the wedge-shaped masses (A and B) there has been subsidence. The bed X is cut by four faults. In the space B two of these faults hade towards each other, and as they have the same amount of throw the level of the bed remains unchanged on either side. Inthe other trough, however, the fault a has a throw twice as much as that of 6 which it completely cuts off. The two faults d and f neutralize each other, and are con- nected with a vertical fissure without any throw. The fault a however descends with its persistent hade and dislocates the bed Z and the other strata below. Mr Jukes proposed the following satisfactory explanation of this kind of struc- ture.

‘* Suppose the beds AA, BB, &c., (fig. 52) to have been formerly in a state of tension, arising from the bulging tendency of an

Cc

Fig. 52.

internal force, and one fissure, FE, to have been formed below, which on its course to the surface splits into two, ED and EC, If the elevatory force were then continued, the wedge-like piece of rock W between these two fissures, being unsupported, as the rocks on each side separated, would settle down into the gap as in fig. 58. Ifthe elevatory action were greater near the fissure than farther from it, the single fissure below would have a tendency to gape upwards, and swallow down the wedge, so that eventually this inight settle down, and become fixed at a point. much below its previous relative position. Considerable friction and destruction of the rocks, so as to cut off the corner gh (fig. 53) on either side, would probably take place along the sides of the fissures, and thus widen the gap, and allow the wedge-shaped piece W to settle down still further.

‘* When the forces of elevation were withdrawn, the rocks would doubtless have a tendency to settle down again, but these newly-

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| Fig. 53.

included wedge-shaped, and other masses, would no longer fit into the old spaces, so that great compression and great lateral pressure might then take place.”

In fig. 49 an excellent illustration is afforded of how an arched inass of strata has been faulted, and how trough-faults have been formed.

VI.—CLEAVAGE.

There is yet another system of divisional planes, termed cleavage, by which rocks are sometimes traversed. When this structure is well developed it divides a rock into parallel laminz, which run at a high angle quite independ- ently of stratification or any other divisional planes. It is most perfect in proportion to the fineness of grain of the material in which it occurs. Hence fine argillaceous rocks show it admirably. An ordinary roofing slate may be taken as an illustration of a cleaved rock; its opposite surfaces are cleavage-planes, while the opposite faces of a slab of shale would be stratification-planes. Though most perfectly exhibited by clay-slate, cleavage occurs in other rocks, even in old lavas and tufts, limestones, and sandstones or greywackes; but as the texture increases in coarseness the cleavage lines become more undecided and further apart. The structure may be observed to vary in distinctness in the same face of rock, being well-defined among bands of slate, but becoming faint or even disappearing in intercalated beds of sandstone or grit.

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Fia. 54.—Sketch (by the late Mr Du Noyer) of a block of variegated slate from Devil’s Glen, county Wicklow. The crumpled bands mark the bedding, and the fine perpendicular strie in front are the cleavage planes; the fine lines on the darkened side merely represent shadow, and must not be taken for planes of division in the rock. It will be observed that the cleavage planes do not pass through the white bands.

The direction of cleavage usually remains persistent over considerable regions, and, as was shown by Sedgwick, corre-

sponds on the whole with the strike of the rocks. It is, however, independent of bedding. Among curved rocks the cleavage planes may be seen traversing the contortions without sensible deflexion from their normal direction, parallelism, and high angle. Mr Jukes pointed out that over the whole of the south of Ireland the trend of the cleavage seldom departs 10° from the normal direction E. 25° N., no matter what may be the differences in character and age of the rocks which it crosses. Some of the more obvious characters of cleavage are shown in fig. 54, which represents a block of cleaved variegated slate about 18 inches in height. The left side of the block which is in shadow is formed by a smooth cleavage plane, and the whole block might be split into laminz parallel to that plane as shown by the cleavage lines in front. The lines of stratification are marked by the white and dark contorted bands, the axes of which evidently correspond nearly with the direction of the cleavage. These bands are commonly marked in nature by zones of different colour, and sometimes of texture. In the present instance the white bands are more sandy than the rest of the mass, and the cleavage-planes only partially enter them. This specimen is further interesting as it bears witness by its puckered bedding to the great lateral pressure in virtue of which, as we have already seen (ante, p- 261), the cleavage structure has been produced.

VII. [anzrous Rocks as PART oF THE STRUCTURE OF THE Eartu's Crust.

In this section we shall consider the part taken by igneous rocks in the architecture of the earth's crust. Their litho- logical differences having already been described in part ii, it is their larger features in the field that now require attention,—features which in some cases can be well illus- trated by reference to the action of modern volcanoes, and iu other cases bring before us parts of the economy of vol- canoes which can never be reached in any recent cone. A study of the igneous rocks of former ages thus serves to augment our knowledge of volcanic actiou.

At the outset an obvious distinction must be drawn between those igneous masses which reached the surface and consolidated there, like modern lava streams or showers of ashes, and those which we must believe never found their way to the surface but consolidated at a greater or less depth beneath

it. There must be the same division to be drawn in the case of every active volcano of the present day. But we can examine only the materials which reach the sur- face, and we can but speculate as to the nature and arrange- ment of what still lies underneath. In the revolutions to which the crust of the earth has been subjected, however, the subterranean continuations of volcanic sheets have often been laid bare, and not only so, but sections have been opened into the very heart of masses which, though molten and eruptive, seem never to have been directly connected with actual volcanic outbursts. All those subterranean intruded masses, which are now revealed at the surface only after the removal of the depth of rock which once covered them, may be grouped together into one division under the names plutonic, intruswe, or subsequent. On the other hand, all those which came up to the surface as ordinary volcanic rocks, whether molten or fragmental, and were consequently contemporaneously interstratified with the formations which happened to bein progress on the surface at the time, may be classed in a second group under the names voleunic, interbedded, or contemporaneous.

It is obvious of course that these are only relative terms. Every truly volcanic mass which, by being poured out as a lava-stream at the surface, came to be regularly inter- stratified with contemporaneous accumulations, must have been directly connected below with molten matter which

did not reach the surface. One part of the total mass therefore would be included in the second group, while another portion, if ever exposed by geological revolutions, would be classed with the first group. Seldom, however, can the same masses which flowed out at the surface be traced directly to their original underground prolonga- tions. It is evident that an intrusive rock, though necessarily subsequent in age to the rocks through which it has been thrust, need not be long subsequent. _ Its relative date can only be certainly affirmed with reference to the rocks through which it has broken. It may be older than other rocks through which it has not been intruded but which lie almost immediately above it. The probable geological date of its eruption must be decided by the evi- dence to be

obtained from the grouping of the rocks all around. Its intrusive character can only certainly deter- mine the limit of its antiquity. We know that it must be younger than the rocks it has invaded ; how much younger must be otherwise determined. On the other hand, an in- terbedded or contemporaneous igneous rock has its date precisely fixed by the geological horizon on which it lies. A lava-bed or tuff intercalated among strata containing Sphenopteris affinis, Lepidodendron veltheimianum, Leper- dita, and other associated fossils, would unequivocally prove the existence of volcanic action at the surface during the Lower Carboniferous period, and at that particular part of the period represented by the horizon occupied by the voleanic bed. An interbedded and an intrusive mass foundon the same platform of strata would not necessarily be coeval. On the contrary, the latter, if clearly intruded along the horizon of the former, would necessarily be posterior in date. It will be understood then that the two groups have their respective limits determined solely by their relations to the rocks among which they may happen to lie.

The value of this classification for geological purposes is great. It enables the geologist to place and consider by themselves the granites, quartz-porphyries, and other crys- talline masses which, though lying sometimes perhaps at the roots of ancient volcanoes, and therefore intimately con- nected with volcanic action, yet owe their special characters to their having consolidated under pressure at some depth within the earth’s crust; while he arranges in another series the lavas and tuffs which, thrown out to the surface, bear the closest resemblance to the ejected materials from modern volcanoes. He is thus presented with the records of hypogene igneous action in the one group, and with those of superficial volcanic action in the other. He is furnished with a method of chronologically arranging the volcanic phenomena of past ages, and is thereby enabled to collect materials for a history of volcanicaction over the globe.

In adopting this classification for unravelling the geologi- cal structure of a region where igneous rocks abound, the geologist will encounter instances where it may be difficult or impossible to decide in which group a particular mass of rock must be placed. He will bear in mind, however, that after all, such schemes of classification are proposed only for convenience in systematic work, and that there are no corresponding hard and fast lines in

nature. He will recog- nize that all crystalline or glassy igneous rocks, whether the portion visible be interbedded or intrusive, must be intru- sive at a greater or less depth from the surface. Every contemporaneous sheet has proceeded from some internal pipe or mass, so that though interbedded and contemporane- ous with the strata at the top, it is intrusive in relation to the strata below. But we cannot always assert that an intrusive mass must have been connected with an outflowing interbedded sheet above.

Section I.—Plutonic, Intrusive, or Subsequent Igneous Rocks. Under this section we have to consider the part played

by igneous rocks which, either possessing a crystalline (sometimes glassy or felsitic) structure have been in- jected in a fluid or at least viscous condition into other rocks, or having been blown into fragments have consoli- dated in volcanic pipes. After some practice in the field the geologist learns to recognize these rocks, and to distin- guish them from the similar masses which must be placed in the contemporaneous series. As a rule their crystalline texture is coarser than in that series; only in a few rare cases does a cellular or amygdaloidal character appear, and the fragmental accompaniments so characteristic of the con- temporaneous sheet are only found in the actual vents of eruption. Granite, syenite, felsite, diorite, basalt, and agglomerate occur in this form.

The general law which has governed the intrusion of igneous rock within the earth’s crust may be thus stated : every fluid mass impelled upwards by pressure from below, or by the expansion of its own imprisoned vapour, has sought egress along the line of least resistance. What that line was to be has depended in each case upon the structure of the tcrrestrial crust and the energy of eruption. In many instances it has been determined by an already existent dislocation; in others by the planes of stratification, or by the surface of junction of two unconformable forma- tions, or by irregular cracks and rents, or by other more complex lines of weakness. Sometimes the intruded mass has actually fused and obliterated some of the rock which it has invaded, incorporating this portion into its own substance. The shape of the channel of escape has neces- sarily determined the form of the intrusive rock, as the mould regulates the form assumed by a mass of cast-

iron. This offers a very convenient means of classifying the intrusive rocks. According to the shape of the mould in which they have solidified, they may be arranged as—(1) amorphous masses, (2) sheets, (3) veins and dykes, and (4) necks.

I, Amorpuous Masszs.—These consist chiefly of crys- talline coarse-textured rocks. Granite and syenite are the most conspicuous, but there are to be included also various quartz-porphyries, felsites, diorites, dc. Where rocks occur in this form which also are found in sheets and dykes as well as contemporaneous beds, it is com- monly observed that they are more coarsely crystalline in the form of amorphous masses than in any other. Doleritic rocks afford many examples of this characteristic.

Granitie Bosses.—It was once a firmly-held tenet that granite is the oldest of rocks, the foundation on which all other rocks have been laid down. This idea no doubt originated in the fact that granite is found rising from beneath gneiss, schist, and other crystalline masses which in their turn underlie very old stratified formations. The intrusive character of granite, shown by its numerous rami- fying veins, proved it to be later than at least those rocks which it had invaded. Nevertheless the composition and structure of gneiss and mica-schist were believed to be best explained by supposing these rocks to have been derived from the waste of granite, and thus, though the existing intrusive granite had to be recognized as posterior in date if was regarded as only a subsequent protrusion of the vast underlying granitic crust. In this way the idea of the primeval or fundamental nature of granite held its ground.

From what has already (ante, p- 258) been said regard- ing the fusion and consolidation of rocks, and the evidence supplied on this subject by granite itself, it will readily be understood that the first or original crust could hardly have been one of granite. That rock, so far as can be made out by careful microscopic examination, appears to have always consolidated under considerable pressure, and in the pre- sence of superheated water and even of liquid carbonic

acid—conditions which probably never obtained at the earth's immediate surface. The original crust may have been of a glassy character like some of the vitreous lavas ; but whatever it was, no trace of it has ever been or is ever likely to be found.

The presence of granite at the existing surface must in all cases be due to the removal by denudation of the masses of rock under which it originally consolidated. The fact that, wherever extensive denudation of an ancient series of crystalline rocks has taken place, a subjacent granite nucleus is apt to appear does not prove that rock to be of a prim- eval origin. It shows, however, that the lower portions of crystalline rocks very generally assume a granitic type, and it suggests that if at any part of the earth we could bore deep enough into the crust we should probably come to a granitic layer. That this layer, even if general round the globe, is not always of the highest geological antiquity is abundantly clear from the fact that in many cases it can be proved to be of later date than fossiliferous formations the geological position of which is known ; that is, the granitic layer has invaded these formations, rising up through them, and probably melting down portions of them in its progress. This is true not only of ancient Paleozoic but of other stratified rocks of various much more recent ages. So that we must conclude that granite does not belong exclusively to the earliest nor to any one geo- logical period, but rather that it has been formed at various epochs, and may even be forming now, wherever the con- ditions required for its production have existed. As a matter of fact granite occurs much more frequently in association with older and therefore lower than with newer and higher rocks. But a little reflexion shows us that this must be the case. Granite having a deep-seated origin must rise through the lower and more ancient masses before it can reach the overlying more recent formations. But many protrusions of granite would doubtless never ascend beyond the lower rocks. Subsequent denudation would be needed to reveal these protrusions, and this very process would remove the later formations and at the same time any portions of the granite which might have reached them.

Granite frequently occurs in the central parts of moun- tain chains ; sometimes it forms there a kind of core round which the various gneisses, schists, and other crystalline rocks are arranged witli more or less irregularity. More frequently it appears in large eruptive bosses which

traverse indifferently the rocks on the line of which they rise. Sometimes it even overlies the schistose and other rocks, as in the Piz de Graves in the upper Engadine, where a wall-like mass of granite, with syenite, diorite, and altered rocks, may be seen resting upon schists. In the Alps and other mountain ranges it is found likewise in large bed-like masses which run in the same general direction as the rocks with which they are associated.

Many of the most characteristic features of granitic bosses can be admirably studied where the rock has risen through contorted sedimentary formations, which form undulating or hilly ground rather than mountains. The granite of the south-east and east of Ireland, the south of Scotland, and the south-west of England may be taken as illustrative examples.

In the south-east of Ireland a mass of granite 70 miles in length and from 7 to 17 in width stretches from north- east to south-west, nearly along the strike of the Lower Silurian rocks. These strata, however, have not been upraiscd by it in such a way as to expose their lowest beds dipping away from the granite. On the contrary, they seem to have been contorted prior to the appearance of that rock ; at least they often dip towards it, or lie horizontally or undulate upon it, apparently without any refcrence to

movements which it could have produced. As Mr Jukes has shown, tle Silurian strata are underlaid bya vast mass of Cambrian rocks, all of which must have been invaded by the granite before it could have reached its present horizon. He infers that the granite must have slowly and irregularly eaten its way upward throngh the Silurian rocks, absorbing much of them into its own mass as it rose. Fora mile or more the stratified beds next the granite have been altered into mica-schist, and are pierced by numerous veins from the invading rock. Within the margin of the granitic mass belts or rounded irregular patches of schist are enclosed ; but in the central tracts where the granite is widest, and where therefore we may suppose the deepest parts of the mass have been laid bare, no such included patches of altered rock occur. From the manner in which the schistose belt is disposed round the granite, it is evident that the upper surface of the latter rock where it extends beneath the schists must be very uneven. Doubtless it rises in some places much nearer to the present surface of the ground than at others,

and sends out veins and strings which do uot appear above ground. If, as Mr Jukes sup- poses, a thousand feet of the schists could be restored at some parts of the granite belt, no doubt the belt would there be eutirely buried; or if, on the other hand, the same thickness of rock could be stripped off some parts of the band of schist, the solid granite underneath would be laid bare. The extent of granite surface exposed must thus be largely determined by the amount of denudation, and by the angle at which the upper surface of the granite is inclined beneath the schists. Where the inclination is high, prolonged denudation will evidently do comparatively little in widening the belt. But where the slope is gentle, and especially where the surface undulates, the removal for some distance of a comparatively slight thickness of rock may uncover a large breadth of underlying granite.}

Recent observations by Professor Hull and Mr Traill of the Geological Survey have shown that in the Mourne Mountains a mass of granite has in some parts risen up through highly inclined Silurian rocks, which consequently seem to be standing almost upright upon an underlying boss of granite. The strata are sharply truncated by the crystalline mass, and are indurated but not otherwise altered, The intrusive nature of the granite is well shown by the way in which numerous dykes of dark melaphyre are cut off when they reach that rock.?

In the Lower Silurian tract of the south of Scotland several large intrusive bosses of granite occur. The strata do not dip away from them on all sides, but with trifling exceptions maintain their normal N.E. and 8.W. strike up to the granite on one side, and resume it again on the other. The granite indeed occupies the place of so much Silurian greywacke and shale. There is usually a metamor- phosed belt of variable width in which, as they approach the granite, the stratified rocks assume a scliistose or gneissoid character. Numerous small, dark, often angular patches or fragments of mica-schist may be observed along the marginal parts of the granite. Similar features are presented by the granite bosses of Devon and Cornwall which have risen through Devonian strata.

The manner in which some bosses of granite penetrate the rocks among which they occur strongly reminds one of the structure of volcanic necks or pipes. The granite is found as a circular or elliptical mass which seems to

descend vertically through the surrounding rocks without seriously altering or disturbing them, as if a tube-shaped opening had been blown out of the crust of the earth up which the granite had risen. Several of the granite masses of the south of Scotland exhibit this character very strik-

‘ See Jukes’s Manual of Geology, 3d ed., p. 243. Horizontal Section No. 22. Geol. Surv. Ireland.

ingly. That granite and grauitoid rocks have actually been associated with volcanic action is shown by the way iu which they occur in connexion with the Tertiary volcanic rocks of Skye, Mull, and other islands in the Inner Hebrides. As Mr Jukes suggested many years ago, granite or granitoid masses may lie at the roots of volcanoes, and may be the source whence tlie more silicated lavas, such as trachyte and liparite, proceed.®

That some granite, however, is of metamorphic origin, that is to say, has been produced by the gradual softening and recrystallization of other rocks at some depth within the crust of the earth, seems to be now satisfactorily estab- lished. Such granite may be looked upon as the extreme of metamorphism, the various schists and gneisses being less advanced stages of the process. Provided the chemical composition of the altered rock be the same as that of granite, it is not necessary that the granite resulting from its alteration should be supposed to differ in any noteworthy particular from ordinary intrusive or igneous granite. The members of the Geological Survey of Ireland have indeed distinguished two granites in Galway, one of which they regard as metamorphic, the other as igneous. The former is characterized by the occurrence of two felspars (orthoclase and oligoclase) ; the latter contains only one (orthoclase). More recently, however, in the east of the country théy have separated two groups of granites, of which the intru- sive masses are composed of dark-coloured quartz, ortho- clase, albite, and black mica (Mourne Mountains), while the metamorphic variety is formed of grey felspar, quartz, and black mica. The mineralogical composition of granite formed by the metamorphism of other and specially sedi- mentary rocks must necessarily vary with that of the masses out of

which it has arisen. In some cases there isa regular gradation from true granite outward into the schistose and gneissose masses. But this passage need not always occur, for if the granite was subject to unequal pressure (which it assuredly would iu most cases be) it would in its soft, pasty condition undoubtedly be squeezed into any rents made in the surrounding rocks, and would thus imitate exactly a truly igneous mass, which in actual fact it would then be. When a mass of granite rises through unaltered or only locally altered strata, it may fairly be assumed to be igneous and intrusive. When, on the other hand, it is intimately associated with extensive masses of schist and gneiss, many of which can only be distinguished from it by their foliated structure, its metamorphic origin may at least be strongly suspected. J*undamentally, indeed, igneous and metamorphic granite seem to be due only to different modifications of the same subterranean processes. A mass of originally sedimentary rocks may be depressed to a depth of several thousand feet within the earth's crust, subjected there to vast pressure and considerable heat in presence of interstitial water or steam, and may thus be metamorphosed into crystalline schists. A portion of this mass, undergoing extreme alteration, may so completely lose all trace of its original fissile structure as to become amorphous crystalline granite, some of which may even be thrust as veins into the less highly changed parts above and around. One stage further would bring before us a con- nexion opened between the surface and such a deep-seated granitic mass, and the consequent ascent and outburst of acid lavas and their fragmental accompaniments.

Amorphous Masses of Diorite, d:c.—On a smaller scale usually than granite, other crystalline rocks assume the condition of amorphons bosses. Syenite, diorite, quartz- porphyry, and members of the basalt family have often been erupted in irregular masses, partly along fissures, partly along the bedding, but often involving and appar- ee tng Oe, Omen hye

3 Manual of Geology, 2d ed., p. 93; Geikie, Trans. Geol. Soc.

. Ldin., ii. 8301; Judd, Quart. Journ. Geol. Soc., XXX. 220.

ently melting up portions of the rocks through which they have made their way. Such bosses have frequently tortu- ous boundary-lines, since they send out veins into or cut capriciously across the surrounding rocks, In Wales, as shown by the maps and sections of the Geological Survey, the Lower Silurian formations are pierced by hnge bosses of different crystalline rocks, mostly included under the old term “greenstone,” which, after running for some way with the strike of the strata, turn round and break across it, or branch and traverse a considerble thickness of strati- fied rock. Incentral Scotland numerous masses of dolerite and quartziferous diabase have been intruded among the Lower Carboniferous formations. One horizon on which they are particularly abundant lies about the base of the Carboniferous Limestone series. Along that horizon they rise to the surface for many miles, sometimes ascending or descending in geological position, and breaking here and there abruptly across the strata) There can be little donbt that they have actually melted down some parts of the stratified rocks, particularly the limestone. Considerable petrographical differences occur among them which may perhaps be in some measure due to the incorporation of such extraneous material into their mass. Gaps occur whiere these intrusive rocks do not rise to the surface, but as they resume their position again not far off, it may be presumed that they are really connected under these blank intervals.

The amount and nature of the alteration produced on contiguous rocks by the invasion of an intrusive boss vary necessarily with the character and bulk of the igneous mass, as well as with the susceptibility of the surrounding rock to metamorphism. Induration is generally traceable ; shales are hardened into porcelain, jasper, Lydian-stone, or some other flinty argillaceous rock. Sandstones are con- verted into a kind of lustrous quartz-rock. Limestones are made to assume a granular or crystalline texture, passing into marble or sometimes into dolomite. Under favour- able conditions crystals of garnet, analcime, pyrite, and other minerals are developed in the surrounding altered rock.

There can be little doubt that, though the portions of these rocks now visible consolidated under a greater or less depth of overlying rock, they must in many cases have been directly connected with superficial volcanic action. Some of them may have been underground ramifications of the ascending

molten rock which poured forth at the surface in streams of lava. Others may mark the position of intruded masses which were arrested in their ascent in the unsuccess- fal attempt to open a new volcanic vent.

Il. Saeers.—These are masses of crystalline rock which have been intruded as sheets between other rocks, and now appear as more or less regularly defined beds. In almost all cases it will be found that these intrusions have taken place between the planes of stratification. The ascending mass of molten matter, after breaking across the rocks, or rather after ascending through fissures either previously formed or opened at the time of the outburst, has at last found its path of least resistance to lie along the bedding planes of the strata. Accordingly it has thrust itself between the beds, raising up the overlying mass and solidifying as a nearly or exactly parallel cake or bed.

It is evident that one of these intercalated intrusive sheets of igneous rock must present such points of resem- blance to a truly contemporaneous bed of lava as to make it occasionally a somewhat difficult matter to determine its true character, more especially when, owing to extensive denudation, only a small portion of the rock can now be seen. The following characters mark intrusive sheets, though they must not be supposed to be all present in every case. (1.) They do not rigidly conform to the bedding, but

sometimes break across it and run along on another plat- form. (2.) They catch up and involve portious of the sur- rounding strata. (3.) They are commonly most close-grained at their upper and under surfaces, and most coarsely crystal- line in the central portions. (4.) They are very rarely cellular or amygdaloidal. (5.) The rocks both above and below them are usually hardened and otherwise more or less altered.

Many of the older volcanic rocks occur in this form, as felstone, quartz-porphyry, diorite, melaphyre, diabase, dolerite, basalt, and others. The remarks above made regarding the connexion of intrusive bosses with volcanic action may be repeated with even greater definiteness here.

Intrusive sheets abound in old volcanic districts intimately associated with dykes and surface outflows, and thus bring- ing before our eyes traces of the underground mechanism of the volcanoes.

The same kinds of alteration may be observed along the line of junction of intrusive sheets with the adjacent rocks as in the case of amorphous masses; but as the boundary lines are often very sharply defined they present the process of alteration in a more generally accessible and interesting form. Sandstone, for example, besides being indurated and acquiring the distinct lustre of quartzite, may occasion- ally be seen to possess a distinctly prismatic structure—tle prisms or columns diverging at right angles to the line of junction with the igneous rock. Even microscopic black microlites, like those which occur in basalt-rocks, have been detected in altered sandstone, in the minute fissures of which: they may be supposed to have been sublimed from the molten injected mass. Argillaceous rocks are commonly converted into hard flinty textures to which the names of flinty-slate, Lydian-stone, jasper, and porcellanite have been applied. Coal-seams when invaded by intruded sheets of igneous matter assume different aspects according to the thickness and nature of the invading sheet, the depth of the coal-seam, and probably to other less easily recognizable causes. In some cases the coal has been fused and has acquired a blistered or vesicular texture, the gas cavities being either empty or filled with mineral matter such as calcite. In other cases it has nearly disappeared, the re- maining portion being a black soot or ash. In others it has become lard and brittle, and has been converted into a kind of anthracite or "‘ blind-coal," owing to the loss of its more volatile portions. In the Ayrshire coal-fields the coal seams have sometimes become beautifully coluninar owing to the intrusion of a sheet of basalt along them. The hexagonal and pentagonal columns diverge like rows of stout pencils from the surfaces of the basalt. In one coal- field of that county a seam of coal has been converted into graphite. The accompanying section (fig. 55) by the late

Fig. 55.—Sheets and strings of intrusive rock in the Ten-yard Coal, South Staffordshire.

Mr Jukes represents one of the numerous sheets of " white rock " intruded into the South Staffordshire coal-field. The horizontal distance shown in

this section is more than 100 yards. The coal (0) resting on sandstone © is traversed by irregular strings and sheets (a) of what the miners term “ white-rock,” which proceed from the large basalt masses of the district. The coal has there become dull and anthra- citic, and is not worth being extracted.

When a coal-field is much invaded by igneous rocks the seams of coal are usually found to have suffered more than the other strata, not merely because they are specially liable to alteration from the proximity of heated surfaces, but

because they have presented lines of more easy escape for the igneous matter pressed from below. The molten rock has very generally insinuated itself along the coal-seams, sometimes taking the lower, sometimes the upper surface, and not infrequently forcing its way along the centre.

In the destruction or alteration of coal and bituminous shales a process of subterranean distillation must often have been set in progress. The gases evolved would find their way to the surface through joints and pores of the overlying rock. The liquid products, on the other hand, would be apt to collect in fissures and cavities. In central Scotland, where the coal-fields have been so abundantly pierced by igneous masses, petroleum and asphaltum are of frequent occurrence in many districts, sometimes in cliinks and veins of sandstones and other sedimentary strata, sometimes in the cavities of the igneous rocks themselves.

It is a remarkable fact that, striking as is the change produced by the intrusion of basalt into coals and bitumin. ous shales, it is hardly more conspicuous than the alteration effected on the invading masses themselves. A compact crystalline black heavy basalt or dolerite, when it sends sheets and veins into a coal or highly carbonaceous shale, becomes yellow or white, earthy, and friable, loses weight, ceases to have any apparent crystalline texture, and in short passes into what any observer would at first unhesitatingly pronounce to bea mere clay. It is only when the distinctly intrusive character of this substance is recognized in the veins and fingers which it sends out, and in its own irregu. lar course in the coal, that its true

nature is made evident (see fig. 55). Microscopical examination shows that this “white-rock”” or “ white-trap” is merely an altered form of basalt, wherein the felspar crystals, though much decayed, can yet be traced, the augite, olivine, and magnetite being more or less completely changed into a mere pulverulent earthy substance. A specimen of this altered rock was

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It is evident that most of the alkalies and much of the silica have been removed, and that most of the iron exists as carbonate of the protoxide.

In connexion with the alteration produced by igneous sheets upon their contiguous stratified rocks, reference may here be made to the lithological differences traceable within the igneous masses. The close grain already referred to as characteristic of the upper and under portions of an intrusive sheet evidently depends upon more rapid cooling towards the surface of contact with the adjacent cold rocks. When thin slices of these marginal parts are placed under the microscope, they sometimes show abundant black microlites which disappear as the rock is traced away from the margin. They may be regarded as incipient stages in the crystallization of the magnetite, arrested in their de- velopment by the rapid consolidation of the outer parts of the rock. In the central portions they lave had an opportunity of coalescing into octahedra or groups of definite isometric crystals. A series of sections of a rock, from the outer edge where the arrested crystallites occur to the centre where definitely-built crystals appear, brings in this way before us a history of the stages in the consoli- dation of the mass.

But considerable differences in composition may also be

detected in different portions of the same intrusive sheet. A rock which at one place gives under the microscope a coarsely crystalline texture with the petrographical elements of dolerite will at a short distance show abundant orthoclase and free quartz—minerals which do not belong to normal dolerite. These differences, like those above referred to as noticeable among amorphous bosses, seem too local and sporadic to be satisfactorily referred to original differences in the composition of various parts of the molten mass, or to segregation by gravitation or otherwise. They suggest rather that the great intrusive sheets, in their passage through the rocks underneath, have here and there involved and melted down portions of these rocks, and have thus acquired locally an abnormal composition.

II], Veins anp Dyxxs.—Veins of igneous rock may occur indifferently in igneous, aqueous, or metamorphic rocks. They may range in diameter from mere thread-like filaments up to huge bands many feet or yards broad. In regard to their origin they may be grouped into two series —(1) veins of segregation, and (2) veins of intrusion.

Veins of Segregation.—These include most of what were formerly and not very happily termed “contempor- aneous veins.” They are peculiar to crystalline rocks. They abound in many granites, likewise in some gneisses and schists. They may not infrequently be observed in sheets of diorite, dolerite, and diabase. They run as straight, curved, or branching ribands, seldom exceeding a foot in thickness. Most frequently they are fiuer in texture than the rock which they traverse, though now and then the reverse is the case, more especially in granite. Close examination of them shows that they are not sharply defined by a definite junction line with the enclosing rock, but that on the contrary they are welded into that rock in such a way that they cannot easily be broken along the plane of union. This welding is found to be due to the mutual pro- trusion of the component crystals of the vein and of the surrounding rock—a structure sometimes admirably re- vealed under the microscope. Veins of this kind are evi- dently to be referred to the earliest condition of the rocks in which they occur, They point to some process, still un. explained, whereby into rents

formed in the deeply buried, and at least partially consolidated or possibly colloid, mass there was a transfusion or exosmosis of some of the erystal- lizing minerals.

Veins of Intrusion.—These are portions of once-melted or at least pasty matter which have been injected into rents of previously solidified rocks. When traceable suffi- ciently far, they may be seen to swell out and merge into their large parent mass, while in the opposite direction they may become attenuated into mere threads. Sometimes they

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Fic. 56.—Intrusive igneous rock.

run for many yards in tolerably straight lines, and when this takes place along the stratification they look like beds. At these parts, they are of course really intrusive sheets. But they may frequently be found to start suddenly upward or downward, and to break across the bedding in a very irregular manner. In fig. 56 ¢ represents an intrusive

igneous rock running through horizontal strata s. If we saw merely the horizontal portion below or above, the really igneous and intrusive nature of the rock ¢ might escape us, but the intermediate connecting vein makes its character at once apparent. ie

No rock exhibits so admirably as granite the varieties assumed by veins. In many cases the veins which traverse the granite itself must be regarded as segregation or infiltra- tion veins, as already described. But where they proceed from the granite, and traverse surrounding rocks, they are probably in most cases intrusive, though where granite and highly granitic gneiss are in contact we may conceive that some of the veins traversing botli rocks may be segregation veins. Most large masses of granite send veins into the surrounding rocks. Frequently the veins so abound as to form a complicated net-work. They vary in breadth from several feet or even yards down to fine filaments at the ends of the smaller branches. They frequently cross each other, not ouly outside of the granite mass, but even within it. They vary

much in texture and in composition. Sometimes they are coarsely crystalline ; but probably most of the veius of this kind are due rather to segregation than intrusion. Most frequently granite veins traversing granite are finer- grained than the main mass. Veins which are clearly in- trusive are not only finer in grain than the parent granite, but sometimes present considerable differences in minera- logical composition. The mica, for example, may be reduced to exceedingly minute and not very abundant flakes, and may almost disappear. The quartz also occa- sionally assumes a subordinate place, and the rock of the veins passes into eurite, elvanite, or one of the varieties of porphyry.

The rocks surrounding a granite mass and traversed by granite veins are almost always more or less metamorpliosed in a belt varying in breadth from a few yards up to a mile or more. It is in this zone that the granite veins typically occur. The altered rocks have assumed the characters of gneiss, mica-schist, or other metamorphic product, but re- sume their usual condition as we trace them away from the granite. Ourious angular portions of them may often be observed within the granite veins and in the main granite mass. In Cornwall the granite and surrounding slates are traversed by veins of quartz-porphyry termed elvans, which are most numerous near the granite. They vary in width from a few inches or feet to 50 fathoms, their central por- tions being commonly more crystalline than the sides. In the great granite region of Leicester Mr Jukes traced some of the elvans for several miles running in parallel bands, each only a few feet thick, with intervals of 200 or 300 yards between them. Many of the other intrusive rocks likewise present the phenomena of veins; diorite, diabase, melaphyre, and basalt furnish numerous illustrations.

Dykes are wall-like masses of igneous rock, filling vertical or highly-inclined fissures. They differ therefore from veins in the greater parallelism of their sides, their verticality, and their greater regularity of breadth and persistence of dircction. They present as great a variety of thickness as that which is shown by veins. Some- times they occur as mere plates of rock not more than an inch or two in thickness; at other times they attain a breadth of ten or twelve fathoms. The smaller or thinner dykes can seldom be traced more than a few yards; but the larger examples may be followed sometimes for miles. Thus in the south of Scotland a remarkable series of basalt- dykes

can be traced across all the geological formations of that region and even across powerful faults) They run parallel to each other in a general north-west and south-east direction for distances of 20 and 30 miles. A remarkable dyke crosses the north of England from the coast of York- shire for fully 60 miles inland.

GEOLOGY

[1V. STRUCTURAL.

The name dyke is applied to these masses of igneous rock ‘on account of their resemblance to wails (Scotdce, dykes). Their sides are often as parallel and perpendicular as those of a piece of masonry. Moreover, the resemblance to humau workmanship is sometimes brought out still more by the numerous joints which, intersecting each other along the face of a dyke, remind us of well-fitted masonry. Where the surrounding rock has decayed, the dykes may be seen projecting above the ground exactly like walls ; indeed in many parts of the west of Scotland they are made use of for enclosures. The material of the dykes has in other cases decayed, and deep ditch-like hollows are left to mark their sites. The coast-lines of many of the Inner Hebrides and of the Clyde Islands furnish numerous admirable examples of both kinds of scenery.

While veins have been injected into irregular branching cracks, dykes have been formed by the welling upwards of liquid rock in vertical or steeply inclined fissures. Some- times the line of escape has been along a fault. In Scot- land, however, which may be regarded as a typical region for this kind of geological structure, the vast majority of dykes rise along fissures which have no throw, and are therefore not faults. On the contrary the dykes may be traced across some of the largest faults in the midland counties.

While the term dyke might be applied to some of the wall-like intrusions of porphyry, elvauite, and even of granite, it is more typically illustrated among the augitic igneous rocks, such as basalt, diabase, &c., though also ainong diorites, porphyries, pitchstones, &c. The central parts of a dyke are usually most crystalline. Towards the margin the grain beconies finer, and even sometimes passes into a vitreous condition. Many of the basalt dykes in different parts of Scotland are coated along the sides with a film or crust

of black vitreous tachylite. Lines of amygdaloidal kernels may not infrequently be traced along the centre of a dyke.

When the rock on one side is freshly stripped off, the dyke is usually observed to present a system of polygonal jointing. The joints start from each face or cheek, and either go right across to the opposite side, or branch and lose themselves about the centre. They thus divide the dyke into irregular prisnis which, when the dyke is vertical, lie of course in a horizontal position, whence they depart in proportion as the dyke is inclined. Occasionally the prisms are as well-formed as in any columnar bed of basalt. A less prominent set of joints runs parallel with the two cheeks of a dyke.

There is usually some alteration of the stratified rocks in contact with a dyke; but the nature and amount of the change vary within a wide range. The most sensitive material to this influence is undoubtedly coal. A seam of coal 6 or 8 feet in thickness may be observed to grow dull and brittle at a distance of 50 yards from a large dyke, becoming what is termed “blind coal,” as it then burns without flame. Still nearer to the intrusive mass the coal passes into a kind of pyritous cinder scarcely half the original thickness of the seam. At the actual contact with the dyke it becomes by degrees a kind of caked soot not more perhaps than a few inches thick. Sandstones are hardened into a kind of lustrous quartzite, and sometimes made columnar, shales into flinty slate or porcellanite ; limestones are occasionally rendered crystalline and even dolomitic. Occasionally a segregation of new minerals has taken place in the rocks adjoining a dyke. But cases are by no means infrequent where dykes have produced little or no appreciable change upon the contiguous rocks.

IV. Necxs.—Under this term are included the filled-up pipes or funnels of former volcanic vents. Every series of voleanic sheets poured out at the surface must have been

connected with one or more orifices which, on the cessation of the eruptions, would remain more or less completely filled with lava or with fragmentary matter. sequent denudation should remove the overlying cone

andits surrounding piles of lava and tuff, these vents must remain buried under the materials which came out of them. So extensive, however, has been the waste of the surface in many old volcanic regions that the sites of the vents have been laid bare. In the study of these we have before us some of the more deep-seated phenomena of volcanic action never to be seen in any modern volcano.

A neck is of a circular or elliptical, but occasionally of a more irregular branching form. It varies in diameter from a few yards up to a mile, or even more, It descends

into the earth perpendicularly to the stratification of the |

formation to which it belongs. Thus, if a neck was formed and filled up during the accumulation of a certain group of strata, it would rise on the whole vertically through these strata, and its ejected lava or tuff would spread out con- formably among them. Should the rocks be subsequently tilted the neck would of course be thrown out of the verti- cal. As arule, however, the vertical descent of the necks into the earth's crust has been comparatively little interfered with.

The materials filling up ancient volcanic orifices are sometimes crystalline, sometimes fragmental. The neck may be occupied by some form of lava, as felstone, quartz- porphyry, diabase, porphyrite, basalt ; or by the fragment- ary materials which fell back into the throat of the volcano aud finally solidified there; or by both kinds of rock com- bined. . Among the Paleozoic volcanic districts of Britain the necks not infrequently are filled with some siliceous crystalline rock, such as a quartz-porphyry or felstone, even where the surrounding lavas are basic. Necks of agglomer- ate and fine tuff abound among the Carboniferous and Permian volcanic regions of Scotland.

The fragmentary materials consist mainly of different lava-form rocks imbedded in a gravelly peperino-like matrix of more finely comminuted debris of the same rocks; but they also contain, sometimes in abundance, fragments of the strata through which the necks have been drilled. Pieces of fine stratified tuff not infrequently appear in the agglomerates. This fact, coupled with the not uncommon occurrence of a tumultuous fractured and

highly-inclined bedding of the materials in the necks appears to show that the pipes were partly filled up by the subsidence of the tuff consolidated in beds within the crater and at the upper part of the funnel. Veins of basalt abound in many of the necks of Carboniferous age in central Scotland.

The strata round a neck are usually somewhat hardened. The sandstones have acquired sometimes a vitreous lustre ; argillaceous beds have been indurated into porcellanite ; coal-seams have been burnt and rendered unworkable. These changes may be due partly to the heat of the ascend- ing column of molten rock or ejected fragments, partly to the ascent of heated vapours, even for a long time subsc- quently to the volcanic explosions. Proofs of a metamor- phism probably due to the latter cause may sometimes be seen within the area of a neck. It is where the altered materials are of a fragmentary character that the nature and amount of this change can be best estimated. What was originally volcanic dust has been converted into a crystalline and even porphyritic mass, through which, however, the likewise intensely altered blocks interspersed through the agglomerate are still recognizable. Such blocks as, from the nature of their substance, must have offered most resistance to change,—pieces of sandstone or quartz, for example,—stand out prominently in the altered mass, though even they have undergone more or less modification, the sandstone being converted into vitreous quartz-rock.

But unless sub-

- calated.

Section II.— Volcanic, Interbedded, or Contemporaneous Igneous Rocks.

The rocks comprised in this section have all been ejected to the surface like the lava-streams and showers of ashes of modern volcanoes. It is evident that on the whole they must agree in lithological characters with those rocks, described in the previous section, which have been extravasated by volcanic efforts though not quite reaching the surface. Yet they have some

well-marked general characters, of which the most important may be thus stated. (1.) They occur as beds or sheets which conform to the bedding of the strata among which they are inter- (2.) They do not break into or involve portions of the overlying beds. (3.) The upper and under por. tions of the lava sheets present commonly a scoriaceous or vesicular character, which may even be found extending throughout the whole of a sheet. (4.) Beds of tuff are frequently interstratified with the crystalline sheets.

I. Crystatyine.—While the underground course of a protruded mass of molten igneous rock has widely varied according to the shape of the channel through which it pro- ceeded, and in which, as in a mould, it solidified, the behaviour of the rock, once poured out at the surface, has been much more uniform. As in modern lava, the erupted rock has rolled along, varying in thickness and other minor characters, but retaining the broad general aspect of a bed or sheet. A comparison of such a bed with one of the intrusive sheets already described shows that in several important respects they differ from each other. An intrusive sheet is closest in grain near its upper and under surfaces, A con- temporaneous bed or true lava-flow, on the contrary, is there usually most open and scoriaceous. In the one case we rarely see vesicles or amygdules, in the other they often abound. However rough the upper surface of an inter- bedded sheet may be, it never sends out veins into nor encloses portions of the superincumbent rocks, which, how- ever, sometimes contain portions of it, and wrap round its hummocky irregularities, as shown in fig. 57, Occasion-

Fic. 57.—Section of the upper surface of an interbedded sheet T, showing how its unevennesses are wrapped round and covered by the sedimentary rocks S, ally it may be observed to be full of rents which have been filled up with sandstone or other sedimentary material. In these cases we see that the lava cracked in solidifying, and that sand was washed into the fissures where it consolidated. The amygdaloidal cavities throughout an interbedded sheet, but more especially at the top, may often be noticed with an elongated form, and even pulled out into tube-like hollows in one general direction, which was obviously the

line of movement of the yet viscous mass.

Some kinds of rock when occurring in interbedded sheets are apt to assume a system of columnar jointing. Basalt in particular is distinguished by the frequency and perfec- tion of its columns, The Giant’s Causeway and the cliffs of Staffa, of Ardtun in Mull, and of Loch Staffin in Skye are well-known examples, The columns are set perpendicularly to the two cooling surfaces, that is, to the top and bottom of the bed. Any inclination from the horizontal in the disposition of the bed will cause a corresponding departure from the vertical on the part of the columns. Sometimes the columns are arched or curved, as in the Clam-shell Cave, Staffa.

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A single interbedded sheet of crystalline rock seldom occurs by itself without any other volcanic accompaniment. It is usually associated at least with bands of tuff showing that the emission of lava was not unattended with frag- mentary ejections. In the majority of cases it will be found to form part of a series of interbedded sheets with intercalated tuffs. Vast piles of such consecutive flows, reaching a total depth of several thousand feet, remain to witness the energy of former volcanic vents.

JI. FRAGMENTAL.—The rocks embraced under this term include all the fragmentary volcanic ejections which enter into the composition of the earth’s crust, from the coarsest agglomerate to the finest tuff. They differ in lithological character, according to the nature of the lavas with which they are associated and from which they have been derived. Thus in a region of trachyte-lavas, we have trachyte-tuffs, trachyte-breccias; in one of basalts, we find basalt-breccias, basalt-agglomerates, basalt-tuffs; in one of obsidians, we meet with pumiceous tuffs and breccias. The fragmentary matter has been ejected from volcanic vents, and has fallen partly back into the funnels of discharge, partly over the surrounding area. It is therefore apt to be more or less mingled with ordinary sedimentary detritus. We find it indeed passing insensibly into sandstone, shale, limestone, and other strata.

Great differences occur in the texture of fragmental rocks even in the same volcanic districts, They are often coarse and tumultuous at or near the vents, and fine-grained at a distance. Alternations of gravelly peperino-like tuff

with a very fine-grained “ash” may frequently be observed. Large blocks of lava-form rock, as well as of the strata through which the volcanic explosions have taken place, occur in the tuffs of most old volcanic districts.

It has been already pointed out that agglomerate and tuff are not infrequently to be met with occupying the sites of the vents of eruption. Their most common disposi- tion, however, is in beds either alone or associated with interbedded lavas. Masses of fine or gravelly tuff several liundreds of feet in thickness, without the intervention of any lava-bed, may be observed in the volcanic districts of the Old Red Sandstone and Carboniferous systems in Scotland. On the other hand, in these same areas thin seams of tuff may be seen interlaminated with ordinary sandstone, shale, or limestone. In the one case we have evidence of long-continued and powerful volcanic action, during which fragmentary materials were showered out and spread over the water-basins to the exclusion of ordinary sediment. In the other we have proof of feeble intermittent volcanic explosions, whereby light showers of dust were discharged, which settled down quietly amidst the sand, mud, or limestone accumulating around at the time. Under these latter circumstances tuffs often became fossiliferous ; they enclose the remains of such plants and animals as might be lying on the lake-bottom or sea-floor over which the showers of volcanic dust fell, and thus they form a con- necting link between aqueous and igneous rocks.

VITI.—MeEramorpuic Rocks as Parts oF THE ARCHITECTURE OF THE Eartu’s Crust,

In part ii, (ante, p. 235) some account has been given of the composition of certain foliated rocks frequently met with in the central portions of mountain chains and else- where, lying beneath geological formations of high antiquity. In part iii, in the discussion of the hypogene causes of change within the earth’s crust, reference was again made to these rocks, and they were alluded to as examples of the effects of subterranean processes altering the original character of large mineral masses (ante, p. 263). They were there cited as metamorphic rocks, but their characters

as integral parts of the earth's crust were reserved for dis- cussion in the present part of this article.

At the outset some caution must be employed as to the exact meaning in which the terms '" metamorphism" and "metamorphosed" are employed. In a certain sense it may be said that all or nearly all rocks have been metamor- phosed, since it is exceptional to find any, at least among such as are not in a geological sense of modern date, which do not show, when closely examined, proofs of having been altered by the action of percolating water or other daily acting metamorphic agent. Even a solid crystalline mass which, when viewed on a fresh fracture with a good lens, seems to consist of unchanged crystalline particles will usually betray under the microscope unmistakable evidence of alteration. And this alteration may go on until the whole internal organization of the rock has been readjusted, though the external form may still remain such as hardly to indicate the change, or to suggest that any new name should be given to the recomposed rock. Among many igneous rocks, particularly the more basic kinds, as basalts, diorites, olivine rocks, &c., metamorphism of this kind may be studied in all its stages.

But it is not to alteration of this nature, effected at the surface by meteoric water, that the term metamorphism is properly applied. That word is reserved for the process of subterranean change above treated of (ante, p. 258), whereby a more or less complete transformation has been effected throughout vast mineral masses which, while under- going crystalline rearrangement, have usually suffered simultaneously enormous compression. Gneiss, mica-schist, and the other schistose or foliated rocks are typical ex- amples of the results of this metamorphic process.

Three antagonistic opinions are at present entertained regarding the origin of these rocks. Some geologists regard the crystalline schists as plutonic rocks representing the early cooled crust of the earth, and suppose that a similar schistose structure has occasionally been super- induced by plutonic action on later sedimentary formations. Again, by some recent writers the Wernerian notion of chemical precipitation has been revived, and the idea of metamorphism has been discarded. These authors suppose that the

schistose rocks, in common with many pyroxenic and hornblendic rocks (diabases, diorites, &c.), as well as masses in which serpentine, talc, chlorite, and epidote are prevailing minerals, have been deposited "'for the most part as chemically-formed sediments or precipitates, and that the subsequent changes have been siniply molecular, or at most confined in certain cases to reactions between the mingled elements of the sediments, with the elimination of water and carbonic acid." To support this view, it is necessary to suppose that the rocks in question were formed during a period of the earth's history when the ocean had a consider- ably different relative proportion of mineral substances dis- solved in its waters, and consequently that they must be assigned to a very early geological period, anterior indeed to what are usually termed the Palzozoic ages. And it becomes further needful to discredit the belief that any gneiss or schist can by possibility belong to one of the later stages of the geological record, The more thorough-going advocates of the pristine or "eozoic" date and original chemical deposition of the so-called '' metamorphic " rocks do not hesitate to take this step, and endeavour, by ingeni- ous explanations, to show that the majority of geologists have mistaken the geological structure of the districts where these rocks have been supposed to be metamorphosed equi- valents of what elsewhere are Palzozoic, Secondary, or Tertiary strata.1 Prevalent opinion supports the third or metamorphic theory, according to which the schistose rocks

1 See Sterry Hunt's Chemical Essays, p. 283 sq.

are held to be crystalline transformations of ordinary sedi- mentary strata. The problem whether or not certain masses of gneiss or schist represent equivalent unaltered sedimnent- ary rocks of other districts is mainly one of structural geology. It must be decided by the geologist rather than the chemist. It has been answered in the affirmative by the great majority of stratigraphical geologists all over the world. We may uot be entitled to assert that every mass of gneiss or schist is a metamorphosed sedimentary rock. Possibly some foliated rocks of extreme antiquity may have originated directly from chemical precipitation. But when it can be shown that ordinary stratified rocks have been converted into schist and gneiss, it

seems permissible to hold that all such rocks have had a similar origin, at least until good reasons can be adduced against that view.

It is evident that if the so-called metamorphic rocks can anywhere be seen to graduate into unaltered strata, it is there that they ought to be specially studied, and that light may be expected to be cast on their origin and history. It is customary to speak of metamorphism as being either local or regional, that is, being confined to one limited portion of a mass of rock, or as extending throughout the whole of the rock and over wide districts. It is doubtless from the first of these developments that we may hope to learn most regarding metamorphic changes.

Local (Contact) Metamorphism.—The simplest and most obvious examples of thiskind of alteration occur where a mass of igneous rock has invaded sedimentary strata, which have in consequence been affected in lithological character along the margin of contact with the intrusive rock. Allusion has already been made to changes of this kind effected by intrusive sheets and dykes, and likewise traceable round the edges of ancient volcanic vents. Sandstones are con- verted into a lustrous crystalline quartz-rock ; shales and argillaceous strata are indurated into porcellanite, jasper, flinty-slate, or some analogous product. Limestones are made crystalline ; coals are charred, turned into anthracite, and sometimes even into graphite. These metamorphisms extend to very variable distances from the intrusive rock. Sometimes they are scarcely perceptible at all, and disap- pear within a space of a few inches. In other cases they extend for some feet, and in the case of some coal-seams even to 50 yards or more.

It is around bosses of granite however that the most inarked examples of local metamorphism can be observed. On a previous page some account has been given of the way in which the Silurian rocks of Ireland and the south of Scotland are pierced by large masses of granite, and how, as they approach the granite even at a horizontal distance of a mile or more, they begin to assume a micaceous foliated texture which becomes more and more marked until, along the margin of the granite, they pass into true mica-schist and gneiss. The identity of origin between these schistose masses and the greywackes and shales beyond the metamor- phic zone does not admit of any question. The unaltered rocks can be followed step by step

into and through the stages of alteration, until they are found to have acquired the genuine gneissic or schistose structure. Moreover, it may be observed that all the bands of sedimentary rock do not give rise to the same kinds of metamorphic products. Some kinds of strata are more prone to alteration than others, and give rise to more perfect schists. In the south of Scotland, for example, certain greywackes and grits formed of a granular mixture of quartz-sand, felspar, clay, and various decomposition products have been metamor- phosed into perfect mica-schist, while some bands of black anthracitic and graptolitic shale have merely been intensely indurated and shattered. Many districts in Scotland, in Ireland, in the lake country of England, and in Wales might

lies upon similar mineral masses.

be cited as furnishing examples of this gradual conversion of ordinary sedimentary rocks into true schists.

Regional Metamorphism.—If then it can be proved that over limited areas thoroughly foliated rocks have been produced by the transformation of ordinary sedimentary strata, a presumption is established in favour of a similar mode of origin for foliated rocks elsewhere and over wider regions. There occur many vast spaces of the earth’s surface occupied by foliated rocks. In Finland, Scandi- navia, and the Scottish Highlands tracts many thousands of square miles in extent consist of gneiss, mica-schist, hornblende-rock, and other members of the same great family of rocks. A large portion of British North America Rocks of this type com- monly rise also along the core of great mountain ranges, as in the Alps and in the Rocky Mountains. If these rocks which cover such vast areas were originally ordinary sedi- mentary rocks, they must have been metamorphosed, not by mere local protrusions of igneous matter, but by some general process.

Gradations of Metamorphism.—We have seen above that the nature and extent of the alteration experienced by rocks have been regulated, not

merely by tlie vigour of the meta- morphic process, but by the composition and structure of the rocks themselves. A siliceous sandstone, for instance, containing little or no alumiuous or other admixture, seems to be capable of retaining much of its original character, while surrounding or intercalated less purely quartzose beds have been completely changed. It is converted into quartz-rock, but still shows the rounded quartz grains of the original sand. In proportion as the sand has been mixed with clay it has produced arock more susceptible of change. ‘The argillaceous (or magnesian) cement has been attacked, and in the process of change the quartz-sand has been affected. Mica in one or other of its various forms, aluminous or magnesian, has very generally appeared, and in proportion to its development has the foliated structure been made apparent. Hence we may obtain every grada- tion from a quartz-rock or grit into a true mica-schist or gneiss,

Production of Foliation.—The term “foliation” means the separation of a rock into approximately parallel or lenticular crystalline layers or folia of different mineral composition. It implies a segregation and crystallization of mineral matter along distinct planes. Those who main- tain the original chemical precipitation of the most ancient gneisses and schists believe that the folia mark the strati- fication of the successive layers of deposit. Those, on the other hand, who hold that all the schistose rocks about the origin of which any satisfactory conclusion can be reached were originally mechanical sediments of ordinary kinds, regard the folia as coincident generally with the stratifica- tion of these sediments.

The folia of a gneiss or schist are crystalline aggregates which along their planes of mutual contact are as it were welded or felted into each other by the interlacing of their several component crystals. They are destitute, as a rule, of the parallelism, flatness, and persistence so characteristic of stratification. On the contrary they are apt to swell out into thick concretionary aggregations and to die out rapidly ; they exhibit a wavy, crumpled, or puckered arrangement traceable in vast folds on the side of a moun- tain, and yet descending even to such minute corrugation as can only be detected by the microscope.

Foliation occurring in altered sedimentary rocks must be due to a crystallization and rearrangement of the chemical constituents of these

rocks along certain lines. On a former page (ante, p. 263) it was pointed out that this kind of metamorphism would as a rule proceed along the lines of stratification. Doubtless in the vast majority of cases

the planes of foliation are coincident with the general direction of this stratification. The metamorphic rocks of the Scottish Highlands furnish admirable proofs of this fact. Bands of quartz-rock and schist alternate with each other and with zones of limestone, precisely as beds of sandstone, shale, and limestone do in unaltered formations. Thin seams of pebbly grit with well-rounded water-worn pebbles may be observed running parallel with the folia of a schist, as a seam of fine grit or conglomerate may be seen to do ina series of shales. Nay, even the false-bedding so characteristic of mechanical sediment may be observed among these metamorphic rocks. The metamorphism 1s not uniform in these regions. Here and there it becomes intensified, and the rocks assume a thoroughly crystalline aud much disturbed aspect. But as they recede from these areas they are found to lose much of their foliated character, and indeed to present such slight traces of meta- morphism that they can be at once recognized as grey-wackes, grits, and shales. Moreover, they have been thrown into anticlinal and synclinal folds, and in these and other larger features of geological structure they differ in no essen- tial respect from ordinary unaltered strata. Lastly, fossili- ferous limestones containing Silurian shells have been found at their base, so that they have all been formed long after the seas over the area of Britain had been tenanted by living organisms.

Professor Sedgwick and Mr Darwin pointed out many years ago that a crystalline rearrangement of mineral matter has in some cases taken place along the planes of cleavage. We have already observed that the water which has been the great agent of metamorphism must always have followed the dominant divisional planes of a rock. If these planes were those of cleavage, the foliation would doubtless be produced along them, irrespective of the original laminse of deposit. So long as the rock remained tolerably homogeneous in chemical composition, there seems no reason why foliation along the cleavage should differ in any material respect from that along strati- fication. But it may be doubted whether a cleavage

foliation could run without sensible and even very serious interruptions over wide areas. For, in the first place, in most large masses of sedimentary matter we encounter alternations of different kinds of sediment, which could not but produce distinct kinds of rock under the in- fluence of metamorphic change. In the second place, cleavage depends for its perfection and continuity on the fincness of grain of the rock through which it runs. While exceedingly perfect in a mass of argillaceous strata, it becomes feebler or even dies out in a coarse sandy or gritty rock. Hence, where foliation coincides with cleavage over large tracts, there will almost certainly be bands, more or less distinct, coincident with the original stratification, and running oblique to the general foliation, like bedding and cleavage, save where these two kinds of structure may happen to coalesce.

In a region of intense metamorphism the foliation of the schists may be observed to become here and there some- what indefinite, until it disappears altogether, and the rocks assume a thoroughly granitic character. Between gneiss and granite there is no difference in mineralogical composi- tion ; in the one rock the minerals are arranged in folia, in the other they have no definite arrangement. Gneiss might be called a foliated granite; granite might be termed a non-foliated gneiss. The two rocks may be observed to graduate into each other. In Aberdeenshire, for example, the common grey mica-schist and gneiss may be seen to pass insensibly into the ordinary grey granite. In such cases it has been naturally concluded that granite is the ultimate stage of metamorphism. Judged merely from their composition and microscopic structure, an intrusive

granite connected with igneous protrusions and a mectamor- phic granite representing the thorough transformation of stratified rock cannot be distinguished from each other.

There is thus nothing improbable in the idea that the same mineral particles may have gone through many suc- cessive cycles of change. Wemay suppose them to have been originally part of a granite mass, and to have been subse- quently exposed at the surface by enormous denudation. Worn

away from their parent granite tlley would be washed down with other particles, and spread out under water as parts of sandy or muddy deposits. Buried under a gradual accumulation of sedimentary material thousands of feet in thickness they might be depressed deep beneath the surface, and be thus brought within the influence of metamorphism. Gradually recomposed, crystallized, and converted into schistose rock, they might be eventually reduced to the condition of granite, and protruded into some of the over-lying Jess metamorphosed masses in the form of granite veins. Or we may conceive, as already (ante, p. 309) sug- gested, that a communication was opened between the granite thus produced and the surface, and that the original mineral particles, whose vicissitudes we have been tracing, were erupted to the surface as part of a stream of lava.

Possible Metamorphism of Igneous Rocks.—In most large tracts of foliated rocks there occur masses less distinctly foliated or quite granitoid in texture, formed mainly of hornblende or of that mineral in combination with others. Zones or bosses of hornblende-rock and hornblende-schist frequently appear among gneiss and mica-schist. Varieties of quartz-porphyry occur in a similar way. Bands of fine unctuous chloritic schists may also often be traced. It is _ not easy to understand how such rocks, at least those con-taining a large percentage of magnesia, could be produced by the metamorphism of ordinary sediment. The difficulty may perhaps be removed if we regard them as having originally been igneous rocks, either erupted at the surface or intrusively injected among the surrounding rocks previous to metamorphism. Such mineral masses as varieties of syenite and diorite, rich in hornblende or other magnesian silicates, might have been the original condition of many of the rocks here referred to. The fine magnesian schists might be regarded as having been at first tuffs associated with the lava-form masses.

Structure of Metamorphic Rocks in the Field.—As the series of metamorphic rocks ranges from scarcely altered sedimentary strata on the one hand to crystalline amorphous granitic masses on the other, they must obviously possess a great range of structure as parts of the architecture of the solid land. In particular they must under different cireum- stances present the features now of aqueous and now of igneous rocks. The most typical form of metamorphism being foliation, we may consider the

structure of foliated rocks as the most characteristic. From what has been said above, it is evident that the planes of foliation give the rocks a general resemblance to stratified sedimentary masses. But these planes are seldom so definite and per- sistent as those of stratification. They do not impart to the rocks the same tendency to split up into well-marked parallel beds. On the contrary they are often so felted or welded together, especially in the coarse and most crystal- line gneisses, that they hardly serve as divisional planes at all, but leave the firm tough rock to split up along other lines.

With care and patience lines of anticlinal and synclinal fold may often be traced among foliated as well as among unaltered rocks. But the unravelling of these and other features of structure is much more difficult than among ordinary stratified formations. This arises partly from the frequent absence of conspicuous and persistent bands which could be used as horizons in working out geological

structure, partly from the abundant crumpling which most foliated rocks have undergone, whereby the continuity of the individual bands is much disturbed or entirely destroyed. The joints among foliated rocks to which the regular and parallel folia impart a marked fissility resemble those among sedimentary strata. Where, however, the foliation is of a more massive kind, as in the coarser varieties of gneiss, the system of jointing approximates to that of granite or one of the more crystalline igneous rocks.

IX. MINERAL VEINS.

The fissures which so abundantly traverse the crust of the earth have in many instances served as places for the deposit of miueral matter quite distinct from that of the rocks through which they run. As metallic ores frequently occur among the minerals so deposited, and have been ex- tensively worked, a large amount of information has been obtained by mining operations regarding these fissures, or, as they are termed, mineral veins. A general though not invariable relation exists between the nature of the minerals in the fissures and that of the contiguous rocks. When the latter are calcareous, calcite usually forms a conspicuous feature in the veins; among siliceous rocks quartz is abundant. These and the other minerals are

for the most part well crystallized or at least largely crystalline in the veins, even when the adjoining rocks are granular or amorphous. They are termed vein-stones. Since the joints, faults, and fissures which have been filled with new mineral substances are commonly highly inclined or vertical, mineral veins generally run as steep wall-like bands across the rocks in which they occur. Their minerals are arranged in strips, which on the whole run parallel with the walls of the vein (fig. 58).

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Fig. 58.—a, Coating of one mineral, say quartz; 6, coating of a second mineral, say fluor spar; c, coating of first mineral, or of a third, say sulphate of baryta; d, rib of ore, as copper or lead; w, w, walls of the lode.

Mineral veins become metalliferous, when among their vein-stones there occur detached crystals or particles, or branching strings and threads, or concretionary masses or parallel bands of native metal, or of the sulphides, oxides, or other ores of metals. The association of these various sub-stances within the two walls or cheeks of a vein is often in a double set of parallel bands, those in one-half of the vein being repeated in the other. The middle of the vein, for example, may consist of galena flanked and partially mixed up with zine-blende and pyrites. On either side of this central rib there may be a layer of some veinstone, perhaps fluor spar, then a duplicate band of another veinstone, such as barytes or quartz, and so on, to the outer edge of the vein (fig. 58). In other cases, as in auriferous veins of quartz, the vein consists wholly or almost wholly of one vein-stone through which the ore is disseminated in minute grains and strings, so that the vein-stone must be extracted and crushed to obtain the metal by washing.

Mineral veins (Jodes, rake-veins) vary in thickness from only an inch or less up to many fathoms. Extraordinary variations may be traced even in the course of the same vein, a breadth of several feet or yards rapidly diminish-ing until the two walls nearly or quite meet, to the exclu- sion of the minerals of the vein. Similar diversities may be observed in the horizontal

extent of veins, some being traceable for miles, others disappearing in a few yards.

They sometimes occupy fissures without any throw, but most frequently seem to occur along lines of fault. In some cases indeed it can be shown that dislocation has taken place after some portion of the vein had been form ed, but before the completion of the process. They usually send out branches, and in some mining districts do this to such an extent that it becomes hardly possible to identify the main vein among its numerous offshoots.

The direction of the veins varies in different districts. Two series may often be traced,—a principal series running in one general direction, and a minor set crossing the first at right angles or obliquely. Great differences in the rich- ness of a metallic lode may be observed as it is worked vertically and horizontally, some of these depending in a way not easily explained upon the nature of the surround- ing rock. Among the Cornish lodes, for example, some contain copper only where they traverse the Devonian slates, and lose it where they enter the granite, where tin takes its place. In the lead tracts of the north of England the metal diminishes where the veins lie in shale, and augments where they run through limestone.

In some rocks, more especially in limestones, large sub- terranean cavities have been filled with vein-stones and ores. The iron mines of the English lake district, for example, lie in the Carboniferous Limestone, where tunnels and caverns anciently dissolved out of the rock by per- colating or running water have been subsequently filled up with hematite. In the lead districts of the north of England also, similar cavities have received a plentiful deposit of vein-stones and galena with its accompanying ores.

Various theories have been proposed to account for the infilling of mineral veins. Of these the most noteworthy are—(1) the theory of lateral segregation,—which teaches that the substances in the veins have been derived from the adjacent rocks by a process of solution and redeposit; and (2) the theory of infilling from below,—according to which the minerals and ores were introduced from below dissolved in water or steam, or by sublimation, or by igneous fusion and injection.

The fact that the nature and amount of the minerals, and especially of the ores, in a vein vary with the nature of the sulrounding rocks seems to show that these rocks have had a certain influence on the precipitation of mineral matter in the fissures passing through them. But that this mineral matter came chiefly from below appears almost certain. The phenomena of the ascent of hot water in volcanic districts afford a close analogy to what has occurred in mineral veins. It is known that at the present time various minerals, in- cluding silica, both crystalline and calcedonic, and various metallic sulphides, are being deposited in fissures up which hot water rises. At the same time it is conceivable that to some extent there may be a decomposition of the rocks on either side of a fissure, and that a portion of the mineral matter abstracted may be laid down in another form along the walls of the fissure, or, on the other hand, that the rocks on either side of the fissure may be permeated for some distance by the ascending waters, and that some of the mineral substances carried up in solution may be deposited in the pores and cavities of these rocks as well as in the fissure itself,

X. UNCONFORMABILITY.

Where one series of rocks, whether of aqueous or igneons origin, has been laid down continuously and without dis- turbance upon another series, they are said to be conform- able. Thus in fig. 59 the sheets of rock numbered 1, 2, 3,

Fria. 59.—Overlap of conformable strata.

and 4 have succeeded each other in regular order, and ex- hibit a perfect conformability. They overlap each other, however, No. 2 extending beyond the edge of No. 1, No. 3 beyond that of No. 2, and soon. Asalready explained (p. 295), this structure points to a gradual subsidence and

enlargement of the area of deposit. But all these conform- able beds repose against the older platform A, with which they have no direct connexion. That platform may consist of horizontal or inclined strata, or contorted schist, or crystalline igneous rocks. In any case there is a complete break between it and the overlying rocks, which rest successively on different

parts of the older mass. This relation is termed an unconformability. The upper conform- able beds in fig. 59 are said to lie unconformably upon A.

It is evident that this structure may occur in ordinary stratified, or in igneous, or in metamorphic rocks, or between any two of these great series. It is most familiarly dis- played among stratified masses, and can there be most satis- factorily studied. The lines of bedding furnish a ready means of detecting differences of inclination and discordance of superposition. But even among igneous protrusions and in ancient metamorphic masses, distinct evidence of uncon- formability is not always difficult to trace.

Though conformable rocks may usually be presumed to have followed each other continuously without any great disturbance of geographical conditions, we cannot always be safe in such an inference. But an unconformability leaves no room to doubt that it marks a decided break in the con- tinuity of deposit. Hence no kind of geological structure is of higher importance in the interpretation of the history of the stratified formations of a country. In rare cases an unconformability may occur between two horizontal groups of strata. In fig. 60, for instance, a set of beds C is shown

av =

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Fic. 60.—Unconformability among horizontal beds,

to lie conformably for some distance upon an older series d. Were nothing more to be seen than what appears towards the right hand, we might justifiably conclude the whole of the rocks to be conformable. By passing to the left, how- ever, we should find evidence of the older group having been upraised and unequally denuded before the deposition of the newer. The denudation would show that the conf ormability was accidental, that the older rocks had really been upraised and worn down before the formation of the newer. In such a case the upheaval must have been so equable as not to disturb the horizontality of the lower rocks.

As a rule, however, it seldom happens that movements of this kind have taken place over an extensive area so

equably as not to produce a want of conformability some- where between the older and newer rocks. Most frequently the older formations have been disturbed, tilted at various angles, or even placed on end. ‘They have likewise been irregularly and enormously worn down. Hence, instead of lying parallel, the younger beds run transgressively across the upturned denuded ends of the older, The greater the

Fig. 61.—Section of unconformable rocks.

disturbance of the older rocks the more marked is the un- conformability. In fig. 61, for instance, the series of beds A is uncomformably covered by the series C. At both sides of the arch the uncomformability is strongly marked, but at the centre d the two series seem to be conformable. An unconformability forms one of the great breaks in the geological record. In the foregoing figure, by way of illus- tration, we see at once that a notable hiatus in deposition, and therefore in geological chronology, must exist between series AandC. ‘The older rocks had been deposited, folded, up- heaved, and worn down before the accumulation of the newer series upon their denuded edges. These changes must have demanded a considerable lapse of time. Yet, looking merely at the structure in itself, we have evidently no means of fixing, even relatively, the length of interval marked by an unconformability. The mere violence of con- trast between a set of vertical beds below and a horizontal group above it is no reliable criterion of the relative lapse of time between their deposition, for an older portion of a given formation might be tilted on end and be overlaid un- conformably by a later part of the same formation. A set of flat rocks of high geological antiquity might, on the other hand, be covered by a formation of comparatively recent date, yet in spite of the want of discordance between the two, they might have been separated by a large portion of the total sum of geological time. It is by the evidence of organic remains that the relative

importance of unconform- abilities must be measured, as will be explained in part v.

Paramount though the effect of an unconformability may be in the geological structure of a country, it must never- theless be in almost all cases local. The disturbance by which it was produced can have effected but a comparatively circumscribed region, beyond the limits of which the con- tinuity of sedimentation may have been undisturbed. We may therefore always expect to be able to fill up the gaps in one district from the more complete geological formations of another. ‘In fig. 61 we see that something is wanting between AandC. But in the structure of another country or a different part of the same country we might discover

—_- rire — —_-—

Fic. 62.—Section showing the groups of fig. 61 in conformable sequence, with the : intervening blank (B) supplied.

the complete succession, as in fig. 62, where the whole of the rocks succeed each other conformably, and where the gap between A and C marked by the unconformability in fig. 61 is bridged over by the intermediate group of strata B.

V. PALEHONTOLOGICAL. |

PART V.—PALAZONTOLOGICAL GEOLOGY.

Paleontology is the science which treats of the struc- ture, affinities, classification, and distribution in time of the forms of plant and animal life embedded in the rocks of the earth’s crust. In one sense it may be regarded as a branch of zoology and of botany, its claim in this view to rank as a separate science resting almost solely on the fact that of the forms with which it deals but a small proportion belongs to the living world. In another aspect it may be looked upon as a branch of geology, seeing that its assist- ance is absolutely indispensable in many of the most fami- liar and fundamental problems of the latter science. It is under this last aspect that we have to regard it here. We shall consider merely those leading features

of palzeon- tological inquiry without some knowledge of which progress in modern geology would be impossible.

Fossils. —Palxontological geology, then, deals with the fossils or organic remains preserved in the rocks, and endea- vours to gather from them information as to the history of the globe and its inhabitants. The term “fossil,” mean- ing literally anything “dug up,” was formerly applied in- discriminately to any mineral substance taken out of the earth’s crust, whether organized or not. Ordinary minerals and rocks were thus included as fossils. For many years, however, the meaning of the word has been restricted, so as to include only the remains or traces of plants and animals preserved in any natural formation whether hard rock or superficial deposit. The idea of antiquity or relative date is not necessarily involved in this conception of the term, Thus the bones of a sheep buried under gravel and silt by a modern flood, and the obscure crystalline traces of a coral in ancient masses of limestone, are equally fossils.

Nor has the term fossil any limitation as to organic grade. It includes not merely the remains of organisms, but also whatever was directly connected with or produced by these organisms. Thus the resin which was exuded from trees of long-perished forests is as much a fossil as any portion of the stem, leaves, flowers, or fruit, and in some respects is even more valuable to the geologist than more determinable remains of its parent trees, because it has often preserved in admirable perfection the insects which flitted about in the woodlands. The burrows and trails of a worm preserved in sandstone and shale claim recognition as fossils, and indeed are commonly the only indications to be met with of the existence of annelide life among old geological forma- tions. The droppings of fishes and reptiles, called copro- lites, are excellent fossils, and tell their tale as to the presence of vertebrate life in ancient waters. The little agglutinated cases of the caddis-worm remain as fossils in formations from which perchance most other traces of life may have passed away. Nay, the very handiwork of man, when preserved in any natural manner, is entitled to rank among fossils ; as where his flint-implements have been dropped into the prehistoric gravels of river- valleys, or where his canoes have been buried in the silt of lake-bottoms.

The term fossil, moreover, suffers no restriction as to the condition or state of preservation of any organism, In Some rare instances the very flesh, skin, and hair of a mammal have been preserved for thousands of years, as in the case of the mammoths entombed within the frozen mud cliffs of Siberia. In most cases all or most of the original animal matter has disappeared, and the organism has been more or less completely mineralized or petrified. It often happens that the whole organism has decayed, and a mere cast in amorphous mineral matter, as sand, clay, ironstone, silica, or limestone remains ; yet all these variations must be comprised in the comprehensive term fossil.

Conditions for the Preservation of Organic Remains.—At the outset the question naturally suggests itself how the

remains of plants and animals come to have been preserved in rocks at all. If we observe what takes place at the present day, and argue that it may fairly be taken as an indication of what has been the ordinary condition of things in the geological past, we see that there must have been so many chances against the conservation of either animal or plant remains that their occurrence among stratified forma- tions should be regarded as exceptional, and as the result of various fortunate accidents.

I. Consider, in the first place, what chances exist for the preservation of remains of the present fauna and flora of a country. The surface of the land may be densely clothed with forest, and abundantly peopled with animal life. But the trees die and moulder into soil. The animals, too, dis- appear, generation after generation, and leave no percep- tible traces of their existence. If we were not aware fron authentic records that central and northern Europe was covered with vast forests at the beginning of our era, how could we know this fact? What has become of the herds of wild oxen, the bears, wolves, and other denizens of primeval Europe? How could we prove from the ex- ainination of the surface soil of any country that those creatures had once abounded there? We might search in vain for any such

superficial traces, and would learn by so doing that the law of nature is everywhere “dust to dust.”

The conditions for the preservation of any relics of the plant and animal life of a terrestrial surface must therefore be always exceptional, They are supplied only where the organic remains can be protected from the air and super- ficial decay. Hence they may be observed in

1. Lakes.—Over the floor of a lake deposits of silt, peat, marl, &c., are formed. Into these the stems, branches, leaves, flowers, fruits, or seeds of plants from the neigh- bouring land may be carried, together with the bodies of land animals, insects, and birds. An occasional storm may blow the lighter debris of the woodlands into the water. Such portions of the wreck as did not float, and were not washed ashore again, might sink to the bottom. Of these the larger part would in most cases probably rot away, so that, in the end, only a very small fraction of the whole vegetable matter cast over the lake by the wind would be covered up and preserved at the bottom. In like manner the animal remains swept by winds or by river floods into the lake would run so many risks of dissolution that only a proportion of them, and probably merely a small propor- tion, would be preserved, When we consider these chances against the conservation of the vegetable and animal life of the land, we must admit that, at the best, lake-bottoms can contain but a meagre and imperfect representation of the abundant life of the adjacent hills and plains.

Butlakeshavea distinct flora and faunaof theirown. Their aquatic plants may be entombed in the gathering deposits ofthe bottom. Their mollusks, of characteristic types, some- times form, by the accumulation of their remains, sheets of soft calcareous marl, in which many of the undecayed shells are preserved, Their fishes, likewise distinctly lacustrine, no doubt must often be entombed in the silt or marl.

2. Peat-mosses.—Wild animals venturing on the more treacherous watery parts of a peat-bog are sometimes engulphed or “aired.” The antiseptic qualities of the peat preserve such remains from decay. Hence from European peat-mosses numerous remains of deer and oxen have been exhumed. Evidently the larger beasts of the forest ought chiefly to be looked for in these localities.

3. Deltas at River Mouths.—From what has been said in previous pages (ante, pp. 27 6-8) regarding the geological operations of rivers, it is obvious that to some extent both the flora and the fauna of the land may be buried among the sand and silt of deltas. When we consider, however, that though occasional or frequent river-floods sweep down

trees, herbage, and the bodies of land animals, the remains so transported run every risk of decaying or being other- wise destroyed while still afloat, and that even if they reach the bottom they will tend to dissolution there unless speedily covered up and protected by fresh sediment, we must perceive that delta formations can scarcely be ex- pected to give us more than a meagre outline of the varied terrestrial flora and fauna.

4. Caverns.—These are eminently adapted for the pre- servation of the higher forms of terrestrial life. Most of our knowledge of the prehistoric mammalian fauna of Europe is derived from what has been disinterred from bone-caves. As these recesses lie for the most part in lime- stone or in calcareous rock, their floors are commonly coated with stalagmite from the drip of the roof; and as this de- posit is of great closeness and durability it has effectually preserved whatever it has covered or enveloped. The caves have in many instances served predatory beasts, like the hyena, cave-lion, and cave-bear, as dens in which they slept, and into which some of them dragged their prey. In other cases they have been merely holes into which different animals crawled to die, or into which they fell or were swept by inundations. Under whatever circum- stances the animals left their remains in these subter- ranean retreats, the result has been that the bones have been covered up and preserved. Still, we must admit that after all but a mere fraction even of the mammals of the time would enter the caves, and therefore that the evi- dence of the cavern-deposits, profoundly interesting aud valuable as it is, presents us with merely a glimpse of one aspect of the life of the land.

II. In the next place, if we turn to the sea, we find cer- tainly many more favourable conditions for the preservation of organic forms, but also many circumstances which operate against it. While the level of the land remains stationary, there can be but little effective entombment of marine organisms

in littoral deposits ; for only a limited accumulation of sediment will be formed until subsidence of the sea-floor takes place. In the trifling beds of sand or gravel thrown up on a stationary shore, only the harder aud more durable forms of life, such as gasteropods and lamellibranchs, which can withstand the triturating effects of the beach waves, are likely to remain uneffaced.

Below tide-marks, along the margin of the land where sediment is gradually deposited, the conditions are favour- able for the preservation of marine organisms. Sheets of sand and mud are there laid down. In those sediments the harder parts of many forms of life may be entombed and protected from decay. But only a small proportion of the total marine fauna may be expected to occur in such deposits. At the best, merely littoral and shallow-water forms will occur, and even under the most favourable con- ditions they will represent but a fraction of the whole assem- blage of life in these juxta-terrestrial parts of the ocean. As we recede from the land the rate of deposition of sedi- meut on the sea-floor must become feebler, until in the remote central abysses it reaches a hardly appreciable mini- mum. Except, therefore, where organic deposits, such as voze, are forming in these more pelagic regions, the condi- tions must be on the whole unfavourable for the preserva- tion of any adequate representation of the deep-sea fauna. Hard euduring objects, such as teeth and bones, may slowly accumulate and be protected by a coating of peroxide of raanganese, or of some of the silicates above (p. 288) referred to as now forming here and there over the deep- sea-bottom. But such a deposit, if raised into land, would supply but a meagre picture of the life of the sea.

We must conclude therefore that of the whole sea-floor the area best adapted for preserving a varied suite of marine organic exuvie is that belt which, running along

the margin of the land, is ever receiving fresh layers of sediment transported by rivers and currents from the adjacent shores. The most favourable conditions for the accumulation of a thick mass of marine fossiliferous

strata will arise when the area of deposit is undergoing a gradual subsidence. If the rate of depression and that of deposit were equal, or nearly so, the movement might proceed for a vast period without producing any great apparent change in marine geography, and even without seriously affecting the distribution of life over the sea-floor within the area of subsidence. Hundreds or thousands of feet of sedi- mentary strata might in this way be heaped up round the continents, containing a fragmentary series of organic re- mains belonging to those forms of shallow-water life which had hard parts capable of preservation.

There can be little doubt that such has in fact been the history of the main mass of stratified formations in the earth's crust. These piles of marine strata have unques- tionably been laid down in comparatively shallow water within the area of deposit of terrestrial sediment. Their great depth seems only explicable by prolonged and repeated movements of subsidence, interrupted, however, as we know, by other movements of a contrary kind. These geographical changes affected at once the deposition of inorganic mate- rials and the succession of organic forms. One series of strata is sometimes abruptly succeeded by another of a very different character, and we generally find a corresponding contrast between their respective organic contents.

It follows from these conclusions that representatives of the abyssal deposits of the central oceans are not likely to be met with among the geological formations of past times. Thanks to the great work done by the " Challenger" expe- dition, we now know what are the leading characters of these abyssal deposits of the present day. They have absolutely no analogy among the formations of the earth's crust. They differ, indeed, so entirely from any formation which geologists considered to be of deep-water origin as to indicate that, from early geological times, the present great areas of land and sea have remained on the whole where they are, and that the land consists mainly of strata formed at successive epochs of terrestrial debris laid down in the surrounding shallow sea.

Relative Value of Organic Remains as Fossils—As the conditions for the preservation of organic remains exist more favourably under the sea than on land, marine organ- isms must be far more abundantly conserved than those

of the land. This is true to-day, and has been true in all past geological time. Hence for the purposes of the geolo- gist the fossil remains of marine forms of life far surpass all others in value. Among them there will necessarily be a, gradation of importance regulated chiefly by their relative abundance. Now, ofall the marine tribes which live within the juxta-terrestrial belt of sedimentation, unquestionably the Mollusca stand in the place of pre-eminence as regards their aptitude for becoming fossils. In the first place they almost all possess a hard durable shell, capable of resisting considerable abrasion, and readily passing into a mineralized condition, In the next place they are extremely abundant both as to individuals and genera. They occur on the shore within tide mark, and range thence down into the abysses. Moreover, they appear to have possessed those qualifications from early geological times. In the marine Mollusca, therefore, we have a common ground of compari- son between the stratified formations of different periods. They have been styled the alphabet of paleontological inquiry. It will be seen, as we proceed, how much in the interpretation of geological history depends upon the testi- mony of sea-shells.

Looking at the organisms of the land, we perceive that, as a rule, the abundant terrestrial flora has a comparatively

small chance of being well represented in a fossil state, that indeed, as a rule, only that portion of it of which the leaves, twigs, flowers, and fruits are blown into lakes is likely to be partially preserved. Terrestrial plants, therefore, occur in comparative rarity among stratified rocks, and furnish in consequence only limited ineans of comparison between the formations of different ages and countries. Of land animals the vast majority perish and leave no permanent trace of their existence. Predatory and other forms whose remains may be looked for in caverns or peat-mosses, must occur more numerously in the fossil state than birds, and are correspondingly more valuable to the geologist for the com- parison of different strata.

Relative Age of Fossils.—-Althoughi absolute dates cannot be fixed in geological chronology, it is not difficult to deter- mine the relative age of different strata, and consequently of their enclosed organic remains. For this

purpose the fundamental law is based on what is termed the “order of superposition.” This law may be thus defined :—in a series of stratified formations the older must underlie the younger. It is not needful that we should actually see the one lying below the other. If a continuous conformable succession of strata dips steadily in one direction we know that the beds at the one end must underlie those at the other, because we can trace the whole succession of beds between them. Rare instances occur where strata have been so folded by great terrestrial disturbance that the younger are made to underlie the older. But this inversion can usually be made quite clear from other evidence. The true order of super- position is decisive of the relative ages of stratified rocks.

If therefore formations lie regularly above each other, B upon A, C upon B, D upon CG, and so on, it is evident that the organic remains found in A must have lived and died before those in B were entombed; the latter must have been covered up before those in C, and these again before thosc in D. The chronological sequence of fossils must be determined first of all by the order of superposition of their enclosing strata. There is nothing in the fossils themselves, apart from experience, to fix their date. Unless, for example, we knew from observation or testimony that Rhynchonella pleurodon is a shell of the Carboniferous Lime- stone, and Rhynchonella tetrahedra is a shell of the Lias, we could not, from mere inspection of the fossils themselves, pronounce as to their real geological position. It is quite true that by practice a paleontologist has his eye so trained that he cin make shrewd approximations to the actual horizon of fossils which he may never have seen before ; but he can only do this by availing himself of a wide experience based upon the ascertained order of appearance of fossils as determined by the law of superposition. For geological purposes therefore, and indeed for all purposes of compari- son between the faunas and floras of different periods, it is absolutely essential first of all to have the order of super- position of strata rigorously determined. Unless this is done the most fatal mistakes may be made in palzontolo- gical chronology. But when it has once been done in one typical district, the order thus established may be held as proved for a wide region where, from paucity of sections, ot from geological disturbance, the true succession of forma- tions cannot be satisfactorily determined.

Uses of Fossils in Geology.—There are two main purposes to which fossils may be put in geological research :—(1) to throw light upon former conditions of physical geography, such as the presence of land, rivers, lakes, and seas, in places where they do not now exist, changes of climate, and the former distribution of plants and animals; and (2) to furnish a guide in geological chronology whereby rocks may be classified according to relative date, and the facts of geo- logical history may be arranged and interpreted as a con- nected record of the earth's progress.

1. A few examples will suffice to show the manifold assistance which fossils furnish to the geologist in the elucidation of ancient geography.

(a.) Former land-surfaces are revealed by the presence of tree-stumps in their positions of growth, with their roots branching freely in the underlying stratum, which, represent- ing the ancient soil, often contains leaves, fruits, and other sylvan remains, together with traces of the bones of land ani- mals, remains of insects, land-shells, &c. Ancient woodland surfaces of this kind are found between tide-marks, and even below low-water line, round different parts of the British coast. They unequivocally prove a snbsidence of the land, Of more ancient date are the "dirt-beds" of Portland, which, by their layers of soil and tree-stumps, show that woodlands of cycads sprang up over an upraised sea-bottom and were buried beneath the silt of a river or lake. Still further back in geological history come the numerous coal- growths of the Carboniferous period, pointing to wide jungles of ter- restrial or aquatic plants, like the modern mangrove swamps, which were submerged and covered with sand and silt,

(0.) The former existence of lakes can be sitisfactorily proved from beds of marl or lacustrine limestone full of fresh-water sliells, or from fine silt with leaves, fruits, and insect remains. Such deposits are abundantly forming at the present day, and they occur at various horizons among the geological formations of past times. The well-known nagelflue of Switzerland—a mass of conglomerate attaining a thickness of fully 6000 feet—can be shown from its fossil contents to be essentially a lacustrine formation.

(c.) Old sea-bottoms are vividly brought before us by beds of marine shells and other organisms. Layers of water- worn gravel and sand, with rolled shells of littoral and infra-littoral species, unmistakably mark the position of a former shore line. Deeper water is indicated by finer muddy sediment, with relics of the fauna which prevails beneath tlic reach of waves and ground-swell. Limestones full of corals, or made up of crinoids, point to the slow con- tinuous growth and decay of generation after generation of organisms in clear sea-water.

(¢.) Variations in the nature of the water or of the sea- bottom may sometimes be shown by changes in the size or shape of the organic remains, If, for example, the fossils in the central and lower parts of a limestone are large and well-formed, but in the upper layers become dwarfed and distorted, we may reasonably infer that the conditions for their continued existence at that locality must have been gradually impaired. The final complete cessation of these favourable conditions is shown by the replacement of the limestone by shale, indicative of the water having become muddy, and by the disappearance of the fossils, which had shown their sensitiveness to the change.

(e.) That the sea-floor represented by a fossiliferous stratum was not far from land is sufficiently proved by mere lithological characters, as has been already explained; but the conclusion may be further strengthened by the occurrence of leaves, stems, and other fragments of terres- trial vegetation which, if found in some numbers among marine organisms, would make it improbable that they had been drifted far from land.

(7) The existence of different conditions of climate in former geological periods is satisfactorily demonstrated from the testimony of fossils. Thus an assemblage of the remains of palms, gourds, and melons, with bones of crocodiles, turtles, and sea-snakes, proves a sub-tropical climate to have prevailed over the south of England in the time of the older Tertiary formations. On the other hand, the presence of an intensely cold or arctic climate far south in Europe during post-Tertiary time can be shown from different kinds of evidence, such as the existence of the remains of arctic

animals even as far as the south of England and of France. xX. — 4I

This is a use of fossils, however, where great caution must be used. We cannot affirm that, because a certain species of a genus lives now in a warm part of the globe, every species of that genus must always have lived in sunilar circumstances. The well-known example of the mammoth and woolly rhinoceros having lived in the cold north, while their modern representatives inhabit some of the warmest regions of the globe, may be usefully remembered as a warh- ing against any such conclusions. When, however, we find that not one fossil merely, but the whole assemblage of fossils in a formation has its modcrn analogue in a certain general condition of climate, we may at least tentatively *nfer that the same kind of climate prevailed where that assemblage of fossils lived. Such an inference would become more and more unsafe in proportion to the antiquity of the fossils and their divergence from existing forms.

2. When the order of superposition has been determined in a great series of stratified formations, it is found that the fossils at the bottom are not quite the same as those at the top of the series. As we trace the beds upward we discover that species after species of the lowest platforms disappears, until perhaps not one of them is found. With the cessation of these older species others make their entrance. These in turn are found to die out and to be replaced by newer forms. After patient examination of the rocks, it is as- certained that every well-marked formation is characterized by its own species or genera, or by a general assemblage or facies of organic forms. This can only, of course, be deter- mined by actnal practical experience over an area of some size. When the typical fossils of a formation are known, they serve to identify that formation in its progress across a country. Thus, as we trace the formation into tracts where it would be impossible to determine the true order of superposition, owing to the want of sections, or to the disturbed condition of the rocks, we can employ the fossils as a means of identification, and speak with confidence as to the succession of the rocks. We may even demonstrate that in some mountainous ground the beds have been turned completely upside down, if we can show that the fossils in what are now the uppermost strata ought properly to lie underneath those in the beds below them.

Observations made over a large part of the surface of the globe have enabled geologists to divide the stratified part of the earth’s crust into

systems, formations, and groups or series. These subdivisions are frequently marked off from each other by lithological characters. But mere lithological differences would afford at the best but a limited and local ground of separation, Two masses of sandstone, for ex- ample, having exactly the same general external and internal characters, might belong to very different geological periods. On the other hand, a series of limestones in one locality might be the exact chronological equivalent of a set of sand- stones and conglomerates at another, and of a series of shales and clays at a third.

It is by their characteristic fossils that the divisions of the stratified rocks can be most satisfactorily made. Each formation being distinguished by its own assemblage of organic remains, it can be followed and recognized even amid the crnmplings and dislocations of a disturbed region. The same general succession of organic types can be observed over a large part of the world, though, of course, with im- portant modifications in different countries, This similarity of succession has been termed homotaxts—a term which ex- presses the fact that the order in which the leading types of organized existence have appeared upon the earth has been similar even in widely separated regions.

It is evident that in this way a method of comparison is furnished whereby the stratified formations of different parts of the earth's crust can be brought into relation with each other, We find, for example, that a certain series of strata

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is characterized in Britain by certain genera and species of corals, brachiopods, lamellibranchs, gasteropods, and cepha- lopods. A group of rocks in Bohemia, differing more or less from these in lithological aspect, contains on the whole the same genera, and many even of the same species. In Scandinavia a set of beds may be seen unlike, perhaps, in external characters to the British type, but yielding many of the same fossils. In Canada and many parts of the northern United States, other rocks enclose many of tle same, and of closely allied genera and species. All these groups of strata are classed together as homotaxtal, that is, as having been

deposited during the same relative period in the general progress of life in each region.

Tt was at one time believed, and the belief is still far from extinct, that groups of strata characterized by this com- munity or resemblance of organic remains were chronologi- cally contemporaneous. But such an infercnce rests upon most insecure grounds. We may not be able to disprove the assertion that the strata were strictly coeval, but we have only to reflect on the present conditions of zoological and botanical distribution, and of modern sedimentation, to be assured that the assertion of contemporancity is a mere assumption. Consider for a moment what would happen were the present surface of any portion of central or southern Europe to be submerged beneath the sea, covered by marine deposits, and then re-elevated into land. The river-terraces and lacustrine marls formed before the time of Julius Cesar could not be distinguished by any fossil tests from those laid down in the days of Victoria, unless, indeed, traces of human implements were obtainable whereby the progress of civilization during 2000 years might be indicated. So far as regards the shells, bones, and plants preserved in the various formations, it would be absolutely impossible to discriminate their relative dates ; they would be classed as “geologically contemporaneous,” that is, as having been formed during the same period in the history of life in the European area; yet there might be a difference of 2000 years or more between many of them. Strict contemporaneity cannot be asserted of any strata merely on the ground of similarity or identity in fossils.

But the phrase “ geologically contemporaneous ” is too vague to have any chronological value except in a relative sense. ‘To speak of two formations as in any sense contem- poraneous which may have becn separated by thousands of years seems rather a misuse of language, though the phraseology has now gained such a footing in gcological literature as probably to be inexpugnable. If we turn again for suggestions to the existing distribution of life on the earth we learn that similarity or identity of species and genera holds good on the whole only for limited areas, and consequently, if applied to wide geographical regions, ought to be an arguinent for diversity rather than for similarity of age. If we suppose the British seas to be raised into dry land, so that the organic relics preserved in

their sands and silts could be exhumed and examined, a general com- mon facies or type would be found, though some species would be more abundant in or entirely confined to the north, while others would show a greater development in the opposite quarter. Still there would be such a similarity throughout the whole that no naturalist would hesitate to regard the organisms as those of one biological province, and belonging to the same great geological period. The region is so small, and its conditions of life so uniform and uninterrupted, that no marked distinction is possible between the forms of life in its different parts.

Widening the area of observation, we perceive that as we recede from any given point the forms of life gradually change. Vegetation alters its aspect from climate to climate, and with it come corresponding transformations in the character of insects, birds, and wild animals. A lake bottom

would preserve one suite of organisms in England, but a very different group at the foot of the Himalaya Mountains, yet the deposits at the two places might be absolutely coeval, even as to months and days. Hence it becomes apparent that while strict contemporaneity cannot be predicated of deposits containing the same organic remains, it may actu- ally be true of deposits in which they are quite distinct.

If, then, at the present time, community of organic forms obtains only in districts, regions, or provinces, it may have been more or less limited also in past time. Similarity or identity of fossils among formations geographically far apart, instead of proving contemporaneity, ought rather to be looked upon as indicative of great discrepancies in the relative epochs of deposit. For in any theory of the origin of species, the spread of any one species, still more of any group of species to a vast distance from the original centre of dispersion, must in most cases have been inconceivably slow.’ It must have occupied so prolonged a time as to allow of almost indefinite changes in physical geography. A species may have disappeared from its primeval birthplace while it continued to flourish in one or more directions in its outward circle of advance. The date of the first appearance and final extinction of that species would thus differ widely according to the locality at which we might examine its remains.

The grand march of life, in its progress from lower to higher forms, has unquestionably been broadly alike in all quarters of the globe. But nothing seems more certain than that its rate of advance has not everywhere been the same. It has moved unequally over the same region. A certain stage of progress may have been reached in one quarter of the globe thousands of years before it was reached in another ; though the same general succession of organic forms might be found in each region.

The geological formations form the records of these ages of organic development. In every country where they are fully displayed, and where they have been properly exa- mined, they can be separated out from each other according to their organic contents. Their relative age within a limited geographical area can be demonstrated by the mere law of superposition. When, however, the formations of distant countries are compared, all that we can safely affirm regarding them is that those containing the same or a repre- sentative assemblage of organic remains belong to the same epoch in the history of biological progress in each area. They are homotaxial ; but we cannot assert that they are contemporaneous, unless we are prepared to include within that term a vague period of perhaps thousands of years.

Doctrine of Colonies.—M. Barrande, the distinguished author of the Systéme Silurien dela Bohéme, drew attention more than a quarter of a century ago to certain remarkable intercalations of fossils in the series of Silurian strata of Bohemia. He showed that, while these strata presented a normal succession of organic remains, there were neverthe- less exceptional bands, which, containing the fossils of a higher zone, were yet included on different horizons among inferior portions of the series. He termed these precursory bands “colonies,” and defined the phenomena as consisting in the partial co-existence of two general faunas, which, con- sidered as a whole, were nevertheless successive. He sup- posed that during the later stages of his second Silurian fauna in Bohemia the first phases of the third fauna had already appeared, and attained some degree of development in some neighbouring but yet unknown region. At inter- vals, corresponding doubtless to geographical changes, such as movements of subsidence or elevation, volcanic eruptions, &¢e., communication was opened between that outer region and the basin of Bohemia. During these intervals a greater

or less number of immigrants succeeded in making their way into the Bohemian area, but as the conditions for their

prolonged continuance there were not yet favourable, they soon died out, and the normal fauna of the region resumed its occupancy. The deposits formed during these partial interruptions, notably graptolitic schists, accompanied by igneous sheets, contain, besides the invading species, remains of somie of the indigenous forms. Eventually, however, on the final extinction of the second fauna, and, we may sup- pose, on the ultimate demolition of the physical barriers hitherto only occasionally and temporarily broken, the third fauna, which had already sent successive colonies into the Bohemian area, now swarmed into it, and peopled it till the close of the Silurian period.

This original and ingenious doctrine has met with much opposition on the part of geologists and paleontologists. Of the facts cited by M. Barrande there has been no ques- tion, but other explanations have been suggested for them. It has been said, for example, that the so-called colonies are merely bands of the Upper Silurian rocks or third fauna, which by great plications have been so folded with the older rocks as to seem regularly interstratified with them. But the author of the Systéme Silurten very justly contends that of such foldings there is no evidence, but that, on the contrary, tlhe sequence of the strata appears normal and undisturbed. Again it has been urged that the difference of organic contents in these so-called colonies is due merely to a difference in the conditions of water and sea- bottom, particular species appearing with the conditions favourable to their spread, and disappearing when these ceased. But this contention is really included in M. Barrande’s theory. The species which disappear and re- appear in later stages must have existed in the meanwhile outside of the area of deposit, which is precisely what he has sought to establish. Much of the opposition which his views have encountered has probably arisen from thie feeling that if they are admitted they must weaken the value of paleontological evidence in defining geological horizons. A palzontologist, who has been accustomed to deal with certain fossils as unfailing indications of particular portions of

the geological series, is naturally unwilling to see his generalizations upset by an attempt to show that the fossils may occur on a far earlier horizon.

If, however, we view this question from the broad nat- ural history platform from which it was regarded by M. Barrande, it is impossible not to admit that such phenomena as he has sought to establish in Bohemia must have con- stantly occurred in all geological periods and in all parts of the world. No one now believes in the sudden extinction and creation of entire faunas. Every great fauna in the earth's history must have gradually grown out of some pre- existing one, and must have insensibly graduated into that which succeeded. The occurrence of two very distinct faunas in two closely consecutive series of strata does not prove that the one abruptly died out and the other suddenly appeared in its place. It only shows, as Darwin has so well enforced, the imperfection of the geological record. In the interval between the formation of two such contrasted groups of rocks the fauna of the lower strata must have continued to exist elsewhere, and gradually to change into the newer facies which appeared when sedimentation recommenced with the upper strata. Distinct zoological provinces have no doubt been separated by narrow barriers in former geo- logical periods, as they still are to-day. There seems, therefore, every probability that such migrations as M. Barrande has supposed in the case of the Silurian fauna of Bohemia have again and again taken place. Two notable examples will be given in later pages, one in the Lower and one in the Upper Old Red Sandstone of Scotland. _

Gaps in the Geological Record.—The history of life has been very imperfectly preserved in the stratified parts of the earth's crust. Apart from the fact that, even under the,

most favourable conditions, only a small proportion of the total flora and fauna of any period could be preserved in the fossil state, enormous gaps occur where no record has been preserved at all. It is asif whole chapters and books were missing from an historical work. Some of these lacunz are sufficiently obvious. Thus, in some cases, powerful disloca- tions have thrown considerable portions of the rocks out of sight. Sometimes extensive metamorphism has so affected them that their original characters, including

their organic contents, have been destroyed. Oftenest of all, denudation has come into play, and vast masses of fossiliferous rock have been entirely worn away. That this cause has operated frequently is shown by the abundant unconformabilities in the structure of the earth's crust.

While the mere fact that one series of rocks lies uncon- formably on another proves the lapse of a considerable interval between their respective dates, the relative length of this interval may sometimes be demonstrated by means of fossil evidence and by this alone. Let us suppose, for example, that a certain group of formations has been dis- turbed, upraised, denuded, and covered unconformably by a second group. In lithological characters the two may closely resemble each otlier, and there may be nothing to show that the gap represented by their unconformability is not of a trifling character. In many cases, indeed, it would be quite impossible to pronounce any well-grounded judg- ment as to the amount of interval, even measured by the vagus relative standards of geological chronology. But if each group contains a well-preserved suite of organic re- mains, it may not only be possible, but easy, to say exactly how niuch of the geological record has been left out between the two sets of formations. By comparing the fossils with those obtained from regions where the geological record is more complete, it may be ascertained perhaps that the lower rocks belong to a certain platform or stage in geologi- cal history which for our present purpose we may call D, and that the upper rocks can in like manner be paralleled with stage H. It would be then apparent that at this locality the chronicles of three great geological periods E, F, and G were wanting, which are elsewhere found to be intercalated between D and H. The lapse of time repre- sented by this unconformability would thus be equivalent to that required for the accumulation of the three missing formations in those regions where sedimentation went on undisturbed.

But fossil evidence may be made to prove the existence of gaps which are not otherwise apparent. As has been already remarked, changes in organic forms must, on the whole, have been extremely slow in the geological past. The whole species of a sea-floor could not pass entirely away, and be replaced by other forms, without the lapse of long periods of time. If then among the conformable stratified formations of former ages we encounter sudden and abrupt changes in the facies of the fossils, we may be certain that these must mark omissions in the record, which we may hope to fill in from a more perfect series elsewhere. The complete contrasts between unconformable strata are sufficiently explicable. It is not so easy to give a satisfactory account of those which occur where the beds are strictly conformable, and where no evidence can be observed of any considerable change of physical conditions at the time of deposit. A group of strata having the same general lithological characters throughout may be marked by a great discrepance between the fossils above and below a certain line. A few species may pass from the one into the other, or perhaps every species may be different. In eases of this kind, when proved to be not merely local but persistent over wide areas, we must admit, notwithstanding the apparently undisturbed and continuous character of the

from the one facies of fossils to the other must represent a long interval of time which has not been recorded by the deposit of strata. Professor Ramsay, who called attention to these gaps, termed them “breaks in the succession of organic remains.” He showed that they occur abundantly among the Palzozoic and Secondary rocks of England. It is obvious, of course, that these breaks, even though trace- able over wide regions, were not general over the whole globe. There have never been any universal interruptions in the continuity of the chain of being, so far as geological evidence can show. But the physical changes which caused the breaks may have been general over a zoological district or minor region. They no doubt often caused the com- plete extinction of genera and species which had a small geographical range.

From all these facts it is clear that the geological record, as it now exists, is at the best but an imperfect chronicle of geological history. In no country is it complete. The lacuuz of one region must be supplied from another. Yet in proportion to the geographical distance between thie localities where the gaps occur and those whence the mis- sing intervals are supplied, the element of uncertainty in our reading of the record is increased. The most desirable method of research is to exhaust the evidence for each area or province, and to compare the general order of its succes- sion as a whole with that which can be established for other provinces. It is, therefore, only after long and patient observation and comparison that the geological history of different quarters of the globe can be correlated.

Subdivisions of the Geological Record by means of Fossils. — As fossil evidence furnishes a much more satisfactory and widely applicable means of subdividing the stratified rocks of the earth's crust than mere lithological characters, it is made the basis of the geological classification of these rocks. Thus we may find a particular stratum marked by the occurrence in it of various fossils, one or more ef which may be distinctive, either from occurring in no other bed above and below, or from special abundance in that stratum. These species might therefore be used as a guide to the oc- currence of the bed in question, which might be called by the name of the most abundant species. In this way a geological horizon or zone would be marked off, and geologists would thereafter recognize its exact position in the series of forma- tions. But before such a generalization can be safely made, we must be sure that the species in question really never does appear on any other platform. This evidently demands wide experience over an extended field of observation. The assertion that a particular species occurs only on one horizon manifestly rests on negative evidence as much as on positive. The paleontologist who makes it cannot mean more than that he knows the fossil to lie on that horizon, and that, so far as his own experience and that of others goes, it has never been met with anywhere else. Buta single example of the occurrence of the fossil on a different zone would greatly damage the value of his generalization, and a few such cases would demolish it altogether. Hence all such statements ought at first to be made tentatively. To estab- lish a geological horizon on limited fossil evidence, and then to assume the identity of all strata containing the same fossils, is to reason in a circle and to introduce utter con- fusion into our

interpretation of the geological record. The first and fundamental point is to determine accurately the order of superposition of the strata. Until this is done detailed paleontological classification may prove to be worth- less. But when once the succession of the rocks has been fixed paleontological evidence may become paramount.

From what has been above advanced it must be evident that, even if the several groups in a formation or system of rocks in any district or country have been minutely sub-

original deposition of the strata, that the abrupt transition | divided by means of their characteristic fossils, and if, after

the lapse of many years, no discovery has occurred to alter the established order of succession of these fossils, neverthe- less the subdivisions can only be held good for the region in which they have been made. They must not be supposed to be strictly applicable everywhere. Advancing into another district or country where the petrographical char- acters of the same formation or system indicate that the original conditions of deposit must have been very different, we ought to be prepared to find a greater or less departure from the first observed or what might be regarded as the normal order of organic succession. There can be no doubt that the appearance of new organic forms in any locality has been in large measure connected with such physical changes as are indicated by diversities of sedimentary materials and arrangement. The Upper Silurian formations, for exaniple, as studied by Murchison in Shropshire and the adjacent counties, present a clear sequence of strata well defined by characteristic fossils, But within a distance of 60 miles it becomes impossible to estab- lish these subdivisions by fossil evidence. If we examine corresponding strata in Scotland, we find that they con- tain some fossils which never rise above the Lower Silurian formations in Wales and the: west of England. Again, in Bohemia and in Russia we meet with still greater depart- ures from the order of appearance iu the original Silurian area, some of the most characteristic Upper Silurian organ- isms being there found far down beneath strata replete with records of Lower Silurian life. Nevertheless the general succession of life from Lower to Upper Silurian types re- mains distinctly traceable. Such facts

warn us against the danger of being led astray by an artificial precision of paleontological detail. Even where the paleontological sequence is best established, it rests probably in most cases not merely upon the actual chronological succession of organic forms, but also, far more than is usually imagined, upon original accidental differences of local physical conditions. As these conditions have constantly varied from region to region, it must hardly ever happen that the same minute paleontological subdivisions, so important and instructive in themselves, can be identified and paralleled, except over comparatively limited geographical areas.

It cannot be too frequently stated, nor too prominently kept in view, that, although gaps occur in the succession of organic remains as recorded in the rocks, there have been no such blank intervals in the progress of plant and animal life upon the globe. The march of life has been unbroken, onward and upward. Geological history, therefore, if its records in the stratified formations were perfect, ought to show a blending and gradation of epoch with epoch, so that no sharp divisions of its events could be made. But the progress has been constantly interrupted ; now by upheaval, now by volcanic outbursts, now by depression. These interruptions serve as natural divisions in the chron- icle, and enable the geologist to arrange his history into periods. As the order of succession among stratified rocks was first made out in Europe, and as many of the gaps in that succession were found to be widespread over the European area, the divisions which experience established for that portion of the globe came to be regarded as typical, and the names adopted for them were applied to the rocks of other and far distant regions. This application has brought out the fact that some of the most marked breaks in the European series do not exist elsewhere, and, on the other hand, that some portions of that series are much more complete than in other regions. Hence, while the general similarity of succession may remain, different subdivisions and nomenclature are required as we pass from continent to continent.

as already mentioned, is often known by the name of a typical fossil, as the different zoues in the Lias are by their special species of ammonite. A series

of such zones, united by the occurrence among them of a number of the same species or genera, is called a group. A series of groups sinilarly related constitute a formation, and a number of formations may be united into a system. The terminology employed in this classification will be discussed in the following part.

PART VL—STRATIGRAPHICAL GEOLOGY.

This branch of the science arranges the rocks of the earth's crust in the order of their appearance, and interprets the sequence of events of which they form the records. Its province is to cull from all the other departments of geology the facts which may be needed to show what has been the progress of our planet, and of each continent and country, from the earliest times of which the rocks have preserved any memorial. Thus from mineralogy and petrography it obtains information regarding the origin and subsequent mutations of minerals and rocks. From dynamical geology it learns by what agencies the materials of the earth's crust have been formed, altered, broken, upheaved, and melted. From structural geology it understands how these materials were put together so as to build up the complicated crust of the earth. From paleontological geology it receives in well- determined fossil remains a clne by which to discriminate the different stratified formations, and to trace the grand onward march of organized existence upon this planet. Stratigraphical geology thus gathers up the sum of all that is made known by the other departments of the science, and makes it subservient to the interpretation of the geological history of the earth.

The leading principles of stratigraphy may be summed up as follows :—

1. In every stratigraphical research the fundamental re- quisite is to establish the order of superposition of the strata. Until this is accomplished it is impossible to arrange the dates and make out the sequence of geological history.

2, The stratified portion of the earth's crust, or geological record, as it has been termed, may be subdivided into nat- ural groups or formations of strata, each marked throughout by some common genera or species, or by a general resem- blance in the type or character of its organic remains.

3. Many living species of plants and animals can be traced downward through the more recent geological forma- tions ; but they grow fewer in number as they are followed into more ancient deposits. With their disappearance we encounter other species and genera which are no Jonger living. These in turn may be traced backward into earlier formations, till they too cease, and their places are taken by yet older forms. It is thus shown that the stratified rocks contain the records of a gradual progression of organic forms. A species which has once died out does not seem ever to have reappeared. But as has been already pointed out in reference to Barrande's doctrine of colonies, a species may within a limited area appear in a formation older than that of which it is characteristic, having temporarily migrated into the district from some neighbouring region where it had already established itself.

4, When the order of succession of organic remains among the stratified rocks has been determined, they become an invaluable guide in the investigation of the relative age of rocks and the structure of the land. Each zone and formation, being characterized by its own species or genera, may be recognized by their means, and the true succession of strata may thus be confidently established even in a

A bed, or limited number of beds, characterized by one | country which has been shattered by dislocation, or where

or more distinctive fossils, is termed a zone or horizon, and,

the rocks have been folded and inverted.

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5. The relative chronological value of the divisions of the geological record is not to be measured by mere depth of strata. While it may be reasonably assumed that a great thickness of stratified rock must mark the passage of a long period of time, it cannot safely be affirmed that a mucli less thickness elsewhere represents a correspondingly diminished period. This may sometimes be made evident by an uncon- formability between two sets of rocks, as has already been explained. The total depth of both groups together may be, say 1000 feet. Elsewhere we may find a single un- broken

formation reaching a depth of 10,000 feet ; but it would be utterly erroneous to conclude that the latter repre- sents ten times the length of time shown by the two former. So far from this being the case, it might not be difficult to show that the minor thickness of rock really denoted by far the longer geological interval. If, for instance, it could be proved that the upper part of both the sections lay on one and the same geological platform, but that the lower unconformable series in the one locality belonged to a far lower and older system of rocks than the base of the thick conformable series in the other, then it would be clear that the gap marked by the unconformability really indicated a longer period than the massive succession of deposits.

6. Fossil evidence furnishes the chief means of comparing the relative value of formations and groups of rock, A break in the succession of organic remains marks an inter- val of time often unrepresented by strata at the place where the break is found. The relative importance of these breaks, and therefore, probably, the comparative intervals of time which they mark, may be estimated by the difference of the facies of the fossils on each side. If, for example, in one case we find every species to be dissimilar above and below a certain horizon, while in another locality only half of the species on each side are peculiar, we naturally infer, if the total number of species seems large enough to warrant the inference, that the interval marked by the former break was very much longer than that marked by the second. But we may go further and compare by means of fossil evidence the relation between breaks in the succession of organic remains and the depth of strata between them.

Three formations of fossiliferous strata, A, C, and H, may occur conformably above each other. By a comparison of the fossil contents of all parts of A, it may be ascertained that, while some species are peculiar to its lower, others to its higher portions, yet the majority extend throughout the formation. If now it is found that of the total num- ber of species in the upper portion of A only one-third passes up into ©, it may be inferred with some probability that the time represented by the break between A and C was really longer than that required for the accumulation of the whole of the formation A. It might even be pos- sible to discover elsewhere a thick intermediate formation B filling up the gap between A and C. In like manner were it to be discovered that, while the whole of the forma- tion C

is characterized by a common suite of fossils, not one of the species and only one half of the genera pass up into H, the inference could hardly be resisted that the gap between the two formations marks the passage cf a far longer interval than was needed for the deposition of the whole of C. And thus we reach the remarkable con- clusion that, thick though the stratified formations of a country may be, in some cases they may not represent so long a total period of time as do the gaps in their suc- cession,—in other words, that non-deposition was more frequent and prolonged than deposition, or that the intervals of time which have been recorded by strata have not been so long as those which have not been so recorded.

In all speculations of this nature, however, it is necessary to reason from as wide a basis of observation as possible, seeing that so much of the evidence is negative. Especially

i needful is it to bear in mind that the cessation of one or

more species at a certain line among the rocks of a particu- lar district may mean nothing more than that, owing to some change in the conditions of life or of deposition, these species were compelled to migrate or beeame locally ex- tinct at the time marked by that line. They may have con- tinued to flourish abundantly in neighbouring districts for a long period afterward. Many examples of this obvious truth might be cited. Thus in a great succession of mingled marine, brackish-water, and terrestrial strata, like that of the Carboniferous Limestone series of Scotland, corals, crinoids, and brachiopods abound in the limestones and accompanying shales, but disappear as the sandstones, ironstones, clays, coals, and bituminous shales supervene. An observer meeting for the first time with an instance of the disappearance, and remembering what he had read about “ breaks in succession,” might be tempted to specu- late about the extinction of these organisms, and their re- placement by other and later forms of life, such as the ferns, lycopods, ganoid fishes, and other fossils so abundant in the overlying strata. But further research would show him that high above the plant-bearing sandstones and coals other limestones and shales might be

observed, once more charged with the same marine fossils as before, and still farther overlying groups of sandstones, coals, and carbona- ceous beds followed by yet higher marine limestones. He would thus learn that the same organisms, after being locally exterminated, returned again and again to the same area. After such a lesson he would probably pause before too confidently asserting that the highest bed in which we can detect certain fossils marked really their final appearance in the history of life. A break in the succession may thus be extremely local, one set of organisms having been driven to a different part of the same region, while another set occupied their place until the first was enabled to return.

7. The geological record is at the best but an imperfect chronicle of the geological history of the earth. It abounds in gaps, some of which have been caused by the destruction of strata owing to metamorphism, denudation, or otherwise, some by original non-deposition, as above explained. Nevertheless from this record alone can the progress of the earth be traced. It contains the registers of the births and deaths of tribes of plants and animals which have from time to time lived on the earth. But a small proportion of the total number of species which have appeared in past time have been thus chronicled, yet by collecting the broken fragments of the record an outline at least of the history of life upon the earth can be deciphered.

The nomenclature adopted for the subdivisions of the geological record bears witness to the rapid growth of geo- logy. It is a patch-work in which no system nor language has been adhered to, but where tle influences by which the progress of the science has been moulded may be distinctly traced. Some of the earliest names are lithologi- cal, and remind us of the fact that mineralogy and petro- graphy preceded geology in the order of birth—Chalk, Oolite, Greensand, Millstone Grit. Others are topogra- phical, and often recall the labours of the early geologists of England—London Clay, Oxford Clay, Purbeck, Portland, Kimeridge beds. Others are taken from local English provincial names, and remind us of the debt we owe to William Smith, by whom so many of them were first used —Lias, Gault, Crag, Cornbrash. Others of later date recog- nize an order of superposition as already established among formations—Old Red Sandstone, New Red Sandstone. By common consent it is admitted that names taken from the

region where a formation or group of rocks is typically developed, are best adapted for general use. Cambrian, Silurian, Devonian, Permian, Jurassic, are of this class, and have been adopted all over the globe.

TABLE OF FORMATIONS. |

But whatever be the name chosen to designate a particu- lar group of strata, it soon comes to be used as a chronologi- cal or homotaxial term, apart altogether from the strati- graphical character of the strata to which it is applied. Thus we speak of the Chalk or Cretaceous system, and embrace under that term formations which may contain no chalk; and we may describe as Silurian a series of strata utterly unlike in lithological characters to the formations in the typical Silurian country. In using these terms we unconsciously allow the idea of relative date to arise prominently before us. Hence such a word as chalk or cretaceous does not suggest so much to us the group of strata so called, as the interval of geological history which these strata represeut. We speak of the Cretaceous, Jurassic, and Cambrian periods, and of the Cretacecus fauna, the Jurassic flora, the Cambrian trilobites, as if these adjectives denoted simply epochs of geological time.

The geological record is classified into five main divisions: ——(L) the Archean, Azoic (lifeless), or Eozoic (dawn of life) Periods ; (2) the Primary or Paleozoic (ancient life) Periods; (3) the Secondary or Mesozoic (middle life) Periods ; (4) the Tertiary or Cainozoic (recent life); and (5) the Quaternary or Post-Tertiary Periods. These divi- sions are further ranged into systems, each system into formations, each formation into groups, and each group or series into single zones or horizons. The subjoined gene- ralized table exhibits the order in which the chief sub- divisions appear.

Order of Succession of the Stratificd Formation of the Earth’s Crust.

Britain. Continental Europe. North America.

> Pa Recent—Alluvium, Alluvium. Reeent or Terrace. ree a peat, de, & | Pleistocene—Cave Diluvium. Champlain. e & deposits, Glacial : 5 i drift. Glaeial. , | Pliocene —Crag de- | Plioeene—Z-gel, Dino- | Sumter. 2 Positsof Norfolkand| therium-Sand. 3 Suffolk. = | Miocene—Lignite of | Miocene—Leithakalk, Yorktown. & ae Tracey, Mull, Upper Molasse. ve, 5

Oligocene—Lower Mo- > lasse, Grés de Fontaine- 3 bleau, &c. £ | Eocene —Tertiaries of | Eocene—Nummulite- Alabama. i Hampshire Basin,| limestone, Flysch. Lignitie. and Isle of Wight. Upper | Senonian—Craie blanche | Fox-Hills group. aa et tuffeau, Upper Qua- 2s : dersandstein, a = Cretaceous. Turonian—//dnerkalk, | Pierre group. ia S Cenomanian—Grés vert. | Niobrara group. Sr a | Gault. Benton group. iS) st Lower. | Neocomlan. Dakotah group. ce esas Upper. | Upper or White Jura 5, [a } Oolitie. (Malm). Jurassie rocks ap- Hig Lower. | Middle or Brown Jura pear to be but |S (Dogger). poorly developed 6 | \ Liassie. Lower or Blaek Jura in N. America. oO Py 2 (Lias). ie Upper. | Rheetic beds, Keuper. | Triassie, { Muschelkalk. Triassie. | Lower. | Bunter. Permian. | Dyas or (Zechstein, Permlan. : Permian} Rothliegendes. z b Coal-measures. | Terrain houiller, Stein- | Carboniferous. Sars g kohlen, & |2 2 Millstone Grit. | Flétzleerer Sandsteln Sub-Carboniferous. {32 | Carboniferous Calcaire Carbonifére, ice Limestone. Kohlenkalk, Kulm. & | Devonian and Old Red! Devonian ‘ Devonian. p Sandstone. 3 | Silurian, Silurian (Transition or Silurian. & Grauwacke system). & | Cambrian. Primordial Silurian, older| Primordial Silurian grauwacke and slate. and Cambrian. Primitive sehists. Huronian. pee os gS & S| Fundamental gneiss. | Ur-gneiss. Laurentian. oo oe aS

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oho £ OG #

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I. ARCHAAN.

Underneath the oldest unaltered stratified and fossiliferous formations in Europe there occur masses of gneiss and other crystalline schistose rocks belonging perhaps to widely different geological periods, but, from want of satisfactory means of discrimination, necessarily united provisionally in one common series. That they are separated by a vast in- terval of time from the rocks which lie upon them is shown by the strong unconformability with which theyare related to every formation of younger date than themselves. Every- where thoroughly crystalline, they are disposed in rude, crumpled, often vertical beds, out of the ruins of which the overlying formations have been partly built.

Britatn.—In no part of the European area are these ancient rocks better seen than in the north-west of Scotland. Their position there, previously indicated by MacCulloch and Hay Cunningham, was ‘first definitely established by Murchison, who showed that they possess a dominant strike to N.N.W., and are unconformably overlaid by all the other rocks of the Scottish Highlands. They consist of a tough massive gneiss usually hornblendic, with bands of horn. blende-rock, hornblende-schist, quartz-felsite, granite, and other crystalline rocks. In two or three places they enclose bands of limestone, but neither in these nor in any other parts of their mass has the least trace of any organic struc- ture been detected. It is impossible at present to offer any conjecture as to their probable thickness. It must be many thousand feet; but its approximate amount, if ever ascer- tainable, will only be made out after the region where they occur has been mapped in detail. These gneisses and schists possess a massiveness and rudeness of bedding which strongly distinguishes them from all the other and younger metamorphic rocks of Britain. They form nearly the whole of the Outer Hebrides, and occupy a variable belt of the western parts of the counties of Sutherland and Ross. Murchison proposed to term them the Fundamental or Lewisian Gneiss from the isle of Lewis—the chief of the Hebrides. Afterwards he called them Laurentian, regard- ing them as the equivalent of some part of the great Laurentian system of Canada.

In recent years Mr Hicks and others have endeavoured to show that in Wales there exist here and there protrusions of an old crystalline group of rocks from beneath the Cam- brian system, and they have described these “pre-Cambrian” masses as overlaid unconformably by younger formations, as in the north-west of Scotland. Professor Ramsay, how- ever, who with his colleagues in the Geological Survey mapped the Welsh areas in detail, contends that the sup- posed older gneiss is merely a metamorphosed portion of the Cambrian rocks.

CoNTINENTAL Evropzt.—On the continent of Europe numerous areas of ancient gneiss rise from under the oldest fossiliferous formations, In Scandinavia the structure of part of the country resembles that of the north-west of Scotland: the fundamental-gneiss (Urgneiss), covering a large area, is overlaid unconformably by red sandstones which underlie the most ancient strata containing organic remains. The gneiss and its accompanying

rocks range through Finland into the north-west of Russia, reappearing in the north-east of that vast empire in Petchora Land down to the White Sea, and rising in the nucleus of the chain of the Ural Mountains, and still further south in Podolia. In Central Europe they appear as islands in the midst of more recent formations. In the midst of the Carpathian Mountains they protrude at a number of points, but westwards in the Alpine chain they rise in a more con- tinuous belt in the central portion of these crests, and show numerous mineralogical varieties, including protogine, mica-schist, and many other schists, as well as limestone

and serpentine. But perhaps their most intelligible sections are those which they present in Bavaria and Bohemia between the valley of the Danube and the head- waters of the Elbe. They are there divided into two well-marked groups—(a) red gneiss, covered by (6) grey gneiss. According to Giimbel the former (called by him the Bojan gneiss) may be traced as a distinct formation associated with granite, but with very few other kinds of crystalline or schistose rocks, while the latter (termed the Hercynian gneiss) consists of gneiss with abundant interstratification of many other schistose rocks, graphitic limestone, and serpentine. The Hercynian gneiss is overlaid by mica-schist, above which comes a vast mass of argillaceous schists and shales. Giimbel some years ago found in the marbles associated with the younger gneiss what he considered to be an organism of the same genus as the Hozoon of Canada, to which reference will immediately be made. He named it Lozoon Bavaricum. More recently a similar substance was obtained in the Archzean series of Bohemia, and named by Fritsch Lozoon Bohemicum. America.—In North America Archean rocks cover a large part of the continent from the Arctic Circle south- ‘wards to the great lakes. They appear likewise, as in Europe, along the central parts of prominent mountain chains, as in the Rocky Mountain range and that of the Appalachians. They have been carefully studied in Canada, where the late Sir W. E. Logan, Director of the Geological Survey of the Dominion, estimated their depth at about 30,000 feet, but neither their top nor their base can there befound. He named them the Laurentian system from their abundant development along the shores of the St Lawrence. They have been divided into two series—(1) a lower formation more than 20,000 feet thick,

consisting chiefly of granitic, orthoclase gneiss, with bands of quartz- rock, schists, iron-ore, and limestone; and (2) an upper formation fully 10,009 feet thick, composed also, for the most part, of gneiss, but marked by the occurrence of bands of Labrador felspar, as well as schist, iron-ore, and limestone. The upper division has been stated to lie un- conformably on the lower. Mr Selwyn, however, has recently pointed out that this is almost certainly not the case, but that the limestone-bearing series rests conformably upon a massive granitoid gneiss, to which he would restrict the term Laurentian, classing the limestones in the next or Huronian system (Vat. Hist. Soc. Montreal, Feb. 1879). In one of the Laurentian limestones of Canada, speci- mens have been found of a remarkable mixture of calcite and serpentine. These minerals are arranged in alternate layers, the calcite forming the main framework of the substance with the serpentine (sometimes loganite, pyroxene, &c.) disposed in thin, wavy, inconstant layers, as if filling up flattened cavities in the caleareous mass. So different from any ordinary mineral segregation with which he was acquainted did this arrangement appear to Logan, that he was led to regard the substance as probably of organic origin. This opinion was adopted, and the structure of the supposed fossil was worked out in elaborate detail by Dr Dawson of Montreal, who pronounced the organism to he the remains of a massive foraminifer which he called Liozoon, and which he believed must have grown in large thick sheets over the sea-bottom. This opinion was con- firmed by Dr W. B. Carpenter, who from a large suite of additional and better preserved specimens, described a system of internal canals having the characters of those in true foraminiferal structures. (See FoRAMINIFERA.) Other observers, notably Profesors King and Rowney of Galway and Mobius of Kiel, have opposed the organic nature of Fozoon, and have endeavoured to show that the supposed canals and passages are merely infiltration veinings of ser- pentine in the calcite. In some cases, however, the “ canal-

system” is not filled with serpentine but with dolomite, which seems to show that the cavities must have existed before either dolomite or

serpentine were introduced into the substance. Dr Carpenter contends that the disposition of these passages in his decalcified specimens is very regular, and quite unlike any mineral infiltration with which he is acquainted.

The opinion cf the organic nature of Hozoon has been supposed to receive support from the large quantity of graphite found throughout the Archean rocks of Canada and the northern parts of the United States. This mineral occurs partly in veins, but chiefly disseminated in scales and laminz in the limestones and as independent layers. Dr Dawson estimates the aggregate amount of it in one band of limestone in the Ottawa district as not less than from 20 to 30 feet, and he thinks it is hardly an exaggeration to say that there is as much carbon in the Laurentian as in equivalent areas of the Carboniferous system. He compares some of the pure bands of graphite to beds of coal, and maintains that no other source for tlieir origin can be imagined than the deoxidation of carbonic acid by living plants. In the largest of three beds of graphite at St John he has found what he considers may be fibrous structure indicative of the existence of land-plants.

Still further evidence in favour of organized existence during Archzan time in the North American area has been adduced from the remarkably thick and abundant masses of iron ore associated with the Laurentian rocks of Canada and the United States. Dr Sterry Hunt has called atten- tion to these ores as proving the precipitation of iron by decomposing vegetation during the Laurentian period on a more gigantic scale than at any subsequent geological epoch.! Some of the beds of magnetic iron ranged up to 200 feet in thickness, Large masses also of hematite and titanifer- ous iron, as well as of iron sulphides, occur in the Canadian Archean series. These great bands of iron ore run southward, and form an important feature in the economic geology of the Northern States of the Union.

Above the Laurentian rocks in the region of Lake Huron lies a vast mass of slates, conglomerates, limestones, and quartz-rocks, attaining a depth of from 10,000 to 20,000 feet. They are termed Huronian. No fossils have yet been found in them; but they must be much younger than the Laurentian rocks, on which they rest unconformably, and from which they have been in part at least derived.

IJ. PALAOZOIC.

Under the general term of Primary or Paleeozoic are now included all the older sedimentary formations containing organic remains, up to the top of what is termed the Permian system. These rocks consist mainly of sandy and muddy sediment with occasional intercalated zones of lime- stone. They everywhere bear witness to comparatively shallow water and the proximity of land. Their frequent alternations of sandstone, shale, conglomerate, and other detrital materials, their abundant, rippled, and sun-cracked surfaces marked often with burrows and trails of worms, as well as the prevalent character of their organic remains, show that they must have been deposited in areas of slow subsidence, bordering continental or insular masses of land. As regards the organisms of which they have preserved the casts, the Palzeozoic rocks, as far as the present evidence goes, may be grouped into two divisions—an older and a newer :—the former distinguished more especially by the abundance of its graptolitic, trilobitic, and brachiopodous fauna, and by the absence of vertebrate remains; the latter by the number and variety of its fishes and amphibians, the

1 Geology of Canada, 1863, p. 573.

disappearance aud extinction of graptolites and trilobites, and the abundance of its cryptogamic terrestrial flora.

CAMBRIAN,

This name was applied by Sedgwick to the rocks of North Wales (Cambria), where he first investigated them. Their base is there nowhere seen, so that, though they attain a great depth, some part of their total mass must be concealed from view. They pass up coutinuously into the base of the Silurian system. Considerable diversity of opinion has existed, and still continues, as to the line where the upper limit of the Cambrian system should be drawn. Murchison contended that this line should be placed below the strata where a trilobitic aud brachiopodous fauna begins,

and that these strata cannot be separated from the overly- |

ing Silurian system. He therefore included in the Cambrian only the barren grits and slates of the Lougmynd, Harlech, and Llanberis. Sedgwick, on the other hand, iusisted on carrying the line up to the base of the Uppér Silurian rocks. He thus left these formations as alone constituting the Silurian system, and massed all the Lower Silurian in his Cainbrian system. Murchison worked out the stratigraphi- cal order of succession from above, and chiefly by help of organic remains. He advanced from where the superposi- tion of the rocks is clear and undoubted, and for the first time in the history of geology ascertained that the “ transi- tion-rocks” of the older geologists could be arranged into zones by means of characteristic fossils as satisfactorily as the Secondary furmations had been classified in a similar manner by William Smith. Year by year, as he found his Silurian types of life descend farther and farther into lower deposits, he pushed backward the limits of his Silurian system. In this he was supported by the general consent of geologists and palontologists all over the world. Sedg- wick, on the other hand, attacked the problem rather from the point of stratigraphy and geological structure. Though he had collected fossils from many of the rocks of which he had made out the true order of succession in North Wales, he allowed them to lie for years unexamined. Meanwhile Murchison had studied the prolongations of some of the same rocks into South Wales, and had obtained from them the abundant suite of organic remains which characterized his Lower Silurian formations. Similar fossils were found abundantly on the continent of Europe, and in America. Naturally the classification proposed by Murchison was adopted all over the world. As he included in his Silurian system the oldest rocks containing a distinctive fauna of trilobites and brachiopods, the earliest fossiliferous rocks were everywhere classed as Silurian, and the name Cambrian was discarded by geologists of other countrics as indicative of a more ancient scries of deposits not characterized by peculiar organic remains, and therefore not capable of being elsewhere satisfacturily recoguized. Barrande, investigat- iug the most ancient fossiliferous rocks of Bohemia, distin- guished by-the name of the “ Primordial Zone” a group of strata underlying the Lower Silurian rocks, and containing a peculiar and characteristic suite of trilobites. He classed it, however, with the Silurian system, and Murchison alopted the term, grouping under it the lowest dark slates which in Wales and the border English counties contained some of the same early forms of life.

Investigations during the last twelve years, however, chiefly by the late Mr Salter and Mr Hicks, have brought to light a much more abundant fauna from the so-called primordial rocks of Wales than they were supposed to possess. These fossils were found to be in large measure distinct from those in the undoubted Lower Silurian rocks. Thus the question of the proper base of the Silurian system was re-opened, and the claims of the Cambrian system to a

great upward extension were more forcibly urged than ever. But these claims could now be urged on palzeortological evidence such as had never before been produced. Accord- ingly there has arisen a general desire ainong the geologists of Britain to revise the nomenclature of the older rocks. Though as yet a common accord of opinion has not been reached, there seems a strong probability that ultimately the boundary line between the Cambrian and Silurian systems will be drawn above the primordial zone along the base of the great Arenig group or Lower Llandeilo rocks of Murchison. All his Silurian strata of older date than these rocks will be classed as Cambrian.

According to this classification, the Cambrian system, as developed in North Wales and the border English counties, consists of purple, reddish-grey, and green slates, grits, sand- stones, and conglomerates. Its true base is nowhere seen, yet cven the visible miass of strata has been estimated to reach tlie enormous thickness of 25,000 feet. By far the larger part of this vast depth of rock is unfossiliferons. Indeed it is only in some bands of the upper 6000 feet, or thereabouts, that fossils occur plentifully. By fossil evi- dence the Cambrian system may be divided into Lower and Upper, and each of these sections may be further subdivided into two groups, as in the following table :—

4, Tremadoc slates.

3. Lingula flags.

2, Menevian group.

- (1. Harlech aud Longinynd group.

1. Harlech and Longinynd Group.—This includes purple, red, and grey flags, sandstones, and slates, with conglomerates. ‘Thcse strata attain a great thickness, estimated at 4000 feet in South Wales, but more than 8000 in North Walcs. They were formerly supposed to be nearly barren of organic remains; but in recent years, chiefly through the researches of Mr Hicks at St Davids, they have yielded a tolcrably abundant fauna, consisting of 30 species. Among these are 16 species of trilobite (Paradoxidcs, Plutonia, Microdiseus, Paleo- pyge, Agnostus, Conocoryphe), four annelides (Arenicolitcs), a sponge (Protospongia), five brachiopods (Discina, Lingulella), two pteropods (Theca), &c. Many ef the surfaces of the strata in some parts of this group are marked with ripples, sun-cracks, and rain- pittings as well as with trails of worms—indicative of shallow-water and shore-conditions of deposit. 14 of the 80 species, accord- ing to Mr Etheridge, F.R.S., pass up into the Menevian group, and 7 continue into the Lingula flags.

2, Mencvian Group.—This subdivision has been proposed for a series of sandstoncs and shales, with dark-blue slates and flags, dark-grey flags and grey grits, which are seen near St David’s (Menevia), where they attain a depth of about 600 feet. They pass down conformably into the Harlech group with which, as just stated, they are connected by 14 specicsin common. The Menevian beds have yielded upwards of 50 species of fossils, of which 24 are confined to the Menevian, while 18 pass up into the lower Lingula flags. Among these the trilobites are specially prominent, Some of them attained a great size, Paradoxides Davidis being nearly two feet long. But with these were mingled others of diminutive size. Itis noteworthy also, as Mr Hicks has pointed out, that while the trilobites had attained their maximum size at this early period, they are represented among the older Cambrian rocks by genera indicative of almost every stage of development, ‘‘ from the little Agnostus with two rings in the thorax, and Microdiscus with four, to Zrinnys with twenty-four,” while blind genera occur together with those having the largest eyes.1 Upwards of 30 species of trilobites have been obtained from the Menevian beds, the genera Agnostus (7

species), Conocoryphe (7 species), and Para- doxides being specially characteristic. Fonr species of sponges (Pro- tospongia) and some annelide-tracks likewise occur. The mollusca are represented by 6 species of brachiopoda of the genera Discina, Lingulella, and Obolella; 5 pteropods (Thcca) have been met with. The earliest entomostraca (Entomis) and the first cystidean (Proto- eystitcs) yet discovered occur in the Menevian fauna.

3. Lingula Flags.—Thcese strata, consisting of bluish and black slates and flags, with bands of grey flags and sandstones, attain in some parts of Wales a thickness of more than 5000 feet. They received their name from the discovery by Mr E. Davis (1846) of vast numbers of a Lingula (Lingulclla Davisit) in some of their layers. They rest conformably upon, and pass down into, the Menevian beds below them, and likewise graduate into the Tre- madoc group above. They are distinguished by a characteristic

Upper.

Cambrian of Wales.

Lower.

1 Hicks, Quart. Journ. Geol. Sce., XXxviil. 174. X. — 42

spe

suite (78 species) of organic remains. ‘The trilobites include the SE Nb ere y napolenus, Conocoryphe, Dikelocephalus, Erinnys, Olenus, and Paradoxtdes. ‘The earliest phylopods (Hynenocuris) and heteropods (Bellerophon) occur in these beds. The brachiopods include speeies of Lingulello (L. Davisii), Diseina, Obolella, and Orthis. The pteropods are represented by three species of Theea. Several annelides (Cruziana) and polyzoa (Fenestella) likewise occur. According to a careful census by Mr Etheridge, the Lingula flags may be grouped into three zones, each characterized. by a peenliar assemblage of organic remains. The lower division contains 37 species, of which 9 are peculiar to it. The middle zone has yielded 5 species, 2 of which (Conocoryphe bucephala and Lingulella

Davisii) pass down into the lower division, 1 (Kutorgia cingulata) into the upper, and 2 (Lingula squamosa and Bellero- phon Cambrensis) are peculiar. The upper zone has yielded 40 species. Of these 9 pass up into the Tremadoc beds, while 2 (Lingulella lepis and L. Davisii) continue on into the Arenig group. 4, Tremadoe Slates.—This name was given by Sedgwick to a group of dark grey slates, about 1000 fect thick, found near remadoc in Carnarvonshire, and traceable thence to Dolgelly. Their importance as a geological formation was not recognized until the discovery of a remarkably abundant and varied fauna in them. They contain the earliest crinoids, star-fishcs, lamelli- branchs, and cephalopods yet found. The trilobites embrace 14 genera, among which, besides some, as Agnostus, Conocoryphe, and Olenus, found in the Lingula flags, we meet for the first time with Angelina, Asaphus, Cheirurus, Neseuretus, Niobe, Ogygia, Psilo- cephalus, &c. The same genera, and in some cases specics, of brachiopods appear which occur in the Lingula flags, Orthis Carausii and Lingulella Davisit being common forms. Mr Hieks

has described 12 species of Jamellibranchs from the Tremadoc beds |

of Ramsay Island and St Davids, belonging to the genera Cteno- donta, Palearca, Glyptarea, Davidia, and Modiolopsis, The cepha- lopods are represented by Orthoceras sericewm and Cyrtoecras preeox; the pteropods by Theca Davidti, T. operewlata, and Conu- laria Homfrayt; the echinoderms by a beautiful star-fish (Palas- terina ransegensis) and by a crinoid (Dendrocrinus Cambrensis).*

Careful analysis of the fossils yielded by the Tremadoc beds suggests a division of this formation into two zones. According to a census by Mr Etheridge, the Lower Tremadoc rocks have yielded in all 56 species, of which 9 pass down into the Lingula flags and 10 ascend into the Upper Tremadoc zone, 31 being peculiar. The Upper Tremadoc beds contain, as at present ascertained, 33 species, of which) are peculiar, and 13 or possibly 15 pass up into thie Arenig group. It is at the top of the Upper Tremadoc strata that the line between the Cambrian and Silurian systems is here drawn. According to Professor Ramsay, there is evidence of a pliysical break at the top of the Tremadoc beds of Wales, so that on a large scale the next succeeding or Arenig strata repose unconformably upon everything

older than themselves. Mr Etheridge also shows that the paleontological break is nearly complete, only about 7 per cent. of the fossils of the one series passing over into theother. Out of 184 known Arenig species, not more than 13 are common to the Tremadoc beds underneath. Besides these important facts the character of the Areuig fauna strongly distinguishes it from that of the formations below, and further supports the line of division here adopted between the Cambrian and Silurian systems.

In the north-west of Scotland a mass of reddish-brown aud chocolate-coloured sandstone and conglomerate (at least 8000 feet thick in the Loch Torridon district) lies uncon- formably upon the fundamental gneiss in nearly horizontal or gently inclined beds. It rises into picturesque groups of mountains which stand out as striking monuments of denudation, seeing that the truncated ends of their com- ponent flat strata can be traced even from a distance forming parallel bars along the slopes and precipices. The denuda- tion must have been considerable even in early Silurian times, for the sandstones are unconformably overlaid by quartz-rocks and limestones containing Lower Silurian fossils. No trace of organic remaius of any kind has been found in the red sandstones themselves. They were at one time regarded as Old Red Sandstone, though Macculloch,

l Hicks, Quart. Journ. Geoi. Soc., xxix. 39.

aud afterwards Hay Cunningham, pointed out that they underlie parts of the schistose rocks of the northern High- lands. The discovery by Mr C. W. Peach of Lower Silurian shells in the overlying limestones showed that the massive red sandstones of western Ross and Sutherland could not be paralleled with those of the eastern tracts of those counties, but must be of older date than part of the Llan- deilo rocks of the Lower Silurian period. Sir R. Murchison classed them as Cambrian—an identification which has much support in the lithological resemblance between these rocks of the north-west Highlands and much of the Lower Cambrian system of Wales.

In the south-cast of Ireland masses of purplish, red, and green shales, slates, grits, quartz-rocks, and schists occupy a considerable area and attain a depth of 14,000 feet with- out revealing their base, while their top is covered by un- conformable formations (Lower Silurian and Lower Carboni- ferous), They have yielded Oldhamia, described originally as a sertularian zoophyte, but now regarded by many paleontologists as an alga; also numerous burrows and trails of annelides (Listioderma Hibernicum, Arenicolites didymus, A. sparsus, Haughtonia pecila). No Upper Cambrian forms have been met with in these Irish rocks, which are therefore placed with the Lower Cambrian, the unconformability at their top being regarded as equivalent to the interval required for the deposition of the intervening formatious up to the time of the Llandeilo rocks, as in the north-west of Scotland. Some portions of the irish Cam- brian series have been intensely metamorphosed. Thus on the Howth coast they appear as schists and quartz-rocks; in Wexford they pass into gneiss and granite. In West Galway Mr Kinahan has described a vast mass of schists, quartz-rocks, and limestones (8000 feet and upwards) pass- ing up into schistose, hornblendic, and unaltered rocks con- taining Llandeilo fossils, and he agrees with Griffith and King in regarding these as probably Cambrian. He suggests that they are Upper Cambrian, which would imply that Upper Cambrian rocks pass conformably into the Llandeilo formation without the occurrence of the thick Arenig rocks of Wales. Ina difficult country, however, broken by faults and greatly metamorphosed, an unconformability might easily escape detection.

ConTINENTAL Evrore.—According to the classification adopted by M. Barrande, the older Palzozoic rocks of Europe suggest an early division of the area of this con- tinent into two regions or provinces,—a northern province, embracing the British Islands, and extending through North Germany into Scandinavia, on the one hand, and into Russia on the other, and a central-European province, including Boliemia, France, Spain, Portugal, and Sardinia.

Bohemia.—The classic researches of M. Barrande have given to the oldest fossiliferous rocks of Bohemia an extra ordinary interest. He has made known tle existence there of a remarkable suite of organic remains representative of those which characterize the Cambrian rocks of Britain. At

the base of the geological formations of that region lie the Archean gneisses already described. These are over- laid by vast masses of scliists, conglomerates, quartzites, slates, and igneous rocks, which have been more or less metamorphosed, and are singularly barren of organic remains, though some of them have yielded traces of anne- lides. They pass up into certain grey and green fissile shales, in which the earliest well-marked fossils occur. The organic contents of this zone (Etage C) form what M. Barrande terms his primordial fauna, which contains 40 or more species, of which 27 are trilobites, belonging to the characteristic Cambrian genera—Paradowides (12), Agnos- tus (5), Conocoryphe (4), Ellipsocephalus (2), Zydrecephalus (2), Arionellus (1), Sao (1). Not a single species of any one of these genera, save Agnostus (of which 4 species

appear in tue second fauna), has been found by M. Barrande higher than his primordial zone. Among other organisms in this primordial fauna, the brachiopods are represented

by 2 species (Orthis and Orbicula), the pteropods by 5 |

(Theea), and the echinoderms by 5 cystideans. Scandinavia.—In Norway the vast masses of Arcliwan gneiss (Tellemark) are overlaid by schists, red sandstones, and conglomerates. These are termed the Sparagmite formation, and have hitherto proved barren of fossils, They are covered, however, by beds containing Dictyonema

Vorvegicum, which may represent the primordial zone of |

Barrande. In Sweden the sparagmite formation has been more productive of organic remains. It is there represented by a sandy zone not more than 50 or 60 feet thick—a poor equivalent for the great mass of strata in the Cambrian system of Wales. It was originally termed the Regio Fucoidarum by Angelin, from the fucoids alone found in it, In more recent years, however, its list of organic re- mains has been considerably increased; 12 species of plants, chiefly fucoids, but including some (Hophyton) of higher grade, 9 species of annelides, 4 brachiopods, a pteropod, a bryozoan, a coral, a crinoid, and a sponge have been obtained. Above the strata containing these

organisms comes a zone which has yielded 77 species of primordial trilobites, including the genera Agnostus (19 species), Cono- coryphe (13), Olenus (21), Paradowides (9).

Nort Amurica.—Rocks corresponding in position and in the general character of their organic contents with the Cambrian formations of Britain have been recognized in different parts of the United States and Canada. They appear in Newfoundland, whence, ranging by Nova Scotia and New Brunswick, they enter Canada, the northern parts of New York, Vermont, and eastern Massachusetts. They rise again along the Appalachian ridge, in Wisconsin, Minnesota, Missouri, Arkansas, Texas, and Georgia. West- wards from the great valley of the Mississippi, where they have been found in many places, they reappear from under the Secondary and younger Palaeozoic rocks of the Rocky Mountains. They have been divided by American geo- logists into two formations—(1) Acadian; a mass (2000 feet) of grey and dark shales and some sandstones; and (2) Potsdain (or Georgian), which attains in Newfoundland a depth of 5600 feet, but thins away westward and southward till in the valley of the St Lawrence, where it was studied by Logan and his associates of the Geological Survey of Canada, it is only from 300 to 600 feet thick.

Among the organic remains of the North American Cambrian rocks fucoid casts appear in many of the sand- stones, but no traces of higher vegetation. The Acadian formation has yielded primordial trilobites of the genera Paradoxides, Conocoryphe, Agnostus, and some others; brachiopods of the genera Lingulella, Discina, Obolella, and Orthis; and several kinds of annelide-tracks. The Potsdam rocks contain a few sponges, the earliest forms of graptolite, some brachiopods, including, besides the genera in the Acadian beds, Obolus, Camarella, and Orthisina ; some pteropods (Hyolites or Theca) ; two species of Orthoceras ; annelide tracks; trilobites of the genera Conocoryphe, Agnostus, Dikelocephalus, Olenellus, Ptychaspis, Charioce- phalus, Aglaspis, and Illenurus. ,

M. Barrande has called attention to the remarkable uni- formity of character in the organic remains of his primordial zone over the continents of Europe and America. He pub- lished in 1871 the subjoined table, to show how close

is the parallelism between the proportions in which the different classes of the animal kingdom are represeuted.}

‘ Trilobites, Prague, 1871, p. 196. Since the publication of this table the progress of research has increased the number of species from some localities; but the general facies of the primordial fauna has not been materially affected thereby.

Crus . Inferior taceans Molinsws, Classes. é

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Countries. rc} «| 3] a = a}sl | al ¢|s|s| S| a] Z S 2/5/38} 3/3] 2] 8] §] 2/8] g| > 3 | 5) 2/312) 5) S| El SE] B15 = |S] 2| |S) 0] 2] S| PS a he BOLO; a/R RIS asl alol] F] & ue Bohemia Pe asenererke eae 27 5 2/1)5 40 Sa NDALL: «sry seed as saestasecss; 9 1 : 2/6/./1 19

- os | Regtones) | ,. 3. Scandinavia rey 77 5 2 8/4 96 4, Eng- § Menevian…... Pa land (Harlech, part 88/1)4) 417 6}. | 1) 2 | 58 &. Newfoundland…,..... Bil), 2 6. New Brunswick …..... 1S! 6 i| 25 Tar OWN OD 2 occ chee ciscecs. 5 5 8. Braintree (Massachusetts)| 1 : 1 | 172|1|10| 4 |14] . | 2 /e815|8 la—o46 SILURIAN,

The important system of rocks next to be described was first investigated by the late Sir R. Murchison in Wales and the bordering counties of England. He found it to be char- acteristically developed over the tract once inhabited by the Silures, an ancient British tribe, and he thence chose the name of Silurian as a convenient designation. It there passes down conformably into the Tremadoc slates at the top of tle Cambrian series, and is covered conformably by the base of the Old Red Sandstone.

GREAT Brirarn.—In the typical area where Murchison’s discoveries were first made he found the Silurian rocks divisible into two great and well-marked series, which he termed LowerandUpper. This classification has been found to hold good over a large part of the world. The subjoined table shows the present arrangement and nomenclature of the various subdivisions of the Silurian system.

Feet.

Fe ERMOW. BPOGD go easconscannaananannaivya 1,950

B. Upper Silurian. { 6. Wenlock group….....cccsceceeeeees 1,600 5. Upper Llandovery group…..... 1,500

4, Lower aN QMO WP sciierscaindaneer 1,000

stead 3. Bala and Caradoc group…..... 6,000

A. Lower Silurian. 2. Llandeilo Po aha ao ais isinisseicedeia eel 2,500 1, Arenig or Stiper Stone group …..... 4,000

Approximate average thickness = 18,550

A, Lower Silurian.

1. Arenig or Stiper Stone Group.—These rocks consist of dark slates, shales, flags, and bands of sandstone, They are abundantly developed in the Arenig mountain, where, as originally described by Sedgwick, they contain masses of associated porphyry. Throughout that district they have been deposited at a time when streams of lava and showers of volcanic ashes were thrown out in great quantity from submarine vents. They contain an abund- ant suite of organic remains (184 species), of which only 13 species are common to the Tremadoc beds below. Trilobites occur of the genera Zglina, Agnostus, Ampyz,, Barrandea, Calymene, Cheirurus, Illenopsis, Ilenus, Ogygra, Phacops, and Trinucleus. Three species of ptero- pods (Conularia, Theca), 18 species of brachiopods (Ling- ula, Lingulella, Obolella, Discma, Siphonotreta, Orthis), 8 lamellibranchs, 3 gasteropods, and 5 cephalopods have been found; but the most abundant organisms are

the graptolites, of which the Arenig rocks of St David's, in Pembrokeshire, have yielded 48 species, which belong to 20 genera, including Didymograptus, Tetragraptus, Diplo- graptus, Dendrograptus, and Callograptus.? Altogether

2 Hicks, Quart. Journ. Geol. Soc., xxxi. 167; Hopkinson and Lap- worth, ibid., p. 635.

78 species of hydrozoa have been obtained from thie British Arenig rocks, but none from any older strata. This sudden and great development of these organisms sives a distinctive aspect to the Arenig rocks, It con- tinues in the overlying Llandeilo group, so that the graptolites form in Britain a convenient character by which to mark off the Cambrian from the Lower Silurian fauna.

2, Llandeilo Flag Group.—Dark argillaceous flagstones, sandstones, and shales, some parts often calcareous. These beds were first described by Murchison as occurring at Llandeilo, in Carmarthenshire. They reappear on the coast of Pembrokeshire, and at Builth, in Radnorshire, Up to the present time they have yielded 227 species of fossils. Of these 13 are commou to the Arenig below, 82 to the Caradoc or Bala above, while 145 are peculiar. The hydrozoa are still the most abundant forms, 94 species being here met with, no fewer than 81 of these being confined to Llandeilo rocks, and only 9 passing down into the Arenig group. Of crustacea 44 species have been obtained. These include the characteristic trilobites —Ampyx nudus, Asaphus tyrannus, Barrandea Corda, Calymene duplicata, C. Cambrensis, Cheirurus Sedgwicki, Ogygia Buchii, Trinucleus concentricus, T. Lloydii. The brachiopods number 37 species, including the genera Orthis, Leptena, Strophomena, Lingula, Siphonotreta. The lamellibranchs are represented by 6 species, the gasteropods by 10 (A/urchisonia, Cyclonema, Loxonema), the heteropods by 7 (Bellerophon), the pteropods by 2 (Conularia, Theca), the cephalopods by 8 (Orthoceras, Cyrtoceras).

A remarkable feature in the history of the Llandeilo rocks in Britain was the outbreak of volcanic action abundantly in North Wales and in Cumberland. Vast piles of lava and ashes were thrown out, which even to this day remain

in mass sufficient to form groups of important hills, as Cader Idris, Aran Mowddwy, the Arenigs, and the Moelwyns in Wales, and Helvellyn and Scaw Fell in Westmoreland and Cumberland.

3. Caradoc or Bala Group.—Under this name are placed the thick yellowish and grey sandstones of Caer ©aradoc in Shropshire, and the grey and dark slates, grits, and sandstones round Bala in Merionethshire. In thie Shropshire area some of the rocks are so shelly as to become strongly calcareous. In the Bala district the strata contain two limestones separated by a sandy and slaty group of rocks 1400 feet thick. The lower or Bala limestone (25 feet thick) has been traced as a variable band over a large area in North Wales. It is nsually identified with the Coniston limestone of the Westmore- land region. The upper or Hirnant limestone (10 feet) is more local. Bands of volcanic tuff and large beds of various felsitic lavas occur among the Bala beds, and prove the contemporaneous ejection of volcanic products. These attain a thickness of several thousand feet in the Snowdon region.

A large suite of fossils has been obtained from this formation :—the sponges represented by Spherospongia and other genera ; the graptolites by Diplograptus pristis, Graptolithus priodon, and G. Sedgwickii, &e.; the corals by species of Heliolites, Favosites, Monticulipora, Haly- sites, Petraia ; the echinoderms by encrinites of the genera Cyathocrinus and Glyptocrinus, by cystideans of the genera Lichinospherites and Spheronites, and by star-fishes of the genera Palcwaster and Stenaster; the annelides by Serpudites, Tentaculites, and numerous burrows and tracks; the trilo- bites by many species of the genera Phacops, Cheirurus, Cybele, Lichas, Acidaspis, Calymene, Remopleurides, Asa- phus, Illenus, Ampyx, and Trinucleus; the polyzoa by

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| by Atrypa, Rhynchonella, Leptena, Orthis (many species), | Strophomena, Discina, and Lingula; the lamellibranchs

Lenestella, Glauconome, and Ptilodictya ; tle brachiopods |

[vI, STRATIGRAPNICAL.

by Modiolopsis, Mytilus, Palcearca, Pterinea, Orthonotu, and Ctenodonta; the gasteropods by Jfurchisonia, Plenro-

tomaria, Raphistoma, Cyclonema, Huomphalus, Macturea,

Holopea; the pteropods by Conularia, Theca, and Kecult- omphalus ; the heteropods by various species of Bellerophon; and the cephalopods by many species of Orthoceras, with forms of Cyrtoceras and Liturtes.

4. Lower Llandovery Group.—In North Wales the Bala beds about 5 miles 8.E. of Bala Lake begin to be covered with grey grits, which gradually expand southwards until they attain a thickness of 1000 feet in South Wales. These overlying rocks are well displayed near the town of Llan- dovery, where they contain some conglomerate bands, and where Mr Aveline detected an nnconformability between them and the Bala group below them, so that the subter- ranean movements had already begun, which in Wales marked the close of the Lower Silurian period. Else- where they seem to graduate downwards conformably into that group. They cover a considerable breadth of country in Cardigan and Carmarthensbire, owing to the numerous widulations into which they have been thrown. Their chief interest lies in the transition which they present between the fauna of the Lower and Upper Silurian for- mations. They have yielded in all about 128 species of fossils, whereof 11 are peculiar, 93 are common to the Bala group below, and 83 pass up into Upper Llandovery rocks above. Some of the peculiar fossils are Nidulites favus, Meristella crassa, M. angustifrons, and Murchisonia angulata. Among the forms which come up from the Bala group and disappear here are the corals J/elzolites tinterstinctus, Petraia subduplicatu, and Favosites aspera ; the trilobites Zichas laxatus and Illenus Bowmanni ; the brachiopods Orthis Actonice and O. insularis ; the gastero- pods Murchisonia gyrogonia and Cylonema crebristria; and the cephalopod Orthoceras tenuicinctum. But many of the Lower Silurian forms continue on into the Upper Llandovery beds. From the abundance of the peculiar brachiopods termed Pentamerus in the Lower, but still more in the Upper Llandovery rocks, these strata were formerly grouped together under the name of ‘“‘Pentamerus beds.” Though the same species are found in both divi- sions, Pentamerus oblongus is chiefly characteristic of the upper group and comparatively infrequent in the lower, while Stricklandinia

(Pentamerus) lens abounds in the lower but appears more sparingly in the upper.

The Lower Silurian rocks, typically developed in Wales, extend over nearly the whole of Britain, though largely buried under more recent formations. They rise into the hilly tracts of Westmorcland and Cumberland, where they consist of the following subdivisions in descending order :—

(Lower Llandovery not represented.)

Coniston Limestone and Shale

Voleanic series: tuffs and lavas without any intermixture of ordinary sedimentary strata ex- cept at the base, 12,000 ft…....

Skiddaw Slates, 10,000 or 12,000 ft. base not scen

Bala beds.

Part of Bala, while of Llandeilo, and perhaps part of Arenig formation.

Arenig, with perhaps Tremadoc and Lingula Flags. Apart from the massive intercalation of volcanic rocks these

strata present considerable lithological and paleontological differ-

ences from the typical subdivisions in Wales. ‘The Skiddaw slates are black or dark-grey argillaceous, and in some beds sandy rocks, often much cleaved though seldom yielding workable slates, some- times soft and black like Carboniferous shale. As a rule they are singularly unfossiliferous, but in some of their less cleaved and altered portions they have yielded about 40 species of graptolites

(chiefly of the genera Didymograptus, Diplograptus, Dichograptus,

Tetragraptus, Phyllograptus, and Climacograptus) Lingula brevis,

traces of annelides, a few trilobites (4glina, Agnostus, Asaphus,

&e.), some phyllopods (Caryocaris), and remains of plants (Butho-

trephis, &e.). 1n many places the slates have been nletamorphosed,

passing into chiastolite-slate, mica-schist, andalusite-schist, &e.,

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with protrusions of granite, syenite, and other crystalline rocks. Towards the close of the long period represented by the Skiddaw slates, volcanic action manifested itself, first by intermittent showers of ashes and streains of lava which were interstratified with the ordinary marine sediment, and then by a more powerful and continuous series of explosions, whereby a huge volcanic mountain or group of cones was piled up above the sea-level. The length of time occupied by this volcanic episode in Cumbrian geology may be inferred from the fact that all the Llandeilo and nearly all the Bala beds are absent here. The volcanic island slowly sank into a sea where Bala organisms flourished. Among these we find such familiar Bala species as Favosites fibrosa, Heliolites interstinetus, Cybele verrucosa, Lepteena serieca, Orthis Aetonie, O. biforata, O. caligramma, O, elegantula, O. poreata, and Strophomena rhom- boidalis, These organisms and their associates gathcred on the submerged flanks of the sinking voleano into a bed of limestone— the Coniston limestone—whieh can still be traced for many miles through the Westmoreland hills, as the Bala limestone whieh it re- presents can be followed through the volcanic tracts of North Wales. Lhe Coniston limestone is covered by certain flags and grits which from their organic remains are referred to the Upper Silurian series.

In the South of Scotland, according to the detailed researches of the Geological Survey, the Lower Silurian formations are represented by the subjoined groups of strata in descending order :—

Sandstones and conglomerates, Girvan valley Conglomerates, grits, shales, and len- ticular bands of limestone, Peebles- shire, Dumfriesshire, S.W. Ayr- shire, sometimes 2000 ft. ..... Carsphairn group, coarse pebbly sta

= Llandovery.

+} =Caradoc or Bala. {

Queensberry group, massive grey- t = Llandeilo (14 000 ft.

wackes and grits, with occasional conglomerate bands and some SMES 4 HOO tomsaceiss’s oo. vies Se oes Lower or Moffat Black Shale group,

28)!

Ardwell group, brown flags, grey- wackes, and shales, sometimes pur- plish and red; base not seen J

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As a whole these strata are singularly barren of organic remains. Most of the fossils whieh the Llandeilo groups contain lie in the bands of dark anthraeitic shale which have been traced across nearly the whole breadth of the country. These shales are crowded with graptolites of recognizable Llandeilo forms, Climacograptus terctiusculus, Diplograpius pristis, and Graptolithus sagittarius being particularly abundant. Crustacca are exceedingly rare, but two phyllopods, Diseinocaris Browniana and Peltocharis aptychoides, occur; while from Dumfriesshire two obscure trilobites are referred doubtfully to Hnerinurus and Phacops, The vast thickness of sandy, gritty, and shaly unfossiliferous strata is the distinguishing feature of the Lower Silurian series in the south of Scotland. The Caradoc or Bala group lies unconformably upon the upper parts of the Llandeilo rocks. It contains in the eastern districts some cal- eareous conglomerates which here and there swell out into local masscs of limestone. In the south-west of Ayrshire the limestones attain considerable dimensions. In these calcareous bands numerous Caradoc species have been found, among them Cheirwrus gelasinosus, Iinerinurus punetatus, with species of {llenus and Asaphus, Orthis calligramma, O. confinis, Leptena serieca, Maclurea, and such corals as fHeliolites, Favosites, Omphyma, and Strephodes. In the south-west of Ayrshire certain shales and sandstones full of Caradoc fossils are overlaid with sandstones, shales, and conglomerates con- taining Pentamcrus oblongus,

The Highlands of Scotland consist mainly of crystalline rocks— gneiss, mica-schist, chlorite-schist, clay-slate, quartz-rock, schistose flagstone, and many others, often much invaded by granite and other intrusive masses. It was at one time supposed that these rocks all belonged to the so-called primary or primitive series, older than any of the fossiliferous systems. But the discovery by Mr C. W. Peach, already referred to, that recognizable fossils occur in the limestone of Durness in Sutherlandshire, led Murchison to infer that the whole of the overlying gneissosc and schistose masses are really inetamorphosed Lower Silurian rocks—a generalization which has been completely confirmed by subsequent investigation. At

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the base of this great scrics of rocks masses of white quartz-rock are found lying with a marked unconformability upon the red sandstones described in a previous page. These quartzose beds are merely hardened and somewhat metamorphosed sandstones; they still show their original false-bedding, and the casts of sea-weeds and worm-burrows. ‘lhey contain a band of limestone which in Assynt swells out to a thickness of 1000 feet or more, and can be traced almost continuously from the Kyles of Skye to the north coast of Sutherlandshire. Over these strata, in perfect conformable sequence, and with a complete lithological gradation, come quartzose flagstones dipping like the rocks below at gentle angles to the south- east. They become more schistose and crumpled as they are traced upwards, until, after a thickness of several thousand feet has been passed over, they begin to undulate in steep folds and pass into the ordinary schistose rocks which cover so much of the Highlands. The gradation from the comparatively unaltered lower quartz-rocks and limestones on the west to the intensely crumpled crystalline upper schists and flagstones on the east can be followed step by step in numerous finc natural sections from the northof Sutherland to the Kyles of Skyc. The proof is thus complete tliat a vast mass of schists and other crystalline rocks overlies fossiliferous limestones in the Scottish Highlands. It therefore becomes of the utmost importance to determine the geological horizon of the fossils in the limestones. ‘This was done by the late Mr Salter, who declared his

conviction that they were unequivocally Lower Silurian, and bore a most remarkable resemblance to a group of fossils from the Lower Silurian rocks of North America. Five of the species he regarded as identical with known American forms (Orthoceras areuoliratum, Hall; Orthis striatula, Emmons ; Ophileta compacta, Salt. ; Mur- chisonia gracivis, Hall; A. bellieincta, Hall), 4 as representative, 3 doubtful, and 1 new genus, found also in Canada. ‘‘ That this truly North Amcrican assemblage,” he remarks, ‘‘ should be found in the extreme north of Scotland on the same parallel as the Canadian,—that species of Maclurea and Raphistoma, resembling those of the St Lawrence basin, and Orthocerata, bearing large siphuncles like those of North America, Scandinavia, and Kussia, should occur in Scotland and yet be scarcely known further south, is at lcast suggestive of a geographical distribution—perhaps even of climatal conditions—not very unlike that of more modern times.” 1 From this paleontological decision it follows that the overlying sehistose series of the Seottish Highlands is a mass of metamorphosed Silurian strata. Examined in detail they show very unequal and sporadic metamorphism. Some portions are scarcely more changed than the ordimary greywackes and shales of unaltered districts. False-lbedding, pebble-beds, and other common features of sedimentation occur abundantly throughout the whole vast series of schists. Here and there the metamorphism has be- come extreme, the rocks passing into coarsely crystalline schists full of garnets, with bands of hornblende-rock, actinolite-schist, and other metamorphic products, and passing even into granitic gneiss and true granite. No more convincing proof could be ob- tained that vast masses of schist do not necessarily belong to an azoic period of the earth’s history, but may have been produced by the alteration of previously existing sediments.

It is not necessary to believe that the sediments so altered were in all cases mere ordinary marine sand and mud. The white quartz-rocks were no doubt at one time pure white siliceous sand, the rounded grains of which can still be readily detected in them. The quartzose flagstones were stratified sand with thin partings of clay or mud. The clay slates were evidently thick accumulations of mud. But the rocks containing a marked percentage of mag- nesia, such as chlorite-slate, actinolite-schist, hornblende-rock, &c., may have resulted from the alteration of voleanic sediments and submarine lavas. The evidence from Cuniberland and Wales proves how voluminous

and long continued were the volcanic eruptions of the Lower Silurian period in Britain. The abundant diffusion of volcanic detritus over the present sea-bottom is now well known. The “Challenger” researches have also shown us that, besides the glauconite previously known to be deposited from sea-water in the chambers of foraminifera and other dead organisms on the ocean- bottom, true magnesian silicates are now in the process of elimina- tion from sea-water in some of the abysses of the ocean. It is quite possible therefore that some of the rocks of the metamorphic scries rich in magnesian silicates may have arisen from the altera- tion of volcanic tutls or submarine lavas, and that others may owe their distinctive composition to original chemical precipitation, as ably contended by Sterry Hunt, though their present crystalline structure must be regarded as a part of the general metamorphism by which the whole of the Lower Silurian rocks of the Highlands have been affected. ‘

In the south-east of Ireland, grey, greenish, and purple grits, and grey and dark shales, lie uncomformably upon the Cambrian rocks, and contain a few fossils of Llandeilo age. They present interstratified beds of tuff and felsitie lavas indicating aie poraneous volcanic action. 1n the north-east of the island a broa

1 Quart. Jour. Geol. Soc., XX. 381.

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belt of Lower Silurian rocks runs from the coast of Down into the heart of Roscommon and Longford. This belt is evidently a pro-

longation of that in the southern uplands of Scotland. It is marked by the oceurrence of similar dark anthracitic shales

crowded with graptolites. The richest fossiliferous loealities among the Irish Lower Silurian rocks are found at the Chair of Kildare, Portrane near Dublin, Pomeroy in Tyrone, and Lisbellan in Fer- managh, whcre small protrusions of the older rocks rise as oases among the surrounding later formations. Portlock brouglit the northern and western localities to light, and Murchison pointed out that, while a number of the trilobites (Trinucleus, Phacops, Caly- mene, and Illenus), as well as the simple

plaited Orthide, Leptene, and Strophomene, some spiral shells, and many Orthoecrata, are specifically identical with those from the typical Caradoc and Bala beds of Shropshire and Wales, yet they are associated with peculiar forms, first discovered in Ireland, and very rare elsewhere in the British Islands. Among these distinctive fossils he cites the trilobites, Remopleurides, Harpces, Amphion, and Brontcus, with the smooth forms of Asaphus (Isotelus), which, though abundant in Ireland and America, seldom occur in Wales or England, and never on the Continent.}

In the north and west of Ireland a large area of surface is occu- pied by crystalline rocks—gneiss, schists, quartz-rocks, limestone, granite, &c.—which are manifestly a continuation of those of the Highlands of Scotland. They run south-westward parallel with the belt of unaltered Lower Silurian rocks from which, in some places, as in county Tyrone, they are only a few miles distant. ‘he district of Pomeroy, so rich in Silurian fossils, promises to afford the greatest light on the interesting but difficult problem of the metamorphism of the Lower Silurian rocks of the Scottish Highlands and the north-west of Ireland. It will be seen from the evidence furnished by the sections in West Mayo (p. 337) that the metamorphism must have taken place prior to the deposition of the Upper Silurian formations of the west of Ireland.

B. Upper Silurian.

The formations which in the British Islands are classed as Upper Silurian occur in two very distinct types. So great indeed is the contrast between these types that it is only by a comparison of organic remains that the whole can be grouped together as the deposits of one great geological period. In the original region described. by Murchison, and from which his type of the system was taken, the strata are comparatively flat, soft, unaltered, consisting mainly of somewhat incoherent sandy mud with occasional bands of limestone. But as these rocks are followed into North Wales, they are found to swell out into a vast series of grits and shales so like portions of the hard altered Lower Silurian rocks that, save for the evidence of fossils, they would naturally be grouped as part of that more ancient series. In Westmoreland and Cumberland, and still further north in the border counties of Scotland, also in the south-west of Ireland, it is the North Welsh

type which prevails, so that in Britain the general lithological charac- ters and minute palontological subdivisions ascertained in the typical Silurian district are almost confined to that limited region, while over the rest of the British area for thousands of square miles the hard sandy and shaly type of North Wales is prevalent.

Taking first the Silurian tract of thesouth-west of England, and the east and south of Wales, we find a decided uncon- formability separating the Lower from the Upper Silurian formations. In some places the latter are found passing across the edges of the former, group after group, till they come to lie directly upon the Cambrian rocks. Indeed, in one district between the Longmynd and Wenlock edge, the base of the Upper Silurian rocks is found within a few mules to pass from the Caradoc group across to the Lower Cambrian rocks, It is evident, therefore, that in the Welsh region very great disturbance and extensive denudation preceded the commencement of the deposition of the Upper Silurian rocks. As Professor Ramsay has pointed out, the area of Wales, previously covered by a wide though shallow sea, was ridged up into a series of islands, round the margill of which the conglomerates at the base of the Upper

1 Siluria, p. 174.

Silurian series began to be laid down. This took place

during a time of submergence, for these conglomeratic and

sandy strata are found creeping up the slopes and even

capping some of the heights, as at Bogmine, where they

reach a height of 1150 feet above tlie sea.2 The subsidence

probably continued during the whole of the interval occu-

pied by the deposition of the Upper Silurian strata, which

thus were piled to a depth of from 3000 to 5000 feet over

the disturbed and denuded platform of Lower Silurian rocks, Arranged in tabular form, the subdivisions of the Upper

Silurian rocks of Wales and the adjoining counties of

England are in descending order as follows :—

Base of Old Red Sandstone.

Tilestones.

Upper Ludlow Rock.

Aymestry Limestone.

Lower Ludlow Rock. Wenlock or Dudley Limc-)

3. Ludlow group |

SUOING. SAgcoatbesobic. GaGabene | Denbighshire 2. Wenlock group + Wenlock Shale …..... = Grits of | Woolhope or Barr Lime- North Wales.

| stone and Shale

1. Upper Lland- { Tarannon Shale.

overy group… (May Hill Sandstoncs. Lower Llandovery Rocks.

1. Upper Llandovery Group.—(a.) May Hill Sandstones. —The position of these rocks as the true base of the Upper Silurian formations was first shown in 1853 by Sedgwick, who named them the May Hill Sandstones from the locality in Gloucestershire where they are so well displayed. Appearing on the coast of Pembrokeshire at Marloes Bay, they range across South Wales until they are overlapped by the Old Red Sandstone. They enterge again in Carmar- thenshire, and trend north-eastward as a narrow strip at the base of the Upper Silurian series, from a few feet to 1000 feet or more in thickness, as far as the Longmynd, where as a marked

conglomerate wrapping round that ancient Cambrian ridge they disappear. In the course of this long tract they pass successively and unconformably over Lower Llandovery, Caradoc, Llandeilo, and Cambrian rocks. They consist of yellow and brown ferruginous sand- stones, often full of shells, which are apt to weather out. and leave casts. ‘Their lower parts are commonly con- glomeratic, the pebbles being largely derived from older parts of the Silurian formations. Here and there, where the organic remains become extraordinarily abundant, the strata pass into a kind of sandy limestone, known as the ‘‘Pentamerus limestone,” from the numbers of this brachiopod contained in it. The species of fossils found in the May Hill Sandstones number about 230.

Among these are some traces of fucoids; sponges (Cliona, Tschadites); the widely diffused Graptolithus priodon; a number of corals (Petraia, Heliolites, Favosites, Halysites, Syringopora, &c.); a few crinoids ; some annelides, particularly the Tentaculites anglieus, which is abundant; a number of trilobites, of whieh Phacops Stokesii, P. Weaveri, Enerinurus punctatus, and Calymene Blumen- bachii are common; numerous brachiopods, as Atrypa hemisphertea, A, reticularis, Pentamerus oblongus, Stricklandinia lirata (S. lens also occurs), Lepteena transversalis, Orthis ealligramma, O. elegan- tula, O. reversa, Strophomena compressa, S. pecten, and Lingula parallela; lamellibranchs of the mytiloid genera Orthonota, Mytilus, and Modiolopsis, with forms of Pterinea, Ctenodonta, and Lyro- desma; gasteropods, particularly the genera Afurehisonia, Pleuro-tomaria, Cyelonema, Holopella; and cephalopods, chiefly Ortho- eerata, with some forms of Actinoceras and Phragmoceras, and the old species Lituites cornu-arietis.

(b.) Tarannon Shale.—Above the Upper Llandovery beds comes a very persistent zone of fine, smooth, light grey or blue slates, which has been traced down the whole length of Wales from the mouth of the Conway into Carmarthen- shire. These rocks, termed the “ paste-rock ” by Sedgwick, have an extreme thickness of 1000 to 1500 feet. Barren in organic remains, their chief interest lies in the fact that

2 Physical Geology of Britain, p. 91.

the persistence of so thick a baud of rock between what were supposed to be continuous and conformable formations should have been unrecognized until it was proved by the detailed mapping of the Geological Survey.

2. Wenlock Group.—(a.) Woolhope Limestone.—In the

original typical Upper Silurian tract of Shropshire and the |

adjacent counties, the Upper Llandovery rocks are overlaid by a local group of grey shales containing nodular line- stone which here aud there swells out into beds having an aggregate thickness of 30 or 40 feet. These strata are well displayed in the picturesque valley of Woolhope in Here- fordshire, which lies upon a worn quaquaversal dome of Upper Silurian strata rising in the midst of the surrounding Old Red Sandstone. They are seen likewise to the north- west at Presteign, Nash Scar, and Old Radnor in Radnor- shire, and to the east and south in the Malvern Hills (where they include a great thickness of shale below the limestone), and May Hill in Gloucestershire. These strata have yielded many characteristically Upper Silurian fossils, among which may be mentioned Bumastus Barriensis, Homalonotus del- Phinocephalus, Phacops caudatus, Atrypa reticularis, Orthis calligramma, Strophomena imbrex, Rhynchonella borealis, Lt. Wilsoni, Euomphalus sculptus, Orthoceras annulatum.

It is a characteristic of the older Palxozoic limestones to occur in a very lenticular form, swelling in some places to a great thickness and rapidly dying out, to reappear again perhaps some miles away with increased proportions. This local character is well exhibited by the Woolhope limestone. Where it dies out, the shales underneath and intercalated with it join on continuously to the overlying Wenlock shale, and no line for the Woolhope group can then be satisfactorily drawn. The same discontinuity is strikingly traceable in the Wenlock limestone to be immedi- ately referred to.

(b.) Wenlock Shale.—This is a group of grey and black fine shales, traceable from the bariks of the Severn near Coal- brook Dale across Radnorshire to near Carmarthen—a diz- tance of about 90 miles. ‘The same strata reappear in the protrusions of Upper Silurian rock which rise out of the Old Red Sandstone plains of Gloucestershire, Herefordshire, and

Monmouthshire. In the Malvern Hills they were estimated by Professor Phillips to reach a thickness of 640 feet, but towards the north they thicken out to 1000 or even 1400 feet. On the whole the fossils are identical with those of the overlying limestone. The corals, however, so abuudant in that rock are here comparatively rare. The brachiopods (of the genera Leptena, Orthis, Strophomena, Atrypa, and Rhynchonella) are generally of small size — Orthis biloba, O. hybrida, and the large flat O. rustica, being characteristic. Of the higher mollusca thin-shelled forms of Orthoceras are specially abundant. Among the trilobites, Lincrinurus punctatus, EL. variolaris, Calymene Blumenbachii, C. tuberculosa, Phacops caudatus, and P. longicaudatus are commou. The Giraptolithus priodon, so frequent among the Bala beds of the Lower Silurian scries, also occurs in the Wenlock shale. Graptolithus Flemingii is here a characteristic species.

(c.) Wenlock Limestone is a thick-bedded, sometimes flaggy, usually more or less concretionary limestone, grey or pale pink, often higkly crystalline, occurring in some places as a single massive bed, in others as two or more strata separated by grey shales, the whole forming a thick- ness of rock ranging from 100 to 300 feet. As its name denotes, this stratum is typically developed along Wenlock Kdge in Shropshire, where it runs as a prominent ridge for fully 20 miles, also between Aymestry and Ludlow. It like- wise appears at the detached areas of Upper Silurian strata above referred to, being specially well seen near Dudley (whence it is often spoken of as the Dudley limestone), Woolhope, Malvern, May Hill, and Usk in Monmouthshire.

A distinguishing characteristic of the Wenlock limestone is the abundance and variety of its corals, of which 53 species have been described. The rock seems indeed to have been formed in part by massive sheets and bunches of coral. Among characteristic species are Halysites catenularia, Heliolites inter- stinctus, H. tubulatus, Alveolites Labeechei, Favosites aspera, F. Jibrosa, F. Gothlandica, Ceenites Junipcrinus, Syringopora fascicu- laris, and Omphyma turbinatum. he crinoids are also specially abundant, and are often beautifully preserved: Pertechoerinus moniliformts is one of the most

frequent species; others are Crotalo- crinus rugosus, Cyathoerinus goniodaetylus, and Marsupiocrinus celatus; with several cystideans, as Pseudocrinites quadrifasciatus. The crustaceans include numerous trilobites, among which we miss some of the persistent Lower Silurian genera, such as Asaphus, Ogygia, and Trinucleus, none of which ascend into the Wen- lock group. The most abundant trilobite is the long-lived Caly- mene Blunvenbachii, which ranges from the Llandeilo flags up to near the top of the Upper Silurian formations. 1t occurs abundantly at Dudley, where it received the name of the ‘ Dudley Locust.” Other common forms are Encrinurus punctatus, E. variolaris, Phacops eaudatus, P. Downingie, P. Stokesti, Bumastus Barriensts, Homaio- notus delphinocephalus, and Cheirurus bimucronatus. ‘he brachio- pods continue to be abundant; among typical species may be noted Atrypa reticularis, Meristella tumida, Spirifer elevatus, S. plicatellus, Rhynchonella borealis (very common), R. cuneadta, Bi. Wilsont, Orthis clegantula, O. rustica, Strophomena rhomboidal is, and Pentamerus galeatus. The lamellibranchs are not well repre-

‘sented; but several species of Pterinea arc abundant, with Gram-

mysia eingulata, and some species of AModiolopsis and Ctenodonta. The gasteropods are most characteristically marked by 8 or 9 species of Huomphalus, 8 or more of Murchisonia, with species of Pleurotomaria, Acroculia, and Cyelonema. The cephalopods are confined to few genera, Litwites, Actinoceras, Cyrtoceras, Orthoceras, and Phragmoceras ; of these the orthoceratites are by far the most abundant both in species and individuals. Orthoceras annulatumn is the most common form. The pteropods appear in thc beautiful and very abundant Conularia Sowerbyi, and the heteropods in the common and characteristic Bellerophon Wenlockensis.

3. Ludlow Group.—This series of strata consists essen- tially of shales, with occasionally a calcareous band in the middle. It graduates downward into the Wenlock group, so that when the Wenlock limestone disappears the Wenlock and Ludlow shales form one continuous argillaceous formation. It is in this united form that the two groups stretch to the south-west through Brecon and Carmarthen. The Ludlow rocks are typically seen between Ludlow and Aymestry. They appear likewise at the detached Silurian areas

from Dudley to the mouth of the Severn. They were grouped by Murchison into three Zones,

(a.) Lower Ludlow Rock.—This is a group of soft dark- grey to pale greenish-brown or olive sandy shales, often with calcareous concretions. Much of the rock, however, presents so little fissile structure as to get the name of mudstone, weathering out into concretions which fall to angular frag- ments as the rock crumbles down. It becomes more sandy and flaggy towards the top. From the softness of the shales this zone of rock has been extensively denuded, and the Wenlock limestone rises up boldly from under it.

An abundant suite of fossils has been yielded by these shales. No fewer than 18 species of star-fishes, belonging to 6 genera, have been described (Protaster, like the brittle-stars of the British seas, Paleocoma, Palasterina). A few graptolites occur, particularly the persistent Graptolithus priodon (common), G. colonus, and G. Flemingiz. A few of the Wenlock corals survive in the Lower Ludlow rock, but the conditions of deposit were evidently un- favourable for their growth. The trilobites are less numerous than in older beds; they include the venerable Calymene Blumenbachii, Phacops eaudatus, and its still longer-tailed variety P. longi- caudatus ; also Aeidaspis Brightti, Homalonotus delphinocephalus, and Cyphaspis megalops. But other forms of crustacean life occur in some number, As the trilobites begin to wane numerous phyllopods appear, the genus Ceratiocaris being represented by 10 or more species. Large eurypterids now make their entrance upon geological history — Eurypterus, Pterygotus, and Hemiaspis. Though brachiopods are not scarce, hardly any seem to be peculiar to the Lower Ludlow rock, the Lingula lata, which Murchison suggested might be peeuliar, having been obtained from what is supposed to be representative of this group of strata in Westmore- land. Rhynchonella Wilsoni, Spirifer exporrectus, Strophomena euglypha, Atrypa reticularis, and Chonetes minima are not infre-

O36 quent. Among the more frequently recurring species of lamelli- branehs the following may be named—Cardiola interrupta, C. striata, Orthonota rigida, O. semisuleata, and a number of species of Picrinea. The orthoecratites are numerous, as Orthoceras Ludense, 0. subundulatum, also

species of Phragmoceras and Litwites. The numbers of these straight and curved cephalopods form one of the distinguishing features of the zone. At one locality, near Leint- wardine in Shropshire, which has been prolific in Lower Ludlow fossils, particularly in star-fishes and eurypterid crustaceans, a fragment of the fish Pteraspis was discovered in 1859. This is the earliest trace of vertebrate life yet detected. It is interesting to note that the Pteraspis does not stand low in the scale of organiza- tion, but has affinities with our modern sturgeon.

(b.) Aymestry Limestone is a dark grey somewhat earthy concretionary limestone in beds from 1 to 5 feet thick. Where at its thickest it forms a conspicuous feature, rising above the soft and denuded Lower Ludlow shales and, owing to the easily removable nature of some fuller's earth on which it lies, it has here and there been dislocated by large landslips. It is still more inconstant than the Wen. lock limestone. Though well developed at Aymestry it soon dies away into bands of calcareous nodules, which finally disappear, and the lower and upper divisions of the Ludlow group then come together. 'The most characteristic fossil is the Pentamerus Knightti; other common forms are Rhynchonella Wilsont, Lingula Lewisti, Strophomena euglypha, Bellerophon dilatatus, Pterinea Sowerbyt, with many of the same shells, corals, and trilobites found in the Wenlock limestone. except in the less number of species and the occurrence of some of the shells more characteristic of the Upper Ludlow zone, there is not much paleontological distinction between the two limestones.

(c.) Upper Ludlow Rock.—In the original Silurian district described by Murchison, the Aymestry limestone is covered by a calcareous shelly band full of Rhynchonella navicula, sometimes 30 or 40 feet thick. This layer is succeeded by grey sandy shale or mudstone, often weathering into con- cretions, as in the Iower Ludlow zone, and assuming ex- ternally the same rusty-brown or greyish olive-green hue. Its harder beds are quarried for building stone; but the

general character of the deposit, like that of the argillaceous |

portions of the Upper Silurian formations as a whole in the typical district of Siluria, is soft, incoherent, and crumb- ling, easily decomposing once more into the original mud, and presenting in this respect a contrast to the

hard fissile and often slaty shales of the Lower Silurian series. Many of the sandstone beds are crowded with ripple-marks, rill- marks, and annelid-trails, indicative of the shallow littoral waters in which they were deposited. One of the upper- most sandstones is termed the " Fucoid Bed," from the number of its cylindrical sea-weed-like stems. It like- wise contains numerous inverted pyramidal bodies, which are believed to be casts of the cavities made in the muddy sand by the rotatory movement of crinoids rooted and half- buried in the micaceous mud.2 At the top of the Upper Ludlow rock near the town of Ludlow, a brown layer occurs from a quarter of an inch to 3 or 4 inches in thick- ness, full of fragments of fish, Pterygotus, and shells. This layer, termed the " Ludlow Bone-bed," is the oldest from which any considerable number of vertebrate rcmains has been obtained. In spite of its insignificant thickness it has been detected at numerous localities from Ludlow as far as Pyrton passage, at the mouth of the Severn—a distance of 45 miles from north to south, and from Kington to Ledbury and Malvern —a distance of nearly 30 miles from west to east ; so that it probably covers an area (now largely buried under Old Red Sandstone) not less than 1900 square miles in extent, yct it appears never to exceed and usually to fall short of a thickness of 1 foot. Fish remains, however, are not confined to this horizon. They have been detected in

1 Siluria, p. 130.

2 Siluria, p. 183.

Indeed, as Murchison has pointed out, |

strata above the original bone-bed at Ludlow, together with some minute globular bodies believed to be the sporangia of alycopod. 'hese, with some other plant remains from the same district, are the earliest traces of land vegetation yet found. 'he higher parts of the Ludlow rock consist of fine yellow sandstone and harder grits known as the Downton sandstone. Originally the whole of these flaggy upper parts of the Ludlow group were called "Tilestones by Murchison, and being often red in colour were

included by him as the base of the Old Red Sandstone, into which they gradually and conformably ascend. Undoubtedly they show the gradual change of physical conditions which took place at the close of the Silurian period in the west of England, and brought in the deposits of the Old Red Sand- stone. But as their organic contents are still unequivocally those of the Ludlow group, they are now classed as the uppermost zone of the Silurian system.

A considerable suite of organic remains has been obtained from the Upper Ludlow rock, which on the whole are the same as those in the zones underneath. Vegetable remains, some of whieh seem to be fucoids, but most of which are probably ter- restrial and lycopodiaceous, abound in the Downton sand- stone and passage-beds into the Old Red Sandstone. Corals, as might be supposed from the muddy character of the de- posit, seldom occur, though Murchison mentions that the en- crusting form Alveolites fibrosus may not infrequently be found enveloping shells, Cyelonema, eorallit and Murehisonia corallit being, as their names imply, its favourite habitats. Some anuc- lides (Serpulites longispinus, Cornulites serpularius, Tentaculites tenuis, and Trachyderma coriacea) are not uncommon. The crus- tacea are represented chiefly by small ostracods (Beyrichia Kledeni, Leperditia marginata, Entomis tuberosa), and by species ef Ceratic- earis, Dictyocaris, Eurypterus, Hemiaspis, Pterygotus, and Stylo- nurus; the trilobites having still further waned, though Homa- lonotus Knightti, Enerinurus punetatus, Phacops Downingie, and a few others still occur, and even the persistent Calymene Blumen- bachit may occasionally be found. Of the brachiopods the most abundant forms are Rhynchonella nucula, Chonctcs striatella, Diseina rugata, and Lingula cornea. The most characteristic lamelli- branchs are Orthonota amygdalina, Goniophora eymbaformis, Pterinea lineata, P. retroflexa; some of the commonest gasteropods are Murchisonia corallit, Platyschisma helieites, and Holopellu obsoleta. The orthoceratites are specifically identical with those of the Lower Ludlow rock, and are sometimes of large size, Urthoceras bullatum being specially abundant. The fish remains consist of bones, teeth, shagreen-like scales, plates, and fin-spines. They include some plagiostomous (placoid) forms (Zhelodus, shagreeu- seales, Sphagodus, skin, Onehus, spines) and some ostracosteans (Cephalaspis, Auchenaspis, and Picraspis).

In the typical Silurian region of Shropshire and the adjacent counties, nothing can be more decided than the lithological evidence for the gradual disappearance of the Silurian sea, with its crowds of graptolites, trilobites, and brachiopods, and for the gradual introduction of those geographical conditions which brought about the deposit of the Old Red Sandstone. ‘The fine grey and olive-coloured muds, with their occasional zones of limestone, are suc- ceeded by bright red clays, sandstones, cornstones, and con- glomerates. ‘The evidence from fossils is equally explicit. Up to the top of the Ludlow rocks the abundant Silurian fauna continues in hardly diminished numbers. But as soon as the red strata begin the organic remains rapidly die out, until at last only the fish and the large eurypterid crus- taceans continue to occur.

Turning now from the interesting and extremely import- ant though limited area in which the original type of the Upper Silurian rocks is developed, we observe that whether we pass northwards or south-westwards the soft mudstones and thick limestones give way to hard slates, grits, and flagstones, among which it is scarcely possible sometimes even to discriminate what represents the Wenlock from what may be the equivalent of the Ludlow group. It is in Denbighshire and the adjacent countics that this change becomes most marked. The Tarannon shale above de- scribed passes into that region of North Wales, where it forms the base of the Upper Silurian formations, It is covered

by a series of grits or sandstones which in some places are at least 3000 feet thick. These are covered by and pass laterally into hard shales, which are believed to represent parts of the true Wenlock group, perhaps even somé por- tion of the Ludlow rocks. It is evident, however, tliat in spite of the wide extent over which these Silurian rocks of North Wales are spread, and the great thickness which they attain, they do not present an adequate stratigraphical equivalent for the complete succession in the original Silurian district. Instcad of passing-up conformably into the base of the Old Red Sandstone, as at Ludlow, they are covered by that formation unconformably. In fact they have been upturned, crumpled, faulted, and cleaved before the deposition of those portions of the Old Red Sandstone

which lie upon them. These great physical changes took place in Denbighshire when, so far as the evidence goes, there was entire quiescence in the Shropshire district ; yet the distance between the two areas was not more than about 60 miles. These subterranean movements were doubtless the precursors of those more widely extended upheavals which converted the floor of the Silurian sea into a series of isolated basins, in which the Old Red Sandstone was laid down.

In Westmoreland and Cumberland a vast mass of hard slates, grits, and flags was identified by Sedgwick as of Upper Silurian age. These form the varied ranges of hills in the southern part of the lake district from near Shap to Duddon mouth. The following are the local subdivisions with the conjectural equivalents in Siluria.?

Flaggy beds, with lamelli-

branchs abundant……. Massive greenish and grey sand-

Hay Fell and =(?) Tilestones.

Kirkby Moor Upper Lud-

Le stones, with bands of fossils, > = 1 Holopella abundant ……. sis Calcareous beds, with Rhyncho- Aymestry nella navicula abundant ….§ (Limestone. Bannisdale Sandstone and shale, with star- Lower Lud- RIEEES) oss seen S13] Op eO REO Renee Mite sis sceiad: sas low. Dark blue flags and grits of) _ | UpperWen- Great CHICKS . .5…0.000.0000 a lock. (Flags and greywacke (Ortho-) ceras subundulatum, O. an- ; c ulatum, Graptolithus Fle- Coniston Grits Snes, G. colonus, Ceratio- Tigivcky; caris Murchisoni), upwards +} = lock a Of 4000 FEEL .....c0sc0.csn0ee0e aii Dark grey coarse flags (Car- Coniston Flags { diola interrupta, Orthoceras subundulatum), 1000 feet… J Coniston Limestone (Lower Silurian).....0600 = oe ?

In the northern part of the Lake district a great anticlinal fold takes place. The Skiddaw slates arch over and are succeeded by the base of the volcanic series above described. But before more than a small portion of that series has appeared the whole Silurian area is overlapped unconform- ably by the

Carboniferous Limestone series, It is necessary to cross the broad plains of Cumberland and the south of Dumfriesshire before Silurian rocks are again met with. In this intervening tract a synclinal fold must lie, for along the southern base of the uplands of the south of Scotland a belt of Upper Silurian rocks, dipping on the whole to the south-east, can be traced from the heart of the Cheviot Hills to the headlands of Wigtownshire. These rocks must reach a thickness of several thousand feet, but their top is nowhere seen. They repose on some of the older parts of the Llandeilo series, with so close a coincidence of dip and strike that no decided unconformability has yet been traced between them. ‘Thcy consist essentially of shales, with a

1The arrangement and thicknesses here given are those in the Kendal district as mapped by Mr Aveline and Mr Hughes in the course of the Geological Survey (Sheet 98, S.E., Explanation, pp. 6-13,

1872).

G HO L Oe F

| fossils with a mixture of Caradoc forms.

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considerable proportion of greywacke bands towards the base. At different horizons they contain lenticular bands of a caleareous pebbly grit. But their most characteristic feature, and one which at once distinguishes them locally from the adjoining Lower Silurian rocks, is the occurrence of a nearly black, highly fissile shale, composed of layers in most cases as thin as ordinary writing paper and usually crowded with graptolites. These peculiar bands occur throughout the whole series of rocks from bottom to top. They are sometimes so thin that 20 or 30 seams or ribs, each finely fissile, may be seen intercalated within the space of an inch of the ordinary shale or greywacke. Occasionally they form zones 80 to 100 feet thick, consisting entirely of finely leaved graptolitic shales. As a whole these Upper Silurian strata resemble lithologically the correspond- ing series in Westmoreland, though here and there they assume the character of mudstones not unlike those of Shropshire. The abundant fossils in them are

simple graptolites (Graptolithus Sedgwickii, G. Becki, G. Flemingit, G. colonus, G. Griestonensis, Retiolites Geiniteianus, &c.). Orthoceratites come next in point of numbers (Orthoceras annulatum, O. tenuicinctum, &c.). In some of the shales crustacean fragments are numerous. They include large pieces of the carapace of Dictyocaris, with remains of Pterygotus and Ceratiocaris. The pebbly grits contain Petraia and crinoid stems. In the south of Kirkcudbright certain limestones and conglomerates intercalated among these shales have yielded a more varied fauna, having on the whole a decidedly Wenlock character. It includes Favosites, Catenipora, Beyrichia tuberculata, Phacops caudatus, Meristella, Lepteena sericea, Atrypa reticularis, Strophomena imbrex, Murchisonia, Orthoceras tenuicinctum, de.

It is impossible in the south of Scotland to separate the Upper Silurian rocks into Wenlock and Ludlow groups. On the whole these rocks seem to be representative mainly of the older half of the Upper Silurian formations. They are covered unconformably by Lower Old Red Sandstone and later formations. In the counties of Edinburgh and Lanark, however, the base of the Lower Old Red Sandstone is found to graduate downward into a thick series of brown, olive, and grey shales, sandstones, and grits, containing undoubted Ludlow fossils. It is deserving of remark also that the peculiar lithological type so characteristic of the strata in the original Silurian area reappears in the centre of Scotland, many of the concretionary brown shales and olive-coloured mudstones being undistinguishable from those in the typical sections at Ludlow. Some of these beds are crowded with fossils. Among the most character- istic are Leptena transversalis, Orthonota amygdalina, Platyschisma_ helicites, Beyrichia Kledem, Orthoceras Maclareni, with many crustaceans of the genera Ceratiocarcs, Eurypterus, Pterygotus, Slimonia, and Stylonurus. In the Pentland Hills these strata are estimated to attain a thick- ness of 3500 to 4000 feet, but their base is nowhere reached; in Lanarkshire they are at least as thick. Their lower portions may represent some of the higher parts of the Wenlock group.

Treland furnishes some interesting evidence regarding the geographical changes in the west of Europe between thie close of the Lower Silurian and the beginning of the Upper Silurian period. It has already been pointed out that the metamorphosed Lower Silurian rocks of the Scottish High- lands

are prolonged into the north of Ireland, whence they range south-westwards to Galway Bay. In the picturesque tract between Loch Mask and the nouth of Killary harbour these metamorphosed rocks are unconformably overlaid by masses of sandstones, conglomerates, and shales more than 7000 feet thick, and containing Llandovery and Wenlock In the midst ,

XxX. ae 48

of the greatly metamorphosed Lower Silurian platform, por- tions are to be found still little altered and full of fossils. The overlying Upper Silurian strata have not been meta- morphosed, but contain pebbles of the altered rocks on the upturned edges of which they lie. It is evident therefore, as Mr Hull has remarked, that the metamorphism must have occurred between the close of the Lower and the com- mencement of the Upper Silurian period. In connexion with this question it should be remarked that abundant volcanic activity accompanied the deposit of these Upper Silurian rocks in the west of Ireland, successive sheets of lava (eurite) and beds of tuff forming conspicuous bands among the stratified rocks, and reaching a collective thick- ness of 800 feet and upwards. Between Brandon Head and Dingle Bay a thick mass of strata on the coast, must, from the comparatively few fossils obtained from it, be held to represent Upper Silurian formations.

ConTINENTAL Euvrore.—The broad hollow which, run- ning from the mouth of the English Channel across the plains of northern Germany into the heart of Russia, divides the high grounds of the north and north-west of Europe from those of the centre and south, separates the European Silurian area into two distinct tracts. In the northern of these we find the Lower and Upper Silurian formations attaining an enormous development in Britain, but rapidly diminishing in thickness towards the north-east, until in the south of Scandinavia and the Gulf of Finland they reach only about 1;th of that depth. In these tracts, too, they have on the whole escaped so well from the dis- locations, crumplings, and metamorphisms so conspicuous to the south-west, that to this day they remain over wide areas nearly as horizontal and soft as at first. In the southern tract Silurian rocks appear only here and

there from amidst later formations, and almost everywhere pre- sent proofs of intense subterranean movement.

In the south of Scandinavia (Christiania, Mjésen See, Malm, Gothland) the Lower and Upper Silurian rocks attain a united thickness of not more than about 1200 fect, yet are said to contain representatives of all the leading subdivisions of the British series. The following table exhibits the Silurian succession in the south of Norway and Sweden, with the supposed English cquivalents:— Sandy beds, with Ptcrinea retroflexa, Rhyn-

chonella nucula, Orthonota retusa, Ber} =Upper Ludlow.

richia tuberculata. S. Gothland ….. esemeece Upper Malmo limestone …....::seeeeeererreeees 7} Upper Graptolite marls, with Graptolithus

priodon (Ludense) abundant…….....sesseeeees s Lower Malmé or upper Orthoceratite limestone, =e with large Orthocerata having central SIPNUMCIES cs .cesnecossansooceest¥ees vans dremeirites J Encrinital schists with orthoceratites and Gom- PROCETAS PYTUOTINE ..cccscreseraceeresvoes posmEa00de Coral limestone (Omphyma turbinatum and Other Wenlock corals) ..niinseecsesnssbaseeeseee Pentamerus limestone, Pentamerus oblongus, P. galeatns, Stricklandinia lens, Leptena transversalis, Encrinurus punetatus, &e. .... TowersarsillaccousisChists vel asncassnscecurecns Calcareous sandstones (containing a mixture of) Liandovery forms, as Mcristella angustifrons, and many large smooth Pentamer?)..... Calcareous and argillaceous flagstones, Orthis calligramma, O. testudinaria, O. pecten, Lcp- +} =Caradoc. tena sericea, Conularia quadrisulcata, Asa- | phus expansus, Trinucleus concentricus, &c. Orthoceratite limestone and lower Encrinital ROMISUS Me neresmerees ae ckiancs lccisceitecles seseicserseass Upper Graptolite schists, with Diplograptus pristis, D. folium, D. teretiusculus, and forms of Asaphus, Ogygia, Trinucicus, &e. ..... Lower Orthoceratite limestone, with Orthoceras duplex, 0. annulutum, Litwites cornu-arietis, Orthis calligramma, O. clegantula, Bcllero- phon bilobatrs, 80. .....-.- eeeceereeessceweeeons

\ = Wenlock.

= Llandovery.

= Llandeilo.

1 Physical Geology of Ireland, p. 22; Kinahan’s Geology of Pint, chap. iii.; Geological Survey of Ireland, Explanation of Sheets (76, 77, 83, and 84).

GEOLOGY

Lower Graptolite schists (with numerous grap-

Wenlock group of Britain. Scandinavian strata containing such characteristically Lower

[vI. STRATIGRAPHICAL,

tolites = Arenig in part.

cic elo o\¥igisieinjaieiolvia.si4/s\0/0/x\)910\ace\w.e|#.4) 01016) 18) 8018 \s\s)4i4isini=isieis

Alum schists, 150 feet (= Regiones A and B of

Angelin), containing the fossils enumerated \ Cambrian. OD) Pie L caietsnilesi. oa ieew enews aehiaene eaenneeaeaee™

Quartzite (Fucoids)... .....0..sescceceereeeneeeeseeene J

Though the general resemblance of the succession of

fossils in Scandinavia and in Britain is singularly close,

there are, as might have been anticipated, differences in the

range of species, some forms having appeared earlier or having survived later in the one region than in the other.

Thus the Pentamerus oblongus ascends in Scandinavia into rocks full of Wenlock corals, but does not occur in the On the other hand, among

Silurian genera of trilobites as Asaphus, T'rinucleus, and Ogygia, there occur organisms which in Britain are typically

Upper Silurian, such as Orthoceras dimidiatum and O. dis-

tans, two fossils of the Ludlow rocks. This is a point of

considerable importance in its bearing upon the value of

paleontological evidence in correlating the formations of different countries. It shows that the order of succession found to hold good in one region cannot be rigidly applied to others, and that in such cases it is not from individual species so much as from the general facies of the fossils that we must draw geological parallels. The first appearance and duration of a species have doubtless greatly varied in different regions.

In Russia Silurian rocks must occupy the whole vast breadth of territory betwecn the Baltic and the flanks of the Ural Mountains, beyond which they spread castwards into Asia. Throughout most of this extensive area they lie

in horizontal undisturbed beds, covered over and concealed from view by later formations. Along the flanks of the Urals they have been upheaved, and placed on end or at a high angle against the central portions of that chain, and have been partially metamorphosed into ehlorite-schist, mica-schist, quartz-rock, and other crystalline masses. But along the southern margin of the Gulf of Finland they appear at the surface as soft clays, sands, and unaltered strata, which, so far as their lithological characters go, might be supposed to be of late Tertiary date, so little have they been changed during the enormous lapse of ages since Lower Paleozoic time. The great plains between the Ural chain on the east and the rising grounds of Germany on the south-west have thus from a remote geological antiquity been exempted from the terrestrial corrugations which have affected so much of the rest of Europe. They have been alternately, but gently, depressed as a sea-floor, and elevated into steppes or plains. The following subdivisions have been established by F. Schmidt among the Silurian rocks of north-west Russia :—*

J. Upper Silurian—

Sandy variable limestone, with marly layers passing into sandstone (Beyrichia tuber- culata, Grammysia cingulata, Chonetes striatella, and numerous fish remains, Onchus, &c.)

= Tilestones.

Upper Oesel group, yellow marly and some- times dolomitic strata (Rhynchonella Wil- soni, Chonetes striatella, Platyschisma heli- + = Ludlow.

cites, Eurypterus remipes, and fish 7 MIVAUTIS, PRCCaoete eee cacieceseeiiects«acmemtentesslats = Lower Oesel group, dolomite, with marl and limestone below (Propora tubulata, Haly- sites distans, Beyrichia Klédent, Eneri- nurus punctatus, Proétus concinnus, Meris- tella tumida, Spirifer crispus, Leptena transversalis, Euomphalus funatus, Ortho- coras annulatwm, KC.) o.ccscoccessccsrencesenes Il. Middle Silurian— Pentamerus band, with P. chstonus (ob- longns), Alveolites Labechei, Bellerophon dilatatus, Bronteus signatus (laticauda)... Compact limestone and dolomite with siliceous nodules (Heliolites interstinetus, Ptilodictya

scalpellum, Strophomena pecten, Orthis hy- brida, Pcntamerus linguifer, Leperditia MT Bs. si aferisiot bn ndls.as.oasesndneasuane. Pentamerus band, limestone, and dolomite, with Pentamcrus borealis, SC. wees ee scenes

= Wenlock.

= Llandovery.

————<— ee

2 Untersuchungen iiber die Silurische Formation von Estland, Nord-Livland, and Oescl, Dorpat, 1858.

SILURIAN. |

IL. Lower Silurian—

(c) Borkholm limestones and marls (Halysites) labyrinthica, Heliolites megastoma, Syrin- | gophyllum organum, Lichas margaritifer, Pleurorhynchus diptcrus, Orthoceras cala- mitcum, &e.)

= Caradoc.

plicata, Asaphus acuminatus, Orthis calli- gramma, Leptoena sericea, &C.) .....ccceeens (b) Orthoceratite limestone and marl bands, 15 to 40 feet thick (Monticulipora petro- politana, chinospherites aurantium, Asaphus expansus, Orthis calligramma, Orthoceras vaginatum, 80.) ...cccccccceeeceees (a) Limestone, full of glauconite grains, especially towards the bottom (Orthis calligramma, O, extensa, abundant frag- ments of I7/enus and Asaphus, &c.)..... ene sand (6 feet), with numerous oraminifera in the glauconite grains (Pandcrella, Cymbulia, Tiedemannia, &c.) and the ‘‘Conodonts ” of Pander…..... (c) Alum-slate (10 feet), highly carbonaceous, with pyrite-nodules and abundant grapto- lites (Dictyonema Hisingeri, Obolus, &c.) (b) Ungulite sandstone (120 feet), yellow to white, with (in the upper part) abundant shells of Obolus Apollinis (‘‘ Ungulites ” Ce eee ee ere Coe eee eee eee | (a) Blue clay, with

sandstone bands, sparingly fossiliferous ; bored at Revel to a depth of 800 feet without its bottom being reached

In the centre and south of Europe by far the most important Silurian area is the basin of Bohemia, so admirably worked out by M. Barrande in his great work already cited (p. 328), wherein the formations are grouped as in the subjoined table :—

Hitage H Shales with coaly layers and beds of quartzite (Phacops fecundus, Tentacu- lites elegans), with species of Leptena, Orthoccras, Lituttes, Goniatitis, &e. ... 850 ft, » G Argillaceous limestones with chert, shales, and calcareous nodules …..... 1000 ,, Numerous trilobites of the genera Dal- manites, Brontews, Phacops, Proétus Harpes, and Calymene; Atrypa reticr laris, Pentamerus lingutfer.

F Pale and dark limestone with chert. Harpes, Lichas, Phacops, Atrypa reticu- laris, Pentamerus galcatus, Favosites Gothlandica, F. fibrosa, Tentaculites.

», E Shales with calcareous nodules, and shales resting on sheets of igneous rock (300 £.) ces ovat + SRN ates Maa 450-900 ,, A very rich Upper Silurian fauna, abundant cephalopods, trilobites, &c. ; Halysites catenularius, graptolites many species.

D Yellow, grey, and black shales, with quartzite and conglomerate at base .. 3000 ,, Abundant trilobites of genera Trinuw- cleus, Ogygia, Asaphus, TIllenus, Remopleurides, &c.

© Shales or ‘‘ schists,” sometimes with porphyries and conglomerates … 900-1200 ,, Paradoxides, Ellipsoccphalus, Agnostus, and other genera of trilobites referred to above (ante, p. 330).

‘sm 2B Schists wholly unfossiliferous resting

= Llandeilo.

= Arenig.

Upper Silurian. 3d Fauna

Lower Silurian. 2d Fauna.

Azoic. Cambrian. Primordial Fauna.

», AJ on bottom gneiss.

The lower two étages (A, B) correspond probably to some of the older party of the British Cambrian series, and perhaps in part to still older rocks. Htage C, or the Primordial Zone, is the equivalent of the Upper Cambrian rocks of Wales, possibly also partly of the Arenig series. Etage D, subdivided into five groups (d1, d2, d8, d4, and d5), appears to be, on the whole, representative of the Lower Silurian formations of the British area, though it is impossible to make the minor subdivisions in the two countries agree. The

remaining four formations answer to the English and Welsh Upper Silurian series,—the highest zone of all (H) indicating by its organic remains the approach of the Devonian series. _, Small though the area of the Silurian basin of Bohenzia is (for it measures only 100 miles in extreme length by 44 miles in its greatest breadth), it has proved extraordinarily rich in organic remains. M. Barrande has named and described above 2000 species from that basin alone, the greater number being peculiar to it. Some aspects of its organic facies are truly remarkable. One of these is the extraordinary variety and abundance of its straight and curved cephalopods. M. Barrande has determined 18 genera and 2 sub-genera, comprising in all no fewer than 1127 distinct species. The genus Orthoceras alone contains 554 species, and Cyrtoccras has 330. The trilobites likewise appear in great numbers, the same indefatigable explorer having detected as Inauy as 42 distinct genera, comprising 850 species. Of these the most prolific genus is Bronteus, which includes 46 species entirely confined to the 3d fauna or Upper Silurian; Acidaspis has 40 species, of which 6 occur in the 2d and 34 in the 8d fauna. Proétws also numbers 40 species, which all belong to the 3d fauna, save 2

found in the 2d. Other less prolific but still abundant genera are Dalmanites, Phacops, and Jilenus. The 2d fauna, or Lower Silurian rocks, contain in all 32 ees and 127 species of trilobites, while the 3d fauna, or Upper ilurian formations, contain 17 genera and 205 species, so that generic types are more abundant in the earlier and specific varieties in the later rocks.?

In Germany Silurian rocks appear in a few detached areas, but present a great contrast to those of Bohemia in their comparatively unfossiliferous character, and the absence of any one continuous succession of the whole Silurian system. They occur in the Thuringer Wald, where a series of fucoidal-schists (perhaps Cam- brian) passes up into slates, greywackes, &c., with Lingula, Discina, Calymene, numerous graptolites, and other fossils. These strata (from 1600 to 2000 feet thick) may represent the Lower Silurian formations. They are covered by some graptolitic alum- slates, shales, flinty slates, and limestones (Favosites Gothlandica, &c.), Which no doubt represent the Upper Silurian, and pass into the base of the Devonian formations. Among the Harz Mountains certain greywackes and shales containing land-plants (lycopods, &c.), trilobites (Dalmanites, &c.), graptolites, &c., are regarded as of intermediate age between true Upper Silurian and Lower Devon- ian rocks. In the north-west of France an impoverished series of sandstones and slates represents the succession of formations up to the top of the Silurian or base of the Devonian system, and contains a suite of trilobites which indicate more analogy with the Silurian fauna of Bohemia and of Spain than with that of the British Islands. In the western half of the Spanish peninsula Silurian rocks are found flanking the older schists and crystalline masses, and spread- ing over a vast area of the tableland. They appear to belong chiefly if not wholly to the lower division of the system, and they include representatives of Barrande’s primordial zone, containing 19 species of organisms, of which 9 are primordial trilobites.

Nortn America.—In the United States and Canada the Silurian formations spread continuously over a vast territory, from the mouth of the St Lawrence south- westwards into Alabama and westwards by the great lakes. They almost encircle and certainly underlie all the later Paleozoic deposits of the great interior basin. The rocks are most typically developed in the

state of New York, where they have been arranged as in the sub- joined table.

B. Upper Silurian.

IV. Oriskany . _ Pinca. Oriskany sandstone Sache aed arenosus). (4) Upper Pentamerus limestone (Penia-

merus pscudogaleatus)

III. Lower (3) Delthyris limestone (Meristella levis) Helderberg { (2) Lower Pentamerus limestone (Penta- } Ludlow. Formation. MEP TUS GOL COLWS)) Si orwes. s cis io seine isise'g dri

(1) Water-lime (Tentaculites, Eury- L plerus, and Ptlerygotus) .....ssece00+: II. Salina Onendago salt group, nearly barren of Formation. SIE iia sital. Seitagsrcracyaiginacnpasisy «Biongs ((8) Niagara shale and limestone (Haly- sites, Favosttes, Calymene Blumen- Wsmlacte bachti, Homalonotus delphinoce- : I. Niagara phalus, Lepteena tranversalis, &c.) Formation. | (2) Clinton group (Pentamerus oblongus, Upper Atrypa reticularis, Ke.).....0+59 las (1) Medina group with Oneida con- | govery,

glomerate (Modiolopsis orthonota)

1 Syst. Silur., vol. ii. suppt., p. 266, 1877, 2 Barrande, Syst. Silur., vol. i. suppt., ' Trilobites," 1871.

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A, Lower Silurian. (3) Cincinnati (Hudson River) group (Syringopora, Halysites, Diplograptus pristis, Pterinca demissa, Leptoena sericea). (2) Utica group—Utica shale. (Graptolithus caulis,

amplext- Trinucleus concentricus, Orthis testudinaria, Mur- chisonia, Conularia, Orthoceras, Cyrto- ceras, &e.

(3) Chazy group—Chazy limestone (Maclurca magna, M. Logani, Orthoceras, Illenus, Asaphus).

(2) Quebec group (upwards of 100 species of trilo- bites of genera Agnostus, Ampyx, Amphion, Conocoryphe, Dikcloccphalus, Illenus,

(1) Caleiferous group (graptolites, Lingulella aci- minata, Lepteena, Conocardium, Ophileta com- pacta, Orthoccras primigenium, 14 species of trilobites of the genera Amphion, Bathyurus, Asaphus, Conocoryphe).

Potsdam formation, representing Cambrian (see ante, p. 331).

The most recent rescarches of Mr Selwyn and his colleagues of the Geological Survey of Canada have shown that in the so-called Quebec group have been included a number of formations of very different stratigraphical positions. He recognizes in it three distinct groups :—(1) at the base a group of crystalline schists ; (2) a group of sandstones and slates with abundant volcanic rocks, probably Cambrian ; and (3) Lower Silurian slates, shales, limestones, quartz- ites, sandstones, and conglomerates. He objects to the introduction of new names to denote systems of rocks, and thinks that Laurentian, Huronian, Cambrian, and Silurian meet all present requirements.

(Trenton limestone. (1) Trenton | Black River group limestone. Birdseye limestone.

JI. Trenton Formation.

J. Canadian Formation.

DEVONIAN AND OLD RED SANDSTONE.

In Wales and the adjoining counties of England, where so full a development of the Silurian system was originally discovered and worked out by Murchison, the abundant marine fauna comes to an abrupt close when the red rocks set in at the top of the Ludlow group. From that horizon upwards in the geological series we have to pass through some 10,000 feet or more of barren red sandstones and nmarls, until we again encounter a copious marine fauna in the Carboniferous Limestone. It is evident that between the disappearance of the Silurian and the arrival of the Carboniferous fauna very great geographical changes must have occurred

over the area of Wales and the west of England. The sea must have been excluded from the area, or at least must have been rendered unfit for the existence and development of marine life over the area in question. From the striking contrast between the general facies of life in the Silurian and that in the Carboniferous system it is manifest that the interval between them must have been of long duration.

The geological records of this vast interval are still ouly very partially unravelled and interpreted. At present the general belief among geologists is that, while in the west and north-west of Europe the Silurian sea-bed was upraised into land in such a way as to enclose large inland basins,

.in the centre and south-west the geographical changes did not suffice to exclude the sea, which continued to cover more or less completely that region. In the isolated basins of the north-west a peculiar type of deposits termed the Old Red Sandstone is believed to have accumulated, while in the shallow seas to the south and east a series of marine sediments and limestones was formed to which the name of Devonian has been given. It is thus supposed that the Old Red Sandstone and the Devonian represent different geographical areas, with different phases of sedimentation and of life, during the long lapse of time between the Silurian and Carboniferous periods.

That the Old Red Sandstone does really represent this prolonged interval can be demonstrated by innumerable sections in Britain, where its lowest strata are found gradu-

ating downward into the top of the Ludlow group aud its highest beds are seen to pass up into the base of the Carboniferous system. But the evidence is not everywhere so clear in regard to the true position of the Devonian rocks. That these rocks lie between Silurian and Carboni- ferous formations is indeed sufficiently clear. But it isa curious fact that where the Lower Devonian beds are best developed the Upper Silurian formations are scarcely to be recognized, or if they occur, they can hardly be separated

from the so-called Devonian rocks. It is therefore quite possible that the lower portions of what has been termed the Devonian series may in certain regions to some extent represent what are elsewhere recognized as undoubted Lud- low or even perhaps Wenlock rocks. We cannot suppose that the rich Silurian fauna died out abruptly at the close of the Ludlow epoch. We should be prepared for the dis- covery of younger Silurian rocks than the latest of those in Britain, such as M. Barrande has shown to exist in his Etage H. The rocks termed Lower Devonian may partly represent some of these later phases of Silurian life, if they do not also mark peculiar geographical conditions of a still older period in Upper Silurian time. On the other hand, the upper parts of the Devonian system might in several respects be claimed as fairly belonging to the Carboniferous system above.

The late Mr Jukes proposed a solution of the Devonian problem, the effect of which would be to turn the whole of the Devonian rocks into Lower Carboniferous, and to place them above the Old Red Sandstone, which would thus become the sole representative in Europe of the interval between Silurian and Carboniferous time.! In the following descriptions an account will first be given of the Devonian type and then of the Old Red Sandstone.

A. Devonian.

This name was first applied by Sedgwick and Murchison to the rocks of North and South Devon and Cornwall, whence a suite of fossils was obtained which Lonsdale pro- nounced to be intermediate in character between Silurian and Carboniferous. The relations of these strata to Silurian rocks cannot be determined from any section. They pass upward into Carboniferous strata. They have been arranged into three divisions, as in the subjoined table.

Pilton and Pickwell-Down Group.—Grey slate with courses of impure limestone (Pilton) passing down into yellow, brown, and red sandstones (Baggy Point, Marwood), and a series of hard grey and red sand-

| stones and micaceous flagstones at the base (Pickwell-

Down, Dulverton, Morte Bay).

| Ilfracombe Group.—Grey unfossiliferous slates (Morte

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Upper…

Hoe, Woolacombe, and Lee Bay) passing down into calcareous fossiliferous slates and limestones (IIfra- combe, Combe Martin, Torquay, Plymouth) resting on hard green, grey, and red grits, sandstones, and conglomerates (Hangman Hill).

Lynton Group.—Soft slates with thin limestone and sandstone bands (Lynton) resting on lowest schists and red and grey micaceous sandstones (Lynton, Lyn- mouth, Foreland, &c.).

The total fauna of the British Devonian rocks numbers about 400 species. The middle group is the chief reposi- tory of fossils.

Lower.—Among the lower gritty slates and limestone bands of North Devon there are found, according to the detailed census compiled by Mr Etheridge, 18 species of fossils, comprising Favosites cervicornis, Fenestella antigua, Orthis arenata, Spirifer canaliferus, S. leevicostus, &e. Of these organisms 7 species are also found among the Devonian rocks of the Rhine, Belgium, or France. Mr Etheridge re-

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1 See his papers in Journ. Roy. Geol. Soc. Ireland (1865), i. pt. 1, new ser., and Quart. Journ. Geol. Soc., xxii. (1866), and his pamphlet on Additional Notes on Rocks of North Devon, &c., 1867.

Middle.

=

I Lower….

DEVONIAN. |

marks that it is singular that the British Lower Devonian rocks should only have yielded 1 gasteropod (Pleurotomaria aspera), 4 lamellibranchs, 1 cephalopod (Orthoceras gracile), and 1 nucleobranch (Bellerophon bisulcatus). They have furnished only 10 brachiopods. Traces of fish remains have been obtained among them in the form of bones and coprolitic debris. So far as observation has gone not a single Silurian species lias been certainly detected in the Devonian rocks of Britain, with, according to Mr Etheridge, the sole exception of the long-lived and universally diffused Atrypa reticularis, which occurs in the Ilfracombe group. There can be no doubt, however, from the meagre list of fossils from the Lower Devonian rocks of Devon and Cornwall, that either the conditions for the existence or those for the fossilization of the early Devonian fauna must have been singularly unfavourable in the south-west of England. It would be exceedingly rasli to argue as to the extinction of the Silurian fauna from the unsatisfactory evidence of these rocks.

Middle.—As above remarked, this is the great storehouse of Devonian fossils in the south-west of England. In this fauna, as tabulated by Mr Etheridge, there are 8 amorpho- zoans, including 5 species of Stromatopora; 23 genera and 50 species of ccelenterates, among which the corals Acervularia, Alveolites, Cyathophyllum, Favosites, Pleuro- dictyum, and Petraia are conspicuous; 4 genera and 8 species of crinoids (Hexacrinus, Cyathocrinus, &ec.); 1 annelide (Tentaculites annulatus); 5 genera and 13 species of crustaceans, which are all trilobites (Phacops granulatus, P. latifrons, P. punctatus, Bronteus flabellifer, Cheirurus articulatus, Harpes macrocephalus, &c.); and 12 species of polyzoans. The brachiopods are abundant; 68 species have been yielded by the rocks of South Devon, including Athyris concentrica, A. lachryma, Atrypa reticularis, A. desquamata, Camarophoria rhomboidea, Cyrtina Lemarlit, Orthis striatula, Rhynchonella acuminata, R. pugnus, Pentamerus brevirostris, Spirifer disjunctus, Stringocephalus Burtini, Unceites gryphus, &c. The lamellibranchs are poorly represented, 11 genera only occurring, and many of them represented by only 1 species. The gasteropods are likewise present in but small numbers and variety ; 12 genera and 36 species have been euumerated. Of these species, 4 (Acroculia vetusta, Huomphalus levis, Macro- cheilus imbricatus, and Murchisonia spinosa) survived into the Carboniferous period. The cephalopods are repre- sented by 5 genera, the

most abundant specifically being Cyrtoceras and Orthoceras; Goniatites, Clymenia, and Nautilus also occur. Of the total list of fossils a large proportion is found in the Middle Devonian rocks of the continent of Europe. Very few species agree with those of the Silurian or with those of the Carboniferous system.

Upper.—From the calcareous portions of the Pether- win and Pilton beds of Cornwall and Devon a considerable number of fossils has been obtained. Among the more characteristic of these we find 11 species of the coiled cephalopod Clymenia (C. undulata, C. levigata, C. striata), the trilobites Phacops granulatus and P. latifrons, the small ostracod Cypridina serrato-striata, the brachiopods Spirifer disjunctus or Verneullii, Strophomena rhomboidalis, Chonetes Iardrensis, Productus subaculeatus, and the lamellibranch Cuculea Harding. The Marwood and Baggy Point beds have also yielded traces of land plants, such as Knorria dichotoma and Adiantites Hibernicus, the latter fern being common in some parts of the Upper Old Red Sandstone of Ireland.

The higher red and yellow sandy portions of the Upper Devonian rocks shade up insensibly at Barnstaple in North Devon into strata which by their fossils are placed at the base of the Carboniferous Limestone series. But in no other Series save the south-western district of Britain can such a

passage be observed, Inall other places the Carboniferous system, where its true base can be seen, passes down into the red sandy and marly strata of the Upper Old Red Sandstone without marine fossils.

CoNTINENTAL Evropr.—Devonian rocks occupy a large area in the centre of Europe, extending from the Ardennes through the south of Belgium across Rhenish Prussia to Darmstadt. They are best known from the picturesque gorges which have been cut through them by the Rhine below Bingen and by the Moselle below Treves. They have been arranged into the following groups in the Eifel region,

where their true geological position was first indicated by Sedgwick and Murchison.

III. Upper Devonian—

(c) Cypridina shales (Cypridina serrato-striata).

(b) Goniatite shales (Gontiatitcs retrorsus, G. primordialis, Orthoceras subjlexuosum, Cardiola retrostriata, &c.).

(a) Nodular crumbling limestone (Kramenzelkalk), dolomitic marl, and shaly limestone (Spirifer disjunctus or Vi erneutllt, Atrypa reticularis, Rhynchonelia cuboides, Productus sub- aculeatus, &ec.).

II. Middle Devonian—

(0) Stringocephalus group, consisting of the great Eifel lime- stone with underlying crinoidal beds (Stringocephalus Bur- tint, Spirifcr undatus, Produetus subaculeatus, Pentamerus galeatus, Atrypa reticularis, Caleeola sandalina, and many corals and crinoids). ;

(a) Calceola group,—marly limestones full of Calccola sandalina, Spirifer coneentricus, Camarophoria mierorhyncha, &c.,

esting upon impure shaly ferruginous limestone and grey- wacke, marked by an abundance of Spirifcr cultrijugatus, Lthynchonella Orbignyana Atrypa reticularis, Phacops lati- Srons, &c. I. Lower Devonicen—

(c) Upper greywacke and shale (Vichter-Schichten}, with a mixture of Lower and Middle Devonian fossils.

(0) Ahr group,—greywacke-shales with Chonetes sarcinulata, C. dilatata, LRhynehonclla Livonica, Spirifer paradoxus, S. speciosus, many species of Pterinea, Pleurotomaria, and Murchisonia.

(a) Coblentz group, greywacke and clay-slate (Leptena laticosta, Chonetes sareinulata, Rhynehonella Livoniea, Plewrodietyum problematicum, &c.).

This threefold subdivision, with a central mass of calcareous strata, is traceable westwards through Belgium (where the Calcaire de Givet represents the Stringocephalus limestone of the Eifel) and castwards into the Harz. ‘The rocks reappear with local petro- graphical modifications, but with a remarkable persistence of general palzontological characters, in Eastern Thuringia, Franconia, Sax- ony, Silesia, the north of Moravia, and East Galicia. Devonian rocks have been detected among the crumpled rocks of the Styrian Alps by means of the evidence of abundant corals, clymenias, gasteropods, lamellibranchs, and other organic remains. Perhaps in other tracts of the Alps, as well as in the Carpathian range, similar shales, limestones, and dolomites, though as yet unfossili- ferous, but containing ores of silver, lead, mercury, zinc, cobalt, and other metals, may be referable to the Devonian system.

In the centre of Europe, therefore, the Devonian rocks consist of a vast thickness of dark-grey sandy and shaly rocks, with occasional seams of limestone, and in particular with one thick central cal- careous zone. These rocks are characterized in the lower zones by numerous broad-winged spirifers and by peculiar trilobites (Phacops, Homalonotus, &c.), which, though generically like those of the Silurian system, are specifically distinct. The central calcareous zone abounds in corals and crinoids as well as in numer- ous brachiopods. In the highest bands a profusion of coiled cephalopods (Clymenia) occurs in some of the limestones, while the shales are crowded with a small but characteristic ostracod crusta- cean (Cypridina). Here and there traces of fishes have been found, more especially in the Eifel, but seldom in such a state of preservation as to warrant their being assigned to any definite place in the zoological scale. More recently, however, E. Beyrich has described from Gerolstein in the Eifel an undoubted species of Pterichthys, which, as it cannot be certainly identified with any known form, he names P. Rhenanus. A Cocecosteus has been described by F. A. Roemer from the Harz, and more recently one has been cited from Bicken near Herborn by V. Koenen; but, as Beyrich points out, there may be some doubt as to whether the latter is not a Pterichthys.1 A Ctenacanthus, seemingly undistin- guishable from the C. Bohemieus of Barrande’s Etage G, has also been obtained from the Lower Devonian ‘‘ Nereitenschichten” of ee eee

1 Zeitschrift der Deutsch. Geol. Gesell., xxix. (5,

Thuringia.! The echaraeteristie Holoptychius nebilissimus has re- eently been detected in the Psammite de Condroz, whieh in Belgium forms a charaeteristie sandy portion of the Upper Devonian rocks. These are interesting faets, as helping to link the Devonian and Old Red Sandstone types together. But they are as yet too few and unsupported to warrant any large deduetion as to the correla- tions between these types.

It is in the north-east of Europe that the Devonian and Old Red Sandstone appear to be united into one system, where the lime- stones and marine organisms of the one are interstratified with the fish-bearing sandstones and shales of the other. In Russia, as was shown in the great work Russia and the Ural Mountains by Mur- chison, De Verneuil, and Keyserling, roeks intermediate between the Upper Silurian and Carboniferous Limestone formations cover an extent of surface larger than the British Islands. This wide development arises not from the thickness but from the undisturbed horizontal eharaeter of the strata. Like the Silurian formations above deseribed, they remain to this day nearly as flat and un- altered as they were originally laid down. Judged by mere vertical depth, they present but a meagre representative of the massive Devonian greywacke and limestone of Germany, or of the Old Red Sandstone of Britain. Yet vast though the area is over whieh they form the surface rock, it is probably only a small portion of their total extent; for they are found turned up from under the newer formations along the flank of the Ural chain. It would thus seem that they spread continuously across the whole breadth of Russia in Europe. Though almost everywhere undisturbed, they afford evidence of some terrestrial oscillation between the timeof their formation and that of the Silurian rocks on which they rest, for they are found gradually to overlap Upper and Lower Silurian formations.

The chief interest of the Russian roeks of this age lies in the fact, first signalized by Murehison and his assoeiates, that they unite within themselves the eharacters of the Devonian and the Old Red Sandstone types. In some distriets they eonsist largely of limestones, in others of red sandstones and marls. In the former they present mollusks and other marine

organisms of known Devonian species; in the latter they afford remains of fishes, some of whieh are specifically identical with those of the Old Red Sand- stone of Seotland. The distribution of these two palxontologieal types in Russia is traced by Murchison to the lithological eharaeters of the rocks, and consequent original diversities of physical eondi- tions, rather than to differences of age. Indeed cases oecur where in the same band of rock Devonian shells and Old Red Sandstone fishes lie commingled. In the belt of the formation whieh extends southwards from Arehangel and the White Sea, the strata eonsist of sands and marls, and contain only fish remains. Traced through the Baltic provinces, they are found to pass into red and green marls, elays, thin limestones, and sandstones, with beds of gypsum, In some of the ealcareous bands sueh fossils oecur as Orthis striatula, Spiriferina prisea, Lepteena produetoides, Spirifer calearatus, Spir- orbis omphaloides, and Orthoceras subfusiforme. In thie higher beds Holoptyehius and other well-known fishes of the Old Red Sandstone oeeur. Followed still further to the south, as far as the watershed between Orel and Woronesch, the Devonian rocks lose their red eolour and sandy eharaeter, and beeome thin-bedded yellow lime- stones, and dolomites with soft green and blue marls. Traces of salt deposits are indieated by oeeasional saline springs. It is evident that the geographieal eonditions of the Russian area during the Devonian period must have elosely resembled those of the Rhine basin and eentral England during the Triassic period.

The Russian Devonian roeks have been elassified as follows :—

Red and white sandstone and green marls,—numerous

Upper…. fish remains, particularly Holoptychius nobilissimus,

Glyptosteus favosus, Diplopterus maerocephalus.

Limestones, elays, marls, dolomite, and gypsum,— numerous eharaeteristie Devonian shells and-erinoids, also Holoptychius nobilissimus.

In some distriets red and green limestones with red marls and Middle Devonian fossils; in others (North Livonia) sandstones and elays, with numerous fish remains of the genera Osteolepis, Dipterus, Diplopterus,

Asterolepis, and others found also in the Caithness flags of Seotland.

There is an unquestionable passage of the uppermost Devonian rocks of Russia into the base of the Carboniferous system. The Devonian rocks of North Ameriea are noticed at the end of the next section.

Middle ..

Lower….

B. Old Red Sandstone.

Under this name is comprised a vast and still imperfectly described series of red sandstones, shales, and conglomerates, intermediate in age between the Ludlow rocks of the Upper Silurian formations and the base of the Carboniferous system

1 Op. cit., 423.

in Britain. These rocks were termed ‘ Old ” to distinguish them from a somewhat similar series overlying the Coal- measures, to which the name New Red Sandstone was applied. When the term Devonian was adopted, it speedily supplanted that of Old Red Sandstone, inasmuch as it was founded on a type of marine strata of wide geographical extent, whereas the latter term described what appeared to be merely a British and local development. or the reasons already given, however, it is desirable to retain the title Old Red Sandstone as descriptive of a remarkable suite of forma- tions to which there is nothing analogous in typical Devonian rocks. Jt is in Great Britain that the Old Red Sandstone of Europe is almost entirely developed. This interesting series of deposits must from the first have been deposited in separate areas or basins, the sites of some of which can still be traced. Their diversities of sediment and discrepance of organic contents point to the want of any direct communication between them. It was maintained niany years ago by Mr Godwin Austen, and has been more recently enforced by

Professor Ramsay, that these basins were lakes or inland seas. The character of the strata, the absence of unequivocally marine fossils, the presence of land- plants and of numerous ganoid fishes which have their modern representatives in rivers and lakes, suggest and support this opinion, which has been generally adopted by geologists. The red arenaceous and marly beds which, with their fish remains and land-plants, occupy a depth of many thousand feet between the top of the Upper Silurian and the base of the Lower Carboniferous formations, are re- garded as the deposits of a series of lakes or inland seas formed by the uprise of portions of the Silurian sea-floor. The length of time during which these lacustrine basins must have existed is shown, not only by the thickness of the deposits formed in them, but by the complete change which took place in the marine fauna between the close of the Silurian and the commencement of the Carboniferous period. The prolific fauna of the Wenlock and Ludlow rocks was extirpated over the British area by the physical changes which produced the lake-basins of the Old Red Sandstone. When a marine population—crinoids, corals, and shells— once more overspreads the area it is found to be completely different. So thorough a change must have demanded a long interval of time.

Murchison, who strongly advocated the opinion that the Old Red Sandstone and Devonian rocks represented differ- ent geographical conditions of the same period, and who had with satisfaction seen the adoption of the Devonian classi- fication by Continental geologists, endeavoured to trace in the Old Red Sandstone of Britain a threefold division like that which had been accepted for the Devonian system. He accordingly arranged the formations as in the subjoined table.

Yellow and red sandstones and conglomerates (Pter- ichthys major, Holoptychius nobilissimus, &c.)= Dura Den beds.

Grey and blue calcareous and bitumenous flagstones, limestones, and red sandstones, and eonglomerates (Dipterus, Osteolepis, Asterolepis, Aeanthodes, Pter- tehthys, &e.) = Caithness flags.

< and purple sandstones, grey flagstones, and coarse

Old Red Sandstone as classified by Murchison.

eonglomerates (Cephalaspis. Pteraspis. Pterygotws) = Arbroath flags.

—\ $$$ — a a a am

Lower. Middle. Upper

It is important to observe that in no district can these three subdivisions be found together, and that the so-called “middle” formation occurs only in one region—the north of Scotland. The classification, therefore, does not rest upon

any actually ascertained stratigraphical sequence, but on an

inference from the organic remains. The value of this inference will be estimated a little further on. All that can be affirmed from stratigraphical evidence in any Old Red Sandstone district in Britain is that a great physical and

paleontological break can generally be traced in the Old Red Sandstone, dividing it into two completely distinct series—a Lower, which graduates downward into the Upper Silurian, and an Upper, which passes upward into the base of the Carboniferous system.

As a whole, the Old Red Sandstone, where its strata are really red, is like other masses of red deposits, singularly barren of organic remains. The physical conditions under which the precipitation of iron oxide took place were evi- dently unfavourable for the development of animal life in tlle same waters. Professor Ramsay has connected the occurrence of such red formations witli the existence of salt lakes, from the bitter waters of which not only iron-oxide but often rock-salt, magnesian limestone, and gypsum were thrown down. He points also to the presence of land- plants, footprints of amphibia, and other indications of terrestrial surfaces, while truly marine organisms are either found in a stunted condition or are absent altogetlier. Where the strata of the Old Red Sandstone, losing their red colour and ferruginous cliaracter, assume grey or yellow tints and pass into a calcareous or argillaceous condition, they not infrequently become

fossiliferous. At the same time it is not unworthy of remark that some of the red con- glomerates, which might be supposed little likely to contain organic remains, are occasionally found to be full of detached scales, plates, and bones of fishes.

Along the border of the Silurian region from Shropshire ;

into South Wales the uppermost parts of the Silurian system graduate into a mass of red strata not less than 10,000 feet thick, which in turn pass up conformably into the base of the Carboniferous system. This vast accu- mulation of red rocks, termed the Old Red Sandstone. consists in its lower portions of red and green shales and flagstones, with some white sandstones and thin cornstones ‘ in the central and chief division, of red and green spotted sandy marls and clays, with red sandstones and cornstones : in the higher parts of grey, red, chocolate-coloured, and yellow sandstones, with bands of conglomerate. No uncon- formability has yet been detected in any part of this series of rocks, though, from the observations of De la Beche, it may he suspected that the higher strata which graduate upward into the Carboniferous formations are separated from the underlying portions of the Old Red Sandstone by a distinct discordance.

Although, as a whole, barren of organic remains, these red rocks have here and there, more particularly in the calcareous zones, yielded fragments of fishes and crus- taceans. In their lower and central portions remains of the ganoids Cephalaspis, Didymaspis, Scaphaspis, Pteraspis, and Cyathaspis have been found, together with crustaceans of the genera Stylonurus, Pterygotus, and Prearcturus, and obscure traces of plants. The upper yellow and red sand- stones contain none of the cephalaspid fishes, which are there replaced by Pterichthys and MHoloptychius, associated with distinct impressions of land-plants. In some of the higher parts of the Old Red Sandstone of South Wales and Shropshire, Serpula and Conularia occur ; but these are ex- ceptional cases, and point to the advent of the Carboniferous marine fauna, which doubtless existed outside the British area before it spread over the Old Red Sandstone basins.

It is in Scotland that the Old Red Sandstone shows the most complete and varied development, alike in physical structure and in organic contents. Throughout that country the system is found everywhere to present a

division into two well-marked groups of strata, separated from each other by a strong unconformability and a complete break in the succession of organic remains. It occurs in distinct areas which appear to mark the site of separate basins of deposit. One of these occupies the central valley between the base of the Highland mountains and the uplands of the southern

counties. On the north-east it is cut off by the present coast-line from Stonehaven to the mouth of the Tay. -On the south-west it ranges by the island of Arran across St George's Channel into Ireland, where it runs almost to the western sea-board, flanked on the north, as in Scotland, by hills of crystalline rocks and on the south chiefly by a Lower Silurian belt. Another distinct and still larger basin lies on the north side of the Highlands, but only a portion of it comes within the present area of Scotland. It skirts the slopes of the mountains along the Moray Firth and the east of Ross and Sutherland, and stretches through Caith- ness and the Orkney Islands as far as the south of the Shetland group. It may possibly have been at one time continued as far as the Sognefjord and Dalsfjord in Norway, where red conglomerates like those of the north of Scotland occur. There is even reason to infer that it may have ranged eastwards into Russia, for some of its most characteristic organisnis are found also among the red sandstones of that country. A third minor area of deposit lay on the south side of the southern uplands over the east of Berwickshire and the north of Northumberland, including the area of the Cheviot Hills. A fourth occupied a basin on the flanks of the south-west Highlands, which is now partly marked by the terraced hills of Lorne. There is sufficient diversity of lithological and palzontological characters to show that these several areas were distinct basins, separated both from each other and from the sea.

In the central basin of Scotland between the Highlands and the southern uplands, the twofold division of the Old Red Sandstone is typically seen. The lower series of deposits attains a maximum depth of upwards of 20,000 fect. In Lanarkshire it is found to pass down conformably into the Upper Silurian rocks; elsewhere its base is con- cealed by later formations, or by the unconformability with which different horizons rest upon the older

rocks. It is covered unconformably by every formation younger than itself. It consists of reddish-brown or chocolate-coloured, grey, and yellow sandstones, red shales, grey flagstones, coarse conglomerates, and occasional bands of limestone and cornstone. The grey flagstones and thin grey and olive shales and “calmstones” are almost confined to For- farshire, in the north-east part of the basin, and are known as the Arbroath flags. One of the most marked lithologi- cal features in this central Scottish basin is the prodigious masses of interbedded volcanic rocks. These, consisting of porphyrite-lavas, felsites, and tuffs, attain a thickness of more than 6000 feet, and form important chains of hills, as in the Pentland, Ochil, and Sidlaw ranges. They lie several thousand feet above the base of the system, and are regularly interstratified here and there with bands of the ordinary sedimentary strata. They point to the outburst of numerous volcanic vents along the lake or inland sea in which the Lower Old Red Sandstone of central Scotland was laid down; and their disposition shows that these vents ranged themselves in lines or linear groups parallel with the general trend of the great central valley. The fact that the igneous rocks are succeeded by thousauds of feet of sand- stones, shales, and conglomerates, without any intercalation of lava or tuff, proves tliat the volcanic episode in the history of the lake came to a close long before the lake itself disappeared.

As a rule the deposits of this lake are singularly unfos- siliferous, though some portions of them, particularly in the Forfarshire flagstone group, have proved rich in fish remains. In Lanarkshire about 5000 feet above the base of the system a thin band of shale occurs, containing a graptolite, Sperorbis Lewisii, and Orthoceras dimidratum,— undoubtedly Upper Silurian forms. This interesting fact serves to indicate that, though geographical changes had elevated the Upper Silurian sea-floor partly into land and

contained an Upper Silurian fauna, which was ready on auy favourable opportunity to re-enter the tracts from which it had beenexcluded. he interval of its reappearance seems to have been very brief, however, for the band of shale con- taining these Upper Silurian marine organisms is only a few inches thick, and the fossils have not been detected on any other horizon. With these exceptions, the fauna of the formation consists entirely

of fishes and crustaceans. Nine or more species of crustaceans have been obtained, chiefly eurypterids, but including one or two phyllopods. The large pterygotus (P. Anglicus) is especially charac- teristic, and must have attained a great size, for some of the individuals indicate a length of 6 feet with a breadth of 14 feet. There occur also a smaller species (P. minor), two Hurypteri, three species of Stylonurus, and abundant clusters of crustacean egg-packets termed Parkia decipiens. Seventeen species of fishes have been obtained, chiefly from the Arbroath flags. They belong to the suborders Acanthodide and Ostracostet. One of the most abundant forms is the little Acanthodes Mitchelli. Another common fish is Diplacanthus gracilis. ‘There occur also Climatius scutiger, O. reticulatus, and C. uncinatus, Parexus tcurvus, Euthacanthus (four species), Cephalaspis Lyellit, and Pter- aspis Mitchelli. Some of the sandstones and shales are crowded with indistinctly preserved vegetation, occasionally in sufficient quantity to form thin lamine of coal, In For- farshire the surfaces of the shaly flagstones are now and then covered with linear grass-like plants like the sedgy vegetation of a lake or marsh. In Perthshire certain layers occur chiefly made up of compressed stems of Psilophyton. The adjoining land was doubtless clothed with a flora in large measure lycopodiaceous.

The Old Red Sandstone of the northern basin is typically developed in Caithness, where it consists chiefly of the well- known dark-grey bituminous and calcareous flagstones of commerce. It restsunconformably upon the metamorphosed Lower Silurian schists, and must have been deposited on the very uneven bottom of a sinking basin, seeing that occasionally even some of the higher platforms are found resting against the schists and granites. The lower zones consist of red sandstones and conglomerates which graduate upward into the flagstones. Other red sandstones, however, supervene in the higher parts of the system. The total depth of the series in Caithness has been estimated at upwards of 16,000 feet.

Murchison was the first to attempt the correlation of the Caithness flagstones with the Old Red Sandstone of the rest of Britain. Founding upon the absence from these northern rocks of the characteristic cephalaspidean fishes of the ad- mitted Lower Old Red Sandstone of the south of Scotland and of Wales and Shropshire, upon the presence of numer- ous genera of

fishes not known to occur in the true Lower Old Red Sandstone, and upon the discovery of a Ptery- gotus in the basement red sandy group of strata, he con- cluded that the massive flagstone series of Caithness could not be classed with the Lower Old Red Sandstone, but must be of younger date. He supposed the red sand- stones, conglomerates, and shales at the base, with their Pterygotus, to represent the true Lower Old Red Sandstone, while the great flagstone series with its distinctive fishes was made into a middle division answering in some of its ich- thyolitie contents to the Middle Devonian rocks of the Continent. This view has been accepted everywhere by geologists. Recently, however, it has been called in ques- tion by Professor Geikie, who gives reasons for maintaining the Caithness flagstones to be Lower Old Red Sandstone, and for denying the existence of any middle division. He shows that the discrepance in organic contents between the Caithness and the Arbroath flags is by no means so strong

partly into isolated inland water-basins, the sea outside still |

as Murchison supposed, but that several species are common to both. In particular, he finds that the characteristically Lower Old Red Sandstone and Upper Silurian crustacean genus Pterygotus occurs, not merely in the basement zone of the Caithness flags, but also high up in the series. The genera Acanthodes and Diplacanthus are abundant both in Caithness and in Forfarshire. Parexus incurvus occurs in the northern as well as the southern basin. It is contended that the palzeontological distinctions are not greater than the striking lithological differences between the strata of the two regions would account for, or than the contrast between the ichthyic faunas of contiguous water-basins at the present time.

Somewhere about 60 species of fishes have been obtained from the Old Red Sandstone of the north of Scotland. Among these the genera Acanthodes, Asterolepis, Chetiracan- thus, Chetrolepis, Coccosteus, Diplacanthus, Diplopterus, Dipterus, Glyptolepis, Osteolepis, and Pterichthys are spe- cially characteristic. Some of the shales are crowded with the little ostracod crustacean Estheria membranacea, Land- plants abound, especially in the

higher groups of the flag- stones, where forms of Psilophyton, Lepidodendron, Stig- maria, Sigillaria, Calamite, and Cyclopteris, as well as other genera, occur. In the Shetland Islands traces of abundant contemporaneous volcanic rocks have been ob- served, which, with the exception of two trifling examples in the region of the Moray Firth, are the only known instances of volcanic action in the Lower Old Red Sandstone of the north of Scotland. In the other two Scottish basins, those of the Cheviot Hills and of Lorne, volcanic action continued long vigorous, and produced thick piles of lava like those of the central basin above referred to.

The Upper Old Red Sandstone consists in Scotland of red sandstones, clays or marls, conglomerates, and breccias, the sandstones sometimes becoming yellow or even white. These strata, wherever their stratigraphical relations can be distinctly traced, lie unconformably upon the lower division of the system, and pass up conformably into the Carboni- ferous rocks above. If they are studied from the side of the underlying formation, they seem naturally to form part of the Old Red Sandstone, since they agree with it in general lithological character and also in containing some distinctively Old Red Sandstone genera of fishes, such as Pterichthys and Ioloptychius. But, approached from the upper or Carboniferous direction, they appear rather to form the natural sandy base of that system into which they insensibly graduate. On the whole, they are remarkably barren of organic remains, though in one locality—Dura Den in Fife—they have yielded a number of genera and species of fishes, crowded profusely through the pale sand- stone as if the individuals had been suddenly killed and rapidly covered over with sediment. Among the character- istic organisms of the Scottish Upper Old Red Sandstone are Pterichthys major, LHoloptychius nobilissimus, i, Andersoni, Glyptopomus, Glyptolemus, and Phaneropleuron.

An interesting fact deserves mention here as a corollary. to what has been stated above regarding the survival for some time of an Upper Silurian fauna outside the area of the British Old Red Sandstone lakes. In the Upper Old Red Sandstone of the basin of the Firth of Clyde, Pterichthys major and Holoptychius occur at the Heads of Ayr, while a band of marine limestone lying in the heart of the red sandstone series in Arran is crowded with ordinary Carboniferous Limestone shells, such as Productus giganteus, P.

semireticulatus, P. punctatus, Chonetes Hard- rensis, Spirifer lineatus, &c. None of these fossils has been detected in the great series of red sandstones overlying the limestone. They do not reappear till the limestones at the base of the Carboniferous series; yet the organisms must have been living during all that long interval outside

of the Upper Old Red Sandstone area. Not only so, but they must have been in existence long before the formation of the thick Arran limestone, though it was only during the comparatively brief interval represented by that lime- stone that geographical changes permitted them to enter the Old Red Sandstone basin and settle for a while on its floor. Thus we see that while, on the one hand, the older parts of the Lower Old Red Sandstone were coeval with an Upper Silurian fauna which, having disappeared from the area of Britain, survived outside of that area, on the other hand, the higher parts of the Upper Old Red Sandstone were contemporaneous with a Carboniferous Limestone fauna which, having appeared beyond the British area, was ready to spread over it as soon as the conditions became favourable for the invasion. It is, of course, obvious that such an abundant and varied fauna as that of the Car- boniferous Limestone cannot have come suddenly into existence at the period marked by the base of that forma- tion, It must have had a long previous existence outside the present area of the deposits. But it is seldom that we obtain such clear evidence of the fact as in these instances from the Scottish Old Red Sandstone.

In the north of Scotland, on the lowlands bordering the Moray Firth, and again in the island of Hoy, one of the Orkney group, yellow and red sandstones, sometimes con- taining characteristic Upper Old Red Sandstone fishes, are found lying unconformably upon the Caithness flags. In these northern tracts the same relation is thus traceable as in the central counties between the two divisions of the system.

Turning southward across the border districts, we trace the red sandstones and conglomerates of the Upper Old Red Sandstone lying unconformably on Silurian rocks and Lower Old Red Sandstone. Some of the brecciated con- glomerates have much resemblance to glacial detritus, and it has been suggested that they have been connected with contemporaneous ice-action.

Such are the breccias of the Lammermuir Hills, and those which show themselves here aud there from under the overlying mass of Carboniferous strata which flanks the Silurian hills of Cumberland and Westmoreland. Red conglomerates and sandstones appear interruptedly at the base of the Carboniferous rocks even as far as Flintshire and Anglesea. They are commonly classed as Old Red Sandstone, but merely from their position and lithological character. No organic remains have been found in them. They may therefore, in part at least, be taken as the basement beds of the Carboniferous system.

In Devonshire, at Barnstaple, Pilton, Marwood, and Baggy Point, certain sandstones, shales, and limestones (already referred to in the account of the Devonian rocks) graduate upward into the base of the Carboniferous system, aud appear to represent the Upper Old Red Sandstone of the rest of Britain. They contain land plants and also many marine fossils, some of which are common Carboni- ferous forms. They thus indicate a transition into the geographical conditions of the Carboniferous period, as is still more clearly illustrated by the corresponding strata in Scotland.

Norra Amrnica.—The Devonian system, as developed in tho northern States, and eastern Canada and Nova Scotia, presents much geological interest in the union which it contains of the same two distinct petrographical and biological types found in Europe. If we trace the range of these rocks along the Alleghany chain through Pennsylvania into New York, we find them to contain a characteristic suite of marine organisms comparable with those of the Devonian system of Europe. But on the eastern side of the great range of Silurian hills in the north-eastern States, we en- counter in New Brunswick and Nova Scotia a succession of red and yellow sandstones, limestones, and shales nearly devoid of marine

organisms, yet full of land-plants, and with occasional traces of fish remains.

The marine or Devonian type has been grouped in the following subdivisions by the geologists of New York:—

(Catskill Red Sandstone. Chemung group. Portage group. Genesee group. Hamilton group. Marcellus group. Corniferous or Upper Helderberg gioup. Schoharie Grit. = a Cauda-galli Grit.

In the Lower Devonian series traces of terrestrial plants (Psilo- phyton, Caulopteris, &c.) have been detected even as far west as Ohio. Corals (cyathophylloid forms, with Favosites, Syringopora, &c.) abound, especially in the Corniferous Limestone, which is per- haps the most remarkable mass of coral-rock in the American Paleozoic series. Among the brachiopods are species of Penta- merus, Stricklandinia, Rhynchonella, and others, with the charac- teristic European form Spirifer cultrijugatus, and the world-wide Atrypa reticularis. The trilobites include the genera Dalmanites, Proétus, and Phacops. The earliest known traces of American fishes occur in the Corniferous group. They consist of ichthyodorulites, and teeth of cestraciont and hybodont placoids, and plates, bones, and tceth of some peculiar ganoids (AMacropetalichthys, Onychodus).

In the Hamilton formation (embracing the Marcellus shale, the Hamilton beds, and the Genesce shale) remains of land-plants occur, but much less abundantly than among the rocks of New Brunswick. Brachiopods arc especially abundant among the sandy beds in the centre of the formation. They comprise, as in Europe, many broad-winged spirifers (S. mucronatus, &c.), with species of Productus, Chonetes, Athyris, &c. The earlicst American goniatites have been noticed in these beds. Newberry has described a gigantic fish (Dinichthys) from the Black Shale of Ohio.

The Portage and Chemung groups have yielded land-plants and fucoids, also some crinoids, numerous broad-winged spirifers, with Avicule, and afew other lamellibranchs. These strata consist in the New York region of shales and laminated sandstones, which attain a maximum thickness there of upwards of 2000 feet, but die out entirely towards the interior. They are covered by a mass of red sandstones and conglomerates—the Catskill group, which is 2000 or 3000 feet deep in the Catskill Mountains, and thickens along the Appalachian region to 5000 or 6000 feet. Those red arenaceous rocks bear a striking similarity in their lithological and

biological charactcrs to the Upper Old Red Sandstone of Europe. As a whole they are unfossiliferous, but they have yielded soine ferns like those of the Upper Old Red Sandstone of Ireland and Scotland (Cycloptcris), and some characteristic genera of fish, as Holoptychius and Bothriolepis.

Turning now to the eastern side of the ancient Laurentian and Silurian ridge, which, stretching southwards from Canada, sepa- rated in later Paleozoic time the great interior basin from the Atlantic slopes, we find the Devonian rocks of New York, Penn- sylvania, and the interior represented in New Brunswick and Nova Scotia by a totally different series of deposits. The contrast strikingly recalls that presented by the Old Red Sandstone of the north of Scotland and the Devonian rocks of North Germany. On the south side of the St Lawrence the coast of Gaspé shows rocks of the Quebec group unconformably overlaid by grey limestones with green and red shales, attaining, according to Logan, a total thickness of about 2000 feet,! and replete in some bands with Upper Silurian fossils. They are conformably followed by a vast arenaceous series of deposits termed the Gaspé Sandstones, to which the careful measurements of Logan and his colleagues of the Canadian Geological Survey assign a depth of 7036 feet. This formation consists of grey and drab-colourcd sandstones, with occasional grey shales and bands of massive conglomerate. Similar rocks reappear along the southern coast of New Brunswick, where they attain a depth of 9500 feet, and again on the qposite side of the Bay of Fundy. The researches chiefly of Dr J. W. Dawson have shown that these strata contain an abundant terrestrial flora ——the oldest of which any relics have yet been recovered, for the few Upper Silurian land-plants at present known hardly deserve to be reckoned as a known flora. In his recent census he enumerates no fewer than 118 species of land-plants. They are almost all acrogeus, the lycopods and ferns being largely predominant. Among the distinctive forms the following may be mentioned— Psilophyton, Arthrostigma, Leptophleum, and Prototaxites. Forty- nine ferns are given, including the genera Cyclopteris, Neuropteris, Sphenopteris, and some trecferns (Psaronius, Caulopteris). Lepi- dodendroid and sigillaroid plants abound, as well as calamites. Higher forms of vegetation are represented by a few conifers (Dadoxylon, Ormoxylon, Prototamitcs, &c.). From a locality on Lake Erie, Dr Dawson describes a fragment of dicotyledonous wood, not unlike that of some modern trees—the most ancicnt

Upper Devonian. –

Lower Devonian.

1 Geology of Canada, p. 398. sae

fragment of an angiospermous cxogeu yet discovered. So abundant are these vegetable remains that in some layers they actually form thin seams of coal. ’

The interest of these remains of the most venerable American forests is heightened by the discovery of the fact that they were not without the hum of insect life. The most ancient known relies of insect forms have been recovered from the Devonian strata of New Brunswick. They are all neuropterous wings, and have been referred by Mr Scudder of Boston to four species combining a remarkable union of characters now found in distinct orders of insects. In one fragment he observed a strueture which he eould only eompare to the stridulating organ of some male Orthoptera. Another wing indieates the existence of a gigantic Ephemera, with a spread of wing extending to 5 inches. In the shallow pools of the period some small crustaceans lived, the remains of which have been partially preserved. Among these is a minute, shrimp-like Eurypterus, and a more highly organized form named A mphipeltis. That the sea had at least oeeasional access to the inland basins into which this abundant terrestrial vegetation was washed is proved by the oecurrence of marine organisms, such as a small annelid (Spirorbis) adhering to the leaves of the plants, and (in Gaspé and Nova Scotia) by the oceasional appearance of brachiopods, especially Lingula, Spirifer, and Chonetes.*

CARBONIFEROUS.

This great system of rocks has received its name from the seams of coal which form one of its distinguishing features both in Europe and in North America. In Europe it is most completely developed in the British Islands. Elsewhere on that continent it occurs in patches, either lying in hollows of older rocks, or exposed by the removal of overlying formations. Great

Britain.—The area within which the Carboni- ferous rocks of Britain occur is sufficiently extensive to contain more than one type of the system, and thus to cast much light on the varied geographical conditions under which these rocks were accumulated. In prosecuting the study of this part of British geology, it is soon discovered, and it is essential to bear in mind, that, during the Carboni- ferous period, the land whence the chief supplies of sedi- ment were derived rose mainly to the north and north-west, as it seems to have done from very early geological time. While therefore the centre and south of England lay under clear water of moderate depth, the north of the country and the south of Scotland were covered by shallow water, which was continually recciving sand and mud from the adjacent northern land. Hence vertical sections of the Carboniferous formations of Britain differ greatly according to the districts in which they are taken. The subjoined table may be regarded as expressing the typical subdivisions which can be recognized, with modifications, in all parts of the country. (Red and grey sandstones, elays, and sometimes | breccias, with oecasional seams and streaks of coal and spirorbis limestone (Cythere inflata, Spirorbis carbonarius).

| Middle or chief coal-bearing series of yellow sand- stones, clays, and shales, with numerous work- able coals (Anthracosia, Anthracomya, Beyrichia, Listheria, Spirorbis, &c.).

Gannister beds, flagstones, seales, and thin coals, | with hard siliceous (gannister) pavements (Ortho.

ceras, Goniatites, Posidonia, Aviewlopecten, Lin- { gula, &e.).

ey ee ae flagstones, and shales, with thin seams of

oal.

Yoredale group of shales and grits passing down into dark shales and nies (Goniatites, Avi- ewlopecten, Posidonomya, Lingula, Diseina, &c.).

Thick limestone in south and centre of England and Ireland, passing northwards into sandstones, shales, and coals (abundant corals, polyzoans brachiopods, lamellibranchs, &c.). :

Lower Limestone Shale of south and centre of Eng- land (marine fossils like those of overlying lime- stone), passing northward into the Caleiferous Sandstone group of Scotland (marinc, estuarine

(and terrestrial organisms).

Coal-mea- sures .

Carbonifcrous Limestone series ……

1 Dawson’s Acadian Geology, chaps. xxi. and xxii.

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| occasionally appear.

[VI, STRATIGRAPHICAL,

In the article Coat (vol. vi. p. 49) au account has been given of the principal coal-fields of the world; likewise a diagram (p. 48) representing the chief subdivisions of the Carboniferous system in Britain, as the rocks are traced from north to south.

Base of the System.—In the south-west of England, and in South Wales, the Carboniferous system passes down con- formably into the Old Red Sandstone. The passage beds consist of yellow, green, and reddish sandstones, of green, grey, red, blue, and variegated marls and shales, sometimes full of terrestrial plants. They are well exposed on the Pem- brokeshire coasts, marine fossils being there found even among the argillaceous beds at the top of the Red Sandstone series. They occur with a thickness of about 500 feet in the gorge of the Avon near Bristol, but show less than half that depth about the Forest of Dean. At their base there lies a bone-bed containing abundant palatal teeth. Not far above this horizon plant-bearing strata are found, Hence these rocks bring before us a mingling of terrestrial and marinecon- ditions. In Yorkshire, near Lowther Castle, Brough, and in Ravenstonedale, alternations of red sandstones, shales, and clays, containing Stigmaria and other plants, occur in the lower part of the Carboniferous Limestone. Along the eastern edge of the Silurian hills of the

Lake district the Old Red Sandstone appears here and there, and passes up through a succession of red and grey sandstones, and green and red shales and marls, with plants, into the base of the Carboniferous Limestone.

It is in Scotland, however, that this peculiar type of the basement Carboniferous rocks is best seen. In that country the lowest subdivision of the Carboniferous system, known as the Calciferous Sandstones, consists of red, white, and yellow sandstones, blue, grey, green, and red marlsor clays, blue and black shales, thin coals, seams of limestone and cement-stone, and abundant volcanic rocks. The red sandstones lie at the base, and pass down into the Upper Old Red Sandstone, in which, as has been already pointed out (ante, p. 344), true Upper Old Red Sandstone fishes are found, while there occur also bands of limestone full of true Carboniferous Limestone corals and brachiopods. Hence it is evident that the Carboniferous Limestone fauna had already appeared outside the British area before the close of the Old Red Sandstone period. It was when the peculiar geographical conditions which prevailed during that period finally ceased, and the sea began to spread over the ancient lakes and land of Britain, that the abundant Carboniferous fauna invaded the area. The Calciferous Sandstones of Scotland may therefore represent a portion of the Carboniferous Limestone of England.

Over the greater part of the south and centre of Scotland the lower red sandstones are surmounted by a series of con- temporaneous volcanic rocks. Successive sheets of por- phyrites and tuffs form long ranges of hills from Arran and Bute on the west to the mouth of the estuary of the Forth on the east, and from the Campsie Fells on the north to the heights of Liddesdale and the English border. These volcanic sheets sometimes reach a thickness of 1500 feet. That they belong to the Carboniferous system is shown by the occurrence of shales and sandstones (with Carboniferous plants) at their base. They show that the early part of the Carboniferous period in Scotland was marked by a prodi- gious volcanic activity, which, on its cessation, was followed by the prolonged subsidence required for the accumulation of the Carboniferous system. The rocks succeeding the volcanic zone are termed the cement-stone group. In Berwickshire and the west of Scotland they consist of thin- bedded white, yellow, and green sandstones, grey, green, blue, and red clays and shales, with thin bands of a pale argillaceous

limestone or cement-stone. Seams of gypsum These strata are, on the whole,

singularly barren of organic. remains. They seem to have been laid down with great slowness, and without disturbance, in enclosed basins, which were not well fitted for the support of animal life, though fragmentary plants serve to show that the adjoining slopes were covered with vegetation.

In the basin of the Firth of Forth, however, the group presents a different lithological aspect and is abundantly fossiliferous. It there usually consists of yellow, grcy, and white sandstones, with bluc and black shales, clay-ironstones, limestoncs, ‘‘ cement-stones,” and occasional seams of coal. The sandstones form excellent building stones, the city of Edinburgh having been built of them. Some of the shales are so bituminous as to yield, on distillation, from 30 to 40 gallons of crude petroleum to the ton of shale; they are consequently largely worked for the manufacture of mineral oils. The limestones are usually dull, yellow, and close grained, in seams seldom more than a few inches thick, and graduate by addition of carbonate of iron into cement-stone; but occasionally they swell out into thick lenticular masses like the well-known limestone of Burdie House, so long noted for its remarkable fossil fishes. This limestone appears to be mainly made up of the crowded cases of a small ostracod crustacean (Leperditia Okeni, var. Scoto-Burdigal- ensis). The coal-seams are few and commonly too thin to be workable, though one of them, known as the Houston coal, has been mined to some extent in Linlithgowshire. The fossils of the cement-stone group indicate an alternation of fresh or brackish- water and marine conditions. They include numerous plants, of which: the most abundant are Sphenoptcris affinis, Lepidodendron (two or three species), Lcpidostrobus variabilis, Araucarioxylon. Some of the shales near Edinburgh have afforded a few specimens of a true monocotyledon allied to the modern Pothos (Pothocites Grantoni). Ostracod crustaceans, chiefly the Leperditia above men- tioned, crowd many of the shales. With these are usually as-sociated abundant traces of the presence of fish, either in the form of coprolites or of scales, bones, plates, and teeth. The following are characteristic species: lonichthys striolatus, EF. Robisoni, Rhadinichthys

ornatissimus, Nematoptychius Greenockti, Eurynotius erenatus, Rhizodus Hibberti, Megalichthys sp., Gyracanthus tubcr- culatus, Ctenoptychius pectinatus. At intervals throughout the group marine horizons occur, usually as shale bands marked by the presence of such distinctively Carboniferous Limestone species as Spirorbis carbonarius, Discina nitida, Lingula squamiformis, Bellerophon decussatus, and Orthoceras cylindraccum.

One of the most interesting features in the cement-stone group of the basin of the Firth of Forth is the prodigious number and variety of the associated volcanic masses, and the proofs which they exhibit that, at the time when that group of strata was accumulating, the region of shallow lagoons, islets, and coal-growths was dotted over with in- numerable active volcanic vents. The eruptions continued into the time of the Carboniferous Limestone, but ceased before the deposition of the Millstone Grit. The lavas are chiefly varieties of basalt-rocks, sometimes coarsely crystal- line aud even granitoid in texture, and graduating through intermediate stages to true close-grained compact basalts, which neither externally nor in microscopic structure differ from basalt of Tertiary date

The basement group of the Carboniferous system in Ireland is evidently a prolongation of the Scottish cement- stone group. In the south of this island, however, a very distinct and peculiar development of the Lower Carboni- ferous rocks is to be remarked: Between the top of the Old Red Sandstone and the base of the Carboniferous Lime- stone there occurs in the county of Cork an enormous mass (fully 5000 feet) of black and dark-grey shales, impure limestones, and grey and green grits and true cleaved slates, To these rocks the name of Carboniferous Slate was given by Griffith. They contain numerous Carboniferous Lime- stone species of brachiopods, echinoderms, &c., as well as traces of land-plants in the grit bands. Great though their thickness is in Cork, they rapidly change their lithological character, and diminish in mass as they are traced away from that district. In the almost incredibly short space of 15 miles, the whole of the 5000 feet of Carboniferous Slate of Bantry Bay have disappeared, and at Kenniare the Old Red Sandstone is followed immediately and con- formably by the Limestone with its underlying shale. Mr

GHOLOEGY

Jukes held that the Carboniferous Slate is the equivalent of part of the Devonian rocks of Devon and Cornwall.

Carboniferous Limestone.—The Lower Limestone shale is overlaid conformably by a thick mass of limestone, one of the most distinctive members of the British Carboniferous system. On referring to a geological map of England it will be seen that from Northumberland southwards to the low plains in the centre of England there runs a ridge of high ground, formed by a great anticline, along which the Carboniferous Limestone appears at intervals from under- neath higher members of the system. In this northern Carboniferous area, of which the axis is known as the Pennine Chain, the limestone attains its maximum develop- ment. In one portion of the district it reaches a depth of 4000 feet, and yet its actual base is nowhere seen. This Pennine region appears to have been the area of maximum depression during the early part of the Carboniferous period in Britain. Traced towards the south-west, the limestone diminishes to sometimes not more than 500 feet in South Wales. Northwards, losing its character as a massive cal- careous formation, it is split up by intercalations of sand-stone, shale, coal, &c., until actual limestone becomes a very subordinate member of the series in central Scotland.

In the Carboniferous areas of the south-west of England and South Wales, the limits of the Carboniferous Limestone are well defined by the Limestone Shale below, and by the Farewell Rock or Millstone Grit above. In the Pennine area, however, the massive limestone is succeeded by a series of shales, limestones, and sandstones, known as the Yoredale group. These cover a large area and attain a great thick- ness. In North Staffordshire they are 2300 feet, which, added to the 4000 feet of limestone below, gives a depth of 6300 feet for the whole Carboniferous Limestone series of that region. In Lancashire the Yoredale rocks attain still more stupendous dimensions, Mr Hull having found them to be no less than 4500 feet thick. Both the lower or main (Scaur) limestone and the Yoredale group pass northwards into sandstones and shales, with coal-seams, and diminish in thickness. It is not impossible, as already suggested, thatthe cement-stone group of the Calciferous Sandstones of Scotland may represent, not only the

thin Lower Limestone shale, but also some of the older parts of the English Carboniferous Limestone.

Where typically developed, the Carboniferous Limestone is a massive well-bedded limestone, chiefly light bluish- grey in colour, varying from a compact homogeneous to a distinctly crystalline texture, and rising into ranges of hills, whence its original name ‘‘ Mountain Limestone.” It contains occasional scattered irregular nodules and nodular beds of dark chert. It is abundantly fossiliferous. The fossils conimonly stand out on weathered surfaces of the rock, but microscopic investigation shows that even those portions of the mass which appear most structureless consist of the crowded remains of marine organisms. The limestone may be regarded as derived entirely from the organic debris of a sea-floor. Diversities of colour and lithological character occur, whereby tlie bedding of the thick calcareous mass can be distinctly seen. Here and therea more marked crystal- line structure has been superinduced ; but the most distinct examples of metamorphic change are those where the rock has been converted into what is termed “dun-stone.” This alteration is frequent in the mining districts of Yorkshire and the neighbouring counties. It consists in the dolomitiz- ation of the rock along either the lines of bedding or the joints. Thus changed, it becomes a yellowish or brown crystalline dolomite, which runs vertically through the mass of the limestone along some definite joint, in courses of 20 or 30 fathoms in width. Such a metamorphism must have been effected by water percolating along the line of the joint, and affecting the rock for some distance on either side. In

Derbyshire sheets of contemporaneous lava, locally termed “toadstone,” are interpolated in the Carboniferous Lime- stone. :

The fauna of the Carboniferous Limestone of England is abund- ant and characteristic. Numerous foraminifers occur, Saceamina Carteri being often very characteristic. The corals are numerous, embracing upwards of 80 genera and about 100 species. These include both simple cup corals, as Zaphrentis, Clisiophyllum, and compound forms, like Alveolites and Phillipsastreea. Crinoids are individually in enormous numbers, many beds of limestone appearing to consist of little else than their fragmentary stems

and cups; Actinocrinus, Platycrinus, Potcriocrinus, Cyathocrinus, are common genera. Three species of sea-urchins are known. Of the trilobites, so characteristic of the older Paleozoic rocks, the last lingering forms are here found in three small genera —Brachymetopus, Phillipsia, and Grifithides. Polyzoa abound, some portions of the limestone being almost entirely composed of them, the genera Fenestclla, Sulcoretepora, Vincularia, Poly- nora, Diastopora, and Glauconome being frequent. The brachio- pods comprise 18 genera and 160 species, some of the most com- mon forms being Productus, Spirifer, Rhynchonella, Athyris, Chonetes, Orthis, Lingula, and Discina. But the higher mol- lusks now begin to preponderate over the brachiopods. The lamellibranchs number 49 genera and 834 species, including forms of Aviculopecten, Leda, Nueula, Sanguinolites, Leptodomus, Schizodus, Edmondia, Modiola, and Conocardium. The gasteropods amount to 206 species belonging to 29 genera, among which Zwom- phalus, Natica, Plewrotomaria, Macrocheilus, and Leronema are frequent. The genus Bellerophon is represented by 23 species, among which B. Urei and B. decussatusare frequent. The cephalopods number 148 species, belonging among other genera to Orthoceras, Nautilus, Discites, and Goniatites. About 100 genera of fishes, chiefly from teeth and spincs, have been described, as Psammodus, Cochliodus, Cladodus, Petalodus, Rhizodus, Ctenoptychius, &e. Some of these were no doubt placoids which lived solely in the sea, but many, if not all of the ganoids, probably migrated between salt and fresh water; at least their remains are found in Scotland in strata full of land-plants, cyprids, and other indications of estuarine or fluviatile conditions.

The Carboniferous Limestone series of Scotland presents a striking contrast to that of the typical formation in England. It consists mainly of sandstones, shales, fire-clays, and coal-seams, with a few comparatively thin seams of encrinal limestone. Its lower portions include the chief limestone bands. The thickest of these seams, known as the Hurlet or main limestone, is usually about 6 feet in thickness, but in the north of Ayrshire swells out to 100 feet, which is the most massive bed of limestone in any part of the Scottish Carboniferous system. It lies upon a seam of coal, and is in some places associated with pyritous shales, which have been largely worked as a source of alum. This superposition of a bed of marine limestone on a seam of coal is of frequent occurrence in the Carboniferous Lime- stone series of

Scotland. Above the group of Lower Lime- stones comes a thick mass of strata containing many valu- able coal-seams and ironstones. Some of these strata are full of terrestrial plants (Lepidodendron, Sigillaria, Stigmaria, Sphenopteris, Alethopteris); others, particularly the iron- stones, contain marine shells, such as Lingula, Discina, Leda, Myalina, Fuomphalus. Numerous remains of fishes have been obtained, more especially from some of the iron- stones and coals (Gyracanthus formosus and other placoid fin-spines, Megalichthys Hibberti, Rhizodus Hibberti, with species of Hlonichthys, Acanthodes, Ctenoptychius, &c.). Remains of labyrinthodonts have also been found in this group of strata, and have been detected even down in the Burdie House limestone. The highest division of the Carboniferous Limestone series consists of a group of sandstones and shales, with a few coal-seams, and three, sometimes more, bands of marine limestone. Although these limestones are each seldom more than 3 or 4 feet thick, they have a wonderful persistence throughout the coal-fields of central Scotland. As already mentioned, they can be traced over an area of at least 1000 square miles, and they probably extended originally over a con- siderably greater region. The Hurlet limestone with its underlying coal can also be followed across a similar extent

of country. Hence it is evident that during certain epochs of the Carboniferous period a singular uniformity of con- ditions prevailed over a large region of deposit in the centre of Scotland.

The difference between the lithological characters of the Carboniferous Limestone series, in its typical development, as a great marine formation, and in its arenaceous and argillaceous prolongation into the north of England and Scotland, has long been a familiar example of the nature and application of the evidence furnished by strata as to former geographical conditions. It shows that the deeper and clearer water of the Carboniferous sea spread over the site of Yorkshire, Derbyshire, and Lancashire ; that the land lay to the north ; and that, while the whole area was under- going subsidence, the maximum movement took place over the area of deeper water. It was from the northern land that the sand and mud were derived,

but the sediment during the time of the Carboniferous Limestone seems to have sunk to the bottom before it could reach the great basin in which foraminifers, corals, crinoids, and mollusks were building up the great calcareous deposit. Yet the thin limestone bands, which run so persistently among the Lower Carboniferous rocks in Scotland, prove that there were occasional episodes during which the sediment ceased to arrive, and when the same species of shells, corals, and crinoids spread northwards towards the land, forming for a time over the sea-bottom a continuous sheet of calcareous ooze like that of the deeper water further south. These intervals of limestone growth no doubt point to times of more rapid submergence, perhaps also to other geographical changes whereby the sediment was for a time prevented from spreading so far.

Viewed as a whole, therefore, the Carboniferous Lime- stone series of Northumberland and Scotland contains the records of a long-continued but intermittent process of subsidence. The numerous coal-seams with their under- clays were undoubtedly surfaces of vegetation that grew in rank luxuriance on the wide marine mud-flats, and mark pauses in the subsidence. Perhaps we may infer the relative length of these pauses by the comparative thicknesses of the coal-seams. The overlying and intervening sandstones and shales indicate a renewal of the downward movement, and the gradual infilling of the depressed area with sedi- ment, until the water once more shoaled, and the vegetation from adjacent swamps spread over the muddy flats as before. The occasional limestones serve to indicate the epochs of more prolonged or more rapid subsidence, when marine life was enabled to flourish over the site of the submerged forests. But that the sea, even though tenanted in these northern parts by a limestone-making fauna, was not so clear and well suited for the development of animal life during some of these submergences as it was further south, seems to be proved by the paucity and dwarfed forms of the fossils in the thin limestones, as well as by the admix- ture of clay in the stone.

In Ireland the Carboniferous Limestone swells out to a vast thickness, and covers a large part of the island. It attains a maximum in the west and south-west, where, according to Kinahan,! it consists in Limerick of the follow- ing subdivisions :—

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Upper (Burren) pc CecwlmMeStO MCh eyo… lersucae ere 240 Wimestonense. | WheruyezOle ……0cscse recess cee em aeieats 20 Upper (Calp) Limestones and shales ….....0000 00 1000 Timestone:.... (\Chenty,z0me) ..... 1. .cezecsessw ese sesernnene 40 L Li Fenestella limestone… .....esesseeee eel Oe ght ES rower Cherty ZONC . ....2+- susiececseeeed 20 a Lower shaly limestones ….....000 00 280 THO WerMMenestOMenGltlels rece… cc.ccec. venectsens seeeeneeentyeme 100

3600

1 Geology of Treland, p. 72.

CARBONIFEROUS. |

among these limestones are counterparts of others found abundantly in the Carboniferous Limestone of England and Scotland. They have been recently studied by Hull and Hardman, who have found them full of siliceous replace- ments of calcareous foraminifers, crinoids, &c., and who regard them as due to a chemical alteration on the floor of the Carboniferous sea. Portions of the limestone have a dolomitic character, and sometimes are oolitic. Great sheets of melaphyre, felstone, and tuff, representing volcanic eruptions of contemporaneous date, are interpolated in the Carboniferous Limestone of Limerick and other parts of Ireland. As the limestone is traced northwards it shows a similar change to that which takes place in the north of England, becoming more and more split up with sandstone, shale, and coal-seams, until, at Ballycastle, it presents exactly the characters of the coal-bearing part of the forma- tion in Scotland.

Millstone Grit.—This name is given to a group of sand- stones and grits, with shales and clays, which runs persist- ently through the centre of the Carboniferous system from South Wales into the middle of Scotland. In South Wales it has a depth of 400 to 1000 feet; in the Bristol coal- field, of about 1200 feet. Traced northwards it is found to be intercalated with shales, fire-clays, and thin coals, and, like the lower members of the Carboniferous system, to swell out to enormous dimensions in the Pennine

region. In North Staffordshire, according to Mr Hull, it attains a thickness of 4000 feet, which in Lancashire increases to 5500 feet. These massive accumulations of sediment were deposited on the north side of a barrier of Silurian and Cambrian rocks, which, during all the earlier part of the Carboniferous period, seems to have extended across central England, and which was not submerged until part of the Coal-measures had been laid down. North of this great' area of deposit the Millstone Grit thins away to not more than 400 or 500 feet. It continues a compara- tively insignificant formation in Scotland, attaining its greatest thickness in Lanarkshire and Stirlingshire, where it is known as the Moor Rock. In Ayrshire it does not exist, unless its place be represented by a few beds of sandstone at the base of the Coal-measures.

The Millstone Grit is generally barren of fossils. When they occur they are either plants like those in the coal- bearing strata above and below, or marine organisms of Carboniferous Limestone species. In Northumberland, indeed, it contains a band of limestone undistinguishable from some of those in the Yoredale group aud Scaur lime- stone.

Coal-Measures.—This division of the Carboniferous sys- tem consists of numerous alternations of grey, white, yellow, sometimes reddish sandstone, dark-grey and black shales, clay-ironstones, fire-clays, and coal-seams. In South Wales it attains a maximum depth of about 12,000 feet; in the Bristol coal-field it is 5090 feet. But in these districts, asin the rest of the Carboniferous areas of Britain, we cannot be sure that all the Coal-measures originally deposited now remain, for they are always unconformably covered by later formations. In some localities, indeed, the denudation must have been very great, for the next overlying system of deposits (Permian) is found resting even on the Carboni- ferous Limestone. In North Staffordshire the depth of the Coal-measures is about 5000 feet, which in South Lancashire increases to 8000. These great masses of strata diminish as we trace them eastwards and north- wards. In Derbyshire they are about 2500 feet thick, in Northumberland and Durham about 2000 feet, and about the same thickness on the west side of the island in the Whitehaven coal-field. In Scotland they attain a maximum of about 2000 feet.

The chert bands which form such marked horizons |

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_ The Coal-measures are susceptible of local subdivisions

indicative of different and variable conditions of deposit.

The following tables show the more important of these :—
GLAMORGANSHIRE.

Upper series, more than | Sandstones, shales, &c., with 26 coal- 3400 feet …..... 02. s

eams, Pennant Grit, 3246 Hard thick-bedded sandstones &c., 15

, HEE een Arent be coal-scams. ower ies, 45 . 850 ae Shales, ironstones, and 34 coal-seams.

Millstone Grit. Sourm LANCASHIRE. Upper, 1680 to 2000 Shales, Spirorbis limestone, ironstone, feStwomterr ccicsseenee sandstone, and thin coal-seams.

Middlc, 3000 to 4000.. 3 A great series of strata, with numerous : ”’ (_ valuable coals. Lower or Gannister, | Flags, shales, and three or four thin coals, 1400 to 2000 feet … with floors of ‘* gannister,”

Millstone Grit.

CENTRAL SCOTLAND.

Red sandstones and clays, with occasional thin coals and Spirorbis limestone.

Upwards of 2000 feet | Sandstones, shales, and fire-clays, with in Lanarkshire …..... ironstones and coals.

Moor-rock or Millstone Grit.

The numerous beds of compressed vegetation form the most remarkable feature of the Coal-measures, Each of them is usually underlaid by a seam of fire-clay, represent- ing the soil on which the plants grew. Hence they mark successive terrestrial surfaces, which, after enduring for a longer or shorter period, were carried down beneath the water and covered over with sand and silt. There is no modern formation that affords a close parallel to that of the ancient coal-growths. The nearest analogy is furnished by the mangrove swamps alluded to already on p. 290. These masses of arborescent vegetation grow out into the sea as a belt or fringe on low shores, and form a matted soil which adds to the breadth of the Jand. Their roots spread in the salt water where marine organisms are abundant. The coal-growths no doubt also flourished in salt or at least brackish water; forsuch shells as Aviculopecten, Anthracosia, and Goniatites are found lying on the coal or in the shales attached to it.

The vegetation of the Carboniferous period must have been luxuriant and varied. Upwards of 500 species of plants have been obtained from the Carboniferous rocks of Britain, yet these must represent but a small portion of the original flora.

The most abundant forms were ferns and lycopods. Numerous reed-like plants likewise played a conspicuous part in the general vegetation of the low grounds, while apparently on the drier and more elevated tracts (for their remains are less frequently met with) large coniferous trees flourished. The ferns strikingly resemble many modern forms. Among the more frequent genera were Sphenopteris, Pecopteris, Alcthopteris, Newropteris, and Cycloptcris, The lycopodiaceous plants attained the size of forest trees. Among the more typical forms were many species of Lepidodendron, the stems and seed-cones of which are scattered through the Carboni- ferous strata. Some of the coal-seams are largely composed of the spores of these plants. SigiJlaria, regarded by some as allied to the cycads, by others as more akin to the lycopods, is represented by numerous species. The roots known as Stigmaria abound in most fire-clays, showing how largely the coal consists of trees having roots of this kind. The Hgwisctacewe show themselves in the form of numcrous Calamites which, though resembling in general aspect our modern horse-tails, differed in many points of structure, and notably in their gigantic size. Coniferous trees occur chiefly in the form

of stems and branches. They include the genera Dadoxylon, Araucarioxylon, and Pinites. Small nut-like fruits (Trigonocarpum) abound in some beds, and are now believed to be the fruits of yew-like conifers. The presence of monocotyledonous plants is proved by the Pothocites referred to above (p. 347).

The animal remains of the Coal-measures are compara- tively few. In certain bands, particularly of ironstone, numerous mollusca occur, and similar forms are to be occa- sionally met with in the shales.

150 feet and upwards..

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Among the more frequent species are Anthracomya modiolaris, Anthracosia ovalis, A. robusta, A. acuta, Anthraeoptera Lrowniana, Avieulopecten papyraceus, and Goniatites Listeri. But at the top of the Middle Coal-measures, near Manchester, a band of true marine shells occurs, including Ctenodonta, Nautilus, Discites, Gontatites, and Orthoceras. The little Spirorbis earbonarius abounds in some ghalcs. The crustaceans are chiefly represented by Beyrichia and Estheria, but large eurypterid forms likewise oecur. Fishes occur frequently, remains of the larger kinds usually appearing as scales, teeth, fin-spines, or bones, while the smaller ganoids are often preserved entire. Common species are Megalichthys Hibberti (2), Rhizodus granulatus, Celacanthus leptwrus, Paleoniscus Egertoni, Pleuracanthus gibbosus. The British Carboniferous rocks have yielded 18 genera of labyrinthodonts (Anthracosawrus, Loxomma, Ophiderpeton, Pholiderpeton, Pteroplax, Uroeordylus, &c.). These were probably fluviatile animals of predaceous habits, living on fish, crustacea, and other organisms of the fresh or salt waters of the coal lagoons. The larger forms are believed to have measured 7 or 8 fect in length; some of the smaller examples, though adult and perfect, do not exceed as many inches.!_ That the woods of the Carboniferous period were not devoid of insect life is known from the discovery of some beetles and neuroptera at Coalbrookdale.

ConTINENTAL Evropr,—As in Britain so on the Con- tinent the Carboniferous system occupies many detached areas or basins—-the result partly of original deposition, partly of denudation, and partly of the spread

and overlap of more recent formations. There can be no doubt that the English Carboniferous Limestone once extended con- tinuously eastward across the north of France, along the base of the Ardennes, through Belgium, and across the present valley of the Rhine into Westphalia. From the western headlands of Ireland this calcareous formation can thus be traced eastward fora distance of 750 English miles into the heart of Europe It then begins to pass into a series of shales and sandstones, which no doubt represent the same proximity to shore as the similar strata in the north of England and Scotland. In Silesia, and still much further eastwards in central and southern Russia, representatives of the Carboniferous Limestone appear, but interstratified, as in Scotland, with coal-bearing strata. Traces of the same blending of marine and terrestrial con- ditions are found also in the north of Spain. But over central France, and eastwards through Bohemia and Moravia into the region of the Carpathians, the Coal-measures rest directly upon the older formations, most commonly upon gneiss and other crystalline recks. It would appear that these tracts had remained above water during the time of the Carboniferous Limestone, but were gradually depressed during that of the Coal-measures.

In the north of France and Belgium the British type of the Carboniferous system is well shown. green, grey, and reddish shales and yellow sandstones, precisely similar in lithological character to parts of the Calciferous Sand- stones of Scotland. They are well seen in some recent railway cuttings to the north of Boulogne, and also in the valley of the Meuse above Namur, lying upon the Psammites de Condroz or Upper Devonian beds. They are succeeded by the Carboniferous Limestone, which is subdivided into eight formations, having an aggregate thickness of 800 metres, and each characterized by its own assemblage of fossils. ‘lhe horizon of the Millstone Grit is marked by the occurrence of certain alum-schists. The Coal- measures of this area have been referred to in the article CoAL.?

The Saarbruck coal-field furnishes a good example of that type of the Carboniferous system where the lower marine series is absent. It lies unconformably on Devonian rocks, and attains a thickness

1 Miall, Brit. Assoc. Rep., 1873, p. 246.

2 [In the article Coat, vol. vi. p. 56, the coal basin of Hardinghem is said to be of Carboniferous Limestone age. This, which appeared to be the most probable view of a very obscure point, has been proved to be a mistake, as tlic strata are actually Coal-measures inverted in position, the same disturbance being characteristic of the south side of the basin of the Pas-de-Calais for a considerable distance. This is now so generally recognized that borings for coal in that basin through the Ter- tiary and Cretaceous formations are not necessarily stopped on reaching Devonian strata, aS coal-seams have been discovered vertically below the older strata at considerable depths, ¢g., at Auchy au Bois. In another pit, at “Courrieres the fact that the measures on the upper levels are inverted in position has been recently proved by the sinkings traversing the same seams in reverse order, 7.¢., in their normal position in the lower workings. These facts have an important bearing on the question of the probable cxtcnsion of the Coal-measures in the south-east of England. The discovery (in 1878) of Devonian strata at the

moderate depth of 1400 fcet in the centre of London, at Messrs Meux’s brewery, –

is another interesting fact that bears out the views previously put forward by Mr Godwin Austen. (iL. B.)j

GHOLOGY

At the base lies a group of

[vI. STRATIGRAPHICAL.

of more than 10,000 feet. of strata :—

2. Upper series, consisting at the top of red sandstones, below which come shales, sandstones, &c., with a few coal-scams— Anthracosia, Estheria.

1. Lower series, consisting of an upper group of red conglomerates, sandstones, clays, resting upon the great coal-bearing division. Abundant plants, with labyrinthodonts and insect remains.

Geinitz, drawing attention to the distribution of plants in the

Saxon Coal-measures, remarks that a certain order can be observed in their appearance. He divides the strata accordingly into three zones, each marked by a characteristic assemblage of plants, and he belicves that the classification can be applied in other countries.

8. The Fern Zone, marked by the profusion of its ferns (Sphenop- teris, Hymenophyllites, Sehizopteris, Odontopteris, Neuropteris, Cyelopteris, Alethopteris, Caulopteris). This is underlaid by

2. The Sigillaria Zone, containing many species of Sigillarta, also Lepidodendron, Calamites, A sterophyllites, and a few ferns.

1. The Lycopod Zone, abounding in Sagenaria Velthcimiana, with Sphenopteris distans, Calamites transitionis, &c.

The lowest of these zones (1) is compared by Geinitz with the Culm, that is, the sandy, shaly, and coal-bearing representative of the Carboniferous Limestone. ‘To the east of the Rhine valley, as already mentioned, the true Carboniferous Limestone loses its normal character and assumes that of the Culm—a series of shales, sandstones, greywackes, and eonglomerates, in which the abundant fauna of the limestone is reduced to a few mollusks (Produetus antiquus, P. latissimus, P. semireticulatus, Posidonomya Beecher, Goniatites sphecrieus, Orthoceras striatulum, &c.). The Posidonomya particularly characterizes certain dark shales known as Posidonia schists. About 50 species of plants have been obtained from the Culm, typical species being Calamites transitionis, Sagenaria Vel- theimiana, Stigmaria ficoides, Sphenopteris distans, Cyelopteris tenutfolia. This flora bears a strong resemblance to that of the Calciferous Sandstonces of Scotland.

Nort America.—Rocks corresponding in geological position and the general aspect of their organic contents with the Carboniferous system of Europe are said to cover an area of more than 200,000 square miles in the United States and British North America, The following table slows the subdivisions which have been established among them :—

[.aring series of sandstones, shales, ironstones, coals,

It is divided into the following groups

&c., varying from 100 feet in the interior continental area to

4000 feet in Pennsylvania, and more than 8000 feet in

Nova Scotia. The plant remains include forms of Lepido-

| dendron, Sigillaria, Stigmaria, Calamites, ferns, and coni- ferous leaves and fruits. ‘The animal forms embrace in the marine bands species of Spirifer, Produetus, Bellerophon,

Nautilus, &. Among the shales and carbonaceous beds

numerous traces of insect life have becn obtained, comi-

prising species related to the may-fly and cockroach.

Spiders, scorpions, ccutipedes, limuloid crabs, and land snails

Tike the modern Pupa have also been met with. The fish

remains comprise teeth and ichthyodorulites of placoid

genera, and a number of ganoids (Hurylepis, Celacanthus,

Megalichthys, Rhizodus, &c.). Several labyrinthodonts

occur, and true reptiles are represented by one saurian genus

found in Nova Scotia, the Losawrus.

Millstone Grit,—a group of arenaeeous and sometimes con- glomcratic strata, with occasional coal-seams, only 25 feet thick in some parts of New York, but swelling out to 1500 feet in Pennsylvania.

Chester group.—Limestones, shales, and sandstones, some- times 600 feet.

St Louis group.—Limestones with shale, in places 250 feet.

Keokuk group.—Limestone with chert layers and nodules.

Burlington group.—Limestone, in places with chert and horn- stone, 25 to 200 feet.

Kinderhook group.—Sandstones, shales, and thin limestones, 100 to 200 feet, resting on the Devonian black shale.

The sub-Carboniferous groups are mainly marine limestones, but contain here and there remains of the characteristic Car- boniferous land vegetation. Crinoids of many forms abound in the limestones. A remarkable polyzoon, Archimedes, occurs in some of the bands. The brachiopods are chicfly represented by species of Spirifer and Productus; the lamellibranchs by Myalina, Schizodus, Aviculopeeten, Nucula, Pinna, and others; the cephalopods by Orthoceras, Nautilus, Goniatites, Gyroceras, &c. The European genus of trilobite, Phillipsia, occurs. Numerous teeth and fin-spines of selachian fishes give a further point of resemblance to the European Carboniferous Limestone. — Some of the rippled rain-pitted beds contain amphibian foot- prints—the carliest American forms yet known.

Carboniferous.

Sub-Carboniferous.

PERMIAN. |

PERMIAN,

Britain.—In England the Coal-measures are uncon- formably overlaid by a series of red sandstones, conglo- merates, breccias, and marls, which at one time were grouped in one great formation as the New Red Sandstone, in contra-

distinction to the Old Red Sandstone lying below the Car- boniferous system. They were likewise known as the Poikilitic series, from their mottled or variegated colours. They are now divided into two systems or

groups of form- ations, the lower half being included in the Paleozoic series under the name of Permian (after Perm, a Russian province where they are well displayed), and the upper half being relegated to the Secondary series, and termed Trias. The Permian system in England consists of the following subdivisions :— W.of England. E.of England.

. Red sandstones, clays, and o: Upper-.. i es pe LL Magnesian limestone … MURMURED on… oo vanannonesvacoue (Red and variegated sand-) SUCHE? Binascccccosceeee onets cot Reddish-brown and purple sandstones and marls,with } 3000 ,, ealeareous conglomerates |

2. Middle.. 600 ,,

1. Lower… | 100-250 ,,

and breccias of volcanic MOGM,,. .ceresete st tresictie sss

From the thicknesses here given, it is evident that the Permian rocks have a very different development on the two sides of England. On the east side, from the coast of Northumberland southwards to the plains of the Trent, they consist chiefly of a great central mass of limestone. But on the west side of the Pennine Chain, and extending southwards into the central counties, the calcareous zone disappears, and we have a great accumulation of red, arenaceous, and gravelly rocks.

Lower.—This subdivision attains its greatest development in the vale of the Eden, where it consists of brick-red sand- stones, with some beds of calcareous conglomerate or breccia, locally known as ‘‘brockram,” derived from the waste of the Carboniferous Limestone. These red rocks extend across the Solway into the valleys of the Nith and Annan, in the south of Scotland, where they lie unconformably on the Lower Silurian rocks. Their breccias consist of frag- ments of the adjacent Silurian greywackes and shales, but near Dumfries some calcareous breccias or “ brockrams ” oceur. These brecciated masses have evidently accumulated in small lakes or narrow fjords. Much further south, in Staffordshire, and in the districts of the Clent and Abberley Hills, the brecciated conglomerates in the Permian series attain a thickness of 400 feet. They have been shown by Ramsay to consist in large measure of volcanic rocks, grits, slates, and limestones,

which can be identified with rocks on the borders of Wales. Some of the stones are 3 feet in diameter and show distinct striation. The same writer has pointed out that these Permian drift-beds cannot be dis- tinguished by any essential character from modern glacial drifts, and he has no doubt that they were ice-borne, and, consequently, that there was a glacial period during the accumulation of the Lower Permian deposits of the centre of England.

Like red rocks in general the Lower Permian beds are almost barren of organic remains. Such as occur are indicative chiefly of terrestrial surfaees. Plant remains occasionally appear, such as Caulerpites (supposed to be of marine growth), Lepidodendron dilatatum, Calamites, Sternbergia, and fragments of coniferous wood. The eranium of a labyrinthodont (Dasyccps) has been obtained from the Lower Permian rocks at Kenilworth. Foot-prints referred to members of the same extinct order have been

observed abundantly on the surfaces of the sandstones of Dumfries- shire, and also in the vale of the Eden.

Middle.—This subdivision is the chief repository of fossils in the Permian system. Its strata are not red,

but consist of a lower zone of hard brown shale with occasional thin limestone bands (Marl Slate) and an upper thick mass of dolomite (Magnesian Limestone). The latter is the chief feature in the Permian develop- ment of the cast of England. It corresponds with the Zechstein of Germany, as the Marl Slate does with the Kupfer-schiefer. It is a very variable rock in its litho- logical characters, being sometimes dull, earthy, fine- grained, and. fossiliferous, in other places quite crystal- line, and composed of globular, reniform, botryoidal, or other irregular concretions of crystalline and frequently internally radiated dolomite. Though the Magnesian Limestone runs as a thick persistent zone down the east of England it is represented on the Lancashire and Cheshire side by bright red and variegated sandstone covered by a thin group of red marls, with

numerous thin courses of limestone, containing Schizodus, Bakevellia, and other characteristic fossils of the Magnesian Limestone.

The middle Permian division has yiclded about 100 species belonging to 46 genera of fossils—a singularly poor fauna when contrasted with that of the Carboniferous system below. The brachiopods (9 genera, 21 species) include Productus horridus, Camarophoria multiplicata, CO. Schlotheimi, Strophalosia Goldfussi, Lingula Credneri, and Terebratula clongata. The lamellibranchs number 16 genera and 31 species, among which Schizodus Schlo- theimti, Bakevellia tumida, B. antiqua, B. ceratophaga, Mytilus squamosus, and Area striata are characteristic. The univalves arc represented by 11 genera and 26 species, ineluding Plewrotomaria and Turbo aseommon genera. Fishes have been obtained chiefly in the marl slate to the number of 21 species belonging to 8 genera, of which Paleoniscus is the chief. These small ganoids are closely pee to some which haunted the lagoons of the Carboniferous period.

Upper.—Murchison and Harkness have classed as Upper Permian certain red sandstones with thin partings of red shale, and an underlying band of red and green marls and gypsum. These rocks, seen at St Bees, near Whitehaven, resting on a magnesian limestone, have not yet yielded any fossils,

ConTINENTAL Evrope.—The two types of the Permian system presented by the east and west sides of England reappear in different areas on the mainland of Europe. The eastern or Durham type is found in enormous masses of strata flanking the Harz Mountains, also in Thuringia, in Saxony, and in Bohemia. The western or Salopian type is found over many thousands of square miles in the north and east of Russia.

The German geologists, recognizing the remarkable two- fold character of its rocks, have called this system “ Dyas,” and have proposed to retain the term Permian to express the more simple type, such as isfound in Russia and western England. They group the members of their Dyas as follows :—

Anhydrite, gypsum, rock-salt, marl, dolomite, fetid shale, and limestone. The amorphous gypsum is the chiet member of this group; the limestone is sometimes full of bitumen.

Crystalline granular (Rawchwacke) and fine sandy (Asche) dolomite (6 to 65 feet).

| tech, an argillaceous thin-bedded compact limestone

15 to 30 (sometimes even 90) feet thick.

Lp ke lt ti black bituminous shale not more than

Zechstein Group.

about 2 feet thick. Zechstein, conglomerate, and ealeareous sandstone. (Upper.—Conglomerates (quartz-porphyry conglomerate) and

S | sandstone, with associated melaphyres and tufts.

2 ek Middle.—Red elays, shales, and fine shaly sandstones, with

x 5 bands of quartz-conglomerate and earthy limestone. Mela-

go | phyre and porphyrite masses intercalated.

eo Lower.—Shaly sandstones, shales (with bituminous bands), Land conglomerates.

The name “‘ Rothliegende” or ‘‘ Rothtodtliegende” (red-layer cr red-dead-layer) was given by the miners because their ores. diss appeared in the red rocks below the copper-bearing Lice The coarse eonglomerates have been referred by Ramsay to a glacia origin, like those of the Abberley Hills. One of the most interest- ing features of the formation is the evidence of the eontemporaneous

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outpouring of great sheets of quartz-porphyry, granite-porphyry, porphyrite, and melaphyre, with abundant interstratifications of various tuffs, not infrequently enclosing organle remains. From the very nature of its component materials, the Rothliegende is comparatively barren of fossils, a few ferns, ealamites, and remains of coniferous trees are found in it,

particularly towards the base, where indeed they form, in the Mansfeld district, a coal-seam about 5 feet thick.

The plants, all of terrestrial growth, on the whole resemble generieally the Carboniferous flora, but seem to be nearly all speei- fieally distinet. They include forms of Calamites (C. gigas), Astero- phyllites, and ferns of the genera Sphenopteris, Alethopteris, Neuropteris, Odontopteris, with well-preserved silieified stems of tree-ferns (Psaronius, Tubieaulis). The eonifer Walehia (W. piniformis) is specially eharaeteristie. Fish remains oceur sparingly (Amblypterus, Paleoniseus, Acanthodes), and traces of labyrintho- donts (Archegosaurus Decheni) have been met with.

The Zechstein group is eharaeterized by a suite of fossils like those of the Middle Permian of England. The Kupfer-schiefer contains numerous fish (Paleoniseus Freislebeni, Platysomus gib- bosus, &e.) and remains of plants (coniferous leaves and fruits and sea-weeds). ‘This deposit is believed to have been laid down in some enelosed sea-basin, the waters of which, probably from the rise of mineral springs conneeted with some of the voleanie foei of the time, were so charged with metallie salts in solution as to become unfit for the continued existence of animal life. The dead fish, plants, &e., by their deeay, gave rise to reduction and pre- cipitation of these salts as sulphides, which thereupon enelosed and replaced the organic forms, and permeated the mud at the bottom. his old sea-floor is now the widely extended band of eopper-slate which has so long and so extensively been worked along the flanks of the Harz. After the formation of the Kupfer-sehiefer the area must have been onee more eovered by elearer water, for the Zeeli- stein contains a number of organisms of whieh Prodwetus horridus, Spirifer undulatus, Strophalosia Goldfussi, Sehizodus obscurus, and Fenestella retiformis are common. Renewed unfavourable condi- tions are indicated by the dolomite, gypsum, and_rock-salt which sueeeed. Professor Ramsay, reasoning upon such phenomena as developed in England, has connected them with the abundant labyrinthodont footprints and other evidences of shores and land, as well as the small number and dwarfed forms of the shells in the Magnesian Limestone, and has speculated on the oceurrenee of along continental period in Europe, during one epoch of whieh a numbei of salt inland seas existed wherein the

Permian roeks were aceumu- lated. He compares these deposits to what may be supposed to be forming now in parts of the Caspian Sea.

Norra AmericA.—The Permian system is hardly repre- sented at all in this part of the globe. In Kansas certain red and green clays, sandstones, limestones, conglomerates, and beds of gypsum lie conformably on the Carboniferous

system, aud contain a few genera and species of molluses |

(Bakevellia, Myalina, &c,), which occur in the European Permian rocks.

Ill. SECONDARY OR MESOZOIC. TRIASSIC.

It has been already mentioned that the great mass of red rocks, which in England overlie the Carboniferous system, were formerly classed together as New Red Sandstone, but are now ranged in two systems. We have considered the lower of these under the name of Permian. The general facies of organic remains in that division is still decidedly Paleozoic. Its brachiopods and its plants connect it with the Carboniferous rocks below. Hence it is placed at the close of the long series of Paleozoic formations. When, however, we enter the upper division of the red rucks, though the general lithological characters remain very much as in the lower group, the fossils bring before us the advent of the great Mesozoic flora and fauna. This group there- fore is put at the base of the Mesozoic or Secondary series. It is called Trias, because in Germany it consists of three well-marked subdivisions. But the old name, New Red Sandstone, is familiarly retained for it by many geologists in England. The term Trias, like Dyas, is unfortunately chosen, for it elevates a mere local character into an import- ance which it doesnot deserve. The threefold subdivision, though so distinct in Germany, disappcars elsewhere.

Great Brirain.—Triassic rocks occupy a large area of

the low plains in the centre of England, ranging thence northwards along the flanks of the Carboniferous tracts to Lancaster Bay, and southwards by the head of the Bristol Channel to the south-east coast of Devonshire. They have been arranged in the following subdivisions :—

Mee… | Probie all -Red, green, and grey marls, and (New Red Marl.—Red and grey shales and matls, with beds of roek-salt and gypsum (Zstheria aud Foraminifera). Lower Keuper Sandstone.—Thinly laminated miea- eeous sandstones and marls (waterstones) passing downwards into white, brown, or reddish sand- stones, with a base of caleareous conglomerate or brecela. Middle…..... Wanting in England (Musehelkalk of Germany). (Upper Mottled Sandstone.— Soft bright-red and variegated sandstones, without pebbles. Pebble beds.—Harder reddish-brown sandstones with quartzose pebbles, passing into conglomerate ; with

Upper Trias or Keuper.

Lower Trias

or Bunter. 5 t a base of caleareous breeeia.

| Lower Mottled Sandstone. — Soft bright-red and variegated sandstone, without pebbles.

Like the Permian red rocks below, the sandstones and marls of the Triassic series are almost barren of organic re- mains. Hence the subdivisions in the foregoing table are based on mineral characters, and could not therefore be relied on as a guide in districts outside of the English area. Indeed, extraordinary differences in the development of the different members of the series occur, even within that area, as may be seen from the subjoined table, which shows the variations in thickness from nortli-west to south-east :—

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Fn Leicester- Lancashire) ciafrord-

and W. f shire and Chiestiine, | sim ” | Werwiee:

Red 1 Feet. Feet. Feet. – WEG) 10H po anaangooanosccd46s 8000 800 700 Keuper. } Lower Keuper sandstone 450 200 150 Upper mottled sandstone 500| 50-200} absent Bunter. ¢ Pebble beds ……. 5uu-750 | 100-800; 0-100

Lower mottled sandstone) 200-500 | 0-100} absent Hence we observe that, while towards the north-west the Triassic rocks attain a maximum depth of 5200 feet, they rapidly come down to a fifth or a sixth of that thickness as they pass towards the south-east. Recent borings in the south-eastern counties show that the Triassic rocks are there absent altogether. It is evident that the source of supply of the sediment lay towards the north. This is further borne out by the character of the pebble-beds. These are coarsest towards the north, and, besides local materials, con- tain abundant rolled pebbles of quartz which have evidently been derived from some previous conglomerate, probably from some of the Old Red Sandstone masses now removed or concealed. The Trias everywhere rests unconformably on the rocks underneath it, so that, although the general physical conditions as regards climate, geography, and sedi- mentation, which prevailed in the Permian period still continued, great terrestrial movements had, in the mean- while, taken place, whereby the Permian sediments were upraised and exposed to denudation. Hence the Trias rests now on Permian, now on Carboniferous, and sometimes even on Cambrian rocks. Moreover, the upper parts of the Triassic series overlap the lower, so that the Keuper groups come to rest directly on Permian or Carboniferous rocks. One of the most interesting features in the English Trias is the occurrence of beds of rock-salt which have long been profitably worked. The uppermost subdivision of the Keuper, consisting of red marls, has a wide distribution, for it can be traced from the coast of Lancashire to the Bristol Channel, and covers a larger area of surface in the central counties than the rest of the Trias and the whole of the Permian sandstones combined. Even as far south as the

coast of Devonshire, it contains casts of the cubical spaces once occupied by crystals of common salt. But in Cheshire the salt occurs in two or more beds, of which the lower is sometimes upwards of 100 feet thick. It is a

crystalline substance, usually tinged yellow or red from intermixture of clay and peroxide of iron, but is tolerably pure in the best part of the beds, where the proportion of chloride of sodium is as much as 98 per cent. Through the bright red marls with which the salt is interstratified there run bands of gypsum, somewhat irregular in their mode of occurrence, sometimes reaching a thickness of 40 feet and upwards. Thin seams of rock-salt likewise occur among the red marls. These facts point to the concentration and evaporation of salt lakes or inland seas.

The organic remains of the Trias are comparatively few, as the conditions for at least animal life must have been extremely unfavourable in the waters of the ancient Dead Sea wherein these red rocks were accumulated. The land possessed a vegetation which, from the few fragments yet known, seems to have consisted in large measure of cypress-like coniferous trees (Voltzia, Walchia), with calamites on the lower more marshy grounds. The red marl group contains in some of its layers numerous valves of the little crustacean Hstheria minuta, and a solitary species of lamellibranch, Pullastra arenicola, A number of teeth, spines, and sometimes entire skeletons of fish have been obtained (Dipteronotus eyphus, Paleoniscus swperstes, Hybodus Keuperi, Acrodus minimus, Sphenon- chus minimus, Lophodus, &c.). The bones, and still more fre- quently the footprints, of labyrinthodont and even of saurian reptiles occur in the Keuper beds—Labyrinthodon (4 species), Cladyodon Lloydti, Hyperodapedon, Palcosaurus, Teratosaurus, Thecodontosaurus, Rhyneosaurus, and footprints of Cheirotheriwm. The remains of a small marsupial (Microlestcs) have likewise been discovered.

Ltheetic.—At the top of the Red Marl certain thin-bedded strata form a gradation upwards into the base of the Jurassic system. As their colours are grey and blue, and contrast with the red marls on which they repose conform- ably, they were formerly classed without hesitation in the Jurassic series. Egerton, however, showed that, from the character of their included fish remains, they had more palzontological affinity with the Trias than with the Lias. Subsequent research, particularly among the Rhetic Alps and elsewhere on the Continent, brought to light a great series of strata of intermediate characters between the Trias and Lias, These results led to renewed examination of the so-called beds of passage in England, which

were found to be truly representative of the massive formations of the Tyrolesa and Swiss Alps. They are therefore now classed as Rheetic, and considered as the uppermost member of the Trias, but offering evidence of the gradual approach of the physical geography and characteristic fauna and flora of the Jurassic period.

The Rheetic beds extend as a continuous though very thin band at the top of the Trias, from the coast of Yorkshire across England to Lyme Regis on the Dorsetshire shores. They occur in scattered patehes even up. as far as Carlisle, and westwards on both sides of the Bristol Channel. Their thickness, on the average, is probably not more than 50 fect, though it rarely increases to 150 feet. They consist of thin-bedded grey and dark shales and clays, with bands of light-coloured limestone. One of their most important sub- divisions is the so-called Bonc-bed—a pyritous, micaceous, and occasionally rippled sandstone, sometimes in several bands, abound: ing in fish bones, teeth, eoprolites, and other organic remains. The grey marly beds in the lower portion of the scries have yielded remains of the Microlestes Rheticus. Among the reptilian fossils are some precursors of the great forms which distinguished the Jurassic period (Ichthyosaurus and Plesiosaurus). The fishes inelude Acrodus minimus, Ceratodus altus, Hybodus minor, Nema- canthus monilifer, &c. Some of the lamellibranchs are spccially characteristie; such are Cardiwm Rheticum, Avicula contorta, Peeten Valoniensis, and Pullastra arenicola.

Professor Ramsay has drawn attention to the probable geo- graphical ehanges recorded by the Triassic rocks of England. Con- neeting them with the earlier and similar Permian sandstones and marls he points out that the great Continental period which began with the Old Red Sandstone closed with the New Red Marl, and was characterized by the existence of great lakes, many of which must have been salt, and by the abundance of labyrinthodont

life. The Triassic rocks were, doubtless, laid down in one of these salt lakes round the margins of whieh the labyrinthodonts left their footprints on the

soft sand. In the Rheetic series we see how these inland basins were gradually invaded by the sea, which brought into the region of Britain the rich fauna of the Jurassic period.

_ContTINENTAL Evropr.—The Trias is the most compactly distributed of all the geological formations of Europe. Its main area extends as a great basin from Basel down to the plains of Hanover, traversed along its centre by the course of the Rhine, and stretching from the flanks of the old high grounds of Saxony and Bohemia on the east across the Vosges mountains into France. This must have been a great inland sea, out of which the Harz nountains, and the high grounds of the Eifel, Hundsruck, and Taunus probably rose as islands. It may have extended up to the base of the Alps, for enormous masses of Triassic rocks now form part of these mountains. Traces of what were probably other basins occur eastward in the Carpathian district, along the southern front of the Alps, in the west and south of France, and over the eastern half of the Spanish peninsula. But these areas have. been considerably obscured, sometimes by dislocation and denudation, sometimes by the overlap of more recent formations.

In the great German Triassic basin the deposits are as

shown in the subjoined table.

(Upper or Rheetic.—Grey sandy clays and fine-grained sand- stones, containing Lgwisetwm, Asplenites, and cycads(Zanvites, Pterophyllum), sometimes forming thin seams of eoal—Car- dium Kheeticum, Avicula contorta, Estheria minuta, Notho- saurus, Termatosaurus, Belodon, and Microlestcs antiquus.

Middle (Bunte Keupermergel, Gypskeuper).—Bright red and mottled marls, with beds of gypsum and rock-salt. In some places where sandstones appear they contain numerous plants

(Zquisctum columnare, Toniopteris vittata, Pterophyllum,

&e.), and labyrinthodont and fish remains. 300 to 1000 feet. Lower (Lettenkohle, Kohlenkeuper).—Grey sandstones and

dark marls and clays, with abundant plants, sometimes

forming thin seams of an earthy hardly workable eoal

(Lettenkohle). The plants include, besides those above

mentioned, the conifers Araucaroxylon Thuringicum, Voltzia

heterophylla, &c. Some of the shales are erowded with small ostracod crustacea (Zstheria minuta). Remains of fish

(Ceratodus) and of the Mastodonsdurus Jogeri have been

obtained. About 230 feet.

E Limestone in thick beds with argillaceous partings.—It

Keuper.

abounds in organic remains among which Ceratites nodosus, Nautilus bidorsatus, Lima striata, Myophoria vulgaris, Tri- gonodus Sandbergert, Terebratula vulgaris, and Encrinus liliiformis are specially characteristic. It is a thoroughly marine formation, sometimes almost wholly made up of crinoid stems. 200 to 400 feet.

Middle Limestone and Anhydrite, consisting of dolomites with anhydrite, gypsum, and rock-salt. Nearly devoid of organic remains, though bones and teeth of saurians have been found. 200 to 400 fect.

Lower Limestone, consisting of limestones and dolomites, but on the whole poor in fossils, save in the limestone bands, some of which are full of Terebratula vulgaris and Encrinus liliiformts. 160 to 500 fect.

Upper (Roth).—Red and green marls, with gypsum in the lower part. 250 to 300 feet.

Middle.—Coarse-grained sandstones, sometimes incoherent, with wayboards of Estheria shale.

Lower.—Fine reddish argillaceous sandstone, often micaceous and fissile, with occasional interstratifications of dolomite and of the marly oolitic limestone called ‘‘ Rogenstein.”

The Bunter division is usually barren of organic remains. The plants already known include Lquisetwm arenaceum, one or two ferns, and a few conifers (Albertia and Voltzia). The lamellibranch Myophoria costata is found in the upper division all over Germany. Numerous footprints occur on the sandstones, and the bones of labyrinthodonts as well as of fish have been obtained.

The Trias attains an enormous development in the eastern Alps, where it bears evidence of having been accumulated under very different conditions from those of the Trias in Germany. The great thickness of its limestones, and their unequivoeally marine organisms, show that it must have accumulated in opener water, which remained clear and comparatively free from inroads of sandy and muddy sediment. It possesses, moreover, a high interest as being a massive formation of marine origin formed between Permian

Muschelkalk.

Bunter.

oot

and Jurassie times, and containing a remarkable blending of true Paleozoic organisms with others as eharacteristically Mesozoic. It ig divided into two great series :—(1) Lower Trias, consisting of (a) Werfen Shales and Guttenstein Limestone, and (0) Virgloria Lime- stone or alpiue Muschelkalk ; and (2) Upper Trias,—a varied series of strata in three leading groups, having a united thiekness some- times of thousands of feet.

Nort America.—Rocks which are regarded as equi- valent to the European Trias cover a large area in North America. On the Atlantic coast they are found on Prince Edward’s Island, New Brunswick, and Nova Scotia, in

Connecticut, New York, Pennsylvania, and North Carolina. Spreading over au enormous extent of the western territories, they cross the Rocky Mountains into California and British Columbia. They consist mainly of red sandstones, passing sometimes into conglomerates, and often including shales and impure limestoues. On the Pacific slope they contain distinctly marine organisms, which include a mingling of such Paleozoic genera as Spirifer, Orthoceras, and Goniatites, with the characteristically Secondary genus Ammonites. In the centre and east of the continent they are marked by the occurrence of terrestrial plants, and in Connecticut by abundant footprints of land animals, The fossil plants present a general facies like that of the European Triassic flora, among them cycads, including some of the European species of Pterophyllum. Ferns (Pecopteris, Neuropteris, Clathropteris), calamites, and conifers are the predominant forms. The fauna is remarkable chiefly for the number and variety of its vertebrates. The labyrinthodonts are represented by footprints, from which upwards of fifty species have been described. Saurian footprints have like- wise been recognized, but in a few cases their bones also have been found. These saurians had some _bird-like characteristics, among others that of three-toed hind feet, which produced impressions exactly like those of birds. It is by no means certain, therefore, that what have been described as ornithichnites were not really made by dinosaurs. A small insectivorons marsupial (Dromatherium), found in the Trias of North Carolina, is the oldest American mammal yet known.

JURASSIC,

The next great period of geological time is termed the Jurassic, from the Jura Mountains, where the deposits of that age are well developed. It was in England, however, that they were first studied by William Smith, in whose hands they were made to lay the foundations of strati- graphical geology. The names adopted by him for the subdivisions he traced across the country have passed into universal use, and though some of them are uncouth English provincial names, they are as familiar to the geologists of France, Switzerland, and Germany as to those of England.

The Jurassic formations stretch across England in a vary- ing band from the mouth of the Tees to the coast of Dorset- shire. They consist of harder

sandstones and limestones interstratified with softer clays and shales. Hence they give rise to a characteristic type of scenery,—the more dur- able beds standing out as long ridges, sometimes even with low cliffs, while the clays underlie the level spaces between. Arranged in descending order, the following subdivisions of the English Jurassic system are recognized :—

Maximum thicknesses. Upper fresh-water beds… ~ 62 4 | Purbeek. ; Middle marine beds …....} .....00006 360 48 Lower fresh-water beds .. ae a Wowilame SHORE... .. lise… cc cecccsssccccssacoees 70 Sie oupeouland. < Rowtland Saids). .....c0..sccosesesessssececs 150 _ Lo 600 ae 8 (ome Coral Rag and Caleareous Grit 238 Ooli te g INU sgebsopaddanDOs 250 Gel eS

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[vi, STRATIGRAPHICAL.

Maximum

thicknesses,

Feet.

ai Cornbrash, Bradford Clay …..... .....++ 40

= Great | and Forest Marble (in Dorsetshire 450 ft.) 30

“3 Oolite. | Great or Bath Oolite with Stonesfield | 49 o slate (part of Northampton Sand)....

a { oe Puller sWarbhy Ovo. ecccee ees sere eens 150

& (Cheltenham beds …….....-ssssseeeeeee seen es 270 i Inferior | Midford Sands (aud perhaps part of

5 Oolite. 1 Northampton Sands), ‘‘ Dogger” of > 160 ae Vioulaeente fa… scsi deaeeee se -« sce

Upper Laas …...ssccccecseaneceeceeseees cos bee snueilenosso tome 400

Tiias 2 Marletones…:scscess-s cossseeeemmeee eon as teach eens 200

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Although these names appear in tabular order as expres- sive of what is the predomiuant or normal succession of the beds, considerable differences occur when the rocks are traced across the country. Thus the Forest Marble attains a thickness of 450 feet in Dorsetshire, but dwindles down to only 15 feet at Blenheim Park. The Inferior Oolite con- sists of marine limestones and shales in Gloucestershire, but chiefly of massive estuarine sandstones and shales in York- shire. These differences help to bring before us some of the geographical features of the British area during the J urassic period.

The Lras consists of three formations, well marked by physical and palzontological characters. In the lower member numerous thin blue and brown limestones with partings of dark shale are surmounted by similar shales with occasional nodular limestone bands, the whole being divided into seven zoues, each characterized by the presence of one or more distinctive species of ammonite. From this point of the geological series up to the close of the Mesozoic formations, the ammonites play a chief part among the mollusks. The Middle Lias, consisting of argillaceous line- stones (marlstones) with micaceous sands and clays, is divided into five ammonite zones. In its Yorkshire develop- ment this subdivision is remarkable for containing a bed of earthy carbonate of iron 15 to 20 feet thick, which has been extensively worked in the Cleveland district. The upper division is composed chiefly of clays and shales with nodules of limestones, among which three ammonite zones have been noted in Yorkshire.

The organie remains of the Lias comprise leaves and other remains of eyeads (Palwozamia), eonifers (Pinites, Cupressus, Peuee), ferns (Otopteris, Alethopteris, &e.), and reeds (Hquisetites). These fossils serve to indicate

the general character of the flora, which seems now to have been mainly eyeadaceous and eoniferous, and to have presented a great contrast to the lyeopodiaeeous vegetation of Paleozoie times. The oecurrence of land-plants dispersedly throughout the English Lias shows also that the strata, though ehiefly marine, were deposited within such short distanee from shore, as to receive from time to time leaves, seeds, fruits, twigs, and stems from the land. Further evidence in the same direetion is supplied by the numerous insect remains, which have been obtained prineipally from the Lower Lias. These were, no doubt, blown off the land and fell into shallow water, where they were preserved in the silt on the bottom. The Newroptera are numerous, and inelude several species of Libellula. The eoleopterous forms comprise a number of beetles. There were like- wise representatives of the orthopterous, hemipterous, and dipterous orders. These relies of insect-life are so abundant in some of the ealcareous bands that the latter are known as inseet-beds. With them are associated remains of terrestrial plants, eyprids, and mollusks, sometimes marine, sometimes apparently brackish-water. The marine life of the period has been abundantly preserved, so far at least as regards the comparatively shallow and_juxta-littoral waters in which the Liassie strata were accumulated. Corals, though on the whole searee, abound on some horizons(Jsastrea, Montlivaltia, Septastrea, &e.). The erinoids were represented by thick growths of Extracrinus and Pentaerinus. There were several kinds of star-fishes, and also of sea-urehins (Cidaris, Diadema, Acrosalenia)— all generieally distinet from those of the Paleozoic periods. The contrast between the Liassie erustaeea and those of the older systems, as Phillips has pointed out, is very decided, the aneicnt trilobites having entirely disappeared, and having been sueceeded by tribes of long-tailed ten-footed lobsters and prawns. There is a similar striking differenee between the mollusks of the Lias and those of the Paleozoic rocks, bearing witness to the great biological

changes which had taken place in the longinterval. The brachiopods are chiefly species of Rhynehonella and Lerebratula—genera which, though occurring in Paleozoic rocks, play there a comparatively subordinate part. They include the last Spiriferi and Leptene. Of the lamellibranchs, a few of

the most characteristic genera are Gryphon, Lima, Pecten, Monotis, Cardinia, Hippopodium, Myacites, and Pholadomya. Gasteropods, though usually rare in such muddy strata as the greater part of the Lias, occasionally occur, but most frequently in the calcareous zoncs. Altogether 89 species are at present known, the chief genera being Pleurotomaria, Turbo, Eucyelus, Cerithium, and Chemnitzia. The cephalopods, however, are the most abundant and characteristic shells of the Lias; the family of the ammonites numbers in Yorkshire at least 118 species. As already stated, some species are so distinctive of special horizons that the whole of the Lias has been subdivided into zones, each denoted by the name of its characteristic ammonite. In ascending order, these zones are named as follows :—In the Lower Lias,—I1st, Ammonites planorbis ; 2d, A. angulatus ; 3d, A. Bueklandi; 4th, A, tuberculatus; 5th, A. obtusus; 6th, A. orynotus; 7th, A. varicos- tatus. Inthe Middle Lias,—I1st, A. Jameson and armatus ; 2d, .A. capricornus ; 8d, A. margaritatus;, 4th, A. spinatus; 5th, A. annu- latus. In the Upper Lias,—Ist, A. serpentinus; 2d, A. communis; 3d, Ad. jurensis, The genus Navtilus is also present. The di- branchiate cephalopods are represented by upwards of 40 specics of the genus Belemnites. Numerous species of fishes have been obtained from the Lias. Some of these are placoids, known only by their teeth (Acrodus, Ceratodus), others only by their spines (Nemacanthus), and some by both teeth and spines (Hybodus). The ganoids are frequently found entire, the genera Dapedius, Pholidophorus, “lichmodus, Lepidotus, Paehyeormus, and Leptolejis being among the most frequent. But undoubtedly the most important pale- ontological feature of the Lias is the number and extraordinary interest of its reptilian remains. These include the extinct order of enaliosaurs or sea-lizards, uniting characters which are not found together in any living forms. Among these are the genus Ichthyo- sawrus, a creature with a fish-like body, two pairs of strong swim- ming paddles, and probably a vertical tail-fin. The head, joined to the body without any distinct neck, was furnished with two large eyes, having a ring of bony plates round the eyeball, and with teeth that had no distinct sockets. Some of the skeletons of this creature exceed 24 feet in length. Contemporaneous with it was the Plesiosaurus, distinguished by its long neck, the larger size of its paddles, the smaller size of its head, and the inscrtion of its teeth in special sockets, as in the higher saurians. These creatures seem to have haunted the shallow seas of the Liassic time. There were also huge winged

bat-like reptiles (Dimorphodon), with large heads, having teeth in distinct sockets, eyes like the Iehthyosawrus, and one finger of each fore foot prolonged to a great length, for the purpose of supporting a membrane for flight, The bones, like those of birds, were hollow and air-filled. Gigantic deinosaurs were like- wise among the inhabitants of Britain during Liassic time. These were true reptiles, yet with peculiarities of structure, particularly in the hinder part of the skeleton, linking them with birds like the ostrich. To this order belongs the Megalosawrus from the Lias of Lyme Regis. Lastly, the truc crocodiles had representatives in the Liassic waters and shores, in the genera Jeleosawrus and Steneo- SUTUS,

The Lower or Batu OotrrsEs lie conformably upon the top of the Lias, with which they are connected by a general similarity of organic remains. Out of the 312 known species in the Upper Lias, about 39 or 40 pass up into the overlying formation. The lowest of the three subdivisions of the English Oolites consists in the south- west and centre of England of shelly marine limestones, with clays and sandstones ; but, as these strata are traced northwards into Northampton, Rutland, and Lincolnshire, they pass into a series of strata indicative of deposit in the estuary of some river descending from the north, for, instead of the abundant cephalopods of the truly marine and typical series, we meet with fresh-water genera such as Cyrena and Unio, with marine forms such as Ostrea and Modiola, thin seams of lignite, and remains of terrestrial plants. These indications of the proximity of land become still more marked in Yorkshire, where the strata (800 feet thick) consist chiefly of sandstones, shales with seams of ironstone and coal, and occasional horizons containing marine shells. It is deserving of notice that the Cornbrash, Which forms the top of the Lower Oolite in the typical Gloucestershire district, occurs likewise in the same position in Yorkshire. Though rarely more than 8 feet thick, it runs across the country from Devonshire to Yorkshire.

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Thus a distinctly defined series of beds of an estuarine character, exactly representative of the marine formations of the south-west, shows us that at the close of the Lower Oolitic period the estuary of the northern tract was

sub- merged, and a continuous sea-floor stretched across the whole of the south-east of England.

Thanks to the deposits of the Yorkshire estuarine series our knowledge of the Oolitic is much more ample than of the Liassic flora. With the exception of a few littoral fucoids all the plants are of terrestrial forms. They comprise about 60 species of ferns, among which the genera Pecopteris, Sphenopteris, Phlebopteris, and. Teniopteris axe characteristic. Next in abundance come the cycads, of which more than 20 species are known, belonging to the genera Otozamites, Zamites, Pterophyllum, and Cycadites. Con- iferous remains are not infrequent in the form of stems or frag- ments of wood, as well as in occasional twigs with attached leaves; the genera Araucarites, Brachyphyllum, Thuytes, Peuce, Walehia, Cryptomerites, and Taxites have been recognized. The Inferior Oolite presents a tolerably copious suite of invertebrate remains, which resemble generically those of the Lias. The predominance of Rhynchonella and Terebratula over the rest of the brachiopods becomes still more marked. Gryphaa, Lima, Pecten, Cardium, Myacttes, Mytilus, Pholadomya, Trigonia are frequent shells, while ammonites and belemnites also occur, though much more sparingly than in the Lias below, and in some of the later subdivisions of the Oolitic scrices. The Fuller’s Earth, though well-marked in the Bath district, where it is about 200 feet thick, dies out in Oxfordshire, and contains only a few distinctive fossils, most of its forms being also found in the Inferior Oolite.

The Great or Bath Oolite consists, in Gloucestershire and Oxfordshire, of three groups of strata, At the base comes a series of thin-bedded limestones with sands, known as the Stonesfield Slate ; in the centre lies a mass of shelly and yellow or cream-coloured often Oolitic limestones, with partings of marl or clay—the Great Oolite; while at the top lies a set of clays and shelly limestones, including the Bradford Clay, Forest Marble, and Cornbrasli. The Stones- field Slate, the lowest of these three zones, is a local but ex- ceedingly important subdivision, which has furnished a large number of reptilian and some mammatian remains. It must have been deposited iu shallow water close to thickly wooded shores.

About a dozen species of ferns have been found in the Stonesfield Slate, the genera Pecopteris, Sphenopteris, and Tceniopteris being still the prevalent

forms. The cycads are chiefly species of Paleozamia, the conifers of Thuytes. With these drifted fragments of a terres- trial vegetation there occur remains of beetles, dragon-flies, and other insects which had been blown or washed off the land. The waters were tenanted by a few brachiopods (Rhynehonella and Terebratula), by lamellibranchs (Gervillia, Lima, Ostrea, Peeten, Astarte, Modiola, Trigonia, &c.), by gasteropods (Natica, Nerita, Patella, Trochus, &c.), by a few ammonites and belemnites, and by placoid and ganoid fishes, of which about 50 species are known. The reptiles comprise representatives of turtles, with peculiar species of Lehthyosaurus and Plesiosaurus. The genus Teleosaurus, which occurs in the Yorkshire Lias, is among the organisms of the Stones- field Slate. It was a true carnivorous crocodile, measuring about 18 feet in length, and is judged by Phillips to have been in the habit of venturing more freely to sea than the gavial of the Ganges and the crocodile of the Nile. The huge deinosaur AMegalosaurus frequented the shores of the Stonesfield lagoons, walking probably on its massive hind legs, and feeding on the mollusks, fishes, and perhaps the small mammals of the district. It is estimated to have had a length of 25 feet, and to have weighed 2 or 3 tons. The flying reptiles were likewise represented by the Rhamphorynchus, — a harpy-like creature which was able to fly, to shuffle on land, or perch on rocks, perhaps even to dive in search of its prey. But the most important organic remains of the Stonesfield Slate are un- doubtedly its mammalia, of which three genera Amphitheriuwm, Phaseolotherium, and Stereognathus have been determined. Only portions of lower jaws have yet been found, pointing doubtless to the fact that, as the animals were drifted from land, the lower jaws, un- protected by outer skin, were separated in decomposition from the rest of the body. These interesting relics were the first traces of mammalian life found in strata of such high antiquity. They are regarded as having belonged to small marsupial animals, to which living analogues exist in Australia. In the Great Oolite the re- mains of a gigantic saurian Ceteosawrus have been found. Accord- ing to Phillips it was probably, when standing, not eet” feet in height and 50 feet in length, a marsh-loving or rivet ~ : animal, living on the ferns, cycads, and conifcrs among which 1 dwelt,

In the Mrppie or Oxrorp Oorrtss, the Oxford Clay, so called from the name of the county through which it passes in its course from the coast of Dorsetshire to that of York- shire, consists mainly of layers of stiff blue and brown clay. In its lower portion lies a marked zone of calcareous abundantly fossiliferous sandstone, kuown, from a place in Wilt- shire, as the Kelaways Rock, which, after dying out in the midland counties, reappears on the Yorkshire coast. This zone contains about 150 species of fossils, of which nearly a half are found in lower parts of the Jurassic series, and about the same number pass upward into higher zoues.

Among its characteristic forms is Ammonites Calloviensis. The Oxford clay, from the nature of its material and the conditions of its deposit, is deficient in some forms of life which were no doubt abundant in neighbouring areas of clearer water. Thus there are hardly any corals, few echinoderms, polyzoa, or brachiopods. Some lamellibranchs are abundant, particularly Gryphaa and Ostrea (both forming sometimes wide oyster-beds), Lima, Avieula, Peeten,

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Astarte, Trigonia—the whole having a great similarity to the assemblages in the Lower Oolite formations. The gasteropods are not so numerous as in the calcareous beds below, but belong mostly to the same genera. The ammonites are numerous,—A. Duncani, A, Jason, A. Lamberti, and A. oculatus being characteristic. Of the belemnites, which also are frequent, B. hastatus is found all the way from Dorsetshire to Yorkshire. Spines and teeth of placoid fishes and entire specimens of Zepidotus are occasionally to be met with. The reptiles, besides Iehthyosawrus, Megalosaurus, Plesiosaurus (4 species), Stencosaurus, and Rhamphorhynchus, comprise also Pletosaurus—a marine saurian with large head, short neck, paddles similar to those of Plesiosaurus, approaching the type of the ichthyosaurians, but even surpassing them in size.

The Coralline Oolite can likewise be traced, with local modificatious and partial interruptions, across England from Yorkshire to Dorsetshire. It is named from its beds full of masses of coral. It consists of three zones,—a lower calcare- ous grit, a central rubbly limestone with corals (the true coral rag” of William Smith), and an upper calcareous erit, which, though feebly

represented further south, attains importance in Yorkshire. It is frequently entirely made up of comminuted shells, urchins, corals, and other marine organisms. The corals include the genera Jsastroa, T'ham- nastreea, and Thecosmilia. The urchins belong to Crdaris, Hemicidaris, Pigurus, Pigaster, and other genera. There are likewise Ammonites, Belemnites, and Nautilt.

The Upper or Portianp Oontss bring before us the closing epochs of the long Jurassic period in Englaud, with the records of some of the physical revolutions which led to this change. At their base lies the Kimeridge Clay, so named from the locality on the coast of Dorsetshire where it is so well exhibited, and whence it is traceable continuously, save where covered by the Chalk, into Yorkshire. Like the Oxford Clay below, it is distinguished by its thickness, persistence, and peculiar organic remains.

Mollusca appear in greatly diminished variety ; Gryphoa virgula, Ostreea deltoidea, Astarte Hartwellensis, and Cardiwm striatulum are eharacteristic species. The reptiles are the most important of the paleontological contents of this zone. They include reiains of turtles, 5 species of Ichthyosaurus, 5 of Pleioswurus, 8 of Plesio- saurus, Ceteosaurus, Megalosaurus, and the crocodilians Stenco- saurus, Teleosaurus, and Goniopholis.

The Portland beds are so named from the isle of Portland, where they directly succeed the Kimeridge Clay. A feeble representative of them is believed to overlie that clay on the Yorkshire coast, but it is in the southern counties that they attain their chief development. They consist, at Port- land, of a lower sandy set of beds about 150 feet thick, and of an upper calcareous zone (containing the well-known lime- stone so largely used for building purposes under the name of Portland stone) about 70 feet thick.

The fossils, which very commonly occur as mere empty casts, in- clude as characteristie species Jsastreea oblonga, Cardium dissimile, Trigonia gibbosa, and Terebra Portlandiea. There occur also remains of some of the great Oolitic sanrians.

The Purbeck beds, so named from the Isle of Purbeck, where they are best developed, are usually connected with

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the foregoing formations as the highest zone of the Jurassic series of England. But they are certainly separated from the rest of that series by many peculiarities, which show that they were accumulated at a time when the physical geography and the animal and vegetable life of the region were undergoing a remarkable change.

They have been arranged in three groups. The lowest consists of fresh-water limestones and clays, with layers of ancient soil contain- ing stumps of the trees which grew in them. The middle group comprises about 180 feet of strata with marine fossils, while the highest division shows a return of fresh-water conditions. Among the indications of the presence of the sea is an oyster bed (Ostrea dis- torta) 12 feet thick, with Pecten, Modiola, Avicula, Thracia, &c. The fresh-water bands contain still living genera of lacustrine and fluviatile shells—Paludina, Limnca, Planorbis, Physa, Valvata, Unio, and Cyclas. Numerous fishes, both placoid and ganoid, haunted these Purbeck waters. Many insects, blown off from the adjacent land, sank and were emtombed and preserved in the cal- careous mud. These include coleopterous, orthopterous, hemipter- ous, neuropterous, and dipterous forms. Remains of several reptiles, chiefly chelonian, but including the Jurassic crocodile Goniopholis, have also been discovered. But the most remarkable organic re- inains of the Purbeck beds are those of 10 genera and 25 species of marsupial mammals, from the size of a mole to that of a pole- cat. They are believed to have been mostly insectivorous. One of them (Z’riconodon major) is regarded by Owen as carnivorous, and probably about the size of the existing Dasywrus mauget of Australia. These mammalian remains occur, alinost wholly as lower jaws, in a stratum about 5 inches thick lying near the base of the Middle Purbeck group.

ConTINENTAL EvRoPE.—QJurassic rocks cover a vast area in central Europe. They rise from under the Cretaceous formations in the north-east of France, whence they range southwards down the valleys of the Saone and ~~Rhone to the Mediterranean. They appear asa broken border round the old crystalline nucleus of Auvergne. Eastwards they range through the Jura Mountains up to the high grounds of Bohemia. They appear in the outer chains of the Alps on both sides, and on the south they rise along the centre~~

~~of the Apennines, and here and there over the Spanish peninsula. Covered by more recent formations they under~~ lie the great plain of northern Germany, whence they range eastwards and occupy large tracts in central and eastern Russia. According to Neumayr, three distinct geographical regions of deposit can be made out among the Jurassic rocks of Europe. (1.) The Mediterranean province, embracing the Pyrenees, Alps, and Carpathians, with all the tracts lying to the south. One of the biological characters of this area was the great abundance of ammonites belonging to the gronps of Heterophylli (Phylloceras) and Fimbriati (Lytoceras). (2.) Thecentral European province, comprising the tracts lying to the north of the Alpine ridge, aud marked by the comparative rarity of the ammonites just mentioned, which are replaced by others of the groups Znflate (Aspido-ceras) and Oppellia, and by abundant reefs and masses of coral. (3.) The boreal or Russian province, comprising the middle and north of Russia, Spitzbergen, and Greenland. The life in this area was much less varied than in the others, showing that in Jurassic times there was a perceptible dim-inution of temperature towards the north. ‘The ammonites of the more southern tracts here disappear, together with the corals.

In France the following arrangement has been made of the Jurassic rocks, the subdivisions nearly corresponding to those first proposed in England :—

(Purbeck beds not recognized.)

Terrain Portlandien (Calcaire tacheté de Boulogne). ,, Kimeridgien (Argile de Honfleur). », Corallien (Caleaire Corallien). ,, Oxfordien (Oolithe de Trouville). 5. Callovien (Argiles de Dives=Kelaways Rock). ,. Bathonien (Oolithe de Caen =Cornbrash, Terre 4 foulon). ,, Bajocien ou Oolithe Inférieure (Oolithe de Bayeux). ,, oarcien (Marnes Liasiques supérieure = Upper Lias). ». Liasien(Marnes et calcaires 4 Belemnites= Middle Lias). 5, Sinémurien (Calcaire 4 Gryphées= Lower Lias).

CRETACEOUS. |

In north-western Germany the subjoined classification has been adopted.

8 hee pou eae” Miinder Mergcl, and Eimbeek- BS lduser Plattenkalk), Bo 1 Kimcridge group (Upper, with Ammonites gigas and Exo- as gyre virgula;

Lower or Nerineen-Schichten). Pes | Oxford eel iba ‘a Cidaris florigemma: Lower, with @ryphea dilatata). (Clays with Ammonites ornatus. Shales with Amm. maerocephalus. a . (Upper + Cornbrash with Avicula cchénata, Amm. posterus. iS & Shales with Ostrea Knor*? Amm. JSerrugineus. al 2p Zone of Amm. Parkinsont. = 8 J ; Coronaten-Schichten, clays with Belemnites gigan- »— | Middle pee Amm. Humphresianus, Amm. Braiken- 3s ridgt. ae j Shales with Inoceramus polyplocus, Amm. Mur- i i Lower ehisonc. Clays and limestones with Amn. opalinus. Grey marls with Ammonites jurensis. ¢ Upper i Bituminous shales (Posidonien-schiefer) with PE 4 ies pena, A. communis, A. bifrons, osidonia Bronni. 3 a (Clays with Arm. amaithea. as | Middle 4 Marls and limestones with Amm. capricornus. ba i) nae clays and ferruginous marls with Amm. 8s revispina. ES (Clays with Amm. planieosta. | Blue grey clays with Amm. Bucklandt (Arieten-

schiehten).

ark clays with Amm. angulatus.

Dark clays and sandy layers with Amm. planorbis { (pstlonotis).

(Lower 4 D

Nortu America.—So far as yet known rocks of Jurassic age play but a very subordinate part in North Amercian geology. Perhaps some of the red strata of the Trias belong to this division, for it is difficult, owing to paucity of fossil evidence, to draw a satisfactory line between the two systems. Strata containing fossils believed to represent those of the European Jurassic series have been met witli in recent years during the explorations in the western domains of the United States. They occur among some of the eastern ranges of the Rocky Mountains, as well as on the western side of the watershed. They have been recog- nized also far to the north beyond the great region of Azoic and Paleozoic rocks in the arctic portion of the continent. They consist of limestones and marls, which appear seldom to exceed a few hundred feet in thickness. The fossils include species of Pentacrinus, Monotis, Trigonia, Lima, Ammonites, and Belemnites.

CRETACEOUS.

The next great series of geological formations is termed the Cretaceous system, from the fact that in England and western Europe one of its most important members is a thick band of white chalk (creta).

Brirain.—The Purbeck beds bring before us evidence of a great change in the geography of England towards the close of the Jurassic period. They show how the floor of the sea in which the thick and varied formations of that period were deposited came to be gradually elevated, and how into pvols of fresh and brackish water the leaves, insects, and small marsupials of the adjacent land were washed down.

These evidences of terrestrial conditions are followed in the same region by a vast delta-formation, that of the Weald, which accumulated over the south of England, while the older parts of the Cretaceous system were being deposited in the north. Hence there are two types of that system, one where the strata are fluviatile or estuarine, termed the Wealden type, the other where they are marine, known as tle Neocomian type. Arranged in descending order the following are the subdivisions of the English Cretaceous rocks :—

GEOLOGY

Bry |

((Upper Chalk with flints …) ¥ Lower Chalk without flints | ; Chalk { Chalk Marl (Grey Chalk)» ¢ **-:++-600 to 1200 ft,

Wadhurst Clay

(120-180 ft) ; Ashdown Sand L (400 or 500 ft).

Lower Cretaceous or Neocomian.—The fluviatile develop- ment of this series in the south of England consists of a great depth of sands and clays known generally as the Wealden series, from the Weald of Sussex and Kent, where they are best displayed.

They precisely resemble the deposits of a delta, and this is borne out by their organic remains, which consist partly of terrestrial plants (Zquisetum,

Sphenopteris, Alethopteris, Thuytes, cycads, and conifers), and fresh-water shells (Unio, 10 species; Cyrena, 5 species; with Cyelas, Paludina, Melania, &c.), with a few estuarine or marine forms as Ostrea and Mytilus, aud ganoid fishes (Lepidotus) like the gar of American rivers. Among the spoils of the land floated down by this river were the careases of huge deinosaurian reptiles (Iguanodon, Hyleosaurus, Megalosaurus), of the long necked plesiosaurs, and of winged pterodactyles. The deltoid formation in which these remains occur extends in an east and west direction for at least 200 miles, and from north to south for at least 100. Hence the delta must have becn not less than 20,000 square miles in area. It has been compared with that of the Quorra ; in reality, however, its extent must have been greater than its present visible arca, for it has suffered from denudation, and is toa large extent concealed under more recent formations. The river probably descended from the north-west, draining a vast arca, of which the existing mountain groups of Britain are perhaps merely fragments.

The marine type of the Lower Cretaceous rocks is now commonly termed Neocomian, from Neufchatel (Veocomum), where it is well developed. In the south of England only the upper division appears, overlying conformably the Wealden series, and showing the gradual depression of the old delta and the advance of the sea. In Yorkshire, how- ever, a thick deposit known as the Speeton Clay bas been ascertained by Mr Judd to pass down into the Jurassic system, and to contain a representation of the upper parts of the Neocomian of the Continent.

The lower division of the Speeton Clay contains, among other fossils, Anunonites Noricus, The central zone is marked by Peeten einctus, Aneyloceras Duvallit, and Meyeria ornata. The upper di- vision is characterized by Perna Mulleti, Ammonites Deshayestt, Peetenorbieularis. It is the fossils of this upper division which oecur in the Lower Greensand of Kent. They amount to about 300 species, of which only 18 or 20 per cent. pass up into the Upper Cretaceous. This marked paleontological break, taken in counexion with traces of unconformability between the Lower Greensand and the Gault, shows that a definite geological boundary-line can be drawn between the lower and upper parts of the Cretaceous system. ‘

Upper Cretaceous.—At the base of this series lies the Gault—a dark blue stiff clay or marl, sometimes sandy and calcareous. It overlaps the older parts of the Cretaceous series, and in Wiltshire lies on Kimeridge Clay. Among the characteristics fossils of this division are Cyclocyathus Fittoni, Caryophilia Bowerbankii, Nucula pectinata, Ino- ceramus sulcatus, Natica Gaultina, Rostellaria carinata, Ammonites dentatus, and Hamites attenuatus. In all, about 200 species of fossils occur, of which about 46 per cent.

pass into up into the Upper Greensand.

BS \Chloritie Marl ….....4.. BS 4 Upper 5 | Green- > Greenish-grey sandstones and sands 40 5 50); oO sand Gault ae blue clay with ealcareous and ; Pyritous NoGules…....c.

ome Folkstone beds.) ,, . 70 to 100 ft. a # | Sandgate beds.. | © Gd [15 5, 100 5, g &4 Hythe beds…... 8 @ | 80,, 300,, 3 >| Atherfield clay. J 7° 7 20,5, 60,, = | WealdClay,1000 _ Upper part of Speeton Clay…... 150 ,, z | ft. (Punfield beds, Tealby “beds, © | Hastings beds 3 and middle part of Speeton 2 consistingof— & LC Sa eee ea 1507, 3 | TunbridgeWells = 8 Sand(i40-3880 = > Lower part of Speeton Clay…... 200 ,, B | oft): Si oO s

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The Gault is overlaid by a group of sands and sandstones often of a greenish tiut from the presence of glauconite grains. Hence the name Upper Greensand which is applied to them. ‘These strata can be traced westwards into Devonshire, and eastwards to the headlands of Kent, but they die out towards the north. Their mineralogical characters and variable thickness seem to point to them as deposits of the shore of the sea in which the chalk was subsequently laid down upon them.

Among their characteristic fossils are the sponges Siphonia pyri- formis and S, costata ; urchins of the genera Cidaris, Echinus and Salenia; numerous Terebratule and Rhyuehonellw; many lamel- libranchs, particularly of the

genera Exogyra, Ostrea, Gryphoua, Lima, Peeten, and Trigonia ; and gasteropods of the genera Natica, Turritella, and others. The cephalopods abound and comprise many forms of Ammonites (40 species), Hamttes, Seaphites, Baeulites, Navtilus, and Belemnites.

Chalk.—This conspicuous member of the Cretaceoussystem has at its base a white or pale yellow marl with green grains of glauconite, phosphatic nodules, and iron pyrites (Chloritic Marl), which is succeeded sometimes by a kind of argil- laceous chalk (Chalk Marl) forming the base of the true Chalk. It can be traced from Flamborough Head in York- shire across the south-eastern counties to the coast of Dorset. Throughout this long course its western edge usually rises somewhat abruptly from the plains as a long winding escarpment, which from a distance often reminds one of an old coast-line. The upper half of the Chalk is generally distinguished by the presence of many nodular layers of flint. With the exception of these enclosures, however, the whole formation is a remarkably pure white pulverulent dull limestone, meagre to the touch, and soiling the fingers, It is compesed mainly of crumbled foraminifera, with the mingled debris of urchins, corals, and mollusks. It must have been accumulated in a sea of some depth and tolerably free from sediment, like some of the foraminiferal ooze of the existing sea-bed. There is, however, no evidence that the depth of the water at all approached that of the abysses in which the present Atlantic globigerina-ooze is being laid down. Indeed, the character of the foraminifera, and the variety and association of the other organic remains, are not like those which have been found to obtain now on the deep floor of the Atlantic.

Somewhere about 800 species of fossils are known from the Eng- lish Chalk. Occasional rare fragments of terrestrial wood occur, perforated by the teredo, and telling of a transport of some dis- tance from land. Sponges are numerous. They have usually been silicified and preserved in the flint nodules. Among the more characteristic genera are Choanites, Cliona, Ventri- eulites, Brachiolites, Spongia, and Siphouia. Careful preparation of a fragment of chalk usually brings to light remains, sometimes well preserved, of foraminifera(Aotalina ornata, Cristellaria rotulata, Globigerina bulloides), Corals are represented by about 15 species (Parasmilia, Ceelosmilia, Caryophyllia, &e.). The echini form one of the most

conspicuous features among the Chalk fossils, from their individual numbers and their variety of forms. Among the more common genera the following may be named—Ananehytes, Eehinoconus (Galerites), Cardiaster, Mieraster, Cyphosoma, Cidaris, Pseudodiadema, Discoidea, and Salenia. Among other star-fishes the genus Goniaster occurs in numerous species in the upper division of the Chalk. The crinoids were represented in the sea of the period by a Conatula, one or two Pentaerinites, Marsupttes, and Bourgucti- crinus. Polyzoa abound in the Upper Chalk (Homeosolen, Pus- tulopora, Holostoma, &c.). The brachiopods appear in the form of great numbers of Rhynchonella, Tercbratula, and Terebratulina, with Crania, Theeidea, and Kingena. Among the lamellibranchs the genera Ostrea, Pecten, Inoceramus, and Lima are particularly fre- quent. Gasteropods are comapratively few, Plewrotomaria perspee- tiva being one of the few forms found both in the lower and upper division of the Chalk. Cephalopods.. however, abound ; character- istic species are Belemnitella plena, B. mueronata, Nautilus Destlong- champsianus, Ammonites navieularis, A. variaus, A. Rothomageusis, Turrilites costatus, Baeulites baculoides. Seaphites cequalis, and Hamites armatus. Upwards of 80 species of fish have been dis- covered. These include chimeroids (Zdaphodon, Ischyodus), sharks (Hybodus, Ptyehodus, Lamna, Otodus), ganoids (Macropoma, Pyc- nodus), and teleosteous or bouy fishes (Beryx, Enehodus, Sauroee- phatus).

GEOLOGY

Numerous reptilian remains have been found, more par-.

[VI. STRATIGRAPHICAL.

ticularly in a bed about 1 foot thick lying at the base of the Chalk of Cainbridge, and largely worked for phosphate of lime derived from reptilian coprolites and bones. Among the known forms are several chelonians, the great deinosaur Acanthopholis, several species of Plesiosaurus, 5 or 6 species of Iehthyosawrus, 10 species of Pterodactylus from the size of a pigeon upwards, one of them having a spread of wing amounting perhaps to 25 feet, 3 species of Afosasaurus, a crocodilian (Polyptyehodon), and some others. At Cambridge also the bones of one or two species of birds have been found, probably belonging to Natatores allied to the living gulls.

ConTINENTAL Evrope.—The Cretaceous system in many detached areas covers a large extent of the Continent. From the south of England it spreads southward across the north of France up to the base of the ancient central plateau of that country. Eastwards it ranges beneath the Tertiary and post-Tertiary deposits of the great plain, appearing on the north side at the southern end of Scandinavia and in Denmark, on the south side in Belgium and Hanover, round the flanks of the Harz, in Bohemia and Poland, eastwards into Russia, where it covers many thousand square miles up to the southern end of the Ural chain. To the south of the central axis in France, it underlies the great basin of the Garonne, flanks the chain of the Pyrenees on both sides, spreads out largely over the eastern side of the Spanish table-land, and reappears on the west side of the crystalline axis of that region along the coast of Portugal. It is seen at intervals along the north and south fronts of the Alps, extending down the valley of the Rhone to the Mediterranean, ranging along the chain of the Apennines into Sicily and the-north of Africa, and widening out from the eastern shores of the Adriatic throngh Greece, and along the northern base of the Balkans to the Black Sea, round the southern shores of which it ranges in its progress into Asia, where it again covers an enormous area.

A series of rocks covering so vast an extent of surface must needs present many differences of type, alike in their lithological charac-. ters and in their organic contents. They bring before us the records of a time when one continuous sea stretched over all the centre with most of the south of Europe, covered the north of Africa, and swept eastwards to the far east of Asia. There were doubtless many islands and ridges in this wide expanse of water, whereby its areas of deposit and biological provinces must have been more or less sharply defined. Some of these barriers can still be traced, as will be immediately pointed out.

The accompanying table contains the subdivisions of the Cretaceous system which have been adopted in a few of the more important areas of Continental Europe.

It will be seen from this table that while there is sufficient paleontological similarity to allow a general parallclism to be drawn among the Cretaceous rocks of western Enrope, there are yet strongly marked differences pointing

to very distinct conditions of life, and probably, in many cases, to disconnected areas of deposit. Nowhere can these contrasts be more strikingly seen than in crossing from the Cretaceous basin of the Loire to that of the Garonne. In the north of France the Upper Cretaceous heds are precisely like those of England, the soft white Chalk forming a conspicuous feature in both countries ; but, on the south side of the great axis of crystalline rocks, the soft chalk is replaced by hard limestones. There is a prevalence of calcareous matter, often sparry, throughout the whole series of formations, with compara- tively few sandy or clayey beds. This mass of limestone attains its greatest development in the southern part of the department of the Dordogne, where it is said to be about 800 fect thick. But the lithological differences are not greater than those of the fossils. In the north of France, Belgium, and England, the singular molluscan family of the Hippuritide or Rudistes appears only occasionally and sporadically in the Cretaceous rocks, as if a stray individual had from time to time fonnd its way into the region, but without being able to establish a colony there. In the south of France, however, the hippurites occur in prodigious quantity. They often mainly compose the limestones, hence called hippurite limestones (Rudisten-Kalke). They attained a great size, and seem to have grown on immense banks like our modern oyster. They appear in successive species on the different stages of the Cretaceous system, and can be used for marking paleontological horizons, as the cephalopods are elsewhere. But while these lamellibranchs played so important a part throughout the Cretaceons period in the south of France, the numerous ammonites and belemnites, so characteristic of the Chalk in England, were absent from that region, This very distinctive type of hippurite limestone has so

much wider an extension than the English type of the Cretaccous system that it should be regarded as really the normal develop- ment. It ranges through the Alps into Dalmatia, and round the great Mediterranean basin far into Asia. Giimbel has proposed to group the European Cretaceous rocks into three great regions :— (1) the northern province, or area of white chalk with Belemnitella,

Tuble showing the Subdivisions of the Cretaccous System in the West of Europe.

Northern France.

North-West Germany and Denmark.

Southern

d. Bl France.

Faxoe chalk. Danien, Craic!Maestricht chalk supérieure et] (p. 360), caleaire piso- litique(p.360).

with Craie blanche Oberquadersandstein |Caleaires (Belemnitella| (Belemnitella mu-| rudistes (Ra- mucronata). cronata, &e.) diolites). Craic (Belem- nitella quad- ratas).

Lower Chalk without|Craie (Aficras- Oberquadersandstein

flints, ter cor-an-| (Aficraster cor’~~an~~

guinum), guinum).

Upper Chalk flints.

Senonian.

: Chalk Marl. Craie

neuse.

mal~|Mittclquader, Mittcel-|Calcaires pliner (/noceramus| Hippurites Cuviert and J. labi-| cornu-vacci- atus). num, et & Ra-

Turonian.

Chiloritie Marl Craic

nicuse

g.auco-

mus labiatus).

Gres vert supéUnterquader, Unter-|Calcaires Py rieur pliner (Ammonites| Caprotina tri- ftotomagensis, A.) angularis, ct

varians). a Ammonites

Rotomagensis

Upper Greensand,

Cenomanian. |

Albien, argile Flammenmergel (Avi-|Albien, sables| marneuse ou) cula gryphcoides).

sableuse, Clay (Belemnites mini-| ou ferrugi mus). neux & Turri- lites. Gault, Aptien, argiles/Marls, &¢. Ammon- Aptien (Orbi-+ & plicatules. ttes tardefurcatus,| tulina lenticu4 Belemnites Ewaldi) | laris).

Brunsvicensis). ! caprotines

Clays (Belemnites|Calcaire Ancyloceras beds.

Urgonien.

Lower Greensand. Argiles ostré-Hils clay (Hilsthon) Neocomien

ennes (#yo-| with Ammonttes| supérieur gyra subpli| Noricus, &c. (Toxoceras cata, Ostrea complanatus),, Leymerii). calcaire Spatangus.

Punfield |Calcaires név-/Hils con-|Weald Néocomien

and Tealby| comiens et glomerate |clay (Me- moyen, éal-,

Neccomian or Hils.

beds and} marnes blcues (7oxoceras lania, Cy-) eaire & Apty-| Weald middle (Toxaster con-|complana- rena). chus, \Clay and|part of planatus), tus, Rhyn- ——————————— \Hastings (Speeton chonella |Deister- |Névcomien in-| Sand. Clay. depressa). |sandstein | férieur (7oro- ——————_——_ with coal) ceras Cam- Lowerpart/Sable blane et scams. pechet).

of Speeton) ferrugineux. Clay.

comprising England, northern France, Belgium, Deninark, West- phalia ; (2) the Hercynian province, or area of Exogyra columba, embracing Bohemia, Moravia, Saxony, Silesia, and central Bavaria ; and (3) the southern province, or area of hippurites, including the regions south of the crystalline axis of France, the Alps, and southern Europe.

The Wealden beds, with the Hastings Sands and Weald Clay, are found in north-west Germany. They contain abundant remains of terrestrial vegetation, which is sometimes aggregated into thin seams of black glancing coal, occasionally even as much as 65 feet thick. The marine or typical Neocomian series attains a great development among the eastern Alps, where it consists mainly of tassive white and grey limestones, divided into zones according to their characteristic fossils. Some geologists place in it a part of the massive Vienna sandstone (Wiener Sandstein) which enters so largely into the structure of the outer Alps. The massive arena- ceous formation formerly massed together under the general name of Quader-sandstein, but now found to be the equivalent of the calcareous bands of other regions, and capable of subdivision into the chief normal groups, forms a conspicuous feature in Saxony and Bohemia, as in the great gorge of the Elbe and the picturesque crags and pinnacles of Saxon Switzerland. From the Upper Creta- ceous beds, in the neighbourhood of Aix-la-Chapelle, consisting of white sands and laminated clays 400 feet thick, a large number of terrestrial plants have been obtained. The number of species is estimated at more than 400. Of these 70 or 80 are cryptogams, chiefly ferns (Gletehenia, Lygodium, Asplenium, &e.); there are

numerous conifcrs (some akin to Sequoia), and three or four kinds of screw-pine (Pandanus). This flora has a much more modern aspect than any other yet found in Secondary formations. But its most important feature is the occurrence of numerous true exogenous plants—the earliest yet found in Europe. The prevalent forms are Proteacee, many of them being referred to genera still living in Australia or at the Cape of Good Hope. There occur also species of oak, bog-myrtle, &c. These interesting fragments serve to indi- cate the modern character of the flora of Europe towards the close of the Cretaceous period, and to show that the climate, doubtless greatly warmer than that which now prevails, nourished a vegeta- tion hke that of some parts of Australia or the Cape. Further information has been afforded regarding the extension of this flora by the discovery in North Greenland of a remarkable series of fossil plants. From certain Lower Cretaccous beds of that Arctic region, Heer has described 30 species of ferns, 9 cycads, and 17 conifers ; while, from the Upper Cretaceous rocks of Noursoak, he enumerates species of poplar, fig, sassafras, credneria, and magnolia.

Nort America.—The recent surveys of the western territories of the United States have greatly increased our knowledge of the Cretaceous system on the American con- tinent, where it is now known to cover a vast expanse of surface, and to reach a thickness of sometimes 10,000 feet. Sparingly developed in the eastern States, from New J ersey into South Carolina, it spreads out over a wide area in the south, stretching round the end of the long Paleozoic ridge from Georgia through Alabama and Tennessee to the Ohio ; and reappearing from under the Tertiary formations on the west side of the Mississippi over a large space in Texas and the south-west. Its maximum development is reached in the western States and Territories of the Rocky Mountain region—Wyoming, Utah, and Colorado. Cretaceous rocks have likewise been detected in Arctic America near the mouth of the Mackenzie River.

Much controversy has been carried on aniong American geologists regarding the upper limit of the Cretaceous system, some maintaining, from the character of the plants and of the shells, that the great plant-bearing series termed the Lignitic is of Tertiary age, others insisting, from the

occurrence of true Cretaceous shells in and above the Lignitic series, that it must belong to the Cretaceous system. In the Upper Missouri region Hayden and Meek established the following subdivisions :—

5. Fox Hills group.—Sandstones and sandy clays (Belem-

nitella, Nautilus, Ammonites, Baculites, Mosasaurus,

5s) te ee a a dasbocaccnecaeceetertbe: Bivens ne 500 ft. 4. Fort Pierre group.—Plastic clays (Ammonites, Scaphites, LInoceramus, &0.)....6.c00.c00e. POORER OM RE SC ces orcs acc 00,, 3. Niobrara group.—Caleareous marl (Ostrea congesta, Inoceramus problematicus, fish remains), ... 200 ,, 2. Fort Benton group.—Clays and limestones (Scaphites, Ammonites, Pholadomya, &6.)...ccscccaseccececseesecaceces 800 ,,

the Cretaceous flora 400 ,,

American Cretaceous fossils include the earliest dicotyledonous

lants yet found on this continent, upwards of 100 species having Bion found, of which one-half were allied to living American forms. Among them are species of oak, willow, poplar, beech, maple, hickory, fig, tulip-tree, sassafras, sequoia, American palm (Sabad), and cycads, The more characteristic mollusea are species of Tere- bratula, Ostrea, Gryphea, Inoceramus, Hippurites, Radiolites, Ammonites, Scaphites, Hamites, Baculites, Belemnites, Aneyloceras, and Turrilites. Of the fishes of the Cretaceous seas 97 species are known, comprising large predaceous representatives of modern or osseous types like the salmon and saury, though cestracionts and ganoids still flourished. But the most remarkable feature in the American Cretaceous fauna, as at present known, is the great number, variety, and size of the reptiles. According to the enume- ration of Cope, who includes, however, in his list the Lignitic group here placed among the Tertiary formations, there are known at present 18 species of deinosaurs, 4 pterosaurs, 14 crocodilians, 13 sauropterygians or sea-saurians, 48 testudinates (turtles, &e.), and 50 pythonomorphs or sea-serpents. One of the most extraordinary of these reptilian forms was the Elasmosaurus—a huge snake-like form 40 feet long, with slim arrow-

shaped head on a swan-like neck rising 20 fect out of the water. This formidable sea-monster on bably often swam many fect below the surface, raising the head) the distant air for a breath, then withdrawing it and exploring the

depths 40 feet below without altering the position of its body. It must have wandered far from land, and that many kinds of fishes formed its food is shown by the teeth and seales found in the position of its stomach" (Cope). But the real rulers of the 'Americau Cretaceous waters were the pythonomorphic saurians or sea-serpents. Some of them attained a length of 75 feet or more. They possessed a remarkable elongation of form, particularly in the tail; their heads were large, flat, and eonie, with eyes directed partly upwards. They swam by means of two pairs of paddles, like the flippers of the whale, and the cel-like strokes of their flattened. tail. Like snakes they had four rows of formidable teeth on the roof of the mouth, which served as weapons for seizing their prey. But the most remarkable feature in these creatures was the unique arraugement for permitting them to swallow their prey entire, in the manuer of snakes. Each half of the lower jaw was articulated at a point nearly midway between the ear and the chin, so as greatly to widen the space between the jaws, and the throat must, conse- quently, have been loose and baggy like a peliean's. Nine species of birds have been obtained from the American Cretaceous rocks. Three of these belonged to the order of Natatores or swimmers, which ineludes our modern gulls, ducks, and geese ; four were Gralla or waders ; while two belonged to a long extinet order, and united certain ichthyic and reptilian characters with those of pirds. (Sce Cope, Report of U.S. Geol. Surv. of Territories, vol. ii., 1875 ; Marsh, American Journ. Science, 3d ser., i. to iv.; Leidy, Smith- sonian Contributions, 1865, No. 192 ; Lesquereux, Cretaccous Flora, Report of U.S. Geol. Surv. of Territories, vol. vi.)

IV. TERTIARY OR CAINOZOIC.

The close,of the Secondary periods was marked in the west of Europe by great geographical changes, during which the floor of the Cretaceous sea was raised partly into land and partly into shallow marine and estuarine waters. These events must have occupied a vast period of time,so that, when sedimentation once more began in the region, the organic remains of the Secondary ages had (save in a few low forms of life) entirely disappeared and given place to others of a distinctly more modern type. In England, the interval between the Cretaceous and the next geological period represented there by sedimentary formations is marked by the abrupt line which separates the top of the Chalk from all later accumulations, and by the evidence that the Chalk seems to have been in some places extensively denuded before even the oldest of what are called the Tertiary beds were deposited upon its surface. There is evidently here a considerable gap in the geological record. We have no data for ascertaining what was the general march of events in the south of England between the eras chronicled respect- ively by the Upper Chalk and the overlying Thanet beds.

Here and there on the Continent a few scraps of evidence are obtainable which help to fill up this gap. Thus, on the banks of the Meuse at Maestricht, a series of shelly and polyzoan limestones with a conglomeratic base (Systeme Maestrichtien of Dumont, who places it above his Senonian system in the Upper Cretaceous series) contains a mingling of true Cretaceous organisms with others which are char- acteristic of the older Tertiary formations. It contains, for example, the characteristic Upper Chalk crinoid, Bourget- crinus ellipticus, in great numbers ; also Ostrea vesicularis, Baculites Faujasti, Belemnitella mucronata, and the great reptile Mosasaurus ; but with these occur such Tertiary genera as Voluta, Fasciolaria, and others. At Faxoe, on the Danish island of Seeland, the uppermost member of the Senonian series contains in like manner a blending of well- known Upper Chalk organisms with the Tertiary genera Cyprea, Olwa, and Mitra. In theneighbourhood of Paris also, and in scattered patches over the north of France, a formation known as the pisolitic limestone occurs, which was formerly classed with the Tertiary formations, seeing that its fossils had more affinities with later than with older rocks. But the discovery in it of numerous distinctively Upper Cretaceous forms has led to its being placed at the top of the Senonian

series, from which, however, it is marked off by a decided unconformability, for it rests on a

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denuded surface of the White Chalk. formations are interesting, in so far as they help to show that, though in western Europe there is a tolerably abrupt separation between Cretaceous and Tertiary deposits, there was nevertheless no real break between the two periods, The one merged insensibly into the other; but the chroni- cles of the intervening ages have been in great measure destroyed.

[VI. STRATIGRAPHICAL.

These fragmentary

In entering upon the Tertiary series of formations, we find

ourselves upon the threshold of the modern type of life. The ages of lycopods, ferns, cycads, and yew-like conifers have passed away, and that of the dicotyledonous angio- sperms—the hard-wood trees and evergreens of to-day—now succeeds them, but not by any sudden extinction and re-creation, for, as we have seen (ante, p. 359), some of these trees had already begun to make their appearance even in

Cretaceous times. ‘The ammonites, baculites, and other

cephalopods, which had played so large a part in the mol- luscan life of the Secondary periods, now cease. reptiles, too, which in such wonderful variety of type were

The great

the dominant animals of the earth’s surface, alike on land and sea, ever since the commencement of the Lias, now wane before the increase of the mammalia, which advance in ever-augmenting diversity of type until man appears at their head.

The name Tertiary, given in the early days of geology before much was known regarding fossils and their history, has retained its hold on the literature of the science. It is sometimes replaced by the term Cainozoic (recent life), which expresses the great fact that it is in the series of strata comprised under this designation that most recent species and genera have their earliest representatives. Taking as the basis of classification the percentage of living species of mollusca found in the different groups of the Tertiary series, Lyell proposed a scheme of arrangement which has been generally adopted. The older Tertiary forinations, in which the number of still living species of shells is very small, where, in fact, we seem to see as it were the first beginnings of the modern life, he named Eocene (dawn of the recent), including under that title those parts of the Tertiary series of the London and Paris basins wherein the proportion of existing species of shells was only 34 per cent. The middle Tertiary beds in the valleys of the Loire, Garonne, and Dordogne, containing 17 per cent. of living species, were termed Mtocene (less recent). The younger Tertiary formations of Italy were included under the designation Pliocene (more recent), because they contained a majority or from 35 to 95 per cent. of living species. Thisnewest series, however, was further subdivided into Older Pliocene (35 to 50 per cent. of living species) and Newer Pliocene (90 to 95 per cent.). This classifica- tion, with various modifications and amplifications, has been adopted for the Tertiary group not of Europe only but of the whole globe.

As the North American development of the Tertiary series differs in so many respects from that of Europe, it will be most conveniently considered by itself after the European classification has been described.

EOcENE,

Great Brrratn.—The Eocene rocks of Britain are en- tirely confined to the south-east of the island, where they occupy two great depressions of the chalk, known respect- ively as the London and Hampshire basins. They have been arranged into the groups shown in the subjoined table.

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U E458 | Bembridge ,, ...c:ssesseeeeetereeeeeeees 1155; pper 4 585 3 | Osborne jpioabeaele Sagan eae AD op [EB 1: nae 200 5»

EOCENE. | ‘ Upper Bagshot Sand……..... 250 to 300 ft. i 2 Middle Bagshot beds, includ- ae ing Barton Clay (300 feet) Middle g2 and Bracklesham beds (100 H 28 feet). { 3 Lower Bagshot beds……..... 100″ 5. PbO, A bs (GIES SS Ci HD) 5, HOD) ap eisr4e 2a (Oldhaven beds……..... 20 30, Lower {tHe i a { Woolwich and Reading beds 15 . 63 ,, eis eOoR@ | Thanet Sand …..... .c.0ccs00 FAD 5 8D 35 Grouped in relation to the physical changes which they

record, these strata naturally stand in three divisions. At the base lies a series of beds laid down in fresh, estuarine, and sea-water, on an upraised denuded surface of Chalk. Then comes a central group bearing witness to the deepen- ing of these shallow waters, and to the advance of the sea far up the former estuary. The upper group brings before us proof of the eventual retreat of the sea, and the conver- sion of the area once more into fresh-water lakes and rivers. This arrangement does not quite tally with that which is based on a comparison of the fossils with existing forms, and with those of other Tertiary districts, for it places the London Clay in the middle series, though the fossil evidence distinctly shows that formation to belong to the older Eocene groups.

Lower Hocene.—The Thanet Sand at the base of the London Tertiary basin consists of pale yellow and greenish sand, sometimes clayey, and containing at its bottom a layer of green-coated flints resting directly on the Chalk. Accord- ing to Mr Whitaker, it is doubtful if any proof of actual erosion of the chalk can anywliere be seen under the Tertiary deposits in England, and he states that the Thanet Sands everywhere lie upon an even surface of chalk with no visible unconformability. Professor Philips, on the other hand, describes the chalk at Reading as having been “literally ground down to a plain or undulated surface, as it is this day on some parts of the Yorkshire coast,” and having like- wise been abundantly bored by lithodomous shells. The fossils of the Thanet Sand comprise about 70 known species (all marine, except a few fragments of terrestrial vegetation). Among them are several foraminifera, numerous lamelli- branchs (Astarte tenera, Cyprina Morrisi, Ostrea Bello- vacina, &e.), a few species of

gasteropods (Natica subde- pressa, Aporrhais Sowerbii, &c.), a nautilus, and the teeth or palatal bones of fishes (Lamna, Prsodus).

The Woolwich and Reading beds, or Plastic Clay of the older geologists, consist of lenticular sheets of plastic clay, loam, sand, and pebble beds. The organic remains show that the sea of the Thanet Sand era gradually shallowed into an estuary. They aniount to more than 100 species, and include a few plants of terrestrial growtli such as Ficus Forbesi, Grevillea Heert, and Laurus Hookert. The lamelli- branchs are partly estuarine or fresh-water (Cyclas, Cyrena, Dreissena, Unio), partly marine. Of the latter a character- istic species is Ostrea Bellovacina, which forms a thick oyster bed at the base of the series. Ostrea tenera is like- wise abundant. The gasteropods include a similar mixture of marine with fluviatilespecies (Cerithium funatum, Melania inquinata, Natica subdepressa, Fusus latus, Paludina lenta, &e.) The fish are chiefly sharks (Zamna). Bones of turtles and scutes of crocodiles have been found. The highest organisms are bones of mammalia, one of which, the Coryphodon, was allied to the modern tapir.

The Oldhaven beds forming the base of the London Clay, though of trifling thickness, have yielded upwards of 150 species of fossils. Traces of Ficus, Cinnamomum, and Coniferce have been obtained from them ; but the organismis are chiefly marine and partly estuarine shells, the gastero- pods being particularly abundant. The London Clay, as its name implies, is a mass of clay, stiff, brown, or bluish-

grey, with septarian nodules. It extends through both the | bling the living tapir; Anoplotheriwm,

London and Hampshire basins, attaining a maximum thick- ness in the south of Essex. It has yielded a long and varied suite of organic remains, from which we can see that it must have been laid dewn in the sea beyond the mouth of a large estuary, into which abundant relics of the vege- tation, and even sometimes of the fauna of the adjacent land were swept. Its fossils

are mainly marine mollusca, and, taken in connexion with the flora, indicate that the climate was somewhat tropical in character. The plants include the fruits or other remains of palms (Wipadites), custard- apple, acacia, gourds, melons, Proteacee, and Contfere. Crustacea abound (Xanthopsis, Hoploparia). Gasteropods are the prevalent mollusks, the common genera being Pleurotoma (45 species), Fusus (15 species), Cypraa, Murex, Cassidaria, Pyrula, and Voluta. The cephalopods are represented by 6 or more species of Vautilus, by Belo- sepia seproidea, and Deloptera Levesquei. Nearly 100 species of fishes occur in this formation, the rays (Mylio- bates, 14 species) and sharks (Lamna, Otodus, &c.) being specially numerous. A sword-fish (Z'etrapterus priscus), and a saw-fish (Pristis bisudcatus) about 10 feet long, have been described by Agassiz from the London Clay of Sheppey, whence almost the whole of the fish remains have been obtained. The reptiles were numerous, but markedly unlike, as a whiole, to those of Secondary times. Among them are numerous turtles aud tortoises, two species of crocodile, and a sea-snake (Palwophis), estimated to have been 13 feet long. Remains of birds have also been met with; one ofthese (Lethornis vulturinus) appears to have been allied to the vulture, another (//alcyornis teliapicus) to our modern king-fisher, besides waders and other types. The mammals numbered among their species a hog (Hyra- cotherium), several tapirs (Coryphodon, &c.), an opossum (Didelphys), anda bat. The carcases of these animals must have been boine seawards by the great river which trans- ported so much of the vegetation of the neighbouring land.

Middle.—The Bagshot group consists of sand and bands of clay which, in the Hampshire basin, are tolerably fossili- ferous. As developed in the Isle of Wight and at Bourne- mouth, their lower members have yielded a large number of terrestrial plants, among which the Proteacee are still numerous, together with species of fig, cinnamon, fan-palm (Sabal), oak, yew, cypress, laurel, lime, senna, and many more. Crocodilian forms still haunted the waters, and have left their bones with those of sea-snakes and turtles and of the tapirs and other denizens of the land, which still, as in the time of the London Clay, continued to be washed out to sea. Among these strata we now find one of the most typical organisms of the Eocene rocks of the Mediterranean basin, a foraminifer termed Nummudlites (NV. leevigata, NV. scabra, NV. variolaria). Characteristic fossils are Voluta athleta, V.

luctatrix, Murex asper, Fusus longevus, Cardita planicosta, and Chama squamosa.

CUpper.—The strata of this division of the English Eocene formations are entirely confined to Hampshire and the Isle of Wight. They consist of sands, clays, marls, and lime- stones, in thin-bedded alternations. These strata were accumulated partly in the sea, partly in brackish, and partly in fresh water. They were heuce named by Edward Forbes the fluvio-marine series. Among the marine fossils are— Fusus porrectus, Oliva Branderi, Natica labellata, Ostrea callifera, and Nummulites levigata. The genera Cerithium, Potamomya, Paludina, Planorbis, Limnea, and Cyclas are abundant, showing the brackish and fresh-water conditions in which many of the strata were deposited. Remains of turtles, snakes, crocodiles, and alligators continue to occur in these Upper Eocene beds. With these are found the bones of several very characteristic mammals also met with

in the Paris basin,—the three-toed Palwothersem, resem- a more graceful

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animal with long tail, and two-toed feet, forming a kind of intermediate type between a hog and a deer or antelope ; Dichobune, allied to the last named ; also Dichodon, ITyopo- tamus, Cheeropotamus, Hycenodon, &e. The top of the Eocene series in the Isle of Wight has been removed by denudation, so that we have no evidence in Britain of what took place after the close of the Eocene period.

ConTINENTAL EvRopE.—Geologists on the continent of Europe, finding it impossible to carry out the principle of percentage of recent species, as originally formulated by Lyell in his terminology of the Tertiary series, have made various modifications of this nomenclature. By some the three terms Eocene, Miocene, and Pliocene are retained, but, following Beyrich, they subdivide the Miocene into two, keeping that term for the upper half and calling the lower Oligocene, which corresponds with Lyell’s Lower

Miocene. Others would consider the whole Tertiary and post-Tertiary series as divisible into three groups, the Eocene or Older Tertiary, corresponding pretty closely to the Lyellian use of the term, the Neogene or Younger Tertiary, embracing both Miocene and Pliocene, and the Diluvial and Alluvial.

In the Paris basin the Eocene formations assume a somewhat different type from that which they present in England, though the occurrence of a number of the same species of fossils in both allows of their being paralleled in a general way. The lower Eocene consists there of sand and clay answering in lithological character to the Thanet Sand and Plastic Clay of the London basin. The common species in that basin (Ostrea Bellovacina) occurs there in great numbers, while the brackish water-beds contain some of the common species at Woolwich, such as Cyrena eunetformis and Melania inquinata. Beds of lignite occur in this division, likewise bones of Coryphodon Eocawnus, Viverra gigantea, and the bird Gastornis. The Middle Eocene is made up of the character- istic “ Calcaire grossier”—a mass of limestone, sometimes tender and crumbling, in other places so compact as to be largely quarried as a building stone. Some portions are entirely composed of minute fora- minifera (miliolitic limestone). Among the characteristic fossils of this division are Nwmmutlites, Cerathium gigantewm, with bones of Dichobune, Lophiodon, Paloplotherium, &c. The Upper Eocene con- sists of sand (Sables moyens) overlaid by the great gypsum and gypseous marl group of Montmartre. Thisis the deposit from which so many of the mammals of the Eocene period have been recovered, It is divided into three zones, and ainong its fossils are upwards of 50 species of quadrupeds, including many Palotheres, Anoplo- theres, Paloplotheres, with Xiphodon, Dichobune, Adapis, Chero- potamus, Myoxus, Canis Parisiensis, Viverra Parisiensis, Vesper- tilio, Didelphys Cuvieri, and about 17 species of birds.

The Eocene formations of the north-west of Europe occupy but a few detached basins, and consist for the most part of soft clays, sands, marls, and thin limestones. They were laid down partly in estuaries, rivers, or lakes, partly in shallow seas near land. They contain abundantly the vegetation, with some remains of the quadrupeds and birds, of that land, and show that still in older Ter- tiary times, as during the long Palwozoic

and Secondary ages, the chief area of land lay to the north-west. But when we turn to the corresponding formations in central and southern Europe, they pre- sent a totally different aspect. In the first place, they at once im- press us with the idea of their antiquity, for they consist chiefly of massive, hard, crystalline, and sometimes even marble-like lime- stones, which suggest some of the Paleozoic rocks rather than those of so modern a date as the London Clay and Calcaire Grossier. Again, instead of being confined to a few local basins, they cover an enormous geographical area and playa notable part in the structure of some of the great mountain chains of the globe. Crowded as they are with nummulites, they must have been deposited not in estuaries and shallow bays but in a wide and clear sea, which, traced by tlie area of these limestones, must have ranged across the whole of thie south of Europe and north of Africa, through Greece, Turkey, Asia Minor, and the heart of Asia, to the far shores of China and Japan. Since the time when this wide channel connected the Atlantic and the Pacific across the heart of the Old World, the great mountain ranges of the Pyrenees, Alps, Apennines, Carpathians, and of Cen- tral Asia, have been upheaved to their present altitude. Some of the prominent peaks along their flanks consist of the hardened and crumpled calcareous mud of the Eocene sea.

In the northern and southern Alps the Kocene formations consist of nummulitic limestone—a grey, yellow, sometimes reddish com- pact rock, usually containing and often made up of nummulites ; nummulite sandstone; Vienna sandstone—an enormous mass of arenaceous rock almost destitute of organic remains, and rcferred

partly to the Cretaceous and partly to the Eocene series ; and Flysch —a massive development of dark shales or schists, sandstones, and argillaceous limestone, sometimes charged with the remains of fucoids and (at Matt, Glarus) of fish. The nummulitic series of southern Europe is divided into zones characterized by fossils, and brought into a kind of broad parallclism with the subdivisions of the English and French Eocene basins. In the eastern Alps, near Vienna and elsewhere, some of the numimulitic

sandstones contain enormous blocks of granite, gneiss, and other crystalline rocks, which are believed to have been ice-borne, and therefore to prove the existence of Alpine glaciers even in Eocene times. These moun- tains already existed, as it were, in embryo, even far back in the Secondary and Paleozoic ages. During the later part of the Eocene period they seem to have been clothed with an abundant flora, among which the fan-palm, Banksia, Dryandria, and other plants remind one of the living vegetation of tropical America, the Kast Indies, and Australia. Out of these plants the important coal- seams of Haring in Tyrol were formed.

MI0ocENE.

According to the original nomenclature proposed by Lyell, this subdivision of the Tertiary series was meant to include those strata in which 17 per cent. or thereabouts of the shells belong to still living species. As the system of nomenclature was adopted at a time when our knowledge both of living and fossil species was still very defective, it could not but require modification with the progress of science. Some strata, classed at one time as Miocene from their proportion of recent forms, might, on more ex- tended research, prove to contain a much larger percentage, and therefore to be referable to a later part of the Tertiary series. The term, however, is used asa convenient and long- established designation for a series of strata younger than the Eocene, which they seem to have succeeded, though in some parts of the European area after enormous geographi- cal changes.

Great Brivain.—Miocene formations, in the ordinary sense of the term, are almost entirely absent from the British Islands. In Devonshire, at Bovey Tracey, a small but interesting group of sand, clay, and lignite beds, from 200 to 300 feet thick, lies between the granite of Dartmoor and the Greensand hills, in what was evidently the hollow of a Miocene lake. From these beds Heer of Zurich, who has thrown so much light on the Miocene flora of both the Old World and the New, has described about 50 species of plants, which, he says, place this Devonshire group of strata on the same geological horizon with some part of the Lower Miocene formations of Switzerland. Among the species are a number of ferns (Lastrea stiriaca, Pecopterts lignitum, dsc.) ; some conifers, particularly a Wellingtonia called the Sequoia Couttsie, the debris of which forms one of the lignite beds ; a

few grasses, water-lilies, and a palm. Leaves of oaks, figs, laurels, willows, and seeds of grapes have also been detected—the whole vegetation implying a subtropical climate. In the north of Ireland lies a great plateau of basalt, presenting along the coast of Antrim a magni- ficent range of mural escarpments. The basalt-beds mark successive outpourings of lava, which took place on a prodigious scale from the Antrim region northwards through the Western Islands and the Faroe Islands into Iceland, and even far up into Arctic Greenland. In Ireland the basalts attain a maximum thickness of 900 feet; in Mull about 3000 feet. They are associated with tuffs, pitchstones, trachytes, and granitoid rocks, which mark the position of the main vents of eruption. It is evident that long-continued and vigorous volcanic action took place in these north-western regious. The geological date of this activity can be approximately fixed by the fossil plants here and there to be found in leaf-beds between the sheets of basalt. They agree generally with species found in the Older Miocene beds of Switzerland; and hence the date of this marked volcanic era in the north-west of Europe and in Greenland is placed in the older part of thie

Miocene period. With these exceptions there are no Miocene rocks in Britain.

CoNTINENTAL Kurope.—The records of the Miocene period in Europe bring before us a scene very different from that which the region presented during the Eocene ages.

he least amount of change took place in the north-west and north, It consisted chiefly in the upraising of the floor of the shallow sea which had stretched eastwards across the north of France, and the formation of numerous fresh-water lakes, lagoons, and morasses. But over the Alpine region a vast revolution took place. ‘The Eocene sea had its bed elevated, and the Alps rose many thousand feet above their previous height, carrying up on their flanks the hardened, upturned, crumpled, and crystallized nummulite limestone. These vast corrugations of the earth’s crust were general over the whole globe about the same geological period. Subter- ranean movements appear to have continued during Miocene times in the Alpine area; large lake-basins were formed over a great part of what is now

Switzerland, and in these the deposits of the period took place. Hence the Miocene formations of Europe are in great measure of lacustrine and terrestrial formation. The sea, however, was allowed to pass across the south of France between the central axis and the Pyrenees. It likewise covered a wide area in eastern Europe, sweeping far up into the Vienna basin and the foot of the Austrian Alps. Traces of the occasional presence of the sea can likewise be followed across Belgium and North Germany, and even on the south side of the Eifel and Westphalian high grounds iu the basin of Mainz.

In France, ou the north side of the axis of old rocks, the upper parts of the Eocene series are covered by certain marls, clays, and lime- stones, containing Ostrea cyathula, and passing up into the thick sandstone of Fontainebleau, well known for its picturesque scenery. These are considered as the base of the Miocene (or Oligocene) series. They coutain Fusus clongatus, Aporrhais speciosa, Pectun- culus obovatus, Cyrena scmistriata, Cerithium plicatum, &c. They are succeeded by some fresh-water limestones (Calcaire de Beauce) full of Paludina, Planorbis, Lumnea, and Helix. These strata show very instructively the gradual shallowing of the sea in the north of France, and its conversion into fresh-water lakes and land. Further to the south a subsequent depression took place, in which the shelly sands and marls (faluns) of Touraine were accumulated. These strata lie in scattered patehes, and seldom cxceed 50 feet in thickness, They contain chiefly marine shells (Cyprwa, Oliva, Mitra, Terebra, Fasciolaria, Conus, &c.), also remains of the Dichobune and Cheropotamus, with some of the huge early pachyderms,—Aastodon, Dinotherium, rhinoceros, hippopotamus, aud species of dolphin, morse, &c.

In North Germany the older Miocene rocks are marine where they pass westwards into the Belgian area, but as they are followed south- wards they bear cvidence of increasing proximity to land, till at last they contain abundant seams of lignite, and hence have heen termed the Brown-coal series. They appear to underlie most of the great north Germanic plain, on the south side of which they rise up into the Rhine velley, Thuringia, Saxony, and Silesia. The Brown-coal series consists of sandstones, conglomerates, and elays, with leaf-beds and seams of lignite, The last, which have been largely worked as fuel, are mainly composed of remains of

conifers, (Taxites, Taxoxylon, Cupressinoxylon, Sequoia), but with them are associated, in the neighbouring strata, leaves and other fragments of oak, beech, maple, fig, laurel, cinnamomum, magnolia, sassafras, palmacites, &c. These strata are overlaid by marine beds contain- ing Ostrea, Cardita, Pleurotoma, Voluta, and numerous corals. The subterranean movements above referred to as having long affected the Alpine region were felt likewise in North Germany, for we find these inarine beds succeeded by a second lignitie forma- tion, seen at Grosser Hubenecken, on the eastern horn of the Gulf of Dantzic. But this could only have been a local uplift, for marine sands and clays are next found with a wide diffusion over the plains of northern Germany,

Nowhere in Europe do the Miocene formations play so important a part in the scenery of the land, or present on the whole so interesting and full a picture of the state of Europe when they were deposited, as in Switzerland. Rising into massive mountains, as in the well-known Righi and Rossberg, they attain a thickness of more than 6000 feet. While they include indications of the presence of

the sea, they have preserved with marvellous perfection a large number of the plants which clothed the Alps, and of the insects which flitted through the woodlands. They are termed ‘‘Molasse” by the Swiss geologists, and have been divided into the following groups :—

Upper fresh-water Molasse and brown-coal, consisting of sand- stones, marls, and limestones, with a few lignite-seams and fresh-water shells, and including the remarkable group of plant and insect-bearing beds of Oeningen.

Upper marine Molasse (Helvetian stage)—sandstones and calcare- ous conglomerates, with 37 per cent. of shells, which are to be found living partly in the Meditcrranean, and partly in tropi- cal seas.

Lower fresh-water Molasse (Mainz stage)—sandstones with abundant remains of terrestrial vegetation, and containing also an intercalated marine band with Cerithium, Venus, &e.

Lower brown-coal or red Molasse (Aquitanian stage)—the most massive member of the whole series, consisting of red sand- stones, marls, and conglomerates (Nagelfiuh), resting upon variegated red marls. It contains seams of lignite, and a vast abundance of the remains of terrestrial vegetation.

Lower marine Molasse (Tongrian stage)—sandstone containing marine and brackish-water shells, among which is the Ostrca cyathula, above nientioned as a characteristic shell, at the base of the Miocene series in the north of France.

By far the larger portion of these strata is of lacustrine origin. They must have been formed in a large lake, the area of which pro- bably underwent gradual subsidence during the period of deposition, so that the sea gained occasional admission into it. We may form some idea of the importance of the lake from the fact already stated, that the deposits formed in its waters are upwards of 6000 feet thick. Thanks to the untiring labours of Professor Heer, we know more of the vegetation of the mountains round that lake than we do of that of any other ancient geological period. The woods were marked by the predominance of an arborescent vegetation, among which ever- green forms were conspicuous, the whole having a decidedly Ameri- can aspect. Among the plants were palms of American type, the Californian coniferous genus Sequoia, a great varicty of maples, oaks, hornbeams, poplars, planes, willows, laurels, evergreen oaks, with vines, clematis, cypresses, and many more. Jn the Oeningen beds, so gently have the leaves, flowers, and fruits fallen, and so well have they been preserved, that we may actually trace the alternation of the seasons by the succession of different conditions of the plants. Selecting 482 of those plants which admit of comparison, Heer re- marks that 131-might be referred to a temperate, 266 to a sub-tropi- eal, aud 85 to a tropical zone. American types are most frequeut among them; European types stand next in number, followed in oider of abundance by Asiatic, African, and Australian. Great numbers of insects (between 800 and 900 species) have been obtained from Oeningen.

Judging from the proportions of species found there, the total insect fauna may be presumed to have been then richer in some respects than it now isin any part of Europe. The wood- beetles were specially numerous and large. Nor did the large animals of the land escape preservation in the silt of the lake. We know, from bones found in the Molasse, that among the inhabitants of that land were species of tapir, mastodon, rhinoceros, and deer. The woods were haunted by musk-deer, apes, opossums, tliree-toed horses, and some of the strange, long-oxtinct Tertiary ruminants, akin to those of Eocene times. There were also frogs, toads, lizards, suakes, squirrels, hares, beavers, and a number of sinall carnivores. On the lake the huge Dinotherium floated, mooring himself perhaps to its banks by the twostrong tusks in his under jaws. The waters were likewise tenanted by numerous fishes (of which 32 species have been described, all save one referable to existing genera), crocodiles, and chelonians. : ;

Contemporaneously with the existence of the great Swiss Miocene lake, one or more large sheets of fresh water lay in the heart of France. In these basins a series of inarls and limestones (1500 feet thick) accumulated, from which have been obtained the remains of nearly 100 species of mammals, including some paleotheres, like those of the Paris Eocene basin, a few genera found also in the Lower Miocene beds of Mainz, crocodiles, snakes, and birds. This water basin appears to have been destroyed by volcanic explosions, which afterwards poured out the great sheets of lava, and formed the numerous cones and puys so conspicuous on the plateau of Auvergne. ’ ,

The sea which during the later part of the Miocene period stretched across the south of France ran also up the present valley of the Danube to the foot of the Alps and the high grounds of Bohemia and Moravia. In this wide eastern bay or Vienna basin a series of deposits was laid down, which have been grouped in four divisions, —the two lower classed as Miocene, and the two Upper a Pliocene. The lowest group (Mediterranean stage or ae egel) has yielded more than 1000 species of mollusca (Conus, Anci et Pyrula, Murex, Cardium, &c.), with remains of Mastodon, Dino-

therium, and other mammals. The second group (Sarmatian stage) consists of brackish-water beds showing the partial uprise of the ottom of the Vienna basin. It contains Cerithium, Paludina, Rissoa, with bones of dolphins, seals, turtles, and fish. The two uppermost divisions (Congeria stage and Belvedere stage), referred to the Pliocene series, are fresh-water formations, showing the final freshening and disappearance of the Miocene sea in the south-east of Europe.

In Styria and Carinthia the lower Aquitanian or Mediterranean stage bears witness in its plants and lignites to the proximity of land during its formation, while its shells are of frésh and brackish water genera. It has subsequently been upheaved, and the later Miocene strata lie unconformably on its edges. The subterranean movements east of the Alps culminated in the outpouring of enor- mous sheets of trachyte, andesite, propylite, and basalt in Hungary and along the flanks of the Carpathian chain into Transylvania. In Croatia the older Miocene marls, with their abundant land-plants, insects, &c., contain two beds of sulphur (the upper 4 to 16 inches thick, the under 10 to 15 inches), which have been worked at Radoboj. At Hrastreigg, Buchberg, and clsewhere, coal is worked in the Aquitanian stage in a bed sometimes 65 feet thiek. In Tran- sylvania, and along the base of the Carpathian mountains, extensive masses of rock-salt and gypsum are interstratified in the Tertiary formations. The largest of these, that of Parajd, has a maximum length of about 2500 yards, a breadth of 1800 yards, and a depth nearly 200 yards, and is estimated to contain 3500 millions of cubic feet of salt.

CReENLAND.—One of the most remarkable geological discoveries of recent times has been that of Miocene plant beds in North Greenland. Heer has described a flora ex- tending at least up to 70° N, lat., containing 137 species, of which 46 are found also in the central European Miocene basins. More than half of the plants are trees, including 30 species of conifers (Sequoia, T’hujopsis, Salisburia, &c.), besides beeches, oaks, planes, poplars, maples, walnuts, limes, magnolias, and many more. These plants grew on the spot, for their fruits in various stages of growth have been obtained from the beds. From Spitzbergen (78° 56 N. lat.) 136 species of fossil plants have been named by Heer. But the latest English Arctic expedition brought to light a bed of coal, black and lustrous like one of the

Paleozoic fuels, from 81°45’ lat. It is from 25 to 30 feet thick, and is covered by black shales and sandstones full of land-plants. Heer notices 26 species, 18 of which had already been found in the Arctic Miocene zone. As in Spitzbergen, thie conifers are most numerous (pines, firs, spruces, and cypresses), but there occur also the arctic poplar, two species of birch, two of hazel, an elm, and a viburuum, Iu addi- tion to these terrestrial trees and shrubs the stagnant waters of the time bore water-lilies, while their banks were clothed with reeds and sedges. When we remember that this vegetation grew luxuriantly within 8° 15’ of the North Pole, in a region which is now in darkness for half of the year, and is ulmost continuously buried under snow and ice, we can realize the difficulty of the problem in the distribution of climate which these facts present to the geologist.

PLIOCENE.

Great Briraty.—The Miocene period seems to have passed away without any notable portion of the British Islands being depressed under the sea. Save the great outpouring of lava in the north-west, and the rise of hundreds of “dykes ” of basalt along cracks of the crust in the north of England and throughout Scotland, tlie area of Britain seems to have remained as a part of the mainjand of Europe, little affected by the subterranean movements which, as we have seen, were so potent among the Alps and in eastern Europe. At length the south-eastern counties began to subside, and on their submerged surface some sand- banks and shelly deposits were laid down, very mucli as similar accumulations now take place at the bottom of the North Sea. These formations are termed the Crag, and are subdivided, according to their proportion of living species of shells, into the following groups :—

GE@*LOUGY

[VI. STRATIGRAPHICAL.

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| Chillesford beds } Chillestord’ Sard wikia… 5 4, oe Norwich (filuvio-marine, mammaliferous) Crag…..... BT ry MO) 5 Red: Cras, ccceses

canes: ~~pccanganes~~ secrets eee ere 25) White (Suffolk, coralline) Crag ….....-...ssssseseseeeeeeesees 40 ,, 60,,

The White Crag consists of shelly sands and marls. It contains 316 species of shells, of which 84 per cent. are still living. Among theseare Z'erebratula grandis, Lingala Dumortieri, Pecten opercularis, Pholadomya histerna, Pyrula reticulata. The name coralline was given to the formation from the immense number of coral-like polyzoa which it contains, no fewer than 130 species having been described. The Red Crag is also a thin and local formation, consisting of a dark-red or brown ferruginous shelly sand. Of its mollusks, 92 per cent are believed to be still living species, and, out of 25 species of corals, 14 are still natives of British seas. Some of the typical shells of this subdivision are Trophon antiquum (Fusus contrarius), Voluta Lamberti, Purpura tetragona, Pecten opercularis, Pectunculus gly- cimeris, and Cyprina rustica. Numerous mammalian re- mains have been obtained from these sands, including bones of Mastodon Arvernensis and If. tapiroides, Elephas me- ridionalts, Rhinoceros Schletermacheri, Tapirus priscus, Sus antiquus, Equus plicideus, Hipparion, Hyena antigua, Felis pardoides, and Cervus anoceros. The Norwich or Fluvio- marine or Mammaliferous Crag consists of a few feet of shelly sand and gravel, containing, so far as known, 139 species of shells, of which 93 per cent. are still living, About 20 of the species are land or fresh-water shells. The name of mammaliferous was given from the large num- ber of bones, chiefly of extinct species of elephant, recovered from this deposit. These fossils comprise Jfastodon Arvernensis, Elephas meridionalis, HE. antiquus, a hippopo- tamus, horse, and deer, likewise the living species of otter and beaver. One interesting feature in this formation is the decided mixture in it of xorthern species of shells, such as Rhynchonella psittacea, Scalaria Greenlandica, and Astarte borealis. These may be regarded as the forerunners of the great invasion of Arctic plants and animals which, in the beginning of the Quaternary ages, came southward into Europe, together with the severe climate of the north. The Chillesford beds occur likewise as a thin local deposit in Suffolk and Norfolk. Of the shells which they contain, about two-thirds still livein Arctic waters. It is evident that, in these fragmentary accumulations of the Crag series, we have merely the remnants of some thin sheets of shelly sands and gravels laid down in the shallow

waters of the North Sea, while that great lowering of the European climate was beginning which culminated in the succeeding or Glacial period.

ConTINENTAL Evrope.—Marine strata, sometimes of considerable thickness, were laid down over different portions of the European area during the Pliocene period. The most extensive of these occur in Italy and Sicily ; in the latter island they have since been up- heaved to a height of 8000 feet above the sea. They have likewise been raised into the chain of heights flanking the Apennine Moun- tains, where they are known as the Subapennine series. In the shore waters and estuaries of that ancient Italy some of the same huge mammals lived as were contemporaneously denizens of England,— the Auvergne mastodon. Rhinoceros Etruscus Klephas meridionalis, Hippopotamus major, with bears and hyenas.

Eastwards we obtain evidence of the gradual exclusion of the sea from the areas of the European continent which it had covered during the Miocene period. The Congeria stage (above referred to) of the Vienna basin brings before us the picture of an isolated gulf gradu- ally freshening by the inpouring of rivers like the modern Caspian, but with bays nearly cut off from the main body of water, and un- dergoing so copious an evaporation without counterbalancing inflow that their salt was deposited over the bottom as in the Karaboghaz of the Caspian (ante, p. 279).

TeRTIARY SERIES oF NortH AMERICA.

Tertiary formations of marine origin extend ina strip of low land along the Atlantic border of the United States,

from the coast of New Jersey southward round the margin of the Gulf of Mexico, whence they run up the valley of the Mississippi to beyond the mouth of the Ohio. On the western sea-board they also occur in the coast ranges of California and Oregon, where they sometimes have a thickness of 3000 or 4000 feet, and reach a height of 3000 feet above the sea. Over the Rocky Mountain region Tertiary strata cover an extensive area, but are chiefly of fresh-water origin, though containing marine interstratifi- cations.

The following are the subdivisicns into which they have been grouped, together with their supposed European equivalents :—

4. Sumter series= Pliocene.

3. Yorktown,, =Miocene, with perhaps part of Pliocene. 2. Alabama ,, =Middle and Upper Eocene.

1, Lignitic ,, =Lower Eocene.

1. Lignitic.—As already mentioned, it is still matter of dispute whether this formation should not be included wholly or in large measure in the Cretaceous system below. It eonsists mainly of lacustrine strata, with occasional brackish water and marine bands. Its name is derived from the beds of fossil fuel which it contains. The mollusca in some of the shell-bearing beds comprise species of Inoceramus, Anchura, Gyrodes, Cardium, Cyrena, Mclampus, Ostrea, and Anomia, Other strata contain the modern lacustrine and fluvi- atile genera Physa, Valvata, Cyrena, Corbula, and Unio. An abundant terrestrial flora has been disinterred from the Lignitic strata. It resembles in many respects the present flora of North America, coinprising as it does species of oak, poplar, maple, elim, dogwood, beech, hickory, ilex, plane, fig, cinnainon, laurel, magnolia, smilax, thuja, sequoia, and several palms. A few of the spccies are common to the Middle Tertiary flora of Europe, and a number of thein have been met with in the Tertiary beds of the Arctic regions. Somme of the seams of vegetable matter are true bituminous coals and even anthracites.

It was stated in the account of the North Amcrican Cretaceous rocks that considerable difference of opinion exists as to the line to be drawn between these rocks and those of Tertiary age. According to Cope, the Vertebrate remains of the Lignitic scries bind it indissolubly to the Mesozoic formations. Lesquereux, on the other hand, insists that the vegetation is unequivocally Tertiary, The former writer, admitting the force of the evidence furnished by the fossil plants, coucludes, that ‘‘there is no alternative but to accept the result that a Tertiary flora was contemporaneous with a Cretaceous fauna, estab- lishing an uninterrupted succession of life across what is generally regarded as one of the greatest breaks in geologic time.” The Lignitic series was disturbed along the Rocky

Mountain region before the deposition of the succeeding Tertiary formations, for these lie uncomformably upon it. So great have been the changes in some regions that the strata have assumed the character of hard slates like those of Paleozoic date, if indeed they have not become in California thoroughly crystalline masses.

2. Alabama Growp.—The strata included in this group are believed to represent the Middle and Upper Eacene of Europe. As their name implies, they are well developed in the State of Alabama, where they consist of two sub-groups,—(1) the Clayborne beds— clays, marls, limestones, lignite, and sands, and (2) the Vicksburg beds—lignitic clays, limestones, and marls,—the whole attaining a thickness of nearly 250 feet. But the strata thicken into South Carolina, Towards the west the marine fossils give place to leaf-beds and lignites. Inthe Green River basin the strata attain a thickness of more than 2000 feet, lying on the disturbed Lignitic group, and containing beds of eoal, with remains of fish and of tapiroid pachy- derms. ‘The fossils of the Alabama group in the eastern States comprise numerous sharks, some of which are specifically, and more are generically, the same as some of the English Eocene fornis, such as Lamna elegans, and Carcharodon megalodon ; also bones of several crocodiles and snakes. In the lacustrine and fluviatile deposits of the west there have been found also the remains of several birds, and a large number of mammals, including marsupials, numerous representatives of the tapirs, with double pairs of nasal horns, an early form of horse (Orohippus) not larger than a fox, and with four toes in the fore foot, rodents, insectivores, bats, carnivores, and a number of forms allied to the living lemurs and marmosets. The ricliness of this fauna is remarkable, particularly in the mammals.

8. Yorktown Group.—Under this name are classed strata of sand and clay, which extend over a large area in the seaward part of the eastern States. Their organic remains (comprising mollusks, with remains of sharks, seals, walruses, whales, &c.) show thein to have been chiefly laid down ina shallow sea in Miocene time. Westward, in the Upper Missouri region, and across the Rocky Mountains into California and Oregon, strata assigned to the same geological period were laid down in great lakes, and attain thicknesses of 1000 to 4000 or 5000 feet. The organic remains of these

ancient lakes embrace examples of three-toed horses (Anchitheriwm), of horned tapir-like

animals (Titanotheriwm), of forms related to the hog, rhinoceros, camel, lama, deer, musk-ox, hare, squirrel, beaver, hyena, wolf, panther, and tiger. The intermediate types indicated by Cuvier among the Paris Tertiary beds have been greatly increased from the American Tertiary groups by the researches of Marsh and Leidy.

4, Sumter Group or Pliocenc.—In the Carolina States beds of loam, clay, or sand, lying in hollows of the older Tertiary deposits, and containing from 40 to 60 per cent. of living marine shells, are referred to the Pliocene age, In the Upper Missouri region, the Yorktown group is overlaid by other fresh-water beds, which are believed to be Pliocene. These strata contain land and fresh-water shells, probably of existing species. But their most remarkable organic remains are the mammalia, which eontinue the wonderful series in the strata underneath. Dana thus summarizes the facts :-— ‘* Leidy has determined a large number of Pliocene mamnuals, all now extinct. They include three species of eamel (Procamelus) 3 a rhinoceros as large as the Indian species ; a mastodon smaller than M. Americanus, L., of the Quaternary; an elephant (Z. Americanus), occurring also in the Quaternary ; four or five species of the horse family, one of which was elosely like the modern horse ; a species of deer (Cervus Warreni, L.) ; others near the musk-deer of Asia ; species of Merechyus, allied to Orcodon (a genius intermediate between deer, camel, and hog); a wolf larger than any living species ; a small fox; a tiger (Felis augustus, L.) as large as the Bengal tiger, besides other earnivores ; asmall beaver ; a porcupine. The collection of animals has a strikingly Oriental character, except in the preponderance of herbivores,”

V. POST-TERTIARY OR QUATERNARY.

Under this division are included the various superficial deposits in which all the mollusca are of still living species. It is usually subdivided into two

series—(1) an older group of deposits in which many of the mammals are of extinct’ species,—to this group the names of Pleistocene, Post- Pliocene, or Diluvial have been given; and (2) a later series, wherein the mammals are all of still living species, to which the name of Recent or Alluvial has been assigned. These subdivisions, however, are confessedly very artificial, and it is often exceedingly difficult to draw any line between them.

In Europe and North America a tolerably sharp demarca- tion can usually be made between the Pliocene formations and those now to be described. The Crag deposits of the south-east of England show traces of a gradual lowering of the temperature during later Pliocene times. This change of climate continued to augment until at last thoroughly arctic conditions prevailed, under which the oldest of the Post- Tertiary or Pleistocene deposits were accumulated.

It is hardly possible to arrange these deposits in a strict chronological order, because we have no means of deciding, in many cases, their relative antiquity. The following table is rather an enumeration of the more important of them than an arrangement in their exact sequence :—

River alluvia, peat mosses, lake deposits, blown sand, marine deposits, raised beaches. Brick-earth, valley-gravels, old marine terraces,

cavern-deposits. Pleistocene Moraine-stuff, Kame or Esker series, Clyde-beds,

Recent…...

or Glacial.. Upper Boulder clays, Interglacial beds, Lower Till, ice-worn rock-surfaces, \ Pre-glacial forests and land surfac

PLEISTOCENE OR GLACIAL.

Under the name of the Glacial Period or Ice Age, a re- markable geological episode in the history of the northern hemisphere is denoted. We have seen in the foregoing section on the Crag deposits that there is evidence of a gradual refrigeration of the climate at the close of the Tertiary ages. This

change of temperature affected the higher latitudes alike of the Old and the New World. It reached such a height that the whole of the north of Europe

| was buried under snow and ice, extending southwards even

ere loaded with iers descended son their way. y ice-covered.

as faras Saxony. The Alpsand Pyrenees w vast snow-fields, from which enormous glac into the plains, overriding ranges of minor hill The greater portion of Britain was similar]

The effect of the movement of the ice was necessarily to less than 1,700,000 square kilometres of the present low-

remove the soils and superficial deposits of the land surface. Hence in the areas of country so affected, the ground having been scraped and smoothed, the glacial accumulations laid down upon it rest abruptly, and without any connexion, on whatever underlies them. Considerable local differences may be observed in the nature and succession of the differ- ent deposits of the glacial period, as they are traced from district to district. It is hardly possible to determine, in some cases, whether certain portions of the series are coeval or belong to different epochs. But the following are the leading facts which have been established for the North- European area. First, there was a gradual increase of the cold, though with warm intervals, until the conditions of modern North Greenland extended as far south as Middlesex, Wales, the south-west of Ireland, and 50° N. lat. in central Europe. This was the culmination of the Glacial period. Then followed a considerable depression of the land and the spread of cold arctic water over the submerged tracts, with abundant floating ice; next came a re-elevation, with renewed augmentation of the snow-fields and glaciers. Very gradually, aud after intervals of increase and diminu- tion, the ice retired towards the north, and with it the arctic flora and fauna that had peopled the European

plains. The existing snow-fields and glaciers of the Pyrenees, Switzerland, and Norway are remnants of the great ice-

sheets of the glacial period, while the arctic plants of the |

mountains are relics of the northern vegetation which was universal from Norway to Spain.

Ice-worn Rocks.—Beginning at the base of the deposits from which this interesting history is compiled, we find the solid rocks over the whole of northern Europe to present the characteristic smoothed flowing outlines which can be pro-

duced only by the grinding action of land-ice (ante, p. 282). |

Where they have been long exposed, this peculiar surface is

apt to be effaced by the disintegrating action of the weather, |

though it retains its hold with extraordinary pertinacity. Along the fjords of Norway and the sea-lochs of the west of Scotland, it may be seen slipping into the water, smooth, bare, polished, and grooved as if the ice had only recently retreated. But where the protecting cover of clay or other superficial deposits has been newly removed, the peculiar ice- worn surface is as fresh as that by the side of a modern glacier. Observations of the directions of the strie have shown that on the whole these markings diverge from the main masses of high ground.

and the plains of northern Germany, it moved southwards and south-westwards, but seems to have slightly changed its direction in different areas and at different times. ments can be made out partly from the striz on the solid rock, but more generally from the glacial drift which it has left behind. Thus it can be shown to have moved down the Baltic into the North Sea. At Berlin its movement must have been from east to west. But at Leipsic, as recently ascertained by Credner, it came from N.N.W. to

S.S.E., being doubtless shed off in that direction by the |

high grounds of the Harz mountains. Its southern limit can be traced with tolerable clearness from Jevennaar in Holland eastwards across the Rhine valley, along the base of the Westphalian hills, round the projecting promontory of the Harz, and then southwards through Saxony to the roots of the Erzgebirge. Passing next south-eastwards along the flanks of the Riesen and Sudeten chain, it sweeps across Poland into Russia, circling round by Kieff, and northwards by Nijni Novgorod towards the Urals.

It has been estimated that, excluding Finland, Scandi- navia, and the British Isles, the ice must have covered not

In Scandinavia they run west- wards and south-westwards on the Norwegian coasts, and | eastwards or south-eastwards across the lower grounds of | Sweden. When the ice descended into the basin of the Baltic | ‘ ness and the Orkney and Shetland Islands.

Its move- |

lands of Europe. Its influence on the solid rocks over which it passed has not been everywhere equal. Over much of the north German plain, indeed, the rocks are con- cealed under drift. Butin the more undulating hilly ground, particularly in the north and north-west, the ice has effected the most extraordinary abrasion. It is bardly possible, indeed, to describe adequately in words these regions of most intense glaciation. The old gneiss of Norway and Sutherlandshire, for example, has been so eroded, smoothed, and polished, that it stands up in endless rounded hum- mocks, many of them still smooth and flowing like dolphins’ backs, with little pools, tarns, and larger lakes lying between them. Seen from a height the ground appears like a billowy sea of cold grey stone. The lakes, every one of them lying in a hollow of erosion, seem scattered broadcast over the landscape. So enduring is the rock, that even after the lapse of so long an interval, it retains its ice-worn aspect almost as unimpaired as if the work of the glacier had been done only a few generations since.

Some idea of the massiveness of the ice-sheet is obtain- able from a consideration of the way in which the stria run across important hill ranges, and athwart what might seem to be their natural direction. Whilst there was a general southward movement from the great snow-fields of Scandi- navia,

the high grounds of Britain were important enough to have their own independent ice, which, as the strize show, radiated outward, some of it passing westwards into the Atlantic and some of it eastward into the North Sea. So thick must it have been as it moved off the Scottish High- lands that it went across the broad plains of Perthshire, filling them up to a depth of at least 2000 feet, and passing across the range of the Ochil Hills, which at a distance of 12 miles runs parallel with the Highland mountains, and reaches a height of 2352 feet. In such cases it has been observed that the striz along the lower slopes of the hill

barrier run either parallel with the trend of the ground or

slant up obliquely, while those on the summits may cross the ridge at right angles to its course. This shows that there must have been a differential movement in the great ice- sheet, the lower parts, as in a river, becoming embayed, and being forced to move in a direction sometimes even at a right angle to that of the general advance. On the lower

“grounds, also, the striz, converging from different sides,

unite at last in one general trend as the various ice-sheets must have done, as they descended from the high grounds on either side and coalesced into one common mass. This is well seen in the great central valley of Scotland, Still more marked is the deflexion of the strive in Caith- In these

| districts the general direction of the striation is from

S.S.E., which, in Caithness, is nearly at right angles to what might have been anticipated. This deflexion has been attributed to the coalescence of the ice from Norway and from the northern Highlands in the basin of the North Sea, aud its subsequent progress along the resultant line into the Atlantic. Butit may have been due to the fan-

‘ shaped spreading out of the vast mass of ice descending

into the Moray Firth; for the striz on the south side of that inlet run E. by S., and at last S.E., on the north-east of Aberdeenshire, showing that the ice, on the one hand, turned southwards into the North Sea, until it met the N.E.

stream from Kincardineshire and the valleys of the Dee and Don, while, on the other, it moved northward so as no doubt to join the Scandinavian sheet, and march with it into the Atlantic. The basin of the North Sea must have been choked up with ice in its northern parts, if not entirely. At that time England and the north-west of France were united, so that any portion of the North Sea basin not invaded by land-ice must have formed a lake,

with its outlet by the hollow through which the Strait of Dover has since been opened. It has been suggested that during such a condition of things the widespread fresh- water deposit termed Loess was formed, which covers so

large a space in the lower plains of the Rhine and the |

north of Belgium, and appears in the valleys of the south- east of England.

The ice is computed to have been at least between 6000 and 7000 feet thick in Norway, measured from the present sea-level. From the height at which its transported debris has been observed on the Harz, it is believed to have been at least 1470 feet thick there, and to have gradually risen

present time covers the interior of Greenland. Among the Alps it attained almost incredible dimensions. The present snowfields and glaciers of these mountains, large though they are, form no more than the mere shrunken remnants of the great mantle of snow and ice which then over- spread Switzerland. In the Bernese Oberland, for example, the valleys were filled to the brim with ice, which, moving northwards, crossed the great plain, and actually overrode a part of the Jura mountains. Huge fragments of granite and other rocks from the central chain of the Alps are found high on the slopes of that range of heights.

Boulder-clay or Tull.—Under this name is included the | debris which accumulated and was pushed onward under > | pushed on in one given direction by the resistless advance | of the ice (ante, p. 282).

the ice-sheet, the ‘‘ grund-morane ” or “ moraine profonde” (ante, p. 282). Allover the low grounds of North Germany, Denmark, and Holland lies a stony or earthy clay passing into sand or gravel, in which, together with locally derived debris, there is a greater or less proportion of fragments from thenorth. Some of the rocks of Scandinavia, Finland, and the Upper Baltic are of so distinctive a kind that they

the peculiar syenite of Lanrwig in the south of Norway has been recognized abundantly in the drift of Denmark; it

occurs in that of Hamburg, and in the boulder-clay of the |

Holderness cliffs in Yorkshire. The well-known Rhomben- porphyr of southern Norway has likewise been recognized at Holderness. Gothland, or from the Russian islands Dago or Oesel, have been met with as far as the north of Holland. These trans- ported fragments, so abundant within the line of demarca- tion just traced, are an impressive testimony to the move- ments of the northern ice-sheet and floating ice.

The boulder-clay is not spread as a uniform sheet over the ground, but varies greatly in thickness and in irregu- larity of surface. Round the mountainous centres of dis- persion it is apt to occur in long ridges or “drums” which run in the general direction of the rock-striation.

In those areas which served as independent centres of dispersion for the ice-sheet, the boulder-clay partakes largely of the local character of the rocks of each district where it occurs. Thus in Scotland the clay varies in colour and composition as it is traced from district to district. Over the Carboniferous rocks it is dark, over the red sandstones it is red, over the Silurian rocks it is fawn-coloured. The great majority of the stones also are of local origin, not always from the immediately adjacent rocks, but from points within a distance of a few miles. Evidence of trans- port, however, can be gathered from the stones, for they are found in almost every case to include a proportion of fragments which have come from beyond the district. The direction indicated by the percentage of travelled stones is always the same for each region. Thus, in the lower part of the valley of the Firth of Forth, while most of the frag- ments are from the surrounding Carboniferous formations, from 5 to 20 per cent. is found to have come eastward from the

Old Red Sandstone range of the Ochil Hills—a distance of 25 or 30 miles, while 2 to 5 per cent. are

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| pieces of the Highland rocks, which must have come from _the high grounds at least 50 miles to the north-west. The _ evidence of dispersion revealed by the stones in the boulder- _ clay harmonizes with that of the strize on the rocks. Every main mass of elevated ground in Britain seems to have _ caused the ice to move outward from it for a certain dis- tance, until the stream coalesced with that descending from some other height. In Scotland the ice was massive enough to move out into the basin of the North Sea (then doubtless in great part usurped by the glaciers) until it met that which was streaming down from Scandinavia. Hence no

| Scandinavian blocks have ever been found in Scotland. in elevation as one vast plateau, like that which at the |

_inconstant and local interstratifications. can be recognized in small pieces in the boulder-clay. Thus |

But the Norwegian ice which crept southwards across Denmark, may once have extended across the North Sea to the Yorkshire coast, if the Scandinavian stones of Holder- hess were not carried on floating ice.

The stones in the boulder-clay have a characteristic form and surface. They are usually oblong, have one or more flat sides or “soles,” are smoothed or polished, and have their edges worn round. Where they consist of a fine-grained enduring rock, they are almost invariably found to be striated, the striz running with the long axis of the stone. These markings are precisely similar to those on the solid rocks underneath the boulder clay, and like them have manifestly been produced by the friction of stones and grains of sand as the whole mass of debris was being steadily

Interglacial Beds.—The boulder-clay is not one uniform mass of material. In a limited section, indeed, it usually appears as an unstratified mass of

stiff stony clay. But it is found on further examination to be split up with various Beds of sand, gravel, fine clay, and peaty layers occur in this way in different platforms in the boulder clay. In Scotland and elsewhere these interpolated beds bear witness to inter- vals when the ice retired from the area, and the land, so far as uncovered, was clothed with vegetation and traversed

Fragments of the Silurian rocks from |

by herds of the hairy mammoth, reindeer, and musk- ox. Hence the long glacial period must have been inter-

_ rupted by episodes probably of considerable duration when

_a milder climate prevailed. Such an alternation of con-

ditions is explained on the hypothesis discussed in previous pages (ante, pp. 218-220).

Lvidences of Submergence.—After the ice had attained its greatest development, the land, which perhaps in north- western Europe stood at a higher level above the sea than it has done since, began to subside. The ice-fields were carried down below the sea-level, where they broke up and cumbered tle sea with floating bergs. The heaps of loose debris which had gathered under the ice, being now exposed to waves, ground-swell, and marine currents, were thereby more or less washed down and reassorted. Coast-ice, no doubt, still formed along the shores, and was broken up into moving floes, as happens every year now in northern Greenland. The proofs of this phase of the long glacial period are contained in the sands, gravels, erratic blocks, and stratified clays which overlie the coarse older till. It is difficult to determine the extent of the submergence, for when the land rose the more elevated portions continued to be the seats of glaciers, which, moving over the surface, | destroyed the deposits which would otherwise have reniained as witnesses of the presence of the sea. The most satis- _ factory evidence is undoubtedly that supplied by beds of marine shells. These have been observed ou Moel Tryfan, in North Wales, at a height of no less than 1350 feet, but as the same kind of deposits in which they occur extend to a much greater height, the submergence probably consider- ably

exceeded the limit at which the shells occur. In Cheshire beds of shells have been met with at a height of

1200 feet. In Scotland the highest level from which they have yet been obtained is 524 feet; and in this instance they lie in one of the interstratifications in the boulder-clay. The coast of Scotland is fringed by a succession of raised beaches which, up to that at 100 feet above the present mean tide-level, are often remarkably fresh. The 100-feet terrace forms a wide plateau in the estuary of the Forth, and the 50-feet terrace is as conspicuous on the Clyde. The elevation of the land has brought up within tide-marks some of the clays deposited over the sea-floor during the time of the submergence. In the Clyde basin and some of the western fjords these clays (Clyde beds) are full of shells. Comparing the species with those of the adjacent seas, we find them to be more boreal in character ; nearly the whole of the species still live in Scottish seas, though a few are extremely rare. Some of the more characteristic northern shells in these deposits are Pecten Islandicus, Tellina calcarea, Leda truncata, L. lanceolata, Saxicava rugosa, Panopea Norvegica, Trophon clathratum, and Natica clausa.

That ice continued to float about in these waters is shown by the striated stones contained in the fine clays, and by the remarkably contorted structure which tliese clays occa- sionally display. Sections may be seen where, upon per- fectly undisturbed horizontal strata of clay and sand, other similar strata have been violently crumpled, while horizontal beds lie directly upon them. These contortions must have been produced by the horizontal pressure of some heavy body moving upon the originally flat beds. No doubt the agent was ice in the form of large stranding masses which were driven aground in the fjords or shallow waters where the clays accumulated. Another indication of the presence of floating ice is furnished by large boulders scattered over the country, and lying sometimes on the stratified sands and gravels, though no doubt many of the so-called erratics belong to the time of the chief glaciation.

One of the most puzzling members of the Drift is the series of sands and gravels which cover the low grounds in many places, and rise up to heights of 1000 feet and more. These deposits are sometimes spread out in

undulating sheets, which, in the lower districts, seem to merge insen- sibly into the marine terraces and raised beaches. But they are also very commonly disposed in remarkable mounds and in ridges which run across valleys, along hill-sides, and even over watersheds. ‘These ridges are known in Scotland as kames, in Ireland as eskers, and in Scandinavia as osar. They consist sometimes of coarse gravel or earthy detritus, but more usually of clean, well-stratified sand and gravel, the stratification towards the surface corresponding with the external slopes of the ground, in such a manner as to prove that the ridges are original forms of deposit, and not the result of the irregular erosion of a general bed of sand and gravel. Some writers have compared these features to the submarine banks formed in the pathway of tidal currents near the shore. Others have supposed them rather to be of terrestrial origin, due to the melting of the great snow-fields and glaciers, and the consequent discharge of large quantities of water over the country. But no very satisfactory explan- ation has yet been given.

Re-emergence.—Later Glaciers.—When the land began to rise again, the temperature all over central and northern Europe was still severe. Vast sheets of ice still held sway over the mountains, and continued to descend into the lower tracts and to go out tosea. To this period are ascribed

certain terraces or ‘‘parallel-roads” which run along the sides

of valleys in the Scottish Highlands. It is believed that the mass of ice descending from some of the loftier snow- fields of this time was so great as to accumulate in front of lateral valleys, and to so choke them up as to cause the water to accumulate in them and flow out in an opposite

direction by the col at the head. In these natural reservoirs the level at which the water stood for a time was marked by a horizontal ledge or platform due partly to erosion of tlie hill-side and partly to the arrest of the descending debris when it entered the water.

Every group of mountains nourished its own glaciers ; even small islands, such as Arran in Scotland, had their snowfields, whence glaciers crept down into the valleys and shed their moraines. It would appear indeed that some of the northern glaciers of Scotland continued to reach the sea-level even when the land had risen to within 50 feet or less of its present elevation. On the east side of Sutherlandshire the moraines descend to the 50- feet raised beach ; on the west side of the same county they come down still lower. The higher mountains of Enrope still show the descendants of these later glaciers, but the ice has retreated from the lower elevations. In the Vosges the glaciers have long disappeared, but their moraines remain still fresh. In Wales, Cumberland, and the southern uplands and Highlands of Scotland, moraines, perched blocks, and roches moutonnées attest the abund- ance and persistence of the last glaciers. It is sometimes possible to trace the stages in the gradual retreat of the ice towards its parent snow-fields, for the crescent-shaped moraine mounds lie one behind another until they finally die out about the head of the valley, near what must have been the edge of the snow-field.

We know as yet very little of the fauna and flora of the land during the Glacial Period in Europe. The vegetation was doubtless in great measure the same as that of arctic Norway at the present day. The animals included the musk-ox, lemming, rein-deer, and other still living arctic forms, but included some which have become extinct, such as the hairy mammoth and woolly rhinoceros. During the milder inter-glacial periods denizens of warmer regions found their way northwards into Europe. Thus the hippopotamus haunted the rivers of the south of England. By degrees, as the climate ameliorated, the arctic vegetation was finally extirpated from the lower grounds of central and western Europe, and plants loving a milder temperature, which had doubtless been natives of Europe before the period of great cold, were enabled to reoccupy the sites whence they had been driven. On the higher mountains, where the climate is still not wholly uncongenial for them, colonies of this once general arctic flora still survive. The arctic animals have also been driven away to their northern homes, or have become wholly extinct. And thus, as imperceptibly as it began, the long and varied Ice Age came to an end as it merged into the next succeeding geological period,

Recent on HumaAN PERIOD.

That long succession of ages to which the name of the Glacial Period has been given shaded without abrupt change of any kind into what is termed the Human or Recent Period.. Indeed it may be said with truth that the Glacial Period still exists in Enrope. The snow-fields and glaciers have disappeared from Britain, but they still linger among the Pyrenees, remain in larger mass among the Alps, and spread over wide areas in northern Scandinavia. This dove- tailing or overlapping of geological periods has been the rule from the beginning of time, the apparently abrupt transitions in the geological record being due to imperfec- tions in the chronicle.

The question has often been asked whether man was coeval with the Ice Age. To give an answer, we must know within what limits the term Ice Age is used, and to what particular country or district the question refers. For it is evident that even to-day man is contemporary with the

| Ice Age in the Alpine valleys and in Finmark. There can

RECENT OR HUMAN PERIOD.]

be no doubt that he inhabited Europe after the greatest extension of the ice, but while the rivers were still larger than now from the melting snow, and flowed at higher levels,

The proofs of the existence of man in former geological periods are not to be sought for in the occurrence of his own bodily remains, as in the case of otheranimals. His bones are indeed now and then to be found, but in the vast majority of cases his former presence is revealed by the im- plements he has left behind him, formed of stone, metal, or bone. Many years ago the archeologists of Denmark, adopting the subdivisions of the Latin poets, classified the prehistoric traces of man in three great divisions—those of (1) tle Stone Age, (2) the Bronze Age, and (8) the Iron Age. There can be no doubt that, on the whole, this has been the general order of succession. Men used stone and bone before they had discovered the use of metal. Never- theless, the use of stone long survived the introduction of bronze and iron, In fact, in many European countries where metal has been known for many centuries, there are districts where stone implements are still employed, or

where they were in use until quite recently. It. is obvious also that, as there are still barbarous tribes un- acquainted with the fabrication of metal, the Stone Age is not yet extinct in many parts of the world. In this in- Stance we again see how geological periods run into each other. The nature or shape of the implement cannot there- fore be always a very satisfactory proof of antiquity. We must judge of it by the circumstances under which it was found. From the fact that in north-western Europe the ruder kind of stone weapons occurs in what are certainly the older deposits, while others of more highly finished work- mauship are found in later accumulations, the Stone Age has been subdivided into an early or Paleolithic and a later or Neolithic epoch. There can be no doubt, however, that the later was in great measure coeval with the age of bronze, and even to some extent of iron.

The deposits which contain the history of the human

periol are cavern-loam, river-alluvia, lake-bottoms, peat- mosses, sand-dunes, and other superficial accumulations.

Most calcareous districts abound in underground tunnels and caverns which have been dissolved by the passage of water from the surface (ante, p. 271). In a large number of cases these cavities have communicated with the outer surface, so that terrestrial animals, including man himself, have made use of them as places of retreat, or have fallen or been washed into them. The floors of some of them are covered with loam or cave-earth, resulting from the deposit of the silt carried in the water which formerly flowed through them. Very commonly also, a deposit of stalag- mite has formed from the drip of the roof. Hence any organic remains which may have found their way to these floors have been sealed up and admirably preserved.

Above the present levels of the rivers there lie platforms or terraces of alluvium, sometimes to a height of 80 or 100 feet. These deposits are fragments of the river gravels and loams laid down when the streams flowed at that elevation, and therefore before the valleys were widened and deepened to their presentform. River action is at the best but slow. To erode the valleys to so great a depth beneath the level of the upper alluvia, must have demanded a period of many centuries. There can therefore be no doubt of the high antiquity of these deposits. They have yielded the remains of many mammals, some of them extinct, together with the flint flakes made

by man. From the nature and structure of some of the high-lying gravels, there can be little doubt that they were formed at a time when the rivers were larger than now, and were liable to be frozen and to be obstructed by large accumulations of ice. We are thus able to connect the formations of the human period with some of the later phases of the Ice Age in the west of Europe.

From the evidence of caverns and river-alluvia of Britain, Germany, and France, Dawkins enumerates about fifty mammals as among the chief inhabitants of Europe during the early human period. They include many of the ani- mals still found wild in Europe, Asia, or Africa, such as the marmot, hare, beaver, lemming, leopard, lynx, wild cat, otter, brown bear, wolf, fox, African elephant, musk sheep, chamois, wild boar, horse, reindeer, and hippopotamus. It will be observed what a remarkable mixture there is in this list of forms now found in alpine or arctic regions, on the one hand, with others only now to be seen in warm lati- tudes. Probably there continued to be great alternations of climate and changes in the distribution of food, so that migrations successively from opposite quarters took place into central and western Europe. But among the denizens of these regions were some that have been long extinct, such as the mammoth, Elephas antiquus, Machairodus latidens, the woolly rhinoceros, the Irish elk, and others, That man was the contemporary of these extinct forms is shown both by the association of his flint weapons with their remains, and by the discovery of a tusk of the mammoth with an admirable outline of the animal carved upon it. This valuable relic, with bones of the reindeer and stag admirably sculptured into likenesses of these animals, was found in one of the caves of Perigord in central France.

From the beds of lakes, and from peat-mosses, evidences of more advanced civilization have been obtained. In Switzerland and elsewhere, remains of wooden pile-dwellings have been observed during times when the water has been low. Associated with these are Weapons and implements of stone, in other cases of bronze and of iron, pottery, rude kinds of cloth, seeds of different cereals, and bones of do- mesticated animals. The dog, swine,

goat, horned sheep, and other familiar animals appear as the companions of man. But there is evidence that some of the creatures which he tamed to his use were not natives of Europe, but had their original stocks in central Asia, and that some of his grains must likewise have been introduced. Hence we have glimpses into some of the early human niigrations from that eastern centre whence so many successive waves of popula- tion have invaded Europe.

The later chronicles of the geologist merge insensibly into those of the archeologist, The latter claims as his field whatever belongs to the history of man on the globe ; the former includes the history of man in that larger history of the earth of which a brief outline has been given in the foregoing pages.

Post-Trrtrary Series In NortH AMERICA,

The general succession of events in post-Tertiary times appears to have been nearly the same over the northern hemisphere both in the New and the Old World. In North America we have the same sharply-defined line between the older post-Tertiary deposits and previous forma- tions, due to the glacial conditions which, overspreading these regions, in great measure destroyed the superficial accumulations of the immediately preceding eras. The Quaternary or post-Tertiary formations are grouped by American geologists in the following subdivisions :—

4. Recent and { Peat, alluvium, blown sand, “alkali” deposits,

Prehistoric geyser deposits, cave deposits, artificial mounds. River-terraces, loess.

Raised beaches. 2. Champlain … Saxicava sand, Champlain clays, Leda clay. VeGlacial@rees Boulder clays, unstratified clays, sands, and gravels.

1. Glacial.—As in Europe, the glacial deposits increase in thick- ness and variety from south to north. The southern limit of the unstratified drift lies somewhere in the neighbourhood of the 39th parallel of north latitude, and the deposit ranges from the Atlantic westward to the meridian of 98°. It spreads, therefore, se British North America, and is found over @

considerable area o the north-eastern States. It rises toa height re 5800 ce among

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3. Terrace….

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the White Mountains. The absence of any true boulder-drift on the Rocky Mountain slopcs, where it might have been looked for, is remarkable.

Underneath the boulder-clay the solid rocks, as in Europe, are often well striated. The direction of the strise is generally south- ward, varying to south-east and south-west according to the form of the ground. In recent years extensive ice-worn rock-surfaces have been observed among the Rocky Mountains by Hayden, King, and others, proving that these clevations formerly possessed their glaciers, if they were not buried under the great ice-sheet.

The drift bears witness to a general southerly transport of material, and, in conjunction with the striated rocks, shows that the great ice- sheet moved from north to south atleast as far as about the latitude of Washington. Logan mentions that in some parts of Canada the glacial drift and boulders run in ridges north and south, thus corre- sponding with the general direction of transport, like the ‘‘ drums” in Britain. As in Europe, the coarse boulder-clay at the base of the Quaternary deposits is essentially unfossiliferous.

2. Champlain.—Under this name American geologists class the sands, gravels, and clays which overlie the lower boulder-drift. These deposits include coarse unstratified gravels, as well as finely- stratified clays. In eastern Canada they are well developed, and show the following subdivisions :—

St Maurice and Sorel sands; Saxicava sand of Montreal;

Upper. upper sand and gravel of Beauport; upper Champlain clay and sand of Vermont.

L Leda clay of the St Lawrence and Ottawa ; lower shell-

iia sand of Beauport ; lower Champlain clay of Vermont.

The lower subdivisions consist chiefly of clays, which rise to a height of 600 fect above the sca. They have some intcrstratified beds of siliceous sand, but few boulders, They contain marine organisms, such as Leda truncata, Saxicava rugosa, Tellina Gran- landica, bones of seals, whales, &c. On the banks of the Ottawa, in Gloucester, the clays contain numerous nodules which have been formed round organic bodies, particularly the fish Mallotus villosus or capeling of the Lower St Lawrence. Dawson also obtained nuinerous remains of terrestrial marsh plants, grasses, carices, mosses, and alge. This writer states that about 100 species of marine invertebrates have been obtained from the clays of the St Lawrence valley. All except four or five species in the older part of the deposits are shells of the boreal or Arctic regions of the Atlantic; and about half are found also in the glacial clays of Britain. The great majority are now living in the Gulf of St Lawrence and neighbouring coasts, especially off Labrador.?

3. Terracc.—This division includes the terraced deposits of alluvial material so marked along the river vallcys and lake margins in the northern part of the United States and in Canada, and found also in some degree along the sea-coast. These deposits occur in successive platforms or terraces, marking the contraction in volume of the lakes and rivers, conscquent, probably, upon intermittent up- heavals of the land. They are well developed round the great lakes. Thus in the basin of Lake Huron deposits of fine sand and clay con- taining fresh-water shells rise to a height of 40 feet or more above the present level of the water, and run back from the shore sometimes for 20 miles. Regular terraces, corresponding to former water- levels of the lake, run for miles along the shores at heights of 120, 150, and 200 feet. Shingle beaches and mounds or ridges, exactly like those now in course of formation along the exposed shores of Lake Huron, can be recognized at heights of 60, 70, and 100 fect. Unfossiliferous terraces occur abundantly on the margin of Lake Superior, At one point mentioned by Logan, no fewer than seven of these ancient beaches occur at intervals up to a height of 331 feet above the present level of the lake.?_ Most of the rivers are bordered with lines of terraces, as in the well-known example of the Con-

necticut valley described by Hitchcock. The rivers are believed to have had their maximum volume at the beginning of the Terrace epoch, swollen doubtless by the melting of the still existing ice- shects and snow-fields. Their work consisted partly in depositing fine alluvium or loess over their flood-plains, partly in scouring their ehannels out of the Champlain formations. Greater elevation towards the interior, by augmenting their slope, increased their excavating power.

Terraces of marine origin likewise occur both on the coast and |

far inland. On the eoast of Maine they occur at heights of 150 to 200 fect, round Lake Champlain at least as high as 300 feet, and at Montreal nearly 500 feet above the present level of the sea. In the absence of organic remains, however, it is not always possible to distinguish between terraces of marine origin marking former sea- margins, and those left by the retirement of rivers and lakes. In the Bay of Fundy evidence has becn cited by Dawson to prove sub- sidence, for he has observed there a submerged forest of pine and beech lying 25 feet below high-water mark.*

4, Recent and Prchistoric.—The deposits in this group are essen-

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1 Acadian Geology, p, 76.

2 Geology of Canada, p. 910. 3 Acadian Geology, p. 28.

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[vir. PHYSIOGRAPHICAL

tially the same with those in Europe; and, as in that continent so in America, no definite lines can be drawn within which they should be confined. They cannot be sharply separated from the Terrace series, on the one hand, nor from modern accumulations, on the other. Besides the marshes, peat-bogs, and other organic deposits which belong to an early

period in the human occupation of America, some of the younger alluvia of the river-valleys and lakes can no doubt claim a high antiquity, though they have not supplied the same copious evidence of early man which gives somuch interest to the corresponding European formations. Heaps of shells of edible species occur on the coasts of Nova Scotia, Maine, &c. The large mounds of artificial origin in the Mississippi valley have excited much attention.

PART VII.—PHYSIOGRAPHICAL GEOLOGY.

In the investigation of the geological history of, any country, two questions present themselves. We have first

to consider the nature and arrangement of the rocks which

underlie the surface, and to ascertain from them what has been the march of events, what changes in geography have successively taken place, and what races of plants and animals have come and gone. The gradual geological evolution of the earth has been sketched in the foregoing But besides the history of the solid rocks beneath the surface of the land, there is that of the surface itself. Mountains, and plains, valleys and ravines, cliffs, peaks, passes, lakes, and the many other features of a country demand attention. By what processes have these varied outlines been impressed upon the surface of the globe? Are they of different ages, and if so, how can their history be ascertained ? aah « : | The branch of geological inquiry which endeavours to answer these questions has been termed Physiography or Physiographical Geology. Its investigations evidently de- mand an acquaintance with Stratigraphical Geology. We must be able to trace out the former geographical conditions of the globe before we can adequately reason on the origin of those now existing. Hence the consideration of this branch of the subject has necessarily been reserved for this concluding section. | The stratified formations, of which the succession and history have been traced in the previous pages, were chiefly laid down on the sea-floor in wide horizontal or gently inclined sheets. ‘They have since been upraised into land; their horizontality has been in great part destroyed; aud they have been enormously wasted by denuding agents. In con- sidering therefore how they have acquired their present ex- ternal forms, we have to deal with the effects of two kinds of forces, one acting from below, the

other on the surface. These stratified rocks were, on the whole, deposited in shallow water, and have been repeatedly upraised and denuded, so that the younger have been formed out of the waste of the older. They have their modern counterparts, not in the deposits of the great ocean-basins, but in those of comparatively shallow seas. The inference to be drawn from these facts is that the present continental regions, through many local oscillations, have existed as terrestrial ridges from a remote geological antiquity, and that the ocean basins in like manner have, on the whole, retained their identity. When the geologist asks himself how the present distribution of sea and Jand is to be accounted for, he finds that the answer to the question goes back to early Paleozoic times, whence he can in some cases trace the gradual growth of a continent downward through the long cycles of geological time. But there still remains the problem to account for the original wrinkling of the surface of the globe, whereby the present great ridges and hollows were produced. It is now generally agreed that these inequalities have been produced by unequal contraction of the earth's mass, the interior contracting more than the outer crust, which must therefore have accommodated itself to this diminution of diameter by undergoing corrugation. But there seems _

to have been some original distribution of materials in the globe that initiated the depressions on the areas which they have retained. It has been already pointed out (ante, p. 223) that the matter underlying the oceans is more dense than that beneath the continents, and that, partly at least, to this cause must the present position of the oceans be attributed. The early and persistent subsidence of these areas, with the consequent increase of density, seems to have determined the main contours of the earth's surface.

From what has been stated in part iv., the reader will understand that rocks which were originally horizontal, or nearly so, have been crumpled over tracts thousands of square miles in extent, so as to occupy now a superficial area greatly less than that which they originally covered. It is evident that they have been horizontally compressed, and that this result can only have been achieved as a con- sequence of the subsidence of such a curved surface as that of our globe. The difficulty of explaining these corruga-

tions on the hypothesis of the contraction of a solid globe is undoubtedly great. Mr O. Fisher, indeed, believes that the present inequalities of contour on the eartl's sur- face are from sixty-six to eleven and a half times as great as they would have been had they resulted from the con- traction of a solid globe; and he has suggested that the earth need not have become solid throughout simultaneously, and consequently may have been considerably larger than it is now at the time when a solid crust was first formed.

The geological phenomena long ago led to a belief in the liquidity of the earth's interior. Since this belief has been so _weightily opposed by the physical arguments already adduced (ante, p. 225), geologists have endeavoured to modify it in such a way as, if possible, to satisfy the re- quirements of physics, while at the same time providing an adequate explanation of the corrugation of the earth's crust. Mr Hopkins, Professor Dana, Professor Shaler, and Mr Fisher have, on different grounds, advocated the ex- istence of a fluid or viscous substratum bencath the crust, the contraction and consolidation of which produce the corrugations of the rocks and of the surface. "The increase of temperature," says Mr Fisher, "though rapid near the surface, becomes less and less as we descend, so that, if the earth were once wholly melted, the temperature near the centre is not very greatly above what it is at a depth which, compared to the earth's radius, is small. Consequently, if it requires great pressure to solidify the materials at such a temperature, it is probable that the melting temperature may be reached before the pressure is sufficient to solidify." The crust, of course, must be able to sustain itself on the cor- rugated surface of the supposed viscous layer without break- ing up and sinking. he same writer has even suggested that the observed amount of corrugation is more than can be accounted for even on this hypothesis, and that the shrink- age may have been due not merely to cooling, but to the escape of water from the interior in the form of the super- heated steam of volcanic vents.2 More recently Herr Siemens has been led, from observations made in May 1878 at Vesuvius, to conclude that vast quantities of hydrogen gas, or combustible compounds of hydrogen, exist in the earth's interior, and that these, rising and exploding in the funnels of volcanoes, give rise to the detonations and clouds of steam. '

. Leaving the vexed question of the condition of the earth’s interior, the hypothesis of secular cooling and contraction furnishes a natural explanation of the origin of the domin- ant elevations and depressions of the surface, and of the intense crumpling which the rocks in many regions have undergone. Taking 0:09 as the coefficient of contraction

1) Cambridge Phil. Trans., vol. xii. Piesit.wl SD. ‘

for a supposed stratum 500 miles thick, lying beneath 25 miles of crust, and passing from a fused into a solid state, Mr Fisher found that every 100 miles measured along a great circle on the surface would have been one mile larger before the contraction, and that this might produce a, trian- gular elevation of “25 square miles on a base of 100 miles, which would give a range of mountains half a mile high. If only 50 miles out of the hundred were disturbed, the range would be a mile high, and so on.’”4

The effects of this lateral pressure may show themselves: either in broad dome-like elevations, or in narrower and loftier ridges of mountain. The structure of the crust is so complex, and the resistance offered by it to the pressure is consequently so varied, that abundant cause is furnished for almost any diversity in the forms and distribution of the wrinkles into which it is thrown. It is evident, however, that the folds have tended to follow a linear direction, In North America, from early geological times, they have kept on the whole on the lines of meridians. In the Old World, on the contrary, they have chosen diverse trends, but the last great crumplings—those of the Alps, Caucasus, and the great mountain ranges of central Asia—have risen along parallels of latitude.

Mountain chains must therefore be regarded as evidence of the shrinkage of the earth’s mass. They may be the result of one movement, or of a long succession of such movements, formed on lines of weakness in the crust, they have again and again given relief from the strain of compression by undergoing fresh crumpling and upheaval. The successive stages of uplift are usually not difficult to trace. The chief guide is supplied by

unconformability, as explained on p, 318, Let us suppose, for example, that a mountain range consists of upraised Lower Silurian rocks, upon the upturned and denuded edges of which the Carboniferous Limestone lies transgressively. The original upheaval of that range must have taken place at the period of geological time represented by the interval between the Lower Silurian and the Carboniferons Lime- stone formations, If, in following the range along its course, we found at last the Carboniferous Limestone also highly inclined and covered unconformably by the Upper Coal-measures, we should know that a second uplift of that portion of the ground had taken place between the time of the Limestone and that of the Upper Coal- measures. By this simple and obvious kind of evidence the relative ages of different mountain chains may be com- pared. In most great mountain-chains, however, the rocks have been so intensely crumpled, and even inverted, that much labour may be required before their true relations can be determined.

The Alps offer an instructive example of a great mountain chain formed by repeated movements during a long succession of geologi- cal periods. As has been already stated, the central portions of the ehain consist of gneiss, schists, granite, and other crystalline rocks, partly referable to the Archean series, but many of which appear to be metamorphosed formations of Paleozoic, Seeondary, and even of older Tertiary age.

It would appear therefore that the first outlines of the Alps were traced out even in Archean times, and that after submergence, and the deposit of Paleozoic formations along their flanks, if not over most of their site, they were re-elevated into land. From the te- lations of the Mesozoic roeks to each other, we may infer that several renewed uplifts after successive denudations took place before the beginning of the Tertiary formations. A large part of the range was, as we have seen, submerged during the Eocene period under the waters of that wide sea which spread across the centre of the Old World, and in which the Nummulitic Limestone and Flysch were deposited. But about the close of that period the grand upheaval took place to which the present magnitude of the mountains is ehiefly due. The older Tertiary rocks, previously horizontal under the sea, were raised up into land, crumpled, disloeated, inverted, together with all the older formations of the

chain. So intense was the compression to which the Eocene clays and sands were subjeeted

_ * Cambridge Phil. Trans., vol._xi. pt. iii.

that they were converted into rocks as hard and crystalline as many of the Paleozoic masses. It is strange to reflect that the enduring matcrials out of which so many of the mountains, cliffs, and pin- nacles of the Alps have been formed are of no higher geological an- tiquity than the London Clay and other soft Eocene deposits of the south of England. After the paroxysm of elevation had ended, one or more large lakes were formed along the northern base of the mountains. In these hollows the Swiss molasse accumulated to a depth of more than 6000 feet—a great pile of slowly formed gravels, sands, andclays. That the sea gained occasional access to the region is shown by the interpolation of bands containing marine organisms, as already stated (ante, p. 363). Not improbably a gradual sub- sidence of the region was going on during the formation of the molasse. But towards the close of the Miocenc period another great epoch of mountain- making was ushered in. The lakes disappeared, and their thick sediments were thrust up into large, broken, moun- tain masses. ‘he Righi, Rossberg, and other prominent heights along the northern flank of the Alps are formed of these upturned lacustrine deposits. Since that great movement no paroxysm secms to have affected the Alpine region. Ceaseless changes, indeed, have been in progress, but they have been due not so much to subterranean causes as to those subaerial forces which are still so active.

The gradual evolution of a continent during a long succession of

geological periods has been admirably worked out for North America by Dana, King, Hayden, Newberry, Powell, Dawson, and others. ‘The general character of the structure is extreme sim- plieity, as compared with that of the Old World. In the Rocky Mountain region, for example, while the Paleozoic formations lie unconformably upon the Archean gneiss, there is, according to King, a regular conformable sequence from the Lower Silurian to the Jurassic rocks. During the enormous interval of time represented by these massive formations what is now the axis of the continent remained

undisturbed save by a gentle and protracted subsidence. Inthe great depression thus produced all the Paleozoic and a great part of the Mesozoic rocks were accumulated. At the close of the Jurassic period tho first great upheavals took place. Two lofty ranges of mountains,—the Sierra Nevada (now with summits more than 14,000 feet high) and the Wahsatch,—400 miles apart, were pushed up from the great subsiding area. These movements were followed by a prolonged subsidence, during which Cretaceous sedi- qents accumulated over the Rocky Mountain region to a depth of 9000 feet or more. Then came another vast uplift, whereby the Cretaceous sediments were elevated into the crest of the mountains, and a parallel coast-range was formed fronting the Pacific. Intense inetamorphism of the Cretaceous rocks is stated to have taken place. During the Tertiary ages the Rocky Mountains were perma- nently raiscd above the sea, and gradually elevated to their present height. Vast lakes existed among them, in which, as in the Miocene basins of the Alps, enormous masses of sediment accumu- lated. The slopes of the land were clothed with an abundant vege- tation, in which, as already stated (ante, p. 365), we may trace the ancestors of many of the living trees of North America. One of the most striking features in the later phases of this history was the outpouring of great floods of trachyte and other lavas from many points and fissures over a vast space of the Rocky Mountains, In the Snake River region these lavas have a depth of 700 to 1000 feet, over an area 300 miles in breadth.

These examples show that the elevation of mountains has been occasional and, so to speak, paroxysmal. Long intervals elapsed when a slow subsidence took place, but at last a point was reached when the descending crust, unable any longer to withstand the accumulated lateral pressure, was forced to find relief by rising into mountain ridges. With this effort the elevatory movements ceased. They were followed either by a stationary period, or more usually by a renewal of the gradual depression, until eventually relief was again obtained by upheaval, sometimes along new lines, but often on those which had previously been used.

We see also how, by such enormous compression, the rocks should have acquired a cleavage structure (ante, p. 306). Soft clays have been squeezed and folded till they have become hard fissile slates. So intense have been the corrugation and compression that the strata have under- gone a chemical

rearrangement of their particles; they have been ‘“ metamorphosed” or changed into schists and gneisses, if indeed some portions of them have not been actually fused and intruded into the surrounding masses as igneous rocks.

The consideration of these changes énables us to realize why the strata of a great mountain chain should rise into

steeper folds as they are traced away from the plains, until they are found at last folded back upon themselves, and the older are made to overlie the younger. Instead of over- lying the central and more ancient masses of the range, they seem really to dip into and under them, so that a section across the region might convey the impression of a great syncline instead of a great and complicated anticline. This fan-shaped arrangement of the rocks may be observed even in the single mountains of a great chain. Mount Blane is a familiar example.

Another piece of geological structure is sometimes brought vividly before us by the examination of these regions of disturbance. Not only have the rocks been crumpled and inverted; they have likewise been traversed by great dis- locations, ‘Those on one side of a fissure have been pushed bodily over those on the other side, or they have experienced a vertical displacement of hundreds or even thousands of feet. Asa rule, however, dislocations are more easily traced, if they are not also larger and more numerous, among the low grounds than among the mountains. One of the most remarkable and important faults in Europe is that which bounds the southern edge of the Belgian coal-field. It can be traced across Belgium, has recently been detected in the Boulonuais (ante, p. 350, note), and may not improbably run beneath the Secondary and Tertiary rocks of the south of England. It is a remarkable fact that faults which have a vertical displacement of many thousands of feet produce little or no effect upon the surface. The great Belgian fault, for example, is crossed by the valleys of the Meuse, and other northerly-flowing streams. Yet so indistinctly is it marked | in the Meuse valley that no one would suspect its existence from

any peculiarity in the general form of the ground, and even an experienced geologist, until he had -learned the structure of the district, would scarcely detect any fault at all.

With the fractures along mountain chains we may connect the hot springs so frequently to be met with in these regions. But the most important connexion with the heated interior is that established by volcanic vents. The theory of secular contraction, while affording a rational explanation of the origin of the great terrestrial ridges, serves at the same time to show why volcanoes should so frequently rise along these ridges (ante, p. 254). The elevation of the crust, by diminishing the pressure on the parts beneath the upraised tracts, permits them to assume a liquid condition, and to rise within reach of the surface when, driven upwards by the expansion of superheated vapours, they are ejected in the form of lava or ashes.

It appears therefore that the present contours of the earth's surface must be due in large measure to the effects of the contraction of a cooling globe. The crust has been repeatedly corrugated, sometimes suffering sudden and paroxysmal shocks, at other times undergoing slow and long- continued upheaval and depression.

But these subterranean movements form only one phase of the operations by which the outlines of the land have been produced. They have ridged up the solid crust above the sea-level, and have thus given rise to land, but the land as we now see it has acquired its features from the prolonged and varied action of the epigene agents upon rocks of very varied heights and powers of resistance.

Tt is evident that, as a whole, the land suffers ceaseless. erosion from the time that it appears above water. It is likewise clear, from the nature of the materials composing most of the rocks of the land, that they have been derived from old denudations of the same kind. And thus, side by side with the various upheavals and subsidences, there has been a continuous removal of materials from the land, and an equally persistent deposit of these materials under

water, and consequent growth of new rocks,

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This degradation of the surface may be aptly compared to a process of sculpturing, which begins as soon as the land emerges from the sea, and never ceases so long as any por- tion of the land remains above water. The implements employed by nature in this great work are those epigene forces whose operations have already been described. Each of them, like a special kind of graving tool, produces its own characteristic impress on the land. The work of rain, of frost, of rivers, of glaciers, can be readily discriminated, though they all combine harmoniously towards the achieve- ment of their one common task. Hence the present con- tours of the land must depend partly (1) on the vigour with which the several epigene agents perform their work of erosion, (2) on the original configuration of the ground, and the influence it may have had in guiding the opera- tions of these agents, and (3) on the varying structure and powers of resistance possessed by the rocks.

1. Taking a broad view of denudation, we may conveni- ently group together the action of air, frost, springs, rivers, glaciers, and the other agents which wear down the surface of the land, under the one common designation of subaerial, and that of the seaas marine. The general results of sub- aerial action are—to furrow and channel the land, to erode valleys, to sharpen and splinter the ridges of mountains, and thus, while roughening, to lower the general surface and carry out the detritus to the sea, The action of the sea, on the other hand, is to plane down the land to the level at which the influence of breakers and ground-swell ceases to have any erosive effect ; the flat platform, so often visible between tide-marks on a rocky exposed coast-line, is an impressive illustration of the tendency of marine denudation. The combined result of subaerial and marine action, if unimpeded by any subterranean movement, would evidently be to reduce the land to one general level under the sea. For, except in that upper marginal zone where the waves and tidal currents play, the waters of the ocean protect the solid rocks which they cover. And the rocks indeed can find: no permanent protection anywhere else. But to reduce a large area of land such as a continent to the condition of a submarine plain, would require a longer period of time than seems to have elapsed between two epochs of upheaval. ‘Traces of ancient plains of marine de- nudation are to

be met with in Scandinavia and in Scotland, on but a comparatively small scale, as if there had been time for only a narrow platform to be formed before the next paroxysm of contraction and uplift completely renovated the geography of the region.

Instead of trying to estimate how much work is done by each of the subaerial agents in eroding the land, we gain a much more impressive idea of the reality and magnitude of their work as a whole by treating their operations as oue great process, the effects of which can be actually measured. The true gauge of the present yearly waste of the surface of the land is furnished by the amount of mineral matter carried every year into the sea by rivers. This mineral matter is partly in mechanical suspension, partly in chemical solution, and is to no small extent pushed in the form of shingle and sand aloug the bottoms of the streams. Some data respecting its amount have been already given (ante, pp. 274, 278). If we take the ratios furnished by the Mississippi as a fair average, which, from the vast area and varied climatal and geographical characters of the region drained by that river, they probably are, then we learn that sooth of a foot is worn away from the general surface of the land every year. At this rate, if the present erosion could be sustained, the whole American continent, of which, according to Humboldt, the mean height is 748 feet, would be worn down to the sea-level in about 4} millions of years —a comparatively short period in geological chronology. It is obvious, however, that the denudation is not equally

distributed over the whole surface of the land. If 5 ¢j9th of a foot is the mean rate from the whole surface, then some. parts, including the more level grounds, must lose very much less than that amount, while other parts, such as the slopes and valleys, must lose very much more. The pro- portions between these extremes must continually vary throughout every country, according to angle of declivity, nature of surface, amount and distribution of rainfall, and whether the rain is spread over the year or concentrated into a short period.

The proportion between the area covered by the more level ground of a country, where the rate of deundation is least, and that of the declivities, valleys, and stream chan- nels, where that rate is greatest, may be assumed as nine to one. ‘The extent of the annual waste may be further taken to be nine times greater over the latter than over the former, so that, while the more level parts of the surface have been lowered 1 foot, the valleys have lost 9 feet. aking the mean rates of waste over the whole area to be ggyoth of a foot per annum we find that on these data the annual loss amounts to ths of a foot from the flatter grounds and 5 feet from the valleys in 6000 years. This is equal to a loss of 1 foot from the former in 10,800 years and from the later in 1200 years, or to ,4,th of an inch from the one in 75 and from the other in 83 years, At this rate of erosion, a valley 1000 feet deep may be excavated in 1,200,000 years. These estimates are only approximations to the truth, but they are valuable in directing attention to the real efficacy of the apparently insignificant subaerial denuda- tion now in progress. Any other estimates of the relative amount of material worn away from the different parts of the surface may be taken, but the mean annual loss from the whole area, as ascertained by the river discharge, re- mains unaffected. If we represent too large an amount as removed from the valleys we diminish the loss from the open country, or if we make the contingent derived from the latter too great we lessen that from the former.

2. From this reasoning it follows that, apart altogether from irregularities of surface due to inequalities of upheaval, every area of land exposed to ordinary subaerial action must, in the end, be channeled into a system of valleys. Even a smooth featureless tract elevated uniformly above the sea would eventually be widely and deeply eroded. Nor would this require a long geological period, for, at the present rate of waste in the Mississippi basin, valleys 800 feet might be carved out in a million years. Un- doubtedly the original features superinduced by subter- ranean action would guide and modify the operations of running water, though their influence would certainly wane as the features themselves slowly disappeared. In no case probably would the aboriginal contour remain through a succession of geological periods. Traces of it might still be discernible, but they would be well-nigh effaced by the new outlines produced by the superficial agents. In the vast tablelands of Colorado and the other western territories of the United States an impressive picture is visible of the results of mere

subaerial erosion on undisturbed and nearly level strata. Systems of stream-courses and valleys, river gorges unexanipled elsewhere in the world for depth and length, vast winding lines of escarpment, like ranges of sea-cliffs, terraced slopes rising from plateau to plateau, huge' buttresses and solitary stacks standing like islands out of. the plains, great mountain masses towering into picturesque peaks and pinnacles cleft by innumerable gullies, yet every- where marked by the parallel bars of the horizontal strata out of which they have been carved—these are the orderly symmetrical characteristics of a country where the scenery is due entirely to the action of subaerial agents on the one hand and the varying resistance of perfectly regular stratified rocks on the other. The Alps, on the contrary, present an-

instructive example of the kind of scenery that arises where a mass of high ground has resulted from the intense cor rugation and upheaval of a complicated series of stratified and crystalline rocks, subsequently for a vast period carved by rain, frost, springs, and glaciers. We see how, on the outer flanks of those mountains among the ridges of the Jura, the strata begin to undulate in long wave-like ridges, and how, as we enter the main chain, the undulations assume a more gigantic tumultuous character, until, along the central heiglits, the mountains lift themselves towards the sky like the storm-swept crests of vast earth billows. 'The whole aspect of the ground suggests intense commotion. Where the strata appear along the cliffs or slopes they may often be seen twisted and crumpled on the most gigantic scale. Out of this complicated mass of material the sub- aerial forces have been ceaselessly at work since its first elevation. They have cut out valleys, sometimes along the original depressions, sometimes down the slopes. They liave eroded lake-basins, dug out corries or cirques, notched and furrowed the ridges, splintered the crests, and have left no part of the original surface unmodified. But they have not effaced all traces of the convulsions by which the Alps were upheaved.

3. The details of the sculpture of the land have mainly depended on the nature of the materials on which nature's erosive tools have been employed. The joints by which all rocks are traversed have served as dominant lines along which the rain has filtered, and the springs have risen, and the frost

wedges have been driven. On the higli bare scarps of a high mountain the inner structure of the mass is laid open, and there the system of joints is seen to have determined the lines of crest, tlie vertical walls of cliff and precipice, the forms of buttress and recess, the position of cleft and chasm, the outline of spire and pinnacle. On the lower slopes, even under the tapestry of verdure which nature delights to hang where she can over her naked rocks, we may detect the same pervading influence of the joints upon the forms assumed by ravines and crags. Each kind of rock, too, gives rise to its own characteristic form of scenery. ‘The massive crystalline rocks, such as granite, yield each in its own fashion to the resistless attacks of the denuding forces. They are broadly marked off from the stratified rocks in which the parallel bands of the bedding form a leading feature in every cliff and bare mountain slope. Among the latter rocks also very distinctive types of surface may be observed. A range of sandstone hills, for example, presents a marked contrast to ove of limestone.

In the physiography of any region, the mountains are the dominant features. A true mountain chain consists of rocks which have been crumpled and pushed up in the manner already described. But ranges of hills almost mountainous.in their bulk may be formed by the gradual erosion of valleys out of a mass of original high ground. In this way some ancient tablelands, those of Norway and of the Highlands of Scotland, for example, have been so channeled by deep fjords and glens that they now consist of massive rugged hills, either isolated or connected along the flanks. The forms of the valleys thus eroded have been governed partly by the structure and composition of the rocks, aud partly by the relative potency of the different denuding agents. Where the influence of rain and frost has been slight, and the streams, supplied from distant sources, have had sufficient declivity, deep, narrow, precipi- tous ravines or gorges have been excavated. The cafions of the Colorado are a magnificent example of this result. Where, on the other hand, ordinary atmospheric action has been more rapid, the sides of the river channels have been attacked, and open sloping glens and valleys have been hol- lowed out.

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precipice in the course of the river when it first commenced to flow, or caused by some hard rock crossing the channel, has eaten its way backward, as already explained (p. 276).

Lakes may have been formed in several ways. 1. By subterranean movements as, for example, during those which gave rise to mountain chains. But these hollows, unless continually deepened by subsequent movements of a similar nature would be filled up by the sediment continually washed into them from the adjoining slopes, The numer-: ous lakes in such a mountain system as the Alps cannot be: due merely to this cause, unless we suppose the upheaval' of the mountains to have been geologically quite recent, or. that subsidence must take place continuously or periodically below each independent basin. But there is evidence that: the upheaval of the lakes is not of recent date, while tlie' idea of perpetuating lakes by continual subsidence. would. demand, not in the Alps merely, but all over the northern, hemisphere where lakes are so abundant, an amount. of sub- terranean movement of which, if it really existed, there: would assuredly be plenty of other evidence. 2. By irregu-. larities in the deposition of superficial accumulations prior to the elevation of the land or during the disappearance of. the ice-sheet. The numerous tarns and lakes enclosed: within mounds and ridges of drift-clay and gravel are ex- amples. 3. By the acccumulation of a barrier across thie. channel of a stream and the consequent ponding back of the: water. This may be done, for instance, by a landslip, by the advance of a glacier across a valley, or by the throwing up of a bank by the sea across the mouth of ariver. 4.: By erosion. The only agent capable of excavating hollows vut of the solid rock such as might form lake-basins is glacier-ice (ante, p. 282). It isa remarkable fact, of which the significance may now be seen, that the innumerable lake- basins of the northern hemisphere lie on surfaces of intensely ice-worn rock. The striz can be seen on the smoother rock-surfaces slipping into the water on all sides. These strise were produced by ice moving over the rock. If the ice could, as the strix prove, descend into the rock-basins and mount up the farther side, smoothing and striating the rock as it went, it could erode the basins. It is hardly possible to convey in words an adequate conception of the enormous extent to whicli the north of Europe and North America has had its surface ground down by ice. The ordinary rough surfaces produced

by atmospheric disintegra- tion have been replaced bya peculiar flowing contour which is traceable even to below the sea-level. .

In the general subaerial denudation of a country, innu-~ merable minor features are worked out as the structure of the rocks controls the operations of the eroding agents. Thus, among comparatively undisturbed strata, a hard bed resting upon others of a softer kind is apt to form along its outcrop a line of cliff or escarpment. Though a long range of such cliffs resembles a coast that has been worn by the sea, it may be entirely due to mere atmospheric waste.: Again, the more resisting portions of a rock may be seen projecting as crags or knolls, An igneous mass will stand out as a bold hill from amidst the more decomposable strata. through which it has risen. These features, often so. marked on the lower grounds, attain their most conspicuous: development among the higher and barer parts of the mountaius, where subaerial disintegration is most rapid. The torrents tear out deep gullies from the sides of the declivities. Corries are scooped out on the one hand, and: naked precipices are left on the other. The harder bands of rock project as massive ribs down the slopes, shoot up into prominent aiguilles, or give to the summits the notched saw-like outlines they so often present.

Tablelands may sometimes arise from the abrasion of hard. rocks and the production of a level plain by the action of the sea, or rather of that action combined with the previous.

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degradation of the land by subaerial waste.

GEOLOGY

But most of

the great tablelands of the globe seem to be platforms of little-disturbed strata which have been upraised bodily to a considerable elevation. No sooner, however, are they placed in that position than they are attacked by rnuning water, and begin to be hollowed out into systems of valleys. As the valleys sink, the platforms between them grow into narrower and more

definite ridges, until eventually the level tableland is converted into a complicated network of hills and valleys, wherein, nevertheless, the key to the whole arrangement is furnished by a knowledge of the disposition

and effects of the flow of water.

The examples of this

process brought to light in Colorado, Wyoming, Nevada, and the other western territories, by Newberry, King,

striking monuments of geological operations in the world. The materials worn from the surface of the higher are

spread out over the lower grounds.

We have already traced

how streams at once begin to drop their freight of sediment

Aeadian formation, 331.

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when, by the lessening of their declivity,

375

their carrying

power is diminished (p. 276-7). The great plains of the earth's surface are due to this deposit of gravel, sand, and loam. They are thus monuments at once of the destructive and reproductive processes which have been in progress un- ceasingly since the first land rose above the sea and the first shower of rain fell. Every pebble and particle of their soil, once part of the distant mountains, has travelled slowly and fitfully downward. Again and again have these materials been shifted, ever moving downward and sea- ward. For centuries, perhaps, they have taken their share in the fer. tility of the plains and have ministered to the necessities of

flower and tree, of the bird of the air

_and of man himself. But their destiny is still the great Hayden, Powell, and other explorers, are among the most |

, the beast of the field,

ocean. n that bourne alone can they find undisturbed repose, and there, slowly accumulating in massive beds, they will remain until, in the course of ages, renewed upheaval shall raise them into fnture land, there once more to pass through the same cycle of change.

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GEOMETRY

PART L—PURE GEOMETRY.

EOMETRY has been divided since the time of Euclid into an “elementary” and a “higher” part. The contents and limits of the former have been fixed by Euclid’s Elements. The latter included at the time of the Greek mathematicians principally the properties of the conic sections and of a few other curves. The methods used in both were essentially the same. These began to be re- placed during the 17th century by more powerful methods, invented by Roberval, Pascal, Desargues, and others. But the impetus which higher geometry received in their works was soon arrested, in consequence of the discoveries of Descartes,—the new calculus to which these gave rise absorbing the attention of mathematicians almost ex- clusively, until Monge, at the end of the 18th century, re-established “pure” as distinguished from Descartes’s “eoordinate” (or analytical) geometry. Since then the purely geometrical methods have been continuously ex- tended, especially by Poncelet, Steiner, Von Staudt, and Cremona, and in England by Hirst and Henry Smith, to mention only a few of the leading names.

Whilst higher geometry thus made most rapid progress, the elementary part remained almost unaltered. It has been taught up to the present day on the basis of Euclid’s Elements, the latter being either used directly as a tcxt-book (in England), or being replaced (in most parts of the Continent) by text-books which are essentially Euclid’s Elements rewritten, with a few additions about the men- guration of the circle, cone, cylinder, and sphere. Only within a very recent period have attempts been made to change the character of the elementary part by introducing some of the modern methods.

We shall give in this article—first, a survey of elemen- tary geometry as contained in Euclid’s Elements, and then, in form of an independent treatise, an introduction to higher gcometry, based on modern methods. In the former part we shall suppose that a copy ‘of Euclid’s Elements is in the hands of the reader, so that we may dispense, as a rule, with giving proofs or drawing figures. We thus shall give only the contents of his propositions grouped together in such a way as to show their connexion, and often expressed in words which differ from the verbal translation in order to make their meaning clear. It will make little difference which of the many English editions of Euclid’s Elements the reader takes. Of these we may mention Simson’s, Potts’s, and Todhunter’s.

Section]L.—ELEMENTARY OR EvcLIDIAN GEOMETRY. The Axioms.

_§ 1. The object of geometry is to investigate the proper- ties of space. The first step must consist in establishing those fundamental properties from which all others follow by processes of deductive reasoning. They are laid down in the Axioms, and these ought to form such a system that nothing necd be added to them in order fully to charac- terize space, and that nothing may be left out without mak- ing the system incomplete. They must, in fact, completely “define” space. Several such systems are conceivable. Euclid has given one, others have- been put forward in recent times by Riemann (Abhand/. der konigl. Gesellsch. zu Gottingen, vol. xiii.), by Helmholz (Géttinger Nach- vichten, June 1868), and by Grassmann (Awsdehnungslehre von 1844). How many axioms the system ought to con-

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still an open question. We shall consider only Euclid’s system.

§ 2. The axioms are obtained from inspection of space and of solids in space,—hence from experience. The same source gives us the notions of the geometrical entities to which the axioms relate, viz., solids, surfaces, lines or curves, and points. A solid is dircctly given by expe- rience; we have only to abstract all material from it in order to gain the notion of a geometrical solid. This has shape, size, position, and may be moved. Its boundary or boundaries are called surfaces. They separate one part of space from another, and are said to have no thickness, Their boundaries are curves or lines, and these have length only. Their boundaries, again, are points, which have no magnitude but only position. We thus come in three steps from solids to points which have no magnitude; in each step we lose one extension. Hence we say a solid has three dimensions, a surface two, a line one, and a point none. Space itself, of which a solid forms only a part, is also said to be of three dimensions. The same thing is intended to be expressed by saying thata solid has length, breadth, and thickness, a surface length and breadth, a line length only, and a point no extension whatsoever.

Euclid gives the essence of these statements as defini- tions :—

Def. 1, I. A point ~ that which has no parts, or which has no mag- nitude.

Def. 2, I. A line is length without breadth.

Def. 5, I. A superficics is that which has only length and breadth.

Def. 1, XI. A solid is that which has length, breadth, and thick- Ness.

If we allow motion in geometry,—and it secms impos- sible to avoid it,—we may generate these entities by moving a point, a line, or a surface, thus : —

The path of a moving point is a line. The path of a moving line is, in general, a surface. The path of a moving surface is, in general, a solid.

And we may then assume that the lines, surfaces, and solids, as defined before, can all be generated in this man- ner. From this generation of the entities it follows again that the boundaries—the first and last position of the mov- ing element—of a line are points, and so on ; and thus we come back to the considerations with which we started.

Euclid points this out in his definitions,—Def. 3, L, Def. 6, I., and Def. 2, XI. He does not, however, show the connexion which these definitions have with those mentioned before. When points and lines have been defined, a statement like Def. 3, LL, “The extremities of a line are points,” is a proposition which either has to be proved, and then it is a theorem, or which has to be taken for granted, in which case it is an axiom. And so with Def. 6, I., and Def. 2, X1.

§ 3. Euclid’s definitions mentioned above are attempts to describe, in a few words, notions which we have obtained by inspection of and abstraction from solids. A few more notions have to be added to these, principally those of the simplest line—the straight line, and of the simplest surface —the flat surface or plane. These notions we possess, but to define them accurately is difficult. Euclid’s Definition 4, I, “A straight line is that which lies evenly between its extreme points,” must be meaningless to any one who has not the notion of straightness in his mind. Neither does it state a property of the straight line which can be used in any further investigation. Such a property is

tain, and which system is the simplest, may be said to be | given in Axiom 10, I. It is really this axiom, together

EUCLIDIAN. |

with Postulates 2 and 3, which characterizes the straight line.

Whilst for the straight line the verbal definition and axiom are kept apart, Euclid mixes them up in the case of the plane. Here the Definition 7, L, includes an axiom. It defines a plane as a surface which has the property that every straight line which joins any two points in it lies altogether in the surface. But if we take a straight line and a point in such a surface, and draw all straight lines which join the latter to all points in the first line, the surface will be fully determined. ‘This construction is therefore sufficient as a definition. That every other straight line which joins any two points in this surface lies altogether in it is a further property, and to assume it gives another axiom.

Thus a number of Euclid’s axioms are hidden among his first definitions. A still greater confusion exists in the present editions of Euclid between the postulates and axioms so-called, but this is due to later editors and not to Euclid himself. The latter had the last three axioms

put together with the postulates (atrjyara), so that these’

were meant to include all assumptions relating to space. The remaining assumptions which relate to magnitudes in general, viz., the first eight “axioms” in modern editions, were called “common notions” (kowat évova). Of the latter a few may be said to be definitions. Thus the eighth might be taken as a definition of “ equal,” and the seventh of halves. If we wish to collect the axioms used in Kuclid’s Elements, we have therefore to take the three postulates, the last three axioms as generally given, a few axioms hidden in the definitions, and an axiom used by Kuclid in the proof of Prop. 4 and on a few other occa- sions, viz., that figures may be moved in space without chauge of shape or size.

We shall not enter into the investigation how far the assumptions which would be included in such a list are sufficient, and how far they are

necessary. It may be sufficient here to state that from the beginning of a geometrical science to the present century attempts without end have been made to prove the last of Euclid's axloms, that only at the beginning of the present century the futility of this attempt was shown, and that only within the last twenty years the true nature of the connexion between the axioms has become known through the researches of Riemann and Helmholz, although Grassmann had pub- lished already, in 1844, his classical but long-neglected Ausdehnungslehre.

§ 4. The assumptions actually made by Euclid may be stated as follows :—

1. Straight lines exist which have the property that any one of them may be produced both ways without limit, that through any two points in space such a line may be drawn, and that any two of them coineide throughout their indefinite extensions as soon as two points in the one coincide with two points in the other. (This gives the contents of Def. 4, part of Def. 35, the first two Postulates, and Axiom 10.)

2, Plane surfaces or planes exist having the property laid down in Def. 7, that every straight line joining any two points in such a surface lies altogether in it.

3. Right angles, as defined in Def. 10, are possible, and all right angles are equal; that is to say, wherever in space we take a plane, and wherever in that plane we eonstruet a right angle, all angles thus constructed will be equal, so that any one of them may be made to coincide with any other. (Axiom 11.)

4, The 12th Axiom of Euclid. This we shall not state now, but only introduce it when we cannot proeeed any further without it.

5. Figures may be freely moved in space without ehange of shape or size, This is assumed by Euelid, but not stated as an axiom.

6. In any plane a cirele may be deseribed, having any point in that plane as centre, and its distance from any other point in that plane as radius. (Postulate 3.)

The definitions which have not been mentioned are all

“nominal definitions,” that is to say, they fix a name for a

thing described. Many of them overdetermine a figure. (Compare notes to definitions in Simson’s or Todhunter’s edition.)

§ 5. Kuclid’s Elements are contained in thirteen books. Of these the first four and the sixth are devoted to “ plane geometry,” as the investigation of figures in a plane is generally called. The 5th book contains the theory of proportion which is used in Book VI. The 7th, 8th, and 9th books are purely arithmetical, whilst the 10th contains a most ingenious treatment of geometrical irrational quantities. These four books will be excluded from our survey. The remaining three books relate to figures in space, or, as it is generally called, to “ solid geometry.” The 7th, 8th, 9th, 10th, 13th, and part of the 11th and 12th books are now generally omitted from the school editions of the Elements. In the first four and in the 6th book it is to be understood that all figures ara drawn in a plane.

Boox I, or Evcuin’s “‘ Eiements.”

§ 6. According to the third postulate it is possible to draw in any plane a cirele which has its centre at any given point, and its radius equal to the distance of this point from any other point given in the plane. This makes it possible (Prop. 1) to construet on a given line AB an equilateral triangle, by drawing first a eirele with A as eentre and AB as radius, and then a cirele with B as centre and BA as radius. The point where these cireles inter- seet —that they interseet Euclid quictly assumes—is the vertex of the required triangle, Euclid does not suppose, however, that a eirele may be drawn whieh has its radius equal to the distanee be- tween any two points unless one of the points be the centre. This implies also that we are not supposed to be able to make any straight line equal to any other straight line, or to earry a distanee about in space. Euclid therefore next solves the problem: It is required along a given straight line from a point in it to set off a distanee

equal to the length of another straight line given anywhere in the plane. This is done in two steps. It is shown in Prop. 2 how a straight line may be drawn from a given point equal in length to another given straight line not drawn from that point. And then the problem itself is solved in Prop. 3, by drawing first through the given point some straight line of the required length, and then about the same point as centre a circle having this length as radius. This cirele will eut off from the given straight line a length equal to the required one. Now-a-days, instead of going through this long process, we take a pair of eompasses and set off the given length byits aid. This assumes that we may move a length about without changing it. But Euclid has not assumed it, and this proceeding would be fully justified by his desire not to take for granted more than was necessary, if he were not obliged at his very next step actually to make this assumption, though without stating it.

§ 7. We now eome (in Prop. 4) to the first theorem. It is the fundamental theorem of Euclid's whole system, there being only a very few propositions (like Props. 18, 14, 15, I.), except those in the 5th book and the first half of the 11th, which do not depend upon it. It is stated very aceurately, though somewhat elumsily, as follows :—

Lf two triangles have two sides of the one equal to two stdes of the other, cach to cach, and have also the angles contained by those sides equal to one another, they shall also have their bases or third sides equal ; and the two triangles shall be equal » and their other angles shall be equal, each to each, namely, those to which the equal sides wre opposite,

That is to say, the triangles are ''identically" equal, and one may be eonsidered as a copy of the other. The proof is very simple. The first triangle is taken up and placed on the second, so that the parts of the triangles which are known to be equal fall upon each other. It is then easily seen that also the remaining parts of one coineide with those of the other, and that they are therefore equal. This process of applying one figure to another Euclid searecly uses again, though many proofs would be simplified by doing so. The process introduces motion, into geometry, and ineludes, as already stated, the axiom that figures may be moved without ehauge of shape or size. .

If the last proposition be applied to an isosceles triangle, which has two sides equal, we obtain the theorem (Prop. 5), if two sides of a triangle are equal, then the angles opposite these sides arc equal. :

Euelid’s proof is somewhat complicated, and a stumbling-block to many schoolboys. The proof becomes much simpler if we cou- sider the isosceles triangle ABC (AB=AC) twiee over, onee as a triangle BAC, and once as a triangle CAB; and now remember that

AB, AC in the first are equal respectively to AC, AB in the sccond, and the angles included by these sides are equal. Hence the tri- angles are equal, and the angles in the one are equal to those in the other, viz., those which are opposite equal sides, z.¢., angle ABC in the first equals angle ACB in the second, as they are opposite the equal sides AC,and AB in the two triangles.

There follows the converse theorem (Prop. 6). If two angles in a triangle are equal, then the sides opposite them are equal,—t.e., the triangle is isosceles. The proof given consists in what is called a reduetio ad absurdum, a kind of proof often used by Euclid, and principally in proving the converse of a previous theorem. It assumes that the theorem to be proved is wrong, and then shows that this assumption leads to an absurdity, 7.¢., to a con- clusion which is in contradiction to a proposition proved before— that therefore the assumption made cannot be true, and hence that the theorem is true. It is often stated that Euclid invented this kind of proof, but the method is most likely much older.

$ 8. It is next proved that two triangles which have the three sides of the one equal respectively to those of the other are identically equal, hence that the angles of the one are equal respectively to those of the other, those being equal which are opposite equal sides, This is Prop. 8, Prop. 7 containing only a first step towards its proof.

These theorems allow now of the solution of a number of pro- blems, viz. :—

To biseet a given angle (Prop. 9).

To bisect a given fintte straight line (Prop. 10).

To draw a straight line perpendicularly to a given straight line through a given point in tt (Prop. 11), and also through a given point not in it (Prop. 12).

The solutions all depend upon properties of isosceles triangles.

§ 9. The next three theorems relate to angles only, and might have been proved before Prop. 4, or even at the very beginning. The first (Prop. 18) says, The angles which one straight line makes with another straight line on one side of % either are two right angles or are together equal to two right angles. This theorem would have been unnecessary if Euclid had admitted the notion of an angle such that its two limits are in the same straight line, and had besides defined the sum of two angles.

Its converse (Prop. 14) is of great usc, inasmuch as it enables us in many cases to prove that two straight lines drawn from the same point are one the continuation of the other. So also is

Prop. 15. If two straight lines eut one another, the vertical or opposite angles shall be equal.

§ 10. Euclid returns now to properties of triangles. Of great importance for the next steps (though afterwards superseded by a more complete theorem) is

Prop. 16. If one side of a triangle be produced, the extertor angle shall be greater than either of the interior opposite angles.

Prop. 17, Any two angles of a triangle are together less than two right angles, is an immediate consequence of it. By the aid of these two, the following fundamental properties of triangles are easily proved :—

Prop. 18. The greater side of every triangle has the greater angle opposite to it ;

Its converse, Prop. 19, The greater angle of every triangle 1s subtended by the greater side, or has the greater side opposite to tt ;

Prop. 20. Any two sides of a triangle are together greater than the third side ;

And also Prop. 21. If from the ends of the side of a triangle there be drawn two straight lines to a point within the triangle, these shall be less than the other two sides of the triangle, but shall contain a greater angle.

$11. Having solved two problems (Props. 22, 23), he returns to two triangles which have two sides of the one equal respectively to two sides of the other, It is known (Prop. 4) that if the included angles are equal then the third sides are equal; and conversely (Prop. 8), if the third sides are equal, then the angles included by the first sides are equal. From this it follows that if the ineluded angles are not equal, the third sides are not equal, and conversely, that if the third sides are not equal, the included angles are not equal. Euclid now completes this knowledge by proving, that ‘‘7f the included angles are not equal, then the third side in that triangle is the greater which contains the greater angle;” and conversely, that ‘af the third sides are unequal, that triangle contains the greater angle which contains the greater side.” These are Prop. 24 and Prop. 25.

§ 12. The next theorem (Prop. 26) says that 7f two triangles have one side and two angles of the one equal respectively to one side and two angles of the other, viz., in both triangles either the angles ad- jacent to the equal side, or one angle adjacent and one angle opposite it, then the two triangles are identically equal.

This theorem belongs to a group with Prop. 4 and Prop. 8. Its first case might have been given immediately after Prop. 4, but the second casc requires Prop. 16 for its proof.

§ 13. We come now to the investigation of parallel straight lines, i.¢., of straight lines which lie in the same plane, and cannot be made to meet

however far they be produced either way. The in-

vestigation, which starts from Prop. 16, will become clearer if a few names be explained which are not all used by Euclid. If two straight lines be cut by a third, the latter is now generally called a “transversal” of the figure. It forms at the two points where it cuts the given lines four angles with each. Those of the angles which lie between the given lines are called interior angles, and of these, again, any two which lie on opposite sides of the transversal but one at each of the two points are ealled ‘ alternate angles.”

We may now state Prop. 16 thus :—Zf two straight lines which meet are eut by a transversal, their alternate angles are unequal. For the lines will form a triangle, and one of the alternate angles will be an exterior angle to the triangle, the other interior and opposite to it.

From this follows at once the theorem contained in Prop. 27. If two straight lines which are cut by a transversal make alternate angles equal, the lines cannot meet, however far they be produced, henee they are parallel. This proves the existence of parallel lines.

Prop. 28 states the same fact in different forms. Jf a straight line, falling on two other straight lines, make the exterior angle equal to the interior and opposite angle on the same side of the line, or make the interior angles on the same side together equal to two right angles, the two straight lines shall be parallel to one another.

Hence we know that, ‘if two straight lines which are cut by a transversal meet, their alternate angles arc not equal” ; and hence that, ‘if alternate angles are equal, then the lines are parallel.”

The question now arises, Are the propositions converse to these true or not? That is to say, ‘If alternate angles are unequal, do the lines meet?” And ‘‘if the lines are parallel, are alternate angles necessarily equal ?”

The answer to either of these two questions implies the answer to the other. But it has been found impossible to prove that the negation or the affirmation of either is true.

The difficulty which thus ariscs is overcome by Euclid assuming that the first question has to be answered in the affirmative. This gives his last axiom (12), which we quote in his own words.

Axiom 12.—Jf a straight line meet two stratght lines, so as to make the two interior angles on the same side of it taken together less than two right angles, these straight lines, being continually produecd, shall at length meet on that side on which are the angles which wre less than two right angles.

The answer to the second of the above questions follows from this, and gives the theorem Prop. 29, Jf a straight line fall on two

parallel straight lines, it makes the alternate angles equal to one

another, and the exterior angle equal to the interior and opposite angle on the same side, and also the two intertor angles on the same side together equal to two right angles.

$14, With this a new part of elementary geometry begins. The earlier propositions are Independent of this axiom, and would be true even if a wrong assumption had been made in it. They all relate to figures in a plane. But a plane is only one among an infinite number of conceivable surfaces. We may draw figures on any one of them and study their properties. We may, for instance, take a sphere instead of the plane, and obtain ‘¢ spherical” in the place of ‘‘plane” geometry. If on one of these surfaces lines and figures could be drawn, answering to all the definitions of our plane figures, and if the axioms with the ex- ception of the last all hold, then all propositions up to the 28th will be true for these figures. This is the case in spherical geometry if we substitute ‘‘ shortest line” or ‘‘great circle” for ‘‘ straight line,” ‘small circle” for ‘‘circle,” and if, besides, we limit all figures toa part of the sphere which is less than a hemisphere, so that two points on it cannot be opposite ends of a diameter, and therefore determine always one and only one great circle.

For spherical triangles, therefore, all the important propositions 4, 8, 26; 5 and 6; and 18, 19, and 20 will hold good.

This remark will be sufficient to show the impossibility of proving Euclid's last axiom, which would mean proving that this axiom is a consequence of the others, and hence that the theory of parallels would hold on a spherical surface, where the other axioms do hold, whilst parallels do not eyen exist.

It follows that the axiom in question states an inherent difference between the plane and other surfaces, and that the plane is only fully characterized when this axiom is added to the other assump- tions.

$15. The introduction of the new axiom and of parallel lincs leads to a new class of propositions.

After proving (Prop, 80) that ‘‘ two lines which are each parallel to a third areparallel to cach other,” we obtain the new properties of triangles contained in Prop. 82. Of these the second part is the most important, viz., the theorem,: The three interior angles of every triangle are together equal to two right angles.

As easy deductions not given by Euclid but added by Simson follow the propositions about the angles in polygons, they are given in English editions as corollaries to Prop. 32.

These theorems do not hold for spherical figures. The sum of tho interior angles of a spherical triangle is always greater than two right angles, and increases with the area.

BOOKS I. 11.]

§ 16. The theory of parallels as such with Props. 33 and 34, which state properties of the parallelogram, 7.é., of a quadrilateral formed by two pairs of parallels. They are—

Prop. 83. Lhe straight lines which join the extremities of two equal

and parallel straight lines towards the same parts are themselves

equal and parallel ; and

Prop. 34. The opposite sides and angles of a parallelogram are equal to one another, and the diameter (diagonal) biseets the parallelo- gram, that ts, divides it into two equal parts.

§ 17. The rest of the first book relates to areas of figures.

The theory is made to depend upon the theorems—

Prop. 35. Parallelograms on the same base and. between the same parallels are equal to one another ; and

Prop. 36. Parallelograms on equat bases, and between the same parallels, are equal to one another.

As each parallelogram is bisected by a diagonal, the last theorems hold also if the word parallelogram be replaced by "'triangle,"' as is done in Props. 37 and 88.

It is to be remarked that Euclid proves these propositions only in the case when the parallelograms or triangles have their bases in the same straight line.

The theorems converse to the last form the contents of the next three propositions, viz. :—

TuxorEM (Props. 40 and 41).—Egual triangles, on the same or on equal bases, in the same straight line, and. on the same side of wt, are between the same parallels.

That the two cases here stated are given by Euclid in two sepa- rate propositions proved separately is characteristic of his method.

§ 18. To compare areas of other figures, Euclid shows fisst, in |

Prop. 42, how to draw a. parallelogram which is equal in area to a given triangle, and has one of its angles equal to a given angle. If the given angle

is right, then the problem is solved to draw a ‘reet- angle” equal in area toa given triangle.

Next this parallelogram is trausformed into another parallelo- gram, which has one of its sides equal to a given straight line, whilst its angles remain unaltered. This may be done by aid of the theorem in

Prop. 48. The complements of the parallelograms which are about the diameter of any parallelogram are equal to one. another.

Thus the problem (Prop. 44) is. solved to construct a paraliclogram on a given line, which is equal in area. to.a given triangle, and whieh has one angle equat to a given angle (generally a right angle).

As every polygon can he divided into a number of triangles, We can now construct a parallelogram having a given angle, say a right angle, of the triangles into which the polygon has been divided, a parallelo-

ram may be constructed, having one side equal to a given straight Fie, and one angle equal toa given angle. If these parallelograms be placed side by side, they may be added together to form a single eee having still one side of the given length. This is one in Prop. 45.

Herewith a means is found to compare areas of different polygons. We need only construct. two: rectangles equal in area to. the given polygons, and having each one side of given length. By comparing the unequal sides we are enabled to judge whether the areas are equal, or which is the greater. Euclid does not state this con- sequence, but the problem is taken up again at the end of the second book, where it is shown how to construct a square equal in area to a given polygon.

§ 19. The first book concludes with one of the most important theorems in the whole of geometry, and one which has been cele- brated since the earliest times. It is stated, but on doubtful authority, that Pythagoras discovered it, and it has been called by his name. If we call that side in a right-angled triangle which is opposite the right angle the hypotenuse, we may state it as follows :—

THEOREM OF PyTHAGorRAS (Prop. 47).—Jn every right-angled triangle the square on the hypotenuse ts equal to the sum of the squares of the other sides.

And conversely—

Prop. 48. If the square deseribed on one of the sides of a triangle be equal tothe squares deseribed on the other sides, then the angle contained by these two sides is a right angle.

On this theorem (Prop. 47) almost all geometrical measurement depends, which cannot be directly obtained.

Boox II.

§ 20. The propositions in the second book are very different in character from those in the first; they all relate to areas of rectangles and squares. Their trne significance is best seen by stating them in an algebraic form. This is often done by expressing the lengths of lines by aid of numbers, which tell how many times a chosen unit is contained in the lines. If there is a unit to be found which is contained an exact number of times in each side of a rectangle, it is easily seen, and generally shown in the teaching of arithmetic, that the rectangle contains a number of unit squares

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may be said to be finished

| which may be divided in two ‘ This sum is denoted by a+b.

and being equal in area to a given polygon. For each |

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equal to the prodnet of the numbers which measure the sides, a unit square being the square on the unit line. If, however, no such unit can be found, this process requires that connexion between lines and numbers which is only established by aid of ratios of lines, and which is therefore at this stage altogether inadmissible. But there exists another way of connecting these

propositions with algebra, based on modern notions which seem destined greatly to change and to simplify mathematics. We shall introduce here as much of it as is required for our present purpose.

At the beginning of the second book we find a definition accord-

| ing to which “a rectangle is said to be ‘ contained’ by the two sides

which contain one of its right angles” ; in the text this phrase- ology is extended by speaking of rectangles contained by any two straight lines, meaning the rectangle which has two adjacent sides equal to the two straight lines.

We shall denote a finite straight line by a single small letter, a, b,c… . x, and the area of the rectangle contained by two lines a and b by ab, and this we shall call the product of the two linesa and b. It will be understood that this definition has nothing to do with the definition of a product of numbers.

We define as follows :—

The swum of two straight lines a and b means a straight line e parts equal respectively to a and 5.

The difference of two lines @ and b

(in symbols, a—5) means a line e which when added to 0 gives a; i

that is, a-—b=e if b+e=a.

The product of two lines a and } (in symbols, ab) means the area of the rectangle contained by the lines a@ and 8. For aa, which means the square on the line a, we write a”, °

§ 21. The first ten of the fourteen propositions of the second book may then be written in the form of formule as follows :-—

Prop. 1. abt+c+d+ ...)=ab+actad+.., » 2 abt+ac=a? if b+e=a. », 8 a(a+b)=a? +ab. » 4 (a+b)? =a? + 2ab +02. » 5. (a+b) (e—b)+B—=a?, », 6. (a+) (a-

b)+0=a?, » 0. a*+(a—b)P?=2al(a -b)+b% » 8 4(a+b)at+b?=(2a+5)?, », 9. (a+b)? +(a— b)?= 2a? + 282

»> 10. (a+b)? + (a— 6)? = 2a? + 207,

It will be seen that 5 and 6, and also 9 and 10, are identical. In Euclid's statement they do not look the same, the figures being

‘ arranged differently.

If the letters a, 6, ec, . . . denoted numbers, it follows from algebra that each of these formule is true. But this does not prove them in our ease, where the letters denote lines, and their products areas without any reference to numbers. To prove them

| we have to discover the laws which rule the operations introduced, | viz., addition and multiplication of segments. This we shall do

now ; and we shall find that these laws are the same with those which hold in algebraical addition and multiplication. , § 22. In a sum of numbers we may change the order in which

‘ the numbers are added, and we may also add the numbers together

in groups, and then add these groups. But this also holds for the sum of segments and for the sum of rectangles, as a little considera- tion shows. That the sum of rectangles has always a meaning follows from the Props. 43-45 in the first book. These laws about addition are reducible to the two —

a+b=b+a ; Dy, at(bte)=avkte (2)3 or, when expressed for rectangles, ab+ed=ed+ab : ‘ (3), ab +(cd+ef)=ab+ed+ef : (4).

The brackets mean that the terms in the bracket have been added together before they are added to another term. The more gencral cases for more terms may be deduced from the above. ;

For the product of two numbers we have the law that it remains unaltered if the factors be interchanged. This also holds for our geometrical product. For

if ab denotes the area of the rectangle which has as base and 0 as altitude, then ba will denote the area of the rectangle which has 6 as base and as altitude. But in a rectangle we may take either of the two lines which contain it as base, and then the other will be the altitude. This gives

ab=ba

(5).

In order further to multiply a sum by anumber, we have in algebra the rule: —Multiply each term of the sum, and add the products thus obtained. That this holds for our geometrical pene is shown by Euclid in his first proposition of the second book, w a he proves that the area of a rectangle whose base is the ee number of segments is cqual to the sum of rectangles which havo

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these segments separately as bases. simplest case,

In symbols this gives, in the

| (6) and (6+ea=ba+ca :

To these laws which have been investigated by Sir William Hamilton and by Hermann Grassmann, the former has given special names. He calls the laws expressed in

(1) and (3) the commutative law for addition;

AE oe rr multiplication ; (2) and (4) the associative laws for addition ;

(6) the distributive law.

§ 23, Having proved that these six laws hold, we can at onee prove every one of the above propositions in their algebraical form.

The first is proved geometrically, it being one of the funda- mental laws. The next two propositions are only special cases of the first. Of the others we shall prove one, viz., the fourth :—

(a +b)2=(a+b) (a+b)=(a+b)a+ (a+b)d by (6). But (a+ b)a=aa + ba by (6), =aa+ab by (5); and – (a+b)b=ab+ bb by (6). Therefore (a+b)?=aa+ab+(ab+ bd) =aa+(ab+ab)+bb by (4). =aa+2ab+ bb

This gives the theorem in question.

In the same manner every one of the first ten propositions is proved.

It will be scen that the operations performed are exactly the same as if the letters denoted numbers.

Props. 5 and 6 may also be written thus—

(a +b) (a—b) =a? – 8.

Prop. 7, which is an easy eonsequenee of Prop. 4, may be trans- foam If we denote by ¢ the line a+, so that c=at+b, a=c-), we get

c+ (c—b)? =2c(e— b) +B? = 2c? — 2bc +b. Subtracting c? from both sides, and writing a for c, we get (a —b)? =a? ~ 2ab + 6”,

In Euelid’s Elements this form of the theorem does not appear, all propositions being so stated that the notion of subtraction does not enter into them.

§ 24. The remaining two theorems (Props. 12 and 18) connect the ‘square on one side of a triangle with the sum of the squares on the other sides, in case that the angle between the latter is acute or obtuse. They are important theorems in trigonometry, where it is possible to inelude them in a single theorem.

$ 25. There are in the second book two problems, Props. 11 and 14.

If writtcu in the above symbolie language, the former requires to find a line z sueh that a(a—x)=xz%. Prop. 11 contains, therefore, the solution of a

quadratie equation, which we may write z? + ax=a?. The solution is required later on in the construction of a regular deeagon.

More important is the problem in the last proposition (Prop. 14). It requires the construction of a square cqual in area to a given rectangle, hence a solution of the equation

=a.

In Book I., 42-45, it has been shown how a rectangle may be constructed equal in area to a given figure bounded by straight lines. By aid of the new proposition we may therefore now deter- mine a line sueh that the square on that line is equal in area to any given rectilinear figure, or we can square any such figure.

_ As of two squares that is the greater which has the greater side, it follows that now the comparison of two areas has been reduced to the comparison of two lines.

The problem of reducing other arcas to squares is frequently met with among Greek matheinaticians. We need only mention the problem of squaring the circle.

In the present day the comparison of arcas is performed in a simpler way by reducing all areas to rectangles having a common base. Their altitudes give then a measure of their areas.

The construction of a rectangle having the base u, and being equal in area to a given rectangle, depends upon Prop. 48, I This therefore gives a solution of the equation ‘iis

ab=unx, where z denotes the unknown altitude.

Boox III.

§ 26. The third book of the Elements relates exelusively to pro- perties of the cirele. A eirele and its circumference have becn

| coincide.

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defined in Book 1., Def. 15. We restate it here in slightly diffe- rent words :—

Definition. —The cireumferenee of a cirele is a plane curve such that all points in it have the same distance from a fixed point in the plane. This point is called the ‘‘ centre” of the eirele.

Of the new definitions, of which eleven are given at the beginning of the third book, a few only require special mention. The first, whieh says that circles with equal radii are equal, is in part a

| theorem, but easily proved by applying the one cirele to the other.

Or it may be considered proved by aid of Prop. 24, equal circles not being used till after this theorem.

In the second definition is explained what is meant by a line which “touches” a cirele. Such a line is now generally called a tangent to the circle. The introduction of this name allows us to state many of Euelid’s propositions in a much shorter form.

For the same reason we shall call a straight line joining two points on the circumference of a circle a ‘ chord.”

Definitions 4 and 5 may be replaced with a slight generalization by the following :—

Definition.—By the distance of a point from a line is meant the length of the perpendicular drawn from the point to the line.

§ 27. From the definition of a cirele it follows that every circle has a centre. Prop. 1 requires to find it when the cirele is given, i.¢c., when its cireumferenee is drawn.

To solve this problem a chord is drawn (thatis, any two points in the circumference are joined), and through the point where this is biseeted a perpendicular to it is erected. Euelid then proves, first, that no point off this perpendicular can be the centre, hence that the centre must lie in this line ; and, secondly, that of the points on the ago rene! one only ean be the centre, viz., the one which

isects the part of the perpendicular bounded by the cirele. In the second part Euclid silently assumes that the perpendicular there used does cut the cireumferenee in two, and only in two points. The proof therefore is incomplete. The proof of the first part, however, is exact. By drawing two non-parallel chords, and the perpendiculars which bisect them, the centre will be found as the point where these perpendieulars intersect.

§ 28. In Prop. 2 itis proved that a chord of a circle lies altogether within the cirele.

What we have called the first part of Euclid's solution of Prop. 1 may be stated as a theorem :—

THEOREM.—LEvery straight line which bisects a chord, and is at right angles to it, passes through the centre of the circle.

The converse to this gives Prop. 8, which may be stated thus :—

If a straight line through the centre of a cirele bisect a chord, then it ts perpendicular to the chord, and if it be perpendicular to the chord it bisects it.

An easy consequence of this is the following theorem, which is essentially the same as Prop. 4 :—

TuEorEM (Prop. 4).—Z'wo chords of a circle, of which neither passes through the centre, cannot bisect each other.

These last three theorems are fundamental for the theory of the cirele. It is to be remarked that Euclid never proves that a straight line cannot have more than two points in common with a eircuinference.

§ 29. The next two propositions (5 and 6) might be replaced by a single-and a simpler theorem, viz. :—

THEOREM. —Z’wo circles which have a common centre, and whose circumferences have one point in common, coineide.

Or, more in agreenient with Euclid’s form:—

THEOREM.—JZ’wo different cireles, whose cirewmferences have a point in common, cannot have the same centre.

That Euelid treats of two cases is characteristic of Greck mathe- matics.

The next two propositions (7 and 8) again belong together. They may be combined thus :—

TuEorEM.—IJf from a point in a plane of a circle, which rs not the centre, straight lines be drawn to the different points of the cir- cumference, then of all these lines one is the shortest, and one the longest, and these lie both in that straight line which joins the given point to the centre. Of all the remaining lines cach ts equal to one and only one other, and these equal lines lie on opposite sides of the shortest or longest, and make equal angles with them.

Euclid distinguishes the two cases where the given point lies within or without the circle, omitting the case where it lies in the eireumferenee.

From the last proposition it follows that if from a point more than two equal straight lines can be drawn to the circumference, this point must be the centre. This is Prop. 9.

As a consequenee of this we get

TuroreM.—Jf the circumferences of the two circles have three points in common they coincide.

For in this ease the two eireles have a common centre, because from the eentre of the one threc equal lines ean be drawn to points ou the

cireumference of the other. But two cireles which have a common centre, and whose circumferences have a point in common,

(Compare above statement of Props. 5 and 6.)

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This theorem may also be stated thus :—

Lhrough three points only one circumference may be drawn; or, Three points determine a ecirele.

Euclid does not give the theorem in this form. He proves, how- ever, that the two cireles cannot cut another in more than two points (Prop. 10), and that two circles cannot touch one another in more potnts than one (Prop. 18).

§ 30. Propositions 11 and 12 assert that ¢f two cireles touch, then the point of contact lies on the line joining their centres. This gives two propositions, because the circles may touch either internally or externally.

§ 31. Propositions 14 and 15 relate to the length of chords. The first says ; that equal chords are equidistant from the centre,and that chords which are equidistant from the centre are equal ;

Whilst Prop. 15 compares unequal chords, viz., Of all chords the diameter ts the greatest, and of other chords that is the greater which is nearer to the centre; and conversely, the greater chord is nearer to the centre.

§ 82. In Prop. 16 the tangent to a circle is for the first time in- troduced. The proposition is meant to show that the straight line at the end point of the diameter, and at right angles to it is a tan- gent. The proposition itself does uot state this. It runs thus :—

Prop. 16. The straight line drawn at right angles to the diameter of a etrele, from the extremity of it, falls without the circle; and no straight line can be

drawn from the extremity, between that straight line and the circumference, so as not to cut the circle.

Corollary.—The straight line at right angles to a diameter drawn through the end point of it touches the circle.

The statement of the proposition and its whole treatment show the difficulties which the tangents presented to Euclid.

Prop. 17 solves the problem through a given point, cither in the circumference or without it, to draw a tangent to a given circle.

Closely connected with Prop. 16 are Props. 18 and 19, which state (Prop. 18), that the line joining the centre of a cirele to the point of contact of a tangent is perpendicular to the tangent; and con- versely (Prop. 19), that the straight line through the point of contact of, and perpendicular to, a tangent toa circle passes through the centre of the cirele,

§ 38. The rest of the book relates to angles connected with a circle, viz., angles which have the vertex either at the centre or on the circumference, and which are called respectively angles at the centre and angles at the circumference. Between these two kinds of angles exists the important relation expressed as follows :—

Prop. 20. Zhe angle at the centre of a circle is double of the angle at the eirewmference on the same base, that ts, on the same are.

This is of great importanee for its consequences, of which the two following are the principal :—

Prop. 21. The angles in, the same segment of a circle are equal to one another ;

And Prop. 22. The opposite angles of any quadrilateral figure inscribed in a cirele are together equal to two right angles.

Further consequences are :—

Prop. 23. On the same straight line, and on the same side of it, there cannot be two similar segments of circles, not coinciding with one another ;

And Prop. 24. Similar segments of circles on equal straight lines are equal to one another.

The problem Prop. 25, 4 segment of a circle being given to describe the circle of which it is a segment, may be solved much more easily by aid of the construction described in relation to Prop. 1, III, in § 27.

§ 34. There follow four theorems connecting the angles at the ecntre, the arcs into which thcy divide the ecircuinference, and the chords subtending thesc arcs. They are expressed for angles, arcs, and chords in equal circles, but they hold also for angles, arcs, and chords in the same circle.

The theorems are :—

Prop. 26. In equal circles equal angles stand on equal ares, whether they be at the centres or circumferences ;

Prop. 27 (converse to Prop. 26). In equal circles the angles which stand on cqual ares are equal to one another, whether they be at the centres or the circumferenees;

Prop. 28. In equal circles equal straight lines (equal chords) cut off equal ares, the greater equal to the greater, and the less equal to the less ;

Prop. 29 (converse to Prop. 28). Jn equal ecireles equal arcs arc subtended by cqgual straight lines.

§ 35. Other important consequences of Props. 20-22 are :—

Prop. 31. In a cirele the angle in a semicirele is a right angle ; but the angle in a segment greater than a semicircle is less than a right angle; and the angle in a segment less than a semicirele is greater than a right angle ;

Prop. 82. If a straight line touch a circle, and from the point of contact a straight line be drawn cutting the circle, the angles which this line makes

with the line touching the circle shall be equal to the angles whieh are tn the alternate segments of the circle.

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§ 36. Propositions 30, 33, 34, contain problems which are solved by aid of the propositions preceding them :—

oy 30. Zo biseet a given are, that ts, to divide it into two equal parts ;

Prop. 38. On a given straight line to describe a segment of a etrele containing an angle cqual to a given reetilineal angle ;

Prop. 34. From a given circle to cut off a segment containing an angle equal to a given reetilineal angle.

§ 37. If we draw chords through a point A within a circle, they will each be divided by A into two segments. Between these segments the law holds that the rectangle contained by them has the same area on whatever chord through A the segments are taken. The value of this rectangle changes, of course, with the position of A.

A similar theorem holds if the point A be taken without the circle. On every straight line through A, which cuts the circle in two points B and C, we have two segments AB and AC, and the rectangles contained by them are again equal to one another, and equal to the square on a tangent drawn from A to the cirele,

The first of these theorems gives Prop. 35, and the second Prop. 36, with its corollary, whilst Prop. 37, the last of Book III., gives the converse to Prop. 36. The first two theorems may be combined im one :—

THEOREM.—Jf through a point A in the plane of a cirele a straight line be drawn cutting the circle in B and C, then the rectangle AB. AC has a constant value so long as the point A be fixed ; and of Srom A a tangent AD can be drawn to the circle, towehing at D, then the above rectangle equals the square on AD.

Prop. 87 may be stated thus :—

THEOREM.—Jf froma point A without a circle a line be drawn cut- ting the circle in Band C, and another Vine to a point D on the circle, and if AB. AC=AD*, then the line AD touches the circle at D.

It is not difficult to prove also the converse to the general pro- position as above stated. It may be expressed as follows :—

Tf four points ABCD be taken on the circumference of a circle, and ¥ the lines AB, CD, produced if necessary, meet at E, then

HA. EB = EC. ED;

and conversely, if this relation holds then the four points lie on a ctrele, that ts, the circle drawn through three of them passes through the fourth.

That a eirele may always be drawn through three points, pro- vided that they do not lie in a straight line, is proved only later on in Book IV.

Boox IV.

§ 38. The fourth book contains only problems, all relating to the construction of triangles and polygons inscribed in and circum- scribed about circles, and of circles inscribed in or cireumseribed about triangles and polygons. They are ncarly all given for their own sake, and not for future usc in the construction of figures, as are most of those in the former books. In seven definitions at the beginning of the book it is explained what is understood by figures inscribed in or described about other figures, with special reference to the case where one figure is a circle. Instead, however, of saying that one figure is deseribed about another, it is now generally said that the onc figure is circumscribed about the other. We may then state the definitions 3 or 4 thus :—

Definition.—A polygon is said to be inscribed in a circle, and the circle is said to be circumseribed about the polygon, if the vertices of the polygon lie in the eircumfercnce of the circle.

And definitions 5 and 6 thus :—

Definition. — A polygon is said to be circumscribed about a cirele, and a circle is said to be inscribed in a polygon, if the sides of the polygon are tangents to the eircle.

§ 39. The first problem is merely constructive. It requires to draw in a given circle a cliord equal to a given straight line, which is not greater than the diameter of the eircle. The problem is not a determinate one, inasmuch as the chord may be drawn from any point in the cireumference. This may be said of almost all pro- blems in this book, especially of the next two. They are :—

Prop. 2. In @ given circle to inscribe a triangle equiangular to a given triangle ;

Prop. 3. About a given eircle to cireumscribe a triangle equi- angular to a given triangle.

§ 40. Of somewhat greater interest are the next problems, where the triangles are given and the circles to be found.

Prop. 4. To inseribe a circle in a given triangle. ;

The result is that the problem has always a solution, viz., the centre of the circle is the point where the biseetors of two of the uterior angles of the triangle meet. The solution shows, though Euclid does not state this, that the problem has but one solu- tion ; and also, ;

THEOREM. — The three bisectors of the interior angles of any triangle

meet in a point, and this is the eentre of the cirele inscribed in the triangle.

The solutions of most of the other problems eontain also theorems. Of these we shall state those which are of special intcrest ; Euclid does not state any one of them.

§ 41. Prop. 5. To cirenmseribe a eircle about a given triangle.

The one solution which always exists contains the following :—

THEOREM.—The three straight lines which biscet the sides of a triangle at right angles meet in a point, and this point is the eentre of the circle circumscribed about the triangle.

Euclid adds in a corollary the following property :—

The centre of the circle circumscribed about a triangle lies within, on a side of, or without the triangle, according as the triangle is acutc-angled, right-angled, or obtuse-angled.

§ 42, Whilst it is always possible to draw a circle which is inscribed in or circumscribed about a given triangle, this is not the case with quadrilaterals or polygons of more sides, Of those for which this is possible the regular polygons are the most interesting. In each of them a circle may be inscribed, and another may be cireumscribed about it.

Euclid does not use the word regular, but he describes the polygous in question as equiangular and equilateral. We shall use the name regular polygon. The regular triangle is equi- lateral, the regular quadrilateral is the square.

Euclid considers the regular polygons of 4, 5, 6, and 15 sides. For each of the first three he solves the problems—(1) to inscribe such a polygon in a given circle; (2) to cirewmscribe it about a given circle; (3) to inscribe a circle in, and (4) to circumscribe a circle about, such a polygon.

For the regular triangle the problems are not repeated, because more general problems have been solved.

Props. 6, 7, 8, and 9 solve these problems for the square.

The general problem of inscribing in a given circle a regular polygon of 2 sides depends upon the problem of dividing the cir- cumference of a circle into n equal parts, or what comes to the same thing, of drawing from the

centre of the circle 7 radii such that the angles between consecutive radii are equal, that is, to divide the space about the centre into n equal angles. Thus, if it is required to inscribe a square in a circle, we have to draw four lines from the centre, making the four angles equal. This is done by drawing two diameters at right angles to one another. The ends of these diameters are the verticcs of the required square. If, on the other hand, tangents be drawn at these ends, we obtain a square circum- scribed about the circle.

§ 43. To construct a regular pentagon, we find it convenient first to construct a regular decagon. This requires to divide the space about the centre into ten equal angles. Each will be ?oth of a right angle, or 4th of two right angles. If we suppose the decagon con- structed, and if we join the centre to the end of one side, we get an isoceles triangle, where the angle at the centre equals $th of two right angles ; hence each of the angles at the base will be 3ths of two right angles, as all three angles together equal two right angles. Thus we have to construct an isoceles triangle, having the angle at the vertex equal to half an angle at the base. This is solved in Prop. 10, by aid of the problem in Prop. 11 of the second book. If we make the sides of this triangle equal to the radius of the given circle, then the base will be the side of the regular decagon inseribed in the circle. This side being known the decagon can be coustructed, and if the vertices are joined alternately, leaving out half their number, we obtain the regular pentagon.

Euclid does not proceed thus. He wants the pentagon before the decagon. This, however, does not change the real nature of his solution, nor does his solution become simpler by not mention- ing the decagon.

Once the regular pentagon is inscribed, it is easy to cireumscribe another by drawing tangents at the vertices of the inscribed peu- tagon. This is shown in Prop. 12.

Prop. 18 and 14 teach how a circle may be inscribed in or cir- cumscribed about any given regular pentagon.

§ 44. The regular hexagon is more casily constructed, as shown in Prop. 15. The result is that the side of the regular hexagon inscribed in a circle is equal to the radius of the circle.

a this polygon the other three problems mentioned are not solved.

§ 45. The book closes with Prop. 16. To inscribe a regular quindeeagon in a given circle. That this may be donc is easily seen. If we inseribe a regular pentagon and a regular hexagon in the circle, having one vertex in common, then the arc from the common vertex to the next vertex of the pentagon is 3th of the cir- cumference, and to the next vertex of the hexagon is 3th of the circumference. The difference between these arcs is, therefore, 4—1=,th of the circumference. The latter may, therefore, be divided into thirty, and hence also in fifteen equal parts, and the regular quindecagon be described.

§ 46. We conclude with a few theorems about regular polygons which are not given by Euclid.

THEoREM,—TZhe straight lines perpendicular to and biseeting the

ETRY

sides of any regular polygon meet in a point. The straight lines bisecting the angles in the regular polygon meet in the same point. This point is the centre of the evreles eireumseribed about and inseribed in the regular polygon. The proof, which is easy, is left to the reader.

We can bisect any given are (Prop. 30, III.). Hence we can divide a circuinference into 27 equal parts as soon as it has been divided into » equal parts, or as soon as a regular polygon of » sides has been constructed. Hence—

TurorEmM.—ZJ/ a regular polygon of n sides has been constructed, then a regular polygon of 2n sides, of 4n, of 8n sides, de., may also be constructed. Euclid shows how to construct regular poly- gons of 3, 4, 5, and 15 sides. It follows that we can construct regular polygons of

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a ee

5, 10, 2, M… ,, i) BO; “G0, A206. G5

The construction of any new regular polygon not included in one of these series will give rise to a new series. Till the beginning of this century nothing was added to the knowledge of regnlar polygons as given by Euclid. Then Gauss, in his celebrated Arithmetic, proved that every regular polgon of 2” +1 sides may be constructed if this number 2” +1 be prime, and that no others can be constructed by elementary methods. This shows that regular polygons of 7, 9, 18 sides cannot thus be constructed, but that a regular polygon of 17 sidcs is possible ; for 17=2*+1. The next polygon is one of 257 sides. The construction becomes already rather complicated for 17 sides,

Boox V.

§ 47. The fifth book of the Elements is not exclusively geome- trical. It contains the theory of ratios and proportion of quantities in general. The treatment, as here given, is admirable, and in every respect superior to the algebraical method by whieh Euclid’s theory is now generally replaced. It has, however, the reputation of being too difficult for schools, and is therefore very seldom read. We shall try to make the subject clear, and to show why the usual algebraical treatment of proportion is not really sound. We begin by quoting those definitions at the beginning of Book Y. which are most important. These definitions have given rise to much discussion.

The only definitions which are essential for the fifth book are Defs. 1, 2, 4, 5, 6, and 7. Of the remainder 3, 8, and 9 are more than useless, and probably not Euclid’s, but additions of later editors, of whom Theon of Alcxandria was the most prominent. Defs. 10 aud 11 belong rather to the sixth book, whilst all the others are merely nominal. The really important ones are 4, 5, 6, and 7.

§ 48. To define a magnitude is not attempted by Euclid. The first two definitions state what is meant by a “part,” that is, a submultiple or measure, and by a “‘ multiple” of a given magni- tude. The meaning of Def. 4 is that two given quantities can have a ratio to one another only in case that they are comparable as to their magnitude, that is, if they are of the same kind.

Def. 8, which is probably due to Theon, professes to define a ratio, but is as meaningless as it is uncalled for, for all that is wanted is given in Defs. 5 and 7.

In Def. 5 it is explained what is meant by saying that two magnitudes have the same ratio to one another as two other magnitudes, and in Def. 7 what we have to understand by a greater ora less ratio. The 6th definition is only nominal, explaining the meaning of the word proportional.

Euclid represeuts magnitudes by lines, and often denotes them cither by single letters or, like lines, by two letters. We shall use ouly single letters for the purpose. If a and 4 denote two magni- tudes of the same kind, their ratio will be denoted by a : 6; if eand dare two other magnitudes of the same kind, but possibly of a different kind from a and 6, tlicn if c and d lave the same ratio to one another as a and 3, this will be expressed by writing—

ao [i BR DG x

Further, if m is a (whole) number, ma shall denote the multiple of a which is obtained by taking it m times.

¢ 49, The whole theory of ratios is based on Def. 5.

Def. 5. The first of fonr magnitudes is said to have the same ratio to the second that the third has to the fourth when, any equimultiples whatever of the first and the third being taken, and any equimul-

| tiples whatever of the second and the fourth, if the multiple of the first

be less than that of the second, the multiple of the third is also less than that of the fourth; and if the maltiple of the first vs eqneal to that of the seeond, the multiple of the third is also equal to that of the fourth ; and if the multiple of the first is greater than that of the second, the multiple of the third ts also greater than that of the fourth.

BOOKS IV. V.]

It will be well to show at once in an cxample how this definition can be used, by proving the first part of the first proposition in the sixth book. Triangles of the same altitude are to one another as their bases, or if and bare the bases, and a and B the areas, of two triangles which have the same altitude, then a:b: :a:8.

To prove this, we have, according to Definition 5, to show—

if ma>nb, then ma>nf, if ma=nb, then ma=nB, if ma

That this is true is in our case easily seen. We may suppose that the triangles have a common vertex, and their bases in the same line. We set off the base a along the line containing the bases m times; we then join the different parts of division to the vertex, and get m triangles all equal to a. The triangle on ma as base equals, therefore, ma. If we proceed in the same manner with the base b, setting it off 2 times, we find that the area of the triangle on the base nb equals 7, the vertex of all triangles being the same. But if two triangles have the same altitude, then their areas are equal if the bases are equal ; hence ma=nB if ma=nb, and if their bases are unequal, then that has the greater area which is on the greater base; in other words, ma is greater than, equal to, or less than np, according asma is greater than, equal to, or less than nb, which was to be proved.

§ 50. It will be seen that even in this example it docs not become evident what a ratio really is. It is still an open question whether ratios are magnitudes which we can compare. We do not know whether the ratio of two lines is a magnitude of the same kind as the ratio of two areas. Thongh we might say that Def. 5 defines equal ratios, still we do not know whether they are equal in the sense of the axiom, that two things which are equal to a third are cqual to one another, hat this is the case requires a proof, and until this proof is given we shall use the :: Instead of the sign =, which, however, we shall afterwards introduce,

As soon as it has been established that all ratios are like magni- tudes, it becomes easy to show that, in some cases at least, they are numbers. This step was never made by Greek mathematicians. They distinguished always most carefully between continuous magnitudes and the discrete series of

numbers. In modern times it has become the eustom to ignore this difference.

If, in determining the ratio of two lines, a common measure can be found, which is containcd m times in the first, and 2 times in the second, then the ratio of the two lines equals the ratio of the two numbers m:n. This is shown by Euclid jn Prop, 5, X. But the ratio of two numbers js, as a rule, a fraction, and the Greeks did not, as we do, consider fractions as numbers. Far less had they any notion of introducing irrational numbers, which are neither whole nor fractional, as we are obliged to do if we wish to say that all ratios are numbers. The incommensurable numbers which are thus introduced as ratios of incommensurable quantities are now-a- days as familiar to us as fractions; but a proof is generally omitted that we may apply to them the rules which have been established for rational numbers only. Euclid's treatment of ratios avoids this difficulty. His definitions holds for commensurable as well as for incommensurable quantities, Even the notion of incgmmensurable quantities is avoided in Book V. But he proves that the more elementary rules of algebra hold for ratios. We shall state all his propositions in that algebraical form to whieh we are now accustomed, This may, of course, be done without changing the character of Euclid's method.

§ 51. Using the notation explained above we express the first

propositions as follows :— Prop. 1. If a=ma', b=mb', c=me' hen a+b+c=m(a'+b'+e'),

a=mb, and e=md, e=nb, and f=nd,

then a+e is the same multiple of b as ¢+f is of d, viz.:— ate=(m+n)b, and c+f=(m+n)d,

Prop. 3. If a=mb, c=md, then is na the same multiple of 6 that ne is of d, viz., na=nmb, ne=nmd.

Prop. 2. lf

Prop. 4. If G3 BOS SA hur then ma :nb::me :nd, Prop. 5. 1f a=mb, and e=md then a—e=m(b—d). Prop. 6. If a=mb, c= md,

then are a—nb and ¢-nd either equal to, or equimultiples of, d and d, viz, a —nb=(m-n)b and ¢-nd= (m—n)d, where m—n may be unity.

All these propositions relate to equimultiples. Now follow propositions about ratios which are compared as to their magnitude.

§ 52. Prop. 7. If a=b, thena:e::b:cande:a::e:b. The proof is simply this.

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As a@=6 we know that ma=mb; |

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t ma>ne, then mb>ne, 1 ma=ne, then mb=ne, if mab, then a:¢>b:e, and C1Ob:e, thena>bd

herefore if f

and if e:aMBWH 8G But,

and TERS BBs

then , G2GA8 BO Sie

In words, if two ratios are equal to a third, they are equal to one another. After these propositions have been proved, we have a right to consider a ratio as a magnitude, for only now can we | consider a ratio as something for which the axiom about magni- tudes holds; things which are equal to a third are equal to one another.

We shall indicate this by writing in future the sign = instead of ::. The remaining propositions, which explain themselves, may then be stated as follows:—

§ 53, Prop. 12, If a:b=e :d=e sf,

then at+e+e:b+d+f=a:b., Prop. 13. lf a:b=c:dandc:d>ce:/, then a:b>e:f.

Prop. 14. If a@:b=e:d, and a>e, then b>d. Prop. 15. Magnitudes have the same ratio to onc another that their equimultiples have— ma:mb=a:b. Prop. 16. Ifa 8, ¢, d are magnitudes of the same kind, and if

a@ ib=¢:d, then @:c=0 3d. Prop. 17. 1£ a+b :b=c+d:d, then Gh 206 2 GH, Prop. 18 (converse to 17). If a:b=e:d then a+b:b=e+d:d.

Prop. 19. lf a, b, ¢, d are quantities of the same kind, and if a@:b=e:d, then a-ce:b-d=a:b,

§ 54. Prop. 20, Jf there be three magnitudes, and other three, which have the same ratio, taken two and two, then of the first be greater than the third, the fourth shall be greater than the sixth ES and if equal, equal ; and if less, less.

If we understand by

DO OO pe cl NO MOP ee oh oe that the ratio of any two consecutive magnitudes on the first side equals that of the corresponding magnitudes on the second side, we may write this theorem in symbols, thus :—

If a, b, e be quantities of one, and d, ¢, f magnitudes of the samo or any other kind, such that

and if a>e, then d>f, but if a=c, then d=f, and if a

or if nr Af Te Oe | and if a>c, then d> f, but if a=e, then d= f, and if a

By aid of these twa propositions the following two are proved.

§ 55. Prop. 22. If there be any number of magnitudes, and as many others, which have the same ratio, taken two and two in order, the first shall have to the last of the first magnitudes the same ratio which the first of the others has to the last.

We may state it more generally, thus :—

fi Cue nemie:. . a! Weed ves… ,

then net enly have two consecutive, but any two magnitudes on the first side, the same ratio as the corresponding magnitudes on the other. For instance—

a:e=a’:c¢3 b:e=b’:e’, &e. Prop. 23 we state only in symbols, viz. :—

If ORCI (Cre. = 2 a, sm 2

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then

and so on.

Prop. 24 comes to this: Ifa@:b=e:d and e:d=f:d, then

ate:b=et+f:d.

Some of the proportions which are eonsidered in the above pro- positions have special names. These we have omitted, as being of no use, since algebra has enabled us to bring the different operations contained in the propositions under a common point of view.

§ 56. The last proposition in the fifth book is of a different character.

Prop. 25. If four magnitudes of the same kind be proportional, the greatest and least of them together shall be greater than the other two together. In symbols—

lf a, 6, e, d be magnitudes of the same kind, and if a :b=e :d, and if a is the greatest, hence d the least, then a+d>b+e.

§ 57. We return onee again to the question, What is a ratio? We have seen that we may treat ratios as magnitudes, and that all ratios are magnitudes of the same kind, for we may compare any two as to their magnitude. It will presently be shown that ratios of lines may be considered as quotients of lines, so that a ratio appears as answer to the question, How often is one line

contained in another? But the answer to this question is given by a number, at least in some eases, and in all eases if we admit ineommensurable uumbers. Considered from this point of view, we may say the fifth book of the Elements shows that some of the simpler algebraieal operations hold for ineommensurable numbers. In the ordinary pe a treatment of numbers this proof is altogether omitted, or given by a process of limits which does not seem to be natural to the subject.

Boox VI.

§ 58. The sixth book contains the theory of similar figures. After a few definitions explaining terms, the first proposition gives the first application of the theory of proportion.

Prop. 1. Triangles and parallelograms of the same altitude are to one another as their bases.

The proof has already been considered in § 49.

From this follows easily the important theorem

Prop. 2. If a straight line be drawn parallel to one of the sides of a triangle, it shall eut the other sides, or those sides produced, pro- portionally ; and of the sides or the sides prodweed be cut proportion- ally, the straight line whieh joins the points of section, shall be parallel to the remaining side of the triangle.

§ 59. The next proposition, together with one added by Simson as Prop. A, may be expressed more conveniently if we introduce a modern phraseology, viz., if in a line AB we assume a point C between A and B, we shall say that C divides AB internally in the ratio AC: CB; but if C be taken in the line AB produeed, we shall say that AB is divided externally in the ratio AC : CB.

The two propositions then eome to this :

THEOREM (Prop. 3).—The bisector of an angle in a triangle divides the opposite side internally in a ratio equal to the ratio of the two sides

tneluding that angle; and eonversely, ¢ a line through the vertex of a triangle divide the base internally in the ratio of the two other sides, then that line bisects the angle at the vertex.

.TuroreM (Simson's Prop. A).—TZhe line which bisects an extertor angle of a triangle divides the opposite side externally in the ratio of the other sides; and conversely, if a line through the vertex of a triangle divide the base externally in the ratio of the sides, then it biseets an exterior angle at the vertex of the triangle.

If we eombine both we have—

THEOREM.—The two lines which biseet the interior and exterior angles at one vertex of a triangle divide the opposite side internally " externally in the same ratio, viz., in the ratio of the other two Staes.

§ 60. The next four propositions contain the theory of similar

—— of which four cases are considered. They may be stated toget ner,

THEOREM.— Two triangles are similar,—

1. (Prop. 4). If the triangles are equiangular ;

2. (Prop. 5). Uf the sides of the one are proportional to those of the other ;

3. (Prop. 6). If two sides in one are proportional to two sides in the other, and Uf the angles contained by these sides are equal ;

4, (Prop. 7). If two sides in one are proportional to two sides in the other, if the angles opposite homologous sides are equal, and if the angles opposite the other homologous sides are both acute, both right,

or both obtuse; homologous sides being in eaeh case those which are .

opposite equal angles.

An important application of these theorems is at once made to a right-angled triangle, viz. :—

Prop. 8. Jn a right-angled triangle, if a perpendicular be drawn from the right angle to the base, the triangles on each side of it are similar to the whole triangle, and to one another.

Corollary.—From this it is manifest that the perpendieular drawn from the right angle of a right-angled triangle to the base is a mean proportional between the segments of the base, and also that eaeh of the sides is a mean proportional between the base and the segment of the base adjacent to that side.

§ 61. There follow four propositions eontaining problems, viz., in language slightly different from Euelid's:—

Prop. 9. To divide a straight line into a given number of equal parts.

Prop. 10. To divide a straight line in a given ratio.

Prop. 11. To jind a third proportional to two given straight lines. .. Prop. 12. Zo find a fourth proportional to three given straight ines.

Prop. 13. To find a mean proportional between two given straight lines.

The last three may be written as equations with one unknown quantity,—viz., if we call the given straight lines a, }, e, and the required line x, we have to find a line x so that

Prep. 14. 30 DBs Prop. 12. 610 Serna s Prop. 13. a:x= 2b.

We shall see presently how these may be written without the signs of ratios.

§ 62. Kuelid considers next proportions connected with parallelo- grams and triangles which are equal in area.

Prop. 14. Equal parallelograms which have one angle of the one equal to one angle of the other have their sides about the equal angles reciprocally

proportional; and parallelograms which have one angle of the one equal to one angle of the other, and their sides about the equal angles reciprocally proportional, are equal to one another. ;

Prop, 15. Equal triangles which have one angle of the one equal to one angle of the other, have their sides about the equal angles reciprocally proportional; and triangles which have one angle of the one equal to one angle of the other, and thet sides about the equal angles reciprocally proportional, are equal to one another.

The latter proposition is really the same as the former, for if, as in the aecompanying diagram, in the figure belonging to the former the two equal parallelo- grams AB and BC be biseeted by the lines DF and EG, and if EF be drawn, we get the figure belonging to the latter.

It is worth noticing that the lines FE and DG are parallel. We may state therefore the theorem—

THEOREM,—If two triangles are equal in aren, and have one angle in the one vertically opposite to one angle in the other, then the two straight lines which join the remaining two vertices of the one to those of the other triangle are parallel.

§ 68. A most important theorem is

Prop. 16. Jf fowr straight lines be proportionals, the reetangle contained by the extremes is equal to the rectangle contained by the means ; and Uf the reetangle contained by the catremes be equal to the rectangle contained by the means, the four straight lines are vropor- tionals.

In symbols, if a, 0, ¢, d are the four lines, and

if a:b=e:d, then ad=be ; and conversely, if ad = be, then & bend,

where ad and be denote (as in § 20), the areas of the rectangles contained by a and d and by 8 and ¢ respeetively.

This allows us to transform every proportion between four lines: into an equation between two produets.

It shows further that the operation of forming a product of two lines, and the operation of forming their ratio are each the inverse of the other.

If we now define a quotient 5 of two lines as the number which multiplied into 6 gives a, so that ; b= as we see that from the equality of two quotients a2

b 6a follows, if we multiply both sides by dd,

a c +b.d=—d. ; qe b,

OS =e.

BOOK VI. |

But from this it follows according to the last theorem that Gia = Beg. Hence we conelude that the quotieut 3 and the ratio a:b are

different forms of the same magnitude, only with this important difference that the quotient > would have a meaning only if a and

b have a common measure, until we introduce incommensurable numbers, while the ratio a: has always a meaning, and thus gives rise to the introduetion of incommensurable numbers.

Thus it is really the theory of ratios in the fifth book which enables us to extend the geometrical ealculus given before in con- nexion with Book IJ. It will also be seen that if we write the ratios in Book V. as quotients, or rather as fraetions, then most of the theorems state properties of quotients or of fractions.

§ 64. Prop. 17 contains only a special ease of 16. After the pro- blem, Prop. 18. On a given straight line to describe a reetilineal Jigure similar and similarly situated to a given rectilineal figure, there follows another fundamental theorem :

Prop. 19. Similar triangles are to one another in the duplicate ratio of their homologous sides. In other words, the areas of similar triangles are to one another as the squares on homologous sides. This is generalized in

Prop. 20. Similar polygons may be divided into the same number of similar triangles, having the same ratio to one another that the polygons have; and the polygons are to one another in the duplicate ratio of their homologous sides.

§ 65. Prop. 21. Reetilincal figures which are similar to the same reetilineal figure are also similar to each other, isan iminediate con- sequenee of tlie definition of similar figures. As similar figures may be said to be equal in ‘‘shape” but not in ‘‘size,” we may state it also thus:

‘Figures which are equal in shape to a third are equal in shape to each other.”

Prop. 22. Jf four straight lines be proportionals, the similar reetilineal figures similarly deseribed on them shall also be pro- portionals; and if the similar reetilineal figures similarly deseribed on four straight lines be proportionals, those straight lines shall be proportionals.

This is essentially the same as the following :—

If a:b @ Bas then a? 3b? = & : d?,

§ 66. Now follows a proposition which has been much discussed with regard to Euelid’s exact meaning in saying that a ratio is eom- pounded of two other ratios, viz. :

Prop. 23. Parallelograms whieh are equiangular to one another, have to one another the ratio whieh is eompounded of the ratios of their sides.

The proof of the proposition makes its meaning clear. In symbols the ratio @ :¢ is compounded of the two ratios a:b and b:c, andif a:b =a’:b’, bie = b” :e”, theua:cis compounded of a’: and ene.

If we eonsider the ratios as numbers, we may say that the one ratio is the product of those of which it is compounded, or in symbols,

Gad

ero 8 ¢c

The theorem in Prop. 23 is the foundation of all mensnration of areas. Froni it we see at onee that two rectangles have the ratio of their areas compounded of the ratios of their sides.

If A is the area of a rectangle contained by a and 8, and B that of a rectangle contained by ¢ and d, so that A = ab, B = cd, then A:B= ab: ced, and this is, the theorem says, compounded of the ratiosa :e¢andb:d. In forms of quotients,

CO Gh

This shows how to multiply quotients in our geometrical] calculus.

Further, Two triangles have the ratios of their areas eomnounded of the ratios of their bases and their altitude. Fora triangle is equal in arca to half a parallelogram which has the same base and the same altitude.

To bring these theorems to the form in which they are usually given, we assume a straight line w as our unit of length (generally an inch, a foot, a mile, &e.), and determine the number a whici expresses how often a is contained in a line a, so that a denotes the ratio a :2% whether eommensurable or not, and thata = aw. We eall this number a the numerical valueofa. If in the same manner B be the numerical valuc of a line b we have

Geo 1 8/8) 6 in words: The ratio of two lines (and of two like quantities in general) ts equal to that of their numerical values. This is easily proved by observing that a = au, b = Bu, there- fore a:b = aw: Bu, and this may without difficulty be shown to equal a: Bf.

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If now a, 6 be base and altitude of one, a’, b’ those of anotlier parallelogram, a, 8 and a’, pf’ their numerical values respectively, and A, A’ their areas, then

f B _ «B

A’ a’ Bp’ oa’Br In words: The areas of two parallelograms are to each other as the produwets of the numerical values of their bases and altitudes.

If especially the seeond parallelogram is the unit square, i.c., a

square on the unit of length, then a = gp’ = 1, A’ = w?, and we have = =aB. or A = af. u2.

This gives the theorem: The number of unit squares contained in a parallelogram equals the product of the numerieal values of base and altitude, and similarly the number of unit squares contained in a triangle equals half the produet of the numerical values of base and altitude.

This is often stated by saying that the area of a parallelogram is equal to the product of the base and the altitude, meaning by this product the produet of the numerical values, and not the produet as defined above in § 20.

§ 68. Propositions 24 and 26 relate to parallelograms about diagonals, sueh as are eonsidered in Book I., 43. They are—

Prop. 24. Parallelograms about the diameter of any parallelo- gram are similar to the whole parallelogram and to one another; and its converse (Prop. 26), Jf two similar parallelograms have a eommon angle, and be similarly sitwated, they are. about the same diameter.

Between these is inserted a problem.

Prop. 25. To deseribe a reetilineal figure which shall be similar to one given reetilincar figure, and equal to another given rectilineal Sigure.

§ 69. Prop. 27 contains a theorem relating to the theory of maxima and minima. We may state it thus:

Prop 27. Ifa parallelogram be divided into two by a straight line cutting the base, and if on half the base another parallelogram be constricted similar to one of those parts, then this third parallelo- gram is greater than the other part.

Of far greater interest than this general theorem is a special case of it, where the parallelograms are changed into reetangles, and where one of the parts into which the parallelogram is divided is made a square; for then the theorein ehanges into oue which is easily recognized to be identical with the following :—

THEOREM.—Of all reetangles which have the same perimeter the square has the greatest area.

This may also be stated thus :-—

THEOREM.—Of all reetangles whieh have the same area the square has the least perimeter.

§ 70. The next three propositions contain problems which may be said to be solutions of quadratic equations. The first two are, like the last, involved in somewhat obscure language. We tran- scribe them as follows :—

Problem.—To describe on a given base a parallelogram, and to divide it either internally (Prop. 28) or externally (Prop. 29) from a point on the base into two parallelograms, of whieh the one has a given size (is equal in area to a given figure), whilst the other has a given shape (is similar to a given parallelogram).

Tf we express this again in symbols, calling the given base a, the one part 2, and the altitude y, we have to determine x and y in the first case from the equations

$(a-x)y= kK,$

cee a Me k? being the given size of the first, and p and g the base and altitude of the parallelogram which determine the shape of the second of the required parallelograms. . If we substitute the value of y, we get

2

(a-a}n—P,

or, ax -~ 22 =? ,

2

where @ and b- are known quantities, taking pie

The second case (Prop. 29) gives rise, in the same manner, to the quadratic ax+a?=b%, The next problem— Prop. 30, To eut a given straight line in extreme and mean ratio, leads to the equation ax+a°=a,

This is, therefore, only a special case of the last, and is, besides, an old acquaintance, being esseutially the same problem as that proposed in I]. 11.

x a8

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Prop. 80 may therefore be solved in two ways, either by aid of Prop. 29 or by aid of II. 11. Euclid gives both solutions.

§ 71. Prop. 81 (Theorem). Jn any right-angled triangle, any recti- lineal figure deseribed on the side subtending the right angle ts equal to the similar and similarly-deseribed figures on the sides containing the right angle,—is a pretty generalization of the theorem of Pytha- goras (I. 47). ;

Leaving out the next proposition, which is of little interest, we come to the last in this book.

Prop. 33. In equat eircles angles, whether at the centres 0? the cir- ennrferences, have the same ratio whieh the ares on which they stand have to one another ; so also have the sectors.

Of this, the part relating to angles at the ccntre is of special importance; it enables us to measure angles by arcs.

_ With this closes that part of the Elements which is devoted to the study of figures in a plane.

Boox XI.

§ 72. In this book figures are considered which are not confined to a plane, viz., first relations between lines and planes in space, and afterwards properties of solids.

Of new definitions we mention those which relate to the perpen- dicularity and the inclination of lines and planes.

Def. 3. A straight line is perpendicular, or at right angles, to a plane when it makes right angles with every straight line mecting it tn that plane. ;

The definition of perpendicular planes (Def. 4) offers no dif- ficulty. Euclid defines the inclination of lines to planes and of planes to planes (Defs. 5 and 6) by aid of plane angles, included by piraight lines, with which we have been made familiar in the first

ooks.

The other important definitions are those of parallel planes, which never meet (Def. 8), and of solid angles formed by three or more planes meeting in a point (Def. 9).

To these we add the definition of a line parallel to a plane as a line which does not meet the plane.

§ 73. Before we investigate the contents of Book XI., it will be well to recapitulate shortly what we know of planes atél lines from the definitions and axioms of the first book. There a plane has been defined as a surfaee which has the property that every straight line which joins two points in it lies altogether init. This is equi- valent to saying that a straight line which has two points in a plane has all points in the plane. Hence, a straight line

which does not lic in the plane cannot have more than one point in common with the plane. This is virtually the same as Euclid’s Prop. 1, viz.:—

Prop. 1. One part of a straight line cannot be in a plane and another part without it.

It also follows, as was pointed out in § 3, in discussing the definitions of Book I., that a plane is determined already by one straight, line and a point without it, viz., if all lines be drawn through the point, and eutting the line. they will form a plane.

This may be stated thus :—

A plane is determinecd—

Ist, By a straight line and a point which does not lée on tt;

2d, By three points which do not lic in a straight line; for if two of these points be joined by a straight line we have case 1;

3d, By two intersecting straight lines; for the point of intersection and two otlier points, one in each line, give case 2;

4th, By two parallel lines (Def. 35, I.).

The third case of this theorem is Euclid's

Prop. 2. Two straight lines which cut one another are m one plane, and three straight lincs which mect one another are in one plane.

And the fourth is Euclid's

Prop. 7. If two straight lines be parallel, the straight line drawn Srom any point in one toany point in the other és in the sane plane with the parallels. From the definition of a plane further follows ¢

Prop. 3. [f two planes cut one another, their common section is a straight line.

§ 74. Whilst these propositions are virtually contained in the definition of.a planc, the next gives us a new and fundamental pro- perty of space, showing at the same time that it is possible to have a straight line perpendicular to a planc, according to Def. 3. It states—

THEOREM (Prop. 4).—Jf @ straight line is perpendicular to two siraight lines in a plane which it meets, then it ts perpendicular to all lines in the plane whieh it meets, and hence it is perpendicular to the plane.

Def. 3 may be stated thus: If a straight line is perpendicular to a plane, then it is perpendicular to every line in the plane which it meets. The converse to this would be :

THEOREM.—All straight lines whieh meet a given straight line in the same point, and are perpendicular to it, lic in a plane which is perpendicular to that line.

This Euclid states thus : .

Prop. 5. If three straight lines meet all at one point, and a straight

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line stands at right angles to each of them wt that point, the three straight lines shall be in one and the same plane.

§ 75. There follow theorems relating to the theory of parallel lines in space, viz. :—

THEOREM (Prop. 6).—Any two lines which are perpendicular to the same plane are parallel to each other ; and conversely

THEOREM (Prop. 8).—Jf of two parallel straight lines one is ver-pendieular to a plane, the other is so also.

Further, the important theorems

Prop. 9. Two straight lines which are each of them parallet to the same straight line, and not in the same plane with it, are parallel to one another; where the words, “‘and not in the same plane with it,” may be left out, for they exclude the case of three parallels in a plane, which has been proved before; and

THEOREM (Prop. 10).—Jf two angles in different planes have the two limits of the one parallel to those af the other, then the angles are cqual. That their planes are parallel is shown later on in Prop. 15.

This theorem is not necessarily true, for the angles in question may be supplementary; but then the one angle will be equal to that which is adjacent and supplementary to the other, and this latter angle will also have its limits parallel to those of the first.

From this theorem it follows that if we take any two straight lines in space which do not meet, and if we draw through any point P in space two lines parallel to them, then the angle in- eluded by these lines will always be the same, whatever the position of the point P may be. This angle has in modern times been called the angle between the given lines :—

DEFINITION.—By the angles between two not intersecting lines we understand the angles whieh two intersecting lines include that wre parallel respectively to the two given lines.

§ 76. It is now possible to solve the following two problems :—

PROBLEM.—T°0 draw «@ straight line perpendicular to a given plane Srom.a given point whieh lies

1. Not in the plane (Prop. 11).

2. In the plane (Prop. 12).

The second case is easily reduced to the first—viz., if by aid of the first we have drawn any perpendicular to the plane from some point without it, we need only draw through the given point in the _ a line parallel to it, in order to have the required perpen-

icular given. The solution of the first part is of interest in itself. It depends upon a construction which may be expressed as a theorem. —.

THEOREM.—ZJf from a point A without a plane a perpendicular AB be drawn to the plane, and ¢f from the foot B of this perpen- dicular another perpendicular BC be drawn to any straight line in the plane, then the straight line joining A to the foot C of this second perpendicular will also be perpendicular to the line in the plane.

The theory of perpendiculars to a plane is concluded by the theorem— »

Prop. 18. Through any point in space, whether in or without a plane, only one straight line can be drawn perpendicular to the plane.

§ 77. The next four propositions treat of parallel planes. It is shown that plancs whieh have a common perpendicular are parallel (Prop. 14); that two planes are parallel if two intersecting straight lines in the one are parallel respectively to two straight lines in the other plane (Prop. 15) ; that parallel planes are cut by any plane in parallel straight lines (Prop. 16); and lastly, that any two straight lines are eut proportionally by a series of parallel planes (Prop, 17).

This theory is made more complete by adding the following theorems, which are easy deductions from the last :—Z'wo parallel plancs have common perpendiculars (converse to 14); and Two plancs which are parallel to a third plane are parallel to each other.

It will be noted that Prop. 15 at once allows of the solution of the problem: ‘‘ Throngh a given point to draw a plane parallel to a given plane.” And it is also easily proved that this problem allows always of one, and only of one, solution. ‘

§ 78. We come now to planes which are perpendicular to one another. ‘Two theorems relate to them.

Prop. 18. Jf a straight line be at right angles to a plane, every plane whieh passes through it shall be at right angles to that plane.

Prop. 19. Zf two planes which eut one another be each of them perpendicular to a third plane, their common section shall be perpendicular to the same plane.

§ 79. If three planes pass through a common point, and if they bound each other, a solid angle of three faces, or a trihedral angle, is formed, and similarly by more planes a solid angle of more faces, or a polyhedral angle. These liave many propertics which are quite analogous to those of triangles aud polygons in a plane. Euclid states some, Viz :—

Prop. 20. [fa solid angle be contained by three plane angles, any two of them are together greater than the third.

But the next—

Prop. 21. Every solid angle is contained by plane angles, which are together less than four right angles—has no analogous theorem in the plane.

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We may mention, however, that the theorems about tri- angles contained in the propositions of Book I., which do not depend upon the theory of parallels (that is all up to Prop. 27), have their corresponding theorems about trihedral aneles. The latter are formed, if for ‘‘side of a triangle” we write ‘* plane angle” or ‘‘face ” of trihedral angle, and for “angle of triangle” we substitute ‘‘angle between two faces” where the planes con- taining the solid angle are called its faces. We get, for in- stance, from I. 4, the theorem, Jf two trihcdral angles have the angles of two faces im the one eyual to the angles of two faces in the other, and have likewise the angles included by these Saces equal, then the angles in the remaining faces are equal, and the angles between the other faces are equal cach to each, viz., those which are opposite equal faecs. The solid angles themselves are not necessarily equal, for they may be only symmetrical like the right hand and the left.

The connexion indicated between triangles and trihedral angles will also be recognized in

Prop. 22. Jf every two of three plane angles be greater than the third, and vf the straight lines which contain them be all equal, a triangle may be made of the straight lines that join the extremities of those equal straight lines.

And Prop. 23. solves the problem, To construet a trihedral angle having the angles of its faces equal to three given plane angles, any two of them being greater than the third. It is, of course, analogous to the problem of constructing a triangle having its sides of given length.

Two other theorems of this kind are added by Simson in his edition of Kuclid's Elements, '

§ 80. These are the principal properties of lines and planes in space, but, before we go on to their applications it will be well to define the word distance. In geometry distance means always "'shortest distance"; viz., the distance of a point from a straight line, or from a eee is the length of the perpendicular from the point to the line or plane. The distance between two non- intersecting lines is the length of their common perpendicular, there being but one. The distance between two parallel lines or between two parallel planes is the length of the common perpendi- cular between the lines or the planes.

§ 81. Parallelepipeds.—The rest of the book is devoted to the study of the parallelepiped. In Prop. 24 the possibility of such a solid is proved, viz. :—

Prop, 24. If a solid be contained by six planes two and two of which are parallel, the opposite plancs are similar and equal parallclograms.

Euclid calls this solid henceforth a parallelepiped, though he never defines the word. Either faee of it may be taken as base, and its distance from the opposite face as altitude.

Prop 25. If @ solid parallelepiped be cut bya plane parallel to two of its opposite planes, it divides the whole into two solids, the base of one of whieh shall be to the base'of the other as the onc solid is to the other.

This theorem corresponds to the theorem (VI. 1) that parallelo- grams between the same parallels are to one another as their bases. A similar analogy is to be observed among a number of the remaining propositions.

§ 82. After solving a few problems we come to

Prop. 28. Jf a solid parallelepiped be cut bya plane passing through the diagonals of two of the opposite planes, tt shall be cut in two equal parts.

In the proof of this, as of several other propositions, Euclid negleets the difference betwecn solids which are symmetrical like the right hand and the

left.

Prop. 31. Solid parallelepipeds, whieh are upon equal bases, and of the same altitude, are equal to one another.

_ Props. 29 and 30 contain special cases of this theorem leading up to the proof of the general theorem.

As consequences of this fundamental theorem we get

Prop. 32. Solid parallelepipeds, which have the same altitude, are to one another as their bases ; and Prop. 33, Similar solid parallel- epipeds are to one another inthe triplieateratio oftheir honologous sides.

If we consider, as in § 67, the ratios of lines as numbers, we may also say—

The ratio of the volumes of similar parallelepipeds is equal to the ratio of the third powers of homologous sides.

Parallelepipeds which are not similar but equal are compared by aid of the theorem

Prop. 34. The bases and altitudes of equal solid parallelepipeds are reciprocally proportional ; and if the bases and altitudes be re- etprocally proportional, the solid parallelepipeds are equal.

§ 83. Of the following propositions the 37th and 40th are of special interest.

Prop. 37. If four straight lines be proportionals, the similar solid parallelepipeds, similarly deseribed from them, shall also be pro- portionals ; and if the similar parallelepipeds similarly described From four straight lines be proportionals, the straight lines shall be proportionals.

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In symbols it says— If a@:b=e:d, then a :03=¢3 ; d3.

Prop. 40 teaches how to compare the volumes of tiiangular prisms with those of parallelepipeds, by proving that a triangular prism is equal in volume to a parallelepiped, whieh has tts altitude and tts base equal to the altitude and the base of the triangular prism.

§ 84. From these propositions follow all results relating ‘to the mensuration of volumes. We shall state these as we did in the case of areas. The starting-point is the ‘rectangular ” parallelepiped, which has every edge papendiculay to the planes it meets, and which takes the place of the rectangle in the plane, If this has all its edges equal we obtain the “cube.”

If we take a certain line w as unit length, then the square on u is the unit of area, and the cube on w the unit of volume, that is to say, if we wish to measure a volume we have to determine how many unit cubes it contains,

A rectangular parallelepiped has, as a rule, the three edges unequal, which meet at a point. Every other edge is equal to one of them. Ifa, b, ¢ be the three edges meeting at a point, then we may take the rectangle} contained by two of them, say by 0 and ¢, as base and the third as altitude. Let V be its volume, V’ that of another rectangular parallelepiped which has the edges a’, b, ¢, hence the same base as the first. It follows then easily, from Prop. 25 or 32, that V: V’=a: a’; or in words,

Rectangular parallelepipeds on equal bases are proportional to their altitudes.

If we have two rectangular parallelepipeds, of which the first has the volume V and the edges a, 8,‘c, and the second,the volume V’ and the edges a’, 0’, c’, we may compare them by aid of two new ones which have respectively the edges a’, b, c, and a’, b’, e, and the volumes V; and V;. Wethen have

Vi Vy=a 303 V1: Vg=0 30, Va: V’=e-e’.

Compounding these, we have

V:V=(a:0’) (6:0) (¢:c,

View ae DO ag hi Voa Wed Hence, as a special case, making V’ equal to the unit cube U on we get a! = & ra . _ B Ct aa

where a, B, yy are the numerieal values of a, b, ¢; that is, The number of unit cubes in a rectangular parallelepiped is equal to the product of the numerical values of its threc edges. This is generally expressed by saying the volume of a rectangular parallelepiped is measured by the produet of its sides, or by the product of its base into its altitude, which in this case is the same.

Prop. 31 allows us to extend this to any parallelepipeds, and Props. 28 or 40, to triangular prisms.

THEOREM.—The volume of any parallelepiped, or of any tri- angular prism, is measured by the product of base and altitude.

The consideration that any polygonal prism may be divided into a number of triangular prisms, which have the same altitude and the sum of their bases equal to the base of the polygonal prism, shows further that the same holds for any prism whatever.

Boox XII.

§ 85. In the last part of Book XI. we have learnt how to com- pare the volumes of parallelepipeds and of prisms. In order to determine the volume of any solid bounded by plane faces we must determine the volume of pyramids, for every such solid may be decomposed into a number of pyramids.

As every pyramid may again be decomposed into triangular pyramids, it beeomes only necessary to determine their volume. This is done by the

Theorem.—Every triangular pyramid is cqual in volume to one third of a triangular prism having the same base and the same altitude as the pyramid.

This is an immediate consequence of Euclid’s

Prop. 7. Every prism having a triangular base may be divided into three pyramids that have triangular bases, and are equal to one another.

The proof of this theorem is difficult, because the three triangular pyramids into which the prism is divided are by no means equal in shape, and cannot be made to coincide. It has first to be proved that two triangular pyramids have equal voluines, if they have equal bases and equal altitudes. This Euclid does in the following manner. He first shows (Prop. 8) that a triangular pyramid may be divided into four parts, of which two are equal triangular pyra- mids similar to the whole pyramid, whilst the other two are equal triangular prisms, and further, that these two prisms together are greater than the two pyramids, hence more than half the given pyramid. He next shows (Prop. 4) that if two triangular pyra-

mids are given, having equal bases and equal altitudes, and if each be divided as above, then the two triangular prisms in the one are equal to those in the other, and each of the remaining pyramids in the one has its base and altitude equal to the base and altitude of the remaining pyramids in the other. Henee to these pyramids the same process is again applicable. We are thus enabled to cut out of the two given pyramids equal parts, each greater than half the original pyramid. Of the remainder we can again cut out equal parts greater than half these remainders, and so on as far as we like. This process may be continued till the last remainder is smaller than any assignable quantity, however small. It follows, so we should conclude at present, that the two volumes must be equal, for they eannot differ by any assignable quantity.

To Greek mathematicians this conelusion offers far greater diffi- eulties. They prove elaborately, by a reductio ad absurdui, that the volumes cannot be unequal. This proof must be read in the Elements. A further discussion of this method of exhaustion, as it is ealled, would belong to a treatise on the history of geometry. We refer readers to Hankel, Geschichte der Mathematik (p. 115 sq). We must, however, state that we have in the above not proved Euelid’s Prop. 5, but only ‘a special case of it. Euclid does not suppose that the bases of the two pyramids to be compared are equal, and hence he proves that the volumes are as the bases. The reasoning of the

proof becomes clearer in the special case, from which the general one may be easily deduced.

§ 86. Prop.-6 extends the result to pyramids with polygonal bases. From these results follow again the rules at present given for the mensuration of solids, viz., a pyramid is the third part of a triangular prism having the same base and the same altitude. But a triangular prism is equal in volume to a parallelepiped which has the same base and altitude. Hence if B is the base and / the altitude, we have

Volume of prism = BA,

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3 BA, statements which have to be taken in the sense that B number of square units in the base, h the numberxaf

length in the altitude, or that B and h denote the numerital vé of base and altitude. “ &

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Volume of pyramid

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§ 87. A method similar to that used in proving Prop. 5 Toads! the following results relating to solids bounded by simple a

surfaces :— x Prop. 10. Every cone is the third part of a cylinder whieh has th same base, and is of an equal altitude with it.

Prop. 11. Cones and eylinders of the same altitude are to one wn- ff

other as their bases. m Prop. 12. Similar cones and eylinders have to one another thé triplicate ratio of that which the diameters of their bases have. Prop. 18. Jf a eylinder be eut by a plane parallel to its opposite planes or bases, it divides the cylinder into two cylinders, one of which ts to the other

as the axis of the first to the axis of the other; which inay also be stated thus:—

Cylinders on the same base are proportional to their altitudes.

Prop. 14. Cones and eylinders upon equal bases are to one another as their altitudes.

Prop. 15. The bases and altitudes of equal cones and eylinders are reciprocally proportional, and if the bases and altitudes be reciprocally proportional, the cones and eylinders are equal to one another.

These theorems again lead to formule in mensuration, if we com- pare a cylinder with a prism having its base and altitude equal to the base and altitude of the cylinder. This may be hous We the method of exhaustion. We get, then, the result that their bases are equal, and have, if B denotes the numerical value of the base, and h that of the altitude,

Volume of eylinder

Bh. Volume of cone = > Bh,

§ 88. The remaining propositions relate to eircles and spheres. Of the sphere only one property is proved, viz. :—

Prop. 18. Spheres have to one another the triplicate ratio of that which their diameters have. The mensuration of the sphere, like that of the circle, the cylinder, and the cone, had not been settled in the time of Euclid. It was done by Archimedes.

Book XIII.

§ 89. The 13th and last book of Euclid’s Elements is devoted to the regular solids. It is shown that there are five of them, viz. :—

1. The regular ¢etrahedron, with 4 triangular faces and 4 vertices ;

2. The ewbe, with 8 vertices and 6 square faces ;

8. The oetohedron, with 6 vertices and 8 triangular faces;

4, The dodecahedron, with 12 pentagonal faces, 3 at each of the 20 vertices ;

5. The icosahedron, with 20 triangular faces, 5 at each of the 12 vertices.

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It is shown how to inseribe these solids in a given sphere, and how to determine the lengths of their edges.

These results are—if r denotes the radius of the eircumseribed sphere, and a the side of the regular solid—

For tetrahedron a?= 3 e,

*,, octahedron = 22.

,, hexahedron or cube a? = an, on ofa – Bu

a? = 2(1 ~ = .

§ 90. The 18th book, and therefore the Elements, conclude with the scholium, ‘‘that no other regular solid exists besides the five ones enumerated.”

The proof is very simple. Each face is a regular polygon, hence the angles of the faces at any vertex must be angles in equal regular polygons, must be together less than four right angles (XI. 21), and must be three or more in number. Each angle in a regular triangle equals two-thirds of one right angle. Hence it is possible to form a solid angle with three, four, or five regular triangles or faces. These give the solid angles of the tetrahedron, the

oetohedron, and the icosahedron. The angle in a square (the regular quadrilateral) equals one right angle. Hence three will form a solid angle, that of the cube, and four will not. The angle in the regular pentagon

equals £ of aright angle. Hence three of them equal ? (7.e., less

than 4) right angles, and form the solid angle of the dodecahedron. Three a polygons of six or more sides cannot form a solid angle. Therefore no other regular solids are possible.

3; icosahedron

», dodecahedron

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et, to characterize Projective uclidian. But a few examples erence between the two. almost all propositions refer to mes, angles, areas, or volumes, and ement. ‘The statement that an angle two straight lines are parallel, refers to Oh the other hand, the fact that a straight floes not cut a circle is independent of measure- being dependent only upon the mutual “ posi- the line and the circle. This difference becomes clearer if we project any figure from one plane to another. By this the length of lines, the magnitude of angles and areas, is altered, so that the projection, or shadow, of a square on a plane will not be a square ; it will, however, be some quadrilateral. Again, the projection of a circle will not be a circle, but some other curve more or less resembling a circle. But one property may be stated at once,—no straight line can cut the projection of a circle’in more than two points, because no straight line can cut a circle in more than two points. There are, then, some properties of figures which do not alter by projection, whilst others do. To the latter belong nearly all properties relating to measurement, at least in the form in which they are generally given. The others are said to be projective properties, and their investigation forms the subject of Projective Geometry.

Different as are the kinds of properties investigated in the old and the new sciences, the methods followed differ in a still greater degree. In Euclid each pro- position stands by itself; its connexion with others is | never indicated; the leading ideas contained in its proof are not stated; general principles do not exist. In the modern methods, on the other hand, the greatest import- ance is attached to the leading thoughts which pervade the whole; and general principles, which bring whole groups of theorems under one. aspect, are given rather than separate propositions. The whole tendency is towards generalization. A straight line is considered as given in its entirety, extending both ways to infinity, while Euclid

is very careful never to admit anything but finite quan- tities. The treatment of the infinite is in fact another fundamental difference between the two methods. Euclid avoids it. In modern geometry it is systematically intro- duced, for only thus is generality obtained.

Of the different modern methods of geometry, we shall treat: principally of the methods of projection and corre- spondence which have proved to be the most powerful. These have become independent of Euclidian Geometry, especially through the Geometrie der Lage of V. Standt, and the Awsdehnungslehre of Grassmann.

For the sake of brevity we shall presuppose a know- ledge of Euclid's Elements, although we shall use only a few of his propositions.

§ 1. We consider space as filled with points, lines, and planes. and these we call the elements out of which our figures are to be formed, calling any combination of these elements a " fignre."

By a line we mean a straight line in its entirety, extending both ways to infinity; and by a plane, a plane surface, extending in all directions to infinity. We suppose

That through any two points in space one and only one line

may be drawn (Eucl. i Def. 4, Ax. 10, Post. 2); That through any three points which are not in a line, one and only one plane may be placed (compare p. 386, $ 73, above) ; That the intersection of two planes is a line (Eucl. XI. 18) ; That a line which has two points in common with a plane lies in the plane (Euel. I., Def. 7), hence that the intersection of a line and a plane is a single point; and That three planes which do not meet in a line have one single point in common. These results may be stated differently in the following form :— . A plane is determined— A point is determined— 1, By three points which do 1. By three planes which do not lie in a line; not pass through a line ; 2. By two intersecting lines ; 2. By two intersecting lines ; 3. Byaline anda pointwhich 3. By a line and a plane which does not lie in it. does not pass through it. Il. A line is determined— 1. By two points ; 2. By two planes.

The reader will observe that not only are planes determined by points, but also points by planes; that therefore we have a right to eonsider the planes as elements, like points; and also that in any one of the above. statements we may interchange the words point and plane, and we obtain again a correct statement, provided that these statements themselves are trne. As they stand, we ought, in several cases, to add ‘‘if they are not parallel,” or some sueh words, parallel lines and planes being evidently left altogether out of consideration. To correct this we have to reconsider the theory of parallels.

§ 2. Let us take in a plane a line p (fig. 1), a point S not in this line, and a line g drawn through 8. Then this line q will meet the line » in a point A. If we turn the line g about S to- wards q’, its point of intersection with p will move along p towards B, passing, on con- tinued turning, to a 8 greater and greater dis- tance, until it is moved out of our reach. If we turn q still farther, its continuation will meet p, but now at the Pp other side of A. The point of intersection has

=

disappeared to the right . gy’

and reappeared to the

left. There is one inter-

mediate ‘eon where Y q is parallel to y—that a

is ie it does not eut i Sh p. In every other position it cuts » in some finite point. If, on the other hand, we move the point A to an infinite distance in p, then the line g which passes through A will be a line which does not cut p at any finite point. Thus we are led to say: Every line through S whieh joins it to any point at an infinite distance in py is parallel to p. But by Euelid’s 12th axiom there is but one line parallel to » through S. The difficulty in which we are thus involved is due to the fact that we try to reason about infinity as if we, with our finite capabilities, could compre- hend the infinite. To overcome this difficulty, we may say that all points at infinity in a line appear to us as one, and may be replaced by a single ‘‘ideal” point, just as all points in a fixed star—which is not at an infinite, only at a great distance—can- not be distinguished by us and to beings on the earth count as

one. We may therefore now give the following definitions and axiom :—

Definition. —Lines which meet at infinity are called parallel.

Axiom.—All points at an infinite distance in a line may be con- sidered as one single point.

Definition.—This ideal point is called the point at infinity in the ine.

The axiom is equivalent to Euclid’s Axiom 12, for it follows from either that through any point only one line may be drawn parallel to a given line.

This point at infinity in a line is reached whether we move a point in the one or in the opposite direction of a line to infinity. A line thus appears elosed by this point, and we speak as if we could move a point along the

line from one position A to another B in two ways, either throngh the point at infinity or throngh finite points only.

It must never be forgotten that this point at infinity is ideal, that the results based on this assumption are true for that finite region of space which is within our reach, and that beyond this region they may or may not be true, —we do not know.

The advantage of this view of parallels will become apparent at every step as we go on.

§ 3. Having thus arrived at the notion of replacing all points at infinity in a line by one ideal point, there is no diffieulty in re- plaeing all points at infinity in a plane by one ideal line.

To make this clear, let us suppgse that a line », which cuts two fixed lines a and 6 in the points Bind B, moves parallel to itself to a greater and greater distance. It will at last cut both a and 6 at their points at infinity, so that a line whieh joins the two points at infinity in two intersecting lines lies altogether at infinity. Every other line in the plane will meet it therefore at infinity, and thus it contains all og at infinity in the plane.

All points at infinity in a plan®Ue in a line, which is called the line at infinity in the plane.

It follows that parallel planes must be considered as planes having a common line at infinity, for any other plane euts them in parallel lines (Eucl. XI. 16), which have a point at infinity in common.

If we next take two intersecting planes, then the point at infinity in their line of intersection lies in both planes, so that their lines at infinity meet. Henee every line at infinity meets every other line at infinity, and they are therefore all in one plane.

All points at tnjinity in space may be considered as lying in one tdeal plane, which is called the plane at infinity.

§ 4. We have now the following definitions :—

Parallel lines are lines which meet at infinity ;

Parallel planes are planes which meet at infinity ;

A line is parallel to a plane if it meets it at infinity.

Theorems like this—Lines (or planes) which are parallel to a third are parallel to each other—follow at once.

This view of parallels leads therefore to no contradiction of Euclid's Elements.

As immediate consequences we get the propositions :—

Every line meets a plane in one point, or it lies in it;

Every plane meets every other plane in a line ;

Any two lines in the same plane meet.

§ 5. We have called points, lines, and planes the elements of geometrical figures. We also say that an clement of one kind contains one of the other if it lies in it or passes through it.

All the elements of one kind which are contained in one or two elements of a different kind form aggregates which have to be eunmerated. They are the following :—

I, Of one dimension.

1. The row, or range, of points formed by all points in a line, which is ealled its base. 2. The flat pencil formed by all the lines throngh a point in aplane. Its base is the point in the plane. 3. The axial penetl formed by all planes throngh a line whieh is called its base or axis. II. Of two dimensions. 1. The field of points and lines—that is, a plane with all its points and all its lines. 2. The pencil of lines and planes—that is, a point in space with all lines and all planes through it. III. Of three dimensions. The space of points—that is, all points in space. The space of planes—that is, all planes in spaco. IV. Of four dimensions. The space of lines, or all lines in space.

§ 6. The word dimension in the above needs explanation.

If in a plane,we take a row p and a peucil with centre Q, then through every point in p one line in the pencil will pass, and every ray in Q will cut p in one point, so that we are entitled to say a row contains as many points as a flat pencil lines, and, we may add, as an axial pencil planes, beeause an axial pencil is ent by a plane in a flat pencil. : ‘

The number of clements in the row, in the flat pencil, and in the

axial pencil is, of course, infinite and indefinite too, but the same in all. ¥or a moment we shall treat it as being a definite number which we denote bya. Then a plane contains a? points and as many lines. ‘To see this, take a flat pencil in a plane. It contains a lines, and each line contains a points, whilst each point in the plane lies on one of these lines. Similarly, in a plane each line cuts a fixed line in a point. But this line is cut at each point by a lines and contains a points ; hence there are a? lines in a plane.

A pencil in space contains as many lines as a plane contains points and as many planes as a plane contains lines, for any plane cuts the pencil in a field of points and lines. Hence a pencil con- tains a? lines and a? planes. The field and the pencil are of two dimensions.

To count the number of points in space we observe that each point lies on some line in a pencil. But the pencil contains a? lines, and cach line a points; hence space contains a’ points. Each plane cuts any fixed plane in a line. Buta plane contains a2 lincs, and through each pass a planes; therefore space contains a®

lanes.

. Hence space contains as many planes as points, but it contains an infinite number of times more lines than points or planes. To count them, notice that every line cuts a fixed plane in one point. But a? lines pass through each point, and there are a? points in the plane. Hence there are a* lines in space.

The space of points and planes is of three dimensions, but the space of lines as of four dimen- stons.

A field of points or lines contains an infinite number of rows and flat pencils; a pencil contains an infinite number of flat -peneils and of axial pencils; space contains a triple infinite number of pencils and of fields, at rows and axial pencils, and a® flat pencils— or, in other words, each point is a centre of a? flat peneils.

§ 7. The above enumeration allows a classification of figures.

Figures in a row consist of groups of points only, and figures in the flat or axial pencil consist of groups of lines or planes. In the plane we may draw polygons; and in the pencil or in the point, solid angles, and so on.

We miay also distinguish the different measurements. We have—

In the row, length of segment ;

In the flat pencil, angles ;

In the axial pencil, dihedral angles between two planes ; In the plane, areas ;

In the pencil, solid angles ;

In the space of points or planes, volumes.

SEGMENTS OF A LINE.

§ 8. Any two points A and B in space determine on the linethrough them a finite part, which may be considered as being described by a point moving from A to B. This we shall denote by AB, and distinguish it from BA, which is supposed as being described by a point moving from B to A, and hence in a direction or in a “ sense” opposite to AB. Such a finite line, which has a definite sense, we shall call a ‘‘ segment,” so that AB and BA denote different seg- ments, which are said to be equal in length but of opposite sense. The one sense is often called positive and the other negative.

In introducing the word ‘‘sense” for direction in a line, we have the word direction reserved for direction of the line itself, so that different lines have different directions, unless they be parallel, whilst in each line we have a positive and negative sense.

We may also say, with Professor Clifford, that AB denotes the “step” of going from A to B.

§ 9. If we now have three points A, B, C in a line (fig. 2), the step AB will bring usfrom A to B, and the step BC from B to C. Hence both A B Cc steps are equivalent to the one step AC. This is expressed by saying that AC oo ‘‘sum” of AB and BC; in symbols A

AB+BC=AC, 4 where account is to be taken of the sense. A Gt 8

This equation is true whatever be the position of the three points on the line. As a special case we have

AB+BA=0 and similarly AB+BC+CA=0 which again is true for any three points in a line.

We further write

AB=—BA, where — denotes negative sense.

We can then, just as in algebra, change subtraction of segments into addition by changing the sense, so that AB—CB is the same as AB+(—CB) or AB+ BC. A figure will at onee show the truth of this. The sense is, in fact, in every respect equivalent to the “ sign” of a number in algebra.

GEOMETRY

[pRosuoTIVE,

§ 10. Of the many formule which exist between points in a line we shall have to use only one more, which connects the segments between any four points A, B, C, Dina line. We haye—

BC=BD+DC, CA=CD+DA, AB=AD+DB; or multiplying these by AD, BD, CD respectively, we get— Bc. AD= BD. AD + DC. AD= BD, AD— CD. AD cA. BD=CD.BD+DA.BD=CD. BD— AD. BD AB. CD =AD.CD+DB.CD=AD.CD — BD. CD.

It will be seen that the sum of the right hand sides vanishes, hence

that BC,AD+CA.BD+AB.CD=0 ,.,.., (8) for any four points on a line, § 11. If C is any point in the line AB, then we say that C

divides the segment AB in the ratio r= , account being taken of

the sense of the two segments AC and CB. If C lies between A and the ratio is positive, as AC and CB have the same sense. But if*C lies without the segment AB, ¢.¢., if C divides AB ex- ternally, then the ratio is negative. To see how the value of this ratio changes with C,

wo will. mowe ©) BP ecg I ee le along the whole Fic. 3 line (fig. 3), whilst PIGs vs

A and B remain fixed. If C lies at the point A, then AC=0O, hence the ratio AC: CB vanishes. As C moves towards B, AC increases and CB decreases, so that our ratio increases. At the middle point M of AB it assumes the value +1, and then increases till it reaches an infinitely large value, when C arrives at B. On passing beyond B the ratio becomes negative. If C is at P we have AC=AP=AB+BP, hence

AO AB SP 2 1

fn Pe” rea _ py In the last expression the ratio AB : BP is positive, has its greatest value co when C coincides with B, and vanishes when BC becomes infinite. Hence, as C moves from B to the right to the point at infinity, the ratio AC : CB varies from —o to —1,

If on the other hand C is to the left of A, say at Q, we have

AC=AQ=AB+BQ=AB—QB, hence A©

cB- QB

Here AB

‘¢ As Cmoves along the line from an infinite distance to the left to an infinite distance at the right, the ratio always increases ; it starts with the value —1, reaches 0 at A, +1 at M, o at B, changes now sign to —co, and increases till at an infinite distance it reaches again the Value —1. J¢ assumes therefore all possible values from —o to +0, and each value only onee, so that not only does every position of C determine a definite value of the ratio AC : CB, but also, conversely, to every positive or negative value of this ratio belongs one single point in the line AB.

PROJECTION AND Cross-RATIOS,

§ 12. If we join a point A to a point S, then the point where the line SA cuts a fixed plane x is called the projection of A on the plane w from S as centre of projection. If we have two planes 7 and 7’ and a point 8, we may project every point A in mw to the other plane. If A’ is the projection of A, then A is also the

rojection of A’, so that the relations are reciprocal. To every gure in m we get as its projection a corresponding figure in 7’.

It will be our business to find such properties of figures as remain true for the projection, and which are called projective properties. For this purpose it will be sufficient to consider at first only construc- tions in one plane.

Let us ware we have given in a plane two lines p and p’ and a centre S (fig. 4) ; we may then pro- ject the points in p from 8S top’. Let A’, BY… be the projections of Z A, B…, the point at infinity in p which we shall denote by J will be projected into a finite point I’ in p’, viz., into the point where the parallel to p through S cuts , p’. Similarly one point J in p will be projected into the point I’ at infinity in p’. This point J is of course the point where

Fig. 4.

q

CROSS-RATIOS.]

the parallel to »’ through S cuts p. We thus see that every point in p is projected into a single point in p’.

A glance at fig. 5 shows that a segment AB into a segment A’B’ which is not equal to it, at least not as a rule ; and also that the ratio AC : CB is not equal to the ratio A’C’: C’B’ formed by the projections. These ratios will beeome equal only if p and p’ are parallel, for in this case the triangle SAB is similar to the triangle SA’B’. Between three points in a line and their projections there exists therefore in

eneral no relation. But between our points a relation does exist.

§ 13. Let A, B, ©, D be four points in p, A’, B’, C’, D’ their pro- jections in py’, then the ratio of the two ratios AC:CB and AD: DB into which C and D divide the segment AB is equal to the cor- responding expression between A’, BY, C, D’. In symbols we have—

AC AD _ A’ AD CB°DB CB’ ‘ DB” p

This is easily proved by aid of Fig. 5. similar triangles.

Through the points A and B on p draw parallels to »’, which eut the projecting rays in Cy, D,, B, and A), O,, D,, as indicated in fig. 6. The two triangles ACC, and BCC, will be similar, as will also be the triangles ADD, and BDD,.

will be projected

AC_ACG, AD AD, CB C,B’ DB D,B’ where acéount is taken of the sense. Hence— AC AD _ 4G, AD, at G8, CB’ DE ~ GB DB” AD,‘ DR but AQ AC ang GB_OB’ , AD, A’D’ D,B DB’? 80 that the above expression becomes AC’ : OBiy A’D’ * D’B” r ’ A’C’ Ty 2 which is equal to as required.

‘ O’B’ * D’B’

This result is of fundamental importance.

The expression formed has been ealled by Chasles the anharmonie ratio of the four points A, B, C, D. Instead of this Professor Clifford has proposed the shorter and more expressive name of ‘‘eross- ratio.” We shall adopt the latter. We have then the

FUNDAMENTAL THEOREM.—The cross-ratio of four points in a line ts equal to the cross-ratto of their projections on any other line which lies in the same plane with it.

§ 14. Before we draw eonelusions from this result, we must in- vestigate the meaning of a eross-ratio somewhat more fully.

Tf four points A, B, C, D are given, and we wish to form their eross-ratio, we have first to divide them into two groups of two, the bes in each group being taken in a definite order. Thus, let A, B be the first, C, D the seeond pair, A and C being the first points in each pair. The cross-ratio ig then the ratio AC :CB divided by AD DB. This will be denoted by (ABCD), so that

, AC AD

This is easily remembered. In order to write it out, make first the two lines for the fractions, and put above and below these

the letters A and B in their places, thus, “Bi Bs and then fill

up, crosswise, the first by C and the other by D.

§ 15. If we take the points in a different order, the value of the eross-ratio will ehange. We ean do this in twenty-four different ways by forming all permutations of the letters. But of these twenty-four cross-ratios groups of four are equal, so that there are really only six different ones,

We have the following rules :—

I. If in a eross-ratio the two groups be interchanged, its value

remains unaltered, (ABCD) =(CDAB).

Ts Le in a eross-ratio the two points belonging one of the two groups be interehanged, the cross-ratio changes into its reeiprocal.

(ABCD) =, ABDG) Il]. If in a cross:ratio the two middle letters be interchanged, the eross-ratio « changes into its eomplement 1-«. (ABCD) =1—(ACBD). The first two are easily proved by writing out their values. third is proved by aid of the formula (3), § 10, BC. AD+CA. BD+ AB. CD=0, If we divide this by CB. AD we get CA.BD,AB.CD_ !*¢B AD' GB. AD%

The

or, AC AD AB, AD 1: up Dn' YO" pe ~* that is, (ABCD) +(ACBD)=1, which was to be proved. IV. From II. it follows at onee that if we interehange the elements in each pair, the eross-ratio remains unaltered; and thus we see

that (ABCD) =(CDAB) by I. =(BADC)=(DCBA) by II. § 16. By aid of these rules we get the following results :— (ABCD) =(BADC) =(CDAB)= (DCBA) =x.

(ABDC)=(BACD) =(CDBA)=(DOAB) =2,

(ACBD)=(BDAC) =(CADB)=(DBCA) =1 =r.

(ACDB)=(BDCA) =(CABD)=(DBAC) =; k-1

a:

(ADBC) =(BCAD) =(CBDA) =(DACB) =

(ADCB) = (BODA) =(CBAD)=(DABO) =—*..

In the theorem that the cross-ratio of four points equals that of the projections, the points have, of course, to be taken in the same order.

§ 17. If one of the points of which a cross-ratio is formed is the point at infinity in the line, the eross-ratio ehanges into a simple ratio. It is convenient to let the point at infinity oeeupy the last place in the symbolie expression for the eross«ratio, Thus if I isa point at infinity, we have

AC (ABCI)=— GR? because AI: IB=-1.

Every common ratio of three points in a line may thus be ex: pressed as a eross-ratio, by adding the point at infinity to the group of points. ;

§ 18. If the points have special positions, the cross-ratios « may have such a value that, of the six different ones, two and two

1

become equal. If the first two shall be equal, we get n= 3, OF R=1, e=41.

AC AD : lf we take e=+1, we have (ABCD)=1, or CB DB? that is,

the points C and D eoineide, provided that A and B are different.

This is too special a case to be of much interest.

_ If, however, we take x=-1, so that (ABCD)=-1, we have A

au = a . Hence C and D divide AB internally and externally

in the same ratio. , é a

The four points are in this case said to be harmonie potnis, . C and D are said to be harmonic conjugates with regard to and B.

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But we have also (CDAB)= -1, so that A and B are harmonic conjugates with regard to Cand D. | ‘ :

The principal property of harmonic points, upon which almost all applications depend, is this, that their cross-ratio remains un- altered if we

interchange the two points belonging to one pair,

Migs (ABCD) =(ABDC) =(BACD). For four harmonic points the six cross-ratios which are generally different become two and two equal :

ge -1, 1-008 1 1 Kk-1 Po iag oe

Hence if we get are harmonic, but this is the case the cross-ratio= —1.

§ 19. If we equate any two of the above six values of the cross- ratios, we get either «=1, 0, 0, ork=—1, 2, 4, or else x becomes

four points whose cross-ratio is 2 or 4, then they

aroot of the equation x?- «+1=0, that is, an imaginary cube root of

1. In this case the six values become three and three equal, so that only two different values remain. This case, though important in the theory of cubic curves, is for our purposes of no interest, whilst harmonic points are all-important.

§ 20. From the definition of harmonic points, the following properties are easily deduced.

If C and D are harmonic conjugates with regard to A and B, then one of them lies in, the other without AB; it is impossible to move from A to B without passing either through C or through D; the one blocks the finite way, the other the way through infinity. This is expressed by saying A and B are ‘separated ” by C and D.

For every position of C there will be one and only one point

D which is its harmonic conjugate with regard to any point pair

and by aid of §11,

A,B, If A and B are different points, and if C coincides with A or B,

D does. But if A and B coincide, onc of the points C or D, lying

between them, coincides with them, and the other may be anywhere in the line.

”

point in the line.

If C is the middle point between A and B, then D is the point at

infinity for AC: CB

+1, hence AD:DB must be equal to ~1.

The harmonic eonjugate of the point at infinity in a line with regard

to two points A, B is the middle point of AB.

This important property gives a first example how metric pro- perties are connected with projective ones.

§ 21. Complete Quadrilateral.—A figure formed by four lines in a plane is called a complete quadrilateral or, shorter, a four-side (fig. 7). The figure has six vertices, that is, points where the sides meet, and three diagonals AB, EF,GH, which join opposite vertices.

Similarly a figure formed by four points in a plane is called a four-point. It has six sides, which join the points, or vertices, and three diagonal points, where the sides meet.

The three diagonals of a four-side cut cach

other harmonically. If we project the points E, F, K, D from H to AB, we get (EFKD)=(ABCD), and if we project them from G, we get (EFKD)= (BACD) ;

so that

(ABCD) =(BACD), that is, the cross-ratio (ABCD) is equal to its reciprocal, hence =-—1, as the four points are all itterent This gives the im-

portant theorem :—

THeorREM. —In every four-side any diagonal is eut harmonically by the other two.

This allows the solution of the problem :—

ProsLEM.—To construet the harmonic conjugate D to a point C with regard to two given points A and B.

Solution.—Through A draw any two lines, and through C one cutting the former two in G and H. Join these points to B, cutting the former two lines in E and F. The point D where EF cuts AB will be the harmonic conjugate required.

This remarkable construction requires nothing but the drawing of lines, and is therefore independent of measurement. It follows, also, that al? four-sides which have two vertices at A and B, and

not arranged so that conjugates are paired. If

It follows that, ‘if of four harmonie conjugates two coincide, then a third coincides with them, and the fourth may be any

one diagonal passing through C, will each have the third diagonal passing through D.

§ 22, The theory of cross-ratios may be extended from points in a row to lines ina flat pencil, and to planes in an axial pencil. We have seen (§ 18) that if the lines which join four points A, B, C, D to any point S be cut by any other line in A’, B’, O’, D’, then (ABCD) =(A’B/C’D’). In other words, four lines in a flat pencil are cut by every other line in four points whose cross-ratio is constant.

Definition.—By the cross-ratio of four rays in a flat pencil is meant the cross-ratio of the four points in which the rays are cut by any line. Ifa, b, e, d be the lines, then this cross-ratio is denoted by (abed).

Definition.—By the cross-ratio of four planes in an axial pencil ig understood the cross-ratio of the four points in which any line cuts the planes, or, what is the same thing, the cross-ratio of the four rays in which any plane cuts the four planes.

In order that this definition may have a meauing, it has to be proved that all lines cut the pencil in points which have the same cross-ratio. This is seen at once for two intersecting lines, as their plane cuts the axial pencil in a flat pencil, which is itself cut by the two lines. The cross-ratio of the four points on onc line is therefore equal to that on the other, and equal to that of the four rays in the flat pencil.

If two non-intersecting lines p and g cut the four planes in A, B,C, D and A’, B’, C’, D’, draw a line r to meet both p and q, and let this line cut the planes in A”,B’,C’,D”. Then (ABCD) = (A’B‘C’‘D’), for each is equal to (A”B”C”D”).

_§ 28. We may now also extend the notion of harmonic elements, viz. :—

Definition.—Four rays in a flat pencil and four planes in an axial pencil are said to be harmonic if their cross-ratio equals ~ 1, that is, if they are cut by a line in four harmonic points.

Harmonic pencils are constructed by aid of the theorem in § 21, which may now be stated thus :—

In a four-side two sides are harmonie conjugates with regard to the diagonal through their interscetion and, the line from this point to the point where the other diagonals meet. Or thus: Jn @ four- point the lines joining one diagonal point to the other two are har- monic conjugates with regard to the sides passing through the first.

If we understand by a ‘median line” of a triangle a line which joins a vertex to the middle point of the opposite side, and by a ‘‘median line” of a

parallelogram a line joining middle points of opposite sides, we get as special cases of the last theorem :—

The diagonals and median lines of a parallelogram form an harmonic peneil; and

At a vertex of any triangle, the two sides, the median line, and the line parallel to the base form an harmonic penerl.

Taking the parallelogram a rectangle, or the triangle isosceles, we get :—

| ae two lines and the bisections of their angles form. an harmoie penetl, Or: —

In an harmonie peneil, if two conjugate rays are perpendicular, then the other two are equally inclined to them; and, conversely, if one ray biseets the angle between conjugate rays, it is perpendiewlar to its conjugate.

This connects perpendicularity and bisection of angles with projective properties.

§ 24. We add a few theorems and problems which are easily proved or solved by aid of harmonics.

‘An harmonic pencil is cut by a line parallel to one of its rays in three equidistant points.

Through a given point to draw a line such that the segment determined on it by a given angle is bisected at that point.

Having given two parallel lincs, to bisect on either any given segment without using a pair of compasses.

Having given in a line a segment and its middle through any given point in the line.

To draw a line which joins a given point to the intersection of two given lines which meet off the drawing paper (by aid of § 21).

oint, to draw plane a line parallel to the given

CoRRESPONDENCE.

§ 25. Two rows, p and 7’, which are one the projection of the other (as in fig. 5), stand in a definite relation to each other, characterized by the following properties.

1. To cach point in either corresponds one point in the other ; that is, those points are said to correspond which are projections of one another.

2. The eross-ratio of any four points in one equals that of the corresponding points in the other.

3. The lines joining corresponding points all pass through the same point.

If we suppose corresponding points marked, and the rows brought into any other position, then the lines joining corresponding points will no longer meet in a common point, and hence the third of the above properties will not hold any longer ; but we have still a

CORRESPONDENCE. |

correspondence between the points in the two rows possessing the

first two properties. Such a correspondence has been ealled a one-one

correspondence, whilst the two rows between which such correspond – ence has been established are said to be projective or homologous. Two rows which are each the: projection of the other are therefore projective. We shall presently see, also, that any two projective rows may always be placed in such a position that one appears as the projection of the other. If they are in such a position the rows are said to be in perspective position, or simply to be perspective,

§ 26. The notion of a one-one correspondence between rows may be extended to flat and axial pencils, viz., a flat pencil will be said to be projective to a flat pencil if to each ray in the first corresponds one ray in

the second, and if the cross-ratio of four rays in one equals that of the corresponding rays in the second.

Similarly an axial pencil may be projective to an axial pencil, But a flat pencil may also be projective to an axial pencil, or either pencil may be projective toa row. The definition is the same in each case: there is a one-one correspondence betwecn the elements, and four elements have the same cross-ratio as the corresponding ones.

§ 27. There is also in each case a special position which is called perspective, viz. :—

1, Two projective rows are perspective if they lie in the same plane, and if the one row is a projection of the other.

2. Two projective flat pencils are perspective—(a) if they lie in the same plane, and have a row as a eommon seetion ; (8) if they lie in the same pencil (in space), and are both sections of the same axial pencil ; (y) if they are in space and have a row as common section, or are both sections of the same axial pencil, one of the conditions involving the other.

3. Two projective axial pencils, if their axes meet, and if they have a flat pencil as a common section.

4, A row and a projective flat pencil, if the row is a section of the pencil, each point lying in its corresponding line.

5. A row and a projective axial pencil, if the row is a section of the pencil, each point lying in its corresponding line.

6. A fat and a projective axial pencil, if the former is a section of the other, each ray lying in its corresponding plane.

That in each case the correspondence established by the position indicated is such as has becn called projective follows at once from the definition. It is not so evident that the perspective position may always be obtained. We shall show in § 30 this for the first threc cases. First, however, we shall give

a few theorems which relate to the general correspondence, not to the perspective position.

§ 28. THEoREM.—Two rows or pencils, flat or axial, which are projective to a third are projective to cach other, as follows at once from the definitions.

§ 29. FUNDAMENTAL THEOREM.—Jf two rows, or two pencils, cither flat or axial, or a row and a pencil, shall be projective, we may assume to any three elements in the one the three corresponding elements in the other, and then the correspondence is uniquely deternined.

Proof.—lf in two projective rows we assume that the points A, B, C in the first correspond to the given points A’, B’, C’ in the second, then to any fourth point D in the first will correspond a point D’ in the second, so that

(ABCD)=(A’B’C’D’). But there is only one point, D’, which makes the cross-ratio (A’B’C’D’) equal to the given number (ABCD).

The same reasoning holds in the other cases.

§ 30. Theorem.—If two rows are perspective, then the lines joining corresponding points all meet in a point, the centre of projection; and the point in which the two bases of the rows Intersect as a point in the first row coincides with its corresponding point in the second.

This follows from the definition, The converse also holds, viz.:—

THEorEM.—/Jf two projective rows have such a position that one point in the one coincides with its corresponding point in the other, then they arc perspective, that is, the lines joining corresponding points all pass through a common point, and form a flat pencil.

Proof.—let A, B,C, D… be points in the one, and A’, B’, C’, D’. .. the corresponding points in the other row, and let A be made to coincide with its corresponding point A’. Let S be the point where the lines BB’ and CC’ meet, and Ict us join S to the point Din the first row. This line will cut the second row in a point D”, so that A,B,C,D are projected from S into the

points A,B’,C’,D”. The cross-ratio (ABCD) is therefore equal to (AB’C’D”), and by hypo- thesis it is equal to (A’B/C’D’). Hence (A’B’C’D”)=(A’B’C’D), that is, D” is the same point as D’. ,

§ 31. Theorem.—If two projected flat pencils in the same plane are perspective, then the intersections of corresponding lines form a row, and the line joining the two centres as a line in the first pencil corresponds to the same line as a line in the second. And conversely,

TuzorEM.—If two projective pencils in the soane plane, but with different centres, have onc line in the one coincident with tts corre- sponding line in the other, then the two pencils are perspective, that is, the intersection of corresponding lines lie in a line.

The proof is the same as in § 30.

§ 32. Theorem.—lIf two projective flat pencils in the same point (pencil in space), but not in the same plane, are perspective, then the planes joining corresponding rays all pass through a line (they form an axial pencil), and the line common to the two pencils (in which their planes intersect) corresponds to itself. And con- versely,

Lheorem.—If two flat pencils which have a common centre, but do not lie in a common plane, are placed so that one ray in the one coincides with its corresponding ray in the other, then they are perspective, that is, the planes joining corresponding lines all pass through a line. 5

§ 83. Theorem.—If two projective axial pencils are perspective, then the intersection of corresponding planes lie in a plane, and the plane common to the two pencils (in which the two axes lic) corresponds to itself. And conversely,

Theorem.—lf two projective axial pencils are placed in such a position that a plane in the one coineides with its corresponding plane, then the two

pencils are perspective, that is, corresponding planes meet in lines which lie in a plane.

The proof again is the same as in § 30.

§ 34. These theorems relating to perspective position become illusory if the projective rows of pencils have a common base. We then have:—

Theorem.—In two projective rows on the same line—and also in two projective and concentrie flat pencils in the same plane, or in two projective axial peneils with a common axis—every element in the one coincides with its corresponding element in tlie other as soon as three elements in the one coincide with their corresponding elements in the other.

Proof (in case of two rows).—Between four elements A, B, C, D and their corresponding elements A’, B’, C’, D’ exists the relation (ABCD)= (A’B’C’D’). _ If now A’, B’, C’ coincide respectively with A, B, C, we get (ABCD)=(ABCD’); hence D and D’ coincide.

The last theorem may also be stated thus :—

Theoren.—In two projeetive rows or pencils, which have a com- mon base but are not identieal, not more than two elements in the one can coincide with their corresponding elements in the other.

Thus two projective rows on the same hne cannot have more than two pairs of coincident points unless every point coincides with its corresponding point.

It is easy to construct two projective rows on the same line, which have two pairs of corresponding points coincident. Let the points A, B, C as points belonging to the one row correspond to A, B, and C’ as points in the second. Fs Then A and B co- incide with their cor- responding points, bot C does not. It is, however, not necessary that two such rows have twice a point coincident with its correspond- ing point; it is pos- sible that this hap- pens only once or not at all. Of this we shall see plenty of examples as we go on.

§ 35. Iftwo projec- tive rows or pencils

Fig. 8.

are in perspective position, we know at once which element in one

corresponds to any given element in the other. If » and q (fig. 8) are two projective rows, so that K corresponds to itself, andifwe know £ that to A and B in p correspond A’ and B’ in g, then the point S, where AA’ meets BB’, is the centre of projec- tion, and hence, in order to find the point C’ corresponding to C, we have only to join C to 8; the point C’, where this line cuts q, is the point required. If two flat pencils, 8, and S,, in a plane are perspective (fig. 9), we need only to know two , j pairs, a, a’ and 3, b’, of corresponding rays 1

Fig. 9. n order to find the axis

8 of projection. This being known, a ray ¢ . S2, —

toa given ray ¢ in §, is found by joining 8, to the point where c

cuts the axis s.

Asimilar construction holds in the other casesof perspectivefigures.

On this depends the solution of the following general problem.

§ 36. Problem.—Three pairs of corresponding elements in two projective rows or pencils being given, to determine for any element in one the corresponding element in the other.

We solve this in the two eases 0 projective flat pencils in a plane.

Problem I.—Let A,B,C be three points in arow 8, A’, B’, C’ the eorre- sponding points in a projective row s’, both being in a plane; it is re- quired to find for any point Dins the eorresponding point D’ in.s’.

f two projective rows and of two

Problem I1.—Let a,b,c be three raysin a pencil S, a’, 0’, e’ the corre- sponding rays in a projective peneil S’, both being in the same plane; it is required to find for any ray din S the corresponding ray @ in S$’.

The solution is made to.depend on the construction of an auxili- ary row or pencil which is perspective to both the given ones. This is found as follows :—

Solution of Problem 1.—On the line joining two corresponding points, say AA’ (fig. 10), take any two points, S and §’, as centres of auxiliary pencils. Join the intersec- tion B, of SB and S’B’ to the intersee- tion ©, of SC and S’C’ by the line s,. Then a row on 8s, will be perspective to swith S as centre of projection, and to s’ with S’ as centre. To find now the point D’ on s’ corre- sponding to a point D on s we have only to determine the

oint D,, where the ine SD cuts s,, and to draw S’D,; the point where this line euts s’ will be the required point D’.

Proof.—The rows s and s’ are both perspective to the

Fig. 10.

row 8, hence they are projective to one another. correspond Aj, By, C,, Dy on s;, and to these correspond A’, BY, C’, D’

To A, B, C, Dons

on s’; so that D and D’ are corresponding points as required.

Solution of Problem 11.—Through the interscetion A of two cor- responding rays and a’ (fig. 11), take two lines, s and s’, as bases of auxiliary rows. Let ~ 8, be the point where the { « s line 0,, which joins B and B’, ; euts the line ¢, whieh joins C and C’.. Then a pencil 8, will be perspective to S with sasaxis of projection. To find the ray d’ in S’ corresponding to a given ray d

in S, eut d by sat D; project this point from S, to D’ on ¢ and join D’ to 8’. This will be the required ray.

Proof.—That the pencil 8; is perspective to S and also to 8’ follows from construetion. To the lines a, 01, ¢, d, in S, correspond the lines a, 6, ¢, d in S and the lines a’, 0’, ¢’, a’ in S’‘, so that @ and d’ are corresponding rays.

In the first solution the two : eentres, S, S’, are any two points Fig. 11. ona line joining any two corresponding points, so that the solution of the problem allows of a great many different constructions. But whatever construction be used, the point D’, corresponding to D, must be always the same, according to the theorem in § 29. This gives rise to a number of theorems, into which, however, we shall not enter. The same remarks hold for the second problem.

§ 37. Asa further application of the theorems about perspective rows and pencils we shall prove the following important theorem.

Theorem.—If ABC and A’BC’ (fig. 12) be two triangles, such that the lines AA’, BB’, CC’ meet in a point S, then the intersections of BC and BC’, of CA and C’A’, and of AB and A’B’ will lie in a line.

Proof.—Let a, 6, ¢ denote the lines AA’, BB’, CC’, whieh meet at S. Then these may be taken as bases of projective rows, so that A, A’, 8 on a@ correspond to B, B’,S on d, and to C,C’,S one. As the point S is common to all, any two of these rows will be perspective.

[PROJECTIVE. If S, be the centre of projection of rows 6 and ¢, 2 29 a3 P a9 é and a, 83 ” 9 ” a and b,

and if the line S,S, cuts in Aj, and 0 in B,, and cin C,, then A,, B, will be corresponding points in a and 3, oth corresponding to C, ine. But and 6 are perspective, therefore the line A,B,, that is S,S,, joining correspond- ing points must pass through the centre of pro- jection S, of aand &. In other words, §,,,S,, S3 lie in a line. This is Desargues’s celebrated theorem if we state it thus :—

Theorem of Desargues. —If each of two triangles has one vertex on each of three concurrent lines, then the interseetions of corresponding sides lie ina line, those sides being called correspond- ing which are opposite to vertices on the same line.

The converse theorem holds also, viz.:—

Theorem.—If the sides of one triangle meet those of another in three points which lie in a line, then the vertices lie on three lines which mect in a point.

The proof is almost the same as before.

§ 88. Metrical relations between projective rows.—Hvery row contains one point which is distinguished from all others, viz., the point at infinity. In two projective rows, to the point I at infinity in one corresponds a point I’ in the other, and to the point J’ at infinity in the second corresponds a point J in the first. The points I’ and J are in general finite. Ve now A and B are any two points in the one, A’, B’ the corresponding points in the

other row, then (ABJI) = (A’B’J’T).

Or, Ay AT_ Ay AY, IB. iB. Je ie’

Fig. 12.

but, by § 17,

AL AV oy

16 = #4

therefore the last equation ehanges into AJ AY _ jp’ yy

or into AJ. A’T = BJ. BT, that is to say—

Theorem. —The product of the distances of any two corresponding points in two projective rows from the points which correspond to the points at infinity in the other is eonstant, viz., AJ. AT’ =k, Steiner has called this number & the Power of the correspondence.

§ 39. Similar Rows.—If the points at infinity in two projective rows correspond so that I’ and J are at infinity, this result loses its meaning. But if A, B, C be any three points in one. A’, B’, C’ the corresponding ones on the other row, we have

(ABCI) = (A’B’CT),

_A’C AG _ BC

cB” Gn *” ae 7 £0? that is, corresponding segments are proportional. Conversely, if corresponding segments are proportional, then to the point at infinity in one corresponds the point at infinity in the other. If we call such rows similar, we may state the result thus—

Theorem.—Two projective-:rows are similar if to the oint at infinity in one corresponds the point at infinity in the ee and conversely, if two rows are similar then they are projective, and the points at infinity are corresponding points.

From this the well-known propositions follow :—

Two lines are cut proportionally (in similar rows) by a series of parallels. The rows are perspective, with centre of projection at infinity. é

If two similar rows are placed parallel, then the lines joining homologous points pass through a common point.

§ 40. Theorem.—If two flat pencils be projective, then there exists in either one single pair of lines at right angles to one another, such that the corresponding lines in the other pencil are again at right angles.

To prove this, we place the pencils in perspective position (fig. 13) by making one ray coincident with its corresponding ray. Cor- responding rays meet then on a line p. And now we Nia the eirele which has its centre O on p, and which passes through the

which reduces to

DUALITY. |

centres S and S’ of the two pencils. This circle cuts p in two points Hand K. The two pairs of rays, h, k and h’,K’, joining these points to S and S! will be pairs of corresponding rays at right angles. The construction gives in general but one circle, but if the line p is the perpendicular bisector of SS’, there exists an infinite number, and to every right angle in the one pencil corresponds a right angle in the other.

PRINCIPLE OF DUALITY,

§ 41. It has been stated in §1 that not only points, but also planes and lines, are taken as elements out of which figures are built up. We shall now see that the construction of

Fig. 13.

one figure which possesses certain properties gives rise in many cases to the construction of another figure, by replacing, according

to definite rules, elements of one kind by those of another. The new figure thus obtained will then possess properties which may be stated as soon as those of the original figure are known.

We obtain thus a principle, known as the prineiple of duality or of reciprocity, which enables us to construct to any figure not containing any measurement in its construction a reciprocal figure, as it is called, and to deduce from any theorem a reetprocal theorem, for which no further proof is needed.

It is convenient to print reciprocal propositions on opposite sides of a page broken into two columns, and this plan will occasionally be adopted.

Mf egin by repeating in this form a few of our former state- ments :—

Two points determine a line. Two planes determine a line,

But there is also a more special principle of duality, according to which figures are reciprocal which lie both in a plane or both in a pencil. In the plane we take points and lines as reciprocal elements, for they have this fundamental property in common, that

two elements of one kind determine one of the other. In the pencil, on the other hand, lines and planes have to be taken as

Three points which are not in a line determine a plane.

A line and a point without it de- termine a plane.

Three planes which do not pass through a line determine a point.

A line and a plane not through it determine a point.

reciprocal, and here it holds again that two lines or planes deter-

mine one plane or line.

Thus, to one plane figure we can construct one reciprocal figure

in the plane, and to each mention a few of these.

A figure eonsisting of n points in a plane will be called an n-point.

A figure consisting of n planes in a pencil will be called an n-flat.

one reciprocal figure in a pencil. We At first we explain a few names :—

A figure consisting of m lines in plane will be called an n-side. A figure consisting of m lines in a

pencil will be called an n-edge.

It will be understood that an n-side is different from a polygon

of ” sides:

The latter has sides of finite length and n vertices, the

former has sides all of infinite extension, and every point where

two of the sides meet will be a vertex: between a solid angle and an n-cdge or an n-flat,

ticularly—

A four-point has six sides, of which two and two are opposite, and three diagonal points, which are intersec- tions of opposite sides.

A four-flat has six edges, of which two and two are opposite, and three diagonal planes, which pass through opposite edges.

A four-side is usually called a complete quadrilateral.

A similar difference exists We notice par-

A four-side has six vertices, of which two and two are opposite, and three diagonals, which join opposite vertices.

A four-edge has six faces, of which two and two are opposite, and three diagonal edges, which are intersec- tions of opposite faces.

The

above notation, however, seems better adapted for the statement of

reciprocal propositions, § 44,

If a point moves ina plane it de- scribes a plane curve.

If a plane moves in a pencil it en- velopes a cone.

Tf a line moves in a plane it en- velopes a plane curve (fig. 14),

If a line moves in a pencil it de- scribes a cone,

A curve thus appears as generated either by points, and then we call it a ‘‘ locus,” or by lines, and then we call it an ‘* envelope,” In the same manner a cone, which

means here a surface, appears either ag the locus of lines passing through

Two lines in a plane determine a Two lines through a point deter- point. mine a plane.

These propositions show that it will be possible, when any figure is given, to construct a second figure by taking planes instead of points, and points instead of planes, but lines where we had lines.

For instance, if in the first figure we take a plane and three points in it, we have to take in the second figure a point and three planes through it. The three points in the first, together with the three lines joining them two and two, form a triangle; the three planes in the second and their three lines of intersection form a trihedral angle. A triangle and a trihedral angle are therefore reciprocal figures.

Similarly, to any figure in a plane consisting of points and lines will correspond a figure consisting of planes and lines passing through a point S, and hence belonging to the pencil which has S as centre.

The figure reciprocal to four points in space which do not lie in a plane will consist of four planes which do not mect ina point, In this case each figure forms a tetrahedron.

§ 42. As other examples we have the following :—

To a row is reciprocal an axial pencil,

», & flat pencil is a flat pencil,

» a field of points and lines __,, a pencil of planes and lines,

», the space of points m the space of planes.

For the row consists of a line and all the points in it, reciprocal to it therefore will be a line with all planes through it, that is, an

a fixed point, the “vertex” of the cone, or as the envelope of plancs passing through the same point.

To a surface as locus of points cor- responds, in the same manner, a surface as envelope of planes; and to a curve in space as locus of points corresponds a developable surface as enve- lope of planes. Of the latter we shall not say any more at present,

It will be seen from the above that we may, by aid of the prin- ciple of duality, construct for every figure a reciprocal figure, and that to any property of the one a reciprocal property of the other will exist, as long as we consider only properties which depend upon nothing but the positions and intersections of the different elements and not upon measurement.

For such propositions it will therefore be unnccessary to prove more than one of two reciprocal theorems,

Fig. 14.

CURVES AND ConES OF SECOND ORDER OR SECOND CLASS.

§ 45. If we havo two projective pencils in a plane, corresponding rays will meet, and their point of intersection will constitute some locus which we have to investigate. Reciprocally, if two pro« jective, rows in a plane are given, then the lines which join corre. sponding points will envelope some curve. We prove first :-—

axial pencil ; and so for the other cases, . . . ’ This correspondence of reciprocity breaks down, however, if we

take figures which contain measurement in their construction.

For

instance, there is no figure reciprocal to two planes at right angles, because there is no segment in a row which has a magnitude as

definite as a right angle.

We add a few examples of reciprocal propositions which are

easily proved.

Theorem.—If A, B, C, Dareany four points in space, and if the lines AB and CD;meet, then all four points lic in a plane, hence also AC and BD, as well as AD and BC, niect,

Theorem.—tf a, B, y, 6 are four planes in space, and if the lines a@ and 6 meet, then all four planes lie in a point (pencil), hence also af and 0, as well as a6 and By, meet.

THEorEM.—TJf of any number of lines every one meets every other,

whilst all do not

lierin a point, then all lie in a

plane,

lie in a plane, then all lie in a

point (peneit),

§ 43. Reciprocal figures as explained lie both in space of three

dimensions.

If the one is confined to a plane (is formed of ele-

ments which lie in a plane), then the reciprocal figure is confined to a pencil (is formed of elements which pass through a point).

Theorem.—If two projective flat pencils lie in a plane, but are neither perspective nor concentric, then the locus of intersections of correspond-ing rays is a curve of the second order, that is, no line contains more than two points of the locus.

Proof.—We draw any line ¢," This cuts each of the pencils in a row, so that we have on ¢ two rows, and these are projective because the pencils are projective. If corresponding rays of the two pencils meet on the line ¢, their intersection will be a point in the one row which coincides with its corresponding point in the other. But two projective rows on the same base cannot have more than two points of one coincident with their corresponding points in the other (§ 34).

Theorem.—If two projective rows lie in a plane, but are neither perspective nor on a common base, then the envelope of lines joining corresponding points is a curve of the second class, that is, through no point pass more than two of the enveloping lines.

Proof.—We take any point T and join it to all points in each row. This gives two concentric pencils, which are projective because the rows are projective. If a line join- ing corresponding points in the two rows passes through T, it will be a line in the one pencil which coincides with its corresponding line in the other. But two projective con- centric flat pencils in the same plane cannot have more than two lines of one coincident with their correspond: ing line in the other (§ 34).

It will be seen that the proofs are reciprocal, so that the one ed be copied from the other by simply interchanging the words point

and line, locus and envelope, row and pencil, and so on.

We shall

therefore in future prove seldom more than one of two reciprocal

theorems, and often state one theorem only, the reader being recommended to go through the reciprocal proof by himself, and to supply the reciprocal theorems when not given.

§ 46. We state the theorems in the pencil reciprocal to the last,

without proving them :—

Theorem.—lf two projective flat pencilsare concentric, but are neither perspective nor co-planor, then the envelope of the planes joining corresponding rays is a cone of the sccond class; that is, no line through the common centre contains more than two of the enveloping planes.

§ 47. Of theorems about cones of second order and cones of second class we shall state only very few. following connexion between the curves and cones under considera-

tion :—.

The lines which join any point in space to the points ou a curve of the second order form a cone of the second order.

The planes which join any point in space to the lines enveloping a curve of the second class envelope them- selves a cone of the second class.

By its aid, or by the principle of duality, it will be easy to ob- tain theorems about them from the theorems about the curves. f the second order is gencrated by These pencils, when joined to the point in space, give rise to two projective axial pencils, which generate the cone in question as locus of the lines where corresponding planes meet.

We prove the first. two projective pencils.

§ 48.

Theorem.— The curve of second order which is generated by two projective flat pencils passes through the centres of the two pencils.

Proof.—If § and 8’ are the two pencils, then to the ray SS’ or p’ in the pencil 8’ corresponds in the pen- cil Saray p, which is different from yp’, for the pencils are not perspec- tive. But p and p’ meet atS, so that 8 is a point on the curve, and simi- larly 8’.

It follows that every line in one of the two pencils cuts the curve in two points, viz., once at the centre S of the pencil, and once where it cuts its

corresponding ray in the other pencil.

oints, however, coincide, if the line is cut by its corresponding §, which corresponds to the line SS’ in S’, is therefore the only line through S which has but one point in common with the curve, or which cuts the curve in two coincident points. Such a line is called a tangent to the curve, touching the latter at the point S, which is called the point of

tia at Sitself. The line p in

contact.

In the same manner we get in the reciprocal investigation the result that through every point in one of the rows, say in s, two tangents may be drawn to the curve, the one being s, the other the line joining the point to its corresponding point in s’. however, one point P in s for which these two lines coincide. Such a point in one of the tangents is called the ‘‘ point of contact”

of the tangent. We thus get—

Theorem.—To the line joining the ceutres of the projective pencils as a line in one pencil corresponds in the other the tangent at its centre.

§ 49. Two projective pencils are determined if three pairs of cor- Hence if a, b,, ¢, are three lines in a pencil S,, and a, by, c, the corresponding lines in a projective pen- therefore the curve of the second order generated by the points of intersection of corresponding rays is determined. Of this eurve we know the two centres S, and S,, and the three points , b,b,, ¢,¢, hence five points in all. This and the reeiprocal considerations enable us to solve the following

responding lines are given.

cil S,, the correspondence and

two problems :—

Problem.—To construct a curve of

the second order, of which five points 8), Sz, A, B, C are given.

In order to solve the left-hand problem, we take two of the given points, say S, and S,, as centres of pencils. jective by taking the rays q, b), &, respectively, as corresponding to the rays a», 0,, ¢,, whieh join S, to A, B, C respectively, so that three rays meet their correspond- ing rays at the given points A, B, C. This determines the correspondence of the pencils which will generate a curve of the second order passing through A, B, C and through the centres 8, and §,, hence through the five given points. 1 on the curve we have to construet for any ray in 8, the eorrespond- ing ray in S,, This has been done in § 36. But we repeat the con-

A eurve o

GEOMETRY

A,, Bg, Cy where a, b, ¢ cut Ug.

Theorem.—lf two projective axial pencils lie in the same pencil (their axes meet in a point), but are neither perspective nor co-axial, then the locus of lines joining corresponding planes is a cone of the second order ; that is, no plane in the pencil con- tains more than two of these lines.

We point out, however, the

Every plane section of a cone of the second order is a curve of the second order.

Every plane section of a cone of the second class is a curve of the second class.

Solution.—Through the point A draw any two lines, 2) and v2 (fig. 15), the first 2, to cut the pencil 8; in a row AB,Cj, the other wv, to cut the pencil S, in a row AB,Cs. These two rows Will be perspective, as the point A corresponds to itself, and the centre of projection will be the point S§, where the lines B,B, and C,C, meet. To find now for any ray d, in 8, its corresponding ray dz in Sg, we dcter- mine the point D, where d, cuts %,

project this point from S to Dz on ug and join 8S, to Dz. This will be the required ray dz which cuts d, at some point D on the curve.

Theorem.—The envelope of second class which is generated by two pro- jective rows contains the bases of these rows as enveloping lines or tangents.

Proof.—If s and s’ are the two rows, then to the point ss’ or P’ as a point in s’ corresponds in 8 a point P, which is not coincident with P’, for the rows are not perspective. But P and FP’ are joined by s, so that s is one of the enveloping lines, and similarly s’.

These two

There is,

Theorem.—To the point of inter- section of the bases of two projective rows as a point in one row corre- sponds in the other the point of con- tact of its base.

ing ray &, cuts it on %p.

Theorent.—In the above construc- tion the bases of the auxiliary rows U, and tw, cut the curve where they cnt the rays SS and 8S respec- tively.

Problem.—To construct a curve of the second class, of which five

tangents 211, tg, a, 6, ¢ are given. ‘i 7 ae : Problem.—To find the second point in which any line through a known These we make pro- point on the curve cuts the curve.

which join S, to A, B, C

the point of contact of the tange § 51. If five points are given,

To find more points

then we can, as has just been s

struction in order to deduce further properties from it. We also solve the right-hand problem. Here we select two, VizZ., U,, UW, of the five given lines, %, Us, @, 6, ¢, as bases of two rows, and the points A,, B,, C, where a, 0, ¢ cut w as corresponding to the points

Fig. 15.

We get then the following solutions of the two problems :—

Solution.—In the line a take any two points 5, and S2 as centres of pencils (fig. 16), the first 8, (A)B,C)) to project the row wu, the other Se (AgB2C2) to project the row tz. These two pencils will be perspective, the line $,A, being the same as the corresponding line SgA», and the axis of projection will be the line vw, which joins the intersection B of 8,B, and S.B, to the intersection C of 8,C; and SCy. To find now for any point D, in uw, the corresponding point D2 in Us, we draw §,D, and project the point D where this line cuts u from 8 to U,. This will give the required point Dz, and the line d joining D, to Dz will be a new tangent to the curve.

Fig. 16.

§ 50. These constructions prove, when rightly interpreted, very important properties of the curves in question.

If in fig. 15 we draw in the pencil S, the ray &, which passes through the auxiliary centre S, it will be found that the correspond- Henec—

Theorem.—In the above constriuc- tion (fig. 16) the tangents to the curve

from the centres of the auxiliary pen-

cils S, and S, are the lines which pass through wou and u,u respectively.

As A is any given point on the curve, and 2, any line through it, we have solved the problems :—”

Problem.—To find the second tan- gent which can be drawn from any point in a given tangent to the curve.

If we determine in S, (fig. 15) the ray corresponding to the ray 8,8, in S,, we get the tangent at S). Similarly we can determine nts W, or %, in fig. 16. of which not three are in a line, hown, always draw a curve of the second order through them, we select two of the points as centres of projective pencils, and then one sueh curve is determined. be presently shown that we get always the same curve if two other points are taken as centres of peucils, that therefore five points deter-

It will

conics, |

mine one curve of the second order, and reciprocally, that five tan- gents determine one curve of the second class. Six points taken at random will therefore not lic on a curve of the second order. In order that this may be the case a certain condition has to be satis- fied, and this condition is casily obtained from the construction in § 49, fig. 15. If we consider the conic determined by the five points A, 8,, 8,, K, L, then the point D will be on the curve if, and only if, the points on D,, 8, D, be in a line,

This may be stated differ- ently if we take AKS,DS,L (figs. 15 and 17) as a hexagon inscribed in the conic, then AK and D8, will be opposite sides, so will be KS, and S,L, as well as 8,;D and LA. The

D Fig. 17.

Pascal’s theorem may be used when five points are given to find more points on the curve, viz., it enables us to find the point where any line through one of the given points cuts the curve again. It is convenient, in making use of Pascal’s theorem, to number the points, to indicate the order in which they are to be taken in form- ing a hexagon, which, by the way,

may be done in 60 different ways. It will be seen that 1 2 and (leaving out 3) 4 5 are opposite sides, so are 2 3 and (leaving out 4) 5 6, and also 3 4 and (leaving out 5) 6 1.

_If the points 1 234 5 are given, and we want a 6th point on a line drawn through 1, we know all the sides of the hexagon with the exception of 5 6, and this is found by Pascal's theorem.

If this line should happen to pass through 1, then 6 and 1 coin- cide, or the line 6 1 is the tangent at 1. And always if two con- secutive vertices of the hexagon approach nearer and nearer, then the side joining them will misiincialy become a tangent.

We may therefore consider a pentagon inscribed in a curve of sccond order and the tangent at one of its vertices as a hexagon, and thus get the theorem :—

first two mect in D,, the others in S and D, respectively. We may therefore state the required condition, together with the re-

ciprocal one, as follows :—

Pascal's Theorem.—If a hexagon be inscribed in a curve of the second order, then the intersections of oppo- site sides are three points in a line.

Brianehon's Theorem.—Ifa hexagon be circumscribed about a curve of the second class, then the lines join- ing opposite vertices are three lines

meeting in a point.

These celebrated theorems, which are known by the names of their discoverers, are perhaps the most fruitful in the whole theory of conics. Before we go over to their applications we have to show that we obtain the same curve if we take, instead of S,, 8,, any two other points on the curve as centres of projective pencils.

§ 52. We know that the curve depends only upon the corre- spondence between the pencils 8, and S,, and not upon the special construction used

for finding new points on thecurve. The point A (fig. 15 or fig. 17), through which the two auxiliary rows 2, Ww. were drawn, may therefore be changed to any other point on the curve. Let us now suppose the curve drawn, and keep the points S,, 8,, K, L, and D, and hence also the point S fixed, whilst we move A along the curve. Then the line AL will describe a pencil about L as centre, and the point D, a row on S,D perspective to the pencil L. At the same time AK describes a pencil about K and D, a row perspective to iton S,D. But by Pascal's Theorem D, and D, will always lie in a line with S, so that the rows described by D, and D, are perspective. It follows that the pencils K and L will themselves be projective, corresponding rays meeting on the curve. This proves that we get the same curve whatever pair of the five given points we take as centres of projective pencils. Hence—

Theorem.—Only one curve of the second order can be drawn which passes through five given points.

Theorem.—Only one curve of the second class can be drawn which touches five given lines.

Theorem.—Every pentagon in- scribed in a curve of second order has the property that the intersec- tions of two pairs of non-consecutive sides lie in a line with the point where the fifth side cuts the tangent at the opposite vertex.

Theorem.—Every pentagon cir- cumscribed about a curve of the second class has the property that the lines which join two pairs of non-consecutive vertices meet on that line which joins the fifth vertex to the point of contact of the opposite side.

This enables us also to solve the following problems.

Problem.—Given five points on a curve of second order to construct the tangent at any one of them.

Problem.—Given five tangents to a curve of second class to construct the point of contact of any one of them.

We have seen that if ou a curve of the second order two points coincide at A, the line joining them becomes the tangent at A. If, therefore, a point on the curve and its tangent are given, this will be equivalent to having given two points on the curve. Similarly, if on the curve of second class a tangent and its point of

Fig, 18.

If twice two adjacent vertices coincide, the hexagon becomes a quadrilateral, with tangents at two vertices. These we take to be

contact are given, this will be equivalent to two given tangents. We may therefore extend the last theorem :—

Theorem.—Only one curve of the second order can be drawn, of which four points and the tangent at one of them, or three points and the tangents at two of them, are given.

Theorem.—Only one curve of the second class can be drawn, of which four tangents and the point of con- tact at one of them, or-three tangents and the points of contact at two of them, are given.

§ 58. At the same time it has been proved :—

Theorem.—If all points on a curve of the second order be joined to any two of them, then the two pencils thus formed are projec- tive, those rays being correspond- ing which meet on the curve. Ifence—

The cross-ratio of four rays joining a point S on a curve of second order to four fixed points A, B, C, D in the curve is independent of the position of 8, and is called the cross- ratio of the four points A, B, C, D.

If this cross-ratio is =—1, the four points are said to be four harmonic points.

Theorem.—All tangents to a curve of second class are cut by any two of them in projective rows, those being corresponding points which lie on the same tangent. Hencc—

The cross-ratio of the four points in which any tangent wu is cut by four fixed tangents a, b, ¢c, d is in- dependent of the position of uw, and is called the cross-ratio of the four tangents a, b, c, d.

If this cross-ratio equals —1, the four tangents are said to be four harmonic tangents.

We have secn that a curve of second order, as generated by projective pencils, has at the centre of each pencil one tangent ; and further, that any point on the curve may be taken as centre of

such pencil. Hence—

Theorem,—A curve of second order has at every point onc tangent.

Theorem.—A curve of second class has on every tangent a point of con-tact.

§ 54. We return to Pascal's and Brianchon's theorems and their applications, and shall, as before, state the results both for curves of the second order and curves of the second class, hut prove them only for the former.

opposite, and get the following theorems :—

Theorem.—If a quadrilateral be inscribed in a curve of second order, the intersections of opposite sides, and also the intersections of the tangents at opposite vertices, lie in a line (fig. 18).

Theorem.—lf a quadrilateral be circumscribed about a curve of second class, the lines joining opposite vertices, and also the lines joining points of contact of epposite sides, meet in a point

Fig. 19. If we consider the hexagon made up of a triangle and the

tangents at its vertices, we get—

Theorem.—If a triangle is inscribed in acurve of second order, the points in which the sides are cut by the tangents at the opposite vertices meet in a point.

Theorem.—Tf a triangle be circum- scribed about a curve of second class, the lines which join the vertices to the points of contact of the opposite sides meetin a point (fig. 19).

§ 55. Of these theorems, those about the quadrilateral give rise to a number of others. Four points A, B, C, D may in three different ways be formed into a quadrilateral, for we may take them in the order ABCD, or ACBD, or ACDB, so that either of the points B, C, D may be taken as the vertex opposite to A. Accordingly we may apply the theorem in three different ways.

Let A, B, C, D be four points on a curve of second order (fig. 20), and let us take them as forming a quadrilateral by taking the

ee

RS

Fig. 20.

points in the order ABCD, so that A, C and also B, D are pairs of opposite vertices. Then P, Q will be the points where opposite sides meet, and E, F the intersections of tangents at opposite vertices: The four points P, Q, E, F lie therefore ina line. The quadrilateral ACBD gives us in the same way the four points Q, R, G, H in a line, and the quadrilateral ABDC a line containing the four points R, P, I, K. These three lines form a triangle PQR.

The piston between the points and lines in this figure may be expressed more elearly if we consider ABCD as a four-point in- seribed in a conic, and the tangent at these points as a four-side eircumscribed about it,—viz., it will be seen that P, Q, R are the diagonal points of the four-point ABCD, whilst the sides of the triangle PQR are the diagonals of the ecireumscribing four-side. Hence the theorem—

THEOREM.—Any four-point on a eurve of the second order and the four-side formed by the tangents at these points stand in this relation that the

diagonal points of the four-point lie in the diagonals of the Jfour-side. And conversely,

Lf a four-point and a cireumseribed four-side stand in the above relation, then a eurve of the second order may be deseribed whieh passes through the four points and touches there the four sides of these figures.

That the last part of the theorem is true follows from the fact that the four points A, B, C, D and the line a, as tangent at A, deter- mine a curve of the second order, and the tangents to this curve at the other points B, C, D are given by the construction which leads to fig. 20.

The theorem reciprocal to the last is—

THEOREM.—Any four-side circumseribed about a curve of sceond class and the four-point formed by the points of contaet stand in this relation that the diagonals of the four-side pass through the diagonal points of the four-point. And conversely,

order is a curve of second class.

[PROJECTIVE.

If a four-side and an inseribed four-point stand in the above relation, then aeurve of the second class may be described which touches the sides of the four-side at the points of the four-points.

§ 56. The four-point and the four-side in the two reciprocal theorems are alike. Hence if we have a four-point ABCD and a four-side abcd related in the manner described, then not only may a curve of the second order be drawn, but also a curve of the second class, which both touch the lines a, 0, ¢, d at the points A, B, C, D.

The curve of second order is already more than determined by the points A, B, C and the tangents a, b,e at A, B, andC. The point D may therefore be any point on this curve, and d any tangent to the curve. On the other hand

the curve of the second class is more than determined by the three tangents a, 0, e and their points of contact A, B, C, so that d is any tangent to this curve.’ It follows that every tangent to the curve of second order is a tangent of a curve of the second class having the same point of contact. In other words, the curve of second order is a eurve of second class, and vice versa. Hence the important theorems :—

THEOREM.—Every curve of second THEOREM.—LEvery curve of second class is a curve of second order.

The curves of second order and of second elass having thus been proved to be identical shall henceforth be called by the common name of Conies.

For these curves hold, therefore, all properties which have been proved for curves of second order or of second class. We may therefore now state Pascal’s and Brianchon’s theorem thus—

Pascal’s Theorem.—If a hexagon be inscribed in a conie, then the intersections of opposite sides lie in a line.

Brianehon’s Theorem.—If a hexagon be eircumscribed about a conic, then the diagonals forming opposite centres meet in a point.

§ 57. If we suppose in fig. 20 that the point D together with the tangent d moves along the curve, whilst A, B, C and their tangents a, 6, c remain fixed, then the ray DA will describe a pencil about A, the point Q a projective row on the fixed line BC, the point F the row b, and the ray EF a pencil about E. But EF passes always through Q. Hence the pencil described by AD is projective to the pencil described by EF, and therefore to the row described by F on b. At the same time the line BD describes a pencil about B pro- jective to that described by AD (§ 53). Therefore the pencil BD and the row F on 0 arc projective. Hence—

THEOREM.—IJf on a conte a point A be taken and the tangent a at this point then the eross-ratio of the four rays whieh join A to any four points on the curve is equal to the cross-ratio of the points in which the tangents at these points eut the tangent at A.

§ 58. There are theorems about cones of second order and second class in a pencil which are reciprocal to the above, according to § 43. We mention only a few of the more important ones.

Theorem.—The locus of intersections of corresponding planes in two projective axial pencils whose axes meet is a cone of the second order.

Theorem.—The envelope of planes which join corresponding lines in two projective flat pencils, not in the same plane, is a cone of the second class.

Theorem.—Cones of second order and cones of second class are identical.

Theorem.—Every plane cuts a cone of the second order in a conic.

THEOREM.—A cone of sceond order is uniquely determined by five of its edges or by five of its tangent planes, or by four edges and the tangent plane at one of them, dc., dc. ;

Theorem (Pascal's).—If a solid angle of six faces be inscribed in a cone of the second order, then the intersections of opposite faces are three lines in a plane.

Theorem (Brianchon's).—If a solid angle of six edges be circum- scribed about a cone of the second order, then the planes through opposite edges meet in a line.

Each of the other theorems about conics may be stated for cones of the second order.

§ 59. We have not yet considered the shape of the conics. We know that any line in the plane of the conic, and hence that the line at infinity, either has no point in common with the curve, or one (counting for two coincident points), or two distinct points. If the line at infinity has no point on the curve the latter is altogether finite, and is called an Ellipse (fig. 20). If the line at infinity has only one point in common with the conic, the latter extends to infinity, and has the line at infinity a tangent. It is called a Parabola (fig. 21). If, lastly, the linc at infinity cuts the curve in two points, it consists of two separate parts which each extend in two branches to the

points at infinity where they meet. The curve isin this case called an Hyperbola (see fig. 19, 24, or 25). The tangents at the two points at infinity are finite because the line at infinity is not a tangent. They are called Asymptotes. The branches of the hyperbola approach these lines indefinitely as a point om the curves moves to infinity.

§ 60. That the circle belongs to the curves of the second order is seen at once if we state in a slightly different form the theorem

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that in a circle all angles at the circumference standing upon the same arc are equal. If two points 8,, S, on a circle be joined to any other two points A and B on the circle, then the angle included by the rays S,A and S,B is equal to that between the rays S,A and 8,B, so

that .as A moves

along the circumfer-

ence the rays S,A

and §,A_ describe

equal and therefore

projective pencils.

The circle can thus

be generated by two

projective pencils,

and is a curve of the

second order.

If we join a point in space to all points on a circle, we geta P (circular) cone of the second order (§ 43).

Every plane section

of this cone is a

conic. This pone P

will be an ellipse, :

a parabola, a an Fig, 21,

hyperbola, according as the line at infinity in the plane has no, one, or two points in common with the conic in which the plane at infinity cuts the cone. It follows that our curves of second order may be obtained as sections of a circular cone, and that they are identical with the "'Conic Sections" of the Greck mathe- maticians.

§ 61. Any two tangents to a parabola are cut by all others in projective rows ; but the line at infinity being one of the tangents, the points at infinity on the rows are corresponding points, and the rows therefore similar. Hence—

THEOREM.—The tangents to a parabola cut cach other propor- tionally.

PoLE AND POLAR.

§ 62. We return once again to the remarkable figure (fig. 20) which we obtained in § 55.

If a four-side be circumscribed about and a four-point inscribed in a conic, so that the vertices of the second are the points of con- tact of the sides of the first, then the triangle formed by the dia- gonals of the first is the same as that formed by the diagonal points of the other.

Such a triangle will be called a polar triangle of the conic, so that PQR in fig. 20 is a polar triangle. It has the property that on the side p opposite P meet the tangents at A and B, and also those at Cand D, From the harmonic properties of four-points and four-sides it follows further that the points L,

M, where it cuts the lines AB and CD, are harmonic conjugates with regard to AB and CD respectively.

If the point P is given, and we draw a line throngh it, cutting the conic in A and B, then the point Q harmonic conjugate to P with regard to AB, and the point H where the tangents at A and B meet, are determined. But they lie both on p, and therefore this line is determined. If we now draw a second line through P, cut- ting the conic in C and D, then the point M harmonic conjugate to P with regard to CD, and the point G where the tangents at C and D meet, must also lieon py. As the first line through P already detcrmines p, the second may be any line through P. Now every two lines through P determine a four-point ABCD on the conic, and therefore a polar-triangle which has one vertex at P and its opposite side at p. This result, together with its reciprocal, give the theorem :—

THEOREM.—All polar-triangles which have one vertex in common have also the opposite side in common.

All polar-triangles which have one side in common have also the opposite vertex in common.

§ 68. To any point Pin the plane of but not on a conic cor- responds thus one line p as the side opposite to P in all polar tri- angles which have one vertex at P, and reciprocally to every line p corresponds one point P as the vertex opposite to g in all triangles which have p as one side.

We call the line p the polar of P, and the point P the pole of the line » with regard to the conic.

If a point lies on the conic, we call the tangent at that point its polar; and reciprocally we call the point of contact the pole of tangent.

§ 64. From these definitions and former results follow—

Theorem.—The polar of any point Theorem.—The pole of any line p P not on the conic isa line», which not a tangent to the conic is a point has the following properties :— P, which has the following pro-

perties :—

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1. On every line through P which cuts the conic, it contains the har- monic conjugate of P with regard to those points on the conic.

2. If tangents can be drawn from P, their points of contact lie on p.

3. Tangents drawn at the points where any line through P cuts the conic, meet on it; and conversely,

4, If from any point on it tangents be drawn, their points of contact will lie in a line with P.

5. Any four-point on the conic which has one diagonal point at P has the other two lying on p.

The truth of 2 follows from 1.

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1. Of all lines through a point on p from which two tangents may be drawn to the conic, it contains the line which is harmonic conjugate to p, with regard to the two tangents.

2. If p cuts the conic, the tangents at the intersections meet at P.

3. The point of contact of tangents drawn from any point on p to the conic lie in a line with P; and con- versely,

4, Tangents drawn at points where any line through P cuts the conic meet on p.

5. Any four-side circumscribed about a conic which has one diagonal on p has the other two meeting at P.

If T be a point where » cuts the

conic, then one of the points where PT cuts the conic, and which are harmonic conjugates with regard to PT, coincides with lie hence the other does—that is, PT touches the curve at T.

That 4 is true follows thus: If we draw from a point H on

the polar one tangent a to the conic, join its point of contact A to the pole P, determine the second point of intersection B of this line with the conic, and draw the tangent at B, it will pass through H, and will therefore be the second tangent which may be drawn

from H to the curve. § 65. The second property of theorem—

Theorem.—From a point in the plane of a conic, two, one, or no tan- gents may be drawn to the conic, according as its polar has two, one, or no points in common with the

the polar or pole gives rise to the

Theorem.—A line in the plane of a conic has two, one, or no points in common with the conic, according as two, one, or no tangents can be drawn from its pole to the conic.

curve.

Of any point in the plane of a conic we say that it was without, on, or within the curve according as two, one, or no tangents to the curve pass through it. The points on the conic separates those within the conic from those without. That this is true for a circle is known from elementary geometry. That it also holds for other conics follows from the fact that every conic may be considered as the projection of a circle, which will be proved later on.

The fifth property of pole and polar stated in § 64 shows how to find the polar of any point and the pole of any line by aid of the straight-edge only. Practically it is often convenient to draw three secants through the pole, and to determine only one of the diagonal points for two of the four-points formed by pairs of these lines and the conic (fig. 21).

These constructions also solve the problem :—

Problem.—From a point without a conic, to draw the two tan- gents to the conic by aid of the straight-edge only.

For we need only draw the polar of the point in order to find the points of contact.

§ 66. The property of a polar-triangle may now be stated thus—

Theorem.—In a polar-triangle each side is the polar of the oppo- site vertex, and each vertex is the pole of the opposite side.

If P is one vertex of a polar-triangle, then the other vertices, Q and R, lie on the polar pof P. One of these vertices we may chose arbitrarily. Forif from any point Q on the polar a secant be drawn cutting the conic in A and D (fig. 22), and if the lines joining these points to P cut the conic again at B and C, then the line BC will pass through Q. Hence P and Q are two of the vertices on the polar-triangle which is determined by the four-point ABCD, The third vertex R lies also on the line p. It follows, therefore, also—

THEOREM. —J/f Q is a point on the polar of P, then P ts a point on the polar of Q; and reciprocally,

If q is a line through the pole of p, then p ts a line through the pole of q.

This is a very important theorem. It may also be stated thus—

THEOREM.—IJf a point moves along a line describing a row, tis polar turns about the pole of the line deseribing a pencil. —

This peneil is projective to the row, so that the cross-ratio of four poles in a row equals the eross-ratio of its four polars, which pass through the pole of the-row. ‘

To es the last part, let us suppose that P, A, and B in fig. cf remain fixed, whilst Q moves along the polar p of P. This wi

Fig, 29.

make CD turn about P and move R along p, whilst QD and RD | case as an inscribed four-point, in the other as a circumseribed

deseribe projective pencils about A and B. Hence Q and R describe projective rows, and hence PR, which is the polar of Q, describes a pencil projective to either.

§ 67. Two points, of which one, and therefore each, lies on the polar of the other, are said to be conjugate with regard to the conic; and two lines, of which one, and therefore each, passes through the pole of the other, are said to be conjugate with regard to the conic. Hence all points conjugate to a point P lie on the polar of P; all lines conjugate to a line p pass through the

ole of p. r If the line joining two conjugate poles cuts the conic, then the poles are harmonic conjugates with regard to the points of inter- section ; hence one lies within the other without the conic, and all poiuts conjugate to a point within a conic lie without it.

Of a polar-triangle any two vertices are conjugate poles, any two sides conjugate lines. If, therefore, one side cuts a conic, then one of the two vertices which lie on this side is within and the other without the conic. The vertex opposite this side lies also without, for it is the pole of a line which cuts the curve. In this case therefore one vertex lies within, the other two without. If, on the other hand, we begin with a side which does not cut the conic, then its pole lies within and the other vertices without. Hence—

Theorem. —Every polar triangle has one and only one vertex within the conic.

We add, without a proof, the theorem—

Theorem.—The four points in which a conic is cut by two conju- gate polars are four harmonic points in the conic.

§ 68. If two conics intersect in four points (they cannot have more points in common, § 52), there exists one and only one four-point which is inscribed in both, and therefore one polar tri- angle common to both.

Theorem.—Two conics which intersect in four points have always one and only one common polar-triangle ; and reciprocally,

Two conics which have fonr common tangents Kase always one and only one common polar-triangle.

The proof that these polar triangles are identical in case of a conie which have four points and also four tangents in cominon is left to the reader.

DIAMETERS AND AXES OF CONICS.

§ 69. Diameters.—The theorems about the harmonic proper- ties of poles and polars contain, as special cases, a number of im- portant metrical properties of conics. These are obtained if either the pole or the polar is moved to infinity,—it being remembered that the harmonic conjugate to a point at infinity, with regard to two points A, B, is the middle point of the seginent AB. The most important properties are stated in the following theorems :—

The middle points of parallel chords of a conic lie in a line—viz., on the polar to the point at infinity on the parallel chords.

This line is called a diameter.

The polar of every point at infinity is a diameter.

The tangents at the cnd points of a diameter are parallel, and are parallel to the chords bisected by the diameter.

All diameters pass through a common point, the pole of the line at infinity.

All diameters of a parabola arc paralicl, the pole to the line at ag being the point where the curve touches the line at in-

nity.

In case of the ellipse and hyperbola, the pole to the line at in- finity is a finite point called the centre of the curve.

A centre of a conic bisects every chord through tt.

Lhe centre of an ellipse is within the curve, for the line at infinity does not cut the ellipse.

The centre of an hyperbola ts without the curve, because the line at infinity cuts the curve. Hence also

From the centre of an hyperbola two tangents can be drawn to the curve which have their point of contact at infinity. These are called Asymptotes (§ 59). ‘

To construct a diameter of a conic, draw twe parallel chords and join their middle points.

Lo find the centre of a conic, draw two diameters ; their intersec- tion will be the centre.

§ 70. Conjugate Diameters.—A polar-triangle with one vertex at the centre will have the opposite side at infinity. The other two sides pass through the centre, and are called conjugate dia- metcrs, each being the polar of the point at infinity on the other.

Of two conjugate diameters cach bisects the chords parallel to the other, and if one cuts the curve, the tangents at its ends wre parallel to the other diameter.

Further—

Every parallelogram inscribed in a conic has its sides parallel to two conjugate diameters ; and

Every parallelogram circumscribed about a conic has as diagonals two conjugate diameters.

This will be seen by considering the parallelogram in the first

four-side, and determining in each case the corresponding polar- triangle. The first may also be enunciated thus—

The lines which join any point on an ellipse or an hyperbola to the cnds of a diameter are parallel to two conjugate diameters.

$71. THe CrrcLe.—ZJ/f every diametcr ts perpendicular to its con- jugate the conic is a circle.

For the line which joins the ends of a diameter to any point on the curve include a right angle.

A conic which has more than one pair of conjugate diameters at right angles to each other is a cirele.

Let AA’ and BB’ (fig. 28) be one pair of conjugate diameters at right angles to each other, CC’ and DD’ a second pair. 1f we draw Ty. 8 through the end point A of one 2 diameter a chord AP parallel to DD’, and join P to A’, then PA and PA’ are, according to § 70, parallel to two conjugate diameters. But PA is parallel to DD’, hence PA’ ibs is parallel to CC’, and therefore PA and PA’ are perpendicular. If we further draw the tangents to the conic at A and A’, these will be

_ perpendicular to AA’, they being

parallel to the conjugate diameter B BB’. We know thus five points on ;

the conic, viz., the points A and A’ Fig. 23.

with their tangents, and the point P. Through these a cirele may be drawn having AA’ as diameter ; and as through five points one conic only can be drawn, this circle must coincide with the given conic.

§ 72. Aaxes,—Conjugate diameters perpendicular to each other are called azcs, and the points where they cut the curve vertices of the conic.

In a cirele every diameter is an axis, every point on it is a vertex; and any two lines at right angles to each other may be taken as a pair of axes of any cirele which has its centre at their intersection.

lf we describe on a diameter AB of an ellipse or hyperbola a circle concentric to the conic, it will cut the latter in A and B (fig. 24). Each of the semicircles in which it is divided by AB will be partly within, partly without the curve, and must eut the latter therefore again ina point. The eircle and the conic have thus four points A, B, C, D, and there- fore one polar-triangle, in common (§ 68). Of this the centre is one vertex, for the line at infinity is the polar to this point, both with regard to the circle and the other conic. The Fic, 24 other two sides are eon- rer : jugate diameters of both, hence perpendicular to cach other. This

ves— * Theorem.—An ellipse as well as an hyperbola has one pair of axes,
.

This reasoning shows at the same time how to construct the amis of an ellipse or of an hyperbola.

A parabola has one axis, if we define an axis as a diameter per- pendicular to the chords which it bisects. It is easily constructed. The line which bisects any two parallel chords is a diameter. Chords perpendicular to it will be bisected by a parallel diameter, and this is the axis.

§ 73. The first part of the right hand theorem in § 64 may be stated thus: any two conjugate lines through a point P without a conic are harmonic conjugates with regard to the two tangents that may be drawn from P to the conic.

If we take instead of P the centre C of an hyperbola, then the conjugate lines become conjugate diameters, and the tangents asymptotes. Hence—

Theorem.—Any two conjugate diameters of an hyperbola are har- monic conjugates with regard to the asymptotes.

As the axes are conjugate diameters at right angles to one an- other, it follows (§ 23)—

Theorem. —The axes of an hyperbola bisect the angles between the asymptotes.

Let O be the centre of the hyperbola (fig. 25), £ any seeant which ents the hyperbola in C,D and the asymptotes in E,F, then the line OH which bisects the chord CD is a diameter conjugate to the diameter OK which is parallel to the secant ¢, so that OK and OM

METRICAL PROPERTIES. |

are harmonic with regard to the asymptotes. The point M there- fore bisects EF, But by construction M bisects CD. It follows that DF = EC, and ED=CF ; or

Fig. 25,

THEOREM. —On any secant of an hyperbola the segments between the curve and the asymptotes are equal.

If the chord is changed into a tangent, this gives

The segment between the asyinptotes on any tangent to an hyperbola is biseeted by the point of contact.

The first part allows a simple solution of the problem to find any number of points on an hyperbola, of which the asymptotes and one point are given. This 1s equivalent to three points and the tan- gents at two of them. This construction re- quires measurement.

_ § 74. For the para- bola, too, follow some metrical properties. A diameter PM (fig. 26) bisects every chord con- jugate to it, and the ole P of sueh a chord C lies ou thediameter. But a diameter cuts the parabola once at in- finity. Hence—

Theorem,—The segs ment PM which joins the middle point M of achord of a parabola to the pole P of the chord is bisected by the parabola at A.

§ 75. Two asymptotes and any two tangents to an hyperbola may be considered as a quadrilateral circumscribed about the hyperbola, But in such a quadrilateral the intersections of the

Fig 26.

Fig. 27.

diagonals and the points of contact of opposite sides lie in a line (§ 54). Iftherefore DEFG (fig. 27) is sucha quadrilateral, then the diagonals DF and GE will meet on the line which joins the points of contact of the asymptotes, that is, on the line at infinity; hence

they are parallel. From this the following theorem is a simple deduction :—

Theorem.—All triangles formed by a tangent and the asym ptotes of an hyperbola are equal in area.

If we draw at a point P (fig. 27) on an hyperbola a tangent, the part HK between the asymptotes is bisected at P. The parallelo- gram PQOQ' formed by the asymptotes and lines parallel to them through P will be half the triangle OHK, and will therefore be constant. If we now take the asymptotes OX and OY as oblique axes of coordinates, the lines OQ and QP will be the coordinates of P, and will satisfy the equation xy = const. =a?.

Theorem.—For the asymptotes as axes of coordinates the equa- tion of the hyperbola is xy = const.

It is not difficult to get the equations to the ellipse and hyperbola referred to their axes as axes of coordinates, We are satisfied to have shown in one case that the curves of the second order as generated by projective pencils are the same as those which are in coordinate geometry defined by equations of the second degree.

INVOLUTION.

§ 76. If we have two projective rows, ABC on wu and A’B’C’ on uw’, and place their bases on the same line, then each point in this line counts twice, once as a point in the row wu and once as a point in the row wu’. In fig. 28 we denote the points as points in the one row by letters above the line A, B, C…, and as points A B in the second row by A’, B’, C’ ee a tas .... belowtheline. Let now A B A and B’ be the same point, then to A will correspond a point A’in the second, and to B’ a point B in the first row. In general these points A’ and B will be different. It may, however, happen that they coincide. Then the correspondence is a peculiar one, as the following theorem shows :—

TarorEM.—I/ two projective rows lie on the same base, and uf ut happens that to one point in the base the same point corresponds, whether we consider the point as belonging to the first or to the second row, then the same will happen for every point in the base— that ts to say, to every point in the line corresponds the same potnt in the first as in the second row.

Proof. In order to determine the correspondence, we may assume three pairs of corresponding points in two projective rows. Let then A’, B’, C’, in fig. 29, corre-

Fig. 28.

spond to A, B,C, sothat AandB’, A D B Cc and also B and A’, denote the ; ‘ 5 same point. Let us further de B c A D note the point C’ when considered Fig. 29.

as a point in the first row by D; | i

then it is to be proved that the point D’, which corresponds to D, is the same point as C. We know that the cross-ratio of four points is equal to that of the corresponding row. Hence

(ABCD) =(A’B’C’D’)

but replacing the dashed letters by those undashed ones which denote the same points, the second cross-ratio equals (BADD), which, according to § 15, iv., equals (ABD’D) ; so that the equation

becomes (ABCD) =(ABD’D). This requires that C and D’ coincide. ‘

§ 77. Two projective rows on the same base, which have the above property, that to every point, whether it be considered as a point in the one or in the other row, corresponds the same point, are said to be in involution, or to form an tnvolution of points on the line.

We mention, but without proving it, that any two projective rows may be placed so as to form an involution. ; ‘

An involution may be said to consist of a row of pairs of points, to every point A corresponding a point A’, and to A’ again the point A. These points are said to be conjugate. – P

From the definition, according to which an involution may be considered as made up of two projective rows, follow at once the following important properties :—

(1.) The cross-ratio of four points equals that of the four con- jugate points. j — ‘y i ~

(2.) If we call a point which coincides with its conjugate point a ‘*focus”’ of the involution, we may say: An involution has either two foci, or one, or none, and is called respectively a hyperbolic, parabolic, or elliptic involution (§ 34). ;

(8.) In a hyperbolic involution any two conjugate points are har- monic conjugates with regard to the two foci. }

For if A, A’ be two conjugate points, F,, F, the two foci, then to the points F,, F,, A, A’ in the one row correspond the points F), F., A’ A in the other, each focus corresponding to itself. Hence (F; em (F,F,A’A)—that is, we may interchange the two points AA’ with- out altering the value of the cross-ratio, whieh is the charac- teristic property of harmonic conjugates (§ 1). -s

(4.) The point conjugate to the point at infinity is called the ‘ eentre” of the involution. Every involution has a centre, unless the point at infinity be a focus, in which case we may say that the centre is at infinity.) ‘ é

In a hyperbolic involution the centre is the middle point between the foci.

(5.) The product of the distances of two conjugate points A, A’ from the centre O is constant :—

OA.OA’=c.

Proof.—l.et A, A’, and B, B’ be two pairs of conjugate points, O the centre, I the point at infinity, then

(ABOI) =(A’B’I0),

OA.OA’=OB. OB’,

In order to determine the distances of the foci from the centre, we write F for A and A’ and get

OF’ =c; OF=4A/c, Hence if ¢ is positive OF is real, and has two values, equal and opposite. The involution is hyperbolic. If c=0, OF =0, and the two foci both coincide with the centre. If cis negative, 4/c becomes imaginary, and there are no foci. Hence we may write— ‘

In a hyperbolic involution, OA. OA’=2?, In a parabolic involution, OA.OA’=0, In an elliptic involution, OA.OA’=-k*,

From these expressions it follows that or ey points A, A’ ina hyperbolic involution lie on the same side of the centre, and in an elliptic involution on opposite sides of the centre, and that in a parabolic involution one coincides with the centre.

In the first case, for instance, OA. OA’ is positive; hence OA and OA’ have the same sign.

It also follows that two segments, AA’ and BB’, between pairs of conjugate points have the following positions:—in a hyperbolic involution they lie either one altogether within or altogether with- out each other; in a parabolic involution they have one point in common; and in an elliptic involution they overlap, each being partly within and partly without the other.

Proof.—We have OA.OA’=OB. OB’=Z2? in case of a hyperbolic involution. Let A and B be the points in each pair which are nearer tothe centreO. If now A, A’and B, B’ lie on the same side of O, and if B isnearer to O than A, so that OBOA’; hence B’ lics further away from O than A’, or the segment AA’ lies within BB’. And so on for the other cases.

(6.) An involution is determined—

(a) By two pairs of conjugate points. Hence also (8) By one pair of conjugate points and the centre; (y) By the two foci;

(3) By one focus and one pair of conjugate points ; (e) By one focus and the centre.

(7.) The condition that A, B, Cand A’, B’, C’ may form an involu-

tion may be written in one of the forms—

(ABCC’) =(A’B’C’C), or (ABCA’) =(A’B’C’A), or (ABC’A’)=(A’B’CA), for each expresses that in the two projective rows in which A, B, C and A’, B’, C’ are conjugate points two conjugate elements may be interchanged.

(8.) Any three pairs, A, A’, B, B’, C, C’, of conjugate points are connected by the relation—

BA’ CB’ AC AC BA CB

Proof.—We have by (7) (ABO’A’) =(A’B’CA), which, when worked out, gives the above relation.

The latter is easily remembered by aid of the following rule of writing the first side First write

BC A CG a 1p and then fill up the gaps in numerator and denominator by A’, B’, C’ respectively. _ § 78. THEOREM.—The sides of any fowr-point arc cut by any line in fe points in involution, opposite sides being cut in conjugate points.

Let A,B,C,D, (fig. 80) be the four-point. If its sides be cut by the line p in the points A, A’, B, B’, C, C’, if further, C,D, cuts the line A,B, in Cy, and if we project the row A,B,C,C to p once from D, and once from ©,, we get

(A’B’C’C) = (BAC’C).

Interchanging in the last cross-ratio the letters in each pair we get (A’B’C’C) =(ABCC’).

Hence by § 77 (7) the points are in involution.

or

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The theorem may also be stated thus :—

Theorem.—The three points in which any line cuts the sides of a triangle and the projections, from any point in the plane, of the vertices of the triangle on to the same line are six points in involu- tion.

Or again—

The projections from any point on to any line of the six vertices

Fig 30.

of a four-side are six points in involution, the projections of oppd- site vertices being conjugate points.

This property gives a simple means to construct, by aid of the straight edge only, in an involution of which two pairs of conjugate points are given, to

any point its conjugate.

§ 79. The theory of involution may at once be extended from the row to the flat and the axial pencil—viz., we say that there is an involution in a flat or in an axial pencil if any line cuts the pencil in an involution of points, An involution in a pencil consists of pairs of conjugate rays or planes ; it has two, one, or no focal rays or planes, but nothing corresponding to a ccutre.

An involution in a flat pencil contains always one, and in gene- ral only one, pair of conjugate rays which are perpendicular to one another. For in two projective flat pencils exist always two corre- sponding right angles (§ 40).

Each involution in an axial pencil contains in the same manner one pair of conjugate planes at right angles to one another.

As a rule, there exists but one pair of conjugate lines or planes at right angles to each other. But it is possible that there are more, and then there is an infinite number of such pairs. An in- volution in a flat pencil, in which every ray is perpendicular to its conjugate ray, is said to be circular. That such involution is possible is easily seen thus:—if in two concentric flat pencils each ray on one is made to correspond to that ray on the other which is perpendicular to it, then the two pencils are projective, for if we turn the one pencil through a _ angle each ray in one coincides with its corresponding ray in the other. But these two projective pencils are in involution.

A circular involution has no focal rays, because no ray in a pencil coincides with the ray perpendicular to it.

§ 80. THEOREM.—Every elliptical involution in a row may be considcred as a section of a circular involution.

Proof.—In an elliptical involution any two segments AA’ and BB’ lie partly within partly without each other (fig. 31). Hence two circles described on ‘AA and BB’ as diameters will intersect in two points E and EF’. The line EE’ cuts the base of the involution at a point O, which, from a well known proposition (Eucl. III. 35), has the property that OA.OA’=OB.OB’, for each

is equal to OE. OF’. The point O is therefore the centre of the involution. If we wish to construct to any

oint C the conjugate point C’, we may draw the circle through CEE’. This will cut the base in the required point C’ for OC.OC’ =OA.0A’. But EC and EC’ are at right angles. Hence the involution which is obtained by joining E or E’ to the points in the given involution is circular. This may also be expressed thus :—

Every elliptical involution has the property that there are two definite points in the plane. from which any tvo conjugate points arc seen under a right angle.

Fig. 31.

INVOLUTION. |

At the same time the following problem has been solved :-—

Problem. —To determine the centre and also the point correspond- ing to any given point in an elliptical involution of which two pairs of conjugate points are given.

§ 81. By the aid of § 53, the points on a conic may be made to correspond to those on a line, so that the row of points un the conic is projective to a row of points on a line. We may also have two projective rows on the same conic, and these will be in involution as soon as one point on the conic has the same point corresponding to it all the same to whatever row it belongs. An involution of points on a conic will have the property (as follows from its defini- tion, and from § 53) that the lines which join conjugate points of the involution to any point on the conic are conjugate lines of an involution in a pencil, and that a fixed tangent iscut by the tangents at conjugate points on the conic in points which are again conju- gate points of an involution on the fixed tangent. For such invol- ution on a conic the following theorem holds :—

THEOREM. — The lines which join corresponding points in an in- volution on a conte all pass through a fixed point; and reciprocally, the

points of intersection of conjugate lines in an involution among tangents to a conte lie on a line.

We prove the first part only. The involution is determined by two pairs of conjugate points, say by A, A’ and B, B’ (fig. 32). Let AA’ and BB’ meet in P. If we join the points in involution to any point on the conic, and the conjugate points to another point on the conic,

Fig. 32.

we obtain two projective pencils. We take A and A’ as centres of these pencils, so that the pencils A(A’BB’) and A(AB’B) are pro- jective, and in perspective position, because AA’ corresponds to A‘’A, Hence corresponding rays meet in a line, of which two points are found by joining AB’ to A’B and AB to A’B’. It follows that the axis of perspective is the polar of the point P, where AA’ and BB’ meet. If we now wish to construct to any other point C ou the conic the corresponding point C’, we join C to A’ and the point where this line cutsyto A. The latter line cuts the conic again in C’. But we know from the theory of pole and polar that the line CC’ passes through P.

INVOLUTION DETERMINED BY A CoNIc ON A LinE.—Foct.

§ 82. The polars, with regard to a conic, of points in a row p form a pencil P projective to the row (§ 66). This pencil cuts the base of the row p in a projective row.

If A isa point in the given row, A’ the point where the polar of A cuts p, then A and A’ will be corresponding points. ~~If we take A’a point in the first row, then the polar of A’ will pass through A, so that A corresponds to A’—in other words, the rows are in in~~ volution. The conjugate points in this involution are conjugate points with regard to the conic. Conjugate points coincide only if the polar of a point A passes through A—that is, if A lies on the conic. Hence—

THEOREM. —A conic determines on every line in its plane an involu- tion, in which those points are conjugate which are also conjugate with regard to the conte.

Tf the line cuts the conic the involution is hyperbolic, the points of intersection being the foci.

If the line touches the conic the involution is parabolic, the two Soci coinciding at the point of contact.

_ If the line does not cut the conie the involution is elliptic, having no oct.

If, on the other hand, we take a point P in the plain of a conic, we get to each line a through P one conjugate line which joins P to the pole of a. These pairs of conjugate lines through P form an involution in the pencil at P. The focal rays of this involution are the tangents drawn from P tothe conic. This gives the theorem reciprocal to the last, viz. :—

THEOREM.—A conic determines in every pencil in its plane an involution, corresponding lines being conjugate lines with regard to the conic,

Tf the point is without the conie the involution ts hyperbolic, the tangents from the points being the focal rays.

If the point lies on the conic the involution ts parabolic, the tangent at the point counting for coincident focal rays.

Lf the point is within the conie the involution is elliptic, having no Socal rays.

It will further be seen that the involution determined by a conic on any line p is a section of the involution, which is determined by the conic at the pole P of p.

§ 83. Definition.—The centre of a pencil in which the conic deter- mines a circular involution is called a “ focus” of the conic.

In other words—

A focus is such a point that every line through it is perpendicular to its conjugate line.

The polar to a focus is called a directrix of the conic.

From the definition it follows that :—

Every focus lies on an asis, for the line joining a focus to the centre of the conic is a diameter to which the conjugate lines are perpendicular ; and

Every line joining two foci is an asis, for the perpendiculars to this line through the foci are conjugate to it. These conjugate lines pass through the pole of the line, the pole lies therefore at in- finity, and the line is a diameter, hence by the last property an axis.

It follows that all foci lie on one axis, for no line joining a point in one axis to a point in the other can be an axis,

As the conic determines in the pencil which has its centre at a focus a circular involution, no tangents can be drawn from the focus to the conic. Hence each focus lies within a conic; and a directrix does not cut the conic.

Further properties are found by the following considerations :—

§ 84. Through a point P one line p can be drawn, which is with regard to a given conic conjugate to a given line q, viz., that line which joins the point P to the pole of the line g. If the line q is made to describe a pencil about a point Q, then the line p will describe a pencil about P. These two pencils will be projective, for the line p passes through the pole of g, and whilst g describes the pencil Q, its pole pe a projective row, and this row is perspec- tive to the pencil P.

We now take the point P on an axis of the conic, draw any line p through it, and from the pole of » draw a perpendicular g to

Let q cut the axis in Q. Then, in the pencils of conjugate

D. | lines, which have their centres at P and Q, the lines p and q are

conjugate lines at right angles to one another. Besides, to the axis as a ray in either pencil will correspond in the other the perpen- dicular to the axis (§ 72). The conic generated by the intersec- tion of corresponding lines in the two pencils is therefore the circle on PQ as diameter, so that every line in P is perpendicular to its corresponding line in Q.

To every point P on an axis of a conic corresponds thus a point Q, such that conjugate lines through P and Q are perpendicular.

We shall show that these point-pairs P, Q form an involution. To do this let us move P along the axis, and with it the line p, keeping the latter parallel to itself. Then P describes a row, pa perspective pencil (of parallels), and the pole of » a projective row. At the same time the line g describes a pencil of parallels perpen- dicular toy, and perspective to the row formed by the pole of p. The point Q, therefore, where q cuts the axis, describes a row pro- jective to the row of points P. The two points P and Q describe thus two projective rows on the axis ; and not only does P asa point in the first now correspond to Q, but also Q as a point in the first corresponds to P. The two rows therefore form an involution. The centre of this involution, it is easily scen, is the centre of the conic.

A focus of this involution has the property that any two con- jugate lines through it are perpendicular ; hence, it is a focus to the conic,

Such involution exists on each axis. But only one of these can have foci, because all foci lie on the same axis. The involution on one of the axis is elliptic, and appears (§ 80) therefore as the section of two circular involutions in two pencils whose centres lie in the other axis. These centres are foci, hence the one axis contains two foci, the other axis none ; or every central conic has two foci which lie on one axis equidistant from the centre.

The axis which contains the foci is called the principal axis; in case of an hyperbola it isthe axis which cuts the curve, because the foci lie within the conic.

In case of the parabola there is but one axis. The involution on this axis has its centre at infinity. One focusis therefore at infinity, the one focus only is finite. .4 parabola has only one focus.

§ 85. If through any point P (fig. 33) on a conic the tangent PT and the normal PN (i.¢., the perpendicular to the tangent through the point of contact) be drawn, these will be conjugate

| lines with regard to the conic, and at right angles to each other.

They will therefore cut the principal axis in two points, which are conjugate in the involution eonsidered in § 84; hence they are har- monie conjugates with regard to the foci. If therefore the two foci F, and F, be joined to P, these lines will be harmonic with

Fig. 33.

regard to the tangent and normal. As the latter are perpendicular, they will bisect the angles between the other pair. Hence—

The line joining any point on a conic to the two foci are equally inclined to the tangent and normal at that point.

In case of the parabola this beeomes—

The line joining any point on a parabola to the focus and the diameter through the point, are equally inclined to the tangent and normal at that point.

From the definition of a focus it follows that—

The segment of a tangent between the directrix and the point of contact is seen from the focus belonging to the directrix under a right angle, because the lines joining the foeus to the ends of this seg- ment are conjugate with regard to the eonic, and therefore perpen- dicular,

With equal ease the following theorem is proved :—

The two lines which join the points of contact of two tangents each to one focus, but not both to the same, are seen from the intersection of the tangents under equal angles.

§. 86. Other foeal properties of a conic are obtained by the fol-

lowing considerations :—

Let F (fig. 34) be a focus to aconic, f the corresponding directrix, A and B the points of contact of two tangents meeting at T, and P the point where the line AB cuts the directrix. Then TF will be the polar of P (because polars of F and T meet at P). Hence TF

Fig. 34.

and PF are conjugate lines throngh a focus, and therefore perpen- dieular, They are further harmonic conjugates with regard to FA and FB (§§ 64 and_ 13), so that they bisect the angles formed by these lines. This by the way proves—

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The segments between the point of intersection of two tangents to a me and their points of contact are seen from a focus under equal angles.

If we next draw through A and B lines parallel to TF, then the points A,, B, where these eut the direetrix will be harmonie conju- gates with regard to P and the point where FT cuts the directrix. The lines FT and FP bisect therefore also the angles between FA, and FB,. From this it follows easily that the triangles FAA, and FBB, are equiangular, and therefore similar, so that

FA : AA,=FB: BB,.

The triangles AA,A, and BB,B, formed by drawing perpen- dieulars from A and B to the direetrix are also similar, so that AA, : AA,=BB, : BB,.

This, eombined with the above proportion, gives

FA:AA,=FB: BB,. Hence the theorem :— .

The ratio of the distances of any point on a conic from a focus and the corresponding directrix is constant. ;

To determine this ratio we consider its value for a vertex on the prineipal axis. In an ellipse the foeus lies between the two vertices on this axis, hence the focus is nearer to a vertex than to the corresponding direetrix. Similarly in an hyperbola a vertex is nearer to the directrix than to the foeus. In a parabola the vertex lies halfway between direetrix and foens.

It follows in an ellipse the ratio between the distanee of a point from the focus to that from the directrix is less than unity, in the parabola it equals unity, and in the hyperbola it is greater than unity.

It is here the same which focus we take, because the two foci lie symmetrical to the axis of the conie. If now P is any point on the conic having the distances r, and 1, from the foci and the distances d, and d, from the eorresponding directrices, then

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ae es where ¢ is constant. Hence also Ts =e, ; dad,

In theellipse, which lies between the direetrices, d, + d,is constant, therefore also 7, +7, In the hyperbola on the other hand d, ~d, is eonstant, equal to the distance between the directrices, therefore in this ease 7, — 7, is constant.

If we eall the distances of a point on a conic from the focus its foeal distances we have the theorem :—

In an ellipse the swm of the focal distances 13 constant ; and in an hyperbola the difference of the focal distances 1s constant.

This constant sum or difference equals in both cases the length of the principal axis,

PENCIL OF CoNIcs.

§ 87. Through four points A, B, C, D in a plane, of whieh no three lie in a line, an infinite number of conies may be drawn, viz., through these four points and any fifth one single conie. This system of conics is called a pencil of conics. Similarly all conies touching four fixed lines form a system such that any fifth tangent deter- mines one and only one eonic. We have here the theorems :—

Theorem.—The pairs of points in Theorem.—The pairs of tangents which any line is cut by a system of which can be drawn from a point to conics through four fixed points are a system of conics touching four in involution. fixed lines are in involution.

Fig. 35.

We prove the first theorem only. Let ABCD (fig. 85) be the four-point, then any line ¢ will cut two opposite sides AC, BD in the points E,E’, the pair AD, BC in points F,F”, and any conic of the system in M,N, and we have

A(CDMN)=B(CDMN).

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If we cut these pencils by ¢ we get

(EFMN) =(F’E’MN)

(EFMN) =(E’F’NM). But this is, according to § 77 (7), the condition that M, N are cor- responding points in the involution determined by the point pairs E, E’, F, F’ in which the line ¢ cuts pairs of opposite sides of the four-point ABCD. Thisinvolution is independent of the particular conic chosen.

§ 88. There follow several important consequences :—

THEOREM.—Through four points two, one, or no cow®ic may be drawn which touch any given line, according as the involution dcter- mined by the given four-point on the line has real, coincident, or tmnaginary foci.

THEOREM. —T’wo, onc, or no conics may be drawn which touch four given lines and pass through a given point, according as the involution

determined by the given four-side at the point has real, coincident, or imaginary focal rays.

For the conic through four points which touches a given line has its point of contact at a focus of the involution determined by the four-point on the line.

As a special case we get, by taking the line at infinity :—

THEOREM. —Through four points of which none ts at infinity either two or no parabolas may be drawn.

The problem of drawing a conic through four points and touch- ing a given line is solved by determining the points of contact on the line, that is, by determining the foci of the involution in which the line cuts the sides of the four-point. The corresponding re- mark holds for the problem of drawing the conics which touch four lines and pass through a given point.

or

RvuLeD QuADRIC SURFACES,

§ 89. Formerly we have considered projective rows which lie in the same plane. In that case, lines joining corresponding points envelope @ conic. We shall now consider projective rows whose bases do not meet. In this case, corresponding points will be joined by lines which do not lie ina plane, but on some surface, which like every surface generated by lines is called a ruled surface. This surface ects contains the bases of the two rows.

If the points in either row be joined to the base of the other, we obtain two axial pencils which are also projective, those plancs being corresponding which pass through corresponding points in the given rows. If A,A be two corresponding points, a,a the planes in the axial pencils passing through them, then AA’ will be the line of intersection of the corresponding planes a,a’, and also the line joining corresponding points in the rows.

If we cut the whole figure by a plane this will cut the axial pencils in two projective flat pencils, and the curve of the second order generated by these will be the curve in which the plane cuts the surface. Hence

THEOREM. — Zhe locus of lincs joining corresponding points in two projective rows which do not lie in the same plane is a surface which contains the bases of the rows, and which can also be generated by the lincs of intersection of corresponding planes in tivo projective axial pencils, This surface is cut by evcry plane in a curve of the second order, hence either in a conic or in a linc-pair. No linc which docs not lic altogether on the surface can have more than two points in common with the surface, which is therefore said to be of the second order, or 73 called a ruled quadric surfacc.

That no line which does not lie on the surface can cut the sur- face in more than two points is seen at once if a plane be drawn through the line, for this will cut the surface inaconic. It follows also that

A line which contains more than two points of the surface lics altogcther on the surface.

§ 90. Through any point in space one line can always be drawn cutting two given lines which do not themselves meet.

If therefore three lines in space be given of which no two mect, then through every point in either one line may be drawn cutting the other two.

THEOREM.—Jf a line moves so that it always euts three given lines of which no two meet, then it generatesa ruled quadric surface.

Proof. —Let a, 6, c be the given lines, and p, g,7…. lines cutting them in the points A, A’,A”...; B,B’,B’...;C,C’,C”.. . respectively; then the planes through a containing g, g, 7, and the planes through b containing the same lines, may be taken as corresponding planes in two axial pencils which are projective, becanse both pencils cut the linc ¢c in the same row C, C’, C”... ; the surface can therefore be generated by projective axial pencils.

Of the lines y, g, 7»... no two can mect, for otherwise the lines a, b, c which cut them would also lie in their plane. There is a single infinite number of them, for one passes through each point of a. These lines are said to form a set of lines on the surface.

If now three of the lines p, g, r be taken, then every line @ cntting them will have three points in common with the surface, and will therefore lie altogether on it. This gives rise to a second set

of lines on the surface. From what has been said the theorem follows :—

_THEOREM.—A ruled quadric surface contains two sets of straight lines. Every line of one set cuts every line of the other, but no two

. Lines of the seme set mect.

_ Any two lines of the same set may be taken as bases of two pro- jective rows, or of two projective pencils which generate the surfacc. They are eut by the lines of the other set in two projective rows. _The plane at infinity like every other plane cuts the surface either in a conic proper or in a line-pair. In the first case the surface is called an Hyperboloid of one sheet, in the second an Hyper- bolic Paraboloid. The latter may be generated by aline cutting three lines of which one lies at infinity, that is, cutting two lines and remaining parallel to a given plane.

QUADRIC SuRFACHS.

§ 91. The conics, the cones of the second order, and the ruled quadric surfaces complete the figures which can be generated by projective rows or flat and axial pencils, that is, by those aggregates of elements which are of one dimension (§§ 5, 6). We = now consider the simpler figures which are generated by aggregates of twodimensions. The space at our disposal will not, however, allow us to do more than indicate a few of the results.

§ 92. We establish a correspondence between the lines and planes in pencils in space, or reciprocally between the points and lines in two or more planes, but consider principally pencils.

In two pencils we may either make planes correspond to planes and lines to lines, or else planes to lines and lines to planes. If hereby the condition be satisfied that to a flat, or axial, pencil corresponds in the first case a projective flat, or axial, pencil, and in the second a projective axial, or flat, pencil, the pencils are said to be projective in the first case and reciprocal in the second.

For instance, two pencils which join two points S, and 8, to the different points and lines in a given plane w are projective (and in perspective position), if those Yines and planes be taken as corre- sponding which meet the plane win the same point or in the same line. In this case every plane throngh both centres S, and S, of the two pencils will correspond to itself. If these pencils are brought into any other position they will be projective (but not perspective).

The correspondence between two projective penctls is wniquely determined, if to four rays (or planes) in the one the corresponding rays (or planes) in the other are given, provided that no threc rays of either sct lie in a plane.

Proof.—ULet a, b,c, d be four rays in the one, a’, b’, c’, d’ the corre- sponding rays in the other pencil. We shall show that we can find for every ray e in the first a single corresponding ray ¢’ in the second. ‘To the axial pencil a(b, c,d…) formed by the planes which join a to 6,c,d…, respectively corresponds the axial pencil a’ (b’, c,d…), and this correspondence is determined. Hence, the plane a’e’ which corresponds to the plane ae is determined. Similarly the plane b’c’ may be fonnd and both together determine the ray ¢’.

Similarl the correspondence between two reciprocal pencils is determined if for four rays in the one the corresponding planes in the other are given.

§ 93. We may now combine—

1. Two reciprocal pencils. ; ;

Each ray ents its corresponding plane in a point, the locns of these points is a quadric surface.

2. Two projective pencils. ;

Each plane cuts its corresponding plane in a line, but a ray as a rnle does not cut its corresponding ray. The locus of points where a ray cuts its corresponding ray is a twisted cubic. The lines where a plane cuts its corresponding plane are secants

8. Three projective pencils. ’

The locus of intersection of corresponding planes is a cubic surface.

Of these we consider only the first two cases.

§ 94. If two pencils are reciprocal, then to a plane in either corresponds a line in the other, to a flat pencil an axial pencil, and soon. Every line cuts its corresponding plane in a point. If S, and S, be the centres of the two pencils, and P be a point where a line a, in the first cuts its corresponding plane ag, then the line b, in the pencil 8S. which passcs through P will meet its corresponding plane B, in P. For b,is alinein the plane aj. The corresponding plane 8, must therefore pass through the linc a, hence through P.

The points in which the lines in S, cut the planes corresponding to them in S, are therefore the same as the points in which the lines in S, cut the planes corresponding to them in 8). ,

The locus of these points is a surface which is cut by a plane in a conic or ina line-pair and by a line tn not more than two points unless it Wes altogether on the surface. The surface itself is there. fore called a quadric surface, or a surface of the sccond order.

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To prove this we consider any line p in space.

The flat pencil in S, which lics in the plane drawn through p and the corresponding axial pencil in 8S, determine on p two pro- jective rows, and those points in these which coincide with their corresponding points lie on the surface. But there exist only two, or one, or no such points, unless every

point coincides with its corresponding point. In the latter case the line lies altogether on the surface.

This proves also that a plane cuts the surface in a curve of the second order, as no line can have more than two points in common with it. To show that this is a curve of the same kind as those considered before, we have to show that it can be generated by projective flat pencils. We prove first that this is true for any plane through the centre of one of the pencils, and afterwards that every point ou the surface may be taken as the centre of such pencil. Let then a, be a plane through S,. To the flat pencil in S, which it contains corresponds in S, a projective axial pencil with axis @,, and this cuts a, in a second flat pencil. These two flat pencils in a, are projective, and, in general, neither concentiic nor per- spective. They generate therefore a conic. But if the line a, passes through S, the pencils will have S, as common centre, and may

therefore have two, or one, or no lines united with their correspond- ©

ing lines. The section of the surface by the plane a, will be accordingly a line-pair or a single line, or else the plane a, will have only the point S, in common with the surface.

Every line 2, through S, cuts the surface in two points, viz., first in §, and then at the poiut where it cuts its corresponding plane. If now the corresponding plane passes through S,, as in the case just considered, then the two points where 7, cuts the surface coin- cide at S,, and the line is called a tangent to the surface with S, as point of contact. Hence if 1, be a tangent, it lies in that plane +, Which corresponds to the line S,S, as a liue in the pencil 8. The section of this plane has just been considered. It follows that — ‘

All tangents to quadric surface at the centre of one of the reciprocal pencils lie in a plune which is called the tungent plane to the surfuce at that point as point of contact.

To the line joining the centres of the two pencils as a line in one corresponds in the other the tangent plane at its centre.

The tangent plane to a quadric surface either cuts the surface in two lines, or it has only a single line, or else only a single point in common with the surface.

In the first case the point of contact is said to be hyperbolic, in the second parabolic, in the third elliptic.

§ 95. It remains to be proved that every point S on the surface may be takeu as centre of one of the pencils which generate the surface. Let S be any point on the surface ©’ generated by the reciprocal pencils S, aud S,. We have to establish a reciprocal correspondence between the pencils S and §8,, so that the surface generated by them is identical with ®. To do this we draw two planes a, aud £, through S), cutting the surface ® in two conics which we also denote by a, and 6,;. These couics meet at S,, and at some other point T where the line of intersection of a, and p, cuts the surface.

In the peucil S we draw sone plane o which passes through T, but not through S, or S,. It will cut the two conics first at T, and therefore each at some other point which we call A and B re- spectively. These we join to S by lines a and 8, and now establish the required correspondence between the pencils S, and S as follows:— To S,T shall correspond the plane o, to the plane a, the line a, and to f, the line 0, hence to the flat pencil in a, the axial pencil a. These pencils are made projective by aid of the conic in qj.

In the same manuer the flat pencil in 6, is made projective to the axial pencil 0 by aid of the conic in f,, corresponding elements being those which meet onthe comic. This determines the correspondence, for we know for more than four rays iu S, the corresponding planes inS. The two pencils S and S, thus made reciprocal generate a quadric surface ’, which passes through the point S and through the two conics a, and A).

The two surfaces and ’ have therefore the points S and S, and the conics a, and 8,incommon. To show that they are identical, we draw a plane through S and S,, cutting each of the conics a, and 8, in two poiuts, which will always be possible. This plane cuts ® and ® in two conics which have the point S and the points where it cuts a, and f, in common, that is five points in all. The conics therefore coincide.

This proves that all those points P on ®’ lie on ® which have the property that the plane SS,P cuts the conics a, 8, in two points each. If the plane SS,P has not this property, then we diawa plane SS,P. This cuts each surface in a conic, and these conics have in common the points S, S,, one point on each of the conics a, 8,, and one point on one of the conics through S and 8, which lie on both surfaces, hence five points. They are therefore coincident, and our theorcin is proved.

§ 96. The following propositions follow :—

A quadric surface has at every potut a tangent plane.

Every plane section of a quadric surface ts a conic or a line-patr.

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Every line which has three points in common with a quadric surface lies on the surface. ;

Every conic which has five points in common with a quadric surface lies on the surface.

Through two conics which lie in different planes, but have two points in common, and through one external point always one quadric surface may be drawn.

§ 97. Every plane which cuts a quadric surface in a line-pair is a tangent plane. For every line in this plane through the centre of the line-pair (the point of intersection of the two lines) cuts the surface in*two coincident poiuts and is therefore a tangent to the surface, the centre of the line-pair being the point of contact.

If a quadrice surface contains a line, then every plane through this line cuts the surface in a line-pair (or in two coincident lines). For this plane cannot cut tle surface in a conic. Hence

If a quadric surface contains one line p then it contains an infinite number of lines, and through evcry point Q on the surface, one line q can be drawn which cuts p. For the plane through the point Q and the line p cuts the surface in a line-pair which must pass through Q and of which p is one line.

No two such lines q on the surface can meet. For as both meet p their plane would contain p and therefore cut the surface in a triangle.

Every line which cuts three lines q will be on the surface; for it has three points in common with it.

Hence the quadrice surfaces which contain lines are the same as the ruled quadric surfaces considered in §§-89-93, but with one im- portant exception. In the last investigation we have left out of consideration the possibility of a plane having only one line (two coincident lines) in commou with a quadric surface.

§ 98. To investigate this case we suppose first that there is one point A on the surface through which two different lines a, b can be drawn, which lie altogether on the surface.

If P is any other point on the surface which lies neither on a nor 8, then the plane through P and a will cut the surface in a second line a’ which passes through P and which cuts a. Similarly there is a line 0’ through P which cuts 6. These two lines a’ and b’ may coincide, but then they must coincide with PA,

Ifthis happens for one point P, it happens for every other point Q. For if two different lines could be drawn through Q, then by the same reasoning the line PQ would be altogether on the surface, hence two lines would be drawn through P against the assumption, From this follows :—

If there is one point on a quadric surface through which one, but only one, line can be drawn on the surface, then through every point one line can be drawn, and all these lines meet in a potnt, The surface is a cone of the second order.

If through one point on a quadric surface, two, and only two, lines can be drawn on the surface, then through every point two lines may be drawn, aud the surface is a ruled quadric surface.

If through one point on a quadric surfuce no line on the surface can be drawn, then the surface contains no lines.

Using the definitions at the end of § 95, we may also say :—

On a quadric surface the points are all hyperbolic, or all parabolic, or all elliptic. :

As au example of a quadric surface with elliptical points, we mention the sphere which may be generated by two reciprocal pencils, where to each line in one corresponds the plane per- pendicular to it in the other.

§ 99. Poles und Polar Planes.—The theory of poles and polars with regard to a conic is easily extended to quadric surfaces.

Let P be a point in space not on the surface, which we suppose not to be a cone. On every line through P which cuts the surface in two points we determine the harmonic conjugate Q of P with regard to the points of inteiscction. Through one of these lines we draw two planesaand 8. The locis of the points Q in a isa line a, the polar of P with regard to the conic in which a cuts the surface. Similarly the locus of points Q in f.is a line 0. This cuts a, because the line of intersection of a and f contains but one point Q. The locus of all points Q therefore is a plane. This plane is called the polar plane of the point P, with regard to the quadric surface. If P lies on the surface we take the tangent plane of P as its polar.

The following propositions hold :—

1. Every point has a. polar plane, which is coustructed by draw- ing the polars of the point with regard to the conics in which two planes through the point cut the surface.

2. If Q is a point in the polar of P, then P ts a point in the polar of Q, because this is true with regard to the conic in which a plane through PQ cuts the surface.

3. Every plane is the polar plane of one point, which is called the Pole of the plane. .

The pole to a plane is found by constructing the polar planes of | three points in the plane. Their intersection will be the pole.

4. The points in which the polar plane of P cuts the surface are points of contact of tangents drawn from P to the surface, as is easily seen. Hence :—

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5. The tangents drawn from a point P to a quadric surface form a cone of the second. order, for the polar plane of P cuts it in a conic.

6. If the pole describes a line a, its polar plane will turn about.

another line a’, as follows from 2. These lincs a and a’ are said to be conjugate with regard to the surfacc.

§ 100. The pole of the line at infinity is called the centre of the surface. Ifit lies at the infinity, the plane at infinity is a tangent plane, and the surface is called a paraboloid.

The polar plane to any point at infinity passes through the centre, and is called a diamectrical plane.

A line through the centre ts called a diameter. the centre. The line conjugate to it lies at infinity.

If a point moves along a diameter its polar plane turns about the conjugate line at infinity; that is, 7 moves parallel to itsclf, its centre moving on the first linc.

The middle points of parallel chords lie in a plane, viz., in the polar plane of the point at infinity through which the chords are drawn,

The centres of parallel secttons lic in a diameter which ts a line conjugate to the line at infinity in which the planes meet.

It ts bisected at

TWISTED CuBIOs.

§ 101. If two pencils with centres S, and S, are made projective, then to a ray in one corresponds a ray in the other, to a plane a plane, to a flat or axial pencil a projective flat or axial pencil, and so on. :

There is a double infinite number of lines in a pencil. We shall see that a single infinite number of lines in one pencil meets its corresponding ray, and that the points of intersection form a curve in space.

Of the double infinite number of planes in the pencils each will meet its corresponding plane. This gives a system of a double infinite number of lines in space. We know (§ 5) that there is a quadruple infinite number of lines in space. From among these we may select those which satisfy one or more given con- ditions. The systems of lines thus obtained was first systemati- cally investigated and classified by Pliicker, in his Geometric des Raumes. He uses the following names:—

A treble infinite number of lines, that is, all lines which satisfy one condition, are said to form a complex of lines; e¢.g., all lines entting a given line, or all lines touching a surface.

A double infinite number of lines, that is, all lines which satisfy two conditions, or which are common to twocomiplexes, are said to form a congruence of lines; ¢.g., all lines in a plane, or all lines cutting two curves, or all lines cutting a given curve twice.

A single infinite number of lines, that is, all lines which satisfy three conditions, or which belong to three complexes, form a ruled surface ; ¢.g., one set of lines on a ruled qnadric surface, or develop- able surfaces which are formed by the tangents to a curve.

It follows that all lines in which corresponding planes in two projective pencils meet form a congruence. gruence consists of all lines which cut a twisted cubic twice, or of all sccants to a twisted cubic.

§ 102, Let 7, be the line S,S, as a line in the pencil S,. To it corresponds a line 7, in S,. At cach of the centres two corresponding lines meet. The two axial pencils with 7, and , as axes are pro- jective, and, as their axcs meet at S,, the intersections of corre- sponding planes form a cone of the second

order (§ 58), with S, as centre. If , and w, be corresponding planes, then their intersec- tion will be a line p, which passes through S,. Corresponding to it in S, will be a line », which lies in the plane ,, and which therefore meets p, at some point P. Conversely, if p, be any line in S, which meets its corresponding line p, at a point P, then to the plane 7, p, will correspond the plane 7, »,, that is, the plane S,S,P. These planes intersect in po, so that p, is a line on the quadric cone generated by the axial pencils 7, and 7,. Hence : —

All lines in one pencil which meet their corresponding lines in the other form a cone of the second order which has tt centre at the centre Of the first pencil, and passes through the centre of the second.

From‘this follows that the points in which corresponding rays meet lie on two cones of the second order which have the ray joining their centres in common, and form therefore, together with the line 8,8, or 1,, the intersection of these cones. Any plane cutseach of the cones in aconic. These two conics have necessarily that point in common in which it cuts the line 7,, and therefore besides either one or three other points. I+ follows that the curve is of the third order as a plane may cut it in three, but not in more than three, points. Hence :—

Lhe locus of points in which corresponding lines on two projective penctls mect is a curve of the third order or a ‘‘ twisted cubic” k, which passes through the centres of the pencils, and which appears as the intersection of two cones of the second order, which have one line tn common. ;

A line belonging to the congruence determined by the pencils is a secant of the cubic; tt has two, or one, or no points in common with this cubte, and ts called accordinglysa secant proper, a tangent, or &

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We shall see this con- |

secant improper of the cubic. A secant improper may be considered, to usc the language of coordinate geometry, as a secant with Imaginary points of intersection.

§ 108. Ifa, and a, be any two corresponding lines in the two pencils, then corresponding planes in the axial pencils having @ and a, as axes generate a ruled quadric surface. If P be any point on the cubic k, and if p,,p, be the corresponding rays in 8, and §, which meet at P, then to the plane ap, ‘in S, corre- sponds a, p, in S,. These therefore meet ina line through -. This may be stated thus :—

Those secants of the cubic which cut a ray a,, drawn through the centre S, of one pencil, form a ruled quadrie surface which passes through both centres, and which contains the twisted cubic k. Of such surfaces an infinite number exists. Livery ray through, or & which is not a secant determines one of them. — : :

If, however, the rays a, and a, are secants meeting at A, then the ruled quadric surface becomes a cone of the second order, having A as centre. Or all lines of the congruence which pass through a point on the twisted cubic k form a cone of the second order. In other words, the projection of a twisted cubic from any point in the curve ou to any plane is a conic.

If a, is not a secant, but made to pass through any point Q in space, the ruled quadric surface determined by a will pass through Q. There will therefore be one line of the congruence passing through Q, and only one. For if two such lines pass through Q, then the lines 8,Q and S,Q will be corresponding lines ; hence Q will be a point on the cubic &, and an jnfinite number of secants will pass through it, Hence :—

Through every point in space not on the twisted enbtic one and only one secant to the cubic can be drawn.

§ 104. The fact that all the secants through a point on the cubic form a quadric cone shows that the centres of the projective pencils generating the cubic are not distinguished from any other points on the cubic. If we take any two points S, S”on the cubic, and draw the secants through each of them, we obtain two quadric cones, which have the line SS’ in common,

and which intersect besides along the cubic. If we make these two pencils having S and S’ as centres projective by taking four rays on the one cone as corre- sponding to the four rays on the other which meet the first on the cubic, the correspondence is determined. These two pencils will generate a cubic, and the two cones of secants having § and S’ as centres will be identical with the above cones, for each has five rays in common with one of the first, viz., the line SS’ and the four lines determined for the correspondence ; therefore these two cones intersect in the original cubic. This gives the theorem :—

On a twisted cubic any two points may be taken as centres of pro- jective pencils which generate the cubic, corresponding planes being those which meet on the same secant.

Of the two projective pencils at S and S’ we may keep the first fixed, and move the centre of the othcr along the curve. The pencils will hereby remain projective, and a plane a in S will be cut by its corresponding plane a’ always in the same secant a. Whilst S’ moves along the curve the plane a’ will turn about a, describing an axial pencil.

In this article we have given a purely geometrical theory of conics, cones of the second order, quadric surfaces, &c. In doing so we have followed, to a great extent, Reye’s Geomctrie der Lage, and to this excellent work those readers are referred who wish for a more exhaustive treatment of the subject.

It will have been observed that scarcely any use has been made of algebra, and it would have been even possible to avoid this little, as is done by Reye. There are, however, other systems of geometry which start inore or less from theorems known to the Greeks, and using more or less algebra.

We cannot do more bere than enumerate a few of the more pro- minent works on the subject, which, however, are almost all Con- tinental. These aie the following :—

Monge, Geonelrre Descriptive: Carnot, Géometrie de Position (1803), contaln- ing a theory of tiansyersals; Poncelet’s great wotk, Tratte des Proprietés Pro- Jectives des Figures (1822); Mobins. Barycentrischer Calcul

(1826); Steiner, Abhdangigkett Geometrischer Gestalten (1832), containing the first full discussion of the projective relations between rows, pencils, &e.; Von Staudt, Geometrie der Lage (1847) and Bettrage zur Geometrie der Lage (1856-60), in which a system of geometry is built up from the beginning without any reference to nuinber, so that ultimately a number itself gets a geometrical definition, and in which imaginary elements are systematieally introdueed into pure geometry; Chasles, Apercu Historique (1837), in which the author gives a brilliant account of the progress of modern geometrical methods, pointing out the advantages of the different purely geometrieal methods as compared with the analytical ones, but withont taking as much aecount of the German as of the Freneh authors; Id., Rapport sur les Progrés de la Géométrie (1870), a continuation of the Aper¢gu; Id., Zraité de Géométrie Supérieure (1852); Cremona, Jntroduzione ad una Teoria Geometrica della Curve Piane (1862) and its continuation Preliminart dt una Teoria Geometrica delle Superficie, which at present are most easily pro- curable in their German translations by Curtze. As more elementary books, we mention Steiner, Vorlesungen, uber Synthetische Geometrie, edited by Geiser and Sehréder (1867); Cremona, Eléments de Géométrie Projective (1875), translated from the Italian by Dewulf ; Townsend, Modern Geometry of the Point, Line, tn 4 Circle (1863), which contains a variety of modern methods, but, unfor tunately, is confined to eireles, without entering into conies. A great many of ony” positions are, however, easily extended to conics. (0. H.

PART II.—ANALYTICAL GEOMETRY.

This will be here treated as a method. The science is Geometry ; and it would be possible, analytically, or by the method of coordinates, to develop’ the truths of geometry in a systematic course. But it is proposed not in any way to attempt this, but simply to explain the method, giving such examples, interesting (it may be) in themselves, as are suitable for showing how the method is employed in the demonstration and solution of theorems or problems.

Geometry is one-, two-, or three-dimensional, or, what is the same thing, it is lineal, plane, or solid, according as the space dealt with is the line, the plane, or ordinary (three- dimensional) space. No more general view of the subject need here be taken :—but in a certain sense one-dimensional geometry does not exist, inasmuch as the geometrical con- structions for points in a linecan only be performed by travel- ling out of the line into other parts of a plane which contains it,and conformably tothe usual practice Analytical Geometry will be treated under the two divisions, Plane and Solid.

It is proposed to consider Cartesian coordinates almost exclusively ; for the proper development of the science homogeneous coordinates (three and four in plane and solid geometry respectively) are required ; and it is more- over necessary to have the correlative linc- and plane- coordinates; and in solid geometry to have the six coordinates of the line. The most comprehensive English works are those of Dr Salmon, The Conics (5th edition, 1869), Higher Plane Curves (2d _ edition, 1873), and Geometry of Three Dimensions (3d edition, 1874); we have also on plane geometry Clebsch's Vorlesungen uber Geometrie, posthumous, edited by Dr F. Lindemann, Leipsic, 1875, not yet complete.

I. Puane ANALYTICAL GEomETRY (§§ 1-25).

1. It is assumed that the points, lines, and figures con- sidered exist in one and the same plane, which plane, therefore, need not be in any way referred to. The position of a point is determined by means of its (Cartesian) co- ordinates; z.¢., as explained under the article Curve, we take the two lines w'Ox and y'Oy, called the axes of x and y respectively, intersecting in a point O called the origin, and de- termine the position of any other point P by means of its coordinates x =OM (or NP), and y= MP (or ON). The two axes are usually (as in fig. 1) at right angles to each other, and the lines PM, PN are then at right angles to the axes of x and y respectively. Assuming a scale at pleasure, the coordinates x, y of a point have numerical values.

It is necessary to attend to the signs: x has opposite signs according as the point is on one side or the other of the axis of y, and similarly y has opposite signs according as the point is on the one side or the other of the axis of x. Using the letters N, E, S, W as in a map, and con- sidering the

plane as divided into four quadrants by the axes, the signs are usually taken to be—

Be y for quadt. + + NE * = SE + + NW – - SW

A point is said to have the coordinates (a, b), and is referred to as the point (a, 6), when its coordinates are x=a, y=b; the coordinates x, y of a variable point, or of a point which is for the time being regarded as variable, are said to be current coordinates.

2. It is sometimes convenient to use oblique coordi- nates; the only difference is that the axes are not at right angles to each other; the lines PM, PN are drawn parallel to the axes of y and w respectively, and the figure OMPN is thus a parallelogram. But in all that follows the Cartesian coordinates are taken to be rectangular; polar coordinates and other systems will be briefly referred to in the sequel.

3. If the coordinates (a, y) of a point are not given, but only a relation between them f(x, y)=0, then we have a curve, For, if we consider x as a real quantity varying continuously from — oo to + 0, then, for any given valuc of x, y has a value or values. If these are all imaginary, there is not any real point; but if one or more of them be real, we have a real point or points, which (as the assumed value of 2 varies continuously) varies or vary continuously therewith ; and the locus of all these real points is a curve. The equation completely defines the curve; to trace the curve directly from the equation, nothing else being known, we obtain as above a series of points sufficiently near to each other, and draw the curve through them. For instance, let this be done in a simple case, Suppose y=2a—1; it is quite easy to obtain and lay down a series of points as near to each other as we please, and the application of a ruler would show that these were in a line; that the curve is a line depends upon something more than the equation itself, viz., the theorem that every equation of the form y=aa+b represents a line ; supposing this known, it will be at once understood how the process of tracing the curve may be abbreviated ; we have x=0, y= —1, and «=4,y=0; the curve is thus the line passing through these two points. But in the foregoing example the notion of a line is taken to be a known one, and such notion of a line does in fact precede the consideration of any equation of a curve what- ever, since the notion of the ceordinates themselves rests upon

that of a linc. In other cases it may very well be that the equation is the definition of the curve; the points laid down, although (as finite in number) they do not actually determine the curve, determine it to any degree of accuracy ; and the equation thus enables us to construct the curve.

A curve may be determined in another way ; viz., the coordinates a, 7 may be given each of them as a function of the same variable parameter 0; 2, y=/(0), $(0) re- spectively, Here, giving to 6 any number of values in succession, these equations determine the values of 2, ¥, that is, the positions of a series of points on the curve. The ordinary form y= (x), where y is given explicitly as a function of z, is a particular case of each of the other two forms: we have f(x, y),=y—-$(x),=9; and v= 6, ,™= (4) :

4, As remarked under Curvs, it is a useful exer- cise to trace a considerable number of curves, first taking equations which are purely numerical, and then equations which contain literal constants (representing numbers); the equations most easily dealt with are those wherein one coordinate is given as an explicit function of the other, say y=¢(x) as above. A few examples are here given, with such explanations as seem proper.

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(1.) y=2a—-1, as before ; itis at once seen that this is a line; and taking it to be so, any two points, for instance, (0,-1) and (4, 0), determine the line.

(2.) y=. The equation shows that 2 negative, but that y is always positive, values for equal positive and _ hegative values of ~: the curve 7 passes through the origin, and through the points (+1, 1). It is already known that the curve lies wholly above the axis of x.

To find its form in the neigh-

bourhood of the origin, give za

small value, «= +0°1 or 40°01,

then y is very much smaller, rn =0‘01 and 0°0001 in the two :

cases respectively ; this shows Fig. 2.

that the curve touches the axis of x at the origin. Moreover, x may be as large as we please, but when it is large, yis much larger ; for instance, =10, y=100. The curve is a parabola (fig. 2).

(3.) y=2. Here x being positive y is positive, but x being nega- tive y is also negative: the curve pres through the origin, y| and also through the points (1, 1) and (—1,~~1). Moreover, when 2 is small, =0°1 for example, then not only is y,=0°001, very much smaller than x, but it is also very much smaller than y was for the last~~ Oo mentioned curve y=z®, that is, in the neighbourhood of the origin the present curve ap- proaches more closely the axis of x, The axis of # is a tangent at the origin, but it is a tangent of

may be positive or and has the same

a — kind (a stationary or Fig. 3. inflexional tangent), cutting the . – curve at the origin, which is an inflexion. The curve is the

cubical parabola (fig. 8). (4.) y7=x-1.w-8.z-4. Here y=0 forv=—1, =8, =4. When- ever w-1.-3.2-4 is positive, y has two equal and opposite values; but when x-1.%-3.7%—4, is negative, then y is imagin- ary. In particular, for x less than 1, or between 3 and 4, y isimagin- ary, but for x between 1 and 8, or greater than 4, y has two values, It is clear that for x somewhere between 1 and 3, y will attain a maxi- mum, the values of x and y may be found ap- roximately by trial. The eurve will consist of . an oval and_ infinite branch, and it is easy to see that, as shown in fig. 4, the curve where it cuts the axis of x cuts it at right angles. It may be further remarked

Fig. 4.

that, as x increases from 4, the value of y will increase more and more rapidly ; for instance, =5, y2=8, x=10, y? =878, &c., and it is easy to see that this implies that the curve has on the infinite branch two inflexions as shown.

(5.) yy=a-c.w-—b.a—a, where a>b>c (that is, a nearer to

+00, ¢to ~ 0). The curve has the same general form as in the last figure, the oval extending between the limits z=c, x=6, the infinite branch commencing at the point «=a. ;

(6.) y2=(—-c)*(e-a). Suppose that in the last-mentioned curve, y7=2-0.2—-b.xz—a, b gradually diminishes, and be- 4 comes ultimately =¢. The in- finite branch (see fig. 5) changes its form, but not in a very marked manner, and it retains the two inflexions. The oval lies always between the values x=c, =b, and therefore its Jength continually diminishes; itis casy to see that its breadth will also continually diminish; ultimately it shrinks up into & mere point. The curve has thus a conjugate or isolated Fig. 5. point, or acnode. For a direct . : verification observe that z=c, y=0, so that (c, 0) is a point of the curve, but if x is either less than c, or between c and a, y? is negative, and y is imaginary. : .

cB A

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(7.) y2=(%—c) (w-a)*. If in the same curve } gradually in- creases and becomes ultimatcly =a, the oval and the infinite branch

change each of them its form, the oval extending always betwcen the values x=c, x=0, and thus

continually approaching the in- 7 finite branch, which begins at x=a. The consideration of a few numerical examples, with careful drawing, would show that the oval and the infinite branch as they approach sharpen out each towards the other (the two inflexions on the in- finite branch coming always nearer to the point (a, 0)) 3—80 that finally, when b becomes 3 =a, the curve has the form Fig. 6. shown in fig. 6, there being now a double point or node (crunode) at A, and the inflexions on the infinite branch having disappeared. In the last four examples the curve is one of the cubical curves called the divergent parabolas: 4 is a mere numcrical example of 5, and 6, 7, 8 are in Newton’s language the

parabola cum vali, punctata, and nodata . respectively. When

a, 6, care all equal, or the form is y?=(a—-c)?, we have a cuspidal form, Newton's parabola cus- pidata, otherwise the semicubical parabola.

(8.) As an example of a curve given by an im- plicit equation, suppose the equation is

+ y8 -8xy=0; this is a nodal cubic curve, the node at the origin, and the axes touching the two branches respectively (fig. 7). An easy mode of tracing it is to express 2, y each of them in terms of a variable 0, = a y= or ; but it is instructive to trace the curve directly from its equation. ;

5. It may be remarked that the purely algebraica. pro- cess, which is in fact that employed in finding a differen-

Fig. 7,

tial coefficient wv if applied directly to the equation of

the curve, determines the point consecutive to any given point of the curve, that is, the direction of the curve at such given point, or, what is the same thing, the direction of the tangent at that point. In fact, if a, B are the coordinates of any point on a curve f(x, y)=0, then writing in the equation of the curve v=a+h, y=B+h, and in the resulting equation f(at+h, B+k)=0 (de- veloped in powers of # and x), omitting the term f(a, 8), which vanishes, and the terms containing the second and higher powers of h, &, we have a linear equation Ah+ Bk =0, which determines the ratio of the increments fh,' Of course, in the analytical development of the theory, we translate this into the notation of the differential calculus ; but the question presents itself, and is thus seen to be solvable, as soon as it is attempted to trace a curve from its equation.

Geometry is Descriptive, or Metrical,

6. A geometrical proposition is either descriptive or metrical: in the former case it is altogether independent of the idea of magnitude (length, inclination, &c.); in the latter case it has reference to this idea. It is to be

noticed that, although the method of coordinates seems to be by its inception essentially metrical, and we can hardly, except by metrical considerations, connect an equation with the curve which it represents (for in- stance, even assuming it to be known that an equation Az+By+C=0 represents a line, yet if it be asked what

line, the only form of answer is, that it is ge a cutting

the axes at distances from the origin -C+A, — C+B respectively), yet in dealing by this method with descriptive propositions, we are, in fact, eminently free from all metrical considerations.

7. Itis worth while to illustrate this by the instance of the well-known theorem of the radical centre of three circles. The theorem is that, given any three circles A, B, ~ C (fig. 8), the common

chords aa, BP’, yy’ of the three pairs of

circles meet in a point. The geometrical

proof is metrical

throughout :—

Take O the point of intersection of aa’, Bp’, and joining this with 7’, suppose that y’O does not pass through y, but that points 7,, Y2 respectively. ; perty of intersecting chords of a circle ; aa’, BB’ are chords meeting at a point O,

Oa. Oa’ =Of.08’, where, as well as in what immediate follows Oa, &c., denote, of course, lengths or distances.

Similarly in circle A,

Op.0p’ = 07.07,

Oa. Oa! = Oy… Or’.

Consequently Oy, . 07 = O72. Oy’, that is, Oy,=O-ve, or the points 7, and y, coincide; that is, they each coincide with y.

We contrast this with the analytical method :—

Here it only requires to be known that an equation Ax+ By+C=0 represents a line, and an equation 2? +4? + A+ By+C=0 represents acircle. A, B, C have, in the two cases respectively, metrical signi- fications; but these we are not concerned with. Using S to denote the function 22-+°+Aa+By+C, the equation of a circle is S=0, where § stands for its value ; more briefly, we say the equation is 8, =a +y?+Ax+By+C,=0. Let the equation of any other circle be S,—=2+y+Az+By+C’=0; the equation S— S’=0 is a linear equation (S-S’ is in fact=(A- A’) «+(B-B’) y+C-C), and it thus represents a line ; this equation is satisfied by the co- ordinates of each of the points of intersection of the two circles (for at each of these points S=0 and S’=0, therefore also S-8’=0); hence the equation S-S’=0 is that of the line joining the two points of intersection of the two circles, or say it is the equation of the common chord of the two circles. Considering then a third

Fig. 8.

it meets the circles A, B in two distinct We have then the known metrical = viz., in circle C where

and in circle B,

circle 8”, =2?+4?+A”x+B”y+C”=0, the equations of the com- 7

mon chords are S—S’=0, S—S8”=0, S’-S”=0 (each of these a linear equation) ; at the intersection of the first and second of these lines S=9’ and S=8”, therefore also S’=S”, or the equation of the third line is satisfied by the coordinates of the point in question ; that is, the three chords intersect in a point O, the co- ordinates of which are determined by the equations S=S’=8”.

It further appears that if the two circles S=0, S=0′ do not intersect in any real points, they must be regarded as intersecting in two imaginary points, such that the line joining them is the real line represented by the equation S-

—S’=0; or that two circles, whether their intersections be real or imaginary, have always a real common chord (or radical axis), and that for any three circles the com- mon chords intersect in a point (of course real) which is the radical centre. And by this very theorem, given two circles with imaginary intersections, we can, by drawing circles which meet each of them in real points, construct the radical axis of the first-mentioned two circles.

8. The principle employed in showing that the equation of the common chord of two circles is S – S’=0 is one of

very extensive application, and some more illustrations of |

it may be given.

_ Suppose S=0, S’=0 are lines (that is, let S, S’ now denote linear functions Av+By+C, A’x+B’y+C’), then S—£S’=0 (& an arbitrary constant) is the equation of any line passing through the point of intersection of the two given lines. Such a line may be

made to pass through any given point, say the point (x, Yo) ; @.¢., if Sp, 8’ are what S, S’ respectively become on writing for (a, y) the values (2, Yo): then the value of kis k=S +S’. The equation in fact is SS’) S,8’=0 ; and starting from this equation we at once verify it a posteriort ; the equation is a linear equation satisfied by the values of (x, y) which make S=0, S’=0; and satisfied also by the values (a, Yo); and it is thus the equation of the line in question.

If, as before, S=0, 8’=0 represent circles, then (& being arbi- trary) S—& S’=0-is the equation of any circle passing through the two points of intersection of the two circles ; and to make this pass through a given point (%, Yo) we have again k=S,+8’p. _ In the particular case 4=1, the circle becomes the common chord (more accurately, it becomes the common chord together with the line infinity, but this is a question which is not here gone into).

If § denote the general quadric function,

S=ax* + Qhary + by? + Bfy + 2ge +e, = (a, b, 6 f, 9, AYa, y 1)’, then the equation S=0 represents a conic ; assuming this, then, if S’=0 represents another conic, the equation S-%S’ =0 represents any conic through the four points of intersection of the two conics.

Returning to the equation Ax+By+C=0 of a line, if this pass through two given points (x, 4), (a, Ye), then we must have Az, + By, +C=0, Ax, + By,+C=0, equations which determine the ratios A:B:C, and it thus appears that the equation of the line through the two given points is

L(Y, — Yo) — Yq — Lq) +2 1Yq — H—yy =O 5

or what is the same thing—

x, y, 1 =0;

%5Y1> 1

qs Yo, 1

9. The object still being to illustrate the mode of

working with coordinates, we consider the theorem of the polar of a point in regard to a circle. Given a circle and.

a point O-(fig. 9), we draw

through O any two lines B’ meeting the circle in the

points A, A’ and B, B’ re- =

spectively, and then taking

Q as the intersection of A &

the lines AB’ and A’B, the theorem is that the locus of the point Q is a right line depending only upon O and the circle, but independent of the particular

lines OAA’ and OBB’.

Taking O as the origin, and for the axes any two lines through O at right angles to each other, the equation of the circle will be

; x? +y?+2Ax+2By+C=0;

and if the equation of the line OAA’ is taken to be y=mz, then

the points A, A’ are found as the intersections of the straight line

with the circle ; or to determine « we have

202(1 +m?) + 20(A+Bm)+C=0.

If (a, y,) are the coordinates of A, and (2, y,) of A’, then the

roots of this equation are 2, 2, whence easily

: ee A+Bm

—+—=-2 —

XH Ly U

And similarly, if the equation of the line OBB’ is taken to be

y=m’s, and the coordinates of B, B’ to be (a, yg) and (tq 4)

respectively, then —s A+Bm’

Ly hy C

Fig. 9.

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We have then

ayy — Ys) — WR —%4) +MY 4 — V4, =O 5

(Yq — Ya) — Y(%_— %g) + LaYa — LgY4=O, |

as the equations of the lines AB’ and A’B respectively ; for the first of these equations, being satisfied if we write therein (x, 4) or (ats, yq) for (xz, y),, is the equation of the line AB’, and similarly the second equation is that of the line A’B. Reducing by means of the relations y,—™2,=0, Y_—M%y=0, Y3- m’t,=0, y4—m’x,=0, the two equations become

ac(amnar, — 10‘2t4) — y(ay — 4) + (m’ — mat, 24= 9,

ar(aay — m’atg) — (aq — %) + (mn! — m)xeaety = C,

and if we divide the first of these equations by m 74, and the second by mms, and then add, we obtain)

i 1 (s +) 1 1 1 ~) a — = jam Sa)t ee oe {m(Z+3,) sa 2 * By % = XL, Xy +2m’-2m=0, or, what is the same thing,

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| ; be td (Fa) e-mer- (34,)y-ma) +n! 2-0

which by what precedes is the equation of a line through the point Q. Substituting herein for . + = – + = their foregoing values,

$:

the equation becomes aR halle — (A+ Bmn)(y -— m’x) + (A + Bm’)(y — mx)+m’-m=0; that is, (m—m’)(Ax+By+C)=0;

or finally it is Axv+By+C=0, showing that the point Q lies in a line the position of which is independent of the particular lines OAA’, OBB’ used in the construction. It is proper to notice that there is no correspondence to each other of the points A, A’ and B, B’; the grouping might as well have been A, A’ and B’,B; and it thence appears that the line Ax+By+C=0 just. obtained is in fact the line joining the point Q with the point R which is the intersection of AB and A’B’,

10. The equation Av+ By+C=0 of a line contains in appearance 3, but really only 2 constants (for one of the constants can be divided out), and a line depends accord- ingly upon 2 parameters, or can be made to satisfy 2 conditions. Similarly, the equation (a, b, ¢, f, g, hv, y, 1)?=0 of a conic contains really 5 constants, and the equation (*)(x, y, 1)8=0 of a cubic contains really 9 constants. It thus appears that a cubic can be made to pass through 9 given points, and that the cubic so passing through 9 given points is completely determined. ‘There is, how- ever, a remarkable exception. Considering two given cubic curves S=0, 8’=0, these intersect in 9 points, and through these 9 points we have the whole series of cubics S-—£8’=0, where & is an arbitrary constant: & may be determined so that the cubic shall pass through a given tenth point (4=S,+S‘,, if the coordinates are (a, yo), and So, S’, denote the corresponding values of S, 9’). The resulting curve SS’,-S’S,=0 may be regarded as the cubic determined by the conditions of passing through 8 of the 9 points and through the given point (x, y); and from the equation it thence appears that the curve passes through the remaining one of the 9 points. In other words, we thus have the theorem, any cubic curve which passes through 8 of the 9 intersections of two given cubic curves passes through the 9th intersection.

The applications of this theorem are very numerous; for instance, we derive from it Pascal’s theorem of the inscribed hexagon. Consider a hexagon inscribed in a conic. ‘The three alternate sides constitute a cubic, and the other three alternate sides another cubic. The cubics intersect in 9 points, being the 6 vertices of the hexagon, and the 3 Pascalian points, or intersections of the pairs of opposite sides of the hexagon. Drawing a line through two of the Pascalian points, the conic and this line con- stitute a cubic passing through 8 of the 9 points of inter- section, and it therefore passes through the remaining point of intersection—that is, the third Pascalian point ; and since obviously this does not lie on the conic, it must lie on the line—that is, we have the theorem that the three Pascalian points (or points of intersection of the pairs of opposite sides) lie on a line.

Metrical Theory.

11. The foundation of the metrical theory consists in the simple theorem that if a finite line PQ (fig. 10) be projected upon any other line OO’ by

lines perpendicular to OO’, then the length of the projection P’Q’ is equal to the length of PQ into the cosine of its inclination to P’Q’; or, what is the same thing, that the perpendicular dis- tance P’Q’ of any two parallel lines is equal to the inclined distance PQ into the cosine of the inclination. It at once follows that the algebraical sum of the projections of the sides of a closed polygon upon any line is = 0; or, re- versing the signs of certain sides, and considering the

polygon as consisting of two broken lines, each extend- ing from the same initial to the same terminal point, the sum of the projections of the lines of the first set upon any line is equal to the sum of the projections of the lines of the second set. Observe that if any line be perpen- dicular to the line on which the projection is made, then its projection is=0.

Thus, if we have a right- ‘ angled triangle PQR (fig. 11), Fig. 10. where QR, RP, QP are=é, 7», p respectively, and whereof the base-

Fig. 11.

angle is=a, then projecting successively on the three sides, we ave

t=p cosa, n=p sina, p=t cosat+7 sina; and we thence obtain p?=2 +77; cos’atsin’a=1, And again, by projecting on a line Qz,, inclined at the angle a’ to QR, we have : p cos (a-a’)=é cosa’ +7 sind; and by substituting for ¢, » their foregoing values, cos (a— a’)=cosa cosa’+sina sina’.

It is to be remarked that, assuming only the theory of similar triangles, we have herein a proof of Euclid, Book I., Prop 47; in fact, the same as is given Book VI., . Prop. 31; and also a proof of the trigonometrical formula for cos(a—a’). The formule for cos(a+ a’) and sin(a = a’) could be obtained in the same manner.

Draw PT at right angles to Qz,, and suppose QT, TP=&, 7, re- spectively, so that we have now the quadrilateral QRPTQ, or, what is the same thing, the

two broken lines QRP and QTP, each extend-

ing from Q to P. Projecting on the four sides successively, we have

t= §& cosa’—-7, sing’, n= &sin a’ +m cosa’, = € cosa’+7 sing,

7 U Uy

where the third equation is that previously written p cos(a-a’)=& cosaty sina.

Equations of Right Line and Circle.—Transformation of Coordinates,

12. The required formule are really contained in the foregoing results. or, in fig. 11, supposing that the axis of x is parallel to QR, and taking a, 6 for the co- ordinates of Q, and (a, y) for those of P, then we have &, 7 =x- 4a, y- b respectively ; and therefore

x—-a=pcosa, y-b=psina, p> =(x-aP +(y-b). Writing the first two of these in the form x-a y-b ane ek we may regard Q as a fixed point, but P asa point moving in the direction Q to P, so that a remains constant, and then, omitting the equation (=p), we have a relation between the coordinates a, y of the point P thus moving in a right line,—that is, we have

“the equation of the line through the given point (a, 6) at a given

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inclination a to the axis of z. And, moreover, if, using this equa- tion (=p), we write s=atp cosa, y=bt+p Sin a, then we have expressions for the coordinates 2, y of a point of this line, in terms of the variable parameter p. : ;

Again, take the point T to be fixed, but consider the point P as moving in the line TP at right angles to QT. If instead of & we take p for the distance QT, then the equation ,=£ cosa’ +7 sma’ will be ©

(2-a) cosa’ +(y-b) sina’ =p; that is, this will be the equation of a line such that its perpendi- cular distance from the point (a, b) is=y, and that the

inclination of this distance to the axis of w is = a’.

From either form it appears that the equation of a line is, in fact, a linear equation of the form Avx+ By+C=0. It is important to notice that, starting from this equation, we can determine conversely the a but not the (a, 0) of the form of equation which contains these quantities ; and in like manner the a’ but not the (a, b) or p of the other form of equation. The reason is obvious. In each case (a, 6) denote the coordinates of a point, fixed in- deed, but which is in the first form any point of the line, and in the second form any point whatever. Thus, in the second form the point from which the perpendicular is let. fall may be the origin. Here (a, 0) =(0, 0), and the equation is 2 cosa’+y sina’-p=0. Comparing this with Av+By+C=0, we have the values of cosa’, sina’, and p.

13. The equation

p= (- a) +(y-b) is an expression for the squared distance of the two points (a, 6) and (x, y). Taking as before the point Q, coordi- nates (a, b), as a fixed point, and writing ¢ in the place of p, the equation

(w—- a)? + (y—- 6)? =e? expresses that the point (x, y) is always at a given distance

c from the given point (a, 6); viz, this is the equation |

of a circle, having (a, b) for the coordinates of its centre, and c for its radius.

The equation is of the form

x? + y? + 2Ax+ 2By+C=9, and here, the number of constants being the same, we can identify the two equations; we find a= — A, b= —B, c? = A? 4+B*—C, or the last equation is that of a circle having -A,—B for the coordinates of its centre, and / A? + B? – G for its radius.

14, Drawing (fig. 11) Qy, at right angles at Qx, , and taking Qz,, Qy, as a new set of rectangular axes, if instead of é,, 7, we write x, y,, we have «,, y, as the new coordi- nates of the point P; and writing also a in place of a’ (a

now denoting the inclination of the axes Qz, and Ox), we have the formule for transformation between two sets of rectangular axes. These are

L-a = L, CoS a—-Y, sina,

y—-b = x, sinat+y, cosa, and % = (x-a)cosat(y—b) sina, Y, =-—(x-a) sina+ (y—)) cosa, each set being obviously at once deducible from the other one. In these formule (a, 6) are the xy-coordinates of the new origin Q,, and a is the inclination of Qa, to Oz. It is to be noticed that Qz,, Qy, are so placed that, by moving O to Q, and then turning the axes Oz,, Oy, round Q (through an angle a measured in the sense Ox to Oy), the original axes Ox, Oy will come to coincide with Qzx,, Qy, respectively. This could not have been done if Qy, had been drawn (at right angles always to Qz,) in the reverse direction, we should then have had in the formule —y, instead of y, The new formule which would be thus obtained are of an essentially distinct

down we can, by giving to a a proper value (in fact a=0), make the (x—a) and (y—6) equal to x, and y, respectively ; in the other system we could only make them equal to %,—¥Y), or —2,, y, respectively. But for the very reason that the second system can be so easily derived from the first, it is proper to attend exclusively to the first system,—that is, always to take the new axes so that the two sets admit of being brought into coincidence.

In the foregoing system of two pairs of equations, the first pair give the original coordinates x, y in terms of the new coordinates x, y,; the second pair the new co- ordinates x,, y, in terms of the original coordinates x, y. The formule involve (a, 0), the original coordinates of the new origin; it would be easy instead of these to intro- duce (a,, b,), the new coordinates of the origin. Writing (a, b) =(0, 0), we have, of course, the formule for trans- formation between two sets of rectangular axes having the same origin, and it is as well to write the formule in this more simple form; the subsequent transformation to a new origin, but with axes parallel to the original axes, can then be effected without any difficulty.

15. All questions in regard to the line may be solved by means of one or other of the foregoing forms—

Ax+By+C=0,

y=Azu+B,

z-a _ y-b

osa sina’

(x -a@) cos a’ +(y—b) sin a -p=0; or it may be by a comparison of these different forms : thus, using the first form, it has been already shown that the equation of the line through two given points (a, 7), (®e5 Yo) is

L(Y — Yo) — Y(@y — La) +LYo — Lyf =O, or, as this may be written, © yt

i Lp — Ly (a – a).

A particular case is the equation vy 7 a ee ie

representing the line through the points (a, 0) and (0, 0), or, what is the same thing, the line meeting the axes of # andy at the distances from the origin a and 0 respectively. It may be noticed that, in the form Ax+By+C=0, – < denotes the tangent of the inclination to the axis of x, or we may say that B+ ,/A?+ B*and-—A+ ,/A?+ B? denote respectively the cosine and the sine of the inclination to the axis of x . A better form is this: A+ ,/A?B? and B ,/A?+ B? denote respectively the cosine and the sine of inclination to the axis of x of the perpendicular upon the line. So of course, in regard to the form y= Aa+ B, A is here the tangent of the inclination to the axis of 2; 1+ A?I1and A ,/A?+1 are the cosine and sine of this inclination, &c. It thus appears that the condition in order that the lines Av + By + C =Oand A’x + B’y —- C’=0 may meet at right angles is AA’+BB’=0; so when the equations are y= Ax+B, y=A’x+B’, the condition is AA’+1=0, or say the value of A’ is= —1+A.

The perpendicular distance of the point (a, b) from the line Ax + By+C=0 is (Aa+ Bo+C)+ /A?+B*% Inall the formule involving ,/A?+B? or ,/A?+1, the radical should be written with the sign +, which is essentially indeterminate: the like indeterminateness of sign presents itself in the expression for the distance of two points p= + J(z=a)?+(y—5)?; if, as before, the points are Q, P, and the indefinite line through these is 2'QPz, then it is the same thing whether we measure off from Q along

form: the analytical test is that in the formule as written | this line, considered as drawn from 2' towards 2, a positive

distance /, or along the line considered as drawn reversely from z towards 7, the equal negative distance — %, and the expression for the distance p is thus properly of the form +, It is interesting to compare expressions which do not involve a radical: thus, in seeking for the expression for the perpendicular distance of the point (a, b) from a given line, let the equation of the given line be taken in the form, # cosa+y sin a—p=O0 (p being the perpen- dicular distance from the origin, a its inclination to the axis of #): the equation of the line may also be written (c—a) cos a +(y—6) sina—p,=0, and we have thence P\=p-—4cos a—b sin a, the required expression for the distance p,: it is here assumed that p, is drawn from (a, b) in the same sense as p is drawn from the origin, and the indeterminateness of sign is thus removed.

16. As an instance of the mode of using the formule, take the problem of finding the locus of a point such that its distance from a given point is in a given ratio to its distance from a given line.

We take (a, 6) as the coordinates of the given point, and it is convenient to take (a, y) as the coordinates of the variable point, the locus of which is required; it thus becomes necessary to use other letters, say (X, Y), for current coordinates in the equation of the given line. Suppose this is a line such that its perpendicular distance from the origin is =y, and that the inclination of p to the axis of wis =a; the equation is X cosa+Ysina—p=0. In the result obtained in § 15, writing (a, y) in place of (a, b), it appears that the perpendicular distance of this line from the point (a, y) is

=p-xcosa-ysina; hence the equation of the locus is V (a— a)? +(y — 6) =e (p- x cos a—y sin a), or say (x— a) +(y —b)?—¢? (w cos aty sin a—p)?=0, an equation of the second order.

The Conics (Parabola, Ellipse, Hyperbola).

17. The conics or, as they were called, conic sections were originally defined as the sections of a right circular cone; but Apollonius substituted a definition, which is in fact that of the last example: the curve is the locus of a point such that its distance from a given point (called the focus) is in a given ratio to its distance from a given line (called the directrix) ; taking the ratio as e:1, then ¢ is called the eccen- tricity.

Take FD for the perpendicular from the focus F upon the di- © rectrix, and the given ratio being that of e: 1 (e >, =,or < 1, but positive), and let the distance FD be divided at Oin the given ratio, say we have OD=m, OF =em, where m is positive ;— then the origin may be taken at O, the axis Ox being in the direc- tion OF (that is from O to F), and the axis Oy at right angles to it.

The distance of the point (a, y) from F is =W(z—em)?+y?, its distance from the directrix is =x-+m; the equation therefore is (x—em)?y?=c? (2 m)? ; or, what is the same thing, it is (1 -€*)a? -2Qme (1+e)u+y?=0. If e=1, or, since e is taken to be positive, if e=1, this is y? -4ma=0,

Fig. 12.

which is the parabola. If ¢? not = 1, then the equation may be written

f (1-29)(2 Te) ty

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a(1 -e)

Supposing ¢ positive and < 1, then, writing m= , the

equation becomes (1-2)(e— a) +y%=a%(1 – ¢), that is, (GeO ye ae a? +30 a) 5 or, changing the origin and writing b?=a%(1 —e?), this is

ae de aigu)

which is the ellipse. And similarly if e be positive and > 1, then writing m= =H)

> the equation becomes

(-@)(v+a)?+y? =a7(1 – &),

that is, (+a)? —_— @ ~ at — é) a or changing the origin and writing b? =a(c?- 1), this is ; ay? ae

which is the hyperbola.

18. The general equation ax? + 2hay + by? + 2fy + 2ge+e =0, or as it is written (a, 8, ¢, f, g, h)(«, y, 1)2=0, may be such that the quadric function breaks up into factors, = (ax+ By+y)(a'x + B'y+y7) ; and in this case the equation represents a pair of lines, or (it may be) two coincident lines. When it does not so. break up, the function can be put in the form A{(~ — a')? + (y — 0')? – eX(xcosa+y sina —p)?}, or, equating the two expressions there will be six equa- tions for the determination of A, a', U', e, p,a; and by what precedes, if a', b', e, p, a are real, the curve is either a parabola, ellipse, or hyperbola. The original coefficients (a, 6, ¢, f, 9, 2) may be such as not to give any system of real values for a' 0', e, p,a; but when this is so the equa- tion (4, b, c, fg, h)(x, y, 1)? =0 does not represent a real curve'; the imaginary curve which it represents is, how- ever, regarded as a conic. 'Disregarding the special cases of the pair of lines and the twice repeated line, it thus appears that the only real curves represented by the general equation (a, 0, c, f, g, h)(x, y, 1)2=0 are the para- bola, the ellipse, and the hyperbola. The circle is con- sidered as a particular case of the ellipse.

The same result is obtained by transforming the equation (a, b, c, f, g, h)(, y, 1)? =0 to new axes, If in the first place the origin be unaltered, then the directions of the new (rect- angular) axes Ox,, Oy, can be found so that A,

(the co- efficient of the term #,y,) shall be =0; when this is done, then either one of the coefficients of x,7, y,2 is =0, and the curve is then a parabola, or neither of these coefficients is = 0, and the curve is then an ellipse or hyperbola, according as the two coefficients are of the same sign or of opposite signs.

19. The curves can be at once traced from their equa- tions :—

y= 4mzx, for the parabola (fig. 13),

w” +¥% =1, for the ellipse (fig. 14 a3tat , for the ellipse (fig. 14), ro

a – 55 =1, for the hyperbola (fig. 15) ;

a and it will be noticed how the form of the last equation

oe 7 of the

Referred to the asymptotes (as a set of

puts in evidence the two asymptotes = —n

hyperbola.

1 It is proper to remark that, when (a, b, ¢, f, g, h) (x, y, 1)?=0 does represent a real curve, there are in fact four systems of values of a’, ‘, €, p, a, two real, the other two imaginary; we have thus two real equations and two imaginary equations, each of them of the form (x— a’)? + (y —b’)? =e? (cos at+y cos B—p)*, representing each of them one and the same real curve. This is consistent with the assertion of the text that the real curve is in every case represented by a real equation of this form.

oblique axes) the equation of the hyperbola takes the form ay=c; and in particular, if in this equation the

4

Fig. 14. Fig. 18. .

Fig. 15.

axes are at right angles, then the equation represents the rectangular hyperbola referred to its asymptotes as axes,

Tangent, Normal, Circle and Radius of Curvature, gc.

20. There is great convenience in using the language and notation of the infinitesimal analysis; thus we consider on a curve a point with coordinates (#,y), and a consecu- tive point the coordinates of which are (x + dz, y+dy), or again a second consecutive point with coordinates (x+da+4d@x, y+dy+4d'y), &c.; and in the final results the ratios of the infinitesimals must be replaced by differ- ential coefficients in the proper manner ; thus, if w, y are considered as given functions of a parameter @, then da, dy have in fact the values " dé, oY 40 , and (only the ratio os were material) they may in the result be replaced

2 dy bY Go? aa" of the curve is given in the form y= ¢(x); @ is here = 2, and the increments dz, dy are in the result to be replaced

d F é as by 1, os . So also with the infinitesimals of the higher

orders d?x, &c.

21. The tangent at the point («, y) is the line through this point and the consecutive point (7+ dz, y+dy); hence, taking § 7 as current coordinates, the equation is

i =.

dx dy ' an equation which is satisfied on writing therein &, 7 =(v, y) or = («+da, y+dy). The equation may be written

n-y~We- 2),

This includes the case where the equation

d a: : : Z being now the differential coefficient of y in regard to a; and this form is applicable whether y is given directly as a function of «, or in whatever way y is in effect given as a function of x: ifas before x, y are given each of them as

‘ q.. .¢ : , function of 0, then the value of is = = + o » Which is the result obtained from the original form on writing dx dy

therein =, >,

qe? ae? for da, dy respectively.

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So again, when the curve is given by an equation u=0 dy dx

=0. But here it is more elegant,

between the coordinates («, y), then

. du du dy the equation J Ju de using the original form, to eliminate dx, dy by the formula du da in the form

is obtained from

d , , da + iy dy ; we thus obtain the equation of the tangent

du du ant) a (n—y)=0.

2

For example, in the case of the ellipse y

2

+ =1, tho

equation is = (-—x) + ie (y-y)=0; or reducing by

means of the equation of the curve the equation of the tangent is

The normal is a line through the point at right angles

to the tangent; the equation therefore is (§—a)da+(n—y)dy=0,

where dz, dy are to be replaced by their proportional

values as before.

22. The circle of curvature is the circle through the point and two consecutive points of the curve. Taking the equation to be ,

(§-a)?+(n- BP =, the values of a, 8 are given by __dy(de? + dy') OO andy — dye and we then have

aos doe(das 4- dy")

~ "dxd?y – dydx '

ae? + dy?)3 Pi-(e- a) +(y- 8) = fe ae :

In the case where y is given directly as a function of 2,

re dy d?y te

then, writing for shortness p = dn? > dae? this is

3

y= fu +e , or, as the equation is usually written, (1+p%)!

=

positive or negative according as the curve is concave or convex to the axis of «. ;

It may be added that the centre of curvature is the intersection of the normal by the consecutive normal.

The locus of the centre of curvature is the evolute. If from the expressions of a, 8 regarded as functions of # we eliminate x, we have thus an equation between (a, f), which is the equation of the evolute.

Polar Coordinates.

23. The position of a point may be determined by means of its distance from a fixed point and the inclina- tion of this distance to a fixed line through the fixed point. Say we have 7 the distance from the origin, and the inclination of 7 to the axis of 2; r and 6 are then the polar coordinates of the point, r the radius vector, and the inclination. ‘These are immediately connected with the Cartesian coordinates 2, y by the formule «=r cos 6, y=r sin 6; and the transition from either set of coordi- nates to the other can thus be made without difficulty. But the use of polar coordinates is very convenient, as well in reference to certain classes of questions relating to curves of any kind—for instance, in the dynamics of central forces—as in relation to curves having in regard to the origin the symmetry of the regular polygon (curves such as that represented by the equation r= cos m), and also in regard to the class of curves called spirals, where

, the radius of curvature, considered to be

the radius vector r is given as an algebraical or exponential function of the inclination 6.

Trilinear Coordinates.

24, Consider a fixed triangle ABC, and (regarding the sides as indefinite lines) suppose for a moment that p, g, 7 denote the distances of a point P from the sides BO, CA, AB respectively,—these distances being measured either perpendicularly to the several sides, or each of them in a given direction. To fix the ideas each distance may be considered as positive for a point inside the triangle, and the sign is thus fixed for any point whatever. . There is then an identical relation between p, q,7: if a, b, c are the lengths of the sides, and the distances are measured perpendicularly thereto, the

relation is ap + bq + er = twice the area of triangle. But taking «, y,z proportional to p, q, 7, or if we please proportional to given multiples of p, g, 7, then only the ratios of , y, 2 are determined ; their abso- lute values remain arbitrary. But the ratios of p, q,7, and consequently also the ratios of x, y,z2 determine, and that uniquely, the point; and it being understood that only the ratios are attended to, we say that (x, y, z) are the coordinates of the point. The equation of a line has thus the furm az + by + cz =, and generally that of a curve of the nth order is a homogeneous equation of this order between the coordinates, (* ta, y,z)”=0. The advantage over Cartesian coordinates is in the greater symmetry of the analytical forms, and in the more convenient treat- ment of the line infinity and of points at infinity. ‘The method includes that of Cartesian coordinates, the homo-

geneous equation in @, y, z is in fact an equation in re –

which two quantities may be regarded as denoting Car- tesian coordinates ; or, what is the same thing, we may in the equation write z=1. It may be added that if the tri- linear coordinates (x, y, 2) are regarded as the Cartesian ’ coordinates of a point of space, then the equation is that of a cone having the origin for its vertex ; and conversely that such equation of a cone may be regarded as the equation in trilinear coordinates of a plane curve.

General Point-Coordinates.—Line-Coordinates.

25. All the coordinates considered thus far are point- coordinates. More generally, any two quantities (or the ratios of three quantities) serving to determine the position of a point in the plane may be regarded as the coordinates of the point ; or, if instead of a single point they determine a system of two or more points, then as the coordinates of the system of points. But, as noticed under Curve, there are also line-coordinates serving to determine the position of a line; the ordinary case is when the line is determined by means of the ratios of three quantities & 7, ¢ (corre- lative to the trilinear coordinates a, y, z). A linear equa- tion a+ by+c€=0 represents then the system of lines such that the coordinates of each of them satisfy this relation, in fact, all the lines which pass through a given point ; and it is thus regarded as the line-equation of this point; and generally a homogeneous equation (* %&,7,0)” = 0 represents the curve which is the

envelope of all the lines the coordinates of which satisfy this equation, and it is thus regarded as the line-equation of this curve.

IL. Soup AnatyticaL Gzomurry (§§26-40).

26. We are here concerned with points in space,—the position of a point being determined by its three coordi. nates x,y,z We consider three coordinate planes, at right angles to each other, dividing the whole of space into eight portions called octants, the coordinates of a point being the perpendicular distances of the point from

the three planes respectively, each distance being considered

as positive or negative according as it lics on the one or the other side

of the plane. Thus the coordinates in _ the eight octants

Zz

have respectively the signs

Ws Us 8

+ + +

+ – +

- + +

- – +

+ + –

+ _ _-

ete ete za! #

Fig. 16.

The positive parts of the axes are usually drawn as in fig. 16, which represents a point P, the coordinates of which have the positive values OM, MN, NP.

27. It may be remarked, as regards the delineation of such solid figures, that if we have in space three lines at right angles to each other, say Oa, Ob, Oc, of equal lengths, then it is possible to project these by parallel lines upon a plane in such wise that the projections Oa’, Ob’, Oc’ shall.be at given inclinations to each other, and that these lengths shall be to each other in given ratios: in particular the two lines Oa’, Oc’ may be at right angles to each other, and their lengths equal, the direction of OV’, and its proportion to the two equal lengths Oa’, Oc’ being arbitrary. It thus appears that we may as in the figure draw Ox, Oz at right angles to each other, and Oy in an arbitrary direction; and moreover represent the coordi- nates x, 2 on equal scales, and the remaining coordinate y – on an arbitrary scale (which may be that of the other two coordinates x, z, but is in practice usually smaller). The advantage, of course, is that a figure in one of the co- ordinate planes wz is represented in its proper form with- out distortion ; but it may be in some cases preferable to employ the isometrical projection, wherein the three axes are represented by lines inclined to each other at angles of 120°, and the scales for the coordinates are equal (fig. 17).

For thedelineation of a sur- faceof atolerably simple form, it is frequently sufficient to draw (according to the fore- going projection) the sections by the coordinate planes ; and in particular when the surface is symmetrical in regard to § the coordinate planes, it is sufficient to draw the quarter- Fig. 17. sections belonging to a single octant of the surface ; thus fig. 18 is a convenient representation of an octant of the wave surface. Or a surface may be delineated by means of a series of parallel sections, or (taking these to be the sections by a series of horizontal planes) say by a series of contour lines. Of course, other sections may be drawn or indicated, if necessary. For the delineation of a curve, a convenient method is to represent, as above, a series of the points P thereof, each point P being accompanied by the ordinates PN, which serves to refer the point to the plane of ay ; this is in

effect a representa- tion of each point P of the curve, by means of two points P, N such that the line PN has a fixed direction. Both as regards curves and surfaces, the employment of stereo- graphic representations is very interesting.

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28. In plane geometry, reckoning the line as a curve of the first order, we have only the point and the curve. In solid geometry, reckoning a line as a curve of the first order, and the plane as a surface of the first order, we

Z

a.

Fig. 18. have the point, the curve, and the surface; but the in- crease of complexity is far greater that would hence at first sight appear. In plane geometry a curve is considered in connexion with lines (its tangents); but ‘in solid geometry the curve is considered in connexion with lines and planes (its tangents and osculating planes), and the surface also in connexion with lines and planes (its tan- gent lines and tangent planes) ; there are surfaces arising out of the line—cones, skew surfaces, developables, doubly and triply infinite systems of lines, and whole classes of theories which have nothing analogous to them in plane geometry : it is thus a very small part indeed of the sub- ject which can be even referred to in the present article.

In the case of a surface we have between the coordi- nates (x, y, 2) a single, or say a onefold relation, which can be represented by a single relation f(x, y, z2)=0; or we may consider the coordinates expressed each of them as a given function of two variable parameters p, q; the form z=f(2, y) isa particular case of each of these modes of representation; in other words, we have in the first mode S («, y, 2)=2-—f (x, y), and in the second mode z=p, y =q for the expression of two of the coordinates in terms of the parameters,

In the case of a curve we have between the coordinates (2, y, 2) a twofold relation: two equations f(x, y, 2) =0, p(x, y, 2)=0 give such a relation; 7.¢, the curve is here considered as the intersection of two surfaces (but the curve is not always the complete intersection of two sur- faces, and there are hence difficulties); or, again, the co- ordinates may be given each of them as a function of a single variable parameter. The form y= x, z=ya, where two of the coordinates are given in terms of the third, is a particular case of each of these modes of representation.

29. The remarks under plane geometry as to descriptive and metrical propositions, and as to the non-metrical char- acter of the method of coordinates when used for the proof of a descriptive proposition, apply also to solid geo- metry; and they might be illustrated in like manner by the instance of the theorem of the radical centre of four spheres. The proof is obtained from the consideration that S and S’ being each of them a function of the form e+yt+e+axrt+by+cz+d, the difference S—S’ is a mere linear function of the coordinates, and consequently that S —S’=0 is the equation of the plane containing the circle of intersection of the two spheres S=0 and S’=0

Metrical Theory.

80. The foundation in solid geometry of the metrical theory is in fact the before-mentioned theorem that if a

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finite right line PQ be projected upon any other line OO’ by lines perpendicular to OO’, then the length of the pro- jection P’Q’ is equal to the length of PQ into the cosine of its inclination to P’Q’—or (in the form in which it is now convenient to state the theorem) the perpendicular distance P’Q’ of two parallel planes is equal to the inclined distance PQ into the cosine of the inclination. Hence also the algebraical sum of the projections of the sides of a closed polygon upon any line is=0; or, reversing the signs of certain sides and considering the polygon as made up of two broken lines each extending from the same initial to the same terminal point, the sum of the projec- tions of the one set of lines upon any line is equal to the sum of the projections of the other set of lines upon the same line. When any of the

lines are at right angles to the given line (or, what is the same thing, in a plane at right angles to the given line) the projections of these lines severally vanish.

31. Consider the skew quadrilateral QMNP, the sides QM, MN, NP being respectively parallel to the three rect- angular axes Ox, Oy, Oz; let the lengths of these sides be §, 7, & and that of the side QP be=p; and let the cosines of the inclinations (or say the cosine-inclinations) of p to the three axes be a, 8, y; then projecting successively on the three sides and on QP we have

é, 7, =pa, p, PYs and p=ab+ Bn+y¢, whence p?= €2+ 72+ £2, which is the relation between a distance p and its projections € 7, £ upon three rect-angular axes. And from the same equations we obtain a? + 82+ ?=1, which is a relation connecting the cosine inclinations of a line to three rectangular axes.

Suppose we have through Q any other line QT, and let the eosine-inelinations of this to the axes be a’, p’, 7’, and 8 be its eosine-inelination to QP; also let p be the length of the projection of QP upon QT; then projecting on QT we have

P= aE+Bn+y¢, = pd.

And in the last equation substituting for & 7, ¢ their values

pa, pB, py we find

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5 = aa’ Ap’+77’’, which is an expression for the mutual ecosine-inelination of two‘ lines, the cosine-inelinations of which to the axes are a, B, y and a’, B’, y’ respectively. We have of course a?+6?7’=1, and a p?+-2=1; and hence also 1-8 =a? + B+ 7)(a? +B? +7) ~ (aa + BB’ +7), = (By — B’y)? + (ya! – 7a)? + (ap’ — a’B)? 3

so that the sine of the inclination ean only be expressed as a square root. These formule are the foundation of spherical trigonometry.

The Line, Plane, and Sphere.

32. The foregoing formule give at once the equations of these loci.

For first, taking Q to be a fixed point, coordinates (a, 0, c) and the cosine-inelinations (a, 8,) to be constant, then P will be a point in the line through Q in the direction thus determined; or, taking (x, y, z) for its coordinates, these will be the current eo- ordinates of a point in the line. The values of £, , ¢ then are x-a, y—b, z-c, and we thus have

which (omitting the last equation, =p) are the equations of the line through the point (a, 2, c), the cosine-inclinations to the axes being a, B, y, and these quantities being conneeted by the relation a2+f?+72=1, This equation may be omitted, and then a, B, 7, instead of being equal, will only be proportional to the cosine- inelinations,

. Using the last equation, and writing

X,Y, 2 = Atap, b+fhp,c+yp, these are expressions for the current coordinates in terms of a para- meter p, which is in faet the distance from the fixed point (a, O50): It is easy to see that, if the coordinates (a, y, z) are connected by any two linear equations, these equations can always be brought

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into the foregoing form, and hence that the two linear equations represent a line.

Secondly, taking for greater simplicity the point Q to be coin- cident with the origin, and a’, p’, 7’,p to be constant, then p is the perpendicular distance of a plane from the origin, and a’, B, ¥ are the cosine-inclinations of this distance to the axes (a?+B?7%=1). P is any point in this plane, and taking its co- ordinates to be (x, y, 2) then (&, n, ¢) are= (x, y,), and the fore- going equation p=a’‘t B’n+-y’¢ becomes

a’ + By+ V2 =~; which is the equation of the plane in question.

If, more generally, Q is not coincident with the origin, then, taking its coordinates to be (a, b, ¢), and writing p, instead of Dy the equation is

ai(a~a)+ B(y-b)+7(e-c)=p, ; and we thence have p, =p -(aa'+bp'+c/), which is an expression for the perpendicular distance of the point (a, 6, c) from the plane in question.

It is obvious that any linear equation Axv+By+Cz+D=0 between the coordinates can always be brought into the foregoing form, and hence that such equation represents a plane.

Thirdly, supposing Q to be a fixed point, coordinates (a, 2, ¢) aud the distance QP,=p, to be constant, say this is=d, then, as before, the values of &, 7, (are x—a, y—b, z—c, and the equation +n? + =p becomes

(%~ a)? + (y- 5)? + (2-0)? =a, which is the equation of the sphere, coordinates of the centre=(a, b, c) and radius=d.

A quadrie equation wherein the terms of the second order are w+y* +2, viz, an equation

m+y?24 Ax+ By+Cz+D=0,

can always, it is clear, be brought into the foregoing form; and it thus appears that this is the equation of a sphere, coordinates of the centre — $A, — 4B, – 4C, and squared radius = 4(A?+ B?+C?) – D.

Cylinders, Cones, Ruled Surfaces.

33. A singly infinite system of lines or system of lines depending upon one variable parameter forms a surface p and the equation of the surface is obtained by eliminating the parameter between the two equations of the line.

If the lines all pass through a given point, then the surface is a cone; and, in particular, if the lines are all parallel to a given line, then the surface is a cylinder.

Beginning with this last case, suppose the lines are parallel to the line z=mz, y=nz, the equations of a line of the system are L=Me+a, y=nz+b,—where a, b are supposed to be functions of the variable parameter, or, what is the same thing, there is be- tween them a relation f(a, 6)=0: we have a=a-mz, b=y— ne, and the result of the elimination of the parameter therefore is Aae- mz, y-nz)=0, which is thus the general equation of the cylinder the generating lines whereof are parallel to the line a=mez,y=nz, The equation of the section by the plane z=0 is Ax, y)=0, and conversely if the cylinder be determined by means of its curve of intersection with the plane «=0, then, taking the equation of this curve to be f(x, y)=0, the equation of the cylinder is ((x- mz, y~nz)=0. Thus, if the eurve of intersection be the eirele (@ —a)??=", we have (x – mz – a)?(y—nz- BY =? as the equation of an oblique cylinder on this base, and thus also (x—a)?+(y- B)?=~ as the equation of the right eylinder.

If the lines all pass through a given point (a, 8, c), then the equations of a line are -a=a(z—c), y—b=A(z-c), where a, B are functions of the variable parameter, or, what is the samc thing, there exists between them an equation (= 8)=0; the elimination

pa unt)=0; and this

of the parameter gives, therefore, 7 ll tem equation, or, what is the same thing, any homogencous equation S(z—a, y—b, z-c)=0, or, taking f to be a rational and integral function of the order n, say **)(z—a, y- b, 2—c)**=0, is the general equation of thecone having the point (a, 6, c) for its vertex. Taking the vertex to be at the origin, the equation is **)(x, y, z)"=0; and, in particular, (**)(a, y, 2)?=0 is the equation of a cone of the second

order, or quadricone, having the origin for its vertex.

34. In the general case of a singly infinite system of lines, the locus is a ruled surface (or regulus). If the system be such that a line does not intersect the consecu- tive line, then the surface is a skew surface, or scroll; but if it be such that each line intersects the consecutive line, then it is a developable, or torse.

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Suppose, for instance, that the equations of a line (depending on the variable parameter) ar + med oe 2 we: i. P We ¢ bj’ .6 @ GP?

22 ae 2 ay 2

then, eliminating 0, we have oan l- RO say B+5.- gal, the equation of a quadric surface, afterwards called the hyperboloid of one sheet ; this surface is consequently a scroll. It is to be re- marked that we have upon the surface a second singly infinite series of lines; the equations of a line of this second system (de- pending on the variable parameter ¢) are

ee y\ 2 #1 y

ye o(1-2),2 sg (144). It is easily shown that any line of the one system intersects evcry line of the other system.

Considering any curve (of double curvature) whatever, the tan- gent lines of the curve form a singly infinite system of lines, eaeh line intersecting the consecutive line of the system,—that is, they form a developable, or torse; the eurve and torse are thus in- separably connected together, forming a single epee nla figure. A plaue through three consecutive points of the curve (or oseu- lating plane of the curve) contains two consecutive tangents, that is, two consecutive lines of the torse, and is thus a tangent plane of the torse along a generating line.

Transformation of Coordinates.

35. There is no difficulty in changing the origin, and it is for brevity assumed that the origin remains unaltered. We have, then, two sets of rectangular axes, O.r, Oy, Oz, and Oz, Oy,, Oz, the mutual cosine-inclinations being shown by the diagram—

2x y z

; 1

2) a B | Y Yy a’ | B’ y

that is, a, 8, y are the cosine-inclinations of Ox, to Ox, Oy, Oz; a’, B’, y those of Oy,, &c.

And this diagram gives also the linear expressions of the coordinates (x1, 7}, 2,) or (a, y, z) of either set in terms of those of the other set ; we thus have

U=axt+Byt+yz, – C= ay + aly + ai” , Yr=a utp yt+yz, y= Bit, + BY, +B’, m=al’at By +y2, R= YTV + Y % » which are obtained by projection, as above explained. Fach of these equations is, in fact, nothing else than the before-mentioned equation p=a&+f’n+y, adapted to the problem in hand. : But we have to consider the relations between the nine coefficients. By what precedes, or by the consideration that we must have identically 2+ 9? +2=2/?+y?+2,, it appears that these satisfy the relations— 2 46 +7? =1 ata’? +q/”2 =] a? ie yi; B+A? +p” =1, 2 Be gp’? +7″ — 5 vy + y? + yy? = 1 aa! + BB’ + 7′7″=0 F By+ By + ey 9 P a’a + B’B +y”y =0), yatya’ +y”a” =0, aa’ + Bp’ +77 BO, aB+a’p’+a”p” =0, either set of six equations being implied in the other set. It follows that the square of the determinant

is=1; and hence that the determinant itself is =+1. The dis- tinction of the two cases is an important one: if the determinant is =+1, then the axes Ox,, Oy,, Oz, are such that they can by a rotation about O be brought to coincide with Ox, Oy, Oz respect- ively ; if it is = —1, then they cannot. But in the latter case, by measuring 2,7, 2 in the opposite directions we change the signso all the coefficients and so make the determinant to be = +1; hence this case need alone be considered, and it is accordingly assumed that the determinant is = +1. This being so, it is found that te have a further set of nine equations, a= f’y” — B’y’, &c.; that 1s, the coefficients arranged as in the diagram have the values

As = 53

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By” < By’ | wa" ate ya , | a’p”— a’ Bp’

B’y = By” | ya ya” | a’B = ap”

ap’ —aB

By -BYy | ya — a

36. It is important to express the nine coefficients in terms of three independent quantities. A solution which, although unsymmetrical, is very convenient in Astronomy and Dynamics is to use for the purpose the three angles 6, , 7 of fig. 19; say 0 = longitude of the node; ¢ = in- clination: and 7 = longitude of x, from node.

x1

Fig. 19.

The diagram of transformation then is

a y

i. ee ee —e cosT cos –sinTsin0cosP| cosTsin@ + sin T cos 6 cos P| sin T sin &

mn sin @ sin d

But a more elegant solution (due to Rodrigues) is that contained in the diagram

a y z

@, 14+02-w-y* 2Au-v) QaAr +p) hy ¥ own +y) ree er ey 2(my oy a 4 wren a a 2(my res 1L-a?-p?+r?

~-(14+a2-p?+ yr’) The nine coefficients of transformation are the nine functions of the diagram, each divided by 1+a?+y?+»*; the expressions contain as they should do the three arbitrary quantities A, mw, v5 and the identity a,2+y,2+%2=2+y?+2″ can be at once verified. It may be added that the transformation can be expressed in the quaternion form tay jy, thay =(1t A)(iatjy+ ke\(l+a) 4

where A denotes the vector 7A +ju + kv.

Quadrie Surfaces (Paraboloids, Ellipsoid, Hyperboloids).

37. It appears by a discussion of the general equation of the second order (a, . . (x, ¥/, % 1)?=0 that the proper quadric surfaces! represented by such an equation are the following five surfaces (a and 0 positive) :—

2 2

Lye = 24 ipti i (1.) Sat a6? elliptic paraboloid.

2 2

(2.) 2 = = a , hyperbolic paraboloid.

2 2 2

(3.) at a = 1, ellipsoid.

2 2 72

(4.) — aE 4 = 5 = 1, hyperboloid of one sheet. x, y2 22 ; (5.) a ae ac are = 1, hyperboloid of two sheets.

EE EE

1 The improper quadrie surfaces represented by the general equation of the second order are (1) the pair of planes or plane-pair, including as a special ease the twice repeated plane, and (2) the cone, including as a special ease the eylinder. There is but one form of cone; but the cylinder may be parabolie, elliptic, or hyperbolic.

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It is at once seen that these are distinct surfaces ; and the equations also show very readily the general form and mode of generation of the several surfaces.

In the elliptic paraboloid (fig.

20), the sections by the planes of zz and zy are the parabolas

2

2 2

ae 4y 24+—, a a

20 2b

having the common axes Oz; and the seetion by any plane z=v+ parallel to that of xy is the 0 ellipse ert

y

so that the surface is generated Fig, 20.

by a variable ellipse moving parallel to itself along the parabolas as direetrices.

In the hyperbolie paraboloid (fig. 21) the sections by the planes of za, zy are the parabolas ga ,2=-

2a 20° – ing the opposite axes Oz, Oz, and the section by a plane z=+ parallel to that of ay is the

hyperbola y =

ef 2a 20’ whichhas its transverse axis parallel to Ow or Oy according as vy is positive or negative. zg’ \

The surface is thus Fig. 21

enerated by a variable “gh reacts moving parallel to itself along the parabolas as direc-

Fig. 22.

trices. The form is best seen from fig. 22, which represents the sections by planes parallel to the plane of ay, or say the contour lines ; the é

eontinuous lines are the sections above the plane of ay, and the dotted lines the sections below this plane. The form is, in fact, that of a saddle.

In the ellipsoid (fig. 23) the sections by the planes of 2x, 2y, and xy are each of them an ellipse, and the section by any parallel plane is also an ellipse. The surface may be con- sidered as generated

Fig. 23.

by an ellipse moving parallel to itself along two ellipses as directrices. In the hyperboloid of one sheet (fig. 24), planes of 22, zy are the hyperbolas gag having a common conjugate axis 207; the section by the plane of

the sections by the

ge

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wy, and that by any parallel plane, is an ellipse; and the surface may be considered as generated by a variable ellipse moving parallel to itself along the two hyperbolas as directrices.

In the hyperboloid of two sheets (fig. 25), the sec- tions by the planes of zx and zy are the hyperbolas

gt 22 =t ? eo b2 ?

having the common trans- verse axis 202’; the section by any plane z = +y par- allel to that of zy, y being in absolute magnitude >c, is the ellipse

a

a PB a Y and the surface, consisting Fig. 24. of two distinct portions or sheets, may be considered as generated by a variable ellipse moving parallel to itself along the hyperbolas as directrices,

The hyperbolic paraboloid is such (and it is easy from the figure to understand how this miay be the case) that there exist upon it two singly infinite serics of right lines. The same is the case with the hyperboloid of one shect (ruled or skew hyperboloid, as with reference to this property it is termed). If we imagine two equal and parallel circular disks, their points connected by strings of equal length, so that these are the generating lines of a right circular cylinder, then by turn- ing one of the disks about its centre through the same angle in one or the other direction, rR the strings will in each case ig. 25. generate one and the same hyperboloid, and will in regard to it be the two systems of lines on the surface, or say the two systems of generat- ing lines ; and the general configuration is the same when instead of circles we have ellipses. It has been already shown analytically

2 2

that the equation = + iz – : =1 is satisfied by each of two pairs of lincar relations between the coordinates.

as

-

Cc a

Pd

~

Curves ; Tangent, Osculating Plane, Curvature, §c.

38. It will be convenient to consider the coordinates (x, y, 2) of the point on the curve as given in terms of a parameter 6, so that dx, dy, dz, d®x, &c., will be propor- die dy de Px & do’? dd’ do’? ap? © analytical formulz will be given. rent coordinates.

The tangent is the line through the point (2, y, z) and the consecutive point (x + dz, y + dy, 2+dz) ; its equations therefore are

tional to But only a part of the

é, n, are used as cur-

Dar So dz dy dz

The osculating plane is the plane through the point and two consecutive points, and contains therefore the tangent ; its equation is f—-%, n—y, (-z dz , dy , de 2, dy , d% or, what is the same thing, (§-x)(dyd?2—dad*y) + (n-y)(dzd?a— dad) + (¢-z)(dad*y-dydx) = 0.

The normal plane is the plane through the point at tight angles to the tangent. It meets the osculating plane in a line called the principal normal 3 and drawing through the point a line at right angles to the osculating plane, this is called the binormal. We have thus at the point a

=0

set of three rectangular axes—the tangent, the principal normal, and the binormal.

We have through the point and three consecutive points a sphere of spherical curvature,—the centre and radius thereof being the centre, and radius, of spherical curvature. The sphere is met by the osculating plane in the circle of absolute curvature,—the centre and radius thereof being the centre, and radius, of absolute curvature. The centre of absolute curvature is also the intersection of the principal normal by the normal plane at the consccutive point.

Surfaces ; Tangent Lines and Plane, Curvature, $e.

39. It will be convenient to consider the surface as given by an equation f(x, y,z)=0 between the coordi- nates ; taking («, y, z) for the coordinates of a given point, and (+d, y+dy, z+dz) for those of a consecutive point, the increments dx, dy, dz satisfy the condition

d, a g@

. da + A = dd = On but the ratio of two of the increments, suppose dx: dy, may be regarded as arbitrary. Only a part of the analy- tical formule will be given. & , £ are used as current coordinates,

We have through the point a singly infinite serics of right lines, each meeting the surface in a consecutive point, or say having each of them two-point intersection with the surface. ‘These lines lie all of them in a plane which is the tangent plane ; its equation is

L(t-2) + Zina + ZE-2 =0, as is at once verified by observing that this equation is satisfied (irrespectively of the value of ds : dy) on writing therein & y, €=”+dr, y+dy, z+dz.

The line through the point at right angles to the tan- gent plane is called the normal ; its equations are

ist. t7¥ 2 tos) df af a da dy da

In the series of tangent lines there are in general two (real or imaginary) lines, each of which meets the surface in a second consecutive point, or say it has three-point intersection with the surface ; these are called the chief-tangents (Haupt-tangenten). The tangent-plane cuts the surface in a curve, having at the point of contact a node (double point), the tangents to the two branches being the chief-tangents,

In the case of a quadric surface the curve of intersec- tion, gua curve of the second order, can only have a node by breaking me into a pair of lines; that is, every tangent- plane meets the surface in a pair of lines, or we have on the surface two singly infinite systems of lines; these are real for the hyperbolic paraboloid and the hyperboloid of one sheet, imaginary in other cases.

At each point of a surface the chief-tangents determine two directions ; and passing along one of them to a con- secutive point, and thence (without abrupt change of direction) along the new chief-tangent to a consecutive point, and so on, we have on the surface a chief-tangent curve ; and there

are, it is clear, two singly infinite series of such curves, In the case of a quadric surface, the curves are the right lines on the surface.

40. If at the point we draw in the tangent-plane two lines bisecting the angles between the chief-tangents, these lines (which are at right angles to each other) are called the principal tangents.![1] We have thus at each point of

1 The point on the surface may be such that the directions of the principal tangents become arbitrary ; the point is then an umbilicus. It is in the text assumed that the point on the surface is not an untbilicus,

dy +

the surface a set of rectangular axes, the normal and the two principal tangents. ae

Proceeding from the point along a principal tangent to a consecutive point on the surface, and thence (without abrupt change of direction) along the new principal tangent to a consecutive point, and so on, we have on the surface a curve of curvature; there are, it is clear, two singly infinite series of such curves, cutting each other at right angles at each point of the surface.

Passing from the given point in an arbitrary direction to a consecutive point on the surface, the normal at the given point is not intersected by the normal at the con- secutive point ; but passing to the consecutive point along a curve of curvature (or, what is the same thing, along a principal tangent) the normal at the given point is inter- sected by the normal at the consecutive point; we have thus on the normal two centres of curvature, and the distances of these from the point on the surface are the two principal radii of curvature of the surface at that point ; these are also the radii of curvature of the sections of the surface by planes through the normal and the two prin- cipal tangents respectively ; or say they are the radii of curvature of the normal sections through the two principal tangents respectively. Take at the point the axis of z in the direction of the normal, and those of x and y in

the directions of the principal tangents respectively, then, if if the radii of curvature be a, b (the signs being such that the coordinates of the two centres of curvature are

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z=a and z=b respectively), the surface has in the neigh- bourhood of the point the form of the paraboloid

an

= Fat 2b” and the chief-tangents are determined by the equation Or= ae ae: The two centres of curvature may be on

the same side of the point or on opposite sides; in the former case a and 0 have the same sign, the paraboloid is elliptic, and the chief-tangents are imaginary ; in the latter case a and } have opposite signs, the paraboloid is hypet- bolic, and the chief-tangents are real.

The normal sections of the surface and the paraboloid by the same plane have the same radius of curvature ; and it thence readily follows that the radius of curvature of a normal section of the surface by a plane inclined at an angle 6 to that of zx is given by the equation

1 cos’@ | sin?@ ee

The section in question is that by a plane through the normal and a line in the tangent plane inclined at an angle @ to the principal tangent along the axis of a. To complete the theory, consider the section by a plane having the same trace upon the tangent plane, but inclined to the normal at an angle ¢; then it is shown without difficulty (Meunier’s theorem) that the radius of curvature of this inclined section of the surface is =

pcos @. (A. CA.)

GEORGE L, king of Great Britain and Ireland (George Louis, 1660-1727), born in 1660, was heir through his father Ernest Augustus to the hereditary lay bishopric of Osnabriick, and to the duchy of Calenburg, which formed

one portion of the Hanoverian possessions of the house of Brunswick, whilst he secured the reversion of the other portion, the duchy of Celle or Zell, by his marriage (1682) with the heiress, his cousin Sophia Dorothea. The marriage was not a happy one. The morals of German courts in the end of the 17th century took their tone from the splendid profligacy of Versailles. It became the fashion for a prince to amuse himself with a mistress or more frequently with many mistresses simultaneously, and he was often content that the mistresses whom he favoured should be neither beautiful nor witty. George Louis followed the usual course. Count Kénigsmark—a handsome adventurer—seized the opportunity of paying court to the deserted wife. Con- jugal infidelity was held at Hanover to be a privilege ot the male sex. Count Kénigsmark was assassinated. Sophia Dorothea was divorced in 1694, and remained in seclu- sion till her death in 1726. fourth generation attempted in England to call his wife to account for sins of which he was himself notoriously guilty, free-spoken public opinion reprobated the offence in no measured terms. In the Germany of the 17th cen- tury all free-spoken public opinion had been crushed out by the misery of the Thirty Years' War, and it was under- stood that princes were to arrange their domestic life accord- ing to their own pleasure.

The prince's father did much to raise the dignity of his family. By sending help to the emperor when he was struggling against the French and the Turks, he obtained the grant of a ninth electorate in 1692. His marriage with Sophia, the youngest daughter of Elizabeth the daughter of James 1. of England, was not one which at first seemed likeiy to confer any prospect of advancement to his family. But though there were many persons whose birth gave them better claims than she liad to the English crown,

When her descendant in the

she found herself, upon the death of the duke of Gloucester, the next Protestant heir after Anne. The Act of Settlement in 1701 secured the inheritance to herself and her descend- ants. Being old and unambitious she rather permitted herself to be burthened with the honour than thrust her- self forward to meet it. Her son George took a deeper in- terest inthe matter. In his youth he had fought with deter- mined courage in the wars of William III. Succeeding to the electorate on his father's death in 1698, he had sent a

welcome reinforcement of Hanoverians to fight under Marlborough at Blenheim. With prudent persistence he attached himself closely to the Whigs and to Marlborough, refusing Tory offers of an independent command, and receiv- ing in return for his fidelity a guarantee by the Dutch of his succession to England in the Barrier treaty of 1709, In 1714 when Anne was growing old, and Bolingbroke and the more reckless Tories were coquetting with the sou of James II., the Whigs invited George's eldest son, who was duke of Cambridge, to visit England in order to be on the spot in case of need. Neither the elector nor his mother approved of a step which was likely to alienate the queen, and which was specially distasteful to himself, as he was on very bad terms with his son. Yet they did not set themselves against the strong wish of the party to which they looked for support, and it is possible that troubles would have arisen from any attempt to carry out the plan, if the deaths, first of the electress (May 28) and then of the queen (August 1, 1714), had not laid open George's way to the succession without further effort of his own.

In some respects the position of the new king was not unlike that of William III. a quarter of a century before. Both sovereigns were foreigners, with little knowledge of English politics and little interest in English legislation. Both sovereigns arrived at a time when party spirit had been running high, and when the task before the ruler was to still the waves of contention. In spite of the difference

| between an intellectually great man and an intellectually

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small one, in spite too of the difference between the king who began by choosing his ministers from both parties, and the king who persisted in choosing his ministers from only one, the work of pacification was accomplished by George even more thoroughly than by William.

George I. was fortunate in arriving in England when a great military struggle had come to an end. He had there- fore no reason to call upon the nation to make great sacrifices. All that he wanted was to secure for himself and his family a high position which he hardly knew how to occupy, to fill the pockets of his German attendants and his German mis- tresses, to get

away as often as possible from the uncongenial islanders whose language he was unable to speak, and to use the strength of England to obtain petty advantages for his German principality. In order to do this he attached himself entirely to the Whig party, though he refused to place himself at the disposal of its leaders. He gave his confidence, not to Somers and Wharton and Marlborough, but to Stanhope and Townshend, the statesmen of the second rank. At first he seemed to be playing a dangerous game. The Tories, whom he rejected, were numerically superior to their adversaries, and were strong in the support of the country gentlemen and the country clergy. The strength of the Whigs lay in the towns and in the higher aristocracy. Below both parties lay the mass of the nation, which cared nothing for politics except in special seasons of excitement, and which asked only to be let alone. In 1715 a Jacobite insurrection in the north, supported by the appearance of the Pretender, the son of James II., in Scotland, was suppressed, and its suppression not only

gave to the Government a character of stability, but dis-’

played its adversaries in an unfavourable light as the dis- turbers of the peace.

Even this advantage, however, would have been thrown away, if the Whigs in power had continued to be animated by violent party spirit. What really happened was that the Tory leaders were excluded from office, but that the principles and prejudices of the Tories were admitted to their full weight in the policy of the Government. The natural result followed. The leaders to whom no regard was paid continued in opposition. The rank and file who would personally have gained nothing by a party victory were conciliated into quiescence.

This mingling of two policies was conspicuous both in the foreign and the domestic actions of the reign. In the days of Queen Anne, the Whig party had advocated the continuance of war with a view to the complete humiliation of the king of France, whom they feared as the protector of the Pretender, and in whose family connexion with the king of Spain they saw a danger for England. The Tory party on the other hand had been the authors ot the peace of Utrecht, and held that France was sufficiently depressed. A fortunate concurrence of circumstances enabled George’s ministers, by an

alliance with the regent of France, the duke of Orleans, to pursue at the same time the Whig policy of separating France from Spain and from the cause of the Pretender, and tle Tory policy of the maintenance of a good understanding with their neighbour across the Channel. The same eclecticism was discernible in the pro- esedings of the home Government. The Whigs were con- ciliated by the repeal of the Schism Act and the Occasional Conformity Act, whilst the Tories were conciliated by the maintenance of the Test Act in all its vigour. The satis- faction of the masses was increased by the general well- being of the nation.

Very little of all that was thus accomplished was directly owing to George I. The policy of the reign is the policy of his ministers, Stanhope and Townshend from 1714 to 1717 were mainly occupied with the defence of the Hano- verian settlement. After the dismissal of the latter in 1717,

Stanhope in conjunction with Sunderland took up &@ more decided Whig policy. The Occasional Conformity Act and the Schism Act were repealed in 1719. But the wish of the liberal Whigs to modify if not to repeal the Test Act remained unsatisfied. In the following year the bursting of the South Sea bubble, and the subsequent deaths of Stanhope in 1721 and of Sunderland in 1722, cleared the way for the accession to power of Sir Robert Walpole, to whom and not to the king was due the conciliatory policy which quieted Tory opposition by abstaining from pushing Whig principles to their legitimate consequences.

Nevertheless something of the honour due to Walpole must be reckoned to the king’s credit. It is evident that at his accession his decisions were by no means unimport- ant. The royal authority was still able within certain limits to make its own terms. This support was so neces- sary to the Whigs that they made no resistance when he threw aside their leaders on his arrival in England. When by his personal intervention he dismissed Townshend and appointed Sunderland, he had no such social and parliament- ary combination to fear as that which almost mastered his great-grandson in his struggle for power. If such a com- bination arose before the end of his reign it was owing more to his omitting to fulfil the duties of his station than from the necessity of the case. As he could talk no English, and his ministers

could talk no German, he absented himself from the meetings of the cabinet, and his frequent absences from England and his want of interest in English politics strengthened the cabinet in its tendency to assert an independent position. Walpole at last by his skill in the management of parliament rose as a subject into the almost royal position denoted by the name of prime minister. In connexion with Walpole the force of wealth and station established the Whig aristocracy in a point of vantage from which it was afterwards difficult to dislodge them. Yet, though George had allowed the power which had been exercised by William and Anne to slip through his hands, it was understood to the last that if he chose to exert himself he might cease to be a mere cipher in the conduct of affairs. As late as in 1727 Bolingbroke gained over one of the king's mistresses, the duchess of Kendal; and though her support of the fallen Jacobite took no effect, Walpole was not without fear that her reiterated entreaties would lead to his dismissal. The king's death in a carriage on his way to Hanover, in the night between 10th and 11th June in the same year, put an end to these apprehensions.

His only children were his successor George II., and Sophia Dorothea (1687-1757), who married in 1706 Fre- derick William, crown prince (afterwards king) of Prussia. She was the mother of Frederick the Great. (s. R. G.)

GEORGE II. (George Augustus, 1683-1760), the only son of George I, was born in 1683. In 1705 he married Wilhelmina Caroline of Anspach. In 1706 he was created earl of Cambridge. In 1708 he fought bravely at Oudenarde. At his father's accession to the English throne he was thirty-one years of age. He was already on bad terms with his father. The position of an heir-apparent is in no case an easy one to fill with dignity, and the ill treatment of the prince's mother by his father was not likely to strengthen in him a reverence for paternal authority. It was most unwillingly that, on his first journey to Hanover in 1716, George I. appointed the prince of Wales guardian of the realm during his absence. In 1717 the existing ill feeling ripened inte an open breach. At the baptism of one of his children, the prince selected one godfather whilst the king persisted in selecting another. The young man spoke angrily, was ordered into > and was subsequently

commanded to leave St James's, and to be excluded from all court ceremonies. The prince took

up lis residence at Leicester House, and did everything in his power to support the opposition against his father's ministers.

When therefore George I. died in 1727, it was generally supposed that Walpole would be at once dismissed. The first direction of the new king was that Sir Spencer Compton would draw up the speech in which he was to announce to the Privy Council his accession. Compton, not knowing how to set about his task, applied to Walpole for aid. The queen took advantage of this evidence of incapacity, advocated Walpole's cause with her husband, and procured his continuance in office. This curious scene was indicative of the course likely to be taken by the new sovereign. His own mind was incapable of rising above the merest details of business. He made war in the spirit of a drill-sergeant, and he economized his income with the nunute regularity of a clerk. A blunder of a master of the ceremonies in marshalling the attendants on a levee put him out of temper. He took the greatest pleasure in counting his money piece by piece, and he never forgot a date. He was above all things methodical and regular. 'He seems," said one who knew him well, "to think his having done a thing to-day an unanswerable reason for his doing it to-morrow."

Most men so utterly immersed in details would be very impracticable to deal with. They would obstinately refuse to listen to a wisdom and prudence which meant nothing in their ears, and which brought home to them a sense of their own inferiority. It was the happy peculiarity of George LI. that he was exempt from tliis failing. He seemed to have an instinctive understanding that such and such persons were either wiser or even stronger than himself, and when he lad once discovered that, he gave way with scarcely a struggle. Thus it was that, though in his domestic relations he was as loose a liver as his father had been, he allowed himself to be guided by the wise but unobtrusive counsels of his wife until her death in 1737, and that when once he had recognized Walpole's superiority he allowed himself to be guided by the political sagacity of the great minister. It is difficult to exaggerate the importance of such a temper upon the development of the

constitution. The apathy ot the nation in all but the most exciting political questions, fostered by the calculated conservatism of Walpole, had thrown power into the hands of the great landowners. They maintained their authority by supporting a minister who was ready to make use of corruption, wherever corrup- tion was likely to be useful, and who could veil over the baseness of the means which he employed by his talents in debate and in finance. To shake off a combination so strong would not have been easy. George II. submitted to it with- out a struggle.

; So strong indeed had the Whig aristocracy grown tliat it began to lose its cohesion. Walpole was determined to monopolize power, and he dismissed from office all who ven- tured to oppose him. An Opposition formidable in talents was gradually formed. In its composite ranks were to be found Tories and discontented Whigs, discarded official hacks who were hungry for the emoluments of office, and youthful purists who fancied that if Walpole were removed, bribes and pensions would cease to be attractive to a corrupt generation. Behind them was Bolingbroke, excluded from parliament but suggesting every party move. In 1737 the opposition acquired the support of Frederick prince of Wales. The young man, weak and headstrong, rebelled against the strict discipline exacted by his father. His niarriage in 1736 to Augusta of Saxony brought on an open quarrel. In 1737 just as the princess of Wales was about to give birth to her first child, she was hurried away by her husband from Hampton Court to St James's Palace at the imminent risk of her life, simply in order that the prince

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might show his spite to his father who had provided all necessary attendance at the former place. George ordered his son to quit St James's, and to absent himself from court, Frederick in disgrace gave the support of his name, and he had nothing else to give, to the Opposi- tion. Later in the year 1737, on November 20, Queen Caroline died. In 1742 Walpole, weighed down by the unpopularity both of his reluctance to engage in a war with Spain and of his supposed remissness in conducting the operations of that war, was driven from office. His successors formed a composite ministry in which Walpole's old colleagues and Walpole's old opponents were alike to be found.

The years which followed settled conclusively, at least for this reign, the constitutional question of the power of appointing ministers. The war between Spain and England had broken out in 1739. In 1741 the death of the emperor Charles VI. brought on the war of the Austrian succession, The position of George II. as a Hanoverian prince drew him to the side of Maria Theresa through jealousy of the rising Prussian monarchy. Jealousy of France led England in the same direction, and in 1741 a subsidy of £300,000 was voted to Maria Theresa. The king himself went to Germany and attempted to carry on the war according to his own notions. Those notions led him to regard the safety of Hanover as of far more importance than the wishes of England. Finding that a French army was about to march upon his German states, he concluded with France a treaty of neutrality for a year without consulting a single English minister. In England the news was received with feelings of disgust. The expenditure of English money and troops was to be thrown uselessly away as soon as it appeared that Hanover was in the slightest danger. In 1742 Walpole was no longer in office. Lord Wilmington, the nominal head of the ministry, was a mere ciplier. The ablest and most energetic of his colleagues, Lord Carteret, attached himself specially to the king, and sought to maintain himself in power by his special favour and by brilliant achievements in diplomacy.

In part at least by Carteret's mediation the peace of Breslau was signed, by which Maria Theresa ceded Silesia to Frederick (July 28, 1742). Thus relieved on her northern frontier, she struck out vigorously towards thie west. Bavaria was overrun by her troops. In the begin- ning of 1743 one

French army was driven across the Rhine. On June 27th another French army was de- feated by George II. in person at Dettingen. Victory brought elation to Maria Theresa. Her war of de- fence was turned into a war of vengeance. Bavaria was to be annexed. The French frontier was to be driven back. George II. and Carteret after some hesitation placed themselves on her ‘side. Of the public opinion of the political classes in England they took no thought. Hano- verian troops were indeed to be employed in the war, but they were to be taken into British pay. Collisions between British and Hanoverian officers were frequent. A storm arose against the preference shown to Hanoverian interests. After a brief struggle Carteret, having become Lord Granville by his mother’s death, was driven from office in November 1744.

Henry Pelham, who had become prime minister in the preceding year, thus saw himself established in power. By the acceptance of this ministry, the king acknowledged that the function of choosing a ministry and directing a policy had passed from his hands. In 1745 indeed he recalled Granville, but a few days were sufficient to convince him of the futility of his attempt, and the effort to exclude Pitt at a later time proved equally fruitless.

Important as were the events of the remainder of the reign, therefore, they can hardly be grouped round tlie name

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of George II. The resistance to the invasion of the young Pretender in 1745, the peace of Aix-la-Chapelle in 1748, the great war ministry of Pitt at the elose of the reign, did not reeeive their impulse from him. He had indeed done his best to exelude Pitt from office. He disliked him on account of his opposition in former years to the sacrifices demanded by the Hanoverian connexion. When in 1756 Pitt became secretary of state in the Devonshire adminis- tration, the King bore the yoke with diffieulty. arly in the next year he complained of Pitt’s long speeches as being above his comprehension, and on April 5, 1757, he dismissed lim, only to take him baek shortly after, when Pitt, coalescing with Neweastle, became master of the situation. Before Pitt’s dismissal George IL. had for onee an opportunity of placing himself on the popular side, though, as was the ease of his grandson during the Ameriean war, it was when the popular side happened to be in the

wrong. In the true spirit of a martinet, he wished to see Admiral Byng executed. Pitt urged the wish of the House of Commons to have him pardoned. “Sir,” replied the king, “you have taught me to look for the sense of my subjeets in another plaee than in the House of Com- mons.” When George II. died in 1760, he left behind him a settled understanding that the monarehy was one of the least of the forces by which the poliey of the country was directed. To this end he had eontributed much by his disregard of English opinion in 1743; but it may fairly be added that, but for his readiness to give way to irresistible adversaries, the struggle might have been far more bitter and severe than it was.

Of the eonnexion between Hanover and England in this reign two memorials remain more pleasant to eontemplate than the reeords of parliamentary and ministerial intrigues, With the support of George II., amidst the derision of the English fashionable world, the Hanoverian Handel produeed in England those masterpieces which have given delight to millions, whilst the foundation of the university of Gottingen by the same king opened a door through which English politieal ideas afterwards penetrated into Germany.

George II. had three sons,—Frederiek Louis (1707- 1751); George William (1717-1718); and William Augus- tus, duke of Cumberland (1721-1765); and five daughters, Anne (1709-1759), married to William, prince of Orange, 1734 ; Amelia Sophia Eleonora (1711-1786) ; Elizabeth Caroline (1713-1757); Mary (1723-1772), married to Frederiek, landgrave of Hesse Cassel, 1740; Louisa (1724-1751), married to Frederick V., king of Denmark, 1743. (Sand)

GEORGE III. (George William Frederick, 1738- 1820), born 4th June 1738, was the son of Frederick prince of Wales and the grandson of George IT., whom he succeededin 1760. After his father’s death in 1751 hehad been edueated in seelusion from the fashionable world under the eare of his mother and of her favourite counsellor the earl of Bute. He had been taught to revere the maxims of Bolingbroke’s “ Patriot King,” and to believe that it was his appointed task in life to break the power of the Whig houses resting upon extensive property and the influence of patronage and eorruption.

That power had already been gravely shaken. The Whigs fromtheir incompetency were obliged whenthe Seven Years' War broke out to leave its management in the hands of William Pitt. The nation learned to applaud the great war minister who suceeeded where others had failed, and whose immaeulate purity put to shame the ruek of barterers of votes for places and pensions. In some sort the work of the new king was the continuation of the work of Pitt. But his methods were very different. He did not appeal to any widely spread feeling or prejudice ; nor did he disdain the use of the arts which had maintained his

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opponents in power. The patronage of the crown was to be really as well as nominally his own; and he calculated, not without reason, that men would feel more flattered in aeeepting a place from a king than from a minister. The new Toryism of whieh he was the founder was no recur- renee to the Toryism of the days of Charles IT. or even of Anne. The question of the amonnt of toleration to be aeeorded to Dissenters had been entirely laid asleep. The point at issue was whether the crown should be replaeed in the position whieh George I. might have oeeupied at the beginning of his reign, seleeting the ministers and influene- ing the deliberations of the cabinet. For this struggle George III. possessed no inconsiderable advantages. With an inflexible tenacity of purpose, he was always ready to give way when resistanee was really hopeless. As the first English-born sovereign of his house, speaking from his birth the language of his subjects, he found a way to the hearts of many who never regarded his predecessors as other than foreign intruders. The contrast, too, be- tween the pure domestic life which he led with his wife Charlotte of Meeklenburg-Strelitz, whom he married in 1761, and the habits of three generations of his house, told in his favour with the vast majority of hissubjeets. Even his marriage had been a saerifice to duty. Soon after his aeeession he had fallen in love with Lady Sarah Lennox, and had been observed to ride morning by morning along the Kensington Road, from which the object of his affec- tions was to be seen from the lawn of Holland House making hay, or engaged in some other ostensible employ- ment. Before the year was over Lady Sarah appeared as one of the queen's bridesmaids, and she was herself married to Sir Charles Bunbury in 1762.

At first everything seemed easy to hin. Pitt had come to be regarded by his own eolleagues as a minister who would pursue war at any priee, and in getting rid of Pitt in 1761 and in carrying on the negotiations whieh led to the peace of Paris in 1762, the king was able to gather round him many persons who would not be willing to aequiesee in any permanent change in the system of government. With the signature of the peace his real diffieulties began. The Whig houses, indeed, were divided amongst themselves by personal rivalries. But they were none of them inelined to let power and the advantages of power slip from their hands without a struggle. For some years a contest of influ- ence was carried on without dignity and without any worthy aim. The king was not strong enough to impose upon parliament a ministry of his own choiee. But he gathered round himself a body of dependants known as the king's friends, who were secure of his favour, and who voted one way or the other aceording to his wishes. Under these cireumstanees no ministry could possibly be stable ; and yet every ministry was strong enough to impose some con- ditions on the king. Lord Bute, the king's first choice, resigned from a sense of his own ineompeteney in 1763. George Grenville was in offiee till 1765; the marquis of Rockingham till 1766 ; Pitt, becoming earl of Chatham, till illness compelled him to retire from the conduct of affairs in 1767, when he was succeeded by the duke of Grafton. But a struggle of interests eould gain no real strength for any Government, and the only chanee the king had of effect- ing a permanent ehange in the balance of power Jay in the possibility of his assoeiating himself with some phase of strong national feeling, as Pitt had associated himself with the war feeling eaused by the dissatisfaetion spread by the weakness and ineptitude of his predecessors. ;

Sueh a ehanee was offered by the question of the right to tax America. The notion that England was justified in throwing on Ameriea part of the expenses caused in the late war was popular in the eountry, and no one adopted it more pertinaciously than George III, At the bottom the

position which he assumed was as contrary to the principles of parliamentary government as the encroachments of Charles IL had been. But it was veiled in the eyes of Englishmen by the prominence given to the

power of the British parliament rather than to the power of the British king. In fact the theory of parliamentary government, like most theories after their truth has long been univer- sally acknowledged, had become a superstition. Parlia- ments were held to be properly vested with authority, not because they adequately represented the national will, but simply because they were parliaments. There were thousands of people in England to whom it never occurred that there was any good reason why a British parliament should be allowed to levy a duty on tea in the London docks and should not be allowed to levy a duty on tea at the wharves of Boston. Undoubtedly George IIL derived great strength from his honest participation in this mistake. Con- tending under parliamentary forms, he did not wound the susceptibilities of members of parliament, and when at last in 1770 he appointed Lord North—a minister of his own selection—prime minister, the object of his ambition was achieved with the concurrence of a large body of politicians who had nothing in common with the servile band of the king's friends.

As long as the struggle with America was carried on with any hope of success they gained that kind of support which is always forthcoming to a Government which shares in the errors and prejudices of its subjects. The expulsion of Wilkes from the House of Commons in 1769, and the refusal of the House to accept himas a member after his re-election, raised a grave constitutional question in which the king was wholly in the wrong; and Wilkes was popular in London and Middlesex. But his case roused no national indignation, and when in 1774 those sharp measures were taken with Boston which led to the commencement of the American rebellion in 1775, the opposition to the course taken by the king made little way either in parliament or in the country. Burke might point out the folly and in-expedience of the proceedings of theGovernment. Chatham might point out that the true spirit of English government was to be representative, and that that spirit was being vio- lated at home and abroad. George III., who thought that the first duty of the Americans was to obey himself, had on his side the mass of unreflecting Englishmen who thought that the first duty of all colonists was to be useful and submissive to the mother-country. The natural dis- like of every country engaged in war to see itself defeated was on his side, and when the news of Burgoyne's surrender at Saratoga arrived in 1777, subscriptions of money to raise new regiments poured freely in.

In March 1778 the French ambassador in London announced that a treaty of friendship and commerce had been concluded between France and the new United States of America. Lord North was anxious to resign power into stronger hands, and begged the king to receive Chatham as luis prime minister. The king would not hear of it. He would have nothing to say to " that perfidious man " unless he would humble himself to enter the ministry as North's subordinate. Chatham naturally refused to do anything of the kind, and his death in the course of the year relieved the king of the danger of being again overruled by too overbearing a minister. England was now at war with France, and in 1779 she was also at war with Spain.

George III. was still able to control the disposition of office. He could not control the course of events. His very ministers gave up the struggle as hopeless long before he would acknowledge the true state of the case. Before the end of 1779, two of the leading members of the cabinet, Lords Gower and Weymouth, resigned rather than bear the responsibility of so ruinous an enterprise as the attempt to

overpower America and France together. Lord North retained office, but he acknowledged to the king tliat his own opinion was precisely the same as that of his late colleagues.

The year 1780 saw an agitation rising in the country for economical reform, an agitation very closely though in- directly connected with the war policy of the king. The public meetings held in the country on this subject have no unimportant place in the development of the constitution. Since the presentation of the Kentish Petition in the reign of William III. there had been from time to time upheav- ings of popular feeling against the doings of the legislature, which kept up the tradition that parliament existed in order to represent the nation. But these upheavings had all been so associated with ignorance and violence as to make it very difficult for men of sense to look with displeasure upon the existing emancipation of the House of Commons from popular control. 'The Sacheverel riots, the violent attacks upon the Excise Bill, the no less violent advocacy of the Spanish war, the

declamations of the supporters of Wilkes at a more recent time, and even in this very year the Gordon riots, were not likely to make thoughtful men anxious to place real power in the hands of the classes from whom such exhibi- tions of folly proceeded. But the movement for econo- mical reform was of a very different kind. It was carried on soberly in manner, and with a definite practical object, It asked for no more than the king ought to have been willing to concede. It attacked useless expenditure upon sinecures and unnecessary offices in the household, the only use of which was to spread abroad corruption amongst the upper classes. George III. could not bear to be interfered with at all, or to surrender any element of power which had served him in his long struggle with the Whigs. He held out for more than another year. The news of the capitulation of York Town reached London on November 25, 1781. On March 20, 1782, Lord North resigned.

George III. accepted the consequences of defeat. He called the marquis of Rockingham to office at the head of 2 ministry composed of pure Whigs and of the disciples of the late earl of Chatham, and le authorized the new ministry to open negotiations for peace. Their hands were greatly strengthened by Rodney's victory over the Frencli fleet, and the failure of the combined French and Spanish attack upon Gibraltar; and before the end of 1782 a pro- visional treaty was signed with America, preliminaries of peace with Franceand Spain beingsigned early in the follow- ing year. OnSeptember 3, 1783, the definitive treaties with the three countries were simultaneously concluded. " Sir," said the king to Mr Adams the first minister of the United States of America accredited to him, "I wish you to believe, and that it may be understood in America, that 1 have done nothing in the late contest but what I thought myself indispensably bound to do by the duty which I owed to my people. I will be very frank with you. I was the last to consent to the separation ; but the separation having been made and having become inevitable, I have always said, as I say now, that I would be the first to meet the friendship of the United States as an independent power."

Long before the signature of tle treaties Rockingliam died (July 1, 1782). The king chose Lord Shelburne, the head of the Chatham section of the Government, to be prime minister. Fox and the followers of Rocking- ham refused to serve except under the duke of Portland, a minister of their own

selection, and resigned office. The old constitutional struggle of the reign was now to be fought out once more. Fox, too weak to obtain a majority alone, coalesced with Lord North, and defeated Shelburne in the House of Commons on February 17, 1783. On April 2 the coalition took office, with Portland as nominal

prime minister, and Fox and North the secretaries of state as its real heads.

This attempt to impose upon him a ministry which he disliked made the king very angry. But the new cabinet had a large majority in the House of Commons, and the only chance of resisting it lay in an appeal to the country against the House of Commons. Such an appeal was not likely to be responded to unless the ministers discredited themselves with the nation. George III. therefore waited his time. Though a coalition between men bitterly opposed to one another in all political principles and drawn together by nothing but love of office was in itself discreditable, it needed some more positive cause of dissatisfaction to arouse the constituencies, which were by no means so ready to in- terfere in political disputes at that time as they are now. Such dissatisfaction was given by the India Bill, drawn up by Burke. As soon as it had passed through the Commons the king hastened to procure its rejection in the House of Lords by his personal intervention with the Peers. He authorized Lord Temple to declare in his name that he would count any peer who voted for the Bill as his enemy. On December 17, 1783, the Bill was thrown out. The next day ministers were dismissed. William Pitt became prime minister. After some weeks' struggle with a con- stantly decreasing majority in the Commons, the king dis- solved parliament on March 25, 1784. The country rallied round the crown and the young minister, and Pitt was firmly established in office.

Since the publication of a letter from Mr Orde in Lord Hi. Fitzmaurice's Life of Shelburne (iii. 393) there can be no reasonable doubt that Pitt not only took advantage of the king's intervention in the Lords, but was cognizant of the intrigue before it was actually carried out. It was upon him, too, that the weight of reconciling the country to an administration formed under such circumstances lay. How he acquitted himself under the task, what were his great achievements, and what his still greater unaccom-

plished projects should be told in connexion with his name rather than with that of the king. The general result, so far as George ITI. was concerned, was that to all outward appearance he had won the great battle of his life. It was he who was to appoint the prime minister, not any clique resting on a parliamentary support. But the circumstances under which the victory was won were such as to place the constitution in a position very different from that in which it would have been if the victory liad been gained earlier in the reign. Intrigue there was indeed in 1783 and 1784 as there had been twenty years before. Parliamentary sup- port was conciliated by Pitt by the grant of royal favours as it had been in the days of Bute. The actual blow was struck by a most questionable message to individual peers. But the main result of the whole political situation was that George ITI. had gone a long way towards disentangling the reality of parliamentary government from its accidents. His ministry finally stood because it had appealed to the constituencies against their representatives. At the present day it has properly become a constitutional axiom that no such appeal should be made by the crown itself. But it may reasonably be doubted whether any one but the king was at that time capable of making the appeal. Lord Shel- burne, the leader of the ministry expelled by the coalition, was unpopular in the country, and the younger Pitt had not had time to make his great abilities known beyond a limited circle. The real question for the constitntional historian to settle is not whether under ordinary circum- stances a king is the proper person to place himself really as well as nominally at the head of the government; but whether under the special circumstances which existed in 1783 it was not better that the king should cali upon the people to support him, than that government should be left

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in the hands of men who rested their power on close boroughs and the dispensation of patronage, without looking beyond the walls of the House of Commons for support.

Of the glories of Pitt’s ministry this is not the place to write. That the king gained credit by them far beyond lis own deserts is beyond a doubt. Nor can there be any reasonable doubt that his own example of domestic propricty did much to strengthen the position of his minister. It is true that that life

was unsufferably dull. No gleams of literary or artistic taste lightened itup. The dependants of the court became inured to dull routine un- chequered by loving sympathy. The sons of the house- hold were driven by the shecr weariness of sucli an existence into the coarsest profligacy. But all this was not visible from a distance. The tide of moral and religious improvement which had set in in England since the days of Wesley brouglit popularity to a king who was faithful to his wife, in the same way that the tide of manu- facturing industry and scientific progress brought popu- larity to the minister who in some measure translated into practice the principles of the Wealth of Nations.

Nor were there wanting subjects of importance beyond the circle of politics in which George III. showed a lively interest. The voyages of discovery which made known so large a part of the islands and coasts of the Pacific Ocean received from him a warm support. In the early days of the Royal Academy, its finances were strengthened by liberal grants from the privy purse. His favonrite pur- suit, however, was farming, When Arthur Young was issuing his Annals of Agriculture, he was supplied with information by the king, under the assumed name of Mr Ralph Robinson, relating to a farm at Petersham.

The life of the king was suddenly clouded over. Early in his reign, in 1765, he had been out of health, and it is now known—what was studiously concealed at the time— that syniptoms of mental aberration were even then to be perceived. In October 1788 he was again out of health, and in the beginning of the following month his insanity was beyond a doubt. Whiist Pitt and Fox were contending in the House of Commons over the terms on which the regency should be committed to the prince of Wales, the king was a helpless victim to the ignorance of physicians and the brutalities of his servants. At last Dr Willis, who had made himself a name by prescribing gentleness instead of rigour in the treatment of the insane, was called in. Under his more humane management the king rapidly re- covered. Before the end of February 1789 he wasable to write to Pitt thanking him for his warm support of his interests during his illness) On April 23 he went in person to St Paul’s to return thanks for his recovery.

The popular enthusiasm which burst forth around St Paul’s was but a foretaste of a popularity far more univer- sal. The French Revolution frightened the great Whig land- owners till they made their peace with the king. Those who thought that the true basis of government was aristocratical were now of one mind with those who thought that the true basis of government was monarchical ; and these two classes were joined by a far larger multitude which had no political ideas whatever, but which had a moral horror of the guillo- tine. As Elizabeth had once been the symbol of resistance to Spain, George was now the symbol of resistance to France. He was not, however, more than the symbol. He allowed Pitt.to levy taxes and incur debt, to launch armies to defeat, and to prosecute the English imitators of French revolutionary courses. At last, however, after the Union with Ireland was accomplished, he learned that Pitt was planning a scheme to relieve the Catholics from the disabilities under which they laboured. The plan was revealed to him by the chancellor, Lord Loughborough, a selfish and intriguing politician who had ~ all parties

in turn, and who sought to forward his own interests by falling in with the king’s prejudices. George III. at once took up the position from which he never swerved, He declared that to grant concessions to the Catholics involved a breach of his coronation oath. All thinking men of a later generation are of opinion that the objection was un- tenable. But no one has ever doubted that the king was absolutely convinced of the serious nature of the objection, or that he believed the measure itself to be beyond measure in- jurious to church and state. Nor can there be any doubt that he had the English people behind him. Both in his peace ministry and in his war ministry Pitt had taken his stand on royal favour and on popularsupport. Both failed him alike now, and he resigned office at once. The shock to the king’s mind was so great that it brought on a fresh attack of insanity. This time, however, the recovery was rapid. On March 14, 180], Pitt’s resignation was formally accepted, and the late speaker, Mr Addington, was installed in office as prime minister.

The king was well pleased with the change. He was uever capable of appreciating high merit in any one; and he was unable to perceive that the question on which Pitt liad resigned was more than an improper question, with which he ought never to have meddled, ‘Tell him,” he said, in directing his physician to inform Pitt of his restora- tion to health, “I am now quite well, quite recovered from my illness; but what has he not to answer for, who has been tle cause of my having been ill at all?” Addington was a minister after his own mind, Thoroughly honest and respectable, with about the same share of abili- ties as was possessed by the king himself, he was certainly not likely to startle the world by any flights of genius. But for one circumstance Addington’s ministry would have lasted long. So strong was the reaction against the Revolu- tion that the bulk of the nation was almost as suspicious of genius as the king himself. Not only was there no outcry for legislative reforms, but the very idea of reform was un- popular. ‘he country gentlemen were predominant in parliament, and the country gentlemen as a body looked upon Addington with respect and affection. Such a minister was therefore admirably suited to preside over affairs at home in the existing state of opinion. But those who were content with inaction at home would not be content with inaction abroad. In time of peace Addington would have been popular foraseason. In time of war even his warmest admirers could not say that he was the man to direct armies in the most terrible struggle which had ever been conducted by an English Government.

For the moment this difficulty was not felt. On October 1, 1801, preliminaries of peace were signed between Eng- land and France, to be converted into the definitive peace of Amiens on March 27, 1802. The ruler of France was now Napoleon Bonaparte, and few persons in England be- lieved that he had any real purpose of bringing lis aggres- sive violence to an end. ‘ Do you know what I call this peace?” said the king; “an experimental peace, for it is nothing else. But it was unavoidable.”

The king was right. On May 18, 1803, the declaration of war was laid before parliament. The war was accepted by all classes as inevitable, and the French preparations for an invasion of England roused the whole nation to a glow of enthusiasm only equalled by that felt when the Armada threatened our shores. On October 26 the king reviewed the London

volunteers in Hyde Park. He fouud himself the centre of a great national movement with which he heartily sympathized, and which heartily sympathized with him.

On February 12, 1804, the king's mind was again affected. When he recovered, he found himself in the midst of a ministerial crisis. Public feeling allowed but

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one opinion to prevail in the country,—that Pitt, not Addington, was the proper man to conduct the administra- tion in time of war. Pitt was anxious to form an adminis- tration on a broad basis, including Fox and all prominent leaders of both parties. The king would not hear of the admission of Fox. His dislike of him was personal as well as political, as he knew that Fox had bad a great share in drawing the prince of Wales into a life of profligacy. Pitt accepted the king's terms, and formed an administration in which he was the only man of real ability. Eminent men such as Lord Grenville refused to join a miuistry from which the king had excluded a great statesman on purely personal grounds,

The whole question was reopened on Pitt's death on Janu- ary 23, 1806. 'This time the king gave way. The ministry of All the Talents, as it was called, included Fox amongst its members. At first the king was observed to appear depressed at the necessity of surrender. But Fox's charm of manner soon gained upon him. "Mr Fox," said the king, "I little thought that you and I should ever meet again in this place; but I have no desire to look back upon old grievances, and you may rest assured I never shall re- mind you of them." On Scptember 13 Fox died, and it was not long before the king and the ministry were openly in collision. The ministry proposed a measure enabling all subjects of the crown to serve in the army and navy in spite of religious disqualifications. The king objected even to so slight a modification of the laws against the Catholics and Dissenters, and the ministers consented to drop the bill. The king asked more than this. He demanded a written and positive engagement tliat this ministry would never, under any circumstances, propose to him "any measure of concession

to the Catholics, or even connected with the question." The ministers very properly rcfused to bind themselves for the future. They were consequently turned out of office, and a new ministry was formed with the duke of Portland as first lord of the treasury and Mr Perceval as its real leader. The spirit of the new ministry was distinct hostility to the Catholic claims, On April 27, 1807, a dissolution of parliament was announced, and a majority in favour of the king's ministry was returned in the elections which speedily followed.

The elections of 1807, like the elections of 1784, gave the king the mastery of the situation. In other respects they were the counterpart of one another. In 1784 the country declared, though perhaps without any clear conception of what it was doing, for a wise and progressive policy. In 1807 it declared for an unwise and retrogres- sive policy, with a very clear understanding of what it meant. It is in his reliance upon the prejudices and ignor- ance of the country that the constitutional significance of the reign of George III. appears. Every strong Govern- ment derives its power from its representative character. At a time when the House of Commons was less really representative than at any other, a king was on the throne who represented the country in its good and bad qualities alike, in its hatred of revolutionary violence, its moral sturdiness, its contempt of foreigners, and its defiance of all ideas which were in any way strange. Therefore it was that his success was not permanently injurious to the work- ing of the constitution as the success of Charles I. would have been, If he were followed by a king less English than himself, the strength of representative power would pass into other hands than those which held the sceptre.

The overthrow of the ministry of All the Talents was the last political act of constitutional importance in which George III. took part. The substitution of Perceval for Portland as the nominal head of the ministry in 1809 was not an event of any real significance, and in 1811 the reign practically came to an end. The king's reason finally broke

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down after the death of the Princess Amelia, his favourite child. The remaining nine years of his life were passed in insanity and blindness, and

when he died on January 29, 1820, in his eighty-second year, no political results were to be anticipated.

George IIT. had nine sons. After his successor came Frederick, duke of York and Albany (1763-1827) ; William Henry, duke of Clarence, afterwards King William IV. (1765-1837); Edward Augustus, duke of Kent (1767-1825), father of Queen Victoria; Ernest Augustus, duke of Cumberland, afterwards king of Hanover (1771-1851); Augustus Frederick, duke of Sussex (1773-1843); Adolphus Frederick, duke of Cam- bridge (1774-1850); Octavius (1779-1783); Alfred (1780-1782), He had also six daughters—Charlotte Augusta (1766-1816), married in 1797 to Frederick, king of Wiirtemberg; Augusta Sophia (1768-1840) ; lizabeth (1770-1840), married Frederick, landgrave of Hesse-Homburg, 1818; Mary (1776-1857), married to William Frederick, duke of Gloucester, 1816; Sophia (1777-1848) ; Amelia (1783-1810). (si BG)

GEORGE IV. (George Augustus Frederick, 1762-1830), lived long enough to strip the crown of the leadership of the nation which his father had won for it, Born on August 12, 1762, he was noted in the years of his early manhood for good looks, for ease of carriage, and gracious- ness of manner. He soon plunged into the whirl of sensual excitement. His life was passed in the grossest profligacy. He was false as well as licentious His word was never to be trusted. Not even an occasional gleam of brightness lights up the dark picture of his career. If he now and then flung to a dependant a kindly word which cost him nothing, no serious project of well-doing ever occupied his thoughts. Politics had no attraction for him except so far as changes of Government might minister to his ease, or bring him money to be squandered in some new scheme of folly.

Such a character was probably beyond the reach of any education. But itis certain that tlie education which he re- ceived in the strict and formal domestic circle of his parents was only fitted to repel him from the path of virtue. His father became to him the type of uninteresting formality. He gladly sought the society of his father’s Whig oppo- nents, and was initiated by Fox and Sheridan in the vices of the fashionable world. In 1783 he naturally supported the coalition ministry which his father detested, and the coalition ministry in return proposed to raise his income from £50,000 to

£100,000. The king saved the ministry from committing one more blunder in its career by refusing to sanction the proposition. In 1786 the prince's friends urged Pitt to increase the allowance, but Pitt refused to do anything of the kind. All the world knew that the money would be frittered away at tlle gambling table or in some other equally disreputable way. Applying to the king and getting a distinct refusal, the prince sold his horses and carriages, shut up his house, and dismissed his servants. As it was well known that these were not the expenses which had brought him to distress, he was only laughed at for his pains. A lower depth was soon reached. The prince fell in love with Mrs Fitzherbert who had been twice a widow at twenty-five. She was ready to marry him, but she would yield to him on no other terms. She wasa Roman Catholic, and a marriage by the heir of the crown with a Roman Catholic forfeited his succession by the Act of Settlement. Nor, by the Royal Marriage Act, could he legally contract marriage even with a Protestant without his father's consent, unless at the end of a year after formal notice had been given, and then only if parliament had not expressed its disapprobation. Believing truly that he could contract no legal marriage with Mrs Fitzherbert, he was

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Fitzherbert, holding that the performance of the ceremony by a priest of her church was of sacramental efficacy, was indifferent' to the legality of the proceeding. The marriage took place. Not long afterwards, in April 1787, Alderman Newenham moved in the House of Commons for a grant in relief of the prince. In the course of debate allusion was made to a marriage which might bring in question the succession. Fox went to the prince, and was assured by him that the marriage had never even formally taken place. Fox, deceived by his apparent openness, came down to the House and assured the Commons that the whole story was a malicious falsehood. The next day a friend of Fox's opened his eyes to the trick which had been played on him. "TI see by the papers, Mr Fox," he said, "that you have denied the fact of the marriage of the prince of Wales with Mrs Fitzherbert. You have been © misinformed. I was present at that marriage." The prince was not content with his original falsehood. He threw out hints to his friends that Fox had exceeded his instructions, He led Mrs Fitzherbert to believe that Foxhad uttered the denial unsuggested. 'Only conceive, Maria," he said to her,

“what Fox did yesterday. He went down to the House and denied that you and I were man and wife.”” The denial however cleared away for the momest one cause of the prince’s unpopularity. With the conseut of the Government he received an addition of £10,000 to his income, £161,000 to pay his debts, and £20,000 for the repairs of Carlton House. The temporary insanity of the king in 1788 again bronght the prince’s name promi- nently before the public. Fox maintained and Pitt denied that the prince of Wales, as the heir-apparent, had a right to assume the regency independently of any parliamentary vote. Pitt, with the support of both Houses, proposed to confer upon him the regency with certain restrictions, The recovery of the king in February 1789 put an end to the prince’s hopes. During the king’s illness he had been in the habit of amusing his companions by mimicry of his unfortunate father. The disgust caused by his behaviour had doubtless some part in the enthusiasm with which the king was received when he went in state to St Paul’s to return thanks for hisrecovery. In 1795 the prince married Caroline of Brunswick, because his father would not pay his debts on any other terms. Her behaviour was light and flippant, and he was brutal and unloving. The ill- assorted pair soon parted, and soon after the birth of their only child, the Princess Charlotte, they were formally separated. With great unwillingness the House of Com- mons voted fresh sums of money to pay the prince’s debts. In 1811 the prince at last became regent in consequence of his father’s definite insanity. No one doubted at that time that it was in his power to change the ministry at his pleasure. He had always lived in close connexion with the Whig opposition, and he now empowered Lord Grenville to forma ministry. There soon arose differences of opinion between them on the answer to be returned to the address of the Houses, and the prince regent then informed the prime minister, Mr Perceval, that he should continue the existing ministry in office. The ground alleged by him for this de- sertion of his friends was the fear lest his father’s recovery might be rendered impossible if he should come to hear of the advent of the Opposition to power. Lord Wellesley’s resignation in February 1812 made the reconstruction of the ministry inevitable. As there was no longer any hope of the king’s recovery, the former objection to a Whig administration no longer existed. Instead of taking the course of inviting the Whigs to take office, he asked them to join the existing administration. The Whig leaders however refused to joiu, on the ground that the question of the Catholic disabilities was too important to be shelved,

and that their difference of opinion with Mr Perceval was too glaring to be ignored. ‘The prince regent was exces- sively angry, and continued Perceval in office till that minister’s assassination on May 11, when he was succeeded by Lord Liverpool, after a negotiation in which the pro- position of entering the cabinet was again made to the Whigs and rejected by them. In the military glories of the following years the prince regent had no share. When the allied sovereigns visited England in 1814, he played the part of host to perfection. So great was his unpopu- larity at home that hisses were heard in the streets as he accompanied his guests into the city. The disgust which his profligate and luxurious life caused amongst a people suffering from almost universal distress after the conclusion of the war rapidly increased. In 1817 the windows of the prince regent’s carriage were brokcn as he was on lis way to open parliament. The death of George ITI. on January 29, 1820, gave to his son the title of king without in any way altering the position which he had now held for nine years. Indirectly, however, this change brought out a manifestation of popular feeling such as his father had never been subjected to even in the early days of his reign, when mobs were burning jack-boots and petticoats, The relations between the new king and his wife unavoidably became the subject of public discussion. In 1806 a charge against the princess of having given birth to an illegitimate child had been con- clusively disproved, and the old king had consequently re- fused to withdraw her daughter, the Princess Charlotte, from her custody. When in the regency the prince was able to interfere, and prohibited his wife from seeing her daughter more than once a fortnight. On this, in 1813, the princess addressed to her husband a letter setting forth her com- plaints, and receiving no answer published it in the Morning Chronicle. The prince regent then referred the letter, together with all papers relating to the inquiry of 1806, to a body of twenty-three privy councillors for an opinion whether it was fit that the restrictions on the inter- course between the Princess Charlotte and her mothershould continue in force. All except two answered as the regent wished them to answer. But if the official leaning was towards the husband, the leaning of the general public was towards the wife of a man whose own life had not been such as to justify him in complaining of her whom he had thrust from him without a charge of any kind. Addresses of sympathy were sent up to the princess from the

city of London and other public bodies. The discord again broke out in 1814 in consequence of the exclusion of tlie princess from court during the visit of the allied sovereigns. In August in that year she left England, and after a little time took up her abode in Italy. The accession of George IV. brought matters to a crisis. He ordered that no prayer for his wife as queen should be admitted into the Prayer Book. She at once challenged the accusation which was implied in this omission by returning to Eng- land. On June 7 she arrived in London. Before she left the Continent she had been informed that proceedings would be taken against her for adultery if she landed in England. a. os alae i : ag commissioners had been sent to Be ca hes ene: ges against her, and their report,) et in 1819, was made the basis of the prosecution. On the day on which she arrived in London a message was laid before both Houses recommending the criminating evidence to parliament. A secret committee in the House of Lords after considering this evidence brought in a report on which the prime minister founded a Bill of Pains and Penalties to divorce the queen and to deprive her of her royal title. The Bill passed the three readings with diminished majorities, and when on the third reading it obtained only a majority of nine, it was aban-

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iL ay doned by the Government. The king’s unpopularity, great as it had been before, was now greater than ever. Public opinion, without troubling itself to ask whether the queen was guilty or not, was roused to indignation by the spec- tacle of such a charge being brought by a husband who had thrust away his wife to fight the battle of life alone, without protection or support, and who, whilst surrounding her with spies to detect, perhaps to invent, her acts of infidelity, was himself living in notorious adultery. Inthe following year (1821) she attempted to force her way into Westminster Abbey to take her place at the coronation. On this occasion the popular support failed her; and her death not long afterwards relieved the king from further annoyance. Immediately after the death of the queen, the king set out for Ireland. He remained there but a short time, and his effusive declaration that rank, station, lonours, were nothing compared with the exalted happiness of living in the hearts of his Irish subjects gained him a momentary popularity which was beyond his attainment in a country where he was better known. His reception in Dublin encouraged him to attempt a

visit to Edinburgh in the following year (August 1822). Since Charles II. had come to play the sorry part of a covenanting king in 1650 no sovereign of the country had set foot on Scottish soil. Sir Walter Scott took the leading part in organizing his reception. The enthusiasm with which he was received equalled, if it did not surpass, the enthusiasm with which he had been received in Dublin. But the qualities which enabled him to fix the fleeting sympathies of the moment were not such as would enable him to exercise the influ- ence in the government which had been indubitably possessed by his father. He returned from Edinburgh to face the question of the appointment of a secretary of state which had been raised by the death of Lord Londonderry, better known to the world by his earlier title of Castle- reagh. It was upon the question of the appointment of ministers that the battle between the Whigs and the king had been fought in the reign of George III. George IV. had neither the firmness nor the moral weight to hold the reins which his father had grasped. He disliked Canning for having taken his wife'sside very much as his father had dis- liked Fox for taking hisown. But Lord Liverpool insisted on Canning's admission to office, and the king gaveway. Tacitly and without a struggle the constitutional victory of the last reign was surrendered. But it was not surrendered to the same foe as that from which it had been won. The coalition ministry in 1784 rested on the great landowners and the proprietors of rotten boroughs. Lord Liverpool's ministry had hitherto not been very enlightened, and it supported itself to a great extent upon a narrow constituency. But it did appeal to public opinion in a way that the coalition did not, and what it wanted itself in popular support would be supplied by its successors. What one king had gained from a clique another gave up to the nation. Once more, on Lord Liverpool's death in 1827, the same question was tried with the same result. The king not only disliked Canning personally, but he was opposed to Canning's policy. Yet after some hesitation he accepted Canning as prime minister ; and when, after Canning's death and the short ministry of Lord Goderich, the king in 1828 authorized the duke of Wellington to form a ministry, he was content to lay down the principle that the members of it were not expected to be unanimous on the Catholic question. When in 1829 the Wellington ministry unexpectedly proposed to introduce a Bill to remove the disabilities of the Catholics, he feebly strove against the proposal and quickly withdrew his opposition. The worn-out debauchee had neither the merit of acquiescing in the change nor the courage to resist it. '

George IV. died on June 26, 1830. He had rendered to

the constitution of his country the service of tacitly aban. doning a position which had been perhaps necessarily achieved by his father, but which it was not desirable that the sovereigns of England should permanently occupy.

His only child by his wife Queen Caroline was the Princess Charlotte Augusta, married in 1816 to Leopold of Saxe-Coburg, afterwards king of the Belgians. She died in childbirth November 6, 1817. (s. R. G.)

GEORGE oF Cappapocia, who from 356 to 361 was Arian archbishop of Alexandria, was born about the begin- ning of the 4th century. According to Ammianus (xxii. 11), he was a native of Epiphania, in Cilicia; but universal tradition makes him a Cappadocian. Gregory Nazianzen tells us that his father was a fuller, and that he himself soon became notorious as a parasite of so mean a type that he would “sell himself for a cake.” By his powers of insinua- tion he succeeded in obtaining a lucrative contract for sup- plying bacon to the army, but fulfilled its terms so ill that lie was soon compelled to abscond after he had with difficulty escaped death at the hands of the indignant soldiers. After many wanderings, in the course of which he seems to have lived for some time at Constantinople, and to have amassed a considerable fortune as receiver of taxes, he ultimately reached Alexandria. It is not known how or when he obtained ecclesiastical orders ; but, after Athanasius had been banished in 356, George was promoted by the influence of the then prevalent Arian faction to the vacantsee. His persecutions and oppressions of the orthodox ultimately raised a rebellion which com- pelled him to flee for his life; but his authority was re- stored, although with difficulty, by a military demonstration. Untaught by experience he resumed his course of selfish tyranny over Christians and heathen alike, and raised the irritation of the populace to such a pitch that, within a few days after the accession of Julian, they rose ex masse, dragged him out of prison, where he had been placed by the magistrates for safety, paraded him with every indignity through thie streets on the back of a camel, burnt his dead body, aud cast the ashes into the sea (December 24, 361). With much that was sordid and brutal in his character George combined a highly cultivated literary taste, and in the course of his

chequered career he had found the means of collecting a splendid library, which Julian ordered to be carefully preserved and conveyed to Antioch for his own use. The original sources for the facts of the life of George of Cappadocia are Ammianus, Gregory Nazianzen, Epipha. nius, and Athanasius. In modern times his character has been drawn with graphic fidelity by Gibbon in the 23d chapter of the Decline and Fall.

GEORGE, Satnt, according to Metaphiastes the Byzan- tine hagiologist, whose narrative is substantially repeated in the Roman Acta Sanctorum and in the Spanish breviary, was born in Cappadocia of noble Christian parents, from whom he received a careful religious training. Having embraced the profession of a soldier, he rapidly rose under Diocletian to high military rank, When that emperor had begun to manifest a pronounced hostility towards Christi- anity George sought a personal interview with him, in which he made deliberate profession of his faith, and, earnestly remonstrating against the persecution which had begun, resigned his commission. He was immediately laid under arrest, and after various tortures, finally put to death at Nicomedia (or, according to other accounts, at Lydda) April 23, 303. His festival is observed on that anniversary by the entire Roman Church as a semi-duplex, and by the Spanish Catholics as a duplex of the first class with an octave. The day is also celebrated as a principal feast in the Greek Church, where the saint is distinguished by the titles peyaAopaprup and tporaroddpos.

In the canon of Pope Gelasius (494) George is mentioned

among the martyrs whom the Roman Church venerates, but whose gesta it does not read.1_ The language implies that even at that date much had been written concerning him, but little that the Catholic Church could accept as trust- worthy. Numerous traits from the biography of the here- tical archbishop had already crept, it would seem, into the acta of the orthodox soldier ; and it was feared that any vigorous attempt to eliminate these would leave but a small residue of fact. Modern investigation has proved that apprehension to have been well-founded, for even on the Catholic side in the controversy regarding the existence and character of St George, the chief contention is simply the improbability that within the space of 150 years a turbulent and un- scrupulous Arian ecclesiastic should have come to

be re- puted a holy martyr for the Catholic faith. The caution displayed with regard to St George in the 5th century was not long preserved ; Gregory of Tours, for example, asserts that his relics actually existed in the French village of Le Maine, where many miracles were wrought by means of them ; and the venerable Bede, while still explaining that the gesta of St George are reckoned apocryphal, commits himself to the statement that the martyr was beheaded under Dacian, king of Persia, whose wife Alexandra, however, adhered to the Catholic faith, The dragon was a still later introduction into the legend, which, as given by Jacobus de Voragine and later writers, ceases to represent the hero as in any sense a sufferer. In its current popular form the story of his successful conflict is probably a mere modifi- cation of the old Aryan mythus, to which many inter- preters are now disposed to attach a solar interpretation.

The popularity of the name of St George in England dates from the time of Richard Coeur de Lion, who, it was said, had successfully invoked his aid during the first crusade ; but it was not till the time of Edward III. that he was made patron of the kingdom, although at the council of Oxford in 1222 it had already been ordered that his feast should be kept asa national festival. The republics of Genoa and Venice weie also under his protection; and his name is much revered in all the Oriental churches,

See Heylin, The History of that most famous Saynt and Souldier of Christ Jesus, St George of Cappadocia (1631) ; and Milner, An Historical and Critical Inquiry into the Existence and Character of St George, Patron of England (1795). For some account of the nuinerous artistic 1epresentations, whether of his martyrdom or of his triuanph, see Jamieson’s Sacred and Legendary Art, vol. ii.

GEORGE, known as Pisiprs or Pisipa, a Byzantine writer of the 7th century, was, as his surname implies, a native of Pisidia ; but of his personal history nothing is known except that he had been ordained a deacon, and that he held either simultaneonsly or successively the offices of “‘ Chartophylax,” “ Scenophylax,” and ‘‘ Referendarius” in the “Great Church ” (that of St Sophia) at Constantinople. He is also believed to have accompanied the first expedition (622) of the emperor Heraclius against the Persians; at all events his earliest work, consisting of 1098 iambic trimeter verses under the title

“Eus rqv xara Tepoay exotpa- tetav ‘Hpaxdetov rod BaciAens dxpodoes tpecs, is devoted to such a description of that campaign as could hardly have come from any other than an eye-witness. This composition was followed by the “ABapixa or depos “ABapexds in 541 verses, containing the details of a futile attack on Constan- tinople made by the Avari in 626, while the emperor was absent and the Persian army in occupation of Chalcedon ; and by the “HpaxAcds, a general survey of the exploits both at home and abroad of Heraclius down to the final over- throw of Chosroes in 627, which is believed to have been written before the end of 628. In addition to these three works, which have been edited by Bekker in the Corpus seriptorum histor. Byzant. (1836), we have from the pen of gs

1 The full text of this canon is given by Heylin, p. ii. c. 9.

George of Pisidia the “Egayjpepov yrot Koopoupyia, 2 poem upon the creation of the world, containing in its present form 1910 trimeter iambic verses; a treatise on the vanity of life, “Eus 7év prdratov Biov, in 262 verses ; a controversial composition against Severus of Antioch, Kara Sevnpov, in 731 verses; two short poems upon the resurrection of Christ and upon the temple of the Virgin at Blacherne respect: ively, and a prose encomium upon Anastasius the martyr, (‘Eyxapuov eis Tov dytov Avacrac.ov paptupa). George of Pisidia is known to have written several other works, which, however, are no longer extant ; and there is no suffi- cient reason for assigning to him the compilation of the Chronicon Paschale, or the astronomical poem entitled Empedoclis Sphera. The Hexaemeron and De Vanitate Vite were first printed along with a Latin version at Paris in 1584 or 1585 by Federicus Morellus. They are also to be found in the Max. Bibliotheca Vett. Patrum, xii. p. 322 (1677); and in the 46th vol. of Migne’s Patrologia Greeca. ‘The only complete edition of all the extant works is that of Quercus in Foggini’s Corp. Hist. Byzant. Nova Ap- pendix (Rome, 1777). Asa versifier George is correct and even elegant; as a chronicler of contemporary events he is exceedingly useful; but the modern verdict on his merits as a poet has not confirmed that of those later Byzantine writers whose enthusiastic admiration led them to compare him with and even

prefer him to Euripides. Recent criticism is unanimous in characterizing his com- position as artificial and almost uniformly dull.

GEORGE or Trepizonp (1396-1486), one of the dis- tinguished writers in the great controversy between Aris- totelianism and Platonism in the 15th century, was born at Chandace in the island of Crete. He received his cognomen apparently from the fact that his ancestors had come from Trebizond. At what period he came to Italy is not abso- lutely certain ; according to some accounts he arrived as early as 1430, and settled as teacher of philosophy and rhetoric at Venice ; according to others he did not come over to Italy till the period of the council of Florence (1438-9). His reputation as a teacher and as translator of Aristotle was very great, and he was selected as secretary by Pope Nicholas V., an ardent Aristotelian. The needless bitter- ness of his attacks upon Plato (in the Comparatio Aristotelis et Platonis), which drew forth a powerful response from BEsSARION (¢.v.), and the manifestly hurried and inaccurate character of his translations both of Plato and of Aristotle, combined to ruin his fame as a scholar, and to endanger his position as a teacher of philosophy. The indignation against him on account of lis first-named work was so great that he would probably have been compelled to leave Italy, had not Alphonso V. given him protection at the court of Naples. He died at Rome in 1486. Many of his transla- tions of Aristotelian treatises are to be found in the older editions of Aristotle. A notice of his other writings is given in Fabricius, Biblioth. Greeca.

GEORGETOWN, the port of entry for the District of Columbia in the United States of North America, is situated on the left bank of the Potomac at the head of navigation, about 2} miles W.N.W. of the capitol of Washington City, with which it communicates by four iron bridges thrown across Rock Creek. Founded by the colonial Government of Maryland in 1751, Georgetown was a city with a distinct administration from 1789 to 1871; but in the latter year it was merged in the District of Columbia, and in 1878 it was incorporated with the city of Washington, so that now it has properly no distinct existence. It is beautifully situated along a range of hills, whose loftier eminences, locally called the Heights, afford delightful positions for villas and country seats, with extensive prospects over the

river and Washington. The most noteworthy institution is Georgetown College, the oldest Roman Catholic college

in the United States, which occupies two handsome brick buildings in the midst of extensive grounds at the west end. It was founded as an academy in 1789, was chartered as a college in 1799, and in 1815 received the right of conferring degrees. Its medical depart- ment, originated in 1851, and the legal department, dating from 1870, are both in Washington. The university has a library of upwards of 30,000 volumes, an extensive apparatus for physical science, and a museum of natural history. 1n 1873 the teaching staff numbered 35. Among the other institutions in the town may be nientioned the Convent of the Visitation, with a female academy attached; the Peabody library; the Linthicum institute (founded in 1872 by a retired merchant, who left $50,000 for the education of poor white boys); the aged women's house, maintained by voluntary subscription; and the industrial home for juvenile vagrants. The aqueduct which conveys a branch of the Chesapeake and Ohio canal over the Potomac is 1446 feet long, and its granite piers, nine in number, rise 36 feet above the ordinary surface of tlle water, and rest on the solid rock 17 feet below the bottom of the river. A great decline has taken place in the commercial activity of Georgetown. Its foreign trade is very slight, being represented in the year ending June 30, 1878, by no more than 6113 dollars of imports and 10,056 dollars of exports ; but its share in the coasting trade is still considerable, 187 steamers and 45 sailing vessels, affording a total tonnage of 96,339 tons, having entered in the year already mentioned ; its position at the terminus of the Chesapeake and Ohio canal secures for it a fairshare in the shipping of the coal from the Alleghany fields; and its fisheries render it a great market for shad and herrings. Among the industrial establishments the first place is held by the flour-mills, six in number; but there are also corn- mills, timberyards, tanneries, foundries, breweries, a paper- mill, and a vinegar factory. The principal cemetery for Washington occupies a beautiful situation on Georgetown Heights. In 1830 the population of Georgetown was 8441; in 1840 it was only 7312; by 1860 it had reached 8738 ; and in 1870 it was 11,384.

GEORGETOWN, known as Stabroek during the Dutch period, now the capital of British Guiana, is situated in the county of Demerara on the east bank of the Demerara river, about a mile from its mouth, in 6° 49’ 30” N. lat. and 58° 11’ 30” W. long. It is one of the prettiest towns of that part of the world, and presents an unusually attractive appear- ance to the approaching voyager. The streets are wide and straight, intersecting each other at right angles, and recall- ing, by the canals that run along the centre, the memory of the Dutch; and the houses are so richly embosomed by cabbage-palms, cocoa-nut trees, and other trees and shrubs, that they look rather like a collection of villas than a town. The street along the river side, where the shops and stores are mainly situated, forms, however, an exception ; there everything is plain, bare, and business-like. Private dwelling-honses are usually built of wood and raised 3 or 4 feet above the soil on wooden piles or brick pillars ; they are painted in various simple colours, for the most part in white; in front they have open verandahs. Among the public edifices the first place is due to a building in the centre of the town which was erected between 1829 and 1834 at a cost of £60,000, to accommodate the legislative council, the courts of justice, the custom house, the treasury, and other administrative offices ; it is of considerable extent and architectural beauty, with shady porticoes and marble- paved galleries supported on cast-iron columns. Besides a cathedral, which cost £15,000, there are churches belonging to the Wesleyans, the Baptists, the London Missionary Society, and other ecclesiastical organizations, several liberally-maintained hospitals, an icehouse, and two market-

places, of which the one opened in 1844 cost £11,400, and the other opened in 1852 cost £2450, The prison, a large building, or rather collection of buildings, surrounded by a strong wooden wall, can accommodate upwards of 200 prisoners. A fort, the Frederick Wilham, situated below the town, ouly contains a small battery, but in the vicinity there are extensive and well-organized barracks. (ne of the principal disadvantages due to the position of Georgetown is the lack of drinking water; but this is so far remedied by the construction of both private and public tanks for the storage of the rain, by the introduction of water from the Lamaha creek, by a canal, and further by the boring of Artesian wells. The first attempts to

apply the Artesian principle was made in 1831 by Major Staple, and his example has been widely imitated not only in the town itself but also in the surrounding country. Though the water thus obtained is strongly impregnated with iron, carbonic acid gas, salt, and magnesia, it is readily drunk by horses and cattle, and after it has been scummed and filtered it can be used for cooking. As it rises to the surface the water has a temperature of 84° Fahr., 5° higher than the water in the river. Ice is almost a necessity of life in the town, and it forms a regular import from Boston, aloug with fresh meat and other northern produce. The population of Georgetown in 1851 was 25,508; in 1861 it was 29,174; and by 1871 it had reached 36,562. (See Appun, Unter den Tropen, Jena, vol. ii).

GEORGIA, a kingdom in central Transcaucasia, re- markable for the long list of its sovereigns, the monarchy having extended over a period of upwards of 2000 years, the kings reigning at times independently, or under the rule of Persia, Turkey, or the Nastern empire. The earliest name of the country was Karthli; the ancients knew it as Iberia, bounded on the one side by Colchis and on the other by Albania; and it has for centuries been called Georgia.

Georgia proper, which includes Karthli and Kakhetia, is bounded on the N. by Ossety and Daghestan, on the E. by

Shekynn, on the S. by Shamshadyl and the khanates of –

Erivan and Kars, and on the W. by Gouria and Imeritia ; but the kingdom at times included Gouria, Mingrelia, Abkhasia, Imeritia, and Daghestan, and extended from the great mountain range to the Araxes. It now forms the government of Tiflis, divided into the districts of Doushett, Telav, Sygnah, Gori, and Akhalzikh, having an area of nearly 25,000 square miles, and in 1873:a population of 635,313, made up chiefly of Georgians and Armenians,— there being also Persians, Tatars, and a few Jews and Europeans. The chief city is the ancient capital of Tiflis, the seat of government, under a governor-general, for the whole cf Transcaucasia, and the principal centre of com- merce. See Caucasus and TiFtis.

Vegetable Products:—The valleys and declivities are fertile, producing maize, millet, barley, oats, rice, beans, lentils, and corn (which is best in the

plains near Gori), also cotton, flax, and hemp, now exported exclusively to Russia. The vineyards cover 75,400 acres, the average produce of wine being at the rate of 230 gallons per acre; the valley of the Alazan yields the best qualities. It is consumed in the country and adjoining districts, the only wine ex- ported being that produced from vine-canes brought from the Crimea. Grapes are gathered in September, and the wine is fit for use one month after it has been put into a bourdyouk, “skin,” or kvevry, a huge earthen jar in which it may be preserved for years. New vines are planted every six, eight, or ten years, according to the nature of the soil, and ure cut after the fruit is gathered, and again in March and April when the soil is turned up. The Lecanium vitis and Ordium have attacked the plants from time to time, though not in severe form, but the Phylloxera vastatrix has been hitherto quite unknown. In the vineyards are often seen

| the apple, pear, and quince trees; other fruits include the

pomegranate, peach, apricot, plum, almond, mulberry, pistachio, fig, cherry, walnut, hazel-nut, medlar, melon and water melon, raspberry, &c. In summer the banks of streams are covered with beautiful wild flowers,—the prim- rose in double form, the crocus of varied colours, and

snowdrops appearing early in March in the greatest pro- fusion.

Animals.—The domestic animals are the camel, ox, mule, ass, and buffalo as beasts of burden, with the goat, and an immense number of pigs, pork being favourite food. The horse—small, hardy, and enduring—is ridden more fre- quently unshod, except in the hills ; no pains are taken to improve the breed. The wild animals of greatest import- ance are the bear, ibex, wolf, hyzna, fox, wild boar, wild goat, and antelope; while the pheasant, woodcock, quail, and “partridge of the Caucasus” are the principal winged game, The fish taken in the Kour and other rivers are the sturgeon, silurus, carp, perch, trout, gudgeon, and a fish resembling the salmon, called oragoula by the Georgians. The great sturgeon, belouga or hansen, is taken at the estuary of the Kour in the Caspian.

Communication.—A railroad connects Tiflis with Poti ou the Black Sea, the line over the Souram pass, 3037 feet above the sea, being laid at gradients of 1 in 22, over a distance of about 8 miles. Lines of rail are projected for connecting Vladykavkaz in the north, and Djoulpha at the Persian frontier, with the capital. Post-roads are excellent, and saddle-horses and comfortable vehicles for post-horses are to be obtained at the principal towns. Locomotion is very inexpensive.

History.—The material at the disposal of the historian of Georgia is scanty. An anonymous work of the 12th century gives the his- tory from the earliest times to the year 1124; another, also anony- mous, is a continuation to the division of the kingdom in 1445; and a third is the compilation by the Czarevitch Wakhoucht, being the complete annals from the earliest times to the year 1745. These, and a few pamphlets indifferently edited, if we except the memoirs of his family by Stephen Orbeliani, archbishop of Siouny in the 13th century, comprise all that is left to us during an in- terval of upwards of 2000 years.

The earliest Armenian chroniclers have included facts on Georgia, which it is believed were founded on traditions they received from the Georgians. According to these authorities, the Geoigian, Armenian, Kakhetian, Lesghian, Mingrelian, and other 1aces in Transcaucasia are the descendants of Thargamos, who was the great-grandson of Japhet, the son of Noah, thongh we read in Gen. x. 3 that Togarmah was the son of Gomer, who was the son of Japhet. Those different populations were afterwards included under the general name of Thargomosiany. The second son of Thar. gamios, named Karthlos, having settled in that part where is now the rivulet Karthli, became the patriarch and king of the people in the laud aiound, called Karthli after himself. His son Mtzkhethos founded the city of Mtzkhetha, which became the capital ; and a son ot Mtzkhethos, named Ouphlis, was the author of the rock-cut town near Gori.. At that period the title assumed by the ruler was mamasaklysy, ‘lord or head of the house,” the worship being that of the sun, moon, and five planets. The first to revive the title of kmg was Phamawaz, 302-237 B.c., who rid the country of the tyrant son, a governor appointed by Alexander the Great. Phar- nawvaz originated the orthography of the Georgian language, and is said to have invented the military alphabet. In 140 3.c. Mirvan became king. His son and successor

was dethroned by his own subjects, and the crown offered to Ardaces I., whose son, Arshag, ascended the throne 71 3.c., the dynasty of Arsaces thus commenc- ing its rule. The deeds of Sulla, Lucullus, Pompey, and Mithra- dates next serve to illustrate the courage and warlike qualities of the people of Iberia. In 265 the Sassanian dynasty commenced in the person of Miriam, son of Shapour I., who was married to a daughter of the late king Asphagor. Miriam and all his subjects were converted to Christianity by Nouna or Nina, a poor captive, who had escaped the persecution of Tiridates, king of Armenia. She prevailed upon the people of Karthli to desist from offering human victims, and to overturn their pagan altars; and the king erected a sanctuary, which was afterwards replaced by a_noble edifice, 364-379, on the spot where now stands the cathedral at M'zhett. Miriam applied to Constantine for priests to instruct his people, and many were sent, among them being Eustace of Antioch. In 469 King Vakhtang, surnamed Gourgasai, '' wolf-lion," founded

a city which he called Tbylysys-Kalaky, now Tiflis, on account of the warm springs there. Vakhtang established a patriarchate at Mtzkhctha, and constructed the fortress of Souram. He conquered Mingrelia, and brought the Ossets and Abkhasians under subjec- tion. He also took possession of a large part of Armenia, and hav- ing formed an alliance with Chosroes, king of Persia, even advanced into India. The seat of government was transferred from Mtzkhetha to Tbylysys-Kalaky, when Datehy came to the throne in 499. At this epoch the Georgian and Armenian Churches had separated ; and a century later, the Georgian and Russian Churches united. On the death of Stephanos, who had ruled under the protection of the Eastern empire, a Bagratide named Gourain was nominated ~~couropolate by the emperor. Soon after the appearance of Mahomet in the 7th century, the Arabs, having conquered the Persians, en~~ tered Armenia and Georgia, and for nearly a century compelled all, under pain of death, to embrace Mahometanism. In 787 the Sassanian dynasty came to an end. Ashod I., Afedz, '"the Great," a Bagratide, succeeded, receiving from the caliph Haroun al Ras- chid the title of grand prince, and that of couropolate from the em- peror ; but it was not until about 841 that the sovereign (Bagrat I.) was recognized by the caliph as ruler, the country during the interval having

been continually ravaged by the Arabs. Their last expedition, in the reign of Bagrat L, included the occupation of Tiflis. The reign of Bagrat III. marks an epoch, for that monarch, who was king of Abkhasia, succeeded to the crown of Georgia by right of inheritance, his sovereignty extending from the Black Sea to the Caspian. He encouraged the arts and sciences, and was the founder of the noble cathedral at Koutais, the first building in the style of arehitecture thenceforth denominated Georgian. During the reign of Bagrat IV. the Seljuks commenced in 1048 a succession of invasions, until they were effectually repulsed by Liparit Orboulk at the head of a comparatively small force of Georgians, Armenians, and Greeks. Liparit himself was taken prisoner, and Bagrat carried off his wife in his absence; but, regain- ing his liberty, Liparit took up arms against his sovereign, and drove him out of his capital into Abkhasia. Bagrat appealing to the emperor, it was arranged that he should return to his kingdom of Georgia and Abkhasia, Liparit being suffeied, as his dutiful sub- ject, to retain the province of Meskhy.

In 1064 the Seljuks under Arp-Aslan again overran Georgia, destroying Tiflis and slaughtering the inhabitants. In 1072 George 1]. ascended the throne, and in his reign Tiflis was again devastated by the Seljuks, the king himself being forced to fly. With his valiant son and successor, David III., the fortunes of Geoigia changed, for the enemy was driven out of the plains of Kakhetia, and the land from Tiflis to Ani was freed of his presence in 1123 by Ivan Orbeliani, whose signal services were rewarded by elevation to the rank of constable. The next monarchs were Demetrius I. and David IV., the latter, at his death, entrusting his son Demna or Demetrius to the guardianship of Ivan Orbeliani, and the 1e- gency to his brother George, who with the assistance of Ivan, greatly extended the Georgian territory, rescuing from the Seljuks a large portion of Armenia. When in 1177 Demna had attained his majority, the nobles desirous of supporting the young prince’s claims called upon Ivan, whose popularity had ‘meanwhile been increasing, to place him on the throne. George fortified himself at Tiflis and awaited events ; his rule, how- ever, was too firmly established to be easily shaken, and, many of Ivan’s partisans espousing his cause, he at length set out to besiege Lorhy, which Ivan and his eharge had made their headquarters. Numerous desertions reduced the ranks of the besieged, until young Demna fled at last to the encampment of his uncle, and entreated him

to spare his life. His prayer was granted, but he was deprived of his eyes, and otherwise mutilated. The prince having sur- rendered, Ivan declared his readiness to submit on condition that he should be honourably treated. George assented, showed his prisoner all honour until he had got the whole of his relatives into his power, when he ordered that all should be massaecied, Ivan himself being blinded and brutally treated. Three only of his kinsmen were saved—a brother named Liparit, and his two sons who had gone to Persia to solicit the aid of the atabek Ildegouz. From them are descended the Orbeliani of the present day. At the time of their extermination, the possessions of the Orboulk comprised more than the half of Georgia, It is related that the ancestors of this powerful family, prinees of the family of Djenkapour of the royal race of Djenesdan, first came to Karthli from that part of Asia which lies between China and the Ural ; the fortress of Orpeth was given to them for a residence. . In return for the friendly recep- tion accorded to them, they united with the Karthlosides in throwing off the Persian yoke, a service which obtained forthe chief Orboulk the rank of sbasalar or generalissimo. During the reign of Pharnawaz, the Orboulk took precedence next to the sovereign, and matrimonial alliances were fornied with the royal house. The first of the family individualized in the annals was the warrior Liparit (875-900). George III. died in 1184, and was suceeeded by his only child Thamar, whose kingdom extended from the Caspian to the Black Sca, and from beyond the Caucasus to Armenia, for

Trebizond, Erzeroum, Tovin, Kars, and Ani fell to her arms. Her missionaries travelled far and wide, and numerous ehurches were constructed, and thus it was that her many virtues and brilliant rule secured to her the title of Aep’he, ‘‘king.” This great queen was sueceeded in 1212-13 by her son George IV., surnamed Lasha, ‘¢He who enlightens the world,” who, assisted by the powerful noble, Ivan Mkhargrdzelidze, of the family that had replaced the Orbeliani in the royal favour, vanquished the Persians in many battles, conquering Gandja, and permanently occupying Kars. In 1220 and 1222 the Mongols again visited Georgia. The king left an infant son who afterwards reigned as David IV., but his own sister, Roussoudan, seized the crown in 1228, and passed a life not free

fromreproach. To revenge himself upon the queen, who refused his suit, Jalal-uddin twice occupied her capital, and her kingdom was again overrun by the Mongols, who committed fearful ravages. Next follow the exploits of Timur, who invaded Georgia in 1886, and, having seized upon the capital, carricd away the king, Bagrat V., who feigned conversion to Islamism that he might gain the confidence of the conqueror. By this means he succeeded in ob- taining from Timur a force of 12,000 men, for the purpose of pre- vailing upon his people to embrace Mahometanism. Bagrat had preconcerted his plans, and in due course every Tatar in his suite was slaughtered by his own warriors. In an ungovernable passion Timur re- entered Georgia (1393-94), and laid waste the entire country, levelling towns and villages, without sparing a single life. Satiated of bloodshed, he withdrew to the plains of Karabagh, and George VII., son and successor to Bagrat, returned upon the death of his father (1401) from the mountains where he had remained concealed, and occupied the capital. Timur made war upon him as well, compelling his submission, and in 1408 finally quitted the country. George was succeeded by Constantine II. , whose suecessor, Alexander I., son of George VII., restored the kingdom to prosperity; but towards the close of his days he conceived the unhappy idea of dividing his kingdom among his three sons, an act that was followed by internecine wars, rebellions, massacres, and foreign invasions. From about this period commence the relations of Russia with Georgia and its neighbouring principalities, for in 1492, during the war fomented between Turkey and Persia, Alexander, king of Kak- hetia, sought the protection of the czar John III. Again, in 1587, Boris Godounoff was appealed to for succour ; and when, in 1618, Shah Abbas invaded Geoigia, Teimouraz I. applied for assistance to Michael Feédorovitch (the first of the Romanoffs), as did also, in 1621, George III. king of Imeritia, and Mamia Gouriel the ruler of Gouria, In 1638 Levan, sovereign of Mingrelia, took the oath of allegiance to Alexis Michaelovitch, and in 1650 Alexander of Imeritia acknowledged the sovereignty of Russia. That empire, however, could not render material assistance to those petty sovereigns in distress, and little was done until fresh excesses committed ‘by the Turks and Persians afforded Peter the Great the excuse for sending an expedition, in 1716, under Bekevitch a Circassian chieftain, to survey the Caspian shore and erect defences. Bekevitch was over- powered by the Tatars, and slaughtered with the whole of his force. Peter then occupied the western shore of the

Caspian, taking the king of Georgia under his protection. This was Vakhtang VI., the author of a code that was in vogue until 1841, when Russian laws were in great measure introduced. But he was unable to resist Nadir Shah, and abdicating in 1724, retired to Astrakhan, where he died. Peter being at peace with Turkey, and having concluded the treaty of Nystadt with Sweden, left Moscow, May 24, 1722, and embarked at Astrakhan with troops destined for Georgia and the Persian provinces, Derbent, Bakou, Ghylan, and Mazanderan fell into his power, and he constructed a fort on the river Soulak, which he named St Croix. All these places were ceded by treaty, in 1732, after Nadir Shah had delivered Karthli and Kakhetia from Turkish oppression. A few years later, in 1735, Turkey renounced all claim to those countries in favour of Persia. When war broke out with Turkey in 1768, Gencral Todleben was sent to the assist- ance of Solomon I., king of Imeritia, and the Turks were expelled that kingdom. Then followed the treaty of Kainardschi in 1744, by which Georgia, Imeritia, and Mingrelia were placed under the protection of Russia. In 1795 Aga Mahomet Shah laid Tiflis in ruins, a disaster that was succeeded by dissensions in the royal family ; and Heraclius I]., who in 1783 had declared himself the vassal of Russia, now appealed to that country for protection. The next sovereign, George XIII, renewed this appeal, which would have been granted but for the sudden death of the emperor Paul. Alexander I. hesitated for a time, until George finally renounced his crown in 1799 in favour of Russia, drawing down upon him the hatred and curses of his country. His younger brother, Alexander, made an effort to secure the crown, but the chiefs saw the hopeless- ness of attempting to throw off the Russian yoke, and, being but poorly supported, the prince was beaten on the banks of the Lora. George died the following year, being the last of the Bagratides to occupy the throne of Georgia, whieh his ancestors had held for the spaee of 1029 years. It may be stated that the Bagrations claim descent from David, by his adulterous intercourse with the wife of Uriah! Georgia was now virtually annexed to the empire, and on

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September 12, 1801, Alexander I. issued a proclamation announc- ing the fact to the pcople of that country. In 1810 the prince of Imeritia revolted against Russia; but this movement was quickly suppressed, and the

principality annexed. Mamia V., the ruler of Gouria, recognized the suzerainty of Russia in the same year, his principality being eventually annexed in 1829.

Sce Wakhoucht, Htstoire dela Géorgie, trans. by Brosset, and additions, 5 vols., St Petersburg, 1849; Vladykyn, Sabesyédnyk v'pouteshestvyry pa Kavkazou, Moscow, 1874; Zeidleitz, Otcherk Vynadyelya Kavkaza, Tiflis, 1875; Comm. J. Buchan Telfer, R.N., The Crimea and Transcaucasia, 1877. (J. B. TE.)

Ethnology. —Of the three main groups into which the Caucasian races are now usually divided, the Georgian is in cvery respect the most important and interesting. It has accordingly largely occu- pied the attention of Orientalists almost incessantly from the days of Klaproth to the preseut time. Yet such are the difficulties con- nected with the origin and mutual relations of the Caucasian peoples that its affinities are still far from being clearly established. Anton Schiefner and P. V. Uslar, however, who must be accepted as undoubtedly the greatest authorities on the subject, have at least arrived at some negative conclusions valuable as starting points for further research. In their valuable papers, published in the Memoirs of the St Petersburg Imperial Academy of Sciences and elsewhere, they have finally disposed of the views of Bopp and Brossct, who attempted on linguistic grounds to connect the Georgians with the Aryan family. They also clearly show that Max Miiller's " Turanian " theory is untenable, and they go a long way towards proving that the Georgian, with all the other Cau- casian languages except the Ossetian, forms a distinct linguistic family absolutcly independent of all others. This had already been suspected by Klaproth, and as the same conclusion has been arrived at by Fr. Miiller and Zagarelli, it is not likely to be set aside by further investigation.

Uslar's " Caucasian Family" comprises the following three great divisions : —

1. Western Group. Typical races: Tcherkessians and Abkhasians. 2. Hastern Group. Typical races: Tchetchenzcs and Lesghians. 3. Southern Group. Typical race : Georgians.

Here the term ‘‘ family ’’ must be taken in a far more elastic sense than when applied, for instance, to the Aryan, Semitic, or Eastern Polynesian Aeasious of mankind. Indeed, Uslar would perhaps be the first to admit that the fundamental unity of the three groups has not yet been established, and that they present at least as wide divergencies as are found to exist between the Semitic and Hamitic linguistic families, whose primitive relationship has not yet been definitely determined. Thus, while the Abkhasian of group 1 is still at the agglutinating, the Lesghian of group 2 has fairly reached the inflecting state, and the Georgian seems still to waver between the two. In conscquence of these different stages of development, Uslar hesitates finally to fix the position of Georgian in the family, regarding it as possibly a connecting link between groups 1 and 2, but possibly also radically distinct from both.

Including all its numerous ramifications, the Georgian or southern group occupies the greater part of Transcaucasia, reaching from about the neighbourhood of Batoum on the Euxine eastwards to the Caspian, and merging southwards with the Armenians of Aryan stock. It comprises altogether nine subdivisions, as in the sub- joined table :—

1. The Gsorcians Proper, who are the /berians of the ancients and the Grusya of the Russians, but who cail themselves Karthalinians, and who in medieval times were masters of the Rion and Upper Kur as far as its junction with the Alazan.

2. The Imerrrians, west of the Suram mountains as far as river Tzchenis-Tzchali.

3. The Gurians, between the Rion and Lazistan,

4. The Lazes of Lazistan on the Euxine.

5. The SWANITHIANS, SHVANS, or SWANIANS, on the Upper Ingur and Tzchenis- Tzchali rivers.

6. The MinGRettans, between rivers Tzchenis-Tzchali, Rion, Ingur, and the Black Sea. .

7. The TusHEs or Mosoxs, ...

8. The Psuavs or Pu’tcHAvy,... ..

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All these formed jointly the ancient kingdom of Iberia, whose mep’hé or “king” resided at Mtzkhet till 469 A.p., when the seat of government was removed to the neighbouring Tphlissi or Tphilis- kalaki, 7.c., “‘ warm town,” so called from its thermal springs. This place has ever since continued to be the capital of the king- dom, and now bears the abbreviated name of Tiflis, The repre- sentative branch of the race have always been the Karthalinians, a name which the native Christian chroniclers profess to trace back to Khartlos, second son of Thargamos, son of Japhct, son of Noah. From Thargaimos all their tribes are by their writers called, collect- ively, Thargamossiani, and from Khartlos their country receives the name of Karthveli or Karthli. But no weight can be attached to these genealogies and etymologies, which would doubtless never liave becn heard of but for the national desire to connect the race with the Mosaic account of the dispersion. It is now pretty well established that the Gcorgians are the descendants of the aborigines of the Pambaki highlands, and that they found their way to their present homes from the south-east some four or five thousand ycars

about the headstreams of the Alazan and Jora rivers.

ago, possibly under pressure from the great waves of Aryan migra- tion flowing from the Eranian table-land westwards to Asia Minor and Europe. The terms Georgian and Grusya are simply corrup- tions of the Persian Gurj, as in Gurjistan=Gurjland = Georgia. The Georgians proper are limited on the cast by the Alazan, on the north by the Caucasus, on the west by the Mcskhian hills, separating then from the Imeritians, and on the south by the Kurriver and the Karadagh and the Pambaki mountains. Southwards, however, no hard and fast ethnical line can be drawn, for even immediately south of Tiflis, Georgians, Armenians, and Tatars are found inter- mingled confusedly together.

The Georgian race, which represents the oldest elements of civilization in the Caucasus, is distinguished by some excellent mental qualities, and is especially noted for personal courage and a passionate love of music, The people, however, are described as fierce and cruel, and addicted to the vice of intemperance, though Vou Thielmann speaks of them as ‘‘ rather hard drinkers than drunkards.” Physically they are a fine athletic race of pure Cau- casian type ; hence during the Moslem ascendency Georgia supplied, next to Circassia, the largest number of female slaves for the Turkish harems and of recruits for the Osmanli armies, more especially for the select corps of the fainous Mamcluks.

The social organization rested on a highly aristocratic basis, and the lowest classes were separated by several grades of vassalage from the highest. But since their incorporation with the Russian em- pire, these relations have become greatly modified, and a more sharply defined middle class of merchants, traders, and artisans has becn developed. The power of life and death, formerly claimed and freely exercised by the nobles over their serfs, has also been expressly abolished. They are altogether at present in a fairly well-to-do con- dition, aud it cannot be denied that under the Russian administra- tion they have become industrious, and have made considerable moral and material progress,

Missionaries sent by Constantine the Great introduced Christi- anity about the beginning of the 4th century. Their cfforts were greatly aided by the exemplary life of a female slave named Nina, who came into Georgia during the rcign of King Miriam (265-318), and who occupies a prominent place in the ecclesiastical records of the country. Since that time the people have, under severe pressure from surrounding Mahometan communities, remained faithful to the principles of Christianity, and are still amongst the most devoted adherents of the orthodox Greek Church. Indeed it was their attachinent to the national religion that caused them to call in the aid of the Christian Muscovites against the proselytizing attempts of the Shiite Persians—a step which ultimately brought about their political extinction.

Asalready stated, the Karthli language is not only fundamentally distinct from the Aryan linguistic family, but cannot be shown to possess any clearly ascertained affinities with either of the two north- ern Caucasian

groups. It resembles them chiefly in its phonetic system, so that accoiding to Rosen (Sprache der Lazen) all the lan- guages of central and western Caucasus might be adequately rendered by the Georgian alphabet. Thoughcertainly not so harsh as the Avar, Serghian, and other Daghestan languages, it is very far from being euphonious, and the frequent recurrence of such sounds as ts, ds, thz,

kh, khh, gh (Arab. é» q (Arab. (5), for all of which there are

distinct characters, renders its articulation rather more energetic and rugged than is agreeable to ears accustomed to the softer tones of the Irenian and western Aryan tongues. It presents great facilities for composition, the laws of which are very regular. Its peculiar mor- phology, standing midway between agglutination and true inflexion, is well illustrated by its simple declension common to noun, adjec- tive, and pronoun, and its more intricate verbal conjugation, with its personal cndings, seven tenses, and incorporation of pronominal subject and object, all showing decided progress towards the inflect- ing structure of the Aryan and Semitic tongues.

Georgian is written in a native alphabet obviously based on the Armenian, and like it attributed to St Mesropius (Mesrob), who flourished in the 6th century. Of this alphabet there are two forms, differing so greatly in outline and even in the number of the letters that they might almost be regarded as two distinct alphabetic systems. The first and oldest, used exclusively in the Bible and liturgical works, is the square or monumental Khutswri, 7.e., ‘‘sacer- dotal,” consisting of 38 letters, approaching the Armenian in appear- ance. The second is the Mkhedrali khélt, .c., “soldier’s hand,” used in ordinary writing, and consisting of 40 letters, neatly shaped and full of curves, hence at first sight not unlike the modern Bur- mese form of the Pali,

Of the Karthli language there are several varietics ; and, besides those comprised in the above table, mention should be made of the Kakhetian current in the historic province of Kakhetia. A dis- tinction is sometimes drawn between the Karthalinians proper and the Kakhetians, but it rests on a purely political basis, having origi- nated with the partition in 1424 of the ancient Aberian estates into the three new kingdoms of Karthalinia,

Kakhetia, and Imeritia. On the other hand, both the Laz of Lazistan ve the Swanian pre-

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Plate IIL,

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such serious structural and verbal differences from the common type that they seem to stand rather in the relation of sister tongues than of dialects to the Georgian proper. All derive obviously from a common source, but have been developed independently of each other. The Zush or Mosok appears to be fundamentally a Kistian or Tchetchenz idiom affected by Georgian influences.

The Bible is said to have been translated into Georgian as early as the 5th century. The extant version, however, dates only from the 8th eentury, and is attributed to St Euthymius. But even so, itis far the most ancient work known to exist in the language. Next in importance is, perhaps, the curious poem entitled Zhe Amours of Turiel and Nestan Darejan, or The man clothed in the panther's skin, attributed to Rustevel, who lived during the prosperous reign of Queen Thamar (11th century). Prince Leonidze of Akhmeti in Kakhetia showed Baron von Thielmann a rare and very old MS. of this poem, written on fine hemp paper in exquisite Mkhedruli ehar-acters, and embellished with arabesques and miniatures evidently the work of an eminent artist. Other noteworthy compositions are the national epics of the Baramiant and the Rostomiani, and the prose romanees of Visramiant and Darejaniant, the former by Sarg of Thmogvi, the latter by Mosi of Khoni. Apart from these, the great bulk of Georgian literature consists of ecclesiastical writings, hymns sacred and profane, national codes, and chronicles.

See Baron Max von Thiclmann's Journey in the Caucasus, Persia, and Turkey in Asia, translated by Dr Charles Hemeage, London 1875; Fr. Miiller's Ethno- graphie and Reise der Ocstr. Fregatte Novarra, Vienna, 1868; Anton Schiefner and General P. V. Uslar, numerous papers in the Bulletins of the Académie Impériale des Sciences de Saint Petersbourg for

1859, &e.; M. Zagarelli’s Hramen de la littérature relative & la grammaire Géorgienne, St Petersburg, 1873; Michel Smirnow’s paper in Revue d Anthropologie, April 15, 1878. (CB. 2. EC

GEORGIA*

Its Hisrory, Conprrion, AND Resources. WirH Map. Copyright, 1879, by Charles Scribner’s Sons.

EORGIA, one of the thirteen original States of the American Union, has Tennessee and North Carolina

on the N., South Carolina and the Atlantic Ocean on the E., Florida §., and Alabama W. The Savannah river separates the State on the E. from South Carolina ; the St Mary’s, on the §., divides it in part from Florida; the Chattahoochee, on the W., flows between Georgia and Ala- bama for nearly half its course. Georgia lies between 30° 21′ 39” and 35° N. lat., and between 81° and 85° 53’ 38” W. long. It is 320 miles long from N. to 8., and 256 miles in its greatest breadth from E. to W., with an area of 58,000 square miles. Surface—Georgia has three distinctly marked zones, varying in soil, climate, and productions. Her sea-coast is similar to that of the Carolinas, being skirted by fertile islands, separated from the mainland by narrow lagoons or by sounds. This section is essentially tropical. Beginning at the sea-coast, a gradually ascending sandy plain extends northward and westward as far as the head of navigation on the Savannah, Ogeechee, Oconee, and Ocmulgee rivers, where it meets a Primary formation. Augusta, Milledge- ville, and Macon indicate the northern limit of this tract. Here begins the hilly and finally mountainous region, the most, extensive, fertile, and salubrious of the State. A second plateau, 60 or 70 miles broad, stretches above the falls of the rivers until it meets the southernmost ranges of the great Appalachian chain of mountains which traverses Virginia, North Carolina, and northern Georgia under the name of the Blue Ridge, and is finally lost in Alabama. This picturesque district extends in Georgia from Rabun county in the north-east corner of the State to Dade in the extreme north-west, where the summit of Lookout Moun- tain dominates the valley of the Tennessee. Here are the sources of the two principal rivers of the State ; here is the gold-producing region ; and here is also the theatre of some of the most sanguinary battles of the civil war. The elevations of

the Blue Ridge vary from 1200 to 4000 feet. In the south-east of the State is the extensive Okefinokee swamp, which has an estimated circumference of 180 miles,

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GEORGIA

is filled with pools and islands, and is the congenial home of alligators, lizards, and other reptiles.

Livers and Harbours.—There are many fine rivers in Georgia. A north and south line passing through Macon would nearly divide the streams flowing into the Atlantic from those discharging into the Gulf of Mexico. The Savaunah, Ogeechee, Altamaha, Santilla, and St Mary's fall into the Atlantic, and the Chattahoochee, Flint, and tributaries of the Suwanee flow to the Gulf coast, The rivers are generally navigable for steamboats to the falls which occur on the great central plateau of the State—that is to say, the Savannah to Augusta, the Oconee and Ocmulgee (confluents of the Altamaha) to Milledgeville and Macon, and the Chattahoochee to Columbus. Besides their ordi- nary purposes as avenues of travel and commerce, her rivers have given to Georgia the character of a manufacturing State, and she is developing and increasing their abundant water-powers with energy and success.

The Savannah is formed of two small streams which rise near the North Carolina line, and unite on the boundary between S. Carolina and Georgiain Hart county. Flowing thenee in a nearly §.S.E. direetion for 450 miles, it enters the Atlantic near 32° N. lat. The Savannah is navigable from November to June. Ships ascend it 18 miles to the city of Savannah,

steamboats to Augusta, 230 miles, and by means of a canal around the falls there, constructed in 1845, light draught vessels navigate it150 mileshigher. This canal, 9 miles long, furnishes the water-power of Augusta. The river is here about 300 yards wide. From Augusta the traveller descends the Savannah through the cotton-fields of the table-lands, and the long reaches of semi-tropical vegetation dominated by groves of live oak, to the rich rice plantations of the seaboard.

The Chattahoochee is one of the largest and most interesting rivers of Georgia. It rises on the declivity of the Blue Ridge, in Habersham county, in the N.E. of the State, pursues a devious S.W. course through the gold region of upper Georgia until it reaches West Point, on the Alabama frontier. It then flows nearly south to the Florida State line, where it is joined by the Flint, when the two streams flow on through Florida to the Gulf under the name of the Appalachicola. Large steamboats ascend the Chattahoochee in the season of navigation to Columbus, 350 miles from the Gulf. The whole estimated length of the river is 550 miles. The falls at Columbus create a valuable water-power, constituting that city one of the three important manufacturing centres of theState. Justabove Columbus the Chattahoochee is broken in pieturesque rapids, over- looked by a roeky cliff called the ‘Lover’s Leap,” which is the subject of an interesting legend. Besides Columbus, the towns of West Point and Fort Gaines are the most important on the Chattahoochee in Georgia ; Appalachicola at its embouchure on the Gulf is its shipping and distributing port, but is decreasing in im- portance since the railway system of the State has assumed a large share of the traffie once confined to the navigable streams.

The Oconee and Ocmulgee rise near each other, in the N. of the State, flow through its centre to within 100 miles of the sea, when their united streams pass on S.E. to the Atlantie under the name of the Altamaha. Milledgeville, the former capital of Georgia, is on the Oconee, and Macon on the Ocmulgee. Darien on the Alta- maha is reached by vessels drawing 11 to 14 feet of water. The Og- eechee, rising also in the north, is about 200 miles long. It drains the country between the Savannah and Altamaha, entering the At- lantic a few miles south of the Savannah. The Ogeechee is navi- gable for light vessels 30 or 40 miles, and for keel-boats to Louisville. ‘The Santilla and St Mary’s drain the south-eastern counties, and are each

navigable 30 or 40 miles for sloops. The Flint, Ockloconee, and Suwanee drain the south-western counties; the Flint is navi- gable to Albany, 250 miles from the Gulf, for steamboats. The Tallapoosaand Coosa, head-waters of the Alabama, and the Hiawassee, one of the sources of the Tennessee, rise in the mountains of Georgia —the last, however, finding its way to the Gulf of Mexico by the Ohio and Mississippi valleys.

Georgia has about 128 miles of sea-coast, but has few good harbours, except within the rivers emptying upon it. St Mary's, Brunswick, Darien, and Savannah are the principal. The chain of islands lying off the mainland produces the celebrated Sea-island cotton, but owing to the changes brought about by the secession war it is now little cultivated. These islands are flat, and generally little elevated above the sea. Cumberland island, one of the most attractive, is nearly 30 miles long. It is covered with magnificent forests of oak, and its shores are skirted with palms,

palmettos, and tropical shrubbery. Other islands from 8. to N. are Jykill, St Simon's, Sapello, St Catharine's, Ossabaw, and Cabbage. The Sea Islands, with the main shore, constitute a coast of 480 miles. St Andrew's, St Simon's, Altamaha, Doboy, Sapello, St Catharine's, and Ossabaw are the principal sounds.

Climate, Soil, and Productions.~-The central and southern portions of Georgia, including the seaboard, are subject to excessive heatsin summer. At Savannah obser- vations show the mean temperature for July to have some- times reached 99° Fahr. In the northern district of the State the same season is cooler and less enervating. Indeed, the mountain region is becoming noted for its genial and healthful climate, and is attracting invalids and pleasure seekers from all parts of the Union. In the low marshy lands lying contiguous to or upon the coast, malarious fevers prevail in spring and summer. The belt of country stretching from Augusta across the State to Columbus, having a width of from 30 to 60 miles, is pronounced a very healthy district. At Augusta the mean summer tem- perature is about 79°, the winter 47°. At Atlanta careful observations give the average of summer heat as 75°, and winter 45°. Diseases of the respiratory organs are rare among natives of northern and central Georgia. The interior is

comparatively free from the dreaded epidemics cholera and yellow fever, but Savannah and the coast are pericdically scourged by them.

There is in Georgia as great diversity of soil as of climate. Beginning with the Sea Islands, which are composed of a sandy alluvium, intermixed with decomposed coral, we pass from the rich alluvions near the coast, in which the great rice plantations are, to the thinner soil of the Pine Belt, sometimes inaptly denominated Pine Barrens. These are at present valuable for their timber and naval stores, but are susceptible of cultivation. The middle region consists of a red loam, once productive, but from long cultivation im- poverished, With the aid of fertilizers it produces cotton, tobacco, and the cereals, We now reach the so-called Cherokee country of the north, containing lands among the most fertile in the State, lands which, notwithstanding their tillage from an unknown period by the aboriginal inhabit- ants, grow wheat, corn, Irish potatoes, pease, beans, &c., abundantly. Cotton may also be successfully cultivated, but with less advantage than in other districts of the State. This fibre is chiefly produced along the fertile bottom-lands or contiguous uplands of the rivers. The same lands yield rice, Indian corn, and sugar. Middle and south-west Georgia are the most productive cotton areas, In the south- west the soil, though light and sandy, produces cotton. In southeru Georgia there are millions of acres of magnificent yellow pine forests of great value for house or ship-building, and in these forests turpentine plantations have been opened. The live-oak, also valuable for ship-building purposes, abounds in the south-east of the State. The swamps afford cedar and cypress, the central region oak and hickory. Walnut, chestnut, ash, gam, magnolia, poplar, sycamore, beech, elm, maple, fir, and spruce trees are found in differ- ent localities; but in the older settled districts the original forests have disappeared.

It is frequently said that there is nothing grown in any of the States except Florida that Georgia cannot profitably produce. A few of the tropical fruits of Florida cannot be raised in Georgia, but all those of the temperate zone suc- ceed well. ‘Tobacco may be grown in any part of the State, although it is not extensively cultivated for export. Cotton is the great crop of Georgia. She ranks third among the eight cotton States, having exported or consumed in her own manufactures, for the year cnding September 1878, 604,676

bales, worth at the point of export $30,000,000. Of this crop 3608 bales is classed as Sea-island. Her

crop for 1877 was 491,800 bales. The counties of Burke, Dougherty, Lee, Monroe, Stewart, Sumter, and Washington yield 25 per cent. of the whole product of the State.

The emancipation of the slaves in the Southern States has naturally produced great and important changes in the labour system of that section, The planter must now pur- chase the labour he formerly owned, The black is free to dispose of his labour to the best advantage. The contracts for labour are of three kinds,—for money wages by the month or year, for a share of the crop, or for specific rent in money or products. The first has been practised to a limited extent by the best and most prosperous planters. The share system has been the one generally adopted, because the blacks greatly affected quasi-proprietorship of the soil, and because the owners were inexperienced in the management of free labour, and not inclined to come personally in contact with it. The share varies in different localities, but usually one-third to half the crop goes to the labourers, the landlords furnishing the necessary tools. The readjustment of labour in the south is watched with the keenest interest in other sections of the Union as one of the difficult problems growing out of the suddenly changed relation between white and black ; and though some traces of his original servitude remain a cause of irritation between North and South, the agreement between the enfranchised black and his late master is likely to be harmonious, where each is so dependent on the other as is the case in the cotton-growing States of the Union.

Statistics. —A carefully tabulated statement shows that, in addition to her cotton crop, Georgia produced, in 1876, 23,629,000 bushels of Indian corn, valued at $14,172,000 ; 2,840,000 bushels of wheat, worth $8,805,600 ; 5,700,000 bushels of oats, worth $3,876,000; and 23,600 tons of hay, worth $347,628. To these principal crops should be added the timber and naval stores exported from Atlantic out- ports. In January 1877 there were in Georgia 118,300 horses, 404,900 oxen and other cattle, 96,200 mules, 270,400 milch cows, 378,600 sheep, and 1,488,100 swine, having a total

valuation of $30,815,117. The State is admirably adapted for stock-raising, but, as cotton culture offers the quickest returns, it has hitherto engrossed the attention of planters and farmers. The grain and root crops are largely cultivated for the support of the agricultural population.

The rice crop of Georgia in 1870 was 22,277,380 Ib; tobacco, 288,596 Ib; molasses, 553,192 gals.; wine, 21,927 gals.; sugar, 644 hhds; swect potatoes, 2,621,562 bush.; Irish potatoes, 197,101 bush.; butter, 4,499,572 ib; honey, 610,877 1b; wool, 846,947 tb, increased in 1878 to about 1,000,000ib. The latest official census shows that 6,831,856 acres, valued at $94,559,468, are improved in farms; value of farm implements and machinery, $4,614,701 ; esti- mated value of all farm products, $80,390,228 ; estimated value of manufactured products, $31,196,115. The total valuation of the State in 1870 was $268,169,207, against $645,895,237 in 1860. The decrease is owing to the emancipation of the slaves ; but the State is steadily gaining ground in increased acreage cultivated, increased number and value of manufactories, and increased pro- ductive capacity everywhere.

Mineral products.—Georgia was perhaps the El Dorado of which the Spaniards who invaded Florida were in search. Before the gold discovery in California, the ‘‘ placers ” of northern Georgia were pro- fitably worked for many years; but since 1852 their produce has almost wholly ceased. “The gold-bearing region is comprised in the counties of Lumpkin, Habersham, Forsyth, and Hall,—the precious metal being found in the alluvial deposits of the streams, and also intermixed with the quartz rock of the hills. A branch mint was established by the Government at Dahlonega, the shire town of Lumpkin county. In 1858 it coined gold bullion of nearly half a million dollars’ value ; but, as in California, the placers, or surface deposits, have become exhausted. Besides this precious metal, Georgia contains, mainly in N.E. or Cherokee Georgia, coal and fossiliferous iron ore distributed along the ridges between the Ten- nessee and Alabama border. The Cohutta mountains contain copper, and also silver and lead ores. Iron ore, manganese, slate, baryta, and brown hematite are found on the western declivity of this range. Between the Cohutta mountains and the Blue Ridge is a vein of marble, and adjacent to it are the gold-bearing schists, which reappear on the south side of the Blue Ridge. Other minerals are granite,

gypsum, limestone, sienite, marl, burrstone, soapstone, asbestos, shales, tripoli, fluor-spar, kaolin, porcelain clay, arragonite, tourmaline, emerald, carnelian, ruby, opal, calce- dony, agate, amethyst, jasper, garnets. schorl, zircon rosc-quartz, beryl, and even diamonds.

Population. —The latest official census of Georgia (1870) gives a population of 1,184,709 sonls, 638,926 being white and 545,142, or nearly one half, black. This population is distributed among 136 counties, which include 8 eities and 134 incorporated towns. Georgia, whieh ranks tenth in area, is the twelfth of the Union in respect to population. Though showing an increase of 127,423 persons in the previous decade, which embraced the period of the war with the North, she has fallen behind one in her rank ; but indications of prosperity in her agricultural and manufacturing in- terests warrant the belief that Georgia will show a marked gain in 1880. A large proportion of this anticipated increase may be confi- dently assigned to the northern section of the State, though the middle section is at present most thickly settled.

Counties. —There are 136 counties in the State, viz.:—Appling, Baker, Baldwin, Banks, Bartow, Berrien, Bibb, Brooks, Bryan, Bullock, Burke, Butts, Calhoun, Campbell, Camden, Carroll, Cass, Catoosa, Charlton, Chatham, Chattahoochee, Chattooga, Clarke, Cherokee, Clay, Clayton, Clinch, Cobb, Coffee, Colquitt, Columbia, Cowetta, Crawford, Dade, Dawson, Decatur, De Kalb, Dodge, Dooly, Dougherty, Douglas, Early, Echols, Effingham, Elbert, Emmanuel, Fannin, Fayette, Floyd, Forsyth, Franklin, Fulton, Gilmer, Glasscock, Glynn, Gordon, Greene, Gwinnett, Habershain, Hall, Haneock, Haralson, Harris, Hart, Heard, Henry, Houston, Irwin, Jackson, Jasper, Jefferson, Johnson, Jones, Laurens, Lee, Liberty, Lineoln, Lowndes, Lumpkin, Maeon, Madison, Marion, M’Dnuifie, M’Intosh, Meriwether, Miller, Milton, Mitchell, Monroe, Montgomery, Morgan, Murray, Museogee, Newton, Oglethorpe, Paulding, Pickens, Pierce, Pike, Polk, Pulaski, Putnam, Quitman, Rabun, Randolph, Richmond, Rockdale, Schley, Scriven, Spalding, Stewart, Sumter, Talbot, Taliafero, Tatnall, Taylor, Telfair, Terrell, Thomas, Towns, Troup, Twiggs, Union,

Upson, Walker, Walton, Ware, Warren, Washington, Wayne, Webster, White, Whitfield, Wilcox, Wilkes, Wilkinson, and Worth.

Cities and Towns.-—Georgia has no large cities. Savannah, the chief sea-port, has a population of about 30,000; Atlanta, the capital, 35,000; Augusta, 23,768; Macon, 10,810; Columbus, 7401; Athens, 4251; Milledgeville, 2750; and Rome, 2748. The important towns are Albany, Americus, Bainbridge, Brunswick, Cartersville, Covington, Cuthbert, Dalton, Dawson, Eatonton, Fort Valley, Griffin, La Grange, Marietta, Newnan, Thomasville, Val- dosta, Washington, and West Point. Columbus, Americus, Atlanta, and Rome, as well as Savannah, are considerable shipping points, for cotton; Athens is the seat of the university of Georgia ; Augusta and Columbus are manufacturing centres ; Macon has three religious colleges ; Darien, Brunswick, and St Mary's manufacture and export lumber. Andersonville, in Sumter eounty, acquired terrible celebrity during the civil war as the site of the chief mili- tary prison of the Southern Confederaey. Atlanta is by far the best example of rapid growth the State affords. From a population of 21,189 exhibited by the census of 1870 the city advaneed to 35,000 in 1876. Itisarailway and manufacturing centre. In the vicinity and for its possession were conducted some of the most important military operations of the secession war.

Manufactures. —Georgia is the foremost southern State in her railway and manufacturing enterprises. Both have been chiefly developed since the war, from which everything in the south of the Union dates. Her rivers and railways afford abundant facilities for the movement of merchandise as well as erops. Her streanis also provide excellent and unfailing water-power. In the develop- ment of her industries a great future is predicted for Georgia. In- deed some of the more'sanguine claim that she is already becoming a formidable rival of New England in the manufacture of cotton and woollen fabrics.

There are in the State 38 cotton factories, with 123,233 spindles and 2125 looms. There are 14 woollen factories, with 4200 spindles and 135 looms. Augusta and Columbus take the lead in the num- ber and capacity of these works, for which certain important advan- tages are claimed. The water-power is so ample that the mills are run by it alone. The streams do not

freeze in winter. The cotton and wool are grown at the faetory door, saving to the mill-owner the eost of transporting his raw material from a great distance. Labour is cheaper. Finally, the State in order to encourage the investment of foreign eapitalin manufactures, has by law exempted such capital from taxation for ten years. The product of the Georgia mills finds a ready market in the Southern and Western States. It is asserted on good authority that during the years 1875, 1876, and 1877—years of unparalleled depression to the manufacturing interests of the United States—the mills of Georgia, especially those of Augusta and Columbus, were never idle, and paid a handsome return on their in- vested eapital. Besides the 52 factories which convert so large a share of her raw product into cloths, there are 1375 grain inills having 1453 run of stones for eorn and 556 for wheat. There are 784 sawmills, 77 waggon and earriage factories, 6 iron-furnaces, 7 iron-foundries, 11 limekilns, 4 potteries, 68 tanneries, 6 turpentine~ distilleries, 2 rolling-mills, 5 paper-mills, 12 furniture manufac- tories, 8 rice-mills, &c. The manufacture of rope, bagging, twine, tobacco, ice, sashes and blinds, agricultural implements, boilers and

machinery, fertilizers, &c., is carried on more or less extensively. Besides Augusta and Columbus, the largest manufacturing city of the State, there are cotton factories at Athens, Macon, West Point, Decatur, and Atlanta. The latter city also has large iron works. Thomasville, Dalton, Albany, Marietta, and Rome are also manu- facturing points.

Commerce.—Large vessels can enter only four harbours, viz. Savannah, Darien, Brunswick, and St Mary’s. The inlets or sounds which divide the coast islands from each other or from the mainland are generally only navigable forsmall eraft. At mean low tides the bar of the Savannah (Tybee entrance) has 19, the Altamaha 14, that of St Simon’s sound (entrance to Bruuswick) 17, and that of St Mary’s river 14 feet of water. Savannah, Brunswick, and St Mary’s are ports of entry. Cotton and lumber are the principal ex- ports. Of the former 610,419 bales of Upland, and 11,309 of Sea- island were exported during the year ending September 2, 1878. The shipment of wool for the same time was 988,389 Ib. These figures should not be taken to represent the erop of the State. The ship-timber, boards,

deals, clapboards, &c., are chiefly shipped from the other ports. About 100 vessels, of 22,000 tons burden, are employed in the foreign and coastwise trade. For the year ending December 31, 1878, the total tonnage of the portof Savannah was— entered, 280,995 tons foreign and 885,532 eoastwise; cleared, 223,885 foreign and 418,958 coastwise ; value of imports $505,596, and of exports $24,014,535. In the distriet of Brunswick and Darien the entries were 124,711 and the elearances 32,579 tons, value of exports $1,030,948. The St Mary's entries were 16,052 tons foreign and 20,065 coastwise ; value of exports $120,186, and of imports $1421.

Railways.— Atlanta, Columbus, Macon, Albany, and Augusta are railway centres. In 1860 there were in Georgia 1404 miles of com- pleted railway ; in 1878 there are 2340 miles. The Atlantie and Gulf Railway crosses the State from Savannah to Bainbridge, in the extreme south-west, on the Flint river. It is 236 miles long, passing throngh Blackshear, Valdosta, and Thomasville (from which there is a branch line to Albany—58 miles—and Macon), while from Dupont there is a junetion with the Florida lines, The Brunswiek and Albany also extends from the coast at Brunswiek to Albany, 172 miles, whence it is to be continued in a westerly direction to the Chattahooehce, in Early county.

Atlanta is situated on the great iron highways from Boston, New York, and Philadelphia to Mobile and New Orleans, and from Chi- cago to Florida. 'The Western and Atlantic connects Atlanta and the Georgia system with the Tennessee lines at Chattanooga (138 miles). Several great battles were fought for the possession of this railway during the seeession war. The Atlanta and Charlotte Air Line extends to Charlotte, N.C. (269 miles). The Georgia railway eonnects Atlanta with Augusta (171 miles), with lateral lines from Carnak to Warrenton (4 miles), Union Point to Athens (40 miles), and Barnet to Washington (18 miles); it also works the Macon and Augusta line from Carnak to Angusta (70 miles). The Atlantaand West Point (80 miles) unites those places. The Alabama and Chat- tanooga crosses the N. W. corner of the State. 'The Cherokee extends from Cartersville on the Western and Atlantic to Rockmart (23 miles). The Columbns and Atlanta, projected betwee Colunibus and Rome, the Memphis branch (Rome to Decatur, Ala.), and Savannah, Griffin, and N. Alabama, from Griffin to Newnan, to be ex- tended to Guntersville, Ala.,are

in progress. The Georgia Southern extends from Dalton to the Ala. State rep (portion of Selma, Rome, and Dalton road); North-Eastern from Athens to Lulali (39 miles) ; Ocinulgee and Horse Creek (7 miles); Rome Railroad, Rome to Kingston (20 miles).

Government.—The exeeutive power is vested in a governor elected for four years by a majority of the people. If there is no election by the people, the general assembly chooses one of the two receiving the highest number of votes. The legislative authority is conferred upon a senate, members of which are elected for four years, and a house of representatives elected for two years. The legislature holds ee sessions, beginning on the second Wednesday of Janu- ary. The State judiciary consists of a supreme court of three judges, who hold office for twelve years, one retiring every four years, and of inferior courts, presided over by nineteen judges, appointed by the exe- cutive with the consent of thesenate. Kxceptin probate cases, these eourts have original jurisdiction, civil and orminalty law and equity. County eourts are established in most of the counties. There is an ordinary for each county elected for four years, who holds a court of

ordinary and probate. The organic law of the State now forbids | slavery or involuntary servitude exeept for the punishment of erime. Imprisonment for debt, and legislation affecting the free exercise of that personal liberty guaranteed to the citizen by the amendments to the constitution of the United States, are also prohibited. All male inhabitants between eighteen and forty-five are subject to military duty. There is a hoinestead exemption of $2000 on real and $1000 on personal property, except for taxes, for money borrowed or ex- pended on the homestead, or for labowr or materials used upon it. The property held by a married woman at the time of marriage, or subsequently inherited or acquired by her, is not liable for the hus- band’s debts. A married woman may also sue and be sued in matters pertaining to her separate estate, and may earry on trade as if single. Georgia is entitled to seven representatives and two senators in Congress.

Education.—Previous to the war, there was no common sehool system in Georgia. Although a plan of publie instruetion was or- ganized at an earlier date, it was not given effect to until 1873. In | that year the sehools were put

in working condition, and are now to be found in every county of the State. The attendance in 1876 was | —whites 121,418, coloured 57,987, showing a small but steady increase for the three years the schools had been in operation. It is computed by the school commission at 200,000 for 1879. The higher branches of education are well represented. As early as 1801 steps for founding a university were taken at Athens. ‘The first commencement took place in 1804. The college proper (Franklin College at Athens) annually admits free of charge “ fifty meritorious young men of limited means,” and also sueh as may be stndying for the ministry who need aid. There is also eonnected with the university a medieal college, located at Augusta, and an agricultural college at Dahlonega, with nearly 250 students, | Whose tuition is free. The State college of agriculture and mechanie arts, also connected with the university, has a special endowment derived from the United States of $240,000 ; the whole endowment of the university is $376,500. The university, exclu- sive of its establishments at Augusta and Dahlonega, has five de- partinents, 13 professors, and 200 studeuts, with a library of 14,000 volumes, and two literary societies. Besides tho usual collegiate | course, there are a preparatory school and a law sehool. Mercer College, at Macon, isa Baptist institntion. It was fonnded in 1838: aud until 1870 it was loeated at Penfield, in Greene county. It has an endowment of $160,000, a library of 12,000 volumes, and about 135 students. Besides the regular academic course, there are schools | of law and theology. The high schools at Penfield and Dalton are eonneeted with this eollege. Emory College at Oxford, Newton eounty, was chartered in 1836. Itis the property of the Georgia and Florida eonferences of the Methodist Episeopal Chnureh(South). The present number of students is 156. Kmory has a valuable eollege apparatus and a good working library, but lacks an endowment. The Wesloyan Female College at Macon was one of the first female colleges, if not the first, in the world, its charter having been granted in 1836. It has 200 students, and is the property of the Methodist denomination. Since 1840 degrees have been conferred | upon 1080 graduates. The Southern Masonie Female College at Covington belongs to the Grand Lodge of Georgia, and is designed to edneate female orphans of freemasons. Pio Nono College at Macon is a reeently established Catholie institution, ehicfly founded by tho | efforts of the bishop of Savannah. The Atlanta University for the elueation of negroes was established by the now extinet Freedmen’s Bureau and various eharitable

societies of the Northern States. It receives an annual appropriation from the Georgia legislature of $8000. It aecommodates 240 pupils. There are a number of insti- tutions, in addition to those enumerated, that are entitled colleges, but come more properly within the designation of high schools, There are also institntions for the blind (at Macon), and for the deaf and dumb (near Rome).

Objects of Interest.—Perhaps the most beautiful scenery in Georgia is to be found in the mountain region traversed by the Air Line railway. About 24 miles from the town of Toccoa the creek of that name falls 135 feet over a precipice. Fifteen miles beyond Toccoa are the cascades of Tallulah, where the river descends | successive terraces of broken rock between the walls of a chasm 800 feet deep. In this vicinity are the | charming valley of Nacooches and Mount Yonah. In. the extreme north-east is Rabun gap and the cascades of | Eastatoia, Connected with this region, once the hunting-grounds of the warlike Cherokees, are many Indian legends. Ihe country between Atlanta and Chattanooga is deeply interesting from having been the battle-ground of opposing armies in the civil war. Kenesaw mountain, itself the scene of a bloody encounter, commands a view of the country which for two months the Confederate commanders disputed

foot by foot. Stone mountain, 9 miles from Decatur, is much visited. The Chattahoochee, in the neighbourhood of Columbus, is picturesque ; and Savannah is one of the most attractive and idiosyncratic cities of the Union. There are numerous mineral springs scattered over the State, which are much resorted to by invalids.

fistory.— Before the arrival of Europeans the country now embraced in Georgia was inhabited by the Cherokee and Creek Indians. The Cherokees possessed the north, the Creeks the south. Both were very powerful and warlike, the Cherokees numbering 6000 warriors, and having 64 towns and villages. To be more precise, the Cherokee country extended from the 34th parallel north to the country of the Six Nations, aud from the heads of the rivers emptying upon the South Carolina coast westward to the Mississippi. The whole course of the Tennessee was within this magnificent domain, now mostly embraced in the four States of Georgia, Alabama, Mississippi,

and Tennessee. In 1729 this extensive territory was surren- dered by treaty to the crown of Great Britain. The following year the Cherokees made formal submission to Sir A. Cuming, Bart.

Georgia was the ouly one of tlie original thirteen colonies

| that received any aid in its settlement from the Government

of England. General James Oglethorpe conceived aud

| executed the plan of founding an English colony in that

portion of the Carolina proprietaries' grant between thie Savannali and Altamaha. His purpose was to create an asylum in the New World where insolvent debtors, and persons fleeing from religious persecution, might begin life anew or enjoy religious freedom. By royal letters-patent issued in June 1732 the proposed colony was called Georgia in honour of the reigning prince; aud the House of Com- mons granted £10,000, which was soon increased by private subscription to £36,000. Under the charter the trustees had powers of legislation, but could receive no reward for their services. Even grants of land to them- selves were forbidden.

With 116 emigrants Oglethorpe sailed from England in November 1732, arriving in the Savannah in February. He landed at the present site of Savannah, where he was soon after hospitably received by delegates from the Lower Creeks, who consented that the English might peaceably inhabit among them. The next year a small number of Bavarians came over, and were settled in what is now Effingham county. Oglethorpe also established settlements at Darien, at Augusta, and on St Simon's island. In 1736 the colony received considerable accessions of emigrants, with whom came Jolin and Charles Wesley, the founders of Methodism. In 1738 the Rev. George Whitefield visited Georgia, founding the orphan-house at Bethseda, near Savannah, from funds chiefly collected on iis tour in the northern colonies.

Anticipating invasion by the Spaniards of Florida, who claimed Georgia, Oglethorpe, on the renewal of war between England and Spain, led an expedition to St Augustine, Florida, which he besieged without success at

the head of 2000 men. The Spaniards retaliated by landing in 1742 a small force on St Sinion’s island, from which they were expelled by Oglethorpe. They then abandoned further attempts. Slavery was introduced into Georgia about 1750. In 1752 the trustees surrendered their privileges to the crown. A royal governor and council were appointed

_ to administer, in conjunction with delegates of the people,

the government of the province. During the French and Indian wars the remote settlements suffered somewhat from incursions of the Cherokees. The treaties of 1763 with France and Spain extended the boundaries of Georgia to the Mississippi on the W., and to St Mary’s on the 8. After this the colony flourished greatly until the breaking

out of war with England, at which time the colony was estimated to have a population of about 70,000 souls. In

1775 Sir James Wright, the crown governor, left the pro- Delegates were sent to represent Georgia in the con- tinental congress who signed the Declaration of Independ- In 1778 a British land and naval force occupied Savannah and Augusta, but were subsequently compelled In September of the same year a combined American and French force, under Lincoln and D’Estaing, unsuccessfully attempted the recovery of Augusta Charleston being sur- rendered by General Lincoln in 17 80, the patriots of South Carolina and Georgia were only able to maintain a partisan warfare, until the advance of General Greene from the north, at the head of considerable forces, resulted in the expulsion Georgia at the conclusion of peace ratified the several Acts constituting She framed her first constitution in 1777, a second in 1789, and a third

vince. ence. to abandon the latter place.

Savannab, losing nearly 1000 men in an assatlt. was reoccupied by the conquerors.

of the royal troops from those provinces. her one of the United States of America.

(which has been several times amended) in 1798.

In 1803 Georgia ceded to the general government all her Chattahoochee, amounting to nearly

out of which the States of Alabama and Mississippi were subsequently formed. The cession of Louisiana to the United States was of great benefit to Georgia in ending hostilities which the Spaniards were con- tinually inciting the Indians to commit upon the scattered settlements. By a treaty with the Creeks, Georgia became

territory west of the 100,000 square miles,

possessed of a large tract in the south-west of the State.

The second war with England (1812-15) involved Georgia in hostilities with the Indians on her western border, who

were finally subdued by General Andrew Jackson. In 1821

the cession of Florida to the United States relieved Georgia from the long series of Spanish aggressions beginning with

her existence as a colony.

In 1825 a serious difficulty arose between the State and

national authorities in consequence of proceedings by the Georgia executive to extinguish the title to lands in the

State held by the Creeks and Cherokees. The head chief

of the Creeks, M‘Intosh, was assassinated by his people for

signing away these lands to the whites. By an Act of

Congress passed in 1830, these Indians were subsequently removed to the Indian territory west of the Mississippi.

Georgia formally seceded from the Union in January 1861. The Government forts and arsenals were seized. The first military operations were on the coast. In April 1862 Fort Pulaski, one of the defences of Savannah, was recaptured by the Federal forces under Com. Du Pont. St Mary's, Brunswick, Darien, and St Simon's island were also occupied.

In the beginning of 1863 the Federal forces were in possession of middle and west Tennessee. In September they occupied Chattanooga in strong force, the Confederates falling back by the Western and Atlantic Railway to Lafayette, Ga. A further advance by General Rosecrans, the Federal commander, brought on the severely contested battle of Chickamauga, on the creek of that name (Sep- tember 20). The Federals retreated to Chattanooga, which was soon threatened by the Confederates under Bragg. In November the Union army under General Grant drove Bragg fron all his positions. In the spring of 1864 the southern army was at Dalton, Ga., on the railway to Atlanta, which it covered. In May General Sherman moved forward against this force a numerous and well-appointed Union army. Severe battles took place at Resaca, Kingston, and Allatoona Pass.

From this point Sherman began in Nov-

ember his memorable march across Georgia to the sea. On December 10th he arrived in the neighbourhood of Savannah, captured Fort M'Allister by assault, and occupied the city on the 2Ist. A cavalry force under General Wilson entered Georgia from Alabama in April 1865, capturing Columbus, West Point, and Macon, and making Davis, the Confederate States president, prisoner. In June 1865 a provisional governor was appointed for the State by the president of the United States. A convention assem- bled in October at Milledgeville, which repealed the ordin- ance of secession, abolished slavery, and declared the war debt void. A new constitution was framed and ratified in 1868, and Rufus B. Bullock inaugurated as governor. The restoration of civil government under the new forms was not effected in Georgia without complications which retarded its re-establishment on a

solid foundation, but the amend- ments to the national constitution were at length adopted, and her senators and representatives were admitted to seats in Congress in December 1870. During the war Georgia furnished about 80,000 soldiers for the Confederate armies. She emerged from it with her industries prostrated, her treasury empty, her social and political system revolution- ized, her most flourishing cities inruins. Her great natural resources are fast advancing her to a commanding position among her sister States ; and these resources are developing in the hands of a free people with greater rapidity and advantage than when half the population was enslaved. Texas possibly excepted, no southern State has a greater future than Georgia.

GEORGSWALDE, a town of Northern Bohemia, on the borders of Saxony, in the circle of Leitmeritz, about 35 miles E. of Dresden, with a station on the North Bohemian railway. Besides Old and New Georgswalde, it comprises Wiesenau and Philippsdorf, the latter a place which since 1868 has attained celebrity through the miracles attributed to its image of the Virgin. Georgswalde was founded in the beginning of the 17th century, and ranks as one of the oldest industrial centres of Bohemia, sharing with the neigh. bouring town of Rumburg a reputation for excellent linen. The parish church is a fine building. In 1869 the total popu- lation was 8220, of whom 5671 were in Old Georgswalde.

GERA, the chief town of the principality of Reuss-Schileiz, stands ina valley on the banks of the White Elster, 35 miles $.9.W. of Leipsic. It has been all rebuilt since a great fire in 1780, and the streets are in general wide and straight, and contain many handsome houses. The principal buildings are the churches of St Salvator’s and St Trinity, the town-hall, the buildings of the imperial bank and of the Gera bank, the music hall, and the central hall, Its educational establishments include a gymnasium, @ general town school (which contains a real school of the first order, a higher female school, and three citizen schools), a com- mercial school, a normal school, and a weaving school. The castle of Osterstein, the residence of the prince of Reuss, dates from the 9th century, but has been nearly all rebuilt within the last thirty years. Gera has long been noted for its industrial activity. Its manufactures comprise woollen, cotton, and silk goods, tapestry, artificial flowers, oil-cloth, leather, hats, tobacco, soap, beer, vinegar, chocolate,

glue, porcelain. and other earthenware, bricks, musical instru- ments, and carriages.

Gera was raised to the rank of a town in the 11th century, at which time it belonged to the counts of Groitch. In the 12th century it came into the possession of the lords of Reuss. It was stormed and sacked by the Bohemians in 1450, was two-thirds burned down by the Swedes in 1639 during the Thirty Years' War, and suffered afterwards from great conflagrations in 1686 and 1780, being in the latter year almost completely destroyed. The popula- tion in 1875 was 20,810, nearly all of whom are Protestants.

GE R—

GERACE or Greract, a town of Italy in the province of Reggio di Calabria, about 59 miles from Reggio on the railway between that city and Monasterace, is situated on a limestone hill not far from the coast, 30 miles N.N.E. of Cape Spartivento, between the rivers Merico and Novito. It is the seat of a bishop and of a subprefect, and has a civil and criminal court dependent on that of Catanzaro. The citadel, formerly of great strength, was reduced to ruins by

the earthquake of 1793 ; and the cathedral was at the same

time so severely injured that only a portion of the erypt remained available for public worship. There is a good

trade in a white wine known as Vino Greco; silk is manu- factured ; and the warm sulphur springs of the neigbour-

hood attract patients to the town. About 5 miles off, at Torre di Gerace, are the ruins of the Greek city of Locri

Epizephyrii, from which Gerace derived materials for its

buildings, and more especially fine marble columns for the cathedral. The population in 1871 was 7257. This Gerace is not to be confounded with

Gerace Siculo, a town of between 3000 and 4000 inhabitants, 4 miles from Cefalu, which was the first place in Sicily erected into a marquisate,

GERANIUM is the name of a genus of polypetalous exogenous plants, which is taken by botanists as the type of the natural order Geraniacew. The name, as a scientific appellation, has a much more restricted application than when taken in its popular sense. Formerly the genus Geranium was almost conterminous with the order Ger- antacece, which latter had then a more limited meaning thai is given to it by those of our leading botanists of the present day who include in it the Z'ropwolacew, the Oxali- dace, and the Balsaminacew. Then as now the geranium was very popular as a garden plant, and the species included in the original genus became widcly known under that name, which has more or less clung to them ever since, in spite of scientific changes which have removed the larger number of them to the genus Pelargonium. This result has been probably brought about in some degree by an error of the nurserymen, who seem in many cases to have acted on the conclusion that the group commonly known as Scarlet Geraniums were really geraniums and not pelargoniums, and have in consequence inserted them under the former name in their trade catalogues. In fact it may be said that, from a popular point of view, the pelargoniums of the botanist are better known as geraniums than are the geraniums themselves.

The species of Geranium bear the English name of Cranesbill, and consist mostly of herbs, of annual or perennial duration, dispersed throughout the temperate regions of the world. They number nearly a hundred, and bear a considerable family resemblance. The leaves are for the most part palmately-lobed, and the flowers are regular, consisting of five sepals, five imbricating petals, alternating with five glandules at their base, ten stamens, and a beaked ovary. Some dozen or more species are natives of the British Isles ; and many of those of exotic origin form hand- some border plants in our gardens of hardy perennials. Amongst these . ibericum, G. platypetalum, G. sanguineum, G. Backhousianum, and the double-flowercd varieties of G. pratense are conspicuous. The genus is not without its virtues, G. maculatum being the alum-root of North Anierica, used there as an astringent in diarrhoea, dysentery, and such like complaints, while the native Herb

Robert of English hedgesides, . Robertianwm, which is both astringent and aromatic, is used as a remedy in nephritic disorders.

From these regular-flowered herbs, with which they had been mixed up by the earlier botanists, L'Heritier in 1787 separated those plants which have since borne the name of Pelargonium, and which, though agreeing with them in certain points of structure, differ in others which are ad- mitted to be of generic value. One obvious distinction of

GER 439 Pelargonium is that the flowers are irregular, the two petals which stand uppermost being different—larger, smaller, or differently markcd—from the other three, which latter are occasionally wanting. 'This difference of irregularity the modern florist has done very much to annul, for the increased size given to the flowers by high breeding has usually been accompanied by the enlargement of the smaller petals, so that a very near approach to regularity has been in some cases attained. Another well-marked difference however remains in Pelargonium: the back or dorsal sepal is fur- nished with a hollow spur, which spur is adnate, 7.¢., joined for its whole length with the flower-stalk ; while in Geranium there is no spur. This peculiarity is best seen by cutting clean through the flower-stalk just behind the flower, when in Pelargonium there will be seen the hollow tube of the spur, which in the case of Geranium will not be found as it does not exist, but the stalk will appear as a solid mass. There are other characters which support those already pointed out, such as the absence of the glandules, and the declination of the stamens; but the features already described offer the most ready and obvious distinctions.

To recapitulate, the geraniums properly so-called aro regular-flowered herbs with the flower stalks solid, while many geraniums falsely so-called in popular language are really pelargoniums, and may be distinguished by their Irregular flowers and hollow flower stalks, In a great majority of cases too, the pelargoniums so commonly met with in greenhouses and summer parterres are of shrubby or sub-shrubby habit.

GERARD or Cremona (1114-1187), the medieval translator of Ptolemy and Avicenna, was born at Cremona, Lombardy, in 1114. Dissatisfied with the meagre philo- sophies of his Italian teachers, he went to Toledo to study among the Moors, who were at that time the chief deposi- taries and

interpreters of the wisdom of the ancients ; and, having thus acquired a knowledge of the Arabic language, he appears to have devoted the remainder of his life to the business of making Latin translations from its literature. The date of his return to his native town is uncertain, but he is known to have died there in 1187. His original version of Avicenna's Canon of Medicine was the basis of all the very numerous subsequent Latin editions of that well-known work; and the Latin translation by which alone Ptolemy's Almagest until the discovery of the original peyadn ocivragis was known to Europe is also as- cribed to him. In addition to these, he translated various other treatises in medicine, mathematics, and astronomy, to the number, it is said, of sixty-six ; but some of the works with which he has been credited (including the translation of the Almansorius of Er-Razi or Rhazes) are more pro- bably due to a later Gerard also called " Cremonensis," but more precisely "de Sabloneta." See Boncompagni, Della Vita e delle Opere di Gherardo Cremonense e di Gherardo da Sabbionetta.

GERARD, variously surnamed Tum, Tunc, Tenaque, or Txom (c. 1040-1120), founder of the order of the knights hospitallers of St John or of Malta, was born at Amalfi about the year 1040. According to other accounts Marti- gues in Provence was his birthplace, while one authority even names the Chateau d'Avesnes in Hainault. Whether as a soldier or a merchant, he in the course of the latter part of the 11th century found his way to Jerusalem, where a hospice had for some time existed for the convenience of those who wished to visit the holy places. Of this institu- tion Gerard became guardian or provost at a date not later than 1100; and here he organized that religious order of St John which received papal recognition from Pascal II. in 1113, by a bull which was renewed and confirmed by Calixtus II. shortly before the death of Gerard in 1120,

4.40

GERARD, Erreyne Maurice, Count (1773-1852), a

distinguished French general, was born at Damvilliers in the department of Meuse, 4th April 1773. He joined the second battalion of the Meuse in 1791, and served in the campaigns of 1792-1793 under Generals Dumouriez and Jourdan. In 1798 he accompanied Bernadotte as aide-de-camp in his embassy to Vienna. In 1799 he was named chief of a squadron,

and in 1800 colonel. He distinguished himself by a brilliant charge against the Russian imperial guard at the battle of Austerlitz, and being raised to the rank of general in November 1806, played a prominent part in the battles of Halle, Jena, and Erfurt ; and for his conduct in the battle of Wagram, where he greatly con- tributed to the victory, he was created a baron. In the Spanish campaign of 1810 and 1811 he gained special dis- tinction at the battle of Fuentes-de-Onoro ; and in the sub- sequent expedition to Russia he was present at the capture of Smolensk, had a principal share in the victory of Walontina-Gora, displayed such bravery and ability in the battle of the Moskova that he was made general of division, and by his coolness and energy in the disastrous retreat from Moscow saved the rearguard of the French army at the passage of the Wilna. In the campaign of 1813, in command of a division under Macdonald, he took part in the battles of Liitzen, Bautzen, Goldberg, and Leipsic, where he was dangerously wounded. After the battle of Bautzen he was created by Napoleon a count of the empire. In the campaign of France of 1814, in command of the army of reserves composed chiefly of recruits, he by his skilful manoeuvres powerfully assisted in securing the victories of Nogent, Nangis, and Montereau-sur-Yonne. After the first restoration he was named by Louis XVIII. grand cross of the legion of honour and chevalier of St Louis. On the return of Napoleon from Elba he was entrusted with the command of the army of the Moselle, and took part in the battle of Ligny. On the morning of the battle of Waterloo, being under the orders of Grouchy, who was marching towards Wavre, he strongly urged him to proceed in the direction whence they heard cannou firing, but his advice was not followed. Gérard retired to Brussels after the fall of Napoleon, and did not return to France till 1817. He was chosen a member of the chamber of deputies in 1822, and was re-elected in 1823 and 1827. He took part in the revolution of 1830, after which he was appointed minister of war and named a marshal of France. On account of his health he resigned the office of war minister in the October following, but in 1831 he took the command of the northern army, and was successful in thirteen days in driving the army of Holland out of Belgium. In 1832 he compelled the surrender of Antwerp, and in the same year he was raised to the peerage of France. He was again chosen war minister in July 1834, and again resigned that office in the October following. In 1835 he was uamed grand chancellor of the legion of honour, and in 1838 commander-general of the national guards of the Seine, an

office which he held till 1842. He became a senator under the empire in 1852, and died in April of the same year. GERARD, Francors, Baron (1770-1837), was born on May 4, 1770, at Rome, where his father occupied a post in the house of the French ambassador. At the age of twelve Gérard left Rome with his family for Paris, and there obtained admission into the Pension du Roi. From the Pension he passed to the studio of Pajou (sculptor), which he left at the end of two years for that of the painter Brenet, whom he quitted almost immediately to place him- self under David. In 1789 Gérard competed for the Prix de Rome, which was carried off by his comrade Girodet. In the following year (1790) he again presented himself, but the death of his father prevented the completion of his work, and obliged him to accompany his mother to Rome.

GERARD

In 1791 he returned to Paris; but his poverty was so great that he was forced to forego his studies in favour of employ- ment which should bring in immediate profit. David at once availed himself of his help, and one of that master's most celebrated portraits—Le Pelletier de St Fargean—is due to the hand of "le petit Gérard." This portrait was executed early in 1793, the ycar in which Gérard, at the request of David, was named a member of the revolutionary tribunal, from the fatal decisions of which he, however, invariably absented himself. In 1794 he obtained the first prize ina competition, the subject of which was " The Tenth of August," and, further stimulated by the successes of his rival and friend Girodet in the Salons of 1793 and 1794, Gérard (nobly aided by Isabey the miniaturist) produced in 1795 his famous '' Bélisaire." In 1796 a portrait of his generous friend (Louvre) obtained undisputed success, and the money received from Isabey for these two works en- abled Gérard to execute in 1797 his " Psyché et l'Amour." At last, in 1799, his portrait of Madame Bonaparte estab- lished his position as one of the first portrait painters of the day. In 1808 as many as eight, in 1810 no less than fourteen portraits by him, were exhibited at the Salon, and these figures afford only an indication of the enormous numbers which he executed yearly; all the leading figures of the empire and of the restoration, all the most celebrated men and women of Europe, sat to Gérard. This extraordi- nary vogue was due partly to the charm of his manner and conversation, for his salon was as much frequented as his

studio; Madame de Stael, Canning, Talleyrand, the duke of Wellington, have all borne witness to the attraction of his society. Rich and famous, Gérard was stung by remorse for earlier ambitions abandoned ; at intervals he had indeed striven to prove his strength with Girodet and other rivals, and his “ Bataille d’Austerlitz” (1810) showed a breadth of invention and style which are even more conspicuous in “T’Entrée d’Henri IV.” (Versailles),—the work with which in 1817 he did homage to the Bourbons. After this date Gérard declined, watching with impotent grief the progress of the Romantic school. Loaded with honours—baron of the empire, member of the Institute, officer of the legion of honour, first painter to the king—he worked on sad and discouraged ; the revolution of 1830 added to his disquiet ; and in 1837 on 11th January, after three days of fever, he died. By his portraits Gérard is best remembered ; the colour of his paintings has suffered, but his drawings show in uninjured delicacy the purity of his line ; and those of women are specially remarkable for a virginal simplicity and frankness of expression.

M. Ch. Lenormant published in 1846 Zssat de Biographie et de Critique sur Francois Gerard, a second edition of which appeared

in 1847; and M. Delécluze deveted several pages to the same subject in his work Louwts David, son école et son temps.

GERARD, Jean Icnace Istpore (1803-1847), a French caricaturist generally known by the pseudonym of Grand- ville—the professional name of his grandparents, who were actors—was born at Nancy, 13th September 1803 He received his first instruction in drawing from his father, a miniature painter, and at the age of twenty-one came to Paris, where he soon afterwards published a collection of lithographs ‘entitled Les tribulations de la petate propreété. He followed this by Les plaisirs de tout dge, and La sibylle des salons ; but the work which first established lis fame was Jfétamorphoses du jour, published in 1828, a series of 70 scenes in which individuals with the bodies of men and faces of animals are made to play a human comedy. These drawings are remarkable for the extraordinary skill with which human characteristics are represented in animal features, but they are liable to the objection of attempting to express by the pencil what

can be properly done only by the pen; while at the same time, in conquering difficulties

incident to his purpose, much ingenuity and labour has |

been wasted which might have been employed otherwise with better results. The success of this work led to his being engaged as artistic contributor to various periodicals such as La Silhouette, L' Artiste, La Caricature, Le Charivari; and his political caricatures, which were characterized by marvellous fertility of satirical humour, soon came to enjoy a general popularity which never diminished. Besides sup- plying illustrations for various standard works, such as the songs of Béranger, the fables of La Fontaine, Don Quixote, Gulliver's Travels, Robinson Crusoe, he also continued the issue of various lithographic collections, among which may be mentioned La wie privée et publique des animaux, Les cent proverbes, L'autre monde, and Les fleurs animées. Though the designs of Gérard are occasionally unnatural and absurd, they usually display keen analysis of character and marvellous inventive ingenuity, and his humour is always tempered and refined by delicacy of sentiment and a vein of sober thoughtfulness. He died of mental disease 17th March 1847.

A short notice of Gérard, under the name of Grandville, is con- tained in Theophile Gautier's Portraits Contemporains. See also Charles Blanc, Grandville, Paris, 1855,

GERARD, Joun (1545-1608), herbalist and surgeon, was born towards the end of 1545 at Nantwich in Cheshire. He was educated at Wisterson, or Willaston, 2 miles from Nantwich, and eventually, after spending some time in travelling, took up his'abode in London, where he exercised his profession. For more than twenty years he also acted as superintendent of the gardens of Lord Burghley, secre- tary of state to Queen Elizabeth. In 1596 he published a catalogue of plants cultivated in his own garden, 1039 in number, inclusive of varieties of the same species. Their English as well as their Latin names are given in a revised edition of the catalogue issued in 1599. In 1597 appeared Gerard's well-known /erball, described by him in its pre- face as "the first fruits of these mine own labours," but more truly

an adaptation of the Stirpium historic pemptades of Rembert Dodoens, published in 1583, or rather of a translation of the whole or part of the same by Dr Priest, with L'Obel's arrangement. Of the numerous illustrations of the erball sixteen appear to be original, the remainder are mostly impressions from the wood blocks employed by Jacob Theodorus (Tabernzemontanus) in his Jcones Stirpium, published at Frankfort in 1590. A second edition of the Herball, with considerable improvements and additions, was brought out by Thomas Johnson in 1633, and reprinted in 1636. Gerard was elected a member of the court of assist- ants of the barber-surgeons in 1595, by which company he was appointed an examiner in 1598, junior warden in 1605, and master in 1608. Hediedin February 1612, and was buried at St Andrews, Holborn.

See Johnson's preface to his edition of the Herball ; and A Cata- logue of Plants cultivated in the Garden of John Gerard in the years 1596-1599, edited with Notes, References to Gerard s Herball, the Addition of modern Names, and a Life of the Author, by Ben- jamin Daydon Jackson, F.L.S., privately printed, Lond., 1876, 4to.

GERARD DE NERVAL (1808-1855) is the adopted name of Gérard Labrunie, a French litterateur, and that by which he is generally known. The son of an officer in the army, and born at Paris, May 21, 1808, he received his early education chiefly from his father, who taught him German, and he afterwards studied at the college of Charlemagne. He made his literary début by the publication of a volume of political odes, and in 1828 he published a translation of Goethe's Faust, of which Goethe himself expressed high approval, and the choruses of which were afterwards made use of by Berlioz for his legend- symphony, The Damnation of Faust. Several other trans- lations from the German, contributed chiefly to the Jlercure de France, a nuniber of poetical pieces, and three comedies

combined to acquire for him, at the age of twenty-one, a considerable literary reputation, and led to his being associ- ated with Theophile Gautier in the preparation of the dramatic fewilleton for the Presse. On the death of Jennie Colon, an actress with whom he had contracted a Jiaison, he resigned his connexion with the Presse, and travelled in various parts of

Europe, leading a somewhat dissipated life. He contributed an account of his travels to the Revue des Deux Mondes and other periodicals. After his return to Paris in 1844 he resumed for a short time the feudlleton. From 1841 he was subject to periodical attacks of insanity, and he committed suicide by hanging, 25th January 1855. The literary style of Gérard is simple and unaffected, and he has a pecullar faculty of giving to his imaginative crea- tions an air of naturalness and reality. In a series of novelletes, afterwards published under the name of Les Illuminés ou les Precurseurs du Socialisme (1852), he gave a sort of analysis of the feelings which followed his third attack of insanity ; and among lis numerous other works the principal are Llégies nationales et Satires politiques, 1827 ; Scénes de la Vie Orientale, 2 vols., 1848-1850; Contes et Facéties, 1852; La Bohéme galante, 1856; and L' Alchimiste, a drama in five acts, the joint composition of Gérard and Alexander Dumas. His Wuvies complétes were published in 1868 in 5 volumes.

GERASA, the modern GERASH or JERASH, a city of Palestine, in the Decapolis of Persea, situated amid the mountains of Gilead, about 1757 feet above the level of the sea, at a distance of 20 miles from the Jordan and 21 miles to the north of Philadelphia. Of its origin nothing is known. Its name is never mentioned in the Old Testa- ment, and in the New Testament the only reference to its existence is the alternative reading of Gerasenes for Gadarenes in Matthew viii. 28. From Josephus we learn that it was captured by Alexander Janneeus, burned by the Jews in revenge for the massacre at Caesarea, and again plundered and depopulated by Annius the general of Vespasian ; but in spite of these disasters it was still in the 2d and 3d centuries of the Christian era one of the wealthiest and most flourishing cities of Palestine. As late as 1121 it gave employment to the soldiers of Baldwin II., who found it defended by a castle built by a king of Damascus ; but at the beginning of the following century the Arabian geographer Yakut speaks of it as deserted and overthrown. The ruins of Jerash, discovered by Seitzen about 1806 and since then frequently visited and described, still attest the splendour of the Roman city. They are distributed along both banks of the Kerwan, a brook which flows south through the Wady-ed-Dér to join the Zerka or Jabbok ; but all the principal buildings are situated on the level ground to the right of the stream. The town walls, which can still be traced and indeed are partly standing, had a circuit of not

more than 2 miles, and the main street was less than half a mile in Jength; but remains of build- ings skirt the road for fully a mile beyond the south gate, and show that the town had far outgrown the limit of its fortifications. The most striking feature of the ruins is the profusion of columns, no fewer than 230 being even now in position: the main street is a continuous colonnade, a large part of which is still entire, and it terminates to the south in a forum of similar formation. Among the public buildings still recognizable are a theatre capable of accom- modating 6000 spectators, a naumachia or circus for naval combats, and several temples, of which the largest was probably the grandest structure in the city, possessing a portico of Corinthian pillars 38 feet high. The desola- tion of the city is probably due to earthquake ; and the absence of Moslem erections or restorations would seem to show that the disaster took place before the Mahometan

period. : XK. — 56

GERBA or JerBa, German Dscherba, an island off the African coast in the Gulf of Gabes, belonging to the regency of Tunis. It is flat and well wooded with date palms, has an area of 425 square miles, and contains a population of 30,000. Most of the inhabitants are of Berber origin, though a certain proportion have adopted the Arabic language. About 5000 Jews live apart in villages of their own, and a number of European merchants are settled in the chief town of Haumt-es-Suk for the purposes of trade. The island has a considerable reputation for the manufac- ture of the woollen tissues interwoven with silk which are known as burnous stuffs; a market for the sale of sponges from the neighbouring seas is held from November till March; anda good trade is maintained in the export of dates and other fruits. Gerba is the Lothophagitis or Lotus- eaters' Island of the Greek and Roman geographers, and it may also be identified with the Brachion of Scylax. The modern name appears as early as the 3d century in Aurelius Victor, who, mentioning the births of the emperors Gallus Trebonianus and Volusianus his son, says—"Creati in insula Meninge, que nunc Girba dicitur." Meninge or Meninx was the name of one of the two ancient towns in the island, the other being Thoar. A castle erected by the Spaniards in 1284 at Haumt-es-

Suk still remains; but the pyramid built of the skulls of the Spaniards under Garcia, who perished in 1516, was removed in 1837.

See Barth, Wanderungen dureh die Kiistenl. des Mittelmeres ; and Maltzan, Revse in Tunis und T'ripolis, Leipsic, 1870.

GERBER, Ernst Lupwie (1746-1819), author of the well-known dictionary of musicians, was born at Sonders- hausen 29th September 1746. His father, Henry Nicolas Gerber (1702-1775), a pupil of J. S. Bach, was an organist and composer of some distinction, and under his direction Ernst Ludwig at an early age had made great progress in his musical studies. In 1765 he went to Leipsic with the view of studying law, but the claims of music, which had gained additional strength from his acquaintance- ship with J. A. Hiller, soon came to occupy alniost his sole attention. On his return to Sondershausen he was appointed music teacher to the children of the prince, and in 1775 he succeeded his father as court organist. Latterly he devoted much of his time to the study of the literature and history of music, and with this view he made hiniself master of several of the modern languages. His Wistorisch- biographisches Lexicon der Tonkiinstler appeared in 1790 and 1792 in two volumes; and the first volume of what was virtually an improved and corrected edition of this work was published in 1810 under the title Vewes historisch- biographisches Lexikon der Tonkiinstler, followed by other three volumes in 1812, 1813, and 1814. Gerber also con- tributed a number of papers to musical periodicals, and published several minor musical compositions. He died at Sondershausen 30th June 1819.

GERBERON, Gasrizet (1628-1711), a Jansenist monk, one of the most diligent students and prolific writers of his century, was born August 12, 1628, at St Calais, in the department of Sarthe. At the age of twenty he took the vows of the Benedictine order at St Melaine, Rennes, and after having taught rhetoric and philosophy in the monasteries of Bourgueil (Touraine) and St Denis, he became sub-prior at Compiégne, whence he was afterwards removed to St Germain-des-Pres. In the year 1669 he fully and finally committed himself in the Jansenist con-

troversy by the publication of his first work, which was an °

apology for the abbé Rupert of Tuits. In 1672 he was ordered to Argenteuil and in 1675 to Corbie; but having by this time aroused the most bitter hostility of the entire Jesuit order, he found it necessary to save himself by flight into the Low Countries, where he seems to have lived in various towns during the next twenty-eight years, and where

he published a great number of works, including the Histoire Générale du Jansenisme (1700), by which he is now best known. Arrested on the 30th of May 1703 at Brussels, at the instance of the archbishop of Malines, he was sent into France and condemned to imprisonment, from which he was not released till 1710, and even then only after he had consented to abjure the five Jansenist propositions. The first use he made of his freedom was to write a work (which, however, his friends prudently prevented him from publishing) Le vaine triomphe des Jeswites, containing a virtual withdrawal of the compulsory recantation. He died at the abbey of St Denis on the 29th of March 1711. A full list of his works is given in the Biographie Générale.

GERBERT. See Sitvester II.

GERBERT, Martin (1720-1793), a Catholic prelate and writer on church music, was a descendant of the Ger- berts of Hornau, and was born at Horb on the Neckar, Wiir- temberg, 12th August 1720. He received his education at the Jewish school of Freiburg in the Breisgau, at Klingenau in Switzerland, and at the monastery of St Blaise in the Black Forest. He joined the order of the Benedictines in the monastery of St Blaise in 1736, became priest in 1744, was soon thereafter appointed professor of theology, and was chosen abbot in 1764. From 1759 to 1762 he travelled in Germany, Italy, and France, chiefly with the view of obtaining access to the old collections of musical literature contained in the libraries of the monasteries. In 1774 he published two volumes De cantu et musica sacra; in 1777, Monumenta veteris liturgice Alemannice; and in 1784, in three volumes, Scriptores ecclesiastict de musica sacra, a collection of the principal writers on church music from the 3d century till the invention of printing. Although this work contains many textual errors, its publication has never- theless been of very great importance for the history of music, by preserving writings which otherwise might either have perished or remained

unknown. He isalso the author of Codex epistolaris Rudolphi 1., 1772, and Historia Nigre St’ve, Cologne, 1783-1788. His interest in music led to his acquaintance with tlie composer Gluck, who became his intimate friend. He died 3d May 1793.

GERHARD, Frreprich WitHEetm Epuarp (1795- 1867), a distinguished German archeologist, was born at Posen, 29th November 1795. After studying at Breslau and Berlin, he in 1816 took up his residence at the former town. The reputation he acquired by his Lecteones Apol- loniane, published in the same year, led soon afterwards to his being appointed professor at the gymnasium of Posen. On resigning that office in 1819, on account of weakness in the eyes, he travelled in Italy, and in 1822 he took up his residence in Rome, where, with the view of prosecuting his archeological studies, he remained for fifteen years. He there contributed to Platner’s Beschreibung der Stadt Rom, then under the direction of Bunsen, and he was also one of the principal originators of the Instituto di corrispondenza archeologica, founded at Rome in 1828, and during his stay in Italy its director. After his return to Germany in 1837, he was appointed archeologist at the Royal Museum of Berlin, and in 1844 he was chosen a member of the Academy of Sciences, avd a professor in the university. He died at Berlin 12th May 1867.

Besides a large number of archzological papers in periodicals, in the Annali of the Institute of Rome, and in the Transactions of the Berlin Academy, and several illustrated catalogues of Greek, Roman, and other antiquities in the Berlin, Naples, and Vatican Museums, Gerhard is the author of the following works :—Antike Bildwerke, Stuttg., 1827-44 ; Auserlesene gricch. Vasenbilder, 1839-58 ; Htrus- kisehe Spiegel, 1889-65 ; Hyperboreiseh-rim. Studien, vol. i., 1838 ; vol. ii., 1852; Prodromus mytholog. Kunsterklérung, Stuttgart and Tiibingen, 1828; and Griech. Mythologie, 1854-55. His Gesam- melte akademische Abhandlungen und kleine Schriften were pub- lished posthumously in 2 vols., Berlin, 1867.

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GERHARD, Jowann (1582-1637), one of the ablest and most learned exponents of Lutheran orthodoxy, was born of a good middle-class family in Quedlinburg, 17th October 1582. In his fifteenth year, during a dangerous illness, he came under the personal influence of Johann Arndt, author of Das Wahre Christenthum, and resolved to study for the churcli. Soon after entering the university of Wittenberg, however, in 1599, he began to waver iu this determination, and ultimately gave himself for two years to the study of medicine, but in 1603 resumed his theologi- eal reading at Jena, and in the following year received a new impulse from Winkelmann and Mentzer at Marburg. ITaving graduated and begun to give lectures at Jena in 1605, he in 1606 received and accepted tle duke of Coburg's invitation to the superintendency of Heldburg and muastership of the gymnasium ; soon afterwards he became general superintendent of the duchy, in which capacity he was much and usefully engaged in the practical work of ecclesiastical organization until 1616, when he found a more congenial sphere in the senior tlieological chair at Jena, where the remainder of his life was spent. Though still comparatively young, Gerhard had already come to be re- garded as the greatest living theologian of Protestant Germany ; in the numerous " disputations" which charac- terized that period he was always protagonist, while on all public and domestic questious touching on religion or morals his advice was eagerly sought on all hands and by every class. It is recorded that during the course of his lifetime lie had received repeated calls to almost every university in Germany, as well as to Upsala inSweden. He died on the 20th August 1637. Personally he is said to lave exhibited a rare combination of all the best elements of the Christian character; the only failing imputed to him by any one decidedly leans to virtue's side—an excessive love of peace.

His writings are very numerous, alike in exegetical, polemical, dogmatic, and practical theology. To the first category belong the Commentarius in harmoniam historic evangelicee de passione Christi (1617), the Comment. super priorem D. Petri Epistolam (1641), and also his commentaries on Genesis (1637) and on Deuteronomy (1658). Of a controversial character are the Con- Jessio Catholica (1634-68), an extensive work which secks to prove the evangelical and catholic character of the doctrine of the Augs- burg Confession from the writings of approved Roman Catholic authors; and the Loez theologici (1629), his principal contribution to science, in

which Lutheranism is expounded ‘‘ nervose, solide, et copiose,” in fact with a fulness of learning, a force of logic, and nu minuteness of detail that had never before been approached. The Meditationes sacrw (1621), a work expressly devoted to the uses of Christian edification, has been frequently reprinted in Latin and has been translated into most of the European languages, including Greek. The English translation by R. Winterton (1631) has passed through at least nineteen editions. There is also an edition by W. Papillon in English blank verse (1801). A Vita Joh. Gerhardi was published by E. R. Fischer in 1728.

GERHARDT, Cuartes Frepreric, was born at Stras- burg, August 21, 1816, and died there August 19, 1856. After his school years spent at home and in Carlsruhe, wliere his taste for chemistry was awakened, he was sent to Leipsic to learn business, but he attended Erdmann’s lectures on chemistry as well. Returning home he very soon found that a commercial life was not to his taste, so, after a sharp dispute with a disappointed father, he enlisted in a cavalry regiment. In a few mouths a military career also became intolerable, and, being bought off by a friend, he went to Giessen to study under Liebig. There he remained eighteen months; displaying such entire devotion to chemistry that he found himself unable to obtain the customary degree. He again thought of enter- ing trade, but Liebig persuaded him to go to Paris, where he arrived in 1838. His good appearance and address recommended him to Dumas and other chemists, and in a short time along with Cahours, who became his intimate friend, he published an important memoir on essential oils, distinguished especially by the new views it contained. He

soon after left Paris and went to Montpellier, where he was professor in the faculty of science till 1848. He then returned to Paris and opened a school for chemistry, which, however, was not commercially a success. From 1848 to 1855 le resided at Paris, and it was during this time that he published the memoirs and carried on the controversies which have been of such importance in the development of scientific chemistry. In 1855 he was appointed pro- fessor at Strasburg, his native place; but he had held the office for but a short time when he died, after two days’ illness. Gerhardt’s

contributions to chemistry are less discoveries of new facts, than of new ideas which organ- ized and vitalized an inert accumulation of facts. He developed the notion of types of structure and reaction; he discovered the order of organic compounds, which led him to the doctrine of homologous and other series ; and on theoretical grounds he remodelled the whole character of the combining weights upon the two-volume molecular basis. The bare statement, however, of his results gives no idea of the lucidity, the wealth of thought, the grasp of the entire subject which his memoirs and his longer works dis- play. It was by his writings especially that Gerhardt's influence was felt. Although a thorough enthusiast in his subject, clear in his exposition, earnest in his work, weiglity in his delivery, he seems to have wanted the qualities of a successful teacher. Nothing is heard of his lectures, or of his influence as a professor,—such influence as drew students round Liebig and other great masters. None the less, however, did he stir the thoughts of other chemists to the very depths; and although the unitary system has had its day, yet, in substance at least, if no longer in name, chemistry is still Gerhardt's, and it is not impossible that chemists may return to some of his views which at present are not acceptable.

GERHARDT, Paut (c. 1606-1676), the greatest hymn- writer of Germany, if not indeed of Europe, was born of a good middle-class family at Grifenhainichen, a small town on the railway between Halle and Wittenberg, in 1606 or 1607,—some authorities, indeed, give the date March 12, 1607, but neither the year nor the day is accurately known. His education appears to have been retarded by the troubles of the period, the Thirty Years' War having begun about the time he reached his twelfth year. After completing his studies for the church he is known to have lived for some years at Berlin as tutor in the family of an advocate named Berthold, whose daughter he subsequently married, on receiving his first ecclesiastical appointment at Mittelwald (a small town in the neighbourhood of Berlin) in 1651. In 1657 he accepted an invitation as '"diaconus" to the Nicolaikirche of Berlin ; but, in consequence of his uncom- promising Lutheranism in refusing to accept the elector Frederick William's " syncretistic" edict of 1664, he was deprived in 1666. Though absolved from submission and restored to office early in the following year, on the petition of the citizens, his conscience did not allow him to retain a post which, as it appeared to him, could only be held on condition of at least

a tacit repudiation of the Formula Concordiz, and for upwards of a year he lived in Berlin without fixed employment. In 1668 he was appointed archdeacon of Liibben in the duchy of Saxe-Merseburg, where, after a somewhat sombre ministry of eight years, he died on the 7th of June 1676. Many of his best known hymns were originally published in various church hymn- books, as for example in that for Brandenburg which appeared in 1658; others first saw the light in Johann Criiger's Getstliche Kirchenmelodien (1649) and Praxis Pretatis Melica (1656). The first complete set of them is the Greistliche Andachten, published in 1666-67 by Ebeling, music director in Berlin. No hymn by Gerhardt of a later date than 1667 is known to exist.

The life of Gerhardt has been written by Roth (1829), by Lang- becker (1841), by Schultz (1842), by Wildenhahn (1845), and by Bachmann (1863); also by Kraft in Erseh un. Gruber's Alig. Encycl. (1855). The best modern edition of the hymns, published by Wackcrnagel in 1848, has often been reprinted. There is an Eng- lish translation by Kelly (Paul Gerhardt's Spiritual Songs, 1867).

GERICAULT, Jzan Louis AnpRé Tatopore (1791- 1824), French painter, led the inevitable reaction which set in under the empire against the fixed and strictly limited aims of the school of David. He was born at Rouen in 1791. In 1808 he entered the studio of Charles Vernet, from which, in 1810, he passed to that of Guérin, whom he drove to despair by his passion for Rubens, and by the

unorthodox manner in which he persisted in interpreting | nature. At the Salon of 1812 Géricault attracted attention |

by his " Officier de Chasseurs & Cheval" (Louvre), a work

in which he personified the cavalry in its hour of triumph, |

and turned to account the solid training received from Guérin in rendering a picturesque point of view which was in itself a protest against the cherished convictions of the pseudo-classical school. Two years later (1814) he re-exhibited this work accompanied with the reverse picture “Cuirassier blessé” (Louvre), and in both subjects called attention to the interest of contemporary aspects of life, treated neglected types of living form, aud exhibited that mastery of and delight in the horse which was a feature of his character. Disconcerted by the tempest of contradictory opinion which arose over these two pic- tures, Géricault gave way to his enthusiasm for horses and soldiers, and enrolled himself in the mousquetazres. During the Hundred Days he followed the king to Bethune, but, on his regiment being disbanded, eagerly returned to his profession, left France for Italy in 1816, and at Rome nobly illustrated his favourite animal by his great painting “ Course des Chevaux Libres.” Return- ing to Paris, Géricault exhibited at the Salon of 1819 the ‘“‘Radeau de la Méduse” (Louvre), a subject which not only enabled him to prove his zealous aud scientific study of the human form, but contained those elements of the hervic and pathetic, as existing in situations of modern life, to which he had appealed in his earliest productions. Easily depressed or elated, Géricault took to heart the hostility which this work excited, and passed nearly two years in

London, where the “ Radeau” was exhibited with success, |

and where he executed many series of admirable lithographs now rare. At the close of 1822 he wasagain in Paris, and produced a great quantity of projects for vast compositions, models in wax, and a horse écorché, as preliminary to the production of an equestrian statue. His health was now completely undermined by various kinds of excess, aa on 26th January 1824 he died at the age of thirty- tiiree.

necessary to the task of reconstruction. Had he steadied himself and survived the abuse of his powers, he might

have played an important part in determining the course of |

the modern school, for, though no colourist, le was in other respects richly endowed, and was possessed by a rare energy which redeemed even that tendency to undue emphasis which gives a theatrical character to much of the best French work, Géricault's biography, accompanied by a catalogue Od of his works, was published by M. C. Clément in

GERIZIM (OI, "the desert hill," or, according to others, "the hill of the Gerizzites"!), the third highest mountain of Samaria," is situated at the western extremity

1 See 1 Sam. xxvii. 8 (Keri.)

2 Josephus (Ané., xi. 8, 2) calls it the highest, but his assertion has been disproved by recent accurate measurement. According to Furrer, Tell 'Azur, Ebal, and Gerizim are 3566, 3375, and 3179 feet respectively above the level of the Mediterranean.

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| time of Justinian.

That which he left us is effective only as a protest ; | his work, like his life, lacked the fixity of conscious purpose |

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of the fertile plain of Mochna, and with Mount Ebal, which lies immediately to the north, forms a narrow valley in which lies the ancient town of Sichem or Shechem. Asseen from this point Gerizim is distinguished from its tamer ueighbour by the boldness of its crags, the richness of its verdure, and the number of its springs. Its southern slope however is much gentler than its northern, and both are almost bare of trees. On the summit stands at present a small Mahometan chapel, and there are besides numerous traces of a fortress and church possibly dating from the But the spot regarded by the Samaritans as the holiest upon earth is a small level plateau situated somewhat to the south of this. Here it is believed stood the temple built by Manasseh, the son of the Jewish high priest in the days of Nehemiah,? and destroyed by Jolin Hyrcanus 300 years afterwards

(Jos., Ant., xiii. 9. 1). According to the Samaritans and some modern writers, Gerizim was the scene of the incidents recorded in Genesis xxii. 9-13. Probably as being the hill on the right hand of the spectator who, standing in the valley of Shechem, looks to the sun rising, it was also the hill on which, according to Josh, vill. 33, 34 (comp. Deut. xi. 29, 30, and xxvii. 12-26), after the conquest of Ai, the tribes of Simeon, Levi, Judah, Issachar, Joseph, and Benjamin stood to pronounce the blessings connected with a faithful observance of the law, while the remaining tribes from mount Ebal confirmed the curses attached to specified violations of the divine com- mands. According to Eusebius and Jerome indeed, the Ebal and Gerizim described in Deut. xi. 30 were not the mountains now known by that name, but two smaller hills in the neighbourhood of Jericho. This view, however, may now be regarded as universaliy abandoned (see Stanley, Sinai and Palestine, p. 236, note).

GERMAN CATHOLICS (DeutscHKaTHOLIKEN), the name assumed in Germany towards the close of the year 1844 by certain disseutients from the church of Rome. The most prominent leader of the German Catholic movement was Johann Ronge, a Roman Catholic priest, who in Octo- ber 1844 made a vigorous attack upon Arnoldi, bishop of Treves, for having made a relic, which he alleged to be the holy seamless coat of Christ, an object of pilgrimage and adoration. On Ronge’s excommunication on this acconnt, by the chapter of Breslau in December 1844, he received a large amount of public sympathy, and a dissenting con- gregation was almost immediately formed at Breslau with a very simple creed, in which the chief articles were belief in God the Father, creator and ruler of the universe; in Jesus Christ the Saviour, who delivers from the bondage of sin by his life, doctrine, and death; in the operation of the Holy Ghost; in a holy, universal, Christian church ; in forgiveness of sins and the life everlasting. Within a very few weeks similar communities had been formed at Leipsic, Dresden, Berlin, Offenbach, Worms, Wiesbaden, and elsewhere; and at a “council” convened at Leipsic in March 1845, twenty-seven congregations were represented by delegates, of whom however only two or at most three were in clerical orders. Almost contemporaneously with the commencement of the agitation led by Ronge, another movement fundamentally distinct, though in some respects similar, had been originated at Schneidemiihl, Posen, under the guidance of Johann Czerski, also a priest, who had come

into collision with the church authorities on the then much discussed question of mixed marriages, and also on that of the celibacy of the clergy. The result had been his suspension from office in March 1844; his public withdrawal, along with twenty-four adherents, from the Roman communion in August; his excommunication im-

3 In the days of Alexander the Great, according to Josephus (Ant., xi, 8, 2); but there are good reasons for believing this to be inexact. See Neh. xiii. 28, and compare Bertheau on the passage

mediately thereafter ; and the formation, in October, of a “Catholic Apostolic Christian” congregation which, while rejecting various practices of the Roman Church, retained the Nicene theology and the doctrine of the seven sacraments, Czerski had been at some of the sittings of the “German Catholic” council of Leipsic; but when a formula somewhat similar to that of Breslau had been adopted, he refused to adhibit his signature because the divinity of Christ had been ignored, and he and his congregation continued to retain by preference the name of “Catholic Apostolic Christians ” which they had originally assumed. Of the German Catholic congregations which had been represented at Leipsic some manifested a preference for the fuller and more positive creed of Schneidemiihl, but a great majority continued to accept the comparatively negative theology of the Breslau school. The number of these increased with considerable rapidity, until in June 1846 in Silesia alone the members of the German Catholiccommunion were reckoned by thousands, while the congregations scattered ever Germany amounted in all to 173. In Austria, however, and ultimately also in Bavaria, the use of the name German Catholics was offici- ally prohibited, that of “ Dissidents” being substituted, while in Prussia the adherents of the new creed were laid under various disabilities ; these and other circumstances, among which the frequent occurrence of internal dissensions was perhaps the gravest, conspired to check at an early stage the prosperous career of a movement which in its begin- nings had been looked upon by many intelligent observers with considerable hopefulness. In 1859 some of the German Catholics entered into a union with the “Free Congregations,” when the united body took the title of “The Religious Society of Free

Congregations.” Before that time many of the congregations which were formed in 1844 and the years immediately following had been dissolved, includ. ing that of Schneidemiihl itself, which ceased to exist in 1857. No very recent statistics of a trustworthy kind as to the numeircal strength of the German Catholics are accessible. Their total in Prussia was 6395 in 1861, and 10,920 in 1867, while in Saxony they numbered 1772 in 1849, and 3015 in1871. Atan early stage the movement attracted the attention of Gervinus, the eminent historian and critic, who in 1846 published a pamphlet entitled Die Mission des Deutschkatholicismus, to which, as well as to Kampe’s treatise Das Wesen des Deutschkatholicismus, reference may be made. See also the article by Schmid in Herzog’s Realencyclopidie (1878).

GERMANTCUS, Casar, a distinguished Roman general and provincial governor in the reign of Tiberius, was born 15 Bc., and died 19 a.p, His name Germanicus, the only one by which he is known in history, he inherited from his father Claudius Drusus Nero, the stepson of Augustus, and the most famous of his generals. His mother was the younger Antonia, the daughter of Marcus Antonius and niece of Augustus, and he married Agrip- pina the grand-daughter of the same emperor. It was natural that a prince so intimately allied both by birth and connexion with the reigning family should be regarded as a candidate for the purple Augustus, it would seem, long hesitated whether he should name him as his successor, and as a compromise required Tiberius to adopt him, though Tiberius had a son of his own. When his uncle succeeded to the throne, Germanicus was the only rival that he feared; and the emperor’s jealousy and suspicion of him not only cut short his career of conquest but embittered the last years of his life, and precipitated, if it did not indirectly cause, his unhappy and premature end.

For the facts of his life our chief and, except a brief notice in Suetonius, almost our sole authority is Tacitus. Germanicus forms the central figure of the first two books

of the Anzals, and in the minute and graphic record of his campaigns, the unravelling of the court intrigues to which he was subject, and the pathetic

description of his last hours and of the outburst of grief and indignation which followed the news of his death, the historian has put forth all his powers. Buta modern biographer, though compelled to trust to Tacitus for his materials, may yet be allowed to put upon them his own construction, to make allowance for the glamour which surrounded an amiable and ill-starred prince, and to discount the exaggerations of a master of rhetoric who has set his favourite hero in a blaze of light in order to deepen the shadows of his masterpiece Tiberius, the darkest and saddest portrait in all history. The following article will consist of a brief abstract of the life as related by Tacitus, and an estimate of the character as it presents itself to us in the foregoing records.

Of the early years and education of Germanicus little is known. ‘That he possessed considerable literary abilities, and that these were carefully trained, we gather, not only from the speeches which Tacitus puts into his mouth, but from the reputation he left as an orator, as attested by Suetonius and Ovid, and from the frag- ments of his works which have survived. At the age of twenty he served his apprenticeship in the art of war under his uncle Tiberius, and was rewarded with the triumphal insignia for his services in crushing the revolt in Dalmatia and Pannonia. In 12 a.p. he was made consul, though he had neither attained the legal age nor passed through the grades of pretor and edile. Soon afterwards he was appointed by Augustus to the important command of the eight legions on the Rhine. The news of the emperor’s death found Germanicus at Lugdunum, where he was super- intending the census of Gaul. Close upon this came the report that a mutiny had broken out among his legions on the lower Rhine. Germanicus hurried back to the camp, which was now in open insurrection. The tumult was with difficulty quelled, partly by well-timed concessions for which the authority of the emperor was forged, but mostly by the help of his personal popularity with the troops. Some of the insurgents actually proposed that he should put himself at their head and secure for himself the empire, but their offer was rejected with righteous horror. In order to calm the excitement and prevent further disaffection, Germanicus determined at once on an active campaign. Crossing the Rhine at the head of 12,000 legionaries and an equal number of allied troops, he attacked and routed the Marsi, and laid waste the valley of the Ems. In the following year he marched against Arminius, the couqueror of Varus, and reached the fatal battlefield in the

Teutoburg Forest. The bones of the Roman soldiers still lay bleaching on the ground near the altars where their tribunes had been im- molated, and the gibbets where the prisoners had been hanged. Having performed the last rites and erected a barrow to mark the spot, he led his army on, breathing vengeance against the foe, Arminius, however, favoured by the marshy ground, was able to hold his own, and it required another campaign before he was finally defeated. A masterly combined movement by land and water enabled Germanicus to concentrate his forces against the main body of the Germans encamped on the Weser, and to crush them in two obstinately contested battles. A monument erected on the field proclaimed that the army of Tiberius had con- quered every tribe between the Rhine and the Elbe. Great as the success of the Roman arms had been, it was not such as to justify this boastful inscription. We read of renewed attacks from the barbarians, and plans of a fourth campaign for the next summer.

But no more victories were in store for Germanicus. His success had already stirred the jealousy and fears of Tiberius,

and he was reluctantly compelled to obey the imperial sum-

mons and repair to Rome. The magnificence of a triumph and the idle honours of a consulship had little attraction for a general in mid-career of conquest, and a man of singularly simple habits and no political ambition. The enthusiasm with which he was welcomed, not only by the populace, which went in crowds to meet him as far as the tweutieth milestone, but by the emperor’s own pretorians, warned Tiberius that it might be equally dangerous to keep so popular a favourite at Rome, aud the earliest pretext was seized to remove him from the capital. The recent death of Archelaus, king of Cappadocia, anda disputed succession in Parthia and Armenia, afforded a sufficient plea for Roman interference ; and, a few months after his return, Germanicus was despatched to the East with extraordinary powers, and started on his mission without waiting to enter onhis consulship. At the same time Tiberius took thefurther precaution of superseding Silanus, a connexion of Germani- cus, in the government of Syria, and appointing in his stead one of the most violent and ainbitious of the old nobility, Cneius Calpurnius Piso, in order to watch his nephew’s

movements, and if necessary to check his ambition. Germanicus proceeded by easy stages to his province, halt- ing on his way in Dalmatia, where he conferred with Drusus, his brother by adoption, and visiting the battlefield of Actium, Athens, Ilium, and other places of historic interest. At Rhodes he met for the first time his coadjutor Piso, who had followed in his wake, and was seeking everywhere to thwart his policy and asperse his character. When at last he reached his destination, he found little difficulty in effect- ing the settlement of the disturbed provinces, notwith- standing the violent and persistent opposition of Piso. At Artaxata Zeno, the popular candidate for the throne, was crowned king of Armenia; to the provinces of Cappadocia and Commagena Roman governors were assigned; and Parthia was conciliated by the banishment of the dethroned king Vonones. After winteriug in Syria Germanicus started next year for a tour in Egypt. The chief motive for his journey was love of travel and antiquarian study, and it seems never to have occurred to him, till he was warned by Tiberius, that he was thereby transgressing an unwritten law of the empire forbidding any Roman of rank to set foot in Egypt without express permission. On his return to Syria he found that all his arrangements had been upset by Piso. Violent recriminations followed, the result of which, it would seem, was a promise ou the part of Piso to quit the province. But at this juncture Germanicus fell ill. Piso deferred his departure, and, when at length compelled to start, lingered in the neighbourhood of Syria, receiving with open exultation the bulletins which told of the prince’s rapid decline. Germanicus on his side was fully convinced that he had fallen a victim to the arts of his uuscrupulous enemy. He knew that he was dying, and believed that he was dying of poison. Even his gentle nature was stung to madness at the thought, and with his dying words he called on his friends and family to denounce his murderer and avenge his death. Whetlier these suspicions were true must remain an open question, yet the arguments in favour of a death from natural causes seem to preponderate. It is true that Piso desired his death, and, from what we know of their characters, neither he nor his wife Plancina were likely to stick at any means for procuring it. But a poisoner does not generally let his wishes be publicly known, nor show his exultation when they are attained. The evidence from the appearance of the corpse is still more uncertain. Suetonius indeed avouches that there were livid marks all over the body and foam at the mouth ; but he adds asa further proof of poison that on the funeral pyre the heart remained

unconsumed, which clearly shows that he was only retailing the vulgar gossip. Tacitus, though inclined to believe the worst of Piso, allows that the

report of the symptoms varied with the prepossession of the observers. .

The sad tidings of his death cast a gloom over the whole Roman empire. To the provincials he had endeared lim- self by his simple manners, his affability, his generosity, his justice. The legions mourned their comrade who had always stood their friend at need, their general who had never known a defeat. At Rome there was a universal outburst of sorrow and indignation. The natural grief at the loss of a favourite prince was aggravated by the sus- picion of foul play, and by hatred of the emperor who was at least guilty of recklessly exposing him to danger, and who now sullenly refused to join the general mourning. Men recalled the forboding words which had been whispered at his departure, ‘Whom the plebs love, die young.” Nor was he unworthy of this passionate devotion. He had wiped out a great national disgrace; he had quelled their most formidable foe; he had pacified distant provinces; and in his high estate he had so borne himself that all save one man had loved and honoured him. His private life had been stainless, and he possessed in a singular degree thie gift of personal attractiveness. And yet an impartial bio- grapher must add that for his fair fame his death was opportune. There were elements of weakness in his character which his short life only half revealed : an almost feminine impetuousness which made him twice threaten to take his own life ; a superstitious vein which impelled him to consult oracles and shrink from bad omens; an amiable dilettantism which led him to travel in Egypt while his enemy was plotting his ruin; a want of nerve and resolution which prevented him from coming to an open rupture with Piso till it was too late. His very virtues, his elegant taste, his chivalrous sense of honour, his unsuspecting openness and candour, unfitted him for the stern times in which he lived. He was as little fitted to play the part of Augustus as that of Alexander, to whom Tacitus fondly compares him; and had he lived to succeed to the purple the historian might have been compelled to pronounce

on him the epitaph of Galba, that all would have thought him fit to reign if he had not reigned. (F. 8.)

GERMAN SILVER, or Nicket Sitver, known also under the names of White Copper aud Packfong, is an alloy of copper, nickel, and zinc, prepared either by melting the copper and nickel together in a crucible, and adding piece by piece the previously heated zinc, or by heating the finely divided metals under a layer of charcoal, by means of an air furnace of strong draught, and promoting the thorough solution of the nickel by stirring. To destroy its crystalline structure, and so render it fit for working, it is heated to dull redness, and then allowed to cool. German silver is harder than silver; it resembles that metal in colour, but is of a greyer tinge. Exposed to the air it tarnishes slightly yellow, and with vinegar affords a crust of verdigris. At a bright red heat it melts, and with access of the atmo- sphere loses its zinc by oxidation. At a heat above dull redness it becomes exceedingly brittle. German silver is much used in the arts. For the manufacture of imitation silver for knives and forks its composition is—nickel and zinc of each 2 parts, and copper 4 parts; for handles of spoons and forks the proportion of copper in this formula is increased by 1. For rolling, the most suitable alloy is copper 3 parts, zinc 1, nickel 1. Candlesticks, bells, spurs, and otlier cast articles are made of a German silver contain- ing 2 or 3 per cent. of lead. The addition of 2 to 24 per cent. of iron, which must first be melted with part of the copper, makes an alloy which is whiter, but also more brittle and harder than ordinary German silver.

See Coppsr, vol. vi. p. 351, and Watts, Dict. of Chem. ii. p. 51. On the electrical conductive capacity of German silver, see KLEC- TRICITY, Vol. viii. p. 53.

GERMANY

PART I—GEOGRAPHY AND STATISTICS.

oo occupies the greater portion of central

Europe, and has but few lines of natural boundary. If by the designation Germany is meant the territory in- habited by Germans, this is considerably larger than the German empire constituted in 1871, the former having an area of about 340,000, and the latter of 208,000 English square miles. The present German empire extends from 47° 16’ to 55° 53’ N. lat., and from 5° 52’ to 22° 52’ & long. The eastern provinces project so far that the extent of the German territory is much greater from S.W. to N.E. than in any other direction. Tilsit is 815 miles from Metz, whereas Hadersleben, in Schleswig, is only 540 miles from the Lake of Constance. The difference in time between the eastern and western points is 1 hour and 8 minutes. The empire is bounded on the S.W. and S. by Austria and Switzerland (for 1170 miles), on the S.W. by France (275 miles), on the W. by Luxembourg, Belgium, and Holland (together 512 miles). The length of German coast on the North Sea or German Ocean is 300 miles, and on the Baltic 830 nuiles, the intervening land boundary on the north of Schleswig being only 53 miles. The eastern boundary is Russia (725 miles).

The total area of the empire, including rivers and lakes but not the “haffs” or lagoons on the Baltic, is 208,427 English square miles,! which is about the 18th part of Europe, the 250th part of the whole dry land, and the 853d part of the whole surface of the globe.

PHyYsicaAt FEATURES,

Coast and Islands.—The length of the coast-line is scarcely the third part of the whole frontier, so that the Germans must be regarded as less a maritime than an in- land people. Unlike the eastern states of Europe, the German empire has not only an inland sea-shore, but is also in direct communication with the great oceans by means of the North Sea. The coasts of Germany are shallow, and deficient in natural ports, except on the east of Schleswig-Holstein, where wide bays encroach upon the land, giving acccss to the largest vessels, so that a great harbour for men-of-war has been constructed at Kiel. With the ex- ception of those on the east coast of Schleswig-Holstein, all

the important trading ports of Germany are river ports, such |

as Emden, Bremen, Hamburg, Liibeck, Stettin, Dantzic, Konigsberg, Memel. A great difference, however, is to be re- marked between the coasts of the North Sea and those of the Baltic. On the former, where the sea has broken up the ranges of dunes formed in bygone times, and divided them into separate islands, the mainland has to be protected by massive dikes, while the Frisian Islands are being gradu- ally washed away by the waters. On the coast of East Friesland there are now only seven of these islands, of which Norderney, a bathing-place, is best known, while of the North Frisian Islands, on the western coast of Schleswig, Sylt is the most considerable. Besides the ordinary waste of the shores, there have been extensive inundations by the sea within the historic period, the gulf of the Dollart having been go caused in the year 1276. Sands surround the whole coast of the North Sea to such an extcnt that the entrance to the ports is not practicable without the aid of pilots. Heligoland, which has belonged to England since 1814, isa rocky island, but it also has been

1 1 English square mile =2-5898945 square kilometres, or 0°0470352

German Square mile; 1 German square mile = 21:26067 English square miles ; 1 sq. kilometre = 0°386]161 English square mile.

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considerably reduced by the sea. The tides rise to the height of 12 or 13 feet in the Jahde Bay and at Bremerhafen, and 6 or 7 feet at Hamburg. The coast of the Baltic on the other hand possesses few islands, the chief being Alsen and Fehmern off the coast of Schleswig-Holstein, and Riigen off Pomerania. It has no extensive sands, though on the whole very flat. The Baltic has no perceptible tides ; and a great part of its coast-line is in winter covered with ice, which also so blocks up the harbours that navigation is interrupted for several months every year. Its three haffs fronting the mouths of the large rivers must be regarded as lagoons or extensions of the river beds, not as bays. The Oder Haff is separated from the sea by two islands, so that the river flows out by three mouths, the middle one ine) being the most considerable. The Frische Haff is formed by the Nogat, a branch of the Vistula, and by the Pregel, and communicates with the sea by

means of the Pillau Tief. The Kurische Haff receives the Memel, called Niemen in Russia, and has its outlet in the extreme north at Memel. Long narrow alluvial strips called Nehrungen, lie between the last two haffs and the Baltic. The Baltic coast is further marked by large indentations, the Gulf of Liibeck, that of Pome- rania, cast of Riigen, and the semicircular Bay of Dantzic between the promontories of Rixhéft and Briisterort. The German coasts are now well provided with lighthouses. Surface and Geology.—In respect of physical structure Germany is divided into two entirely distinct portions, which bear to one another a ratio of about 3 to 4. The northern and larger part may be described as a uniform plain, covered generally by very recent deposits, but with small areas of Tertiary and Secondary formations pro- truding here and there. South and Central Germany, on the other hand, is very much diversified in scenery and in geological structure. It possesses large plateaus, such as that of Bavaria, which stretches away from the foot of the Alps, fertile low plains like that intersected by the Rhine, mountain chains, and isolated groups of mountains, comparatively low in height, and so situated as not seriously to interfere with communication either by road or by railway. Its geological structure corresponds to this diversity of surface. The most ancient rocks of Germany are the gneisses, schists, and granites which form the Bohemian and Bavarian plateau, and extend

| into Saxony. Another isolated mass of similar rocks

rising into the heights of the Vosges and Black Forest has been cut through by the valley of the Rhine. Silurian rocks are but scantily developed in Germany. The Devonian system, however, occupies an extensive area, since it forms the high tableland of the Taunus, Hundsruck, and Eifel, which ranges westward into Belgium. Carboni- ferous rocks with productive coal-fields cover isolated areas, chiefly in north-western Germany, particularly in West- phalia, at Saarbriick, in Saxony, and in Upper and Lower Silesia (see Coat). Between the Devonian uplands of the Taunus and the crystalline rocks of Bavaria a vast area of western Germany is occupied by the Triassic system, which ranges from Hanover to Basel and from near Metz to Baireuth. The southern half of this vast Triassic basin is bordered by a belt of overlying Jurassic rocks which skirt the Danubian plain in Wiirtemburg and Bavaria. Cretaceous rocks occur chiefly in north Germany in seattered patches flanking older formations. They evi- dently underlie the great plain,

since they are found rising up here and there to the surface between Westphalia and

Denmark. Older Tertiary formations are absent from Germany, save the portion of the Eocene Alps included within the territory of Bavaria. But Miocene deposits extend into numerous detached basins, including those of the Rhine below Bonn, and at Mainz, the country round Magdeburg, and the plains of Bavaria, These strata contain valuable seams of lignite. The vast plains of northern Germany are covered with glacial drift, which rises to heights of 1400 feet above the sea along the edges of the flanking hills. Igneous rocks of different ages have been erupted in many districts, and further diversify the geology. The best known are the Tertiary and post-Tertiary lavas and cones of the Eifel and Siebengebirge; others of more ancient date occur along the southern slopes of the Harz.

Mountains and Plateaus.—Bavaria is the only division of the country that includes within it any part of the Alps, the Austro-Bavarian frontier running along the ridge of the Northern Tyrolese or Bavarian Alps. The loftiest peak of this group, the Zugspitze (57 miles south of Munich), is 9702 feet in height, being the highest summit in the empire. The Upper German plain sloping northwards from the Bavarian Alps is watered by the Lech, the Isar, and the Inn, tributaries of the Danube, all three rising beyond the limits of German territory, This plain is separated on the west from the Swiss plain by the Lake of Constance (Bodensee, 1306 feet above sea-level), and on the east from the undulating grounds of Austria by the Inn. The average height of the plain may be estimated at about 1800 feet, the valley of the Danube on its north border being from 1540 feet (at Ulm) to 920 feet (at Passau). The plain is not very fertile. In the upper part of the plain, towards the Alps, there are several lakes, the largest being the Ammersee, the Wiirmsee or Starnberg Lake, and the Chiemsee. Many portions of the plain are covered by moors and swamps of large extent, there called Moose. The left or northern bank of the Danube, from Regensburg (Ratisbon) downwards presents a series of granitic rocks called the Bavarian Forest (Bayerischer Wald), which must be regarded as a branch of the Bohemian Forest (Bohmi- scher Wald). The latter is a range of wooded heights on the frontier

of Bavaria and Bohemia, occupying the least kuown and least frequented regions of Germany. The summits of the Bayerischer Wald rise to the height of about 4000 feet, and those of the Bohemian Forest to 4800 feet, Hoher Arber, about 49° N. lat., being 4842 feet. The valley of the Danube above Ratisbon is flanked by Jurassic plateaus sloping gently to the Danube, but precipitous towards the valley of the Neckar. The centre of this ele- vated tract is the Rauhe Alp, so named on account of the harshness of the climate. The plateau continuing to the north-east and then to the north, under the name of the Franconian Jura, is crossed by the valley of the winding Altmiihl, and extends to the Main. To the west extensive undulating grounds or low plateaus occupy the area between the Main and the Neckar.

The south-western corner of the empire contains a series of better defined hill-ranges. Beginning with the Schwarzwald (Black Forest), we find its southern heights decline to the valley of the Rhine, above Basel, and to the Jura The summits are rounded and covered with wood, the highest being the Feldberg (10 miles S.E. of Freiburg, 4902 feet). Northwards the Black Forest passes into the plateau of the Neckarbergland (average height, 1000 feet). The heights between the lower Neckar and the Main form the Odenwald (about 1700 feet); and the Spessart, which is watered by the Main on three sides, is nothing but a continuation of the Odenwald. West of this range of hills lies the valley of the upper Rhine, extending about 180 miles from south to north, and with a width of only 20 to 25 miles. In the upper

parts the Rhine is rapid, and therefore navigable with difficulty ; this explains why the towns there are not along the banks of the river, but some 5 to 10 miles off. But from Speyer (Spires) town succeeds town as far down as Diisseldorf. ‘The western boundary of this valley is formed in the first instance by the Vosges, where granite summits rise from under the surrounding red Triassic rocks (Sulzer Belchen, 4700 feet), To the south the range is not continuous with the Swiss Jura, the valley of the Rhine being connected here with the Rhone system by low ground known as the Gate of Miilhausen. The crest of the Vosges is pretty high and unbroken, the first

con- venient pass being near Zabern, which has been taken ad- vantage of for the railway from Strasburg to Paris. On the northern side the Vosges are connected with the Haardt sandstone plateau (Kalmit, 2230 feet), which rises abruptly from the plain of the Rhine. The mountains south of Mainz (Mayence), which are mostly covered by vineyards, are lower, the Donnersberg, however, raising its head to 2262 feet. These hills are bordered on the west by the high plain of Lorraine and the coal-fields of Saarbriicken, the former being traversed by the river Moselle. The larger half of Lorraine belongs to France, but the German part possesses great mineral wealth in its rich layers of ironstone (siderite), aud in the coal-fields of the Saar. The Devonian tract of the Hundsruck, Taunus, and Eifel is an extended plateau, divided into separate sections by the river valleys. Among these the Rhine valley from Bingen to Bonn, and that of the Moselle from Treves to Coblentz, are winding gorges excavated by the rivers. The Eifel presents a sterile, thinly-peopled plateau, covered by extensive moors in several places, It passes westwards imperceptibly into the Ardennes. The hills on the right bank of the Rhine also are in part of a like barren character, without wood ; the Westerwald (about 2000 feet), which separates the valleys of the Sieg and Lahn, is particularly so. The northern and southern limits of the Niederrheinisches Gebirge present a striking contrast to the ceutral region. In the south the declivities of the Taunus (2890 feet) are marked by the occurrence of mineral springs, as at Ems on the Lahn, Nauheim, Homburg, Soden, Wiesbaden, &c., and by the vineyards which produce the best Rhine wines. ‘To the north of this Gebirge, on the other hand, lies the great coal basin of Westphalia (the largest in Germany). In the south of the hilly duchy of Hesse rise the isolated mountain groups of the Vogelsberg (2530 feet) and the Rhin (3117 feet), separated bythe valley of the Fulda, which uniting further north with the Werra forms the Weser. ‘To the east of Hesse lies Thuringia, a province consisting of the far-stretching wooded ridge of the Thiiringer Wald (with three peaks of upwards of 3000 feet high), and an extensive elevated plain to the north. Its rivers are the Saale and Unstrut. This plateau is bounded on the north by the Harz, an isolated group of mountains, rich in minerals, with its highest elevation in the bare summit of the Brocken (3743 feet). To the west of the Harz a series of hilly tracts is comprised under the name of the Weser Mountains, out of which above Minden the river Weser bursts by the Porta Westphalica. A narrow ridge, the Teutoburger Wald (1300 feet),

extends between the Weser and the Ems as far as the neighbourhood of Osnabriick. To the east the Thiiringer Wald is connected by the plateau of the Frankenwald with the Fichtelgebirge. This group of mountains, occupying what may be regarded as ethnologi- cally the centre of Germany, forms a hydrographical centre, whence the Nab flows southward to the Danube, the Main westward to the Rhine, the Eger eastward to the Elbe, and the Saale northward, also into the Elbe. In the north-east the Fichtelgebirge connects itself directly with the Erzge- birge, which forms the northern boundary of Bohemia.

MOUNTAINS. |

The southern sides of this range are comparatively steep ; on the north it slopes gently down to the plains of Leipsic, but is intersected by the deep valleys of the Elster and Mulde. Although by no means fertile, the Erzgebirge is very thickly peopled, as various branches of industry have taken root there in numerous small places. Around Zwickau there is a productive coal-field, and mining for metals is carried on near Freiberg. In the east a table- land of sandstone, called Saxon Switzerland, from the picturesque outlines into which it has been eroded, adjoins the Erzgebirge; one of its most notable features is the deep ravine by which the Elbe escapes from it. Numerous quarries, which supply the North German cities with stone for buildings and monuments, have been opened along the valley. The sandstone range of the Elbe unites in the east with the low Lusatian group, along the east of which runs the best road from northern Germany to Bohemia. Then comes a range of lesser hills clustering together to form the frontier between Silesia and Bohemia. The most western group is the Isergebirge, and the next the Riesenge- birge, a narrow ridge of about 20 miles’ length, with bare summits, Excluding the Alps, the Schneekoppe (5266 feet) is the highest peak in Germany; and the southern declivities of this range contain the sources of the Elbe, The hills north and north-east of it are termed the Silesian Mountains. Here one of the minor coal-fields gives em- ployment to a population grouped round a number of comparatively small centres. One of the main roads into Bohemia (the pass of Landshut) runs along the eastern base of the Riesengebirge. Still farther to the east the mountains are grouped around the hollow of Glatz, whence the Neisse forces its way towards the north. This hollow is shut in on the

east by the Sudetic group, in which the Altvater rises to almost 4900 feet. The eastern portion of the group, called the Gesenke, slopes gently away to the valley of the Oder, which affords an open route for the international traffic, like that through the Miilhausen Gate in Alsace. Geographers style this the Moravian Gate. The North-German plain presents little variety, yet is not absolutely uniform,

the last hundred years, have been considerably reduced by the construction of canals and by cultivation,—improve- ments due in large measure to Frederick the Great. The Spreewald, to the S.E. of Berlin, is one of the most remark- able districts of Germany. As the Spree divides itself there into innumerable branches, enclosing thickly wooded islands, boats form the only means of communication. West of Berlin the Havel widens into what are called the Havel lakes, to which the environs of Potsdam owe their charms. In general the soil of the North-German plain cannot be termed fertile, the cultivation nearly everywhere requiring severe and constant labour. Long stretches of ground are covered by moors, and there turf-cutting forms the principal occupation of the inhabitants. The greatest extent of moorland is found in the westernmost parts of the plain, in Oldenburg and East Frisia. The plain contains, however, a few districts of the utmost fer- tility, particularly the tracts on the central Elbe, and the marsh lands on the west coast of Holstein and the north coast of Hanover, Oldenburg, and East Frisia, which, within the last two centuries, the inhabitants have reclaimed from the sea by means of immense dikes.

Hivers.—Nine independent river-systems may be distin- guished: those of the Memel, Pregel, Vistula (Weichsel), Oder, Elbe, Weser, Ems, Rhine, and Danube. Of these the Pregel, Weser, and Ems belong entirely, and the Oder mostly, to’ the German empire. The Danube has its sources on German soil; but only the fifth part of its course is German. Its total length is 1730 miles, and the Bavarian frontier at Passau, where the Inn joins it, is only 350 miles distant from its sources. It is navigable as far as Ulm, 220 niles above Passau ; and its tributaries the Lech, Isar, Inn, and Altmiihl] are also navigable. The Rhine is the most important river of Germany, although

neither its sources nor its mouths are within the limits of the empire. From the Lake of Constance to Basel (122 miles) the Rhine forms the boundary between the German empire and Switzerland; the canton of Schaffhausen, however, is situated on the northern bank of the river. From Basel to below Em- merich the Rhine belongs to the German empire—about 470 miles, or fourth-sevenths of its whole course. It is navigable all this distance, as are also the Neckar from Esslingen, the Main from Bamberg, the Lahn, the Lippe, the Ruhr, the Moselle from Metz, with its affluents the Saar and Sauer. Vessels sail up the Ems as far as Papen- burg, and river craft as far as Greven, and the river is con- nected with a widely branching system of canals for turf- boats. The Fulda, navigable for 63 miles, and the Werra 38 miles, above the point where they unite, form by their junction the Weser, which has a course of 271 miles, and receives as navigable tributaries the Aller, the Leine from Hanover, and some smaller streams. Large steamers cannot, however, get as far as Bremen, and that commercial emporium has, in consequence, been obliged to form a sea- port at Bremenhafen. The Elbe, after a course of 250 miles, enters German territory near Aussig, 482 miles from its mouth, It is navigable above this point to its junction with the Moldau. Hamburg may be reached by vessels of 10 to 11 feet draught. The navigable tributaries of the Elbe are the Saale (below Naumburg), the Havel, Spree, Elde, Sude, and some others. The Oder begins to be navigable almost on the frontier at Ratibor, 480 miles from its mouth, receiving as navigable tributaries the Glatz Neisse and the Warthe. Only the lower course of the Vistula belongs to the German empire, within which it is a broad, navigable stream of considerable volume. On the Pregel ships of 2500 tons reach Kénigsberg, and river barges reach Insterburg ; the Alle, its tributary, may also be navigated.

. Vistula, Netze, Warthe, Oder, Spree, and Havel form vast | The Memel is navigable in its course of 113 miles

swampy lowlands (in German called Briiche), which, during | from the Russian frontier.

Germany is thus a country is oi

abounding in natural waterways, the total length of them

being estimated at 7000 miles. But it isonly the Rhine, in |

its middle course, that has at all times sufficient volume of water to meet the requirements of a good navigable river. Lakes. —The regions which abound in lakes have already been pointed out. The Bodensee or Lake of Constance (186 square miles) is on the frontier of the empire, — portions of the northern banks belonging severally to Bavaria, Wiirtemberg, and Baden. The largest lake en- tirely on German territory is the Chiemsee (75 square miles) ; the Ammersee and the Wiirmsee are, however, but little less. A good many smaller lakes are to be found in the Bavarian Alps. The North-German plain is dotted with upwards of 500 lakes, covering an area of about 2500 square miles. The largest of these are the three Haffs,— the Oderhaff covering 370 square miles, the Frische Haff 332, and the Kurische Haff 626. The lakes in the Prussian and Pomeranian provinces, in Mecklenburg, and in Holstein, and those of the Havel, have already been mentioned. In the west the only lakes of importance are the Steinhuder Meer, 14 miles north-west of Hanover, and the Diimersee on the southern frontier of Oldenburg. Climate. —The climate of Germany is to be regarded as intermediate between the oceanic and continental climates of western and eastern Europe respectively. It has nothing in common with the Mediterranean climate of southern Europe, Germany being separated from that region by the lofty barrier of the Alps. Although there are very con-siderable differences in the range of temperature and the amount of rainfall throughout Germany, these are not so great as they would be were it not that the elevated plateaus and mountain chains are 1a the south, while the north is occupied by low-lying plains. In the west no chain of hills intercepts the warmer and moister winds which blow from the Atlantic, and these accordingly in- fluence at times even the eastern regions of Germany. The mein annual temperature of south-western Germany, or the Rhine and Danube basins, has in recent years been about 52° to 54°, that of central Germany 48° to 50°, and that of the northern plain 46° to 48°. In Pomerania and West Prussia it is only 44° to 45°, and in East Prussia 42° to 44°. The warmest districts of the German empire are the northern parts of the Rhine plain, from Carlsruhe downwards, especially the Rheinthal ; these are scarcely 300 feet above the sea-level, and are protected by mountainous

tracts of land. The same holds true of the valleys of the Neckar, Main, and Moselle. Hence the vine is everywhere cultivated in these districts. The mean summer temperature there is 66° and upwards, while the average temperature of January does not descend to the freezing point (32°). The climate of north-western Germany (west of the Elbe) shows a predominating oceanic character, the summers not being too hot (mean summer temperature 60° to 62°), and snow in winter remaining but a short time on the ground. West of the Weser the average temperature of January exceeds 32°; to the east it sinks to 30°, and therefore the Elbe is generally covered with ice for some months of the year, as are also its tributaries. The further one proceeds to the east the greater are the contrasts of summer and winter. While the average summer warmth of Germany is 60° to 62°, the January temperature falls as low as 26° to 28° in West Prussia, Posen, and Silesia, and 22° to 26° in East Prussia and Upper Silesia. The navigation of the rivers is regularly interrupted by frost. Similarly the upper basin of the Danube, or the Bavarian plain, has a rather inclement climate in winter, the average for January being 25° to 26°. As regards rainfall, Germany belongs to those regions where atmospheric precipitation takes place at all seasons, but chiefly in the form of summer rains. In respect to the quantity of rain the empire takes a middle position

between the humidity of north-western Europe and the aridity of the east. There are considerable differences between particular places. The rainfall is greatest in the Bavarian table-land and the hilly regions of western Germany. For the Eifel, Sauerland, Harz, Thiiringer Wald, Rhén, Vogelsberg, Spessart, the Black Forest, the Vosges, &c., the annual average may be stated at 34 inches or more, while in the lower terraces of south-western Germany, as in the Erzgebirge and the Sudetic range, it is estimated at 30 to 32 inches only. The same average obtains also on the humid north-west coast of Germany as far as Bremen and Hamburg. In the remaining parts of western Germany, on the shores of Further Pomerania, and in East Prussia, it amounts to upwards of 24 inches, In western Germany there is a district famous for the scarcity of rain, and for producing the best kind of

wine: in the valley of the Rhine below Strasburg, in the Palatinate, and also in the valley of the Main, no more than from 16 to 20 inches fall. Mecklenburg, Brandenburg, and Lusatia, Saxony and the plateau of Thuringia, West Prussia, Posen, and Lower Gilesia are also to be classed among the more arid regions of Germany, the annnal rainfall being 16 to 20 inches.

VEGETATION, ANIMALS, AND AGRICULTURE.

The flora of Germany comprises about 3000 species of phanerogamic and about 4000 cryptogamic plants. The country does not, however, form a single natural region, and cannot be characterized distinctively by any of the principal botanical types.

No uniform returns for the whole empire have been pub- lished, furnishing details regarding the distribution of the soil in respect of its cultivation, and thus statistics can only be collected from the official returns and estimates or valuations for separate districts. The following tabular statements must therefore be regarded as only approximately accurate :—

Cultivable and Uncultivable Arca.

Cultivable. Uncultivable. States or Groups. ai – Square | Pereent.} Square Percent, | Mites, |of Total,| Bliles. | of Total. | Prussia, including the | | minor states of North } | 134,400 | 91°7 | 12,180 83 | Germany ……eeeeeerenes | | SPIVUTTIIAIB.....00..0000e0e e901 | 4,450| 98°7 300 630 QAROTMY . 6s c.0.caretece sevens 5,570 | 96:0 230 4°0 J BARI) oqeanesogee sono cos es50ce 27,500 | 93°8 1,800 6:2 Wiirtemberg ……...eeeeeee 7,200 | 95°6 330 dhol /Byi les) sapeaonnasaanes cangs0edadne 5,200} 89°4 620 10°6 | Alsace-Lorraine ……..++.0++ 5,200 | 90°9 520 91 | , ee 2,850| 96:0 120 40 | Total… | 192,870) 928 }16,050 | 77 |

Meadows and

5

Pasture Grounds. Woodland.

Arable.

Percent.) Square | Percent. Square | Percent. of Total.| Miles. | of Total. Miles. j of Total.

States.

Square Miles.

Prussia, &C. . ..1. ceeeee 74,150 50°7 26,870 18°3 33,380 i THULIN GIA 2.0… seereeee ee 2,500 52°6 440 9°3 1,510 318 SAXONY ..cccscecseeoecre reese 3,200 55°2 770 13:2 1,600 27°6 Bavaria. .....0-seceee—sseee 12,350 42:1 5,120 17-5 10,030 34’°2 Wiirtemberg ….....ee0: 3.600 47°8 1,300 173 2,300 30°5 Baden. see eeee seers 2,200 379 1,030 177 1,970 33°8 Alsace-Lorrainc…. ..— 2.770 485 660 11-6 1,770 30°8 LIOSSE 0-2 cereessceneceecers 1,550 516 380 12°8 940 816 a SS SS Total…...-..| 102,300 | 49:0 | 36,570 | 176 | 53,500 | 25°7

Froin these tables it will be seen that the extent of un- cultivable ground in Germany is inconsiderable ; and that the arable land, including garden ground and vineyards, amounts to about one-half of the area.

AGRICULTURE. |

Forests.—The woodlands form about one-fourth of the entire soil, the proportion of forest being far greater than in any other state in the west or south of Europe; the percentage for France is but 17, for Italy 12, for Great Britain about 3. The state forests alone occupy 17,600 square miles ; and the greatest attention is paid through- out the empire to forest culture. Speaking generally, northern is not nearly so well wooded as central and southern Germany, where indeed most of the smaller mountains are covered with timber, as is indicated by the frequent use of the termination wald affixed to the names of the mountain ranges (as Schwarawald, Thiiringer Wald, &e.). The “Seenplatten” are less wooded than the hill country, but the eastern portion of the northern lowlands is well provided with timber. A narrow strip along the shores of the Baltic is covered with oaks and beeches; further inland coniferous trees are the most prevalent, par- ticularly the Scotch fir; birches are also abundant. The mountain forests

consist chiefly of firs, pines, and larches, but contain also silver firs, beeches, and oaks. Chestnuts appear on the terraces of the Rhine valley, and in Swabia and Franconia. The whole north-west of Germany is destitute of wood, but to compensate for this the people have ample supplies of fuel in the extensive stretches of turf.

Agriculture.—The same kinds of cereal crops are culti- vated in all parts of the empire, but in the south and west wheat is predominant, and in the north and east rye, oats, and barley. To these in some districts are added spelt, buckwheat, millet, rice-wheat (Zriticum dicoccunr), lesser spelt (Zreticum monococcum), and maize. In general the soil is remarkably well cultivated. The three years' rotation formerly in use, where autumn aud spring-sown grain and fallow succeeded each other, has now been abandoned, ex: cept in some districts, where the system has been modified and improved. In Soutli Germany the so-called Mrucht- wechsel is practised, the fields being sown with grain crops every second year, and with pease or beans, grasses, pota- toes, turnips, &c., in the intermediate years. In North Germany the mixed Koppelwirthschaft is extending, by which system, after several years of grain crops, the ground is for two or three seasonsin pasture. No general statistics on the subject of crops have as yet been published, but, according to private estimates, a fair average season will yield 325 million quarters of rye,! oats 300, wheat and spelt 170, barley 100. In good seasons the production has been found sufficient to meet the native demand. Formerly the exports of the produce of the wheat and pulse crops exceeded the imports, but the importation of cereals has now for a number of years been constantly increasing. The potato is largely cultivated, not merely for food, but for distillation into spirits. This manufacture is prosecuted especially in eastern Germany. The Prussian provinces east of the Elbe, including Mecklenburg and Saxony, with a popula- tion of about 19 millions, produced 72 million gallons? of spirits in 1876, while the rest of Germany (population 24 millions) produced only 25 million gallons. The common

Years. me 'sg Sugar produced. Cwts. Cwts.

1846-47 107 5,600,000 331,000 1856-57 233 27,500,000 1,800,000

1866-67 296 50,700,000 | 3,900,000 1874-75 333 55,100,000 | 5,100,000
1875-76 332 83,200,000 | 7,100,000

1876-77 328 71,000,000 5,800,000

beet (Beta vulgaris) is largely grown in some districts for

the production of sugar, which has greatly increased during 2 1 quarter=2°90781 hectolitres ; 2 1 gallon =0°22 litre.

1 hectolitre = 0°34888 quarter.

GERMANY

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the last thirty years. There are two centres of the beet- root sugar production: 231 factories, or more than two- thirds of the whole, are in Prussian Saxony, Hanover, Brunswick, Anhalt, and Thuringia, and there are 71 in Silesia, Brandenburg, and Pomerania, the principal centre of the latter group being Frankfort-on-the-Oder. Flax and hemp are cultivated, though not so much as formerly, for manufacture into linen and canvas, and also for the production of oil. The home supply no longer suffices for the native demand. The cultivation of hops is in a very thriving condition in the southeru states of Germany. The soil occupied by hops was estimated in 1873 at 93,680 acres,3—a larger area than in any other country of the globe (Great Britain having about 70,000 acres). The total production of hops is 477,000 ewts., and of this 402,000 cwts, are grown in Bavaria, Wiirtemberg, Baden, and Alsace-Lorraine. Hops thus form one of the standard articles of exportation from Germany, as well as beer. The following table shows the number of breweries in different parts of the country, and the amount of their production :—

States. Breweries. | Total. | Per Head.

- Gallons, Rourtycem| Northern Germany …..... 12,186 | 448,000,000 14

Bavaria, not including

Palatinate | emer: 6,703 | 269,000,000 59 Palatinate (estimated)..... at 13,000,000 20 WViiintemiberoeee. wesseese scenes MAAC 85,300, 000 46

Baden (estimated) .,.. ..... 1,500 24,200, 000 18 Alsace-Lorraine…..... ..... 241 17,600,000 11 Total, about…....| 28 500 | 857,100,000 | 20

Tobacco forms the most productive and most profitable object of culture in many districts. The total extent under this crop in 1876 was 53,720 acres, no less than 32 per cent. of this being in Baden, 22 in Bavaria, 16 in Alsace-Lorraine, and only 30 per cent. in the rest of Germany. In the north the plant is cultivated principally in Pomerania, Brandenburg, and East and West Prussia. Of late years the production has on the whole diminislied, the average amount having been 800,000 ewts. from 1872 to 1876.

The culture of the vine is almost confined to southern and western Germany, and especially to the Rhine district. The northern limits of its growth extend from Bonn in a north- easterly direction through Cassel to the southern foot of the Harz, crossing 52° N. lat. on the Elbe, running then east some miles to the north of that parallel, and finally turning sharply towards the south-west on the Warthe. In the valley of the Saale and Elbe (near Dresden), and in Lower Silesia (between Guben and Griinberg), the number of vine- yards is small, and the wines of inferior quality; but along the Rhine from Basel to Coblentz,in Alsace, Baden, the Pala- tinate, and Hesse, and above all in the province of Nassau, the lower slopes of the hills are literally covered with vines. Here are produced the celebrated Riidesheimer, Hochheimer, and Johannisberger. The vines of the lower Main, particu- larly those of Wiirzburg, are the best kinds ; those of the upper Main and the valley of the Neckar are rather inferior. The Moselle wines are lighter and more acid than those of the Rhine. The total amount produced in Germany is estimated at 1000 million gallons,—Alsace-Lorraine turning out 400 millions, Baden 175, Bavaria, Wiirtemberg, and Hesse together 300, while the remainder, which though small in quantity is in quality the best, is produced by Prussia,

Live Stock,—The cultivation of grazing lands in Germany has been greatly improved in recent times, and is in a highly prosperous condition. The provinces of Pomerania

3 1 acre=0°40467 hectare ; 1 hectare=2°4711442 acres,

and Hanover are particularly remarkable in this respect. The best meadow lands of Bavaria are in the outer range of the Alps, those of Saxony in the Erzgebirge. The follow- ing table shows the results of a live-stock census in 1873 :—

JeIGTEES) poneeenpanceso aes anocodcoouasonsndasec 3,352,231 (errr) (eee ponoecacocmsanenocacucounpaccc 15,776,702 Sheep ic wanawewtaebanien-v- PAGS is nasassueresseailies -ssotsoenenenenewess 7,124,088 LB YIES Bacma saenudauobbecacodonsovadcusdedcueass 2,320,002

Mojtalevents: ace 538,572,429

The breeding of domestic animals is prosecuted most extensively in Bavaria, and in the maritimo provinces. There we find 1000 to 1500 head of the larger kinds (horses, cattle, sheep, goats, swine) for every 1000 inhabit- ants; in the rest of eastern Germany 600 to 800 ; and in central and southern Germany only 400 to 600. In the number of horses Germany ranks with Great Britain (about 80 for every 1000 inhabitants); and, although the pro- duction cannot satisfy the home demand, the imports being nearly 30,000 in excess of the exports annually, the breed- ing of horses has attained great perfection. The main centre is in East and West Prussia, where there are more than half a million of horses,—about 30 per English square mile; then follow the marsh districts on the Elbe and Weser, some parts of Westphalia, Saxony, and Upper Silesia, Lower Bavaria, Lower Alsace, and Lorraine. Cattle abound in most South-German states, especially Pavaria and Wiirtemberg, where there are 180 to 200 head for every square mile. In the northern and north-eastern dis- tricts, on the other hand, the numbers are small (in some districts only 30 to 50 head to the square mile), except Schleswig-Holstein and the marsh lands along the shores of the North Sea, whence there is a considerable exportation to Eugland. The aggregate number of sheep in Germany is only exceeded in Europe by that in Great Britain and Russia. The principal sheep districts are Pomerania and Mecklenburg (300 per square mile). As a rule, sheep- farming is resorted to where the soil is of inferior quality and unsuitable for tillage and the breeding of cattle. Far more attention is accordingly given to the rearing of sheep in northern and north-eastern Germany than in Schleswig- Holstein,

East Frisia, Westphalia, Rbineland, and South Germany. The exportation of sheep is considerable, amounting in 1871 to 1,460,000 head ; in 1875, however, the number was only 1,000,000. At the same time the native demand for wool is not covered by the home pro- duction. The largest stock of swine is in central Germany and Saxony, in Westphalia, on the lower Rhine, in Lorraine, Hesse, &c. Central Germany (especially Gotha aud Brunswick) exports sausages and hams largely, as well as Westphalia ; but the excess of swine imported over the exports for the whole of Germany ranges from 600,000 to 800,000 annually.

Agricultural Population.—In the census returns of 1871 the number of persons entered as agriculturists (including persons engaged in rearing stock, iu forestry, and the fisheries) was about 12,210,000, comprising 1,844,202 pro- prietors (1,690,931 males and 153,271 females), 2,101,005 agricultural labourers, &c., with 6,764,747 members of their families (2,338,174 males and 4,426,573 females), and about 1,500,000 (660,000 males and 840,000 females) engaged in household duties. Agriculture thus supports three-tenths of the population.

Wild Animals.—The number of wild animals in Germany is not very great. Foxes, martens, weasels, badgers, and otters are to be found everywhere ; wolves are rare, but they find their way sometimes from French territory to the western provinces, or from Poland to Prussia and Posen. Among the rodents the hamster and the field-mouse are a scourge to agriculture. Of game there are the roe, stag,

boar, and hare; the fallow deer and the wild rabbit are less common. The elk is to be found in the forests of East Prussia. The feathered tribes are everywhere abundant in the fields, woods, and marshes. Wild geese and ducks, grouse, partridges, snipes, woodcocks, quails, widgeons, and teal are plentiful all over the country. Geese and ducks are found mostly in the flat districts, where the great abundance of standing water affords ample scope for their increase. Tame geese are bred in large flocks, particularly in Pomerania. The length of time that birds of passage remain in Germany

differs considerably with the different species. The stork is seen for about 170 days, the house- swallow 160, the snow-goose 260, the snipe 220. In northern Germany these birds arrive from twenty to thirty days later than in the south.

The waters of Germany abound with fish ; but the genera and species are few. Carp and salmon tribes are the most abundant ; after them rank the pike, the eel, the shad, the roach, the perch, and the lamprey. In addition to frogs, Germany has few varieties of Amphibia. Of serpents there are only two kinds, one of them being poisonous.

The rearing of bees is particularly attended to in the heathy districts of Hanover. The number of bee-hives may be estimated at 2 millions, and the produce of wax and honey at 100,000 ewts. The cultivation of silk-worms has been attempted, but has either entirely failed or had very in- different success. In 1852-62 an attempt was made to extend the cultivation of the mulberry in the province of Brandenburg ; but disease among the silk-worms, which it was found impossible to repress, rendered it unsuccessful.

Mines AND MINERALS.

Germany abounds in useful minerals, and in consequence takes a high place among industrial states. The produc- tion falls short, indeed, of that of England, but bears com- parison with that of France and of the United States. The last annual report of the imperial statistical office (for the year 1876) classified the mineral produce of Germany under the following heads :—

Mineral Production in 1876.

Minerals. Quantities. Value. Miners.

| |

Metric Tons.! £

Coal, including lignite …| 49,588,050 | 15,131,000 | 208,429

TpOM (OTE. ae ese s -eaese eee 3,515,020 1,047,850 24,373

ZMELORG eon ceaseceseasieestsn 503,360 650,840 11,680

IRGHAN ONG) coset ectessccccmsene 12,060 1,019,300 16,929

Copper OTe… 5.6.0. csseaens 30,450 356,250 7,077

Silver and gold ore…..... 2,311 219,150 7,475

PUN KOLEN 5… se sssenee sae 185 6,380 306

Cobalbroreeecssccccncseer eee 313 10,000 Ss

NiekelVoret…...

‘Antimony oOre,.....005 43

IAvGenIC Oe. <2… oneesoes: 1,670

Manganese ore …..... 11,651

EHSAN AA CID Goosandncnesoccs 28

Uranium Ores… .... ccs. 9 2,210

Tungsten ore…....-++++ a 20 06

Tron pyrites ….....006 | 113,708 107,290 =

JANOMINGTOS) «5:2 -.-0 6s anes 35,320 4,400 829

IS TalltN nagreedudaroncaconaaeaqaeu: 170,150 60,700 198

Tee SINA (840) Sonsnpsecouedne: 580,900 234,500 2,053 Total, about…..... | 55,000,000 | 18,900,000 | 280,401

The general value of the production has increased con. siderably during the ten years ending 1876, as will be seen by the following table :—

11 centner or 50 kilogrammes = 110°23 pounds = 0°9851 cwt. In round numbers the centner is taken as equivalent to the cwt., and the metric ton to the English ton; the exact value of the latter, however, is 19°702 cwts., or 0°9851 tons. £1 sterling = 20°4294 matks. In round numbers £1 is taken as 20 marks; the valnes given are therefore too large by 2°15 per cent.

MINERALS. | £ £ 1867) 9, | 10,720,700 | 1872 | 20,783,000 1868 28 & | 11,248,000 | 1873 | 26,782,000 1869 ce = |} 12,021,000 | 1874 | 25,283,000 1870| “3S 8 | 12,412,000 | 1875 | 20,844,000 1871) ---4 | 15,708,000 | 1876 | 18,900,000

The metals extracted from ores in 1876 were thus classi- fied :— : Metal Production in 1876.

Metuis. Quantities, | Value. Cwts. £ — from home ores … 30,410,000 | 4,920,550 po ,, foreign ores 1,884,000 306,890 Zine ,, home ores .. 1,582,300 1,655,980 “{ ,, foreign ores 82,270 84,630 Leat! ,, home ores . 1,872,800 1,417,070 “1 foreign ores 139,100 148,220 . ,, home ores . 165,100 628,170 Copper.. », foreign ores 3,300 13,520 Ounces, —— », home ores .. 4,347,200 967,820 “ », foreign ores 587,150 130,650 Gold », home ores … 10,445 26,040 in », foreign ores ee 13,200 wts.

‘ »» home ores .., 4,050 57,730 Nake », foreign ores 38,380 79,0380 WoWallit, Bavee. seins. sade «: 7,150 58,400 (CEVIIOTTININT, sapegse spasoneaneees 36 1,450 IVT aidasononecoe eRe ee 3,671 9,540 IS(GMIMUG ets s ces cane ssetave cc 430 12,520 Arsenic products …..... 0… L7MIS0 16,540 SUMNDINIUT eeaticnal aceite. ster: 6,800 3,300 Oiob Vittiol, @er,..022-..... 2,201, 400 438,950

wts. 37,882,

Oz. £938”100 || 10,995:100 Coal.—Coal-mining appears to have been first practised

in the 14th century, at Zwickau (Saxony), and on the Ruhr.

The production, which certainly did not exceed 500,000 tons

in 1800, has vastly increased during the last thirty years,

as may be seen from the following table (which does not

include lignite) :—

Coal Production, 1848-1877.

Quantities, Value

Metric Tons. £

1848 4,384,000 1,284,000

1853 | Lorraine 8,329,000 2,566,000 1857 + ~— not 11,279,000 4,137,000 1862 | included. 15,576,000 4,155,000 1867 J 23,808,000 6,371,000

1871 29,398,000 10,917,000 1872 33,306,000 14,833,000 1873 36,392,000 20,183,000 1874 35,919,000 19,359,000 1875 37,436,000 14,874,000 1876 88,454,000 13,184,000 1877 37,576,000 10,854,000

There are six large coal-fields, occupying an area of about 3600 square miles, of which the most important occupies the basin of the Ruhr, its extent being estimated at 2800 square miles. Here there are more tlian 60 beds, of a total thickness of 150 to 200 feet of coal; and the amount in the pits has been estimated at 45,000 millions of tons, so that the basin, at the present rate of 17,500,000 tons raised per annum, would not be exhausted in 2000 years. Smaller fields are found near Osnabriick, Ibbenbiiren, and Minden, and a larger one near Aix-la-Chapelle. The Saar coal-field, within the area enclosed by the rivers Saar, Nahe, and Blies (460 square miles), is one of greatimportance. The thick. ness of 80 beds amounts to 250 feet, and Von Decheun esti- mates the total mass of coal at 45,400 million tons. The

greater part of the basin belongs to Prussia, the rest to Lorraine. A still larger field exists in the Upper Silesian basin, on the border-land between

Austria and Poland, con- taining about 50,000 million tons. Beuthen is the chief centre. The Silesian coal-fields have a second centre in Waldenburg, east of the Riesengebirge. The Saxon coal- fields stretch eastwards for some miles from Zwickau. Deposits of less consequence are found in Upper Bavaria, Upper Franconia, Baden, in the Harz, &e. Number and Production of Collicries in 1876.

Coal-Fields. Number of Coai produced in (Not including Lignite). Collieries 1876. Ruhr (gov. districts, A a uhr (gov. districts, Arns- berg and Diisseldorf) ... wail! 17,430,000 UTS MOSTAR, wicscs0. ericczaaicnns 107 8,468,000 HOUR mentees rer eemncctridneee cess 33 5,080,000 AMM ea ice es sc ankes. ae vas 71 8,038,000 Ue)? os) 1 ee 44 2,150,000 Aix-la-Chapelle ..... 17 994,000 Osnabriick, Ibbenbiiren, &c. 22. 822,000 Minor fields). ~~.0.. 0s. .-.s 47 472,000~~

The above tables do not include lignite, of which numerous beds are scattered over Germany. Extensive strata follow the course of the Oder, and a second group is spread over Lusatia, but the largest and most important deposit is in the Saale districts from Altenburg to the Harz. Smaller fields are situated round Cassel, northward of Frankfort, near Cologne and Aix-la-Chapelle, in the west of Hanover, and in the Upper Palatinate. The total pro- duction is stated in the official returns at 11,100,000 tons, representing a value of £1,922,000. Of this 8,780,000 tons are supplied by the fields in the Saale districts (pro- vince of Saxony, Anhalt, Brunswick, Saxe-Altenburg, and kingdom of Saxony), In North Germany turf also is of importance as a fuel; the area of the turf moors in Prussia is estimated at 8000 square miles, of which more than 2000 are in the north of Hanover. The coal produced supplies the home demand, although a considerable trade is carried on across the frontier. Through the ports of the North Sea and the Baltic more than 2 million tons of coals are imported annually from England, and nearly 24 million tons of lignite come from Bohemia, On the other hand, the Ruhr and the Saar basins export nearly 3 million tons of coal to the Netherlands, France, and Switzerland, and the Upper Silesian basin 12 millions to Austria and Russia. The following table gives a comparative view of the quan-

tity supplied by the more important coal-producing countries in 1876 :—

Tons. : Tons, Great Britain ..,.... 13556027000) | rancen……...-4. <6
16,889,000 United States…... 50,000,000 | Belgium …..... 14,829,000

Germany… ..... 48,296,000 | Austria-Hungary .. 18,362,000

Graphite is produced only in Lower Bavaria ; the total amount in 1876 was 20,104 ewts., value £2090. Asphalt occurs near Hanover, in Brunswick, and in Alsace; total production in 1876, 720,000 ewts., value £15,300. Petroleum is found in limited quantity near Liineburg, and in Alsace.

Iron Ore.—Germany abounds in iron ores, some of which are of superior quality. The production increased rapidly for a time, but in recent years there has been a very great decline.

About 35 per cent. is brown iron ore, 25 per cent. spathic iron, 18 per cent. black band, and 10 per cent. red iron ore. The rest consists of clay-ironstone, bog-iron ore (in the northern lowlands), and magnetic ores. Unfortunately but few mines are found in proximity to coal-pits, and important ore-deposits of great extent are far from coal, as, for

instance, the iron districts of Nassau, of the Sieg valley, and | severely from the overproduction of 1872 and 1873, as

of Hesse, Thuringia, Lorraine, Bavaria, and Wiirtemberg, Tron Ore Production, 1848-1876.

| Quantities, Value.

Tons, £

694,000 191,000 903,000 250,000

1,962,000 583,000 3,264,000 918,000 5,896,000 2,118,000 6,177,000 2,117,000 5,137,000 1,430,000 4,730,000 1,387,000 4,712,000 1,181,000

Lorraine not included.

1848 18538 1857 1867 1872 1873 1874 1875 1876

Ores free of phosphorus, suitable for the manufacture of Bessemer pig-iron, are also very scarce.

The following table shows the number and production of furnaces in blast in 1876 :—

Furnaces in

Blast, Pig-lron made.

Government Districts.

Arnsberg Diisseldorf Oppeln Coblentz Lorraine

Osnabriick

Upper Palatinate Wiesbaden

Cologne

Hesse (grand-duchy) Wiirtemberg Saxe-Meiningen Other districts

1,614 680

The iron manufacture has not been in a thriving condi. tion since 1873 ; the total number of furnaces in Germany in 1876 was 435,—225 in blast as above, and 210 blown out. The following table shows the progress of pig-iron production, including castings :—

—___----—__,

Quantities. ‘ Value

Tons. £

1848 200,000 1,230,000

1862 > about 640,000 2,630,000

1867 990,000 3,600,000 1871 1,421,000 5,946,000 1873 1,983,000 11,238,900 1874 1,660,000 7,243,000 1875 1,759,000 6,632,900 1876 1,615,000 5,232,000

Since the incorporation of Lorraine with the German empire the pig-iron production of Germany exceeds that of France. The following table shows the comparative increase

in those countries, as well as in Great Britain and the United States :—

Quantities of Pig-Iron.

Tons.

4,596,000 1,225, 000 1,000,000

1,260,000 |

Tons

6,660,000 2,351,000 1,615,000 1,453,000

Great Britain …. 1876

1877 1876 1877

United States …. Germany)Pinhte ypnoacseenes

Iron Industry.—While the produce of pig-iron has thus been advancing, similar progress appears in the iron in- dustry, in some branches of which Germany has already emancipated herself from dependence on England. During the last few years, it is true, this trade has suffered

may be seen from the following table, showing the quantities and values of worked pig-iron in 1872 and 1876 :—

1872. 1876. | Articles. Quantities. Value. Quantities. Value. . . Cwts. ‘£ Cwts. fs), Wrought iron Seralled irdh 19,194,000 }12,255,000 |15,515,000 5,013,000 Iron plate ……. 2,348,000 | 2,007,000 | 2,190,000 | 1,095,000 Tron wire….. ...| 2,053,000] 1,695,000 | 2,650,000 | 1,392,000 Raw steel…..... 2,708,000 | 2,333,000 | 2,680,000 | 1,104,000 Cast steel…..... 3,542,000 | 2,840,000 | 4,877,000 | 2,488,000

The greatest advance has been made in the production of steel. In 1863 the quantity was only 1,400,000 cwts., but in 1872 it was about 6,500,000. The greater part of this is produced at the celebrated works of Krupp in Essen and the cast-steel works in Bochum. Many European states have for a considerable time been supplied by Krupp with cast-steel guns. The production of rails not only covers the home demand, but has allowed an annual exportation of 3,000,000 ewts, since 1877. Hardware also, the production of which is centred in Solingen, Heilbronn, Esslingen, &c., is largely exported. Germany stands second to Great Britain in the manufacture of machines and engines. There are in many large cities of North Germany extensive establishments for this purpose, but the industry is not limited to the large cities. It must be admitted that in agricultural machinery Germany cannot as yet coni- pete with England. The locomotives and waggons for the German railways, however, are almost exclusively built in Germany ; and Russia, as well as Austria, receives large supplies of railway plant from German works. In shipbuilding likewise Germany is becoming independent of England; and dockyards have been erected on the coast for the construction of large ironclads.

Silver and Gold.—Cermany produces more silver than any other European state, and the quantity is annually increasing. Silver and gold are extracted from the ores in the mines of Freiberg (Saxony) and near the Harz; but silver is also refined from lead and copper ores in Upper Silesia, Merseburg, Aix-la-Chapelle, Wiesbaden, and Arns- berg. The gold-mining is of far less importance. The value of silver produced was, in 1867, £791,370; 1873, £1,539,590 ; 1876, £1,098,470 ; and that of gold, 1867, £11,750; 1876, £39,234. |

Lead.—The quantity of the lead produced allows Ger- many to export from 300,000 to 400,000 cwts. annually. Nearly half the produce is obtained near Aix-la-Chapelle (651,273 ewts. in 1876); next come Upper Silesia (265,000 ewts.), Harz (176,550 cwts.), Nassau (143,770 cwts.), Saxony, Arnsberg, &c. The value in 1867 was only £898,140; but in 1876, £1,565,280; the quantity was 987,090 ewts. in 1867, and 1,512,000 cwts. in 1876.

Copper.—Although Germany yields more copper than any other European state, the native supply does not meet thedemand. In recent years more than 200,000 ewts. have been imported. The Harz mountains and their environs (Mansfeld) alone produce five-sixths of the whole amount, which has been doubled during the ten years ending 1876 :—1867, 77,440 cwts., value £312,750; 1876, 168,430 ewts., value £641,750.

Zinc.— About 90 per cent. of the zinc produced in Europe is yielded by Belgium and Germany. The exportation from the latter amounts to more than half a million of ewts. per annum. The production doubled during the period from 1850 (620,000 cwts.) to 1860, but has made only slow progress since that time. In 1867 it was only 1,277,000

ewts., value about £600,000; £1,740,600. 70 per cent. is produced in Upper Silesia in the neighbourhood of Beuthen, the rest in Westphalia and the Rhineland.

Salt.—Germany possesses abundant salt deposits. The actual production not only covers the home consumption, but_also allows a yearly increasing exportation, especially to Russia, Austria, and Scandinavia. In 1877-78 there were 77 salt works in operation, 8 of which were mining works for rock-salt. The provinces of Saxony and Han- over, with Thuringia and Anhalt, have 28 works, and produce half the whole amount. A large work is found at Strzalkowo (Posen), avd smaller ones near Dortmund, Lippstadt, and Minden (Westphalia). In South Germany salt abounds most in Wurtemberg (Hall, Heilbronn, Rottweil) ; the principal Bavarian works are at the foot of the Alps near Freilassing and Rosenheim. Hesse and Baden have 6 salt works; Lorraine and the Upper Palatinate, 6. ‘The total yield now amounts to 8,318,000 ewts. boiled salt, 3,221,000 ewts. rock-salt, and

256,000 ewts. of other kinds. The production has made great advance during the last thirty years, having in 1850 been only 5 million cwts., while in 1877 it was upwards of 11 million ewts.

Chloride of Potash.—A considerable amount of this sub- stance is turned out by 15 works in Anhalt, where only the potash ores are found. The production there in 1876 was 846,000 ewts., value about £250,000.

POPULATION.

Till very recent times no estimate of the population of Germany was precise enough to be of any value. At the beginning of the present century tle country was divided into some hundred states, but there was no central agency for instituting an exact census on a uniform plan. the formation of the German Confederation in 1815 effected but little change in this respect, and it was left to the different states to arrange in what manuer the census should be taken. On the formation, bowever, of the German Customs Union or Zollverein between certain German states, the necessity for accurate statistics became apparent, since the amounts accruing from the common import duties were to be distributed according to the number of inhabitants in the several states. The Zollverein had its origin in a customs convention between Prussia and the grand-duchy of Hesse in 1828 ; and other states, as they gradually became couviuced of the advantages afforded by a general customs frontier, joined it from time to time during the succeeding forty years. The following table shows the progressive territorial limits of the Zollverein—which may be regarded as the precursor of the present German empire :—

Population of the Zollverein.

Years. States iat och the various Sas aed a | Ba ae

1828 | Prussia, Hesse (grand-duchy) | 112,000 | 13,295,254

1831 Hesse-Cassel eM re atta sisisten oo 115,300 | 15,090,075 (34)

1834 } | Bavaria, Wurtemberg, Sax- 168,900 ; 28,478,120 | ony, Thuringia, &e…..... :

1844 | Brunswick, Luxembourg, &c.| 171,900 | 28,498,136 (‘43)

Hanover, Oldenburg Schleswig-Holstein, Lauen-

burg, Mecklenburg Alsace-Lorraine

191,800 | 82,559.055(‘52) 205,500 | 88,277,939(67 209.281 | 40,677,950

The returns made at different times by the separate states cannot be combined into an aggregate, showing pre- cisely the former population of Germany. An enumera- tion was made every third year of the number of people that could be held as belonging to the different states

GERMANY

in 1876, 1,664,500, value | comprised in the Zollverein ;

Even

455

and it was only from 1867 that the returns gave the actual resident population, The following table gives the area and population of the twenty-

six states of Germany as returned at the two last censuses (1871 and 1875) : —

Population of the German Emptre, 1871 and 1875.

Area, Population. States of the Empire. English Sq. Miles. Dee. 3, 1871, | Dec, 1. 1875. Kingdoms.

Lae 134,178 | 24,691,483 | 25,742,404 QA AMG, oases s-cecveeences 29,292 | 4,863,450 | 5,022,390 SHRED ONY. ec cénecsscseoceass 5,789 | 2,556,244 | 2,760,586 4. Wiirtemberg…..... 7,581 | 1,818,539 | 1,881,505

Grand-Duehies. i Dh ie 5,824 | 1,461,562 | 1,507,179 GApEICSSeNeeeacceoncanntssases 2,965 852,894 884,218 7. Mecklenburg-Schwerin} 5,187 557,897 553,785 8. Saxe- Weimar ….....

1,404 286,183 292,933 9. Mecklenburg-Strelitz 1,131 96,982 95,673 OMOldeninigcmertees 2,471 814,459 819,314

Duehies.

11. Brunswick ….. reeeahhfoae 1,425 811,764 327,493 12. Saxe-Meiningen …..... 953 187,957 194,494 13. Saxe-Altenburg…... Re 510 142,122 145,844 14, Saxe-Coburg-Gotha .. 760 174,339 182,599 DAM ereremeaeceeenes «ce 906 203,437 213,565

Principalities. 16. Tins – Rudol- 364 75,528 76,676

17. Sehwarzburg-Sonders- Nausentee's, reese. os 333 67,191 67,480 US? Wraldeck#eerewe….0e-. 433 56,224 54,7438 19. Reuss-Greiz) ..c50.s.0000° 122 45,094 46,985 20. Reuss-Gera….....00. 320 89,032 92,375 21. Schaumburg-Lippe…. 171 32,059 33,133 BOONE M Es acovccot ee csc: 438 111,135 | 112,452 free Towns. Sw aulbec Kiss sks ecccns 109 52,158 56,912 EL LES RENO ON Son casancooocaendas 97 122,402 142,200 | #52 Hambure…..... 158 338,974 388,618 Imperial Territory.

26. Alsace-Lorraine …..... 5,603 | 1,549,738 | 1,581,804

EOED ea ctas ae 208,425 | 41,058,792 | 42,727,360 eee ee ee, ae ee The following table shows the rate of recent increase,

the population of Alsace-Lorraiue returned at the French census of 1866 being included in the statement for 1867 :—

Total

Percentage | Percentage increase.

Years. for the period.) per annum.

Population,

Dec, 3, 1867 | 40,108,029

Dec. 8, 1871| 41,058,792 Dec. 1, 1875 | 42,727,360

950,768 1,688,568

Comparing the census returns of 1871 and 1875, it is found that only Alsace-Lorraine (17,934), the two Meck- lenburgs (together 5231), and Waldeck (1481) are decreas- ing ; all other states are increasing, though at very different rates. A comparison cannot here be made, however, be- tween the smaller and the larger states. Hamburg and Bre- men, for example, have considerably increased, but these must be regarded as consisting of single large towns, and a similar increase is found in all the great cities of Germany. In southern Germany (Alsace-Lorraine not included), and also in Hanover, the growth of population has been in- significant, whereas the population in the eight old provinces of Prussia and in Saxony shows a marked increase.

It appears from the following table that the inhabitants of Prussia and Saxony have increased 60 to 70 per cent. in 40 to 44 years, and those of the other states only 18 to 23 percent. And it is to be observed that this increase is not confined to the industrial districts, but that those pro- vinces also which have few large cities and the population of which live for the most part by agriculture, such-as

Pomerania, Prussia, Posen, have increased by 50 to 60 per cent. his is to be explained by

the fact that there has been a very extensive immigration into Prussia since 1815, whereas emigration has been mostly from South Germany. But the surplus of births over deaths alsv has at all times been greater in the North.

Increase of Population in States.

Population.

Total Inereas per cent.

Provinces or States.

Census 1831-54 Census 1875.

Saxony (kingdom) |(’34) 1,596,000 2,760,000 73

The eight ancient } | 31) 13,940,000 | 21,116,000 | 62 Prus. provinces

Brandenburg

(nel, Berlin) 4 |” 1,612,000 | 8,126,000 84

Rhineland …..... 5, 2,250,000 | 3,804,000 70

Pomerania …..-. A 910,000 | 1,462,000 63

Prussia . »» 2,015,000 | 3,199,000 59

Silesia …...ccceee 2,460,900 | 3,844,000 56

Westphalia ….... », 1,270,000 | 1,905,000 52

= ” 1,450,000 | 2,169,000 50

au eee * 15070,000 | 1,606,000 50

Racbcoseereenesse (°34) 1,228,000 | 1,507,000 23

ae (’33) 1,663,000 | 2,017,000 21

? a

(34) 1,573,000 | 1,882,000 20

Pees y, 4,245,000 | 5,022,000 18

DOOOHBERE DOODOOEOS 750,000 884,000 18

Vital Statistics. —It is very receutly that general registers of births, deaths, and marriages began to be kept for all the German states, but these prove the increase of the excess of births over deaths in recent years to have been consider- able. he following table of returns for the whole of Ger- many during the period 1872-76 brings out a natural addi- tion by births of upwards of half a million yearly :—

“ Births (nel. | Deaths (inel.| Still | Surplus of

Marvinges.| ‘¢iq), a. sane. torn. || Mathes

1872 423,900 1,692,227 1,260,922 66,190 431,305

1873 | 416,049 | 1,715,287 | 1,241,459 | 67,166 | 474,012 1874 400,282 | 1,752,976 1,191,132 | 69,536 560,579 1875 | 886,746 | 1,798,591 | 1,246,572 | 74,179 | 552,019 | 1876 | 366,912 | 1,831,218 | 1,207,144 | 73,517 | 624,074 Mean…| 898,778 | 1,758,059 | 1.229,606 | 70,117 528 378

The numbers of births, deaths, and marriages for every 1000 of the population of Germany during the period 1872-5 were as follows :—

To 1000 Persons tiving. To 1000 Marriage- able Persons.

Marriages.

Births.

Deaths | Marriages

EF

41°1 41°3 41°8 42°3

30°5 29°9

39°9 37°8 36°0

3 0 #3)

il 34°3

0 0

y

9

41°6 36°7

In comparing this with similar tables for England, a great difference is obvious. While the average annual rate of births (41°6) has been much higher than in England (34°0) during recent years, the annual death-rate does not compare favourably with that of England (22-3) or of other states. Only Russia, Finland, Austria-Hungary, Italy, and Servia exhibit greater higher rates.

Sexes. —The numbers of the different sexes in 1871 and 1875 were as follows :—

Exeess of lemales.,

Females for 1000 Males

1037 1036

Males. Females.

752,638 758,958

20,154,109 20,986,701

20,908,737 21,740,659

GERMANY

| or 0°3 per cent.

[POPULATION,

As in most European states, the surplus of females arises from their lower death-rate, for in Germany as else- where more boys are born than girls. The following table shows the numbers of births, including still-born :—

Exeess of Boys. |Boys for 1000 Girls.

871,438 | 820,786 1062 883,017 | 832,265 1061 903,148 | 849,821 1063 928,397 | 870,194 1067 943,433 | 887,781 1063 905,837 | 852,170 1068

Illegitimacy.—The number of illegitimate births is greater than in any other European state, except Sweden, Denmark, Austria, and Portugal. ‘The rate of illegitimacy is about 9 per cent. of the births, the annual average for 1872-75 being 8-86. In Rhineland the proportion was 2°8 per cent., North-Western Germany, Oppeln, and Posen 5 to 6, South-Western Germany 7 to 9, province of Saxony, Brandenburg (exclusive of Berlin), Pomerania, Schleswig- Holstein 9 to 10, Saxony, Thuringia, and Lower Silesia 12, Berlin 13°5, and Bavaria 14°6 per cent. On the whole, illegitimacy has decreased of late, particularly in Bavaria.

Emigration.—The increase of population would have been still greater if emigration had not for years drained the country of considerable numbers of its inhabitants. The number of emigrants from Germany since 1820 may be estimated at 3,500,000, but this includes many Austrians, and it cannot be stated how many of the emigrants were natives of the German empire, as no authentic statistics of emigration were issued before 1873. The greater part of the emigrants take their passage via Bremen and Hamburg. The following statement, therefore, of the numbers of emigrants from these ports may afford a sufficient indica- tion of the total emigration :—

Emigrants Emigrants.

Average. | 1836-44 14,653 |} 1870 79,837 1845-49 | 36,706 yy altel 102,740 1850-54 77,165 | 1872 154,834 1855-59 54,4383 | 18738 132,417 1860-64 41,665 | 1874 74,076

1865-69 107,672 1875 56,313

1870-74 108,675 | 1876 50,396

- 1875-77 49,786 1877 41,749

The following table, on the other hand, gives the number of emigrants from the German empire according to the official returns. The numbers are

considerably lower than those of the last table. It will be seen that emigration has decreased greatly during recent years.

Tis Baan oapeoaccscaconaodonon codecs 103,638 German Emigrants. Fh) nM cco. 45,112 i. US Bachodooncadssdacohacnscanede son 30,773 48) ISG seeucseannonnbe eadeesonad oe 28,368 AD (ee ere © shee 21,964 a MGtale . c.ceaeeee 229,855 ae

The greater part of the recent emigration has been from the maritime provinces. Out of 230,000 emigrants in the years 1873-77, 132,350 were from Prussia, Pomerania, Mecklenburg, Schleswig-Holstein, Hanover, Oldenburg, Bremen, and Hamburg. These states, with a total popula-

| tion (1875) of 9,245,000, accordingly lost 1} per cent., the

rest of the country (33,482,000 inhabitants) only 97,500, It must be added, however, that the emigration from South Gerinany was formerly much more considerable. Alsace-Lorraine lost only 1193 inhabitants in 1873-77 by emigration to America, The great mass of

POPULATION. |

German emigrants go to the United States,—90°5 per cent. of the whole (207,974) having embarked for that country in 1873-76. According to the official returns of the board of statistics at Washington, more than 2,900,000 immi- grants arrived from Germany at American ports during 1820-1877. The rest of the emigrants find their way to Australasia, Brazil, the Cape, &c.

Immigrants and Foreigners.—In comparison with the emigrants, the number of immigrants is inconsiderable. The bulk come from Belgium, Holland, and Russia. The following table shows the number of natives of the empire who after being abroad have re-established themselves at home, and also the number of naturalized foreigners :—

Re-established. Naturalized.

897 1284 1514 8735 2007

651

2296 2381 6532 9604 3643 5810

30,266

10,088

The number of foreign residents has considerably in- creased during 1871~75. In 1871 there were in the empire 40,852,037 natives and 206,755 foreigners; in 1875, 42,436,561 natives and 290,799 foreigners. The follow- ing table gives the native countries of the foreigners for 1871,—the latest date for which these statistics have been published :-—

Austria-Hungary …..... ED TOS. | Bel cine, cas eticse se 5,097 Switzerland…..... 24,518 | Luxembourg…..... 4,828 FLOM aM v.05 wes swieweie sisters 22) OGD) | PTAC Oi i.8 Gack sqordvaatsien 4,671 WOM AT KE « ssseatseisssaremars axaye De GS Pa eee os Ae en onan 4,019 OS a ae Ca a 2 Se 504 Sweden and Norway….. WAGOED ||) PMA 5.0. vase vananennoa non oes 310 United States: . ..s.00..-. UONGOS? |METECCES Teena cciegsoane we 192 Great Britain …....000 10,104 | Other countries…..... 2,026

Density of Population.—The population is very unequally distributed, and the differences are far greater now than they were formerly. The mean density of the population had increased from about 120 inhabitants per square mile in 1820 to 150 in 1840, and to 205 in 1875. We have already pointed out the great increase of population during the present century in many agricultural provinces of Prussia. In South Germany, however, the density of population was considerable even at the beginning of the century. But Germany during this period has become an important industrial state, and, as in England, distinct in- dustrial districts have been formed, where the inhabitants cluster in populous centres. Besides, the population of the cities has gone on increasing at the expense of the agricul- tural] districts, so that the natural increase of the inhabitants

Percent, of Total,

Number

Classes of Towns. at Toate,

Population.

1,968,537

2,665,914 3,147,272 8,487,857

4,588,364 5,132,971

5,086,625 4,922,781

Large towns of more than { 1871 100,000 inhabitants… (1875

Middle-sized towns, from § 1871 20,000 to 100,000 ….. 1875

| Small towns, from 5000 { 1871 ti BOM) brid san nck 1875

Rural towns, from 2000 { 1871 to 5000 1875

14,790,798 16,209,523

26,219,352 25,517,837

Town population

Rural population

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the accompanying official statistics all the inhabitants of communes with more than 2000 souls are designated ‘“‘town population,” and the term “rural population” is applied to those of the smaller places. But it must be remarked that in several provinces, such as Westphalia, Rhineland, and Oldenburg, there are many communes consisting of numerous small

villages and hamlets which have not the character of a town, and the inhabitants of which are almost exclusively agriculturists. These rank as town population, which accordingly appears in the returns to be a little larger than it really is. The figures exhibit the extremely unequal increase of the different groups from 1871 to 1875.

Increase per cent. of Population, 1871-75.

Large towns…….....000200 realaereiante ene ees es 14°83 DEiddle-Bized, TOWDS,.....ccicisess.ccsceseeecoes 12°41 Do 555 ci gas gs sisevsiiceent ares oaowinn 10°74 Rural GOWNS. os ssicecgees0c00 pea iar ecrentre Goreptehre 5°75 CE ee 9°59 PRUE ODOIMON. 5. iiieeicescasencdascanenonsncees 0°79

Total for the empire ….....0scercsseernsns 4°19

The following is a list of the 35 towns which had upwards of 50,000 inhabitants at the census of 1875. The first column exhibits the population within the boun- daries of the municipal boroughs (Stadtgemeinde). The numbers in the second are not official, but include all suburbs of a really urban character. The latter therefore afford a better indication of the actual size of the several towns,

Population of the Principal Towns in 1875.

Within the | Within the Towns, Municipal | Topograph.

Boundaries. | Boundaries. |, Ce pel la al natin TR 966,858 | 1,062,000

EO ELATDUEO TS oo. voce esilesssinesourescuetorecs 264,675 348,447 |, 3. Breslaw (Silesia) .:.....2..0.0800 asses 239,050 239,050 4 Miumich (Bavaria)! x 9a5.0..000s0y

berfe : 80,589

6. Havuien { (Rhine) sittriartd teas 86,502 167,091 dy Leippie (Saxony) «csc… hive. ciara 127,387 160,686 &. Cologne (Rhine) Goes. eicass oesouswastt 135,371 154,564 9. Frankfort-on-Main (Hesse-Nassau)..|

103,136 134,776 EI ORS EM SRN Oy ele .PMtarrclas os soisd one deciles foxe 106,677 127,576 11. Magdeburg (Saxony) ..... 40.000 87,925 122,789 12. Koénigsberg (Kast Prussia)..... 122,636 122,636 RSD eM eHy Meath as. Mac et ae com ne: Seco 102,532 111,039 14, Stuttgart (Wiirtemberg)..... 107,273 105,062 15: Dantzie (West Prussia). .J… 520dsd022 97,9381 | ab. 99,000 16. Nuremberg (Bavaria).....¢.01.00000s- 91,108 94,878 17s Strasburg (AIAG). adscsccsecesaejonns 94,306 92,379 WSs Chemnitz, (Saxony) ciccctcstsenesaecos 78,209 85,334 OF Ad tong. (Holstein) ...:.crsscebscaea pene 84,097 84,097 20. Stettin (Pomerania) ..... Essence 80,972 80,972 al. Wusseldort (RHINE). cascnte. nner acne. 80,695 80,695 22. Aix-la-Chapelle (Rhine) ..... 79,606 79,606 23s Basen(Rhitkey 4). eee csevis You se bess vetee. 54,790 76,450 Bars Poseny Ch OSem)), tier seceinansthecsuaetwere 4 60,998 66,505 25, Exetel. xs cnpcvaseh wadboacsaseREGO) .ccccsteceevalscareseees 62,905 62,905 28. Halle (Prov. Saxony). ....ci2s.seccecaee 60,503 60,503 29. Dortmund (Westphalia)..... 57,742 57,742 30. Augsburg (Bavaria) ...:.....00- 57,213 57,213 31, Cassel (Hesse-Nassau) .....6..- 53,048 56,745 SO.” MAINS CBG) os ck ines sen’deaoatewoess ou 56,421 56,421 33. Potsdam (Brandenburg) ..... 45,003 54,186 34. Metz, (Lorraine))....0…i00. ssocdeeanss rece 45,856 53,151

35. Erfurt (Prov. Saxony).....008 50,477

The inhabitants of these 35 towns amount to 10:1 or 11 per cent. of the entire population of the empire, according

in these districts by the surplus of births is neutralized | as we reckon by the municipal or the topographical boun-

by the steady migration of the people into the cities.

In | -daries.

A similar proportion pikes —e and. of as

Belgium ; but the towns of England and Wales of 50,000 inhabitants and upwards have nearly 94 million inhabitants, or 44 per cent. of the whole population.

Density of Population—The town population amounts in some districts, such as Gumbinnen (East Prussia) and Lower Bavaria, to only 11 to 12 per cent.; in others, as Zwickau, Leipsic, Diisseldorf, it reaches 50 to 66 per cent. Arranging Germany in 13 large divisions, we get the follow- ing table, the divisions being named after their principal provinces :—

Proportion Per | per cent. of Divisions. a 2 Sq. | no *) Mile. | Town Popul. ee | Se 1. Prussia (East and West).....0…se0:seenesseeee 3,199,171 | 132 | 23°8 2. Pomerania, Sehleswig-Holstein, Meck-) 3,665,289 | 144 42°3 TENDULE, LC. csccesececececsccsceescrserenenes

3. Brgudenyure (uot ineluding Berlin) and 3,765,637 | 142 | 30-0 4, Hanover, Miinster, Oldenburg, &c……..... 2,437,476| 187 | 35:0 5. Bavaria (not including Palatinate)..... 4 381,186] 163 | 250 6. Prov. of Saxony, Anhalt, Brunswick, &c.| 3,123,643] 228 40°8 MASI OBIE NE or eetcor nes cel etes scensscesslctens|slersenersr 3,843,699 | 247 | .33°0 8. Hesse, Hesse-Nassau, Minden, Lippe .. .. | 3,033,856 250 | 336 9, Wiirtemberg, Baden …....-c0. cere ceereee) 3,455,150} 250 33°9 10, Alsaee-Lorraine, Palatinate 2.173.058 | 274 | 359 11. Rhineland, Arnsberg .,... : 4,823,215) 355 | 60°2 12. Saxony and ‘Thuringia …. 3,859,972 | 365 | 40°8

WES Be elinices sce ccachecccsscseetitesccscseneccscensedeedte : 966,858 100 HO | eosesogoendennnncooscee 12,727,360 | 205 | 37°9

gi

The most thinly peopled territories are found, not as might be. expected in the mountain regions, but in some parts of the plains. There are not more than 50 persons to the square mile (about the same proportion as in the Scotch Highlands) on the moors of the Isar north of Munich, on the East-Frisian moors, and on the Liineburg Heath. There are 50 to 100 inhabitants to the square mile on the, Seenplatten of Pomerania and Mecklenburg, on the middle ridges of Schleswig-Holstein, inthe northern districts of Hanover, in the Spreewald, &c. Leaving out of account the small centres,

Germany may be roughly divided into two thinly and two densely peopled parts. In the former division has to be classed all the North German plain; there it is only in the valleys of the larger navigable rivers, and on the southern border of the plain, that the density reaches 150 to 200 inhabitants per square mile. In some places indeed it is far greater: at the mouths of the Elbe and the Weser, in East Holstein, in the delta of the Memel, 250 to 300, and in the environs of Hamburg even 400, in- habitants are found to the square mile. This region is bordered on the south by a very densely inhabited district, the northern boundary of which may be defined by a line from Breslau to Hanover, and its southern by a line from Coburg via Cassel to Miinster. Here the density rises from 150 to 570 per square mile, for in this part of Germany there are not only very fertile districts, such as the "Goldene Aue" in Thuringia, but also centres of industry. The population is thickest in Upper Silesia around Beuthen (coal-fields), round Ratibor, Neisse, and Waldenburg (coal-fields), round Zittau (Saxony), in the Elbe valley around Dresden, in the districts of Zwickau and Leipsic as far as the Saale, in the Goldene Aue, on the northern slopes of the Hartz, and around Bielefeld in Westphalia. In all these places: the density is greater than 350 inhabitants to the square mile, and in Saxony it exceeds 500. The third division of Germany comprises the basin of the Danube and Franconia (the Upper Main system), and sweeps to the north-west between the valleys of the Werra and the tributaries of the Rhine as far as Sauerland. The population of Franconia rises alittle above that of the rest of this region, the density in the valley of the Regnitz between Nuremberg and Bamberg, and in the Main valley round Wiirzburg, reaching about 200 to 240 inhabitants per square mile. The fourth division embraces

the valleys of the Rhine and the Neckar. In the latter and in the Upper Rhine plain agriculture has reached a high degree of perfection, and the soil is so fertile as tu support a population of 400 per square mile. North of the Niederrheinisches Schiefergebirge, again, are rich coal-fields, —making this the most important industrial district in Germany. Here indeed, in the governmental district of Diisseldorf, the population amounts to 700 per

square mile, —about the same proportion as in the West Riding of Yorkshire; but no such density as exists in Lancashire (1500 to the square mile) is found anywhere in Germany. West of the Rhine a thickly peopled district is grouped round the coal-field of the Saar basin, but there is only a scattered population in the surrounding country. On the Eifel there are scarcely 100 inhabitants to the square mile.

Houses. —The number of houses was estimated in 1871 at 5,330,000, so that the average number of inhabitants per house is from 7 to 8, In England and Wales it is only 5°3 (1871). The greatest proportion of dwelling-houses to the population is in Alsace (5°1 persons to one house) and in Swabia (54), All the larger cities of Germany consist largely of houses in which a number of families live together. In Berlin the proportion per house is 57 persons, while in London it is only 8. This marks one important point of difference in the habits of the two countries.

Occupations,—The census of 1871 distinguishes 8 prin- cipal classes of occupation, but does not subdivide these. The official returns give for each class the nuinber of per- sons engaged in the several occupations comprised in that class, with the number of attendants and other members of the families of those so occupied. The following table pre- sents an abstract of the returns. In the case of Alsace- Lorraine the attendants are not given in the separate classes, but are all returned under class D.

Attendants

Engaged in : Occupations. the several Aa Total. occupations. rere nee 2 familics. . 2 ‘ males …{ 2,968.738 2,986,556 A. Agricultural class …..... females “976.669 5,247,344 ; 12,179,307 5 (males… 2,462,937 Ete B. Industrial class… pe ee 580,048 ; 13,407,798 = males … 322,249 P C. Commerciat class …....+ feratick 1.709.435 3,256,605 D Domestic elass (and oom zee 2,344,235 ‘ 9.569.658 gencral labourer’s)..... females : 4,511,404 pos OR : Recon males 430,800 20,654 * ; E, Army and Navy «esse fe ie me seos9 (¢ 598,413 = males 506,734 318,238 ss G Other occupations …..... cores 98,974 828,030 \ 1,751,976 H. Persons not returned {males,... 414,284 255,822 1.985.162 under any oecupation (females 620,881 694,685 , i) males… =S0 :) 1. Not stated (poor, é&c.)... {Pao \ 437,968 |. ALORA cscescieeree 15,540,610 25,080,214 41,058,792

This table does not admit of comparison with the census returns of England and Wales, the mode of classification being different. It will be seen that more persons belong to the industrial than to the agricultural class.

INDUSTRIES.

Some account of different industries has already been given in connexion with the productions of the empire. The principal textile manufactures have still to be noticed.

Cotton Manufacture.—Before 1871 the production of cot- ton fabrics in France exceeded that in Germany ; but as the cotton manufacture is pursued largely in Alsace, more than 2 million spindles being employed there, the balance is now against the former country. In 1873 there were about 5 million spindles in Germany and 4,611,000 in France. From the subjoined table of imports and exports (gross

TEXTILE INDUSTRIES. |

weight, the net weight being about 4 per cent. less) of the raw material, it will be seen that this industry has not im- proved sinee 1873 :—

Total Imports of Raw Cotton.

Total Exports of

RaeiCoLtan: Excess of Imports.

Cwts. Cwts. Cwts.

1873 3,609,000 1,153,000 2,456,000 1874 3,490,000 848,000 2,642,000 1875 3,199,000 819,000 2,380,000 1876 3,518,000 705,000 2,813,000 1877 3,262,000 831,000 2,431,000 1878 3,289,000 973,000 2,313,000

Cotton spinning and weaving are not confined to one district, but are prosecuted in Upper Alsace (Miilliausen, Gebweiler, Colmar), in Saxony (Zwiekau, Chemnitz, Anna- berg), in Silesia (Breslau, Liegnitz), in the Rhine province (Diisseldorf, Miinster, Cologne), in Erfurt and Hanover, in Wiirtemberg (Reutlingen, Cannstadt), in Baden, Bavaria (Augsburg,

Bamberg, Baireuth), and in the Palatinate. The number of hands oceupied in the mills in 1875 was 68,555 (34,385 males, 34,170 females) and in the weav- ing establishments 186,496 (124,732 inales and 61,764 females). Of these 98,188 were in Saxony. The produc- tion of cotton yarn is not sufficient for the home demand, and for some years back the imports of the article have ex- eeeded the exports by about 200,000 ewts., till 1878, when the excess was only 117,000 ewts.

Woollen and Worsted.—In this elass of manufactures Germany is far behind France. First of all, the home pro- duetion of wool is not sufficient. In 1873-75 the imports of wool exeeeded the exports by 300,000 ewts. per annum, and in 1876-78 the exeess amounted to 800,000 cwts. In 1875 there were about 1,200,000 spindles for earded woollen yarn,—about 700,000 of them in Prussia, and 320,000 in Saxony. For worsted spinning there were 450,000 spindles,—Upper Alsace having 180,000, and Saxony 110,000 ; nevertheless the production falls short of the de- maud, and from 150,000 to 250,000 ewts. must be obtained from foreign countries. The manufacture of woollen cloth is well developed, and is prosecuted for exportation.- ‘The cloth is valued as being well woven, durable, and cheap. The centres of its manufaeture are the Rhine provinee, Brandenburg, Lower Silesia, Magdeburg, Thuringia, Saxony, Wiirtemberg, and Alsace. In 1875 there were altogether 192,452 persons engaged in the woollen industry.

Linen, Hemp, and Jute.—Germany, although linen was formerly one of her most important artieles of manufacture, is now left far behind in this industry, not only by Great Britain and Franee, but also by Austria-Hungary. In 1874 there were 326,538 spindles at work in Germany for flax, hemp, and jute spinning, while there were 415,000 in Austria, 663,000 in Franee, and 1,670,000 in Great Britain. About 300,000 cwts. of linen yarn are imported into Germany annually, whereas Austria exports about 100,000 cwts, Hand-loom weaving is practised all over Germany, but centres prineipally in Saxony, Silesia, and Westphalia. In reeent times also power-loom weaving has been extending. In 1873 there were 68 establishments in Germany, prineipally at Elberfeld and Barmen, with 3473 power-looms, ineluding 7 factories, with 546 power-looms, for jute. The linen industry employed 187,793 persons in 1875. The demand for linen is nearly covered by the home produetion.

Silk.—Raw silk ean scarcely be ranked among the pro- duets of the empire, and the annual demand has thus to be provided for by importation, It amounts to about 50,000 ewts., there being some superior silk-weaving estab- lishments. The main eentre of the silk industry is Crefeld and its neighbourhood ; then come Elberfeld and Barmen, Aix-la-Chapelle, as well as Berlin, Potsdam, Chemnitz and

Annaberg, Munich, Stuttgart, Saargemiind, &c. The ex- ports of silk stuffs always exeeed the imports.

General Census of Industries.—In 1875 a census of industrial oeeupatious was taken in Germany. ‘The fol- lowing table gives the numbers of the different establish-

nients and of the persons engaged in them :—

Clase, see | aa Be POEUCMIUITISES .....00:00 00 8,640 51,739 8. Workers in lighting materials, soap, resins, a POO OCCU OGEAE TER Onrero s , 8,947 42,318 OPM GMOUSIEY os sccicacns carseoe~se0s 380,918 925,457 10. Workers in paper and leather…..... 56,614 | 187,174 WV ORREFS UV AVOOO oc cec.c cs eevee on 245,703 463,538 12. Workers in food and drink…..... 241,694 693,278 13. Workers in dress and washing …..... 755,616 | 1,049, 470 18. Workers in buUthdings…....0.:..10+-00 05 234,334 485,997 15, Polyaraphic imdustry wavi…..-.000c.0s 8,108 55,852 UG AGUSTICHIAMUStTVae s,s. ccscseetesossaceees 5,534 13,183 17. Persons in mercantile business…....| 420,129 659,988 18. Persons engaged in conveyance…..... 74,655 233,819 19. Lodging and boarding…..... 159,881 234,848

2,936,572 | 6,467,570

eee rere cee ere oe

Roaps, Ratbways, AND CANALS.

Ttoads.—The construction of good highways has been well attended to in Germany only since the Napoleonie wars. The separation of the empire into small states was favour- able to road-making, inasmuch as it was principally the smaller Governments that expended large sums for their network of roads. Thirty years ago the best roads were found in Hanover and Thuringia: the Thiiringer Wald has been almost transformed into a park by its splendid roads, But some districts.suffer even still from the want of good highways. The introduction of railways for a time diverted attention from road-making, but this neglect has of late been to some extent remedied. In Prussia the circles (reise) have now themselves undertaken the charge of the construction of the roads; but they receive a subsidy from the publie funds of the several provinees. The total length of the public roads is now estimated at 72,000 miles.

Railways.—The period of railway construction was in- augurated in Germany by the opening of the line froin Nuremberg to Fiirth in 1835, but the development of the system was slow. The want of a central government operated injuriously here, for it frequently happened that intricate negotiations and solemn treaties between several sovereign states were required before a line could be eon- structed ; and moreover the course it was to take was often determined less by the general exigencies of commerce than by many trifling interests or desires of neighbouring states. The state whieh was most self-seeking in its railway polities was Hanover, which separated the eastern and western parts of the kingdom of Prussia. The diffieulties arising to Prussia from this souree were experieneed in a still greater degree by the seaports of Bremen and Hamburg. Until 1866 there was no railway from Bremen into the interior of Germany, while now there are four. Prior to 1865 the eonstruetion of railways advaneed pretty uniformly, the average eonstruetion during the years from 1840 to 1865 havitig been from 340 to 370 miles per annum. Germany was at that time far outstripped in the extent of its railway system by England, Belgium, and Switzerland, and even

‘by France. A new period of railway construction begins

with the year 1866, and is closely connected with the eco- nomical and political progress of Germany. Numerous great undertakings were then set on foot, partly to remedy the defects of the existing system. Everywhere it became a primary object to establish the most direct lines of com- munication between important places of industry and com- merce. As a consequence the German railway system was immensely enlarged, and from 1865-75 it has nearly been doubled. In 1872, 2000 miles were opened, the average from 1869 to 1877 being 1080 miles annually, so that Ger- many now owns a greater length of railways than any other state in Europe. On the 3lst December 1877 Germany had 18,830 miles, Great Britain and Ireland 17,092, France 14,785. Asregards proportion to the area and population, however, Belgium, Great Britain, and Switzerland are still in advance. In 1877 Belgium had 320 miles of railways to every 1000 square miles, Great Britain 273, Switzerland 155, and Germany 147. The following table exhibits the development of the German railways, including those of Alsace-Lorraine :—

Of which double Lines.

Length of Lines open for Traffic.

Cost of Construction.

Milcs.

3804 3,/58 7,195 8,887

11,457

17,061

18,080

18,8380

Miles.

207,608, 000 339,225,000 378, 558,000

In recent years the multiplication of competing rail- ways has greatly reduced the receipts of the older lines. The total amount of capital sunk in railway construction is estimated for the year 1876 at £373,558,000, or just about half the capital invested for the same purpose in Great Britain (£741,800,000). From the subjoined table it will be seen that the working expenses have considerably advanced during late years, and dividends accordingly have experienced a great decline. Railways formerly pay- ing 15 to 18 per cent. have gone down to 5 to6; the average dividend, which in 1870 was still 6 per cent., in 1876 had fallen to 4°4 per cent.

Proportion of Expenditure to total Receipts.

| Total Working Expenditure.

Total

Receipts. Net Receipts.

Per cent. 50°5 63°0 62°0

£ | £ £ 25,312,000 | 12,770,000 | 12,543,000

42,151,000 26,534,000 15,617,000 42,862,000 26,559, 000 16,303,000

|

The making of railways has from the outset been regarded by some German states as exclusively a func- tion of the Government. The South German states, for exainple, possess only state railways. In Prussia numerous companies have in the first instance constructed their systems, and the state has contented itself for the most part with laying lines in such districts only as were not likely to attract private capital. Yet, in order to establish a preponderating influence over the administration of all German railways, the Government has for some time been buying up private lines. Saxony not long ago pur-

chased all the Saxon railways belonging to private com- |

panies. The following table gives the proportion of state and private railways at 31st December 1877, the minor North German states being classed along with Prussia. Of these Oldenburg alone possesses a greater length of rail- ways belonging to the state than of those in the hands of private companies. The railways of Alsace-Lorraine are the

GERMANY

} postal union (Deutsch-Oesterreichischer

[COMMUNICATION,

property 6f theempire. The number of independent man- agements in 1878 was 67.

| Private

Stati Rail Privat States. Ranvays: worked oH Ratlecayas Tome State. 4 Miles. Miles. Miles. Miles. Prussia and minor Ger- 8,285 2,060 6,857 12,202

2,241 169 371 2,781 1,035 23 170 1,228 761 = 10 771

651 77 4 ion 179 ao 270 449 660 ute if 667

8,812 2,329 7,689 18,8380

Canals.—Germany cannot be said to be rich in canals. In South Germany the Ludwigs-canal was until the an- nexation of Alsace-Lorraine the only one of importance. It was constructed by King Ludwig of Bavaria in order to unite the German Ocean and the Black Sea, and extends from the Main at Bamberg to Kelheim on the Danube. Alsace-Lorraine had canals for connecting the Rhine with the Rhone and the Marne; the coals of the Saar valley were conveyed by canals to Lorraine. The North German plain has several canals, of which only the more important need be named. In the east a canal by which Russian grain is conveyed to Kénigsberg joins the Pregel to the Memel. The Netze canal unites the Vistula and Oder. The Upper Silesian coal-field is in communi- cation with the Oder by means of a canal.

The greatest number of canals is found around Berlin; they serve to join the Spree to the Oder and Elbe. Smaller canals are found also in the north-west. The Meuse and the Rhine are also connected by a canal. The 70 canals in Germany have a total length of only 1250 miles, a very small extent when the other canal systems of western Europe are com- pared with it. 3

Posts AND TELEGRAPHS.

With the exception of Bavaria and Wiirtemberg, which have administrations of their own, all the German states belong to the system of the reichspost. Since 1874 the postal and telegraphic departments have been combined. Both branches of administration have undergone a surprising development during the last 10 years, especially since the reduction of the postal rates. Germany, including Bavaria and Wiirtemberg, constitutes with Austria-Hungary a special Postverbaud), besides forming part of the international postal union. There are no statistics of posts and telegraphs before 1867, for it was only when the North German union was formed that the lesser states resigned their right of carrying mails in favour of the central authority. Formerly the prince of Thurn-and-Taxis was postmaster-general of Germany, but only some of the central states belonged to his postal terri- tory. The seat of management was Frankfort. Of late years the number of post-offices has increased considerably, as will be seen from the following figures, in which the statis- tics of the Bawarian and Wiirtemberg post-offices are in- cluded, as well as those of the reichspost. In 1872 there were 7400 post-offices; in 1877, 8600. In the latter year therefore there was one post-office for every 23 square miles. In 1877 there were 3194 imperial post-and-telegraph offices, and 3746 imperial post-offices, while the Bavarian post-offices numbered 1243, and those of Wiirtemberg 499. The following table shows the increase of letter circulation

| from 1872 to 1877 -—

SHIPPING, | Letters. Total in German | Average Number Imperial Post. Empire. to each Person.

Millions. Millions,

1872 352°0 407°8 10

1873 429°0 492°4 12

1874 456°6 521°9 13

1875 498°2 576°0 14

1876 516°4 596°3 14

1877 521°5 604°2 14

The average number of letters to each person is thus a little greater in Germany than it is in Ireland, whereas it is 26 in Scotland and 35 in England. The number of post- cards has increased from 26°5 millions in 1872 to 99°3 millions in 1877. The following table shows the general postal circulation during the three years 1875-77 :—

1875. 1876.

Millions. Millions. Millions, WetLotomecncesstn couseranesnees « 576°0 596°3 6042 IMOSUCCATOS). caeve-sgecsceecccscys 64°7 82°7 99°3 |Phenioeetel 92) eta) Wpppeguonoeacees 93°0 101°0 112°4 TNCWSPRPOS.....cseceesceser ses 392°8 414°2 433°5 BUM INOs oss oncsvecnasicesenences 9°3 9°0 9°8 ey TOA akcce vax seieee ese 33‘5 39°8 Bae otal amount of money

orders and remittances } £840 £798 £784 EMO Met tc ssc sess sivas ss eess 78°4 80°3 82°3 Total weight of parcels…... Tb 559 Tb 583 Tb 915

Telegraphs.—By combining the postal and telegraphic departments Germany has been saved a large number of officials; but great sums are still spent annually on the extension of the telegraph system. Since 1876 important localities have been brought into communication with Berlin by subterranean wires. This plan is expensive, but under it a considerable saving is anticipated in repairs. The number of telegraph offices in 1877 was 7251, of which about 4600 belonged to the state, and the rest to private railways. The following table shows the progress of the telegraphic system between 1872 and 1877, and the number of messages in these two years :—

1872. |

Telegraph Service. |

Length of line

Length of wire

Number of offices

Number of messages— LOMO SCMVICCE te csnaseneseestrrece International (includ. in transit)

8,478, 000 4,945,000

8,994,000 5, 203, 000

The increase of messages is insignificant, a circumstance which must be attributed to the recent dulness of trade. On the whole the telegraph is not as yet used to a very great extent in Germany. The number of messages for every 100 inhabitants in 1877 was 33, as compared with 47 in Norway, 49 in Denmark, 54 in Belgium, 58 in the Netherlands, 64 in Great Britain, and 100 in Switzer- land.

SHIPPING.

The German mercantile marine has always been distin- guished by the excellence of its personnel. The seamen of Frisia are acknowledged to be among the best in the world, and the shipping of Bremen and Hamburg had won an everywhere respected name long before a German mercantile marine, properly so-called, was heard of. Many Hamburg vessels sailed under charter of English and other houses in foreign waters, especially in the Chinese. Since 1868 all German ships have carried a common flag—black, white, red—but formerly Oldenburg, Hanover, Bremen, Hamburg, Liibeck, Mecklenburg, and Prussia had each its

own flag, and Sclileswig-Holstein vessels sailed under the Danish flag. It is but lately that a uniform mode of measuring the hold tonnage of German ships has been in- troduced, and accordingly it is only since 1871 that it has been possible to give an exact statement of the position of German shipping. The official returns show that the marine is on the increase. The following table gives its position on the lst of January in the years 1872-78. The tonnage is reckoned according to the English register ton.

Sailing Vessels. Steamers. Total.

Tons. Number. Tons.

97,000! 4,529 | 988,000 130,000} 4,527 | 999,000 168,000 | 4,495 | 1,034,000 190,000} 4,602 | 1,068,000 184,000 | 4,745 | 1,084,000 181,000 | 4,809 | 1,104,000 183,000 | 4,805 | 1,118,000

Number. Tons, Number.

892,000 869,000 866,000 878,000 901,000 923,000 935,000

4,354 4,311

175 216 253 299 319 318 336

4,249 4,303 4,426 4,491 4,469

The lowest tonnage of vessels included in this return is 16 tons for sailing vessels and 11 tons for steamers. On comparing the state of the German marine with that of other countries we find that Germany ranks fourth in the list of maritime nations. Great Britain and the United States have considerably larger fleets. That of Norway also was even in 1871 greater than that of Germany, and it has increased much more rapidly than the other since that time; but on the other hand the mercantile marines of France and Italy, which in 1871 were larger than the German, are both now less. The following table shows the proportion of the mercantile shipping of Germany belong- ing to each of the maritime states on the lst of January 1878. It must be borne in mind that Bremen and Ham- burg properly consist

only of one port each, whereas Prussia has hundreds of miles of coast-line both on the North Sea and on the Baltic.

+. “1: 4 States. Neer a! Steamers. Total. Tons. Tons. Tons, TUGBA Meieaisaciccssaaaeeeee. 243 464,477 | 31,573) 496,050 Ja leva s) Ub, Se acopnaoee sonooe 2 137,347 | 84,127) 221,474 BLOM EN eas saves cxavenanvere 2 158,677 | 57,377} 216,054 Meeklcnburg «..... 2 108,521 SB ollie dhe S33 Oldembune pees seeseec vee 21 61,774 27 61,801 Mbt eGke ee asccncava oases: il 3,760 6,463 10,223 lo taleees cere 271 934,556 | 183,379 | 1,117,935 North Sea Ports……...} 62 419 698 | 38,699| 458,397 Balliiemeortsseccessen ete 209 514, 858 | 144,680

659,538 |

The number and the tonnage of steamers have, as in other countries, increased greatly, while those of sailing vessels have remained almost stationary. The aggregate horse- power of the steamers in 1871 was 23,287; in 1877 it was 50,603. The number of seamen employed in 1878 was 40,832, and of those 8173 served on board steamers.

In 1876 165 sailing vessels of 35,439 tons, and 14 steamers of 6200 tons, were built in Germany ; and 8 sailing vessels of 3862 tons, and 1 steamer of 1910 tons, were built abroad. There were besides 50 ships with a total tonnage of 21,755 which had been bought in America, Holland, and Great Britain.

The shipping returns of German ports have lately fluctu- ated but little. The total amount was 13,311,000 tons in 1876. A striking difference will be observed in the follow- ing table in the returns between the numbers entering and clearing in ballast :—

Total Tonnage of Ships, 1876.

Total.

In Ballast. |Not for Trade.

} With Cargo.

Tons.

6,585,000 6,726,000

Tons.

130,000 128,000

Tons. Tons. 6,072,000 | 505,000 4,100,000 | 2,619,000

Entered Cleared

Only 44 per cent. of the ships that trade with German ports sail under the German flag. British ships have a very considerable trade in German ports. They constitute 32 per cent. of the total tonnage, and as much as 47 per cent. of the tonnage of steam vessels. Denmark follows next with 7°2 per cent., Sweden 4:8, Norway 4°6, Russia 2°3, Holland 2°1, France 1°2, United States 1°2, Italy 0°5, other countries 0°4, The number of voyages in all made by German ships in 1876 was 45,492, of which 12,963 were made between German ports. Much more consider- able, however, is the trade of German ships between the home ports and foreign countries, as the subjoined table will show, while no fewer than 9777 voyages were made in 1876 by German vessels without calling at any home port :—

Number of Ships

in Ballast.

Number of Ships with Cargo.

Tonnage

of Ships

- with Cargo.

Tonnage of Ships in Ballast.

220,000

79,000 602,000

880,000

Home trade (average of entered) | 49 9¢5 and cleared ships).....sssse. or

8,002

trade (cleared from ,, oe 5,449 Voyages of German ships be- 6.950 tween foreign Ports …..c.esceeee =

577,000

1,984,000 1,552,000

3,314,000

5,194

710 3,397

2,827

Foreign ie into German ports

Total 38,364 | 7,429,000 | 12,128 | 1,782,000

There were 5544 voyages made between non-German ports in Europe, the greater number being between one English port and another. Many German vessels also run between the Baltic ports of Russia and Sweden. From European ports 993 vessels sailed for non-European ports, and 869 returned thence to Europe. Here also the greater number ran from Great Britain to the United States, the West Indies, and South America, 2371 ships made their voyages without touching at European ports. Most of these were engaged in the coasting trade in the Chinese Seas, on the South American coasts, and in the West Indies,

As regards the shipping of the most important German ports, the following table will show the total tonnage of ships entered and cleared in 1876 :—

Ports. | Tonnage. | Ports. Tonnage. Hamburg……. | 4,406,000 | Kiel…...eessee. vx] 608,000 Bremerhafen …... 1,300,000 | Pillau wo… 440,000 MOUGLEDI ctacanseniane 1,144,000 | Konigsberg …..... 418,000 Neufahrwasser 780.000 Geestemiinde.,.....; 378,000

(Dantzic).... ? (102) ae 352,000 EARDCCK 4 seers t ont 646,000 | Swinemiinde…....) 382,000

CoMMERCE,

Statistics relating to the foreign trade of the empire are necessarily confined to very recent times. The quantities of such imported articles as are liable to duty have indeed been known for many years; and some years ago an attempt was aiso made to compile official tables showing the value both of imports and of exports. But when the results of these tables proved the importation to be very much greater than the exportation, the conviction arose that the valuation of the exports was erroneous, and below the reality. There is no compulsory declaration of such goods, and conse- quently the attempt to compute statistics of this nature has been abandoned since 1875. It must at the outset be observed that the customs frontier does not coincide with the political frontier of Germany, for it does not take in the free-port territories of Hamburg and Cuxhaven, Bremen,

GERMAN T

| Bremerhafen and Geestemiinde, &e. (in all, 129 square

[COMMERCE.

miles with 593,040 inhabitants, in 1875), besides some communes in Baden adjoining the Lake of Constance (22 square miles, 5236 inhabitants). On the other hand the grand-duchy of Luxembourg (998 square miles, with 205,158 inhabitants in 1875) and tle small Austrian com- mune of Jungholz 206 inhabitants), near Fiissen, belong to the German Zollverein. The collection of duties is a function of the empire. The following table shows the re- sults of the official calculations of the imports into Germany for 1872-76, and also the values of the exports, but in the case of these it is only the figures for the years 1872-74 that are official The numbers for

1875 and 1876 are those published by Professor Laspeyres in the Economiste Francais.

Years. Imports. Exports. | Transit.

|

£54,700,000

61,700,000

| 1872 £173, 400,006 | £124,700,000

1873 1874 1875 1876

212,800,000 | 124,400,000 183,700,000 | 121,600,000

176,500,000

190,200,000 |

127,600,000

127,400,000 |

Average…) 187,100,000 | 125,200,000 |

The extremely slight variation which this table shows in the exports of the several years from 1872 to 1876 appears so improbable that we can hardly venture to make it a basis of calculation, or to draw a conclusion so unfavourable to the trading balance of Germany as the figures would suggest. The proportion per head of population is, as regards imports and exports respectively, about £4, 10s. and £3, whereas the proportion in Great Britain in 1876 amounted inthe one case to £11, 10s. and in the other to £6, thus showing the German trade to be less than half that of England. The statistical tables do not specify the several foreign markets for imports and exports; they only give the value of imports on the different frontiers,

Total Value of lmpoits.

Frontiers,

1875,

Millions.

1876.

Millions. North Sea line, including Bremen and

Aah SAMO RLU Fs ose crac cgrefoterma alte see seco aed ont Denmark ..0.::azeiaze aise cai Rane ee ee 1:0 1:0 RSS Atenizad on Pee gota aMy-cal te Rosaceae ace 19°0 19°2 RNS occ sre Saetgeags he SR Dek gore eee 32°2 30°38 SwitZerland) 426s iispavsnackeeehreee gene Soe 8:0 92 ARVO COM areata? es cctirncte te Reine opis satan Slaneant 11°3 12°41 Belg, bes ir. « taetencee tis Sovic amwenrnes tsa ere 16°3 16°3 TOMB TIGL E: walt naatacemmncnineenine nee aacordoeeee 21 2 28°8 By post, or frontier not stated…..... 50 49

Teta 95 eae. aegeeee 176°5 190-2

According to the official trade returns of Great Britain, France, and other countries, the trade between Germany and these countries is very considerable. By the English tables the importation from Germany to British ports was in 1875-76 between £21,000,000 and £22,000,000; the exportation to Germany in 1875 was £23,300,000, and in 1876, £20,100,000. The movement of trade is shown in the following tables of the principal articles imported and exported. We begin with articles of consumption :—

1872.

Articles.

Animals, except horses..No 1,490,000 1,719,000 2,443,000 | 1,848,000 Cwts.| 28,800,000 | 21,860,000 | 73,070,000 | 39,600,000

arrels 691,000 Jes 667,000 5

.-Cwts.| 1,855,000 asya 1,916,000 wen vardiooe 4 879,000 264,000 155,000 | 1,802,000 hve sisidiaioawrermarnrs sition ‘5 817,000 400,000 1,182,000 380,000 a saihiua eatin caaaced i 100,000 590,000 300,000 } 1,280,000 PROPS)

GOVERNMENT. |

The weights are stated in hundredweights (cwts.) net throughout (see Statzstecal Abstract published by the Eng- lish Board of Trade, No. V., 1878). This table shows that of late years Germany has had to order considerable quan- tities of grain from abroad. The value of the importation, estimated at £14,000,000 in 1872, was nearly £36,000,000 in 1877. Similarly the value of the imported animals advanced from £4,400,000 in 1872 to £9,500,000 in Rerr:

The following table gives the imports and exports of the principal raw materials :—

1872. 1877.

Articles, Imports. Exports. | Imports. | Exports. | Coal, lignite, &e……...Cwts. | 71,600,000 | 76,395,000 | 95,000,000 |100,184,000 |. ae serie re ae 1» | .8,200,000 | 5,300,000 | 6,855,000 | 16,140,000 | Tron, pig .esscssseeseee yy | 12,395,000 | 3,616,000 | 10,536,000 | 9,119,000 MCAD DIG eos MAIS ciieegeradte se issiowsiinose~ wan 786,000 667,000 1,380,000 1,010,000 SUCRE Berea treet tan nisstge 4h 500,000 248,000 930,000 469,000 WOON TEW oct ss scsncverses 55, | 1,070/000 857,000 | 1,370,000 445,000 Silk, raw cocoons …... * 61,300 16,000 63,000 20,000 7hG: Ne eer ee » | 1,181,000 290,000 857,000 295,000 (Ania) nee » | 1,400,000 190,000 | 2,440,000 127,000 Linseed, &c. .....0++-+. 5, | 1,110,000 670,000 | 1,116,000 | 1,354,000 Grease …..... ea deecc a 578,000 40,000 725,000 75,000 Petroleum …....65+ 5, | 8)320,000 907,000 } 6,810,000 | 1,810,000 Wood { Cwts. | 49,400,000 | 30,200,000 | 36,800,000 | 21,400,000 vee sreeesereere”l Pieces, | 5,600,000 79,000. | 3,800,000 ohn

With regard to the proper products of industry, the exports, with few exceptions, such as yarn, exceed the im-

pore mnSNery ee, 48. 18 shown in the table below. The | been vested in the king of Prussia, who accordingly bears

total value of all fabrics imported is estimated at about £30,000,000, that of those exported at from £42,000,000

to £45,000,000. But, even supposing the last figures to be

too low, the difference between the German and the British trade is still very great, since the value of all the industrial products exported by Great Britain may be stated at £170,000,000 for the year 1875 (see Almanach de Gotha, 1877). The difference is greatest in the textile industries, —the value of tissues exported from England in 1875 being estimated at £100,000,000, while that of Germany did not rank higher than from £20,000,000 to £25,000,000. Articles of hardware are showing a great decrease of imports and a considerable increase of exports.

Industrial Products—Imports and Exports.

1872. 1877.

Articles, > Imports, | Exports. | Imports. | Exports. as ——— ee eae aes Cwts. Cwts. Cwts. Manufactures of cotton …... 48,000 166,000 45,000 ei a! | Ob ? 31,000 16,000

163,000 285,000 114,000 243,000 892,000 00 158,000 150,000 627,000 15,000 :

Metal wares …….....+.+s.6.| 2,633,000 | 1,330,000 | 1,121,000 | 2,530,000 Machinery, exelus. of boilers 563,000 596,000 729,000 801,000 Ralls ….scscceeeeeeseeesesee] 284,000 | 1,414,000 | 1,521,000 | 4,497,000 Musical instruiments ……..... 8,000 53,000 10,000 69,100

The principal ports of import and export are Ham- burg and Bremen, and in these places the annual amount of shipping business has advanced step by step with the general development of German trade. As to the total value of goods entering Hamburg we have accurate sta- tistics for several decades.

Imports of Hamburg.

Total Imports, exclud. Bullion.

Total Imports, exciud. Bullion.

Millions.

£20°5 33°5 49°8 ‘es $5°6

Millions,

£85°3 84°3 Spt 85°2 88°8

1846-50 1851-60 1861-70 1871 1872

Average.

GERMANY

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The stagnation in the development of trade during the period 1871-77 is obvious; and with Bremen the case is the same, The following table states the total imports of Bremen by sea and from the interior. The importation from Germany or the Zollverein territory represents about one- third of the total amount. Bremen trades principally with the United States; Hamburg more with England, South America, &e.

Imports of Bremen.

| Total Imports, |

———

Total Imports, |-

| Millions,

Millions. 1847-51 £53 1873 £26°5 Average. } 1857-61 PE 1874 24°9 1867-71 171 1875 21°9 1871 23°3 1876 22°1 1872 24:8 1877 | 22-1 GOVERNMENT.

The German empire is a union of 25 sovereign states, —4 kingdoms, 6 grand-duchies, 5 duchies, 7 principalities, 3 free towns. Alsace-Lorraine, ceded by France at the peace concluded 10th May 1871, forms a twenty-sixth constituent of the confederation, but it is administered by the central authority. The supreme direction of the military and political affairs of the empire has, by the vote of the reichstag or diet of the North German confederation,

the title of German Emperor (Deutscher Kaiser).

The imperial dignity is hereditary in the line of Hohen- zollern, and follows the law of primogeniture. The emperor exercises the imperial power in the name of the confederated states. In his office he is assisted by a federal council or bundesrath, which represents the Governments of the indi- vidual states of Germany. The members of this council, 59 in number, are appointed for each session by the Govern- ments of the individual states. The legislative functions of the empire are vested in the emperor, the bundesrath, and the reichstag or diet. ‘The members of the latter, 397 in number, are elected for a space of three years by universal suffrage. Vote is by ballot, and one member is elected by (approximately) every 100,000 inhabitants.

As regards its legislative functions, the empire has supreme and independent control in matters relating to military affairs and the navy, to the imperial finances, to German commerce, to posts and telegraphs, and also to rail- ways, in so far as these affect the common defence of the country. Bavaria and Wiirtemberg, however, have preserved their own postal and telegraphic administration. The legisla-

| tive power of the empire also takes precedence of that of the

separate states in the regulation of matters affecting freedom of migration (Freiziigigkeit), domicile, settlement, and the rights of German subjects generally, as well as in all that relates to banking, patents, protection of

intellectual pro- perty, navigation of rivers and canals, civil and. criminal legislation, judicial procedure, sanitary police, and control. of the press and of associations,

The executive power is in the emperor's hands, He represents the empire internationally, and can declare war if defensive, and make peace as well as enter into treaties with other nations; he also appoints and receives ambassa- dors. For declaring offensive war the consent of the federal council must be obtained. The separate states have the privilege of sending ambassadors to the other courts; but all consuls abroad are officials of the empire, and are named by the emperor.

Both the federal council and the reichstag meet in annual sessions convoked by the emperor. who has the right of proroguing and dissolving the diet; but the prorogation

must not exceed 60 days, and in case of dissolution new elections must be ordered within 60 days, and the new session opened within 90 days. All laws for the regu- lation of the empire must, in order to pass, receive the votes of an absolute majority of the federal council and the reichstag. The subjoined table gives the number of votes which the separate states have in the federal council. Each state may appoint as many members to the federal council as it has votes. The table also gives the number of the deputies in the reichstag. The official order of pre- cedence of the 26 states is given in a former table (see p. 455); here they are arranged in the order of the number of their inhabitants.

Representation in Federal Council and Retehstag.

Deputics in

States of the Empire in order aie 'Revelias

Population, | Votes in the | of their Population. 1875.

Federal Council.

o JOU, qo BepsooocoodpbDe 25,742,404 . Bavaria

. Saxony

. Wiirtemberg

Alsace-Lorraine

. Mecklenburg-Schwerin Hamburg

. Brunswiek

. Oldenburg

. Saxe- Weimar

1 Wy

2 6 3 4 4 4

De 0

6. 3

te 3

8 2

a 1

2

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1

. Anhalt 1

1 1 1 1 1 1 1 1 1

al il

1

i

. Saxe-Meiningen . Saxe-Coburg-Gotha … . Saxe- Altenburg

. Lippe

. Mecklenburg-Strelitz..

. Reuss-Gera

. Schwarzburg-Rudol- stadt

. Reuss-Greiz . Schaumburg-Lippe….

Ht et Et ft pt ee ODDO ODMDOR OINT OD

Total 58

oC) Yo)

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The federal council is presided over by the chancellor of the empire (Reichskanzler). Imperial measures, after passing the federal council and the reichstag, must obtain the sanction of the emperor in order to become law, and must be countersigned, when promulgated, by the chancellor of the empire. All members of the federal council are entitled to be present at the deliberations of the reichstag, The federal council, acting under the direction of the chancellor of the empire, is also a supreme adminis- trative and consultative board, aud as such it has nine standing committees, viz.:—for army and fortresses, for naval purposes ; for tariffs, excise, and taxes ; for trade and commerce; for railways, posts, and telegraphs; for civil and criminal law; for financial accounts; for foreign affairs; and for Alsace-Lorraine. Each committee includes repre- sentatives of at least four states of the empire.

For the several branches of administration a considerable number of imperial offices have been gradually created. All of them, however, either are under the immediate authority of the chancellor of the empire, or are separately managed under his responsibility. The most important are the chancery office, the foreign office, and the general post and telegraph office. But the heads of these do not form a cabinet.

By the electoral law of 3lst May 1869 every German of twenty-one years of age is entitled to be an elector, and every one who has completed his twenty-fifth year,

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and has resided for a year in one of the federal states, is eligible for election. The deputies are unsalaried, but during the session they have the right of travelling free by rail. The following table shows the political composi- tion of the reichstag after the four elections from 1871 to 1878 :—

| 1871.

Partics. 1874, 1877. 1878, Con’senvativesieenccst eee 50 oil 40 61 Deutsche Reiehs-partci (Liberal-

@onsenvativies)\)....:...cceeeee ss 38 31 38

Nationallibenils saeesessescscsee- 150 | 126 Fortschritts-partei (Progressists)...| 44 49 33 Soeial Democrats)... ssscsdereseca> ss 2 9 Wy Centrum (Glenteal) Mansseeereetereeee: 57 94 96 fg0) Col iter ee OEE on ocicon ocaomeena 13 13 14 Othenspanties Fe. ese eee cee 62 30 38

382 | 3897 | 397

397

All the German states are constitutional, except Alsace- Lorraine and the two grand-duchies of Mecklenburg. The six larger states have adopted the two-chamber system, but in the composition of the houses great differences

are found. The following table gives analyses of the member- ship for the sessions of 1878. As regards the lower house, 60,000 inhabitants elect one deputy in Prussia, 33,000 in Bavaria, 35,000 in Saxony, 20,000 in Wiirtemberg, 24,000 in Baden, 18,000 in Hesse.

| Prussia. Bavaria.

| Saxony.

| Wiirtemberg,

Members of Upper Houses. Royal princes of age, heads of the 64

mediatized princely houses, &c… Bee ea ee

Higher clergy, Catholicand Protestant; 4] 4, 3]. 2| 2 Delegates of the nobility and rich | :

Vand owers..s.cccsssccessesesseeesseees a i Representatives of university chapters, 11; ... | 3]...| 2{ 1 Burgomasters of large towns…..... [SB)) sel MOMs are i Members nominated by the king.|

OF primgemior 1Mg .,..5.2:..ccecsacenses | BS ee a ae

Total for Upper Houses…... 302} 72] 48) 45 | 29 | 38 |

Members of Lower iLouses.

General representation …....0.00005 20) 8) 1Us{e) eae | aco || noe" ge Delegates of nobility and landowners | he {2k} || aoa fl Representatives of large towns …..... a 35| 7|22,10 Representatives of rural districts …... |.| 45/63 | 41 | 34 lehedhar CleiriAy osogopepoooooooscontebeaaheoas 9

WER ISEHHGS vorecs esc .s can cern eons saancuneeed | UB ress aa

The lesser states also have chambers of representatives numbering from 12 members (in Reuss) to 46 members (in Brunswick), and in most states the different classes, as well as the cities and the rural districts, are separately repre- sented. The free towns have legislative assemblies, numbering from

120 to 200 members. In the so-called landtagen (diets) of Mecklenburg, which have but few privi- leges, 684 rittergiiter (allodial estates) are represented and only 40 towns.

FINANCE.

The most important expenses which the budget of the German empire has annually to meet are those of the cen- tral administration, the army and navy, posts and telegraphs, the high court of justice, the foreign office, and some smaller items. For defraying these, all customs receipts and the net amount of certain excise duties are paid into

the imperial treasury (reichskasse). Of the excise duties those on beet-root sugar, salt, and tobacco are common to all the states; but the imperial malt tax is not imposed in Bavaria, Wiirtemberg, Baden, or Alsace-Lorraine. The three first-named states are likewise exempt from the im- perial excise on spirits. Additional receipts are derived from the duty on bill stamps, from posts and telegraphs (excluding Bavaria and Wiirtemberg), from the railways in Alsace-Lorraine, &c. These receipts are, however, insuffi- cient to meet the expenses of the administration, and for that reason the separate states have to make contributions to the revenues of the empire, varying in proportion to their population. Bavaria, Baden, Wiirtemberg, and Alsace-Lorraine pay proportionally higher direct contri- butions, because they impose taxes on their own account on malt and spirits; so also do Bremen and Hamburg, because they are situated outside the customs territory. For the last few years the average contributions have ranged from £3,000,000 to £4,000,000; but they are increasing with the diminution of the funds available from the French war indemnity. These contributions press heavily upon the minor states.

The imperial budget is voted every year by the reichstag. The ordinary and extraordinary expenses for the financial year ending March 31, 1879, were distributed as follows :—

Expenditure, 1878-79.

Ordinary. Extraordinary. Imperial chancery… . CRUG OBSCOORBOSD £226,799 £116,516 ETC NSCOR rasta susiseasonnsese gAbnonda boon. 6,100 1,500 IRGMEIGMMOMICE se. ccscecce cetiae slevveeesoe 305, 233 26,350 PNURTN Meera oir sic’s cet etsiscteirieintssrisesie’os’e 16,125,914 1,868,927 1 O04 sce ee 1,205,526 1,729,008 NinAMUGMEUTC sreniecteces veces css isesceescewes 1,602,658 ae IVI EUT VA DETISLODS erycs+e es .essesr ese esses 829,072 CIV MIMMENSTOUS iiss cvs ece see csc seescneseoss 48,586 ah PEPerIaLAMEICALTINC,.....-2.-00001000 ene ens 40,309 1,750 Imperial court of railway affairs ……. 13,637 505,117 Posts and telegraphs ……..secseceeeeeeene 6 664,967 MRI OEIAY SHOE oc se cnoosnwseesveeesvey ae 22,526 500 Interest of debt of the empire …….. 339,075 aay Mintage of imperial coins.,..... ans 1,135,000 Expenditure in remission of war-taxes ane 499,766 HOt Gecnisnegessunene’s 20,775,488 6,049,402 Revenwe, 1878-79. 1 CustOmsteneteerscssscmtetcnsccceaaernt scicsenssianegecnscneeas £5,327, 524 D,. EXCISE, MO iies «v.04 ie nsn name teteesa nex taaentans eereocoen: 6,951,768 Beet-root sugar …. £2,868, 336 Common duties, { Salt …….0008 1,699,009 TODACEO: secrerss woes 47,075 Spirits …..0000 ee 2,040,070 Special duties. } Malt 797,278 3. Contributions by territories outside the Zollverein… 287,050 ME SEEM Siaaicisise.e oie teien ev esseraitalowseiee Alinscieie ooPaaemre pea aaanesans 332,655 5. Posts and telegraphs (gross revenue £6,443,000), net 764,420 6. Railways in Alsace-Lorraine (gross £1,908,600), net… 567,800 7. Imperial printing-office, Net ……..scccseccenneeseeceees 8,716 S, linperial bank (share of profits) .....0vsee eooes 100,500 OM AMIGUSRNOVETIUICSs «-.0.0sesccamesicnnecnsscessceeeasenncnsarsoen 381,509 AIO hveeW MGMT TANG rer iecerssscajsie ssisie ais erseis aoe 0’s)u 0:0 osesieevennes noes 1,602.658 MePeenest ofMmnperialeGUNdS . 650… .c.c0:sscereseesersrenee 366,210 MOtaliGiveCt TEVEMUE! ...ca0se0eccaeseene 16,640,810 Extraordinary supply (loans, various funds)..... 5.826 753 Contributions of states to revenue …….5. pannacececе 4,357,276

oe

Total revenue to cover expenditure… 26,824,840

The direct contributions of the principal states of the empire to the revenue for 1878-79 were as follows :—

TUS th… cahheeeaenene Coa UTANONSAOMVG wisiss oc cisvnevsses- £228,786 JRE yE by El sempsacropdascase 984,137 | Alsace-Lorraine …..... 103,020 Wurtemberg…..... BORSSUNEEICSEEMccte…ccce.s-s es FLD JE (Gl, a AeadaEpeoooouatads 241,828 | Mecklenburg …...,..... 40,602

Customs Revenue.—The revenue from the customs duties has increased but little since 1872. In that year it was £5,534,000, and in 1873, £6,131,000; but in 1877-78 it

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465

was only £5,768,000. No export duties have been raised in Germany for many years. On the other hand, all imported goods were taxed till 1865, with very few excep- tions. Since then free trade has been more in favour, and a considerable reduction has taken place in the number of taxed articles. There are still, however, according to the official lists, about 148 articles on which custom duties are levied under 43 divisions. Raw materials are duty free. Four-fifths of the receipts (£4,323,000) are derived from articles of consumption, coffee being the principal item, after which come tobacco, wine, spirits, &c. The sub- joined table shows the customs receipts, in round numbers, from the following items in 1878 :—

Ecce voces wsssinses-< lgs58, 000) | Herrings:.....:~~..:0+.+6 £108,000 MIGWACCO) cars sec eeeses ess SONROOOMMROLKE ¢ochecscsersssecsccss 108,000 Wine and spirits ……. 517,000 | Sugar and molasses…. 101,000 SEN iscodcopdssencceseneenonen POOR OCMC t2~~ cence tevcslincs cote 83,000 EMR UU tarneice con ccucce nese 258,000 | Miscellaneous…..... 235,000

The preceding table shows great differences when com- pared with the corresponding list for Britain. The con- sumption of coffee is considerably larger,—Germany having imported 2,128,000 cwts. in 1876, Great Britain

only 1,361,000. The duty is at the same time much higher than in England, where the revenue from coffee was only £200,000. On the other hand, tea yields only £36,000 duty in Germany, but in England £3,700,000; wine and spirits in Germany £517,000, in England £7,560,000; tobacco, in Germany £821,000, in England £7,800,000.

The German customs tariff serves as a protective duty for several industrial products, although in general a free-trade policy has prevailed in Germany during the last ten years. In 1873 the duties on iron were abolished; still its im- portation, owing to the stagnation of trade, has not increased. The following is a statement of the produce of the duties on specific manufactured articles in 1878 :—

Mexcilestabniessencac srs £604,000 | Furniture, &. ..... £23,000 Glass and eartheuwares 50,000 | Copper-warcs ..... 16,000 Ost .dendduS aceon eaeene 4A 7ROOOmelironm-=wwares) -c:ssc0:-c0s se 10,000

Leather and leather-wares 62,000 | Paper…….....sececeeueeees 12,500

In 1879, however, Germany has suddenly returned to an extreme protective system. The present import duties are much increased, and duties are imposed on many articles hitherto duty free. The Government hopes to make a gross revenue of about £8,000,000 by the new customs.

Excise. —The excise duties on articles of consumption have for the most part been considerably increased since 1872, especially the duty on sugar. The tax on tobacco is, how- ever, still trifling (in 1877, £47,000). Bavaria, Wiirtem- berg, and Baden are exempt from the duties both on spirits and on malt, Alsace-Lorraine from that on spirits.

Receipts from Exeise Duties.

Beetroot a Sugar. Spirits.

£

1,644,000 1,704,000 1,786,000

& 1,631,000 1,902,000 2,632,000

£

1,726,000 2.578,000

3,274,000 922.000

Funds of the Empire.—The extraordinary funds, from which verv large sums appear annually in the budget, were created after the French war. Part of the indemnity was invested for fixed purposes. The largest of these investments served for paying the pensions of the invalided, and amounted originally to £28,000,000. Every year not only the interest, but also part of the capital of this fund is expended in paying these pensions. Another fund, of about £5, 200,000, serves for the construction and armament of fortresses ; a third for building new houses of parliament; a fourth for the construction of railways in Alsace-Lorraine. Further, the empire has put aside £6,000,000 as a Reichs-Kriegs-Schatz, or imperial war reserve fund, which is not laid out at interest, but exists in coined gold and bullion at Spandau. The railways in Alsace-Lorraine are also the property of the empire,—France having paid an allowance

x. ao

466

to the Eastern Railway Company of £13,000,000 for the railways The following table shows

brought under the control of Germany. the state of the imperial funds at 1st March 1878 :—

Tnvaliditund: seco ccc canon oe £27,870,700 Fund for armament of fortresses …..... 6,515,800 War resenviestund memes… caeseee seen se 6,000, 000 Parliament House building fund. 1,455,400

Imperial Debts.—The loans contracted by the North German Confederation for the war with France have long since been paid off. The extraordinary

expenditure of the empire was for several years paid out of the French indemnity, but that resource is now exhausted. Accordingly, for defraying the expenses of the army and navy, the extension of the subterranean telegraphs, &c., two new loans had to be raised in 1877 and 1878, amounting to £8,760,800. There exists, besides, an unfunded debt. The law allows the imperial chancellor to effect an issue of bills of exchequer for short terms to the extent of £7,500,000, and these are destined partly for the expenses of administration, and partly for the completion of tlie monetary reform. Since 1874 also a debt bearing no interest has been created in imperial treasury bills (Reichscassenscheine), which are to be substituted for the paper currency issued by the separate states. At that date only four states—Lippe, Liibeck, Hamburg, and Bremen —had no paper currency. Prussia had in 1872 only £3,000,000 of paper currency, or 2s. 6d. a head, but in the minor states the proportion was highcr,—reaching in Saxe-Coburg-Gotha 10°8s. a head, in Anhalt 14s., in Mecklenburg-Strelitz 24°7s., andin Schaum- burg-Lippe the very high figure of 34°8s, This inconvenience was remedied by an imperial law, ordering the states to call in their paper currency, and replacing it by the issue of imperial treasury bills, amounting to £6,000,000. For many of the smaller states this sudden withdrawal of their paper currency was too severe an ordeal, Accordingly, to these a further sum was advanced for a term of years in treasury bills; £8,338,000 was thus in circulation on the 30th September 1878.

Reform of the Currency.—The German empire adopted a gold currency by the law of the 4th December 1871. Subsequently the old local coinages (Landesmiinzen) began to be called in and replaced by new gold and silver coins. The old gold coins, amounting to £4,550,000, had been called in as early as 1873; and the old silver coins have also been successively put out of circulation, so that none actually now remain as legal tenders but the thaler (3s.). Silver currency to the amount of £52,000,000 had been withdrawn up to the 30th September 1878, and copper coins to £157,600. To replace these there were coined up till the 30th September 1878—gold pieces, £81,900,000; silver coins, £21,330,000; nickel and copper, £2,287,800. The currency reform was at first facilitated by the French indemnity, a great part of which was paid in gold. But later on that metal became scarcer; the London gold prices ran higher and higher, while silver declined. The average rate per ounce of standard silver in 1866-70 was

602d., in January 1875 only 574d., in July 1876 as low as 49d. It rose in January 1877 to 574d., but again declined, and in September 1878 it was 503d. While, thcrefore, the proportion of like weights of fine gold and fine silver in 1866-70 averaged 1 to 15°55, it was 1 to 17°79 in 1876, and 1 to 17°18 in 1877, and the difference again increased in 1878.

Banking.—A new banking law was promulgated for the whole empire on the 14th March 1875. Before that date there existed 32 banks with the privilege of issuing notes, and on the 31st December 1872 £67,100,000 in all was in circulation, £25,100,000 of that sum being uncovered. The banking law was designed to reduce this circulation of notes; £19,250,000 was fixed as an aggregate maximum of uncovered notes of the banks. The private banks were at the same time obliged to erect branch offices in Berlin or Frankfort for the payment of their notes. In consequence of this regulation 13 banks resigned the privilege of issuing notes, so that at present there are in Germany but 19 note-issuing banks of which 5 belong to South Germany (Frankfort included). The Imperial Bank (Reichs- bank) ranks far above the others in importance. It took the place of the Prussian Bank in 1876, and is under the superintendence and management of the empire, which shares in the profits. Its head office is in Berlin, and it is entitled to erect branch offices in any part of the empire. It has a capital of £6,000,000 in shares of £150. The following table exhibits the position of the German Reichsbank as compared with the other 18 banks at the 30th Sep- tember 1878 :—

Banke. Circulation, | Bullion. | PGfe rs

£ £ £ Reichsbank …….++++- 33,561,350 | 28,452,150 | 10,099,200 18 private banks……. 9,395,850 | 7,209,450 | 2,186,400 ee 42,947,200 | 30,261,600 | 12,685,600

Subjoined is a comparison with the great banks of England, France, and Austria at the same date:—

GERMANY

[FINANCE, Notes i . E £ £ £ Bank of England ……. 26,592,000 | 23,846,000 | 2,742,000 Bank of France……. 91,250,000 | 86,114,000 |

5,126,000 German Reichsbank….. 33,551,000 | 23,452,000 | 10,099,000

Austrian National Bank | 29,698,000 | 18,836,000 | 15,862,000

Finances of the separate States.—The budgets of the different German states are so variously arranged that it is difficult to group them on uniform principles. We extract the following particulars from the scheme published by Prof. H. Waguer in the Almanach de Gotha for 1874. The expenses and reccipts of the empire and those of the separate states are in the two tables taken together. The first table contains the net expenses for 1872-78, the charges of collection being deducted ;—

Net Expenditure of German States, including the Emptre.

1. Civil list and annuities to the princely families…... £1,750,000 2. Diets). . cacanen ses ocenicecnesoucearccete ec rseccenstins «sasseneiast 112.500 3. Civillgeryleenn. orcas tac can tamtcncoratebacsastases «ake 20, 200, 000 4. Interest and management of the public debts ……... 19,060,000 5, Amy adimayyis….scs0s0 WOE el naan escent 17,360,000

pRotalaeersas. cut sccm seca 48,422,500

Professor Wagner’s second table gives the principal items of revenue :—

Net Revenue.

£ £

Revenue. gos . I. Revenue from public property and establish- ments managed by state,

. Crown land and state forests . 5,800,000 . al ou consolidated funds, profits of issue, pe 3,075,000

375,000 1,445,000 353,000

6,285 000

c.

. State lotteries

. Produce of public mines and salt works

. Various state establishments

. Post-office, telegraph service, state railways, } CONG Sieeececetesesestenceatsceesanacensenerencsearsateneaes

Il. Taxes. ; . Direct taxes 10,680,000 2, Excise— Spirits and malt .. Beetroot sugar.

8,800,000

5,500,000 5,885,000 450,000

47,638,000

. Stamps of all kinds, and fC€S ……...ceeereees soo

5,700,000

. Tolls, tounages, &c. aa

In the absence of trustworthy statistics the local taxes have not been taken into consideration in the above table. These, however, are very considerable in many cities in Germany, in consequence of recent expenditure on schoolhouses, sewage-works, &c.

A comparison of the foregoing tables with tlie corresponding sta- tistics tor the United Kingdom (1874) gives the following result. The payments on account of the national debt in Great Britain formed 42°2 per cent. of the total expenditure after deducting the charges of collection ; in Germany only 18‘14 per cent. The army and navy in England absorb 39°3 per cent. of the expenditure (or 68:0 per cent. after deducting the charges of debt), in Germany 35°6 per cent. (or 43°7). The expenses of the national debt in England are about 17s. a head, in Germany about 5s. The expenscs of the army and navy in England are about 16s. a head, in Germany 9s. The public property in domains and forests is greater in Germany than in any other

state of Europe, the area of the state forests being no less than 17,600 square miles. Many of the smaller states defray more than one-half of their expenditure by the revenue from domains and forests. From this source Germany is able to meet nearly one- fifth of her expenditure (17°3 per cent.), whereas in England only 0°6 percent. is thus obtained. On the other hand, the expenses in- curred by Germany for the civil lists and for annuities to the princely families are very considerable. Germany pays 3°6 per cent. of the national income to her princes, Great Britain only 1°04 per cent. In the minor states the princely households absorb 10 to 12 per cent. of the expenditure. The proceeds of establishments managed by the state cover 17°5 per cent. of the whole expenditure in Germany, but only 2°5 in England. The proportion of direct to indirect taxes is in England as 17 to 83, in Germany as 31 to 69. Buton the whole the English are taxed twice as heavily as the Germans. The gross revenue in England was, in 1874, 42s. a head, in Germany 16°2s.; of these sums 13°2s, came, in England, from customs duties, and 13°3s. from excise on spirits and malt (apart from the customs duties), while in Germany the corresponding figures were only 3s. and 2°4s.

A considerable part of the public debt of the separate states was

paid off by them after the war. In 1873 the total amount of all debts of the German states was only about £171,000,000. In this sum was included £9,500,000 of currency. ‘The greater part of this liability has been incurred for productive purposes, particularly for the construction of railways. The railway debts (which are not directly charged on the population) were in 1873 about £96,500, 000. Since then some states have gone on reducing their debts still further; Prussia, for example, has done so by more than £11,000,000. Others again, such as Bavaria, Saxony, Wiirtemberg, and Baden have contracted new loans for constructing railways, or, as Saxony, for purchasing them. The entire debt of all the Ger- man states, including the imperial debt, at 31st December 1877, may be estimated at £220,000,000, of which sum, however, more than £140,000,000 consists of railway debt. The average sum per head will accordingly be £5, whereas in

Great Britain it is £23 to £24. When the railway debts are deducted the proportion is less than £2 a head in Germany.

ARMY AND Navy.

By the constitution of 16th April 1871 every German is liable to service (wehrpflichtig), and no substitution is allowed (art. 57). Every German capable of bearing arms (wehrfihig) las to serve in the standing army for seven years—as a rule from the end of tle twentieth till the commencement of the twenty-eighth year of his age. Three of these seven years he must spend in active service, and the remainder in the reserve ; after quitting the latter he forms part of the landwehr for five years more—the full time of military service thus being twelve years. The strength of the army on a peace footing (friedensfuss) was fixed in the army bill of 1874 at 401,659 (or say 1 per cent. of the population at the census of 1871) for a term of seven years ending the 3lst December 1881, The number of recruits levied annually is 145,000 men. All young men who reach a certain fixed standard of higher school training, however, are obliged to serve only for one year in the active army, and these are not included in the effective strength of the army on a peace footing. Collaterally with the army there has existed since 1875 the landsturm, to which all men liable to service and capable of bearing arms, between the ages of seventeen and forty-two, belong, if they are neither in the line, the reserve, the landwehr, nor the marine. The landsturm is only called to arms in the event of a hostile invasion of the imperial territory being threatened or effected.

By the articles of the constitution the whole of the land forces of the empire form a united army in war and peace under the orders of the emperor. The sovereigns of the chief states are entitled to nominate the lower grades of officers, and the king of Bavaria has reserved to himself the special privilege of superintending the general administration of the two Bavarian corps d’armée ; but all appointments are made subject to the emperor’s approval. ‘The 64th article of the constitution enacts that all German troops are bound to obey unconditionally the orders of the emperor, and to take the oath of allegiance accordingly. The emperor is empowered to erect fortresses in any part of the empire.

Organization of the Army.—The imperial army consists of 18 army corps, viz., the Prussian garde-du-corps, 13 Prussian corps (including the troops of the minor states in military convention with Prussia—Nos. 1 to 11 being Prussian, while Nos. 14 and 15 are the Baden and Alsacc-Lorraine corps respectively), the Saxon corps (No. 12), the Wtirtemberg corps (No. 13), and the 2 Bavarian corps. One army ‘‘inspection”” comprises from 8 to 4 corps. Generally 1 army corps consists of 2 divisions, each of which includes 1 horse and 2 foot brigades. As arule the infantry brigade consists of 2 infantry regiments and 2 landwehr regiments, the cavalry brigade of from 2 to 3 cavalry regiments. An infantry regiment consists of 3 battalions of 4 companies each ; a cavalry regiment has 5 squad- rons. There are many exceptions, however, to these rules, e.g., the garde-du-corps and the Saxon corps d’armée consist each of 1 cavalry and 2 infantry divisions, the 11th contains 3 divisions, &c. Some divisions also are stronger than others. Altogether the Ger- man army numbers 40 divisions, of which 6 are infantry, 3 cavalry,

and 31 both combined. There are in all 74 infantry and 388 cavalry brigades, and 148 infantry and 98 cavalry regiments.

Besides the troops above named, each army corps generally includes (a) 1 jager or light battalion (the Bavarian army has, how- ever, 10 of them); (5) 1 field artillery brigade; (c) 1 foot artillery regiment; (d@) 1 engineer battalion ; (¢) 1 train battalion. The garde- du-corps has, in addition, two railway battalions, 1 instruction in- fantry battalion (Lehrbataillon), &c. The several ficld artillery brigades are not uniformly constituted, but in 12 of the 18 army corps the brigade consists of 2 artillery regiments. One of thesc with 8 batteries is attached to the division, while the other remains under the orders of the corps commander. This latter consists of 2 sections (Abtheilungen) of 3 batteries each, anda mounted division of 3 batteries. Each battery has as arule 4 guns. A foot artillery regiment has 2 battalions of 4 companies each. There are in ail 36 field artillery regiments with 301 batteries and 1206 guns, and 13 foot artillery regiments. In war time several corps are combined as ‘‘ armies,” the entire military force consisting then of

the field or battle army, the reserve or supplementary troops (Ersatztruppen), and the garrison troops (Besatzungstruppen).

The following tables exhibit the strength of the German army on a peace footing and on a war footing respectively.

There are other 25,975 men who are not included in the latter sum-total but whose cost is defrayed by army grants. Thcy include 4658 physicians, 838 veterinary surgeons, 1600 paymasters, &c. Nor does the table take account of the troops of the field rescrve and of the landsturm, regarding the organization of which no details have been published ; the former, which is drawn from the landwehr, is estimated at 250,000 men. It is calculated that Germany may put in arms at any given time two millions and a half of armed men without having recourse to the last reserves. Thc maximum strength af the army in the war with France was 1,350,787 men and 263,753

orses.

Strength of the Imperial Army.

Officers. Rage and | Horses.

Peace-Footing. ‘le

. Infantry, 763 battalions— infantry, 148 regiments or 444 battalions .

1,987

8,740 | 255,679

Jager (light infantry). 26 battalions…..... 534 Depéts of landwehr, 298 battalions 3, Cavalry, 93 regiments, 465 squadrons …....

. Artillery— Field artillery, 301 batteries Fort artillery, 29 battalions. . Engineers, 20 battalions ; . Train, 18 battalions…. 7. Special troops ….....

14,845

401,659

.,.| Rank and

File. Horses

War-Footing.

a. Field Army.

it2! Aaya & secbecosebecoscnodpodt 863 5,170 5,070 Intantry, 443 battalions …..... 10,190 455,620 | 17,908 Declare ODALTHMOMBectctveccsss « cacosascssvecccceesreerae 572 26,676 1,046 Wavaliya dd SOMAGTONS sccc,cssccsccesccsescososress-cee 2,144 59,814 | 65,608 Artillery, 300 batterics, 1800 ZUNS .....cceeeee 2,286 78,120 | 79,482 Engineers, 54 cOMpanies….....s00csscsssceveseoees 555 20,917 9,647 PLURIN OI COMATINIS! idcencecescecscaesescerseeancsassenccaes 484 88,451 | 46,017 Administration department …....cscccccscsssseees 216 2,856 | 10,864

Total field army….....| 17,810 687,594 | 233,592

b. Reserve. Rbatimecesrotssnenccseccecccesns infantry, 148 battalions Jager, 26 companies…... Cavalry, 93 squadrons… Artillery, 71 batteries, 426 guns .. Sch 4 EMGINEEIS, 20 COMPANIES. 20..00..ceesssessneccosen cess

90 4,950 20

Train, 37 COMPANIES ....s.sseeseeee cecssceeseeersseenef 240 | —-11,522 | 8,903 FROLALVESCHY CG. .0..02 0060050 4,426 248,095 | 50,530 c. Garrison Troops. \ PACHA SUBA TION Waseca carentieaieensicceeecse/as’sss\se tessa 850 10,000 1,850 lnfantry. 293 landwehr battalions ….....] 6,424 250,244 2,044 Jager, 26 landwehr companies …....css00-8 oe: 104 6,500 26 | Cavalny, MetisquadiOns 5.22. .,. 00.5 s00ccss sce annveccees 828 22,768 | 25,380 Artillery, 54 batteries, 324 guns….....0-.| 1,870 54,852 8,114 ENSIMEETS ASICOMPANICS Io… ....240+ 0200s ssccereeaeseos 531 8,538 Total garrison troops…..... 10,107 353,102 | 37,414

Granctotalimesns s-

Fortresses.—Since the Franco-German war the fortress system has been entirely remodelled. A number of old and useless fortresses have been dismantled ; several new ones have been erected along the sea-coast; and most of those flanking the land frontiers have been enlarged. The

empire is divided into nine fortress districts, each includ- ing a certain number of fortified places. The Baltic coast fortresses are Memel, Pillau, Dantzic (first-class fortress), Colberg, Swinemiinde, Stralsund, Travemtinde, Kiel, Friedrichsort, Sonderburg-Diippel. On the North Sea are Wilhelmshaven and the fortresses by which the mouths of the Elbe, Weser, and Ems are guarded. The eastern frontier is protected by the first-class fortresses of Kénigs- berg, Dantzic, Thorn, and Posen; and by the secondary ones of Marienburg and Dirschau on the Vistula, and of Glogau on the Oder, which are especially intended for the protection of the railways. For the southern frontier there exist only the fortresses of Neisse, Glatz, and Kénigstein on the Elbe. The old inland fortresses have been abol- ished, except the first-class ones of Kiistrin, Magdeburg, Spandau, and (for railway protection) Torgau on the Elbe. Ulm and Ingolstadt on the Danube, both first-class fortresses, are also maintained. On the western frontier Strasburg and Metz have been fortified by a wide range of outer fortifications, and there is besides an outer line of smaller fortified places, consisting of New Breisach, Bitsch, Saarlouis, and Thionville. A second line runs along the Rhine, where there are large fortresses serving as encamp- ments at Rastadt, Mainz, Coblentz, and Cologne, and smaller ones for the protection of the Rhine bridges at Germers- heim, Ehrenbreitstein opposite Coblentz, Diisseldorf, and Wesel. The empire thus possesses 16 fortified places of the first class serving as camps, and 27 other fortresses.

Navy.—The German navy is but of recent origin. In 1848 the German people urged the construction of a fleet. Money was collected, and a few men-of-war were fitted out ; but these were subsequently sold, the German bundestag (federal council) not being in sympathy with the aspirations of the nation. Prussia, however, began laying the founda- tions of a small navy. To meet the difficulty arising from the want of good harbours in the Baltic, a small extent of territory uear Jahde Bay was bought from Oldenburg in 1854, for the purpose of establishing a war-port there. Its

construction is now practically completed, although at.

chormous expense, and it was opened for ships by the em- peror in June 1869 under the name of Wilhelmshaven. In 1864 Prussia, by annexing Holstein, obtained possession of the excellent port of Kiel, which has since been strongly fortified. From the time of the formation of the North German confederation the navy has belonged to the common federal interest. Since lst October 1867 all its ships have carried the same flag, —black, white, red, with the Prussian eagle and the iron cross.

From 1848 to 1868 the increase of the navy was slow. In 1851 it consisted of 51 ships with 188 guns (among which there were, however, 36 small gunboats of 2 guns each), and with 1180 hands in all. In 1868 it consisted of 89 vessels of 563 guns, aniong which number there were 2 ironclads, and 43 other steamers. Since then a definite plan for the development of the navy has been set on foot, and great activity has been displayed in fitting out ships and in augmenting the personnel.

The following table shows the increase that has occurred in the navy budget since 1868:—

Extra-

‘ Extra- ordinary.

ae ordinary.

Ordinary.

£ £ £ £ 351,000 394,000 1974 692,000 | 1,976,000

385,000 897,000 1875 902.000 454,000 630,000 1876 1,053,000 238,000

660,000 1877 1,083,000 | 1,428.000 685,000 1878-79, 1,205,000 | 1.729,000 730,000 |

470,000 539.000 666 000 688,000

The personnel of tlie navy consisted in 1878 of 965 officers and 9265 men. There are 2 sailors divisions (Matrosendivisionen) of

GERMANY

[WAVY.

(Abtheilung) of 400 hands, 2 dockyard divisions (Werftdivisionen) with 148 officers and 1718 men, and 1 battalion of marines with 1035 men. The sailors and marines are levied by conscription from among the seafaring population, which is on this account exempt from service in the army. The total sea-going population of Ger- many is estimated at 80,000, 48,000 of whom serve in the mer- chant marine at home, and about 6000 in foreign service. Great inducements to enter the navy are held out to able seamen. The following table gives the state of the navy in August 1878 :—

Ships. Number. ;, Guns. Tonnage. Horse-Power Armour-clad ships— FMP ATES! s.0<-ssccre sco a3ees 7 85 8,400 te 5,900 | 3,500 to 8,000 COTVGEEGS |... cs ssscccssscse 3 20° 2,400 to 5,000 | 3,000 to 5,600 Floating batteries….,. 7 12 780 to 1,200 700 to 1,200 Non-armour-clad ships— Floating battery…..... 1 23 3,300 3,000 Decked corvettes …... 11 166 1,700 to 2,800 | 1,500 to 4,800 Corvettes…….....ses.006 7 62 1,000 to 1,600 | 800 to 2,400 Despatch vessels…..... 5 6 330 to 1,500 350 to 8,000 GI DOAESD. «co aessccescees 1? 30 600 to 1,200 600 to 1,100 Torpedo ships…..... 11 a 24 to 900 80 to 2,300 Transport steamer…... 1 BAe 425 820 Sailing vessels .. 4 298 2,800 re LOLA eeteee 70 399 ~ 91,500 110,000 RELIGION.

In the official census it has been usual to return the religious creed of the inhabitants, though a few states, such as Prussia and Hamburg, omitted this particular in 1875. Official estimates indeed have been made of the religious profession of the people in these states for 1875 also, but only the census of 1867 and that of 1871 can be accurately compared. The number of persons styling themselves of no religion, or refusing to state their religion, is very small. The following table gives the results of the three last enu- merations :—

1875.

Partly estimated.

1867

Census.

1871

Creeds. Gente

Protestamts……ceses

24,921,000 | 25,581,623 | 26,718,823

Roman Catholics ….| 14,564,000 | 14,867,600 | 15,371,227 Dissenters. .oc1….<00 117,000 82,156 its sedis suas cote 499,000 512,160

176 16,980

Religion not stated..

Total…...

6,000

40,107,000 | 41,058,722 | 42,727,360

Almost two-thirds of the population belong to the Evan- gelical Church, and rather more than a third to the Church of Rome. The dissenters are very inferior in numbers, amounting to only about 100,000 souls, but the Jewish ele- ment, represented by half a million (14 per cent.), is more considerable than in any other state of West, North, or South Europe. The following table gives the proportion of Protestants, Catholics, and Jews in every 1000 inhabi- tants :—

Rate to 1000 Inhabitants.

Protestants. Catholics.

The Protestants have increased in number by 0:4 per cent. of the population since 1867. This increase, however, must not be attributed to conversions, but rather to the greater increase of population in the Protestant provinces of Germany as compared with the Catholic ones; though at the same time the official returns of Prussia prove that conver- sion to the rival communion is much more frequent with Catholics than with Protestants. Three states in Germany

79 officers and 6029 seamen and boys, a ship-boys department | have a decidedly predominant Catholic population, viz.,

RELIGION. |

Alsace-Lorraine, Bavaria, and Baden ; and in four states the Protestant element prevails, but with 23 to 33 per cent. of Catholics, viz., Prussia, Wiirtemberg, Hesse, and Olden- burg. In Saxony and eighteen minor states the Catholics number only from ‘1 to 3°3 per cent. of the population. The following table gives the respective numbers of Pro- testants and Catholics according to the census of 1871 :—

Rate per 1000

States. Protestants, ae a i aia

Prot. Cath.

Alsace-Lorraine ……. 270,699 | 1,235,097 | 175 | 797 [BUA IGIGyAR ono pangrdeonandecnnce 1,342,592 | 3,464,364 | 276 | 712 oe 491,008 | 942,560| 336 | 645 i. ne 16,041,215 | 8,268.309| 650 | 335 Wiirtemberg … cccccecsese 1,248,860 | 553,542] 687 | 304 THGSSOR «cane, sane assnesss ses 585,399 238,080 | 686 279 Olde Dai …

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From the above figures little can be inferred as to the geographical distribution of the two confessions. On this point it must be borne in mind that the population of the larger towns, on account of the greater mobility of the population since the introduction of railways and the abolition of restrictions upon free settlement, has become more mixed,—Berlin, Leipsic, Hamburg, &c., showing pro- portionally more Catholics, and Cologne, Frankfort, Munich, &c., more Protestants than formerly. Otherwise the geo- graphical limits of the confessions have been but little altered since the Thirty Years’ War. In the mixed terri- tories those places which formerly belonged to Catholic princes are Catholic still, and vice versa. Hence a religious map of South Germany looks like an historical map of the 17th century. The number of localities where the two confessions exist side by side is small. Generally speaking, South Germany is predominantly Catholic. Some districts along ‘the Danube (province of Bavaria, Upper Palatinate, Swabia), in southern Wiirtemberg and Baden, and in Alsace-Lorraine are entirely so. These territories are bordered by a

broad stretch of country on the north, where Protestantism has maintained its hold since the time of the Reformation, including Baireuth or eastern Upper Franconia, Middle Franconia, the northern half of Wiirtem- berg and Baden, with Hesse and the Palatinate. Here the average proportion of Protestants to Catholics is two to one. The basin of the Main is again Catholic from Bamberg to Aschaffenburg (western Upper Franconia and Lower Franconia). In Prussia the western and south-eastern provinces are mostly Catholic, especially the Rhine pro- vince, together with the government districts of Miinster and Arnsberg. ‘The territories of the former principality of Cleves and of the countship of Mark (comprising very nearly the basin of the Ruhr), which went to Branden- burg in 1609, must, however, be excepted. North of Minster, Catholicism is still prevalent in the territory of the former bishopric of Osnabriick. In the east, East Prussia (Ermland excepted) is purely Protestant. Catholi- cism was predominant a hundred years ago in all the frontier provinces acquired by Prussia in the days of Frederick the Great, but since then the German immigrants have widely propagated the Protestant faith in these districts. A prevailingly Catholic population is still found in the district of Oppeln (89 per cent.) and the countship of Glatz, in the province of Posen (64 per cent.), in the Polish- speaking “circles” of West Prussia, and in Ermland (East Prussia). In all the remaining territory the Catholic creed is professed only in the Hichsfeld on the southern border of the province of Hanover, and around Hildesheim.

Protestant Church.—The adherents of Protestantism are divided by their confessions into Reformed and Lutheran. To unite these the “church union” has been introduced i several Protestant states, as for example in Prussia and Nassau in 1817, inthe Palatinate in 1818, and in Baden in 1822. Since 1817 the distinction has accordingly been ignored in Prussia, and Christians are there enumerated only as Evangelical or Catholic. The union, however, has not remained wholly unopposed,—a section of the more rigid Lutherans who separated themselves from the state church being now known as Old Lutherans. In 1866 Prussia annexed Hanover and Schleswig-Holstein,

where the Protestants were Lutherans, and Hesse, where the Reformed Church had the preponderance. The inhabitants of these countries opposed the introduction of the union, but could not prevent their being subordinated to the Prussian oberkirchenrath (high church-council), the supreme court of the state church. Subsequently the official returns have been thus classified :—

1875,

(a) Members of the Evangelical State Church ……..... 16, 636,990
Wynteclpyee son. 2 seins See cinscuauicon enna 13, 266, 620
IGUETETENE: goamedoboandoisnnacolipoonsnbonse 2,905,250
TEHOMUM Ee peas is. sateen w ecer meee ee oreacs 465,120 (≥)
Separatist Lutherans (Old ..)....0.01.isssdeeccedsverees 40,630
(cjiSepamatist Reiornicd Me… cisvacnssess ree titeaws«s soneeases 35,080

The separatists are thus not numbered among dissenters. A synodal constitution for the Evangelical State Church was introduced in Prussia in 1875. The oberkirchenrath retains the right of supreme management. The ecclesistical affairs of the separate provinces are directed by consistorial boards. The parishes (pfarreien) are grouped into dioceses (sprengel), presided over by superintendents, who are subordinate to the superintendent-general of the province. Prussia has sixteen superintendents-general. The ecclesi- astical administration is similarly regulated in the other countries of the Protestant creed. Regarding the number

‘of churches and chapels Germany has no exact statistics,

but in 1867 it was estimated that there were 12,959 places of worship in Prussia.

Roman. Catholic Church.—There are six archbishoprics within the German empire :—Breslau (where the archbishop has the title of prince-bishop), Gnesen-Posen, Cologne, Frei- burg (Baden), Munich-Freising, and Bamberg. The eighteen bishoprics are—Ermland (see at Frauenburg, East Prussia), Kulm (see at Pelplin, West Prussia), Fulda, Hildesheim, Osnabriick, Paderborn, Miinster, Limburg, Treves, Metz, Strasburg, Spires, Wiirzburg, Ratisbon, Passau, Eichstadt, Augsburg, Rottenburg

(Wiirtemberg). An apostolic vicari- ate exists in Dresden. Inrecent years numerous convents, especially in Prussia, have been suppressed. The order of the Jesuits is interdicted in Germany.

Old Catholics:—After the infallibility of the pope had been proclaimed as a dogma by the Vatican council in 1871, several communities as well as individuals declared their secession from the Roman Church. They are called Old Catholics, and they have selected a bishop who has been acknowledged by most of the states. At the lst of January 1877 the denomination had 121 congregations with 56 clergymen and 16,557 adult male adherents, so that we may fairly estimate the total number of Old Catholics at a little more than 50,000.

The number of Greek Catholics was 2660 in 1871.

Dissenters.—There is no uniformity in the state returns of the several denominations, and detailed statements are wanting for Wiirtemberg, Alsace-Lorraine, and eight of the lesser states. In the sixteen remaining states there were in 1875 21,000 Mennonites (particularly in East and West Prussia and the Palatinate), 10,451 Baptists, 3000 Irving- ites, 4000 Hermnhuter (Moravian brethren), and 1600

| members of the Church of England. The Mennonites had

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increased from 14,000 in 1871. Besides these there were about 6800 German Catholics, 3600 Freethinkers, and more than twenty-five sects represented by from 100 to 500 members.

Jews.—It is in the towns that the Jewish element is chiefly to be found. They belong principally to the mercan- tile class, and are to a very large extent dealers in money. Within the last thirty years their wealth has grown to an extraordinary degree. They are increasingly numerous in Hamburg,

Berlin, Frankfort, Breslau, Konigsberg, and Fiirth. Though still, in fact at least, if not also by law, excluded from many public offices, especially from com- mands in the army, they nevertheless are very powerful in Germany, the press being for the most part in their hands. Some towns of the Marienwerder and Posen districts con- tain from 20 to 30 per cent. of Jews. By far the greater number are found among the Slavs in the east ; in the west they appear chiefly in Hesse, Baden, and Alsace.

LANGUAGES.

The German-speaking nations in their various branches and dialects are found to extend in a compact mass along the shores of the Baltic and of the North Sea, from Memel in the east to a point between Gravelines and Calais near the Straits of Dover. On this northern line the Germans come in coutact with the Danes who inhabit the northern parts of Schleswig within the limits of the German empire. A line from opposite Sonderburg in the isle of Alsen to Tondern in the west will nearly form the boundary between the two idioms. The Germau-French frontier traverses Belgium from west to east, touching the towns of St Omer, Courtrai, and Maastricht. Near Eupen, south of Aix-la-Chapelle, it turns southward, and near Arlon south-east as far as the crest of the Vosges mountains, which it follows up to Belfort, traversing there the watershed of the Rhine and the Doubs. In the Swiss territory the line of demarcation passes through Biel, Freiburg, Saanen, Leuk, and Monte Rosa. In the south the Germans come into contact with Rheto-Romans and Italians, the former inhabiting the valley of the Vorder-Rhein and the Engadine, while the latter have settled on the southern slopes of the Alps, and are continually advancing up the valley of the Adige. Carinthia and Styria are inhabited by German people, except the valley of the Drave towards Klagenfurt. Their eastern neighbours there are first the Magyars, then the northern Slavs and the Poles. The whole eastern frontier is very much broken, and cannot be described in a few words. Besides detached German colonies in Hungary, the western parts of that country are held by Germans. The river March is the frontier north of the Danube from Pres- burg as far as Briinn, to the north of which the German regions begin near Olmiitz,—the interior of Bohemia and Moravia being occupied by Czechs and Moravians. In the Prussian provinces of Silesia and Posen the eastern parts are mixed territories, the German language progress- ing

slowly among the Poles. In Bromberg and Thorn, in the valley of the Vistula, German is prevalent. In West Prussia some parts of the interior, and in East Prussia a small region along the Russian frontier, are occupied by Poles (Kassubians in West Prussia, Masurians in East Prussia). The German tongue is also fast invad- ing the Lithuanian territory, and in a short time no people speaking that idiom will be found to the left of the river Memel. The total number of German-speaking people, within the boundaries wherein they constitute the compact mass of the population, may be estimated, if the Dutch and the Flemings be included, at 56 millions.

The geographical limits of the German language thus do not quite coincide with the German frontiers. The empire

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[LANGUAGE,

contains about 3} millions of persons who do not make use of German in everyday life, not counting the 290,000 resident foreiguers. The non-German languages have their representatives only in Prussia, Saxony, and Alsace-Lorraine. No census since 1861 has given the statistics of the dif- ferent languages spoken in the first- mentioned country ; and, in regard to Alsace-Lorraine also, the figures are based upon estimates only. The following table gives the results of semi-official estimates for 1875 :—

[*, ot 5 Languages. | Persons. Prop cues 1000 a «sigs seiveteticeaeesemememeree | 39,100,000 921 |e) 1 ee ceeocace Pern eranausaoce 2,600,000 AW (2000 SO RR RBG ichiconoacaneode 140,000 66 CZeCW a ccncs cc oOo 50,000 JUANDE Saoanesncococasodnooe na: 150,000 4 Dainislir ees. ee eee ee 150,000 4 IBrenGhi, hay cacesee meee oneeeere 250,000 6 Total—Natives …... 42,440,000

Foreigners .. | 290,000

From this it will be observed that the Poles form a considerable part of the population,—about 60°1 per cent. in the district of Oppeln, 59°3 in Posen, 49°6 in Bromberg, 37°8 in Marienwerder, 27°3 in Dantzic, 21:9 in Guimbinnen, 17°1 in Koénigsberg, and 4‘3 in Breslau. The Wends, who

inhabit Lusatia, are decreasing in number,—in the Saxon district there were 52,097 in 1871, and in 1875 only 50,737. The Lithuanians are likewise diminishing on the eastern border of East Prussia. Czechs are found only in Silesia on the confines of Bohemia. The Freneh are represented in Lorraine and Upper Alsace, and on the Belgian frontier.

EDUCATION.

In point of intellectual culture Germany ranks high. Much is done by the Government for the promotion both of primary and of secondary education ; there are no exact statistics, however, of the educational establishments, or of the expenditure incurred in connexion with them. In regard to the latter the sums which figure in the Government budgets are not the only contributions which must be cqn- sidered; for in most of the states the several local com. munities provide from their own resources for primary in- struction and for many of the higher schools, while many of the superior institutes have funds of their own not included in the budget. School instruction is obligatory on the whole people, but in many districts there is still a scarcity of teachers and some want of efficient control. The total number of primary schools is estimated at 60,000, and that of pupils at 6,500,000, or 150 pupils to every 1000 inhabitants. Some provinces exhibit a larger pro- portion; in Saxony, Thuringia, Brunswick, Rhineland, and Westphalia there are from 165 to 175 pupils to every 1000 inhabitants. In Bavaria, Posen, East and West Prussia, Brandenburg, on the other hand, there are only from 120 to 130. A good criterion of the school instruction is to be found in the statistics of the annual levies of recruits. The following table shows the number of recruits during the years 1876-78 who were unable to read and write :—

Number of levied Recruits | Number of levied Recruits um able to write and read. able to write and read.

ere : = In other Lan- | Rate to 10,000

ee ee guages only. Number. Reeruits.

1875-76 130,176 6,868 3,011 237

1876-77 130,939 6,283 2,975 nal)

1877-78 134,189 6,292 2,476 1738

It will be seen from the above that the number of illiterate recruits has considerably decreased during the last three years. The figures given compare very favourably with those of other European countries. In 1872 the number

EDUCATION. |

of illiterates was 4:6 per cent. in the army, and 2°3 in the navy, the corresponding numbers in France being 23 and 14 per cent. In England 23 per cent. of the marines could neither read nor write in 1865, 4 per cent. could only read, and 37 per cent. could write but imperfectly. In Austria only 28 per cent. of the recruits could write, and in Russia scarcely 10 per cent. had any school education. But the provinces of Germany differ much from one another in this respect. Education is very inferior in the eastern Polish districts. During the three years from 1875-78 in the districts of Posen, Bromberg, and Oppeln there were in all 10°7, 9:24, 8:02 per cent. of illiterates among the recruits, in the provinces of West and East Prussia 8°77, 8°66, 7°80. After these the rate takes a long leap to 3°18, 3:17, 1:94 in Alsace-Lorraine and the Palatinate. In 1877-78 there was no considerable district in Germany which sent so many as 1 per cent. of illiterates. The most satisfactory state of matters is to be found in Saxony, Thuringia, Baden, and Wiirtemberg, and especially in the last two. Wiirtemberg had only one recruit among 6000 that was unable to read.

The census in Prussia in 1871 proves primary school instruction to be much better among the Protestants than among the Catholics, as will be seen in the following table :—

Percentage of correspond- Illiterates of 10 Years Srales ee ing Population.

and under. i : a wee

| Males. | Fem. | Total. Protestants ….. 390,117 698,400 } 4:9 8°3 6°7 Catholics ……... 464,755 685,535 |11°3 | 16:4 | 13:9 CWS Teer veecu

7,976 15,648 | 4:9 9°4 f@ OPGHSIST cocs ccc veese 995 2,846 37 9°4 5:2 Mo taleneces 868,848 | 1,396,434 CA Nees 9°2

| + 1

Unremitting attention is being paid to the improvement of. primary schools (volksschulen), although many of the eastern districts are still destitute of these in the rural localities. Not long ago the position of teachers of primary schools was very unsatisfactory ; and the supply of masters was unequal to the demand. In recent years much has been done in all the states to effect a reform on thisstate of matters.

In 1875 there were 170 seminaries in Germany for the training of schoolmasters. But this number is insufficient, for it may be estimated that 5000 to 6000 new appointments are required annually, if one master is not to have charge of more than 60 children. Saxony has the greatest number of institutions of this kind (15). Within the last few years many municipalities have begun to found schools of a somewhat higher rank for the lower classes of the town population, called middle schools.

There are four different kinds of schools for the higher branches of education. The gymnasia supply preparatory training for the universities, the foremost place in the course of instruction being assigned to the classical languages ; but French, English, and mathematics are also taught, and sonie attention is given to natural science, history, and geography. Their constitution dates back to very remote times, and but few and slight alterations have been made in their schemes of study since the beginning of the present century. Officials, judges, clergymen, teachers, and physi- cians for the most. part receive their early education at the gymnasia. In 1878 there were 360 gymnasia in Germany, or 1 for every 600 square miles and every 117,000 in. habitants. Central Germany has the largest proportion, 1 for every 75,000 inhabitants. To these must be added the progymnasia, about 90 in number. The same studies are prosecuted in these, but the highest classes of a gym- nasium are wanting. Of more recent growth is the system of realschulen, where Latin is the only ancient language

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taught, the other branches being modern languages, espe- cially French and English, mathematics and natural philo- sophy, geography, and modern history. These schools have long enjoyed great popularity. They are classified as of the first and of the second order. In the former a pupil remains generally for nine or ten years, as in the gymnasia ; and those who pass the highest examination are allowed to enter the universities, but only to study the modern languages, mathematics, and natural sciences. In 1878 there were 129 realschulen of the first order, mainly in Saxony, Rhineland, Berlin, and Hanover. The real- schulen of the second order prepare pupils for those pro- fessions which do not require a university course. On the average a pupil leaves school in the seventeenth year of his age. Besides these institutions, which are increasing every year, there is a considerable number of technical schools (gewerbeschulen). Their purpose is purely in- dustrial ; drawing, mechanics, mathematics, physics, and chemistry are among the subjects of instruction, languages being excluded, There are, moreover, schools of commerce, navigation, and agriculture in different towns. The military law relating to the one year's volunteers has had an important influence on the attendance at all these institu- tions. In 1879 there were 878 schools with the privilege of furnishing pass certificates to such volunteers; of these 360 were gymnasia, 129 were realschulen, and about 40 were private schools. Exact and uniform statistics of the higher schools do not as yet exist. Many of the last-men- tioned institutions are maintained partly or entirely at the expense of the municipalities, and by far the greater number are denominational, Protestant ones prevailing. The follow- ing table shows the number of Prussian schools in 1875 maintained severally by the Government, by the munici- palities, and by other funds ;
—

| Number of Middle Schools in Prussia maintained by

Denomination. Government. Municipalitics, Private Funds. Protestant …....
100 199 16 IUUBAGT, Qoacnopasone 18 38 . @atholic' 32… .:.

Ber eee resene

ee eeee

Universities and Higher Technical Schools.—Germany owes its large number of universities, and its widely diffused higher education to its former subdivision into many separ- ate states, Only a few of the universities date their existence from the present century ; the majority of them are very much older. Each of the larger provinces, except Posen, has at least one university, the entire number at present being 21. All have four faculties except Miinster, which has no faculties of law and medicine, As regards theo- logy, Bonn, Breslau, and Tiibingen have both a Protestant and a Catholic faculty; Freiburg, Munich, Miinster, and Wiirzburg are exclusively Catholic ; and all the rest are Protestant. The following table gives the names of the 21 universities, the dates of their respective foundations, the number of their professors and other teachers, and of the students attending their lectures during the summer session 1878, arranged according to the numbers in attendance :—1

1 The teaching staff was classified as follows: ordinary professors 957, extraordinary professors 403, honorary professors 41, private teachers (privat-docenten) 438, language and exercise masters 39. The following table gives the number of the students in the different faculties for 1878 :—

1. Students of Protestant theology ……...c.00.-

2 i. Roman Catholic theology ……...00 689

3. MW, PONIEIGS, ATTA EOUCSEIYL <..sscecesscesccseceses ese esse

4. ” medicine, surgery, and pharmacy ……..sssecssseercorseneeee O,F2T

5. ” philosophy, philology, history, geography, mathematics, PUIRTLACIITAIUSC (EN COlcetrestens Srcacts caste ttecssccsnoseaneesssoeneane sisal,

6. Unmatriculated students (chiefly at Berlin) .....s.eussssscreessvereeres 2,285

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wee Dates of Number of ‘Number of Universities. a Ps in

1. Berlimpeeaussiae.aseesr. se 1810 215 4,331 2, Léipsic, Saxony. .....c12.6 1409 160 2,948 8) Munich, Bavarial……...00 1826 136 1,396 4, Breslau, Prussia (1702) ..... 1811 106 14250 5. Tiibingen, Wiirtemberg…... 1477 88 1,144 6) Bonn, $2nussia Co .n.occ1esesaesl) eS 100 ROD 7. Gottingen, Prussia …..... 1737 120 1,009 8. Wiirzburg, Bavaria…..... 1402 66 960 O} Hallie? Pissian… sssisccsset 1697 107 944 . Heidelberg, Baden …..... 1386 110 808 . Strasburg, Alsace-Lorraine 1872 90 736 . Kénigsberg, Prussia ……... 1544 89 671 . Jena, Thuringian states …... 1558 78 570 . Greifswald, Prussia ……... 1456 61 534 ~ aronrg, Pitiggia…....0.00+053 1527 pl 458 SMMCI Ne BDAGED 5…5..00.55 000 1457 57 454 . Erlangen, Bavaria ……... 1748 64 415 . Giessen, Hesse…..... ..| 1607 55 847 ; Mninster, Prusela:..c.co0c0 1780 30 oon AGL, JEWOGE Gaseapseseodoouneae 1665 69 264 . Rostock, Mecklenburg…..... 1419 41 157 Be. eee 1,913 20,826

A number of technical high schools rank along with the universities ; they all took their rise in the course of the present century, and usually bear the name of Polytechni- cum. To the number of these belong the academies of industry (founded 1821) and of architecture (1798) in Berlin, and the polytechnica at Hanover, Brunswick, Aix- la-Chapelle, Darmstadt, Carlsruhe, Stuttgart, Munich, and Dresden.

Among the remaining higher technical schools may be mentioned the mining academies of Freiberg in Saxony, of Berlin, and of Clausthal in the Harz, and the academies of forestry at Neustadt-Eberswalde, Miinden on the Weser, Tharand near Dresden, and Hohenheim near Stuttgart, and at Brunswick, Eisenach, Giessen, and Carlsruhe. Schools of agriculture have also been attached to several universities, the most important being at Berlin, Halle, Gottingen, Kénigsberg, Jena, Poppelsdorf near Bonn, Munich, and Leipsic.

Libraries.—Mental culture and a general diffusion of knowledge are extensively promoted by means of numerous public libraries established in the capitals, the university towns, and other places. The most celebrated public libraries are those of Berlin (800,000 volumes), Munich (800,000 volumes and 22,000 manuscripts), Gottingen, Dresden, Stuttgart, Hamburg, Strasburg, Frankfort-on-the- Main, Breslau, Gotha, and Wolfenbiittel.

Societies. —There are also numerous societies and unions, some being of an exclusively scientific character, and others being designed for the popular diffusion of useful knowledge. The academies of science in Berlin, Munich, Gottingen, and Leipsic are Government institutions. Ample provision is made for scientific collections of all kinds in almost all places of any importance, either at the public expense or through private munificence.

Observatories.—These have in recent years been consider- ably augmented. There are 22 observatories in the empire, viz., at Altona, Berlin, Bonn, Bothkamp in Schleswig, Breslau, Dantzic, Diisseldorf, Gotha, Gdttingen, Hamburg, Kiel, Konigsberg, Leipsic, Liibeck, Mannheim, Marburg, Munich, Potsdam, Schwerin, Spires, Strasburg, and Wil- helmshaven.

Book Trade.—This branch of industry, from the important position it has gradually acquired since the time of the Reformation, is to be regarded as at once a cause and a result of the mental culture of Germany. Leipsic is the centre of the trade. The number of booksellers in Germany was not less than 5196 in 1878, among whom were 1546

publishers. The following table will show the recent pro- gress of German literary production, and its proportion te that of other European states :—

Number of Published Works.

Gt. Britain. |

Germany. | France. ltaly, 1868 | 10,563 | 11,267 4,439 4,084

1870 10,058 8,831 5,082 4,318

1872 11,127 | 10,559 4,812 6,429

1877 13,925 1878 13,912

Newspapers. —While in Eugland a few important news- papers have an immense circulation, the newspapers of Germany are much more numerous, but individually com- mand a far more limited sale. Leaving out of account insignificant local papers, Germany in 1878 possessed 600 newspapers published daily, or two to three times a week ; of these only 90 were published in South Germany. Berlin alone produces 44 newspapers. Most readers re- ceive their newspapers through the post-office or at their clubs, which may help to explain the smaller number of copies sold. Only 50 of the 600 daily newspapers print more than 10,000 copies, and only 20 more than 20,000.

Fine Arts.—There are many academies which have for their object the promotion of a taste for painting, sculpture, architecture, and music, and the improvement of the tech- nique of art. The largest academy is now that of Berlin. The three schools of painting (malerschulen) are repre- sented by the academies of Berlin, Munich, and Diisseldorf. Other academies for painting are to be found in Dresden, Carlsruhe, Weimar, and Kénigsberg. The chief musical academy is at Leipsic. Numerous museums of art and col- lections of pictures exist in the country, but there is no concentration of these as in London or Paris. Although the collections in Berlin have of late years been considerably enriched, they do not equal in their number of celebrated originals the galleries of Dresden, Munich, and Cassel. An archzological institute is maintained by the imperial Govern- ment at Rome and at Athens, and recently Germany has done much for the advancement of archeology by the part she has taken in the excavations at Olympia.

Bibliography.

Maps.—The topographical maps of Prussia and of some North Gerinan states (scale 1:100,000) are not yet quite completed. The South German states have for the greater part finished their topo- graphical maps, scale 1:50,000, Other good special maps, though not quite completed, are—the maps of Central Europe by Reymann (1:200,000) and by Liebenow (1:3800,000), and of Germany by Stieler (1:750,000) and by Ravenstein (1:800,000).

Physical Geography.—There is still wanting a sufficiently detailed work on the physical geography of Germany as a whole, although there are some

excellent descriptions of the separate provinces. For general information we may mention—Cotta, Deutsehland's Boden, 2 vols., 1858; Daniel, Deutschland, 1878; Kutzen, Das deutsche Land; Von Kléden, Geographisches Handbueh, vol. ii, 1875; Neumann, Das deutsche Reieh, 2 vols., 1874; Peschel and Andree, Atlas der deutschen Reiches, 2 parts, 187 6-78.

Statistics.—Since the year 1871 there has been established in Berlin an imperial office for statistics which does excellent work. Most of the figures in the foregoing article have been derived from these official returns. From 1871 to 1878 the same office has pub- lished 30 volumes in 4to, under the title of Statistik des deutschen Reiches und Monatshefte der Statistik des deutschen Reiches. But the returns do not give statistics under all the heads in which the scparate states collect them. Much valuable geographical, statis- tical, and topographical information is given in Neumann's Das deutsche Reich. The most recent summaries are to be found year by year in the Almanach de Gotha. é'

Topography.—Rudolph's Vollstindiges Ortslexicon von Deutsch- land, 2 vols. 1870, is exact and very ample. The separate states have published lists of all places (towns, villages, hamlets, farms), according to the census of 1871. Das Reiehs-Postgebiet, issued by the General Post-Office, 1878, containing about 7000 places, exclusive of Wiirtemberg and Bavaria, forms an excellent topographical and statistical handbook. (H. WA.)

Tribes.

Char- acter of people.

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PART IIL—HISTORY OF GERMANY. By James Sime.

Enicred according to Act of Parliament of Canada, in the year 1879, by Apam & CHARLKS BLACK, Edinburgh, Scotland, in the office of the Minister of Agriculture.

Ancient Times.

The people whom we call “the Germans,” and who call themselves “‘die Deutschen,” are a branch of the Teutonic race, which, again, belongs to the great Aryan family. At what time the Teutons broke away from their Aryan kinsfolk we have no means of knowing. In the 4th century B.c., when they are first mentioned, they were settled along the shores of the Baltic Sea; but long before that time the race must have scattered itself far and wide over the countries now known as Scandinavia aud Germany, and the Scandinavians and the Germans were gradually marked off from each other by important differences in language, in customs, and in institutions.

At the time of Tacitus, whose Germania is our chief authority as to the condition of ancient Germany, central Europe was in the possession of a large number of German tribes. These tribes did not call themselves by a common name. The word ‘‘German” is of Celtic origin, meaning, according to some philologers, ‘‘shouters,” according to others, “neighbours.” It seems to have been applied by the Gauls in the first instance to a particular German tribe with which they were in conflict, and afterwards to the whole people. The word “ Deutsch” (Goth., Zhiuda, the people) does not occur till the 9th century, and was not used in the sense now given to it for some time later. Although without a common name, the ancient Germans believed that they had a common origin, all of them regarding as their forefather Mannus, the first man, the son of the god Tuisco. Mannus was supposed to have had three sons, from whom had sprung the Istzevones, the Ingzevones, and the Herminones. These groups were without political significance, but they seem to have marked real distinctions. The Isteevones were the tribes with whom the Romans were brought most into contact, occupying, as they did, both banks of the Rhine. The lands held by those of them on the left bank were divided by the Romans into “Germania Superior” and ‘“‘ Germania Inferior,” the chief tribe of the latter being the Ubii, who had an important settlement on the site of what is now Cologne. Qn the right bank, from the Lippe to the Ruhr, were the Usipetes and Tencteri, and to the north of them the Sicambri and the Bructeri; the land now called Hesse appears to have been inhabited by the Chatti. On the island formed by the Meuse and an arm of the Rhine were the Batavi. The second great group, the Ingzvones, among whom were the Frisii, the Chauci, and the Cherusci, were settled along the shores of the North Sea, and inland along the banks of the Weser and the Ems, The

Herminones were much more numerous than either of the two other groups; they held the greater part of central and eastern Germany, reaching as far as the Vistula and the Carpathians. Most prominent among them were the Suevi, a great confederation of tribes which included the Mar- comanni, the dwellers in what is now Bohemia, and the Semnones, who held what is now Lusatia and Brandenburg. Other Herminones were the Hermunduri, in and around the Thuringian forest ; the Lombards, at the mouth of the Elbe ; the Vandals, at the upper parts of the same river; the Heruli, to the west of the Vistula; and the Quadi, in what is now Moravia.

The ancient Germans were a tall and vigorous race, with long fair hair and what Tacitus calls “fiercely blue eyes.” They wore mantles of fur or of coarse woollen stuff, thrown over the shoulders and fastened by a tliorn or a pin. Their dwellings were wooden huts of slight construction, the inner walls of which they roughly coloured, and in which cattle were sometimes accommodated with the family.

War and the chase were the favourite occupations of the men; and when engaged neither in fighting nor in hunting they often lay idly by the hearth, leaving peaceful work to women and to males incapable of bearing arms. They liked social gatherings, but after a time conversation usually gave place to drunkenness, quarrelling, or excessive gambling. Although violent and cruel in moments of excitement, they were rarely treacherous, and in the ordinary intercourse of life they appear to have been kindly and considerate. They cherished the memory of illustrious ancestors, and listened often and with delight to songs celebrating their famous deeds.

The bulk of the people were freemen, who alone exercised Social re- They inherited their position, and the sign lations.

political rights. of their dignity was that they always carried arms, A limited class of freemen were nobles, whose sole privilege seems to have been that they were more respected on account of their birth than their neighbours, and more easily acquired a leading place in public life. Each freeman had slaves, who were chiefly prisoners of war and their offspring, and persons condemned to slavery for crime. They had no legal rights as against their owners, but in practice they were well treated. The Liti, composed mostly of freedmen, stood between freemen and slaves. A freeman necessarily

either possessed land or was a member of a family that did; the Liti could only hold land of a superior with whom they shared the produce. If any one killed a noble, a free- man, or one of the Liti, he had to pay to the relatives a fine called afterwards the wergeld, and the amount was determined by the class to which the murdered man be- longed,

Great importance was attributed to family relations. Instead of the bridegroom looking for a dowry, he was expected to present his bride with a valuable gift which should remain her property throughout life. The wife was completely subject to her husband, and if she proved un- faithful, custom allowed him to cut off her hair and to whip her through the village in which she lived; but this punish- ment had seldom to be inflicted, the German women being famous for their chastity. They were treated as friends by their husbands, who had a high respect for their judgment, and whom they often accompanied in distant expeditions, Thechildren, over whom the father had absolute control, were hardily trained, boys being early taught the use of weapons, and girls devoting themselves to domestic duties. Relatives were held in great esteem, and, when the head of a house- hold died, it was considered their duty to guard the interests of his family.

Many freemen lived apart from all others with their Political families and dependants, but the majority were grouped consti- in villages. The land around a village—its “mark ”— tution.

originally belonged to the community, and was periodically divided among the inhabitants. About the beginning of the Christian era, however, the arable land was mostly in the possession of individual freemen, the forests and waste places being almost the only common property. A number of villages made a hundred, and the “ gau,” if the word existed so early, may have been a higher division, although it was more probably the name for the whole land of the tribe. ach village had its chief, elected by the freemen, but the important chiefs were the heads of the hundreds and the head of the tribe, whom the freemen also appointed. Some tribes had kings, but their power had no other source than that of other chiefs, nor was it more extensive ; their only distinction was that they were chosen from particular noble families supposed to have as he the gods, tS

Army+

Religion.

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The chiefs of the hundreds and of the tribes had the right of gathering around them bands of followers; and they never failed to exercise it, vying with each other in the number and quality of the young men whom they attracted to their service. These young men were generally eager for active duty, and if the tribe was at peace an adventurous chief would often give them an opportunity of distinguishing themselves by taking part in the wars of other communities. They swore to be faithful to him, and he in return supplied them with horses, with armour, and with food. The authority of the chief was extremely limited, the constitution of ancient German society being essentially democratic. Every village, hundred, and tribe had its periodical assembly, and these assemblies were attended by all freemen, no one of whom had higher rights than his fellows. Before the meeting of the assembly of the tribe, the king or other supreme chief would consult with the chiefs of the hundreds, who formed his council ; but the final decision rested with the freemen, whom they could influence only by persuasion. At this assembly the chiefs were elected; and in its presence freemen clad their sons in the armour which indicated that they had attained the rights of. citizenship. It declared war and made peace, permitted the chiefs with their followers to undertake war-like expeditions, and settled all disputed cases of justice.

The army was not a distinct institution ; it was made up of the whole body of freemen, all of whom were liable at any moment to be called to service. Hach had a long shield and spear, the cavalry having no other armour. The infantry were provided also with missile weapons, of which they made dexterous use, and occasionally wielded clubs and battle-axes. The men of each hundred kept together in war, and were commanded by their chief, the supreme command being undertaken by the head of the tribe, or entrusted to a “herzog” appointed by the army. In the event of several tribes uniting, a herzog was chosen by the chiefs of the allied communities. upon their enemies with fury, shouting or chanting as they did so, and adding to the noise by putting their shields to their mouths. To throw away the shield in

panic was perhaps the worst crime of a German; and most persons guilty of it committed suicide in an agony of remorse and shame.

The religion of the ancient Germans was essentially the same as that of their Scandinavian kinsmen, but our sources of information respecting it are few and imperfect. The highest place among the gods was held by Wuotan or Wodan, the Scandinavian Odin. The Romans identified him with Mercury, and the medieval German writers, in referring to him, follow their example. He was the god of the air and of the sky, and was looked upon as the giver of the fruits of the earth. He delighted in battle and in the chase, and was represented as an imposing figure in a large white mantle, riding upon a white horse. Along with him the Germans worshipped Donar, the Scandinavian Thor, to wkom Tacitus seems to refer in speaking of Hercules as a German divinity. He was the god of thunder and of the weathér, and was armed with a hammer or thunderbolt. In later times the Germans supposed him to be Jupiter. He presided over marriage, and controlled the operations of agriculture ; and to him were sacred the oak and the mountain ash, the bear and theram. Another great divinity was Ziu or Tiu, the Scandinavian Tyr, the god of war, whom Tacitus speaks of as Mars, and whose synibol was the sword. Tacitus says that a powerful goddess called Nerthus was worshipped on the shores of the Baltic ; he also mentions Isis as a goddess of the Suevic tribes. Both names evidently refer to the same divinity. On the coasts her symbol was a ship; inland, it was a

waggon; in some districts she was represented with the plough. Like Donar, she presided over marriage ; she also watched over the house and the fields, was the giver and protector of children, and ruled the world of the dead. At a later time she was kuown to the Saxons as Fria or Frigg, to the Franks as Holda, to the Bavarians as Perchta,—the first-name indicating her freedom of manner, the second her kindness, the third her splendour. In the Scandinavian mythology Frigg is the wife of Odin; and to this day, it is said, the peasants in certain parts of Low Germany speak of Fru: Fricke, the

wife of the wild hunter Wod. The mythology of the Germans, like that of the Scandi- navians, included the three sisters of fate, two of whom were fair and good, the third dark and evil. Beneath the gods were giants, elves, and dwarfs. After death, it was believed, good men were received into Walhalla ; and by good men were meant warriors who never shrank in battle—above all, warriors who died fighting. The Germans were profoundly influenced by their religious faith, and both in daily life and on special occasions attended scrupulously to the duties and precautions it was supposed to involve. Each god and goddess had his and her own festival, and their images were preserved in sacred groves, Sacrifices were offered to them, and their will was discovered by means of lots, the neighing of wild horses, and the flight of birds. Priests, without dominating the whole of life, exercised considerable influence, especially when the freemen met in public assembly, and when they were advancing against an enemy.

Roman Period.

The Cimbri and the Teutones, who appear to have wandered from the northern coasts of Germany, were the first German tribes with whom the Romans came into con- tact. In rather less than half a century after their final defeat by Marius, Ariovistus, a bold and powerful Suevic chief, crossed into Gaul with his followers to aid the Sequani against the Aldui. The latter were defeated, and, in reward for his services, he received from the Sequani a third of their best lands. It soon became obvious that his friendship was dangerous, and in 58 B.c. his terrified allies appealed for aid to the new proconsul, Julius Cesar, who had just inflicted a crushing defeat on the Helvetii. When Ceesar sent to him proposing a personal interview, the bar- barian haughtily answered that he himself had better come, which Cesar quickly did. And the issue was that the army of Ariovistus: was utterly beaten, and that he escaped with difficulty, severely wounded, across the Rhine, and soon afterwards died. Cesar crossed the Rhine twice, but left no permanent mark of his invasions. He thoroughly sub- dued the Germans on the left bank, and from this time the whole people began to be powerfully affected by their mighty neighbours, many of them taking service in the Roman army.

The first serious attempt to conquer Germany was made by Augustus, who, after he rose to supreme power, wanted occupation for his legions. He began by conquering Rhetia and Noricum, Celtic countries along the southern borders of Germany, extending northwards through what is now German Austria and Bavaria to the Danube. Drusus, who, with Tiberius, executed this conquest in the summer of 15 B.c., was then entrusted with the task of sub- duing Germany. Deciding to reach the interior of the country by means of the sea and the northern rivers, he cut a canal between the Yssel and the Rhine; and for the protection of Gaul he built no fewer than fifty forts along the latter river. Many of the tribes were at enmity with one another, and in his first expedition in 12 B.c. he was able to form an alliance with the Frisii against the Chauci and the Bructeri. In three different expeditions in the

immediately following years he found otlier native allies,

conquest of the whole country must have seemed quite certain. After the death of Drusus in 9 3.c., Tiberius conquered the Tencteri and Usipetes; and at a later time he not only subdued the Sicambri, but settled 40,000 of them at the mouth of the Rhine, where they lived under Roman rule. A good many of the Istevones were now overcome, while others entered into a more or less com- pulsory alliance with Rome; and it is probable that, if great generals had represented the empire, Germany would soon have shared the fate of Gaul. Quinctilius Varus, who, in 6 A.D., was placed at the head of the Roman troops in Germany, lost all the advantages gained by his prede- cessors. He had held office in Syria, where he had ruled with great harshness ; and fancying that he might act in the same way towards the fierce tribes of the north, he roused among them a bitter hatred of the Romans. They found in Arminius, a son of the chief of the Cherusci, a leader of extraordinary bravery and resource. He had been a Roman soldier, and had so distinguished himself— perhaps in wars against his countrymen —that he was made a citizen and knight. He formed the design of freeing his people, and soon came to a secret understanding with in- fluential Cheruscan and other chiefs. In the year 9, in the month of September, Varus, who had been told that a northern tribe was in- revolt, was led at the head of

his legions into the Teutoburg Forest. Here the Germans were lying in wait for him; and everything was in their -favour, the narrow defiles having caused disorder among the troops, and the ground having been made muddy by heavy rains. The battle which ensued lasted three days, during which the Romans were altogether destroyed, and Varus, in despair, killed himself by falling upon his sword.

The despairing cry of Augustus—" Varus, Varus, give me back my legions !"—testities to the consternation which this defeat caused at Rome, where it was expected that the barbarians would take a terrible revenge for the wrongs they supposed themselves to have suffered. The Germans, however, were too much occupied with internal disputes to think of any enterprise beyond their own country ; and in the year 14, after Tiberius had become emperor, Rome again'assumed the offensive. Germanicus, the son of Drusus, crossed the Rhine, and defeated the Marsi. He returned in the year 15, when he was joined by the Chauci and other tribes, who fought for him as zealously as his own soldiers. Thusnelda, the wife of Arminius, fell into the hands of Germanicus, and was sent as a prisoner to Rome. This intensified the hostility of the young chief, who now exerted to the utmost his vast influence to stir up against the invaders his tribe and its allies. The Teutoburg Forest was again sclected as thie scene of an attack; and although Arminius was not vic- torious, he so far injured his enemy that Germanicus was forced to retreat. The struggle was resumed in the year 16, when Germanicus gained two victories. He gained them, however, at so great a cost that he and his army had to take refuge in their ships, the greater number of which were lost in a storm.

No sooner had the Romans been driven off than Arminius had to protect his people against an internal danger. Maroboduus, the chief of the Marcomanni, a man of great ambition, had by treachery or by open fighting made him- self master of several ncighbouring tribes. Arminius began to fear his designs, and after the defeat of Varus warned him of his peril by sending him the Roman general's head. When Germanicus finally left the country, Arminius de- clared war against Maroboduus, broke up his kingdom, and drove him from Germany. It is possible that Arminius himself may afterwards have wished to found a great state.

| At any rate, a number of chiefs combined against him, and and with their hclp mastered so many positions that the |

in the year 21, at the age of thirty-seven, he was killed. Although the Romans did not again attempt on a large scale the conquest of Germany, they acquired great influ- ence throughout the country, and they gradually obtained considerable possessions tothe east of the Rhine and to the south of the Main. Among the tribes whom they forced to become their allies were the Frisians aid the Batavians ; and in the year 69 a formidable conspiracy against them

was headed by a Batavian chief, Claudius Civilis, who, like Claudius Having been eim- Civilis.

Arminius, had been a Roman soldier. bittered by ill-usage from the emperor Nero, he stirred up his countrymen, and he found a large number of allies on both banks of the Rhine. He struggled valiantly for a time, supported by the mysterious utterances of Vclleda, a prophetess who lived in a tower in the land of the' Bructeri, and excited popular enthusiasm on bebalf of the enemy of Rome. At last he was overcome by the Roman general Cerealis, and the Batavians were thenceforth com- petled to send recruits to the Roman army.

About a hundred years after this time the relations of the Romans and the Germans began to be reversed, the latter being the aggressors. In the Marcomannic war Marcus Aurelius opposed for thirteen years a vast host of Germans who sought to push southward into Roman territory. Mean- while the Romans-had profoundly influenced large parts of the country. They built many fortresses along their frontier, and some of these were connected by a great wall, of which there are still remnants in southern Germany.

Around the fortresses grew up towns, which became the Roman In towns in Rhetia, which reached from the Lake of Constance along °°?

centres of civilization over pretty wide districts.

the Danube as far as the Inn, there were important settle- ments at Augsburg and Regeusburg (Ratisbon); Noricum, which stretched far to the east of Rhetia, possessed, among other towns, Vienna, Salzburg, and Wels. Germania Superior and Germania Inferior, on the left bank of the Rhine, included Strasburg, Mainz (Mayence), Worms, Cologne, and Bonn, In the province of Belgium, which was at least partly German, was the great city of Treves, one of the most splendid in the Roman empire, and often the residence of the emperors.

Confederations of Tribes.

The experience of the Germans in contending with the Romans taught them the necessity of some measure of union; and from the third century we hear no longer of the individual tribes which had before been famous, but of groups or confederations, each forming, for purposes of attack and defence, a single state. The Goths were one of the most important of these groups. They included many of the tribes in the eastern and north-eastern parts of Germany, such as the Vandals, the Burgundians, and the Heruli. Next to them, in the order in which they appear in history, were the Alemanni, a confederation made up of several Suevic tribes. They held the Rhine country in the neighbourhood of the Muin, and were continually pushing southwards and eastwards in the hope of securing Roman lands and towns. ‘To the north’of them, on both banks of the Rhine as far as the sea, were the Franks; and to the east of the Franks, the Frisians and Saxons. The Thur- ingians, descendants of the Hermunduri, inhabited the Thuringian Forest and the surrounding country.

The Goths were the first of these confederations to found Migra- a great kingdom ; in the 4th century their lands stretched tions.

from the Baltic to the Black Sea. This vast state was broken up by the Huns, who poured in immense hordes from the Asiatic steppes into Europe. Urged forward by so tremendous a force, the Burgundians, the Vandals, and many of the Suevi wandered westwards early in the 5th

Changes in Ger- many.

Franks.

Salic code.

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century in search of new homes ; and the Burgundians soon conquered from the Romans the whole of the valley of the Rhone, in which they thenceforth settled. The Vandals and the Suevi went on to Spain, the latter remaining there, but the former crossing over to Africa, where they main- tained an independent kingdom for upwards of a century. Meanwhile, in a portion of Rhetia a new confederation had been forming itself, the Bavarians, who were probably in part descendants of the Marcomanni and also included some of the bands which had been driven westwards by the Huns. When the latter had settled themselves in the Gothic lands, the East Goths continued subject to them ; but the West Goths crossed the Dannbe into Roman terri- tory, and afterwards, under their bold chief Alaric, pene- trated into Italy and seized Rome itself. In the 5th century they conquered the southern part of Gaul, and nearly the whole of Spain, shutting up the Suevi, who had preceded them, in the small part of the peninsula which now forms Portugal. In the great battle with Attila, in which the destinies of civilization were decided, they fought by the side of the Romans; and it was chiefly owing to their valour that he was forced to retreat. After his fall and the consequent disruption of his kingdom, Odoacer, the chief of the Heruli, became lord of Italy, and his authority was recognized beyond the Alps as far as Bavaria. Theo- doric, the East Goth, displaced him ; and to Theodoric, too, the Bavarians yielded some kind of submission, None of the German kings who planted themselves on Roman soil displayed higher statesmanship than this great sovereign } but his kingdom was built on too narrow foundations, and after his death soon gave way. The Lombards, who suc- ceeded the East Goths in Italy, were not so brilliantly successful, but their power was more enduring.

While these migrations were going on, great changes took place in the mother country.. The Slavs, the last of the Aryan family to enter Europe, and at that time a listless and indolent race, having been stirred up by the terrific onslaughts of the Huns, had followed the general impulse towards the west. Finding many German lands vacant, they took possession of them

; and so numerous were their incursions that in the 5th century the Elbe and the Saale became the eastern boundaries of Germany. Within Germany itself the confederations had greatly extended their lands. The Alemanni held both banks of the Rhine at the points where it is joined by the Moselle and the Main, and reached far into what is now Switzerland. The Thuringians had pushed down as far as the Danube, and penetrated northwards and westwards along the Elbe and towards the Weser. The basins of the Elbe and the Weser were in the hands of the Saxons, and the Bavarians steadily advanced in and around the valley of the Inn.

More important than any of these groups were the Franks, whose destiny it was to found the German and the French kingdoms. They were remarkable for the compara- tively friendly terms on which they lived with the Romans, in whose armies many of them served, and by whose side they fought the Alemanni, the West Goths, and the Bur- gundians. This alliance did not, however, prevent them from enriching themselves, whenever they had an oppor- tunity, at the expense of the Romans, who were repeatedly compelled to turn against them and drive them back. The Franks who lived to the east and the west of the Rhine were called Ripuarians; those at the mouth of the Rhine and along the western shores of the North Sea were known as Salians,—both of them names whose origin is still uncer- tain. One consequence of the relation of the Franks to the Romans was that the kingly authority soon became higher among them than among other Germans. The Salic code, which probably belongs to the middle of the 5th century, shows us the Salian king as in all respects the centre of

GUiRMW any?

-under Theodoric, the eldest.

[HISTORY.

his state. He was not then elected, but inherited his rights ;

and the only nobility which existed was that belonging to

his officers and followers. The state was divided into “ saus,” presided over by grafs or counts, whose duty was to administer the laws emanating from

him, and to execute the sentences of his tribunal. There were still, however, popular assemblies, without whose sanction the king could not undertake any national enterprise.

Early Medieval Period.

The first Salian king of whom we know anything is Chlodio, who reigned about the middle of the 5th century, and whose kingdom reached to the Somme. His successor, Merwig, or Meroveeus, who gave his name to the first great Frankish dynasty, fought beside the Romans and the West Goths against Attila, Childeric I., the son of Merovzus, offended his people, and appears to have fled from them and taken refuge for a time among the Thuringians. During his absence the Salians placed themselves under the Roman commander-in-chief, AXgidius, not as the representative of Rome, but as a personal ruler in whom they had confidence. His representative governed so badly that they were glad to welcome Childeric back. In a great battle Childeric overcame Aigidius, and made himself master of Cologne and Treves; but afterwards he was reconciled to the Romans, and before his death he ruled in their name in Paris. When he died in 481, his son and successor, Chlodwig (Clovis) was a boy of fifteen, but a boy of high spirit, daring and aggressive. From him, in 486, came, in the battle of Soissons, the blow which made an end of Roman rule in Gaul. In a few years he conquered the greater part of the country, and many of his warriors scattered themselves over it, seizing much of its most fruit- ful land. He turned also against men of his own race. The Alemanni having made war on the Ripnarian Franks, the latter appealed for help to Chlodwig, who gladly re- sponded to their summons, and defeated the invaders in the battle of Ziilpich. It was in this battle that he vowed, according to tradition, to become a member of the Catholic Church if the God of the Christians gave him the victory. Whether or not the tale be true, it is certain that to his baptism he owed the greater part of his amazing success ; for the West Goths and the Burgundians were Arians, and the Gallic clergy, who exercised unlimited power over the popular mind, welcomed into their country an orthodox believer. As for the Alemanni, he would have annexed their whole territory, but Theodoric, the East Goth, who was interested in them, and whom he did not dare offend, warned him that he must not treat them with undue severity. He must, however, have taken the part of their

territory in the neighbourhood of the Main and the Neckar, for it was henceforth known as Franconia. At a somewhat later date the whole of Alemannia was added to his kingdom. Being as unscrupulous as he was ambi- tious, he put to death all who had any claim to independent authority among the Franks; so that he became their sole king, and they quickly acquired the proud feeling of being the centre of a vast and growing state,

Chlodwig died in Paris, his capital, in 511, leaving four sons. They did not destroy the unity of the kingdom, which in its relation to the outer world continued to be regarded asa single power. But each, as a king of the Franks, received a separate territory. The East or Rhenish Franks, with the Alemanni subject to them, were placed He was as valiant as his father, and not less deceitful and cruel. The great Thuringian kingdom was in his time ruled by three brothers, Hermanfried, Berthar, and Baderich. The former of these was married to a niece of Theodoric the East Goth, Amala- berga, a kind of Thuringian Lady Macbeth. Consumed by

Early Frankish ings.

Chlod- wig.

Division of Frank ish king- dom.

Mero- Vingian kings.

FRANKISH KINGDOM. |

a vehement ambition, she persuaded her husband to murder Berthar ; and she wonld have caused the death of Baderich also, but that he knew her design and rose against the guilty pair. Hermanfried sent to Theodoric, the East Frankish king, and offered to reward him if he would form an alliance against Baderich. The offer was gladly accepted, and in a battle which followed Baderich was slain. No reward, however, was given, aud Theodoric, indignant at being thus treated, vowed to be avenged. He allied him- self with the northern neighbours of the Thuringians—the Saxons ; and with their united forces they completely sub- dued the country. Theodoric himself murdered Herman- fried by pushing him off the wall of Ziilpich, where they were carrying on an apparently friendly conversation,

the Thuringian king having received an assurance that he would be treated with honour. Thereupon the murderer divided between himself and the Saxons the territory of tlie Thuringians, annexing the southern half to the Frankish kingdom. His son, ‘heudebert, not only maintained this conquest but added to it, after the downfall of the Gothic kingdom in Italy, that of Bavaria, The Alemanni were also made altogether subject to his rule. Thus the Saxons and the Frisians alone retained their independence.

The rights of the Franks in Germany were at first vigor- ously asserted; but achange soon came. The Merovingian kings carried on so many fierce wars with each other that they had little time to look after their subjects in the remote east ; moreover, the rise of a great new aristocracy steadily undermined tlie royal power. This aristocracy was made up of the class directly associated with the king by military or court duties. They were rewarded by im- mense grants of land, which they held in the first instance subject to the condition of rendering faithful service, but tle possession of whicli, in most cases, became in the end absolute and hereditary. Nowhere was the new aristocracy so powerful as in Austrasia, the eastern division of the Frankish monarchy. In Neustria, the western division, where the sovereign had to deal for the most part with a race which for five centuries had been accustomed to the

despotic government of Rome, he had little difficulty in |

maintaining his supremacy; for the Franks settled in different districts could not but be more or less influenced by the feeling of the native population. Besides, they lived at great distances from one another, so that it was difficult to hold popular assemblies of any kind, and the powers which belonged to them were naturally transferred to the lead of the state. Hence, even when the Mero- vingian kings of Neustria were driven into the back- ground, and the mayors of the palace governed, the latter had high authority, and exercised it, as a rule, in the interests of the crown. In Austrasia the conditions were wholly different. There the Franks were the pre- dominant element ; and the distances were not so great but that an assembly could be rapidly summoned on every occasion of real need. Thus the important landowners of Austrasia were able to hold together, and to

limit the powers of the sovereign on the one hand and of the ordinary freemen on the other. And the mayor of the palace, who

‘was their nominee, and could at any moment be dismissed

if he displeased them, usually acted as their representative and leader.

Kings under the authority of an aristocracy of this kind are not likely to be troublesome to unruly snbjects; especially kings of such feeble personal character as those who, from the first half of the 7th century, nominally held the sceptre of the mighty Chlodwig. The German confederations which he and his immediate descend- ants had conquered soon became virtually free, They continued to acknowledge Frankish supremacy; but the acknowledgment was only formal. At the head of each

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confederation was its own herzog or duke. ‘I’hese rulers were at first appointed by the Frankish kings, or received their sanction; but in course of time the office became hereditary in particular families. This was the case, longer than anywhere else, in Bavaria, where the ancient Agilolfing family held tle ducal dignity from the earliest days of Frankish authority down to the time of Charles the Great. The dukes were far from being absolute sovereigns, for in Germany the freemen lad retained many. of their primeval rights. The assemblies of the hundred and of the con- federation still exercised great authority. As among the Austrasian Franks, however, although in a less degree, the leading landowners constantly encroached upon the powers both of the poorer freemen and of the head of the state.

In the time of the great dukes of the Franks, who arose Frankish to infuse new life into the decaying monarchy, there was dukes.

another profound change in the position of the Germans, After the battle of Testri, in 687, in which Pippin of Heristal decided that the Frankish kingdom should not then fall to pieces, and that, in the reunited state, the Aus- trasian Franks should have the supremacy, the German dukes begau to

find that they were likely again to have a master. He made war on them, and forced them to some extent to return to the allegiance which they had all but forgotten. His successor, Charles Martel, asserted his rights with not less vigour, and added East Friesland for the first time to the monarchy. The high importance of the efforts of these two illustrious rulers was seen in the struggle of Charles Martel with the Arabs. Had the Frankish kingdom been dissolved, they would have had little difficulty in overrunning Europe; but having under him a state more or less organized, Charles was able to rally around him powerful warriors from all the districts he governed, Germany among the rest. And so, at the memorable battle of Poitiers, hesaved Christendom. Other favourable results of the policy of Charles and his father were that new and vigorous life streamed towards the Gallic part of the kingdom from Germany, while the Germans were brought into closer contact than before with tlie higher and more refined civilization of the Gauls. Pippin the Short, the first king of the Carolingian line, although his chief fame was won in his wars with Aqui- tania and with Lombardy, did not neglect Germany, in which he strove to assert an authority more thorough and extensive than had been exercised even by the early Merovingian sovereigns.

After all, however, even these powerful Frankish con- querors had but imperfect success in Germany. When they were present with their formidable armies, they could com- mand obedience; when engaged, as they often were, in distant parts of the vast Frankish territory, they could not trust to the fulfilment of the fair promises they had exacted. One of the chief causes: of their ill-success was the continued independence of the Saxons. the northern half of Thuringia, this warlfke race had been extending its power. They were still heathens, and main- tained all the old customs and institutions of primitive Ger- many. As in ancient times, they appointed a herzog only when an officer of this class was needed, in time of war; at ordinary times the chiefs elected by the freemen ruled in asso- ciation with the popular assemblies. They cherished bitter hatred towards the Franks, whom they justly regarded as the enemies both of their liberties and of their religion ; and their hatred found expression, not only in expeditions into Frankish territory, but in help willingly rendered to every German confederation which wished to throw off the Frankish yoke. No rebellion against the dukes of the Franks, or against King Pippin, took place in

Germany without the Saxons coming forward to aid the rebels. This was perfectly understood by the Frankish rulers, who tried

Ever since they had acquired Saxons.

717-772.

Tntrodue- tion of Cbhris- tianity.

St Boni- face.

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again and again to put an end to the evil by subduing the Saxons. They could not, however, attain their object. An occasional victory was gained, and some border tribes were from time to time compelled to pay tribute ; but the mass of the Saxons remained unconquered. ‘This was partly due to the fact that the Saxons had not, like the other German confederations, a duke who, when beaten, could be held responsible for the engagements forced upon him as the re- presentative of his subjects. A Saxon chief who made peace with the Franks could undertake nothing for the whole people. As a couquering race, they were firmly compact ; conquered, they were in the hands of the victor a rope of sand.

Although, at the time of King Pippin’s death in 768, the Germans were still imperfectly subdued, they had received the germs of new life; for, with the exception of the Saxons, they were then nominally Christians. The first missionaries to Germany were Irish monks. In the 7th century a number of these laboured with considerable suc- cess in different parts of the country, especially among the Alemanni and the Bavarians; and when the influence of the Franks became dominant, Frankish missionaries also began to do for the church what the warriors did for the state. The honour of converting Germany as 2 whole, how- ever, belongs mainly to St Boniface, an Englishman, who in 717 began the task of his life as an assistant to another English missionary, Willibrord, in Friesland. Soon after- wards, during a visit to Rome, he received from Pope ({regory II. a commission as apostle of the Germans, and worked incessantly among the Thuringians and the Frisians. He proved himself one of the most skilful of missionaries,

adapting the conceptions of Christianity to the ideas of those whom he taught. The peculiar powers of Wodan, for instance, were transferred to the archangel Michael, those of Donar to St Peter; and the chief Christian festival, Easter, received its name from the goddess Ostara. His zeal and talent, although largely rewarded, effected less than he had hoped, so that in 723 he went once more to Rome to obtain, if possible, increased powers. Hitherto the mission in Germany had possessed an esseutially independent character; Boniface now undertook to work in all things under the direction and for the benefit of the papacy. In return for this engagement he was not only made bishop of all Germans who had been or should be converted, but received from the pope a letter commend- ing him to Charles, the mighty duke of the Franks. The Frankish bishops, who had no wish to become subordinate to the papacy, received Boniface coldly, and threw every kind of obstacle in his way. Charles, however, believing that the conversion of Germany would be the most effectual means of establishing Frankish authority, took Boniface under his protection, and sent him forth with orders that he should be everywhere respected. Thus strengthened, he entered upon a wholly new stage of his career. He was looked upon as to some extent armed with the authority of the great warrior and ruler, and he and his fellow-workers rapidly brought vast districts within the pale of the church, Possessing a high talent for organization, he would willingly have established an orderly ecclesiastical system as he pro- ceeded ; buié the Alemanni and the Bavarians, among whom Christianity had made some progress before his time, would not allow him free scope for his activity ; and Charles, who, by “resuming” church lands and granting them to faithful followers, had done much to weaken ecclesiastical authority in Gaul, did not wish to see it assume threatening propor- tions in Germany. In 738 Boniface again visited Rome, from which he returned in the following year as papal legate to the Frankish state. Armed with this new authority, he was able to some extent to give effect to his ideas. The duke of Bavaria permitted him to divide the whole of

Bavaria into the episcopal sees of Salzburg, Freisingen, Ratisbon, and Passau, and to appoint the bishops; and a little later, with the sanction of Charles, he formed also the sees of Wiirzburg, Erfurt, Buraburg, and Eichstidt.

Before Pippin the Short was made king, he ruled for some years in association with his brother Carlman, to whom the eastern part of the kingdom was confided. Carlman was a man of strongly religious temperament, and warmly supported Boniface. He set up by his advice bishoprics and monasteries, among the latter being the great abbey of Fulda, which, throughout the Middle Ages, was one of the chief centres of intellectual light in Germany. In 742 was held the first German council, s1nmoned by Carlman, and presided over by Boniface. It did much for the organization of the church, and was the beginning of an important movement for the reform of ecclesiastical abuses among the Franks. Boniface wished to become archbishop of Cologne, that he might the more readily influence the Frisians ; but the suggestion met with opposition, and he ultimately accepted the see of Mainz. As archbishop of Mainz and primate of Germany, he was able to foster and control the institutions he had established. The last years of his life he spent in missionary labours among the Frisians, and in 755 he died a martyr's death. By that time all German tribes, with the exception of the Saxons, professed Christianity ; and the church was not only highly organized, but possessed great wealth. The old pagan faith had struck its roots too deeply into the German nature to be at once or soon completely destroyed. 'Traces of its influence may even yet be detected in popular beliefs and customs; and for many centuries some of its conceptions, in altered forms, had hardly less vitality than those of the Catholic creed. Christianity was, however, the dominant power, and soon became a great civilizing agency. It was a fact of high importance that its triumph was due mainly to the influence of the papacy. The German Church thus stood from the beginning in close relation to the pope,— a circumstance which added largely to his power, and which was followed by results of the utmost consequence in the later history of the nation.

Under Charles the Great (Charlemagne) a momentous era dawned in the history of the Germans.

From the Charle-

outset of his reign he had vast plans, which, however, magne.

were not so great as those ultimately realized. He saw at once that he could not hope to execute his schemes if on the north-eastern boundary of his kingdom there was a powerful and hostile people, ready at all times to plot against him, and to take advantage of any misfortune which might temporarily befall him. Accordingly, when the death of his brother Carlman made him, in 771, sole king, one of his first resolutions was to advance against the Saxons, and thoroughly to subdue them. It is not necessary to suppose that he went to war without an adequate special reason ; for, as the Frankish and the Saxon frontiers touched each other along the whole western and southern boundary of Saxony, and as the Saxons were con- tinually robbing their neighbours, pretexts for war were always overabundant. In his first campaign in 772 he overran the country, took the fortress of Eresburg, previ- ously supposed to be impregnable, and cast down the Irminsul, a mysterious column to which the Saxons attached profound religious significance. Awed by thre lordly bearing of the great Frank, by the numbers and dis- cipline of his army, and by these proofs of his power, the

| Saxons appeared to submit at once, and Charles was under

the impression that he had conquered them. Never was there a more profound mistake; in reality, he was at the beginning of a struggle which lasted upwards of thirty years, ‘Time after time, when apparently they were utterly beaten, they rose against the invaders, and tried with des-

Conquest of Saxony.

Bavaria.

The imperial title.

The

clergy.

perate energy to drive them from thecountry. The execu- tion of 4500 prisoners by Charles—an act which even then was looked upon as barbarous—only deepened their resolve never to yield to his authority. At last, however, their strength was exhausted, and they had no alternative but to submit. Charles introduced among them the political institutions which were established throughout the kmgdom; and they were compelled to exchange their heathenism for the Christian faith, Thus one of the greatest dangers which threatened the stability of the Frankish kingdom was overcome, and all Germany was for the first time brought under a single ruler.

The part of Germany which, next to Saxony, had retained most independence was Bavaria. Its duke, Thassilo, had been on ill terms with Pippin, and, had he allied himself with the Saxons during their great conflict, he might have baffled even Charles. But he did not become troublesome until they were too weak to be of service tohim. Repeated acts of treachery gave Charles a pretext for depriving him of his office, and after him no duke was placed over the couutry. As the dukes of the Alemanniand the Thuringians had also been displaced, Germany became, more directly than it had ever before been, subject to the Frankish sove- reign. Not content with completing the conquest of the German people, he made war on the tribes which harassed their eastern frontier. The Avars, who held the greater part of what is now Hungary, were thoroughly beaten ; and the Slavs, including the Czechs of Bohemia and Moravia, and the Slavonic tribes to the north of them, as far as the Baltic, were also more or less effectually forced into submission.

The great step taken by Charles on Christmas Day 800, when at St Peter’s in Rome he was crowned Roman emperor, intensified the allegiance of his German as of his other subjects ; but it could not produce so powerful an impres- sion in Germany as in Gaul. Ultimately, however, it was in Germany that the significance of the step was fully revealed ; for, in becoming emperor, Charles created so splendid a prize, that later German kings could not resist the tempta- tion to grasp at it, and its possession proved their ruin.

All the advantages which attended the rule of Charles throughout his vast empire were shared by the Germans. The border countries he formed into ‘‘ marches,” over which he appointed margraves, whose duty was to administer justice in his name, to collect tribute, and to extend his conquests. Germany itself was placed under counts, who did not merely, like the counts of an earlier time, execute the sentences of the royal tribunals, but tliemselves de- cided questions of justice in accordance with local laws and the capitularies of Charles. Four times a year the whole country was visited by his Missi Dominici, who reported as to the state of their districts, investigated grievances, and proclaimed the imperial decrees. Although he could not write, Charles was a man of. true culture, and en- couraged education by causing schools to be established in connexion with cathedrals and monasteries. These schools were modelled on the famous school of the palace over which Alcuin presided, and in which the emperor himself passed some of his happiest hours. By his magnificent

basilica in Aachen (Aix-la-Chapelle), his favourite capital, |

and by the palaces he built there and in Ingelheim and

Nimeguen, he fostered a love of art among the more ad- |

vanced of his German subjects.

In Germany, as in Gaul, Charles treated the clergy in the Spirit in which he treated the papacy; he set up and put down archbishops, bishcps, and abbots, as if he were the supreme lord of the church,—which indeed, in theory as well as in practice, he claimed to be. But the church never had a truer friend. As emperor, he believed that his chief

duty was to protect and to encourage it, and he was stimu-

lated to the performance of his supposed duty by the con- 800-817.

viction that a strong spiritual power would be one of the soundest pillars of his secular authority. Hence he not only founded bishoprics and monasteries in Germany, and enriched them with magnificent gifts of land, but invested the prelates with some of the functions which properly belonged to the counts, Criminal cases they did not yet decide ; but they were allowed to settle all civil disputes between the inhabitants of their territories. This policy may have been beneficial at the time, but it caused much disaster to his German successors ; for the church became one of the most vigorous and obstinate powers with which they had to contend in maintaining their lawful functions.

Although in many respects one of the greatest of states- The men, Charles was of thoroughly despotic temper; more than people.

any previous Frankish king he set himself against popular liberties. Hitherto all Germans had had the right of at- tending national assemblies or diets ; the common freemen were now excluded, and only the great nobles, spiritual and secular, were summoned. Even they had but slight influ- ence. They had the right of advising, but Charles limself originated and decided ; and he would not brook opposition, although, indeed, so commanding was his presence, and so high the moral authority conferred by his great deeds, very little opposition was ever offered. Popular assemblies of all kinds he discouraged, transferring their functions to the counts. Not only were the rights of freemen limited, but severe hardships were imposed upon them by Charles's incessant warlike expeditions. At any moment they were liable to be dragged from their homes to some distant corner of the empire ; and while they were away, their fields lay neglected, and their families suffered grind- ing poverty. What made this evil most galling was the fact that its pressure was very unequally felt. Well-off freemen knew how to purchase exemption from the counts, part of whose business was to see that the ranks of the army should be properly filled. It is true that Charles treated severely offences of this kind; but in such an empire as his, it was impossible even for his Missi Dominici to find out every case of injustice. Thus the burden of his many wars fell to the largest extent on the poorer class of freemen, who had but a sorry recompense in the glory their sacrifices reflected on their lord.

Not content with the general allegiance due to him as Feudal- king and emperor, Charles compelled many great land- ism.

owners to take the oath of vassals ; he imposed a like con- dition on his prelates and counts. A man might be his vassal without possessing land; but no land was granted by Charles except to those who were willing to assume this intimate personal relation. As his conquests put vast quantities of land at his disposal, especially in Saxony and on the frontiers, many freemen gladly swore to be his ‘“‘men”

| in the hope that he would reward them for their services with

extensive benefices. On the other hand, large numbers of poor freemen became the vassals of their stronger neigh- bours, as there was a chance that the military demands made upon them would thus be made rather less exorbitant. By these changes, due either directly or indirectly to him, Charles helped to build up that system of feudal tenures, the foundations of which had been laid by the first Mero- vingian kings. As in giving great temporal power to the church, so in establishing feudalism, he imagined that he was providing for the monarchy a steady support ; but in the latter case, even more than in the former, he prepared weakness and humiliation for those who came after him. After the death of Charles Germany remained for some time, in common with the other countries which composed the Frankish empire, under the direct rule of his son, Louis (Hludwig or Ludwig) the Pious. On the division of the monarchy, effected by the emperor in 817, in order

son Louis; the other parts of Germany fell to his eldest son Lothair (Hlothar), who received also the rest of the empire, except Aquitania, which was the portion of Pippin, the youngest. This arrangement lasted until the emperor fell completely under the power of his second wife, Judith, a Bavarian princess, who intrigued incessantly to obtain for her son Charles

—afterwards “Charles the Bald”—a position similar to that of his half brothers. The emperor at last, at the expense of his son Lothair, marked off an important territory for this inconvenient child. In the wars which followed, Louis the Bavarian firmly maintained his rights ; but he disapproved the cruel harshness with which his father was treated by Lothair. In Germany the emperor was highly esteemed,— especially in Saxony, where he softened the rigorous system introduced by Charles, by sanctioning as far as possible a return to ancient popular institutions. The result was that when he was virtually deposed by Lothair, and after- wards not only deposed but humiliated almost beyond endurance, the Germans warmly supported Louis the Bavarian in insisting that the emperor should be restored to imperial rights. For his servives on these occasions Louis received extensive additions of territory, and had he con- tinued to be fairly treated, he would have been the most effectual support of his father’s power. But the spirit of the gentle-hearted emperor was broken by misfortune, and when Pippin of Aquitania died, he was easily persuaded by Judith, who had come to an understanding with Lothair, to sanction a division of the empire by which his son in Germany would have been confined strictly to his original possession of Bavaria. Louis instantly revolted; and it was in marching against him that the emperor fell sick and died, in 840, on a small island on the Rhine opposite Ingelheim. The last words of the dying sovereign were a message of forgiveness to his rebellious son.

Lothair at once assumed the imperial dignity, and showed that he intended to demand the complete submission of his brothers, Louis and Charles. They combined against him, and in the battle of Fontenay, in 841, after fearful slaughter, defeated him. The armies of the allied brothers soon after- wards met in Strasburg, where they swore to be true to each other, Louis taking the oath, so as to be understood by the army of Charles, in a language in which we find the beginnings of modern French, Charles in a German dialect.

Treaty of In 843 the treaty of Verdun was signed. By this treaty

Verdun.

Begin- ning of German kingdom

Lothair retained the title of emperor, and received, in addi- tion to the Italian territory of the Franks, a long narrow kingdom, stretching from the Mediterranean up through the valleys of the Rhone and the Rhine tothe North Sea. This kingdom was called Lotharingia, a name afterwards confined to the northern part of it along the left bank of the Rhine. To the west of Lotharingia was the kingdom of Charles, which included the greater part of what is now France. Louis received most of the German lands to the east of the Rhine, with the towns and sees of Mainz, Worms, and Spires, on the western bank.

Nothing was further from the intention of the brothers than finally to break up the Frankish state by this division. In relation to the outer world the empire was still considered a single power, as the kingdom had been after the death of Chlodwig, more than three centuries before. And, after a time, it was for a brief period reunited under one head. Still it is not an arbitrary impulse that has led historians to fix upon 843 as the date of the real beginning of the German as well as of the French kingdom. Although it can hardly be said that a true national life had yet revealed itself in Germany, at least the foundations of national life had been laid. For the first time Germany was ruled by a king who reigned nowhere else, and it could not but be

that the people should slowly acquire a sense of common interests.

Keen animosity soon revealed itself between Louis and Charles the Bald, and on one occasion when the former, accepting the invitation of certain West-Frankish nobles, rashly invaded his brother’s territory, he was made prisoner. He escaped without dishonour only by the intercession of Lothair IL., the emperor Lothair’s second son, who, after his father’s death, had received the greater part, and ultimately

the whole, of Lothair’s kingdom to the north of Italy. When

Lothair II. died in 869, Charles the Bald pounced upon his territory ; but Louis the German had naturally something to say to this seizure of the whole prize, and in 870 the rival brothers signed the treaty of Mersen, by which Louis became possessed of most of Lotharingia or Lorraine. Germany at this time assumed very nearly the proportions which it maintained during the Middle Ages.

Louis the German.

New

On the east bound-

its boundaries were the Elbe and the Saale; to the west @7es-

it reached to and included the valleys of the Meuse and the Moselle, taking in, among others, the important towns and dioceses of Utrecht, Aix-la-Chapelle, Metz, Strasburg, and Basel. Franconia, which reached eastward from the Rhine through the valleys of the Neckar and the Main to the Saale, and extended also a little to the west of the Rhine, occupied the central position, and, as the home of the Franks, was the most important division of the kingdom. To the north and north-east of it were Saxony and Thur- ingia ; to the south, Alemannia, or, as it now began to be called, Swabia; and to the east of Swabia, in the valley of the Inn, Bavaria. There were five archbishoprics, those of Mainz, Treves, Cologne, Salzburg, and Bremen.

Louis, who was on the whole the worthiest of tle grandsons of Charles the Great, ruled his kingdom vigor- ously and efficiently. During his reign the Frankish empire was vexed throughout nearly its whole extent by the Northmen, whom the fame of Charles the Great had held in awe, but who now swept the coasts of northern, southern, and western Europe with persistent fury. The East-Frankish kingdom was, however, much less troubled at this time than the kingdom of the West Franks ; the main evil with which Louis had to contend was the arrogance of his Slavonic neighbours, Exactly to the east of Franconia, from the Saale to the Oder, were the Sorabi, and to the north of them, between the Elbe and the Oder, the Wiltzi and Abotrites ; while along the Baltic coast, as far as the Vistula, in what is now Pomerania, were the Wends. ‘To the south of the Sorabi,

behind the Bohemian Forest, were the Czechs of Bohemia and Moravia. All these Slavonic tribes Charles the Great had either thoroughly subdued or made tributary; and of course Louis the German claimed supremacy over them. But it was hard to make his claims good. While he was a very young ruler, a vigorous duke—Moimir—acquired a position of great power among the Moravians. Soon after the signing of the treaty of Verdun, Louis, becoming alarmed at the growing influence of this chief, advanced against him, and put in his place a chief named Rastislaus, on whose allegiance he thought he could rely. But on his way back he was defeated by the Bohemians, who were on good terms with the Moravians. From this time the Moravians were a source of incessant anxiety to him. Rastislaus extended his kingdom far to the east, and formed alliances with the Bulgarians and even with the Byzantine emperor; at the same time he stirred up the Bohemians and the Sorabi against Louis, and built strong fortresses on his western frontier. This gallant chief, after much fighting, at last fell into the hands of his enemies, who put out his eyes, and caused him to end his

Slavs.

Charles the Fat.

North- men,

Arnulf.

LATER CAROLINGS. |

days in a monastery. But his successor, Suatopluk, was not less energetic, and Louis was never able to overmaster him.

The emperor Lothair's successor in the empire was his eldest son Louis II., who received as his kingdom the Frankish possessions in Italy. After his death Charles the Bald adroitly managed to secure the imperial crown. This happened in 875, almost immediately before the death of Louis the German, Having succeeded so easily in regard to the supreme title, Charles fancied he might be able to unite the whole empire under his rule. But Louis had divided Germany between his three sons, Carlman, Louis, and Charles; and

the second of these met Charles the Bald on the field of Andernach, and by a decided victory convinced the West Franks that it was useless to hope for dominion east of the Rhine. The same son of Louis the German forced Charles the Bald to give up such portions of Lorraine as had been ceded to him by the treaty of Mersen, so that the right of possessing the whole of this important terri- tory, which included the best part of what had been Austrasia, was vindicated for the Germans, The two eldest sons of Louis soon died, and the kingdom passed into the hands of the youngest, Charles the Fat, a prince of indolent habits and feeble mind. He crossed the Alps, however, and was crowned emperor; and, as the Northmen were at this time tormenting the West-Frankish kingdom, and no descendant of Charles the Bald was fit to cope with them, Charles the Fat was invited to become king of the West Franks. He thus ruled, with the exception of Burgundy, which at this time became an independent state, the whole empire of Charles the Great ; but the mighty fabric could not exist without the genius which had built it up. In Germany also the Northmen had made themselves more and more troublesome. Time after time their skiffs had pene- trated far up the Rhine; they had plundered Cologne and Treves, and fed their horses over the grave of the great Charles himself, in his own beautiful basilica. His degen- erate great-grandson adopted the policy of buying them off, and when he reached Paris, to the disgust of his subjects, he pursued the same course. It happened that his brother Carlman had left an illegitimate son, Arnulf, whom he had made ruler of Carinthia, a country lying to the east of Bavaria. This young noble, who inherited the undaunted spirit of his forefathers, was indignant at the cowardice of his uncle; and when the latter, in 887, summoned an assembly in Tribur, Arnulf, instead of obeying the summons, marched at the head of a powerful army against the emperor. Deserted even by his ministers, and unable to offer the smallest resistance, Charles was dethroned, and in a week or two afterwards died ; and Arnulf, notwithstanding his illegitimacy, became king. For some time after this, Ger- many was still called Hast Francia, and the western kingdom West Francia, but they never again had a common ruler ; they were now in all respects separate, independent states. The empire of Charles the Great had fallen to pieces.

Arnulf, following the example of Charles the Fat, went to Rome and was made emperor. He could exercise but little authority in Italy, however, and

soon returned. In 890 the Northmen desolated the valleys of the Meuse and the Moselle, and Arnulf, instead of buying them off, sent against them a powerful army. As it was defeated, he himself took the command in the following year. The Northmen occupied a strongly entrenched camp near Louvain ; and Arnulf's force, consisting mainly of cavalry, seemed to be quite powerless. Leaping from his horse, he induced his men to fight beside him on foot; and they were so stimulated by his valour that for the first time the dreaded enemy fled, leaving thousands of bodies on the field. They never returned in such numbers as to be again a national peril, The emperor had also to wage war with

the Moravians, but his efforts here were not crowned with 875-911.

like success. By this time the fierce and warlike Magyars had become a terror to eastern Europe, and it occurred to Arnulf to ask for their alliance. They gladly assented; and with their help he overcame one of the three reigning sons of Suatopluk, and contrived to detach from Moravia the Bohemians, the Sorabi, and other Slavs whom Suatopluk had joined to his kingdom. But at the time of his death, in 899, he had not succeeded in breaking up the state estab- lished by this powerful warrior and his predecessor.

During the nominal reign of Louis the Child—the last of Louis the Carolingian dynasty inGermany (899-911)—the German the

people passed through one of the darkest periods of their

history; for when the Magyars heard that Arnulf had Magyars.

been succeeded bya child, they swept into Germany in vast numbers, and fearful was the havoc they caused in every part of the kingdom. At such a time as this it happened that there was no leader around whom the nation could rally ; it was virtually defenceless, and year {after year savage hordes returned, bearing away with them as much plunder as they could carry, and

driving before them as many prisoners as they could control. Where the North- men had whipped with cords, these barbarians lashed with scorpions. .

During the wars with the Magyars, the Northmen, and Growth the Slavs, feudalism made rapid advances in Germany. offeudal-

Even in the days of Louis the German and Arnulf it was impossible for the sovereign to protect at all times every part of the kingdom. The people themselves were obliged to rise against their enemies, and, as in old times, they appointed herzogs or dukes for special warlike expeditions. These leaders, being chosen from the ancient ducal families, naturally began to think of restoring the power of which their fathers had been deprived; and, as there never was more urgent need of strong local rulers, they found no great difficulty in gratifying their ambition. The first reigning duke of whom we hear is Otto of Saxony, a country not only liable, like the rest of Germany, to the attacks of the Magyars, but specially exposed to the Scandinavian sea-robbers and the northern Slavs, This duke ruled over both Saxony and Thuringia. Soon afterwards we hear also of dukes in Bavaria, in Swabia, in Lorraine, and last of all, in Franconia. Having unusual opportunities of acquiring new lands, the dukes increased their power by granting them as fiefs to vassals on whom they could depend ; and many independent landowners were glad to obtain their protection by offering them homage. Multi- tudes of the humbler class of freemen either were forced to change the tenure of their possessions into a feudal tenure, or did so in order to escape from still greater evils. Thus, when Louis the Child died, the feudal tenure of land was the prevailing system in nearly all parts of the country. Even those who held their offices and lands im- mediately of the monarch, like the dukes themselves, might still, in theory, be deprived of both; but in reality they asserted almost complete independence, rendering only such service to their lord as he could force from them, or as suited their convenience. The royal authority, nominally great, had become but a shadow of the authority exercised by the early Carolingian kings. ing Had Germany had no powerful external enemy, it is probable that it would now have lost the slight measure of unity to which it had attained. While Louis lived, the dukes were virtually kings in their duchies; and their natural tend- ency would have been to make themselves absolute rulers.

But, threatened as they were by the Magyars, with the Slavs and Northmen always ready to take advantage of their weak- ness, they could not afford to do without a central govern- ment. Accordingly the nobles assembled at Forchheim,

and by the advice of Otto, the aged duke – ian Conrad. .— 61

911-936.

Conrad I.

Saxon dynasty.

Henry I.

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of Franconia was raised to the throne (911-918). He had some excellent qualities, and in quieter times would have done good service to Germany; but he was rash and im- pulsive, and far too ready to submit to priestly influence. The dukes of Bavaria, Swabia, and Lorraine were not present at his election; and the choice displeased them, pro- bably because he was likely to prove considerably more powerful than they wislied. Rather than acknowledge him, the duke of Lotharingia or Lorraine transferred his allegi- ance to Charles the Simple of France; and it was in vain that Conrad protested and despatched armies into Lorraine. With the help of the French king the duke maintained his ground, and, for the time, his country was lost to Germany. Bavaria and Swabia yielded, but, mainly through the fault of the king himself, their submission was of brief duration. The rise of the dukes had been watched with extreme jealousy by the leading prelates. They saw that the inde- pendence they had hitherto enjoyed would be much more imperilled by powerful local governors than by a sovereign who necessarily regarded it as part of his duty to protect the church. Hence they had done everything they could to prevent the dukes from extending their authority, and as the government was carried on during the reign of Louis the Child mainly by Hatto, archbishop of Mainz, they had been able to throw considerable obstacles in the way of their rivals. They now induced Conrad to force a quarrel both upon Swabia and upon Bavaria, and the

result was a series of wars in which he had only partial success. What was incomparably worse, his clerical advisers involved him in a struggle with Henry, duke of Saxony, son of the duke to whom he chiefly owed his crown. Henry was a man of great personal charm, a just ruler, strong, and brave. The Saxon people were devoted to him; and his influence over them was intensified by the virtues of his beautiful wife, to whom he was known to be passionately attached. Conrad committed a profound mistake in making an enemy of a man like this; and he lived to repent his error. Ou his death-bed he recommended the Franconian nobles to offer the crown to Henry, wliom, with fine generosity, he recog- nized as the only man in the kingdom who could cope with the anarchy by which he had himself been baffled.

The nobles of Franconia acted upon the advice of their chief and king, and the Saxons were very willing that the duke they loved so well should rise to still higher honours. Henry I. (918-936) was one of the best kings Germany ever had, a born statesman and warrior. His ambition was of the noblest order, for he sank his personal interests in the cause of his country ; and he knew exactly when to attain his objects by force, and when by calmness and moderation. By wise concessions he almost immediately overcame the opposition of the dukes of Swabia and Bavaria; and some time later, taking advantage of the troubled state of France, he accepted the homage of the duke of Lorraine, which for many ceuturies afterwards remained a part of the German kingdom.

Having established internal order, Henry was able to turn to matters of even more pressing moment. In the very first year of his reign the terrible Magyars, who had continued to scourge Germany during the reign of Conrad, broke into Saxony and plundered the land almost without hindrance. In 924 they returned, and this time, by good fortune, one of their greatest princes fell into the hands of the Germans. Henry restored him to his country- men on condition that they should agree to a truce of nine years; and he had the courage to undertake to pay, during this period, yearly tribute. The heedless barbarians accepted his terms, and faithfully kept their word in regard to the immediate lands of Henry, although Bavaria, Swabia, and Franconia they occasionally invaded as before. He made admirable use of the opportunity he had secured,

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confining his efforts to Saxony and Thuringia, the only parts of Germany over which he had strong control. In the

southern and western German lands, towns and fortified Fortitica-

places had long existed ; but in the north, where Roman influence had but feebly extended, and where even the Franks had not exercised much authority until the time of Charles the Great, the people still lived as in ancient times either on solitary farms or in exposed villages. Such fortresses as Charles had built had been for the most part destroyed in the wars after his time, and almost the only attempts at fortification were to be found around the towers or castles of the great nobles, and tlie dwellings of the leading churchmen, Henry saw that, while this state of things lasted, the population could never be safe, and began in earnest the construction of fortresses and walled towns. Of every group of nine men one was compelled to devote himself to this work, while the remaining eight cultivated his fields, and allowed a third of their produce to be stored against times of trouble. The necessities of military discipline were next attended to. Hitherto the Germans had fought mainly on foot, and, as the Magyars came on horseback, the nation was placed at an imniense disadvantage. A powerful force of cavalry was now raised, while at the same time the infantry were drilled in new and more effective modes of fighting. Although these prepara- tions were carried on directly under Henry's supervision only in Saxony and Thuringia, the neighbouring dukes knew what he was doing, and were stimulated to follow his example. When he concluded that he was almost ready, he made use of his new troops, before turning them against their chief enemy, the Magyars, to punish refractory Slavonic tribes ; and at this time he brought under tem- porary subjection nearly all the Slavs between the Elbe and the Oder. He proceeded also against the Bohemians, whose duke was compelled to do homage.

At the expiry of the truce the Magyar messengers came Defeat of They were sent away empty Magyars.

as usual for their tribute. handed, whereupon a vast body of invaders crossed as in former years the frontier of Thuringia. Henry prudently waited until dearth of provisions forced the enemy to divide into two bands. He tlien swept down upon the weaker force, annihilated it, and rapidly advanced against the remaining portion of the army. The second battle was more severe than the first, but not less decisive. The Magyars, unable to cope with a disciplined army, were cut down in great numbers, and those who survived rode in wild terror from the field, The exact scenes of these con- flicts are not known, but few more important battles have ever been fought. The power of the Magyars was not indeed destroyed, but it was broken, and the way was prepared for the effective liberation of Germany from an intolerable plague. While the Magyars had been troubling Germany on the east and south, the Danes had been irritat- ing her on the north. Charles the Great had established a march between the Eider and the Schlei; but in course of time the Danes had not only seized this territory, but had driven the German population beyond the Elbe. The Saxons had been slowly reconquering the lost ground, and now Henry, advancing with his victorious army into Jutland, forced Gorm, the Danish king, to become his vassal. The German lands were given back, and it is probable that the march of Schieswig was at this time instituted.

When this great king died, every land inhabited by a German population formed part of the kingdom, and none of the duchies were at war either with him or among themselves. Along the northern and eastern frontier were tributary races, and the country was for the time rid of an enemy which, for nearly a generation, had kept it in per- petual fear. Vast as were these results, perhaps Henry did even greater service in beginning the growth of towns

tion of towns.

Import- ance of Henry’s reign.

Otto 1.

throughout north Germany. He was not content with merely making them places of defence, he decreed that they should be centres for the adminstration of justice, and that in them should be held all public festivities and ceremonies ; he also instituted town markets, and encouraged traders to take advantage of the opportunities provided for them, A strong check was thus imposed upon the tendency of freemen to become the vassals of great lords. This move- ment was made so powerful by the troubles of the epoch that, had no other current of influence set in, the entire class of freemen must soon have disappeared. As they now knew that they could in the last resort find protection without looking to a superior, they had less temptation to give up their independence, and many of them settled in the towns, where they could be safe and free. Besides maintaining a manly spirit in the population, the towns rapidly added to their importance by the stimulus they gave to all kinds of industry and trade.

Before his death, Henry obtained the promise of the nobles at a national assembly or diet in Erfurt to recognize his son Otto as his successor, and the promise was kept. Otto I. (936-973) began his reign under the most favour- able circumstances, He was twenty-four years of age, and to so high a pitch of honour had Henry raised the crown that, at the coronation festival, which was of unprecedented

than Otto’s doings in France were his wars with his northern 936-952.

and eastern neighbours, The duke of Bohemia, after a long struggle, was brought to submission. between the Elbe and the Oder the king was represented by Margrave Gero, one of his most important vassals, a warrior well fitted for the rough work he had to do, loyal to his sovereign, but capable of any treachery towards his enemies, and sometimes guilty of outrageous harshness. This remarkable man conquered most of the country north of Bohemia between the Oder and the Upper and Middle Elbe.

Margrave Billung, who looked after the Abotrites at the Lower Elbe, was less fortunate, mainly because of the

neighbourhood of the Danes, who, after the death of King panes.

Henry, often attacked the hated Germans, At last they made Billung prisoner, and Otto himself had to proceed against them. Their king did him homage, and he re- established the march of Schleswig, after which the mar- grave made rapid way among the Abotrites and Wends. Otto, having profound faith in the power of the church to reconcile conquered peoples to his rule, provided for the benefit of the Danes the bishoprics of Schleswig, Ripen, and Aarhuus ; and among those which he established for the Slavs was the important bishopric of Brandenburg. In his later years he set up the archbishopric of Magdeburg, which took in the sees of Meissen, Zeitz, and Merseburg.

Among the Slavs Slavs.

splendour, the dukes performed for the first time the nominally menial offices known as the arch offices of the German kingdom. These peaceful relations soon came to

Having secured peace in Germany, and begun the real Expedi- conquest of the border races, Otto was by far the greatest tion inte sovereign in Europe; and, had he and his successors refused “ly.

an end. It was Henry’s aim to establish the dukes in their rights, maintaining the royal authority rather by moral influence than by force. Otto, who was of haughty temper, despotic, and ambitious, seems early to have.resolved that the dukes should act in the strictest sense as his vassals, or lose their dignities. At the time of his coronation Germany was virtually a federal state; he wished to transform it into a firm and compact monarchy. This policy speedily led to a formidable rebellion, headed by Thankmar, the king’s half-brother, a fierce warrior, who fancied that he had a prior claim to the crown, and who had managed to secure a number of followers in Saxony. He was joined by the dukes of Franconia and Bavaria ; and it was only by the aid of the duke of Swabia, whom the duke of Franconia liad offended, that the rising was put down. A second rebellion, led by Otto’s

brother Henry, was supported, among other nobles, by the dukes of Franconia and Lorraine. Otto again triumphed, and derived immense advantages from his success. The duchy of Franconia he kept in his own hands, and he granted Lorraine to Conrad, an energetic and honourable count, whom he still further attached by promising him his daughter to wife. Bavaria, on the death of its duke, was placed under Henry, who, having been pardoned, had become a loyal subject and friend of his brother. The duchy of Swabia was also brought into Otto's family by the marriage of his son Ludolf with the duke's daughter. By these means he made himself master of the kingdom, as none of his immediate predeces- sorshad been. For the time, feudalism in truth meant that lands and offices were held on condition of service ; the king was the genuine ruler, not only of freemen but of the highest vassals in the nation.

to go beyond the limits within which he had hitherto acted, it is almost certain they would have established a united monarchy. But a decision to which Otto soon. came deprived posterity of the results which might have sprung from the policy of his earlier years. About this time Adelaide, the young and beautiful widow of Lothair, son of King Hugh of Provence, having refused to marry the son of Berengar, king of Lombardy, was cast into prison and cruelly treated. She appealed to the mighty German sovereign, and the appeal not only touched his sympathies, but awoke an overmastering ambition, since the way was thus opened for a partial restoration of the Carolingian em- pire. At the head of a great force, accompanied by his son Ludolf and many of his chief nobles, he crossed the Alps in 951, and descended into Lombardy. He displaced Berengar, and was so fascinated by Queen Adelaide that within a few weeks he married her. Ludolf, who had received a promise of the German crown, saw his rights threatened by this marriage, and returned sullenly to Germany. He went to an old enemy of his father, the archbishop of Mainz, and the two plotted together against the king, who, hearing of their proceedings, hastily departed, leaving Duke Conrad of Lorraine to attend to Italy. Otto had already taken the title of king of Italy, and Duke Henry, who hoped to obtain a large addition to his duchy, joined Queen Adelaide in urging him to assert the claims of the old Frankish sovereigns. Conrad, however, soon appeared with the intelligence that he had restored the Italian king- dom to Berengar, although as a fief of the German crown. This news being roughly

received, Conrad took offence, and entered into the conspiracy of Ludolf and the arch- bishop. Otto, who did not suspect how deep were their

Trouble In the midst of his troubles at home Otto had brought | designs, paid a visit to Mainz, and there was compelled i om ‘ fresh perplexities upon himself by intriguing in the West- | to take certain solemn pledges which, after his escape, he Ce.

Frankish kingdom against “Louis d’Outremer.” Louis responded with unexpected vigour, giving the signal for the second rising against Otto by invading Alsace. He also asserted a claim to Lorraine. When peace had been restored in Germany, Otto penetrated far into France, and received the homage of “Hugh the Great,” his son-in-law; but he soon re- turned, and afterwards used his great influence in favour of Louis against his rebellious nobles. Much more important

repudiated. War then broke out, and the struggle was the civil In Lorraine, war.

most serious in which he had been engaged. of which Otto made his brother Bruno, archbishop of Cologne, administrator, his cause was triumphant; but everywhere else dark clouds gathered over his head. Henry of Bavaria was deserted by his vassals; in Swabia, in Franconia, and even in Saxony, the native land of the king, his own duchy, the majority sided with the rebels.

955-973.

Defeat of Magyars.

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It is extremely remarkable that the movement acquired so quickly this force and volume. The explanation, according to some historians, is that the people looked forward with alarm to the union of Germany with Italy and the empire. There were still traditions of the hardships inflicted upon the common folk by the vast expeditions of Charles the Great, and it is supposed that they anti- cipated like evils in the event of his empire being once more set up. Whether or not this be the true explanation, the power of

Otto was shaken to its foundations. At last he was saved by the presence of an immense external peril. The Magyars were as usual stimulated to action by the disunion of their enemies; and Conrad and Ludolf were guilty of the fatal crime and blunder of inviting their co-operation. This baseness disgusted the Germans, many of whom fell away from the enterprise, and rallied to the head and protector of the nation. In a very short time Conrad and the archbishop of Mainz submitted; and al- though Ludolf held out a little longer, he too broke down and entreated to be pardoned. The archbishop was ordered to be closely confined in a monastery, and soon afterwards died. Lorraine was given to Bruno ; but Conrad, its former duke, although thus punished, was not disgraced, for Otto had urgent need of his services in the war with the Magyars. The great battle against them was fought in 955 at the Lechfeld, near Augsburg. They had never before appeared in such numbers, and there was a strong feeling on both sides that it was to be finally settled whether the work of King Henry should be completed or wholly overthrown. After a fierce and obstinate fight, in which Conrad with many other nobles fell, the question was decided in favour of Germany and of Europe; the Magyars were even more thoroughly scourged than in the battles in which Otto's father had given them their first real check. The deliver- ance of Germany was complete, and from this time, notwith- standing certain wild raids towards the east, the Magyars began to settle in the land they still occupy, and to adapt themselves to the conditions of civilized life.

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There are signs that during Otto's reign they began to have a distinct consciousness of national life, their use of the word "deutsch " to indicate the whole people being one of these symptoms. Their common sufferings, struggles, and triumphs, however, account far more readily for this feeling than the supposition that they were elated by their king undertaking obligations which took him for years together from his native land. So solemn were the associations with the imperial title that, after acquiring it, Otto pro- bably looked for more intimate obedience from his subjects. They were willing enough to admitits abstract claims ; but in the world of

feudalism there was a multitude of estab- lished customs and rights which rudely conflicted with them, and in action, remote and abstract considerations gave way before concrete and present realities. Instead of strengthen- ing the allegiance of the Germans towards their sovereign, the imperial title was the means of steadily undermining it. To the connexion of their kingdoin with the empire they owe the fact that for centuries they were the most divided of European nations, and that they have only now begun to create a genuinely united state. France was made up of a number of loosely connected lands, each with its own lord, when Germany, under Otto, was to a large extent moved by a single will, well organized, and strong. But the attention of the French kings was concentrated on their immediate interests, and in course of time they brought their unruly vassals to order. The German kings, as emperors, had duties which often took them away for long periods from Germany. 'This alone would have shaken their authority, for, during their absence, the great vassals seized rights which it was afterwards difficult to recover. But the emperors were not merely absent, they had to engage in struggles in which they exhausted the energies necessary to enforce obedience at home; and, in order to obtain help, they were sometimes glad to concede advantages to which, under other conditions, they would have tenaciously clung. Moreover, the greatest of all their struggles was with the papacy ; so that a power outside theirkingdom, but exercising

Otto Entreated by Pope John XII, who needed a helper | immense influence within it, wasin the end always prepared crowned goainst King Berengar, Otto went a second time to Italy, in | to weaken them by exciting dissension among their people. emperor. 969. and on this occasion he received from the pope the | Thus the imperial crown was the most fatal gift that could

imperial crown. He did not return to Germany for more | have been offered to the German kings ; apparently giving

than two years; and in 966 he was again in Italy, where | them all things, it deprived them of nearly everything.

he remained six years, exercising to the full his imperial | And in doing this, it inflicted on many generations incalcul-

rights in regard to the papacy, but occupied mainly in an | able and needless suffering.

attempt to make himself master of the southern as well as By the policy of his later years Otto did much to prepare Increase

of the northern half of the peninsula. the way for the process of disintegration which he rendered °f nobles. Connex. By far the most important act of Otto's eventful life was | inevitable by restoring the empire. With the kingdom ion of hig assumption of the Lombard and the imperial crowns. | divided into five great duchies, the sovereign could always ee His successors so steadily followed his example that the | have maintained at least so much unity as King Henry empire. Sovereign crowned at Aix-la-Chapelle claimed as his right to | secured ; and, as the experience of Otto himself showed,

be afterwards crowned in Milan and in Rome. Thus grew up the Holy Roman empire, that strange state which, directly descending, through the empire of Charles the Great, from the empire of the Czsars, contained so many elements foreign to ancient life. We are here concerned with it only in so far as it affected Germany. Germany itself never until our own day became an empire. It is true that at last the Holy Roman empire was as a matter of fact confined to Germany; but in theory it was something quite different. Like France, Germany was a kingdom, but it differed from France in this, that its king was also king in Italy and Roman emperor. As the latter title made him nominally the secular lord of the world, it might have been expected to excite the pride of his German subjects ; and doubtless, after a time, they did learn to think highly of themselves as the imperial race. But the evidence tends to show that at first they had no wish for this honour, and would have much preferred had their ruler limited himself strictly to his own people.

there would have beenchances of much greater centralization. Yet he threw away this advantage. Lorraine was divided into two duchies, Upper Lorraine and Lower Lorraine. In each duchy of the kingdom he appointed a palsgrave, whose duty was to maintain royal rights; and after Margrave Gero died, his territory was divided into several marches, and placed under six margraves, each with the same powers as Gero, and having extensive

lands. Otto gave up the practice of retaining the duchies either in his own hands or in those of relatives. Even Saxony, his native duchy, and the chief source of his strength, was given to Margrave Billung, whose family long afterwards kept it.

vassals of the crown ranked as princes—Otto, especially after he became emperor and looked upon himself as the protector of the church, immensely increased the importance of the prelates. They received great gifts of land, were endowed with jurisdiction in criminal as well as civil cases, and obtained several other valuable sovereigu rights. The

As a set-off The to the power of the princes—for the reigning immediate church,

Otto IT.

Civil wars.

SAXON EMPERORS. |

emperor's idea was that, as church lands and offices could not be hereditary, their holders would necessarily favour the crown. But he forgot that the church had a head beyond Germany, and that the passion for the rights of an order may be not less intense than that for the rights of a family. While the empire was at peace with the popes, the prelates did strongly uphold it, and their influence was unquestionably, on the whole, higher than that of rude secular nobles. But with the empire and the papacy in conflict, they could not but abide, as a rule, by the autho- rity which had the most sacred claims to their loyalty. From all these circumstances it curiously happened that the sovereign who did more than almost any other to raise the royal power, was also the sovereign who, more than any other, wrought its decay.

Otto II. (973-983) had been crowned king and co- imperator in his father's lifetime. His troubles began within a year in Bavaria, which was now a very great duchy, not only including the valley of the Inn, but reaching up along the western frontier of Bohemia and the eastern frontiers of Swabia and Franconia as far as the Bohemian Forest. Henry, the brother of Otto I., had died soon after the battle of the Lechfeld, and had been suc- ceeded by a

young son, who, as he grew up, showed himself of so contentious a disposition that he was known as Henry the Wrangler. This young duke's sister had married the aged. duke of Swabia, over whom she had absolute control, so that the younger branch of the house of Saxony had acquired an importance which the emperor could not affect to ignore. Taking offence at some action of Otto's, Henry the Wrangler conspired against him and rebelled. This first rebellion was easily put down, but Henry soon escaped from the imprisonment to, which he was condemned, and then Bavaria was the scene of a war which gave occasion to great bloodshed. When at last Henry was overcome, his duchy was taken from him and granted to one of the emperor's cousins, a son of Ludolf, who had caused so much anxiety to Otto J. As this prince had already received Swabia, Otto was able, without seeming to be harsh, to deprive Bavaria of some of its importance. The southern part, Carinthia, which had hitherto been a march, was separated from it and made a duchy; and the eastern march, Austria, was also taken away, and formally made over to Liutpold, of the Babenberg family, who had already ruled it for some time, and had proved himself a faithful vassal, Another member of the same house was invested with the Nordgau, a part of Bavaria to the north of the Danube, which formed a sort of wedge between Bohemia on the one hand and Franconia and Swabia on the other. Having arrived at this settlement, Otto went to chastise the unruly Bohemians; but while he was away war was begun behind him by the new duke of Carinthia, who, forgetful of the benefits he had just received, rose to avenge the wrongs of his friend Duke Henry. The emperor hastily concluded peace with Bohemia, the duke of which did him homage ; and the rising was quickly put down. Henry was made over to the keeping of the bishop of Utrecht, and Carinthia received another duke.

In his anxiety to obtain southern Italy, Otto I. had secured, as wife for his successor, Theophano, daughter of the Byzantine emperor, to whom southern Italy belonged. Otto II., having all his father's ambition with much of his strength and haughtiness, and being in the full flush of youth, longed to get away from Germany and to claim these remote possessions. But he was detained for some time by a sudden and unscrupulous invasion of Lower Lorraine in 978 by Lothair, king of France. So stealthily did the invader advance that the emperor and empress, who hap- pened at the time

to be at Aix-la-Chapelle, had just time to escape before the town was seized. As quickly as pos-

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‘although somewhat fantastic, nature.

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sible Otto placed himself at the head of a great army, and marched to Paris.

but soon afterwards Lothair gave up all claim to Lorraine, and peace was restored. At this time Lower Lorraine, which Otto I. had added to the crown lands, was held as a fief of the German sovereign by King Lothair’s brother Charles, the last of the Carolings, whose claims to the French throne were afterwards put aside in favour of Hugh the Great. At last Otto was able to fulfil the wish of his heart, and he did not again see Germany. His claims to southern Italy were vehemently opposed; and in 982 he suffered a

973-83..

The approach of winter compelled him Invasion

to return without taking the city, which was well fortified; rance.

disastrous defeat at the hands of the Greek emperor’s sub- Defeat of jects and their allies, the Saracens of Sicily,—saving his life Otto in by a romantic adventure. The tidings of this crushing blow “#!Y-

cast gloom over Germany, and in the north and east the Danes and Slavs, as if the spell by which the first Otto had held them was broken, attacked the Germans with an audacity and a determination tliey had never before displayed. With tlhe Danes the Saxons were able to cope; but the Slavs, who vehemently detested the German yoke, fought with such desperate courage that much of the work effected by Margraves Billung and Gero was altogether undone. They had seemed to be decisively conquered, but two centuries passed before they were beaten back to the position to which they

had been reduced in the previous reign. Such were the first fruits of the assumption of the imperial title.

About a year before his sudden death in Rome, Otto held a diet in Verona which was attended by the German princes. They would not help him in his Italian enterprise, which was extremely unpopular; but they consented to recognize his infant son Otto as his successor. This child they took back with them to Germany, and after the emperor's death he was crowned in Aix-la-Chapelle. Henry the Wrangler, as his near relative, was released from confinement and made his guardian ; but as this restless prince soon showed an inclina- tion to secure the crown for himself, the infant king was taken from him and placed under the charge of his mother Theophano. Afterwards, when she died, he lived with his grandmother, the empress Adelaide. While these two ladies acted, one after the other, as regent, the chief func- tions of government were discharged by Willigis, archbishop of Mainz, a vigorous prelate who had risen from a humble rank to the highest position in the German Church. He was aided by the princes of the state, each of whom claimed to have a voice in the supreme administration. Under these conditions vigorous rule was impossible; so that during the minority of Otto the royal authority was greatly weak- ened. In Bavaria, after the death of Henry the Wrangler, the higher vassals, without waiting for the appointment of a duke, returned to the ancient German custom, and elected Henry's son. A similar election took place in Thuringia,

Otto IIT.

the head of which, although not a duke, ranked with the –

chief aristocracy. And along the coasts of Friesland was formed a virtually free state, which was at a later time the scene of a long-continued contest between the Frieslanders and the powerful counts of Holland. At the age of fifteen Otto III. (983-1002) was declared to have reached his majority. He had been so carefully trained in all the learn- ing of the age that he was called " the wonder of the world," and a certain fascination still attaches to his imaginative, His mother having imbued him with the extravagant conceptions of the Byzantine emperors, he introduced into his court an amount of splendour and ceremonial that had hitherto been unknown in western Europe.

Most of his time he spent in Rome, Scheme

and here he cherished a vast scheme by which he was to do of Otto

much more than recall the empire of Charles the Great in its whole extent. As the heir of the Western emperors, and

1000-24, the grandson of an Eastern emperor, he fancied that he | was as little prosperous as in his government at home. might unite the entire known world under his rule. Rome | Boleslaus, who was now a powerful sovereign, had con- was to be its centre, and Germany but a province. In this | quered Bohemia and Lusatia; and so anxious was Henry

vague design he was warmly encouraged by Gerbert, thie greatest scholar of the day, whom, as Silvester IT., he raised to the papal see. Silvester saw that in such an cmpire, with such an emperor, it would not be difficult for the papacy to become the real source of influence. Meanwhile Germany suffered severely from internal disorder and from the inroads of her rude neighbours; and when, in the year 1000—a year which Otto, with many others, feared might see the end of the world—he visited his northern kingdom, there were eager hopes that he would smite the national enemies with something of the vigour of his predecessors. But the imperial dreamer found it more interesting to go to Aix-la-Chapelle, and to descend into the tomb of the mighty Charles, beside whose gorgeously arrayed body, as it sat

to win back these lands that, notwithstanding his Christian zeal, he obtained the alliance of certain Slavonic tribes by undertaking that their religion should not be interfered with. Bohemia and Lusatia were for a time detached from the Polish kingdom, but they were reconquered, and after a war of fourteen years the Pole was a greater ruler than ever. Henry went three times to Italy, and was crowned Lombard king and emperor. Before he became emperor, in order to assert his right of sovereignty over Rome, he

called himself king of the Romans ; and this was the designation borne by his successors until they received the higher title from the pope. Up to this time a sovereign crowned in Aix-la-Chapelle was simply “ king of the East Franks ” or “ king of the Franks and Saxons.”

on its marble throne, he gave free scope to his fancy,—ap- parently under the strange impression that his was a spirit akin to that of the worldly and resolute conqueror. One The practical step he did take, but it was ina direction contrary

The great nobles now met at Oppenheim, and elected to Fran- the throne Conrad, a count of Franconia. The dukes of conian Upper and Lower Lorraine, with a number of prelates, op- ¢¥79Sty- posed this choice ; but their objections were overborne, and Conmad

Poles.

Henry Il.

to that desired by his subjects. The Poles, of whom we hear first during the reign of Otto I., and who inhabited the country immediately to the east of the Oder, had since his time owed a vague allegiance to the Germans. They were now ruled by Boleslaus, a chief of an aggressive and deter- mined spirit, who by ostentatious loyalty gained the good- will of Otto IIT. The latter commissioned him to conquer the Pomeranians, a duty which he gladly and effectually discharged, adding to the Pomeranians the Prussians and some of the Bohemians. The large state thus formed the emperor made independent of Germany, probably in the hope that it might form the centre for a province of his future empire. Its Christian missions were severed from the church of Germany and formed into a new Polish church ; and the emperor himself founded the head see at Gnesen, where his friend Adalbert had met a martyr’s death. This was done with the sanction of Pope Silvester, who at the same time established an independent national church in Hungary, and encouraged Stephen to become the first Magyar king, by sending him from Rome a golden crown.

Otto’s magnificent plans received a fatal shock from the insubordination of the Romans, for whose city he designed so much honour. When he died,

perhaps by poison, there was no representative of the elder branch of the Saxon family, and several candidates came forward for the throne. Henry II. (1002-1024), son and successor of Henry the Wrangler, and therefore the great-grandson of King Henry I. by a younger line, managed to reach Aix-la- Chapelle before his chief rival, the duke of Swabia, and was there crowned. As he had not been elected, he was obliged to humble himself by going about among the princes and entreating their allegiance. His shattered health, querulous temper, and abject submission to priestly influence unfitted him for the great position to which he had raised himself, and his reign was an unfortunate one for Germany. For ten years civil war raged in Lorraine; in Saxony, too, torrents of blood were shed in petty quarrels. Hitherto it had been the right of the crown, when a duke or other prince died, to appoint his successor ; and obviously no royal right was of greater importance. In Henry's time the principle of inheritance was virtually established in favour of the im- mediate vassals of the sovereign. He the more willingly made this concession because of his extravagant generosity to the church, in which, like Otto I., he looked for his main support. He had his reward in the attachment of the papacy, by which lie was ultimately canonized; but he succeeded no better than his predecessors incounterbalancing the secular by the spiritual princes. In his foreign wars he

Conrad II. (1024-39) seemed to have no reason to dread

internal enemies. Very soon, however, he had to battle with a formidable conspiracy, and during nearly his whole reign he was exposed"to dangers of this kind; for he was a masterful king, looked with extreme jealousy on the rights the princes had acquired, and wished his crown to be the symbol of a genuine central authority. He was remarkably successful in contending with rebellion; and the chief cause of his success was that he allied himself with a powerful force, the significance of which had not been detected by previous sovereigns.

their superiors. Conrad, seeing that he and they had a common danger, made them more independent. It was not until nearly the end of his reign that he issued his famous edict in Italy, decreeing that no fief-holder should be deprived of his fief without judgment of his peers; but he carried out this

policy from the beginning in Germany, and even from the judgment of a fief-holder's peers there was a right of appeal to the royal tribunals. The result of this policy was that the inferior fief-holders were unwill- ing to follow their lords against the king. Thus when Duke Ernest of Swabia, his stepson, rose against him,and appealed to his men, as in old times, to make his cause their own, they refused, urging that the sovereign was the supreme protector of their liberties. Conrad soon revealed that his object was the same as that which Otto I. long pur- sued,—not to do away with the duchies, but to get them, if possible, under his immediate control. The principle of inheritance he extended to the throne; and in his case it was recognized, his son Henry being crowned as his successor soon after he himself became king. To young King Henry he granted Bavaria in fief, when the reign- ing duke, by rising against him, forfeited his title ; and afterwards, despite the bitter opposition of the nobles, he invested the same prince with Swabia, the ducal family of which died out. Carinthia, being vacant, was given to Conrad's nephew. As Franconia ever since the time of Otto had remained in the hands of the sovereign, Saxony, Thur- ingia, and the two Lorraines were the only duchies of which Conrad was not more or less master.

When Conrad mounted the throne, the safety of Germany Neigh- was endangered from three different points. On the north ee Denmark was ruled by Canute, the great English sovereign ; a

on the east was the wide Polish state, whose sovereign Boleslaus crowned himself king, and still had possession of Bohemia and Lusatia; to the south-east was Hungary, which, under Stephen I., was rapidly becoming an organized and formidable power. Conrad was prudent enough to ask

Hitherto the vassals of great lords— Mediate the mediate nobles—had been very much at the mercy of nobles.

Bur- gundy.

Henry III.

FRANCONIAN EMPERORS. |

in marriage for his son Henry Canute's daughter; and in return he ceded to Denmark the march of Schleswig. The Danes thus became the friends of the Germans, and were of service to them in keeping down the Wends. With Hungary, Conrad waged war, but not successfully, for, although a statesman, he appears to have been no great general, He was more fortunate in Poland; Boleslaus having died, the Poles plunged into a furious civil war, and he was able to turn their disunion to his own advan- tage. Moreover, a youthful hero, Breteslaus, an illegiti- mate son of the duke of Bohemia, having carried away from a convent a young German lady, a powerful noble's daughter, whom he passionately loved, and who had un- bounded influence over him, was induced to place his sword at the disposal of Conrad, and by a single raid he drove the Poles from Lusatia. Lusatia and Bohemia were thus restored to Germany, and the Polish ruler, who now claimed no higher title than duke, did homage to Conrad for his lands,

In Italy Conrad was ill received, for although as emperor aud Lombard king he was its lawful sovereign, the Germans were still looked upon as intruders, and by force alone they could maintain their rights. The event which at the time threw most lustre on his reign was his acquisition of the kingdom of Burgundy or Arles. It was bequeathed to him by Rudolf ITI, whose niece Gisela was Conrad's wife. In 1032 he was crowned, and was at once recognized by the German-speaking population. The others resisted, but in two years all opposition had been overcome, and he re- ceived in Geneva the homage of the leading southern nobles. This beautiful kingdom was full of prosperous cities, and its possession seemed to add incalculably to the power of the German kings; but in the end it proved an occasion of humiliation rather than of strength.

Henry III. (1039-56), who had been crowned, while his father was alive, king of Burgundy as well as of Germany, had none of the rudeness and reckless impulsiveness which marred Conrad's great qualities; but he had the same decisive judgment, far-reaching ambition, and irresistible will, In the later years of Conrad, Breteslaus, the young Bohemian prince who had served him so well in Lusatia, having succeeded his father as duke of Bohemia, waged war in his own interest against the disunited Poles, and easily brought their whole state into subjection. As he showed signs of wishing to become an independent sovereign, Henry invaded his territory,

and so completely overcame him that he appeared before the king in Ratisbon, barefooted and in a penitent's garb. Henry treated him generously, and was rewarded by receiving to the end of his reign the ser- vice of a loyal vassal ; and the young king also gained the good-will of the Poles by placing over them their lawful prince, Casimir, who willingly did homage for his land. The king of Denmark, too, acknowledged Henry as his feudal lord. Moreover, by several campaigns in Hungary, forced upon him by the violence of its king, Samuel, son- in-law of Stephen I., Henry brought that country for the first time, but only temporarily, into the position of a fief of the German crown. In Germany itself he acquired, during the first ten years of his reign, an authority which had been unknown since the days of Otto I. His bitter enemy, Duke Gottfried of Upper Lorraine, who conspired against him time after time, and found powerful allies in certain Burgundian nobles and in the counts of Flanders and of Holland, was beaten down; and he was able to dis- pense against the most powerful princes the laws of the kingdom, and to force them to maintain the public peace, Under this severe and beneficent rule Germany enjoyed a period of internal quiet such as she had probably never before experienced. But even Henry could not permanently divert from its course the central political tendency of the

age. ans under his direct authority, and thus to create a monarchy which should have but one head, sullenly awaited their opportunity ; and it came when, in 1052, after a ten months' siege of Presburg, he was obliged to retreat precipitately from Hungary. The influence of his great fame was shaken, and from this time he had to contend against warlike nobles. On one occasion he found out, only through the death-bed repentance of a rebel, that he was the object of a widespread conspiracy, which, had he remained in ignorance, would inevitably have succeeded. Even the mediate nobles, who had stood loyally by Conrad, were not his friends; for his wars made serious demands upon them, and his administration of justice was often stricter in regard to their class than they quite approved. Although at the time of his death he was still one of the most powerful sovereigns who

ever reigned in Germany, he was obliged to adopt a conciliatory policy,—even Duke Gottfried, after all his offences, being established in his duchy.

At the beginning of Henry's reign the church all over The Europe was in adeplorable condition. Simony in its basest Papacy.

forms was almost universally practised, and morality among the clergy was at its lowest ebb. The papacy, too, had sunk into a degraded state, its authority being annihilated, not only by the character of successive popes, but by the fact that there were at the same time three claimants of the Roman see. These evils were regarded with sorrow by Henry, who was a man of sincere and rigorous piety. Associating himself with the reforming movement which proceeded from Cluny, he not only commanded and pleaded with his prelates to put an end to abuses, but resolved to strike the evil at its root by stern exercise of his imperial rights, In 1046 he entered Rome at the head of an army which had secured for him in northern Italy such respect as had been given to noGerman ruler since Charles the Great, and summarily deposed the three popes whose contentions had caused scandal throughoutChristendom. He then raised to the papal see the bishop of Bamberg as Clement II., who crowned him emperor; and after Clement, when death made fresh appointments necessary, three other German popes, Damasus II., Leo IX., and Victor IJ. Under these popes a new era began for the church and for the papacy. Behind the two latter was the stern, unfaltering, high- minded Hildebrand, who, as their adviser, silently prepared the way for his own memorable term of rule. In thus reforming the papacy, Henry III. fulfilled what was regarded as the noblest duty of his imperial office; but he also sharpened a weapon whose keen edge was first tried against his son.

The last years of Henry III. form a turning-point in German history, Great kings and emperors came after him; but none of them possessed the direct, absolute authority which he freely wielded ; even in the case of the strongest, the forms of feudalism more and more interposed themselves between the monarch and the nation, and at last royal authority virtually altogether disappeared. The process was hastened by the unfortunate fact that Henry

III. was;succeeded by a child. The infant king, Henry IV, Henvy (1056-1106), was at first in charge of his mother, the lV:

empress Agnes, a lady of excellent qualities, but too gentle for a position which demanded the exercise of stern virtues. Her rule was jealously watched by Anno, arch- bishop of Cologne, a rigid churchman of imposing per- sonality, cold to the ordinary interests of the world, but passionately devoted to his order. Discontented by the predominant influence of the bishop of Augsburg at court, he managed, by a clever trick, to get possession of the king and the insignia of royalty. Agnes, knowing. his power, and deserted hy her friends, retired from the regency ;

The princes, convinced that his aim was to bring the 1024-56,

1036-77. and Anno began forthwith to rule the state. By and by | to have no strength of character, now announced his inten- he was compelled by the diet to share his duties with | tion of going to Rome and assuming the imperial title. Adalbert, archbishop of Bremen, who was not less ambitious | The pope, to whom the Saxous had been encouraged to than Anno, but was as gay, sociable, and worldly as his rival | make complaint, responded by sending back certain mes- was proud and morose. In the end Adalbert made himself | sengers of Henry's, with the command that he should do complete master of Henry, who thus grew up under the | penance for the crimes of which his subjects accused him. most diverse influences. The young king was generous, and | Enraged by this unlooked-for arrogance, Henry summoned endowed with considerable intellectual gifts; but, passing | a synod of German bishops, who declared Hildebrand as he did from the gloomy palace in Cologne, where he | deposed. The answer was a bull excommunicating the lived a monk's life under terrible censors, to the palace in | German king, dethroning him, and liberating his subjects Bremen, where he was petted and flattered, he became | from their oath of allegiance. wayward and self-willed. He assumed the duties of govern- Never had a pope ventured to take so bold a step. It Effect of ment at the age of fifteen, and soon made enemies of nearly | was within the memory of even young men that a German Henry's Saxony. all the chief princes. In Saxony, where, like his father, king had dismissed three popes, and raised, one after oe he held his court, he excited by a series of injudicious pro- |

another, four of his own prelates to the Roman see. And tion. ceedings intense hostility. While the Ottos were in pur- | now a pope attempted to drag from his throne the successor suit of the imperial phantom, a number of the crown lands | of this very sovereign. ‘The effect of the bull was tremen- in this duchy had been seized by nobles whose descend- | dous; no other was ever followed by equally important ants now held them. Henry insisted on restoring these; | results. The princes had long been chafing under royal and, as Henry I. had taken possession of the domains of | power; they had shaken even so stern an autocrat as Henry his Carolingian predecessors, so Henry IV. claimed the | IIL, and the authority of Henry IV. was already visibly domains of his Saxon predecessors. As if this were not | lowered. At this important stage in their contest with the enough, he built a number of fortresses which the free | crown a mighty ally suddenly offered himself, and, with peasantry imagined were intended for prisons ; he kept in | indecent eagerness, they hastened to associate themselves confinenient the heir to the duchy, and he persistently | with him. Their vassals and subjects, appalled by the spoke of the Saxons in a tone of supreme contempt. All | invisible powers wielded by the head of the church, sup- classes were thus combined against him; and in 1073 the | ported them in their rebelliousness. Henry had looked for universal discontent found expression in a vast popular | no such result as this ; he had not comprehended the influ- assembly, attended alike by freemen and by nobles, and in | ences which lay beneath the surface, and was horrified by which—such was the gratitude of the church for royal | his unexpected isolation. Ata diet in Oppenheim he in vain favours—a leading place was taken by the archbishop of | humbled himself before the princes. They turned from him Magdeburg and by the bishop of Halbertstadt, the former coldly, and decided that the pope should be asked to come the brother, the latter the nephew, of Archbishop Anno. | to Germany to investigate, along with themselves, the accusa- Henry was surprised by a band of rebels in his fortress of | tions brought against him ; that if, within a year, the sen- Harzburg, near Goslar. Attended by a few followers he | tence of excommunication were not removed, the king should escaped, and appealed to the princes for support ; but he | lose his crown; and that in the meantime he should live in could not compel their aid, and of free will they would retirement. grant him nothing. After tedious and degrading negotia- Now came the strange scene at Canossa which burned Scene at tions, in which he was accused of every kind of crime, he itself

into the memory of Europe. For three days, in the Canosa. was at last obliged to yield the demands of his enemies. depth of winter, the representative of the Caesars, clad in a As these demands did not include the destruction of the | penitent’s shirt, shivered in the outer court of the Countess fortresses, the peasants, fancying they were betrayed, refused Mathilda’s castle, entreating to be admitted into the pope’s to lay down their arms, and stormed through the duchy, | presence. No other mode of escape than complete subjec- not ouly battering down the detested buildings, but even tion to Gregory had suggested itself, or was perhaps pos- destroying the chapel of the Harzburg fortress and com- sible; but it did not save him. Although the pope in a mitting acts of desecration with ruthless fury. This so | manner forgave him, the German princes, being resolved alarmed the princes, both spiritual and secular, that Henry | not to miss the chance which fortune had given them, met was able to advance with a large army into Saxony, where | in his absence and deposed him, electing Rudolf, duke of in 1075 he gained a decisive victory, and re-established the Swabia, as his successor. But Henry’s bitter humiliations authority of the crown. transformed his character; they brought out all his latent Busty While Germany was in this confused state, Hildebrand | capacities of manliness. !‘rom being a wilful, thoughtless

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had become pope, as Gregory VII., and in 1075 he issued his famous decree against the marriage of the clergy and against their investiture by laymen,—for boldness and vastness the most magnificent policy ever devised, since, lad it been effected, the pope must have become the secular as well as the spiritual lord of Christendom. So quickly had the reforming zeal of Henry III. made the papacy a power which threatened to overshadow the world. ‘To the decree as to investiture it was impossible for any sovereign to submit, and in Germany there were stronger reasons than elsewhere for resistance. Half the land of the country was held by the clergy, and most of it had been granted to them because, in virtue of their feudal relation to the sovereign, it was supposed that they would be his most efficient helpers. Had the feudal tie been broken, the crown would soon have vanished, and the con- stitution of medizval society must have undergcne a radical

change. Henry, who had hitherto treated the new pope with excessive respect, and was believed at the Vatican

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lad, he became a resolute man, with many evil traces indeed of his irregular training, but with a deep conscious- ness of his rights, and a fixed determination to maintain them.

The war that followed —the war of investitures—was the War of

opening of that tremendous struggle between the empire ! and the papacy, which is the central fact of medizval history, and which, after two ceuturies of conflict, ended in the exhaustion of both powers. Its details belong more to the history of Italy than to that of Germany, but in Germany its effects were most deeply felt. It was now that the nation plucked the bitter fruits of the seed planted by Otto I. in assuming the imperial crown, and both by Otto and his predecessors and successors in lavishing worldly power upon the church. In the ambition of the spiritual and the secular princes the popes had an immense engine of offence against the emperors ; and they unscrup- ulously turned it to the utmost advantage. The most loyal friends of the emperors were the cities. They had been

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steadily growing up, especially in the Rhine country and in southern Germany, and could not but see that they had far more to fear from the princes than from the crown. Hence, when Henry returned to Germany, Worms, Spires, and many other towns opened their gates to him, and freely

contributed of their wealth ; and towards his successors they |

pursued a like policy.

After several indecisive battles the rival king, Rudolf, was, in 1080, defeated and slain. Henry then carried the war into Italy, where he was crowned emperor by his own anti- pope, and in 1085 Hildebrand died an exile from Rome, although with unbroken spirit. In Germany two other

rival kings were set up, Hermann, count of Luxembourg, |

and Ekbert, margrave of Meissen; but they were only

had Germany followed her own impulses, there would have becn peace. In the papacy, however, Henry had an impla- cable foe; and again and again, when he seemed tu be on the point of complete triumph, it kindled anew the smould- ering embers. His son Conrad was stirred up against him in Italy; and in Germany, when he was near the end of his days, his second son Henry was induced to head a dangerous rebellion. During his reign the first crusade – took place, and he suffered severely from the pious zeal which it expressed and intensified. The movement was not in the end favourable to papal supremacy, but tlie early crusaders, and those who sympathized with them, regarded the enemies of the pope as tlie enemies of re- hgion.

Pope Paschal II. did not doubt, after the death of Henry IV., that he would immediately triumph, but he was mistaken. Henry V. (1106-25), who had promised, with uncunscious irony, to treat him as a father, went on, like his predecessors, investing prelates with ring and staff, and, when expostulated with, replied that he could not be ex- pected to give up a right which had belonged to all pre- vious kings. War broke ont anew, and, as in the time of Henry IV., the pope found enthusiastic supporters among the princes. One of the most ardent of these was Lothair, whom Henry V. himself had made duke of Saxony, after the extinction of the Billung line, by which for a century and a half the duchy had been ruled. Henry's chief friends were the two Hohenstaufen princes, Frederick and Conrad, to the former of whom Henry IV. gave the duchy of Swabia when Rudolf became his rival king, while the latter was created by Henry V. duke of Franconia, a country which had been attached to the crown lands since the time of Otto L These two brothers were enthusiastic imperialists, and up- held with persistent courage the cause of their sovereign on the repeated occasions on which he went to Italy to chastise the pope. At last, in 1122, peace was restored by the con- – cordat of Worms. By this compromise, which was forced by exhaustion

upon both parties, the right of electing the ” prelates was granted to the clergy, and the emperor resigned the right of investing them with ring and staff. On the other hand, it was arranged that the clections should take place in the presence either of the emperor or of his repre- sentative, and that he should invest the prelates with the sceptre, The papacy was thus very far from realizing the great schemes of Hildebrand ; still, even in regard to the particular question in dispute, it gained solid advantages, and its general authority was incomparably more important than it had been half a century before. For it had waged war on the emperor himself; instead of acknowledging its inferiority as in old times, it had claimed to be the highest power ; it had even attempted to dispose of the im- perial crown as if the empire were a fief which it granted of its good will; and it had found out that it could at any time hamper, perhaps paralyse, imperial authority, by exciting strife in Germany.

The Franconian dynasty died out with Henry V., and 1080- Lothair, duke of Saxony, was elected to succeed him. Lothair 1152. (1125-37) excited the enmity of the Hohenstaufen princes Lothair by demanding that they should give up certain crown lands aaa which had been incorporated with their duchies. Unable ‘ to defend himself against them without help, he secured a powerful ally by granting his daughter in marriage to Henry Henry the Proud, grandson of Welf, a prince whom Henry IV, the had made duke of Bavaria. As this vehement noble soon P°“4- succeeded to Bavaria, and was also invested with Saxony, he became by far the greatest subject in Germany. Never- theless, the duke of Franconia and the duke of Swabia withstood him, and not until within thrce years of the

| emperor’s death were they forced to crave for peace. A partially successful, and after the death of the latter in 1089, |

considerable portion of Lothair’s reign was spent in Italy ; and Innocent II. claimed that when he received the im- perial crown he did so as a vassal of the pope.

Nothing could indicate more clearly than this fact Decay of how much of their old power the German kings had lost. royal It was not past hope that even yet some of their former PW splendour might be restored ; and for a brief period mon- archy did again stand high. Still, its foundations were

sapped. Incessant war, both at home and in Italy, had deprived it of its force; it had lost moral influence by humiliations of which the scene at Canossa was an extreme type. Steadily, with unwearied energy, letting no oppor- tunity escape, the princes had advanced towards independ- ence, and they might well look forward to such a hearing in regard to the kings as the kings had formerly adopted in regard to them.

Later Medieval Period.

Henry the Proud was confident that he would succced Hohen- Lothair ; but, by a hasty and irregular election, Conrad, duke peer of Franconia, was chosen king. Conrad ITI. (1137-52), an a Le : impulsive and not very wise ruler, found himself at once in uL serious perplexities. Henry the Proud, knowing that evil was designed against him, rebelled, whereupon he was declared to have forfeited his duchies; and Saxony was granted to Albert the Bear, a strong and truly great Saxon noble, while Bavaria fell to Leopold, margrave of Austria. Thus again the country was ravaged by war, for Henry the Proud, although he was unpopular in Bavaria— the ducliy he had inherited—was powerfully upheld in Saxony, which, ever since Henry [Y. lad alienated it, had always beeu

|Teady to join in an attack on the monarchy. Henry

suddenly died, but the struggle was continued by his brother

Duke Welf ; and, but for the opportune death of some of

the chief combatants, among them Leopold of Bavaria, it seemed probable that it would go hard with the king. Welf, hoping to be made Leopold's successor, agreed to a com- promise, by which Saxony, with the assent of Albert the

Bear, was granted to Henry—afterwards Henry the Lion—

the young son of Henry the Proud. Bavaria, however, was

in the end given to Henry Jasomirgott (so called from his

habit of saying “Ja so mir Gott helfe!”), margrave of Austria, a rough noble, who was afterwards found to have a decidedly inconvenient temper. Welf again took to arms,

and for years contended with his rival. N ot withstanding

this and many other sources of confusion, Conrad was Second persuaded by the passionate eloquence of St Bernard to crusade. take part in the second crusade. He came back broken, dispirited, and near his end, to find Henry the Lion at the

head of a great army, claiming Bavaria in addition to Saxony,

—a claim which Conrad in vain attempted to dispute.

Germany now passed under one of the greatest of her Frederick sovereigns, Frederick Barbarossa (1152-90), nephew of ent King Conrad, and son of the Frederick, duke of Swabia, j who had fought along with Conrad against Henry the Proud.

He was a man of large and noble nature, pa a indeed, X. — 62

1152-90.

Henry the Lion.

Frede- rick’s relations to other countries.

Internal pros- perity.

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if resisted, of great harshness, but a passionate lover of justice, with far-reaching ideals, ready to battle with gigantic difficulties, yet knowing how to recognize and submit to the inevitable. Allied to the Welfs through his mother, and laving a personal regard for Henry the Lion, he was anxious to bring to an end the strife of the Welfic and the Hohenstaufen families, and began his reign by promising to secure for Henry the duchy of Bavaria. For his adventurous and imaginative spirit the splendour of the imperial name

had an irresistible charm; and two years after he ascended the throne, in 1154, he went to Rome to be crowned emperor. After this the best years of his life were spent in Italy, where, in his obstinate struggle with the Lombard cities and with Pope Alexander III., he chiefly acquired his fame. Although it was con- ducted on his side mainly with German troops, it properly comes under Italian history, in which the record of his reign forms a bloody page, while his name is associated with one of the most peaceful and prosperous periods in the internal history of Germany.

The promise that Bavaria should be granted to Henry the Lion was not easily fulfilled, for Henry Jasomirgott doggedly refused to give it up. At last, however, Frederick, after his return from his first expedition to Italy, in 1156, recon- ciled the surly prince by detaching Austria, his native march, from Bavaria, and making it a duchy with certain special privileges,—an important step in the process by which Austria gradually became the centre of a powerful state. Henry the Lion then became duke both of Bavaria and of Saxony. This prince often gave offence by a haughty and aggressive disposition, but few German dukes won so true a title to the good-will of posterity. Since the time of Otto II. and Otto ITIL. the Slavonic countries to the east of Saxony had been very imperfectly held in subjection. Henry devoted himself to the conquest of the territory along the shores of the Baltic, and he succeeded as no one before him had ever done. But he was not a mere con- queror ; he built towns and encouraged those which already existed, founded bishoprics in the newly-won lands, and planted in them bodies of industrious colonists. While he was thus at work, a similar task was fulfilled a little to the south of him by Albert the Bear, the first margrave of Brandenburg, who, by just and energetic rule, worthily pre- pared the land for its great, although far-off, destinies.

Early iu his reign, by settling a dispute between two brothers who claimed the crown of Denmark, Frederick brought the king of that country once more into the position of a vassal of Germany. He broke into Poland also, and compelled its ruler to do homage, and, in return for great services rendered in his Polish campaign, raised the duke of Bohemia to royal rank, —a change which in no way affected his duties to the German crown, but which gave lim a certain precedence over all other subject princes. The king of Hungary, although no attempt was made to subdue him, became a useful

ally of Frederick. Thus the ancient fame of Germany, which was lost during the con- fusion that came after Henry III., was to a large extent restored in the neighbouring countries. Frederick re- asserted the royal authority in Burgundy, and added to the kingdom, by right of marriage, Upper Burgundy, or, as it was afterwards called, Franche Comté. Internal quiet he established by strictly applying such Jaws as existed against those who should break the peace ; and the robber nobles never found a more implacable enemy. The cities flourished during his reign, aud he attached them to himself by granting to many of them the very liberties which, by a too literal interpretation of his imperial rights, he withheld from the cities of Lombardy. Yet, with all this, the nobles appear to have been enthusiastically devoted to him. They followed him time after time into Italy,

going through incredible sufferings that he might assert claims which were of no advantage to them, and which had been a curse to their nation. On one occasion, when a tvo confiderit legate read before the diet a papal letter, which seemed to imply that the empire was a fief of the papacy, indignant murmurs broke from the assembly, and the life of the offender was saved only by the intervention of Frederick himself. Thesecret of this great popularity was partly the national pride excited by his foreign achieve- ments, partly the ascendency which his genius gave him over other minds, partly the conviction that, while he would abate nothing of his rights, he would ask no more than the laws of the empire sanctioned.

In the later years of Frederick’s reign, Henry the Lion Fall of

had the misfortune to incur his deep displeasure. The duke, rendered arrogant by success, positively refused, because his conditions were not admitted, to attend tlie emperor in the Italian campaign which resulted in the fatal battle of Legnano. Ascribing this defeat wholly to Henry, Frederick returned to Germany resolved to work his ruin. Summoned on three different occasions to attend the diet, Henry held aloof; whereupon, by judgment of his peers, he was condemned to the loss of both his duchies. After some resistance he submitted; but the utmost favour he could secure

was permission to retain Brunswick and Liineburg, while his term.of banishment to England was reduced from seven years to three. Bavaria was granted to Otto of Wittelsbach, but it lost much of its importance, for, among other changes, Styria was taken from it and made a separate duchy. Saxony was finally broken up. The duchy was confined toa comparatively small territory to the east of Brunswick and Liineburg, and conferred upon Ber- nard, son of Albert the Bear, while most of the western half of the country was attached, as the duchy of Westphalia, to the archbishopric of Cologne. The chief prelates of Saxony, and many of the most important vassals of the duke, such as the counts of Oldenburg, of Holstein, and of Schwerin, were made virtually independent of all control save that of the crown. Frederick's object in thus disintegrating the two greatest duchies in the kingdom was, by playing off the nobles against each other, to secure imperial authority. But, in reality, he made it doubly certain that the princes would one day shake off imperial power altogether ; for it was incomparably more difficult for the sovereign to con- tend with scores of petty nobles than with two or three great lords.

Towards the close of Frederick's career fortune appeared to smile upon him. Germany was at peace; even in Ital since the force of events had persuaded him that the time was past for too severe a straining of his lawful claims, he had been well received by the cities which had wrought him so much disaster ; pope and emperor were temporarily reconciled ; and, by the marriage of his son Henry with the princess Constantia, he had reason to hope that the empire would soon include Naples and Sicily. Resolving that the sunset of his life should be even more splendid than its dawn, he undertook the third crusade, and started with a great army for the Holy Land. When the news reached Germany that he had been drowned, men felt that evil days must come, since the elements of strife could no longer be controlled by his strong hand.

Henry

the Lion.

7

Last years of Frederick.

Evil days did not, however, come in the time of Henry Hemy VI. (1190-97), who, although without his father's greatness Vl.

of soul, had his determination and energy. Partly by means of the immense ransom obtained from his prisoner Richard of England, he was able to beat down resist- ance in the south Italian kingdom to which his marriage entitled him; and the papacy was more completely subject to him than it had ever been to Frederick. In Germany he was so powerful that he not only secured the election of

his infant son Frederick as king of the Romans (as a king.| crowned king of the Romans, and in whose name the 1190-

elected during the lifetime of an emperor was now and henceforth called), but he made proposals that the crown should be declared hereditary. 'To secure this important end, he offered so many concessions that, but for his sudden death, it would probably have been achieved.

Great as was Henry's authority, there had been a danger- ous conspiracy against even him, and after his death the princes who had taken part in it refused to recognize his son. There was now a double election, those who were favourable to the Hohenstaufen dynasty choosing Philip, Henry's brother, their enemies appointing Otto, son of Henry the Lion. Had Germany had no relation to the papacy, or had the papacy continued as weak as in the days of Henry VI, there could have been no doubt how the strife wouldend, A large majority of the princes were on Philip's side, and his personal character commanded univer- sal respect, while Otto was a man without principle, harsh and violent. But, to Germany's misfortune, the papal see was at this time held by Innocent III., a pope in whom were revived the ambition, statesmanship, and force of Hildebrand. After a little delay he decided for Otto, and thenceforward for some years the country was desolated by civil war. Even with the help of the pope, Otto by and by

lost ground ; and Philip, had he not been murdered, in 1208, would soon have been universally acknowledged. After his death, however, there was no-longer any excuse for war, and Otto IV. was crowned emperor. While his position was undecided he remained a humble suppliant of the pope, but after his coronation he cast aside his pledges, and began to act as an independent sovereign. Up to this time Frederick, the son of Henry VI, had lived in his southern kingdom, nominally under the guardianship of Innocent, but in reality left to be trained by the severe discipline of practical life. Although the pope did not altogether like him, he now resolved to punish Otto by bringing forward this young prince as a candidate for the German throne.

Frederick II. (1212-50), if not the strongest, was per- sonally the most brilliant, of the German kings. With the medieval passion for adventure he combined the intellectual freedom and culture of a modern gentleman. A lover of poetry, of science, and of art, he was also a great statesman ; with a power of will which the most adverse circunistances could not break, he knew how to adapt his policy to changing circumstances, and how to move men by appealing at one time to their selfishness and weakness, at another to the most ideal qualities of human nature. And for outward splendour his position never was surpassed, since, when he died, he possessed no fewer than six crowns,—the imperial crown, and the crowns of Germany, Burgundy, Lom- bardy, Sicily, and Jerusalem. But Germany, his proper kingdom, profited not at all by his magnificent gifts. In 1220 he left it for a space of 15 years, to accomplish his famous crusade, to carry on his bitter contest with the Lombard cities and Pope Gregory IX., and to rule Sicily, with an insight into its needs that made it the most pros- perous land in Christendom. In his absence he was repre- sented in Germany by his young son Henry, who was

country was governed by two successive regents. Through- out the kingdom the princes did very much what seemed good in their own eyes; and in the north a confused warfare was carried on between the Germans and the Danes. As there was now no powerful Saxon duke to uphold the northern interests of the kingdom, and as the central Govern- ment did not choose, or was unable, to act with energy, the Danes had decidedly the best of this struggle, and extended tleir power along the Baltic coast. At the same time

Prussia was conquered for Christianity and for civilization by the knights of the Teutonic Order, who here slowly built up the state which ultimately, in association with Branden- burg, was to influence so profoundly the course of history. Crusading knights from all lands came to their help against the Prussian heathen, and their strength was permanently increased by their union with the Knights of the Sword, who, before their appearance in Prussia, had been subduing Livonia and Courland. In all these countries Christian institutions were introduced, and German settlers brought with them the peaceful arts.

As young King Henry grew up, he displayed none of the good characteristics of his house, and in 1235 he openly rebelled. So confident was Frederick of his own position that he entered Germany with only a few personal attend- ants, and lis presence had the effect he anticipated. At Mainz, amid circumstances of unprecedented pomp, he held a diet which was attended by nearly all the princes, and Henry was solemnly deposed. Yet Frederick was in reality watched with sullen suspicion. The princes did not know what might be implied in his extravrdinary display of imperial power; they resented his evident dislike of their country ; as loyal sons ef the church, they could not but hold somewhat aloof from one who was believed to be at heart a Mahometan. It was significant of the limits of his influence that, in declaring private war to be unlawful, he had to except cases in which justice could not be ob- tained ; and that, although desirous of setting up courts of justice which should make private war unnecessary, he could only establish a tribunal from whose jurisdiction princes of the empire were excluded.

Some years after this, the gulf between Frederick and the nation was further widened by his indifference to a fearful danger by which Germany was threatened. Hordes of Mongols appeared on the eastern frontiers, yet Frederick had neither counsel nor help for his subjects ; the peril was warded off independently of lim by the brave margrave, Henry of Liegnitz. At that time he was once more absorbed by his Italian wars. In Innocent IV. he found an enemy quite as persistent as Gregory IX. Innocent grasped at the old and well-tried weapon, the ambition of the princes ; and he succeeded so far as to induce a number of them, mostly prelates, to accept his sentence of deposition, and to appoint a rival king. The king of their

choice was Henry Raspe, landgrave of Thuringia, a rude noble, who had ex- tended his territories at the expense of those of his dead brother, husband of the famous St Elizabeth of Hungary. Frederick's younger son, Conrad, who had some time before been elected king of the Romans, resisted the parsons' king, as Henry Raspe was popularly called ; and the rebellion did not at any time assume dangerous proportions. After Henry Raspe's death, the papal party elected William, count of Holland, a prince who had no quality to recommend hin, except that he was young and weak, and therefore likely to be a willing tool in the hands of his friends. Had Frederick chosen to leave the Lombard cities, he might still have found sources of strength in Germany ; but he preferred to remain at what he considered the centre of his empire, and King Conrad had not influence enough to restore harmony. At the time of the emperor's death, when he was almost ready

1250.

Con- quest of Prussia.

ae Mongols.

Henry Raspe.

William of Holland.

1250-54.

Conrad aN,

Period of

Hohen- staufen dynasty.

Political

to make a new spriug at his cuemics, but when to the world be seemed tv have lost everything, the prospects of his sup- porters were dark indeed.

They acknowledged Conrad IV. as their lawful sovereign, but he, too, fought in Italy rather than at home, and the country continued till his death, in 1254, to be torn by the two contending factions.

With King Conrad IV. the Hohenstaufen line came to an end in Germany, and William of Holland received a nominal allegiance. In two years he followed his predeces- sors, and then there was a double election, that of Alphonso, king of Castile, and Richard, earl of Cornwall, brother of Henry IIL. of England. Richard was crowned, but he went to Germany only three times, and the majority of his subjects probably hardly knew his name. Alphonso never even visited the country of which he also claimed to be the sovereign.

The age of the Hohenstaufen emperors is, in many respects, the most interesting in the medizval history of Germany. Everywhere there were dramatic contrasts of character: in the innumerable struggles of the time we are struck, now by heroic devotion, again by almost incredible selfishness ; a gay enjoyment of the world as it is existed side by side with almost superliuman spirituality. Chivalry was in full bloom, with much in its nature that was fan- tastic and insincere, but keeping alive a beautiful ideal of manliness, courtesy, and generosity. Women never held a higher place, nor, on the whole, did they ever respond more nobly to the honours freely lavished upon them. The excitement of the crusades, contact with the life of Italy (in that age presenting so many elements fitted to awaken even dull minds), and study of the Provengal poets revealed worlds that had been hitherto unknown ; while the national genius for the first time flowered in the romances and lyrics of the Minnesinger. In the cities, magnificent churches in the Gothic style gave expression to high aspiration, and gratified a cultivated feeling for art. And the problems of government were seen in new lights, partly from the study of oman law which passed from Italy to Germany, partly from the suminaries of native custom in the “ Sach- senspiegel” and “Schwabenspiegel.” Altogether, Germany lias seen 0 more fascinating epoch, none more full of life, movement, and colour.

Yet it was iu this age that the German nation utterly

character lost its political strength, Even after Lothair the Saxon,

10)

German settled,

a line of sovereigns rigidly confining themselves to their own kingdom might have mastered the many influences which were making for disunion. But the Hohen- staufen family, like their Saxon and Franconian pre- decessors, would be content with nothing short of world- dominion ; and thus the crown which had once been signifi- cant of power and splendour gradually sank into contempt. Under the strong rule of Frederick Barbarossa and his son the process was temporarily stopped, but only to advance the more rapidly when they were gone. During the con- fusion of the civil war carried on by Otto IV. and Philip, the princes, being subject to hardly any check, seized crown lands and crown riglits ; and the mischief was too extensive to be undone by Frederick II. In 1220,in order to secure the adhesion of the church to his son Henry, he formally confirmed the spiritual princes iu tivir usurpations, agreeing uot to introduce into their territories, without their consent, new coinage, or custoins, or tolls. Fifteen years later the rebel king, Henry, was isolated by similar advantages being granted to the secular princes. The two pragmatic sanc- tions in which Frederick made these concessions formed the lawful basis of the independence of the princely class. Such authority as he reserved he could ill exercise from a distant landin which his energies were otherwise occupied. His immediate successors can hardly be said to have exer- cised any authority whatever; and they lost hold of the

border countries which had hitherto been dependent upon or connected with Germany. Denmark and Poland rendered no homage thenceforth to the German crown, and Burgundy was gradually absorbed by France.

The country was not now divided into a few duchiies Classes which, with skilful management, might still on difficult.of the emergencies liave been made to act together. The age of ro the great duchies was past. As we lave seen, Bavaria was shorn of extensive lands, over which new dukes were placed, and the duchy of Saxony was altogether broken up. Swabia and Franconia also ceased to have dukes, and Lorraine gave place to the duchy of Brabant and other small immediate states. Thus there were prelates, dukes, pals- graves, margraves, landgraves, counts—forming together a

large body—each of whom claimed to have no superior save the emperor, whose authority they and their predeces- sors had slowly destroyed. All immediate nobles were not princes ; but even petty knights or barons, who possessed little more than the rude towers from which they descended | upon passing travellers, if their only lord was the emperor, recognized no law save their own will. Another independ- ; ent element of the state was composed of the imperial cities.

So long as the emperor really reigned, they enjoyed only such liberties as they could wring from him, or as he volun- tarily conferred. But when the sovereign's power decayed, the imperial cities were really free republics, governing themselves according to their own ideas of law aud justice. Besides tle imperial citics, and the princes and other im- mediate nobles, there were tlie mediate vobles, the men who held land in ficf of the highest classes of the aristocracy, aud who, in virtue of this feudal relation, thought themselves entitled to look down upon allodial proprietors or freemen, and upon simple burghers. There were also mediate towns,

acknowledging the supremacy of some lord other than the sovereign. LPeneath all these, forming the mass of the agricultural population, were the peasantry and the serfs, the latter attached to the land, the former ground down by heavy taxes.

The period which followed the death of Conrad IV., called Great the Great Interregnum, was made good use of by the princes interreg: for the extension of their territories and the confirmation ™™- of their authority. On several occasions the crown liad The seemed to be on the verge of becoming hereditary ; but the electors. jealousy of the papacy, and the growing influence of the aristocracy, had succeeded in keeping it elective. Although each election needed the sanction of the whole class of immediate nobles, tlie right of appointing the king had long been virtually in the hands of the leading princes. During the interregnum, mainly through the influence of Pope Urban IV., it was definitely transferred to the archbishops of Maiuz, Cologne, and Treves, the houses of Wittelsbach and Saxony, the margrave of Brandenburg, and the king of Bohemia. After this the electors became a distinct element in the state. Their importance consisted in this, that they could maintain the existing disunion by imposing rigid con-

ditions on candidates for the crown, aud by taking care that it should be conferred on no prince likely to be dangerous to the aristocracy.

Up to the time of the interregnum the territories of a Division prince were never divided among his descendants, the reason of princi- being that, although the private fiefs of the princes were Palites. hereditary, their offices as rulers were in theory at the dis- posal of the crown. This principle was now set aside.

Otto, duke of Bavaria, of the house of Wittelsbach, had become by marriage lord also of the Rhenish palatinate. After his death these extensive lands were ruled in common by his two sons; but a formal division soon took place, by which the powerful family of Wittelsbach was separated into two branches, the Palatine and the Bavarian. The small duchy of Saxony was also divided into two duchies,

Import- ance of the cities.

Rudolf I.

RISE OF HOUSE OF HAPSBURG. |

south, the latter to the north, of the great march of Branden- burg. About the same time there were like divisions in Nassau, Brunswick, Meissen, and Holstein. It was thins practically settled that the offices and territories, as well as the private fiefs, of the princes were hereditary, to be disposed of by them at their pleasure. This being thoroughly esta- blished, it would have been hard, perhaps impossible, even for a sovereign of the highest genius, to reassert in anything like its full extent the royal authority. The process of division and subdivision which steadily went on broke up Germany into a bewildering multitude of principalities ; but as a rule the members of each princely house held together against common eneinies. Ultimately they learned to ar- range by private treaties that no territory should pass from the family while a single representative of it survived. This consolidation of the power of the princes was con- temporary with the rise of the cities into new importance. The destruction of imperial authority compelled them to organize tlieir resources, so as to be at all times prepared against ambitious neighbours. They began to form leagues which the greatest princes, and

combinations of princes, could not atford to despise. Of these leagues the chief at this time was the Rhenish Confedcration, which was founded by Mainz and Worms, aud which, within a year of its formation—so pressing was the need of union—included

about 70 cities,—among them Cologne, Strasburg, Basel, |

and towns far to the east and north, such as Nuremberg, Erfurt, and Bremen. Great importance was also acquired by the Hanseatic League, which had originated some time before the interregnum in a treaty of alliance between Liibeck and Hamburg. It ultimately included more than 80 cities, and became one of th greatest commercial powers in Europe.

A political system which allowed the princes to do as they pleased was exactly to their liking ; and had they been able to follow their own impulses, it is improbable that they would have placed over the country even a nominal king. But the papacy intervened. It found from its troubles at home and from its diminished northern revenues that it would still be convenient to have in Germany a sovereign who would, like his predecessors, be the protector of the church. Pope Gregory X. therefore, after the death of Richard, let the electors know that if they did not choose aking he himself would appoint one. This threat was effective. The electors met, and raised to the throne Rudolf, count of Hapsburg, a petty Swabian noble who was supposed to be too unimportant to do much harm. Rudolf (1273-91), however, proved himself to have much more energy than the electors supposed. For a long time the most powerful prince in Germany had been Ottocar, king of Bohemia, He had by marriage and conquest obtained a great territory beyond his native state, including the Austrian possessions of the house of Babenberg, of which the male line had died out. As he had himself expected to receive the German crown, he refused to do homage to the new sovereign, who could not for a time compel his allegiance. At last, in a great battle at the Marchfeld, Ottocar was defeated and slain. Rudolf has often been called the restorer of the German kingdom, but he has no real claim to this honourable title. In the later years of his life he made some attempts to maintain the public peace, and he distinguished himself by the vigour with which he punished robber barons; he also won back some of the crown lands and dues which had been stolen during the interregnum. But he

made no essential change in the con- dition of Germany. There was but one way in which a king could hope still to overcome the arrogance of the princes, and that was to encourage the cities and to form with them a close and enduring alliance. This was the

that of Wittenberg and that of Lauenburg, the former to the | policy pursued by the French kings, and it was pursued with 1254- But Rudolf invariably favoured the princes 1208.

splendid effect. rather than the cities. The latter had a peculiar class of citizens called “pfahlbiirger,” who dwelt in the open country beyond the city palisades, and could claim the protection of the city authorities. As freemen were able, by becom- ing pfahlbiirger, to escape from the tyranny of local despots, the princes vehemently opposed the right of the towns to receive them. MJudolf not only took the side of despotism in this important struggle, but harassed and weakened the cities by subjecting them to severe imposts. He had all the sympathies and prejudices of a noble ; and the supreme object of his life was not to increase the authority of the state, but to add to the greatness of his own family. In this he was brilliantly successful, Some years after the fall of Ottocar he obtained the assent of the princes, notwithstanding their dislike of the scheme, to the granting of Austria, Styria, and Carniola in fief to his son Albert. Carinthia was given to Mein- hard, count of Tyrol, on condition that on the dying out of his male line it sliould fall to Rudolf’s descendants. Thus Rudolf made himself memorable as the founder of the house of Hapsburg, which from his time formed one of the most influential forces in the national life of Germany.

In vain Rudolf sought to obtain the crown for his son ; the electors would not take a step that might endanger their special rights. Guided mainly by the archbishop of

Cologne, they chose Adolf, count of Nassau (1291-98), a Adolf of He Nassau.

noble of eveu less importance than Rudolf had been. had, however, a considerable reputation for valour and ability. Edward I. of England persuaded him to form an alliance against France. Instead of applying the large sum sent from England to promote the objects of the alliance, Adolf was unprincipled enough to expend it in the purchase of Thuringia from the worthless landgrave, Albert the Degenerate. As the transfer was resisted by Albert's sons, it led to a war in which Adolf was opposed by several princes. In his general policy he was much more enlight- ened than in these wretclied proceedings, for he detected what had escaped his predecessor, the value of the cities as the true support of the monarchy. He relieved them of some of their burdens, and upheld them in the controversy respecting the pfahlbiirger. Taking alarm, the electors met, and by an irregular vote proclaimed him dethroned. Adolf resisted, but lost his life in a battle near Worms.

Now that there could be no pretext for asserting that the Albert I.

crown had been obtained by inheritance, Duke Albert of Austria, Rudolf's son, was chosen to be Adolf's successor. Albert I. (1298-1308), like his father, made it his principal object to extend the power of his house, and he came very near to securing Bohemia and Thuringia; but his schemes were cut short by a violent death. Although a hard, stern man, he had a keen sense of justice when his selfish interests were not involved, and few of the German kings possessed so strongly practical an intelligence. He encouraged the cities even more effectually than his predecessor, and was not content with issuing proclamations against private war, but formed alliances with the princes in order to enforce his decrees. The serfs, whose wrongs seldom attracted notice in an age indifferent to human dignity, found a friend in this severe monarch, and he protected even the despised and persecuted Jews.

Albert's successor was Henry, count of Luxembourg. Henry Henry VII. (1308-13) was fortunate enough to obtain for V1!

his son John the crown of Bohemia, but the aggrandisement of his family was not the main object of this remarkable sovereign, the last of the German kings of the old, grandly ambitious type. It was the memory of the

empire which stirred his blood; and from the beginning of his reign he looked forward to the assumption of the Lombard and

1308-47.

Frederick

III. and Louis IV.

Swiss League.

Rela- tions of Louis to the

papacy.

494

imperial crowns. His purpose of crossing the Alps at the head of a mighty force was hailed with delight in Italy by the Ghibelline faction, whose aspirations found noble utter- ance in Dante's prose; but the emperor lived too short a time to fulfil the hopes of his friends. The effect of the connexion of Germany with the empire was in his time, as in former ages, altogether mischievous; for before starting for Rome he tried to conciliate the princes by adding to their already enormous. privileges and by repressing the cnergies of the cities.

The electors, with their usual dread of the crown becom- ing hereditary, would not appoint Henry's son, John, the young king of Bohemia. But they were unable to agree on auy one else, and the result of their disputes was a double election—one party choosing Frederick the Fair, duke of Austria, son of Albert I. ; another, Louis, duke of Bavaria. War at once broke out and lasted for about nine years. In 1322 the rival claims were set at rest by the battle of Miithlberg, in which Frederick's army was deci- sively routed. Louis had no personal ill-will to his op- ponent, who was the friend of his youth; and in 1325 he agreed that they should rule in common. Frederick III, however, being without strength of character, sank into insignificance, and in 1330 he died.

The success of Louis IV. (1314-47) in the war with Frederick was to a large extent due to the imperial cities, which clung to him from the first. They not only willingly paid high taxes, but made splendid voluntary contributions; and they often stimulated anew the king of their choice, when lie himself would have preferred to give up a struggle in which the sympathies of most of the princes and nobles were with his enemy. He was even more indebted to the memorable conflict between the house of Hapsburg and the League composed of Schwyz, Uri, and Unterwalden. The inhabitants of these districts claimed to have never owed allegiance to any sovereign save the emperor. Although this claim had been confirmed by King Adolf and Henry VIL, the dukes of Austria would not recognize it; and when Frederick was chosen king by his party among the electors, lie sent bailiffs into the country to bring it under the rule of his family. Probably the tyranny of these officers, although it occurred at a later time than that to which the Tell legend refers, afterwards gave rise to the romantic tales which gathered around the name of the mythical champion of Swiss independence. At any rate it brought on a conflict between Austria and the confed- erates, which strained the resources of Frederick at the very time when he needed them in defence of his royal claims. It was not only Louis who profited by this struggle, for the splendid battle of Morgarten Pass laid the foundation of the structure which we now see in free Switzerland.

Had Louis been a wise prince it would have been easy for him to rise to a great position after the battle of Miihl- berg ; but he was wayward, treacherous, and selfish. He mortally offended King John of Bohemia, who had been of great service to him, but who now became his bitter and unrelenting enemy. Pope John XXII., stirred up by Charles IV. of France, who had some hope of obtaining the empire for himself, took advantage of the strife of the two princes, and arrogantly claimed that the German crown could not be worn but with papal sanction. When Louis gave the answer that was to be expected, the pope responded by excommunicating him and by placing under the interdict all places by ‘which be should be supported. Thus it seemed that the ancient struggle between the papacy and the empire was to be revived ; but the pope and his French master had altogether misread the signs of the times. The princes had no longer, as in former ages, reason to dread an ambitious ruler; the kingdom was their own, and there- fore they could not tolerate that its destinies should be

decided bya foreign power. Even the spiritual princes for the most part took this view. The electors had of course the strongest of all motives for resisting the papal claim, since, had it been conceded, they would have been deprived of their importance. As for the cities, they had stood beside the empire in the most difficuit crises of its contest with Rome, and they were not likely to desert it now. Encouraged, or rather driven forward, by the national sentiment, Louis continued to maintain the independence of his crown, and even made a descent upon Italy, where he was crowned emperor by his own anti-pope. This enterprise ended disastrously, but it made no difference in the conditions of the controversy. Louis was personally very much frightened by the possible consequences of ex- communication, and intrigued incessantly with Pope Jolin

and his successor Benedict XII. to be taken back into the

church. In order to win papal favour he basely betrayed Edward III. of England, with whom he had formed an alliance against the French king, Philip VI. The nation, however, stood fast, and in 1338 the electors, with the exception of King John of Bohemia, met at Rense, near Coblentz, and formally declared that the German king and emperor, if appointed by a majority of the electors, received his authority from God alone, and needed not papal sanction in the exercise of his rights. This declara- tion was accepted as the fundamental law of the empire by a diet which Louis summoned in Frankfort, and which was largely attended by princes, nobles, and citizens. Louis did not maintain the popularity forced upon him by this conflict. His greed ef territory for his family made

him so unscrupulous, and excited so many jealousies, that

the Bohemian king succeeded in forming a party against him; and in 1346 a number of the electors voted his de- position, and appointed in his place Charles, margrave of Moravia, King John’s son. The cities persisted in their loyalty, and few of the princes were willing to involve themselves in another great war; so that for a time the sentence of deposition had no

effect. But after King John had met his death, fighting heroically despite his blindness as the French king's ally, on the field of Crécy, Charles, who succeeded him on the Bohemian throne, began to make vigorous preparations ; and probably the sudden death of Louis prevented Germany from being once more rent by civil strife.

Notwithstanding the defects of Louis's personal character his reign was one of the most important in German history. The claim of the papacy to political supremacy received in his time its deathblow, and the popes themselves sowed the seeds of the spiritual alienation from Rome which was effected at the Reformation. In regard to the public peace, Louis persistently followed the lines laid down by Albert 1. He encouraged the princes to form alliances for its mainten- ance, and at the time of his death such alliances existed in all parts of the country. To the cities he usually showed himself a faithful friend. In many of them there had been for more than a century a struggle between the old patrician families and the guilds composed of workmen and trades- people. Louis could not always follow his own impulses ; but whenever he could, he associated himself with the latter party. Thus in his day the government of the imperial cities became more democratic, and industry and trade flourished as they had never before done. The steady dis- like of the princes was the best proof of the importance of the cities. They contained elements capable of enormous development; and had a great king arisen he might even yet, by their means, have secured for Germany a truly national life.

The friends of Louis elected Gitinther, count of Schwarz- burg, but Charles IV. (1347-78), by a liberal use of bribes, bought over his enemies; and Giinther himself resigned

Unpopu-

larity of

Louis V

Louis IV. and the cities.

Luxem- bourg dynasty.

Charles IV.

Golden Bull.

Fehm- gerichte.

The cities.

LUXEMBOURG DYNASTY.|

his claim, and soon afterwards died. Charles was an accom- plished diplomatist, of a keen and penetrating intellect, but capable of almost any trickery in order to gain his ends. Apparently the most pliant of men, he had in reality great persistence of character, and if foiled in one set of plans readily turned round and reached his goal by a wholly dif- ferent path. The result of his endless intrigues was that, when he died, he wore the crowns of Bohemia, of Germany, of Burgundy, of Lombardy, and of the empire; and he succeeded in adding to his native kingdom Lusatia, Silesia, aud Brandenburg. As a Bohemian king he ranked high among therulers of his day. He so carefully organized the administration, and practised such strict economy in govern- ment, that no German country was so lightly taxed as 3ohemia; and it became, under his rule, a home of learning and of the arts. Towards Germany he was cynically indif- ferent, caring for it only in so far as it could add to his personal welfare. It never stood in more urgent need of a strong and beneficent ruler than in the early years of his reign, for the Black Death swept over the land, and the half-mad population rose in fury against tle Jews, who were supposed to have in some way caused the evil. In dealing with this monstrous outburst of fanaticism, many of the princes, both spiritual and secular, displayed vigour and humanity; but Charles saw in the suffering of the down- trodden race, which was peculiarly under his protection, only an excuse for robbing it of its wealth.

His most famous achievement is the Golden Bull. Although the principle of election to the crown had long been settled, it was surrounded by many practical difficul- ties. It had never, for instance, been decided whether all the princes of each electoral house were entitled to vote; nor was it certain, when a choice was made among several branches of a family, by what law the choice ought to be regulated. The Golden Bull, which was granted as

the result of many tedious negotiations in 1356, was primarily intended to set at rest such doubts as these; but it did very much more. It decided that the number of elec- tors should be strictly limited to seven, that the spiritual electorates should belong as before to the archbishops of Mainz, of Cologne, and of Treves, and the secular elect- orates to the king of Bohemia, the Rhenish palsgrave, the duke of Saxony (Sachsen-Wittenberg), and the margrave of Brandenburg. ‘That there might be no possibility of dis- pute between the princes of a single house, tliese countries were declared to be indivisible, and to be heritable only on the principle of primogeniture. The electors were invested with full sovereign rights within their territories, and their subjects were allowed to appeal to the royal or imperial tribunals only if the administration of justice should be refused. The king of Boliemia received precedence among the secular electors, but it is difficult to believe that this alone was his aim in making these vast concessions, What- ever may have been his motives, the effect of the Golden Bull was to perpetuate the disunion of the state. With such powers the electors collectively were of more import- ance than the sovereigu ; and their greatness stimulated the other princes to seize every chance of acquiring like privileges.

If we except the Golden Bull, the true interest of Charles’s reign is not in his unimportant labours for Germany, but in the movements beyond tlie range of his influence. It is significant that at this time the Fehmge- richte, for whose origin we must go back to the 12th century, vastly extended the sphere of their activity, and that in the utter absence of central authority they were respected as a rough check upon the lawlessness even of high princes. The cities, notwithstanding every kind of discouragement, formed new associations for mutual defence, or strengthened those which already existed. The Hanseatic League carried

on war with the Danish king and forced him to come to 1347- terms, and its commerce was extended to nearly every part 1437.

of the known world. A powerful league was formed by the Swabian towns, but. it was defeated in the battle of Altheim by a confederation of princes who regarded its growth with fear and jealousy.

Wenceslaus (1378-1400), son of Charles IV., and also Wences- king of Bohemia, had some good natural qualities; but aus.

he had been badly trained, and when he became his own master was indolent and capricious. His bloodhounds had stronger attractions for him than the duties of govern- ment, and even more tlian his father he left Germany to look after itself. The tendency to association became the deepest of the time ; princes allied themselves against cities, cities against princes, and nobles against both. Fora brief period the prospects of the cities seemed to be splendid, for the Swabian League recovered from the effects of its reverse, extended its relations far and wide, and formed an alliance with the Swiss confederates. The latter won the brilliant victories of Sempach and Nafels, and had the Swabian League taken advantage of the opportunity, it might have definitely gained predominance. But it gave the princes time to reorganize their scattered forces, and in 1388, in the battle of Doffingen, it suffered complete defeat. So crushing was this blow that the Swabian cities were never again so strong, and all over Germany it encouraged the princes to fresh aggression.

The confusion caused by the king's neglect of lis most elementary duties gave rise to a conspiracy against him, in which Rupert, the elector of the palatinate, took a leading part. Wenceslaus was deposed, and after much intrigue the crown was granted to Rupert (1400-10). He was an ex- cellent elector, and under favourable circumstances would have been a good king ; but such were the jealousies and divisions of the state that he found no scope for his energy beyond his native dominions. He made an attempt to reacli Rome, but the result covered him with ridicule. After his death Jobst, margrave of Moravia, and Sigismund, king of Hungary, brother of Wenceslaus, were elected by opposing parties. Jobst soon died, and then Sigismund was generally

recognized, Sigismund (1410-37) was an intelligent and Sigis- cultivated prince, but vain, restless, and shifty. He could mund.

form great plans, but had not determination to execute them, and was easily moved by flattering counsellors. The commanding questions of his reign were ecclesiastical. It was the age of the great schism, and through all ranks of the church there was an urgent cry for thorough reform. Un- fortunately, the council of Constance, summoned mainly through the efforts of Sigismund, marred its labours by the judicial murder of Huss and Jerome of Prague. This atro- cious act, for which the king was to a large extent respon- sible, stirred vehement rage among the Bohemians; and when, after the death of Wenceslaus, Sigismund, as his heir, claimed the crown, they broke into revolt.

who, although his inferiors in genius, were of equally resolute temper, they defeated army after army, and spread havoc through the neighbouring German lands. So divided was Germany, and so poor was Sigismund himself, that for fifteen years he could not collect a force sufficient to put down the rebellion; and he at last succeeded only because the Hussites gradually split into two factions, the Calix- tines and Taborites, and he was able to conciliate the less extreme party.

Sigismund, who was of lavish habits, never had enough Branden- money for his wants; sometimes he had even to force >”.

himself upon princes and cities as an unwelcome guest. This undignified poverty had one good result. In return for 400,000 gulden he granted to his friend Frederick, count of Hohenzollern, first as a pledge, afterwards as a permanent

Led for a time Hussite by the blind general Zisca, and afterwards by commanders war.

1438-93.

Haps- burg dynasty. Albert IL

Frederick

Vee

Private wars,

Local diets.

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fief, the march of Brandenburg. into the hands of the family under whom it was destined to become the centre of a mighty kingdom.

Sigismund was succceded by Albert, duke of Austria, who, as his son-in-law, became king of Bohemia and Hungary. Although the German crown remained elcctive, it was henceforth always conferred on a member of the house of Hapsburg until the extinction of the male line ; and the same family never willingly lost its grip of the two countries which now fell to it, and of which it ultimately gained complete possession. Albert IL (1488-39) evidently meant well by Germany; but his reign was too short to enable him to do more than indicate his good in- tentions. He was succeeded by Frederick, duke of Styria. Frederick IV, (1440-93), unfortunately for his subjects, oceupied the throne longer than any other sovereign. He was a solemn trifler, obstinate without being firm, and bent on promoting only the interests of his family. The council of Basel having met after the council of Constance, King Albert accepted its reforming decrees ; and it appeared probable that the abuses which scandalized Christendom were about to be brought to an end. But Fredcrick, whose dull mind did not see that in the changed circumstances of the world the papacy could be strong only in proportion to its purity, fancied that in its existing condition it miglit be made a powerful ally of the empire. He accordingly carried his submissiveness so far as to sign in 1448 the concordat of Aschaffenburg, perpetuating the very evils from which the church had aimed at delivering itself. After his assent had been obtained it was comparatively easy to overcome the scruples of the princes, so that the chances of a voluntary reformation were lost ; the upheaval of the 16th century was rendered inevitable.

Frederick’s care2r is one of great importance in Austrian history ; he was involved in wars with the Turks, with the Hungarians, with his brothers, and with his own subjects, In 1452 he was crowned emperor, being the last wlio passed through the ceremony in Rome. He had no influence in Italy; and in

Burgundy he could neither check the towering ambition of Charles the Bold, nor after Charles's death prevent the seizure of the duchy of Burgundy by the French king. In Germany he hardly made a pretence of exercising supreme authority, and many private wars were waged, especially between the cities and the princes. The most famous of these was tle margraves' war, carried on by Albert of Brandenburg with a number of princely allies against Nuremberg, which had the support of the Swiss League and upwards of 70 cities. The war was in every respect a critical onc. Had the cities gained they might still have aimed at balancing the power of the princes; but owing partly to their imperfect union, partly to the necessity of fighting with hired troops, they were not successful. They won, indeed, great advantages in the course of the war; but after the conclusion of peace it was felt that on the whole they had decidedly lost ground. After this struggle, which lasted seven years, there could be no doubt as to the clement in which the centre of gravity of the state was to be found.

The princes, however, did not have everything their own way. About this time their power was seriously limited by the formation of diets in nearly all the principalities. These bodies were composed of the mediate prelates, the mediate nobles, and representatives of the mediate cities. They were not summoned because the princes wished their aid, but because arms could be had only with the consent of the nobles, and money only with that of the cities and the clergy. When once formed, the local diets soon extended their functions. They claimed the right of sanctioning taxation; they had something to say as to the expenditure of the public revenues; they insisted on

Thus Brandenburg passed | justice being administered.

Such institutions as these were clearly of the highest importance, and for two cen- turics they did much to make up for the lack of a genuine monarchy.

During this reign the conditions of warfare began to be radically changed, The discovery of gunpowder made small bodies of men, properly armed, more than a match for great forecs equipped in the medieval style. Hence the custom of hiring mercenary troops came into use; and a prince could never feel sure, however numerous his vassals, that the advantage would not rest with his opponent. This fact, added to the influence of the local diets, made even tle princes sick of war; and everywhere a demand arosc for the reform of the national institutions. In 1488 a great Swabian confederation, consisting of princes, nobles, and towns, was created for the establishment of peace ; and its effects were excellent. But obviously no partial remedy of this kind could suffice; it was essential that there should be some central reform by which every part of the kingdom could be effectually reached. Had the proposal been that the imperial authority should be directly strengthened, Frederick would not have objected ; but the scheme repeat- edly forced upon him was that he should in some form delegate to others the power which tlieoretically belonged to him, so that it might really be put in force. The emperor doggedly withheld his assent, and the nation im- patiently waited in the hope that his successor would be more pliant.

Maximilian I. (1493-1519) mounted the throne with unusual advantages. He was not cnly lord of the great Austrian lands, but, as husband of the princess Mary, daughter of Charles the Bold, administered the Low Countries and the free county of Burgundy. These terri- tories he soon gave up to their lawful ruler, his son Philip ; but the fact that they were in the possession of his family added to his influence, which was still further increased when Philip, by marrying the infanta Joanna, had the prospect of becoming king of Spain. From tlus time the empire exercised in the affairs of Europe an authority which had not belonged to it for several centurics. The reason was not that the empire itself was stronger, but that the crown was held by princes who were in their own right mighty sovereigns.

This emperor is often called the last of the knights, and in some respects the name is strikingly appropriate. He had not, indeed, sufficient dignity to rank among the greatest representatives of chivalry. A knight who was also emperor ought not, for instance, as Maximilian did at the siege of Terouenne, to have scrved a foreign prince for pay. But he possessed many

of the more prominent qualities sug- gested by the word chivalry ; he was a man of fascinating manner, a lover of poetry and art, and endowed with a bold and adventurous spirit. Above all, he was a knight in his political opinions. Maximilian never could learn that the world had changed since the time of the Hohenstaufen dynasty ; that the old order of society was passing away, and a new order arising, was altogether hidden from him. An irresistible fascination attracted him to the glitter of the medieval empire, and the best part of lis life he spent in vague schemes for its revival. The agitation for reform in the direction indicated by the princes and the cities met his ungualified disapproval. During the whole course of his reign the diet, which was now composed of three colleges, the electors, the princes, and representatives of the imperial cities, urged him with even greater importunity than it had displayed toward his father, to adapt himself to the circum- stances of the time. The only occasions on which it could bend him to its will were when he needed money for his military enterprises; and by taking advantage of these

Agitation for na- tional

reform.

Maximi- lian [.

opportunities it obtained his sanction to the division of the.

appointed for the purpose of preventing private war. These institutions were of genuine service, but no other real con- cession could be wrung from Maximilian. In his first diet, held at Worms in 1495, a permanent public peace was pro- claimed, and he unwillingly consented to the formation of an imperial chamber, consisting of a president and assessors, the former to be appointed by the emperor, the latter by the states. This chamber was to judge between princes of the empire, and to act as a court of appeal for parties of lower grade ; and partly for the payment of its expenses a tax called the common penny was granted. Maximilian, who was always in straits for money, took much interest in the common penny ; but to the imperial chamber, which limited the rights of the crown, lie was so persistently hostile that it did no good in his day. An administrative council to which, after his defeat by the Swiss League in 1499, he was forced to agree, also failed in consequence of his opposition.

The famousinvasion of Italy by Charles VIII. of Francein 1494 brought Maximilian into the field, and ever afterwards le mixed himself up in the confused struggles to the south of the Alps, hoping to assert the ancient claims of the German kings, at least in northern Italy. In 1508 he joined the infamous League of Cambray against the Venetian republic, and at a later time he took part in the conflict of the Holy League against Louis XII. of France. He was everywhere baffled, for his own territories, great as they were, did not suffice for his vast undertakings, and Germany refused to let herself be dragged into conflicts in which she was not directly concerned.
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Period of the Reformation.

The reign of Maximilian must be regarded as in many respects the end of the Middle Ages. The feudal relation ‘between the king and the princes, and between the princes and their vassals, had become purely nominal, No real control was exerted by the crown over the heads of the various states, and now that war was carried on mainly by mercenary troops, the mediate nobles did not hold their lands on condition of military service. The princes were sovereigns, not merely feudal lords; and by the institution of local

diets in their territories an approach was made to modern conceptions of government. The age of war was far indeed from being over, but men had at least begun to see that unnecessary bloodshed is an evil, and that the true outlet for the mass of human energies is not conflict but peaceful industry. By the growth of the cities in social if not in political importance the products of labour were being more and more widely diffused; and it was now incomparably easier than at any previous time for the nation to be moved by common ideas and impulses. The discovery of the New World, the invention of printing, the revival of learning, and many other causes had contributed to effect a radical change in the point of view from which the world was regarded ; and the strongest of all medizval relations, that of the nation to the church, was about to pass through the fiery trial of the Reformation, This vast movement, which began in the later years of Maximilian, definitely severed the medieval from the modern world. The seeds of the Reformation were laid at so remote a a- time as that of the conflict between the papacy and the empire. The arrogance and the ambition of the popes then stamped upon the minds of the people an impression that was never effaced. During the temporary struggle of Louis IV. with the popes of his day the old feeling revived with fresh intensity ; all classes, clerical as well as lay, looked Upon resistance to papal pretensions as a necessity imposed by the national honour. At the same time the spiritual teaching of the mystics awakened in many minds an

kingdom into ten circles, each with its own administrators, |

aspiration which the church, in its corrupt state, could 1495- ill satisfy, and which was in any case unfavourable to 1521.

a merely external authority. The Hussite movement, shaking as it did many ancient beliefs and shattering many ancient institutions, further weakened the spell of the church. Still more powerful, because touching deeper elements of human nature and affecting a more important class, was the influence of the Renaissance, which, towards the end of the 15th century, passed from Italy to the uni- versities of Germany. ‘The men of the new

learning did not sever themselves from Christianity, but they became indifferent to it ; its conceptions seemed to them dim and faded, while there was a constantly increasing charm in literature, in philosophy, and in art. No kind of effort was made by the church to prepare for the storm which might have been foreseen. The spiritual princes, besides dis- playing all the faults of the secular princes, had special defects of their own ; and as simony was universally prac- tised, the lives of multitudes of the inferior clergy were a public scandal, while their services were cold and unim- pressive. The moral sense was outraged by such a pope as Alexander VI. ; and neither the military ambition of Julius IT. nor the refined paganism of Leo X, could tend to revive the decaying faith in the spirituality of their office. Pope Leo by his incessant demands for money, and his unscrupulous methods of obtaining it, awakened bitter hostility in every class of the community.

The popular feeling for the first time found expression Luther.

when Luther, in 1517, nailed to a church door in Witten- berg the theses in which he contested the doctrine at the root of the detestable traffic carried on for the pope by Tetzel and hisaccomplices. In appearance a slight cireum- stance, this was in reality an event of vast significance ; for it brought to the front, as the exponent of the nativnal sentiment, one of the mightiest spirits whom Germany has produced,—a man who had certainly many faults, but who amply made up for them by the force of his intellect, the loftiness of his aims, and the rare combination of caution and audacity with which he devoted himself to noble causes. Under the influence of Luther’s great personality the most active and progressive elements of the nation were soon in more or less open antagonism to the papacy.

When Maximilian died, the throne was competed for by his grandson Charles, by Henry VIII. of England, and by Francis I. of France. ‘The first and the last were the only real candidates, and ultimately Charles was chosen. time he reached Germany in 1521, Luther had passed through his famous controversy with Eck; he had con- fronted the papal legate, Cajetan; he had burned the pope’s bull. After this, retreat was impossible; and his innumerable adherents waited with keen excitement to see on which side the new king would declare himself, Charles V. (1520-55), although a boy in years, was not really

young. He soon made up his mind as to the general lines His of his policy, and no one who knew his grave and obstinate Policy.

spirit supposed that any influence would cause him to diverge from his path, He had no adequate conception of the strength of the feeling which had been aroused. He fancied, as had at first been imagined in Rome, that he had to deal with a monkish quarrel; at one time he even sup- posed that a little money would easily set the difficulty at rest. Nor did he ever comprehend the real nature of the questions which stirred the hearts of his subjects. For Charles, although a diplomatist of astonishing skill, was a man of cold and narrow nature ; it was incredible to him that men should be genuinely moved by aspirations to which he was himself a stranger. Even if his knowledge had been far more exact, he would not have turned against the church. Since the interregnum none of the emperors, with the exception of Maximilian, had been powerful princes X. — 63

By the Charles V.

1521-32. apart from the empire, and some of them had been | Maximilian himself |

National

reform.

Nobles' war,

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wretchedly poor and insignificant. could not compete on equal terms with the leading European monarchs. Charles, however, was by far the most import- ant sovereign of his time. He was king of Spain and the Two Sicilies, with the resources of the New World at his command, lord of the Low Countries and of the county of

Burgundy, co-regent with his brother Ferdinand of the great |

Austrian inheritance; and now he had been made king of Germany with a right to the imperial crown. ‘To such a potentate it naturally seemed possible to restore the splendour of Charles the Great, and he early set before himself this ideal. But the protection of the church had always been looked upon as the chief function of the empire ; he could not, therefore, desert it at the very time when it seemed to be in need of his services. He reserved to him- self the same right as his predecessors to resist it in the realm of politics; in the realm of faith he considered that he owed it his entire allegiance, Moreover, he intended to complete the task at which his grandfather had worked in vain, the subjection of northern Italy; and in order to realize this scheme it was of high importance that he should in no way needlessly offend the pope. Hence, in 1521, in the diet of Worms, without really examining the positions of Luther, Charles issued an edict denouncing him and his followers, and placing him under the ban of the empire.

Alarmed lest the emperor’s great power should be too freely applied in Germany, the electors had before his appointment exacted a promise that he would respect German liberties and institute the reforms which had been vainly demanded of Maximilian. At the diet of Worms steps were taken to give effect to these conditions. An administrative council was nominated for the government of Germany while Charles should be away ; and the imperial chamber was so effectually re-established that, with the aulic council (which was at first subordinate to it, but ultimately became independent), it lasted till the destruction of the empire. A matricula was drawn up settling the number of troops to be raised for common purposes by each state ; and this also was in force while the empire existed. Having made these arrangements, Charles invested his brother Ferdinand with the sole authority in the Austrian territories, and then left Germany, to begin soon after his long struggle with Francis I. of France.

While Charles was absent carrying on his wars with Francis, great disturbances took place in Germany. One of the most remarkable of Luther’s friends was Ulrich von Hutten, a young noble, who, although penetrated by the enthusiasm of the Renaissance, was emphatically a man of action. His class, the nobles, had ever chafed against the supremacy of the princes; and it occurred to him that the Reformation might be made the

means of effecting a total change in the constitution of the empire. As no general reform either in church or state could be effected while the nation was cut up into a large number of principalities, his plan was to combine against the princes all who were dis- contented with the existing order, and to place the emperor at the head of a united country. Then the nobles would obtain their due, peace would be secured throughout the land, and papal authority might be easily put down. The scheme was a great one, and Hutten inspired with his enthusiasm Francis von Sickingen, an energetic and popular Rhenish baron who could at any time attract a large army to his standard. A force of 12,000 men was soon collected, and the enterprise was begun in 1522 by an attack on the elector of Treves, who, being a spiritual prince, would not, it was supposed, receive the sympathy of the reforming party. For a moment it seemed as if this dream of a new empire might be realized ; but it was too late to make so vast a change. Several princes united, and in 1523

Sickingen was defeated and slain, while Hutten, who had devoted pen and sword to his cause, died in loneliness and misery on an island in the Lake of Ziirich.

This war was followed by another of a still more serious Peasants' The peasantry of Germany had grievances com- War.

nature. pared with which those of the nobles were imaginary, for they were treated as if they had no right to expect any ray of brightness in their dreary lot. Extravagant hopes were kindled among them by the Reformation, and in a few

|. years, notwithstanding all Luther's efforts to dissuade them,

widespread conspiracies were formed. In 1524 war broke out in the greater part of southern and central Germany, and the peasants, aided by a few valiant knights like Gotz von Berlichingen, were at first triumphant. But they soon became so violent that Luther himself urged they should be

sternly punished ; andin 1525, after a vast amount of con- fusion and bloodshed, the rising was completely suppressed. By these two wars the authority of the princes was madc greater than ever; the peasantry suffered if possible morc severe oppression, and many even of the immediate nobles were compelled to submit to a yoke which they detested.

Notwithstanding the injurious impression caused by tlie struggles of the peasantry and of the barons, the Reforma- tion made rapid progress, and those who remained loyal to the church became so alarmed that at the diet of Spires in 1526 theyclamoured for repressive measures. The adminis- trative council at the head of Germany in Charles's absence was, however, not unfriendly to the Reformers, and the diet ended by decreeing that, until the questions in dispute should be authoritatively settled, each state should have religious freedom. This proved to be a most important edict. As yet no religious body had been organized to compete with the Catholic Church ; now the leading states in which the ideas of the Reformation prevailed began, under the guidance of Luther and Mclanchthon, to carry out measures which they had in vain hoped the church itself, by means of a general council, would undertake. The Catholics saw clearly the significance of what was done; and at anotlier diet held in Spires in 1529 they obtained, in opposition to the previous edict, a new decree, forbidding further changes in religion. The supporters of Luther formally protested ; but the Catholics maintained their ground. In the following year the emperor, who was no longer an untried youth, but a sovereign famous for skill in council and success in war, came to Germany for the express purpose of making an end of heresy. At the diet he held in Augsburg the Lutherans submitted a sum- mary of their doctrines in the Augsburg Confession, which had been drawn up, with the sanction of Luther, by Melanchthon, and which was afterwards regarded as their chief standard of faith. Charles made no real effort to comprehend the controversy ; he was resolved, whether the heretics had right on their side or not, that they should submit, and he had at first no doubt that he would awe them into submission by an unwonted display of power and splendour. To his surprise the Lutheran princes, while perfectly respectful, continued firm, and not only declined to attend mass, but held Lutheran services in their own quarters. Paying no attention to the edict of Spires of 1526, he renewed that which he

had issued at Worms in 1521; and it seemed more than probable that if it were not obeyed he would soon have recourse to arms.

But fresh difficulties with France, and a threatened invasion of the Turks, who had besieged Vienna in 1529, forced him to mask his designs. In 1532 he granted the religious peace of Nuremberg, which conceded temporary toleration to the adherents of the Augsburg Confession, and this peace was repeatedly confirmed in the following years. Meanwhile, the Lutherans, both princes and cities, had increased their power by forming the League of Smalkald,

Progress of the Refor- mation,

Diet of Augs- burg.

GERMANY

aud this confederation ultimately took in, besides many cities of South Germany, most of the North-German cities

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tion of making him prisoner. He fled, and all the advan- 1532- tages he had gained by the battle of Miihlberg were at once 1612.

GROWTH OF PROTESTANTIS©. |

and principalities. The Reformation in Germany was above all things a popular movement. It sprang directly from the heart of the nation, and, the conditions favourable to it being widely spread, it passed with extraordinary speed from one part of the country to another. Thus many princes, who would not of their own accord have deserted the church, were compelled to do so from political motives. They had been strong enough to undermine imperial authority; they were not strong enough to resist the pressure of the majority of their subjects.

His hands being full elsewhere, Charles was obliged to temporize during his second absence from Germany, and to

” send counsels of moderation to his brother Ferdinand, who

liad been elected king of the Romans. He never, however, gave up his original purpose. His plan was, when he should have leisure to devote himself to the task, to secure

lost. Within six months he had to sign the treaty of Passau, agreeing that a diet should be summoned for the purpose of arriving at a new settlement, and that in the meantime Lutherans and Catholics should have like privi- leges. In 1555 the religious peace of Augsburg was con- cluded by the diet thus promised.

Henry II. had seized the bishoprics of Metz, Verdun, and Toul; and Charles endeavoured at the earliest possible opportunity to win them back. But his efforts failed; and thus in his last years the power he fancied he had thoroughly humbled began a series of depredations which were thence- forth to be continued at frequent intervals. Disgusted with his ill fortune, he handed over the government of Germany to his brother Ferdinand in 1555, having in the previous year entrusted Spain, the Two Sicilies, and the Low Coun- tries to his son Philip.

the meeting of a general council which should make all necessary reforms, and to insist, at whatever cost, on the Lutherans abiding by its decisions. The peace of Crespy,

The peace of Augsburg, instead of bringing tranquillity, Peace of was the cause of fresh discord. ‘The toleration it conceded Avgs- did not include the Calvinist or Reformed faith; only the PS:

signed in 1544, gave him free scope; and he began by inducing Pope Paul III. to summon the council which ulti- mately met at Trent. At the same time he made vigorous preparations for war. He affected that he had no intention of fighting for religious objects, but merely wished to bring to subjection certain states which liad set him at defiance. By these means he was able to detach from the League of Smalkald the reforming states which were without real enthusiasm, or which were too timid to enter upon a great struggle. Those which took up arms were so disunited that the troops sent to Charles from Italy and th: Low Countries had no difficulty in joining him;

and in.1546 he not only made himself master of the South- German Lutheran cities, but in the battle of Miihlberg completely routed the Saxons and took their elector, John Frederick, prisoner. Shortly afterwards the landgrave Philip of Hesse, who with the Saxon elector had been the main political support of Lutheranism, fell into his hands, and both were treated with great harshness. Charles took advantage of his triumph to issue what was called the "Tnterim," a confession which was to be obligatory on the Lutheran states until the council then sitting should con- clude its labours. It was everywhere resisted, but most of the states had at least outwardly to submit. All Germany thus seemed to be at the emperor's feet. The Reformation had enabled him to deal both with the princes and the imperial cities as no sovereign had dealt with them for five centuries.

Lutherans received liberty of worship. And even aLutheran was not tolerated unless his prince chose to let him alone; for each secular state had the right to eject from its territory all who did not accept the doctrine it established. Thus Catholic, Lutheran, and Calvinist were exposed to irritating despotism ; and each came to regard the other with hearty detestation. Another source of trouble was a clause in the treaty called the ecclesiastical reservation. It required that if a spiritual prince accepted the Augsburg Confession he should-forthwith resign his lands. The Lutherans denied the validity of this clause ; and notwithstanding the protests of the Catholics several prelates became Lutherans and kept their territories as secular possessions.

Ferdinand I. (1556-64), who, like all German sovereigns Ferdi- after him, was recognized as emperor without being crowned nand I.

by the pope, had at one time been distinguished for his zeal for the church. But the experience of his brother had taught him the necessity of prudence ; and he was also kept quiet by troubles in Bohemia and Hungary, both of which countries he had acquired by marriage, and to both of which the house of Hapsburg soon began to lay hereditary claim. He tried to moderate the excesses of each party, and was anxious that the council of Trent should follow a concili-

atory policy. Maximilian II. (1564-76), one of the most Maximi- He lian II.

enlightened princes of his time, adopted the same line. would have had the state withdraw altogether from religious disputes, and so sincerely did he carry out his principles that, although he was himself a Catholic, Protestant

efeatof But his triumph was too great to be enduring. The harles. Catholic princes themselves were alarmed at his predomi- nance; King Ferdinand was alienated by his attempts to

doctrines spread during his reign throughout the Austrian hereditary lands, from which they had hitherto been ex- cluded. Rudolf IT. (1576-1612) reversed the policy of his Rudolf II.

secure the crown for his son Philip; and the Lutheran princes chafed angrily under his severe rule. The general discontent found a representative in Maurice, a subtle and ambitious Saxon prince, who, caring little about doctrinal disputes but a great deal about the increase of his own im- portance, had sided with Charles against the Lutherans, and had been rewarded by being made John Frederick's successor. He now turned, under the influence of what motives it is hard to determine, and plotted against the emperor, forming an alliance with the chief Lutheran princes and with Henry II. of France, who eagerly caught the opportunity to profit by the dissensions in the empire. Charles heard vague rumours of what was going on; but he had been thrown off his guard by the ease with which he had hitherto attained his will, and carelessly trusted to chance. Suddenly, in 1552, Henry II. invaded Germany as protector of her liberties, and Charles learned that Maurice was marching rapidly to Innsbruck with the inten-

immediate predecessors. The Jesuits, wlio had been hard at work, although without much success, during his father's reign, gained complete ascendency over him ; and acting on their advice he continually warred against the Protestants. But he was too weak to do much good to his friends or injury to his enemies. Trained in the gloomy court of Spain, he had come to be of a moody, variable temperament ; and he was given to outbursts of violent passion, followed by abject submission to his advisers. So much confusion sprang from his incompetence that the archdukes of Austria, with the sanction of the Spanish branch of the house of Hapsburg, met in 1606, and placed the government of the hereditary lands in the hands of his brother Matthias. He took refuge among his Bohemian subjects, who, in

1609, wrung from him a royal charter, granting religious freedom to the nobles, knights, and cities, with the right to build churches on their own and the royal lands. succeeded him as emperor (1612-19), was almost as unfit

Matthias, who Matthias,

1612-32.

Catholic reaction.

Protest- ant Union and. Catholic League.

Ferdi- nand IT.

Thirty Years' War. Bohemia.

for the duties he assumed. He put forth his whole energy against Protestantism ; but he could not in the least dis- courage it, and in his time it prevailed over by far the larger part of the Austrian territory.

By this time, however, there were signs of a great Catliolic reaction which was to work fearful havoc in Germany. It was due mainly to the persistent zeal of the Jesuits. For a long time the Protestants absorbed the intellectual strength of the country ; but many able scholars and divines among the Jesuits could hold their own with their antagonists, who afforded them excellent vantage ground by foolish and bitter controversies. These devoted inissionaries of the church gave their attention mainly to the young; and during the reign of Rudolf they were fortunate enough to make a profound impression upon two princes, each of whom was destined to play a great part in the events of the time. These princes were Maximilian, duke of Bavaria, and Ferdinand, duke of Styria. The former early showed the fruit of his training by executing, in 1606, an unjust imperial mandate against the Protestant city of Donauworth, and afterwards treating it as his own. The Protestant princes, rendered suspicious by this arbitrary act, formed in 1605 a confederation called the Union, which was to last for ten years; and in response the Catholics, under the guidance of Maximilian, to whom they

gave the command, united in a similar confederation called the League. As the Union was headed by the elector palatine, who was a Calvinist, many Lutherans, among them the Saxon elector, regarded it coldly. It acquired, however, immense importance by aun alliance with Henry IV. of France, who, like Henry II., wished to profit by German quarrels. War was on the point of breaking out between the two confederations in regard to the Juliers-Cleves terri- tory; but the Union did not venture to fight after the sudden death of the French king.

Ferdinand was even more vigorous than his friend in the defence of his religion. His faith was that of a genuine fanatic, narrow, intense, austere; and with the feelings of a monk rather than of a secular ruler, he began at once, on assuming the government of Styria, to extirpate Protestant- ism. Individuals and families were driven without mercy from their homes until at last a country which had been mainly Protestant became in appearance altogether Catholic. He was the heir of Matthias; and on coming to Vienna after the death of that sovereign, he found himself in the midst of what seemed hopeless confusion. The Bohemians, embittered by the violation of the royal charter granted by Rudolf, refused to acknowledge him as king, and elected Frederick V. of the palatinate, son-in-law of James I. of England ; and the people of Hungary and of the Austrian lands, terrified by the prospect of a stern rule in opposition to their religious beliefs, were almost in open revolt. He succeeded in obtaining the imperial crown ; and from that time Ferdinand IT. (1619-37) was dominated by a fixed resolve to secure the triumph of his church throughout the oe resolve which cost Germany the Thirty Years’

ar.

He began with Bohemia. Although supported by Spain, he could not obtain from her sufficient troops for his purpose ; aud as he was for some time nearly powerless in Vienna he was obliged to come to terms with Duke Maximilian, who, after securing his own interests, put the army of the League commanded by Tilly at his disposal. The Union helped Frederick V.; but being a man of feeble character he wasted precious months, needlessly irritated his subjects, and vaguely hoped that his wife’s father would see him out of hisembarrassments. In 1620 his army was utterly

routed at the battle of Weissenburg ; and he and his family had just time to escape from the kingdom he had rashly undertaken to govern. Ferdinand drove to the

uttermost the advantages of his victory. The Union was broken up; and Bohemia was placed under such a system of government that in becoming Catholic it lost more than two-thirds of its population, sank from high prosperity to a state of indigence, and ceased to be a seat of art and learn- ing. TheSpanish troops and the army of the League next invaded the palatinate, which after severe struggles, was Palati- finally subdued ; and there also the process of conversion nate. was carried on with a thoroughness which ended in the death or exile of multitudes of the inhabitants. Frederick

was banished from his inheritance; and the electorate he was declared to have forfeited was conferred on Duke Maximilian.

Thus ended the first stage of the Thirty Years' War. The Danish second began (1625) by the formation, after much fruitless war. negotiation, of the Protestant League, which comprised Eng- land, Holland, and Denmark. The burden of the struggle fell on the last-named power, whose king, Christian IV., was also duke of Holstein, and therefore a prince of the empire.

It was in the war with him that Europe first became familiar with the great name of Wallenstein, a Bohemian noble who, Wallen. by marriage and by loyal service to the emperor, had risen stein. to immense wealth and power. Ferdinand became restive

at his dependence on the League, and gladly accepted Wallenstein's offer to raise an army over which it should have no control. This scheming, mysterious general, co- operating with Tilly and soon casting him into the shade, chased Christian, after the battle of Lutter, into Denmark,

and overran Mecklenburg, of which he was created duke.

He apparently intended to make himself master of the Hanse towns with the view of securing predominance at sea

as well as on land; but this purpose was thwarted by the bravery of the city of Stralsund, which he in vain tried to conquer. Denmark, however, was compelled to conclude peace in 1629.

Intoxicated by success, Ferdinand now issued the edict Edict of of restitution, demanding the restoration of all ecclesiastical testitu- lands of which the Protestants had become possessed since ““°™ the treaty of Passau. As two archbishoprics and twelve bishoprics had become Protestant, this was to strike a tremendous blow at his enemies; and it stirred among them intense and universal opposition. At the same time, yielding to Duke Maximilian and other members of the League, he recalled Wallenstein, whose movements had given rise to suspicion. A more inauspicious moment could not have been chosen for these two important steps, for in 1630 Gustavus Adolphus left Sweden at the head of a well- Gustavus disciplined army for the purpose of raising up the Protestant Adolphus. | cause which had fallen so low. At first this great king was received coldly, even by his co-religionists. They were ignorant of his designs, and did not want a stranger to profit by the internal disputes of their country. A mistake at the outset would probably have proved fatal to him; but he saw the dangers of his position, and moved so warily that in less than a year he had obtained, partly by intimida- tion, partly by argument, the alliance of the duke of Pomerania and the elector of Saxcny. Tilly, at the head of nearly the whole force of the League, met him at Breitenfeld, and was completely defeated. This victory put Germany at his feet; and had he realized how utterly he had broken the imperial strength, he might have advanced on Vieuna itself. He preferred, however, to make the country around and behind him absolutely secure; and everywhere the cities opened their gates to him as the deliverer of the Protestants. After again defeating Tilly, who was wounded and died, he took possession of the palace at Munich, while Duke Maximilian fled. Whatever may have been the motives of Gustavus in undertaking this memorable expedition,—-and they were probably not altogether unselfish,—he had the power of

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kindling confidence and enthusiasm among those who depended upon him; and the result of his presence in South Germany was that the faith of the

Protestants in | their cause and in themselves revived, and that they no longer doubted of ultimate victory. The emperor felt how great had been his mistake in dismissing Wallenstein, and

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already effected. The whole tendency of the Reformation 1632-48, had been to relax the bonds which united the various The Refor- elements of the state to each other and to their head. It mation divided the nation into two bitterly hostile parties, and the pas emperor was not able to assume towards them a perfectly ?° mie

: : Bi 8 : : constitu- impartial position. His imperial crown imposed upon him tion.

THIRTY YEARS' WAR. |

Richelieu.

after many fruitless entreaties, at last persuaded him to come forth from his retirement and form a second army. He did so on condition that he should have absolute command ; and so urgent was the need of his services that Ferdinand allowed him to make himself in this way a great and dangerous power within the state. In 1632 he was defeated at the battle of Liitzen ; but the defeat was better than an ordinary victory, for the Swedish hero was among the slain. Wallenstein now aimed at becoming a great sovereign ; perhaps he even aspired to the imperial crown itself. In any case his dilatory movements, his endless intrigues, and his haughty tone caused such profound uneasiness at Vienna that in 1634 he was got rid of by murder.

For fourteen years longer, although the original objects of the war were almost forgotten, the tempest continued tosweep over Germany. It received a fresh impetus from the inter- vention of Cardinal Richelieu, who, although the enemy of Protestants in France, thought fit to weaken Austria by aiding them inGermany. While Gustavus Adolphus lived, Richelieu was kept comparatively in the background ; after the king's death he was one of the mainsprings of the war. At last, in 1648, after five years of negotiation at Osuabriick and Miinster, the peace of Westphalia was concluded.

the necessity of associating himself with the Catholics ; so that the Protestants had a new and powerful reason for looking upon him with jealousy, and trying to diminish his authority. The Catholics, while maintaining their religion, were willing enough to co-operate with them for this object; and Germany often saw the strange spectacle of princes rallying round the emperor for the defence of the church, and at the same time striking deadly blows at his political influence. The diet was a scene of perpetual quarrelling between the two factions, and their differences made it impossible for the imperial chamber to move beyond the region of official routine. Thus before the Thirty Years' War the empire had virtually ceased to exist, Germany having become a loose confederation of principalities and free cities. Fora moment the emperor Ferdinand appeared to have touched the ideal of Charles V., in so far, at least, as it related to Germany, but only for a moment. The stars in their courses fought against him, and at the time of his death he saw how far beyond his power were the . forces with which even Charles had been unable to contend. The state of things which actually existed the peace of Westphalia made legal. So nearly complete was the independence of the states that each received the right to

Effects The Thirty Years' War settled once for all the principle | form alliances with any of the others or with foreign powers, ofthe that men should not be persecuted for their religious faith. | nominally on condition that their alliances should not be ry It is true that the peace of Westphalia formally recognized | injurious to the emperor or to the empire. Any authority War, only the three creeds, Catholicism, Lutheranism, and | which still lawfully belonged to the emperor was transferred Religious Calvinism, but so much suffering had been caused by the | to the diet. It alone had now the power of making laws, freedom. interference of the state with individual conviction, that | of concluding treaties in the name of Germany, and of toleration in the largest sense, so far as law was concerned, | declaring war and re-establishing peace. No one, however, was virtually conceded. This was the sole advantage gained | expected that it would be of any real service. After 1654 from the war by the Protestants. The Catholics insisted | it became a permament body, and was attended only by the at first on keeping all the ecclesiastical lands which had | representatives of the princes and the cities ; and from that been taken from them before the edict of restitution in 1630. | time it occupied itself mainly with trifles, leaving

the affairs The Protestants responded by demanding that they should | of each state to be looked after by its own authorities, and. lose nothing which they had held before 1618, when the | those of the country generally to such fortunes as chance war began. A compromise was at last effected by bcth | should determine. parties agreeing to the date 1624,—an arrangement which It would not have been strange if so shadowy an empire Continu- secured to the Catholics their immense gains in Bohemia | had been brought altogether to an end. Some slight bond ance of and the other territories of the house of Hapsburg. The | of connexion was, however, necessary for defence against the em- restoration of the elector palatine to part of his lands, and | common dangers; and the empire had existed so long, and his reinstatement in the electoral office, were important | so many great associations were connected with it, that it concessions ; but on the other hand, the duke of Bavaria | seemed to all parties preferable to any other form of union. kept the Rhenish palatinate, and, as he remained an elector, | Moreover, Sweden, and other states which were now the votes of the Protestants in the electoral college were | members of the empire, warmly supported it; and the fewer by one than they had been in 1618. house of Hapsburg, on which it reflected a certain splendour, Loss of The country suffered enormous territorial losses by the | would not willingly have let it die. An Austrian ruler, territory. war. Up to this time the possession of Metz, Toul, and | even when he spoke only in the name of Austria, derived

Verdun by France had never been officially recognized; now these bishoprics were formally conceded to her. She also received as much of Alsace as belonged to Austria. To the Swedes were granted Western Pomerania, with Stettin, and the bishoprics of Bremen and Verden. ‘These acquisitions, which surpassed the advantages Gustavus Adolphus had hoped to win, gave Sweden the command both of the Baltic and of the North Sea. In virtue of her German possessions Sweden became a member of the empire; but France obtained absolute control of her new territories. There was a further diminution of Germany by the recognition of the independence of Switzerland and the United Provinces. 30th had long been virtually free; they now for the first time took the position of distinct nations.

In the political constitution of Germany the peace of Westphalia did not so much make changes as sanction those

authority from the fact that as emperor he represented many of the greatest memories of European history.

The effect of the Thirty Years' War on the national life National It had not been carried on by disciplined life.

was disastrous. armies, but by hordes of adventurers whose sole object was plunder. The cruelties they inflicted on their victims are almost beyond conception. Before the war the population was about twenty millions; after it the number was pro- bably five or seven millions, and cannot have been more than ten. Whole towns and villages were laid in ashes, and vast districts turned into deserts. Churches and schools were closed by hundreds, and to such straits were the people often reduced that cannibalism is said to have been not uncommon. Industry and trade were so completely paralysed that in 1635 the Hanseatic League was virtually broken up, because the members, once so wealthy, could

1648 not meet the expenditure it involved. The population was | should remain quiet. In his war with the United Pro- 1724. not only impoverisked and reduced in numbers but broken | vinces and Spain, begun in 1672, he was opposed by the in spirit. It lost confidence in itself, and for a time effected | emperor as ruler of Austria, and by Frederick William, in politics, literature, art, and science little that is worthy | the elector of Brandenburg ; and in 1675 the latter gained of serious study. a splendid victory at Fehrbellin over his allies, the Swedes. The The princes knew well how to profit by the national | At the end of the war, in 1678, by the peace of Nimeguen, princes. prostration. The local diets, which, as we have seen, formed | Louis took care that Frederick William was deprived of the a real check on petty tyranny, and kept up an intimate | fruits of his victory, and

Austria had to resign Freiburg in relation between the princes and their subjects, were nearly | Breisgau to the French. Under the pretence that when alldestroyed. Those which remained were injurious rather | France gained the Austrian lands in Alsace she also than beneficial, since they often gave an appearance of | acquired a right to all places that liad ever been united to lawfulness to the caprices of arbitrary sovereigns. After the | them, Louis began a series of systematic robbcries of Cer- Thirty Years' War it became fashionable for the heirs of | man towns and territories. "Chambers of Reunion" were principalities to travel, and especially to spend some time | appointed to give an appearance of legality to these pro- at the court of France. Here they readily imbibed the | ceedings, which culminated, in 1681, in the seizure of ideas of Louis XLV., and in a short time every petty court | Strasburg. Germans of all states and ranks were indignant in Germany was a feeble imitation of Versailles. Before | at so gross a humiliation, but even the loss of Strasburg the Reformation, and even for some time after it, the princes | did not suffice to move the diet. The emperor himself were thorough Germans in sympathies and habits; they | might probably have interfered, but Louis had provided now began to be separated by a wide gulf from their people. | him with ample enrployment by stirring up against him the Instead of studying the general welfare, they cruelly wrung | Hungarians and the Turks. So complete was his hold over from exhausted states the largest possible revenue to sup- | the majority of the princes that when the Turks, in 1683, port a lavish and ridiculous expenditure. The pettiest | surrounded Vienna, and appeared not unlikely to advance princeling had his army, his palaces, his multitudes of | into the heart of Germany, they looked on indifferently, and household officers; and most of them pampered every vulgar | allowed the emperor to be saved by the promptitude and appetite without respect either to morality or decency. | courage of Sobieski, king of Poland. At last, when, in Many nobles, whose lands had been wasted during the war, | 1689, on the most frivolous pretext, Louis poured into flocked to the little capitals to make their way by con- | south Germany armies which were guilty of shameful temptible court services. Beneath an outward gloss of re- | outrages, a number of princes came forward and aided the finement these nobles were, as a class, coarse and selfish, | emperor. This time France was sternly opposed by the and they made it their chief object to promote their own | league of which William ITI. of England was the moving interests by fostering absolutist

tendencies. Among the | spirit; and although at the end of the war he kept Stras- people there was no public opinion to discourage despotism; | burg, he had to give up Freiburg, Philipsburg, Breisach, the majority accepted their lot as inevitable, and tried rather | and the places he had seized because of their former con- to reproduce than to restrain tle vices of their rulers. Even | nexion with Alsace. In the war of the Spanish succession War of the churches offered little opposition to the excesses of | two powerful princes, the elector of Bavaria and the elector Spanish persons in authority, and in many instances the clergy, both | of Cologne, joined Louis; but as the states of the empire °° Protestant and Catholic, acquired an unenviable notoriety | declared war against him in 1702, the other princes, more for their readiness to overlook or condone actions which | or less loyally, supported the emperor and his allies, outraged the higher sentiments of humanity. In the | Leopold died during the progress of this war, but it was The free imperial cities there was more manliness of tone than | vigorously continued by his son Joseph I. (1705-11). cities. elsewhere, but there was little of the generous rivalry among | Charles VI. (1711-40) also went on with it ; and such were Charles the different classes which had once raised them to a high | the blows inflicted on France by the victories of Blenheim, VI. level of prosperity. Most of them resigned their liberties | Ramillies, and Malplaquet that the war was generally into the hands of oligarchies, and others allowed themselves | expected to end in her utter discomfiture. But the conclu- to be annexed by ambitious princes. sion of the treaty of Utrecht by England, in 1713, so : limited the military power of Charles VI. that he was Modern Times. obliged to resign the claims of Austria to the Spanish Ferdi- Ferdinand IIT. (1637-57) succeeded to the throne when | throne, and to content himself with the Spanish Netherlands, nand III. the fortunes of his house were at a low ebb, and he con- | Milan, Naples, and Sardinia. He cared so little for tinued the Thirty Years' War, not in the hope of re-estab- | Germany, as distinguished from Austria, that he allowed lishing the Catholic religion or of restoring the imperial | Louis to compel the diet to cede the imperial fortress of authority, but to undo as much as he could the havoc caused | Landau. At a later stage in his reign he was guilty of an by his father's recklessness. After the conclusion of peace | act of even grosser selfishness; for after the war of the nothing happened to make his reign memorable. His son, | Polish succession, in which he supported the claims of Leopold J, Leopold I. (1658-1705), was a man of narrow intellect and |

Augustus III., elector of Saxony, he yielded Lorraine to feeble will; yet Germany seldom so keenly felt the need of | Leszezynski, whose claims had been defended by France, a strong emperor, for she had during two generations to | and through whom France ultimately secured this beautiful contend with a watchful and grasping rival. For more than | German province. Having no son, Charles drew up in 1713 a century it had been the policy of France to strengthen | the pragmatic sanction, which ordained that, in the event of Pragmatic herself by fostering the internal dissensions of Germany. | an Austrian ruler being without male heirs, his hereditary sanction. Louis 'This was now easy, and Louis XIV. made unscrupulous use | lands and titles should pass to his nearest female relative. XIV. of of the advantages his predecessors had helped to gain for | The aim of his whole policy was to secure for this mea- France. him. Germany as a whole could not for a long time be | sure, which was proclaimed as a fundamental law in 1724, induced to resist him. His schemes directly threatened | the approval of Europe; and by promises and threats he the independence of the princes; but they were too | did at last obtain the guarantee of the states of the empire 7 indolent to unite against his ambition. They grudged | and the leading European powers. even the contributions necessary for the maintenance of Germany was now about to be aroused from the torpor the frontier fortresses, and many of them stooped to | into which she had been cast by the Thirty Years' War; accept the bribes he offered them on condition that they | but her awakening was due, not tothe action of the empire,

FREDERICK THE GREAT. |

which was more and more seen to be practically dead, but

to the rivalry of two great German states, Austria and

Growth of Prussia. The latter had long been laying the foundations

Prussia. of her power. Brandenburg, the centre of the Prussian

kingdom, was, as we have seen, granted in the 15th century

by the emperor Sigismund to Frederick, count of Holien-

zollern. In his hands, and in those of his prudent succes-
sors, it became one of the most flourishing of the North-
German principalities. At the time of the Reformation
Albert, a member of a subordinate branch of the house of
Hohenzollern, happened to be grand master of the Teutonic
Order, He became a Protestant, dissolved the order, and
received in fief of the king of Poland the duchy of Prussia.
In 1611 this duchy fell by inlieritance to the elector of
Brandenburg, and by the treaty of Wehlau, in 1657, in the
tine of I'rederick William, the Great Elector, it was declared
independent of Poland. By skill, foresight, and courage
Frederick William managed to add largely to his territories ;
and in an age of degenerate sovereigns he was looked upon
as an almost model ruler. His son, Frederick, aspired to
royal dignity, and in 1701, having obtained the emperor's
assent, was crowned king of Prussia. The extravagance of
Frederick drained the resources of his state, but this was
amply atoned for by the rigid economy of Frederick William
I., who not only paid off the debts accumulated by his
father, but amassed an enormous treasure. He so organized

all branches of the public service that they were brought to

a point of high efficiency, and his army was one of the

largest, best appointed, and best trained in Europe. He

died in 1740, and within six months, when Frederick II.

Maria was on the Prussian throne, Maria Theresa claimed, in

Theresa. virtue of the pragmatic sanction, the lands and hereditary titles of her father, Charles VI,

Frederick Frederick II., a young, ambitious, and energetic sovereign, He ; longed not only to add to his dominions but to play a great reat.

part in European politics, His father had guaranteed the pragmatic sanction, but as the conditions on which the guarantee had been granted had not been fulfilled by Charles VI., Frederick did not feel bound by it, and revived First Sile- some old claims of his family on certain Silesian duchies. sian war. Maria Theresa would not abate her rights, but before she could assert them Frederick had entered Silesia and made himself master of it. Meanwhile, the elector of Bavaria had come forward and disputed Maria Theresa's right to the succession, and the elector of Saxony had also put in a claim to the Austrian lands. Taking advantage of these disputes, France formed an alliance with the two electors and with the king of Prussia against Austria; and in the war which followed the allies were at first so successful that the elector of Bavaria, through the influence of France, Charles was crowned emperor as Charles VII. (1742-45), Maria VU. Theresa, a lady of a noble and undaunted spirit, appealed, 'with her infant son, afterwards Joseph II., in her arms, to the Hungarian diet, and the enthusiastic Magyars responded chivalrously to her call. To be more at freedom she concluded peace with Frederick, and ceded Silesia to him, although greatly against her will. Saxony also was pacified aud retired from the struggle. After this Maria Theresa, supported by England, made way so rapidly and so trium- phantly that Frederick became alarmed for his new posses- Second sion; and in 1742 he once more proclaimed war against her, Silesian nominally in aid of the emperor, Charles VIL. Ultimately, ws in

1748, she was able to conclude an honourable peace at Aix-la-Chapelle ; but she had been forced, as before, to rid herself of Frederick by confirming him in the sovereignty

of the territory he had seized. After the death of Charles VII., Francis, grand duke of] Tuscany, Maria Theresa's husband, was elected emperor. | Francis I. Francis I. (1745-65), an amiable nonentity, with the | instincts of a shopkeeper, made no pretence of discharging

lnportant imperial duties, and the task of ruling the here- 1740-72, | ditary possessious of the house of Hapsburg fell wholly to the empress-queen. She executed it with discretion and vigour, so that Austria in her hands was known to be one of the most formidable powers in the world. Her rival, Frederick II., was, if possible, still more active. The bitter experiences of his youth, although they had soured his temper, had uot quenched the generous aspirations which had been fed by study of the best writers of his time. It did not occur to him, any more than to the other German sovereigns of the 18th century, to associate his people with him in the government of the country; he was in every respect a thoroughly absolute sovereign, Even his ministers performed but the duties of superior clerks. But he shared the highest ideas of the age respecting the responsibilities of a king, and throughout his long reign acted in the main faithfully as "the first servant of the state." The army he always kept in readiness for war; but he also encouraged peaceful arts, and diffused throughout his kingdom so much of his own alert and aggressive spirit that the Prussians became more intelligent and more wealthy than they had ever before been. He excited the admiration of the youth of Germany, and it was soon the fashion among the petty princes to imitate his methods of government. As a rule, they succeeded only in raising far larger armies than the taxpayers could afford to maintain.

Maria Theresa never gave up the hope of winning back Prepara- Silesia, and, in order to secure this object, she laid aside tions for the jealousies of her house, and offered to conclude an ¥@ alliance with France. Frederick

had excited the envy of | surrounding sovereigns, and had embittered them against him by stinging sarcasms, Not only France, therefore, but Russia, Saxony, and ultimately Sweden, willingly came to terms witb Austria, and the aim of their union was nothing short of the partition of Prussia. Frederick, gaining know- ledge of the plot, turned to England, which had in the previous war helped Austria. At. the close of 1755 his offer of an alliance was acceded to; and in the following year, hoping by vigorously taking the initiative to prevent his enemies from united action, he invaded Saxony, and began the Seven Years' War (1756-63).

The result of this war was to confirm Prussia for ever in Results of the possession of Silesia, but it was followed by still greater the Seven indirect consequences. Prussia now took rank as one of *©8 the leading European powers, and by her rise a new ele- ment was introduced into the political life of Germany. Austria, although associated with the empire, could no longer feel sure of her predominance, and it was inevitable that the jealousies of the two states should lead to a final conflict for supremacy. Even before the Seven Years' War there were signs that the German people were tired of in- cessaut imitation of France, for in literature they welcomed the early efforts of Klopstock, Wieland, and Lessing; but the movement received a powerful impulse from the great deeds of Frederick. The nation, as a whole, was proud of his heroic courage, his splendid military qualities, and his beneficent rule, and began, for the first time since the Thirty Years' War, to feel that it might once more assume a commanding place in the world. This stir of life ulti- mately revealed itself in the outburst of philosophic and literary activity represented by the names of Kant, Goethe, and Schiller. By that time Germany had not only asserted intellectual independence, but had become thoroughly tired of the national disunion and of the petty despotisms it imposed upon them,

In 1772 the necessities of Frederick's position compelled Partition him to join Russia and Austria in the deplorable partition of Poland. of Poland, whereby he gained West Prussia, exclusive of Dantzic and Thorn, and Austria acquired West Silesia.

After this he had to watch closely the movements of the

French Revolu- tion.

emperor Joseph IT. (1765-90), who, although an ardent admirer of Frederick, was anxious to restore to Austria the greatness she had partially lost. The younger brancli of the Wittelsbach line, which had hitherto possessed Bavaria, having died out in 1777, Joseph asserted claims to part of its territory. Frederick intervened, and although no battle was fought in the nominal war which followed, the emperor was obliged to content himself with a very unimportant concession. He made a second attempt in 1785, but Frederick again came forward. This time he formed a league for the defence of the imperial constitution, and it was joined by the majority of the small states. The memory of this league was almost blotted out by the tre- mendous events which soon absorbed the attention of Germany and the world, but it truly indicated the direction of the political forees which were then at work beneath the surface, and which long afterwards triumphed. The forma- tion of the league was a distinct attempt on the part of Prussia to make herself the centre for the national aspira- tions both of northern and of southern Germany.

The French Revolution was hailed by many of the best minds of Germany as the opening of a new era. Among the princes it excited horror and alarm, and in 1792 the emperor Leopold II. (1790-92), and Frederick William II., the unworthy successor of Frederick the Great, met at Pill- nitz, and agreed to support by arms the cause of the French king. A more important resolution was never taken. It plunged Europe into a conflict which cost millions of lives, and which overthrew the entire state system of the Con- tinent. Germany herself was the principal sufferer. The structure which the princes had so laboriously built up crumbled into ruins, and the mistakes of centuries were expiated in an agony of disaster and humiliation.

The states of the empire joined Austria and Prussia, and, had there been hearty co-operation between the allies, they could scarcely bave failed of success. While the war was in progress, in 1793, Prussia joined Russia in the second partition of Poland. Austria considered herself overreached, and began negotiations with Russia for the-third and final partition, which was effected by the three powers in 1795. Prussia, irritated by the proceedings of her rival, did as little as possible in the war with France; and in 1795 she

retired from the struggle, ceding to France her possessions on the left bank of the Rhine. The war was continued by Austria, but her power was so effectually shattered by blow after blow that in 1797 she was forced to conclude the peace of Campo Formio. Napoleon Bonaparte, to whose genius the triumph of France was mainly due, began separate negotiations with the states of the empire at Rastadt; but, before terms could be agreed upon, war again began in 1799, Austria acting on this occasion as the ally of England and Russia. She was beaten, and the peace of Luuéville added fresh humiliations to those imposed upon her by the previous war. France now obtained the whole of the left bank of the Rhine, the dispossessed princes being compensated by grants of secularized church lands and of mediatized imperial cities, The contempt of Napoleon for the empire was illustrated by his occupation of Hanover in 1803, and by his seizure of the duke of Enghien on imperial territory in 1804. In 1805 Austria once more appealed to arms in association with her former allies, but in vain. By the peace of Presburg she accepted more disastrous terms than ever, and for the moment it seemed as if she could not again hope to rise to her former splendour. In

this war she was opposed not only by France, -but by.

Bavaria, Wiirtemberg, and Baden, all of which were liberally rewarded for their services, the rulers of the two former countries being proclaimed kings. The degradation of Germany was completed by the formation, in 1806, of the Confederation of the Rhine, which was composed of the

chief central and southern states. The welfare of the Rhenish empire was asserted to be its object, but a body of which conlede- Napoleon was the protector existed, of course, for no rately other purpose than to be a menace to Austria and Prussia. Francis II., who had succeeded Leopold II. in 1792, now resigned the imperial crown, and thus the empire and the German kingdom came to an end. The various states, which End of . had for centuries been virtually independent, were during the Holy — the next few years not connected even by a nominal bond. a

Frederick William III. (1797-1840) of Prussia, the — successor of Frederick William II., had held selfishly aloof from the struggle of Austria with France. Alarmed by the Confederation of the Rhine, he suddenly resolved on war. Napoleon gladly accepted the challenge, and Prussia was 60 ill-prepared for the contest she had invited that the first serious battle—the battle of Jena—prostrated her at his feet. Aided by Russia, the king held out some time longer ; but when, after the battle of Friedland, in 1807, the czar was detached from the alliance, Frederick William had to sign the treaty of Tilsit, by which he was deprived of the best part of his kingdom and of more than half his subjects.

In 1809 Austria made one more attempt to retrieve her fortunes, and at first not without success. After the battle of Wagram, however, Napoleon dictated peace from Vienna.

Germany was now thoroughly in the grip of France, and Revival the French emperor proved how absolute was his power by °f annexing, in 1810, the whole northern coast as far as the Cone Elbe. The completeness of the humiliation of Germany was the means of her deliverance. She had been taught self-respect by Frederick II., and by her great writers in literature and philosophy; it was felt to be intolerable that in politics she should do the bidding of a foreign master. Amonga large section of the community patriotism became for the first time a consuming passion, and it was stimulated by the counsels of several manly teachers, among whom the first place belongs to Fichte. The Governments responded prudently to the national movement. Even in Austria timely concessions were made to her various popula- tions. Prussia, under the guidance of her great minister Stein, reorganized her entire administration. She abolished serfdom, granted municipal rights to the cities, established an admirable system of elementary and secondary education, and invited all classes to compete for civil offices; and ample means were provided for the approaching struggle by drastic military reform. Napoleon had exacted an engage- ment that the Prussian army should be limited to 42,000 men. ‘This was fulfilled in the letter, but in spirit set aside, for one body of men was trained after another until the larger part of the male population were ina position, when a fitting opportunity should occur, to take up arms for their country.

The disastrous retreat of the French from Moscow in 1812 Delivers gave Germany the occasion she desired. In 1813 Prussia (0° of formed an alliance with Russia, which was ultimately joined — by Austria, and in the great battle of Leipsic the issue was virtually settled. The first peace of Paris was soon followed by the eseape of Napoleon from Elba ; but in the battle of Waterloo he was decisively overcome, and Europe had no more to fear from his ambition. The Germans believed that by the second peace of Paris they ought to have received back all the lands which had ever been taken from them by France, but they had to content themselves with the recovery of their boundary as it had existed in

1792.

Between the conclusion of the first and the second peace Congress of Paris the congress of Vienna had met and finished its of Vienm™ labours, It was hard to reconcile the conflicting claims of so many states, and no party was fully satisfied with the compromise arrived at. The kingdom of Westphalia, and several other states set up by Napoleon, were brought to an

end. Prussia was compeusated for her losses by receiving a part of Saxony, the Rhineland, and Swedish Pomerania ; and to Austria were restored Salzburg, Vorarlberg, and

in 1819 a conference of ministers at Carlsbad issued 1815-40. what were called the Curlsbad decrees, placing the univer- Carlsbad sities under police supervision, reviving a rigid censorship, decrees.

Tyrol. Most of the members of the Rhenish Confederation were either left alone or deprived of small portions of ter- ritory; Hanover was made a kingdom; Weimar, Meck- Icnburg, and Oldenburg became grand duchies; and Liibeck, Bremen, Hamburg, and Frankfort were declared free cities,

In regard to the political constitution of Germany, the – people were prepared for great and far-reaching changes. The need of union had been

impressed upon them by the bitter experiences of nearly a generation, and they would have welcomed the establishment of a vigorous empire. But the jealousies of Austria and Prussia, and the hostility of the petty princes, prevented the popular policy from being adopted. Instead of an empire the congress formed the German bund or confederation. It was composed of 39 states, each of which was to be indcpendent in regard to its internal affairs, the confederation taking cognizance only of matters of common interest. A permanent diet, in which each state should have its representative, was formed; it was to sit in Frankfort, aud to be presided over by the Austrian plenipotentiary. This body was to settle all dis- puted questions between the various states, each of which engaged uever to make war on any of the others, nor to —. alliances which should be injurious to a member of the

und.

The events which arose from the French Revolution had

awakened in the German mind not only a passionate desire ~ for unity but an equally intense wish for freedom. Grow- ing intelligence had revealed to the people that personal rule is ill-adapted to the wants of a civilized community, especially the personal rule of such men as the majority of their princes, who clung obstinately to every kind of abuse, and regarded their functions as a means rather of glorifying themsclves than of promoting the general welfare. Humi- liating as had been their submission to France, it had done something to deepen this conviction, for in the districts ruled by French officials a higher idea of human rights was introduced than had before prevailed, and what was great and attractive in the principles of the Revolution stirred general sympathy. So urgent were the demands for free government that, while the struggle with Napoleon remained undecided, the princes made lavish promises of concession after peace should be restored. The act of confederation contained a positive decree that in each state should be established a constitutional system.

The history of the next period is little more than a history of the elaborate and pitiful devices by which the German sovereigns evaded their engagements. Within a few years, indeed, the rulers of Nassau, Weimar, Bavaria, Baden, and Wiirtemberg granted constitutions, but even in these countries absolutism was only in a slight degree modified. In Austria, where

Prince Metternich was the controlling spirit, the most diverse nationalities were governed as if they had been a single people, and the methods of rule were as despotic and harsh as could be tolerated in a modern community. Although Frederick William IIT. of Prussia could not act upon quite so anti- quated a system as Francis I.,he resisted popular aspira- tions. The utmost concession he made was to appoint a number of provincial diets, which tended rather to foster than to allay the general discontent. Every opportunity was seized by the various Governments to repress the free movement of ideas. A number of students were guilty of some follies at a festival in the Wartburg, and some time aftcrwards a fanatical youth stabbed Kotzebue, the play- wright, who had sided with the reactionary party. These Incidents were held to be symptoms of a grave peril; and

and opposing the cession of state constitutions. A central commission of inquiry was also appointed for the purpose of hunting out secret societies, the very existence of which was merely subject of conjecture. In the diet, whose authority was slighted by these decrees, there were seve- ral members favourable to a conciliatory policy; and in the small states liberal politicians continued to demand parliamentary representation. The reactionists, however, were united and determined, and sncceeded in thwarting

political progress until 1830. Even in that year the Revolu- Prussian and Austrian Governments were able to hold on tion of

in their old path, but the French Revolution caused so loud an outcry in countries in which the police were less powerful, that Hanover, Brunswick, Saxony, and Hesse- Cassel received constitutions, and in the lands where parlia- ments already existed the Governments granted freedoin of the press, and promised more liberal legislation for the future. The two leadiug powers looked upon these changes with extreme disapproval, and they soon made use of the diet as a means of virtually annulling every measure that conflicted with their own aims. When the diet was insti- tuted, it had been hoped that it would ultimately lead to closer national unity, and to the establishment of modern political institutions. It was now seen to be a mere instrument in the hands of the enemics both of unity and of liberty. So soon did the princes pluck up courage that in -1837 Ernest Augustus, who

succeeded William IV. of England as king of Hanover, abolished the constitution which his predecessor had sanctioned, and set up another of an earlier period and of a far less liberal character. This unlawful act met with resistance which had to be put down by force. An appeal on behalf of the constitution was made to the diet, but with the result that was to be expected from its previous action ; it declined to consider the question.

During this dismal pcriod almost tke sole political event Zoll-

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on which Germans can look back with pleasure is the forma- Verein.

tion of the Zo}lverein or customs union. As in all other re- spects, the bund had failed to realize the expectations it had excited respecting the abolition of injurious restrictions oncommercc. Several attempts had been made by groups of states to regulate their customs, but none of them had been attended with much success. At last Prussia arrived at an understanding with Bavaria, Wiirtemberg, and several other states, and between 1833 and 1835 the union thus formed was joined by all German countries with the excep- tion of Austria. It happened that about this time railways began to be introduced. The customs union enabled the nation to derive from them the utmost possible benefit, so that the prevalent political confusion did not hinder the population from attaining to considerable material pros- perity. The obvious advantages of commercial union deepened the desire for unity in every great department of the national life, and at the same time raised the position of Prussia, which had been wise enough to associate itself with a most important movement.

It was not only by its relation to the customs union that Prussia attracted the attention and awakened the hopes of

German liberals. In 1840 Frederick William IV. (1840-61) Frederick

succeeded his father, and, as he was known to be a thoughtful arm

and cultivated prince, there was a general expectation that he would abandon the arbitrary ideas of Frederick William Ill. He began his reign

well. For some years the Govern-

ment had been in conflict with the Catholic Church; the

struggle was at once ended by graceful concessions. The

king pardoned political prisoners, restored to their offices

certain professors who had been degraded during the pre- X. — 64

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vious reign for supposed revolutionary tendencies, and wel- comed to the Berlin University the brothers Grimm, who, with five other professors, had been driven from Gottingen for protesting against the violence of Ernest Augustus. But it soon became manifest that Frederick Wilham's favourite conception of "the Christian state" did not in- clude any genuine exercise of political power by the nation ; he wished to rule in a more enlightened spirit than his father, but not less absolutely. It was arranged that the provincial diets established by Frederick William III. shonld meet periodically, but this was a poor substitute for the great positive measures which had been anticipated. And within a very few years "the Christian state" was found to be compatible with a strict censorship, with the arbitrary punishment of schoolmasters, clergymen, and judges who did not meet the approval of the Government, and generally with inccssant and irritating interference with the private life of the individual. The king lost all the popularity he had acquired in the early days of his reign by vaguely enthusiastic promises, and impartial observers

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self at the head of the national movement. By these means a more pacific temper was restored, and, after the united diet had passed an electoral law,

the country was called upon to choose a national assembly.

It was not only reform in the individual states that was National demanded in 1848; the majority of the people felt that the union.

time had come for sweeping away the effete bund which had done service only to the enemies of freedom, and for replacing it by a system of national representation which should maintain the dignity of Germany abroad and foster enlightened institutions at home. There was, indeed, a general conviction that only by means of a great central movement could the special agitations lead to enduring results. A number of deputies, belonging to different legis. lative assemblies, taking it upon themselves to give voice to the national demands, met at Heidelberg, and a committee appointed by them invited all Germans who then were, or who had formerly been, members of diets, as well as some other public men, to meet at Frankfort for the purpose of considering the question of national reform.

saw that he and his people must sooner or later enter upon a serious struggle. A like state of things existed all over Germany. The German, Hungarian, Slavonic, and Italian subjects of the emperor Ferdinand (1835-48), who suc-

About 500 representatives accepted the invitation. They Prelimi- constituted themselves a preliminary parliament, and at Dry par — once began to provide for the election of a national assembly. lame

It was decided that there should be a representative for ere

ceeded Francis I., were all agitating for reform; and in Bavaria, Hesse-Cassel, and Baden reactionary ministers were confronted by opponents who daily acquired increased influence among the masses of the population.

every group of 50,000 inhabitants, and that the election should be by universal suffrage. A considerable party wished that the preliminary parliament should continue to act until the assembly should be formed, but this was

Prussian In so many threatening forms did the rising spirit of the | overruled, the majority contenting themselves with the

united Prussian people reveal itself that in 1847 the king sum- | appointment of a committee of 50, whose duty it should be

diet. moned to Berlin a united diet composed of the representa- | in the interval to guard the national interests. Some of tives of the provincial diets. This assembly truly expressed | those who were discontented with this decision retired from the popular feeling, but with so much moderation, and | the preliminary parliament, and a few of them, of repub- accompanying its demands by so many sincere assurances | lican sympathies, called the population of Upper Baden of loyalty, that it could not alarm the most timid. | to arms. The rising was put down by the troops of Frederick William, however, was offended by its tone, and | Baden, but it did considerable injury by awakening the haughtily proclaimed that he would never abate the rights | fears of the more moderate portion of the community. which, as a lawful prince, he held bya higher than human | Great hindrances were put in the way of the elections, authority. but, as the Prussian and Austrian Governments were

Revolu. Such was the condition of Germany at the breaking | too much occupied with ‘their immediate difficulties to

tion of out of the French revolution of 1848. Its effect upon the | resist to the uttermost, the assembly was at last chosen, and

1848. public mind was immediate and profound. It had been | met at Frankfort onthe 18th May. The old diet broke up, Frank- made clear that no dependence was to be placed upon the | and the national representatives had before them a clear fort as

engagements of the sovereigns, and that if anything was to be done it must be done by the people themselves. At a convention in Mannheim four demands were formulated— freedom of the press, trial by jury, national armies, and national representation. These demands were universally adopted as the liberal programme; and within a few days there was a liberal ministry in every one of the small states. In Bavaria, King Louis, whose

well-meant efforts to make Munich a centre of art had not induced the nation to forget its political rights, resigned the crown to his son Maximilian. The popular excitement in Austria became so intense that Prince Metternich was dismissed, constitutional government was promised, and the Hungarians received a new cabinet. Still more vehement was the revolutionary movement in Prussia. Seccnes of great violence occurred in the streets of Berlin, and on the 18th of March the king, who had previously tried to allay the storm by announcing that the united diet should meet periodically,—a concession he had refused to make at the proper moment, —declared that the national desire for a constitution should be satisfied. There was, however, a general feeling of distrust, and a conflict, which continued till the following morning, broke out between the troops and the population. Frederick William, who, althongh an ardent upholder of the divine right of kings, was too kind-hearted a man and too timid to approve of a struggle of this kind, laid aside his high pretensions, changed his ministers, and asserted that he would place him-

field. There is no reason to doubt that if they had acted sembly.

with promptitude and discretion they would have succeeded in the task they had undertaken. Neither Austria nor Prussia was for some time in a position to thwart them, and the sovereigns of the smaller states were too much afraid of the revolutionary elements manifested on all sides to give way to reactionary impulses. But the Germans had had no experience of free political life. Nearly every deputy had his own theory of the course which ought to be pursued, and felt sure that the country would go to ruin if it were not adopted. Learned professors and talkative journalists insisted on delivering interminable speeches, and on examining in the light of ultimate philosophical principles every proposal laid before the assembly. Thus precious time was lost, violent antagonisms were called forth, the patience of the nation was exhausted, and the reactionary forces were able to gather strength for once more asserting themselves. The very first important question brought out the weaknesses of the deputies. This related to the nature of the central provisional executive. A committee appointed to discuss the matter suggested that there should be a directory of three members, appointed by the German Governments, subject to the approval of the assembly, and ruling by means of ministers responsible to the latter

bedy. This elaborate scheme found favour with a large number of members, but others insisted that there should be a presi- dent or a central committee, appointed by the assembly,

while another party pleaded that the assembly itself should exercise executive as well as legislative functions. At last, after a vast amount of tedious and useless discussion, it was agreed that the assembly should appoint an imperial vicar who should carry on the government by means of a ministry selected by himself; and, by the decision of a large majority, the archduke John of Austria was chosen for tle office. With as little delay as possible he formed an imperial cabinet, and there were hopes that, as his appointment was generally approved both by the sovereigns and tle people, more rapid progress would be made with the great and complicated work in land. Unfortunately, however, it was necessary to enter upon the discussion of the fundamental laws, a subject presenting many opportunities for the display of rhetoric and intellectual subtlety. It was soon obvious that beneath all varieties of individual opinion there were two bitterly hostile tendencies—those of the republicans, and tliose of the constitutionalists. These two parties attacked each other with constantly growing animosity, and in a few weeks sensible men outside the assembly gave up all hope of their dealing satisfactorily with the problem they had been appointed to solve.

In the midst of these disputes the attention of the nation was occupied by a question which had arisen before the outbreak of the revolutionary movements,—the so-called “Schleswig-Holstein question.” In 1846 Christian VITI. of Denmark had officially proclaimed that Schleswig and the greater part of Holstein were indissolubly connected with the Danish monarchy. This excited vehement opposi- tion among the Germans, on the ground that Holstein, although subject to the king of Denmark, was a member of the German confederation, and that in virtue of ancient treaties it could not be severed from Schleswig. In 1848 the German party in the duchies, headed by Prince Frederick of Augustenburg, rose against the Danish Government. Frederick VIL, who had just succeeded Christian VILL, put down the rebellion, but Prussia, acting in the name of the

confederation, despatched an army against the Danes, and drove them from Schleswig. The Danes, who were supported by Russia, responded by blockading the Baltic ports, which Germany, having no navy, was unable effectually to defend. By the mediation

ence. the hands of the revolutionary party, and it was retaken only after desperate fighting. A reactionary ministry, headed by Prince Schwarzenberg, was then raised to power, and in order that a strong policy miglit be the more vigorously pushed forward, the emperor Ferdinand resigned, and was succeeded by his nephew, Francis Joseph.

The prospects of reform were not much more favourable Reform in pier : The assembly summoned amid the revolution- Prussia.

in Prussia. ary excitement of March met on the 22d May. Demands for a constitutional system were urged with great force, and they would probably have been granted but for the opposi- tion due to the violence of politicians out of doors. The aristocratic class saw ruin before it if the smallest conces- sion were made to popular wishes, and it soon recovered from the terror into which it had been plunged at the out- break of the revolution. Extreme antagonism was excited by such proposals as that the king should no longer be said to wear his crown “by grace of God;” and the animosity between the liberal and the conservative sections was driven to the highest pitch when, in the midst of tle struggle between the populace and the Government in Vienna, it was proposed that Prussia should support the cause of freedom. The motion, although at first rejected, was passed in a modified form. Before this, ministry after ministry had been appointed, but none had been so decidedly reactionary as to preclude tlie lope of a settlement. Now the king resolved to break finally with the liberals, and, notwithstanding a solemn warning addressed to him by a deputation from the assembly, he called to office a cabinet about whose intentions there could be no misunderstanding, On the pretext that fair deliberation was impossible in the capital, the assembly was ordered to meet in Brandenburg, troops were concentrated near Berlin, and a state of siege was proclaimed. In vain the

assembly protested and con- tinued its sittings, going even so far as to forbid the pay- ment of taxes while it was subjected to illegal treatment. It was forced in the end to submit, but the discussions in Brandenburg were no more successful than those in Berlin. At last, on the 5th December, the king dissolved the assembly, granted a constitution about which it had not been consnited, and gave orders for the election of a repre- sentative chamber.

Towards the end of 1848 Vienna was completely in 1848.

of England an armistice was concluded, and the Prussian troops evacuated the northern districts of Schleswig. As the Danes soon afterwards took possession of Schleswig again, the Prussians once more drove them back, but on the 26th of August an arniistice of seven months was agreed upon at Malmoe.

The new Frankfort Government disapproved the con- ditions of this armistice ; but, as it had empowered Prussia to act for it, it was obliged to accept what had been done, The majority of the assembly, furious at an arrangement

which was denounced as a national humiliation, decided

About the time that the Prussian parliament was thus Frank- created, and that the emperor Ferdinand resigned, the fort as- Frankfort assembly succeeded in formulating the funda- rae mental laws, which were duly proclaimed to be the funda- ow con- mental laws of Germany as it was now to be constituted. stitution. The principal clauses of the constitution then began to be discussed. By far the most difficult question was the rela- tion in which Austria should stand to the Germany of the future. There was a universal wish that the Austrian Germany Germans should be included in the German state; on the and other hand, it was felt that if all the various nationalities of Austria.

that the armistice should not be sanctioned. The ministry resigned ; but, a new combination being impossible, it was replaced, and the assembly unwillingly agreed to accept the armistice, on the understanding that the Government should lose no time in negotiating for peace on fair terms. A large minority, however, was intensely dissatisfied. It was composed of the

republicans and other radical sections ; and when defeated, they appealed from the assembly to the people. The Government kept its place, but was unable to prevent a rising which led to the murder of two unpopular representatives. There were also temporary republican agitations in Baden and Wiirtemberg.

While these events were in progress, it seemed not im- possible that the Austrian empire would fall to pieces. Bohemia and the Italian states were in revolt, and the Hungarians strove with passionate earnestness for independ-

Austria formed a united monarchy, and if this monarchy as a whole were included in the contederation, it would necessarily overshadow Germany, and expose her to un- necessary external dangers. It was therefore resolved that, although a German country miglit be under the same ruler as non-German lands, it could not be so joined to them as to form with them a single nation. Had the assembly adopted this resolution at once, instead of exhausting itself by pedantic disquisitions on the abstract principles of juris-prudence, it might have hoped to triumph; but Austria was not likely to submit to so severe a blow at the very time when she was strong enough to appoint a reactionary Government, and had nearly re-established her authority, not only in Vienna, but in Bohemia and in Italy. Prince Schwarzenberg took the earliest opportunity to declare that the empire could not assent to any weakening of its influ-

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Bitter strife now broke out in the assembly. Two of the ministers resigned, and one of those who took their place, Herr von Gagern, proposed that, since Austria was to be a united state,.she should not enter the confederation, but that her relations to Germany sliould be regulated by a special act of union. This of course meant that Prussia

should be at the head of Germany, and recommended itself

to the majority of the constitutional party. It was resisted by the Austrian members, who were supported by the ultramontanes and the democrats, both of whom disliked Prussia, the former because of her Protestantism, the latter because of her bureaucratic system. Herr von Gagern's proposal was, however, adopted. Immediately afterwards the question as to the character of the executive was raised. Some voted that a directory of princes should be appointed, others that there should be a president, eligible from the whole German nation; but the final decision was that the headship of the state should be offered by the assembly to

title of emperor of the Germans.

The whole subject was as eagerly discussed throughout the country as in Frankfort. Austria firmly opposed the idea of a united German state, insisting that the Austrian emperor could not cousent to be subordinate to any other prince. She was supported by Bavaria, but on the other side were Prussia, Brunswick, Baden, Nassau, Mecklenberg, and various other countries, besides the Hanseatic towns. For some time Austria offered no counter scheme, but she ultimately proposed that there should bea directory of seven

GERMANY 'afforded by the difficulties of Austria.

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He invited the states to send representatives to Berlin to discuss the condition of Germany; and he concluded a treaty with the kings of Saxony and Hanover. Two days afterwards the three allies agreed upon a constitution which was in many respects identical with that drawn up by the Frankfort assembly. The functions of the executive were, however, extended, the electoral law was made less democratic, and it was decided that, instead of an emperor, there should be merely a supreme chief aided bya college of princes. This constitution was accepted by a number of states, which assumed the name of the "The Union," and on the 20th March 1850 a parliament consisting of two houses met in Erfurt. Both houses accepted the

constitution ; and, im- mediately after they broke up, the members of the Union

‘assembled in Berlin, and a provisional college of princes

‘tion of Germany had changed. some particular German prince, and that he should bear the |

was elected. By that time, however, the whole situa- In the autumn of 1849 Austria had succeeded, by the help of Russia, in quelling the Hungarian insurrection, and she was then in no mood to let herself be thrust aside by Prussia. Encouraged by her, Hanover and Saxony had severed themselves from the Union, and Saxony, Wiirtemberg, and Bavaria arrived at an understanding as to a wholly new constitution. After- wards all four states, with several others, accepted the in- vitation of Austria to consider the propriety of re-establish- ing the Confederation. The representatives of the states favourable to this proposal came together in Frankfort on

the 4th September 1850, and acted as the restored diet.

princes, the chief place being held alternately by a Prussian and an Austrian imperial vicar. Nothing came of this | suggestion, and in due time the assembly proceeded to the second reading of the constitution. It was revised in a democratic sense, but the imperial title was maintained, and a narrow majority decided that it should be hereditary. Frederick William IV. of Prussia was then chosen emperor. Frederick All Germany awaited with anxiety the reply of Frederick William William. It was thought not improbable that he would — eee accept the honour offered him, for in the early part of his» imperial Teign he had spoken of German unity as enthusiastically as crown. Of liberty, and, besides, the opportunity was surprisingly | favourable. The larger number of the North-German states were at least not unwilling to submit to the arrange- ment; and Austria, whose opposition in ordinary circum- stances would have been fatal, was paralysed by her struggle with Hungary. Frederick William had not, however, the courage of his opinions ; the deputation which waited upon him was dismissed with the answer that he could not assume the imperial title without the full sanction of the | princes and the free cities.

Thus the issue to which the events of about a century had Austria been pointing was apparently raised ; Germany was divided pe into two hostile parties, one set of states grouping them- “’*”™ selves around Austria, another around Prussia. A difficulty Disturb. which arose in Hesse-Cassel almost compelled the powers ance in to bring their differences to the test of war. In this small ae state the liberal movement of 1848 had been followed by] reaction, and the elector ventured to replace Hassenpflug, the unpopular minister who had been driven from power. Hasseupfiug, being detested by the chamber, dissolved it in June 1850; but the new one was not less hostile, and refused to sanction the cvllection of the taxes until it had considered the budget. For this offence it also was dis- solved, and orders were issued for the raising of the taxes without its consent. Many officials refused to obey ; the judges remained Joyal to the constitution; and when attempts were made to solve the difficulty by the army, the officers instructed to act resigned in a body. Meanwhile, Hassenpflug had appealed to the representatives in Frank- fort who claimed to be the restored diet, and under the influence of Austria they resolved to support him. Prussia,

End of This auswer was in reality a deathblow to the hopes of on the other hand, announced its determination to carry out Frank- German patriots, but the assembly affected to believe that the principles of the Union, and to maintain the Hessian oes its cause was not yet lost, and appointed a committee to | constitution. Austrian and Bavarian troops having entered y see that the provisions of the constitution were carried out. | Hesse, a Prussian army immediately occupied Cassel, and A vigorous agitation began in the country for the acceptance | war appeared to be imminent. Prussia, however, shrank of the constitution by the Governments. The king of | from the conflict. Radowitz, the foreign minister, who had Wiirtemberg was forced to accede to it; and in Saxony, | so far pursued a vigorous policy, retired, and was replaced Baden, and Rhenish Bavaria armed multitudes kept the | by Manteuffel, who, although the whole Prussian army was sovereigns in terror. Prussia, which, following the example | mobilized, began by making concessions. The Union was of Austria, had recalled her representatives from Frankfort, | dissolved; and after Austria had despatched an ultimatum sent her troops to put down these risings, and on the 21st | formulating her demands, the new minister met Prince May 1849 the larger number of the deputies to the | Schwarzenberg at Olmiitz, and

virtually yielded everything Confer- assembly voluntarily resigned their seats. A few republican | he insisted upon. The difficulty in Hesse was to be left to ence at members held on by it, and transferred the sittings to | the decision of the German Governments ; and as soon as Olmlllz Stuttgart. Here they even elected an imperial Government, | possible ministerial conferences were to be held in Dresden, but they had no longer any real influence, and on the 18th | with a view to the settlement of the Gerinan constitution. June they were forcibly dispersed by the Wiirtemberg These conferences began in the last days of 1850. The Diet ministry. Austrian Government strove to secure the appointment of stored. The Although Frederick William had refused to become | a stronger executive than had hitherto existed ; but its pro- Union. emperor, he was unwilling to miss altogether the opportunity | posals met with steady opposition from Prussia. Every

Schles- wig-Hol- stein.

Austria and the customs – union.

Political | reaction.

POLITICAL REACTION. |

Prussian scheme was in like manner resisted by Austria. Thus, from the sheer inability of the assembled ministers to devise a plan on which all could agree, Prussia and tlie states that had joined lier in the Union were compelled to recognize the Frankfort diet. From the 12th June 1851 its sittings went on as if notlung had occurred since it was dispersed.

This wretched fiasco was hardly less satisfactory to the majority of Germans than the manner in which the national claims in Schleswig-Holstein were maintained. The armistice of Malmoe having expired in March 1849, the war with Denmark was resumed.

but that, in the meantime, Prussia and Austria should act |

together. By the intervention of Austrian troops peace was restored ; and when, early in 1852, the Government of

Denmark, in providing a constitution for the whole |

monarchy, promised to appoint separate ministers for

Schleswig and Holstein, and to do equal justice to the | German and the Danish populations, the two powers declared |

themselves satisfied, and the Austrian forces were with- drawn. content with this arrangement.

by Austria. union in 1851 gave her an opportunity of trying to extend

her influence; she demanded that a union should be : A |

formed of which she should be the leading member. congress of all German states, with the exception of Prussia

and one or two states which sympathized with her, was ‘ held in Vienna; and it was followed by several other ‘ Prussia, ‘ however, being here on strong ground, refused to give | way; and not only was the customs uniou restored in | accordance with her wishes, but Austria concluded with ‘ her in 1853 a treaty of commerce which embodied some © | a chamber was returned with scarcely a single liberal ele-

congresses favourable to Austrian pretensions.

important concessions.

Germany had now fairly entered a period which, although it did not last very long, was, in some respects, as humiliat- ing as any in her history. The popular movement, from which great things had been hoped, had on some occasions almost touched its goal; and, as might have been expected,

a reaction set in, which the princes knew how to turn to |

the fullest advantage. The Austrian Government, after the subjection of Hungary, withdrew every concession it liad made under pressure, and established a thorough des- potism, trampling upon the rights of the individual nation- alities, and forcing all its subjects into a common

political mould. In Prussia the parliament, summoned by the king on the 5th December 1848, met early in the following year. Although the democrats had declined to vote, it Was not conservative enough for the court, and not till the 3lst January 1850 was an understanding arrived at respecting the constitution. The system thus established was repeatedly revised, and always with the same object— to reduce to a minimum the power of the national repre- sentatives, and toexalt and extend that of the Government,

GERM AN ®

The diet also, after some delay, professed to be | While it was discussing | the subject, a conference of the Huropean powers met in | London, and settled that Frederick VII. of Denmark ‘ should be succeeded by Christian, duke of Gliicksburg, | and that the duchies should be indissolubly united to the | Danish monarchy, Austria and Prussia accepted the protocol . setting forth these results, but it was not signed by the diet. –

In all these later events the first place had been taken | The temporary dissolution of the customs |

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At the same time the ministry perseeuted the press, and 1849-55,

allowed hardly a whisper of discontent to pass unpunished. The smaller states followed with alacrity in the steps of the two leading powers. The liberal ministries of 1848 were dismissed, the constitutions were changed or abolished, and new chambers were elected under a severely restricted suffrage. Had the battle been fairly fought out between the Governments and the people, the latter would still have triumphed ; but the former had now, in the Frankfort diet, a mightier instrument than ever against freedom. What it could do was seen too clearly from the case of Hesse- Cassel. After the settlement of Olmiitz, federal troops occupied that country, and federal execution was carried out with shameful harshness. Martial law was everywliere proclaimed ; officers, and all classes of officials who had incurred the displeasure of the Government, were subjected to arbitrary penalties; and such was the misery of the people that multitudes of them were compelled to emigrate. The constitution having been destroyed by the

bund, the elector proclaimed one of his own making; but even the chamber elected under the provisions of this despotic scheme could not tolerate his hateful tyranny, and there were incessant disputes between it and the Government. The bund interfered in a like spirit in Hanover, although with less disastrous results, after the accession of George V. in 1851. For the whole of Germany this was emphati- cally the period of petty despotism; and not only from Hesse but from all parts of the country there was a vast stream of emigration, mainly to the New World.

The outbreak of the Crimean war profoundly moved the Crimean German nation. Thesympathiesof Austria were necessarily Wa".

with the Western powers, and in Prussia the majority of the peuple took the same side; but the Prussian Govern- ment, which was at this time completely under the control of Russia, gave its moral support to the czar. It did, indeed, assent to a treaty—afterwards signed on behalf of the bund—by which Prussia and Austria guaranteed eacli other, but it resolutely opposed the mobilization of the confederate army. The Prussian people were keenly irritated by the cordial relations between their court and the most despotic power in Europe. They felt that they were thus most unjustly separated from the main stream of Western progress.

During the Crimean war the political reaction continued with unabated force. In Prussia the Government appeared resolved to make up for its temporary submission to the popular will by the utmost violence on which it could ven- ture. A general election took place in the autumn of 1855, and so harshly was the expression of opinion restrained that

ment of serious importance. The feudalists called for a still further revision of the constitution, aud urged that even the reforms effected by Stein should be undone. In Bavaria a chamber elected about the same time as that of Prussia was rather less docile; but the Government shared to the full the absolutist tendencies of the day, and ener- getically combated the party which stood up for law and the constitution. The Hanoverian government, backed by the Frankfort diet, was still more successful in its warfare with the moderate reformers whom it was pleased to treat as revolutionists; and in Austria the feudalists so com- pletely gained the upper hand that on the

18th August 1855 the Government signed a concordat, by which the state virtually submitted itself to the control of the church.

The German people seemed to have lost both the power and the will to assert their rights ; but in reality they were deeply dissatisfied. And it was clear to impartial observers that, in the event of any great strain upon the power of the Governments, the absolutist system would break down. The first symptom that the reaction had attained its

 utmost development displayed itself in Prussia, whose atten- | scheme which would have effected a change without tion was for a time distracted from home politics by a | improving her position. In 1863 the emperor Francis Prussia quarrel with Switzerland. The Swiss authorities had im- | Joseph invited the German princes toa congress in Frank- aad prisoned some foolish royalists of Neuchatel, in which the | fort, for the purpose of settling the question. A settlement witzer- Pouse of Hohenzollern had never resigned its rights. War | proposed by him was unlikely to be acceptable to Prussia ; jaad. vas threatened by Prussia, but when the prisoners were | and she held aloof. When the Austrian emperor's plan sat free, the two states entered upon negotiations, and in the | was unfolded, its aim, as every one expected, was seen to summer of 1857 King Frederick William withdrew all | be the confirming of his own authority. It was, therefore, claims to the principality. Soon after this, the mental | with equal decision, rejected by the Prussian Government condition of the king made it necessary that his duties | and by the German liberals. should be undertaken by a substitute, and his brother, the Meanwhile, changes had taken place in Prussia which Prince of Prussia, took his place for three months. In | were destined to lead to a solution of the long-discussed October 1858 the prince became regent; and as he was | problem, as complete as it was unexpected. On the death unfavourable to the policy which had hitherto been pursued, | of Frederick William IV. on the 2d January 1861, the Liberal- he appointed a new ministry of a moderately liberal char- prince regent assumed the crown of Prussia as William I. William ism in acter. A general election was ordered; and, the free action | Within ten years Germany was united, and this amiable I. of | Prussia. of the constituencies being in no way interfered with, they | king was proclaimed emperor. Prussia. returned a parliament in which the

feudalists held the place This result was the issue of a vast series of historical that had belonged to the liberals in the previous chamber. | causes ; but it is indissolubly associated with the name of No more thorough proof could have been given of the | King William’s great minister, Bismarck, who was made Bismarck, liberal sentiments of the population, and the effect was | Prussian premier in 1862. No more remarkable figure soon seen in the growing hopefulness of the liberal party | has arisen in the history of Germany. Before he became in every German state. prime minister he had acted as Prussian plenipotentiary at Franco- The Italian war of 1859, in which Austria found herself the confederate diet, and as Prussian ambassador in Paris Austrian opposed by France and Sardinia, excited vehement interest | and St Petersburg; he was, therefore, familiar with the con- on in inGermany. A section of the liberal party would have been flicting political currents of the time. When raised to the “‘Y pleased had Prussia taken the occasion to reconstitute the | highest post in the state under the crown, he soon formed confederation by excluding Austria; but Prussia was so far | the fixed resolution of adding to the power of Prussia, and from attempting this that she put herself in a state of placing her at the head of united Germany. Having readiness for war with France. After the battle of Magenta | something of Cromwell’s superstition as well as Cromwell’s she mobilized part of her army, and gave her assent to the strength, he apparently regarded this as a sort of religious placing of confederate troops on the upper Rhine. These mission; and in many respects he could hardly have been measures induced the emperor Napoleon to conclude a | better adapted to the task. A rough, despotic, vehement hasty peace ; but Austria was bitterly offended because she | nature, he was undeterred by scruples which might harass had not received the open support both of the bund and | ordinary statesmen ; having set up a goal, he marched to it of Prussia. by the straightest path. The solemn traditions of diplomacy, The misfortunes of Austria in this war brought to light | to the astonishment of Europe, he laughed out of court. the instability of the absolutist system which had been | He respected treaties exactly in so far as they were capable maintained since the crushing of the revolution of 1848. | of being defended, and produced by boisterous frankness The army had fought without enthusiasm, and after the | the effects which other men achieve by mystery and restoration of peace voices were everywhere raised for | deceit. With little faith in the action of moral causes, he reform. Petty

concessions were at first attempted, but | took care to have behind him those big battalions which in December 1860 the emperor changed his ministers, | destiny is said unduly to favour. Prussia at once recognized promising that the constitutions of the various provinces that she had in him a statesman of commanding type,—a should be revised, and that a Reichsrath, with the right of | bold and resolute spirit, with narrow but intense vision, initiating legislation, should be freely elected by the pro- | and a will created to go crashing through difficulties, and vincial diets. Although this arrangement was far from | to fashion a world to its liking. pacifying the populations, it was a great advance on any When Bismarck was made premier the Government was previous proposal, and stirred the hope of still larger con- engaged in a hot dispute with the representative chamber. cessions. The latter refused to sanction a great scheme of military Revival Another result of the Italian war, of far greater import- | reform, and the ministry was compelled, in direct opposition ofna- ance for the general progress of Germany, was the revival | to the constitution, to trust to the upper honse for supplies. ae of the old desire for national unity. The Germans could | Bismarck carried on the contest with cynical audacity ; and ment, not persuade themselves that that which the Italians had he was in no way shaken when the country, over and over attained was unattainable by them ; and they believed that, | again, proved that its sympathies were with his opponents. if they acquired the same measure of unity, there would | The military reforms were executed, and the nation was soon be an end of despotism. After the war, a number of | tolerably plainly told that its approval was of secondary leading politicians, having held repeated conferences, | importance. founded what they called the National Union, an organi- An opportunity for stirring up the chaotic elements from Schles- zation intended to promote the national cause; and it had | which the Prussian premier proposed to evolve a cosmos of wig-Hol- a profound effect in maintaining and stimulating public | his own was soon afforded by the revival of that most com- oe interest in its object. The Governments, seeing the | plicated of “questions,” the question of Schleswig-Holstein. strength of the movement, sought to give it a direction Ever since the settlement of 1852 it had from time to time suitable to their own interests. Prussia and Austria entered | engaged attention. The tendency of Danish policy, accord- into negotiations, but failed to arrive at an understanding. | ing to the Germans, was to subject Holstein and Schleswig The Saxon

minister, Baron Beust, then came forward with | to wholly different treatment, and, in the application of the a proposal, whose aim was to play off the two great states | general constitution of the kingdom, to pay insufficient re- against one another, and to enable the smaller states to | spect to the rights of Holstein as a member of the German hold the balance. Austria was not unwilling to be confederation. Soon after the duke of Gliicksburg, in persuaded : but Prussia would have nothing to say to a | accordance with the London protocol, mounted the Danish

Danish war.

Dispute . between Austria and

) Prussia.

| Gastein | cohven- tion,

WAR OF AUSTRIA AND PRUSSIA. |

throne (1863), federal troops were despatched to the | duchies, nominally to secure that the new king should fulfil his predecessor's engagements. In reality, however, their presence gave rise to demonstrations among the German population in favour of Prince Frederick of August- enburg, wlio, although his father had renounced his rights, | claimed to be the true duke of Holstein. Prussia and | Austria, having signed the London protocol, professed to disapprove his pretensions, and towards the end of 1863 proposed in the diet that they should be empowered to occupy Schleswig, so that justice might be done both to the Danish king and to the duchies, The proposal was rejected, and Jiad Austria been acting alone, there is no reason to believe that she would have pushed her demands farther, if indeed she would ever have advanced so far. Bnt Prussian policy was determined by a statesman who had vast ulterior ends to serve; and by his influence

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Austria was induced to join Prussia in declaring that, since the bund would not follow their counsel, they were forced to act independently. In the war which followed the Danes distinguished themselves by their courage and

military skill; but they could not very long contend single- handed with two such enemies, and on the Ist August 1864 a treaty was signed in Vienna, by which Denmark ceded to the conquerors Schleswig, Holstein, and Lauenburg. All Europe disapproved these harsh conditions; but the Prussian minister did not trouble himself about disapproval which found utterance only in words.

Before the outbreak of war, Prussia had been engaged in a serious dispute with Austria, In 1862, in the name of the customs union, the former power had concluded with France a treaty of commerce, based mainly on the principles

of free trade. Most of the small states, strongly objecting to the treaty, refused to sign it; and they were supported by Austria, which had never given up the hope of taking precedence of Prussia in the commercial as well as the political relations of Germany. She protested against the treaty, and demanded admission into the customs union. Prussia maintained her original position, insisting that if the treaty with France were rejected she would regard the union as no longer existing. After the war Bismarck not only succeeded in obtaining the signatures of the small states, but induced Austria to conclude a commercial treaty, essentially the same as that of 1853; and about the same time treaties were signed, owing to his exertions, between the union aud England and Belgium. These triumphs unmistakably indicated the rising influence of Prussia.

It was not long before grave difficulties sprang from the results of the Schleswig-Holstein war. Prussia was of opinion that there was no longer any need for the troops of the bund in Holstein; and although this view was hotly contested, the diet was compelled in the end to act upon it. Still more important was the question, what should now be done with the duchies, Austria favoured the claims of the prince of Augustenburg; and the bund by a small majority decided to request the two powers to invest him with the sovereignty of Holstein, Prussia protested that the matter was beyond the competence of the diet. What she herself intended was plainly shown by the fact that the Prussian war minister explained in the Prussian parliament, in connexion with a special demand for money, that it was to be devoted to the erection of a harbour at Kiel. Austria, which had the same right as Prussia

to Kiel, refused her assent to this proposal; and an inter- change of angry despatches took place, which made it highly probable that the spoilers of Denmark would soon be at each other's throats. War was for a time prevented by the Gastein convention, by which Austria handed over Lauenburg to Prussia, and it was agreed that the former

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state should in the meantime administer Holstein, the latter 1863-66.

Schleswig.

Count Bismarck did not intend that the Gastein conven- tion should seriously interrupt the development of his policy. He had made up his mind to force a quarrel on Austria, and to settle once for all the question, first raised by Frederick the Great, whether she or Prussia should prevail in Germany. The opportunity was so favourable that the like might never again offer itself, Although the Govern- ment and the parliament of Prussia were still engaged ina struggle which called forth much indignation on both sides, the mass of the population was thoroughly loyal; and, as events proved, the army had been reorganized with splendid skill. Never, perhaps, in the history of the world, were there better fighters than the Prussian soldiers of that day; and they were led by officers full of patriotic ardour, with almost un- limited influence over their men, and trained in the best schools of military science. In the Austrian empire, notwith- standing the reforms recently instituted, discontent was still almost universal. The Hungarians sullenly demanded independence, and among the Slavonic populations there were also dangerous agitations for local self-government. Although the army was composed of magnificent material, it was far behind that of Prussia in the mode of its adminis- tration, and grave doubts were entertained whether con- fidence could be placed in its loyalty. In these circum- stances, no one familiar with the facts could hesitate as to the side on which victory would declare itself in the event of war, and to Count Bismarck the facts were intimately known. With well-considered boldness he advanced rapidly to his aim, The Austrian governor of Holstein encouraged, as he had a perfect right to do, the pretensions of the prince of Augustenburg, In January 1866 Count Bismarck made this the subject of a bitter despatch to the Vienna Govern- ment; and Count Mensdorf, the

Austrian foreign minister, replied in the same tone. Both powers now began to make active preparations for the worst. The majority of the small states sided with Austria; but Prussia found means of more than counterbalancing this advantage. Now that

Italy was partially united, the Italians felt humiliated at Alliance

Venetia remaining in the hands of Austria. Count Bismarck of eta

offered, if she would conclude an alliance with Prussia against their common enemy, to obtain for her this magnifi- cent prize. The Italian Government saw that it could never have a better chance, and signed the proposed treaty.

The occasion for which Count Bismarck waited presented Seven

itself when the Austrian governor of Holstein summoned oe d ale

the assembly of the states. Holstein was at once occupie by Prussian troops, and those of Austria were driven from the duchy. The Austrian Government indignantly protested against this outrage; and on the 14th June 1866 its pro- posal that the forces of the bund should be mobilized against Prussia was adopted by a majority of the diet. The Prussian plenipotentiary withdrew after submitting a scheme for the reconstitution of Germany; and the war immedi- ately began. Its events followed each other with startling rapidity, Within a fortnight Prussia had in her grasp Hanover, Hesse-Cassel, and Saxony; and on the 3d July was fought the great battle of K6niggritz, which laid her chief enemy at her feet. The power of Austria was shattered by the swift and mighty blows directed against it; and on the 26th July she was glad to accept the pre- liminaries of Nicolsburg, which were soon afterwards followed by the peace of Prague.

The result of this war was the final exclusion of Austria Peace of

from Germany. Prussia annexed Hanover, Hesse-Cassel, Prague.

Nassau, Frankfort, and Schleswig-Holstein, By the fifth clause of the treaty of Prague, indeed, the inhabitants of the northern districts of Schleswig

were to be reunited to Denmark, if, when freely consulted, they expressed a wish

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the llth October 1878. All states to the north of the Main, including the northern half of Hesse-Darmstadt, were compelled to form a North-German confederation under the leadership of Prussia. The four South-German states, Baden, Hesse-Darmstadt, Wiir- temberg, and Bavaria, were left independent, but with the right, if they chose, to form a South-German confederation and to unite with that of North Germany. By secret treaties, as Count Bismarck announced at a critical moment soon afterwards, they undertook to place their armies at the disposal of Prussia in time of war.

King William, who had accompanied his troops, returned in triumph to Berlin, and the nation was so elated by his victories that the newly-elected house of representatives willingly consented to forget past disputes. On the 24th February 1867 the constituent diet of the confederation, elected by universal suffrage and the ballot, met in Berlin, and soon accepted in its essential features the constitution submitted to it. It was arranged that the headship of the confederation should be hereditary, that it should belong to the king of Prussia, and that legislative functions should be exercised by a federal eouncil, representative of the various Governments, and by a diet elected by the whole people.

The confederate parliament began at ouce the task of consolidating the new institutions, In the sessions of 1869 and 1870 it established a supreme tribunal of com- merce, sitting in Leipsic, and passed a new penal code. Great as were these results, they did not satisfy the aspirations of patriotic Germans, who, having so sud- denly and so unexpectedly approached unity, longed that the work should be completed. A party called the ‘national liberals” was formed, whose main object was to secure the incorporation of south with north Germany, and it at once entered into peculiar relations with the great minister at the head of the country. The members of this

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1367-70. for this result; but the engagement, which was never Northern seriously intended, was abrogated by secret treaty between confede- Austria aud Germany on

(HISTORY.

nationalists had a large majority ; and even in Baden and Hesse-Darmstadt, where the opposition to Prussia was less severe, a powerful minority of the deputies had no liking for the Prussian premier. Thus the customs parliament was kept rigidly to the objects for which it was founded, greatly to the disappointment of patriots who had not doubted that it would become an effective instrument for the attainment of far larger purposes. Even in regard to the army, notwithstanding the secret treaties giving Prussia the command of the southern forces in the cvent of war, a spirit of bitter opposition to the northern confederation was manifested. Baden and Hesse-Darmstadt reorganized tlieir armies in accordance with the Prussian system, but Bavaria and Wiirtemberg were more obstinate, and in both countries there was an agitation for military arrangements by which the secret treaties should be virtually annulled.

Had the completion of unity depended wholly on internal Irritation causes, it certainly would not have been soon achieved; but of France.

other forces, not altogether unexpectedly, eame to Count Bismarck's aid. France had been irritated by the enormous increase of Prussian power, and even before the treaty of Prague was sigued the emperor Napoleon III. indicated a wish to be " eompensated" with the left bank of the Rhine. Not being in a position to make war, he was compelled to suppress this desire. Soon afterwards he proposed a secret arrangement by which Belgium was to fall to France, while Prussia was to have free scope elsewhere. Finding that if not decisively rejected his plan was at least not accepted, Napoleon next sought to restore the balance by concluding a treaty with the king of Holland, in 1867, for the purchase of Luxembourg. Prussia protested; and it was on this occasion that Count Bismarck first made public the secret treaties with the South-German states. War ap- peared almost inevitable, but the emperor, being still uncer- tain as to the state of his forces, allowed the question to be settled by a conference, which declared Luxembourg a neutral state, its neutrality being guaranteed by the great powers.

party, believing, as sincere liberals, that the German people were ripe for free institutions, desired from the outset to give larger power to the popular element of the constitution

The idea of a war with Prussia was not given up by Franco- Napoleon. Whether he felt the necessity of strength- German ening the claims of his dynasty by military glory, or War

both in Prussia and in Germany. With these ideas Prince Bismarck had no sympathy. Throughout his career he has consistently manifested contempt for parliamentary forms of government. He cannot tolerate that a minister should be thwarted or hindered by political critics, and fancies that the eommunity would be much better off if it allowed itself to be directly governed by the statesmen who are good enough to devote themselves to its service. But his achievements in the cause of German unity have more than counterbalanced, in the esteem of the liberals, his dislike of national freedom.

An important step towards complete unity was supposed to be taken in 1867, by the conclusion of a treaty with the southern states, by which it was agreed that all questions of customs should be decided by the federal council and the federal diet, and that, for the consideration of such questions, the southern states should send representatives to Berlin. In reality, however, the customs parliament was of no service beyond the strict limits of its special activity. The mass of the South Germans were bitterly opposed to the idea of union with the north. The democrats detested Prussia more than any other country, and looked upon Count Bismarck as the incarnation of all that was most ob- jectionable in its aristocratic and military system of govern- ment. Among the ultramontanes there was a not less vehement dislike of a nation which continually boasted that it was the headquarters of Protestantism and free thought.

German Hence, in the election to the customs parliament in 1868,

Wiirtemberg did not return a single deputy who was favourable to the national cause; in Bavaria the anti-

whether, as many Germans believe, he was urged forward by a powerful ultramontane intrigue, he secms to have re- solved in 1870 to undertake the long-delayed struggle. A pretext was found in a proposal of the Spaniards to raise to their throne Prince Leopold of Hohenzollern. There is no evidence that the French people were in the least disturbed by this scheme} certainly, if they had been left to their own free judgment, they would never have thought of going to war about it. But the imperial ministry, managing to get up a little artificial excitement among a noisy section of the Parisians, angrily protested ; and Prince Leopold announced that he would not accept the Spanish erown, Stimulated by this diplomatic triumph, the emperor next required that Prussia should give a general engagement that no Hohenzollern prince should in future become king of Spain. Prussia declined to humble herself so far, whereupon, on the 15th July 1870, France declared war against her. A telegram from Ems, falsely stating that the French ambassador had been publicly insulted by King William, caused considerable sensation in France; and enemies of Bismarck often assert that he caused it to be despatched for the purpose of making war unavoidable. Although this is a mere assertion, he was not unwilling to accept the challenge, coming as it did in a manner that would have rendered: any shrinking from it disgraceful. He believed that, whatever policy she adopted, Prussia would one day have to defend her conquests; and he could not but foresee the enormous advantages which would spring from a triumphant war with France.

Napoleon, as we now know, had reason to suppose that

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he might trust to the aid of Austria and Italy, and his diplomatic agents in South Germany had left no doubt in his mind that the South Germans would hail his approach as

old

military system to which her victories have been due. The 1870-78. main object of Prince Bismarck’s foreign policy appears Foreign to have been to isolate France, While not unfriendly to Policy.

THE GERMAN EMPIRE.]

Sedan.

Peace of

(mperial

iet,

loyally kept their engagements with Prnssia.

of the most sanguine patriots.

that of a deliverer. He was cruelly undcceived. After his first reverses, Italy and Austria resolved to hold aloof; and the South Germans did not for an instant hesitate; they

emperor did not realize how bitter, in South as well as in North Germany, were the memories of the sufferings caused by his uncle. However energetically the various states might fight among themselves, in the presence of “the hereditary enemy ” their disputes were forgotten; they re- membered only their common origin and their common speech. There is no parallel in German history to the en- thusiasm called forth by the French declaration of war. Its absolute universality. was a new phenomenon, and its intensity probably could not be surpassed.

The course of the war went far beyond the expectations In battle after battle the armies of France were smitten to the ground; her strong places, one after another, delivered themselves to the enemy; and her brave sons were sent by hundreds of thousands as prisoners to Germany. At last, on the Ist September, after the disastrous battle of Sedan, the emperor yielded his sword to the Prussian king,

It was the opinion of many impartial observers that the war ought now to have stopped, and there were Germans who had the courage to express this conviction. But the nation as a whole wished to see France thoroughly humbled, and applauded the advance on Paris, In vain M. Gambetta sought

to infuse into his countrymen his own impulsive and vigorous spirit; they did what they could, but the German armies were irresistible. On the 28th January 1871 Paris surrendered, and on the 6th May the peace of Frankfort was signed. By this treaty France engaged to pay the enormous indemnity of five milliards of francs, and to restore to Germany Alsace and the German portion of Lorraine.

Amid the glowing pride of the Germans in the un-

- surpassed achievements of their armies the difficulties which had hitherto prevented complete unity seemed |

altogether to vanish. In the autumn of 1870 negotiations were opened between the southern Governments and the northern confederation ; and in the course of November treaties were signed by which the North-German confeder- ation became the German confederation. Bavaria insisted

upon some highly important reservations, such as the main- |

tenance of her own diplomacy, of her postal, telegraph, and railway systems, of her military administration, and of cer- tain valuable taxes. Baden, Hesse-Darmstadt, and Wiirtem- berg also maintained special rights. But all this was thought of comparatively little moment ; and the treaties were readily sanctioned both by the confederate parliament and by the southern parliaments. Thus Germany became a united state. The king of Bavaria then proposed to the other German sovereigns and to the free cities that the head of the confederation should be declared emperor. The suggestion was approved ; and on the 18th January 1871, in the Hall of Mirrors in the palace of Versailles, the king of Prussia was proclaimed, in presence of a brilliant assem- bly of German princes and officers, emperor in Germany.

On the 21st of March 1871 the first diet of the empire met in Berlin. The constitution of the northern confeder- ation was extended so as to be applicable to the changed circumstances of Germany, but no alteration was made in its essential character.

Since the conclusion of the treaty of Frankfort Germany has been at peace, but as she believes that the French may one day seek to regain their lost provinces and to avenge

their recent humiliations, she has maintained the vast.

The French |

England, he has assiduously cultivated the friendship of Austria and of Russia. In 1872 the czar and the Austrian emperor visited Berlin, and during their stay the three emperors concluded an alliance, the exact limits and conditions of which are not known. Soon afterwards Victor Emmanuel, the Italian king, also visited the German capital, and the emperor William went for a short time to Italy, where he was received with manifestations of hearty friendship. It is understood that after the reopening of the Eastern question in 1875 Prince Bismarck made repeated attempts to enter into close relations with England ; but in lus public acts, both before and after the signing of the treaty of Berlin in 1878, he mainly supported Russia. He also encouraged Austria to extend her influence in the east by occupying Bosnia.

In her home politics the attention of Germany was for Church some years mainly occupied with a great struggle between and After the close of the State.

the state and the church in Prussia. Franco-German war—in the course of which the dogma of papal infallibility was proclaimed—Prince Bismarck per- suaded himself that the empire was imperilled by ultra- montane intrigues ; and with his usual promptitude he took vigorous precautions against his supposed enemies. He be- gan in 1872 with the expulsion of the Jesuits. This was followed in 1873 by the famous May Laws, introduced by Dr Falk, the energetic minister of public worship. By these laws it was required that candidates for the clerical office should undergo a certain amount of secular training at the universities, and that every ecclesiastical appointment should receive the sanction of the secular authorities. A royal tribunal for ecclesiastical matters was also set up. This legislation, which the pope denounced as invalid, was disregarded by the Catholic bishops; and Prince Bismarck, supported by Dr Falk, imposed penalty after penalty

in order to establish the supremacy of the state. Refractory bishops were imprisoned, deposed, and banished ; the con- tributions of the Government were withdrawn from the clergy who incurred its displeasure; religious orders were dissolved; the administration of church property was taken from the clergy and invested in bodies of laymen. It may be that these stern measures were rendered necessary by facts of which the world is insufficiently informed ; but they have alienated from Prince Bismarck, and from the empire founded by him, the sympathies of the vast majority of the German Catholics.

The period which has followed the war with France has Socialism.

been remarkable, not only for the ecclesiastical struggle in Prussia, but for the rapid growth of socialism throughout the empire. Socialism first became a power in Germany through the labours of the ardent scholar and publicist, Ferdinand Lassalle. He began his brief and noisy public career by addressing large audiences of workmen in Berlin and Leipsic in 1862, and in less than two years he had formed a party which regarded him with boundless reverence and admiration. He himself was a man of for- tune, with luxurious habits ; but he had in an unusually intense degree the desire, shared by all truly modern men, for the elevation of the depressed and suffering masses. The theory of which he had convinced himself was that, with existing social relations, workmen as a class can never improve their position; that their sole chance is to form productive associations which shall enable them to secure the whole benefit of their labour ; and that it is the duty of the state to provide such associations with capital, to see that justice is done to their members, and to regulate the markets of the world. After the death of Lassalle, this

theory became a sort of evangel among = followers ; but . — 65

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1870-78. many of them stated it in violent terms, and openly aimed

at the equal division of property, if possible by peaceful agitation, if necessary by revolution. At the time of the formation of the party Herr von Bismarck was engaged in his struggle with the liberals in the Prussian

parliament, and he did not scruple to damage his opponents by encour- aging Lassalle, who detested them more vehemently than did the premier himself. Soon after the war with France the condition of the country was in the highest degree favourable to the progress of the movement. Intoxicated by the national triumphs, and having a vague impression that the French indemnity must be an inexhaustible source of wealth, many of the German middle class indulged in wild speculation, and contracted habits of reckless expenditure. ‘At the same time the resources of the nation were drained by the most costly military system the world has ever seen. The inevitable result was that in a short time trade was depressed beyond all recent experience ; wages fell, and large numbers of workmen were deprived of employment. Socialism found its opportunity ; multitudes of the sufferers eagerly listened to instructors who depicted for them a bril- liant future that might be easily attained. In England no considerable body of men has ever been deeply impressed by socialist schemes ; but in Germany the conditions of political life are altogether different. There the Govern- ment is the greatest of all powers. At every stage of a man’s life it makes itself felt; it creates around the com- munity a sort of political atmosphere from which there is no escape, in which every one moves and breathes. Thus to an uninstructed German there seems tobe hardly any limit to the feats of which the state is capable. It pro- fesses to be so nearly omnipotent that he appears to himself to be within his right in asking it to make all poor men suddenly rich.

At each successive general election the numbers of socialist deputies to the imperial parliament increased ; and in 1877 it was calculated that, although only twelve mem- bers of the party were returned, about a tenth of the entire body of voters were socialists. Some alarm was excited by these facts, but no one thought of putting down the move- ment by force until one day in May 1878 a shot was fired at the aged emperor in Berlin, as he drove along the Unter den Linden with his daughter, the grand-duchess of Baden, by his side. The criminal, a youth named Hodel, boasted of his socialist opinions and aims. A wave of anger swept over the nation; and the reactionary party, fancying it had an opportunity of laying a rough hand on far more than socialism, succeeded in inducing the imperial Government to draw up without delay a severe measure, directed nominally against the socialists, but in reality against all politicians obnoxious to the

conservatives. The bill was hurried through the federal council and submitted to the diet. By that tiine the majority of the liberals had recovered their self-control ; and with the aid of the centre party they threw out the proposed scheme by an immense majority. Parliament was prorogued, and it was uncertain whether there would be any further attempt at repression.

Suddenly the announcement came that the emperor had

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again been shot at, and that this time he had been wounded, For some days Germany was convulsed with rage and horror, and on all sides the cry was raised that now at last socialism must be sternly dealt with, Taking courage, the Government dissolved parliament, and pressure of every kind was put upon the electors to secure a thoroughly reactionary diet. The country, however, re- flected that, although it was necessary to protect society, it might not be necessary to sacrifice the liberties which it had with so much difficulty conquered. Accordingly, when the new parliament assembled in August 1878, it was found

that the liberals had not sustained very serious losses. The Repres- progressists bitterly opposed the measure introduced by sivelegis- Prince Bismarck !#tion.

the Government ; but by some means managed, as he had often done before, to overcome the objections of the national liberals. By their support a law was passed which gave the police of the empire, for two years and a half, enormous special powers. These powers were at once rigidly enforced ; and socialism appeared to vanish from the land. Whether, however, it may not spring up in some great national crisis, all the stronger for the sufferings of its adherents, is a point that can be deter- mined only when some great national crisis occurs.

The socialists and the ultramontanes, without having National anything else in common, have joined in opposition to unity.

measures for promoting the national unity. They have been aided by the Polish deputies, by the members for Alsace and Lorraine, and by the so-called particularists, conserva- tive politicians ardently attached to the ancient customs and rights of the individual states. Notwithstanding this formidable band of allies, considerable progress has been made in the task of transforming a loose confederation of countries into a true nation. Between 1872 and 1875 utter anarchy in important departments of life was brought to an end by laws relating to imperial coinage, imperial paper money, and the system of banking, And in 1877 thorough investigation resulted in the appointment of a supreme imperial tribunal (Reichsgericht). It was pro- posed that this tribunal should sit in Berlin; but many liberals having no desire that that city should assume in Germany the place which belongs in France to Paris, a large majority decided for Leipsic. This was taken as a hint that, while Germany wishes to be united, she will not vol- untarily see herself transformed into a magnified Prussia.

In spite of their military strength, their victories, and the establishment of their empire, the Germans are not, politically, a contented people ; and the reason is that they have outgrown their institutions. While a statesman of extraordinary genius and authority stands in the way, a progressive system may be impossible ; but the more in- telligent classes have never lost the desire to add to the hardly-earned national unity the crowning triumph of un- fettered representative government.

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PART III.—LANGUAGE.

In its ordinary sense the name German Language or Deutsche Sprache is now generally used to denote, in all their stages from the earliest time to the present day, the different languages and dialects of Teutonic origin spoken in the German and Austrian empires and in Switzerland, not including, however, the Frisian language, which once was spoken, and still in a few

remnants survives, on the shores and islands of the German Ocean, nor the dialects of

the Danish population of nortnern Schleswig. Flemish and Dutch, although very closely counected with German, are likewise excluded. But the word Deutsch has also been, and still continues to be, used in a wider sense. Jacob Grimm introduced it, in his famous Deutsche Grammatik, as a comprehensive name for that family of the so-called Indo-European or Aryan languages, for which English writers generally use the name of " Teutonic," and of whiclt

the principal branches are represented by Gothic, the Scandinavian languages, English, Frisian, and German, In this Grimm has had many followers, but scarcely anywhere out of Germany; and even there the fact that the name, in this application, besides being incorrect from an historical point of view (as the word has never been used thus by any one of the people to whom it has been applied by Grimm), is also liable to be misunderstood, has caused a growing tendency towards confining it again to its original meaning described above, and using Germanisch, or Germanic, in the collective sense of the English "Teutonic." But even in the stricter sense the designation Deutsch is not of very long standing, nor has the word always been a real proper name for a distinct people or tribe. In Bishop Ulfilas's Gothic version of the Bible we find the adverb thiudisko (€6vuxés), Gal. ii, 14, which is clearly a derivative from thiuda (vos), meaning primarily "after the manner of the people." German writers of the earlier centuries were therefore as fully justified in calling their own language diwtisc, or, in a Latinized form, theudiscus, theotiscus, that is, their popular or vernacular language, as were those medieval Latin writers of all nations who distinguished their national languages by the name of lingua vulgaris from Latin, the only literary language fully acknowledged in their time. It was not until the 10th century that another Latinized form frequently used in later times, viz., teutonicus, began to be used instead of the older theotiscus, of which the only rivals in former times had been such local names as franciscus (frenkisc) or saxont- cus, which were no doubt derived from the names of single tribes, but were often also used in the

same comprehensive sense as theotiscus, without necessarily implying any allusion to dialectal differences between the languages of the tribes they properly belonged to. The last name we have to mention here is the Latin Germanus, with its different derivatives in the modern languages, including the English form German. Many attempts have been made to elucidate the origin of this word, but as yet nothing can be taken for certain beyond the fact that it is neither of Latin nor of German origin. Most probably it was a Celtic word, and, according to what Tacitus says in his Germania (ch. ii.), it was originally the name of a Celtic tribe, from which, by some strange error of the Roman and Greck historians, it has been transferred to the non-Celtic inhabitants of Germany. Accordingly the name has never been used by the Germans themselves except in imitation of its use in the works of Latin writers.

As to its geographical extension the German language has undergone very great changes in the course of the last two thousand years. At the dawn of history no Germans were to be found to the left of the Rhine, and even to the right of it Celtic tribes occur in the earliest times. There were Celts also in the south of the present Germany as far north at least as the Danube and the Main; Bohemia, too, derives its name from an early Celtic population, the Boii. Only the midland and north were inhabited by Germanic nations or tribes, stretching as far east as Poland, and perhaps covering even parts of the adjoining territories of Russia, where Slavonic and Finnish tribes were their neighbours. But of these Germanic tribes and their languages some have left no equivalents in our modern German tribes and dialects. We have mentioned the Frisian language as not belonging to German in its proper sense, although the Frisians have kept their original residence up to the present day, and have always been in constant connexion and frequent intercourse with their “German” neighbours. Many other tribes have wandered from their seats and colonized other countries. It was as late as the middle of the 5th century that the Jutes, Angles, and Saxons began their voyages of conquest to England, where they founded a new people and a new

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old

language, leaving their native soil open to Danish invasions. Much earlier the midland tribes had already been slowly push- ing on to the west and south, and expelling or subduing and assimilating the Celtic owners of the territories they invaded. But what was gained in these parts was counter-balanced by great losses in the north and east. The terri- tories about the lower and middle Elbe, Oder, and Vistula, abandoned by the Lombards, the Burgundians, the Goths, and some other Germanic tribes, as well as Bohemia, which for some short time had been in the possession of the German Marcomans, were soon filled up by the immigration of numerous tribes of the great Slavonic family. Without going into details of the facts which are well known to the student of history,? we may simply state that, since about 500 a.D., when the great migration of the nations had come to an end so far as Germany was concerned, no further change of any great importance has taken place in the western and southern parts. In the east the German popu- lation at this time did not go beyond a line that may be drawn from about Kiel to the Béhmerwald, passing near Hamburg, Magdeburg, Naumburg, Coburg, and Baireuth. As is well known, it is in later centuries that almost all the eastern districts have been recovered for the German language.?

In the 6th century the remains of the numerous smaller Germanic tribes, mentioned before and during the migration of the nations, had consolidated into seven larger bodies or aggregations of tribes. The Frisians still held the extreme north of Holland and Germany. Their midland and eastern neighbours were then called by the new name of Saxons, borrowed from the Saxons who had left the Continent for England. In the main parts of the Nether- lands and Belgium, along both sides of the Rhine, and across Germany to the Thuringian and Bohemian Forests, the powerful Frankish confederation had established itself, and it soon incorporated the smaller and less vigorous tribes of the Hessians and Thuringians, which were sur- rounded by the midland or eastern Franks, the Saxons, and the Slavs. Alsatia, Switzerland, and South Germany east- ward to the river Lech were occupied by the Alemannians, while the inhabitants of the remaining districts of the present Bavaria and Austria bore the collective name of Bavarians.

The history of the German language cannot be severed from the history of these tribes, for Frisian, Saxon, Frankish (Hessian, Thuringian), Alemannian, and Bavarian are the leading dialects of the Continental brancli of the Teutonic family. What Dr J. A. H. Murray has pointed out about the origin of the principal English dialects4 may equally well be said of these Continental idioms. Having no specimens of the languages of the Continental tribes for nearly three centuries after their final settle- ment, we cannot tell to what extent they originally agreed with or differed from each other, although there must have been some dialectal differences to begin with, which were afterwards increased and multiplied, partly by phonetic changes (most probably resulting from scarcely discern- ible phonetic peculiarities, which, even in the earliest times, must have prevailed in those idioms), and partly by such alterations of the inflexional systems as are known to occur frequently in all languages whose character is not merely literary. But, however scanty our means of illustrating the earliest history of these idioms may be, there is no doubt that they were not all of them related to each other in the same

1 See the article ENGLISH LANGUAGE, vol. viii. p. 390 sqq.

? For fuller particulars see C. Zeuss, Die Deutschen und die Nach-barstémme, Munich, 1837.

3 See G. Wendt, Die Nationalitét der Bevilkerung der Deutschen Ostmarken vor dem Beginne der Germanisierung, Gottingen, 1878.

4 See ENGLISH LANGUAGE, as above, p. 391.

degree. Three main groups are easily distinguishable :— 1) Frisian and Saxon, whose nearest relation is English ; (2) Frankish, Hessian, and Thuringian; and (3) Alemannian and Bavarian. Frisian is generally considered as a separate language. From Saxon the later Low German dialects (Niederdeutsche Mundarten) have sprung. The members of the third-group (generally designated as Oberdeutsch, or Upper German), combined with Af utteldeutsch, or the midland dialects, viz., Thuringian, Hessian, and part of the Frankish dialects, are the sources of the later

Hochdeutsch or High German. The greatest difference prevails between the first and third groups; the second may be characterized as con- taining various transition dialects. The southern Frankish dialects are very closely akin to the adjacent Upper German idioms, while Dutch, the utmost offshoot of the Frankish language to the north, does not very materially differ from Saxon or Frisian in the earliest period. The most striking phonetic feature of the languages of the first group is their regular dropping of the nasal sounds before the spirants /, th, s, accompanied by subsequent lengthening of the pre- ceding vowels. Thus we have in Anglo-Saxon or Old English fi, 6Ser, cé8, gos (Mod. English five, other, (un-) couth, goose), in Old Frisian fi, othar, cuith, gos, in Old Saxon fif, othar, ctith, gds, corresponding to such Gothic forms as fimf, anthar, kunths, or the ordinary High German fin/, ander, kund, gans. Since, however, Dutch partakes of this peculiarity to some extent, we cannot easily form a decisive opinion as to the value of this fact as a distinctive mark; but more stress may be laid on a very remarkable difference in the inflexional system of the verb. Here the languages of the first group have melted together the forms of the three persons of the plural number, thus wé, gé, hie finda', or fundon, we, you, they find, or found, in Old Eng- lish; wi, 92, hia findad, or fundon in Old Frisian; w%, gi, sea findad, or fundon in Old Saxon. The corresponding Old High German forms are wir findam, ir findat, ste findant for the present, wir funtum, ir funtut, sie funtun for the perfect tense. Old Dutch joins, in this case, the German branch ; from werthan, to become, for instance, are derived wi werthun, 7% werthi, sia werthunt, &e. The declension of the substantives showsanother remarkable difference. While the languages of the first group have retained the original s in the nominative plural of such words as Old English dagas, days, Old Saxon dagos, or changed it to 7, as Old Frisian dagar, Dutch aud German have dropped it altogether, the corresponding forms being daga and taga. These facts must be taken for decisive, as it seems to be certain that they existed before any distinction of Low and High German in their modern sense (a distinction chiefly dependent on subsequent changes in. their mute system) could be thought of. From a purely grammatical point of view, Dutch, although generally considered a separate lan- guage (which no doubt it is, with regard to its literary and political position), is entitled to claim a closer relation to High German than even Low German, whose non- literary character, taken along with the political union of northern and southern Germany, has led to the

current opinion that it is only a dialect of “German” in its narrower sense. We do not mean to deny that there is, at present, a more conspicuous conformity between Dutch and Low German than between Low German and High Ger- man; but this is only due to the fact that High German, after the final settlement of the German tribes, has deviated much more from its original features than either Dutch or Low German. The most striking peculiarities of High German, as opposed to all other Teutonic idioms, have mainly been caused by the second or High German ‘« Lautverschiebung,” or change of mute consonants, which forms partof a long series of sound-changes generally compre- hended under the name of Germanische Lautverschiebung

or Grimm’s Law. This Lautverschiebung began, perliaps as early as the 7th century, in the south, and thence slowly spread northward, but with decreasing vigour and con- sistency, Dutch and Low German not being touched at all. It was only thus that the idiom of the Netherlands Franks of the later centuries was separated from the dialects of their ‘‘German” relations. Before, however, the first literary documents are met with, this separation is com- plete; and we may therefore restrict ourselves here to a short history of High and Low German alone.

The German language presents, as do most of the cognate tongues, three main stages of development,—Old, Middle, and Modern,—distinguished by their inflexional and lite- rary character. In accordance with Mr Henry Sweet’s description of the stages of the English language,? Old German may be defined as the period of full inflec- tions (Old Low German, dages, dage, dagu; dagds, dago, dagun ; Old High German, tages, tage, tagu; tagd, tago, tagum), while the Middle period is that of levelled inflections (Middle Low German, dages, dage, dagen ; Middle High German, tages, tage, tagen); but it is chiefly the literary character that distinguishes Modern High German from Low German and its own earlier stages. A special form of High German is established in this period for all literary purposes, supplanting the dialects both of Low and of High German that formerly

were freely used in literary intercourse. Assuming two periods of transition besides, we have the following divisions, with the approximate dates : .

Old High German ….....ssscceeessseeerseeees to 1050 Early Middle High German….....-... 1050 to 1150 Middle High German….....ssssssseeserners 1150 to 1850 Late Middle High German….....4+ 1350 to 1500 Modern High German….....seeeereeree 1500 onward.

The same divisions have to be made for Low German, but the scheme cannot be so fully carried through, as the time between 1000 and 1200 is almost destitute of literary monunients.

Old German.—The inflexional characteristics of Old German are almost identical with those of Old English. Nouns had the same five cases,—nominative, accusative (only in a few instances kept distinct), genitive, dative, and instrumental. Strong and weak declensions of nouns and their subdivisions are likewise the same. The dual of the first and second personal pronouns is almost ex- tinct in Old High German, but is quite common in Low German. In the verb we find the same distinction of the subjunctive from the indicative mood, and the same two inflected tenses, present and past,—the former also used for the future, the latter for all shades of past time. The order of the sentence corresponds generally to the modern use, but is not kept so strictly as now, especially in the oldest prose texts, which are often materially influenced by the Latin sources from which they have been derived or trans- lated.

The earliest extant specimen of Low German belongs to the beginning of the 9th century. It is a short formula of renunciation of the devil to be used before the ceremony of baptism.2 It begins thus :— Forsachistu diobole? et respondeat : ec forsacho diabole. End allum diobolgelde? respondeat : end ec forsacho allum diobolgelde. End allum dioboles uuercum? respondeat : end ec forsacho allum dio- boles uuercum and uuordum, Thuner ende Uuoden ende Saxnote ende allum them unholdum the hira genotas sint.” “ Forsakest thou (the) devil? I forsake (the) devil. And all devil-sacrifice? And I forsake all devil-sacrifice. And

1 See article ENGLISH LANGUAGE, vol. viii. p. 391.

2 It has been published, along with all the minor pieces of Old Saxon still extant, by M. Heyne, Kleinere altviederdeutsche Denkméiler, 2d edit., Paderborn, 1877. See also K. Miillenhoff and W. Scherer,

Denkmiiler deutscher Poesie und Prosa, 2d edit., Berlin, 1873.

and words, Thuner and Woden and Saxnot and all the un- couth (beings) that their companions are."

We cannot, unfortunately, tell what special dialect of Low German this piece belonged to, nor even whether it was originally written in German, as several forms occur- ring in it have rather an Old English look. No more cer- tain are the place of origin and the dialect of the most important relic of the Old Saxon language, the great poem of the /Zéliand, or the History of our Saviour, composed in the old alliterative verse by a Saxon cleric or monk, about the year 830. We quote as a specimen the following lines from the Munich MS.} :—

'*Quamun managa Iudeon an thene gastseli ; uuard im thar gladmod hugi, blidi an iro breostun: gisahun iro baggebon uuesen an uunneon. Drog man nuin an flet skiri mid scalun, scenkeon huurbun, gengun mid goldfatun ; gaman uuas thar inne, hlud an thero hallu, helidos drunkun."

'¢ (There) came many Jews to the guest-hall; became to them there glad (their) mind, blithe in their breasts: (they) saw their ring-giver be in joy. Wine was borne into (the) hall bright in cups; cup-hearers walked about, went with golden vessels, joy was therein loud in the hall, the knights drank."

Much more numerous and various in age and dialect are the documents of Old High German, some of which date as far back as the 8th century. Welcome as they may be to the student of grammar, not much can be said for their intrinsic value. Almost all the prose pieces are mere translations (many of them could not be worse) from the Latin ; and even such poetical works as Otfrid's Lzfe of Christ? are no more than prose thoughts forced into bad verse. Only a very few relics of true poetry have reached us,

among which the //i/debrandslied (in a mixed dialect), the fragments of the Iféspilli (a poem about the Last Judgment, in the Bavarian dialect, belonging, like the Ihildebrandslied, to the beginning of the 9th century, and also written in alliterative verse), and the Ludwigslied (881 or 882, in one of the Frankish dialects) may be mentioned here.?

High German, as already hinted, is chiefly distinguished from the other Teutonic languages by a certain transfor- mation of its mute system. ‘The ordinary changes,—that is to say, those received in the modern High German literary language, —are the following :—d is changed to ¢ in all positions ; ¢ to z (either pronounced és or ss); p to pf, ff, or f according to its position in the word; & initial and following a consonant is kept, but after a vowel & passes into

ch (pronounced as Scotch or Modern German ch), Thus we get the following comparisons :—

Old Old Old High Modern High Modern English. Saxon. German. German. English. don don tuon thun do td i) Zuo zu to sealt salt salz salz salt settan settian SeZZ setzen set etan etan ezzan essen eat pund und pfunt pfund pound hearp narpa harpfa, harfa harfe harp slépan slapan slafian schlafen sleep cyning kuning kuning konig king thencan thenkiai thenken denken think macian makon machon machen make

1 This MS. gives the poem in a pure Saxon dialect, while the dialect of the Cotton MS. in some respects resembles the Frankish idiom. Both texts are printed in the latest edition by E. Sievers, Halle, 1878.

2 Otfrid, a monk of Weissenburg, in Alsace, formerly a pupil of Hrabanus Maurus, at Fulda, wrote his work (in the South-Frankish dialect) in 867 or 868. It is for the most part due to him that the rhymed stanza (imitated from that of the Latin Church hymns) was introduced into German poetry, instead of the earlier alliterative metre. The latest editions are by J. Kelle, Ratisbon, 1856, 1869, and by P. Piper, Paderborn, 1878.

3 The minor pieces of Old High German, both verse and prose, are collected in Miillenhoff and Scherer’s Denkmédiler, 1873.

GERMANY 517 all (the) devil’s works? And I forsake all the devil’s works |

‘ This is the state of things in the High Frankish or Eastern Frankish dialect, spoken in the south-east of the Frankish territory. In the earliest period, as may be seen. from the above list, it still preserved the ¢h sound in many cases; in the later stagesd is found to have been substituted, as in Modern High German. The Upper German dialects show the same change at a much earlier time, and, in addition to this, they have also changed & initial and following a consonant into ch, and} and g initial into p and k& (representing most likely voiceless soft stops, as still pro- nounced in South Germany and Switzerland); Bavarian admits ~ for b even in the middle of words. Thus we have, for instance, denchen for Frankish thenken, to think; sztten for Frankish betten, to bid; keban, or Bavarian kepan, for Frankish geban, to give. In illustration of these distinctions and some other variations of spelling we may quote three contemporaneous versions of the Lord’s Prayer which have- fortunately been preserved *:—

Frankish Version.

Fater unser thu in himilombist, giuuihit sinamo thin. Queme richithin. Uunerdhe uuilleo thin samaso in himile endi in erthu. Broot unseraz emezzigaz gib uns

Alemannian Version. Fater unsar thu pist in himile, uuihi na- mun dinan. Qhueme rihhi din. Uuerde uuillo diin samaso in himile sosa in erdu. Prooth unsaremezich kip uns hiutu. Oblaz

Bavarian Version. Fater unser, du pist in himilum. Ka- uuihit si namo din. Piqhueme rihhi din. Uuesa din unillo samaso in himile est, samainerdu. Pilipi

unsraz emizzigaz kip uns eogauuanna. Enti flaz uns unsro seuldi samaso uwuir flazzames unsrem scolom. Enti ni

uns sculdi unsaro so uuir oblazem uns sculdikem. Enti ni unsih firleiti in kho- runka, uzzer losi

hiutu. Endi farlaz uns sculdhi unsero samaso uuir farlaz- zem scolom unserem. Indi ni gileiti unsih

in costunga, auh unsih fona ubile. prine unsih in cho- arlosi unsih fona runka, uzzan kaneri ubile. unsih fona allem

sunton.

It is impossible to give here asufficient idea of the varia- bility of Old High German, as, indeed, out of several hundred pieces that have come to our knowledge, there are. not two representing exactly the same dialect to all its shades or at least in exactly the same spelling. We shall therefore restrict ourselves to a short notice of the more important documents. South-western Frankish is best re- presented bya very old translation of a treatise by Isidorus Hispalensis, De Fide Catholica,® and Otfrid's Life of Chrast, mentioned above. The chief source of Eastern Frankish is a translation of the Harmony of the Gospels erroneously ascribed to the Syrian father Tatianus.® For Bavarian we may quote some old glossaries,' for Alemannian the interlineary versions of the Benedictine Rule® and some Latin church hymns, besides several glossaries. For later Old High German, the works of Notker Labeo, or Teutonicus, a monk of St Gall who died in 1022, are the fundamental sources. What Ormin did for English phonetics, Notker may be said to have done, even more completely, for those of Germany. He not only care- fully marks the quantities of vowels, but also points out the phonetic difference between such diplithougs as et, ou, zu, and ze, wo by his way of accentuating them (é, 6u, tu, and ée, do); even such phonetic minutize as the change of initial voiced stop consonants into voice- less stops after a pause or a voiceless consonant are duly registered, as may be seen from the following specimen.

4 Ten different versions of the Lord's Prayer (down to the 14th century) are given, in a synoptical order, by Massmann, Die deutschen Abschwirungs-, Beicht-, und Betformeln, Quedlinburg and Leipsic, 1839, p. 158 sq.

5 K. Weinhold, Die altdeutschen Bruchstiicke des Bischof Fsidorus von Sevilla de fide Catholica, Paderborn, 1874.

6 Yiatest edition by E. Sievers, Paderborn, 1872. .

7 KE. Steinmeyer und E. Sievers, Althochdeutsche Glossen, i., Berlin,

1879.

8 H. Hattemer, Denkmahle des Mittelalters, i., St Gall, 1844.

9 E. Sievers, Die Murbacher Hymnen, Halle, 1874.

10 Hattemer, op. cit., vols. ii., iii.

“Sanctus paulus kehiez tien die in sinén ziten uudndon des sfionetagen, taz er ér uechime ér romanum imperium zegienge unde antichristus richesdn begéndi. Uuér guiuelét romanos iu uuésen Allero richo hérren unde fro geuuAlt kén ze énde dero uuérlte?” “St Paul assured those who in his time expected the day of judgment that it would not come before the Roman Empire was dissolved, and Antichrist began to reign. Who doubts that the Romans are the masters of all kingdoms, and that their power reaches to the end of the world ?”

It will be clear from what has been said above that the main feature of the Old High German period is the total absence of a common literary language. No voluntary modifications of the form of speech are to be found, but such as are naturally involved in any attempt to adapt a spoken idiom to literary use. Nevertheless it has been suggested by K. Miillenhoff! and others that idioms of a more refined character than the ordinary popular dialects were spoken at the principal courts of the empire, and especially at the imperial court itself, and that the autho- rity of these Hofsprachen was great enough to exer- cise a modifying influence on the literary productions throughout the empire, or in those parts at least where High German was the vernacular speech. But how these suppositions can be proved does not appear, or how they can be reconciled with the fact that all literary documents of the period are dialectal.

Middle German.—The transition to Middle High and Low German is conspicuously marked by a decided im- provement in the poetic faculties of the nation.? While the 10th century has left only a very few specimens of

poetry, and these of poor quality, the number of poems (mainly of a theological bearing) dating from the 11th century is not inconsiderable, and the 12th century shows a rapidity of literary development almost unparalleled. At first indeed religious and legendary poetry is still prevalent, but soon literature begins to take a more historical or epic turn. This tendency is clearly visible in the Kazserchronik, or Emperor's Chronicle, in which the first attempt is made to give a survey of universal and German history in a poetical form, The romantic tales of Alexander the Great and of the battle of Roncesvalles weretranslated from the French,—the Alexanderlied by the Pfaffe Lamprecht, the Rolandslied by the Pfaffe Konrad ; while old national traditions contri- buted fitting subjects for such epic poems as that concern- ing the adventures of the Lombard King Rother. Lyric poetry, hitherto altogether neglected, sprang suddenly into vigour in the remote east of Austria about the middle of the century, and soon found its way to other countries. But the most decided advance was not made till about 1180, when the new forms of social life that had crept in among the more cultivated classes, in imitation of the laws and customs of French chivalry, began to exercise a powerful reforming influence on all branches of poetry. The example set by the Netherlands poet, Heinrich von Veldeke (who for some time lived, and partly wrote, in Germany), in his Eneit, or 4ineid, was soon followed by the three great epic masters of the period, Hartmann von Aue, Gottfried von Strasburg, and Wolfram von Eschenbach. About the same time the Nrbelungenlied and other compositions of a more national character were composed, while lyric poetry was raised to a height of excellence never attained at any other period of the Middle Ages, and best represented in the songs of Walther von der Vogelweide. It is true enough that this new chivalrous poetry was not always very original in thought ; indeed, most epic poems of this class, and many lyric stanzas, have been directly copied from French models ;

1 See his Denkmdler, Introduction. 2 See W. Scherer, Geschichte der deutschen Literatur im XI. und XII. Jahrhundert, Strasburg, 1875.

but its influence on the culture of the language was immense. It was then for the first time that Germany possessed a real literary language, undoubtedly homogeneous as far as style and metre are concerned. Whether a similar unity of the outer form of speech had already been reached at that period is a point very difficult to decide. The question was raised for the first time as early as 1820, by Karl Lachmann, in his Auswahl aus den hochdeutschen Dichtern des XIII..Jahrh. Uachmann's opinion was that the poets of the 13th century spoke a definite, unchange- able sort of High German, a few minor dialectal peculiari- ties being excepted, and that uneducated scribes had been guilty of introducing older or corrupt forms of the common speech into our manuscripts. These views were at the time unanimously accepted, and are still held (though in a somewhat modified form, admitting two literary idioms, one in the south, the other in the midland) by a majority of the German philologists of the present day. As a consequence of this, most of the "critical" editions of Middle High German poetry that have appeared since Lachmann's time do not reproduce the original readings of the manuscripts, but give the texts in a "corrected" form, commonly called " correct Middle High German," which is assumed to appear in its purest form in the works of Hartmann von Aue. It is chiefly Alemannian, or Swabian, with some Frankish peculiarities of spelling in the use of the consonants, in order to produce a greater resemblance to ordinary Modern High German orthography. No manu- script, however, is known to be written in exactly the same language or orthography ; nor are there any poets, except those of Swabia, who do not clearly show by their rhymes the existence of dialectal forms in their speech, All incon- gruities in the rhymes disappear when they are transferred to the forms peculiar to the local dialects of their authors.® It was therefore but natural that a reaction against Lachmann's views should ultimately have set in;* and this reaction appears to have been right in denying that dialectal forms were purposely and studiously avoided, even by the classic authors of the period, with a view to the approximation of their language to a certain universal idiom never existing anywhere but in the fancy of certain modern writers. How injurious to the study of Middle High German dialects the views of Lachmann, had they prevailed, must have been, it is easy to see; but on the other hand it must not be forgotten that the only method of investigating the dialects of the single authors was that followed by Lachmann, viz., to reconstruct them by a care- ful study of the rhymes, for the dialects of the

manuscripts are often, nay in most cases, clearly different from those of the writers themselves, as shown by the rhymes. It is‘ therefore not so much the principle of reconstruction that has been resisted by Lachmann’s opponents as the way in which this reconstruction has been practically carried out. For prose writings of course no such reconstruction is pos- sible; still, prose documents, especially such as were destined for local use only (charters, &c.), and therefore less liable to adulterations of the original, are often the main sources for German dialectology.

The prominent feature of German (Low German in- cluded) in this period is the levelling of the unaccented vowels of the inflexional and some of the derivative syl-

This has been exemplified in a most masterly manner by W. Braune, in his Untersuchungen iiber Heinrich von Veldeke; see Zeit- schrift fiir deutsche Philologie, iv. p. 279 sqqg. Braune has conclu- sively shown that Heinrich von Veldeke never tried to write German (although he wrote for German readers), as had generally been sup- posed before, but simply wrote in his familiar Netherlands dialect.

4 See especially H. Paul, Gab es eine mittelhochdeutsche Schrift- sprache? Halle, 1873. Paul seems, however, to go too far in denying the existence of some peculiarities of style pointed out by Lachmann and his followers,

lables already mentioned. As to the former there is only one exception, viz., the retaining of the termina- tion 7 (pronounced as Modern German & or French long w) for the nom. sing. fem. and the nom. and acc. plur. neutr. of the adjectives (dl:ndiu, while all other cases have the levelled ¢); and even this seems to be a speciality of Upper German, the corresponding Midland form being blinde as in Modern German. The unaccented e is frequently dropped in all dialects, especially in the south, where the dropping is almost regular after an 7 or / closing a short syllable, as in bern, steln, for beren, stelen, to bear, to steal; Old High German, beran, stelan. In the Midland dialects ¢ is often written for this e, thus berin, stelin. The accented vowels of the root syllables are greatly changed in this period by the ‘ Umlaut,” or

mutation of sounds, being an assimilation of these vowels to an zor y originally following. Thus a, a, 0, 6, u, %, wo are changed to e, , % or 6, , ui, cu (long %), tie, as may be seen in the following instances :—hant, hand, pl. hende,; rat, council, pl. recte ; golt, gold, giildin, golden, or mohte, I might, subj. mohte ; gréz, great, groze, size; kus, a kiss, kiissen, to kiss ; mis, mouse, pl. miuse; guot, good, giiete, goodness, The Umlaut, however, is not always expressed in the spelling of the manuscripts, though it must have existed in the living language. Of the diphthongs, zz has been changed into long z, but the old spelling is often retained in the MSS. (liute, modern Leute, Old High German Jiwtz, people). As to the consonants, the ¢h sound had nearly disappeared at the beginning of the period, and was lost entirely in its course ; sk has passed into the sk sound, written sch as in Modern German. Spelling in general is simpler, and in some points more rigidly phonetic than in Old German. Final voiced consonants, as 5, d, g, are generally changed into the corresponding voiceless sounds, as y, ¢, c (in High German grap, grave, gen. grabes, pfat, path, gen. pfades, tac, day, gen. dages; in Low German graf graves, pat pades, dach dages). position, as in Old German (bal, ball, gen. balles). The use of the letter v has greatly increased; in High German it means simply /, and is therefore quite superfluous ; in Low German its pronunciation is f at the beginning of words, while in the middle of words it has the same sound as English v.

The leading dialects of the period are those of Old Ger-

man, the most noteworthy difference being the accession of –

the dialects of the kingdom of Saxony (Obersdchsisch, or Upper Saxon) and Silesia to the midland dialects, and those of some eastern provinces of Prussia (Viedersdichsisch, or Low Saxon) to Low German, in consequence of the Ger- man colonization of these countries. Low German, to begin with, has retained the phonetic structure of its con. sonantal system unaltered, except by the loss of the zh sound. The spelling of the vowel system is very imperfect. Umlaut is not expressed in the older manuscripts, except in the case of a ande. A long e corresponds to both High German e and ze, a long o to High German ow, 6u, and wo, tie, the only diphthong generally admitted being ow before a W, a8 in howwen, to hew. The pronunciation of é and 6 must, however, in these cases have been different

according to their etymological values, for all the High German sounds men- tioned above are distinctly kept asunder in the modern Low German dialects, and e/ and uw or @ are often written for é and 6 where they stand for High German ez and wo or tie, but never otherwise. Itis most likely, judging from the present state of things, that open e, o were the equivalents for High German ¢, ou, du, while close e, 0 corresponded to High German ze, wo, we. The prefix geis dropped, as in English and in the Scandinavian languages (thus ort, birth, High German geburt). But the most remarkable fact in the his- tory of Low German sounds is the restoration of nd or nn

Double consonants are simplified in the same.

ol9

for th after a dropped nasal sound (see above, p. 516), as in ander or anner, other, for Old Saxon éthar, or in munt, mouth, for Old Saxon mth. This transition cannot be explained by any phonetic laws, but must necessarily be ascribed to High German influence. As to the inflexional system, a similar influence seems to have introduced the High German terminations of the plural of verbs (wi geven, ge gevet, se geven we, you, they give). The Old Saxon -s in the nominative plural has been dropped, as in High German. The following lines quoted from the municipal laws of the town of Hamburg (written 1270) may be taken as a fair specimen of 13th-century Low German :—“ Dat nement syn erue verkopen schal, he ne bede id erst synen negesten. So we syn erue vorkopen wil, dat bynnen desser stad vnde bynnen dessem wicbelde belegen is, de schal id bedeu twen synen negesten vrunden, dar syn erue vp vallen mach, vnde wil it erer nen kopen, so mot he-syn erue wol vorkopen deme de eme dar vmme allermest geuen wil.” ‘That nobody shall sell his inheritance, unless he offer it first to his nearest (relations), Whosoever is willing to sell his inheritance, that is situated within this town and within these precincts, shall offer it to two his nearest friends (relations), to whom his inheritance may fall, and if neither of them is willing to buy it, he must (may) well sell his inheritance to him who is willing to give him most for it.”

The differences of the main dialects of High German are

not very striking during the first stage of this period. Alemannian is best characterized by its rigidly keeping its original vowel qualities, some of the modern Swiss dialects showing exactly the same system as about 1200. Swabian is easily discovered by its frequent use of aw for d, as in gaun, to go, for gan. A very important change of vowel qualities is found to have taken place, at a very early time, in the Bavarian dialect. While ze, wo, aie were preserved as in Alemannian, ez, ow, du were changed into i (or ai), au, eu (or au), and three new diphthongs, ei, ow, ew, sprang up from the long vowels , , iw (%). In the Midland dialects again, ez, ow, and 2, , & were kept, as in Alemannian (although « is generally not distinguished from ~ in writing, as in most Midland manuscripts no special signs for the Umlaut vowels are used, except ¢), but ce, wo, die were contracted to simple 2, @ (uw), differing from the old 2, a, cw only in their open quality. The system of these changes may be illustrated by the following list :—
Alemann. diep guot siieze | min his miuse | stein boum froude Bavarian diep guot siieze | mein hous meuse | stain paum freude Midland dip git size | min his mise | stein boum freude Low Ger, déf god sdte | min his mise | stén bom froude English thief good sweet | mine housemice | stone beam (joy)

As to the consonants, Alemannian and Bavarian still clung to the use of ch or keh for ordinary k, as chomen, for komen, to come. J initial for is especially Bavarian, and was rather more frequent in the 14th and 15th centuries than before ; w initial isoften expressed by } in Bavarian manuscripts since the 13th century ; thus we find pazdew, both, for beidiu or perdiu in Alemannian, or beide in the Midland dialects, and bewp, wife, or even zbaz, two, for ordinary wip, zwei; k initial for ordinary g went altogether out of use. In Midland orthography the two sounds of Old High German 2, viz. ts and ss, were expressed by cz or zc, and z or zz respectively. The following specimens of the language of this period are taken from the Schwabenspiegel, or Swabian Law, for Alemannian (13th century); the Spiegel deutscher Leute, or Mirror of German People, for Bavarian (14th century) ; and a Midland version of the Sachsenspiegel, or Saxon Law ! :—

1 The editions whence the extracts are taken are—for the Schwabenspiegel, that of Lassberg, Tiibingen, 1840, p. 5; for the Spiegee deutscher

Leute, that of J. Ficker, Innsbruck, 1859, p. 35; and for the Sachsenspiegel, that of Hildebrand, Leipsic, 1870, p. 3.

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Schwabenspicgel. Dem pabest ist ge- sctzet in bescheiden- licher zit ze rihten vf einem blanchen pherde, vnd der cheiser sol dem pabest den stegreif haben, daz sich der satel nit entwinde. Daz be- zeichent daz, swaz dem pabest widerste des er mit geistlichem gerihte niht betwin- gen mac; daz sol der cheiser vnd ander weltliche rihter be- twingen mit der ehte,

Sp. deutscher Leute.

Dem babstist gesetzet ze richten ze beschai- dener zeit auf einen blanchem rosse, vnd der chaiser sol im den stegraif haben durch daz sich der satel icht entwende. Ditz ist dev beschaidenunge: swaz dem babest widerste, daz er mit geistleichem gerichte nicht betwingen mie, daz sol der chaiser vnd ander wertleich richter mit der echte betwingen vnd das geistleich sol

GE RW AGN ®

Sachscnspiegel. Deme babste ist ouch gesaczt zu ritene zu bescheidener zcit uf eime blanken pferde, und der keiscr sal im den stegereif halden, durch daz der satel nicht enwinde. Daz ist die bezcechenunge: swaz deme babste widerste, des her nicht mit geistlichem gerichte getwingen mag, daz ez der keiser mit werltlichem ge- richte twinge deme babste gehorsam zu wesene.

twingen mit dem panne.

“To the pope it is set (ordained) that he shall judge at a certain time,(sitting) on a white horse, and the emperor shall hold the stirrup to the pope, that the saddle may not slide off. This means that whatsoever resists the pope, so that he cannot overcome it with spiritual censure, the em- peror and other secular judges shall overcome with the pro- scription, (and the spiritual [court] shall exercise discipline with the ban).”

In the 14th and 15th centuries the development of the dialects rapidly advanced. The greatest changes were those occurring in the vowel system.

The new diphthongs et, ou, eu, for older 7, %, iw, which had originated in the south- eastern parts of the Bavarian district gradually spread to the north and west; even some of the South Midland dialects, as Bohemian and Silesian, began to partake of this change, while the north Midland dialects and Alemannian remained unaltered. Short root syllables ending in a single consonant began to be lengthened in almost all dialects, as geben, némen, for gében, némen, to give, to take. Unac- cented e was dropped in the southern dialects, especially in Bavarian, to the utmost extent possible. Such forms as pscheech, gtorst, keert, for beschache, happened (subj.), getorste, I durst, gehret, heard (part.), began to be quite familiar. Even before a final / or nasal sound e was now and then dropped in Bavarian, as in gebm for geben, to give, gegnt for gegende country, which are exactly the forms still used in our time. Midland and Low German dialects continued to be much more conservative in all these respects. In the consonantal system we have to mention the loss of the z sound in all dialects, where it wasa simple spirant (not ¢s) ; although the letter 2 was still often preserved in spelling, it was frequently confounded with s in the rhymes, a thing which never occurred in the earlier centuries. Alemannian is chiefly distinguished by its constant change of sm, sn, sl, sw, sp, st into schm, schn, schl, schw, schp, scht, as in schmat, smith, schne, snow, schlahen, to slay, schwimmen, to swim, geschprochen, spoken, geischtlich, “ghostly,” spiritual. Late Bavarian favours such spellings as chrankch, pekch, for krank, becke, Spelling in general was much neglected, although it was not quite so bad as often in the 16th cen- tury, when there was a strong tendency towards crowding as many letters into a word as possible.

While the 15th century was thus marked by great diver- gencies. of the spoken dialects, important steps towards gaining a greater uniformity of literary speech were made in the same period by the invention of the art of printing, and by the development of certain Kanzleisprachen, or lite- rary idioms of the imperial and other chanceries. There is no need to explain how the habit of reading books printed in dialects not familiar to the reader must have obliged the learned public of the time to acquire a certain amount of knowledge of dialects in general, and must have made them better aware of the peculiarities of their own idioms than

was either necessary or possible at the time when manu- scripts written expressly in the local dialects of the readers were the only means of conveying literary information. Besides, writers as well as printers must soon have found it profitable to publish their works in a language readily understood by readers in all parts of the country. Tlic principal work, however, was done in Germauy by the chanceries. Among these the imperial chancery naturally held the most prominent position; and, inasmuch as its public acts were addressed to readers of all dialects exist- ing throughout the empire, it obviously had also the greatest interest in calling into existence a general idiom. In thie 14th century no difference between the language of the imperial chancery and the local idioms of the particular emperors was yet visible! The public Acts of Louis of Bavaria (1314-1347) were written in the Bavarian dialect. The succession of Charles IV. (1347-1378) was accompanied by the introduction of the Bohemian dialect into the imperial charters, This dialect, as was natural from its local position, was neither purely Southern nor purely

Midland. £2, ou, ew for 7, %, 7w were frequently adopted

from the Southern dialects, but ch for & and p for 6 were generally rejected; unaccented vowels were preserved to about the same extentasin Midland German. In the reign of Wenceslaus of Bohemia (1378-1400) the same state of things was maintained; but in the charters of Rupert, the elector palatine (1400-1410), we find the Midland dialect of the Palatinate. Sigismund (1410-1437) reintroduced the Bohemian dialect, which by this time had, with the excep- tion of a very short period, prevailed for nearly a hundred years in the imperial chancery. It was therefore but nat- ural that Duke Frederick of Austria should exchange the Austrian dialect of his ducal chancery (which abounded with kch, kh, kg for k, and p for b) for the Bohemian chancery dialect of his predecessors, when he succeeded to the imperial throne (1470-1493). His example was followed by Maximilian (1493-1519), but only so far as public Acts were concerned. In charters destined for local Austrian use as well as in his private correspondence he always kept his vernacular Austrian dialect, showing thus that no change of the spoken idioms had been caused as yet by the introduction of the new artificial language. In the same manner and at the same time the Midland dialect of the electoral chancery of Saxony came to be better adapted for

general use by the adoption of the Southern et, ou, ew for 7, u, iu, and the abolition of several prominent Midland peculiarities.

Modern High German.—tIn the preceding paragraph we have tried to give a short sketch of the origin of literary Modern High German ; and it is this very idiom of the imperial and Saxon chanceries that Luther made afterwards popular by his translation of the Bible and his numerous other writings. We may quote his own words in confir- mation :—

“Ich habe keine gewisse, sonderliche, eigne sprache im deutschen, sondern brauche der gemeinen deutschen sprache, das mich beide Ober- und Niederlinder verstehen mogen. Ich rede nach der sech-

sischen cantzlei, welcher nachfolgen alle fiirsten vnd konige in Deutschland; Alle reichsstedte, fiirstenhofe schreiben nach der

sechsischen vnd vnsers fiirsten cantzcley. Darumb ists auch die gemeinste deutsche sprache. Kaiser Maximilian vnd churfurst Friderich, hertzog von Sachsen, haben im rémischen reiche dic

deutschen sprachen also in eine gewisse sprach zusammengezogen.’*

Luther’s language, again, was soon acknowledged by Ger- man grammarians, as Sebastian Franck (1531) and Johannes Clajus (1578),and was accordingly imitated, as the nearer

1 The particulars which follow are chiefly taken from an able sketch by Dr E. Wiilcker, Die Entstehung der kursichsischen Kanzleisprache. See Zeitschrift des Vereins fir thivringische Geschichte, ix. p. 349.

2 Tischreden, ch. 69. Dr Wiilcker assigns these words to the year

1545.

best pattern of High German. It is true that in the 16th century many writers, especially in Switzerland and Lower

Germany, still clung with great pertinacity to’their native

dialects. But about 1600 Luther’s language was fully

established as the only idiom of literary intercourse through~

out Germany.!| The changes the language has undergone since Luther’s time mostly concern the inflexional system. In the strong verbs the differences between the singular and plural and the indicative and subjunctive of the past have been levelled in the course of time; thus, ¢ch fand, wir fan- den, I, we found, ~~subj. ch faénde, or ich schnitt, wir schnatten, I, we cut, for ich fand, wir funden, ich Stinde, or ech schnert, wir schnitten. At present the verb werden, to become, is the only specimen left of the old regular inflex~~ ion :—ich ward, wir wurden, ich wiirde; but even here a new irregular form, ich wurde, has come into useand almost superseded the more archaic ich ward, which is now chiefly confined to poetry. place besides, as in webe, wob, gewoben, weave, wove, woven, for Middle High German wide, wap, geweben, so that the old system of “Ablaut,” or vowel change in the root syllables of the strong verbs has often become quite indis- tinct. A great number of verbs have passed from the strong inflexion to the weak, and wice versa. The declension of substantives has also been greatly altered. Umlaut is now regularly used as a plural sign with most monosyllabic and many dissyllabic masculine words, as in baum, béwme, or nagel, nigel, for Middle High German bowm, bowme, and nagel, nagele; originally it was confined to a much smaller number of words (¢-stems, as gast, gdste, Middle High Ger- man gast, geste). Other masculine words have adopted the plural ~~er, together with Umlaut of the root syllables, from the neuter declension, as mann, manner, geist, gevster, besides frequent exchanges between the strong and weak declen~~ sions, which cannot be specified here, The strong and the weak declension of feminine words originally ending in ¢ have been melted together, one form (ending in e or a consonant) being used for all singular, and one (ending in en or m after a consonant) for all plural cases, as gabe, guben, zahl, zahlen, zunge, zwngen, for Middle High German gabe, gabe, gen. and dat. gaben; zal, zal, gen. and dat. zaln; zunge, gen, dat. and acc. zungen, pl. zwngen through.

out. As to phonology, no change of vowel quality is noticeable ~~in literary German. Modern High German still has the Midland sounds 7 (often spelt ze), a, a, for Southern ze, wo, tie, as well as the Bavarian diphthongs ez, au, eu (du), for the older sounds 7, 7, iu, the latter not being distinguished either in spelling or in educated pro~~ nunciation from the older diphthongs ez, ou, 6u. We have thus zwed, dre', baum, haus, freude, héiuser, leute for Middle High German zwei, dri, boum, his, vriude, hiuser, liute. Change of vowel quantity is the most prominent phonetic feature of Modern High German when compared with the earlier stages of the language. All root-syllables ending formerly in a short vowel followed by a simple consanant have now become long, either by lengthening the vowel or by doubling the consonant, thus tdg, tage, sal, béte, or gott, gottes, blatt, blatter, for Middle High German tdg (or tdc), tdge, sil, bote, got, gotes, bldt, bléter. The rules for dropping unaccented vowels have often been changed accordingly, It must not be forgotten, however, that all these rules are only applicable to the literary idiom ; the dialects, and even those of the educated people, often differ very materially from the rules laid down above. There is, indeed, no such thing as a generally recognized standard pronunciation of German, except perhaps on the stage, which no doubt has exercised and still exercises a certain influence on the cur- ee ee a

1 For fuller particulars readers are referred to H. Riickert, Geschichte der nevhochdeutschen Schriftsprache, 2 vols:, Leipsic, 1875,

Many other vowel changes have taken |

a2. rent opinions as to how one ought to pronounce, but has not been powerful enough to abolish all dialectal peculi-

arities in the case of even the highest classes. Only a very few general rules can be given. Englishmen will do well

'to pronounce the vowels as in Italian: e%and 6 aré rounded

or labialized 7 and e sounds, formed by pouting the lips while trying to pronouuce 7 or e. Long vowels are always pronounced simple, never as

diphthongs (which is fre-. quently the case in English, especially with a and 0). Un- accented e is invariably dropped in the terminations ¢/, en, the real pronunciation of such words as handel, bitten, loppen, haben, nehmen being hand, bittn, lippn or lippm, habn or habm, ném (with a lengthened .m).2 Among the peculiarities of the consonantal system we may mention the: sound of ch (in two distinct varieties asin ach.and ich), the z, which is a combination of ¢ and s, and the r, which ought to be trilled with the tip of the tongue, but is often pronounced as a uvular or guttural sound. initial is generally sounded like the English z,in stage pronunciation, but not usually elsewhere ; s¢ and sp initial are never pro- nounced on the stage like English s¢ or sp, but are always sht, shp, a8 in stein, spiel, pronounced (to use English spelling) as shtine, shpeel. ‘he English w ought to be avoided, The German w sound is more like English », but somewhat softer; in Midland pronunciation a sound intermediate between English w and v takes jts place. German ¥ is simply 2 The varieties of the German dialects of the present are

too numerous to be described here. It may suffice to state that the old divisions of Low German, Midland, and Upper German dialects are still applicable. Among the first, tha Western or Westphalian dialects are distinctly marked by the pronunciation of g initial as a. gh, or voiced ch (sametimes even voiceless), and the use of numerous diphthongs, both long and short, instead of simple vowels. The principal sub. divisions of Midland German are the Lower Rhenish or Middle Frankish dialect (including the German dialects of Transylvania), South-Western and Easternor High Frankish, Hessian, Thuringian, Saxon, and Silesian, Alemannian is divided intothe three main groupsof Swabian, Alsatian, and Swiss, while Bavarian is constituted by several subdialects. spoken in Bavaria and Austria, The study of these dia- lects hag been carried on in Germany for a considerable: time,* but not always very successfully, especially so far as phonology is concerned ; for many observers, while well- trained in all the disciplines of the older school of philology, have been totally ignorant of the simplest laws of phonetics. . It is only within the last few years that the value af phonetic studies (although they began in German researches) has been duly recognized in the country of their origin, and dialectology has not hitherto gained much by the more theoretical study of general phonetics. Some excellent beginnings indeed have been made, among which Dr Win-: teler’s

book on his native Swiss dialect holds by far the foremost rank ;° butit is probable that a long time must yet elapse before Germany can possess go well trained and inde- pendent a school of phonetists as that. which already exists in England headed by Mr A. Melville Bell and Mr Alex- ander J. Ellis. Not till then, however, ¢an a real history of the German language be written, (E. SI.)

® Foreigners are easily detected by their generally inserting a real vowel-sound before the j, x.

3 For more accurate descriptions of the German so Slevers, Grundziige der Lautphystologie, Leipsic, 1876. 4

4 A very full list of books referring to German dialectology has' ng given by C. H. Herrmann, Bibliotheca Germanica, Halle, 1878,. . sqq. : ' Og Winteler, Die Kerenzer Mundart des Kantons Glarus, Leipsic, 1876. This is indeed the only work that can be justly compared with, Dr J. A. H. Murray's Dialect of the Southern Counties of Scotland, published in 1873. : x 66 : se

unds see E. A

2

Ancient poetry.

Opposi- tion of the clergy.

Pagan litera- ture.

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PART IV.—LITERATURE.

There is a deep vein of poetry in the Teutonic nature, and it appears to have revealed itself in the earliest ages. According to Tacitus, the Germans of his time had ancient songs relating to the god Tuisco, his son Mannus, and the three forefathers uf the Teutonic race. They had also poems in honour of Arminius, the original subject of which was probably the god Irmin, whose

pillar Charles the Great overthrew long afterwards in his first campaign against the Saxons. A song called “ barditus,” celebrating the greatness of the war-god whom Tacitus calls Hercules, was sung or chanted by the freemen as they advanced to battle. The name “barditus” led some ingenious writers of the 18th century to speculate respecting an order of bards among the ancient Germans ; but there is no evidence that any such order existed. “ Barditus” meant in the first instance a shield, and was transferred to the song because, while the singing went on, the shield was held to the mouth to make the sound more terrible. It is the opinion of many critics that the stories of “Reynard the Fox” and “Isengrim the Wolf” may be traced back to these remote times. If so, the probability is that they were brought by the Teutons from Asia, and were originally common to the Aryan family. There is every reason to believe that some elements of the Nibelungenlied belong to the prehistoric age. The legend of Siegfried has all the marks of extreme antiquity, and it seems to have had at first a purely mythological character. Of the rhythm in which these primitive conceptions were embodied we have no certain knowledge ; but as the most ancient poems which have been preserved are in alliterative verse, it is reasonable to assume that this had grown up long before writing came into use.

I. The Early Middle Age.—When the German tribes be- gan to accept Christianity the clergy everywhere opposed thie native poetry, and strove to replace its rude conceptions by the milder images of the gospel. Among the Goths of the 4th century Bishop Ulfilas took the most effectual means of achieving his purpose by preparing a clear, faithful, and simple rendering of the Scriptures,—a translation which has been of inestimable value in the scientific study of the Teutonic languages. No clergyman of like genius arose in Germany itself; but there, too, pagan compositions were steadily discouraged. Charles the Great was the first to check this hostile movement. He showed his love of his native speech, not only by beginning to put together a German grammar, but by issuing orders for a collection of old German poetry. Louis the Pious had little sym- pathy with the taste of his father, but he could not efface the impression produced by the great emperor. Many of the clergy ceased to dislike that which so mighty a friend of the church had approved, and in some monasteries there were ardent collectors of ancient epic fragments and ballads.

These treasures of Old High and Low German literature are nearly all lost, but from the small portions which have come down to us, and from hints in Latin chronicles, we can at least make out the themes with which many of them dealt. Ermanrick, or Ermanaricus, the famous Gothic king of the Ath century, was the subject of a large number of poetical legends. Siegfried continued to be a great epic hero, and from about the 7th century he appears to have been no longer treated as superhuman. The legend of the over-throw of the Burgundian king, Gundicarius or Giinther, by Attila assumed many forms, and was at a later time connected with the story of Siegfried. Around the name of Theodoric the East Goth, as Dieterich, several legends soon grouped themselves; and from about the 9th century he was associated with Attila, with whom

in history he had nothing to do.

subjects are of subordinate importance and interest. The ratives early in the 9th century, and is in a mixed dialect,

turning from the wars carried on by his lord, is compelled to fight his own son ; but we are left in uncertainty whether father or son is conqueror.

been a favourite at the court of Charles the Bald. There is also an Old High German ballad celebrating the reconcilia- tion of Otto I. with his brother Henry ; and similar ballads are known to have kept up the fame of Duke Ernest of Swabia,

heroes. Walter of Aquitania, who flies with his bride from

Unfortunately, the frag- ments which have been preserved—all of which are alliterative—do not treat of these supreme heroes ; their

Hildebrandslied, which was written from traditional nar-

introduces us to a follower of Dieterich. Hildebrand, re-

The Ludwigslied is a ballad of the latter part of the 9th century, written im honour of a victory gained over the Northmen by Louis III., the West-Frankish king. The author was probably a monk who had

who rebelled against Conrad II., and of many other popular

the court of Attila, and at Worms fights King Giinther and his warriors, is the hero of a Latin poem of the 10th cen- tury, written by a mouk of St Gall, whose materials were evidently taken from a more vigorous German original. The Merseburger Gedichte, two songs of enchantment, were written in the 10th century, but must have come down from a much more remote period. They are chiefly interesting for the light they throw upon the religious beliefs and customs of ancient Germany.

The old ballads, which were intended to be sung as well Min- as recited, were handed down from generation to generation, Strels. and necessarily underwent many changes. They were pre- served from an early period in the memory of the people by professional minstrels, who were held in considerable honour in the time of Charles the Great, but were after- wards rather tolerated than encouraged by the higher classes. Many of them were blind men, and in their soli- tary wanderings the ancient stories must often have assumed | in their minds new shapes. They usually accompanied their singing with the zither or the harp.

Of the works with which the church sought to counter- Religious — act pagan influences very few remain. The most import- Poetty. ant is Heliand, a Low German poem in alliterative verse

said to have been written by a Saxon at the request of

Louis the Pious. It is a narrative of the life of Christ,

and follows closely the Four Gospels, whose separate accounts it attempts to harmonize. The author has con- siderable force and freedom of expression, and seems to

have been so absorbed in the grandeur of his theme as

to have deliberately rejected rhetorical ornament. The so-called Krist of Otfrid, a High German poet, who dedicated his work to Louis the German, has the same | subject, but is not nearly so effective. It is the first

rhymed German poem, and the necessities of rhyme ofteu | compel Otfrid to fill out his line with words and phrases

which obscure his meaning. His lyrical passages are too

didactic to rank as genuine poetry. The fragment of Muspilli, a Bavarian poem of the 9th century on the Last Judgment, indicates power of a much higher order. Its

form is alliterative; and reminiscences of paganism are strangely mingled with its Christian ideas.

During the reigns of Charles the Great and Louis the Monastic Pious secular learning was zealously cultivated in the learning, monasteries of Germany as well as in those of other por- tions of the Frankish empire. The school established by Hrabanus Maurus in the famous abbey of Fulda vied with that of Tours, where Hrabanus had been a pupil |

of Alcuin, in the excellence of its teaching. In the wars with the Northmen, with the Magyars, and witli the Slavs under the latcr Carolingian kings, many of the ecclesiastical institutions were destroyed ; but they sprang up again under the protection of Henry I. From the time of his son Otto I. the Germans stood in direct relation with Italy ; the marriage of Otto II. with the princess Theo- phano brought them into connexion with the learning and refinement of the Byzantine court ; and Gerbert, the friend of Otto III., afterwards Pope Silvester II., introduced them to some of the achievements of Arabian science. These influences quickened the energies of enlightened church- men, and originated an intellectual movement which to some extent continued during the vigorous reigns of the first two Franconian sovereigns, Conrad II. and Henry ITI. The chief subject of study was the scholastic philosophy, to which, however, in its earlier stages, Germany made no supremely important contribution. The Neo-Platonic ten- dencies of Scotus

Erigena were opposed by Hrabanus Maurus, who remained loyal to Aristotle and Boetius ; and his example was generally followed, not only by his successorsin Fulda, but by the members of all other German schools. The school of St Gall was exceptionally active, and one of the monks, Notker Labeo, who died in 1022, wrote some original philosophical books, and translated into German the De Consolatione of Boetius and two of Aristotle's works. In pure literature very little was done ; but there are several well-written Latin histories belonging to the 11th century. The best thought of the age was manifested in its Romanesque architecture, and in the then subordinate arts of painting, sculpture, and music.

Il. The Age of Chivalry.—The reign of Henry IV., dur- ing which the struggle between the empire and the papacy began, had a disastrous effect on the national culture; and the evil was not remedied under the disturbed rule of his two immediate successors. But under the Holienstaufen dynasty, during the period of Middle High German, the country passed through one of the greatest epoclis of its literature. The more learned of the clergy interested them- selves deeply in the development of scholasticism through the nominalists and the realists; and in the 13th century Albertus Magnus, a native of Swabia, produced the first systematic exposition of Aristotle, in the full light of Arabian research. It was, however, in poetry that Ger- many achieved the highest distinction; and her most important poets were members of the knightly class, which at this time rose to its utmost power and fame. There were many reasons why the members of this class became sensitive to the higher influences of the imagination, In the first place, they had the elevating consciousness of a life shared with a vast community which set before itself the loftiest aims. Historians sometimes take a malicious pleasure in contrasting the mean performance of many knights with their high vows; but these vows at auy rate introduced into the life of rough nobles an ideal element, and inclined them to take interest in the gentler and nobler aspects of existence. In the Italian wars of Frederick Bar- barossa the German knights saw more than they had ever before done of Southern civilization, and their minds were continually stimulated by the varying fortunes of their adventurous emperor. Of still greater importance was the influence of the crusades, in which the Germans first took an active part under Frederick's predecessor, Conrad ITI. The crusaders had a remote and unselfish aim, connected with all that was most sacred and most tender

in their religious ideas ; and this alone would have created a senti- ment favourable to poetic aspiration. But, besides this, the far-off Eastern lands, with their strange peoples and mystical associations, awoke dreams which could not have other than harmonious utterance, and on the return of the

warriors they stirred the fancy of their friends with reports of a newand greater world. While the crusades lasted,the knights were forced into intimate acquaintance with the clergy, whose refined cujture inevitably to some extent softened their rudeness; they also formed friendships with representatives of French chivalry. In France the works of the troubadours and the trouvéres formed one of the most prominent elements of the national life, and the French nobles did not forget in Palestine the songs and romances of their home. The better minds in the German armies caught the inspiration, and longed to distinguish themselves by like achievements. And their desire was deepened when, by the acquisition of the Free County of Burgundy, Frederick Barbarossa opened a new pathway by which intellectual influcnces might pass from the western to the eastern bank of the Rhine.

The poetic impulse which thus entered Germany affected a wide circle; the highest princes as well as the humblest knights felt its power. Even the emperor Henry VI. him- self is said to have been moved by the prevailing feeling, and to have composed verses. At the impcrial and princely courts poets were encouraged to give expression to their genius ; and the ladies whose beauty and virtues they de- lighted to praise stimulated their endeavours by marked appreciation. Thus the national imagination found in the whole temper of the age an atmosphere well adapted to the blooming of its first spring-time.

The most characteristic outcome of this active era is tlie Poetical series of poetical romances produced in the 12th and 13th romances.

centuries, The German poets might have found magni- ficent material in their old, native legends; but for the most part they preferred subjects which

had already been artistically wrought by the trouveres, whose methods and style they also closely imitated. Among the themes they selected may be mentioned the legends of Alexander the Great, of Charles the Great and his paladins, of Arthur and the knights of the Round Table, with the allied legend of the Holy Grail. The fortunes of Tris- tram and Iseult also exercised a powerful charm over many minds. These and all other chosen subjects were treated wholly in the spirit of chivalry. The poets of the Middle Age had no idea of being true to the characteristics of a particular epoch; their own time was the only one they attempted to understand. Ancient heroes became in their hands medizval knights; men who had died long before the rise of Christianity were transformed into devoted ser- vants of the Church. Andin every romance the supreme aim was to present an idealized picture of the virtues of knighthood.

One of those who prepared the way for the chief romance- Romance writers was Conrad, a priest in the service of Henry the writers.

Proud, who, before 1139, composed the Rolandslied, setting forth, in imitation of the French Chanson de Holand, the overthrow of Roland, the favourite paladin of Charles the Great, in the pass of Roncesvalles. He was followed by another priest, Lamprecht, who, also working upon a French original, relates in the Alewanderlied the deeds of the Macedonian hero. Greater than either of these was Heinrich von Veldeke, the first of the poets who may claim to rank as German trouvéres. His great work was the Hneit, written beween 1175 and 1190. It is not only in armour and in dress that Virgil’s characters are here changed ; in thought and feeling they are recreated. The language of the poem is so carefully chosen, and the incidents are narrated with so much spirit, that it is still possible to understand

the immense popularity it once enjoyed. Hurtmann von Hart- d mann

von Aue.

Aue, in Der Arme ifeinrich and other poems, selecte themes that are extremely repulsive to modern feeling; but he was endowed with genuinely plastic force, and interests us by touching certain mystical aspects of medizval senti-

Wolfram von Eschen- bach.

Gottfried of Stras-

burg.

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ment, The master in whom these aspects were most fully represented was Wolfram von Eschenbach, a member of a noble family of Franconia, who was born during the reign of Frederick Barbarossa and died during that of his grand- son, Frederick II. He was one of a group of poets who established themselves at the Wartburg, the court of the brilliant landgrave Hermann of Thuringia ; and his chief poem, Parzival, was composed there towards the end of the 12th century. Germany did not produce during the Middle Ages a more truly poetic mind, and it is curious to observe how exactly he anticipated some of the qualities for which she long afterwards became famous. He has all the dreaminess, the sentiment, the passion for the ideal, which

are, or rather at one time were, her most attractive charac- |

teristics. The hero, trained by his mother amid circum- stances of idyllic simplicity, suddenly passes into a world of movement and adventure, and he is brought by accident to the gorgeous palace of the Holy Grail, of whose kingdom he ultimately becomes lord. The object of the poem is

evidently to depict the strivings of a restless but noble –

spirit, dissatisfied with passing pleasure, having always be- fore it a high and spotless aim. It is difficult for modern readers to detect the spiritual significance of many of the scenes; the poet seems to escape from us into a far-off region, whence his words reach us rather as dim echoes than as clear, ringing sounds. And some of tlie descriptions are in themselves tedious and superfluous, while advance from one stage of the tale to another apparently proceeds accord- ing to the arbitrary whim of the moment. Nevertheless,

the character of Parzival is a true conception of genius, and

enables us to understand, better than any other imaginative creation of medizval Germany, that discontent with life as it is, that sense of being haunted by visions of spiritual loveliness, which, throughout the Middle Ages, existed side: by side with unrestrained delight in the out- ward world,

Eschenbach is found in Gottfried of Strasburg, the greatest of his literary contemporaries. These two men are repre-

‘sentatives of a distinction which incessantly recurs,—that

between the poet who fashions spirits of a finer mould than those we actually know, and the poet who contents himself

with penetrating into the innermost recesses of existing.

character. Gottfried’s theme is Tristram and Iseult ; and the charming tale, which unfortunately he did not live to carry to the end, was perhaps never more beautifully told.

There are no mystic longings in the men and women he

presents tous: they love the earth and the sky, with their

gorgeous colours, graceful forms, and happy sounds ; they care not to inquire what may lie behind these, or whether |

in the scheme of things there is a place for moral law. Few poets have set forth so powerfully the fascination of youthful passion. In his glowing pictures we find no shadowy figures like those of Wolfram, with step so light that they appear to be the figures of a dream; his images are clear, sharply cut, like those of the world from which they are taken. And although psychological analysis was

unknown to‘ him, the actions of his characters display keen

insight into the secrets of human hearts when entangled in the most confused meshes. :

Medizeval romance bore its richest fruit in the works of these two great poets ; and most of their successors imitated one or other of them. (steps came nearest to a happy result, for Wolfram was one of those lonely and daring spirits in whose remote path it is given to few to tread without stumbling. The best known of Gottfried’s imitators was Conrad von Wiirzburg, who wrote on the Trojan war and many other subjects, and is considered one of the most artistic of medizeval writers,

GERMANY

A complete, almost a dramatic, contrast to Wolfram von |

Those who followed in Gottfried’s |

[LITERATURE,

signs of exhaustion, and romances began to make way for rough popular tales and rhymed chronicles.

Fortunately the poets of the age of chivalry did not all occupy themselves with the subjects of French romances, A few, whose names we do not know, turned towards the rich material in the metrical legends of their native land.

Of these poets the most important was he who collected and put into shape the ancient ballads which make up the

Nibelungenlied. How far he modified them we cannot Nibelung. tell. In the formin which we possess them, they probably enlied,

owe something of their force to his genius; but he needed rather to arrange and to curtail than to invent, and, although a genuine poet, he was not at all times competent for his

task. The work includes the legends of Siegfried, of

Gundicarius, or Giinther, king of Burgundy, of Dieterich, and of Attila; and the motives which bind them into a whole are the love and revenge of Kriemhild, the sister of Giinther and Siegfried's wife. She excites the envy of Brunhild, the Burgundian queen, whose friend, Hagen, one of Giintber's followers, discovers the vulnerable point in Siegfried's enchanted body, treacherously slays him, and buries in the Rhine the treasure he has long before con- quered from the race of the Nibelungen. There is then a pause of thirteen years, after which Kriemhild, the better to effect her fatal purpose, marries Attila, king of the Huns. Thirteen years having again passed, her thirst for vengeance is satiated by the slaying of the whole Burgundian court. The Germans justly regard this great epic as one of the most precious gems of their literature, It has little of the grace of courtly poetry} its characters are without subtlety or refinement ; we are throughout in the presence of vast elemental forces. ordinary vividness of imagination, and with a profound

The narrative begins with epic calmness, but swells into a

| torrent, and dashes vehemently forward, when the injured

queen makes a fearful return for her wrongs, and is herself swept away by the tragic powers she has called to her service. In the management of the story there are occa- sional traces of medizevalism ; but its spirit is that of a more primitive time, when the German tribes were breaking into the Roman empire, when passions were untamed by Christian influence, and when the necessities of a wander- ing and aggressive life knit closely the bonds that

united the chief to his followers. Deliberate villany hardly ap- pears in the poem; the most savage actions spring either from the unrestricted play of natural feeling, or from un- questioning fidelity to an acknowledged superior. Here and there we come upon touches which indicate that the poet who preserved the ancient legends was not incapable of appreciating finer effects than those at which he gene- rally aims, The sketch of the hospitable and chivalrous Riidiger, who receives the Burgundians on their way to the court of Attila, and afterwards dies while unwillingly fighting them in obedience to his queen's command, is not surpassed in the most artistic of the medizeval romances.

Gudrun is another epic in which a poet of this period 'gave form to several old legends. They had for centuries been current along the coasts of Friesland and Scandinavia, and.the society they represent is essentially the same as that of the Wibelungenlied,—a society in which the men are rude, warlike, and loyal, the women independent and faithful. Although full of serious episodes, Gudrun is as happy in its ending as the greater poem is tragic ; and we feel throughout that the beautiful Princess Gudrun of Seeland, whom the Northmen have carried from her home, and on whom the cruel Queen Gerlind heaps indignities, will at last be restored to King Herwig, her brave and passionate lover. The characters stand out

Towards the end of the 13th century the movement showed | clearly in their rough vigour ; and several happy strokes

But these forces are rendered with extra- .

feeling for what is sublime and awful in human destiny. .

Gudrun

MINNESANGER. |

call up a vision of the bleak coasts and changeful northern sea which are the scenes of their adventures.

In the 15th century a German writer brought together in a single volume which he called the Heldenbuch—the "Book of Heroes"—a number of old

legendary tales that must have been frequently on the lips of the people and of the wandering minstrels, while the knightly poets were singing of Tristram or of Arthur. This work, which was putly written by Kaspar von der Rhon, will not compare in imaginative force with its more famous rivals. The most powerful of the stories is probably the “Grosser Rosengarten,” in which a monk, Ilsan, displays a very unclerical, but truly Teutonic, passion for war.

The age of chivalry was remarkable. not only for its romances and epics but for its lyrics. All the leading writers of the time exercised themselves in lyrical poetry, and it was laboriously cultivated by multitudes who did not feel equal to the task of a prolonged effort. Among

time at the Wartburg, and was the friend of King Philip and Frederick II; he died on a little estate which the latter gave him in fief. Other Minnesinger lavished praise on generous princes ; Walther was of a more manly charac- ter, and seems always to have maintained an independent bearing. Besides the usual themes of the lyrical poetry of his time, he wrote with enthusiasm of his native land ; he also frequently alludes to the strife between the spiritual and secular powers, and sternly rebukes the ambition of the papacy. Beyond all his rivals he gives us the impres- sion of writing with ease and delight. The structure of his stanzas does not hamper the movement of his feeling ; it appears to provide the conditions of perfect freedom. Such a lyric as his Unter der Linden an der Heide, with its musical refrain Z’andaradez, although a master- piece of art, is exquisite in its childlike simplicity ; it has the unaffected grace of a flower, the spontaneity of a bird’s song.

those who gained more or less distinction may be named Heinrich von Morungen, Reinmar der Alte, and Gottfried von Neifeu, The poets of this class were known as

As the expression of all that was fantastic and ridiculous Ulrich in the age of chivalry, must be mentioned the /rauendienst von

of Ulrich von Lichtenstein, a work which was written about er

_, Walther | von der |, Vogel-

Minnesinger, because their favourite theme was Minne or love. They began by imitating the troubadours, whose metres they often reproduced when not penetrated by the emotion which originally found in these forms a genuine expression. Ata later stage it was considered a

point of honour for each poet to invent a stanza of his |

own, whether or not those already existing were appro- priate to his feeling. Thus many of the minne songs pro-

duce an impression of unreality and coldness, seeming at | best to be but clever pieces of handiwork. But when the |

utmost deduction has been made, it is surprising how much

of what was achieved by these ardent writers still appeals |

to us. The best among them strike notes which respond in every age to a master's touch; and they do it with a fine sense of beauty, a trained instinct for the appropriate- ness of words, and an evident delight both in simple and in subtle melody.

Perhaps no group of writers has ever had a deeper under- |

tone of sadness than is to be detected in the greatest of the minnesiinger.

ruption lurks behind the gayest forms and brightest colours.

But they caught with proportional eagerness the passing rap- ; ture, letting no drop escape from the cup that would soon fall :

from their grasp. This intensity of feeling is reproduced in their lays, yet it was purified and generalized as it passed from the fleeting reality to the permanent realm of art.

plays genuine elevation of sentiment. impassioned strains the loyalty of the vassal to his lord, the devotion of the Christian to his church. if they do

not exhibit the soaring spiritual ambition of Wolfram's ; Parzival, they have a kind of pathetic memory of a lost | paradise, a vague longing, by some distant difficult service, | in battle with the infidel, to attain to a world in which the | discords of the present life may be forgotten or harmonized. |

And behind all their images is the background of nature, whose loveliness they do not the less appreciate because they refrain from elaborately describing it. dwellers in dreary towers winter had often a cheerless and melancholy aspect ; but this made all the more enchanting the new life of spring. It is in bailing the returning warmth and colour of the young season that the minnesdnger attain their happiest triumphs.

Of all the minnesiinger the first place belongs without question to Walther von der Vogelweide, probably of Tyrol, whom Gottfricd of Strasburg praises as heartily as he slyly 'depreciates Wolfram von Eschenbach. Walther lived some

They had a vivid consciousness of the | evanescence of human pleasure, an abiding feeling that cor- |

Their treatment of love, although sometimes, accord- | ing to modern ideas, extravagant and fantastic, often dis- They sing also in |

To the:

the middle of the 13th century, and had a certain popu- larity in its time. It is an autobiography, with a number of lyrics interwoven to give variety and animation to the narrative. The solemn gravity with which the author relates the amazing tasks imposed upon him by his mistress shows how easily the worship of womanhood degenerated into almost incredible childishness. Ulrich is sometimcs compared to Don Quixote, but this is to do extreme in- justice to Cervantes's hero, Amid all his ilJusions the fictitious knight maintains a certain pathetic dignity; the knight of reality passes from absurdity to absurdity with- | out a touch of idealism to redeem his folly. And his lyrics

are the tasteless manufacture of a thoroughly prosaic spirit. °

Several of the minnesiinger, Walther von der Vogelweide Didactic especially, display at times a strongly didactic tendency, poets.

From the beginning of the period this tendency was developed by writers who took little interest in poetry for its own sake, and it became more and more prominent as the purely lyrical impulse passed away. The didactic poet, however significant his labours may be to his contempor- aries, has necessarily the stamp of commonplace for posterity; and the gnomic writers of the 13th century form no exception to this rule. But several of them have at least the interest that attaches to sincerity and earnest- ness. There is genuine enthusiasm for pure morality in the Welsche Gast of Thomasin Zerklar; and the Bescherden- heit of Freidank expresses so high a conception of duty, and expresses it so well, that the work was ascribed to Walther himself. Reinmar von Zweter and Heinrich Frauenlob came a little later, and they were followed by Hugo von Trimberg, whose Renner sets forth un- impeachable lessons in homely and satirical verses. A higher tone is perceptible in Der Winsbecke, a collection of sayings in which we find an echo of the reverence for noble women that marked the epoch at its dawn. Among didactic writings must be classed the well known Der Krieg auf der Wartburg (“ The Contest at the Wartburg”). It includes the verses supposed to have been sung at a tournament of poets attended by Heinrich von Ofterdingen, Walther von der Vogelweide, and Wolfram von Eschenbach.

As Latin continued to be the speech of scholars, and the passion for metrical expression pervaded the higher classes, there was not mucliscope for the growth of prose. Never- theless, it is in this age that we find the first serious attempts to secure for German prose a place in the national literature. The Sachsenspiegel and the Schwabenspiegel, two great collections of local laws, although of a scientific character, and mainly interesting because of their social importance, had considerable influence in encouraging the

Beginnings of prose.

Decline of chivalry.

Litera- ture in the cities.

respect of the Germans for their own language. The preachers, however, were the principal founders of prose style. Preaching became about the middle of the 13th century an agency of great power in the life of Germany. A number of the clergy, dissatisfied with the technicalities of scholasticism, and with the mere forms under which spiritual aspiration was often crushed, strove to attain to a fresh vision of religious truth, and to kindle their own enthusiasm in the minds of others. Of this generous band the most popular was Brother Berthold, a Franciscan monk, a man of a noble and commanding temper, and an orator of the highest rank. Love for the poor was his dominant motive, and he sometimes expressed it in language a modern socialist might envy. Having something of the imaginative glow of the minnesiinger, he gave such colour to his abstract teaching as made it at once intelligible and attractive. Of a less poetical nature than Berthold, Master Eckhart, the next early master of religious prose, was more deeply philosophical. Although familiar with the scholastic systems, he broke away from their method, and became the founder of the mystical school which was one of the most potent factors in preparing the way for the Reformation. Eckhart's reasonings are sometimes hard to follow, but he is not a confused thinker; his obscurity arises rather from the nature of his themes than from his mode of handling them. He occasionally tuuches profound depths in the spiritual nature of man, and it is refreshing to pass from the formal hairsplitting of the scholastic philosophers to the large conceptions of a mind which obeys its own laws and is evidently in direct contact with the problems it seeks to solve.

Ill. The Later Middle Age.—After the fall of the Hohenstaufen dynasty the age of chivalry in Germany virtually came to an end. The breaking up of the old duchies set free a large number of petty nobles from their allegiance to mediate lords; and as there was no longer a strong central authority, either to hold them in check or to provide them with such outlets for their energy as they had found in the crusades and in the imperial expeditions into Italy, nearly the whole class sank from the high level to which it had temporarily risen. Many knights became mere robbers, and thought themselves

honourably employed in taking part in the innumerable little wars which shattered the prosperity of the nation. Men of this kind were not very likely to inherit the free and poetic spirit of Walther von der Vogelweide. In the course of the 14th and 15th centuries attempts were still made by Wolkeustein, Muskatbliit, and other writers to imitate his style; but in their hands the lyre of the minnesinger gave forth only feeble or discordant notes. For a long time the princes were no more inclined to literature than the nobles; they were too much occupied with mutual jealousies, and with incessant attempts to shake themselves free of the crown, to give heed to anything so removed from practical interests as poetry.

It so happened that during this period the cities rose to a position of higher importance than they had ever before occupied. There was a while when it even seemed possible that by their leagues, and by alliance with those emperors who had insight enough to recognize their strength, they might become the preponderating element in the state. Driven from the castles of the princes and the towers of the nobles, literature took refuge in these young and growing centres of a vigorous life. Not one or two here and there, but multitudes of honest citizens, became possessed by the desire to distinguish themselves in the arts in which they had been so much surpassed by the nobles of a previous generation. Unfortunately, they had no literary training; they were not familiar with any great models; few of them had leisure

for the cultivation of style; and the character of their

daily employments was not such as to kindle thoughts that demand poetic utterance. At that time every trade had its guild; and they now formed guilds of poetry, the task of whose members was in intervals of leisure to pro- duce songs according to a body of strict rules, as in hours of business they produced shoes or loaves. The rules were called the “Tabulatur,” and the rank of each member was determined by his skill in applying them. The lowest stage was that of a man who had simply been received into the guild; the highest, that of a master, who had invented a new melody. Between

these were the scholar, the friend of the school, the singer, and the poet. Literature produced under such conditions could not have much vitality. It amused the versifiers, and de- veloped a certain keenness in the detection of outward faults; but the spirit of poetry was wanting, and there is hardly a ‘‘ meistersinger” whose name is wortliy of being remembered.

Much more important than these tedious manufacturers of verse were the unknown authors of the earliest attempts at dramatic composition. Jn the 10th century Hroswitha, the abbess of Gandersheim, wrote Latin imitations of Terence ; but they were without influence on the progress of culture. The real beginnings of the modern drama were the crude representations of scriptural subjects with which the clergy strove to replace certain pagan festivals. These representations gradually passed into the ‘‘ Mysteries” or “ Miracle Plays,” in which there was a rough endeavour to dramatize the events celebrated at Easter and other sacred seasons. They were acted at first in churches, but after- wards in open courts and market places; and for many hours, sometimes day after day, they were listened to by enormous audiences. The fragment of a Swiss “ Mystery” of the 13th century has survived ; but the earliest that has come down to us in a complete form is a play of the first half of the 14th century, treating of the parable of the ten virgins. Like those of France and England, these medi- zeval German dramas display little imagination ; and they are often astonishingly grotesque in their handling of the most awful themes. Along with them grew up what were known as “Shrove Tuesday Plays,” dialogues setting forth some scene of noisy fun, such as a quarrel between a husband and wife, with a few wise saws interspersed. They were declaimed without much ceremony in the public room of an inn, or before the door of a prominent citizen, and gave ample occasion for impromptu wit. Nuremberg seems to have been particularly fond of “‘Shrove Tuesday Plays,” for one of its poets, Hans Rosenbliit, who flourished about the middle of the 15th century; was tlie most prolific

author of them. A little later he was extensively imitated

by Hans Folz, a Nuremberg barber and meistersinger.

By far the most interesting writers of the 14th century Mystics.

were tle mystics, who continued the movement started by Eckhart. Johannes Tauler of Strasburg (1300-61) had not the originality and force of his predecessor, but the ultimate mysteries of the world had an intense fascination for him, and his tender and sensitive spirit opened itself to lights which find no way of entrance into more robust and logical intellects. He did not in the main pass beyond the specu- lations of Eckhart, but he added grace and finish to their expression, and made them a greater popular power than they could have become through the master's writings. Heinrich Suso, of Constance (1300-65), who has been called " the minnesiinger of the love of God," made the doc- trines of Eckhart an occasion for the outpourings of a full and sometimes extravagant fancy. Eckhart's teaching was also put into shape by an unknown author, whose work was afterwards published by Luther under the title Hyn deutsch Theologia. 'To all these writers the phenomenal world is in its nature evil, but it is also unreal; the only reality

Meister. sdnger,

Beginnings of the drama,

Miracle plays.

shro- icles.

4 he enais- ance.

Prose .

Jopular 'erature of study, for the stir of new life had affected not only

POPULAR SATIRE. |

they recognize is a world outside the limits of space and time, in union with which man rises to his true life. They are chiefly of importance in the history of speculative thought, but even from the point of view of literature they were of lugh service in the development of a rich and vigorous prose.

A plain narrative prose style was cultivated in the chronicles which began at this time to be written in different parts of Germany. The Limburg

Chronicle written between 1336 and 1398, the Alsace Chronicle about 1386, and the Thuringian Chronicle, by Rothe, a monk of Hisenach, about 1430, lave all considerable his- torical value; and the fact that they are in German, not like previous chronicles in Latin, proves the rising respect among the people for their native speech.

During the latter part of the 15th century there was in Germany, as in the other leading European nations, a great revival of intellectual life. And it was due to the same causes as prevailed elsewhere,—especially the rediscovery of Greek literature and the invention of printing. The moveinent was naturally most powerfully felt in the uni- versities. The first of these institutions had been founded early in the 14th century by Charles IV. in Prague. Soon afterwards others were established in Vienna, Heidelberg, Cologne, and Erfurt ; and in the 15th century universities were set up also in Rostock, Greifswald, Tiibingen, Leipsic, and elsewhere. For a long time law and divinity were almost tle only subjects studied ; but when the Renaissance passed from Italy into Germany, university teaching be- came the instrument of a freer and larger culture. Scho- lastic philosophy fell into disrepute ; the most active minds occupied themselves only with the intellectual treasures of the ancient world. The men devoted to the new studies were called " Humanists," and they carried on continual warfare with the more ignorant and intolerant of the clergy. Unfortunately they knew nothing of the value of their own language ; they wrote, as the scholastic philosophers had done, solely in Latin, and they gave but slight and contemptuous attention to the movements of popular literature,

Yet the popular literature of their time was quite worthy

scholars but all classes of society, citizens and even peasants included. It is surprising how many books found their way to the public between 1450 and the outbreak of the Reformation ; every one seemed anxious that the newly discovered process by which writers could appeal to so wide an audience should be turned to the utmost possible advan- tage. Of this great mass of literature a comparatively small proportion was created in obedience to the free im- pulses of the intellect. The problems of the time were mainly social and practical; men were less moved by ideal interests than by questions as to the tyranny of the princes, the greed and sensuality of the clergy, the

worldliness of the papacy, the powerlessness of the crown to enforce peace and order. Multitudes of little tales in prose and verse appeared, in which the princes, the nobles, the clergy, and sometimes rich citizens, were held up to ridicule, The “Shrove Tuesday Plays,” which now became extremely popular, also expressed the general discontent ; and there were even “Miracle Plays” whose object was to reveal the wrongs of the people. In one of them, the leading char- acter of which was Joanna, the mythical female pope, a clerical author did not hesitate to pour contempt on the Roman see itself.

By far the greatest of these satirical writings was the epic narrative, Reineke Vos. It has been already stated that the stories of “Reynard the Fox” and “Isengrim the Wolf” probably belong to prehistoric ages. They became current, through the Franks, in Lorraine and France ;

aud from the 11th to the 15th century they formed the subject of many works in Latin, French, and German. The epic to which allusion is now made appeared in 1498, and was probably by Hermann Barkhusen, a printer of Rostock. It is in Low German, and its materials were obtained from a prose version of the tale which had appeared some years before in Holland, and of which Caxton printed an English translation, Originally, the story had no satirical significance; it was a simple ex- pression of interest in what may be called the social life of wild animals. In the hands of the author of this Low Ger- man poem it becomes an instrument of satire on some endur- ing tendencies of human nature. He does not lash himself into fury at the vices he chastises ; he laughs at while he exposes them. His humour is broad and frank, and he did more than any one else to make Reynard the type of the resource and cunning which overmaster not only brute force but even truth and justice, There are several renderings of the poem into High German, the most im- portant being the well-known work of Goethe in hexameters.

Anotlier popular satirical work was the Narrenschiff Brandt.

(“Ship of Fools”) of Sebastian Brandt, published in Basel in 1494, It is an allegorical poem of more than a hundred sections, in which the vices are satirized as fools. This work passed through many editions, and was rendered into more than one Low German dialect, and into Latin, French, and English ; it was even made the subject of a series of sermons by Geiler, of Kaisersberg, a well-known preacher of the day, who had himself some satirical talent. Brandt was personally of a mild and unassuming character, and the fact that he became a satirist in spite of himself is a strik- ing proof of the confusion which liad fallen upon both church and state. Now that the occasion of his book has passed away, it is difficult to realize that it once enjoyed almost unprecedented popularity. Wecannot but feel that the writer was an honest man; but his allegories are with- out force or charm, and his moral lessons have been the commonplaces of every civilized society. A satirist of a

bolder type was Thomas Murner, who, although he Murner.

lived far into the age of the Reformation, belongs in spirit altogether to the preceding period. He was a preacher, and both in sermons and in secular writings attacked without mercy the classes who were the butts of his fellow-satirists. After the beginning of the Reformation he included Luther among the objects of his comprehensive dislikes. His laughter was loud and harsh, and can hardly have been favourable to any small buddings of ‘charity that may have revealed themselves among the antagonisms of his generation.

Oue of the favourite books of this time was TZyll Tyll It was published in 1519, and the author Ewlen-

Eulenspiegel. (probably Murner) seems to have included in it many anecdotes already well known. According to the preface, Tyll was a Brunswick peasant of the 14th century, who went about the country perpetrating practical jokes. The force of his humour mainly consists in taking every word addressed to him in its most literal sense, and in giving it applications altogether different from those intended by the speaker. There are readers who still find amusement in his rough pleasantries.

During the better part of this stirring period Maximilian Maxi- I. was emperor, and he interested himself a good deal in milian 1

the current literature. As in politics, however, so in poetry, his sympathies were altogether with an earlier age; and he attempted to revive the taste for medixval romance. From a sketch said to have been prepared by him, Melchior Pfinzig celebrated in Theuerdank the emperor's marriage with Princess Mary of Burgundy. The work was splendidly printed, and attracted much notice; but romantic poetry, once so fascinating, produces in Its pages:

Popular poetry.

Refor- mation period.

Luther.

the effect of an elderly coquette who, refusing to believe in the ravages of years, tricks herself out in the gay adorn- ments of youth. An earlier book, the Weess Kung, an autobiography of Maximilian, written by his direction in prose by his secretary Treizsauerwein, has the excellence neither of a chronicle nor of a romance ; it is for the most part the fantastic work of a mind which misunderstood its epoch and its own powers.

Behind the strife and noise of contending sections there was slowly growing up an admirable intellectual product of Germany,—its popular poetry. One of the earliest writers who struck the note of the popular poets was Veit Weber, a Swiss who fought with his countrymen against Charles the Bold, and who celebrated in vigorous verses the battles of Granson, Murten, and Nancy. From this time the German people had always a living poetry of their own, created by unknown authors, but caught up by the masses, passed on from village to village till it was every- where known, and handed down by each generation to its successors. This popular poetry ultimately reflected every aspect of daily life among the humbler classes ; eacli section among them had its appropriate lyrics, and there were songs of youth, of age, and of middle life. There is no elaboration in these offshoots of the

popular fancy, but many of them have an artless beauty which touches the fountains of smiles and tears, and which had an irresistible fascination for the poets of the greatest period of German literature.

IV. The Century of the Reformation.—It is possible that if there had been no Reformation the Renaissance would have revealed itself in Germany in a great literary movement, as in France and England, or ina great artistic movement, as inItaly. The conditions of both movements were present in the labours of the humanists on the one hand, and of the Holbeins, Albert Diirer, and Lucas Cranach on the other. But the questions of the Reformation were too profound and agitating for the mind of the nation to turn seriously to any task save that which they imposed. Thus it happened that the young shoots of the Renaissance withered almost before they were in leaf. It was settled that Germany must wait until a much later time for the full exercise of her highest energies.

In literature not less than in religion Luther (1483-1546) was the commanding spirit of the age; but he was so rather by accident than by choice. For form for its own sake he cared little ; he studied it solely that he might the better produce the moral effect at which he aimed. It is hardly possible for any one to sympathize now with the violence and the dogmatism of his tracts, addresses, and sermons ; but they had the high merit of addressing the nation in a language it could understand. They are always clear, simple, warm with the glow of a passionate nature ; and amid their noise and fury an attentive ear will sometimes catch the still small voice of a spirit touched to finer issues than mere party warfare. ‘My husk may be hard,” he himself said, ‘but the kernel is soft and sweet.” We do extreme injustice to Luther if we do not recognize in him a strongly poetic element,—an element which had free play only in the best of his private letters, and in his still popu- lar hymns. By the highest of his literary achievements, his translation of the Bible, he made a truly splendid contribution to the spiritual life of his people. No body of literature has been so fortunate in its translators as the Scriptures ; and Luther’s rendering ranks with the best. Its absolute simplicity brings it to the level of a child’s understanding ; its strength and grace give it an enduring place as a work of art. Germany instantly felt its charm ; and for three centuries it has been to

innumerable millions thesupreme consoler and sanctifier, the power associated with

their tenderest, most pathetic memories, the one link which has connected sordid lives with noble and sublime ideas. And for the first time it gave the nation a literary language. Up to this stage every author had written in the dialect with which he was himself familiar; henceforth for the men of Swabia, of Bavaria, of Saxony, and of all other dis- tricts there was a common speech, which the writers of each state could use without any sense of inferiority to those of another. It is thus to Luther that the Germans owe the most essential of all the conditions of a truly national life and literature.

The writer who deserves to stand next to Luther is Ulrich Ulrich von MHutten (1488-1523). An accomplished von humanist, he effectively attacked the enemies of the new cul- Hutten, ture in the Hpistole Obscurorum Virorum, of which he was one of the chief writers. This was before the special work of Luther began; and at a still earlier period he had assailed ina series of fine Latin orations the tyranny of Duke Ulrich of Wiirtemberg, who was accused of inurder- ing a member of Hutten's family. He had little real sym- pathy with Luther's religious aims; but he threw himself heartily into a movement by which it seemed possible to purge the state of the spiritual and secular ills which' were in deadly antagonism to the progressive energy of humanism, His German writings are mainly short satirical poems and prose dialogues and addresses, Their style is direct, bold, and trenchant; but they are now in teresting mainly because of the spirit of freedom which breathes through them, the lofty political ideals of the writer, and his generous ardour forthe popular welfare.

A far more voluminous author than Hutten or Luther Hans was Hans Sachs, meistersinger of Nuremberg (1494- Sachs. 1576). He was, indeed, one of the most prolific of Ger- man writers, having composed, according to his own cal- culation, more than 6000 poems. Although extremely popular in his own time, Sachs was almost forgotten after his death. His memory was revived by Wieland and Goethe, and he is now universally admitted to have been the chief German poet of the 16th century. Every species of verse then known he freely cultivated, and there is no important element of his age

which is not touched in one or other of his works. He had little of the culture of the schools, and many of his verses are excessively rude. But Hans had considerable force of imagination, sly humour, and, in his happiest moments, a true feeling for melody.

His best works are his “Shrove Tuesday Plays.” Itis true he makes hardly more attempt than Rosenbliit to develop a dramatic action, but his characters have life, and in many individual scenes are artistically grouped. His didactic dialogues and satirical tales present a remarkably vivid picture of the ideas, controversies, and moral senti- ments of his generation ; and some of his lyrics still live in the memory of the nation. The song in which he hailed the “Wittenberg Nightingale ” gave fine utterance to the reverence of the Lutherans for their chief, and in his hymn, Warum betriibst du dich, mein Herz? he so happily met the spiritual need of the day that it was soon translated into eight languages, including English, French, and Greek. .

If Hans Sachs was the most industrious poet of the century, Johann Fischart was beyond all comparison its Fischarh

greatest satirist. There was a distinctly Rabelaisian touch in this restless, bizarre, and effusive spirit,—a man of up- right and manly character, keenly alive to the evils of his | time, and continually opening fire at new points on his enemies. He was an enthusiast for the Reformation, and — ; did it more lasting service among the middle class than half

the theologians. His chief work was an adaptation of | Rabelais’s Gargantua, which he rendered with an insight

into its purpose, and a fulness of sympathy with its

methods, unsurpassed even by Urquhart. In the poem, Das Gliickhaft Schiff, he gives evidence of a faculty for stirring narrative verse, but his prose is richer, fuller, and more free. Considering how imperfectly prose style was then developed, he had an astonishing command over the resources of the language. He delighted in new and complicated word-formations, and by means of them often succeeded, while dealing with his

main theme, in casting side lights on its subordinate branches. Even he, pene- trating and enlightened as he was, could not rise so far above his age as to condemn the burning of witches; but hardly another popular folly escaped his glance. From the evil practices of hypocritical priests to the impudence of astrologers and weather prophets every abuse found in him a watchful critic ; and nothing of the kind could be more admirable than the skill with which he excites contempt while professing to write in a spirit of respect and credulity. The secret of his power lay also partly in his profound humanity, for this scathing satirist was at heart thoroughly genial ; his mockery had its root in an abiding faith in justice,

Several other cultivators of prose style deserve mention. Albert Diirer, whose paintings, drawings, and engravings gave to the age of transition between medizvalism and the modern world its most perfect artistic expression, wrote several scientific treatises, one of which, on the proportions of the human body, is a masterpiece of calm, clear, and systematic exposition, Johann Thurnmeier, called Aven- tinus (1466-1534), Sebastian Franck (1500-45), and Aigidius Tschudi, of Glarus (1505-72), wrote histories which, as ordered narratives, rank considerably above mere chronicles. The autobiography of Gétz von Berlichingen, if its style is without merit, has an enduring interest as a sketch of the rude lives of the petty nobles at the time when the old social order was breaking up under the influence of new ideas. Huldrich Zwingli, the Swiss Reformer (1484-1531), could state an argument with logical precision, but

| he sought to ground them in the deepest reason; and

although he often appears to darken counsel by words, yet his writings contain many bold suggestions, which have profoundiy influenced later philosophical systems. There are times when one feels that his strnggling thought is imperfectly uttered only because it is not expressed in poetic forns. For Boehme was one of those thinkers who occupy the borderland between philosophy and poetry, a fact often perceptible in the concrete shape which the most abstract ideas assume in his hands. There is a touch of

poetry in the very title of his first and best known, although not perhaps his best, book, Aurora.

The secular poetry of this period, if we except the works of Hans Sachs and Fischart, is without value. An ambitious didactic poem by Rollenhagen, Der Frosch- mdusler, gained a certain reputation; but it stands far beneath Meineke Vos, of which it is partly an imitation.

The religious lyrics of the age are, however, of high Religious excellence ; they, indeed, are the sole works in which 4 lyrics.

perfect marriage was effected between idea and form in the epoch of the Reformation. In his grand battle-hymn fin feste Burg ist unser Gott, in his pathetic verses Aus tieffer Not schrey ich 2u dir, and in other lyrics, Luther led the way ; and he was, as we have seen, followed by Hans Sachs, Nicolaus Herrmann in his Lrschienen ist der herrlich Tag, Paul Eber in his Wenn wir in héchsten Nothen sein, Philip Nicolai in his Wie schén leucht wns der Morgenstern, and several other writers not less distin- guished, created, in moments of genuine inspiration, lyrics which must move men while religious instincts survive. The adherents of the Reformation everywhere opened their hearts to these beautiful poems, for in them alone, not in creeds or sermons or controversial treatises, were the deep- est emotions of the time freely poured forth. Next to the translation of the Bible, nothing did so much as the popular hymns to ynite the Protestants, to stimulate their faith, and to intensify their courage.

During this century the drama made considerable pro- Growth gress, Besides the ‘ Mysteries” and “Shrove Tuesday a the Plays,” ‘School Comedies,” in imitation of Terence and “7?

ye; ;

his style is thin and weak in comparison with the nervous force of Luther. Johann Agricola (1492-1566) wrote some theological works on the Catholic side; he is chiefly im-

portant, however, fora collection of German proverbs, which afford important evidence as to the currents of popular thought. Of a far higher

class as a religious writer was Johann Arndt (1555-1621), who wrote the most widely read work of the 16th century, Vier Biicher vom Wahren Christenthum (‘* Four Books on True Christianity”). Soon after Luther’s death the doctrines of the Reformation lost nearly all vitality; becoming the subjects of vehement con- troversy amoug contending theologians, they ceased to in- terest the masses, who turned to simpler and more congenial themes. Arndt, like Eckhart, Tauler, and Luther himself, being a man of religious genius, saw the futility of these noisy disputes, and brushing them aside went to the heart of Christianity asa power fitted to nourish spiritual feeling and to govern conduct. His work appeared in Magdeburg in 1610, passed through edition after edition, and was translated into eleven languages. It still has a place of its own, for beneath the forms of a past age there burns the fire of a true enthusiasm. Sebastian Franck, already men- tioned as a historian, wrote some religious works in a spirit akin to that of Arndt; but he lacked the intensity, the power of touching the popular mind, which was possessed by the later writer. Less practical in tendency, but incom par- ably deeper in philosophic thought, were the writings of the . Gorlitz theosophist, Jacob Boehme (1575-1624). Boehme is in many respects one of the most striking figures in the history of German speculation. A man of mild and humble temper, working in patient obscurity as ashoemaker, hespent his life in grappling with the vastest problems which perplex humanity, Starting from the dogmas of Christianity,

Plautus, were written and acted in the universities and public schools. Luther, with the large humanity character- istic of him when dogmatic disputes were not in question, encouraged these comedies, and was, indeed, friendly to dramatic effort of all kinds, To persons who complained that modesty was often offended by the actors he replied that if they carried out their principle they would have to refraip from reading the Bible. When the Jesuits began to agitate in opposition to Protestantism they detected at once, with their usual tact, the importance of this element in popular life ; and through their influence more attention was paid not only to the plays but to the manner in which they were represented. Towards the end of the 16th century Germany was visited by a band of English comedians, who weut about acting in their own language. They appear to have produced a deep impression ; and at least one of their im- portations, the clown, the “

Pickelhiring" of the Dutch, survived in Hanswurst or Jack Pudding, who was for more than a century an indispensable character in every play de-signed to gratify the prevailing taste. In imitation of the English comedians, wandering companies, consisting largely of idle students, now began to be formed, and thrilled both rustic and city audiences with blood-and-thunder tragedies, and with comedies too coarse to deserve even the name of farces, About the middle of the century a theatre was built in Nuremberg, and Augsburg and other cities soon followed the example. Duke Julius of Brunswick (1564-1613) not only built a theatre in his capital but maintained a perma nent conipany ; and he amused himself by writing for it comedies and tragedies in the approved style of the day. X. — 67

Popular poetry.

Refor- mation period.

Luther.

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the effect of an elderly coquette who, refusing to believe in the ravages of years, tricks herself out in the gay adorn- ments of youth. An earlier book, the Wezss Kunzg, an autobiography of Maximilian, written by his direction in prose by his secretary Treizsauerwein, has the excellence peither of a chronicle nor of a romance ; it is for the most part the fantastic work of a mind which misunderstood its epoch and its own powers.

Behind the strife and noise of contending sections there was slowly growing up an admirable intellectual product of Germany,—its popular poetry. One of the earliest writers who struck the note of the popular poets was Veit Weber, a Swiss who fought with his countrymen against Charles the Bold, and who celebrated in vigorous verses the battles of Granson, Murten, and Nancy. From this time the German people had always a living poetry of their own, created by unknown authors, but caught up by the masses, passed on from village to village till it was every- where known, and handed down by each generation to its successors. This popular poetry ultimately reflected every aspect of daily life among the humbler classes ; eacli section among then had its appropriate lyrics, and there were songs of youth, of

age, and of middle life. There is no elaboration in these offshoots of the popular fancy, but many of them have an artless beauty which touches the fountains of smiles and tears, and which had an irresistible fascination for the poets of the greatest period of German literature.

IV. The Century of the Reformation,—It is possible that if there had been no Reformation the Renaissance would have revealed itself in Germany in a great literary movement, as in France and England, or ina great artistic movement, as in Italy. The conditions of both movements were present in the labours of the humanists on the one hand, and of the Holbeins, Albert Diirer, and Lucas Cranach on the other, But the questions of the Reformation were too profound and agitating for the mind of the nation to turn seriously to any task save that which they imposed. Thus it happened that the young shoots of the Renaissance withered almost before they were in leaf. It wag settled that Germany must wait until a much later time for the full exercise of her highest energies.

In literature not less than in religion Luther (1483-1546) was the commanding spirit of the age; but he was so rather by accident than by choice. For form for its own sake he cared little ; he studied it solely that he might the better produce the moral effect at which he aimed. It is hardly possible for any one to sympathize now with the violence and the dogmatism of his tracts, addresses, and sermons ; but they had the high merit of addressing the nation in a language it could understand. They are always clear, simple, warm with the glow of a passionate nature ; and amid their noise and fury an attentive ear will sometimes catch the still small voice of a spirit touched to finer issues than mere party warfare. ‘ My husk may be hard,” he himself said, ‘but the kernel is soft and sweet.” We do extreme injustice to Luther if we do not recognize in him a strongly poetic element,—an element which had free play only in the best of his private letters, and in his still popu- lar hymns. By the highest of his literary achievements, his translation of the Bible, he made a truly splendid contribution to the spiritual life of his people. No body of literature has been so fortunate in its translators as the Scriptures ; and Luther’s rendering ranks with the best. Its absolute simplicity brings it to the level of a child’s understanding ; its strength and grace give it an enduring place as a work of art. Germany instantly felt its charm; and for three centuries it has been to

innumerable millions thesupreme consoler and sanctifier, the power associated with

GEHAMAR

LITERATURE,

their tenderest, most pathetic memories, the one link which has connected sordid lives with noble and sublime ideas, And for the first time it gave the nation a literary language, Up to this stage every author had written in the dialect with which he was himself familiar; henceforth for the men of Swabia, of Bavaria, of Saxony, and of all other dis- tricts there was a common speech, which the writers of each state could use without any sense of inferiority to those of another. It is thus to Luther that the Germans owe the most essential of all the conditions of a truly national life and literature.

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The writer who deserves to stand next to Luther is Ulric)

Ulrich von Hutten (1488-1523).

An accomplished von |

humanist, he effectively attacked the enemies of the new cul- Hutt!

ture in the Hpistole Obscurorum Virorum, of which he was one of the chief writers. This was before the special work of Luther began; and at a still earlier period he had assailed in a series of fine Latin orations the tyranny of Duke Ulrich of Wiirtemberg, who was accused of murder- ing a member of Hutten's family. He had little real sym- pathy with Luther's religious aims; but he threw himself heartily into a movement by which it seemed possible to purge the state of the spiritual and secular ills which were in deadly antagonism to the progressive energy of humanism. His German writings are mainly short satirical poems and prose dialogues and addresses, Their style is direct, bold, and trenchant; but they are now in- teresting mainly because of the spirit of freedom which breathes through them, the lofty

political ideals of the writer, and his generous ardour for the popular welfare.

A far more voluminous author than Hutten or Luther Han was Hans Sachs, meistersinger of Nuremberg (1494- Sal

1576). He was, indeed, one of the most prolific of Ger- man writers, having composed, according to his own cal- culation, more than 6000 poems. Although extremely popular in his own time, Sachs was almost forgotten after his death. His memory was revived by Wieland and Goethe, and he is now universally admitted to have been the chief German poet of the 16th century. Every species of verse then known he freely cultivated, and there is no important element of his age which is not touched in one or other of his works. He had little of the culture of the schools, and many of his verses are excessively rude. But Hans had considerable force of imagination, sly humour, and, in his happiest moments, a true feeling for melody. His best works are his "Shrove Tuesday Plays." It is true he makes hardly more attempt than Rosenbliit to develop a dramatic action, but his characters have life, and in many individual scenes are artistically grouped. His didactic dialogues and satirical tales present a remarkably vivid picture of the ideas, controversies, and moral senti- ments of his generation ; and some of his lyrics still live in the memory of the nation. The song in which he hailed the "Wittenberg Nightingale" gave fine utterance to the reverence of the Lutherans for their chief, and in his hymn, Warum betriibst du dich, mein Herz? he so happily met the spiritual need of the day that it was soon translated into eight languages, including English, French, and Greek.

If Tans Sachs was the most industrious poet of the

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century, Johann Fischart was beyond all comparison its Fis}

greatest satirist. There was a distinctly Rabelaisian touch in this restless, bizarre, and effusive spirit,—a man of up- right and manly character, keenly alive to the evils of his time, and continually opening fire at new points on his enemies. did it more lasting service among the middle class than half the theologians. His chief work was an adaptation of Rabelais's Gargantua,

which he rendered with an insight into its purpose, and a fulness of sympathy with its

He was an enthusiast for the Reformation, and —

: Prose

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REFORMATION PERIOD.]

methods, unsurpassed even by Urquhart. In the poem, Das Glickhaft Schiff, he gives evidence of a faculty for stirring narrative verse, but his prose is richer, fuller, and more free. Considering how imperfectly prose style was then developed, he had an astonishing command over the resources of the language. He delighted in new and complicated word-formations, and by means of them often suecceded, while dealing with his main theme, in casting side lights on its subordinate branches. Even he, pene- trating and enlightened as he was, could not Tise SO far above his age as to condemn the burning of witches; but hardly another popular folly escaped his glance. From the evil practices of hypocritical priests to the impudence of astrologers and weather prophets every abuse found in him a watchful critic ; and nothing of the kind could be more admirable than the skill with which he excites contempt while professing to write in a spirit of respect and credulity, The secret of his power lay also partly in his profound humanity, for this scathing satirist was at heart thoroughly genial ; his mockery had its root in an abiding faith in justice.

Several other cultivators of prose style deserve mention. Albert Diirer, whose paintings, drawings, and engravings gave to the age of transition between medivalism and tle modern world its most perfect artistic expression, wrote several scientific treatises, one of which, on the proportions of the human body, is a masterpiece of calm, clear, and systematic exposition, Johann Thurnmeier, called Aven- tinus (1466-1534), Sebastian Franck (1500-45), and Aigidius Tschudi, of Glarus (1505-72), wrote histories which, as ordered narratives, rank considerably above mere chronicles. The autobiography of Gotz von Berlichingen, if its style is without merit, has an enduring interest as a sketch of the rude lives of the

petty nobles at the time when the old social order was breaking up under the influence of new ideas. Huldrich Zwingli, the Swiss Reformer (1484-1531), could state an argument with logical precision, but

he sought to ground them in the deepest rcason; and although he often appears to darken counsel by words, yet his writings contain many bold suggestions, which have profoundly influeuced later philosophical systems, There are times when one feels that his struggling thouglit is imperfectly uttered only because it is not expressed in poetic forms. For Boehme was one of those thinkers who occupy the borderland between philosophy and poetry, a fact often perceptible in the concrete shape which the most abstract ideas assume in his hands. There is a touch of poetry in the very title of his first and best known, although not perhaps his best, book, Aurora.

The secular poetry of this period, if we except the works of Hans Sachs and Fischart, is without value. An ambitious didactic poem by Rollenhagen, Der Frosch- mdusler, gained a certain reputation ; but it stands far beneath Reimeke Vos, of which it is partly an imitation.

The religious lyrics of the age are, however, of high Religious excellence ; they, indeed, are the sole works in which a lyrics.

perfect marriage was effected between idea and form in the epoch of the Reformation. In his grand battle-hymn Lin feste Burg ist unser Gott, in his pathetic verses Aus tieffer Not schrey ich 2a dir, and in other lyrics, Luther led the way ; and he was, as we have seen, followed by Hans Sachs, Nicolaus Herrmann in his Lrschienen ist der herrlich Tag, Paul Eber in his Wenn wir in héchsten Néthen sein, Philip Nicolai in his Wee schén leucht uns der Morgenstern, and several other writers not less distin- guished, created, in moments of genuine inspiration, lyrics which must move men while religious instincts survive. The adherents of the Reformation everywhere opened their hearts to these beautiful pocms, for in them alone, not in creeds or sermons or controversial treatises, were the deep- est

emotions of the time freely poured forth. Next to the translation of the Bible, nothing did so much as the popular hymns to unite the Protestants, to stimulate their faith, and to intensify their courage.

‘ his style is thin and weak in comparison with the nervous forceof Luther, Johann Agricola (1492-1566) wrote some theological works on the Catholic side; he is chiefly im.

During this century the drama made considerable pro- Growth gress, Besides the “‘ Mysteries” and “Shrove Tuesday ef the Plays,” “ School Comedies,” in imitation of Terence and “7?™*

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portant, however, fora collection of German proverbs, which afford important evidence as to the currents of popular thought. Of a far higher class as a religious writer was Johann Arndt (1555-1621), who wrote the most widely read work of the 16th century, Vier Biicher vom Wahren Christenthum (“Four Books on True Christianity”), Soon after Luther’s death the doctrines of the Reformation lost nearly all vitality; becoming the subjects of vehement con- troversy among contending theologians, they ceased to in- terest the masses, who turned to simpler and more congenial themes. Arndt, like Eckhart, Tauler, and Luther himself, being a man of religious genius, saw the futility of these noisy disputes, and brushing them aside went to the heart of Christianity asa power fitted to nourish spiritual feeling and to govern conduct. His work appeared in Magdeburg In 1610, passed through edition after edition, and was translated into eleven languages. It still has a place of its own, for beneath the forms of a past age there burns the fire of a true enthusiasm. Sebastian Franck, already men- tioned as a historian, wrote some religious works in a spirit akin to that of Arndt ; but he lacked the intensity, the power of touching the popular mind, which was possessed by the later writer. Less practical in tendency, but incompar- ably deeper in philosophic thought, were the writings of the Gorlitz theosophist, Jacob Boehine (1575-1624). Boehme 18 In Many respects one of the most striking figures in the history of German speculation. A man of mild and humble temper, working in patient obscurity as ashoemaker, hespent his life In grappling with the vastest

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Thirty Years' War.

Religious lyrics.

Literary societies.

530

It is significant of the stage of literary culture reached by Germany that she enjoyed the barbarous productions of this scribbling prince while English

audiences were appreciating “Hamlet” and ‘“ Othello.”

V. The Period of Decay.—The period at which we have now arrived is in many respects the most dismal in German history. From 1618 to 1648 the country was desolated by the Thirty Years’ War, a struggle which—as Gustavus Adolphus, its greatest hero, declared—absorbed into itself all the other wars of Europe. It completed the dis- integration of Germany, blurred every great national memory, fastened upon the people hundreds of petty despotisms, reduced the population by more than half, caused a whole generation to grow up in ignorance, accus- tomed all classes to an almost incredible brutality of nanners, and put an end to the material prosperity which had been steadily growing during the 16th century. It is not surprising that pure literature drooped and nearly died out during the time which followed this tremendous war, for the conditions of pure literature were almost wholly wanting. Had a man of high genius arise, the buds of his fancy must have faded for lack of light and air.

The only species of literature for which the conditions were favourable was the religious lyric. Under the pressure of grinding care, with no hope that a better day would dawn for them in this world, meditative and gentle spirits devoted their thoughts to another life; and many of them linked themselves to the truest poets of the pre- vious century by giving musical voice to their spiritual fears and joys. Their prevailing tone in regard to “ things seen” is one of profound melancholy ; but all the brighter are

the strange lights from the invisible which break through | poetry must be the expression of an emotional life; it

the gloom. The greatest of these writers is Paul Gerhardt (1606-75), many of whose hymns—such as O Haupt voll Blut und Wunden, O Welt sieh hier dein Leben— penetrate to the essence of Christianity as the religion of humility, of sacrifice, and of sorrow. He had worthy associates among the Protestants in Johann Rist (1607-67), Joachim Neander (1610-88), and Louise Henriette of Brandenburg, wife of the Great Elector (1627-67). Some of the wiser Jesuits also attempted the lyrical expression of religious feeling ; and one of them, Friedrich von Spee (1592-1635), fell little short of the best among his Lutheran rivals. Spee was a man of admirable moral as well as literary qualities. Asked by the elector of Mainz how it happened

that at the age of forty his hair was white, he answered, ‘It is because I have accompanied to the stake so many women accused of witchcraft, not one of whom was guilty.”

The standard of pure speech set up by Luther in his translation of the Bible had not been maintained by later writers. The innumerable dialects of Germany are an almost inexhaustible fountain for the renewal of the youth of her literary language; but when the literary language was less fixed than it is now, they were also a temptation to barbarism. In addition to the evils of excessive provin- ciality, the written speech had suffered from a too generous importation of Latin, Spanish, and French words. In the early years of the 17th century the prevailing laxitysuggested to an enlightened prince, Louis of Anhalt-Kéthen, that it would be desirable to introduce into Germany institutions resembling the Italian academies. Accordingly, in 1617, the “Fruchtbringende Gesellschaft” (“The Fruit-bearing Society”) was established,—a union which took the form of an order, with a palm tree for its emblem, and the words “ Alles zu Nutzen” (“ Everything for use”) for its motto. It immediately became fashionable for members of the highest classes of central Germany to belong to this society ; and at a somewhat later time other societies were

started in imitation of it. Of these the most famons was the “Order of the Pegnitzschifer” (“ Shepherds of the River Pegnitz”) in Nuremberg, which to some extent took the place of the school of meisterstinger on which honour had been reflected by Hans Sachs.

These societies were associated with much pedantic folly, and from none of them proceeded any great work of genius ; but they did good service by at least protesting against un- lawful forms of speech. One of the earliest writers who

worked in their spirit was Weckherlin (1584-1651), who, We. being associated with the German embassy in London, her,

became intimately acquainted with some of the many forms in which the English genius then revealed itself. He wrote a number of odes, idylls, and sonnets, with an evident desire to give them a careful artistic finish. To Fi him belongs the doubtful honour of having introduced i! alexandrines into German poetry,—a measure totally un- suited to the national spirit, but which for more than a century was in general use. The fame of Weckherlin was — soon overshadowed by that of Martin Opitz (1597-1639). Oy. The beginnings of modern German poetry are often dated from the publication of his critical book, Dre deutsche Poeterei, which appeared in 1624, and enjoyed an astonish- ing popularity. It became a sort of secular Bible to the " Fruit-bearing Society," of which Opitz was a member, and was regarded by several generations of verse-makers as an almost infallible guide. In regard to merely outward forms, it deserved its reputation, for Opitz was the first German writer who attempted sharply to distinguish the different species of poetry, to bring together some of the external laws which govern them, and to insist with emphasis that purity of style is essential to high literary effect. He altogether missed the fact, however, that

became in his exposition a mere handicraft, for excellence | in which industry and familiarity with good models are | alone necessary. The result is seen in his own lyrical and didactic poems, which are laudably correct in language and in metre, but are hardly once lighted up by the fire of in- tense feeling.

Opitz was born in Silesia; and from this circumstance | the writers who shared his tendency or came under his © influence are known as the first Silesian school. By far the most distinguished member of this so-called school was Paul Fleming (1609-40), the only secular German poet of Fil the 17th century of whom it can be confidently said }jam that he was endowed with true genius. He did not live long enough to reveal his full capacity ; he confined him- self to short rapid flights, aud all his lyrics are contained in a moderately sized volume, Geistliche und Weltliche Poemata. This single volume, however, comprises enough to secure for him an enduring place in literature. He moves freely over the whole range of lyrical poetry, but his charm is at once strongest and most delicate in his love verses, which sometimes recall the gaiety of Herrick, although a touch of sentimentalism distinguishes the Ger- man writer from the more worldly Englishman. A

fine spirit of manliness is the note of Fleming’s sonnets ; and in several hymns he almost equals the religious depth of Gerhardt. Even in its artistic qualities his best work is higher than anything achieved by Opitz; in its power of awakening permanent human sympathies it stands alone m1 its era.

Another writer of the first Silesian school was Andreas yp Gryphius (1616-64), who sought to create a drama 10 | accordance with the laws laid down by Opitz. He was the first German dramatist who divided his tragedies—of which he wrote five—into five acts; but his characters are roughly conceived, and he produces his effects rather by violence and | bombast than by the gradual evolution of a definite plan.

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Second Silesian

’ school.

Court poets,

PERIOD OF DECAY.] GHEURWAWN Y 531

His comedies, although also rude, have more life than his tragedies. In one of them, Peter Squenz, there are traces of Shakespeare’s Ifidsummer Night’s Dream, of which Gryphius appears to have had some knowledge through a third writer. Friedrich von Logau (1604-55) applied the principles of Opitz in epigram. He had a decided talent for terse, emphatic expression, and a considerable number of the vast collection of his epigrams have a keenness

of edge which must have made him a dreaded enemy. His prevailing tone is satirical, and the chief object of his satire is the moral corruption of his time. Joachim Rachel (1618-69) was another satirist who strove by means of polished verses to castigate popular vices; but he lacked force and invention. There was much more vigour in the Scheregedichte of Hans Wilmsen Lauremberg (1591-1659), who wrote in Platt Deutsch; he, however, can hardly be claimed as a member of the first Silesian school. Philip von Zesen (1619-89), a writer of some versatility, wrought in the spirit of Opitz by warring against foreign words which had intruded into German,—a warfare in which his zeal was not always as wise as it was patriotic. He founded in Hamburg, in imitation of the ‘ Fruit-bearing Society,” an association (the ‘‘ Deutschgesinnte Gesellschaft”) in- spired by his enthusiasm for Teutonic purity of speech.

While the admirers of Opitz were striving, with the best intentions, to introduce a correct poetic style, a movement of a very different kind originated among the ‘‘ Pegnitzschiifer” of Nuremberg. ‘The members of this society, conscious of the barrenness of existing poetry, and not feeling in them- selves the sources of a higher activity, turned for help to Italian literature. Instead of studying the great Italian poets they attached themselves to Marino and his extrava- gant school ; and the chief result was a number of fantastic pastorals, the writers of which seemed to have no other aim than to show how much silly affectation the German language may be made to express. Their tendency was carried to its utmost development by the second Silesian school, whose leading representatives were Hoffmannswaldau (1618-79) and Lohenstein (1635-83). Hoffmannswaldau wrote odes, pastorals, and heroic epistles, which are marked by a childish foppery of manner, and whose tone affords startling evidence of the moral laxity of the society to which they were addressed. Lohenstein chiefly cultivated the drama, and he has the distinction of having written perhaps the worst plays ever accepted as literature by a modern community. They are so wild and bombastic that, even if presented as burlesques, they would now be condemned as ridiculously extravagant. The lyrics of this pretentious writer are not less crude and unnatural than his plays.

As the century advanced, the German courts passed more and more under the influence of France. Pocket editions of Louis XIV. were to be found in all the little capitals, courtiers talked more French than German, and it was unfashionable not to know, or not to affect to know, con- temporary French literature. It was, therefore, inevitable that some writers should turn away from the path of the second Silesian school, and compete for court favour by linitating the French style. This was done by Canitz (1654-99), Besser (1654-1729), Kénig (1688-1744), and Many other authors of the same class. These " court poets" took Boileau for their guide, and had, therefore, the nega- tive merit of avoiding the absurdities of Lohenstein and Hoffmannswaldau. But they were, as a rule, tame, cold, and dull. In Canitz alone, who was a Prussian statesman and wrote for his pleasure, is there any evidence of original energy ; the others were professional versifiers who pro- duced appropriate odes and sonnets at the bidding of their employers.

During the greater part of the 17th century Germany pro- duced few prose works that can now be tolerated. Notwith-

standing the efforts of the purists, the language became Prose more and more corrupt, and most writers were either arti- writers ficial, or pedantic, or coarse. One of the small number a » whose power we can still feel was Grimmelshausen, whose "> Stmplicissimus (1659) has qualities bordering upon genius. —— The hero is a peasant's son, who tells his own tale. Torn pausen. from his parents during the Thirty Years' War, he is brought up by a hermit; afterwards in the service of a commandant, he makes himself notorious for tricks like

those of Tyll Eulenspiegel; he then becomes a soldier,

rises to wealth and rank, but ultimately loses both, passes through many wild adventures, and retires from the world

to a desert island, in which he devotes himself to religion.

The value of the book consists in its graphic pictures of the horrors of the Thirty Years' War,—pictures relieved by touches of rough, sometimes of the coarsest, humour. Another writer of great but insufficiently cultivated talent

was Moscherosch, author of Gesichte Philanders von Mosche- Suttewalt (1650), which is partly an imitation of the Suefios rosch. of Quevedo. It is made up of a number of visions or dreams, some of which, like passages of Stmplicissimus, convey a vivid idea of the sufferings of Germany during ber

great struggle; in others the writer strikes with effect at popular follies, including the extravagances of the second Silesian school. Sigmund von Birken wrote a history of

the house of Austria, which, although one-sided, is not without merit as a plain narrative; and an ecclesiastical history by Gottfried Arndt has some interest as an attempt to do justice to heretics condemned by the church.

A very good book of travels was written by Adam Olearius, describing the adventures of a mission to Persia, of which

the author and Paul Fleming were subordinate officials, A Protestant pastor, Balthasar Schupp (1610-61), was the Schupp. author of several didactic prose works, which, although rough in form, display native wit, and pour wholesome ridicule on the follies and barbarisms of contemporary writers. Against these more or less valuable prose writings

we must set piles of enormous romances in the style of Ro- D'Urfé and Mademoiselle Scudéry. The favourite authors mances. of these astonishing productions were Buchholtz, who wrote Hercules und Valisca, and Ilerculiscus und Herculadisla ; Anton Ulrich, duke of Brunswick, whose Octavia was loudly applauded by aristocratic readers; and Von Ziegler,

the writer of Zhe Aszatic Banise, an incredibly foolish

book which, published in 1688, took Germany by storm,

and maintained its popularity for more than a generation. Lohenstein was also the author of a romance, dealing with

the fortunes of Arminius and Thusnelda. It is hard to understand the interest which works of this class once excited ; they are barren of every

imaginative quality, with

no kind of relation to life, and grotesque in style. They

were ultimately driven from the field by imitations of Leobinson Crusoe, which, notwithstanding the charm of

their model, display no more talent than the romances. Various writers imitated Svmplicissimus, but they succeeded

only in reproducing in an exaggerated form its occasional brutalities. Abraham a Sancta Clara (1642-1709), a Abraham Vienna priest, whose real name was Megerlin, revealed con- # Sancta siderable power of satire in his Judas der Hreschelm ("Judas ©! the Arch-Rogue"), and in pamphlets and sermons ; but his naturally rich fancy was wholly uncontrolled, and his humorous passages are marred by a far larger number in which he is pedantie or vulgar.

No progress was made during the 17th century towards State of the formation of a national dramia. At the courts the the Italian opera was the favourite entertainment, and the "™* wandering companies of actors represented for the most part barbarous plays of their own devising, in which Hanswurst was generally the popular character. Occasion- ally 2 man of some talent found his way into these com-

Pietism.

Philoso- phy. Leibnitz.

Wolf.

Thoma- slus,

Wer- nicke.

Giinther.

Brockes.

panies; and one such actor, Velthen, showed so much insight as to include in his repertory some of the works of Molidre. But the general tendency of what passed for the drama was from bad to worse, and the usual character of the plays to a considerable extent justified the hatred with which they were denounced by the clergy.

For a time it almost seemed as if Germany could never hope to emerge from the intellectual degradation into which she had sunk; but in reality the higher forces of the nation were rallying in preparation for a new era. One of the first symptoms of revival was presented by the remarkable pietistic movement, which, although it ultimately led to the formation of the pettiest of petty sects, was in its origin noble both in aim and in method. Its originators were the ardent, generous, and eloquent Jacob Spener (1633-1705), and August Hermann Francke (1663-1727). The labours of these writers and preachers, who had close affinity to the mystics, not only gave more sincerity to religious forms, but did service to literature by quickening the popu-

lar intellect, and awakening emotions which could find no

satisfaction in the tedious writings of the day. Of still greater importance were the beginnings of modern German philosophy. It was in this dreary period that Germany gave birth to one of the most brilliant of her thinkers, Leibnitz (1646-1716). The prevailing style of the day— " Mischmasch," he called it—seems to have disgusted him with his own language, for nearly all his writings are in French or Latin. Nevertheless, he exercised a profound influence on the best minds of his generation. His monad- ology, his doctrine of the pre-established harmony, his theory of the best ot possible worlds, while carrying on the central current of European thought, offered Germany new problems for solution, and helped to replace a rigid orthio- doxy by a spirit of disinterested curiosity. The task of giving shape to his ideas was undertaken by Wolf (1679- 1754), who had none of Leibuitz's genius, and often crushed his fruitful suggestions under a burden of logical proofs. The disciple, however, so far taught in his master's spirit as to exalt the claims of reason over mere authority; he also encouraged habits of systematic thinking, and proved by his practice that serious writers

had no excuse for clothing their doctrines in any other language than their own. Less philosophical than Leibnitz, and even than Wolf, Christian Thomasius (1655-1728) was an impressive popular thinker. He edited the first German periodical, a sort of monthly magazine, in which he vigorously attacked pedants and bigots. His style, although not pure or grace- fal, received glow and warmth from his moral earnestness. Through him literature became a great practical power, for it was mainly he who put an end to the burning of witches and to punishment by torture.

Even in poetry, before the close of this period, there were a few glimmerings or dawn. Wernicke, a man of cultivated and severe taste, published a volume of epigrams (1697) in which he thrust home at the follies of Lohenstein and his followers ; and that his mockery had effect was plain from the outery of two noisy members of the school, Postel and Hunold. Giinther (1695-1723), who died too soon for his genius, wrote lyrics in which the voice of nature was once more heard. “A poet in the full sense of the word,” Goethe calls him; and no one can realize how great was his achievement without making some acquaintance with his truly dismal predecessors. Brockes (1680-1747) had not Giinther’s fine spontaneity, but he had the merit of giving simple expression to unaffected pleasures,—a virtue for which historians of literature, remembering the formality of the court poets and the insincere posturing of the second Silesian school, readily forgive his occasional flatness and garrulity. He was the first German poet who displayed some knowledge of English literature. Although un-

acquainted with Shakespeare, he directed his countrymen to Milton, Young, and Pope; and he appended to his chief work, Irdisches Vergniigen in Gott, a fair translation of Thomson’s Seasons,

VI. The Period of Revival.—For five centuries there had been no great literary period in Germany which deserves to be named with the famous periods in the history of Eng- land, France, Italy, and Spain. The Reformation was a spiritual achievement of splendid originality, but in

litera- ture Germany had for the most part followed timidly in the footsteps of her neighbours. She was soon to make up amply for this tardy progress; and we have now reached the age in which she fairly awoke to a consciousness of her strength,—au age mainly of preparation, but one which has also an independent interest, since it includes names that rank high in the history of European as well as of German culture, We have seeu that in the midst of the period of decay there were already symptoms of revival. These be- came more and more numerous, and while they increased, Germany was suddenly startled by the appearance in her midst of a great warrior and statesman. It is impossible to estimate with any approach to exactness the impres-

sion produced by Frederick IL.; but it is beyond doubt Frederick

that he profoundly affected the intellectual life not only of t Prussia but of Germany. After the Thirty Years' War the people had lost confidence in themselves. They forgot that they had a magnificent history ; they only saw that the structure of society had been rudely battered, and that nearly every enterprise of the nation as a whole ended in failure. Frederick the Great restored to them faith in their own vigour; he convinced them that it depended on themselves whether or not they should rise to their ancient place in Europe; and by the prompt, faithful, and energetic discharge of his personal duties he set before them an example which was widely felt. Literature shared the impulse which penetrated the national life. It became stronger, more independent, and moved forward with the assured step of a power conscious of high destinies.

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Several causes of a purely literary character contributed Classical

to promote this advance. classical study in the best sense. Classical study had been pursued with ardour by the humanists ; but after them it became dry, pedantic, and tedious, and was subordinated to theological controversy. In the 18th century a number of scholars arose, who, ceasing to interest themselves in merely verbal criticism, sought to pierce to the meaning of

classical writers, to understand and enjoy their imagi native effects, their ideas, and theirstyle. They also strove to construct what the Germans call ‘“ Alterthumswissen- schaft,” the science of antiquity—that is, to comprehend the life of the Greeks and Romans, their religion, art, and philosophy, and to interpret their literature in the light of this knowledge. The movement passed from one univer- sity to another and soon made itself felt in the public schools. Thus the best class of ininds were familiarized with higher ideals than they had yet known, and received, almost without being aware of it, the germs of new activity. Another cause, which co-operated with the more intelligent study of the classics, was acquaintance with English litera- ture, the Germans had come from Italy, Spain, and, above all, France ; but now they began to know something of contemporary English writers, way back to Shakespeare. The English genius was instinctively recognized as more in harmony with that of Germany than any other, and its products stimulated the free exercise of the imagination and the reason, while the ancient classics led to the perception of the greatest laws of form.

Among the poets who helped to effect the revival of a

One of these was the revival of study.

Hitherto the foreign influences which had affected Influence of English – litera and gradually worked their Pi

PERIOD OF REVIVAL. |

(1708-77), who, although chiefly famous as a man of science, revealed imagination and poetic sympathies in his descriptive and didactic poem Die Alpen (“The Alps”). Tlagedorn (1708-54) was for a time the most popular poet of his day in virtue of his songs, odes, fables, and narra- tives in verse. He was of a genial and happy temper ; and no author who preceded him was master of so clear, bright, and animated a style. One of the chief character- istics of the time was the tendency of writers to group them- selves in schools. If two or three writers who lived in the – game place happened to become friends, they forthwith called themselves a school ; and the result was that they usually developed some marked common characteristics. These coteries inevitably became more or less narrow and exclusive; but theyalso stimulated each other to fresh effort, and the clash of

their ideals sometimes helped the outside world to new points of view. The Saxon school, whose headquarters were in Leipsic, was for some years more prominent than any of its rivals. It was founded by Gottsched (1700-66), who, although he made himself ridiculous by pedantry and vanity, became the ruling liter- ary man of Germany. He was appointed a professor in Leipsic in 1724, and founded there " The German Society," which soon became the centre of a number of similar bodies for the cultivation of literature. Gottscled aimed at nothing short of the complete reformation of German poetry. He had the sense to see that if he wished to reach the people he must begin with the drama, and he was fortunate enough to find in Frau Neuber, who had formed a company in Leipsic, an intelligent actress capable of giving effect to lus ideas. With her help he banished Hanswurst from the stage ; and she was forthwith supplied with plays by him- self, by his clever wife Louisa Victoria, and by several dis- ciples. He gave his attention chiefly to tragedy, and un- fortunately he had but one idea in regard to it—that it had reached the utmost possible excellence in the classic drama of France. The English drama, he admitted, had some merit, but only in so far as it had modelled itself on the work of Corneille and Racine. Hence, in his chief tragedy Der Sterbende Cato ("The Dying Cato") he availed himself freely of Addison's Cato; the Elizabethan dramatists, of whom his direct knowledge was slight, he believed to be mere barbarians. His taste gave the law in nearly every theatre in which German plays were acted ; and it was certainly a good consequence that Lohenstein fell into permanent disrepute, while even the groundlings began to feel that the uncouth works which actors them- selves had hitherto produced were, to say the least, far from perfection. On the other hand, the German genius was forced to submit to arbitrary laws antagonistic to its true nature ; and so long as its submission lasted, a genuinely native drama was impossible. It was not only in regard to drama that Gottsched insisted on absolute subservience to France. In regard to all species of verse his sympathies were with the court poets, and both by example and by critical precept he insisted that in poetry as in everything else the understanding must be supreme, and that clearness of statement, correctness in the management of figures, and logical arrangement are the highest literary virtues. Re- garding the function of imagination and feeling in poetry he had no suggestion to offer.

There were writers who instinctively felt that this could not be a complete theory; and of these the chief were Bodmer and Breitinger, the leaders of the Swiss school, which was formed in Ziirich. These writers, although destitute of creative genius, had nourished their imagination on English poetry, especially on Paradise Lost, and it was incredible to them that a critical doc- trine could be correct which left out of account or con-

truly national literature a place of honour belongs to Haller | demned their favourite writers.

At first they were on friendly terms with Gottsched, but when the latter harshly criticized a translation of Milton's epic issued by Bodmer, his Swiss rivals prepared to defend themselves ; and thus broke out a literary controversy which made much noise at the time, and in which the angry critics, to the edifi- cation of onlookers, pelted each other unmercifully with abusive epithets. Neither party was fully conscious of the significance of its attack, and sometimes the warriors seemed almost to change sides. But the general tendency of the dispute was that the Swiss school, amid much exaggeration, defended the claims of free poetic impulse, while the Saxon school, in a narrow and pedantic spirit, maintained those of conscious art. It is hard work now to follow their arguments, but at the time they interested a considerable public in literature, and opened fresh lines of investigation. One of the results was that Baumgarten, a disciple of Wolf, published a book which Germans regard as the beginning of modern esthetics,—a branch of mental science to which their philosophers have ever since devoted thought and labour.

While this warfare of critics was going on, there were in Leipsic a number of young writers who more or less attached themselves to Gottsched, but who gradually shook off his authority. They founded a periodical, the Bremer Beitrdge (the "Bremen Contributions"), which had considerable influence in forming their own style, and in keeping alive the popular interest excited by the central controversy. After a while many of them were scattered over different parts of Germany, but they retained their original

impulse, and continued to be known as members of the Saxon school. Gellert (1715- 69) was by far the most famous of the circle. It is impossible to mention without respect this amiable writer. His plays are unimportant, but his fables and tales reveal so gentle and pure a spirit that we cannot wonder at his great popularity. He was a favourite among all classes, even Frederick the Great himself, who rarely condescended to notice a German author, declaring after a long interview that he was "the most reasonable of German scholars." His supreme defect was a tendency to weak sentimental- ism and pious commonplace. Rabener (1714-71) acquired fame as a good-humoured satirist. His prose is fresh and clear, but he has not sufficient grasp of any important principle to entitle him to very high rank among moralists. Christian Felix Weisse (1726-1804), the friend of Lessing's youth, failed as a writer of tragedy, but was a favourite author of comic operettas. He was also the first successful Genman writer for children, and edited for many years a periodical (the Bibliothek der schinen Wissenschaften) which had a favourable influence on popular culture. Johann Elias Schlegel (1718-49), uncle of the two Schlegels who became long afterwards leaders of the Romantic school, gave evidence of high dramatic talent, but died when he was beginning to be conscious of his power. Arnold Ebert distinguished himself by good translations from English; and Zacharidi wrote with some success mock heroics in the style of The Rape of the Lock. Kistner, whose disputations at the Leipsic university were diligently attended by young Lessing, made him- self feared as a biting epigrammatist. Cramer became one of the most eloquent preachers of the day, wrote popular religious odes, and edited The Northern Guardian, a well- ineaning but rather commonplace imitation of the Guardian of Steele. These writers, who from being Gottsched's friends all became more or less hostile to him, have a clear- ness and grace of style which were unknown in the previous century. Another author who was from the beginning Gottsched's enemy, but who had no relation with this par- ticular school, may be here mentioned,—Liscow (1701-60).

Bremer Beitrige.

Halle School.

Gleim,

Religious lyrics.

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His prose has nerve and animation, and few satirists have dealt severer blows at literary pretence.

both from the Saxon and the Swiss schools. members were Gleim (1719-1803), Uz (1720-96), and (Giétz (1721-81). These three writers formed a friendship in their student days at Halle, where they came under the influence of the poets, Pastor Lange, and the tutor of his children, Immanuel Pyra, ardent disciples of Bodmer and Breitinger. The young students, while feeling sincere re- spect for the Swiss critics, did not attempt any very serlous flight ; they preferred to amuse themselves with lively little anacreontic verses, which they soon brought into high repute. Afterwards Gleim settled in Halberstadt, where he lived to an extreme age. His didactic poem Hadladat, which he wrote, he himself modestly explained, in order to gratify a wish of his youth to produce a book like the Bible, has no vitality ; but during the Seven Years' War he composed War Songs of a Grenadier, which were everywhere read, and have not yet lost their popularity. 'They were edited by Gleim's friend Lessing, who, however, protested against their patriotic vehemence. Gleim was one of the most kindly of men, and became tlie patron of young poets, several of whom he always had in his pleasant bachelor's home. He also kept up an extensive corre- spondence with other writers, which is now an important source of information respecting the movements of contem- porary literature. One of his most intimate friends, who resembled him ouly in geniality of disposition, was the noble-hearted Ewald Christian von Kleist (1715-59), who was fatally wounded on the battle-field of Kunersdorf. He would still deserve to be remembered as the man whom, of all others, the equally noble Lessing most loved. His descriptive poem /riihling ("Spring") is partly an imi- tation of Thomson; but it is also the work of an inde- pendent lover of nature, who knew how to give beautiful utterance to true and simple feeling. Ramler (1725-98), another friend of Gleim, and the friend, too, of Kleist and Lessing, wrote spirited odes in Horatian metres, which, like the War Songs of a Grenudier, gave pleasure because of their strongly patriotic tone,—the direct result in both cases of Frederick's influence. Anna Louisa Karsch

(1722-91), a poetess who owed much to Gleim's goodness, was a favourite among the literary men of the day, but! her verses are ruder than they ought to have been at so late a date. Idyllic poetry, which Kleist and Gétz to some extent cultivated, was taken up in ear- nest by Solomon Gessner (1730-87), whose prose idylls, The Death of Abel, The First Sailor, and others, were trans- lated into French and English, and were better received in their foreign dress than in their original form. They are written in an easy style, and express much harmless although somewhat tedious sentiment. He was imitated by Xaver Bronner, a Catholic priest, whose idylls have not half the merit of his autobiography, which affords remarkable insight into the religious life of Catholic Ger- many about the middle of the 18th century.

The religious lyric, which had shared the general decay during the latter half of the 17th century, displayed more vitality during part of this period. It owed its fresh life mainly to the pietists, who reopened fountains of spiritual feeling that had been apparently dried up by theologians. Among the best of this younger generation of hymn writers were Freylinghausen, Neumeister, and Tersteegen. Their fame was, however, less extensive than that of Count von Zinzendorf (1700-60), the founder of the sect of Herrnhiiter or Moravian Brethren. Besides hymns he wrote religious works in prose, and made himself one of the most prominent figures of his time by ardent nlissionary zeal. His followers, like all deeply religious

tinguish himself as a fabulist. | in their zeal for a combination of the wonderful and the

sects in Germany, delighted in hymns ; and many of those

| they produced are remarkable for the sensuous, sometimes The Halle school of poets was in some respects different | Its original |

almost sensual, forms in which their emotions are expressed.

Fables were at this time an extremely popular class of writings, and nearly every imaginative writer sought to dis-

The Swiss school, indeed,

useful in literature, maintained that the fable was the highest type of literature. As a rule, Lafontaine was taken as the model in works of this kind, but we look

Fabus lists,

in vain among his German imitators for his exquisite grace ~

and naiveté. Gellert stands at the head of the more sentimental fabulists; after him may be named Willanow and Lichtwer. The latter (1719-83) has humour as well as sentiment, aud some of his fables have an artistic finish that indicates a faculty by which he might have won distinction in more important labours.

From about the middle of the 18th century onwards a number of prose writers, who may be classed together as popular philosophers, worked effectively for the enlighten- ment of ordinary readers. ‘They attached themselves to some extent to Wolf; they also came under the influence, although not in any great degree, of the French Encyclo- pedists ; and they were admiring students of the English deists, and of Locke, Shaftesbury, and Hutcheson. They are often condemned for the shallowness of their thought ; and if we compare them with the great thinkers who followed them, the condemnation is just. They did not grasp the significance of the problems which had been handed down by Descartes, Spinoza, and Leibnitz, with which Hume was now grappling, and which were soon to enter upon a new phase in the critical philosophy of Kant. In regard to religion they had a very imperfect appreciation of every element that could not be expressed in clear logi- cal statements ; feeling and imagination were rigidly subor- dinated to the understanding. And they had not even a remote suspicion of what is now familiar as the historical spirit, so that they displayed amazing narrowness of vision in their treatment of past spiritual developments, and of contemporary creeds with which they did not happen to agree. But if we are to do justice to these popular philosophers, they must

be compared rather with their pre- decessors than with their successors. An important place belongs to them in the movement by which vital human interests have been raised above theological disputes, by which morality has received a basis independent of dog- matic religion, and by which toleration has been secured for men of every faith. They were penetrated by a truly humane sentiment; and it must be counted a high merit that in a country which had been more or less dominated by pedants, and whose great writers of a later age have not always attempted to be both profound and clear, they sought to express themselves in unpretending and straightforward German. The chief of the popular philosopliers was Moses Mendelssohn (1729-86), not a deep or massive

thinker, but a man of fine moral sympathies, an entliusiast — | sonn.

for freedom—from the lack of which he himself, as a Jew, keenly suffered —and an incisive psychological analyst. His

friend, Frederick Nicolai (1733-1811), the Berlin book- Nicola |

seller, had the misfortune to outlive his epoch. He had only words of contempt for Goethe and Schiller ; and Kant, whom he did not profess to understand, seemed to him a sort of cross between a bungler and an impostor. These terrible mistakes have made poor Nicolai, notwith- standing his lifelong warfare against bigotry, the type of a narrow-minded bigot. Yet in his earlier days he was re- cognized by such a judge as Lessing, with whose friendship he was honoured, as a writer of talent. And his Bibliothek (Library ”), the most important literary periodical of his

Popular philoso. hers,

Moses

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day, did excellent service by providing the popular phuilo- sophers witli a medium for the expression of their opinions

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Klopstock stvod in direct relation to the Swiss writers, Klop- When a pupil at Schulpforta, one of the great Saxon schools Stock.

KLOPSTOCK. |

on all the great questions which then agitated Germany. Other popular philosophers were George Sulzer (1720-79), who devoted himself to zsthetics in the spirit of the Swiss school, but with the advantage of later lights; Thomas Abbt (1738-66), whose style was one of uncommon vigour ; Christian Garve (1742-98), who did not attempt any great original work, but in letters and articles examined many individual philosophic questions from new points of view; and Johann Jacob Engel (1741-1802), whose Philosoph ftir die Welt ("' Philosopher for the World") interested a class of readers who would liave been unable to follow a more adventurous guide. Zimmermann (1728- 95) hardly deserves to be mentioned in such good company ;

on Solitude") by its sentimentalism and rhetoric carried

which sent forth many of the best authors of the day, he was a diligent student of Bodmer, by whose critical principles he guided himself in reading Homer, Virgil, and Milton. The Messiah, on which his fame mainly rests, is now little read, and it is impossible even to glance through it without becoming conscious of glaring faults. Klop- stock's genius was essentially lyrical ; he lacked the plastic force of imagination necessary for a great epic. His cen- tral figure is nowhere presented in clear sharp outlines ; it wavers between two distinct conceptions, that of a divine and that of a human character. And the facts to which he turns our gaze in the crisis of his narrative are not such

as kindle the deepest sympathies ; he exhausts the powers but his Betruchtungen tiber die Kinsamkeit (" Observations |

his name far beyond the bounds of Germany. Some theo- | logians, without exactly sharing the beliefs of the popular |

philosophers, were profoundly affected by them. Among these were Mosheim, the ecclesiastical historian; Spalding, the translator of

Shaftesbury ; and Jerusalem, the father of the young writer whose suicide suggested some elements in Goethe's Werther, These liberal theologians did not hold a very intelligible logical position, but they were of some importance by their attempts to introduce a freer and more polished style of eloquence than had hitherto marked the German pulpit. In regard to the permanent movements of thought, their influence was greatly inferior to that of Michaelis and Semler, whose labours heralded the approach of modern Biblical criticism.

In history Germany produced at this time at least one – writer of high eminence, Justus Moser (1720-94), author of the Osnabrtickische Geschichte (" History of Osnabriick ") and Patriotische Phantasien (" Patriotic Fancies"). Moser was the first German historian who wrote a good style and attempted to penetrate to the meaning of events and to present them in the light of great principles. He also produced a strong impression by his enlightened patriotism and by his burning scorn of wrong. Schréck and Schlézer were prominent historians, and the latter made himself known asa clear writer on contemporary politics. Karl von Moser, of Stuttgart, applied to political subjects a faculty for wit and satire that was estimated highly in his own day.

It has been already stated that the revival of classical study was one of the chief causes by which the mind of Germany was awakened to new effort. Professors Christ and Ernesti, of Leipsic, who were the favourite teachers of many young students, including Lessing, were two of the chief writers to whom this revival was due. Incomparably – greater than either, however, was Johann Joachim Winckel- mann (1717-68), whose History of Ancient Art (1764) opened a new era in the appreciation of ancient life. Later investigation has corrected Winckelmann on many points, but no critic has displayed a keener feeling for the beauty and the significance of such works as came within his knowledge, or a truer imagination in bridging over the gulfs at which direct knowledge failed him. And his style, warm with the glow of sustained enthusiasm, yet calm, dignified, and harmonious, was worthy of his splendid theme. What he did for ancient art was to some extent done for ancient literature by the untiring editorial labours of Christian Gottlob Heyne (1729-1812),

Important as were many of these writers, Winckelmann above all, they exercised slight influence on the national mind compared with the three men whom the Germans justly regard as the founders of their classical literature— Klopstock (1724-1803), Wieland (1733-1813), and Less- ing (1729-1781).

of language to convey an impression of the Messiah's suffer- ings, but we hear nothing of the qualities of soul which these sufferings rouse into action, The subordinate characters are innumerable, and except Abaddona, a repentant fallen angel, between whose character and whose fate there is an effective contrast, none of them can be said to live; they exist only as an excuse for the utter- ance of Klopstock's feelings. They talk incessantly, weep, embrace, and kiss, but they never do anything that exhibits more than a vast quantity of obtrusive sentiment. Not- withstanding its obvious defects, however, the Messiah has qualities which must still command admiration; it reveals a nature full of lofty aspiration and deep humanity, and it contains individual images of striking force and beauty.

It would be difficult to imagine anything more dreary than Klopstock's plays, the subject of three of which is Arminius, while the others deal with scriptural themes. He knew enough ueither of life nor of the stage to be a true dramatist ; his characters are mere names, and the in- cidents are grouped according to no principle of art. His odes, which he continued to write from the beginning to the end of his long career, are of far higher excellence. Those which derive their inspiration from Northern mythology are too remote from general sympathy and too obscure in con- struction to awaken interest ; but the stamp of genius is upon several of the lyrics in which he expresses his passion- ate feeling for the grander phenomena of nature, his ardent patriotism, his enthusiasm for freedom, and his elevated sense of human worth and destiny. Both as an epic poet and as a writer of odes he had many imitators, who, like most others of their class, exaggerated the defects of their model and left his virtues alone. His influence upon the intellectual life of Germany was deep, and, on the whole, beneficent. He encouraged the self-respect of his country- men, intensified their desire for an independent literature, and by handling high themes, sometimes powerfully, always seriously, suggested that the national

imagination would reveal its full capacity only by undertaking greater enterprises than any it had yet attempted.

Although Klopstock was one of the central literary fig- Wieland.

ures during two generations, he was not a prolific writer ; Wieland, on the other hand, was one of the most prolific of German authors. He was continually at his desk, and in the course of his career produced a considerable library. Of his many works the romantic poem Oberon is by far the most famous, and the only one that really pleases modern readers. Agathon is perhaps the best of the prose romances in which le endeavoured to depict ancient Greek life. He was not endowed with great vividness of imagination, and his prevailing tendency is to extreme diffuseness ; but some of his descriptive passages, espe- cially those in Oberon, have a touch of ideal grace which enables us to return to them with fresh relish. He had a fine appreciation of style, and by the study of Greek

Lessing.

and French masterpieces persistently strove to acquire lightness, clearness, and ease. Even yet few German writers will compare with him in these qualities. In all his works he had a strongly didactic tendency, but his teaching was the opposite of that inculcated by most modern writers who deliberately aim at ethical effect. Above all, he differed from his great contemporary, Klop- stock. Writing at first as a strict pietist, he ultimately became a pronounced Epicurean in the popular sense, and made it his object to proclaim an Epicurean theory of life, discouraging enthusiasm, laughing at such aspirations as those of his own youth, exalting the claims of the senses, and placing the highest virtue in kindliness and good humour. This tendency often conducts him to more slippery ground than any on which a German writer of lis standing would now venture; but it also gives him innumerable occasions for the play of a gentle and refined irony.

Whatever may be the excellences of Wieland and Klopstock, both are essentially writers of the past. This cannot be said of Lessing, the third great German of this period ; he is still a living influence. only writer before

Goethe whom Germans can now read without feeling themselves in a world foreign to their sympathies. ‘Throughout his career he strove to renew and fructify the intellectual life of his nation, and he achieved his aim by important creative activity, and by the clearest, freest, and most drastic criticism of the 18th century.

As an imaginative writer he was chicfly distinguished in the drama, and his most important dramatic work is Minna von Barnhelm. If it cannot be said that this is, in the highest sense, a comedy of genius, it is at any rate a comedy which contains elements of permanent interest. The characters are vividly presented ; the plot is systemati- cally, yet naturally, unfolded; the dialogue is clear, fresh, and animated. And the work has the high merit of giving artistic shape to elements taken by the dramatist from the living world around him, mila Galotti is marred by a deep flaw in the conception of the central figure ; but every other character in the tragedy is conceived with bold imaginative force, and it is possible for a compe- tent actress to soften, if not to harmonize, even the clashing elements in Emilia herself. No drama making even a dis- tant approach to the excellence of these two plays had been produced in Germany; they thus gave literature in its highest department a fresh start.

But valuable as were Lessing’s imaginative creations, they were inferior to his labours as a thinker. Here he was absolutely supreme among his contemporaries ; and in some respects he has not since been surpassed. His method is invariably critical, but he aims at rising to the highest, most universal aspects of every subject with which he deals. As a master of style he ranks with the greatest European writers. The structure of his sentences is clear, precise, and compact; and he keeps the mind awake by vivid images drawn from nature and from human life, by interesting, sometimes remote, allusions, by rapid strokes of wit, and by unexpected turns of thought, as if he were abandoning his main theme, while he is in reality indirectly advancing it. He has often been called the most critical of poets ; it would be equally just to call him the most poetical of critics.

The greatest of Lessing’s purely critical writings is Laocoon, a fragment, but a fragment containing the germs of much of the best thought of his own and the immedi- ately succeeding generations. It has an. enduring value as

the first serious and great attempt to distinguish sharply the realms of art and poetry, and to foster both by subjecting each to its own laws. Next in importance

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He is, indeed, the”

| movement began which is known as that of “Sturm und

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stands his Hamburgische Dramaturgie, a series of criti- cisms on plays represented at the Hamburg National Theatre. By these splendid criticisms, which are based in the main on Aristotle’s Poetics, with many side-references to Diderot’s theories, he put an end to the abject sub- mission of dramatic writers to French traditions. In his later years he issued the Wolfenbiittel Fragments, por- tions of a theological work by Reimarus, a deistical writer of admirable force and clearness. He thus became involved in a hot controversy with indignant professors and pastors, the noisiest of whom was Pastor Goeze of Hamburg. The tracts issued by Lessing in the course of this controversy are in form among the most perfect of his writings; they are at once learned, keen, and witty. And in the history of Western thought they are of deep significance. His immediate object was to secure for criticism absolute freedom of movement; but he did very much more. He fore- shadowed, as a vital element of the coming time, inquiry as to the origin and growth of the Scriptures, the rise of Christianity, and the fundamental character of religion. And he indicated a far higher standpoint than that of the popular philosophers by vindicating the claims of feeling in spiritual life as opposed to those of the bare understanding. In his Education of the Human Race he gave systematic shape to the fruitful principle that a religion which is not true absolutely or forall time may be of vast importance by meeting the needs of a portion of the race in special epochs, and that there isin history, notwithstanding apparent reac- tions, a progressive movement towards higher intellectual and moral ideals. The suggestions thrown out in contro- versy he developed artistically in one of the greatest of his writings, the fine dramatic poem, Nathan the Wise, a work which enshrines all that was noblest in the struggles and the

aspirations of his age, and connects the thought of the 18th with that of the 19th century. As a drama, it has serious faults; but it powerfully effects its purpose by revealing, in the enlightened Jew, its hero, the grandeur of a nature which, instead of binding itself in dogmatic fetters, cultivates a spirit of free and disinterested humanity.

Thus in all directions this great writer laboured for the intellectual regeneration of his people. If Goethe, Schiller, and Kant found a nation prepared to receive their work, they owed the fact to many causes; but among these the chief were the political activity of Frederick II. and the literary activity of Lessing.

VIL. The Classical Period.—At the close of the Seven Afterthe Years' War the conditions of public life were very unfavour- Sova able to literature. The eountry was impoverished, and wae Frederick the Great and Maria Theresa were almost the only sovereigns who showed the least regard for the wel- fare of their subjects. But the mind of the nation had been thoroughly aroused from its long slumber. It had been startled into patriotism by Frederick's unsurpassed energy, while the labours of the chief writers had imbued the better part of the middle class with a desire for a more varied and interesting life. As political freedom was still a dream of the future, they turned more and more to books for refresh- ment and stimulus. Multitudes of young men who in other circumstances would have occupied themselves solely with practical duty became authors, and they urged each other to an activity without parallel in any previous period.

Most of these young writers were deeply influenced by the men of the older generation—Lessing, Wieland, and Klopstock. They were also ardent students of Shakespeare, Ossian, and Dr Young, poets who were oddly supposed to be on the same level and to share the same tendencies. Rousseau excited almost as much enthusiasm in Germany as in France, and the criticism of Diderot found many warm admirers. Under these diverse influences a curious

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Drang" ("Storm and Pressure"). It lasted, from about 1770, for ten or twelve years, and included nearly all the writers who still had fame to win. Their

most prominent quality was discontent with the existing world. They detested not only tyranny and superstition but everything which prevented, or seemed to prevent, the free exercise of any powerful impulse. To break down conventionalities appeared to the "' Sturm und Drang" poets their true function ; but even this did not satisfy them. They longed for some knowledge deeper and more intimate than that attained by science, philosophy, or history, for some emotion intenser than can arise from any known human relation. All these conflicting feelings they expressed in their writings. From slavish submission to French critical laws they were of course completely emancipated. Most of them despised laws of every kind in literature as well as in life, and con- tinually proclaimed that the duty of a man of genius was to write precisely as nature dictated. By "genius" they meant vehement sensations, by "nature" a free use of vigorous epithets.

The writer who formed the connecting link between

Lessing on the one hand and Goethe and Schiller on the |

other, and whom the best writers of the "Sturm und Drang" movement regarded as their critical guide, was Johann – Gottfried Herder (1744-1803). Herder is sometimes com- pared with Lessing, but while Lessing has a cosmopolitan touch which makes him intelligible and attractive to all the world, Herder is in the strictest sense a German, and is only slightly studied beyond his own nation. He was less boldly original than his older contemporary, and never attained the clearness, force, and classic beauty of Lessing's style. Nevertheless he is justly ranked among the most distinguished spirits Germany has produced. His mind was receptive in many different directions, and what he absorbed he made his own by independent thought, giving it out in new and suggestive forms. As an original poet, Herder does not rank high; yet genuine poetic impulses are visible in the poem in which he gave shape to the Spanish legends of the Cid. The literature in which he looked for the highest manifestation of thought and feeling was that which appeals to popular sentiment and has its root in popular life. Lessing had already called attention to the songs and ballads of the people; but Herder was the first German who decisively followed the impulse which led in England to the publication of Percy's Reliques. In his Stimmen der Vélker (" Voices of the Peoples") he brought

together an admirable collection of the lyrical utterances of many races; and it would be difficult to overrate the ser- vice he thus rendered, for he conducted his countrymen to a source of imaginative pleasure and revival in which their literature is exceptionally rich. By far his most important prose work was his /deen zur Philosophie der Geschichte der Menschheit ("Ideas towards the Philosophy of the History of Humanity"), in which, working to some extent on the lines laid down in the brief paragraphs of Lessing's Educa- tion of the Human Race, he develops the conception of pro- gress, and indicates that we can fully understand any single element of history only by seeing it in the light of human evolution as a whole. This excellent book elevated the aims and enlarged the scope of historic inquiry in Germany ; and it still produces a powerful moral effect by its noble spirit of humanity, To the end of his days Herder was animated by a fine enthusiasm for human happiness, and it lights up his pages even when his subject does not lead to its direct expression.

To Herder belonged the high honour of stimulating and directing, at a critical stage, the young genius of Johann – Wolfgang Goethe (1749-1832). In naming Goethe we Inention the writer who holds in German literature the place held by Shakespeare in the literature of England,

and by Dante in that of Italy. He towers high above even the greatest of his contemporaries, predecessors, and successors,—Schiller himself, who is most worthily asso- ciated with him, being far inferior in breadth of sympathy and splendour of creative impulse. Goethe, indeed, is one of the few writers who, while marked by strongly national characteristics, belong to the world rather than to a particu- lar country. The special phases of his age have begun to pass away, but his best work has lost none of its freshness ; it cannot become old, since it is rooted in elements of human life that eternally endure.

All things co-operated to render worthy of his destiny this favoured child of fortune. During his long life he enjoyed almost uninterrupted physical vigour ; he was boru into a family of prosperous circumstances, although

not so highly placed as to satisfy his ambition; he received the best intellectual training his epoch could afford ; in Weimar he was free to adapt the plan of his life tu his inclinations ; and he appeared at the very time when, by an era of sincere poetic endeavour and unparalleled critical labour, the mind of the nation had been prepared for the boldest efforts of genius. Nature has seldom lavished so many advantages on the greatest of her great men.

The quality in Goethe which immediately arrests atten- tion is the extraordinary range of his activity. Hardly any aspect of human existence was strange tohim. He possessed in an unsurpassed degree the faculty of dramati- cally thinking himself into phases of life to which his per- sonal impulses would not have led him; and he deliberately enlarged his experience by exercising this power at every stage of his career. It was his prevailing conviction that all ideals which fascinate or have fascinated humanity must have a touch of vitality; and none was so remote from him but he sought to penetrate to its meaning. He could be just to Hellenic culture without doing wrong to medizvalism ; he appreciated the spirit of Christianity without being indifferent to the faith of the Parsees or the Buddhists ; he presented the ascetic aspirations of a “beautiful soul,” while setting forth the gaiety of the brightest and most careless tempers ; he felt the charm of

art at the same time that he carried on profound researches

in science ; he loved his country, and yet, even when it was overrun by Napoleon’s troops, he would not join the patriots in saying a harsh word of France. This absolute vniver- sality destroyed enthusiasm for special practical move- ments; but it gave astonishing variety to his literary achievements. Goethe’s was in every respect a thoroughly poetic nature. He could not pass through a profound experience, an image of beauty could not cross his vision, without an accompanying impulse to find for his emotion an adequate sensuous representation. So vast a body of writings as his inevitably includes much that is tedious, but in his happiest moments his genius moved with the ease, the certainty, the calmness of the great forces of nature ; he could be as perfect in the lightest stroke of delicate feeling as in the grandest flight of soaring imagina- tion. The world he reflects is the

world we actually know ; but he is not, therefore, in any narrow sense, a realist. The facts he images are shaped and coloured by his thought and feeling ; he breathes into them a life by which they are made of universal significance. This combination of realism and idealism is one of the chief seerets of his power. His art aims at producing the most general effects, yet it is kept fresh, vivid, and true by incessant contact with the concrete life of men.

Heine relates that he felt inclined to address Goethe in Greek, so like was the calm dignified old man to an earthly Zeus; and this is probably the image suggested to most minds by his name. But in youth he was full of eager life, restless, and passionate, and his early RyaLy uae the

impress of turbulent feeling. Of these the first published was Gotz von Berlichingen, which instantly established his fame as one of the chief writers of the “Sturm und Drang” school. It is alinost as formless as their inartistic writings. The language is sometimies excessively rude, and there is no attempt to combine the different scenes into an harmoni- ous picture. Yet it is sharply separated off from the taste- less plays with which it was compared, for everywhere we find traces of immature power. The characters are alive ; they act and react upon each other as we should expect men and women to do in a stormy and troubled epoch ; and by a few touches of apparently unconscious art we are made to realize the vital change through which the society of the age of the Reformation was passing. Die Leiden des jungen Werthers (“ The Sufferings of Young Werther”) gave Goethe a European reputation. Much of its sentimentalism now excites smiles instead of tears; but with all its faults it has an enduring fascination. It breathes a warm love of nature, of which it presents vivid pictures ; it conveys a powerful impression of the mingled force, sweetness, and unreasonableness of early passion ; and it expresses with deep pathos that weariness of life which forms oue of the moods of poetic youth, and the manifestation of which was a favourite pastime of the less sincere “Sturm und Drang” versifiers. ‘The promise of Gétz and Werther was not sustained by all the works produced in the first part of his career. Clavigo is only a fairly good acting play; and Stella has even more than the extravagant

sentimentalism of Werther, with only an occasional touch of its poetry. On the other hand, it was now that Goethe began Faust ; and the fragment, Prometheus, expresses a grand defiance that is the more impressive because of the deep philo- sophic thought which may be traced in the background. It was, however, in his lyrics that the richly varied life of Goethe's youth most perfectly revealed itself. There are no German lyrics, if we except Heine's, which deserve to be compared with Goethe's ; perhaps none in any literature have a more subtle charm. Profiting by the teaching of Herder, he studied the artless beauty of the best songs of the people, to some of which he gave new form, while re- taining their primitive simplicity. His own lyrics are at once popular and artistic ; he takes as his themes the joys, the longings, the regrets which all men understand, and weds them to melodies of delightful ease and grace. Almost every poem was suggested by some passing emotion of his own; yet his feeling is so purified that his words be- come the voice rather of humanity than of an individual man. THis ballads are not, as a rule, so powerful as his songs, but both have one quality in common—without elaborate descriptions they continually call up by an apparently accidental word or phrase a clear vision of some natural object or scene. He is equally master of himself in rendering nature as a mirror in which we see the reflec- tion of our own experience, or as a power moving on in calm indifference to our hopes and fears.

In 1775 Goethe settled in Weimar, where Wieland already was, aud whither he was ultimately followed by Herder and Schiller, so that the little town became the centre of the intellectual life of Germany. After an inter- val of ten years, during which he published nothing, he paid his famous visit to Italy. Here his genius was kindled anew, and a close study of-sculpture and painting suggested to him the necessity of submitting more fully than he had yet done tv the permanent laws of art. The fruits of this experience were Iphigenia, Tasso, and Lgmont, all of which he took with him to Italy in an unfinished form. The first two of these dramas were accepted as imitations of the antique; but they are so only in the sense that in each the parts are rigidly subordinated to the intention of the whole, that there is an orderly sequence in the development of the

action, and that they are marked by elevation and simpli- city of style. While incomparably more finished as works of art than any of the greater works he had before produced, they indicated no falling off in energy of imagination. Iphigenia, although its subject is Greek, is in tone and motive altogether Christian; and it would be difficult to name a more attractive picture of a modern lady than the pure and high-minded heroine. In Zasso Goethe draws in strong and sure outlines the sorrows of a poetic nature which will not sharply discriminate the real from its own ideal world, This dramatic poem is hardly more remarkable for the truth and vividness of its conceptions than for the charm of its versification aud the wealth and beauty of its language. Hgmont, however, has more movement, and touches human experience at deeper points. Most readers agree witli Schiller's criticism, that there is too much melo- drama in the closing scene, in which Clirchen appears to the hero as the spirit of freedom, and that, notwithstanding the liberties taken with history, Goethe has hardly succeeded in making Egmont the type of an enemy of despotism. But Clarchen is a beautiful study of a mind stirred by love to great resolves ; and there is splendid portraiture in the characters of Alva, William of Orange, and the Princess of Parma.

Meanwhile, a new literary force had revealed itself in Schiller.

the life of Germany : Schiller (1759-1805), Goethe's great rival, had begun to divide with him the public attention and interest. The names of these two poets, in virtue of whose labours their period deserves to be called classical, are indissolubly connected, yet they were marked off from each other by profound distinctions. Goethe is often called the poet of culture, and it is true that he never ceased to subject his powers to systematic discipline. He was also one of the keenest critics of modern times. But the charm of his best writings is not dependent on criticism or cul- ture ; it springs from the spontaneous movement of a great imaginative faculty. Schiller, on the other hand, while also endowed with imagination, possessed it in a mucit less degree. His poetry would probably have lived even if he had not had the advantage of a thorough grasp of esthetic laws; but it would certainly have had no claim to the dis- tinguished place it now holds in European

literature. He did not attempt so wide a range as Goethe, and within his scope he was not, like Goethe, a disinterested observer ; he flung himself into the midst of the struggles of his time, and fought valiantly as the champion ofaside. Fortunately for Germany, his side was always that of a truly chivalrous mind ; for Schiller was one of the most unselfish of men, with lofty aspirations for the race, and a generous confidence in its essential goodness. These qualities determined the character of his conceptions. Goethe presents us with idealized pictures of the world ; Schiller's creations are not so much pictures of the world as the figures of a realm distinct from actual life. His supreme aim was to express great sentiments and ideas, and as the medium for their utterance he conceived characters which are to be found only in a poet's dreams.

Schiller began his literary career as a youth of two-and- twenty, inspired by revolutionary ardour, detesting every conventionality of society, dreaming of a world in which will and passion should have absolute licence. He relieved himself of his vehement emotions in his first three plays, Die Réuber ("The Robbers "), Fiesco, and Cabale wad Liebe ("Intrigue and Love"). Genius never beat with more Titanic energy against an unsympathetic world than in these dramas; the impulse of the "Sturm und Drang" period, as it was about to die away, spoke in them its wildest, most passionate word. Don Carlos, his mext drama, still manifested inability to form an organic whole ; it contains scenes which have no bearing on the central

action, and there is hardly an attempt to explain deeds by natural and intelligible motives. But we are no longer in the presence of one who merely raises an outcry against thie existing world ; furious resistance to despotism has become enlightened enthusiasm for freedom, humanity, and pro- gress. Although the part of Marquis Posa is imperfectly worked into the scheme of the play, he is a nobly ideal creation ; through him Schiller pours forth his own aspira- tions for the welfare of mankind. There is admirable art in the momentary elevation caused by his greatness of soul even in the dark and selfish Philip and the restless and wayward Don Carlos.

After he settled in Jena in 1789 as professor of history, Schiller was often in Weimar; but for a time he and Goethe held apart. By and by they began to approach each other, and from about 1794 their acquaintance ripened into fast friendship. The friendship of Goethe and Schiller is one of the most beautiful in the history of literature. It made no essential change in Goethe's modes of thought or expression, but it spurred him to the highest activity of which his genius was capable. His friend, he himself declared, "' created for him a second youth, and again made him a poet, which he had almost ceased to be." On the other hand, in contact with Goethe's larger intellectual life, Schiller was raised to new points of view, and he acquired for the first. time that mastery of artistic methods which secured for him his highest triumphs. He now became as remarkable for the perfection of his form as for the depth and warmth of his feeling.

The two friends worked harmoniously in connexion with Schiller's journal Die Horen, and wrote in common the Aenven, a number of epigrammatic verses meant to wound their literary enemies. On the whole, it is surprising that comparatively so few of the arrows in this rather large quiver are delicately pointed and feathered. A very differ- ent stage of excellence is reached by Schiller's well-known ballads, which were written during the period of his intimacy with Goethe, Nearly all of them are marked by force of conception and by purity and dignity of style. In lyrical poetry he had acquired some distinction before he knew Goethe, but it was in competition with his friend that he achieved his masterpiece, Das Lied von der Glocke ('The Song of the Bell"), in which within a small compass he presents an impressive picture of the course of human life, varying his melody with subtle art to suit the changing aspects of his theme. Less artistically perfect than the Glocke, other lyrics, such as Der Genius, Die Ideale, Der Spaztergang, have the power which belongs to deeper per- sonal emotion. In ease and spontaneity none of Schiller's lyrics equal Goethe's, in which, as Heine says, "the word embraces you while the thought kisses you." But they express in clear and noble language some of the highest feelings excited in a poetic mind by contemplation of human life and destiny.

In his dramatic writings Schiller was influenced by Goethe even more than in his lyrics and ballads. The whole series of tragedies which he now wrote have historic or legendary themes, and he displays remarkable skill in

unfolding through the past his greatest ideas respecting the future. At the same time he evokes from it a company of finely ideal figures, whose qualities are revealed by the systematic development of large and carefully conceived schemes. Wallenstein, the earliest of the series, consists of two plays, Zhe Piccolomini and Wallenstein's Death, the former of which is preceded by a number of scenes present- ing a vivid picture of Wallenstein's camp. The tragic motive of this great work is somewhat obscure. We are made conscious by many artful touches of the ultimate issue; but Schiller does not render fully intelligible the play of tlie influences which result in disaster. There is,

however, high imaginative faculty in his conception of |

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O39 Wallenstein's powerful, dark, and wavering character ; and every reader feels the charm of the love passages between Max Piccolomini and Thekla. In Maria Stuart Schiller triumphs over an obvions difficulty by admitting the heroine's guilt, while he stirs our pity for her sufferings and our admiration for the spirit of endurance with which they aremet. In the Jungfrau von Orleans, "The Maid" would have given purer pleasure if she had not been represented as loving one of the English commanders; but this only slightly mars the splendid picture of her patriotic devotion. Asa work of art, the Braut von Messina is the least successful of the later dramas, for it attempts to combine romantic and classic elements which are irreconcilable ; it contains, however, some of the most brilliantly rhetorical passages in the German language. The last of his completed works, and in some respects the best, was Wilhelm Tell. Here his love of freedom shaped for itself forms of immortal beauty. At a time when the French emperor threatened the inde- pendence of all Europe, men felt the power of the play more keenly than can be done in a calmer period; but it has permanently enriched the life of humanity by its con- ception of a character dominated by high, ideal passions. Schiller never saw Switzerland, yet in this powerful drama he renders with astonishing vividness tlie grander effects of Alpine scenery.

During his friendship with Schiller Goethe wrote in com-

Goethe’s

petition with him many lyrics and ballads. In works of the ballads.

latter class, as Goethe himself thought, he was surpassed by his friend. He is incomparably more subtle and suggestive than Schiller ; but for this very reason he is less effective. A ballad does not deserve its name if it is not popular; and we hear tlie voice of the people themselves in Schiller’s free, bold, and simply harmonious verses. One of the longer works published by Goethe during this period was Hermann und Dorothea. His delicately chosen language and digni- fied hexameters are not always in keeping with the some- what prosaic life they are here used to portray; but the poem is the nearest approach that has been made to the successful epic treatment of an ordinary theme. And it rises to a high level of imaginative power in the coutrast it suggests between the still life of the humble village, with its little idyll of satisfied love, and the far-off desolation of the revolutionary wars, of which we are reminded by the band of emigrants. The genius of Goethe moves more freely in Wilhelm Meister, of which the first part was now published. This work has perhaps given rise to more con- tradictory criticism than any otlier book in modern literature. We may safely disregard the opinion of those who find in it all the excellences ‘that can be combined in a prose romance, for it is without plan, and its style is singularly unequal, When Gocthe himself admitted that he did not possess the key to its full significance, his warmest admirers may allow that perhaps there is no key to possess. Yet few of his writings present more striking evidence of the fertility of his power. He interests us equally—- to recall only a few of the characters—in the gay and worldly Phillina, in the romantic Mariana, and in that most mysterious, lovely, and fascinating of creations, Mignon, whose Kennst du das Land is perhaps the noblest of those pathetic poems in which a soul iu an uncongenial world calls up a momentary vision of its true home. It is not only in its dramatic conceptions that Wilhelm Meister is great ; it contains some of Goethe’s deepest thoughts on life and literature.

After the death of Schiller Goethe turned his attention more and more to science, his achievements in which have been fully appreciated only since the growth of the doctrine of evolution. pleted the most famous and the

greatest of his works, Faust, 2 poem which he began in youth and did not finish

Her- mann und Doro- thea.

Wilhelm Meister,

Still, it was in his latest period that he com- Faust.

Goethe's latest writings.

French Revolu- tion.

Kant.

until nearly his last birthday. The Faust of legend was a vulgar magician ; Goethe so conceives the character that it indicates the deepest mysteries of human existence. The second part, in which the problem of the poem is solved, can hardly be regarded as a work of art; it is, or seems to be, confused and dark. And the individual elements of the first part are not completely welded; they form rather a series of poems than a single creation. In these individual elements, however, we find the grandest sweep of imaginative thought yet achieved by the German genius. The episode of Gretchen reflects with perfect art the most alluring and the most sorrowful facts of life; and philoso- phy and religion in their highest aspects meet in Faust's aspiratious and struggles.

It might have been supposed that at the age of seventy Goethe liad no new imaginative worlds to conquer ; yet he then published his Westéstlicher Dwan, representing, with dramatic sympathy and lyric force almost unabated, the combined mysticism and sensuousness of Oriental life. Ten years before, he had issued Wahlverwandtschaften (" Elective Affinities"), a powerful picture of impulses which law cannot control, and in which are concealed the germs of tragic issues. It has, however, less charm than another prose work, Dichtung und Wahrheit ("Poetry and Truth"), in which he draws a slightly idealized sketch of his early life. This fascinating book

has made the figure of young Goethe as familiar as his chief dramatic characters; and no creations of the fancy are better known than the Frederikas and the Lilis, who had long before occasioned his sweetest lyrics, and the memory of whom in old age gave delicacy and music to his style.

While Goethe and Schiller were in the midst of their career, Europe was startled by the French Revolution. At first it stirred as much interest in Germany as in England. The aged Klopstock greeted it with odes full of the fiery energy of youth, and for a time Schiller almost fancied that his loftiest hopes were about to be realized. Sympathy, however, was transformed into bitter opposition by the Reign of Terror; and when Germany was trodden under foot by Napoleon, she turned more aud more from every kind of French influence. Thus it happened that, although the ideas of the Revolution have indirectly affected the literature of Germany as deeply as that of the rest of Europe, their immediate effect was slight and transitory.

An event of the highest importance in the intellectual growth of Germany was the publication, in 1781, of Kant's Kritik der Reinen Vernunft. It is hard for men of a later time, accustomed to metaphysical speculation, to realize the impression produced by this great book. Its effect in philosophy was not unlike that caused in our own day in science by Mr Darwin's Origin of Species. Everywhere among thoughtful men, at the universities especially, philosophy became the absorbing subject of study ; and it was taken up at a point from which its whole past develop- ment was for the first time intelligible. Goethe, without neglecting the movement, was perhaps less stirred by it than any other prominent writer ; Schiller became one of Kant's most enthusiastic students, and traces of the new system are to be found in many of his later lyricsand dramas. He also applied its principles to zesthetics in several admirable critical writings. By and by, dissatisfied with the gulf left by Kaut between mind and matter as "things in them- selves," philosophers started in search of some principle which should harmonize all the elements of existence ; and thus grew up, one after the other, the systems of Fichte, Schelling, and Hegel. For more than a generation these thinkers excited deeper interest than imaginative writers ; the most serious minds were fascinated by speculations which placed in new lights all the greatest questions relating to human thought and action.

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Of the poets or versifiers who began their career with Goethe, the one who for some time attracted most notice was Klinger (1753-1831), whose play, Sturm und Drang, is at least memorable through its title. Other plays of his were Conradin and Medea; and he also wrote romances, of which the best known were Faust's Leben, Thaten, und Hollenfahrt and Der Weltmann und der Dichter, His writings are violent and noisy, without a touch of true art ; what he mistook for imagination was a power of crude and unmeasured declamation. His later works express the bitterness of a deeply disappointed man, Lenz (1750-92), whose name is usually connected with that of Klinger, did not make even so distant an approach to imagination as his rival ; his plays are the wild outgrowths of a mind which has made no sincere observation of life, and has submitted neither to intellectual nor to moral discipline. A man of much greater talent than either was Daniel Schubart (1739-91), the restless, licentious, and unfortunate poet who, for publishing a piece of false news, was confined for ten years in a fortress, where he suffered incredible hard- ships. In his attempts to portray the horrible he is some- times extremely grotesque, but his best verses have both

Sturm und Drang poets,

rausic and pathos, and they had the good fortune to exercise.

some influence on Schiller. He was one of the earliest publicists of Germany, and his hatred of despotism was the real cause of the infamous act which deprived him of freedom. Writers who shared the spirit of "Sturm und Drang," and applied it in new directions, were Lavater and Basedow. Lavater enjoyed the friendship of nearly every distinguished man of his day, yet he was vain and fanatical. His Physiognomische Fragmente (" Fragments on Physiognomy") were supposed by thousands of readers to find in the relations of mind and body the materials of a new and mysterious science; but the pretended science was in reality a mixture of commonplace and extravagance. Basedow, although with too passionate a faith in the power of education to effect an immediate transformation of the

race, did excellent service by advocating, after Rousseau, a more humane and natural system of mental training than had before prevailed. The same cause was more temper- ately promoted by Campe, who wrote some admirable books for the young; and the Swiss educational reformer, Pes- talozzi, set forth methods of instruction in earnest didactic works which had some effect in nearly every country in Europe.

The excitement of the "Sturm und Drang" writers was shared by a band of young poets who in other respects dis- played a wholly different temper. Most of them were students at Gottingen, where they gathered round Boie, editor of the Musenalmanach, a journal he had started in imitation of Le Mercure de France, and to which Goethe and many of the best of the younger men of the day contributed. They called themselves the " Hainbund" (" Grove Contede- ration "), because of their dancing one night by moonlight round an oak tree, swearing eternal friendship, and vowing to devote themselves to their native land. The god of their idolatry was Klopstock, whose somewhat fantastic enthusiasm for primitive Germany they fully shared, and whose labours on behalf of virtue they never ceased to celebrate, while they loathed and despised Wieland. Several members of the " Hainbund" afterwards acquired distinction, and all of them were more or less remarkable for the genuinely popular tone of their writings. By far

Hain- bund or Giottin- en school.

the greatest of them was Biirger (1748-94), who, although Birger. |

he never did full justice to himself, gave evidence of an original and adventurous genius. His Lenore, a translation of which was Scott's first published work, is full of weird power, and his sonnets are among the most perfect in Ger- inan literature. His faculty of meeting the popular taste was possessed by Hélty (1748-76), who, however, delighted

Claudius.

Imitat- ors of Wieland.

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‘Imitat- ors of Goethe

‘and Schiller,

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in mild and calm expression, while the best of Biirger’s poems are full of stir and action. Johann Martin Miller (1750-1814) became known chiefly as the author of the romance Sveywart, a rather weak imitation of Werther. Some irreverent spirits ventured to laugh at its tedious pathos, but it was welcomed by the majority of the middle class, who took especial delight in the songs it includes, Christian, Count Stolberg, and his brother, Frederick Leo- pold, were also members of the Géttingen school. Besides imitations of Greek plays, they issued odes, ballads, and sougs. Of the two the most powerful was Frederick Leo- pold (1750-1819), in some of whose briefer pieces there is true feeling for nature. He continually verges, however, on extravagance, and often takes the fatal step from the sublime. A stronger writer was Johann Heinrich Voss (1751-1826), author of a famous idyll, Louise, which was received by Schiller as a poem of first-rate importance, and suggested to Goethe the idea of his Hermann und Dorothea. Its homeliness of style is perhaps more in keeping with its simple and commonplace theme than the classic grace of Goethe’s verses. Voss acquired a better title to fame by an admirable translation of Homer, which did for the Ihad in Germany what Pope’s translation did in England. Voss’s rendering is less polished than Pope’s, but incom- parably more faithful. Matthias Claudius (17 40-1815), although not a member of the “ Hainbund,” is usually associated with it because of his general sympathy with its tone. The Wandsbecker Bote (“ Wandsbeck Messenger ”), in which he brought together all his writings, contains much simple poetic feeling, and some of his songs are still popular favourites.

While these writers attached themselves to Klopstock, others showed traces of Wieland’s influence. The most important of this class was Wilhelm Heinse (1749-1803), whose chief work was Ardinghello, a prose romance. He shares Wieland’s general theory of life, but, instead of ex. pressing it in the calm, ironical style of his master, he is veliement, tumultuous, and enthusiastic. Amid his wild exaggerations he sometimes displays a remarkable power of describing physical beauty. He was an ardent student

of art, and was the first German writer who succeeded in reproducing in glowing language the impression produced upon him by pictures and music. Other imitators of Wie- land were Aloys Blumauer, who mistook vulgar burlesque for satire; Alxinger, whose Doolin von Mainz may be taken to represent a large class of tiresome poems of chivalry ; and Von Thiimiel, who, with considerably more ability than these writers, spoiled his good qualities by cynical grossness. An indefinite number of medieval plays were written in imitation of Goethe's Gotz, and robber romances in imitation of Schiller's Rauber. Of the latter the earliest and most famous was the Rinaldo Kinaldint of Vulpius. Jung Stilling (1740-1817) con- tinued the sentimental tone of Werther in a number of curious autobiographic tales, which acquired extraordinary popularity, and threw much light on the inner tendencies of the later pietists. Among imitators of Schiller's lyrical poetry the best were Matthison and Salis-Seewis 3 but they were more successful in reproducing his moral feeling than in rivalling his high art. For many years the stage Was in the possession of Iffland (1759-1814) and Kotzebue (1761-1819). The former, who was a distinguished actor, wrote dramas chiefly of domestic interest. They are without genius, but had the merit of almost displacing the foolish medisval plays of Goethe's imitators. Kotzebue was a most prolific writer; and although he had no imagination, and wrote merely to catch the applause of the Inoment, his comedies still deserve to be named among the few works of this class which have hitherto been pro- duced in Germany.

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A writer who exercised some influence over the youth Jacobi.

of Goethe was Frederick Jacobi (1743-1819). He was the author of two romances, Alwill and Woldemar, in both of which there is a little of Werther's senti- mentalism, although their main purpose is didactic. He also wrote a number of philosophical works. His main principle is that the sources of religion and morality are to be found in intuition; and by a constant re- iteration of this doctrine he worked in Opposition to Spinoza, to Kant, and to Schelling. There are occasional gleams of philosophical genius in Jacobi, and he is of some interest to English readers because of the

attention Sir William Hamilton appears to have devoted to his writings. An author of a very different type, and of far greater

eminence, was Jean Paul Richter, usually called Jean Paul Richter.

(1763-1825). It is difficult to do justice to Jean Paul, for he commits almost every fault of which a writer of romance can be guilty; he is at different times pedantic, extravagant, sentimental, and tedious. He pre- scribed for himself no limits ; everything that occurred to him at the moment of his writing went down exactly as it suggested itself. Yet it is impossible even to look into any of his innumerable bocks without recognizing his genius. The work which has maintained the strongest hold over the nation is perhaps his charming prose idyll, Die Flegeljahre ("The Years of Wild Oats "); but his great romance, Z?tan, and the less ambitious Siebenkis, or " Flower, Fruit, and Thorn Pieces," have also kept their place as works of permanent excellence. The most admir- able quality of Richter is his humour, No German writer plays with his subject more delightfully, and he produces his most striking effects in dealing with the simplest, most unpretending relations of life. He is usually very near the sources of pathos when he smiles, and Jean Paul's pathos, at its best, is full of power, awakening the deepest feeling by its obvious sincerity. Sometimes it is associated with lofty imagination, as in the famous dream in which he de- scribes a universe without religion. His feeling for the periodic changes of season in nature is that of a poet in the highest sense, his descriptions of spring being perhaps un- surpassed for their glowing yet tender beauty. To his other excellences we must add the manly spirit which led him to scoff, occasionally without due measure, at every kind of vulgarity and pretence, and at the same time pre- served in its original freshness his sympathy with his fellow-men and his passion for their enlightenment and progress,

The most important literary movement which originated Romane

during the lifetime of Goethe was thatof the Romantic school, tic whose leading members at first attached themselves to him, but gradually diverged more and more from his spirit, The rise of the school was in some measure due to the philo- sophy of Fichte, whose theory of the ego as the principle which freely creates its own world gave new importance to the individual as opposed to law and convention. Schelling still more effectually prepared the

way for the Romanticists by his poetic treatment of the relations between the mind and nature; and several of his disciples, especially Steffens, worked in the same direction by dwelling on the possibilities of mystery in human life and in the external world. The aim of the Romantic school was to assert for modern feeling the right of a freer, more varied utterance than can be provided for it by the forms of classic litera- ture. They were not in sympathy with their own time; they found it tame, prosaic, colourless; and to enrich it with new elements they went back to medivalism, in which, as they conceived it, daily life had not been divorced from poetry. They drew enthusiastic pictures of the Middle Ages, of the charms of chivalry, of the loyalty of each class to the class above it and to society as a whole,

school.

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The brothers Schlegel.

of the devout piety which was supposed to regulate the conduct of prince and peasant alike, and which revealed itself in splendid architecture anda gorgeous ritual. With a like purpose the Romanticists pointed to Oriental life, and began the serious study of Sanskrit and Persian poetry. The chief writers whom they opposed to the classical poets both of antiquity and of modern times were Shakespeare and Calderon ; but they also brought to light many medi- seval authors who had previously been neglected, and stimu- Jated the Germans to a systematic study of the whole of their past literature.

The Romanticists did not strike out a wholly original path, for there were in the writings of Lessing, Goethe, and Schiller—especially of Goethe—elements in full harmony with all that was best in the new tendency. They were guilty of grotesque exaggeration in their descriptions of the superior happiness of medieval nations and Oriental peoples, and they did much harm by checking the rising appreci- ation of measure and order in litcrary form which had been encouraged by the great classical writers, In practical life, too, their labours led to results opposed to the progressive tendencies of

the age; for in the case of many adherents of the Romantic school, enthusiasm for the Middle Ages soon ceased to be a mere literary fancy,—they strove to re- produce obsolete medizval ideas. Large numbers of them joined the Catholic Church, opponents of spiritual and political freedom. Romanticists gave prominence to certain vital principles. That we now feel the charm of what was great and beauti- ful in the Middle Ages, is in part the result of their teach- ing .; and to some extent we owe to

stself a medium of expression adapted to its special nature.

The writer known as the prophet of the Romantic school was Frederick von Hardenberg, generally called Novalis (1772-1801). In his unfinished romance, Heinrich von Ofterdingen, he revealed a mystical and sensitive spirit,

penetrated by religious aspiration, and feeling itself ill at

ease in the hard rough world. These qualities are still more pathetically expressed in his poems, the best perhaps being those in which he directly utters spiritual emotions. The critical leaders of the' school were the brothers August Wilhelm von Schlegel (1767-1845) and Friedrich von Schlegel (1772-1829). It is to be feared that many English readers have derived their impression of the former mainly from Heine's malicious caricature. In reality, although destitute of creative power, he was a man of great intellectual distinction. His translations from Shakespeare are masterly, and his rendering of Calderon has also genuine merit. He did much to promote the scientific study of Sanskrit, and his lectures on dramatic art and literature, and on the theory and history of plastic art, contain many fruit- ful suggestions, Friedrich von Schlegel, who was a writer of greater depth and versatility than his brother, caused much scandal by his romance, Lucinde, in which the school appeared for the moment as a powerfully dissolving force in regard to the most sacred of human relations. His most important work, however, is his History of Ancient and Modern Literature. Throughout his exposition he is a propagandist of his special ideas; but the book is of lasting importance as the earliest attempt to present a systematic view of literary development as a whole. The period in which the brothers worked most effectually for their school was between 1796 and 1800, when they lived in Jena, and formed the ceutre of a brilliant circle

which included Fichte, Schelling, Tieck, and Wilhelm von Hum- poldt, Here they edited the Athenwum, in which they chastised feeble and pretentious writers, and awoke general interest in medizval art and literature, and in the

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and became the most vehement Still the

them the recognition of deeper elements in the world than reason can formulate, and the conviction that the thought of each age must create for

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systems of philosophy that harmonized with their special tendency.

The most productive, and for a time the most famous, writer of the Romantic school was Ludwig Tieck (1773— Tieck. 1853). Many of the smaller tales in his Phantasus have not yet lost: their interest. They are, indeed, as far as pos- sible from representing the real life of medizvalism, but they have a mystic and fairy-like charm which is not the less powerful because it is purely imaginative. In his later novels he took his themes from modern life, and they dis- play a remarkable talent for keen and searching satire. Most of them, however, are already practically forgotten, for Tieck was unable to give form to his ideas, and his imagination was wayward and eccentric. In his lyrical poetry he seldom touches a true note, and lis dramas have no high qualities to make up for their utter and deliberate lack of plan. Yet his dramatic criticism, of which he wrote a great deal in Dresden,—where he lived for many years, the centre of an adoring body of disciples,— is often happy and suggestive ; and his completion of Schlegel's translation of Shakespeare is poetic in feeling, and indicates a rare mastery of language and versification. A writer of less importance, but who exercised considerable 'nfluence over Tieck at an early period of his career, was . W. H. Wackenroder (1772-98), whose Phantasien diber Wacken | die Kunst (" Fancies concerning Art") was published by Toler Tieck after the writer's early death. Both in this book and in his Overflowings from the Heart ofan Art-loving Friar he expresses a deep feeling for Christian, especially allegoric, art. He was here in full sympathy

with the whole Romantic school, which derived intense delight from the spiritual art of the early mediaval painters, but cared little for the noble beauty of Greek art or of the art of thie Renaissance. —

Among the authors who wrote in the spirit of the Romantic school, and who were for a long time extremely

opular, one of the chief was E. ‘f. A. Hoffmann (1776- 1822). His treatment of ghostly and horrible themes is often very grotesque ; but he has flashes of vivid narra- tive which indicate a deep appreciation of some of the more mysterious aspects of human nature. Clemens Brentano (1777-1842) was one of the most anibitious of the Romanticists, and he had originality both of thought and fancy; but he was too confused, too indifferent to form, to produce more than a passing impression. Of far more enduring excellence than anything he himself wrote was Des Knaben Wunderhorn, a book of popular lyrics which he collected with his brother-in-law, Achim vou Arnim. Arnim (1781-1831) revealed imagination and feeling in his Kronenwdichter (* Guardians of the Crown”) ; and his Countess Dolores gives evidence of great natural power. His works, however, suffer the penalty which attaches to the total neglect of art. De La Motte Fouqué (1777-1843) does not, in the majority of his Fouqué writings, rise above the level of his fellows ; like them, he usually lacks clearness, precision, and genuinely human interest. But in one little book, Undine, he achieved a masterpiece. This charming tale, with its sweetness, pathos, and dream-like beauty, is now above criticism ; it has taken its place as one of the select class of creations which appeal to all the world, and do not depend for their popularity on the tendencies of a particular time. J oseph Yon Eichendorff (1788-1857) is an adherent of thie Romantic school only in some of his tales ; his lyrics com- bine its depth of emotion with clear and musical expression, and his best stories are written in a frank and attractive style. Adelbert von Chamisso (1781-1838), although usually classed as to some extent a Romanticist, has none of the dreaminess and mysticism of the school. He

became a German both in thonght and feeling ; but his

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ier- doctrine. ‘ thorough Protestant, and his services to serious literature

- Christian thought and life.

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ordered and vigorous style preseuts many traces of his French origin. He is now chietly remembered by Peter Schlemihl, a tale of quaint and suggestive humour. The most distinguished dramatist of the Romantic school was Heinrich von Kleist (1776-1811), whose dramas were not represented till after his death, but have since then attracted much attention. Some of his characters are con- ceived with great vigour, but in his tragic motives he lacks invention, and all his works are more or less marred by morbid sentimentalism. Allied to the Romantic school,

- although not directly connected with it, were the writers

of the so-called fate-tragedies. The originator of this curious class of works was Werner (1768-1823). It would be difticult to imagine a more trivial conception of fate than that which he develops in his Zwenty-Fourth of February, which represents a series of disasters as occurring at inter- vals on a particular day in consequence of a father’s curse. The notion, however, struck the popular fancy, and for ten years even Kotzebue could not contest the supremacy of the fate-tragedians. The chief followers of Werner were Milner and Houwald. Franz Grillparzer (1791-1872) began his career with a play—Die Ahnfrau (“The Ances- tress”)—in the style of these popular writers, but in his later tragedies he strove to attain classic force and dignity; and by at least one play, Sappho, he achieved a place among the most distinguished German dramatists.

The whole life of Germany was to some extent influenced by the Romantic school. In politics it was represented, ainong others, by Joseph Gérres, who agitated with con- stantly growing enthusiasm for the revival of medisvalism both in church and state. In philosophy Franz Xaver von Baader followed a like tendency by entering deeply into the spirit of Jacob

Boehme’s mystical philosophy, and interpreting its principles in accordance with Catholic Frederick Schleiermacher (1768-1834) was a

were incomparably higher than those of Baader. He was an admirable dialectician, and did more than any other writer to promote in Germany a sympathetic study of Plato. Yet there is a touch of Romanticism in the vague, shadowy, and mystic language in which he presents the elements of The love of the Romantic writers for previous epochs of German history and litera-

- ture led to the great researches of the brothers Grimm, who

founded the scientific study of the German language and of German antiquities. They were followed by many de- voted scholars, among whom may be named Beneke, Lach- mann, Moritz Haupt, and Franz Pfeiffer. The Oriental studies of the Romanticists also promoted comparative philology, which acquired something of the character it now bears through the labours’of the illustrious scholars, Wil- helm von Humboldt and Franz Bopp.

During the calamitous period when Germany was beaten and humbled by Napoleon the Romantic school, by continually recalling the past glories of the nation, con- tributed largely to the revival of patriotic feeling. A like result was achieved by Fichte, whose addresses to the Ger- man people, delivered in Berlin while it was occupied by French soldiers, are models of fervid yet thoughtful and dignified eloquence. In the war of liberation the popular excitement was expressed with great spirit by Theodor K6rner (1791-1813) and Ernst Moritz Arndt (1769-1860). Of these two writers Arndt is the most poetic, but few even of his lyrics have much literary value. To judge them fairly we must think ourselves back into the epoch in which the nation spontaneously arose to avenge its wrongs and assert its independence. It was as a writer of patriotic war-songs that Frederick Riickert (1789-1866) opened his career. Afterwards he moved over a wide range, dis- tinguishing himself especially as a translator of Oriental

poetry. He was master of almost every form of lyrical expression, and had hardly less facility in narrative and didactic verse. As regards the substance of his poetry, he is perhaps chiefly remarkable for the tone of calm resig- nation which he learned from his Eastern masters, In his preference for Oriental modes of thought he has been followed in recent times by Daumer, Bodenstedt, and other poets, who, however, chiefly aim at contrasting the ascetic ideals of Christianity with a gayer, brighter scheme of life. The whole movement had its origin, and was virtually exhausted, in Goethe's Westistlicher Divan.

Had the hopes of German patriots been realized after War of the war of liberation, literature might have profited by the libera- But the reward #°.

growth of an intelligent national spirit. of the German people for their immense sacrifices was bitter opposition on the part of their Governments to every aspir- ation for freedom and unity. Arndt himself, who had done so much to kindle patriotic ardour, was dismissed in disgrace from his professorship at Bonn, which he did not regain till 1840, when Frederick William IV. mounted the Prussian throne. And the brothers Grimm with other scholars were ignominiously turned out of Gottingen. The mass of the people lost interest in high thought and endeavour, and nourished itself on weak poetry like the Urania of Tiedge, and detestable novels like those of Clauren.

was not destitute of important names. Ludwig Uhland

(1787-1862), whose first volume of poems appeared in

1815, ranks with the greatest of modern lyrical writers. He is truly popular and patriotic in tone, yet his songs and ballads have an ease and grace of style which raise him far above any of the Romantic school. Uhland was the

founder of the so-called Swabian school of poets, of whont gwabian the most cultivated was Gustav Schwab. Other Swabian school.

poets were Justinus Kerner, who attempted, not unsuccess- fully, to combine pathos and humour, and Eduard Mérike, whose poetry is generally of a melancholy tone, relieved, however, by touches which indicate a fine

sympathy with nature. The theatre was dominated by Raupach (1784- 1852) and Freiherr von Auffenberg (1798-1857), the former reigning in Berlin, the latter in Carlsrulie. Both had talent and knowledge of the stage, but there is neither genius nor art in their plays. Immermann (17 96-1840), although not without poetic power, lacked the faculty of controlling his dramatic conceptions. He was more successful in romance—his Zpigonen, and still more his Miinchhausen, displaying vivid fancy and a quaintly original humour. Sir Walter Scott, who was deeply influenced by German literature, repaid his obligations by influencing it in turn. One of the best of his imitators was Wilhelm Hauff (1802-1827), who had the merit of nearly putting an end to Clauren's popularity by satirizing his style. Hauff's chief work was Lichtenstein, which excited hopes that were too soon extinguished by death. Wilhelm Haring, known as Wilibald Alexis (1798-1876), also began as an imitator of Scott, but he afterwards wrote more original historical romances, the scenes of which he laid in Brandenburg. Johanna Schopenhauer, mother of the philosopher, was considered in her day an attractive writer of romance, but she is now remembered only for the sake of her son. She was surpassed in vigour of thought and style by Caroline Pichler (1769-1843), who wrote several well-known historical novels.

Throughout the whole of this period Germany maintained her eminence in classical study, contributions of the highest importance to the knowledge of ancient life being made by Wolf, Hermann, Boeckh, and Otfried Miiller. she produced several writers of distinction. Spittler (1752— 1810) was a worthy successor of Justus Moser in the free and artistic treatment of historical subjects; in youth he

Yet even in poetry the period yptang.

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was kindly treated by Lessing, whose clear style he appears to lave taken as his model. Johannes von Miller (1752-1809), the historian of Switzerland, used to be con- sidered by the Germans an eloquent writer, almost a prose poet, but he is now generally regarded as an affected rhetorician. Raumer, in his chief work, Wustory of the Hohenstaufen, gave forth the results of deep research in an animated aud vigorous narrative. Schlosser, author of a History of the Highteenth Century, was aJso an historian who combined purity and strength of style with learning. Niebuhr, in his Roman History, pushed his scepticism too far, but he profoundly modified opinion in regard to the tests of historic credibility.

VIL. Lhe Latest Period.—With the death of Goethe in 1832 began a new era in German literature, an era not yet closed. The period has been one of intense political excitement. In 1848 the national aspiration for freedom and unity found decisive expression in action ; since that time Germany has achieved unity by the sword, while she still slowly feels her way towards freedom. It was inevit- able that in such an epoch much of the best energy of the nation should be devoted to politics, but there has also. been great literary activity—activity deeply influenced by the practical struggles, hopes, and fears of the time.

Philosophical speculation has been continued without. interruption, and in many respects it has been, and still is, the deepest current in the intellectual life of Germany. From 1818 till his death in 1831, when he was a. professor in Berlin, Hegel dominated the highest thought. His vast system, in which he attempted to explain the ultimate facts of the world and to bind by a chain of deductive reasoning the elements of all knowledge, found enthusiastic adherents among the more ambitious of the younger literary men, and for many years after his death it determined the character of their work. Gradually, however, the school broke up into three distinct divisions, the right, the centre, and the left. Of these the most active were the members of the latter party, who interpreted Hegel’s doctrine in a revolutionary sense. Arnold Ruge, one of the most bril- liant writers of the school, applied Hegelianism to politics, in which he associated himself with the extreme radicals. David Friedrich Strauss, who also started as a follower of Hegel, in

his memorable Leben Jesu resolved the narratives of the Gospels into a series of myths, and found the vital element of Christianity in its spiritual teaching. Feuer- bach, going still further, warred against all religion, urging that it should be replaced by a sentiment of humanity. While the different sections of Hegelians opposed each other, Schelling developed the later phases of his system ; and thought was turned into a new channel by Herbart, whose psychological work has been carried on at a later time by Lotze. Krause also attracted attention by philo- sophical ideas through which he aimed at solving the practical difficulties of modern life. Ulrici and the younger Fichte have exercised considerable influence as the advocates of a pantheistic doctrine by which they endeavour to reconcile religion and science. None of these names, however, have the importance which attaches to that of Arthur Schopenhauer, who, although his chief book was written in the lifetime of Goethe, did not secure a hearing until long afterwards. At the present time he stirs deeper interest than any other thinker, German philosophers have, as a rule, been utterly indifferent to style, but Schopen- hauer's prose is clear, firm, and graceful, and to this fact he owes much of his popularity. He expressed bitter con- tempt for his philosophical contemporaries, and, going back to Kant, claimed to have corrected and completed his system. His main doctrine is that will is the fundamental principle of existence ; but his importance arises less from his abstract teaching than from his descriptions of the

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misery of human life, record of turmoil and wretchedness ; literary genius as

reconcile Schopenhauer not only with Hegel aud Schelling but with Leibnitz,

| widest popularity is Leopold Ranke, who has instructed two

results of extensive research in many different fields of in-

| diligent historian of Prussia ; from Dahlmann, whose

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History seemed to him but a and there is high well as moral earnestness in his graphic and scornful pictures of the darker aspects of the world. Eduard von Hartmann, the latest original philosopher of Germany, works on essentially the same lines, but seeks to

The growth of science has been one of the most powerful Science, factors in the recent intellectual development of Germany, and some of the best books of the period have been works presenting ina popular form the results of scientific labour. Among these the first place still belongs to the Cosmos of Alexander von Humboldt. Its fundamental conceptions Hum- are no longer in full accordance with the best thought ; boldt. but it. is made enduringly impressive by the writer's power of handling vast masses of facts, by his poetic feeling for the beauty and the order of nature, and by the purity and nobility of his style. Some of the greatest men of science, such as Liebig, Virchow, and Helmholtz, have also made admirable attempts to render their subjects intelligible and interesting to ordinary readers, Biichner and Vogt have considerable merit as popular scientific authors, but their writings are marred by a polemical tendency, which induces them to dogmatize on metaphysical questions be- yond their proper range.

In historical literature Germany has recently produced His- many eminent writers, The historian who enjoys the torians

generations. by communicating in an agreeable style the

quiry. Gervinus acquired a permanent. place as an historian by his excellent Listory of the Nineteenth Century. Works of high value have also proceeded from Giesebrecht, who has written on the Holy Roman Empire with enthusiastic appreciation of the great emperors ; from Droysen, the

labours included German, English, French, and Danish history ; from Hausser, whose masterpiece is an elaborate history of Germany since the death of Frederick the Great ; from Waitz, the chief authority on the growth of the Ger- man constitution ; from Sybel, by whose researches much new light, has been thrown on the French Revolution ; from Mommsen, the vigorous historian of ancient Rome ; and from Curtius, whose history of Greece is not more remark- able for its learning than for the clear and attractive arrangement of its materials. Of late years much attention has

been devoted to."'Culturgeschichte," which describes the life of a people in all its phases, either through the whole past or during a particular epoch. A favourable example of works of this class is Karl Biedermann's Germany a the Eighteenth Century.

Recent German literature is extraordinarily rich in his- tories of the individual elements of intellectual development. In its histories of philosophy it is absolutely supreme. Hegel atill ranks as one of the greatest historians of philosophy, although the value of his expositions is lowered by a tendency to find his own doctrine in preceding thinkers. Erdmaun, Schwegler, and Ueberweg were among the most important workers in the same department; and with them may be named Kuno Fischer, who, writes the history of philosophy with a striking power of sympathetic appreci- ation and in a fascinating literary style. Less attractive in manner than Fischer, Lange, in his History of Material- ism, did full justice for the first time to the different phases of materialistic philosophy, and is especially happy in the skill with which he traces the growth of a recog- nition of law in the phenomena of nature. Since Lessing, sesthetics have always formed a prominent branch of philosophy among the Germans ; and they have hardly

been less successful as historians of art than as historians of metaphysics. High distinction has been achieved, among other art historians, by Kugler, Vischer, Carriére, and Liibke. Of historians of literature, especially German literature, there is almost a small army. One of the earliest of these was Gervinus, who, although his critical canons are not now in favour, had an unusual faculty for grouping his materials and sharply defining what seemed to him the essential qualities of particular writers and movements. The history of German literature by Vilmar, although written in an eloquent style, is too partial in its judgments to have permanent value. Koberstein is remarkable rather for industry than for insight ; but the literary histories of Julian Schmidt and Gottschall are both marked by decisive, often penetrating, critical judgment, One of the best works of this kind for style, thought, and research is Hettner's elaborate History of Literature in the Lighteenth Century.

The Germans possess a vast mass of biographical litera- – ture, a large proportion of which is rendered almost worth- less by inartistic treatment. Luther alone forms the sub- ject of more than one hundred and fifty biographies ; yet a satisfactory study of the Reformer has still to be written. In recent times, however, there hasbeen amarked im provement, several biographers having conscientiously striven not only to be thorough in research but to write simply, clearly, and vividly. The first to set a good example was Varnhagen von Ense, whose numerous biographies are masterpieces of well ordered and dignified prose. Germany owes an ad- mirable biography of Ulrich von Hutten to Strauss, who also wrote interesting sketches of several prominent modern authors. Other biographies which deserve mention are Karl Griin's philosophical study of Feuerbach, Rosenkranz's scholar-like life of Diderot, and Justi's life of Winckelmann. The popularity of Mr Lewes's life of Goethe for a long time deterred German writers from touching a subject he had handled with so much talent ; but of late there has been a remarkable revival of interest in Goethe, and Hermann Grimm has ventured to present a fresh study of his intel- lectual and moral character.

In imaginative literature the greatest writer of the latest period is Heinrich Heine. No German writer since Goethe and Schiller has excited so much interest throughout Europe, and among the Germans themselves his fame is steadily rising. He professed to care little for what men said of his poetry, yet it is mainly as a lyrical poet that bis name lives. His Buch der Lieder is one of the most fascinating collections of lyrics in European literature. Although a deadly enemy of the Romantic school, he had moods, especially in youth, in which he shared its dreami- ness and mysticism; and these qualities he expressed in some of his best songs, but with perfect grace of style and melody. He struck with equally finished art chords of passion and aspiration beyond the range of even the chief Romanticists, for Heine was in every respect a modern man, penetrated by a love of freedom, and by a high enthusiasm for beauty. Except Goethe, no other German poet achieves his effects by such simple means; with the language of a village maiden he gives shape to feelings and ideas of exquisite refinement and subtlety. His satirical poems are sometimes gross and cynical; but none of them are without touches of humour. In his prose, which deals with a wide range of subjects, he is rather French than German in his love of sparkling epigram

and biting wit. Almost every theme, however sacred, gives Heine occasion for mockery, but in the midst of cruel laughter he is often restrained by a pathetic memory, which he expresses with unsurpassed delicacy. This combination of pathos, wit, and humour gives him a unique place in the literature of his country.

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Platen, who belongs rather to the previous period, was one of the many writers wliom Heine bitterly attacked, but he was a poet of considerable power. Like Heine himself, he failed in the drama ; and even in his successful writings he is not remarkable for wealth of thought or depth of feeling. His odes and sonnets, however, are in language and metre so artistically finished as to rank among tlie best classical poems of modern times. Borne was another writer whose fame, although the two men were at one time warm friends, suffered from Heine's satire. He was a manly literary critic, and as a political writer dealt at the despotic Governments of Germany blows which they keenly felt.

A school of writers known as Young Germany was deeply influenced by Heine, and had the good fortune to be singled out for persecution by the confederate diet: Their object was to effect a complete revolution in the political and social institutions of Germany, and at the same time they became the propagandists of ideas intended to under- mine the church. The most important member of the school was Karl Gutzkow, who wrote a number of dramas which maintain their hold of the stage. He was also the author of many romances, of which the chief were Die Ritter vom Gerste ("The Knights of the Mind") and Der Zauberer von Rom ("The Magician of Rome"), These works are of enormous length, and their polemical tendency has already begun to weaken their interest. But the lead- ing characters are genuine creations, and the incidents are interwoven with great artistic skill. Heinrich Laube, another member of the group, is the author of an historical romance, Zhe German War, which represents, in a clear, fresh, and vivid style, the condition of Germany during the Thirty Years' War. He has also enriched the stage with several excellent plays. Less important authors asso-

ciated with these writers were Gustav Kiihne, Theodor Mundt, and Ludolf Wienbarg—the latter universally re- cognized as a keen and vigorous critic.

The novel has acquired the same important place in Germany as in France and England, and it need scarcely be said that the vast majority of works of this class are forgotten almost as soon as they are issued. One of the most distinguished of recent novelists is Gustav Freytag, whose chief work, Soll und Haben ("Debit and Credit"), is a study of commercial life intensely realistic in tendency, Lately he has undertaken a series of romances, Die Ahnen ("The Forefathers"), intended to represent in a highly poetic form the different epochs of German history. Im- portant historical romances have been written by Levin Schiicking, who is remarkable for his power of vividly con- ceiving character. The Countess Ida Hahn-Hahn is the writer of a number of novels in an artificial style, affect- ing to represent good society. Her manner has been cleverly satirized by Fanny Lewald, who is one of the best German novelists, keen and true in observation of life, and artistic inmethod. Paul Heyse's short tales have firmness of outline, and are at the same time full of delicate grace; as a writer of elaborate romance, he has also achieved suc- cess. The humour of Hacklinder is generally considered to surpass that of any other recent writer; and among the novelists of simple village life Auerbach easily takes the first place. Frederick Spielhagen has penetrated deeply into the spirit of the age, and in Problematische Naturen ("Problematic Natures") and other works reveals its tendencies with cultivated imaginative force. The novels of Fritz Reuter, although written in Platt Deutsch, take high rank; they are fresh in style, and combine keen observation of life with a fine appreciation of comic effect.

Contemporary literature has not, as in England, been

divorced from the stage ; the best imaginative writers find = oe

scope for their energies in work for the theatre. Besides Gutzkow and Laube, Gottschall has been a fertile writer. . X, — 69

Platen

Young Ger-

many.

Novel- ists.

Drama-

Lyrical and nar- rative poets.

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both of tragedy and comedy ; are original dramatic authors. Grabbe, full of eccentricity, originated a movement resem of the ‘Sturm und Drang” poets. was Hebbel, a writer endowed with imaginative gifts,

GERMANY

Freytag also, and Prutz, The dramas of Christian but with a certain wild power, bling to some extent that Its chief representative

but

who marred every play by affectation and extravagance.

Freiherr von Miinch-Bellinghausen,

Halm,

ator of Ravenna”), achieved distinction by a

mere stage effect.

refined comedies, an comedies and tragedies which Charlotte Birch-Pfeiffer and Ro

known as Friedrich author of Der Fechter von Ravenna and Mosenthal, author of Deborah, iming at something higher than

(“The Gladi-

Paul Lindau is the author of some

d Adolf Wilbrandt has written both meet the taste of Vienna. derich Benedix were prolific

writers of plays with the sort of merit that belongs to an intimate knowledge of the technical necessities of the stage.

Many recent wri poetry, some of t worthily the traditions of German literature. 1830 onwards, a group of Austrian poets, in tendency, commanded the respect of all

The chief was Count von Auersperg, who

political Germans.

assumed the name of Anastasius Griin.

work was Walks of a Vienna Poet, published in

ters have attempted lyrical and narrative hem witli sufficient power to maintain

From about more or less

His first important

1831, but

his fame rests chiefly on two volumes of lyrics issued some

years later.

expresses his hopes in brilliant and effective.

Strehlenau, generally called Lenau, in several poems to Meissner an considerable reputation, artistic merit, the former as a poe Leopold Schefer

nature.

free sympathies.

He had enthusiastic faith in the future, verses full of colour, sometimes Another Austrian writer, Nicholas gives powerful utterance

and

the sorrows of a deeply melancholy

popular poet, and the genial optimisin

the Laienbrevier, is interesting becaus

it presents to the pessimist tone writers. Before the revolutionary movements of 1848 a number of writers attempted to force poetry into the ser- Of these one of the best known is

vice of freedom.

d Hartmann, Bohemian poets, have a the latter as a writer of great tof vivid imagination and was for a long time a of his chief book, e of the contrast

of more recent

Herwegh. He advocated liberty with a vehemence that

won for him immense popularity, but the interest of his

writings is rather historical than Freiligrath was of a m poems, although withou in his earlier writings h reproducing the gorgeou Other poets who have ma mind

in the popular

ore truly poetic temperament. t delicacy, have graphic force, and e displayed a remarkable talent for s colours of tropical landscape, de verse a means of awakening a passion for political justice are

literary. Ferdinand

His

Hoffmann von Fallersleben, who has a considerable com- mand of musical expression, and Franz Dingelstedt, a ver- satile writer who has done good work as a novelist and dramatist, Gottschall, already named as a dramatist and an historian of literature, began as a political poet, but after-

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wards gave evidence of disinterested imagination in two narrative poems, Géttin and Zeno. The lyrics of Emmanuel Geibel, some of which are also political, with a conservative have found favour with nearly all classes ; they reveal a gentle and refined spirit, and are written with something of Uhland's grace. guished contemporary writers is poetry is remarkable for the boldness of its conceptions and its almost vehement passion.

Since the middle of been without writers of deep thought and vast research ; German and in her supreme writers—in Lessing,

tendency,

Schiller,

nearly all value po try, which would

Frenchman.

change. are one people,

Bibliography. literatur ; Gervinus, Deutschen , Vilmar, Nationalliteratur ; Dichtung ;

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and Heine—these qualities have been asso- ciated with a feeling for artistic finish which has not been surpassed in England or even in France. tendency of German authors beneath been to neglect the laws of expression.

Germany an extraordinary quantity of although the result of great labour, intolerable demands on the patience of readers. of measure and precision has in many cases wers of imagination, reason, and have made the literary fortune of a This deficiency of style is in some degree explained by the fact that an undue proportion of German literature has hitherto but to specialists, who naturally concern themselves more with substance than with form. During the present generation there have been symptoms of a remarkable Ever since and to strive after political unity, an in- creasing number of scholars and thinkers have displayed an ambition to extend their influence, tive writers have consciously appealed to the nation as a whole. Tle inevitable result has been that they have aimed at more methodical arrangement than their predecessors, and have cultivated greater force, simplicity, and directness of speech. Nothing has fostered this wholesome tendency so much as the growing respect of the nation for the great masters of its language, a respect indicated by the new edi- tions of their writings which appear year after year. higher class of poets, profited by the deepening conviction that the function of art is not to battle with practical evils, but to create a world of ideal beauty in which the mind may find refuge from the perplexities of real life.

—Koberstein, Geschichte der poetischen Nationalliteratur der Vorlesungen tiber die Goedeke, Grundriss zur Kurz, Geschichte Literaturgeschichte des

18¢” Jahrhunderts; Julian Schmidt, Ge- schichte des geistigen Lebens in Deutschland von Leibniz bis auf and Geschichte der deutschen Literatur im 19en Jahrhundert, Gottschall, Geschichte der deutschen Nationalliteratur des 19¢” Jahrhunderts; Outlines of German Literature.

Among the most distin- Robert Hamerling, whose

the 18th century Germany has never Form in

Goethe, liter

ture.

But the the highest rank has Thus there is in literature which, and full of ideas, makes The lack deprived of indus-

been addressed, not to the public,

the Germans began to feel that they

while several imagina-

The

dramatists, and novelists have also

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GERMERSHEIM, a fortified town in Rhenish Bavaria,

the chief town of a circle, is situated at the confluence | in |

possesses a Catholic and a Protestant church, a Latin school, |

of the Queich and the Rhine, 8 miles S.W. of Spires.

and a hospital. ‘The industries include fishing, shipbuild- ing, brewing, the manufacture of cigars, and the cultivation of vegetables, fruit, flax, garrison

in the town is usually about 2500.

Germersheim existed as a Roman stronghold under the name Or ae pe é | flies, as was sufficiently proved by the destruction of the | French investing the city in 1285 and again in 1684. The

Vicus Julius, The citadel was rebuilt by the emperor Conrad I1., but the town itself was founded in 1276 by the emperor Rudolph I., who granted it the rights of a free imperial city. He died here in 1291. the town formed part of the Palatinate of the Rhine. to 1650 it was in the possession of France ; of the peace of Westphalia it

From 1644 but on the conclusion was again joined to the Palatinate.

From 1330 to 1622, when it d by Austria, | ° ; o ete F , when it was conquered by /Ausvi™ interesting Romanesque building of early date ; and in the

In 1674 it was captured and devastated by the French under |

‘Turenne, and after the death of the elector Charles in 1685, it was that it is the place in which St Paul and St James first rested when

claimed by the French as a dependency of Alsace, on which account followed the Germersheim succession war, which lasted till the peace of Ryswick in 1697. Through the intervention of the pope in 1702, the French, on payment of a large sum, agreed to vacate the town, and in 1715 its fortifications were rebuilt. On the 3d July 1744 the French were defeated there by the imperial troops, and on the 19th the beautiful new town was built, and the present extensive fortifi-

| they came to Spain ; and it became

and 22d July 1793 by the Austrians. In 1835 | ‘Aragon’s eldest son.

cations commenced. Population in 1875, includiug the garrison, |

6456.

GERONA, a city of Spain, the chief town of the pro- vince of Gerona (one of the four into which Catalonia was divided), the railway to Perpignan in France, near the junction of the Tor and the Oiia. The older part of the town occupies the

is situated about 54 miles N.E. of Barcelona on —

steep slope of the hill of the Capuchins, and with its old- |

fashioned buildings presents a picturesque appearance against a background of Joftier heights; while the newer

portion stretches down into the plain and beyond the river, |

which adds to the effect of the scene by a bridge of three

though in a dilapidated state; and the hill is crowned by –

what were at one time very strong fortifications, At present Gerona is a comparatively insignificant place, although it is the seat of a bishop, has four parish churches, an instituto,

a seminary, a public library, and a theatre, numbers about |

15,000 inhabitants, and carries on the manufacture of paper and cotton and woollen goods. To the ecclesiologist, however, it offers unusual attractions. The cathedral is one of the grandest specimens of Gothic architecture in Spain, the nave being the widest pointed vault in Christendom, as it measures no less than 73 feet from side to side, while Albi, the next in size, is only 58 feet, and Westminster Abbey is only 38. The old cathedral on the same site was used as a mosque by the Moors, and on their expulsion in 1015 it appears to have been very greatly modified, if not entirely rebuilt. During the 14th century new works were again carried out on an extensive scale; but it was not till the beginning of the 15th that the proposal to erect the present magnificent nave was originated by the master of the works, Gullielmo Boffiy.

| needless to enter; but its historians

under Marshal Hocquisicourt in 1653,

GER—GER

Emnesinda (0b. 1057). The collegiate church of San Feliu (St Felix) is mainly of the 14th century, but it was con- siderably modified in the 16th, and its facade dates from the 18th. It is one of the few Spanish churches that can

boast of a genuine spire, and it thus forms a striking feature in the general view of the town. and hemp. The number of the |

Besides the tomb of Alvarez and the sepulchre of the patron saint, it contains an image of St Narciso, which, according to the local super- stition, had the power of producing swarms of poisonous

Benedictine church of San Pedro de los Gallos is an

same vicinity is a small church worthy of notice as a rare Spanish example of a transverse triapsal plan.

Gerona is the ancient Gerunda, a city of the Ausetani. It boasts the see of a bishop about 247. For a considerable period it was in the hands of the Moors, and their emir, Soleiman, was in alliance with Pepin about 759. It was taken by Charlemagne in 785; but the Moors regained and sacked it in 795, and it was not till 1015 that they were finally expelled. At a later date it gave the title of count to the king of Into the details of its later vicissitudes it is tell how it has been besieged all, and that only four of the The investnient by the French that of 1684 by the French under Marshal Belfond, and the successful enterprise of Marshal

no fewer than twenty-five times in sieges have resulted in its capture.

| Noailles in 1694, are the threc great events of the 17th century.

“The keystone of the last |

division of the vault,” says Mr Street, “seems to have been |

placed in the time of Bishop Benito, so late as cerca 1559,”

and in 1581 the same bishop laid the first stone of the bell

tower. ‘At the east end of the nave three arches open into the choir and its aisles, which with their many subdivisions give an extraordinary impression of size to the vast vault of the nave, and make it look larger than it really is.”

which rises in tiers and terminates in an oval rose-window. Among the interior decorations the most remarkable is the retablo and baldachin of the 14th century ; and among the tombs may be mentioned those of Bishop Berenger (ob.

|.| Pyrénées and Basses-Pyrénées, and W. by Landes.

Surrendered by the French at the peace uf Ryswick, it was again captured by Marshal N oailles in 1706, after a brilliant defence; and in 1717 it held out against the Austrians. But its noblest resistance was yct to be made. In May 1809 it was besieged by the French, with 35,000 troops, under Verdier, Augerean, and St Cyr ; forty batteries were erected. against it, and a heavy bombard- ment inaintained ; but under the leadership of Mariano Alvarez it held out till famine and fever compelled a capitulation on 12th December. The French, it is said, had spent 20,000 bombs and

i i ‘ : . ree 60,000 cannon balls, and their loss was estimated at 15,000 men. arches. The old city walls with their bastions still remain, eae , n

See Juan Gaspar Roig y Jalpi, Resumen de las Grandezas, &c., Barcelona, 1678; J. A. Nieto y Samaniego, Memorias, Tarragona, 1810; Street, Gothic Architecture in Spain.

GERRHA, an ancient city of Arabia Felix, on the west side of what is now the Persian Gulf, described by Strabo as inhabited by Chaldzan exiles from Babylon, who built their houses of salt and repaired them by the application of salt water. Three identifications of the site have been attempted, D’Anville choosing El Katig, Niebuhr prefer-

ring Koneit, and Forster suggesting the ruins at the head

of the bay behind the islands of Bahrein.

GERS, a department of France, composed of the whole or parts of the five old districts of Gascony, viz., Armagnac, Astarac, Lomagne, Comminges, and Condomois. It is bounded N. by the department of Lot-et-Garonne, E. Tarn-et-Garonne and Haute-Garonne, 8. by Hautes- It lies between 43° 17’ and 44° 5’ N. lat.,and between 1° 10’ E., and 0° 18’ W. long., being about 72 miles in length from E. to W., and 53 in breadth from N.toS. This department is hilly, particularly in the south, where it is mostly covered with ramifications of the Pyrenees. Some of these in the south rise nearly 1200 feet above the level of the sea, but they rapidly decrease in height towards the north.

he principal of them run from N.E., N., and N.W.,

The | ceneral appearance of the exterior is rather ungainly, but | there is a fine approach by a flight of 86 steps to the facade,

and are separated by longitudinal valleys of great beauty and fertility, narrow in the south, but opening in the north toa width of 3or4 miles. The greater part of the depart- ment belongs to the basin of the Garonne, while a small portion in the west is drained by the Adour. The chief affiuentsof the formerare the Save, Gimone, Arratz, Gers, and

Baise ; and those of the latter, the Arros, Midou, and Douse,

the last two uniting and taking the name of Midouse, before

_ joining the Adour. The climate is temperate and salubrious, 1408), Ramon Berenger (Cap de Estopa), and the Countess

but very changeable. There is seldom any snow, and there

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is scarcely any frost. More than half of the department is arable ; about one-seventh is occupied by vines, and the rest is meadows, wood, or heath. ‘The

soil is not of great fertility, but is tolerably well cultivated, and the grain pro- duced is more than sufficient for home consumption. Wheat, maize, oats, and rye are the principal grain crops, About one-third of the wine produced is used for home consump- tion, and the remainder is chiefly manufactured into brandy, known by the name of Armagnac. The amount of brandy distilled in the department annually is about 22 million gallons. Horned cattle, sheep, mules, swine, game, and poultry, particularly ducks and geese, are abundant. The minerals and manufactures are unimportant. There are quarries of red and green marble; and gypsum, marl, white clay, and sand for the manufacture of glass are obtained, Gers is divided into the arrondissements of Auch, Lectoure, Mirande, Condom, and Lombez, with 29 cantons and 467 communes. The chief town is Auch. The total area is 2425 square miles, and the population in 1866 was 295,692, and 283,546 in 1876.

GERSON, Jonn (1363-1429), otherwise John Charlierof Gerson, Johannes Gersonus, John de Gersone, J. Jarson, De Jarsone, or Gersen, the famous chaucellor of the university of Paris, and the ruling spirit in the cecumenical councils of Pisa and Constance, was born at the village of Gerson, in the bishopric of Rheims and department of Ardennes, on December 14, 1363. We learn a good many details about his family and early upbringing from allusions in some of his devotional tracts. His parents, Arnulph Charlier and Elizabeth de la Chardeniére, “a second Monica,” belonged to the peasant class, were of eminent piety, and rejoiced to see seven of their twelve children, four daughters and three sons, devoting themselves to a religious life. Young Gerson was sent to Paris to the famous college of Navarre when fourteen years of age. After a five years’ course he obtained the degree of licentiate of arts, and then began his theological studies under two very celebrated teachers, Giles Des Champs (Aigidius Campensis) and Peter D? Ailly (Petrus de Alliaco), rector of the college of Navarre, chancellor of the university, and afterwards bishop of Puy, archbishop of Cambray, and cardinal. D’Ailly remained his life-long friend, and in later life the pupil seems to have become the teacher (see pref. to Liber de Vita Spur, Anime). Gerson very soon attracted the notice of the university. He was elected procurator for the French nation in 1383, when barely twenty years of age, and re-elected the year afterwards. In 1384 he took the degree of bachelor of theology. Three years later a still higher honour was bestowed upon him;

he was sent along with the chancellor and others to represent the university in a case of appeal taken to the pope. Dr John Montson had been condemned by the faculty of theology because he had taught that the Virgin Mary, like other ordinary descendants of Adam, was born in original sin; and the Dominicans, who were fierce Opponents of the doctrine of the immaculate conception, were expelled the university. Montson appealed to Pope Clement VII. at Avignon, and D'Ailly, Gerson, and the other university delegates, while they personally supported the doctrine of the immaculate conception, were content to rest their case upon the legal rights of the university to test in its own way its theological teachers. Gerson's bio- graphers have compared his journey to Avignon with Luther's visit to Rome. It is certain that from this time onwards he was zealous in his endeavours to spiritualize the universities, to reform the morals of the clergy, and to put an end to the schism which then divided the church. In 1392 Gerson became doctor of theology, and in 1395, when D'Ailly was made bishop of Puy, he was, at the early age of thirty-two, elected chancellor of the university of Paris, and made a canon of Notre Dame. This great university

was then at the height of its fame, and its chancellor was necessarily a man prominent not only in France but in Europe, sworn to maintain the rights of his university against both king and pope, and entrusted with the conduct and studies of a vast crowd of students attracted from almost every country in Europe. Gerson's writings bear witness to his deep sense of the responsibilities, anxieties, and troubles of his position. He was all his days a man of letters, and an analysis of his writings is his best biography. His work has three periods, in which he was engaged in re- forming the university studies, m aturing plans for overcoming the schism (a task which after 1404 absorbed all his energies), and in the evening of his life writing books of devotion.

Gerson wished to banish scholastic subtleties from the Studies of the university, and at the same time to put Some evangelical warmth into them. He was called at this period of his life Doctor Christianissimus ; later his devotional works brought him the title Doctor Consola- torius. His plan was to make theology plain and simple by founding it on the philosophical principles of nominal- ism. His method was a clear exposition of the principles of theology where clearness was possible, with a due re-cognition of the place of mystery in the Christian system of doctrine. Like the great nominalist William of Occam, he saved himself from rationalism by laying hold on mysticism—the Christian mysticism of the school of St Victor. He thought that in this way he would equally guard against the folly of the old scholastic and the seductions of such Averroistic pantheism as was preached by heretics like Amalric of Bena. His plans for the reformation of university studies may be learned from his Tract. de Examinatione Doctrinarum (Opp a. 7), Epistole de reform. Theol. (i. 121), Zpistole ad Studentes Collegii Navarre, quid et qualiter studere debeat novus theo- loge auditor, et contra curiositatem studentium (i. 106), and Lectiones duce contra vanam curtositatem tn negotio fider (i. 86). The study of the Bible and of the fathers was to supersede the idle questions of the schools, and in his Z'ract, contra romantiam de rosa (iii. 297) he warns young men against the evil consequences of medizval romance-reading, He was oftentimes weary of the chancellorshi p,—it involved him in strife, and in money difficulties; he grew tired of public life, and longed for learned leisure. To obtain jt he accepted the deanery of Bruges from the duke of Burgundy, but after a short sojourn he returned to Paris and to the chancellorship.

Gerson's chief work was what he did to destroy the great schism. Gregory XI. had died in 1378, one year after Gerson went to the college of Navarre, and since his death the church had had two popes. To the medieval mind, imaginatively apprehending great thoughts in picture-representations, two popes meant two churches and a divided Christ. The spiritual unity of the church, which is founded on the spiritual union of all believers to Christ, was unin- telligible to it. Gerson and his contemporaries could not disen-tangle the invisible from the visible, and if daring spirits like Wickliffe and Huss declared that the elect were the true church, the practical

consequences which they drew from this showed that they also were unable to escape from the confusion. The schism had practically been brought about by France. The popes had been under French influence so long that it appeared to France a political necessity to have her own pope, and pious Frenclimen felt themselves somewhat responsible for the sins and scandals of the schism. Hence the melancholy piety of Gerson, D'Ailly, and their companions, and the energy with which they strove to bring the schism to an end. During the lifetime of Clement the univer. sity of Paris, led by D'Ailly, Gerson, and Nicholas Clamenges, met in deliberation about the state of Christendom, and resolved that the schism could be ended in three ways,—by cession, if both popes renounced the tiara unconditionally, by arbitration, or by a general council. Clement died. The king of France, urged by the university, sent orders that no new pope should be elected. The cardinals first elected, and then opeued the letter. In the new elections, however, both at Rome and Avignon, the influence of Paris was so much felt that each of the new popes swore to "' cede if his rival would do so also.

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Meanwhile in 1395 the national assembly of France and the French clergy adopted the programme of the university—cession or a general council. The movement gathered strength. In 1398 most of the cardinals and most of the crowned heads in Europe had given their adhesion to the plan. During this period Gerson's literary activity was untiring, and the throb of public expectancy, of hope and fear, is revealed in his multitude of pampliets. At first there were hopes of a settlement by way of cession. These come out in Protest. super statum ecclesi (ii. 1), Tract. de modo habendi se tempore schismatis, De Schismate, &c. But soon the conduct of the popes made Europe impatient, and the desire for a general council grew strong—see De Concilio gencrali wnius obedi- entice (ii. 24). 'The council was resolved upon. It was to meet at Pisa, and Gerson poured forth tract after tract for its guidance. The most important are—Trilogus in materia Schismatis (ii. 83), and De unitate Ecclesie (ii. 113), in which, following D'Ailly (see Nschackert's Peter v. Alli, p. 153), Gerson demonstrates that the ideal unity of the church, based upon Christ, destroyed by the popes, can only be restored by a general council, supreme and legiti- mate, though

unsummoned by a pope. The council met, deposed both anti-popes, and elected ‘Alexander V. Gerson was chosen to address the new pope on the duties of his office. He did so in his Sermo coram Alexandro Papa in die ascensionis in concilio Pisano (ii. 131). All hopes of reformation, however, were quenched. by the conduct of the new pope. He had been a Franciscan, and loved his order above measure. He issued a bull which laid the parish clergy and the universities at the mercy of the mendicants. The great university of Paris rose in revolt, headed by her chancellor, who wrote a fierce pamphlet—Censura professorum in theologia cirea bullam Alexandri V. (ii. 442). The pope died soon after, and one of the most profligate men of that time, Pope Jolin XXIII. (Balthasar Casas nvane elected lis successor. The council of Pisa had not brought peace; it had only added a third pope. D’Ailly despaired of general councils (see his De dificultate reforma- tionis in concilio wniversali), but Gerson struggled on. Another inatter too had roused him. The feuds between the houses of Orleans and Burgundy had long distracted France. The duke of Orleans had been foully and treacherously murdered by the followers of the duke of Burgundy, and a theologian, John Petit, had publicly and unambiguously justified the murder. His eight verities, as he called them—his apologies for the murder—had been, mainly through the influence of Gerson, condemned by the university of Paris, and by the archbishop and grand inquisitor, and his book had been publicly burned before the cathedral of Notre Dame. Gerson wished a council to confirn this sentence. His literary labours were as untiring as ever. He maintained in a series of tracts that a general council could depose a pope 5 he drew up indictments against the reigning pontiffs, reiterated the charges against John Petit, and exposed the sin of schism—in short, he did all he could to direct the public mind towards the evils in the church and the way to heal them. His efforts were powerfully seconded by the emperor Sigismund, and the result was the council of Constance. This council, unlike its predecessor at Pisa, was summoned by a pope—Pope Johu XXIII. Sigismund was present, resolutely determined to unite and reform the church, and guided by Cardinals D’Ailly and Zarabella, and above all by Gerson. Gerson indeed practically ruled the council up to the election of a new pope. It was he that dictated the form of submission and cession made by John XXIII., and directed the process against Huss. Many of Gerson’s biographers have found it difficult to reconcile his proceedings against Huss with his own opinions upon the supremacy of the pope; but the

difficulty has arisen partly from misunderstanding Gerson's position, partly from supposing hii to be the author of a famous tract—De modis wniendi ac refor- mandi ecclesiam in concilio universali, All Gerson's high-sound- ing phrases about the supremacy of a council were meant to apply to some time of emergency. He was essentially a trimmer, aud can scarcely be called areformer. He never wrote thie bold tract of Abbot Andrew of Randolf (cf. Schwabe, Johannes Gerson, p. 483-491), and he hated Huss with all the hatred the trimmer has of the reformer. The council of Constance, which revealed the eminence of Gerson, became in the end the cause of his downfall. He was the pro- secutor in the case of John Petit, and the council, overawed by tlie duke of Burgundy, would not affirm the censure of the university and archbishop of Paris. Petit's justification of murder was declared to be onlya moral and philosophical opinion, notof faith. Theutmost length the council would go was to condenin one proposition, and even this censure was annulled by the new pope, Martin V., ona formal pretext. Gerson dared not return to France, where, in the disturbed state of the kingdom, the duke of Burgundy was in power. He lay hid for a time in Germany, and then returned to France, to Lyons, where his brother was prior of the Celestines. It is said that he taught a school of boys and girls in Lyons, and that the only fee he exacted was to make the children promise to repeat the prayer, " Lord, have mercy on thy poor servant Gerson." His later years were spent in writing books of mystical devotion and hymns. He died at Lyons on July 12, 1429.

Tradition declares that during

his sojourn there he translated or adapted from the Latin a work upon eternal consolation, which afterwards became very famous under the title of The Imitation of Christ, and was attributed to Thomas 2» Kempis. Recent rescarches, however, have proved beyond a doubt that the famous Imitatio Christi was really written by Thomas, and not by John Gerson or the Abbot Gersen.

The literature on Gerson is very abundant. See Dupin, Gersoni- ana, including Vita Gersoni, prefixed to the edition of Gerson's works in 5 vols. fol., from which quotations have jiere been made ; Charles Schmidt, Essai

sur Jean Gerson, Chancelier de V Université de Paris, Strasburg, 1889 ; Schwabe, Johannes Gerson, Wiirzburg, 1859. On the relations between Gerson and D'Ailly, see Paul Tschackert, Peter von Ailli, Gotha, 1877. On the authorship of the Imitatio Christi, see the editions of Dibden, Gene, and Kettle- well. On Gerson's public life, see also histories of the councils of Pisa and Coustance, especially Herm. v. der Hardt, Con. Con- stantiensis libri IV., 1695-9. (T. M. L.)

GERSONIDES, or Ben Gerson, Levi, a distinguished Jewish philosopher and commentator, was born at Bagnolo in Languedoc, towards the close of the 13th century, pro- bably in 1288. – As in the case of the other Jewish writers on philosophy during the Middle Ages, extremely little is known of his life. His family had been distinguished for piety and exegetical skill, but though he was known in the Jewish community by commentaries on certain books of the Bible, he never seems to have accepted any Rabbinical post. Possibly the freedom of his opinions, which drew on him the suspicion of infidelity, may have put obstacles in the way of his preferment. He is known to have been at Avignon and Orange during his life, and is believed to have died at Perpignan in 1370. Part of his writings consist of commentaries on the portions of Aristotle then known, or rather of commentaries on the commentaries of A verroes. Some of these are printed in the early Latin editions of Aristotle's works. His most important treatise, that by which he has a place in the history of philosophy, is entitled Milhamoth Adonai (The Wars of God), and is said to have occupied twelve years in composition. A portion of it, con- taining an elaborate survey of astronomy as known to the Arabs, was translated into Latin in 1342 at the request of Clement VI. The Milhamoth is throughout modelled after the plan of the great work of Jewish philosophy, the Moré Nebuchim of Moses Maimonides, and may be regarded as an elaborate criticism from the more philosophical point of view (mainly Averroistic) of orthodoxy as presented in that work. The six books pass in review (1) the doctrine of the soul, in which Gersonides defends the theory of imper- sonal reason as mediating between God and man, and ex- plains the formation of the higher reason (or acquired intellect, as it was called) in humanity,—his view being thoroughly realist and resembling that of Ibn Gebirol (see Avicesron); (2) prophecy ; (3) and (4) God's knowledge of facts and providence, in which is advanced the curious theory that God does not know individual facts, and that, while

there is general providence for all, special providence only extends to those whose reason has been enlightened ; (5) celestial substances, treating of the strange spiritual hierarchy which the Jewish philosophers of the Middle Ages accepted from the N eo-Platonists and the Pseudo-Dionysius, and also giving, along with astronomical details, much of

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astrological theory ; (6) creation and miracles, in respect to

which Gerson deviates widely from the orthodox position of Maimonides.

A careful analysis of the Milhamoth is given in Rabbi Isidore Weil's Philosophie Religiewse de Lévi-Ben-Gerson, Paris, 1868. See also Munk, Mélanges de Phil. Juive et Arabe ; and Joel, Religions- philosophic d. L. Ben-Gerson, 1862. The Milhamoth was pub- lished in 1560 at Riva di Trento, and has been republished at Leipsic, 1866.

GERSTACKER, Friepricu (1816-1872), whe enjoyed a most extensive popularity as a novelist and a writer of travels both at home and abroad, was born at Hamburg on 10th May 1816. Having lost his father at the age of nine,

he was placed under the guardianship of an uncle at

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Brunswick, who sent him to a house of business at Cassel as clerk. He soon got tired, however, of the mono- tonous commercial routine, and selected the more active life of a farmer, in which capacity he spent the years from 1835 to 1837 in Saxony. But the uneventful agricultural life was unable to repress in him the innate roving instinct which, according to his own statement, had received a strong impulse in his eighth year by the perusal of Robdrson Crusoe. The word " America" had from that time exercised on him an irresistible charm, and so he went in 1837 from Bremen to New York. He travelled on foot over all parts of the United States, working as he went for his bare sub- sistence, and then settled for some time in Arkansas, where he led the life of a roving sportsman, Only now and then he visited

inhabited places to see civilized society, and to earn some means by whatever work he could obtain. Thus he went in 1842 to Point Coupée in Louisiana, where he undertook the management of a hotel. This time, however, he did not return with the acquired means to the backwoods, but repaired to his German home to see his mother and other relatives, after having led an adventurous life for six yearsand a half. On his return to Germany he found himself, to his great surprise, known as an author, ona limited scale at least. His mother had shown his diary, which he regularly sent home, and which contained descrip- tions of his adventures in the New World, to the editor of the /tosen, who readily published them in his periodical. The travelling sketches having found great favour with the German public, Gersticker issued them, in 1844, in a collected form, under the title of Streif- und Jagdzige durch die Vereinigten Staaten Nordamerikas. His next literary labours consisted of translations from the English, during the performance of which it occurred to lim that he might himself become an original author, since he was able to delineate original characters, to relate remarkable occurrences, and to describe romantic scenery from his own experience, whilst others were obliged to draw upon their imagination only in producing works of fiction, Accord- ingly Gerstiicker issued, in 1845, his first novel, Die Kegulatoren in Arkansas, and henceforth the stream of his productiveness flowed on uninterruptedly. In 1849 he again repaired to America, being this time provided with a grant from the then "German Government," and acting at the same time as correspondent to the Augsburger Allgem. Zeitung. After having made very extensive travels both in America, Polynesia, and Australia, he returned in 1852 to Leipsic. In 1860 his innate restlessness drove him to South America, chiefly with a view of inspecting the Ger- man colonies there, After having traversed nearly all the principal South American countries he returned to Germany, but for a short time only, for in 1862 he accompanied the Duke Ernest of Coburg-Gotha to Egypt and Abyssinia. This was his last great journey, after the return from which he lived first near Gotha and then at Brunswick, where he died on May 31, 1872,

Gerstiicker was greatly esteemed and liked as a man, on account of his genial temper and straightforward character, and as an author he enjoyed an almost unprecedented popularity at home and was very favourably known abroad. The charm of his productions consists in the natural fresh- ness of

his descriptions, nearly all of which have an exotic background, and in the originality of his characters, the most prominent of which are drawn from real life. He did not possess any high literary power, and probably never touched up what he had once written ; his writings lack therefore on the whole that artistic finish which forms one of the principal elements of a good writer. This defect, however, impresses even on his works of fiction the stamp of probability, nay of truthfulness. His writings nowhere betray that intention of producing an effect which so often

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destroys the illusion of the reader in elaborately worked out productions. He generally writes in a homely, ungar- nished manner, just as a traveller would relate his adven- tures amidst a circle of friends. His writings, therefore, nearly always rivet the attention of the reader from begin- ning to end. The works of Gerstiicker have, besides, the merit that they formed a wholesome counterpoise against the too idealistic tendency of the literature of Germany, against the lax and realistic school of France, and against the morbid sensationalism which prevailed in England. A number of his works have been translated into several modern languages, but mostly into English; their deserip- tions of exciting adventures on Jand and sea affording, with their sturdy humour, congenial reading to the English-speaking community in the Old and New World. His best works, from a literary point of view, are, besides the above- mentioned Regulatoren, his Fluszpiraten des Mi; isstssippr, his South Sea novel Zahiti, his Australian romance Die beiden Strdjflinge, his Matrosenleben and Blau Wasser. His collected works have been issued in a cheap and handy edition published at Jena.

GERVAIS, Pavn (1816-1879), an eminent palzeonto- logist, was born September 26, 1816, at Paris, where he obtained the diplomas of doctor of science and of medicine, and in 1835, as assistant to De Blainville in the laboratory of comparative anatomy at the Museum of Natural History, commenced paleontological research, In 1841 he obtained the chair of zoology and comparative anatomy at the Faculty of Sciences in Montpellier, of which he was in 1856 appointed dean. In 1848-52 appeared his important work Zoologie et Paléontologie Frangaises, supplementary to the

paleontological publications of G. Cuvier and De Blainville : of this a second and greatly improved edition was issued in 1859. In 1865 he accepted the professorship of zoology at the Sorbonne, vacant through the death of Gratiolet é this post he left in 1868 for the chair of comparative anatomy at the Paris Museum of Natural History, the anatomical collections of which he greatly enriched by his exertions. He was elected a member of the Academy of Sciences at Paris, in the place of Coste, January 26, 1874. Gervais was remarkable for the disinterestedness with which he devoted himself to the cause of science. He died February 10, 1879, in the sixty-third year of his age.

Besides his Zoologie et Paléontologie Frangaises, Gervais wrote :— The "' Zoologie" for Laplace's Voyage autour du Monde, 1833, &e. (with F. Eydoux); Hist. naturelle des insectes aptéres, 1837, &e. (with Walkenaer); Le jardin des plantes, 1842, &c. (with P. Ber- nard); Atlas de Zoologie, 1844 ; Zoologie de la France, 1847 (with Aicard and others); Hist. naturelle des mammiferes, 1858, &e.; part of Thiollitre's Description des poissons Jossiles, 1854, &c.; Théorie du squelette humain, 1856 ; Zoologie médicale, 1859 (with Van Beneden); De la métamorphose des organes et des générations alternantes, 1860; Un million de faits, 1861 (with Aicard, Des- portes, and others); De l'ancienneté de homme, 1865 ; Zoologie, 1866, in the scries Hléments des seienees naturelles ; Recherches sur Vancienneté de Vhomme et la période quaternaire, 19 pl., 1867; Zool. et paléontologie générales, 1867; Eléments de zoologie, 1868 and 1869; Ostéographie des Cétaeés, 1869, &c. (with Van Beneden); Notions élémentaires @histoire naturelle, 1869 and 1872 (with Mar- chand and Raulin). His scientific papers are exceedingly numerous, See E. Blanchard, '' Nécrologie," Revue Scientifique, Feb. 15, 1879, p. 783; S. Meunier, La Nature, March 15, 1879, p. 225.

GERVAISE or Cantersury, born about 1150, was one of the monks of the priory of Christ Church, Canterbury, and witnessed the burning of the cathedral in 1174. His earliest known literary effort was a Tractatus de Combus- tone et Reparatione Dorobornensis Ecclesice, being an account of that conflagration and of the subsequent process of re- building, written probably about 1184. This was followed about 1194 by Jmaginationes de discordiis inter monachos Cantuarienses et Archiepiscopum Baldewinum, a

detailed relation of clerical disputes which had occurred during the episcopate of Baldwin from 1185 to 1190. Gervaise's

Chronica de tempore regun Angle, Stephani, Henrict LL., et Ricardi I., brings the history down to the death of the last named (1199); but his Vite Dorobornensium Archi- episcoporum closes with that of Reginald Fitz-Joceline(1191). These works, which are all of them characterized by labori- ousness and trustworthiness, are reprinted in Twysden's Historie Anglicanee Scriptores (vol. X.). In the library of Corpus Christi College, Cambridge, there is an unpublished MS., also by Gervaise, containing a work entitled Mappa Mundi, and also an English chronicle from the fabulous ages to the death of Richard. The year of the death of Gervaise is not recorded, but the fact that he does not appear to have accomplished any part of his promised chronicle of the reigu of John may fairly be taken to imply that he did not live long after 1200. See Wright, Lzo- graphia Britannica (1846).

GERVASE, or Gervaisz, of Tilbury (Gervasius Tilburi- ensis), an English Latin writer of the 13th century, was probably born at Tilbury in Essex. He is frequently said to have been a nephew of Henry II. of England ; but if this was the case, it is strange that in speaking of Henry to Otto IV. he makes no allusion to this relationship, but simply calls him "my master the illustrious king of the English, Henry II., your uncle vestri avuncult." The truth probably is that the statement owes its origin to some care- less copyist or reader either taking vestri for nostri in this passage, or, as M. Petit Radel suggests, the contraction ori for met. Gervase was present at the peace of Venice in 1177, was professor of canon law some years later at Bologna, and afterwards entered the service of William II. of Sicily. Having obtained the favour of Otto IV., who had close intercourse with England, he was by him appointed about 1200 chancellor and marshal of the kingdom of Arles. He subsequently received the provostship of the nunnery at Ebsdorf, and died about 1235, His best known, if not his only important work, is the Otia Im- perialia, which he composed about 1212 for the entertain- ment of his imperial patron. The first two books are a sort of geographical and historical compendium, and the third is devoted to all kinds of curious facts and

beliefs. The history begins at the beginning with the creation of the world, but it only comes down to the author's own days, as he confesses he had not the gift of prophecy. It is a fairly learned but on the whole very dry digest of the ordinary narratives handed on from chronicler to chronicler, relieved at times with curious disquisitions, or passages from the writer's own experience. It is mainly the third book which justifies Mr Wright's assertion that Gervase was "one of the most amusing writers of the period," for in it he collects a great many popular myths and legends about such matters as the magnet, asbestos, the sirens of the British sea, the veronica, the horn of St Simon, and so on.

The Otia was printed by Leibnitz in vol. i. of Seriptores rerum Brunsvicensitwm, and corrections from MSS. appeared in Yo). "i. A portion of the second book had already been printed by J. J. Maderus as Gervasii Tilb. de Imperio Romanorwm, Helmstadt, 1673; and Liebrecht has since made selections from the non-historical portions, Hanover, 1856, The Dialogus de Scaccario, now recog- nized as the work of Nigel bishop of Ely, was long attributed to Gervase ; and he had consequently the credit also of the 7''ricolwm- nus (now lost) claimed by the author of the dialogue. It is need- less to mention the works assigned to him by Bale; but we have his own authority for the statement that he wrote a Liber Facctia- rwm, or book of anecdotes, for Henry II. See Petit Radel in Hist. Litt. de la France, vol. xvii.

GERVINUS, Grorc GoTTFRIED, (1805-1871), one of the most eminent literary and political historians of Germany, was born on May 20, 1805, at Darmstadt. His well-to-do parents, belonging to the middle classes, had him educated at the gymnasium of the town, where he studied with great success. At the age of fourteen they chose

for him a commercial career, but Gervinus continued his classical studies privately, and made himself fully acquainted with the polite literature of Germany and other countries. He also cultivated his literary and musical taste by frequent ing the theatre of the Hessian capital, which was then in an excellent condition. In 1825 he relinquished the uncon- genial commercial life, and repaired, after a brief prepara- tion, to the university of Giessen to

study philology. The short interruption in his school education helped to de- velop in him, in an eminent degree, his social qualities, and taught him to employ methodically and usefully every hour of his life. In 1826 he went to Heidelberg, where he attended the lectures of the great historian Schlosser, who became henceforth his guide and his model. From 1828 to 1830 he held a mastership in a private insti- tution at Frankfort-on-the-Main, issuing at the same time, in conjunction with Morstadt and Hertlein, a comprehensive edition of Thucydides, and writing an essay on Bloomfield's English translation of the Greek historian. In 1830 he returned to Heidelberg, and wrote among other essays one on Probert's Ancient Laws of Cambria. The year 1832 he spent in Italy as travelling tutor to a young Englishman, and on his return to Heidelberg he wrote several historical treatises, which he issued in 1833, in a collected form, as the first volume of his H istorische Schriften. This publication procured him the appoint- ment of professor extraordinarius ; and the first volume of his Geschichte der poetischen Nationalliteratur der Deut- schen brought him, through the special recommendation of the historian Dahlmann, the appointment to a regular professorship of history and literature at Gottingen. He settled there at Easter 1836, and married a wealthy young lady, who proved a true " companion to his intellect." In the following year he wrote his Grundziige der Historik, which is perhaps the most thoughtful of his philosophico-historical productions. The same year brought his ex- pulsion from Gottingen in consequence of his manly protest, in conjunction with six of his colleagues, against the un- scrupulous violation of the constitution by Ernest Augustus, king of Hanover and duke of Cumberland. After applying himself to his literary and artistic studies at Heidelberg, Darmstadt, and Rome, he returned once more to Heidel- berg, where he continued, among other works, his history of German literature, and was appointed in 1844 honorary professor. He zealously took up in the following year the cause of the German Catholics, hoping it would lead to a union of all the Christian confessions, and to the establish- ment of a national church. He alsocame forward in 1846 as a patriotic champion of the Schleswig-Holsteiners, and when, in 1847, King Frederick William IV. promulgated the royal decree for summoning the so-called " United Diet" (Vereinigte Landtag), Gervinus hoped that this event would form the basis of the constitutional development of the largest German state; and, thinking that the hour of publicistic activity had arrived, he founded, in common with some other

patriotic scholars, the Deutsche Zeitung, which certainly was one of the best-written political journals ever published in Germany. His appearance in the political arena secured his election as deputy for the Prussian province of Saxonytothe National Assembly sitting in 1848 at Frank- fort. The weight of his name and his journalistic activity were of considerable advantage to the liberals in that short- lived parliament ; but when he saw that all their endeavours were frustrated by the indecision of the king of Prussia, who declined accepting the imperial crown of Germany, he re- tired in gloomy disappointment from all active political life. So embittered was he against the royal house of Hohenzol- lern that neither the formation of the North German Con- federation in 1866, which in former years he would have hailed with the greatest satisfaction, nor the glorious estab-

lishment in 1870 of an united German empire, could re-

concile hin to a dynasty one sickly scion of which had foiled the national aspirations of Germany. Gervinus now took

refuge among his literary and historical studies, more especially devoting himself to the study of Shakespeare, the

result of which was his great work Shakespeare (1849, 1850), in four volumes, He also revised his magnum opus, the Mistory of German Literature, for a fourth edition (1853), and began at the same time to plan his Mistory of the 19th Century, which was to bea continuation of the History of the 18th Century by his guide and teacher, Schlosser. He heralded that voluminous work by a pro- gramme or manifesto entitled Minlettung in die Geschichte des neunzehnten Jahrhunderts, which was issued in 1853, and made a great stir in the literary and political world, chiefly owing to the circumstance that the Government of Baden imprudently instituted a prosecution against the author for high treason. Gervinus had prophesied in his famous pamphlet the final victory of democracy, and based his prediction on the theory that all the great revolutionary

outbreaks follow each other in a kind of geometrical pro- Hence he con-

gression,— to wit, 1820, 1830, and 1848. cluded that the next great revolutionary shock would take

place about 1888-1890, and that it would insure the final

victory to democracy, just as the same decade brought in

former centuries freedom and independence to the Ameri-

cans, the French, the English, and the inhabitants of the Netherlands. Arraigned before a tribunal, he defended himself with a great display of ability and manly courage, but was nevertheless condemned to an imprisonment of two months, and all the copies of the “seditious publication ” were to be destroyed. grace was spared her, the verdict having been rescinded by a higher tribunal. his occurrence, which would have aroused a more elastic temper to greater political activity, had the contrary effect upon the sensitive mind of Gervinus. Te buried himself still more among his books, and even forebore to deliver lectures. With unwearied energy he now devoted himself to his above-mentioned great liis- torical work, Geschichte des neunzehnten Jahrhunderts sett den Wiener Vertrdgen, which he issued in eight volumes, the first in 1855 and the last in 1866. In the midst of his historical studies he found relief in his devotion to the works of his favourite musician Handel. He founded, and liberally supported, the Handel Society in Germany, whose object it was to restore the com- positions of the great master in an authentic form, and to issue German versions of the texts suitable to the com- positions. The result of his Handel studies was his critical and ssthetical work [dndel und Shakespeare, zur Aisthetth der Tonkunst (1868), in which he drew an ingenious parallel between his favourite poet and his favourite composer, showing that their intellectual affinity was based on the Teutonic origin common to both, on the same healthiness of their mental capacities, on their analogous intellectual development, and even on a similarity of their inclinations and fates. This philosophical treatise fell flat on the German public, who could not forgive the author for having extolled Handel above the great national masters, Haydn, Mozart, and Beethoven. The ill-success of that publica- tion, and the indifference with which the latter volumes of his History of the 19th Century were received by his countrymen, together with the feeling of disappointment that the unity of Germany had been

brought about in another fashion and by other means than he wished to see employed, combined to embitter in the highest degree the writer and the politician, but it could not sour in him his kindly and humane disposition, nor did it in the least affect his sociable temper, and he cultivated refined society to the last. He died rather suddenly, on the 18th of March 1871.

Fortunately for Germany, this dis-

The works which will, above all others, insure to Gervinus a lasting fame, are his Geschichte der Deutschen Diehtung, and his work on Shakespeare. The former, a fifth edition of which was edited (1871-74) by the eminent literary historian and philologist, Professor Karl Bartsch of Heidelberg, was the first comprehensive history of German poetry in a connected form, and was executcd with a literary skill, a profound erudition, and a lofty enthusiasm for the subject, which imprinted upon it the stamp of a national work of permanent value. The author represented the literary activity of Germany in its successive stages as it grew out of her political life, thus making political history the foil and basis of literary history. His judgment was sincere and independent, and although his criticism often assumed a censorious and pedantic tone against the most prominent poets of Germany, the German people, without allowing themselves to be misguided in their judgment regarding the merits of Goethe, Schiller, Jean Paul, &c. , gratefully accepted his work as a national homage to that subject of which they have most reason to be proud. The object of Gervinus in writing his literary history was, besides, a patriotic one. He endeavoured to show that Germany, having already attained great eminence in literature, should henceforth exclusively devote herself to political activity, and surpass other nations also in this respect. He had ano less patriotie object in view in writing his commentary on Shakespeare, which has been made popular in England by an excellent translation. This work is not so much a philological or esthetical commentary as a treatise pointing out the ethical or moral precepts which may be deduced from his productions, and this circumstance makes it of considerable value and interest also to English readers. Gervinus, who considered Shakespeare the intellectual property of Germany, in the same way as he considered Handel the artistie property of

England, wished above all to in- culcate on his countrymen the teachings of healthy practical activity to be found in the works of the English drainatist. The object for which he wrote, viz., the moral improvement of his readers from a practical point of view, seemied to him the easier to be accomplished through the productions of Shakespeare, because the poet was descended from a kindred race, and the fructifying seeds of his thoughts and scntiments, falling upon a congenial soil, would bo sure to take root there kindly. “As a political historian, Gervinus was the antipode of Ranke. Following the principles of F. C. Schlosser, he slighted all documentary history. He had such a deep distrust of all state papers and diplomatic documents that he considered them as most untrustworthy sources for any his- torical record. He confined himself, therefore, chiefly to taking into account the political events and their results just as they lay on the surface; and, not consulting the state ‘archives for the secret springs which set them in motion, he based his his- torical narratives almost entirely on his subjective judgment. Many brilliant passages will be found in his general History of the 19th Century, suchas the accounts of the South American and Greek revolutions, and of the July revolution in 1830; and his Historische Schriften also contain a number of valuable treatiscs and essays, which may be said to have paved the way to a new era in the art of writing history, Gervinus cntertaincd a kindly feeling towards England, which he called the land of political mastery ; and though he was, what is both the bane and the glory of so many Germans, rather a cosmopolitan, he nevertheless remained a German patriot to the core. He was, besides, distinguished by a rare nobleness and manliness of character, and considering that he was a powerful factor in the literary and political progress of modein times, we may fully agree with Ranke’s opinion ‘that he will never be for- gotten.” (C. A, B.)

GESENTUS, Friepricn Heryricn Witnetm (1786— 1842), Orientalist and biblical critic, was born at Nord- hausen, Hanover, on the 3d of February 1786. From the gymnasium of his native town he passed in 1803 as a student of philosophy and theology to the university of Helmstadt, where Henke was his most influential teacher; but the latter part of his undergraduate course was taken at Gottingen, where Eichhorn and T, C. Tychsen were then at the height of their popularity. In 1806, shortly after graduation, he became “ repetent ” and “ privat-docent” in that university ;

and, as he was fond of afterwards relating, had Neander for his first pupil in Hebrew. In 1809, on the recommendation of Johann von Miiller, he was appointed to a mastership in the gymnasium of Heiligenstadt, West- phalia, whence, in the following year, he was transferred to the university of Haile, where, from being professor extra- ordinarius in theology, he was in a very short time promoted to an ordinary chair (1811). Many offers were subsequently made to him of high preferment elsewhere, but he clung to

Halle for the remainder of his life, and taught with great X. — 70

regularity for upwards of thirty years, the only interruptions indeed being that of 1813-14, occasioned by the war of liberation, during which the university was closed, and those occasioned by two prolonged literary tours, first in 1820 to France and England in the society of his col- league Thilo for the examination of rare Oriental manu- scripts, and afterwards in 1835 to England and Holland in connexion with his Phcenician studies. At a very early

eriod he became the most popular teacher of Hebrew and of Old Testament introduction and exegesis in Germany; and during his later years the annual nuinber of students attending his lectures on these and kindred subjects, such as church history and Biblical archeology, amounted to nearly 500. Of his pupils many have risen to great eminence in the departments he specially cultivated; among these the names of Von Bohlen, Hoffmann, Hupfeld, Rédiger, Tuch, Vatke, and Benfey may be mentioned. In 1827 Gesenius was made a consistorialrath ; but, unless account be taken of the violent attacks to which he, along with his friend and colleague Wegscheider, was in 1830 subjected by Hengstenberg and his party in the Evangelische Kirchenzeitung, there are few noteworthy occurrences to be recorded in his biography. Hisdeath took place at Halle, October 23, 1842. It would be difficult to overestimate the services rendered by Gesenius to Semitic philology. To him belongs in a large measure the credit of having freed it from the trammels of theological and religious pre- possession by which it had previously been hampered, and of inaugurating the strictly scientific method which has since been so fruitful in valuable results. Nor can it be doubted that as an exegetc he has exercised a powerful, and on the

whole a beneficial, influence on the tendencies of modern theological investigation.

Of his very numerous works the earliest, published in 1810, entitled Versuch tiber die Maltesische Sprache, was a suecessful re- futation of the widely current opinion that the modern Maltese was of Punie origin. In the same year appeared the first volume of the Hebrdisches wu. Chalddisches Handwéorterbuch, eompleted in 1812 (8th ed., 1878 ; English translation by Tregelles, 1846-52). The Hebrdische Grammatik, published in 1818 (22d ed., by Kautzsch, 1878), was followed in 1815 by the Geschichte der Hebriiischen Sprache (now very rare), and in 1817 by the Aus- fithrliches Lehrgcbéude der Hebriischen Sprache. The first volume of his well-known commentary on Isaiah (Der Prophet Jcsaja), with a translation, appeared in 1821; but the work was not com- pleted until 1829. The Thesaurus philologico-criticus Lingue Hebraice e Chaldaice V. T., begun in 1829, he did not live to complete ; the latter part of the third volume is edited by Rodiger (1858). The other works of Gesenius are De Pentatewchi Samari- tani Origine, Indole, ef Auctoritate (1815), supplemented in 1822 and 1824 by the treatise De Samaritanorum theologia, and by an edition of Carmina Sanuritana ; Paldographische Studien dtber Phinizische u. Punische Schrift (1835), a pioneering work whieh he followed up in 1837 by his colleetion of Phcenieian monuments (Scripture: linguceque Pheenicic monument quotquot supersunt) ; an Aramaie lexieon (1834-39); and a treatise on the Himyaritic language written in conjunction with Rodiger in 1841. Gesenius

also contributed extensively to Ersch and Gruber’s Encyclopédie, and enriched the German translation of Burekhardt’s7’ravels in Syria and the Holy Land with valuable geographieal notes. For many years he also edited the Halle Allgemeine Lttcraturzeitung. A well exeeuted sketeh of his life was published in 1843 (Gesentus : cine Erinnerung fir seine Freunde).

GESNER, Jowann Marruias (1691-1761), a distin- guished German classical scholar, was born at Roth near Ansbach, 9th April 1691. He studied at the university of Jena, and in 1714 published a work on the Philopatris ascribed to Lucian. In 1715 he became librarian and conrector at Weimar, in 1729 rector of the gymnasium at Ansbach, and in 1730 rector of the Thomas school at Leipsic, where he had for colleagues Joh. A. Ernesti

and Joh. Sebastian Bach. On the foundation of the university of Gottingen he became professor of rhetoric and subse- quently librarian also. He died at Gottingen 3d August 1761. His special merit as a classicist is the attention he

devoted to the explanation and illustration of the subject matter of the classical authors.

His prineipal works are editions of the Scriptores de re rustica, of Quintilian, Claudian, Pliny the Younger, Horaee, and the Orphie poems ; Prime: lineee isagoges in eruditionem universam ; an edition of Faber's Thesaurus eruditionis scholastice, afterwards continued under the title Novus lingue et eruditionis Romane thesaurus; Opuscula varii argumentt ; and Thesaurus epistolarum Gesnert. See Ernesti, Opuscula oratoria, 1762; and Gottinger Professoren, Gotha, 1872. ;

GESNER, or GussNER, KonrRAD (1516-1565), a very famous naturalist and author, surnamed the German Pliny and literarum miraculum on account of his vast erudition, was born of poor parents at Ziirich, 26th March 1516. He received the first elements of education from Chaplain Frick, his maternal uncle; and it was while gathering plants in his relative's garden that he became imbued with that enthusiastic love of science which remained with him through life. In 1513 he went to Strasburg, then to Bourges, and in 1534 to Paris, studying at all those places with characteristic passionate zeal. In 1535 we find him again in Ziirich, where he married somewhat imprudently, for he was very poor, and had no immediate prospect of bettering his condition. His whole day was occupied in teaching, but at least the night was his own, and too great a portion of the time that others give to rest was occupied by Gesner in adding to his already great stock of erudi- tion. In 1537 he was appointed professor of Greek at Lausanne, and in 1541 professor of physics and natural history at Ziirich. But in neither of these offices was he well paid, and during those years he wrote a large number of books, partly to support himself, partly from the interest he felt in their subjects. He wrote several works on ancient medicine and on botany, and a treatise on milk (in which he described the rural economy of Switzerland), translated into Latin a Greek logical manual and some works on the moral interpretation of Homer, carefully edited a

new edition of Johannis Stobaei Sententic (iirich, 1543) and an expurgated edition of Martial (1544), pre- pared a new edition of the Latin dictionary of Ambrosius Calepinus (Basel, 1544), and wrote besides some lesser dis- sertations and translations. All this, however, was only mere side work, for in 1545 he issued at Ziirich the first part of his justly renowned Bibliotheca Universalis, a cata- logue of all the works in Latin, Greek, and Hebrew, extant and not extant, published or as yet unpublished. Under each important name there was given a vast mass of biblio- graphical information and criticism, original and selected.

Three years later the second part of this stupendous work —

appeared, likewise at Ziirich, under the title of Pandectarwm sive partitionum universaliwm Conradi Gesnert Tigurint Libri XXI. Only nineteen of these books then appeared; the twenty-first, which was a theological encyclopedia, was published in 1549, but the twentieth, which was to contain the medical writings, and which he intended should repre- sent the quintessence of the labours of a lifetime, was never finished and never published.

The next few years were spent in writing small trea- tises, and in the preparation of another magnum opus, a zoological work entitled Historia Animalium, which was published in six books (the last of these unfinished) at Ziirich between 1551 and 1587. To prepare himself for the worthy execution of this undertaking he read 250 authors, travelled over nearly all Europe, received hints from hosts of learned friends, and did not disdain the information which he obtained from hunters and shepherds. He also made himself a proficient artist, in order that he might by drawings assist his labours. This work contained the names of all known animals in the ancient and modern languages, a description of each as to every important particular, and a mass of interesting literary information, embracing facts

and legends regarding them. After this he again occupied He devoted some attention to philology, aided in the preparation of a German-Latin

dictionary, and pointed out the force and undreamt-of beauty that lay in that then vulgar and half- But again these and other publications were only secondary labours, for he had a third great work in preparation. He had for some time given great atten- tion to botany, and he now proposed to publish a work on

himself with lesser writings for some years.

developed tongue.

that science corresponding to his great work on zoology. He had made a large collection of materials towards this

when his health, never very good, completely gave way. A few hours before his death he desired to be carried into his

museum, and there he spent the last moments of life. He

died 13th December 1565, not having completed his fiftieth

year.

Gesner's intense devotion to science, and his almost in- credible powers of acquisition, are seen from the recital of the facts of his biography, and from a mere catalogue of It deserves to be added that his life was sin-

his labours. gularly pure and blameless, that his love of knowledge was as disinterested as it was engrossing,

ready and glad to acknowledge any help he received.

When obliged to engage in controversy, he did so in a His medical writings show him to have been far above the silly prejudices of his A cheerful and amiable piety was a prominent

dignified and courteous manner.

day. feature in his character—a character chastened, not soured, by the trials of a hard lifetime.

After Gesner's death his unpublished writings went through a carcer of vicissitudes not unlike that of their author. them, edited by Professor Schmiedel, was published at Nuremberg in 1753. Other parts followed, but the work was never completed. Lives of Gesner have been written by J. Simmler (Ziirich, 1566) and J. Hanhart (Winterthur, 1824).° Sce also Lebert's Gesmer als Art (Ziirich, 1854), and Gesner's autobiography in his Bibliotheca Universalis (1st ed., p. 180).

GESSNER, Satomow (1730-1788), Swiss painter and poet, and once a very favourite and widely-read author, was born at Ziirich 1st April 1730. With the exception of some time spent in Berlin, and a visit to Hamburg undertaken in order to see Hagedorn, he passed the whole of his life in his native town, where he carried on the business of a book. seller. He died 2d March 1788. The first of his writings that attracted attention was his Lied eines Schweizers an seim bewaffnetes Miidchen (1751). Then followed Daphnis (1754), Idyllen (1756), Inkel and Yariko (1756), a version of a story already worked out by Gellert and Bodmer, and Der Tod Abels (1758), "a sort of idyllic prose pastoral." It is somewhat difficult for us now to understand the reason of Gessner's universal popularity, unless it was the taste of the period for the conventional pastoral. His writings are marked, it is true, by sweetness and melody, but the sweet- ness soon becomes insipidity, and the melody monotony. He represents in most of his works the existence of Shepherds in a golden or rather tinsel age, and nothing more unreal could possibly be imagined. His men and women are inane and lifeless representations, They are all alike, and all equally uninteresting, They never give utter- ance to any powerful, genuine, human sentiments. Their talk is but meaningless platitude. As a painter Gessner represented "still country scenes, rocks, springs, and water- falls, shepherds and shepherdesses "—in short, the conven- tional classical landscape. His son, Konrad Gessner (1764- 1826), was also a painter of some reputation.

Collected editions of Gessner's works were repeatedly published (2 vols. 1777-78, finally 2 vols. 1841, both at Ziirich). They were translated into French (3 vols., Paris, 1786-93), and versions of the Idyllen appeared in English, Dutch, Portuguese, Spanish, Swedish, and Bohemian. Gessner's life was written by Hottinger

(Ziirich, 1796); see also his Briefwechsel mit seinem Sohn (Bern and Ziirich, 1801).

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GESTA ROMANORUM, a Latin collection of anecdotes and tales, probably compiled about the end of the 13th century or the beginning of the 14th, which still possesses a twofold literary interest, first as one of the most popular books of its time, and secondly as the source, directly or indirectly, of much which has since become current under the stamp of genius. Of its authorship nothing certain is known; and there is little but gratuitous conjecture to associate it either with the name of Helinandus or witli that of Petrus Berchorius (Pierre Bercheure). It is even a matter of debate whether it took its rise in England, Germany, or France ; while Mr Douce was disposed to give the credit of it to the Germans, Herr Cisterley is inclined to recognize the priority of the English. The work at least was evidently intended as a manual for preachers, and was probably written by one who himself belonged to the clerical profession. The name, Deeds of the Romans, is only partially appropriate to the collection in its present form, since, besides the titles from Greek and Latin history and legend, it comprises fragments of very various origin, Oriental and European. The unifying element of the book is its moral purpose : everything is made service- able for reproof and doctrine, the powerful chemistry of the allegorical method extracting the sunshine of Christian truth from the cucumbers of the most worldly and wicked circumstance. The style is barbarous, and the narrative ability of the compiler seems to vary with his source; but he has managed to bring together a considerable variety of excellent material. He gives us, for example, the germ of the romance of " Guy of Warwick," the story of " Darius and his Three Sons," versified by Occleve, part of Chaucer's " Man of Lawes' Tale," a tale of the emperor Theodosius, the same in its main features as that of Lear, the story of the " Three Black Crows," the "Hermit and the Angel," so well-known from Parnell's version, and a story identical with the Fridolin of Schiller. Owing to the loose structure of the book, it was easy for a transcriber to insert any

ad- ditional story into his own copy, and consequently the MSS. of the Gesta Romanorum exhibit considerable variety. Cisterley, who has bestowed the fullest investigation on the subject, recognizes an English group of MSS. (written always in Latin), a German group (sometimes in Latin and sometimes in German), and a group which is represented by the vulgate or common printed text. The earliest editions are supposed to be those of Ketelaer and De Lecompt at Utrecht, of Arnold Ter Hoenen at Cologne, and of Ulrich Zell at Cologne; but the exact date is in all three cases uncertain.

An English translation, probably based directly on the MS. Harl. 5369, was published by Wynkyn de Worde about 1510-1515, the only copy of which now known to exist is preserved in the library of St John's College, Cambridge. Jn 1577 Richard Robin- son published a revised edition of Wynkyn de Worde, and the book proved highly popular. Between 1648 and 1703 at least eight impressions were issued. In 1703 appeared the first vol. of a trans- lation by B. P., probably Bartholomew Pratt, ''from the Latin edition of 1514." A translation by the Rev. C. Swan, first pub- lished in 2 vols. in 1824, forms part of Bohn's Antiquarian Library, and was re-edited by Wynnard Hooper in 1877. The German translation was first printed at Augsburg, 1489. A French version, under the title of Le Violter des histotres romaines moraliséz, appeared in the early part of the 16th century, and went through a number of editions; it has been reprinted by G. Brunet (Paris, 1858). Critical editions of the Latin text have been produced by A. Keller (Stuttgart, 1842), and Csterley (Berlin, 1872). See also Warton, '' On the Gesta Romanorum," dissertation iii., prefixed to the History of English Poetry ; Douce, Illustrations of Shakespeare, vol. ii.; Frederick Madden, Introduction to the Roxburghe Club edition of The Old English Versions of the Gesta Romanorum, 1838.

GETA, Pustius Septimus Antoninus (189-212), younger son of the Roman emperor Severus, was born at Milan, 189 a.v. Between him and his brother Caracalla there existed from their early years a keen rivalry and antipathy. On the death of their father in 211 they were,

in accordance with his instructions, proclaimed joint em- perors ; and after the failure of a proposed treaty by which Caracalla was to retain Europe and western Africa, and Geta Asia and Egypt, Caracalla, on the pretence of a desire for reconciliation, arranged a meeting with his brother in his mother's apartments, and by means of assassins mur- dered him in her presence (212). His name was obliter- ated from all public inscriptions; all coins bearing his effigy were to be destroyed; and the use of his name, either in con- versation or in writing, was forbidden under pain of death.

GETHSEMANE. See JERUSALEM.

GEULINCX, Arnotp (1625-1669), one of the most distinguished of the earlier Cartesians, was born at Antwerp in 1625. Few details are known with regard to his life, and his more important works are extremely rare. He studied philosophy and medicine at the university of Louvain, and took there the degree of doctor. For twelve years he continued at the same university as lecturer, and was noted asone of the most successful teachers. For what reason he left is quite uncertain, but he seems to have been obliged to fly from Louvain and to take refuge in Leyden, where he appears to have been in the utmost distress. Only the generous assistance of a friend, by name Heidanus, pre- vented his death from absolute want of means. At Leyden he entered the Protestant Church, having been previously a Catholic, and it has been supposed that his flight from Lou- vain was due to doubts excited there as to his orthodoxy. This, however, is merely conjecture. In 1663, through his friend Heidanus, he obtained leave to lecture at Leyden, and devoted himself with the utmost zeal to his new duties. He died in 1669. His most important works were pub- lished posthumously. During his lifetime there seem to have been made public only the theses which he defended on graduating at Louvain (Saturnalia, seu qucestiones quod- libetice: in utramque partem disputate, 2d ed. 1665). The Metaphysica vera, 1691, and the Tvabt ceavrov, sive Ethica, post tristia auctoris fata, 1696 (first part, 1665), are the works by which he is known in the history of philosophy. In addition to these were published Physeca Vera, Logica restituta, and Annotata in Principia Philosophice R. Cartesit. Geulincx takes up principally the doctrine, left in an obscure and unsatisfactory state by Descartes, of the relation between soul and body. Extension and thought, the essences of spiritual and corporeal natures, are

absolutely distinct, and cannot act upon one another. External facts are not the causes of mental states, nor are mental states the causes of physical facts. So far as the physical universe is concerned, we are merely spectators. ‘The influence we seem by will to exercise over bodies is only apparent ; voli- tion and action only accompany one another. I cannot be the author of any state of which I am unconscious, for my very nature is consciousness ; but I am not conscious of the mechanism by which bodily motion is produced, hence Tam not the author of bodily motion, Body and mind are like two clocks which act together, because at each instant they are adjusted by God. A physical occurrence is but the occasion on which God excites in me a corresponding mental state. Geulincx is thus definitely the originator of the theory called Occasionalism. But the principles on which that theory was founded compelled a further advance. God, who is the cause of the concomitance of bodily and mental facts, is in truth the sole cause in the universe. No fact contains in itself the ground of any other; the existence of the facts is due to God, their sequence and co-existence are also due to him. He is the ground of all thatis. My desires or volitions and my thoughts are thus the desires, volitions, or thoughts of God. Apart from God, the finite being has no reality. Geulincx is thus the precursor of Spinoza, and, like Spinoza, he gave out his final results under the title of Ethics. Descartes had left untouched,

or nearly so, the difficult problem of the relation between the universal element or thought and the particular desires or inclinations. Al these are regarded by Geulincx as modes of the divine thought and action, and accordingly the end of human endeavour is the end of divine will, or the realization of reason. ‘The love of right reason is the supreme virtue, whence flow the cardinal virtues, diligence, obedience, justice, and humility. Liberty is obedience to reason; nemo servit qui rationi servit. Geulincx has not directly touched the problem which evidently must have caused the greatest difficulty to the Cartesians,—how we perceive extended reality,—though he plainly indicates the opinion that we do not perceive it, but have the idea of it from God. He thus carried out to their extreme cousequences the irreconcilable elements in the Cartesian metaphysics, and his works have the peculiar value attaching to the vigorous development of

a one-sided principle. The abrupt contradictions to which such develop- ment leads of necessity compels revision of the principle itself, See Damiron, Phil. en France aw 17me siecle, 1846; Bouillier, His. de la Phil. Cartesienne, i. ch. 14; Erdmann, Versuch ciner Gesch. d. neu. Phil., i., b., sec. 2; Ritter, Gesch. d. Phil., xi. pp. 97-169 (Ritter's account of Geulincx is the fullest in any history of philosophy); K. Fischer, Gesch. d. neu. Phil., i. 2, 11-27. GEX, a town of France, the chief town of an arrondisse- meut in the department of Ain, is beautifully situated, 2000 feet above sea-level, at the base of the Jura chain on the Journant, 3 miles from the Swiss frontier, and 10 miles N.W. of Geneva. It has tanneries, saw-mills, and corn-mills, and a considerable trade in cheese and wine. The town gives its name to the old Pays de Gea, situated between the Alps and the Jura, which was successively under the protec- tion of the Swiss, the Genevese, and the counts of Savoy, until in 1602 it came into the possession of France, retain. ing, however, until the Revolution its.old independent juris- diction, with Gex as its chief town. The population of the town in 1876 was 1469. GEYSERS, Geisers, or Gzrsirs, are fountains of a peculiar construction, in virtue of which they shoot up into the air, at more or less regular intervals of time, a column of heated water and steam or of mud. 'Those of Iceland have been known at least from the time of Saxo Grammaticus, who briefly mentions them in his Danorum regun historie ; but no satisfactory explanation of the phenomena was advanced till near the middle of the present century, when Bunsen brought his scientific knowledge and power of investigation to bear on the subject. Sir George Mackenzie, in his Zravels in Iceland, — 1811, had written as fol- lows :—" Let us suppose a cavity C (fig.1), communicat- ing with the pipe PQ, filled with boiling water to the height AB, and that the steam above this line is con- fined so that it sustains the water to the height P. If we suppose a sudden addition of heat to be applied under

Fig. 1. the cavity C, a quantity of steam will be produced which, owing to the great pres-

sure, will be evolved in starts causing the noises like discharges of artillery, and the shaking of the ground." He admitted that even to his own mind this could be only a partial explanation of the facts of the case, and that he was unable to account for the frequent and periodical production of the

necessary heat; but he has the credit of hitting on what is certainly the proximate cause—the sudden evolution of steam. By Bunsen's theory the whole difficulty is solved, as is beautifully demonstrated by the artificial geyser designed by Professor J. H. J. Miiller of

Freiburg (fig. 2). If the tube ad be filled with water and

heated at two points, first at @ and then at 0, the follow- The water at a beginning to boil, the superincumbent column is conse-

Ing succession of changes is produced.

quently raised, and the stratum of water which was on the point of boiling at b being raised to d is there subjected to a diminished pressure ; a sudden evolution of steam accordingly takes place at d, and the superincumbent water is violently ejected. Received in the basin ¢, the air-cooled water sinks back into the tube, and the tem- perature of the whole column is consequently lowered ; but the under strata of water are naturally those which are least affected by the cooling process; the boiling begins again at A, and the same succes- sion of events is the result (see R. Bunsen, "Physikalische Beo- bachtungen itiber die hauptsiich- lichsten Gisire Islands," in Poggen- dorf's Annaler der Physik and Chemie, vol. Ixxii., 1847; and J. Miller, "Ueber Bunsen's Geyser- theorie," zéd., vol. Ixxix., 1850). The principal difference between the artificial and the natural geyser-tube is that in the latter the effect $

is not necessarily produced by two Fig. 2.

distinct sources of heat like the two fires of the experi- mental apparatus, but by the continual influx of heat from the bottom of the shaft and the differences between the boiling points of the different parts of the column owing to the different pressures of the superincumbent mass. 'his may be thus illustrated :—AB is the column of water; on the right side the figures represent ap- proximately the boiling points (Fahr.) calculated accord- ing to the ordinary laws, and the figures on the left the actual temperature of the

same places. Both gradually increase as we descend, but the relation between the two is very different at

Observed. A Calculated.

different heights, At the top the water 1 ¢° | 225° is still 39° from its, boiling point, and 930° 941° even at the bottom it is 19°; but at D ~ the deficiency is only 4°. If, then, the = stratum at D be suddenly lifted as high 251″ |__| 55° as C, it will be 2° above the boiling point . there, and will consequently expend 255° 266° those 2° in the formation of steam, 259° 278°

__Any hot spring capable of depositing -— …... Siliceous material by the evaporation of its water may in course of time transform itself into a Seyser, a tube being gradually built up as the level of the basin is raised. And every geyser continuing to deposit siliceous material ig preparing its own destruction ; for as Soon as the tube becomes deep enough to contain a column of water sufficiently heavy to prevent the lower strata attaining their boiling points, the whole mechanism is deranged, In geyser districts it is easy to find thermal springs busy with the construction of the tube; warm pools, or laugs, as the Icelanders call them, on the top of siliceous mounds, with the mouth of the shaft still open in the middle; and dry basins from which the water has receded with their shafts now choked with rubbish.

xeysers exist at the present time in many volcanic Tegions, as in the Eastern Archipelago, Japan, and South

merica; but the three localities where they attain their

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highest development are Wyoming in the United States, we call them indicates the historical] priority of the Iceland group. It is an old Icelandic word—geysir, equivalent to gusher or rager—from the verb geysa, itself a derivative of Wosa, to gush. In the Great Geyser, and not an appellative—the general term hver, a hot spring, making the nearest approach to the (see Cleasby and Vigfusson, Icelandic English Dictionary, s, v.).

The Iceland geysers are situated about 50 miles N.W. of Hecla, in a broad valley of alluvial formation, at the foot of a range of hills from 300 to 400 feet in height. Within a circuit of about two miles, upwards of one hundred hot springs may be counted, varying greatly both in char- acter and dimensions. The Great Geyser in its calm periods appears as a circular pool 72 feet in diameter and 4 feet in depth, occupying a basin on the summit of a mound of siliceous concretion ; and in the centre of the basin is a shaft, about 9 feet in diameter and 70 feet in depth, lined with the same siliceous material. The clear sea-green water flows over the eastern rim of the basin in little runnels, On the surface it has a tem- perature of from 76° to 89° Cent., or from 168° to 188° Fahr. Within the shaft there is of course a continual shift- ing both of the average temperature of the column and of the relative temperatures of the several strata. The results of the observations of Bunsen and Descloizeaux in 1874 were as follows (of. Poggendorf's Annalen, loc. cit., and Comptes Rendus, vol. xxiii.) :—A bout three hours aftera great eruption on July 6th, the temperature 6 metres from the bottom of the shaft was 121 6°C.; at 9°50 metres, 121 i sya 16°30 metres, 109° (2); and at 19°70 metres, 95° (1), About nine hours after a great eruption on July 6th, at about 0-3 metres from the bottom, it was 123°; at 48 metres it was 122°7°; at 9-6 metres, 113°; at 14:4 metres, 85'8°; at 19-2 metres, 82°6°. On the 7 th, there having been no eruption since the previous forenoon, the temperature at the bottom was 127°5°; at 5 metres from the bottom, 123°; at 9 metres, 120°4°; at 14°75 metres,1064°; and at 19 metres, 55°, About three hours after a small eruption, which took place at forty minutes past threeo'clock in the afternoonof the 7th, the temperature at the bottom was 126°5° 3; at 6°85 metres up itwas 121°8°; at 14°75 metres, 110°; and at 19 metres, 55°, Thus, continues Bunsen, it is evident that the temperature of the column diminishes from the bottom upwards ; that, leaving out of view small irregularities, the temperature in all parts of the column is found to be steadily on the in- crease in proportion to the time that has elapsed since the previous eruption; that even a few minutes before the great eruption the temperature at no point of the water column reached the boiling point corresponding to the atmospheric pressure at that part ; and finally, that the temperature about half-way up the shaft made the nearest approach to the appropriate boiling point, and that this approach was closer in proportion as an eruption was at hand. Observations made by Mr Robert Walker in August 1874 remarkably confirm those of

Professor Bunsen (see Proceedings of Roy. Soc. of Edinburgh, vol. vii. p. 514). The Great Geyser has varied very much in the nature and frequency of its eruptions since it began to be observed. In 1809 and 1810, e.9., according to Hooker and Mackenzie, its columns were 100 or 90 feet high, and Tose at intervals of 30 hours, while, according to Hender- son, in 1815 the intervals were of 6 hours, and the altitude from 80 to 150 feet.

About 100 paces from the Great Geyser is the Strokkr or churn, which was first described by Stanlay in 1789. The shaft in this case is about 44 feet deep, and, instead of being cylindrical, is funnel-shaped, having a width of

about 8 feet at the mouth, but contracting to about 10 ‘nchies near the centre. By casting stones or turf into the shaft so as to stopper the narrow neck, eruptions can be accelerated, aud they often exceed in magnitude those of the Great Geyser itself.1 During quiescence the column of water fills only the lower part of the shaft, its surface usually lying from 9 to 12 feet below the level of the soil. Unlike that of the Great Geyser, it is always in ebullition, and its tem- perature is subject to comparatively slight differences. On the 8th of July 1847 Bunsen found the temperature at the bottom 112 9° C.; at 3 metres from the bottom, 111°4°; and at 6 metres, 108’; the whole depth of water was on that occasion 10°15 metres. On the 6th, at 2°90 metres from the bottom, it was 114 2°; and at 6:20 metres, 1093”. “On the 10th, at 0°35 metres from the bottom, the reading gave 113:9°; at 4°65 metres, 113°7°; and at 8°85 metres, 99°9°,

The great geyser-district of New Zealand is situated in the south of the province of Auckland in or near the upper basin of the Waikato river to the N.E. of Lake Taupo. In many respects the scene presented in various parts of the districts is far more striking and beautiful than anything of the same kind to be found in Iceland, but this is due not so much to the grandeur of the geysers proper as to the bewildering profusion of boiling springs, steani-jets, and inud-volcanoes, and to the fantastic effects produced on the rocks by the siliceous deposits and by the action of the boil- ing water. At Whakarewarewa, near Lake Loto Rua, there is a group of eight geysers, one of which, the Waikate, throws the column to a height of 30 or 35 feet (see Hochstetter, New Zealand, 1867). But it is in the Yellowstone Park, in the

north-west corner of Wyoming, that the various phenomena of the geysers can be observed on the most portentous scale. The geysers themselves are to be counted by hundreds, and the dimensions and activity of several of them render those of Iceland and New Zealand almost insignificant in comparison. The principal groups are situated along the course of that tributary of the Upper Madison which bears the name of Fire Hole River. Many of the individual geysers have very distinctive characteristics in the form and colour of the mound, in the style of the eruption, and in the shape of the column. The "Giantess," as observed by Langford (1870) and Dunraven (1874), lifts the main column to a height of only 50 or 60 feet, but shoots a thin spire to no less than 250 feet. The "Castle" varies in height fron 10 or 15 to 250 feet; and on the occasions of greatest effort the noise is appalling, and shakes the ground like an earthquake. Strong distinct pulsations, says Lord Dun- raven, occurred at a maximum rate of seventy per minute, having a general tendency to increase gradually in vigour and rapidity until the greatest development of strength was attained, and then sinking again by degrees. The jets grew stronger and stronger at every pulsation for ten or twelve strokes, until the effort would culminate in three impulses of unusual power. The total display lasted about an hour. "Old Faithful" owes its name to the regularity of its action. Its eruptions, which raise the water to a height of 100 or 150 feet, last for about five minutes, and recur every three-quarters of an hour. The " Beehive" sometimes attains a height of 219 feet; and the water, instead of falling back into the basin, is dissipated in spray and vapour. Very various accounts are given of the "Giant." Hayden saw it playing for an hour and twenty minutes, and reaching a height of 140 feet, and Lieutenant Doane says it continued in action for three hours and a half, and had a maximum of 200 feet; but at the earl of

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1 According to Professor Tyndall (see Royal Institution Notices, 1853, and Heat as a Mode of Motion, 1863), this effect of the stopper is simply due to the fact that it is an impediment to the normally gradual ascent of the heated aqueous strata, and that it is an impedi- ment which at last is suddenly removed.

Dunraven's visit the eruption lasted only a few nuinutes. For further details see Dunraven's Great Divide (1874), and the Reports of Professor Hayden.

GEZER (733), a royal Canaanite city on the boundary of Ephraim in the maritime plain (Josh, xvi. S—1G) It was allotted to the Levites, but its original inhabitants were not driven out until the time of Solomon, when the Egyptians took the city, which was given to Solomon's wife (1 Kings ix. 16), Under the form Gazera it is mentioned as being in the neighbourhood of Emmaus-Nicopolis (Amwas) and Jamnia (Yebnah) (1 Macc. iv. 15). Throughout the history of the Maccabean wars Gazera plays the part of an important frontier post. It was first taken from the Greeks by Simon the Asmonean (1 Mace. xiv. 7). Josephus also mentions that the city was 'naturally strong" (Antiy., viii. 6,1). The position of Gezer is defined by Jerome (Onomasticon, s.v.) as 4 Roman miles north (contra septentrionem) of N icopolis ('Amwas). This points to the ruined site called Zell Jezer, near the village of Abu Shisheh, about 4 miles north-west of 'Amwas. The site is naturally very strong, the town standing on an isolated hill, commanding the western road to Jerusalem just where it begins to enter the mountains of J udah. The name Gezer (from a root signifying 'insulated ") was no doubt derived from the position of the place. The ruins include rock-cut tombs, wine-presses, caves, and quarries, with foundations of a citadel on the hill top. A very fine spring ('Ain Yerdeh) exists on the east, and in 1874 a curious discovery was made on the hill side near the spring. The words Tahum Gezer, "boundary of Gezer," were found cut in Hebrew letters on the live rock in two places, and in each case the Greek name Alkios occurred with them. The genuineness of this curious inscription has not been disputed.

GFRORER, Aveust Friepricx (1803-1861), historian, was born at Calw, Wiirtemberg, on the 5th of March 1803, and at the close of his preliminary studies at the seminary of Blaubeuren, entered the university of Tiibingen in 1821 as a student of evangelical theology. After passing his final examinations in 1825, he spent a year in Switzerland, during part of which time he acted as companion and secre- tary to Bonstetten; the year 1827 was spent chiefly in Rome. Returning to Wiirtemberg in 1828, he first under- took the duties of repetent or theological tutor in Tiibingen and afterwards accepted a curacy in Stuttgart ; but having in 1830 received an

appointment in the royal public library at Stuttgart, he thenceforth gave himself exclusively to literature and historical science. His first work on Philo (Philo u. die jiidisch-alexandrinasche Theosophie, 1831) was rapidly followed by an elaborate biography, in two volumes, of Gustavus Adolphus (Gustav Adolf, Kénig von Schweden, 1835-37), and by a critical history of primitive Christianity (Kritische Geschichte des Urchristenthums, 1838), in three volumes, consisting of three parts, entitled respectively “The Century of Salvation” (Jahrhundert des Heils), “Sacred Legend” (Die heilige Sage), and “Truth” (Die Wahrheit). In both of the last-named works, Gfrorer had manifested opinions unfavourable to Protestantism, which, however, were not openly avowed. until fully developed in his church history (Allgemeine Kirchengeschichte bis Beginn des 14ten Jahrhunderts, 1841-46). In the autumn of 1846 he was appointed to the chair of history in the university of Freiburg, where he continued to teach until his death, which took place at Carlsbad on the 10th of July 1861. In 1848 he sat as a representative in the Frankfort parlia- ment, where he supported the “High German” party, and in 1853 he publicly went over to the Church of Rome, influenced, however, in this, it is said, more by regard for what he conceived to be its political value, than by any purely religious consideration. Among his later works the most important is the Greschichte cer ost- w. westfrdnkischen

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Karolinger (1858); but those on the pseudo-Isidorian Decretals (Untersuchung diber Alter, Ursprung, u. Werth der Decretalen des falschen Isidorus, 1848), on the primitive history of mankind (Urgeschichte des menschlichen Geschlechts, 1855), on Hildebrand (Paps¢ Gregor VII. u. sein Zeitalter, 1859-61), on the history of the 18th century (Geschichte des 18ten Jahrhunderts, 1862-73), on German popular rights (Zur Geschichte deutscher Volksrechte, 1866), and on Byzantine history (Byzantinische Geschichte, 1872-74), are also works of real value. The fruit of much original re- search, they convey a great quantity of fresh information, and are unusually rich in suggestion; their chief fault may be said to lie in an excess of ingenuity, which leads their author to imagine combinations which never existed, and to invent the most recondite causes for historical occur. rences, the explanation of which is rather to be sought in the regiou of the obvious,

GHATS, or Guavrts (literally “the Landing Stairs” from the sea, or “‘ Passes”), two ranges of mountains extending along the eastern and western shores of the Indian penin- sula. The Hastern Ghats run in fragmentary spurs and ranges down the Madras coast, They commence in the Orissa district of Balasor, pass southwards through Cuttack and Purf, enter the Madras presidency in Ganjam, and Sweep southwards through the districts of Vizagapatam, Godavari, Nellore, Chengalpat, South Arcot, Trichinopoli, and Tinnevelly. They run at a distance of from 50 to 150 miles from the coast, except in Ganjdm and Vizaga- pitam, where in places they almost abut on the Bay of Bengal. Their geological formation is granite, with gneiss and mica slate, with clay slate, hornblende, and primitive limestone overlying. The average elevation is about 1500 feet, but several hills in Ganjam are between 4000 and 5000 feet. The Western Ghats start from the north of the Tapti valley, and run south through Khandesh, N Asik, Tanna, Satara, Ratnagiri, Kanara, aud Malabar, and the states of Cochin and Travancore, meeting the Eastern Ghats at an angle near Cape Comorin. The range of the Western Ghats extends uninterruptedly, with the excep- tion of a gap or valley 20 miles across known as the Palghat gap. The length of the range is 800 miles from the Tapti to the Palghat gap, and south of this about 200 miles to the extreme south of the peninsula, In many parts there is only a narrow low strip of coast between the hills and the shore; at one point they rise in magniti- cent precipices and headlands out of the ocean. The average elevation is 3000 feet, precipitous on the western side facing the sea, but with a more gradual slope on the east to the plains below. The highest peaks in the northern section are Mahabaleswar, where is the summer capital of the Government of Bombay, 4700 feet ; Purandhar, 4472 ; and Sinhgarh, 4162 feet. South of Mahdabaleswar the elevation diminishes to about 1000 feet above sea-level. Further south the elevation again increases, and attains its maximum towards Coorg, where the highest peaks vary from 5500 to 7000 feet, and where the main range joins the interior N igiri hills; South of the Palghat gap, the peaks of the Western Ghats rise as high as 7000 feet. The geological formation is trap in the northern and laterite in southern section,

GHAZIABAD, a town in Meerut district, North-Western Provinces of India, distant 12 miles from Dellti and 28 miles from Meerut, in 28° 39’ 55” N. lat., 77° 28’ 10” E, long, The town was founded in 1740 by Ghazi-ud-

din, brother of NawAb Saldbat Jang, ruler of the Deccan, and takes lts name from its founder. It has considerably risen in importance of late years, from having been selected as the point of junction of the East Indian, and the Sind, Punjab, and Delhi railways. A branch into Delhi city

diverges from Ghazidbad. Population (1872) 7365,

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GHAZIPUR, a district of British India, in the lieutenant- governorship of the North-Western Provinces, and included in the Benares division. It is bounded on the N. by Azimgarh and Saran, E, by Sdran, 8. by Shahabad, and W. by Benares and J aunpur. Ghazipur forms part of the great alluvial plain of the Ganges, which divides it into two unequal portions. The northern subdivision lies between the Gumti and the Gogra, whose confluences with the main stream mark its eastern and western limits respectively. The southern tract is a much smaller strip of country, en-closed between the Karamndsa and the great river itself, No hill or natural eminence is to be found in the district,- A few lakes are scattered here and there, formed where the rivers have deserted their ancieut channels, The largest is that of Surdha, once a northern bend of the Ganges, but now an almost isolated sheet of water, 5 miles long by about 4 broad.

Ghazipur is a closely cultivated district, and out of a total area of 2168 square miles 1546 are actually under cultivation. harvests are the same as those common to the whole of the plain districts of the North-Western Provinces. returned a total population in Ghazipur district of 1,345,570 souls (males 696,572, females 648,829), dwelling in 3725 villages or townships, and inhabiting 285,007 houses. The Hindus numbered 1,221,810, or 90°7 per cent., and Mahometans, 123,455. Of the three higher Hindu castes there were — Brahmans, 123,012; Rajputs, 295,355; and Baniyds, 49,5388. The lower castes are represented by the Ahirs, 171,216; Chamars, 122,075 ; Kayasths, 22,480; and Kurmis, 18,136. Amongst the Mussulmans, the Shaikhs numbered 26,940; Sayyids, 4525; Mughals, 570; and Pathans, 18,452. The district is rich, and in the eastern parts the soil is extremely fertile, so that the cultivators are, on the whole, in easy circumstances, Sixteen towns contain a popula- tion exceeding 5000, viz., Ghazipur, 38,853; Mahatwar Khas, 8975 ; Shiupur Diar, 9279; Gahmar,

9050; Sherpur, 7958 ; Riotipur, 9323; Bara, 5424; Chit, 5821; Narhi, 5597; Bansdih, 7319; Rioti, 7700; Maniar, 5285; Balla, 8521; Bairia, 5589; Sonbarsa, 7162; and Rasra, 7261. The chief imports into the district are English piece goods and thread, cotton, salt, spices, and grain; the principal exports, country cloth, sugar, fuller's earth, oil seeds, and hides. The headquarters of the Government opium manufacture is at Ghazipur town. Carbonate of soda is manufactured from the reh or saline efflorescence of the barren wsar plains, and largely exported. Saltpetre is also largely prepared from the same source. The great trade route is the Ganges, but good roads connect all the principal centres with each other, The East Indian Railway runs for 24 miles through the district, with stations at Zamaniah, Dildarnagar, and Gahmar. The total amount of imperial, local, and municipal revenue of the district in 1876 was £200,000. Ghazipur is said to be one of the hottest and dampest districts in the North-Western Provinces. In 1869 the annual mean temperature was 80° Fahr., the lowest monthly mean being 61° Fahr., in January, and the highest 98°, in May. The aver- age total rainfall for 11 years from 1860 to 1871 was 40°] inches, the maximum being 50°5 inches, in 1861, and the minimum 21°5 inches, in 1868,

GuAzipuR Town, the capital of the district, stands on the low alluvial northern bank of the Ganges, in 35° 23' 36" N. lat. and 83° 35' 13" E, long,, covering an area of 416 acres, and with a population in 1872 of 38,853. There is considerable trade in sugar, tobacco, long cloth, and rose water. It is the headquarters of the Government opium department, where all the opium from the N orth-Western Provinces is collected and manufactured under a monopoly, A metalled road runs from Ghazipur to ZamAniah station on the East Indian Railway, 133 miles. Lord Cornwallis, the governor-general of India, died at Ghazipur in 1805, and a monument and marble statue areerected over his grave,

GHAZNI (called in European books often Ghaznah, Gazna, Ghizni, or Ghuznee, in the Oriental histories more generally Ghaznin), a famous city in Afghanistan, the seat of an extensive empire under two different medieval dynasties, and again of prominent interest in the modern history of British India. Ghazni stands on the high table- land of central Afghanistan, in 68° 20' E. long,, 33° 34' N, lat., ata height of 7726 feet

above the sea, and on the direct road between Kandahar and Cabul, 233 miles by

560

road N.E. from the first, and 85 miles S.W. from the second. It also stands at the head of the Gomal route from the Indus, one much followed by trade.

Ghazni, as it now exists, is a place in decay, and probably does not contain more than 4000 inhabitants. It stands at the base of the terminal spur of a ridge of hills, an off- shoot from the Gul-Koh, which forms the watershed between the Arghandab and Tarnak rivers (see AreHANisTAN). The castle stands at the northern angle of the town next tlie

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Rauza Village & Tomb of Mahnud

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Sketch of Ghazni and its Environs.

hills, and is about 150 feet above the plain. The town walls stand on an elevation, partly artificial, and form an irregular square, close on a mile in circuit (including the castle), the walls being partly of stone or brick laid in mud, and partly of clay built in courses. They are fianked by numerous towers. ‘There is also a loopholed fausse-braye wall, and a ditch which can be filled (partially at least) from the Ghazni river, which flows close to the west of the

GHAZNI

town. There are three gates. The town consists of dirty and very irregular streets of houses several stories high, but with two straighter streets of more pretension, crossing near the middle of the town. New fortifications had been erected previous to 1857, but their present state is not known. In 1839 they were of no real power to resist artillery of moderate calibre, though imposing in aspect and highly picturesque, judging from the views given by Sir Keith Jackson and others. Of the strategical importance of Ghazni there can hardly be a question. The view to the south is extensive, and the plain in the direction of Kanda- har stretches to the horizon. It is bare except in the vicinity of the river, where villages and gardens are tolerably numerous. Abundant crops of wheat and barley are grown, as well as of madder, besides minor products. The climate is notoriously cold,—snow lying two or three feet deep for about three months, and tradition speaks of the city as having been more than once overwhelmed by snow- drift. Fuel is scarce,

consisting chiefly of prickly shrubs. In summer the heat is not like that of Kandahar or Cabul, but the radiation from the bare heiglits renders the nights oppressive, and constant dust-storms occur. It is evident that the present restricted walls cannot have contained the vaunted city of Mahmud. Probably the existing site formed the citadel only of his city. The remarks of Ibn Batuta (c. 1332) already suggest the present state of things, viz., a small town occupied, a large space of ruin; for a considerable area to the N.E. is covered with ruins, or rather with a vast extent of shapeless mounds, which are pointed out as Old (thazni. The only remains retaining architectural character are two remarkable towers, rising to the height of about 140 feet, and some 400 yards apart from each other. They are similar, but whether identical, in design, is not clearly recorded. They belong, on a smaller and far less elaborate scale, to the same class as the Kutb Minar at Delhi. Views of oue of the minarets will be found in Fergusson's /ndzan Architecture, in Vigne's Visit to Ghazni, Cabul, éc., in Atkinson's Sketches in Afghanistan, and other works. Arabic inscriptions in Cufic characters show the most northerly to have been the work of Mahmud himself, the other that of his son Masa'id. On the Cabul road, a mile beyond the Minaret of Mahmud, is a village called Rauzah ("the Garden," a term often applied to garden-mausoleums). Here, in a poor garden, stands the tomb of the famous conqueror himself. It is a prism of white marble standing on a plinth of the same, and bearing a Cufie inscription praying the mercy of God on the most noble Amir, the great king, the Lord of church and state, Abul Kaésim Mahmud, son of Sabuktigin. The tomb stands ina rude chamber, covered with a dome of clay, and hung with old shawls, ostrich eggs, tiger-skins, and so forth. The village stands among luxuriant gardeus and orchards, watered by a copious aqueduct. Sultan Baber celebrates the excellence of the grapes of Rauzah.

The famous "Gates of Somnath" (so-styled) were at- tached to the building covering Mahmid's tomb until their removal to India, under Lord Ellenborough's orders, on the evacuation of the country in 1842. The gover nor-general's intention, as announced in a famous prose pean addressed to the Hindu princes, was to have carried them solemnly through Upper and Central India to Guzerat, and there to have restored them to the (long-desecrated) temple. Calmer reflexion prevailed, and the gates were consigned to the arsenal at Agra, where they now remain. 'These gates (11

fect in height, 9} in width) are ascertained to be of Himalayan cedar (deodar), and are richly carved in geometric Saracenic patterns, so that there is no likelihood of any real connexion with Somnath. But tradition did ascribe to them such a connexion. And when Shah Shuja in 1831 treated with Maharaja Ranjit

Singh for aid to recover the throne of Cabul, one of Ranjit's stipulations was the restoration of the gates to Somnath, a circumstance which probably suggested the notion to the eccentric governor-general. A still more remarkable fact (stated in a report by Capt. Claude Wade, dated 21st N. ov. 1831) is that the sh4h reminded the mahéraja of a prophecy that foreboded the downfall of the Sikh dominion on the removal of the Ghazni gates. The gates were removed to India in the end of 1842; and the Sikh kingdom practically collapsed with the death of Sher Singh in September 1843. Another relic of Sultan Mahmtd is the Band-i-Sultdn, a great dam on the Ghazni river, some 12 miles above the city. Baber describes it as 80 or 100 feet in height, pro- bably along the slope, and about 600 feet long. It had lain ruined in his time since its destruction by Alauddin Jahdnsoz, but Baber sent money to restore it. Vigne calls it only 25 feet in height. He found it much out of repair, It supplies irrigation to the plain west of Ghazni.

There are many holy shrines aboot Ghazni surrounded by orchards and vineyards. Baber speaks of them, and tells how he detected and put a stop to the imposture of a pre- tended miracle at one of them. These sanctuaries make Ghazni a place of Moslem pilgrimage, and it is said that at Constantinople much respect is paid to those who have worshipped at the tomb of the great Ghazi. To test the genuineness of the boast, professed pilgrims are called on to describe the chief notabilia of the place, and are expected to name all those detailed in certain current Persian verses,

The city is not mentioned by any narrator of Alexander's expedi- tion, nor by any ancient author so as to admit of positive recogni-

tion. But it is very possibly the Gazaca which Ptolemy places among the Paropamisade, and this may not be inconsistent with

the empire never reached anything like the same splendour and power. It was overshadowed by the Seljuks of Persia, and by the rising rivalry of Guur (9. v.), the hostility of which it had repeatedly provoked. Bahram Shih (1118-1152), put to death Kut- buddin, one of the princes of Ghur, called king of the Jibdl or Hill country, who had withdrawn to Ghazni. This prince's brother, Saifuddin Suri, came to take vengeance, and drove out Bahram. But the latter recapturing the place (1149) paraded Saifuddin and his Vizier ignominiously about the city, and then hanged them on the bridge. Ald-uddin of Ghir, younger brother of the two slain princes, then gathered a great host, and came against Bahram, who met him on the Helmand. The Ghiri prince, after repeated vic- tories, stormed Ghazni, and gave it over to fire and sword. The dead kings of the house of Mahmud, except the conqueror himself and two others, were torn from their graves and burnt, whilst the bodies of the princes of Ghuir were solemnly disinterred and carried to the distant tombs of their ancestors, It seems certain that Ghazni never recovered the splendour that perished then (1152), Aldé-uddin, who from this deed became known in history as Jahdn-sox (Brile- monde), returned to Ghur, and Baliram reoccupied Ghazni ; he died

Ghiydssuddin Sultan of Ghur (nephew of Ala-uddin Jahansdz), who made Ghazni over to his brother Muizuddin, This famous prince

Khusri Malik, the last of Mahinid's house, whio died a captive in the hills of Ghir. In 1192 Prithvi Rai or Pithora (as the Moslem writers call him) the Chohan king of Ajmir, being defeated and slain near Thanesar, the whole country from the Himalaya to Ajmir became subject to the Ghiri king of Ghazni. On the death

Muldhidah or Assassins, The slave lieutenants | of Muizuddin pilgrim, Hwen Thsang, who speaks of Ho-si-na (7.e., probably Ghazna) as one of the capitals of Tsaukuta or Arachosia, a place of great strength. In early Mahometan times the country adjoin- ing Ghazni was called Zébu?. When the Mahometans first invaded that region Ghazni was a wealthy entrepét of the Indian trade. Of the extent of this trade some idea is given by Ibn Haukal, who states that at Cabul, then a mart of the same trade, there was sold yearly indigo to the value of two million dinars (£1,000,000).

Ghazni is much less prominent in Asiatic history. It continued subject to the Mongols, sometimes to the house of Huldku in Persia, and sometimes to that of Chaghatai in Turkestan, In 1326, after a battle between Amir Husain, the viceroy of the former house in Khorasan, and Tarmashirin, the reigning khan of Chaghatai, the former entered Ghazni and once more subjected it to devastation, and this time the tomb of Mahmud to desecration, The statement in a recent book on Afghanistan, that a new Ghori dynasty reigned at Ghazni from 1336 to 1383, is erroneous.

Ibn Batuta (c. 1832) says the greater part of the city was in ruins, and only a small part continued to be a town. Timur seems never to have visited Ghazni, but we find him in 140] bestowing the govern- ment of Cabul, Kandahar, and Ghazni on Pir Mahommed, the son of hisson Jahangir. In the end of the century it was still in the hands of a descendant of Timur, Ulugh Beg Mirza, who was king of Cabul and Ghazni. The illustrious nephew of this prince, Baber, got

ascribed by a Mahometan historian to "Amrut Leis, the brother and Successor of Ya'kuib (d. 901), though the facts already stated dis-. credit this, In the latter part of the 9th century the family of

favour of the court, wrested Ghazni from its chief (who is styled

and of the Punjab. In 997 Mahmud, son of Sabuktigin, succeeded to the government, and with his name Ghazni and the Ghaznevid dynasty have become perpetually associated. Issuing forth year after year from that capital, Mahmtd carried fully seventeen expe-

far it had now fallen, "Tt is," he says, '* but a poor mean place, and I have always wondered how its princes, who possessed also

for the seat of their government, in preference to Khorasan." He commends the fruit of its gardens, which still contribute largely to the markets of Cabul. Ghazni remained in the hands of Baber's descendants, reigning at Delhi and Agra, till the invasion of N adir Shah (1738), and became after Nadir's death a part of the new king- dom of the Afghansunder Ahmed Shéh Durrani. We knowof but two modern travellers who have recorded visits to the place previous to the war of 1839. George Forster passed as a

disguised traveller with a kafila in 1783. ‘*Its slender existence,” he says, “is now mains

as others to the north and west. From the borders of Kurdistan to Samarkand, from the Caspian to the Ganges, his authority was acknowledged. The wealth brought back to Ghazni was enormous, and contemporary historians give glowing descriptions of the magnificence of the capital, as well as of the conqueror’s Munificent support of literature. Mahmid died in 1030, and Some fourteen kings of his house came after him; but though there was some revival of importance under Ibrahim (1059-1099),

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tained by some Hindu families, who support a small traffic, and supply the wants of the few Mahometan residents.” Mr Vigne visited it in 1836, having reached it from Multan with a caravan of Lohani merchants, travelling by the Gomal pass. The historical name of Ghazni was brought back from the dead, as it were, by the

news of its capture by the British army under Sir John Keane, 23d July 1839. ‘The siege artillery had been left behind at Kandahar ; escalade was judged impracticable ; but the project of the command- ing engineer, Captain George Thomson, for blowing in the Cabul gate with powder in bags, was adopted, and carried out succcss- fully, at the cost of 182 killed and wounded. Two years and a half later, the Afghan outbreak against the British occupa- tion found Ghazni garrisoned by a Bengal regiment of sepoys, but neither repaired nor provisioned. They held out under great hard- ships from 16th December 1841 to 6th March 1842, when they sur- rendered. In the autumn of the same year General Nott, advancing from Kandahar upon Cabul, reoccupied Ghazni, destroyed the de- fences of the castle and part of the town, and carried away the famous gates. Since then Ghazni has not been entered by any Englishman ; for when Colonel Lumsden’s mission passed this way

in 1857 they were not allowed to approach the place.

See Elliot, Hist. of India, ed. by Dowson; Tabakdti-t-Ndsiri, translated by Major Raverty in the Bibliotheca Indica; E, Thomas, in J. R. As. Soc., vols, ix. and xvii; Forster's Journey ; Vigne's Visit to Ghuzni, &c.; Masson's Travels; Reports of Lumsden's Mission in 1857; Journal of the As. Soc. of Bengal, vol. xii.;

ae i of Baber, by Leyden and Erskine; Cunningham's a 'a – ikhs, &e. Galo GHEE (Sanskrit, Ghrita), a kind of clarified butter made in the East. The best is prepared from butter of the milk of cows, the less esteemed from that of buffaloes. The butter is melted over a slow fire, and set aside to cool; the thick, opaque, whitish, and more fluid portion, or ghee, re- presenting the greater bulk of the butter, is then removed. The less liquid residue, mixed with groundnut oil, is sold as an inferior kind of ghee. It may be obtained also, according to the Indian Domestic Economy and Meceipt Book, p. 16, 6th ed., 1865, by boiling butter over a clear fire, skimming it the while, and, when all the water has evapo- rated, straining it through a cloth. Ghee which is rancid or tainted, as is often that of the Indian bazaars, is said to be rendered sweet by boiling with leaves of the Moringa pterygosperma or horse-radish tree. In India ghee is one of the commonest articles of diet, and indeed enters into the composition of everything eaten by the Brahmans. Tt is also extensively used in Indian religious ceremonies, being offered as a sacrifice to idols, which are at times bathed in it. Sanskrit treatises on therapeutics describe ghee as cooling, emollient, and stomachic, as capable of increasing the mental powers, and of improving the voice and personal appearance, and as useful in eye-diseases, tympanitis, painful dyspepsia, wounds, ulcers, and other affections. Old ghee is in special repute among the Hindus as a medicinal agent, and its efficacy as an external applica- tion is believed by them to increase with its age. Ghee more than 10 years old, the purdna ghrita of Sanskrit materia medicas, has a strong odour, and the colour of lac. Some specimens which have been much longer preserved— and " clarified butter a hundred years old is often heard of " have an earthy look, and are quite dry and hard, and nearly inodorous. Medicated ghee (Sanskrit, ghrita pdka) is made by warming ordinary ghee to remove contained water, melt- ing, after the addition of a little turmeric juice, in a metal pan at a gentle heat, and then boiling with the prepared drugs till all moisture is expelled, and straining through a cloth. See Udoy Chand Dut,

The Materia Medica of the Hindus, com- piled from Sanskrit Medical Works, Calcutta, 1877, and, on the uses

of ghee in culinary operations, the above quoted Receipt Book, and The Indian Cookery Book, Calcutta (1869 2).

GHEEL, or Geet, a town of Belgium, in the province of Antwerp, about 25 miles E. of Antwerp, on the railway between Herenthals and Moll, with a population, according to the census of 1876, of 10,265. Situated in the midst of that half barren stretch of moorland which is known as the Campine or Kampenland, it would have been of little importance, in spite of its manufactures of cloth, leather, wooden shoes, and wax-lights, had it not for long centuries been the seat of a unique method of dealing with the insane,

A local legend, tracing the origin of the town back to a chapel of St Martin erected in the 7th century, goes on to tell how an Irish princess, fearing the fate that long after- wards befel Beatrice Cenci, sought refuge in this remote asylum, but was pursued by her relentless father and put to death, along witl a priest Gerrebert, the companion of her flight. The tomb of the victims was soon discovered to have a healing virtue for minds diseased; the sainted Dymphna became the patroness of the insane; and a large and beautiful church in her honour was erected on the site of St Martin's chapel. Commenced in the 12th century, it was finished in 1340, and consecrated by the bishop of Cambray; and the pilgrimages to the tomb were sanctioned by a brief of Eugenius IV. In 1538 Jean de Mérode, within whose domains the church was situated, instituted a vicariate of nine priests and a director, and in 1562 Henri de Mérode transformed the vicariate into a regular chapter of nine canons and a dean. The church still remains to bear witness to the importance formerly attached to the shrine; and though the tomb of St Dymphna has long been a cenotaph, a few stray enthusiasts still pass beneath it in hopeful imitation of the thousands in byegone years, whose knees have worn deep furrows in the pavement as they made their ninefold transits on nine successive days. As food and lodging had to be provided for the patients who were brought to the saint, the inhabit- ants of Gheel grew accustomed to the treatment of the various kinds of mental alienation, and

gradually discovered that forcible measures were much less frequently necessary, and danger less likely to result from free intercourse with the insane, than was generally believed throughout Europe. When M. Pontecoulant was appointed by Napoleon prefect of the Revolution department of the Dyle, his attention was called to the success of the domestic régime in force at Gheel, in contrast to the sad condition of affairs in the asylum at Brussels, and he caused the patients to be removed from the capital to the little country town. His example was freely followed by the authorities of different districts, and Gheel received full official recognition. Investigations undertaken about 1850 by M. Ducpétiaux, inspector-general of benevolent establishments in Belgium, resulted in the reform of such abuses as had crept into the system ; and the relations of the patient and his protectors were placed on astrict legal footing by the law of Ist May 1851. Further ameliorations have been introduced in 1852, 1857, 1858, &c. The whole management of the system is under the supervision of officially appointed physicians, and the advantages of a regular establishment are thus combined with those of domestic comfort, social freedom, and activity. Permission to receive patients is granted not only to the town residents, but also to the villagers of the vicinity. Among the numerous works and papers descriptive of Gheel and its régime, the following may be mentioned:—Gazot, Hist. ecclésiastique des Pays Bas, 1614 ; Biffi, "' Memorie originali," in Gazetta medica Italiana, 2d Oct. 1854 ; Brown, in Asylum Journal, 1858; Bucknill, Joid., 1858, 1859 ; Bulckens, Rapport, &c., Brussels, 1857 ; papers by Auguste Droste, in Allg. Zeitsch. fiir Psychiatrie, 1853, Corr. Blitter der Dewtschen Ges. fiir Psychiatric, 1856, Hygea, 1857, and Deutsche Klinik, 1858 ; Esquirol, Afal. mentales, vol. ii.; Jules Duval, Gheel, ow Une colonie d'aliénés, Paris, 1860; Ruedy, Gheel, Beitrag zur Gesch. der prakt. Psychiatrie, Berlin, 1875. GHENT, in Low Latin Ganda or Gandavum, in French Gand, in Flemish Gend, in German Gent, a city of Belgium, at the head of the province of East Flanders, is situated about 30 miles to the west of Antwerp on the Scheldt and the Lys. The two streams branch out to such an extent as to partition the town into 26 islands, which are connected by about 270 bridges, 42 being of stone, and 28 of the others being wooden structures of considerable size. In general Ghent is well built, and, though the older portion has narrow and gloomy lanes, it occupies as @ whole a larger area than most European towns in proportion to the popu

GHENT

lation and the number of houses. A striking and pleasing feature is the number of promenades, the most noteworthy being the Coupure or “ Cutting,” so called from the branch of the Bruges canal constructed in 1758. Gardens, orchards, and corn-fields are enclosed within the ancient boundaries of the walls, which extended nearly 8 miles in circumfer- ence. An excellent view of the city and its environs is obtained from the belfry of the grand old watch-tower erected by the men of Ghent between 1183 and 1339, from whose summit the voice of the famous bell Roland called the burghers together for fire or fray. The present

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FRERE- on

LEVARD

Plan of Ghent.

Chureh of St Michel. 18, Church of St Nicholas, 19. Béguinage. Hotel de Ville, 20, Church of Ste Barbe. Watch Tower (Belfry). | 21. Theatre. . Church of St Jacques. |13, Cathedral of St Bavon. | 22, Gas-Works,

23.

4 Great Béguinage, uy

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: Statue of Artevelde. 14. University, . Church of St Anne, q

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- Church of St Sauveur, 10. Library and Royal |11. Athenzum, 12.

Abbey St Bayon,

» Cannon (Dulle Griete). | 15. Court-House. 24, Little Béguinage, . Counts' Castle, 16, Theatre, 25, 26, 27. Barracks, . Fish Market, 17. Baths,

in Flemish means field), In 1812, and is the favourite rendezvous of tlie fashionable World ; the Plaine de St Pierre, especially used for military

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reviews ; the Corn Market, which is one of the busiest spots in the town ; i i i

Castle, and is annually the scene of the so-called Fair of the Little Presents (Presentjesmarkt). The Plaine des Recollets, which takes its name from the convent of the Reformed Franciscans (1225-1 796), was in 1836 chosen as the site of the new court-house, Near the Friday Market is an enormous cannon, 18 feet long, 10 feet in girth, and nearly 3 feet wide at the mouth, formed in the same fashion as "Mons Meg" in Edinburgh Castle, and surnamed Dulle Griete, or " Mad Meg or Margaret."

j century, and the other parts were not completed till the 16th. The roof of the nave has been of 1822.

1559. The chapels are twenty-four in number ; their gates are of brass, and almost every available spot has its paint- The eleventh is known as the Chapel of the Lamb, as it contains the central and principal portion of the famous Adoration of the Lamb painted by John Van Eyck in 1432. Hubert Van Eyck, his brother and compeer, and Margaret, his sister, lie buried in the crypt. The church of St Nicholas—an early Gothic structure, with a great tower of the 15th century and a modern portico—has the credit of being the oldest in the town 3 and St Michael's, dating from about 1450, but frequently restored, is memor. able as the scene of the worship of reason during the French Revolution. Previous to the Revolution there existed in Ghent a large number of convents and monasteries (thirty- seven establishments of this class, with 1122 inmates, are recorded in 1781); and one of its most famous institutions at the present day is the Béguinage of St Elizabeth, a com- munity of about 600 or 700 nuns, who inhabit a separate

quarter of the town, consisting of little brick-built cottages arranged in streets and squares within a common wall, Among the secular buildings of Ghent one of the finest facade being an excep- tionally rich example of flamboyant Gothic of the 15th century, and its eastern facade presenting a curious contrast, with its rows of Doric, Tonic, and Corinthian columns after Renaissance. The court-house or

the architect Roelandt at the common expense of the state, The minor apartments of the lower floor have been all more or less sacrificed to the great Hall of the Lost Footsteps, which is 240 feet long and 7 0 feet wide. About the same time the same architect was entrusted with the designs for the casino, a building adapted

for the flower-shows of the Botanical Society and the concerts of the choral union of St Cecilia. Government house, which is partly occupied bythe provincial administration and partly by the governor as his residence, was assigned by Charles V. to the provost of St Bavon, became in 1581 the property of William of Orange (the Silent), at a later date served as episcopal palace, and in the time of Napoleon was the prefecture. The present episcopal palace was built in 1845 as an appendage to the cathedral.

With benevolent institutions of various kinds Ghent is abundantly supplied. A lunatic asylum, the Hospital of the Byloque, founded as early as 1225, a maternity hos- pital dating from 1827, a blind asylum (1854) due to the beneficent bequests of L. Van institution (1822), and an atelier de charité, or establish- ment for giving work to the unemployed, which has been in operation since 1817, are worthy of special mention. It would be less of a paradox than might be supposed if the great penitentiary (Rasphuis, or Maison de Force) had been included in the list; for it is remarkable, not only for the sumptuous style of its buildings, but for the pbil- anthropic character of its administration. It was erected between 1772 and 1825 at a cost of 2,150,000 francs, and can accommodate 2600 prisoners.

The spacious university buildings were erected between 1819 and 1826, at the expense of the city, under the auspices of William I, king of Holland. They were designed by Roelandt in the Greek style, and one of the principal

features is theon at Rome. The university library, containing upwards of 100,000 volumes, and reckoned one of the most valuable in Belgium, was formerly the property ofthe town. Along with the royal athenzeum or high school, it occupies the old abbey of Baudeloo, founded by Baldwin of Constantinople in 1199. The abbey gardens were transformed in 1797 into a botanical garden, which now ranks as one of the finest in Europe. A royal academy for the encouragement of art, founded in 1751 by Charles Marissal, and a musical

conservatory originated by the communal council in 1835 |

and the technical school the very best in Belgium. dating from 1851, has estab-

are both flourishing institutions ; with about 800 pupils is one of The Natural History Society, lished a zoological garden.

Though Ghent has no longer the industrial pre-eminence that it enjoyed in the 14th and 15th centuries, it is still the principal seat of the cotton and leather manufactures of Belgium. Flax-spinning, calico-printing, and sugar-refining are also extensively carried on, and there are engineering works, works, paper-mills, and breweries, No fewer than sixty considerable firms, trading with Germany, France, Italy, and Russia, are engaged in commercial floriculture ; and, as a consequence, perhaps the earliest, are still among the finest exhibitions of the kind in Europe. ‘The trade of the town, which deals mainly with the products and raw materials of the indus- tries, is fostered by a good railway system and numerous canals. There is direct communication with the sea by a grand canal, which, however, unfortunately for the Belgians, enters thesea at Terneuse in Dutch territory. The harbour, completed in 1828, is capable of accommodating 400 vessels, and vessels drawing 17 feet of water can unload under the walls of the town. At Sas van Gend, 15 miles north of the city, on the frontier of Holland, there are sluices by which the district can be laid under water.

In 1812 Ghent had no more than 55,161 inhabitants ; by 1856 they had increased to 109,668, and by 1869 to 121,469. The census of 1876 gave 127,653. Among the celebrities born in the city are Henry Goethals, distinct- ively Henry of Ghent, a famous theologian and member of

The so-called |

Caneghem, a deaf and dumb |

| Ghent, and a few years after he erected the Gravenstcen or Counts'

| St Amand,

chemical works, iron-foundries, soap- |

the flower-shows of Ghent, as they were |

| she had intrusted with the mission.

GHENT

the Sorbonne (d. 1295); Philippe Mouskes, the chronicler ; P. Vanderberghe or Montanus, the geographer; Daniel

Heinsius ; Jacques van Zevecote, one of the principal Flemish | poets ;

Lauren Delvaux, a sculptor; Cc. L. Diericx, the local historian ; and J. Guislain, the lunacy physician.

The investigations of local antiquaries leave it still doubtful whether Ghent had a Roman origin, as Petrarch supposed (Gandavunr Casare conditore superbum). That there was a military fortress on the spot in the 7th century, is proved by Baudemont's life of the first missionary of Christianity in the district (Acta Sanctorum vol. i.). Of the two monasteries founded by the saint in 'honour of St Peter, the one near the Antwerp gate was richly endowed by St Bavon, and his name became attached, not only to the building, but to the part of the city. About the year 1000 Baldwin Ironarm, first count of Flanders, took possession of

Castle. Trade and manufactures, especially of linen and woollen, were encouraged by Baldwin and his successors, and by the close of the 12th century the men of Ghent were able to purchase commer- cial and political privileges, and to establish a form of municipal government. They established a court of justice, elected sheriffs, joined the association of the

Hanse Towns, and obtained the free navigation of the Rhine from the emperor Frederick I. By the charter of 1192 they obtained the right of fortifying their city, and the first circumvallation carried out between that date and 1214 had a development of 6560 feet. By the end of the 13th century Ghent was a greater city than Paris. In the 14th, under the leadership of the famous Jacob van Artevelde and his son Philip (1332-1882), it raised frequent insurrections against the counts of Flanders, and took a prominent part in the oe movements of the Low Coun- tries. In 1885 it was obliged to submit to the duke of Burgundy, but its rights and privileges were left uninjured. At the commence-

. | ment of the 15th century it had upwards of 40,000 men employed a portico after the model of the Pan- |

in the woollen manufactures alone, and was able to place in the field from 18,000 to 20,000 men-of-arms. When in 1452 the duke of Burgundy, Philip the Good, imposed a tax on salt and grain, it rose in rebellion, but after a few years' conflict the defeat at Gaveren left itat the duke's mercy. The independence of the burghers was far from being crushed. 'They showed themselves as turbulent as ever

"under Mary of Burgundy, who made the city her principal residence ;

and when she made certain unpopular concessions to Louis XI., they took the Jaw into their hands, and on April 3, 1477, put to death in her presence the two councillors Hugonet and Himbcr-Court, whom After her marriage at Ghent (August 17) with Maximilian of Austria, matters were more peaceful. On Mary's death in 1482 the discontent of the people again broke out, In 1488 they restored their ancient form of government, and held out against the emperor Frederick, who led an army against them in person, but at length in 1492 they came to terms. In 1500 Charles V. was born in the palace at Ghent, the site of which is now occupied by the street called the Cour des Princes. His reign was a critical one for the city, for though it had a popula- tion of 175,000, it was but a drop in the bucket of his vast dominions,

i When in 15386 his

and he treated it with but little consideration. sister Maria, at that time in command of the Netherlands, demanded

| the extraordinary subsidy of 1,200,000 gold florins from Flanders, the

citizens refused to contribute, and in 1539 they took arms in self defence. Charles himself appeared on the scene in 1540, forced them to submission, deprived them of their privileges, executed 26 of the principal leaders of the revolt, confiscated the public build- ings, and erected a citadel at a total expense of 411,334 livres, the greater part of which had to be defrayed by Ghent itself. Even this did not crush the spirit of the city. It was by the pacification of Ghent, signed in the town-hall Nov. 8, 1578, that Holland and Zeeland, and the southern states of the Nethcrlands, formed an alliance against the Spanish supremacy, and three days after the Spanish garrison capitulated to the citizens. In 1584, however, the duke of Parma captured the town for Philip, and the citadel, which had been almost completely demolished, was restored. The attempts of the French in 1641 and 1642 to get possession of Ghent were frustrated by laying the country under water; but in 1678, though in the meanwhile the fortifications had been considerably extended, the feeble garrison under Don Francisco de Pardo was unable to defend the place against Marshals Humiéres, Luxem- bourg, Schomberg, and Vauban. Ghent continued in French hands till the peace of Nimwegen. It played an important part in the war of the Spanish succession, being captured in 1706 by Marl- borough, recovered in 1708 by the French Marquis de Grimaldi, and again captured by Marlborough in 1709. In the war of the ‘Austrian succession, Louis XX. made his entry into the city on 25th July 1745, and remained in possession till the treaty of Aix-la-Chapelle in 1748. By order of Joseph II. in 1781, the citadel and fortifications were dismantled, and the grounds on which they were built were sold. Under the régime of the French Revolution the city was made the chief town of the department of the Scheldt.

citadel was erected according to the designs of M. Gey van Pittius

(1822-1830),

See Jean de Thielrode, Chronique de St Bavon; Sanderus, Verheerlykt Viaenderen ; De Jonghe, Gendtsche Geschiedenissen, 1746; Diericx, Lopographie de Vancicnne ville de Gand (Ghent, 1808), Mémoires sur la ville de Gand (Ghent, 1814-15, 5

in Mémoires Couronnés de Vacad. royale de Belgique, tom. Xxy., 1851-53 (Brussels, 1854); ©. L. Gyselynck, Guide de lq ville de Gand précédé dune notice historique, (Ghent, n. d.).

GHENT, Jopocus, or J USTUS, oF (1465-75). The public records of the city of Ghent have been diligently searched, but in vain, for a clue to the history of Justus or Jodocus, whom Vasari and Guicciardini called Giusto da Guanto. Flemish annalists of the

and it is impossible to compare their style with that of Giusto. It was between 1465 and 1474 that this artist executed the Communion of the Apostles which Vasari has described, and modern critics now see to the best advantage in the museum of Urbino. It was painted for the brother- hood of Corpus Christi at the bidding of Frederick of Montefeltro, who was introduced into the picture as the com- panion of Caterino Zena, a Persian envoy at that time on a mission to the court of Urbino, From this curious produc- tion it may be seen that Giusto, far from being a pupil of Hubert Van Eyck, was merely a disciple of a later and less gifted master, who took to Italy some of the peculiarities of his native schools, and forthwith commingled them with those of his adopted country, As a composer and draughts- man Giusto compares unfavourably with the better known painters of Flanders ; though his portraits are good, his ideal figures are not remarkable for elevation of type or for subtlety of character and expression. His work is techni- cally on a level with that of Gerard pictures are preserved in the Belvedere at Vienna. Vespasian, a Florentine bookseller who contributed much to form the antiquarian taste of Frederick of Montefeltro, states that this duke sent to the N etherlands for a capable artist to paint a series of “ancient worthies” for a library recently erected in the palace of Urbino. It has been con. of these “worthies,” which are still in existence at the Louvre and in the Barberini palace Yet there are notable divergences between these pictures and the Communion of the Apostles, Still, it is not beyond the range of probability that Giusto

ment of the Venetian Academy. There is no ground for presuming that Giusto da Guanto is identical with Justus @'Allamagna who painted the Annunication cloisters of Santa Maria di Castello at Genoa. ing and colouring of South Germany as his homonym at Urbino was a born N etherlander.

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GHERARDESOCA, Ucorrno Deserta (c. 1220-1289), count of Donoratico and head of the Gherardeschi, one of the leading Ghibelline houses of Pisa, began to take part in public affairs about the time when the dissensions which had arisen about the partition of Sardinia had resulted in sending over the entire clan of the Pisan Visconti to the Guelphs, For having given his sister in marriage to one of these—Giovanni Visconti of Gallura—he was banished from Pisa by his own party, who seem to have had good reason otherwise for suspecting his loyalty; but he was permitted to return in terms of the peace of 1267. Not- withstanding the ambiguous cliaracter of his politics, he soon succeeded in gaining a high place in the public service of his native city ; and in the battle of Meloria (6th August 1284), which terminated the long war with Genoa, he was one of the three Pisan admirals, Tt was by his cowardly or traitorous flight at a critica] moment, it is said, that the contest was decided in favour of the Genoese ; but, be this as it may, whether by means of his treachery, or in spite of it, he almost immediately afterwards (October 1284) was nominated by the citizens who remained to the twofold office of capitano and podest4 for one year; and some months afterwards (February 1285) this term was extended to ten years. In this capacity of virtual dictator he, by the banishment of ten leading Ghibelline citizens of Pisa, secured peace with the Florentines ; he also endeavoured to propitiate the Genoese by the offer of Castro in Sardinia, and the Lucchese by the actual surrender of Ripafratta and Viarregeio, but unsuccessfully, Meanwhile, though thoroughly alienated from the Ghibellines, he had not suc- ceeded in gaining the confidence of the Guelphs ; and in 1287 he was by them compelled to associate with himself in the government Nino Visconti, a nephew by the marriage already referred to, who had now reached manhood. But this arrangement was rendered nugatory by the disagree- ments of the two colleagues, and Ugolino found it necessary to resign his office in December of the same

year. In his unscrupulous ambition after personal ascendency he now turned for support to the party he had so long deserted, and entered into an alliance with the Gualandi, Sismondi, Lanfranchi, and other uncompromising Ghibellines, who looked upon the archbishop Ruggiero degli Ubaldini as theirhead. But this unnatural combination soon terminated in an open rupture, the immediate occasion of which was the violence of Ugolino, who, on some sudden provocation, had killed a nephew of the archbishop. In August 1288 he was beset in the Palazzo del Popolo by the Ghibellines, and, after fire had been set to the building, taken prisoner, along with his sons Gaddo and Ugoccione, and his grand- sons Nino (surnamed Brigatto) and Anselmuccio, (Some accounts mention a third grandson, named Henry.) After having been confined for twenty days in the Palazzo del Comune, they were removed to the Gualandi's Tower, Alle Sette Vie, afterwards called the Torre della Fame, Here they were kept till March 1289, when, by order of the archbishop, the door was locked and the keys thrown into the Arno. Nine days afterwards the tower was re-entered and the bodies removed to the church of San Francisco. tq be met with in other con- temporary writers (see Villani, vii. cc. 120, 127), owes all its fame to Dante, who has placed him above Ruggiero on the inner margin of the second division (Antenora) of the ninth and lowest circle of Dante's powerful narrative, which includes ** thirty lines unequalled by any other thirty in the whole dominions of poctry"' (Landor), has 'been paraphrased, or rather almost trans-

accusation of having sold the fortresses of Pisa to the Lucchese and Florentines, Dante, though evidently himself believing it, does not Say more than that lie "was alleged" (aveva voce) to have done so.

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Ruggiero's share in the murder of Gherardesca has sometimes been doubted, but on very inadequate grounds. Only in one respect can the poet be fairly accused of having absolutely departed from striet historical accuracy, namely, with regard to the age of the sons and grandsons, who, though represented by him as children, appear to have been all of them grown up. The narrative of Villani has already been referred to ; references

to other sources may be found in Sismondi and in the annotated editions of Dante, particularly in that of '* Philalethes " (the late king of Saxony).

GHERIAH, a town and fortress of British India, in the presidency of Bombay, about 170 miles south of Bombay, otherwise called Viziadrug. See VIZIADRUG,

GHIBELLINES. See GUELPHS.

GHIBERTI, Lorenzo (1378-1455), whose name alone is worthy to rank with that of Donatello amongst the grand Italian sculptors of the Renaissance, was born at Florence in the year 1378. He learned the trade of a goldsmith under his father Ugoccione, commonly called Cione, and his stepfather Bartoluccio ; but the goldsmith's art at that time included all varieties of plastic arts, and required from those who devoted themselves to its higher branches a general and profound knowledge of design and colouring. In the early stage of his artistic career Ghiberti was best known as a painter in fresco, and when his native city Florence was visited by the plague he repaired to Rimini, where he executed a highly prized fresco in the palace of the sovereign Pandolfo Malatesta. He was recalled from Rimini to his native city by the urgent entreaties of his stepfather Bartoluccio, who informed him that a competition was to be opened for designs of a second bronze gate in the baptistry, and that he would do wisely to return to Florence and take part in this great artistic contest. The subject for the artists was prescribed,—the sacrifice of Isaac; and the competitors were required to observe in their work a certain conformity to the first bronze gate of the baptistery, executed by Andrea Pisano about 100 years previously. Of the six designs presented by different Italian artists, those of Donatello, Brunelleschi, and Ghiberti were pronounced the best, and of the three Brunelleschi's and Ghiberti's superior to the third, and of such equal merit that the thirty-four judges with whom the decision was left entrusted the execution of the work to the joint labour of the two friends. Brunelleschi, however, withdrew entirely from the contest,—according to one account, from his cordial admiration of Ghiberti's genius, according to another, from his unwillingness to share so great an undertaking with any fellow-labourer. The first of his two bronze gates for the baptistry occupied Ghiberti twenty years, and when com- pleted was justly regarded as the

greatest work of its kind since the most glorious days of Grecian art. Ghiberti brought to bis task a deep religious feeling and the striving after a high poetical ideal which are not to be found in the works of Donatello, though in power of characterization the second sculptor often stands above the first. Like Dona- tello, he seized every opportunity of studying the remains of ancient art; but he sought and found purer models for imita- tion than Donatello, through his excavations and studies in Rome, had been able to secure. The council of Florence, which met during the most active period of Ghiberti's artistic career, not only secured him the patronage of the pontiff, who took part in the council, but enabled him, through the important connexions which he then formed with the Greek prelates and magnates assembled in Florence, to obtain from many quarters of the Byzan- tine empire the precious memorials of old Greek art, which he studied with untiring zeal. The unbounded admiration called forth by Ghiberti's first bronze gate led to his receiving from the chiefs of the Florentine guilds the order for the second, of which the subjects were likewise taken from the Old Testament. The Floren- tines gazed with especial pride on these magnificent crea-

tions, which must still have shone with all the bright- ness of their original gilding when, a century later, Michel- angelo pronounced thein worthy to be the gates of paradise.! Next to the gates of the baptistry Ghiberti's chief works still in existence are his three statues of St John the Baptist, St Matthew, and St Stephen, executed for the church of San Michele, among which three works, from the ideal character of the entire figure and the peculiar felicity of expression, the palm is generally awarded to the St Stephen. In the bas-relief of the coffin of St Zenobio, in the Florence cathedral, Ghiberti put forth much of his peculiar talent, and though he did not, as is commonly stated, execute entirely the painted glass windows in that edifice, he furnished several of the designs, and did the same service for a painted glass window in the church of San Michele. He died at the age of 77.

We are better acquainted with Ghiberti's theories of art than with those of most of his contemporaries, for he left behind him a commentary, in which,

besides his notices of art, he gives much insight into his own personal character and views. Every page attests the religious spirit in which he lived aud worked. Not only does he aim at faithfully reflecting in his creations Christian truths; he regards the old Greek statues with a kindred feeling, as setting forth the highest intellectual and moral attributes of human nature. He appears to have cared as little for money as Donatello, and expressly thanks heaven that he had not been cursed with a sordid and mercenary spirit, but had ever loved and laboured at art for art's own sake.

Benvenuto Cellini's criticism on Ghiberti that in his crea- tions of plastic art he was more successful in small than in large figures, and that he always exhibited in his works the peculiar excellences of the goldsmith's quite as much as those of the sculptor's art, is after all no valid censure, for it merely affirms that Ghiberti faithfully complied with the peculiar conditions of the task imposed upon him. More frequent lave been the discussions of late years as to the part played by perspective in his representations of natural scenery. These have acquired a fresh importance since the discovery of the data, from which it now appears that Fabio Uccelli, commonly regarded as the first great master of perspective, worked for several years in the studio or workshop of Ghiberti, and it becomes difficult to determine to what extent Uccelli's successful innovations in perspective were due to Ghiberti's teaching.

Cicognaro's criticism on Ghiberti, in his History of Sculpture, has supplied the chief materials for the illustrative text of Lasinio's series of engravings of the three bronze gates of the baptistry. They consist of 42 plates in folio, and were published at Florence by Bardi in 1821. Still more vivid representations are the repro- ductions on a very large scale by the photographic establishment of Alinari. In the Florence edition of Vasari's Lives there is given at full length Ghiberti's commentary on art. Both Mr Perkins, in his History of Tusean Seulpture, and Mr Rio, in his Art Chrétien, have treated Ghiberti's works with much fulness, and in a spirit of sound appreciation. But the most recent contributions to what may be termed the Ghiberti literature are the chapter expressly devoted to the history of the competition for the baptistry gates in Semple's Donatello (Vienna, 1875), and the articles by Adolf Rosemberg in Dohme's Kunst und Kiinstler des Mittelalters (Leipsic,

1877).

GHILAN, or Gitan, a province of Persia, lying along the S.W. shore of the Caspian, separated from the Russian district of Talish by the Astara, aud bounded W. by Azerbijan, 8. by Irak Adjemi, and 8.E. by Mazanderan. It ‘5 about 150 miles in length, with a breadth varying from 15 to 50 miles; and its area is estimated at from 4500 to 5000 square miles. The greater portion of the province is

1 Through long exposure to the dusty atmosphere of the town they have of late years begun to lose eonsiderably in delicacy of outline ; and it is mueh to be feared that, unless measures are speedily taken for their preservation, they will at no distant period suffer a still more

marked deterioration.

a lowlaud region shut in by the mountains of the Elburz range ; and though the Kyzyl Usen, which has its sources in the mountains of Kurdistan, is the only river of any size, the country is abundantly watered, and vast stretches of swamp are found in various directions, This is mainly due to the character of the climate, which is distinguished by a very heavy precipitation both in winter and summer. Vegetation is almost tropically luxuriant, and the forests are as dense as an Indian jungle. Oaks, maples, ash trees, planeras, lime trees, and parrotivas, are among the prevail- ing types. The chestnut-leaved oak attains colossal propor- tious, and a height at times of 130 or 140 feet; and the box tree comes to rare perfection, and forms an important source of wealth. Vines and pomegranates, walnuts, plums, pears, and apples grow wild; and oranges, lemons, peaches, and other fruits are easily cultivated, though some- times a severe winter proves fatal to the trees. The olive succeeds well in the valley of the Sefudrood, but the oil is extracted in a very primitive manner. Rice is largely cul- tivated, and forms the principal food of the inhabitants, except in the west, where its place is partially taken by Wheat, a cereal indeed to which the Ghilanese farmer ig more and more directing his attention, Cotton and sugar are both grown in small quantities, and the character of the climate gives reason to hope that tea plantations may be rendered profitable in some districts,

Hitherto the most successful occupation has been silk-growing ; but frequent failures in the crop have disheartened, if they have not ruined, many of the silk-masters, The quantity produced in 1866 was valued at £743,300, while the average between 1870 and 1875 was only about £270,000. In quality the silk does not rank very high, the greater portion being the produce of J apanese seed. Animal life is nearly as well represented in Ghilan as vegetable life. Tigers, wild boars, deer, and a considerable variety of snakes are found in the jungles ; pheasants are a common form of game ; aquatic birds of various kinds—pelicans, storks, heron, gulls, ducks, &¢., swarm along the coast ; and the fisheries in the Caspian are highly productive. The ordinary cattle, a small humped species like that of India, form an article of export; sheep and goats are not so plentiful, but they furnish very fine wool ; and the horses are a hardy race, greatly prized in other parts of Persia, and especially in the capital Wild horses are to be met with in the forests, Trade and commerce are in a very undeveloped state,—and no wonder when, with one trifling exception, there is no carriageable road in the province, and merchandise has to be transported on the backs of horses, mules, or camels.

striking instance of the primitive state of matters is fur- nished Mr Mounsey,

a natural harbour, and in rough Weather it is not accessible to the mail steamers, which in the ordinary course call once a week,

The administration of the province is nearly as primitive as its system of roads, and consists of nothing but machinery for the collection of the taxes, which yield about £63,000 to the royal revenue. The capital is Resht, and the administrative districts are Resht, Lahijan, Fomen, Gesku, Talishan, Sheft, Rustemabad, Rudbar, Menjech, Lengerood, Siah Kuh, and Dilman. Every able-bodied man is enrolled in a sort of frontier guard in the district of

alishan, but no regular police is maintained throughout the province. The population is of very various composi- tion ; but the main stock, including the Tats and the Gileki, 1s of Iranian origin. The Gilek is strongly built, but lank, and his complexion is a sort of olive or copper colour 3 the

| Tat, on the other hand, has a tendency to corputence, and his complexion is swarthy. According to different estimates, the inhabitants of the province number 150,000, 200,000, or 275,000; but it is more than usually difficult to ascer- tain the truth of the case, as they are for the most part scattered through the country in small hamlets. Qhilan is part of the ancient district The name is usually explained ag objects to this word is Gelan, which has received no interpretation.

position, its climate, and its soil should secure it a flourishing future were its political condition improved.

See Melgunoff, The Southern Shore of the Caspian (in Russian); Mounsey, Journey through the Caucasus, &c., 1872 ; Tietze, Zeit. schrift der Ges. fitr Lrdkunde, Vienna, 1875 ; and Consular Reports,

GHIRLANDAJO, Domenico DEL (1449-1494), an illustrious Florentine painter. His full name is given as Domenico di Tommaso Curradi di Doffo Bigordi ; it appears therefore that his father's surname was Curradi, and his grandfather's Bigordi. The painter is generally termed Domenico Bigordi, but some authors give him, and apparently with reason, the paternal surname Curradi. Ghirlandajo (garland-maker) was only a nickname, coming to Domenico from the employment of his father (or else of his earliest instructor), who was renowned for fashioning the metallic garlands worn by Florentine damsels ; he was not, however, as some have said, the inventor of them. Tommaso was by vocation a jeweller on the Ponte Vecchio, or perhaps a broker, Domenico, the eldest of eight chil- dren, was at first apprenticed to a jeweller or goldsmith, probably enough his own father ; in his shop he was continn- ally making portraits of the passers-by, and it was thouglit expedient to place him with Alessio Baldovinetti to study painting and mosaic, His youthful years were, however, entirely undistinguished, and at the age of thirty-one he had not a fixed abode of his own. This is remarkable, as immediately afterwards, from 1480 onwards to his death at a comparatively early age in 1494, he became the most proficient painter of his time, incessantly employed, and condensing into that brief period of fourteen years fully as large an amount of excellent

work as any other artist that could be named; indeed, we should properly say eleven years, for nothing of his is known of a later date than 1491.

In 1480 Ghirlandajo painted a St Jerome and other frescos in the church of Ognissanti, Florence, and a life- sized Last Supper in its refectory, noticeable for individual action and expression. From 1481-1485 he was employed upon frescos in the Sala dell' Orologio in the Palazzo Vecchio ; he painted the apotheosis of St Zenobius, a work beyond the size of life, with much architectural framework, figures of Roman heroes, and other detail, striking in per- spective and structural propriety. While still occupied here, he was summoned to Rome by Pope Sixtus IV. to paint in the Sixtine Chapel; he went thither not earlier than 1482. In the Sixtine he executed, probably before 1484, a fresco which has few rivals in that series, Christ calling Peter and Andrew to their Apostleship,—a work which, though somewhat deficient in colour, has greatness of method and much excellence of finish, The landscape background, in especial, is very superior to anything to ke found in the works, which had no doubt been zealously studied by Ghirlandajo, of Masaccio and Masolino in the Brancacci Chapel. He also did some other works in Rome, now perished. Before 1485 he had likewise produced his frescos in the chapel of §, Fina, in the Tuscan town of 8. Gemignano, remarkable for grandeur and grace,—two pictures of Fina, dying and dead, with some accessory work. Sebastian Mainardi assisted him in these productions in Rome and in §, Gemignano ; and Ghirlandajo was so well

pleased with his co-operation that he gave him his sister in marriage.

He now returned to Florence, and undertook in the church of the Trinita, and afterwards in §. Maria Novella, the works which have set the seal on his celebrity. The frescos in the Sassetti Chapel of S. Trinita are six subjects from the life of St Francis, along with some classical acces- gories, dated 1485. Three of the principal incidents are St Francis obtaining from Pope Honorius the approval of the Rules of his Order ; his Death and Obsequies ; and the Resuscitation, by the interposition of the beatified saint, of a child of the Spini family, who had been killed by falling out of a window. In the first work isa portrait of Lorenzo de' Medici; and in the third the painter's

own likeness, which he introduced also into one of the pictures in 8. Maria Novella, and in the Adoration of the Magi in the hospital of the Innocenti. The altar-piece of the Sassetti Chapel, the Adoration of the Shepherds, is now in the Florentine Academy. Immediately after disposing of this commission, Ghirlandajo was asked to renew the frescos in the choir of §. Maria Novella. This choir formed the chapel of the Ricci family, but the Tornabuoni and Torna- quinci families, then much more opulent than the Ricci, undertook the cost of the restoration, under conditions, as to preserving the arms of the Ricci, which gave rise in the end to some amusing incidents of litigation. The frescos, in the execution of which Domenico had many assistants, are in four courses along the three walls,—the leading sub- jects being the Lives of the Madonna and of the Baptist. Besides their general richness and dignity of art, these works are particularly interesting as containing many his- torical portraits—a method of treatment in which Ghir- landajo was pre-eminently skilled. There are no less than twenty-one portraits of the Tornabuoni and Tornaquinci families ; in the subject of the Angel appearing to Zacharias, those of Poliziano, Marsilio Ficino, and others; in the Salutation of Anna and Elizabeth, the beautiful Ginevra de' Benci; in the Expulsion of Joachim from the Temple, Mainardi and Baldovinetti (or the latter figure may perhaps be Ghirlandajo's father). The Ricci chapel was re-opened and completed in 1490; the altar-piece, now removed frum the chapel, was probably executed with the assistance of Domenico's brothers, David and Benedetto, painters of ordi- nary calibre ; the painted window was from Domenico's own design. Other distinguished works from his hand are an altar-piece in tempera of the Virgin adored by Sts Zenobius, Justus, and others, painted for the church of St Justus, but now in the Uffizi gallery, a remarkable masterpiece ; Christ in glory with Romuald and other Saints, in the Badia of Volterra ; the Adoration of the Magi, in the church of the Innocenti (already mentioned), perhaps his finest panel- picture, 1488; and the Visitation, in the Louvre, bearing the latest ascertained date, 1491, of all his works. Ghir- landajo did not often attempt the nude; one of his pictures of this character, Vulcan and his Assistants forging Thunderbolts, was painted for Lo Spedaletto, but (like several others specified by Vasari) it exists no longer. The picture attributed to him in the London National Gallery is dubious ; it may perhaps have come from the atelier of Verrocchio. The mosaics which

he produced date before 1491; one, of especial celebrity, is the Annunciation, on a portal of the cathedral of Florence.

In general artistic attainment Ghirlandajo may fairly be regarded as exceeding all his precursors or competitors ; though the names of a few, particularly Giotto, Masaccio, Lippo Lippi, and Botticelli, stand higher for originating power. His scheme of composition is grand and decorous ; his chiaroscuro excellent, and especially his perspectives, which he would design on a very elaborate scale by the eye alone ; his colour is more open to criticism, but this remark

applies much less to the frescos than the tempera-pictures, which are sometimes too broadly and crudely bright. He worked in these two methods alone—never in oils; and his frescos are what the Italians term “buon fresco,” without any finishing in tempera. A certain hardness of outline, not unlike the character of bronze sculpture, may attest his early training in metal work. He first introduced into Florentine art that mixture of the sacred and the profane which had already been practised in Siena. His types in figures of Christ, the Virgin, and angels are not of the highest order ; and a defect of drawing, which has been often pointed out, is the meagreness of his hands and feet. It was one of his maxims that “painting is designing.” Ghirlandajo was an insatiate worker, and expressed a wish that he had the entire circuit of the walls of Florence to paint upon. He told his shop-assistants not to refuse any commission that might offer, were it even for a lady’s petticoat-panniers: if they would not execute such work, he would. Not that he was in any way grasping or sordid in money-matters, as is proved by the anecdote of the readi- ness with which he gave up a bonus upon the stipulated price of the Ricci chapel frescos, offered by the wealthy Tornabuoni in the first instance, but afterwards begrudged. Vasari says that Ghirlandajo was the first to abandon in great part the use of gilding in his pictures, representing by genuine painting any objects supposed to be gilded ; yet this does not hold good without some considerable exceptions— the high lights of the landscape, for instance, in the Adora- tion of the Shepherds, now in the Florence Academy, being put inin gold. Many drawings and sketches by this painter are in the Uffizi Gallery, remarkable for vigour of outline. One of the great glories of Ghirlandajo is that he gave some early art-education to Michelangelo, who cannot, how- ever, have remained with him long, Granacci was another of his pupils.

This renowned artist died of pestilential fever on 11th January 1494, and was buried in S. Maria Novella. He lad been twice married, and left six children, three of them being sons. He had a long and honourable line of descend- ants, which came to a close in the 17th century, when the last members of the race entered monasteries. It is pro- bable that Domenico

died poor; he appears to have been gentle, honourable, and conscientious, as well as energeti- eally diligent. (W. M. R.)

GHIRLANDAJO, Riporro (1483-1560), son of Dome- nico, was also a painter of considerable celebrity. Born on 14th February 1483, and being thus less than eleven years old when his father died, he was brought up by his uncle David. ‘To this second-rate artist he owed less in the way of professional training than to Granacci, Piero di Cosimo, and perhaps Cosimo Rosselli. It has been said that Ridolfo studied also under Fra Bartolommeo, but this is not clearly ascertained. He was certainly one of the earliest students of the famous cartoons of Leonardo da Vinci and M ichel- angelo. His works between the dates 1504 and 1508 show a marked influence from Fra Bartolommeo and Raphael, with the latter of whom he was on terms of familiar friend- ship ; hence he progressed in selection of form and in the modelling and relief of his figures. Raphael, on reaching Rome in 1508, wished Ridolfo to join him; but the Florentine painter was of a particularly bome-keeping humour, and he neglected the opportunity. He soon rose to the head of the Florentine oil-painters of his time ; and, like his father, accepted all sorts of commissions, of what- ever kind. He was prominent in the execution of vast scenic canvases for various public occasions, such as the Wedding of Giuliano de’ Medici, and the Entry of Leo. X. into Florence in 1515. In his prime he was honest and conscientious as an artist; but from about 1527 he declined, having already accumulated a handsome property, more

than sufficient for maintaining in affluence his large family of fifteen children, and his works became comparatively

seems that, after completing one mosaic, the Annunciation over the door of the N unziata, patience failed him for con- In his old age Ridalfo was He appears to have been of a kindly, easy-going character, much regarded by his friends

The following are some of his leading works, the great majority of them being oil-pictures -—

Christ and the Maries on the road to Calvary, now in the Palazzo Antinori, Florence, an early example, with figures of half life-size. An Annunciation in the Abbey of Mountoliveto near Florence, Leonardesque in style. now in the Louvre. A N ativity, very carefully the Hermitage, St Petersburg, and ascribed in Granacci. A Predella, in the oratory of the Bigallo, Florence, five panels, representing the Nativity and other subjects, charmingly In 1514, on the ceiling of the chapel of St Bernard in the

al life, and firm accomplished pictorial method, now in the ga

various saints, at S, Pier Agere, Pistoja. elsa, life-sized, Assuniption, now in the Berlin Museum, containing the Mari own portrait. ici (the Great) in youth. In 1548, a series of frescos in the monastery of the Angcli, altar-pieces were cxecuted by Ghirlandajo, with the assistance of his pupil, currently named Michele di Ridolfo. Another of his pupils was Mariano da Pescia. (W. M. R.)

GHIZNI, See GHAZNI,

GHOORKAS. See Nzpat,

GHUR (Ghor, Ghoor, Gour, &c.) is the name of a terri- tory in Asia, and Guvrr (Ghori, Ghoory, &c.) that of a dynasty deriving its origin from that territory,

The name of Ghir was, in the Middle Ages, and, indeed, locally still is, applied to the highlands east of Herat, and extending eastward to the upper Helmand valley, or nearly so. There is hardly any region of Asia regarding which we continue to be more in the dark than about this, Ghiur is the southern portion of that great peninsula of strong mountain country which forms the western part of modern Afghanistan, and which may be taken in a general way to represent the Paropamisus of the ancients. The northern portion of the said peninsula was in the Middle Ages com- prehended under the names of Gharjistén (on the west), and Jugdnd (on the east), whilst the basin of the Herat river, and all south of it, constituted Ghur, The name as now used doeg not perhaps include the valley of the Herat river; on the south the limit seems to be the declivity of the higher mountains (about 32° 45’ N. lat.) dominating the descent to the lower Helmand, and the road from

Farrah to Kandahar. It is in Ghur that rise all those affluents of the closed basin of Seistdn, the Hartt, the Farrah-rid, the Khash-rid (see AFGHANISTAN), besides other considerable Streams joining the Helmand above Girishk,

Ghur is mentioned in the Shahnamah of Firdousi (1010 A.D.), and in the Arab geographers of that time, though these latter fail in details almost as much as we moderns, thus Indicating how little accessible the country has been through all ages. Ibn Haukal's map of Khorasan (c. 976) shows Jibal al-Ghir, "the hill-country of Ghur," as a circle ring- fenced with mountains. His brief description speaks of it asa land fruitful in crops, cattle, and flocks, inhabited by Infidels, except a few who passed for Mahometans, and

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indicates that, like other pagan countries surrounded by Moslem populations, it was regarded as a store of slaves fur the faithful. The boundary of Ghur in ascending the valley of the Hari-rid was six and a half easy marches from Herat, at Chist, two marches above are still in our maps).

The chief part of the present population of Ghur are Taimiinis belonging to the class of nomad or semi-nomad clans called Limdks (see AFGHANISTAN, vol. i. p. 235). There are algo, according to Ferrier, Stiris, who were formerly the main part of the population, apparently the same ag the Zoorees of Elphinstone (Caubul, ii. 204), another of the Kim4k clans ; and in the north of Ghur Ferrier mentions Mongols. Camels are kept in great numbers by the Eimaks, chiefly for their wool, Though the country is very moun- tainous, there are fruitful valleys of considerable width, But our knowledge is too slight for us to say more.

fruitful valleys, and of numerous strongholds held by a variety of

of modern Afghanistan, though there seems no good reason to It is probable that they were of old Persian blood, like the older of those tribes which still It is possibly a corroboration of this that, in the 14th century, when one of the Ghirj kings, of the Kurt dyuasty reigning in Herat, had taken to himself some of the insignia of in- dependent sovereignty, an incensed Mongol

prince is said to have reviled him as ‘an insolent Tajik” (Journal Asiat., ser. v. tom, Sabuktigin of Ghazni, and his famous son Mahmud,

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the son of Mahmud, being then governor of Khorasan, made a systematic invasion of Ghur from the side of Herat, laying siege to its strongholds one after the other, and subduing the country more a century later one of the princely families of Ghur, deriving the appellation of Shansabi, or Shansabaniah, from a certain ancestor Shansab, of local fame, and Zohak, acquired predominance in all the country, and at the time mentioned Malik ’Izzuddin al Husain of this family came to be recognized as lord of Ghiir. He was known afterwards as “the Father of Kings,” from the further honour to which several of his seven sons Tose. Three of these (see GHAZN1) were—(1) Amir Kutbuddin Mahomed, called the lord of the Jibal

Suri, for a brief period master put to death by Bahram the ; and (3) Sultan Alduddin Jahansoz, who wreaked such Alauddin began the conquests which were afterwards immensely extended both in India and in the west by his nephews Ghiydssuddin Mahommed ibn S4m and Muizuddin Mahommed Sim (the Shahébuddin Ghuri of the histo- rians), and fora brief period during their rule it was boasted, with no great exaggeration, that the public prayer was read in the name of the Ghiuri from the extremity of India to the borders of Babylonia, and from the Oxus to the Straits of Ormus. After the death of Muizuddin (alias Shahabuddin), Mahmiid the gon of Ghiydssuddin was proclaimed sovereign (1206) throughout the territories of Ghiir, Ghazni, and Hindustan. But the Indian dominion, from his uncle’s death, became entirely independent, and his actual authority was confined to Ghiir, Seistén, and Herat. The whole kingdon fell to pieces before the power of Mahommed Shéh of Khwarazm and his son Jaldluddin (c. 1214-1215), a power in its turn to be speedily shattcred by the Mongol flood (see GHAZNI).

Besides the thrones of Ghiir and Ghazni, the Shansabaniah family, in the person of F akhruddin, the eldest of the seven sons of Malek *Tzzuddin, founded a kingdom in the Oxus basin, having its seat at BAMIAN (7.v.), which endured for two or three gencrations, till ex- tinguished by the power of Khwarazm (1214). And the great Mussulman empire of Delhi was based

on the conquests of Muizuddin the Ghurian, carried out and consolidated by his Turki freedmen, Kutbuddin Aibak and his successors. The princes of Ghir experienced, about the middle of the 13th century, a revival of power, which endured for 140 years. This later dynasty bore the name of Kurt or Kart. The first of historical prominence was Malik Shamsuddin Kurt, descended by his mother from the great king Ghiyassuddin Ghurt, whilst his ‘other grandfather was

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that prince’s favourite minister. In 1245 Shamsuddin held the lordship of Ghir in some kind of alliance with, or subordination to, the Mongols, who had not yet definitively established themselves in Persia, and in 1248 he received from the Great Khan Mangu an in- vestiture of all the provinces from Merv to the Indus, including by ame Sijistan (or Seistén), Cabul, Tirah (adjoining the Khaibar pass), and Afghanistan (a very early occurrence of this name), swhieh he ruled from Herat. He stood well with Hulaku, and for a long time with his son Abaka, but at last incurred the latter’s jealousy, and was poisoned when on a visit to the court at Tabriz (1276). His son Ruknuddin Kurt was, however, invested with the government of Khorasan (1278), but after some years, mistrustiug his Tartar suzerains, he withdrew into Ghur, and abode in his strong fortress of Kaissar till his death there in 1305. The family held on through a succession of eight kings in all, sometimes submissive to the Mongol, sometimes aiming at independence, sometimes for a series of prosperous years adding to the strength and splendour of Herat, and sometimes sorely buffeted by the hosts of masterless Tartar brigands that tore Khorasan and Persia in the decline of the dynasties of Hulaki and Chagatai. riight have established a lasting the time of the last of the dynasty, Ghiyassuddin Pir’ Ali, Tartar- dom, reorganized and re-embodied in the person of Timur, came against Herat, and carried away the king and the treasures of his dynasty (1380). A revolt and massacre of his garrison provoked Timur’s vengeance ; he put the eaptive king to death, came against the city a second time, and showed it no mercy (1383). Ghur has sinee been as obscure in history as it is in its topography.

The proper eapital of the kingdom of Ghwr when its princes were rising to dominion in the 12th century was Firtiz-Koh, where a city and fortress were founded by Saifuddin Suri. The true position of Firtiz-Koh does not scem to have been determined, out it was probably on or near the upper waters of the Hari-rid or river of Herat ; and it is possible that it may be represented by Shahrak, a place in that valley (about 65° 30’ E, long.), onee a populous and flourishing town, which was described to Ferrier, who passed not far from it, as having been anciently the capital of Ghir. The name of Firdz-Kohis has been appropriated to one of the most numerous of the nomad tribes occupying the upper part of the Hari-rad and part of the Murghab, but it is doubtful if this has to do with the Ghir capital, as the name is otherwise explained. Other places claim to have been the old capital. Thus Karrukh, a place visited by Khanikoff in 1858, in a rapid exeursion from Herat, and lying on the north side of the valley, is one. But this seems too near Herat (only 30 miles distant). Ferrier, again, deseribes as the ancient capital a place, which he reached in his journey, called Zarnt, about 150 miles by road from Herat towards the S.E. The population did not exeeed 1200, belonging to the Suri and Taimuni tribes. The peak of Chalap Dalan, ‘‘one of the highest in the world,” rose before Zarni in imposing majesty. The mountain, at half its height, has a compass of some 40 miles ; the sides are eovered with forests and pastures, villages and tents, and also exhibit naturally impregnable positions where successive chiefs have built strongholds. Ferricr, in accompanying the Afghan governor, Who lived at Zarni, saw three ancient towns on the skirts of this mountain, all large and fortified, viz., Kala’ Kaissar, Kala’ Sangi, and Fakhrabid. ‘These are described as ouly a few farsakhs, or hours’ march, nortli-east of Teivereh, which last is in some of our maps. Doubts have indeed becn cast on the authenticity of this part of Ferrier’s book, chiefly on account of the extreme brevity of the time which he allows. But the professed journal was probably, under the circumstances, only an expansion from memory of the merest jottings; and several things are in favour of authenticity. His notices of the country, slight as they are, corre- spond notably in the impression conveyed with those of the Tabakdti-i-Ndsiri(see below). Kaissaz, which he mentions, is a place that has already been referred to as the stronghold of Ruknuddin Kurt. Zarni, as roughly located by him, corresponds fairly with what was told Conolly on his journey between Herat and Kandahar, of the position and character of ‘the old city of Ghore…. now a ruinous, ill-

inhabited town, the capital of a petty province, governed by one of Shah Kamran's sons, who has his residenee there" (Journey, vol. ii. p. 61). Zarni is mentioned by Major Leeeh in connexion with Taiwara (Teivereh of Ferrier) and other places in the south of the Ghur country, but uot so as to determine its position. In some other points, moreover, as to names of chiefs &c., Ferrier's statements agree with Leech's. '

See the " Tabakdt-i-Ndsiri," in the Bzbl. Indica, transl. by Raverty; Journal

Asiatique, ser. v., tom. xvii.; 'Ibn Haukal," in /. As. S tes Ferrier's Caravan Journeys: Hammer's Iikhans, &e. Eee "aLY)

GIAMBELLI, or GianiIBeLui, FepErico, a military engineer, was born at Mantua about the middle of the 16th century. Having had some experience as a military engi- neer in Italy, he went to Spain to offer his services to Philip II. His proposals were, however, somewhat lukewarmly

It is possible that the Kurts — Tajik kingdom at Herat, but in |

received, and as he could obtain from the king no immedi- ate employment, he took up his residence at Antwerp, where he soon gained considerable reputation for his knowledge in various departments of science. He is said to have vowed to be revenged for his rebuff at the Spanish court; and when Antwerp was besieged by the duke of Parma in 1584, he put himself in communication with Queen Elizabeth, who having satisfied herself of his abilities, engaged him to aid by his counsels in its defence. His plans for provision- ing the town were rejected by the senate, but they agreed to a modification of his scheme for destroying the famous bridge which closed the entrance to the town from the side of the sea, by the conversion of two ships of 60 and 70 tons into infernal machines. One of these exploded, and, besides destroying more than 1000 soldiers, effected a breach in the structure of more than 200 feet in width, by which, but for the hesitation of Admiral Jacobzoon, the town might at once have been relieved. After the sur- render of Antwerp Giambelli went to England, where he was engaged for some time in fortifying the river Thames ; and when the Spanish Armada was attacked by fire-ships in the Calais roads, the panic which

ensued was due to the conviction amoug the Spaniards that the fire-ships were infernal machines constructed by Giambelli. He is said to have died in London, but the year of his death is unknown. See Motley's History of the United Netherlands, vols. 1. and ii., and the authorities therein referred to, GIANNONE, Pierro (1676-1748), the most distin- guished historian of whom Naples can boast, and amongst all Italian historians second alone to Fra Paulo Sarpi for the stroug and clear light thrown in his works on the growth of the papal power, was born at Ischitella, in the province of Capitanata, on the 7th of May 1676. Arriving in Naples at the age of eighteen, he devoted himself to the study of law, but his legal pursuits were much surpassed in import- ance by his literary labours. He devoted twenty years to the composition of his great work, Zhe Civil History of Naples, which was ultimately published in 1723. Here, in his account of the rise and progress of the Neapolitan laws and government, he warmly espoused the side of the civil power in its conflicts with the Romish hierarchy. The position thus taken up by him, and the manner in which that position was assumed, gave rise to a life-long conflict between Giannone and the church; and we must know much more accurately than we at present do all the facts concerning his alleged retractation in prison at Turin, before we can withhold from him the palm—as he certainly endured the sufferings —of a confessor and martyr in the cause of what he deemed historical truth. Hooted by the mob of Naples, and excommunicated by the archbishop's court, he was forced to leave Naples and repair to Vienna. Meanwhile the Inquisition had attested after its own fashion the value of his history by putting it on the Jndez. At Vienna the favour of the emperor Charles VI. and of many leading personages at the Austrian court obtained for him a pension and other facilities for the prosecution of his historical studies. Of these the most important result was Il Triregno, ossia del regno del cielo, della terra, e del papa. On the transfer of the Neapolitan crown to Charles of Bourbon, Giannone lost his Austrian pension, and was com- pelled to remove to Venice. There he was at first most favourably received. 'The post of consulting lawyer to the republic, in which he might have continued the special work of Fra Paulo Sarpi, was offered to him, as well as that of professor of public law in Padua; but he declined both offers. Unhappily there arose a suspicion that his views on maritime law were not favourable to the pretensions 0 Venice, and, notwithstanding all his efforts to dissipate

that suspicion, it was resolved to expel him from the state. On the 23d of September 1735 he was seized and conveyed to

Ferrara. After wandering, under the assumed name of Antonio Rinaldo, for three mouths through Modena, Milan, and Turin, he at last reached Geneva, where he enjoyed the friendship of the most distinguished citizens, and was on excellent terms with the great publishing firms. But in an evil hour he was induced to visit a Catholic village within the Sardinian territory, where he was kidnapped by the agents of the Sardinian Government, conveyed to the castle of Miolan, and thence successively transferred to Ceva and Turin. In the fortress of Turin he remained im- mured during the last twelve years of his life, though part of his time was spent in composing a defence of the Sardinian interests as opposed to those of the papal court, and though he was led to sign a retractation of the state- ments in his history most obnoxious to the Vatican. He died March 7, 1748, in his seventy-second year,

Giannone's style as an Italian writer has been pronounced to be below a severe classical model. But his very ease and freedom, if not classical, have helped to make his volumes more popular than many works of greater classical renown. In England the just appreciation of his labours by Gibbon, and the ample use made of them in the later volumes of The Decline and Fall, early secured his rightful place for him in the estimation of English scholars,

A good and complete edition of Giannone's works is still a desideratum. The more important facts of his life have been recorded by the Abbe Fernando Parizini in Italian, and in Latin by Fabroni; whilst a more complete estimate of his literary and political importance may be formed by the perusal of the collected edition of the works written by him in his Turin prison, published in Turin in 1859—under the 'care of the distinguished statcsman Pasquale Stanislao Mancini, late minister of grace and justice, universally recognized as one of the first authorities in Italy on questions relating to the history of his native N aples, and especially to the conflicts between the civil power and the church.

GIANT is the Old English geant, derived through French and Latin from Greek gigas (gagant). The idea conveyed by the word in classic mythology is that of beings more or less manlike, but monstrous in size and strength. Figures like the Titans and the Giants whose birth from Heaven and Earth is sung by Hesiod in the Theogony, such as can heap up mountains to scale the sky, and war beside or against the gods, must be treated, with other like monstrous figures of the wonder-tales of the world, as belonging altogether to the realms of mythology. But there also appear in the legends of giants some with historic significance. The ancient and commonly-repeated explanation of the Greek Word yiyas, as connected with or derived from ynyerys, or 'earth-born," seems by no means sound as a matter of etymology, but at any rate the idea conveyed by it was fimiliar to the ancient Greeks, that the giants were earth- born or indigenous races (see Welcker, Griechische Gétter- lehre, vol. i. p. 787). The Bible (the English reader must be cautioned that the word giant has been there used ambiguously, from the Septuagint downwards) touches the present matter in so far as it records the traditions of the Israelites of fighting in Palestine with tall races of the land such as the Anakim (Numb. xiii. 33; Deut, ii HO; iti, 11 I Sam. xvii. 4), When reading in Homer of " the Cyclopes aud the wild tribes of the Giants," or of the adventures of Odysseus in the cave of Polyphemus (Homer, Odyss., vii. 206 ; ix.), we seem to come into view of dim traditions, exaggerated through the mist of ages, of pre-Hellenic barbarians, godless, cannibal, skin-clothed, hurling huge stones in their rude warfare, Giant-legends of this class are common in Europe and Asia, where the big and stupid giants have often every token of uncouth native barbarians, exaggerated into monsters in the legends of the later tribes Who dispossessed and slew them.

Besides the conception of giants as special races distinct from mankind, it was a common opinion of the ancients that the human race had itself degenerated, the men of primeval ages having been of so far greater stature and Strength as to be in fact gigantic, This, for example, is

O71 received by Pliny (Zis¢. Nat., vii. c. 16), and it becomes a common doctrine of theologians such as Angustine (De Civitate Dei, xv. 9), lasting on into times so modern that it may be found in Cruden's Concordance. Yet so far as can be judged from actual remaius, it does not appear that giants,

in the sense of tribes of altogether superhuman stature, ever existed, or that the men of ancient time were on the whole taller than those now living. It is now usual to apply the word giant to beings not superhuman in their height, but merely the tallest. men aud women of our nations. In every race of mankind the great mass of in- dividuals do not depart far from a certain mean or average height, while the very tall or very short men become lesg and less numerous as they depart from the mean standard, till the utmost divergence is reached in a very few giants on the one hand, and a very few dwarfs on the other, At both ends of the scale, the body is markedly out of the ordinary proportions ; thus a giant's head is smaller and a dwarf's head larger than it would be if an average man had been magnified or diminished, The principle of the distri- bution of individuals of different sizes in a race or nation has been ably set forth by Quetelet (Physique Sociale, vol. li. ; Anthropométrie, books iii. and iv.). Had this principle been understood formerly, we might have been spared the paius of criticizing assertions as to giants 20 feet high, or even more, appearing among mankind. The appearance of an individual man 20 feet high involves the existence of the race he is an extreme member of, whose mean stature would be at least 12 to 14 feet, which is a height no human being has been proved on sufficient evidence to have approached (Anthropom., p. 302). In fact, Quetelet considers the tallest man whose stature has been authentically recorded to have been Frederick the Great's Scottish giant, who was not quite 8 feet 3 inches. Modern statisticians, though admitting that this may not be the extreme limit of human stature, cannot accept the loose conclusion in Buffon (Zfist. Nat., ed. Sonnini, vol. iv. p. 134), that there is no doubt of giants having been 10, 12, and perhaps 15 feet high. Confidence is not even to be placed in ancient asserted ineasurements, as where Pliny gives to one Gabbaras, an Arabian, the stature of 9 feet 9 inches (about 9 feet 54 in. English), capping this with the mention of Posio and Sec- undilla, who were half a foot higher. That two persons should be described as both having this same extraordinary Measure suggests to the modern critic the notion of a note jotted down on the philosopher's tablets, and never tested afterwards.

Under these circumstances, it is worth while to ask how it is that legend and history so abound in mentions of giants outside all probable dimensions of the human frame. One cause is that, when the story-teller is asked the actual

Stature of the huge men who figure in his tales, he is not sparing of his inches and feet. What exaggeration can do in this way may be judged from the fact that the Pata- gonians, whose average height (5 feet 11 inches) is really about that of the Chirnside men in Berwickshire, are described in Pigafetta's Voyage round the World as so monstrous that tle Spaniards' heads hardly reached their waists. It is reasonable to suppose, with Professor Nilsson (Primitive Inhabitants of Scandinavia, chap. vay), that in the traditions of early Europe tribes of savages may have thus, if really tall, expanded into giants, or, if short, dwindled into dwarfs, Another cause which is clearly proved to have given rise to giant-myths of yet more mon- strous type, has been the discovery of great fossil bones, as of mamnioth or mastodon, which have from early ages been supposed to be bones of giants, and have given rise to a Whole class of giant-myths (see Tylor, Harly Ifistory of Mankind, chap. xi.; Primitive Culture, chap. x.). Such anatomical inferences from the leg-bone or tooth of some

huge extinct animal are rather creditable to the ingenuity | which tourists start to visit the remains of the gigantic of natives of America, or of barbarians of the Old World; , chestnut tree of the hundred horses (di cento cavall2). but their late continuance in the midst of European culture GIAVENO, a market-town of Italy, in the province of shows how recently the principles of comparative anatomy | Turin, and circondario of Susa, about 16 miles W. of Turin, obtained their present hold on the public mind. A tooth | at the foot of the Cottian Alps, and on the left bank of the weighing 42 Ib, and a thigh-bone 17 feet long, having been | Sangone, a head water of the Po. It possesses a fine old found in New England in 1712 (they were probably | castle, an almshouse, a gymnasium, a children's asylum, mastodon), Dr Increase Mather thereupon communicated to | several well-built churches, and an aneient abbatial resi- the Royal Society of London his confirmation from them of | dence ; and its inhabitants manufacture paper and silk, and the existence of men of prodigious stature in the ante-| maintain a trade in wine and timber. Population of the diluvian world (see the Philosophical Transactions, vol. xxiv | town in 1871 5722, and of the commune 9638. p. 85; D. Wilson, Prehistoric Man, vol. i. p. 54). The GIB, Apam (1714-1788), the leader of the Antiburgher giants in the

streets of Basel and supporting the arms of | section of the Scottish Secession Church, was born April Lucerne appear to have originated from certain fossil bones | 14, 1714, in the parish of Muckhart, Perthshire, and, on found in 1577, examined by the physician Felix Plater, and | the completion of his literary and theological studies at pronounced to have belonged to a giant some 16 or 19 feet | Edinburgh and Perth, was licensed as a preacher in 1740. high. These bones have since been referred to a very | In the following year he was ordained minister of the large different geological genus, but within the present century | Secession congregation of Bristo, Edinburgh, being the Plater's giant skeleton was accepted as a genuine relic of | first in the city inducted into such a charge; and thtre the giants who once inhabited the earth. See the disserta- | his powerful intellect and his intensity of character soon tion of Le Cat, cited in the 5th edition of the Hncyclopedia | secured for him a position of considerable prominence. Britannica (1817). (=, @7)) In 1742 he caused some stir by the publication of an in-

GIANT'S CAUSEWAY, a promontory of columnar | vective entitled A warning against countenancing the basalt, situated on the coast of Antrim in the north of | ministrations of Mr George Whatefield ; and in 1745 he was Ireland. It is divided by whin-dykes into the Little | almost the only minister of Edinburgh who continued to Causeway, the Middle Causeway or " Honeycomb," as it is | preach, and to preach against rebellion, while the troops of locally termed, and the Larger or Grand Causeway. The | Charles Edward were in occupation of the town. When in pillars composing it are close-fitting and for the most part | 1747 'the Associate Synod," by a narrow majority, decided somewhat irregular hexagons, made up of articulated por- | not to give full immediate effect to a judgment which had tions varying from a few inches to some feet in depth, and | been passed in the previous year against the lawfulness of concave or convex at the upper and lower surfaces. In | the "' Burgess Oath,"! Gib led the protesting minority, who diameter the pillars vary from 15 to 20 inches, and in | forthwith separated from their brethren and formed the height some are as much as 20 feet. The Great Causeway | Antiburgher Synod. It was chiefly under his influence is chiefly from 20 to 30, and for a few yards in some places | that it was agreed by this ecclesiastical body at subsequent nearly 40 feet in breadth, exclusive of outlying broken | meetings to summon to the

bar their ‘“ Burgher” brethren, pieces of rock. It is highest at its narrowest part. At | and finally to depose and excommunicate them for contu- abont half a dozen yards from the cliff, widening and be- | macy. In 1765 he made a vigorous and able reply to the coming lower, it extends outwards into a parade or plat- | General Assembly of the Chureh of Scotland, which had form, which has a slight seaward inclination, but is easily | stigmatized the Secession as “‘ threatening the peace of the walked on, and for nearly 100 yards is always above water. | country ;” and this apology was further developed in his At the distance of about 150 yards from the cliff it turns | Display of the Secession Testumony, published in 1774. a little to the eastward for 20 or 30 yards, and then sinks | From 1753 (when after protracted litigation he was com- into thesea. The neighbouring cliffs exhibit in many places | pelled to leave the Bristo church) till within a short period columns similar to those of the Giant’s Causeway, a con- | of his death, which took place June 18, 1788, he preached siderable exposure of them being visible at a distance of | regularly in Nicolson Street church, which is said to have about 100 roods in the bay to the eastward. A group of | been filled every Sunday with an audience of 2000 persons. these columns, from their arrangement, have beeu fancifully | Besides other publications, he wrote a volume of Sacred named the “Giant’s Organ.” ‘Lhe most remarkable of the | Contemplations (1786), to which was appended an “ Essay cliffs is the Pleaskin, the upper pillars.of which have the | on Liberty and Necessity” in reply to Lord Kames, appearance of a colonnade, and are 60 feet in height ; GIBBON. See Aps, vol. ii. p. 150. beneath these is a mass of coarse black amygdaloid, of the GIBBON, Epwarp (1737-1794), one of the most cele- same thickness, underlain by a second range of basaltic | brated historians of any age or couitry, was also his own pillars, from 40 to 50 feet in height. Near the Giant’s | historian. He has left us one of the most piquant auto- Causeway are the ruins of the castles of Dunseverick and | biographies ever written. In the following sketch the chief Dunluce, situated high above the sea on insulated crags, and | incidents of his life will be condensed from that authentic the swinging bridge of Carrick-a-Rede, spanning achasm of | source. For more than facts, even for the setting of these, 80 feet deep, and connecting a rock, which is used as a | it is needless to say that it would be unwise to trust to any salmon-fishing station, with the mainland. Fairhead,a pro | man’s autobiography—though Gibbon’s is as frank as most.- montory composed

of columnar greenstone, the highest point | There are points on which vanity will say too much, and: on the coast, has an altitude of 550 feet. perhaps others on which modesty will say too little.

See Hamilton, Letters from the Coast of Antrim; Dubourdiew, Clibbon was descended, he tells us, from a Kentish family Statistical Survey of Antrim; and articles ANTRIM and GroLoey. | of considerable antiquity ; among his remoter ancestors' he:

GIARRE, a town of Sicily, in the province of Catania, | reckons the Lord High Treasurer Fiennes, Lord Say and between Etna and the sea, with a station on the railway | Sele, whom Shakespeare has immortalized in his Henry VIL from Messina to Catania, distant from the former 40 miles, and from the latter nearly 19. It is a flourishing place of 1 This was an oath imposed upon all burgesses of Edinburgh, Glas-. 6956 inhabitants, according to the census of 1871, or of | gow, Perth, and some other towns, by which they "professed and 9990 if the suburbs of Macchia, St Giovanni, and St Alfio allowed the true religion presently prof) aaa ras are included ; but it has little to show except a handsome authorized by the laws thereof denied na an

: : 4 : words implied an approbation of the Established Church, with all its modern church, and is mainly of interest as the point from , "corruptions." " a

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GIBBON

His grandfather was 2 man of ability, an enterprising merchant of London, one of the commissioners of customs under the Tory ministry during the last four years of Queen Anne, and, in the judgment of Lord Bolingbroke, as deeply versed in the " commerce and finances of Eng- land" He was not always wise, however, either for himself or his country; for he became Scheme, in the disastrous collapse of which (1720) he lost the ample wealth he I the eompany, moreover, complicity, taken into £10,000 was allowed and with this his skill and enterprise soon constructed asecond fortune. He died of his property to his two daughters —nearly disinheriting his only

son, the father of the historian, for having married against his wishes. This son (by name Edward) was educated at Westminster! degree, travelled, be- came member of Parliament, first for Petersfield (1734), then for Southampton (1741),. joined the party against Sir Robert Walpole, and (as his son confesses, not much to his father's honour) was animated in so doing by "private revenge" against the supposed " oppressor " of his family in the South Sea affair. If So, revenge, as usual, was blind ; for Walpole had sought rather to moderate than to inflame public feeling against the projectors,

The historian was born at Putney, Surrey, April 27 (Old Style), 1737, His mother, Judith Porten, was the daughter of a London merchant. He was the eldest of a family of six sons and a daughter, and the only one who survived childhood ; his own life in youth hung by so mere a thread as to be again and again despaired of. His mother, be- tween domestic cares and constant infirmities (which, how- ever, did not prevent an occasional plunge into fashionable dissipation in compliance with her husband's wishes), did but little for him. The "true mother of his mind as well as of his health " by name—with respect to whom he expresses himself in language of the

Many wakeful nights did ling expectation that each

rudiments of English and Latin grammar, and doubtless truly, so far as he could trust the impressions of childhood. With reference to more reserved in his praise, deny- its depth, and its elegance ; but, he adds, "the book is not devoid of entertainment or in- struction."

In his ninth year (1746), during a "lucid interval of Coniparative health," he was sent to a school at Kingston- upon-Thames; but his former infirmities soon returned, and his progress, by his own confession, was slow and unsatisfac- tory. " My timid reserve was astonished by the crowd and tumult of the school ; disqualified me for the sports of the play-field….. By the common methods of discipline, at the expense

' The celebrated William Law had been for some time the private tutor of this Edward Gibbon, who is supposed to have been the original of the rather clever sketch of ''Flatus" in the Sertous Cail. ~

O73 of many tears and some blood, I purchased the knowledge of the Latin syntax," but manifestly, in his own opinion, the Arabian Nights, Pope's Homer, and Dryden's Virgil, eagerly read, had at this period exercised a much more powerful influence on his intellectual development than Pha- drus and Cornelius N epos, " painfully construed and darkly understood."

In December 1747 his mother died, and he was taken home. After a short time his father removed to the "rustic solitude" of Buriton (Hants), but young Gibbon lived chiefly at the house of his maternal grandfather, at Putney, where, under the care of his devoted aunt, he developed, he tells us, that passionate love of reading "which he would not exchange for all the treasures of {ndia," and where his mind received its most decided stimulus. Of 1748 he says, "This year, the twelfth of my age, I shall note as the most propitious to the growth of my intellectual stature." After detailing the circumstances which unlocked for him the door of his grandfather's "tolerable library," he says, "I turned over many English pages of poetry and romance, of history and travels. Where a title attracted my eye, without fear or awe I snatched the volume from the shelf." In 1749, in his twelfth year, he was sent to Westminster, still resid- ing, however, with his aunt, who, rendered destitute by her father's bankruptcy, but unwilling to live a life of depend- ence, had opened a boarding-house for Westminster school, Here in the course of two years (1749-50), interrupted by danger and debility, he « painfully climbed into the third form ;" but it was left to his riper age to acquire the beauties of the Latin and the rudiments of the Greek tongue." The continual attacks of sickness which had re- tarded his progress induced his aunt, by medical advice, to take him to Bath; but the mineral waters had no effect. He then resided for a time in the house of a physician at Winchester; the physician did as little as the mineral waters ; and, after a further trial of Bath, he once more returned to Putney, and made a last futile attempt to study at Westminster. Finally, it was concluded that he would never be able to encounter the discipline of a school ; and casual instructors, at various times and places, were pro- vided for him. Meanwhile his indiscriminate appetite for reading had begun to fix itself more and more decidedly upon history ; and the list of historical works devoured by him during this period of chronic ill-health is simply astonishing, It included,

besides Hearne's Ductor LNstoricus and the successive volumes of the Universal History, which was then in course of publication, Littlebury's Herodotus, Spelman's Xenophon, Gordon's Tacitus, an anonymons translation of Procopius ; ''many crude lumps of Speed, Rapin, Mezeray, Davila, Machiavel, Father Paul, Bower, éic., were hastily gulped. I devoured them like so many novels ; and I swallowed with the same voracious appetite the descriptions of India and China, of Mexico and Peru." His first introduction to the historic scenes the study of which afterwards formed the passion of his life took place in 1751, when, while along with his father visiting a friend in Wiltshire, he discovered in the library "a common book, the continuation of Echard's oman History." "To me the reigns of the successors of Constantine were absolutely new ; and I was immersed in the passage of the Goths over the Danube, when the summons of the dinner bell reluctantly dragged me from my intellectual feast." Soon afterwards his fancy kindled with. the first glimpses into Oriental history, the wild " barbaric" charm of which he never ceased to feel. Ockley's book on the Saracens " first opened his eyes" to the striking career of Mahomet and his hordes ; and with his characteristic ardour of literary research, after exhausting all that could be learned in English-of the Arabs and Persians, the:

Tartars aud Turks, he forthwith plunged into the French of D'Herbelot, and the Latin of Pocock's version of Abulfaragius, sometimes understanding them, but oftener only guessing their meaning. He soon learned to call to his aid the subsidiary sciences of geography and chronology, and before he was quite capable of reading them had already attempted to weigh in his childish balance the competing systems of Scaliger and Petavius, of Marsham and Newton. At this early period he seems already to have adopted in some degree the plan of study he followed in after life, and recommended in his Essat sur ? Etude—that is, of letting his subject rather than his author determine his course, of suspending the perusal of a book to reflect, and to compare the statements with those of other nuthors,—so that he often read portions of many volumes while mastering one.

Towards his sixtecnth year he tells us “ nature dis- played in his favour her mysterious energies,” and all his infirmities suddenly vanished. Thenceforward, while never possessing or abusing the insolence of health, he could say “few persons have been more exempt from real or imaginary ills.” His unexpected recovery revived his father’s hopes for his education, hitherto so much neglected if judged by ordinary standards ; and accordingly in Janu- ary 1752 he was placed at Esher, Surrey, under the care of Dr Francis, the well known translator of Horace. But Cibbon’s friends in a few weeks discovered that the new tutor preferred the pleasures of London to the instruction of his pupils, and in this perplexity decided to send him prematurely to Oxford, where he was matriculated as a gentleman commoner of Magdalen College, 3d April, 1752. According to his own testimony, he arrived at the university “ with a stock of information which might have puzzled a doctor, and a degree of ignorance of which a school-boy might be ashamed.” And indeed his huge wallet of scraps stool him in little stead at the trim banquets to which he was invited at Oxford, while the wandering habits by which he had filled it absolutely unfitted him to be a guest. He was not well grounded in any of the elementary branches, which are essential to university studics, and to all success in their prosecution. It was natural therefore that he should dislike the university, and as natural that the uni- versity should dislike him. Many of his complaints of the system were certainly just; but it may be doubted whether any university system would have been profitable to him, considering his autecedents. He complains especially of his tutors, and in one case with abundant reason ; but, by his own confession, they might have recriminated with justice, for he indulged in gay society, and kept late hours. His observations, however, on the defects of the English univer- sity system, some of which have only very recently been removed, are acute and well worth pondering, however little relevant to his own case. He remained at Magdalen about fourteen months. ‘“ Tothe university of Oxford,” he says, “ T acknowledge no obligation ; and she will as cheerfully renounce me for a son as I am willing to disclaim her for a mother. I spent fourteen months at Magdalen College ; they proved the fourteen months the most idle and unpro- fitable of my whole life.”

But thus “idle ” though he may have been asa ‘‘stu- dent,” he already meditated authorship. In the first long vacation—during which he, doubtless

with some sarcasm, says that “his taste for books began to revive”—he con- templated a treatise on the age of Sesostris, in which (and it was characteristic) his chief object was to investi- gate not so much the events as the probable epoch of the reign of that semi-mythical monarch, whom he was inclined to regard as having been contemporary with Solomon. “ Unprovided with original learning, unformed in the habits of thinking, unskilled in the arts of composition, I

resolved to write a book ;” but the discovery of his own weakness, he adds, was the first symptom of taste. On his first return to Oxford the work was “ wisely relinquished,” and never afterwards resumed. The most memorable inci- dent, however, in Gibbon’s stay at Oxford was his teim- porary conversion to the doctrines of the church of Rome. he bold criticism of Middleton’s recently (1749) published Free Enquiry into the Miraculous Powers which are supposed to have subsisted in the Christian Church, appears to have given the first shock to lus Protestantism, not indeed by destroying his previous belief that the gift of miraculous powers had continued to subsist in the church during the first four or five centuries of Christianity, but by con- vincing him that within the same period most of the leading doctrines of popery had been already introduced both in theory and in practice. At this stage he was introduced by a friend (Mr Molesworth) to Bossuet’s Variations of Protestantism, and Exposition of Catholic Doctrine (see Gibbon, Decline and Fall, c. xv., note 79). “ These works,” says he, “achieved my conversion, and I surely fell by a noble hand.” In bringing about this “ fall,” however, Parsons the Jesuit appears to have had a con- siderable share ; at least Lord Sheffield has recorded that on the only occasion on which Gibbon talked with him on the subject he imputed the change in his religious views principally to that vigorous writer, who, in his opinion, had urged all the best arguments in favour of Roman Catholi- cism. But be this as it may, he had no sooner adopted his new creed than he resolved to profess it ; “a momentary glow of enthusiasm” had raised him above all temporal con- siderations, and accordingly, on June 8, 1753, he records that having “ privately abjured the heresies ” of his child- hood before a Catholic priest of the name of Baker, a Jesuit, in London, he announced the same to his father in an elaborate

controversial epistle which his spiritual adviser much approved, and which he himself afterwards described to Lord Sheffield as having been " written with all the pomp, the dignity, and self-satisfaction of a martyr."

The elder Gibbon heard with indignant surprise of this act of juvenile apostacy, and, indiscreetly giving vent to his wrath, precipitated the expulsion of his son from Oxford, a punishment which the culprit, in after years at least, found no cause todeplore. In his Memoirs he speaks of the results of his " childish revolt against the religion of his country" with undisguised self-gratulation. It had de- livered him for ever from the " port and prejudice" of the university, aud led him into the bright paths of philosophic freedom. That his conversion was sincere at the time, that it marked a real if but a transitory phase of genuine religious conviction, we have no reason to doubt, notwith- standing the scepticism he has himself expressed. "To my present feelings it seems incredible that I should ever believe that I believed in transubstantiation," he indeed de- clares ; but his incredulous astonishment is not unmixed with undoubting pride. "I could not blush that my tender mind was entangled in the sophistry which had reduced the acute and manly understandings of a Chillingworth or @ Bayle." Nor is the sincerity of the Catholicism he professed in these boyish days in any way discredited by the fact of his subsequent lack of religion. Indeed, as one of the acutest and most sympathetic of his critics has remarked, the deep and settled grudge he has betrayed towards every form of Christian belief, in all the writings of his maturity, may be taken as evidence that he had at one time experi- enced in his own person at least some of the painful workings of a positive faith.

But little time was lost by the elder Gibbon in the forma- tion of a new'plan of education for his son, and in devising some method which if possible might effect the cure of his "spiritual malady." The result of deliberation, aided by the

advice and experience of Lord Eliot, was that it was almost immediately decided to fix Gibbon for some years abroad a Calvinist miuister at Lausanne. regards the instructor and guide thus selected, a more fortunate choice could scarcely have been made. From the testimony of his pupil, and

the stjj] more conclusive evidence of his own correspondence with the father, Pavilliard seems to have been a man of singular good sense, temper, and tact. At the outset, indeed, there was one considerable obstacle to the free intercourse of tutor and pupil: M. Pavilliard appears to have kuown little of Eng- lish, and young Gibbon knew practically nothing of French. But this difficulty was soon removed by the pupil's dili- gence ; the very exigencies of his situation were of service to him in calling forth all his powers, and he studied the language with such success that at the close of his five years' exile he declares that he "spontaneously thought" in French rather than in English, and that it had become niore familiar to "ear, tongue, and pen." It is well known that in after years he had doubts whether he should not compose his great work in French; and it is certain that his familiarity with that language, in spite of considerable efforts to counteract its effects, tinged his style to the last,

Under the judicious regulations of his uew tutor a methodical course of reading was marked out, and most ardently prosecuted ; the pupil's progress was proportion- ably rapid. With the systematic study of the Latin, and to a slight extent also of the Greek classics, he con- joined that of logic in the prolix system of Crousaz; and he further invigorated his reasoning powers, as well as enlarged his knowledge of metaphysics and jurisprudence, by the perusal of Locke, Grotius, and Montesquieu. He also read largely, though somewhat indiscriminately, in French literature, and appears to have been particularly struck with Pascal's Provincial Letters, which he tells us he reperused almost every year of his subsequent life with new pleasure, and which he particularly mentions as having been, along with Bleterie's Life of Julian and Giannone's Mstory of Naples, a book which probably contributed in a special Sense to form the historian of the Roman empire. The comprehensive scheme of study included mathematics also, far as the conic sections in the He assures us that his tutor did not complain of any inaptitude on the pupil's the pupil was as happily unconscious of

Under the new influences which were brought to bear on two years resumed his Protestantism. "He is willing," he Says, to allow M. Pavilliard a hand- some share in his Teconversion," though he maintains, and no doubt rightly, that it was principally due "to his own Solitary reflections." He particularly congratulated himself on having discovered the 'philosophical argument"

against transubstantiation, “that the text of Scripture which seems to inculcate the real presence is attested only by a single Sense—our sight, while the rea] presence itself is disproved by three of our Senses—the sight, the touch, and the taste.” Before a similar mode of reasoning, all the other distinctive articles of the Romish creed “disappeared like a dream” ; and “after a full conviction,” on Christmas day, 1754, he received the sacrament in the church of Lausanne,

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Although, however, he adds that at this point he suspended his religious inquiries, ‘‘acquiescing with implicit belief in the tenets and mysteries which are adopted by the general consent of Catholics and Protestants,” his readers will pro- bably do him no great injustice if they assume that even then it was rather to the negations than to the affirmations of Protestantism that he most heartily assented.

twelve hours a day), he still found some time for the acqui- sition of some of the lighter accomplishments, such as riding, dancing, drawing, and also for mingling in such Society as he writes to

by at least one memorable tour of Switzerland, by Basel, and Bern, made along with Pavilliard in the autumn of 1755. this residence abroad saw the infusion of two new elements—one of them at least of considerable import- ance—-into his life. at Lausanne; and although the young Englishman of twenty, who eagerly sought and easily obtained an introduction, the establishment of the theatre at

In the same year—apparently about June—he saw for the first time, and forthwith loved, the beautiful, intelligent, and accom- Curchod, daughter of the pasteur of Crassier. That the passion which she inspired in him was tender, pure, and fitted to raise to a higher level a nature which in some respects was much in need of such elevation will be doubted by none but the hopelessly cynical ; and probably there are few readers who can peruse the paragraph in which Gibbon « approaches the delicate

i | Subject of his early love” without discerning in it a pathos

much deeper than that of which the writer was himself aware. During the remainder of his residence at Lausanne

he had good reason to “ indulge his dream of felicity ”; but on his return to England, “I soon discovered that my father would not hear of this strange alliance, and that without his consent I was myself destitute and helpless.

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- The Journal for 1755 records that during that year, besides writing and translating a great deal in Latin and F rench, he had read, amongst other works, Cicero’s LEpistole ad Familiares, his Brutus, all his Orations, his dialogues De Amicitia and De Senectute, Terence (twice), and Pliny’s Epistles. In January 1756 he says :— **T determined to read over the Latin authors in order, and read this year Virgil, Sallust, Livy, Velleius Paterculus, Valerius Maxiinus, Tacitus, Suetonius, Quintus Curtius, J ustin, Florus, Plautus, Tereuce, and Lucretius.. I also read and meditated Locke Upon the Understand- j Again in January 1757 he writes;—‘‘T began to study algebra, under M. de Traytorrens, went through the elements of algebra and geometry, and the three first books of the Marquis de l’Hopital’s Coniz Sections. I also read Tibullus, Catullus, Propertins, Horace (with Dacier’s and Torrentius’s notes), VirgiJ, Ovid’s Epistles, with Mezi- riac’s commentary, the Ars Amandi, aud the Hilegies; likewise the Augustus and Tiberius of Suetonius, and a Latin translation of Dion Cassius from the death of Julius Cesar to the death of Augustus. I also continued my Correspondence, begun last year, with M. Allamand of Bex, and the Professor Breitinger of Ziirich, and opened a new one with the Professor Gesner of Gottingen. W.2B.—Last year and this I read St John’s Gospel, with part of Xenophon’s Cyropaedia, the Niad, and Herodotus; but, upon the whole, I rather neglected my Greek.

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After a painful struggle I yielded to my fate ; I sighed as a lover, 1 obeyed asa son; my wound was insensibly healed by time, absence, and the habits of a new life.” }

In 1758 he returned with mingled joy and regret to Eng- land, and was kindly received at home, But he found a stepmother there ; and this apparition on his father's hearth at first rather appalled him. The cordial and gentle

for his happiness, won him from his first prejudices, and gave her a permanent place in his esteem and affection. He seems to have been much indulged, and to have led a very pleasant life of it; he pleased himself in moderate

excursions, frequented the theatre, mingled, though uot

very often, in society ; was sometimes a little extravagant, and sometimes a little dissipated, but never lost the benefits of his Lausanne exile; and easily settled into a sober, dis- creet, calculating Epicurean philosopher, who sought the summum bonum of man in temperate, regulated, and elevated pleasure. The first two years after his return to England he spent principally at his father's country seat at Buriton, in Hampshire, only nine mouths being given to the metro- polis. He has left an amusing account of his employments in the country, where his love of study was at once inflamed by a large and unwonted command of books and checked by the necessary interruptions of his otherwise happy domestic life. After breakfast "he was expected," he says, to spend an hour with Mrs Gibbon; after tea his father claimed his conversation ; in the midst of an in- teresting work he was often called down to entertain idle visitors ; and, worst of all, he was periodically compelled to return the well-meant compliments. He mentions that he dreaded the ""'recurrence of the full moon," which was the period generally selected for the more convenient accomplishment of such formidable excursions.

His father's library, though large in comparison with that he commanded at Lausanne, contained, he says, " much trash ;" but a gradual process of reconstruction transformed it at length into that " numerous and select" library which was "the foundation of his works, and the best comfort of his life both at home and abroad." No sooner had he re- turned home than he began the work of accumulation, and records that, on the receipt of his first quarter's allowance, a large share was appropriated to his literary wants. " He could never forget," he declares, "the joy with which he exchanged a

bank note of twenty pounds for the twenty volumes of the Memoirs of the Academy of Inscriptions," an Academy which has been well characterized (by Saiute- Beuve) as Gibbon's intellectual fatherland. It may not be uninteresting here to note the principles which guided him both now and afterwards in his literary purchases. 'I am not conscious," says he, "of having ever bought a book from a motive of ostentation; every volume, before it was deposited on the shelf, was either read or sufficiently ex- amined"; he also mentions that he soon adopted tlie tolerating maxim of the elder Pliny, that no book is ever so bad as to be absolutely good for nothing.

In London he seems to have seen but little select society, —partly from his father's taste, '"which had always preferred the highest and the lowest company," and partly from his own reserve and timidity, increased by his foreign educa- tion, which had made English habits unfamiliar, and the very language in some degree strange. And thus he was led to draw that interesting picture of the literary recluse among the crowds of London: "While coaches were rattling through Bond Street, I have passed many a solitary

1 The affair, however, was not finally broken off till 1763. Mdlle. Curchod soon afterwards became the wife of Necker, the famous finan- cier ; and Gibbon and the Neckcrs frequently afterwards met on terms of mutual friendship and esteem.

CAB ow

sometimes interrupted with a sigh, which I breathed towards Lausanne; and on the approach of spring I with- drew without reluctance from the noisy and extensive scene of crowds without company, and dissipation without plea- sure." He renewed former acquaintance, however, with the "poet" Mallet, and through him gained access to

Lady Hervey's circle, where a congenial admiration, not to manners of Mrs Gibbon, however, and her unremitting care ©

say affectation, of French manners and literature made him a welcome guest. It ought to be added that in each of the twenty-five years of his subsequent acquaintance with London "the prospect gradually brightened,"

and his social as well as his intellectual qualities secured him a wide circle of friends. In one respect Mallet gave him good counsel in those early days. He advised him to addict himself to an assiduous study of the more idiomatic English writers, such as Swift and Addison,—with a view to unlearn his foreign idiom, and recover his half-forgotten vernacular,— a task, however, which he never perfectly accomplished. Much as he admired these writers, Hume and Robertson were still greater favourites, as well froni their subject as for their style. Of his admiration of Hume's style, of its nameless grace of simple elegance, he has left us a strong expression, when he tells us that it often compelled him to elose the historian's volumes with a mixed sensation of delight and despair.

In 1761 Gibbon, at the age of twenty-four, after many delays, and with many flutterings of hope and fear, gave to the world, in French, his maiden publication, an Lssaz sur U Etude de la Littérature, which he had composed two years before. It was published partly in compliance with his father's wishes, who thought that the proof of some literary talent might introduce him favourably to public notice, and secure the recommendation of his friends for some appointment in connexion with the mission of the English plenipotentiaries to the congress at Augsburg which was at that time in contemplation, But in yielding to paternal authority, Gibbon frankly owns that he "com- plied, like a pions son, with the wish of his own heart."

The subject of this youthful effort was suggested, its author says, by a refinement of vanity—'"the desire of justifying and praising the object of a favourite pursuit," nainely, the study of ancient literature. Partly owing to its being written in French, partly to its character, the Essai excited more attention abroad than at home. Gibbon has criticized it with the utmost frankness, not to say severity ; but, after every abatemeut, it is unquestionably a surprising effort fora mind so young, and contains many thoughts which would not have disgraced a thinker or a scholar of much maturer age. His account of its first re- ception and subsequent fortunes in England deserves to be cited as a curious piece of literary history. "In England," he says, "it was received with cold indifference, little read, aud speedily forgotten. A small impression was slowly dis- persed ; the bookseller murmured, and the author (had his feelings been more exquisite) might have wept over the blunders and baldness of the English translation.

The publication of my history fifteen years afterwards revived the memory of my first performance, and the essay was eagerly sought in the shops. But I refused the permission which Becket solicited of reprinting it; the public curiosity was imperfectly satisfied by a pirated copy of the booksellers of Dublin ; and when a copy of the original edition has been discovered in a sale, the primitive value of half-a-crown has risen to the fanciful price of a guinea or thirty shillings.”” Sometime before the publication of the essay, Gibbon

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2 The Essai, in a good English translation, now appears in the Miscellaneous Works. Villemain finds in it ‘‘peu de vues, nulle originalité surtout, mais une grande passion littéraire, Vamour des recherches savantes et du beau langage.” Sainte-Beuve’s criticism 18

| almost identical with Gibbon’s own ; but though he finds that ‘‘ La

Gib BOW O77

had entered a new and, one might Suppose, a very uncon- genial scene of life. In an hour of patriotic ardour he became (June 12, 1759) a captain in the Hampshire militia, and for more than two years (May 10, 1760, to December 23, 1762) led a wandering life of « military ser- vitude.” Hampshire, Kent, Wiltshire, and Dorsetshire formed the successive theatres of what he calls his ‘ blood- less and inglorious campaigns.” He complains of the

pendent, I should have prolonged and perhaps have fixed my residence at Paris,”

From France he proceeded to Switzerland, and spent nearly a year at Lausanne, where many old friendships and studies were Tesumed, and new ones begun. His reading

however brief, ‘““‘My temper is not very susceptible of enthusiasm, and the enthusiasm which I do not feel I have

battalion gave me a clearer notion of the phalanx and the legion, and the captain of the Hampshire grenadiers (the

It was during this period that he read Homer and Lon- ginus, having for the first time acquired some real mastery of Greek ; and after the publication of the Lssaz, his mind was full of projects for a new literary effort. The Italian

The five years and a half which intervened between his return from this tour, in June 1765, and the death of his father, in November 1770, seem to have formed the por- tion of his life which « he passed with the least enjoyment, and remembered with the least satisfaction." He attended

parisons of Henry V. and. the emperor Titus, the history of the. Black Prince, the life of Sir Philip Sydney, that of

and rose successively to the rank of major and lieutenant- colonel commandant ; but was each year "more disgusted with the inn, the Wine, the company, and the tiresome re. petition of annual attendance and daily exercise." From

particular prejudice or belief to overthrow.

The militia was disbanded in 1762, and Gibbon joyfully shook off his bonds ; but his. literary projects were still to be postponed. Following his own wishes, though with his father's consent, he had early in 1760 projected a Conti- nental tour as the completion " of an English gentleman's education." This had been interrupted by the episode of the militia ; now, however, he resumed his purpose, and left England in January 1763, Two years. were "loosely de- fined as the term of his absence," which he exceeded by half a year—returning June 1765, He first visited Paris, Where he saw a good deal of D'Alembert, Diderot, Bar- thélemy, Raynal, Helvétius, Baron d'Holbach, and others of that circle, and was often a welcome guest in the

the chances of civil office or India adventure, or even the fat slumbers of the church." From the emoluments of a

land, he consulted M. Deyverdun, a young Swiss with whom he had formed a close and intimate friendship during his first residence at Lausanne, and finall y decided in favour of the land which was his “friend’s by birth” and “his own by adoption.” He executed the first book in French ; it was read (in 1767), as an anonymous produc-

him, and into. which some literary reputation had already Preceded him, that he declared, “Had I been rich and inde-

1 Her letters to Walpole about Gibbon contain some interesting Temarks by this ““aveugle clairvoyante,”’ as Voltaire calls her 3 but

strictures. It never got beyond that rehearsal 3; Hume, they belong to a later period (1777),

indeed, approved of the performance, only deprecating as

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unwise the author’s preference for French ; but Gibbon sided with the majority.

In 1767 also he joined with M. Deyverdun in starting a literary journal under the title of Mémoires Littéraires de la Grande Bretagne. But its circulation was limited, and only the second volume had appeared (1768) when Dey- verdun went abroad. The materials already collected for a third volume were suppressed. It is interesting, however, to know that in the first volume is a review by Gibbon of Lord Lyttelton’s History of Henry II., and that the second volume contains a contribution by Hume on Walpole’s Historic Doubts.

The next appearance of the historian made a deeper im- pression. It was the first distinct print of the lion’s foot. “Ex ungue leonem” might have been justly said, for he attacked, and attacked successfully, the redoubtable War- burton. Of the many paradoxes in the Divine Legation, few are more extravagant than the theory that Virgil, in the sixth book of his Znezd,

intended to allegorize, in the visit of his hero and the Sibyl to the shades, the initiation of ZEneas, as a lawgiver, into the EJeusinian mysteries. This theory Gibbon completely exploded in his Critical Observa- tions (1770),—no very difficult task, indeed, but achieved in a style, and with a profusion of learning, which called forth the warmest commendations both at home and abroad. Warburton never replied; and few will believe that he would not, if he had not thought silence more discreet. Gibbon, however, regrets that the style of his pamphlet was too acrimonious; and this regret, considering his antago- nist's slight claims to forbearance, is creditable to him. "JT cannot forgive myself the contemptuous treatment of a man who, with all his faults, was entitled to my esteem ; and I can less forgive, in a personal attack, the cowardly concealment of my name and character."

Sxon after his "release from the fruitless task of the Swiss revolution" in 1768, he had gradually advanced from the wish to the hope, from the hope to the design, from the design to the execution of his great historical work. His preparations were indeed vast. The classics, ''as low as Tacitus, Pliny the Younger, and J uvenal," had been long familiar. He now " plunged into the ocean of the Augustan history," and "with pen almost always in hand," pored over all theoriginal records, Greek and Latin, between Trajan and the last of the Western Cwsars. " The subsidiary rays of medals and inscriptions, of geography and chronology, were thrown on their proper objects; and I applied the col- lections of Tillemont, whose inimitable accuracy almost assumes the character of genius, to fix and arrange within my reach the loose and scattered atoms of historical informa- tion." The Christian apologists and their pagan assailants ; the Theodosian Code, with Godefroy's commentary ; the Annals and Antiquities of Muratori, collated with ''the parallel or transverse lines" of Sigonius and Maffei, Pagi and Baronius, were all critically studied, Still following the wise maxim which he had adopted as a student, * multum legere potius quam multa," he reviewed again and agai the immortal works of the French and English, the Latin and Italian classics. He deepened and extended his acquaint- ance with Greek, particularly with his favourite authors Homer and Xenophon; and, to crown all, he succeeded in achieving the third perusal of Blackstone's Commentaries.

The course of his study was for some time seriously inter- rupted by his father's illness and death in 1770, and by the many distractions connected with the transference of his residence from Buriton to London, It was not, indeed, until October 1772 that he found himself at last independ- ent, and fairly settled in his house and library, with full leisure and opportunity to set about the composition of the first volume of his history. Even then it appears from his own confession that he long brooded over the chaos of

materials he had amassed before light dawned upon it. At the commencement, he says, "all was dark and doubtful "; the limits, divisions, even the title of his work were unde- termined ; the first chapter was composed three times, and the second and third twice, before he was satisfied with his efforts. This prolonged meditation on his design and its execution was ultimately well repaid by the result : So methodical did his ideas become, and so readily did his materials shape themselves, that, with the above excep- tions, the original MS. of the entire six quartos was sent uncopied to the printers. He also says that not a sheet had been seen by any other eyes than those of author and printer, a statement indeed which must be taken with a small deduction ; or rather we must suppose that a few chapters had been submitted, if not to the "eyes," to the "ears" of others; for he elsewhere tells us that he was "soon disgusted with the modest practice of reading the manuscript to his friends." Such, however, were his pre- liminary difficulties that he confesses he was often "tempted to cast away the labour of seven years"; and it was not until February 1776 that the first volume was published. The success was instant, and, for a quarto, pro- bably unprecedented. The entire impression was exhausted in a few days; a second and a third edition were scarcely adequate to the demand. The author might almost have said, as Lord Byron after the publication of Childe Harold, that "he awoke one morning and found himself famous." In addition to public applause, he was gratified by the more select praises of the highest living authorities in that branch of literature: "the candour of Dr Robertson embraced his disciple ;" Hume's letter of congratulation "overpaid the labour of ten years." The latter, however, with his usual sagacity, anticipated the objections which he saw could be urged against the famous fifteenth and sixteenth chapters. "T think you have observed a very

prudent temperament ; but it was impossible to treat the subject so as not to give grounds of suspicion against you, and you may expect that a clamour will arise."

The "clamour" thus predicted was not slow to make itself heard. Within two years the famous chapters had elicited what might almost be called a library of controversy. The only attack, however, to which Gibbon deigned to make any reply was thatof Davies, who had impugned hisaccuracy or good faith, His Vindication appeared in February, 1779; and, as Milman remarks, "this single discharge from the ponderous artillery of learning and sarcasm laid prostrate the whole disorderly squadron" of his rash and feeble assailants.!

1 For a very full list of publications in answer to Gibbon's attack on Christianity reference may be made to the Bibliographer''s Manual, pp. 885-6 (1858). Of these the earliest were Watson's Apology (1776), Salisbury's Strictures (1776), and Chelsum's (anonymous) Remarks (1776). In 1778 the Few Remarks by a Gentleman (Francis Eyre), the Reply of Loftus, the Letters of Apthorpe, and the Examina- tion of Davies appeared. Gibbon's Vindication (1779) called forth @ Reply by Davies (1779), and A Short Appeal to the Public by Francis Eyre (1779). Laughton's polemical treatise was published in 1780, and those of Milner and Taylor in 1781. Chelsum returned to the attack in 1785 (A Reply to Mr Gibbon's Vindication), and Sir David Dalrymple (An Inquiry into the Secondary Causes, &c.) made his first appearance in the controversy in 1786. 'ravis's Letters om 1 John v. 7 ave dated 1784; and Spedalieri's Confutazione dell Esame del Cristianismo fatto da Gibbon was published at Rome (2 vols. 4to) in the same year. Itis impossible not to concnr in almost every point with Gibbon's own estimate of his numerous assailants. Their crude productions, for the most part, Were conspicuous rather for insolence and abusiveness than for logic or learning. Those of Bishop Watson and Lord Hailes were the best, but simply because they con" tented themselves with a dispassionate exposition of the general argu ment in favour of Christianity. The most foolish and discreditable was certainly that of Davies ; his unworthy attempt to depreciate tne great historian's learning, and his captious, cavilling, acrimonious charges of petty inaccuracies and discreditable falsification gave the object of his attack an easy triumph.

GIBBON O79

Two years before the publication of this first volume | voice—‘ Vincentem strepitus et natum rebus agendis,’ Gibbon was elected member of parliament for Liskeard Timidity was fortified by pride, and even the success of my (1774). His political duties did not suspend his prosecution pen discouraged the trial of my voice.” Hig repugnance of his history, except on one occasion, and for a little while, | to public life had been strongly expressed to his father in in 1779, when he undertook, on behalf of the ministry, a | a letter of a very early date, in which he begged that the task which, if well performed, was also, it must be added, | money which a seat in the House of Commons would cost well rewarded. The French Government had issued a mani- | might be expended in a mode more agreeable to him.

secretary of state, to answer it, In compliance with this | had courage to encounter were hardly likely to be vanquished request he produced the able Mémoire Sustificatif, com-| then, N or had he much political Sagacity. He was better posed in French, and delivered to the courts of Europe; and | skilled in investigating the past than in divining the future.

with a very substantial salary of nearly £800 per annum. | Gibbon saw nothing but colonies in rebellion, and a pater- His acceptance displeased some of his former political associ- nal Government justly incensed, His silent votes Were all ates, and he was accused of « deserting his party.” In his | given on that hypothesis. In a similar manner, while he Memoir, indeed, Gibbon denies thathehad ever enlisted with | abhorred the French Revolution when it came, he seems to the Whigs.

within a fortnight of the date of his acceptance of office, he | speculations of the philosophic coteries jn which he had is there alleged to have said that “there was no salvation for | taken such delight. But while it may be doubted whether

merely replies, somewhat weakly it must be said, that | of the present advantage which he derived from it in the his friend never intended the words to be taken literally. | prosecution of the great work of his life,—an advantage of More to the point is the often-quoted passage from Gibbon’s |

which he was fully conscious when he wrote: « The eight letter to Deyverdun, where the frank revelation is made : Sessions that I sat in parliament were a school of civil

out patriotism and without ambition, and that all my views Having sold all his property except his library—to him tended to the convenient and Tespectable place of a lord equally a necessary and a luxury—Gibbon repaired to of trade." Lausanne in September 17 83, and took up his abode with

Mistory were published, They excited no controversy, and | fectly free from every engagement but those which his own were comparatively little talked about—so little, indeed, | tastes imposed, easy in his circumstances, commanding just as to have extorted from him a half murmur about " eold. as much society, and that as select, as he pleased, with ness and prejudice." The volumes, however, were bought | the noblest Scenery spread out at his feet, no situation can and read with silent avidity. Meanwhile public events | be imagined more favourable for the prosecution of his lit.

in 1782, and Gibbon's salary vanished with it,—no trifle, | a spacious and convenient mansion, connected on the for his expenditure had been for three years on a scale | north side with the city, and open on the south to a beau- somewhat disproportionate to his private fortune. He did tiful and boundless horizon, A. garden of four acres had not like to depend on Statesmen's promises, which are pro- | been laid out by the taste of M. Deyverdun ; from the verbially uncertain of fulfilment ; he as little liked to garden a rich scenery cf meadows and Vineyards descends retrench ; and he was wearied of parliament, where he had | to the Leman Lake, and the prospect far beyond the lake Never given any but silent votes, Urged by such consider- | js crowned by the stupendous mountains of Savoy." In ations, he once more turned his eyes to the scene of his | this enviable retreat, it is no wonder that a year should early exile, where he might live on his decent patrimony | have been suffered to roll round before he vigorously re- in astyle which wags impossible in England, and pursue | sumed his great work,—and with many men it would never unembarrassed his literary studies, He therefore resolved | have been resumed in such a paradise, We

may remark to fix himself at Lausanne. in passing that the retreat was often enlivened, or in.

A word only is necessary on his parliamentary career, vaded, by friendly tourists from England, whose « frequent Neither nature nor acquired habits qualified him to be incursions" into Switzerland our recluse seems half to on orator; his late entrance on public life, his natural | lament as an evil. Among his more valued Visitors were timidity, his feeble voice, his limited command of idiomatic | M. and Mme. N ecker ; Mr Fox also gave him two welcome English, and even, as he candidly confesses, his literary | « days of free and private society " in 1788, Differing as fame, were all obstacles to success. "After a fleeting, they did in politics, Gibbon's testimony to the genius and illusive hope, prudence condemned me to acquiesce in the | character of the great statesman is highly honourable to humble station of a4 mute… I wes not armed by | both ; "Perhaps no human being," he says, "was ever nature and education with the intrepid energy of mind and more perfectly exempt from the taint of malevolence,

SLMS 7 75″ he owe: '*I am still a mute; it is more | V@HIty, or falsehood." : : Biitiendor, than fo eet, ate ae sede fill me with despair; ' Vhen once fairly reseated at his task, he proceeded in the bad ones with terror," this delightful retreat leisurely, yet rapidly, to its comple-

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tion. completed in June 1784; the preparation of the fifth volume occupied less than two years ; while the sixth and last, begun 18th May, 1786, was finished in thirteen months. The feelings with which he brought his labours to a close must be described in his own inimitable words: "It was on the day, or rather night, of the 27th of June 1787, between the hours of eleven and twelve, that I wrote the last lines of the last page in a summer house in my garden. After laying down my pen, I took several turns in a berceau or covered walk of acacias, which commands a prospect of the country, the lake, and the mountains. The air was temperate, the sky was serene, the silver orb of the moon was reflected from the waters, and all nature was silent. T will not dissemble the first emotions of joy on the re- covery of my freedom, and, perhaps, the establishment of my fame. But my pride was soon humbled, and a sober melancholy was spread over my mind by the

idea that I had taken an everlasting leave of an old and agreeable com- panion, and that whatsoever might be the future date of my History, the life of the historian must be short and pre- carious.”

Taking the manuscript with him, Gibbon, after an absence of four years, once more visited London in TST ; and the 5lst anniversary of the author’s birthday (27th April 1788) witnessed the publication of the last three vol- umes of The Decline and Fall. They met with a quick and easy sale, were very extensively read, and very liberally and deservedly praised for the unflagging industry and vigour they displayed, though just exception, if ouly on the score of good taste, was taken to the scoffing tone he continued to maintain in all passages where the Christian religion was specially concerned, and much fault was found with the indecency of some of his notes.

He returned to Switzerland in July 1788, cherishing vague schemes of fresh literary activity ; but genuine sor- row caused by the death of his friend Deyverdun interfered with steady work, nor was it easy for him to fix on a new subject which should be at once congenial and proportioned to his powers ; while the premonitory mutterings of the great thunderstorm of the French Revolution, which rever- berated in hollow echoes even through the quiet valleys of Switzerland, further troubled his repose. Forsome months he found amusement in the preparation of the delightful Memoirs (1789) from which most of our knowledge of his personal history is derived; but his letters to friends in England, written between 1788 and 1793 occasionally betray a slight but unmistakable tone of ennuz. In April 1793 he unexpectedly received tidings of the death of Lady Shef- field; and the motive of friendship thus supplied combined with the pressure of public events to urge him homewards, He arrived in England on the following June, and spent the summer at Sheffield Place, where his presence was even more highly prized than it had ever before been. Returning to London early in November, he found it necessary to consult his physicians for a symptom which, neglected since LAG, had gradually become complicated with hydrocele, and was now imperatively demanding surgical aid; but the painful operations which had to be performed did not interfere with his customary cheerfulness, nor did they prevent him from paying a Christmas visit to Sheffield Place. Here, however, fever made its appearance ; and a

removal to Lon- don (January 6, 1794) was considered imperative. Another operation brought him some relief ; but a relapse occurred

1 An anonymous pamphlet, entitled Observations on the three last volumes of the Roman History, appeared in 1788; Disney's Sermon, with Strictures, in 1790; and Whitaker's Review, in 1791. With regard to the second of the above complaints, surprise will probably

be felt that if was not extended to portions of the text as well as to the notes.

GIBBON

The fourth volume, partly written in 1782, was | during the night of the 15th, and on the following day he

peacefully breathed his last. His remains were laid in the burial place of the Sheffield family, Fletching, Sussex, where an epitaph by Dr Parr describes his character and work in the language at once of elegance, of moderation, and of truth.

The personal appearance of Gibbon as a lad of sixteen is brought before us somewhat dimly in M. Pavilliard's de- scription of the "thin little figure, with a large head, dis- puting and arguing, with the greatest ability, all the best arguments that had ever been used in favour of popery." What he afterwards becaine has been made more vividly familiar by the clever silhouette prefixed to the Aftscel- laneous Works (Gibbon himself, at least, we know, did not regard it as a caricature), and by Sir Joshua Reynolds's portrait so often engraved. It is hardly fair perhaps to add a reference to Suard's highly-coloured description of the short Silenus-like figure, not more than 5€ inches in height, the slim legs, the large turned-in feet, the shrill piercing voice; but almost every one will remember, from Croker's Boswell, Colman's account of the great historian " tapping his snuff-box, smirkingand smiling, and rounding his periods" from that mellifluous mouth. It has already been seen that Gibbon's early ailments all left him on the approach of manhood ; thenceforward, "till admonished by the gout," he could truly boast of an immunity well-nigh perfect from every bodily complaint; an exceptionally vigorous brain, and a stomach "almost too good," united to bestow upon him a vast capacity alike for work and for

enjoyment. This capacity he never abused so as to burden his conscience or depress his spirits. "' The madness of superfluous health I have never known." 'To illustrate the intensity of the pleasure he found alike in the solitude of his study and in the relaxations of genial social intercourse, almost any page taken at random, either from the Life or from the Letters, would suffice; and many incidental touches show that he was not a stranger to the delights of quiet contemplation of the beauties and grandeurs of nature. His manners, if formal, were refined; his conversation, when he felt himself at home, interesting and unaffected; and that he was capable alike of feeling and inspiring a very constant friendship there are many witnesses to show. That his temperament at the same time was frigid and comparatively passionless cannot be denied ; but neither ought this to be imputed to him as a fault ; hostile criticisms upon the grief for a father's death, that "'was soothed by the conscious satisfaction that I had discharged all the duties of filial piety." seem somewhat out of place. His most ardent admirers, however, are constrained to admit that he was de- ficient in large-hearted benevolence ; that he was destitute of any "enthusiasm of humanity"; and that so far as every sort of religious yearning or aspiration is concerned, his poverty was almost unique. Gibbon was such a man as Horace might have been, had the Roman Epicurean been fonder of hard intellectual work, and less prone than he was to the indulgence of emotion.

Of Gibbon's mental qualities it is interesting to read the estimate formed and recorded by himself on his twenty- sixth birthday [May 8th, N.S., 1762]: "Wit I have none. My imagination is rather strong than pleasing. My memory both capacious and retentive. The shining qualities of my understanding are extensiveness and penetration; but it want both quickness and exactness." Twenty-six years afterwards, he wrote on the same subject in his Memoirs :— " The original soil has been highly improved by cultivation ; but it may be questioned whether some flowers of fancy, some grateful errors, have not been eradicated with the weeds of prejudice." No student of The Decline and Fall will accuse its author of immodesty or vanity in these self- appreciations, but will rather be surprised that he should have so considerably underestimated both his endowments

Of the kind and amount of varied truly immortal work it would be almost impossible to speak in language of exaggerated

treats, the history of the world 3 and it is nothing less than astonishing that he should have been able to work with so much ease the vast and incongruous materials into such a unity of design. Tt is the spread, the largest historic single hand; and only a comprehensive and orderly intellect of the highest rank could have grappled as Gibbon has done with the task of blending that vast array of nations, in al] their varieties of costume, habit, language, and religion, into one picturesque and harmonious whole, been conscious of ally inexactitude in his mental habit, it was a defect which he very early and very successfully remedied. No man could that "curiosity as well as examine all the original documents that could illustrate the subject which he had undertaken to treat,"

obscure tribes, blems which ethnology presents, deductions of

migrations of the of Belisarius or the conquests of the

control been, on the whole, more uniformly exhibited in cases

something to Precise, energetic, massive it is g splendid, when the Pictorial demands of the narrative re-

antithesis, ation; not the fluent naturally-winding stream, but a

embankments, or flowing over noble arches, duct still. Itisa just criticism of Sir James Mackintosh

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that probably no great writer ever derived less benefit from is professed models, Pascal, Voltaire, Hume, were hig

delight ; and he acknowledges, as so

well might, that he often closed the pages of the last with

a feeling of despair. Addison and

very purpose of improving his acquaintance with idiomatic

chapter, where he treats of the crusades. In this instance b “a brief parallel” he has Sought to save himself « the re- petition of a tedious narrative,” but hag only succeeded in presenting a superficial sketch

characterized than as

political life must, however inarticulately, have often felt. Gibbon’s enthusiasm for the empire of Trajan and the Antonines—. that “solid fabric of human greatness ”—is undisguised and perfectly sincere ; to his thinking, if the earth ever enjoyed a golden age, it was then.

See Sainte-Beuve, Causeries, viii. 460. ‘ – 2 Tha du lettré chinois dang sa maniére d’apprécier les religions. —Sainte-Beuyve,

ss unable when Christianity comes to be discussed to con- ceal his heartfelt dislike. Comparing “ superstition ” with “ superstition,” virtue with virtue, vice with vice, Gibbon had formed a deliberate preference for the religion and ethics of ancient Rome. Philosophical students of history, even though they may feel themselves unable to subscribe the Athanasian creed, may now be said to be almost unani- mous, however, in finding that the phenomenon called Christianity did mean for mankind a higher conception of truth and a nobler conception of duty.

Upon the famous fifteenth and sixteenth chapters it is not necessary to dwell, because at this time of day no Christian apologist dreams of denying the substantial truth of any of the more important allegations of Gibbon. Christians may complain of the suppression of some circumstances which might influence the general result ; and they must remonstrate against the unfair construction of their case. But they no longer refuse to hear any reasonable evidence tending to show that persecution was less severe than had ouce been believed; and they have slowly learned that they can afford to concede the validity of all the secondary causes assigned by Gibbon, and even of others still more dis- creditable. The fact is, as the historian himself has again and again admitted, that his account of the secondary causes

which contributed to the progress and establishment of Christianity leaves the question as to the natural or supernatural origin of Christianity practically untouched ; that question still continues to be agitated, but the battle is fought ou a new field and with other weapons than those selected by Gibbon.

Of the original quarto edition of The Decline and Fall, vol. i.

appeared, as has already been stated, in 1776, vols. ii. and iii. in 1781, and vols. iv ~~vi. (inscribed to Lord North) in 1788. In later editions vol. i. was considerably altered by the author; the others hardly at all. The number of modern reprints has been very considerable ; but the most important and valuable English edition is that of Milman (1839 and 1845), still more recently enriched under the editorship of Dr W. Smith (8 vols. 8vo, 1854 and 1872). Asa curiosity of literature Bowdler's edition, '* adapted to the use of families and young persons" by the expurgation of 'the indecent expressions and all allusions of an improper tend~~ ency" (5 vols. 8vo, 1825), may be specially noticed. The French translation of Le Clerc de Septchénes, continued by Démeunier, Boulard, and Cantwell (1788-1795), has been frequently reprinted in France. It seems to be certain that the portion usually attri- buted to Septchénes was, in part at least, the work of his distin- guished pupil, Louis XVI. A new edition of the complete trans- lation, prefaced by a letter on Gibbon's life and character, from the en of Suard, and annotated by Guizot, appeared in 1812 (and again in 1828). There are at least two German translations of The Decline and Fall, one by Wenck, Schreiter, and Beck (1805-1807), and asecond by Sporschil (1862). The Italian translation (alluded to by Gibbon himself) was, along with Spedalieri's Confutazionc, reprinted at Milan in 1823. Gibbon's AMiscedlancous Works, with Memoirs of his Lifeand Writings, composed by himself ; illustrated from his letters, with occasional Notes and Narrative, published by Lord Sheffield in two volumes in 1796, has been often reprinted. The new edition in five volumes (1814) contained some previously unpublished matter, and in particular the fragment on the revolu- tions of Switzerland. A French translation of the Miscellaneous Works by Marigné appeared at Paris in 1798. There is also a German translation (Leipsic, 1801). It may be added that a special translation of the chapter on Roman Law (Gibbon's historische Uebersicht des Rémischen Rechts) was

published by Hugo at Got- tingen in 1839, and has frequently been used as a text-book in German universities. (H. RO.—J. S. BL.) GIBBONS, Grintine (1648-1721), a celebrated English wood-carver, was born in 1648, according to some authorities of Dutch parents at Rotterdam, and according to others of English parents at London. By the former he is said to have come to London after the great fire in 1666. He early displayed great cleverness and ingenuity in his art, on the strength of which he was recommended by Evelyn to Charles II., who employed him in the execution both of statuary and of ornamental carving in wood. In statuary one of his principal works is a life-size bronze statue in the

court of Whitehall, representing James II. in the dress

of a Roman emperor, and he also designed the base of the statue of Charles I. at Charing Cross. It is, however, chiefly as an engraver in wood that he has acquired a reputation. He was employed to execute the ornamental carving for the chapel at Windsor, the foliage and festoons in the choir of St Paul's, the baptismal fonts in St J ames's, and an immense quantity of ornamental work at Burleigh, Chats- worth, and other aristocratic mansions. The finest of all his productions in this style is believed to be the ceiling which he devised for a roomat Petworth. His subjects are chiefly birds, flowers, foliage, fruit, and lace, and many of his works, for delicacy and elaboration of details, and truth- fulness of imitation, have never been surpassed. He, how- ever, sometimes wasted his ingenuity on trifling subjects : mauy of his flowers used to move on their stems like their natural prototypes when shaken by a breeze. In 1714 Gibbons was appointed master carver in wood to George I. He died at London August 3, 1721.

GIBBONS, Ortanpo (1583-1625), like Johann Sebastian Bach, was the most illustrious of a family of musicians all more or less able. We know of at least three generations of musical Gibbons, for Orlando's father, William Gibbons, having been one of the waits of Cam- bridge, may be assumed to have acquired some proficiency in the art. His three sons and at least one of his grandsons 'nherited and further developed his talent. The eldest, Edward, was made bachelor of music at Cambridge, and successively held important musical appointments at the cathedrals of Bristol and Exeter;

Ellis, the second son, was organist of Salisbury Cathedral, and is the composer of two madrigals in the collection known as the The Triwmphs of Oriana. Orlando Gibbons, the youngest and by far the most celebrated of the brothers, was boru at Cambridge in 1583, Where and under whom he studied is not known, but in his twenty-first year he was sufficiently advanced and celebrated to receive the important post of organist of the Chapel Royal. His first published com- position " Fantasies in three parts, composed for viols," appeared in 1610. It seems to have been the first piece of music printed in England from engraved plates, or " cut in copper, the like not heretofore extant." In 1622 he was created doctor of music by the university of Oxford. For this occasion he composed an anthem for eight parts, O clap your Hands, still extant. In the following year he became organist of Westminster Abbey. Orlando Gibbons died before the beginning of the civil war, or it may be supposed that, like his eldest brother, he would have been a staunch royalist. In a different sense, however, he died in the cause of his master; for having been summoned to Canterbury to produce a composition written in celebration of Charles's marriage, he there fell a victim to small-pox on June 5, 1625. Of his life very little is known, but that little is well summed up in the article contributed by Mr W. H. Husk to Dr Grove's Dictionary of Music and Musicians, where a complete list of his compositions is also given. His portrait may be found in Hawkins's well-known /7story. The works of Gibbons may be divided into secular and sacred compositions, the latter being by far the most im- portant portion. His vocal pieces, madrigals, motets, canons, songs, &c., are admirable specimens of part-writing, and prove him to have been a perfect master of polyphonous treatment. Many of them are for five voices, a very cOm- mon number in those days ; but pieces for four and for six voices also are by no means rare. To the first-named class belong a Ze Dewm in D minor, two sets of Preces and other compositions for church service, also most of the madrigals. We have also some specimens of his instrumental music, such as the six pieces for the virginals published in Parthenia, a collection of instrumental music produced by Gibbons in conjunction with Dr Bull and Byrd.

GIs 2

GIBEON, a town famous in Old Testament history, under the name of FE] Jib, situated 5 mites north-west of Jerusalem. spring (2 Sam. south-east side

groves surround the place. from the Hebrew root gabah, signifying "prominence," and there are throughout Palestine many ancient sites situate on rocky knolls which receive names (¢.g., Gibeah, Geba, Gabe, Gaba—nearly all represented by the present J eba) derived from this same root,

GIBRALTAR, a British fortress aud town in the south of Spain, Occupying a i

Its latitude is 36° 6' 93" N. and its W. The "rock," as the promontory is about 24 miles in length, with a varying breadth of from 2 to 6 furlongs. Rising abruptly from the low sandy isthmus which connects it with the mainland to a height of 1200 feet, the main ridge continues south for about 14 miles, being separated by two transverse depres- sions, known respectively as the Northern and Southern Quebrada, into three pretty distinct summits—the Wolf's Crag or North Front, the Middle Hill or Signal Station (1255 feet high), and the Pan de Azucar or Sugar Loaf Hill, dominated by O'Hara's tower (1 mit descends somewhat abruptly

familiarly called, is

as precipi- north, but comparatively gradual though interrupted by longitudinal cliffs and Tavines, and a con- siderable space of fairly level ground at the foot affords a site for the town.

The basement rock of Gibraltar is for the most part a greyish white or pale grey limestone, of compact and some- times crystalline texture, places apparently amorphous, Series of

the shales age, but the rest of the forma- tions are of much more ancient date, According to the Ramsay and Geikie (" Geology of the Geological Society, London, 1878),the oldest superficial accumulation is the unfossiliferous limestone breccia of Buena Vista, which somewhat severer climatic when the rock had a wider

conditions than the present, and This period was probably

area of low ground at its base, followed by one with a genial climate, during which the Promontory, if indeed it was not rather an isthmus between

rope and Africa, was clothed with vegetation and inhabited by a rich mammalian fauna, whose remains are

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sandstones which have mcorporated shells of recent Mediter- The process of depression wag apparently Qn its re-elevation, the land wag

Like most masses of limestone formation, of Gibraltar is boneycombed with caverns ous I

the promontory and subterrane-

SEA

BAY

CATALAN BAY

SALTa CARROBO

JUMPERS BASTION

\ ge + G% Old Convicts /})4 Estebt (NEW mote wl) 09929 lj Swe

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ROSIA BAY \ 7S ** Chee Ase

C/BRAL TAR

- 35: a) E Vigvista Buena Vista Pt +, by oe ‘

ME. BOTT ERR ALR EN

2. RaseHn ‘s fellow:

. Fig Tree a ye PSe 4. Monkey’ 5 1) ey 5. Beef Steak ShingjePt\ Ge 3.

6. The Judge’s 1

7. Remains of

12, Presbyterian Church, 13. Convent or Governe Ment House,

HALF ENCLISH MILE

Chart of Gibraltar,

some of them for the paleontological and archeological remains which they yielded to the Brome between 1863 and 1868. St Michael’s Cave, which

Southern Quebrada, A rapid slope of earth gives admission to a hall 200 feet long by 70 feet high, the roof of which appears as if it were supported pillars ; and from this hall access is obtained to a series of four similar caves connected with each other by tortuous passages, the last cave being situated about 300 feet below the surface, and about 400 feet of travelling distance south by west from the entrance. was called Victoria cave by its dis- coverer Captain Brome, and the three others, being more closely associated, received the common name of Leonora’s

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caves, “Nothing,” says Captain Brome, “can exceed the beauty of the stalactites ; they form clusters of every im- aginable shape—statuettes, pillars, foliages, figures. Even the American visitors have been compelled to acknowledge that, as regards beauty and picturesqueness, even the Mammoth Cave would not come near them.” The mam- malian remains of the Genista cave have been investigated by Mr Busk (“Quaternary Fauna of Gibraltar,” in Z’rans. of Zool. Soc., vol. x. p. 2, 1877), and found to comprise specimens of a bear, probably Ursus fossilis of Goldfuss ; a hyena, probably H. crocuta or spelea; various species of cats, from the size of a leopard to that of a wild cat; a rhinoceros similar to the species found in

the valley of the Thames; two forms of ibex; and the hare and the rabbit. No trace has been discovered of Rhinoceros tichorinus, of Ursus spelcus, or of the reindeer, and the only relic of the elephant as yet registered within the peninsnla is a per- fect specimen of the penultimate upper molar tooth of Elephas antiquus. Yor further details see James Smith of Jordanhill "On the geology of Gibraltar," in Quart. Journ. of Geol. Soc., vol. ii., and G. Busk and Hugh Falconer "On the Fossil Contents of the Genista Cave," in Quart. Journ. of Geol. Soc. vol. xxi., reprinted in Falconer's Paleontological Memoirs, London, 1868.

To the voyager entering the straits the rock presents a bare and almost barren aspect, especially when the summer suns have dried up the verdure; but as he approaches he discovers a considerable clothing of vegetation, and closer acquaintance reveals the existence of an extensive flora. Here and there a grassy glen gives shelter to a group of trees, and the villas of the English residents are snr- rounded with luxuriant gardens and copses. Dr E. F. Kelaart in his Flora Calpensis (London, 1846) enumerates upwards of 400 flowering plants and ferns as indigenous to Gibraltar, and about fifty as introduced. Of the former a few appear ta be species peculiar to the rock. White poplars, the cotton-tree, the pepper-tree or pimenta, the ilex, and the pine are the most noticeable of the larger trees ; the bella-sombra (Phytolacca dioica), introduced by General Don, the aloe, and the prickly pear are common ; and on the eastern side of the rock the dwarf palm (Chamerops humilis) covers large areas. Among the fruit trees, which, however, are cultivated rather for ornament than for profit, may be mentioned the almond, the olive, the orange, the lemon, the pomegranate, the fig, and the loquat. In January and February many portions of the rock present a charming sight from the profusion and beauty of the wild flowers. The fauna of Gibraltar is naturally poor,—rabbits, foxes, partridges, pigeons, and woodcocks being the principal species. The little Barbary apes, of which every schoolboy has heard, but which not every resident in Gibraltar has seen, are few in number, not more than twenty per- haps, and they usually inhabit the higher and eastern parts of the rock, except when they are driven towards the lower grounds by the cold winds from the north-east. They then do a little damage to the fruit trees; but they enjoy impunity as perfect as that of the storks in Holland or the ibis in Egypt. As to its climate Gibraltar belongs to the subtropical zone, with a dry summer

and a rainy season in winter. More than half the rainfall of the year, which ouly amounts to about 28 or 30 inches, occurs in November, December, and January; and the three months of June, July, and August are hardly refreshed by a shower, The temperature is subject to frequent disturbances: from 93° to 87° is the highest reached (July), and 43° the lowest (February), and the mean for the summer months is from 74° to 79°. Insummer the heat is tempered by a sea-breeze which blows from about 10 a.m. till shortly before sunset. Easterly winds or levanters are common from July to November, and during their prevalence every living creature

seems to suffer. Heavy dews and thick fogs occur in autumn, and are as disagreeable as they are unhealthy. In the early part of the present century Gibraltar was notori- ously filthy and ill-drained, and epidemic diseases committed great ravages from time to time; but great improvements have been effected, especially through the sanitary com- mission instituted in 1865. The inhabitants were formerly dependent on the rainfall for most of their water supply, the springs in the rock being both scanty and brackish; but in 1869 an abundant source of fairly good water was found to exist under the sands of the North Front, and pumps and conduits have been constructed for its distribution. In 1876 the quality of the water was reported to be de- teriorating. Besides the private tanks, still numerous throughout the town, there are eight bomb-proof cisterns for rain-water, of a total capacity of 40,000 tons. The navy tank, for the supply of ships, holds from 9000 to 11,000 tons.

Gibraltar is emphatically a fortress, and in some respects its fortifications are unique. On the eastern side the rock needs no defence beyond its own precipitous cliffs, and in all other directions it has been rendered practically impreg- nable. Besides a sea-wall extending at intervals round the western base of the rock, and strengthened by curtains and bastions and three formidable forts, there are batteries in all available positions from the sea-wall up to the summit 1350 feet above the sea; and a remarkable series of galleries has been hewn out of the solid face of the rock towards the north and nortli-west. These galleries have an aggregate length of between 2 and 3 miles, and their breadth is sufficient to let a carriage pass. Port-holes are

cut at intervals of 12 yards, so contrived that the gunners are safe from the shot of any possible assailants. At the end of one of the galleries hollowed out in a prominent part of the cliff is St George's Hall, 50 feet long by 35 feet wide, in which the governor was accustomed to give fétes. Alter- ations, extensions, and improvements are continually taking place in the defensive system, and new guns of the most formidable sort are gradually displacing or supplementing the old-fashioned ordnance. 'The whole population of Gibraltar, whether civil or military, is subjected to certain stringent rules. For even a day's sojourn the alien must obtain a pass from the town-major, and if he wish to remain longer a consul or householder must become security for his good behaviour, Licences of residence are granted only for short periods—ten, fifteen, or twenty days—but they can be renewed if occasion require. Military officers may introduce a stranger for thirty days. A special permit is necessary if the visitor wishes to sketch.

Though the town of Gibraltar may be said to date from the 14th century, it has preserved very little architectural evidence of its antiquity. Rebuilt on an enlarged and im- proved plan after its almost complete destruction during the great siege, it is still on the whole a mean-looking town, with narrow streets and lanes and an incongruous mixture of houses after the English and the Spanish types. Asa proprietor may at any moment be called upon to give up his house and ground at the demand of the military authorities, he is naturally deterred from spending his money on sub- stantial or sumptuouserections. The area of the town is about 100. acres. The public buildings comprise the cathedral of the Holy Trinity, a poor imitation of Moorish architecture ; the governor's house, formerly a Franciscan monastery and still familiarly known as "The Convent "; the exchange; the court-house; the civil hospital ; the revenue offices ; and the garrison library, planned by Colonel Drinkwater in 1793. 'The library has excellent reading- rooms, and contains from 40,000 to 45,000 volumes. At the north-eastcorner of the town stand the remains of the Moorish castle. Towards the south the lower grounds are

occupied by the Grand Parade and the Alameda Gardens, laid out by General Don in 1814; and beyond these are the old convict establishment,

the dockyard, and the new. mole parade. Further sou th, at Rosia, is the naval hospital, erected in 1771,

Gibraltar has been a free port since the year £705, ——a

distinction which it owes in part to the refusal of the |

While

manufactures ex- ported to the rest of Spain during the ten years from 183] to 1840 was less than £385,000, the corresponding average i than £486,000 ; and in the year Gibraltar was £404,252 to £1,111,176. Since that date there has been comparatively little advance, —the average annual value of all the British

on by Spaniards, it continued to thrive in spite of the exertions of

officials, the Jews'

About 1200 tons of tubacco are sold annually in no fewer than eleven houses import ; and its manufacture and it is said, to about 1550 Persons. Fully two-thirds of the tobacco comes from Calcutta and other Indian ports, « Wool, and wax from Morocco, fruit, wine, oil, and other produce from Spain, are sent to Gibraltar for

he average between 187] Jess than 1,594,174 was British, lished in 1830, By the shipping act of 1868 the governor was empowered to remove from the register any vessel

tons burden

The population of Gibraltar in 1840 was 15,554, of whom 11,313 wera British subjects and 424] aliens; and by 1850 it had increased to 15,823, with 3641 aliens In

1860 the civil population, including foreigners Visiting

but it is almost always exceeded by the birth-rate. During the five years 1871-1875 the average 592'4, and of deaths

of the Mediterranean, it Was specially bargained by Spain that “no leave shall be

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the Free Church of Scotland in 1854, 4 proposal for concomitant endowment of « church bodies for the Anglican and Roman Catholic communities” with the annual sum of £500 was made by the governor in 1876, but it was not sanctioned by parliament. An annual grant to this amount is made to both bodies, but the Goverument no longer keeps the cathedral in repair, The Roman Catholic bishop of Antinoe is vicar apostolic of Gibraltar,

wines and spirits, and the ground and house rents,—thie three departments yielding respectively on the from 1871 to 1875 £11,011, £11,512, and £6,206. worthy of note that the ground and house rentals have in-

astical expenses, which were, on an average from 1871 to 1875, Tespectively £3909 and £1061. The total cost of the military establishment was, on the average of four years from 1869 to 1873, £315,454,—of which £250,340 was the average cost of the regular troops, £1610 for the jails, and £19,293 for the barracks. The convict establishment was abolished in 1875. At that date it contained 238 prisoners, who were managed on the associated system ; and grievous complaints were made of the difficulty of maintaining satisfactory discipline,

History.—Gibraltar was known to the Greek and graphers as Cal pe or Alybe, the two names being probably corruptions

competitor in Gebel af Futah or H ill of the gained acceptance, and stillremains sufficient] yTecognizableinthe cor. rupted form of the present day. Thefirst siege of the rock wasin 1309,

asylum to swindlers, thieves, aud murderers, and promised to levy no

The attack of Ismail ben Ferez in 1315 (2d siege) was frustrated ; but in 1333 Vasco Paez de Meira, having allowed the fortifications and galrison to

decay, was obliged to capitulate to Mahomet IY, (3d siege), Alphonso's attem pts

Gibraltar. In 1349 he invested the rock, but the siege (5th siege) was brought to an untimel y close by his death from the plague in February

and the 7th, undertaken by the Spanish count of Niebla, Enrico de Guzman, proved fatal to the besieger and

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de Arcos (8th sicgc), and in August the rock passed once more under | Christian sway. The duke of Medina Sidonia, a powerful grandee who had assisted in its eapture, was anxious to get possession of the fortress, and though Henry IV. at first managed to maintain the claims of the crown, the duke ultimately made good his ambition by force of arms (9th siege), and in 1469 the king was constrained to declare his son and his heirs perpetual governors of Gibraltar. In 1479 Ferdinand and Isabella made the second duke marquis of Gib- raltar, and in 1492 the third duke Don Juan was reluctantly allowed to retain the fortress. At length in 1501 Garcilaso de la Vega was ordered to take possession of the place in the king's name tad it was formally incorporated with the domains of the crown. After Ferdi- nand and Isabella were both dead the duke Don Juan tried in 1506 to recover possession, and added a 10th to the list of sieges. Thirty- four years afterwards the garrison had to defend itself against a much | more formidable attack (11th siege)—the pirates of Algiers having | determined to recover the rock for Mahomet and themselves. The conflict was severe, but resulted in the repulse of the besiegers. After this the Spaniards made great efforts to strengthen the place, and they succeeded so well that throughout Europe Gibraltar was regarded as impregnable.

in the course of the War of the Spanish Succession, however, it was taken by a combined English and Dutch fleet under Sir George Rooke, assisted by a body of troops under Prince George of Hesse- Darmstadt. The captors had ostensibly fought in the interests of Charles archduke of Austria (afterwards Charles III.), but, though his sovereignty over the rock was proclaimed on

July 24, 1704, Sir George Rooke on his own responsibility caused the English flag to be hoisted, and took possession in name of Queen Anne. It is hardly to the honour of England that it was both unprincipled enough to sanction and ratify the occupation, and ungrateful enough to leave unrewarded the general to whose unscrupulous patriotism the acquisition was due. The Spaniards keenly felt the injustice done to them, and the inhabitants of the town of Gibraltar in great numbers abandoned their homes rather than recognize the

authority of the invaders. In October 1704 the rock was invested by sea and land; but the Spanish ships were dispersed by Sir John Leake, and the marquis of Villadarias fared so ill with his forces that he was replaced by Marshal Tess¢, who was at length compelled to raise the siege in April 1705. During the next twenty years there were endless negotiations for the peaceful surrender of the fortress, and in 1726 the Spaniards again appealed to arms. But the Conde de la Tories, who had the chief command, succeeded no better than his predecessors, and the defence of the garrison under General Clayton and the earl of Portmore was so effective that the armistice of June 23d practically puta close to the siege, though two years elapsed before the genera pacification ensued. The most memorable siege of Gibraltar, indeed one of the most memorable of all sieges, was that which it sustained from the combined land and sea forces of France and Spain during the years 1779-1783. The grand attack on the place was made on the 13th Scptember 1782, and all the resources of power and science were exhausted by the assailants in the fruitless attempt. On the side of the sea they brought to bear against the fortress forty-six sail of the line, and a countless fleet of gun and mortar boats. But their chief hope lay in the floating batteries planned by D'Argon, an eminent French engincer, and built at the cost of half a million sterling. They were so constructed as to be impenetrable by the red-hot shot which it was foreseen the garrison would employ ; and such hopes were entertained of their efficiency that they were styled invincible. The Count d'Artois (afterwards Charles X.) hastened from Paris to witness the capture of the place. He arrived in time to see the total desttuction of the floating batteries, and a considerable portion of the combined fleet, by the English fire. Despite this disaster, how- ever, the siege continued till brought to a close by the general pacification, February 2d, 1783. The history of the four eventful rears' siege is fully detailed in the

work of Drinkwater, who himself took part in the defence, and in the Life of its gallant defender Sir George Augustus Eliott, afterwards Lord Heathfield, whose military skill and moral courage place him among the best oo and noblest men whom Europe produced during the 18th century.

Since 1783 the history of Gibraltar has been comparatively uneventful. In the beginning of 1801 there were rumours of a Spanish and French attack, but the Spanish ships were defeated off Algeciras in June by Admiral Saumarez. Improvements in the fortifications, maintenance of military discipline, and legislation in regard to trade and smuggling are the principal matters of recent interest.

See Col. Thomas James, History of the Herculean Ghatiz, Lond.. 1777; Ayala, Wistoria de Gibraltar, Madrid, 1782, English translation by Bell, Lond., 1845; Ancell, A Circumstantial Journal of the Blockade and Siege of Gibraltar, 1779-1783, Liverpool, 1784; Chevalier d'Arcon, Mémoires pour servir a Vhistoire du siége de Gibraltar, Paris, 1783; Hennen, Sketches of the Medical Topography of the Medi- terranean, Lond., 1830; Boissier, Voyage botanique dans la Midi de Tl Espagne,

Paris, 1839; Major Hort, Descriptions and Legends of Gibraltar, Lond., 1839; J. M. Carter, Select Views in Gibraltar, Lond., 1846; Sayer, The History of Gibraltar, Lond., 1862; A History of Gibraltar; with Photographic Illustrations by J. H.

Mann, Lond., 1870; Fenton, Sorties from Gibraltar, 1872.

GIB—GI1B

GIBSON, Epmunp (1669-1748), bishop of London, the learned compiler of the Codex Juris Hcclesiastics Anglicant, was born at Bampton in Westmoreland in 1669. After a promising career at one of the local schools, he was in 1686 entered a scholar at Queen's College, Oxford, where, at the early age of twenty-two (1692), he distinguished himself by the publication of a valuable edition of the Saxon Chronicle, with a Latin translation, indices, and notes. This was fol- lowed in 1693 by an annotated edition of the De J nstitutione Oratoria of Quintilian, and in 1694 by a translation in two volumes folio of Camden's Britannia, " with additions and

improvements," in the preparation of which he had been largely assisted by the volunteered aid of various English antiquaries. Shortly after Tenison's elevation to the see of Canterbury in 1694 Gibson was appointed chaplain and librarian to the archbishop, and at a somewhat later period he became rector of Lambeth and archdeacon of Surrey. In the discussions which arose during the reigns of William and Anne relative to the rights and privileges of the Con- vocation, Gibson took a very active part, and in a series of pamphlets warmly argued for the right of the archbishop to continue or prorogue that assembly. The controversy suggested to him the idea of those researches which resulted in the Codex Juris Ecclesiastici Anglicana, published in two vols, folio in 1713,—a work which discusses more learnedly and comprehensively than any other the legal rights and duties of the English clergy, and the constitution, canons, and articles of the English Church. In 1715 Gibson was presented to the see of Lincoln, whence he was in 1723 translated to that of London, where for twenty-five years he exercised an immense influence, being the authority chiefly consulted by the court on all ecclesiastical affairs. While a conservative in church polities, he yet respected the vati- ous forms of dissent, and discouraged all attempts to prevent dissenters from worshipping in the manner and according to the principles which they preferred. He exercised a vigilant oversight over the morals of all ranks and classes of the community committed to his charge; and his fearless denunciation of the licentious masquerades which had become highly popular at court finally lost him the royal favour. Among the literary efforts of his later years the principal were a series of Pastoral Letters in defence of the "gospel revelation," against " lukewarmness" and " en- thusiasm," and on various topics of the day; also the Preservative against Popery, in 3 vols. folio (1738), a compilation of numerous controversial writings of eminent Church of England divines, dating chiefly from the period of James II. Gibson died on the 6th September 1748.

A second edition of the Codex Juris, 'revised and improved, with large additious by the author," was published at Oxford in 1761. Besides the works already mentioned, Gibson published a number of Sermons, and other works of a religious and devotional kind. The Vita Thome Bodleii with the Historia Bibliothece Bodleianw in the Catalogi librorum

manuscriptorwm (Oxford, 1697), and the Reliquie Spelmanniance (Oxford, 1698), are also from his pen.

GIBSON, Jonn (1790-1866), sculptor, was born near Conway, in 1790, in very humble circumstances, his father being a market gardener. He is a notable example of one who, with no so-called start in life, carved his way to dis- tinction by the force of a steady purpose and strong will. To his mother, whom he described as ruling his father and all the family, he owed, like many other great men, the energy and determination which carried him over every obstacle. He narrowly escaped emigration to America, the first step towards which took the family to Liverpool, where his mother's will interposed to keep them. He was then nine years of age, and was sent to school. The windows of the print shops of Liverpool riveted his atten- tion; and, having no means to purchase the commonest print, he acquired the habit of committing to ocular memory the outline of one figure after another, drawing it on his

This satisfied him for another year, when the foreman of some marble works, and unsettled him again.

that his efforts found their way to the notice of Mr Francis, the proprietor of the marble works. The wood- carving now, in turn, became his aversion; and having in vain entreated his masters to set him free, he instj- He was every day duly at his post, but did no work. Threats, and even a blow, moved him not, £70 from Francis for

works, —sundry early works by the youthful sculptor, which exist in Liverpool and the neighbourhood, going by the name of Francis to this day. It was while thus apprenticed that Gibson attracted the notice of Mr Roscoe, whose taste in Greek art seems to have been superior to his judgment in Italian history, For him Gibson executed a basso rilievo in terra cotta, now in the Liverpool Museum. Roscoe opened to the sculptor the treasures of his library at Allerton, by which he became acquainted with the designs of the great Italian masters. A cartoon of the Fall of the Angels marked this period,—now also jn the Liverpool Museum, We must pass over his studies

in anatomy, pursued gratu- itously by the kindness of a medical man, and his introduc-

breast panted for “the great university of and the first step to the desired goal was to

comparatively late There he immediately experienced the charm and goodness of the true Italian character in the berson of Canova, to whom he had introductions,—the Venetian puting not only his experience in art but his purse at the English student’s service,

age for a first visit,

| supported by Austria, and, as is natural with a mind like

Gibson’s, the first sense of his deficiencies in common matters of practice was depressing to him. He saw Italian

the power of beauty of form.

grace beyond the reach of a mere imitator, Hig subjects of the splendid Italian

; his Amazon thrown from her Horse, one of his most original productions, was taken from an accident he witnessed to a female rider in a circus ; and the Hunter

he prominence he gave among his favourite subjects to the little god “ of soft tribulations” was no less owing to his

In monumental and portrait statues for public places, necessarily represented in postures of dignity and repose, Gibson was very happy. His largest effort of this class—the group of Queen Victoria supported by Justice and Clemency, in the palace of Westminster—we agree with himself in pronouncing his finest work in the round. Of noble character also in execution and expression of thought is the statue of Mr Huskisson with the bared arm; and no less, in effect of aristocratic case and refinement, the seated figure of Dudley North. He lays down the axiom in his journal that

the Greeks represented “men thinking, and women tranquil,” and to the departure from this rule we attribute the unattractive colossal statue of Sir Robert Peel in West- minster Abbey. The very animation he has given to the head is too individual to harmonize with the classic drapery, or with the real character of the man, The great states. man is here colloquial rather than eloquent in expression, while the position of the right foot suggests the idea of a walking figure. chief excellence lay in basso rilievo, and in this less disputed

friend Mrs Huskisson in Chichester Cathedral, and that of the Bonomi children. Tn reviewing the qualities most characteristic of this great artist, that of passionate expres- sion may be said to stand foremost. Passion, either indulged or Tepressed, was the natural impulse of his art :—

| repressed as in the Hours leading the Horses of the Sun,

and as in the Hunter and Dog ; indulged, as scarcely before seen in the same intensity in the whole range of sculpture, as in the meeting of Hero and Leander, a drawing executed before he left England, Gibson's power of drawing may be pronounced to have been unsurpassed by any modern. He had an iron hand, and used the pen in rapid action with as much certainty as if it had been the graver. Nowhere is the fire of his genius so unmistakably seen as in these first-hand productions. Nor can we wonder that marble, however highly wrought, could never entirely compensate for what was necessarily lost in the translation. Gibson was the first to introduce colour on his statues,—first, as a mere border to the drapery of a portrait statue of the Queen, and by degrees extended to the entire flesh, as in his Venus, and in the Cupid tormenting the Soul, belonging to Mr Holford. In both of these it amounts to no more than the slightest tint. Gibson's individuality was too strougly marked to be affected by any outward circumstances. In all worldly affairs and business of daily life he was simple and guileless in the extreme; but he was resolute in matters of principle, determined to walk straight at any cost of personal advantage. Unlike most artists, he was neither nervous nor irritable in temperament. It was said of him that he made the heathen mythology his religion ; and indeed in serenity of nature, feeling for the beautiful, and a certain philosophy of mind, he may be accepted as a type of what a pure-minded Greek pagan, in the zenith -of Greek art, may have been. Gibson was elected R.A. in 1836, and bequeathed all his property and the contents of his studio to the Royal Academy, where his marbles and casts are open to the public. He died at Rome in January

1866.

The letters between Gibson and Mrs Henry Sandbach, grand dauchter of Mr Roscoe, and a sketch of his life that lady induced

him to write, furnish the chief matcrials for his biography. A volume of engravings from his finished works renders them very indifferent justice. A volume of facsimiles from his drawings is more worthy of him. E. E.)

GICHTEL, Jowann Guore (1638-1710), founder of the mystic sect of Gichtelians or Angelic Brethren, was born at Ratisbon, where his father was a member of senate, on the 14th of March 1638. Having acquired at school, besides an ordinary elementary education, a considerable acquaint- ance with Greek, Hebrew, Syriac, and even Arabic, he proceeded to Strasburg to study divinity ; but finding that the theological prelections of Schmidt and Spener there were not conducive to the growth of his piety, he removed to Spires, where he entered the faculty of law. In 1664 he was admitted an advocate at Ratisbon; but having become acquainted with the Baron von Weltz, an Hungarian noble- man who cherished enthusiastic if not extravagant schemes for the reunion of Christendom and the conversion of the world, he abandoned all interest in his profession, and became an energetic promoter of the "Christerbauliche Jesusgesellschaft," or Christian Edification Society of Jesus, in the interests of which he visited many parts of Germany and Holland. The movement in its beginnings provoked at least no active hostility; but when Gichtel began to attack the teaching of the Lutheran clergy and church, especially upon the fundamental doctrine of justification by faith, he exposed himself to a prosecution which ulti- mately resulted in sentence of banishment and confiscation (1665). After many months of wandering and occasionally romantic adventure, he in January 1667 reached Holland, and settled at Zwoll, where he co-operated with Breckling, a man who shared his views and aspirations. Having become involved in the troubles of this friend, Gichtel, after a period of imprisonment, was banished for a term of years from Zwoll, but finally in 1668 found a home in Amster- dam, where in a state of poverty (which, however, never became destitution), he lived out his strange life of visions

and day-dreams, of prophecy aud prayer. He became an ardent student and disciple of Jacob Boehme, whose works he published in 1682 (Amsterdam, 2 vols.) ; but before the time of his death, which occurred January 21, 1710, he had attracted to himself a small band of followers known as Gichtelians or Angelic Brethren, who propagated certain views at which he had arrived independently of Boehme. Seeking ever to hear the authoritative voice of God within them, and endeavouring to attain to a life altogether free from carnal desires, like that of "the angels in heaven, who neither marry nor are

given in marriage," they claimed to exercise a priesthood "after the order of Melchizedek," appeasing the wrath of God, and ransoming the souls of the lost by sufferings endured vicariously after the example of Christ. The sect, never a numerous one, is said still to subsist in some districts of Holland and North Germany. Gichtel's correspondence was published without his know- ledge by Gottfried Arnold, a disciple, in 1701 (2 vols.), and again in 1708 (3 vols.). It has been frequently reprinted under the title Dheosophia Practica. The seventh volume of the Berlin edition (1768) contains a notice of Gichtel's life.

GIDEON, liberator, reformer, and "judge" of Israel, was the youngest son of Joash, of the "house" of Abiezer, and tribe of Manasseh, and had his home at Ophrah, the site of which is probably to be sought westward of Jordan, somewhat to the south of the plain of Jezreel. Gideon lived at a time when Israel, grown idolatrous, had been biought very low by periodic incursions of the "' Midianites " and " Amalekites," nomad tribes from the east of Jordan, who in great numbers were wont to overrun the country, destroy- ing all that they could not carry away. In the beginning of the narrative of his public life he is represented as an uvambitious man, quietly engaged in agricultural pursuits, who yet had already distinguished himself as a " mighty man of valour," probably in guerilla warfare against the common foe. According to that narrative, his first exploit worthy of special commemoration was the destruction, by divine command, of the altar of Baal belonging to his father, and of the Ashera beside it, and the substitution of an altar to Jehovah. But immediately before this he had also been summoned by "the angel of the Lord" to undertake, in dependence on supernatural direction and help, the work of liberating his country from its long oppression, and, in token that he accepted the mission, had already erected in Ophrali an altar which he called " Jahveh-Shalom" (Jehovah is prosperity). The great gathering of the Midianites and their allies on the north side of the plain of Jezreel "'stretch- ing from the hill of Moreh"; the general muster first. of Abiezer, then of all Manasseh, and lastly of the neighbour- ing tribes of Asher, Zebulun, and Naphtali; the sigus by which the wavering faith of Gideon was steadied ; the methods by which an unwieldy mob was reduced to a small but trusty band of energetic and determined men ; and the stratagem by which the vast army of Midian was surprised and routed by the handful of Israelites descending from 'above

Endor," are indicated with sufficient clearness in the Scripture narrative, and need not be detailed minutely here, There is some difficulty in following the account of the subsequent flight of the Midianites, which seems to have taken place in two directions,—Oreb and Zeeb making for the lower fords of Jordan towards the south-east, while Zebah and Zalmunna took the upper passage, a little below the place where the river flows out of the Sea of Galilee. Leaving the Epbraimites (who had now risen in force) to deal with the former, Gideon with his 300 appears to have kept up the pursuit of the latter to Nobah and J ogbehah, points beyond Succoth and Penuel, where a bloody contest resulted in the destruction of that portion of the Midianite army, aud in the ultimate capture and execution of Zebah and

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Zalmunna. Almost simultaneously with these occurrences eastward of Jordan, messengers from Ephraim bearing the heads of Oreb ("raven ") and Zeeb ("wolf "), who with their followers had been crushed at "the raven's rock" and "the wolf's den" respectively, announced the completeness of Israel's victory. on the men of Penuel and Succoth, who hag shown a timid

which proved a snare to all Israel, not For forty years after own house in Opbrah in and magnificence, yet always in a private station—there being no direct Scriptural evidence at least that his judgeship lasted during all that Period, or that it ever gave him any position of

authority. The name of Gideon occurs in Heb, xl. 32, in the list there given of those who became heroes by faith ; but, except in Judges vi—viii., it is not to be met with any- Where in the Old Testament, In 1 Sam. xii, Sam. xi. 21 (LXX.) he is called Jerubbaal (the reading Jerubbesheth having been introduced into the latter passage in accordance with the usage explained in the article

proper name, that of Gideon (MY, te. "hewer" op « warrior," cf. Isa, x, 33) having been a later designation, In confirmation of this it is pointed out that the derivation of Sy35» as equivalent to Yai 1a 35 (" Let Baal contend against him," y, 32, or 'Let Baal contend for himself," v. 31) is much less

probable than that which interprets it as precisely analogous with such names as Merib-baal, Jehoiarih j

and perhaps also J osadee, all meaning “God fights” or ‘con. tends.” The nature of the grounds on which it is conjectured that Gideon’s conquest of the

slower than the narrative ou a first reading would lead one

end of the 15th century. The town is the seat of a tribunal of the first instance and of a justice of peace court. The inci i hospital, the old castle, originally built by Charlemagne, and reconstructed I j of Louis XI., and

Serge, leather, and earthenware, and some trade in corn i : 6493, GIESELER, Jonann Karu Lupwic (1792-1854), one of the most distinguished of the modern school of scientific Writers

interrupted, 1815 by a period of military service, during which he was

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enrolled as a volunteer in a regiment of chasseurs, in 1817 taken his degree in philosophy, he in the same year

in so far as it may be considered to have finally theory of a “* primitive ” which most critics in the earlier part of the century had inclined. In 1819 Gieseler was appointed a professor

ordinarius

noteworthy events beyond the steady publication of volume after volume of his contributions to historical Science, In 7 he was appointed a consistorialrath, and shortly after- wards was created a knight of the Guelphie order,

published postlumously by Redepenning (1855) ; and they were followed in 1856 bya Dogmengeschichte, which is some-

Among church historians Gieseler continues to hold a very high place. Lesg vivid and picturesque in style than Hase, conspicuously deficient in Neander's deep and sympathetic insight into the more spiritual forces by which church life ig

in " Clark's Theological Library " (Compendium astical LTistory, Edin., 5 vols.) closes with the beginuing of For the life of Gieseler reference may

which great work, it may be energetic promoter). Both

He frequently held the office of pro-rector of the university, and

orphanage, where he was children personally, and taught them to regard him as a

GIESSEN, a town of Germany, grand-duchy of Hesse-Darmstadt,

Lahn, 33 miles N.N.W. of a bailiwick, a high court, The old streets are narrow and

Fraukfort, and a district penal court,

590

irregular, but in the suburbs outside the old walls there are many elegant houses, Besides the university, the principal buildings are the provincial Government offices, comprising a portion of the old castle dating from the 12th century, the arsenal, the town-hall, the new gymnasium, and the town church. 'The university, founded in 1607 by the landgrave Louis V., has a large and valuable library, a botanic garden, an observatory, an anatomical theatre, an infirmary, a maternity hospital, a museum of natural history, and a chemical laboratory which was directed by Professor Licbig. The number of professors and teachers of the university in 1875 was 52, and of students 340. There is also a gynmasium and a real school. The in- dustries include the manufacture of woollen and cotton cloth of various kinds, leather, candles, tobacco, and beer.

Giessen was formed in the 12th century out of the villages Selters, Aster, and Kroppach, for whose protection Count William of Gleiberg built the castle of Giessen. Through marriage the town came into the possession of the palgrave of Tiibingen, who sold it in 1265 to the landgrave Henry of Hesse. It was surronnded with fortifications in 1530, which were demolished in 1547 by the emperor Charles V., but rebuilt in 1560. From 1807 they were gradually pulled down, and their site converted into promenades. The population of Giessen in 1875 was 13,980.

GIFFORD, Wittram (1757-1826), publicist and man of letters, was born at Ashburton, Devon, in April 1757. Having as a shoemaker's apprentice manifested a remark- able aptitude for intellectual pursuits, he was by the charity of friends enabled to complete a previously imperfect school education, and ultimately to proceed in his twenty-third year to Oxford, where he was appointed a Bible reader in Exeter College. Leaving the university shortly after graduation in 1782, he for some years acted as tutor to Lord Belgrave, whom he accompanied on two prolonged Continental tours. After having settled in London, he in 1794 published his first work, a satirical piece, after Persius, entitled the Baviad, successfully aimed at a numerous school of second-rate writers then popularly known as the Della Cruscans. A second satire of a similar description, the Meviad, directed against the corruptions of the drama, appeared in 1795. About this time Gifford became acquainted with Canning, with whose help he in August 1797 originated a weekly newspaper of Conservative politics entitled the Anti-Jacobin, which, however, in the following year ceased to be published. An English version of Juveual, on which he had been for many years engaged, appeared in 1802; to this an autobiographical notice of the translator was prefixed. Two years afterwards Gifford pub- lished an annotated edition of the plays of Massinger ; and in 1809, when the Quarterly Renew was projected, he was entrusted with the management of that publication. It is on all hands conceded that the success which attended the Quarterly from the outset was due in no small degree to the ability and tact with which Gifford discharged his editorial duties. His connexion with the Review continued until within about two years of his death, which took place in London on the 31st of December 1826. Besides numerous contributions to the Quarterly during the last fifteen years of his life, he wrote a metrical translation of Persius, which appeared in 1821. Gifford

also edited the poems of Ben Jonson, Ford, and Shirley. His edition of the first of these appeared in 1816, those of the other two, posthumously, in 1827 and 1833. The Autobiography was republished in

1827.

GIFT generally means an alienation of property other- wise than for a consideration, although in law it is often used to signify alienation with or without consideration. The effect of a gratuitous gift only need be considered here. Formerly in English law property in land could be conveyed by one person to another by a verbal gift of the estate accompanied by delivery of possession. The Statute of

Frauds required all such conveyances to be in writing, and a later statute (8 and 9 Vict. c. 106) requires them to be by deed. Personal property may be effectually transferred from one person to another by a simple verbal gift accom- panied by delivery. If A delivers a chattel to B, saying or signifying that he does so by way of gift, the property passes, and the chattel belongs to B. But unless the actual thing is bodily handed over to the donee, the mere verbal expression of the donor's desire or intention has no legal effect whatever. 'The persons are in the position of parties to an agreement which is void, as being without considera- tion. When the nature of the thing is such that it cannot be bodily handed over, it will be sufficient to put the donee in such a position as to enable him to deal with it as the owner. For example, when goods are in a warehouse, the delivery of the key will make a verbal gift of them effectual ; but it seems that part delivery of goods which are capavle of actual delivery will not validate a verbal gift of the part undelivered. So when goods are in the possession of a warehouseman, the handing over of a delivery order might, by special custom (but not otherwise it appears), be sufficient to pass the property in the goods, although delivery of a bill of lading for goods at sea is equivalent to an actual delivery of the goods themselves. A donatvo mortis causa is a gift made by a person in contemplation of death, to take effect only in the event of his death. It is revocable so long as he lives. There must be actual or constructive delivery of the thing itself, and therefore it has been said that only chattels can be the proper subject of a donatio mortis causa, although

policies of insurance, bills, notes, &e., have been allowed to pass by mere delivery as death-bed gifts. A donatio mortis causa is not an out-and-out gitt, but is conditional on death.

GIJON, a town and seaport of Spain, in the province of Oviedo or Asturias, on the coast of the Cantabrian Sea, about 13 miles E. of the Cabo de Pefias and 2 miles E. of the Rio Abofio, The older part of the town, partly sur- rounded by its walls, occupies the upper slope of a penin- sular headland, while the more modern portion extends to thebeach. On the whole, it isa clean and flourishing place, with wide streets and good houses; but there are few build- ings of individual note except the church of San Pedro of the 15th century, the town house, the mansion of the Marquis Revilla-Gigedo, and the Asturian Institute. The last, which was founded in 1797 by J ovellanos, has a fine library, and comprises classes for navigation, mathematics, Latin, French, and English. Besides the works in connexion with the railways which run inland from Gijon to Mieres del Camino and Sama on the Nalon, there is a large glass work, an iron foundry, and a tobacco factory which alone gives employment to upwards of 1400 females, An exten- sive trade is carried on in the export of coal, iron, jet, and hazel- nuts, and in the import of fish and colonial produce. The nuts amount to upwards of 1600 tons per annum, and a large proportion finds its way to the English market. Though the harbour is a mere roadstead between the small promontories of San Lorenzo and Torres, it is of consider- able value on such a coast as that of Asturias, especially as it has a good bottom. A quay was constructed by means of a grant from Charles V. in 1552-4, and a new one by Pedro Menendez in 1766-8, and an extension was effected in 1859 at a cost of £65,000. The population of Gijon in 1860 was 24,802. During the summer there is a con siderable influx of strangers.

Gijon is usually identified with the Gigia of the Romans, which, however, oceupied the site not of the present town but of the ad- joining suburb of Cima da Villa. Captured and strengthened by the Moors, who mused the stones of the Roman city for their forti- fications, it remained in their hands till after the battle of Canicas,

when its governor Munuza surrendered to Pelayo. In 844 it held ont against an attack by the Normans, and in the following ¢el-

turies it gradually rose into importance. In the time of Philip JL. 4) ally possessed of any Christian prince or people, as should

it possessed good arsenals, and was able to undertake the repairs of : ” Disposing not only of his patri.- the Invincible Armada. Jovellanos, the statesman and poet, and | SC good to him or them, Dispos – P

Cean Bermudez, a writer on art, were both natives of Gijon, and | Mony but also of the estates in Kent which he had through the former is buried in the church of San Andrea his wife, daughter of John Aucher of Ollerden, he strenu-

a number of works on banking, was descended from a | Raleigh joined him in the enterprise. By the end of the Cornish family, and was born in London, March 21, | Summer of 1578 a fleet of 11 sail, with 400 mariners and

among the captains and disorder among the crews, Knollys, for example, boasted that, as kinsman to royalty, he was of More value than twenty knights, and insolently rejected Gilbert’s invitation to dinner ; and his men, encouraged by their captain’s conduct, filled the town of Plymouth with

was not till the 19th of N ovember that Gilbert set sail, with his forces reduced to 7 ships and 150 men, The history of the voyage is involved in obscurity ; but about the begin- ning of summer or a little earlier in 1579, the fleet returned to England, with hittle, it would appear, to report except that it had lost one of its chief ships and one of its bravest captains, Miles M organ, in an encounter with the Spaniards, Gilbert lent his three ships to the Government for service against the Spaniards on the Trish coast ; but in J uly 1], 1582, we still find him complaining to Walsingham that he

shareholders of joint-stock banks presented him in 1846 with a handsome service of plate. In the same year he was elected a Fellow of the Royal Society. He retired on a pension from the management of the London and West- minster Bank, 1st January 1860, and died in London August 8, 1863. From an early period Gilbart took an active part in the Athenian Debating Society of London

numbered among its other eminent members J, 8, Mill and Lord Macaulay. He algo devoted much of his attention to the promotion of literary and scientific institutions among

“ran from him in fair and clear weather having a large wind.” This desertion was a cause of no small displeasure to the admiral, and he wrote to Sir George Peckham to solicit his brother to make the crew an example to all knaves ; but it appears not improbable (according to Hayes in Hakluyt’s collection) that the reason of their conduct was

GILBERT, Str Humpnrey (1539-1583), a celebrated English navigator, was born in 1539 in the county of Devon, second of the three sons of Otho Gilbert of

character, and whose early life was largely influenced and guided by his example. Educated first at Eton and then at Oxford, he was destined by his father for the law; but being introduced at court by Raleigh’s aunt, Catherine Ashley, he obtained the special favour of the queen, and was thus enabled to follow his natural inclination for active

southwards with three vessels, he lost the largest near Cape Breton, and was at last constrained to return homewards with the “Golden Hind” and the “Squirrel” ag the only remnant of his fleet. “On Monday the 9th September,”

up by the sea.” So perished Sir H umphrey Gilbert,

See Hakluyt’s Collection, vol. iii. ; Hooker’s Supplement to Hollin- shed’s Irish, Chronicle ; Roger Williams, The Actions of the Low

a subject at that time before the minds of meu, the possi- Countries, 1618: Bliss’s edition of Wood’s Athene Oxonienses, vol,

bility of a north-west passage to India; and in 1576 it was published without. his knowledge by George Gascoigne as

and as he did not disdain to prostitute his muse to the celebration of the heroic and royal virtues of the despicable Louis XY., he was rewarded with pensions to a considerable amount. Hedied in October 1780 from the results of a fall from his horse. The satiric force of one or two of his pieces, as Mon apologie (1778), and Le dix-huitiéme siécle (1775), would alone be sufficient to preserve his reputation, and it has been further increased by the eulogies of those modern writers who, like Alfred de Vigny, consider him a victim to the spite of his philosophic opponents.

Among his other works may be mentioned Les Famitles de Darius et d'Eridame, histoire persane (1770), Le Carnaval des Auteurs (1773), Odes nowvelles ct patriotiques (1775). Gilbert's Guvres conuplétes were first published in 1778, and they have since been edited by Mastrella (Paris, 1823) and by Charles Nodier (1840, 1859, &c.).

GILBERT, or Gitserp, Witi1am (c. 1540-1603), was the most distinguished man of science in England during the reign of Queen Elizabeth. He was born at Colchester. where his father was recorder, but was a descendant of an ancient Suffolk family, long resident at Clare. Of his early years no account is left. He entered St Johu's College, Cambridge, in 1558, when eighteen years of age, and in due course took the degrees ot B.A., M.A., and M.D.; he also became Symson fellow, and in 1569 was elected a senior fellow of his college. After leaving the university he went to the Continent, and, on his return in 1573, settled in London, where for thirty years,—that is, till his death, —he practised as a physician with "great success and applause." He was admitted to the College of Physicians, and filled various offices in it. He began in 1581 as censor, which duty he discharged for several years; then he became treasurer, consiliarius elect, and, at last, president in 1600. His professional skill and general ability drew the attention of Queen Elizabeth to him, and she appointed him royal physician. She also settled a pension on him to enable him to prosecute the scientific inquiries to which he was devoted. After this Gilbert seems to have removed to the court, and to have vacated his house, which was "on St Peter's Hill, between Upper Thames Street and Little Knight- Rider Street." At this house he seems to have had a society or college, which was broken up and the members dispersed by his promotion. In the year 1600 he published his work on the magnet. In 1603 the queen died, but Gilbert was

reappointed by her successor. He did not long enjoy the honour, however, for he died November 30, 1603, some say at Colchester, others at London. He was buried at Colchester, in the chancel of the church of the Holy Trinity, where a monument was erected to him. 'To the College of Physicians he bequeathed his books, instruments, and minerals, but he gave his portrait to the School Gallery at Oxford. In it he is represented as tall of stature and of cheerful countenance, " holding in his hand a globe inscribed 'Terella'; over his head is the inscription '1591, etatis 48; and a little below his left shoulder, ' Magneticarum virtutum primus indagator Gilbertus.'" The date thus given does not tally with the conclusion of the inscription on his tombstone: 'Obiit anno Redemptionis Humane 1603, Novembris ultimo, etatis suw 63." If the latter be correct, he was born in 1540; if the former, in 1543.

Gilbert's principal work is his treatise on magnetism, entitled De Magnete, Magneticisque Corporibus, et de Magne Magnete Tel- lwre, London, 1600 (later editions—Sedan, 1628, 1633; Frankfort, 1629, 1638). The merit of this work consists in its originality, containing, as it does, an account of the author's experiments on magnets and magnetical bodies, and also the great discovery that the whole earth is nothing but a large magnet, and that it is this which explains, not only the direction of the magnetic needle north and south, but also the variation and dipping or inclination of the needle. Gilbert's is therefore, not merely the first, but the most

important systematic contribution to the scicnce of magnetism, and its merits were freely acknowledged by his contemporaries. A

GILBAET

William, from two MSS. in the possession of Sir William Boswell ; its title is De Mundo Nostro Sublunari Philosophia Nova (Am- sterdam, 1651). He is the reputed inventor besides of two instrn- ments to cnable sailors ''to find out the latitude without seeing of sun, moon, or stars." An account of these instruments is given in Thomas Blondeville's Theoriques of the Planets (London, 1602). The only writing of Gilbert in English is a short epistle addressed to William Barlowe, printed at the end of his little work entitled Magneticall Advertisements (London, 1616),—a letter which has hitherto escaped the notice of all the writers about Gilbert. It is of interest

both because it shows that he carried on a scicntific cor- respondence with the Continent, and that his book had been very well received, and because he says that he was intending to add six or eight sheets to the book,—an intention, however, which was never carried into effect, The lettcr is dated 14th February, un- fortunately without the year, but it must have been written be- tween 1600 and 1603. In his preface Barlowe says that he had numerous letters from Gilbert, but these have long since disap- peared. It is a matter of great regret for the historian of chemistry that Gilbert left nothing on that branch of science, to which he was deeply devoted, ‘‘ attaining to great cxactness therein.” So at Icast says Fuller, who, in his Worthics of England (among whom he in- cludes Gilbert), prophesied truly how he would be afterwards known: “ Mahomet’s tomb at Mecha,” he says, ‘‘is said strangely to hang up, attracted by some invisible loadstone ; but the memory of this doctor will never fall to the ground, which his incomparable book De Alagnete will support to eternity.”

GILBERT DE LA PORREE (Gilbertus Porretanus or Pictaviensis), an eminent scholastic logician and theologian of the 12th century, was born at Poitiers. He was educated under Bernard de Chartres and Anselm of Laon, and after completing his studies remained attached as teacher to the church at Chartres. In 1135 he is recorded as discharging these functions, but he seems soon after to have repaired to Paris and opened public courses on dialectics and theology. His fame caused him to be called to his native town, where in 1141 he was elected bishop. The heterodox opinions he was led to express regarding the doctrine of the Trinity drew upon his works the condemnation of the church. The synod of Rheims in 1148 procured papal sanction for four propositions opposed to certain tenets of Gilbert’s, and the works of the latter were condemned until they should be corrected in accordance with the principles of the church. Gilbert seems to have submitted quietly to this judgment; he yielded assent to the four propositions, and remained ou friendly terms with his antagonists till his death in 1154. Gilbert is almost the solitary logician of the 12th century who is quoted by the greater scholastics of the succeeding age. Hischief logical work, the treatise De Sex Principrs, was regarded with a reverence almost equal to that given to Aristotle, and furnished matter for numerous commen- taries. Albertus Magnus did not disdain to comment upon this work of an earlier logician. The treatise itself is an elaborate discussion of

the Aristotelian categories, specially of the six subordinate modes, Gilbert distinguishes in the ten categories two classes, one essential, the other derivative. Essential or inhering (forme inherentes) in the objects themselves are only substance, quantity, quality, and relatoon in the stricter sense of that term. The remaining six, when, where, action, passion, position, and habit, are relative and subordinate (forme assistentes). This suggestion has some interest, but it cannot be said to have great value, either in logic or in the theory of knowledge. More important in the history of scholasticism are the theological consequences to which Gilbert's realism led him. In the commentary on the treatise De Z'rinitate, erroneously supposed to be by Boetius, he proceeds from the metaphysical notion that pure or abstract being is prior in nature to that which iS. This pure being is God, and must be distinguished from the triune God as known to us. God is incomprehensible, and the categories cannot be applied to determine his exist- ence. In God there isno distinction or difference, whereas

"in all substances or things there is duality, arising from the | element of matter. posthumous work of Gilbert's was edited by his brother, also called '

Between pure being and substances stand the ideas or forms, which subsist though they are not

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» are called = or

when materialized

of things, and in themsely dents of things, Things are temporal, the idea God eternal. The pure form

Hauréau, Phil. Seo. 78; Stéckl, Phil, a. Mittclalters, i, 279-88.

MPRINGHAM, Sr (e, Ibertines (Ordo Gi pringensis), was born Lincolnshire, Where h Norman noble who h settled. On the com

GILBERT or Sr of the order of Qj corum, Ordo Sem

unusually severe, lands with which t also formed into a bling that of the close beside that where were encou placed under the

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516-570), the earliest of British Some Sapiens, and by others m in the year 516,

GILDAS, or

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ay course of his work,

to be lives of Gildas, and 12th centuries 4

have confoun the name. namely, the batt]

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use he has made of leave scarcely a doubt that he w

h | tells us, were collec

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| Own times.

_Persecution under Diocle

593

We learn that he went abroad, thirty-fourth year, where, after ion and preparation, he composed, bearing his name, His materials, he ted from foreign rather than native which had been put beyond his reach The Cambrian Annals give 570 as the

der or other, In addition

| probably to France, in his 10 years of hesitat about 560, the work

| Sources, the latter of | by circumstances, | year of his death, wn to us under the nice Liber Querulus,

the work is now e history argely made up

as have come do

at first writte usually divided into th proper, and an epistle, of passages and texts

rulers, being the least

y far the longest of the three,

brief review the Romans till hfs e is made to the of Tiberias ; the

rian y the legions

matters reference ty in the reign tian; the spread of the A heresy ; the election of Maximus as emperor b in Britain, and his subsequent death at Aquileia; the incur- sions of the Picts and Scots into the southern part of the island ; the temporary assistance rendered to the harassed Britons by the Romans 3 the final abandonment of the island by the latter; the coming of the Saxons and their recep- tion by Guortigern (Vortigern) ; and, finally, the conflicts en the Britons, led by a noble Roman, Ambrosiug Aurelianus, and the new invaders, Unfortunately, on almost every point on which he touches, the statements of Gildas are vague and obscure, With one exception already no dates are given, and events are not always the order of their Occurrence. These faults are tance during the period when Greek and Roman ice the affairs of Britain ; but tl

serious when, as is the case from ne the 5th century i narrative is our

Among other

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worthy, testimon been sent to R 446 by the despairing Britons, commencing :— To Agitius (Aetius), consul for the third time, the groans of the Britons.”

Gildas’s treatise was first published in 1525 b but with many avowed alterations and omissions. Forty-three years later Josseline, secretary to Archbishop Parker, issued a new edition of it more in conformity with manuscript authority ; and in 1691 a still more carefully revised edition appeared a Thomas Gale. It was frequently reprinted on the Cont the 16th centur , and once or twice since, was that published by the English Historical Societ edited by the Rev. J. Stevenson. elaborate introductions an scripts, is included in the by Petrie and Sharpe, Lon

y Polydore Vergil,

spreading or covering chemical means, over the se of ornament, g the ancients,

gold, either surface of a

The art of gilding was According to Herodotus,

0 gild wood and metals : gold plates is frequently mentioned Testament, Pliny informs us that

ds that luxury ad- le time you might

see all, even private and Poor persons, gild the walls, vaults, and other parts of their dwellings. Owing tothe compara- 5 ae

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tive thickness of the gold-leaf used in ancient gilding, the traces of it which yet remain are remarkably brilliant and solid. Gilding has in all times occupied an important place +n the ornamental arts of Oriental countries; and the native processes pursued in India at the present day may be taken as typical of the art as practised from the earliest periods. For the gilding of copper, employed in the decoration of temple domes and other large works, the following is an outline of the processes employed. The metal surface is thoroughly scraped, cleaned, and polished, and next heated in a fire sufficiently to remove any traces of grease or other impurity which may remain from the operation of polishing. It is then dipped in an acid solution prepared from dried un- ripe apricots, and rubbed with pumice or brick powder. Next, the surface is rubbed over with mercury which forms a super- ficial amalgam with the copper, after which it is left some hours in clean water, again washed with the acid solution, and dried, It is now ready for receiving the gold, which is laid on in leaf, and, on adhering, assumes a grey appear- ance from combining with the mercury, but on the applica-

tion of heat the latter metal volatilizes, leaving the gold a |

dull greyish hue. The colour is brought up by means of rubbing with agate burnishers. The weight of mercury used in this process is double that of the gold laid on, and

the thickness of the gilding is regulated by the circumstances |

or necessities of the case. For the gilding of iron or steel, the surface is first scratched over with chequered lines, then washed in a hot solution of green apricots, dried, and heated just short of red-heat. The gold-leaf is then laid on, and rubbed in with agate burnishers, when it adheres by catching into the prepared scratched surface.

Modern gilding is applied to numerous and diverse sur- faces and by various distinct processes, so that the art is prosecuted in many ways, and is part of widely different ornamental and useful arts. It forms an important and essential part of frame-making (see CARVING AND GILDING) ;

it is largely employed in connexion with cabinet-work, |

decorative painting, and house ornamentation; and it also bulks largely in bookbinding and ornamental leather work. Further, gilding is much employed for coating baser metals, as in button-making, in the gilt toy trade, in electro-gilt re- productions, and in electro-plating ; and it is also a charac- teristic feature in the decoration of pottery, porcelain, and glass. As details of the processes employed in connexion with these various substances will be found in the parts of this work where the technical processes to which they are related are described, it is only necessary here to indicate how the processes of gilding differ from each other.

The various processes fall under one or other of two heads—mechanical gilding and gilding by chemical agency.

MECHANICAL GILDING embraces all the operations by which gold-leaf is prepared (see Goup-BEATING), and the several processes by which it is mechanically attached to the surfaces it is intended to eover. It thus embraces the burnish or water-gilding and the oil-gilding of the carver and gilder, and the gilding operations of the house decorator, the sign-painter, the bookbinder, the paper- stainer, and several others. Polished iron, steel, and other metals are gilt mechanically by applying gold-leaf to the metallic surface at a temperature just under red-heat, pressing the leaf on with a burnisher, and reheating, when additional leaf may be laid on. The process is completed by cold burnishing.

CHEMICAL GILDING embraces those processes in which the gold used is at some stage in a state of chemical combination. Of thesc the following are the principal:—

Cold Gilding.—In this process the gold is-obtained in a state of extremely fine division from a chemical compound, and applied by mechanical means. Cold gilding on silver is performed by a solution of gold in aqua-regia, applied by dipping a linen rag into the sol- ution, burning it, and rubbing the black and heavy ashes on the silver with the finger or a piece of leather or cork. Wet gilding is effected by means of a solution of gold in ether, obtained by treating a dilute solution of chloride of gold with twice its quantity of ether. The liquids are agitated and allowed to rest, when the ether sepa- rates and floats on the surface of the acid. The whole mixture is then poured into a funnel with a small aperture, and allowed to

rest for some time, when the acid is run off and the ether separated. The ether will be found to have taken up all the gold from the acid, and may be used for gilding iron or steel, for which purpose the metal is polished with the finest emery and spirits of wine. The ether is then applied with a small brush, and as it evaporates it de- posits the gold, which can now be heated and polished. For small delicate figures a pen or a fine brush may be used for laying on the ether solution. Fire-gilding or Wash-gilding is a process by which an amalgam of gold is applied to metallic surfaces, the mercury being subsequently volatilized, leaving a film of gold or, according to Struve, an amalgam containing from 13 to 16 per cent. of mercury. In the preparation of the amalgam the gold must first be reduced. to thin plates or grains, which are heated red hot, and thrown into mer- cury previously heated, till it begins to smoke. Upon stirring the mercury with an iron rod, the gold totally disappears. The propor: tion of mercury to gold is generally as six or eight to one. When the amalgam is cold it is squeezed through chamois leather for the pur- pose of separating the superfluous mercury; the gold, with about twice its weight of mercury, remains behind, forming a yellowish silvery mass of the consistence of butter. When the metal to be gilt is wrought or chased, it ought to be eovered with quicksilver before the amalgam is applied, that this may be more easily spread ; but when the surface of the metal is plain, the amalgam may be applied to it direct. Whenno such preparation is applied, the surface to be gilded is simply bitten and eleancd with nitric acid. A deposit of vnereury is obtained on a metallic surface by means of ‘‘ quicksilver water,” a solution of nitrate of mercury,—the nitric acid attacking the metal to which it is applied, and thus leaving a film of free metallic mercury. The amalgam being equally spread over the pre- pared surface of the metal, the mercury is then sublimed by a heat just sufficient for that purpose; for, if itis too great, part of the gold may be driven off, or it may run together and leave some of the sur- face of the metal bare. When the mercury has evaporated, which is known by the surface having entircly become of a dull yellow colour, the metal must undergo other operations, by whieh the fine gold colour is given to it. First, the gilded surface is rubbed with a scratch brush of brass wire, until its surface be smooth ; then it is covered over with a composition ealled “ gilding wax,” and again ex- posed to the fire until the wax is burnt off.

‘This wax is composed of beeswax mixed with some of the following substances, viz., red ochre, verdigris, copper scales, alum, vitriol, borax ; but, according to Dr Lewis, the saline substances alone are sufficient, without any wax. By this operation the eolour of the gilding is heightened; and the effect seems to be produced by a perfect dissipation of some mer- cury remaining after the former operation. The dissipation is well effected by this equable application of heat. The gilt surface is then eovered over witha saline composition, eonsisting of nitre, alum, or other vitriolic salts, ground together, and mixed up inito a paste with water or weak ammonia. The pee of metal thus covered is exposed to a certain degree of heat, and then quenched in water. By this method its colour is further improved and brought nearer to that of gold, probably by removing any particles of eopper that may have been on the gilt surface. ‘This process, when skilfully carried out, produces gilding of great solidity and beauty ; but owing to the ex- posure of the workmen to mercurial fumes, it is very unhealthy, and further there is much loss of mercury. Numerous contrivances have been introduced to obviate these serious evils ; and the gilding fur- nace invented by M. D’Arcet is so arranged that the whole of the mercurial fumes are caught and recondensed for further use. Gilt brass buttons used for uniforms are gilt by this process, and there is an Act of Parliament yet unrepealed which prescribes 5 grains of gold as the smallest quantity that may be used for the gilding of 12 dozen of buttons 1 inch in diameter.

Electro-gilding, which has numerous and important applications, is described under ELECTRO-METALLURGY.

Gilding of Pottery and Porcelain.—The quantity of gold consumed for these purposes is very large. The gold used is dissolved in aqua- regia, and the acid is driven off by heat, or the gold may be preci- pitated by means of sulphate of iron. In this pulverulent state the gold is mixed with 7yth of its weight of oxide of bismuth, together with a small quantity of borax and gum water. The mixture 1s applied to the articles with a camel’s hair pencil, and after passimg through the fire the gold is of a dingy colour, but the lustre 18 brought out by burnishing with agate and bloodstone, and after- wards cleaning with vinegar or white-lead.

GILEAD (7993, ie. “hard” or “rugged”) is sometimes used, both in earlier and in later writers, to denote the whole of the territory occupied by the Israelites eastward of Jordan, extending from the Arnon to the southern base of Hermon (Deut. xxxiv. 1; Judg. xx. 1; Jos., Ant. xii. 8. 3, 4). More precisely, however, it was the usual name of that mountainous district which is bounded on the N. by the Hieromax (Yarmuk), on the E. by the Jordan, on the 8. yi the Arnon, and on the W. by a line which may be said

follow the meridian of Amman (Philadelphia or Rabbath- Ammon). It thus lay wholly within 31° 95’ and 32° 49’ N. lat., and 35° 34’ and 36° E.long. Excluding the narrow strip of low-lying plain along the J ordan, it has an average elevation of 2500 feet above the Mediterranean ; but, as

trees; but the western are well supplied with oak, terebinth,

flat meadows of green turf, exhibit a beauty of vegetation such as ig hardly to be seen in any other district of Palestine.

The first mention of « Mount Gilead” in Scripture occurs in Gen. XXXi., where it is said that the place where Jacob’s covenant with his father-in-law was ratified was thencefor. ward called “the hill of witness” (7Y?3), The locality con- templated by the sacred writer was doubtless somewhere on the ridge of what is now known as Jebel Ajlfin, and probably not far from Mahneh (Mahanaim), near the head of the wady Yabis.! Gilead next comes under notice in connexion with the partition of the promised land among the twelve tribes of Israel. At the period of the conquest the portion

was ruled by Sihon, king of the Amorites, having been at an earlier date wrested from Moab (Numb, xxi, 24; Deut. iii,

peculiarly suited to the pastoral and nomadic character of these tribes, A somewhat wild Bedouin disposition, fostered by their Surroundings, was retained by the Israelite inhabit-

Jephthah, of David’s Gadites, and of the prophet Elijah, After the close of the Old Testament history the word Gilead seldom occurs. It seems to have

soon passed out of

Proper. In Josephus and the New Testament the name Perea or Tépav Tod ’Topddvov is most frequently used 3 and

northern portion between the Jabbok and the Yarmuk being called Jebel Ajlan. Jebel Jilad includes Jebel Osha, and has for its capital the town of Es-Salt, The cities of Gilead

with Es-Salt, and apparently ought not to be regarded as distinct from Mizpeh (Judg. xi, Il, 34), called also peh-Gilead (Judg. xi, 29), or Ramoth Mizpeh (Josh.

. 26),

X11]

1 See Beke, ‘* Notes on an Excursion to Harran,” &c., in vol. xxxii,) ofthe Journal of the Royal Geographical Society (1862). «Tt was not | the river Jordan, but the ridge of Mount Gilead, which formed the natural boundary of the Possessions of the children of Israel,”

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tinguished for piety and charity. On the death of his parents he, while sti]] young, distributed amongst the poor his entire patrimony, including hig very tunic, which gar- ment effected a miraculous cure upon the poor sick man to whom it had been given, Shrinking from the publicity involved in this and many other (apparently involuntary) miracles, he betook himself to Provence, where, after a resi- dence of two years with St Crsarius at Arles, he withdrew into the solitude of the neighbouring desert, living upon herbs and the milk of a hind which came to his cell at stated hours. Here he was discovered after some time by the king of France, who ona hunting expedition bad tracked the hind to the hermit’s cave. With the reluctant

consent of Agidius, a monastery was now built on the spot, he being appointed its first abbot, The functions of this office he discharged with prudence and piety until hig death, which occurred some years afterwards,

Some uncertainty attaches to the date, as well ag to several other circumstances stated in this narrative, Tt is known that a certain Aigidius, whose name at least (’Avyé8.0s, from aif or ayés) is suggestive of a Greck origin, held an abbacy in Provence in the 6th century, and, at the instance of Bishop Ceesarius, undertook, in 514, a mission to Pope

between the sees of Arles and Vienne (Labbe, Cone., v.

the advocacy of St Giles towards the end of the 9th cen- tury there can be no question (Ménard, Hist. de Wismes) ; while Benjamin of Tudela makes special mention of the crowds of foreigners from all countries who in his time

Petit-Rhéne, about 12 miles westward of Arles, In the 11th and following centuries the cultus of the saint, who came to be regarded as the special patron of lepers, beggars, and cripples, spread very extensively over Europe, especially in England, Scotland, France, Germany, and Poland. The church of St Giles, Cripplegate, London, was built about

was founded by Queen Matilda in 1117. In England alone there are 146 churches dedicated to this saint ; and they

Cumberland (Parker, Calendar of the Anglican Church), In Edinburgh the church of St Giles (c, 1359) could boast

French and German art, but are much less common in Italy and Spain (Jameson, Sacred and Legendary Art, pp.

768-770).

ordained pastor of a Secession congregation in Dundee. His first effort beyond the pulpit was in 1839, when he issued

D96

Five Discourses, which, though neglected by the reading public, had many high merits, and gave the promise of more and of higher. Some time afterwards he rather unadvisedly published a sermon on “Hades,” which, distinguished by bold but ill-sustained speculation, and by brilliant but irregular imagination, brought him under the scrutiny of his co-presbyters, and was ultimately withdrawn from circula- tion. ilfillan next contributed a series of sketches of celebrated literary men to the Dumfries Herald, then edited by Thomas Aird; and these, along with several new ones formed his first Gallery of Literary Portraits, a volume which appeared in 1846, and had a wide circulation. It was quickly followed by a Second and a Third Gallery, until almost all our great men were delineated. In 1851 the Bards of the Bible appeared; and this has been his most successful work. His aim was that it should be “a poem on the Bible”; and it was far more rhapsodical than critical. Still the little criticism that was scattered through- out it was more than enough to keep it from soaring into poetry; and the poetry, when pure, was so fragmentary,

that instead of making one poem, it consisted of many small |

pieces, though in these there were grand strokes and ex- quisite touches of description. His sketching powers were next exercised upon the ‘Scottish Covenanters,” and some of the heroes and episodes of the struggle received a glowing commemoration. At a later date he published similar re- presentations of English Puritans and of Scotch Seceders, as champions of the rights of conscience. The most exten- sive publication with which Gilfillan was connected was Nichol’s edition of the British Poets; and his office was not only to secure the utmost accuracy in the text of each poet’s works, but also to furnish both a biography and a critical estimate. This engagement, taking him again and leisurely through the studies in which he had most delighted, and with which he had been most conversant, stimulated him to finish the work on which he had resolved in youth, and to which he had long given the brightest moods of his most genial hours. Waght, a Poem, came out in 1867, when he was fifty-four years of age; but the work which had re- ceived his labour and his polishing during his best thirty years was far less successful than his most ephemeral produc- tions. It was, indeed, an absolute failure. The theme was vast, vague, and unmanageable, even though the poem had extended to ninety, instead of

nine books. Then, though his nature was largely and essentially poetic, Gilfillan had never given himself a training or even any practice in verse. Besides he had already, in his many prose volumes, made use of all his poetic ideas and illustrations. There was not a line in Wight that had not often sounded forth in his essays with stronger and finer melody. It was but a faint echo, and it had no music. His History of a Man, partly autobiographic and largely fabulous, was not written with his usual candour and geniality. Not less abundant and striking than his literature was his oratory ; and wherever he appeared as a preacher, or as a lecturer on some literary or secular theme, he drew large crowds that were invariably thrilled by his eloquence. There was no token either of physical or of mental exhaustion when he died suddenly of heart disease, in the summer of 1878. He had just finished a new life of Burns designed to accompany a new edition of the works of that poet.

GILGAL. ‘Three towns of this name are mentioned in the Bible. (1.) The first and most important was situated “in the east border of Jericho” (Joshua iv. 19), on the border between Judah and Benjamin (Joshua xv. 7). Josephus places it 50 stadia from Jordan and 10 from Jericho (Antig., v. 1, 4), but these measurements do not agree with the posi- tion of Jericho with respect to Jordan. Jerome (Onomas- ticon, s.v. Galgal) places Gilgal 2 Roman miles from Jericho,

and speaks of it as a deserted place held in wonderful venera-

tion (“miro cultu”) by the natives. This site, which in the Middle Ages appcars to have been lost,—Gilgal being shown further north,—has lately been recovered by a German traveller (Schokke), and fixed by the English survey party. It is about 2 miles east of the site of Byzantine Jericho, and 1 mile from the modern Eriha. A fine tamarisk, traces of a church (which is mentioned in the 8th century), and a large reservoir, now filled up with mud, remain. ‘The place is called Jiljtilieh, and its position north of the valley of Achor (WAdy Kelt) and east of Jericho agrees well with the Biblical indications above mentioned. A tradition con- nected with the fall of Jericho is attached to the site (sec Tent Work in Palestine, vol. ii. p. 7). (2.) The second Gilgal, mentioned in Joshua xii. 23 in connexion with Dor,

appears to have been situated in the maritime plain. Jerome (Onomasticon, s.v. Gelgel) speaks of a town of the name 6 Roman miles north of Antipatris (Rés el Ain). This is apparently the modern Kalkilia (vulgarly Galgilia), but about 3 miles north of Antipatris is a large village called Jiljalieh, which is more probably the Biblical town. (3.) The third Gilgal (2 Kings iv. 38) was in the mountains (compare 2 Kings ii. 1-3) near Bethel. Jerome mentions this place also (Onomasticon, s.v. Galgala). It appears to be the present village of Jiljilia, about 7 English miles north of Beitin (Bethel).

GILGIT (Ghilghit, &c.), properly a secluded valley- state on a tributary of the Upper Indus, but also applied to the tributary river and the whole of its basin, which is one of great interest in many respects, though as yet but imperfectly known. Captain J. Biddulph has for some time past been employed in Gilgit on the part of the Government of India, but no part of the information communicated by him has yet been made available. We shall describe the whole basin so far as materials allow.

About 10 miles below the elbow formed by the Indus (74° 42’ long,, 35° 50’ lat.) in suddenly changing its course from a general direction north-west to a general direction south-west, in the vicinity of some of the highest mountains and vastest glaciers in the world, the Gilgit river enters it on the right bank, and with a general direction from the north-west. Thus the axis of the Gilgit valley is in fact a prolongation of that of the Indus valley in the direction maintained by the latter for some 300 miles above the elbow just mentioned. The length of the basin, so far as we know, on a line nearly west to east, is 120 miles; and its greatest width from north to south is about 75. The south limit of the basin is formed by the lofty watershed which divides the west-to-east Gilgit basin from the meridional basins of the (Lower) Indus, the Swat, and the Panjkora. At its intersection with the Indus-Swat watershed this limit rises to a peak of 19,400 feet, and at its intersection with the Panjkora-Chitral watershed to peaks of 18,490 and 19,440 feet. The western limit of the basin is the lofty watershed dividing it from the Mastuj valley on the upper waters of the Chitral river. This limit runs from the inter section last mentioned north-north-east and then north-east, till it joins the great mountain node in which the ranges of Hindu-Kush and the Muztagh (or Karakoram), accord- ing to our usual nomenclature, coalesce on the margin of the Pamir plateau. The northern limit of the basin is

formed by the Muztagh itself, with peaks of 23,330 feet, 22,740 feet, 22,590 feet, 25,370 feet, 25,050 feet, and the basin is closed on the east by an offshoot of the Muztagh which, over the Indus elbow, forms that other great congeries of peaks and glaciers, of which the culminating point (Raki-pushi) rises to 25,550 feet, whilst seven others exceed 19,000 feet. South of the gorge through which the Gilgit waters force their way to the Indus this eastern barrier continues with summits rising to 14,000 and 15,000 feet, and joins the southern limit already described. ‘This last-mentioned

part of the barrier is known as the Niludar Hills, and has to be passed by the traveller who enters Gilgit from Kashmfr, z.¢., from India, The remotest source of the Gilgit waters is in a lake called Shundar, close above Masttij, and by which one of the chief passes leads from Gilgit and Yassin to Masttj and Chitral. The Ghizar river runs out of this, and, after a course of 60 miles, is joined by the river of Yassin, coming fromthe north. These two may be considered to form the Gilgit river. The Yassin river itself is formed by two streams joining 6 or 8 miles above the village of Yassin, by each of which leads a pass. From the north-west comes the Tui or Moshabbar stream, by which lies the Moshabbar pass, probably at least 16,000 feet in height, and traversing a deep crevassed glacier for 8 miles. From where the road reaches the upper stream of Mastij one path leads down the latter to Mastuj, and another up-stream, crossing by the Baroghil pass (12,000 feet), Hindu-Kush watershed, into the Upper Oxus, chagam river, coning from the north, the very source of the Mastuj

Baroghil pass. Another im- portant stream, the Karambar, joins the Gilgit river from the north, about 21 miles below the confluence of the Ghizar

and Yassin river. This flows through the Ishkaman valley, rising in a lake called the Karambar Sar, said to have been formed in recent years by glaciers damming up the stream, and by this runs the most easterly pass of those that lead from the Gilgit basin direct to Wakhan. It is believed to be

very lofty and difficult, but it has not been explored. About 36 miles below the Ghizar-Yagsin confluence, and 25 miles above the confluence with the Indus, on the right bank, stand the fort and village of Gilgit. Five miles below this the river is joined by the last important confluent, called the Nagar river. Recent information suggests that this stream has a very lengthened course, flowing, in fact, from the northern side of the Muztagh in the vicinity of the Karam- bar lake; and, if this be so, a large addition must be made to the Gilgit basin ag a whole. But of this we have no defined knowledge.

The states occupying the basin of Gilgit are, or till lately

were, the following ;—

and held by a member of the same family. and named as a subdivision of Upper Chitral. C information as to the population or even the number of Villages in

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this lofty district ; but the route surveys show about thirty. The height of the chief place, Yassin, is 7770 feet,

his way to the Darkot pass, in hope of penetrating to Wakhan and It is believed that Yassin has recently

2. Next below Yassin is the small state of Punidl or Punyd, long held by j

Kashmir,

7000 feet down to 5500 feet,

forts, so that (as in Khorasan, villages and forts are have been occupied in gates are closed. Sentries guard the towers all night, and at dawn an armed patrol goes forth and makes the round of all places that might harbour an enemy, before the people issue to their avoca- tions. In this part of the valley there are frequent mauvais pas

The villages ‘are all within little and in Marco

the power of Kashmir, and therefore the influence of the British Tt stands 6940 feet above the sea. Gakuj and Yassin the road passes through a natural gate of rock. The ruler of Punial is, or was in 1873, Raja ‘Isa Bagdur, an old man who, in his little kingdom of nine best characteristics of a king,—feared by his enemies, liked and implicitly obeyed by his people. On meeting him they go up and kiss his hand. remainder of the main valley down to the Indus, but we shall first speak uf Hunza and N agar, lying in the eastmost part of the basin, on the N agar river, 3 and 4. Nagar lies on the left bank of opposite, and the two ‘* capitals,” against one another.

Nagar sends a gmall complimentary tribute to the maharaja of Kashmir, Hunza (also called Kan jud), a more warlike country, has often been at active enmity with him, coming down upon his villages in Gilgit, sweeping off the inhabitants, and selling them into

from Ladak to that territory. 5. Gilgit occupies all the lower part of the main valley to the Indus. If we take the whole length of the river, from the source

Punial 25, and Gilgit 35. The lower part of Gilgit is a valley from 1 to 3 miles wide, bounded on ‘ach side by steep rocky mountains. The valley contains stony alluvial plateaus of various forms and at various levels above the river, which flows between cliffs worn in these. The greater part of this space is barren, but as usual in those high regions there is in frout of each lateral ravine a cultivated space watered by the tributary stream, and on that a collection of houses. The village of Gilgit is 4800 feet above the sea, and stands on a flat plain of the river alluvium, forming a terrace 30 or 40 feet above the water. The cultivation here covers a square mile or thereabouts, irrigated from the nearest lateral stream. The houses are flat-roofed, scattered over the plain in twos and threes, among groups of fruit-trees. The destruction wag great in the wars to which Gilgit has been subject in the last half- century, and it will take long before the village recovers the former abundance of fruit-trees. The fort of Gilgit is the chief stronghold of the maharaja of Kashmir in Dardistan.

There is very little snow-fall at Gilgit. The vegetable products are wheat, barley, naked barley, rice (at Gilgit village only), maize, millet, buckwheat, various pulses, rape, and cotton; and of fruits, mulberries, peaches, apricots, grapes, apples, quinces, pears, greengages, figs (poor), wal- nuts,

pomegranates, and elecagnus, besides musk and water- melons. Silk is grown in very small quantity. There are three fabrics from it,—one half-wool, much wom by those above the common peasant, one half-cotton, and the third all silk, strong though loosely woven, and prized for girdles. Gold is washed from the river-gravels as in many other

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parts of the Indus basin. The vine is much cultivated in some parts of the valley. In Punidl it is grown in small vineyards, the vines being often old trees ; the whole vine- yard is covered with a horizontal framework of sticks, 2 to 4. feet above the ground, and over this the vines are trained.

The people of the basin are all reckoned to be Dards, though there is this perplexing fact, that (setting aside dialects) two languages are spoken among them, which are entirely and radically different,—the Khajuna language, which is spoken in Hunza, Nagar, and Yassin, being one of which no relation has yet been traced to any other tongue, whilst the Shzna, spoken in the rest of the basin, is clearly Aryan, and kindred to the Sanskritic languages of India. Now there seems to be no doubt entertained that the Yassin people at least have allthe characters of undisputed

Dards. It is worth while to exhibit the numerals from these two languages.

Shina. Khajuna. Shina Khajuna, (Ohne Boner Cyl …..... hann. Seven … sath …... tato. TG in …0 Occ es altatz. Hight … atsi…... altambu. Three ….. tia Boca usk6. Nine …. 2a …... untsho. Blount. sa tshar …. walt. MEM... ss QU aca téronvo. Fae es sistas WOOT secs tshudo. Eleven.. akdy…... turma-hann. SLs seuss Sib pescane mishindo, Twelve .. bdy…..... turma-altatz.

The Dards not only occupy the Gilgit basin, but also

extend down the Indus basin, in which they form a). 400, and Hwen-thaang, aseatding from Swat,c. 681

number of small republican communities (whilst the states of the Gilgit basin are all, so to speak, monarchical), reach- ing to Batera, where the Pushto-speaking tribes who are of Afghan blood, or at least Afghanized,

commence. The Dards are described as decidedly Aryan in features, broad-shouldered, well-proportioned, active, and enduring. The hair is usually black but sometimes brown, the eyes brown or hazel, the skin sometimes fair enough to show a ruddy complexion ; the voice and manner of speech are harsh. In bearing they are cheerful, bold, and independent, not dis-obliging when rightly handled, and as a race decidedly clever. They do not care much for human life, but still are not blood-thirsty. They are, says Mr Drew, "a people who will meet one on even terms, without sycophancy or fear, and without impertinent self-assertion." are not pretty in Gilgit, but those of Yassin have a better

more English cast of countenance than any I have yet seen in Asia, light-brown locks prevailing." woollen, trousers, choga (long robe like a dressing-gown), and girdle. The cap is most characteristic; it is a long woollen bag rolled up at the edge till it fits close to the head. The feet are wrapt in scraps of leather, with a long strip as abinder. There is a distinct separation into castes, of which Drew counts five, others only four. The lowest caste is Dum, the name of a low caste found all over India to the extreme Deccan,—a notable circumstance. The middle castes, Shin and Yashkun, form the body of the Dard people. The pure Shin looks more like a European than any high- caste Brahman of India. A Shin man may marry a Yashkun woman, but a Yashkun man may not marry a Shin woman. The Yashkuns predominate in Gilgit basin; the Shins in Haramosh (up the Indus valley) and Astor (east of Gilgit), and in the states of the Indus basin below Gilgit. It is a notable circumstance that the Dards abhor the cow, much as the Mussulmans abhor swine. They will not drink cow's milk, nor make or eat butter. In this last point the Indo- Chinese nations generally and the Chinese resemble them, but not in the dislike to the animal. The Dards will not burn cow-dung nor touch the cow if they can help it.

All the Dards of the Gilgit basin are Mahometans, and of three different sects, Sunnis, Shiahs, and Molais (Mullahis?), the last being a Shiah offshoot and modifi- cation. The last two drink wine, the Sunnis do not, Gilgit proper is half Sunni, half Shiah ; Punidl, Moldi;

The women |

The dress is entirely |

GiBbG@Lt

Hunza, Molai—these are great wine drinkers; Nagar, Shiah ; Ishkaman, Moldéi; Yassin, Molai and Sunni, with- out any Shiahs. Till lately they were very loose Mahome- tans. Some of the Moslem officers in the Sikh and Dogra garrisons have spread greater rigidity. The wine is put in large earthenware jars, which are then buried for a time. The people do not understand clarifying the wine, Dr Leitner tasted some which was very palatable, but looked more like mutton-broth than wine.

History.—The Dards are located by Ptolemy with surprising aceuraey (Darade) on the west of the Upper Indus, beyond the head-waters of the Swat river (Soastws), and north of the Gandare, %.¢., the Gandharas, who oceupied Peshawar and the eountry north of it. The Dardas and Chinas also appear in many of the old Pauranie lists of peoples, the latter probably representing the Shin branch of the Dards. This region was traversed by two of the Chinese pilgrims of the early centuries of our era, who have left records of their journeys, viz., Fahian, eoming from the north, The latter says: ‘‘ Perilous were the roads, and dark the gorges. Sometimes the pilgrim had to pass by loose cords, sometimes by light stretched iron chains. Here there were ledges hanging in mid-air; there flying bridges across abysses; elsewhere paths eut with the chisel, or footings to elimb by.” Yet even in these inaceessible regions were found great convents, and miraculous images of Buddha. How old the name of Gilgit is we do not know, but it occurs in the writings of the great Mahometan savant Al-Birtni, in his notices of Indian geography. Speaking of Kashmir, he says: ‘‘ When thou hast passed the defile which forms the entranee and hast penetrated into the plain, thou hast to thy left the mountains of Balaur and Shamilan. Two days’ journey distant are the Turks ealled Bhatdwaridn, whose king takes the name of Bhatshth. The eountry which these Turks oeeupy is called K7kit (or Gilgit), Asora, and Shaltds. Their tongue is Turk; the people of Kashmir have to suffer much from their raids ’—(Reinaud, ‘‘ Extraits,” in Journal Asiatique, ser. iv. tom. iv.). There are difficult matters for diseussion here. It is impossible to say what ground the writer had for eallin the people Turks. But it is curious that the Shins say they are a

: | of the sé ac the Moghuls of Indi hatever th repute, and indeed Hayward says: “The women have a | Denton Gilet uc fae lene oa Lace eee ee

by that. Gilgit, as far back as tradition goes, was ruled by rajas of a family called Trakane. When this family beeame extinct the valley was desolated by successive invasions of neighbouring rajas, and in the 20 or 80 years ending with 1842 there lad been five dynastic revolutions. The most prominent character in the history was a certain Gaur Rahman or Gauhar Aman, chief of Yassin, a eruel savage and man-seller, of whom many evil deeds are told. Being remonstrated with for selling a mullah, he said, ‘‘ Why not? the Koran, the word of God, is sold; why not sell the expounder thereof?” The Sikhs entered Gilgit about 1842, and kept a garrison there. When Kashmir was made over to Maharaja Gulab Singh of Jamu in 1846, by Lord Hardinge, the Gilgit claims were transferred with it. And when a commission was sent to lay down boundaries of the tracts made over, Mr Vans Agnew (afterwards murdered at Multan) and Lieut. Ralph Young of the Engineers visited Gilgit, the first Englishmen who did so. The Dogras (Gulab Singh’s race) had mueh ado to hold their ground, and in 1852 a catastrophe oeeurred, parallel on a smaller seale to that of the English troops at Cabul. Nearly 2000 men of theirs were exterminated by Gaur Rahman and a combination of the Dards ; only one person, a soldier’s wife, eseaped, and the Dogras were driven away for eight years. Gulab Singh would not again eross the Indus, but after his death (in 1857) the present Maharaja Ranbir Singh longed to reeover lost prestige. In 1860 he sent a force into Gilgit. Gaur Rahman just then died, and there was little resistance. ‘The Dogras have twice since then taken Yassin, but did not hold it. Now, recently, it is believed, they have not only occupied Yassin, but have invaded Chitral also. They also, in 1866, invaded Darel, one of the most seeluded Dard states, to the south of the Gilgit basin, but with- drew again.

The chief source of the information in this article is an excellent work by Mr Frederick Drew, who was long in the employment of the maharaja, The Jummoo and Kashmir Territories, a Geographical Account, 1875. Use has also been made of Dr Leitner’s uncompleted work, Results of Tour in Dardistan, &¢.; of Mr Hayward’s Ictters (Proc. Roy. Geog. Soc., vol. xv., and Journ, Roy. Geog. Soc., vol. xli.); and of Col. Walker’s Report on the

Survey Dept. for 1877-78. The narrative of “the ullah,” who performed the remarkable journeys noticed

GIL—GIL

(HL. Y,) GILL, Joun (1697-177 1), a Baptist minister and learned Rabbinical scholar, was born at Kettering, N. orthampton- shire, in 1697, On account of the limited means of his parents, he owed his education chiefly to his own persever- ance.

at Horsleydown, i where he continued fifty- one years. In 1748 he received the degree of D.D. from the university of Aberdeen. He died at Camberwell, October 14, 1771.

His principal works are Exposition of the Song of Solomon, 17 28 ; The Prophecies of the Old Testament respecting the Messiah con- sidered, 1728; Treatise on the Doctrine of the Lrinity, 1731; Cause of God and Truth, in 4 vols, , 1731; Exposition of the Bible, in 10 vols., in preparing which he formed a large collection of Hebrew and Rabbinical books and MSS. ; Dissertation on the Antiquity of

memoir by Dr Ripon, which has also appeared Separately. Various editions of several of his other works have also appeared.

GILLESPIE, Grorcz (1613-1648), a prominent member of the presbyterian party in the Westminster Assembly, was born at Kirkcaldy, where his father was parish minister, on the 21st of January 1613, and entered the university of St Andrews as a “ presbytery bursar” in 1629. On the com- pletion of a brilliant’ student career, he became domestic chaplain to Lord Kenmure, and afterwards to the earl of Cassilis, his conscience not

some remonstrance on the Commissioner. In 1642 Gillespie was translated to Edin- burgh ; but the brief remainder of his life was chiefly spent in the conduct of public business in London, Already, in 1640, he had accompanied the commissioners of the peace to England as one of their chaplains ; and in 1643 he was appointed by the Scottish of the four commis-

prominent part in almost all the protracted discussions on

as by an Erastian question, in particular, besides a series of vigorous

for an exclusive spiritual jurisdiction of the Church. Shortly after his return to Scotland, Gillespie was elected

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moderator of the Assembly (1648); but the laborious duties of that office (the court continued to sit from 12th July to the 12th of August) told fatally on a constitution which, at no time Very vigorous, had of late years been

cross by the hand of the common hangman, but was restored in 1746, Among the other works of Gillespie may be

many useful Questions and cases of Conscience are discussed and resolved, published posthumously (1649); and The Anz of the Testament opened, being a treatise on the covenant of grace, also posthumous (2 vols., 1661-1677 » GILLESPIE, Tuomas (1708-1774), one of the founders of the Scottish ‘Presbytery of Relief,” was born in the Midlothian, in 1708, On the com- pletion of his literary course at the university of Edinburgh, he for a short time attended a small theological seminary at

in matters of religion, Having on conscientious grounds persistently absented himself from the meetings of presby- of ordaining an unacceptable presentee as minister of Inverkeithing, he was, after an un- obtrusive but useful ministry of ten years, deposed for con- tumacy by the Assembly of 1752 3 he continued, however, to preach, first at Carnock, and afterwards in Dunfermline, where a large congregation gathered round him ; was not until 1761, and after repeated efforts to obtain readmission to

Presbytery of Relief, —relief, that is to say, “from the yoke of patronage and the tyranny of the church courts.” He died on the 19th January 1774, His only literary efforts

and some ability,

Both works appeared posthumously (1774). See Etves

of Fathers of the United Presbyterian Church (Edin.

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in the family of Lord Hopetoun,

Conquests, which he published two years later in 2 vols, Ato, This work gives a clear and generally accurate account of the various states of Greece, and the progress of each in litera- ture and the arts. The learning it displays is considerable, but its reflexions are generally somewhat trite, and the style is abrupt and frequently diffuse. It enjoyed, however, for Some time a great popularity, and was translated into French and German. It was long a favourite text-book for schools, but is now completely superseded. On the death

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of Robertson, Gillies was appointed historiographer-royal of Scotland. In his old age he retired to Clapham, where he died 15th February 1836, in the 90th year of his age.

Of his other works, none of which are much read, the principal are— View of the Reign of Frederick IT. of Prussia, with a Parallel between that Prince and Philip LI. of Macedon, 1789; Translation of Aristotle's Rhetoric, and of his Ethies and Politics; and History of the World from Alexander to Augustus, in 2 vols., 1807.

GILLRAY, James (1757-1815), one of the most eminent of caricaturists, was born at Chelsea in 1757. His father, a native of Lanark, had served as a soldier, losing an arin at Fontenoy, and was admitted first as an inmate, and afterwards as an out-door pensioner, at Chelsea Hospital. Gillray commenced life by learning letter-engraving, in which he soon became an adept. This employment, how- ever, proving irksome, he wandered about for a time with a company of strolling players. After a very checkered experience he returned to London, and was admitted a student in the Royal Academy, supporting himself by en- graving, and probably issuing a

considerable number of caricaturcs under fictitious names. Hogarth's works were the delight and study of hisearly years. Paddy on Horse- back, which appeared in 1779, is the first caricature which is certainly his. Two caricatures on Rodney's naval victory, issued in 1782, wcre among the first of the memorable series of his political sketches. The name of Gillray's publisher and printseller, Miss Humphrey— whose shop was first at 227 Strand, then in New Bond Street, then in Old Bond Street, and finally in St James's

Street—is inextricably associated with that of the cari-'

caturist. Gillray lived with Miss (often called Mrs) Hum- phrey during all the period of his fame. It is believed that he several times thought of marrying her, and that on one occasion the pair were on their way to the church, when Gillray said :—" This is a foolish affair, methinks, Miss Humphrey. We live very comfortably together ; we had better let well alone." There is no evidence, however, to support the stories which scandalmongers have invented about their relations. Gillray's plates were exposed in Humplrey's shop window, where eager crowds examined them. A number of his most tren- chant satires are directed against George III., who, after examining some of Gillray's sketches, said, with char- acteristic ignorance and blindness to merit, "I don't under- stand these caricatures." Gillray revenged himself for this utterance by his splendid caricature entitled A Connoisseur Examining a Cooper, which he is doing by means of a candle on a "save-all"; so that the sketch satirizes at once the king's pretensions to knowledge of art and his miserly habits.

The excesses of the Frencli Revolution made Gillray con- servative ; and he issued caricature after caricature ridicul- ing the French and Napoleon, and glorifying John Bull. He is not, however, to be thought of as a keen political adherent of either the Whig or the Tory party; he dealt his blows pretty freely all round. His last work, from a design by Bunbury, is entitled Interior of a Barber's Shop in Assize Time, and is dated 1811. While he was engaged on it, he became mad, although he had occasional intervals of sanity, which he employed on his last work. The ap- proach of madness must have been hastened by his intem- perate habits. Gillray died on the Ist of June 1815, and was buried in St James's churchyard, Piccadilly.

The times in which Gillray lived were peculiarly favour- able to the growth of a great school of caricature. Party warfare was carricd on with great vigour and not a little bitterness ; and personalities were freely indulged in on both sides. Gillray's incomparable wit and humour, know- ledge of life, fertility of resource, keen sense of the ludi- crous, and beauty of execution, at once gave him thie first place among caricaturists, Hc is honourably distinguished

in the history of caricature by the fact that his sketches are real works of art. The idcas embodied in some of them are sublime and poetically magnificent in their intensity of

meaning ; while the coarseness by which others are dis-

figured is to be explained by the general freedom of treat- ment common in all} intellectual departments in the eighteenth century. The historical value of Gillray's work has been recognized by accurate students of history. As has been well remarked: "Lord Stanhope has turned Gillray to account as a veracious reporter of speeches, as well as a suggestive illustrator of events." His contem- porary political influence is borne witness to in a letter from Lord Bateman, dated November 3, 1798. "The Opposition," he writes to Gillray, "are as low as we can wish them. You have been of infinite service in lowering them, and making them ridiculous." Gillray's extraordinary industry may be inferred from the fact that nearly 1000 caricatures have been attributed to him; while some con- sider him the author of 1600 or 1700. He is invaluable to the student of English manners as well as to the political student. He attacks the social follies of the time with scathing satire; and nothing escapes his notice, not even a trifling change of fashion in dress. The great tact Gillray displays in hitting on the ludicrous side of any subject is only equalled by the exquisite finish of his sketches—the finest of which reach an epic grandeur and Miltonic sublimity of conception.

Gillray's caricatures are divided into two classes, the political series and the social. The political caricatures form really the best history extant of the latter part of the — of George III. They were circulated not only over Britain but throughout Enrope, and exerted a powerful influence. In this series, George III., the Quccn, the Prince of Wales, Fox, Pitt, Burke, and Napoleon are the most prominent figures. In 1788 appeared two fine carica- tures by Gillray. Blood on Thunder fording the Red Sea represents Lord Thurlow carrying Warren Hastings through a sea of gorc : Hastings looks vcry comfortable, and is carrying two large bags of money. Markct-Day pictures the ministerialists of the time as horned cattle for sale. Among Gillray's best satires on the king are—Farmer George and his Wife, two companion plates, in one of which the king is toasting muffins for breakfast, and in the other the queen is frying sprats ; The Anti-Saccharites, where the royal pair propose to dispense with sugar, to the great horror of the family ; A Connoisseur Examining a Cooper ; Temperance enjoying a Frugal Meal; Royal Affability ; A Lesson in Apple Dumplings ; and The Pigs Possessed. Among his other political caricatures may be mentioned—Britannia between Scylla and Charybdis, a pieture in which Pitt, so often Gillray's butt, figures in a favour- able light ; The Bridal Night; The Apotheosis of Hoche, which concentrates the excesses of the French Revolution in one view; The Nursery with Britannia reposing in Peace; The First Kiss these Ten Years (1803), another satire on the peace, which is said to have greatly amused Napoleon; The Handwriting npon the Wall; The Confederated Coalition, a fling at the coalition which superseded the Addington Ministry ; Uncorking Old Sherry ; The Plum-Pudding in Danger ; Making Decent, 7.¢., Broad-bottomites getting into the Grand Costume; Comforts of a Bed of Roses ; Vicw of the Hustings in Covent Garden ; Phaethon Alarmed ; and Pandora opening her Box. The miscellaneous series of caricatures, although they have scarcely the historical importance of the political series, are more readily intelligible, and arc even more amusing. Among the finest are—Shakespeare Sacrificed ; Flemish Characters (two plates) ; Twopenny Whist ; Oh ! that this too solid flesh would melt ; Sandwich Carrots ; The Gout; Comfort to the Corns ; Begone Dull Care; The Cow-Pock, which gives humorous expression to the popular dread of vaccination ; Dilletanti Theatri- cals ; and Harmony before Matrimony and Matrimonial Harmonics —two exceedingly good sketches in violent contrast to each other.

A selection of Gillray's works appeared in parts in 1818; but the first good edition was Thomas M'Lean's, which was published with a key, in 1830. A somewhat bitter attack, not only on Gillray's character, but even on his genius, appeared in the Atheneum for October 1, 1831, which was successfully refuted by J. Landseer in the Atheneum a fortnight latcr. In 1851 Henry G. Bohn put out an cdition, from the original plates, in a handsome folio, the coarser sketchcs being published in a separate volume. For this edition Thomas Wright and R. H. Evans wrote a valuable commentary, which isa good history of the times embraced by the caricatures. The next edition, entitled The Works of James Giliray, the Caricaturist: with the Story of his Life and Times

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(Chatto and Windus, 1874), was the work of Thomas Wright, and, by its popular exposition and narrative, introduced Gillray to a very large circle formerly ignorant of him. This edition, which is complete in one volume, contains two portraits of Gillray, and upwards of 400 illustrations. Mr J. J. Cartwright, in a letter to the Academy (Feb. 28, 1874), drew attention to the existence of a MS. volume, in the British Museum, containing letters to and from Gillray, and other illustrative documents. The extracts he gave were used in a valuable article in the Quarterly Review for April 1874, Sce also the Academy for Feb. 21 and May 16, 1874.

For a contemporary life of Gillray, sce George Stanley's notice in his edition of Bryan's Dictionary of Panters. There is a good account of him in Wright's History of Caricature and Grotesque in Literature and Art, 1865. See also the article CARICATURE,

GILLYFLOWER, a popular name applied to various flowers, but principally to the clove, Dianthus Caryophyllus, of which the carnation is a cultivated variety, and to the stock, Matthiola' incana, a well-known garden favourite. The word is sometimes written gilliflower or gilloflower, and is reputedly a corruption of July-flower, "so called from the month they blow in." Phillips, in his Flora Historica, remarks that Turner (1568) "calls it gelouer, to which he adds the word stock, as we would say gelouers that grow on a stein or stock, to distinguish them from the clove- gelouers and the wall-gelouers, Gerard, who succeeded Turner, and after him Parkinson,

calls it gilloflower, and thus it travelled from its original orthography uutil it was called July-flower by those who knew not whence it was derived." Dr Prior, in his useful volume on the Popular Names of British Plants, very distinctly shows the origin of the name. He remarks that it was " formerly spelt gyllofer and gilofre with the o long, from the French giroflée, Italian garofalo (M. Lat. garvofilum) corrupted from the Latin Caryophyllum, and referring to the spicy odour of the flower, which seems to have been used in flavouring wine and other liquors to Teplace the more costly clove of India. The name was originally given in Italy to plants of the pink tribe, especially the carnation, but has in England been transferred of late years to several cruciferous plants." The gillyflower of Chaucer and Speuser and Shakespeare was, as in Italy, Dianthus Caryophyllus ; that of later writers and of gardeners Uf, athiola. Much of the con- fusion in the names of plants has doubtless arisen from the vague use of the French terms grroflée, oeillet, and violette, which were all applied to flowers of the pink tribe, but in England were subsequently extended and finally restricted to very different plants. The use made of the flowers to impart a spicy flavour to ale and wine is alluded to by Chaucer who writes—

- And many a clove gilofre To put in ale";

also by Spenser, who refers to them by the name of sops in wine, which was applied in consequence of their being steeped in the liquor. In both these cases, however, it is the clove-gillyflower which is intended, as it is also in the pass- age from Gerard, in which he states that the conserve made of the flowers with sugar "is exceeding cordiall, and wonder- fully above measure doth comfort the heart, being eaten now and then." The principal other plants which bear the name are the wallflower, Chetranthus Cheirt, called wall- gillyflower in old books; the dame's violet, Hesperis mat- ronalis, called variously the queen's, the rogue's, and the winter gillyflower ; the ragged robin, Lychuis flos cucult, called marsh-gillyflower ; the water-violet, Hottonia palus- tris, called water-gillyflower ; and the thrift, Armeria vulgaris, called sea-gillyflower. As a separate designation it has in modern times been chiefly applied to the Mathiola or stock, but it is now very little used.

GILPIN, Bernarp (1517-1583), rector of Honghton- le-Spring, distinguished by the unusual way in which he carried out his conception of the duties of a Christian pastor, was descended from a Westmoreland family, and was born at Kentmere in 1517. At Oxford he first adhered to the

gations, and if possible satisfy his mind on some disputed matters. He carried out this intention at Louvain, Antwerp, and Paris; and from a letter of his own, dated Louvain, 1554, we get a glimpse of the quiet student rejoicing in an "excellent library belonging to a monastery of Minorites," Returning to England towards the close of Queen Mary's reign, he was invested by his uncle, Dr Tonstall, bishop of Durham, with the archdeaconry of Durham, to which the rectory of Effington was annexed, The freedom of his attacks on the vices, and especially the clerical vices, of his times excited hostility against him, and he was formally brought before the bishop on a charge consisting of thir- teen articles. Tonstall, however, not only dismissed the case, but presented the offender with the rich living of Houghton-le-Spring ; and when the accusation was again brought forward, he again protected him. Enraged at this defeat, Gilpin's enemies laid their complaint before Dr Bonner, bishop of London, and he immediately gave orders for his apprehension. Upon this Gilpin prepared for mar- tyrdom ; and, having ordered his house-steward to provide him with a long garment, that he might "goe the more comely to the stake," he set out for London. Providentially, however, he broke his leg on the journey, and his arrival was thus delayed till the news of Queen Mary's death freed him from further danger. Heat once returned to Houghton, and there he continued to labour til] his death in 1583. When the Roman Catholic bishops were deprived, he was offered the see of Carlisle ; but he declined the honour, At Houghton his course of life was a ceaseless round of bene- volent activity. His hospitable manner ~~of living was the admiration of all, In his household, he spent " every fort~~ night 40 bushels of corn, 20 bushels of malt, and an ox, besides a proportional quantity of other kinds of provisions," Strangers and travellers found a ready reception; and even their horses were treated with so much care that it was humorously said that, if one were turned loose in any part of the country, it would immediately make its way to the rector of Houghton. Every Sunday from Michaelmas till

Easter was a public day with Gilpin. For the reception of his parishioners he had three tables well covered,—one for gentlemen, the second for husbandmen, the third for day- labourers ; and this piece of hospitality he never omitted, even when losses or scarcity made its continuance difficult, He built and endowed a grammar-school at a cost of up- wards of £500, educated and maintained a large number of poor children at his own charge, and provided the more promising pupils with means of studying at the universities, So many young people, indeed, flocked to his school that there was not accommodation for them in Houghton, and he had to fit up part of his house as a boarding establish- ment. Grieved at the ignorance and superstition which the remissness of the clergy permitted to flourish in the neighbouring parishes, he used every year to visit the most neglected parts of Northumberland, Yorkshire, Cheshire, Westmoreland, and Cumberland 3 and that his own flock might not suffer, he was at the expense of a constant assistant. Among his parishioners he was looked up to asa judge, and did great service in Peres eine a

amongst them. If an industrious man suffered a loss, he delighted to make it good; if the harvest was bad, he was liberal in the remission of tithes. And all this he was enabled to do because his frugality was as great as his generosity; for his rectory was worth no more than £400 a year. The boldness which he could display at need is well illustrated by his action in regard to duelling. Find- ing one day a challenge-glove stuck up on the door of a church where he was to preach, he took it down with his own hand, and proceeded to the pulpit to inveigh against the unchristian custom.

A life of Bernard Gilpin, written by George Carleton, bishop of Chichester, who had been a pupil of Gilpin's at Houghton, will be found in Bates's Vite Selcetorum aliquot Virorwm, &c., London, 1681. A translation of this sketch by William Freake, minister, was published at London, 1629; and in 1852 it was reprinted in Glasgow, with an introductory essay by Edward Irving. It fornis one of the lives in Christopher Wordsworth's Ecclesiastical Biography (vol. iii., 4th edit.), having been compared with Carleton's Latin text. Another biography of Gilpin, which, however, adds little to Bishop

Carleton's, was written by William Gilpin, M.A., pre- bendary of Ailsbury, London, 1758, and 1854.

GILPIN, Winttam (1724-1804), author of several works on the scenery of Great Britain, was born at Carlisle in 1724. He was educated at Oxford university, and, after holding for some time a small curacy in the north of England, established a school for sons of gentlemen at Cheam in Surrey. Among his pupils were Viscount Sidmouth, Lord Bexley, and Mitford, the author of the History of Greece, the last of whom presented him, when he had resolved to retire from teaching, with the living of Boldre, near the New Forest, Hampshire. Gilpin died there, April 5, 1804. He is author of a Life of Bernard Gilpin, several miscellaneous religious publications, and lives of a number of the Reformers, but is chiefly known for his works on the scenery of various parts of England and Scotland, illustrated by tasteful engravings in aquatint executed by himself,

The principal of these works are—The River Wye and Southern Districts of Wales, 1782; The Lake Country, 1789; Observations on Picturesque Beauty made in the year 1776 in several parts of Great Britain, particularly the Highlands of Scotland, 1778; two corre- sponding volumes on the Lakes of Cumberland and Westmoreland ; Forest Seenery, 1791; Three Essays on Picturesque Beauty, with a Poem on Landscape Painting, 1782; Essays on Prints and Early Engravings; Western Parts of England and Isle of Wight, 1798; and The Coasts of Hampshire, Sussex, and Kent, published post-humously. :

GIL VICENTE. See Vicente, Git,

GIN, the name commonly given to an aromatized spirit for drinking, varieties of which are also known as Geneva, Hollands, andSchiedam. Gin is an abbreviation of Geneva, both being primarily derived from the French gendévre (juniper), from the fact that the characteristic flavouring ingredient of the spirit is juniper berries. Gin was origin- ally and is still largely a Dutch compounded liquor, but it has long been a favourite stimulant beverage with the lower orders in London and other large English towns; and it is manufactured on a great scale by English rectifiers, As each separate distiller varies to some extent the materials and proportions of ingredients used in the preparation of gin, the varieties of the beverage are

numerous; but gene- rally a clear distinction exists between Hollands or Dutch gin and English gin. In the manufacture of Hollands a mash is prepared consisting of say 112 ib of malted bere or bigg and 228 tb of rye meal, with 460 gallons of water, at 162° Fahr. After infusion a proportion of cold water is added; and when the heat is reduced to about 80°, the whole, about 500 gallons, is run into the fermenting vat, to which about half a-gallon of yeast is added. Fermentation speedily ensues, and in about two days the attenuation is complete, although at this stage nearly one-third of the saccharine matter in the liquor is undecomposed, The

special features of the fermentation are the small proportion of yeast employed and the imperfect attenuation of the worts. The wash so obtained is distilled, and the resulting low wine is redistilled, with the addition of juniper berries and a little salt, sometimes with the addition of hops, Dutch gins vary much one from another, but generally they are much purer and mellower liquors than the more highly flavoured and frequently adulterated British gins. Good qualities of the latter have as their basis plain grain spirit from the ordinary whisky distilleries, the following being an example of a mixture for distillation :—

47 ib crushed almond cake.

2 ,, angelica root. 6 ,, powdered liquorice.

300 gallons of low wines. 650 ,, rectified spirit 95 Ib juniper berries. 95 ,, corianders.

There is, however, much variation in the ingredients employed, and several other flavouring substances—notably cardamoms and cassia or cinnamon—are freely employed. A kind of gin is also prepared by mixing proportions of essential oils by agitation with plain spirits without any redistillation, and much inferior liquor is said to be made with oil of turpentine and aromatic substances without the use of juniper berries at all. To prevent the cloudiness or turbidity that would arise in these inferior beverages when mixed with water, they are fined with alum, potassium car- bonate, acetate of lead, or sulphate of zinc. To give facti- tious pungency and mellowness

to such drinks, grains of. paradise and Cayenne pepper are freely used, and the absence of spirit is also covered by the use of sugar. What is known as cordial gin is usually more highly aromatized than the other varieties, and sweetened so that it really ought to be classed as a coarse liqueur. In thirty-eight specimens of gin examined by Dr Hassall, the alcoholic strength of which ranged from 22°35 to 48-80 degrees, and the sugar present varied between 2°43 and 9°38 per cent., seven were' found to contain Cayenne pepper, two had cinnamon or cassia oil, and nearly all contained sulphates. From the fact that the essential oil of juniper is the most powerful of all diuretics, gin is frequently prescribed in diseases of the urinary organs. Its beneficial effects in such cases is most marked ; but, on the other hand, the grossly sophisticated liquors which are largely consumed under the name of gin are most detrimental in their effects. In the early part of the 18th century gin-shops multiplied with great rapidity in London, and the use of the beverage increased to an extent so demoralizing that retailers actually exhibited placards in their windows intimating that there people might get drunk for 1d., and that clean straw in comfortable cellars would be provided for customers. The legislature was obliged to interfere in order to try to curb the tide of debauchery, and what is known as the Gin Act was passed in 1736, under the provisions of which, dealers were prohibited from selling gin and other spirits in quanti- ties less than 2 gallons without a licence of £50, and an excise duty of 20s. was charged on each gallon. The opera- tion of the Act, however, gave rise to much confusion, to illicit trade, and to gin riots, and after a lapse of seven years the statute was repealed.

GINCKELL, Goparr van (1640-1708), first earl of Athlone, general, was born in Guelderland about 1630 or 1640. He was the head of an ancient and noble family, and bore the title of Baron van Reede. In his youth he entered the Dutch army, and in 1688 he followed William prince of Orange in his expedition to England. In the following year he distinguished himself by a memorable exploit—the pursuit, defeat, and capture of the Scottish regiment which had mutinied at Ipswich, and was marching across the fens to their native land. It was the alarm ex- cited by this mutiny that facilitated the passing of the first Mutiny Act. In 1690 Ginckell accompanied William III.

to Ireland, and commanded a body of Dutch cavalry at the battlo of the Boyne. On the king's return to England General Ginckell was entrusted with the conduct of the war. He took the field in the spring of 1691, and estab- lished his headquarters at Mullingar. Among those who held 2 command under him was the marquis of Ruvigny, the recognized chief of the Huguenot refugees, Early in June Ginckell took the fortress of Ballymore, capturiug the whole garrison of 1000 men. The English lost only 8 men. After reconstructing the fortifications of Ballymore, the army marched to Athlone, then one of the most important of the fortified towns of Ireland. 'The Trish defenders of the place were commanded by a distinguished French general, Saint-Ruth. The firing began on June 19th, and on the 30th the town was stormed, the Irish army retreat- ing towards Galway, and taking up their position at Aghrim. Having strengthened the fortifications of Athlone and left a garrison there, Ginckell led the English, on July 12th, to Aghrim. An immediate attack was resolved on, and, after a severe and at one time doubtful contest, the crisis Was precipitated by the fall of Saint-Ruth, and the dis- organized Irish were defeated and fled. A horrible slaughter of the Irish followed the struggle, and 4000 corpses were left unburied on the field, besides a multitude

of others that lay along the line of the retreat. Galway uext capitulated, its garrison being permitted to retire to

Limerick. There the viceroy, Tyrconnel, was in command of a large force, but his sudden death early in August left the command in the hands of General Sarsfield and the Frenchman D'Usson. The English army came in sight of the town on the day of Tyrconnel's death, and the bombard- ment was immediately begun. Ginckell, by a bold device, crossed the Shannon and captured the camp of the Irish cavalry. A few days later he stormed the fort on Thomond Bridge, and after difficult negotiations a capitulation was signed, the terms of which were divided into a civil and a military treaty. Thus was completed the conquest or pacification of Ireland, and the services of the Dutch general were amply recognized and rewarded, He received the formal thanks of the House of Commons, and was created by the king first earl of Athlone and baron of Aghrim. The immense forfeited estates of the earl of Limerick were given to him, but the grant was a few years later revoked by the English parliament. The earl con- tinued to serve in the English army, and accompanied the king to the Continent in 1693. He fought at Landen, and assisted in destroying the French magazine at Givet. In 1702 he took command of the Dutch serving under the duke of Marlborough. He died at Utrecht, February 10, 1705. On the death of the ninth earl without issue in 1844, the title became extinct.

GINGER (French, Gingembre ; German, Ingwer), the rhizome or underground stem of Zingrber officinale, Roscoe, a perennial reed-like plant growing from 3 to 4 feet high. The flowers and leaves are borne on separate stems, those of the former being shorter than those of the latter, and averaging from 6 to 12 inches. The flowers themselves are borne at the apex of the stems in dense ovate oblong cone- like spikes from 2 to 3 inches long, composed of obtuse strongly-imbricated bracts with membranous margins, each bract enclosing a single small sessile flower. The leaves are alternate, bright green, smooth, tapering at both ends, with very short petioles. The plant, though unknown in a wild state, is considered with very good reason to be a native of the warmer parts of Asia, over which it has been culti- vated from an early period, and the rhizome imported into England. From Asia the plant has spread into the West Indies, South America, western tropical Africa, and Australia.

The use of ginger as a spice has been known from very

quently mentioned in the Middle Ages ; a name which denoted that the spice had been brought from or by way of Mecca. ginger plant both in India and China between 1280 and

or wanting the epidermis,

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early times ; it was supposed by the Greeks and Romans to be a product of southern Arabia, and was received by them by way of the Red Sea ; In India it has also been kuown from a very remote period, the Greek and Latin names being derived from the Sanskrit. Fliickiger and Hanbury, in their Pharmacographia, give the following notes on the history of ginger. On the authority of Vincent's Commerce and Navigation of the Ancients, it is stated that in the list of imports from the Red Sea into Alexandria, which in the second century of our era were there liable to the Roman fiscal duty, ginger occurs among other Indian spices. So

frequent is the mention of ginger in similar lists during the

Middle Ages, that it evidently constituted an important

item in the commerce between Europe and the East. It

thus appears in the tariff of duties levied at Acre in Pales- tine about 1173, in that of Barcelona in 129 1, Marseilles in 1228, and Paris in 1296. Ginger seems to have been well

known in England even before the Norman Conquest, being

often referred to in the Anglo-Saxon leech-books of the llth century. It was very common in the 13th and 14th

centuries, ranking next in value to pepper, which was then

the commonest of all spices, and costing on an average about 1s. 7d. per tb. "Three kinds of ginger were known

among the merchants of Italy about the middle of the 14th

century :—(1) Belledi or Baladi, an Arabic name, which, as applied to ginger, would signify country or wild, and

denotes common ginger ; (2) Colombino, which refers to

Columbum, Kolam, or Quilon, a port in Travancore, fre- and (3) Micchino,

Marco Polo seems to have seen the

1290.

John of Montecorvino, a missionary friar who

visited India about 1292, gives a description of the plant, and refers to the fact of the root being dug up and trans- ported. Nicolo di Conto, a Venetian merchant in the early part of the 15th century, also describes the plant and the collection of the root, as seen by him in India, Venetians received ginger by way of Egypt, some of the superior kinds were taken from India overland by the Black Sea. The spice is said to have been introduced into America by Francisco de Mendoga, who took it from the East Indies to New Spain. for commercial purposes from San Domingo as early as 1585, and from Barbados in 1654; quantities were sent from the West Indies to Spain.

Though the

It seems to have been shipped so early as 1547 considerable

Ginger is known in commerce in two distinct forms, termed respectively coated and uncoated ginger, as having For the first, the pieces, which or “hands,” from their irregular

are called “races”

palmate form, are washed and simply dried in the sun. In

this form ginger presents a brown, more or less irregularly wrinkled or striated surface, and when broken shows a dark brownish fracture, hard, and sometimes horny and resinous. To produce uncoated ginger the rhizomes

are washed, scraped, and sun-dried, and are often subjected to a system of bleaching, either from the fumes of burning sulphur or by immersion for a short time in a solution of chlorinated lime. The whitewashed appearance that much of the ginger has, as seen in the shops, is due to the fact of its being washed in whiting and water, or even coated with sulphate of lime. This artificial coating is supposed by some to give the ginger a better appearance ; it often, however, covers an inferior quality, and can readily be detected by the ease with which it rubs off, or by its leaving a white powdery substance at the bottom of the jar in which it is contained. Uncoated ginger, as seen in trade, varies from single joints an inch or less in length to flattish irregularly branched pieces of several joints, the “races” or “hands,” and from 3 to 4 inches long; each branch has a depression at its

summit showing the former attachment of a leafy stem. The colour, when not whitewashed, is a pale buff; it is somewhat rough or fibrous, breaking with a short mealy fracture, and presenting on the surfaces of the broken parts numerous short bristly fibres.

The British market derives its supply of ginger from various parts of the world. The principal sorts, however, or those most commonly found in commerce, are Jamaica, Cochin, Bengal, and African, though each of these in its turu has its several varieties and qualities. The best or most valued kind of all is the Jamaica, and next to it the Cochin. For ordinary purposes uncoated ginger is con- sidered the best ; the largest and finest pieces, of a pale buff colour both outside and inside, and cutting softly and evenly, are considered the most valuable. The chief sources of supply are the East and West Indies, Sierra Leone, and Egypt.

The principal constituents of ginger are starch, volatile oil (to which the characteristic odour of the spice is due), and resin (to which is attributed its pungency). Its chief use is as a condiment or spice, but as an aromatic and stomachic medicine it is also used internally. ‘‘The stimulant, aromatic, and carminative propetties render it of much value in atonic dyspepsia, especially if accom- panied with much flatulence, and as an adjunct to purgative medi- cines to correct griping.” Externally applied as a rubefacient, it has been found to relieve headache and toothache. The

rhizomes, collected in a young green state, washed, scraped, and preserved in syrup, form a delicious preserve, which is largely exported both from the West Indies and from China. Cut up into pieces like

lozenges, and preserved in sugar, ginger also forms a very agrecable sweetmeat, (J. R. J.)

GINGHAM is a woven cotton fabric, of a close stoutish texture, the distinguishing characteristics of which are that it is a plain (¢e., untwilled) cloth, woven into yarn-dyed stripes or checks of two or more colours. In some cases as many as seven or eight colours are introduced in the warp and weft of a gingham; but no patterns are made that cannot be woven in a common plain loom. Gingham was originally an Indian product, but its manufacture was early introduced into the Lancashire aud Glasgow districts ; and during the first half of the present century the trade formed an important feature in the textile industries of the latter locality—the demand for the fabric coming chiefly from the United States and the West Indies. The trade distinction of gingham is now to a large extent superseded by other terms.

GINGUENK, Prerre Lovis (1748-1815), the author of the Histoire littéraire d'Italie, was born on 25th April 1748 at Rennes in Brittany. He was educated at a Jesuit college in his native town, but he owed most of his literary tastes and accomplishments to his father, who early imbued him with a love of musicand the languages of England and Italy. His first literary effort, a poetical piece entitled Confession de Zulmé, brought him into notice among the literary coteries of Paris, from the circumstance that, when published at first anonymously, it was claimed by six or seven different authors. Though the value of the piece is not very great, it is Ginguené's poetical chef d'acuvre. The part he took asa defender of Piccini against the partisans of Glnck made him still more widely known ; and the reputa- tion he acquired asa promising political writer secured em- ploymeut for him in the public service in 1780. He hailed, however, the first symptoms of the Revolution, joined Rabaut, St Etienne, and Cerntti in producing the Feuille Villageoise, and celebrated in an indifferent ode the opening of the states-general. A more creditable effort was his Lettres sur les Confessions de J. J. Rousseau, 1791, in which he defended to the

uttermost the life and principles of his author. Refusing to countenance the excesses of the Itevolution, he was thrown into prison, whence he only escaped with life by the downfall of Robespierre. Some time after his liberation he assisted, as director-general of

the “commission exécutive de Vinstruction publique,” in reorganizing the system of public instruction. When the Institute was established in 1796, he was elected a member of the division called the academy of moral and political sciences. In 1798 the directory appointed him minister. plenipotentiary to the king of Sardinia, whose ruin, begun by force of arms, they had determined to complete by treachery. A less promising tool could not have been found for carrying out their design. After fulfilling his duties for seven months, very little to the satisfaction of his employers, Ginguené retired to his country house of St Prix, in the valley of Montmorency, and there he prose- cuted his literary labours till the Revolution of the 18th Brumaire called him once more before the world. He was appointed a member of the tribunate, which made a show of maintaining democratic opposition to the first consul ; but Napoleon, finding that he was not sufficiently tract- able, had him expelled at the first “purge,” and Ginguené once more joyfully returned to his favourite pursuits, These were now more than ever a necessity of life to him, as his only other source of income was the small endow- ment attached to his seat in the Institute. Fortunately he was nominated one of the commission charged to con- tinue the literary history of France, which had been brought down by the Benedictines to about the close of the 12th century; and the three volumes of this series which ap- peared in 1814, 1817, and 1820 are for the most part the result of his labours. But the work by which Ginguené will be longest remembered is his [Vistoire ittératre d’Italic (9 vols, 8vo, 1811-1819), to which he was putting the finishing touches when he was cut off by a painful disease, November 16, 1815. The first six volumes ap- peared before their author’s death; the seventh is entirely his except a few pages; and of the eighth and ninth he wrote about a half, the other half being composed by Salfi, and revised by Daunou. The success of the history in Italy was astonishing: editions were published in various parts of the peninsula, with notes and

comments by the best scholars, and three translations appeared respectively at Milan, Naples, and Venice.

Ginguené was originally led to make Italian literature his special study by finding how ill that subject was under- stood, and how little it was appreciated, by his countrymen. In the composition of his history he was guided for the most part by the great work of the Jesuit Tiraboschi, but he avoids the prejudices and party views of his model. His own style, though occasionally forcible and eloquent, is not unfrequently too tame for the subject, and he often tres- passes on his reader's patience by over-minuteness of detail ; but these faults are more than atoned for by fine critical discernment, impartiality, and freedom. On the score of accuracy, indeed, Ginguené sometimes offends, but seldom in matters of great moment; and his slips are such as are alinost inevitable to a foreigner, who could hardly be said to have even seen the country whose literary history he relates. The Italians felt grateful to him for having placed their literature in its proper light, and readily forgave the excessive eulogies which he passed on many of their writers, whose very names had been forgotten in their own country.

During the latter years of his life Ginguené wrote extensively for the press, and he edited the Décade philosophique, politique, et lit- térazre, till it was suppressed by Napoleon in 1807. He contributed largely to the Biographie wniversclle, the Mercure de France, and the Eneyclopédie méthodique; and he edited the works of Chamfort and of Lebrun. Among his minor productions are an opera, Pom- ponin ou le Tuteur mystifié, 1777; La Satire des Satircs, 1778; De Vautorité de Rabelais dans la révolution présente, 1791; De M. Neckar, 1795; Fables inédites, 1814. See ''Hloge de Gingnené," by Dacier, in the Afémoires de U' Institut, tom. vii. ; '"' Discours" by M. Daunou, prefixed to the 2d edit. of the Hist. ltt. d'Italic; D. J. Garat, Notice sur la vie et les ouvrages de P, L, Guingené, Paris, 1817,

GIN—GIO

GINSENG, the root of a species of Panax (P. Ginseng, Meyer), belonging to the natural order Araliacee, is a very celebrated Chinese medicine, The demand is so great that many other roots are substituted for it, notably that of Panax quinguefolium, Linn., distinguished as American ginseng, and

imported from the United States, At one time the ginseng obtained from Manchuria was considered to be the finest quality, and in consequence became so scarce that au imperial edict was issued prohibit- ing its collection. That prepared in Corea is now the most esteemed variety. The root of the wild plant is preferred to that of cultivated ginseng, and the older the plant the better is the quality of the root considered to be. Lockhart states that all the ginseng collected in the Chinese empire is imperial property, and is sold to those who have the privilege of dealing in it at its weight in gold. Great care is taken in the preparation of the drug. The account given by Keempfer of the preparation of nindsin, the root of Stum ntnsi, Thunb., in the Corea, will give a good idea of the preparation of ginseng, ninsi being a similar drug of sup- posed weaker virtue, obtained from a different plant, and

often confounded with ginseng. “Tn the beginning of |

winter nearly all the population of Sjansai turn out to collect the root, and make preparations for sleeping in the fields. The root, when collected, is macerated for three dlays in fresh water, or water in which rice has beeu boiled twice ; it is then suspended in a closed vessel over thie fire, and afterwards dried, until from the base to the middle it assumes a hard, resinous, and translucent appearance, which is considered a proof of its good quality,”

Ginseng of good quality generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from 2 to 4 inches, The taste is mucilaginous, sweetish, and slightly bitter and aromatic, The root is frequently forked, and it is probably owing to this circumstance that medicinal properties were in the first place attributed to it, its resemblance to the body of a man being supposed to indicate that it could restore virile power to the aged and impotent. In price it varies from 6 or 12 dollars to the enormous sum of 300 or 400 dollars an ounce. Root of this quality can of course only be pur- chased by the most wealthy, aud the greatest care is taken of sucht pieces by the vendors.

Loekhart gives a graphie description of a visit to a ginseng mer- chant. Opening the outer box, the merchant renioved several paper pareels whieh appeared to fill the box, but under them was a second box, or perhaps two

smal] boxes, which, when taken out, showed the bottom of the large box and all the intervening space filled with more paper parcels. ‘These parcels, he said, ‘‘ contained quicklime, for the purpose of absorbing any moisture and keeping the boxes quite dry, the lime being packed in paper for the sake of eleanli- ness. ‘The smaller box, which held the ginseng, was lined with sheet-lead ; the ginseng further enclosed in silk wrappers was kept

in little silken-covered boxes, Taking up a pieee, he would request his visitor not to breathe upon it, nor handle it ; he would dilate

The dose of the root is from 60 to 90 grains. During the use of the drug tea-drinking is forbidden for at least a month, but no other change is made in the diet. It is taken in the morning before breakfast, from three to eight days together, and sometimes it is taken in the evening before going to bed.

At one time it was proposed by some Russians to establish gin- seng plantations, with the view of growing the rvot as an important

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article of trade with China. Ginseng is also cultivated in Japan, having been introduced from Corea ; but, although it grows more luxuriantly there than in its native country, the root is considered to be mueh less active. This may be due to the fact that, while in the mountains of Corea the root is perennial, in Japan the plant runs to seed the first year, and becomes annual, Europeans have hitherto failed to discover any remarkable properties in the drug. Dr Porter Smith, however, mentions having seen some eases in which life appeared to be prolonged fora time by its use; and M. Maaek states that one of the Cossacks of his party, having chopped off a finger accidentally with an axe, applied ointment made from ginseng, and the wound healed rapidly. Its properties, which may be likened to those of the mandrake of Seripture, are perhaps dependent in great measure upon the faith of the patient.

pp. 197, 333, (2), vol. ix. p. 77; Lewis, Materia Medica, p. 824; Journal of Botany, 1864, p. 320 ; Geoffroy, Z’ract. de Materié Medicale, t. ii. p- 112; Loureiro, Flora Cochinchinensis, p. 656; Kempfer, 4Amenitates Exoticee, p. 824.

GIOBERTI, Vincenzo (1801-1852) the ablest philo- sophical writer of modern Italy, and one of the most inte- resting actors in the recent history of the country, was born in Turin on the 5th April 1801, the only child of parents in moderate circumstances there, and was educated by the fathers of the Oratory with a view to the priest- hood, to which he was ordained in 1825, Hig study of the ancient philosophers, and the fathers and doctors of tho church, occupied him for years, during which he led a very retired life ; gradually, however, he took more and more interest in the affairs of his country, as well as in the litera- ture of the day, entering warmly into the new ideas then beginning to be discussed in connexion with politics, The freedom of Italy from foreign masters became his ruling motive in life, and this freedom in his conception of it was an emancipation, not only from armed masters, but from modes of thought alien to its genius, and detrimental to its European authority. This authority was in his mind con- nected with papal supremacy, though in a way quite novel— intellectual rather than political. One must remember this in considering nearly all his writings, and also in estimating his position, both in relation to the ruling clerical party— the Jesuits—and also in relation to the politics of the court of Piedmont after the accession of Charles Albert in 1831. He was now noticed by the king and made one of his chaplains. His popularity and private influence, however, were reasons enough for the court party to mark him for exile; he was not one of them, and could not be depended on. Knowing this, he in 1833 asked permission to resign his chaplaincy, but was suddenly arrested while walking with a friend in the public gardens, and, after an imprisonment of four months, sent out of the country in the escort of a carabineer, under decree of banishment. This was done without trial or process—simply, it would appear, by private influence of the clerical party, his name being at the same time struck off the list of theological doctors of the college of Turin. With broken fortunes and ruined plans Gioberti arrived in Paris in the beginning of October 1833. A year later he went to Brussels, where he spent the best period of his life from that time to 1845, teaching philosophy, and assisting in the work of a college superintended by his friend Gaggia, yet finding time, by rising early and sitting late, to write many works of great importance in philosophical Inquiry, but bearing a special relation to his country and its position. His spirits never

, | Teturned to him, however, as his whole being was bound

up with the welfare of his native country. An amnesty having been passed by Charles Albert in 1846, Gioberti had liberty to return' to Italy, just as Pius IX, in the beginning of his pontificate manifested strongly liberal sympathies. Gioberti took no step, however, till the end of 1847, and did not return to his native land till after

certain negotiations, and the public expression of popular enthusiasm in his favour, On his entrance into Turin, 29th April 1848, there was a general ouburst of this enthusiasm, mainly caused, it appears, by his unjust banishment and by the large circulation of lis books, especially the Gesuita Moderno. The city was illuminated; deputa- tions waited upon him; the king made him senator, but, having been returned both by Turin and by Genoa as deputy to the assembly of representatives, now first meeting under the new constitution, he elected to sit in the lower chamber, for his native town. Previous to the opening he made a tour in various provinces, beginning at Milan and including Rome, where he had three interviews with the liberal pope, who at that moment seemed to be the repre- sentative of his ideal imagined in the work Del Primato morale e civile, which Pius had read and admired. While he was engaged in this tour, constantly addressing the people publicly, the chamber met and elected him president. In the same parliament sat Azeglio, Cavour, and other liberals, and Balbo was prime minister. At the close of the same eventful year, a new ministry was formed, headed by Gioberti ; but with the accession of Victor Emmanuel in March 1849 his active life came to an end. For a short time indeed he held a seat in the cabinet, though without a portfolio; but an irreconcilable disagreement soon fol- lowed, and his removal from Turin was accomplished by his appointment on a mission to Paris, whence he never returned. There, refusing the pension which had been offered him and all ecclesiastical preferment, he lived frugally, and spent his days and nights as at Brussels in literary labour. Many other exiles gathered about him, and the Marquis Pallavicino became his bosom friend. He died suddenly, of apoplexy, on the 26th October 1852. Gioberti's writings are more important than his political career. In the general history of European philosophy they stand apart. As

the speculations of Rosmini, against which he wrote, have been called the last link added to medixval thought, so the system of Gioberti, more especially in his greater and earlier works, is unrelated to other modern schools of thought. It shows a harmony with the Roman Catholic faith which caused Cousin to make the superficial criticism that ‘‘Italian philosophy was still in the bonds of theology.” Method is with him a syuthetic, subjective, and psychological instru- ment. He reconstructs, as he declares, ontology, and begins with the ‘‘ ideal formula,” ‘‘ the Ens creates ex nihilo the existent.” He is in some respects a Platonist, and transplants certain dogmata from the ancient idealist. He identifies religion with civilization, and arrives in his treatise Del Primato morale e eivile degli Italiani at the conclusion that the church is the axis on which the well- being of human life revolves. His later works, the Riwnovamento and the Protologia, are sometimes thought to be less affirmative in this matter, and there is a division in opinion among his critics how far he shifted his ground under the influence of events before he died. His first work, written when he was thirty-seven, had a personal reason for its existence. A young fellow-exile and friend, Paolo Pallia, having many doubts and misgivings as to the reality of revelation and a future life, Gioberti at once set to work with La Leorica del Sovrannaturale, which was his first publication (2 vols., 1838). After this the enormous labours of his pen made up for the lateness of his commencement as an author. Philosophical treatises in two or three volumes, which would occupy, generally speaking, half a lifetime, followed in rapid succession, each one being a corol- lary to the last. The Teorica was followed by Introduzione allo Studio della Filosofia in three volumes, passing through the press in 1889-40. In this work he states his reasons for requiring a new method and new terminology. Here he brings out the doctrine that religion is the direct expression of the idea in this life, and is one with true civilization in history. Civilization is a conditioned mediate tendency to perfection, to which religion is the final com- pletion if carried out; it is the end of the second cycle expressed by the second formula, the Ens redeems existences. Essays on the lighter and more popular subjects, Del Bello and Del Buono, followed the Jntroduetion, but were not published as a volume till 1846, having first appeared in connexion with the writings of other authors. Del Primato morale ¢ eivile degli Italiani and the Pro- legomeni to the same, and soon afterwards his triumphant exposure of the Jesuits, 17 Gesuita Moderno, in five successive volumes (eight volumes

altogether), began to be issued in 1843, and no doubt hastened the transfer of rule from clerical to civil hands. I¢ was, as has been seen, the popularity of these semi-political works,

heightened by other occasional political articles which fill two volumes, and by his Rinnovamento eivile d'Italia, that cansed Gioberti to be welcomed with such enthusiasm on his return to his native country. All these works were perfectly orthodox, and aided in drawing the liberal clergy into the movement which has resulted since his time in the unification of Italy. The Jesuits, how- ever, closed round the pope more firmly after his return to Rome, and in the end Gioberti's writings were placed on the Indes, although with no unfavourable result as far as thcir influence is concerned. The remainder of his works need not be particularized, although they give his mature views on many points, especially La Filosofia della Rivelazione and the Protologia. The entire writings of Gioberti, including those left in manuscript, have been carefully edited by Giuseppe Massari in thirty-six volumes.

See Massari, Ricordi Biografici e Carteggio (Naples, 1863); Lettere di Vineenzo Gioberti e Giorgio Pallavieino (Milan, 1875) Rey. C. B. Smyth, Christian Metaphysics (London, 1851).

GIOJA, Metcuior (1767-1828), a distinguished Italian writer on philosophy and political economy, was born at Piacenza in 1767. He was educated at the celebrated college of St Lazare in his native town, and showed special fondness for the philosophical sciences. Apparently he had been destined for the church, but he seems to have given up at an early period the study of theology, and after completing his course at the college spent some years in retirement. His first work was the philosophical treatise Il nuovo Galateo (1802), which was followed by the Logica Statistica. The arrival of Napoleon in Italy drew Gioja into public life. He advocated warmly the establishment of a republican government, and under the Cisalpine Republic he was named historiographer and director of statistics. After the fall of Napoleon he retired into private life, and does not appear again to have held office. He died in 1828. Glioja's fundamental idea is the value of statistics or the collection of facts. Philosophy itself is with him

classification and consideration of ideas. Logic he re- garded as a practical art, and his Lserciziont Logici has the further title, Art of derwing benefit from ill-constructed books. In ethics Gioja follows Bentham, and his large treatise Del Merito e delle Recompense, 1818, is a clear and systematic view of social ethics from the utilitarian principle. In poli- tical economy this avidity for facts produced better fruits, The Nuovo Prospetto delle Scienze Economiche, 6 vols., 1815-17, although long to excess, and overburdened with classifications and tables, contains much valuable material. In particular, Gioja must be credited with the finest and most original treatment of division of labour since the Wealth of Nations. Much of what Babbage taught later on the subject of combined work is anticipated by Gioja. His theory of production is also deserving of attention from the fact that it takes into account and gives due prominence to immaterial goods. Throughout the work there is con- tinuous opposition to Smith. Gioja's latest work Filosofia della Statistica, 1828, contains in brief compass the essence of his ideas on human life, and affords the clearest insight into his aim and method in philosophy both theoretical and practical.

A notice of Gioja's life is given in the 2d edition of the Filosofia della Statistiea, 1829. See Ferri, Essai sur V'histoire de la Phil. en Italie au 19me Steele, 1869.

GIORDANO, Luca (1632-1705), a painter of great immediate celebrity, was born in Naples, son of a very indifferent painter, Antonio, who imparted to him the first rudiments of drawing. Nature predestined him for the art, and at the age of eight he painted a cherub into one of his father's pictures, a feat which was at once noised abroad, and which induced the viceroy of Naples to recommend the child to Spagnoletto. His father afterwards took him to Rome, to study under Pietro da Cortona. He acquired the nickname of Luca Fa-presto (Luke Work-fast). One might suppose this nickname to be derived merely from the almost miraculous celerity with which from an early age and throughout his life he handled the brush; but it is said to

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have had a more express origin. The father, we are told,

poverty-stricken and greedy of gain, was perpetually urging

his boy to exertion with the phrase, “Luca, fa presto.”

The youth obeyed his parent to the letter, and would actu- hasty meal, but received into his mouth, while he stil] worked on, the food which his father’s hand supphed. He copied nearly twenty

ally not so much as pause to snatch a

times the Battle of Constantine by Julio Romano, and with

proportionate frequency several of the great works of His rapidity, which belonged as much to invention as to mere handiwork, and his versa- tility, which enabled him to imitate other painters decep- tively, earned for him two other epithets, “The Thunderbolt” and “The Proteus,” of Painting. He shortly visited all the main seats of the Italian school of art, and formed for himself a style combining in a certain measure the ornamental pomp of Paul Veronese and the contrasting

Raphael and Michelangelo.

(Fulmine),

compositions and large schemes of chiaroscuro of Pietro da Cortona. He was noted also for lively and showy colour.

Returning to Naples, and accepting every sort of commis- sion by which money was to be made, he practised his art with so much applause that Charles IL. of Spain towards Madrid, where he remained

1687 invited him over to

thirteen years. Giordano was very popular at the Spanish

court, being a sprightly talker along with his other marvel-

lously facile gifts, and the king created him a cavaliere.

One anecdote of his rapidity of work is that the queen of

Spain having one day made some inquiry about his wife,

he at once showed Her Majesty what the lady was like by painting her portrait into the picture on which he was en-

gaged. After the death of Charles in 1700 Giordano, gorged with wealth, returned to Naples. sums in acts of munificence, and was particularly liberal to his poorer brethren of the art. He again visited various parts of Italy, and died in Naples on 12th J anuary 1705, his last words being "O Napoli, sospiro mio" (O Naples, my heart's love!). One of his maxims was that the good painter is the one whom the public like, and that the public are attracted more by colour than by design.

At the present day, when the question is not how quickly Giordano could do his work, but what the work itself amounts to, his reputation has run down like the drops of heavy rain off a window, or like one of the figures in his own paintings, in which he was wont to use an excessive quantity of oil. His astonishing readiness and facility must, however, be recognized, spite of the general common- ness and superficiality of his performances. He left many works in Rome, and far more in N aples. Of the latter one of the most renowned is Christ expelling the Traders from the Temple, in the church of the Padri Girolamini, a colossal work, full of expressive lazzaroni; also the frescos of 8. Martino, and those in the Tesoro della Certosa, including the subject of Moses and the Brazen Serpent; and the cupola-paintings in the Church of §, Brigida, which con- tains the artist's own tomb. In Spain he executed a sur- prising number of works,—continuing in the Escorial the series commenced by Cambiasi, and painting frescos of the Triumphs of the Church, the Genealogy and Life of the Madonna, the stories of Moses, Gideon, David, and Solomon, and the Celebrated Women of Scripture, all works of large dimensions. His pupils, Aniello Rossi and Matteo Pacelli, assisted him in Spain. In Madrid he worked more in oil. colour, a Nativity there being one of his best productions, Another superior example is the J

udgment of Paris in the Berlin Museum. In Florence, in his closing days, he painted the Cappella Corsini, the Galleria Riccardi, and other works. In youth he etched with considerable skill some of his own paintings, such as the Slaughter of the Priests of Baal. He also painted much on the crystal borderings of looking-glasses, cabinets, é&c., seen in many

He spent large

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Ttalian palaces, and was, in this form of art, the master of Pietro Garofolo. His best pupil, in painting of the ordinary kind, was Paolo de Matteis.

GIORGIONE (1477 1511), the name adopted both by his contemporaries and by posterity for one of the most renowned of Italian painters, signifies George the Big, or Great, and was given him, according to Vasari, " because of the gifts of his person and the greatness of his mind." Like Lionardo da Vinci, Giorgione appears to have been of illegitimate birth. His father belonged certainly to the gentle family of the Barbarella, of Castelfranco in the Trevisan ; his mother, it seems probable, was a peasant girl of the neighbouring village of Vedelago ; and he was born in or shortly before the year 1477. In histories and cata logues he is now commonly styled Giorgio Barbarella of Castelfranco ; but it seems clear that he was humbly reared, and only acknowledged by his father's family when his genius had made him famous, 'Twenty-seven years after his death, the brothers Matteo and Ercole Barbarella were glad to inscribe the name of Giorgione among the members of their family in whose honour they built and dedicated a monument in the church of San Liberale in their native town. Presently this church was demolished and replaced — by anew one. In the course of this operation the inscrip- tion in question perished. Not so a more important memorial of Giorgione's greatness, in the shape of an altar- piece which he painted for the same church on the cominis- sion of Tuzio Costanzo, Tuzio Costanzo was a famous captain of free lances, who had followed his mistress, the Queen Cornaro, from Cyprus to her retirement in the Trevisan, and at the beginning of the 16th century was settled at Castelfranco. The altar-piece with which Giorgione adorned the chapel of this patron in the old church of San Liberale, was afterwards transferred to the new church, where it remains to this day, so that there is something more than the mere

memory of the great painter to attract the lover of art on a pilgrimage to his native town. Castelfranco is a hill fort standing in the midst of a rich and broken plain at some distance from the last slopes of the Venetian Alps. Giorgione's ideal of luxu- riant pastoral scenery, the country of pleasant copses, glades, and brooks, amid which his personages love to wander or recline with lute and pipe, was derived, no doubt, from these natural surroundings of his childhood. We can- not tell how long he remained in their midst, nor what were the circumstances which led him, while still, it seems, a boy, to Venice. Once there, we do not hear of him until his genius is, so to speak, full-fledged. He appears all at once as a splendid presence, the observed of all observers 3 an impassioned musician, singer, lover; and, above all, as a painter winning new conquests for his art. His progress from obscurity to fame, probably under the teaching of Giovanni Bellini, must have been extraordinarily rapid, as he was still very young when he was employed to paint the portraits of two successive doges, and of great captains and princesses such as Gonzalvo of Cordova and Catharina Cornaro. Gliorgione effected, in the Venetian school, a change analogous to that effected by Lionardo in the school of Florence,—a change, that is, which was less a revolution than a crowning of the edifice. He added the last accom- plishments of freedom and science to an art that at his advent only just fell short of both. Venetian painting towards 1495 had reached the height of religious dignity in the great altar-pieces of Bellini, the height of romantic sentiment and picturesque animation in Carpaccio's series from the legend of St Ursula. The efforts of the school for nearly half a century had been concentrated on the develop- ment, with the help of the new medium of oil, of colour as the great element of emotional expression in painting. Giorgione came to enrich the art with a more faultless

design ; with a system of colour yet more ardent, melting, and harmonious ; with a stronger sense of life and of the glory of the real world as distinguished from the solemn dreamland of the religious imagination. He had a power hitherto unknown of interpreting both the charm cf merely human grace and distinction, and the natural joy of life in the golden sunlight among woods and meadows. His active career cannot have extended over more than fifteen years, since we know that he died in 1511,

—according to one account, of a contagious disorder; according to another, of grief at discovering that his mistress had played false with a pupil. But in that brief carecr he had both deeply modified the older manner of the Venetian schvol, as represented even by a master so great and so austcre as John Bellini, and had prepared the way for its final manner, as represented by the most complete master of all, Titian. Bellini, who outlived Giorgione, had not been ashamed to learn something from the practice of a teacher fully forty years younger than himself, who was probably in the first instance his own pupil. Titian, only ten years younger than Giorgione, succeeded to his conquests, and enjoyed the length of days which was denied him.

A consecutive biography of Giorgione it is impossible to construct, either from literary records or from extant works. The literary records only furnish us with a few general characteristics, and with the mention of a few of his productions, especially the frescos with which he adorned the front of the Fondaco dei Tedeschi or hall of the German traders at Venice, after its destruction by fire in 1504; and the frescos and altar-piece, sometimes attributed to the same year, which he executed for Tuzio Costanzo in his native town. The decorations of the Fondaco dei Tedeschi, which Vasari praises for their design and glowing colour, but blames for their too fantastic and enigmatical invention, have unhappily been utterly destroyed by the combined operation of weather and of reckless architectural changes in the building. The frescos of the chapel of Castelfranco were also sacrificed, while the altar-piecc was preserved in the manner we have related. A fragment of a love- madrigal, which was once to be read on the back of this panel, addressed apparently by the painter to his modcl, is quoted as in character with our traditions of the man. The picture itself represents the Virgin and Child enthroned, with a group of saints, and prominent among them the warrior- saint Liberale, the patron of the church. A small and highly finished study in armour for this figure is now one of the treasures of the National Gallery in London, to which it was bequeathed by Mr Rogers. To Giorgione are also attributed pictures in almost all the public and private galleries of Europe, to a number ten times greater than could possibly be consistent with the short duration of his career, and with the fact that no inconsiderable portion of that career must have been occupied with the production of the perished frescos. These so-called

Giorgiones of the galleries may to some extent be recognized and classified as the work of one or another of several groups of painters whose manner was more or less akin to, or influenced by, that of Venice in Giorgione's days. One such group belongs to Bergamo; another to Brescia; another is in alliance with Palma; another with Titian ; another, again, consists of the later and looser imitators of the master himself, as Andrea and Schiavone, Pietro della Vecchia and Rocco Marcoue. It is probable, indeed, that those distinguished authorities, Messrs Crowe and Cavalcaselle, have gone too far in excluding from the genuine work of Giorgione several of the most famous pictures which have hitherto passed as standards whereby to judge his manner, as, for instance, the Entombment of Christ at Treviso, and particularly the beautiful Concert of the Louvre. Without, however, entering upon disputed ground, there remains a reasonable number of undoubted

pictures of the master, and these, while they possess in common the qualities of feeling and invention which we have above defined, in technical style vary from a minute and painstaking precision, almost like that of Antonello da Messina, or of Bellini in his earlier manner, to a degree of breadth, glow, and softness, which are the qualities more popularly associated with the name of Giorgione, and more commonly attempted by his imitators. —

We conclude with a mention of a few of the principal undisputed examples of Giorgioue's handiwork, following a chronological order, which, however, it should be understood, is necessarily but approxi- mate and conjectural. Florence, Uffizi: an Ordeal of Moses, and a Judgment of Solomon,—small pictures with rich landscape acces- sories, aud figures of extraordinary grace and delicacy, painted apparently in imitation or in rivalry of the New 'Testament allegory by Bellini, in the same manner, which is preserved in the same gallery; all three were originally in the summer residence of the Medici at Poggio Imperiale. London, collection of Mr Wentworth Beaumont: Holy Family, with the angel appearing to the shepherds in the background, —again a small picture, very delicately finished ; formerly in the possession of Cardinal Fesch, London, National Gallery: the Stndy for San Liberale above men- tioned. Castelfranco,

Church of San Liberale : the altar-piece,— figures life size, exhibiting much of the manner of Bellini in his aultar-pieces. Vienna, Belvedere Gallery: a Group of Astronomers in a Glade, known as the Chaldeans,—rich sunset landscape, with villages in the distance and trees in the foreground ; beside the trees on the left, three figures in Oriental costumes, one-third of life size ; formerly in the Taddeo Contarini gallery. Venice, Manfrini palace: man, woman, and child, known as the Family of Giorgione, in a landscape recalling the neighbourhood of Castel franco,—one of the most beautiful works of the master, formerly in the house of Gabriel Vendramin at Santa Fosca. England, Kingston Laey, eol- lection of Mr Bankes: Judgment of Solomon,—a large unfinished picture of great beauty, of clearer tones and broader treatment than the foregoing, bought, at the suggestion of Lord Byron, from the Marescalchi gallery. Florence, Pitti: Concert,—a monk of the Augustinians, seated at the harpsichord ; behind him, a clerk with a viol; on the left a young man with plumed hat and long hair. This is the most perfect of all the works which are assumed to belong to the later time of the master.

See Vasari, Vite de' pit eccellenti pittori, &c., vol. vii. p. 80, ed. Lemonnier; Ridolfi, Afwraviglie dell' Arte, vol. i. p. 121; Crowe and Cavaleaselle, History of Painting in North Italy, vol. ii. p. 119. (8. C.)

GIOTTINO (1324-1357), an early Florentine painter. Vasari is the principal authority in regard to this artist ; but it is not by any means easy to bring the details of his narrative into harmony with such facts as can be verified at the present day. It would appear that there was a painter of the name of Tommaso (or Maso) di Stefano, termed Giottino ; and the Giottino of Vasari is said to have been born in 1324, and to have died early, of consumption, in 1357, —dates which must be regarded as open to considerable doubt. Stefano, the father of Tommaso, was himself a celebrated painter in the early revival of art ; his naturalism was indeed so highly appreciated by contemporaries as to earn him the appellation of '" Scimia della Natura" (ape of nature). He, it seems, instructed his son, who, however, applied himself with greater predilection to studying the works of the great Giotto, formed his style on these, and hence was called Giottino. It is even said that Giottino was really the son (others say the great-grandson) of Giotto. To this statement little or no importance can be attached. To Maso di Stefano,

or Giottino, Vasari and Ghiberti attri- bute the frescos in the chapel of 8. Silvestro (or of the Bardi family) in the Florentine church of 8. Croce; these represent the miracles of Pope St Sylvester, as narrated in the Golden Legend, one conspicuous subject being the seal- ing of the lips of a malignant dragon. These works are animated and firm in drawing, with naturalism carried further than by Giotto. From the evidence of style, some modern connoisseurs assign to the same hand the paintings in the funeral vault of the Strozzi family, below the Cappella degli Spagnuoli in the church of §. Maria Novella, represent- ing the crucifixion and other subjects. Vasari ascribes also to his Giottino the frescos of the life of St Nicholas in the

lower church of Assisi. This series, however, is not really in that part of the church which Vasari designates, but is in the Chapel of the Sacrament ; and the works in that chapel are understood to be by Giotto di Stefano, who worked in the second half of the 14th century—very excel- lent productions of their period. It might hence be inferred that two different men produced the works which are unitedly fathered upon the half-legendary " Giottino," the consumptive youth, solitary and melancholic, but passion- ately devoted to his art. A large number of other works have been attributed to the same hand ; we need only men- tion an Apparition of the Virgin to St Bernard, in the Florentine Academy ; a lost painting, very popular in its day, commemorating the expulsion, which took place in 1343, of the duke of Athens fron Florence ; and a marble statue erected on the Florentine campanile. Vasari parti- cularly praises Giottino for well-blended chiaroscuro. He left behind him various scholars in the art.

GIOTTO (1276-1336), relatively to his age one of the greatest and most complete of artists, fills in the history of Italian painting a place analogous to that which seems to have been filled in the history of Greek painting by Polygnotus. That is to say, he lived at a time when the resources of his art were still in their infancy, but consider- ing the limits of those resources, his achievements were the highest possible. At the close of the Middle Age, he laid the foundations upon which all the progress of the tenaissance was afterwards securely based. In the days of Giotto, the knowledge possessed

by painters of the human frame and its structure rested only upon general observation, and not upon any minute, prolonged, or scien- tific study ; while to facts other than those of humanity their observation had never been closely directed. Of linear perspective they possessed few ideas, and those elementary and empirical, and scarcely any ideas at all of aerial perspective or the conduct of light and shade. As far as painting could ever be carried under these conditions, so far it was carried by Giotto. In its choice of sub- jects, his art is entirely subservient to the religious. spirit of his age. Even in its mode of conceiving and arranging those subjects, it is in part still trammelled by the rules aud consecrated traditions of the past. 'Thus it is as far from being a perfectly free as from being a perfectly accom- plished form of art. Many of those truths of nature to which the painters of succeeding generations learnt to give accurate and complete expression, Giotto was only able to express by way of imperfect symbol and suggestion. But in spite of these limitations and shortcomings, and although he has ofteu to be content with expressing truths of space and form conventionally or inadequately, and truths of structure and action approximately, and truths of light and shadow not at all, yet among the elements over which he has control he maintains so just a balance that his work produces in the spectator less sense of imperfection than that of many later and more accomplished masters. He is one of the least one-sided of artists, and his art, it has been justly said, resumes and concentrates all the attainments of his time not less truly than all the attainments of the crowning age of Italian art are resumed and concentrated in Raphael. In some particulars the painting of Giotto was never surpassed,—in the judicious division of the field and massing and scattering of groups,—in the union of dignity in the types with appropriateness in the occupa- tions of the personages,—in strength and directness of intellectual grasp and dramatic motive,—in the combination of perfect gravity with perfect frankness in conception, and of a noble severity in design with a great charm of harmony and purity in colour. The earlier Byzantine and Roman workers in mosaic had bequeathed to him the high abstract qualities of their practice, their balance, their impressive-

ness, their grand instinct of decoration ; but while they had compassed these qualities at an entire sacrifice of life and animation, it is the glory of Giotto to have been the first among his countrymen to breathe life into art, and to have quickened its stately rigidity with the fire of natural incident and emotion. It was this conquest, this toucli of the magician, this striking of the sympathetic notes of life and reality, that chiefly gave Giotto his immense reputation among his contemporaries, and made him the fit exponent of the vivid, penetrating, and practical genius of emancipated Florence. His is one of the few names in history which, having become great while its bearer lived, has sustained no loss of greatness through subsequent generations.

No two men were ever more unlike than the rustic Giotto and the patrician Dante ; but among the high places of his- tory, their figures stand side by side on a conimon eminence. They were contemporaries, Dante being the elder of the two by eleven years, and friends, or, at tle least, acquaintances. The poetry of Dante, reporting concerning things unseen with a definiteness not less than that of actual vision, served in many ways, until the days of Michelangelo, not only as an inspiration but as a law to the religious art of Italy. This inspiring and legislating authority of the sacred poet was exercised first of all upon Giotto,—partly, it appears, by means of personal intercourse between the two men. On the other hand, Giotto is celebrated in Dante's verse as the foremost painter of the new age. Nor is this the only tribute to his pre-eminence which we find in contemporary, or almost contemporary, literature. He is from the first a kind of popular hero. He is celebrated by the poet Petrarch and by the historian Villani. He is made the subject of tales and anecdotes by Boccaccio and by Franco Sacchetti. From these notices, as well as from Vasari, we gain a distinct picture of the man, as one whose nature was in keeping with his peasant origin; whose sturdy frame and plain features corresponded to a character rather dis- tinguished for shrewd and genial streugth than for sublimer or more ascetic qualities; a master craftsman, to whose strong combining and inventing powers nothing came amiss; conscious of his own deserts, never at a loss either in the things of his art or in the things of life, and equally ready and efficient whether he has to design the scheme of some great spiritual allegory in colour or imperishable monument in stone, or whether he has to show his wit in the encounter of practical jest and repartee. From his own hand we have a contribution to literature which helps to substantiate this conception of his

character. A large part of Giotto's fame as a painter was won in the service of the Franciscans, and in the pictorial celebration of the life and ordinances of their founder. As is well known, it was a part of the ordinances of Francis that his disciples should follow his own example in worshipping and being wedded to poverty,—poverty idealized and personified as a spiritual bride and mistress. Giotto, having on the commission of the order given the noblest pictorial embodiment to this and other aspects of the Franciscan doctrine, presently wrote an ode in which his own views on poverty are expressed ; and in this he shows that, if on the one hand his genius was at the service of the ideals of his time, and his imagination open to their significance, on the other hand his judgment was very shrewdly aware of their practi- cal dangers and exaggerations,

Giotto di Bondone (a name, as it happens, also borne

'in the same generation by a distinguished citizen of

Siena) was the son of a poor peasant of Vespignano. He

was born in 1276, and drew, we are told, by natural

instinct with whatever materials he could lay his hands on.

He was ten years old when Cimabue, as the story goes,

found him by the wayside, drawing a sheep with a piece

of charcoal upon a stone or tile. The ge then at the aime

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height of his fame, took the peasant boy, with the glad consent of his father, to Florence to be his pupil. Of his early career after this we know no more until we find him at work as the foremost among many scholars employed under Cimabue at the interior decorations of the great memorial church of St Francis at Assisi. This church con- sists of two structures, one superimposed on the other; it is of the upper and not of the lower church that we speak at present. On the walls of this, a great series of frescos, now

more than half obliterated, was painted by the primi- tive masters of the Tuscan school, including some of older and some of younger standing than Cimabue. ‘The series is in three tiers, tle uppermost tier containing scenes from the Old Testament; the next, scenes from the New ; the lowest, scenes from the life of St Francis. It is in this last tier than we can discern with certainty the hand of the youthful Giotto. The extent of his participation has been much debated. According to the more probable opinion, it can be traced even in the earlier scenes of the history ; but it is in the later scenes only that the hand and promise of the master, the presence of a new and vital spirit, reveal themselves with fulness. Some interval (but the chronology of Giotto’s career is at all points obscure) would seem to have elapsed between the execution of these frescos and of others, better known than these, which adorn the lower story of the same structure. In four lunette-shaped spaces in the vaulting of this lower church, Giotto has painted four vast compositions, of which the scheme was dictated to him, no doubt, by some pious and Jearned mouth- piece of the wishes of the order. One of these exhibits the mystical wedding of Francis with Poverty; a second is an allegory of Chastity ; a third of Obedience ; a fourth shows the saint glorified in heaven among the angels. To describe and explain these famous compositions would be beyond our scope. The ideas they embody cannot but seem strained and cold when we express them in modern language. Strained and cold, indeed, the ideas would have been in any other age of the world ; but we must remember that the religious temperament of that age in Italy gave even to pedantry the colours of passion, and an ardent and solemn reality to the most far-drawn fantasies of devotion. And however cool the private judgment of Giotto in such matters may have been, it is not his private judgment which speaks to us from the painted allegories of Assisi ; it is the sincere imagination of the men among whom he lived; it is the ardour and solemnity of the devotional spirit of his race. In one of the transepts of the same lower church there are frescos of the Passion of Christ, and others of the life of St Francis, which modern authorities hold against ancient, most likely with justice, to be also from the hand of Giotto.

Assuming that the later work of the master at Assisi belongs to the year 1296 or thereabouts, we have good evidence that two years afterwards he was working at Rome for the Cardinal Stefaneschi, nephew of Pope

Boniface VIII. The remains of his industry in this employ- ment may be seen in a mosaic of the Navicella, or Christ saving St Peter from the waves, now preserved in the portico of St Peter's at Rome, and in three panels, kept in the sacristy of the canons of the same church, which originally formed part of a ciborium. It is also recorded that Giotto adorned certain MSS. with miniatures for this patron ; and in truth there exists in public libraries a very rare class of MSS., in which the miniatures bear the marks, if scarcely of the hand, at any rate of the immediate influ- ence of Giotto. Lastly, a discoloured fragment of a fresco of the church of St John Lateran shows the figure of Pope Boniface VIII. announcing from a balcony the opening of the famous Jubilee of the year 1300. Soon after this, Giotto was once more in his native city. Recent research

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has again thrown in doubt the relative shares of the master and of his pupils in the decorations of the chapel, called by Ghiberti the chapel of the Magdalene, in the Bargello or palace of the Podesta at Florence. These were painted to celebrate the pacification between the Black and White parties in the state, effected by the Cardinal d'Acquasparta as delegate of the Pope in 1302, and consisted of a series of Scripture scenes, besides great compositions of Hell and Paradise. It is in the Paradise that the painter has intro- duced those groups, typical of pacified Florence, in which occur the portraits of Dante, Brunetto Latini, and Corso Donato, and which, amid the emotion of all who care for art or history, were recovered in 1841 from the white- wash that had overlain them.

The whole central period of Giotto's life, from about 1305 to about 1334, is divided between periods of residence at Florence and expeditions, of which we can in very rare instances trace the date or sequence, undertaken in conse- quence of commissions received from other cities of thc peninsula, He was as much or more of a traveller as was Van Eyck a century later; and his travels exercised as much or more of the same fertilizing and stimulating influence on art in Italy as did those of the great Fleming in the north-west of Europe. The familiar story of the O belongs to a journey to France, which was projected b Giotto but never undertaken. Pope Bencdict XI., the successor of Boniface VITI., sent a messenger to bring him proofs

of the painter's powers. Giotto would give the mes- senger no other sample of his talent than an O drawn with a free sweep of the brush from the elbow ; but the pope was satisfied, and engaged Giotto at a great salary to go and adorn with frescos the papal residence at Avignon. Benedict, however, dying at this time (1305), nothing came of this commission; and the Italian 14th century frescos, of which remains are still to be seen at Avignon, have been proved to be the work, not, as was long supposed, of Giotto, but of the Sienese master Simone Martini, called Simone Memmi. Another certain date in Giotto's carcer belongs to the close of the period we have defined. In 1328 he had painted in the palace of the Signoria at Florence a portrait (now lost) of Charles of Calabria knecl- ing before the Virgin. Two years later he was invited by the father of this prince, King Robert of N aples, to come and work for him in that, city. Some frescos in the chapel of the Incoronata had been long erroneously supposed, on the authority of Petrarch, to represent a part at any rate of the industry of Giotto during the three years which he spent at Naples. It is the merit of Messrs Crowe and Cavalcaselle, while conclusively setting aside this tradition, to have called attention to a real and very noble work of the master existing in a hall which formerly belonged to the convent of Sta. Chiara in that city. This is a fresco celebrating the charity of the Franciscan order under the figure of the miracle of the loaves and fishes, with the personages of St Francis and St Clare kneeling on either hand,

Between these two dates (1305 and 1330), Giotto is said to have resided and left great works at Padua, Ferrara,

Urbino, Ravenna, Rimini, Faenza, Lucca, and other cities ;

and in several of these paintings are still shown which bear his name with more or less of plausibility. But among them it is at Padua only that his authentic and mature powers can really be studied, and that in perhaps the greatest and most complete series of creations of all that he has left. These are the frescos with which he decorated the chapel built in honour of the Virgin of the Annuncia- tion by a rich citizen of the town, Enrico Scrovegni, and called sometimes the chapel of the Arena, because it is on the site of an ancient amphitheatre. Since it is recorded that Dante was Giotto's guest at Padua, and since we know

that it was in 1306 that he came from Bologna to that city, we may conclude that to the same year, 1306, belongs the beginning of Giotto's great undertaking in the Arena chapel. The scheme includes a Saviour in Glory over the altar, a Last Judgment over the entrance door, and on either side a series of subjects from the Old and New Testaments and the apocryphal Life of Christ, painted in three tiers, and lowest of all, a fourth tier with emblematic Virtues and Vices in monochrome, the Virtues being on the side of the chapel which is next the incidents of redemption in the entrance fresco of the Last Judgment, the Vices on that side which is next the incidents of perdition, There is no other single building, or single series of representations, in which the highest powers of the Italian mind and hand at the beginning of the 14th century may be so well studied as here. In the same city, the great Franciscan church of St Antonio. contains also the remains of works by the master. And it was still for the same order, in their renowned church of Santa Croce, that Giotto executed most of the paintings which mark the periods of his residence in Florence, Besides a vast altar-piece or panel for the Baroncelli chapel, he decorated with frescos the walls of a number of private chapels in this church. The Baroncelli altar-piece still exists; the only chapels of which the frescos have been uncovered are those of the Bardi and Peruzzi. Nor are these the only walls in Florence which to this day bear record of the powers of Giotto— without taking into account many that are attributed to him, but are really by the hand of pupils like Taddeo Gaddi or Puccio Capanna, or of weaker followers like Giottino, Giovanni da Milano, or Agnolo Gaddi. Meantime, Giotto had been advancing, not only in fanie, but in years and in prosperity. He was married young, and had, so far as is recorded, three sons, Francesco, Niccola, and Donato, and three daughters, Bice, Caterina, and Lucia. He had added by successive purchases to the plot of land inherited from his father at Vespignano. His fellow-citizens of all occupations and degrees delighted to honour him. And now, in his fifty-eighth year, on his return from Naples by way of Gaéta, he received the final and official testimony to the esteem in which he was held at Florence. By a solemn decree of the Priori (April 12, 1334), he was appointed master of the works of the cathe- dral of Sta. Reparata (subsequently and better known as Sta. Maria del Fiore), and architect of the city walls and of the towns within her territory. Dying in

1336, he only enjoyed these dignities for two years. But in the course of these two years he had found time not only to make an excursion to Milan, on the invitation of Azzo Visconti and with the sanction of his own Government, but to plan and in part to superintend the execution of two monuments of architecture, of which the one remaining is among the most exquisite in design and richest in decoration that were ever conceived by man. These were, the west front of the cathedral, and its detached campanile or bell tower. The cathedral front was barbarously stripped of its enrichments in @ later age, and stood naked until the other day, when the city of Florence undertook to restore it in a modern imitation. The campanile remains, except for inconsider- able repairs, as it was left by the pupils of Giotto after their master's death; and in the consummate dignity as well as consummate delicacy of its design, in its fair pro- portions and in the opulent but lucid invention and appor- tionment of its details, in the thoughtfulness and pregnant simplicity of its sculptured histories, it is the most fitting crown and monument of a strong and memorable career.

A complete bibliography of the earlier as well as the more recent authorities on Giotto would here be out of place. The main mate- rials and references will be found in the following :—Vasari, ed. Lemonnier, vol. i. pp. 809 sqg.; Crowe and Cavalcaselle, Hist. of

Painting in Italy, vol. i. chaps. 8 to 11; Ernst Forster, Geschichte der Italienischen Kunst, vol. ii. pp. 211 sqg,, and E. Dobbert in article '* Giotto" in Dohme's Kunst und Kistler, vol. iii. (8. C.)

GIOVINAZZO, a town of Italy, in the province of Bari, about 11 miles from Bari, on the railway from Otranto to Bologna. Situated on the coast, it hasa small harbour, and carries on an export trade in the olives, almonds, and carobs produced in the vicinity. It is also the seat of a bishop, and possesses a cathedral, a castle, and a famous ospizto or poorhouse, which was founded by Ferdinand I. of Naples, and is now used partly for the education of foundlings and orphans, and partly for the reformatory treatment of juvenile criminals. Cloth, carpets, thread, and shoes are among the manufactures of the place, and the children of the Ospizio are largely trained in such industries. Whether the identi- fication with the ancient town

called Netium or Natiolum be well founded or not, it is certain that Giovinazzo was in existence at a very early date, and some portions of its sea- wall are supposed to belong to the later Roman period. The population of the town in 1875 was 8902, and of the commune 9108.

GIOVIO, Pau. See Jovius,

GIPSIES, a wandering folk scattered through every European land, over the greater part of Asia and North America, and along the northern coast of Africa. Bell of Antermony speaks in his Zravels (1763) of meeting at Tobolsk a band of sixty Tziggany on their way to China; Koster describes the Brazilian Ciganos (Z''ravels in Brazil, 1816); and at the present day cases of Gipsy emigration to Australia are not unknown. No general estimate can be formed of their numbers outside Europe, but travellers agree that they are very numerous in Persia (3000 families in 1856), Armenia, Asiatic Turkey (67,000 in 1877), and Egypt (one alone of the three chief tribes, the Ghagars, being reckoned at 16,000); whilst in America, besides a multitude of British Gipsies, Gipsies from Spain, France, Germany, and Hungary are not unfrequent. The total, 700,000, at which Miklosich placed (187 8) the European Gipsies, fairly agrees with the following frag- mentary statistics. Turkey, before its late dismemberment, contained 104,750 (9537 in Bosnia and the Herzegovina in 1874); Servia had 24,691 in 1874, Montenegro 500 in 1873; and in Roumania there are from 200,000 to 300,000, according to the varying estimates of Cretzulesco (1876) and the Annuaire général officiel de Rowmanie (1874). In 1876 Austria counted about 1000 (13,500 in Bohemia in 18461), and Hungary 159,000 (78,923 in Transylvania in 1350, and 36,842 in Hungary proper in 1864); while Spain is credited with 40,000, France with from 2000 to 6000 (700 in the Basque country), Germany and Italy together with 34,000 (7), and Scandinavia with 1500. In Russia their number in 1834 was stated at 48,247, ex- clusive of Polish Gipsies, in 1844 at 1,427,539, and in 1877 at 11,654.}

Names.—Just as in every European land the Gipsy calls "Gentiles" (i.e, non-Gipsies) gajé, he calls himself Rom, ''a man or husband." This word Rom, connected by Paspati with the name of the Indian god Réma, is by

Miklosich identified with the Sanskrit doma or domba, “a low-caste musician.”? Of names conferred by “ Gen-

1 In England the census of 1871 gives the number of * vagrants and Gipsies” as 2280, in Scotland of ‘* vagrants” as 1793. These figures, however, while they include a good many non-Gipsy tramps and show-people, exclude all house-dwelling Gipsies, besides the Gipsy horse-dealers, basket-inakers, hawkers, and tinkers, entered under their several headings, and are therefore utterly valueless.

® Sinté, another appellation current among the Gipsies of Germany, Poland, and Scandinavia, and possibly connected with the Zincalo of the Gitanos, has been likewise variously derived from the Sanskrit Sindhu (Indus), and from the Romani sundé, ‘‘ famous,” whilst Batail- lard identifies it with the Siyties or Slvriot Uvdpes of Homer, Strabo, &c, (ef. Pott, i. 82~85).

tiles,” some point to the fancied cradle of the Gipsy race. Thus Gipsy or Gypsy itself (Lgyptean in the 16th century), the Spanish Gitano, Albanian Jevk, modern Greek Tudros, Magyar Pharao népek (“ Pharaoh’s people”), and Turkish Fdrtiwni, preserve the belief in its Egyptian origin, a belief which finds no confirmation except in the casual resemblance between Kom and the Egyptian réme, “man” (of. Rawlinson’s /ferodotus, vol. ii. p. 225), and which was possibly due to the Gipsies’ skill in serpent-charming. The Scandinavian and Low-German Zatare identifies Gipsies with the Mongolian hordes, the terror of Europe in the 13th century; and their French name Bokémiens was probably due either to a confusion of some such form as Secani with Czech or to the belief that Gipsies originated in Bohemia. To the same class belong Walachi, Cilices, Uxu, Saracent. Agareni, Nubiani, &., cited by Fritschius (1660). Other names again denote the character, hue, or callings of the race, as Arabic Jardémi, “villain;” Dutch LHeydens, “heathens,” Persian Kardchi, “swarthy ;” and modern Greek KarfiBedos, by Somavera derived from the Latin captivus, by Bataillard connected with Rédos, “a dart,” and so with the Gipsies’ name in Cyprus, Kilindjiridés, from the Turkish gylidj, “a sword.” Their Scotch name Zinkler, which occurs in a charter of William the Lion (1165-1214), is

commonly held to be a mere variant of ténker ; but if its initial ¢ correspond to z (cf. English ten, German zehn), it comes very near the Italian Zingaro or Zingano, which, like the German Zigewner, Czech Oingdn or Cugén, and Magyar Cogdny, is a form of the most widespread of all the Gipsies' appellations—Bulgarian

First Appearance in European History.—From whatever cause, it is certain that a confusion did exist between the "Arotyxavo. and 'A@iyyavo., which renders it extremely difficult to determine whether the Byzantine historians are speaking of Gipsies or heretics in seven passages collected by Miklosich. It appears from these that "AGOiyyavot, described as magicians, soothsayers, and serpent-charmers, first emerge in Byzantine history under Nicephorus I. (802-11), were banished by Michael I. (811-13), and were restored to favour by Michael IT. (820-29); but Miklosich's reasons for absolutely identifying them with Gipsies, and positively asserting the latter to have appeared at Byzantium in 810 under Nicephorus, are hard to recognize. Less dubious seems an extract from the Georgian Life of Giorgi Mtharsmindel (11th century), which describes how at Constantinople cer- tain descendants of the race of Simon Magus, Atsinkan by name, sorcerers and famous rogues, slew wild beasts by their magic arts in the presence of Bagrat IV. Such passages are open to some doubt ; hardly so the following from the [tinerarium Symonis Simeonis (ed. by J. Nasmith, Camb. 1778), where Fitz Simeon, a Franciscan friar of Dublin, describing his stay in Crete in 1322, says :—'* We there saw a people living outside the city (of Candia), who

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worship according to the Greek rite, and declare themselves of the race of Ham. They rarely or never stop in one place more than thirty days, but, as though accursed of heaven, wander from field to field with little, oblong, black, low tents, like those of the Arabs, or from cave to cave." The empress Catherine de Valois, again, who died in 1346, granted to the suzerains of Corfu authority to reduce to vassalage certain homines vagenitt coming from the mainland, who under the Venetians formed in 1386 the nucleus of a feadum Acinganorum that lasted down to the present century. About 1378 the Venetian governor of Nauplion confirmed the Acingani of

that Greek colony in privileges granted by his predecessors; and in 1387 Mircea I., waiwode of Wallachia, renewed a grant made by his uncle Ladislaus to the monastery of St Anthony at Voditza of forty salaschi (tents) of Acigant. Other docu- ments might be cited, but these are enough to show that in the 14th century Gipsies existed in the Balkan peninsula and islands of the Levant ; that in Wallachia they were re- duced to a state of bondage (from which they were only freed in 1856); and that nowhere were they regarded as new-comers, so that by these documents it is impossible to fix the date of the first Gipsy immigration. More than this, a metrical German paraphrase of Genesis, made by an Austrian monk about 1122, preserved at Vienna, and edited by Hoffmann in his Fundgraben Stir Geschichte deutscher Sprache (Breslau, 1837), goes far to prove that Gipsies were known in Austria three centuries before the commonly-accepted date of their appearance in that country. A passage relating to Hagar's descendants (Gen. xvi. 15) runs :—''So she (Hagar) had this son; they named him Ishmael. It is from him the Ishmaelites descend. They journey far through the world; we call them chaltsmide (lit. cold-smiths). . . . They have nohouse nor country ; everywhere they are found alike; they wander over the country, abusing people by their knaveries. Thus they deceive men,—robbing no one openly." That here by chaltsmide, Ishmaelites, and descendants of Hagar Gipsies are meant, scarcely admits of doubt, seeing that the smith's is still the Gipsies' leading handicraft ; that Lusignan in 1573 speaks of the Gipsies of Cyprus as "'Cinquanes, otherwise called Agariens;" and that in German and Danish Rotwalsch or thieves' slang Geschmeilim and Smaelem (t.6., Ishmaelites) signify "Gipsies." The xwpodpduo. also of Byzantine writers were possibly Gipsies, being defined by Ducange as "circulatores atque adeo Fabri erarit qui per pagos cursitant: ut hodie passim apud nos, quos Chaudronniers dicimus." Theophanes (7 58-818) speaks under the date 544 of a xwpodpduos from Italy.

Later Movements.—Late in 1417 there came to Liine- burg a band of 300 wanderers, "black as Tartars and calling themselves Secani." At their head rode a "duke" and "count," splendidly dressed, and leading like nobles dogs of chase ; next came a motley crew afoot 5 and women and children brought up the rear in waggons, They bore among other letters of safe-conduct one granted by the emperor Sigismund, and professed themselves engaged on a seven years' pilgrimage, imposed by their bishops in

expiation of apostacy from the Christian faith. From Liineburg they passed to Hamburg, Liibeck, Wismar, Rostock, Stralsund, and Greifswald, camping by night outside the walls, thieving by day, " wherefore several were taken and slain" (cf. the contemporary annals of Korner and Rufus, and Krantz's Saxonia, 1520). In 1418 they journeyed southwards through Meissen, Leipsic, and Hesse, and, entering Switzerland, arrived at Zurich on August 31st, visiting also Basel, Bern, and Solothurn, according to Conrad Justinger (died 1426), who speaks of them as "more than 200 baptized heathens from Egypt." They now split up into two bands, the first of

which appeared before Augsburg (November 1, 1418), the second before Sisteron in Provence (October 1, 1479), where the terrified citizens bestowed on the "Saracens" a hundred loaves. Next comes a long notice of a troop of fully 100 lean, black, hideous Egyptians in the Chronica di Bologna (July 18, 1422), which tells how the sorceress, "Duke" Andrew's wife, could read the past and future of men's lives; but Bologna in fifteen days became too hot for them, so by way of Forli—where "certain said they were from India"—the pilgrims travelled on to Rome. Their object was to procure fresh letters from the pope ; and such they afterwards produced, though of their sojourn in the imperial city no record has yet been published. To the burghers of Ratisbon Gipsies presented themselves in 1424; they pitched their tents again before its walls in 1426; and at Paris in 1427 the fair of Landit was attended by a duke, a count, and ten other mounted pilgrims, late renegades of 'Lower Egypt," whose women practised palmistry and cleared everybody's pockets. Later we hear of Gipsies at Armheim (1429), at Metz (1430), at Erfurt (1432), and in Bavaria (1433),—these and all notices of the seventeen years preceding referring probably to the movements of a single ubiquitous band, sent forward to spy out the lands of promise, and composed of from 600 to 1400 persons. For not until 1438 did the great tide of westward immigration begin to flow; then, not in hundreds but thousands, headed no longer by paltry "dukes" and "counts," but by a " king," King Zindl,! the Gipsies poured over Germany, Italy, and France, reaching Poland by 1501, Sweden by 1512, and having already appeared in Spain in 1447. We find them in England in 1514

(A Dyaloge of Syr Thomas More, 1529), but nothing is known of the date of their landing ; and in Scotland the earliest certain record of their presence is an entry in the books of the Lord High Treasurer : " Apr. 22, 1505. Item, to the Egyptianis, be the kingis command, vij lib." (Pitcairn's Criminal Trials, Edin. 1833, vol. iii. p. 592). In a "King of Rowmais" (4 Rémas, Gipsies), twice mentioned in entries of J uly 1492, as also in the "Erle of Grece" (1502), "King Cristall" (1530), and the " King of Cipre" (1532), one dimly recog- nizes four Gipsy chiefs ; and with Gipsies perhaps the Sara- cens may be identified, whom a tradition represents ag mak- ing depredations in Scotland prior to 1460 (Simson, p. 98). In no other country were Gipsies better received than in this, where they ''dansit before the king in Halyrudhous " (1530) ; where James IV. gave (July 5, 1505) Anthonius Gagino, count of Little Egypt, a letter of commendation to the king of Denmark ; and where James V. subscribed a writ (February 15, 1540) in favour of "oure louit Johnne Faw, lord and erle of Litill Egipt,"? to whose son and suc- cessor he granted authority to hang and punish all " Egyp- tians" within the realm (May 26, 1540). But in 1541 an Act was passed, commanding the "Egyptians to pass forth of the realm " under pain of death, and similar edicts were issued before and afterwards in most of the European states —Germany (1497), Spain (1499), France (1504), England (1531), Denmark (1536), Moravia (1538), Poland (1557),

1 The titles of king, duke, earl, count, and (in south-eastern Europe) waiwode were and are borne by the chiefs of greater or smaller bands, more to impress the vulgar than as denoting real authority. With British Gipsies one is bewildered by the host of soi-disant kings and queens, from King John Buelle, laid side by side with Athelstan in Malmesbury Abbey in 1657, down to the Gipsy queen of the United States, Matilda Stanley, royally buried at Dayton, Ohio, in 1878.

2 This letter has an especial interest, since it presents the earliest specimens of the Gipsy tongue, in the names of three of the Gipsies mentioned in it: Grasta (grast, "fa horse"), Towla Bailyow (telo batilo, ''fat pig"), and Matskalla (? matchka, " cat "). Paspati gives as female Turkish Gipsy names Tchiriclt, "bird," and Sappnt, 'viper ;" but probably the above were merely assumed by way of a jest, like Corrie, (Hoyland, p. 165) and

Gallimensch (Pott, i. 52). See, on Gipsy names, Mr Crofton in Notes and Queries (5th ser., vol. ii, p. 349).

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&c Conveying across the seas was among the milder measures adopted ; it is, however, noteworthy as one of the causes of the dispersion of the tribes. Under Henry VIII. Gipsies were shipped from England to Norway (Wright's History of Ludlow, pp. 389-92) or France ; whilst by the latter power, so lately as 1802, the bands infesting Bayonne and Mauléon were caught by night as in a net, huddled on shipboard, and landed on the coast of Africa (Michel, Pays Basque, p- 137). In Scot- land four Faas were hanged at Edinburgh in 1611 "for abyding within the kingdome, they being Egiptianis ;" and in 1636 doom was pronounced on other " Egyptians " at Haddington, the "men to be hangit, and the weomen to be drowned ; and suche of the weomen as hes children to be scourgit throw the burgh and brunt in the cheeke," Under the English statute of 1562 (repealed 17 83) making it felony without benefit of clergy to be merely seen for a month in the fellowship of Gipsies, five men were hanged at Durham "for being Egyptians," 8th August 1592. Still greater were the cruelties and injustice suffered by Gipsies on the Continent, since there, to the charge of kid-napping, were added the weightier imputations of being cannibals and emissaries of the Turk. Quifiones recounts how in 1629 four Estremaduran Gitanos owned under torture to having eaten a friar, a pilgrim, and a woman of their tribe ; and in 1782 forty-five Hungarian Gipsies were beheaded, quartered, or hanged on a like monstrous charge. First racked till they confessed the crime of murder, they were brought to the spot where their victims were said to be buried, and when no bodies appeared they were racked again. 'We ate them" was their despairing cry ; and forthwith the journals teemed with accounts of "eighty-five persons roasted by Gipsy cannibals "; straight- way the "cannibals" were hurried to the scaffold. Then Joseph II. sent a commission down, whose inquiries showed that no one had been murdered—except the victims of the false accusation. The full, impartial annals of the race have still to be compiled, from edicts and law-books, from local histories and a few monographs like Dirk's Geschiedkundige onderzoekingen aangaande het verblijf der Heidens of Egyptiérs in de Noordelijke Nederlanden (Utrecht, 1850), or Weber's

Zigeuner in Sachsen, 1488- 1792, in vol. ii. of his Aus vier Jahrhanderten (Leip. 1861).

Language.—Until lately the information about the Gipsy language to be gathered from books was meagre in the extreme. The thirteen works published prior to 1840 which furnish specimens of the Anglo-Romani dialect— Boorde (1547), Bryant (1785), Bright (1818), Copsey (1818), Harriot (1830), Roberts (1836), &e.—together contain but 396 genuine stems, besides 69 doubtful words, and furnish scarcely any examples of the grammar. Nor are the Continental works cited by Pott, from Vulcanius (1589) downwards, much more copious. Even to-day there are still great gaps in our knowledge, especially of the dialects outside of Europe; but enough has been done to show that from the Nile to the Arctic Ocean, from the Euphrates to the Atlantic, the Gipsies speak, with dialectal variations, one and the selfsame speech. The Romani names for "water," " fire," "hair," and "eye," are in Persia pani, ack, bdl, and aki; in Egypt pdni, dg, bal, and ankhi; in Norway pani, jag, bal, and jak; in England pani, yog, bal, and yok. And these four instances, which might be multiplied indefinitely, serve further to show, by their resemblance to the Hindi pant, ag, bal, and ankh, that in Romani we have an Indian tongue. Riidiger first compared Romani, so long regarded as a thieves' jargon, with one of the New Indian dialects, and in 1782 published the result of the comparison in his Weuester Zuwachs der Sprackkunde, In 1783 Grellmann's Historischer Versuch reaped all the fruits of Riidiger's research ; and in the same

year Marsden was independently led to a like discovery, The conclusion that the Gipsies wandered forth from India is now almost universally accepted, but when, or from what part of India, are questions on which few have done more than idly speculate. Whether Romani is derived from Hindi, Marathi, &c., can only be deter- mined by minute investigations, which, long neglected, are now being carried on by various Orientalists. They have at least established that Romani stands in the relation of a sister, not a daughter, to the seven principal New Indian dialects. Its forms are often more primitive than theirs, sometimes than those of Pali or the Prakrits, e.¢., vast, "hand" (Sanskrit hasta, Pali hattha), kasht, " wood"

(Sanskrit kashtha, Pali hattha), vusht, “lip” (Sanskrit oshtha, Pali ottha), trash, “fear” (Sanskrit trdsa, Pali tas), trin, “three” (Sanskrit ¢rd,trin¢; Pali tz, t¢nc), and pral, “brother” (Sanskrit bhratd, Pali bhata). And while the archaisms of Romani forbid us to derive it from Hindi or Marathi, some of its seemingly modern forms are the result of independent development. On the other hand, our know- ledge of Romani itself, and of the multitudinous spoken dialects of India, is not at present sufficient to warrant our pronouncing the former more primitive than any of them ; and as a fact many of its archaisms may be paralleled in the languages of Dardistan and Kafiristan (¢f. Miklosich, Bettrdge, iv. 45-54). Thus there are difficulties on both sides in the way of adjudicating between the opinions of Ascoli and Miklosich. The former maintains (Saggi Indiant, vol. ii., 1875) that Romani, preserving certain consonantal nevus which had almost entirely disappeared at the epoch of the most ancient Prakrit texts, approaches Sanskrit more nearly even than Pali—conclusions, he observes, that harmonize well with Bataillard’s pre-historic theory. Miklosich, on the other hand, opposes that theory in Meyer’s Konversations-Lexikon (3d ed. 1878), where he infers from the agreement of Romani in its phonetic laws and system of case-endings with the modern Aryan languages of India that the emigration cannot have taken place till these were formed, 7.¢., until after the Prakrit period.

In Europe Miklosich distinguishes thirteen Romani dia- lects—the Greek or Turkish, Roumanian, Hungarian, Moravo-Bohemian, German, Polo-Lithuanian, Russian, Finnish, Scandinavian, Anglo-Scottish, Italian, Basque, and Spanish. To these should be added the Welsh, which, generally unintelligible to the English Gipsy, is one of the most perfect, as it has also been the least studied, of all the dialects. Asa general rule, the further these dialects remove from Turkey, the more corrupt have they become, so that the Gipsies of Spain, of Scandinavia, and in great measure of England, know no case or verb endings other than those of the lands of their adoption. From Turkish Romani, therefore, and Welsh the following examples will be drawn. The Turkish (marked T.) are taken from Paspati; the Welsh (W.) are derived from letters and stories written by John Roberts, the oldest living harper, whose thorough knowledge of his language is probably unique.

The definite article, wanting in Asia, is supplied in every European dialect by the Greek 6 and 4#—6 for the masculine, 7 for the feminine and the oblique cases, e.g., W. Potchdas ow bearengaro e vaver tringengey, ‘the sailor asked the other three,” 2 colley pendas, ‘‘the Gipsy woman said.” The indefinite article, in some dialects supplied by yek, ‘‘ one,” is still omitted by the Welsh and the “‘deeper” English Gipsies, ¢.g., Yeker porro gougeo ta porrey gougey jivenes undra borrow veshestay, ‘‘ once (an) old man and (an) old woman were living in (a) great wood.” Romani has no trace of either a dual number or a neuter gender, Excepting mono- syllables, most of its nouns terminate in -o (masc.) and ~~2 (fem.), as raklo, ‘‘lad,” rakli, “girl.” Masculine nouns ending in a con~~ sonant form their feminines in -ni, as rom, ‘‘husband,” romni, ‘‘ wife.” Inanimate objects are indifferently masculine or feminine: to the former belonging gav, ‘‘town,” and gad, ‘‘shirt;” to the

latter nok, ‘‘nose,” and bok, ‘‘ hunger.” om, ‘‘a husband,” and rakli, ‘‘a girl,” are thus declined in Turkish Romani :~

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SING. Pour. SING. Puivr. om. Rom Rom-a Nom. Rakli Rakli-a

Ace. Rom-és Rom-én Ace. Rakli-a Rakli-én Gen. Rom-éskoro Rom-éngoro| Gen. Rakli-akoro Rakli-éngoro Dat. i. Rom-éste Rom-énde Dat. i. Rakli-ate Rakli-énde Dat. ii. Rom-eske Rom-énghe | Dat. ii, Rakli-dke Rakli-énghe Instr. Rom-ésa Rom-éndja | Instr. Rakli-asa Rakli-éndja Abl. Rom-éstar Rom-éndar | Abl. Rakli-Atar Rakli-éndar Voe. 26m-a Rom-ale Voce. Rakli-e Rakl-ale

Here the so-called genitive is in reality an adjective. It precedes and agrees in gender with its noun, e.g., T. e derviséskert rakli, “the dervish’s daughter ;” W. sonckaicsko moehto, ‘a golden box,” and dakey pen, ‘‘ mother’s sister.” Welsh Gipsies often use the dative where we should look for the genitive, as in Ze pogerel yeck ¢ herrenday ow vodrestay, ‘‘to break one of the legs of the bed.” Datives and instrumentals are formed by suffixing to accusatives the separable post-positions ¢e or ke, ‘‘to,” and sar, “‘with;” and the -tar of the ablative (also occurring in hd-tar, “whence,” lit. ‘where from”) Pott (i. 188) compares with the Pali adverbial ending -to—Sansk. tas=Lat. -tus in celitus. In most European Romani dialects considerable

confusion has arisen in the use of the oblique cases, but Welsh Gipsies employ the following rightly enough: Sing. aec. te dickel ow kralliscs, ‘to see the king;” dat, mase. te dickel pesko jivamaskay, ‘to look for his living ;” dat. fem. pendas e gougeackey, ‘‘she said to the woman;” inst, rokkerdas ow kralliscsa, ‘‘he spoke with the king;” voc. Ria, “Sir!”—Plur. ace. te patsell e callen, ‘‘to believe the Gipsies;” dat. te kerrav les undra chichaw grengey, ‘‘ to make it into shoes for horses ;” voc. Chovollay, ‘‘mates!” Nouns ending in -o form their plural in Welsh, as in Turkish Romani, in aeceented -é, ¢.g,, chavay, ‘children ” (sing. chdvo), and ehiriklay, ‘ birds” (sing. chirtklo); other nouns form it in -a or -ta, as chaia, “girls” (sing. chat), tema, “lands” (sing. tem), penya, ‘‘sisters” (sing. pen), ke. Of adjectives it need only be remarked that, with rare exceptions, they end in -o (mase.) and -¢ (fem.), and form the plural in -é, ¢.9., W. Java te kerra esa te rigeren tomen tatay, ‘I go to make clothes to keep you (plur.) warm.” The termination of the comparative is -der, ¢.g,, W. porro, ‘‘old,” poradare, * older;” and the want of a true superlative is frequently supplied, as in French, by prefixing the definite article to the comparative, ¢.g,, W. con sce ow poradare, “‘who is the eldest.” Romani pronouns present an interesting study, since everywhere they have been better preserved than any other parts of speech. Turkish Romani gives me, ‘‘I,” man, “me,” amén, ‘*we,” &., and tu, ‘thou,” tut, ‘ thee,” tumén, “ye” (lit. thou-we), &c., all of which forms are employed by English and Welsh Gipsies. How strikingly indeed the Turkish and Welsh dialects agree may be seen from the instances followin these paradigms, taken from Paspati, of ov, “‘ he,” 6¢, ‘ she,” and 0 (Bohemian Romani, jon) ‘‘ they” :—

Nom. ov 6i ol Dat, ii. léske like Iénghe Ace, les la. len Instr. lésa ldsa — léndja Gen. léskoro lakoro léngoro} Abl. léstar latar éndar Dat. i. léste late Iénde

Now in Welsh Romani we find: Since. Masc. nom. Pendas you, “said he;” gen. lesko pickoo, ‘his shoulder;” acc. cordas les poley, ‘*he called him back ;” dat. i. deyas lestay, ‘‘ he gave him ;” dat. ii. chotehy ow Rye leskay, ‘“quoth the gentleman to him;” inst. biteherdas vaver yeck lessa, ‘‘he sent another one with him:” Sinc. FEM. nom. yoi comdas les, ‘‘she loved him;” gen. worea lacko nogo drom, ‘‘in her own way;” acc. you eomdas la, “‘he loved her ;” dat. i. aney joncles yov ehomancy trostel latay, ‘whether he

knew something about her;" dat. ii. jalla te dickel lakey, 'he goes to look for her;" inst. commesa to te jas lasa, '' wilt thou go with her:" PLur. nom. yon jivenes, **' they were living ;" gen. sawe chava biteherana lengo camyben, "all the children send their love ;" aec. commos tokey te bichaves len, '** I should like you to send them ;" dat. i. trosel lenday, '' about them;" dat. ii. potchdas lengcy, 'he asked them ;" instr. potchday leskey so wantines lensa, '' they asked him what he wanted with them ;" abl. te ¢ardel lovo from lenda, ''to extract money from them," where the English " from" is redundant. That nineteen out of the twenty-one forms of the Turkish dialect should be preserved in the Welsh after a separation of four centuries, Romani, moreover, being an unwritten language, is singular; hardly less striking is the similarity in the use of the reflexive pronoun pes, ''himself" or '' herself," ¢.g., W. dickel pesko drom glan pestay, ''he sees his way before him ;" ow Jack rivdas pes, '' Jack dressed himself ;" te den pengo lovo, '' to give their money ;" ¢ é7in morsh gillay pengay, '* the three men went away " (lit. '* went to themselves,'' a curious use). The third pronoun, Jo, "he," lt, "she," and /é, '' they," commonly only used after the auxiliary verb ''to be," isalso noteworthy, as playing an important part in the formation of the verb. Instances of its use are—W. postey seslo kinno, '' till he was tired;" vasavee chibalengerey ses le, '' she was a foul-tongued woman ;" trashaday seslay, '* they were frightened." The auxiliary verb runs in Turkish Romani: Pres. sing. isém, isdn, ist (asti in Asiatic R.); plur. isém, isdn, ist: IMPERF.

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sing. isémas, isénas, isds; plur. isémas, isénas, isds. And in Welsh Romani occur the forms, shom, 'I am;" shan, "thou art;" se, "he is" or 'they are ;" sham, "we are" (e9., sham betcherda te las a kai filashin, "we are sent to get this man- sion"); shen, ''ye are;" shomas, '*I was 3" shennes, *' thou wert " or "'ye were ;" ses, ''he was" or 'they were." The terminations of the present indicative in Turkish Romani are: SING. -va, -sa, -la; PLUR. -sa, -na, -na, which are joined immediately to the verbal stem (identical with the imperative) if it is monosyllabic and ends in a vowel, but otherwise are connected with it by a vowel. For example, Jd-va, 'I take 3" Ud-sa (lésa), ld-la (léla), ld-sa, lé-na, lé-na; and ker-d-va, 'I make ;" ker-é-sa, &. Welsh Romani retains all these forms, ¢.g., bitcherava, *'I send ;"' shonesa, "thou

hearest;" penela, 'he says;" bitcherasa, 'we send;" vend, "ye come ;" bitcherena, 'they send." In -va (-mi in Asiatic R.), -st, and -la (¢f. lo above) may be recognized the first, second, and third personal pronouns; the 2 of the second and third persons plural may be compared with the 2 in romén, **'husbands." The imperfect is formed from the present by the suffix of -s, or, in the Hungarian dialect, -hi, ¢.g,, T. kerdva-s, 'I was making ;" Hung. kamesa-hi, '** thou wast loving;" W. salles, '*he was laughing," Jivenes, "they were living." This -s or ~~Ad is the third person singular of the auxiliary verb, isi, " it is," so that literally kerdvas means ''I make+it is" (? some time ago). Perfects are com~~ pounded of participles—ending in -do (rarely -to), -Jo, and -no— and the auxiliary verb. Thus from T. pirdva, "I walk," part. pirdé, comes pird-dm, 'I walked," pird-dn, ''thou walkedst," pird-ds, ""he walked," &c. ; and from ddva, 'I give," part. dind, dindm, 'I gave." Here too the Welsh agrees generally' with the Turkish dialect, c.g,, kerdom, 'I made," keddan, '' thou madest," kerdas, ''he made;" but kedan, '' we made," should roperly be kerddénv; and for the third person plural Welsh R., like the German and othcr dialects, simply employs the plural participle, as dicktta, "they saw." In Continental dialects a pluperfect is formed from the perfect by adding to it -a-s or -a-hi, just as the imperfect from the present; and for a future kama- (kamava, "I love, wish, or will"') is prefixed to the present, ¢.9., kama-kerdva, ''1 will do," kama-kerésa, 'thou wilt do," &c. The sign of the subjunctive, which supplies the place of an infinitive, is the conjunction tc, "that," prefixed to the indicative, which usually drops its vowel- ending, c.g., T. teréla dit lav te péncl tike, "he has two words to tell (lit. that he tells) you;" W. trashaday seslay te dicken man, ''they were frightened to sce (lit. that they sec) me." Enough has been said to show that Romani is not so utterly "degraded in its grammar" as Max Miiller has declared it to be; and the following short Welsh Gipsy story (printed literatim from Roberts) will illustrate some of the foregoing remarks :—

Yeker a doi ses bearengaro ta vaver store morsh ; yek ses

Once there were (a) sailor and other four men; one was peltanengero, ta ow vaver ses koramangaro, ta sivamangaro,

(a) blacksmith, and the other was (a) soldier, and (a) tailor, to pallano ses kirchimackaro. Ow bearengaro potchedas e andthe last was (an) innkecper. The sailor asked the peltanengaro te vel apra ow dorcavy. Ow peltanengaro pendas, blacksmith to come on the sea. The blacksmith said, "' Nau, shom te ja te kerra boottee." 'So se tero bootee?" 'Te "No, (1) am to go to do work." "Whatis thy work?" To

tasarra sastarn," chotcly ow pelttenengaro, ' ta te kerravles undra

heat iron," quoth the blacksmith, "andto makeit into chichaw grengey." Potchdas ow bearengaro e vaver trinengey te shoes for horses.' Asked the sailor the other three to

ven adra ow bearo. come in the © ship.

Ow koramangaro pendas ta jalla te kel The soldier said that he goes to make

moyaben ta javaben; to sivamangaro pendas, ''Shom te ja te facings and marching; andthe tailor said, "(I)am to go to

kerra esa te rigeren tomen tatay." A ow kirchimackaro pendas, makeclothesto keep you warm." Andthe innkeeper said,

"'Java ma te kerra lovina te kel tomen matay, te jan saw "Go I to make beer to make you drunk, that may go all

to menday kai ow Beng." Okke saw dolestay. you to the Devil." Mere (is) all to that (4.e., of that).

The Romani vocabulary reveals positively and negatively the route by which the Gipsies must have entered Europe, and the various ways by which they have since dispersed to their present quarters. The absence, for instance, of Arabic elements from every European dialect disproves a common belief that the earliest immigrants may have landed in the Balkan peninsula from Egypt. On the other hand, the presence of Persian and Armenian words shows that they must have traversed and halted in the lands where those languages are spoken. Among the Persian are devrudil, "sea," poshom, "wool," vesh, "forest," ambrél, " pear," and avgin, "honey;"

whilst the Armenian words number twenty-six, according to Miklosich—grast, “horse,” chor,

them, deserves ‘consideration. | collected by Campbell were, it should be remarked, taken

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“deep,” kotér, “a piece,” mortt, “skin,” é&e. Again, every dialect presents a large number of Greek words, testify- ing to the long residence of the Gipsies in a Greek- speaking land. In the German Romani dialect Miklosich reckons forty-two, besides the article, in the English thirty, which latter number might be certainly aug- mented. Alike in Russia and Spain, England and Hungary, Gipsies call a road drom (8pduos), time chairos (xatpds), a@ horseshoe petul (wéradov), a hat stadt (ox.dd), cc. ; in every land of Europe éfrd, “ seven,” dy7o, “ eight,” and évvéa, “nine,” have superseded the haut, asch, and naw of Asiatic Gipsies. This identity of their borrowed Words disproves the view that the Gipsies of different European countries are the result of successive immigra- tions. Next to the Greek, and almost more numerous than they, come the Slavonic elements. Miklosich cites 70 from the German dialect, 30 from the English, and from the Spanish 46, among them being kralis, “king,” kitchima, “inn,” mdtchka, “cat,” lovina, “ale,” and plashta, “cloak.” Similarly English Romani contains Wallachian, Magyar, German, and French words, showing that the Gipsies reached England after wandering among Greeks, Slavs, Magyars, Germans, and French. It must not, how- ever, be inferred from the foregoing that Romani is essentially other than an Indian speech. The Gipsies’ linguistic pilferings form but a small percentage in the 2332 articles gathered together by Pott. And though some of these articles, founded on error, must be struck out, their place might be more than filled up by omissions ; and the sum total is largely multiplied when one considers how many derivatives are grouped under a single head. Altogether, the entire stock of Romani words probably exceeds 5000, though the number known to any individual Gipsy is often small.

Elements of Literature.—The Gipsies have no literature worthy of the name—nothing but some rude ballads, some love and dance songs, and a considerable mass of folk-tales. Valuable from a linguistic point of view, the

songs have little merit of their own, and seem to be mainly echoes of Gentile strains. The folk-tales, however, would possibly repay a keener investigation than they have yet received. Alike in Wales and Turkey they may be identi- fied with those of other Aryan races; scarce one has yet been published but its counterpart may be found in Grimm's, Ralston's, or other collections of European folk-lore. For instance Paspati's third story, taken down at Constanti- nople from a Gipsy professional raconteur, is unquestion- ably the same as Grimm's Zreuer Johannes. Similarly in the Bukowina we meet with Romani versions of Das tapfere Schneiderlein, Die zwei Briider, &c., whilst Nazdrivénu may be matched from Ralston's Russian Folk- tales, p. 73, and frequent: mention is made of the waters of life and death, of hills that butt together like rams (cf. Ralston, p. 236), and of other features common in Slavonic folk-lore. This resemblance of Romani to Gen- tile stories may be explained (1) by the common origin of the Aryan races, (2) by the Gipsies having borrowed from the nations among whom they wander, or (3) by these nations having received their stories from the Gipsies. Probably all three explanations are true by turns, but the first is sometimes excluded by an identity of details too close to have been preserved through untold ages, and as to the second it is hard to see how a story current at Pader- born should have travelled eastward to Constantinople, especially as Paspati's tales, enshrining words and phrases otherwise obsolete, are plainly of some antiquity. Accord- ingly the third explanation, that the Gipsies may have carried T'rewer Johannes and other stories westward with Some of the Gaelic stories

down fromTinklers ; and from a London Gipsy he obtained | take the kettle-prop and make the holes exactly opposite cach other,

a version of Zhe Master Thief, which is current also among Roumanian Gipsies. At present our information is far too scanty to warrant a definite conclusion; but could it once be shown that the Asiatic possess the same stories as the European Gipsies, it might be necessary to admit that Europe owes a portion of its folk-lore to the Gipsies.1

Religious Beliefs and Observances. —“ The Gipsies,” says Grellmann, “brought no particular religion with them, but regulate themselves in religious matters according to the country where they live,... wherefore most writers place them below the heathens.” This author notwithstanding, the Gipsies mix with their beginnings of Christianity or Mahometanism the relics of an older faith. Devel, their name for God or sky, is akin to the Sanskrit “God” (ef. dyaus, “ sky”), and the German Romani Miro baro devel dela berschindo, ‘my great God gives rain,” té., “it tains,” preserves the original signification. Gériben, “thunder” (lit. “bellowing of cattle ”), is another reminiscence of nature worship; and ¢trishul, “cross ” (Sanskrit ¢triscla, “the trident of Siva”), presentsa curious instance of the transference of religious ideas. Beng, “devil,” compared by Miklosich with the Sanskrit bheka, “frog,” is possibly a survival of serpent-worship, traces of which may be also found in various phrases, stories, emblems, and customs. Survivals also of phallic worship may probably be seen in the honour paid by the three great German Gipsy clans to the fir-tree, the birch, and the hawthorn (Liebich, p. 38) ; and in the veneration in which Welsh Gipsies hold the fasciated vegetable growth known as the broado koro. There are besides a number of other Gipsy superstitions interesting enough in themselves, but which lose their full significance by being at present isolated or insufficiently authenticated, such as, for instance, the alleged devotion of Norwegian Gipsies to a moon-god, Alako (Sundt, 105-10). In the People of Turkey (1878) the Tchinghianés are said to keep a fire continually burning in their camp ; on the first of May to go allina body to the sea-coast or banks of a river, where they thrice throw water on their temples, invoking the invisible genii loc’ to grant their special wishes ; and annually to drink some potion, prepared in a way known only to the oldest and wisest of the tribe.

Modes of Life.—In Turkey, according to Paspati, the nomad Tchinghianés far outnumber the sedentary ; but how far the same statement is true of Gipsies of other lands is hard to determine. Certain at least it is that in England few house-dwelling Gipsies are to be met with who do not remember that their forefathers followed a wandering life, or who do not themselves go temporarily under canvas as hop- picking or the great race-meetings come round. But though for centuries the tent has been the Gipsy’s normal habitation, it would not scem to have been so always, if we

look to the evidence of the Gipsy tongue. For had it been, assuredly the Romani name for “tent” would be everywhere the same, whereas the Persian Gipsy calls it guri, the nomad Tchinghiané hatiéina (modern Greek katovva), the sedentary tchérga (Turkish cherkeh), the Polish Gipsy czater, the Ger- man tattin (from tatto, “hot”), the English tan, &e. On the other hand, ker, “a house,” oceurs in every dialect. From the time, however, of Fitz-Simeon onwards Gipsies have everywhere been found dwelling: in tents, and his description of these tents as “like those of the Arabs, low, black, and oblong,” tallies with Mr Boswell’s :-—

‘The tents are made of rough blankets. They are nearly always

brown ones, because the white blankets are not so good for the rain. First of all they measure the ground with a ridge-pole, then they

1See Paspati (pp. 594-629), Miklosich (part iv.), Professor Friedrich Miiller’s Beitrage zur Kenntniss der Rom-Sprache (2 parts, Vienna, 1869-72), and Dr Barbu Constantinescu’s Probe de Limba st Literatura Tiganiler din Romania (Bucharest, 1878).

Then they take up the ridge-pole and stick ‘all the rods into it, Then there is a blanket that goes behind, and is pinned on with pin-thorns ; next to that come the large ones over the top of all, also pinned with the same pins.”

In the matter of dress, Mr Crofton, in Papers of the Manchester Literary Club (1876), infers that « Gipsies formerly had a distinctive costume, consisting of a turban- like headdress of many colours, together with a large cloak, worn after the fashion of a toga, over a long loose under-skirt.” The Gipsies, however, of to-day can hardly be said to have a distinctive garb, though certain minutix of dress still render them easily recognizable. In T’ran- sylvania, for instance, their women’s earrings differ in pattern from those of the natives; the Hungarian Gipsy chief wears silver buttons, bearing a serpent crest ; and hig old-fashioned English brother decks his Newmarket coat with spade-guineas or crown-pieces. The English Gipsy woman may be known by her bright silk handkerchief, her curiously-plaited hair, her massy rings, her coral or bead necklace, and by the monging-guno, a tablecloth arranged bagwise over her back. In August 1878 Queen Victoria was welcomed to Dunbar by a Gipsy “ queen,” one of the

Reynolds family, who was “dressed in a black robe with white silk trimmings, and over her shoulders wore a yellow handkerchief. Behind her stood two other woinen, one of them noticeable from her rich gown of purple velvet, and two stalwart men, conspicuous by their scarlet coats.” “ On the other hand, the dress of the children upon the Continent is simple, not to say scanty,

Everywhere Gipsies ply an endless variety of trades. In Egypt they monopolize the art of serpent-charming ; in France and Spain they sit as professional models ; in England we meet Gipsy Methodist preachers, actors, quack doctors, chimney-sweeps, carpenters, factory hands, &e. But everywhere the men have three principal callings— workers in metals, musicians, and horse-dealers ; everywhere the women are “pleasaunt dauncers” as in the days of Andrew Boorde, and by peddling and fortunc-telling con. tribute their share—often more than their share—to the family purse. Gipsies have long becn famous as copper and iron smiths in south-eastern Europe, where their horseshoes are reckoned unrivalled. The calderari (copper- smiths) of Hungary and Transylvania, at certain intervals make trading tcurs to Germany, France, England, Norway, and even Spain and Algeria. The workers in iron, on the other hand, seldom or never quit the land of their adoption, as neither naturally do the few remaining awrari, or Gipsy gold-washers of Transylvania. Simson describes a primitive Tinkler method of smelting iron, and the caves of Granada still echo to the clink of Gipsy anvils; but in England the surname Petulengro, “smith” (from petul, “horseshoe”), alone recalls the days when Gipsies sur- passed the Gentile in the farrier’s craft. Liszt, in his work Des Bohémiens et de leur Musique en Hongrie (Paris, 1859), ascribes to the Gipsies the creation of Hungary’s national music. Bartalus (1868) contests the theory, but few would hesitate to admit its plausibility who at the Paris Exhibition (1878) or elsewhere have listened to the Gipsies’ thrilling performance of a czardas, or are familiar with the undoubted compositions of Bihary, Csermak, and other Gipsy maestr?. The Gipsy’s favourite instrument is the violin, but few are the instruments he hag not success- fully essayed. The Eisteddfods of Wales have witnessed the triumphs of Gipsy harpists; and hundreds have been charmed by the concerts of the Roberts family, not know- ing they were hearing a Gipsy band. “The Egyptians,” as Krantzius drily remarked in 1520, “frequently change their horses ;” horse-dealing and horse-stealing

are too often synonymous terms with them. Fortune-telling is on the wane with Gentiles' waning belief in the fortune-

teller's powers. The Gipsy crone can no longer persuade the yeoman's wife to bury her treasure in the earth, and return in a fortnight's time to find it—gone. Those halcyon days of madnzin are passed by; the servants' hall is now the only El Dorado left. Enclosure Acts have struck a deadly blow at English Gipsydom, driving the wanderers from. breezy common and turf-edged lane to the smoky suburbs of great towns, or at best the outskirts of some watering place. Here, surrounded by Gentiles, the younger generation forget the wisdom of the Egyptians, relinquish time-honoured customs, and, wedding with the sons and daughters of the land, widen the stream of Romani blood, and so diminish its "depth." Several accounts have been furnished of Romani marriages, but they rarely tally, and some (Bright's, Borrow's, and Simson's) do not bear quotation. On the Continent one common feature is the breaking by the chief of a flower- crowned pitcher, from whose fragments, as they are many or few, he argues the fortunes of the bridal pair. There are many curious Gipsy practices relating to death and burial, such as waking the corpse, burning the deceased's effi ects, the fasting of his kinsfolk, and a species of tabu. The earliest record of Gipsies burning the property of their dead occurs in the Annual Register for 1773, p. 142: "The clothes of the late Diana Boswell, queen of the Gipsies, value £50, were burnt in the Mint, Southwark, by her principal courtiers, according to ancient custom" (ef. Liebich, p. 55). Abstention from flesh or some other delicacy is not always a sign of mourning for the dead (cf. Crofton in Papers of the Man. Lit. Club, 1877) ; but its most interest- ing form is where a Gipsy wife or child for ever renounces the favourite delicacy of the dead husband or parent. Like motives prompt the dropping of the dead Gipsy's name entirely out of use, any survivors who happen to bear the same changing it to another. Much might be written of a kind of ceremonial purity prescribed by Gipsy law, and indicated in the language by the distinction between chiklo, "dirty," and mokado, "unclean." To wash a tablecloth with clothes is mokado, since it is connected with food ; and a German Gipsy woman may not cook for four months after childbirth, while a vessel touched by the skirt of a woman's dress is held to be defiled. But

with one other widespread practice we must take our leave of Gipsy customs, that, namely, of leaving at a cross-road a handful of grass or leaves, a heap of stones, a stick or some such mark (patrin, " leaf") to guide the stragglers of the band. Sce Liebich, p. 96, and Smart and Crofton, p. 199; and com- pare "Pola," in Sleeman's Ramasecana, or a Vocabulary of the Thugs (Calcutta, 1836).

Character.—The Gipsy character, strange medley of evil and of good, presents itself as black and hateful to the outside world, whilst to the Romani race it is all that is fair and lovable. " There's nothing worse than mumply Gentiles" is a saying often in Gipsy mouths, which affords a clue to much that is puzzling in the Gipsy's nature. He is at war with mankind, for centuries his oppressors, and, all being fair in war, may plunder and beguile at will, so that he be not caught. Gipsies' light-heartedness and courtesy are patent to all men; but only to true or adopted members of the tribe are their inmost hearts revealed. Their principal faults are childish vanity, professional cun- ning, indolence (caused by the absence of ambition), and a hot passionate temper. But they are as ready to forgive as they are quick to resent a wrong; and before implicit confidence their cunning gives place to inviolate honour, a fact borne strongly out by an incident in the Life of the actor Charles Mayne Young (p. 186, ed.1871). Their family affection is intensely strong, prompting a parent never to chastise a younger child, a grown-up son meekly to take a thrashing from his father ; and they are lavishly generous

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to such as are poorer than themselves, even though Gentiles. 'Their love of nature reveals itself in a hundred quaint, peetic phrases, in a familiarity with beasts and herbs ; their love of dumb creatures in the number of their pets. Quick and versatile, all Gipsies readily adapt themselves to any state of life; they have so wonderful a gift of tongues that formerly it was reckoned against them for a proof of sorcery. That hitherto the race has produced, outside the realm of music, none but mute geniuses, is rather due to lack of education than of ability ; but " Zingaro" seems to have only been a nickname of the Quentin Matsys of the South, Antonio Solario(1382-

1455),and John Bunyan from parish registers does not appear to have had one drop of Gipsy blood (ef. Notes and Queries, 5th ser. vol. ii.). Physique. —Outwardly as within Gipsies present strong contrasts, some being strangely hideous, others very beau- tiful, though not with a regular, conventional beauty. Finely proportioned, they are as a race of middle stature, but lithe and sinewy, insensible to cold or wet, capable of supporting great fatigue. They pride themselves on their small bands and feet ; corpulence rarely occurs, and only with the older women. The hair, black or dark brown, inclines to coarseness, is often frizzled, and docs not soon turn grey; the complexion, a tawny olive, was compared by the Plymouth Pilgrims (1622) to that of the Indians of North America. The teeth are of dazzling whiteness and perfect regularity, the cheekbones high ; and the aquiline nose is overhung by a strongly-marked brow, knit often in deep lines of thought. But the most striking feature is the full, dark eye, now lustreless, then changing to an expres- sion of mysterious, childlike sorrow, presently blazing forth with sudden passion. As is the case in other Oriental races, the Gipsies early develop and early fade. See, in the Archiv fiir Anthropologie (1872), M. Isidor Kopernicki's learned and exhaustive treatise on Gipsy craniology.

Theories as to Origin.—Several attempts have been made to identify Gipsies with nomad Indian tribes: Grellmann, for example, diseovers them in the Siidras, Richardson in the Nats (Asiatic Ltesearches, vol. vii. 1784), Leland in the Doms, and B. R. Mitra in the Bediyas (Memoirs of London Anthrop. Soe., vol. iiil., 1870). These theories, however, need not detain us long; they rest merely on analogies, real or imagined, between the manners of Gipsies and such Indian vagrants, and not on the evidence of language. Nor, were it even shown that any or all of these pariahs speak Romani among themselves, would sueh a discovery throw of neeessity much light on the origin of our European Gipsies; it might simply prove that India has its Gipsy tribes. It is otherwise with the identifiea- tion of Gipsies with the Jats, who in the Punjab alone numbered (1871) 1,809,399,—a theory started by Pott, elaborated by Batail- lard, and supported by Newbold, Sir H. Rawlinson (Proceedings of the Geogr. Soe., vol. i., 1857), Professor de Goeje (Bijdrage tot de Geschiedenis der Zigewners, Amst., 1875), Captain Burton (Academy, March 27, 1875), and a writer in the Edinburgh Review (July 1878). About 420 A.p., says Firdousi (eirea 1000), the Persian

monarch Behram Gur imported 10,000 minstrels from India, assigning them lands and eattle. But they, wasting their substance, angered the king, who bade them take their instruments, and roaming through the land proeure by their songs a livelihood, ‘‘ wherefore the Ldri now wander about the world.” Hamza, the Arab historian of Ispahan (¢. 940), had already told how Behram dispersed through the cities of his realm 12,000 Indian musicians, ‘‘whose de- seendants are known as Zuth ;” and of three writers who repeat the tale Mirkhond (15th century) calls the musicians Djatt. Thus Ldri (mod. Pers. ‘‘ Gipsy”) appears to be synonymous with Zuth or Jat, the name on the one hand of Damaseus Gipsies (?), on the other of an agricultural and cattle-breeding race inhabiting the valley of the Indus. Neither are reeords laeking of west- ward migrations of Jats from the Indus, as in 714 to Mopsuestia and Antioch, while in 810 we hear of them in the Tigris valley, in 834 in the marshes of Khuzistan, in 855 in the territory of the Byzantine empire (Goeje). Jat theorists differ as to the date of the great migration that gave Europe its Gipsies, the Edinburgh Review writer plaeing it at 1025, while Sir Henry Rawlinsou regards our Gipsies as lineal deseendants of Firdousi’s Liri. These writers, how- ever, all agree in making the Gipsies Jats; but none have essayed the necessary comparison of Romani and Jataki (the idiom of the living Indian Jats), though Captain Burton himself has published a grammar of the latter in the Jowrnal of the Sh ee Society

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(Bombay, 1849). We have seen that the dialect of the Turkish Gipsies has remained unchanged for near five centuries, and the Jats are said to ‘‘ preserve their vernacular tongue wherever they go.” Supposing Gipsies then to have broken off from the main Jat stem so late as the eleventh, or even as early as the fifth cen- tury A.D., we should look fora striking resemblance between Jataki and Romani. Compare, however, with the foregoing paradigms the following from Burton’s grammar:—Sine. nom. ghord, ‘‘a horse;” gen. ghore-dd; dat. ghore-ntin; acc. ghord; abl. ghore-te or ~~ton, ‘‘from a horse;” PLuR. nom. ghore; gen. ghoridn or ghoren~~ dd; dat. ghoridn nin, &c. The Jataki third personal pronoun, again, runs:—SIne. nom. wha,

‘‘he;” gen. usadd; dat. and ace. usnin; abl, uste; PLUR. nom. uhe; gen. whindd, &c.: its verbal formation is almost equally unlike the Romani. In the face of the great unlikeness of Romani and Jataki onc may well concur with Bataillard in the rejection of this theory, and proceed to consider the later views of that writer as advanced in Les Origines des Tsiganes (Par., 1875), Les Tsiganes de l’Age du Bronze (Par., 1876), and Ktat de la question de Taneienneté des Tsigancs en Europe (Par., 1877). He now believes the Gipsies to have cxisted in Europe from immemorial times,—a conclusion to which he is

led by the absence of any record of their passage across the Bos-

phorus, by their cnslaved condition in Wallachia in the 14th century, by the casual notices cited above of their presence at a still earlicr date, and by their present monopoly of metallurgical arts in South-Kastern Kurope. These mainly negative proofs lose some of their force when we remark that neither is any record known to exist of the passage of Gipsies to England, Scotland, or America; and that at Corfu in 1346 (i.¢., in historic times) we read of Gipsies being reduced to vassalage. Assuredly it is a mighty leap from the Athingani of the 9th century a.p. to the Sigynne: of Herodotus (v. 9), whom Bataillard claims for the ancestors of the Gipsy race. The strength, however, of the theory lies less in attempted identifications than in its explanation of the unsolved problem, What was the race that carried bronze to Northern and Western Europe? Referring for a general survey of the question to the article ARcimoLocy, to E. Chantre’s Age de Bronze (4 vols., Paris, 1877), an to Lubbock’s Prehistorie Times (2d ed., London, 1869), we extract from the last-named work the following pas- sages:—‘‘ The absence of implements made either of copper or tin seems to indicate that the art of making bronze was introduced into Europe, [a view confirmed by the fact that] wherever we find the bronze swords or celts they are the same, not similar in char- acter, but identical. . . . The discovery of moulds proves that the art of casting in bronze was known and practised in many countries. Hence it appears most probable that the knowledge of metal is one of those great discoveries which Europe owes to the East. ... The implements of bronze appear to have belonged to a race with smaller hands than those of is present European nation. . . . As regards the smallness of the hands, we must remember that Hindus share this

peculiarity with Egyptians. . . . The Phcenicians were well acquainted with the use of iron. . .. We have still very much to learn in regard to the race by whom the knowledge of metal was introduced into our continent." Each passage suggests or is explained by the supposition that this was no other than the small-handed and eastern Gipsy race. The Calderari work exclusively in copper, never in iron; no Gipsy bronze-smith would have spoilt his trade by introducing iron. Traces might perhaps yet be found in Norway of the workings of a band of Calderari, who visited that country in 1874; and ecrtainly the utensils they wrought in France were exactly similar to those that they wrought in Norway. Bataillard's theory is strengthened by the fact that so high an authority as M. de Mortillet—who is followed by Chantre and Bur- nouf—had been independently led to a like conclusion in 1874. Its strongest confirmation, however, is the important discovery of Dr Kopernicki that in Eastern Galicia there survive to the present day certain Zlotars (Ruth. '' goldsmiths"), Gipsy workers in bronze, whose processes Bataillard minutely describes in Les Zlotars (Paris, 1878). Difficulties there are in accepting the theory:—thc unsettled question of the antiquity of the Romani tongue; the yawning chasm of a thousand years; above all, the unnoticed fact that nearly all the metallurgical terms of Romani seem to be borrowed from Greek— kaléi, "tin" (xadalov); khdrkoma, '"copper" (xdAKwua); moliv, "lead" (uordBiov); kakkavt, kettle" (karxaBn); amunt, "anvil" (aud), rin, '' file" (fut); sivri, "hammer" (odupt) ; kstldvi, ''pincers" (fvAdBiov) ; karfin, "nail" (kappl); klidi, "key" (xAedt); gampdna, "bell" (xaurdva); and pétalo, '' horseshoe" (éradov). This looks like an insuperable objection, since certainly no Calderari of to-day would borrow from French or German the names for these the most. familiar objects of his long-practised calling; and unless Bataillard be prepared to maintain that Greek took the terms from Romani, not vice versa, his theory falls. Bibliography. —The literature on the Gipsies is richer in appear- ance thanin reality. Miklosich (i. 54-59)and Bataillard (Les derniers Travaux relatifs aux Bohémiens, Paris, 1872) give the titles of 118 works, a number which might be largely increased. But many of these '' works" are articles hidden away in periodicals, as '*The

English Gipsies," by the Rev. S. James, in The Church of Eng: land Magazine, 1875 ; many are mere rechauffés of earlier publi- cations. Imperfect though it be, Grellmann's Historiseher Versuch uber die Zigeuner (1783; 2d and enlarged ed., Gott., 1787; Eng. translation by M. Raper, 1787) remains the only attempt at a full history of the Gipsy race; its grave deficiencies are best supplied by Sprengler's Dissertatio historica-juridica de Cinganis sive Zigewnts Leyden, 1839), by Hopf's Zinwanderung der Zigewner in Europa (Gotha, 1870), by the historical portions of Miklosich's work, and above all by Bataillard's De ? Apparition et de la Dispersion des Bohénviens en Europe (Paris, 1844), Nouvelles Recherches (Paris, 18 49), and Etat dela Question, &c. (Paris, 1877). On the language viewed as a whole the chief authorities are—Die Zigeuner in Europa und Asien (2 vols., Halle, 1844-45), by A. F. Pott ; Zigewnerisches (Halle, 1865), by G. H. Ascoli; and Ueber die Mundarten und die Wander- ungen der Zigeuner Europa's (8 parts, Vienna, 1872-78), and Beitriige zur Kenntniss der Zigewnermundarten (4 parts, Vienna, 1874-78), by F. von Miklosich. From works on the Gipsies of diffe- rent European lands the following may be given as a selection (the more important being marked with an asterisk):—for Turkey, *Etudes sur les Tehinghianés (Constan., 1870), by A. G. Paspati; for Roumania, the unsatisfactory Granumatre, Dialogues, et Vocabu- laire de la Langue des Cigains (Paris, 1868), by J. A. Vaillant; for Hungary, A' ezigdny myelv elemei (Pesth, 1858), by J. Bornemisza; for Bohemia, *Romdni Czib (Prague, 1821), by A. J. Puchmayer; for Germany, *Die Zigewner in ihrem Wesen und ihrer Sprache (Leipsic, 1863), by R. Liebich; for Poland, Rys historiezny ludu eyganskiego (Wilna, 1830), by T. Narbutt; for Russia, Ueber die Sprache der Zigeuner in Russland (St Pet. 1853), by O. Béltlingk; for Norway, Beretning am Fante- eller Landstrygerfolket 1 Norge, (5 parts, Christian., 1850-65), by E. Sundt; for Denmark, Tatere og Natmandsfolk ¢ Danmark (Copenh., 1872), by F. Dyrlund; for England, * The English Gipsies and their Language (Loudon, 1873), by C. G. Leland, Romano Lavo-Lil: Word-book of the English Gipsy Language (1874), by G. Borrow, and *The Dialect of the English Gipsies (1875), by B. Smart and H. T. Crofton; for Scot- land, A History of the Gipsies (London, 1865), by W. Simson; for Italy, Zigewnerisches (Halle, 1865), by Ascoli; for the Basque Country, Vocabulaire de la Langue des Bohémiens habitant les Pays Basques Frangais (Bord. 1862); for Spain, The Zineali (2 vols., Lond., 1841; new ed. 1873), by Borrow. From works on

non-European Gipsies selection is unnecessary, since their sum total is as follows :—‘‘ Ueber die Sprache der Zigeuner in Syrien,” by Pott, in Zettsehrift fiir die Wissenschaft der Sprache (Berlin, 1846); Reisen dureh Syrien, Paldstina, &c. (Berlin, 1854), by U. J. Seetzen, containing a Syro-Romani vocabulary; *‘‘ The Gipsies of Egypt,” in the Journ. of the Roy. Asiatic Soe. (Lond., 1856), by Captain Newbold, comprehending vocabularies from Egypt, Syria, and Persia ; ‘‘ Die Zigeuner in Agypten,” in Petermann’s Mittheilungen (Gotha, 1862), by A. von Kremer; Notes et Questions sur les Bohémiens en Algerie (Paris, 1874), by P. Bataillard; and Travels in the East (Lond., 1823), by Sir W. Ouseley, vol. iii. of which gives a Karachi vocabulary. To these may be added the specimens of the Gipsy dialects of Asia Minor, furnished by Paspati, and vocabularies from Armenia and Siberia in Miklosich’s Beitrdge (iv. pp. 38-41). (F. H. G.)

GIRAFFE (Camelopardalis giraffa), a mammal belonging to the ruminant group of the Artiodactyle Ungulates, and the single living representative of the family Cameloparda- lide. Intermediate between the members of the deer and ox families, the giraffe differs from both in having neither true horns nor antlers. It possesses however two solid, bony, and persistent appendages, attached partly to the frontal and partly to the parietal bones; and not to the former only as in the true horned ruminants, and these, un-like the processes of the latter, are distinct bones, separable, at least in the young animal, from those of the forehead. These horn-like peduncles are completely covered over by the skin of the forehead, and are terminated by a tuft of bristles, while in front of them there is a protuberance caused by a thickening of the bone, sufficiently prominent in the male to have been frequently described as a third horn, The giraffe is the tallest of existing animals, mea- suring usually from 15 to 16 feet high—the females being somewhat less—but attaining in the largest examples a height of 18 feet. This exceptional elevation is chiefly due to its great length of neck and limb, the cervical vertebre, although only seven in number as in other mammals, being in this case exceedingly long. Its body is proportionately short, measuring only 7 feet between the breast and rump,

and slants rapidly towards the tail—a peculiarity which has

given rise to the erroneous impression that the fore legs of the giraffe are longer than the pair behind. Its feet ter- minate in a divided hoof, which, says Sir Samuel Butler, “is as beautifully proportioned as that of the smallest gazelle”; and the accessory hoofs found in most ruminants are entirely awanting. Its head is small, its eyes large and lustrous; and these, which give to the giraffe its peculiarly gentle appearance, are capable of a certain degree of lateral projection, which enable the creature without turning its head to see around and to a certain extent behind it. ‘The elevated eyes of the giraffe thus enjoy a wider range of vision than those of any other quadruped. Its nostrils are provided with a peculiar mechanism of sphincter muscles, by which they can be opened or closed at will, and the animal is thus enabled to avoid the injurious effects of the sand storms which occasionally pass over its native haunts.

‘ me = See Giraffe.

Its tongue is remarkable for its great length, measuring about 17 inches in the dead animal, and for its great elas- ticity and power of muscular contraction while living. It is covered with numerous large papille, and forms, like the trunk of the elephant, an admirable organ for the examina- tion and prehension of its food, The graceful appearance presented by the giraffe, to which it owes its name through the Arabian Xtrapha, is greatly heightened by the orange- red colour of its hide, mottled as it is all over with darker spots ; while in its long tail, ending in a luxurious tuft of dark- coloured hair, it possesses an admirable fly-whipper, without which it would probably be impossible for the giraffe to maintain its ground against the seroot fly and other stinging insects of central Africa. It lives on open plains in the neighbourhood of low woods, high forest being scrupulously avoided, as depriving it of the exten-

sive prospect which forms its chief defence against the attacks of its two great enemies—the lion and man. It feeds almost exclusively on the foliage of trees, showing a preference for certain varieties of mimosa, and for the young shoots of the prickly acacia, for browsing on which the pre- hensile tongue and large free lips of the giraffe are specially adapted. It is gregarious in its habits, living in small herds rarely of more than twenty

individuals, although Sir 8. Baker, who hunted it in Abyssinia, states that he has seen as many as a hundred thus herding together.

There is probably no animal more difficult of approach than the giraffe, owing to that exceeding wariness which prompts it to place sentinels to give the herd timely warnin g of approaching danger, as well as to its ability, from the elevated position of its eyes, and the openness of the ground it frequents, to see danger, and from its keenness of scent to smell it from afar. It is a fleet though by no means graceful runner, its awkward, shambling gait being due to its moving the fore and hind legs of the same side simultane- ously. In hunting it on horseback the rule to be observed, according to the traveller already mentioned, is to press the giraffe the instant he starts; "it is the speed that tells upon him, and the spurs must be at work at the very commence-

| ment of the hunt, and the horse pressed along at his best

pace ; it must be a race at top speed from the very start, but should the giraffe be allowed the slightest advantage for the first five minutes the race will be against the horse." In pursuing it thus on horseback the experienced hunter avoids too close an approach to the creature's heels, a blow from which he has probably learnt to regard, with Dr Livingstone, as leaving little to choose between it and "a clap from the arm of a windmill." Although trusting for safety to flight, it will, when brought to bay, even turn upon the lion; and not seldom does it defend itself successfully against his attacks by the vigorous blows of its powerful limbs, It is, however, powerlessagainst the "king of beasts" when taken unawares, and with this object the latter lies in wait by the banks of streams, and springs upon the giraffe as it seeks to quench its thirst. In captivity it is said to make use of its skin-covered horns as weapons of defence, giving impetus to the blow, not by depressing and then ele- vating the head, as in the butting of an ox or sheep, but by a sidelong swing of its muscular neck. The skin of the giraffe is in many parts so thick that the bullet of the hunter often fails to pierce it, the surest method of hunting it being that pursued by the Hamran Arabs of Abyssinia, who run it down, and when galloping at full speed cut the tendons of its legs, or "hamstring" it, as this operation is called, with their broadswords, and thus completely disable it.

The giraffe is only found wild in Africa, where it ranges throughout the open country of Ethiopia as far south as the confines of Cape Colony. Until about fifty years ago it was almost totally unknown in Europe ; it is now, however, to be found in most of the European zoological gardens, where it appears to thrive as well on corn and hay as on the mimosas of its native haunts, It also breeds freely in con- finement, so that it may now be regarded as acclimatized in Europe. The giraffe family was more largely represented and enjoyed a wider distribution during the Miocene period, fossil remains of extinct species having been found in Greece and the Siwalik Hills; while an allied genus, Helladotheriwm, with less neck and more body than the ex- isting giraffe, extended during the same period from the south of France to north-west India.

The skin of the giraffe forms a valuable leather material, that made from the thicker parts being in special request for sandals ; its flesh, according to Sir 8. Baker, was, when roasted, the best he had ever tasted; the tendons of its long legs are valued by the Arabs as thread for sewing

leather, and as strings for their musical instruments; while its leg bones, which differ from those of other ruminants in being solid, are largely used in England in the manufac- ture of buttons and other articles of bone.

GIRALDI, Giciio Grecorio (1479-1552), or Lilius Gregorius Gyraldus, one of the scholars and poets of the golden age of Italian literature, was born June 14, 1479, at Ferrara, where he early distinguished himself by his talents and acquirements. On the completion of his literary course he removed to Naples, where he lived on familiar terms with Pontano and Sannazaro; and subsequently to Lombardy, where he enjoyed the favour of the Mirandola family. At Milan in 1507 he studied Greek under Chal- condylas ; and shortly afterwards, at Modena, he became tutor to Ercole (afterwards Cardinal) Rangone. About the year 1514 he removed to Rome, where, under Clement VII., he held the office of apostolic protonotary; but having in the sack of that city (1527), which almost coincided with the death of Cardinal Rangone his most powerful patron, lost all his property, he returned in poverty once more to Mirandola, whence again he was driven by the troubles consequent on the assassination of the reigning prince in

1533. The rest of his life was one long struggle with ill health, poverty, and neglect ; and he is alluded to with sorrowful regret by Montaigne in one of his Zssais (i. 34), as having, like Sebastian Castalio, ended his days in utter destitution. He died at Ferrara in February 1552; and his epitaph makes touching and graceful allusion to the sadness of his end. Giraldi was a man of very extensive erudition ; and numerous testimonies to his profundity and accuracy have been given both by contemporary and by later scholars. His Historia de Diis Gentiwm marked a distinctly forward step in the systematic study of classical mythology ; and by his treatises De Annis et Afensibus, and on the Calendarium Romanum et Grecum, he contributed to bring about the reform of the calendar, which was ulti- mately effected by Pope Gregory XIII. His Progymnasma adversus Lnteras et Literatos deserves mention at least among the curiosities of literature ; and among his other works to which reference is still occasionally made are H?s- toria Poetarum Grecorum ac Latinorum; De Poetis suorum temporum; and De Sepultura ac vario sepeliendi ritu. Giraldi was also an elegant Latin poet. His Opera Omnia were published at Leyden in 1696.

GIRALDI, Giovanni Bartista (1504-1573), surnamed Cyntiius, CINTHIO, or CrnTIO, Italian novelist and poet, born at Ferrara in November 1504, was educated at the university of his native town, where in 1525 he became pro- fessor of natural philosophy, and where, twelve years after- wards, he succeeded Celio Calcagnini in the chair of belles- lettres. Between 1542 and 1560 he acted as private secretary, first to Ercole II. and afterwards to Alphonso II. of Este ; but having, in connexion with a literary quarrel in which he had got involved, lost the favour of his patron in the latter year, he removed to Mondovi, where he remained as a teacher of literature till 1568. Subsequently, on the invitation of the senate of Milan, he occupied the chair of rhetoric at Pavia till 1573, when, in search of health, he returned to his native town, where on the 30th of December he died. Besides an epic entitled Ercole (1557), in twenty-six cantos, Giraldi wrote nine tragedies, the best known of which, Orbecche, was produced in 1541. The sanguinary and disgusting character of the plot of this play, and the general poverty of its style, are, in the opinion of many of its critics, almost fully redeemed by occasional bursts of genuine and impassioned poetry ; of one scene in the third act in particular it has even been affirmed that, if it alone were

sufficient to decide the ques- tion, the Orbecche would be the finest play in the world.

Of the prose works of Giraldi the most important is the |

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LHecatommitht or Ecatomiti, a collection of tales told some- what after the manner of Boccaccio, but still more closely re- sembling the novels of Giraldi's contemporary Bandello, only much inferior in workmanship to the productions of either author in vigour, liveliness, and local colour. Something, but not much, however, may be said in favour of their pro- fessed claim to represent a higher standard of morality. Originally published at Monteregale, Sicily, in 1565, they were frequently reprinted in Italy, while a French transla- tion by Chappuys appeared in 1583, and one in Spanish in 1590. They have a peculiar interest to students of English literature, as having furnished, whether directly or indi- rectly, the plots of Afeasure for Measure and Othello. That of the latter, which is to be found in the Lecatommithi (ili. 7), is conjectured to have reached Shakespeare through the French translation ; while that of the former (/Zecat., vill. 5) is probably to be traced to Wheatstone's Promos and Cassandra (1578), an adaptation of Cintlio's story, and to his Heptamerone (1582), which contains a direct English translation. To Giraldi also must be attributed the plot of Beaumont and Fletcher's Custom of the Country.

GIRALDUS CAMBRENSIS. See Barri.

GIRARD, Puitipre Henri DE (1775-1845), a celebrated French mechanician, was born at Lourmarin, in the depart- ment of Vaucluse, lst February 1775. In his early life he manifested a strong aptitude for mechanical invention, and he also at that time devoted his attention to botany, paint- ing, and literature. When at the Revolution his family took refuge in Italy he supported himself there for some time by painting, but afterwards, at the age of eighteen, he established a soap manufactory at Leghorn. Returning to France after the fall of Robespierre, he began to conduct a chemical work at Marseilles, but soon afterwards judged it prudent to go to Nice, where he obtained the professorship of chemistry and of natural history. Returning to Mar- seilles about 1800, he afterwards went

to Paris, where, in company with his brother Frederick, he established a soap manufactory. In 1804 he and his brother took out a patent for what is known as the fountain lamp; and at the “Exposition” of 1806 he was awarded a gold medal for his one-cylindered direct acting steam engine. Napoleon having in 1810 decreed a reward of one million francs to whoever should invent a machine for the spinning of flax equally successful with those in use for the spinning of hemp, Girard, after a course of experiments, invented and patented a flax-spinning machine. In 1813 he established a flax mill at Paris and another at Charonne, in both of which he made use of his machine ; but although he was declared to have earned the reward offered for the invention the fall of Napoleon in 1815 left the decree unfulfilled. Girard, who expected that the expenses connected with his experiments would be met by the promised premium, now got into serious money difficulties, and had to leave France for Austria, where, besides establishing a flax mill at Hirtenberg, he built the first line of steam ships on the Danube. In 1825, at the invitation of the emperor Alexander I. of Russia, he went to Poland, where he erected a flax manufactory, round which grew up a village which received the name of Girardow. He was also appointed chief engineer of the mines of Poland. In 1844 he re- turned to Paris, and exhibited at the Exposition a large number of inventions, including a machine for combing flax, a machine for making gunlocks, several new improvements in guns, a piano of double octaves, and a new instrument called the Z’remolophone. For his inventions connected with the manufacture of flax a gold medal was decreed to him by the jury; and in 1845 the Society of In- ventions awarded him a sum which raised the pension he received from the Russian Government to 6000 francs. Besides the inventions already mentioned, Girard was the

author of a large nuniber of others, many of them of con- siderable importance in connexion with various departments of industrial machinery. He died at Paris August 26, 1845. A pension of 6000 francs was bestowed in 1857 on his only surviving brother, and another on his niece,

GIRARD, StepHen (1750-1831), American philan- thropist, was born at Bordeaux on 21st May 1750. At the age of thirteen he commenced life as a

sailor, and followed his avocation with such assiduity that he was enabled, before the French requisitions of age and service allowed, to become master and captain, in October 1773. His first mercantile venture was to St Domingo in February 1774, whence he proceeded in July to the then colony of New York. After trading for three years between New York, New Orleans, and Port au Prince, he went to Phila- delphia in May 1777, and gave up the sea for a mercantile career. While he was engaged most successfully in the prosecution of an extensive trade, the yellow fever in its most malignant type broke out in Philadelphia, sweeping away one-sixth of its population. When, during its height, a hospital was established, for whieh it seemed almost im- possible to secure competent management, Girard devoted himself personally, fearless of all risks, to the care of the sick and the burial of the dead, not only in the hospital, of which he became manager, but throughout the city, sup- plying the poorer sufferers with money and provisions. Two hundred children, made orphans by the ravages of the fever, were in a great measure thrown upon his care. From this period his success commercially and financially was unexampled. He gave a portion of his time to the manage- ment of municipal affairs for several years, and rendered efficient service as warden of the port and as director of many public institutions, On the dissolution of the Bank of the United States, he instituted what is known now as the Girard Bank. During the war of 1812 “he rendered valuable services to the Government by placing at its disposal the resources of his bank at a time of difficulty and embarrassment, subscribing to a large loan which the Government had vainly sought to obtain.” Girard added to his other avocations that of a practical agriculturist. He died December 26, 1831.

Girard College was founded by him for the education and support of the poor white orphans of his adopted city. His fortune amounted to about seven and a half millions of dollars. After specific legacies of two millions for the erection and endowment of the college, $140,000 to his relatives, $300,000 to the State for internal improvements, $500,000 to the city of Philadelphia to improve its eastern front, $116,000 to public charities, and various annuities and legacies, he bequeathed the residue of his estate to the city of Philadelphia, mainly for the improvement and main- tenance of the college. The most minute directions were given by Girard in regard to the buildings to be erected, aud the admission and management of the inmates.

He specifically requires that the orphans be instructed in the purest principles of morality, so that on their entrance into active life they may evince benevolence towards their fellow creatures, and a love for truth, sobriety, and industry. As for religious belief they are left to adopt such tenets as their matured reason may lead them to prefer; and to secure this he interdicts the employment, and even the admission into the grounds, of any ecclesiastic whatever.

GIRARDIN, Mapame Emite pg, a French authoress, was born at Aix-la-~Chapelle, January 26, 1804, and died at Paris June 29, 1855. Her maiden name was Delphine Gay, and her mother, the well-known Madame Sophie Gay, brought her up in the midst of that brilliant literary society of which she was afterwards a conspicuous ornament. In 1822 she obtained peculiarly honourable mention from

Sainte Camille at the Siege of Barcelona ; and not long after she published two volumes of miscellaneous pieces, L'ssazs poétiques (1824) and Nouveaux essais poétiques (1825), A visit to Italy in 1827, during which she was enthusiastically welcomed by the literati of Rome and even crowned in the capitol, was productive of various poems, of which the most ambitious was Vapoline (1833), Her marriage in 1831 to M. Emile Girardin opened up a new literary career. The contemporary sketches which she contributed from 1836 to 1839 to the feuilleton of La Presse, under the nom de plume of Charles Delaunay, were collected under the title of Lettres Parisiennes (1843), and obtained a success which has proved as permanent as it was brilliant. But it was to more elaborate efforts that the authoress would have pre- ferred to entrust her reputation, and she indeed confesses, in a half serious half mocking mood, that it was almost a disappointment to find herself famous for so slight a thing. To the close of her life she continued to appear both as a novelist and as a writer for the stage, and in both departments she reaped a wide popularity through the wit and emotional force of her productions. Contes d'une vierlle fille & ses neveus (1832), La canne de Monsieur de Balzac (1836), and 12 ne faut pas jouer avec la douleur (1853) are among the best known of her romances; and her dramatic pieces include L'Hcole des journalistes (1840), Judith (1843),

Cléopatre (1847), C’est la faute du mari (1851), Lady Tartufe (1853), La joie fait peur (1854), Le chapeau @un horloger (1854), and Une femme qui déteste son mart, which did not appear till after the author’s death. In the literary society of her time Madame Girardin exercised no small personal influence, and among the frequenters of her drawing-room were Gautier and Balzac, Alfred de Musset and Victor Hugo. During the latter years of her life a pensive melancholy gathered round her: for long years she had prayed the prayer of Hannah, and her woman’s heart had not been comforted. Her col- lected works were published in six volumes, 1860-1861.

See Sainte-Beuve, Causerics du lundi, t. iii; G. de Molenes, ‘

GIRARDIN, Sarnt-Marc (1801-1873), a politician and man of letters whose real name was Marc Girardin simply, was born at Paris in 1801, and died at Morsang-sur-Seine on the 11th of April 1873. His school career at the Lycée Henri IV. was a distinguished one, and he afterwards took university honours both in literature and law, but he never practised at the bar. During the reign of Charles X. he obtained several Academy prizes, and a mastership at the Lycée Louis le Grand, though his liberal principles stood a little in his way. In 1828 he began to contribute to the Journal des Débats, on the staff of which he remained for nearly half acentury. At the accession of Louis Philippe he was appointed professor of history at the Sorbonne and master of requests. Soon afterwards he exchanged his chair of history for one of literature, continuing to contri- bute political articles to the Débats, and sitting as deputy in the chamber from 1835 to 1848. As a professor he directed his efforts chiefly against the elerical reaction. In 1844 he was elected a member of the Aeademy. During the revo- lution of February 1848 Girardin was for a moment a minister, but after the establishment of the republic he was not re-elected deputy, nor did he take any prominent part in politics during the seeond empire save with his pen. In the capacity of journalist he continued to be active, and interested himself not merely in moderate opposition to the Government at home but also in foreign politics, especially in the affairs of Syria, Greece, and Turkey. After the war

the Academy for a poem on the Devotion of the Sisters of | of 1870 he was returned to the Bordeaux assembly by his old

department—the Haute Vienne. His Orleanist tendencies and his objections to the republic were strong, and though he at first supported Thiers, he afterwards became a leader of the opposition to the president. He died, however, before Thiers was actually driven from power. Saint-Marc Girardin was one of the most distinguished of the many writers whose political and literary activities combined have raised them to distinction in France during this century, but to whom there cannot be assigned the highest rank either as politicians or as littérateurs. His political claims were not above those of a vigorous and intelligent journalist. His professorial lectures were popular and well attended ; his literary knowledge was wide, and included German and Italian; his criticisms, on which his claims as a man of letters rest, were acute and well expressed, but not remarkable for great subtlety or novelty of thought or style.

His chief work is his Cours de littérature dramatique (1843- 1863), a series of lectures the delivery and publication of which lasted for over twenty years. ‘This work has for second title De VUsage des Passions dans le Drane, which describes it more accurately. The author goes through the list of the various pas- sions, and of the chief situations which call them out, discussing at the same time the mode in which they are treated in the most cele- brated dramas of ancient and modern times. The source of these illus- trations is not indeed limited to drama, and the lecturer takes a wide range over the fields of poetry and romance. The result was doubt- less as a course of lectures interesting and stimulating ; as a book it is somewhat desultory. Among his other works may be noticed Essais de Littérature (1844, 2 vols.), made up chiefly of contributions to the Débats, his Notices sur ? Allemagne (1834), and many volumes of collected Souvenirs, Reflexions, &c., on foreign countries and passing events. His latest works of literary importance were La Fontaine ct les Fabulistes (1867) and an Etude sur J. J. Rousscaw (1870) which had appeared in the Revue des Deux Mondes,

GIRARDON, Francois (1628-1715), a sculptor whose works are typically characteristic of the epoch of Louis XIV., was born at Troyes in 1628, and died in the Louvre in 1715. As a boy he had for master a joiner and wood-

carver of his native town, Baudesson by name (Arch. de l' Art Francais, v. 4), under whoi he is said to have worked at the chateau of Liébault, where he attracted the notice of Chancellor Séguier. By the chancellor's influence Girardon was first removed to Paris and placed in the studio of Francois Anguier, and afterwards sent to Rome. In 1650 he re- turned to France, and seems at once to have addressed him- self with something like ignoble subserviency to the task of conciliating Le Brun, who owed his start in life to the same patron. Girardon is reported to have declared himself incapable of composing a group, whether with truth or from motives of policy it is impossible to say. This much is certain, that a very large proportion of his work was carried out from designs by Le Brun, and shows the merits and defects of Le Brun's manner—a great command of cere- monial pomp in presenting his subject, coupled with a large treatment of forms which if it were more expressive might be imposing. The court which Girardon paid to the "'premier peintre du roi" was rewarded. An immense quantity of work at Versailles was entrusted to him, and in recognition of the successful execution of four figures for the Bains d'Apollon, Le Brun induced the king to present his protegé personally with a purse of 300 louis, as a distinguishing mark of royal favour. In 1650 Girardon was made mem- ber of the Academy, in 1659 professor, in 1674 'adjoint au recteur," and finally in 1695 chancellor. Five years before (1690), on the death of Le Brun, he had also been appointed "inspecteur général des ouvrages de sculpture"— a place of power and profit. In 1699 he completed the bronze equestrian statue of Louis XIV., erected by the town of Paris on the Place Louis le Grand. This statue was melted down during the Revolution, and is known to us only by a small bronze model (Louvre) finished by Girardon himself. His Tomb of Richelieu (church of the Sorbonne) was saved from destruction by M. Alexandre Lenoir, who

received a bayonet thrust in protecting the head of the cardinal from mutilation. It is a capital example of Girardon's work ; but amongst other important specimens yet remaining may also be cited the Tomb of Louvois (St Eustache), that of Bignon (St Nicolas du Chardonneret), and decorative sculptures in the Galerie d'Apollon and Chambre du roi, in the Louvre. Although chiefly occupied at Paris, Girardon never forgot his native Troyes.

In the Hotel de Ville is still shown a medallion of Louis XIV, and in the church of St Rémy a bronze crucifix of some importance, — both works by his hand. In 1850 M. Corrard de Breban, who has given much time to researches concerning artists native to the town of Troyes, published a Notice sur la vie et les ceuvres de Girardon.

GIRDLE, a band of leather or other material worn round the waist, either to confine the loose and flowing outer robes so as to allow freedom of movement, or to fasten and support the garments of the wearer. In southern Europe and in all Eastern countries the girdle was and still is an important article of dress. Among the Romans it was used to confine the ¢unzca ; and so general was the custom that the want of a girdle was regarded as strongly presumptive of idle and dissolute propensities. It also formed a part of the dress of the Greek and Roman soldier ; the phrase cin- gulum deponere, to lay aside the girdle, was as equivalent to quitting the service. It was used as now iu the East to carry money in; hence zonam perdere, to lose one's purse.

Girdles and girdle-buckles are not found in early Celtic interments, nor are they frequent in Gallo-Roman graves. But in Frankish and Burgundian graves they are alinost constantly present, often ornamented with plaques of bronze or silver, and the clasps and mountings chased or inlaid with various ornamental designs, occasionally including figures of the cross, and rude representations of Scripture subjects. In later times girdles are frequently represented on brasses and monumental effigies from the 12th to the 16th century. They were either of leather or of woven materials, often of silk and adorned with gold and gems. The mode in which they were worn is shown on the effigies ; usually fastened by a buckle in front, the long free end of the girdle was passed up underneath and then down over the cincture, and through the loop thus formed the orna- mented end hung down in front. Among the sumptuary regulations of Edward III. there were prohibitions against wearing girdles of gold and silver unless the wearer were of knightly rank or worth £200 a year. Similar regulations against extravagance in girdles are occasionally found to the 16th century. The brasses of the 15th century present many beautiful examples of ladies' girdles, which were often worn like that of the knight with the ornamental end hang- ing down in front, sometimes with both ends depending from a

large clasp or ornamental fastening in the centre. Allusions to the girdle are common in the poetry of the 16thand 17th centuries. The purse, the dagger, the rosary, the pen and inkhorn and the bunch of keys were carried suspended from it, and hence it was an ancient custom for bankrupts or insolvent persons to put off and surrender their girdles in open court. It is recorded that the widow of Philip I., duke of Burgundy, renounced her right of suc- cession by putting off her girdle upon the duke's tomb. The girdle, which was a very important element in the dress of the Levitical priesthood, does not appear as an ecclesias- tical vestment in the Christian Church until the 8th century. Germanus, who died in 740, mentions the girdle worn by deacons ; and Hrabauus Maurus in the succeeding century speaks of the girdle as one of the regular vestments, and refers to its symbolism. Some centuries later the church had to discountenance extravagance in this article of attire, and splendour in the decoration of girdles was denounced as secular and unbefitting the ecclesiastical character,

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GIRGEH, Grrea, or JirsEn, a town of Upper Egypt, | situated on the left bank of the Nile, about 9 miles north- | west of the ancient city of Abydus. It owes its name to the Coptic monastery of St George or Girgis, and is the | seat of a Coptic bishop, possesses eight mosques and a Roman Catholic monastery which ranks as the oldest in Egypt, and numbers from 8000 to 10,000 inhabitants, of © whom about 500 are Christians. For a long time it was the capital of the Sa'id, but this rank is now held by Soohag. The worst enemy of Girgeh is the river, which was a quarter | of a mile to the east at the time of Pococke's visit about 1740, but has gradually crept nearer, and is now slowly undermining the very site of the town.

GIRGENTI, a city in the south of Sicily, at the head of a province of its own name, occupies a fine position about 3 miles from the coast on a platform of Mount Camicus, more than 1100 feet above the level of the sea. It lies about 60 miles §.S.E. of Palermo, with which it is connected by a railway 90 miles long. As seen from the lower ground Girgenti presents a grandiose but sombre appearance, with its buildings rising in close array from ancient substruetions | and the steep rocks of the mountain ; but within it is for | the most part mean, monotonous, and melancholy, the streets with

few exceptions being confined, irregular, steep, and ill-paved, and the houses all presenting the same grey- brown walls, the same reddish roofs, and the same narrow doors and narrow windows. The cathedral, begun in the 14th century, has still an impressive effect, in spite of the incongruous mixture of styles ; but the interior is a typical specimen of modern rococo. The acoustic conditions are sufficiently peculiar: a word spoken in the softest whisper at the entrance can be distinctly heard behind the choir, 100 paces off. One of the chapels contains the shrine and bears the name of St Gerlando, the first bishop of Girgenti; the altar-piece is a Virgin and Child by Guido Reni; and in the north aisle there stands a marble sarco- phagus now used as a font, with fine rilievos, probably of | Roman. workmanship after a Greek original, representing — the story of Hippolytus and Phedra. Not only are the archives of the cathedral rich in historic documents of the Norman period, but they profess to contain an autograph — letter of the devil himself, Among the other churches, | upwards of forty in number, 8. Maria dei Greci is worthy of note as preserving two Doric pillars which had belonged to the temple of Zeus Polieus, founded in 570 B.c, by Phalaris, and are thus the oldest architectural remains in Girgenti. As the chief town of a province, Girgenti is the residence of a prefect and the military headquarters of the district. It is also the seat of the wealthiest bishopric in Sicily, dating from the pontificate of Urban IT. ; and it possesses a chamber of commerce and art, an industrial institute, a lyceum, a gymnasium, a technical school, and an episcopal seminary. Its principal library, Bibliotheca Lucchesiana, was presented to the town by Don Andrea Lucchese of the family of Campo Franco; the Casino Empedocleo, with well-appointed library and reading- rooms, was founded by a number of the wealthier citizens. In the early part of the century Girgenti was a poverty-stricken town, but it has attained a considerable degree of prosperity since 1850. It lies in the centre of the sulphur

| executed for Napoleon I. in 1802.

district of Sicily, and its port, formerly Molo di Girgenti, now Porto Empedocle, is the principal place of shipment. The harbour has been largely improved since 1870: the pier, originally constructed in the 17th century, in part at least from the ruins of the temple of the Olympian Jupiter, has been extended to a length of 4800 feet, so as to include an area of 330,000 square

yards, and the depth, which was only 10 feet on the bar and 16 within, has been greatly increased by dredging. Around the port, which is 3 miles from the city proper, has gathered a cluster of houses and |

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stores, and the spot is defended by a small fort. Almonds and grain are the only important articles of export besides sulphur ; but, though the grain-pits hewn out of the rock are of large extent, the actual shipments of grain are not very

great. The average value of the annual export of sulphur amounted, between 1868 and 1870, to £411,700, while that

of the other articles was less than £15,000 cach. The popu-

lation of Girgenti was 18,802 in 1871, and that of Porto

Empedocle 6691. In the history of Girgenti there is little of note ; the historical interest of the district gathers round the splendid ruins of the older Agrigentum, which lie between Girgenti and the sea,

See Piccone, Memorie storiche Agrigentine ; De la Salle's Voyage .

| pittoresque en Sicile; Hackel's ' Reiseskizzen aus Sicilien," in | Aeitschrift fir Erdk. zw Berlin, 1860; Renan, " Voyage in Sicile," | in Revue des Dew Mondes, Nov. 1875.

GIRODET DE ROUSSY, Anne Lours (1767-1824),

better known as Girodet-Trioson, was born at Montargis, January 5, 1767. He lost his parents in early youth, and

the care of his fortune and education fell to the lot of his guardian, M. Trioson, '"'médecin de mesdames," by whom he was in later life adopted. After some preliminary

| Studies under a painter named Luquin, Girodet entered the

school of David, and at the age of twenty-two he successfully competed for the Prix de Rome. At Rome he executed his Hippocrate refusant les présents d'Artaxerxes, and Endymion dormant (Louvre), a work which was hailed with acclamation at the Salon of 1792. The peculiarities which

mark Girodet's position as the herald of the romantic move-

ment are already evident in his Endymion. The firm-set forms, the grey cold colour, the hardness of the execution,

are proper to one trained in the school of David, but these

characteristics harmonize ill with the literary, sentimental, and picturesque suggestions which the painter has sought

| to render. The same incongruity marks Girodet's Danae,

and his Quatre Saisons, executed for the king of Spain, (repeated for Compiégne), and shows itself to a ludicrous ex- tent in his Fingal (St Petersburg, Leuchtenberg collection), This work unites the defects of the classic and romantic schools, for Girodet's imagination ardently and exclusively pursued the ideas excited by varied reading both of classic and modern litera-

| ture, and the impressions which he received from the exter-

nal world afforded him little stimulus or check ; he conse-

| quently retained the mannerisms of his master's practice

whilst rejecting all restraint on choice of subject. The credit lost by Fingal Girodet regained in 1806, when he exhibited Scéne de Deluge (Louvre), to which (in competi- tion with the Sabines of David) was awarded the decennial prize, This success was followed up in 1808 by the pro- duction of the Reddition de Vienne, and Atala au Tombeau ——a work which went far to deserve its immense popularity, by a happy choice of subject, and remarkable freedom from the theatricality of Girodet's usual manner, which, however, soon came to the front again in his Révolte de Caire

(1810). His powers now began to fail, and his habit of work- ing at night and other excesses told upon his constitution ; in the Salon of 1812 he exhibited only a Téte de Vierge; in 1819 Pygmalion et Galatée showed a still further decline of strength ; and in 1824—the year in which he produced his portraits of Cathelineau and Bonchamps—Girodet died on 9th December, aged fifty-nine.

The number of his paintings is inconsiderable ; but he exccuted a vast quantity of illustrations, amongst which may be cited those to the Didot Virgil (1798) and to the Louvre Racine (1801-1805). Fifty-four of his designs for Anacreon were engraved by M. Chatillon. Girodet wasted much time on literary composition, his poem Le Peintre (a string of commonplaces), together with poor imitations of classical poets, and essays on Le Genie and La Grace, were published after his death (1829), with a biographical notice by his friend M. Coupin de la Couperic ; and M. Deleécluze, in his Lowis David et son temps, has also a brief life of Girodet,

GIRONDE, © maritime department in the 8.W. of France, formed from four divisions of the old province of Guyenne, viz., Bordelais, Bazadais, and parts of Périgord and Agénois. It is bounded on the N. by the department of Charente-Inférieure, E. by those of Dordogne and Lot-et-

Garonne, 8. by that of Landes, and W. by the Bay of |

Biscay. It lies between 44° 12’ and 45° 35’ N. lat. and

between 0° 18’ E. and 1° 16’ W. long., being 106 miles in | length from N.W. to 8.E., and 80 in breadth from N.E. to |

§.W. It takes its name from the river or estuary of the Gironde formed by the union of the Garonne and Dordogne. The department divides itself naturally into a western and an eastern portion. The former, which is termed Les Landes, occupies more than a third of the department, and consists chiefly of morasses, or of sandy and unfruitful downs. The downs stretching along the sea-coast have, however, been now planted with pines, which, binding the sand together by means of their roots, afford an effica-

cious protection against the encroachments of the sea. Near |

the coast are two extensive lakes, Carcans and Lacanau,

communicating with each other, and with the bay of | Arcachon, near the southern extremity of the department. | The Bay of Arcachon contains numerous islands, and on the |

land side forms a vast shallow lagoon, a considerable portion of which, however, has been drained and converted into arable land. The eastern portion of the department

to 300. Of late years the herring-fishing has been gréatly developed ; in the spring of 1879 304 boats were engaged in it, the “take” exceeding 20,000 crans. The harbour is a tidal one, with a depth at high water of only 9 feet. The public buildings are very superior; and of late many handsome villus lave been erected. The situation of the town is one of the finest in the west of Scotland, and the shore affords excellent facilities for sea-bathing. The population, which was 7319 in 1851, had fallen to 4776 in 1871, but it is now increasing.

GISORS, a town of France, department of Eure, is situated in a pleasant valley on the Epte, 45 miles E.N.E. of Paris. Of its ancient castle, which dates from the 12th century, and was at one time one of the principal strong-

holds in the kingdom, the octagonal keep, built by Henry Il. of England, remains entire, and the rest of the ruins still present an imposing appearance. Its ancient ramparts have been converted into promenades. There is a fine old church, the choir of which was built in 1240, and contains windows with portraits of Blanche of Castile and Louis VIII. The north portal is a good specimen of the florid style of the Renaissance. The church contains some fine sculptures and paintings. The principal other buildings

are the communal college, the convent, and the hospital.

consists chiefly of a succession of hill and dale, and, especially |

in the valley of the Gironde, is very fertile. The estuary

of the Gironde is about 45 miles in length, and varies in |

breadth from 2 to 6 miles. The principal affluent of the Dordogne in this department is tlie Isle. The feeders of the Garonne are, with the exception of the Dropt, all small. West of the Garonne the only river of importance is the

Leyre, which flows into the bay of Arcachon. The climate |

is humid and temperate. Wheat, rye, maize, millet, and hemp are grown to a considerable extent. The corn pro- duced, however, does not more than half meet the wants of the inhabitants. Theculture of the vine is by far the most important branch of industry carried on, the vineyards occupying about one-seventh of the surface of the depart- ment. The wine-growing districts are the Médoc, Graves, Cotes, Palus, and Entre-deux-Mers. The Médoc country grows the three grands crus. ‘The Graves country forms a zone 30 miles in extent, and is situated in the vicinity of the Garonne and Dordogne, extending from Chatillon-sur- Gironde to Langon. wines of the Cédtes district are St Emilion, Pommerol, St Laurent, St Hippolyte, St Christophe, and St George. The Palus and Entre-deux-Mers produce is inferior. Fruits and vegetables are increasingly cultivated, strawberries, cherries, apricots, prunes, artichokes, and peas being largely exported. Tobacco is also cultivated to a considerable ex- tent. Large supplies of resin, pitch, and turpentine are

obtained from the pine wood. There are stone quarries and | The manufactures are |

smelting works, but few mines. various, and, with the general trade, are chiefly carried on at Bordeaux. Gironde is divided into the arrondissements of Bordeaux, Blaye, Lesparre, Libourne, Bazas, and La Réole, with 48 cantons, and 547 communes. town is Bordeaux. The total area is 3761 square miles; and the population in 1866 was 701,855, and in 1876 735,242. For a graphic description of the scenery of Les Landes in Gironde see the novel Afattre Pierre of Edmund About.

GIRONDISTS. See France.

GIRVAN, a burgh of barony and market-town, in the

river Girvan, 21 miles S.W. of Ayr, and nearly opposite Ailsa Craig, a rocky island 10 miles distant. The prin- cipal industry was formerly hand-loom weaving, but the number of persons so employed has decreased from 3000

This is the Sauterne country. The |

The chief |

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The industries include tanning, brewing, cotton-spinning, and bleaching. The population in 1876 was 3590. GITSCHIN, the chief town of a circle in Bohemia, is situated on the Cydlina and on the North-West Austrian railway, 50 miles N.E. of Prague. The principal buildings are the parish church, erected after the model of the pilgrim's

church of Santiago de Compostella in Spain; the prison, | formerly a Jesuit college; the castle, built by Wallenstein

in 1630; the gymnasium, the normal school, and the real school. There is a considerable trade in corn. Gitschin was nade the capital of the duchy of Friedland by Wallen- stein in 1627, at which time it contained only 200 houses. Wallenstein was interred at the neighbouring Carthusian mouastery,

but in 1639 the head and right hand were taken by General Banér to Sweden, and in 1702 the other remains were removed by Count Vincent of Waldstein to his heredi- tary burying ground at Miinchengritz. At Gitschin tlie Prussians gained a great victory over the Austrians, June 29, 1866. The population in 1869 was 6750.

GIULIO ROMANO. See Prprt.

GIUNTA PISANO, the earliest Italian painter whose ulame is found inscribed on an extant work, exercised his art from 1202 to 1236; he may perhaps have been born towards 1180 in Pisa, and died in or soon after 1236. There is some ground for thinking that his family-name was Capiteno. In recent times some efforts have been made to uphold his deservings as an artist, thereby detracting so far from the credit due to the initiative of Cimabue; but it caunot be said that these efforts rest on a very solid basis. To most eyes the performances of Giunta merely represent a continuing stage of the long period of pictorial inaptitude. The inscribed work above referred to, one of his carliest, is a Crucifix now or lately in the kitchen of the con- vent of St Anne in Pisa. Other Pisan works of like date are very barbarous, and some of them may be also from the hand of Giunta. It is said that he painted in the upper church of Assisi,—in especial a Cruci- fixion dated 1236, with a figure of Father Elias, the general of the Franciscans, embracing the foot of the cross. In the sacristy is a portrait of St Francis, also ascribed to

| Giunta; but it more probably belongs to the close of the county of Ayr, Scotland, is situated at the mouth of the |

13th century. This artist was in the practice of painting upon cloth stretched on wood, and prepared with plaster. GIURGEVO, in Roumanian Giurgiu or Shursha, a town of Roumania (formerly of Lower Wallachia), at the head of the district of Vlashka, lies on the left or northern bank of

the Danube, over against Rustchuk in Bulgaria, and is distant about 40 miles from Bucharest, with which it has been connected by railway since 1869, It presents on the whole rather a mean appearance, rising out of the

mud embankments of the river, but its population is increasing, its commerical advantages as the port of Bucharest are becoming more generally recognized, and improvements are consequently being effected in the town itself. It is the

seat of a court of primary instance, and has a normal school

and a gymnasium. The fortifications to which it was

formerly indebted for no small part of its importance were destroyed in 1829, and its only defence is a castle on the

island of Slobosia, with which it communicates by a bridge. Giurgevo, or, as it was called by its founders, San Zorzo, that is, San Giorgio, or St George's, owes its origin to tlie

Genoese of the 14th century. It has frequently figured in the wars whereby the lower Danube has so often been laid

waste. The population in 1875 was about 15,000. GIUSTI, Gruszprz (1809-1850), Tuscan satirical poet,

was born at Monsummano, a small village of the Valdinie- His father, a cultivated and rich man, accustomed his son from childhood to study, and himself taught him, among other subjects, the first Afterwards, in order to curb his

vole, on May 12, 1809.

rudiments of music. too vivacious disposition, he placed the boy under the

charge of a priest near the village, whose severity did perhaps more evil than good. At twelve Giusti was sent to school at Florence, and afterwards to Pistoia and to

Lucca; and during those years he wrote his first verses, In 1826 he went to study law at Pisa; but, disliking the

study, he spent eight years in the course, instead of the He lived gaily, however, though his father

customary four. kept him short of money, and learned to know the world, seeing the vices of society, and the folly of certain laws and customs from which his country was suffering, The experience thus gained he turned to good account in the use he made of it in his satire.

His father had in the meantime changed bis place of abode to Pescia; but Giuseppe did worse there, and in November 1832, his father having paid his debts, he re- turned to study at Pisa, seriously enamoured of a woman whom he could not marry, but now commencing to write in real earnest in behalf of his country. With the poem called La Ghigliottina (the guillotine), Giusti began to strike out a path for himself, and thus revealed his great genius. From this time he showed himself the Italian Béranger, and even surpassed the Frenchman in richness of language, refinement of humour, and depth of satirical conception. In Béranger there is more feeling for what is needed for popular poetry, His poetry is less studied, its vivacity perhaps more boisterous, more spontaneous; but Giusti, in both manner and conception, is perhaps more elegant, more refined, more penetrating. In 1834 Giusti, having at last entered the legal profession, left Pisa to go to Florence, nominally to practice with the advocate Capo- quadri, but really to enjoy life in the capital of Tuscany. He fell seriously in love a second time, and as before was abandoned by his love. It was then he wrote his finest verses, by means of which, although his poetry was not yet collected in a volume, but for some years passed from land to hand, his name gradually became famous. The greater part of his poems were published clandes- tinely at Lugano, at no little risk, as the work was destined to undermine the Austrian rule in Italy. After the publi- cation of a volume of verses at Bastia, Giusti thoroughly established his fame by his Gingillino, the best in moral tone as well as the most vigorous and effective of his poems. The poet sets himself to represent the vileness of the treasury officials, and the base means they used to conceal the necessities of the state.

The Gingillino has

all the character of a classic satire. When first issued in Tuscany, it struck all as too impassioned and per- sonal. Giusti entered heart and soul into the political movements of 1847 and 1848, served in the national guard, sat in the parliament for Tuscany; but finding that there was more talk than action, that to the tyranny of princes had succeeded the tyranny of demagogues, he began to fear, and to express the fear, that for Italy evil rather than good had resulted. He fell, in consequence, from the high position he had held in public estimation, and in 1848 was regarded as a reactionary. His friend- ship for the marquis Gino Capponi, who had taken him into his house during the last years of his life, and who published after Giusti's death a volume of illustrated pro- verbs, was enough to compromise him in the eyes of such men as Guerrazzi, Montanelli, and Niccolini, On May 31, 1850, he died at Florence in the palace of his friend.

The poetry of Giusti, under a light trivial aspect, has a lofty civilizing significance. The type of his satire: is entirely original, and it had also the great merit of appear- ing at the right moment, of wounding judiciously, of sustaining the part of the comedy that "castigat ridendo mores." Hence his verse, apparently jovial, was received by the scholars and politicians of Italy in all seriousness, Alexander Manzoni in some of his letters showed a hearty admiration of the genius of Giusti; and the weak Austrian and Bourbon Governments regarded them as of the gravest importance,

His poems have been often reprinted, the best editions being those of Le Monnier of Florence, and also that published in Verona, with valuable annotations, by Professor Giovanni Fioretti in 1876. Besides the poems, and the proverbs already mentioned, we have a volume of seleet letters, full of vigour and written in the best Tuscan language, and a fine critieal discourse on Giuseppe Parini, the satirical poet of the last century, whose poetical works are published in a volume by Le Monnier. In some of his composi- tions the elegiac rather than the satirieal poet is seen, Many of his verses have been excellently translated into German by Paul Heyse. Good English translations were published in the Atheneum by the late Mrs T, A. Trollope.

GIUSTINIANI, the name of a prominent Italian family which originally belonged to Venice, but established itself subsequently in Genoa also, and at

various times had repre- sentatives in Naples, Corsica, and several of the islands of the Archipelago.

In the Venetian line the following are most worthy of mention, I. Lorenzo (1380-1465), the Laurentius Justinianus of the Roman calendar, at an early age entered the congregation of the canons of Saint George in Alga, and in 1433 became general of that order. About the same time he was made by Eugenius IV. bishop of Venice; and his episcopate was marked by considerable activity in church extension and reform. On the removal of the patriarchate from Grado to Venice by Nicholas V. in 1451, Giustiniani was promoted to that dignity, which he held for fourteen years, He died on J: anuary 8, 1465, was canonized by Pope Alexander VIIL., his festival (semi-duplex) being fixed by Innocent XII. for September 5th, the anni- versary of his elevation to the bishopric. His works, con- sisting of sermons, letters, and ascetic treatises, have been frequently reprinted,—the best edition being that of the Benedictine P. N. A. Giustiniani, published at Venice in 2 vols. folio, 1751. They are wholly devoid of literary merit. His life has been written by Bernard Giustiniani, by Maffei, and also by the Bollandists. (2.) LEonaRDo (1388-1446), brother of the preceding, was for some years a senator of Venice, and in 1443 was chosen procurator of St Mark. He translated into Italian Plutarch's Lives of Cinna and Lucullus, and was the author of some poetical pieces, amatory and religious, as well as of rhetorical prose compositions. (3.) BerNarpo (1408-1489), son of Leonardo, was a pupil of Guarino and of Gcorge a Trebizond, and

ear)

entered the Venetian senate at anearly age. He served on several important diplomatic missions both to France and Rome, and about 1485 became one of the council of ten. His orations and letters were published in 1492; but his title to any measure of fame he possesses rests upon his history of Venice, De Origine Urbis Venetiarum rebusque ab ipsa gestis historia (1492), which was translated into Italian by Domenichi in 1545, and which at the time of its appearance was undoubtedly the best work upon the subject of which it treated. It is to be found in vol. 1. of the Thesaurus of Grevius. (4.) Pierro, also a senator, lived in the 16th century, and wrote an

Historia rerum Venetarum in continuation of that of Bernardo. He was also the author of chronicles De Gestis Petri Mocenigi and De Bello Venetorum cum Carolo VIII, ‘The latter has been re- printed in the Script. er. Ital., vol. xxi.

Of the Genoese branch of the family the most prominent members were the following. (1.) Paono, pt Monicuia (1444-1502), a member of the order of Dominicans, was, from a comparatively early age, prior of their convent at Genoa. Asa preacher he was very successful, and his talents were fully recognized by successive popes, by whom he was made master of the sacred palace, inquisitor-general for all the Genoese dominions, and ultimately bishop of Scio and Hungarian legate. He was the author of a number of Biblical commentaries (no longer extant), which are said to have been characterized by great erudition. (2.) Acosrino (1470-1536), was born at Genoa, and spent some wild years in Valencia, Spain. Having in 1487 joined the Dominican order, he gave himself with great energy to the study of Greek, Hebrew, Chaldee, and Arabic, and in 1514 commenced the preparation of a polyglot edition of the Bible. As bishop of Nebbio in Corsica, he took part in some of the earlier sittings of the Lateran council (1516- 17), but, in consequence of party complications, withdrew to his diocese, and ultimately to France, where he became a pensioner of Francis I., and was the first to occupy a chair of Hebrew and Arabic in the university of Paris. After an absence from Corsica for a period of five years, during which he visited England and the Low Countries, and became acquainted with Erasmus and More, he returned to Nebbio about 1522, and there remained, with comparatively little intermission, tillin 1536, when, while returning from a visit to Genoa, he perished in a storm at sea. He was the possessor of a very fine library, which he bequeathed to the republic of Genoa. Of his projected polyglot only the Psalter was published (Psalterium Iebreum, Grecum, Arabicum, et Chaldaicum, Genoa, 1616). Besides the Hebrew text, the LXX. translation, the Chaldee paraphrase, and an Arabic version, it contains the Vulgate translation, a new Latin translation by the editor, a Latin translation of the Chaldee, and a collection of scholia. Giustiniani printed 2000 copies at his own expense, including fifty in vellum for presentation

to the sovereigns of Europe and Asia; but the sale of the :

work did not encourage him to proceed with the New Testa- ment, which he had also prepared for the press. Besides an edition of the book of Job, containing the original text, the Vulgate, and a new translation, he published a Latin version of the Moreh Nevochim of Maimonides (Director »Dubitantium aut Perplexorum, 1520), and also edited in Latin the Aureus Libellus of A®neas Platonicus, and the LPvmeus of Chalcidius. His annals of Genoa (Castigatissimi annali di Genova) were published posthumously in 1537.

The name Giustiniani has also been borne by the follow- ing :—(1.) Pomprto (1569-1616), a native of Corsica, who served under Alessandro Farnese and the marquis of Spinola in the Low Countries, where he lost an arm, and, from the artificial substitute which he wore, came to be known by the soubriquet Bras de Fer. He also defended Crete against the Turks ; and subsequently was killed in a reconnaissance

at Friuli. He left in Italian a personal narrative of the war in Flanders, which has been repeatedly published in a Latin translation (Bellum Belgicum, Antwerp, 1609). (2.) Grov- ANNI (1513-1556), born in Candia, translator of Terence's Andria and KHunuchus, of Cicero's Jn Verrem, and of Virgil's dneid, |. viii. (3.) ORsatTo (1538-1603), Vene- tian senator, translator of the @dipus Tyrannus of Sopho- cles, and author of a collection of Rime, in imitation of Petrarch. He is regarded as one of the latest representa- tives of the classic Italian school. (4.) GrRonimo, a Genoese, flourished during the latter half of the 16th cen- tury. He translated the Alcestis of Euripides and three of the plays of Sophocles ; and wrote two original tragedies, Jephte and Christo in Passione. (5.) VINCENZO, who in the beginning of the 17th century built the Roman palace and made the art-collection which are still associated with his name (see Galleria Giustiniana, Rome, 1631). The collec- tion was removed in 1807 to Paris, where it was to some ex- tent broken up, In 1815 all that remained of it, about 170 pictures, was purchased by the king of Prussia and removed to Berlin, where it forms a portion of the royal museum.

GIVET, one of the strongest fortified towns of France, on the Belgian frontier, situated in the department of Ardennes, on the river Meuse, 40 miles N.N.E. of Meziéres. The Eastern French railway connects it with

Rheims, and the Belgian railways connect it with Namur and Charleroi. It is divided into three portions—the citadel called Charlemont, and Grand Givet on the left bank of the river, and on the opposite bank Petit Givet, connected with Grand Givet by a stone bridge of five arches. The citadel of Charlemont, built by the emperor Charles V. in 1555, is situated at the top of a precipitous rock 705 feet high, and on the east side, by which alone it is accessible, is fortified by six bastions and several other works. Grand Givet has four bastionsand three ravelins, and Petit Givet 3 bastions. The fortress has accommodation for 25,000 men, but can be held by 3000 or 4000. The town is famed for its clay tobacco-pipes. There are also manu- factures of nails, lead pencils, sealing wax, white lead, glue, earthenware, and leather, and the town has some trade. The population in 1876 was 5275.

GIVORS, a town of France, department of Rhéne, is situated on the Rhone and the canal of Rive-de-Gier, near the railway between Lyons and St Etienne, 14 miles south of Lyons. It has glass and tile works, potteries, tanneries, foundries, silk factories, and dyeworks, and is the prin- cipal entrepét for the coal and coke of the Gier valley. Near it are the ruins of the chateau of St Gerald and of the convent of St Ferréol. Population (1876), 10,856.

GLACIER,! a name given toa mass of ice, having its origin in the hollows of mountains where perpetual snow accumulates, but which makes its way down towards the lower valleys, where it gradually melts, until it terminates exactly where the melting, due to the contact of the warmer air, earth, and rain of the valley, compensates for the bodily descent of the ice from the snow reservoirs of the higher mountains.

The diminution of temperature as we ascend the slopes of mountains, is indicated by successive zones of vegetation, and finally by the occurrence of perpetual snow (see GroLoey, p. 280). It was first shown by Baron Humboldt and Von Buch that the limit of perpetual snow depends principally on the temperature of the summer, and not upon that of the whole year.

1 The following are synonyms in different languages and dialects :— French, glacier; German, gletscher ; Italian, ghiacciaja; Tyrolese, fern; in Carinthia, kdss; in the Valais, biegno ; in part of Italy, vedretto ; in

Piedmont, rudze ; in the Pyrenees, serneille ; in Norway, tisbree or tisbrede; in Lapland, geikna or jegna; in Iceland, jokull or Sall-jokull.

GhACIinR

A glacier usually protrudes into a valley far below the limit of perpetual snow, and terminates amidst a wilderness of stones borne down upon its surface and deposited by its fusion. This earthy and rocky rubbish is termed moraine matter, and has already been described (GEoLoey, p. 281). Lying in front of the lower end of a glacier, it marks in a characteristic and certain manner the greatest limit of extension which the glacier has at any one time attained. Sometimes a glacier is seen to have withdrawn very far within its old limits, leaving a prodigious barren waste of stones in advance of it, which, being devoid of soil, nourishes not one blade of grass. At other times the glacier pushes forward its margin beyond the limit which it has ever reached (at least within the memory of man), tears up the ground with its icy ploughshare, and shoves for- ward the yielding turf in wrinkled folds, uprooting trees, moving vast rocks, and scattering the walls of dwelling-houses in fragments before its irresistible onward march.!

The lower end of a glacier is usually steep,—sometimes with a dome-shaped unbroken outline, more frequently broken up by intersecting cracks into prismatic masses which the continued action of the sun and rain sharpen into pyramids, often assuming (as in the glacier of Bossons at Chamouni) grotesque or beautiful forms. From a vault in the green-blue ice, more or less perfectly formed each sum- mer, the torrent issues which represents the natural drain- age of the valley, derived partly from land springs, partly from the fusion of the ice. The united or crevassed condi- tion of the glacier generally depends almost entirely on the slope of its bed. If it incline rapidly, numerous transverse fissures are formed from the imperfect yielding of the ice during its forced descent along its uneven channel. These cracks often extend for hundreds of yards, and may be hundreds of feet in depth; but their greatest depth is not accurately known, since they are rarely quite vertical. In many cases, however, the crevasses are comparatively few in number, and the glacier may be readily traversed in all directions, This is especially the case if a glacier of con- siderable dimensions meets with any contraction in its course. The ice is embayed

and compressed, and its slope lessens, just as in the case of a river when it nears a similar contraction preceding a fall. Such level and generally traversable spaces may be found about the middle regions of the Mer de Glace, the lower glacier of Grindelwald, the lower glacier of the Aar, and in many other cases. The last-named glacier is perhaps the most remarkably even and accessible of any in Switzerland. The slope of its surface is in many places only 3°. The Pasterzen glacier in Carinthia is even less inclined. It is in such portions of a glacier that we commonly find internal cascades, or "'moulins." These arise from the surface water being collected into a considerable mass by a long course over its unbroken surface, and then precipitated with violence into the first fissure it meets with. The descending cascade keeps open its channel, which finally loses the form of a fissure, presenting that of an open shaft, often of immeuse depth.

Nearly connected in their origin with the internal cas- cades are the " gravel cones," occasionally seen on the sur- face of glaciers, which appear to be formed in this way. A considerable amount of earthy matter derived by the superficial water-runs from the moraine accumulates in heaps in the inequalities of the ice, or at the bottom of the "moulins," As the glacier surface wastes by the action of the sun and rain, these heaps are brought to the surface, or

' Such a sudden and disastrous increase took place in many of the glaciers of Switzerland and Savoy in 1818 (occasioning the catastrophe of the Val de Bagnes), and in those of the Bergenstift in Norway about 1740. The retreat of a glacier far within its old moraines is well exemplified in most of the glaciers of the latter country, and especially in that of Nygaard.

rather the general surface is depressed to their level. If the earthy mass be considerable, the ice beneath is protected from the radiation of the sun and from the violent washing of the rain ; it at length protrudes above the general level of the glacier, and finally forms a cone which appears to be entirely composed of gravel, but is in fact ice at the heart, with merely a protecting cover of earthy matter. These singular cones are very well seen on the glacier of the Aar, but on most others they -are comparatively rare. The similar protective action of large stones detached from the moraines

and lying on the surface of the ice often produces the striking phenomenon of “glacier tables.” Stones of any considerable size almost invariably stand upona slightly elevated pillar of ice; but when they are broad and flat they occasionally attain a height of 6 and even of 12 feet above the general level.

The superficial waste of a glacier is thus a very important phenomenon. Owing to it the body of the ice has its vertical thickness rapidly diminished during the heats of summer, and, as we have already intimated, the lower end of a glacier has its position determined by the amount of this waste. Suppose a glacier to move along its bed at the rate of 300 feet per annum, and imagine (merely for the sake of illustration) its yearly superficial waste to be 20 feet; then the thickness of the glacier will diminish by 20 feet for every 300 feet of its length, or at the rate of 360 feet per mile, so that the longitudinal section of a glacier has the form of a wedge; and however enormous its original thickness, after a certain course we must at length come to the thin end of the wedge, and that the more rapidly as the causes of melting increase towards the lower extremity. These causes are indeed so various that it is difficult to estimate them with accuracy. We have (1) the direct solar heat, (2) the contact of warm air, and (3) the washing of. rain, All these causes act on the surface and produce the “ ablation” of the surface. Besides these, the ice of the glacier wastes somewhat beneath by the contact of the soil and the washing of the inferior streams. This may be called its ‘subsidence,’ Further, the natural slope of the rocky bed of the glacier causes any point of the surface to stand absolutely lower each day in con- sequence of the progressive motion. These three causes united produce the “ geometrical depression” of the sur- face. Principal J. D. Forbes showed how the several effects may usually be distinguished by observation. During the height of summer, near the Montanvert, he found the daily average ablation to be 3°62 inches, the daily subsidence to be 1°63 inches. Seventh-tenths of the geo- metrical depression are due therefore to the former cause, and three-tenths to the latter. This is a very large amount, and it is certain that during the colder period of the year, and whilst the glacier is covered with snow, the subsidence is not only suspended, but the glacier recruits in thickness a portion of its waste during the seasons of summer and autumn. To this subject we shall again return,

The middle region of the great glaciers of the Alps extends from the level of about 6000 to 8000 feet above the sea, The inclination is usually there most moderate—say from 25° to 6°. But this is not invariably the case. Beyond 8000 feet we reach the snow-line. The snow-line is a fact as definite on the surface of a glacier as on that of a moun- tain, only in the former case it occurs at a somewhat lower level. It cannot be too distinctly understood that the fresh snow annually disappears from the glacier proper. Where it ceases entirely to melt, it of course becomes in- corporated with the glacier. We have therefore arrived at the region where the glacier forms; everywhere below it only wastes. This snowy region of the glacier is called in French névé, in German jirn. As we ascend the glacier it passes gradually from the state of ice to the state of snow. The

superficial layers are more snowy and white, in fact nearly

fig. 4. The structure of the compound glacier, originally

pure snow ; the deeper ones have more colour and consist- | double, becomes gradually single; and the ‘“ frontal

ence, and break on the large scale into vast fragments, which at Chamouni are called seracs. The névé moves, as the glacier proper does, and it is fissured by the inequalities of the ground over which it passes. These fissures are less regular than those of the lower glacier. They are often much wider, in fact of stupendous dimensions, and, being often covered with treacherous snowy roofs, constitute one of the chief dangers of glacier travelling. The constitution of the névé may be well studied on the Glacier du Géant, a tributary of the Mer de Glace. The mountain-clefts in which large glaciers lie usually expand in their higher portions (in conformity with the ordinary structure of valleys) into extensive basins in which snow is perpetual, and which therefore contain the névé, the true origin and material of the glacier, which is literally the overflow of these snowy reservoirs. The amount of overflow, or the dis- charge of the glacier—upon which depends the extent of its prolongation into the lower valleys-—depends in its turn on

the extent of the névé or collecting reservoir. Glaciers with small reservoirs of necessity perish soon. Their thickness being small, the wedge of the glacier soon thins out. They are common in confined cirgues of the higher mountains. Such are the glaciers of the second order described by De Saussure. Their slope is often very great—from 20° to 40°.

The ice of the glacier proper has a very peculiar struc- ture, quite distinct from. the stratification of the snow on the névé (the relics of its mode of deposit), and one which requires special notice. When we examine the appearance of the ice in the wall of an ordinary crevasse (especially if itbe tolerably near the side of the glacier) we are struck with the beautiful vertically laminated structure (first observed by Principal Forbes) which it commonly presents, resembling delicately veined marble (especially the variety called in Italy cipollino), in shades varying from bluish-green, through green, to white. When we trace the direction of the planes constituting the laminated structure, by observing them on the surface of the glacier (where they are usually well seen after rain, or in the channels of superficial water-runs), we find that where best developed (or not very far from the sides of the glacier) these laminz are nearly parallel to the sides, but rather incline from the shore to the centre of the ice stream as we follow the declivity of the glacier.

Forbes found that certain superficial discolorations in the |

form of excessively elougated hyperbolas are due to the

recurrence (at intervals of some hundred feet along the.

course of the glacier) of portions of ice in which the veined

‘of sand and dirt become entangled in the superficial ice, and give rise to the phenomena of “dirt bands,” which thus at a distance display (though in a manner requiring some attention to discover) the exact course of this singular structure on the surface of the glacier. Fig. 1 displays

S

Fig. 1.

Fig. 3 the superficial form of the dirt bands, and the course of the structural laminz projected horizontally. Fig. 2 shows an ideal transverse section of the glacier, and fig. 3 another vertical section parallel to its length. These three sections in rectangular planes will serve to give a correct idea of the course of this remarkable structure within the ice, but a more popular conception will be formed of it from the imaginary sections of a canal-shaped glacier in

Fig. 2.

| mountain torrent, or of a stream of lava.

dip" of the laminz at the loop of the horizontal curves, which in the upper region is nearly vertical, gradually

Fig, 4,

slopes forwards until at the lower termination it has a very slight dip inwards, or indeed may be reversed and fall out- wards and forwards. The general form of a structural lamina of a glacier rudely resembles that of a spoon.

This structure and the accompanying dirt bands have been recognized by different observers in almost all glaciers, including those of Norway and of India. The interval between the dirt bands has been shown in the case of the Mer de Glace (and therefore probably in other cases) to coincide with annual rate of progression, and in the higher parts of the glacier (towards the névé) to be accompanied by wrinkles or inequalities of the surface which are well marked by the snow lying in them during the period of its partial disappearance. —

The Motion of Glaciers and its Causes.—There is some- thing about a glacier which almost inevitably conveys to the mind the idea of a stream. This may be traced in the descriptions of unscientific tourists, of poets, and of some of those who have addressed themselves more seriously to the question of the real nature of these bodies. To the latter class of observers belong Captain Basil Hall and

| Monseigneur Rendu, bishop of Annecy, who had ‘much ‘structure is more energetically developed than elsewhere, and |

where, by the decomposition of the softer laminz, portions |

more than hinted at the possibility of a true mechanical connexion between the descent of a glacier and that of a But until the actual conditions of motion were reduced to rule, it was impossible to know how far the analogy was real.

The most characteristic and remarkable feature of gla-

| ciers is their motion downwards from the névé towards the

lower valley. The explanation of it is by far the most important application of mechanical physics connected with the subject. The prin- cipal theories to account for the progressive motion of glaciers which were prevalent pre- vious to 1842 may be briefly characterized as De Saussure’s and De Charpentier’s, though each had been maintained long before by the earlier Swiss writers. The first may be called the gravitation theory, the latter the dilatation theory. Both suppose that the motion of the ice takes place by its sliding bodily over its rocky bed, but they differ as to the force which urges it over the obstacles opposed by friction and the irregularities of the surface on which it moves.

The following quotation from De Saussure explains his

views with his usual precision :—“These frozen masses, carried along by the slope of the bed on which they rest, disengaged by the water (arising from their fusion owing to the natural heat of the earth) from the adhesion which they might otherwise contract to the bottom—sometimes even elevated by the water—must gradually slide and descend along the declivity of the valleys or mountain slopes (croupes) which they cover. It is this slow but continual sliding of the icy masses (des glaces) on their inclined bases

which carries them down into the lower valleys, and which replenishes continually the stock of ice in valleys warm enough to produce large trees and rich harvests." Very sufficient objections have been urged against this theory. It is evident that De Saussure considered a glacier as an accuinulation of icy fragments, instead of a great and con- tinuous mass, throughout which the fissures and "crevasses" bear asmall proportion to the solid portion ; and that he has attributed to the subglacial water a kind and amount of action for which there exists no sufficient or even probable evidence. The main objection, however, is this, that a sliding motion of the kind supposed, if it commence, must be accelerated by gravity, and the glacier must slide from its bed in an avalanche. The small slope of most glacier- valleys, and the extreme irregularity of their bounding walls, are also great objections to this hypothesis.

The dilatation theory ingeniously meets the difficulty of the want of a sufficient moving power to drag or shove a glacier over its bed, by calling in the well-known force with which water expands on its conversion intoice. The glacier being traversed by innumerable capillary fissures, and being in summer saturated with water in all its parts, it was natural to invoke the freezing action of the night to convert this water into ice, and by the amount of its expansion to urge the glacier onwards in the direction of its greatest slope. In answer to this, it is sufficient to observe, in the first place, that during the height of summer the portions of those glaciers which move fastest are never reduced below the freezing point, and that, even in the most favourable cases of nocturnal radiation producing congelation at the surface, it cannot (by well-known laws of conduction) pene-

trate above a few inches into the interior of the glacier. Again, the ascertained laws of glacier-motion are (as will be immediately seen) entirely adverse to this theory, as it is always accelerated by hot weather and retarded by cold, yet does not cease even in the depths of winter.

It is singular how slow observers were to perceive the importance to the solution of the problem of glacier- motion of ascertaining with geometrical precision the amount of motion of the ice, not only from year to year, but from day to day, in summer and winter, whether constant or variable at the same point, whether continuous or by starts; if variable, on what

circumstances it depended, and in what manner it was affected at different points of the length and breadth of a glacier.

This method of studying the question was taken up by Forbes. His observations were commenced on the Mer de Glace of Chamouni, in June 1842. Between the 26th and 27th of that month the motion of the ice Opposite a point called the " Angle" was found, by means of a theodolite, to be 16°5 inches in 26 hours; between the 27th and 28th, 17-4 inches in 254 hours; and from about 6 a.m. to 6 P.M. on the 28th the motion was 9-5 inches, or 17:5 inches in 24 hours ; whilst the proportional motion during even an hour and a half was observed. No doubt could therefore remain that the motion of the ice is continuous and toler- ably uniform-—in short, that it does not move by jerks. He also ascertained about the same time that the motion of the ice is greatest towards the centre of a glacier and slower at the sides, contrary to an opinion then maintained on high

'authority. He next found that the rate of motion varied

at different points of the length of the same glacier, being on the whole greatest where the inclination of its surface is greatest. As the season advanced, he observed notable changes in the rate of motion of the same part of the ice, and connected it by a very striking direct relation with the temperature of the air. These facts were established during the summer of 1842, and promptly published. By means of occasional observations during the following winter and spring by his guide, Auguste Balmat of Chamouni, and by a more full comparison of the entire motion of a glacier for twelve months with its motion during the hot season of the year, another generally received error was rectified: the motion of the glacier continues even in winter, and it has a very perceptible ratio to the summer motion. Last of all, it was found that the surface ofa glacier moves faster than the ice nearer the bottom or bed.

These and some minor laws of motion, being undoubted expressions of the way in which glaciers move, were formu- lated by Forbes in an approximate theory: "A glacier is an imperfect fluid or a viscous body, which is urged down slopes of a certain inclination by the mutual pressure

of its parts." The analogy subsisting between the motion of a glacier and that of a river (which is a viscous fluid,—were it not so, its motion would be widely different) will be best perceived by stating more precisely its laws of motion.

1. Each portion of a glacier moves, not indeed with a constant velocity, but in a continuous manner, and not by sudden sub- sidences with intervals of repose. This, of course, is characteristic also of a river.

2. The ice in the middle part of the glacier moves much faster than that near the sides or banks; also the surface moves faster than the bottom. Both these facts obtain in the motion of a river in consequence of the friction of the fluid on its banks, and in con- sequence also of that internal friction of the fluid which constitutes its viscosity.

Thus, at four stations of the Mer de Glace, distant respectively from the west shore of the glacier…... 100 230 405 365 yds, the relative velocities werc…..... 1:000 1°382 1°356 1:°367.

3. The variation of velocity (as in a river) is most rapid near the sides, whilst the middle parts move nearly uniformly. This and the preceding laws are also fully brought out by the subsequent experiments of M. Agassiz on the glacier of the Aar, and of MM. Schlagintweit on the Pasterzen glacier.

4. The variation of velocity of a glacier from the sides to the middle is nearly in proportion to the absolute velocity of the glacier,—whether that absolute velocity change in the same place in consequence of change of season, or between one point and another of the length of the same glacier, depending on its declivity. See (5) and (6) below.

5. The glacier, like a stream, has its pools and its rapids. Where it is embayed by rocks it accumulates, its declivity in- creases, and its velocity at the same time. When it passes down a steep, issuing by a narrow outlet, its velocity increases, Thus the approximate declivities of the inferior, middle, and superior regions of the Mer de Glace (taken in the direction of its length) LG Minnie se tincetnenc cat tcsaciemacee ste ca cchatcanenie tcc saat 15° 44° 8° and the relative velocities are as the numbers .. 1‘398 °574 -925.

6. A fact not less important than any of the preceding is that increased temperature of the air favours the motion of the ice, and generally whatever tends to increase the proportion of the watery to the solid constituents of a glacier, as mild rains, and especially the thawing of the superficial snow in spring. The velocity does not, however, descend to zero even in the depth of winter. Indeed, in the lower and most accessible portions of the Mer de Glace (or Glacier des Bois) and the Glacier des Bossons, the ratio of the winter to the summer motion is almost exactly 1:2. On en- deavouring to establish a relation between the velocity of the glacier and the temperature of the ambient air, we find that these diminish together almost regularly down to the freezing-point, below which the velocity scems to remain constant.

Any mechanical theory of glaciers must be more or less imperfect which does not explain the remarkable veined or ribboned structure of the ice, with its peculiar course through the interior of the glacier, as above described. According to Forbes the fundamental idea is that the veined or ribboned structure of the ice is the result of internal forces, by which one portion of ice is dragged past another in a manner so gradual as not necessarily to

of one detached part over another, but rather the effect of a general bruise over a considerable space of the yielding body. According to this view, the delicate veins seen in the glacier, often less than a quarter of an inch wide, have their course parallel to the direction of the sliding effort of one portion of the ice over another. Amongst other proofs of this fundamental conception that the veined structure is the external symbol of this forced internal motion of a body comparatively solid, Forbes cited a striking instance froin the glacier of La Brenva, on the south side of Mount Blanc. In this case the ice of the glacier, forcibly pressed against the naked rocky face of an opposing hill is turned into a new direction ; and in thus shoving and squeezing past a prominence of rock, he observed developed in the ice a ‘veined structure” so beautiful that “it was impossible to resist the wish to carry off slabs, and to perpetuate it by hand specimens.” This perfectly developed structure was visible opposite the promontory which held the

glacier in check, and past which it struggled, leaving a portion of its ice completely embayed in a recess of the shore behind it. Starting from this point as an origin, the veined laminz extended backwards and upwards into the glacier, but did not spread latcrally into the embayed ice. They could, however, be traced from the shore to some distance from the promontory into the icy mass. The direction of lamin- ation exactly coincided with that in which the ice must have moved if it was shoved past the promontory at all. That it did so move was made the subject of direct proof, by fixing two marks on the ice opposite the promontory, one on the nearer, the other on the farther side of the belt of ice which had the lamination best developed. The first mark was 50 feet from the shore, and moved at the rate of 4°9 inches daily ; the other mark was 170 feet further off, and moved almost three times faster, or 14°2 inches daily. Throughout this breadth of 170 feet there was not a single longitudinal crevasse which might have facilitated the dif- ferential motion. A parallelogram of compact ice, only 170 feet wide, was therefore moving in such a manner that, whilst one of its sides advanced only a foot, the other advanced a yard. No solid body, at least no rigid solid body, can advance in such a manner; Forbes therefore concluded that glacier-ice is plastic, that the veined structure is unquestionably the result of the struggle between the rigidity of the ice and the quasi-fluid character of the motion impressed upon it, and that this follows, not only from the direction of the laminz, but from their becoming distinct exactly in proportion to their nearness to the point where the bruise is necessarily strongest. The subsequent experiments of Sorby on the cleavage structure of rocks proved that it has arisen as the result of intense lateral compression, and could be imitated in many artificial sub- stances. Tyndall obtained it even in beeswax, the analogy between which and the veined structure of ice is very close.

Though Forbes termed his expression of the laws of glacier motion the "viscous" or "plastic theory," it was rather a state- ment of fact than an explanation of the physical processes concerned in the descent of glaciers. Against his views it was of course objected that ice is by its nature a brittle solid, and not sensibly possessed of any viscous or plastic quality. But he cogently replied that the qualities of solid bodies of vast size, and acted on by stupendous and long-continued forces, cannot be estimated from experiments ona small scale, especially if short and violent; that sealing-

wax, pitch, and other similar bodies mould themselves, with time, to the surfaces on which they lie, even at atmospheric temperatures, and whilst they maintain, at the same time, the quality of excessive brittleness under a blow ora rapid change of form ; that even ice does not pass at once, and per saltum, from the solid to the liquid state, but absorbs its latent heat through-

produce large fissures in the ice, and the consequent sliding.

out a certain small range of temperature (between 28°-4 and 32° of Fahrenheit), which is precisely that to which the ice of glaciers is actually exposed ; that, after all, a glacier is not a crystalline solid, like ice, tranquilly frozen in a mould, but possesses a peculiar fissured and laminated structure, through which water enters (at least for a great part of the year) into its intrinsic composition. He insisted that the quasi-fluid or viscous motion of the ice of glaciers is not a theory but a fact. A substance which is seen to pour itself out of a large basin through a narrow outlet without losing its continuity; the different parts of which, from top to bottom, and from side to centre, possess distinct though related velocities; which moves over slopes inconsistent with the friction between its surface and the ground on which it rests; which surmounts obstacles, and even if cleft into two streams by a projecting rock, instead of being thereby anchored as a solid would necessarily be, reunites its streams below, and retains no trace of the fissure, leaving the rock an islet in the icy flood,—-a substance which moves in such a fashion cannot, Forbes maintained, in any true sense of the word, be termed a rigid solid, but must be granted to be ductile, viscous, plastic, or semifluid, or to possess qualities represented by any of these terms which we may choose to adopt as least shocking to our ordinary conception of the brittleness of ice.

The problem of the cause of glacier-motion cannot yet be considered to be satisfactorily solved. One of the most im- portant contributions to the solution of this question was made by Professor James Thomson when he predicted that the freezing point of ice must be lowered by pressure, and when he sought by means of this property to explain the plastic or viscous behaviour of glaciers contended for by Forbes. This prediction was experimentally verified by his brother, Sir W. Thomson. Tyndall

subsequently to Forbes's work brought forward an explanation termed the '¢ pressure or fracture and regelation theory." Some experi- ments of Faraday in 1850 had shown that two pieces of ice with moistened surfaces would if in contact adhere, owing to the freezing of the thin film of water between them, while at a lower temperature than 32°, and with consequently dry surfaces, no adhesion took place. The freezing was obtained even under warm water. Starting from those observations Tyndall was led to make experiments on the effects of compression upon ice, and found that a quantity of pounded ice could be moulded into a compact homo- geneous inass. This property possessed by ice of reuniting by pressure after fracture was termed regelation, and was applied by Tyndall in explanation of the motion of glaciers. He maintained that the ice of a glacier is a solid brittle substance, and that its descent down a valley is due to constant rupture produced by the effects of gravitation and to the consequent sliding forward of the mass in which the surfaces of fracture speedily reunite. He pointed more particularly to the ice-falls of glaciers where the ice in pass- ing over a steep descent and undergoing great tension does not yield asa viscous body, but is fractured as a solid. More recently Canon Mosely investigated the physics of glaciers, especially by determining the shearing force of the ice. He found that in a glacier of such a uniform section and slope, moving at such a uniform rate, as the Mer de Glace at Les Ponts, the aggregate resistance offered by the ice to its descent is about 34 times greater than the force of gravitation. He therefore concluded it to be physically impossible thata glaciercould slide down its valley by its own weight, and consequently that the gravitation or fracture and regelation theory could not be maintained. The slow descent of sheet lead on a roof of moderate inclination, and its ability even to draw out from the rafters the nails with which it had been fastened, led him to propound another theory of glacier-motion, viz., that it is due to expansion

and contraction caused by changes of solar heat. He con- tended that the ice, like the lead, is expanded by heat, and that, as it cannot on expansion move up the valley without overcoming the resistance of gravitation as well as of friction, it necessarily moves chiefly downward, in which direction gravitation co-operates. Contraction on the other hand must also tend to

send the ice downward, for a larger part will move with the force of gravitation than against it. Dr Croll, objecting to Canon Mosely's views that no observed alterna. tions of glacier temperature warrant the conclusion that the ice can be impelled downward by that cause, has proposed yet another explanation. He regards the motion of the ice of a glacier as molecular, resulting from the very conduc- tion of heat through the mass of the glacier. He contends that from the thermal conditions of glacier-ice its molecules will melt before their temperature can be raised. Any given molecule on melting will transmit its extra heat or part of it to the next molecule, which in turn may melt, and thus a wave of thaw will travel through the ice. But as each molecule loses its heat again it freezes, and in the act of solidification exerts an enormous pressure on the walls of the interstice into which while fluid it entered. Hence in proportion to the amount of heat received by it the ice is subjected to great molecular pressure, As the glacier cannot expand laterally on account of the walls of its channel, and as gravitation opposes its expansion up the valley, it necessarily finds relief by a downward move- ment—the direction in which gravitation co-operates,

See De Saussure's Voyages dans les Alpes, § 585; De Charpentier, Essai sur les Glaciers, 1841; Agassiz, Etudes sur les Glaciers, 1840, Systeme Glaciaire, 1847 ; L' Abbé Rendu, " Théorie des Glaciers de la Savoie," in Afem. Acad. Savoie, x., 1841, translated by G. Forbes and published 1875; J. D. Forbes, Z'ravels in the Alps, 1843, Norway and tts Glaciers, 1853, and Occasional Papers on Glaciers, 1859; Tyndall's Glaciers of the Alps, 1857; Mousson's

Getscher der Jetztzeit, 1854 ; Mosely, Proc. Roy. Soc., 1869 ; Croll, Climate and Time, 1875 ; J, Thomson, Proe. Roy. Soe., 1856-7.

GLADBACH, usually called Brrciscu-GLapBacu, a town of Prussia, circle of Miilheim, government district of Cologne, is situated 8 miles N.E. of the latter town. It possesses an iron foundry, and manufactories of paper, pasteboard, powder, percussion caps, nets, and machinery. Ironstone, peat, and lime are found in the vicinity. The population in 1875 was 7030.

GLADBACH, or Moncuen-Guappacn, a flourishing and rapidly increasing manufacturing town of Rhenish Prussia, capital of a circle in the government district of Diisseldorf, is situated 16 miles W.S.W. of the town

of that name. It is one of the chief manufacturing seats of Rhenish Prussia, its principal industries being the spinning and weaving of cotton, the manufacture of silks, velvet, ribbons, and damasks, and dyeing and bleaching, There are also tanneries, tobacco manufactories, machine works, and foundries, The town possesses a chamber of commerce, a gymnasium, and a female school of the higher grade. There are an Evangelical and three Catholic churches, one of which possesses a choir of 1250, a nave dating from the beginning of the 12th century, and a crypt of the 8th century. Gladbach existed before the time of Charlemagne, and a Benedictine monastery was founded near it in 972 by Archbishop Gero of Cologne. The population in 1855 was only 4398 ; but it had increased in 1858 to 13,965, in 1861 to 17,074, in 1871 to 26,354, and in 1875 to 31,962.

GLADIATORS, professional combatants with men or beasts in the Roman arena. That this form of spectacle, which is almost peculiar to Rome and the Roman provinces, was originally borrowed from Etruria is shown by various indications. On an Etruscan tomb discovered at Tarquinii there is a representation of gladiatorial games; the slaves employed to carry off the dead bodies from the arena wore masks representing the Etruscan Charon; and we learn

| from Isidore of Seville that the name for a trainer of gladiators, danista, is an Etruscan word meaning butcher or executioner. These games are evidently a survival of the practice of immolating slaves and prisoners on the tomb of illustrious chieftains, a practice recorded in Greek, Roman, and Scandinavian legends, and traceable even as late as this century in the Indian suttee. Even at Rome they were for a long time confined to funerals, and hence the older name for gladiators was bustuarii ; but in the later days of the republic their original significance was forgotten, and they formed as indispensable a part of tho public amusements as the theatre or the circus,

The first gladiators are said, on the authority of Valerius Maximus, to have been exhibited at Rome in the Forum Boarium 264 B.c., by Marcus and Decimus Brutus at the funeral of their father. On this occasion only three pairs fought, but the taste for these games spread rapidly, and the number of combatants grew apace. In 174 B.c. Titus Flamininus celebrated his father’s

obsequies by a three days' fight, in which 74 gladiators took part. Julius Czesar engaged such extravagant numbers for his eedileship, that his political opponents took fright, and carried a decree of the senate imposing a certain limit of numbers ; but notwithstanding this restriction he was able to exhibit no less than 300 couples, During the later days of the republic the gladiators were a constant element of danger to the public peace, The more turbulent spirits among the nobility had each his band of gladiators to act as a body guard, and the armed troops of Clodius, Milo, and Catiline played the same part in Roman history as the armed retainers of the feudal barons or the condottieri of the Italian republics.

Under the empire, notwithstanding sumptuary enactments, the passion for the arena steadily increased, Augustus, indeed, limited the shows to two a year, and forbade a pretor to exhibit more than 120 gladiators, yet allusions in Horace and Persius show that 100 pairs was the fashionable number for private entertainments; and in the Marmor Ancyranum the emperor states tliat more than 10,000 men had fought during his reign, The imbecile Claudius was devoted to this pastime, and would sit from morning till night in his chair of state, descending now and then to the arena to coax or force the reluctant gladiators to resume their bloody work. Under Nero senators and even well- born women appearedascombatants ; and Juvenal hashanded down to eternal infamy the descendant of the Gracchi that appeared without disguise as a retiarius, and begged his life from the secutor, who blushed to conquer one so noble aud so vile. Titus, whom his countrymen surnamed the Clement, ordered ashow which lasted 100 days; and Trajan, in celebration of his triumph over Decebalus, exhibited 5000 pairs of gladiators. Domitian instituted venationes by torchlight, and at the Saturnalia of 90 «.p. arranged a battle between dwarfs and women. Even as late as 200 A.D. an edict was passed forbidding women to fight. How widely the taste for these sanguinary spectacles extended through- out the Roman provinces is attested by monuments, inscrip- tions, and the remains of vast amphitheatres, From Britain to Syria there was not a town of any size that could not boast its arena and annual games. The following inscrip- tion copied from the pedestal of a statue shows the important part they played in provincial life :—" In four days, at Min- turnze, he showed eleven pairs of gladiators, who did not cease fighting till one half, all the most valiant men iu Cam- pania, had fallen, You remember it well, noble fellow

citizens.” After Italy, Gaul, North Africa, and Spain were most famous for their amphitheatres; and Greece was the only Roman province where the institution never took root.

Gladiators were commonly drawn either from prisoners of war, or slaves, or criminals condemned to death. Thus

chariots, Thracians with their peculiar bucklers and sclmi- tars, Moors from the villages round Atlas, and negroes from central Africa, exhibited in the Colosseum. Down to the time of the empire only greater malefactors, such as brigands and incendiaries, were condemned to the arena; but by Caligula, Claudius, and Nero this punishment was extended to minor offences, such as fraud and peculation, in order to supply the growing demand for victims. For the first century of the empire it was lawful for masters to sell their slaves as gladiators, but this was forbidden by Hadrian and Marcus Aurelius. Besides these three regular classes, the ranks were recruited by a considerable number of freedmen and Roman citizens who had squandered their estates, and voluntarily took the auctoramentum gladia- torium, by which for a stated time they bound themselves to the Janista. Even men of birth and fortune not seldom entered the lists, either for the pure love of fighting, or to gratify the whim of some dissolute emperor ; and oneemperor, Commodus, actually appeared in person in the arena.

Gladiators were trained in schools (/udi) owned either by the state or by private citizens; aud though the trade of a lanista was considered disgraceful, to own gladiators and let them out for hire was reckoned a legitimate branch of commerce. Thus Cicero, in his letters to Atticus, congratu- lates his friend on the good bargain he had made in pur- chasing a band, and urges that he might easily recoup him- self by consenting to let them out twice. Men recruited mainly from slaves and criminals, whose lives hung on a thread, must have been more dangerous characters than modern galley slaves or convicts; and, though highly fed and carefully tended, they were of necessity subject to an iron discipline. In the school of gladiators discovered at Pompeii, of the sixty-three skeletons buried in the cells many were in irons. But hard as was the gladiator’s lot, —so hard that special precautions had to be taken to prevent snicide,—it had its

consolations. A successful gladiator en- joyed far greater fame than any modern prize-fighter or athlete. He was presented with broad pieces, chains, and jewelled helmets, such as may be seen in the museum at Naples ; poets like Martial sang his prowess ; his portrait was multiplied on vases, lamps, and gems ; and high-born ladies contended for his favours. Mixed, too, with the lowest dregs of the city, there must have been many noble bar- barians condemned to the vile trade by the hard fate of war. There are few finer characters in Roman history than the Thracian Spartacus, who, escaping with seventy of his com- rades.from the school of Lentulus at Capua, for three years defied the legions of Rome; and after Antony's defeat at Actium, the only part of his army that remained faithful to his cause were the gladiators whom he had enrolled at Cyzicus to grace his anticipated victory.

There were various classes of gladiators, distinguished by their arms or modes of fighting. The Samnites fought with the national weapons—a large oblong shield, a vizard, a plumed helmet, and a short sword. The Thraces had a small round buckler and a dagger carved like a scythe ; they were generally pitted against the Mirmillones, so called from the fish (uoppvdAos) which served as the crest of theirhelmet. In like manner the Retiarius was matched with the Secutor: the former had nothing on but a short tunic or apron, and sought to entangle his pursuer, who was fully armed, with the cast-net (jaculum) that he carried in his right hand ; and if successful, he despatched him with the trident (tridens, fuscina) that he carried in his left. We may also mention the Andabate, who wore helmets with closed vizors ; the Dimacheri of the later empire; the Essedarii, who fought from chariots like the ancient Britons; the Hoplomachi, armed like a Greek hoplite; and the Laqueatores, who tried to lasso their antagonists,

GLA—

in the first class we read of tatooed Britons in their war |

GLA

The estimation in which gladiatorial games were held by Roman moralists deserves notice, and the influence that they exercised upon the morals aud genius of the nation. The Roman was cssentially. cruel, not sormuch from

spite or vindictiveness, as from callous- ness and defective sympathies. This element of inhumanity and brutality must have been deeply ingrained in the national char- acter to have allowed the games to become popular, but there can be no doubt that it was fed and fostered by the savage form which their amusements took, That the sight of bloodshed provokes a love of bloodshed and cruelty is a commonplace of morals. To the horrors of the arena we may attribute in part, not only the. brutal treatment of their slaves and prisoners, but the frequency: of suicide among the Romans, On the other hand, we should be careful not to exaggerate the effects or draw too sweeping infcr- ences from the prevalence of this degrading amuscment. Human. nature is happily illogical; and we know that many of the. Roman statesmen who gave these games, and themselves enjoyed these sights of blood, were in every other department of life irre- proachable,—indulgent fathers, humane generals, and mild rulers of provinces. In the present state of society it is difficult to con- ceive how a man of taste can have endured to gaze upon a scene of human butchery. Yet we should remember that it is less than half a century since bear-baiting was prohibited in England, and we are only now attaining that stage of morality in respect of eruelty to animals that was reached in the 5th century, by the help of Christianity, in respect of cruelty to men, We shall not then be greatly surprised if hardly one of the Roman moralists is found to raise his voice against this amusement, except on the score of extravagance, Cicero, in a well-known passage commends the gladiatorial games as the best discipline against the fear of death and suffering that can be presented to the eye. The younger Pliny, who perhaps of all Romans approaches nearest to our ideal of a cultured gentleman, speaks approvingly of them. Marcus Aurelius, though he did much to mitigate their horrors, yet in his writings condemns the monotony rather than the cruelty. Seneca is indeed a splendid exception, and his letter to Lentulus is an eloquent protest against this inhuman sport. But it is without a parallel till we come to the writings of the Cliistian fathers, Tertullian, Lactantius, Cyprian, and Augustine. In the Confes- sions of the last there occurs a narrative which is worth quoting as a proof of the strange fascination which the games exercised even on a religious man and a Christian, He tells us how his friend Alipius was dragged against his will to the amphitheatre, how he strove to quiet his conscience by closing his eyes, how at some exciting crisis the shouts of the whole assembly aroused his curiosity, how he looked and was lost, grew drunk with the sight of blood,

and returned again and again, knowing his guilt yet unable to abstain. The first Christian emperor was persuaded to issue an edict abolishing gladiatorial games (825), yet in 404 we read of an exhibition of gladiators to celebrate the triumph of Honorius over the Goths, and it is said that they were not totally extinct in the West till the time of Theodoric (see GAMES).

Gladiators formed admirable models for the sculptor. One of the finest pieces of ancient sculpture that has come down to us is the Wounded Gladiator of the National Museum at Naples. The so-called Fighting Gladiator of the Borghese collection, now in the Museum of the Louvre, and the Dying Gladiator of the Capitoline Museum, which inspired the famous stanza of Childe Harold, have been pronounced by modern antiquaries to represent, not gladi- ators, but warriors, In this connexion we may mention the admirable picture of Gérome which bears the title, Ave, Cesar, morituri te salutant,

The attention of archeologists has been recently directed to the tesseree of gladiators. These tessere, of which about sixty exist in various museums, are small oblong tablets of ivory or bone, with an inscription on each of the four sides. The first line contains a name in the nominative case, presumably that of the gladiator ; the second line a name in the genitive, that of the patronus or dominus; the third line begins with the letters SP, for spectatus er approved, which shows that the gladiator had passed his pre-liminary trials; this is followed by a day of a Roman mouth ; and in the fourth line are the names of the consuls of a particular year.

Lipsius, Saturnalia, Wesel, 1675; Friedllinder, Darstellungen aus der Sitien-geschichte Roms, Leipsic, 1869; H. Goell, Aulturbilder aus Hellas und Rom, Leipsic, 1863; Charles Magnin, Les Origines du thédtrve moderne, Paris, 1838; H.

Wallon, Histoire de lesclavage, Paris, 1847; Guhl and Koner, Zhe Life of the Greeks and Romans; Lecky, History of European Morais, (F. 8.)

GLADIOLUS, a genus of monocotyledonous or endogen- ous plants, belonging to the natural order Jridacew, and representative of the tribe Gladiolew, a group of bulbous plants in which the perianth is irregular, and the stamens unilateral and arched, with the filaments free. It belongs to a

subdivision of the Gladiolee, in which the segments of the limb of the perianth are very unequal, and is specially distinguished by having the perianth tube curved, funnel-

shaped, and widening upwards, and by the segments equalling or exceeding the tube in length. About ninety species are described, of which number upwards of fifty are from the Cape, and the rest from tropical Africa, the central and southern regions of Europe, Persia, the Caucasus, and the Levant. One species, G. illyricus, is found apparently wild in England, in the New Forest, Hampshire. Some of the species have been cultivated for a long period in our flower-gardens, where both the introduced species and the modern varieties bred from them are very ornamental and popular, G. segetum has been cultivated since 1596, and G. byzantinus since 1629, while many additional species were introduced during the latter half of the 18th century. One of the earlier of the hybrids originated in gardens was the beautiful G. Colvillii, raised in the nursery of Mr Colvill of Chelsea in 1823 from G. concolor fertilized by G. cardinalis. In the first decade of the century, however, the Hon, and Rev. W. Herbert had successfully crossed the showy G. cardinalis with the smaller but more free-flowering G. blandus, and the result was the production of a race of great beauty and fertility. Other crosses were made with G. tristis, G. oppositiflorus, G. hirsutus, G. alatus, and G. natalensis; but it was not till after the production of &@. gandavensis about 18438, by the crossing of G. natalensis with @. oppositiflorus (sometimes erroneously attributed to natalensis and cardinalis), that the gladiolus may be said to have become a general favourite in gardens. Since that time the varieties have been greatly multiplied in number, and improved in size and quality, as well as marvellously varied in colour and marking, so that they have now become exceedingly popular. A few years since large numbers of novel varieties were annually introduced by the French florists, but the English-raised varieties are now in great measure superseding them. One cultivator, Mr Kelway of Langport, devotes a space of not less than 8 acres to gladioli, and cultivates annually from 10,000 to 60,000 each of some of the more popular kinds, while seedlings are raised to the extent of half a million a year. The seeds are sown in the open ground about April, glass culture with so large a

num- ber being out of the question ; and in the first season the young plants make bulbs averaging the size of peas. The time occupied from the sowing of the seed until the plant attains its full strength is from three to four years. The approved sorts, which are identified by name, are multiplied by means of bulblets or offsets which form around the principal bulb or corm ; but in this they vary greatly, some kinds furnishing abundant increase and goon becoming plentiful, while others persistently refuse to yield offsets, The stately habit and rich glowing colours of the modern gladioli render them exceedingly valuable as decorative plants during the late summer months, They are, moreover, very desirable and useful flowers for cutting for the purpose of room decoration, for while the blossoms themselves last fresh for some days, the undeveloped buds open in succes- sion, if the stalks are kept in water, so that a cut spike will go on blooming for a considerable period.

GLAMORGAN (Welsh, Gwlad Morgan), a maritime county of South Wales, bounded on the N. by Breck- nock and Carmarthen, on the W. by Carmarthen and its bay, on the S. by the Bristol Channel, and ou the E. by Monmouth, the boundary line of which is the Rhymney. Its greatest length from E. to W. is about 53 miles, its greatest breadth from N. to 8. about 29; its coast-line is about 60 miles, and its area 547 070 acres.

Glamorgan, with the exception of some flat tracts on the borders of the Bristol Channel, consists of a succession of hills and valleys, the country inland growing more and more mountainous, after a broad tract of plain on the south coast, until on the borders of Brecknock its surface is a sea of hills, None of the mountains rise to a great height,

the most lofty, Mynydd Llangeinor, being but 1859 feet, and the escarpment of Craig y Llyn about the same height oralittle higher. Yet their bold forms add grandeur to the scenery of the county, and their lower slopes are clothed with picturesque though not large timber.

The valleys of Glamorgan have been long famous for great beauty of scenery. The vale of Glamorgan, some 8 miles in breadth, has been truly called the “Garden of Wales,” and its climate is so mild that myrtles and

other tender plants flourish in the open air. The vale of Neath is known to tourists as the waterfall district. of South Wales, the finest falls being betwixt Hirwain and N eath, near the Vale of Neath Railway, viz. Cilhepsté fall, the three Clwngwyns, the falls of the Pyrddin, Sewd-Einon Gam, Scwd-Gladys, and Sewd Hen Rhydd on the Llech, with Melincourt and Abergarwedd still nearer Neath. The highest of these falls are above 80 feet. Swansea valley has also fine scenery. Other valleys are those of the Rhymney, the Taff, the Rhondda, and the Llwechwr, the first two giving their names to important railways.

The rivers of Glamorgan are not large. The chief are the Rhymney, forming the county's eastern boundary ; the Ogwr or Ogmore, which flows into the Bristol Channel near Porth-Cawl harbour; the Taff, which rises in the Brecon Beacon, flows southward through the county, and forms the important harbour of Cardiff; the Neath and Tawe, flowing south into Swansea Bay; and the Llwchwr, which is the boundary of the county on the west, and, falling into Car. marthen Bay, forms the estuary of the Burry river.

The chief geological feature of Glamorgan is the Coal- measures, which are of the greatest thickness near N eath, but extend nearly over the whole county, and are bounded by a narrow band of Millstone Grit and Mountain Lime- Stone, nearly coincident with the county boundary on the north. In the extreme south and south-west the Devonian, Magnesian Limestone, and the Lias show themselves.

The climate is mild, and the plains on the coast as well as inland are very fertile. The soil isa deep rich loam, improved by lime. Agriculture is as yet not so forward as it might be with such a soil and climate ; but the farms are seldom large, and the buildings are not suited to high farm- ing. The crops chiefly raised are wheat, beans, pease oats, barley, vetches, turnips, and potatoes. 'The cattle are of good useful breeds; and good sheep and ponies are reared in the hill-country. According to the agricultural statistics for 1878, the extent under the different crops (the total area being 547,070 acres), and the numbers of live-stock, were as follows :—

Corn crops (two-thirds wheat and oats, and nearly OMRON DAMEW <2; oresss-ceosecereecuensomen ok 37,189 acres

Green crops (two-thirds turnips and SWEMES) recess ies 15,054 ,, GUASSHONGUBE TOLALIOT. <...-o000-101.-. aecseor ueele cus 26,468 ,, POtReaMen PHSHUNCs 6 55.00… eee lec 186,697 ,, Bare, fallow, and uncropped arable yi 0 A 33,359 ,, Total under crops, bare fallow, and FANS) Gassqaneaoneaac 268,707 ,, Live Stock :—Horses, including jE ane ee re 13,727 ee. oy nan ales 46,545 Berea of axisrecces Peed nsguassnnces Hock. «: 283,389 ARMM Sas P28 oa oo ss anes SAIS oho scenes 15,572

According to the Owners and Heritages Return 1872~ 73, the county was divided among 8426 proprietors, holding 428,386 acres, with a gross estimated annual rental of £1,609,379. The estimated amount of commons and waste lands was 47,018 acres. Of the owners, 78°8 per cent. possessed less than one acre, and the average value per acre was £3, 1s. 81d. There were 16 proprie- tors holding 5000 acres and upwards, viz, C. R. M. Talbot 33,920; Earl of Dunraven, 23,706; Marquis of Bute, 21,402; Lord Windsor, 12,016 ; Earl of Jersey, 7110; Edward Rees Wingfield, aii ae ee

X. — 80

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6157; Major Vaughan Lee, 6128; Mrs Blandy Jenkins, 6082; Col. K. Lynte, 5933; Sir Iver B. Guest, 5640 ; T Penrice, 5411; Mrs Chetwode, 5399; R. F. L. Jenner, 5381; C. Bailey, 5343; John D. Llewellyn, 5000.

Te industry of Glamorgan is chiefly applied to its coal and iron mines, which practically underlie the whole super- ficies of the county, and give it its pre-eminence among Welsh counties. In 1872 there were no less thau 420 coal- pits in Monmouthshire and South Wales, and the yield of some 15 million tons a year came in very large proportion from the Glamorganshire vales of Neath, Taff, Rhondda, Ely, &c. Within the last twenty years the iron works were carried on at an enormous scale of labour and enterprise, there being near Merthyr-Tydvil alone upwards of 60 blast furnaces; but in 1873 it appeared that of 57 furnaces in Glamorganshire 27 were out of blast, and at present (1879) the industry is, from various causes, in a backward state. Excellent means of export for coal and iron are afforded by the unrivalled docks at Cardiff, the enterprise of the late and present marquis of Bute, and by those also at Penarth at the mouth of the Ely. These have

within con- siderably less than a century transformed an insignificant Welsh town into a leading port and emporium with a first rate harbour and anchorage; whilst another dock at Swan- sea serves a like purpose for the export of the copper ore smelted at Swansea, Neath, Aberavon, and Treforest, and chiefly sold at public ticketings in the first-named town. Cardiff and Swansea, especially the latter, also have a very large export trade in patent compressed fuel prepared from culm and tar.

Glamorgan can boast historic ruins, such as Caerphilly, and Castle Coch near Llandaff, the former a Norman for- tress held for Edward II. by the younger De Spencer, the latter an early English fortress on an escarpment of moun- tain limestone. Other ruined castles are Oystermouth and Pennard in Gower, and Coity near Bridgend; while as restored castles, resided in by their present owners, are Cardiff, the residence of the marquis of Bute, St Fagan's, near Ely station, and St Donat's and Dunraven, both on the verge of the Bristol Channel. cromlechs at St Nicholas and St Lythan's on the Dyffrin estate, at Cotterell near Peterston, and at Arthur's Stone in Gower. The Sarn Helen, an ancient road, traverses the county. At Llantwit Major, near Cowbridge, was the once famous divinity school founded by St Germanus, and pre- sided over for an incredible term of years by St Iltyd. Every stone in this old-world town is "of old memorial." Coity, Coychurch, and Ewenny, near Bridgend, present a fine trio of cross churches, with fortified or embattled towers, characteristic of the county.

South of Swansea lies the promontory of Gower, famed for the beauty of its coast scenery, its people of Flemish descent, planted here by Henry I, and its bone-caves. The last, in the limestone cliffs, accessible only at low water, are at Bacon Hole, Paviland, and Rhosilly Bay.

Besides its ports, Glamorgan has abundant means of transit in four railways and a canal, beside numerous tram- ways. The county is divided into 128 parishes and 10 hundreds, and is situated in the diocese of Llandaff. The cathedral, 2 miles from the county town of Cardiff, having fallen into decay through the neglect of ages previous to 1844, owed its restoration to a beauty befitting the prestige of the earliest Christian see to the energetic endeavours of Dean Thomas Williams. It was completed in 1869.

The great changes of recent years in elementary education have curiously affected the statistics of schools in Glamorgan. Whereas in 1847 there were 327 day schools in all, with 15,674 scholars, in 1877 the parliamentary return shows a great reduction in the number of schools, though these have probably a much larger aggregate of scholars. This

The county has some fine

return exhibits 226 public elementary schools in Glamor- gan, of which 56 were board-schools, 30 British and foreign, 12 Romau Catholic, 1 Wesleyan, and the remainder national, parochial, and Church of England schools. Of these schools, 41 had each in average attendance upwards of 300 scholars, and 2 had upwards of 1000. Fourteen only had night schools in operation. As in other south- west counties, the Welsh language is losing ground, except in remote agricultural districts.

In 1851 the population of the county was 231,849, 120,748 males and 111,101 females ; and in 1871 it was 397,859, 205,660 males and 192,199 females. The popu- lation has increased since the first census in 1801 by 326,980 persons, or 451 per cent. The county returns two members to parliament, the borough of Merthyr one, and the Cardiff and Swansea districts of borouglis oue each, a total of five in all. In the year ending April 1871 the amount of real property assessed to income and pro- perty tax was £1,219,922. The principal towns with the populations in 1871 were—

ADeTAVOM ss d.escreceses ces S67 | Wiomtresint*..... 2,039 ADOTRBUG,...- ci secasnccaess 90,119 |!” Tea recone. sa esrs 120 Bridcend!....:-:-2:.0..008 3,539 | MerthyrTydvil…... ..... 51,949 (Cina? annageneppeosconnane $0,508 | WNedit! 82… cc… .c00 B19 Cowbridge? 1,184 | Swansea?..... To othes sce 51,702 Kenfig!.. 591

The bibliography of the county is stronger in such old chronicles as the Brut y Tywysogion than in modern researches. Among its important contributions to the Archwologia Cambrensis may be mentioned the Rev. H. H. Knight’s Account of Newton Notiage in 1853; and Dr Thomas

Nicholas's History of the Annals and Antt- quities of Glamorganshire is the foundation of his Counties and County Families of Wales. (J. DA.)

GLANDERS, or EqurntA, a specific infectious disease to which certain animals, chiefly those possessing an undivided hoof, are liable, and which is communicable from them to man. The term farcy is also employed to designate a variety of this affection, but there is no pathological distinc-. tion between the two. The disease as it affects animals belongs to the subject of Veterinary Medicine.

Glanders is happily a rare form of disease in man, there being evidently less affinity for its development in the humau subject than in the equine species. It occurs chiefly among those who from their occupation are fre- quently in contact with horses, such as grooms, coachmen, cavalry soldiers, veterinary surgeons, &c., and seems always produced either by direct inoculation of the virus from a diseased animal into the broken skin, or by the respiration of air containing the poison. It is said to have occasionally been transmitted from man to man, but such an oceurrence is extremely rare,

A period of incubation, lasting from three to five days, generally follows the introduction of the virus into the system. This period, however, appears sometimes to be of much longer duration, especially where there has been no direct inoculation of the poison. The first symptoms are a general feeling of illness, accompanied with pains in the limbs and joints resembling those of acute rheumatism. If the disease has been introduced by means of an abraded surface, pain is felt at that point, and inflammatory swelling takes place there, and extends along the neighbouring lymphatics. An ulcer is formed at the point of inoculation which discharges an offensive ichor, and blebs appear in the inflamed skin, along with diffuse abscesses, as in phlegmonous erysipelas. Sometimes the disease stops short with these local manifestations, but more commonly goes on rapidly accompanied with symptoms of grave coustitutional disturb- ance. Over the whole surface of the body there appear numerous red spots or pustules, which break and discharge .. 2 eee Se 2 eee

2 Contributory to Swansea parliamentary district of boronghs.

2 Contributory to Cardiff parliamentary district of boroughs.

a thick mucous or sanguineous fluid. Besides these there are larger swellings lying deeper in the subcutaneous tissue, which at first are extremely hard and painful, and to which the term farcy ‘“‘buds” or “buttons” is applied. These ultimately open and become extensive sloughing ulcers.

The mucous membranes participate in the same lesions as are present in the skin, and this is particularly the case with the interior of the nose, where indeed, in many instances, the disease first of all shows itself. This organ becomes greatly swollen and inflamed, while from one or both nostrils there exudes a copious discharge of highly offensive purulent or sanguineous matter. The lining mem- brane of the nostrils is covered with papules similar in character to those on the skin, which form ulcers, and may lead to the destruction of the cartilaginous and bony textures of the nose. The diseased action extends into the throat, mouth, and eyes, while the whole face becomes swollen and erysipelatous, and the lymphatic glands under the jaws inflame and suppurate. Not unfrequently the bronchial tubes become affected, and cough attended with expectoration of matter similar to that discharged from the nose is the consequence. The general constitutional symptoms are exceedingly severe, and advance with great rapidity, the patient passing into a state of extreme pros- tration. In the acute form of the disease recovery rarely if ever occurs, and the case generally terminates fatally in a period varying from two or three days to as many weeks.

A chronic form of glanders and farcy is occasionally met with, in which the symptoms, although essentially the same as those above described, advance much more slowly, and are attended with relatively less urgent constitutional dis- turbance. Cases of recovery from this form are on record . but in general the disease ultimately proves fatal by exhaus- tion of the patient, or by a sudden supervention, which is apt to occur, of the acute form. On the other hand, acute glanders is never observed to become chronic. ‘

In the treatment of this malady the main reliance is to be placed on the maintenance of the patient’s strength by stroug nourishment and tonic

remedies. If the point of inoculation of the virus can be early made out, its active cauterization, as in the case of any poisoned wound, should be resorted to. The opening of abscesses antiseptically, as well as the use of antiseptic lotions for the affected mucous membranes, is recommended. In all cases of the outbreak of glanders it is of the utmost consequence to prevent the spread of the disease by the destruction of affected animals, and the cleansing and disinfection of infected localities,

GLANVIL, Gianvitt, or Guanvittz, RaNuLPH DE (died 1190), the oldest writer on English jurisprudence and chief justiciary of England in the reign of Henry II., was born at Stratford in Suffolk, but in what year is unknown. There is also almost no information regarding his early life. Butterley Abbey was founded by him in 1171. In 1174, along with other barons of Yorkshire, he raised a body of knights to oppose William the Lion, king of Scotland, who had invaded the north of England, and it was he who took the king prisoner at Alnwick. In 1175 he was appointed sheriff of Yorkshire, in 1176 justice of the king's court and a justice itinerant in the northern circuit, and in 1180 chief justiciary of all England. It was under his direction that Henry IL. completed his judicial reforms, but the principal of them had been carried out before he came into office. After the death of Henry in 1189 Glanvil was removed from his office by Richard L, and imprisoned till he had paid a ransom, according to one authority, of £15,000. Shortly after obtaining his freedom he joined the order of the cross, and he died at the siege of Acre in 1190. At the instance, it is supposed, of Henry IL, Glanvil wrote or superintended the writing of the Z'ractatus de legabus et consuetudinibus regni Anglic, which is divided

into 14 books, and is chiefly a practical treatise on the forms of procedure in the curia regis or king's court, the principles of law involved in these forms being only incident- ally referred to. As the source of our knowledge regard- ing the earliest form of the curia regis, and for the informa- tion it affords regarding ancient customs and laws, it is of great value to the student of English history. It is now generally agreed that the work of Glanvil is of earlier date than the Kegiam Majestatem, a work which bears a

close resemblance to his. To him is also ascribed the recension of English laws made in the reign of Henry II.

The treatise of Glanvil was first printed in 1554. An English translation, with notes and introduction by John Beames, was pub- lished at London in 1812. A MS. copy of a Norman-French transla-

tion, made apparently in the reign of King John, is contained in the library of the duke of Northumberland at Alnwick Castle.

GLANVILL, or Gianvit, Josepy (1636-168 0), was born at Plymouth in 1636, and was educated at Oxford uni- versity, where he graduated as M.A. in 1658. In 1666 he obtained the cure of Abbey Church at Bath; in 1678 he became prebendary of the church of Worcester, and acted as chaplain in ordinary to Charles II. He died at Bath, November 16, 1680, in the forty-fourth year of his age. Glanvill's first work, The Vanity of Dogmatizing, or Con-

Jidence in Opinions, manifested in a Discourse of the short-

ness and uncertainty of our Knowledge, and its Causes, with Leflexions on Peripateticism,and an Apology for 1 *hilosophy, 1661, is interesting as showing one special direction in which the new method of the Cartesian philosophy might be developed. Pascal had already shown how philosophical scepticism might be employed as a bulwark for faith, and Glanvill follows in the same track. The philosophic endeavour to cognize the whole system of things by refer- ring all events to their causes appears to him to be from the outset doomed to failure. For if we inquire into this causal relation we find that though we know isolated facts, we can- not perceive any such connexion between them as that the one should give rise to the other. In the words of Hume, "they seem conjoined but never connected." All causes then are but secondary, are merely the occasions on which the one first cause operates. It is singular enough that Glanvill who had not only shown, but even exaggerated, the infirmity of human reason, himself paid a strange tribute to its weakness ; for, after having combated scien- tific dogmatism, he not only yielded to vulgar super- stitions, but actually endeavoured to accredit them both in his Scepsis Scientifica, 1665, and in his Philosophical Considerations concerning the existence of

Sorcerers and Sorcery, published in 1666, in 4to. The story of the pretended drum, which was said to have been heard every night in the house of an inhabitant of Wiltshire (Mr Mompesson), a story which made much noise in the year 1663, and which is supposed to have furnished Addison with the idea of his comedy of the Drummer, appears to have given occasion to the latter work. At his death Glanvill left a piece entitled Sadducismus Triwm-phatus, which was printed in 1681, reprinted with some additions in 1682, and translated into German in 1701. He had there collected twenty-six relations or stories of the same description as that of the drum, in order to establish, by a series of facts, the opinion which he had expressed in his Philosophical Considerations. Glanvill supported a much more honourable cause when he undertook the defence of the Royal Society of London, under the title of Plus Ultra, or the Progress and Advancement of Science since the time of Aristotle, 1658, a work which shows how thoroughly he was imbued with the ideas of the empirical method as in Bacon. The style of Glanviil is clear, easy, and animated ; and to the student of philosophy his works are of considerable interest.

Besides the works already noticed, Glanvill wrote—Luz Orientalis, 1662; Philosophia Pia, or Discourse on the Religious Character, and the Tendeney of Experimental Philosophy ; Essays on Several Im- portant Subjeets in Philosophy and Religion, 1676; An Essay Concerning Preaching; and Sermons. After his death in 1681, there were published other sermons, &c., in one volume 4to. See Rémusat, Hist. de la Phil. en Angleterre, bk. ili. eh. xi. GLARUS, or Graris, a canton of Switzerland, is bounded on the N. and N.E. by St Gall, on the E. and S. by the Grisons, and on the W. by Uri and Schwyz. Its area is 266 or 267 square miles, its greatest length about 33 miles, and its greatest breadth about 16. A thoroughly Alpine district, sloping northwards from the lofty range which comprises the Todi (11,887 feet), the Biferten Stock (11,237), and the Scheibe (9587), and including within its limits the Glarnisch (9584) and the Miirtschen Stock (8012), Glarus is almost completely cut off from the neighbouring cantous, except towards the south. Of the three passes, the Segnes, the Kisten, and the Panix, which communicate with the Grisons, the first and second are over the snow, and the third has only a bridle path ; and the Klausen pass and the

Pragel pass, which conduct respectively to Schwyzand Uri, have also mere bridle paths. As far as it is a habitable country it may be said to consist of the valley of the Linth, which extends from the Tédisouthward to the Wallenstadt Lake along with the lesser valleys of the Sernf (or Sernft) and the Klon, which branch off to the east and the west. The climate, it need hardly be said, is a severe one, the snow generally reniaining, even in the lowlands, till near the beginning of May. The fohn at times blows with terrific violence; and, by a law enforced in the town of Glarus, every fire in the place must be extinguished as soon as it sets in. The chief sources of wealth in the canton are the pastures and the manufacturing indus- tries. Though copper, silver, and iron mines were formerly wrought, the only mineral production now of commercial importance is slate, which is extensively quarried in the Plattenberg. Not more than a fifth of the soil is capable of cultivation by the plough, and the agricultural produce has consequently to be supplemented by foreign supplies. About 9009 or 10,000 head of cattle are pastured in the

canton, and according to the census of 1876 there are 2000 |

sheep, 6960 goats, and 3000 swine. Neither butter nor ordinary cheese is made in sufficient quantities for the local consumption, but the Schabzeiger, Schotter Kise, Krduterkdse, or green cheese," made of skim milk, whether of goats or cows, mixed with butter-milk and coloured with powdered steinklee (Melilotus ccerulea), is still largely manu- factured. The curd is brought down from the mountain chalets in sacks, which contain about 200 ib each. After being ground for about 24 hours in a mill along with the klee powder, which is added in the proportion of 3 fb to the 100, the curd is put into shapes, and pressed in the usual way. It grows ripe inabout a year and keeps a long time. Large quantities are exported to America. The cotton manufacture is the staple of the canton, and gives support to about a fourth of the population. Formerly distributed through the country as a domestic industry, it is now con- centrated in a few factory towns and villages, which in the aggregate keep about 250,000 spindles going. The cotton goods are sent to the East, America, and Africa. It is not only in their own little country that the people of Glarus find a field for their energies; they have contributed to the industries of many parts of Europe, and their poorer emi- grants have founded three flourishing settlements in Wis- consin—New

Glarus, Vilten, and New Elm. The popula- tion, which in 1851 was 30,213, had increased by 1870 to 35,150, and was estimated in 1876 at 36,179. The vast majority are Protestarts, only 6,888 being Catholics accord- ing to the census of 1870. The constitution of Glarus is of the simplest kind, and extremely democratic. According

to the law of 1842, revised and sanctioned by the federal council in 1851, the government rests in the hands of a Landesgemeinde or assembly of the whole male population above the age of eighteen, which usually meets on the first Sunday in May, and elects the cantonal officials, votes the income and poll-taxes, and passes or rejects any laws that may be presented by the cantonal council or Landesrath. The cantonal council consists of 117 members. A council of 45 members, and a committee of 9 members have control of the executive. The landamman is president of the com- mittee, the executive council, the cantonal council, and the assembly. Justice is administered by five courts completely independent of the Government. Freedom of the press, freedom of religious worship, and freedom of trade and industry are all guaranteed. Aliens are readily naturalized and admitted to the rights of citizens. The canton is divided into 25 communes, only one of which, that of Glarus, has more than 5000 inhabitants, while 16 have less than 1000, and the smallest has only 231.

GuaRus, the capital of the canton, is a flourishing little town on the left bank of the Linth, about 1495 feet above the sea-level. Its environment is a remarkable one: to the 8. the Glirnisch rises 6153 feet; to the N.W. the Wiggis, 6033 , aud tothe E. the Schild, 6010. The fire of 1861 devastated the greater part of the town, destroying its Gothic church of the 10th century, the casino, the Govern- ment houses, and all its principal buildings ; 2000 of the inhabitants were rendered houseless, and property to the value of 8,000,000 francs was destroyed. Contributions however were sent in from far and near to the amount of 2,754,606 francs, the federal authorities of Switzerland voted a loan of 1,000,000 at two per cent., and the canton furnished a subsidy at 3 per cent.; the town was rapidly rebuilt in a substantial and regular style, and the public edifices restored. The church is used in common by the Protestants and the Roman Catholics. The high

school accommodates 700 pupils. Most of the population, which in 1870 numbercd 5516, are supported by the cotton manu- facture carried on in the town and the vicinity. A certain trace of rustic life is still maintained, as the operatives have each a bit of ground in the “almend.” On the opposite side of the river lies the industrial village of Enneda.

In the end of the 5th century an Irvisn monk, Fridolin, the founder of the convent of Seckingen on the Rhine, built a chureh on the site of the present town, and the name of St Hilarius, which he gave it in honour of his patron the bishop of Poitiers, in eourse of time became eorrupted to Glarus or Glaris. The whole valley was reckoned to the estates of the abbey of Seckingen, and it was governed by a mayor or bailiff whose nomination was vested ultimately in the Hapsburg family. The tyranny of these officers constrained the people of Glarus to join the Helvetic confederation in 1352, and in 1388 they secured their independence by a victory over the Austrians at Nafels, the anniversary of which is still cele- brated on the second Thursday of April, Zwingli the Reformer was curate of Glarus from 1506 to 1516, and by 1530 the new doctrines had been aeeepted by five-sixths of the population of the canton. The two religious parties, though they were happily prevented from appealing to arms, continued long in a state of mutual alienation and suspieion; the Protestants, for example, would have nothing to do with the Gregorian calendar because it was introduced by the papal party. At length a settlement of a peculiar kind was effected in 1683. Each confession was allowed to have a cantonal assembly, a cantonal council, and officials of its own; while for all matters in whieh both parties were interested there was a eantonal assembly and a eantonal council for discussion and administration in common. It was in the beginning of the 18th century that the present prosperity of the canton received its original impulse. Cotton- spinning was introdueed in 1712 by Heidegger of Zurich, and Weaving and ealico-printing followed before 1750. The popula- tion of the canton inereased from 15,000 to 20,000 during the cer.tury. The effects of the great Revolution were beneficially experienced, and the early part of the 19th eentury was marked by numerous improvements, politieal and social. Till 1811 the lower eourse of the Linth was extremely irregular, and its inundations had gradually turned a large streteh of country into a swamp ; but, under the patronage and direction mainly of Eseher (von der Linth,

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as he came afterwards to be called), there was constructed a magni- ficent system of canals which completely remedied the evils, and the desolate region soon became one of the finest parts of the canton. The whole cost of the works up till 1823 was 974,553 francs, When the new constitution of 1836 was introduced, the Roman Catholic min- ority, whose influence it greatly diminished, were urged on by Bossi, the bishop of Chur (Coire), to break off from their Protestant country- men ; but the Government expelled the few priests who refused to take the oath, and separated the canton from its connexion with the diocese of Chur. After Bossi's death the decree of separation -was revoked. In the Sonderbund war of 1847 Glarus was true to the federation ; and the same spirit was shown in the voting about the constitution in 1872-75.

Sce Valentin Tschudi, Kurze historische Beschretb- oder Erzellung, der in Kriegs- und Fridenszeiten verloffenen Sachen und Handlen zu Glarus, a 16th-century chronicle, printed by J.J Blumer, zn Archiv fur Schweizerische Geschichte, Zurich, vol. ix., 1853; Johann Heinrich Tschudi, Beschreibung des Lobl. Orths und Lands Glarus, Zurich, 1714; Christoph Vriimpi, Neuere Glarner-Chromk, Wintherthur, 1774; J. M. Schuler, Die Linththdéler, Zurich, 1814; Résultat moral du desséche des marais dela Linth, Geneva, 1825; Melchior Schuler, Geschichte des Landes Glarus, Zurich, 1834; J.J. Babler, Geschichte u. Inhalt der alien Verirdge zwischen den Refornirien u Katholiken im Kanton Glarus, Glarus, 1836; J. J. Blumer, " Das Thal Glarus unter Seckingen und Oesterreich und scine Befreiung,"'in Archiv fiir Schweizerische Geschichte, Ba iii., Zurich, 1844; Dr Oswald Heer ana J .J. Blumen- Heer, Der Kanton Glarus, historisch-geographisch-st atrst isch geschildert, St Gall, 1846, forming part of Gemdlde der Schweiz; Oswald Heer, Escher von der Linth, Ein Lebensbild, Zurich, 1873; Egli, Taschenbuch Schweizer. Geographie, Zurich, 1875.

GLAS, Joun (1695-1773), the founder of the sect gene- rally known as Glassites or Sandemanians, was born at Auchtermuchty, Fife, where his father was parish minister, on the 5th of October 1695. On completion of his educa. tion for the ministry at the universities of St Andrews and Edinburgh, he was licensed as a preacher by the presbytery of Perth, and

soon afterwards ordained by that of Dundee as minister of the parish of Tealing (1719). During his ministry there he gradually formed peculiar opinions, which as early as 1725 found expression in the formation of a society "separate from the multitude," numbering nearly a hundred, and drawn from his own and neighbouring parishes. The members of this ecclesiola in ecclesia pledged themselves "to join together in the Christian profession, to follow Christ the Lord as the righteousness of His people, to walk together in brotherly love and in the duties of it in subjection to Mr Glas as their overseer in the Lord, to observe the ordinance of the Lord's Supper once every month, to submit themselves to the Lord's law for removing offences" (Matth, xviii.), and so on. From the scriptural doctrine of the essentially spiritual and heavenly nature of the kingdom of Christ, Glas in his public teaching drew the conclusions, not only that the church, as being identical with that kingdom, ought to consist of none but truly spiritual Christian men, but also that the civil establishment of the church was unlawful and utterly incon- sistent with the spirit of Christianity.! For the promulga- tion of these views, which were confessedly at variance with the doctrines of the standards of the national Church of Scotland, he was summoned (1726) before his presbytery, where, in the course of the investigations which followed, he affirmed with still more explicitness than formerly his belief that "every national church established by the laws of earthly kingdoms is antichristian in its constitution and persecuting in its spirit," and further declared opinions upon the subject of church government which amounted to an entire repudiation of Presbyterianism and an acceptance of Independency. For these opinions he was in 1728 sus- pended from the discharge of ministerial functions, and finally in 1730 deposed ; the members of the society already referred to, liowever, for the most part continued to adhere to him, thus constituting the first "Classite" or " Glasite " church. The seat of this congregation was shortly afterwards transferred to Dundee, whence Glas subsequently removed to Edinburgh, where he officiated for some time as an "elder." He next laboured in Perth for a few years, but ultimately returned to Dundee, where the remainder of his life

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‘ His argument is most fully exhibited in a treatise entitled The Testimony of the King of Martyrs concerning His Kingdom (John Xvili. 36, 37) Explained and Illustrated (1729). ?

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was spent. In 1739 the General Assembly, without any application either from him or from his friends, removed the sentence of deposition which had been passed against him, and restored him to the character and exercise of a minister of the gospel of Christ, though declaring that he was not to be esteemed a minister of the Established Church of Scotland, or eligible for a charge, until he should have re- nounced the principles embraced and avowed by him that Were inconsistent with the constitution of the church. Besides the Testimony Glas wrote a number of papers, ex- pository, polemical, or practical, which were published in a collected edition at Edinburgh in 1761 (4 vols. 8vo), and again at Perth in 1782 (5 vols. 8vo). He died in 1773,

The Glassite denomination, which has never been a numerous one, is distinguished by a number of peculiarities alike in doctrine, discipline, and worship, some of which have already been indicated. One of the most characteristic of its tenets is that which owes its elaboration to Robert Sandeman (1718-1771), the son-in-law of Glas, from whom is derived the uame of Sandemanians, by which the sect is principally known in England and America. In a series of letters (1757) to Hervey, the author of Theron and Aspasio, he maintained that justifying faith is a simple assent to the divine testimony concerning Jesus Christ, differing in no way in its character from belief in any ordinary human testimony. No dis- tinctive theological system, however, has as yet been elaborated from this point of view. In their practice the Glassite churches aim at a strict conformity with the primitive type of Christianity as that is understood by them. Each congregation has a plurality of elders, pastors, or bishops, who are chosen according to what are believed to be the instructions of Paul, without regard to previous education or present occupation, aud who enjoy a perfect equality in office. To have been married a second time disqualifies for ordination, or for continued tenure of the office of bishop. In all the action of the church unanimity is considered to be necessary ; aud if any member

differ in opinion from the rest, he must either surrender his judgment to that of the church or be shut out from its communion. To join in prayer with any one who is nota member of the denomination is regarded as unlawful, and even to eat or drink with one who has been excommunicated is held to be a heinous sin. The Lord's Supper is observed weekly ; and between forenoon and afternoon service every Sunday a love feast, at which it is incumbent on every member to be present, is held after the manner of the primitive Christians. Mutual exhortation is practised at all the meetings for divine service, it being lawful for any member who possesses the gift to speak. The practice of washing one another's feet was at one time observed; and it is still customary for each brother and sister to receive new members, on adinission, with a holy kiss. ''Things strangled" and "blood " are rigorously abstained from; the lot is regarded as sacred; the accumulation of wealth is 1egarded as unscriptural and improper, and each member considers his property as liable to be called for at any time to meet the wants of the poor and the necessities of the church. The number of adherents at present belonging to the denomination is probably a little under 2000.

GLASER, Curistoruer, one of the minor chemists of the 17th century, concerning the details of whose life very little is known. He was a native of Basel, came to Paris, succeeded Lefebvre as demonstrator on chemistry in the Jardin du Roi, and was appointed apothecary to Louis XIV. and to the duke of Orleans. He is best known to us by his Trawté de la Chymie (Paris, 1663), which gives a very favourable idea of the chemical science of his time. The little work went through some ten editions in about five- and-twenty years, and was translated into both German and English. Dumas and other writers indeed have spoken very disparagingly both of the Zraité and of the author's merits and character, but this adverse judgment appears to rest on altogether insufficient grounds. One thing very much against Glaser is his alleged connexion with the marchioness de Brinvilliers. It does not appear, however, that he had any share in the notorious poisonings beyond making the deadly substances which the marchioness and others employed in secret. He appears to have died some years before 1676. A salt (the normal sulphate of potas- sium) which he showed how to prepare, and the medicinal properties of which he pointed out, was named Glaseri sal polychrestum, or salt of many uses. The native sulphate is still known as glaserite.

GLASGOW, the most populous city in Great Britain next to London, is situated on the banks of the river Clyde, in the Scottish county of Lanarkshire, about 20 miles above Greenock, where the river spreads out into a noble estuary, with branching lochs running deep into the heart of the Western Highlands. It is within ten hours' railway run (4053 miles) of the metropolis, and an hour and a quarter (45 miles) of Edinburgh, the latitude being 55° 51' 32" N., and the longitude 4° 17' 54" W. The extreme breadth of the city is about 3} miles from north to south, and the extreme length 5 miles from east to west. The circumference is about 10 miles; and the area em- braced within the municipal boundaries is now (1879) 61114 acres. The population when the last census was taken in 1871 was 477,732, but during the eight years tbat have elapsed, the increase of inhabitants both in the city proper and in its suburbs has been very great, It is within the mark to say that above 100,000 have been

added to the population of the city; this indeed is the estimate given in official registration returns, which set down the population estimated to the middle of 1879 as 578,156. The smaller burghs which have sprung up round Glasgow within the last twenty or thirty years have kept pace with the mother burgh in development, and now contain a population amongst them of about 170,000. As these burghs are essentially parts of Glasgow, having been formed by the overflow of its population, they ought to be added to the city in any estimate of its size and importance. The population of Glasgow, taking this basis, is therefore close upon three quarters of a million (750,000). The increase of the population during the present century has been greater perhaps than that of any other city or town of the Old World. In 1801 it was only 77,385; in 1821 it was 147,043; in 1841, 255,650; in 1861, 395,503; and in 1871, 477,732, In 1877 the dwelling-houses numbered 105,062, and the rental exceeded £3,250,000,

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Plan of Glasgow (central portion).

Unlike the “grey metropolis-of the north,” Glasgow | church of St Mungo, and that as the site was pleasant, and

shows rather poorly in the history of Scotland. Its own real history—the history of its commerce and iudustries—can hardly be dated farther back than the beginning of the last century, when the union of England and Scotland roused into extraordinary activity the trading spirit of its inhabit-ants. And yet Glasgow is an old city. Its foundations were laid when the half-mythical Kentigern sat down by the banks of the Molendinar, to teach the rough Celts of Strathclyde the truths of Christianity. It was about the middle of the 6th century that this apostle of truth made his appearance in the west of Scotland, and built his little wooden church on the spot upon which sone centuries later his successors reared the noble cathedral which still stands in perfect beauty. One can only guess that the inhabitants of this portion of Strathclyde gathered round the abode and

the Molendinar and the Clyde supplied ample store of trout and salmon, the village under the fostering care of the monks grew slowly till it became a place of importance. Of that growth, however, nothing is really known till we reach the 12th century. In the year 1115 an investigation was ordered by David, then prince of Cumbria, of the lands and churches belonging to the bishopric of Glasgow, and from the deed which still exists it is evident that at that time a cathedral had been endowed. A few years later David succeeded to the Scottish throne on the death of his brother, Alexander I., and among the many endowments he made for religious purposes, we find that he gave to the see of Glasgow the lands of Partick, besides restoring many possessions of which it had been despoiled. Jocelyn was bishop of Glasgow for a long period, and is memorable for

the efforts he made to rebuild the cathedral which had been | took place between the parties at the Butts to the east of

destroyed by fire. He collected funds with so much success that in 1197 the new structure was sufficiently advanced to be dedicated. The next bishops of note were Bodington and Wisheart. The former carried on the build- ing work of Jocelyn; the latter was a patriotic Scot who resisted the conquering army of Edward I., and was among the first to join in the revolt of Wallace, and to receive Robert Bruce when he was proscribed by Edward and lay under the ban of the church for the murder of the Red Comyn. Wisheart was a prisoner from the year 1306 to the battle of Bannockburn, and he lived to see Bruce firmly established upon the Scottish throne. Bishop Rae deserves mention for having built a stone bridge over the Clyde (1345). Bishop Turnbull was the greatest benefactor the city had till then found ; for he was the founder of Glasgow university (1450). He also received a charter from James II. in 1420, erecting the town and the lands of the bishops into a regality. In 1491 the see was made metropolitan through the influence of James IV., who had been a canon of the cathedral in early life. The last Roman Catholic arch- bishop of Glasgow was James Bethune, consecrated in 1552. At the Reformation in 1560 the archbishop fled to France, carrying with him all the relics, documents, and valuables belonging to the see. The cathedral, upon which so much care had been bestowed by the successors of Bishop Jocelyn, very nearly suffered the devastation which was inflicted upon so many abbeys and churches by the more bigoted of the Reformers. It was saved by the craftsmen of Glasgow turning out in their strength and chasing away the destroyers of the ‘ rookeries,” who had already begun to lay sacrilegious hands upon the venerable building. After the Reformation, and till the Revolution of 1688, which re-estab- lished Presbyterianism as the religious form of worship in Scotland, the see of Glasgow was occupied by a. number of archbishops, the tenure of whose office in many cases was precarious. The most notable fact after the Reformation in the history of the Glasgow Church was the Assembly of 1638 which was held in the city, when Episcopacy was energeti- cally abjured, the Solemn League and

Covenant accepted, and its signature made binding upon all who claimed the ordi- nances of the Presbyterian Church. The fact that the craftsmen were zealous for the preservation of their fine old cathedral indicates probably that the Reformation doctrines were not recciyed so enthusiastically in Glasgow as in many other places in Scotland ; but they took deep root latterly, and in the struggles for religious and civil liberty in the 17th century the inhabitants were among the foremost to assist and endure in the good cause.

Glasgow owed its erection into a burgh to its ecclesiastic lords. One of these obtained a royal charter from William the Lion in the last quarter of the 12th century (between the years 1175 and 1178), which made the town a burgh, and gave it amarket with freedom and customs. Another charter, it is supposed, was granted in 1190, and according to a deed dated 1268 the town was governed by a provost and bailies, and had courts of justice for settling disputes among the inhabitants. There are no records, however, till almost quite recent times. A few incidents of national history with which Glasgow was connected may be noted, to fill up the blank from the period when it was an ecclesi- astical town to the date at which it started its great career as the capital of Scottish industry and commerce. Wallace fought one of his successful battles for Scottish liberty in the High Street of Glasgow in the year 1300. In 1350 the plague raged in the city, and returned thirty years after- wards, though not in so severe aform, About 1542 the bishop's castle, which was garrisoned by the earl of Lennox, was besieged by the earl of Angus, then regent, and after its surrender on terms which were dishonoured, a skirmish

the town. The regent's troops were successful, and to punish the inhabitants for their devotion to the Lennox family the town was pillaged. The unfortunate Queen Mary visited her husband Darnley when he lay ill at his father's house Limmerfield, near Glasgow—a visit which afterwards was made of fatal significance to her when her case was heard before Queen Elizabeth in council, The inhabitants of Glasgow had no liking for the fair queen, for many of them fought against her at the battle of Lang- side, where she lost her crown and kingdom. Glasgow seems to have been fairly prosperous after the accession of James VI. and the union of the crowns of England and Scotland. It was recovering from the loss which it sus- tained

by the Reformation through the dispersion of the wealth of its ecclesiastical lords. A little trade was spring- ing up with foreign parts, chiefly with the Low Countries, But the city suffered somewhat severely in the reign of Charles I. Its inhabitants had become fiercely anti-pre- latical, and were obnoxious to the ruling powers. When Montrose in his victorious course marched into the city after the battle of Kilsyth he levied a heavy contribution, although the city was suffering at the time from one of the periodical visits of the plague. In 1648 the provost and his bailies were deposed for contumacy to Charles I., and were imprisoned for a few days, while four regiments of foot and horse were quartered on the magistrates, council, and session. Plague and famine prevailed during the following year; in 1652 there was a great fire which destroyed about a third of the town and £100,000 worth of property. After the restoration of Charles II., and during the persecutions of his and his brother's reign, Glasgow suffered severely. It was a centre of dis- affection against the Government, the headquarters of the Whigs of the west of Scotland. Glasgow prison was filled to overflowing with the rebels, as they were called, and it is a proof of the sympathy with which they were regarded by the citizens that on the occasion of another great fire in 1678 the doors of the prison were thrown open, and the prisoners set at liberty. The Govern- ment retaliated by sending an army of wild Highlanders to the city, who savagely oppressed the inhabitants and roused up the spirit of resistance which vented itself at Loudon. Hill and Bothwell Bridge. With the Revolution peace and prosperity came to Glasgow, only to be partially interrupted by the risings in 1715 and 1745. A regiment of 500 men was raised in Glasgow to support William and Mary and Presbyterian rights and privileges; and in return the city was declared free by a charter, the citizens having the right of electing their own municipal rulers.

Glasgow was not aware of the vast benefits that were conferred upon her by the union of England and Scotland in 1707. The measure was stoutly resisted by the inhabi- tants, and its proclamation nearly led to a riot; but the merchants very soou saw that by the water highway which flowed through the town they could have access to the pro- fitable trade that had been opened up in North America. Glasgow's situation for the western foreign traffic was the best in Scotland, and inferior to none of the great towns of England. The Treaty of Union put every Scottish port, so far as trade was

concerned, on an equal footing with the English ports ; and there was no reason why Glasgow should not share in the wealth which in ever-increasing amount was yearly coming across the Atlantic. As has been already stated, after the troublous times of the Reformation the trade prosperity of Glasgow was considerable. In the middle of the 16th century there were ten towns in Scot- land above it in population and importance, but by the close of the 17th century it had risen to the second rank, with a population of about 10,000 or 11,000. This

increase is to be ascribed to the monopoly which the in- habitants had secured in the middle of the 17th century of the sale of raw and refined sugars for the most of Scot- land. Besides this they had the right of distilling spirits from molasses free of duty; they conducted a consider- able trade in cured herrings and salmon, were manufacturers of soap, and sent to the English ports hides and linen, bringing back in exchange tobacco and manufactured goods, which they distributed north of the Tweed. Bristol was then the great emporium of tobacco, and Glasgow's com- mercial connexions with it naturally turned the attention of its traders to that lucrative branch of commerce. When it became possible for Glasgow merchants to enter into competition with the merchants of Bristol, companies were formed to carry on the trade with the North American colonies, and a large trade was soon established. Ships were chartered, and as wealth poured in were built, and sailed regularly for Virginia, Maryland, and Carolina, taking out goods in barter for cargoes of tobacco. In 1760 Glasgow had completely rivalled Bristol in the tobacco trade, and in 1772 its importations were more than half of the entire quantity brought into the United Kingdom. The Virginian trade being exceedingly lucrative, Glasgow flourished under it. Thetown rapidly extended westward, handsome mansion- houses for the "tobacco lords" were erected, and the austerity of manners which had come down from the covenanting days was somewhat relaxed. The money made by tobacco found its way into other branches of commerce and stimulated new industries. The tobacco trade however received a crushing blow at the outbreak of the American War,—a blow from which it never wholly recovered, for after the war was over, and the thirteen colonies had become the United States of North America, Glasgow

was engaged in other commercial enterprises. The distress in the city was keen during the first years of the war, and Glasgow capital- ists turned their attention to the West Indies and the culti- vation of the sugar cane. The manufacture of cotton goods was introduced also about this time, and proved a new source of wealth and prosperity. Calico printing, which was soon to develop into a great industry employing thousands of persons, was started at Pollokshaws in 1742; the inkle loom was set up in 1732; glass-making was established ina feeble way in 1730; and the brewing of beer and ale on a large scale was attempted with success. In 1764 James Watt perfected his first model of a steam engine in asmall workshop, which had been granted to him by the senatus of the university, within the college walls. From the Treaty of Union down to the end of the 18th cen- tury, the progress of the city had been remarkable. In 1708 the population was estimated to be upwards of 12,000 ; at the end of the century it was close upon 80,000.

The Harbowr.—The energies of the traders of Glasgow were naturally somewhat confined by having a port so far away as Port- Glasgow, and there is little wonder that, when their commerce began to extend, they should have cast about for plans to deepen the water-way and enable them to bring their merchandise to their own warehouses in the city, The task which lay before them was one involving numerous difficulties. ‘ A hundred years ago,” says Mr Deas, the engineer of the Clyde trust, in his interesting sketch of The Rise and Progress of the Harbour of Glasgow, “ the river was almost in a state of nature, and was fordable on foot at Dumbuck Ford, more than 12 miles below Glasgow.” As early as 1566 the authoritics of the towns of Glasgow, Renfrew, and Dumbarton endeavoured to remove a sandbank, a little above the latter town, and though operations were intermittingly carried on for some years, they do not appear to have been very successful. Prior to 1658 the shipping port of Glasgow was Irvine in Ayrshire, but the passage of lighters from that place was tedious and the land carriage expensive. 1t was determined in 1658 by the magistrates of Glasgow to purchase ground at Dumbarton, and construct a spacious harbour there. The magistrates of that royal burgh, however, objeeted, on the plea that “‘the great influx of mariners and others would raise the price of provisions to the inhabitants.” The Glasgow authorities, how- ever, were determined to have a harbour nearer than Irvine, and in

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1662 they purchased 13 acres of ground on the south side of the river (now Port-Glasgow), where they built harbours and constructed the first graving doek in Scotland. In 1688 a quay was built at the Broomielaw, although nothing had yet been done for the deepening of the river. It was only after the city had expericnced the vast importance of foreign traffic that the magistrates, most of whon were "‘ tobacco lords," seriously turned their attention to the ques- tion. In 1740 the town council authorized the expenditure of £100 in making a deepening experiment below the Broomielaw quay, and fifteen ycars later they employed Smeaton the well-known engineer to report on the subject. He found the two shallowest places at the Pointhouse Ford, now the western boundary of the harbour, and at Hirst, now within the harbonr. The depth at low water at the former was 15 inches and at the latter 18 inches, while at high water it was 3 feet 3 inches and 3 feet 8 inches respectively. Smeaton proposed a lock and dam, four miles below Glasgow Bridge, so as to secure 4 fect 6 inches of water at the Broomielaw quay. Fortunately his report was not adopted. In 1768 the first begin- nings were inade on the report of Mr John Golborne, who suggested the contraction of the river by the construction of rubble jetties and the removal of the shoals by dredging. Jamcs Watt reported in 1769 to the magistrates on the declivity of the bed of the Clyde from Broomielaw quay to that obdurate obstacle Dumbuck Ford. In 1773 Mr Golborne contracted with the town council to make this ford 6 feet deep at low water and 300 feet wide, and carried out his contract successfully in1775. Rennie reported on the river in 1799, and recommended "‘ the shortening of some of the jetties, the con- struction of new ones, and the building of low rubble walls from point to point of the jetties so as to render the channel uniform, and prevent the accumulation of shoals." His suggestions were carried out, and upwards of 200 jetties were constructed betwecn Glasgow and Bowling, the result being a considerable improvement in the navigation, and reclamation of land to the proprietors on both banks from the alveus of the river, the greater portion of which has since had to be purchased at high prices for other improvements. Telford reported in 1806, and Rennie again in 1807, and the deepening wpeneaes went on without pause. In 1836 the engineer of the Clyde Trust reported to the trustees that there was then from 7 to 8 feet of water at the Broomielaw quay at low water, that the lift of a

neap tide, which was only sensible in 1755, was 4 feet, and of a spring tide 7 or 8 feet, making a depth of 12 feet at high water of a neap and of 15 feet of a spring tide. The river had become capable of taking craft of 400 tons to Glasgow. In 1840 parliament sanctioned an Act for carrying out plans for the further improve- ment of the navigation of the entire river under the jurisdiction of the trustees. Upon the lines then laid down the improvements have ever since proceeded, with only very slight modifications, but the result may probably be best expressed in the following figures. In 1839 vessels of 17 feet draught of water were safely navigated to and from the harbour, in 1854 of 19 feet draught, in 1861 of 20 feet draught, in 1862 of 21 fect draught, and in 1870 of 22 feet draught. Only a few years ago vessels of 15 fect draught were two and often three tidcs in the river in their passage up and down, but now vessels of 22 feet draught leaving Glasgow two or three hours before high water get to sea in one tide. The rapidity of the deepening process has been due almost entirely to the powerful steam dredgers employed by the trustees, to the use of the diving bell for blasting purposes, and latterly to the introduction of steam drilling and dynainite. The quantity of dredged matter taken from the river every year is somewhere about a million and a quarter of tons, which is carried off by barges and deposited in Loch Long, an arm of the Firth running up into the Western Highlands. During the last thirty-one years upwards of 20 million tons have been dredged from the river, and since the year 1770 the cost for dredging and depositing alone has been between £500,000 and £600,000. The total expenditure upon the river since the year above named has been upwards of seven millions sterling ; and the revenue, Which a hundred years ago was £1733, is now about £210,000. The first dock constructed at the Glasgow harbour was opencd so late as 1867. Though Acts of Parliament had been obtained more than twenty years before, the sides of the river were utilized for quayage extension ; but within the last ten or twelve years the pressure for space became very great, and the new dock, which is tidal, and covers 53 acres of water space, was found to be quite inade- quate. A new Act was obtained in 1870 to construct docks at Stob-cross, and these, which are now nearing completion, will have an area of 30 acres, and will accommodate one million tons of shipping. The estimated cost, including the purchase of land, is £1,163,000.

The traffic on the Clyde received an extraordinary im- petus by the application of steam to navigation, and from the date of the " Comet," which was built on the Clyde in 1811-12 for Mr Henry Bell, Glasgow has been the true home of steam navigation. The steam shipbuilding trade has become one of the largest industries of the city, and with its growth the commerce of Glasgow has kept pace.

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The river has been the fruitful source of the city's greatness. As the accessibility of the water-way became greater year by year, so the commerce and the industries of tle city developed, and the material wealth increased. Glasgow, too, is fortunate in being the centre of an enormous coal and iron field, in the working of which she has greatly benefited. Her industries, now very numerous, are re- ferred to in detail below. They embrace almost every species of manufacture to be found in Great Britain; and this variety is probably the reason for the all but uninterrupted prosperity of the city, for it is rare that every department of manufacture and commerce is dull at the same time. Her resources are so numerous that she is not much affected by stagnation in one or two branches. But Glasgow' has undoubtedly come through one or two crises of a serious character in the course of her industrial career. In 1857 the failure of the Western Bank struck a hard blow at her trade and commerce, though it was wonderful how soon she recovered from the heavy loss and the derangement of commercial affairs which were caused by the failure. The American Civil War paralysed the cotton manufactures of Glasgow, as it did those of Lanca- shire ; but otherwise it did little harm, and the stimulus that was given to shipbuilding by the carrying trade of the world practically falling into British hands more than compensated for other losses. The close of the American War was followed by a period of commercial and industrial activity in the city, which, however, sustained a severe check within the last two years, during which time trade has been languishing everywhere. While enterprising citizens were looking forward with some slight hope for signs of a revival, the collapse of the City of Glasgow Bank on the 2d October 1878 fell upon them like a thunderbolt, In a few days after the stoppage it was known that matters were ~~far worse than the most sinister prophet of evil could have imagined, much less foretold. The whole of the capital and reserve of the~~

bank, amounting to close upon a million and a half sterling, was squandered, and nearly five and a quarter millions besides. The total loss cannot be set down at much less than eight millions sterling, and the most of this enormous sum had gone to support great Indian and colonial firms, which had been hopelessly bankrupt for years. The inquiry into the affairs of the bank revealed such recklessness and misconduct on the part of some of those who were responsible for its manage ment that the manager and the directors were tried on a charge of fabricating and uttering false balance sheets. They were all convicted, and sentenced to varied terms of imprisonment. Since this gigantic failure Glasgow has been passing through the greatest crisis of its existence. Administratian.—The affairs of Glasgow are managed by a corporation consisting of 48 representatives of the 16 wards into which the city is municipally divided, and by one representative from the Trades' and one from the Merchants' House. The lord provost is the head of the corporation, and is assisted in his executive functions by 10 bailies. The bailies hear and decide cases in the police courts, aided by assessors, who are local legal prac- titioners of good standing. There is also a stipendiary magistrate who sits every day in the central police court, and undertakes the heavier portion of the cases. The dean of guild court has a certain jurisdiction over the construc- tion of new and the alteration of old buildings. The corporation of Glasgow, since it became popularly elected, has shown great and enlightened interest in the welfare of the city. It has during the last quarter of a century acquired three public parks for the recreation of the citizens, and laid them out in an ornamental manner. Within the same period, too, it has undertaken and carried out immense works for a supply of water unequalled in

the kingdom, has bought up the old gas-works and supplies artificial light within and beyond the municipal boundaries, and is at present engaged in bringing to a successful close a series of city improvements on a very large scale.

City Improvements.—As the last-mentioned work is the most important upon which the corporation has been engaged since the introduction of Loch Katrine water, and formed the model upon which Mr Cross, the home

secre- tary, framed his Artisans Dwellings Act, a slight sketch of the plan upon which it was founded nay be given here.

The city had grown go fast in population during the present cen- tury that it had become greatly overcrowded, especially in the central portions. From the leading thoroughfares of High Street, Saltmarket, Trongate, Gallowgate, and Argyll Street long narrow closes and wynds penetrated into the densely-built spaces behind. The population in these regions varied from 400 to 1000 per acre, and the dirt, darkness, and foul air in which the poor creatures lived, made their homes breeding-places of fevers and disease of every kind. In some of the worst spots the death-rate was 70 per 1000 per annum. The closes and wynds, besides being dens of disease, were the haunts of the criminal class of the population, who were able to dispose of their plunder and escape the police with comparative ease in these deep alleys, many of them connected with each other by ways only known to the experienced criminal. Some benevolent citizens made a small effort at improvement about twenty years ago, by buying up one of the most notorious of these closes; but it was not till the City Union Railway was projected that the attention of the municipality was fairly called to the question, or that any step was taken byit. The Union Railway passed through some portions of the old town which were densely overcrowded, and it was suggested by the late Mr Blackie, who was then chief-magis- trate, that the corporation might work in harmony with the railway company, and clear out old and densely-crowded properties, which the railway only touched at certain spots. Mr Carrick, the city architect, drew out improvement plans, and in 1866 an Act was passed by parliament enabling the corporation to acquire old over- crowded localities, to borrow money, and to levy rates. The improvements contemplated involved the destruction of 10,000 houses, all of them really unfit for habitation, but which were filled by upwards of 50,000 souls. The corporation was bound by the Act to find accommodation for the dispossessed when the numbers exceeded 500. In point of fact, the corporation never required to build houses, as private enterprise more than kept pace with the operations of the improvement scheme. By the Act the corporation was empowered to borrow £1,250,000, and to levy a rate of 6d. per pound on the rental for five years, and 3d, per pound for ten years, by which time it was calculated the whole work would be completed. No sooner was the Act passed than the

trustees—all of them mem- bers of the town council—proceeded ta purchase the properties scheduled, a delicate and difficult task, which, however, was most economically carried out, first by Sir James Watson, and afterwards by Mr James Morrison, the conveners. The work of demolition also went on; the densely-built districts were cleared out, open Spaces and squares secured, streets driven through huge blocks of building, others widened, till now there is hardly a remnant lett of the old notorious abodes of fever and crime. There is still a good deal to do, and it may be hecessary to get an extension of the time fixed in the Act, as it expires in 1881 ; but up to the present time upwards of 30,000 people have been turned out of their unhealthy homes, and have been provided with better ones elsewhere. So far the improvements have been very cheaply executed. The great amount of demolition effected by the trustees and the railway companies greatly raised the value of building ground in the central portions of the town; and the corporation has been able to sell the properties which it had acquired at considerable profit, after utilizing large portions of them for streets and open spaces. The cost to the citizens will be the rates which have been and are to be levied; but perhaps to this should be added an uncertain amount represented by the rise of house rents. Up to May 1878 the sum raised by rates was £305,867; and, adding to that other three years' rates, the total amount which the improvements will cost will be about £375,000, £40,000 of which was spent in buying a park for the use of the people in the north-eastern district of the city.

Public Health:—The result of these improvements has been a marked decrease in the mortality. In 1866 Glasgow was one of the least healthy towns in Great Britain 5 it 1877 it was nearly as healthy as London. In 1866 the annual death rate was 29-6 per thousand, and continued slightly rising or falling till 1875, when there was a fall to 28-7, This was the year in which the work of the improvement trustees began to tell. In 1876 the death

rate was 25:2 per thousand, in 1877 it 'ell ao and in

1878 it was 25:0. The improvement scheme has done good otherwise in directing attention to sanitary questions of all kinds. There is now in Glasgow a public department of health, at the head of which there is a most

efficient medical officer, and provision has been made for the isolation of contagious diseases immediately on their break- ing out. Great attention is paid to cleansing the city, and fever epidemics, which not long ago were seldom absent, are now very rare, and hardly ever assume large propor- tions. Crime has also diminished as one of the results of the city improvements, and its detection is much surer.

There can be no doubt that the demolition of so large a number of small dwelling-houses in such a short period was no small grievance to those who inhabited them ; not that there ever was any lack of accommodation, but because families had in many cases to remove to places at incon- venient distances from their work, and into houses which, though much better in a sanitary sense, were somewhat dearer. The distance difficulty, however, was greatly mitigated by the construction of tramways throughout the town, and by the authorities providing for the running of morning and evening workmen's cars at exceedingly low fares; and it is scarcely doubtful that the change from unhealthy and overcrowded houses into others roomier and built with some regard to sanitary principles has been a blessing to the lower class of the population. When the works are completed, Glasgow in its older regions will be a city transformed.

Water Supply.—Previous to 1859 Glasgow was supplied by water from the river Clyde and from ponds erected some miles south of the city, to which the water was conveyed by gravitation. The supply was insufficient, and the Clyde water bad. In 1848 the idea of bringing water from Loch Katrine was first spoken of. The citizens at that time began to see that something far more extensive than had ever been attempted was required to supply the rapidly growing wants of the city. Between 1848 and 1855 many schemes were proposed by the water companies and by private individuals, none of which came to anything. In 1852 the corporation took the matter up, and, after a long and arduous struggle, the Act for tapping Loch Katrine was carried in 1855. The corporation itis believed would have been defeated again but for the attention which Lord Palmerston paid to a subject in which Glasgow was so deeply interested, and for the influence which he brought to bear in favour of the works. The engineer selected to bring the water from a distance of 34 miles was Mr J. F. Bateman, and four years after the

passing of the Act the waters of the Highland loch, at the touch of Her Majesty the Queen, flowed into the city.

The sources of the supply are Loch Katrine with a surface of 3000 acres, Loch Vennacher with an area of 900 acres, Loch Drunkie 150 acres,—altogether about 4000 acres of water surface,and containing within the limits to which they may be raised or lowered about 1,600,000,000 cubic feet of water. The drainage area is 45,800 acres, and the rainfall is from 80 to 90 inches per anuum. The source is ample for the supply of a population double that which is at present supplied, but ‘tee works are not more than sufficient to provide 50,000,000 of gallons of water per day, and it will be necessary before many years are past to construct other works, probably to double that quantity. Loch Katrine is 360 feet above the tide at Glasgow, which, allowing for the loss of fall, secures a pressure of 70 or 80 feet above the highest summit in the city. The water is conveyed by mined tunnels, built tunnels, aqucducts, andiron pipes. There are altogether 70 tunnels, one of which is 2650 yards and another 2325 yards in length, and 8 feet in diameter. One of these works is 600 feet below the surface. The aqueducts over rivers and ravines of an important character are 27 in number; some of these are of iron and some of masonry. Twenty-six niiles from Loch Katrine and 7 or 8 from Glasgow a large reservoir was constructed, 70 acres in extent and capable of holding 500,000,000 gallons of water; and from this reservoir the water, having undergone a filtering process, is conveyed in pipes to Glasgow. The, engineering cost of the works was £700,000, or ten per cent.

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above the estimate, but as the contract was only for 20,000,000 gallons per day, and the actual product was 30,000,000 gallons, the cost cannot be said to have been excessive. There have bcen great additions made to the works since they were opened in 1859, the total capital expenditure at the end of 1877 being a little over £2,000,000. The quantity of water brought into the city from Loeh Katrine is now 30,000,000 gallons per day, but the area of distribution is much larger than Glasgow. Ina very short time the corporation will be able to bring in 50,000,000 gallons a day, which is the limit of the capacity of their present works. ‘The cost of the water to the

inhabitants is 8d. per pound on the reutal, and 1d. per pound is charged for public purposes. The quality of the water is excellent, and there can be no doubt that it has been an active agent in improving the health of the city. Besides the Loch Katrine works there is a supply of water from the Gorbals gravi- tation works amounting to rather more than four millions of gallons per day. The consumption of water over the area of distribution is thus 34,000,000 gallons in the 24 hours, or 45 gallons for every nian, woman, and child,—a very large supply even when deduction is made for the watcr used in large public works, and for purposes other than domestic.

Lighting.—In the parliamentary session of 1868-9 the corporation applied for and obtained powers to purchase the works of the two gas-light companies which had until that period supplied Glasgow and its suburbs with gas. The capital of these companies consisted of £415,000, on £300,000 of which the shareholders were entitled to profits not exceeding 10 per cent. per annum, the remaining £115,000 paying dividends at the rate of 74 per cent. per annum. ‘The corporation agreed to give for the works to the shareholders annuities of 9 per cent. on the stock which paid 10 per cent., and of 6% per cent. on the stock which paid 74 per cent. These annuities were guaranteed by a six- penny rate upon the whole rental within the municipality. Besides these rates the corporation took over mortgages amounting to £119,265. It is needless to state that, no rate has ever been levied upon rental for the maintenance of the gas-works, the manufacture having proved remunerative at a moderate charge per thousand cubic feet. The gas-works, as taken over by the corporation, were capable of producing 6,500,000 cubic feet; but since then they have been greatly extended at a cost of half a million sterling, and are now capable of making 12 million cubic feet of gas. The consumption varies between 2 million cubic feet in twenty- four hours in summer and 11 million cubic feet during the same time in winter. The area of supply includes nearly all the surrounding suburbs, in addition to the city. The cost of gas to the consumer is 4s. per thousand cubic feet, and no rent is charged for the use of meters.

Tramways.—The next project with which the corporation has had to do in recent years has been laying down lines of tramways along the principal throughfares of the city. This work was undertaken for the purpose of preventing the control of the streets and the street traffic from passing out of

the hands of the corporation; the cost was about £200,000 for 134 miles of tramway; but this sum, with interest at 44 per cent. per annum, is to be repaid in thie course of twenty-three years by the lessees, who also keep up the roadway between the tramway lines, and pay a rent of £150 per mile per annum. 'The fares are one penny per mile, and the number of passengers carried is very great. Pecuniarily the tramways have been successful.

Income and Expenditure.—The income and expenditure of Glasgow are larger than those of many a flourishing state. The trusts, which till quite recently were semi- independent, but are now simply committees of the town council, are the police board, the water commissioners, the gas commissioners, the city improvement trustees, parks and galleries trust, market trust, &c. The revenues which they collect and distribute amount altogether to close upon one million sterling per annum. The common good of the city, that is to say, property belonging to the corporation, is estimated as being worth about £300,000, the interest of which is expended in maintaining what are called the

city churches, and generally on municipal purposes for which the citizens are not taxed. The number of parlia- mentary voters in 1877-8 was 60,582, and the list of school-board electors, which includes all ratepayers, when the roll was last made up, numbered 112,897. Glas- gow returns three representatives to the House of Com- mons since 1868, each elector having, however, only two votes. Previous to this, and from the passing of the great reform measure of 1832, the city had only two representatives. Glasgow has a police force of about 1000 men, which is maintained at an expense of £78,000 per annum, half of which is paid by the Government. The sheriff-depute of Lanarkshire holds his court in Glasgow, and is assisted by five sheriffs-substitutes resideut in the city. The amount of legal work which is gone through in the disposal of civil and criminal cases is very great, being equal to about one-third of the whole disposed of in Scot- land, including the supreme courts in Edinburgh.

Bridges and Railway Stations—There are three fine bridges over the river within the municipal boundaries, and two iron suspension bridges. One railway bridge was erected a few years ago by the City Union Railway

Company, and another by the Caledonian Railway Company is now nearly completed. All the bridges are free. Glasgow is the centre of a vast railway system, the Cale- donian and Glasgow & South-Western Railways having their termini in the city; these work with the great English lines, the Midland and the London & North-Western Com- panies. The St Enoch's Square station, which provides for the traffic over the Glasgow & South-Western, City Union, and Midland Companies, is one of the most spacious in the United Kingdom. The same companies are erecting an equally commodious goods station in High Street; the Caledonian Company, finding themselves greatly liampered for room at the old terminus in Buchanan Street, are building a colossal structure in Gordon Street; and the North British Company, which have their headquarters in Edinburgh, are greatly extending their present limited accommodation in Dundas Street.

Public Buildings.—There are not many of these of im- portance in Glasgow. The one which naturally attracts the greatest attention of strangers is the cathedral, which is now in a complete state of repair, and a few years ago, through the munificence of Glasgow citizens and of noble- men and gentlemen of the vicinity, its windows were filled with richly stained glass from one of the great stained glass establishments of Munich. The cathedral is acknowledged to be a fine specimen of Early English Gothic. It is situated in a good position in the north-east quarter of the city, and is about 104 feet above the Clyde level. Its form is that of a Latin cross with short transepts. The length from east to west is 319 feet, its breadth 63 feet, the height of the choir 93 feet, and of the nave 85 feet, At the intersection it has a tapering octagonal spire, the height of which is 225 feet. It contains 147 pillars and 159 windows. The crypt under the choir is exceedingly fine and complete. The Royal Exchange in the centre of the city contains a newsroom 122 feet in length by 60 feet broad. Its portico is formed of 12 fluted Corinthian columns, supporting a rich frieze and pediment; the north and south sides of the building are ornamented by a colonnade of Corinthian pillars. The Royal Infirmary is in the Roman style of architecture from a design by Adams. It has been greatly extended since its erection in 1792. The City Hall is a plain building capable of holding up- wards of 3000 people. The new Public Halls, opened in 1877, are the most recent addition to the architecture of the city. The building cost upwards of

£80,000, and since its opening has been mainly used for musical entertainments, music being one of the arts which has been

cultivated with the greatest success in Glasgow of late years, The principal hall in this fine building, which is of the classic style of architecture, is capable of holding between 4000 and 5000 persons. By far the grandest building in Glasgow, however, is the new university structure on Gilmorehill, which is described below. During the last thirty years a vast improvement has been made in Glasgow in church arehitecture. Dissenters who were satisfied in the earlier part of the century with plain meeting-houses now vie with each other, and with the Church of Scotland, in the elegance and adornment of their places of worship. There is probably no town in the United Kingdom which has spent more upon ecclesiastical buildings in recent times than Glasgow, or which in this respect has made greater improvements in taste. The Roman Catholics and Episcopalians, nearly one-fourth of the population of the city, have also erected some very fine ecclesiastical edifices. The street architecture of Glasgow has greatly improved, many of the large business firms having rebuilt their warehouses upon a splendid scale. The new post- office buildings in George Square also deserve mention, The work of the post-office of Glasgow has increased with the increase of the city, and is now practically larger than that of any other town save London. It was found necessary a few years ago to extend the accommodation, and now the greater part of one side of George Square is devoted to postal and telegraph purposes, Tle new buildings are plain but massive, and seem to have been planned on the principle of the least ornament with the most room. The corpcration have obtained an Act for tlie erection of municipal buildings on the east side of George Square. Not without reason has Glasgow been called one of the best built cities of the empire, its substantial masonry owing much to the excellent quality of the material, a sandstone quarried in abundance all round the city.

Statues.—The public statues in Glasgow are not numer- ous, though several of them are very fine. Most of them are in George Square. The equestrian statue of the great duke of Wellington stands opposite the inain entrance to the royal exchange, and that of William III. is close to the junction of

Trongate with the Saltmarket, High Street, and Gallowgate, the ancient cross of thie city. In George Square there are equestrian statues of tle Queen and the late Prince Consort, a seated figure of James Watt, statues of Sir John Moore, Lord Clyde, Sir Robert Peel, Sir Walter Scott, James Oswald of Auchincruive, Thomas Graham the celebrated chemist, Robert Burns, Tlomas Campbell, and David Livingstone. The statue of Burns, executed by Mr George E. Ewing, a Glasgow sculptor, was subscribed for in shillings by the working classes of Scotland,

University and Schools.—Of the educational institutions of Glasgow precedence must be given to the university. As already stated this great seminary of learning was founded by Bishop Turnbull, who obtained a papal bull for the purpose, dated 7th January 1450. By this bull a corporate body was formed, consisting of a chancellor, rector, and dean, with doctors, masters, regents, and students, in the several faculties into which it was divided. One of these was known as the pedagogium, or college of arts. This school of learning was first situated in Rottenrow (1459). James, Lord Hamilton, bequeathed to the principal regent of that college some buildings and several acres of land, on part of which in the High Street the college was afterwards erected. The college of arts was restored and endowed by James VI. During the period which intervened between 1577 and 1688 the university underwent many changes ; but in the year 1693, each of the Scottish colleges having received a grant of £300 per annum out of the bishops' rents, the Glasgow institution again revived ; and having

received other public and private gifts, its progress has been since uninterrupted. The academic body of the uni- versity consists of the chancellor, the lord rector, the dean of faculty, the principal and vice-chancellor, and the pro- fessors. The whole business of the university is transacted in three distinct courts, viz., the senatus, the faculty, and the comitia. There are many bursaries connected with the college, the most important being those bequeathed by Mr Snell, by Mrs Black, the widow of a late minister of the Barony church, and by Mr Orr-Ewing, M.P. for Dumbartonshire. The college buildings in High Street were principally erected in 1593 and 1658. The spire, which was 153 feet in height,

possessed a lightning con- ductor which was reared under the auspices of Franklin in

17-72.

The present university buildings at Gilmorehill occupy a magnificent site above the Kelvin, overlooking the Kelvin- grove Park, and commanding a splendid view of the valley of the Clyde. In 1860 the commissioners under the “ Uni- versities Scotland Act” reported that in the interests of the university it was necessary that the college should be re- built, and that the site which it occupied in High Street was most ineligible for the purpose of the university. In 18638 the promoters of the City of Glasgow Union Railway Company offered to purchase the college grounds for the sum of £100,000, which was ultimately accepted; and dur- ing the negotiations Government offered to give £21,400, on condition that £24,000 for the erection of an hospital was raised by private subscription. On the 29th July 1864 the lands of Gilmorehill, consisting of 43 acres, were purchased by the senate for £65,000 ; about six months later the adjacent lands of Donaldshill were secured for £16,000, and the property of Clayslaps, containing 5 or 6 acres, was bought for a hospital site for the sum of £17,400. Part of the lands of Gilmorehill not required for the university were advantageously sold to the corporation of Glasgow. Sir Gilbert Scott was appointed architect of the new buildings at the end of September 1864, and the plans were completed and approved of in the beginning of 1866. The estimated cost of the bnilding, including hospital, was £266,000,—a sum far beyond the means of the university authorities. The citizens of Glasgow, however, came heartily to their help, and subscribed liberally to the building fund. In January 1868 Government agreed to give £120,000, on condition that the same amount was raised by private sub- scriptions. ‘The work at once progressed under these assur- ances of support, and on the 8th October 1868 the founda- tion stone of the new buildings was laid by the Prince of Wales. In 1870 the buildings were so far completed that the removal from High Street took place, the last meeting of the senatus in the old college buildings having been held on 28th July of that year. The financial difficulty, however, proved a very serious one. The cost of the build- ings greatly exceeded the estimate, and went far beyond the funds placed at the disposal of tlie senatus, although the public subscriptions amounted to nearly

£160,000. The fine building is therefore up to the present time incomplete. The tower had to be stopped when less than half-way up, and the grand hall, designs of which were prepared by Sir Gilbert Scott, is still untouched. The senatus, however, has now been practically relieved of its difficulties by the splendid contributions of the marquis of Bute and of Mr Charles Randolph, one of the pioneers of steam shipbuilding on the Clyde. The marquis has given £40,000 for the erection of the common hall, and Mr Randolph bequeathed £60,000 for the completion of the buildings. With these sums at its disposal the senatus will no doubt in a few years finish this noble structure, and it will then be unequalled, so far as the building is concerned, as an educational institution,

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The following notes, descriptive of the new buildings, are from the pen of the architect :—

The architcctural style of the building is founded on that of works of the 14th century, subject to some modifications introduced with a view to giving the building a character allied to that of the old Scottish buildings. It is probable, however, that during the 14th century this specific character may not have prevailed in Scot- land. It seems, in fact, to have been introduced from France ata later period, and worked up with so much originality into buildings in Scotland as to have become quite received as the style of the country. In France it had existed at least from the 13th century, so that what has been done in the design of the college is to trans- late back the characteristics in question, and to unite them with the general style of the architecture of tle 14th century, though in Scotland they may not probably have actually existed till a later date. As the building stands on the crown of a hill, whose principal and rapid slope is toward the south, it has been made to occupy, as far as may be, the whole of the ridge facing in that direction ly along and continuous front of about 540 feet in length. In advance of this lengthened facade is a system of terraces, bringing the ground down by gradual steps towards the Kelvin, which flows through a decp ravine along its base. The southern fagade comprises three more lofty portions, a central block and two corner towers, between which are two ranges of buildings of smaller elevation. The centre of the line of building facing the south is occupied by a lofty tower, through which, on the ground floor, is the principal entrance to the building. There is also a gateway through the centre of each of the lower ranges of building, arched and groined, leading into the east and west quadrangles. Another main entrance is provided in the central block of the northern range of building. This entrance consists of a double gateway, the passages from which turn round to meet one another in the basement within the building. Much in the same manner, the north side of the building is divided into five parts, the angle blocks forming towers, similar to those in front; but facing each quadrangle there is a building of great dimensions, one of which is devoted to the museum and the other to the library. Between these is a central block, in

this case of less ele- vation than the main side portions, containing the students' read- ing-room below and the hall of the Hunterian museum above.

The whole rectangular range of buildings, thus briefly described, is about 540 feet in length by 300 feet in breadth, occupying the greater part of the crown of the hill. From it to the west extend the different ranges of the principal's and professors' houses, while towards the south-east the outline is prolonged and diversified by the chemical laboratory, a partially detached building of octagonal form, and, at the north-east, by the anatomical rooms. The library and museum are alike in design. There are two great halls in each, oc- cupying respectively the ground and first floors, these being 129 feet long by 60 feet wide.

Anderson's College, formerly called Anderson's (or the Andersonian) University, was founded by John Anderson, professor of natural philosophy in the university of Glasgow in 1795, and endowed by him with valuable philosophical apparatus, a museum, and a library. It is governed by 81 trustees, and its object is to bring literary and scientific education within the reach of the mass of the community. Every branch of study taught in Glasgow university is provided for, with the exception of divinity. Drs Garnett and Birkbeck were the original professors of natural philo- sophy and chemistry; Dr Ure and Thomas Graham also occupied chairs in this college ; and it was there that the first mechanics' class was established in Great Britain. The trustees contemplate the removal of the institution to the west end of the city, where it is believed it will greatly extend its sphere of usefulness. The number of students in 1878 was 986; and those attending popular evening classes, at which lectures are delivered in various brauchies of science, numbered 992. :

The High School or Grammar School, formerly in John Street and under the charge of the corporation, is the oldest educational institution in the city. It appears that a grammar school existed in Glasgow early in the 14th century, being then dependent on the cathedral church. Up to 1834 its masters taught only Latin and Greek, but at that period the school underwent a complete alteration. Two of the classical masterships were suppressed, and in lieu of these teachers of English grammar, foreign languages, writing, arithmetic,

geography, mathematics, and drawing were introduced. The name was also changed

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from the grammar school to the high school. The school was up to 1873 under the control of the corporation, but it was in that year placed under the jurisdiction of the school board of the city. In 1878 the school was removed to Elmbank Street, to the premises occupied by the Glasgow academy—a commodious been greatly improved by the school board, and is now one of the best secondary educational establishments in Scotland. It has upwards of 500 pupils. There are other secondary schools in Glasgow that are doing good educa- tional work. Among these may be mentioned the Glasgow academy, the Kirklee academy, and the schools belonging to Hutcheson's hospital. There is also a Government school of design well attended, a technical school recently insti- tuted, the mechanics' institution, founded in 1832, for the purpose of diffusing a knowledge of science among the working classes, the athenzeum, which draws its students principally from the lower middle class, and the normal schools belonging to the Church of Scotland and the Free Church, for the training of teachers,

The passing of the Education (Scotland) Act in 1872 gave Glasgow an opportunity of dealing practically with the dense ignorance that prevailed within her boundaries. Before the Act passed it was believed that at least 20,000 (possibly far more) children in the city received no educa- tion whatever. The school board has persistently dealt with these uneducated waifs, and the most of this large ignorant mass have been reached. There are now not more than 3000 children of school age who are not receiving some education in the board and other schools. The school board rate in the city is 4d. per pound on the rental. The amount raised per annum is about £30,000.

Lnbraries, Museums, bc.—The libraries 0 pen to the public are Stirling's public library, a large collection of literature, and famous for its tracts of the 16th and 17th centuries, and the Mitchell public library, established a few years ago by the munificence of a citizen of Glasgow, who left about £80,000 for the purpose. This library is under the manage- ment of the town council, and during the short period of its existence has collected a large

number of valuable books. It is meant to be a consulting library. The college library is very extensive, but can only be used by alumni of the university. An industrial museum was instituted some years ago in the old residential building of the West End Park. “An addition was made to it about three years since, and the collection is now very considerable. It is supported under the Parks and Galleries Act, as are also the corpora- tion galleries of art, a collection of pictures and statuary, acquired partly by purchase but more largely by donation and bequest. The galleries contain a very valuable series of old Dutch masters, and there is a noble statue of Pitt by Chantrey. The Hunterian and Andersonian museums are accessible to the public. The Hunterian contains a noble collection of anatomical subjects, and a most valuable assortment of coins. There is a botanical garden in Glas- gow, but this has never heen worthy of the city.

Theatres.—The drama las always been tolerably well patronized in Glasgow, which now contains some half dozen theatres.

Commercial Institutions—The Chamber of Commerce was instituted in 1783, for the purpose of encouraging and protecting trade, and keeping a watchful eye on whatever might be supposed to affect the commercial interests of Glasgow and its neighbourhood. There are eight banks and branch banks in the city, two of them being properly Glasgow institutions ; they are all joint-stock companies. In 1815 the first attempt was made in Glasgow to estab- lish an institution for the accumulation of the savings of the community, the Provident Bank. This and some others of a like kind in 1836 were all merged in the National

Savings Bank, which has had a most successful career. The deposits now amount to about £2,771,066, and the de- positors are 104,329 in number.

Parks.—The city is specially well provided with public

| parks, although not more than a quarter of a century has building. The high school has |

elapsed since it possessed only one—Glasgow Green—a noble expanse along the north bank of the river, which was long neglected and uncared for. Since that time Kelvingrove Park, in the Kelvin valley at the west end of the city, was acquired, and laid out under the direction of Sir Joseph Paxton, and it has been frequently added to. At a later date the Queen's Park, on the southern out- skirts, was formed; and subsequently the city improve- ment trust expended £40,000 on the purchase and laying-out of the Alexandra Park on the north east side of the city. These parks are all liberally maintained by the parks and galleries trust of the town council.

Glasgow has been almost exclusively a commercial city within the last half century. As wealth increased culture also increased, though more slowly. The university has always been the centre of intelligence in the city, and many of its professors have been conspicuous for their devotion to the applications of pure science to the development of the arts and manufactures, Of the great names connected with this institution it may suffice to mention Baillie, whose letters on the troubles of the 17th century, recovered by the late Dr Laing of Edinburgh, added considerably to our knowledge of that period, and Professors Adam Smith and Thomas Reid. James Watt, though not a member of the university, was generously protected by it when the burgesses of Glasgow refused to allow him to open shop within the jurisdiction of the trades house and magistrates of the city. There are many literary men, and poets of the minor class, who claim Glasgow as their birthplace, but none of them reached sufficient eminence to claim particular notice. Of the practical workers who by their mechanical aptitude, amounting in many cases to genius, have pushed on the industries of the city, it is impossible here to give even meagre biographical details. The commercial capital of Scotland has prospered more by the general energy and indomitable perseverance of its inhabitants than by the special genius of individuals.

InpusrriEs.—The most outstanding feature in the industrial position of Glasgow is the great variety and wide range of its manufacturing and trading activity. While no one of the great industries occupies a position of predominant importance so as to stamp itself as the peculiar characteristic of the town, there are numerous leading departments of industry which have been long established and are prosecuted on a great scale, while a variety of

special manufactures have found their principal centre in Glasgow and the Clyde valley. When to this fact is added the consideration that Glasgow is one of the three principal seaports of the United Kingdom, it will at once be obvious that the wealth and prosperity of the city are contributed to by many separate and im- portant streams. The circumstances and conditions which have favoured the establishment of the leading industries in Glasgow are quite as varied as are the industries themselves. The abundance of pure water in the hill streams around the city led at an early date to the introduction of bleaching, calico-printing, and allied pursuits ; and these, in their turn, reacted favourably on hand-loom weaving and other textile manufactures. In a similar way the first begin- nings of the now great chemical industries are clearly related to the carly stages of the bleaching and printing trades. The fact, how- ever, that the town is actually built within the richest coal and ironstone field in Scotland has had, of all causes, the most import- ant influence in determining the current and prosperity of local industries. Further, the river Clyde, rendered navigable for vessels of the largest tonnage, flowing through the centre of that great coal and iron region, presents incomparable facilities for the prosecution of shipbuilding and marine engineering. But beyond the advantages of natural position and mineral wealth it is right to say that Glasgow owes much of her industrial prestige to a long line of highly-gifted, ingenious, sagacious, and energetic citizens, whose influence has not only been stamped on local industries, but has been felt and acknowledged throughout the entire world.

The principal industries of Glasgow range themselves under the

heads separately noted below. — With respect to many of them it is a matter of regret that no trustworthy source of specific informa- tion exists; and thus the origin, vicissitudes, and progress of really important trades can only be recorded in vague and general terms. Textile manufactures.—The industries embraced under this head were the first which gave Glasgow a place among the great manufacturing communities ; but though, through many changes and fluctuations, they continue to yield cxtensive employment, they now occupy a comparatively secondary position. In the cotton trade, which originated about 1780, Glasgow possesses several

factories which are reckoned among the largest in the trade; the industry has, however, for a number of years been in a stationary if not declining condition. The manufacture of light textures has always been the leading feature of the Glasgow trade,—plain, striped, and figured muslins, ginghams, and fancy fabrics forming the staple. Thread manufacture, although specially a Paisley industry, is also extensively prosecuted in Glasgow. According to a return obtained in 1875 the whole cotton industry of Scotland afforded employment to 33,276 individuals, and excepting about 10 per cent. it was entirely centred in Glasgow and the surrounding district. Jute and silk are staples worked only to an inconsiderable extent in Glasgow, though about a century ago the manufacture of silk gauze flourished extensively, and has left traces of its former importance to the present day. The most characteristic of woollen and worsted manu- factures is carpet weaving, all the leading kinds of carpets being ex- tensively made, and the '* tapestry " curtains and portieres made by several firms are examples of highly artistic woollen fabrics. Bleaching, Printing, and Dycing.—These allied industries took root in the Glasgow district at an earlier period than that of their introduction into the rival regions of Lancashire, calico-printing having been begun near Glasgow in 1738. The use of chlorine in bleaching was first introduced in Great Britain at Glasgow in 1787, on the suggestion of the illustrious James Watt, by his father-in- law, a local bleacher; and it was a Glasgow blcacher—Charles Tennant—who first made and introduced bleaching powder (chloride of lime). The dyeing of Turkey red was begun as a British industry at Glasgow by two eminent citizens—David Dale and George M 'Intosh—and that unequalled colour was long locally known as Dale's red. All these industries continue to hold a fore- most place in Glasgow, a large amount of grey cloth being sent from the Lancashire looms to be bleached and printed in the Scotch works, In particular Turkey red dyeing and printing have developed to an extent unequalled in any other manufacturing centre. Chemical Manufactures.—The operations of bleaching and calico- printing in the early part of last century gave rise to such chemical manufactures—the preparation of dye liquors, &c.—as these in- dustries demand. The discovery of bleaching powder by Charles Tennant in 1799 led directly to the development of the great cheii- cal works of C. Tennant & Co. at St Rollex and its various branches, and gave the first great impetus to chemical manufactures in Glasgow. Among the prominent chemical industries are to

be reckoned the alkali trades—including soda, bleaching powder, and soap-making—the preparation of alum and prussiates of potash, bichromate of potash manufacture (an industry peculiarly identified with Glasgow), the extraction of iodine and other products from sea-weeds, dynamite and gun-powder mannfacture, the making of flint glass, bottle glass, paper, white-lead and other pigments, and brewing and the distillation of spirits). The numerous chemical preparations used in the bleaching and calico-printing trades are also among the local manufactures, as well as the preparation of starch, British gum, and dextrine, and the manufacture of lucifer matches. Lron Manufacture and other Metallurgieal Industries, —Although the blast furnaces of Scotland are distributed over several of the midland counties, the great proportion of them are in Lanark- shire and Ayrshire, and the trade is entirely controlled and practi- cally monopolized in Glasgow. The discovery of the value of blackband ironstone by Mushet and the invention of the hot-blast by Neilson were two events which exercised a wonderful influence on the development of iron smelting in Scotland. So rapid was the expansion of the industry during the earlier half of this century that in 1859 one-third of the whole iron produced in the United Kingdom was Scotch. For 20 years past the trade has shown little elasticity, the annual production averaging about a million of tons of pig iron,—the maximum output having been reached in 1870, when 1,206,000 tons were smelted. In 1877 of a total of 152 furnaces existing there were 109 in blast, and of the whole 131 were situated in Lanarkshire and Ayrshire, 102 of these being in operation. ‘The entire output of pig iron in that year was 982,000 tons, while in 1878 from 90 furnaces in blast the production is estimated at 902,000 tons. in Glasgow and its neighbourhood is 22, having had during 1877 345 puddling furnaces and 53 rolling mills in operation. Mild steel is manufactured on an extensive scale by the Siemens-Martin pro- cess, and a small amount of crucible cast steelis also made. Other metallurgical industries include the extraction of copper by Henderson’s wet process, and a limited amount of zinc smelting. Engineering.—With abundance of iron and coal, and great

facilities of both land and water carriage, it is only to be expected that mechanical engineering should be carried on in Glasgow with peculiar cnergy and success. Almostall departments of engineering work are well

represented in the district; and among the special features of the industries may be enumerated the great water and gas pipe casting establishments, sanitary and general iron-founding, malleable iron tube making, locomotive engine building, the manu- facture of sugar machinery and of sewing machines,—two great establishments on the model of American factories for the latter trade being conducted by the Singer and the Howe Machine Com- panies respectively. The marine engineering works of the Clyde—which in many instances are worked in direct connexion with shipbuilding yards—are equipped on a scale worthy of the great industry of which they form an important part ; and few establish- ments exist in any other quarter capable of producing the enormous forgings for propeller shafts, &c., of ocean steamers, which form a regular item in the undertakings of Glasgow engineering firms.

Shipbuilding is the greatest of all the modern industries of Glas- gow, and the position attained by the shipbuilders of the Clyde is a matter of imperial consequence and national pride. The ship- building yards of the Clyde extend from Rutherglen above Glasgow to Greenock,—Dumbarton, Port Glasgow, and Greenock having an important stake in the industry. In some years about half the total tonnage built in the United Kingdom has been launched from the Clyde yards, as is shown by the following statement :—

1871. | 1872. | 18738.

196,229 |230,347 |282,926 |262,480 |211,482 |174,824 |169,383 391,058 |474,718 [458,543 |608,867 |472,058 |378,020 |450,963

Tonnage launched, \

Tonnage launched, t United Kingdom

During the year 1878 the tonnage launched on the Clyde from the yards of 35 different firms amounted to 222,353 tons, one vessel, the “Gallia,” built for the Cunard Company, being of 5200 tons burthen,—a tonnage, however, which has been exceeded by the Guion steamer “ Arizona” (5500 tons), launched in 1879. The work turned out is very diversified, but as a rule of the highest class, and includes armour-plated and other vessels for the Royal Navy, mail and passenger occan steamers for the great Transatlantic

and other lines, river steamboats famous throughout the world for swiftness and elegance of appointments, merchant sailing vessels, dredging plant, and hopper barges. With the exception of a very insignificant proportion of wooden vesscls, the whole of the shipping built on the Clyde is of iron and steel, the latter having recently been introduced with great success. 'The shipbuilding trade in Glasgow indeed owes its extraordinary expansion almost entirely to the rapid supplanting of wood by iron as a building material. Twenty years ago, in 1859, the tonnage launched measured only 35,709 tons, from which amount, by rapid strides, it reached in 1863 a total of 128,262 tons, and in 1874 the maximum amount of 262,430 tons was floated off.

ComMeErcr.—For a century past the records of the Clyde Navi- . gation Trust indicate that the trade of Glasgow, so far as regards shipping, hasprogressed, with few and unimportant fluctuations, with steady rapidity. In 1778 the annual revenue of the Clyde Trust was £1733; in 1828 it amounted to £17,669, a tenfold increase in 50 years; and in 1878 the total amounted to £217,100. Of course these figures do not necessarily indicate a corresponding expansion of shipping trade, though they probably bear a close relation to the comparative value of cargoes carried. In the year 1828 the tonnage of vessels of all kinds which arrived in the harbour of Glasgow was 696,261, the sailing vessels having numbered 4405 of 214,315 tons, and the steamers 7100 of 481,946 tons. For the year ending 30th June 1878 the arrivals of sailing ships numbered 2727, with 457,290 tons capacity, and of steamers there were 13,210, the tonnage of which amounted 2,154,733 tons,—in all 15,987 arrivals with a gross tonnage of 2,612,023 tons, being the greatest amount on record. In that year the weight of goods imported from abroad was 658,319 tons ; and coastwise 586,576 tons were landed at Glasgow, making in all 1,244,895 tons. The foreign imports consisted in largest measure of Indian corn, wheat, flour, and other food substances, with timber, pyrites, iron ore, and sulphur, the coasting arrivals eontain- ing principally limestone, iron, cement, potter's clay, salt, timber, and food stuffs. The goods shipped to foreign ports amounted to 712,249 tons, and coastwise 603,374 tons left Glasgow, making in all 1,315,623 tons. The principal exports were coal, iron, cast pipes, chairs and other railway iron, chemical manufactures, and general

machinery, with malt liquors and spirits ; and in the eoasting trade The number of malleable iron works |

the leading articles were of a similar general description. The great bulk of the foreign trade is with New York and Canadian ports, India, France, Spain, and Belgium; and coasting traffic beyond the Clyde estuary is directed principally to Liverpool, Belfast, Dublin, Londonderry, Waterford, Bristol, and London ; but there are few commercial ports throughout the world which have not more or less direct trading communication with the port and harbour of Glasgow. (J. H. 8.—J. PA.)

Egyptian glass.

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GLASS

‘History.

HE art of glass-making, unlike that of pottery, would appear uot to have been discovered and practised by different nations independently, but to have gradually spread from a single centre. No trace of it was observed among the inhabitants of America at the time when that continent was discovered, although considerable progress in the arts had been made by some among them, ¢g,, the Mexicans and Peruvians; but the steps by which it reached China may be indicated with much probability. The credit of the invention was given by the ancients to the Phoenicians, as is shown by the well-known story of its fortuitous discovery by Phosnician merchants, who rested their cooking pots on blocks of natron (sub-carbonate of soda), and found glass produced by the union under heat of the alkali and the sand of the shore (Pliny, Vat. Hist., XxXvVi. 26,65). A glassy mass may, however, be produced in the smelting of many metallic ores, silica being present, while the fuel supplies the alkali; or by the combustion of great masses of reeds or straw, in which the elements of glass are present,—lumps of coarse imperfect glass being

often found on the spot where a stack of wheat has been |

burned. Now the Egyptians practised metallurgic opera- tions from a very early period, and vast heaps of straw are, and no doubt have been from the earliest times, accumu- lated in that country, and probably not unfrequently set on fire. The adoption of glass as a substance capable of being made subservient to the use of mankind may therefore be due to the intelligence of some one who noticed its fortui- tous production there. Be this as it may, by far the earliest examples of glass existing of which the dates are attested by inscriptions are of Egyptian origin. The earliest of these, a small lion's head of opaque blue glass of very fine colour, but changed externally to an olive green, was found at Thebes by Signor Drovetti, and is now in the British Museum ;! on the underside are hieroglyphics coutaining the name of Nuantef IV., whose date according to Lepsius's chronology was 2423-2380 n.c. A bead of dusky green glass bears the prenomen of Hatasu, a queen who is con- jectured to have lived about 1450 n.c. (Wilkinson, Manners and Customs of the Anctent Lyyptians, vol. iii. p. 88). That such may be the real dates of these objects is con- firmed by the fact that glass bottles containing red wine are represented on monuments of the fourth dynasty, more than 4000 years old; and in the tombs at Beni Hasan, dating from the reign of Usurtesen I, at least 2000 years B.c., the process of glass-blowing is represented in an unmistakable manner (Wilkinson, vol. iii. p. 69). Very many examples of glass found in Egypt may be seen in museums, but, as they rarely bear inscriptions, it would be difficult to trace the progress of the art through them ; no competent person has hitherto undertaken the task. The manufacture probably continued to flourish as well during the period of the native monarchy as in that of the Greek dynasty ; and its importance after the subjugation of the country to Rome was probably even increased by the new market then opened to its products. Martial (£'p., xxi. 74) alludes to the importation of Egyptian glass into Rome ; and it is mentioned in an ordinance of Aurelian Hadrian in a letter addressed to the consul Servianus men- tions glass-blowing as one of the chief industrial occupations of the inhabitants of Alexandria. The manufacture was not confined to that city, but was also carried on in the

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1 See introduction to Catalogue of Glass Vessels in the South Ken- sington Musewm, where an engraving of it is given.

lower Diospolis on Lake Mensaieh, as appears by a passage in the Periplus Maris Erythrei (em6).

Much of the Egyptian glass was uncoloured and of a somewhat dusky hue; of the coloured and ornamental varieties perhaps the most characteristic examples are the small vases usually in the form of either alabastra or amphoree, but occasionally in that of an Egyptian column. In these the prevailing colour is a deep transparent blue ; but uot unfrequently the colour of the body of the vase is some shade of pale buff, fawn, or white (an imitation probably of arragonite, Egyptian alabaster), sometimes deep green, and in rare cases red. In almost every example the surface is ornamented by bands of colour, white, yellow, or tor- quoise blue, forming zigzag lines ; in some examples there are only two or three such lines, in others the whole surface is covered by them. These lines are incorporated with the surface of the vessel, but do not penetrate through its entire thickness. By the Greeks and Etruscans such vessels were evidently much valued ; the amphore have been occasion- ally found in tombs, furnished with a stand of gold. In Rhodes and elsewhere they have been found associated with objects which probably do not date from an earlier period than the 3d or 4th century before Christ, and it does not appear that they are met with in tombs later than the Christian era; when coloured or ornamental glass vessels are discovered in these last, they are of a different character. Another species of glass manufacture in which the Egyptians would appear to have been peculiarly skilled is the so-called mosaic glass, formed by the union of rods of various colours in such a manner as to form a pattern ; the rod so formed was then reheated and drawn out until reduced to a very small size, a square inch or less, and divided into tablets by being cut transversely, each of these tablets presenting the pattern traversing its substance and visible on each face. This process was no doubt first practised in Egypt, and is never seen in such perfection as in objects of a decidedly Egyptian character in design or in colour. Very beautiful pieces of ornament of an architec- tural character are met with, which probably once served as decorations of caskets or other small pieces of furniture, or of trinkets; also tragic masks, human faces, and birds. Some of the last-named are represented with such truth of colouring and delicacy of detail that even the separate feathers of the wings and tail are well distinguished, although, as in an example in the British Museum, a human- headed hawk, the piece

which contains the figure may not exceed three-fourths of an inch in its largest dimension. Works of this description probably belong to the period when Egypt passed under Roman domination, as similar objects, though of inferior delicacy, appear to have been made in Rome.

The Phcenicians probably derived their knowledge of the Pheenician.

art from Egypt ; whether this be so or not, they undoubt- edly practised it from a very early period and to a very large extent. Probably much the same processes were em- ployed in Pheenicia and Egypt during some centuries before the Christian era, as they certainly were in Phoenicia, Egypt, and Rome for some centuries after. It seems pro- bable that the earliest products of the industry of Phoenicia in the art of glass-making are the coloured beads which have been found in almost all parts of Europe, in India and other parts of Asia, and in Africa. The '"aggry " beads, so much valued by the Ashantees and other natives of that part of Africa which lies near the Gold Coast, have pro- bably the same origin. These coloured beads are usually of opaque glass; they exhibit great variety of colour and

. Assyrian.

Greek.

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pattern, and very different degrees of skill in manipulation. Their wide dispersion may be referred with much proba- bility to their having been objects of barter between the Phcenician merchants and the barbarous inhabitants of the various countries with which they traded. It is probable, however, that many of the specimens which exist in our museums date from times several centuries later than those in which Tyre and Sidon flourished ; for, as we may learn from the Periplus and Strabo, glass in various forms was an article imported in the Ist and 2d centuries, as well into the emporia of the Red Sea as into the ports of Britain. Even at the present day beads are very extensively made at Venice for export to Africa, which bear a resemblance, doubtless not accidental, to those which we have reason to believe to be of very early date.

Next in date to the earlier Egyptian examples mentioned above would appear to be the vase of transparent greenish glass found in the north-west palace of Nineveh, and now in the British Museum. On one side of this a lion is en- graved, and also a line of cuneiform characters, in which is the name of Sargon, king of Assyria, 722 Bc. Frag- ments of coloured glasses were also found there, but our materials are too scanty to enable us to form any decided opinion as to the degree of perfection to which the art was carried in Assyria. Many of the specimens discovered by Layard at Nineveh have all the appearance of being Roman, and were no doubt derived from the Roman colony, Niniva Claudiopolis, which occupied the same site.

The Greeks, excellent in the ceramic art, do not appear to have cultivated the art of glass-making at a very early period ; but it was probably made in many places on the shores of the Mediterranean for some centuries before the Christian era. At Mycenze many disks of opaque vitreous pastes were found by Schliemann, and very similar objects at Ialyssus in Rhodes ; but it is not certain that these may not have been brought from Egypt, where very similar objects have been found, or whether they ought not to be attributed to Greek or to Phcenician artisans. At Camirus in Rhodes, however, many vessels of glass of very elegant forms have been discovered, which were probably made in the island.

In Etruscan tombs in Italy are also found glass vessels of peculiar character; these are small bowls resembling in form the half of an egg; they are usually of the variety of glass which is mentioned further on as “madrepore,” the ground green and transparent, the stars yellow, while patches of colour of gold and of filigree glass are sometimes inter- spersed. They differ from and appear to be earlier than the madrepore glass, fragments of which are so often found in Rome. They are also said to be found in Magna Grecia. Another variety found in tombs in the same district is of blue and opaque glass, with much gold in leaf, all twisted together; the most frequent form in which this kind of glass has been found is that of a bottle several inches long and about one inch in diameter, without a neck, having probably had a mounting of gold. It remains to be deter- mined whether these should be attributed to a Greek or toa Phoenician origin. Glass, however, was occasionally used for purposes of architectural

decoration during the best period of Grecian art, for Stuart and Revett, when

describing the temple of Minerva Polias at Athens, give

the following note :—“ A remarkable singularity observed in the capitals of this portico is in the plaited torus be- tween the volutes having been inlaid at the interstices with coloured stones or glass.” Mr H. March Phillips states that he well remembers having remarked these decora- tions, and that he believes them to be of blue glass.}

“ae example of the employment of glass in a like manner is indicated by the odd story which Pliny tells (Nat. Hist., xxxvii. 5, 17) that on the tomb of Hermias, a prince of the island of Cyprus,

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In the first centuries of our era the art of glass-making Roman.

was developed at Rome and other cities under Roman rule in a most remarkable manner, and it reached a point of excellence which in some respects has never been excelled or even perhaps equalled. It may appear a somewhat ex- aggerated assertion that glass was used for more purposes, and in one sense more extensively, by the Romans of the imperial period than by ourselves in the present day; but it is one which can be borne out by evidence. It is true that the use of glass for windows was only gradually ex- tending itself at the time when Roman civilization sank under the torreut of German and Hunnish barbarism, and that its employment for optical instruments was only known in a rudimentary stage; but for domestic purposes, for architectural decoration, and for personal ornaments glass was unquestionably much more used than at the present day. It must be remembered that the Romans possessed no fine porcelain decorated with lively colours and a beautiful glaze; Samian ware was the most decorative kind of pottery which was then made. Coloured and ornamental glass held

among them much the same place for table services, vessels for toilet use, and the like, as that held among us by porcelain. Pliny (Wat. Hist., xxxvi. 26, 67) tells us that for drinking vessels it was even preferred to gold and silver. Trebellius Pollio, however, relates of the emperor Gallienus that he drank from golden cups, despising glass, than which, he said, nothing was more vulgar. Glass was largely used in pave- ments, and in thin plates as a coating for walls. It was used in windows, though by no means exclusively, mica, alabaster, and shells having been also employed. Glass, in flat pieces, such as might be employed for windows, has been found in the ruins of Roman houses, both in England and in Italy, and in the house of the faun at Pompeii a small pane in a bronze frame remains. Glass of this description seems to have been cast on a stone, and is usually very uneven and full of defects; although capable of transmitting light, it must have given at best an indifferent view of external objects. When the window openings were large, as was the case in basilicas and other public buildings and even in houses, the pieces of glass were, doubtless, fixed in pierced slabs of marble or in frames of wood or bronze.

The invention and ingenuity employed by the Roman artisans in producing variety in glass vessels are most re- markable; almost every means of decoration appears to have been tried, and many methods of manipulating glass, which have been considered inventions, have in reality been anticipated by the glass-workers of the period under con- sideration. The fertility of invention which devised so many modes of ornamentation and so many shades of colour, and the skill with which the manual execution is carried out, alike deserve great admiration. This prodigious variety seems to show that glass-making was at that time carried on, not as now in large establishments, which pro- duce great quantities of articles identical in form and pattern, but by many artificers, each working on a small scale. This circumstance enables us to understand why very pure and crystalline glass was, as Pliny tells us, more valued than any other kind. To produce glass very pure and free from striz and bubbles, long-continued fusion is required ; this the system of working of the ancients did not allow, and their glass is in consequence remarkable for the great abundance of bubbles and defects which it contains. was a marble figure of a lion with eyes of emerald which shone so brightly into the sea that they frightened away the tunnies from the

adjacent fisheries, so that it became necessary to change the eyes. In the great marble lion discovered by Mr Newton near Cnidus, and now

in the British Museum, in the place of the eyes are deep sockets which

probably, like those of the Cypriote lion, were filled with coloured glass,

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colours, blue, green, purple or amethystine, amber, brown, and rose; of opaque colours, white, black, red, blue, yellow, green, and orange. There are many shades of the

former as well as of the latter, particularly of transparent |

blue, and of opaque blue, yellow, and green, colours many varieties appear to be due to the mixture of one colour with another. In any larg2 collection of frag- ments it would be easy to find eight or ten varieties of opaque blue, ranging from lapis lazuli to turquoise or to lavender, and six or seven of Opaque green. Of red the varieties are fewer; the finest is a crimson red of very beautiful tint, and there are various gradations from this to a dull brick red. One variety forms the ground of a very good imitation of porphyry; and there is a dull semi- transparent red which, when light is passed through it, appears to be of a dull green hue. With these colours the Roman vitrarius worked, either using them singly or blending them in almost every conceivable combination, sometimes, it must be owned, with a rather gaudy and inharmonious effect.

These combinations of colour were effected in two ways: —first, by glasses of two or more colours being combined 80 as to traverse the entire substance of the object ; and, secondly, by the superposition of the one colour on the other.

To the former class belong all those termed mosaic and mille fiori, where the process of manufacture was the pre- liminary union, by heat, of threads of glass into a rod, which when cut transversely every section. Such rods were placed together side by side, and united by heat into a mass which was then formed into cups or other vessels. A vast quantity of ‘small cups and

pateras were made by this means in patterns which bear considerable resemblance to the sur- faces of madrepores, and are of the same kind as those which by the Venetians are termed “mille fiori.” In these every colour and every shade of colour seem to have been tried in great variety of combination with effects more or less pleasing, but transparent violet or purple appears to have been the most common ground colour. Although inost of the vessels of this mille fiorj glass were small, some were made of large size; a fragment in the possession of the present writer must have formed part of a dish not less than 20 inches in diameter. Another variety of glass, evidently much used, ig that in which transparent brown glass is so mixed with opaque white and blue as to re- semble onyx. This was sometimes done with great success, and very perfect imitations of the natural stone were pro- duced. Sometimes purple glass is used in place of brown, probably with the design of imitating the precious mur- rhine. Imitations of porphyry, of serpentine, and of granite are also met with, but these were used chiefly in pavements, and for the decoration of walls, for which purposes the onyx-glass was likewise employed. Under this head must also be included the interlacing of bands and threads both of white and of coloured glass. Vessels are found composed of bands either so placed in sections as to present a plaited pattern, or simply arranged side by side; others, again, resemble the Venetian vitro di trina, threads of opaque white or yellow glass being twisted with clear transparent glass, and the vessel then formed by the welding together of the rods so made. Blue threads are occasionally intermixed, and several varieties of pattern may be found ; but this branch of the art does not appear to have bzen carried by the Romans to anything like the perfection to which it was afterwards brought by the Venetians,

So few examples of glass vessels of this period which have been painted in enamel have come down to us that

Of opaque

exhibited the same pattern in |

GLASS

The Romans had at their command, of transparent | it has been

| Nordisk Oldkyndeghed for 1861, p. 305.

questioned whether that art was then practised ; but several specimens have been recently described which can leave no doubt on the point ; decisive examples are afforded by two cups found at Vaspelev, in Denmark, engravings of which are published in the Annaler for These are small

| cups, 3 inches and 2} inches high, 32 inches and 3 inches

| that these were applied in the form of melted

is a line of sheep and goats in varied attitudes,

Wide, with feet and straight sides ; on the larger are a lion and a bull, on the lesser two birds with grapes, and on each some smaller ornaments. On the latter are the letters DVB.R. The colours are vitrified and slightly in relief ; green, blue, and brown may be distinguished. They were found with Roman bronze vessels and other articles, Vessels also are not uncommon on the surface of which enamel colours appear in the form of spots ; it is probable glass, not, as in true enamel painting, in that of a finely divided powder tempered with an essential oil and applied cold.

The first place among those processes in which one colour was superimposed on another may be given to that by which the cameo glass was produced. In this a bubble of opaque white glass was formed at the end of the tube used by the glass-blower; this was coated with transparent blue, and that again with opaque white, and the vessel required was formed from this threefold globe. The outer coat was then removed from that portion which was to constitute the ground, leaving the white for the figures, foliage, or other ornamentation; these were then sculptured by means of the gem-engraver's tools, Pliny no doubt means to refer to this when he says (Nat. Hist., xxxvi. 26, 66), "aliud argenti modo celatur," contrasting it with the process of cutting glass by the help of a wheel, to which he refers in the words immediately preceding, "aliud torno teritur."

The famous Portland or Barberini vase is the finest ex- ample of this kind of work which has come down to us, and was entire until it was broken into some hundred pieces by a drunken medical student some years ago. The pieces, however, were joined together by Mr Doubleday with extraordinary skill, and the beauty of design and execution may still be appreciated almost as well as when it was intact.

The two other most remarkable examples of this cameo

| glass are an amphora at Naples and the Auldjo vase. |The amphora measures 1 foot $ inch in height, 1 foot

7% inches in circumference ; it is shaped like the earthen amphoras with a foot far too small to Support it, and must no doubt have had a stand, probably of gold; the greater part is covered with a most exquisite design of garlands and vines, and two groups of boys gathering and treading grapes and playing on various instruments of music ; below these The ground is blue and the figures white. It was found in a house in the Street of Tombs at Pompeii in the year 1839, and is now in the Royal Museum at N aples. It is well engraved in Richardson's Studies of Ornamental Design. The Anldjo vase, a part of which is or was in possession of Mr Auldjo, and another in the British Museum, is an cenochoe about 9 inches high; the ornament consists mainly of a most beautiful band of foliage, chiefly of the vine, with bunches

| of grapes ; the ground is blue and the ornaments white F

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it was found at Pompeii in the house of the faun. has been engraved by Richardson.

Costly as these beautiful objects must have been, a very great number of them existed, for even now fragments of ten to fifteen may probably be met with in the hands of the curiosity dealers in Rome in the course of three or four months. The same' process was used in producing large tablets,

employed, no doubt, for various decorative purposes. In the South Kensington Museum collection. is a fragment of such a tablet or slab; the figure, a portion of which remains, could not have been less than about 14 inches high.

The ground of these cameo glasses is most commonly transparent blue (often lined with opaque white to throw up the colour), but sometimes opaque blue, purple, or dark brown. ‘The superimposed layer, which is sculptured, is generally opaque white. A very few specimens have been met with in which several colours are employed.

At a long interval after these beautiful objects come those vessels which were ornamented either by means of coarse threads trailed over their surfaces and forming rude patterns, or by coloured enamels merely placed on them in lumps; and these, doubtless, were cheap and common wares. But

It also |

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a modification of the first-named process was in use in the 4th and succeeding centuries, showing great ingenuity and manual dexterity,—that, namely, in which the added por- tions of glass are united to the body of the cup, not through- out, but only at points, and then shaped either by the wheel or by the hand. The attached portions form in some instances inscriptions, as on a cup found at Strasburg, which bears the name of the emperor Maximian (286- 310 a.p.), on another in the Vereinigte Sammlungen at Munich, and on a third in the Trivulzi collection at Milan, where the cup is white, the inscription green, and the net- work blue. Probably, however, the finest example is a situla, 104 inches high by 8 inches wide at the top and 4

inches at the bottom, preserved in the treasury of St Mark at Venice. This is of glass of a greenish hue; on the upper part is represented, in relief, the chase ofa lion by two men on horseback accompanied by dogs; the costume appears to be Byzantine rather than Roman, and the style is very bad. The figures are very much undercut. The lower part has four rows of circles united to the vessel at those points alone where the circles touch each other.

All the other examples have the lower portion covered in like manner by a network of circles standing nearly a quarter of an inch from the body of the cup.+

The art of glass-making no doubt, like all other art, deteriorated during the decline of the Roman empire, but it is probable that it continued to be practised, though with constantly decreasing skill, not only in Rome but in the provinces. Some few existing vessels, as two chalices of coarse blue glass in the British Museum, may perhaps be referred to this period, but the most remarkable production was mosaic for the decoration of churches. Examples of such decorations may be still seen in Rome dating from every century through the dark ages; and, though glass for mosaic was certainly made at Constantinople, and perhaps also at Ravenna, it is probable that it was also made in Rome. Glass was largely used in the immense windows of the churches built between the 3d and the 10th centuries. The first mention of coloured glass in a church window occurs in the time of Pope Leo III. (795-816); but pro- bably it was used at a mucli earlier period.

1 An example connected with the specimens just described is the cup belonging to Baron Lionel de Rothschild; though externally of an opaque greenish colour, it is by transmitted light of a deep red. On the outside, in very high relief, are figures of Bacchus with vines and panthers, some portions being hollow from within, others fixed on the exterior. The changeability of colour may remind us of the “calices versicolores’”” which Hadrian sent to Scrvianus.

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Some of the Roman artificers in glass no doubt emigrated Byzan-

to Constantinople, and it is certain that the art was prac- tine.

tised there to a very great extent during the Middle Ages. One of the gates near the port took its name from the adjacent glass-houses. St Sophia when erected by Justinian had vaults covered with mosaics and immense windows filled with plates of glass fitted into pierced marble frames ; some

of the plates, 7 to 8 inches wide and 9 to 10 high, not blown but cast, which are in the windows, may possibly date from the building of the church. Glass for mosaics was also largely made and exported. In the 8th century when peace was made between the caliph Walid and the emperor Justinian II., the former stipulated for a quantity of mosaic for the decoration of the

/new mosque at Damascus, and in the 10th century the

materials for the decoration of the niche of the kibla at Cordova were furnished by Romanus IJ. In the 11th century Desiderius, abbot of Monte Casino, sent to Con- stantinople for workers in mosaic. The grounds of the Byzantine mosaics were usually either of gold or silver, a thin leaf-of the metal having been enclosed between two layers of glass.

We have in the work of the monk Theophilus, Diversarum Artium Schedula, and in the probably earlier work of Eraclius, about the 11th century, instructions as to the art of glass-making in general, and then as to that of producing coloured, gilt, and enamelled vessels, which these writers speak of as being practised by the Greeks. But we look almost in vain for existing specimens of such works. Perhaps the only entire enamelled vessel which we can confidently attribute to Byzantine art is a small vase preserved in the treasury of St Mark at Venice, a very clever reproduction of which was exhibited by the Murano Glass Company at the Paris exhibition of 1878. This is decorated with circles of rosettes of blue, green, and red enamel, each surrounded by lines of gold ; within the circles are little figures evidently suggested by antique originals, and precisely like similar figures found on carved ivory boxes of Byzantine origin dating from the llth or 12th centuries. Two inscriptions in Cufic characters surround the vase, but they, it would seem, are merely ornamental and destitute of meaning. The presence of these inscriptions may perhaps lead to the inference that the vase was made in Sicily, but by Byzantine workmen.?

Of uncoloured glass brought from Constantinople several examples exist in the treasury of St Mark at Venice, part of the plunder of the imperial city when taken by the crusaders in 1204. The glass in all is greenish, very thick, with many bubbles, and has been cut with the wheel; in some instances circles and cones, and in one the outlines of the figure of a leopard have been left standing up, the rest of the surface having been laboriously cut

away. The in- tention would seem to have been to imitate vessels of rock crystal.

Probably at Alexandria, one of the great seats of glass- making, the art survived the conquest of Egypt by the Saracens, for a glass disk serving as a weight has been met with in Egypt bearing the date 96 of the Hegira, corre- sponding with 715 a.p. (see memoir by Mr E. T. Rogers, Journal of the Royal Asiatic Society, vol. x. pt. 1). Numer- ous later examples leave no doubt that the manufacture of glass continued to exist in Egypt, though perhaps in a

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2 The Sano Catino at Genoa, supposed throughout the Middle Ages to have been an emerald but really composed of green glass, is a shallow hexagonal dish rather clumsily formed and finished by cutting. It was perhaps originally a paten, and was taken at the capture of Caesarea in 1101. At Reichenau in the Lake of Constance, is (or was) preserved a slab of transparent green glass 2 feet wide by 13 inches high and 8 inches thick, which was also supposed to be an emerald. According to tradi- tion it was sent to Charles the Great by the empress Irene.

Alex- andria.

Syria.

Persia.

Tadia.

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languishing condition. In the 11th century, however, we find in the life of St Odilo, abbot of Fulda (od. 1049), men- tion of a “vas pretiosissimum vitreum Alexandrini generis,” and in the same century Nasir Ibn Khusru (Safarnamah, published by Royal Asiatic Society), who visited Jerusalem in 1060, says that pictures of our Lord and others in one of the churches of that city were covered with plates of glass. No examples of ornamental

vessels dating from this period have, however, come duwn to us. But we have many very remarkable examples of the skill of Egyptian and Syrian glass-workers in the 13th and 14th centuries,—large bottles, basins, and lamps, very striking objects from the free use of enamel and gilding in their decoration. This is, as in most objects of Hastern art, chiefly composed of inscriptions written in large characters ornamentally treated; but figures of birds, lions, sphinxes, é&c., may be found, especially on vessels made in Egypt. Although there may have been some indigenous practice of the art of glass-making in the Kast,—for in the cup of Chosroes I. of Persia (531-579) preserved in the Bibliothéque Nationale at Paris are medallions of coloured and moulded glass,—the arts of gilding and enamelling, as we see them exhibited in the Syrian and Egyptian works of the 13th and 14th centuries, were probably derived from the Byzantines. Damascus was also the seat of a like manufacture. In inventories of the 14th century, both in England and in France, mention may frequently be found of glass vessels described as of the manufacture of Damascus. That city was taken by Timur in 1402, and we are tuld by Clavijo, who visited his court in 1403-1406, that he carried off to Samarcand "men who made bows, glass, and earthenware, so that of these articles Samarcand produces the best in the world."

Glass no doubt continued to be made, as it still is, in Syria and Persia, but no very remarkable products of the manufacture are known in Europe, with the exception of some vessels brought from Persia, blue richly decorated with gold. These probably date from the 17th century, for Chardin tells us that the windows of the tomb of Shah Abbas II. (0b. 1666) at Kom, were "de cristal peint d'or et d'azur." At the present day bottles and drinking vessels are made in Persia which in texture and quality differ little from ordinary Venetian glass of the 16th or 17th centuries, while in form they exactly resemble those which may be seen in the engravings in Chardin's 7vavels.

Pliny states (Vat. Hist., xxxvi. 26, 66) that no glass was to be compared to the Indian, and gives as a reason that it was made from broken crystal; and in another passage (xii. 19, 42) he says that the Troglodytes brought to Ocelis (Ghella near Bab-el-Mandeb) objects of glass. We have, however, very little knowledge of Indian glass of any considerable antiquity. A few small vessels have been found in the "topes," as in that at Manikyala in the

Punjab, which probably dates from about the Cliristian era ; but they exhibit no remarkable character, and fragments found at Brahminabad are hardly distinguishable from Roman glass of the imperial period. The chronicle of the Singhalese kings, the Mahawanso, however, asserts that mirrors of glittering glass were carried in procession in 306 B.c., and beads like gems, and windows with ornaments like jewels, are also mentioned at about the same date. If there really was an important manufacture of glass in Ceylon at this early time, that island perhaps furnished the Indian glass of Pliny; or it is possible that it really came from China. Glass is made in several parts of India—as Behar and Mysore—by very simple and primitive methods, and the results are correspondingly defective. Black, green, red, blue, and yellow glass is made. The greater part is worked into bangles, but some small bottles are blown (Buchanan, Journey through Mysore, vol. i. p. 147 3 Vol, iii, p. 369).

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The history of the manufacture of glass in China is obscure, but the common opinion that it was learnt from the Europeans in the 17th century seems to be erroneous. A writer in the Mémoires concernant les Chinois (vol. li. p. 46) states on the authority of the annals of the Han dynasty that the emperor Ou-ti (140 po.) had a manufactory of the kind of glass called “lieou-li,” thut in the beginning of the 3d century of our era tlie emperor Tai-tsou received from the West a considerable present of glasses of all colours, and that soon after a glass-maker came into the country who taught the art to the natives.

The Wei dynasty, to which Tai-tson belonged, reigned in northern China, and at this day a considerable manufacture of glass is carried on at Po-shan-hien in Shautung, which it would seem has existed fora long period. The Rev. A. Williamson (Journeys in North China, i. 131) says that the glass is extremely pure, and is made from the rocks in the neighbourliood. The rocks are probably of quartz, a¢., rock crystal, a correspondence with Pliny’s statement respecting Indian glass which seems deserving of attention.

Whether the making of glass in China was an original dis- covery of that ingenious people, or was derived wia Ceylon from Egypt, cannot perhaps be now ascertained ; the manu- facture has, however, never greatly extended itself in China. The case has been the converse of that of the Romans ; the latter had no fine pottery, and therefore employed glass as the material for vessels of an ornamental kind, for table services and the like. The Chinese, on the contrary, having from an early period had excellent porcelain, have been careless about the manufacture of glass. A Chinese writer, however, mentions the manufacture of a huge vase in 627 Ben. and in 1154 Edrisi (first climate, tenth section) mentions Chinese glass. A glass vase about a foot high is preserved at Nara in Japan, and is alleged to have been placed there in the 8th century. It seems probable that this is of Chinese manufacture. A writer in the Mémoires concernant les Chanois (vol. ii. pp. 463 and 477), writing about 1770, says that there was then a glass-house at Pekin g, where every year a good number of vases were made, some requiring great labour because nothing was blown (rien n'est soufiié), meaning no doubt that the ornamentation was produced not by blowing and moulding, but by cutting. 'This factory was, however, merely an appendage to the imperial mag- nificence. The earliest articles of Chinese glass the date of which has been ascertained, which have been noticed, are some bearing the name of the emperor Kienlung (1736- 1796), one of which is in the South Kensington Museum.

Tn the manufacture of ornamental glass the leading idea in China seems to be the imitation of natural stones. The coloured glass is usually not of one bright colour through- out, but semi-transparent and marbled; the colours in many instances are singularly fine and harmonious. As in 1770, cutting is the chief method by which ornament is produced, the vessels being blown very solid.

The chief source from whence a knowledge of the art of glass-making spread through Europe was probably Rome ' in the Roman imperial period glass was undoubtedly made, not only in Italy, but also in France, in Spain, and in all probability at or near Cologne, and perhaps in other places near the Rhine. Whether refugees from Padua, Aquileia, or other Italian cities carried the art to the lagoons of Venice in the 5th century, or whether it was learnt from the Greeks of Constantinople at a much later date, has been a

disputed question. It would appear not improbable that the former was the case, for it must be remembered that articles formed of glass were in the later days of Roman civilization in constant daily use, and that the making of glass was carried on, not as now in large establishments, but by artisans working ona small scale. It seems certain that some knowledge of the art was preserved in France and in

China.

Diffusion of the art in Europe,

Venice and Murano

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Spain, possibly even in England, and it seems improbable that it should have been lust in that archipelago, where the traditions of ancient civilization must have been better preserved than in almost any other place. In 523 Cassiodorus writes of the “innumerosa navigia” belonging to Venice, and where trade is active there is always a pro- bability that manufactures will flourish. However this may be, the earliest positive evidence of the existence at Venice of a worker in glass would seem to be the mention of Petrus Flavianus, phiolarius, in the ducale of Vitale Falier in the year 1090. In 1224 twenty-nine persons are mentioned as friolari (¢.e., phiolari), and in the same century “mariegole ” or codes of trade regulations were drawn up (Monograjia della Vetraria Veneziana e Muranese, p. 219). facture had then no doubt attained considerable proportions ; in 1268 the glass-workers exhibited decanters, scent-bottles, and the like; in 1279 they made,among other things, weights and measures. In the latter part of this century the glass- houses were almost entirely transferred to Murano. From thenceforward the manufacture continued to grow in im- portance; glass vessels were made in large quantities, as well as glass for windows. The earliest example which has as yet been described—a cup of blue glass, enamelled and gilt—is, however, not earlier than about 1440. A good many other examples have been preserved which may be assigned to the same century : the earlier of these bear a resemblance in form to the vessels of silver made in the west of Europe; in the later an imitation of classical forms becomes apparent. Enamel and gilding were freely used, in imitation

no doubt of the much admired vessels brought from Damascus or Egypt. Many of the ornamental processes which we admire in Venetian glass were already in use or were invented in this century, as that of mille fiori, in which rods of various colours are joined by heat and so arranged as when cut transversely to form patterns resembling flowers or coral- lines. Such sections were then placed side by side and united by a lining of heated glass applied to them; the joint mass was then relieated and worked into the desired form. The beautiful kind of glass known as vitro di trina or lace glass, was made by a variation of the same process ; the rods or canes, being composed of opaque white threads surrounded by transparent glass, were placed side by side in a mould, and a bubble of glass blown into the midst so as to adhere to the canes; the whole was then reheated and fashioned in the same manner as any ordinary glass. Some- times two canes or cylinders were used, the lines of which ran in opposite directions, and a reticulated pattern was thus produced. An elaborate account of the process is given by M. Labarte (Histoire des Arts Industries, iv. 575 sq.). Many of the examples of this process exhibit surprising skill and taste, and are among the most beautiful objects produced at the Venetian furnaces. Glass was made by the Romans in like manner, but no ancient example which has come down to us equals in correct execution some of those made at Venice, That peculiar kind of glass usually called schmelz, an imperfect imitation of caleedony, was also made at Venice in the 15th century. Avanturine glass, that in which numerous small particles of oxide of copper are diffused through a transparent yellowish or brownish mass, was not invented until about 1600.

The peculiar merits of the Venetian manufacture are the elegance of form and the surprising lightness and thinness of the substance of the vessels produced. The glass on the other hand wants brilliancy, and is often tinged with yellow, or if, as is not uncommon, too much manganese (which neutralizes the yellow tinge imparted by the presence of ivon) has been used, a faint purple. This slight coloration may not, however, appear a defect to eyes fatigued by the brilliancy of modern flint glass. The Venetian workmen perhaps somewhat abused their skill by giving

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extravagant forms to vessels, making drinking glasses in the forms of ships, lions, birds, whales, and the like.

Besides the making of vessels of all kinds the factories of Murano had fora long period almost an entire monopoly of two other branches of the art,—the making of mirrors and of beads. Attempts to make mirrors of glass were made as early as 1317 a.D., but even in the 16th century mirrors of steel were still in use. To make a really good mirror of glass two things are required,—a plate free from bubbles and striz, and a method of applying a film of metal with a uniform bright surface free from defects. The principle of applying metallic films to glass seems to have been known to the Romans and even to the Egyptians, and is mentioned by Alexander Neckam in the 12th century, but it would appear that it was not until the 16th century that thie pro- cess of '"silvering" mirrors by the use of an amalgam of tin and mercury had been perfected. During the 16th and 17th centuries Venice exported a prodigious quantity of mirrors, but France and England gradually acquired know- ledge and skill in the art, and in 1772 only one glass-house at Murano continued to make mirrors,

The making of beads was probably practised at Venice from a very early period, but the earliest documentary evi- dence bearing on the subject does not appear to be of carlier date than the 14th century, when prohibitions were directed against those who made of glass such objects as were usually made of crystal or other hard stones. In the 16th century it had become a trade of great importance, and about 1764 twenty-two furnaces were employed in the production of beads. Towards the end of the same century from 600 to 1000 workmen were, it is stated, employed on one brancli of the art, that of ornamenting beads by the help of the blow-pipe. A very great variety of patterns was produced; a tariff of the year 1800 contains an enumeration of 562 species and a vast number of sub-species. Beads to the value of £200,000 are still annually made in Venice (Monografia della Vetraria Veneziana e Muranese).

The efforts made in France, Germany, and England, in the 17th and 18th centuries, to improve the manufacture of glass in those countries had a very injurious effect on the industry of Murano. The invention of flint glass in England (about 1620?) brought in its train the practice of cutting glass, a method of ornamentation for which Venetian glass from its thinness was ill-adapted. One remarkable man, Giuseppe Briati, exerted himself, with much success, both in working in the old Venetian method and also in imitating the new fashions invented in Bohemia. He was especially successful in making vases and circular dishes of 'vitro di trina," one of the latter in the Correr collection at Venice, believed to have been made in his glass-house, measures 55 centimetres (nearly 23 inches) in diameter. The vases made by him-are as elegant in form as the best of the Cinquecento period, but may perhaps be distin- guished by the superior purity and brilliancy of the glass. He also made with great taste and skill large lustres and mirrors with frames of glass ornamented either in intaglio or with foliage of various colours. He obtained a know- ledge of the methods of working practised in Bohemia by disguising himself as a porter, and thus worked for three years in a Bohemian glass-house. In 1736 he obtained a patent at Venice to manufacture glass in the Bohemian manner. He died in 1772.

The fall of the republic was accompanied by interruption of trade and decay of manufacture, and in the last years of the 18th and beginning of the 1 9th century the glass-making of Murano was at a very low ebb. In the year 1838 Signor Bussolin revived several of the ancient processes of glass-working, and this revival was carried on by C. Pietro Biguglia in 1845, and by others, and later by Salviati, to whose successful efforts the modern renaissance of the glories

Western Europe during Roman period.

he dark ges,

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former processes and practised them, not in mere slavish imitation, but with freedom, invention, and fine artistic instinct. Every general industrial exhibition has con- tained brilliant examples of the products of the Venice

and Murano Glass Company, composed chiefly of English capitalists, and formerly managed by Salviati.

The fame of Venice in glass-making so completely eclipsed that of Italian cities that it is difficult to learn much respecting their progress in the art, It appears, however, that as early as 1295 furnaces had been established at Treviso, Vicenza, Padua, Mantua, Ferrara, Ravenna, and Bologna. In 1634 there were in Rome two and in Florence one glass-house ; but whether any of these produced orna-

of Venetian art glass is principally due. Salviati revived the |

mental vessels, or only articles of common use and window glass, would not appear to have as yet been ascertained.

The history of glass-making in France, Spain, Germany, and England offers many points of resemblance. In the first three, and probably in England also, glass was made at the period of the Roman empire; in France about Lyons, as is shown by a monument in the Musée Lapidaire to one Julius Alexander, described as an " opifex artis vitrie," in Normandy and Poitou, and probably in many other parts, In Spain glass, according to Pliny, Hist., xxxvi. 26, 66) in many parts of the country, " per Hispanias," but the remains of Roman glass-making have been chiefly found in the valleys which run down to the coast of Catalonia, but also near the mouth of the Ebro, in Valencia and in Murcia (Sefior Rico y Sinobus, Del Vidrio, p. 11).

Glvee-making in Germany during the Roman period

was manufactured (Vat. |

would seem to have been carried on extensively at Cologne, near which city many remarkable glass vessels of peculiar character have been discovered. 'The art was probably not lost during the period which followed the downfall of the Roman power. In the year 758 Cuthbert, abbot of Jarrow, wrote to Lullo, bishop of Mainz, to request him to send him a maker of

glass vessels, It is searcely probable that the art had been forgotten and revived between the 5th and the 8th centuries.

It is not equally clear that glass was made in England, though it is probable that this was the case. Both vessels and window glass have been found in almost all parts of the country, and at Buckholt, near the Roman road from Winchester to Salisbury, the remains of a glass furnace, among which were numerous fragments of glass which may possibly have been of Roman origin, and a fragment of un- doubtedly Roman pottery. But associated with these were fragments of glass of the 14th and later dates, and of pottery of the 16th century.

Very little has been ascertained as to the practice of the art in either of the four countries during the dark ages, but it would seem to have been preserved in France and Germany, and perhaps also in England and Spain. The fact narrated by Bede, in his history of the abbots of Wearmouth, that Benedict Biscop about 675 procured workmen from France to make glass for his monastery, shows at once that it was preserved in France and lost or nearly so in England. But a great quantity of drinking vessels are found in the tombs of the Anglo-Saxons while still pagan ; and although the like are found both in France and in Germany, it is said that a greater number and more varieties occur in England, and it has thence been inferred that they were probably made in the country. Welsh poets of the 6th century (?), Aneurin and Llywarch Hen, both mention glass vessels by a name, "'wydr," evidently derived from vitrum, and it is possible that the Welsh retained a knowledge of its manufacture. Some know- ledge of the art of manipulating glass existed in Ireland in and before the 12th century, as is shown by cameo

heads and small pieces of mosaic glass of quite peculiar patterns which occur on objects of Irish workmanship (Transactions of the Royal Irish Academy, vol. XXiv., Antiq., part. iv.)

In France "vitrarii" are mentioned in several centuries from the 6th to the 11th; in Germany, as has been shown above, there is ground for believing that the art was prac- tised in the 8th century ; and in the 12th artisans are

found at Cologne with the designation “ustor” attached to their : names, which Merlo (Kiinst und Kiinstler in Koln, p. 563) Suggests may probably mean maker of glass. Nothing seems to have been ascertained about the existence of the art in Spain between the Gothic conquest and the 13th century, when it was practised at Almeria by the Moors.

During the medizval quantities of glass, as well of window glass. The first were made on a large scale in Dauphiné in the 14th century. In 1338 Humbert the dauphin granted a part of the forest of Chamborant to a glass-maker on condition that he should furnish him with more than 3000 vessels of glass annually (fist. Dalph., il. 363). In 1302 window glass was made at Bezu le Foret, in the department of the Eure, for the king of France; a fragment of a roll of accounts for that year is preserved in the Bibliothéque Nationale. Glass was also made in Poitou, and a drageoir with the arms of Charles VIII. of France (147 0-1498) has been engraved by M. Fillon (L’art de Terre, &c.) which is believed to have been made in that province.

Much glass was no doubt made for windows both in Germany and the Low Countries, during the Middle Ages, and in 1453 mention occurs of a fountain and four plateaux made for Philip the Good, duke of Burgundy, by a glass- maker of Lille; but if artistic objects were made, hardly any examples have been preserved. Glass-makers existed at Vienna in 1221 (Peligot, Le Verre, p. 342). In 1428 a Muranese artificer set up a furnace in the same city, and another was established by another Italian in 1486, which it is said was still at work in 1563. How far these efforts to rival the manufactures of Murano may have succeeded we have no information, but contemporaneously the native artificers continued to produce articles for common use, as we may see by the woodcut in the edition of George Agricola De Re Metallica, published at Basel in 1561, re- presenting the interior of a glass-house. In this the tall cylindrical drinking-glasses known as wiederkoms, bottles with big bellies and slender necks, and retorts may be seen. A glass-house was founded at Daubitz in Bohemia in 1442, others in 1504 (Peligot, Le Verre, p. 343).

In England vessels of glass seem to have been but little used during the Middle Ages; they occur very rarely in inventories, and when they do, as in the Calendars of the Treasury of the Exchequer, they are usually described

as mounted in gold or silver, or as painted, being probably enamelled glass vessels from Constantinople, Damascus, or Venice, objects rather of virtu than of daily use. It has even been asserted that there is no evidence that any description of glass was made in England before the l5th century, but in the roll of the taxation made at Colchester in 1295 three of the principal inhabitants are designated “verrer”; and it would seem hardly probable that so many in such a town were glaziers only and not glassmakers. In the 14th century Andrew le glasswright is mentioned in the records of Great Yarmouth. In 1439 (or 1447) English glass is mentioned in the contract for the windows of the Beauchamp chapel at Warwick, but dis- paragingly, as the contractor binds himself not to use it. In 1485, however, it is mentioned in such a manner as to lead to the conclusion that it was dearer and presumably better than either “Dutch, Venice, or Normandy glass”

period France produced large Mediwval in the form of vessels as in that period.

16th century.

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(Domestic Architecture of the Middle Ages, by Hudson Turner, p. 78).

In Spain glass was made at Barcelona in considerable quantities in 1324; and Almeria, according to an Arab author of the 13th century, was famous for its manufacture of glass. In the 15th century the export of glass from Barcelona was considerable ; Jeronimo Paulo in 1491 says that glass vessels of various sorts were sent thence to many places and even to Rome.

In the 16th century the fashion of using glass vessels of ornamental character spread from Italy into France, England, and the Low Countries. Henry VIII, had a large quantity, chiefly or wholly, it wouldseem, of Venetian manufacture (see inventory in 1542, Archeological Journal, vol. xviii.). This increasing use of glass led to the reflexion that large sums of money went annually to Venice for such wares, and to the question whether the manufacture might not be carried on at home. We therefore find that about the middle of this century attempts were mude to introduce the Venetian methods of manufacture into the several countries; Henry II. of

France established an Italian named. Mutio at St Germain-en-Laye, and Henry IV. in 1598 per- mitted two “gentilshommes verriers ” from Mantua to settle themselves at Rouen in order to make “ verres de cristal et autres ouvrages qui se fonta Venise.” A like attempt was made in England about 1550, for in that year eight glass- makers from Murano addressed from London a petition to the Council of Ten at Venice praying to be excused from the penalties decreed by that body in 1549 against Venetian subjects who taught the art to foreigners (Cal. State Papers, Venetian, No. 648). The council allowed the eight workmen to remain until the end of the term for which they had engaged themselves. Other attempts followed: Stow says (Chron., p. 1040) that Venice glasses were first made in London by one Jacob Vessaline about the beginning of the reign of Queen Elizabeth, and in 1565 one Cornelius de Lannoy (or Launoy) was working in the pay of the Government (Cal. State Papers, Dom.). Others, as Carre or Quarre, and Becku alias Dolin, from the Low Countries, were engaged in similar undertakings during the latter part of this century, but it does not seem that any great success was attained, as the importation of glass from Venice continued until long after.

These attempts to rival Murano seem to have been most successful in the Low Countries and in Spain. Ambrozio de Mongarda had a privilege in the former country to make “ voirres de cristal & la faschon de Venise,” which in 1599 was continued to Philippe de Gridolphi; his glass- house was at Antwerp. Glass-works also existed at Lidge. Much glass in the 16th century was sent from Antwerp to England (Houdoy, Les Verreries & la facon de Venise). This manufacture went on during the following century, and many examples remain, more or less resembling the products of Murano.

In Germany Ferdinand I. established a glass-house at Weidlingen near Vienna, which was to work in the Italian manner ; but no great success it would scem attended these efforts, partly no doubt because about the same time the native glass-makers struck out a new and original style of ornamentation for the great cylindrical beakers, sometimes 20 inches in height, usually called wiederkom (come again), but which M. Peligot says ought to be called willkkomm (welcome). This was a somewhat coarse but very effective system of painting in enamel such subjects as the empcror and electors of Germany, or the imperial eagle bearing on its wings the

arms of the states which composed the empire, &c. The earliest example which has been met with bears the date 1553, but the system had great vogue, and con- tinued in use until about 1725.

Spanish writers have not as yet acquainted us with the

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precise means by which the Venetian methods of working were brought to their country ; but Gaspar Baneiros in his Chronographia, published in 1562, says that the glass made at Barcelona was almost equal to that of Venice, and during this and tlhe next century large quantities were exported. Venetian glass was imitated in several other places in Spain, and with considerable success, as several examples in the South Kensington Museum testify. The native forms and methods of working, however, went on contemporaneously, and it would appear da so down to the present day.

The branch of glass-making in which the greatest results 17th were obtained in France during the 17th century was that of century.

the manufacture of mirrors. In 1665 the services of eighteen Venetians were obtained, and a factory established in the Faubourg St Antoine at Paris, and another factory was founded at Tour-la-Ville near Cherbourg. Thliese were united and worked with great success; the plates which ornament the ‘Galerie des Glaces” at Versailles were made at Tour-la-Ville. In 1688 the process of casting plates of glass was first adopted in modern times (for the window glass of Roman times was cast); and thus it became pos- sible to make mirrors of dimensions which could not be attained as long as the plates were produced by blowing. The manufacture was carried on at St Gobain, still the scat of an immense production of glass.

English glass-making of the 17th century is distinguished by one of the most important innovations in the practice of the art which has at any time been introduced, that of using a large proportion of oxide of lead in combination with potash. Glass so made is more brilliant than other kinds, and is known in England as “ flint glass,” in France as “cristal.” The

employment of lead as one of the ingredi- ents of glass was not a discovery, for it had been practised to a small extent and for certain purposes, as in the imi- tation of gems by the Romans, and through the Middle Ages. Neither the date when flint glass was first made nor the inventor of the process is known.

Sir William Slingsby before 1611 (Cal. State Papers, Dom.) had obtained a patent for making glass with sea coal and in 1615 the use of wood for that purpose was forbidden by royal proclamation. How far this proclamation may have been obeyed does not appear, but Sir R. Mansel, who held a patent of monopoly for glass-making from 1616 until about 1634 (and perhaps even later), states in 1623 that furnaces erected in London, the isle of Purbeck, Milford Haven, and on the Trent, had all failed, but that he had established them successfully at Newcastle-on-Tyne. Pro- bably coal was used at this last place, and it seems not unlikely that flint glass may have been first made there. Merret, however, writing about 1665 (in his edition of the Ars Vitraria of Neri), says that glass made with lead was not in use in the English glass-houses on account of its too grcat fragility; but in 1673 Evelyn notes in his diary a visit to the Italian glass-houses at Greenwich " where glass was blown of finer metal than that of Murano," and in 1677 a visit to the duke of Buckingham's glass-works (at Lambeth), "where they made huge vases of metal as clear, ponderous, and thick as crystal, also looking-glasses far larger and better than any that come from Venice." From this time much glass was made in England, and Dr Pococke, who travelled in Germany in 1736, gives the preference in point of quality to English glass over Bohemian.

During this century much art and labour were employed in Germany in the ornamentation of vessels for drinking, such as goblets and wiederkoms. Sometimes they were painted in grisaille, the subjects being battles, processions, and the like, sometimes engraved or etched; common sub- jects are escutcheons with arms, views of cities, ciphers, &c. Many excellent artists worked in these various styles (Beckmann, J/ist. of Inventions, iii. 209; Doppelmayr,

18th and 19th cen- turies.

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Nirnubergische Kinstler, p. 231, 233, &c.), and their works brought high prices. Dr Pococke mentions seeing some at Rispen, to which the glass-works formerly carried on at Potsdam had been removed, which cost from £100 to £150. Excellent material for these artistic efforts was furnished by the Bohemian furnaces; the art was patronized by several German princes; the celebrated Kunkel was in 1679 director of the glass-houses at Potsdam, which were carried on at the cost of the elector, and whcre the beautiful ruby glass was produced. Etching and engraving on glass was also much practised in Holland.

In Spain glass was made in 1680, at San Martin de Valdeiglesias, in imitation of Venetian; and Barcelona, Valdemaquada, and Villafranca are named in a royal schedule of the same date, fixing the prices at which glass was to be sold in Madrid, as places where wares imitative of Venetian were made. There was also an important manufactory at La Granja (see Introduction to Cat. of Spanish Glass in South Kensington Museum, by Seiior Riano). Some of the products of the Spanish furnaces closely resemble those of Murano, but rarely exhibit much beauty or much originality. Others again, attributed to the factory of San Ildefonso and to the 18th century, bear a very close resemblance to some of the Dutch glass of that period.

Although during the 18th and earlier part of the 19th cen- tury progress was made both in the purity and in the beauty of the material (especially in the case of glass for optical pur- poses), and in the organization and working of factories, it was a period marked in no country by much of novelty or of artistic effort in the manufacture of glass. M. Labarte even goes so far as to say (Hist. des Arts Industriels, iv. 597) that in France in 1759 the fabrication of “ vases de verre” had so completely fallen into decadence that the Academy of Sciences offered a prize for an essay on the means by which the industry coula be revived. In the beginning of the present century cut glass was much in vogue, aud was produced in England of great brilliancy, though the forms of the objcts often left much to be desired in point of elegance.

The manufacture of coloured glass for windows was a consequence of the revival of Pointed architecture, and England, France, Belgium, and

Germany have in this century rivalled each other in its production.

Lhe Exhibition of 1851 did not perhaps produce a more marked effect on any of the industrial arts than on that of glass. The progress made since that date in the fabrication of artistic glass wares (the verrerie de luxe of the French) has been surprising, and at the present moment enlightened and enterprising manufacturers of glass are in every country studying the products of the furnaces of all times and all countries, as their predecessors at Murano in that great period of the art—that of the Renaissance—did tle relics of Roman glass-working (Biringuccio, Pirotechnia, lib. ii.) in order to glean from them lessons and suggestions of further advance in their art. (A. NE.)

THE MANUFACTURE OF GLAss.

Glass, in its ordinary signification, is a brittle, transparent compound produced by the fusion, at a very high tempera- ture, of silica (silicic acid) with one or more basic substances, one of which, in all cases, must be an alkaline metal. But the silicates of sodium and potassium, whether separate or combined, being soluble in water, and also readily acted on by other agents, are not in themselves suitable for most of the purposes to which glass is ordinarily applied. When, however, to these silicates, or to either of them, a silicate of an alkaline earth is added, the resulting body is not sensibly affected by water or ordinary solvents ; and it is the

fused amorphous mass thereby obtained that alone is glass in the restricted technical sense. Thus the definition given by Dumas that glass is a silicate of at least two metals belonging to different groups, one of which must be an alkaline metal, strictly embraces and limits all varieties of ordinary glass. Boracic acid, a substance closely allied in chemical properties to silica, has a similar influence on the alkalies and alkaline eartlis, producing by their mutual fusion a transparent amorphous compound; and indeed, for certain special purposes, a glass in which borates to a certain extent supplant silicates is used for optical purposes, The substances, however, which form

the essential basis of all varieties of common glass are (1) silica as the acid element ; (2) soda or potash as the alkaline base; and (3) lime and oxide of lead as the alkaline earths. To the alkaline earths commercially employed there ought also to be added baryta and alumina, the former being used in the place of lead, and the latter being a common ingredient in certain kinds of glass.

The following tabular statement shows the bodies capable of yielding transparent glass :—

Earthy.

Alkaline. ———— Colourless. Coloured.

Oxides of Calcium, Lead. Barium. Strontium. Magnesiuni. Aluminiuni. Zine. Thallium.

ae

Oxides of Tron. Manganese, Copper. Chromium, Uranium. Cobalt. Gold,

Oxides of

Silica, Potassium.

Boracic acid. | Sodium.

Various authorities who have investigated the constitution of glass have endeavoured to establish a chemical formula for what they term normal glass. ‘The results arrived at, however, by different investigators disagree among them- selves; and the balance of opinion is in favour of the view that no sucli substance as normal glass exists, and that glass does not result from any definite chemical compounds, but is simply a mixture of silicates, with usually an excess of uncombined silica. The proportions in which the ingredients of glass are present, however, have not only a very great influence on the fusibility of the mass; but these conditions also very materially affect the qualities of the substance. In general the more nearly the proportion of silica approaches the amount necessary to form definite

compounds with the basic ingredients, the better and the more stable is the quality of the glass) The conclusion of Otto Schott in his investigation of the constitution of glass, that the simplest formula for glass is represented by xNa,O yCaO

The phenomenon of devitrification, which is exhibited most readily by glass of inferior quality, has important bearings on the chemical constitution of glass, as well as on the working of the material. Devitrification is a change which may be induced in all varieties, but only with diffi- culty in the finer kinds of potash glass—either by slowly cooling the glass from the state of fusion, or by heating it in a mixture of sand and plaster of Paris till it softens, and then allowing it to cool by very slow degrees. Thereby it partly or entirely loses its transparent amorphous form, and by the formation of innumerable minute crystals it becomes opaque. When such a change penetrates the entire mass it assumes a milky and porcelain-like appear- ance, whence it is in this condition known as Réaumur's porcelain—the phenomenon having been first investigated by that observer. Devitrification renders the material much

\ 2810, may be accepted as a safe statement.

harder and less fusible than the same glass in a transparent

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condition ; and it is less subject to fracture on the applica- tion of heat. According to Pelouze, Splittgerber, and

others, devitrification results simply from a rearrangement |

of the molecules into the crystalline form while the mass is

GEASS

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soft, no alteration in the proportions of the constituents |

taking place concurrently; but Dumas and his followers maintain, on the contrary, that in undergoing the change the glass loses part of its alkali, and that crystallization takes place through the formation of compounds infusible at the temperature existing at the moment of crystallization. These compounds may result either from the dissipation of alkaline matter or from the separation of the mass into two strata,—that most highly alkaline retaining its amorphous condition more persistently than the other more siliceous portion.

The physical properties upon which the great value and utility of glass principally depend are (1) its well-known

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It is difficult to give a consistent and systematic view of the manufacture of glass, because not only chemical con- stitution, but the mechanical operations by which glass is prepared, and the purposes to which the material is ap- plied, have also to be taken into consideration. A good

classification, from a chemical point of view, is that given

prevailing transparency combined with a brilliant lustre and —

great hardness; (2) its fusibility at a high temperature ; and (3) its softness and viscosity at a red heat, whereby it can be moulded and otherwise worked with facility into any shape desired. Of great value also is its resistance to the influence of common solvents. Properly-made glass is not sensibly acted on by any of the acids except hydro- fluoric acid, which attacks it powerfully, combining with and removing its silica. Water affects glass so feebly that for practical purposes its action may be disregarded; but when it is submitted for a prolonged period to water at a high ternperature, itis slowly dissolved. Even prolonged ex- exposure to moist air so acts on glass, particularly on highly alkaline varieties, that the surface becomes clouded and obscure, and the beautiful iridescent scaling off observable in ancient glass is due to the exposure of the substauce for long ages to the influence of moist air or damp earth. Glass is an extremely bad conductor of heat, and from that property springs, in great measure, its brittleness. Owing to this imperfect conductivity it necessarily results that a mass of glass, or a

glass object cooling from a state of fusion, becomes cooled and set or solidified on its outer

surface before the internal molecules have parted with their |

heat, contracted, and established themselves in a stable re- lation to each other.

outer range of molecules. In this condition a very moderate impact is sufficient to determine the fracture of the glass, The high degree of brittleness which results from unequal cooling is exhibited in a very marked manner by the philo- sophical toy known as “ Rupert’s drops.” Such pear-shaped masses of glass are prepared by allowing molten glass to fall, drop by drop, into cold water, when the drops assume a more or less spheroidal form, with a finely tapering point.

Of course a very sudden and rapid cooling of the surface |

takes place, while the interior is still at a high temperature, and correspondingly much dilated, the consequence of which is that a state of great tension is established between surface and centre.

between the hard superficial and the dilate internal molecules ; and immediately the whole mass is shattered to dust with explosive violence. Excessive brittleness is

The solidification of the superficial | stratum thus necessarily hinders the contraction of the | internal portion of the mass, and as the internal molecules | cool down a state of tension is created, the central portion | tending to draw the surface stratum inwards with a force | held in check by the strain in the contrary direction of the |

ea t The breaking off of a small portion of | the tail is sufficient to destroy the equilibrium established |

overcome by the operation of annealing to which glass is

submitted,—a process which has been explained under ANNEALING, and which will be further referred to in deal- ing with a method of tempering or hardening glass which has been introduced by M. de la Bastie within the last few years,

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| glass. which go to the formation of glass.

by Stein (in Bolley's Zechnologie), who distinguishes three classes :—

(1.) Glass containing one or two bases belonging to the same group. 'This class embraces only the soluble silicates which do not fulfil the ordinary functions of glass.

(2.) Glass with several bases which belong to different groups, comprehending two classes:—(1) calcium glass, under which come sodium-calcium glass and potassium-

| calcium glass; and (2) lead glass, which constitutes ordinary

flint glass or crystal and strass.

(3.) Coloured and opaque glass, of which there are also two classes,—the first embracing the varieties of transparent coloured glass whicli may belong to any of the above classes, with the addition of colouring oxides, and the second being

| devoted to the various kinds of opaque glass.

The raw materials of the glass manufacture embrace the following principal ingredients. (1.) Silica is used in the forms of pure quartz (for very fine qualities of glass), crushed sandstone, pulverized flints, and especially sand of degrees of purity varying in proportion to the quality of the glass to be made. The finest iron-free sand in the United King- dom is obtained from Alum Bay in the Isle of Wight, from Lynn, Norfolk, and from Leighton Buzzard, Bedfordshire ; but much pure sand is imported into the United

Kingdom from Fontainebleau in France, from Belgium, and other localities. (2.) Lime is employed in the form of chalk or marble, either burned or unslaked, and it also must for colourless glass be free from iron impurities. Of (3.) potash and (4.) soda any of the ordinary salts except chlorides, but especially the sulphates and carbonates, are indifferently utilized, the point of real importance being here also the free- dom of the compound from contamination whien fine glass is being made. At no very remote date kelp was the principal source of soda alkali in glass, but this is now entirely dis- used, and the principal source of potash is the salt mines of Stassfurt and Leopoldshall in Prussia, and at Kalusz in Galicia. Both potash and soda are frequently constituents of the same glass ; but glass made from potash is free from the decided sea-green tinge whicli invariably is seen in soda glass, although the latter is the more brilliant in lustre. (5.) Lead is the characteristic ingredient of a distinct class of glass of which ordinary flint glass is the type. It is usually employed in the form of minium or red lead (2PbO,PbO,), partly on account of its fine state of division and partly because by giving off oxygen it helps to purify the metal. (6.) Baryta and witherite or baric carbonate have been introduced with much success as a partial sub- stitute for alkali in soda or potash glass, and for a part of the lead in ordinary flint glass, aud in all probability barium compounds are destined to occupy a much more important place in glass manufactures than hitherto they have done. (7.) Cullet or waste and broken fragments of the special kinds of glass to be made is an important and essential ingredient, being added to the extent of about one- third of the whole charge in the melting and preparation of These materials constitute the essential ingredients In coarse varieties, such as bottle glass, alumina and iron are present, but their presence simply results from the inferior and

impure nature of the raw materials employed, and are

neither essential nor desirable. Some portion of alumina too is taken up from the pots in which the materials are melted. Bleaching or oxidizing agents are also employed to produce a high degree of colourlessness in

MANUFACTURE. |

clear glass, and for this purpose peroxide of manganese, arsenious acid, and nitrate of potash are the materials gene- rally used. These bodies oxidize

carbon compounds which may be present, and neutralize to a large extent the colour yielded by iron by converting its protoxide into peroxide, foo much manganese, however, gives the glass a reddish tinge, and excess of arsenic produces a milky cloudiness. The various substances employed to produce coloured and opaque varieties of glass will be enumerated when these special kinds are described. The requisite proportions of the raw materials ground and prepared are intimately mixed with the aid of a mixing apparatus, and in this form con- stitute the "batch." Formerly it was the habit to frit or partially decompose and fuse the ingredients in a form of reverberatory furnace called a calcar arch, but since the use of kelp was abandoned that operation is no longer essential, and generally the well-mixed batch is placed at once in the melting pots, or the tank in the case of tank furnaces,

Melting Pots.—These pots or crucibles are made of thie finest fire-clay, that from Stourbridge in Worcestershire being exclusively used for glass pots in Great Britain. Great care is requisite iu the selection, and in cleansing the clay from extraneous particles, the presence of which, even in the smallest degree, will injure the pot,

opening to the third compartment, whence it was to be drawn for working. The specific gravity of the cbarge in the first compartment would rise in proportion as the materials melted and became homogeneous in structure. Therefore the metal would sink in proportion as it melted ;

Fic. 1.—Crown-Glass Pot.

i Fig, 2.—Flint-Glass Pot.

and the best melted portions pass into the second com- partment, in which, under the influence of the direct fur- nace leat, it would be cleared. There, similarly, the per- fectly fined glass falling to the bottom would pass into the cooler working compartment, which is protected by a cover- ing cap. Dr

Siemens's idea has been practically developed in his continuous tank referred to below,

Furnaces,—A glass-melting furnace or oven isa modified form of reverberatory furnace, which assumes many different shapes and arrangements according to the kind of glass to the manufacture of which it is devoted, and the nature of the fuel used. As regards the latter cause of difference it may be noted that, while coal is the principal fuel em- ployed in Great Britain, dried wood and peat are extensively cousumed in Germany, and in modern times gas furnaces on the Siemens and other principles are being freely intro- duced. In the construction of a furnace the principal objects to be kept in view are not only the production and maintenance of an intense heat, but its uniform distribution throughout the furnace, and the bringing of the charges of glass materials directly under its fusing influence. The form assunied by melting furnaces is, in general, square or oblong for sheet and plate-glass making, and circular in English flint-glass making. The fire-space or grate occupies the centre of the furnace, and the fire, when fuel is used for direct heating, is either fed or stoked from both ends, or raised from under the bars by a patented method. The fire-grate is usually on a level with the floor of the house in which it is erected, but under it is an arched subterranean passage forming the "cave" or ash-pit, both ends of which extend to the open air outside the glass-house. The fire-grate bars are placed in the top of this arched passage, which thus serves as a canal for the atmospheric air required to main- tain combustion within the furnace; and for regulating the admission of air, and so controlling the heat, there are doors at both ends of the archway. In some cases two such arched passages at right angles to each other, and intersect- ing at the fire-bars, are constructed, so that either can be used according to the prevailing direction of the wind, &c. In general no flue or chimney is directly connected with the furnace, the only exit for the products of combustion being the working holes, and thus the heat is directed around and over each pot placed opposite a working hole in the furnace. Within the furnace, around the grate space in the case of circular furnaces, or on both sides of it in quadrangular furnaces, is a raised bank or narrow platform termed the "siege," on which the melting pots are placed. The number of pots arranged in a furnace vary from four to ten, and each is reached, either for charging or for work- ing off the prepared metal, by means of "working

holes” in the side of the furnace situated directly over the pots. The general form and construction of a six-pot crown-glass furnace, which also may be taken as the type — and

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ground plan at the level of the siege of a common form of furnace, while in fig. 1 is seen a front elevation of the same furnace, 1, 2, and 3 being the working holes, 4, 5, 6, and 7 pipe-holes for heating the blowing pipes, and 8, 9, and 10 foot-holes for mending the pots and sieges. The furnace

Fic. 3.—Section of Flint-Glass Furnace. is covered with a low-roofed crown or dome, and the whole

structure is bound together with a system of iron bars. The materials used in the construction and lining of all furnaces must be selected with the utmost care, and built with special regard to the enormous temperature to which they are subjected. Formerly a fine-grained purely siliceous

sandstone was much used, but now the principal materials |

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Plate V. plate-glass furnaces, is shown in Plate V., where fig. 3 is a

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are large moulded bricks or blocks of fire-clay of the most infusible and refractory description. For the crown of the furnaces used in plate-glass melting Dinas silica blocks are employed. In laying the blocks and throwing the arches no mixture containing lime can be used, but only fire-clay or Dinas sand, in as small quantity as possible. Should any of the materials of the crown of the furnace gradually fuse under the influence of the heat, the dropping of the molten matter into the glass-pots is the cause of most serious annoyance and loss to the manufacturer.

An English flint-glass furnace furnishes the type of cir- cular furnaces. Usually a large number of pots, sometimes ten, are provided for in such a furnace, because, the objects made in flint glass being in general of small size, the metal is worked off only slowly, and a large number of glass-blowers can be accommodated at the separate work-holes. The arrangements of the cave and fire-grate are the same as in the ease of square or oblong furnaces, but flint-glass furnaces differ from the prevailing rule in others by being provided with a system of flues and chimneys, one flue being placed between each pair of pots. The general appearance

presented within a flint-glass house is illustrated in Plate Plate

VI. fig. 1; and the accompanying woodcut (fig. 3) is a sec- tional illustration showing the construction and internal appearance of a seven-pot furnace. The furnace is com- posed of a double arch or vault springing from strong pillars or abutments 0b, The space c, between the outer arch and the vault proper of the furnace d, is a comnion receptacle for the flues ff led from within the furnace, and the products of combustion escape by the chimney ¢. The work-loles are at 4, and at that place the furnace wall is taken down when a pot requires to be removed and renewed. The “cave” or air canal is seen at /; x is the fire-grate, stoked in this case from one side only; / shows openings at which the blowing tubes are heated; m is an opening for cleaning the flues; and @ is the bank or siege with the position of the pots indicated. Fre- quently instead of being arched the outer portion of the furnace is carried up in the form of a wide truncated cone or open chimney stalk, and in other cases short separate chimney stalks are built for each flue terminating within the glass-house, which itself forms such an open-topped

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Fias. 4 and 5.—Siemens’s Continuous Tank Furnace.

cone or chimney. Of course in cases where such separate small chimneys are provided no second or outer vault is required.

In the year 1861 Dr C. W. Siemens introduced a form of furnace in which the use of melting pots was altogether abandoned, and the batch was introduced into, melted in, and worked from a tank which occupied the whole bed of the furnace. ‘This furnace he heated from the sides by

means of his well-known regenerative gas system described under Furnace and Iron. In 1872 he effected a further development of the tank furnace by dividing the tank,

‘on the principle of his melting pot, by means of two

floating bridges or partitions into three compartments, and thus he elaborated what is termed Siemens’s patent con- tinuous melting furnace. Of this improved furnace fig. 4 shows a longitudinal section, and fig. 5 is a transverse

MANUFACTURE. |

section.

1. An increased power of production, as the full melting heat may be employed without interruption, whilst with the old method of melting nearly half time is lost by cooling and settling the metal, the working it out, and the re-heating of the furnace.

2, An economy in working, as only half the number of men are required for the melting operations.

3. A greater durability of the tank and furnace, uniform temperature to which they are subjected.

4. A much greater regularity of working, and more uniform quality of the product than in other furnaces.

5. For the manufacture of window glass, the compartment C may be so arranged that the blowers can work without interfering with the gatherers; this would do away with the separate blowing fur- nace now 1n use,

Although the Siemens regenerative gas firing is generally used with tank furnaces, that system is not essential to the successful working of tanks. Mr Archibald Stevenson of Glasgow has patented a tank furnace fired by common coal from one end, with working holes on the other three sides ” and furnaces on this principle are worked in a perfectly satisfactory manner with much economy of coal and working room. ‘Tank furnaces are used principally in bottle works and in the manufacture of rolled plate. The following statement shows the extent to which Siemens furnaces and tanks have been introduced by manufacturers.

Furnaces using Pots,

owing to the

Plate Glass. ane ose Flint Glass. Great Britain…..... 5 5 2; RATIO Msc ec s. 7 4 11 BORO «0.560260 000000. : 4 1 1 Other countries …..... 6 10 15 Furnaces with Tanks. GTM TEE csi. bestilss-sscnesse «easeereccetevicesa: 6 Furnaccs with Continuous Tanks.

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Formerly it was the habit that to the sides or wings of the main melting furnace there were attached calear or fritting arches, annealing ovens, pot-firing arches, and other sub- sidiary furnaces required in certain stages of glass manu- |

facture. These were heated by flues leading from the fire- space of the principal furnace; but such a practice is now generally abandoned, and distinct furnaces or ovens, arranged and fired according to the necessities of the case, are provided instead. In the manufacture of common bottle glass, however, for which highly impure materials are used, it is still the practice to prepare a frit in a side archi occasionally attached to the melting furnace.

The whole of tbe pots in a common furnace are charged or filled with the prepared “batch” at the same time. Immediately the beat is forced, and the stoking must thereafter be carefully regulated to maintain the high temperature. As the mass begins to fuse it settles down and occupies considerably less space in the pot, to which thereon a second quantity of material is added, and generally a third portion is subsequently filled in so as to have at the close of the melting process as large a quantity of metal as possible. When tle fusion is complete a scum composed of uncombined salts, and known as glass gall or sandiver, rises and collects on the surface. It consists almost entirely of sulphate of soda, with sulphate of lime, and a sinall percentage of chloride of sodium. This scum of glass-gall is carefully removed with a perforated scoop, and the heat of the furnace is then forced to the most intense degree with the view of rendering the metal as fluid and limpid as possible, so as to free it from all included gaseous bubbles which it still contains. This process of “fining,” “refining,” or hot-stoking, as it is indifferently termed, involves a temperature which is esti- mated in certain cases to reach from 10,000° to 12,000° Fahr. ; and the operation is sometimes assisted by stirring the molten mass witha pole of wood, ina manner analogous to the poling of copper in the refinmg of that metal. Throughout the operation of melting, test pieces are periodi- cally withdrawn from the pots for the purpose of observing the progress and condition of the glass, When it is found that the vitrification is complete and

the object of refining fully accomplished, the heat of the furnace is considerably reduced, so that the glass may be brought into that condition of viscosity in which it is capable of being worked, Tn contradistinction to the refining or hot-stoking period, this is known as cold-stoking.

Glass Working.—The means by which melted glass is caused to assume its varied forms for use are (Ll) by blow- ing ; (2) by casting; and (3) by pressing in moulds—an operation in which the other two processes may be partly combined. Minor manipulative processes which do not fall under any of these heads are called into action; but these are for the most part merely subsidiary to the others, which really comprehend all the lines along which the formation of glass proceeds.

Having regard principally to the forms into which glass is worked and the uses to which it may be applied, the following classification embraces the principal departments of the glass-making industry,

I, Flat glass. Crown glass, Sheet glass, Plate glass, II. Hollow glass, Flint glass, blown. Bohemian glass. Venetian glass. Bottle glass. Slag glass (Britten's). Tube and gauge glass, Ill. Pressed and massive glass. Flint glass. Optical glass. Strass. Rod glass, marbles, aud beads. : ; 1V. Coloured, opaque, and enamel glass, including glass mosaics and hot cast porcelain, &c.

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So far as they involve distinct manufacturing processes, these varieties of glass will be here noticed in the above order. Such of the divisions as result from the application of special methods of ornamentation, and as come under the head of art glass, do not fall within the scope of this article.

Crown Gu Lass.—This, with sheet or cylinder glass, forms all ordinary blown window glass. Both varieties are precisely the same in composition, being a mixture of sodic and calcic silicates, and differ only in the manner in which the shects of finished ylass are produced. The raw materials employed for this and all other kinds of glass vary within rather wide limits, and, as already explained, the form in which the sodic and calcic compounds are used may also be varied. The following composition of

batch for window glass must therefore be regarded as only onc out of very many mixtures in use :—

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To these materials a minute proportiou of white arsenic and peroxide of manganese, as bleaching agents, may also be added.

Crown glass was, inthe early part of the present century, the only form of window glass made in Great Britain, and consequently it was generally recognized as English window glass, having been manu- factured only on a very limited scale in any other country. Since the introduction of sheet-glass making, the crown-glass industry has steadily declined, and now its manufacture may be regarded as practieally a thing of the past, not more than one or two crown fur- naces being in operation. Seeing that it possesses little more than an historical interest, it is now unnecessary to enter into much detail as to the processes cmployed in the manufacture of crown glass.

The metal being brought to a proper condition for working, the ‘* gatherer” dips into the pot of metal an iron pipe or tube, 6 or 7 feet in length, of the shape shown in fig. 6, heated at that end which takes up the glass, and, by turning it gently round, gathers about 1416

SS a Se Fic. 6.—Blowing Tube.

of liquid glass on the end of it. Having allowed this to cool for a little, he again dips the rod into the pot, and gathers an additional quantity of from 24 to 3ib. Thisisalso permitted to cool as before, when the operation of dipping

is again repeated, and a sufficient quantity of metal, from 9 to 10 tb weight, is ‘‘ gathered,” to form what is techni- cally called a table or sheet of glass. The rod, thus loaded, is held for a few seconds in a perpendicular position, that the metal may distri- bute itself equally on all sides, and that it may, by its own weight, be lengthened out beyond the rod. The operator then moulds the metal into a regular form, by rolling it on a smooth iron plate, called the ‘‘marver,” aterm corrupted from the French word marbre. He then blows strongly through the tube, and thus causes the red-hot mass of glass to swell out into a hollow pear-shaped vessel. The tube with the elongated sphere of glass at the end of it is then handed to the ‘‘ blower,” who heats it a second and third time at the furnace, press- ing the end, between each blowing, against the bullion bar, so called from the part thus pressed forming the centre of the sheet or “ bull’s eye,” and by the dexterous management of this operation, the glass is brought into a somewhat sphericalform. The blower now heats a third time at the ‘‘ bottoming hole,” and blows the metal intoa full- sized flattened spheroid. When this part of the process has been completed, and the glass has been allowed to coola little, it is rested on the ‘‘casher box,” and an iron rod, called a ‘‘ pontil” or punty rod, on which a little hot metal has been previously gathered, is applied to the flattened side, exactly opposite the tube, which is de- tached by touching it-with a piece of iron, dipped beforehand in cold water, leaving a circular hole in the glass of about 2 inches diameter. Taking hold of the punty rod, the workman presents the glass to another part of the furnace called the ‘‘ nosc hole,” where the aper- ture made by its separation from the tube is now presented and kept until it has become sufficiently ductile to fit it for the operation of the flashing furnace. Whilst here, it is turned dexterously round, slowly at first, and afterwards with increasing rapidity; and the glass yielding to the centrifugal force, the aperture just mentioned becomes enlarged. The workman, taking great care to preserve, by a regu- lar motion, the circular figure of the glass, proceeds to whirl itround with increasing velocity, until the aperture suddenly flies open with a loud ruffling noise, which has been aptly compared to the unfurl- ing of a flag in a strong breeze ; and the glass becomes a circular plaue or shect, of 44 feet diameter, of equal thickness through- out, except at the point called the bullion or bull’s eye, where it is attached to the iron rod. The shiect of glass, now fully ex- panded, is moved round with a moderate velocity until it is

sufficiently cool to retain its form. It is carried to the mouth of the kiln or annealing arch, where it is rested on a bed of sand and de-

tached from the punty rod by a shears. The sheet or table is then lifted on a wide pronged fork, called a faucet, and put into the arch to be tempered, where it is ranged with many others set up edge- wise, and supported by iron frames to prevent their bending. From 400 to 600 tables are placed in one kiln. A sketch of the interior of a crown-glass house, during the progress of these operations, has been given in Plate VI., fig 2. The kiln having been clayed up, the fire is permitted to die out, and the heat diminished as benindllg as possible. When the glass is properly annealed, and sufficiently cold to admit of its being handled, it is withdrawn from the oveu after the removal of the wall built into the front of the arch, and is then quite ready for use. The largest sized tables of crown glass made will cut into slabs 30 inches across, from which squared pieces measuring 38 by 24 or 85 by 25 inches may be obtained.

Surer Guass, as already mentioned, is the same in composition as crown glass, which it has now entirely supplanted. The success of sheet glass is due principally to the fact that it can be produced in sheets of much greater dimensions than is possible in the case of crown glass; it is free from the sharp distorting strie and waves common in crown class ; there is no loss of glass as there is witli the bull’s eye of crown ; and modern improvements effected in the manu- facturing process leave little distinction in brilliancy of surface be- tween the two qualities. Sheet glass is made on the greatest scale in Austria, Germany, and Belgium, and it was long distinguished in the British market as German sheet glass. In 1832 Chance of Bir- mingham and subsequently Hartley & Co. of Sunderland introduced the manufacture into England, and in the hands of these firms, as well as of others who followed in their footsteps, the industry prospered and developed, till it has now attained dimensions equal to those it has reached in most of the Continental nations, where the art was long established before it came into use in England.

Sheet-glass — —? involves two principal operations, ~~—(1) the blowing of the cylinder, and (2) the opening, flattening, or spread~~ ing of the glass. The structure and internal arrangements of the melting furnace is practically the same as in the case of crown glass. The ordinary type of oblong furnace usually contains 10 pots—5 in each side of the fire-grate—each pot being of a capacity of about 1 ton or 22 cwt. of metal. Radiating from the work-holes, and raised about 7 feet above the floor level, or a correspondingly deep sunk pit, are ten long stages with an open space between each sufficient to allow the workman to swing about his long tube freely in forming the elongated cylinder of glass. Fig. 7 is a ground plan of a common sheet-glass furnace and staging of planks c, at the extremities d of which are placed a tub of water and a wooden moulding-block. In- stead, however, of having these stages erected in front of the melting furnace, it is now a common practice to {? gather and block the glass at the melting furnace, and tof blow it in front of a separate oblong reheating or blowing furnace, from each opening of which the wooden stage runs out over a pit excavated to the depth of 7 feet or thereby. Common bricks may be used for the construction of this reheating furnace, as the heat required in it is by no means intense.

Blowing.—The charge or batch requires about 16 hours to melt, and other 8 hours are consumed in cooling it to pyg, 7,—Plan of Sheet-Glass Furnace. the working consistency.

When the metal is ready for working, the workmen take their stations, each having his own pot and stage and also an assist- ant, and commence making the cylinders. After gathering the quantity of metal required (which on an average amounts to 20 ib), the workman places it iu a horizontal position in the large hollow of a wooden block (fig. 8), which has been hollowed so that, when the workman turns the metul, it shall form it into a solid cylindrical mass. In the meantime, the assistant, with a sponge in his hand, and a bucket of water by his side, lets a fine stream of water run into the block, which keeps the wood from burning, and also gives a brilliancy to the surface of the glass. The water, the moment it comes in contact with the glass, is raised to the boiling point, and in that state does no injury to the metal ; but it is only when the

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| metal is at a high temperature that such is the case; for, whenever

the glass is cooled to a certain degree, it immediately cracks upon coming in contact with water. When the workman perceives that the mass of metal is sufficiently formed and cooled (fig. 9), he raises the pipe to his mouth at an angle of about 75 degrees, and

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eommenees blowing it, at the same time continuing to turn it in the wood bloek, till he perecives the diameter to be of the requisite dimen- sions (fig. 10), whieh are usually from 11 to 16 inehes. The workman then reheats this cylindrical mass, and, when itis sufficiently softened, commenees swinging it over his head, continuing to reheat and swing till he has made it the desired length, which is commonly about 45

Fig. 8. Fig. 9

Fig. 10. inehes. It is now a eylinder of say 45 inches long by 12 inehes in

diameter, one end being elosed, and the other having the pipe attached to it. The workman begins to open the end which is elosed, for which purpose he eneloses the air in the eylinder, by stopping the aperture of the pipe with his finger ; and then plaeing the elose end of the eylinder towards the fire, it becomes softened, while at the same time the air within is expanding, and, in about thirty seconds, the softened glass at the extremity of the eylinder gives way, forming an aperture asin fig. 12. The workman then turns the eylinder round very quickly, aud, by keeping the opened extremity warm at the same time flashes it out perfeetly straight asatg, fig. 13. Ifthe burst edges are ragged in appearanee they are trimmed by eutting with a pair of seissors before finally expanding. The bursting of the end of athick heavy eylinder has to be determined by allowing a glowing drop of glass to fall on the spot to be burst before presenting it to the fire.

Fig. 13,

Fig. 11. Fig. 12.

The other end, whieh is attached to the pipe, has now to be eut off, and is done in the following manner. The workman, having gathered a small quantity of metal on the pontil, draws it out into a thread of about one-eighth of an inch in diameter, laps it round the pipe end of the cylinder, and, after letting it-remain there for about five seeonds, withdraws it suddenly, and immediately applies a eold iron to the heated part, which oeeasions such a sudden eontraction, that it craeks off where the hot string of glass has been placed round it. Another method is to draw a semi-eylindrieal rod of iron e (fig. 18) heated to redness around the line d of desired fracture, and a drop of water then allowed to fall on the line so drawn determines its fracture. The stages in the development of a eylinder to its full length are illustrated in figs. 9 to 13.

Flattening.—The cylinder so blown and detached is now allowed to eool ; and, previous to its flattening, the burst extremity being thinner than the remainder, and slighly contracted at its edge, has to be removed to the depth of about 2 inehes. For this purpose the cylinder is plaeed vertieally in the jaws of a eutting instrument, having a diamond cutter, pressing by a spring, inside the glass (fig. 14). The cutter moves by small wheels on the table on which it is placed, and being pushed around the cylinder it makes an accurate eut of uniform height. The cylinder has then to be split longitudinally to allow it to be opened out toa flat sheet. To ac- complish this the praetice was formerly to lay the cylinder horizon- tally on a beneh, and draw a red-hot iron two or three times along the inner surface at the line of desired fraeture. Now the splitting is done with a diamond cutter fixed in the eleft of a stiek and (fig. 15) guided from end to end of the eylinder by a straight-edge K laid within it. The cylinder is now ready to be taken to the flat-

tening kiln, which consists of two chambers built together, the one for flattening the eylinders, the other for annealing the sheets, the former being kept at a much higher temperature than the latter.

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The cylinder, after being gradually reheated, is placed in the eentre of the flattening oven, upon a smooth stone, with the split side upwards, Ina short time it becomes softened with the leat, and

by its own weight falls out into a flat square sheet of 45 inches by 36, The flattener, with a piece of charred wood, rubs it quite smooth, and then places it on edge in the annealing arch, where it remains about three days to be annealed.

In the arrangement of the flattening and annealing ovens numer- ous improvements have been effected, which have resulted in greatly inereased smoothness and uniformity of the glass, and in considerable economy of time and labour in the operations. Fig. 16

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Fig. 16.

shows a section of a flattening (L) and annealing kiln (M) in common

use. The split cylinder O is introduced and gradually pushed for- ward so as to be uniformly heated till it reaches P, the flattening stone or table, mounted ona movable waggon N. On this waggon after it has been flattened

it is carried into the annealing arch M, as shown by the dotted outline. Here ina less heat it gradually stiffens, till it is ready to be moved by a forked tool to a horizontal position on the bed of the annealing oven. The waggon then goes back to the flattening areh, and when it is reintroduced with anotlier sheet, that pronayisty flattened is ready to be piled up on edge at R, and thus the work proceeds till the annealing oven is filled, when it is elosed up and allowed to cool down by slow degrees. Chanee Brothers & Co. of Birmingham are the introdueers of a system of continu- ous flattening and annealing furnaces. This they aeceomplish by means of two contiguous cireular kilns having revolving soles, the

fires being arranged and the inside partitioned so that the split eylinder gradually approaches the greatest heat, where the flattening takes plaee, and then passes round in a decreasing temperature till at the opening into the annealing arch it has attained sufficient eonsistency to be moved into the yet cooler annealing arch, round which the sheet is slowly carried till it arrives fully annealed at the point where it is withdrawn.

Although the average size of finished sheet glass as now made is about 50 inches by 86 inches, very much larger sizes may he and occasionally are produced, the extreme trade limit being 85 inches long by 49 broad; but both these extremes cannot be obtained in the same sheet, and few workmen attain the dexterity necessary for properly manipulating the larger sizes. sheets from blown cylinders measuring 10 feet by 4 feet have been made. The thickness of finislied sheet glass is estimated by the amount it weighs per square foot, and the commercial range of weight is from 15 oz. to 42 oz. per foot, the thicker and heavier kinds, of course, selling at the highest price.

Polishing of Sheet Glass.—Polished sheet glass is known in com- merce as patent plate glass, to distinguish it from ordinary polished cast-plate. The practice of. polishing sheet glass was first intro- duced and patented by Chance of Birmingham, and polished sheet is now in considerable demand for photographic purposes, for fram- ing engravings, and generally where a fine true surface combined with lightness or thinness is requisite. The polishing process in- volves two operations—smoothing and finishing or

polishing. The smoothing is done on a thick slab of slate, which must possess a surface as smooth and level as possible. This is covered with a piece of wet cotton cloth, and, the sheet of glass to be smoothed being laid thereon, by gentle pressure all air is expelled from between the surfaces, and the atmospheric pressure then keeps the glass firmly in position. The process of smoothing and the subsequent finishing are from this point the same as in the case of ordinary plate glass, under which head these operations will be detailed. It is only selected plates of fine clear metal that are used for polishing.

PLATE GuAss is manufactured by a process entirely different from any of those yet described, consisting as it does of glass cast and spread in sheets, As plate glass is invariably thicker than blown sheet, it is of the utmost consequence that the ‘‘ metal” should be prepared from the purest possible materials, aud that the found- ing or melting should be done with great care to ensure the expul- sion of air bubbles. It is only thus that the fine clear homogeneous and flawless plates aimed at in the manufacture can be produced. Formerly the French excclled all other nations in the manufacture of plate glass, and the manufactures of the great St Gobain Com- pany yet command the highest prices in the market; but the increased care which has now for about a quarter of a century been given in England to the pee of materials, and the ingenious maehinery whieh has been devised for polishing plate in England, have resulted in placing British-made plate glass on a level with the best productions of France.

The following is given as an example of the materials employed for the preparation of fine French plate :—

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The materials are melted in furnaces and pots of the ordinary construction, but in some cases the melting pots are of greater eapacity, and contain charges of from 2 to 24 tons. In French establishments, and in many others, two forms of pot are placed within the furnace—(1) the ordinary melting pot, and (2) a pouring pot or cuvetéc, quadrangular in form, made of the same material as the melting pot, and capable of holding sufficient metal for casting a single sheet of the superficial extent and thickness desired. Melting pots and cuvettes are placed side by side in the furnace, and the molten mixture is ladled with copper or malleable iron ladles from the pot into the cuvette, in which it is allowed to clear before easting. In some works, however, the molten glass is poured direct from the melting pots, and in other cases it is ladled to the casting table from the huge melting pots with large malle- able iron ladles.

The casting table is a heavy thick flat table of cast-iron, of a length and breadth exceeding the size of the largest plate of glass which may be cast on it. At one end is placed a heavy cast-iron roller, the full breadth of the table, and fitted to roll the whole length of the table by means of spur wheels working into gearing along its sides. The cast-iron roller determines the thickness of the glass by the height at whieh it is caused to roll above the table aud that height is regulated by placing narrow strips or ribs of metal of the required thickness of the the table on which the two extremities of the roller bear as it revolves. The breadth of the plate again is determined within the limits of the table by the two sides of the ‘‘ gun,” an apparatus consisting of two plates of cast-metal, placed in front of the roller, and bolted together by cross bars at a distance apart which can be

In Belgium :

glass along the edges of

easily altered and adjusted according to the breadth of plate the apparatus is intended to control. The edge of the plates abutting against the roller are accurately fitted to the roller curvature, and thus they and the roller form

three enelosing sides for the molten mass poured on the table, and as they travel forward they carry in front of them all the semi-fluid mass except the uniform layer which represents the distance between the moving surface of the roller and the surface of the casting table on which the glass is spread. As the glass does not instantly solidify the moment the roller has past over and spread it into a sheet, the cdges generally assume a rounded and somewhat wavy cast-like appearance. Immediately the plate has sufficiently solidified to bear moving, it is taken to the annealing furnace, the heat of which has been care- fully raised to the proper pitch. The sole of the annealing oven on which the plate is to rest (for with large plates any piling on edge is impracticable) must be as smooth and level as possible, since the still semi-plastic mass moulds itself to the surface on which it is laid. As the oven only accommodates a single plate of the largest dimen- sions, and since the annealing process occupies several days, a large nuinber of ovens, occupying a great space and involving the expen- diture of much labour and fuel, are needed in works where many

lates are cast. In dealing with plates of small size they may be laid norizontally on the furnace bed for a little till they come to the fur- nace temperature, after which they are piled up on edge in twenties or thirties, leaning against a range of iron bars running across the furnace. When the plates have been deposited in the annealing oven, the openings are all carefully stopped up, and the furnace with its contents 1s cooled by slow degrees down to a temperature at which the glass may safely be withdrawn and exposed to ordi- nary atmospheric influences. The cooling of such furnaces is now hastened as far as the safety of the plates and the completion of the annealing will permit by allowing cold currents of air to pass under their sole.

The plates, as withdrawn from the annealing oven, have a very irregular, rough, undulating surface, and although the glass is per- feetly pure, they have, owing to their uneven surface, no trans- parency. In this condition they eonstitute the ‘‘ common rough plate” of commerce, and as such they are extensively used for the glazing of roofs, for floor and cellar lights, and generally in positions where light without transparency is requisite.

Polishing. —When the annealed plates are withdrawn from the oven they are carefully examined for any defeets, such as spots, air-bells, &c., which they frequently exhibit, If serious defects are found, the plates are cut inte the largest pieees which can be obtained free from flaws, and the select- ed pieces are then submitted to the operations of polish- ing, consisting of—(1) grinding, (2) smoothing, and (3) polishing. Various forms of machine have been devised and introduced for effecting these opera- tions. The grind- ing and smoothing table invented by Mr Daglish of Raven- head works consists of a great revolving

Fia. 17.—Plate-Glass Grinding Table.

flat table A (fig. 17), with a strong fixed bar CE, stretched across it about 10 inches above its surface, to which two runner-

frames B, B, shod with iron, are pivoted at Q. The glass to be ground is cemented with plaster of Paris on the surface of the table, and the runner-frames rest on that surface. When the table A is set in motion, each oblong runner-frame B has communicated to it a revolving motion also, owing to the excess of friction brought into action by the more rapid revolution of the outer edges of the revolving table. The effect of these com- pound revolutions is that every point of the surface of the glass is equally and uniformly abraded, when the apparatus in revolution is fed with sharp sand and water. When a level surface is thus pre- pared, the smoothing process is next begun on the same table, the only difference being that emery powder of increasing degrees of fineness is substituted for the sand, and as the operation approaches completion the utmost care must be exercised as to the purity and uniformity of the emery, seeing a single particle of grit would effec- tually destroy the smoothness of a whole plate. The quality of the

| emery is thus of essential conseqnenee, and an ingenious apparatus

is brought into use for arranging the sizes by means of a current of water of diminishing velocity, obtained by passing a uniform stream with agitation successively through cylinders or troughs of increasing

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size. In these troughs the emery powder is deposited in increasingly fine division, according to the growing capacity of the trough and the consequent slow replacement of its contents. The last touches of the smoothing process can only be given by the hand, which at once detects any appearance of grittiness. Both sides of the glass are in succession submitted to these operations, after which it is again bedded in plaster and fixed on the polishing table. The polishing is done with reciprocating rubbers, covered with fine felt, and supplied with rouge (peroxide of iron) in a liquid state. While a reciprocating motion is communicated to the rubbers, the table itself moves backward and forward in a transverse direction, so that all parts of the plate are equally brought under the polishing influence of the rubbers. About 40 per cent. of the weight of the rough plate is removed in the three polishing operations.

Ordinary finished plates vary in thickness from about #th to 3th inch, and the largest sizes measure about 17 feet by 9 feet 6 inches. The great St Gobain Company of France quotes regular prices up to 324c. (10 feet 8 inches) by 204c, (6 feet 8 inches), beyond which size the price becomes special. In the Paris Exhibition of 1878 that company showed a silvered plate 24 fect by 14 feet, the largest piece of plate glass which has hitherto been polished.

Rolled Plate.—A form in which unpolished plate glass is exten- sively employed is the patent rolled plate, originally made by Hartley & Co. of Sunderland. The surface of the casting table on which the rolled plate is spread, instead of being smooth and plain, is engraved or otherwise indented with fine lines, grooves, or flutes, or it may be with small squares, lozenges, or even ornamental patterns, and the glass, of course, takes on its lower surface an accurate impression of any such pattern. Rolled plate is now very largely used for partitions, and in places where obscure lights are required. Such plates are always cast comparatively thin, and of moderate size, so that a large number may be piled in the annealing oven. They, as well as certain qualities of coloured glass, are cast by ladling the molten metal from huge pots which may contain about 24 tons of material. By this ladling numerous “air bells ” are enclosed in the glass, but the circumstance does not affect the durability and ae of the glass.

Fuint Giass on CrystaL.—The name flint glass originated in the circumstance that at first the silica used in the manufacture of this variety of glass was in the form of ground flints. The industry belongs characteristically to the United Kingdom, where it was first established on a large scale, and to the present day flint glass is much more extensively manufactured in England than in any other country.

Flint glass is a compound entirely different from those above described, consisting as it does of a silicate of potassium and lead. As is the case with all kinds of glass, its composition and the pro- portion of ingredients used in its preparation vary widely. ‘The average composition of a batch has been stated thus :—

Fine white sand ……..... Minium (red lead) Refined potash …..

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Its specific gravity varies according to the proportion of lead it contains ; and, as the silicate of lead tends to sink when the glass isin the molten state, Faraday found glass from one melting to vary from 3°28 to 3°85, and in another instance from 3°81 to 4°75. The higher the specific gravity of the glass the greater is its refractive power and consequent brilliancy.

Flint glass is in no case used for architectural or structural pur- poses, but its purity and lustre peculiarly fit it for table glass, ornamental objects, glass globes and lustres, and for imitations of gems and precions stones. For the latter purpose a dense glass called strass, appropriately coloured when necessary, is employed, and a glass of still greater density and refractive power is used for optical puposes, The softness of flint glass adapts it for engraving, cutting, and polishing; and these methods of ornamenting the finished glass are very much employed.

The special covered form of pot (fig. 2, supra) and the arrange- ment of the furnace have already been alluded to. Plate VI., fig. 1, represents the various arrangements, tools, and processes connected with a flint-glass house, the building in the centre being the large cone or chimney built over

the furnace, which is seen through the arches a. At 5 and 6 men are seen at the working holes with- drawing metal from the pots on their long iron tubes; 7 is the marver on which the gathering is rolled till it acquires a circular shape ; at 8 a blower is sccn in process of expanding a gathering

of glass by blowing; and at 9 a servitor or second man is attaching a post or lump of metal he has gathered on a pontil or punty to the end of a blown globe of glass. The two masses of glass are thus united together, and that attached to the hollow tube is separated by touching it, near to where the tube enters the globe, with a small picce of iron wetted with water. By this means the glass cracks, and a smart blow on the iron tube completes the disunion. ‘The workman now takes the punty from his assistant, and laying it on his chair arm, rolls it backward and forward with his left arm, while with his right he moulds it into the various shapes required, by means of a very few simple instru- ments. By one of these, called a pucellas, the blades of which are attached by an elastic bow like a pair of sugar-tongs, the dimen- sions of the vessel can be enlarged or contracted at pleasure. Any superfiuous matter is cut away by a pair of scissors. For smoothing and equalizing the sides of the vessel a piece of wood is used. After the article is finished it is detached from the punty and carried on a pranged stick to the annealing oven.

The annealing oven or leer for flint glass is a low arched furnace, generally of considerable length, with several openings at each end between which narrow lines of rails run. On these rails, small waggons, or trays mounted on four wheels, are placed, and the articles to be anncaled are filled into such waggons. They are slowly pushed to the hottest part of the chamber, and passing that point they very gradually approach the cold end of the oven, from which they are withdrawn fully annealed. As each waggon is withdrawn at one end, another is entered at the other so that the line from end to end is kept constantly full, The ordinary method of gradually decreas- ing the temperature around the articles stationary in the leer is also practised. ;

Flint-Glass Cutting, Engraving, and Htching.—The sparkle and brilliancy of flint glass is developed by the process of grinding and polishing technically called glass-cutting. In fig. 18 is seen a representation of a glass-cutter's mill, @ being the pulley and band communicating motion to the mill }, which is made of wrought

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Fic. 18.—Glass-Cutter's Mill.

or cast iron. Over it is suspended a wooden trough or cistern ec, containing a mixture of sand and water, which is fed on the wheel as required for the operation of grinding. Smoothing is done on a wheel of fine sandstone to which water alone is applied, and for polishing, a wooden wheel supplied with emery, and finally with putty powder (oxide of tin), is employed. The trough d under the wheel receives the detritus of the grinding and other operations. The articles are held in the hand, and applied to the mill while rotating. The punty marks are ground off tumblers, wine-glasses, and the like, by boys holding them on small stone mills. Ground or obscured glass is made by rubbing the surface with sand and water. Iron tools fixed on a lathe and moistened with sand and water are used to rough out the stoppers and necks of bottles, which are completed by hand with emery and water. Engraving is the production of ornamental surfaces by a fine kind of grinding mostly done with copper dises revolving in a lathe. Etching is variously done by.

submitting the portions to be etched or bitten to the influence of hydrofluoric seid, the remainder of the glass being stopped off or protected by a coating of wax or some pitchy eompound.

PressED GLAss.—The most brilliant effect is produced by cutting, but moulding or pressing is much cheaper, and this branch of the art has now reached a high state of excellence. Glass formed by pressing in moulds, known distinctively as pressed glass, is peculiarly an English industry, principally because it is only flint glass, or glass possessed of similar properties, that can with advantage be formed in that way. Although moulded glass has ex- isted from early Roman times, it isonly within the present century that the modern industry has been developed, and of late years the trade has assumed important dimensions. A metal that melts at a comparatively moderate heat, and does not quickly pass from the plastic state, is essential for success in pressed glass making, because it has not only accurately to fill all the intricacies of the mould, but it must also be susceptible of fire-polishing. This operation consists of a reheating sufficient to melt a thin superficial stratum of the glass, whereby the roughness and obscurity of surface incidental to moulding is removed, and a smooth brilliant effect brought out, inferior only to the sparkling appearance produced by cutting. The moulds for pressed glassare made of iron or bronze ; with great accuracy of surface; and they are, in use, kept a little under a red heat. The various segments of the mould are so hinged or connected as to elose and leave internally a space representing the form and size of the article to be made, the internal hollow not being pro- duced by blowing but by the plunger of the press under which the mould is placed. The required quantity of metal being dropped into the mont, the plunger descends and forces it into all parts of the cavity, completing immediately the formation of the article, which is then fire-polished by reheating, and afterwards annealed. In this way glass with elaborate facets, bosses, futings, or other bold orna- ments can be produced with rapidity and ease ; and the only bar to great cheapness is the heavy cost of the lead and potash in flint glass. Several manufacturers both in England and on the Con- tinent, where the pressed glass industry is ext2nding, now partially supply the place of these costly materials by lime and baryta; and indeed English pressed glass of excellent quality is now in the market containing neither lead nor potash to any appreciable extent.

Baryta Guass.—The high price of red lead, and various disad- vantages connected with its use, have given rise to many efforts to find an efficient substitute for it in the manufacture of table and ornamental glass. Barium

compounds, principally the native sul- phate (common baryta or heavy spar) and the artificially prepared carbonate, have been more or less experimentally tried ever since 1830; but of late years the use of baryta has attracted much atten- tion, and in several French and Belgian glass-works it is under- stood to have taken its place as a raw material, without, however, much being publicly said regarding the subject. H. E. Benrath, the scientific director of the Lisette glass-works near Dorpat has in- vestigated the application of barytain glass-making with great ful- ness. Baryta, it Sea can be used as a partial substitute for the alkalies in glass-making .; and indeed it was affirmed by Peligot that carbonate of baryta could altogether supplant either potash or soda, aud yield a glass perfectly free of alkali. Such aglass is, how- ever, shown by Benrath to be without practical value ; but he has demonstrated that baryta may be used in the place of either lead or linie, to produce an easily fused dense glass much more brilliant than common glass, and in appearance and properties intermediate between that and flint glass. The qualities of the glass and its usefulness for various purposes can be modified by using both baryta and lime in varying proportions. There seems little doubt that pe will occupy an important place in the future of the glass industry.

Botte Guass.—This department of glass manufacture is of im- portance on account of its enormous extent ; and although the raw matcrials employed in the trade are coarse and impure, and though the finished product has little appearance of excellence, the quality of the glass is in the highest degree important. Glass bottles, for example, are used for storing and preserving ail manner of liquid substances for food, some of which undergo active chemical change, throughout a period of many years. In such a case it is of the highest consequence that the glass should be eapable of resisting the solvent and corrosive action of acids and other substances which may be imprisoned or generated within the bottle, and such an ob- ject is attained by the high proportion of alumina which is found in bottle glass. Bottle glass variesin tint from the dark-green, almost black, semi-transparent claret bottles to clear and transparent qualities such as are employed for bottling aerated waters. The difference in colour is partially due to the varying purity of the materials used, and partly to the action of bleaching or oxidizing agents. The materials ordinarily employed are common sand, gas-lime, brick-clay, common salt, and soap-boilers' waste; but local

1 A large proportion of the obscuring of the commoner varieties of glass and of the obscured ornamentation on plate and sheet as well as on flint glass is now produced by means of Tilghman's sand blast described below.

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circumstances have much influence in determining the class of inaterials used. In Continental bottle works lava, basalt, and simi- lar rocks of volcanic origin were formerly employed; and in Den- mark and Sweden fluoride of calcium, left as a waste product of the manufacture of soda from cryolite, is used with marked advantage.

For bottle-making the tank furnace with or without compart- ments as already described is much used ; but pot furnaces also continue in use. The arrangements of a common bottle house are seen in fig, 19, which is a ground-plan indicating a bilateral

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Fic, 19.—Plan of Buttle House,

arrangement of a double bottle house, with the complete plan of a four-pot furnace and ash arches. The furnace is oblong, similar to the crown furnace, but arched over in a barrel shape. It is erected in the centre of the brick cone, above a cave, which admits the atmosphere to the grating. The working holes of this furnace, opposite each pot, for putting in the materials and taking out the liquid glass, are each about 1 foot in diameter. At each angle of the furnace there is also a hole about the same size communicating with the caleining arch, and admitting the flame from the main furnace, which reverberates on and calcines the materials in the arch. In the figure, 1

shows the main furnace ; 2, 8, 4, 5, the ash arches for calcining the materials; 6, 7, 8, 9, 10, 11, annealing arches ; 12, two-pot arches ; 14, clay-house for picking, grinding, sifting, and afterwards working the elay into paste for the pur- pose of manufacturing pots ; 15, mill house for grinding clay ; 16, a building containing a calcar furnace for experiments, or for pre-paring the materials, when the ash arch attached to the main fur- nace is under repair, including 1, a sand crib, and 2, an ash crib for sifting and mixiug the materials, sufficient for two houses.

The following is an outline of the process of making a common bottle. After the metal has been skimmed, the person who begins the work is the gatherer, who, heating the pipe, gathers on it a small quantity of metal. After allowing this to cool a little, he again gathers such a quantity as he conceives to be sufficient to make a bottle. This is then handed to the blower, who, while blowing through the tube, rolls the metal upon a stone, at the same time forming the neck of the bottle. He then puts the metal into a brass or cast-iron mould of the shape of the bottle wanted, and, continuing to blow through the tube, brings it to the desired form. The ane mould now in use is made of brass, the inside finely polished, divided into two pieces, which the workman, by pressing a spring with his foot, opens and shuts at pleasure. The blower then hands it to the finisher, who touches the neck of the bottle with a small piece of iron dipt in water, which cuts it completely off from the pipe. He next attaches the punty, on which is a little metal gathered from the pot, to the bottom of the bottle, and thereby gives it the shape which it usually presents. This punty may be used for from 18 to 24 dozen of bottles. It is occasionally dipped into sand to prevent its adhering to the bottle. The finisher then warms the bottle at the furnace, and taking out a small quantity of metal on what is termed a ring iron, he turns it once round the mouth, forming the ring seen at the mouth of bottles. He then employs the shears to give shape to the neck. One of the blades of the shears has a piece of brass in the centre, tapered like a common cork, which forms the inside mouth ; to the other blade is attached a piece of brass, used to form the ring. The bottle is then lifted by the neck on a fork by a boy, and carried to the

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annealing arch, where the bottles are placed in bins above one another. This arch is kept a little below melting heat, till the whole quantity, which aniounts to 10 or 12 gross in each arch, is deposited, when the fire is allowed to die out.

SiaG GLAss.—Under a patent obtained by Mr Bashley Britten, a manufacture of bottles has reeently been established with every prospect of success, the leading peculiarity of the process being the use of blast-furnace slag, molten as it issues from the furnace, as a principal ingredient. The use of slag in bottle-making is by no means new, but the catching of the intensely hot liquid mass and its immediate use for glass-making had not before been attempted ; and therein results the great saving in fuel and consequent economy of the manufacture, A company formed to work the process has erceted glass-works in Northamptonshire in the immediate neigh- bourhood of a set of blast furnaces, and these works are now in con- stant and successful operation. A regenerative gas furnace applicd toa glass tank working on Dr Siemens's continuous principle is used, aud in it the ingredients of the glass are fed at one end of the tank, where they are fused and fined, and the fused '' metal" flows through a bridge to the other end of the tank, whence it is worked out, blown into bottles, and annealed in the usual way. The tank is from time to time fed with fused slag taken as it flows from the blast furnaces, and with it is introduced the required proportion of the other in- gredients. The slag furnishes more than half the total material of the glass, and, as it is already melted, its use effects a saving of about half the heat or fuel and also half of the time necessary for the production of the ''metal." Thus the prime cost of the glass as it is worked out is considerably less than that of glass made in the ordinary way. The natural tint of the glass thus produced is greenish, but it can be coloured to any required tint, and by careful fining and bleaching it can be produced almost as colourless as com- inon window glass. The working qualities of the glass are excellent ; it comes from the furnace in that beautifully plastic condition which reuders it capable of being blown, cast, pressed, or otherwise moulded into any desired form, and the company expects to manufacture other articles besides bottles from a material so cheaply produced.

OPTICAL Guass is of two principal kinds—flint and crown—the combination of these two, with their different refractive powers, being necessary to produce perfect achromatism in the lenses of telescopes, For astronomical telescopes, for microscopes, and forall delicate scien- tific instruments in which optical glass occupies a place, glass of the utmost purity, transparency, freedom from colour, streaks, and strice is of the highest importance ; and to secure these qualities to the fullest extent much care, trouble, and expense are requisite. The first really successful maker of optical flint glass was M. Guinand of Solothurn in Switzerland who succeeded in making discs 9 inches in diameter free from strie. Guinanddied in 1828, and from his son, M. George Bontemps learned his secret, aud at Choisy-le-Roi, near Paris, further improved the manufacture, In 1848 M. Bontemps was induced by Messrs Chance of Birmingham to establish the art in their great works, In the hands of that eminent firm the preparation of optical glass has attained a perfection not approached by any other glass workers, and the chef d'wuvre of optical glass hitherto made consists of a pair of flintand crown glass discs, 29 inches in diameter, exhibited by Chance Brothers at Paris in 1855. Re arding these Sir David Brewster said, ''I have entertained the hope that the English Government would purchase these discs and construct witli them the grandest achromatic telescope that ever was contemplated by the most sanguine astronomer." They were, however, purchased by the French Government in 1867,

Optical flint glass contains more lead, and is consequently heavier and more refractive, than the quality used for common purposes. It is made in a furnace having a single covered pot, and Guinand's secret consisted in constantly stirring the mass while it is in a-mol. ten condition so as to keep the heavier lead silicate from falling to the bottom. For the very highest qualities of optical glass, the contents of the pot are most scrupulously clearcd, and the stirring is continued after the heat is lowered till the contents are cooled down to little more than a red heat. The furnace is then closed and the metal is allowed to cool and anneal gradually in the pot within the furnace. When withdrawn the pot is broken, and the mass of glass is polished ou two opposite sides so that any imperfections may be detected by examination. From the mass, cut horizontally, perfect discs of

such size as can be formed arc then obtained. Optical glass is also blown into thick cylinders, and cast in slabs from } inch to 1 inch in thieknoss,

Chance Brothers make six kinds of optical glass, of which the average densities and refractive indices for the three hydrogen lines and for the sodium linc are given in the following table :—

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In 1830 Faraday proposed the use of a compound silicate and borate of lead glass, with a density of 5°44, for optical use ; and Maez and Clemandot have successfully introduced a boro-silicate of zinc, An optieal glass of higher refractive and dispersive power than any previously known has been made by Lamy from a mixture of silica, red lead, and carbonate of thallium. The glass is perfectly homo- genous, but of a yellow tint—an evil, however, said to be avoidable by the use of the sulphate instead of the carbonate of thallium. The extraordinary refractive power of the glass renders it peculiarly adapted for the fabrication of imitation precious stones,

Srrass.—Remarkably faithful imitations of every kind of precious stone can be made from suitably prepared and, when necessary, coloured glass. The transparent basis from which arti- ficial precious stones is prepared is called strass or paste, a material which must of necessity be the purest, most transparent, and most highly refractive glass that can be prepared. These qualities are combined in the highest degree in a flint glass of unusual density from the very large percentage of lead it contains, Among various mixtures given by Donault-Wieland as suitable for strass the

| following is an example:—powdered quartz 300 parts, red lead | 470, potash (purified by alcohol) 163, borax 22, and white arsenic

1 part by weight. Special precautions are adopted in the melting of the materials, and the finished colourless glass is used for imitating diamonds. When employed to imitate coloured precious stones the strass is melted up with various metallic oxides, to which refer- ence will be made under coloured glass. Artificial precious stones are, of course, easily distinguished from real stones by their inferior hardness, and by chemical tests, They may also be gencrally detected by a comparatively soft warm sensation they conmiuni- cate when applied to the tongue,

Giass TuzEs, used for gauge glass for steam boilers and for many other purposes, are made by a very simple process; but as the manufacture is a separate department of industry it demands some notice. A gathering of glass is madeon a blow-pipe, which is marvered, and slightly blown, so as to form a thick-walled elongated. globe. To the end of this globe opposite the blowing pipe a pontil- rod is attached by an assistant, and the two workmen move back- wards the one from the other, drawing out the tube as they recede. One or two boys watch the process of elongation, and when the tube reaches the desired gauge they fan its surface so as to "'set" the glass, and thus prevent further attenuation at that particular point, The relation of the mass of metal to the original cavity determines the comparative stoutness and bore or internal diameter of the tube, and it requires much dexterity to make a tube at once straight and of uniform gauge and diameter, In drawing out tubes of large gauge the operatives recede from each other at a slow rate ; and in proportion as the size of tube decreases the rate of drawing out increases. In the Venetian factories, where small tubes for beads are made, the workmen move at a smart walking

pace.

MASssIvE GLAss.—Under this term may be conveniently noticed the manufacture of various familiar solid glass objects which do not acquire their-form either b blowing or pressing in the ordinary sense. Glass Rods form the basis of many of these objects ; and the formation of a plain rod of glass is accomplished by a manipulation in all respects similar to that described under the head of glass tubes, the only difference being that the

rod is drawn from a solid instead of from a hollow or blown gathcring as in the case with tube drawing, From solid rod glass, glass buttons of various forms are “pinched” by heating the rod till it softens, and immediately pinching it in heated moulds made and worked like ordinary pincers, but having moulds of suitable form in place of the gripping surface of the pincers. The small facets of glass lustres and girandoles and glass marbles, are made by au analogous process,

Spun Guass.—Certain qualities of glass in the plastic condition are capable of beiug drawn out to threads of great tenuity, which, while possessing much brilliancy and beauty of colour, are perfectly flexible and elastic, and feel to the touch soft and smooth like fine wool. A good deal of attention has been given to glass spinning in Vienna and in the Bohemian glass-works, the thread produced being woven into many textiles for upholstery and wearing purposes. The material is specially useful in millinery ornaments owing to the fine colours in which it may be produced, and to the fact that it is unalterable in and unaffected by all kinds of weather,

A remarkable and novel application of glass was patented in 1878 by Mr J. B. Hannay. It consists in making glass a cementing or binding substance in the manufacture of emcry wheels, now so much used instead of files. For preparing the wheels any broken fragments of glass are utilized. These are reduced to powder, mixed with proportions of powdered flints and emery, and in the form of a cake introduced on a layer of paper into a furnace where the material is submitted to a heat sufficient to fuse it into a com paet ringing mass. The resulting eake is of intense hardness and dura- bility, and cuts through ordinary emery wheels with ease. As the glassy emery wheels can be made very much cheaper than those at present in use, there is little doubt that this material will come into

extensive use, in the rapidly increasing applications of cmery to grinding, smoothing, and cutting.

CoLoURED GLAss.—When to the ordinary materials in the melting pot small quantities of various metallic oxides and other mincral substances are added, coloured but still transparent glass is produced. The colours yielded vary in intensity according to the proportion of oxides used ; and the temperature at which the fusion is effected, the length of time the molten glass remains in the melting pot, not only modify, but actually change altogether, the resulting colour. Indeed, it has been asserted by M. Bontemps that all the colours of the spectrum may be obtained by the use of one oxide alone, if employed in varying proportions and at different temperatures. The materials, temperatures, and other conditious employed by manufacturers for producing certain of their colour effects in glass are keptas trade secrets; although, in agencral way, the substances which produce particular colours are perfectly well known. Blue is obtained by the use of cobalt, —the ordinary blue pigment smalt being a powdered cobalt glass. Yellow glass can bo prepared from several sources: uranium yields a beautiful opalescent yellow ; salts of silver are the source of fine shades of ycllow; a different tone of the same colour may also be obtained from oxide of antimony ; anda dull yellow is produced from powdered charcoal. Green was at one time prepared chiefly by the use of cupric oxide and of ferrous oxide; now oxide of chromium—which produces a beautiful emerald green —is much employed, that substance being mixed with other oxides when modified colours are desired. For red glass, cuprous oxide is employed to produce an intense ruby tint; and the purple of Cassius—a compound of gold with tin oxide —yields magnificent shades of ruby, carmine, and pink, while oxide of iron also is the source of a brownish-red colour. For the produc~ tion of violet tints the black oxide of manganese is depended on, and a mixture of the oxides of manganese and cobalt is employed for black. he decp-black glass prepared at Venice for making glass beads contains a large percentage—about 11:40—of manganese. Avanturine an imitation in glass of the mineral bearing that name, is a warm, brown, opaque glassy body, studded with innumerable minute spangles having a metallic lustre. It was originally made in the Venctian glass-houses, but can now be manufactured gene~ rally throughout the Continent. According to Von Pettenkofer, the metallic spangles consist of cuprous oxide, and one means of preparing the glass consists of melting equal parts of cuprous oxide and ferrous oxide with the glassy mass. ‘The other opaque varieties of coloured

glass are obtained by using the various metallic oxides with the compounds that produce milky or white glass.

The uses of coloured glass are various, the most obvious and usual being for ornamental windows, for signal lights, for imitation precious stones and ornamental table glass, &c. For the imitation of precious stones the strass already alluded to forms the basis, and both flint glass and Bohemian (potash) glass are much uscd for coloured domestic glass. Window and signal coloured glass are made both as rough plate and as sheet glass. In the case of plate glass the metal is, of course, uniformly coloured throughout, but coloured sheet glass may either be composed of ‘‘ pot metal” or it may be ‘flashed colours.” Pot metal consists of glass uniformly coloured throughout; but in flashed colours the body of the glass is transparent sheet metal covered on one surface only with coloured glass. It is very simply made: the workman, taking up on the end of his blowing tube a gathering of clear metal from one pot, dips this into a pot of coloured metal, thus gathering over the transparent mass a uniform stratum of coloured glass. The whole is then blown in the ordinary manner, and according to the original relative proportions of clear and coloured metal will be the thickness of each in the finished sheet. It is obvions that this process admits of many variations, such as gathering the coloured metal first, or making alternate gatherings of coloured and clear mctal so as to have clear within coloured, coloured within clear, and so on.

IRtDESCENT GLAss.—Ancient glass, which has for ages been sub- mitted to the slow disintegrating influence of the damp of the earth and other gently operating agencies, in many instances dis- plays an iridescent play of colours of a most magnificent description. The iridescence thus shown, it has been long known, is due to a pro- ecss of decomposition resulting in the formation of excessively thin scales of glass. Numerous attempts have been made to imitate by artificial means the gorgeous display of colours thus produced by the slowly acting influences of many centuries, and a certain amount of success has attended some of these efforts. The Venetian glass workers possess the nieans of giving the surface of their glass a kind of metallic iridescence; and in certain Hungarian glass houses iridescent glass has been made for at least about 20 years. But in 1873, at the Vienna Exhibition, iridescent glass formed a prominent feature, and since that time

it has become very common. ‘The iridescent glass now generally seen is a plain flint glass having a slightly metallic tinge and a play of colours like a soap bubble. It is probable that several methods of producing iridescence in glass arc practised, as the nacreous lustre in different examples

and Clemandot; and under a patent obtained by the latter gentle- man, one mcthod, commonly practiscd, has been made public. It consists in submitting the object to be iridized to the influence of a weak acid solution —such as water with 15 per cent. of hydrochloric acid—under the combined influence of heat and pressure. The effect certainly falls immensely short of the iridescence of ancient glass, but the glass assumes permanently a pearly iridescence, and, though the effect is tiresome, the process will doubtless continuc to occupy a place among the methods of ornamenting table glass, &c.

OPAQUE GLAss.—Absence of transparency in glass may be duc to any of three causes—(1) to the grinding, or roughening by other means, of the surface of ordinary clear glass; (2) to devitrifica- tion or crystallization of the substance; and (3) to the mechanical intermixture of an opaque substance in the glassy mass. Obscured glass was formerly principally prepared by a process of grinding the surface,—the means employed in the case of shect and plate glass being simply the smoothing process, which forms an intermediate stage in the operation of polishing plate glass. Now the greater part of ordinary obscured glass is prepared by the agency of Tilghman’s sand blast, an apparatus by which a fine stream of sand is blown with great violence against the glassy surface. Tlie impinging grains of sand abrade the surface with extraordinary rapidity, and by protecting certain portions with suitable stencils, elaborate patterns in clear glass are produced in a very simple manner, Alabaster glass, so called on account of its resemblance to that substance, is an opaque variety of glass which has been long known and used. Its opacity is due toa process of devitrification it readily undergoes, favoured by the excess of uncombined silica used in its preparation. The material is prepared from a combination sucli as 100 parts of sand, 40 of potash, 5 of borax, and 5 of tale (silicate of magnesia). Into

thc composition of this glass it will be observed no lime enters, although sometimes bone-earth is added to the materials, For enamel glass a mixture of varying proportions of lead and tin oxides is prepared by calcining the two metals together, and using the compound in the preparation of a mixture for fusing, of which the following is an Caer :—sand 100 parts, pure potash 80, and mixed oxides 200 parts. ‘The proportion of tin varies within wide limits, and oxide of antimony may be substituted for the tin. Bone glass, milk ee and opal glass, differing in degree of opacity, are made by adding to the materials of clear glass large proportions of bone-ash, or of oxide of tin, or both together, and with these substances white arsenic may also be combined. The following is an example of a batch for opal-flint os :—sand 100 parts, bone-ash 80, potash 30, borax 5, and red lead 5 parts. Such a glass was formerly in extensive use for the opal shades of gas lights and moderator lamps, &c.; but the ruddy glow possessed by the rays passing through the imperfectly opaque glass was an objectionable feature in the resulting material. During recent years an opal or milk glass free from such a defect has been introduced, and itis now in extensive use for globes. This preparation, which diffuses light from its surface in a clear pure white glow, owes its milky opacity to the use of cryolite—a mineral substance consisting of a double fluoride of aluminium and sodium (Al,I’,, 6NaF) obtained from Greenland. The cryolite glass was first brought prominently into public notice by the Hot-Cast Porcelain Company of Philadelphia, by whom it was made on a large scale, although the material had been in use in Bohemian and Silesian glass-works for some years previous to the commencement of the manufacture in America. For milk white glass the materials used are—sand 100 parts, cryolite 40, and zinc oxide 10 parts. The finished glass, which is remarkably strong, hard, and indifferent to acids contains about 15 per cent. of undecomposed cryolite, to which its opacity is due, The copious evolution of fumes of hydrofluoric acid during the melting, which continues even in the working, is the source of serious difficulty in the manufacture of cryolite

lass.

i TOUGHENED OR HARDENED GLAss,—In the year 1875 the announcement that a French gentleman, M. de la Bastic, had dis- covered a means of rendering glass practically unbreakable attracted a great amount

of attention ; and his statements were immediately made the subject of practical investigation throughout the glass- making community. All the experiments made in connexion with M. de la Bastie's process tended to confirm his claim to have dis- covered a method of rendering glass capable of bearing a shock or strain variously estimated at from 30 to 100 times greater than the same material annealed in the common way. De la Bastie was led to undertake the prolonged series of experiments, which ultimately resulted in his discovery, by the consideration that, the brittleness of glass arises from weak cohesion of its molecules ; and his efforts were first directed to improving its molecular arrangement, by sub- mitting glass, in a molten state, to forcible compression. This series of experiments led to no practical result; and the line of investigation he ultimately pursued, as well as the merits and defects of his process, are thus succinctly stated by Mr H. J. Powell of Whitefriars Glass Works, with whom M. de la Bastie carried out his first practical experiments with hollow glass. Mr Powell,

varies considerably. The subject was investigated by MM. Fremy | writing in August 1875, says of the process:—

MANUFACTURE. |

" That it consists in plunging glass heated to the Melting polnt into a bath containing an oleaginous mixture, at a high temperature, but considerably cooler than the glass itsclf; and that this, according to the specification of the patentce, is effected by re-heating already manufactured and wunealed glass in a kiln, aud passing it thence into the bath. After a rough trial of this process, which cer- tainly answers well for flat or solid glass, we decided that it is defective, for hollow flint glass, as hollow vessels, left to themselves in a kiln, are almost certain to collapse on reaching the required heat. To avoid this difficulty, and knowing that a vessel in course of manufacture, however hot, is always under control whilst it remains on the workman's rod, we placed a bath ag near the mouth of the working-pot as possible, and directed the workman, instead of sending the finished vessel to the annealing oven, to drop it into the bath. The vessel] is cauglit in a wire net, aud is ready for removal as soon as it has acquired the temperature of the bath. For all vessels made in one pizce, eg., tumblers, finger basins, &c., this process answers well; and it is obvious that if it proves to be tie

best way of treating hollow flint glass, the use, for this description of glass, of the complicated machinery described in M. de la Bastie's specification will be done away with, and the glass will be tempered in the course of manufacture, instead of being re-heated and tempered after it has been already manufactured and aunealed, We ascertained, with M. dela Bastie's aid, the right constituents aud right temperature of a bath for flint glass; for although the conditions for sheet, plate, and flint glass are nearly the same, there is a difference, aud it seems probable that every chemically different glass, and even every different thickness of glass, may require certain variations, In our experiments as to the hardness of the glass, we found that it could be marked, but not ent, with the diamoud, and, although it could be smoothed and engraved in the ordi- nary way, that the disturbance caused by the wheel, when penctrating to any appreciable depth, teuded to weaken, or even to cause the destruction of the entire mass, The value of the invention, as far as it concerns flint glass, is at present somewhat modified by difficulties in manipulation. 1. It seems to be im- possible to heat a vesscl made up of different pieces and of various thicknesses to un absolutcly equal temperature throughout, so that the whole may be equally tempered. 2. 1t seems also impossible to displace the air from a narrow-mouthed vessel quick enough for the inside and outside to be tempered simultaneously, However, setting aside these difficulties, we come to a point which applies equally to all sorts of hardened glass. Hardened glass Is not 'unbreakable'; it is only harder than ordinary glass, and though it undoubtedly stands rough usage bettcr, it has the disadvantage of being utterly disintegrated as soon as it receives the slightest fracture, and up to the present, until broken, of being 'undistinguishable from ordinary glass. This glass is known as 'toughened' glass, and we have seen the terms ' malleable' and ' annealed' applied to it. Nothing can be more misleading than these unfortunate epithets, The glass is hard, aud not tough or malleabic, and is the very opposite to annealed glass. Annealed glass is that the molecules of which have been allowed to settle them- selves; the molecules of hardened glass have been tortured into their position, and until the glass is broken are subject to an extreme tension. It is the sudden change of temperature that 'hardens'; glass heated up together with the oil may be annealed, but decidedly is not hardened. A piece of hardened glass is only a modified Rupert's drop, 7.é., it is case-hardened; the fracture of both is identical, both resist the diamond, and both can be annealed. Moreover, in

the middle of imperfectly hardened glass a line is plainly visible, which seems to mark the extent of the case-hardening. This line resolves itself under the microscope into a mass of bubbles and strie; itseems to be the nucleus of breakage, and consequently as soon as the cutting wheel approaches it, utter destruction ensues."

The great anticipations which extended use of hardened Bastie has improved severa

at first were formed as to the lass have not been realized. M. de la

of his processes, but the demand for his productions, at no time great, is understood to decrease rather than to increase. For a short time the process was worked by both Messrs Powell and Messrs Pellatt in London, but both' these eminent firms have given it entirely up. Sheet glass hardened by the process does not appear ever to have come generally into the Seals, the most serious obstacle to its introduction being the im- possibility of cutting it with the diamond, after which the utter destruction resulting from fracture isa serious defect, For laborato purposes—as flasks and beukers, &c.—it has been suggested that the glass has great advantages, but experiments have proved that its great resistance is not absolutely reliable, and that hardened vessels sub- mitted to a high heat lose their distinguishing peculiarities and become as common glass, Thus a glass, partially filled with water and heated considerably above the boiling point at the parts un- covered with water, broke, the bottom of the glass showing the fracture peculiar to hardened glass, while the upper uncovered part was broken into large sharp-edged fragments like common glass. A modified process of hardening, patented by Herr F. Siemens, consists in pressing and suddenly cooling the glass in moulds 'Specially constructed to conduct away the hcat with the various degrees of rapidity found to produce the best results,

STATISTICS OF THE GLASS TRADE. —According to a factory report of 1871, there were in that year 240 glass-works in the United Kingdom, employing, in addition to steam-power, 21,434 operatives, of whom 2116 were females. Of these works 213 were in England, 19 in Scotland, and 8 in Ireland. Further, there were at the same date 37 glass-cutting factories, employing 500 people, principally situated in the county of Warwick. "The

quantities and value of glass manufactures exported were as under in the year 1878 :—

late PIASSH os. cecesecss

srrseeeereereees 1,156,435 8q. ft, £106,906

Flint glass ..... «-+e+e 93,112 cwts, 239.966 Common bottles ..... ttitesteeseeteeseesee 575,160 ,, 808,481 Other glass manufactures tt eeeeseeevesesereevereesT 2209 4s 99,170

£754,528

In 1878 the imports of manufacturcd glass were thus given :— Wino wag lass, «52880 ccsoso

Flint glass ..... . 143,665 ,, 489,518 Rliterglage were ee 91,198 ,, 233,602 Glass manufactures .....60-sseces. – 335,751 ,, 879,733

1,222,989 —-£2,055,05*

GLASS

667

The following table shows the comparative imports and exports of glass in the ten years ended 1877 :-—

Exports of British Glass. Imports, Foreign.|————— . Plate Glass. | Other Kinds.

Cwts.

609,806 601,070 602,376 629,472 688,156 807,410 946,903 983,677 1,060,861 1,140,694

Cwts.

868,950 933,475 799,252 847,988 1,002498 1,148,640 1,114,253 880,983 743,495 792,424

Square Fect.

911,330 1,076,130 1,857,508 1,643,575 2,131,924 2,183,106 1,411,268 1,609,180 1,779,628 1,157,063

1868 1869 1870 1871 1872 1873 1874 1875 1876 1877

In the Bulletin de la Société @ Encouragement pour Vindustrie nationale for 1877 there is an elaborate statistical computation of the extent and value of the glass manufacture throughout the world, based chiefly on returns applicable to 1874. The writer, M. Henry de Fontaine, arrives at the conclusion that the annual production of glass has almost doubled in the past twenty years, and estimates the total yearly production throughout the world at a value of six hundred millions of francs.

Libliography.—The literature of glass-making of English origin is scanty and imperfect. In France and Germany the subject has received much fuller attention. The following list embraces the principal works:—Antonio Neri, 47s Vitraria, eum Merritti observationibus, Amst., 1668 (Neri's work was translated into Eng- lish by C. Merritt in 1662, and the translation, Zhe Art of making Glass, was privately reprinted by Sir T. Phillipps, Bart., in 1826); Johann Kunkel, Vollstandige Glasmacher-Kunst, Nuremberg, 1785 ; Apsley Pellatt, Ouriosities of Glass-making, London, 1849; A. Sauzay, Varvels of Glass-making (from the French), London , 1869; G. Bontemps, Guide du Verrier, Paris, 1868; E. Peligot, Le Verre, son histoire, sa fabrication, Paris, 1878 ; W. Stein, Die Glas-fabri- kation fin Bolley's Technologie, vol. iii.), Brunswick, 1862; H. E. Benrath, Die Glasfabrikation, Brunswick, 1875; J. Falck and L, Lobmeyr, Die Glasindustrie, Vienna, 1875. (J. PA.)

Gass PaintiIna.

The manufacture of coloured glass, which is the basis of the beautiful and interesting art of glass painting, originated at a period of remote antiquity, and the use of enamels, to vary or ornament its surface, was known to the

ancient Egyptians ; but the formation of windows of mosaics of coloured glass upon which the shapes of figures and orna-

) ments are painted with an enamel fixed by fire is medieval,

and emphatically a Christian art. In all probability it was suggested by the mosaic pictures with which churches were adorned from an early period for the instruction of the illiterate, as was shown by the inscription which they bore, “sancte plebi Dei.” The step from mosaic pictures to glass mosaic windows was merely a question of time; it is not known when the step was taken, but coloured windows existed in St Sophia at Constantinople in the 6th century, whilst the basilicas of St John Lateran and of St Peter at Rome were adorned about the same time in the same manner. In the year 709 Wilfrid, bishop of York, invited workers in glass from France (“artifices lapidearum et vitrearum fenestrarum primus in Angliam ascivit we “The French claim the honour of having invented the process of painting upon the mosaic windows of coloured glass, and of thus transforming them into works of art, and also of teaching this to the English, who in their turn instructed the Germans; but Muratori, in the second volume of his Antichita Italiche of the Middle Ages, printed a treatise on mosaic and painted glass written by an anonymous Italian in the 8th century, and probably not later than the 11th was written the interesting essay Diversarum Artium Schedula Theophili Presbyteri et Monachi, which details with minute accuracy the process of painted glass as it has been practised with some additions and modifications, throughout the best periods of the art; it may reasonably be assumed that Theophilus describes methods invented before his time. Probably the oldest specimen of glass

painting now existing is a window of the 11th century in a church at Neuwiller, in Alsace, representing St Timothy. The figure is rudely designed, but, with the rich border of ornament, shows that the executant knew his art, which in the following century is further illustrated by windows in St Denis, near Paris, erected by the abbot Suger, which are still preserved. It was however in the 13th century, that great age of the revival of art, that glass painting attained its first great development, and notwithstanding the claims advanced by France, it is most probable that as all art

radiated from Italy as a general centre of invention and progress, as well as of faith and dogma, so glass painting partook of the general impulse. It has indeed been asserted that glass manufactured iu the north was superior to that produced in Italy, and this is admitted by Vasari, but an examination of old Italian windows throws doubt upon this statement, for the Italian glass will be found to be more even in texture, more diaphanous, and certainly not inferior in colour, whilst the beautiful, pearly, white glass of the earliest date in Italy is superior to the pale green representing white in northern glass, and assorts much more harmoniously with the glowing coloured glass with which it is associated. Considered as a branch of fine art, Italian painted glass occupied a very high posi- tion at all periods of its history, for the designs were fre- quently made by some of the most famous of that long roll of immortal artists who have had so few equals elsewhere. Iu Germany the family of Hirschvogel of Nuremberg and other eminent artists, including, it is popularly believed, Albert Diirer, and in France Jean Cousin, Bernard Palissy, Louis Fauconnier, and others, equalled the Italian glass-painters, whilst both German and French artists excelled them in technical processes.

The late Mr Charles Winston, author of An Inquiry

into the difference of style observable in Ancient Glass Painting, | especially in England, with his usual accuracy and profound |

knowledge of his subject, thus classifies the consecutive

styles :—the Early English, from~the date of the earliest |

specimens extend to the year 1280; the Decorated, which prevailed from 1280 to 1380; the Perpendicular from 1380 to 1530; and the Cinquecento from 1500 to 1550. The styles successively prevalent in Italy, although they have an affinity with those following each other in northern countries, cannot be accurately designated by the titles selected in England, the last excepted. Like other branches of painting they are most readily divided and understood by centuries; as the 13th century, a style principally in- fluenced by Giunta Pisano and Cimabue; the 14th century, in which the spirit of Giotto and Orcagna and their followers prevailed ; the 15th century, the first period of which was transitional, and the second early revival, as illustrated

by the designs for windows of Lorenzo Ghiberti, Donatello, Paolo Ucello, Pietro Perugino, Andrea della Robbia, and other great artists of the time. The last age, called by Mr Winston the Cinquecento, lasted in Italy beyond the period assigned by him for its termination, and was characterized by florid magnificence of design and splendour of colour, imitative of the pictorial art of that age, and the ornament resembled that prevalent amongst the ornamentists of the schools of Raphael and Michelangelo. In this brief analysis of the history and practice of glass painting, the Italian examples of the art are selected for description as being less known than those existing in other parts of Europe, which have been minutely and ably illus- trated. Besides being classified by centuries, Italian glass painting may be appropriately arranged under the following heads or schools :—the Pisan, Florentine, Sienese, Umbrian, Lucchese, Bolognese, Lombard, and Venetian ; for notwith- standing the lamentable destruction of painted glass in Italy even now in progress, specimens by artists belonging to

these schools still exist, and the names of a numerous array of glass-painters of these provinces are preserved. The best examples extant of this art in Italy of the first half of the 13th century are two couplets in the apse of the famous basilica of St Francis at Assisi. In general arrangement and design they resemble windows of the same age in other parts of Europe classed by Mr Winston under the general head of Early English, being divided into panels of varied and admirably designed geometrical forms surrounded by diapers and borders of rich fancy and glowing colour, which, however, are rather more confused than similar details in contemporary glass elsewhere. The panels are filled with scripture subjects, and Italian skill and refine- meut are obvious in the design of the figures; this may be readily understood when it is considered that Italian artists of this time rendered the Greek art, uni- versally followed, with more sentiment and power than auy other people. The ornament shows the influence of Byzantine conventions, but the ornamentists imitated natural forms of foliage sooner than northern artists. A remarkable peculiarity of the early painted windows at Assisi, which are here taken as the best and almost the only specimens of 13th-

century glass ieft in Italy, is that throughout the couplets the backgrounds in each light differ in colour. The subjects for instance in the right light are on a blue ground, on the left on a red ground, in other examples the grounds are alternately blue and green. It might be supposed that all unity of effect must have been destroyed in this way; but such is the skill with which the general harmony of colour is arranged, that the counter- changes are less objectionable than might appear possible. Early Italian glass painting, like that of other parts of Europe, is characterized by an obvious ignorance of perspec- tive ou the part of the designers, but there are manifest indicatious of attempts to represent retreating surfaces and lines ; that these have not the effect intended was not due, as some suppose, to the maintenance of a principle appro- priate to glass painting, but simply to a wantof knowledge of perspective laws common to all, even the greatest artists of the time.

Besides executing panel windows with small figures, the artists of the 13th century painted figures of comparatively large proportions under canopies of simple and primitive forms. These figure windows were placed in positions at a distance from the eye, as above in the clerestory, or at the ends of aisles. At Assisi such figures are painted at the bases of some of the windows irrespective of the idea of distance, the upper portions being filled with panels and small figures. This irrational system gave way to the entire window being filled with large figures placed over each other within canopies or geometric borders, a method of design which survived in Italy to the close of the 15th century.

The coloured windows of the upper and of the lower church are associated with mural paintings which cover every available space on the walls and vaults. It might be supposed that the refulgent painted glass would either obscure the frescos or diminish their effect by contrast ; but in the first place the glass is not so thick as that of northern manufacture, nor is it made opaque by the effect of climate, whilst, as already noticed, the white glass is purer, and the brilliant sun of a southern climate illumines the frescos sufficiently, notwithstanding the coloured medium through which the rays are transmitted. Such is the case at Assisi ; but at Florence the coloured glass in the cathedral darkens the church too much, from causes which will be explained afterwards. The true method of combining coloured glass in a building with the presence of pictures and sculpture in a less sunny climate

will be illustrated in describing glass painting of the 16th century, the subject being im- portant at the present time.

GLASS PAINTING. |

In the next great age of art, that which commences with the triumphs of the genius of Giotto, glass painting evi- dently shared in the general progress. No windows remain which are associated with his name as designer, but in Santa Croce at Florence, by tle will of Count Alberto dj Lapo, dated the 9th of July 1348, money was provided for adorn- ing the apse of the church with frescos and painted windows to be completed in three years. The frescos were

painted by Angelo di Taddeo Gaddi, and it seems reason-

able to suppose that he designed two of the three windows,— that in the centre being of later date. The following extract from the archives of the cathedral of

Santa Reparata”—the ancient name of the cathedral—

“over the door towards the street of the Cassettai is com-

missioned of Antonio of Pisa, master glass-painter, and the design is by Angelo Gaddi.”

other. changes of the colours of the canopies, which are not white,

these being rare in Italian glass painting. Thus in one of the windows the first two canopies are respectively red and

green, which colours are counterchanged in those immedi-

ately over; the next two in ascent are green and yellow, the next pair brown and yellow, the fifth order shows both yellow. Thus that variety of colour prevalent in the back- grounds of Italian 13th century work is found in the canopies of windows of the next century, a custom limited to glass painting, and not found as a rule either in mural or other pictures. There are in Santa Croce several win- dows of the 14th century, but they are generally inferior

to tllose of the same period extant in St Francis of Assisi, where there are important examples of rare beauty of design and workmanship, more liarmoniously coloured than those at Florence, and suggesting that the Umbrian excels the Florentine school of glass painting.

Throughout the whole of the painted windows existing in Florence, of the fully developed style of the 14th century, and for a considerable portion of the 15th, the influence of the architectural design of Giotto and Orcagna is very per- ceptible, The graceful twisted shafts common to the works of both architects, the richly adorned niches and gablets, the dome-like covering of the famous baldacchino in the church of Or San Michele, the work of Orcagna, are features which are imitated in various ways by Italian glass-painters. The colour is especially noteworthy; the canopy, somewhat squat in form, is adorued in every part with rich and diversified colours evidently imitative of the varied marbles and the infinity of marble inlay and mosaics, characteristic of so much of the medieval architecture of Italy ; whilst in northern countries the canopies in windows, with their beautiful details of form showing such rich fancy and such graceful lines, are chiefly white, not that they are altogether colourless, for it is of the perfection of medixval architec- ture to associate colour with form. ‘That which in Italy was done by the help of rich stores of marbles of many hues, was effected in the north, where these were not avail- able, by means of polycliromatic painting, which was imi- tated in window design by the glass-painters. Thus the canopies in Italian windows differ as much from those pre- valent at the same period in the rest of Europe as the campanile of Giotto differs from the spires raised by the genius of northern architecture.

In the history of painted glass in Italy during the 15th century, the windows of the cathedral of Florence, dating fron 1390 to 1503, occupy an important position, not only by reason of their interest as connected with that cele- brated church, but also because they were designed and

GLASS

Florence shows that Angelo Gaddi designed for glass-painters: “A window in

The windows illustrate the system of ranging single figures under canopies over each The colouring is harsh ; there is too great a preval- ence of dark green; and the general design of ornament is meagre and confused. This is increased by the capricious

executed by artists of the highest reputation. The cathe- dral was founded on the 8th of September 1298, the architect being Arnolfo di Cambio di Colle di Valdelsa, In 1334 Maestro Giotto was architect, and commenced the famous belfry. In 1364 the church was vaulted over at its eastern end, and in 1420 Filippo Brunelleschi and Lorenzo Ghiberti, who built the clerestory of the nave with its round windows and Renaissance cornice, were appointed joint architects. Painted glass was introduced into the windows thirty-six years before the completion of the cupola, and thirty before that of the clerestory. These dates are an interesting testimony to the importance attached at the time to painted windows as portions of the design of so great a church. They were erected in the aisles, before the nave was finished, by Don Lionardo di Simone, monk of Vallombrosa, and Niccolo di Pietro della Magna, so early as 1390, and when the nave was roofed over by its architects, Fra Bernardino di Stefano executed the two first windows of the clerestory from designs by Lorenzo Ghiberti.1 Ghiberti is also alleged to have de- signed many of the painted windows at the east end of the church; but those now existing, judging by the design and colour, as well as by the technical execution, cannot be lis, for they are manifestly of earlier date, Whilst the authorship of some of them is recorded in the archives without reference to Ghiberti. One only, on the north side of the apse and in the lower row, suggests the design of this great artist, the suggestion being strengthened by the fact that the diapered ornament on the ruby dress of the figure is made by the wheel, which brings this window within the 15th century, whilst the diapers in the other figures of the same series are executed in an older style. It has been stated that Ghiberti advised the muni- cipality of Florence to invite a celebrated glass-painter of Liibeck, Francesco di Domenico Lievi da Gambassi, by letters, the second being dated October 15, 1436, to settle in Florence with special privileges; he came, and it is assumed that he painted Ghiberti’s designs for glass, but of this there seems to be no satisfactory evidence. We find that in 1434,

before his arrival, Maestro Domenico di Pisa painted the east window of the drum, representing the coronation of the Virgin, which was designed by Donatello in competition with Ghiberti, and preferred. As it was on the 12th of January 1434 that Brunelleschi completed the dome, evidently no time was lost in com- mencing the painted windows. Bernardo di Francesco del Boni is recorded in the archives as having executed in 1442 the following windows in the drum, called in Italian

1 This circumstance has led to the erroneous statement, repeated to the present time in every guide-book and by every writer on the cathedral, and to the still prevalent belief, that the three windows in the fagade of the church were designed by Ghiberti, who has himself recorded :— "I designed for the front of Santa Maria del Fiore, for the central round window of the fagade, the Assumption of our Lady, and I designed those on each side." The windows which Ghiberti really designed were the great circle of the facade, a noble work still in its place, and the two of the clerestory on each side of it, long since removed and lost. That they were painted by Fra Bernardino di Stefano in 1423 is thus shown in the archives of the cathedral—" Fra Bernardino di Stefano, of the order of the Preachers of Santa Maria Novella, is to execute two round windows in the nave of Sa Maria del Fiore, one to the right and the other to the left,—that to the right representiug Joachim driven from the Temple, that to the left the Death of the Virgin Mary, and the designs are by Lorenzo di Bartoluccio (Ghi- berti)." It is thus evident that the windows of the clerestory of the nave were to be painted with the Hfe of the Virgin Mary, of which these two were the first and last of the series, whilst the Assumption of the Virgin appropriately occupied the centre. 'Those in the clere- story having disappeared, it has invariably been supposed that the two remaining at the ends of the aisles are those described by Ghiberti, although they differ in subject and entirely in style from his work. They are in fact thus mentioned in the archives :—" In 1414 Nicolo di Pietro della Magna painted the two windows on each side of the front of the cathedral," which record settles the question.

the tribune :—the Resurrection, designed by Paolo Uccello, and the Ascension and the Prayer in the Garden, by Lorenzo Ghiberti, although by this time Francesco di Lievi da Gambassi had been some time in Florence. Bernardo del Boni is also recorded to have painted the Annunciation designed by Uccello, removed some years ago, and the Ascension described as being either by Ghi- berti or Uccello ; the uncertainty is curious. In 1448 the same artist painted the Presentation in the Temple, which was designed by Ghiberti. What windows then did the artist from Liibeck really execute? Born an Italian, he was instructed from his youth in Germany, and it is reasonable to suppose that his style would be German. Now several of the upper windows of the trausepts contain figures which have a decided affinity with German ideas, and it is not unreasonable to suppose that these were by the new comer. He established furnaces by special permis- sion, and it has therefore been hastily assumed that he inanufactured coloured glass; but tlese no doubt were to burn his painted glass. 'The letter inviting " Francescho Dominici Livi de Ghambasso comitatus Flor., magistro in omni et quocunque genere vitreorum de musayco et de quodam alio colore vitreoruin," dated 15th October 1436, was preceded by another written on the 26th August 1434, which is thus recorded :—" Letter written to the master glass-painter Gambassi, then in Scotland, and who made works in glass of various kinds, and was held to be the best glass painter in the world." It is now vain to express the feeling with which Scotch people must regret the de- struction of the works of this excellent artist in Holyrood Chapel; the blow then inflicted upon ecclesiastical art never has been remedied.

Many other glass-painters executed windows in the cathedral, the last of whom, Sandro di Giovanni Agolanti, in 1486 glazed the windows of the lantern, showing that it was finished, and in 1503 inserted glass "in an aperture for the astrologers to see the sun through." The windows of the cathedral of Florence are of rich deep colours, but unfortunately they are incrusted with dirt inside and out- side. Many of them which have been broken have been wretchedly repaired, and the modern glass is toned with glazings of oil paint. They darken the church to such an extent that works of art within it are seen to disadvan- tage. Michelangelo's group of the Pieta is merely a dark ass, and it may be mentioned that his statue of Christ in Santa

Maria sopra Minerva is similarly sacrificed to the painted glass lately introduced.

The history of glass painting is illustrated by windows in other churches in Florence ; those in Santa Croce have been alluded to, with the exception of the magnificent circular window of the fagade designed by Ghiberti. It is of special interest, as showing this great sculptor's ideas of colour as well as of form. The subject is the Descent from the Cross, and the colour strongly recalls the bright clear system of Fra Beato Angelico. In Santa Maria Novella there is another very fiue circular window of the 14th cen- tury, the history of which seems to be forgotten ; but in design it recalls the style of Andrea Orcagna, to whom also may be attributed the fragments of a window in the Strozzi chapel, which he partly painted in fresco, and for which he also provided the admirable altarpiece. In another Strozzi chapel in the same church, painted by Filippino Lippi in fresco, there is a very ricli window which is obviously also of his design, but so completely has all critical knowledge of glass painting disappeared in Florence, that this and other noble works excite no atteution and no remark, and are in danger either from removal or from the clumsiest renovation. The great window of the chancel, a large triplet, is so excellent that it places Sandro di Giovanni Agolauti in the foremost rank as a designer and glass-

painter of the 15th century. He was born in 1446, and of his numerous works this superb triplet, which was erected in 1491-2, is the only example now remaining, whilst there are twenty-one records of his productions, evidently a small portion of them ; the last describes him as decrepit in 1515, and mentions that Niccolo di Giovanni di Paolo, master glass-painter, took his place.

A window in St Francis at Assisi by the Umbrian Angioletto da Gubbio, an artist of the early part of the 15th century, deserves special notice in connexion with the admirable works of this great age of the art. It was erected about a century after the death of Cardinal Gentili (who built the chapel) by his heirs. 'The wiudow is so full of light, so delicate in its

arrangement of colour, and so tenderly and skilfully painted, whilst the prevalent white ornament is so brilliant, that it is perhaps the most perfect type in existence of a painted window suitable for a building containing works of art, or where the climate is unfavourable and consequently the light imperfect. The close of the 15th century was in important respects the greatest epoch of painted glass in Italy: the general style of design of the great quattrocentista masters, their monu- mental and decorative methods of composition, simplicity of attitude and form, and rich unbroken colour, were emi- nently adapted for reproduction in glass paiuting, whilst the prevalent style of ornament was singularly graceful and pleasing. The influence of the Italian style was felt in France, Germany, and the Low Countries, in which very noble works of glass painting rivalling the Italian were pro- duced by eminent artists, examples of whose works may be seen at Bourges and Rouen, at Antwerp and Brussels, and in various cities in Germany, altliough singularly enough one of the finest typical examples of this great epoch of German glass painting exists at Assisii—the glazing panels of which the noble window has been composed being dis- persed through two or three windows of the upper and lower church. The technical execution of the windows of this period in all these countries was snperb, showing how thoroughly the artists were trained in every process of their art. In England the feeble Perpendicular style was con- temporaneous, entirely devoid of good drawing, pallid in colour and weak in execution, a singular contrast in every respect to the state of the art on the Continent.

Amongst the most active and able glass-painters of the prolific 15th century in Italy the Gesuati monks, whose convent was close to Florence and was razed to the ground during the siege when Michelangelo aided in the defence of the city, were celebrated. They prepared colours for artists, supplying Michelangelo when he painted the Last Judgment, and they executed numerous windows of which there are records from 1467 to 1562. As glass-paiuters they painted the designs intrusted to them with forcible execution, but their drawing was less happy and their ornameutation heavy. There are several windows by these Brethren in Florence: in Santo Spirito the great circle of the fagade shows every indication of having been de-

| signed by Pietro Perugino; in San Salvatore, near San

Miniato, the east window, evidently by a Gesuato, has very probably been designed by Andrea della Robbia. In anotlier window in the same church a figure of St John is a very fine specimen of their art. Several windows filled with small round panes of white glass, with richly coloured borders and sacred monograms or heraldry in the centre, are especially noteworthy as admirable types for domestic architecture. There are also works of the same character as the above in the church of Santa Maria Maddalena dei Pazzi.

A glass-painter was now to make his appearance in Italy who was destined, although a foreigner, to eclipse in the opinion of the Italians all previous masters of the art; tls was Fra Guglielmo di Marsillat, born in the diocese of

Verdun in 1475. It is not known under whom he studied glass painting, but for protection from the consequences of some escapade he entered the Dominican order. Claude, an eminent French glass-painter, being summoned to Rome by Julius IT. to decorate the Vatican with painted windows, induced Marsillat to accompany him. Of the numerous windows which they must have painted only two remain in the church of Santa Maria del Popolo, so complete has been the destruction of painted windows in the Eternal City, Marsillat executed a number of magnificent windows in his manner for the cathedral of Arezzo, The following is a form of contract made with him :—“ The board of works of the cathedral have commissioned three windows of painted glass for the cathedral from Master William, son of Peter, Frenchman, that is, one window above the chapel of St Francis, one window above the chapel of Mattliew, one window above the chapel of St Nicholas, for the price of fifteen livres the Square braccio,”—nearly 2 square feet,—“to be burnt in the fire and not painted in oil, and they are to be finished by the end of June 1520,” Marsillat, who painted well in oil and fresco, was the designer of his own windows, He was so impressed by the works of Michelangelo that he imitated his manner, and one of his windows at Arczzo, representing the Raising of Lazarus, is almost a transcript of the picture of the same subject designed by Michelangelo, and painted by Sebastian del Piombo, which is now in the National Gallery, London, The design of the Frenchinan is rather more

crowded, but is characterized by more life and action. He introduced into glass painting the magnificent architectural back- grounds, with figures on balconies and terraces, made familiar by the works of Paul Veronese ; he drew the human figure admirably, and was very successful in the repre- sentation of motion, and his arrangement of colour was perfect in harmony. It is not to be wondered at that his works produced so great an effect upon the minds of his contemporaries, They also show upon his part a consnm- mate knowledge of technical conditions, and his windows are so perfectly executed that except where injured by vio- lence or carelessness they are in admirable condition at the present time. Marsillat also executed some fine glass paintings at Cortona, which have been removed and are now in Florence.

Without entering upon the description of a consider- able number of interesting works of glass painting in various parts of Italy, and of detailed notices of the artists, enough has been done to illustrate the history and pro- gress of the art from the 13th century to nearly the first half of the 16th, Later much less coloured glass came to be used, and a considerable change in taste took place in this art as in architecture ; it is shadowed forth even as early as 1501 in the following record :— Quod in dicto loco semper et pro omnia tempore in dicto loco et ecclesia sunt media die tenebre et ut vulgo dicitur buio et habeto colloquio cum consolibus Sancter Johannes de vietro faciat sumptibus opere unam finestram ex vitri cum ochi biacchi fregio d’allato et cum arme popoli.” The desire for windows admitting more light led to the invention and adoption of a beautiful variety containing much white glass varied with yellow stain, and the introduction of a small quantity of coloured glass. These windows were painted with graceful arabesques executed in enamels and burnt in, and they never have been surpassed at any time for excel- lence of drawing and skill of execution. Such are the windows in the Laurentian library at Florence, attributed to Giovanni da Udine, but erected after his death. Other examples might be referred to, and they are now of great value as showing the best description of ornamental window suitable for buildings of the developed Reuaissance style,

GLASS

adorned with works of painting and sculpture. They have enough of colour to harmonize them with painted decora- tions, and enough of white glass not to destroy the chiaro- scuro of sculpture. It should be remembered that the 13th century produced beautiful windows possessing similar advantageous qualities suitable for medizval buildings con- taining modern sculpture, such as the famous five sisters of York cathedral, or the white windows of the same period at Chartres.

The technical execution of the glass paintings still exist- ing in Italy resembles that prevalent elsewhere, and the method of the old masters is clearly described by Theo- philus, The glass used was either pot metal or coated ; that is, the colour either pervades the whole body of the metal or is applied as a film over white glass, invariably the case with ruby, which would seem black but for this contrivance. The artist employed to design a window prepared a full size working drawing, which, according to Theophilus, was exe- cuted on a whitewashed board in his time; but later tliese were made on paper, as is proved by the following contract from the archives of the cathedral of Florence (1437):—“ To Lorenzo di Bartoluccio (Ghiberti), sculptor, seven florins, being the half of the price of his skill and labour for draw- ing four figures on paper of bombagia (coarse cotton) for a window to be executed by Bernardo di Francesco, glass- painter, at three livres per figure.” Guided by the firmly marked outlines, the glazier cut his mosaic of glass of the requisite colours by the aid of a hot iron, the diamond not being used for this purpose till the 17th century. The pieces of glass were futher reduced to the shapes and sizes needed by the aid of the grosing iron, still a familiar instrument ; thus prepared they were ready for the painter, and at the present time are attached to a transparent eascl formed of a large sheet of glass. Theophilus thus describes the enamel colour prepared for painting with :—“Take copper beaten small, burn it in a little pipkin until it is entirely pulverized, then take pieces of green glass and sapphire” (a blue paste used in mosaic work), “and pound them separately between two porphyry stones; mix these ingredients together in the proportions of one-third powder, oue-third green glass, and one-third sapphire, Grind them on the same stone with wine or urine, put them into an iron or leaden vessel, and paint the glass with the utmost care. For with the three colours” (that is,

shades of one colour), “if you are diligent in the work, you can make the lights and shadows of the draperies in the same manner asin coloured painting. When you have laid on the first touches in the drapery with the aforesaid colour, spread it in such a manner that the glass may be pure” (that. is, untouched) “in that part which you are accustomed to make light in a picture, and let the touches be dark in one place and light in another ” (that is, graduated), “and again yet lighter and distinguished with much care, that it may appear as if three shades of colour had been applied. This order you should observe below the eyebrows, and round the eyes, and nostrils, and chin, round the naked feet and hands, and other portions of the naked body ; and thus let the glass painting have the appearance of a painting composed of many colours,” It must be obvious from this description of the most ancient method of glass painting, in important respects the same as that still followed, that the art is re- gulated by certain necessary conventions distinguishing it from painting upon opaque surfaces, The features and accessories are drawn with sharp black lines making them out clearly to be seen at a distance, and in a very different way from the representation ofsuch details inapicture. The highest lights are the local colour, that is, the pure colour of the glass ; the deepest shadows are solid black produced by laying on the enamel thickly; all this is precisely the reverse of the system pursued at the same early period in

painting pictures in which the shadows were the local colour and the lights white. As painting advanced it gradually approached more nearly to the scale of colour of the glass- painter, the lights instead of being white were painted of appropriate shades of the local colour, and the shadows were graduated into black in their deepest parts. It may have been that glass painting suggested this important change in ideas of colour and chiaroscuro. The glass being painted as described must be burnt to fix the enamel thereon with its flux. The separate pieces with the painted side upwards are placed upon the shelves of a kiln or iron box, covered with whiting ; the kiln is placed in a brick oven, and a fire kindled which surrounds it with flames. Much experience is needed to determine when the glass is sufficiently burnt to fix the enamel. When this has been done the fire is withdrawn, the oven is hermetically sealed, and the glass is left to cool

gradually, so as to be annealed. From the appearance of many Italian windows as compared with those executed elsewhere, it is reasonable to infer that the Italians were less skilful than their northern contemporaries in firing their glass) The next process is to unite the numerous pieces of mosaic, thus painted and burnt, into panels of a given size, which is done by means of ribbons of lead grooved on both sides, the ribbons being soldered at all their angles, thus firmly tying the mosaic together. When the painted window is erected, the leads are seen internally in contrast with the transparent glass as intensely black lines, but externally, where they catch the light, as meandering lines of metal dividing the surface. Mistaken attempts have repeatedly been made to get rid of these lines, but they are constituent parts of the art, can only be got rid of by changing its true character, and are only disfigur- ing when injudiciously introduced, as for instance in some 14th-century glass in Santa Croce, in which the white of the eyes are fixed with leads of the form of spectacles, so that all the saintly persons represented appear, ridiculously enough, tv wear these aids to defective vision. The panels, which are technically called glazing panels, are inserted in their places in the windows by means of grooves prepared in the stone work, into which they are secured with cement and strengtliened at intervals with cross bars of iron called saddle bars, to which the glass is made fast by ties of copper wire. Thus fixed, experience has shown that painted windows if duly cared for will last for many cen- turies. Regarded in their connexion with past history, no monuments of art surpass painted windows in interest ; they are only equalled by the paintings still extant in the tombs of the Egyptians as illustrations of faith, history, and customs. It was almost the universal usage that persons of every rank and position, as well as corporate bodies and guilds, made offerings of painted windows to churches. Whilst they give the most vivid ideas of ancient taste and methods of decoration, the religious opinions of successive ages are interpreted by the manner in which sacred subjects are selected or represented; the actual state of art at ditferent times, from its rudest forms to the most perfect, is admirably exemplified; and, as it was customary to introduce the donors in appropriate parts of their gifts, the prince or noble in knightly panoply, with his armorials, is seen kneeling, sometimes accompanied by his spouse, In like devout attitude the ecclesiastic appears in the rohes and with the insignia of his office, or the wealthy merchant and his wife in appropriate costume. In other examples trades- men, surrounded

with the objects and materials of their commerce, sell to their customers articles of clothing or of food. Every occupation is illustrated in these ancient pictures in glass. How great then has been the loss to art and history caused by the reckless demolition of painted glass which has taken place in all parts of Europe, but especially in Italy, where the clergy have been the chief

offenders! The Italians have not been impelled to this lamentable destruction of these precious records and beauti- ful creations by any of tlie convictions, changes of faith, or fanaticism, fatal to so many works of art in other coun- tries, but by unreasoning transformations of taste, by ignor- ance, or by the paltry desire of gain. In northern climates ancient glass is found to have beeu affected by the action of the weather, its outside surface is roughened and pierced to a small depth by little pits, or is so altered as to resemble sheets of ziuc; it is also covered with dirt, especially inter- nally, the enamel rougher than the surface of the glass favouring this incrustation. ‘These injuries and accumula- tions veil the glass paintings, and produce a mysterious confusion of form and colour, admired by many, who to obtain in modern work such effects of age, and to conceal the inharmonious crudity of colour, soil it artificially with varnish, paint, or enamel applied externally, or with dirt applied of set purpose, showing thereby their ignorance of art and their bad taste, by having recourse to processes which are outside the domain of art, for perfect harmony of colour and effect of chiaroscuro ought to be the results of the artist’s cultivated knowledge and skill, and nothing should be done to hasten the obscuration of the windows cr to anticipate the effects of time. Important improve- ments have been made in the art of glass painting, as well as in the manufacture of glass, since Theophilus wrote his treatise, but some of these have not been favourable to the art; for instance, old glass is much quieter in colour than modern, and as it was less diaphanous, and less smooth in texture, it was better adapted to the operations of the glass-painter. This being observed, eminent manufac- turers of coloured glass in England and on thie Conti- nent have prepared imitations of the soft, pleasing hneg of old glass, and of

its varied texture, with considerable success. The addition of an enamel brown from iron, and much warner in tone than that made from copper, has been an important aid to glass painting, whilst about the middle of the 16th century numerous colourcd enamels were invented, which, however ingenious and beautiful, subsequently modified the art unfavourably. Vehicles composed of spirits of turpentiue, fat turpentine, or gum senegal have advantageously replaced the primitive distempers already alluded to. An important addition wag the discovery of the yellow stain, made from silver, the only purely transparent colour applicable to the surface of glass. it has been described as the invention of the Beato Giacomo of Ulm, who practised glass painting at Bologna, and died in the odour of sanctity in 1491; but the yellow stain was characteristic of glass paintings for more than a century before histime. The introduction of the system of coating white with coloured glass jn the same way as it had been coated with ruby glass, and the invention in the 15th cen- tury of removing portions of the coloured glass by abrasion or with the wheel so as to lay the white bare iu conformity with special designs, together with the practice of staining such white portions yellow, led to important modifications in the art, Embroideries on coloured garments and other ornaments were thus easily represented, and the system is very useful in painting heraldry. Instead of the wheel fluorio acid is now chiefly used to remove the film of coloured glass from its white backing. The leads with which the mosaic of glass is brought together in glazing panels have undergone various changes. arly lead-work is massive; but at the beginning of the 15th century it becomes lighter in appearance but without loss of strength, for although the grooves were made shallower, the lead was increased in thickness and was rounded on the outer sur- faces. Alterations also were made in the method of fixing painted windows: the saddle bars, according to climate, were made more or less robust ; and, instead of crossing the

windows in straight horizontal lines, they were frequently bent to suit the design. Generally speaking, horizontal bars are not objectionable unless they cross faces, or hands and feet,—an arrangement which ought carefully to be avoided. Mosaic windows should be made waterproof, and the saddle

bars should be painted at intervals of time, as otherwise the rust injures the glass,

Enamelled glass, that is to say, white glass enamelled with colours, finally took the place of mosaic glass. In England in the last century glass-painters of merit who practised enamel painting have left considerable works, amongst whom Francis Eginton, F orrest, Henry Giles, Robert §. Godfrey, Jarves, and especially J ervais, who in 1717 executed from designs by Sir Joshua Reynolds the great east window of New College, Oxford. Whatever may be thought of their method, these glass-painters were meri- torious artists. Reference has been made to some of thie works of the admirable glass-painters of other countries besides Italy, but the object of the present paper has been to illustrate the history and practice of the art by Italian speciniens hitherto little observed, and very inadequately and generally inaccurately described.

At the present time the art of glass painting is practised in different countries with very divergent views of its character and limits. Some think that the more nearly it can be assimilated to pictures in oil or fresco the better, whilst others maintain that all such resemblance is beyond its distinctive conditions as a branch of decorative art. It is a common but erroneous belief that the art of glass painting was lost, and that it has been revived in the pre- sent century. It survived in its latest form of the enamel method, classed by Mr Winston as the intermediate style, which is still carried out with unsurpassed skill in Germany. Undoubtedly the mosaic system had disappeared, and it has been judiciously and ably restored wherever glass painting is how common, although with different modifications and ideas of its nature. In England glass-painters possessed of much technical skill and cultivated knowledge of old forms of the art, have produced meritorious works within the limits of almost servile imitation, insisted upon by pre- valent but mistaken sentiment; and in too many instances this imitation las reduced the art to the state of mere trade, so that at no period of its history have worse specimens been executed, too often found in the windows of the grandest monuments of medizval architecture, which ought to have been preserved from such profanation. Of the great value and interest of early painted windows, as well as of those of more matured art, every one who studies them with intelligence must be sensible

; and this value and interest are increased by the fact that they illustrate, with perfect truth, the tastes andideas, the faith and customs, of the periods during which they were created, but modern counterfeits do nothing of the kind, and can convey no such impressions to future times. It is only by the restoration of the old union which existed between the great artist and the glass-painter, dwelt upon in these columns, that the beautiful art of glass painting can be really restored, nor are we without a completely successful instance of the happy results of this union. A window in the parish church at Alnwick, designed by the late William Dyce, R.A., and painted on glass at Munich, is a magnificent specimen of the art, equal in design and execution to the works of its golden age.

In Germany the arts ornamental still flourish as branches of fine art. There, as generally throughout the Continent, the acquirement of a knowledge of ornament forms part of the curriculum of study of most artists ; to the entire neglect of this in England, in academies of fine art, may be attributed the low estate into which these branches have fallen. The most eminent German artists of the present

century have made desigus for painted windows, which have been executed by highly-trained glass-painters, with that care which is so characteristic a national attribute. Such being the case, it remains a source of wonder that artists Surrounded by precious remains of ancient genius remark- able for exquisite colour should notwithstanding show so little ability as colourists. They assimilate the coloured glasses of the best qualities, with every attention to the laws of harmony, but they do not bring them into union ag the old masters did by forcible painting of the shadows and half tints. The shadows generally are too transparent, and the general effect is weak. The finest work of the Munich school of glass painting, and one of the best windows produced in the present century, is in the Parliament House Edinburgh. It is richer in colour than is usual; and, having been designed by the illus- trious Wilhelm von Kaulbach, the general composition is of a noble character.

In France an imitative school, resembling that which has been dominant in England, has executed skilful mimicries of ancient glass painting, and has restored successfully ancient windows broken or otherwise injured in revolution- ary times or by neglect. Glass-painters of this class may be found in France, who dispute the supremacy in bad art of their island rivals. In efforts to escape from this abject imitation, trained artists have produced original works of considerable power of form and colour, but too many aim at a picturesque eccentricity, and an affected design, incon- sistent with the grave beauty of the art; and Jean Cousin and other great masters of the grand period of French glass painting have no successful followers, nor has any painted window been produced in France in the present century which equals that by the Scottish artist, William Dyce, or that by the German, Von Kaulbach.

In Italy there are glass-painters whose merits as draughts- men, designers, and executants place them in the first rank, but their windows are almost invariably laborious imitations of pictures in oil; they have undoubtedly lost the methods as well as the ideas and style of their great predecessors, whose windows they not unfrequently injure deplorably by their restorations. It is to be regretted that artists so ad- mirably trained in many respects should so little compre- hend the magnificent works of former times which would be

their best models, and which tliey have skill enough to rival but for their vicious method of execution.

In Belgium the art is practised with considerable skill, and works of merit have been executed, but here, as else- where, the modern glass-painter is inferior to his prede- cessors, although he is surrounded by so many admirable specimens of ancient art.

The following works on glass painting may be advantageously studied :— Ferdinand de Lasteyrie, Histoire de la petnture sur verre apres scs monuments en France, Paris, 2 vols. folio, 1852; Id., Quelques mots sur la Theorie dela peinture sur verre, Paris, 12mo, 1858; Id., Notice sur les vitraux de Vabbaye de Rathhausen, canton de Lucerne, Paris, 1856; A. Lenoir, Histoire de la peinture sur verre et description des vitraue anetennes et modernes, &c., Paris, 1803 ; Id., Notice historique sur Vancicenne peinture sur verre, sur les moyens pratiques dans ect art depuis Vépoque de son invention Jusqwa nos jours, et par suite sur Jean Cousin, qui a execellé dans le méme art, Paris; E. H. Langlois, Essai historique et descriptif sur la peinture sur verre aneienne et moderne, Rouen, 1832; Pierre le Vieil, L'art de la peinture sur verre et de la vitrerie, Paris, 1774; Glass: the manner howe to anneile or paint in glass: the true receptes of the cullors, 1616; Gessert, Rudimentary Treatise on Painting on Glass, London, 1851; Mrs Merrifield, Aneient Praetice of Painting in Oil, Miniature, Mosaic, and on Glass, &c., London, 1849 ; Charles Winston, An Inquiry into the difference of style observable in ancient Glass Painting, especially in England, Oxford, 1847 ; Padre L. V. Marchese, Memorie dei pias insigni Pittori, Scultori, ¢ Architetti Domenicani, Florence, 1846; G. Gaye, Carteggio inedito a artiste dct sceolt xiv., xv., xvi., 3 vols., Florence, 1839 ; Gaetano emer Le Opere di Georgio Vusari con nuove annotazioni e commente, Flor- ence, 1879. (C. H. W.) X. —~ 35

674 :

GLASSIUS, Sonomon (1593-1656), theologian and Biblical critic, was born at Sondershausen, in the principality of Schwarzburg-Sondershausen, in 1593, received his school- education at the gymnasium of Gotha, and in 1612 entered the university of Jena, where, with the exception of some months spent at Wittenberg in 1615, he passed the following nine years of

his life. As a student of theology under John Gerhard he directed his attention especially to Hebrew and the cognate dialects ; in 1619 he was made an '"adjunctus" of the philosophical faculty, and some time afterwards he received an appointment to the chair of Oriental languages. From 1625 to 1638 he discharged the duties of superintendent in Sondershausen ; but in the latter year, shortly after the death of Gerhard (1637), he was, in accordance with the last wish of that great?man, appointed to succeed him in the chair of theology at Jena. He did not, however, continue long at that university ; forin 1640, at the earnest invitation of Duke Ernest the Pious, he re- moved to Gotha, there to act as general superintendent in the execution of important reforms which bad been initiated both in the ecclesiastical and in the educational establish- ments of the duchy. 'he delicate duties attached to this office he discharged with singular tact and energy; and when called upon to take part in what is known as the "syncretistic" controversy, by which Protestant Germany was so long vexed, he manifested a combination of firmness with liberality, of loyalty to the past with a just regard to the demands of the present and the future, which unhappily have only too seldom been equalled in theological disputes. His principal work, the well known Phelologia Sacra, pub- lished originally in 1625, was and still is regarded as a work of great value in biblical hermeneutic; and it has an his- torical importance as marking the transition from the earlier views on questions of biblical criticism to those of the school of Spener. It was more than once reprinted during the author's lifetime, and appeared in a new and revised form, edited by Dathe and Bauer at Leipsic, towards the close of the century (1776-1797). Glassius succeeded Gerhard also in the editorship of the Weimar zbelwerk, and he wrote the commentary on the poetical books of the Old Testament for that publication. A volume of his Opuscula was printed at Leyden in 1700. He died in

1656.

GLASTONBURY, a market town and municipal borough of England, is situated near the middle of Somer- setshire, about 22 miles S.W. of Bath, on the great western road from London to Exeter. The spot occupied by the town is a sort of peninsula formed by the windings of the river Brue, which flows west through the valley between the Poldew and the Mendip Hills;

and in earlier times it was to all intents an island, as the country round was an extensive marsh, broken, however, by the Tor of St Michael to the N.E. of the town. Of the public buildings the most important, besides the ruins of the great abbey, are the church of St John tle Baptist, in the Perpendicular style, with a tower of fine proportions; the church of St Benedict, dating from between 1493 and 1524; the hospital of St John, founded in 1246; and the George Inn, erected about the time of Henry VII. or Henry VIII. There was formerly in the town a remarkable cross, which is figured in Warner's Glastonbury; but it fell into decay, and was replaced by the present insignificant monument in 1846. Though Glastonbury has a station on the Somerset and Dorset Railway, and communicates with the estuary of the Severn by means of a canal for vessels of 70 or 100 tons burden, it has comparatively little trade. The woollen manufacture was introduced by the duke of Somerset in the first half of the 16th century, as may be seen at length in Strype's Life of Cranmer ; but neither that nor the manu- facture of silk, which was also carried on to some extent

during the 18th century, is now of any importance. There are tanneries, however, and tile-works. The population of the town in 1861 was 3496, and in 1871 it was 3670.

The abbey of Glastonbury is without doubt one of the very earliest ecclesiastical foundations in England. In the words of Mr Freeman (" King Ine,"' Proc. of Somersetshire Arch. Soc., 1874), "it is on any showing a tie between the Briton and the Englishman, between the older Christianity of our island and the newer, the one church of the first rank which lived through the storm of Eng- lish conquest, which passed into the hands of our victorious fathers as a trophy of victory undestroyed and unplundered." But unfor- tunately " everything relating to its carly history is so enveloped in legend that one has to tread one's way with the greatest caution at every step." As Canon Stubbs remarks,! the extravagant claims of the monks in regard to the antiquity and celebrity of their church " doubtless provoked criticism, and criticism forced on them the need of a forged history to assert, and of forged monuments to sup- port these pretensions. The fabrication of such evidence must have gone on at Glastonbury on a scale

proportioned to the claims ; and William of Malmesbury, it would almost seem, undertook to erect the story out of materials which he distrusted. This did not content his employers, and they interpolated his work to a degree which makes it impossible to rely with confidence on any part of it."

Though Glastonbury is not mentioned cither by Bede or by the authors of the Saxon Chronicle as one of the carly foundations, its existence (continues Prof. Stubbs) is proved by the incontrovertible authority of the letters of St Boniface and the life of the same by S. Willibald. The name of Glastonbury however is of compara- tively modern origin, being a corruption of the Saxon Glestingaburh or town of the Glestings. By the Britons the spot seems to have been called Ynys yr Avallon (Latinized as Avallonia), the Island of Apples, or Ynyswitrin, the Glassy Island; and it became the local habitation of various fragments of Celtic romance.

According to the legends which grew up under the care of the monks, the first church of Glastonbury was a little wattled building erected by Joseph of Arimathea as the leader of the twelve apostles sent over to Britain from Gaul by St Philip. About a hundred years later, according to the same authorities, the two missionaries Phaganus and Deruvianus who came to king Lucius from Pope Eleutherius established a fraternity of anchorites on the spot, and after three hundred years more St Patrick introduced amongst them a regular monastic life. About 546 David of Menevia is said to have built a new church near the old one, and in the 7th century the old one was encased with boards and covered with lead by the care of Paulinus of York. In the early part of the 8th century the great West Saxon king Ine (¢f. charter in Kemble, Codex diplomaticus avi Saxonict, vol. i. No. lxxi.) built and endowed a monastery at Glastonbury, which, in spite of the preceding cstablishments, may almost be considered as a new foundation. From the decadent state into which, like other monasteries, Glastonbury was brought by the Danish invasions, it was brilliantly recovered by the powerful le of Dunstan who had been educated within its walls and was appointed its abbot about 946. The church and other buildings of his erection remained till the installation, in 1082, of the first Nor- man abbot, who inaugurated the new epoch by commencing a new church. His successor Herlewin (1101-1120), however, dissatisfied with the meanness of the edifice, pulled it down to make way for a finer structure. Henry of Blois (1126-1172)

added greatly to the extent of the monastery, building a bell tower, a chapter-house,‘a cloister, a dormitory, a refectory, a palacc, a brew-house, &c. In 1184 (on 25th May) the whole of the buildings were laid in ruins by fire; but Henry II. of England, in whose hands the monastery then was, entrusted his chamberlain Rudolphus with the work of re- storation, and caused it to be carried out with much magnificence. The great church of which the ruins still remain was then erected. In the end of the 12th century, and on into the following, Glaston- bury was distracted by a strange dispute, caused by the attempt of Savaric the ambitious bishop of Bath to make himself master of the abbey. The conflict, carricd on alternately by blows and bribes, was brought to a close by the decision of Innocent III., that the abbacy should be merged in the new see of Bath and Glastonbury, and that Savaric should have a fourth of the property. On Savaric’s death his successor gave up the joint bishopric and allowed the monks to elect their own abbot. From this date to the Reforma- tion the monastery continued to flourish, the chief events in its history being connected with the maintenance of its claims to the possession of the bodies or tombs of King Arthur and St Dunstan. ‘As early at least as the beginning of the 11th century the tradi- tion that Arthur was buried at Glastonbury appears to have taken shape; and in the reign of Henry I!., according to Giraldus Cambrensis and others, the abbot Henry de Blois, causing search to be made, discovered at the depth of 16 feet a massive oak trunk with an inscription ‘‘Hic jacet sepultus inclitus rex Arthurusin insula Avalonia.” After the fire of 1184 the monks asserted that they were

1 Introduction to Memorials of St Dunstan, Rolls Series, 1874.

in possession of the remains of St Dunstan » Which had been abstracted from Canterbury after the Danish sack of 1011 and kept in conceal- ment ever since. The Canterbury monks naturally denied the asser- tion, and the contest continued for centuries. In 1508 Warham and Goldston having examined the Canterbury shrine reported that it contained all the principal bones of the saint, but the abbot of Glastonbury in reply as stoutly maintained that this was impossible. The day of such disputes was, however, drawing toa close. On 1539 the last and 60th abbot of

Glastonbury, Robert Whyting, was, in the words of a contemporary lettter (MS. Cotton, Cleop. E., iv. fol. 996), "' arraigned, and next day put to execution for robbing of Glastonbury church." Hig body was quartered, and his head fixed on the abbey gate. A darker passage does not occur in the annals of our English Reformation than this murder of an able and high-spirited man, whose worst offence was that he defended as best he could from the hand of the spoiler the property of his charge.

The ruins of the abbcy are now comparatively few, and as the work of destruction has in many places descended to the very foundations it is impossible to make out the details of the plan. Of the vast range of buildings for the accommodation of the monks almost nothing remains except the abbot's kitchen, noteworthy for its octagonal interior, the porter's lodge, and the abbey barn. Consider- able portions are still standing of the so-called chapel of St Joseph at the west end, which Mr Willis has identified with the lady chapel, occupying the site of the old wicker church. 'This chapel, which is the finest part of the ruins, is transition work of the 12th century. It measures about 66 feet from east to west and about 36 from north tosouth. Below the chapelis a erypt which Professor Willis shows to be a construction of the 15th century inserted in a building which had no previous crypt. Between the chapel and the great church is an Early English building which appears to have served as a Galilee porch, The great church itself was a cruciform structure with a choir, a nave, and transepts, and a tower surmounting the centre of intersection. From east to west the length was 410 feet, and the breadth of the nave was about 80 feet. The nave had ten severies, and the choir six. Of the nave three bays of the south side are still standing, and the windows have pointed arches externally and semi-circular arches internally. Two of the tower piers and a part of one arch give some indication of the grandeur of the building. The old clock, presented to the abbey by Adam de Godbury (1322-1335), and noteworthy as the first recorded example of a clock striking the hours automatically with a count-wheel, is still preserved, although not in its entirety, in the cathedral at Wells.

The Glastonbury thorn, planted, according to the legend, by Joseph of Arimathea, has been the object of considerable comment. According to London (Arboretum ct Fruticetum) it was probably Crategus preecox, and

he reports that he received from Glastonbury in December 1833 a thorn branch in full blossom, having also on it ripe frnit. The actual thorn visited by the pilgrims was destroyed about the Reformation time, but specimens of the same variety are still extant in various parts of the country.

See William of Malmesbury, " De Antiq. Glastoniensis Eeelesie," in Rerum Anglicarum Script. Vet., tom. i, 1684 (also printed by Hearne and Migne); John of Glastonbury, Chronica sive de Hist. de Rebus Glast., ed. by Hearne, Oxford, 1726, 2 vols; Adam of Domerham, De Rebus Gestis Glast., ed. by Hearne, Oxford, 1727, 2 vols.; Hist. and Antigq. of Glast., London, 1807; Avalonian Guide to the Town of Glastonbury, 1839, 8th ed.; Warner, Jist. of the Abbey and Toun, Bath, 1826; Rev. F. Warre, " Glastonbury Abbey," in Proc. of Somersetshire Archeol, and Nat, Hist. Soc., 1849; Rev. F Warre, " Notice of Ruins of Glastonbury Abbey," 7bid., 1859; Rev. W. A, Jones, "On the Reputed Discovery of King Arthur's Remains at Glastonbury," zbid., 1859; Rey. J. R. Green, "Dunstan at Glastonbury," and ' Giso and Savarie," bid, 1863; Rev. Canon J ackson, "Savaric, Bishop of Bath and Glastonbury," ibid., 1862, 1863; E. A. Freeman, " King Ine," tbid., 1872 and 1874; Dr W. Beattie, in Journ. of Brit. Archeol. Ass., vol. xii., 1856; Rev. R. Willis, Architectural Ifistory of Glastonbury Abbey, 1866. Views and plans of the abbey building will be found, says Mr Willis, in Dugdate's Monasticon, 1655; Stevens's Monasticon, 1720; Stukeley, Jtinerarium Curiosum, 1724; Grose, Antiquities, 1754; Carter, Ancient Architecture, 1800; Storer, Antig. and Topogr. Cabinet, vols. ii., iv. v. 1807, &c.; Britton's Architectural Antiquities, vol, 'iv., 1813; Vetusta Monumenta, vol. iv., 1815; and New Ifonas- ticon, vol, i, 1817.

GLATZ (Slav. Avadsko), a fortified town of Prussian Silesia, chief town of a countship in the government dis- trict of Breslau, is situated 50 miles 8.S.W. of the town of that name, It stands in a narrow valley on the left bank of the Neisse, not far from the Austrian frontier, It is strongly walled, and is further defended by an old castle built on a high hill on one side of the town, and by a regular modern fortress erected on a hill on the opposite side, Before the town on both banks of the river there js also a strongly fortified camp, by which its bombardment from the neighbouring heights may be hindered, and which affords accommodation for as many as 10,000 men. The town is the seat of a circle court and of an agricultural union, and

1 A curious relie of Abbot Whyting, his watch, was purchased in 1837 at the sale of T. Bowen's effects, and presented by C, K, Tynte to the duke of Sussex,

possesses one Lutheran and three Catholic churches, one of which is very old and contains several monuments of Silesian dukes. Among the other. buildings the principal are the nunnery, the royal Catholic gymnasium, the asylum for destitute children, and the military hospital The in- dustries include the manufacture of spirits, linen, damask, broad cloth, hosiery, beads, and leather. Glatz existed as early as the 11th century. In the Thirty Years' War it was several times besieged and taken. It surrendered to Frederick the Great in 1742, was retaken by the Austrians in 1760, and was restored to Prussia at the peace of 1763. . The population in 1875 was 12,553,

GLAUBER, Jonann Rupotpr (1603-1668), alchemist and medicinal chemist, was born at Carlstadt in 1603, and died at Amsterdam in 1668. There is no authentic record of details concerning his life; his name has been somewhat marred by tradition, but it is not unreasonable to suppose that this originated with persons who did not heed the warning given by the chemist himself, in one of his more important memoirs, "let no one rashly judge of this work, until he be thoroughly informed concerning the same." Comniencing his career as a chemist at the time he did, it was not unnatural that he imbibed the notion, prevalent among his contemporaries, of the existence of " alkaheat," a liquid which was to be universal in its uses as a solvent and @ medicine, and of the " philosopher's stone." But whatever the motive which induced him to toil in his laboratory, it is certain that he, by ascertaining the preparation of many valuable medicines, contributed largely to pharmacy. He undoubtedly was the first, in 1648, to procure hydrochloric acid by the action of oil of vitriol on common salt, and also in all probability to obtain nitric acid by means of oil of vitriol and nitre. Sodium sulphate, discovered by him, and commonly therefore termed Glauber's salt (see below), he obtained by the action of oil of vitriol on salt.

His treatises, about thirty in number, were published at Frankfort in 2 vols. 4to, in 1658-1659; at Amsterdam, in 1661, in 7 vols. 8vo ; and at London,

translated into English by Parke, in 1689, 1 vol. folio.

GLAUBER'S SALT the popular term for neutral sul- phate of sodium (Na,SO,), discovered by the chemist whose name it bears, and formerly known as "sal mirabile Glauberi." It occurs in nature in combination with calcium sulphate as the mineral glauberite, and uncombined in right rhombic prisms, as thenardite, being found in this form in Bolivia and Peru, and near Madrid; or in monoclinic prisms, with ten molecules of water as glauberite or ordinary Glauber's salt, in Austria, Hungary, Italy, and in great quantity as a deposit from the hot springs of Carlsbad. It is also a constituent of sea-water, and the chief active prin- ciple of medicinal waters, and occurs in minute traces in the blood. It has a bitter but not acrid taste. It is somewhat anontalous in its solubility, the maximum occurring at about 34°C. According to Liéwel, it exists in aqueous solution at temperatures as high as 34° C, as a decaliydrate, but above that temperature as an anhydride, the solubility of the former increasing, and of the latter decreasing, with a a rise of temperature (see CHEMISTRY, vol. v. p. 505). Under ordinary circumstances it crystallizes from solution in large colourless prisms ; these, when exposed to the air or heated, effloresce, giving a white powder, which melts at a strong red heat, and on cooling forms a transparent mass. The salt has also been the subject of some interesting ex- periments made by Guthrie, who at—7° C. procured it in combination with 166 molecules of water, From his investigation of this and other substances, he concluded that the solution of a solid body consists in the formation of a liquid hydrate which ultimately diffuses into the rest of the solvent, In the manufacture of sodium carbonate from salt and sulphuric acid, this sulphate is prepared in large quantities, In medicine itis employed as a purgative,

GLAUCHAU, one of the most important manufacturing towns of Saxony, circle of Zwickau, is situated on the right bank of the Mulde, 7 miles north of Zwickau and 17 west of Chemnitz. It is the seat of a royal administrative com- mission, of a district court, and of the ecclesiastical and secular courts of the countship of Schénburg. Its principal manufactures are woollen and half-woollen goods, in regard to which it occupies the first position in

Germany. Besides 3000 hand-looms and 1000 power-looms in the town, the trade gives employment to many others in the neighbouring districts. There are also dyeworks, print works, and manu- factories of paper, linen, thread, and machinery. Glauchau possesses a real school, an elementary school, a weaving school of the higher grade, an orphanage, and an infirmary. Some portions of the extensive old castle date from the 12th century, and the Gottesacker church contains interest- ing antiquarian relics. Glauchau was founded by a colony of Sorbs and Wends, and belonged to the lords of Schon- burg as early as the 12th century. The mineralogist Agricola was born at Glauchau in 1494. While the popu- lation in 1834 was only 6292, it was 14,357 in 1858 and 21,743 in 1875.

GLAUCUS (TAaikos, te, yAavkos, " silvery" or "sheeny"), in Greek mythology, the name of several fig- ures, the most important of which are the four described below :—

(1.) Gravcus, surnamed Pontius (6 rovttos, equivalent to § Paddoowos), according to the common legend had originally been anexpert fisherman and diver at Anthedon (Beeotia),'but, having eaten of the magical herb sown by Cronos, had leapt into the sea, where ultimately he was changed into a god, and cndowed with the gift of unerring prophecy. A principal seat of his cultus was Anthedon, where the inhabitants claimed to be descended from him; but he was also wor- shipped extensively, not only on the coasts of Greece, but also on those of Sicily and Spain, it being customary for fishermen and sailors at certain seasons to watch during the night for the moment when he should come on his periodi- cal rounds accompanied by his train, in order that they might consult him as an oracle. He is generally represented as endowed with most of the attributes of Nereus, but occasionally he is identified with Melicertes. He is some- times said to have instructed Apollo in prophecy. In art he is depicted as a vigorous old man with long hair and beard, his body terminating in a scaly tail. The Argo- nautica represent Glaucus as having been builder and steers- man of the "Argo," as having alone remained unhurt in the fight of Jason with the Tyrrhenians, and as having after- wards become a sea god, in which capacity he was able in various ways to assist the expedition. A poetical account of his metamorphosis is given by Ovid (Met., xiii. 906), and his story has been also treated by Pindar and by Aaischylus, the latter of whom

is known to have made Glaucus Pontius the subject of one of his satyr-dramas (see Pausanias, 1x. 22, 6; and compare Hermann, De dischyli Glaucis). Allusions to the loves of Glaucus with Ariadne, Scylla, the Nereids, and Melicertes are frequently to be met with in ancient literature; and a considerable quantity of folklore concerning him will be found in the scholiast on Plato's Republic, p. 536, and also in Athenzeus, Deipnosoph. vii. 47, 48. See also Giidechen's monograph (Glaukos der Meergott, 1860).

(2.) Guaucus, usually surnamed Potnieus (6 aorvets), from Potniee near Thebes, a deity worshipped chiefly in Corinth, is to be carefully distinguished from Glaucus Pontius. He was the son of Sisyphus by Merope, and the father of Bellerophon. According to the legend he was destroyed by his own mares,—the most common form of the story being that he was torn to pieces by them. Accounts differ as to the place of his violent death, and also as to the

immediate occasion of it. Sometimes it is represented as having happened at Ioleus, at the funeral games of Pelias, but usually the scene is laid at Potnie. He is most fre- quently represented as having offended Aphrodite by having kept his mares from breeding; but other versions of the myth are that he had fed them on human flesh to make them more spirited, or that they had been suffered to drink at a sacred well at Boeotia, or that they had eaten the herb hippomanes. On the isthmus of Corinth, and also at Olympia and Nemea, he was worshipped as tapdéur7os; and he was the subject of a lost tragedy of Aischylus, His affinities with Poseidon Hippius are obvious; and it may be taken for granted that the frantic horses of Glaucus Potnieus represent the stormy waves of the sea, just as Glaucus Pontius is himself a personification of the ocean in its friendlier and calmer moods.

(3.) Guaucus, the son of Minos by Pasiphae, when a child, playing at ball or pursuing a mouse, fell into a honey pot and was smothered. His father, after a vain search for him, consulted the oracle, and was referred for an answer to the person who should suggest the aptest comparison for one of the cows of Minos which had the power of assuming three different colours. Polyidus (IIodviSos) of Argos, who had likened it to a mulberry (or bramble), which changes from white to red and then to black, soon afterwards discovered the

child. Minos then desired him to restore young Glaucus to life ; and on his failure in this, he was sentenced to be entombed alive along with the corpse. Having in the sepulchre killed a serpent by which he had been attacked, he saw its com- panion revivify it by laying upon it a few leaves of a certain herb. The same herb he successfully applied to Glaucus. This curious myth is now very generally admitted to be of a solar character; but interpreters are far from unanimous as to the significance of the various details. The story, which is related by Apollodorus (iii. 3, 1), and also by ZElian, was a favourite subject with poets and artists. Zschylus, Sophocles, and Euripides are each of them said to have treated it dramatically ; and, according to Lucian, it was often represented in mimic dances (Lucian, De Salta- tione, 49; Welcker, Die Griech. Tragoedie). In some of its features at least the mythus is found to be very widely diffused. See Cox, Aryan Mythology, i. 161; Baring- Gould, Myths of the Middle Ages, ii. 145.

(4.) Guaucus, son of Hippolochus, and grandson of Bellerophon, mythical progenitor of the kings of Tonia, was a Lycian prince who, along with his brother Sar- pedon, assisted Priam in the Trojan war. The incident between Glaucus and Diomede, as related in the Zhad, is well known. He was afterwards slain by Ajax; but his body was carried back to Lycia, as that of his brother had been. It seems probable that these two sons of the Lycian land—the land of light—who leave it in youth, but are carried thither again (by Hypnos and. Thanatos) when their course is done, originally were meant to represent respectively the creeping light of the early dawn (Sarpedon) and the brightness of the open day (Glaukos).

GLEBE, in ecclesiastical law, is the land devoted to the maintenance of the incumbent of a church, Burn (Zcclest- astical Law, s.v. “Glebe Lands ”) says :—“ Every church of common right is entitled to house and glebe, and the assigning of them at the first was of such absolute necessity that without them no church could be regularly consecrated. The house and glebe are both comprehended under the word manse, of which the rule of the canon law is, sancitum est ut unicuique ecclesia unus mansus integer absque allo servitio tribuatur.” In the technical language of English law the fee-simple of the glebe is said to be in abeyance, that is, it exists “ only in the remembrance, expectation, and intendment of the law.” But the freehold is in the parson,

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although at common law he could alienate the same only with proper consent,—that is, in his case, with the consent of the bishop. The disabling statutes of Elizabeth (1 Eliz. c. 19, and 13 Eliz. c. 10) made void all alienations by eccle- siastical persons, except leases for the term of twenty-one years or three lives. As to exchange of glebe lands, see 5 and 6 Vict. c. 54, and 17 and 18 Vict. c. 84. In Scotch ecclesiastical law, the manse now signifies the minister's dwelling-house, the glebe being the land to which he is

entitled in addition to his stipend. All parish ministers |

appear to be entitled to a glebe, except the ministers in royal burghs proper, who cannot claim a glebe unless there be a landowner's district annexed ; and even in that case, when there are two ministers, it is only the first who has aclaim. See Bell's Dictionary and Digest.

GLEE is a musical term for a part song of a par- ticular kind. The word, as well as the thing, are essen- tially confined to England. The technical meaning has been explained in'different ways; but there is little doubt of its derivation from the Anglo-Saxon "gleov, gleo," gaudium, delectamentum, and hence ludus musicus. Glee- man, Anglo-Saxon "gleo-man," is translated simply as '"'musicus" or "cantor," to which the less distinguished titles of "mimus, jocista, scurra," are frequently added in old dictionaries. The accomplishments and social position of the gleeman seem to have been as varied as those of the Provengal "joglar." To return to the word '* slee," there are early examples of its being used as synonymous with harmony or concerted music. The former explana- tion, for instance, is given in the Promptorium Par- vulorum, a work of the 15th century. Glee in its present meaning signifies, broadly speaking, a piece of concerted vocal music, generally unaccompanied, and for male voices, though exceptions are found to the last two restrictions. The number of voices ought not to be less than three. is little distinguished from the catch,—the two terms being often used indiscriminately for the same song; but there is a distinct difference between it and the madrigal— one of the earliest forms of concerted music

known in England. While the madrigal does not show a distinction of contrasted movements, in the glee. In the madrigal the movement of the voices is strictly contrapuntal, while the more modern form allows of freer treatment and more compact harmonies. Differences of tonality are fully explained by the development of the art, for while the madrigal reached its acme in Queen Elizabeth's time, the glee proper was little known before the Commonwealth ; and its most famous representatives belong to the last century and the first quarter of the pre- sent. Among the numerous collections of the innumer- able pieces of this kind, only one of the earliest and most famous may be mentioned, Catch that Catch can, a Choice

Collection of Catches, Rounds, and Canons, for three and

Jour voices, published by John Hilton in 1652. The name "glee," however, appears for the first time in John Playford's Musical Companion, published twenty-one years afterwards, and reprinted again and again, with additions by later composers—Henry Purcell, William Croft, and John Blow among the number. The father of the glee in its modern form is Dr Arne, born in 1710. Awong more recent English musicians famous for their glees, catches, and part-songs, the following may be mentioned: —Attwood, Boyce, Bishop, Crotch, Callcott, Shield, Stevens, Horsley, Webb, and Knyvett. The convivial character of the glee led, in the last century, to the formation of various societies, which offered prizes and medals for the best com- positions of the kind, and assembled for social and artistic purposes. The most famous amongst these—The Glee Club—was founded in 1783, and at first used to meet at

As regards musical form, the glee |

this feature is absolutely necessary |

| expression,

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the house of Mr R. Smith, in St Paul's Churchyard. This club was dissolved in 1857. A similar society—The Catch Club—was formed in 1761, and is

still in existence. A short historic survey of the subject is contained in Mr W. A. Barrett's The English Glee and Madrigal Writers.

GLEIG, GrorcE (1753-1839), bishop of Brechin, Scot- land, was the son of a farmer, and was born at Boghall, Kincardineshire, May 12, 1753. He received his early education at the school of Arbuthnott, and at the age of thirteen entered King's College, Aberdeen, where he especially distinguished himself in mathematics and the moral and physical sciences. In his twenty-first year he took orders in the Scottish Episcopal Church, and was ordained to the pastoral charge of a congregation at Pitten- weem, Fife, whence he removed in 1790 to Stirling. His pastoral duties allowing him considerable leisure for literary pursuits, he became a frequent contributor to the Monthly Review, the Gentleman's Magazine, the Anti-Jacobin Review, and the British Critic. He also wrote several articles for the third edition of the Lncyclopedia Britannica, and on the death of the editor, Colin Macfarquhar, in 17 93, was engaged to edit the remaining volumes. One of his principal contributions to this work was the article Metaphysics. He was twice chosen bishop of Dunkeld, but the opposition of the primus rendered the election on both occasions ineffectual. In 1808 he was consecrated assistant and successor to the bishop of Brechin, in 1810 was pre- ferred to the sole charge, and in 1816 was elected primus of the Episcopal Church of Scotland, in which capacity he greatly aided in the introduction of many useful reforms, in fostering a more catholic and tolerant spirit, and in cement- ing a firm alliance with the sister church of England. He died at Stirling in February 1839.

Besides various sermons, Gleig was the author of Directions for the Study of Theology, 1827 ; an edition of Stackhouse's History of the Bible, 1817 ; and a life of Robertson the historian, prefixed to an edition of his works. See Life of Bishop Gleig by the Rev. W. Walker, 1879.

GLEIM, Jonaxn Witurtm Lupwie (1719-1803), a minor German poet, was born April 2, 1719, near Halber- stadt, and died there February 18, 1803, after having occupied, during half a century, the situation of secretary to the chapter of Halberstadt. 'Father Gleim" was the title accorded to him:throughout all literary Germany on account of his kind-hearted though inconsiderate and un- discriminating patronage alike of the poets and

poctasters of the period. He wrote a large number of feeble imita- tions of Anacreon, Horace, aud the minnesingers, a dull didactic poem entitled Halladat oder das rothe Buch (Hal-

berstadt, 1774, 4th ed. 1812), and collections of fables and

romances (/abeln, Berlin, 1756-57; Romanzen, Berlin and Leipsic, 1756; Lieder, Fabeln, und Romanzen, Berlin, 1758). Of higher merit are his Preussische Kriegs- lieder eines Grenadiers (Berlin, 1758). These, which were inspired by the campaigns of Friederick II., are often dis- tinguished by genuine feeling and vigorous force of expres- sion. They are also noteworthy as being the first of that long series of noble political songs in which later German literature‘is so rich. With this exception, Gleim’s writings are for the most part tamely commonplace in thought and His very best odes have only a certain feeble prettiness to recommend them. A few, as Das Hiittchen and An Leukon, have still some popularity, and appear in most collections of German poetry.

See Gleim’s Saéimmtliche Werke (7 vols., Halberstadt, 1811-1818), and Korte’s Gleim’s Leben aus seinen Briefen und Sehriften (Hal- berstadt, 1811). :

CLEIWITZ, a town in the Prussian province of Silesia, chief town of the circle of Tost-Gleiwitz, government dis- trict of Oppeln, is situated on the Klodnitz, and on the railway between Oppeln and Cracow, 40 miles S.H. of the

former town. It is the seat of a royal mining board, a pro- vincial court of justice, and a tax office. It possesses one Protestant and two Catholic churches, a synagogue, a gymnasium, a school of industry, two female schools of a higher grade, a convent, a hospital, an infirmary, two orphanages, and a barracks. Gleiwitz is the centre of the iron industry of Upper Silesia. Besides the royal foundry, with which are connected machine manufactories and boiler- works, there are other two foundries, neal mills, and manu- factories of wire, gaspipes, cement, and paper. The popu- lation in 1875 was 14,156.

GLENDOWER, or Grynpwr, Owen, the last native who assumed the title of Prince of Wales, and the leader of the only formidable attempt made by tlie Welsh to re- gain their freedom, after they had been subjugated by Edward I., was born most probably at Glyndwrdy in Mont- gomeryshire, whence his name, about the year 1354. He was the son of Gruffydd Vychan, sprung from the lords of Bromfield, and through his mother he claimed descent from a daughter of Llywelyn, the last crowned prince of Wales. He was entered a member of one of the inns of court, and brought up to the profession of the law, but he does not seem to have practised. In 1385, in the great dispute between the Grosvenors and the Scropes as to their right to bear a certain coat of arms, he was a witness for Grosvenor—one of the witnesses for Scrope being the poet Chaucer. He found his way to court, where he became a favourite with King Richard, and was made an esquire of his body. When Richard went to Ireland Owen accompanied him, as he did also on his return to Wales. He was present when Richard placed himself in the hands of the treacherous Northumberland, and at Flint, where his deposition was decided upon. Owen thereupon retired into private life. He had the mis- fortune to have for a neighbour Reginald de Grey, earl of Ruthin ; and between him and De Grey a feud existed, occasioned by a dispute about a piece of waste land. In the time of Richard, Owen was successful in a lawsuit ; but no sooner was the king deposed than De Grey took

forcible possession of the land. Owen in vain appealed to |

parliament, although the bishop of St Asaph entreated them to grant lis request, and warned them that if they did not, Wales would rise in rebellion; and a little later Henry IV., on the ground that Owen, as a crown tenant, had neglected to join an expedition to Scotland (while the fact was that the summous, which had been entrusted to De Grey to give to Owen, was not delivercd until it was too late), declared a forfeiture of his land held of the crown, and granted some of it to De Grey. With armed retainers De Grey took possession ; but Owen mustered his followers, and after regaining his own, devastated the lands of De Grey. Henry took De Grey's part, and Owen set both at defiance. On the 20th September 1400 Owen struck the first blow for the freedom of his country at Ruthin, where a fair was being held. The town was burnt down. During that and the following year Owen

steadily added to his strength, and the king, although be thrice invaded Wales at the head of a large army, failed to get at the enemy, who retired to the mountain fastnesses. This, and the stormy weather which the English seem to have invariably experienced, so awed them that they thought the Welsh chieftain was allied with the powers of darkness. Harsh laws were enacted against the Welsh, who thereby were only the more goaded to re-bellion. The lord-marchers sided with the king, and Sir Edward Mortimer, uncle of the earl of March, gave Owen battle at Brynglas in Radnorshire, on June 22, 1402. Herefordshire men were left dead on the field, and Morti-mer himself was made prisoner. It was at this battle that the Welsh women were guilty, as Shakespeare says, of in- human conduct to the dead. Thisso alarmed the king that

he invaded Wales in the autumn with three armies, but nothing came of it. Ata parliament held at Machynlleth, at the close of this year (1402), Owen was formally pro- claimed Prince of Wales. About this time it was that the first steps were taken which secured the league between Owen, Mortimer, and Percy. Early in 1403 Prince Henry— Falstaff's Hal—was appointed lieutenant of the king in Wales. He led an army into North Wales and destroyed Owen's residences, "and laid waste a fine and populous country." The next great event was the battle of Shrews- bury, at which Percy was defeated. Glendower has been accused of having neglected aid to his ally at this battle, but letters recently discovered exonerate him from blame in this respect, as he was elsewhere at the time. Mean- while Owen was committing terrible ravages in the districts under the sway of the marchers, or where Norman castles overawed the natives ; and in 1404 he sent ambassadors— his chancellor Griffith Young, and his brother-in-law John Hanmer—to Charles of France, who entered into treaty to aid Owen. In pursuance of this treaty a large force, under the command of Hugueville, landed at Milford Haven at the end of July 1405. But meanwhile Owen had sustained two crushing defeats from the army under Prince Henry, the first at Grosmont in Monmouthshire on the 11th March, and the second at Mynyddpwllmelin in Brecknockshire four days later. Still he was able to

muster a force to join the French contingent, and with them he pushed on to the ueighbourhood of Worcester, where the king met them but did not fight, and the French returned home. Owen's power appears to have suffered irrevocably at the defeats of the spring. For years afterwards he carried on a desul- tory warfare, but defections from his ranks so weakened his power that he was no longer the dangerous enemy he had been. But he never submitted. In July 1415—fifteen

| years after the first outbreak—the king, now Henry V.,

authorizes Sir Gilbert Talbot to treat with Owen, and to offer him and his followers free pardon, "in case they should desire it." A similar offer was made in February 1416. His death is believed to have taken place at the house of one of his daughters in Monmouthshire, but there is no certainty as to either the date or the place of his death.

GLEYRE, Marc Cuaries Gasriet (1806-1874), a celebrated French painter, was of Swiss origin, having been born at Chevilly in the canton of Vaud, May 2, 1806. His father died, and then his mother, while he was yet a boy of some eight or nine years of age; and he was brought up by an uncle at Lyons, who sent hiin to the industrial school of that city. Going up to Paris a lad of seventeen or nineteen, he spent four years in close artistic study— in Hersent's studio, in Suisse's academy, in the galleries of the Louvre. To this period of laborious application suc- ceeded four years of meditative inactivity in Italy, where he became acquainted with Horace Vernet and Léopold Robert ; and six years more were consumed in adventurous wanderings in Greece, Egypt, Nubia, and Syria. At Cairo he was attacked with ophthalmia, and in the Lebanon he was struck down by fever; and he returned to Lyons in shattered health. On his recovery he proceeded to Paris, and, fixing his modest studio in the Rue de Université, began carefully to work out the conceptions which had been slowly shaping themselves in his mind. Mention is made of two decorative panels—Diana leaving the Bath, and a Young Nubian—as almost the first fruits of his genius ; but these did not attract public attention till long after, and the paint- ing by which he practically opened his artistic career was the Apocalyptic Vision of St John, sent to the Salon of 1840. This was followed

in 1843 by Evening, which at the time received a medal of the second class, and after- wards became widely popular under the title of the Lost

Illusions. It represents a poet seated on the bank of a river, with drooping head and wearied frame, letting his lyre slip from a careless hand, and gazing sadly at a bright company of maidens whose song is slowly dying from his ear as their boat is borne slowly from his sight. In spite of the success which attended these first ventures, Gleyre retired from public competition, and spent the rest of his life in quiet devotion to his own artistic ideals, neither seeking the easy applause of the crowd, nor turning his art into a means of aggrandizement and wealth. After 18 45, when he exhib- ited the Separation of the Apostles, he contributed nothing to the Salon except the Danse of the Bacchantes in 1849, And yet helaboured steadily and was abundantly productive. He had an “infinite capacity of taking pains,” and when asked by what method he attained to such marvellous per- fection of workmanship, he would reply, “En y pensant toujours.” A long series of years often intervened between the first conception of a piece and its embodiment, and years not unfrequently between the first and the final stage of the embodiment itself. A landscape was apparently finished ; even his fellow artists would consider it done ; Gleyre alone was conscious that he had not “found his sky.” Happily for French art this high-toned laboriousness became influential on a large number of Gleyre’s younger contemporaries ; for when Delaroche gave up his studio of instruction he recommended his pupils to apply to Gleyre, who at once agreed to give them lessons twice a week, and characteristically refused to take any fee or reward. By instinct and principle lie was a confirmed celibate: “ For- tune, talent, health,—he had everything; but he was married,” was his lamentation over a friend. Though he lived in almost complete retirement from public life, he took a keen interest in politics, and was a voracious reader of political journals. For a time, indeed, under Louis Philippe, his studio had been the rendezvous of a sort of liberal club. ‘To the last—amid all the disasters that befell his country—he was hopeful of the future, “la raison finira bien par avoir raison.” It was while on a visit to the Retrospective Exhibition, opened on behalf of the exiles from Alsace and Lorraine, that he suddenly dropped down and expired May 5, 1874. He left

unfinished the Earthly Paradise, a noble picture, which Taine has described as “a dream of innocence, of happiness, and of beauty—Adam and Ive standing in the sublime and joyous landscape of a paradise enclosed in mountains,”—a worthy counterpart to the Evening. Among the other productions of his genius are the Deluge, which represents two angels speeding above the desolate earth, from which the destroying waters have just begun to retire, leaving visible behind them the ruin they have wrought; the Battle of the Lemanus, a piece of elaborate design, crowded but not cumbered with figures, and giving fine expression to the movements of the various bands of combatants and fugitives ; the Prodigal Son, in which the artist has ventured to add to the parable the new element of mother’s love, greeting the repentant youth with a welcome that shows that the motlier’s heart thinks less of the repentance than of the return; Ruth and Boaz; Ulysses and Nausicaa; Hercules at the fect of Omphale ; the Young Athenian, or, as it is popularly called, Sappho; Minerva and the N ymphs; Venus zavdnjos ; Daphnis and Chloe; and Love and the Paree. Nor must it be omitted that he left a considerable number of drawings and water-colours, and that we are indebted to him for a number of portraits, among which is the sad face of Heine, engraved in the Revue des Deum Mondes for April 1852. In Clément’s catalogue of his works there are 683 entries, including sketches and studies. Gleyre is in great favour in Switzerland; and a special exhibition of his works was held at Lausanne in the Arland Museum, August and September 1874.

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See Fritz Berthoud in Bibliothéque Universelle de Geneve, 1874 Q | Albert de Montet, Dict. Biographique des Genevots et des Vaudois, 1877; and Vie de Charles Gleyre, 1877, written by his friend, Charles Clément, and illustrated by 30 plates from his works.

GLINKA, Fepor Nixoraxvicu (1788-1849), a Russian poet and author, was born at Smolensk in 1788, and was specially educated for the army. In 1803 he obtained a commission as an officer, and two years later took part in the Austrian campaign. His tastes for literary pursuits, however, soon induced him to leave the service, Whereupon he withdrew to his estates in the government of Smolensk, and subsequently devoted most of his time to

study or travelling about Russia. Upon the invasion of the French in 1812, he re-entered the Russian army, and remained in active service until the end of the campaign in 1814. Upon the elevation of Count Milarodovich to the military governorship of St Petersburg, Glinka was appointed colonel under his command. On account of his suspected revolutionary tendencies he was, in 1826, banished to Petrozavodsk, but he nevertheless retained his honorary post of president of the Society of the Friends of Russian Literature, and was after a time allowed to return to St Petersburg. Soon afterwards he retired completely from public life, and died on his estates in 1849.

Glinka's martial songs have special reference to the Russian military campaigns of his time. He is known also as the author of the descriptive poem Kareliya, &e. (Carelia, or the Captivity of Martha Joanovna), 18380, and of a metrical paraphrase of the book of Job. His fame as a military author is chiefly due to his Pisma Ltusskago Ofitsera (Letters of a Russian Officer), 8 vols., 1815-16.

GLINKA, Micuart Ivanovicu (1804-1857), a cele- brated Russian composer, was bom at N ovospassky, a village in the Smolensk government, in 1804, and not, as stated generally in the dictionaries, in 1803. His early life he spent at home, but at the age of thirteen we find him at the Blagorodrey Pension, St Petersburg, where he studied music under Carl Maier and John Field, the celebrated Irish composer and pianist, settled in Russia. We are told that in his seventeenth year he had already. begun to compose romances and other minor vocal pieces; but of these no- thing now is known. His thorough musical training did not begin till the year 1830, when he went abroad and stayed for three years in Italy, to study the works of old and modern Italian masters. His thorough knowledge of the requirements of the voice may be connected with this course of study. His training as a composer was finished under Dehn, the celebrated contrapuntist, with whom Glinka stayed for several months at Berlin. In 1833 he returned to Russia, and devoted himself to operatic composition. On November 27, 1836, took place the first representation of his Life for the Czar. This was the turning point in Glinka's life,—for the work was not only a great success, but in a manner became the origin and basis of a Russian school of national music. Subject and music combined to bring

about this issue. The story is taken from the invasion of Russia by the Poles early in the 17th century, and the hero is a peasant who sacrifices his life for the czar. Glinka has wedded this patriotic theme to inspiring and in some places admirable music. His melodies, moreover, show distinct aflinity to the popular songs of the Russians, and for that reason the term "national" may be justly applied to them. His appointment as imperial chapel-master and conductor of the opera of St Petersburg was the just reward of his dramatic successes. His second opera, Russlan and Lyudmila, founded on Poushkin's poem, did not appear till 1842; but in the meantime he wrote an overture and four entre-actes to Kukolnik's drama Prince Kholmsky. In 1844 he went abroad for a second time, and lived chiefly in Paris and Spain, On his return to St Petersburg he wrote and arranged several pieces for the orchestra, amongst which the so-called Kumarinskaya has achieved popularity beyond the

limits of Russia. He also composed numerous songs and -romances. In 1857 he went abroad for the third time, and died suddenly at Berlin, ou February 14th of that year. GLINKA, Sercy Nrkoxarvica (1774-1847), Russian author, the elder brother of Fedor N. Glinka (noticed above), was born at Smolensk in 1774, In 1796 he entered the Russian army, but after three years' service retired with the rank of major. He afterwards employed himself in the education of youth and in literary pursuits, first in the Ukraine, and subsequently at Moscow, where he died in 1847. His poems are spirited and patriotic ; he wrote also several dramatic pieces, and translated Young's Night Thoughts.

Among his numerous prose works the most important from an historical point of view are—Russkoe Chtente (Russian Reading: Historical Memorials of Russia in the 18th and 19th Centuries), 2 vols., 1845 ; Istoriya Rossii, &c. (History of Russia for the use of Youth), 10 vols., 1817-19 (2d ed. 1822; 3d ed. 1824); Istoriya Armyan, &c. (History of the Migration of the Armenians of Azerbijan from Turkey to Russia), 1831; and his contributions to the Russky Vyestnik (Russian Messenger), a monthly periodical, edited by him from 1808 to 1820.

GLOBE. With the exception of illuminated portolani, the most interesting monuments of geography are globes. Celestial globes are much more ancient than terrestrial ones. The earliest of these with which we are acquainted is one made of eopper engraved in the Arab-Cufic character of the llth century. It is preserved in the Bibliotheque Nationale de Paris, Sect. Géog,, No. 396 (see fig. 1). In Italy the

Fic. 1.—Globe in Bibliothéque Nationale, Paris.

emperor Frederick II. (1197-1250) possessed a celestial globe of gold, probably also of Arab manufacture, on which the stars were indicated by pearls; from the scanty infor- mation that has come down to us respecting it we should imagine that it partook somewhat of the nature of an armillary sphere, as representations of the planets were to

be seen in the interior of it. To these succeed a series of globes ranging from the 15th to the 17th eentury.

One might suppose that many specimens of these globes would exist in public libraries, but diligent research has shown that the majority of those not made of metal are more perishable than maps, and much more so than books.

The earliest terrestrial globe of any importance known to geographers is the well known one of Martin Behaim of Nuremberg, bearing the date of 1492. It is about 21 inches in diameter, and is made of pasteboard covered with parchment, on which are designed historical pictures with their legends written in Old German in various colours. The first meridian passes through Madeira, and the only other lines on it are those of the equator, the two tropics, and the polar eircles, It has also a meridian of iron and an horizon of brass, but these were not added until 1500, which date they bear. As a monument of geography it is of the highest importance, being the only original document that has eome down to us in this form embodying the geographical views of its author with those of his gifted eontemporaries, Toscanelli, Columbus, &c. This globe represents with some slight modifications most of the disproportions of the Ptolemaic geography, into which is incorporated information evidently derived from the travels of Marco Polo and Sir J. Maundeville. It was executed by Behaim, assisted by

Holtzschuer, while on a visit to his native city (1491-3), after a sojourn of five years at the Azores. It is still preserved in the house of his ancestors at Nuremberg. An exact and authenticated facsimile of it, mounted on a stand, is preserved in the Bib. Nat. de Paris, Section Géographique, No. 393.1

The Laon globe of 1493, in the possession of M. Leonee Leroux of the Administration Centrale de la Marine & Paris, is made of red copper engraved, about the size of a 36-pounder cannon ball, and pierced by a socket which at a former period held an axis. It has all the appearance of having formed part of the apparatus of an astronomical clock. On the globe are engraved many eir- cles. The first meridian, as in the globe of Behaim, passes through Madeira. In the northern hemisphere meridian lines are drawn at every 15th degree ; these meridians are again crossed by certain parallels of latitude corresponding somewhat to the seven climates usually found on maps of the period. Neither meridians nor parallels are to be traced on the southern hemisphere. Although this globe bears a legend upon it dated 1493, it is evident that the general geographical information recorded upon it is earlier than that on Behaim's globe by five or six years. In all probability it was that current in Lisbon between the voyage of Diego Cam to the Zaire or Congo river, 1484-5, and that of Bartholomeu Diaz to the Cape of Good Hope in 1487. Theauthor is unknown. A heart-shaped projec- tion of this globe was published in the Bulletin de la Soc. de Géog. de Paris, 4me série, tom. 20te, 1860.

In all probability the earliest post-Columbian globe ex- tant is the one now preserved in the Lenox Library, New York. It was found in Paris some twenty-five years ago by Mr Richard M. Hunt, who, upon learning its value, presented it to the Lenox Library, of which he is the architect. This globe is of copper, about 44 inches in diameter and engraved. It is pierced for an axis, and probably, like the Laon sphere, formed the principal feature of an astronomical elock or armillary sphere. The date assigned to the Lenox globe by Mr Henry Stevens, who first recognized its importance, and had an accurately drawn projection made of it in the Coast Survey Bureau at Washington in 1869, is about 1506-7. A eomparison of that projection, now published in reduced facsimile for the first time (see fig. 2), with several con- temporary maps and globes, serves to show the accuracy of the

date assigned to it, as also to suggest its French origin. The author is unknown.

1For other reproductions of it see J. C. Doppelmayr, Historische Nachricht von den Niirnbergischen Mathematicts und Kiinstlern, Nuremberg, 1730 ; Dr F. W. Ghillany, @eschichte des Seefahrers Ritter Martin Behaim, Nuremberg, 1853; and Jomard, Monuinents de la Géographie, Paris, 1854.

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GLOBE

The next globe that demands attention is the famous one made at Bamberg in 1520 by Johann Schéner, at the cost and charges of his friend Johann Sayler. It was afterwards taken to Nuremberg by Schéner, where it is still preserved in the town library. The importance attached to this globe is that hitherto it has always been regarded as the first of its kind to portray the discoveries in the New World, in combination with the notions that had previously prevailed of the space intervening between Europe and Africa on one side, and the eastern ends of Asia on the other. Schéner in this globe breaks up America into as many islands as possible. Thus North America is shown as one large island. He also represents South America as a large island, to which he applies several names, among which we observe, for the first time on a globe, the name “ America.” North America was not comprised under the name until a later date. Schéner’s globe indicates two great series of North American discoveries, of which one, commencing with the Cabots in 1497, extended by degrees to Canada and Nova Scotia, while the other, commencing with Columbus in 1492, advanced from the Bahamas slowly

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hemisptueres opens outwards horizontally, the interior being also gilt. It formerly served the purpose of a pyx on the altar of the church of Notre-Dame-de-Sion, to which church it was offered by Charles IV., duke of Lorraine, on his re- turn in 1663. It is now preserved in the town library. It

bas all the appearance of having been made at a period immediately following the execution of the curious heart- shaped map by Oronce Finé of 1531, found in the Paris edition of Grynzus, 1532. In this map and the globe at Nancy we find the New World still regarded as an exten- sion of eastern Asia or the Indies, the geography of Marco Polo being apparently mixed up with that of Cortez in Mexico. A stereographic projection of this globe was pub- lished in Mem. de la Soc. Roy. de Nancy, vol. viii., 1836. There is another globe somewhat larger than the preced- ing, made of copper engraved, known as the De Bure globe. It has no date, but its geographical features in the main bear a close resemblance to the globe at Nancy. It is supposed to be of Spanish origin. It is preserved in the Bib. Nat. de Paris, Section Géographique, No. 427. In the same section, No. 394, is preserved the Ecuy globe, made of brass. The word "Rhotomagi" (Rouen) is appended to the title, whence it seems to be of French

northwards to Virginia and New England. Between these two points there remained a region more or less known which on this globe ig indicated by open water. In depicting the east coast of Asia and the many islands there, including Japan and J ava-major, the author follows the globe of Behaim. By some it has been regarded as a new edition of Behaim. There are in Germany several globes which depict the world nearly in the same manner as Schéner's. One, preserved in the city of Frankfort, bearing the same date (1520), is about 104 inches in diameter, and has been reproduced by M. Jomard in his Monuments de la Géographie, pl. 15 and 16. There is also another in the library of the grand-duke of Weimar, As all these globes give to North and South America the con- figuration they have in Schéner, Humboldt was of opinion that they all are, with respect to America, copies of an older chart "hidden perhaps in the archives of Italy or Spain." There is at Nancy a terrestrial globe which is also a geographical curiosity. It is of chased silver gilt, about 6 inches in diameter ; the land portions are represented in fine gilding, the water by azure blue enamel. One of the

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Fra. 2.—Lenox Globe.

origin. We have on this globe the first indications of a separation between East Asia and North America. The date appears to be about 1540. .

In 1541 the illustrious Gerard Mercator constructed and published at Louvain a terrestrial globe, and in 1551 a companion celestial globe.1 These are without doubt the most important monuments of the kind of the 16th century. They were to be found in nearly all the universities and libraries of Europe, in the private libraries of the rich, and the class-room of the teacher of navigation. We also know from Blundeville's Exercises that up to the date of 1592 they were in common use in England. Six pairs at least of these globes were sold for Mercator by Camerarius of Nuremberg.; others we know were sold at the book-fairs of Frankfort-on-the-Main; and Mercator himself presented one pair to the university of Louvain, of which he was a student and a master of arts. Yet only two sets of the original globes are known now to exist in Europe—one in the royal library at Brussels, discovered in 1868, the

? At a later period Mercator also made for Charles V. a pair of globes, the terrestrial one of wood, the celestial one of glass ; these were destroyed in the subsequent troubles in the Low Countries.

other in the imperial court library at Vienna, discovered in 1875. These globes are about 2 feet high, and when first mounted on stands with all their accessories of meri- dians, horizons, &c., must have presented a noble appear- ance. They are only known to us by facsimiles of gores reproduced from the originals in their natural size, pub- lished at Brussels in 1875, with an introduction to their history by Dr J. Van Raemdonck. A comparison of the terrestrial globe with all those that preceded it shows it to be a monument at once of Jearning and of science, worthy of the greatest scientific geographer of his age.1 The authors used by Mercator in his configurations of the continents of the Old World were chiefly Ptolemy and Marco Polo. For representing the New World he evidently acquainted himself with the narratives of all the most recent voyages, maps, and charts that were to be had in his time. These were used with the greatest possible

skill and discrimination ; and in consequence we have the best delineation of the world on a globe that it was possible to produce at the period. In Mercator's time the imperfect knowledge of pilots in general, and the defects of their charts in plano, made terrestrial globes much more useful to navigators than we can well realize to-day. Convinced of their importance Mercator neglected nothing in order to adapt them to the use of seamen; he therefore added to his globes the rhumbs hitherto found only on plain charts. He added yet another improvement, delineating about thirty leading stars of the principal constellations according to their magnitudes and their positions in the heavens. Theseimportant improve- ments appear to be quite peculiar to the globes of Mercator.

An examination of the celestial globe of 1551 also reveals many improvements introduced by Mercator in his deline- ation of the heavens. Without counting a great number of stars as yet unresolved into symbolical groups, Mercator gives us 934 fixed stars, distributed in 51 constellations. Two of the latter are entirely new, and are not met with on later celestial globes. These are Antinous, formed of six stars on the equator below the Eagle, and Cincinnus, or the Lock of Hair, formed of one star and two nebule in the north hemisphere, under the tail of the Great Bear.?

The Globe of Euphrosynus Ulpius of 1542.—This globe, apparently made in Rome, is now preserved in the museum of the New York Hist. Soc. It is 15} inches in diameter, made of copper, and is divided into two hemispheres on the line of the equator, and fastened together with iron pins. The normal position of the globe in its stand being vertical, the north pole with its hour-circle is surmounted by an iron cross. It is encompassed by a horizon, upon which are engraved the signs of the zodiac. The height of the whole apparatus, with its stand of oak, is 3 feet 8 inches. It was executed by Euphrosynus Ulpius, a name unknown to geographers, and is dedicated to Cardinal Marcellus Cervinus, D.D., who, thirteen years later, was elevated to the Roman see, under the title of Marcellus IT., and survived his election only twenty-two days. The first meridian line passes through the Canaries; the re- maining ones are repeated at intervals of 30 degrees. Great prominence is given to the line of demarcation between Spain and Portugal in the New World, laid down by Pope Alexander VI. The geographical features peculiar to this globe are two, evidently copied from the Verra-

zano map of 1529,—the legend found upon it recording the voyage made by Verrazano on behalf of Francis I. in 1524, and the rude line drawn south-east from about 57° to 36° N. lat. The latter, common to both map and globe, gave

1 According to Dr F. Wieser, a third example of it is preserved at Weimar.

- A pair of Mercator's globes reproduced in facsimile, natural size, were conspicuous features in the Belgian section of the exhibition connected with the geographical congress held in Paris in 1875.

GLOBE

rise to the curious conception of the " Mare Verrazano," the origin of which has exercised the minds of geographers from Hakluyt down to our day.®

In the South Kensington Museum is a celestial globe 7} inches in diameter, made of gilt metal (it is supposed for Rudolph IL), by G. Roll and J. Reinhold at Augsburg, dated 1584,

Mollineux Globes of 1592.—The true successor of Mercator in the art of globe-making was neither J. F. Van Langren, Jodocus Hondius, nor W. J. Blaeu, as has been supposed, but an Englishman named Emerie Mollineux, the friend of Hakluyt, and of John Davis of Arctic fame. The earliest notice we have of the terrestrial globe made by him is the prospective one of its intended publication, to be found at the end of the preface to the Ist edition of Hakluyt's Voyages of 1589. The 'comming out of the very large and most exact terrestriall globe " of Mollineux there referred to, with its companion celestial one, was accomplished in 1592. At the same time appeared a manual in English for their use, by Thomas Hood of Trinity College, Cambridge ; and in 1594 appeared another manual, written expressly for them in Latin by Robert Hues, entitled Z'ractatus de Globis et eorum usu. Two years afterwards this latter was trans- lated by J. Hondius, and published in Amsterdam, giving rise to the notion, apparently still prevalent in Holland, that Hues wrote this book expressly for Hondius,—a biblio- graphical blunder involving injustice to the memory of Mollineux. The only examples of these once famous globes known to exist are now preserved in the library of the Middle Temple, London. They are both 2 feet

in diameter, mounted on stands, with the usual accessories of horizon, meridian, &c. The celestial globe still bears the date of 1592, but the terrestrial appears to have received additions, and the date has been altered by the pen to 1603. The best description of these two globes is a contemporary one to be found in Blundeville's Zxercises, London, 1594, which enables us to realize the difference between these globes and Mercator's :—

'The mappe which covereth Mr Molineux his terrestrial globe dif- fereth greatly from Mercator his terrestriall globe, by reason that there are found out divers new places, as well towards the North Pole as in the East and West Indies, which were unknowne to Mer- cator. They differ also greatly in names, longitndes, latitudes, and distances of such places set down not only in Mercator's globe but also in divers maps more lately made. As touching the map of the stars which covereth the celestiall globe of Mr Molinenx, I do not find it greatly to differ from that of Mercator, saving that Mr Molinenx hath added to his celestiall globe certain southern images, as the Crosse, &c. In the great terrestriall globe the voyage, as well of Sir F. Drake as of Mr Th. Candish, is set down and shewed by help of two lines, the one red, and the other blew, whereof the red line doth show what course Sir Francis observed in all his voyage; as well outward as homeward ; and the blew line showeth in like manner the voyage of Master Candish, and in that globe is also set down how farre Sir Martin Furbisher discovered towards the north parts. Nothingis set down in this globe but only the outermost end of his voyage, named Forbisher's Straights, having in N. lat. about 63 degrees.''+

From a later inscription on the terrestrial globe we learn that it was still further repaired in 1818 by Messrs J. & W. Newton, globe makers, of Chancery Lane. These globes are of special interest as the first of the kind made in England and by an Englishman.

In the same year J. Van Langren, and Jodocus Hondius five years later (1597), put upon record their intention of bringing out pairs of globes; but no globes of their

'8 The history of this curious geographical puzzle will shortly be dealt with by Mr Henry Stevens, to whom we are indebted for much infor- mation

respecting this globe. A projection of a portion of it is to be seen in the Mag. of American History, vol. iii. p. 17, Jan. 1879.

*This last remark does not appear to be quite accurate, as John Davis says: —“ How far I proceeded doth appear upon the globe made by Master Emery Mullineux” (Hydrographical Description, — London, 1595),

manufacture are known to exist of a date anterior to the 17th century. To Mollineux succeeds William Jansson Blaeu (1571-1638), a celebrated mathematician, map- drawer, and publisher of Amsterdam, who secured a con- siderable reputation by publishing terrestrial and celestial globes, which excelled in beauty and accuracy everything that had preceded them. He was succeeded by his son John, editor of the well-known Aélas Major in 11 vols, folio. The elder Blaeu constructed globes in three sizes, the largest measuring 27 inches, the next about 14} inches, the smallest about 74 inches in diameter. The bodies of the globes were usually made of wood, covered with plastic composition upon which the maps were pasted in gores, thus admitting of corrections being made from time to time. Tn consequence of this no examples of his globes are known to exist without additions of the 17th century. Mr P. J. K. Baudet, who wrote the Life and Works of W. J. Blaeu, Utrecht, 1871, notwithstanding his utmost exertions, could find in Holland only two pairs, one in the astronomical observatory at Leyden, the other in the physical museum at Amsterdam, the latter being of the smallest size. Another pair, however, of the smallest size, dated 1603, are in the possession of Mr Henry Stevens; anda pair of the medium size, belonging to Mr Fred. Miiller of Amsterdam, were ex- hibited at the geographical congress held in Paris in 1875. Of the last pair, the celestial globe bears the date of 1603. The terrestrial globe, though still bearing the date of the first edition of 1599, has received corrections of a much later date, embodying the geographical results of the first Dutch expedition to the East Indies under Houtman in 1598, and those of Oliver Van Noort in the same year, and of Le Maire in 1616. From a report presented to the French minister of public instruction by M. E. Cortambert in 1855 we learn that a pair of fine globes by Blaeu is preserved in the Bibliothéque de Bourges. Two pairs of the 27-inch globes of Blaeu’s heirs have recently been found,

the first in the library of Trinity Honse, Tower Hill, the second in the British Museum, of date about 1645. In their main features the globes of Blaeu coincide more or less with several well-known maps published at this period, and with others to be found in the atlases of Mercator aud Hondius,

The only remaining globes of the 16th century known to us are two pairs by A. F. Van Langren; the first, pre- served in the Bib. Nat. de Paris, Sect. Géog,, No. 405; the second in the Bibliothéque de Grenoble, found by M. E. Cortambert in 1855. In the latter library is also to be seen a curious terrestrial globe in MS., made by some monks of the Grande Chartreuse; it is undated, but is sup- posed to be of the 17th century.

It remains to notice briefly the few globes of a later period that are remarkable either for their historical interest, peculiar form, or great size. In the Academy of Sciences at St Petersburg there are or were four that call for notice. The first is a terrestrial one, 3 feet in diameter, made at Pleskow by a deacon named Karpow Maximow. It is supposed to have been the first made in Russia. This is accompanied by a planetary 2} feet in diameter, presented to Peter the Great by the company of English merchants established in Russia. Here is also preserved a large ter- restrial globe of copper, made in 1664 by the heirs of W. J. Blaeu; it is 7 feet in diameter, and was brought from Moscow about 1747. In the same academy is preserved the famous Gottorp globe; it is a hollow sphere 11 feet in diameter, containing a table and seats for twelve persons. It was made by A. Bush in 1654, under the direction of Olearius, from designs found among the papers of Tycho Brahe, and was not finished until 1664. The outside re- presents the terrestrial globe, the interior showing the heavens ; the stars are distinguished according to their re- spective magnitudes by gilt nails of various sizes,

‘upon it are very legible.

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presented to Peter the Great by Frederick IV, of Denmark in 1713. ‘The Czar was so pleased with his acquisition that he had it transported by water to Revel, and thence on rollers and sledges to his new capital. Being partly burut in 1747, it was repaired again 1751, and adjusted to the horizon of St

Petersburg, the meridian and horizon being made by an English mechanic named Scott.

The two largest complete globes existing are those pre- served in the “Salle des Globes” in the Bibliothéque Nationale of Paris. They are each 12 feet in diameter, and were made under the direction of the famous Italian geographer Coronelli in 1683, by order of Cardinal d’Estrées, thie Spanish ambassador, and presented by him to Louis XIV. They are made of wood, very solid, and are covered witli cloth or canvas on which the configurations have been drawn by an able artist, particularly those on the celestial globe. The meridians and horizons are of bronze, the latter are sustained by eight columms of the same material, and the former by two bronze feet highly ornamented. Between the brackets that form the feet of the meridians is placed, under each globe, a compass in marble and bronze ; the ascent tu these is by five steps which encircle each globe. On the celestial globe painted blue are marked all the fixed stars, and their constellations with the paths of the comets, also the places of all the planets at the moment of the birth of Louis XIV. This last event is alluded to also in a hyperbolical inscription to be seen on a copper plate to be found on it. The geography of the terrestrial globe is based upon that of Sanson ; the sea being painted in deep blue, and the land portions being white, the inscriptions There is also to be seen on it a bust of the king placed above a dedication somewhat like that on the celestial globe. Although these globes are

| without any great scientific value, they serve to indicate the

astronomical and geographical knowledge prevalent in France at the end of the 17th century, A good illustration of these globes, accompanied by a detailed account of their history, by M. C. Letort of the Bibliothéque Nationale, will be found in Za Nature, No. 116, August 21, 1875. In the Bib. Mazarine is preserved a terrestrial globe 8 feet in diameter, known as the Louis XVI. globe. It is made of copper engraved, the names of places being inlaid with black, and is mounted on a temporary wooden struc- ture, the beautiful accessories of bronze cast for it never having been finished or utilized ; they are, however, to be seen in another part of the library. We learn froma MS. description of this globe, also preserved here, that it was

made for Louis XVI, himself no mean geographer, by the direction of Vergennes in 1784. The geography of it is based upon that of D'Anville, corrected by Robert de Vaugondy and Le Clerc; it also indicates the net results of all the voyages round the world made up to this period.

About 1764 Dr Roger Long of Cambridge, professor of astronomy and master of Pembroke, erected in an outbuild- ing of his hall a sphere 18 feet in diameter. The concave interior was lined with tin, upon which was depicted all the stars and constellations visible in England on the horizon of Cambridge. The lower part of the sphere was cut off at the diameter of 13 feet, and the truncated meridians were screwed down on toa circle which ran or rollers of lignum vitze, the whole being movable by simple machinery pro- vided for the purpose. It was capable of holding thirty persons, and had an entrance by six steps placed over the South Pole. In the centre was placed a planetarium. Although it is said funds were left for its preservation, it appears to have fallen into neglect and decay.

To these succeed in order of size the globes known as "'Georamas." One exhibited in Paris in 1844 was 30 feet in diameter ; another by Delanhard erected in 1823 was 40

It was | feet in diameter; of the last the proprietor published a

description. globe," erected in Leicester Square, London, 60 feet in diameter. The largest appears to have been the one erected by Colonel Langlois in Paris in 1825, on the Champs Elysées. This was 120 feet in diameter. As has been truly said, these structures served more to satisfy curiosity than to impart scientific instruction. (c. 1. ¢.)

Manufacture. —The manufacture of artificial globes has changed but little in character during the last hundred years. Such im- provements as have been introduced have reference either to the quality of the maps or to the mode of mounting the globes. The number of sizes manufactured has also been increased. The diameter has always been used to indicate the size of the globes, and those now produced by the various makers vary from 1 to 36 inches.

The process of manufacture differs little if at all in the sizes of globes ranging between 3 and 25 inches. Thus supposing, for ex- ample, a 12-inch globe (the ordinary school globe) is required to be made, a spherical mould measuring some quarter of an inch less in diameter is prepared on which to form hemispherical caps that are to constitute a hollow foundation forthe globe. This mould, made preferably hollow for lightness, and having a central axle terminat- ing in poles, is well greased on the surface to enable it to resist damp. To form the caps, strips of white paper, damped in water, are first applied to the mould to form a coating thereon. Upon this coating is applied brown paper saturated with paste, and alternate layers of white and brown paper are added, until the required thickness of paper, say 7';th of an inch, is obtained. The change of colour is adopted simply as a guide to the workman, that he may know when he has completed a coating of paper. The mould thus covered is put aside to dry, and after two or three days the paper covering is severed into two hemispherical caps, which are then drawn off from the mould.

A wooden axle furnished with poles (which will eventually form the north and south poles of the globe) is provided, of sucha length as Will enable the caps, when fitted over the poles, to meet at their severed edges. By means of lay these edges are joined up, and the ome are firmly attached to the ends of the axle. Thus a hollow sphere of rude outline is formed, measuring somewhat less than 12 inches in diameter. The next operation is to bring this sphere to the required diameter for the globe, and to make it perfectly true. For this purpose the ball is coated with a plastic composition of whiting, boiled oil, and glue, and passed under the action of a steel semicircle fitted with bearings for receiving the poles of the ball, and retaining the same in place while the ball is being slowly rotated. By applying to the ball repeated coatings of this composition, and removing all superfluities by means of the gauging edge of this steel semicirele, a smooth spherical surface is eventually obtained. When the ball is finished and hard, it is tested in loose bearings to see whether it will remain quiescent in all positions. If it shows a tendency to run round, the ball is balanced by the introduction of a counterweight at the highest part of its periphery. When the ball is balanced, and the hole made good by which the counterweiglit was introduced, the surface is polished, after which it is ready to re- ceive the map. For 12-inch globes the maps of the earth and of the heavens are

engraved on steel or copper plates in 12 gores, measur- ing each 380 degrees in width, and extending from pole to pole, or more usually to the 70th degree of latitude, the remaining portion of the maps being made up by north and south pole plates. This arrangement is somewhat modified for larger globes. Thus, for globes above 15 inches in diameter, the gores are divided in the line of the equator, and they are also divided longitudinally for say one-fourth of their length at the 15th degree, in order to facilitate the laying down of the maps evenly upon the spherical surface. Prepava- tory to covering the sphere with the map, it is marked with lines corresponding to the equator, parallels of latitude, and lines of lon- gitude on the map, such lines serving as a guide for the workman. The gores of the map having been carefully cut out, they are damped and laid down in proper order in a pile upon a pasting board. The workman then covers his polished ball, for the length and breadth of a gore, with paste, or, more properly, a preparation of starch, and having coated with starch the uppermost gore of the pile, he with an ivory knife lifts that gore, and lays it upon the pasted portion of the ball, fitting it to the lines marked thereon, and smoothing down creases, at the same time taking care that the lati- tude and longitude lines of the gore correspond exactly with the lines on the ball. Having laid down this gore in place, he next applies a second gore in like manner, taking care that the two gores shall join each other, and not expose any portion of the underlying surface. In this way the workman proceeds until all the gores are in place, and he finishes the pasting of the ball by applying the pole papers which fit respectively on to the opposite ends of the gores. The map has next to be sized, preparatory to its being coloured, in order to form a resist to the varnish which is subsequently to be applied to the globe. The map is tinted and outlined with water colours,

Then follows Wyld's well known "great |

and a coat of varnish 1s then applied. When this is dry the globe is ready for mounting; after which the varnishing opera- tion is completed by the application in a heated room of several coats of spirit varnish following quickly the one on the other. Some skill is requisite in laying on the varnish, so as to obtain a surface as clear and smooth as glass. This result is unfortunately evanescent, as the best varnish is liable to discolour and to crack, and thereby obscure to some extent the legibility of the under- lying

map. After varnishing the globe will be fit to handle in from four to six days. For the purpose of mounting the globe a flat ring, termed the brazen meridian, is provided, and bearings arc formed thereon to receive the poles of the globe. This ring is divided on its face into 360 degrees, the numbering of these degrees being from 0 (which corresponds with the equator) to 90 at the poles on one half of the i1ing, and on the other half the numbering starts from the poles at 0, running up to 90, which corresponds with the equator. Fitted to the poles, and capable of turning thereon, are hour circles, which underlie the brazen meridian, and are divided and numbered to correspond with the 24 hours of the day and night. The frame for the reception of the globe and ring is formed with a wooden horizon, which consti- tutes an imaginary line dividing the globe into two equal parts, the portion above the horizon being the visible half, and that below the horizon the invisible half of the sphere. This horizon is covered, like the globe, with papers which are varnished to protect them from injury. The horizon papers near their inner edge are divided into 360 degrees, by which are reckoned the azimuth and the amplitude; they also indicate the points of the compass in the space called the circle of the winds. The horizon of the frame is notched to receive the brass meridian, which rests in a step-bearing fitted to the central pillar or block of the frame, aud is held therein by a screw stop, which, entering an annular groove in the back of the meridian, leaves the ring free to turn round in the frame, for the purpose of rectifying the globe, or bringing its axis to any desired angle with the horizon. The fitting of the globe is completed by the quadrant of altitude, consisting of a thin flexible slip of brass, jointed to a clamp- ing nut, which is intended to embrace the brass meridian, and may be adjusted thereon by a tightening screw. This flexible strip or blade is divided off into 90 degrees, conaevenins to those on the equator, and is intended to measure distances between any two places upon the curved surface of the earth, or the altitude of the sun, a star, or any planetary body in the heavens, and for this pur- pose its graduations are numbered from 0 to 90. A useful appendage to the globe frame is a mariner’s compass, which facilitates the adjustment of the globes to their true polar position.

The value of a globe, whether terrestrial or celestial, depends mainly on the quality of the map with which it is covered. Before the present century, English globes were not only poor specimens of the engraver’s art, but they

showed little attention to accuracy of detail. Now, however, they rank in quality with, if they do not surpass, the best foreign maps, notwithstanding that little encour- agement is given to their manufacture. Specimens of globe plates published at the latter end of the 17th century in Italy are yet to be seen, which are a marvel of the eosmographer's art. Under the patronage of the Venetian republic, P. Coronelli, cosmographer to the republic, published a terrestrial and celestial globe of the un- precedented size of 4 feet in diameter, which enibodied the utmost scientific knowledge of the time, andin the constellations of the celestial globe showed the finest quality of line engraving at its best period. 'The composition of these figures served as a basis for the remodelling of the constellations on English globes some 40 years since, at which time the drawing of the figures was not merely barbarous, but absurd. Whether these fine globes were ever manu- factured it is now difficult to ascertain, but none are known to exist except a celestial globe produced by the late Mr William Newton, to whom the globe manufacture is indebted for such im- provements as have been introduced during the present century, and another which is preserved in the Bibliotheque Nationale of Paris, bearing the name of Deuvez as the maker.

An amusing illustration of the difficulties which attend the de- lineator of globe plates is to be found in the preface of a book published in 1686, for its author, Mr J. Moxon, entitled A Tutor to Astronomy and Geography. Moxon appears to have been a globe-maker, and in expatiating on the improvements to be found in his new terrestrial globe, he says:—" California is found to be an island, though formerly supposed to be part of the main continent, whose north-west shore was imagined to thrust itself forth close to the coasts of Cathaio, and so make the supposed straits of Anian."' On his globe, therefore, the peninsula was converted into an island. Precisely the same difficulties are now experienced by globe-makers; and those who have watched, for example, the varied forms which the lakcs in Central Africa have taken during the last 25 years will understand at what risk the globe-maker corrects his costly plates, to bring them up to the current geographical knowledge.

The inconvenience attendant on the transport of large globes, manufactured as above explained, not to speak of their excessive cost, led to the introduction of flexible or compressible globes, both

ou the Continent and in the United States. It does not appear that they have been extensively manufactured, for at the best they were but toys, but they certainly displayed great ingenuity in their con- struction, A French manufacturer used a spherical bladder as a base for his globe, affixing to it rigid poles, and eovering it with a map printed on soft white leather, which map was applied in the same way as the mapson the ordinary globe. By inflating the bladder through a mouth-piece which was fitted with a stop-cock and constituted also one of the poles, the spherical form of the globe was obtained; and by discharging the air, the globe could be compressed into a small space. A frame composed of detached pieces was also provided for this globe, to permit of its being used for working problems thereon. When not required for use, the globe and its fittings could be packed into a verysmall compass. The best globes of this elass were to be seen in the American department of the 1851 Exhibition. These measured 24 inches in diameter, and were manufactured by the late Mr Goodyear, of india-rubber fame; but they never obtained a market in England, and were evidently intended for reference globes only.

Some 50 years ago, the late Mr William Newton designed a pocket globe of some merit. It was mounted in a spherical case, whieh, opening at a centre line, disclosed the globe mounted in a brass ring and within a fixed horizon. Upon this globe, measuring 3 inches in diameter, numerous problems eould be worked with tolerable accuracy. His last and best improvement was what he termed the "‘ Newtonian Globe." It was designed chiefly for commion schools, and was set upou an iron pillar, which avoided the cost of a wooden frame. The principal object, however, of the author was to convey to children, in the most simple manner, an clementary acquaintance with the eonstruction and movements of the heavenly bodies. The author’s design may be thus briefly explained. The Newtonian globes are hung in stationary rings or meridians, and are capable of turning upon their axes or poles for the purpose of showing the real diurnal motion of the earth and the apparent diurnal motion of the heavens, according to the Newtonian system or real structure of the universe. In place of a wooden horizon, a sliding annular plate is substituted. On the terrestrial globe this plate aets asa terminator to indicate the line of demarcation between day and night. The globe is so

mounted upon its pedestal that the axis always lies in its true inclined position, and points to the north polar star in the heavens. A small brass ball representing the sun is made to slide upon the meridian, and it is carried by an arched arm, which connects it with the annular terminator. This ball is adjust- able to correspond to the declination or perpendieular position of the sun north or south of the equator, according as the sun's deelination varies from day to day throughout the year; and the terminator follows the motions of the sun. Upon the eelestial globe a similar sliding annular plate marks the visible horizon of any place on the earth's surface, and shows what part of the heavens would be there secu at a given time ; it also assists in illustrating the rising and setting of the sun and moon at different seasons and periods of the year, and the apparent diurnal rotation of the planets and fixed stars, These globes have been well appreciated in the north of Europe, but as they are not in conformity with English school books, they have had little success in the United Kingdom. (A. V.N.)

GLOBE-FISH or Sga-Hepcenoc. By these names some sea-fishes are known, which have the remarkable faculty of inflating their stomachs with air. They belong to the genera Diodon and Tetrodon. Their jaws resemble the sharp beak of a parrot, the bones and teeth being coalesced into one mass with a sharp edge. In the Diodonts there is no mesial division of the jaws, whilst in the Tetrodonts such a division exists, so that they appear to have two teeth above and two below. By means of these jaws they are able to break off branches of corals, and to masticate other hard substances on which they feed. Usually they are of a short, thick, cyclindrical shape, with powerful fins (fig. 1).

Fic. 1.—Diodon maculatus.

Their body is covered with thick skin, without scales, but provided with variously formed spines, the size and extent of which vary in the different species. When they inflate their capacious stomachs with air, they assume a globular

form, and the spines protrude, forming a more or less for- midable defensive armour (fig. 2). A fish thus blown out turns over and floats belly

upwards, driving before the wind and waves. Many of these fishes are highly poisonous when eaten, and fatal accidents have occurred from this cause. It appears that they acquire poisonous qualities from their food, which frequently consists of decomposing or poison-

Fig, 2.—Diodon maculatus (inflated).

ous animal matter, such as would impart, and often does impart, similar deleterious qualities to other fish. They are

most numerous between the tropics and in the seas con- tiguous to them, but a few species live in large rivers, as, for instance, the Zetrodon Jahaka, a fish well known to all travellers on the Nile, Nearly 100 different species are kuown.

GLOBIGERINA. Sce FoRAMINIFERA.

GLOGAU (sometimes called Gross or Great Glogau, to distinguish it from Klein or Little Glogau, in the govern- ment of Oppeln), is a fortified town of Prussia at the head of a circle in the Lower Silesian government of Liegnitz, situated partly on an island and partly on the left bank of the Oder, about 80 miles S.E. of Frankfort, Among its more important buildings are the cathedral, in the Gothic style, and a castle in the Renaissance style, now used as a courthouse ; and it also possesses a new town-house, a Synagogue, a poorhouse, an orphanage, a military hospital, two gymnasia, and several libraries. Situated as it is on a navigable river and at a junction of two or three railway lines, Glogau carries on an extensive trade, which is fostered by a variety of local industries, dealing with tobacco, beer, oil, sugar, vinegar, bone-meal, earthenware, &c. One of its publishing firms—that of Flemming & Company—has at- tained a wide reputation for maps. In 1871 the population of Glogau, inclusive of the garrison, amounted to 18,266,— of whom 6039 were Roman Catholics and 947 J ews; and in 1875 it was stated at 18,062.

In the beginning of the 11th century Glogau, even then a popu- lous and fortified town, was able to Withstand a regular siege by the emperor Henry V.; but in 1157 the duke of Silesia, finding he could not hold out against Frederick Barbarossa, set the place on fire. In 1252 the town, which had

been raised from its ashes by Henry the Bearded, becaine the capital of a principality of Glogau, which continued till 1506, when town and district were united to the Bohemian crown. In the course of the Thirty Years' War Glogau suffered greatly. The inhabitants, who had become Pro- testants soon after the Reformation, were dragooned into conformity by Wallenstein's soldiery; and the Jesuits received permission to build themselves a church and a college. Captured by the Pro- testant allies in 1632, and recovered by the Imperialists in 1633, the town was again captured by the Swedish general Torstenson in 1642, and continued in Protestant hands til] the peace of West- phalia in 1648. In 1741 the Prussians took the place by storm, and during the Seven Years' War it formed an important centre of operations for the Prussian forces. After the battle of Jena it fell into the hands of the French; and they have reason to be proud of the gallant defence made by Laplane, who held out against the Russian and Prussian besiegers, after the battle of Katzbach (August 26, 1813), till the 17th of the following April.

GLOSS, GLOSSOGRAPHER, GLOSSARY, GLOSS- ATOR. The Greek word yAéooa, meaning originally a tongue, hence a language or dialect, gradually came to denote especially any obsolete, foreign, provincial, technical, or other- wise peculiar word or use of a word (see Arist., het. iil. 3, 2); aud the making of collections and explanations of such yAdooa was at a comparatively early date a well-recognized form of literary activity. Even in the 5th century, among the many writings of Democritus of Abdera was included a treatise entitled Iepi "Opnpov 7 dpOoereins cal yAwooeuwr. It was not, however, until the Alexandrian period that the yAwoooypado: became very numerous. Of many of these it is probable that even the names have perished ; but in the writings of Athenzus alone (c. 250 A.D.) allusions are to be found to no fewer than thirty-five. Among the earliest may be mentioned Philetas of Cos (d. c. 290 B.c.), the elegiac poet, to whom Aristarchus dedicated the treatise rpds®iAyrav; he was the compiler of a lexicographical work, arranged probably according to subjects, and entitled "Araxra or TAdooa (sometimes draxro: yAdooa). Next came his dis- ciple Zenodotus of Ephesus (c. 280 B.c.), one of the earliest of the Homeric critics and the compiler of TAdaqas 'Opnpixac; Zenodotus in turn was

succeeded by his greater pupil Aristo- phanes of Byzantium (c. 200 B.c.), whose great compilation epi A€fewy (still partially preserved in that of Pollux), is known to have included “Arrixal A€ers, Aakwvikai yAdooa, and the like. From the school of Aristophanes issued niore than one glossographer of name,—Diodorus, Artemidorus (yAdooa, and a collection of Xéfers dWaprurixai), Nicander of Colophon (yAéooa, of which some twenty-six fragments still survive), and Aristarchus, the famous critic, whose numerous labours included an arrangment of the Homeric vocabulary (Aééers) in the order of the books. Contemporary with the last named was Crates of Mallos, who, besides making some new contributions to Greek lexicography and dialectology, was the first to create at Rome a taste for similar investi- gations in connexion with the Latin idioms. From his school proceeded Zenodotus of Mallos, the compiler of “EOvixat Nears or yA@ooa, a work said to have been designed chiefly to support the views of the school of Pergamus as to the allegorical interpretation of Homer.! Of later date were Didymus (Chalkenteros, c. 50 B.c.), who made collections of A€Lers Tpaywdovpévar, kwptxal, &c.; Apollonius Sophista (c. 20 B.c.), whose Homeric Lexicon has come down to modern times; and Neoptolemus, known distinctively as 6 yAwoooypados. Coming down to the beginning of the first century of the Christian era we find Apion, a gram- marian and rhetorician at Rome during the reigns of Tiberius and Claudius, following up the labours of Aristar- chus and other predecessors with yAdocat “Ounpikai, and a treatise wept ras ‘Pwpaikis dudéxrov; Heliodorus or Herodorus was another almost contemporary glossographer ; Erotian also, during the reign of Nero, prepared a special glossary for the writings of Hippocrates, still preserved. To this period also Pamphilus, the author of the Amor, from which Diogenian and Julius Vestinus afterwards drew so largely, most probably belonged. In the following century one of the most prominent workers in this depart- ment of literature was Avlius Herodianus, whose treatise mept povypovs Aéfews has been edited in modern times, and whose ém

1See Matthai, Glossaria graca, Moscow, 1774-5.

GLOSS

senses different from those im which they had been employed by older and approved writers. Of somewhat later date is the well-known Hesychius, whose often-edited Ac&xdv rightly superseded all previous works of the kind; Cyril, the celebrated patriarch of Alexandria, also contributed somewhat to the advancement of glossography by his cuvaywyn Tov Tpos Sidghopoy onpactay diaddpws Tovovp.evov AeSewv ; the names of Orus and Orion, of Philoxenus, and of the two Philemons also belong to this period. The works of Photius, Suidas, and Zonaras, as also the Ltymologicum Magnum, to which might be added the Leaxica Sanger-mansia and the Lexica Segueriana, have already becn referred to (DIcTIONARY, vol. vii. p. 183). In Latin lexi- cology the most prominent name is that of Festus, whose

‘ only extant work, however, is but an epitome of the treatise

of Verrius Flaccus De Verborum Significatu. This last- named author had himself been preceded by Varro (De Lingua Latina), who in turn makes allusion to several before him ‘qui glossas scripserunt.” The introduction of gram- matical and linguistic studies into Rome is usually attributed to Crates of Mallos (c. 267 B.c.) mentioned above.

To a special category of technical glossaries belongs a large and important class of works relating to the law- compilations of Justinian, Although the emperor forbade under severe penalties all commentaries (taouvypara) on his legislation (Const. Deo Auctore, sec. 12; Const. Tanta, sec. 21), yet indices (“Ivéuces) and references (zapdrirAa), as well as translations (€pynvetat xara moda) and para- phrases (épynveiar «is tXdTos), were expressly permitted, and lavishly produced. Among the numerous compilers of alphabetically arranged Adfes “Pwaixa’ or Aarewvixai, and yAéooa voyixat (Glosse nomics), Cyril and Philoxenns are particularly noted ; but the authors of zapaypadai, or onpemoes, Whether efwOev or eowbey keipevar, are too numerous to mention. A collection of these rapaypadai tov wadadv, combined with véar tapaypadai on the revised code called ra BaciAuxd, was made about the middle of the 12th century by a disciple of Michael Hagiotheodorita. This work is known as the Glossa Ordinaria rév Baciukév.?

Tn Italy also, during the period of the Byzantine ascend- ency, various glossaz(glosa) and scholia on the Justinian code were produced;* particularly the Turin gloss (reprinted by Savigny), to which, apart from later additions, a date prior to 1000 is usually assigned. After the total extinction of the Byzantine authority in the West the study of law became one of the free arts, and numerous schools for its cultivation were instituted. Among the earliest of these was that of Bologna, where Pepo (1075) and Irnerius (1100-1118) began to give their expositions. They had a numerous following, who, besides delivering exegetical lectures ("' ordinariz " on the Digest and Code, " extraordi- nariz " on the rest of the Corpus Juris Civilis), also wrote Glossz, first interlinear, afterwards marginal.t The series of these glossators was closed by Accursius (see Accorso) with the compilation known as the Glossa ordinaria or magis- tralis, the authority of which soon became very great, so that ultimately it came to be a recognized maxim, "Quod non agnoscit glossa, non agnoscit curia."®° For some

2See Labbé, Veteres glosse verborum juris que passim in Basilicis reperiuntur (1606) ; Otto, Thesaurus juris Romani, vol. ii (1697); Stephens, Thesaurus linguwe Grace, vol. viii. (1825).

3See Biener, Geschichte der Novellen, p. 229 sqq.

4Trnerius himself is with some probability believed to have been the author of the BRACHYLOGUS (q.¥.).

> Thus Villani (De origine civitutis Florentine) says of the Glosse that "tant auctoritatis gratizeque fuere, ut conseusu omuium publice approbarentur et spretis abolitisque penitus aliis sole juxtustextus legum opposite sunt et ubique terrarum sine controversia pro legibus obser- vantur, ita ut propemodum nefas sit, non secus quam textui, Glossis Accursii contraire, sicut antiqua fama referente comperi." For similar testimonies see Bayle's Dictionnaire, s.v. '* Accursius"' and Rudorff, Rim. Rechtsgeschichte, i. p. 888 (1857).

Di VII.

GLO—

account of the glossators on the canon law, see vol. v. p. 20 (Canon Law),

Bible Glosses. —With the decay of learning and originality during the dark ages grew the necessity for making and the custom of transcribing on manuscript copies of the Vulgate various notes, explanatory or otherwise, of the text. Ultimately collections of these glosses or sets of glosses came to be made. They are distinguished as either marginal or interlinear. The most famous collection of Glossce marginales was that made by Walafridus Strabus in the 9th century ; it consists of notes grammatical, his- torical, and theological, culled from the writings of Augus- tine, Ambrose, Jerome, Gregory, Isidore, Bede, Alcuin, and Hrabanus Maurus, with additions by himself. The inter- linear glosses (which as a rule were not so full as the marginal) were sometimes theological but more generally purely philological. A somewhat important collection of interlineal glosses belonging to the former class was made by Anselm of Laon (c. 1100). The philological glosses have considerable value to the linguistic student, especially those which originated in Germany during the Carolingian period, The MS. vocabularies in the libraries of St Gall, Munich, Vienna, &c., have been frequently examined of late years with results which have been fully indicated by Raumer in his treatise on the influence of Christianity upon Old High German (Kinwirkung des Christenthums auf die althochdeutsche Sprache)! Some interlinear vernacular translations of portions of the Bible into the Anglo-Saxon, of the 9th and following centuries, have also been recently reprinted (see ENGLIsH Breuer).

GLOSSOP, a municipal borough of Derbyshire, is situ- ated on the extreme northern border of the couuty, 14 miles E.S.E. of Manchester. It is the chief seat of the cotton manufacture in Derbyshire, and it has also woollen and paper mills, dye and print works, and bleaching greens. The town has for several years been rapidly increasing in size, and now consists of three main divisions, viz., the Old Town (or Glossop proper), Howard Town (or Glossop Dale), and Mill Town. The principal buildings are the town hall and market-house, the temperance hall, the grammar school, and the mechanics' institution. In the immediate neigh- bourhood is Glossop Hall, the seat of Baron Howard, lord of the manor, a picturesque old building with extensive terraced gardens. On a hill near the town is Milandra Castle, the site of a Romau station.

Glossop was granted by Henry J. to William Peverel, on the attainder of whose son it reverted to the crown. In 1157 it was gifted by Henry II. to the abbey of Basingwerk. Henry VIII. bestowed it on the earl of Shrewsbury, and it now belongs to the Howards. It was made a municipal borough in 1866. The popu- lation in 1871 was 17,046.

GLOUCESTER, a county in the west midland district of England, bounded on the N. by Worcester and Warwick, on the S. by Somerset, on the E. by Oxford and Wilts, and on the W. by Hereford and Monmouth. The river Wye forms the western boundary line, the Stratford Avon part of the northern, the Bristol Avon the south-western, and the Thames for some miles the south-eastern. The shape of the county is irregularly elliptical, its greatest length in direct line from Bristol to Clifford Chambers (N.E.) being 54 miles, its greatest width from Down Ampney to Pres- ton, near Ledbury, at right angles, 33 miles. The area, according to the tithe surveys—deducting 3000 acres of detached land incorporated by an Act of 1844 with the counties of Worcester, Warwick, and Wilts, by which they were surrounded, and 17,688 acres of water—amounts

1 Considerable interest of a similar kind attaches to the so-called Glosse malbergice upon the Latin text of the Salic law. It was at one time held that in these glosses we have some relics of the ancient Celtic tongue ; but their truly Germanic character was afterwards conclusively established by Jacob Grimm,

to 805,102 acres, mostly cultivable. The county contains 29 hundreds, among which are grouped 351 parishes, 227 tithings, liberties, and hamlets; and the parishes are arranged in 17 poor law unions for the relief of the poor, and 21 petty sessional divisions for thé administration of justice and sanitary purposes. Electorally Gloucestershire is divided into the two divisions of East and West Glouces- tershire, each returning two members. The latter com- prises Dean Forest to the Severn bank (the “ Eye between Severn aud Wye” of the local proverb), and the country S. of the former river to 8.E, and N.E. of Dursley, the chief polling place of the division. East Gloucestershire, comprehending the rest of the county, has its chief polling places at Gloucester and Cheltenham, and besides these boroughs,

the former of which returns two members and the latter one, has within its limits the boroughs of Stroud with two members, and Tewkesbury and Cirencester with one each. West Gloucestershire, sharing with North Somerset the city of Bristol, sends two more members to parliament, so that the total representation of the county is 13 members. Gloucestershire contains 28 market-towns and 2 cities,

The population of the county in 1851 was 458,805 (218,187 males and 240,618 females); in 1861 it was 485,770 (229,009 males and 256,761 females); and in 1871 it had increased to 534,320 (251,943 males and 282,377 females). Since the first census in 1801 the population has increased by 283,917 persons, or 113 per cent.

The population of the principal towns at the census of 1871 was as follows : —

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The county has three natural divisions, the hill, the vale, and the forest, parallel to each other north and south. (1.) The hill country, which, except the high ground of the Forest of Dean, consists wholly of the Coteswolds, a range extending from Broadway near Chipping-Campden on the north to Bath on the south, and from Birdlip hills on the west to Burford on the east, and traversing the eastern side of the county at an average elevation of 700 feet, though in parts, as at Cleeve Hill near Prestbury, it is 1134 feet above the level of the sea. It covers nearly 300,000 acres of undulating table-land, locally subdivided into the Southwolds betwixt Bath and Badminton, the Stroudwater hills betwixt Tetbury and Woodchester, and the Coteswolds proper, or the rest of the hill country northward. (2.) The Vale, or that level tract extending from the base of the Coteswolds to the east bank of the Severn, the upper or nor- thern part of which expanse is known as the vale of Glou- cester, and embraces Gloucester, Cheltenham, Tewkesbury, and some 50,000 acres; whilst the lower is the vale of Berkeley, a tract of

similar area reaching from Aust Cliff on the Severn opposite the mouth of the Wye to Robin's Wood hill, two miles south-east of Gloucester. The vale of Gloucester is a continuation of the vale of Evesham. (3.) The Forest division is the peninsula lying between the Wye and the Severn, in modern times limited to the Forest of Dean, but anciently occupying all Gloucestershire west of Severn, and covering some 43,000 acres. The area of the. present forest is 23,015 acres, 11,000 of which are en- closed. Its length from north to south is 20 miles, its breadth (east to west) 10 miles. ,

Geology.—Though the igneous rocks are little de- veloped, the great variety of sedimentary deposits makes Gloucestershire a rich field for the geologist. At

Damory, Charfield, and Woodford is a patch of green- stone, the cause of the upheaval of the Upper Silurian basin of Tortworth, in which are the oldest stratified rocks of the county. Of these the Upper Llandovery is the dominant stratum, exposed near Damory mill, Micklewood chase, and Purton passage, wrapping round the base of May and Huntley hills, and reappearing in the vale of Woolhope. The Wenlock limestone is exposed at Falfield mill and Whitfield, and quarried for burning at May hill. The Lower Ludlow skales or mudstones are scen at Berkeley and Purton, where the upper part is probably Aymestry limestone. The series of sandy shales and sand- stones which, as Downton sandstones and Ledbury shales, form a transition to the Old Red Sandstone, are quarried at Dymock. The 'Old Red " itself occurs at Berkeley, Tort- worth Green, Thornbury, and several places in the Bristol coal-field, in anticlinal folds forming hills. It forms also the great basin extending from Ross to Monmouth and from Dymock to Mitcheldean, Abenhall, Blakeney, &c., within which is the Carboniferous basin of the Forest. It is cut through by the Wye from Monmouth to Woolaston. This formation is over 8000 feet thick in the Forest of Dean. The Bristol and Forest Carboniferous basins lie within the synclinal folds of the Old Red Sandstonc; and though thie seams of coal have not yet been correlated, they must have been once continuous, as further appears from the existence of an intermediate basin, recently pierced, under the Severn. The lower limestone shales are 500 feet thick in the Bristol area, and only

165 in the Forest, richly fossiliferous, and famous for their bone bed. The great marine series known as the Mountain Limestone, forming the walls of the grand gorges.of the Wye and Avon, are over 2000 feet thick in the latter district, only 480 in the former, where it yields the brown hematite so largely worked for iron even from Roman times. It is much used too for lime and road metal. Above this comes the Mill- stone Grit, well seen at Brandon hill, where it 1s 1000 feet in thickness, though but 455 in the forest. On this rest the Coal-measures, consisting in the Bristol field of two great series, the lower 2000 fect thick with 36 seams, the upper 3000 feet with 22 seams, 9 of which reach 2 feet in thickness. These two series are divided by over 1700 feet of hard sandstone (Pennant Grit), containing only 5 coal- seams. In the Forest coal-field the whole series is not 3000 feet thick, with but 15 seams. At Durdham Down a Dolomitic conglomerate, of the age known as Keuper or Upper Trias, rests unconformably on the edges of the Paleozoic rocks, and is evidently a shore deposit, yielding dinosaurian remains. Penarth beds, of which classical sections occur at West- bury, Aust, &. paper shales containing much pyrites and a celebrated bone bed, the Cotham landscape marble, and the white Lias limestone, yielding Ostrea Liassica and Cardium Rhett- cum. The district of Over Severn is mainly of Keuper marls. The whole Vale of Gloucester is occupied by the next formation, the Lias, a warm sea deposit of clays and clayey limestones, characterized by ammonites, belemnitcs, and gigantic saurians. At its base is the insect limestone bed. The pastures producing Gloucester cheese are on thie clays of the Lower Lias. The more calcareous Middle Lias or marlstone forms hillocks flanking the Oolite escarpment of the Coteswolds, as at Wotton-under-Edge, and Church- down. The Coteswolds consist of the great limestone series of the Lower Oolite. At the base is a transition series of sands, 30 to 40 feet thick, well developed at Nails- worth and Frocester. Leckhampton hill is a typical section of the Lower Oolite, where the sands are capped by 40 feet of a remarkable pea grit. Above this are 147 feet of free- stone, 7 feet of oolite marl, 34 feet of upper freestone,

Above the Keuper clays come the |__lege, a Gothic structure near Circencester, which has hitherto The series consists of grey marls, black |

GLOUTCHESYTER

and 388 feet of ragstone. The Painswick stone belongs to lower freestone. Resting on the Inferior Oolite, and dipping with it to S.E., is the “fuller’s earth,” a rubbly limestone about 100 feet thick, throwing out many of the springs which form the head waters of the Thames. Next comes the Great or Bath Oolite, at the base of which are the Stonesfield “slate” beds, quarried for roofing, paling, &c., at Scvenhampton and elsewhere, From the Great Oolite Minchinhampton stone is obtained, and at its top is about 40 feet of flagey Oolite with bands of clay known as the Forest Marble. Ripple marks are abundant on the flags ; in fact all the Oolites seem to have been near shore or in shallow water, much of the limestone being merely com-minuted coral. The highest bed of the Lower Oolite is the Cornbrash, about 40 feet of rnbble, productive in corn, form- ing a narrow belt from Siddington to Fairford. Near the latter town and Lechlade is a small tract of blue Oxford Clay of the Middle Oolite. The county has no higher Secondary or Tertiary rocks ; but the Quaternary series is represented by much northern drift gravel in the Vale and Over Severn, by accumulations of Oolitic detritus, including post-Glacial extinct mammalian remains on the flanks of the Coteswolds, and by submerged forests extending from Sharpness to Gloucester.!

Agriculture.—In the soil of the hill country is so much lime that a liberal supply of manure is required. This is provided by folding sheep, and by paring and burning the turf and strewing the ashcs on the surface, Good crops of barley and oats are thus obtained, and even of wheat, if the soil is mixed with clay. But the poorest land of the hill country affords excellent pasturage for sheep, the staple commodity of the district; and the sainfoin, which grows wild, yields abundantly under cultivation. The Coteswolds have been famons for the brecd of sheep named from them since the early part of the 15th century,—a breed hardy and prolific, with lainbs that quickly put on fleece, and become attempered to the bracing cold of the hills, where vegetation is a month later than in the vale. Improved of late years by judicious crossing with the Leicester sheep, the modern Coteswold has attained high perfection of weiglit, shape, fleece, and quality, The ewes are good mothers ; the wool produce, of which the staple is long and mellow to the hand though rather coarse in quality, is an important item, averaging from 7 to 8 tb a head in a Coteswold flock. An impulse has been given to Coteswold farming since the chartering in 1845 of the Royal Agri-

cultural College at Cirencester, to instruct young men in farming aud the kindred sciences. The pupils engage in the cultivation of a farm of 700 acres attached to the col-

accommodated on an average 100 inmates. Yet, despite the march of improvement, the aspect of the district is somewhat barren, owing to the absence of trees and hedge- rows in the so-called “stone wall” country, and to the size of the farms, sometimes exceeding 1000 acres. Cattle are kept for home needs and to improve the soil. Oats and barley are the chief grain crops. In the Vale the deep rich black and red loamy soil is well adapted for cattle, anda moist mild climate favours the growth of grasses and root crops. A great proportion of the Vale is in per- manent pasture, and its farmers look largely to hay as the winter food of their stock. The cattle, save on the frontier of Herefordshire, are mostly shorthorns, of which

1 Authorities. —Geology of East Somerset and Gloucester Coal-fields, H. B. Woodward, F.G.S.; Memoirs of Geol. Survey, London, 1876 ; ‘Geology of Country round Cheltenham,” E. Hull, A.B., F.G.S., in Memoirs of Geol. Survey, 1857; ‘*Geology of Parts of Wilts and Gloucester,” 7., 1852; The Coteswold Hills, John Lycett, London, 1857; papers by Mr Lycett in Quart. Journ, of Geol. Soc., vol. iv., and by Dr Wright in vols. xii. and xvi.

many are fed for distant markets, many reared and kept

for dairy purposes. The rich grazing tract of the Vale of Berkeley is said to produce annually 1200 tons of the famous double Gloucester cheeses, has long been celebrated for its cheese and butter. The Vale of Gloucester is the chief corn district. Its aspect is generally pastoral, characterized by grass-lands hemmed in with hedgerows and hedgerow timber, and dotted with apples, pears, and orchard fruit as if to compensate for the comparative barrenness of the Coteswolds. The Vale, from its position and climate, is subject to violent storms of wind and rain.

Statistics of Agriculture for Gloucestershire as returned on 4th of June 1878,

Oe ee cay tA wees cin cacy, cee ae, 804,977 acres. Total acreage under crops, bare fallow, and grass….. 648,795 ,, Corn crops (nearly one-half wheat and one-fourth

I. eM tes cicc cs cca MOO ee ns, G2sollee Green crops (about two-thirds turnips and swedes)... 62,679 ,, Gees ONAOT LOLAUIONY,.....06c000sssacscccccveeesecesessc.., 94,279 ,, Permanent pasturage ……..ccscsecceeseesesevercccs..,, 807,026 ,, MEENA LAME... 062 2c ceccecssces von sect sonedvscccorsecscoucs 2520504, HORSPAO NODS. 555 c00s00+ovescscresiccareeseecasecesscc..c.., GB) A,

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According to the Owners and Heritages Return 1872-7 3, the county was divided among 37,705 proprietors, holding land whose acreage was 733,640, and whose gross esti- mated rental was £2,556,543. The estimated extent of commons and waste lands was 7429 acres. Of the owners 76 per cent. possessed less than one acre, and the average value all over was £3, 8s. 113d. There were 10 proprie- tors who possessed upwards of 5000 acres, viz. :—Lord Fitzhardinge, 18,264; Duke of Beaufort, 16,610; Lord Sherborne, 15,773 ; Earl Bathurst, 9967 ; Crown Pro- perty, 9575; R.S. Holford (Weston Birt), 9332; Thomas W. C. Master (Cirencester), 7226 ; Earl Eldon (Encomb), 6664; Lord Sudeley (Winchcomb), 6620; Earl Ducie,

5193.

Forest District.—The surface of this district is agree- ably undulating to the height of from 120 to 1000 feet, and its sandy peat soil renders it most suitable for the growth of timber, which is the cause of its having been a royal forest from time immemorial. John Evelyn records that the com- manders of the Armada had orders not to leave in it a tree standing. In the reign of Charles J. the Forest contained 105,537 trees, and, straitened for money, he granted it to Sir John Wyntour for £10,000, and a fee farm rent of £2000. The grant was cancelled by Cromwell; but at the Restoration only 30,000 were left, and Wyntour, having got another grant, destroyed all but

200 trees fit for navy timber. In 1680 an Act was passed to enclose 11,000 acres and plant with oak and beech for supply of the dockyards ; and the present forest, though not containing very many gigantic oaks, has six “walks” covered with timber in various stages of growth. The two finest oaks of the Forest are a headless giant 45 feet in girth just out- side the village of Newland, to the left of the road from Coleford to Monmouth, and “Jack of the Yat,” with 19 feet of girth, on the right of the roadside from Coleford to Mitcheldean.}

1 The Forest is locally governed by two crown-appointed deputy gavellers to superintend the woods and mines, and four verderers elected by the freeholders, whose office, since the extermination of the deer in 1850, is almost purely honorary. From time immemorial all persons born in the hundred of St Briavel’s, who have worked a year and a day in a coal mine, become “ free miners,” and may work coal in any part of the Forest not previously occupied. At the present time the Forest laws are administercd at the Speech-House by the quecn’s officers end the free miners.

and the Vale in general

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Botany.—The flora of the county, representing that of the two main hydrographical areas of the kingdom and of various geological formations, is extremely rich. Its dis- tinct forms of phanerogams number more than half the British flora. But there is little bog land in the county, and no true sea coast. Hence certain gaps in the list of indigenous plants. There are only some 25 species of ferns; but the rare flowers mentioned below are worthy of note as indigenous.2 The quantity of mistletoe on the numerous apple trees in the cider orchards of the Vale ig another botanical feature of the county, a parasite occurring on other trees also, notably on the Badham Court oak, Sedbury Park, Chepstow, and on the Frampton-on-Severn oak, The elm, used at Bristol for shipbuilding, the willow, and the maple form the chief hedge timber of the Vale, while in the Forest some fine hollies, 6 feet round, are found amongst the oaks. The Spanish chestnut at Tort worth, Piff’s elm, Boddington, near Cheltenham, and the Lassington oak are the most notable trees of the county. Mustard was once much cultivated in the Vale, “few houses being without a cannon ball and bowl in which the seeds

were bruised” (see Rudge’s General Views of Agriculture of Gloucester, London, 1807).3

Communication and Tradc.—Gloucestershire is, in virtue of its two city ports, Bristol and Gloucester, a maritime county. The approach to the first is by the Somerset Avon, to the second by the Severn, or, more strictly, by the Gloucester and Berkeley canal, for which, owing to the dangerous navigation of the Severn, an Act was obtained in 1793, though the works were not com- pleted and opened for traffic till 1827, They consisted of a small tidal basin and lock at Sharpness Point, on the Scvern, near Berkeley, connecting the estuary of the river by a ship canal 16 miles long with the city of Gloucester, where there was a suitable discharging dock, and where the canal was again connected with the 1iver Severn by a lock. The gradual extension of the trade necessitated a corresponding extension of the works, and in 1869 a new and enlarged entrance, half a mile further down the liver, was projected, with suitable dischaiging and repairing docks, which last form one large sheet of water on the same level as the old canal connecting them also with Gloucester. These were coni- pleted and opened in 1874. Through the river Severn from Glou- cester to Worcester and Stourport the port is brought into direct communication with the great system of internal canals throughout the kingdom, and both at Sharpness docks and Gloucester is in direct communication with the Midland and Great Western rail- way systems. The following are the trade statistics of the year ending September 25, 1878.

Tons, Tons, Ut 20) 0 428,532 COMBINE. csccxscs-seescaves us Bashan so snornonenionssesoc 105,224 ———— 533,756 Foreign exports…….....-. asoncosne eels Ree 51,047 COG caress cdnivnicdvaciscovnences sgesudanonban dodon%s 112,176 2 Gas Total Rane… ..itiasce e 696,979

Of the foreign imports 253,643 tons, amounting to about 1,200,000 quarters, were grain and seed. The port is well situated fora corn port, its corn warehouses at Sharpness accommodating 100,000 quarters, and those at Gloucester about 130,000 quarters. The new works at Sharpness will accommodate vessels up to 2500 tons burden.

The Severn Bridge railway—5 miles in length—commences at Lydney by a junction with the Great Western Railway and the Severn and Wye 1ailway,

crosses the Severn at Purton Passage, and terminates at the Berkeley new docks by a junction with the Midland, thus forming a long-needed connexion between the two sides of the river, and shortening the distances from South Wales to London by 14 miles, and from South Wales to Bristol by 20.

- Anemone Pulsatilla; Arabis stricta ; Thlaspi perfoliatum ; Hut. chinsia petroca; Polygala oxyptera and calcarea; Cerastium pumilum ; Lotus angustissimus ; Pyrus pinnatifida; Epilobium lanceolatum ; Sedum rupestre; Trinia vulgaris; Limnanthemum nympheoides ; Veronica hybrida; Orobanche Heder ; Cynoglossum montanum ; Utricularia neglecta ; Daphne Mezereum ; Buus sempervirens ; Ce-

\ phalanthera rubra; Galanthus nivalis. .

3 Authorities.—Swete's Flora Bristoliensis, 1854; Buckman's Botany of Cheltenham, 1844; Marshall's Rural Economy of Glouces- tershire, 1789; H. G. Nicholl's Forest of Dean, 1858; and MS. Floras of Gloucestershire, by Messrs Harker and ee 87

Its great local importance consists in providing a communication from South Wales and Dean Forest and their coal-fields to the Berkeley new docks and the south of England, and is evidenced by the various competing schemes introduced in the same session of 1872 for bridges having the same object. The great iron bridge itself consists of girders constructed on a modification of the bow- string principle, and rests on piers composed of cast iron cylinders sunk down inthe rock and filled with concrete. Commencing with the Lydney shore, the spans are as follows :—one of 134 feet, two of 327, five of 171 feet, thirteen of 134, and one of 196 feet (inclusive of swing bridge over canal), making in all 22. The width of the river is 1186 yards, and the total length of the bridge, including the masonry viaduct and swing span, 1887 yards. While the main object of this stupendous undertaking is the transit of coal, arrange- ments are also contemplated for passenger traffic across the river.

Another canal, once of great importance to the commerce of Gloucestershire, is the Thames and Severn canal, connecting the navigation of these two great rivers, the first of which rises at the back of Leckhampton Hill, at Seven Springs. The Thames and Severn canal begins at Lechlade on the former river, and joining the Strondwater canal, which crosses the Gloucester and Berkeley, enters the Severn at Framilode. But this canal, though of con- siderable engineering skill, is now but little used, the Great Western railway having almost entirely superseded it; and it is the same with another canal running from the Severn at Gloucester to Newent and Ledbury.

Manufactures.—Gloucestershire is also an important manufac- turing county. In the time of Edward III. the manufacture of woollen cloth was introduced into its hill country by the Flemings, attracted probably by the facilities offered for felting by the numerous streams of water flowing from the Coteswolds. The manufacture gradually increased in spite of vexatious legislation, enacted with the view of encouraging native industry, but really tending to hamper the trade. Cirencester is mentioned as its seat in Henry IV.'s reign, and Stroud in 1553. The raw material for the manufacture was long obtained from the produce of English flocks, but afterwards a better description of wool was imported from Spain, and towards the close of the last century a still finer ltd was got from Germany. The main supply is now obtained from the British colonies in the southern hemisphere. The description of cloth for which Gloucestershire and the west of England have been and still are most famous is broad-cloth, dressed with teazles to produce a short close nap on the face, and made of all shades of colour, but chiefly black, ite, and scarlet. The most prosperous time of the Gloucestershire woollen trade was from 1800 to 1820, during which period the water-power of the various streams was keenly utilized, and a very large pro- portion of the population was engaged early and late on the several processes, either in their cottages or at the mills. The commercial crisis of 1825 very seriously crippled the trade; and though it afterwards recovered, it is probable that fewer persons have since been employed in it. The further introduction of machinery, enabling manufacturers to dispense with much manual labour, the passing of the factory laws, and the increased facilities of obtaining education, have greatly improved the social habits of the manu- facturing population.

History.—Gloucestershire has not been uunoted in the annals of England. At Gloucester Heury III. was crowned; at Berkeley Castle Edward II. was murdered; the Wars of the Roses were ended at the battle of Tewkesbury, where in May 1471 Queen Margaret and Prince Edward were taken prisoners; the repulse which Charles I. sustained at Gloucester, when the earl of Essex compelled him to raise the siege, was the climax of his fortunes. The county is strewn with relics of antiquity. Four Roman roads intersect it; Roman pavements and vestiges are found at Ciren- cester, Gloucester, Woodchester, aud Lydney, and camps—British, Saxon, Danish, and Roman—in numerous places, with many interesting relics of the Middle Ages. Among these are the restored castle of Sudeley, near Winchcombe, a manor house before the Conquest, a baronial castle in the days of Stephen, and the home in succession of the Botelers, Seymours, Queen Katherine Parr, and the Chandos family ; Thornbury Castle, an interesting ruin instead of a castellated palace, as it would have been had not its pretensions provoked the jealousy of Wolscy against its builder, Edward Stafford, duke of Buckingham, who was beheaded in 1521; St Briavel's Castle, to the south of the Forest of Dean, an ancient seat of the Norman kings, if not the Saxon, which became the residence of the chief officer of the Forest, and retains in its ruined state a decorated chimney shaft surmounted by a horn, the warder's badge. Berkeley Castle, built prior to Henry II., is an almost unique speci- meu of a feudal residence in the actual occupation of a descendant of its founder, Baron Fitzharding. Edward II. was murdered in a detached upper chamber of the square tower. The chief mansions of the county are Badminton House (Duke of Beaufort); Oakley Park, Stroud (Earl Bathurst); Tortworth Park, with a chestnut measuring 52 feet, a boundary tree in King Stephen's reign (Earl Ducie) ; Sherborne Park, Northleach (Lord Sherborne) ; Clearwell

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Court, Coleford (Earl of Dunraven); Highnam Court (T. Gambier Parry) ; Sudeley Castle (J. Coucher Dent); Southam House, the oldest residential house in the county, built in the time of Henry VII., a timber and stone mansion of two stories (Karl of Ellen- borough) ; and Prinknash Park, a 15th century residence of the abbots of Gloucester (B. St John Ackers). Besides tliese there are various other seats of somewhat lesser size. Among

the eminent persons born in the county are the chronicler Robert of Gloucester, Sebastian Cabot, William Cartwright the poet, Thomas Chatterton, Robert Southey, the Rev. John Eagles, and George Whitfield.

Education.—According to the parliamentary returns of public elementary schools for the ycar ending 31st August 1876, there were in Gloucestershire 408 day schools, 34 of which were also used as night schools. Of these schools 314 were in connexion with the Church of England, or the National Society or parochial ; 15 were board schools, 9 Roman Catholic, 86 British and Forcign, and 18 Wesleyan Methodist Conference schools.

See Atkyns's Gloucestershire, 1769; Rudder's Gloucestershire, a republication of Atkyns, with additions, 1779; Fosbrooke's Abstract of Records and Manuseripts respecting the County of Gloucester, 1807, 2 yols. 4to; The Forest of Dean, an Historieal and Deseriptive Account, by H. G. Nicholls, M.A., 1858.

GuovucesteEr, the capital city of the county named after it, 106 miles from London by road and 114 by railway, derives its name from the British Caer-Gloui, near which at Kings- holm the Romans formed their camp of Glevum, vestiges of which remain in four principal streets running N., 8, E., and W., and crossingat the centre, as well as in Roman pave- ments, altars, coins, and pottery. A Roman station under Aulus Plautius, it became a city of Mercia, by name Gleauanceastre, under the Saxons, and is named by Bede as one of the noblest cities in the land. A monastery was founded here in 679, in which in 1022 Bishop Wulstan of Worcester established the Benedictine rule. In the 8th century the city was repeatedly ravaged and burnt by the Danish invaders, and endured ruinous conflicts up to the time of the settlement between Canute and Edmund Iron- side. The abbey throve from the time of Canute, the foundations of the present church having been laid by

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Abbot Serlo (1072-1104), and Walter Frocester, its his torian, becoming its first mitred abbot in 1381. Edward the Confessor often resided at Gloucester, and it was @ favourite resort of the Norman kings, of whom Henry I. met with his death from a surfeit of lampreys, for which he acquired a taste there. Henry II. held a great council there, and Henry IIL. was crowned in the abbey, and “loved Gloucester better than London.” ‘The “ statutes of Glou- cester ” were passed in parliaments held there in succeeding reigns; but the tide of royal favour experienced an ebb when Charles I. subjected the city, garrisoned by the Par- liamentarians, to a critical siege, which was eventually raised in September 1643 by the earl of Essex. Until 1541 the whole of Gloucestershire lay in Worcester diocese, but in that year it was constituted the see of Gloucester, with the abbey church for its cathedral, and John Wakeman, last abbot of Tewkesbury, for its first bishop. The cathe-

Spring was discovered in 1814.

dral may be succinctly described as “a Norman carcase,” altered by additious in every style of Gothic architecture. It is 420 feet long, and 144 broad, with a beautiful central tower rising to the height of 225 feet, and topped by four graceful pinnacles. The nave is massive Norman with Early English roof ; the crypt also, under the choir, aisles, and chapels, is Norman, as is also the chapter house. The south porch is Perpendicular, with fan-tracery roof, as also is the north transept, the south being transitional Decorated. The choir has Perpendicular tracery and an apsidal chapel on each side, and the triforium carried under the east win- dow in a curve, so as to form a whispering gallery, is very noteworthy. Between the apsidal chapels is a cross lady- chapel, and north of the nave are the cloisters with very early example of fan-tracery, the carols or stalls for the monks’ study and writing lying to thesouth. The beautiful tower is 15th century work. For several years an extensive process of restoration has been in progress. The finest monument is the canopied shrine of Edward IL, who was brought hither from Berkeley. By the visits of pilgrims to this the building and sanctuary were enriched. At the step of the altar, too, is a monument in

coloured bog oak of Robert Curthose, a great benefactor to the cathedral, the eldest son of the Conqueror, who was interred there; and those of Bishop Warburton and Dr Edward Jenner are also worthy of special mention. One of the oldest houses in

the city is the “ New Inn in the N orthgate Street,” a strong

and massive timbered house with external galleries and court yards, built in 1450 for the pilgrims to Edward IL’s shrine, by Abbot Sebroke, a traditional subterranean passage leading thence to the cathedral. The timber is

principally chestnut.

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Plan of Gloucester,

1. St Mark’s Church. 6. St Nicholas Church. | 15. Post Office, 2. Ruins of St Catherine’s 7. Gas Works. 16. Corn Exchange. Abbey. 8. County Hall, 17. Meat and Vegetable 3. St Bartholomew Hos- | 9. Theatre. Market, pital. 10. St John’s Church. 18, St Mary de Crypt. 4, St Mary de Lode Church ll. Wesleyan Chapcl. 19. County Gaol and Hooper’s Monu- | 12. New Hospitals, 20. Custom House,

ment, 13. Blue Coat School. 21. City Gaol.

5. Statue of Queen Anne. } 14, St Michacl’s Church. | 22. St Luke’s Church.

Gloucester is situated on a gentle eminence overlooking the Severn, and sheltered by the Coteswolds on the east, while the Malverns rise prominently to the west. TheTolsey or Guildhall stands at the cross, the point of intersection of the four principal streets, in each of which are various quaintly gabled and timbered houses, helping to preserve the ancient aspect of the city. The most modern quarter of it is in the region of the spa, to the south, where a chalybeate The principal public

buildings are the shire hall, the town hall or Tolsey (occupy- ing the site of the ancient Roman capitol), the county gaol and penitientiary, the East-gate market, the corn market, the infirmary, the lunatic asylum, and the hospital erected in 1861 in place of the four old almshouses. There are 14 churches and several dissenting chapels, and it may have been the olden proverb, “as sure as God’s in Gloucester,” which provoked Oliver Cromwell to declare that the city had “more churches than godliness.” Of the churches four are of special interest : St Mary de Lode, which is very old, and contains a monument of Bishop Hooper ; St Mary de Crypt, a cruciform structure of the 12th century, with a beautiful and lofty tower; the church of St Michael, said to have been connected with the ancient abbey of St Peter, and from whose tower the curfew bell is still rung every evening ; and St Nicholas church, originally of Norman erection, and possessing a tower and other portions of later date. A new episcopal palace was erected in 1862. There are three endowed schools: the College school, founded by Henry VIIL., as part of the cathedral establish- ment ; the Crypt school, founded by Dame Joan Cooke in the same reign; and Sir Thomas Rich’s Blue Coat Hospital for 30 boys (1666). The first Sunday school was held in Gloucester, being originated by the Rev. Richard Raikes. Gloucester has returned two members to parliament since the 23d year of Edward I, The city was chartered by Richard III, and is now governed by a mayor, six aldermen, and eighteen burgesses, Its ancient industries were iron- founding, cloth-making, pin-making, and bell-founding, but the last two have been for some time discou- tinued. It now possesses iron and brass foundries, marble and slate works, chemical works, soap works, rope works, flour mills, manufactories of engines, machines, and agri- cultural instruments, and boat and ship-building yards. In 1877 the number of British ships that entered the port was 3762, with a tonnage of 272,391, and of foreign ships 549, with a tonnage of 167,200; the number of British ships that cleared was 3992, with a tonnage of 278,773, and of foreign ships 488, with a tonnage of 144,581. The principal imports are timber, corn, wine, and spirits, and the principal exports iron, coals, malt, salt, bricks, and pottery. The town is celebrated for its Severn salmon and lampreys. Near the canals and docks are the remains (a gateway and some walls) of Llanthony Priory, a cell of the mother abbey in the vale of Ewyas, Monmouthshire, which in the reign of Edward IV. had become the secondary establishment. The famous bore of the Severn attains its great height just below Gloucester.

The: area of the municipal borough is 415 acres, and of the parlia- mentary borough 1606 acres. The population of the municipal and parliamentary borough in 1861 was 16,512 ; that of the inunicipal borough in 1871 was 18,330, and of the parliamentary borough (extended since 1861)

31,804.

See Handbook to the Cathedrals of England, Western Division, 1864; General Architectural Description of the Cathedral Church

at Gloucester, with Plans and Sketehes, by Frederick 8. Waller, F.R.I.B.A., 1856. (J. DA.)

GLOUCESTER, a city and port of entry of Essex | county, Massachusetts, United States, is beautifully situated | near the southern extremity of the peninsula of Cape Ann,

30 miles N.N.E. of Boston by rail. It includes six vil. lages—Gloucester village, East Gloucester, West Gloucester, Annisquam, Bay View, and Lanesville. The harbour, open- ing out into Massachusetts bay, is onc of the best on the coast, and is defended by a fort. The prosperity of Gloucester depends mainly on its cod and mackerel fisheries, which employ nearly 400 vessels, with upwards of 3500 men, and have an annual value of about 4,000,000 dollars, For the year ending June 30, 1878, the total value of im-

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ports was 81,450 dollars, of domestic exports 36,172 dollars, and .of foreign exports 384 dollars. Steamers ply daily between the city and Boston. There are a number of manu- factories connected chiefly with the fisheries, and in the neighbourhood there are extensive granite quarries. Glou- cester possesses a fine city hall, a high school, seven gram- mar schools, and a free library. On account of its attrac- tive situation, and the fine scenery of the neighbourhood, it is a favourite summer residence. About 2 miles from it is Norman’s Woe, the scene of the wreck of the ‘“ Hes- perus,” celebrated in Longfellow’s poem.

Gloucester received its name from the fact that many of its early settlers came from the county of Gloucester in England. It was occupied as a fishing station in 1624, was incorporated as a town in 1642, and was made a city in 1874, It was attacked by the English in 1775 and in 1814, in both cases unsuccessfully. The population in 1800 was 5313; in 1850, 7786; in 1860, 10,904; and in 1870, 15,389, of whom 4007 were foreigners.

GLOUCESTER, Ropert or. See Ropert or Gtiov- CESTER.

GLOVE (Saxon glof), a covering for the hand, with a separate sheath for each finger. Among our ancestors, to throw down the glove or gauntlet was equivalent to a challenge to single combat, and the person thus defied signified his acceptance of the challenge by taking up the glove, and casting down his own,—which ceremony was re- garded as a mutual compact to meet at the time and place specified. This custom, according to Favyn (Thédtre @ Honneur et de Chevalerie), was derived from the Oriental mode of contracting sales of land and the like by giving the purchaser a glove, by way of delivery or investiture ; and to this effect he quotes Ruth iv. 7 and Psa. cviii. 9, passages where the word commonly translated “shoe” is by some rendered “glove.” Du Cange quotes from a charter of the 13th century an instance of re-investiture or restitution symbolized by the person depositing his glove on the earth. The use of gloves is of high antiquity. There is reason to believe the ancient Persians wore them, since it is mentioned in the Cyropedia of Xenophon that on one occasion Cyrus went without his gloves; and we know that some kind of protecting coverings for the hands were used by the Greeks and Romans in certain kinds of manual labour, although their precise form is unknown.

The word gantus, used for a glove in medieval Latin, is obviously of Teutonic derivation. In the life of St Colum. banus, written by Jonas, abbot of Bobbio, in the 7th cen- tury, gloves for protecting the hands in manual labour are spoken of as “tegumenta manuum que Galli wantos vocant.” A pair of gloves are mentioned in the will of Bishop Ricul- fus, who died 915 a.p. Gloves did not become articles of ecclesiastical vestment till the 12th century. They do not appear in the Bayeux tapestry, and they did not come into general use in England till the 13th century. Matthew Paris, noticing the burial of Henry IT. (1189), mentions that he was buried in his

coronation robes, with a golden crown on his head and gloves on his hands. Gloves were also found on the hands of King John when his tomb was opened in 1797, and on the hands of Edward I. when his tomb was opened in 1774. In the 14th century they were in common use among the better classes. In the 16th century they were frequently embroidered with great elaboration, and in the reign of Charles II. the short sleeves of the ladies' dresses brought in long gloves reaching almost to the elbow. It is an old custom in England that a pair of gloves are given by the sheriff to the judge who presides at a maiden assize ; and in Scotland white gloves are given to the judges on a mnaiden circuit,—that is, when there are no cases for trial.

The manufacture of gloves was early introduced into the British Islands, and such was the dignity of the craft that,

of glovers of Perth was chartered—a wealthy guild still existing, although the calling has long ceased to characterize that town. The glovers' company of London received its armorial bearings as early as 1464, but the body was not chartered till 1638 ; and in Worcester, which has long been the principal British centre of the trade, a company was incorporated in 1661.

The glove industry of the present day is both extensive and diversified, seeing that gloves are now almost univer- sally worn, and made of various classes of material and in several different ways. Of yarn, thread, silk, and cloth gloves it is unnecessary to speak, as these varieties are, in comparison with leather gloves, of comparatively little im- portance. The leather employed by glovers is prepared from the skins of deer, sheep and lambs, goats and kids— the last being by far the most important. The skins are prepared either by the ordinary processes of shamoying for wash-leather and doe or buck leather gloves, or by a special method of tawing in the case of ordinary dress gloves, The kid-skins are principally collected by hawkers in the South European countries, and sold in the Leipsic and Naples fairs. The tawing industry is conducted on a great scale at Annonay, Paris, and Milhau in France. The tawing process differs from ordinary tanning in the greater care and cleanliness of all the operations, in the submission of the dressed skins to a brief fermentation by piling them under the influence of heat, which increases the soft- ness and flexibility of the leather, and in

tawing witha mixture of flour, the yellow of eggs, and alum. On the completion of this operation, they are stretched by hand and dried as rapidly as possible. Thereafter they are damped, placed in dozens between linen cloths, and worked about to render them soft and pliable, after which they are planed on the flesh side, dried, and again planed. They are then polished by rubbing with a heavy glass disc or other smooth substance, and dyed by brushing liquid dyes over one side. Finally they are stretched on a marble table, and smoothed with a blunt knife. From a kid skin so prepared the materials of three gloves are obtained. The skins are moistened and stretched, and the various parts are cut out by a machine having steel punches the shape and size desired. The thumb piece, the quirks and the fourchettes inserted between the fingers, and the wrist welt—the latter frequently white—are cut out separately. Machine sewing, in which a kind of button stitch is made, is to a small ex- tent utilized in the manufacture of gloves ; but the greater part of the sewing is done by hand. The pieces to be sewn together are placed in a machine between a pair of jaws, the holding edge of which is composed of fine saw teeth, between each of which the sewer passes back and forward her needle, and in this way a neat uniform stitch is secured. There are three kinds of hand-sewing in the glove trade—round sewing or ordinary glove stitch, piqué stitch, and prick seam. After sewing, the backs are stitched or tam- boured, the button-hole is formed, the wrist attached, and the button sewed on, thus finishing the glove. After damp-

ing and stretching to its utmost length, the glove is ready to be stamped and put up for use.

Paris is, beyond question, the most important centre of glove-making, and for delicacy of material and beauty of workmanship the productions of some Parisian manufac- turers are without any rivals; but it is at Grenoble that French gloves are most extensively manufactured. English

gloves, of unfailing excellence of material and workmanship, are principally made at Worcester; and in one specialty—

“dogskin” gloves made from Cape sheep-skin, having 4 warm tan colour—English makers have no competitors. A very large quantity of cheap but

useful gloves are made at Brussels and Copenhagen. During the year 1876,1 084,400

as early as the reign of King Robert IIL, the incorporation | dozen pairs, of a value of £1,380,884, were imported into

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the United Kingdom from France; from Belgium there were 301,305 dozen pairs, valued at £345,174; and the total imports from all quarters amounted to 1,497,437 dozen pairs, of a value of £1,840,956. In 1878 the total imports were 1,060,940 dozen pairs, valued at £1,302,060.

Buckskin gloves are largely made in the United States, and that branch, together with a limited production of kid and other gloves, is chiefly centred in the village of Gloversville, Fulton co., N.Y. It is estimated that from about 140 separate glove factories in that village not less than two-thirds of the gloves made in the United States are sent out. Kid gloves are made to some extent in New York city.

GLOVER, Ricuarp (17 12-1785), an English poet, was born in 1712, He was the son of a London mer. chant, and received his education at Cheam in Surrey. While there he wrote in his sixteenth year a poem to the memory of Sir Isaac Newton, which was appended by Dr Pemberton to his View of Newton's Philosophy, published in 1728. Though Glover followed the business of his father, he devoted much of his attention to literary pursuits, and he aequired the reputation of being one of the best Greek scholars and most famous poets of his day. In 1737 he published an epic poem, Leonidas, written in celebration of the defence of Thermopyle. As the praise of liberty formed the subject matter of the poem, it was thought to have a special reference to the politics of the time ; and being warmly commended by the regent and his court, by Lord Lyttelton, and the novelist Fielding, it soon passed through several editions, Though exhibiting a well-culti- vated taste and some skill in versification, it possesses, how- ever,

little poetical merit, and is totally wanting in the higher qualities of epic poetry. A continuation of the Leonidas, entitled Atheniad, subsequently appeared, but had little or no popularity. In 1739 Glover published a poem entitled London, or the Progress of Commerce ; and in the same year, with a view to excite the nation against the Spaniards, he wrote a ballad, Hosier's Ghost, which is spirited and effective, and was one of the most popular of its day. He was also the author of two tragedies, Boadicea (1753)and Medea (17 61), which, however, on account of their close imitation of Greek models, are unsuited for the modern Stage. The success of Glover's Leonidas led him to take considerable interest in politics, and in 1760 he entered parliament as member for Weymouth, in which capacity his abilities as a speaker, and his knowledge of commercial questions, acquired for him considerable influence. He died in November 1785. His diary, entitled Memoirs of a dis- tinguished literary and political Character from 1742 to 1757, was published in 1813. Glover is one of the reputed authors of Junius; but his claims—which were advocated in an J; nguary concerning the author of the Letters of Junius, with reference to the Memoirs, &c., published in 1815—rest on very slight grounds.

GLOWWORM. See CoLEoprera, vol. vi. p. 132.

GLUCINUM, or Berviuium (Greek yAukds, sweet, from the taste of its salts), is a metal related most nearly in its physical properties to zinc and mercury, symbol G, atomic Weight 9°3. It occurs in the beryl and emerald, G,A1,8i,0,,, or 3G0,A1,0,,6Si0, (see vol. iii. p. 613, and vol. viii. p- 170), from which its oxide was earliest obtained by Vauquelin In 1798; also in the minerals euclase (H,G,Al,Si,0,,, or H,0,2G0,A1,0, »28i10.), phenacite (G,SiO,), chrysoberyl (GO,A1,0,), gadolinite, leucophanite, and helvite. Glucinum was first obtained by Wohler and Bussy in 1828, in an im- pure pulverulent form, by the fusion of its chloride with potassium ; and by Debray in 1854, in the compact state, by the decomposition in an atmosphere of hydrogen of the vapour of the chloride by that of sodium (Ann. Chim. Phys., Ser. ill, vol. xliy, 5). Heated in air the metal oxidizes

superficially, or, if in a state of fine division, burns with brilliancy. The spark-spectrum of glucinum presents two brilliant blue lines. Glucinum

may be estimated in mine- rals, after removal of their silica, in the insoluble form or as fluoride, by the separation of aluminium mostly as alum, what remains being tlien thrown down, with iron, by means of warm solution of ammonium carbonate ; to the filtrate excess of hydrochloric acid is added ; and finally the glucinum is precipitated as hydrate, G(OH),, which is washed, dried, and ignited. An alloy of glucinum with iron has been obtained by Davy and by Stromeyer,

On the chemistry of glucinum see further vol. v. pp. 526-8 and 543; also Watts, Dict, of Chemistry, ii.; W. Crookes, Select Methods

in Chemical Analysis, pp. 45, 46, 66 ; and Roscoe and Schorlemmer, Treatise on Chemistry, ii. pt. 1, pp. 231-6.

GLUCK (not, as frequently spelt, Gitick), CHRISTOPHER WILLIBALD (17 14-1787), a celebrated operatic composer, was born at Heidenwang, near Neumarkt, in the Upper Palatinate, on July 2,1714, He belonged to the lower middle class, his father being gamekeeper to Prince Lob- kowitz; but the boy's education was not neglected on that account. From his twelfth to his eighteenth year he fre- quented the Jesuit school of Kommotow in the neighbour- hood of Prince Lobkowitz's estate in Bohemia, where he not only received a good general education, but also had lessons in music. At the age of eighteen Gluck went to Prague, where he continued his musical studies under Czernhorsky, and maintained himself by the exercise of his art, sometimes in the very humble capacity of fiddler at village fairs and dances. Through the introduction of Prince Lobkowitz, however, he soon gained access to the best families of the Austrian nobility, and when in 1736 he proceeded to Vienna, he was hospitably received at his pro- tector's palace. Here he met Prince Melzi, an ardent lover of music, who invited Gluck to accompany him to Milan, where the young musician continued his education under Giovanni Battista San Martini, an interesting composer who, although self-taught, was one of the most accomplished musicians of the 18th century, and has been called the model of Haydn. His works belong chiefly to the class of chamber music. In this respect, however, the master's example was not followed by the pupil. Gluck's dramatic instinct was irrepressible, and soon we find him producing operas at the rapid rate necessitated by the omnivorous taste of the Italian public in those days.

Eight of these works were produced at various Italian theatres between 1741 and 1745. Although favourably received, they were not much above the ordinary operatic level of the day, and it would be needless even to give their names. Only the first may be mentioned here, Artaserse, libretto by Metas- tasio, first performed at Milan in 1741. To the repu- tation thus acquired Gluck owed an invitation to London, where in 1745 he became composer for the opera house in the Haymarket. The first opera produced there was called La Caduta dei Giganti (1746, words by Metastasio), followed by one of his earlier operas, re-written for the purpose. It is stated that he also appeared as a performer on the musi- cal glasses. The success of the two operas, as well as that of a so-called pasticcio, or dramatic medley entitled Piramo e Tisbe, was anything but brilliant, and Gluck accordingly left London. But his stay in England, although not accompanied by immediate success, was not without important consequences for his subsequent career. Gluck at this time was neither more nor less than an ordinary producer of Italian opera. Handel's well-known saying that Gluck knew no more counterpoint than his (Han- del's) cook, whether true or not, was unfair, for the reason that, if Gluck had known as much counterpoint as the author of Israel in Egypt himself, it would have been difficult to make use of it in the style of music

then exclusively cultivated by him. Had the young com- poser been successful in the ordinary opera seria, there is every reason to fear that the great dramatic reform, initiated by him, would never have taken place. The critical temper of the London public fortunately averted this calamity. It may also be assumed that the musical atmosphere of the English capital, and especially the great works of Handel, were not without beneficial influence upon the young com- poser. But of still greater importance in this respect was a short trip to Paris, where Gluck became for the first time acquainted with the classic traditions and the declamatory style of the French opera—the future scene of his own triumphs. Of these great issues little trace, however, is to be found in the works produced by Gluck during the fifteen years after his return from England. His first opera written for Vienna, called La Semiramide reconosciuta (1748), is again an opera seria of the ordinary kind, and little more cau be said of Zelemacco (Rome,

1749), La Clemenza di Tito (Naples, 1751), and numerous occasional pieces of a more or less serious kind written for the court at Vienna, where Gluck settled permanently in 1756, having two years previously been appointed court chapel-master, with asalary of 2000 florins, by the empress Maria Theresa. On a previous occasion he had received the order of knight- hood from the pope, consequent upon the successful produc- tion of two of his works in Rome. During the long inter- val from 1756 (the date of his opera J/ Ré Pastore) to 1762, Gluck seems to have matured his plans for the reform of the opera; and, barring a ballet named, like Mozart's opera, Don Giovanni, and some airs nouveaux to French words with pianoforte accompaniment, no compositions of any im- portance have to be recorded. His piece d' occasion, 11 Trionfo di Clelia, produced at Bologna in 1762, is still written in the old manner. But his Orfeo ed Huridice, played in October of the same year at Vienna, shows that the composer had entered upon a new career. It is significant that in the original score the work is de- scribed as a "dramma per musica" or niusic-drama, the title opera seria being avoided. Gluck also for the first time had deserted Metastasio, and Raniero Calzabigi fur- nished the highly dramatic book of Orpheus. Quite apart from its significance in the history of dramatic music, Orpheus is a work which, by its intrinsic beauty, commands the highest admiration, and does not fail to impress an audience, even now, wherever an adequate representative of the title-part can be found. Orpheus's air, " Che faro," is known to everyone; but finer even is the great scena in which the poet's song softens even the ombre sdegnose of Tartarus. The ascending passion of the entries of the solo (Deh! placatevi; Mille pene; Men tiranne), interrupted by the harsh but gradually-softening exclamations of the Furies, is of the highest dramatic effect. These melodies, moreover, as well as every declamatory passage assigned to Orpheus, are made subservient to the purposes of dramatic characteri- zation ; that is, they could not possibly be assigned to any other person in the drama, any more than Hamlet's mono- logue could be spoken by Polonius. It is in this power of musically realizing a character—a power all but unknown in the opera of his day—that Gluck's genius as a dramatic composer is chiefly shown. After a short relapse into his earlier manner, Gluck followed up his Orpheus by a second classical music-drama named Alceste, and first produced in December 1767 at Vienna. In his dedication of the score to the grand-duke of Tuscany, Gluck has fully expressed his aims, as well as the reasons for his total breach with

the old traditions. “I shall try,” he writes, ‘to reduce music to its real function, that of seconding poetry by intensifying the expression of sentiments and the intercst of situations without interrupting the action by needless ornament. I have accordingly taken care not to interrupt the singer in

the heat of the dialogue, to wait for a tedious ritornel, nor do J allow him to stop on a sonorous vowel, in the middle of a phrase, in order to show the nimbleness of a beautiful voice in a long cadenza.” Such theories, and the stern consist- ency with which they were carried out, were little to the taste of the pleasure-loving Viennese ; and the success of Alceste, as well as that of Paris and IHelena, which followed two years later, was not such as Gluck had desired and ex- pected. He therefore eagerly accepted the chance of find- ing a home for his art in the centre of intellectual and more especially dramatic life, Paris. Such a chance was opened to him through M. Bailli du Rollet, attaché of the French embassy at Vienna, and a musical amateur who entered into Gluck’s ideas with enthusiasm. A classic opera for the Paris stage was accordingly projected, and the friends fixed upon Racine’s Iphigénie en Aulide. After some difficulties, overcome chiefly by the intervention of Gluck’s former pupil the dauphiness Marie Antoinette, the opera was at last accepted and performed at the Académie de Musique, on April 19, 1774. The great importance of the new work was at once perceived by the musical ama- teurs of the French capital, and a hot controversy on the merits of Jphigénie ensued, in which some of the leading literary men of France took part. Amongst Gluck’s opponents were not only the admirers of Italian vocalization and sweetuess, but also the adherents of the earlier French school, who refused to see in Gluck the legitimate suc- cessor of Lulli and Rameau. Marmontel, Laharpe, and D’Alembert were opponents, the Abbé Arnaud «and others the enthusiastic friends of the German master. Rousseau took a peculiar position in the struggle. In his early writings he is a violent partisan of Italian music, but when Gluck himself appeared as the Frencli champion, he will- ingly acknowledged the great composer’s genius. In a letter to Dr Burney, written shortly before his death, Rousseau gives a close and appreciative analysis of the Adceste, the first Italian version of which Gluck had submitted to him for suggestions ;

aud when, on the first performance of the piece not being received favourably by the Parisian audi- ence, the composer exclaimed, “ Alceste est tombée,” Rous- seau is said to have comforted him with the flattering bon- mot, ‘Oui, mais elle est tombée du ciel.” The contest received a still more personal character when Piccini, a celebrated and by no means incapable composer, came to Paris as the champion of the Italian party. Into the details of the historic battle between Gluckists and Piccinists this is not the place to enter. Volumes have been written on the subject, and the whole affair has been denounced asa sign of the frivolity of the eighteenth century. But to those interested in music and in the dramia, the question whether the vocal virtuoso or the trne dramatic artist should reign on the lyrical stage is by no means without import- ance; although, perhaps, the geutlemen of the queen’s court, and their friends who applauded her countryman and pro- tegé Gluck from “le coin de la reine,” hardly looked upou the matter in so serious a light. The victory at last re mained, by common consent (including, it is said, Piccint’s own), with Gluck. Thesuccession of the operas written for Paris is the following :—Orphée et Eurydice (the Orfeo te written), 1774; Alceste (also an adaptation of the earlier work, 1776); Armide, 1777 ; Iphigénie en Tauride, 1779. Some minor compositions, written partly by desire of the queen for the court festivals, it would be needless to men: tion. Gluck was engaged upon an opera Les Danardes when an attack of apoplexy compelled him to relinquish all thoughts of work. He left Paris for Vienna, where he lived for several years in dignified leisure, disturbed only by his declining health. He died on November 18, 1787. To the general character of Gluck’s music some allusion has already been made. He was essentially a dramate

composer, and no notice need be taken of the few works belonging to a different sphere. In connexion with its dramatic purpose his music ought always to be judged. He never was a great contrapuntist in the sense that Bach and Handel were. But neither was there much room for polyphonous display in the music-drama as he understood it. The chorus of Scythians in the second Iphigenca (“Tl nous falloit du sang ”) would not gain in effect if it contained an elaborate fugue. This and other choruses in the same great work at the same time illustrate Gluck’s power of rendering musically national as well as individual characteristics. As a masterly trait of psycho- logical characterization may further be cited the accompani- ment to Orestes’s air, also in Iphigénie en Tauride (“Le calme rentre dans mon coeur”), where the unfortunate man in vain tries to find relief from the pangs of conscience, distinctly heard in the unceasing semiquavers of the orchestral accompaniment. The severe censure passed on Gluck for drowning the voices by the instruments posterity has converted into one of the composer’s highest claims to fame. Not only has Gluck developed the orchestra as re- gards mere beauty and volume of sound, but he also has made it an important factor in the dramatic organism. Instances from the second J Plugénte alone might again be multiplied. The savage Scythians, for instance, are charac- terized by the noise of brass and percussion ; while Iphi- génie’s simple prayer is accom panied by the strings and two oboes. The care bestowed by Gluck upon a correct and emphatic declamation of the words is another important point in his dramatic reform. Readers interested in the matter will have noticed the striking parallelism between the views and aims advocated by Gluck in the 18th century and by Wagner in the 19th century—a parallelism which may be extended to the bitter animadversions evoked by these theories amongst contemporary critics. The means, however, by which the theories were to be realized are very different in the two cases. Gluck’s reform is essen- tially directed against the encroachments of the singer; Wagner’s against those of the composer as an independent artist. Gluck, it is true, felt the necessity of a perfect unity between music and poetry, but he never intended to bring about this desirable effect by surrendering any of the strict forms of his own art. The consequence was that the poet was more than ever bound to adapt his work to the demands of the composer, and that the latter remained practically the omnipotent ruler on the operatic stage. Wagner at last has made dramatic

purpose the suprenie consideration to which the forms of music, as a separate art, have to submit,

An altogether satisfactory biography of Gluck remains stil] to be written. With regard to the life, Anton Schmid's Chr. W. Ritter

von Gluck may be consulted. Herr Marx, in his Gluck und die Opera, has attempted to define the composer's position in the history of dramatic music. M. Desnoiresterres's Gluck et Piccini refers to the most important portion of the composer's career. For it must always be remembered that Gluck, although a German by birth, belongs as an artist to France rather than to his native country. His works form as it were the musical complement to the tragedy of Corneille and Racine. In France he was first appre- ciated, and in France also his traditions were continued by a school of highly gifted composers. (F. H.)

GLUCKSTADT, a town of Prussia, in the province of Schleswig-Holstein, is situated on the right bank of the Ibe, where it receives the small river Rhin, and on the railway from Itzehoe to Elmshorn, 28 miles N.W. of Altona, thas a Protestant and a Catholic church, a synagogue, a symuasium, a provincial prison, and a provincial penitenti- ary. 'The inhabitants are chiefly engaged in commerce and fishing; but the frequent losses from inundations has greatly retarded the prosperity of the town. It suffers at the same time from a very deficient water supply for culinary purposes,

Gliickstadt was founded by Christian 1V. of Denmark in 1616, and fortified in 1620. It was formerly the seat of the royal dukes of Schleswig-Holstein, who assumed from it the name of Holstcin- Gliickstadt. In 1627-8 it was besieged for fifteen weeks by Tilly, without success. In 1814 it was blockaded by the allies and eapitu- lated, whereupon its fortifications were demolished. In 1830 it was made a free port. It came into the possession of Prussia along with the rest of Schleswig-Holstein in 1866, The population in 1875 was

5031

GLUCOSE, a species of sugar, on the chemical and other properties and the occurrence and manufacture of which see articles CHEMISTRY, vol. y, pp.

564, 572; DeExtRin and Diazertes, vol. vii. pp. 146, 147; Fermenra- TION, vol. ix. pp. 93, 94, 96, 97; Gatzic ActD, vol, x. p. 41; and Sugar.

GLUE. See Grnarin,

GLUKHOFF, or GLucHow, as the name is transliterated in Gerinan, a town of Russia, at the head of a district in the government of Tchernigoff, 132 miles E. of Tchernigoff in 51° 54'N. lat. and 33° 35' E, long., on the highway between Moscow and Kieff. It is situated on the sloping banks of the Yasmin, a subtributary of the Desna, which in its turn unites with the Dnieper. Among its buildings are eleven churches and two Jewish meeting-houses, a district school, an almshouse, and a hospital, In 1860 its population, mainly engaged in agricultural pursuits and petty commerce, amounted to 10,008, of whom 4998 were males ; dn BFS it was 10,747 ; and according to the St Petersburg Calendar for 1878, it has increased to 13,398. The Jews in 1860 numbered 2517. About 4 miles from the town, near the village of Poloshek, there exists an extensive deposit of white clay, which supplies nearly all the porcelain factories in Russia. Glukhoff is mentioned in the Laurentian Chronicle as early as 1152. For some time it was in the hands of a branch of the ducal family of Tchernigoff, which retired before the encroachments of the Tartars in the middle of the 13th century. Before its final incorporation with Russia, it passed under the sway first of the Lithuanians and then of the Poles. On the destruction of Baturin by Peter I. in 1708, it was made the residence of the hetmans.

GLUTEN, a tough, tenacious, ductile, somewhat elastic, nearly tasteless, and greyish-yellow albuminous substance, obtained from the flour of wheat by washing in water, in which it is insoluble. In Martin's apparatus for the pre- paration of gluten on the large scale, balls of dongh are worked backwards and forwards in troughs by means of cylinders, whilst water plays upon them in fine jets delivered by copper pipes. A sack of flour may be thus made to yield about 110 ib of moist gluten, and twice that quantity of dry starch. Good samples of white English wheat con- tain some 10 or 11 per cent, of gluten; from hard Venezuela wheat as much as 22°75 per cent. has been pro- cured. The outer and inner coats of wheat, separated from it as bran, contain respectively 4 or 5and 14 to 20 per cent. of gluten. Gluten, when dried, loses about two-thirds of its weight, becoming brittle and semi-

transparent ; when strongly heated it crackles and swells, and burns like feather or horn. It is soluble in strong acetic acid, and in caustic alkalies, which latter may be used for the purification of starch in which it is present. When treated with ‘1 to ‘2 per cent, solution of hydrochloric acid it swells up, and at length forms a liquid resembling a solution of albumin, and leevorotatory as regards polarized light. Moistened with water and exposed to the air gluten putrefies, and evolves carbon dioxide, hydrogen, and sulphuretted hydrogen, and in the end is almost entirely resolved into a liquid, which contains leucin and ammonium phosphate and acetate. On analysis gluten shows a composition of about 53 per cent. of carbon, 7 per cent. of hydrogen, and nitrogen 15 to 18 per cent., besides oxygen, and about 1 per cent. of sulphur, and a small quantity of inorganic matter. It is not a

simple substance, and according to Ritthausen consists of glutencasein (Liebig’s vegetable fibrin), glutenjibrin, gliadin Pflanzenleim), glutin or vegetable gelatin, and mucedin, which are all closely allied to one another in chemical com- position, It is the gliadin which confers upon gluten its capacity of cohering to form elastic masses, and of separat- ing readily from associated starch. In the so-called gluten of the flour of barley, rye, and maize, this body is absent (Kreusler and Ritthausen). The gluten yielded by wheat which has undergone fermentation or has begun to sprout is devoid of toughness and elasticity. These qualities can be restored to it by kneading with salt, lime-water, or alum. Koopmans found that a larger amount of raw gluten was digested in a relatively dilute than in a strong artificial gastric juice, the reverse holding good of albumin. From experiments on six pigs and three dogs, he came to the con- clusion that the digestive fluid in the stomachs of living animals, even of the same species, dissolves unlike quantities of albumin and gluten, so that if much albumin be digested the loss of weight of gluten present with it is but small, and vice versa (see Brit. and For, Med.-Chir. Rev., 1857, ii. pp. 318-25). Gluten is employed in the manufacture of gluten bread and biscuits for the diabetic (see D1aBETES, vol. vii. p. 148), and of chocolate, and also in the adulteration of tea and coffee. For making bread it must be used fresh, as otherwise it decomposes, and does not knead well. Granu- lated gluten is a kind of vermicelli, made

in some starch manufactories by mixing fresh gluten with twice its weight of flour, and granulating by means of a cylinder and con- tained stirrer, each armed with spikes, and revolving in opposite directions. The process is completed by the drying and sifting of the granules. See H. Ritthausen, “Ueber die Bestandtheile des Weizenklebers,” Erdmann’s Journ. f. praktische Chemie, lxxxv., 1862, pp. 193-229 ; also ib., Ixxxvi., 1862, pp. 257-265; and lxxxviii., 1863, pp. 141—

147; T. Langer, Lehrbuch der Chemie, pp. 361-371, Leipsic, 1878 ; and Payen, Industrial Chemistry, ed. B. H. Paul, 1878.

GLUTTON, or Wotverene (Gulo luscus), a carnivor- ous mammal, belonging to the DMustelide or weasel family, but differing from the typical forms of the genus Mustela in the greater heaviness and clumsiness of its body, present- ing in this respect a striking resemblance to the bear. Its legs are short and stout, with large feet, the toes of which terminate in strong, sharp claws, considerably curved. Its mode of progression is semi-plantigrade. In size and form it is not unlike the European badger, measuring from 2 to 3 fect in length, exclusive of the thick bushy tail, which is about 8 inches long. Its head is broad, its eyes small, with defective vision, and its back arched. Its fur consists of an undergrowth of short woolly hair, mixed with long straight hairs, to the abundance and length of which on the sides and tail the creature owes its shaggy appearance. The colour of its fur is blackish-brown, with a broad band of chestnut colour stretching from the shoulders along each side of the body, the two meeting near the root of the tail ; while, unlike the majority of arctic animals, the fur of the glutton in winter-time grows darker in colour. Like other weasels it is provided with anal glands, which secrete a yellowish fluid possessing a highly foetid odour. The glutton is a boreal animal, inhabiting the northern regions of both hemispheres, but most abundant in the cireumpolar area of the New World, where it occurs throughont the British provinces and Alaska, being specially numerous in the neighbourhood of the Mackenzie River, and extending southwards as far as New York and the Rocky Mountains. Many erroneous statements have been made regarding the glutton by early writers on natural history, from Olaus Magnus to Buffon, one of which has perpetuated itself in the animal’s

common name,—the fact being that the wolverene is not more gluttonous than are the majority of

carnivorous animals, It feeds on grouse and the smaller rodents, and on foxes, which it digs from their burrows during the breeding season. Its want of activity, however, renders it dependent for most of its food on the dead car- cases of animals. These it frequently obtains by methods which have made it peculiarly obnoxious to the hunter and trapper. Should the hunter, after succeeding in killing his game, leave the carcase insufficiently protected for more than a single night, the glutton, whose fear of snares is sufficient to prevent him from touching it during the first night, will, if possible, get at and devour what he can of it on the second, hiding the remainder beneath the snow. He annoys the trapper by following up his lines of marten traps, which often extend to a length of 40 or 50 miles, each of which he enters from behind, extracting the bait, pulling up the traps, and devouring or concealing the entrapped martens. So persistent is the glutton in this practice, when once it discovers a line of traps, that its extermination along the trapper's route is a necessary preliminary to the success- ful prosecution of his business. This is, however, no easy task, as the glutton is too cunning to be caught by the methods successfully employed on the other members of the weasel family. The trap generally used for this purpose is one made to resemble a cache, or hidden store of food, such

as the Indians and hunters are in the habit of forming, the discovery and rifling of which is one of the glutton's most congenial occupations,—the bait, instead of being paraded as in most traps, being in this case carefully concealed, to lull the knowing beast's suspicions. One of the most pro- minent characteristics of the wolverene is its propensity, akin to that of certain members of the crow family, to steal and hide things, not merely food which it might afterwards need, or traps which it regards as personal enemies, but articles which cannot possibly have any interest for it except that of curiosity. An amusing instance of this is quoted by Coues in his valuable work, recently published, on the Fur-bearing Animals of North America, in which he says— "A hunter and his family, having left their

lodge ur guarded during their absence, on their return found it completely gutted—the walls were there, but nothing else. Blankets, guns, kettles, axes, cans, knives, and all the other paraphernalia of a trapper's tent had vanished, and the tracks left by the beast showed who had been the thief. The family set to work, and, by carefully following up all his paths, recovered, with some trifling exceptions, the whole of the lost property." The cunning it displays in unravelling the oftentimes complicated snares set for it forms at once the admiration and the despair of every trapper, while its great strength and ferocity render 1t 4

dangerous antagonist to animals much larger than itself, and occasionally even to man. The rutting season occurs in March, and the female, secure in her burrow, produces her young—four or five at a birth—in June or J uly. In de- fence of these she is exceedingly bold, and the Indians, according to Cowes, "have been heard to say that they would sooner encounter a she-bear with her cubs than a carcajou (the Indian name of the glutton) under the same circumstances." The wolverene has a curious habit which has not hitherto been observed in any other of the lower animals. On catching sight of its relentless human enemy, it may be observed, before finally determining on flight, sitting on its haunches, and, in order to get a clearer view of the danger, shading its eyes with one of its forepaws. When ' pressed for food it becomes fearless, and has then been known to come on board an ice-bound vessel, and in pre- sence of the crew to seize on a canister of meat, The flesh

laundry operations of Nausicaa, The discovery of glycerin, however, is of modern origin, the body having been first described in 1776 by Scheele under the name of oelsiiss (principe doux des huiles—sweet principle of oils), and more fully investigated subsequently by Chevreul, Berthelot, and many other chemists, from whose researches it results that glycerin is a trihydric alcohol indicated by the formula C;H;(OH),, the natural fats and oils, and the glycerides generally, being substances of the nature of compound ethers formed from glycerin by the replacement of the hydrogen of the OH groups by the radicals of certain acids, called for that reason " fatty acids."! The relationship of these glycerides to glycerin will be more

conveniently shown by an example, such as the series of bodies formed from glycerin by replacemeut of hydrogen by “€ stearyl ” (C,,H;,0), the radical of stearic acid (C,3H3,0.0H):—

: been Glyeerin. Monostearin. Distearin. Tristearin, | of the glutton is uneatable 3 1t is therefore only valuable CH, . OH CHy . O(CigH330) CH, . OC rgl13s0) CHz . OC gH350) | ‘for its ne ~~ ey several skins are sewn together, CH .OH CH .oH CH . O(CigHs50) CH . 0(C,gH450) o forms elegant hearth an carriage rugs, CH,.OH CH,. oH CH, . OH CH . O(CygH550)

GLYCAS, Mrcwast, a Byzantine historian, often called Siculus. The time when he flourished is very uncertain.

He is justly reckoned among the better Byzantine historians

on account of the terseness and perspicuity of his style. His MS. letters still extant are addressed to the last Constan- | tine; their authenticity, however, has been questioned.

These four substances evidently form a progressive series, each number of which differs from the preceding one in the same way, viz,, that one more stearyl group replaces hydrogen in the original OH groups,

The process of saponification may be viewed as the gradual progressive transformation of tristearin, or some analogously constituted substance, into distearin, monostearin, and glycerin, or as the similar transformation of a substance analogous to distearin or to monostearin into glycerin. If the reaction is brought about in presence of an alkali, the acid set free becomes transformed into the corresponding alkaline salt; but if the decomposition is effected without the presence of an alkali (i.e, by means of water alone, or by an acid fluid), the acid set free and the glycerin are ob- tained together in a form which usually admits of their ready separation. It is noticeable that with few exceptions the fatty and oily matters occurring in nature are sub- stances analogous to tristearin, .e., they are trebly replaced glycerins. Amongst these glycerides may be mentioned the following :—

Pristearin—CH,(0.CgH 0)», The chief constituent of hard animal fats, such as beef and mutton tallow, &c.; also con- tained in many vegetable fats in smaller quantity.

Priolein—C,H;(0.C,,H4,0)s. Largely present in olive oil and other saponifiable vegetable oils and soft fats; also present in animal fats, especially hog's lard.

Lripalmitin—CzH,(0.C,gHy,0)s, The chief constituent of palm oil; also contained in greater or less quantities in human fat, olive oil, and other animal and vegetable fats.

Lriricinolein—C,H,(0. CigH3302)3. The main constituent of castor oil.

Other analogous glycerides are apparently contained in greater or smaller quantity in certain other oils, Thus in cows' butter, tributyrin, C;H; (O.C,H,O),, and the analogous glycerides of other readily volatile acids closely resembling butyric acid, are present in small quantity ; the production of these acids on saponification and distillation with dilute sulphuric acid is utilized as a test of a purity of butter as sold. 7'riacetin, C3H;(0.C,H,0),, is appar- ently contained in cod-liver oil. Some other glycerides isolated from natural sources are analogous in composi- tion to tristearin, but with this difference, that the three radicals which replace hydrogen in glycerin are not all identical ; thus kephalin, myelin, and lecithin are glycerides in which two hydrogens are replaced by fatty acid radicals, 'aud the third by a complex phosphoric acid derivative. In no case, however, is the existence of a natural glyceride eg Ural erycemae

His chief work is BéBdos Xpovixy, divided into four parts, treating of history from the creation of the world to the death of Alexis I. Comnenus (1118). The best edition is that sf J. Bekker, in the Bonn collection of the Byzantines

1836).

GLYCERIN, Gtycerine, or Gryceror (in pharmacy Gtycsrinum), a sugar-like substance obtainable from most natural fatty bodies by the action of alkalies and similar reagents, whereby the fats are decomposed, water

being taken up, and glycerin being formed together with the alkaline salt of some particular acid (varying with the nature of the fat). Owing to their possession of this common property, these natural fatty bodies and various artificial derivatives of glycerin, which behave in the same way when treated with alkalies, are known as glycerides. This decomposition into an organic acid and a substance of more or less neutral character is a typical kind of reaction with numerous classes of organic bodies, and is termed sapont- Jication, from the circumstance that the ordinary process of soap-making consists simply in the formation from natural fatty bodies and alkalies of the alkaline salts of the fatty acids thence derivable, soap being a mixture of these alkaline Salts in various proportions, according to the particular pur- poses for which it is required, and its price. Inthe ordinary process of soap-making the complementary product, glycerin, remains dissolved in the aqueous liquors from which the Soap is separated, and is usually thrown away ; in many other instances, however, in which a substance capable of | undergoing a reaction of saponification is thus treated, the } product complementary to the alkaline salt is the more im- portant of the two. The fact that soap is obtainable by boiling together oily or fatty substances and alkalies (such as potashes and natron or mineral alkali) was known at an early period of history, being mentioned by Pliny, Galen, Aetius, and Paulus Aigineta. On the other hand, substances referred to in the Old Testament and translated « soap ” (¢.g., Jeremiah ii. 22, “For though thou wash thee with nitre [properly, natron], and take thee much soap ;” Malachi iii. 2, “For he is like ‘ refiner’s fire, and like fuller’s soap”) refer to the alkali | itself (viz., borith = vegetable alkali, potash ; or neter = mineral alkali, soda), and not to the substances prepared from oily bodies and these alkaline matters. Similarly Homer makes no mention of soap whilst describing the

1 The name is often further extended so as to embrace other acids, analogous to the true acids of fats and oils in composition, properties, and chemical characters, but not yet found to exist in natural oils and

fats, X. — 88

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analogous to distearin or monostearin substantiated with certainty, bodies of these classes being either formed syn- thetically by reversing the reactions of saponification, or being produced by the partial saponification of substances analogous to tristearin.

Glycerin is also a product of certain kinds of fermentation, especially of the alcoholic fermentation of sugar ; thus it is a constituent of many wines and other fermented liquors, being formed together with small quantities of various other substances by reactions subsidiary only to the main change taking place, and hence varying in their nature and extent with circumstances. According to Pasteur, about z\5th of the sugar transformed under ordinary conditions in the fermentation of grape juice and similar saccharine liquids into alcohol and other products becomes converted into glycerin. In certain natural fatty substances, ¢7., palm oil, it exists in the free state, so that it can be separated by washing with boiling water, which dissolves the glycerin but not the fatty glycerides; but how far its occurrence in this form is due to the breaking up of the glyceride by a spontaneous saponification is open to some question.

Properties. —In a state of purity glycerin is a viscid, colourless liquid of sp. gr. 1°264, possessing a somewhat mawkish sweet taste; when exposed to a high degree of cold for a long time it sometimes solidifies to a crystalline mass, which then melts at about 7° C. The crystals when once melted often do not resolidify again readily, even when in contact with the solid substance, although sometimes contact with a crystal of the solid at a temperature of about 0° suffices to produce solidification of the whole. This solidification of glycerin is, however, a very exceptional phenomenon, only occurring with extremely pure sub. stance under certain conditions not thoroughly under- stood, and then only after long continued exposure to a low temperature, as during a cold winter. When con- taining a minute quantity of water glycerin never solidi- fies, and to this circumstance several of its useful applica- tions are due. A weak aqueous solution, when chilled sufficiently, allows crystals of ice to form, the glycerin accumulating in the unfrozen portion as alcohol does when a mixture of spirit and water is partially frozen. When heated alone it partially volatilizes, but the greater part decomposes ; by reducing the pressure to about +’,th of an atmosphere, it can, however, be readily distilled unchanged, boiling under a pressure of

50 millimetres of mercury at about 20° C. In an atmosphere of steam, also, it distils without decomposition under ordinary barometric pressure. In water and alcohol it dissolves readily in all proportions; in ether it is insoluble. Under certain conditions, such as prolonged contact with poor cheese and chalk at about 35° to 40° C., it can be made to ferment partially, becoming changed into alcohol ; but under any circumstances, only a small fraction, at most a tenth, becomes thus transformed, the rest remaining unaltered. It possesses remarkable solvent powers on many substances, whence it is employed for nunierous purposes in pharmacy and the arts. Its viscid character, and its non-liability to dry and harden by exposure to air, also fit it for various other uses, such as lubrication, &c., whilst its peculiar physical charac- ters, enabling it to blend with either aqueous or oily matters under certain circumstances, render it a useful ingredient in a large number of products of varied kinds. Applied to the living skin (and similarly to untanned leather) it pro- duces a remarkable softening effect, whence it is largely employed as a cosmetic, either by itself or in admixture with other substances. Taken internally it is alleged to be valuable as a substitute for cod-liver oil for phthisical patients, not possessing the disagreeable fishy flavour of that valuable food, and having a fattening tendency.

lower animals, it does not appear to possess any marked injurious action peculiar to itself; when, however, large doses of glycerin are subcutaneously injected into dogs, amounting to from 8 to 10 grammes per kilogramme of animal operated on (0°8 to 10 per cent. of the weight of the dog, corresponding to from 1 Ib to 1} Ib of glycerin for the weight of an average man), death ensues within twenty- four hours, accompanied by symptoms analogous to those of acute alcoholism (Dujardin, Beaumetz, and Audigé). Like sugar it possesses antiseptic qualities, so that meat, albumin, é&c., immersed in it do not for long periods of time undergo putrefactive clianges.

Manufacture.—The simplest modes of preparing glycerin in a state of purity are based on the saponification of fats, either by alkalies or analogous basic substances, or by superheated steam, and on the circumstance that, although glycerin cannot be distilled by itself under the ordinary pressure without decomposition, it can be readily volatilized in a current of

superheatcd steam ; in this way the glycerin formed is separated from the non-volatile snb- stances present. It was by means of saponification of olive oil or lard with litharge (lead oxide), wheieby a lead soap insoluble in water, or nearly so, is formed, together with glycerin, that the existence of glycerin was first demonstrated by Scheele, who obtained it asa bye-product in the formation of the ‘‘Jead-plaster” of pharmacy made from lard and lead oxide. Fora long time this was the ouly known method of preparing glycerin, the aqucous solution obtained being treated with sulphuretted hydrogen to remove any soluble lead compounds, filtered, and evaporated until almost all the water was driven off, leaving the glyceiin behind as a syrupy fluid. By evaporating down the spent leys of the soapmaker (after the soap is separated therefrom by ‘‘salting out,” and any excess of alkali neutralized with sulphuric acid), and treating the residue with alcohol, glycerin can also be obtained, the alcoholic solution of it thus formed being simply evaporated to drive off the alcohol; but this process is far too costly for ordinary purposes. An im- provement on this method was patented in 1858 by H. Reynolds, the concentrated leys being passed into a vessel where they are met by a stream of superheated steam at about 200° C. ; the glycerin then passes over with the aqueous vapour, whilst the inorganic salts present are left behind. In the manufacture ‘of stearic acid for candle-making (see CANDLE) one of the older processes was the saponification of tallow with lime, forming an insoluble lime soap and an aqueous solution of impure glycerin, fiom which the pure substance can be readily obtained by distillation with super. heated steam. Less pure products were foimerly obtained by treating the crude solution with sulphuric acid to separate lime, boiling to remove small quantities of volatile acids, evaporation, and filtration through animal charcoal to decolorize ; or by evaporat- ing, dissolving out by alcohol, and purifying by treating with lead oxide, filtering to separate an insoluble lead compound formed, removing lead from this filtrate by sulphuretted hydrogen, filtering again, and evaporating to a syrup. In practice all these older methods have, however, been superseded by the process patented in 1854 by Wilson & Payne. This consists in heating the fatty matter to be saponified in an appropriate still to a temperature of 290° to 315° C. (550° to 600° Fahr.), and passing in heated steam in such a way that it rises up through the fatty matter in numerous streams; saponification is thus rapidly effected, and the liberated glycerin and fatty acids are volatilized and carried along with the steam to the

condensing arrangement. If the temperature do not exceed 310° C, there is no fear of the glycerin being decomposed, whilst under suitable conditions even higher temperatures than this can be employed without causing its decomposition ; but there is always a great liability to destruction of glycerin when the tem- perature of 310° is exceeded. This arises from the tendency of the glycerin to char on heating, and to split up into water and acroletn (acrylic aldehyde), thus :—

C3Hg03 = 2H,0+C3H,0.

When a series of chambers is used as the refrigerator, the com- partments nearest the still are found to condense little but fatty acids, the water and glycerin chiefly accumulating in the more dis- tant chambers, the last of which is usually open to the air at the end; so that there is no excess of pressure in the still and con- densers; the fatty acids readily separate from the aqueous solntions of glycerin, which only requircs concentration by evaporation to be fit for the market. Since the date of Wilson's patent various special forms of apparatus for effecting the transformation have been patented by Wright & Fouché, Gilbee, and others.

This method of saponification is, strictly, only an improvement on former processes invented for the purpose of decomposing the glycerides and obtaining the fatty acids without the use of alkalies, lime, &c.; inthese older methods theextraction of glycerin was not an important feature, and they were frequently worked in such a way 88

When it is given in moderately small repeated doses to the | to decompose the whole or greater part of the glycerin pari passu with

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its liberation. Thus, as far back as 1825, Chevreul and Gay-Lussae sketched ont the idea of the process of saponification by superheated steam, and the method was actually carried out with certain modi- fications by various chemists and manufacturers. For example, in 1842, E. Price & Co. patented, in the name of Jones & Wilson, a

rocess of the kind, which was largely worked for some years; in this, the fatty matter frecd from extraneous impurities is mixed with 6 to 8 per cent. of strong sulphuric acid, and then heated in copper boilers to about 180° C., by superheated steam blown through the mass for about two hours; after which hotter steam at about 300° to 350° is blown through, when fatty acids distil, but little or no glycerin passes ove: unaltered, almost the whole being charred or decomposed, forming acrolein, &c. Here the saponification and destruction of glycerin are largely effected by the sulphuric acid, as well as by the steam itself, Price's process was suggested to the inventors by Tilghman's method, brought out early in 1854, which consisted in making an emulsion of melted fatty matter and water (or solution of alkali) by agita- tion, and then pumping it through a long coil of iron tubing kept at a temperature near that of melted lead under a pressure of about 2000 Ib to the square inch, In this way complete' saponification is effected, fatty acids and an aqueous solution of glycerin being obtained when water is used, and soap with more or less water and glycerin when alkaline liquor is employed. It is noticeable that in this process it is not necessary that the alkali: should be caustic, as it must be for the ordinary process of soap-boiling ; sodium and potassium carbonates answer just as well as their respective hydrates (caustic soda, caustic potash).

Derivatives.—Among the numerous derivatives obtainable from glycerin by appropriate chemical reactions, may be more particn- larly mentioned nitro-glycerin, which is, strictly speaking, im- properly named, inasniuch as it does not belong to the class of true nitro-substitution derivatives, but is simply constituted like tri- stearin, the radical of nitric acid displacing the hydrogen of the OH groups. By treating glycerin with nitric acid (preferably by dropping pure glyccrin into a mixture of nitrie and sulphuric acids) the following reaction ensues, the glycerin becoming what would be systematically termed trinitrin or glyccrotrinitrin :—

CH,. OH (CH2.0.NO, CH .OH + 2NO0,0H = 3H,0 + CRONO, CIl,. OH (CH,.O.NO,

By treating the resulting ‘‘nitro-glycerin” with caustic potash, saponification ensues, potassium nitrate being formed and glycerin reproduced precisely as when tristearin is similarly saponified, Two other important products obtainable from glycerin are isopropyl todide and allyl todide, each of which serves as the starting-point ot a large series of chemical products, many of them of utility in the arts. These substances are manufactmed by heating glycerin with hydriodic acid, and are formed in virtue of the 1eactions :-—

Glycerin, a wa ss Isopropyl iodide. C3H,(OIT) + 5 = i

pat , ° ‘ Allyl iodide. C3H;(OH)3 + 3HI = I, + 3H20 + 3H gL

Again, glycerin is employed in the mannfactute of Sormic acid, which is piepared most conveniently by heating together glycerin and oxalic acid. The splitting up of oxalic acid into carbon dioxide and formic acid, which takes place only to a minute extent when oxalic acid is heated alone (owing to the further deconiposition of the formic acid), then ensues with but little formation of bye- products, and especially with but little loss of formic acid through further decomposition. This arises from the occurrence of a cycle of changes highly interesting from a chemical point of view, and cousisting essentially in the continnal formation of a body analo- gous to monostearin, and its continual breaking up into formic acid, which distils over, and glycerin, which acts over again ona fresh portion of oxalic acid.

Technical Uses.—Besides its use as a starting-point in the pro- duction of ‘ nitro-glycerin ” and other chemical products, glycerin is largely cmployed for a number of purposes in the arts, its appli- cation thereto being due to its peculiar physical properties. Thus its nou-liability to freeze (wheu not absolutely anhydrous, which it practically never is when freely exposed to the air) and its non volatility at ordinary temperatures, combined with its power of always keeping fluid and not drying up and hardening, render it valuable as a lubricating agent for clockwork, watches, &e,, as a substitute for water in wet gas-meteis, and as an ingredient in cataplasms, plasters, modelling clay, pasty colouring niatters, dye- ing materials, moist colours

for artists, and numerous other analo- Sous substances which are required to be kept in a permanently soft condition. From its softening property when applied to the skin, it constitutes a chief ingredient in many toilet preparations, creams, and the like. Many of these indeed, sold -under fancy names, are nothing but glycerin diluted with water or weak alcohol, or mixed with some oleaginous emulsion or paste, and variously scented. Its solvent power for numerous substances Tenders it valuable in pharmacy as an ingredient in numerons

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preparations. In some of these the glycerin acts not merely as a solvent but also as a preservative against decomposition, owing to its antiseptic qualities, which also led to its being em- ployed to preserve untanned leather (especially during transit when exported, the hides being, moreover, kept soft and supple); to make solutions of gelatin, albumen, gum, paste, cements, &c., which wiil keep without decomposition ; to preserve meat and other edibles ; to niount anatomical preparations; to preserve vaccine lymph un- changed ; and for many similar purposes. Its solvent power is also utilized in the production of various colouring fluids, where the colouring matter would not dissolve in water alone ; thus aniline violet, the tinctorial constituents of madder, and various allied colouring matters dissolve in glycerin, forming liquids which remain coloured even when diluted with water, the colouring matters being either retained in suspension or dissolved by the glycerin present in the diluted fluid. It has been proposed to use glycerin as a medium for the extraction of the odoriferous principle of flowers, &c., and as a substitute for sugar in the manufacture of some gorts of tobacco, the aioma of which is liable to be deteriorated shonld fermentation of the saccharine matter set in. Certain kinds of copying inks are greatly improved by the substitution of glycerin, in part or entirely, for the sugar or honey usually added. In fine, the number of useful adaptations of glycerin as an ingredient in o1der to confer certain special properties is almost unlimited, and its use in these directions is increasing yearly,

Impurities.—For some of these purposes it is essential that the glycerin should be of considerable purity. The chief impurities liable to be preseut

vary with the mode of preparation. Substances made by saponification of oils, &c., with oxide of lead or lime, are apt to retain more or less of the metallic compounds, whilst glycerin extracted from soap-leys may also contain mineral matters. Such impure substances are readily purified by distillation with steam or under greatly diminished pressure. Glyceriu prepared by saponi- fying clarified tallow, &c., by superheated steam, rarely contains fatty acids ; if not deprived of practically all the water with which it is mixed in the distillate first obtained, it is less viscid and has a lower density, so that the specific gravity forms a good test as to whether it contains much water or not. Occasionally glycerin is met with intentionally adulterated with sugal-syrup, gum, mineral matters, &c., but such falsifications are compatatively yare. They may be detected by the substance being not wholly soluble in alcohol, by its leaving a residue on ignition in air, by its precipi- tating a solution of basic lead acetate (after being dissolved in water), or by other special tests, according to the nature of the impurity sought for. Thus, whilst pure glycerin does not reduce alkaline copper solutions so as to precipitate cuprous oxide when boiled therewith, the precipitation is readily produced by certain kinds of sugar, either without any previous treatment (¢.g., gliucose), or after boiling for a short time with water acidulated with a iineral acid such as sulphuric acid (ey., cane sugar). (C. R. A, W.)

GMELIN, Joaann Georc (1709-1755), a distinguished. naturalist, son of the chemist of the same name, was born at Tubingen, June 12,1709. Having taken his degree in medicine, he in 1727 repaired to St Petersburg, where in 1731 he was appointed professor of chemistry and natural history. In 1733, by order of the empress Anna, he joined Deslisle, G. F. Miiller, and Behring in an expedition for the exploration of Siberia, which was penetrated as far as the Lena. He returned to St Petersburg in 1743. In 1749 he was chosen professor of botany and chemistry at Tiibingen, where he died, May 20,1755. Linnzeus named a genus of plants Gmelina in his honour,

His chief works are Flora Sibiriea (4 vols.. St Petersburg, 1749~ 50), and Reisen Durch Sibirien (4 vols., St Petersburg, 1752).

GMELIN, Leoporp (1788-1853), a celebrated chemist, was born August 2, 1788, at Gottingen, in the university of which city his father, Johann

Friedrich Gmelin, was professor of medicine. He studied medicine and chem. istry at Gottingen, Tiibingen, and Vienna, and in 1813 commenced lecturing on chemistry at Heidelberg, where in 1814 he was appointed extraordinary and in 1817 ordi- nary professor of medicine and chemistry; the latter office he held till 1850. He died at Heidelberg, April 13,

1853.

Gmelin's fame rests chiefly on his chemical dictionary, the Hand- bueh der Chemie, the first edition of which, in 2 vols., was pub- lished at Frankfort in 1817-19. The fourth edition (Heidelberg, 1843, &c.) was written by Gmelin himself as far as the end of vol,

v., was continued by Drs List and Kraut and others, and completed by an eighth volume on physiological chemistry, the work of Prox

fessors Lehmann and Rochleder. A revision of the Handbuch by Kraut, in two parts, has since appeared. Of the fourth edition an English translation by H. Watts was published by the Cavendish Society in 1848-59. Gmelin was the author also of Versuch eines neuen chem. Mincralsystems (Heidelberg, 1825), and of numerous seientific papers. With Tiedemann he wrote Versuche tiber die Wege auf welchem Substanzen aus dem Magen und Darmkanale in das Blut gelangen (Heidelberg, 1820), and Die Verdauwng (2 vols., . Heidelberg, 1826-27).

GMELIN, Samvet Gortiies (1743-1774), an eminent naturalist, nephew of J. G. Gmelin (see above), was born at Tiibingen, June 23,1743. He graduated there as M.D. in 1763, went to St Petersburg in 1767, and in 1768, with Pallas, Gitldenstaidt, and Lapuchin, commenced a journey for the scientific exploration of the southi-east possessions of Russia. Having visited in succession the western districts of the Don, the Persian provinces to the south and south- west of the Caspian Sea, the regions of the Volga, and the eastern borders of the Caspian, he in 1774 was on his way back to St Petersburg when he was seized as a hostage by Usmey Khan, of the

Kaitak tribe, through whose ill- treatment he died on July 27th of the same year.

His principal works are Historia Fucorum tconibus illustrata (St Petersburg, 1768), and Voyages dans differentes partics des lL Empire de Russie (4 vols. 4to, St Petersburg, 1770-84).

GMUND, a town of Wiirtemberg, circle of Jaxt, for- merly a free imperial town, is situated in a charming and fruitful valley on the Rems, here spanned by a beautiful bridge, 31 miles E.N.E. of Stuttgart. It is surrounded by old walls, flanked with towers, and has a considerable num- ber of ancient buildings, among which are the church of the Holy Cross; St Jolin's church, which dates from the time of the Hohenstaufens; St Leonard's church, situated on a height near the town, partly hewn out of the rock and much frequented by pilgrims ; the chapels of St Joseph and God's Rest ; and the Dominican convent, founded in 1204, now a house of correction. Among the modern buildings are the gymnasium, the drawing and tradeschools, the Roman Catholic seminary, the town hall, the royal deaf-mute and blind institute, the blind asylum, the lunatic asylum, and two hospitals. The industries include the manufacture of gold, silver, copper, bronze, and brass wares, silk and part- silk ¢loths, tobacco, wax, glue, leather, furniture, bone-dust, and lucifer matches. There is also considerable trade in corn, hops, and fruit. Population in 1875, 12,838.

Gmiind was surrounded by walls in the beginning of the 12th century by Duke Frederick the elder of Swabia. It received town rights from Frederick Barbarossa, and after the dying out of the Hohenstaufens became a free imperial town. In 1546 it was besieged and taken by the Protestants, and in 1793 it was burned by the Swedes. It retained its independence till 1803, when it came into the possession of Wiirtemberg. Gmiind is the birth- place of the painter Hans Baldung and of the architect Heinrich Arler. In the Middle Ages the population was about 10,000.

GNAT, a name (Anglo-Saxon, gnet) properly applied to the members of the Culicide (a family of the insect order Diptera, division Orthorrhapha, subdivision Nematocera, section Hucephala), but sometimes also used for the Chiro- nomide. The Culicide consist of about 150 known species, of the genera Culex, Anopheles, Aedes, Psorophora, Corethra, &c.; they are

distributed over the chief divisions of the world, and, in spite of their very feeble build, reach as far north as man has penetrated (having been found during Nares's recent Arctic expedition). As regards time, ex- amples of a Culex and a Corethra have been discovered in the Tertiary beds of the Lower White River, Colorado. The Culicide are distinguished from their immediate allies, amongst other characters, by having the parts of the mouth produced into a slender porrected rostrum, nearly half the length of the insect, and composed of many distinct pieces (seven, according to Westwood, who remarks that the mouth in these delicate creatures is formed of the same number of pieces, and on the same plan, as that of the

robust Zabani), and many-juinted palpi, very long and pilose in the male, in which sex the antenne are pluimose and 14. jointed. The fibrils of the antenne are considered by Mayer as auditory organs. The usual special representative of the family is Culex pipiens, the common gnat, whose blood-sucking propensities have rendered it too well known, It pierces the skin with the needle-like lancets of its rostrum, which are barbed at the tips, and gradually inserts the whole of those organs, at the same time liquefying the blood by some fluid secretion, which apparently adds to the sub. sequent irritation. The female, recognizable by her more simple antenne and palpi, alone attacks man, and, in default of her favourite food, will feed on the honey of flowers. This blood-sucking taste is shared by the allied Simuliide, The dreaded mosquito is nothing but a species of Culex, so closely allied to C. pipiens that it is difficult to say where " gnat" ends and " niosquito " begins, though the original mosquito is a native of Cuba. The curious hum. ming noise (from which the name pipiens is fancifully derived) accompanying the flight of the gnat is caused by the extremely rapid motion of its wings, which have been calculated to vibrate 3000 times in a minute,—the great relative bulk of the thoracic muscles accounting materially for this. In connexion with the gnat's wing it may be observed that, though apparently clear, " battledore scales" have been discovered upon it by microscopists. The habit of gnats to associate in clouds has been frequently noticed, from the poet Spenser downwards; and instances are even on record of their gatherings round church-spires having caused alarms of fire, from being mistaken for smoke, This apparently arises from

the extreme spontaneity and ease of the individuals in their evolutions, which are so rapidly con- ducted as to enable them to fly unwet in a shower of rain. Tt has been observed that many of these large gatherings are exclusively composed of femaies. The transformations of the gnat have often been chronicled, and by none ina more interesting way than Réaumur. The female deposits her eggs in a little raft or boat-like mass, upon the surface of water, using her hind-legs while packing them together; the larve hatched from them are very active, diving in a jerky manner quickly, and often coming to the surface to breathe, suspending themselves head downwards, and taking in atmospheric air through a spiracle in one of the large tubes into which the end of the body subdivides. The pupe are also capable of active motion by means of paddles at the tail, and also suspend themselves under the surface for respiratory purposes, though not breathing as in the larva, but through two little tubes on the back of the thorax. When the perfect insect makes its appearance, the pupa-skin is used by it as a floating foothold until itis ready to take to flight. So short a time is occupied by the entire series of metamorphosis that many generations are perfected in one summer. ; GNESEN (Polish, Gniezno), the chief town of a circle in the Prussian province of Posen, government of Bromberg, 18 situated on the Wrzesnia, 30 miles E.N.E. of Posen. Besides the cathedral, which contains the remains of St Adalbert, there are nine Roman Catholic churches, and there is also a Protestant church, a synagogue, a clerical seminary, and a convent of the Franciscan nuns. The industries are cloth and linen weaving and brandy making. A great horse and cattle market is held annually. The popula tion in 1875 was 11,203, of whom about half are Poles. Gnesen is said to be the oldest town in Poland, and. was the capital of the kingdom till 1320. It was made the seat of an arch-

bishop early in the 11th century. It is still the seat of the cathe- dral chapter, but the archbishop now resides at Posen.

GNOSTICISM, a general name applied to various forms of speculation in the early history of the church. The term yéors is found in the Septuagint translation of the Old

GNOSTICISM™

Testament, and in the Apocryphal Book of Wisdom, denot- ing the knowledge of the true God, or knowledge communi- cated by Him. In the New Testament the word is fre- quently used by St Paul (1 Cor. i. 5, xii. 8; 2 Cor. iv. 6, x. 5), and in the second epistle of St Peter (i. ByGy itto 18), to express the saving knowledge of God in Christ ; and in the first epistle to Timothy occurs the significant phrase, “Oppositions of Science (yrécews) falsely so called.” It may be inferred, therefore, that the use of the simple term, in a bad as well as a good sense, was not unknown to the apostolic age, although the expression yreotixos (Gnostic) is said not to be found till the beginning of the 2d century, when it was first employed by the sect of the Ophites, or, according to some, by Carpocrates. Both expressions were used by the early Christian fathers with the double meaning already indicated. Clement of Alexandria, in his Stro- mata or Miscellanies, entitles the enlightened or perfect Christian a Gnostic (Strom. i. 20, ii. 6). He points out at length the distinction between the true Gnostic and the disciples of false systems who laid claim to the name of Gnostics, It is only to systems of the latter kind that the name of Gnosticism is now applied.

The sources of Gnosticism are to be found in diverse forms of religious aud speculative culture antecedent to Christianity, especially in the theology of the Alexandrian Jews, as represented in the writings of Philo, and again in the influences flowing from the old Persian or Zara- thustrian religion and the Buddhistic faiths of the East. To the theosophic system of Philo, with its mixture of Platonic and Old Testament ideas, some of the most characteristic conceptions of Gnosticism are certainly to be traced, such as the infinite Separation between God and the world, and the necessity of a mediating power or powers in the creation of the world. This class of ideas prevailed largely at the time of the introduction of Christianity, especially in Alexandria, which was the great meeting-point of Jewish and Hellenic culiure. The more the state of the pre-Christian Jewish mind and Jewish literature is investigated, the more do we recognize everywhere a strange commingling of old with new thoughts,

of tradition with philosophy, of religion with speculation. eclectic, and the Jewish no

The age was in all its aspects of the time were centres for

less than the Gentile schools the fusion of old streams of culture from many quarters, Ever since

and the rise of broader intellectual tendencies. the ciptivity, Judaism had borne more or less the impress of the old state religion which it encountered in its exile. How far post-Exilian Judaism was moulded by Zarathus- trian conceptions is a very difficult question ; but no his- torical student can doubt that its cosmogony, its angelology, and even its anthropology, were largely modified by contact with Persia. But not only was Zarathustrianism active in and through Judaism. In itself, it Spread westward, and became directly and indirectly both a precursor and a parent of Guostic speculation. Certain forms of Gnos- ticism seem little else than adaptations of the Persian dualism to the solution of the great problem of good and evil. In other forms of it, again, the Pantheism of Tndia seems to have been a pervading influence. This, too, has its representative in the Jewish schools of the time, in the secret doctrines of the Kabbala, which many catry considerably beyond the time of Christ, although the two books through which we alone know these doctrines— the Book of Creation and the book called Zohar or Light —are plainly of much later production. These doctrines Sprang up in Palestine, and not among the Hellenistic J ews. The philosophy on which they rest is plainly pan- theistic. Whereas the principle lying at the foundation of the theosophy of Philo makes almost an absolute distinction between the Supreme indefinable Source of all things and

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the world, the philosophic postulate cf the Kabbala is the identity of God and the world—the one being the Eternal Substance of which the other is the manifestation and form. “In place of the personal God, distinct from the world, acknowledged in the Old Testament, the Kabbala substi- tutes the idea of an universal and infinite substance, always active, always thinking, and in the process of thought, developing the universe, In the place of a material world distinct from God and created from nothing, the Kabbalist substitutes the idea of two worlds-—the one intel- ligible, the other sensible,—both being, not substances dis- tinct from God, but forms under which the Divine Sub. stance manifests itself ” (Mansel’s Gnostic Heresies, p. 35).

Gnosticism is found reproducing one and all of these con- ceptions, with the additional idea of redemption directly borrowed from Christianity. In all its forms, it may be said to represent the efforts made by the speculative spirit of the time to appropriate Christianity, and to make use of some of its most fertile principles for the solution of the mysteries lying at the root of human speculation. The more advanced writers of the present day refuse to recog- nize Gnosticism as a heresy, or to speak of the Gnostics as deserters from the Christian Church. And they are right sofar. The Gnostic schools were always so far outside the church. They were not heretical, therefore, in the ordinary sense. But it is no less true that Gnosticism, in all its developments, is only intelligible in connexion with Chris- tianity. It was the impulse of Christian ideas which alone originated it, which constituted the vital force of thought that made it one of the most significant phenomena of early Christian history; and it is only its connexion with Chris- tianity which can be said to make it any longer interesting.

The question as to the date of its origin has been much investigated of late by such writers as the late Dean Mansel amoug ourselves, and Lipsius, Harnack, and Hilgenfeld in Germany. Do we find traces of it in the New Testament writings? or are the supposed allusions to it there to be otherwise explained? It is well known that this question has an important bearing upon other questions as to the origin of some of the New Testament writings, and the special object for which these writings were composed. Without entering into details, or attempting to examine the several passages which may be Supposed to contain allusions to Gnosticism in the New Testament, it may be said that such allusions, more or less definite, seem to occur in the later epistles of St Paul, especially the epistles to the Ephesians and Colossians, and in the Pastoral epistles. A supposed allusion has also been traced in the first epistle to the Coriu- thians, where the word yéous, for the first time in the New Testament writings, is found in a depreciatory sense, in the phrase 4 yrdous dow, 7) 08 dydan oikoSope? (1 Cor. viii. 1). In so very general a use of the expression, however, even in its connexion with the question of eating meats which had been offered to idols, it must be held very doubtful whether anything more than a general meaning is intended. And the same remark applies to many even of the more defined modes of expression, such as Pleroma and Mion, which occur in the later epistles.

The true explanation of all these phrases, as well as much else in St Paul's writings,

.is probably the fact that the spirit of Gnosticism, and the

language which it afterwards developed and applied, were "in the air" of the apostolic age. Its modes of thought, as already seen, were prevalent in Philo and in other quarters, and the tendencies which were afterwards worked up into systems were no doubt in existence in the time of St Paul, and still more in the later apostolic time. It seems plainly against such tendencies, rather than against any special sects or schools, that the cautions of St Paul are directed. In the Apocalypse, and in the epistles and §ospel attributed to St John, these tendencies are seen in a

more developed although hardly ina more distinct state. The second chapter (vv. 6-15) of the Apocalypse has been held to mention a sect of the Gnostics by name—the Nicolaitans—a sect supposed to derive its name from Nicolas, one of the seven deacons, who had departed from the faith and fallen into licentious doctrines and practices. Even in such a sect as this, however, we recognize rather the expression of those lax and restless teudencies which sought everywhere to corrupt the doctrines of the gospel, than any clear philosophical bias. Upon the whole, it may be concluded that what we see in the writings of the New Testanient is exactly what we might expect. 'The Gnostical spirit is present, but Gnosticism is as yet undeveloped. The apostolic age is an age of transition, in which the speculative and ethical spirit of the time is everywhiere seen encountering the new life of Christianity, and new seeds of creative thought are everywhere springing from the encounter. There are teachers of all kinds, especially Jewish teachers, busy throughout the Roman world. But Gnosticism properly so-called, as a series of speculative systems, is not yet born. Its approach is heralded by many tendencies forecasting it ; but it is only in the Syrian and Alexandrian schools of the beginning of the 2d century that we see it coming forth into distinct shape. Men like Simon Magus and his pupil Menander, the former the opponent of St Peter, and again men like Cerinthus, the opponent of St John, may be called Gnostics. In such traditions of their teaching as survive, we see the workings of the Gnostical

spirit—the spirit which sought to trans- mute the facts of Christianity into some ideological theory. But none of these leaders elaborated systems, or at least we are no longer able to trace with precision of outline the doctrines which they taught. Properly speaking, therefore, they are the precursors of Gnosticism, rather than the founders of Gnostic schools. It is implied by Irenzeus (i. 25) that the followers of Carpocrates first called themselves Gnostics ; and again by Hippolytus that this designation was first assumed by the Ophites (1. v.). But little can be gathered from writers like Irenzeus, or even Hippolytus, as to the true order of development of the Gnostic systems. With the former, for example, Saturninus and Basilides stand not only before Carpocrates, but before Cerinthus, the Ebionites, and the Nicolaitans (i. 24, 26). The last thing to seek in the early fathers is either accuracy of chronology, or a clear sequence of thought. They handle topics, for the most part, quite irrespective of either; and the student is forced back mainly, if not exclusively, on internal evidence as his only trustworthy guide in analysing and classifying the systems of thought which prevailed in the first two centuries.

According to such evidence, and the bias of individual writers, the Gnostic systems have been very differently classified. Mosheimn has divided them with reference to their greater or less recognition of the Dualistic principle ; Neander with reference to their relation to Judaism; F. Baur with reference to their relation both to Judaism and heathenism. Lipsius, one of the most recent and careful writers on the subject, arranges the Gnostical systems in a threefold order—lst, in so far as they arise within the Jewish schools, and aim to distinguish between Christianity and Judaism; 2d, in so far as they appear within the broader sphere of Hellenism ; and 3d, in so far as they approach the circle of Christian faith, and become more or less united with the doctrines of the church.

The most intelligible principle of classification seems to be that already indicated, which recognizes first an inchoate period corresponding to the New Testament age, and repre- sented by many diverse teachers, chiefly of Jewish origin, and then fixes attention upon tlie great scliools of Syria and of Egypt, with the addition of that of Asia Minor, repre-

sented by Marcion. These schools are distinguished by their internal features, and their respective relations to Judaism on the one hand and dualism on the other; but they stand out more clearly from their geographical centres, perhaps, than from any other distinguishing features.

I. The inchoate phase of Gnosticism is represented by men like Simon and Cerinthus, both prominently associated with apostles and sects, such as the Ophites or Naasseni (from 12, serpent), the Peratz or Peratics, the Sethiani, and the followers of one Justinus, author of a book called the Book of Baruch, which was written probably not earlier than the beginning of the 2d century. All these sects are elaborately described by Hippolytus in the fifth book of his Refutation of Heresies. Simon Magus follows them in his order of treatment (l.v.). There can be little doubt, however, that Simon must be placed in the very front of the history of Gnosticism, in so far as he belongs to this history at all. This is the position that he occupies in the treatise of Trenxus (Adv. Hereses, |. i. c. 23); and his association with St Peter, as well as the account of him in the apostolic history in which he appears (Acts viii. 5, 9, 10) within seven years of the ascension of our Lord, plainly indicates that this is his true position. The character of his teaching, moreover, points to the same conclusion. It is a form of anti-Christianism, rather than any mere depravation of the Christian system. It is true that he is represented in the passage of the Acts of the Apostles already referred to (viii. 13) as having professed himself a believer, and having been baptized; but his whole careet afterwards, and the doctrines attributed to him, prove that, whatever may have been his feelings for the moment, he neither understood Christianity, nor came under its practi: cal influence in any degree. Probably he regarded the apostles as only magicians of remarkable skill, and enrolled himself for a time in their company in order that he might learn their secrets and be able to exercise their powers. He was plainly an impostor of the first magnitude, who must be credited with a marvellous and unblushing audacity rather than with any clear philosophic or spiritual aims. He gave himself out as “the great power of God” (Acts viii. 10). “Ego sum sermo Dei,” he said of himself, according to St Jerome (on Matt. xxiv. 5), with much blasphemous nonsense besides. He carried about with him a “certain woman named Helena,” a prostitute whom he had purchased in the city of Tyre, and who he said “was the first conception (“Evvora) of his mind, the mother of all things, by whom in the beginning he conceived the thought of

making the angels and archangels" (Iren., Adv. Her., i. 23). He recognized Christ as Redeemer, but only as occupying an inferior position to himself. He was the true Logos or Power of God, which had previously in an imperfect degree appeared in Jesus. He himself is "the God who is over all things, and the world was made by his angels" (Zbid., i. 23). It is clear that a teacher of this kind had little relation to Christianity, except in so far as it came across his own designing and ambitious path. He had knowledge and intellectual address to avail himself of the prevailing conceptions of the Alexandrian philosophy, so as to impart some coherency to his own insane dreams; but he was characteristically a magician (as his character has survived in history) rather than a philosopher or spiritual thinker. He claims the position assigned to him in the history of Gnosticism mainly in virtue of his pupil and successor Menander who laid the foundation at Antioch of the Syrian Gnostic school more conspicuously represented by Saturninus and others.

For an account of Cerinthus and his system we refer our readers to the article Cerinruus. The account of his relations with St John, as given by later Christian tradi- tion, may be a mythical expression of the popular Christian

feeling about an obnoxious teacher rather than a state- ment of actual facts; but there seems no doubt that Cerinthus represented, in the close of the lst century, a type of doctrine especially opposed to that of the fourth gospel. He is supposed to have been of Jewish descent, to have been educated in Alexandria, and to have diffused his doctrine in Asia Minor. Opposed as he was to the Christianity of the church in attributing the creation of the world, not to the Supreme God, but to "a power separate and distinct from" Him, and in conceiving Jesus as a mere man to whom the Christ was united at baptism, and from whom the Christ departed before His death (Iren., i, 2; Hippolytus, vii. 33), he was yet far from being the mere anti-Christian impostor that Simon was. He makes no claim to miraculous or divine powers in himself, but holds a distinct, however erroneous, Christology. The idea of redemption is not only recognized by him, but recognized as verified in Christ and in Him alone. His chief concep- tion of the Creator of

the world being other than the Supreme God was probably borrowed by him from the Egyptian schools in which he seems to have taught.

The sects of the Naasseni, the Perats, the Sethiani, and the followers of Justin, placed, as we have said, by Hippoly- tus before Simon, may probably all be ranked along with him and Cerinthus in the early and still undeveloped stage of Gnosticism. It is very difficult to attain to any certainty as to their chronological position. Bunsen traces the origin of the Ophites as far back as the Pauline age; but ou very definite grounds it may be concluded that the sect, if existent then, could hardly have acquired any pronlinence or intellectual interest,—not even in the time of St John i. and certain details of their teaching cannot well be earlier than the beginning of the 2d century. Hippolytus gives a distinct and lengthened account of these several sects. The Naasseni, he says, borrowed their opinions from the Greek philosophers and the teachers of the mysteries ; the Peratze took them "not from the Scriptures, but from the Astro- logers;" the Sethiani "patched up their system out of shreds of opinion taken from Muszeus, and Linus, and Orpheus ;" and Justin was indebted for his to the "marvels of Hero- dotus!" He says, moreover, of the Naasseni that they "call themselves Gnostics." We must leave here, as else- where, the more particular description of these sects to special articles, All of them, however, may, with Mansel (Gnostic Heresies, p. 96), be regarded as branches of 4 common sect to which the title of Ophites particularly answers. The serpent was more or less a commun symbol with them all; and the idea of the Serpent as in Some manner a redeeming power for mankind—"a symbol of intellect by whose means our first parents were raised to the knowledge of the existence of higher beings than their creator "—seems to have run through them all. The Serpent no doubt tempted man, but he fell from allegiance to the Demiurge, or Creator of the present world, only to rise to the knowledge of a higher world. Thus to iden- tify the serpent with the Redeeming Word or Divine Son came very near to converting the power of Evil into the ideal of Good. This was the logical conclusion which pro- bably lay more or less in all their systems ; but it only showed itself fully in a cognate sect called the Cainites, the description of which follows that of the Ophites and the Sethians in the first book of the treatise of Irenzus (c. xxxi.). This sect carried to its extreme form the inver- sion of Biblical story, and raised the serpent into a creative and redeeming power. All the evil

characters in the Old Testament, with Cain at their head, are set forth as the true spiritual heroes ; and, in consistency with the same view, Judas Iscariot, in the New Testament, is repre- sented as alone “knowing the truth,” and so accomplishing the betrayal of the Saviour, as some later theorists have

| also supposed, in order that His good work might be com- pleted. They had a gospel of their own in the interest of such views, which they styled “ the gospel of Judas.”

Another name in the history of Gnosticism, that of Carpocrates, may be classed in this earlier period, although le is said to have been still active as a teacher in the time of Hadrian (117-138). ‘The followers of Carpocrates, as already mentioned, are represented by Irenzeus (i. 25) as first styling themselves Gnostics. His opinions had a certain affinity both with those of Cerinthus and the Ophites. They are described at length by Irenzeus (i. 25) and Hippo- lytus (vii. 20). Both writers also ascribe to this teacher and his disciples a great devotion to magical arts, and accuse them of voluptuousness and even licentiousness of life. They seem to liave cherished an esoteric doctrine which inculcated tlie indifference of all actions, and that nothing was really evil by nature. Some of the teachers of the sect marked their pupils by branding them on the inside of the lobe of the right ear. Epiphanes, a son of Carpocrates, is associated with his father in the reign of Hadrian as actively promot- ing the spread of their heresy, and, dying young, he is said to have been worshipped as a god by the inhabitants of a town in Cephalonia, of which his mother was a native, He must have been a remarkable youth, credited as he is with a work on Justice, fragments of which have been pre- served by Clement of Alexandria, advocating a very out- rageous form of communism. Women of note allied them- selves to this free confederacy, one of whom, Marcellina, came to Rome in the time of Anicetus (d. 168), and “led multitudes astray ” (Iren. i. 25 ; see also CARPOCRATES).

II. But, as already indicated, it is not till the first quarter of the 2d century that we see Gnosticism in full and systematic development ; and then it rauges from two main centres—Antioch in Syria, and Alexandria.

(1.) Menander, the pupil of Simon, settled at Antioch, and there laid the foundation of the Syrian Gnostic school, whose chief representatives in the 2d century are Saturninus, Tatian, and Bardesanes, the last two of whom were more or less connected with the church—Tatian, as a pupil of Justin Martyr, and the writer of a harmony of the four gospels under the name of Diatessaron, and Bardesanes as one of the first of the interesting series of hymn-writers for which we are indebted to the Syrian church. The Syrian Gnosis is distinguished by its admixture of Zarathustrian elements, and the consequent sharpness and precision with which it seizes the idea of conflict between the powers of Good and Evil—the Supreme God, on the one hand, and the Demiurge and his angels or zons, on the other hand. For a more particular account of the characteristics of the system, see articles on the names above mentioned.

(2.) Along with the Syrian school, and occupying a more prominent place in the development of the religious thought of the 2d century, stands the great school of Alexandrian Gnosticism, represented especially by Basilides and Valen- tinus and their followers. Basilides appears to have been a native of Syria, and to have taught in Alexandria about the year125. " He is the first Gnostic teacher," says Bunsen (Hippolytus and his Age, p. 107), "who has left an indi- vidual personal stamp upon his age… . His erudition is unquestionable. He had studied Plato deeply… . All that was great in the Basilidean system was the originality of thought and moral earnestness of its founder." Bunsen also maintains that " Basilides was a pious Christian, and worshipped with his congregation," while admitting that his sect fell away from the church and from Christianity by refusing to recognize the authority of Scripture and the necessity of practical Christian communion.

Valentinus was probably educated in the school of Alex- andrian Gnosticism, as he developed Gnostic ideas in their connexion with Hellenic, rather than Persian, modes of

thought into the most elaborate and carefully reasoned system which they reached, He came to Rome about the year 140, and there formed a sect which exercised con- siderable influence over the commingling speculations of the time which met in that great centre. Bunsen vindi- cates

his Christian character, and says that St Jerome speaks of him with great respect. If at any time he really belonged to the church, it seems to be admitted (Epiph., Her., xxxi. 7) that in Cyprus, whither he returned and where he died, he ultimately proclaimed himself outside its pale. The most illustrious disciples of the Valentinian Gnosticism, which prevailed on till the 6th century, were Ptolemzus, Heracleon, and Marcus. It is the tenets of these teachers, especially of the first, that are chiefly dis- cussed in the opening chapter of the well-known treatise of Trenzeus.

(3.) In addition to these two great scliools of Gnosticism there is still a third, especially represented by the famous Marcion of Pontus, whose centre may be regarded as Asia Minor. Marcion was the son of a Christian bishop, by whom he is said to have been excommunicated. Following one Cerdon, a Gnostic of Antioch, Marcion distinguished himself by his extreme opposition to Judaism, and generally by a Gnostic attitude at variance with the Old Testament, the God of which is to him the Demiurge in conflict with the Supreme Being and the Christ whom He sent to redeem the world from the power of this Demiurge. His Christ- ology was of course docetic,—the divine power being only united to the man Jesus for a time. He accepted ouly ten of St Paul's epistles, and a mutilated copy of the gospel of St Luke. The teaching of the Clementine fictions and a Jewish sect known by the name of Elkesaites, whose tenets seem to have resembled this teaching, is considered by Mansel and others to constitute a Judaizing reaction from the Pauline Gnosticism of Marcion.

Our readers are referred to special articles for a detailed exposition of these several Gnostic systems. It remains for us here to give a general sketch of the questions which Gnosticism discussed, and the broader features which char- acterized its main developments.

IIL. The fundamental questions with which Gnosticism concerned itself are the same which in all ages have agitated inquiry and baffled speculation, viz., the origin of life and the origin of evil,—how life sprung from the Infinite Source,—how a world so imperfect as this could proceed from a supremely perfect God. The Oriental notion of matter as utterly corrupt is found to pervade all Gnostical systems, and to give so far a common

chiaracter to their speculations. It may be said to be the ground-principle of Gnosticism.

Setting out from this principle, all the Gnostics agree in regarding this world as not proceeding immediately from the Supreme Being. A vast gulf, on the contrary, is sup- posed to separate them. In the general mode in which they conceive this gulf to be occupied they also agree, although with considerable varieties of detail.

The Supreme Being is regarded as wholly inconceivable and indescribable —as the unfathomable Abyss (Valentinus) —the Unnameable (Basilides), From this transcendent source existence springs by emanation in a series of spiritual powers (duvdues). It is only through these several powers or energies that the infinite passes into life and activity, and becomes capable of representation. To this higher spiritual world is given the name of zArpwpa, and the divine powers composing it, in their ever-expanding procession from the Highest, are called Avons.

So far a common mode of representation characterizes all the Gnostical systems. All unite in this doctrine of a higher emanation-world. It is in the passage from this higher spiritual world to the lower material one that a

speculative distinction of an important cliaracter begins to characterize them. On the one hand, this passage is appre- hended as a mere continued degeneracy from the Sonrce of Life, at length terminating in the kingdom of darkness and death—the bordering chaos surrounding the kingdom of light. On the other hand, this passage is apprehended in a more precisely dualistic form, as a positive invasion of the kingdom of light by a self-existent kingdom of darkness, According as Gnosticism adopted one or other of these modes of explaining the existence of the present world, it fell into the two great divisions which, from their places of origin, have received the respective names of the Alexandrian and Syrian Gnosis. The one, as we have seen, presents more a Western, the other more an Eastern type of speculation. The dualistic element in the one case scarcely appears beneath the Pantheistic, and bears resemblance to the Platonic notion of the vAj—a mere blank necessity, a limit- ing void. In the other case, the dualistic element is clear and prominent, corresponding to the Zarathustrian doctrine of an active principle of evil as well as of good—of a king- dom of

Ahriman (Auro-Mainyus) as well as a kingdom of Ormuzd (Ahura - Mazdao).

In the Alexandrian Gnosis a link of subordination is preserved between the two kingdoms, separated as they are. For the tAy only becomes a living and active power of evil through the quickening impartation of some element from the higher kingdom in its progressive descent from the Supreme Source. The stream of being in its ever-outward flow at length comes in contact with dead matter, which thns receives animation, and becomes a living source of evil. Its life and power, however, are withal only derived from the higher kingdom. But in the Syrian Gnosis the kingdom of darkness has no such dependence upon the kingdom of light, There appears from the first a hostile principle of evil in collision with the good.

Out of this main distinction other more special distine- tions arise, still more clearly defining the one form of yréois from the other. According as the two kingdoms are recog- nized as subordinate the one to the other, or as opposed to each other, it is obvious that different views will prevail as to the character of the Anprovpyds, or maker of this world, whose name and functions are so prominent in all systems of Gnosticism. In the one case, lis relation to the Supreme Source of life will be appreliended as more dependent—in the other, as more hostile. In the former view, the yvéous, while rising in its pride of speculation far above all mere earthly relations and historical religions, could yet find in these a point of contact, whereby the higher spiritual truth, penetrating this lower world, would gradually raise it to its own elevation. In the latter, no such point of contact is left between nature, or history, and the yv@ous. Accord- ingly, while the Alexandrian form of Gnosticism was found to embrace Judaism, as a divine institution, although very inferior and defective in its manifestation of the Divine character, the Syrian rejected it as being wholly the work of the spirit of the lower world—the Anrovpyos warring with the supreme God. This anti-Judaical spirit is found developed to its extreme in Marcion. }

The Gnostic conception of Christ, in so far uniform, 18 also of course greatly modified by the different relations which the systems thus bore to Judaism. In all he ts te- cognized as a higher A‘on, proceeding from the kingdom of light for the redemption of this lower kingdom of darkness.

But, in the one case, however superior, he is yet allied to the lower angels and the Anpuoupyds, governing this lower — world. His appearance, accordingly, admits of being his- torically connected with the previous manifestations of the Divine presence upon earth. But, in the other case, he 1s apprehended as a being wholly distinct from the Anproupyos

and his appearance takes place in this lower world without

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any previous preparation, in order that he may draw to himself all kindred spiritual natures held in bondage by the power of this lower world. If any point of connexion is admitted in this latter case betwixt Christianity and the lower world, it is certainly not found in J udaism or any historical religion, but in the theosophic schools, where an esoteric knowledge of the Supreme was cultivated.

IV. Vague, confused, and irrational as Gnosticism in most of its systems is, its influence upon the development of Christian thought was by no means detrimental. It com. pelled Christian teachers to face the great problems of which it attempted the solution in so many fantastic forms. It expanded the horizon of controversy within as without the church; and made men like Trenzeus, and Clement, and Origen, and even Tertullian, feel that it was by the weapons of reason and not of authority that they must win the triumph of Catholic Christianity. Gnosticism, therefore, may be said to have laid the foundation of Christian science, and it is certainly interesting and deserving of notice that it is in the two great cities of Antioch and Alexandria, — where Gnosticism had chiefly planted itself,—that we see the rise of the first two schools of Christian thought, These centres of half-Pagan and half-Christian speculation became the first centres of rational Christian theology.

The several schools of Gnosticism seem to have gradually lost importance after the middle of the 3d century, although some of them continued to linger till the 6th century. Manichzism was little else than a revival of it in the Syrian form, and this system in the 4th and 5th centuries became 80 powerful as almost to be a rival to Christianity. The great Christian father St Augustine, as is well known, was long fascinated by its influence. Again, strangely, in the 12th century the same spirit burst forth afresh, and in

special connexion with the name of the great apostle of the Gentiles. The sect of Paulicians, originating in the old Syrian haunt of heresy, Samosata, spread through Asia Minor, and then through Bulgaria and the borders of the Greek empire into Italy, Germany, and France. Gibbon, in the 54th chapter of his famous Decline and Fall of the Roman Empire, has given a vivid and powerful description of the fortunes and persecutions of the sect, and the readi- ness with which its doctrines seized upon whole populations. In southern France especially it spread like wildfire, and for a time almost entirely displaced Catholic Christianity. This Western development of the old Oriental dualism was characterized by many of the features of the earlier Gnos- ticism, such as the doctrine of the radical evil of matter, aversion to the Old Testament as the work of an evil Demiurge, and a docetic Christology. Extinguished in the horrors of the Albigensian war, it can hardly be said to have reappeared in the history of Christendom.

Literature.—Only one original Gnostic work" has survived to modern times, the rloris copia of Valentinus (edited by Petermann, Berlin, 1851); for all further knowledge of the system we are en- tirely dependent on that of Irenzus (

| of Hippolytus (freyvx may also be made to Pp of Justin bius, Philastrius, is taken up with more tories of philosophy.

although reference ect in the writings Clemens Alexandrinus, Origen, Euse-

mentioned those o Cnostischen 1828, 2d ed. 1843), Baur 1827; Die Christliche Gnosis, 1835; Die dret ersten Jahrhunderte, | 8d ed., 1863), Bunsen (Hippolytus u. seine Zeit, 1852-53), (art. "Gnosticismus" in Ersch and Gruber's Encyclopédie, repub- ! lished in a revised form with the title Der Gnosticismus ; sein | lenkritik

Wesen, Ursprung, und Entwickelung, 1860), Harnack (Zur Quel- Heresies, 187 5), and Lipsius (Die Quellen der Gltesten Ketzergeschiehte

der Geschichte des Gnosticismus, 1873), Mansel (Gnostic

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new untersucht, 1875). References to the monographs by Ritschl, Volkmar, Heinrici, Hilgenfeld, and others on special branches of the subject will be found under the several headings BARDESANES, BAsILiDEs, Marcion, VALENTINUS, &c.

GNU (Catoblepas), a genus of ruminant mammals con- stituting the equine group of the antelope family, and con- taining two species—the gnu or kokoon (Catoblepas gnu) and the brindled gnu (Catoblepas gorgon). Owing to their singular appearance, which has been aptly compared to that of a creature compounded of a bison's head, a horse's body, and an antelope's legs, their proper zoological position has been a matter of dispute—some placing them among the oxen, while others regard them as a connecting link between bovine animals and the true antelopes. The gnu measures about 44 feet in height at the shoulders, and 9 feet in ex. treme length. Its nose is broad and flattened, and bears on its upper surface a crest of reversed hair, while there is an abundant growth of bushy black hair beneath the chin and between the forelegs. The horns, which are present in both Sexes, are very broad at their base, forming a solid helmet on the forehead, from which they bend, downwards and out- wards, tliereafter curving rapidly upwards to the tip, A mane of light-coloured hair, tipped with brown, and present- ing a neatly clipped appearance, extends along the neck,

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while the horse-like tail, which is more or less of a creamy colour, reaches to the ground. The nostrils are large, and are furnished with a muscular valve by which they can be closed. The gnu is a native of the arid plains of South Africa, where it congregates in considerable herds, its rest- lessness of disposition leading it to migrate frequently from place to place. The fantastic appearance of those creatures is fully equalled by the grotesqueness of their actions, Ad- vancing, as they generally do, in single file, they may be seen wheeling and prancing in all] directions, tossing their heads, switching their long tails, and then starting off, especially if alarmed by the appearance of a lion, at tremen- dous speed, raising columns of dust along their track, and leaving their pursuers hopelessly in the rear. Should

they be surprised in their gambols by the sight of a caravan, their exceeding inquisitiveness impels them to approach the intruding object, which they do in a compact square, looking all the while the very picture of defiance. “ During bright moonlight,” says Captain Harris, “curiosity often prompted a clump of gnus to approach within a few yards of our bivouac, where they would stand for hours in the same position, staring wildly, lashing their dark oe and utter-

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ing a subdued note resembling the harsh croaking of a frog.” The noise made by the old bulls, as they roam singly during the rutting season, is much more formidable, being usually compared to the roar of the lion ; and many sportsmen who have hunted the gnu bear testimony to the remarkable like- ness between the solitary males with their long manes, when seen at a considerable distance, and the “king of beasts.” They are by no means the formidable creatures their fero- cious aspect might lead one to suppose. However defiant the herd appears as it approaches a caravan, the report of a gun puts the whole troop of gnus to flight, and they are never known to attack man unless driven thereto in self- defence. The female has seldom more than a single young one at a birth, the calf at first being of a whitish colour. When captured young, the gnu may, according to Captain Harris, be reared by the hand on cows’ milk ; and although of uncertain temper, it can be got to herd with the cattle on the farm. The flesh of the calf is considered a delicacy, but that of the adult is insipid, being almost destitute of fat, Its long silky tail is in great request for chowries, and its hide is cut into strips and used for ropes and twine.

The brindled gnu is a more northerly form, never being found south of the Orange river. It is readily distin- guished from the other species by the black colour of its tail and mane, the obscure vertical streaks on its body, its more elevated withers, and its extremely long aquiline nose. While equally grotesque in appearance and manner, it is much less spirited and active than the gnu. Its flesh is highly prized by the natives, who also convert its hide

into mantles, rendered attractive to South-African taste by being dressed without removing the long hair of the mane and beard.

GOA, a Portuguese settlement on the Malabar or western coast of India, lying between 15° 44’ 30” and 14° 53° 30” N. lat., and between 73° 45’ and 74° 26′ E. long. It is bounded on the N. by the river Tirakul or Auraundem, separating it from Sawant Wari State, on the E. by the Western Ghats, on the S. by Kanara district, and on the W. by the Arabian Sea. Total area, 1062 square miles ; population, 392,234.

This settlement forms a patch of foreign territory on the east of the Bombay coast, and is surrounded on all sides, except to the seaward, by British districts. Goa is a hilly country, especially the recently acquired portion known as the Novas Conquistas. Its distinguishing feature is the Sahyadri Mountains, which after skirting a considerable portion of the north-eastern and south-eastern boundary, branch off westwards across the territory with numerous spurs and ridges. The plains are well watered by large navigable rivers. The most important is the Mandavi river, on whose banks both the ancient and modern cities of Goa stand, with a fine harbour formed by the promontories of Bardez and Salsette. The port of New Goa or Panjim is divided into two anchorages by the projection of the cabo (cape) from the island of Goa, both capable of safely accom- inodating the largest shipping.

Goa ranks high as regards its early importance among the cities of western India. It emerges very distinctly in the 14th century, and was visited by the famons traveller [bn Batuta. In the 15th century it formed the chief em- porium of trade on the western side of India. Caravans of merchants brought down its products to the coast, and it was the only city in western India which enjoyed at this period a revenue of £10,000. Its wealth and advantageous situation attracted the Mahometan princes of the Deccan, and in 1469 it was taken by the Bahmani king. A fleet of 120 ships operated from the sea; the Baéhmani troops forced their way down the passes of the Ghats; and Goa capitulated. It next passed under the Bijapur dynasty, and on the arrival of Albuquerque, at the beginning of the

Mussulmans fell, forced his way into the town. days the miserable citizens were subjected to every atrocity, The fifth part of the plunder, reserved for the Portuguese crown, amounted to £20,000.

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16th century, its military and commercial capabilities at once struck his mind. consisting of 20 sail of the line, with a few small vessels and 1200 fighting men, hove in sight off the harbour. A holy mendicant or jogt had lately foretold its conquest by a foreign people from a distant land, and the disheartened citizens rendered up the town to the strangers. leading men presented the keys of the gates to Albuquerque on their knees, together with a large banner which was usually unfurled on state occasions. caparisoned steed, Albuquerque entered the city in a trinmphal procession, with the Portuguese banners carried by the flower of the Lisbon nobility and clergy amidst the acclamations of an immense multitude, who showered upon the conqueror filigree flowers of silver and gold. Albu- querque behaved well to the inhabitants, but was shortly afterwards expelled by the Bijapur king. However, he re- turned a few months later with a fleet of 28 ships carrying

In 1510 the fleet of Albuquerque,

Eight

Mounted on a richly

1700 men, and after a bloody attack, in which 2000 For three

The conquest of Goa illustrates the essentially military basis on

which the Portuguese power in India rested. The subsequent history of the town has been one of luxury, ostentation, and decay.

After bearing a siege by the king of Bijapur, and suffering from a

terrible epidemic, Goa reached the summit of its prosperity at the

end of the 16th century, during the very years when the English Company was struggling into existence under Elizabeth. ‘‘ Goa Dourada,” or Golden Goa, seemed a place of fabulous wealth to the plain merchants who were destined to be the founders of British India. ‘* Whoever has seen Goa need not see Lisbon,” said a proverb of that day. Indeed, if the accounts of

travellers are to be trusted, Goa presented a scene of military, ecclesiastical, and com- mercial magnificence, such as has had no parallel in the European capitals of India, The brilliant pomp a picturesque display of Goa were due to the fact that it was not only a flourishing harbour, but the centre of a great military and ecclesiastical power. The Portuguese based their dominion in India on conquest by the sword, They laboured to consolidate it by a proselytizing organization which throws all other missionary efforts in India into the shade. Goa reached its climax of pomp and power about the year 1600.

Immediately afterwards commenced the long struggle with the Dutch, which before the end of the century had stripped Portugal of its fairest possessions in the East. In 1603 the Dutch blockaded Goa, but had to raise the siege. In 1685 the old epidemic fever which had afflicted Goa in the preceding century again broke out, and raged for five years. In 1639 the Dutch once more blockaded Goa, but found their meagre force of twelve ships insufficient for its capture. In 1666 luxury and the plague and the Dutch privateers had effectually crippled the commerce of Goa. Thevenot in that year drew a powerful picture of the decayed city. In 1675 DrJohu Fryer described the city as in a ruinous state, whilst the inhabitants still made pitiful attempts at display in spite of their increasing misery. In 1683 Goa narrowly escaped falling into the hands of the Marhatté hordes under Sambaji. Before 1687 the abandonment of Old Goa had taken place. ‘‘ Many streets,” says an official docu- ment of that year, ‘“‘have now become lonely and uninhabited.” The river had silted opposite its quays, ships could no longer ap- proach the city, the fever had again broken out, and the population had moved out to suburbs nearer the mouth of the river. | In 1695 only 20,000 inhabitants remained. In 1739 the whole territory was attacked by the Marhattas, and only saved by the unexpected ap- pearance of a new viceroy with a fleet. Various attempts were made in vain to rebuild Old Goa, and by the middle of the 18th century “this fairest but poorest settlement had become a burden to the Portuguese Home Government, costing no less than 300, 000 piastres a year.” in 1759 further attempts to rebuild Old Goa were given up, and the governor changed his residence to Panjim or New Goa, the present city, at the mouth of the river. In 1775 the population was reduced to about 1600 souls, of whom 1198 were Christians, almost entirely half-castes and native converts. In 1759 also the

Jesuits were expelled. They had got into their hands what little commerce remained, and the last touch was put to the ruin of 0 Goa. ‘The river washes the remains of a great city,—an arsenal in ruins, palaces in ruins, quay walls in ruins, churches in ruins, all in ruins. We looked and saw the site of the Inquisition, the bishop’s prison, a grand cathedral, great churches, chapels, con- vents, religious houses, on knolls surrounded by jungle and trees

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scattered all over the country. We saw the crumbling masonry which once marked the lines of streets and enclosures of palaces, dockyards filled with weeds and obsolete cranes.”

Panjim or New Goa lies in lat. 15° 30’ N,, long. 75° 53’ E., at

The territory of Goa, including the two cities of Old Goa and Panjim with the ad joining country under Portuguese rule, amounts, as already stated, to 1062 square miles. Of the total] population, namely, 392,234, nearly two-thirds or 232,089 are Roman Catholics, 128,824 are Hindus, and 2775 Mahometans. The Roman Catholics are subject in spiritual matters to an archbishop, who has the title of primate of the East. The Hindus and Mahometans enjoy per- fect liberty in their religious affairs, and have their own places of worship. Agriculture forms the chief industry of the country. The total area under cultivation is 234,754 acres. Rice is the staple produce; next is the cocoa-nut, which is deemed important from the variety of uses to which the products are applied. The chief exports are cocoa-nuts, betel-nuts, mangoes, water-melons, cinnamon, pepper, salt fish, gum, firewood, and salt; and the ehief imports rice, cloth, sugar, wines, tobacco, glassware, and hardware. The district seldom suffers from great floods. parts are subjected to inundations during heavy rains, but little damage is done to the crops. its name from the native word Ponji, meaning “ arable land that cannot be iuundated.” The total revenue in 1873-74 was £108,148; the expenditure, £107,145. The police foree numbers 919 men. In 1869-70 there were 137 lower schools, and 25 higher schools, including a National Lyceum with 2433 pupils. There are also medical and chemistry schools, and since 1870 a college for the study of practical sciences has been established. The prevailing endemic diseases are intermittent and remittent fevers, diarrhea,

and dysentery. The average annual rainfall for the three years ending 1875 was 100-22 inches.

Sce '* Livro dos privilegios da Cidada de Goa," in Archivio Portuguez Oriental, 1857; Archivo da Relacas de Goa contendo varios documentos dos Seculos, 17, 18, J. I. de Avranches Garcia, 1872, &c.; Fetcées meterologicas de Goa, 1867; Boletim de Governo dos Estados da India, Goa and New Goa, 1838-70, &.; O Gabinete litterario das Fontainhas (monthly, 18416, &.); Tolbort, 'The Autho- rities for the History of the Portuguese in India," in Journ, of Asiatic Soc. of

Bengal, 1873; RB. F. Burton, Goa and the Blue Mountains, 1851 3 Mrs Burton, 4.2.2. Arabia, Egypt, India, 1879,

GOA POWDER, a drug occurring in the form of a yellowish-brown powder, varying considerably in tint, which has recently been brought into notice by Dr Fayrer of Calcutta as a remedy for ringworm, It derives its name from the Portuguese colony of Goa, where it appears to have been introduced about the year 1852. In 1875 it was shown by Dr Lima that the substance had been exported from Bahia to Portugal, whence it found its way to the Portuguese colonies in Africa and Asia. The tree which yields it belongs to the genus Andria of the natural order Leguminosee, and has been named A, Araroba, It is met with in great abundance in certain for- ests in the province of Bahia, preferring as a rule low and humid spots. The tree is from 80 to 100 feet high, and is furnished with imparipinnate leaves, the leaflets of which are oblong, about 14 inch long and 3 inch broad, and some- what truncate at the apex. The flowers are papilion- aceous, of a purple colour, and arranged in panicles. The Goa powder or araroba is contained in the trunk, filling crevices in the heartwood. To obtain it, the oldest trees are selected as containing a larger quantity, and after being cut down are sawn transversely into logs, which are then split longitudinally, and the araroba chipped or scraped off With the axe. During this process the workmen feel a bitter taste in the mouth 3; and great care has to be taken

to prevent injury from the irritating action of the powder onthe eyes. In this state, @.¢., mixed with fragments of wood, the Goa powder is exported in casks.

In India Goa powder has been used in the form of a paste, made Y mixing the powder with vinegar or lime juice, as a local appli- cation for the cure of Indian ringworm. It appears to be one of the best remedies for that obstinate disease ; and so highly is it valued that its price in Bombay averages £3, 19s, per tb. Its use in chlo-

_ 4smaa, intertrigo, and psoriasis, aswell as in various other skin diseases, has also been attended with considerable success. The only disad-

vantages attending its use are—that it leaves a stain which is diffi- eult to Temove, and that the powder is apt to sct up severe irritation of the eyes, if it come in contact with the conjunctiva,

iment. When given internally it has been found to act as an emetic and purgative.

eflicacious remedies in intractable cases of ringworm.

westerly district of Assam, be- tween 25° 21’ and 26° 54’ N. lat. and between 89° 44’ and 91°0′ E. long., bounded on the N . by Bhutan, E. by Kamrup, S. by the Garo Hills, and W. by Kuch Behar and Rangpur.

corner where the river takes its southerly course into

Bengal.

common and occasionally severe shocks have been experi- enced. The Brahmaputra annually inundates vast tracts of country. timber.

Mughuls extended the limits of the Delhi empire. Mughuls came into. collision with the Ahams, but were forced to retreat with a decisive defeat. British pos- session with the rest of Bengal in 1765. It has undergone several changes in administration, and in 1872, when Assam was consti- tuted a separate administration, Godlpara was included within it.

In 1872 the population was 407,714,—311,419 being Hindus, and 89,916 Mahometans, Goalpira town, with between 3000 and 4000 inhabitants, is

the most populous place, as well as the chief centre of trade. Dhubri is the point where the traffic of northern Bengal is shipped on board the Assam steamers, Gauripur and Lakhshmipur carry on a thriving trade in timber,

Rice forins the staple crop of the district. M ustard and jute are also largely grown. The area under cultivation is estimated at 600,000 acres, or about one-third of the total area. The district is not liable to any form of natura] calamity; occasionally blights have been caused by worms and insects, but the harvests have never been affected. The manufactures consist of the making of brass and iron utensils and of gold and silver ornaments, weaving of silk cloth, basket-work, and pottery. The cultivation of tea hag recently been introduced, and is advancing considerably. The chief centres of traffic are Goalpara town, Dhubri, Jogigopha, Bijni, Gauripur, and Singiwéri. Local trade is in the hands of Marwari merchants, and is carried on at the bdzdrs, weekly hats or markets, and periodical fairs, The chief exports are mustard-seed, jute, cotton, timber, lac, silk cloth, india-rubber, and tea ; the imports, Bengal rice, European piece goods, salt, hardware, oil, and tobacco, The Brahmaputra and its tributaries are the chief' means of coni-munication, and are navigated by river steamers aud the largest native boats. Godlpdra is considered an unhealthy district both for Europeans and for natives. The principal discases are intermit. tent and remittent fevers, diarrhea, dysentery, rheumatism, and chest complaints. Cholera frequently occurs in an epidemic form, and small-pox is more or less prevalent every year. The mean annual temperature is 75° Fahr. ; and the average annual rainfall is 98°75 inches,

Godtpdra, the chief town of above district, situated on the left bank of the Brahmaputra, in 26° 11' 0" N. fat., 90° 41' 0' E. long. It was the frontier outpost of the Mahometan power in the direction of Assam, and bas long been a flourishing seat of river trade. The civil station is built on the summit of a small hill commanding a magnifi- cent view of the valley of the Brahmaputra, bounded on the north by the snowy ranges of the Himalayas and on the south by the Géro hills. The native town is built on the western slope of the hill, and the lower portion is subject to inundation from the marshy land which extends in every direction. Population (1872) 4678.

GOAT. All the species of the genus Capra may be divided into two classes, the one being represented by the ibex (see [pex) and the other the goat. The latter class is subdivided into the segagrus or wild goat (Capra egagrus) and the domestic goat (Capra hircus), of which there are many varieties.

The Wild Goat, or Paseng of the Persians (Capra egagrus, Pall.), is an inhabitant of the mountainous regions of Cen- tral Asia from the Caucasus to the Himalayas, and is occasionally met with in troops at great elevations. It stands somewhat higher than any of the domesticated varieties of the goat, from which it.further differs in its stouter limbs and more slender body. Its neck is short, and is thus fitted to bear the enormous horns, which in the male are larger proportionally than in any other ruminant animal. These measure nearly three feet in length, are obscurely triangular in form, transversely ridged, and are bent backward as in the domestic varieties. The wild goat of the Himalayas, according to Darwin, when it happens to fall accidentally from a height, makes use of its massive horns by bending forward its head and alighting on them, thus breaking the shock. In the female the horns are exceedingly diminutive, or are altogether awant- ing. The fur, which over the greater part of the body is short, is of a greyish-brown colour, with a black line running along the entire length of the back ; the short tail and the muzzle are also black, while the under surface of the neck, and the beard, which is present in both sexes, are of a brown colour. The paseng is exceedingly wary of the approach of man, and as its agility is no less remarkable there has been little opportunity of studying it closely. The concretions known as bezoar-stones, which were for- merly much used in medicine and as antidotes of poison, are believed to have been originally obtained from the intestines of this species.

Considerable diversity of opinion has been expressed by naturalists as to the original stock of the domestic goat, which is met with in nearly every quarter of the globe,— the now prevalent and the most probable opinion being that the various domestic breeds are severally descended from wild stock now extinct. Beth the ibex and the egagrus interbreed freely with the common goat, though the produce is not always fertile. Instances of this are not unusual in the Alps and Pyrenees, where goats abound in a semi-domesticated state. Hybrids between the goat and the sheep are also known to have occurred, but are rare.

The following are the chief domestic breeds, possessing distinct characteristics :—the Common Goat, the Maltese, the Syrian, the Angora, the Cashmere, the Nubian or Egyptian, and the Dwarf Goat of Guinea.

The Common Goat.—This has many varieties which differ from each other in length of hair, in colour, and slightly in the configuration of the horns. The ears are more or less upright, sometimes horizontal, but never actually pendent, as in some Asiatic breeds. The horns are rather flat at the base and not unfrequently corrugated ; they rise vertically from the head, curving to the rear, and are more or less laterally inclined. The colour varies from a dirty white to a dark-brown, but never black, which indicates Eastern blood. Most of the European countries possess more than one description of the common goat. In the British Isles there are two distinct types, one short and the other long haired. In the former case the hair is thick and close, witli frequently an undercoat resembling wool. The horns are large in the male, and of moderate size in the female, flat at the base and inclining outwards. The head is short and tapering, the forehead flat and wide, and the nose small ; the legs strong, thick, and well covered with hair. The colour varies from white or grey to black, but is frequently

fawn, with a dark line down the spine and across the shoulders. The other variety owns a shaggy coat, gene- rally of a reddish-black hue, though sometimes grey or pied and occasionally white. The head is long, heavy, and ugly, the nose coarse and prominent, the horns are situated close together, and often continue parallel almost to the extremi- ties, being also large, corrugated, and pointed. The legs are long, and the sides flat, the animal itself being generally gaunt and thin, This breed is peculiar to Ireland, the Welsh being of a similar description, but more often white. The short-haired goat is the English goat proper. From the constant crossing however that takes place between these native breeds and imported foreign specimens, one meets in England with animals possessing very great diver- sity ofform. Both the British breeds and those from abroad are frequently ornamented with two peculiar tassel-like appendages, which hang near together under the throat. It is supposed by many that these ornaments are traceable to some foreign origin ; but although there are foreign breeds that

possess them, they appear to pertain quite as much to the English native breeds as to those of distant countries, and indeed the peculiarity referred to is mentioned in very old works that describe the goats of the British Islands. ‘The milk produce in the common goat as well as other kinds varies very greatly with individuals. Irish goats often yield a quantity of milk, but the quality is compara- tively poor. ‘The goats of France are very similar to those of Britain, varying in length of hair, colour, and character of horns. A French writer describes them as possessing “a particularly neat and compact head, small mouth, horns cor- rugated, and inclining upwards and outwards, a thin neck, narrow chest, and long body, long but muscular legs, and in colour white, black, fawn, or pied.” The Norway breed is frequently pure white with long hair ; it is rather small in size, with small bones, a short rounded body, head small with a prominent forehead, and short, straight, corrugated horns, The facial line is concave. The horns of the male are very large, and curl round after the manner of the wild goat, with a tuft of hair between and in front.

The Maltese Goat has its ears long and wide and per- fectly pendulous, hanging down below the jaw. The hair is long and cream-coloured. Specimens of this kind are usually hornless, which is perhaps the cause of it having been called the “‘Hornless Variety.” It would appear, however, that the absence of these appendages is simply a freak of nature, and not the peculiar characteristic of particular species.

The Syrian Goat.—This breed is met with in various parts of the East, in Lower Egypt, on the shores of the Indian Ocean, and in the island of Madagascar. Both its hair and ears are excessively long, the latter so much so that they are sometimes clipt to prevent their being tom by stones or thorny shrubs. Its horns are somewhat erect and spiral, with an outward bend.

The Angora Goat is often confounded with the Cashmere, but is in reality quite distinct from it. The principal feature of this breed, of which there are two or three varieties, is the length and quantity of its hair, which has a particularly soft and silky texture, covering the whole body and a great part of the legs with close matted ringlets. The horns of the male differ from those of the female, being directed vertically and in shape spiral, whilst in

the female they have a horizontal tendency, somewhat like those of a ram. The face has a sheepish expression. The coat1s com- posed of two kinds of hair, the one short and coarse and of the character of hair, which lies close to the skin, the other long and curly and of the nature of wool, forming the outer covering. Both are used by the manufacturer, but the ex- terior portion, which makes up by far the greater bulk, 1s much the more valuable. The process of shearing takes,

place in early spring, and is conducted with the utmost care ; the average amount of wool yielded by each animal is about 2} ib. The best quality comes from castrated males, the females producing the next best. The annual ex- port of wool from Angora is estimated at about 2,000,000 ib, and its value at £200,000. Large herds are shipped at Constantinople and sent to Cape Colony, where this breed thrives well and is largely propagated, the climate being specially suitable to the perfect development of the wool. A very valuable consignment of these animals arrived in London in May 1879 for transshipment to the Cape, having been procured from different parts of Asia Minor, by means of great personal exertion, by Mr J. B. Evans, a South- African goat farmer. The wool, or mohair, as it is techni- cally termed, of these goats was remarkably long, fine, and heavy, the average weight of the produce of the herd being reckoned at 6 tb per head. So highly is this breed

between half to three quarters of a rupee. It is sold by the “turruk” of 12 tb. This is the material of which the far-famed and costly shawls are made, which at one time had such a demand that, it is stated, “16,000 looms were kept in constant work at Cashmere in their manufacture.” Those goats having a short, neat head, very long, thin ears, a delicate skin, small bones, and a long heavy coat, are for this purpose deemed the best. There are several varieties possessing this valuable quality, but those of Cashmere, Thibet, and Mongolia are the most esteemed. About the year 1816 a small herd of Cashmeres was intro- duced into France with a view to acclimatize

and breed them for the sake of their wool, but the enterprise failed. A few were purchased and brought over to England by Mr C. ‘T. Tower, who, by careful treatment, so far succeeded with them that, in course of time, he had a shawl made from their fleece, which turned out to be of good quality. At the death of the owner some years later, the herd, which had then deteriorated through in-breeding, was presented to the Queen and placed in Windsor Park.

The Nubian Goat, which is met with in Nubia, Upper Egypt, and Abyssinia, differs greatly in appearance from all those previously described. The coat is in the female extremely short, almost like that of a race-horse, and the legs are very long. This breed therefore stands considerably higher than the common goat. One of its peculiarities is the strongly convex shape of the face, the forehead being very prominent and the nostrils sunk in, the nose itself ex- tremely small, and the lower lip projecting from the upper. The ears are long, broad, and thin, and hang down by the side of the head like a “double lop” rabbit. The horns are quite black, slightly twisted, and very short, flat at the base, pointed at the tips, and recumbent onthe head. But

Sa Tae Fig. 1.—Angora Male Goat. esteemed by the Turkish farmers that it was with the greatest reluctance they were induced to sell them, and then only at exorbitant prices, some of the males costing £250 and females £150. £50 and £60 are common prices for these goats at Angora. Fig. 1 is from a photo. graph of the finest male of the flock, the fleece of which was estimated to weigh when shorn full 15 tb. The breed was introduced at the Cape about 1864. In 1878, according to the customs returns, 1,300,585 ib weight of mohair was exported, of the value of £105,313. The Angora is a bad milker and an indifferent mother, but its flesh is better eating than that of any other breed, and in its native country is preferred to mutton. The kids are born very small, but grow fast, and arrive early at maturity. This variety of the goat approaches nearest in its nature, form, and habits to the sheep, even the voice having a strong resemblance. The Cashmere Goat.—This animal has a delicate head, With semi-pendulous ears, which are both long and wide, The hair varies in length, and is coarse and of different colours according to the individual. The horns are very erect, and sometimes slightly spiral, inclining inwards and | tosuch an extent in some cases as to cross. The coat is composed, as in the Angora, of two materials; but in

this breed it is the under coat that partakes of the nature of Wool and is valued as an article of commerce. This under. | growth, which is of a uniform greyish-white tint, whatever the colour of the hair may be, is beautifully soft and silky, and of a fluffy description resembling down. It makes its appearance in the autumn, and continues to grow until the | following spring, when if not removed, it falls off naturally ; Its collection then comniences, occupying from eight to ten days.) The animal undergoes during that time a Process of combing by which all the wool and a portion of the hair, which of necessity comes with it, isremoved. The latter is afterwards carefully separated, when the fleece in & good specimen weighs about half a pound, being worth

Fic. 2,—Nubian Goat.

little was known of this breed in Europe—in the West at least—until some ten or twelve years ago, when some were imported into France by the Société d'Acclimatation of Paris, who found its milking qualities to surpass those of all other breeds, Among the goats that are met with in England a good many show unmistakable signs of a more or less remote cross with this breed, derived probably from specimens brought from the East on board ships for supply- ing milk during the voyage. It isno doubt on this account that they often go by the name of « Indian " goats.

The Vepaul Goat appears to be a variety of the last breed, it having the same arched facial line, pendulous ears, and longlegs. The horns, however, are more spiral. The colour of the hair, which is longer than in the Nubian, is black, grey, or white, with black blotches.

The Guinea Goat is a dwarf species originally from the coast whenceits nameisderived. There are three varieties. Besides the commonest (Capra recurva, Linn.), there is a rarer breed (Capra depressa, Linn.), inhabiting the Mauritius and the islands of Bourbon and Madagascar. The other variety is met with along the White Nile, in Lower Egypt, and at various points on the African coast of the Mediterranean. Some of these dwarf goats may be seen at the Jardin d'Acclimatation in Paris.

Habits and Management.—The milch goat has been aptly described as the “ poor man’s cow ”—a designation it well merits, for with a couple of these animals the cottager may at an almost nominal expense enjoy the same advantages in a domestic point of view as the rich man with his ‘© Alderney.” Comparatively few are kept in England, because the advantages of goat-keeping are but very im- perfectly known, and also on account of the large propor- tion of land under cultivation. The goat in a state of nature frequents hills and mountainous places, and in a domesticated condition it generally gives preference to elevated situations; but it is a mistake to suppose that it will not thrive on low ground. Being naturally adapted to rocks and dry soils, however, it should not be exposed in marshy places, as this brings on disease of the feet and general ill health; otherwise there is no animal more uni- formly hardy. The common varieties will stand heat and cold equally well, but have a decided objection to storms of wind and rain; when they are left to roam loose, therefore, a rough shed should be erected to shelter them from the weather. Under this arrangement a goat may be left out day and night the whole year round; but, if it is kept for the sake of its milk, the yield is greater and it thrives better if housed during winter. Owing to the troublesome propensity of these animals to bark trees and destroy shrubs by nipping off all young and tender shoots, they should not be allowed to roam loose—except on a common—unless proper protection is afforded by wire netting or some such arrangement.

The goat breeds, generally speaking, but oncea year. If well housed and under liberal treatment, it will bring forth young twice in twelve months; but this is not advisable. As a rule, at the first birth one kid only is produced, but afterwards two and sometimes three. One has been known for three consecutive years to drop four at a birth; but this is rare and by no means desirable, as the progeny are sure to be small and thrive badly,—the dam in most cases having insufficient milk for so large a family.

The goat propagates at a very early period of its life. The male is generally capable of engendering at seven months; and, in the case just referred to of four at a birth, the father on one occasion was barely six months old. One is sufficient for a hundred females. The latter bring forth at twelve months, and sometimes earlier. For the sake of the future growth and productiveness of the animal, however, it is unwise to permit intercourse between the sexes

earlier than at eighteen or at least sixteen months, It is owing to the baneful practice of letting tlem breed as soon as they will, under the mistaken idea that a more rapid return is obtained, that so many diminutive specimens are met with, both dam and progeny being spoiled in consequence.

The best kind for milch purposes are those with long and deep bodies, not necessarily so broad at the chest as about the haunches, the belly ample, and the legs tolerably short ; head fine and tapering, with prominent eyes, ears long, thin, wide, and inclining horizontally, horns short and not corrugated, neck thick, and coat close and short. The udder above all must be not only large but soft and elastic, with nice pointed teats, Hornless specimens are often the best milkers.

The goat has 32 teeth, and by these the age up to five years may be pretty accurately ascertained. The lower jaw possesses 12 molars and 8 incisors, and the upper 12 molars alone. The kid at its birth has 6 molars but no incisors ; the latter, however, are generally all cut in about three weeks, the first cut molar being visible at three months. At a year or fifteen months old the two front “milk teeth,” as the first set of incisors are called, fall, and are replaced by permanent ones; the next two at from two years to thirty months, the third pair from two and a half to three and a half years, and the fourth and last at from three and a half to four and a half years. When all are changed the mouth is said to be “ full.”

Between two and five years old the she-goat gives the best return in milk, continuing productive often for eight or nine years; its length of life is on an average from ten to fifteen. These animals vary very greatly in the quantity of milk they yield. An ordinary specimen gives from 2 to 3 pints, a superior one 2 quarts, and occasionally first-rate individuals are found supplying 3 quarts a day. The Nubian breed surpasses the common goat in this respect, as the following table from the French work of M. du Plessis will show, in which the yield of a Nubian is compared with that of a half-bred, itself a superior milker,

Half-bred Nubian and Native. Pure Nubian Breed.

Milk. Cream. Milk. Cream.

Ist day 3°57 litres, °22 litres. Ist day. 4°39 litres. ‘3800 litres a eee 21 2% 5 %w4l 4, 3848, 3d, B80) 59 Ome; 3d yy 4538 4, “3850, 4th ,, 5162 Is athe eT, 3969 4, bth ,, 369, 24h bth ,, 4 ; 4080, ye, Ky, 29:94 ,, 1-920q0me

The litre being as near as possible 1? pints, the return in English measure is accordingly—from the half-bred 31 pints, or an average per day of 3 quarts, and from the pure Nubian 40 pints, or nearly 4 quarts daily, the rich. ness of the quality being proportionately greater.

Milking should be performed at regular hours, morning aud night; but with heavy milkers three times daily is better for the first two or three months, as the oftener the udder is emptied when once full the quicker it is replen-ished, a sufficient supply of food being of course provided. It is a good plan to accustom the animal to jump on a plat- form whilst being milked ; the teats are thus more easily manipulated, and more command is obtained over the goat and the pail. Feeding and milking should always be carried on at the same time.

Many persons are under the wrong impression that the milk of the she-goat, —which by the way has no strong hircine scent attaching to her like the male, another common error,—possesses a flavour peculiar to itself ; but this is quite a mistake. Out of dozens kept by the present writer, only one has been found to yield milk differing from that of the cow in taste. The peculiarity m this case seemed natural to the animal, and the milk was decidedly unpalatable. ‘

The flesh of the common goat, although quite eatable, 18 not to be recommended in comparison with mutton, being rather hard and indigestible. Kid, however, is a great delicacy, and tastes like lamb or veal, according to the manner of dressing. It is preferable cooked like veal, with layers of bacon tied round and stuffed, for with the exception of the suet there is very little fat. A good rich gravy should accompany the joint when served, and there should be no lack of cooking. Hot or cold it is then equally acceptable. Suckling kids are the best eating, as they have then their milk flesh, and are nice and plump. The skins dressed and sewed together make handsome TUg* For food and other remarks on goat-keeping see AGRICUL TURE, vol. i. p. 399. (s. H. P.)

GOATSUCKER

GOATSUCKER, a bird from very ancient times absurdly believed to have the habit implied by the common name it bears in many European tongues besides our own— as testified by the Greek AiyoOyXas, the Latin Capri-mulgus, Italian Succiacapre, Spanish Chotacabras, French Tettechévre, and German Liegenmelker. The common Goatsucker (Caprimulgus europeus, Linn.), is admittedly the type of a very peculiar and distinct Family Caprimul- gide, a group remarkable for the flat head, enormously wide mouth, large eyes, and soft, pencilled plumage of its members, which vary in size from a Lark to a Crow. Its position has been variously assigned by systematists. Though of late years judiciously removed from the Passeres, in which Linnzeus placed all the Species known to him, Professor Huxley considers it to form, with two other Families—the Swifts (Cypselide) and Humming-birds (Trochilide), the division Cypselomorphe of his larger group Mipithognathe, which is equivalent in the main to the Linnean Passeres. There are two ways of regarding the Caprimulgidee—one including the genus Podargus and its allies, the other recognizing them as a distinct Family, Podargide. As a matter of convenience we shall here comprehend these last in the Caprimulgide, which will then contain two subfamilies, Caprimulgine and Podar- gine ; for what, according to older authors, constitutes a third, though represented only by Steatornis, the singular

Common Goatsucker.

Oil-vird, or Guacharo, certainly seems to require separation a3 an independent Family (see GUACHARO), Some of the differences between the Caprimulgine and Podargine have been pointed out by Mr Sclater (Proc. Zool. Soe, 1866, p. 123), and are very obvious. In the former, the outer toes have Jour phalanges only, thus presenting a very uncommon character among birds, and the middle claws are pectinated ; while in the latter the normal number of five phalanges is found, and the claws are smooth, and other distinctions more recondite have also been indicated by him: (tom. cit., p. 582). The Caprimulgine may be further divided into those having the gape thickly beset by strong bristles, and those in which there are few such bristles or none—the former containing the genera Capri. —

mulgus, Antrostomus, N; yctidromus, and others, and the latter Podager, Chordiles, Lyncornis, and a few more, The common Goatsucker of Europe (C. europeus) arrives late in spring from its winter-retreat in Africa, and its pre- Sence is soon made known to us by its habit of chasing its prey, consisting chiefly of moths and cockchafers, in the even. ing-twilight. As the season advances the song of the cock, tom its singularity, attracts attention amid all rural sounds, +418 song seems to be always uttered when the bird is at 'Test, though the contrary has been asserted, and is the continuous repetition of a single burring note, as of a thin lath

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fixed at one end and ina state of vibration at the other, and loud enough to reach in still weather a distance of half- a-mile or more. On the wing, while toying with its mate, or performing its rapid evolutions round the trees where it finds its food, it has the habit of occasionally producing another and equally extraordinary sound, sudden and short, but somewhat resembling that made by swinging a thong in the air, though whether this noise proceeds from its mouth is not ascertained. In general its flight is silent, but at times when disturbed from its repose, its wings may be heard to smite together. The Goatsucker, or, to use per- haps its commoner English name, Nightjar, passes the day in slumber, crouching on the ground or perching on a tree —in the latter case sitting not across the branch but length- ways, with its head lower than its body. In hot weather, however, its song may sometimes be heard by day and even at noontide, but it is then uttered, as it were, drowsily, and without the vigour that characterizes its crepuscular or uocturnal performance. Towards evening the bird becomes active, and it seems to pursue its prey throughout the night uninterruptedly, or only occasionally pausing for a few seconds to alight on a bare spot—a pathway or road— and then resuming its career. It is one of the few birds that absolutely make no nest, but lays its pair of beautifully- marbled eggs ou the ground, generally where the herbage is short, and often actually on the soil. So light is it that the act of brooding, even where there is some vegetable growth, produces no visible depression of the grass, moss, or lichens on which the eggs rest, and the finest sand equally fails to exhibit a trace of the parental act. Yet scarcely any bird shows greater local attachment, and the precise site chosen one year is almost certain to be

occupied the next. The young, covered when hatched with dark- Spotted down, are not easily found, nor are they more easily discovered on becoming fledged, for their plumage almost entirely resembles that of the adults, being a mixture of reddish-brown, grey, and black, blended and mottled in a manner that passes description. They soon attain their full size and power of flight, and then take to the same manner of life as their parents, In autumn all leave their sum- mer haunts for the south, but the exact time of their departure has hardly been ascertained, The habits of the Nightjar, as thus described, seem to be more or less essen- tially those of the whole Subfamily—the differences obser- vable being apparently less than are found in other groups of birds of similar extent.

A second species of Goatsucker (C. ruficollis), which is somewhat larger, and has the neck distinctly marked with rufous, is a summer visitant to the south-western parts of Europe, and especially to Spain and Portugal. The occur. rence of a single example of this bird at Killingworth, near Newcastle-on-Tyne, in October 1856, has been re- corded by Mr Hancock (Jbis, 1862, p. 39); but the season of its appearance argues the probability of its being but a casual straggler from its proper home. Many other species of Caprimulgus inhabit Africa, Asia, and their islands, while one (C. macrurus) is found in Australia. Very nearly allied to this genus is Antrostonus, an American group containing many species, of which the Chuck-will's- widow (A. carolinensis) and the Whip-poor-will (A. voei- ferus) of the eastern United States (the latter also reaching Canada) are familiar examples. Both these birds take their common name from the ery they utter, and their habits seem to be almost identical with those of the Old- World Goatsuckers. Passing over some other forms which need not here be mentioned, the genus Nyctidromus, though consisting of only one species (Z. albicollis) which

? Other English names of the bird are Evejar, Fern-Owl, Churn-Owl, and Wheel-bird—the last from the bird's song resembling the noise made by a spinning-wheel in motion,

inhabits Central and part of South America, requires re- mark, since it has tarsi of sufficient length to enable it to run swiftly on the ground, while the

legs of most birds of the Family are so short that they can make but a shuffling progress. Zeleothreptes, with the unique form of wing possessed by the male, needs mention. Notice must also be taken of two African species, referred by some ornithologists to as many genera (Macrodipteryx and Cos- metornis), though probably one genus would suffice for both. The males of each of them are characterized by the wonderful development of the ninth primary in either wing, which reaches in fully adult specimens the extra- ordinary: length of 17 inches or more. The former of these birds, the C'. macrodipterus of Afzelius, is considered to belong to the west coast of Africa, and the shaft of the elongated remiges is bare for the greater part of its length, retaining the web, in a spatulate form, only near the tip. The latter, to which the specific name of vewdlarius was given by Mr Gould, has been found on the east coast of that continent, and is reported to have occurred in Madagascar and Socotra. In this the remigial streamers do not lose their barbs, and as a few of the next quills are also to some extent elongated, the bird, when flying, is said to look as though it had four wings. Specimens of both are rare in collections, aud no traveller seems to have had the opportunity of studying the habits of either so as to suggest a reason for this marvellous sexual development.

The second group of Caprimulgine, those which are but poorly or not at all furnished with rictal bristles, contains about five genera, of which there is here only room to par- ticularize Lyncornis of the Old World and Chordiles of the New. 'The species of the former are remarkable for the tuft of feathers which springs from each side of the head, above and behind the ears, so as to give the bird an appear- ance like some of the " Horned " Owls—those of the genus Scops, for example ; and remarkable as it is to find certain forms of two Families, so distinct as are the Strigide and the Caprimulgide, resembling each other in this singular external feature, it is yet more remarkable to note that in some groups of the latter, as in some of the former, a very curious kind of dimorphism takes place. In either case this has been frequently asserted to be sexual, but on that point doubt may fairly be entertained. Certain it is that in some groups of Goatsuckers, as in some groups of Owls, indivi- duals of the same species are found in plumage of two entirely different hues—rufous and grey, The only ex- planation'as yet offered of this fact is that the difference is sexual, but, as just hinted, evidence to that effect is con- flicting. It must not, however, be

supposed that this com- mon feature, any more than that of the existence of tufted forms in each group, indicates any close relationship between them. The resemblances may be due to the same causes, concerning which future observers may possibly enlighten us, but at present we must regaid thein as analo- gies not homologies. The species of Lyncornis inhabit the Malay Archipelago, one, however, occurring also in China. Of Chordiles the best known species is the Night-hawk of North America (C. wirginianus or C. popetue), which has a wide range from Canada to Brazil. Others are found in the Antilles and in South America. The general habits of all these birds agree with those of the typical Goatsuckers.

We have next to consider the birds forming the genus Podargus and those allied to it, whether they be regarded asa distinct Family, or as a Subfamily of Caprimulgide. As above stated, they have feet constructed as those of birds normally are, and their sternum seems to present the con- stant though comparatively trivial difference of having its posterior margin elongated into two pairs of processes, while only one pair is found in the true Goatsuckers. Podargus includes the bird (P. cuvierz) known from its ery as Morepork

to Tasmanian colonists,! and several other species, the num- ber of which is doubtful, from Australia and New Guinea, They have comparatively powerful bills, and it would seem feed to some extent on fruits and berries, though they mainly subsist on insects, chiefly Czcade and Phasmide, They also differ from the true Goatsuckers in having the outer toes partially reversible, and they are said to build a flat nest on the horizontal branch of a tree for the reception of their eggs, which are of a spotless white. Apparently allied to Podargus, but differing among other respects in its mode of nidification, is gotheles, which belongs also to the Australian Subregion; and further to the northward, extending throughout the Malay Archipelago and into India, comes Batrachostomus, wherein we again meet with species having aural tufts somewhat like Lyncornis, The Podar- gine are thought by some to be represented in the New World by the genus Vyctibius, of which several species occur from the Antilles and Central

America to Brazil. Finally, it may be stated that none of the Caprimaulgide seem to occur in Polynesia or in New Zealand, though there is scarcely any other part of the world suited to their habits in which members of the Family are not found, (A. N,)

GOBELIN, the name of a family of dyers, who in all probability came originally from Rheims, and who in the 15th century established themselves in the Faubourg Saint Marcel, Paris, on the banks of the Biévre. The first head of the firm was named Jehan, and died in 1476. He dis- covered a peculiar kind of scarlet dye, and he expended so much money on his establishment that it was named by the common people la folie Gobelin. To the dye works there was added in the 16th century a manufactory of tapestry, So rapidly did the wealth of the family increase, that in the third or fourth generation some of thein forsook their trade and purchased titles of nobility. More than one of their number held offices of state, among others Balthasar, who became successively treasurer general of artillery, treasurer extraordinary of war, councillor secretary of the king, chancellor of the exchequer, councillor of state, and president of the chamber of accounts, and who in 1601 received from Henry II. the lands and lordship of Brie comte-Robert. He died in 1603. The name of the Gobelins as dyers cannot be found later than the end of the 17th century. In 1662 the works in the Faubourg Saint Marcel, with the adjoining grounds, were purchased by Colbert on behalf of Louis XTV., and transformed into a general upholstery manufactory, in which designs both in tapestry and in all kinds of furniture were executed under the superintendence of the royal painter Lebrun. On account of the pecuniary embarrassments of Louis XIY., the establishment was closed in 1694, but it was reopened in 1697 for the manufacture of tapestry, chiefly for royal use and for presentation. During the Revolution and the reign of Napoleon the manufacture was suspended, but it was revived by the Bourbons,and in 1826 the manufacture of carpets was added to that of tapestry. In 1871 the building was partly burned by the Communists.

See Lacordaire, Notice historique sur les manufactures dmpériales de tapisserie des Gobelin et de tapis de la Savonnerie, précédée db cataloque des tapisseries qui y sont exposées, Paris, 1853; and also the article TAPESTRY.

GOBI is the name usually applied by European ge graphers to a vast stretch of desert in Central Asia, which has its western limits in the neighbourhood of 75° E. long, and its eastern somewhere between 114° and 115% Lake many other geographical designations, the word is not only of doubtful origin, but in conventional usage has modified its meaning. According to Sir T. Douglas Forsyth, it 18 originally the Turki for “great” ; and Richthofen informs

1 In New Zealand, however, this name is given to an Owl (Seelo- glaux nove-zelandic).

us that by the Chinese it is employed, not as a proper name, but, like Shamo, as a general term for any sandy and desert piece of country. This being the case, the great German geographer proposes to displace the word Gobi in European usage by the Chinese Han-hai or Dry Sea, suggestive as he says not only of the present appearance but also of thie former history of the region; but it is to be feared that the older designation has become too fa miliar, and the dis- advantages arising from its use are of too recondite a char- acter, to render it likely that his proposal will be generally accepted, .

As a sea the Gobi or Han-hai must haye been comparable in extent to the Mediterranean, and the ancient coast-line can be pretty clearly recognized. In its present state it may be divided into two distinct basins, the western taking its name from the river Tarim or Tarym, and the eastern from the Chinese Shamo or “Sand Desert.” The Dzun- garian valley stretches westwards like a gulf. The Tarim basin is bounded on the S. by the range of mountains which, under various names applicable to different portions, such as the Kwen-lun and the Altyntag, forms the northward rim of the great plateau of Thibet 3 on the west it comes up to the spurs of the Pamir plateau, and on the north it lies along the foot of the Thian Shan, If We measure from the source of any of its principal tributaries, the Tarim must have a course of more than 1000 miles. The head-waters rise in the mountains just named, and the more important of them in the south and west. The: Khotau river and its confluent the Kara-Kash both descend from the Karakorum mountains, and flow in a generally northward direction ; the Zarafshan or Yarkand River, nsing in the same range, Winds about in the

first part of its course so as to enter the Gobi almost from the west ; and the Kizil Su or Kashgar River has its numerous head streams in the Kizil Yart mountains belonging to the Pamir plateau. The Aksai River and the Shah Yar are the most importaut contributions from the Thian Shan. The course of all of these rivers after they enter the Gobi is largely matter of conjecture, and all that can be asserted with confidence is that they unite to form the Tarim, and find their final goal in an inland lake, They have probably all reached a common channel about 82° FR, long. ; but as the stream presses east- ward it again breaks up into numerous branches, the arrangement of which, except along the route followed by Przhevalski, is still unknown, As it passes east the stream geadually loses in volume by absorption, evaporation, and the demands of riparian populations. In the neighbourhood of the Ugendarya, the breadth is about 300 or 360 feet, and the depth about 20. The course of the Tarim lies much nearer the northern side of the Gobi than the southern, but it gradually trends south east, and at length passing through Lake Karaburan, loses itself iu Lake Chon-Kul (t.e., great lake) or Kara-Kurchin. This last lake is identi. fied with the famous Lob-nor, the position of which has

fen one of the outstanding problems of comparative geo- gtaphy. Against the identification a number of objections have been urged by Richthofen (cf, « Bemerkungen zu den Ergebnissen von Ober-licut. Prejewalski's Reise" in Zeit.

sch. fiir Evdh., Berlin, 1878), the most important of which are the prevailing tradition that the Lob-nor was a salt lake while the Chon-Kul is fresh, and the fact that the

hinese maps place the Lob-nor to the north of the position assigned to the Chon Kul, which according to Przhevalski lies about 39° 30′ N. lat., immediately to the N. of the Altyntag range (13,000 to 14,000 'feet high). The country through which the Lower Tarim flows is dreary and monotonous, « In general," reports the traveller, "the 4ob-nor desert is the wildest and most unfertile of al] that

have yet seen in Asia ; it is sadder than the desert of AlaShan." A meagre vegetation of tamarisks and reeds

lines the course of the river, Away towards the south- west there stretch, if we may trust to native reports, those vast fields of drifting and treacherous sands which have given so much of its terror to the legendary account of the desert of Gobi. That the reports are in the main true, and that the legends are founded on fact, appears to be rendered probable by the statements of Sir T. Douglas Forsyth, who has contributed an interesting paper on the subject to the Proceedings of the Royal Geographical Society (1876). The population of the Tarim basin is scanty and poverty-stricken. On the Lower Tarim there are nine villages with a total of 1200 souls. Cattle-rearing is more general than agriculture, which indeed is of the most recent introduction, and con- fines itself to barley and wheat. Mahometanism is the uni- versal religion, and the language appears to be identical with the Taranchi and the Sart.

The Shamo or eastern basin is quite different in its char- acter. Here we have no large river like the Tarim, and, instead of its boundaries being marked by lofty ranges of mountains from 13,000 to 20,000 feet high, the ground gradually rises in a series of scarce] y marked terraces. The central point, at Ozon Khoshu, is the lowest discovered in Central Asia, being only 607 metres (1948 feet) above the level of the sea. “The aspect of the country,” says N ey Elias, “who crossed in a north-westerly direction from China, is that of low hills or downs, with valleys and plains intervening, the whole of a rocky or stony nature rather than sandy, though patches of sand do occur every here and there. What little vegetation exists is chiefly composed of weeds, ‘scrub,’ and heath, there being scarcely any grass, and only a dwarfed and stunted tree here and there, in the Sorges or passes of those low rocky ranges that at uncertain intervals cross the desert in almost parallel lines from east to west.” Of the western portion of the basin we have no modern account,

Marco Polo was the first European who gave a distinct deseription of the desert of Gobi. He tells us how on quitting Charchan (the modern Chachan, according to Yule) “you ride some five days throngh the sands finding none but bad and bitter water ; and then you come to a city called Lop at the edge of the descrt…. The length of the desert is so great that it would take a year and more to ride from one end of it to the other. It is all composed of hills

and valleys of sand.” And then he goes on to speak of spirits that haunt the waste, and syllable men’s names, and of strange noises like the tramp and huin of a great cavalcade, of the sound of drums, and a variety of musica] instruments. Polo appears to have pro- ceeded east from Khotan to Lob, and then further east to Ktsina on the southern edge of the desert, and afterwards to have spent forty days in crossing the desert northwards to Karakortim.!

Later notices of the Gobi, especially of its. eastern portions, are given by Gerbillon, 1688-98 (in Duhalde’s appendix), by the Dutch- man Evert Ysbrand Ides (1692-94), and by Lorenz Lange, who was sent in 1727-28 and in 1736 by Peter the Great to Peking.? But it was not till the present century that accurate information began to accumulate about the eastern portions, and the traveller who has lifted the veil from the western portions is still engaged in hig ex. plorations. In 1830-31 Fuss and Bunge crossed the eastern Gobi from Urga to Kalgan ; and Dr Fritsche executed a series of journeys in the same district between 1869 and 1873.3 The missions of the Russian officials Andre Gustavitch Prinz (1863) and Shishmaroff (1868) added little to the knowledge of the region; but in 1870 Pavlinoff, consul at Chuguchak, being accompanied by a Government topographer Matusovski, made valuable observations on the route from Suok to Kobdo, and from Kobdo to Uliassutai.? Of stil] greatcr moment were the travels of N. ey Elias in 1872-73, and of Przhevalski between 1870 and1877. In his earlier journey (1870- 72) Przhevalski travelled across the Gobi ina line almost due south from Urga, and in 1877 he struek south-east from the Yulduz range, one of the outrnnners of the Thian Shan.

Besides the works referred to in the text see especially Richthofen’s °

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1 See Yule’s Marco Polo, vot. i. p. 178-200.

? Lange’s narrative has often been printed. See especially Tage- buch Zwoer Reisen von L. Lange: aus ungedruekten Quellen mit. getheilt vom Herrn Prof. Pallas, Leipsie, 1781.

3 See Verhandlungen der Gesellschaft fir Erdkunde, 1874, and for map 4eitsch. der Ges. fir Erdk., Berlin, 1874.

- See results of Journey in Petermann's Mittheil., Jan. 1873,

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(714 GOB—GOD

masterly account of the Gobi in his China, vol i., Berlin, 1877, and Prejevalsky, Mongolia, the Tangut Country, &c., London, 1876, and From Kulja across the Tian-Shan to Lob Nor, London, 1879. An account of Elias's journey will befound in Journal of the Royal Geo- graphical Society, 1873, and in Guido Cora's Cosmos 1874. GOBY. The Gobies (Gobius) are small fishes readily re-

cognized by their ventrals (the fins on the lower surface of

Fic. 1.—G@obius lentiginosus.

the chest) being united into one fin, forming a suctorial disk, by which these fishes are enabled to attach themselves in every possible posi- tion to a rock or other firm substances. They are essentially coast-fishes, inhabi- ting nearly all seas, but disappearing to- wards the Arctic and Antarctic Oceans. Many enter, or live exclusively in, such fresh waters as are at no great dis- tance from the sea, Between 200 and Fis. 2.—United ven- 300 different kinds are known. wale of Goby.

GOD. See THetsm,

GODALMING, a municipal borough and market-town of England, county of Surrey, is situated 32 miles S.W. of London, in a valley on the right bank of the Wey, which is navigable thence to the Thames. It consists principally of one street nearly a mile in length, on the high road between London and Portsmouth. The chief public buildings are the town-hall and market-house, Wyat's almshouses for poor men, the public hall, and the parish church, an old cruci- form building, of mixed architecture, but principally Early English and Perpendicular. The church was repaired in

1840, and also in 1867. It contains a large number of old |

memorials. Godalming has manufactures of paper, leather, parchment, and hosiery, and some trade in corn, malt, bark, hoops, and timber. The town obtained a market from Edward I. in 1300, and was incorporated in 1575. The population in 1871 was 2444.

GODAVARL, a river of Central India, which flows across the Deccan from the western to the Eastern Ghats, for sanctity, picturesque scenery, and utility surpassed only by the Ganges and the Indus. The total length is 898 miles ; the estimated area of drainage basin, 112,200 square miles. Its traditional source is on the side of a hill behind the village of Trimbak in Nasik district, Bombay, but according to popular legend it proceeds from the same ultimate source as the Ganges, though underground. Its course is generally south-easterly. After passing through Nasik district, it crosses into the dominions of the nizim of Hyderabad. When it again strikes British territory it is joined by the Pranhita, with its tributaries the Waraha, the Penganga, and Wainganga. For some distance it flows between the Nizam's dominions and the upper Godavari district, and receives the Indravati, the Sal, andthe Sabari. The stream is now very imposing, with a channel varying from 1 to 2 miles in breadth, occasionally broken by alluvial islands. Parallel to the river stretch long ranges of hills; on the opposite side the country is more open and cultivated. Below the junction of the Sabari the scenery is such that the Godavari has got the name of the Indian Rhine. The channel here begins to contract. The flanking hills gradu- ally close in on both sides, and the result is a magnificent gorge only 200 yards wide through which the water flows into the plain of the delta, about 60 miles from the sea. The head of the delta is at the village of Dhaulaishvaram,

where the main stream is crossed by the irrigation anicut, The river has seven mouths, the largest being the Gautami Godavari. The Godavari is regarded as peculiarly sacred, and once every twelve years the great bathing festival called Pushkaram is held on its banks.

The upper waters of the Godavari are scarcely utilized for irrigation, but the entire delta has been turned into a garden of perennial crops by means of the anicut at Dhau- laishvaram, from which three main canals are drawn off, The river channel here is 34 miles wide. The anicut isa substantial mass of

stone, bedded in lime cement, about 2 miles long, 130 feet broad at the base, and 12 feet high, The stream is thus pent back so as to supply a volume of 3000 cubic feet of water per second during its low season, and 12,000 cubic feet at time of flood. The canals have a total length of 528 miles, capable of irrigating 780,000 acres, while 463 miles are also used for navigation. In 1864 water-communication was opened between the river-systems of the Godavari and Kistna. Rocky barriers and rapids obstruct navigation in the upper portion of the Godavari. Attempts have been made to construct canals round these barriers but with little success, and lately the undertaking has been entirely abandoned.

GODAVARI, a district of Madras presidency, British India, lying between 16° 15’ and 17° 35’ N. lat. and between 80° 55’ and 82° 38’ E. long.; and bounded N. by the Central Provinces and Vizagapatam district, E. by Vizagapatam and the Bay of Bengal, S. by the Bay of Bengal and Kistna district, and W. by the Nizdm’s dominions. The district is divided by the Godavari river into two nearly equal parts. The scenery along the course of the river is varied and striking. The only lake of importance is the Koléru, which is studded with islands and fishing villages. Building stone and limestone are abundant in the uplands. Iron is also found. The jungle

products are myrobalans, soap-nuts, tamarinds, bamboo-

rice, honey, and beeswax. Wild animals and game birds are numerous.

The population in 1871 numbered 1,592,939 (803,603 males, 789,336 females), showing a considerable increase on former years. The Hindus numbered 1,555,981, the Mahometans 35,178, the Christians 1483 (Protestants and Roman Catholics in nearly equal numbers); 39 were Buddhists, and 263 not separately classified. Nineteen towns each contain upwards of 5000 inhabitants,—the

aggregate population of the three chief towns, Ellor, Rajahmandri,

and Cocanada, being 63,064.

The total area of the district is 7345 square miles, of which 2713 square miles belong to Government. Of Government land, 386,400 acres are under cultivation; the rest either belongs to the zaminddrt estates, or is waste and uncultivable. The chief productsare rice, gram, jute, hemp, gingelly, tobacco, sugar-cane, and indigo ; rice and food grains have improved in quality owing to the extension of irrigation by canals. Government tenants have permanent right of occupancy so long as they pay the Gevernment demand, while on the caménddrt estates cultivators are merely yearly tenants. The district is well supplied with means of communication by 491 miles of good road and 431 miles of canals. The principal manufactures are cotton and woollen carpets, sheep wool blankets, uppada cloths, sugar, and indigo. The chief articles of trade are grain, cotton, jaggely, turmeric, cocoa-nut, flax-cloth, onions, garlic, lace cloths, tobacco, gingelly sced, lamp-oil, salt, tamarinds, eattle, teakwood, skins, opium, and indigo. Cocanada, Ellor, Rajahmandri, Mandapetta, Jaggampetta, Husanbada, Nasapur, Palakollu, Dowlaishvaram, Ambajipetta, and Jagannathpur are the most important seats commerce. The estimated value of imports in 1874-75 was £204,238, and of exports, £903,253. The total revenuein 1875-76 was £558,812; the expenditure, £28,604; the total municipal income, £5152. There are 28 magisterial and 15 revenue and courts. There are 387 schools, attended by 7759 pupils. The administrative headquarters is at Cocanada. The prevailing epidemic diseases are beri-beri and fevers ; cholera and small-pox occur during the hot season, but only the poorer classes are attacked. Cattle diseases also prevail. The average annual ralll- fall from 1871 to 1875 was 43°35 inches; the average sean temperature at Rajahmandri in 1876 was 82°7° Fahr. Two severe storms, which caused great destruction to property, occurred 12 1832 and 1839. see

The Godavari district formed part of the Andhra division =

Godolphin owed his rise to power and his continuance in it under four sovereigns chiefly to his exceptional mastery of financial matters ; for if latterly he was in some degree indebted for his promotion to the support of Marlborough, he received that support mainly because Marlborough recog- nized that for the prosecution of England's foreign wars his financial abilities were an indispensable necessity, He was cool, reserved, and cautious, but his prudence was less associated with high sagacity than traceable to the weak- ness of his personal antipathies and prejudices, and his freedom from political predilections, Perhaps it was his unlikeness to Marlborough in that moral characteristic which so tainted Marlborough's greatness that rendered possible between them a friendshi Pp so intimate and undis- turbed: he was, it would appear, exceptionally devoid of the passion of avarice; and so little advantage did he take of his opportunities of aggrandizement that, though his style of living was unostentatious,—and in connexion with his favourite pastimes of horse-raci ng, card-playing, and cockfighting he gained perhaps more than he lost,—all that he left behind him did not, according to the duchess of Marlborough, amount to more than £12,000. His treacherous intercourse with James II. was doubtless largely due to the spell of Marlborough's influence ; but in any case it indicates that, if in other respects his political conduct was upright and trustworthy, this is to be accounted for by his prudence and certain other mental peculiarities, rather than by the strength of his moral principle or his keen sense of honour. His son and successor Francis, who had married Henrietta, eldest daughter of the duke of Marl- borough, in 1698, died in 1766, leaving no male issue.

GODOY. See Aucupta.

GODWIN, Francis (1561-1633), son of Dr Godwin, bishop of Bath and Wells, was born at Havington in North. amptonshire in 1561. He was elected student of Christ Church, Oxford, in 1578, took his bachelor's degree in 1580, and that of master in 1583. Entering holy orders, he became successively rector of Sampford-Orcais in Somerset: shire, and vicar of Weston-in-Zoyland in the same county. In 1587 he was appointed subdean of Exeter. Having turned his attention to the subject of British antiquities, he became acquainted with Camden, whom in 1590 he accom- panied in a journey through Wales. He was created bachelor of divinity in 1593, and

doctor in 1595. In 1601 he pub- lished his Catalogue of the Bishops of England since the Jirst planting of the Christian Religion in this Island, a work which procured him in the same year the bishopric of Llandaff from Elizabeth. A second edition appeared in 1615, and in 1616 he published an edition in Latin with a dedication to King James, who in the following year con- ferred upon him the bishopric of Hereford, The work was republished, with a continuation by Dr Richardson, in 1743. In 1616 Godwin published Rerum Anglicarum, Henrico VITI., Edwardo VI, et Maria regnantibus, Annales, which was afterwards translated and published byhis son under the title Annales of England, 1630. The last of his works pub- lished before his death, which took place in 1633, was Com- putation of the value of the Roman Sesterce and Attic Talent, which appeared in 1630. THe is also the author of a some- what remarkable story, published posthumously in 1638, and entitled The Man in the Moon, or a Discourse of a Voyage thither, by Domingo Gonsales, written apparently sometime between the years 1599 and 1603. In this pro- duction Godwin not only declares himself a believer in the Copernican system, but adopts so far the principles of the law of gravitation by supposing that the earth's attraction diminishes with the distance. The work, which displays considerable fancy and wit, was translated into French, and Was imitated in several important particulars by Cyrano de Bergerac, from whom Swift obtained valuable hints in

Dravida, the north-west portion being subject to the Orissa kings, and the south-western belonging to the Vengi kingdom. For cen- turies it was the battlefield on which various chiefs fought for independence with varying success till the beginning of the 16th century, when the whole country may be said to have passed under Mahometan power. At the conclusion of the struggle with the French in the Carnatic, Godavari with the Circars was ceded to the English by the nawab, and finally confirmed by the imperial sanad in 1765. The present district was constituted in 1859, by the redistribution of the territory comprising the former districts of Guntoor, Rajalmandri, and Masulipatam, into what are now the Kistna and Godavari districts,

GODEFROI. See Gorgorrep.

GODFREY or Bourtton. See Bourttoy.

GODOLPHIN, Swwyey Gopvotraty, Eart or (c. 1635- 1712), was a cadet of an ancient family of Cornwall, and was born most probably in 1635. At the Restoration he was introduced into the royal household by Charles IL., with whom he had previously become a favourite, and he also at the saine period entered the House of Commonsas mem- ber for Helstone. Although he very seldom addressed the House, and, when he did so, only in the briefest manner, he gradually acquired a reputation as its chief if not its only financial authority. In March 1679 he was appointed a member of the privy council, and in the September follow- ing he was promoted, along with Viscount Hyde (afterwards earl of Rochester) and the earl of Sunderland, to the chief management of affairs. Though he voted for the Exclusion Bill in 1680, he was continued in office after the dismissal of Sunderland, and in September 1684 he was created Baron Godolphin of Rialton, and succeeded Rochester as first lord of the treasury. After the accession of James II. he was made chamberlain to the queen, and, along with Rochester and Sunderland, enjoyed the king's special con- fidence. In 1687 he was named commissioner of the treasury. He was one of the council of five appointed by King James to represent him in London, when he went to join the army after the landing of William prince of Orange in England, and, along with Halifax and N ottingham, he was afterwards appointed a commissioner to treat with the prince. On the accession of William, though he only obtained the third seat at the treasury board, he had virtually the chief control of affairs. He retired in March 1690, but was recalled on the November following, and appointed first lord, While holding this office he for several | years continued, in conjunction with Marlborough, a treacherous intercourse with James II., and is said even to have anticipated Marlborough in disclosing to James in- telligence regarding the intended expedition against Brest. After Fenwick's confession in 1696 regarding the Assassina- tion Plot, Godolphin, who was compromised, was induced to tender his resignation; but when the Tories came into power in 1700, he was again appointed lord treasurer, and retained office for about a year. Though not a favourite

with Queen Anne, he was, after her accession, appointed to his old office, on the strong recommendation of Marlborough. He also in 1704 received the honour of knighthood, and in December 1706 he was created Viscount Rialton and Earl of Godolphin. The influence of the Marlboroughs with the

Masham and Harley earl of Oxford, and with the fortunes of the Marlboroughs those of Godolphin were indissolubly united. The services of both were so appreciated by the nation that they were able for a time to regard the loss of

Some thraldom of Marlborough by abruptly dismissing Godolphin from office, 7th August 1710. He died 15th September 1712,

writing his voyage to Laputa. Another work of Godwin's, Nunetus Inanimatus in Utopia, originally published in 1629, but subsequently suppressed, seems to have been the proto- type of Wilkins's Mercury, or Secret and Swift Messenger, which appeared in 1641. Godwin's pamphlet was again published in 1657.

GODWIN, Mary Wottstonecrarr (1759-1797), an English authoress of the last century, was born at Hoxton, on April 27,1759. Her family was of Irish extraction, and Mary's grandfather, who was 2 respectable manufac- turer in Spitalfields, realized the property which his son squandered. Her mother, whose maiden name was Dixon, was Irish, and of good family. Mr Wollstonecraft, after dissipating the greater part of his patrimony, tried to earn a living by farming, which only plunged him into deeper difficulties, and he Jed a wandering, shifty life. The family roamed from Hoxton to Edmonton, to Essex, to Beverley in Yorkshire, to Laugharne, Pembrokeshire, and back to London again.

After Mrs Wollstonecraft's death in 1780, soon followed by her husband's second marriage, the three daughters, Mary, Everina, and Eliza, sought to earn their own liveli- hood. The sisters were all clever women,—Mary and Eliza far above the average,—but their opportunities of culture had been few. They turned their thoughts towards the profession of teaching, and Mary, the eldest, was to make the first venture. She went in the first instance to live with her friend Fanny Blood, a girl of her own age, whose father, like Wollstonecraft, was addicted to drink and dissipation. As long as she lived with the Bloods, Mary helped Mrs Blood to earn money by taking in needle-work, while Fanny painted in water-colours, Everina went to live with her brother Edward, and Eliza made a hasty and, as it proved, unhappy

marriage with a Mr Bishop. All the Wollstonecraft sisters were enthusiastic, excitable, apt to exaggerate trifles, and to magnify inattentions into slights ; and Eliza had the family temperament in excess. Bishop was a man of violent temper, and when his wife's reason had almost given way under the miseries of her married life, Mary resolved to find some means of supporting her, and arranged her secret and sudden flight. A legal separa- tion was afterwards obtained, and the sisters, together with Fanny Blood, took a house, first at Islington, afterwards at Newington Green, and opened a school, which was carried on with indifferent success for nearly two years. During their residence at Newington Green, Mary was in- troduced to Dr Johnson, who, as Godwin tells us, '" treated her with particular kindness and attention."

In 1785 Fanny Blood married Hugh Skeys, a merchant, and went with him to Lisbon, where she died in child- bed after sending for Mary to nurse her. 'The loss of Fanny," as she said in a letter to Mrs Skeys's brother, George Blood, ' was sufficient of itself to have cast a cloud over my brightest days… . I have lost all relish for pleasure, and life seems a burden almost too heavy to be endured." Her first novel, Mary, a Fiction, written in 1787, was intended to commemorate her friendship with Fanny. After closing the school at Newington Green, Mary obtained a situation as governess in the family of Lord Kingsborough, in Ireland, which she held for nearly a year. Her pupils were much attached to her, especially Margaret King, afterwards Lady Mountcashel; and indeed Lady Kingsborough gave the reason for dismissing her that the children loved their governess better than their mother. Mary now resolved to devote herself to literary work, and she was encouraged in this purpose by Johnson, the publisher in St Paul's Churchyard, in whose house she resided fora few weeks, before she obtained lodgings in George Street, Blackfriars. She acted as Johnson's literary adviser, and undertook translations, chiefly from

GOD

WIN

the French. Jfary, a Fiction, the story already mentioned was not published till 1796. Zhe Elements of Morality, an old fashioned book for children, and Lavater's Physiog- nomy, were among her translations. Her Original Stories

from Real Life were published, with illustrations by

Blake, and in 1792 appeared A Vindication of the Rights of Woman, the work with which her name is always associated.

It is not among the least oddities of this book that it is dedicated to M. Talleyrand Périgord, late bishop of Autun, Mary Wollstonecraft still believed him to be sincere, and working in the same direction as herself. In the de. dication she states the ‘main argument” of the work, ‘““built on this simple principle that, if woman be not pre- pared by education to become the companion of man, she will stop the progress of knowledge, for truth must be common to all, or it will be inefficacious with respect to its in- fluence or general practice.” In carrying out this argument she used extraordinary plainness of speech, and it was this that caused all, or nearly all, the outcry. For she did not attack the institution of marriage, nor assail orthodox religion ; her book was really a plea for equality of edu- cation, passing into one for state education and for the joint education of the sexes. It was a protest against the assumption that woman was only the plaything of man, and she asserted that intellectual companionship was the chief, as it is the lasting, happiness of marriage. It may, however, be admitted that she discussed some subjects, not usually mentioned in print, with a certain want of reticence and delicacy. She dealt directly with dangerous and ex- plosive questions, incidentally upheld greater freedom of divorce, and denied the eternity of the torments of hell.

Mrs Wollstonecraft, as she now styled herself, desired to watch the progress of the Revolution in France, and went to Parisin 1792. Godwin, in his memoir of his wife, con- siders that the change of residence may have been prompted by the discovery that she was becoming attached to Fuseli, but there is nothing to confirm this surmise ; indeed, it was first proposed that she should go to Paris in company with him and his wife, nor was there any subsequent breach in their friendship. She remained in Paris during the Reign of Terror, when communication with England was difficult or almost impossible. Some time in the spring or summer of 1793 Captain Gilbert Imlay, an American, became acquainted with Mary—an acquaintance which ended in a more intimate connexion. There was no legal ceremony of marriage, and it is doubtful whether such a marriage would have been valid

at the time; but she passed as Imlay's wife, and her brother, Charles Wollstone- craft, wrote from Philadelphia that he had seen a gentleman who informed him "that Mary was married to Captain Imlay of this country." Imlay himself terms her in a legal document, " Mary Imlay, my best friend and wife," and she believed that his love, which was to her sacred, wouldendure. In August 1793 Imlay was called to Havre on business, and was absent for some months, during which time most of the letters published after her death by Godwin were written. Towards the end of the year she joined Imlay at Havre, and there in the spring of 1794 she gave birth to a girl, who received the name of Fanny, in memory of the dear friend of her youth. Imlay became involved in a multitude of speculations, which rendered him restless and dissatisfied, and his affection for Mary and their child was already waning. He left her for some mouths at Havre, and when he allowed her to join him m England, it appears from her letters that she went with a heavy heart and forebodings of sorrow. In June 1795, i less than two montlis after their reunion, Mary again left Englaud for Norway, empowered by the document in which Imlay calls her his wife, to act for him in his business

relations with Norwegian timber merchants. Her Letters from Norway, divested of all personal details, were after- wards published. She returned to England late in 1795, and found letters awaiting her from Imlay, intimating his intention to separate from her, and offering to settle an annuity on her and her child. For herself she rejected this offer with scorn: "From you," she wrote, "1 will not receive anything more. I am not sufficiently humbled to depend on your beneficence." They met again, and for a short time lived together, until the discovery that he was carrying on an intrigue under her own roof drove her to despair, and she attempted to drown herself by leaping from Putney bridge, but she was rescued by watermen. Imlay now completely deserted her, although she continued to bear his name.

In 1796, when Mary Wollstonecraft was living in Loudon, supporting herself and her child by working, as before, for Mr Johnson, she met William Godwin. A friendship sprang up between them,—a friendship, as he himself says, which "melted into love." Godwin states that "ideas which

he is now willing to denominate prejudices made him by no means willing to conform to the ceremony of marriage ;" but these prejudices were overcome, and they were married at St Pancras Church on March 29, 1797. And now Mary had a season of real calm in her Stormy existence. Godwin, for once only in his life, Was stirred by passion, and his admiration for his wife equalled his affection. But their happiness was of short duration. A daughter, Mary, afterwards the wife of Percy Bysshe Shelley, was born August 30, 1797. At first ail seemed to go well, but unfavourable symptoms set in, and on September 10th, the mother, after enduring all her sufferings with unvarying gentleness and sweetness of temper, passed away. She was buried in the churchyard of Old St Pancras, but her remains were afterwards removed by Sir Percy Shelley to the churchyard of St Peter's, Bournemouth.

Her principal published works are as follows :—Zhoughts on the Eidweation of Daughters, 1789; Original Stories from Real Life, 1791; An Historical and Moral View of the Origin and Progress of the French Revolution, and the Effects it has produced in Europe, vol. i. (no more published), 1790; Vindieation of the Rights of Woman, 1792; Vindi- cation of the Rights of Man, 1793 3; Mary, a Fiction, 1796; Letters written during a Short Residence in Sweden, Norway, and Den- mark, 1796 ; Posthumous Works, 4 vols., 1798. It is impossible to , trace the many articles contributed by her to periodical literature, or to identify the translations executed for Mr J ohnson. A memoir of her life was published by Godwin soon after her decease. A large ' portion of the work, William Godwin, his Friends and Contempo- raries, was devoted to her, and a new edition of the Letters to Imlay, London, 1879, of which the first edition was published by Godwin, is prefaced by a somewhat fuller memoir. (Gers be)

GODWIN, Wittram (1756-1836), an English political writer, historian, novelist, and dramatist, was born March 3, 1756, at Wisbeach in Cambridgeshire, at which place his father was a Nonconformist minister. His family came on both sides of worthy middle-class people, able to trace their descent in the same level of society for about 150 years : and it was probably only as a joke that Godwin, a stern political reformer and philosophical radical, attempted to ace his pedigree to a time before the Norman conquest and the great Karl Godwine. His father was a cold and }

dull man, his mother uneducated, but clever, shrewd, and full of sound common sense. Both parents were Calvinists :

the father strict in observances beyond what was even then

ordinary; the mother regretting in Godwin's maturer years, 4nd when some of her sons had turned out ill, that she had given birth to so many children, who, as she thought, were heirs of damnation. Mr Godwin, senior, died young, and never inspired love or much regret in his son ; but in spite of wide differences of opinion, the most tender affection always subsisted between William Godwin and his mother, until her death at an advanced age.

1787; The Female Reader (selections),

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William Godwin was educated for his father's profession, and was at first more Calvinistic than his teachers, becom- ing a Sandemanian, of which sect he says, that they were the followers of "a celebrated north-country apostle [Glas], who after Calvin had damned ninety-nine in a hundred of mankind, has contrived a scheme for damning ninety-nine in a hundred of the followers of Calvin."

He officiated as a minister at Ware, Stowmarket, and Beaconsfield. At the second of these places the teachings of French Reformers were brought before him by a friend, and these, while they intensified his political, undermined his religious opinions. He came to London, still nominally a clergyman, to set about the work of the regeneration of society with his pen —a real enthusiast, who, theoretically, shrank from no conclusions from the premises which he laiddown. These were the principles of the Encyclopedists, and his own aim was the complete overthrow of all existing institutions, political, social, and religious. He believed, however, that calm discussion was the only thing needful to carry every change, and from the beginning to the end of his career he deprecated every approach to violence. He was, like Bentham—whom, however, he does not seem to have influenced or been influenced by—a philosophic radi- cal in the strictest sense of the term,

His first published work was an anonymous Life of Lord Chatham; the first to which he gave his name was still nominally clerical. Under the inappropriate title Sketches of History, he published six sermons on the characters of Aaron, Hazael, and Jesus, in which, though writing in the character of an orthodox Calvinist, he enunciates the preg- nant proposition, “God himself has no right to be a tyrant.” This was published in 1782, and for the next nine years he wrote largely in the Annual Register and other periodicals, producing also three novels, which have more completely vanished from the world than even the contributions to reviews. They were probably not worth preserving, but the “Sketches of English History ” written for the Annual Register from 1785 onward still deserve study. He joined a club called the Revolutionists, and associated much with Lord Stanhope, Horne Tooke, Holcroft, and others, who, from their political principles and activity, Were obnoxious to men in power. It is perhaps needless to say that the title of “reverend” dropped off from him without difficulty, and with no sense of discordance be- tween the old and the new. Doubt and change never seem to have brought with them any keen sense of pain or outrooting. The equable calm of a cold temperament preserved him from much which affects warmer natures ; but he also knew that he was at all times seeking after truth, and striving for what seemed right ; and while such an one can scarcely be called modest, he is preserved for many qualms whicli affect more nervous and more self- distrustful persons,

In 1793 Godwin published his great work on political science, The Inquiry concerning Political Justice, and its Influence on General Virtue and Happiness. Although this work is little known and less read now, it was one of the epoch-making books of English thought, Godwin could never have been himself a worker on the active stage of life. But he was none the less a power behind the workers, and Political Justice takes its place with Milton’s Speech for Unlicensed Printing, with Locke’s Essay on – Lducation, with Rousseau’s Emile, among the unseen levers which have moved the changes of the times, It is there- fore necessary to speak of this book more particularly. By the words “political justice” the author meant « the adoption of any principle of morality and truth into the practice of a community,” and the work was therefore an inquiry into the principles of society, of government, and of morals. For many years Godwin had been “satisfied

that monarchy was a species of government unavoidably corrupt," and from desiring a government of the simplest con- struction, he gradually came to consider that "government by its very nature counteracts the improvement of original mind." Believing in the perfectibility of the race, that there are no. innate principles, and therefore no original propensity to evil, he considered that 'our virtues and our vices may be traced to the incidents which make the history of our lives, and if these incidents could be divested of every improper tendency, vice would be extirpated from the world." All control of man by man was more or less in- tolerable, and the day would come when each man, doing what seems right in his own eyes, would also be doing what is in fact best for the community, because all will be guided by principles of pure reason. But all was to be done by discussion, and matured change resulting from dis- cussion. Hence, while Godwin thoroughly approved of the philosophic schemes of the precursors of the Revolution, he was as far removed as Burke himself from agreeing with the way in which they were carried out. So logical and uncompromising a thinker as Godwin could not go far in the discussion of abstract questions without exciting the most lively opposition in matters of detailed opinion An affectionate son, and ever ready to give of his hard-earned income to more than one ne'er-do-well brother, he main- tained that natural relationship had no claim on man, nor was gratitude to parents or benefactors any part of justice or virtue. In a day when the penal code was still extremely severe, he argued gravely against all punishments, not only that of death. Property was to belong to him who most wants it; accumulated property was a monstrous injustice. Hence marriage, which is law, is the worst of all laws, and property the worst of all properties. A man so passionless as Godwin could venture thus to argue without suspicion that he did so only to gratify his wayward desires. Portions of this treatise, and only portions, found ready acceptance in those minds which were prepared to receive them. Perhaps no one received the whole teaching of the 'book. But it gave cohesion and voice to philosophic radi- calism ; it was the manifesto of a school without which the milder and more creedless liberalism of the present day had not been. Godwin himself in after days modified his com- munistic views, but his strong feeling for individualism, his hate of all restrictions on liberty, his trust in man, his faith in the power

of reason remained ; it was a manifesto which enunciated principles modifying action, even when not wholly ruling it.

In May 1794 Godwin published the novel of Caleb Williams, or Things as they are, a book of which the politi- cal object is overlooked by many readers in the strong interest of the story. It is one of the few novels of that time which may be said still to live. A theorist who lived mainly in his study, Godwin yet came forward boldly to stand by prisoners arraigned of high treason in that same year—1794. The danger to persons so charged was then great, and he deliberately put himself into this same danger for his friends. But when his own trial was dis- cussed in the Privy Council, Pitt sensibly held that Political Justice, the work on which the charge could best have been founded, was priced at three guineas, and could never do much harm among those who had not three shillings to spare.

From this time Godwin became a notable figure in London society, and there was scarcely an important person in poli- tics, on the liberal side, in literature, art, or science, who does not appear familiarly in the pages of Godwin's singular diary. or forty-eight years, beginning in 1788, and con- tinuing to the very end of his life, Godwin kept a record of every day, of the work he did, the books he read, the friends he saw. Condensed in the highest degree, the diary is yet

easy to read when the style is once mastered, and it is a great help to the understanding of his cold, methodical, unimpas- sioned characters. He carried his method into every detail of life, and lived on his earnings with extreme frugality, Until he made a large sum by the publication of Political Justice, he lived on an average of £120 a year. In 1797, the intervening years having been spent in strenuous literary labour, Godwin married Mary Wollstonecraft (see last article). Since both held the same views regard- ing the slavery of marriage, and since they only married at all for the sake of possible offspring, the marriage was con- cealed for some time, and the happiness of the avowed wnarried life was very brief. Mrs Godwin died in giving birth to a daughter, afterwards the second wife of Perey Bysshe Shelley, on September 10, 1797, leaving Godwin, prostrated by affliction, and with a charge for which he was wholly unfit—his own little daughter

Mary, and her step- sister, Fanny Imlay, who ever afterwards bore the name of Godwin. His unfitness for the cares of a family, far more than love, led him to contract a second marriage with Mrs Clairmont, in 1800. She was a widow with two children, energetic and painstaking, but a harsh stepmother ; and it may be doubted whether the children were not worse off under her care than they would have been under Godwin's neglect. The second fiction which proceeded from Godwin's pen was called S¢ Leon, and published in 1799. It is chiefly remarkable for the beautiful portrait of Marguerite, the heroine, which was drawn from the character of his own wife.

The events of Godwin's life werefew. Under the advice of the second Mrs Godwin, and with her active co-operation, he carried on business as a bookseller under the pseudonym of Edward Baldwin, under which name he published seve- ral useful school-books and books for children, some by Charles and Mary Lamb. But the speculation was unsue- cessful, and for many years Godwin struggled with constant pecuniary difficulties, for which more than one subscription was raised by the leaders of the Liberal party, and by literary men. In his later years the Government of Earl Grey conferred upon him the office known as " Yeoman Usher of the Exchequer," to which were attached apart- ments in Palace Yard, where he died in the full posses sion of his faculties, April 7, 1886, having completed his eightieth year.

In his own time, by his writings and by his conversation, Godwin had a great power of influencing men, and especially young men. Though his character would seem, from much which is found in his writings, and from anecdotes told by those who still remember him, to have been unsympathetic, it was not so understood by enthusiastic young people, who hung on his words as those of a prophet. The most remark- able of these was Percy Bysshe Shelley, who in the glowing dawn of his genius turned to Godwin as his teacher and guide. The last of the long series of young men who sat at Godwin's feet was Edward Lytton Bulwer, afterwards Lord Lytton, whose early romances were formed after those of Godwin, and who, in Hugene Aram, succeeded to the story as arranged, and the plan to a considerable extent sketched out, by Godwin, whose age and failing health prevented him from completing it.

Godwin’s more important works are—The Inquiry concerning Political Justice, and its Influence on General Virtue and Happiness, 1793; Things as they are, or the Adventures of Caleb Wuhams, 1794; The Inquirer, a series of Essays, 1796 ; Memoirs of the Author of the Rights of Woman, 1798; St Leon, a Tale of the Sixteenth Cen- tury, 1799; Antonio, a Tragedy, 1801; The Life of Chaucer, 1803; Fleetwood, a Novel,1805; Faulkner, a Tragedy, 1807; Essay on Sept chres, 1809; Lives of Edward and Johii Philips, the Nephews Milton, 1815; Mandeville, a Tale of the Times of Cromwell, 18175 History of the Commonwealth, 1824-1828; Cloudesley, a Novel, 1830; Thoughts on Man, a series of Essays, 1881; Lives of the Neeroman- cers, 1834. A volume of essays was also collected from his papel

and published in 1873, as left for publication by his daughter Mrs Shelley. Many other short and anonymous works proceeded from

his ever busy pen, but many are irrecoverable, and all are forgotten.

Godwin’s place in literature is permanent, in that he produced one work which proved effective in changing the course of thought in its time, but not permanent in the sense that his writings will continue to be widely read. His life was published in 1876 in two

volumes, under the title William Godwin, his Friends and Con- temporartes, by C. Kegan Paul.

in the 18th Century. (CAS SE)

GODWINE, son of Wulfnoth, earl of the West-Saxons, is

the leading Englishman in the first half of the 11th century, and he holds a special place in English history generally. He is the first Englishman who plays the part of a minister and parliamentary leader, of one high in office under the crown who at the same time sways the assemblies of the nation by his power of speech. Such a position was per- fectly possible before the Norman Conquest; it did not again become possible for some ages. Godwine appears as the chief champion of England against Norman

influence, and as the father of the last English king of the native stock. In these two characters he drew on himself the fullest bitterness of Norman hatred ; and to this hatred is doubtless largely, though not wholly, owing the extraor- dinary contradiction with which the chief events of his life are told, and the amazing slanders which have been heaped upon his memory.

His birth and origin are utterly uncertain. The highest authorities, the contemporary English Chronicles, are silent. There are two alternative statements, which are seemingly quite irreconcilable, but either of which alone would have much to be said for it. By putting together certain passages in the English Chronicles, in Domesday, and in the will of the AZtheling A&thelstan, son of King thelred, a strong presumption is raised that Godwine was the son of Wulfnoth the South-Saxon who was outlawed in 1009, and that his services in the war against Cnut were deemed to entitle him to a restitution of his father's forfeited lands, There is no direct statement to this effect, but a number of undesigned coincidences point towards such a belief. On the other hand, there is a story which appears in various quarters, and which seems to come from more than one in- dependent source, which makes Godwine's father Wulfnoth a churl somewhere on the borders of Gloucestershire and | Wiltshire, and which makes Godwine win the favour of the Danish earl Ulf by showing him his way after the battle , of Sherstone in 1016. A third account connects Godwine with the family of Eadric the traitor of A®thelred's day ; but this version seems at once to be impossible to reconcile with either of the other two stories, and to rest on less authority than either.

But, whatever was Godwine's origin, there is no doubt that, according to Cnut's rule of preferring Englishmen to high oftice, he rose to power very early in that king's reign. He was an earl in 1018. The next year he distinguished | himself at the head of the English troops in Cnut's Northern Wars, and received in marriage Gytha, the sister of the king's brother-in-law Earl Ulf. In 1020 he became earl of the West-Saxons, that is, of all England south of the | Thames, 4 new office, doubtless connected with Cnut's fre- quent absences from England. All this again is not in

the Chronicles, though particular points are incidentally confirmed by them. Still this stage of his history seems to be fairly made out from other sources.

From Cnut's death in 1035 the events of Godwine's life are recorded in the Chronicles, often with great minuteness. Much is also learned from the contemporary biographer of Eadward. He asserted the claims of Harthacnut, the son of Cnut and Emma, to the crown of his father ; but he had to consent to a division of the kingdom, and could only secure Wessex for Harthacnut, while Harold reigned in Northum-

The best estimate of his literary position is that given by Mr Leslie Stephen in his Znglish Thought

berland and Mercia. He then acted as the chief minister of Emma, while she was regent on behalf of Harthacnut during his first reign. During this time the flitheling Alfred, son of Aithelred and Emma, landed in England in the hope of winning back his father's crown; but coming into the power of Harold, he was blinded by his order, and died of his wounds. Godwine was said to have betrayed A@lfred to Harold, and the charge was eagerly seized upon by the Norman writers. But it was not invented by them. At the beginning of Harthacnut's second reign in 1040, Godwine was formally accused of the death of fElfred, and was regularly tried and acquitted. His guilt is asserted in a poem inserted in one of the Chronicles, but the words which tell against him are carefully altered in another version, The story is told with great confusion and contradiction, and the version unfavourable to Godwine seems to be incon- sistent with his position at the time as minister, not of Harold, to whom he is said to have betrayed /Elfred, but of Harthacnut, whose kingship seems to be forgotten in the story. Godwine remained in power during the reigns of Harold and Harthacnut, and on the death of the last-named king in 1042, he was foremost in promoting the election of Eadward, the son of /Ethelred and Emma, to the vacant throne As earl of the West-Saxons he was the first man in the kingdom, but his power was still balanced by that of the other great earls, Leofric in Mercia and Siward in Northumberland. His sons Swegen and Harold, together with Beorn, the nephew of his wife Gytha, were promoted to earldoms (1043-1045), and his daughter Eadgyth was married to the king (1045). We hear much of his good and strict government of his earldom, and of his influence with the king and with the whole nation. He was not, however, all-powerful

; in one very remarkable case, which is most instructive as a piece of constitutional history, he was out-voted in the witenagemdt on a question of foreign policy, In 1047, when his wife's nephew Swegen Estrith- son, now king of the Danes, was at war with Magnus of Norway, Godwine proposed to help Swegen with fifty ships ; but the notion was opposed by Leofric, and "all folk" ac: cepted the amendment of the Mercian earl. Godwine had also to strive against the king's fondness for Normans and other strangers, above all in the disposal of ecclesiastical offices. Godwine's policy, in this and in other matters, was opposed to all French connexions of every kind. Next to Englishmen he favoured natives of the kindred Continental lands, and he supported a policy of alliance with the empire and its princes. In all this, at home and abroad, he had specially to withstand the influence of the king's Norman favourite Robert of Jumiéges, appointed bishop of London in 1044 and archbishop of Canterbury in 1051. Godwine was supported by the English bishops Stigand of Winches- ter and Lyfing of Worcester. The appointment of Robert to the archbishopric marks the decline of Godwine's power ; the foreign influence was now at its height, and the English earl was to feel the strength of it.

In the course of 1051 a series of outrages committed by the king's foreign favourites led to a breach between the king and the earl. The king's brother-in-law, Eustace count of Boulogne, returning with his followers from a visit to the king, tried to obtain quarters by force in the houses of the burgesses of Dover. An Englishman who withstood them was killed ; a fight followed, in which the count and his company were driven out of thetown. The king, hear- ing the tale from Eustace, bade Godwine inflict military chastisement on the townsmen; the earl refused, and de- manded a fair trial of the charge before the witan. About the same time men's minds were stirred by the outrages of several Normans who had received estates in Herefordshire. The influence of the archbishop was used against Godwine, and he was summoned to appear before the witan at

Gloucester as a criminal. He and his sons now gathered the whole force of their earldoms, and marched towards Gloucester in arms. They demanded the surrender of Count Eustace and of the other strangers who had done

outrages, whether at Dover or in Herefordshire. The king called the other earls to his help; war was hindered by the mediation of Leofric, and matters were adjourned to another meeting in London. There the king appeared with an army; Godwine and his sons were arraigned as criminals, and, on refusing to appear without a safe-conduct, were outlawed. Godwine and his whole family now left the kingdom, except his daughter, the Lady Eadgyth, who was banished from conrt to the monastery of Wherwell. The foreign favour- ites of the king were now supreme.

The next year the tide turned ; the feeling of the nation showed itself in favour of Godwine. When lis petition for a removal of his outlawry was refused, he came back from his shelter in Flanders at the head of a fleet. In most parts of England he was welcomed; he sailed up the Thames to London ; the army gathered by the king refused to fight against him; and, ina great meeting outside the walls of London, he and his family were restored to all their offices and possessions, and the archbishop and many other Normans were banished. Godwine's friend Stigand succeeded to the archbishopric. The next year Godwine was smitten with a fit at the king's table, and died three days later, April 15, 1052. His death was worked up into a fabulous tale by lis Norman enemies.

Tho patriotism and good government of Godwine are un- doubted; but it is plain that he accumulated vast wealth for himself. Sometimes, it was said, he showed little regard to the rights of the church; but in the only case where we hear both sides, that of some lands in Kent disputed between him and the Norman archbishop, it appears that he had a legal claim. It is much more certain that he was unduly bent on the promotion of his own family. His eldest son Swegen gave great and deserved offence by the seduction of Eadgifu, abbess of Leominster, and still more by the treacherous murder of his cousin Beorn. He was out- lawed, but was afterwards restored to his earldom. He accom- panied his father to Flanders, but did not come back, having gone on a pilgrimage to Jerusalem, on his return from which he died. Of his other sons, the second, Harold, succeeded Godwine in his earldom and Eadward in his kingdom ; 'Tostig, Gyrth, and Leofric, all earls, play a part in the later history; Wulfnoth, the youngest, was a captive of William. Of his daughters the Lady Eadgyth survived her father, husband, and brother, and lived in great honour under the Conqueror. The others were

Gunhild and A‘lfgifu, the latter of whom appears in the story of Harold’s oath to William.

See the English Chronicles and Florenee of Worcester, 1035-52 ; the Life of Eadward, published in the Chronieles and Memorials ; the Encomium Emince or Gesta Cnutonis, published by Pertz, and elsewhere; various notices in Domesday, and in the writers of the time generally. All the passages, historical and legendary, bearing on Godwine’s life, are eolleeted and examined in the appendices to Freeman’s History of the Norman Conquest, vols. i. ti. (E. A. F.)

GODWIT, a word of unknown origin, the name com- monly applied to a marsh-bird in great repute, when fattened, for the table, and formerly abundant in the fens of Norfolk, the Isle of Ely, and Lincolnshire. In Turner’s days (1544) it was worth three times as much as a Snipe, and at the same period Belon said of it—‘“‘ C’est vn Oyseau es delices des Frangoys.” Casaubon, who Latinized its name “ Dei ingenium” (Ephemerides, 19th September 1611), was told by the ‘“ ornithotropheus” he visited at Wisbech that in London it fetched twenty pence. Its fame as a delicacy is perpetuated by many later writers, Ben Jonson among them, and Pennant says that in his time (1766) it sold for half-a-crown or five shillings. Under the name Godwit two perfectly distinct species of British birds were included,

but that which seems to have been especially prized ig known to modern ornithologists as the Black-tailed Godwit, Limosa cegocephala, formerly called, from its loud cry, a Yarwhelp,! Shrieker, or Barker, in the districts if inhabited. The practice of netting this bird in large num- bers during the spring and summer, coupled with the gradual reclamation of the fens, to which it resorted, has now rendered it but a visitor; ard it probably ceased from breeding regularly in England in 1824 or thereabouts, though under favourable conditions it may have occasionally laid its eggs for some thirty years later or more (Stevenson, Birds of Norfolk, ii. p. 250). This Godwit is a species of wide range, reaching Iceland, where it is called Jardreka (=earth-raker), in summer, and occurring numerously, it is said, in India in winter. Its chief breeding-quarters seem to extend from Holland eastwards

to the south of Russia, The second British species is that which is known as the Bar-tailed Godwit, Z. lapponica, and this seems to have never been more than a bird of double passage in the United Kingdom, arriving in large flocks on the south coast about the 12th of May, and, after staying a few days, pro- ceeding to the north-eastward. It is known to breed in Lapland, but its eggs are of great rarity. Towards autumn the young visit our coasts, and a few of them remain, together with some of the other species, in favourable situa- tions throughout the winter. One of the local names by which the Bar-tailed Godwit is known to the Norfolk gunners is Scamell, a word which, in the mouth of Caliban (Tempest, act ii. scene 2), has been the cause of much per- plexity to Shakespearian critics.

The Godwits belong to the group Limicole, and are about as big asa tame Pigeon, but possess long legs, and a long bill with a slight upward turn. It is believed that in the genus Limosa the female is larger than the male. While the winter pluinage is of a sober greyish-brown, the breeding-dress is marked by a predominance of bright bay or chestnut, rendering the wearer a very beautiful object. The Black- tailed Godwit, though varying a good deal in size, is con- stantly larger than the Bar-tailed, and especially longer in the legs. The species may be further distinguished by the former having the proximal third of the tail-quills pure white, and the distal two-thirds black, with a narrow white margin, while the latter has the same feathers barred with black and white alternately for nearly their whole length.

America possesses two species of the genus, the very large Marbled Godwit or Marlin, Z. fedoa, easily recognized by its size and the buff colour of its axillaries, and the smaller Hudsonian Godwit, Z. hudsonica, which has its axillaries of a deep black. This last, though less numerous than its congener, seems to range over the whole of the continent, breeding in the extreme north, while it has been obtained also in the Strait of Magellan and the Falkland Islands. The first seems not to go further southward than the Antilles and the Isthmus of Panama.

From Asia, or at least its eastern part, two species have been described. One of them, L. melanuroides, differs only from L. cegocephala in its smaller size, and is believed to breed in Amurland, wintering in the islands of the Pacific, New Zealand, and Australia. The other, Z. uropygialis, 18 closely

allied to and often mistaken for L. lapponica, from which it chiefly differs by having the rump barred like the tail. This was found breeding in the extreme north of Siberia by Dr von Middendorff, and ranges to Australia, whence it was, like the last, first described by Mr Gould. (a. N.)

GOES, or Ter Goes, a town of the Netherlands in the province of Zealand, on the island of South Beveland, with railway communication since 1868 with Bergen-op-Zoom, and since 1872 with Middelburg, its distances from these

1 This name seems to have survived in Whelp Moor, near Brandon, in Suffolk.

places being respectively 12 and 15 miles. The Reformed church, called in the olden times St Mary Magdalen's, is considered the finest ecclesiastical building of Zealand, and dates from 1423. In the one half, known as the Preekkerk

century. 'The industries of the town are varied but not extensive, dealing with linen, dyes, chocolate, oil, flour, straw hats, wood, and cigars. Shipbuilding is also carried on, aS well as a trade in wood and coals. The harbour, which is defended by a fort, is formed by a short canal communicating with the eastern Scheldt, extended and im- proved in 1818-19. The population of the town, which received its municipal rights in 1406, and was surrounded with a wall about 1420, numbered 4916 in 1860, 5205 in 1870, and 6063 in 1876.

GOES, Huco van per (2 ~-1482), a painter of con- siderable celebrity at Ghent, was known to Vasari, as he is known to us, by a single picture ina Florentine monastery. At a period when the family of the Medici had not yet risen from the rank of a great mercantile firm to that of a reign- ing dynasty, it employed as an agent at the port of Bruges Tommaso Portinari, a lineal descendant, it was said, of Folco, the father of Dante's Beatrix, Tommaso, at that time patron of a chapel in the hospital of Santa Maria – Nuova at Florence, ordered an altar-piece of Hugo van der

Goes, and commanded him to illustrate the sacred theme of "Quem genuit adoravit." Tn the centre of a vast triptych, } comprising numerous figures of

life size, Hugo represented the Virgin kneeling in adoration before the new-born Christ attended by Shepherds and Angels. On the wings he por- trayed Tommaso and his two sons in prayer under the pro-

‘Mary Magdalen. “The triptych was sent to Florence, and placed on the altar upon which it still remains. Van der Goes, like Hubert Van Eyck and Jodocus of Ghent, has bequeathed but this one picture to posterity ; but it is a picture which shows that he was an artist of whom Ghent

‘and Brussels of Roger van der Weyden. Unhappily the triptych of Santa Maria Nuova suffered so much from decay

GOE

OHANN WOLFGANG VON GOETHE (1749-1832) , ~ Was born in Frankfort on August 28, 1749. His parents Vere citiz

Jer family was better than his own, and held a higher posi-

~ath, at the age of twent “seven, her brother’s most inti- “ate friend. She was married in 1773 to John George The house in which Goethe was born is still to) Seen in the Hirschgraben. Goethe has described to us tt was rebuilt, and it has since been much altered. 18 education was irregular ; he went to no school, and his ‘her rather stimulated than instructed him. But the at- Sphere by which he was Surrounded gave him, perhaps, ” Dest education he could have received. Frankfort, a

GOE—GOE G21.

aud restoring that the defects peculiar to the Flemings became unduly prominent as time and neglect effaced the brilliancy and harmony of the principal colours. We cau only discern at the present day that the art of Van der Goes is a variety of that which characterizes Van Eyck and Van der Weyden. Less finished and less coloured than tlie work of the first, it is less subtle and expressive than that of the second. It lacks depth of religious feeling, and hardly rises above the comnion level of the school in respect of feeling or execution. It is a cold and stiff art, marked by hardness of surface, dryness of contour, angularity of drapery, overladen ornament, and ill-

balanced light and shade. Imposing' because composed of figures of unusual size, the altar-piece is more remarkable for portrait character than for charms of ideal beauty. There are small pieces in public galleries which claim to have been executed by Van der Goes, but none that are certified as the work of his hands, One of these pictures in the National Gallery in

London is more nearly allied to the school of Memling than the triptych of Santa Maria N uova ; another, a small and very beautiful John the Baptist, at the Pinakothek of Munich, is really by Memling ; whilst numerous fragments of an altar-piece in the Belvedere at Vienna, though assigned to Hugo, are by his more gifted countryman of Bruges. Any one who visits Continental collections will see that the name of Van der Goes was given to pictures of which he could not have been the author, N one of the compositions mentioned by historians have survived except the altar-piece of Florence. But Van der Goes was not habitually a painter of easel pieces. He made his reputation at Bruges by producing coloured hangings in distemper. After he settled at Ghent, and became a master of his guild in 1465, he designed cartoons for glass windows. He also made decorations for the wedding of Charles the Bold and Margaret of York in 1468, for the festivals of the Rhetori- cians and papal jubilees on repeated occasions, for the solemn entry of Charles the Bold into Ghent in 1470-1, and for the funeral of Philip the Good in 1474. The labour which he expended on these occasions might well add to his fame without being the less ephemeral. About the year 1475 he retired to the monastery of Rouge Cloitre near Ghent, where he took the cowl, There, though he stil] clung to his profession, he seems to have taken to drinking, and at one time to have shown decided symptoms of insanity. But his superiors gradually cured him of his intemperance, and he died in the odour of sanctity in 1482,

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free town of the empire, still preserved the appearance of the Middle Ages. It had lost the reality of power, but its citizens naturally grew up with a Strong sense of independence, and a power of realizing the unity of Germany which was wanting in a small state. The boy from his earliest youth was accustomed to the companion- ship of his elders. His father was strict and formal, his mother quick and lively, inspired with no small share

of the genius of her son. Goethe lived in the freest intercourse with every kind of society in the town, in which he might expect some day to be an important personage. There Was no capital like London or Paris to call him away; Berlin was poor and distant, Vienna half Italian and half Spanish. Goethe must have been brought up with the ambition to take his degree at the university as doctor, to return home and become an advocate, to make a rich marriage, to go through the regular course of civil offices, to inherit his father's house, and perhaps one day to be burgomaster. His home was a cultivated one. The father was fond of art and of — German poetry

First love.

Leipsic.

GOH

The influence of Lessing had scarcely made itself felt; Herder was only five years older than Goethe himself. Gellert and Gottsched were the two oracles of poetry,—-Gottsched a pedantic product of tlie earlier French culture, Gellert old and immovable, and unable to comprehend the new spirit. The chief debt that Goethe owed to him was the improvement in his hand- writing, on which Gellert laid great stress, and which he coupled with moral excellence. Goethe's father had a great respect for these rhyming poets, and he so strongly objected to the new German hexameters that Wolfgang could only read Klopstock's Messiah with his sister in the greatest secrecy and in terror of diseovery. He did, how- ever, read it, and learned much of it by heart. French cul- ture gave at this time the prevailing tone to Europe. Goethe could not have escaped its influence, and he was destined to fall under it in a special manner. In the Seven Years' War, which was now raging, France took the side of the empire against Frederick the Great. Frankfort was full of French soldiers, and a certain Comte 'Thorane, who was quartered in Goethe's house, had an im- portant influence on the boy. Still more strongly was he affected by the French company of actors, whom he eame to know both on and off the stage. He learned to declaim in this manner passages of Racine without under- standing, a word of them. Ata later period he knew French thoroughly. well, and composed both prose and poetry in that language. His first writings were imitations of the French manner; his earliest play was the imitation of a French after-piece. We can

understand how these different forces were to work upon his future life. From iis father he derived the steadfastness of character which enabled him to pursue an independent career of self-culture and devotion to art in the midst of every kind of distract- ing influence ; from his mother he inherited the joyous nature and lively sympathy, the flow of language and love of narration, without,which he could not have been a poet. Before the age of sixteen he had seen every kind of life in a city particularly favourable to a richness of individual char- acter; he was entirely free from the prejudices of a small state ; and as far as he cared for Germany he cared foritasa whole. He was tinged at an early age with the influence of the clearest and most finished language in Europe, and this influence, uniting with the natural clearness of Goethe's mind, made his prose a new phenomenon in the literature of his country, wulike anything which had been seen before. Lastly, with the most passionate aspirations for freedom and independence of life, he was born into the slavery of a mechanical career of prosaic prosperity, the pressure of which was not strong enough to confine him, but was strong enough to stimulate all his efforts to break the bonds.

Goethe, if we may believe his autobiography, experienced his first love about the age of fifteen in the person. of Gretchen, whom some have supposed to be the daughter of an innkeeper at Offenbach. He worshipped her as Dante worshipped Beatrice. She treated him as a child, much as Miss Chaworth treated Byron. But there is no other evi- dence of this first love, and it would be quite in accordance with Goethe's manner to enlarge on a very small founda- tion, or to concentrate on one person the feelings which were devoted to several individuals. His letters speak of a boyish love for one Charitas Meixner, a friend of his sister, two years younger than himself, the daughter of a rich mer- chantat Worms. He expresses his affection for her with all the fervour of French phraseology, and the passion did not leave him when he had removed to Leipsic. But Charitas was able to console herself with another engagement. She married in February 1773 a merchant of her native town, and died at the end of the following year.

In the autumn of 1765 Goethe, who had just completed

then in fashion.

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his sixteenth year, travelled to Leipsic in the company of a bookseller, Fleischer, and his wife, who were on their way to attend the fair. On the 19th of October he was admitted as a student of the Bavarian nation, one of the four into which the university was divided. For his lodging he had two neat little rooms in the Feuerkugel the Fire Ball, looking into the long court-yard which leads from the old market to the new. When we remember that his three years at Leipsic, about which so much has been written, correspond with the last three years of an English boy at a public school, we can form some idea of the singular individuality of his character and the maturity and ripeness of his genius. He was sent to Leipsic to study law, in order that he might return to Frankfort fitted for the regular course of municipal dis- tinction, For this purpose he carried with him a letter to Professor Béhme, who taught history and imperial law in the university, but had no other distinction to recommend him. He told Professor Bohme that he intended to devote himself not to law but to belles lettres, or, to use the word which F. A. Wolf had invented, philology. Bohme did his best to dissuade him, and in this was assisted by his wife. The effect of their advice was rather to disgust Goethe with modern German literature, to make him despise what he had already written, and to drive him into the distractions of society, which wasted both his time and his money. He did, however, attend some lectures. He heard Ernesti on Cicero's Orator, but he dealt rather with questions of grammar than of taste. He attended Gellert's lectures on literature, and even joined his private class. Gellert held a high position among German men of letters, which was due quite as much to his character as to his genius. He advised Goethe to desert poetry for prose, and to take to authorship only as an employment subordinate to the serious occupations of his life. Goethe tells us that in his lectures upon taste he never heard Gellert mention the names of Klopstock, Kleist, Wieland, Gessner, Gleim, or Lessing. He also attended the lectures of another literary professor, Clodius, a young man about ten years older than himself. Clodius corrected Goethe's writings with red ink, and pointed out the faults without showing the way to mend them, Goethe had written a poem of congratulation for the marriage of his uncle Textor (February 17, 1766), which, according to the fashion of the time, was full of gods and goddesses and other mytho- logical apparatus. Clodius was unsparingly hard upo this

production, and Goethe then perceived that his erthe was just as faulty as himself in the use of abstractions and strange outlandish words to give weight and authority to his verse. He satirized Clodius in a poem in praise of the cakes of the confectiouer Handel, and by a parody of his drama Medon. His position towards the professors of his university was not an enviable one. His real university education was derived from intercourse with his friends First among these was J. G. Schlosser, who afterwards married his sister. Goethe used to dine with him at @ table d'héte kept by a wine-dealer, Schénkopf, in the Bruhl (No. 79), ina house which still exists. Schlosser, who was at this time private secretary to the duke of Wiirtemberg and tutor to his children, was ten years older than Goethe. He had a great influence upon him, chiefly in introducing him to a wider circle of German, French English, and Italian poetry. At the table of Professor Ludwig, where Goethe had previously dined, the conversy tion had generally turned on medical and scientific a jects. Another friend of Goethe's was Behrisch, nel the young Count Lindenau. He was a man 10 middle hie, and he combined originality of character aud clearness © literary judgment with a dry and caustic wit, and an a abiding sense of humour, much in the same proportions

were found in Merck, who exercised at a later period an importaut influence over Goethe's career. His friendship with Goethe was not at first of advantage to him. He was deprived of his tutorship from a suspicion that he did not always keep the most select society, and his successor was for. bidden to allow his charge to associate with the young poet. This is supposed to have been caused by Goethe's disrespect- ful behaviour to Professor Clodius. Gellert obtained for Behrisch an educational post at the court of Dessau, and Goethe kept up a constant correspondence with him til] his death in 1809. Behrisch would not allow Goethe to print his poems, but copied them out instead in a beautiful hand. He probably had a considerable effect in producing the simplicity aud naturalness of Goethe's early style.

But the person who had the strongest effect on Goethe's mental development was Adam Frederick Oeser, at this time director of the

academy of arts in Leipsic. Goethe took lessons from him in drawing, and, not content with this, tried his hand at etching. A little device of his fora book-plate or a bill-head is extant, in which a slab with the name (. G. Schénkopf is represented with three bottles above and a wreath of flowers below. Oeser had been afriendof Winckel- mann's, and exercised great influence over his views of art. This was a source of considerable reputation to him, and Winckelmann's tragic death, the news of which reached Leipsic whilst Goethe was there, must have brought the relation between them into stronger relief. Goethe always spoke of Oeser's influence with the greatest affection and respect. He writes—' Oeser's discoveries have given mea fresh opportunity of blessing myself that I had him for my instructor. He entered into our very souls, and we must indeed have been without souls not to have derived benefit from him. His lessons will produce their effects through all the rest of my existence. He taught me that the ideal of beauty is simplicity and repose." We find Goethe at Weimar continually consulting Oeser for designs for furni- ture and for theatrical entertainments.

Goethe from his earliest years was never without a passion, and at Leipsic his passion was Kitty Schonkopf, the Aennchen of the autobiography, the daughter of the host at whose house he dined. She often teased him with her inconstant Ways, and to this experience is due his first drama Die Laune desVerliebten, " Lovers' Quarrels," as it may be styled. It is amere trifle, a pastoral in one act, written in alexandrines in the French style. Two happy and two unhappy lovers are contrasted. The only interest of the piece is that itis a fragment from Goethe's own life. A deeper chord is struck in Die Mitschuldigen (The Fellow Sinners), which forms a dis- mal and forbidding picture both of the time and of the ex-

periences of the youth who wrote it. The daughter of an innkeeper has made an unhappy marriage, and is visited by a former lover who is in good circumstances. An assignation is arranged, and the interview is witnessed by the husband, who has come to steal the stranger's purse. The father comes in to read one of the stranger's letters. He is sur- prised, and is with his daughter suspected of the theft.

The real culprit is discovered, but defends himself by accus- ing the stranger of his conduct to his wife, all guilty. This play was first written in

one act. It was afterwards enlarged to three acts, and published in 1787. The manuscript, which still exists, was given to Frederike Brion of Sesenheim. Besides these plays Goethe wrote at Leipsic twenty little songs of an erotic chararacter, which Were set to music by his young friend Breitkopf. He de- Scribes them as moral-sensuous, but they are more sensuous than moral. They have the merit of a musical easy flow of expression, various moods of passion, with a happy readi-

hess and elegance. Only a few of them were included In his collected works, and those very much altered. | They show the influence of Wieland, but by one side of |

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Wieland Goethe was never affected. He was never led to mingle classical ideas and emblems with the unrestrained and sensual frivolity which was disseminated from France. He never imitated Agathon or Musarion, Whatever may have been the bitterness of his experience of life, or the waywardness of his excited fancy, he conceived a true idea of the real nature of classical art. In this Winck- elmann and Lessing were his teachers, and he was never untrue to the lessons which they inculcated. This was the most valuable possession he brought back from Leipsic. He had an opportunity of establishing lis principles of taste during a short visit to

Dresden, in which he devoted him- self to the pictures and the antiques. The end of Goethe's Stay at Leipsic was saddened by illness, One morning at the beginning of the summer he was awakened by a violent hemorrhage. For several days he hung between life and death, and after that his recovery was slow, although he was tended with the greatest anxiety by his friends. He finally left Leipsic far from well on August 28, 1768, his nineteenth birthday.

Goethe made an enforced stay of a year and a Frank. half in his native town. It was perhaps the least happy fort. part of his life. He was in bad health. His cure pro- ceeded slowly, and he had several relapses, and the weak- ness of the lungs, which was his first complaint, was suc- ceeded by a weakness of the digestion, which was yet more troublesome and painful. The society of Frankfort seemed to him far less agreeable than that of Leipsic ; he con- trasted the cold, stiff, formal, old-fashioned life of the imperial city with the freshness, geniality, and intellectual activity of the Saxon university. His family relations were not pleasant. His grandfather Textor was struck with paralysis ; his father showed but little sympathy with his aspirations for universal culture, and could imagine no career for him but that of a successful jurist. His sister had grown somewhat harsh and cold during his absence, and was possessed by a morbid self-consciousness, which she committed to the confidential pages of a secret diary. The tone of this diary, partly the result of family temperament, partly of the character of the age, throws an interesting light on the despair of Werther. Goethe's mother was always the same to him, a bright, genial, sympathetic friend. But her love could not ward off the pressure of circumstances, or supply a substitute for a wider and more unfettered life. Goethe, during his illness, received great atteution from Friulein von Klettenberg, a friend of his mother's, a pietist of the Moravian school. She initiated him into the mystical writings of those abstracted saints, and she engaged him in the study of alchemy, which served at once to prepare him for the conception of Faust and for the scientific researches of his later days. During his stay at Frankfort he wrote very little. It may be that the two Leipsic dramas received here their completed form. A farce in memory of his Leipsic life, a poetical letter to Frederike Oeser, the daughter of his teacher, a few songs, some of them religious, make up the tale of his produc- tions, as far as we know them.

He arrived at Strasburg April 2,1770. It was intended Stras- that after a sojourn in the university of that place he should burg. visit Paris, the centre of refinement. Goethe stayed in Stras- burg till August 28, 1771, his twenty-second birthday, and these sixteen months are perhaps the most important of his life. During them he came into active contact with most of those impulses of which his after life was a development. If we would understand his mental growth, we must ask who were his friends. He took his meals at the house of the Fraulein Lauth in the Kriimergasse. The table was mainly filled with medical students. At the head of it sat Salz- mann, a grave man of fifty years of age. His experience and his refined taste were very attractive to Goethe, who

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made him his intimate friend. Goethe was soon drawn by the studies of his companions to desert his own. A note- book of this date is preserved, which gives us a full account of his studies and employments. He attended lectures on anatomy, on midwifery, and on chemistry. His own studies were chiefly devoted to the last science; and he did not forget his favourite alchemy. He had brought with him to Strasburg introductions to pietistic circles, and this made him at first somewhat staid and retired in his pleasures, and disinclined for general society. This soon wore off, and the natural cheerfulness of his genial nature returned to him. Two songs, Blinde Kuh and Stirbt der Fuchs so gilt der Balg, refer to the social life of this period. He went on picnics, he wrote French poetry, he took dancing lessons, he learnt the violoncello. The table of the Fraulein Lauth received some new guests. Among these was Jung-Stilling, the self- educated charcoal-burner, who in his memoir has left a graphic account of Goethe's striking appearance, his broad brow, his flashing eye, his mastery of the company, and his generosity of character. Another was Lerse, a frank open character who became Goethe's favourite, and whose name is immortalized in Gétz von Berlichingen. Goethe did uot desert his studies in art. He learnt from the constant study of the cathedral of Strasburg the effect of Gothic architecture, and he shuddered when he saw the reception- rooms of the youthful Marie Antoinette hung with tapestries which represented the

marriage of Jason and Medea, and seemed to forebode the coming doom. His diary also shows that he spent much time in philosophical speculation. But the most important event of his Strasburg sojourn was his acquaintance with Herder. He was five years older than Goethe.- Herder was then travelling as tutor to the young prince of Holstein-Eutin, but was obliged to spend the whole winter of 1770-71 in Strasburg on account of an affection of his eyes. Goethe was with him every day, often all day. Herder, who was a pupil of a more original genius, Hamann, taught him the true value of nature in art, and the principles of what we should now call the romantic school. He made Osstaz known to him, and the wealth of popular poetry in all nations which the publication of Ossian revealed ; he enchanted him with the idyllic simplicity of the Vicar of Wakefield; but, above all, he shook his sensi- bility to the roots by revealing to him the power of the mighty Shakespeare. Henow saw how far superior Homer was to his Latin imitators, and how false were the canons of French art. Goethe's spirit was liberated from its trammels, and Gotz and Faust and Wilhelm Meister became possible to his mind. At a later period he forged for him- self fetters of a different kind.

Goethe's stay at Strasburg is generally connected still more closely with another circumstance,—his passion for Frederike Brion of Sesenheim. The village lies about twenty miles from Strasburg, and her father was pastor there. Goethe was introduced by his friend Weyland, an Alsatian, as a poor theological student. Fresh from his study of Goldsmith, he found the Vicar of Wakefield realized. The father was a simple worthy man, the eldest of the three daughters was married, the two younger remained,— Maria Salome, whom Goethe calls Olivia, and Frederike, to whom the poet principally devoted himself. She was tall and slight, with fair hair and blue eyes, and just sixteen years of age. Goethe gave himself up to the passion of the moment ; what he felt and suffered is known to us by his songs. At least ten songs are addressed to her, and several others were written for her. During the winter of 1770, in the intervals of his conversations with Herder, Goethe often rode over to Sesenheim. Neither storm, nor cold, nor darkness kept him back. He should have been busy with his dissertation for the degree of doctor. The subject he had chosen was the duty of providing an established church,

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But the attractions of Trederike were a great interruption to his labours. In the spring Herder went away. The fine weather drew him still more strongly to Sesenheim, Picnics, water parties, games, dances, illuminated by enthusiasm for literature, filled up the weeks. As his time for leaving Strasburg came nearer, he felt that this love was merely a dream, and could have no serious termination, Frederike felt the same on her side. A visit of the mother and daughters to Strasburg in July made this appear more clearly. On August 6 Goethe took his degree as doctor of law. Shortly afterwards he bade adieu to Sesenheim, and the tears stood in Frederike's eyes as he reached out his hand from horseback. From Frankfort he wrote his final farewell, and it was then, as he tells us, that he found from her answer for the first time how deeply she had loved him, The account of this love episode in the autobiography does Goethe injustice. There is nothing in the letters or the poems of the time to show that he had wantonly trifled with her affections. Hight years afterwards, on his way to Switzerland, he spent a night with the Brions at Sesenheim, and was received with the utmost kindness, He was shown the arbour where he had sat, the songs he had written, the carriage he had painted. He left them in the morning with content. Frederike lived till 1813, well known for her works of charity. She never married ; the heart that Goethe had loved, she said, should never love another.

Goethe's return to Frankfort is marked by a number of Retum

songs, of which the " Wanderer's Sturmlied" is the most to Frank

remarkable. He found his Frankfort existence more intoler- ™ able than before. He had outgrown many of the friends of his youth. Those with whom he felt most sympathy were the two Schlossers and his sister Cornelia. He found in her one who sympathized with all his aspirations. He cared nothing for his profession; he was more determined than ever to devote himself to letters, and not to law. He found in the neighbouring town of Darmstadt a literary circle which Frankfort did not supply. The landgravine Caroline set a good example, and had collected round her a number of kindred spirits, men and women. Among them were Wenck, and Petersen, and Caroline Flachsland, who was afterwards to marry Herder.

But the soul of the literary circle was Merck, now thirty years of age, attached to the war office. Goethe has represented him in the autobio- graphy as a cold and unfeeling cynic, a spirit who always said no, a prototype of Mephistopheles. History represents him otherwise as a man of cultivated and chastened judg- ment, a represser of enthusiasm, a respecter of the rules of art, anxious to hold the balance between the old school and the new. Goethe had dominated over all his other friends; Merck dominated over him. He has left but little of his own writings. He was one of those who inspire gemius m others, and whose truest picture lives in the recollections of their friends. These months were full of literary activity. To them belong an oration on Shakespeare, delivered at Frankfort, an essay on Erwin von Steinbach, the builder of the Strasburg cathedral, two theological treatises of a neologistic character on the commandments of Moses and the miraculous tongues of Pentecost, and a number of reviews written for the Frankfurter Gelehrte Anzeiger, which had been founded by Merck. But the work into which he threw all his genius was the dramatization 0 the history of the imperial knight of the Middle Ages, Gottfried or Gétz von Berlichingen. The immediate a cause of this enterprise was his enthusiasm for Shakespeare sagt After reading him he felt, he said, like a blind man who suddenly receives his sight. The unities of time and place vanished into nothing. The true form of art was seep to be that which holds the wayward impulses together by invisible bond, just asin the life of man necessity 18 we

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found friends, Goué, formed a round table of knights,—a Ritter-tafel. The

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to free will. The study of a dry and dull biography of Gétz, published in 1731, supplied the subject for his awakened powers. From this miserable sketch he conceived within his mind a complete picture of Germany in the 16th century. The chief characters of his play are creatures of his imagina- tion representing the principal types which made up the his. tory of the time. Every personage is made to live ; they speak in short sharp sentences like the powerful lines of a great master's drawing. The first sketch of Gétz was finished in six weeks, in the autumn of 177]. Cornelia was con- sulted at every stage in the work. Herder saw it, and gave his approval, On his return from Wetzlar in 1773 Goethe wrote the piece over again, and published it, with the help of Merck, in the form in which we now possess it. It ran like wild-fire through the whole of Germany. It was the progenitor, not only of the "Sturm und Drang" period to which it gave the tone, but of the romantic knightly literature which teemed from the German press. Ata later period, in 1804, Goethe prepared another edition for the stage, which took five hours in acting. It has never been represented since.

With the manuscript of G@dtz in his pocket, Goethe left

. Frankfort in the spring of 1772 for Wetzlar, a quiet country

town ou the Lahn, one of the seats of government of the Holy Roman Empire. The emperors lived at Vienna ; they were crowned at Frankfort ; they held their parliaments at tatisbon, and at Wetzlar their courts of justice. It lawyers to attend the sittings of these courts for a certain time before they could be admitted to practise on their own account. The com- pany of these students, of the embassies from the com- and of various imperial officials, made the society a pleasant and lively one. Goethe soon The secretary of the Brunswick legation,

members adopted names from the age of chivalry, and ap- portioned among themselves the neighbouring villages as commanderies and fiefs. Goethe took the name of Gétz, Prowess were performed in friendly rivalry, chiefly inks This masquerade at least

The Deutsches Haus, then the property of the knights of the Teu- oni exists still in the main street of Wetzlar. It was /oceupied by one of the officials of the order, by name Buff, an honest man with a large family of children. The

second daughter, Lotte, blue-eyed, fair, and just twenty years of age, Was first met by Goethe shortly after his arrival at a ball at Wolpertshausen. She strongly attracted him; he became a He found that Lotte was a second mother to her brothers and sisters, and he delighted 0 play games with them and tell them stories. Lotte was

ill midnight ; they kept their common birthday together in he German house on the 28th of August; Kestner felt no ealousy; Goethe was content with Lotte's friendship ; ser heart was large enough for both,

-were shed ;

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Roche, the friend youth, and to her daughter Maximiliane, in the neigh-

young He had been with Goethe at the university of little of him at Wetzlar. heartened by failure in hig profession, and hopeless passion for the wife of another, he a pair of pistols from Kestner under pretence of a and liad shot himself on the night of October 29. Goethe obtained a full narrative of the circumstances from Kestner, and immediately afterwards began his Werther, in which the circumstances above related are all interwoven. Goethe tells us that it was written in four weeks, but this can hardly have been the case, notices of its slow progress during the whole of the summer of 1773. In 1774 it is far advanced enough to be shown to Some intimate friends. It is not til] the middle of Septem- ber 1774 that two copies of the book are sent in the

journey,

The Werther fever wrung the hearts of men and women with imaginary sorrows 3 floods of tears young men dressed in blue coats and yellow breeches shot themselves with Werther in their hands. Tt opened the floodgates of pent-up sentimentalism which had been stirred by the philosophy of the time, and which the calamities of the next generation were sternly to suppress, It may be imagined that Kestner and Lotte were not well satisfied with the liberty which Goethe had taken with them. They were married on April 4, 1773, and Goethe provided the wedding ring.

Notwithstanding the coolness which the publication of Werther produced between them, the correspondence between Goethe and Kestner continued to the end of the century. Lotte saw Goethe in Weimar in 1816, when she was 63 years old ; she was stil] beautiful, but her head shook with palsy. Shediedin 1828. The second part of Werther represents the agony of a jealous husband. This was inspired by Bretano, an Italian merchant resident in Leipsic, a widower with five children, who had married Maximiliane, the daughter of Sophie la Roche, Goethe loved her as an elder brother, but her husband scarcely approved of the intimacy. Merck tells us that his ideas went very little beyond his business, and that it was dispiriting to have to look for his young girl friend among barrels of herrings and » “much consoles her for husband’s manners.”

other. It is difficult to imagine that the same man can have produced both works, andin style. Werther represents the languid sentimentalism, the passionate despair, which possessed an age vexed by evils which nothing but the by the presence of a high ideal which revealed to it at once the depth of its misery and

Gotz was the first manly appeal to the chivalry of German spirit, which, caught up by other voices, sounded through- out the fatherland like the call] of a warder’s trumpet, till

Werther.

Satires.

Clavigo.

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it produced a national courage founded on the recollection of an illustrious past, which overthrew the might of the con- queror at the moment when he seemed about to dominate the world. Werther is the echo of Rousseau, the lamentation of a suffering world; Goéz is the prototype of Stein, the corner stone of a renovated empire. Gotz, in its short, sharp dialogue, recalls the pregnant terseness of medieval German before it was spoilt by the imitators of Ciceronian Latinity. Werther, as soft and melodious as Plato, was the first

revela- tion to the world of that marvellous style which, in the hands of a master, compels a language which is as rich as Greek to be also as musical.

These two great works were not the only occupations of Goethe at this time. In Wetzlar he had translated Gold- smith's Deserted Village, and had written a number of small poems addressed to Lotte. The spring of 1773, which wit- nessed the publication of Gotz, saw him actively employed as an advocate. Hisrelations with his father became easier. His literary success brought him a number of friends,—the young Counts Stollberg, and Von Schonborn,a friend of Klopstock's. He also began to correspond with Lavater the physiognomist and with Klopstock himself. To the latter half of this year are to be referred a number of satirical poems, aimed at prevailing follies of the time, clever and amusing, but of little permanent value. In Peter Brey he satirized the meddler Leuchsenring, who, with soft tread and lamblike manners, interfered with the family relations of Herder. Satyros is directed against the prophets of the school of nature, who bid us return to nature without remembering how coarse and repellent some aspects of nature are. Bahrdt had trans- lated the Bible into modern cultivated German ; Goethe wrote a prologue to this newest of divine revelations, in which the four evangelists appear each with his attendant animal, Of yet another kind is the Fair of Plundersweilern, in which the hucksters and booth-keepers represent the motley variety of human life and the characteristics of modern littérateurs. It is a foretaste of the second part of Faust. Harlequin's Marriage is only preserved in fragments; it was perhaps too coarse and personal to be published. The most important of these writings is Gods, Heroes, and Wieland, a dialogue in the style of Lucian written ata sitting over a bottle of Burgundy, in which Alcestis, Mercury, Hercules, Euripides, and other ancient worthies appear to Wieland in all their original greatness, and upbraid him with the mean and paltry representation of them which he had given to the world. Wieland was the apostle of an emasculated antiquity. Goethe would make the gods speak in their own large utterance if they spoke at all. Wieland revenged himself by recommending the satire in his paper, the Deutsche Merkur, as a delicate piece of persiflage worthy of the study of his readers. In November Gioethe's sister Cornelia was married to Schlosser and left Strasburg. Goethe felt the loss deeply. Sho lived but a short time. perpetual suffering, and she died in 1777.

The beginning of 1774 is marked by a new passion and a new work. Crespel had invented a plan for enlivening their social meetings ; each man was to draw lots for a partner, and for the time to consider her as his wife. Three times Goethe drew the name of Anna Sibylla Miinch, a pleasant girl of sixteen, daughter of a merchant. One of the favourite topics of the day was the trial of Beaumar- chais, which ended on February 16, 1774. Immediately afterwards his Mémoires or pleadings were published, and from the fourth of these the play of Clarigo was arranged. It represents a young writer of ambition deserting the woman to whom he is engaged and breaking her heart. The fifth act, in which Clavigo kills himself, is Goethe's own. The real Clavigo died, a distinguished man of letters,

Her married life was tortured witk |

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in 1806. The piece was written in eight days, and published

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GOETHE

on June 1. It hada great success, and still keeps the stage, But Goethe's best friends were disappointed with it. Merck told him not to write such trash, as others could do that as well. In reality there is no period of Goethe's life in which his literary activity was so prodigious, or wlien he was more fully occupied with literary plans which had reference to the deepest problems of human nature. To this time belong the conceptions of Cesar, Faust, Mahomet, the Wandering Jew, and Prometheus. The first was soon given up; of the second the first monologue, the dialogue between Faust and Mephistopheles, and part of the scenes with Gretchen, were now written. He has told us in his Autobiography what he intended to make of AMJahomet. In five acts he was to show us how the purity of prophetic zeal is recognized by love, rejected by envy, sullied by human weakness, spiritn- alized by death. To write this drama he had studied the Koran through and through ; only a few fragments were completed. Of the Wandering Jew very little remains to us. The design, conceived in Italy, of making a great work on the subject was never carried out. The Prometheus was completed in two

acts. The monologue of Prometheus included in the Lyrical Poems, was written at the same time; but it is doubtful whether it was intended to form part of the drama. These works are to be referred to the study of the ethics of Spinoza, for whom he now began to feel a. deep reverence, which continued throughout his life. The calm repose of Spinoza's mind spread over his own like a breath of peace ; his systematic and well-ordered reasoning was the best antidote to Goethe's passionate waywardness, Goethe now acquired a wider view of all the relations of the moral and natural world; he felt that he had never seen the world so clearly. His time at Frankfort was also largely occupied with art. His room was covered with the works of his pencil, and a number of poems on the subject of the artist's life arose from the same influence.

The summer of 1774 was spent in a journey to the Rhine, Rhine On July 12 Basedow, the educational reformer, came toJumé). Frankfort; three days afterwards Goethe went with him to Ems, where he found Lavater, who had been with him in the previous month. The three went down the Lahn together, and reached Coblentz on July 18. Here the famous dinner took place at which Lavater explained the secrets of the Apo- calypse to a clergyman, Basedow demonstrated the useless: ness of baptism to a dancing master, while Goethe, the worldling between the two prophets, made the best of his time with the fish and the chicken. They then went down the Rhine to Elberfeld, where Goethe found his old Stras- burg friend Jung-Stilling, and back to Pempelfort, near Diisseldorf, the house of Fritz J acobi, where Goethe also met Jacobi'swife Betty, his sister Charlotte, his aunt Johanna Fallmer, and his friend W. Heinse. Their letters are full of the effect which he produced upon them. Heinse says— "TT know of no man in the whole history of learning who, at such an age, was so completely full of original genius." Jacobi writes— Goethe is the man whom my heart re- quired ; my character will now gain its proper stability ; the man is complete from head to foot." Again he says that you could not be an hour with him, without seeing that it would be ridiculous to suppose that he could think or at otherwise than he really thinks and acts. No change cou. make him fairer or better ; his nature has followed its ow? development, as the growth of a seed, or of a flower on a tree. Nor were these impressions evanescent. Forty years after- wards he writes of these times —" What hours ! what days! I seemed to have a new soul. From that moment forth

would never leave you.” 3 & pals Frankfort at the beginning 0

Goethe returned to August. The autumn brought new friends, ani ’ mong

him by the fame of the newly published Werther. these was Klopstock, twenty-five years older than Goethe,

. Journey with Jacobi.

- the youthful couple.

GOE

and author of the Messiah, the acknowledged head of German poets. On December 11 Goethe was surprised by thé visit of a stranger, whom he at first took for Fr. Jacobi. It was Karl Ludwig von Knebel, who was travel- ling with the two young princes of Saxe-Weimar, the reign- ing duke Karl August, then just seventeen, and his younger brother Constantine. They were on their way to France with their tutor, Count Gorz, and they could not pass through Frankfort without making the acquaintance of the new genius who had risen upon their country. Goetlhie went to see them, was warmly received, and talked with them about the condition and prospects of Germany. This meeting decided the future course of Goethe’s life. Knebel thought Goethe “the best of men, the most lovable of man- kind.” The princes invited him to visit them at Mainz, where they would stay longer than at Frankfort. The visit lasted from December 13 to 15, when they went on to Carlsruhe, where the duke was to meet his intended bride. Goethe took the opportunity of reconciling himself with Wieland, who lived in Weimar. On his return he found Fraulein von Klettenberg dead. “My Klettenberg is dead,” he writes, “before I had an idea that she was dangerously ill, Dead and buried in my absence! She who was so dear, so much to me.” Frederike was lost to him, Charlotte, Maximiliane, and his sister married. Some attachment was a necessity of his nature. He now came under the influence of Lili Schénemann, the daughter of a rich banker, whose father was dead, but whose mother con- ducted the business, and held one of the most brilliant salons in Frankfort. This passion seemed to be of a more lasting nature than the others. Goethe was drawn into the whirl of society. He is described as moving in brilliantly-lighted rooms, in a gold-

laced coat, passing from party to concert, from concert to ball, held captive by a fair- haired girl with a pair of bright eyes. Such was Goethe in the carnival time. To Lili's influence we owe several of his smaller poems, Vewe Liebe neues Leben, Herz mein Herz was soll das geben, Heidenrdslein, and two little vaudevilles, Erwin und Elmire and Claudine von Villa Bella. The first contains some pretty songs, notably " Das Veilchen," set to music by Mozart. It is founded on the ballad of "Edwin and Angelina" in the Vicar of Wakefield. The latter half belongs to an earlier period, and is complete in itself. Claudine von Villa Bella has one good character, the prodigal son Crugantino ; and the ballad which is sung at the crisis of the plot was written during the Rhine To this period also belongs Stella, a comedy for lovers, a strange, wild play, full of extravagant passion. The weak-minded hero Fernando marries two Wives one after the other. They meet together in an inn, and he is reduced to extremity of misery. He loves them both, and they both love him. Finally, the first wife Stella surrenders her rights, and they agree all to live together. The play in this form suggested to Canning the parody of the Rovers, or the Double Arrangement. In 1806 Goethe altered the close by making Fernando shoot himself and Stella take poison. It is seldom performed, but Stella is a fine character for a great actress. It is said to be founded on an occurrence in the Jacobi family.

Neither family approved of the engagement between Goethe's parents thought Lili too much of a fine lady; they had a suspicion, which was well founded, that her wealth had no very sure founda- tio. Frau Schénemann did not think that Goethe, with all his genius, would make a good husband for her child. Cornelia Schlosser was strongly opposed to the match. Goethe tore himself away, and went for a tour in Switzerland. His companions were the brothers Stolberg, hoisy, wild young noblemen, who in May had stayed at Goethe's house. They gave Goethe's mother the name of

Frau Aya, which she ever afterwards retained.» On his journey Goethe visited the duke of Saxe-Weimar and his betrothed at Carlsruhe, his sister at Emmendingen, Lavater at Zurich. He bore with him the constant memory of Lili; he wore a golden heart which she had given him round his neck. He

climbed the St Gotthard on her birth- day, and looked with longing eyes to the promised land of Italy. But a stronger power drew him home again, and he returned. At Strasburg he met his old friends, and saw Zimmermann, the writer on solitude. He showed him a profile of Frau von Stein who lived at Weimar, with which Goethe was enchanted.

He returned to Frankfort on July 20. August was Return.

spent delightfully with Lili at Offenbach 3 his letters speak of nothing but her. September and the fair-time at Frankfort brought back his troubles, His position is described in the poem Lili's Park. He is the half-tamed bear who is held by magic bands amongst the birds and the fish, and yet sees a door left a little open for escape, and swears that he has the power to pass it. During this last period of his passion he éranslated part of the Song of Solomon. He wrote some scenes in Faust—the walk in the garden, the first conversation with Mephistopheles, the interview with the scholar, the scene in Auerbach's cellar. Ligmont was also begun under the stimulus of the American Rebellion. A way of escaping from his embarrassments was unexpectedly opened to him. The duke of Weimar passed through Frankfort both before and after his marriage, which took place on October 3. He invited Goethe to stay at Weimar, and it was arranged that one of the duke's household, who was expected every day with a new carriage, should bring him with him. He took leave of everyone, including Lili. But the carriage did not come 3 @ second leave-taking was impossible. He remained all day in the house working at Egmont, going out only at night. Once he stood by Lili's window, heard her sing lis songs, and saw her shadow on the curtain. He could not linger longer in the town. He started for Heidelberg hoping to meet the carriage, determined if it did not come to go on to Italy. He was summoned hastily back by a messenger, found the carriage at Frankfort, and entered Weimar in the early morning of November 7, 1775. It was not for his happi- ness or for Lili's that they should have married. She afterwards thanked him deeply for the firmness with which he overcame a temptation to which she would have yielded.

At this time the smaller German courts were beginning Weimar.

to take an interest in German literature. Before the Seven Years' War the whole of German culture had been French. Even now German writers found

but scant acceptance at Berlin or Vienna. The princes of the smaller states, shut out from the great world of politics, surrounded themselves with literature and art, and with men who would be likely to give an interest to their lives. The duke of Brunswick had made Lessing his librarian at Wolfenbiittel, and had not objected to the publication of Emilia Galott. Emmerich Joseph, the worldly elector and arch- bishop of Mainz, was devoted to Munich and the theatre, and made his stage one of the best in Europe. The mar- grave of Baden had invited Klopstock to his court, and delighted to associate with himself the author of the Messiah, the "poet of religion and of his country." The duke of Wiirtemberg paid special attention to education ; he promoted the views of Schubart, and founded the school in which Schiller was educated. Hanover offered a home to Zimmermann, and encouraged the development of Schlegel. Darmstadt was specially fortunate. Caroline, the wife of the landgrave, had surrounded herself with a literary circle, of which Merck was the moving spirit. She had collected and privately printed the odes of Klopstock, and her death in 1774 seemed to leave Darmstadt a desert. Her daughter

Louise, the youngest of eight children, seemed to have | was ennobled by the emperor, and took for his arms a silver inherited something of her mother's qualities, veiled by a | star in an azure field ; inJune of the same year he became serious and retiring temper. She married on October 3, | president of the chamber ad interim. We know that 1775, the young duke of Weimar, who was just of age. | Goethe devoted himself with industry and enthusiasm to the She reigned over that illustrious court respected and admired, public business ; he made himself acquainted with every but repelled rather than attracted by its brilliancy and | part of his master's territory ; he did his best to develop its eccentricity. The place which she would naturally have | resources ; he opened mines and disseminated education ; occupied was taken by the duchess Amalia, mother of the | he threw himself with vigour into the reconstruction of the grand-duke. She was of the house of Brunswick, and after | tiny army. A complete account of his labours in this field two years of marriage had been left a widow at nineteen | cannot be known until the secrets of the Goethe house with two sons. She committed their education to Count | at Weimar, now hermetically

closed, are opened to the Gorz, a prominent character in the history of the time. She | curious. We shall then probably find that Goethe cannot afterwards summoned Wieland to instruct the elder, and | be fairly charged with want of patriotism, or coldness to the Knebel to instruct the younger. The Deutsche Merkur, | national interest, and that his apparent indifference to the founded in 1773 to diminish the influence of the school of | rising of 1813 must be considered in connexion with his Klopstock, gave Weimar importance in the literary world. | resistance to the encroachments of Austria at an earlier The duchess was a great lover of the stage, and the best | time. play writers of Germany worked for Weimar. The palace Goethe's life was at no time complete without the Franvo and the theatre were burnt down in 1774, and the duchess | influence of a noble-hearted woman. This he found in Stein had to content herself with amateurs. After her son's | Charlotte von Stein, a lady of the court, wife of the master marriage she lived in the simple country houses which | of the horse, She was thirty-three years of age, mother of surround the capital, the lofty Ettersburg, the low-lying | seven children, His letters to her extend over a period Tiefurt, the far-seeing height of Belvedere. Each of these | of fifty years. Until his journey to Italy he made her was awakened to new life by the genius of Goethe. The | acquainted with every action, every thought of his mind, duke, eighteen years of age, was simple in his tastes, a hater | all the working of his brain, He calls her by every endear- of etiquette and constraint, true, honest, and steadfast, fond | ing epithet—the sweet entertainment of his inmost heart, of novelty and excitement, of great courage and activity ; | the dear unconquerable source of his happiness, the sweet his impulses, rarely checked, led him rather to chivalrous | dream of his life, the anodyne of his sorrows, his happiness, enterprise than to undesirable excess. His brother, Prince | his gold, his magnet, whom he loves in presence and absence, Constantine, had perhaps more talent but less character than | sleeping and waking, from whom he can never bear to be the grand-duke. He took but little part in the Weimar | parted, Many of Goethe's writings were from this time life, and died in 1793. inspired by the necessities of the court. One group of Goethein Upon this society Goethe, in the strength and beauty | them is formed by the succession of masks or ballets which Weimar. of youth, rose like a star. From the moment of his | were performed to celebrate the birthday of the grand- arrival he became the inseparable and indispensable com- | duchess Louise. Zhe Four Seasons; The Procession of

panion of the grand-duke. He subdued the affections of | Laplanders, the Nine Female Virtues, The Dance of the all he met with. Wieland said that his soul was as full | Planets, are sufficiently explained by their names. Others of him asa dewdrop of the morning sun. He was, take | were called for by the amateur theatre, which now was forced him all in all, the greatest, best, most noble human being | to supply the place of the regular drama. 'The stage was that God had ever created. The first months at Weimar | often set in the open air, the seats cut out of turf; the side were spent ina wild round of pleasure. Goethe was treated | scenes, of trimmed box, still exist at Belvedere and Etters- asaguest. Inthe autumn, journeys, rides, shooting parties, | burg. The actors were the duchess-mother and her sons, in the winter, balls, masquerades, skating parties by torch- | the civil servants and the officers, the ladies in waiting and light, dancing at peasants' feasts, filled up their time. Evil | the pages. Goethe was very good in comic parts; in solemu reports few about Germany ; the court of Weimar had a | tragedy, as in his own Orestes, be could best interpret the bad name ; Klopstock wrote letters of solemn advice, and | dignity of the ancient stage, Muszeus, head-master of the forbade his young friend Stolberg to accept an appointment | public school, was set to play low comedy ; Knebel repre- which the duke had offered to him. We do not know, and | sented the dignified hero. The chief professional support we need not examine, how much of these reports was true. | of the stage was Corona Schréter, whom the duke and Goethe wrote to Klopstock that if Stolberg came he would | Goethe personally carried off from Leipsic. On this find them no worse, and perhaps even better, than he had | visit he saw, after a long absence, Catherine Schénkopf, known them before. We may believe that no decencies | Oeser, and other friends of his youth. Goethe represented were disregarded except the artificial restrictions of courtly | most of his earlier pieces on the Weimar stage. He etiquette. Goethe and the duke dined together and bathed | wrote nothing of great importance for it till the first together; the duke addressed his friend by the familiar thou. | sketch of his Jphigenie. But several smaller pieces Goethe slept in his chamber, and tended him when he was | owe their origin to this cause. Proserpina and Du ill. In the spring he had to decide whether he would go | Geschwister are melodramas; Jery und DBately and Die or stay. In April the duke gave him the little garden by the | Fischerin are little operas composed to suit the Weimar side of the Ilm, with its lofty roof, in which he lived for the | taste.

Scherz, List, und Rache is an imitation of the nexteight years. In June he invested him with the title, so | Italian style. . -* important to Germans, of geheim-legationsrab, with a seat Besides numerous visits to the court of the Thuringian Jum? and voice in the privy council, and an income of £180 a | princes, sojournings at Dornberg and at Ilmenau, that retired year. By accepting this he was bound to Weimar for ever. | nook of the Weimar fatherland which still attracts many @ We may here mention the different grades of service through | pilgrim lover of Goethe, the first ten years at Weimar were which Goethe passed. In January 1779 he undertook the | interrupted by longer journeys. One of these was the commission of war; on September 5, 1779, he became | winter Harzjourneyin December 1777, undertaken suddenly geheim-rath ; in September 1781 he received an addition | to make the acquaintance of Plessing, a self-torturing hypo to his salary of £30. This was afterwards raised by £60 | chondriac, who had written to the poet for advice. With more, and in 1816 he received £450, with an additional | Goethe's help Plessing recovered from his melancholy, allowance for the expense of a carriage. In April 1782 he ! visited him at Weimar, and entertained him as professor at

Duisburg on his return from the campaign in France. A visit to Dessau inspired the improvements of the park and grounds at Weimar, which now make it so attractive, The close of 1779 was Occupied by a winter journey to Switzerland, undertaken with the duke and a small retinue. Two days were spent at Frankfort with Goethe's parents, Sesenheim was visited, and left with satisfaction and con- tentment. At Strasburg they found Lili happily married, with a new-born child. At Emmendingen Goethe stood by his sister's grave, and saw her successor J ohanna Fahlmer, Jacobi's aunt. The Swiss journey began at Basel. The chief object of it was to forward the health and education of the young duke. It was a bold plan to execute in October and November. From Bern they made the tour of the Bernese Oberland. From Geneva, by the advice of De Saussure, they visited Mont Blanc and the valley of Chamouni ; they crossed the Furka, not without danger, in the middle of N ovember, descended the St Gotthard to Lucerne, and visited Lavater at Zurich, the seal and sum- mit of their tour. From this time Lavater lost his influ- ence over Goethe, and in 1786 he would gladly

have run away from Weimar to avoid him. In December they went by the Lake of Constance and the falls of the Rhine to Stuttgart, where, on December 14, Goethe saw Schiller for the first time. He was a student at the Academy, and in Goethe's presence received the prize.

The return to Weimar, on J anuary 13, was the beginning of a newera, The period of genius and eccentricity was at anend; that of order and regularity succeeded. As an out- ward sign of the change, the duke cut off his pigtail, an example which was long without imitators. Wieland said that the Swiss winter journey was the greatest of Goethe's dramas. In the same serious mood Goethe began to write history. He chose for his subject Duke Bernhard of Saxe- Weimar, the knight-errant of the Reformation. He spent much time and trouble in collecting materials, but at length reasonably concluded that his strength lay elsewhere. At this time also he began to write Tasso, and adapted the Birds pf Aristophanes to modern circumstances. His deeper phoughts were concentrated in Welhelm Meister. Countess Werther, the sister of the great minister Baron 'von Stein, whom he visited at N' eunheiligen, was transferred in living portraiture to its pages, he duke's dominion naturall yled him to the study of science, fhe opening and direction of mines induced him to stud seology ; the classification of ancient forms of life led him p osteology and anatomy. Goethe was always fond of \hildren.

pe son of Charlotte von Stein, ve with him in his garden house. In the autumn they pok a journey together in the Harz, At Ilmenau was ritten the touching poem of that name on the duke's birth- py. Goethe reviews in it their common friendship and ftivity as far as it has yet gone, and a few days afterwards, # he slept in the hut onthe Gickelhahn, he wrote in pencil i he anticipates for himself tat rest and silence which then held enchained the summits | the hills and the birds of the wood. In the following Par another journey was undertaken in the Harz for the : dy of mineralogy. But this was only a relaxation from ; Te serious affairs. In 1785 the Fiirstenbund or league i princes was formed, under the supremacy of Frederick = Great, to resist the ambition of Austria under J oseph The duke of Saxe-Weimar took an important part in fming this league, and in the negotiations which preceded Goethe was his indispensable adviser, and must on this fasion, if

not on others, have taken a keen interest in Jitics and in the independence of Germany.

THE The year 1786 marks an

epoch in Goethe’s life.

own inward development, and the work which he was most fitted to do in the world, were not advancing as favourably as they should. He had written little of first-rate import- ance. of intense beauty and of deep short and fugitive. He had brought with him from Frankfort the sketches of Faust and done tothem since. His occa- sional writings for the amateur theatre, or for court festivi- tles, were not such as to add to his solid reputation in Germany. Iphigenie was the one

acts were written, and these in prose. the most exact expression of this portion of Goethe’s life 5 but loftily as it now towers above the level of his dramas, it did not then satisfy the author, nor was it in a state to be published. For the completion of these works Goethe required leisure and repose, impossible to obtain in the dis- traction and pleasures of the court, This became more apparent to him as he set himself to collect his scattered writings, Four volumes were goon completed, but the pre- paration of the other four convinced him how much labour many of his poems still required for perfection. Another cause of discontent was his relation to Frau von Stein. It could not have been more intimate. She was all to Goethe and more than Gretchen, Frederike, Lili, or his sister Cornelia had been. He communicated to her every thought and every action of his life. The relation was blameless, to a character like Goethe’s it was natural ; but it became every year more difficult and more full of danger. The ardent devotion which sat well on the impetuosity of youth was less becoming and less possible to the man of middle age. Yet the tie could not be severed without a struggle, and the wrench could not be effected without an enforced absence, ‘To these necessities, the need of quiet for compo- sition, and for deliberately rearranging the circumstances of his life, was added the stress of other impulses, Goethe had all his life been fascinated by the practice of art. In- deed it was not until he had discovered at Rome the limitation of his

powers that he definitely renounced the hope of becoming an artist. He tried almost every branch in turn. He drew in pencil and in sepia, sketched, painted in oil, engraved on copper and wood, and etched. For these occupations he had but little leisure 3; at this time he attributed his slow improvement rather to want of labour than to want of power. He saw infinite possibilities of advance in a life of freedom spent under the inspiration of sunny skies, and amidst the environment of the highest art.

Of still deeper interest and importance were his scientific Science.

researches. In these he aspired to detect the secrets of nature ; he succeeded in seeing, as in a vision, the great scheme of evolution applied to all phenomena of the natural and moral world, which the labours of many workers have revealed to us in our own day. He longed for time and leisure to perfect these ideas, to base them on solid fact, Goethe has not added much of positive value to the treasury of scientific truth, but be deserves the credit of having dis- cerned the right method of inquiry when it was obscure to many, and of having thrown that glow of imagination over dry and technical inquiry, without which no great discoveries can be made, His inquiries into the nature of light belong toa later time. He began with physiognomy under the auspices of Lavater. From this he was led to the study of anatomy, and especially to the comparison of the skeletons of men and animals. In this department he made a real discovery, that the intermaxillary bone which exists in the lower animals is found in the human kin in a rudimen- ».— 92

He had Leaves now been ten years in Weimar, and he must have felt that his Weimar.

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tary state, —that it is seen distinctly in youth, but as years | name of Goethe ; Spoleto again delighted him with the re- advance is united with the body of the skull. The dis- covery that the skull itself is only a development of the vertebrae of the spine was made a little later. He was led to this further step by picking up the head of a sheep on the shore of the Lido at Venice,

The care of his garden cottage naturally led him to the study of plants. He soon found himself attracted to wide and compreliensive generalizations. The Metamorphoses of Plants was not published till 1790, but the idea which had possession of his mind was a solid contribution to the science of botany. Goethe sought to dis- cover an original or standard flower, from which, as from a Platonic ideal type, all existing flowers were deflexions and aberrations, In this he followed an unscientific method, but he clearly saw that all the different parts of the plant, except the stem and the root, might be regarded as modifi- cations of the leaf; that leaf, calyx, corolla, bud, pistil, and stamen were all referable to the same type; and that whether a plant produced leaves, or flowers, or fruit, depended on the differentiation of the nutrition which it received. Less fortunate were his speculations in geology, to which he devoted a very large portion of his time and thoughts. Itis something that he recognized the importance and reality of that science, then in its infancy, which has had to undergo more than its due share of obloquy and distrust. But he was of necessity a follower of Werner, who based his classification of rocks rather on the minerals which they contained than upon an examination of the fossil remains of organic life. All these causes contributed together to one end. His desire to complete the great poetical works which he had begun, to disentangle his life from the complexities which had entwined themselves round it, to give a fair trial to his impulses towards art, to afford opportunity for the careful and systematic interrogation of nature, and, above all, a longing to possess his soul in peace, and solemnly to probe in silence the depths of his own being, conspired together to drive him from Weimar to the land which he had yearned after from boyhood. The resolu- tion, slowly formed, was boldly executed. In the summer of 1785 he had visited Carlsbad for the first time, passed a pleasant month in the company of the duchess Louise, Herder, and Frau von Stein. In July 1786 he paid ita second visit. After five weeks of brilliant society, very favourable to his health, spent in revising his works for the press, he stole secretly away. The duke alone knew that he designed an absence of some duration. In the strictest incognito, in the guise of a German merchant, he drove alone to the land of the citron and the orange.

Goethe’s Italian journey, the most momentous epoch in the development of his intellectual life, lasted from Septem- ber 3, 1786, to June 18, 1788. Assuming the common German name of Miiller, in the strictest incognito

he journeyed by way of Munich, where he studied the picture gallery and the collection of antiquities ; by the Lake of Garda, where he began his metrical version of the Iphigenie ; by Verona, where he saw the first specimen of Roman build- ing in Italy in the stupendous amphitheatre ; by Vicenza, where he was attracted by the grace and harmony of the classical Palladio ; by Padua, where he neglected the frescos of Giotto, but rose to a clear conception of the form of the original plant by the marks on the leaves of a palm in the botanical garden; to Venice, where for the first time he was able to taste the charm and richness of southern life. As he proceeded farther, Ferrara spoke to him of Tasso ; Bologna showed him the great masters of the academic school who have now grown pale and dim before the prede- cessors of Raphael ; Florence interested him a little; Assisi drew his attention, not to the triple church of Saint Francis, tle unrivalled museum of religious art, but to the little ruined temple which no modern traveller would notice but for the

ber 28. His first stay was till February. The constant companion of his studies was the painter Tischbein, who helped him to disentangle the many difficulties of the old Rome and the new. He lived chiefly among the German artists and men of letters who frequented the Caffé Greco, Among these were Angelica Kaufmann and Moritz, who deepened his knowledge of German versification, and pre- pared him for the composition of Iphigenia. Although Goethe occupied himself chiefly with drawing, he was able to announce on June 6 that this work was finished. The second Iphigenie, written in verse, was the first important fruit of the Italian journey. It is in very strong contrast with Gétz von Berlichingen. It is written in the strictest classical form. Although based on the Jphigenia in Tauris of Euripides, it has little in common with it, In Euripides Thoas is represented as a cruel barbarian, against whom it is justifiable to employ every artifice of fraud or violence. In Goethe the characters are ennobled by a higher principle, and the struggle between truth and falsehood is madea pro- minent motive of the piece. When Thoas discovers that, according to the oracle of Apollo, the return of Orestes’s sister to Greece will satisfy the anger of the gods, he gives his consent, and his last words are a friendly farewell. Towards the end of February Goethe left Rome for Naples. Here he was attracted less by the remains of antiquity, even the new revelations of Herculaneum and Pompeii, than by the prospects of nature, the bay, the

islands, the volcano, the thousand beauties which make the gulf unrivalled in the world, and by the multitudinous and teeming life which throngs the endless quays that line the shore. Sorrento

did not complete the drama till his return from Italy, It did not appear in print till the spring of 1790. The play had a special fascination for him as a picture of his own distracted life. He could depict with feeling the struggle between the actual and the ideal, the ill-assortment of a passionate poet with the jealous and artificial environment

rolled up in his cloak he meditated the composition of his Tasso. Sicily struck him, as it must strike all travellers who have studied the ancient world, as a revelation of Greece, It is, if one may say so, more Greek than Greece itself. Its mountains, streams, trees, flowers, the form of its boats and pottery, the habits of tho people, the quivering smile of the bright blue sea fringed with golden sand, represent completely the Greece of the Odyssey and of the choruses of Euripides. Goethe was overmastered by this powerful influence. He sketched and began Nausicaa, the story of the Odyssey indramaticform, which always remained a fragment, He returned to Rome in June. The rest of the year was spent in the city and its neighbourhood, in the serious study of drawing, for which unfortunately he had but little talent,

approval of his father in the early Frankfort days. It was finished in September 1787, and appeared in the Easter of the following year. Although Lymont still keeps the stage it has very grave faults. Itis an unfortunate mixture of the natural and ideal treatment. The licence with which the scenes are transposed in modern performance shows how much the work lacks symmetry and cohesion. Schiller criticized it severely as being untrue to history. He de- scribed the close, where all difficulties are solved by the appearance of Clirchen, as adews ew machina or asalto mortale into the world of opera. The music of Beethoven has contrl- buted to ita charm of art which was necessary tu its complete- ness. Besides this, Goethe rewrote for publication his early vaudevilles of Erwin und Elmire aud Claudine von Villa Bella. The carnival of 1788 was of importance to nis

mains of ancient architecture. He reached Rome on Octo-Rome,

stimulated him to the revisal of Zorquato Tasso, but he Tass.

of a court, At the end of March Goethe sailed to Sicily ; Sicily.

and in the composition of Zymont, a work begun with the Egmont

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experience. He wrote some scenes of

gardens. At the end of April he t Italy, and arrived at Weimar in the middle of June. From this time his life takes a new colour.

that life itself should be a work of art.

able for the purposes of his life.

friendly meetings was in a Goethe met Schiller.

park, he met Christiane Vulpius, him with a petition in favour of her brother. golden curling locks, round cheeks, rounded figure ; she looked, as has b

_ take her into society;

intellectual companion.

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in Germany from home experiences. We must pass rapidly over the next six years, until

fhis friendship with Schiller. In the spring of 1790 he ravelled to Venice to meet the duchess Amalia.

jthan the Roman, were the fruit of this journey. In the autumn of the same year he accompanied the duke to ilesia, the first of those military journeys which strike fo discordant a note in the harmonious tenor of his pxistence. The year 1791 offered a quiet contrast to the fnovement of the year before. He began to take a more ppecial interest in the university at Jena, in which his young friend Fritz von Stein had now entered asa student, tnd his time was more and more occupied with the study bf colours, the least happy and successful of his scientific jabours. In the autumn of 1791 Goethe was able to devote himself regularly to a task which had informally occupied his first years in Weimar. The new theatre was completed, {nd Goethe was made director of it. It was in this capacity that he was best known to the citizens of Weimar. He lin the final decision on every detail of plece, scenery, and cting .; in later years his seat was in a large arm-chair in he middle of the pit, and applause was scarcely permitted ntil he gave the signal for it. The German stage owes erhaps as much to Goethe as to Lessing. The répertotre f the Weimar theatre was stocked with pieces of solid merit phich long held their place. Shakespeare was seriously jerformed, and the actors were instructed in the delivery {blank verse. Stress was laid on the excellence of the semble as against the predominance of particular stars, he theatre was considered as a school not only of elevating

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j Faust : especially the scene in the witches' kitchen was composed in the Borghese

ook a sad farewell of

He had "- learned in Italy not only new principles of art,—not only that a work of art, whatever of Gothic ornament i may possess, must be solid, firm, and simple in its con- struction as a Grecian temple,—but he had also learned He was deter- mined henceforth to be himself, to break the bonds

which had confined him and the distractions which had confused him, to possess his soul sacred and inviol- He was relieved of the presidency of the chamber and of the war commission, but in a manner which did him the greatest honour. His relations with Frau von Stein, which had been one reason of his leaving Weimar, began to cool. One of their last journey to Rudolstadt, where Neither knew the influence which the other would have upon his life. Their relations were those of shyness, and partly even of dislike. Goethe's friendship with Frau von Stein was to receive a final blow, In the autumn of 1788, walking aimlessly through the a young girl who presented She had laughing eyes, a neatly een said, "like a young ." Dionysus." Goethe took her into his house, and she became his wife in conscieuce, and the mother of his children. He did not marry her till 1806, when the terrors of the French occupation made him anxious for the position of his eldest son. She had but little education, and he could not but she made him a good and loving wife, and her quick mother-wit made her available as an To these days of early married life belong the Roman elegies, which, although Italian and 'pagan in form, in colour, and in sensuality, were written

oethe's genius received a new impulse and direction by

The enetian epigrams, still more outspoken in sensuality

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amusement but of national culture. Goethe wrote the Gross Cophta for the Weimar stage, a piece founded on the history of Cagliostro and the diamond necklace. He was fascinated by the story as o foreboding of the coming horrors of the Revolution. In these events he was destined to take a more active part than he expected. In August 1792 he accompanied the duke to the campaign in the Ardennes. Passing by Frankfort, where he visited his mother, he joined the allied armies at Longwy. He beguiled the tedious siege of Verdun by writing an account of his theory of colours in a leaky tent ; and on the disas- trous day of Valmy, which he recognized as the birth of a new era, he sought the thickest of the fight that he might experience the dangerous rapture of the cannon-fever, He retreated with the Prussian army, spent five weeks with his friend Jacobi at Pempelfort, and on his return to Weimar at the end of the year found that the duke had built him a spacious

house in the square where the joint statues of Goethe and Schiller now stand, in eternal memory of their friendship, In 1793 he went with his master to the siege of Mainz. He continued his optical studies during the bombardment, witnessed the marching out of the garrison, and was one of the first to enter the conquered town. He received leave to withdraw, and went to his mother at Frankfort, and persuaded her to sell the old house and its contents, and to provide a more convenient home for her old age. There was some talk of her coming to Weimar. In the autumn of this year the duke left the Prussian service, and Goethe could look forward to a period of peace. He was chiefly occupied with the management of the theatre, and for this he wrote two pieces, both of which had reference to the politics of the time. The Birgergeneral is a satire on the Revolution, and was long a stone of offence to Goethe's friends, who thought that he should have hailed with delight the birth of a new era,

The Aufgeregten, left unfinished, sketched the outbreak of the Revolution in a country town, and would have declared the author's views with greater distinctness. But the feel- ings of scorn and contempt which he felt for the cowardice,

cunning, and perfidy of mankind were expressed in a work

of greater magnitude. He had good reason to deplore the misery of the time, His mother's home in Frankfort was

broken up ; Schlosser, his brother-in-law, had retired to

Auerbach; Jacobi was flying to Holstein. Goethe took the

old German epic of Reynard the Fox, with which he had

long been familiar, and which, under the guise of animals,

represents the conflicting passions of men, and rewrote it in

flowing German hexameters.

Thus far he had produced but little since his return Friend. from Italy. He was now to undergo the most powerful ship with influence which had as yet affected his life. His friendship Schiller. with Schiller was now to begin, an alliance which, in the closeness of its intimacy and its deep effect on the character of both friends, has scarcely a parallel in literary history. If Schiller was not at this time at the height of his reputation, he had written many of the works which havo made his name famous. He was ten years younger than Goethe. The Rduber plays the same part in his literary history as Gétz plays in that of Goethe. This had been followed by Fiesco and Kabale und Liebe. The second period of Schiller's life had begun with his friendship with KG6rner, and his residence in Saxony. Here he wrote the Hymn of Joy,and completed Don Carlos. In 1787 he settled at Weimar. He found the place deserted, the duke in the Prussian camp, Goethe in Italy. He applied himself to history, wrote the Revolt of the Netherlands, and studied the literature and art of Greece. In 1789, mainly upon Goethe's recommendation, he was made professor of history at the university of Jena, although he was afraid lest the scholars should discover that they knew more history than the teacher.

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Wilhelm Meister.

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He made a successful marriage, and worked seriously at his History of the Thirty Years' War. In 1794 Schiller had arranged with the publisher, Cotta of Augsburg, whose name is from this time indissolubly connected with the history of German literature, for the production of a new literary journal. It was to be called the Horen, and the most dis- tinguished German writers were to contribute toit. Goethe accepted the invitation willingly. The work was designed to mark an epoch in German taste, and it did so, It soon had two thousand subscribers. Among those who promised to contribute were not only Matthisson, Herder, Knebel, Fritz Jacobi, and Gleim, but the brothers Humboldt, the veteran Kant, the youthful Fichte, who had just begun to lecture in Jena, and, at a later period, the brothers Schlegel. Schiller opened the first number of the journal with his letters on the " Austhetic Education of the Human Race." Goethe contributed the

“Unterbaltungen deutscher Ausge- wanderten,” a series of stories told by a number of German emigrants who had been driven to cross the Rhine by the invasion of the French. The most remarkable of these stories is the “Mirchen,” a wild and mystic tale, which has been the subject of as much controversy and of as many interpretations as the second part of Yaust. Goethe also published in the Horen the “Rémische Elegien,” the flavour of which even Karl August found a little too strong. The first effect of Schiller’s influence on Goethe was the com- pletion of Wilhelm Meisters Lehrjahre. He had conceived the plan of the work twenty years before, and the first six books had been written before the Italian journey. It was now finished by the addition of two more books. It stands in the first rank of Goethe’s writings. He has aimed in it to attain to perfect objectivity of tone, to represent men as they are, and to pass no judgment upon them. The hero passes with weak irresolution through a number of ordinary circumstances, apparently the sport of fortune and the play- thing of chance, yet all these experiences have their definite result in the training of his character. Like the son of Kish, he goes forth to seek his father’s asses and finds a king- dom. The unearthly charm of the child Mignon, the dark fate which shrouds the aged harper like the doom of Gidipus, the uncertain yearning after a happier home in brighter climes, give a deeper undertone to the prevailing lightness of the story. The style is exquisitely soft and flowing. It has the sweetness and simplicity of Werther, but is more mellow and more mature, The sixth book is occupied with the Bekentnisse einer schiinen Seele, a piece of the auto- biography of Goethe’s early friend Fraulein von Kletten- berg, altered to suit its new surroundings. The Musen Almanach for 1796, edited by Schiller, was enriched by some of Gocthe’s most exquisite poems —Die Nahe des Geliebten, Meeres Stille, and Gliickliche Fahrt, The storm of criticism which was aroused by the Horen, and the little success which, after the first numbers, it met with from the public, determined the two friends to retaliate upon their aggressors, The poems of Martial contain a number of epigrams written in two lines, describing the numberless little presents or xenia, which it was customary for friends to exchange at Rome during the time of the Saturnalia.

Xenien. The name was borrowed by the two poets, and the Xenzen

was a convenient vehicle for the expression of their opinion on every subject. The newspapers of the day were the first object of attack, but they soon went farther afield. The epigrams were written in Schiller's rooms at Jena, It is impossible to fix the authorship of the Xenten ; one con- ceived the idea, the other wrote the lines; one wrote the hexameter, the other the pentameter; they intended the authorship as well as the ownership of the copyright to be one and indivisible. Notwithstanding this, the collection has been broken up. There is no guarantee that the epigrams which appear in the separate works of either poet were really

written by the authors to whom they are ascribed ; someare reprinted in the works of both; some have remained yp- printed altogether. They appeared in the I/usen Almanach for 1797, together with the Venetian elegies mentioned above. It is needless to say that they roused the writers whom they attacked to unspeakable fury, and were the occasion of a copious literature. A more solid result of the

friendship between the poets was the production of Hermann 9, 5 : 5 erimann,

It is a German idyll; the story is taken und from the sufferings of Lutherans driven out in the early Poroiten

und Dorothea.

part of the 18th century from the province of Salzburg, but Goethe has given it the character of his own time. He had seen much of the suffering produced by the French Revolu- tion, and he wished this poem to bea reflexion in a tin mirror of the storms and convulsions of the great world, In its literary form it is a descendant of Voss's Luise. Tt was conceived at Ilmenau in August 1796, and finished in the following spring. Schiller tells us how it was composed with extraordinary ease and rapidity. During nine days Goethe produced 150 lines a day. You have only to shake the tree, as Schiller said, and ripe apples will tumble down about you. The lines thus hastily written underwent a careful revision. Contemporaneous with Hermann und Dorothea is the production of Wallensteins Lager by Schiller,

which was written with the advice and assistance of his brother poet. The completion of this cycle of plays falls two years later.

The year 1797 is the year of ballads. house at Jena Schiller worked diligently at this vein, that perhaps for which he was best suited, and in which he most nearly rivals Goethe. Goethe wrote Die Braut von Korinth, Gott und die Bayadere, and Der Zauberlehrling; and the whole collection was published in the Musen Almanach for 1798, The latter half of this year was occupied with a tour in Switzerland. Before its com- mencement he visited his mother at Frankfort for the last time, and presented to her his wife and his son. It was a year of extraordinary activity, Besides the ballads and his researches in the morphology of plants and insects, he translated a great part of the autobiography of Benvenuto Cellini, wrote a number of essays on the question of zesthetics, and worked at his long neglected Faust. Of this he wrote the dedication, the " Prologue in Heaven," and the "' Golden Marriage of Oberon and Titania"-—so power- ful was the effect of intellectual sympathy and stimulus. The six years which succeeded Goethe's return from his third Swiss tour, although they embrace the period in which he and Schiller were in daily co-operation, have left us little of permanent worth from the older poet. On the other hand, they are the years of Schiller's greatest activity. The great trilogy of Wallenstein, perhaps the highest point of Schiller's genius, was followed by Maria Stuart, the Jungfrau von Orleans, the Braut von Messina, and Wilhelm Tell. From the end of 1799 Schiller was permanently settled in Weimar; a dramatic school was founded, and the representation of these classical dramas was the glory of the Weimar stage. During these years Goethe was occupied with Faust, with his researches into the theory of colours and of biological development, with the conduct of the theatre and the practical encouragement of art. In 1798 the Horen died a natural death, and was succeeded by the Propyléen, a journal of literature and criticism, which, although it contained many essays by Goethe, never ex- ceeded a circulation of 300. In the spring 1799 the study of Homer incited Goethe to sketch a long epic poem 0 the subject of Achilles. Schiller did his best to encou- rage the work. The first canto was rapidly completed, but it had no successor. Goethe contented himself with trans lating the works of others, and prepared the Mahomet an Tancred of Voltaire for the Leipsic stage. In the first

In his garden Ballads

death

| was recalled by order of the duke. versations in the salons of Weimar is contained in her book

Schillls authority on Greek metres.

‘ de Rameau of Diderot.

cORTHSs

days of the new century he suffered a dangerous attack of scarlatina. His friends feared for his life. Frau von Stein recalled her forgotten friendship, and showed kindness to his son. After his recovery he sketched out what was the most important work of these years, a trilogy on the subject of the French Revolution ; of this only the first part, the Natiirliche Tochter, was completed. The story was a true one of a princess of the French house of Conti. The play is written with the full beauty of Goethe’s style, and some passages and effects are worthy of his highest genius. But as a whole it fails. It has the quality, which in a drama must be a fault, so characteristic of Goethe’s later writing, of too great universality of treatment. The characters are not living beings but abstractions, and the language is vague and general rather than clear and defined. The play was performed at Weimar on April 2, 1803. ‘Two masterpieces of Schiller—the Braut von Messina and the Jungfrau von Orleans—preceded and followed it by a few weeks. At the end of this year Madame de Stael arrived in Weimar accompanied by Benjamin Constant. She had heard of the fame of this new Parnassus, and she

was bent on proclaiming the intellectual superiority of

Germany to the world. Goethe at first fled from her, as Byron did at a later period. He hid himself in Jena, but

De l’ Allemagne. In March she was suddenly recalled by the death of her father, the minister Necker. Goethe was at this time the centre to which the

most distinguished men of all kinds in Germany naturally turned. He was most intimate with Zelter the musician, with whom he main. tained a full correspondence ; with Wilhelm von Humboldt, the statesman-scholar ; with F. A. Wolf, the founder of the science of philology ; with Gottfried Hermann, the best But the friendship which was worth all these was soon to be severed. In the beginning of 1805 Goethe was convinced that either he or Schiller would die in that year. In January they were both seized with illness ; Schiller had finished his Phddra and begun to work at his Demetrius. Goethe was translating the Veveu Schiller was the first to recover, and visiting Goethe in his sick room, fell on his neck and kissed him with intense emotion, On April 29 they saw each other for the last time. Schiller was on his way to the

theatre whither Goethe was too ill to accompany him. They parted at the door of Schiller's house.

Schiller died on the evening of the 9th of May. No one dared to tell Goethe the

' sad news, but he saw in the faces of those who surrounded

him thatSchiller must beveryill. Onthe morrowof Schiller's

death, when his wife entered his room, he said, " Is it not

true that Schiller was very ill yesterday?" She began to sob. He then cried, 'He is dead!" "Thou hast spoken it thyself," she answered. Once more he cried, "He is dead!" and turning aside covered his weeping eyes with his 'hands. He at first intended to have completed Demetrius as a memorial of his friend, but a happier inspiration was

, to arrange a performance of Schiller's great poem of The Bell, and to crown it by an epilogue Since that time

Schiller and Goethe have been inseparable in the minds of their countrymen, and have reigned as twin stars in the literary firmament. If Schiller does not hold the first place, it is at least true that he is more beloved, although Goethe may be more admired. It would be invidious to

Separate them. But it is evident that the best fruits of Schiller's muse were produced when he was most closely

| under Goethe's influence, and the foreign student of German

culture has ground for believing that at some future time

| the glory of the lesser luminary will be absorbed in that of

the greater, and the name of Goethe will represent alone and unrivalled the literature of his age and country.

The result of the con-

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Schiller was happy in the occasion of his death. not see the troubles which immediately afterwards burst upon Thuringia. On October 14, 1806, the battle of Jena was fought. The court had fled from Weimar ; only the duchess Louise remained, In the evening of the defeat Weimar was plundered by the conquering troops. Many of Goethe's friends lost everything they possessed. His property and perhaps his life was saved by the firmness of Christiane, and afterwards by the billeting of Marshal Augereau in his house. On the 15th N apoleon eutered the town, but Goethe did not go to see him. The duchess obtained her husband's pardon by her entreaties. It was not till the autumn of 1808 that Napoleon and Goethe, perhaps the two greatest men then living in Europe, met and conversed. It was at the congress of Erfurt, where the sovereigns and princes of Europe were assembled, Goethe's presence was commanded by the duke. He was attracted at least as much by the prospect of seeing Talma as of meeting Napoleon, He was invited to an audience on October 2; Talleyrand, Berthier, and Savary were present. The emperor sat at a large round table eating his breakfast. He beckoned Goethe to approach him, and said to him, "Vous étes un homme!" He asked how old he was, ex- pressed his wonder at the freshness of his appearance, said that he had read Werther through seven times, and made some acute remarks on the management of the plot. Then, after an interruption, he said that tragedy ought to be the school of kings and peoples; that there was no subject. worthier of treatment than the death of Cesar, which Voltaire had treated insufficiently. A great poet would have given prominence to Cexsar's plans for the regeneration of the world, and shown what a loss mankind had suffered by his murder. He invited Goethe to Paris ; that was the centre of great movements ; there he would

find subjects worthy of his skill, They parted with mutual admiration. The bust of Napoleon was a prominent ornament in Goethe's study.

In the same year, 1808, an edition of Goethe's works Faust. in thirteen volumes was published by Cotta at Tiibingen. It is remarkable as containing the first part of Faust in its complete form. The principal portions of 'the drama had already been published as a fragment in 1790, It had then attracted but little attention. Heyne wrote of it— There are fine passages in it, but with them there are such things as only he could give to the world who takes other men to be blockheads." Wieland and Schiller were apparently dissatisfied with it. It had perhaps the appear- ance of patchwork, as it was made up of fragments which had been written at very different periods of his life. The idea of writing Faust seems to have come to Goethe in his earliest manhood. He was brooding over it at the same time with Gétz von Berlichingen, but at Strasburg he spoke to Herder of neither, He apparently began to write it down at the same time as Werther in 1774, and we find mention of its progress in the two following years ; indeed, all the important parts of the fragment which appeared in 1790 were known to Jacobi before 1776. He took the work with him to Italy, where he added little to it except the scene in the witches' kitchen. The dedication, the "Prologue in Heaven," which presents to the reader the idea of the whole work, the prelude on the stage copied from the Indian drama, the lyrical intermezzo, the scene with Wagner before the city gate, and the scene with Mephistopheles in the study were written before 1800. In that year he was busy with Helena for the second part, and he added nothing afterwards to the first except the " Walpurgis Night" and the scene of Valentine's death. Faust justly stands at the head of all Goethe's works, and it deserves a very high place among the best works of every age. Founded on a well-known popular tale, indebted for its interest and

He did Napoleon.

Wahlver- awandt- schaften.

Farben- lehre.

pathos to incidents of universal experience, it deals with the deepest problems which can engage the mind of man. In this combination of qualities it is perhaps superior to any one of Shakespeare's plays. 'The plot is as simple and as well known to the audience as the plot of a Greek tragedy. The innocence and the fall of Gretchen appeal to every heart ; the inward struggles of Faust, like those of Hamlet, and the antagonism of the sensual and moral principles, interest the reader just in proportion as his own mind and nature have been similarly stirred. Each line is made to stand for eternity; not a word is thrown away ; the poem has entered as a whole into the mind and thought of modern Germany ; nearly every expression has become a household word. Characters are sketched in a single scene; Valentine lives for us as clearly as Faust himself Deeper meanings are opened up at every reading, and the next age will discover much in it which is concealed from this. Goethe, writing of Yaust in his eightieth year, says with truth, "The commendation which the poem has re- ceived far and near may be perhaps owing to this quality, that it permanently preserves the period of development of a human soul which is tormented by all that afflicts man- kind, shaken also by all that disturbs it, repelled by all that it finds repellent, and made happy by all that it desires. The author is at present far removed from such conditions ; the world likewise has to some extent other struggles to undergo ; nevertheless the state of man, in joy and sorrow, remains very much the same, and the latest born will still find cause to acquaint himself with what has been enjoyed and suffered before him in order to adapt himself to that which awaits him."

In 1809 he finished Die Wahlverwandtschaften (The Elec- tive Affinities), a story which is always cited to prove the immoral tendency of his works. A married couple, Edward and Charlotte, are thrown into constant companionship with two unmarried persons, the Captain and Ottilie. A cross attraction takes place similar to that which is often seen in chemical experiments. Edward unites himself with Ottilie, Charlotte with the Captain. The psychological changes by which this result is produced are portrayed with a masterly hand. The moral may be held by some to exalt the preponderance of fatality in human affairs, and the use- lessness of contending against irresistible circumstances. Others may believe that the story is intended to show the disastrous calamities which may be wrought ky a weak and self-indulgent will. Ottilie, though she cannot resist her

passion, has strength enough to starve herself to death ; Edward is the prototype of Arthur Donnithorne and Tito Melema. The work is replete with earnest purpose and terrible warning.

In 1810 Goethe finished the printing of his Farbenlehre (Theory of Colours), a work which had occupied his mind ever since his journey to Italy. His theories were rejected and disregarded by his contemporaries, but he left them with confidence to the judgment of posterity. Goethe's labours in this domain fall into two natural divisions—one in which he tries to prove that the hypotheses of Newton are unsatisfactory, and another in which he promulgates a theory of his own. In his first work, published in 1791 and 1792, he describes with great accuracy and liveliness the experiments which he has made. They consist chiefly of the appearances presented by white discs on a black ground, black discs on a white ground, and coloured dises on a black or white ground when seen through a prism. There are two points which he considers fatal to Newton's theory,—that the centre of a broad white surface remains white when seen through a prism, and that even a black streak on a white ground can be entirely de-composed into colours. The scientific friends to whom he communicated these observations assured him that there was

uothing inthem opposed to Newton's theory,—that they were even confirmations of it. He would not be convinced, and took no pains to acquire that exact knowledge of mathe- matics and geometrical reasoning without which the more abstruse problems of physical optics could not be ip- telligible. He went on further to formulate a theory of his own. His views on the subject are contained in their shortest form in a letter addressed to Jacobi from the camp at Marienburg in July 1793. They are divided into six heads, of which the following is an abstract. (1.) Lightis the simplest matter we have knowledge of, the least capable of analysis, the most homogeneous. It is not a compound body. (2.) Least of all is it compounded of coloured lights, Every coloured light is darker than colourless light, Brightness cannot be compounded of darkness. (3.) Inflex-ion, refraction, reflexion, are three conditions under which we often observe apparent colours, but they are rather oceasions for their appearance than the

cause of it. (4,) There are only two pure colours, blue and yellow; red may be regarded as a property of both of them. There aretwo mixed colours, green and purple; the rest are gradations of these colours, and are not pure. (5.) Colourless light cannot be produced out of coloured lights, nor white from coloured pigments. (6.) The colours which appear to us arise solely out of a modification of the light. The colours are excited in the light, not developed out of the light. These views he afterwards extended and explained, but very slightly modified. In Goethe's opinion, yellow was light seen through a thickened medium; blue was darkness seen through an illuminated medium; all other colours were de- rived from these two, The theory of the Farbenlehre has not yet received the recognition which Goethe anticipated for it. In his own day he had some adherents,—the most distinguished perhaps was the philosopher Hegel, whose views, however, of natural philosophy have caused many inquirers to recoil from his theory of metaphysics. Goethe complained that no physicist believed in him, and as that is still true in an age which has been devoted more than any other to physical inquiries, we may conclude that the prin- ciple upon which his theories are based is radically wrong.

The year 1809, in which Die Wahlverwandtschaften was written, was for Goethe the beginning of a newera. He was then fresher and brighter than he had been for ten years before, He had lived through a troubled period of oppressive sorrow. The death of Schiller, the violation of his beloved Weimar, the deaths of the duchess Amalia and of his mother, his own bodily and mental sufferings, had given a tone of sadness to his poetry. As if to put the finishing stroke to the efforts of his life, he married the mother of his children, arranged and published his collected works, and completed his theory of colours. The unfinished drama of Pandorais a symbol of this time. The part which is completed refers only to past experiences of sadness ; the continuation was to have lifted the curtain of future hope.

It was natural at the beginning of a new course of life that Goethe should write an account of his past existence. The study of his collected poems made it apparent to him how necessary it was to furnish a key by which they might be understood. These various causes led to the comp

phical history of the poet’s life from his birth till his settle- ment at Weimar. This work is the cause of much embarrass- ment to the poet’s biographers. Where it ought to be the most trustworthy source of information, it is most mislead- ing. It is probable that Goethe intended it to bean acca and circumstantial account of his life. But the inner life o an individual is more clear to him than the outer, The stages of our self-development are better remembered than the exact circumstances which produced them, still less “ the order of time in which they followed each other. Goethe

osition of gains Dichtung und Wahrheit (Poetry and Truth), an autobiogra- IP”

of the poet’s life and every phase of his feeling, its place as a classic, versal interest from being less particular.

five in 1812, the third instalment at Easter 1814, and the

man people against the power of Napoleon. In this Goethe took no share, and with it he apparently felt little sympathy. countrymen like Fichte ; he wrote no inspiring lays like Korner. The ballads which he composed in 1813 are

hart, Der Todtentanz. He saw Stein and Arndt at Dres- den in 1813, but disappointed them by his impassive manner. He said to Korner’s father at the same time, “Yes, shake your chains! The man is too great for you. You will not break them, but only drive them deeper into your flesh.” The reasons for this apparent coldness are perhaps more simple than they appear at first sight. Goethe was a man of thought rather than of action. AL though a fair portion of his long life was given to the } practical business of his adopted country, his heart was always in speculation or artistic production. While in- Specting mines he was spinning theories of geological for- “mation ; while working for the war commission he gladly Tan away to the castle of Dornburg to bury himself amongst his deserted papers. The pressure of court business at Weimar drove him to the solitude of Italy. In the defiles of the Argonne, and in the trenches before Mainz, he was scheming and arranging his theory of colours. A bombard- “ment was valued by him less as an attack upon the enemy jthan as a series of interesting experiments in optics, Added to this natural indifference to the

details of human affairs was his belief in the predominance of force, and in | the necessary evolution of the history of the world. Na-)poleon was to him the greatest living depository of power. Nations, whether conquered or victorious, separated or united, obeyed a common law against which individual will ‘strove in vain. Goethe was thus incapacitated for politics, “both by his qualities and his defects. This habit of abstract contemplation grew upon him in later life. Those who condemn him on this ground should remember that he hailed in no grudging spirit the formation of a united Ger- “many, and that his works have been the most potent agency in making all Germans feel that they areone. Few would wish to exchange the self-conflict of Faust, or even the wayward wanderings of Meister, for the hectic extrava- gance of Korner or the unsubstantial rhetoric of Posa.

It was hardly to be expected that at the age of sixty-five ‘al

willing refuge in the restoring fountain of the Eastern poet.

he book Z%imur has an obvious reference to the expedition pf Napoleon in Russia, but the large majority of the poems te amatory, and are addressed to an imaginary Suleika,

GOETHE

took pains to ascertain facts which he had forgotten. But he was so conscious that imagination would play a large } part in the composition that in the title he gave poetry the | precedence before truth, The indefatigable industry of German investigation has laid open before us every detail Dichtung und Wahrheit, if it has lost its rank as a history, still keeps The simple loving delineation of the childhood of genius is as fresh as ever, and is of more uni- The first five books of this autobiography appeared in 1811, the next

fhe we Conclusion after Goethe’s death. The period during which lib@ this was his principal work witnessed the greatest political ion

event of the first half of our century, the rising of the Ger- He made no impassioned orations to his

harmless enough,—Der wandelnde Glocke, Der getreue Eck-

whose name is given to one of the books. Once more in his old age Goethe came under the sovereignty of a woman. She was Marianne von Willemer, the newly married wife of a Frankfort banker, Jacob von Willemer, who was an old ‘ friend of Goethe’s and of his brother-in-law Schlosser. Goethe made her acquaintance in a journey which he took in the Rhine country with Sulpiz Boiserée, who had suc- ceeded in interesting Goethe in early German art, a sub- ject to which he was himself devoted. The correspondence between Goethe and Marianne was published in 1877. It extends almost to the day of his death, and includes letters from Eckermann giving an account of his last moments, Not only were most of the Divan poems addressed to Suleika, but several of those included in the collection are by Marianne herself, and will bear comparison with those of Goethe. In these poems the Oriental form is not very strictly observed. The fondness of the Orientals for the re- petition of single rhymes is not attended to, and if some- times remembered is soon forgotten. Their Eastern colour depends rather on the suggestion of Eastern scenery and the introduction of Eastern names, This, however, gives the poet a greater licence to levity, to fatalism, aud to passion than would have been possible in poems of a purely German character.

The last twelve years of Goethe’s life, when he had The clos- passed his seventieth birthday, were occupied by his criti- ing years. cisms on the literature of foreign countries, by the Wander- jahre, and the second part of Faust. He was the literary dictator of Germany and of Europe. He took but little interest in the direction in which the younger German school was moving, and was driven to turn his eyes abroad.

He conceived an intense admiration for Byron, which was increased by his early death. Byron appears as Euphorion

in the second part of Faust. He also recognized the great-

ness of Scott, and was one of the first to senda greeting to

the Italian Mazzini. He conceived the idea of a world- literature transcending the narrow limits of race and country,

which should unite all nations in harmony of feeling and aspiration. German writers claim that his design has been realized, and the literature of every age and country can be studied in a tongue which Goethe had made rich, flexible,

and serviceable for the purpose. The Wanderjahre, al- Meister's though it contains some of Goethe's most beautiful concep- Wander. tions, The Flight into Egypt, The Description of the Peda-J"¢- gogic Province, The Parable of the Three Reverences, is

yet an ill-assorted collection of all kinds of writings, old and

new. Its author never succeeded in giving it form or coherency, and his later style, beautiful as it is, becomes

in these years vague and abstract. Still without this work

we should not be acquainted with the full richness and

power of his mind.

The second part of Faust has been a battlefield of Second controversy since its publication, and demands fuller part of attention. Its fate may be compared with that of the "ws latest works of Beethoven, For a long time it was regarded as impossible tounderstand, and as not worth understanding, the production of a great artist whose faculties had been impaired by age. By degrees it has, by careful labour, be- come intelligible to us, and the conviction is growing that it is the deepest and most important work of the author's life. Its composition cannot be called an after-thought. There is no doubt that the poet finished at the age of eighty the plan which he had conceived sixty years before.

The work in its entirety may be described as the first part of Faust 'writ large." This is a picture of the macrocosm of society as that was of the microcosm of the individual, The parallelism between the two dramas is not

perfect, but it reveals itself more and niore clearly to a patient study. Some points of this similarity have been well expressed by Rosenkranz (quoted by Bayard Taylor) :—* Both parts are

symmetrical in their structure. The first moves with de- liberate swiftness from heaven through the world to hell ; the sccond returns therefrom through the world to heaven. Between the two lies the emancipation of Faust from the torment of his conscious guilt, lies his Lethe, his assimi- lation of the past. In regard to substance, the first part begins religiously, becomes metaphysical, and terminates ethically; the second part begins ethically, becomes esthetic, and terminates religiously. In one, love and knowledge are confronted with each other ; in the other, practical activity and art, the ideal of the beautiful. In regard to form, the first part advances from the hymnal shout to monologue and dialogue ; the second part from monologue and dialogue to the dithyrambic, closing with the hymn, which here glorifies not alone the Lord and His uncomprehended lofty works, but the human in the process of its union with the divine, through redemption and atonement." The first act, with its varied scenes of country, castle, garden, galleries, and halls, answers to the two prologues of the first part; the second act introduces us again to Faust's study and his familiar Wagner. The classical Walpurgis Night has its prototype in the first part. The third act is devoted to Helena, who is the heroine of the second part as Gretchen is of the first. The marriage of Faust and Helena typifies the union of the classical and romantic schools, and their child is Euphorion, who is symbolical of Byron. In the fourth act Faust is raised instead of being degraded by his union with Helena. He wishes for a sphere of beneficent activity, and obtains it by war. The fifth act is devoted to the complete regeneration of the soul of Faust. Even the sight of all that he has accomplished does not satisfy him. It is not until he is blind to outward objects that one moment of divine rapture reveals to him the continuance of his work in coming generations, and convinces him that he has not lived in vain. In this one moment of supreme happiness he dies. The struggle for the possession of Faust's soul, indicated in the first part, is fully elaborated in the second. Mephistopheles is shown to have worked out the good in spite of himself, and Margaret appears transfigured as the revelation to man of

the divine love, With the completion of Faust, Goethe felt that the work of hislife was accomplished. He still continued to work with regularity. He ordered and arranged his writings, he laboured at his Tages- und Jahresheften, an autobiographical journal of his life. He bated not one jot of heart or hope, and took the liveliest interest in every movement of litera- ture and science. When the news of the July Revolution of 1830 reached Weimar, Goethe was excited beyond his wont, not on account of the triumph of liberal principles, but because the controversy between Cuvier and Geoffrey St Hilaire had been decided in favour of the latter. Still he had much to darken his latter days. His old friends were falling fast around him. His wife had died in 1816, after a union of thirty years. He felt lier loss bitterly. The duchess Amalia had died eight years before, not long after the death of his own mother. He now had to undergo bitterer experiences when he was less able to bear them. Frau von Stein, with whom he had renewed his friendship if not his love, died in January 1827 ; and in June 1828 he lost the companion of his youth, the grand-duke Karl August, who died suddenly, awayfrom Weimar, on his return from a journey. Goethe received the news with outward calmness, but said forebodingly, “ Now it is all over,” and went to mourn and labour at the castle of Dornburg, where everything reminded him of the days of their early friend- ship. The duchess Louisesurvived her husband till February 1830. When Goethe died in 1832 none of the old Weimar set were left except Knebel, who lived two years longer. A greater blow than these was the death of his only son, whom, in spite of hismoral weakness, his father deeply loved.

GOETHE

He died at Rome in October 1830, and is buried close by ; the pyramid of Caius Cestius, where Goethe himself once desired to be laid. We have afull account of the last nine years of Goethe’s life from the writings of Eckermann, who ; became his secretary in 1823, lived with him till his death and has noted down his conversations and his habits with the minuteness and fidelity of a Boswell. | We must pass on to the closing scene. On Thursday, His March 15, 1832, he spent his last cheerful and happy day. death, He was visited by the grand-duchess and other friends, He awoke the next morning with a chill. From this he gradually recovered, and on Monday was so much better that he designed to begin his regular

work on the next day, But in the middle of the night he woke up with a deathly coldness, which extended from his hands over his body, and which it took many hours to subdue. It then appeared that the lungs were attacked, and that there was no hope of his recovery. Goethe did not anticipate death. He sat fully clothed in his arm-chair, made attempts to reach his study, spoke confidently of his recovery, and of the walks he would take in the fine April days. His daughter-in-law Ottilie tended him faithfully. On the morning of the 22d his strength gradually left him. He sat slumbering in his arm- chair holding Ottilie's hand. Her name was constantly on his lips. His mind occasionally wandered, at one time to his beloved Schiller, at another to a fair female head with black curls, some passion of his youth. His last words were an order to his servant to open the second shutter to let in more light. After this he traced with his forefinger letters in the air. At half-past eleven in the day he drew himself, with- out any sign of pain, into the left corner of his arm-chair, and went so peacefully to sleep that itwaslong beforethe watchers knew that his spirit was really gone. Hc is buried in the grand-ducal vault, where the bones of Schiller are also laid. Goethe differs from all other great writers, except per- haps Milton, in this respect, that his works cannot be under- stood without a knowledge of his life, and that his life is in itself a work of art, greater than any work which it created. This renders along and circumstantial biography a necessity to all who would study the poet seriously. At the same time he is so great that we are even now scarcely sufficiently removed from him to be able to form a correct judgment of his place in literary history. He is not only the greatest poet of Germany; he is one of the greatest poets of all ages. Posterity must decide his exact preced- ence in that small and chosen company which contains the names of Homer, Dante, and Shakespeare. He was the apostle of self-culture. Always striving after objective truth, and sometimes attaining to it, he exhibited to the world every phase of his plastic mind in turn, and taught both by precept and example the husbandry of the soul. The charge of selfishness so often brought against him cannot be maintained. His nature responded to every influence of passingemotion. Like a delicate harp, 1b was silent if not touched, and yet gave its music to every WoO ing of the wilful wind. The charge of unsympathetic coldness roused the deep indignation of those who knew him best. He learned by sad experience that the lesson of life is to renounce. Rather than cavil at his statuesque repose, we should learn to admire the self-conflict and self- command which

moulded the exuberance of his impulsive nature into monumental symmetry and proportion. ill autobiography has done him wrong. It is the story not of his life, but of his recollections. He needs no defence, nothing but sympathetic study. As Homer concentrated in himself the spirit of antiquity, Dante of the Middle Ages, and Shakespeare of the Renaissance, so Goethe 18 the representative of the modern spirit, the prophet of man- kind under new circumstances and new conditions, the appointed teacher of ages yet unborn.

Bibhiography.—A complete bibliography of Goethe) literature would fill a very large space. We must con- tent ourselves with an indication of the principal sources

from which a knowledge of his life may be derived. The most important source of all is his own works. The Dicht- ung und Wahrheit, the Italienische Reise, the Campagne am hein, and the Tages- und Jahresheften have an especial autobiographical value. Next to these come the poems, and lastly the letters. Many of these are lost for ever, many remain unpublished. For the first period of his life Der Junge Goethe, in three volumes, published by Hirzel, with an introduction by Michael Bernays, is indis- pensable. It contains his letters and poems in chrono- logical order. .A commentary on this work by Wilhelm Scherer, entitled Aus Gocthes Friihzeit was published in 1879. Otto Jahn published Goethes Briefe an seiner Leip- auger Freunde. Schélland A. Hober have collected the letters of the Strasburg period. Goethe's correspondence with Schiller and with Zelter was published during his life- time. Besides these we have his letters to Herder, Merck, Kestner and Lotte, Lavater, Knebel, Countess Stolberg, Jacobi, Karl August, and Frau von Stein. Lately have appeared his letters to Marianne von Willemer, and some of those addressed to J. G. Schlosser. We are without his letters to Behrisch, Lerse, and Zimmermann ; and we have only a few of those addressed to Horn and Sophie La Roche. Goethe's real letters to Bettina von Arnim are in the main unpublished; those which bear the name have been largely falsified, but have a substratum of truth. We "have also a few volumes of Goethe's scientific correspond- 'ence, published hy his descendants. Help to the understand- ing of his poetry is given by the letters of Wieland, Caroline Flachsland, and his Weimar friends. The letters addressed to him by Frau von Stein exist, but have not

been made ‘public. The first life of Goethe was published by Déring in 1828, of which a second enlarged edition appeared after the poet’s death in 1833. Then followed Viehoff in 4 volumes, 1847-1853. The best life of Goethe is that of

pf which dates from 1877. It is contained in two volumes of moderate size, and is written with scarcely a superfluous word. The account of Goethe and Schiller by Karl oedeke in his Grundriss der Deutschen Dichtung is admir- and so is the little book Goethes Leben und Schriften,

GOETZ, Hermann (1840-1876), a musical composer, presents one of those instances, too frequent in the his- tory of art, of success long sought for, and cut short by fleath when achieved at last. He was born at K6énigs- purg in Prussia in 1840, and began his regular musical

studies at the comparatively advanced age of seventeen,

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and its success was as instan- Aueous as it has up to the present proved lasting. It hpidly made the round of the great German theatres, and bread its composer’s fame over all the land. But Goetz id not live to enjoy this happy result for long. In Decem- er 1876 he died at Zurich from overwork. A second & Francesca da Rimini, on which he was engaged at he time of his death, remained a fragment; but it has ‘nce been finished according to his directions by a friend,

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Schafer, which appeared first in 1851, and the third edition –

. 1879 ; Vine. Prokl, Goethe in Eger, Vienna, 1879,

published by him in 1874. The life of Goethe has been popularized in England by G. H. Lewes, in a work which is as much read in German as in English. A complete biography of Goethe cannot be written until the

archives of the Goethe Haus at Weimar are thrown open for con- sultation. The knowledge of Goethe's works in England is due as much as anything else to the writings of Thomas Carlyle. The commentaries on Goethe's works are end- less in number. The most active labourer in this field has been H. Diintze, who has left no side of Goethe's activity and no period of his life unexplored. We must also men- tion the brilliant lectures on Goethe by Hermann Grimm (Berlin, 1877), and the excellent sketch of his life and works published by W. Hayward in 1878, The following works deserve particular mention :—

Aus Goethes Knabenzeit 1757-59, Mitthetlungen aus einem Originalmanuscript der Frankfurter Stadtbibliothek, evlautert und herausgegeben von Dr H, Weismann, Frankfurt, 1846; Briefe an J. H. Merck von Goethe, Herder, Wieland, wnd andern bedeutenden Zeitgenossen, hrsg. von K. Wagner, Darmstadt, 1835; Briefe aus dem Freundeskreise von Goethe, Herder, Hipfner, und Merck, hrsg. von Dr K. Wagner, Leipsic, 1847 ; Briefe Gocthes an Frau von Stein aus den Jahren 1776-1826, hrsg. durch A. Schéll, 3 vols., Weimar, 1848-1851; Briefe Gocthes an die Gréfin Auguste zu Stollberg, Leipsic, 1839; Briefe Goethes an Lavater, aus den Jahren 1774-83, hrsg. von Heinr. Herzel, Leipsic, 1833; Briefe Goethes an Leipziger Freunde, hrsg, von O. Jahn, Leipsic, 1849 ; Briefe Goethes in den Jahren 1768-1832, hrsg. von H. Déring, Leipsic, 1836 ; Bricf- weehsel d. Groszherzogs Karl August v. Sachsen- W etmar-Hisenaeh mit Goethe in den Jahren von 1775 bis 1828, 2 vols, Weimar and Leipsic, 1863 ; Briefwechsel zwischen Goethe u. F. H. Jacobi, hrsg. v. Max Jacobi, Leipsic, 1847; Briefweehsel zwisehen Goethe und Zelter in den Jahren 1796-1832, hrsg. von Fr, W. Riemer, 8 parts, Berlin, 1833-34-36; Briefweehsel zwischen Goethe 1. Marianne von Witlemer (Suleika), hrsg. mit Lebensnachrichten, &c., von Th. Creizenach, Stuttgart, 1877; H. Doring, Goethes Leben, Weimar, 1828, 2ded., Jena, 1833; and Goedeke, Goethes Leben wu. Schriften, Stuttgart, 1874, Goethes Sammlungen, 3 parts, Jena, Leipsic, 1848, 1849; Dr Karl Mendelssohn-Bartholdy, Gocthe u. Felix Mendelssohn Bartholdy, Leipsic, 1871; Neue Mittheilungen aus Johann Wolf- gang von Goethes handsehrifilichem Nachlasse, 8 parts, Leipsic, 1874-76; Dr J. W. Schiifer, Gocthes Leben, 2 vols., 8th ed., Leipsic, 1877; H. Viehoff, Goethes Leben, 3 parts, Stuttgart, 1847— 49; Franz Wegele, Goethe als Historiker, 1876; Zellenck, Die Bexiehungen

Gothes zu Spinoza, 1878; Edmund Hoefer, Goethe und Charlotte von Stein, Stuttgardt, 1878; Briefe Goethes an Sophie ta Roche und Bettina Brentano, hrsg. von C. Loeper, Berlin, 1879 (a most valuable little book); Graf Ferdinand von Diirkheim, Lilis Bild geschichtlich entworfen, 18795

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and was performed for the first time at Mannheim a few months after the composer's death. Besides his dramatic work, Goetz also wrote various compositions for chamber- music, of which a trio (Op. 1) and a quintet (Op. 16) have been given with great success at the London Monday Popular Concerts. Still more important is the Symphony én F, on which the composer's great reputation in England is mainly founded. As a composer of comic opera Goetz lacks the sprightlinessand artistic savoir faire so rarely found amongst Germanic nations. His was essentially a serious nature, and passion and pathos were to him more congenial than humour. The more serious sides of the subject are therefore insisted upon more successfully than Katherine's ravings and Petruchio's eccentricities. There are, however, very graceful passages, e,g., the singing lesson Bianca re- ceives from her disguised lover. Goetz's style, although influenced by Wagner and other masters, shows signs of a distinct individuality. The design of his music is essenti- ally of a polyphonous character, and the working out and interweaving of his themes betray the musician of high scholarship. But breadth and beautiful flow of melody also were his, as is seen in the symphony, and perhaps still more in the quintet for pianoforte and strings above

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referred to. The most important of Goetz's posthumous works are a setting of the 137th Psalm for soprano solo, chorus, and orchestra, a " Spring" overture (Op. 15), and a pianoforte souata for four hands (Op. 17).

GOG (243) occurs in two passages of Scripture (Ezek. xxxvili. xxxix., and Rev. xx.) as the name of a great anti- theocratic power destined to manifest itself in the world immediately before the final dispensation is ushered in.

In the later passage, Gog and Magog are spoken of as co- ordinate ; in the earlier, Gog is given as the name of the person or people, and Magog as that of the land of its origin. Notwithstanding this discrepancy, it is obvious that the passages are intimately related, and that both depend upon Gen. x. 2, where, however, Magog alone is mentioned. Here he is the second son of Japhet, and, on the assumption that a geographical order underlies these ethnographical tables, his locality is to be sought between Gomer and Madai or Media. According to Josephus, who is followed by Jerome, the Scythians were primarily intended by this designation; and this opinion has been almost universally accepted in modern times. The name Sxv6a, it is to be observed, however, is often but a vague word for any or all of the numerous and but partially known tribes of the north; and any attempt to assign a more definite locality to Magog can only be very hesitatingly made. According to some, the Maiotes about the Palus Mzotis are meant ; according to others, the Massagetz ; according to Kiepert, the inhabitants of the northern and eastern parts of Armenia. In Ezekiel, Gog is regarded asa terrible ruler in the extreme north, being prince of Rosh, Mesech, and Tubal, as well as governor in the land of Magog, and having the support of Persia, Ethiopia, and Phut, as well as of Gomer and the house of Togarmah. It may be considered as certain that the imagery employed in this prophetic description was suggested by the Scythian invasion which about the time of Isaiah had devastated Asia (Herod. i. 103 ff.), As might have been expected from the prominence given to that description in the Old Testament, Gog figures largely in Jewish and Mahometan as well as Christian eschatology. In the district of Astrakhan a legend is still to be met with, to the effect that Gog and Magog were two great races, which Alexander the Great subdued and banished to the inmost recesses of the Caucasus, where they are meanwhile kept in by the terror of twelve trumpets blown by the winds, but whence they are destined ulti- mately to make their escape and destroy the world. The legends that attach themselves to the effigies of Gog and Magog which are at present to be seen in Guild Hall, London, are only remotely connected, if at all, with the statements of Scripture. According to the Lecuyell des Histoires de Troye, Gog and Magog were the survivors of a race of giants descended from the thirty-three wicked daughters of Diocletian; after their brethren had been slain by Brute and his companions, Gog and Magog were brought to London (Troy-novant), and compelled to officiate as porters at the gate of the royal palace. It is known that effigies

similar to the present existed in London as early as the time of Henry V.; but it is uncertain at what date this legend first began to attach to them. According to Geoffrey of Monmouth (Chronicles, i, 16), Goémot or Goémagot (either corrupted from or corrupted into " Gog and Magog") was a giant who, along with his brother Corineus, tyrannized in the western horn of England until slain by foreign invaders.

GOGO, or GHocHA, a town in Ahmadabad district, Bombay, 193 miles north-west of Bombay. About three- quarters of a mile east of the town is an excellent anchorage, in some measure sheltered by the island of Perim, which lies still further east. The natives of this are reckoned the best sailors in India; and ships touching

here may procure water and supplies, or repair damages, It is a safe refuge during the south-west monsoon, or for vessels that bave parted from their anchors jpn the Snrat roads, the bottom being an entire bed of mud three-quarters of a mile from the shore, and the water always smooth. Gogo has of late years lost its commercial importance. Its rival, Bhaunagar, is 8 miles nearer to the cotton districts. North of the town is a black salt marsh, extending to the Bhaunagar creek. On the other sides is undulating cultivated land, sloping to the range of hills 12 miles off. South of the town there is another galt marsh. The land in the neighbourhvod is inundated at high spring tides, which renders it necessary to bring fresh water from a distance of 4 or 5 miles. The average annual value of the exports for five years ending 1871-72 was £56,227 and of the imports £103,083. Population

(1872), 9571.

GOGOL, Nrxona1 VasiiiEvica (1809-1852), was born in the province of Poltava, in South Russia, March 31, 1809. Educated at the Niejin gymnasium, he there started a manuscript periodical, 'The Star," and wrote several pieces including a tragedy, The Brigands. Having com- pleted his course at Niejin, he went in 1829 to St Feters- burg, where he tried the stage but failed. Next year he obtained a clerkship in the department of appanages, but he soon gave it up. In literature, however, he found his true vocation. In 1829 he published anonymously a poem called /taly, and, under

the pseudonym of V. Alof, an idyll, Hans Kuchel Garten, which he had written while still at Niejin. The idyll was so ridiculed by a reviewer that its author bought up all the copies he could secure, and burnt them in a room which he hired for the purpose at an inn, Gogol then fell back upon South Russian popular literature, and especially the tales of Cossackdom on which his boyish fancy had been nursed, his father having occupied the post of "regimental secretary," one of the honorary officials in the Zaporogian Cossack forces. In 1830 he published in a periodical the first of the stories which appeared next year under the title of Hvenings in a Farm near Dikanka: by Rudy Panko. This work, containing a series of attrac- tive pictures of that Little-Russian life which lends itself to romance more readily than does the monotony of " Great- Russian " existence, immediately obtained a great success,— its light and colour, its freshness and originality, being hailed with enthusiasm by the principal writers of the day in Russia. Whereupon Gogol planned, not only a history of Little-Russia, but also one of the Middle Ages, to be completed in eight or nine volumes. This plan he did not carry out, though it led to his being appointed to a profes- sorship in the university of St Petersburg, a post in which he met with small success, and which he resigned in 1839. Meanwhile he had published his Arabesques, a collection of essays and stories; his Zaras Bulba, the chief of the Cossack Tales translated into English by George Tolstoy; and a number of novelettes, which mark his-transition from the romantic to the realistic school of fiction, such as the admirable sketch of the tranquil life led in a quiet country house by two kindly specimens of Old-world Gentlefolks, ot the description of the petty miseries endured by an ill-paia clerk in a Government office, the great object of whose life is to secure the "cloak" from which his story takes its name. To the same period belongs his celebrated comedy, the Revizor, or Government Inspector. His aim in writing it was to drag into light 'all that was bad in Russia," and to hold it up to contempt. And he succeeded in rendering contemptible and ludicrous the official life of Russia, the corruption universally prevailing throughout the civil service, the alternate arrogance and servility of men In office. The plot of the comedy is very simple. A traveller who arrives with an empty purse at a provincial town 1s taken for an

inspector whose arrival is awaited with fear, and he receives all the attentions and bribes which are meant to propitiate the dreaded investigator

of abuses. The play appeared on | the stage in the spring of 1836, and achieved'a full success, in spite of the opposition attempted by the official classes whose malpractices it exposed. The aim which Gogol had in view when writing the Revizor he afterwards fully attained in his great novel, Mertvuiya Dushi, or Dead 'Souls, the first part of which appeared in 1842. The hero of the story is an adventurer who goes about Russia making fictitious purchases of "dead souls," z.e., of serfs who have died since the last census, with the view of pledging his ,imaginary property toGovernment. But his adventures are merely an excuse for drawing a series of pictures, of an un- favourable kind, of Russian provincial life, and of introduc- jing ou the scene a number of types of Russian society. Of 'the force and truth with which these delineations are exe- cated the universal consent of Russian critics in their fivour may be taken as a measure. From the French version of the story a general idea of its merits may be formed, and some knowledge of its plot and its principal characters may be gathered from the English adaptation i original work, under the title of Home Life in Russia. But no one seems to be able fully to appreciate Gogol's merits as a humorist, who is not intimate with the language in which he wrote as well as with the society which he depicted. In 1836 Gogol for the 'first time went abroad. Subsequently he spent a consider- able amount of time out of Russia, chiefly in Italy, where His residence there, ? turned towards mysticism, The last works which he published, his Confession and DO rondence with Friends, offer a painful contrast to

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| In 1848 he made a ind on his return settled down at Moscow, where he died, March 3, 1852, not having quite completed his forty-third rear.

GOITO, a large village of Italy, in the province of flantua and district of Volta, situated on the right bank of he Mincio, about 14 miles from Castiglione, on the high- ay between Brescia and Mantua. Its position has made | figure. from time to time in the records of Italian warfare. In 1701 it was taken by the allies, in 1706 by the prince f Hesse, and in 1796 by the French. It was the scene of j Severe conflict between the French and the Austrians in 3814; and in 1848 it saw the defeat of the Austrians by le Piedmontese. The population of the commune in 1871

if the thyroid gland. This structure, which lies between te skin and anterior surface of the windpipe, and in health | not large enough to give rise to any external prominence, t liable to occasional variations in size, more especially in tmales, a temporary enlargement of the gland being not common at the catamenial periods, as well as during fegnancy. In the disease now under consideration, how- rer, the swelling is well marked, and is not only unsightly, nt may by its growth occasion much discomfort, and even ve rise to serious symptoms from its encroachment on the ndpipe and other important parts in the neck. The size | which goitrous growths may attain is extraordinary, tibert recording cases of goitre where the tumour not only

enormously enlarged the neck but hung down over the breast, or even reached as low as the middle of the thigh.

In districts where the disease prevails the goitre usually appears in early life, often from the eighth to the twelfth year. Its growth is at first slow, but after several years of comparative quiescence a somewhat sudden increase is a not unfrequent occurrence. In the earlier stages of the disease the condition of the gland is simply an enlargement of its constituent parts, which retain their normal soft consistence ; but in the course of time other changes super- vene, and it may become the seat of cystic. formations, or acquire hardness from increase of connective tissue or cal- careous deposits. Occasionally the enlargement of the gland is uniform, but more commonly one of the lobes, generally the right, is the larger. In some rare instances the disease has been noticed to be limited almost entirely to the isthmus which connects the two lobes of the gland. The growth is unattended with pain, and is not inconsistent with a fair measure of health.

Goitre is a marked example of an endemic disease. There are few parts of the world where it is not found pre- vailing in certain localities, these being for the most part valleys and elevated plains in mountainous districts, The wide distribution of this disease has naturally led to exten- sive inquiry and to abundant speculation as to its origin. It is unnecessary to mention the

numerous theories which have been advanced on the subject. Many of these have already been referred to under CRETINISM (g.v.). The most generally accepted view among physicians is that which ascribes the malady to the use of drinking water impreg- nated with the salts of lime and magnesia, in which ingredients the water of goitrous districts would appear always to abound. This theory alone, however, is inade- quate, as is evident from the often-observed fact that in localities not far removed from those in which goitre pre- vails, and where the water is of the same chemical composi- tion, the disease may be entirely unknown. Hence among the best authorities the tendency now is to regard goitre as the result of a combination of causes, among which local telluric or malarial influences concur in an important manner with those of the drinking water in developing the disease. It is noteworthy that goitre can often be cured by removal from the district where it prevails, as also that it is apt to be acquired by previously healthy persons who settle in goitrous localities; and it is only in such places that the disease exhibits any hereditary tendencies.

In the treatment of goitre the first step is the removal, if possible, of the patient from the affected locality, aud attention to general hygienic rules. The employment of burnt sponge as a cure for goitre was in general use until Dr Coindet of Geneva showed that its acknowledged virtues were in all probability due to the iodine which it contained, and proposed as a substitute this latter agent in a pure state. Dr Coindet's views were amply borne out, and iodine and its preparations have been universally adopted as the most potent remedy in this disease, and have super- seded all other medicines. Small and gradually increased doses of the drug, either in the form of iodide of potassium or what is known as Lugol's solution appear to be the best methods of administration. The external appli- cation of iodine to the goitre, in the form of liniment or ointment, is of scarcely less value than its internal employment, and would seem to be sometimes capable of effecting a cure alone, as is evident from the method of treatment adopted with singular success in India and originally proposed by the late Major Holmes. This con- sists in applying to the goitre, by means of a spatula, an ointment of biniodide of mercury for about ten minutes soon after sunrise, and placing the patient with his goitre exposed to rays of the sun for six or seven hours, Blister-

ing of the surface generally follows, a second application of the ointment is made, and the patient sent home. This is often found sufficient to effect the cure, but the treatment can, if necessary, be repeated.

The name " Exophthalmic Goitre" is applied to another form of enlargement of the thyroid gland, differing entirely in its pathological connexions from that above described. In this affection the bronchocele is but one of three pheno- mena, which together constitute the typical characteristics of the disease, viz., palpitation of the heart and great vessels, enlargement of the thyroid gland, and protrusion of the eyeballs.) This group of symptoms is generally known by the names of Graves's disease or Von Basedow's disease, in reference to the physicians by whom the malady was originally recognized and described. Although occa- sionally observed in men, this affection occurs much more commonly in females and in comparatively early life. It is generally preceded by ill health in some form, more par- ticularly impoverishment of blood, and nervous or hysterical disorders, and is occasionally seen in cases of organic heart- disease. It has sometimes been suddenly developed as the effect of fright or violent mental emotion. The first of the symptoms to appear is usually the palpitation of the heart, which is aggravated by the slightest exertion, and may be go severe as not only to shake the whole frame but even to be audible at some distance from the patient. An uncom- fortable sensation of throbbing is felt throughout the body, and many of the larger blood-vessels are seen to pulsate strongly like the heart. The enlargement of the thyroid gland generally comes on gradually, and rarely increases to any great size, thus differing from true goitre, as originally noticed by Dr Graves. The enlarged gland is of soft con- sistence, and communicates a thrill to touch from its dilated and pulsating blood-vessels.

Accompanying the goitre a remarkable change is observed in the appearance of the eyes, which attact attention by their prominence and the startled expression thus given to the countenance. In extreme cases the eyes protrude from their sockets to such a degree that the eyelids cannot be closed, and injury may thus arise to the constantly exposed eyeballs. Apart from such risk, however, the vision is rarely affected in this disease. Much

difference of opinion prevails as to the immediate cause of the protrusion of the eyes, but it is generally ascribed to the increase of the fatty tissue and distension of the blood-vessels of the orbits. It occasionally happens that in undoubted cases of the disease one or other of the three above-named phenomena is absent, generally either the geitre or the exophthalmos. The palpitation of the heart is the most constant symptom. Sleeplessness, irritability, disorders of digestion, diarrhcea, and uterine derangements are common accompaniments.

The pathology of exophthalmic goitre is still somewhat uncertain, but there are strong reasons to believe that it is

GO

HE colour, lustre, and power of resisting oxidation, which this metal possesses, have caused it to be valued ftom the earliest ages. Allusions to gold are fre- quent in the Old Testament, and the refining of the pre- cious metals by cupellation seems to have been a favourite illustration with the Jewish poets.! Jewellery and vessels found in Egyptian tombs afford evidence of the perfec- tion attained in working gold at a period earlier than the government of Joseph,? and drawings on tombs of about this epoch clearly indicate the method of conducting the operations of washing, fusing, and weighing the metal.

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1 Percy’s Metallurgy of Lead, p. 177.

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2 Jacquemart, History of Furniture, translation, p. 331.

essentially a nervous ailment, and that the symptoms depend on a morbid state of the sympathetic nerve in the neck, which is well known to play an important part in the vaso-motor functions—that is, in controlling the action of the heart and regulating the calibre of the blood-vesselg, In numerous

instances of exophthalmic goitre a diseased state of this nerve has been found post mortem, although it must be admitted that in some cases no morbid change could be detected. The experiments of Bernard, Brown-Sequard, Schiff, and others upon the functions of the sym- pathetic nerve lend strong support to this view of the pathology of the disease. Exophthalmic goitre is not directly a fatal malady, but, on the other hand, complete recovery is a less frequent result than partial improvement, the patient continuing to suffer from chronic ill-health, The disturbed condition of the heart's action leads in some instances to permanent disease of that organ in the form of dilatation of its cavities. In the treatment of exophthalmic goitre the most successful results have been attained by the use of digitalis, which has the effect of giving tone to the heart and contracting the dilated blood-vessels. The tincture of digitalis, in doses of 5 to 10 drops twice or thrice daily, is perhaps the best form of administration, Where anemia is present iron is indicated, and may be combined with the digitalis, although in some cases it is found to be unsuitable. In allaying the palpitation benefit is said to have frequently followed the application of ice to the cardiac region as well as to the thyroid gland. Iodine, which is so valuable in cases of true goitre, is generally admitted to be of no service in this disease, and is rather held to be injurious. (3. 0. As)

GOLCONDA, a fortress and ruined city, situated in the Nizdm's Dominions, 7 miles west of Hyderabad city. In former times Golconda was a large and powerful kingdom of the Deccan, which arose on the downfall of the Bahmani dynasty, but was subdued by Aurungzebe in 1687, and annexed to the dominions of the Delhi empire. The fortress of Golconda, situated on a rocky ridge of granite,is extensive, and contains many enclosures. It is strong and in good repair, but is commanded by the summits of the enormous and massive mausolea of the ancient kings about 600 yards distant. These buildings, which are now the chief character- istics of the place, form a vast group, situated in an arid, rocky desert. They have suffered considerably from the ravages of time, but more from the hand of man, and nothing but the great solidity of their walls has preserved them from utter ruin. These tombs were erected at a great expense, some of them being said to have cost as much as £150,000. Golconda fort is now used as the nizdm's treasury, and also as the state prison. The diamonds of Golconda have obtained great celebrity throughout the world; but they were

merely cut and polished here, being generally found at Partial, near the south-eastern frontier of the nizdm's territory.

LD

Excavations in Etruria have brought to light beautiful ornaments of gold, enriched with minute grains of the metal, the workmanship of which was unrivalled until Castellani studied and revived the methods employed by Etruscan artists. The Greeks were familiar with natural alloys of silver and gold named electrum, rough nuggets of 'which were frequently stamped, and formed the earliest coing in Lydia.t The colour of this electrum 1S pale yellow to yellowish white, and it contains from 20 to 40 per cent. of silver.

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5 tre oan "Soins," by Barclay V. Head, Numismatic Chronicle, part iv. 1875, p. 245.

G O With regard to the history of the metallurgy of gold, it may be mentioned that, according to Pliny, mercury was employed in his time both as a means of separating the precious metals and for the purposes of gilding. Vitruvius also gives a detailed account of the means of recovering gold, by amalgamation, from cloth into which it had been woven. Properties. —Gold is the only metal of a yellow colour, which is, however, notably affected by small quantities of other metals ; thus the tint is sensibly lowered by small quantities of silver, and heightened by copper. The surface colour of particles of gold is often apparently reddened by translucent films of brown iron ore. It is nearly as soft as lead. The hardness varies, however, with the composi- tion. Crystallized specimens from Oregon and Fraser River, containing respectively 835 and 910 parts of gold in 1000, are slightly harder than calc Spar but sensibly softer than fluor spar, or much harder than the pure metal, When pure, gold is the most malleable of all metals. One grain may be beaten into leaves which cover a surface of 56 square inches, and are only syc5qpth of an inch thick. Faraday has shown that the thickness of gold leaves may be still further reduced by floating them on a dilute solution of cyanide of potassium. When very thin, leaf gold appears yellow by reflected and green by transmitted light. If, however, certain gold films are heated, the light transmitted is ruby red ; the pressure

of a hard substance on the film so changes its state of agerega- tion that green light is again transmitted.1 The metal is extremely ductile; a single grain may be drawn into a wire 500 feet in length, and an ounce of gold covering a silver wire is capable of being extended more than 1300 miles. Gold can readily be welded cold, and thus the finely divided metal, in the state in which it is precipitated from solution, may be compressed between dies into discs for medals. According to G. Rose,? the specific gravity of jguld in the finely divided state in which it is precipitated (from solution by oxalic acid is 19-49, The specific gravity)ef cast gold varies from 18°29 to 19°37, and by compression? between dies the specific gravity may be raised from 19°37 to 19°41; by annealing, however, the previous density is fo Some extent recovered, as it then is found to be 19°40. Hts atomic weight is variously given as follows :—196-67 | Berzelius), 196°3 (Levol), 196°5 (Wurtz), 196-0 (Watts). lhe number adopted in this work (CuEmisrRry, vol. v. p. 28) is 196:2. Different observers have given the following pomperatures as its melting point :—1425° C. (Daniell), } 200° C. (Pouillet), 1380° C. (Guyton de Morveau). Riems- Hujk,* after comparing the several results, concludes that jt may be considered to be 1240° C. The electric con- uctiwity is given by Matthiessen as 73-99 at 15‘1° C., pure ilver being 100; this depends greatly on its degree of purity,—the presence of a few thousandths of silver

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vessel in that part of a glass-house where the glass is kept constantly melted, and retained it in a state of fusion for two months without the loss of the smallest portion of its weight. Kunkel describes a similar experiment, which was attended with the same result, Homberg,® however, ob- served that when a small portion of gold is kept at a violent heat, part of it is volatilized, Both Macquer and Lavoisier showed that when gold is strongly heated, fumes arise which gild a piece of silver held in them. Its volatility has also been studied by Elsher, and, in the presence of other metals by N apier.” Hellot affirms that when an alloy of 7 parts of zinc and 1 part of gold is heated in air, the whole of the gold rises in the fumes of oxide of zine which are produced. Gold is dissipated by sending a powerful charge of electricity through it when in the form of leaf or thin wire. In the gold spectrum Huggins has observed twenty-three lines, and the wave

pwering its conductivity by 10 per cent. The speczjic Jesestance of the metal in electromagnetic measure, accord- pg to the centimetre-gramme-second system of units, is {154. Its conductivity for heat is 53-2 (Wiedemann and ytanz), pure silver being 100. Its specific heat is 0‘324 Regnault). Its coefficient of expansion for each degree be- }veen 0° and 100° C. is 0-000014661, or for gold which has jeen annealed 0-000015136 (Laplace and Lavoisier), The hecific magnetism of the metal is 3°47 (Becquerel). De- hils as to its tenacity and rigidity are given in the article (LASTICITY. With regard to its volatility, Gasto Claveus 5 tates that he placed an ounce of pure gold in an earthen

|} Phil. Trans., 1857, p. 145.

1? Pogg. Ann., vol. xxiii. p. 1, and Ixxv. p. 408.

|° Highth Ann. Report of Deputy Master of the Mint, 1877, p. 41. 4 Archives Néerlandaises, t. iii., 1868.

> Quoted by Dr T, Thomson, System of Chemistry, 5th edition, 1817, bl. i. p. 484,

lengths of the three most important of these are 5231, 5835, and 6276 respectively. Some preliminary observations on the spectrum of the vapour at the temperature of the oxy- hydrogen flame, made by Lockyer and Roberts,’ showed that there was a distinct absorption both at the blue and at the red end.

The solvents for gold are given in the article CHEMISTRY, vol. v. p. 529. It may be added that finely-divided gold. dissolves when heated with strong sulphuric acid and a little nitrie acid. Dilution with water, however, pre-cipitates the metal as a violet or brown powder from the solution so obtained. Gold is also attacked when strong sulphuric acid is submitted to electrolysis with a gold positive pole.® W. Skey has shown!° that in substances which contain small quantities of gold, the precious metal may be removed by the solvent action of a tincture of iodine or bromine in water. Filter paper soaked with the clear solution is burnt, and the presence of gold is indicated by the colour of the ash.

Occlusion of Gas by Gold.—Graham has shown! that gold is capable of occluding 0-48 of its volume of hydrogen, and 0°20 of its volume of nitrogen. Varrentrapp has also pointed out that “cornets” from the assay of gold may retain gas if they are not strongly heated. Artificial crystals of gold may be formed when the molten metal is slowly cooled.

Occurrence and Distribution.—Gold is found in nature chiefly in the metallic state, or as native gold, and less frequently in combination with tellurium, lead, and silver, forming a peculiar group of minerals confined to a few localities in Europe and America. These are the only certain examples of natural combinations of the metal,—the minute although economically valuable quantity often found in pyrites and other sulphides being probably only present in mechanical suspension, although for practical purposes it may be spoken of as combined. The native metal occurs tolerably frequently in crystals belonging to the cubic system, the octahedron being the commonest form, but other and complex combinations have been observed. Owing to the softness of the metal, large crystals are rarely well defined, the points being commonly rounded. In the irregular crystalline aggregates branching and moss-like forms are most common, and in Trausylvania thin plates or sheets with diagonal structures are character- istic. These have recently been shown by Vom Rath to be° repeated combinations of distorted tetrahexahedra. During the preparation of a mass of pure gold in the Mint at London, some fine crystals which appear to be aggregations of octahedra were obtained ; and dendritic crystals of gold,

= SSS Seer 6 Mem. Paris Academy, 1702, p. 147. 7 Chem. Soc. Journ., vol. x. p. 229, vol. xi. p. 168, ® Proc. Roy. Soc., 1875, p. 344. 9 Spiller, Chem. News, x. 178. 10 Toid,, xxii, 245. Phil, Trans., 1866, 433, _

prepared artificially, have been described by Chester. It is possible also to obtain gold in crystals by heating its amalgam ; according to Knafil, an amalgam of 1 part of gold with 20 parts of mercury is maintained at a tempera- ture of 80° C. for eight days. It is then heated to 80°C. with nitric acid of specific gravity 1°35, when dull crystals will be left, which become brilliant when more strongly heated. More characteristic, however, than the crystallized are the irregular forms, which, when large, are known as

‘nuggets ” or “ pepites,” and when in pieces below 7 to 1 ounce weight as gold dust, the larger sizes being dis- tinguished as coarse or uuggety gold, and the smaller as gold dust proper. Except the larger nuggets, which may be more or less angular, or at times even masses of crystals, with or without associated quartz or other rock, gold is generally found bean-shaped or in some other flattened form, the smallest particles being scales of scarcely appreciable thickness, which, from their small bulk as compared with their surface, subside very slowly when suspended in water, and are therefore readily carried away by a rapid current. These form the “ float gold” of the miner. The physical properties of native gold are generally similar to that of the melted metal and its alloys as described above. ‘The com- position varies considerably in different localities, as shown in the following table : —

Analyses of Native Gold from various localitics.

Locality. Gold. | Silver. | Iron. | Copper. Authority. EUROPE, British Isles — Vigra & Clogau…| 90°16 | 9°26 | trace | trace | Forbes. Wicklow(river)...} 92°32 | 6°17 ‘78 | ... | Mallet. Transylvania …..... 60°49 | 38°74 0°77 | G. Rose. ASIA. Russian Empire— Brezovsk …..... ~~| 91°88 | 8°03 | trace 09 | G. Rose. Ekaterinburg….. 98°96 | 0°16 O05 |. Tae i AFRICA. ASNONTCE cee~~ ee se 52> 90°05 | 9:94 AMERICA. WBravileey,... SA te 94:0 5°85 D’ Arect. Central America …| 88 05 | 11-96 | § Fremy and Pelouze. BIEL less o20sesemecis 76°41 | 23°12 0°87 | Rose. @alifonniatcs cesace. ot 90:12} 9°01 hy aie BUAIPOR... 0.60.06 $1200.) 18sf0 a… ... | EF, Claudet. (Chijii| s¥ovo}Gesgncnne caper fey bcbeals) |) ie) 03 | Claudet. AUSTRALIA. South Australia… | 87°78] 6°07| 6°15 A. 5S. Thomas. Ballarat…..... ce of SED | ONCE... | Claudet.

Of the minerals containing gold the most important are sylvanite or graphic tellurium, of composition (AgAu) Te,, with 24 to 26 per cent.; calaverite, AuTe,, with 42 per cent.; and nagyagite or foliate tellurium, of a complex and rather indefinite composition, with 5 to 9 per cent. of gold. These are confined to a few localities, the oldest and best known being those of Nagyag and Ofenbanya in Transylvania ; but latterly they have been found in some quantity at Red Cloud, Colorado, and in Calaveras county,

California—the nearly pure telluride of gold, calaverite, being confined to these places.

The minerals of the second class, usually spoken of as auriferous, or containing gold in sensible quantity, though not to a sufficient amount to form an essential in the chemical formule, or even in many instances to be found in the quantisies ordinarily operated upon in analyses, are comparatively numerous, including many of the metallic sulphides. Prominent among these are galena and iron pyrites, —the former, according to the observations of Percy and Smith, being almost invariably gold-bearing to an extent that can be recognized in operating upon a pound weight

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of the lead smelted from it, the proportion increasing to some extent with the amount of silver.! The second is of greater practical importance, being in some districts exceed- ingly rich, and, next to the native metal, is the most prolific source of gold. Magnetic pyrites, copper pyrites, zinc blende, and arsenical pyrites are other and less important examples,—the last constituting the gold ore formerly worked in Silesia, A native gold amalgam is found ag a rarity in California, and bismuth from South America ig sometimes rich in gold. Native arsenic and antimony are also very frequently found to contain gold and silver. The association and distribution of gold may be con. sidered under two different heads, namely, as it occurs in mineral veins, and in alluvial or other superficial deposits which are derived from the waste of the former. Ag regards the first, it is chiefly found in quartz veins or reefs traversing slaty or crystalline rocks, usually talcose or chloritic schists, either alone, or in association with iron, copper, magnetic and arsenical pyrites, galena, specular iron ore, and silver ores, and more rarely with sulphide of molybdenum, tungstate of calcium, bismuth, and tel- lurium minerals. Anothér more exceptional association, that with bismuth in calcite from Queensland, was described by the late Mr Daintree. In Hungary, the Urals, and northern Peru, silicates and carbonates of manganese are

‘| not uncommouly found in the gold and silver bearing veins.

In the second or alluvial class of deposits the associated minerals are chiefly those of great density and hardness, such as platinum, osmiridum, and other metals of the platinum group, tinstone, chromic, magnetic, and brown iron ores, diamond, ruby, and sapphire, zircon, topaz, garnet, &e., which represent the more durable original constituents of the rocks whose disintegration has furnished the detritus. Native lead and zinc have also been reported among such minerals, but their authenticity is somewhat doubtful. The distribution of gold-bearing deposits is world-wide; although the relative importance of different localities is very different, their geological range is also very extensive. In Europe the principal groups of veins are in slaty or crystalline schists, whose age, when it can be determined, is usually Paleozoic, Silurian, Devonian, or Carboniferous, and less commonly in volcanic formations of Tertiary age. The alluvial deposits, being more extensive, are less inti- mately connected with any particular series of rocks. Few of either are, however, of much importance as compared with the more productive deposits of America and Australia. In the United Kingdom gold-bearing quartz veins were worked during the Roman occupation at Ogofau, neat Llanpumpsant, in Carmarthenshire ; and in the year 1863 as much as 5300 oz. was produced from similar ves im Lower Silurian slates at Vigra and Clogau mines, near Dolgelly. In 1875 the mine was reopened, and in 1878 it produced 720 oz. Tetradymite, native bismuth, and several other characteristic associates of gold were also found in small quantity. In Cornwall small pieces of native gold have at intervals been found in alluvial or stream tin works; and similar but more important finds have been made in the granite district of Wicklow, and more recently at Helmsdale, in Sutherlandshire. The largest nugget of British origin weighs under 30z On the continent of Europe the great rivers originating in the crystalline rocks of the Alpine region, such as the Rhine and Danube, are slightly auriferous in their alluvial deposits in several places ; but the proportion of gold c extraordinarily minute, so that the working Is only carne on by gipsies, or by the local peasantry at irregular inter vals, the return for the labour expended being vely small. The same remark applies to the Rhone and its

1 Phil. Mag., vii., 1854, p. 126,

affluents, and the rivers of the central granitic mass of France. In the Austrian Alps the gold quartz mines at the Rathausberg, near Gastein, at a height of about 9000 feet above the sea-level, and at Zell, in Tyrol, are of interest historically as having developed the system of amalgamation in mills, although they are economically of small importance at present. On the Italian side, in the Valanzasca and Val Toppa above Lago Maggiore, a group kuown as the Pestarena mines have yielded from 2000 to 3000 ounces annually for several years past; and more recently a discovery of great interest of a highly auriferous copper ore has been made at Ollomont in the Val d'Aosta, In Hungary the gold-bearing veins of Schemnitz occur in greenstones and trachytes of Tertiary age, the most power- ful example, the Spitaler-gang, being filled with a mixture of quartz and brown iron ore known as zinnopal, aud contain- ing gold associated with silver ores, galena, and pyrites. In Transylvania, at Nagyag, the gold-bearing tellurium mine- rals previously noticed are found in small veins greenstone trachyte. ith to

ertiary sandstone, of such a mode of occurrence.

The Russiau empire has the largest gold production among the countries of the Old World, most of the produce, nowever, being derived from its Asiatic territories.

The chief (56° 30' N.),

being present on the Asiatic side, jut in much disturbed and contorted 'positions, in associa- jon with plutonic rocks, diorite, diabase, and granite, with hich the gold veins are intimately connected. The latter te therefore of post-Carboniferous and probably of Permian ate. At Berezovsk the mines cover an area of about 25 fare miles, mainly composed of talcose, chloritic, and lay slates, vertical 'or sloping at high angles, and pene- fated by dykes of beresite, a fine grained rock made up ff quartz and white mica with some felspar and pyrites, ie latter usually transformed into brown iron ore. jhese dykes, whicli have a general north-and-south direc- jou are vertical, and are from 20 to 70 feet aud upwards b thickness, are traversed perpendicularly to their direction veins of quartz from the thinnest string to a maximum x or 4 feet thick, in which gold is associated with fown iron ore or ochres, resulting from the " pyrites. The workings being essentially shallow, none

of je associated sulphides, galena, disulphide of copper, &c., tive as yet been found, as arule, to be gold-bearing. The luable parts of the veins are almost entirely restricted to fe beresite dykes. The richest of the Ural mines are ose of Smolensk, near Miask, and Ouspensk, near tlie age of Katchkar, in52°N. The alluvial deposits which, but very slightly sandy clays, ex- ml the inhabited regions, and to the luth into the Cossack and Bashkir countries, The most Huable diggings are in the district of Miask, where the ‘gest nuggets have been found, and in the Katchkar, which € remarkable for the great number of gems, pink topazes,

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found in connexion with the gold. Mag- netite, quartz, and platinum are very common in all the Ural gold sands ; less common are hematite, titani- ferous and chromic iron, pyrites, garnet, and, least of all, zircon, kyanite, and diamond. These alluvial deposits are of later Tertiary age, some of them containing traces of pre- historic humau work; others are post-Pliocene, with the remains of the mammoth, tichorrhine, rhinoceros, and other mammalian fossils. Somewhat similar conditions prevail In the alluvial gold region of the Altai. Besides the veins and alluvial deposits, the Ural rocks, such as serpentine, diorite, beresite, agrairite, &c., are at times auriferous.

The gold deposits of the Caucasus, thongh immortalized in the tradition of Jason and the Argonauts, are now entirely abandoned, the last attempt at working them having been suspended in 1875.

In India gold is obtained in small quantities by native gold washers in various parts of the highlands of southern Bengal, and more receutly quartz veins and alluvial deposits of considerable promise have been discovered in the district of Wynaad, in the southern part of the Madras presidency.

Ou the Atlantic slopes of North America the chief gold. bearing localities are on the Chaudidre river, near Quebec, and in Nova Scotia. In both

instances the quartz veins worked are contained in slates belonging to the Quebec group of the Lower Silurian period, those of the latter province being specially remarkable for their quasi-stratified character, as they penetrate the slates at a very low angle of inclination, and have been folded and corrugated together with the containing rocks by subsequent disturb-ances. Other deposits of old geological periods are found in Tennessee and North Carolina,

On the Pacific side of America gold is found under very different conditions, and on a much larger scale than on the Atlantic side. The whole distance from Mexico to Alaska may be said to be more or less auriferous, the most extensive deposits being in the great north-and-south valley of the Sacramento, which runs parallel to the coast, between the so-called Coast Mountains and the Sierra Nevada, the latter being distinguished further to the north in the Cascade range. Others of less extent are known in the Klamath, Columbia, and Fraser river basins ; they extend in the last two far back into the interior, to the region between the Cascade range and the Rocky Mountains. In many of these valleys alluvial deposits are developed to an extent unparalleled elsewhere, the river channels being bordered by banks or benches of gravel and sand, rising in terraces to considerable heights on the flanks of the hills, For example, at the Methow a tributary of the Columbia, there are sixteen lines of such terraces, the highest about 1200 feet above theriver; and at Colville, on the Columbia, traces of old terraces, much degraded by frost and rain,

p=) are seen at 1500 feet above the river. These gravels, origin, are in

emeralds, &c.,

which are of Pliocene and more recent many places, though very unequally, auriferous, the richest points being found in the bars or shingle banks of the river after the summer floods, and in the channels of the smaller tributary streams, where the poorer material has been partially enriched by a process of natural washing, The most extensive, or rather the best known because most completely explored, deposits of this class are those of the Upper Sacramento valley, in California (see vol. iv. p. 701).1 Others of considerable importance are worked in the Cariboo district on the Upper Fraser river, yielding very coarse gold. Another discovery of a singular

character, the produce being a regular gold gravel, was made some years back at Salmon river in Oregon, but the deposit, though exceedingly rich, was soou exhausted. (Gold.

1 See also Whitney, On the Auriferous Gravels of the Sierra Nevada, Cambridge, U.S., 1879.

bearing quartz veins are also common over a large part of California, notably in Grass Valley (vol. iv. p. 702), in strata that are supposed to be of Triassic age, the associated minerals being iron and arsenical pyrites, galena, &c. In Calaveras county, tellurium ores like that of Tran- sylvania are characteristic of the gold veins. In the adjacent States of Nevada and Colorado, gold is so intimately associated with silver ores that it is for the most part only obtained from the ultimate process of refining the reduced silver. The same remark applies to the most of the mines of Mexico, and on the south-west coast of America, in Peru, Bolivia, and Chili. See SILver.

Very rich gold quartz has been brought from Carabaya on Lake Titicaca ; and recently considerable deposits both alluvial and in veins have been opened at Caratal in Vene- zuela and at St Elie in French Guiana, which are interesting as proving the actual existence of Raleigh's Eldorado.

In Brazil the principal gold mines are upon veins in clay slate, aud a peculiar class of rocks known as Jacotinga or Itabirite, and which are mixtures of quartz, chlorite, and specular iron ore, the Jatter often occurring in large mirror- like crystals several inches across. The gold occurs almost entirely in pyritic minerals, being most abundant in ordinary iron pyrites, and less so in magnetic and arsenical pyrites, free gold being rarely seen. See Brazit, vol, iv, p. 224.

In Africa the chief gold-bearing localities are on the west coast—gold dust derived from alluvial washings forming an article of export from many of the trading stations along the Guinea coast. Latterly, alluvial deposits have been worked in the mountains of Transvaal, in the Leydenburg district (25° S. lat., 31° E. long.), producing coarse nuggetty gold in masses up to 11 Ib weight, and in a few cases gold- bearing quartz has been found in veins in

talcose schist and quartzite, closely associated with eruptive masses of diorite. The age of these rocks is considered by Dunn! to be Silurian or Devonian, and the observed phenomena to be similar to those generally observed in Australia. The upper valley of the Nile produces a little gold in Abyssinia and Nubia, the latter being the land of gold of the old Egyptians. Very extensive ancient mines have been de- scribed by Linant Bey in the district. known as Attaki or Allaki on the Red Sea, situated about 120 miles back from Ras Elba, the headland midway between Berenice and Sauwakin. These are probably the same mines that were described by Diodorus Siculus, and one of the oldest topographical documents known, a map or itinerary of the route to them from the Nile, is preserved at Turin. In the reign of Setee I., of the 19th dynasty, wells were opened along this route, in order that the mines, that were then of very great autiquity, might be reopened.? Similar ancient gold mines have, recently been discovered by Burton in the land of Midian, on the east coast of the Gulf of Akaba.

The gold districts of Australia cover a very considerable area, extending from the east side of the continent for about 20° of latitude (18° to 38° S.), the more important deposits being those of Victoria in the south. The principal districts are in Victoria,—Ballarat, Castlemaine, and Sandhurst, lying west and north from Melbourne, and Beechworth near the Murray river to the north-east. In New South Wales the gold fields are scattered over the entire length of the colony from north to south, the more important districts lying between the 32d and 36th parallels of S. lat. on the western side of the Australian cordillera, on the upper tributaries of the Macquarie and Lachlan rivers, the centre being about the town of Bathurst, This is known as the western district. Another group, known as

1 Quarterly Journal of the Geological Socicty, xxxiii. p. 882. 2 Mariette Bey, Histoire Ancienne @ Egypt, 1867, p. 96. The oldest notice of the mines goes back to the 12th dynasty.

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GOLD

the northern district, is on the eastern side of the mountains near the Queensland boundary, in 29° S., Rocky River being the principal locality ; while the southern district includes Braidwood, Adelaide, Tumbarumba, and other localities neay the Murray river. In Queensland the chief localities are commencing on the south, Gympie and Kilkevan near Many. borough, 26° S. lat.; a group extending about 50 miles north and south of Rockhampton, in 24° 30'S. lat., all near the coast ; Eastern River, Hurley, and Peak Downs, about 300 miles inland on the 23d parallel; and Clomenny and Gilbert ou a stream running into the Gulf of Carpentaria, besides numerous others. In all those localities two principal kinds of deposits are observed, namely, auriferous quartz veins traversing slates of Silurian and Devonian age, which are in intimate relation with masses of diorite and other eruptive rocks ; and gold-bearing drifts of Miocene or even newer Tertiary date, derived from the degradation of the older strata. According to Daintree,* no auriferous vein of any kind has been found in any Secondary or Tertiary strata, or in the igneous rocks erupted through any such newer formations; and as a result of his experience the same observer gives the following as the modes of occurrence of gold in Australia :—(1) In pyritic diorites and felstones in Queensland, and their alluvial drifts; (2) in pyritic granites in New South Wales ; (3) in drifts from auriferous serpen- tine in Queensland, also in the two northern colonies; (4) in more or less regular veins with quartz and calespar in the preceding rocks; (5) in quartz and other veins in Devonian and Upper Silurian strata in proximity to similar igneous rocks, which is the general character of the Victoria: quartz veins ; (6) in veins of metamorphic rocks of unknown age in Queensland ; and (7) in quartz veins in Lower Silurian strata, without any apparent connexion with igneous masses. The latter occur only in Victoria, and are of comparatively minor importance. In the northern territory of South Australia, alluvial gold mining has re- cently been developed to a considerable extent in the neigh- bourhood of Port Darwin in the Gulf of Carpentaria, the export being from 2000 to 3000 oz. monthly.

Statistics, —There are no means of stating exactly the total gold produce of the world for any particular year, as in many of the larger producing countries no systematic returns are obtained, and in others where such returns are collected their publication is often delayed for a considerable time. The following figures, mostly derived froma recent statistical work,

A. Soetbeer, Kdelmetall-Produktion, 1879, with some additions from late official sources, will give some idea of the relative importance of the different countries. “Previous to 1837 the first place was held by Russia, and the estimated average annual yield from all sources was, in the decennial period 1841-50, 1,760,500 ounces,

The contributions of the different countries are as follows :—

02, 02.

0z. United States …... 1876, 2,050,0004

RWSSIa:. «ccna eee == 1876, 1,072,920 1877, 1,281,260

New South Wales..1876, 126,789 1877, 97,582

hain a 1876, 963,760 1877, 809,653 1878, 758,039 Queensland ……..
1876, 410,830 1877, 468,418

New Zealand…....1876, 822,016 1877, 371,685 1878, 311,498
Venezuela……..... 1878, 150,000 New Granada …... 1876, 112,500

PATTTCHN ¢ Seine mes 1875, 110,100

INEXICO ns serenrentsececs 1875, 65,950

BOMV Ties s os2+5-00 1875, 64,300

Austria-Hungary…1876, 61,214

15) aval Wanennerenocensos ; 55,300

dys EbTadgecsa- doc08coc 1876, 21,660

GM). cc ae. 1876, 12,860

Nova Scotia,..... 1876, 12,039

Rentz wet 876, 11,570

3 Quarterly Journal of the Geological Society, vol. Xxxiv. P- 435. 4 4 The two principal mines, on the Comstock lode, the Consolidate Virginia and California, produced, apart from silver, gold of the value in United States currency ee follows: —

76, 1877. 1

Consolidated: Virginia…$7,378,145 $6,270,000 8 T Oy California ….cseuseees cere 6 648,641 9,886,745 5,553;

discovery of the Australian and Californian sources, the annual averages being—

Pe eM OOD. ons 05/4504 onininesns «gajni ce. 6,350,180 ounces », 1856-1860……..0… ise cS UES ecaae 6,624,850 ,, AOS OGs 5 oe ir adele Wea lh eceel en 5,951,770 ,,

Pe BOORNG 10). ..DOLD 5 cvs ws sar esiins ing or 00r08y487,400 –

Proportion of Gold in Deposits.—A rich gold-bearing deposit is quantitatively very different from one to which the same term is applied when containing ores of other metals. In the latter the useful material must asa rule form a colsiderable proportiou—one or more parts in a hundred—of the mass ; while in the former, owing to the superior value of the product, it rarely attains as much as 1 per cent., and is generally very much less, the amount of gold coutained in easily worked alluvial deposits being often extremely small. For example, the yield of the Siberian gold washings ranges from 12 grains to 1 dwt. 12 grains per ton ;! while in the lodes, which are more difficult and expensive to work, the proportion is about 8 dwts. per ton. In the alluvial washings of California it is estimated at about two shillings worth, equal to about oth of an ounce, per ton of gravel. In Australia the alluvial ground worked in the colony of Victoria in 1878 is returned as averaging 25 grains (1 dwt. 1 gr.) per ton, or about double the above quantity.

In vein mining, which is more difficult and costly, a lirger yield is necessary, but probably 5 dwts., or about £1 in value per ton, will in most places represent paying quantities from quartz containing free gold, i.c., not

asso- ciated with pyrites. The proportional yield and quantities of the different kinds of auriferous materials treated in the colony of Victoria during the last three months of 1878 were —

ovis: Yiceid per ton.

oz. dwt gr. Alluvial sand ‘ washdirt” .....,.. 173379 1 1 596 Cement (gravel) requiring crushing….5871 ee i Be 20a Rrcascned neh. satdewhdsnes oo 222 775 9 21 Witte failings ow. eee couse 11°139 get ly 18 Pyrites and blanketing (ore col- 1°599 2 6 137

lected on blanket tables)

In the less tractable minerals, such as arsenical pyrites occurring in the lower portions of the veins, as much as 1} to 3 oz. may be required for profitable working. When associated with the ores of other metals, such as silver, lead, and copper, the extraction of the gold is in most cases an incidental and final operation in their metal- lurgical treatment, and may therefore be best considered in the articles on these metals,

Mining.—The various deposits of gold may be divided into two classes—“ veins ” and « placers.” The vein min- ‘ing of gold does not greatly differ from that of similar “deposits of metals. It will only be necessary to refer here to certain details of the extraction of gold in such cases. In the placer or alluvial deposits, the precious metal is found

based on the disintegration of the earthy matter by the action of a stream of water, which washes away the lighter portions and leaves the denser gold. In alluvial deposits ‘the richest ground is usually found in contact with the “bed rock”; and, when the overlying cover of gravel is very thick, or, as sometimes happens, when the older gravel is ‘covered with a flow of basalt, regular mining by shafts and Jovels, as in what are known as tunnel-claims, may be |Tequired to reach the auriferous ground. In the early days of gold washing in California and Australia, when rich 1 dwt. per ton corresponds to 1 part in 653,333 by weight, and about 1 in 5 or 6 millions by volume,

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Since 1851 the yield has been very largely increased by the |

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alluvial deposits were common at the surface, the most simple appliances sufficed ; the most characteristic being the “ pan,” a circular dish of sheet-iron with sloping sides about 13 or 14 inches in diameter. The pan, about two- thirds filled with the “pay dirt” to be washed, is held in the stream or in a hole filled with water. The miner, after separating the larger stones by hand, imparts a gyratory motion to the pan by a combination of shaking

| aud twisting movements which it is impossible to describe

exactly, so as to keep its contents suspended in the stream of water, which carries away the bulk of the lighter material, leaving a black residue consisting of magnetic iron ore and other heavy minerals, together with any gold which may originally have been present in the mass. The washing is repeated until enough of the enriched sand is collected, when the gold is finally recovered by careful washing or “panning out” in a smaller pan. In Mexico and South America, instead of the pan, a wooden dish or trough, variously shaped in different districts, and known as “ batea,” is used.

The “cradle,” a simple appliance for treating somewhat larger quantities, varies in length from 3 feet 6 inches to 7 feet, but the shorter length is that usually adopted. Its nature will be evident from fig. 1, in which a is a movable hopper with a perforated bottom of sheet-iron in which the “pay dirt” is placed. Water is poured on the dirt, and the rocking motion imparted to the cradle causes the finer particles to pass through the holes in the hopper on to the screen }, which is of canvas, and thence to the base of the cradle, where the auriferous par- ticles accumulate on the transverse bars of wood c, called “riffles.” Washing by the cradle, which is now but little used except in preliminary workings, is tedious and expensive,

The “tom” is a sort of cradle with an extended sluice placed on an incline of about 1 foot in12. The upper end contains a perforated riddle plate which is placed directly over the riffle box, and under certain circumstances mercury may be placed behind the riffles. Copper plates amal- gamated with mercury are also used when the gold is very fine, and even in some

instances amalgamated silver coins have been used for the same purpose. Sometimes the stuff is disintegrated with water in a “puddling machine,” which is used, especially in Australia, when the earthy matters are tenacious and water scarce. The machine frequently resembles a brickmaker’s wash-mill, and is worked by horse or steam power. :

In workings on a larger scale, where the supply of water is abundant, as in California, sluices are generally employed. They are shallow troughs about 12 feet long, about 16 to 20 inches wide, and 1 foot in depth. The troughs taper

Fic. 1.—Cradle.

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Fig. 2.—Sluice.

slightly so that they can be joined in series, the total length

often reaching several hundred feet. he incline of the

sluice varies with the conformation of the ground and the

tenacity of the stuff to be washed, from 1 in 16 to 1 in 8,

Fig. 2 represents one of the simplest forms of sluice as X. — 94

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used in river diggings in the north-west of America. A rectangular trough of boards, whose dimensions depend chiefly on the size of the planks available, is set up on the higher part of the ground at one side of the claim to be worked, upon trestles or piers of rough stone-work, at such an inclination that the stream may carry off all but the largest stones, which are kept back by a grating of boards about 2 inches apart at a. The gravel, which in this par- ticular instance is from 12 to 16 feet thick, and with an average breadth to the river of 25 to 30 feet, is dug by hand and thrown in at

the upper end, the stones kept back being removed at intervals by two men with four-pronged steel forks. The floor of the sluice is laid with riffles made of strips of wood 2 inches square laid parallel to the direction of the current (as at b, and in cross section at c), and at other points d with boards having transverse notches filled with mercury. These were known originally as Hungarian riffles. The bottom of the working, which is below the drainage level of the valley, is kept dry by a Chinese bucket pump e, attached to a rough undershot wheel driven by the current in the sluice. The sluice boxes are made in lengths, and united together spigot and faucet fashion, so that they may easily be removed and re-erected as the different parts of the claim are progressively exhausted.

In the larger and more permanent erections used in hydraulic mining, the upper ends of the sluices are often cut in rock or lined with stone blocks, the grating stopping the larger stones being known asa " grizzly." In order to save very fine and especially rusty particles of gold, so-called " wnder-current sluices" are used; these are shallow wooden tanks, 50 square yards and upwards in area, which are

placed somewhat below the main sluice, and communicate |

with it above and below, the entry being protected by a grating so that only the finer material is admitted. These are paved with stone blocks or lined with mercury riffles, so that from the greatly reduced velocity of flow, due to the sudden increase of surface, the finer particles of gold may collect. In order to save finely-divided gold, amalga- mated copper plates are sometimes placed in a nearly level position, at a considerable distance from the head of the sluice, the gold which is retained in it being removed from time to time. Sluices are often made double, and they are usually cleaned up,—that is, the deposit rich in gold is removed from them,—once a week. The gold is then re- covered by 't panning."

The application of a jet of water to the removal of auriferous gravels by the so-called hydraulic system of mining has already been noticed at vol. iv. p. 701.1 This method has for the most part been confined to the country of its invention, California, and the western territories of America, where the conditions favourable for its use are more fully developed than elsewhere,

—notably the presence of thick banks of gravel that cannot be utilized by other methods, and abundance of water, even though considerable

work may be required at times to make it available. The |

general conditions to be observed in such workings may be briefly stated as follows :—(1) The whole of the auriferous

gravel, down to the ‘bed rock,” must be removed,—that |

is, no selection of rich or poor parts is possible ; (2) this must be accomplished by the aid of water alone, or at

times by water supplemented by gunpowder ; (3) the con- :

glomerate must be mechanically disintegrated without interrupting the whole system; (4) the gold must be saved without interrupting the continuous flow of water ;

and (5) arrangements must be made for disposing of the |

vast masses of impoverished gravel.

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1 Much valuable information on this subject will also be found in the Fifth Annual Report of the United States Commissioners of Mining Slatistics, Washington, 1873, p. 390,

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The general appearance of an hydraulic gold working is

seell in fig. 3, the water being brought from a ditch on the high ground, and through a line of pipes to the dis- tributing box, whence the branch pipes supplying the

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Fig. 8.—Hydraulic Gold Working.

three jets diverge. The stream issues through a nozzle resembling that of a fire engine (fig. 4), which is movable in a horizontal plane around the vertical axis a, and ina vertical plane on the spherical joint and centre 6, so that the direction of the jet may be varied through considerable angles by simply mov- ing a handle. The material of the bank, being loosened by the cutting action of the Fig. 4.

water, crumbles into holes, or " caves in," and the superin- cumbent mass, often with large trees and stones, falls into the lower ground. The stream, laden with stones and gravel, passes into the sluices, where the gold is recovered in the manner already described. Under the most advantageous conditions the loss of gold may be estimated at 10 or 20 per cent., the amonnt recovered representing @ value of about two shillings per ton of gravel treated. The loss of mercury is about the same, from 5 to 6 ewt. being in constant use per mile of sluice. About 1 ewt. is added daily in at least two charges. The average half-yearly consumption is estimated at about one hundred flasks of 74 Ib each, after allowing for the amount recovered in clearing up and dis- tillation of theamalgam. The latter operation is performed at intervals of seven or fourteen days in the upper lengths of the sluice, and half-yearly in the lower parts.

The dressing or mechanical preparation of vein stuff con- taining gold is generally similar to that of other ores, except that the precious metal should be removed from the waste substances as quickly as possible, even although other minerals of value that are subsequently recovered may be present. This is usually done by amalgamation with mercury. In all cases the quartz or other vein stuff must be reduced to a very fine powder as a preliminary to further operations. This may be done in several ways, e.g., either (1) by the Mexican crusher or arrastrda, 1 which the grinding is effected upon a bed of stone, over which heavy blocks of stone attached to cross arm' are dragged by the rotation of the arms about @ central spindle, motion being furnished by mules or other power, . by the Chilian mill or trapiche, also known as the edge- runner, where the grinding stones roll upon the floor, at the same time turning about a central upright,— Col trivances which are mainly used for the preparation of silver ores; but by far the largest proportion of the gold

quartz of California and Australia is reduced by (3) the stamp mill, which is similar in principle to that used 10 Europe for the preparation of tin and other ores, but has

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received special modification in many details. Fig. 5 represents the ordinary Californian pattern of a stamp mill. The stamp is a cylindrical iron pestle faced with a chilled cast-iron shoe, removable so that it can be renewed when necessary, attached to a round iron rod or lifter, the whole weighing from 600 to 800 tb. The lift is effected by cams acting on the under surface of tappets a, and formed by cylindrical boxes keyed on to the stems of the lifter about one-fourth of their length from the top. As, however, the cams, unlike those of European stamp mills, are placed to one side of the stamp, the latter is not only lifted but turned partly round on its own axis, whereby the shoes are worn down uniformly. The bed or mortar A is of cast-iron, The height of lift may be between 8 and 10 inches, and the number of blows from 30 to 90 per minute. The stuff, previously broken to about 2 inch lumps in a Blake's rock. breaker, is fed in through the aperture n at the back of the ''battery box," a constant supply of water being given from the channel £, and mercury in a finely divided state is added at frequent intervals. The discharge of the com. minuted material takes place through the aperture d, which is covered by a thin steel plate perforated with numerous

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= YY YYyYyyy y Y / MMMM MMMM

VS j WY Yi LEY YY" MMMM Fia. 5.—Stamp Mill. slits about ;);th inch broad and ,,th to 1th inch long, a certain volume being discharged at every blow and carried forward by the flushing water over the apron or table in front, m, covered by copper plates filled with mercury, Similar plates are often used to catch any particles of gold) that may be thrown back, while the main operation is so conducted that the bulk of the gold may be reduced to the State of amalgam by bringing the two metals into intimate contact under the stamp head, and remain in the battery. |The tables in front are laid at an incline of about 8 degrees, jand are about 13 feet long; they collect

from 10 to 15 per cent. of the whole gold; a further quantity is recovered by leading the sands through a gutter about 16 inches broad and 120 feet long, also lined with amalgamated copper plates, after the pyritic and other heavy minerals jnave been separated by depositing in catch pits and other ‘Stmilar contrivances. | When the ore does not contain any considerable amount jof free gold, mercury is not, as a rule, used in the battery. he pulverized stuff is received upon blanket tables or sluices, These are inclined boards covered with coarse

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woollen cloth or sacking. The heavier particles become entangled in the fibres of the cloth, while the lighter deposits are carried forward by the current. At intervals of a quarter to half an hour the surface of the blanket is completely covered, when it is removed, and its con- tents are washed off in a tub of water and reserved for further treatment. This consists of amalgamation, in a contrivance analogous to the Hungarian mill subsequently described, and subsequent treatment in pan amalgamators somewhat similar to the arrastra in character, but with grinding surfaces of iron instead of stone.

At Schemnitz, in Hungary, quartz vein stuff containing a little gold, partly free and partly associated with pyrites and galena, is, after stamping in mills similar to those described above, but without rotating stamps, passed

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Fic. 6.—Hungarian Mill. through the so-called Hungarian gold mill, fig. 6. This consists of a cast-iron pan a, having a shallow cylindrical bottom 6, holding 50 Ib of mercury, in which a wooden runner c, nearly of the same

shape as the inside of the pan, and armed below with several projecting blades, is made to revolve by gearing wheels placed either above, or, ag in

the figure, below. The connexion of the runner with the driving shaft is effected by the three-armed crutch shown in plan at e¢, which sits on the square part of the shaft. By means of set screws analogous to those of a flour mill, the runner is adjusted at such a height that the knives just clear the surface of the mercury. The stuff from the stamps arrive by the gutter /, and, falling through the hole in the middle of the runner, is distributed over the mercury, when the gold subsides in virtue of its superior density, while the quartz and lighter materials are guided by the blades to the circumference and are discharged at g, usually into a second similar mill, and sometimes to a third, placed at lower levels, and subsequently pass over blanket tables. The most advantageous speed is from 12 to 14 revolutions per minute. The action of this so-called mill is really more nearly analogous to that of a centrifugal pump, as no grinding action takes placein it. The amalgam is cleaned out about once a month. The average amount of gold collected from 50 tons of stuff stamped, is about 6 oz. in the mills, and in the subsequent dressing processes 1 Ib of auriferous silver and 10 cwt. of lead. According to Rittinger, mercury that has been purified by distillation acts much more rapidly upon gold than such as has been saturated with the metal without losing its fluidity, although the amount that can be so dissolved is very small.

There are various forms of pan amalgamators of which space will not permit a description to be given. It may be stated, however, that experience of the great variety of pans that have from time to time been devised has led to

the adoption of the more simple forms, in which the grind-

ing is effected between horizontal flat surfaces instead of curved or conical bottoms, and in the pans now usually employed these flat grinding surfaces form an annular foor round a central cone through which a vertical shaft passes. The Knox pan, fig. 7, may be considered to be fairly typical. It is of

cast-iron, 4 feet in diameter and 14 inches deep. It has a false bottom to form a hollow annular space through which steam

diameter, are introduced into an iron vessel lined with q paste of fire-clay and wood ashes, and provided with an iron tube that dips below the surface of water. The dis. tillation is then effected by heating, care being taken that the retort does not become visibly red in daylight. The amalgam yields about 30 to 40 per cent. of gold. In California the amalgam is retorted in cast-iron pans placed in cast-iron cylinders 11 inches in diameter, 4 feet 6 inches long, supported on brick work. The bullion left in the retorts is then melted in black-lead crucibles, with the addition of small quantities of suitable fluxes.

cau be introduced. The ceutre of the yoke d attached to the muller m, is keyed to a vertical wrought-iron shaft §, 2 inches in diameter, which can be brought in connexion with the driving gear G. The blocks 7, 7 are of wood. In working the pan 100 Ib of skimmings are introduced, and water added until the pulp will just adhere to a stick. After three hours grinding the pulp is heated with steam. About 5 tb of mercury are added for every charge, together with a cupful of equal parts of saltpetre and sal ammoniac. After three hours further working, water with a little caustic lime is added, and the pulp is discharged first through an upper and then through a lower hole.

One of the greatest difficulties in the treatment of gold by amalgamation, and more particularly in the treatment of pyrites, arises from the so-called sickening or flouring of the mercury; that is, the particles, losing their bright metallic surfaces, are no longer capable of coalescing with or taking up other metals. Of the numerous remedies pro- posed the most efficacious is perhaps sodium amalgam. It appears that amalgamation is often impeded by the tarnish found on the surface of the gold when it is associated with sulphur, arsenic, bismuth, antimony, or tellurium. Wurtz! in America (1864) and Crookes in England (1865) made independently the discovery that, by the addition of a small quantity of sodium to the mercury, the operation is much facilitated. It is also stated that sodinm prevents both the “sickening ” and the “flouring” of the mercury which is produced by certain associated minerals. Cosmo Newberry has investigated with much care the action of certain metals in impeding amalgam- ation.2 Wurtz recommends two

amalgams, one containing 2 and the other4 per cent. of sodium, and in practice 1 per cent. or less of these is added to the mercury in the amalgamator. Crookes employs three kinds, which he calls A, B, and C amalgams ; each contains 3 per cent. of mercury, but the B variety has, in addition to the sodium, 20 per cent. of zine, and C is mixed with 10 per cent. of zinc and 10 per cent. of tin. The addition of cyanide of potassium has been suggested to assist the amalgamation and to prevent "flouring," but Skey® has shown that its use is attended with loss of gold.

Separation of Gold from the Amalgam.—The amalgam is first pressed in wetted canvas or buckskin in order to re- move excess of mercury. According to Rittinger, mercury will dissolve from 0°05 to 0°08 per cent. of native gold of standard 650 to 850 without loss of fluidity, the solubility of the gold increasing with its fineness; and until the point of saturation is reached, no separation of solid amalgam is possible. Lumps of the solid amalgam, about 2 inches in

Fic, 7.—Knox Pan.

1 American Journal of Science and Arts, vol. xli., March 1866. 2 Uye's Dictionary of Arts, supplement to 7th ed., p. 412 3 Transactions of the New Zealand Institute, 1876.

The extraction of gold from auriferous minerals by fusion,

except as an incident in their treatment for other metals, is very rarely practised.

It was at one time proposed to treat the concentrated black iron obtained in the Ural gold washings, which consists chiefly of magnetite, as an iron ore, by smelting it with charcoal for auriferous pig-iron, the latter metal possessing the property of dissolving gold in considerable quantity. By subsequent treatment with sulphuric acid the gold could be recovered. Experiments on this point were made by Anossow in 1835, but they have never been followed in practice. '

Gold in galena or other lead ores is invariably recovered in the refining or treatment of the lead and silver obtained. Pyritic ores containing copper are

treated by methods analogous to those of the copper smelter. This is extensively done. In Colorado the pyritic ores containing gold and silver in association with copper are smelted in re verberatory furnaces for regulus, which, when desilverized by Ziervogel's method, leaves a residue containing 20 or 30 ounces of gold per ton. This is smelted with rich gold ores, notably those containing tellurium for white metal or regulus; and by a following process of partial reduction analogous to that of selecting in copper smelting, " bottoms" of impure copper are obtained in which practically all the gold is concentrated. By continuing the treatment of these in the ordinary way of refining, poling, and granulat- ing, all the foreign matters other than gold, copper, and silver are removed, and, by exposing the granulated metal to ahigh oxidizing heat for a considerable time, the copper may be completely oxidized while the precious metals are unaltered. Subsequent treatment with sulphuric acid renders the copper soluble in water as sulphate, and the final residue contains only gold and silver, which is parted or refined in the ordinary way. This method of separating gold from copper, by converting the latter into oxide and sulphate, is also used at Oker in the Harz.

Chlorination Process.—Plattner suggested that the rest- dues from certain mines at Reichenstein, in Silesia, should be treated with chlorine after the arsenical products had been extracted by roasting. The process, which depends upon the fact that chlorine acts rapidly upon gold, but does not attack ferric oxide, is now adopted in Grass Valley, California, where the waste mine- rals, principally pyrites from tail- ings, have been worked for a considerable time by amalgama- tion. The roasting is conducted at a low temperature in some form of reverberatory furnace. Salt is added in the roasting to convert all the metals present,

except iron, into chlorides, The Fig. & auric chloride is, however, decom- ihe posed at the elevated temperature into finely-diviae

metallic gold, which is then readily attacked by the et rine gas. The roasted mineral, slightly moistened, ig nex 'ntroduced into a wooden vat, pitched inside, and furnishe

with a double bottom, as is shown in fig. 8. Chlorin¢

is led from a suitable generator beneath the false bottom, jand rises through the moistened ore, resting on a bed of broken quartz below the false bottom, converting ithe gold into a soluble chloride, which is afterwards removed by washing with water. The precious metal is then precipitated as metallic gold by sulphate of iron. The process has been greatly improved in America by Kiistel, Deetken, and Hoffmann; with proper care it is a very perfect one, and yields 97 per cent. of the gold originally present in the ore. It is stated not to cost 'more in California than 50s. a ton. Any silver origin- ally present in the ore is of course converted into chloride of silver and remains with the residue, from which it may be extracted by the solvent action of brine or by amalga- mation.

Refining or Parting Gold from other Metals.—Strabo states' thatin his time a process was employed for refining 'and purifying gold in large quantities by cementing or burning it with an aluminous earth, which, by destroying the silver, left the gold in a state of purity. Pliny shows 'that for this purpose the gold was placed on the fire in an earthen vessel with treble its weight of salt, and that it was afterwards again exposed to the fire with two parts of salt jand one of argillaceous rock, which, in the presence of moisture, effected the decomposition of the salt ; by this means tlie silver became converted into chloride. Ina similar process still practised in New Granada the granulated argentiferous gold is mixed with one part of common salt and two parts of brick dust. In the presence of moisture, effected by the passage of aqueous vapour through the porous pots in which the mixture is heated, the salt acts on the brick dust, producing silicate of soda, and the evolution of hydrochloric acid affords a source of chlorine for the silver. The chloride of silver formed fuses readily and drops off, " exposing a fresh surface of the alloy to the action of the gas. Various methods for separating gold from silver or other jalloys appear to have been in use from ancient times. Among these may be mentioned prolonged oxidation by exposure to air, and treatment with sulphur, sulphide of antimony, and corrosive sublimate. In the Harz, 2 ounces of the granulated alloy of gold and silver were mixed and heated with 1 ounce of sulphur, litharge being added to separate the gold remaining in the sulphide of silver. | Parting by Nitric Acid, the old process of refining, jis now practised in England by only one firm, although in some refineries both the nitric acid and the sulphuric acid processes are combined, the alloy being first treated with nitric acid. It used

to be called “ quartation,” from the fact that 4 parts of the alloy best suited for the opera- tion of refining contain 3 parts of silver and 1 of gold. The operation may be conducted in vessels of glass or pueioum, and each pound of granulated metal is treated with a pound and a quarter of nitric acid of specific gravity 1°32, It is the method employed in the assay of gold (see ASSAYING). Refining by Sulphuric Acid is the process usually adopted \for separating gold from silver on the large scale. It appears to have been proposed in France by Dizé at the beginning of the present century. It was actually in use in France in 1820, and was introduced into the Mint refinery, London, by Mr Mathison in 1829.2 It is based upon the facts that concentrated hot sulphuric acid con. verts silver and copper into soluble sulphates without attacking the gold, the sulphate of silver being subsequently reduced to the metallic state by copper plates with the |formation of sulphate of copper. About 80 ib of the granulated alloy are boiled for three

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1 Fabbroni, Ann. Chim., t. Ixxii. p, 25. ? Report on the Royal Mint, 1837, Appendix, p. 59.

or four hours in a platinum vessel (fig. 9) with 2:5 times its weight of sulphuric acid of specific gravity 1:84. The sulphurous acids which arise are partially condensed before being allowed to pass into the air. When the acid has

Fig. 9.—Refinery Siphon and Alembic.

ceased to act on the metal, a small quantity of sulphuric acid of specific gravity 1:53 is added, and, after a second boiling, the contents of the vessel are allowed to settle. The supernatant liquid is then withdrawn from the gold, which falls to the bottom of the vessel, and is diluted until its density is 1:21 or 1-26. ‘he silver is usually precipitated from solution by copper plates, but sometimes iron is used, and the silver is roughly dried and

compressed by an hydraulic press before it is melted into ingots. The gold, which is often again treated with sulphuric acid, is then washed and melted into ingots that contain from 997 to 998 parts of gold in 1000. The operation of parting may be conducted in iron or platinum vessels; the use of the former was advocated by M. Tocchi, and they are still extensively employed. Magnificent vessels of platinum have, however, been made in England by Messrs John- son, Matthey, & Co. The alloys best suited for the operation contain from 800 to 950 of silver and 50 to 200 of copper and gold, but the proportion of gold must not ex- ceed 200 parts in 1000. Refiners obtain alloys in suitable proportions by mixing together auriferous silver and argenti- ferous gold, the proportions of the respective metals having been previously indicated by assay. By such an arrange- ment, silver which contains but the 0:0004 part of gold, or 2°25 grains in the troy pound, may be profitably treated.

Cost of Refining.—The charge to the public for refining depends in a great measure on the amount of metal to be operated upon and its richness. In England, however, it may be considered to be about 1d. per ounce for the silver and 4d. per ounce for gold, In France the charge is about 90 cents to 1 franc 25 cents for a kilogramme of silver.

The Lower Harz smelting works produce annually from 50 to 55 ewts. of test silver of an average fineness of 950 silver and 50 gold per 1000; the proportion of the latter metal is, however, variable, being lowest (3 per 1000) in the silver obtained from clean lead ores, and highest (10 per 1000) in that separated from argentiferous copper ores,—that from the mixed copper and lead ores being of interniediate richness. The silver, in quantities of 25 kilogrammes, is refined upon small tests in a muffle, and when sufficiently purified is granulated by ladling it into water, whereby thin flattened granules suitable for dissolv- ing are obtained.

The parting vessels (fig. 10) are of porcelain which, to protect them against fracture by irregular heating, are covered with wire netting and plastered over with a mixture of clay and smithy scales. They are mounted in a frame and set loose in an iron pot with a hemi- spherical bottom, which is heated by a fire from below ; the pot also serves to catch the contents of the porcelain vessel if the latter should be accidentally broken. The cover is

perforated by a hole in the centre for the passage of a lead pipe to carry off the sulphurous acid fumes,

and a smaller one at one side through which acid may be introduced. These, as well as other connexions on the pipes carrying off the vapours, are secured by water-joints. The charge of about 200 ounces (6°25 kilogrammes) of granulated silver is ——— treated with twice its weight of sulphuric acid marking 66° Baumé, and, by care- ful firing, is dissolved in six hours. The proper management of the heat is of im- portance, as neglect in the conduct of the operation may easily lead to a breakage of the pot. When the charge is completely dissolved the liquid is allowed to settle for some time, and is then poured off into a lead pan, where the silver sulphate solidifies. This, when redissolved by an ad- dition of water and careful warming, is treated with strips of copper, the separation of the silver being WY facilitated by agitat- \ ing the liquid. When

the latter is found to be completely free from silver the heating is stopped, and the contents of the pan are allowed to settle for eighteen hours, when the copper solution is drawn off bya siphon and sent to the vitriol crystallizers. In the precipitation of 100 kilogrammes of silver about 30 kilogrammes of sheet-copper are expended.

The precipitated silver is washed with water in a copper vessel upon a linen filter until the reaction of copper in the washings ceases, and then moulded in cylindrical ‘blocks by screw pressure, to express the residual water. These when fire-dried are melted in black-lead pots, holding 75 tb, with the addition of a little soda nitre,

The parted gold remaining in the porcelain pot, though already sensibly finer than is usual when iron parting vessels are used, still contains silver, and is therefore boiled once more with sulphuric acid of 66° Baumé, Afterwards it is washed with water until silver can be no longer detected in the washings, when it is transferred to a porcelain dish and dried. When a quantity of about 10 tb of gold has been accumulated, it is mixed with a little borax glass, melted in a black-lead pot, and cast. The resulting bars average {jy‘5 fine.

Refining by Chlorine Gas.—F. Bowyer Miller! devised in 1867 the following method for separating silver from gold. The process, which is the one now adopted in the Australian mints,? consists in converting the silver into chloride by the passage of a stream of chlorine gas through the molten alloy. Clay crucibles are employed after hav. ing been saturated with a strong solution of borax and allowed to dry. The chlorine is introduced through the gold by a clay pipe passing to the bottom of the crucible, and connected with the chlorine generator in which the necessary pressure is obtained by a pressure tube 8 feet

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1 Chem. Soc. Journ., v. xxi., 1868, p. 506.

2 Fourth Annual Report of Deputy-Master of Mint, 1878, p. 62.

high. The chloride of silver is easily poured off from the surface of the molten metal, and by carefully fusing with a little carbonate of soda, the small amount of gold j, retains is separated and falls to the bottom of the crucible The gold operated upon contains from 3 to 12 per cent, of silver, and the average fineness of the refined gold is 994. The operation is now conducted on a considerable scale in Australia, aud in the years 1871 and 1872 no legs than 1,100,000 ounces of gold were refined by its aid in Sydney alone. Theabsolute loss of gold does not execed 14 parts in 100,000.

Toughening Brittle Gold.—It will be seen from p, 75] that minute traces of certain metals, which do not exceed the zslz9th part of the mass, render gold brittle and unfit for coinage. Miller showed that the removal of the deleterious metals might be effected by converting them into volatile chlorides by a stream of chlorine gas. The process was introduced into the English mint by Roberts, who successfully treated over 40,000 ounces of brittle gold with but trifling loss of precious metal. Wagner has suggested 4 that bromine may replace chlorine in Miller's process. Brittle gold may also be toughened by throwing a sinall quantity of corrosive sublimate on to the surface of the molten metal, but this method is wasteful, and the fumes evolved are deleterious. The late Mr Warington' proposed to tonghen brittle gold by the addition of about 10 per cent. of black oxide of copper. The process is efficacious, but the crucibles become much corroded and even perforated ; the standard fineness of the gold is, more- over, lowered by such copper as is reduced to the metallic state. If gold is but slightly brittle, it may be toughened by pouring it in a thin stream through atmospheric air into a crucible lined with borax, or by the addition of a small quantity of chloride of copper.

Preparation of Pure Gold.—Chemically pure gold may be prepared by several methods. The metal, either in the form of powder or "cornets" from the purest gold that can be obtained, is dissolved in nitro-hydrochloric acid. The excess of acid is driven off, alcohol and chloride of potas- sium added to precipitate platinum, and the chloride of gold is then dissolved in pure distilled water, the solution being diluted until each gallon does not contain

more than half an ounce of the precious metal. The solution is allowed to stand for several weeks, and the supernatant liquid is carefully removed by a siphon from any chloride of silver

{ that may have fallen to the bottom of the vessel. The

gold may then be precipitated by a stream of carefully washed sulpburous anhydride, or by the addition of oxalie acid, formic acid, or ferrous sulphate. The spongy gold is washed with dilute hydrochloric acid, distilled water, ammonia water, and again with distilled water, after which it is melted in a clay crucible with a little bisulphate of potash and borax, and poured intoa stone mould. Roberts" prepared by this method 70 ounces of gold of which the average purity was 999-96, the precipitant being oxalic acid. Gold precipitated by oxalic acid from an acid solu- tion containing copper is always contaminated with cupric oxalate, E. Purgotti? has, however, shown that by heating the solution with the addition of potash, a soluble double oxalate of copper and potash is formed, and the gold is left in the pure state. } Alloys of Gold.—The most important alloys are those with silver

and copper. Those used for coinage at the present day contain from 800 parts of gold in 1000, the standard of the Norwegian 9-kroner

3 First and Second Annual Reports of Deputy-Master of Mint, p. 1870-2, p. 93 and 34 respectively.

4 Bull. Chem. Soc. Paris, t. xxv., 1876, p. 188.

5 Chem. Soc. Journ., xiii. 1860, p.31. :

6 Fourth Annual Report of Royal Mint, 1874, p. 46; Committee of British Association Report, 1873, p. 219,

7 Zeitschr. Anal. Chem., ix. 127.

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piece, to 986°6, that of the Austrian reichsducaten, the alloying metal being mainly eopper. In England, when gold coins were first introduced by Henry III., in 1257, they were of pure gold. Mdward III., in 1345, was the first to use a standard 994°8, and in 1526 Henry VIII. issued crowns of the double rose of the standard 916°6 for concurrent issue with sovereigns, and other coins of the original standard 994°8. In 1544 the standard for all gold coins

Standard Weight.

GOLD

|

Least Current Weight,

Tol

was reduced to 916°6, and again in 1546 to 833°4, the lowest point ever reached in England. Mary restored the old standard 994°8, Elizabeth directed that coins of both standards, 916°6 and 994°8, should be issued, and the latter was employed at intervals until 1640. Since then the lower standard, 916°6, has been solely used, and, as is shown by the following extract from the Coinage Act of 1870, 33 Vic. c. 10, is the one now in use : —

temedy Allowance,

) In America and in those countries which have formed the “ Latin Convention,” the standard of gold coin is 900, with a * of Erooo M. Peligot suggested! valloy containing 58°1 per cent. of gold, 36°1 of copper, and 5°8 of “zinc, a coin might be produced which, 25 francs, would have the decimal weight of 10 grammes.

to 500, the precious metal being developed by ‘ pickling” in a mixture of plum-juice, vinegar, and sulphate of copper. They may be said to possess a series of bronzes, in which gold and silver replace tin and zinc, all these alloys being characterized by patina having a wonderful range of tint. The common alloy, Shi-ya-ku- Vo, contains 70 per cent. of copper and 30 per

eent. of gold ; when xposed t) air it becomes coated with a fine black patina, and is nuch used in Japan for sword ornaments. Gold wire may be drawn af any quality, but it is usual to add 5 to 9 dwts. of copper to the »ound

The “solders” used for red gold contain 1 part of copper and 5 pf gold ; for light gold, 1 part of copper, 1 of silver, and 4 of gold.

Alloys of Gold and Silver,—Electrum, the natural alloy of gold vnd silver, has already been described, p. 740. Matthiessen ob- served that the density of those alloys, the composition of which yates from AuAg, to AugAg, is greater than that calculated from he densities of the constituent metals.

ormule AuAg, AuAg,, AuAg,, and AuAgy) are perfectly homo- Hatchett has shown,* nies of carcful experiments, that certain metals, even when | quantities as the zyy5th part of the mass, eader standard gold brittle and unfit for rolling. These metals are aismuth, lead, antimony, arsenic, and zinc. | Gold and Zine.—With regard to the latter metal, it may be ematked that, although its presence in small quantities renders old brittle, it may be added to gold in larger quantities without estroying the ductility of the precious metal, for, as has been lready stated, Peligot proved that a triple alloy of gold, copper, “nd zine, which contains 5‘8 per cent. of the last-named, is perfectly uctile. The alloy of 11 parts gold and 1 part of zinc is, however, tated to be brittle.) Gold and Tin.—Alchorne® showed that gold alloyed with 3th jart of tin is sufficiently ductile to be rolled and stamped into coin, rovided the metal is not annealed at a high temperature. The lloys of tin and gold are hard and brittle, and the combination of ‘he metals is attended with contraction ; thus the alloy SnAu as a density 14243, instead of 14‘828 indicated by ealculation. atthiessen and Bose® obtained large erystals of the alloy Au,Sn,, -aving the colour of tin, which changed to a bronze tint by oxidation. Gold and Iron.—Hatchett found that the alloy of 11 parts gold nd 1 part of iron is easily rolled without annealing. In these Toportions the density of the alloy is less than the mean of its nstituent metals,

1 Comptes Rendus, t. \xxvi. p. 1441,

2 Ure’s Dictionary of Arts. 7th editian, 1875, vol. i p 96.

3 Ann. de Chim. et de Phys. (3), t. xxxvi. p, 183, and t, xxxix. p. 163, 4 Phil Trans. 1803, part 1, pp. 43-194.

5 Phil. Trans., 1784,

® Proc. Roy. Soc., vol. xi. 1860-2, p. 433

Denomination of TT] —— ; ‘Caybiy Imperial Metrie Imperial Metrie Standard Fineness. Weight per piece. Weight, Weight. Weight, Weight. Tswaend Metric Millesimal Grains. Grams. Grains. Grams, Gul Grams. Fineness. GoLp—

EUBVGILOUNG, 01 4.00eeceeseves 616°37239 | 39°94028 | 612°50000 | 39°68935 Eleven-twelfths fine |) 1:00000 0°:06479

EPO SOUM oo sc scci eve cesnes 246°54895 | 15°97611 | 245-00000 | 15°87574 gold, onetwelfth alloy; |{ 0°40000 0°02592 ;

Sovereign voce 123°27447 | 798805 | 122°50000 | 7-93787) | or millesimal fineness | 0-20000 | 0-o1296 | ¢ 9-002

Half-Sovereign…... ...00.., 61°63723 3°99402 | 61°12500] 3:96083 { | 916-66. 0‘10000 0°00648

Gold and Palladium.—These metals are stated to alloy in all proportions. According to Chenevix,7 the alloy composed of equal parts of the two metals is grey, is less ductile than its constituent metals, and has the specific gravity 11:08. The alloy of 4 parts of gold and 1 partof palladium is white, hard, and ductile. Graham has shown® that a wire of palladium alloyed with from 24 to 25 parts of gold does not exhibit the remarkable retraction which, in pure palladium, attends its loss of occluded hydrogen.

Gold and Platinum.—Clarke states that the alloy of equal parts of the two metals is ductile, and has almost the colour of gold.

Goldand Rhodiun.—Gold alloyed with 4th or 4th of rhodium is, according to Wollaston, very ductile, infusible, and of the colour of gold.

Gold and Iridium.—Small quantities of iridium do not destroy the ductility of gold, but this is probably because the metal is only disseminated through the mass, and not alloyed, as it falls to the bottom of the crucible in which the gold is fused.

Gold and Nickel.—Eleven parts of gold and 1 of nickel yield an alloy resembling brass.

Gold and Cobalt.—Eleven brittle alloy of a dull yellow

Assay of Gold.—It may be well to supplement the information given in the article Assayine with some additional details as to the assay of gold bullion, as practised in the Royal Mint, and of gold ores. The assay of bullion consists of six operations :—

(1.) The sample of metal taken for assay is flattened, and an assistant adjusts a portion of it to an exact weight by cutting or filing. This weight varies with different operators from 5 to 16 grains. The assayer then eompletes the adjustment on a more sensitive balance. The prepared assay piece is wrapped in lead foil, together with a certain amount of pure silver, which is generally equal to 24 times the amount of gold assumed to be present. In the case of standard gold, the weight of lead employed is to the weight of the alloy taken for assay as 8 to1, and the ratio of the weight of lead to the weight of copper present is 100:1. Much diversity of opinion exists as to the amount of lead that should be employed. The pro- portions recommended by D'Arcct® are considerably less than those advocated by Kandelhardt ;!9 and it may be stated, with regard to the silver, that the last mentioned authority and Chaudet recommend the proportion of 1 of gold to 23 of silver, but Pettenkofer states that the proportion need not exceed 1 to 14, provided that the subsequent boiling in nitric acid is sufficiently prolonged. The amount of gold lost in cupellation has been shown by Rossler to increase with the amount of lead used, and to decrease as the amount of silver is increased,"

(2.) The necessary number of cupels are arranged on the bottom of the muffle (fig. 2, AssAyine), and the packets containing the silver and gold are transferred from a numbered wooden range to corresponding cupels. The

furnace operations are then performed as is described in ASSAYING (p. 727), and the result iy that each eupel eontains a button of silver and gold.

(3.) The button (fig. 11) is flattened by striking it with a hammer on a polished anvil, first in the centre, and then on the edge, a third blow being given on the opposite edge which elongates the metal. After annealing in an iron tray, the flattened buttons 6 are reduced by laminating rolls to the thickness of a visiting eardc, They are again annealed and rolled into a spiral or cornet .

(4.) These corncts are then treated with nitric acid of specific gravity 1°2, either separately in parting flasks, or together in cups

parts of gold and 1 of cobalt forma colour,

i Wurtz, Dictionnaire de Chimie, t. ii, p. 630.

8 Proc. Roy. Soc., xvii. p. 503. ;

® Bodemann's Anleituna zur Berg- und Hiittenmdnnischen Probierkunst, 2a ed., 1856, p. 360.

10 Gold-Probirverfahren, p. 8.

Mt Dingl. Polytech. Journ., 206, p. 185.

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of platinum, which are introduced into a suitable vessel of platinum, an arrangement by whieh it will be evident much time may be saved. The boiling is then continued for fifteen or twenty minutes, when the eornets are washed with distilled water, and treated with nitric acid of specifie gravity 1°38, and in this the cornets remain for

about the same period, after which they are again washed in distilled water and dried.

Fig, 11.

(5.) The cornets are annealed, separately, in little clay crucibles, or in the platinum cups in which they have been boiled, by heating them to bright redness. They then diminish eonsiderably in bulk as ¢ (fig 11), and are of a pure yellow colour.

(6.) The cornets are then weighed in comparison with '* check assays" made on pure gold. These " checks" are necessary, as the aeeuracy of the result of an assay is Hable to be affeeted either by retention of silver or copper, or by loss of gold by volatilization in the muffle, solution in the acid, or retention in the eupel. The weight of gold, therefore, indieated by the balanee, may be either less or greater than the amount originally present in thealloy. The correction to be applied to a gold assay will be evident from the following formula :'—

Let 1000 be the weight of alloy originally taken ;

p the weight of the piece of gold finally obtained ;

1. the actual amount of gold"in the alloy expressed in thousandths ;

a the weight of gold (supposed to be absolutely pure) taken as a cheek, which approximately equals x ;

b the loss or gain in weight experienced by @ during the process of assay, expressed in thousandths ;

i: the variation of ''cheek gold" from absolute purity, ex- pressed in thousandths ;

then the actual amount of fine gold in the echeck-piece

= a(1 –) and # the corrected weight of the assay will

=p- a +b; b being added or subtracted according as it is a loss or gain. If a be assumed to be equal to x this equation becomes

ds ne ie ° 1000. Example.—Let p = 901'1 thousandths. a = 920°0 oy b= 053 Ho gain in weight. k= O'1 25 Then by the first formula— x = Gorg*-/ Mt 9-8;

1000

For, as 0 is a gain in weight, it must be deducted, hence x = 901‘1 — 0:092 — 0°3

= 900‘708.

And by the second formula—

2 . 9011-03

A Ol ae 1000 = 900°708

Assay of Gold Ores.—500 grains of the finely powdered sample, which must be taken with the greatest care and aceuraey, is passed through a sieve of fine wire gauze with at least 80 meshes to the linear inch. Any residue there may be of flattened particles of gold is set aside for subsequent treatment, usually by direet eupel- lation. Assay of the ore by fusion with litharge is best suited to ores which do not contain mueh iron pyrites. For auriferous quartz

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1 Fourth Annual Report of the Deputy-Master o, if the Mint, 1873, p. 42.

GOLD

500 grains of the ore are fused with 500 grains of red lead, 300° grains of sodie earbonate, 20 grains of powdered eliareoal, and 250 grains of borax. The mixture is introduced into a elay erucible whieh it should half fill, and is fused in an air furnace. The button of reduced lead may be removed, either by pouring the eontents of the erueible into a mould, or by breaking the crueible when cold If the ore eontains much iron pyrites, or is of the nature of “sweep,” the name given to carbonaceous residues which accumu- late in mints and goldsmiths’ shops, it will be necessary to roast it in a shallow fire-clay dish placed in a muffle. In the ease of pyrites containing about 7 dwts. to the ton, the operation would be con. ducted on about 1000

grains. The roasted ore is then fused with about the same mixture of fluxes as has been given for quartz,

Assay by Scorification.—Scorification resembles eupellation, but the oxide of lead produced in the operation, instead of sinking into a porous cup, is held in a flat saucer of fire-clay, and dissolves the earthy constituents of the ore, leaving the precious metal to pass into another portion of lead whieh remains in the metallic state, About 200 grains of the roasted ore ate placed in the scorifier intimately mixed with 500 grains of granulated and 50 grains df borax lead ; 500 grains of lead are then distributed over the surface of the mixture ; the contents of the seorifier are fused in a mutile ; air is admitted to oxidize the greater portion of the lead; and, at the conclusion of the operation, the litharge should be perfectly fluid and eover the molten lead. The slag may be freed he par- ticles of precious metal by the addition at the conclusion of the operation of a small quantity of powdered anthracite, which re- duees a portion of the litharge to metallic globules, which fall through the slag and unite with the lead button. The gold is then separated by cupellation, and the silver with which it is nearly always associated is removed by parting in nitrie acid.

Assay by means of the Speetroscope.— Lockyer and Roberts? state, as the result of a careful speetroscopie investigation of the alloys of gold and copper, that it is possible to distinguish between alloys of these metals which only differ in proportion by yy oth part. Their experiments have been repeated in America by A. E. Outerbridge.® (W. C. R.—H. B.)

It will be convenient to give here, in connexion with the article Gop, rather than in their proper alphabetical place, the articles GoLDBEATING and Gop Lacg.

GOLDBEATING. ‘The art of goldbeating is of great antiquity, being referred to by Homer ; and Pliny states that one ounce of gold was extended to 750 leaves, each leaf being four fingers square, which is three times the thickness of the ordinary leaf gold of the present time, In all probability the art originated among Oriental communi- ties, where the working of gold and the use of gold orna- ments have been distinguishing characteristics from the most remote periods; and in India goldbeating 1s still carried on asa craft involving many mysteries and great difficulties. On the coffins of

the Theban mummies speci- mens of original leaf-gilding are met with, where the gold is in so thina state that it resembles modern gilding. The Incas of Peru do not appear to have been able to reduce gold further than to plates which could be nailed for orna- mentation on the walls of their temples. In England goldbeating was confined to London until within the present entury. It was introduced into Scotland and the United States within that period, and it is now practised in most towns of any considerable size ; but 80 far as concerns Great Britain it is principally centred in London. One grain of gold has been beaten out to the extent of 75 square inches, and the same weight of silver to 98 square inches. Taking a cubic inch of gold at 4900 grains, this gold-leaf is the 367,650th part of an inch in thickness, of about 1200 times thinner than ordinary printing paper. ‘The silver, though spread over a larger surface, was thicker, owing to the difference in its specific gravity ; but, — lated by weight, silver is the most malleable metal with which we are acquainted, in that respect considerably exceeding gold. This experiment does not, ie determine the extent of the malleability of either meta as the means employed to test it were found to fail before there was any appearance of the malleability of the metal

2 Phil. Trans., 1874, vol. elxiv. p. 495. 3 Journal of the Franklin Instatute, 1874.

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being exhausted. In practice the average degree of tenuity to which the gold is reduced is not nearly so great as the example above quoted. A “book of gold” containing 25 | leaves measuring each 3} inches, equal to an area of 264 | square inches, generally weighs from 4 to 5 grains,

The gold used by the goldbeater is variously alloyed, according to the variety of colour required. Fine gold is ‘commonly supposed to be incapable of being reduced to thin leaves. This, however, is not the case, although its use for ordinary purposes is undesirable on account of its | greater cost. It also adheres on one part of a leaf touching another, thus causing a waste of labour by the leaves being spoiled; but for work exposed to the weather it is niuch preferable, as it is more durable, and does not tarnish or change colour. The external gilding on many public build- ings, such, eg,, as the Albert Memorial in Hyde Park, London, is done with pure

gold. The following is a list of the principal classes of leaf recognized and ordinarily prepared by British beaters, with the proportions of alloy__per ounce they contain.

i, i. maray r ii o,) Ms Name of Leat oa eo Grains. Grains Giains, RUMEMME Te scicccracuccusscee seus 456-460 20-24 HEART EC cee .cccsscsssessvecesencees 464 a 16 EIPAVANCCED ce scccceceaeveascnenes 456 12 12 BORE cs 5 siioliuestiis .aGeeeees vs 444 24 12 OMEN oes teh sce cis cise cleitees 440 30 10 BONER cass eeees caddies onesees 408 72 a Go 384 96 MCE OR cre e's sios seiscase cna dresi 0 860 120 BPECMEOL PAC. .....ssaccsusencsses 312 168 BME B i s:ccrireaissineta tn onaa eae 240 240

The process of goldbeating is thus conducted. The gold, having been alloyed according to the colour desired, is melted in a cru- cible, at a higher temperature than is simply necessary to fuse it, as Jits malleability is improved by exposure to a greater heat; sudden__cooling does not interfere with its malleable properties, gold differing ' in this respect from some other metals. It is then cast into an ingot, and flattened, by rolling betwcen a pair of powerful smooth steel rollers, into a ribbon of 14 inch wide and 10 feet in length to the -ounce. After being flattened it is annealed and cut into pieces of about 6$ grs. each, or about 75 per ounce, and placed between the ' leaves of a '' cutch," which is about half an inch thick and 34 inches – square, containing about 180 leaves of a tough paper manufactured Jin France. Formerly fine vellum was used for this purpose, and generally still it is interleaved in the proportion of about one of vellum to six of paper. The cutch is beaten on for about 20 minutes with a 17-pound hammer, which rebounds by the elasticity of the skin, and saves the labour of lifting, by which the gold is spread to the size of the cutch; each leaf is then taken out, and cut into four "pieces, and put between the skins of a ''shoder," 44 inches square 'and ¥ths of an inch thick, containing about 720 skins, which have been worn out in the finishing or '' mould" process. The shoder requires about two hours' beating upon with a 9-pound hamnner. As the gold will spread unequally, the shoder is beaten upon after the larger leaves have reached the edges. The effect of this is that__the margins of larger leaves come ont of the edges in a state of dust,

This allows time for the smaller leaves to reach the full size of the ‘shoder, thus producing a general evenness of size in the leaves. Each leaf is again eut into four pieces, and placed between the leaves of a “mould,” composed of about 950 of the finest gold-beaters’ skins, five inches square and three-quarters of an inch thick, the contents /of one shoder filling threo moulds. The material has now reached) the last and most difficult stage of the process; and on the fineness of the skin and judgment of the workman the perfection and thin- ness of the leaf of gold depend. During the first hour the hammer is allowed to fall principally upon tho centre of the mould. This causes gaping cracks upon the edges of the leaves, the sides of which readily coalesce and unite without leaving any trace of the union after being beaten upon. At the second hour, when the gold is about the 150,000th part of an inch in thickness, it for the first time per- mits the transmission of the rays of light. In pure gold, or gold but slightly alloyed, the green rays are transmitted; and in gold highly alloyed with silver, the pale violet rays pass. The mould Yequires in all about four hours’ beating with a 7-pound hammer, /when the ordinary thinness for the gold leaf of commerce will be reached. A single ounce of gold will at this stage be extended to 75× 4× 4=1200 leaves, which will trim to squares of about 34 imehes cach. The finished leaf is then taken out of the mould,

and the rough edges are trimmed off by slips of the ratan fixed in parallel grooves of an instrument called a waggon, the leaf being laid upon a leathern cushion for that purpose. ‘The sizes to which British leaf is cut are 8, 34, 3}, 38, and 34 inches. The leaves thus prepared are placed into “books” capable of holding 25 leaves each, which have been rubbed over with 1¢d ochre to prevent the gold clinging to the paper. The leaf is used for gilding picture-frames, and for other ornamental purposes. See GILDING.

The fine membrane called goldbeaters’ skin, used for making up the shoder and mould, is the outer coat of the cecum or blind gut of the ox. It is stripped off in lengths about 25 or 30 inches, and freed from fat by dipping in a potash solution and scraping with a blunt knife. It is afterwards stretched on a frame ; two membranes are glued together, treated with a

solution of aromatic substances or camphor in isinglass, and subsequently coated with white of egg. Finally they are cut into squares of 5 or 54 inches ; and to make upa mould of 950 pieces the gut of about 380 oxen is required, about 2} skins being got from each animal. A skin will endure about 200 beatings in the mould, after which it is fit for use in the shoder alone.

The dryness of the cutch, shoder, and mould is a matter of extreme delicacy. They require to be hot-pressed every time they are used, although they may be used daily, to remove the moisture which they acquire from the atmo- sphere, except in extremely frosty weather, when they acquire so little moisture that then a difficulty arises from their over-dryness, whereby the brilliancy of the gold is diminished, and it spreads very slowly under the hammer. On the contrary, if the cutch or shoder be damp, the gold will become that which is technically termed hollow or sieve-like ; that is, it is pierced with innumerable micro- scopical holes; and in the moulds in its more attenuated state it will become reduced to a pulverulent state. This condition is more readily produced in alloyed golds than in fine gold. It is necessary that each skin of the mould should be rubbed over with calcined gypsum (the fibrinated variety) each time the mould may be used, in order to pre- vent the adhesion of the gold to the surface of the skin in beating. Dentist gold is gold leaf carried no further than the cutch stage, and should be perfectly pure gold.

By the above process also silver is beaten, but not so thin, the inferior value of the metal not rendering it com- mercially desirable to bestow so much labour upon it, Copper, tin, zinc, palladium, lead, cadniium, platinum, and aluminium can be beaten into thin leaves, but not to the same extent as gold or silver.

GOLD AND SILVER LACE. Under this heading a general account may be given of the use of the precious metals in textiles of all descriptions into which they enter. That these metals were used largely in the sumptuous textiles of the earliest periods of civilization there is abund- ant testimony; and to this day, in the Oriental centres whetice a knowledge and the use of fabrics inwoven, orna- mented, and embroidered with gold aud silver first spread, the passion for such brilliant and costly textiles is still most strongly

and generally prevalent. The earliest mention of the use of gold in a woven fabric occurs in the description of the ephod made for Aaron (Exod. xxxix. 2, 3)—" And he made the ephod of gold, blue, and purple, and scarlet, and fine twined linen. And they did beat the gold into thin plates, and cut it into wires (strips), to work it in the blue, and in the purple, and in the scarlet, and in the fine linen, with cunning work." In both the /iiad and the Odyssey distinct allusion is frequently made to inwoven and embroidered golden textiles. Many circumstances point to the conclusion that the art of weaving and embroidering with gold and silver originated in India, where it is still principally prosecuted, and that from one great city to another the practice travelled westward,—Babylon, Tarsus, Baghdad, Damascus, the islands of a and Sicily, Con-

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stantinople and Venice, all in the process of time becom- ing famous centres of these much prized mauufactures. Alexander the Great found Indian kings and princes arrayed in robes of gold and purple; and the Persian monarch Darius, we are told, wore a war mantle of cloth of gold, on which were figured two golden hawks as if pecking at each other. There is reason, according to Josephus, to believe that the "royal apparel" worn by Herod on the day of his death (Acts xii. 21) was a tissue of silver, Agrippina, the wife of the emperor Claudius, had a robe woven entirely of gold, and from that period downwards royal personages and high ecclesiastical digni- taries used cloth and tissues of gold aud silver for their state and ceremonial robes, as well as for costly hangings and decorations. In England, at differeut periods, various names were applied to cloths of gold, as ciclatoun, tar- tarium, naques or nac, baudekin or baldachin, Cyprus damask, and twssewys or tissue. The thin flimsy paper known as tissue paper, is so called because it originally was placed between the folds of gold "tissue " to prevent the contiguous surfaces from fraying each other. At what time the drawing of gold wire for the preparation of these tex- tiles was first practised is not accurately known. The art was probably introduced and applied in different localities at widely different dates, but down till

medizeval times the method graphically described in the Pentateuch continued to be practised with both gold and silver.

Fabrics woven with gold and silver continue to be used on the largest scale to this day in India; and there the preparation of the varieties of wire, and the working of the various forms of lace, brocade, and embroidery, is at once an important and peculiar art. The basis of all modern fabrics of this kind is wire, the “gold wire” of the manufac- turer being in all cases silver gilt wire, and silver wire being, of course, composed of pure silver. In India the wire is drawn by means of simple draw-plates, with rude and simple appliances, from rounded bars of silver, or gold- plated silver, as the case may be. The wire is flattened into the strip or ribbon-like form it generally assumes by passing it, fourteen or fifteen strands simultaneously, over a fine, smooth, round-topped anvil, and beating it as it passes with a heavy hammer having a slightly convex surface, From wire so flattened there is made in India soniri, a tissue or cloth of gold, the web or warp being composed entirely of golden strips, and rupert, a similar tissue of silver. Gold lace is also made on a warp of thick yellow silk with a weft of flat wire, and in the case of ribbons the warp or web is composed of the metal. The flattened wires are twisted around orange (in the case of silver, white) coloured silk thread, so as completely to cover the thread and present the appearance of a continuous wire ; and in this form it is chiefly employed for weaving into the rich brocades known as kincobs or kinkhdbs. Wires flattened, or partially flattened, are also twisted into exceed- ingly fine spirals, and in this form they are the basis of numerous ornamental applications. Such spirals drawn

GOLDAST, Mertcator HarminsFELp (1576-1635), an historical writer and collector whose works did great service to the study of the older documents of Germany, was born, January 6, 1576 (or 1578), of poor Protestant parents, near Bischofzell in Thurgau. His university career at Ingoldstadt and Altdorf was cut short by his poverty; but at length, in 1603, after he had spent some time at St Gall and Geneva, partly supported by the learned and benevolent jurist Bartholomeus Schobinger, he obtained the post of secre- tary to Henry, duke of Bouillon, and with him he went to Heidelberg and Frankfort-on-the-Main. But Goldast,

out till they present a waved appearance, and in that state flattened, are much used for rich heavy embroideries termed karchobs. Spangles for embroideries, &c., are made from spirals of comparatively stout wire, by cutting them down ring by ring, laying each C-like ring on an anvil, and bya smart blow with a hammer flattening it out into a thin round disk with a slit extending from the centre to one edge. Fine spirals are also used for general embroidery purposes. The demand for various kinds of loom-woven and embroidered gold and silver work in India is immense ; and the variety of textiles so ornamented is also very great, "Gold and silver," says Dr Birdwood in his Handbook to the British-Indian Section, Paris Exhibition, 1878, "are worked into the decoration of all the more costly loom. made garments and Indian piece goods, either on the borders ouly, or in stripes throughout, or in diapered figures, The gold-bordered loom embroideries are made chiefly at Sattara, and the gold or silver striped at Tanjore ; the gold figured mashrus at Tanjore, Trichinopoly, and Hyderabad in the Deccan; and the highly ornamented gold-figured silks and gold and silver tissues principally at Ahmedabad, Benares, Murshedabad, and Trichinopoly."

Among the Western communities the demand for gold aud silver lace and embroideries arises chiefly in connexion with naval and military uniforms, court costumes, public and private liveries, ecclesiastical robes and draperies, theatrical dresses, and the badges and insignia of various orders. To a limited extent there is a trade in gold wire and lace to India and China. The metallic basis of the various fabrics is wire round and flattened, the wire being of three kinds—Ist, gold wire, which is invariably silver gilt wire; 2d, copper gilt wire, used for common liveries and theatrical purposes ; and 3d, silver wire. These wires are drawn by the ordinary processes, and the flattening, when done, is accomplished by passing the wire between a pair of revolving rollers of fine polished steel. The vari- ous qualities of wire are prepared and used in precisely the same way as in India,—round wire, flat wire, thread made of flat gold wire twisted round orange-coloured silk or cotton, known in the trade as "orris," fine spirals and spangles, all being in use in the West as in the East. The lace is woven in the same manner as ribbons, and there are very numerous varieties in richness,

pattern, and quality. Cloth of gold, and brocades rich in gold and silver, are woven for ecclesiastical vestments and draperies.

The proportions of gold and silver in the gold thread for the lace trade varies, but in all cases the proportion of gold is exceedingly smal], An ordinary gold lace wire is drawn from a bar containing 90 parts of silver and 7 of copper, coated with 3 parts of gold. On an average each ounce troy of a bar so plated is drawn into 1500 yards of wire; and therefore about 16 grains of gold cover a mile of wire, It is estimated that about 250,000 ounces of gold wire are made annually in Great Britain, of which about 20 per cent. is used for the headings of calico, muslin, &c., and the re- mainder is worked up in the gold lace trade.

though able and laborious, had fallen into an unsettled way of life, and in 1604 we find him in the service of the Baron Hohensax—then the possessor of that unique manuscript of old German poems which now forms one 0 the treasures of the National Library at Paris, and which Goldast was the first to make partially accessible by the Before long he was back in Switzerland, and by

press. 1606 he was again in Frankfort living by his pen, a0 finding his efforts to obtain a regular post frustrated by

Lipsius aud Scioppius, whom he had offended by his out- spokenness. In 1611 he was appointed councillor at the

court of Saxe- Weimar ; in 1615 he entered the service of the count of Schaumburg at Biickeburg, and in 1625 returned to Frankfort. As the transport of his books from Biicke- burg to Frankfort was attended with danger, owing to the warlike operations then on foot, he entrusted them to the town of Bremen, and they now form part of the municipal library. Appointed in 1627 councillor to the emperor and to the elector of Treves, Goldast soon after passed into the service of the landgrave of Hesse-Darmstadt, who raised him to be chancellor of the university of Giessen. He died at Giessen in the beginning of 1635. Nothing perhaps proves the value of Goldast’s labours better than the fact that, in consideration of the service he has rendered, the modern historical and philological investigator is

willing to condone the almost unpardonable sin of direct literary forgery of which he has been accused and convicted.

Among his more important works are his Parcneticorum veterum (Lille, 1604), which contained the Kunig Tyro von Schottland, the Winsbeken, and the Winsbekin; Rerum Alamanniearum Seriptores, Frankf. 1606, 3 vols., new ed. by Senckenberg, ibid. 1730; Monarehia S. Romani imperit, Frankf. 1621; Commentarti de regno Bohemie, Hanover, 1627, new ed. by H. Schmink, Frankf. 1719. He edited the works of Pirkheimer aud De Thou; and a volume of correspondence, Virorum Cll. ad Goldastum epistole, was published in 1688, See Senckenberg's Goldasti Memoria, prefixed to Ler, Alamann. Serip., 1730; Bayle's Dietionary; and Von Raumer, Geschiehte der germanisehen Philologie, Munich, 1870.

GOLDBERG, a town in the Prussian province of Silesia,

capital of a circle in the government district of Liegnitz, is situated 14 miles 8.W. of that town, on the Katzbach, an atfluent of the Oder. The principal buildings are an old church dating from the beginning of the 13th century, the Schwabe-Prieseinuth institution, completed in 1876, for the board and education of orphans, and the gymnasium, which in the 17th century enjoyed great prosperity, and numbered ' Wallenstein among its pupils. The chief manufactures are woollen cloth, flannel, gloves, stockings, leather, and beer, and there is a considerable trade in corn and fruit. Gold- berg owes its origin and name to a gold mine in the neigh- bourhood, which, however, has been wholly aandoned since the time of the Hussite wars. Population (1875), 6492. The town suffered heavily from the Tartars in 1241, from the plague in 1334, from the Hussites in 1428, and from the Saxon, 'imperial, and Swedish forces during the Thirty Years' War. On » 27th May 1813 a battle took place near it between the French under Macdonald and the rear guard of the Russians under Wittgenstein; / and on the 23d August of the same year a skirmish, in which Mac- donald suffered defeat from the Prussians under Bliicher. GOLD COAST, a British colony in Western Africa recon- ~ stituted on the 24th of July 1876 by a royal charter which defines it as consisting of two settlements—(1) the Gold Coast proper, comprising "'all places, settlements, and terri- tories which may at any time belong to us in Western Africa, between the fifth degree of

west longitude and the second degree of east longitude ; and (2) the settlement of Lagos, similarly comprising all possessions between the second and fifth degrees of east longitude." The charter appoints a governor, establishes a legislative andan executive } council, and authorizes the appointment of judges and other 'legal officers, &c. Both the Gold Coast colony and Lagos had previously been administered by lieutenant-governors dependent on the governor of Sierra Leone; and the two 'divisions are still sufficiently distinct to require separate treatment.

By Bosman, the Dutch factor at Elmina iu the begin- ning of the 18th century, the Gold Coast is said to extend "about 60 miles, beginning with the Gold River, 3 miles /west of Assini, or 12 miles above Axim, and ending with the village Ponni, 7 or 8 miles east of Acra."! jIn modern times, Cape Apollonia (2° 35' W. long.) being

1 See Nawwhkeurige Besehryving van de Guinese Goud-Tand-en | Slave Kust, Amsterdam, 1709 (frequently translated).

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accepted as the western boundary, and the mouth of the Volta river (0° 41' 2" E. loug.) as the eastern, the whole coast measures about 225 miles, and this is divided into two sections, the windward or western and the leaward or eastern, the boundary between the two being the Sccoom river (0° 3° 2" W. long,). Beginning at the west, the first places on the coast that deserve to be mentioned are Grand Bassam and Assini, both French settlements up to 1870. The mouth of the river Assini forms the outlet of a series of lagoons, the eastmost of which is fed by a considerable river —the Tanno or Tando. About 55 miles eastward from this point are the Four Hills or Hummocks of Apollonia, where the English formerly had a fort; and about 20 miles from Apollonia is the mouth of the Ankobne. Three miles further and we come to Axim, the site of an old Dutch fort built near the mouth of the Axim river; and other 20 miles and we reach Great Friedriclsburg, founded by the Brandenburg Company. Rounding Cape Three Points (2° 7' W. long.), whose vicinity is marked by a line of breakers nearly 2} miles long, the first place of importance that we find is Akodah or Aquidah, and 10 miles

beyond Akodah lies the better known Dixcove or Dick's Cove. From Dixcove Pompendi is distant 10 miles, and other 12 or 13 miles brings us to Secondee, which is only 8 or 9 miles from the mouth of the Busum (or Sacred) Prah. With the exception of the Volta this is the largest river of the Gold Coast; it is on one of its sub-tributaries that Coomassee is situated. At the mouth of the Beyah, 19 or 20 miles eastward, stands Elmina, or in the native language Edena, one of the most important posts of European settlement, with a native population of some 10,000 (see Exmina). Eight miles east of Elmina is Cape Coast Castle, which was the capital of the British territory until 1876. Anamaboe, 10 miles distant, is a town of some 4000 or 5000 inhabitants, with a free port and a good landing-place ; and about 38 miles further on we come to Winnebah, which up till 1812 was the seat of an English fort. About 11 miles eastward there is another abandoned fort at Barrocoe; and at Barrocoe we are only 23 miles from Acra or Accra (in Tshi Nkran), the preseut capital of the Gold Coast colony. It was selected instead of Cape Coast Castle on account of its comparatively healthy position. In the words of Dr A. F. Elliot, it is the healthiest station on the west coast of Africa, being surrounded for miles by fresh undulating ground, and backed at the distance of a day's journey, or about 30 miles, by a range of hills where Europeans can recruit. A sanitary station has been fixed at Akropong, 1800 feet above the sea-level, where the Basel missionaries have their headquarters. About 2 miles east of Acra is the old Danish fort of Christiansborg. There is no station of much importance except Tassi, Ponce, and Great Ningo or Ningua, in the 60 miles between Acra and the Volta. The Volta, otherwise known as the Firaw, the Shilao, or tlie Amu, is a large river, the course of which has been only partially explored, but which may be ex- pected to furnish a means of opeuing up the interior. In December 1875, M. M. J. Bonnat, journeying partly by water and partly by land, proceeded as far as Salaha or Paraha, a commercial town of some 18,000 inhabitants. He reports that the Labelle rapids, though 25 feet high, can be ascended by steamers during the rains in September and October, because at that season the river rises 50 fect. The lower part of the course is of difficult navigation in the dry season owing to the shallows, Addah, on the right bank of the river near its mouth ; Quittah, the seat of a British fort; and Jellah Coffi, a trading port, are the principal places on the coast between the Volta and Flouhow, which lies at the eastmost extremity

of the Volta lagoon. Accord- ing to the ordinary divisions we enter the Slave Coast when we proceed east of the Volta.

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Sueh are the chief points of interest along the Gold Coast, but there is a considerable range of territory extending from 20 to 60 iniles inland, which belongs to the colonial protectorate; and about this a few words are necessary. ‘The western portion of the pro- tectorate is occupied by the woody hill country of Fanti, which stretches northwards towards Ashantee. From the mouth of the Secoom a fine range varying in height from 1200 to 1500 or 1600 fect stretches N.N.E., and divides the eastern portion into two halves. Between the monutains and the sea there are large stretches of prairie land, in which the grass grows to a height of 10 or 12 feet. The inhabitants of the Gold Coast may be divided into two great classes—the Tshi or Chee, a black type, and the Acra, a red type. The Fantis and Ashantis, both belonging to the former class, have already been described in ASHANTEE. The Akems live ina thick forest region, and maintain existence by hunting, gold-digging, and the gathering of wood snails. The capital of their country 1s Kyebi.1 The Aquapems are extensively engaged in agriculture and in trade, both with the other tribes and with Europeans. The Ga or Acra, a clever race, greatly modified by contact with European culture, are to be found in all the towns of the West African coast as artisans and sailors. They are employed by the interior tribes as middle men and interpreters. On the right bank of the Volta are the Adangme? or Adampe, distinguished by strength and rude- ness. The Crobos live in little villages in the midst of the palm tree woods which grow round about the Croboberg, an eminence about 1000 feet high. ~The Tshi or Chee language? belongs to the great prefix-prono- minal group. Jt comprises many dialects, which may, however, be reduced to two classes or types.* Akan dialects are spoken in Assini, Amanahia (Apollonia), Awini, Ahanta, Wasaw, Tshuforo (Juffer or Tufel), and Denkyera iu the west, and in Asen, Akein, and Aquapem in the east, as well as in the different parts of Ashantee. Fante dialects are spoken, not only in Fanti proper, but in Afutu or the country round Cape Coast, in Abora, Agymako, Akomfi, Gomoa, and Agona. The

difference between the two types is not very great; a Fanti, forexample, can converse without much difficulty with a native of Aquapem or Ashantee, his language being in fact a deteriorated form of the same original. Akemis considered the finest and purest of all the Akan dialects. The Aquapem, which is based on the Akem but has imbibed Fanti influences, has been made the book-language by the Basel missionaries. About a million people in all, it is estimated, speak dialects of the Tshi. The south-eastern corner of the Gold Coast is occupied by another Janguage known as the Ga or Acra, which comprises the Ga proper and the Adangme and Crobodialects. Ga proper is spoken by about 40,000 people, including the inhabitants of Ga and Kinka (7.¢., Dutch and British Acra, in Tshi, Nkran, and Kankan), Osu (7.¢., Christiansborg), La, Tessi, Ningua, and numerous inland villages. It has been reduced to writing by the missionaries. The Adangmie and Crobo dialects are spoken by about 80,000 people. They differ very considerably from Ga proper, but books printed in Ga can be used by both the Crobo and Adangme natives, Another language known as Guan is used in parts of Aquapem and in Anum beyond the Volta; but not much is known either about it or the Obutu tongue spoken in a few townsin Agona, Gomoa, and Akomfi. The dialects of the Ahanta country have still to be investigated.° Mahometanism and Christianity are both making themselves felt to some extent among the natives of the Gold Coast. A Danish mmission was started at Christiansborg about 1736 by Protten and Huckoff, the Moravian brethren. In 1835 the Wesleyan mission began its labours among the Fanti. The Basel missionaries had nade a start in 1828, but it was not till 1835 that they were fairly settled at Akropong, the capital of Aquapem. They now have stations also at Kyebi, at Kukurantimy, at Abune, at Abokoli, at Addah, and at Acra, and the leaders of the English expedition against the Ashantces speak very highly of their labours.

The climate of the Gold Coast is notoriously unhealthy. At Cape Coast Castle the thermometer ranges from 72° to 85° or 90°, and the amount of moisture in the atmosphere is very great. Not only are the coasts in many places lined with swamps and lagoons, but, according to Dr Gordon, the

1 See an interesting paper by Captain Hay. ‘‘On the District of Akem in West Africa,” in Journ. Roy. Geogr. Soc., London, 1876.

2 Adangme == Adan-gbe, 7.c., Adah language, so called from the town of Ada or Addah on the Volta.

3 This name appears in a great variety of forms—Kwi, Ekwi, Okwi, Oji, Odschi, Otsui, Tyi, Twi, Tshi, Tschi, Chwee, or Chee.

4 See Rev. J. G. Christaller, A Grammar of the Ashante and Fante Language called Tshi, Basel, 1875.

5 See D. L. Carr and F. P. Brown, Mfantsi (i.e., Fanti) Grammar, Cape Coast, 1868 ; Zimmermann, Grammatical Sketch and Vocabulary of the Akra or Ga language, Stuttgart, 1858; and A Dictionary, English, Tshi, Akra, by Christaller, Locher, and Zimmermann, Basel,

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very basis rock of the country—a granite in which iron ore and hornblende are present—gives off under the influence of the air and the rain large quantities of sulphuretted hydrogen gas. The native towns are populous and dirty, and to add to the evil it was, until the prohibition ofthe British autho. rities (at Elmina by Colonel Festing, and at Cape Coast by Governor Strahan), the custom to bury the dead in the floors of the houses. Intermittent fevers, remittent fevers (the so-called coast fever is of this class), and dysentery are the diseases most to be dreaded by the European. “The native inhabitants,” says Marcus Allen, “appear to enjoy tolerable health and to live to an average age; but in the rainy season it is not uncommon.to find them suffering from pleuritis and pneumonia, rheumatic attacks, bronchitis, and catarrh.”

Though the precious dust to which the Gold Coast owes its name is no longer obtained in any considerable quan- tities by the rude methods of collection employed by the natives, there is abundant proof that the whole region is more or less auriferous, and it is possible that European energy and skill might make it again a real gold coast. In some parts of the country —in the neighbourhood of the Volta, for example—the surface of the ground is broken by innumerable small pits dug by the native miners.® At

present the value of the territory is mainly due to the pro- fusion of vegetable products supplied by the rich alluvial soil. Of the timber trees which abound in the vast stretches of forest, the best known are several species of the genus bombax (silk cotton tree, &c.), from which canoes and wooden wares are manufactured, and the odoom used for building and cabinet-work. The cocoa-nut and the palm oil are common along the coast, and the bread-fruit tree has been introduced with success at Napoleon. Indian corn, yams, cassava, sweet potatoes, tiger-nuts, ground-nuts (Arachis hypogea), Guinea corn (Sorghum vulgare), Guinea grains (Amomum grana-paradisi), the egg-plant (Solanum ovigerum), bennie seed, oranges, limes, shaddocks, pine apples, ginger, and indigo are some of the many objects of cultivation. Nor must the kola nut be forgotten (Sterculia acuminata), variously styled colat, khola, and in older writers gura or gouroo; for it is the favourite substitute in Western Africa for the betel nut, and forms an important article of export. Both tobacco and cotton are indigenous, but neither is cultivated by the natives. Coffee and tobacco are grown by the missionaries at Akropong.

The exports are mainly gold dust, palm oil, and palm kernels; and the imports, in exchange, dry goods from the United Kingdom, and tobacco and spirits from America. In 1875 and 1876 the exports were respectively of the value of £327,012 and £465,268, and the corresponding imports amounted to £364,672 and £446,088. The revenue of the Gold Coast, mainly derived from customs duties, was £67,368 in 1875, and £64,788 in 1876; the corresponding expenditures were £67,368 for 1875, and £93,944 for 1876. There is no public debt.

The jurisdiction of England on the Gold Coast was defined by the bond of the 6th of March 1844, an agreement with the native chiefs by which Her Majesty receives the right of trying crimma and repressing human sacrifices, pannyaring, &c. The limits of the protectorate inland were not very rigidly defined. The purchase of the Danish forts in 1851, and of the Dutch forts and territory m 1871, led to the consolidation of the British power along the coast ; and the Ashantee war of 1873-74 resulted in the extension of the area of British influence towards the intcrior. By the royal ordinances 0 December 1874 the selling, buying, or dealing in slaves was declared unlawful, and no person can any longer be put in pawn for debt ;

but those who were actually slaves at that date are left in the same state, except where cruelty can be proved against the masters. —

See The Golden Coast or a Deseription of Guinney, together with @

6 For many interesting details on the gold of the Gold Coast, se€ the chapter specially devoted to the subject in Burton's Wandermys in West Africa. 5

relation of sueh persons as got wonderful estates by their trade thither, London, 1665: James Horton, Medical Topography of the West Coast of Afriea, London, 1859, Physical and Medical Climate, London, 1867, and Letters on the Political Condition of the Gold Coast, London, 1870; Otto Finsch, '' Die Goldkiiste und ihre Bewohner in ihrem heutigem Zustande," in Zeitsch. fiir allg. Erdkunde, Berlin, 1864; Wanderingsin West Africa by a F.R.G.S. (i.e., Captain Burton), London, 1863; Marcus Allen, The Gold Coast, London, 1874 ; Charles A. Gordon, Life on the Gold Coast, London, 1874 ; Captain Croft, '' Exploration of the River Volta," in Proe. Roy. Geog. Soe., Lond., 1874; P. Wurm, ''Anfange der Basler Mission auf der Goldkiiste," in Kvangelisches Missions-Mayazin, 1874; E. Buhl, '' Die Basler Mission auf der Goldkuste," JZdid., 1877. The following maps are of service:—J. Wyld, Map of British Possessions on the Gold Coast, London, 1873; Die Goldkiiste nach den Arbeiten der Missionare A. Riis, &c., Basel and Stuttgart, 1873; and HK. Stanford, Map of the Gold Coast, &c., 1878.
GOLDEN BULL (Latin, Butta Aurea) is, in general, the designation of any charter decorated with a golden seal or bulla, either froni the intrinsic importance of its contents, or from the rank and dignity of the bestower or the recipi- ent. The custom of thus giving distinction to certain docu- ments is said to be of Byzantine origin, though if this be the case it is somewhat strange that the word employed as an equivalent for golden bull in Byzantine Greek should be the hybrid xpvadBovdAdoy (cf. Codinus Curopalates, 6 wéyas Aoyobérys duardrre: Ta Tapa Tod Baciréws drooreAddpeva Tpoordypara Kut ypvadBovAXa. tpds Te Prpyus, YovAravas, kat torapxovs; and Anna Comnena, Alexiad, lib. iii, da xpuroBovriov Adyou; lib. viii., xpvedBovdov Adyov). In , Germany a Golden Bull is mentioned under the reign of Henry 1. in Chronica Cassin, ii. 31, and the oldest German example, if it be genuine, dates from 983. At

first the golden seal was formed after the type of a solid coin, but at a later date, while the golden surface presented to the eye was greatly increased, the seal was really com- | posed of two thin metal plates filled in with wax. The number of golden bulls issued by the imperial chancery

‘ must have been very large; the town of Frankfort, for 1 nk | in 1742— Aurea Bulla seeundum exemplar originale Frankfurtense

example, still preserves no fewer than eight. But the name has become practically restricted to a few documents of un-

usual political importance, the golden bull of the Empire, the golden bull of Brabant, the golden bull of Hungary,

and the golden bull of Milan—and of these the first is un- doubtedly the golden bull par excellence. It was drawn up under the direction of the emperor Charles IV., and it was formally ratified in 1356,—the first twenty-three chapters by the diet of Nuremberg (10th January), and the remaining seven by the diet of Metz oon December). The actual redaction has been assigned to Bartolus de Saxoferrato, to Rudolf of Friedberg the im- ‘perial secretary, and even to the emperor himself; but there is no distinct authority for any of the three hypo- theses as opposed to the others. A brief statement of the general purpose of its enactments has already been given at page 495 of the present volume, a strangely rhetorical lamentation over the miseries of division, and more especially of a kingdom divided against | itself; and the body of the document gives a survey of the duties, privileges, and relations of the various dignitaries of the empire, the emperor, the electors ecclesiastical and secu-

lar, the electoral plenipotentiaries, and the officers of the |

court. As might almost be expected, a large place is given to rnles of ceremony and etiquette. At first the document

was known simply as the Lex Carolina; but by and by the |

name of the Book with the Golden Bull came into use, and

| the present elliptical title was sufficiently established by —

1417 to be officially employed in a charter by King Sigis- Iund. The original autograph was committed to the care of the electoral prince of Mainz, as chancellor-in-chief of the | empire, and it was preserved in the imperial archives at Mainz till 1789. Official transcripts were probably fur- | nished to each of the seven electors at the time of the pro-

The exordium is >

Vol mulgation, and before long many of the other members of the empire secured copies for themselves. The transcript which belonged to the elector of Treves is preserved in the state archives at Stuttgart, that of the elector of Cologne in the court library at Darmstadt, and that of the elector of Bohemia in the imperial archives at Vienna. Berlin, Munich, and Dresden also boast the possession of an electoral transcript ; and the town of Kitzingen has a con- temporary copy in its municipal archives. There appears, however, to be good reason to doubt the genuineness of most of these so-called original transcripts. But perhaps the best known example is that of Frankfort-on-the-Main, which was procured from the imperial chancery in 1366, and is adorned with a golden seal like the original. Not only was it regularly quoted as the indubitable authority in regard to the election of the emperors in Frankfort itself, but it was from time to time officially consulted by mem- bers of the empire.

The manuscript consists of 48 leaves of parchment of medium quality, each measuring about 164 inches in height by 7} in breadth. The seal is of the plate and wax type. On the obverse appears a figure of the emperor seated on his throne, with the sceptre in his right hand and the globe in his left; a shield, with the crowned imperial eagle, oceupies the spacc on the one side of the throne, and a corresponding shicld, with the crowned Bohemian lion with two tails, occupies the space on the other side; and round the margin runs the legend, Karolus quartus divina favente clementia, Roman- orum imperator semper Augustus et Boemice rex. On the reverse is a castle, with the words Aurea Roma on the gate, and the circum- scription reads, Roma caput Mundi Regit orbis frena rotundi. The original Latin text of the bull was printed at Nuremberg by Creussner in 1474, and a second edition by Kobergen appeared at the same place in 1477. Since that time it has been

frequently reprinted from various manuscripts and collections. Goldastus gave the Palatine text, compared with those of Bohemia and Frank- fort, in his Collectio Constitutionum Imperialium, tom. i. Another is to be found in Onuphrius Panvinius, De Comitiis Imperit, and as an appendix to Cujacius, De feudis; and a third, of unknown history, 1s prefixed to the Codex Recessuuwm Imperit, printed at Maiuz in 1599, and again in 1615. The Frankfort text appeared

—from the pen of Wolfgang Ch. Multz. German translations, none of which, however, had any official authority, were published at Nuremberg, 1474(#); at Venice, Johannus Jenson, 1476; and at Strasburg, Joh. Preusseu, 1485. Among the earlier commentators of the document are Buxtorf, Dominicus Arumeus, Martinus Rumelius, H. Caninius, G. T. Dietrich, Ostermann, Speidelius, and Limneus (In Aurecam bullam, Strasburg, 1662). The student will find a good account of the older literature of the subject in Bicner, Commentarii de origine ect progressu legum Germani- corum, 1787 (vol. ii.); and, besides the important work of Ohlen- schlager, Neue Erlduterungen der Guldener Bulla, Frankfort and Leipsic, 1766, he may consult H. G. Thiilemarius, De bulla aurea argentea, &c., Heidelberg, 1682 (which gives the Frankfort text of the bull of Charles IV., a golden bull of Andronicus of Constanti- nople, the Bulla Brabantina, and the capitulation of Maximilian IJ.); Piitters, Staatsverfassung des deutsehen Revehs, Gottingen, 1788; Pfister, Geschichte der Deutschen, Hamburg, 1831 (vol. ili.); and Stobbe, Gleseh. der Deutschen Rechtsquellen, Brunswick, 1860. A learned article on ‘‘Goldene Bulle,” by H. Brandes, will be found in Ersch and Gruber’s Hneyelopddie, 1861.

GOLDEN-EYE, a name indiscriminately given in many parts of Britain to two very distinct species of Ducks, from the rich yellow colour of their irides. The commonest of them—the Anas fuligula of Linnzus and Fuligula cristata of most modern ornithologists—is, however, usually called by English writers the Tufted Duck, while “ Golden-eye ” is reserved in books for the A. clangula and A. glaucion of Linneus, who did not know that the birds he so named were but examples of the same species, differing only in age or sex; and to this day many fowlers perpetuate a like mistake, deeming the “ Morillon,” which is the female or young male, distinct from the “Golden-eye” or “ Rattle- wings” (as from its noisy flight they oftener call

it), which is the adult male. This species belongs to the group known as Diving Ducks, and is the type of the very well-marked genus Clangula of later systematists, which, among other differences, has the posterior eud of the sternum prolonged

so as to extend considcrably over, and, we may not un- reasonably suppose, protect the belly—a character possessed ina still greater degree by the Mergansers (Mergine), while the males also exhibit in the extraordinarily developed bony labyrinth of their trachea and its midway enlargement another resemblance to the members of the same Subfamily. The Golden-eye, C. glaucion of modern writers, has its home in the northern parts of both hemispheres, whence in winter it migrates southward ; but as it is one of the Ducks that constantly resorts to hollow trees for the purpose of breeding it hardly transcends the limit of the Arctic forests on either continent. So well known is this habit to the people of the northern districts of Scandinavia, that they very commonly devise artificial nest-boxes for its accom- modation and their own profit. Hollow logs of wood are prepared, the top and bottom closed, and a hole cut in the side. These are affixed to the trunks of living trees in suitable places, at a convenient distance from the ground, and, being readily occupied by the birds in the breeding-season, are regularly robbed, first of the numerous eggs, and finally of the down they contain, by those who have set them up.

The adult male Golden-eye is a very beautiful bird, mostly black above, but with the head, which is slightly crested, reflecting rich green lights, a large oval white patch under each eye, and elongated white scapulars ; the lower parts are wholly white and the feet bright orange, except the webs, which are dusky. In the female and young male, dark brown replaces the black, the cheek-spots are indis- tinct, and the elongated white scapulars wanting. The Golden-eye of North America has been by some authors deemed to differ, and has been named C. americana, but apparently on insufficient grounds. That country, however, has, in common with Iceland, a very distinct species, C. islandica, often called Barrow's Duck, which is but a rare

straggler to the continent of Europe, and never, so far as"

known, to Britain. In Iceland and Greenland it is the only habitnal representative of the genus, and it occurs from thence to the Rocky Mountains. In breeding-habits it differs from the commoner species, not placing its eggs in tree-holes ; but how far this difference is voluntary may be doubted, for in the countries it frequents trees are wanting. Tt is a larger and stouter bird, and in the male the white cheek-patches take a more crescentic form, while the head is glossed with purple rather than green, and the white scapulars are not elongated. The New World also possesses a third and still more beautiful species of the genus in C'. albeola, known in books as the Buffel-headed Duck, and to American fowlers as the " Spirit-Duck" and '" Butter-ball" —the former name being applied from its rapidity in diving, and the latter from its exceeding fatness in autumn. This is of small size, but the lustre of the feathers in the male is most brilliant, exhibiting a deep plum-coloured gloss on the head. It breeds in trees, and is supposed to have occurred more than once in Britain. (A. N.)

GOLDEN FLEECE. See ArGonavrts.

GOLDEN LEGEND. See Voracine, JACOBUS DE,

GOLDEN ROSE (rosa aurea), an ornament, made of wrought gold and set with gems, which is blessed by the pope on the fourth (Letare) Sunday of Lent, and usually afterwards sent as a mark of special favour to some distinguished individual, church, or civil community. The cere- monies which at present accompany the consecration of a golden rose are of a somewhat elaborate character, and are explained by liturgists as designed to make it specially emblematic of Christ and of the Christian graces, Some difficulty is experienced in tracing them to their ultimate origin; but the custom of blessing and sending some symbol of the kind seems to be as old at least as the time of Gregory the Great, with whom it was a frequent practice to

seid persous whom he wished to flatter a few particles filed from " Peter's chains," and set in keys or crosses of gold (Greg,, Op. ii. 648, 711, 796, 1031, ed. 1705). This practice continued to be observed for several centuries ; thus we find Gregory VII., in 1079, writing to Alphonso of Castile, "Ex more sanctorum misimus vobis claviculam anream in qua de

catenis beati Petri benedictio continetur" (Mansi, Conc. Gen., xii, 460). The first mention of the " golden rose," as such, is said to occur in the 11th century; and an allusion to it is certainly made in the Chronicle at William of Newburgh (1197). Pope Urban V., who sent a golden rose to Joanna of Naples in 1366, is alleged to have been thie first to determine that the consecration should be annually observed. Among the very numerous recipients of this honour have been Henry VIII. of England, the famous Gonsalvo de Cordova, and, in more recent times Napoleon III. of France and Isabella II. of Spain. The gilt of the golden rose used almost invariably to accompany the coronation of the king of the Romans, If in any particular year no one is considered worthy of the rose, it is laid up in the Vatican.

GOLDFINCH (German Goldfink?), the Fringilla cardu- elts of Linnzus and the Carduelis elegans of later authors, an extremely well-known bird found over the greater parts of Europe and North Africa, and eastwards to Persia and Turkestan, Its gay plumage is matched by its sprightly nature; and together they make it onc of the most favourite cage-birds among all classes. As a songster it is indeed snr- passed by many other species, but its docilityand readyattach- ment to its master or mistress makes up for any defect in its vocal powers, In some parts of England the trade in Gold- finches is very considerable. In 1860 Mr Hussey reported (Zool., p. 7144) the average annual captures near Worthing to exceed 11,000 dozens— nearly all being cock-birds ; and a witness before a Committee of the House of Commons in 1873 stated that, when a boy, he could take forty dozens in a morning near Brighton. In these districts and others the number has of late years become much reduced, owing doubtless in part to the fatal practice of catching the birds just before or during the breeding-season ; but perhaps the strongest cause of their growing scarcity throughout the kingdom is the constant breaking-up of waste lands, and the extirpation of weeds (particularly of the Order Composite) essential to the improved system of agriculture ; for in many parts of Scotland, East Lothian for instance, where Gold- finches were once as plentiful as Sparrows, they are now only rare stragglers, and yet there they have not been thin- ned by netting. Though Goldfinches may occasionally be observed in the coldest weather, incomparably the largest number leave Britain in autumn, returning in spring, and resorting to our gardens and orchards to breed, when the lively song of the cock, and the bright yellow wings of both sexes, quickly attract

the notice of even the unobservant. The nest is a beautifully neat structure, often placed at no great height from the ground, but generally so well hidden by the leafy bongh on which it is built as not to be easily found, until, the young being hatched, the constant visits of the parents reveal its site, When the broods leave the nest they move into the more open country, and frequent: ing pastures, commons, heaths, and downs, assemble 1n large flocks towards the end of summer. Eastward of the range of the present species its place is taken by its con- gener C. caniceps, which is easily recognized by wanting the black hood and white ear-coverts of our own bird. Its home seems to be in Central Asia, but it moves southward in winter, being common at that season in Cashmere, and is not unfrequently brought for sale to Calcutta. | The position of the genus Carduelis in the family Fringillule

1 ‘The more common German name, however, is Disteyink (Thistle- Finch) or Stieglitz,

is not very clear. Structurally it would seem to have some relation to the Siskins (Chrysomitris), though the members of the two groups have very different habits, and perhaps its nearest kinship lies with the Hawfinches (Coccothraustes), See Finou, vol. ix. p. 191. (A. NL) GOLDFISH (Carassius auratus). In China and the warmer parts of Japan a fish extremely similar to the Crucian carp of Europe is of very common occurrence in ponds and other still waters. In the wild state its colours do not differ from those of a Crucian carp, and like that fish it is tenacious of life and easily domesticated. Albinos seem to be rather common; and as in other fishes (for | instance, the tench, carp, eel, flounder), the colour of most of these albinos is a bright orange or golden yellow; occa- sionally even this shade of colour is lost, the fish being more or less pure white or silvery. The Chinese have domesticated these albinos for a long time, and by careful selection have succeeded in propagating all those strange | varieties, and even monstrosities, which appear in every domestic animal. In some individnals the dorsal fin is only half its normal length, in others entirely absent; in others the anal fin has a double spine ; in others all the fins are of nearly double the usual length. The snout is frequently

| Goldfish (Carassius auratus).

malformed, giving the head of the fish an appearance jsimilar to that of a bulldog. The variety most highly prized at present has an extremely short snout, eyes which almost wholly project beyond the orbit, no dorsal fin, and Ya very long three or four-lobed caudal fin (Telescope-fish). i The gold-fish is now distributed over nearly all the civilized parts of the world. It was first brought to England in the year 1691, but was very scarce till 1728, when it was ‘imported in great numbers from Holland, where the fish had already become domesticated. It will not thrive in rivers ; in large ponds it readily reverts to the coloration “of the original wild stock. It flourishes best in small tanks and ponds, in which the water is constantly changing and does not freeze; in such localities, and with a full | supply of food, which consists of crumbs of bread, bran, worms, small crustaceans, and insects, it attains to a length of from 6 to 12 inches, breeding readily, sometimes at different times of the same year. GOLD HILL, a town of Storey county, Nevada, United States, is situated at the head of a precipitous ravine of the Nevada mountains, 1 mile S. of Virginia city, and 328 E. from San Francisco by rail. The name was derived from ” a small hill connected with the famous Comstock lode, and containing rich golden ore. Some of the most valuable | Mines of this lode are within the limits of the town, the average yield being about two million dollars monthly in gold and silver. Though there are some quartz mills within ! the town, the greater part of the ore is conveyed to the mills on Carson river. There is a fine hall in connexion

with the miners’ union, and another has been erected by the Oddfellows aud Freemasons. The Methodists, Epis- copalians, and Roman Catholics are the principal denomina- tions of the town. Gold Hill obtains its water supply im conjunction with Virginia from the summit of the Sierra Nevada, 25 miles distant. The population in 1860 was 638, and in 1870 4311. Since then it has been rapidly increasing, and must have more than trebled its numbers.

GOLDINGEN, in Lettish Kunpica, a district town of the Russian province of Courland, in 50° 58’ N, lat. and 11° 58’ EK. long., 85 miles W.N.W. of Mittau, on the left bank of the Windau, which forms a beautiful waterfall—the Rummel—-in the neighbourhood. On the Schlossberg or Castlehill are a

few remains of the foundations of what in the end of the 18th ceutury was the most magnificent ruin in Courland, and in the 17th century had been the palatial residence of the dukes. The town is beautifully built; and it possesses a Lutheran church dating from 1606, and a Catholic church five years older, a hospital and two almshouses, two benevolent societies, founded respectively in 1836 and 1839, and a society of rural economy. Brush- making is the only local industry of much importance. In 1861 the population was 5475 (2764 males), of whom the greater proportion were Lutherans, 1551 being Jews, 360 Roman Catholics, and 290 members of the Greek Church ; but according to the S¢ Petersburg Calendar for 1878 it has diminished to 4758. The castle of Goldingen was founded in 1249 by Dietrich of Groningen, and in 1347 the town re- ceived its first charter of privileges from Goswin von Gerike, master of the Teutonic order. It has been a district town since 1795,

GOLD LACE. See under Gotp, p. 753.

GOLDONI, Caro (1707-1793), the most illustrious of the Italian comedy-writers, and the real founder of modern Italian comedy. His life is known to us from his Mémoires, which, though they do not reveal a great thinker, are of great value as faithfully representing the Italian society, especially the Venetian society of the 18th century. Goldoni was born at Venice in 1707, in a fine house near St Thomas's church, His father Giulio was a native of Modena. The first playthings of the future writer were puppets which he made dance ; the first books he read were plays,—among others, the comedies of the Florentine Cicognini. Later he received a still stronger impression from the Jfandragora of Macchiavelli. At eight years old he had tried to sketch a play. His father, meanwhile, had taken his degree in medicine at Rome and fixed himself at Perugia, where he made his son join him ; but, having soon quarrelled with his colleagues in medicine, he departed for Chioggia, leaving his son to the care of a philosopher, Professor Caldini of Rimini. The young Goldoni soon grew tired of his life at Rimini, and ran away with a Venetian company of players. He began to study law at Venice, then went to continue the same pursuit at Pavia, but at that time he was studying the Greek and Latin comic poets much more and much better than books about law. 'I have read over again," he writes in his Mémoires, " the Greek and Latin poets, and I have told to mysclf that I

should like to imitate them in their style, their plots, their precision ; but I would not be satisfied unless I succeeded in giving more interest to my works, happier issues to my plots, better drawn characters, and more genuine comedy." For a satire entitled Z/ Colosso, which attacked tle honour of several families of Pavia, he was driven from that town, and went first to study with the juris- consult Morelli at Udine, tlien to take his degree in law at Modena, After having worked some time as clerk in the chanceries of Chioggia and Feltre, his father being dead, he went to Venice, to exercise there his profession as a lawyer. But the wish to write for the stage was always strong in

him, and he tried to do so ; he made, however, a mistake in his choice, and began with a tragedy, Amalasunta, which was represented at Milan and proved a failure. In 1734 he wrote another tragedy, Belisario, which though not much better, chanced nevertheless to please the public. This first success encouraged him to write other tragedies, gome of which were well received; but the author limself saw clearly that he had not yet found his proper sphere, and that a radical dramatic reform was absolutely neces- sary for the stage. He wished to create a characteristic comedy in Italy, to follow the example of Moliére, and to delineate the realities of social life in as natural a manner as possible. His first essay of this kind was Momolo Cor- tesan (Momolo the Courtier), written in the Venetian dialect, and based on his own experience. Other plays followed— some interesting from their subject, others from the char- acters; the best of that period are—Le trentadue Dvs- grazie @ Arlecchino, La Notte critica, La Bancarotta, La Donna di Garbo. Having, while consul of Genoa at Venice, been cheated by a captain of Ragusa, he founded on this his play Z'Jmpostore. At Leghorn he made the acquaint- ance of the comedian Medebac, and followed him to Venice, with his company, for which he began to write his best plays. Once he promised to write sixteen comedies in a year, and kept his word ; among the sixteen are some of his very best, such as 7 Cafe, Jl Bugiardo, La Pamela. When he left the company of Medebac, he passed over to that maintained by the patrician Vendramin, continuing to write with the greatest facility. In 1761 he was called to Paris, and before leaving Venice he wrote Una delle aultime Sere di Carnevale (One of the Last Nights of Car- nival),

an allegorical comedy in which he said good-bye to his country. At the end of the representation of this play, the theatre resounded with applause, and with shouts expressive of good wishes. Goldoni, at this proof of public sympathy, wept asa child. At Paris, during two years, he wrote comedies for the Italian actors; then he taught Italian to the royal princesses; and for the wedding of Louis XVI and of Marie Antoinette he wrote in French one of his best comedies, Le Bourru Bienfatsant, which was a great success. When he retired from Paris to Versailles, the king made him a gift of 6000 frances, and fixed on him an annual pension of 1200 francs. It was at Ver- sailles he wrote his Memoirs, which occupied him till he reached his eightieth year. The Revolution deprived him all at once of his modest pension, and reduced him to extreme misery; he dragged on his unfortunate existence till 1793, and died on the 6th of February. The day after, on the proposal of André Chénier, the Convention agreed to give the pension back to the poet; and as he had already died, a reduced allowance was granted to lus widow.

The best comedies of Goldoni are—La Donna di Garbo, La Bot- tega di Caffe, Pamela nubile, Le Baruffe chiozzotte, I Rusteghi, Todero Brontolon, Gli Innamorati, Il Ventaglio, Il Bugiardo, La

Casa Nova, Il Burbero benefico, La Locandiera. See P. G. Mol- menti, Carlo Goldoni, Venice, 1875.

GOLDSCHMIDT, Hermann (1802-1866), a German painter and astronomer, was the son of a Jewish merchant, and was born at Frankfort on the 17th June 1802. He for ten years assisted his father in lis business; but, his love of art having been awakened while journeying in Holland, he in 1832 began the study of painting at Munich under Cornelius and Schnorr, and in 1836 established himself at Paris, where he painted a number of pictures of more than average merit, among which may be mentioned the Cumzan Sibyl, 1844 ; an Offering to Venus, 1845 ; a View of Rome, 1849; the Death of Romeo and Juliet, 1857 ; and several Alpine landscapes. In 1847 he began to devote his atten- tion to astronomy ; and from 1852 to 1861 he discovered fourteen asteroids between Mars and Jupiter, on which

account he received the grand astronomical prize from the Academy of Sciences. His observations of the protuberances on the sun, made during the total eclipse on the 10th July 1860, are included in the work of Midler on the eclipse published in 1861. Goldschmidt died at Fontainebleau, 26th August 1866. ‘

GOLDSMITH, Ouiver (1728-1774), one of the most pleasing English writers of the 18th century. He was of a Protestaut and Saxon family which had been long settled in Ireland, and which had, like most other Protestant and Saxon families, been, in troubled times, harassed and put in fear by the native population. His father, Charles Goldsmith, studied in the reign of Queen Anne at the diocesan school of Elphin, became attached to the daughter of the schoolmaster, married her, took orders, and settled at a place called Pallas, in the county of Longford, There he with difficulty supported his wife and children on what he could earn, partly as a curate and partly as a farmer.

At Pallas Oliver Goldsmith was born in November 1728, That spot was then, for all practical purposes, almost as remote from the busy and splendid capital in which his later years were passed as any clearing in Upper Canada or any sheep walk in Australasia now is. Even at this day those enthusiasts who venture to inake a pilgrimage to the birthplace of the poet are forced to perform the latter part of their journey on foot. The hamlet lies far from any high road, on a dreary plain which, in wet weather, is often a lake. The lanes would break any jaunting car to pieces; and there are ruts and sloughs through which the most strongly built wheels cannot be dragged.

While Oliver was still a child his father was presented to a living worth about £200 a year, in the county of West Meath. ‘The family accordingly quitted their cottage in the wilderness for a spacious house on a frequented road, near the village of Lissoy. Here the boy was taught his letters by a maid-servant, and was sent in his seventh year toa village school kept by an old quartermaster on half-pay, who professed to teach nothing but reading, writing, and arithmetic, but who had an inexhaustible fund of stories about ghosts, banshees, and fairies, about the great Rap- paree chiefs, Baldearg O’Donnell and galloping Hogan, and about the exploits of Peterborough

and Stanhope, the sur- prise of Monjuich, and the glorious disaster of Brihuega. This man must have been of the Protestant religion ; but he was of the aboriginal race, and not only spoke the Irish language, but could pour forth unpremeditated Irish verses. Oliver early became, and through life continued to be, a passionate admirer of the Irish music, and especially of the compositions of Carolan, some of the last notes of whose harp he heard. It ought to be added that Oliver, though by birth one of the Englishry, and though connected by numerous ties with the Established Church, never showed the least sign of that contemptuous antipathy with which, in his days, the ruling minority in Ireland too generally regarded the subject majority. So far indeed was he from sharing in the opinions and feelings of the caste to which he belonged that he conceived an aversion to the Glorious and Immortal Memory, and, even when George ILL. was ou the throne, maintained that nothing but the restoration of the banished dynasty could save the country.

From the humble academy kept by the old soldier Gold- smith was removed in his ninth year. He went to several grammar-schools, and acquired some knowledge of the ancient languages. His life at this time seems to have fon far from happy. He had, as appears from the admirable portrait of him at Knowle, features harsh even to aa The small-pox had set its mark on him with more t 7 usual severity. His stature was small, and his limbs }

‘put together. Among boys little tenderness is shown to ‘ personal defects ; and the ridicule excited by poor Oliver’s appearance was heightened by a peculiar simplicity and a disposition to blunder which he retained to the last. He became the common butt of boys and masters, was pointed vat as a fright in the play-ground, and flogged as a dunce in the school-room. When he had risen to eminence, those who had once derided him ransacked their memory for the events of his early years, and recited repartees and couplets which had dropped from him, and which, though little noticed at the time, were supposed, a quarter of a century later, to indicate the powers which produced the Vicar of Wakefield and the Deserted Village.

In his seventeenth year Oliver went up to Trinity Col- lege, Dublin, as a sizar. The sizars paid nothing for food and tuition, and very little for lodging ; but they had to perform some menial services from which they have long

been relieved. They swept the court, they carried up the dinner to the fellows' table, and changed the plates and poured out the ale of the rulers of the society. Goldsmith was quartered, not alone, in a garret, on the window of which his name, scrawled by himself, is still read with 'interest. From such garrets many men of less parts than his have made their way to the woolsack or to the episcopal bench. But Goldsmith, while he suffered all the humili- ations, threw away all the advantages of his situation. He neglected the studies of the place, stood low at the examin- itions, was turned down to the bottom of his class for "dlaying the buffoon in the lecture-room, was severely repri- nanded for pumping on a constable, and was caned by a

orutal tutor for giving a ball in the attic story of the sollege to some gay youths and damsels from the city. ' While Oliver was leading at Dublin a life divided Spetween squalid distress and squalid dissipation, his father | lied, leaving a mere pittance. The youth obtained his | sachelor's degree, and left the university. During some ime the huinble dwelling to which his widowed mother liad retired was his home. He was now in his twenty-first "year; it was necessary that he should do something .; and jnis education seemed to have fitted him to do nothing but yo dress himself in gaudy colours, of which he was as fond is a magpie, to take a hand at cards, to sing Irish airs, to "olay the flute, to angle in summer, and to tell ghost stories oy the fire in winter. He tried five or six professions in yurn without success. He applied for ordination ; but, as je applied in scarlet clothes, he was speedily turned out of phe episcopal palace. He then became tutor in an opulent amily, but soon quitted his situation in consequence of a lispute about play. Then he determined to emigrate to America. His relations, with much satisfaction, saw him set out for Cork on a good horse, with £30 in his pocket. S3ut in six weeks he came back on a miserable hack, with: sub a penny, and informed his mother that the ship in which te had taken his passage, having got a fair wind while he vas at a party of pleasure, had sailed without him. Then 1e resolved to study the law.

Gc OC Ds Mit

which everywhere set the peasantry dancing, and which often procured for him a supper and a bed. He wandered as far as Italy. His musical performances, indeed, were not to the taste of the Italians ; but he contrived to live on the alms which he obtained at the gates of convents. It should, however, be observed that the storics which he told about this part of his life ought to be received with great caution ; for strict veracity was never onc of his virtues ; and a man who is ordinarily inaccurate in nar- ration is likely to be more than ordinarily inaccurate when he talks about his own travels. Goldsmith indeed was so regardless of truth as to assert in print that he was present at a most interesting conversation between Voltaire and Fontenelle, and that this conversation took place at Paris. Now it is certain that Voltaire never was within a hundred leagues of Paris during the whole time which Goldsmith passed on the Continent.

'In 1756 the wanderer landed at Dover, without a shilling, without a friend, and without a calling. He had indeed, if his own unsupported evidence may be trusted, obtained from the university of Padua a doctor's degree ; but this dignity proved utterly useless to him. In England his flute was not in request ; there were no convents ; and he was forced to have recourse to a series of desperate expedi- ents. He turned strolling player; but his face and figure were ill suited to the boards even of the humblest theatre. He pounded drugs and ran about London with phials for charitable chemists. He joined a swarm of beggars, which made its nest in Axe Yard. He was for a time usher of a school, and felt the miseries and humiliations of this situ- ation so keenly that he thought it a promotion to be permitted to earn his bread ag a bookseller's hack ; but he soon found the new yoke more galling than the old one, and was glad to become an usher again. He obtained a medical appointment in the service of the East India Com- pany; but the appointment was speedily revoked. Why it was revoked we are not told. The subject was one on which he never liked to talk. It is probable that he was incompetent to perform the duties of the place. Then he presented himself at Surgeon's Hall for examination, as mate to a naval hospital, Even to so humble a post he was found unequal. By this time the schoolmaster whom he had served for a morsel of food and the third part of a bed was no more. Nothing remained but to return to the lowest drudgery of literature. Goldsmith took a garret in a miserable court, to which he had to climb from tlie brink of Fleet Ditch by a dizzy ladder of flagstones called Breakneck

Steps. The court and the ascent have long dis- appeared, but old Londoners well remember both. Here, at thirty, the unlucky adventurer sat down to toil like a galley slave. P

In the succeeding six years he sent tof the press sume things which have survived, and m My which have perished. He produced articles for reviews, magazines, and newspapers ; children's books, which, bound in gilt paper and adorned with hideous woodcuts, appeared in the window of the once far-famed shop at the corner of Saint Paul's Churchyard ; An Inquiry into the State of Polite Learning in Europe, which, though of little or no value, is still reprinted among his works; a Life of Beau Nash, which is not reprinted, though it well deserves to be so; a superficial and incorrect, but very readable, History of fingland, in a series of letters purporting to be addressed by a nobleman to his son ; and some very lively and amus- ing Sketches of London Society, in a series of letters purport- ing to be addressed by a Chinese traveller to hid nds. All these works were anonymous ; but some of them were well known tv be Goldsmith's ; and he gradually rose in the estimation of the booksellers for whom he drudged. He was, indeed, emphatically a pois writer. For

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accurate research or grave disquisition he was not well qualified by nature or by education. He knew nothing accurately; his reading had been desultory; nor had le meditated deeply on what he hadread. He had seen much of the world ; but he had noticed and retained little more of what he had seen than some grotesque incidents and characters which had happened to strike his fancy. But, though his mind was very scantily stored with materials, he used what materials he had in such a way as to produce a wonderful effect. There have been many greater writers ; but perhaps no writer was ever more uniformly agreeable. His style was always pure and easy, and, on proper occa- sions, pointed and energetic. His narratives were always amusing, his descriptions always picturesque, his humour rich and joyous, yet not without an occasional tinge of amiable sadness, About everything that he wrote, serious or sportive, there was a certain natural grace and decorum, hardly to be expected from a man a great part of whose

life had been passed among thieves and beggars, street- walkers and merryandrews, in those squalid dens which are the reproach of great capitals.

As his name gradually became known, the circle of his acquaintance widened. He was introduced to Johnson, who was then considered as the first of living English writers; to Reynolds, the first of English painters ; and to Burke, who had not yet entered parliament, but had dis- tinguished himself greatly by his writings and by the eloquence of his conversation. With these eminent men Goldsmith became intimate. In 1763 he was one of the nine original members of that celebrated fraternity which has sometimes been called the Literary Club, but which hag always disclaimed that epithet, and still glories in the simple name of the Club.

By this time Goldsmith had quitted his miserable dwell- ing at the top of Breakneck Steps, and had taken chambers in the more civilized region of the Inns of Court. But he was still often reduced to pitiable shifts. Towards the close of 1764 his rent was so long in arrear that his landlady one morning called in the help of a sheriff's officer. The debtor, in great perplexity, despatched a messenger to Johnson; and Johnson, always friendly, though often surly, sent back the messenger with a guinea, and promised to follow speedily. He came, and found that Goldsmith had changed the guinea, and was railing at the landlady over a bottle of Madeira. Johnson put the cork into the bottle, and entreated his friend to consider calmly how money was to be procured. Goldsmith said that he had a novel ready for the press. Johnson glanced at the manu- script, saw that there were good things in it, took it toa bookseller, sold it for £60, and soon returned with the money. 'The rent was paid ; and the sheriff's officer with- drew. According to one story, Goldsmith gave his land- lady a sharp reprimand for her treatment of him ; accord. ing to another, he insisted on her joining him iu a bow! of punch. Both stories are probably true. The novel which oe thus ushered into the world was the Vicar of Wake- Jield.

But before the Vicar of Wakefield appeared in print, came the great crisis of Goldsmith's literary life. In Christmas week 1764 he published a poem, entitled the Traveller. It was the first work to which he had put his name, and it at once raised him to the rank of a legiti- mate English classic. The

opinion of the most skilful critics was that nothing finer had appeared in verse since the fourth book of the Dunciad. In one respect the Traveller differs from all Goldsmith's other writings. In general his designs were bad, and his execution good. In the Zraveller, the execution, though deserving of much praise, is far inferior to the design. No philosophical poem, ancient or modern, has a plan so noble, and at the same

time so simple. An English wanderer, seated ona crag among the Alps, near tle point where three great countries meet, looks down on the boundless prospect, reviews his long pilgrimage, recalls the varieties of scenery, of climate

of government, of religion, of national character, which iis has observed, and comes to the conclusion, just or unjust

that our happiness depends little on political institutions, and much on the temper and regulation of our own minds,

While the fourth edition of the 7'raveller was on the

counters of the booksellers, the Vicar of Wakefield appeared and rapidly obtained a popularity which has lasted down 6 our own time, and which is likely to last as long as our language. was constructed. which ought to be found in a tale of common English hfe but that consistency which ought to be found even in the

The fable is indeed one of the worst that ever It wants, not merely that probability

wildest fiction about witches, giants, and fairies. But the earlier chapters have all the sweetness of pastoral poetry, together with all the vivacity of comedy. Moses and his spectacles, the vicar and his monogamy, the sharper and

his cosmogony, the squire proving from Aristotle that rela-

tives are related, Olivia preparing herself for the arduous task of converting a rakish lover by studying the contro- versy between Robinson Crusoe and Friday, the great ladies with their scandal about Sir Tomkyn's amours and Dr Burdock's verses, and Mr Burchell with his " Fudge," have caused as much harmless mirth as has ever been caused by matter packed into so smalla number of pages. The latter part of the tale is unworthy of the beginning. As we ap- proach the catastrophe, the absurdities lie thicker and thicker, and the gleams of pleasantry become rarer and rarer.

The success which had attended Goldsmith as a novelist emboldened him to try his fortune as a dramatist, He wrote the Goodnatured Man, a piece which had a worse fate than it deserved. Garrick refused to produce it at Drury Lane. It was acted at Covent Garden in 1768, but was coldly received. The author, however, cleared by his benefit nights, and by the sale of the copyright, no less than £500, five times as much as he had made by the Traveller and the Vicar of Wakefield together. The plot of the Goodnatured Man is, like almost all Goldsmith's plots, very ill constructed. But some passages are exquisitely ludicrous,—much more ludicrous indeed than suited the taste of the town at that time. A canting, mawkish play, entitled False Delicacy, had just had an immense rum. Sentimentality was all the mode. During some years, more tears were shed at comedies than at tragedies; and a pleasantry which moved the audience to anything more than a grave smile was reprobated as low. It is not strange, therefore, that the very best scene in the Goodnatured Man, that in which Miss Richland finds her lover attended by the bailiff and the bailiff's follower in full court dresses, should have been mercilessly hissed, and should have been omitted after the first night. ;

In 1770 appeared the Deserted Village. In mere dic- tion and versification this celebrated poem is fully equal, perhaps superior, to the Z'raveller; and it is generally pre- ferred to the Traveller by that large class of readers who think, with Bayes in the Rehearsal, that the only use of a plan is to bring in fine things. More discerning judges, however, while they admire the beauty of the details, are shocked by one unpardonable fault which pervades the whole, The fault which we mean is not that theory about wealth and luxury which has so often been censured by political economists. The theory is indeed false ; but the poem, considered merely as a poem, is not necessarily

the worse on that account. The finest poem in the Latin lan- guage,— indeed, the finest didactic poem in any language;—

was written in defence of the silliest and meanest of all

) easily be pardoned for reasoning ill; but he cannot be par- ‘ doned for describing ill, for observing the world in which he lives so carelessly that his portraits bear no resemblance

could be found together. What would be thought of a painter who should mix August and January in one land- scape, who should introduce a frozen river into a harvest scene? Would it be a sufficient defence of such a picture to say that every part was exquisitely coloured, that the green hedges, the apple-trees loaded with fruit, the wag- gons reeling under the yellow sheaves, and the sun-burned reapers wiping their foreheads were very fine, and that the ice and the boys sliding were also very fine? To such a

picture the Deserted Village bears a great resemblance. It

is made up of incongruous parts. The village in its happy

days is a true English village. The village in its decay is an Irish village. The felicity and the misery which Gold. smith has brought close together belong to two different

/countries, and to two different stages in the progress of society. He had assuredly never seen in his native island such a rural paradise, such a seat of plenty, content, and

j tranquillity, as his Auburn, He had assuredly never seen in England all the inhabitants of such a paradise turned

out of their homes in one day, and forced to emigrate in a

body to America, The hamlet he had probably seen in Kent ; the ejectment he had probably seen in Munster; but by joining the two, he has produced something which

“never was and never will be seen in any part of the world.

| In 1773 Goldsmith tried his chance at Covent Garden with a second play, She Stoops to Conquer. The manager

” was, not without great difficulty, induced to bring this piece

out. The sentimental comedy still reigned, and Gold- smith’s comedies were not sentimental. The Goodnatured

Man had been too funny to succeed ; yet the mirth of the

Goodnatured Man was sober when compared with the rich

drollery of She Stoops to Conquer, which is, in truth, an in-

comparable farce in five acts. On this occasion, however,

genius triumphed. Pit, boxes, and galleries were in a

onstant roar of laughter. If any bigoted admirer of Kelly

“and Cumberland ventured to hiss or groan, he was speedily

silenced by a general cry of “turn him out,” or “throw

iim over.” Two generations have since confirmed the ver- ‘dict which was pronounced on that night.

While Goldsmith was writing the Deserted Village and

She Stoops to Conquer, he was employed on works of a very

different kind,—works from which he derived little reputa-

ion but much profit. He compiled for the use of schools

a story of Rome, by which he made £300; a History of

England, by which he made £600; a History of Greece, for

which he received £250; a Natural Mistory, for which the

booksellers covenanted to pay him 800 guineas. These works he produced without any elaborate research, by lerely selecting, abridging, and translating into his own lear, pure, and flowing language, what he found in books well known to the world, but too bulky or too dry for boys jind girls, He committed some strange blunders, for he

(new nothing with accuracy. Thus, in his Wistory of Eng-

) and, he tells us that Naseby is in Yorkshire; nor did he sorrect this mistake when the book was reprinted. He was

In his Animated Nature he relates, with jaith and with perfect gravity, all the most absurd lies vhich he could find in kooks of travels about gigantic /-atagonians, monkeys that preach sermons, nightingales lat repeat long conversations. 'If he can tell a horse toma cow," said Johnson, " that is the extent of his know. edge of zoology." How little Goldsmith was qualified to

. systems of natural and moral philosophy. A poet may

to the originals, for exhibiting as copies from real life mon- strous combinations of things which never were and never

write about the physical sciences is sufficiently proved by two anecdotes. He on one occasion denied that the sun is longer in the northern than in the southern signs. It was vain to cite the authority of Maupertuis, " Mauper-tuis!" he cried, "I understand those matters better than Maupertuis." On another occasion he, in defiance of the evidence of his own senses, maintained obstinately, and even angrily, that he chewed his dinner by moving his upper jaw.

Yet, ignorant as Goldsmith was, few writers have done more to make the first stepsin the laborious road to know- ledge easy and pleasant. His

compilations are widely dis- tinguished from the compilations of ordinary bookmakers. He was a great, perhaps an unequalled, master of the arts of selection and condensation. In these respects his his- tories of Rome and of England, and still more his own abridgments of these histories, well deserved to be studied, In general nothing is less attractive than an epitome ; but the epitomes of Goldsmith, even when most concise, are always amusiug; and to read them is considered by intelli- gent children not as a task but asa pleasure.

Goldsmith might now be considered as a prosperous mall, He had the means of living in comfort, and even in' what to one who had so often slept in barns and on bulks must have been luxury. His fame was great and was constantly rising. He lived in what was intellectually far the best society of the kingdom, in a society in which no talent or accomplishment was wanting, and in which the art of con- versation was cultivated with splendid success, There pro- bably were never four talkers more admirable in four dif- ferent ways than Johnson, Burke, Beauclerk, and Garrick; and Goldsmith was on terms of intimacy with all the four. He aspired to share in their colloquial renown, but never was ambition more unfortunate. It may seem strange that a man who wrote with so much perspicuity, vivacity, and grace should have been, whenever he took a part in con- versation, an empty, noisy, blundering rattle. But on this point the evidence is overwhelming. So extraordinary was the contrast between Goldsmith's published works and the silly things which he said, that Horace Walpole described him as an inspired idiot. Noll," said Garrick, " wrote like an angel, and talked like poor Poll." Chamier declared that it was a hard exercise of faith to believe that so foolish a chatterer could have really written the Zraveller. Even Boswell could say, with contemptuous compassion, that he liked very well to hear honest Goldsmith run on, " Yes, sir," said Johnson, "but he should not like to hear him- self." Minds differ as rivers differ. There are transparent and sparkling rivers from which it is delightful to drink as they flow; to such rivers the minds of such men as Burke and Johnson may be compared. But there are rivers of which the water when first drawn is turbid and noisome, but becomes pellucid as crystal and delicious to the taste, if it be suffered to stand till it has deposited a sedimeut ; and such a river is a type of the mind of Goldsmith. His first thoughts on every subject were confused even to ab- surdity, but

they required only a little time to work them- selves clear. When he wrote they had that time, and therefore his readers pronounced him aman of genius ; but when he talked he talked nonsense, and made himself the laughing-stock of his hearers. He was painfully sensible of his inferiority in conversation; he felt every failure keenly; yet he had not sufficient judgment and self-com- mand to hold his tongue. His animal spirits and vanity were always impelling him to try to do the one thing which he could not do. After every attempt he felt that he had exposed himself, and writhed with shame and vexation ;

yet the next moment he began again.

His associates seem to have regarded him with kindness, which, in spite of their admiration of his writings, was not

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unmixed with contempt. In truth, there was in his char- acter much to love, but very little to respect. His heart was soft cven to weakness: he was so generous that he quite forgot to be just ; he forgave injuries so readily that lie might be said to invite them, and was so liberal to beggars that he had nothing left for his tailor and his butcher. He was vain, sensual, frivolous, profuse, impro- vident. One vice of a darker shade was imputed to him, envy. But there is not the least reason to believe that this bad passion, though it sometimes made him wince and utter fretful exclamations, evcr impelled him to injure by wicked arts the reputation of any of his rivals. The truth pro- bably is that he was not more envious, but merely less prudent, than his neighbours. His heart was on his lips. All those small jealousies, which are but too common among men of letters, but which a man of letters who is also a man of the world does his best to conceal, Goldsmith avowed with the simplicity of a child) When he was envious, instead of affecting indifference, instead of damn- ing with faint praise, instead of doing injuries slily and in the dark, he told everybody that he was envious. “ Do uot, pray, do not, talk of Johnson in such terms,” he said to Boswell; “you harrow up my very soul.” George Steevens and Cumberland were men far too cunning to say such a thing. They would have echoed the praises of the man whom they envied, and then have sent to the news- papers anonymous libels upon him. Both what was good and what was bad

in Goldsmith's character was to his associates a perfect security that he would never commit such villainy. He was neither ill-natured enough, nor long- headed enough, to be guilty of any malicious act which re- quired contrivance and disguise.

Goldsmith has sometimes been represented as a man of genius, cruelly treated by the world, and doomed to struggle with difficulties, which at last broke his heart. But no representation can be more remote from the truth. Hie did, indeed, go through much sharp misery before he had done anything considerable in literature. But after lis name had appeared on the title-page of the Z'raveller, he liad none but himself to blame for his distresses. His average income, during the last seven years of his life, cer- tainly exceeded £400 a year, and £400 a year rauked, among the incomes of that day, at least as high as £800 a year would rank at present. A single man living in the Temple, with £400 a year, might then be called opulent. Not one in ten of the young gentlemen of good families who were studying the law there had so much. But all the wealth which Lord Clive had brought from Bengal, and Sir Lawrence Dundas from Germany, joined together, would not have sufficed for Goldsmith. He spent twice as much as he had. He wore fine clothes, gave dinners of several courses, paid court to venal beauties. He had also, it should be remembered, to the honour of his heart, though not of his head, a guinea, or five, or ten, according to the state of his purse, ready. for any tale of distress, true or false. But it was not in dress or feasting, in promiscuous amours or promiscuous charities, that his chief expense lay. He had been from boyhood a gambler, and at once the most sanguine and the most unskilful of gamblers. For a time he put off the day of inevitable ruin by temporary expe- dients. He obtained advances from booksellers, by pro- mising to execute works which he never began. But at length this source of supply failed. He owed more than £2000; and he saw no hope of extrication from his em- barrassments. His spirits and health gave way. He was attacked by a nervous fever, which he thought himself com- petent to treat. It would have been happy for him if his inedical skill had been appreciated as justly by himself as by others. Nothwithstanding the degree which he pre- teuded to have received at Padua, he could procure no

paticnts. ‘I do not practise,” he once said ; “I make t a rule to prescribe only for my friends.” “ Pray, deay ” . 2) Doctor,” said Beauclerk, “alter your rule; and prescribe only for your enemies.” Goldsmith now, in spite of this excellent advice, prescribed for himself. The remedy ageravated the malady. The sick man was induced to cal] in real physicians; and they at one time imagined that they had cured the disease. Still his weakness and restlessness continued. He could get no sleep. He could take no food ‘‘ You are worse,” said one of his medical attendants, “ than you should be from the degree of fever which you have, Is your mind at ease?” <“* No; it is not,” were the last recorded words of Oliver Goldsmith. He died on the 3d of April 1774, in his forty-sixth year. He was laid in the churchyard of the Temple; but the spot was not marked by any inscription, and is now forgotten. The coffin was followed by Burke and Reynolds. Both these great men were sincere mourners. Burke, when he heard of Gold- smith’s death, had burst into a flood of tears. Reynolds had been so much moved by the news that he had flung aside his brush and palette for the day.

A short time after Goldsmmith’s death, a little poem ap- peared, which will, as long as our language lasts, associate the names of his two illustrious friends with his own, It has already been mentioned that he sometimes felt keenly the sarcasm which his wild blundering talk brought upon him. He was, not long before his last illness, provoked into retaliating. He wisely betook himself to his pen; and at that weapon he proved himself a match for all his assailants together. Within a small compass he drew with a singularly easy and vigorous pencil the characters of nine or ten of his intimate associates. Though this little work did not receive his last touches, it must always be regarded as a masterpiece. It is impossible, however, not to wish that four or five likenesses which have no interest for pos- terity were wanting to that noble gallery, and that their places were supplied by sketches of Johnson and Gibbon, as happy and vivid as the sketches of Burke and Garrick.

Some of Goldsmith’s friends and admirers honoured him with a cenotaph in Westminster Abbey. Nollekens was the sculptor, and Johnson wrote the inscription. It is much to be lamented that Johnson did not leave to pos

terity a more durable and a more valuable memorial of his friend, A life of Goldsmith would have been an inesti- mable addition to the Lives of the Poets. No man appreciated Goldsmith's writings more justly than J ohnson ; no man was better acquainted with Goldsmith's character and habits ; and no man was more competent to delineate with truth and spirit the peculiarities of a mind in which great powers were found in company with great weak- nesses. But the list of poets to whose works Johnson was requested by the booksellers to furnish prefaces ended with Lyttelton, who died in 1773, The line seems to have been drawn expressly for the purpose of excluding the person whose portrait would have most fitly closed the series. Goldsmith, however, has been fortunate in his biographers. Within a few years his life was written by Mr Prior (1836), by Mr Washington Irving (1849), and by Mr Forster (1848; 2ded., 1854). The diligence of Mr Prior deserves great praise ; the style of Mr Washington Irving 1s always pleasing; but the highest place must, in justice, be assigne to the eminently interesting work of Mr Forster. (M)

GOLDSTUCKER, Tuxopor (1821-1872), an eminent Sanskrit scholar, was born of Jewish parents at Konigsberg on the 18th of January 1821, and, after passing through 2 prolonged course of study at the gymnasium, entered the university in 1836, where he attended the lectures ° Lobeck, Rosenkranz, and Von Bohlen, under the last of whom he began the study of Sanskrit. In 1838 he removed to Bonu, where he heard W. von Schlegel, Lassen, on

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Freytag; and after graduating at Konigsberg in 1840, he proceeded to Paris, where he heard the lectures and enjoyed the friendship of Burnouf, and where in 1842 he edited a German translation of the Prabodha Chandrodaya. From 1846 to 1850 he resided at Berlin, where his talents and scholarship were recognized by A. von Humboldt; in the latter year he was induced, for the further prosecution of his Sanskrit researches, to remove to London, where in 1851 he was appointed professor of Sanskrit in University He now began to devote himself to the execution of a new Sanskrit dictionary, of which the first instalment In 1861 he published an important monograph, entitled Panini: his Place in Literature; and from

1866 he was one of the chief promoters of the Sanskrit Text Society, which had been founded in that year; he was also an active member of the Philological His literary produc- tiveness was not, however, proportionate to the extent and accuracy of his reading; he had “allowed his learning to stifle his creative faculty,” and a morbid dread of the risk of making inaccurate or defective statements made him unduly reluctant to communicate to the world the results of his laborious collecting and collating. The dictionary, —so copious as almost to deserve the name of a cyclopedia of Indian archeology, —was never advanced further than to about the middle of the first letter (1864) ; and whatever else he may have written was published anonymously in various periodicals and works of reference. He died on the

College. appeared in 1856,

Society, and of other learned bodies.

6th of March 1872.

| it—it may be called, par excellence, the national game.

“German folbe, a club—in Dutch, kolf,—which last is)nearly in sound identical, and might give inference for the gume of a Dutch origin.

Golf may be practised on any good stretch of meadow-land, where the grass is not too rank ; but the ground best suited ‘for the purpose is a reach of undulating down-country, jsuch as is common on the seaboard,—sandy in soil, and as such covered with a short crisp turf, occasionally broken up

whins constitute the main “ hazards ” of the game, in the “avoidance of which skill in it is specially shown; and without a fair provision of them, no golfing “links” or “green” can be held to approach the ideal standard. Small holes, of about 4 inches diameter, are punched in the turf at distances indefinitely variable, but ranging from about 100 to 400 or 500 yards ; and from one of these holes into she next in order, a ball of gutta percha of about 1? oz, eight has to be driven with implements (clubs) of some variety, devised for the purpose. Their variety is deter- jnined by this, that while, in starting from the hole, the yall may be teed (t.¢., placed where the player chooses, vith a little pinch of sand under it called a tee), it must in yvery other case be played strictly from its place as it Phances to lie——in sand, whin, or elsewhere,—a different ‘lub being necessary in each particular difficulty. These

/1 From an enactment of James VI. (then James J. of England),

caring date 1618, we find that a considerable importation of golf balls t that

“ingdome of Scoteland” (see letter of his Majesty from Salisbury, wth Aug. 1618), he issues a royal prohibition, at once as a wise “Conomy of the national monies, and a protection to native industry on the article. From this it might almost seem that the game was at hat date still known and practised in Holland, though it has long nee entirely disappcared there,

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i!

GOLF (in its older forms Gorr, Gourr, or Gowrr, the last of which gives the genuine old pronunciation) is an amusement so peculiar to Scotland and so prevalent there that—unless curling may be held to dispute the place with

| There seems little doubt the word is derived from the

time took place from Holland, and as thereby ‘‘na small | uantitie of gold and silver is transported zierly out of his Hienes’ !

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clubs may generally be defined as shafts of wood, with so called heads of wood or iron attached.” Starting from the one hole, it is the immediate aim of the player to drive his ball as far towards the next as he can. Having got within Some moderate distance of it, he proceeds to make his “approach shot,” carefully selecting the appropriate imple- ment. When he has reached the “ putting green,”—a smooth space carefully chosen for the purpose,—he essays to put (or putt) his ball into the hole ; and generally, if he does it in two strokes, he may be held skilful or fortunate. The player who holes his ball in the smallest number of strokes is, as matter of course, winner of the hole. The “approach” and the “ putting” are by far the most difficult, critical, and important parts of the game ; though no one who is not fairly competent in his driving also is ever in the least likely to take rank as a first-class player. The maximum length of a good driving stroke for a first-class player, not favoured by any exceptional circumstances, may perhaps fairly be stated as something over 180 yards, and under 200. For further details as to the mode and order of playing, the reader is referred to the set of “rules” appended to this article.

The game, in description as above, may not seem very lively or entertaining ; and it is to be admitted that, seen for the first time, more especially if played by bungling or indifferent performers, it does not look of much promise, No game, however, stirs a keener enthusiasm in its votaries 3 and very few people who have ever fairly committed them- selves to serious practice of it will be found to deny its extreme fascination, It is amanly and eminently healthful recreation, pursued as it is mostly amid the fresh sea-breezes ; while, as exercise, it has this peculiar merit, that, according to pace, it may be made easy or smart at pleasure, and thus equally adapts itself to the overflowing exuberance of youth, the matured and tempered strength of manhood, and the gentler decays of age.

It is uncertain at what date golf was introduced into Scotland, but in 1457 the popularity of the game had already become so great as seriously to interfere with the more important pursuit of archery, and cause the rulers of the realm to sound a note of alarm. in March of that year, it is recorded that the Scottish parliament ‘‘decreted and ordained that an be halden be the lordis and baronis spirituale and temporale, four times in the zeir ; and that the fute-ball and golf be utterly cryit doun, and nocht usit ; and that the bowe-merkis be maid at ilk paroche kirk a pair of buttis, and schuttin be usit idk Sunday.” 1t does not appear, how- ever, that to this patriotic decree of their pailiament the people paid much attention; and fourteen ycars afterwards, in May 1471, it was judged necessary to pass another Act ‘‘anent wapenshawings,”’ and for opposing “‘our auld enimies of England.” But it seems to have becn pretty much as before; schuttin was no more ustt, nor golf the less steadily played because of these decrees of parlia- ment; and accordingly in 1491 a final and evidently angry fulmination is issued on the gencral subject, with pains and penalties annexed, It runs thus—‘‘ Futeball and Golfe forbidden. Item, it is statut and ordainit that in na place of the realme there be usit futeball, yolfe, or uther sik unprofitabill sportis, but for the commoun gude of the realme, and defence thereof, that bowis and schuttin be hanted, and bow-markis maid therefor, ordainit in ilk parochin under the pain of fourtie shillinges, to be raisit be the schireffe and baillies foresaid,” &c. This, be it noted, is an edict of James IV. : and it is not a little curious presently to find the monarch himself breaking his own behest, and setting an ill example to his com- mons, by practice of this ‘ unprofitabill sport,” as is shown by various entries in the accounts of the Lord High Treasurer of Scotland (1503-6).

About a century later, the game again appears on the surface of history, and it is quite as popular as before. In the year 1592, the Town Council of Edinburgh ‘ordanis proclamation to be maid

2 A complete set of them may number about a dozen :—a driving club, a long, a middle, and a short “spoon” (so called from the face of the club being spooned, or bevelled, to lift a bad-lying ball), and a “putter” (the use of which is explained below) are the clubs formed wholly of wood, while of iron there are—a heavy and a light “iron,” a driving and a lifting ‘‘cleek,”

possibly also a “* putting” cleek, finally a ‘‘niblick,” constructed to pick a ball out of some such hole as no other iron can reach,

threw this burgh that, seeing the Sabboth day being the Lordis day, it beeumis every Christiane to delicat himselff to the service of God, thairfore commanding in our soverane lord’s name, and in name of the provost and baillies, that na inhabitants of the samyn be seen at ony pastymes within or without the toun, upoun the Sabboth day, sic as golfe, &c.”1 The following year the edict was reannounced, but with the modification that the prohibition was ee tyme of sermons.”

Golf has from old times been known in Scotland as ‘‘ The Royal and Ancient Game of Goff.” Though no doubt Scottish monarchs handled the club before him, James IV. is the first who figures formally in the golfing record. James V. was also very partial to the game distinctively known as ‘‘ royal”; and there is some scrap of evidence to show that his daughter, the unhappy Mary Stuart, was, in some sort of feminine way, a golfer. It was alleged by her enemies that, as showing her shameless indifference to the fate of her husband, a very few days after his murder, she ‘‘wag seen playing gojf and pallmall in the fields beside Seton.”? That her son, James VI. (afterwards James I. of England), was a golfer tradition confidently asserts, though the evidence which connects him with the personal practice of the game is slight. Of the interest he took in it we have evidence in his Act—already alluded to—‘‘anent golfe ballis,” prohibiting their importation, except under certain restrictions. Charles I. (as his brother Prince Henry had been*) was devotedly attached to the game. Whilst engaged in it on the links of Leith, in 1642, the news reached him of the Irish rebellion of that year. He had not the equanimity to finish his match, but returned precipitately and in much agitation to Holyrood.4 Long afterwards, while prisoner to the Scots army at Newcastle, before being given up to the tender mercies of the English Parliament, he found his favourite diversion in ‘‘ the royal game.” “The King was nowhere treated with more honour than at New- castle, as he himself confessed, both he and his train having liberty to go abroad and play at goffin the Shield Field, without the walls.” ® Of his son, Charles II., as a golfer, nothing whatever

is ascertained, but his brother, James II., was a known devotee. ® After the Restora- tion, James, then duke of York, was sent to Edinburgh in 1681-2 as commissioner of the king to parliament, and an historical monument of his prowess as a golfer remains there to this day in the * Golfer's and," as it is still called, 77 Canongate. The duke having been challenged by two reve noblemen of his suite, or entourage, to gis a match against them, for a very large stake, along with any

cotch ally he might select, judiciously chose as his partner one « Johne Patersone," a shoemaker—a local crack of the day, it is to be presumed. The duke and the said Jolie won easily, and half of the large stake the duke made over to his humble coadjutor, who therewith built himsclf the house mentioned above. With the Revolution royal patronage entirely ceased, to be renewed only in comparatively recent times. In 1834 William IV. became patron of the St Andrews Golf Club (St Andrews, the ancient ecclesiastical metropolis of Scotland, being now, as of old, the most famous seat of the game), and to approve of its being styled in time coming '' The Royal and Ancient Golf Club of St Andrews." In 1837, as further proof of royal favour, he presented to it a magnificent gold medal, which ''should be challenged and played for annually ie and in 1838 the queen dowager, duchess of St Andrews, became patroness of the club, and presented to it a handsome gold medal— 'The Royal Adelaide,"—as a mark of her approbation, with a request that it should be worn by the captain, as president, on all public occasions. In June 1863 the prince of Wales signified his desire to become patron of the club, and in the following September was elected captain by acclamation. The engagements of the prince did not admit of his coming in person to undertake the duties of the office, but his brother Prince Leopold, having in 1876 done the club the honour to become its captain, twice visited the ancient city in that capacity. Prince Leopold is himself a keen player, and under his superintendence a green has been laid out in Windsor-park. The ancient game of golf has thus fairly now again become as ''roya – as ever it was in its old historic periods.

The later fortunes of the game have been uneventful. While always keeping its hold on the affections of the people, it might readily be shown, that over Scotland generally its tide, till nearly within our own time, was rather an ebbing than a flowing one. While it remained a favourite pastime with some

of the aristocracy aud gentry who always had a sufficient following where —as instance, in Edinburgh—the due facilities admitted, the general enthusiasm for the sport which lives for us in the old records had certainly dis- appeared, and over various isolated greens, where playing was at one time constant, it had virtually and sometimes absolutely died out. Its increased popularity within recent years has no doubt been largely due to those general causes which have led to a keener

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1 Records of the City of Edinburgh. 2 Inventories of Mary Queen of Scots, preface, p. Ixx., 1863, 3 Anonymous author of MS. in the Harleian Library, 4 See History of Leith, by A. Campbell, 1827. Zz 8 Local Records of Northumberland, by John Sykes, Newcastle, 1833, € Robertson's Historical Notices of Leith.

clubs and golfing grounds. which primacy is by common consent accorded, is' that of the ci

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interest in almost every form of out-door amusement, but it is also in some measure to be attributed to greatly extended railway facilities, and to the introduction some thirty years ago of the cheap and durable gutta pereha ball to replace the old missile.'

It remains to give some little account of the more noted golf The most famous of golf elubs, to

of St Andrews, instituted in 1754. For various reasons this club has always been of much more than merely local celebrity. Its member.

ship is far more numerous than that of any other ; nearly all golfers

of note belong to it; and to its spring and autumn meetings they flock from every part of the kingdom. To be winner of a medal at St Andrews is thus the highest honour to which the anibition of the golfer can aspire. A ''round," as it is termed, of the links ig

very nearly four miles; and, extent and quality considered, the

green is on the whole unrivalled by any other in Scotland. Of greens in Fife of minor importance, those of Elie and Leven may be noted. Next inimportanceto ‘‘The Royal and Ancient Golf Club of St Andrews” ranks ‘“‘ The Honourable the Edinburgh Company of Golfers,” who play over Musselburgh green, one of fair but scareely supreme quality. The first of its regular series of minutes bears date 1744, and is signed by Lord President Duncan Forbes of Culloden, but the club itself is heyond question very much older. Of other Edinburgh golf clubs may be noted ‘‘‘The Bruntsfield,” founded in the year 1760, and the ‘‘ Edinburgh Burgess,” the minute books of which are preserved since the year 1773, though it claims to have date of origin 1735. In Kast Lothian, besides the good old green of North Berwick, there are of late years two others,—Gullane and Luffness, —and on all three excellent golfing sport is to be had, At the ancient city of Perth, though the ground is but indifferently adapted for it, the old Scottish game has continuously been main- tained, and still flourishes. So also in Forfarshire, at the historic green of Montrose, to which in our own time have been added those of Monifeith and Carnoustie, which, from their proximity to Dundee, naturally attract many players; and all three may be ranked as greens of fair quality. At Aberdeen, till very lately, the game had quite died out, but it has now been with more or less of vigour resumed, At Stirling likewise it was extinct, but is now again fairly alive, though under conditions of ground, as at Perth, not quite satisfactory. At Glasgow also, where on the old “ Glasgow Green” the game was habitually played, it had lapsed into disuse and even oblivion; but within the last ten years the gencral resuscitation has reached it, and a spirited club now exists there, If the ground is by no means what might be wished, the Glasgow golfer, by a very casy railway run, can reach the green of Prest- wick, near Ayr. The ‘‘ Prestwick Club” is, by comparison, of recent origin, having been organized mainly by the last earl of Eglintoun, and one or two gentlemen in the neighbourhood, interested like himself in the game. Except for limitation in extent, making it impossible that a large ‘‘field” should be accommo dated without confusion and even danger, such is the excellence of the ground that, as a ‘‘ sporting” green, to test play, that of Prestwick is held by competent judges pethaps to surpass all others. A second links has recently been opened at Prestwick, and another at Troon, on the same coast.

The oldest golf club in the kingdom is not improbably that of Blackheath, near London. ‘The old records of the club were unfor- tunately destroyed by fire at Greenwich, where they were kept, and 1766 is thus the earliest date for which there is documentary evidence. ‘Tradition places the origin of this elub so far back as 1608, when King James, with his Scotch following, brought the game south into England. Recently another London club has been started, whose ground of play is at Wimbledon. Neither green 18 of great merit, but both are much prized and frequented by golfers in and near London. In 1864, at Bideford, in Devonshire, a colfing green was laid out by the well-known Tom Morris of St Andrews, and a club was duly instituted, which has since continued to flourish. This links is one of the finest and most extensive any: where to be found, and despite the disadvantage of renroteness an difficulty of access, the meetings of the club attract players from all quarters, and are commonly most successful. More lately an excel- lent green was opened at Hoylake, near Liverpoo!, and the er here has also prospered greatly. At Crookham in Berkslure, an Alnwick in Northumberland, the game is regularly played ; am at the universities of Oxford and Cambridge rival golf clubs have within the last few years been formed. In brief, the game has ae thoroughly taken root in England ; from ycar to year it is rapidly spreading, and many fine English players have already passed into the front rank. ae

In nearly all the British colonies the game has naturalize itself. Golf clubs of old standing exist at Calcutta and Boni and more casually over India a good deal of play is to be me with. Wherever Scots congregate in any numbers @ golf club 18 pretty sure to spring up. In Canada and the United States, a8

7 The old ball was, roughly, a eirelet of leather, stitehed together in sot and stuffed as hard as a stone with feathers. It was about twice the price 0

| present ball, and almost incomparably less durable.

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Australia and New Zealand, many clubs may be found flourishing ;

and, oddly enough, at Pau in the Pyrenees, a golf club has long

existed. An export of clubs and balls to all.thcese golfing depend-

encies has long formed, and still forms, an important item of the inanufacture.

We must not quit the subject without making note of one pleasing Innovation. Some six or eight years ago, the ladies took to the | game, and since have diligently prosecuted it in large numbers, Some attaining no mean proficiency. They have hitherto confined themselves to the ‘‘short game,” as it is termed, or putting ; and where a separate piece of ground has been assigned them, as at St Andrews, North Berwick, and elsewhere, the ‘‘ Ladies’ Links ” form a pretty and charming adjunct to the main green,

We append the more important rules of the game, as played by “The Royal and Ancient Golf Club of St Andrews,” which, though

it has no claim to give law to other clubs, may be accepted as, on the whole, the best authority on the subject :—

I. Mode and Order of Playing the Game.—The gaine of golf is played by two persons, or by four (two of aside), playing alternately. It may also be played by three or more persons, each playing his own ball. The game commences by each party playing off a bali from a place called the fee, near the first hole.’ In a match of four, those who are opposed to each other, and to play off, shall be named at starting, and shall continue so during the match. The person entitled to play off first shall be nanied by the parties themselves : and although the courtesy of starting is generally granted to old captains of the club, or members, it may be settled by lot or toss of a coin. The hole is won by the party holing at fewest strokes, and the reckoning of the game is

hole, the player may take it out, tee it on the line where it entered the burn, on the opposite side from the hole to which he is playing, and lose a stroke; or he may play it where it lies, without a penalty. However, should a ball be driven into the Eden at the high hole, or the sea at the first hole, the ball must be placed a club-length in front of either sea or river, the player or

party losing astroke. In playing for a medal, a ball driven into the Eden may be treated as a lost ball.

IX. Rubs of the Green. — Whatever happens to a ball by accident, such as striking any person, or being touched with the foot by a third party, or by the fore cady, must be reckoned a rub of the

the wrong ball, it is then too late to claim the penalty, and the hole must be played out with the balls thus changed. If, however, the mistake occurs from wrong information given by one party to the

X. Ball Lost.—If a ball is lost, the player (or his partner, in a double match) returns to the Spot, as near as possible, where the ball was struck, tees another ball, and loses both the distance and a stroke. If the original ball is found before the party has struck the other ball, the first shall continue the one to be played.

XI. Club Breaking.—If, in striking, the club breaks, it is never- theless counted to be a stroke, if the part of the club remaining in the player's hand either strike the ground or pass the ball.

XII. Holing out the Ball.—In holing, no mark shall be placed, or line drawn, to direct the ball to the hole ; the ball must be played fairly and honestly for the hole, and not on your opponent's ball not being in the way to the hole; nor, although lying in the way to the hole, is the playcr entitled to play with any strength upon it that might injure his opponent's osition, or greater than is necessary honestly to send your own ball the distance of the hole. Either party may smooth sand lying around the hole, but this must be done lightly and without pressure, or beating down with the feet, club, or otherwise, If, in holing out, the ball rests upon the flag-stick in the hole, the player shall be entitled to have the stick removed, and if the ball falls in, it shall be considered as holed out ; but either party is entitled to have the flag-stick removed when approaching the hole.

XIII. Unplaying Balls.—In Match playing every ball must be

played, wherever it lies, or the hole be given up, excepting when it in a bunker, sand, or any other hazard, there shall be no impression | lies on

clothes, in water, or in the bed of the burn (see Rules IV. nade, nor sand or other obstacle removed by the club, or otherwise, | and VIII.), or in any of the holes, or short holes, made for golfing, vither on or off the green, before striking at the ball. When a ball | in which latter case it may be lifted, dropped behind the hazard, and ies within a club length of a washing-tub, the tub may be removed, | played without losing a stroke. In Medal playing a ball may, ind when on clothes the ball may be lifted and dropped behind | under a penalty of two strokes, be lifted out of a difficulty of any hem, description, and teed behind the hazard, and if in any of the golfing | V. Entitled to see the Ball.—When a ball is completely covered | holes, it may be lifted, dropped, and played, without a penalty. in hith fog, bent, whins, &., so much thereof shall be set aside as | all cases where a ball is to be dropped, the party doing so shall front nat the player shall merely have a view of his ball before he plays, | the hole to which he is playing, standing close on the hazard, and ‘hether in a line with the hole or otherwise. A ball stuck fast in | drop the ball behind him from his head, ‘ et ground or sand may be taken out and replaced Joosely in the XV, Asking Advice.—A player must not ask advice about the i f game, by word, look, or gesture, from any one except his own cady, V VI. Clearing the Putting Green.—All loose impediments, of | his partner’s cady, or his partner. Vhatever kind, may be lifted on the putting green or table-land on XVII. Balls Splitting.—If a ball shall split into two or more hich the hole is placed (excepting as declared in Rule IV.), which | pieces, a fresh ball shall be put down where the largest portion of) considered not to exceed twenty yards from the hole. N othing | the ball lies; and if a ball is cracked the player may change it on n be lifted either on the course or putting green, if it is to move intimating his intention of doing so to his opponent. jhe ball out of its position. X1X. Breach of Rules.—Where no penalty for the infringement) VII. Lifting Bails. —When, on any part ofthe course, or off it, | of a rule is specially mentioned, the loss of the hole shall be under- ¥ in a bunker, the balls lie within six inches of each other, the ball | stood to be the penalty. yarest the hole must be lifted till the other is played, and then Golf which, as we have seen, has a history of some interest, has)aced as nearly as possible in its original position—the six inches | also a literature (copious in verse and prose), and a somewhat € measured from the surface of the balls. In a three-ball match, | amusing anecdotage. In Golf, a Royal and Ancient Game, a work ‘ye ball in any degree interposing between the player and the hole |

issued in 1875 by Mr Robert Clark of Edinburgh, a well-known and i the putting green, must be played out. accomplished adept, a very careful collection will be found of every- \VIII. Ball in Water, or in the Burn, and Place of Re-tecing.— | thing connected with the game which in this form deserves pre- |} the ball is in water, the player may take it out, change the ball | servation. Through the ready kindness of the author this ad- Whe pleases, tee it, and play from behind the hazard, losing a | mirable compendium has been available, and free use has been made woke. If the ball lies in any position in the burn across tlie first | of it, in the preparation of this article, MEO Pr. As)

we struck off, the ball farthest from the hole to which the parties are playing must be played first. When two parties meet on the putting green, the party first there may claim the privilege of holing out, and any party coming up must wait till the other party has ‘played out the hole, and on no account play their balls np lest they should annoy the parties who are putting. No player may ie teed ball till the party in front have played their second strokes. AIL. Changing the Balis.—The balls struck off from the tee must jot be changed, touched, or moved before the hole is played out Yexcept in striking, and the cases provided for by Rules VIII, KVII1., and XIX.); and if the parties are at a loss to know the ‘ne ball from the other, neither shall be lifted till both parties gree.

GOLGOTHA. See JERUSALEM.

GOLIUS, Jacopus (1596-1667), Orientalist, was born at the Hague in 1596, and studied at Leyden, where in Oriental Janguages he was the most distinguished pupil of Erpenius. In 1622 he accompanied the Dutch embassy to Morocco, and on his return he was chosen to succeed Erpenius (1624). In the following year he set out on a Syrian and Arabian tour from which he did not return until 1629. The remainder of his life was spent at Leyden where from that date he held the chair of mathematics as well as that of Arabic until his death, which occurred on September 28th, 1667.

His most important work is the Lexicon Arabico-Latinum, fol., Leyden 1653, which, based on the Sihah of Al-Jauhari, has only recently been

superseded by the corresponding work of Freytag. Among his earlier publications may be mentioned editions of vari- ous Arabic texts (Proverbia quadam Alis, imperatoris Muslemict, et Carmen Tograi, poctce doetissimi, necnon dissertatio quedam Aben Syne, 1629; and Ahmedis Arabsiade: vitee et rerum gestarum Pimuri, qui vulgo Tamerlanes dicitur, historia, 1636). In 1656 he published a new edition, with considerable additions, of the @ram- matica Arabica of Erpenius. After his death, there was found among his papers a Dietionarium Persico-Latinum which was pub- lished, with additions, by Edmund Castell in his Lexicon Hepta- glotton (1669). Golius also edited, translated, and annotated the astronomical treatise of Alfragan (Mthammedis, filii Ketiri Fer- ganensis, qui vulgo Alfraganus dicitur, Elementa

GOLLNOW, a town in the Prussian province of Pomer- ania, government district of Stettin, is situated on the right bank of the IIna, 14 miles N.N.E. of Stettin, with which it has communication by steamer. It possesses two suburbs, and has manufactures of linen and woollen goods, copper wares, ribbons, paper, and tobacco. Gollnow was founded in 1190, was raised to the rank of a town by Barnim I. in 1268, and in 1314 received Liibeck rights. It was formerly a Hanse town, and came into the possession of Prussia in 1720. The population in 1876 was 7913.

GOLNITZ, or GoLLNitTz (GoLNICZBANYA), @ mining town of Hungary, on a river of the same name, in the county of Szepes (Zips), about 18 miles south-west of Eperies, 48° 51’ N. lat., 20° 59’ E. long. In the vicinity are irou and copper mines, which, with the forges, and the nail and wire factories, &c., afford employment to most of the inhabitants. It is the seat of a mining council and tribunal, has Roman Catholic and Protestant churches, post and telegraph offices, and a high school. In 1870 the popu- lation amounted to 5205, composed of Magyars, Slavs, and Germans. Gdélnitz was formerly a royal free town ; its chief importance now is as a mining centre.

GOLOVNIN, Vastry Missamovicn (1776-1831), a Russian vice-admiral, was born April 20, 1776, in the vil- lage of Gulynki, in the province of Ryazan, and received his education at the Cronstadt naval school. From 1801 to 1806 he served as a volunteer in the English navy. In 1807 he was

commissioned by the Russian Government to survey the coasts of Kamchatka and of Russian America, including also the Kurile Islands. Golovnin sailed round the Cape of Good Hope, and on October 5, 1809, arrived in Kamchatka. In 1810, whilst attempting to survey the coast of the island of Kunashir, he was seized by the Japanese, and was retained by them as a prisoner until October 13, 1813, when he was liberated, and in the following year he returned to St Petersburg. Soon after this the Govern- ment planned another expedition, which had for its object the circumnavigation of the globe by a Russian ship, and Golovnin was appointed to the command. He started from St Petersburg on the 7th September 1817, sailed round Cape Horn, and arrived in Kamchatka in the following May. He returned to Europe by way of the Cape of Good Hope, and landed at St Petersburg, September 17, 1819. He died July 12, 1831.

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Golovnin published several works, of which the following are the

most important :—Journey to Kamehatka, 2 vols., 1819; Journe round the World, 2 vols., 1822; and Narrative of m ote a Japan, 2 vols., 1816. ote ae German, and English. A complete edition of his works was pub- lished at St Petersburg, 1864, in five volumes, with maps and charts and a biography of the author by N. Grech. ’

The last has been translated into French,

GOLTZ, Bocumrt (1801-1870), humorist and satirist,

was born of a German family settled at Warsaw, March 20

1801.

to Konigsberg, and after studying at the gymnasium was placed under the care of a country clergyman near Marien- werder. and finally returned to Kénigsberg. In 1817 he began to learn practical farming on an estate near Thorn; but the strong desire which he felt for scientific culture led him, five

years later, to the university of Breslau. There he at first entered upon the study of theology, but he did not pursue it, selecting instead philosophy and philology. The next year he bought an estate near Thorn, married the daughter of a Prussian officer, and applied himself to the duties of a farmer. successful experiments in the same line in Poland and Prussia, he retired in 1830 to the small town of Gollub, and devoted himself to literary studies. meditative seclusion passed away ; and then, having taken up his abode at Thorn, he gave to the world the first fruits of his studies and reflexions in the charming poetic Buch der Kindheit (1847), in which he delineates the incidents and impressions of his own childhood with a tender feeling like that of Jean Paul. narrative are inconsistent with those which he furnished for the memoir in Brockhaus's Conversations-Lexikon; and a

At the age of seven he was taken by some friends

He next went to the gymnasium of Marienwerder,

He did not succeed; and after other equally un-

Sixteen years of

The dates which he gives in this

chronological difficulty is thus created which perhaps it may not be possible to solve.

The Buch der Kindheit was speedily followed by a satiri- cal and polemical epistle against Ronge and the friends of enlightenment, which he entitled Deutsche Entartung i der lichtfreundlichen und modernen Lebensart. For the purpose of enlarging his experience of men, and of amassing stores of material for his art as humorist and reformer of human life and society, he undertook a course of extensive travels, visiting Germany, France, England, Italy, and Egypt. In 1850 he published Das Menschendaseyn in seinen weltewigen Ziigen and Zeichen. This was followed by another poeti- cally conceived work on his own early life, entitled Hin Jugendleben: Biographisches Idyll aus Westpreussen (1852), and by Lin Kleinstddter in Aegypten (1853). In his next work, Der Mensch und die Leute (1858), he especially dis- plays his peculiar powers in profound and acute sketches of

various races of men. It isa book of enduring value. His Die Deutschen, consisting of a series of studies on the history and peculiarities of the genius of the Germans, appeared in 1860, His other works are Zur charakteristih und Naturgeschichte der Frauen (1859), Typen der Gesellschaft (1860), Die Bildung und dre Gebildeten (1864), Vorlesungen (1869), and Dre Weltklugheit und dee Lebens- weisheit mit ihren correspondirenden Studien (1869). Goltz is a follower of Jean Paul, and has many of the characteristics of his master ; but he takes a lower place as literary artist, wanting Jean Paul's creative imagination. He died at Thorn, November 11, 1870.

An interesting essay on Goltz was contributed by the port, Rudolf Gottschall, to Unsere Zeit, new series, 1871.

GOLTZIUS, Hanprik (1558-1617), a Dutch painter and engraver, was born in 1558 at Miilebrecht, in the duchy of Juliers. After studying painting on glass for some years under his father, he was taught the use of the burin by Dir Volkertsz Coornlert, a Dutch engraver of mediocre attain- ment, whom he soon surpassed, but who retained his services for his own advantage. He was also employed by Philip

Galle to engrave a set of prints of the history of Lucretia. At the age of twenty-one he married a widow somewhat advanced in years, whose money enabled him to establish at Haarlem an independent business ; tions with her so affected his health

Of his larger heads, the life-size sortrait of himself is probably the most striking example.

is " master-pieces," so called from their being attempts o imitate the style of the old masters, have perhaps been

His prints Mount to more than 300 plates, and are fully described in and Weigel's supplement to the

| GOMARUS, Francis (1563-1641), professor of theology | t Leyden, was born at Bruges on the 30th January 15638. lis parents, having embraced the principles of the Reforma- vo emigrated to the Palatinate in 1578, in order

to enjoy “reedom to profess their new faith, and they sent their son > be educated at Strasburg under John Sturmius, He re-

ained there three years and then went to N eustadt, whither she professors of Heidelberg had been driven by the elector- jalatine because they were not Lutherans. He did not stay png at Neustadt, but crossed to England towards the end ft the year 1582, and entered first the university of Oxford, there he attended the lectures of John Raynold, and then pe university of Cambridge, where he attended those # William Whitaker. At Cambridge he received his ‘achelor’s degree in June 1584, and thence proceeded » Heidelberg, where the faculty had been by this time re- “tablished, and continued his ‘studies there for two years llore. He was called to be minister of a Reformed church ») Frankfort in 1587, and laboured there till the congrega- pn was dispersed by the persecution of the year 1593, In p94 he was appointed professor of theology at. Leyden, #d before going thither received from the university of #eidelberg the degree of doctor. He taught quietly at eyden till 1603, when Arminius came to be one of is colleagues in the theological faculty, and began to teach Wlagian doctrines and to create a new party in the uni- Hrsity. Gomarus immediately set himself earnestly to 4 pose these views, in his classes at college, and wherever # found opportunity. He became the leader of the “ponents of Arminius, who from that circumstance came ! be known as Gomarists. He engaged twice in personal fsputation with Arminius in the assembly of the estates ! Holland in 1608, and was one of five Gomarists who *t five Arminians or Remonstrants in the same assembly Hthe following year. On the death of Arminius shortly ier this time, Vorstius, who sympathized with his views, ‘S appointed to succeed him, in spite of the keen opposi- go of Gomarus and his friends; and Gomarus took his ureat so ill that, rather than have such a man for his

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colleague, he resigned his post, and went to Middleburg in 1611, where he became minister of a congregation and gave public lectures. From this place he was called to a chair of theology at Saumur, where he remained four

years, and then accepted a call as professor of theology and Hebrew to Groningen, where he stayed till his death on 11th January 1641. He took a leading part in the synod of Dort, assembled in 1618 to judge of the doctrines of Arminius. He was a man of ability, enthusiasm, and learning, a considerable Oriental scholar, and also a keen controversialist. He took part in the translation of the Old Testament into Dutch in 1633, and after his death a book by him called the Lyra Davidis was published, which sought to explain the principles of Hebrew metre, and which created some controversy at the time, liaving been opposed by Louis Capel. His works were collected and published in one volume folio, in Amsterdam in 1645,

GOMBROON, another name for BENDER-ABBASI (9.v.).

GOMER, the eldest son of Japhet (Gen. x. 2), and an ally of Gog (Ezek. xxxviii. 6), has usually, since Calmet's time, been identified with those Cimmerii who, originally inhabiting the districts to the N.E. and N. of the Black Sea and Sea of Azoff, at an early period began to penetrate as far as to Asia Minor, and in the 7th century B.C. overran Lydia, though without leaving permanent traces of their presence. 'This identification, however, is to be met with in none of the older writers. Josephus understands the Galatians of northern Phrygia to be intended; and Gimmeri or Gamir was, in the language of the ancient Armenians, a usual designation for their neighbours the Cappadocians (see Dillmann on Gen. x. 2; whose authority is Kephalion, in the Armenian version of the Chronica of Eusebius, ed. Aucher). It is not impossible that an intimate ethnologi- cal connexion between the Cappadocians of Kephalion and the Cimmerians of Homer may ultimately be established ; but meanwhile it is important to observe that the three sons of Gomer, as named in Gen. x, 2, admit of a tolerably definite localization. Ashkenaz, who has sometimes been identified with the Germans, is almost certainly the same as the Ascanians, a very ancient tribe of northern Phrygia (cf. Strabo, xii. 4, 5, sgq., and note the juxtaposition in Jer. h. 27). Riphath has nothing to do with the Rhipzean mountains, with the Carpathians, or with N iphates, but, as Josephus has pointed out, is to be identified with Paphlagonia; as Bochart has shown, the name probably sur- vives in "P7Gas, the designation of a river in Bithynia, and in 'PyBarria, a district situated on the Thracian Bosphorus. Although Togarmah is by Josephus interpreted as equi- valent to Phrygia, there is a considerable

amount of ancient testimony in favour of its identification with Armenia, Tt is possible that the same root is actually at the basis of the two words ; at all events the connexion is assumed in the account which the Armenians themselves give of their legendary history.

GONDA, a district of Oudh, lying between 26° 46’ and 27° 50’ N. lat., and between 81° 35’ and 82° 48’ E. long., bounded on the N. by the lower range of the Himalayas, on the E. by Basti district, on the S. by Fyzabad and Bara Banki, and on the W. by Bharaich, and having an area of 2824 square miles.

Gonda presents the aspect of a vast plain with very slight undulations, studded with groves of mango trees. The surface consists of a rich alluvial deposit which is naturally divided into three great belts known as the tardi or swam py tract, the wparkdr or uplands, and the tarhdr or wet low: lands, all three being marvellously fertile. Several rivers flow through the district, but only two, the Gogra and Rapti, are of any commercial importance, the first being navigable throughout the year, and the latter during the rainy season. The country is dotted over with small lakes,

the water of which is largely used for irrigation. The fere nature consist of tigers, leopards, bears, wolves, and deer. Large game birds are plentiful.

This district has no particular history of its own; what ancient history it has is included in that of Oudh. On the outbreak of the mutiny, the raja of Gonda, after honourably escorting the Govern- ment treasure to Fyzabad, joined the rebels. His estates, along with those of the rani of Tulsipur, were confiscated, and conferred as rewards upon the maharajas of Balrampur and Shahganj, who had remained loyal. The census of 1869 disclosed a population of 1,166,515 (602,862 males, and 563,653 females)—Hindus, 1,049,397; Mahometans, 117,070; Christians—European, Eurasian, and native 48, Five towns contain a population exceeding 5000, namely, Gonda, Balrampur, Colonelganz, Nawabganj, and Utraula. Rice, wheat, and barley are the chief products of the district. The area under cultivation is 993,858 acres. The exports are rice and food grains ; the imports, cotton, European

piece goods, and salt. The administration is undcr a deputy commissioncr, aided by two European assistants. The total revenue (1875-76) amounted to £135,509 ; the expenditure to £15,810. The police force (1873) consisted of 484 officers and men, maintained at a cost of £6655. Education is still in its infancy. In 1875-76 there were 116 schools under Government inspection, attended by 5879 pupils. Fever is prevalent throughout the district. The other principal diseases are scurvy, cholera, diarrhea, and goitre.. The average rainfall during the eleven years 1865-1875 was 420 inches. The average yearly temperature is 77°5° Fahr., the highest recorded being 106°, the lowest 48°.

Gonpa, the chief town and administrative headquarters of Gonda district, in 27° 8’ N. lat. and 82° 1’ E. long. The site on which the town now stands was originally a jungle, in the centre of which was a cattle fold (Gontha or Gothan), in which the cattle were enclosed at night as a protection against wild beasts, and from this the town derived its name. The place was formerly celebrated for the manufacture of shields; now it is neither of commercial nor of religious importance. The town contains a civil station, dispensary, school, literary institute, court- house, and jail. Population, 13,722.

GONDAR, properly Guenpar, a town of Abyssinia, formerly the capital of the Amharic kingdom, is situated on a basaltic ridge in the country of Dembea, about 21 miles N.E. of Lake Tsana or Tana, a splendid view of which is obtained from the castle. According to Riippell, its latitude is 12° 35’ N. and its longitude 37° 31’ 57” E, and it lies 7460 feet above the level of the sea. Two streams, the Angreb on the east side and the Gaha or Kaha on the west, flow down from the ridge, and meeting below the town pass onwards to the lake. In the Gaha the Christian inhabitants of Gondar are accustomed to bathe in vast disorderly crowds on the feast of St John the Baptist (10th September), and again in a more decent manner on the anniversary of the Saviour’s birth. The town is divided into several districts separated from each other by wood and field,—one being the Abun-Bed or bishop’s quarter, another the Etchege-Bed or quarter of the prior or chief of the monks, while a third takes its name from the Debra Birhan or Church of the Light, and a fourth from the Gemp or castle. This was at one time a splendid pile, designed on the plan of a medizval stronghold; and the

solidity of its masonry, the beauty of its ornamentations, and the general effect of its arrangement stand in striking contrast to the mean and monotonous houses of the town, which are all erected after the cylindro-conical type. It was built in the 16th century for King Socinius by the Portuguese adventurers, who employed Indian workmen in its erection. At some distance there is another palace built ata later date for Ras Michael, which affords no bad imitation of the Portuguese style. Upwards of forty churches, all in the circular Abyssinian style, are said to exist in the town and immediate vicinity; of these the most important is the Quisquam or Flight into Egypt, erected by Mint- wab Muntwar, the empress mother of Yasu the Great

and Yasu the Little. The painting of the interior was probably executed by the Venetian artists mentioned by Bruce. The city was founded in the 15th century by emperor Fasilidas, or A'lem-Seged ; it has been frequently sacked, and in 1868 it was laid in ruins by Theodorus who did not spare either the castle or the churches, The population, estimated by Bruce at 10,000 families, has been brought to a very low ebb by the political distrac. tions of the country. In 1853 Heuglin thought the jn. habitants might number from 5000 to 6000, and in 1861-63 he raised the figure to from 6000 to 7000. Atout 2000 of the number are Mahometans, and there is a considerable settlement of Jews (Falasha). Cotton cloth, gold and silver ornaments, copper wares, fancy articles in bone and ivory, excellent saddles, and shoes are among the products of the local industry. The shoes are made almost ex- clusively for the clergy, as the ordinary Abyssinians either go barefoot or wear sandals. See especially Riippell, Reise in Abyssinien, Frankfort-on-the-Main, 1838-40 ; Heuglin, Reise nach Abessinien, Jena, 1868; Lejean, Voyage en Abyssinie, Paris, 1872; and Raffray, Afrique Occidentale, Paris, 1876. Views of the castle are given by Heuglin and Raffray.

GONDOKORO. See Ismatruta.

GONDWANA, a tract of country in Central India, ex- tending from the 19th to the 25th degree of N. lat., deriv- ing its name from the aboriginal tribe of Gonds, who form the predominant element in the population. The tract may be considered as comprising part of the British territory of Sagor and Nerbudda, with the districts of Singrauli, Chota Nagpur, and Sirguja, the petty native states on the 8.W. frontier of Bengal, the Cuttack Mahals, and the northern portion of Nagpur. It is estimated to be 400 miles in length by 280 in average breadth. Gondwana, in its most extensive sense, includes all that part of India within the above-mentioned boundaries which remained unconquered by the Mahometans up to the reign of Aurungzebe. But Gondwana proper is limited to four districts, named Mandla, Chhatisgarh, Nagpur, and Chandal, and it stretches south: along the east side of the Wardha and Godavari, to within 100 miles of the mouth of the latter. The greater part of this province is a mountainous, unhealthy, and ill-watered country, covered with jungle, and thinly inhabited ; and to its poverty and other bad qualities its independence may be ascribed. A continued chain of moderately elevated hills extends from the southern frontier of Bengal almost to the Godavari, and by these the eastern was formerly separ- ated from the western portion of the Nagpur dominions. This province contains the sources of the Nerbudda and the Son, and is bounded by the Wardha and Godavar1 ; but a want of water is still the general defect, the streams by which it is intersected, namely, the Mahanadi, Karun, Hatus, and Sildir, being inconsiderable, and not navigable within its limits. The Gonds, or the hill tribes who took refuge in the mountains and fastnesses from the invaders of the country, are the original inhabitants of the country, and, till recently, retained all their primeval habits of barbarism. They have now adopted a form of Hinduism, but they retain many of their ancient customs, and abstain from no flesh except that of the ox, cow, and bull. Accord- ing to the census of 1872 they numbered 2,041,276, nearly 25 per cent, of the entire population of the Centra Provinces. The more fertile tracts of Gondwana were sub- dued at an early period by the Marhattas, who claimed paramount over the whole. The inhabitants were pee nominally tributary; but it was found impossible 0 collect any revenue from them without military oe MY that, in fact, the collection of the revenue was h : ; plundering expedition, the cost of which always exceede the profit.

During the war against the Pindaris in 1818, when the British troops invaded the territories of Appa Sahib, the raja of Nagpur,

‘ their operations were greatly facilitated by the insurrection of the | hill tribes, who occupied the passes into the Nagpur territories. For a long series of years it was the policy of the raja of this terri- |) tory, a descendant of Sivaji, to interfere as little as possible with the neighbouring powers. At length, in 1803, Raghoji Bhonsla was induced, in an evil hour for himself, to depart from this system

of neutrality, and to join Sindhia in a confederacy against the British. He was soon reduced, however, by the defeats which the confederatcs sustained at Assaye and Argaum, to sue for peace, as the price of which he ceded a large portion of his dominions to the conquerors, namely, the province of Orissa. After the death of this raja, the throne, contested by various competitors, was at last secured by Appa Sahib, his nephew, who, in the war against the Pindaris, joined the coalition against the British power, and was involved in ruin along with his other allies. A treaty of peace was concluded with him, which he violated; and he was finally deposed in 1818, and the grandson of the late raji put in his stead. The latter prince, after a reign of 35 years, died without issue in 1853; the dynasty thus became extinct, and the kingdom of Nagpur was incorporated with the British empire, and now forms the chief commissionership of the Central Provinces.

GONG (Chinese, gong-gong or tam-tam), a sonorous or musical instrument of Chinese origin and manufacture, made in the form of a broad thin dise with a deep rim. Gongs vary in diameter from about 20 to 40 inches, and they are made of bronze containing a maximum of 22 parts of tin to 78 of copper; but in many cases the pro- portion of tin is considerably less. Such an alloy, when cast and allowed to cool slowly, is excessively brittle, but it can be tempered and annealed in a peculiar manner. If /suddeuly cooled from a cherry-red heat, the alloy becomes so soft that it can be hammered and worked on the lathe, and afterwards it may be hardened by re-heating and cool- ‘ing it slowly. In these properties, it will be observed, the alloy behaves in a manner exactly opposite to steel, and the Chinese avail themselves of the known peculiarities for pre- /paring the thin sheets of

which gongs are made. They cool their castings of bronze in water, and after hammering ‘out the alloy in the soft state, the finished gongs are hardened by heating them to a cherry red, and allowing them to cool slowly. The gong is beaten with a round, hard, leather-covered pad, fitted on a short stick or handle. It emits a peculiarly sonorous sound, its complex vibrations bursting into a wave-like succession of tones, sometimes shrill, sometimes deep. In China and J apan it is used in religious ceremonies, state processions, marriages, and other festivals ; and it is said that the Chinese can modify its jtone variously by particular ways of striking the disc. jAmong Western communities it is only employed as a Jsubstitute for a dinner bell or a general household signal. |. GONGORA Y ARGOTE, Luis pe (1561-1627), |Spanish lyric poet, was born at Cordova, on the 11th of jJuly 1561. His father, Don Francisco de Argote, was jcorregidor of that city ; and his mother, Dojia Leonora de ‘|Gongora, was descended from an ancient and noble family jof Navarre. Having been sent, at the age of fifteen, as a student of civil and canon law to the university of Sala. jmanca, he soon took a prominent place among his fellow- students ; but the great talent which he exhibited did not {point in the direction either of legal or of diplomatic em- jployments. Leaving the university some years afterwards i(the exact date is unknown) without a degree, but already jwith a considerable literary reputation, he returned to ordova, where he had succeeded to a moderate property, jaud where he was able to associate on terms of intimacy fand equality with the best society of the city and province. ope de Vega, writing about 1593, speaks of him as sur- ounded there by a literary society, and acknowledged as its hief. In 1604, when past his fortieth year, he took the jtonsure, and accepted a prebendal stall in the cathedral of ordova,—steps which have usually been attributed to worldly or sordid motives, but which really cannot be re-

garded as unnatural or unbecoming in a man cireumstanced as he was. From this time he began tospend a portion of each year at the seat of the court, first at Valladolid and afterwards at Madrid, where as Pellicer, his contemporary, remarks, he “noted everything and pecked at everything with his satirical pen.” His circle of literary and other dis- tinguished admirers was now greatly enlarged; but the acknowledgment which the court

accorded to his singular genius was both slight and tardy. Ultimately indeed, through the influence of the duke of Lerma and the marquis of Siete Iglesias, he obtained an appointment as honorary chaplain to Philip III., but even this slight lonour he was not permitted long to wear. A severe illness, which had seriously impaired his memory, compelled his retirement to Cordova, where, after a period of deepseclusion, he peacefully breathed his last on the 23d of May 1627. An edition of his poems was published almost immediately after his death by Juan Lopez de Vicufia ; but the frequently reprinted edition by Hozes did not appear till 1633. The collection consists of numerous sonnets, heroical, amorous, satirical, humorous, elegiac, and " miscellaneous," of various odes, ballads, songs for the guitar, of a few uncompleted comedies, and of certain larger poems, such as the Soledades ("Solitary Musings") and the Polifemo, which hardly admit of classi- fication. They all exhibit that learned and polished elabor- ation of style (estilo culto) with which the name of Géngora is inseparably associated ; but if, since the days of Lope de Vega, they have been justly censured for their affected Latinisms, unnatural transpositions, strained metaphors, and frequent obscurity, it must never be forgotten that their author was a man of genius, ~~—a fact cordially acknowledged by those of his contemporaries who were most capable of judging, and indeed a fact capable of direct verification by any one who chooses to take the trouble of reading him even in animperfect translation. It was only in the hands of those who served themselves heirs to Géngora's style, withont inheriting his genius, that " cul~~ tismo " became really laughable ; but it is manifestly unjust to charge the memory of the master with the follies of his weaker disciples.

A series of Leceiones Solenvnes, or expository lectures on the Poli- femo, Soledades, Panegirico, and Piramo y Tisbe was published by Pellicer in 1630; an Ilustracion y Defensa de la Fibula de Piramo y Tisbe, by Salazar Mardones, followed in 1686; there is also a commentary on the entire works by Salecdo Coronel (1636-48). A good edition of the works of the " Andalucian Pindar' (as Géngora is designated by Pellicer) is that of Brussels (1659). The admirable labours of Churton (Gongora, an Historical and Critical Essay on the Times of Philip III. and IV. of Spain, with Translations, 1862)

have made this obscure author easily accessible to the English reader.

GONIOMETER. Strictly speaking this name is appli- cable to any instrument, such as a mural circle, a theodolite, and so on, used for measuring an angle; it is in reality, however, applied exclusively to instruments used for measur- ing the angles between the faces of crystals. The oldest instrument of the kind was invented by Carangeot, and con- sisted simply of a pair of rulers jointed together and fitted with a graduated circle for measuring the angle between their edges. A carpenter uses a somewhat similar instru- ment, not, it is true, for measuring, but for transferring angles. ‘The application of the principle of reflexion by Wollaston in 1809 converted the goniometer into an instru- ment of precision. His form, with a vertical divided circle, is still much used. The principle of reflexion is briefly this. The crystal is mounted so that it can be rotated about an axis parallel to the edge in which its two faces meet. It is first placed so that a ray of light coming in some fixed direction (say, along the axis of a collimator), when reflected from one face, passes in another fixed direc- tion (say, along the axis of a telescope). The crystal is then turned till the ray reflected from the other face passes

in the same direction as before. The angle through which

the crystal has been turned is either 180° + 2A or 180° ~ 2A,

where A is the angle between the faces. The introduc- tion of the fixed mirror by Degen and Lang, and of the horizontal circle with collimators, brought the instrument into its most modern form. Babinet, Malus, Mitscherlich, Haidinger, Von Lang, and others have contributed towards perfecting the instrument. Recently Professor W. H. Miller (Phil. Mag,, 1876) has described a new form of gonio- meter. In the paper quoted some useful details concern- ing the use of the instrument will be found. For further instructions how to use the goniometer the reader may refer to Phillips’s Mineralogy, or Groth’s Physikalische Krystallo- graphie, Abth. iii. The modern goniometer has so much in common with the spectrometer that it is unnecessary to describe it in detail here. See SPECTROSCOPE.

GONSALVO. See Gonzato.

GONZAGA, or Gonzuaus, an old princely family of Italy, which traces its origin to the emperor Lothair, but first came into notice in the 11th century, after the over- throw of the imperial power in Italy, where they for some time disputed the sovereignty of Mantua with the Bonacosse. The long dispute was ended by the murder of Passerino de Bonacossi in 1328, after which the Gonzaga retained posses- sion of Mantua for four centuries. Their claims were in 1354 confirmed to Ludovico I. (1267-1360) by Louis the Bavarian, who nominated him imperial vicar, and gave him also the sovereignty of Reggio and other towns. Petrino, youngest son of Ludovico, founded the countship of Novellara, which became extinct in 1728. The elder branch of the family was continued by Guido and his son Ludovico II., who, on his death in 1382, was succeeded by his brother Francesco. He was followed in 1407 by his son Giovanni Francesco (1394-1444), on whom, for his services in the Italian wars, the emperor Sigismund in 1433 bestowed the title of marquis. Ludovico III. (1414-1478), son of the preceding, surnamed, for what reason is not quite certain, the Turk, retained a body of troops which he granted on hire to neighbouring princes. The younger sons of this Ludovico, Giovanni Francesco and Rudolpho, founded the dukedoms of Gabioneta and Castiglione respectively, which were confiscated in 1692. The elder branch of the family was continued by Frederick I. (1439-1484), whose son, Giovanni Francesco IT, (1466-1519), was in 1494 appointed to the supreme command of the united Italian army against Charles VIII. of France, and on the 6th of July of the follow- ing year gained the victory of Fornovo, and took prisoner the bastard of Bourbon. His son, Frederick II. (1500-1540), received in 1530 the title of duke from Charles V., and in 1536 the principality of Montferrat. A younger son, Ferdinand, was the founder of the Guastella branch of the family, which became extinct in 1746. Of the succeeding members of the elder branch, the only notable one was Vincenzo I. (1562-1612), to whom the Admirable Crichton was tutor, and by whom he was murdered from jealousy in 1582. This branch became extinct in 1627 through the death of Vincenzo IL., sixth successor of Frederick II. The nearest heir was Carlo I., duke of Nevers, who was recog- nized by the Mantuans, but his claims were contested by Ferdinand II. of Guastella, who had the support of the emperor Ferdinand IJ. In the war which followed, the duke of Nevers obtained the assistance of Louis XIII. of France, but in 1630 Mantua was captured and pillaged by the imperial troops, and the duke was forced to retire to the

States of the Church. In 1631 a treaty was, however. con- cluded between France and the emperor, by which the duke, on making submission, was reinvested with the duchies of Mantua and Montferrat. Anna, a daughter of Carlo L., became wife of Edward, elector-palatine of the Rhine, and after playing a distinguished part at the French court, died

at Paris in 1684, leaving behind her a volume of interesting Memoirs (London and Paris, 1686). and was succeeded by his grandson Carlo ITT., who, on his death in 1665, was succeeded by his son Carlo IV. This duke married in 1670 Anna Isabella, eldest daughter of Ferdinand duke of Guastella; and on the death of Ferdi. nand in 1679, he endeavoured to obtain possession of that duchy, but was compelled to relinquish his claims to Vincenzo, a cousin-german of the deceased duke, part on the side of France in the Spanish succession war and received a French garrison into Mantua. After ie defeat of the French he was placed under the ban by the emperor Joseph J., whereupon Victor Amadeus of Savoy

Carlo died in 1639,

He took

conquered Montferrat, and Austria, in agreement with France whom Carlo had offended, took possession of Mantua. On his death without issue in 1708, the dynasty

of the Gonzagas of Mantua became extinct.

GONZAGA, Txuomaz Antonto (1744-1809), “the Portuguese Petrarch,” perhaps better known as Dircgv, was born at Oporto in 1744, and received his early education there and at Bahia, where his father, after having held vari- ous judicial appointments, became a member of the supreme court in 1759. Having completed his law studies at the university of Coimbra, which he attended from 1763 to 1768, Gonzaga in the latter year returned to Brazil, and after having acted for some years as juiz de fora or local magis. trate at Beja and elsewhere he ultimately was appointed a judge (ouvidor) at Villa-Rica in the province of Minas, where he highly distinguished himself

it is said both by his administrative ability and by the many excellences of his private character. He appears before this time to have developed some talent for versification, and his literary tastes soon brought him into imtimate association with Claudio Manoel, Alvarenga Peixoto, and other writers of the so-called Minas school; but the love which makes the poet did not, in his own opinion at least, come upon him until he had made the acquaintance (about 1788) of D. Maria Joaquina Dorothea de Seixas, the " Marilia de Dirceu" to whom all his extant poems relate. He had just been nominated a member of the supreme court of Bahia, and was on the eve of his marriage, when discovery was made of the treasonable plot of Minas, and he was arrested on suspicion of having been implicated in it, On merely circumstantial evidence, and that of a very incon: clusive kind, he was condemned, 18th April 1792, to banishment for life to Pedras de Angoche, a sentence which was afterwards commuted to one of ten years' exile at Mozambique. Here he made some effort to practise as an advocate, but he never recovered from the wearing-out de- pression into which he had been thrown by his cruel lot ; an attack of nervous fever undermined his health, and after years of an ever-deepening melancholy, which occa- sionally alternated with fits of acute mania, he died in

1809.

His collection of poems, entitled Marilia de Direct, consists of two parts. In the first of these, the charms of Marilia and his own happiness in the love he bears to her are his endlessly varied theme. The second, written during his imprisonment, is full of laments over his terrible fate, protestations of his innocence, and many fine expressions of the support and comfort he still finds in the remem- brance of his love. Almost everywhere these '"'lyras"' plainly enough betray a conscious imitation of Petrarch or other models ; but they also exhibit an imaginative charm, a naturalness and delicacy of feeling, a harmoniousness of diction, and a gracefulness of versification which, in the unanimous opinion of competent critics, entitle them to rank among the best love lyrics in the language. In Brazil their popularity, perhaps aided by feelings of sympathy for their unfor- tunate author, has from the first been very great. The editions are very numerous, the best probably being that of J. M. P. da Sylva which is accompanied with an historical and biographical introduc- tion (1845). A critical notice, along

with selections from the poems of Gonzaga, will be found in Wolf's Brésil Littéraire (1863). They have been translated into French by Monglave and Chalas (1825), into Spanish by Vedia, and into Italian by Ruscalla.

GON—

GONZALO DE BERCEO, mystic and didactic poet, and one of the earliest names in Castilian literature, was parish priest at Berceo, near San Domingo de la Calzada, in the province of Burgos, and lived, it is believed, during the first sixty years of the 13thcentury. His works, which are reprinted in the Poesias Castellanas Anteriores al Siglo XV, of Sanchez, amount to upwards of 13,000 lines of verse, chiefly in rhymed quatrains, The subjects chosen for treatment are the Lives of San Domingo de Silos, Santa Oria, and San Millan; the Sacrifice of the Mass ; the Miracles, Glories, and Pains of the Blessed Virgin ; the Signs of the Day of Judgment; and the Martyrdom of San Lorenzo. Apart from the interest which attaches to them in the eyes of the literary and ecclesiastical archeologist, they have little to attract the modern reader, The monotony of their "'sermo pedestris" is but seldom relieved by any touches of poetical genius; in some places, however, as Ticknor remarks, there is a simple-hearted piety that is very attractive, and in others a power in story-telling that is very striking. The poem on the Miracles of the Virgin, which is the largest, is also the most curious; but that upou the Signs of the Last Day is often very solemn, while the Mourning of Mary at the Cross breathes such a childlike spirit of gentle, faithful, credulous devotion as enables one to realize with some vividness many of the best characteristics of the religious life of the time.

See Ticknor, History of Spanish Literature; and Carus, Darstel-

lung der Spanischen Literatur (1846); also Dunham's History of Spain and Portugal, vol. iv. (1882).

GONZALO FERNANDEZ Y AGUILAR (1453- 1515), commonly known as Gonsalvo de Cordova, El Gran Capitan ("The Great Captain"), was born at Montilla on the 16th of March 1453, and in his fifteenth year was presented to Queen Isabella at Segovia, where his manly beauty, his graceful manners, and his soldierly accomplish- ' ments speedily made him conspicuous in the court. He first saw active military service in Portugal

under Alonzo de Cardenas, and gained special praise for his conduct on the battlefield of Albuera in 1479, In the protracted Moorish war begun in 1481, he served with distinction in various capacities, and was finally employed to conduct the peace negotiations with Abdallah. For his efficient services) in this business he was rewarded with a pension and a grant j out of the conquered territory (1492). When, in con- sequence of the advance of Charles VIII. into Italy, a | Spanish expedition was decided upon in 1495, Gonzalo was) selected for the chief command ; and although at Seminara near Reggic, through the interference of the friendly Ferdi- nand of Naples, he lost the battle (it was the only occasion on | which he ever was defeated), he gained in reputation both for | prudence and for bravery. In spite of his subsequent suc- | cesses in Lower Calabria, the campaigu of this year closed with indecisive results ; but in the opening of the following season, he still further increased his fame by his brilliant | surprise and capture of Laino, and by his junction with the |} Neapolitan forces before Atella, after an arduous march | through hostile territory. It is most commonly, and with most probability, said to have been on this occasion that he | received the honourable title of El Gran Capitan, by which | the Spaniardsstill delight to designatehim. Theconquest of | Calabria having been thus rapidly achieved, he, at the pope's | invitation, proceeded to clear Ostia of the French garrison | by which it had been held, and shortly afterwards entered Rome itself, where he was greeted by the populace as | "'deliverer of the city." The object of his expedition, the | total expulsion of the French from Neapolitan territory, | having been fully attained, he, in August 1498, returned | to Spain, where he was received with the utmost enthusiasm | by all classes, the king publicly declaring that the reduction of Naples, and the humiliation inflicted on the French,

reflected more lustre on his crown than the conquest of Granada, After having, early in 1500, efficiently co- operated with Tendilla in putting down the Moorish insur- rection in the Alpujarras, Gonzalo, in May of the same year, took command of an armada designed to operate on the coast of Sicily and in the Levant, and generally to uphold the influence of Spain. In conjunction with the Venetian admiral he stormed St George in Cephalonia, in J anuary 1501; and soon afterwards returning to Sicily, commenced

operations against Frederick in accordance with the treaty concluded between France and Spain for the partition of Naples. The whole of Calabria was occupied in less than a month, with the exception of Tarento, which did not sur- render until March 1502. On the outbreak of hostilities between France and Spain in July of the same year, Gon- zalo ‘was compelled to fall back upon Barletta, whence, after having sustained a memorable siege of nearly ten months, he sallied in April 1503, and coming upon the French troops at Cerignola, inflicted on them a disastrous defeat, which at once made him master of the city of Naples and of the greater part of the kingdom. A subsequent victory at the bridge of Garigliano (29th December 1503) gave him Gaeta, and terminated the war. For more than three years he continued to act with popularity and efficiency at N aples as Ferdinand’s viceroy ; but the jealousy and distrust of that somewhat narrow-minded monarch led to his recall in 1507, and to his subsequent retirement from court shortly afterwards. The remainder of his days were passed on his estate at Loja, where, in the midst of preparations for a voyage to Flanders, he was seized with a fever, of which he died, 2d December 1515.

The life of ‘‘the great captain” has been rather a favourite sub- ject with literary men, having been treated by Giovio in his Vite Iilustrium Virorum, and by Quintana in his Espafioles Célebres, as well as by Florian (Gonsalve de Cordoue, ou Grenade Reconquise, 1791), Duponcet (Histoire de Gonsalve de Cordoue, 1714), and an anonymous author, sometimes supposed to be Pulgar (Crénica del Gran Capitan, 1584). A skilful and judicious use of all these sources has been made by Prescott in his History of the Reign of Ferdinand and Isabella, where the purity, generosity, and loyalty of the private character of Gonzalo, as well as the coolness, sobriety, and energy of his military genius, are very fully and vividly illus- trated.

GOOD, Joun Mason (1764-1827), a writer on medical, religious, and classical subjects, was born May 25, 1764, at Epping, Essex, where his father, the Rev. Peter Good, was Independent minister. After receiving his education in the seminary conducted by his father, he was, at about the age of fifteen, apprenticed to a surgeon-apothecary at Gosport. In 1783 he went to London to prosecute his medical studies, and in the autumn of 1784 he commenced practice as a surgeon at Sudbury in Suffolk. Through an obligation rendered to a friend he, in 1792, got into pecuniary embar-

rassment, and, with a view to surmount his difficulties, he removed in 1793 to London, where he entered into part- nership with a surgeon and apothecary who enjoyed an extensive practice. In November of the same year he was admitted a member of the college of surgeons. On account of disagreements with his colleague, the partnership was soon afterwards dissolved, and to increase his income he now devoted more of his attention to literary pursuits. Besides contributing both in prose and poetry to the Ana- lytical and Critical Reviews, and the British and Monthly Magazines, and other periodicals, he is the author of a large number of works relating chiefly to medical and religious subjects. In 1794 he became a member of the British Pharmaceutical Society, and in that connexion, and especi- ally by the publication of his work, A liistory of Medicine, he did much to effect a greatly needed reform in the profession of the apothecary. In 1820 he took the diploma of M.D. at Marischal College, Aberdeen. He died, January 2, 1827. Dr Good was not only well versed in classical

literature, but was acquainted with the principal European languages, and also with Persian, Arabic, and Hebrew. His prose works display wide erudition and considerable intel- lectual vigour, and contain much interesting and curious information ; but their style is dull and tedious, and they are now very generally forgotten. His poetry never rises above pleasant and well-versified commonplace.

The following are his principal writings :—Jaria, an elegiac ode, 1786; Diseases of Prisons and Poorhouscs, 1795; History of Medi- cine, 1795; Parish Workhouses, 1798; Song of Songs, translated from the Hebrew, with notes critical and explanatory, 1803; Tri- umph of Britain, an Ode, 1808; Memoirs of the Life and Writings of Alex. Geddes, LL.D., 18038; The Nature of Things: a Didactic Poem, translated from the Latin of Titus Lucretius Carus, with the original text and notes philological and explanatory, 1805-7, 2 vols. 4to, which is still of considerable value for its parallel passages and quotations both from European and Asiatic languages ; Oration on the Structure and Physiology of Plants, 1808; Essay on Medical Technology, 1810; The Book of Job literally translated, &c., 1812; The Study of Medicine, 1822, 4 vols. 8vo, 3d ed. in 1832, edited by Dr

Samuel Cooper; and Zhe Book of Nature, 1826, 3 vols. See Memoirs by Olinthus Gregory, LL.D., 1828, and a biographical sketch in the Gentleman's Magazine for March 1827. His Thoughts for all Scasons, in Prose and Verse, was published, with a short biographical sketch, in 1860.

GOOD FRIDAY, the usual English name for the day observed throughout a great part of Christendom as the anniversary of the passion and death of Christ. In the Greek Church it has been or is known as racxa [crav-pdcy.ov], tapackevy, Tapackevyn peydAn OF ayia, cwrypia oF Ta TWTHPLA, Hepa TOV gTavpod, while among the Latins the names of most frequent occurrence are Pascha Crucis, Dies Dominic Passionis, Parasceve, Feria Sexta Pasche, Feria Sexta Major in Hierusalem, Dies Absolutionis. It was called Long Friday by the Anglo-Saxons! and Danes ; in Germany it is sometimes designated Stiller Freitag (com- pare Greek, éBSopas drpaxtos ; Latin, hebdomas inofificiosa, non laboriosa), but more commonly Charfreitag, The etymology of this last name has been much disputed, but there seems now to be little doubt that it is derived from the Old High German chara, meaning suffering or mourning,

The origin of the custom of a yearly commemoration of the crucifixion is involved in some obscurity. It may be regarded as certain, indeed, that among Jewish Christians it almost imperceptibly grew out of the old habit of annu- ally celebrating the Passover on the 14th of Nisan, and of observing the "days of unleavened bread," from the 15th to the 21st of that month. In the Gentile churches, on the other hand, it seems to be well established that originally no yearly cycle of festivals was known at all. The weekly observance of the dies dominica, however, became universal at a very early date; and the practice of giving special prominence to Easter Sunday (the first Sunday after the 14th of Nisan), as well as that of keeping a previous fast of considerable rigour, though of indeterminate duration, had established itself in Egypt and in the Western churches at least by the middle of the 2d century. The accounts which have been transmitted by Eusebius, Socrates, and Epiphanius of the paschal controversies, which began to be agitated about 160 a.p., are obscure on many points—so ob- scure, indeed, as to suggest doubts whether these historians had altogether comprehended the questions under dis- cussion. So much, however, is clear, that Occidental feeling had even then begun to take great offence at the

prevailing Eastern practice. In Asia Minor, Syria, and Mesopotamia, the 14th and 16th of Nisan were specially observed, alto- gether irrespective of the day of the week, and for this apostolic sanction was urged by Polycarp; but Anicetus of Rome, with great earnestness, though still with deference, pleaded immemorial usage for the custom of observing a

1 See Johnson's Collection of Ecclesiastical Laws (vol. i., anno 957): ** Housel ought not to be hallowed on Long Friday, because Christ suffered for us on that day."

Friday and Saturday fast followed by an Easter Sunday feast. As the Western churches gained in influence, the practice of tolerance became increasingly difficult ; already in 190 a.p. we find Victor of Rome insisting on the con- formity of Polycrates of Ephesus, and proclaiming the con- tumacious Asiatics to be out of communion (dxowwvyrous), To secure uniformity in this matter was one of the objects for which the council of Nice was convened in 325; no canon, however, was framed by the fathers there assembled, but it was recommended in a circular letter that Easter (zwdoxa) should invariably be observed on a Sunday, and that the passion should, with equal regularity, be com- memorated on Friday. Considerable progress towards the compulsory establishment of a uniform paschal usage was made in the years immediately following; thus, by a canon of the council of Antioch (341), the followers of the Oriental

-use were laid under severe ecclesiastical censures ; in the

decrees of that of Laodicea (361) the ominous word aipeois is heard (aipecis tov Teaoapes Katdexarirov) ; while in the Theodosian Code (xvi. 5,9; 6, 6; 10, 24), the Quartodeci- mans are formally ranked among the other heretics whose error is to be visited with civil pains and penalties.

From the earliest period of its observance, the day was marked by a specially rigorous fast, and also, on the whole, by a tendency to greater simplicity in the public services of the church. Prior to the 4th century there is no evidence of non-celebration of the eucharist on Good Friday; but after that date the prohibition of communion became com- mon. In Spain,

indeed, it became customary to close the churches altogether asa sign of mourning ; but this practice was condemned by the council of Toledo (633). In the Romish Church the Good Friday ritual at present observed is marked by many special features, most of which can be traced back to a date at least prior to the close of the 8th century (see the Ordo Romanus in Muratori's Liturg, Rom. Vet.). The altar and officiating clergy are draped in black, this being the only day on which that colour is permitted. Instead of the epistle, sundry passages from Hosea, Habak- kuk, Exodus, and the Psalms are read. The gospel for the day consists of the history of the passion as recorded by St John. The reading of this is followed by bidding prayers for the peace and unity of the church, for the pope, the clergy, all ranks and conditions of men, the sovereign, for catechumens, the sick and afflicted, heretics and schismatics, Jews and heathen. Then follows the "adoration of the cross" (a ceremony said to date back to near the time of Helena's "invention of the cross"); the hymns Pange Lingua and Vewilla Regis are sung, and the reserved host brought out and partaken of by the priest. In many Roman Catholic countries, as, for example, in Spain, it 1s usual with the faithful to spend much time in the churches in medita- tion on the "seven last words" of the Saviour ; no carriages are driven through the streets; the bells and organs are silent; and in every possible way it is sought to deepen the impression of a profound and universal grief. In the Greek Church also the Good Friday fast is excessively strict; as in the Roman Church, the passion history is read and the cross adored ; towards evening a dramatic representation of the entombment takes place, amid open demonstrations of contempt for Judas and the Jews. In Lutheran churches the organ is silent on this day ; and altar, font, and pulpit are draped in black, as indeed throughout Holy Week. In the Church of England the history of the passion from the gospel according to John is also read; the collects for the day are based upon the bidding prayers which are found 1n the Ordo Romanus.

GOODRICH, Samvuet Griswotp (17 93-1860), an American author better known under the pseudonym © Peter Parley, was the son of a Congregational minister, – was born at Ridgefield, Connecticut, August 19, 1793. 4

1814 he commenced business as a publisher in Hartford. | He visited Europe in 1823-4, and on his return to America removed to Boston, where

from 1828 to 1842 he published an illustrated journal, the Z'oken, to which he was a frequent contributor both in prose and verse. A selection from these contributions was published in 1841 under the title Sketches from a Student's Window. In the same year he established | Merry's Museum, which he continued to edit till 1854, In 1827 he commenced, under the name of " Peter Parley," his series of books for the young, which, embracing geography, biography, history, science, and miscellaneous tales, num- bered in 1857 as many as 170 volumes, of which about 7,000,000 had been sold, and 300,000 were being sold annually. In 1858 he published Recollections of a Lifetime, which contains a list both of the works of which he was the author and of the spurious works published under his name. By his writings and publications he amassed a large fortune. In 1838 he was chosen a member of the senate of Massa- chusetts, and in 1851 he was appointed consul to Paris, | where he remained till 1855, taking advantage of his stay to have several of his works translated into French. After his return to America he published, in 1859, History of the | Animal Kingdom. He died at New York, May 9, 1860. GOODSIR, Joun (1814-1867), anatomist, born at Anstruther, Fife, March 20, 1814, was the son of Dr John Goodsir, and grandson of Dr John Goodsir of Largo, He was educated at the burgh and grammar schools of his native place, and at the university of St Andrews. He served an apprenticeship for a short time to Mr Nasmyth, the entinent dentist, but the higher studies of medicine and surgery were more to his liking, and, under the fascinating impulsion of the lectures of Dr Knox, anatomy, descriptive, ' surgical, and pathological, became his hobby,—the work of ' Carus giving the first impetus to his investigations in | developmental anatomy. From his mother he had imbibed | a love of art, and his sketches and casts and methodical | demonstrations were the admiration of his fellow students, In Dr Knox's rooms he made the acquaintance of Edward | Forbes, the naturalist. Goodsir also worked under Mr Syme, Professor Christison, Dr John Macintosh, Professor Robert Jameson, Dr Thomas Hope, and Dr Graham. His earliest) scientific paper was on the snail,—a novel, elaborate, and j highly illustrated treatise, In 1835 he became a licentiate j of the Royal College of Surgeons, Edinburgh, After aiding '| Mr Nasmyth, he joined his father in practice at Anstruther. | Three years later he communicated to the British Associa- | tion a paper on the pulps and sacs of the human teeth, his researches on the whole process of dentition being at this | time distinguished by their completeness. He had

already jcommenced the formation of a natural history museum, | which attracted many visitors,—the habits of animals, from) the polype to the ape, possessing an irresistible charm for jhim. The results of his studies in natural history were jlaid before the Society of St Andrews, at the request of) whose president, Sir D. Brewster, he furnished an account of cilia, reading to the society in 1840 his views on the jcephalic termination of the sympathetic nerve. The ich- \thyolites of the Concerres quarry had not escaped him; and jwe find him now foreshowing his diversified knowledge in jessays on the eye of the cephalopodous mollusks, in descrip- itions of his dredging expeditions with Edward Forbes, and Vin his lectures at Cupar on the conditions of health, On jthe nomination of Forbes, he was in 1838 elected to the jfamous coterie called the ‘ Universal Brotherhood of the

naturalists, and others whose relationship became a potent jinfluence in science. Goodsir was a noble example of the |brotherhood, which sought to bind man to man in ties of jhome and friendship, love and good will. Goodsir and jForbes worked together at marine zoology, but human

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\Wriends of Truth,” which comprised artists, scholars, |

anatomy, pathology, and morphology formed Goodsir’s chief study. The connexion of these two men was illustrated in a paper read at the British Association in 1840 on Pelonaia, and further researches on the British Ciliograda. In that year Goodsir became a member of the Wernerian Society, contributing several papers, some jointly with Forbes. Professor Jameson was the president, which may account for the greater part of Goodsir’s studies in comparative anatomy from 1840 to 1847 being imparted to its members. In 1841 he joined the Edinburgh Botanical Society, holding the office of secretary from 1842-48, when he was chosen vice-president. In 1840-42 ulcers and abscesses and continued fever, in cases of which he advocated the deple- tive system, occupied his attention. He had associated hiniself with the Royal Medical Society in 1833, and was in 1841-42 elected the senior president, at the same time becoming president of the Anatomical and Physiological Societies, to which he

submitted his studies on the struc- ture of the liver and kidneys. A member of the Royal Physical Society in 1841, he read his papers on the develop- ment of the skeleton in the series of invertebrate animals ; in 1849 he was elected president, remaining in office till 1852. His own estimate of his work at this period was represented to the Royal College of Surgeons of Edinburgh on his candidature for the post of conservator of the museuin, He stated that he had practised every de- partment of preparation and conservation, that he had con- siderable experience in modelling in clay, plaster, and wax, and in the use of microscope and pencil, and that his own collection of preparations in human, comparative, and morbid anatomy exceeded 400 examples. He succeeded Macgillivray in April 1841, giving lectures on the subjects illustrated by the museum. Goodsir rested no small part of his reputation on his knowledge of the anatomy of tissues, In his lectures in the theatre of the college in 1842-43 he evidenced the largeness of his observation of cell-life, both physiologically and pathologically, advocating the importance of the cell as a centre of nutrition, and pointing out that the organism is subdivided into a number of departments. Virchow recognized his indebtedness to these discoveries by dedicating his Cellular Pathologie to Goodsir, as “one of the earliest and most acute observers of cell-life.” In 1843 Goodsir obtained the post of curator in the university of Edinburgh ; the following year he was appointed demonstrator of anatomy to Professor Monro, and in 1845 curator of the entire museum. He elucidated about this time much that had been obscure in digestion, in parasitic formation and in the secreting structures. He fully confirmed the supposition that cells are the structures which perform the process of secretion, aud that the func- tions of nutrition and secretion are essentially alike in their nature. His views on the nucleated cell as the great agent in absorption, nutrition, and secretion are established data in the science of physiology. In 1846 Goodsir was elected to the anatomical chair in the university of Edinburgh, his highest ambition being thus satisfied. The same year the Royal Society of London enrolled him as a fellow. All his energies were now devoted to the perfection of the science of anatomy; and his system of teaching was regarded as the best that ever regulated the anatomical department of any British university or medical school.

Human myology was his strong point; no one had laboured harder at the dissecting-table ; and he strongly emphasized the necessity of practice asa

means of research. He believed that anatomy, physiology, and pathology could never be properly advanced without daily consideration and treatment of disease. In 1848 he became a fellow of the Royal College of Surgeons, and in the same year he joined the Highland and Agricultural Society, acting as chairman of the veterinary department, and advising on

strictly agricultural matters. In 1847 he delivered a series of systematic lectures on the comparative anatomy of the invertebrata; and, about this period, as member of an esthetic club, he wrote papers on the natural principles of beauty, the wsthetics of the ugly, of smell, the approba- tion or disapprobation of sounds, and other refinements. Owing to the failing health of Professor Jameson, Goodsir was induced to deliver the course of lectures on natural his- tory during the summer of 1853, It was mainly zoological, and included the psychological conditions of man as com- pared with the brute, and the highest exercise of the human faculties—perception, logic, and science. These lectures are among the memorabilia of the university ; but the in- finite amount of thought and exertion which they cost broke the health of the lecturer. Goodsir, nevertheless, persisted in work till 1853, when the necessity for rest urged itself with painful force. A sojourn on the Continent, though it refreshed, could not rid him of incipient paralysis, the common penalty for overtaxing powers. The death of Forbes in 1854 was a sore trial to Goodsir, and though other friends were numerous, the firm attachment of this man could not be replaced. Goodsir persevered in his labours, writing in 1855 on organic electricity, in 1856 ou morphological subjects, and afterwards on the structure of organized forms, —his speculations in the latter domain giving birth to his theory of a triangle as tho mathematical figure upon which nature had built up both the organic and inorganic worlds, The fundamental principle of form he conceived to exist within the province of crystallography, and to be discernible by a close study of the laws of that science, As he believed that every cell had a parent cell, or “a mother,” so he argued there was an umbilicus or centre in everything. He regarded man as simply a con- glomerate of cells, rising up, maturing, and decaying. He saw in the growth and form and finished structure of man a tetrahedron,—man, a physical being and a form divine, but a crystal in his structural entity and

arrangement. Goodsir hoped to complete the triangle theory of formation and law as the greatest of his works. In his lectures on the skull and brain he held the doctrine that symmetry of brain had more to do with the higher faculties than bulk or form. Goodsir was still working out these higher studies when death ended his labours. He expired at Wardie, near Edinburgh, on the 6th of March 1867, in the same cottage in which his friend Edward Forbes died. Goodsir's anatomical lectures are remarkable for their solid basis of fact; and no one in Britain took so wide a field for survey, or marshalled so many facts for anatomical tabulation and synthesis.

See Anatomical Memoirs of John Goodsir. F.R S., edited by W. Turner, M.B., with Memoir by H. Lonsdale, M..D., Edinb. 1868, 2 vols., in which Goodsir's lectures, addresses, and writings are epitomized; Proceedings of the Roy. Soc. of Lond., vol. iv., 1868; Transactions of the Botanical Soc. Edin., 1868, vol. ix. (T. N.)

GOODWIN, Tuomas (1600-1679), a prominent English divine of the later Puritan period, was born at Rollesby, Norfolk, on the 5th of October 1600, and a little before the completion of his thirteenth year was enrolled a student of Christ's College, Cambridge, where in 1616 he pro- ceeded to the degree of B.A. In 1619 he removed to St Catherine's Hall, and there in 1620 he was chosen fellow. In 1625 he was licensed a preacher of the university; and three years afterwards he became lecturer of Trinity Church, to the vicarage of which he was presented by the king in 1632. Harassed by the interferences of his bishop, who was a zealous adherent of Laud, he resigned all his prefer- ments and left the university in 1634. He then seems to have lived for some time in London, where in 1638 he married the daughter of an alderman; but, in the follow- ing year, he found it expedient to withdraw to Holland, and for some time was pastor of a small congregation of

| English merchants and refugees at Arnheim. Returnino to London soon after Laud's impeachment by the Long Parliament, he ministered for some years to an Independent congregation in the parish of St Dunstan's-in-the-

East, and rapidly rose to considerable eminence as a preacher ; in 1643 he was chosen a meinber of the Westminister Assembly, and at once identified himself with the Con- gregational party, generally referred to in contemporary documents as “the dissenting brethren.” He frequently preached by appointment before the Commons, and in January 1650 his talents and learning were rewarded b the House with the presidentship of Magdalen Collece Oxford, a post which he held until the period of tile Restoration. He rose into high favour with the Protector and ultimately became somewhat prominent among his more intimate advisers. From 1660 until his death, which occurred on the 23d of February 1679, he lived in London and devoted himself exclusively to theological study and “ the pastoral charge of a small congregation which his piety and intellectual abilities had attached to hin.

The works published by Goodwin during his lifetime consist chiefly of sermons printed by order of the House of Commons; but he was also associated with Nye and others in the preparation of the Apologeticall Narration (1643). His collected writings, which include expositions of considerable portions of the Epistle to the Ephesians and of the Apocalypse, were published in five folio volumes between 1681 and 1704, and have recently been reprinted in twelve 8vo volumes (Edin. 1861-66). Characterized by great yet one-sided reading, remarkable at once for the depth and for the narrowness of their observation and spiritual experience, often admirably thorough in their workmanship, yet in style prolix toa degree that, by modern readers at. least, is sometimes found to be almost intolerable,—they fairly exemplify both the merits and the defects of the special school of religious thought to which they belong. Calamy’s estimate of Goodwin’s qualities may be quoted as both friendly and just. ‘*He was a considerable scholar and an eminent divine, and had a very happy faculty in descanting upon Scripture so as to bring forth surprising remarks, which yet gene- rally tended to illustration.” A memoir, derived from his own papers, by his son is prefixed to the fifth volume of his collected works; as a ‘patriarch and Atlas of Independency” he is also noticed by Wood in the Athenw Oxonienses. A somewhat amusing sketch, from Addison’s point of view, of the Puritan president of Magdalen’s is to be met with in No. 494 of the Spectator.

GOOJERAT. See Gusarar.

GOOLE, a market town and river-port of England, West Riding of Yorkshire, is situated on the right bank of the Ouse, 25 miles W. of Hull, on the Hull and Doncaster Railway, and at the eastern terminus of the Wakefield, Pontefract, and Goole branch of the Lancashire and York- shire Railway. About a mile north of Goole the Ouse 18 crossed by a railway swing bridge, worked by hydraulic power. Until it was made a bonding port in 1829, Goole was an obscure hamlet; but since the erection shortly afterwards of commodious docks, it has steadily advanced in prosperity. The harbour, 250 feet long and 200 wide, communicates by gates with the wet docks, which consist of the ship dock 700 feet by 200, with a depth of 18 feet, the railway dock 600 feet by 200, and the steamship dock 900 feet by 150. The town is well built, and possesses fine modern parish church in the Perpendicular style, a Roman Catholic chapel in the Early English style, a neat custom-house, a market hall, a handsome courthouse, union poorhouse, public, free, and national schools, and extensive warehouses for grain and other goods. ‘The number of British ships that entered the port in 1877 was 1686, with a tonnage of 298,150; of foreign ships 62, with a tonnage of 16,399. The number of British ships that cleared was 2642, with a tonnage of 342,727 ; of foreign ships 64, with a tonnage of 17,038, There 3s regular steam communication with London and the prin- cipal Continental ports. The chief exports are cual, woollen goods, and machinery; and the chief imports, butter, fruit, indigo, logwood, timber, and wool. The

agricultural instruments, is also carried on, jpatent slip for repairing vessels, was 7680.

GOOSANDER. See Mercansen,

than Ducks and less than

Gander (Anglo-Saxon, Gandra).

Spain and Bulgaria. does not seem to be known. in Japan. indigenous to the British Islands, abundantly in the English Fen-country, where the young

reclaimed condition with the vast flocks of tame-bred. Geese that at one time formed so. valuable a wellers in and around the Fens.

in England, but it certainly did so towards the end of the last century, for Daniell mentions (Rural Sports, iii. p. 242) is having obtained two broods in one season.

peing generally placed in long heather, and the. eggs seldom ‘ It is. most likely the birds ‘reared here that.are from time to time obtained in England, “or at the present day the Grey Lag Goose, though once so numerous, is, aud for many years has been, the rarest species of those that habitually resort to the British Islands,

he domestication of this species, as Mr Darwin remarks : 287), is Houbtless of very ancient date, and yet scarcely: any ae fnimal that has been tamed for so. long a period, and bred

polour.? The most generally recognized breeds of domestic

eese are those to which the distinctive names of Emden pnd Toulouse are applied ; but a singular breed, said to pave come from Sebastopol, was introduced into Western In this the scapulars are pirally twisted, having their shaft

| ’ The meaning and derivation of this word Lag had long been a puzzle until Prof. Skeat suggested (Ibis, 1870, p. 301) that it.signified pte, last, or slow, as in laggard, a loiterer, lagman, the last man, gteeth, the posterior molar: or ‘‘ wisdom” teeth (as the last to ppear), and lagelock, a clock that is behind time. Thus the Grey tag Goose is the Grey Goose which in England when the name was jiven was not migratory but lagged behind the other wild species at he season when they betook themselves to their northern breeding- In connexion with this word, however, must be noticed the jurious fact mentioned by the late Mr Rowley (Orn. Miscell., iii. p. j13), that to this day the flocks of tame Geese in Lincolnshire are irged on by their drivers with the ery of ‘‘ Lag’em, Lag’em.”

|” From the times of the Romans white Geese have been held in yeat estimation, and hence, doubtless, they have been preferred as eeding stock,

but the practice of plucking Geese alive, continued for p many centuries, has not improbably also helped to perpetuate this priation, for it is well known to many bird-keepers that a white rather is often produced in place of one of the natural colour that has Jeen pulled out.

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industries include the manufacture of alum, sugar, ropes, and and iron-founding. Shipbuilding and there is a large dry dock, and a The population in 1871

GOOSE (Anglo-Saxon, Gs), the general English name for a considerable number of birds, belonging to the Family Anatide of modern ornithologists, which are mostly larger Swans. Technically the word Goose is reserved for the female, the male being called

The most important species of Goose, and the type of the genus Anser, is undoubtedly that which is the origin of our well-known domestic race, the Anser- Jerus or A. cinereus of most naturalists, commonly called in English the Grey or Grey Lag! Goose, a bird of exceedingly wide range in the Old World, apparently breeding where suitable localities are to be found in most European countries from Lapland to Eastwards it extends to China, but It is the only species and in former days bred

were caught in large numbers and kept in a more or less

property to the It is impossible to deter- mine when the wild Grey Lag Goose ceased from breeding

GOO a7

transparent, and so thin that it often splits into fine fila- ments, which, remaining free for an inch or more, often coalesce again.®

The other British species of typical Geese are the Bean- Goose (A, segetum), the Pink-footed (A. brachyrhynchus), and the White-fronted (A. albifrons). On the continent of Europe, but not yet recognized as occurring in Britain, is a small form of the last (A. erythropus) which is known to

breed in Lapland. All these, for the sake of discrimination, may be divided into two groups—(1) those having the “nail” at the tip- of the bill white, or of a very pale flesli colour, and (2) those in which this “nail” is black. To the former belong the Grey Lag Goose, as well as A. ald:- Jrons and A. erythropus, and to the latter the other two. A. albifrons and A. erythropus, which hardly differ but in size,—the last being not much bigger than a Mallard (Anas boschas),—may be readily distinguished from the Grey Lag Goose by their bright orange bill and legs, and their mouse- coloured upper wing-coverts, to say nothing of their very conspicuous white face and the broad black bars which cross the belly, though the two last characters are occasion- ally observable to some extent in the Grey Lag Goose, which has the bill and legs flesh-coloured, and the upper wing-coverts of a bluish-grey. Of the second group, with the black “nail,” A. segetum has the bill long, black at the base and orange in the middle; the feet are also orange, and the upper wing-coverts mouse-coloured, as in A. albifrons and A. erythropus, while A. brachyrhynchus has the bill short, bright pink in. the middle, and the feet also pink, the upper wing-coverts being nearly of the same bluish-grey as in the Grey Lag Goose. Eastern Asia possesses in A, grandis.a third species of this group, which chiefly differs from A. segetwm in its larger size. In North America there is only one species of typical Goose, and that belongs to the white-“nailed” group. It very nearly resembles A. albi- Jrons, but is larger, and has been described as distinct under the name of A. gambeli. Central Asia and India possess in the Bar-headed Goose (A. indicus) a bird easily distin- guished from any of the foregoing by the character implied by its English name; but it is certainly somewhat abnormal, and, indeed, under the name of Fulabia, has been separated from the genus Axser, which has no other member indigen- ous to the Indian Region, nor any at all to the Ethiopian, Australian, or: Neotropical Regions.

But the New World possesses by far the greatest wealth of Anserine forms. Beside others, presently to be men- tioned, its northern portions are the home of all the species of Snow-Geese belonging to the genus Chen. It is true that two of these are reported as having appeared, and that not unfrequently, in Europe and Asia; but they possibly have been but stragglers from America. The first of these is C. hyperboreus, the Snow-Goose proper, a bird of large size, and when adult of a pure white, except

the primaries, which are black. This has long been deemed a visitor to the Old World, and sometimes in considerable numbers, but the later discovery of a smaller form, @. albatus, scarcely

3 Want of space forbids our entering on the breeding of tame Geese, which was formerly so largely practised in some English counties, especially Norfolk and Lincoln. It was no uncommon thing for a man to Keep a@ stock of a thousand, each of which might be reckoned to rear on an average seven Goslings. The flocks were regularly taken to pasture and water, just as sheep are, and the man who tended them was called the Gooseherd, corrupted into Gozzerd. The birds were plucked five times in the year, and in autumn the flocks were driven to London or other large markets. They travelled at the rate of about a mile an hour, and would get over nearly ten miles in the day. For further particulars the reader may be referred to Pennant's British Zoology; Montagu's Ornithological Dictionary; Latham's General History of Birds; and Rowley's Ornithological Miscellany (iii. pp. 206-215), where some account also may be found of the Goose-fatting at Strasburg, which, since the reconquest of Alsacc, has been trans~ ferred to the south of France,

differing except in size, throws some doubt on the older records, especially since examples which have recently been obtained in the British Islands undoubtedly belong to this

lesser bird, and it would be satisfactory to have the occur- rence in the Old World of the true C. hyperboreus placed

on a surer footing. So nearly allied to the species last |

named as to have been often confounded with it, is the Blue-winged Goose, C. cwrulescens, which is said never to attain a snowy plumage. Then we have a very small species, long ago described as distinct by Hearne, the Arctic traveller, but until 1861 discredited by ornithologists. Its distinctness has now been fully recognized, and it has received, somewhat unjustly, the

name of C. rossi. Its face is adorned with numerous papille, whence it has been removed by Mr Elliot to a separate genus, Hxanthemops, and for the same reason it has, for more than a cen- tury, been known to the European residents in the fur countries as the "' Horned Wavey "—the last word being a rendering of a native name, Wawa, which signifies Goose. Finally, there appears to belong to this section, though it has been frequently referred to another (Chloephaga), and has also been made the type of a distinct genus (Philacte), the beautiful Painted Goose, C. canagica, which is almost peculiar to the Aleutian Islands, though straying to the con- tinent in winter, and may be recognized by the white edg- ing of its remiges.

The southern portions of the New World are inhabited by about half a dozen species of Geese, akin to the foregoing, but separated as the genus Chloephaga. The most notice- able of them are the Rock or Kelp Goose, C. antarctica, and the Upland Goose, C. magellanica. In both of these the sexes are totally unlike in colour, the male being nearly white, while the female is of a mottled brown, but in others a greater similarity obtains.1 Very nearly allied to the birds of this group, if indeed that can be justifiably separ- ated, comes one which belongs to the northern hemisphere, and is common to the Old World as well as the New. It contains the Geese which have received the cominon names of Bernacles or Brents,? and the scientific appellations of Bernicla and Branta—for the use of either of which much may be said by nomenclaturists. All the species of this sec- tion are distinguished by their general dark sooty colour, relieved in some by white of greater or less purity, and by way of distinction from the members of the genus Anser, which are known as Grey Geese, are frequently called by fowlers Black Geese. Of these, the best known both in Europe and North America is the Brent-Goose—the Anas bermcla of Linnzus, and the B. torguata of many modern writers—a truly marine bird, seldom (in Europe at least) quitting salt- water, and coming southward in vast flocks towards autumn, frequenting bays and estuaries on our coasts, where it lives chiefly on sea-grass (Zostera maritima). It is known to breed in Spitsbergen and in Greenland. A form which is by some ornithologists deemed a good species, and called by them B. nigricans, occurs chiefly on the Pacific coast of North America. In it the black of the neck, which in the common Brent terminates just above the breast, extends over most of the lower parts. The true Bernacle-Goose,? the B. leucopsis of most authors, is but a casual visitor to

1 See Sclater and Salvin, Proc. Zool. Society, 1876, pp. 361-369.

2 The etymology of these two words is exceedingly obscure, and no useful purpose could be attained by discussing it here, especially as any disquisition upon it must needs be long. Suffice it to say that the ordinary spelling Bernicle seems to be wrong, if we may judge from the analogy of the French Bernache. In both words the e should be sounded as a.

8 The old fable, perhaps still believed by the uneducated in some parts of the world, of Bernacle-Geese being produced from the Ber- nacles (Lepadide) that grow on timber exposed to salt-water, is not more absurd than many that in darker ages had a great hold of the popular mind, and far less contemptible than the conceited spirit in which many modern zoologists and botanists often treat it. They

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North America, but is said to breed in Iceland, and occa. sionally in Norway. Its usual zncunabula, however, sti)] form one of the puzzles of the ornithologist, and the diff. culty is not lessened by the fact that it will breed freely in semi-captivity, while the Brent-Goose will not. From the latter the Bernacle-Goose is easily distinguished by its larger size and white cheeks. Hutchins's Goose (B Hutchinsi) seems to be its true representative in the New World. In this the face is dark, but a white crescentic or triangular patch extends from the throat on either side upwards behind the eye. Almost exactly similar in colorg- tion to the last, but greatly superior in size, and possessing 18 rectrices, while all the foregoing have but 16, is the common wild Goose of America, B. canadensis, which, for some two centuries or more, has been introduced into Europe, where it propagates so freely that it has been included by nearly all the ornithologists of this quarter of the globe, as a member of its fauna. An allied form, by some deemed a species, is B. leucopareta, which ranges over the western part of North America, and, though having 18 rectrices, is distinguished by a white collar round the lower part of the neck. The most diverse species of this group of Geese are the beautiful 2. rzjicollis, a native of North- eastern Asia, which occasionally strays to Western Europe, and has been obtained more than once in Britain, and that which is peculiar to the Hawaian archipelago, B. sandu- censis.

The largest living Goose is that called the Chinese, Guinea, or Swan-Goose, Cygnopsis cygnoides, and it seems to be the stock whence the domestic Geese of several Eastern countries have sprung. It may not unfrequently be seen in English farmyards, and it is found to cross readily with our common tame Goose, the offspring being fertile, and Blyth has said that these crosses are very abundant in India. The true home of the species is in Eastern Siberia or Mongolia. It is distinguished by its upright bearing, which has been well rendered by Bewick's excellent figure. The Ganders of the reclaimed form are distinguished by the knob at the base of the bill, but the evidence of many observers shows that this is not found in the wild race, Of this bird there is a perfectly white breed.

We have next to mention a very curious form, Cereopsis nove-hollandie, which is peculiar to Australia, and appears to be a more terrestrial type of Goose than any other now existing. Its short, decurved bill and green cere give it a very peculiar expression, and its almost uniform grey plumage, bearing rounded black spots, is also remarkable. It bears captivity well, breeding in confinement, and may be seen in many parks and gardens. It appears to have been formerly very abundant in many parts of Australia, from which it has of late been exterminated. Some of its peculiarities seem to have been still more exaggerated in a bird that is wholly extinct, the Cnemiornis caleitrans of New Zealand, the remains of which were described in full by Professor Owen in 1873 (Zrans. Zool. Society, 1X. P. 253), Among the first portions of this singular bird that were found were the tibie, presenting an extraordinary development of the patella, which, united with the shank- bone, gave rise to the generic name applied. For some time the affinity of the owner of this wonderful structure was in doubt, but all hesitation was dispelled by the dis- covery of a nearly perfect skeleton, now in the British Museum, which proved the bird to be a Goose, of great

size, and unable, from the shortness of its wings, to fly.

should remember that the doctrine of spontaneous generation has still many adherents, and that seems to be hardly less extravagant mn the notion of birds growing from ‘‘ worms,” as they were then called. The mistake of our forefathers is of course evident, but that is 20 reason for deriding their innocent ignorance aS some of our contem- poraries are fond of doing.

| In correlation with this loss of power may also be noted the | dwindling of the keel of the steraum. Generally, however, | its osteological characters point to an affinity to Cereepsis, as was noticed by Dr Hector (Trans. New Zeal. Institute, vi. pp. 76-84), who first determined its Anserine character.

Birds of the genera Chenalopex (the Egyptian and Orinoco Geese), Plectropterus, Sarcidiornis, Chlamydochen, and some others, are commonly called Geese. To the writer it Seems uncertain whether they should be grouped with the Anserine. The males of all appear to have that curious enlargement at the junction of the bronchial tubes and the trachea which is so characteristic of the Ducks or Anatine. As much may be said for the genus Netiapus, but want of space precludes further consideration of the subject here. (ALN)

GOOSEBERRY, Lebes grossularia, a well-known fruit- bush of northern and central Europe, usually placed in the same genus of the natural order to which it gives name as the closely allied currants, but by some made the type of a small sub-genus, Grossularia, the members of which differ from the true currants chiefly in their spinous stems, and in their flowers growing on short footstalks, solitary, or two or three together, instead of in racemes.

The wild gooseberry is a small, straggling bush, nearly re- sembling the cultivated plant,—the branches being thickly set with sharp spines, standing out singly or in diverging tufts of two or three from the bases of the short spurs or lateral leaf shoots, on which the bell-shaped flowers are produced, singly or in pairs, from the groups of rounded, deeply-crenated 3 or 5-lobed leaves. The fruit is smaller than in the garden kinds, but is often of good flavour; it is generally hairy, but in one variety smooth, constituting the 2. wva-crispa of writers; the colour is usually green, jbut plants are occasionally met with having deep purple uberries. The gooseberry is indigenous to the central parts of Europe and western Asia, growing naturally in alpine |thickets and rocky woods in the lower country, from France ‘eastward, perhaps as far as the Himalaya. In Britain it is often found in copses and hedgerows and about old ruins, jbut has been so long a plant of cultivation that it is difficult jto decide upon its claim to a place in the native flora of the jisland. Common as it is now on some of the lower slopes jof the Alps of Piedmont and Savoy, it is uncertain whether jthe

Romans were acquainted with the gooseberry, though jt may possibly be alluded to in a vague passage of Pliny: jthe hot summers of Italy, in ancient times as at present, would be unfavourable to its cultivation. Abundant in ermany and France, it does not appear to have been jmuch grown there in the Middle Ages, though the wild fruit was held in some esteem medicinally for the cooling properties of its acid juice in fevers ; while the old English mame, Fea-berry, still surviving in some provincial dialects, Hodicates that it was similarly valued in Britain, where it 'Wwas planted in gardens at a comparatively early period. yfurner describes the gooseberry in his Herball, written Pbout the middle of the 16th century, and a few years jfater it is mentioned in one of Tusser's quaint rhymes as an ordinary object of garden culture. Improved varieties jvere probably first raised by the skilful gardeners of Holland, whose name for the fruit, Aruisbezie, may have been easily corrupted into the present English vernacular word.t Towards the end of the last century the gooseberry pecame a favourite object of cottage-horticulture, especially in Lancashire, where the working cotton-spinners have raised numerous varieties from seed, their efforts having peen chiefly directed to increasing the size of the fruit.

)) 1 The Scotch grossart, originally grosel, evidently from the French yroseille, may have the same ultimate origin ; the usual derivation from rossus, a green fig, seems far-fetched. The rough wild fruit is called py the Germans rausbeere.

GOO0O—

Of the many hundred sorts enumerated in recent horti- cultural works, few perhaps equal in flavour some of the older denizens of the fruit-garden, such as the "old rough red" and "hairy amber." The climate of the British Islands seems peculiarly adapted to bring the gooseberry to perfection, and it may be grown successfully even in the most northern parts of Scotland ; indeed, the flavour of the fruit is said to improve with increasing latitude. In Norway even, the bush flourishes, in gardens on the west coast, nearly up to the Arctic circle, and it is found wild as far north as 63°. The dry summers of the French and German plains are less suited to it, though it is grown in some hilly districts with tolerable success. The goose- berry in the south of

England will grow well in cool situations, and may be sometimes seen in gardens near London flourishing under the partial shade of apple trees ; but in the north it needs full exposure to the sun to bring the fruit to perfection. It will succeed in almost any soil, but prefers a rich loam or black alluvium, and, though naturally a plant of rather dry places, will do well in moist land, if drained.

The varieties are most easily propagated by cuttings planted in the autumn, which root rapidly, and in a few years form good fruit-bearing bushes. Much differ- ence of opinion prevails regarding the mode of pruning this valuable shrub ; it is probable that in different situations it may require varying treatment. The fruit being borne on the lateral spurs, and on the shoots of the last year, it is the usual practice to shorten the side branches in the winter, before the buds begin to expand ; some reduce the longer leading shoots at the same time, while others prefer to nip off the ends of these in the summer while they are still succulent. When large fruit is desired, plenty of manure should be supplied to the roots, and the greater portion of the berries picked off while still small. Bur- bidge states that the gooseberry may be with advantage grafted or budded on stocks of some other species of Rides, ft. aureum, the ornamental golden currant of the flower garden, answering well for the purpose. The giant goose- berries of the Lancashire “fanciers” are obtained by the careful culture of varieties specially raised with this object, the growth being encouraged by abundant manuring, and the removal of all but a very few berries from each plant. Single gooseberries of nearly 2 ounces in weight have been occasionally exhibited ; but the produce of such fanciful horticulture is generally insipid. The bushes at times suffer much from the ravages of the caterpillar of the gooseberry or magpie moth, Abraxas grossulariata, which often strip the branches of leaves in the early summer, if not destroyed before the mischief is accomplished. The most effectual way of getting rid of this pretty but destructive insect is to look over each bush carefully, and pick off the larvee by hand ; when larger they may be shaken off by striking the branches, but by that time the harm is generally done— the eggs are laid on the leaves of the previous season. Equally annoying in some years is the smaller larva of the V-moth, Halias vanaria, which often appears in great numbers, and is not so readily removed. The gooseberry is sometimes attacked by the grub of a fly, Vematus ribesi?, of which several broods appear in the course of

the spring and summer, and are very destructive. The grubs bury themselves in the ground to pass into the pupal state ; the first brood of flies, hatched just as the bushes are coming into leaf in the spring, lay their eggs on the lower side of the leaves, where the small greenish larve soon after emerge. For the destruction of the first broods it has been recommended to syringe the bushes with tar- water ; perhaps a very weak solution of carbolic acid might prove more effective. The powdered root of white helle- bore is said to destroy both this grub and the caterpillars

of the gooseberry and V-moth; infusion of foxglove, and tobacco-water, are likewise tried by some growers. If the fallen leaves are carefully removed from the ground in the autumn and burnt, and the surface of the soil turned over with the fork or spade, most eggs and chrysalids will be destroyed.

The gooseberry was introduced into the United States by the early settlers, and in some parts of New England large quantities of the green fruit are produced and sold for culinary use in the towns; but the excessive heat of the American summer is not adapted for the healthy maturation of the berries, especially of the English varieties. Perhaps if some of these, or those raised in the country, could be crossed with one of the indigenous species, kinds might be obtained better fitted for American conditions of culture, although the gooseberry does not readily hybridize. The bushes are apt to be infested by a minute fly, known as the gooseberry midge, Cecidomyia grossularie, which lays its eggs in the green fruit, in which the larve are hatched, causing the berries to turn purple and fall prematurely. According to Mr Fitch, the midge attacks the wild native species as well as the cultivated gooseberry,

The gooseberry, when ripe, yields a fine wine by the fermentation of the juice with water and sugar, the result- ing sparkling liquor retaining much of the flavour of the fruit. By similarly treating the juice of the green fruit, picked just before it ripens, an effervescing wine is pro- duced, nearly resembling some kinds of champagne, and, when skilfully prepared, far superior to much of the liquor sold under that name. Brandy has been made from ripe gooseberries by distillation; by exposing the juice with sugar to the acetous fermentation a good vinegar may be obtained. The gooseberry,

when perfectly ripe, contains a large quantity of sugar, most abundant in the red and amber varieties; in the former it amounts to from 6 to upwards of 8 per cent. The acidity of the fruit is chiefly due to malic acid.

Several other species of the sub-genus produce edible fruit, though none have as yet been brought under economic cul- ture. Among them may be noticed A. oxyacanthoides and R. cynosbati, abundant in Canada and the northern parts of the United States, and 2. gracile, common along the Alleghany range. The group is a widely distributed one, species occurring to the west of the Rocky Mountains, and in Siberia and Japan, while one is said to have been found by recent explorers on the lofty Kilimanjaro, near the lake- sources of the Nile. (0.22.5)

GOPHER (Testudo gopher, Bartr.), the only living representative on the North American continent of the Testudinide or family of land tortoises, where it occurs in the south-eastern parts of the United States, from Florida in the south to the river Savannah in the north. Its cara- pace, which is oblong and remarkably compressed, measures from 13 to 14 inches in extreme length, the shields which cover it being grooved, and of a yellow-brown colour. The gopher abounds chiefly in the forests, but occasionally visits the open plains, where it does great damage, especially to the potato crops, on which it feeds. It is a nocturnal animal, remaining concealed by day in its deep burrow, and coming forth at night to feed. Its strength in proportion to its size is said to be enormous, it being able, according to Dumeril and Bibron, to move along comfortably bearing aman on its back. The flesh of the gopher or mungofa, as it is also called, is considered excellent eating.

GOPPINGEN, a town of Wiirtemberg, circle of the Danube, on the right bank of the Fils, 22 miles E.8.E. of Stuttgart. It possesses an old castle erected by Duke Christopher in the 16th century, two evangelical churches, a Roman Catholic chapel, a synagogue, a real school, a classical school, and an advanced school. The manufactures

include linen and woollen cloth, leather, glue, paper machines, and toys. Three miles north of the town are the ruins of the old castle of

Hohenstaufen, with the Barbarossa chapel, containing, besides other adornments, an old fresco of Frederick Barbarossa dating probably from the 16th century. Géppingen originally belonged to the house of Hohenstaufen, and at a later period came into the posses- sion of the counts of Wiirtemberg. It was surrounded by walls in 1129. The population in 1875 was 9532.

GORAKHPUR, a district of the North-Western Pyo- vinces, India, between 26° 50’ 15” and 27° 28’ 48” N, Jat, and between 83° 7’ and 84° 29’ E. long,, bounded on rs N. by the territory of Nepal, on the E. by Champaran and Saran, on the 8. by the Gogra river, and on the W. by Basti and Fyzabad, with an area of 4578 square miles, The dis. trict lies immediately south of the lower Himalayan slopes, but forms itself a portion of the great alluvial plain, Onlya few sandhills break the monotony of its level surface, which is, however, intersected by numerous rivers studded with lakes and marshes. In the north and centre dense forests abound, and the whole country has a verdant appearance, The principal rivers are the Rapti, the Gogra, the great and little Gandak, the Kudna, the Rolim, the Ami, and the Gunghi. The tiger is found in the north, and many other wild animals abound throughout the district. The lakes are well stocked with fish.

The population, which in 1853 numbered 1,816,390, had risen to 2,019,361 in 1872, a great increase in so short a period ; of these, 1,819,445 or 90°1 per cent. are Hindus, 199,372 Mussulmans, and 533 Christians. ‘The district contains a total cultivated area of 2621 square niiles, with 897 square miles available for cultivation, most of which is now under forest. The chief products are cotton, rice, béjra, jodr, moth, and other food-stuffs. The commerce of Gorakhpur is confined to the above products. The means of com- munication are still imperfect. Two good metalled roads run through the distriet, one from Gorakhpur to Benares via Bar- halganj, the other to Basti and Fyzabad. The total revenue in 1876 was £227,738. The police force in 1875 numbered 755 officers and men. In 1875 there were 435 schools, with 13,525 pupils. The district is not subject to very intense heat, from which it is secured by its vicinity to the hills and the moisture of its soil. Dust-storms are rare, and cool breezcs from the south, rushing down the gorges of the Himalayas, succeed each short interval of warm weather. The climate is, however, relaxing. The southern and eastern portions are as

healthy as most parts of the province, but the édrai and forest-tracts are still subject to malaria. The average rainfall from 1860 to 1871 was 45°8 inches; the maxt- mum was 60 inches in 1861, and the minimum 25 inches in 1868. The mean monthly temperature in the shade was 77° in 1870, and 76° in 1871. The death rate in 1875 was 40°092, or 19°85 per thousand of the population. ;

Gautama Buddha, the founder of the religion bearing his name, died within the district of Gorakhpur. It thus became the head- quarters of the new creed, and was one of the first tracts to receive it. The country from the beginning of the 6th century was the scene of a continuous struggle between the Bhars and their Aryan antagonists, the Rahtors. About 900 the Domhatars or military Brahmans appeared, and expelled the Rahtors from the town of Gorakhpur, but they also were soon driven back by other invaders. During the 15th and 16th centuries, after the district had been desolated by incessant war, the descendants of the various con- querors held parts of the territory, and each seems to have live quite isolated, as no bridges or roads attest any intercourse with each other. Towards the end of the 16th century, Mussulmans occupied Gorakhpur town, but they interfered very little with the district, and allowed it to be controlled by the native rajas. In the middle of the 18th century a formidable foe, the Banjaras bee the west, kept the district ina state of terror, and so weakened the power of the rajds that they could not resist the fiscal exactions 0 the Oudh officials, who plundered and ravaged the Gage great extent. The district formed part of the territory ceded by Oudh to the British under the treaty of 1801. During the wie it was lost for a short time, but under the friendly Gurkhas the rebels were driven out, and the whole district once more passe under British rule.

GoraKapur, a municipal city, and the administrative

headquarters of Gorakhpur district, North-Western Pro- vinces, in 26° 44’ 8” N, lat., and 83° 23’ 44” E. long,, on the river Rapti, near the centre of the district. It was

founded about 1400, on the site of a more ancient city. It is the headquarters of a civil and sessions judge, with the usual administrative offices, and has a considerable trade in grain and timber sent down the Rapti to the Gogra and the Ganges. The municipal revenue in 1875-76 was £4771, Population (1872), 51,117.

GORAMY, or Gouramy (Osphronemus olfax), is reputed to be one of the best-flavoured freshwater fishes in the East Indian archipelago. Its original home is Java, Sumatra, Borneo, and several other East Indian islands, but thence it has been transported to and acclimatized in Penang, Malacca, Mauritius, and even Cayenne, Being

Goramy.

an almost omnivorous fish and tenacious of life, it seems to recommend itself particularly for acclimatization in other tropical countries ; and specimens kept in captivity become as tame as carps. It attains the size of a large turbot. Its shape is flat and short, the body covered with large scales ; the dorsal and anal fins are provided with numerous spines, and the ventral fins produced into long filaments.

GORCUM, or Gorxum (Dutch, Gorinchem), a town of the Netherlands, chief town of a circle in the province of South Holland, 22 miles E.8.E. of Rotterdam, on the right bank of the Merve or Merwede, at the influx of the Linge, by which it is intersected. It is surrounded by walls, and has an old town-house adorned with fine old paintings, a prison, a | custom-house, barracks, an arsenal, and a military hospital. The old church of St Vincent contains the monuments of the lords of Arkel. The charitable and benevolent institutions) are numerous, and there is also a library and several learned | associations. Gorcum possesses a good harbour, and carries | on aconsiderable trade in grain, hemp, cheese, potatoes, and } fish, although it is still destitute of railway communication, The population in 1876 was 9301.

The earliest notice of Gorcum is in a document of John I., duke of Brabant (in the close of the 13th century), granting the town's folk | free trade throughout his duchy. The history in the 15th century is closely connected with that of the countship of Arkel. It was within its walls that William, the

last lord of Arkel, perished in } 1417, on the capture of the town by the Kabeljaus; and it was the } burghers of Goreum who in 1578 laid the castle of Arkel in ruins. In 1572, when the town was taken by William de la Marck, he put to death 19 priests and friars, who have a place in the Romish calendar as the Martyrs of Gorcum. The place defended itself suc- cessfully against the French in 1672, but was taken by the Prussians in 1785, by the French in 1795, and by the allies in 1814.

GORDIANUS, or Gorpran, the name of three Roman emperors. The first, Marcus Antonius Africanus Gordi- | anus, the wealthiest of the Romans, was descended on the father's side from the Gracchi, on the mother's from Trajan, while his wife was the granddaughter of Antoninus Pius. While be gained unbounded popularity by his mag- nificent games and shows, his prudent and retired life did not alarm the tyranny of Caracalla. Alexander Severus /called him to the dangerous honours of government in | Africa, and during his proconsulship there occurred the | usurpation of Maximin. The universal discontent roused

by the oppressive rule of Maximin culminated in a revolt

in Africa in 238, and Gordian reluctantly yielded to the |

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popular clamour and assumed the purple. His son was associated with him in the dignity, The senate confirmed the choice of the Africans, and most of the provinces gladly sided with the new emperors; but, even while their cause was so successful abroad, they had fallen before the sudden inroad of Capellianus, who commanded Mauretania in the interest of Maximin, They had reigned only 36 days. Both the Gordians had deserved by their amiable character their high reputation ; they were men of great accomplishments, fond of literature, and voluminous authors; but they were rather intellectual voluptuaries than able statesmen or powerful rulers. Having embraced the cause of Gordian, the senate was obliged to continue the revolt against Maximin, and appointed Maximus and Balbinus, two of its noblest and most esteemed members, as joint emperors. At their in- auguration a sedition arose, and the popular outcry for a Gordian was appeased by the association of M. Antonius Gordianus Pius, nephew of the younger and

grandson of the elder Gordian, a boy of thirteen. Maximin forthwith invaded Italy, but was murdered by his own troops while besieging Aquileia; and a revolt of the pretorian guards, to which Maximus and Balbinus fell victims, left Gordian sole emperor. For some years he was under the control of his mother's eunuchs, till happily Misitheus, his teacher of rhetoric, whose daughter he married, roused him to free himself from the ignoble tyranny. Misitheus was appointed prefect of the preetorian guards, and wielded ably the supreme power that now belonged to him. When the Persians invaded Mesopotamia, the young emperor at his persuasion opened, for the last time recorded in his- tory, the temple of Janus, and marched in person to the Kast. Misitheus proved a skilful and prudent general; but his sudden death under strong suspicions of poisoning was the end of Gordian's prosperity. Discontent and seditions, fostered by Philip, who had succeeded Misitheus, arose in the camp, and Gordian was slain by the mutinous soldiers (244). A monument near the confluence of the Euphrates and Aboras marked the scene,

GORDIUM, an ancient town of Bithynia, was situated not far from the river Sangarius, but the site has not been exactly ascertained, though M. Lejean believes that it may be identified with ruins which he observed in the vicinity of the village Emret. It was undoubtedly a place of high antiquity, and though Strabo describes it as a village, it afterwards increased in size, and, under the name of Juliopolis, which it received in the reign of Augustus, it continued to flourish to the time of Justinian at least, According to the legend, Gordium was founded by a cer- tain Gordius, who had been called to the throne by the Phrygians in obedience to an oracle of Zeus commanding them to select the first person that rode into the agora in acar. The king afterwards dedicated his car to the god, and another oracle declared that whoever succeeded in un- tying the strangely entwined knot of the yoke should reign over all Asia, Alexander the Great, according to the well- known story, overcame the difficulty of the Gordian knot by a stroke of his sword.

See Kiepert, Beitrdge zur inschriftlichen Topographie Klein- Asiens, 1863; Lejean, in Bull. de la Soc. de Géogr., Paris, 1869.

GORDON, Atexanper, the “Sandy Gordon” of Scott’s Antiquary, is believed to have been a native of Aberdeen, and a graduate of either King’s or Marischal College, but of his parentage and early history nothing is known. When still a young man he is said to have travelled abroad, probably in the capacity of tutor. He must, how- ever, have returned to Scotland previous to 1726, when, betaking himself to antiquarian pursuits, he made the acquaintance of, among others, Roger Gale, the first vice-president of the Society of Antiquaries. In the year just

mentioned appeared the Jtinerarium Septentrionale, his greatest and best known work. He was already the friend of Sir John Clerk, of Penicuick, better known as Baron Clerk, from his having been appointed one of the Barons of the Exchequer; and the Baron and Roger Gale are the ““‘two gentlemen, the honour of their age and country,” whose letters were published, without their consent it appears, as an appendix to the Jtinerariwm. Subsequently Gordon was appointed secretary to the Society for the Encouragement of Learning, with an annual salary of £50. Resigning this post he succeeded Dr Stukeley as secretary to the Society of Antiquaries, and also acted for a short time as secretary to the Egyptian Club, an associa- tion composed of gentlemen who had visited Egypt. In 1741 he accompanied Governor Glen to South Carolina. No explanation has yet been given of the reasons which led to this step, or of the relations between the old “Roman” antiquary and his new patron, A hint, but nothing more, is. afforded by the fact that in the list of subscribers to the Zécnerarium we find the name of ‘ James Glen of Longcroft, Esq.” Through the influence probably of his friend, Gordon, besides receiving a grant of land in Carolina, was appointed registrar of the province, and justice of the peace, and filled several other offices. From his will, still in existence, dated 22d August 1754, we learn that he had a son Alexander and a daughter Frances, to whom he bequeathed most of his property, among which were portraits of himself and of friends painted by his own hand.

Some additional particulars regarding Gordon and his works may be got from a communication to the Society of Antiquaries of Scot- land by Professor Daniel Wilson, LL.D., Toronto, printed in the Procecdings, with

Additional Notes and an Appendix of Original Letters by the late Dr David Laing (Proc. Soc. of Antig. of Scot., vol. x. pp. 363-382).

GORDON, Lorp Grorcz, (1751-1793), third and youngest son of Cosmo George, duke of Gordon, was born in London 26th December 1751. After completing his education at Eton, he entered the navy, where he rose to the rank of lieutenant; but on account of a disagreement regarding promotion with Lord Sandwith, then at the head of the admiralty, he resigned his commission shortly before the commencement of the American war. In 1774 he entered parliament as member for the small borough of Luggershall, and possessing some wit, great ease of address, and the confidence arising from sincere conviction, he advo- cated his individual notions on any subject with great volu- bility and with something of the eagerness of monomania. After supporting the ministry for some time, he began to attack both ministry and opposition with such ceaseless pertinacity that it became a common saying that "there were three parties in parliament, the ministry, the opposi- tion, and Lord George Gordon." He vehemently opposed the passing of the Acts for the removal of the Roman Catholic disabilities, and took a leading part in organizing the Protestant associations of Scotland and England. Of both associations he was chosen president, and on June 2d 1780 he headed the mob which marched in procession from St George's Fields to the Houses of Parliament in order to present the monster petition against the Acts. After the mob reached Westminster a terrific riot ensued, which con- tinued several days, during which the city was virtually at their mercy. At first indeed they dispersed after threaten- ing to make a forcible entry into the House of Commons, but reassembled soon afterwards and destroyed several Roman Catholic chapels, pillaged the private dwellings of many Roman Catholics, set fire to Newgate and broke open all the other prisons, attacked the Bank of England and several other public buildings, and continued the work of violence and conflagration until the interference of the military, by

before the riots were quelled. For his share in instigating the riots Lord Gordon was apprehended on a charge of hich treason; but, mainly through the skilful and eloquent

| defence of Erskine, he was acquitted on the ground that

he had no treasonable intentions. In 1786 he was excon. municated by the archbishop of Canterbury for refusing to bear witness in an ecclesiastical suit; and in 1787 he wos convicted of libelling the queen of France, the French am- bassador, and the administration of justice in England. He was, however, permitted to withdraw from the court without bail, and made his escape to Holland; but on account of representations from the court of Versailles he was com- manded to quit that country, and, returning to England, was apprehended, and in January 1788 was sentenced to five years' imprisonment in Newgate, where, after refusing to grant the guarantees required as a condition of his obtaining his liberty at the conclusion of his original term of imprison- ment, he died of delirious fever November 1, 1793, Some

time before his apprehension he had become a convert to Judaism, and had undergone the initiatory rite, A serious

defence of most of his eccentricities is undertaken in The Life of Lord George Gordon, with a Philosophical Review of his Political Conduct, by Robert Watson, M.D., Lon- don, 1795.

GORDON, Str Joan Watson (1788-1864), Scottish painter, was the eldest son of Captain Watson, R.N., a cadet of the family of Watson of Overmains, in the county of Berwick. He was born in Edinburgh in 1788, and, it being his father's desire that he should enter the army, was educated specially with a view to his joining the Royal Engineers. As drawing was even at that period con- sidered a not inappropriate accomplishment for the scientific service, he was, while waiting for his commission, entered as a student in the Government school of design, then as uow under the management of the Board of Manufactures. With the opportunity, his natural taste for art quickly developed itself, and his industry and progress were such that his father was persuaded to allow him to adopt it as his profession. Captain Watson was himself a skilful draughtsman, and his brother George Watson, afterwards president of the Scottish Academy, stood high as a portrait painter, second only to Sir Henry Raeburn, who also was a friend of the family. Between the studios of his uncle and his friend, John Watson seems to have thought he had every necessary assistance a young artist required,

and neither then or at a future period showed any desire for foreign study ; his art consequently is more purely of native growth than that of any of his contempor- aries. Inthe year 1808 he sent to the exhibition of the Lyceum in Nicolson Street a subject from the Lay of the Last Minstrel, and continued for some years to exhibit fancy subjects; but, although freely and sweetly painted, they were altogether without the force and character which in his own proper walk stamped his portrait pictures as the works of a master. After the death of Sir Henry Raeburn in 1823, he succeeded to much of his practice ; and as there were at that time in Edinburgh four artists of the name of Watson, all of them portrait painters, he assumed in 1826 the name of Gordon, by which he is best known. Mixing 8 good deal in literary and scientific society, he painted most of the notabilities who lived in or visited the northern metro- polis during his career; one of the earliest of his famous sitters was Sir Walter Scott, who sat for a first portrait im 1820. Then came J. G. Lockhart in 1821; Professor Wilson, 1822 and 1850, two portraits ; Sir Archibald Alison, 1839; Dr Chalmers, 1844; a little later De Quincey; and Sir David Brewster, 1864, being the last picture he painted. Among his most important works may be mentioned the earl of Dalhousie, 1833, now in the Archers' Hall, Edin-

whom no fewer than 450 persons were killed and wounded | burgh ; Sir Alexander Hope, 1835, in the county buildings,

} ries, and were connected with the house of Haddo. } born in 1635, and after completing his education at the

GOR—

Linlithgow ; Lord President Hope, in the Parliament House : and Dr Chalmers, 1844. These are all full lengths, and were exhibited in London, where they attracted great atten- tion (the Chalmers portrait was purchased some years later by Sir Robert Peel, and is now in the Peel Gallery) ; they belong to his middle period, and are distinguished by great sweetness in execution, and, unlike his later works, are generally rich in colour. The full length of Dr Brunton, 1844, and Dr Lee, the principal of the university, 1846, both in the staircase of the College Library, mark a modification of his style, which ultimately resolved itself into extreme simplicity, both of colour and treatment.

During the last twenty years of his life he painted many distinguished Englishmen who came to Edinburgh to sit to

him. And it is significant of the position he held in the

esteem of artists themselves that David Cox, the landscape painter, on being presented with his portrait, subscribed for by many friends, chose to go to Edinburgh to have it executed by Watson Gordon, although he neither knew the painter personally nor had ever before visited the country. Among the portraits painted during this period, in what may be termed his third style, are De Quincey, the opium eater, in tlie National Portrait Gallery, London; General Sir Thomas Macdougall Brisbane, in the Royal Society; the prince of Wales, Lord Macaulay, Sir M. Packington, Lord Murray, Lord Cockburn, Lord Rutherford, and Sir John Shaw Lefevre, in the Scottish National Gallery, and a host

of others, for latterly he not only possessed great facility

of brush but was industrious to a fault. These latter pictures are mostly clear and grey, sometimes showing

little or no positive colour, the flesh itself being very grey,

aud the handling extremely masterly, though never ob- truding its cleverness, He was very successful in rendering acute observant character, and there is a look of mobility of feature, in repose it is true, but suggesting that the eye could twinkle and the lips relax, As an example of his

| last style, showing pearly flesh painting freely handled, yet highly finished, the head of Sir John Shaw Lefevre will hold

its own in any school. John Watson Gordon was onc of the earlier members of

the Royal Scottish Academy, and was elected its president

in 1850; he was at the same time appointed limner to her majesty for Scotland, and received the honour of knight-

j hood. Since 1841 he had been an associate of the Royal) Academy, and in 1851 he was elected a Royal Academician. | Sir John continued to paint with little if any diminution

of power until within a very few weeks of his death, which

) occurred on the Ist of June 1864.

GORDON, Patrick (1635-1699), of Auchleuchries, a Russian general, was descended from a Scotch family of Aberdeenshire, who possessed the small estate of Auchleuch- He was

parish schools of Cruden and Elon, entered, in his fifteenth year, the Jesuit college at Braunsberg, Prussia ; but, as “his humour could not endure such a still and strict way of living,” he soon resolved to return home. He changed his mind, however, before re-embarking, and after journeying

| on foot in several parts of Germany, ultimately, in 1655, j enlisted at Hamburg in the Swedish service. In the course

\

) of the next five years he served alternately with the Polcs

and Swedes as he was taken prisoner by either. In 1661,

| after changing his resolution more than once, he took service

in the Russian army under Alexis I., and in 1666 he was sent on a special mission to England. After his return he

| distinguished himself in several wars against the Turks and

Tartars in southern Russia, and in recognition of his services he in 1678 was made major-general, in 1679 was appointed to the chief command at Kietf, and in 1683 was made lieutenant-general, He visited England in 1686, and, after

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his return to Russia, he in 1687 and 1689 took part as quartermaster-general in the expeditions against the Crim Tartars in the Crimea, On the breaking out of the revolu- tion in Moscow in the latter year, Gordon with the troops he commanded virtually decided events in favour of the czar Peter I., and against the czarina Sophia. He was therefore during the remainder of his life in high favour with the czar, who confided to him the command of his capital during his absence from Russia, employed him in organizing his army according to the European system, and latterly raised him to the rank of general-in-chief. He died November 29, 1699. The czar, who had visited

him frequently during his illness, was with him when he died, and with his own hands closed his eyes.

General Gordon left behind him a diary of his life, written in Eng- lish. Several of those parts of the diary connected with the military history of Russia were at an early period translated into German— then the literary language of St Petersburg—but never printed, although made use of for various other works. A complete German translation, by Prince M. A. Kolenski and Mr M. C: Powell, was published, the first volume at Moscow in 1849, the second at St Petersburg in 1851, and the third at St Petersburg in 1853; and Passages from the Diary of General Patrick Gordon of Auchleuchries, 1635-1699, was printed, under the editorship of Joseph Robertson, for the Spalding Club, Aberdeen, 1859.

GORE, Mrs Catuerine Gracx (1799-1861), an exceed- ingly prolific English novelist, was born in 1799 at East Retford, Nottinghamshire, and was the daughter of Mr Moody, a wine-merchant. In 1823 she was married to Captain Charles Gore ; and, in the same year, she published her first work, Theresa Marchmont, or the Maid of Honour. Then followed, in rapid succession, the Lettre de Cachet and The Reign of Terror (1827), Hungarian Tales, Manners of the Day (1830), Mothers and Daughters (1831), and The Fair of May Fair (1832), At this point the critics began to say that Mrs Gore had written enough ; and she accordingly went to France to extend her range of obser- vation, and did not publish till 1836, when her next novel, entitled Mrs Armytage, appeared. Every succeeding year saw several volumes from her pen; and in 1839 The Cabinet Minister, Preferment, and The Courtier of the Days of Charles IT, were issued from the press. But in 1841 Mrs Gore fairly eclipsed her other novels by the publication of Cecil, or the Adventures of a Coxcomb, which produced a great sensation. This year also appeared Greville, or a Season in Paris. Then followed, in 1842, Ormington, or Cecil a Peer, Fascination, and T'he Ambassador's Wife ; and in. 1843 Mrs Gore produccd another masterpiece, entitled The Banker's Wrfe, She continued to write, with unfailing fertility of invention, till her death in January 1861. Mrs Gore also published some dramas and translations from the French ; but it is as a fashionable novelist that she is re- membered. Her life was one of extraordinary literary in- dustry, as may be inferred from the fact that she is the author of more than seventy distinct

works. Among her best novels are Cecil, or the Adventures of a Coxcomb, Greville, and The Banker's Wife. Cecil gives extremely vivid sketches of London fashionable life, and is full of happy epigrammatic touches. It displays great knowledge of London clubs, for which Mrs Gore was indebted to Mr Beckford, the author of Vathek. The narrative is varied by occasional glimpses of Continental life. Greville is marked by faithful pictures of English country life, and of the ease and grace of French society. The Banker's Wife is distinguished for masterly studies of character, especially in the persons of Mr Hamlyn, the cold calculating money- maker, and his warm-hearted country neighbour, Colonel Hamilton.

Mrs Gore's works are characterized by great cleverness in invention, lively satire, shrewd insight into character, and keen observation of life. They are exceedingly deficient in feeling ; and the lover of fiction passes a pleasant hour

or two over her novels, not much excited by the triumphs, or vexed by the sufferings of her characters. Sometimes her novels weary the reader; but this does not arise from any failing in her style, which is always clear, animated, and full of point, nor from lack of inventiveness, but from the endless repetitions involved in writing so many books on a subject of such comparatively limited range as fashionable life. Mrs Gore's novels have not only achieved an immense temporary popularity, but possess genuine historic value as eminently readable, and on the whole faithful, pictures of the life and pursuits of the English upper classes.

GOREE (in French Gorée, and in the native tongue Bir or Berr, that is, a belly, in allusion to its shape), a small island off the west coast of Africa, belonging to the French colony of the Senegal. It lies immediately to the south of Cape Verd, and, according to the Annuarre du Sénégal for 1878, in 14° 39' 55" N, lat. and 12° 16' 40" W. long. The distance from the mainland in one direction is about 8 miles, aud in another from 3 to 4. Though little more than a barren rock, Goree is of importance as a commercial and military post, and all the more as it has the advantage of a milder climate than the neighbouring mainland. The greater part of its area is occupied by the town, which was constituted a commune in 1872, and

placed under the government of a municipal council of 14 members, The streets are narrow, and the houses, built for the most part of dark red stone, are flat-roofed. Among the principal buildings are the castle of St Michael, which occupies the rocky eminence in the south of the island, the governor's residence, the hospital, and the barracks. The summit of the rock within the citadel is levelled to an esplanade, and in the centre is a deep Artesian well, the only source in the otherwise arid island, which is dependent on its rain-water tanks for its ordinary supplies. Goree is a free port, and forms a couvenient centre for the distribution of European goods. It is regularly visited by the vessels of the British and African Steam Navigation Company. The harbour is formed in a small sandy bay on the north-east side of the island. Telegraphic communication with St Louis dates from 1862. A chamber of commerce was established in 1870, and a sanitary commission in 1874. The town was reported in 1878 to have a population of 3243, and the arrondissement of Gorée-Dakar, of which it is the adminis- trative centre, had a total population of 61,394. Dakar is a new settlement on the mainland, with a port constructed since 1857 for the vessels of the Messageries Maritimes ; but with the exception of the public buildings the town has still to be built. Goree owes its name to the Dutch, who took possession of it in the beginning of the 17th century, and called it Goeree or Goedereede, in memory of the island on their own coast now united with Overflakkee. It was taken from them in 1663 by the English under Commodore Holmes, but recovered in the following year by De Ruyter. They were finally expelled, in 1677, by the French under Admiral D'Estrées, whose conquest was confirmed in 1678 by the peace of Nymwegen. In 1758 the island was captured for the English by Commodore Keppel, but a few years afterwards it was restored to France. With the exception of a few months in 1804, when the island was held by the French, the English were again in possession from 1800, when it was seized by Sir Charles Hamilton, till the peace of 1814.

GORGIAS of Leontini, in Sicily, a rhetorician and sophist of whose personal history nothing is known beyond the facts that in 427, when already a comparatively old man, he was sent by his fellow-citizens at the head of an embassy to ask Athenian protection against the aggression of the Syracusans; that he then settled in Athens, and supported himself by the practice of oratory and by teach-

ing rhetoric; and that he ended his days at Larissa in Thessaly. His birth and death may be approximately dated respectively at 483 and 375 B.c. He was the author of g lost work On Nature or the Non-existent (wept rod HA) Ovtos i) wept ioews), the substance of which may be gathered from the writings of Sextus Empiricus, and also from the treatise (ascribed to Theophrastus) De Melisso, Xenophane Gorgia. His philosophical opinions may be summed up i three propositions, which stand in direct relation to the teachings of the Eleatic school. He held (1) that there is nothing which has any real existeuce ; (2) that, even if any- thing did really exist, it could not be known; and (8) that supposing real existence to be knowable, the knowledge would be incommunicable. On the first point his argument was that a real existence must either have come into being or have been eternal. But the first alternative would re- quire it to have been produced, either from the existent or from the non-existent; the second alternative would require us to identify it with the infinite, but the infinite exists nowhere (for that would involve the absurdity of its exist- ing either within itself or within something else), but what exists nowhere is nothing. In support of the second pro- position he argued that, if existence could be known, then thought would be existence, and the non-existent would be unthinkable and error would be impossible. The third point for which he argued was the inadequacy of language to convey ideas, and the impossibility of the idea being the same in different minds. In natural philosophy, his opinions, so far as these are known, appear to have been similar to those of Empedocles. See the monograph, De Gorgia Leontino Commentatio, by Foss, 1828.

GORGON, yopys, according to Hesychius, is a word akin to yopyés, which means terrible, lively, rapid. Sophocles (fr. 167) calls the sea-nymphs yopyides and yopyades is quoted as a title of the daughters of Oceanus. Now it is a well-established fact that the sea was at one time the sea of air and its nymphs the clouds. Hence we may infer that words from this stem are employed in the sense of quick-moving as epithets of the clouds.

The various forms in which the Gorgon appears in Greek mythology originate probably from the rapidly gathering terrible thunder-cloud. When the cloud covered the heaven and hid the sun, a primitive race, whose

thoughts and words were few and simple, said that the sun was united in marriage to the cloud. From this union sprang the light: ning and the thunder. Now the sun, in its different aspects and relations, was conceived in different ways, which developed, as thought unfolded itself, into distinct deities ; and, as connected with clouds, rain, aud the fertility that springs therefrom, he is the original of the Vedic Savitar and Tvashtar and of the Greek Poseidon. Accordingly (Hes., 7heog,, 273 ff.) Poseidon on a meadow (:.¢., the heaveu, thus often in mythology) begat from the Gorgon Medusa Chrysaor and Pegasus. Chrysaor, Gold-sword, is obviously the lightning; and Pegasus, who bears the thunder and lightning for Zeus (cbid. 286), was probably at first simply the thunder. Gorgo and Erinys are merely tribal or local varieties of the same conception ; Gorgo is specially Attic, Erinys Minyan. A similar legend occurs about children of Erinys and Poseidon (Paus., viii. 37). Hence ZEschylus (Cho., 1048) compares the Erinyes to Gorgons. ;

Gorgo is always the impersonation of the atmospheric terrors, and is conceived in connexion with the deities that are armed with thunder and lightning—Zeus and Athene. With Athene in particular is the connexion very close, and some facts of ritual and nomenclature almost suggest an original identity of the two. Palephatus says that Athene was worshipped in the island of Cerne under the name Gorgo; Sophocles (A/., 450) calls her yopydms; and aS (Arat., 32) says that her wooden statue at Pallene, 1

brought out of the temaple, destroyed human life (compare the description of the birth of Athene in Pindar, Ol, vii. 65 ff, which strongly suggests the phenomena of the thunderstorm). Here we have preserved to usa relic from the very earliest thought among the Indo-European race. When a phenomenon in the heavens attracted their atten- tion, they naturally spoke of it as of an animated being, The storm appeared to act out its own natural course, to live its own life. But afterwards the phenomenon was conceived with reference to human needs; beneficent and hostile deities worked in nature ; a hostile power denies to men what a friendly power after a conflict grants. Among the Greeks this opposition appears in the antithesis of Olympian and older or Chthonian gods. The goddess who ruled the storm

for man was set in opposition to the actual thundercloud—Athene to Gorgo (see Graczs). Accord- ingly the usual Greek account is that the yopydve.v or yopyein kepady, a tcrror-striking countenance, is fixed in the middle of the xgis of Zeus. Zeus gives the xgis (Iliad, v. 736 ff, comp. Aisch., Hum., 825) to Athene, the goddess of the air. The Gorgoneion is always said to have been won in battle, viz., in the conflict of the beneficent gods against the older nature-powers, who would scorch the earth with heat and deny the needed rain. Zeus then assuming the zegis (the shield of the storm-cloud) overthrows the Titans or the Giants in the aerial battle; the rain descends, and a clearer and cooler sky succeeds. Or in other accounts the whole array of gods engages in the battle ; Athene then ap- pears naturally as yopyoddévy, 7.e., she clears tlie atmosphere, her own special domain, from the terrible cloud, which she keeps on her shield threatening death to all her foes. The Attic tradition was that the Gorgon was a monster produced by Earth to aid her distressed sons the Giants, and was slain by Pallas (Eur., Jan, 1002). In Homer Gorgo appears also § in connexion with Apollo, Agamemnon, Hector, and Perse-

phone,—a connexion which might be justified by an exami- |

nation into the mythological ideas that underlie these names, Later accounts, beginning from Hesiod (Theog,, l.c.), mention three Gorgons; but Medusa alone inherits the \ character and history of the older Gorgo, while two sisters are added to make up the sacred number, in analogy with the Moir, Gree, Erinyes, &c. The Argive story has established itself in all later literature as the standard account of the Gorgons. Perseus, the light-giving hero, aided by Athene and the other gods, goes to the abode of the Gorgons beside Oceanus far away in the dark West, and cuts off the head of Medusa. Then from the stream- ing neck sprang Chrysaor and Pegasus, her two sons by Poseidon. This head, which, like the lightning, had the |} power of turning into stone all that looked on it, was | given to Athene, who placed it in her shield. According || to another account, Perseus buried the head in the Agora } of Argos. Beside it was buried his daughter Gorgophone, who is obviously a mere impersonation of the old epithet of the Gorgon-slaying goddcss,

These ideas of sun and storm give only the starting point for the myths; the history of their further growth involves the whole subsequent history of the nation. Just as in Germany, after Christianity was introduced, many old myths and customs lived on applied to Christ and his apostles instead of the old gods, so must the Greek myths as we know them bear traces of the historical vicissitudes of the race. Hence Bottiger (Kunst-J/yth., i. 369) has possibly some ground for referring the Perseus tale to the extinction of Phoenician human sacrifices by the Greeks.

The gradual development in art from the old hideous and terrible representation of the Medusa head to the calm repose of a beautiful dead face is described in detail by Miller, History of Ancient Art, and Denkmdler der Alten Kunst. See also Rosenberg, Die Lrinyen.

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GORI, in Georgia, an ancient fortress, is now the chief town of a district of the same name in the government of Tiflis, and a station on the Poti-Tiflis railroad. It is built at the foot of an isolated hill crowned by the old fortifi- cations, in a luxuriantly fertile plain on the left bank of the Kour, at the junction of the Bleejah'va and Medjoura, 48 miles west of Tiflis. The population, about 5000, is almost exclusively Armenian, engaged in commerce. The women are noted for their beauty. This town, at one time cele- brated for its silk and cotton stuffs, is now famous for corn, reputed the best in Georgia ; the wine is also esteemed, 5200 acres being laid out in vineyards. The climate is excellent, delightfully cool in summer, owing to the refresh- ing breezes from the mountains of the great Caucasian range, which, however, are at times disagreeably felt in winter. Gori was founded (1123) by David II., " the Re- storer," for the Armenians who fled their country on the Per- sianinvasion. The earliest remainsof the fortressare Byzan- tine, but it was thoroughly restored in 1634-58, during the reign of Rustam, and destroyed by Nadir Shah. Besides the Armenian and Georgian churches, and some good schools, there is a church constructed in the 17th cen- tury by Capuchin missionaries from Rome. Gori was the birthplace (1773) of Stephan Peshanegishvyly, a distin- guished and popular poet. Eight miles from Gori is the remarkable rock-cut town of Ouplytz-tzykhé, consisting of several large dwellings haviug their interiors ornamented with

mouldings, imitation beams, and designs sculptured in relief, and innumerable smaller habitations, the majority being divided into chambers with doorways, openings for light, and sundry provisions for domestic comfort. The

"whole have been hewn out of the solid rock, the groups

being separated by streets, where steps for facilitating com- munication and grooves for water courses are cut. This "Fortress of Ouplytz" was projected and completed, according to the annals of Georgia, by Ouphlis, an immedi- ate descendant of Noah (see Grorcia). It was a fortress in the time of Alexander of Macedon, and an inhabited city in the reign of Bagrat III. (980-1014).

GORILLA. See Aps, vol. ii. p. 148,

GORITZ. See Gorz.

GORLITZ, a town in the Prussian province of Silesia, capital of a circle in the government district of Liegnitz, is situated on the left bank of the Neisse, and at the juuction point of several railways, 55 miles east of Dresden. The Neisse at this point is crossed by a railway bridge half a mile long and 120 feet high, with 32 arches. The town is the seat of a provincial office, a circle court, and a chamber of commerce. It is surrounded by beautiful walks and fine gardens, and although its old walls and towers have now been demolished, many of its ancient build- ings remain to form a picturesque contrast with the signs of modern industry. From the hill called Landskrone, about 1500 feet high, an extensive prospect is obtained of the surrounding country. The principal buildings are the fine church of St Peter and St Paul, dating from the 15th century, with a famous organ and a very heavy bell; the church of Our Lady erected about the end of the 15th cen- tury, and possessing a fine portal and choir in pierced work; the Catholic church, founded in 1853, in the Roman style of architecture, with beautiful glass windows and oil- paintings ; the town house, containing the arms of King Matthias of Hungary, and having at its entrance a fine flight of steps; the old bastion, named Kaisertrutz, now used as a guardhouse and armoury; the gymnasium buildings in the Gothic style erected in 1851; the fine new middle school, the real school, the provincial trade school, the theatre, and

the barracks, Near the town is the chapel of the Holy Cross, in connexion with which there is a model of the Holy Grave at Jerusaiem. ‘In the public park there

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is a bust of Schiller and a monument to Alexander von Humboldt ; and a monument has also been erected in the town in commemoration of the war of 1870-71. In con- nexion with the National History Society there is a valu- able museum, and the Scientific Institute possesses a large library and a rich collection of antiquities, coins, and articles of vertu. Gérlitz, next to Breslau, is the largest and most flourishing commercial town of Silesia. Besides cloth, which forms its staple article, it has manufactories of vari- ous linen and woollen wares, machines, railway waggons, sago, tobacco, leather, chemicals, and tiles.

Gorlitz existed as a village from a very early period, and at the beginning of the 12th eentury it was made a borough by Duke Sobieslaus J. of Bohemia. It was then known as Drebenau, but on being rebuilt after its destruction by fire in 1131 it reeeived the name of Zgorzelice (burnt town). About the end of the 12th cen- tury it was strongly fortified, and in 1346 it joined the league of the six towns. It was several times besieged and taken during the Thirty Years’ War, and it also suffered considerably in the Seven Years’ War. In the battle which took place near it between the Austrians and Prussians, 7th September 1757, Winterfield, the general of Frederiek the Great, was slain. In 1815 the town, with the greater part of Upper Lusatia, eame into the possession of Prussia. The aaa in 1831 was only about 8000, but in 1849 it had inereased to 19,032, and in 1875 it was 45,310.

GORRES, Joseph Jonann (1776-1848), a distin- guished controversialist and writer on religious, political, and scientific subjects, was born January 25, 1776, at Coblentz. His father was a man of moderate means, who sent his son, after he had passed through the usual elementary school, to a Latin college under the direction of the Roman Catholic clergy. The sympathies of the young Gérres were from the first strongly with the Revolution, and the dissolute- uess and irreligion of the French exiles in the Rhineland

confirmed him in his hatred of princes. He harangued the revolutionary clubs, and in his first political tract, called Universal Peace, an Ideal, he insisted on the unity of interests which should ally all civilized states to one another. He then commenced a republican journal called Das Rothe Blatt, and afterwards Aiibezahl, in which he strongly condemned the administration of the Rhenish provinces by France.

After the peace of Campo Formio (1797) there was some hope that the Rhenish provinces would be constituted into an independent republic. In 1799 the provinces sent an embassy, of which Gorres was a member, to Paris to put their case before the directory. The embassy reached Paris on the 20th of November 1799; two days before this Napoleon had assumed the supreme direction of affairs. After much delay the embassy was received by him; but the only answer they obtained was "that they might rely on perfect justice, and that the French Government would never lose sight of their wants." Gdorres on his return pub- lished a tract called Results of my Mission to Paris, in which lie reviewed the history of the French Revolution. During the thirteen years of Napoleon's dominion Gérres lived a retired life, devoting himself chiefly to art or science. In 1801 he married Catherine de Lassaulx, and those of Gérres's admirers who claim him as a radical have laid great stress on the fact that this lady was a free-thinker. He published Aphorisms on art and physiology—fanciful but suggestive. He was for some years teacher at a secondary school in Coblentz, and in 1806 moved to Heidelberg, where he lectured at the university. He sought, with Brentano, Arnim, and others, to stir up the old national spirit by the republication of some of the old Teutonic ballads, but fruitlessly. He returned to Coblentz in 1808, and again found occupation as a teacher in a secondary school, supported by civic funds. He now studied Persian, and in two years produced a really valuable translation of part of the Shaknamah, the epic of Firdousi.

GOR—GOR

It was in the year 1810 that he seems to have conceived the notion of arousing the people to efforts by means of the press ; and after the battle of Leipsic, in the year 1814, he set lus paper going. It bore the name of a paper which had been a mere echo of Prussia, the Rheinischer Merkur. The

intense earnestness of the paper, the bold outspoken- ness of its hostility to Napoleon, and its fiery eloquence secured for it almost instantly a position and influence unique in the history of German newspapers. Bliicher read it every day; Gentz, the brothers Grimm, Varn- hagen von Ense, were all loud in praise of it; Stein used it as an instrument to move the pnblic in the direction he desired, and continually sent it information of his plans;

° e) Napoleon himself called it Ja cingucéme puissance. The ideal it insisted on was a united Germany, with a re- presentative government, but under an emperor after the fashion of other days,—for Gorres now abandoned his early advocacy of republicanism. When Napoleon was at Elba, Gorres wrote an imaginary proclamation issued by him to the people, the intense irony of which was so well veiled that many Frenchmen mistook it for an original utterance of the emperor. He inveighed bitterly against the second peace of Paris (1815), declaring that Alsace and Lorraine should have been demanded back from France.

Stein was glad enough to use the Merkur at the time of the meeting of the congress of Vienna as a vehicle for giving expression to his hopes. But Hardenberg, in May 1815, warned Gorres to remember that he was not to arouse hostility against France, but only against Bonaparte, There was also in the Merkur an antipathy to Prussia, a con- tinual expression of the desire that an Austrian prince should assume the imperial title, and also a tendency to pro- nounced liberalism,—all of which made it most distasteful to Hardenberg, and to his master King Frederick William III. Gorres disregarded warnings sent to him bythe censor- ship and continued the paper in all its fierceness. Accord- ingly it was suppressed early in 1816, at the instance of the Prussian Government; and soon after Gérres was dis- missed from ‘his post as teacher at Coblentz, From this time his writings were his sole means of support, and he became a most diligent political pamphleteer. He was not himself a member of the 7’ugendbund, but he watched that society with deep interest, and believed, as did all the patriots of his time, that the clubs of students, or Burschen- schaften, were calculated to restore the pristine greatness of Germany. ‘The agitation continued, and finally Kotze- bue’s denunciation of young Germany led to his assassina- tion. In the wild excitement which followed, the reac- tionary decrees of Carlsbad were framed, and these were the subject of Gérres’s

celebrated pamphlet Deutschland und die Revolution. In this work he reviewed the cir- cumstances which had led to the murder of Kotzebue, and, while expressing all possible horror at the deed itself, he urged that it was impossible and undesirable to repress the free utterance of public opinion by reactionary measures. The success of the work was very marked, despite 1ts pon- derous style. It was suppressed by the Prussian Govern- ment, and orders were issued for the arrest of Gorres and the seizure of his papers. He escaped to Strasburg, and thence went to Switzerland. Two more political tracts, Europa und die Revolution (1821), and Jn Sachen der Rhein Provinzen und in eigener Angelegenheit (1822), also deserve mention.

In Gérres's pamphlet Die Heilige Allianz und die Volker auf dem Congress von Verona he asserted that the princes had met together to crush the liberties of the people, and that the people must look elsewhere for help. The " else- where" was to Rome; and from this time Gorres became a vehement Ultramontane writer. He was summoned to Munich by King Louis of Bavaria, and there his writings

enjoyed very great popularity. His Christliche Mystik gave a series of biographies of the saints, together with an ex- position of Roman Catholic mysticism, But his most celebrated Ultramontane work was a polemical one. Its occasion was the deposition and imprisonment by the Prussian Government of the archbishop Clement Wen- ceslaus, in consequence of the refusal of that prelate to sanction in certain instances the marriages of Protestants and Roman Catholics. Gorres in his Athanasius fiercely up- held the power of the church, although the liberals of later date who have claimed Gérres as one of their own school deny that he ever insisted on the absolute supremacy of Rome. Athanasius went through several editions, and originated a long and bitter controversy. In the Histo- vesch-politische Blatter, a Munich journal, Gérres and his son Guido continually upheld the claims of the church. Gorres received from the king the order of merit for his services. He was terribly disturbed when the king sunk under the dominion of Lola Montez, and he died July 29,

1848.

See A. Denk, Joseph von Gorres, 1870; J. J. Sepp, Gérres und seine Zeitgenossen, 1877. A complete edition of Gorres's works was published at Munich in 1854. (L. A. M.)

GORTSCHAKOFF (Gorcuaxov), a noble Russian family, descended from Michael Vsevolodovich, prince of Chernigoff, wlio, in 1246, was assassinated by the Mongols. The following are the most distinguished members of this family. Petr Dimirrievicu (1790-]868) served under Kamensky and Kutuzoff in the campaign against Turkey, and afterwards against France in 1813-1814. In 1820 he suppressed an insurrection in the Caucasus, for which service he was raised to tle rank of major-general. In 1828-29 he fought under Wittgenstein against the Turks, occupied Aidos, and signed the treaty of peace at Adrianople. In 1839 he was made governor of eastern Siberia, andin 1851 retired into private life. When the Crimean war broke out he offered his services to the emperor Nicholas, by whom he was appointed general of the 6th army corps in the Crimea. At the battles of Alma and Inkerman he commanded the left wing of the Russian army. In 1855 he retired, and died at Moscow, March 18, 1868. MiKaatn DimitriEevicH (1792-1861), brother of the preceding, was born in 1792. In 1807 he entered the Russian army, in 1810 he took part in the campaigns against Persia, and in 1812-1815 against France. During the Russo-Turkish war of 1828-29, he directed the operations of the sieges of Silistria and Shumla. After being appointed, in 1830,

general of artillery, he was present in the campaigns in

Poland, and was wounded at the battle of Grochow, February 25, 1831. He also distinguished himself at the battle of Ostrolenka and at the taking of Warsaw. Yor tliese services he was promoted to the rank of lieutenant-general. In 1846 he was nominated military governor of Warsaw. In 1849 he commanded the Russian artillery against the Hungarians, and in 1852 he visited London as a representative of the Russian army at the funeral of the duke of Wellington. Upon Russia declaring war against Turkey in 1853, he was appointed commander-in-chief of the troops, numbering in all some 60,000 men, which occupied Moldavia and Wallachia. On the 23d March 1854 he crossed the Danube and besieged Silistria, but was superseded in April by Prince Paskievich, who, however, resigned on the 8th of June,

when Gortschakoff resumed the command. In July the siege of Silistria was raised, and the Russian armies recrossed the Danube ; in August they withdrew to Russia. In 1855 he was appointed commander- in-chief of the Russian forces in the Crimea in place of Prince Mentshikoff. Gortschakoff's defence of Sebastopol, and final retreat to the northern part of the town, which he con- tinued to defend till peace was signed in Paris, were con-

ducted with skill and energy. In 1856 he was appointed governor-general of Poland. He died at Warsaw on the 30th May 1861.

GORTYNA, or Gortyn, an important ancient city on the southern side of the island of Crete. It stood on the banks of the small river Lethzeus (Mitropolipotamo), at a short distance from the sea, with which it communicated by means of its two harbours, Metallum and Lebena. It had temples of Apollo Pythius, Artemis, and Zeus. Near the town was the famous fountain of Sauros, inclosed by fruit-bearing poplars; and not far from this was another spring, overhung by an evergreen plane-tree which in popular belief marked the scene of the amours of Jupiter and Europa. Gortyna was, next to Cnossus, the largest and most powerful city of Crete. The two cities com- bined to subdue tlie rest of the island; but when they had gained their object, they quarrelled with each other, and the history of both towns is from this time little more than a record of their feuds. Neither plays a conspicuous part in the history of Greece. Under the Romans Gortyna became the metropolis of the island. Some ruins may still be traced at the modern village of Hagii Deka.

GORZ, with Graptsca, is one of the crown-lands of the Austrian monarchy, between 45° 36' 3" and 46° 27" N. lat., and bounded N. by Carinthia, E. by Carniola, Istria, and the Triestine territory, S. by the Triestine terri- tory and the Adriatic, and W. by Italy. On all sides, except towards the south-west where it unites with the Friulian lowland, it is surrounded by mountains, and four-sixths at least of its area of 1140 square miles is occupied by mountains and hills. From the ridge of the Julian Alps, which rise in an almost unbroken line to a height of 6000 or 7000 feet, the country descends in successive terraces towards the sea, and may roughly be divided into the upper highlands, the lower highlands, the hilly district, and the lowlands. The highest summit is the Terglou, 9370 feet, in the north-west.

Geologically the country is a great limestone district, comprising lime- stone of many different formations, Rhztian, Jurassic, Neocomian, and Nummulitic ; and the strata have evidently undergone a series of powerful disturbances. The hydro- graphy is sufficiently peculiar, a considerable proportion of the circulation of the waters taking place by under- ground channels. The limits of the country coincide in the main with that of the basin of the Isonzo, which rises in the extreme north at a height of 2650 feet, and pursues a strange zigzag course for a distance of 78 miles before it reaches the Adriatic. At Gérz the Isonzo is still 138 feet above the sea, and it is navigable only in its lowest section, where it takes the name of the Sdobba. Its tributaries, of which the most important are the Idria, the Torre, and the Wippach, are little more than mountain streams. Of special interest not only in itself but for the frequent allusions to it in classical literature is the Timavus or Timavo. In ancient times it appears, according to the well-known description of Virgil (dim., i. 244) to have rushed from the mountain by nine separate mouths and with much noise and commotion, but at present it usually issues from only three mouths and flows quiet and still. It is strange enough, however, to see the river coming out full formed from the rock, and capable at its very source of bearing vessels on its bosom. According to a probable hypothesis it is a continuation of the river Reka which is lost in a cleft of the rock in the south-east of the country near §. Canziano. The coast-line of Gorz and Gradisca, though extending for 25 miles, presents no harbour of much importance. It is fringed by alluvial deposits and lagoons which are for the most part of very modern formation; for as late as the 4th or 5th centuries Aquileia was a great seaport. The harbour of Grado is the only one accessible

to the larger kind of coasting craft. A large part of the country formerly covered with forest has been recklessly cleared, but the Tarnova plateau is still a fine wooded district with au area of about 35 or 40 square miles. The red beech is the predominant and in some parts almost the exclusive tree, but it is being displaced by the fir and the pine. A number of pits in the plateau are full of ice all the year round, and yield about 16,000 cwts. annually for the con- sumption of the neighbouring countries. More than a

fifth of the area of the country is pasture-land, and less than a twenty-fourth is under the plough.

The vine is largely cultivated, being not only planted in regular vineyards but introduced in long lines through the ordinary fields and carried up the hills in terraces locally called ronchi. Wheat, maize, buck-wheat, and potatoes are the usual crops. Silk growing is largely carried on, especi- ally in the lowlands, and furnishes the material for the most extensive industry of the country. There are about 2000 workers in silk, and the produce is worth upwards of £200,000, while the cotton manufacture, which is next in importance, employs about 1000, and produces £100,000. Leather, linen, paper, and soap are manufactured on a smaller scale. The trade of the country is of very little importance. Gd6rz and Gradisca, according to the consti- tution of 1861, have a diet consisting of six representatives of the landed proprietors, seven representatives of the towns aud industrial interests, and eight representatives of the rural communes. The elector for the landed interest must pay 100 florins (about £10) of land-tax in the Italian circle, and 50 florins (about £5) in the Slovenian circle. Two representatives are sent to the imperial council. The political administration is in the hands of the lieutenant of the coast-lands, which include not only Gérz and Gradisca but also Trieste and Istria. Roman Catholicism is the ex- clusive religion, the only Protestant community being in the town of Gorz, and the Jews numbering only some 400. Ethnographically the population must contain much more various elements, but in 1857, out of a total of 196,276 inhabitants, 130,748 were registered as Slovenians, 47,841 as Friulians, 15,134 as Italians, and only 2150 as Germans.

Gorz first appears distinctly in history about the close of the 10th century, as part of a district bestowed by the emperor Otto III. on John, patriarch of Aquileia. In the 11th century it became the seat of the Eppenstein family, who frequently bore the title of counts of Gorizia; and in the beginning of the 12th century the countship passed from them to the Lurngan family which con- tinued to exist till the year 1500, and acquired possessions in Tyrol, Carinthia, Friuli, and Styria. In the course of the 13th and 14th centuries the counts often appear as protectors (Schirmvogt or Advocatus) of the church of Aquileia and as captains-general of Friulia. When the Venetians took possession of Friulia they gave Count Henry the title of

hereditary marshal as a compensation for his loss of office. The right of coining was exercised by the counts from the 13th century. On the death of Count Leonhard (12th April 1500) the fief reverted to the house of Hapsburg.

GOrz, GORTZ, or GOriz (Italian, Gorizia; Modern Latin, Goritia), the chief town of the crown-land, is beautifully situated in the fruitful valley of the Isonzo, 25 miles N.N.W. of Trieste by railway. It is the seat of an archbishop, of a circle court, and of a head tax-office. The principal buildings are the cathedral, the former Jesuit church and college now converted into barracks, the convents of the brothers and sisters of mercy, of the Francisans, of the Capuchins, and of the Ursulines, the municipal buildings, the theatre, the house of the bishop, and the old castle of the former counts of Tyrol and Gérz now converted into a prison. Among the educational establishments are a central episcopal seminary, a gym- nasium, an upper real-school, a deaf and dumb institute, and an agricultural school. The industries include cotton and silk weaving, sugar refining, brewing, the manufacture of leather, and the making of rosoglio. There is also a con- siderable trade in wooden work, fruit, and wine. On

account of its mild climate the town is coming to be much resorted to by invalids in winter. Charles X., the exiled king of France, died at Gorz 6th November 1836. The population of the town in 1869 was 16,659,

Besides the great monograph of K. von Czornig, Das Land Qérz und Gradisca, Vienna, 1873 and 1874, see Siegmund, Stidliche Klimatische Kurorte, Vienna, 1875; Coronini, Fastorwm Goriti. ensium lib, i., Vienna, 1769, and ZL' Antica moneta Goriziana Gorz, 1785; Schweizer, Abrégé de Uhistoire des comtes de Gorice, Trieste, 1859; Carlo Morelli of Schonfeld, Istoria della Contea di Gorizia, Gorz, 1855-56; Della Bona, Sunto istorico di Gorizia ¢ di Gradisca, Gorz, 1853; Siebert, Gérz, Stadt und Land,

GOS-HAWK, 2.e., Goose-Hawk, the Astur palumbarins of ornithologists, and the largest of tle short-winged Hawks used in Falconry. Its English name, however, has possibly been transferred to this species from one of the long-winged Hawks, or true Falcons, since there is no tradition of the Gos-

Hawk, now so called, having ever been used in Europe to take Geese or other large and powerful birds. The genus Astur may be readily distinguished from Falco by the smooth edges of its beak, its short wings (not reaching beyond about the middle of the tail), and its long legs and toes — though these last are stout and comparatively shorter than in the Sparrow-Hawks (Accipiter). In plumage the Gos-Hawk has a general resemblance to the Peregrine Falcon (see Fatcon, vol. ix. p. 2), and it undergoes a corresponding change as it advances from youth to maturity— the young being longitudinally streaked beneath, while the adults are transversely barred. The irides, however, are always yellow, orin old birds orange, while those of the Falcons aredark brown. Thesexes differ greatly in size. There can be little doubt that the Gos-Hawk, now-a-days very rare in Britain, was once common in England, and even towards the end of the last century Thornton obtained a nestling in Scotland, while Irish Gos-Hawks were of old highly cele- brated. Being strictly a woodland-bird, its disappearance may be safely connected with the disappearance of our ancient forests, though its destructiveness to Poultry and Pigeons has doubtless contributed to its present scarcity. In many parts of the continent of Europe it still abounds. It ranges eastward to China, and is much valued in India (see Fatconry, vol, ix. p.11). In North America it is represented by a very nearly allied species, A. atricapillus, chiefly distinguished by the closer barring of the breast. Three or four examples corresponding with this form have been obtained in Britain. A good many other species of Astur (some of them passing into Accipiter) are found in various parts of the world, but the only one that need here be mentioned is the A. nove-hollandice of Australia, which is remarkable for its dimorphism—one form possessing the normal dark-coloured plumage of the genus, and the other being perfectly white, with crimson irides. It must be stated, however, that some writers liold these two forms to be distinct species, and call the dark-coloured one A. cinereus or A. raw. a (A. N.)

GOSHEN (j¥4), or the land of Goshen, a territory of Egypt in which the Israelites were settled from Jacob’s im- migration to the Exodus. In the Septuagint the equivalent is usually the land Gesem (T’ecéu), but in Gen. xlv. 10 “the land Gesem of Arabia,” Arabia being here either the Arabian nome (‘Apafias vopds) or the extreme east of Lower Egypt. According to Dr Brugsch the Arabian nome was the 20th of Lower Egypt in the older

division known to us, the 32d in the later, the alteration in the number being due toa new division under the Ptolemies (Dict. Géogr., List follow- ing preface). The Egyptian name of the nome was Supt,

-and the capital was Kesem, probably Kosem, also called

Kesem-Abot, Kesem of the East (Arabia), equivalent to the Gesem of the Septuagint, preserved in the classical Phacusa (Pa-Kesem), and the modern Fakoos, where mounds mark the site of the ancient town (¢f. Brugsch,

Ib,, 876-7, 1049-50). The etymology is doubtful; pro- bably the name is like many others in the same part of Egypt of Semitic origin, as another land of Goshen, with a capital city of the same name, is mentioned in southern Palestine. It is therefore certain that the land of Goshen was around the town of Phacusa. The site of this town lies within the easternmost part of Lower Egypt, under 20 miles in a direct line south of San, the site of Tanis. These conditions suit those of the Biblical narrative. It is obvious that Goshen was a pastoral country, that it was suited for a Shemite settlement, and was in the Shemite part of Lower Egypt, its north-eastern portion. It was near the seat of government in that part of the country, which at this time was Tanis-Rameses, which town, or another of the same name, was the starting-point at the Exodus. In one place (Gen. xlvii. 11) the “land of Rameses” occurs where we should expect “the land‘of Goshen.” We are not sufficiently acquainted with the administrative divisions at this early time to be able to explain this. It may, how- ever, be conjectured that if the Rameses of the Exodus journey was the same as Tanis-Rameses, tlie archaic Tanite nome may have included the land of Goshen.

GOSLAR, a town in the district of Hildesheim, Prussia, province of Hanover, is situated on the Gose, an affluent of the Ocker, at the foot of the Harz, 24 miles §.E. of Hildes- heim. It is surrounded by walls, and has a very antique appearance. Among the noteworthy buildings are the market church, in the Romantic style, restored since its partial destruction by fire in 1844, and containing the town archives, and a library in which are some of Luther’s manu- scripts; the old town-house, possessing many interesting antiquities; the Kaiserworth, with the statues of the German emperors; the

Kaiserhaus, founded by Henry III. in 1050, and along with the adjoining Ulrich's chapel re- stored in 1873 at the cost of the Prussian Government ; the small chapel, which is all that remains since 1820 of the old cathedral founded by Henry III. in 1040, containing among other antiquarian relics of the cathedral an old altar supposed to be that of the idol Krodo which formerly stood on the

top of the Burgberg near Neustadt-Harzburg ; the church of the monastery of Neuwerk, in the Roman style, with wall paintings of considerable merit; and the house of the bakers' guild, the birthplace of Marshal Maurice of Saxony. There are four Evangelical churches, one Catholic church, a synagogue, a real school of the first order, a higher girls' school, and a number of small foundations. The population are chiefly occupied in connexion with the sul- phur, copper, silver, and other mines in the neighbourhood. The town has also been long noted for its beer, and pos- sesses some small manufactures, and a considerable trade in fruit. The population in 1875 was 9838,

Goslar was founded by Henry the Fowler about 920, and when in the time of Otto the Great the mineral treasures in the neigh- bourhood were discovered it increased rapidly in prosperity. It was frequently the seat of German diets, and the residence of the emperor, About 1350 it joined the Hanseatic League. It was unsuccessfully besieged in 1625, during the Thirty Years' War, but was taken by the Swedes in 1632, and nearly destroyed by fire. Additional conflagrations in 1728 and 1780 gave a severe blow to its ancient prosperity. It was a free town till 1802, when it came into possession of Prussia. In 1807 it was joined to Westphalia, in ao to Hanover, and in 1866 it was, along with Hanover, reunited to Prussia.

GOSLICKI, Wawrzyntec (1533-1607), a learned Pole, better known under his Latinized name of Laurentius Grimalius Goslicius, was born about 1533. After having studied first at Cracow and afterwards at Padua, he entered the church, and was successively appointed bishop of Kaminietz and of Posen. Goslicki, although an ecclesiastic, was an active man of business, was held in high estimation by his contemporaries, and was frequently engaged in politi- cal affairs. It was chiefly through his influence, and through the letter he wrote to the pope against the Jesuits,

that they were prevented from establishing their schools at Cracow. He was also a strenuous advocate of religious toleration in Poland. He died October 31, 1607.

His principal work is De optimo senatore, &c. (Venice, 1568). There are two English translations published respectively under the titles 4 commonwealth of good counsaile, &c. (1607), and The Accomplished Senator, done into English by Mr Oldisworth

(1788).

GOSPELS

SyNoPTICAL GosPELs.

F the four canonical Gospels! (god, God or good ; spell, discourse or tidings, cf. edayyéduov) the first three (differing from the fourth) agree in narrating nearly the same events in somewhat similar language, and are hence called synoptical (cvv, together; dys, view). It will be advantageous to begin with the treatment of these, as to their origin, date, and objects, so far as can be determined from (1) internal evidence and (2) external evidence.

Internal Evidence.

In discussing the internal evidence, it will be convenient to speak, first, of those portions of the synoptic narrative which are found in three Gospels; then of those which are found in only two; aud, lastly, of those which are found in only one.

The Triple Tradition.—Few are aware of the very small extent to which independent narrators of the same events use the same words. A comparison of a few specimens of independent narratives (of such events, for example, as the attempt to assassinate King Humbert, or the recent death of the Prince Imperial) would show that the narra- tives often contain scarcely two or three consecutive words in common, and rarely or never a whole clause of five or six words. The same statement applies to narratives

of discourses of any length reported from memory, and not from notes taken at the moment. Now it is well known

1 For Apocryphal Gospels, see APOCRYPHA, vol. ii. p, 184.

that in many parts of the first three Gospels the same Originality words and phrases are curiously interlaced, in such a way of Mark.

as to suggest that the writers have borrowed either from each other or from some common source. For example, in describing the healing of the sick (Mat. vii. 16; Mk. i, 32; Lu. iv. 40), Matthew begins thus: dyias dé yevouerys ; Mark, dias S¢ yevopevys dre ucev 6 HAwos ; Luke, dvvovros 8: rod #Adov. From this and many similar passages it might seem natural to infer that Mark borrowed one of these expressions from Matthew and the other from Luke, and that the narrative of Mark is little more than a combination of passages from Matthew and Luke. This is an inference which has actually been drawn by many critics both before and since De Wette; but at present it finds comparatively little support among competent investigators. However, the oscillations of New Testament criticism have been so numerous that it may be of use to indicate a method by which the originality of Mark may be estab- lished on an immovable basis. That Mark (at all events in many parts) contains the original document or tradition from which Matthew and Luke have borrowed can be proved to demonstration by a necessary inference from the follow- ing specimen of narrative common to the three writers.”

2 From a Harmony of the Synoptic Gospels, now in preparation, by Mr W. G. Rushbrooke, B.A., formerly Scholar of St John’s College, Cambridge. The text followed here and throughout this article has been generally that of Tischendorf.

MATTHEW XXII. 33—44.

33 “A-V-A-n-vy TwapaBodjy a-k- ow-o-a-T-e. “AvOpwmos Fv o-tK- 0-S- €-o-T-6-7-7-S, G-o-T-05 epv- TEevoey apTreA@va, Kal dpaypov aU-T-@ —-wepréOyxey Kal dpvtev ev a-U-T-@ Aqv-ov Kal dxoddpnoev wipyov,

kai é&édero avtov yewpyois, Kal dmrednunoer. 34 6-t-e 6-8 Hy-y- Lo-eV O- Kalp-OS TOV Ka-p- T-O-V, amTéaTetnev T-0-U-s SovA- ous a-v-t-0-D mpos Tods yewp- yovs daPet-v Tov-¢ Kapi-o-U-s

a-v-t-0-0. 35 Kal AaPdvres of yewp- yol to-v-¢ S00-R-o-v-¢ a-v-T-0-0

by we Seupav, Sy 88 dréx«r-E-t- vay, ov &é éXr-t-6-0-B-0-A-7-c-a-v,

36 addw drécredey d&dd-0-v-¢9 So0d- OVS T-MEL-OV-A-S TOV T-p-0-TOV, Kal €77-0-4-N-C-A-V a-V-T-0-l-5 @-C-A-U-T-W-S,

on U-o-T-€-p-0-V O€ daréoradey mpds aitots T-0-v vidv a-v-T-0-D éywv' "Evtpamnoovtas toy viov pov. 38 of dé yewpyot ldovres T-o-v v-i-0-velr-o-p é-Véavt-o-0-5° OUTOS EoTLV) KAmpovopos* Sebre dmrokreivepiev aurov kal o-X- O-[L-€-V ~~THV~~ xAmpovo- play a-v-t-0-0. 39 Kat dAaBdvres abtov é&éBarov éEw Tov autedo- vos «Kal améxtewav. 40 6-T-a-v obv E-A-O-y 6 KUpLos TOD duTeEdNO- VOS, Tl TroLoes T-0-1-S Y-€-W-p-y-071 5 écei-vors, 41 Néq-ov~d-wy a-v-T-@° K-a-K-0-0-5 K-a-K-O-5 ATONE: Cel a-t-T-0-U-s, Kal TOV auTENOVA E-K-SWo-E-T-a-L AANoLs yewpy-o-t-s, O-(-T-6-V-€-§ A-T-0-0-@-G-0-UV-G-t-V A-V-T-@ T-0-U-S K-A-p-T-0-U-S E-Y T-0-6-5

' fear

K-Q—p-0-U-S A-U-T-O-V.

42 meyer avTois o- 'Ty -0-0-0-S" O08 ¢-77-0-T-€ dvéyvore é-v Ta-t-s ypa-$ a-i-s> At@ov ov dm eOokimacay ol oikodopodvres, ovTos éyevnOn eis Keparny yovias tapd Kuptov éyévero sie kai

44 K-a-t 6 wWecev ér-l Tov riGov

T-0-0-T-O-V cwOracbijceras' ed sy ov

0 dv réon, MuKpyioes autor.

GOs PLS

LUKE XX, 9—18,

9 “Hp£ato 5é T-p-0-5 TOV h-a-o-v Ey Evy T-H-V mapaBoriy T-OU-T-N-D, “AvOpwmos epureuoev auTeAx@va Kal é&édSero avrov yewpyois, Kal ameSnuna ev X-p-0- v-o-v-¢ i-K-a-v-0-U-s. 10 Kal me atéoretdev Tos TODS “yewpyovs SovAoy, fi iva amo T0-D Kapio-D Tod apm eX@vos 8-0-c-0-v-c—v a-d- TO ot O-€ yewpyol éFamréoreinav abtoy

Selp-a-v-T-€-5 KEVOD,

11 Kai 7-p-0-c-é-0-€-1-0 Er-epov wépa-t o-i 8-8 kdxeivov Set p-A-V-T-€-5 Kala-Tido-a-v-T-€S é-E-a- Téorervav K-evev. 12 Kal T-p-0-0-€- 0-€-T-0 TplT-ov T-€-pp- a-t’ 0-1 8-€ Ka-l T-0-D-T-0-V T-p-a-V-f-a- Ti-o-av-t-65 ¢&6B-ar-0-r,

13 ¢-éi—e-v 8 6- K-v-p-+-o-§ T-0-D G-[-T-EN-G-V-0-5″ T-¢ T-O-U-9-O-W 5 T-€-[L- tte TOV UVLOV [LOU T-0-V ayarn- TOV’ i-o-w-s T-0-D-T-0-V evtpamnoov- Tat, 14 i8dvres Se a-d-T-0-v Of syeopyot dvedoyiFov-t-0 mpos dM 0-u-s N-€--O-V-T-€-S" Obrés éorw 6 KANpovomos’ atroKTetvwmev ad- TOV bV-a HMOV Y-é-v-n-T-A-L) KAN- povoyla. 15 Kat éxBad-6-v-7-€-5 avtov é€w tod aumeXvos dé KTEWAV, TLodv TOLNTEL A-V-T-0-0-9 O KUpLos TOD dpm eN@vos 5 16 édev- SETA Kab ATrONEeTEL TOUS yewpryovs T-OU-TOUS, Kal SwoEL TOV Gyre A@va aANOLSs. G-K-0-0-0-A-V-T-€-5 8-€ e-t-1-a-v, M-1 y-6-v-0-t-T-0,

lf 6- &-é ep Bd éypars autos eitr-ev T-i od-v éo-t-ly T6- y-e- Ypa-p-p-ev-o-v T-0-0-T-0° AiOov dy amedoxivacay ot oikodopodrtes, ovTos éyernOn eis Kepadny ywvias;

18 a7-d-s 6 weody ey egg vov A(Oov cv Ohacbricreras ép’ dy 8’ a rion, Auicurioret aiurdy,

[SYNOPTICAL,

MARK XII. 1—11.

1 K-a-l jptato § a-U-T-o- cs ép TapaSonr-ais -a-rA-e-(~~v, Aurme~~ have avOpwiros épurevoey, kat U-11-0- Miy-vo- VY Kai @kodoune mupyov, Kat é&éSero avtoy yewp- ryots, Kal anediuncer. 2 Kal arré- OTELAEY

TPOS TOUS ‘yewpyous TO Kalpo dovhoy, tva bil! a Tey ry-€- ao p-y- O-V AGB-y and TO-py Kap- T-O-V Tod dumeddvos: 3 Kah AaPovres aurov eéderpay K-a-l dnéoreday Kevoy,

A nol radu améorerrev ™-p- o> a-v-7-0-0-5 ANA-0-V bOUA-0-V” Kawéiyoy €-K-€- padiw-o-a- Vai i-rlwac-a-y, Q Kal d-A-A- -O-V A-T-€-0-T-€— EV’ Kd-K-€-0-p- ov OT -6-K-T-E---O- y; K-a-t T-O-AN-A-0-0-§ a-N-A-0-U-5, o- b-s bev

5-€p-o-v-T-e-5 ob-3 b€ dr-o-KTéV- V-U-V-T-€-S,

” ? 2 i

6 érs Eva elyev uty

dyanntév’ améoteinev a-b-TO-v &o- X-A-T-0-V Tpds avTovs Aeyov 6-7-1 Evtparioovrat TOV vidy pov. i EK-eb-V-0-4 (2) & of ryewpryol mies EQUT-O-U-S €LT-U-V O-T- ob’res €oTu O “6 KXnpovepos’ debre amro-KTELV@MEV AUTOY, Kal Hpav &o-T-a4 ” Khnpovopia. 8 «al NaPortes améxteway adtov, Kab é&éBadov a-U-T-O-V (2) eo Tov D dwreddvos. 9 ti mowuoes 6 KUpLOS TOD ame AGVOS; Actoerar Kal aTroNec et Tois yewpyots, Kal Soca Tov aumehava adXots.

10 Ove-€ r7-v Wpagay Ta-v- Tv avéyvwte, AiGov ov ate- Soxiwacay of oi oixodopourTes, obTos ever On els Kepadny ryovias’ 11 Tapa Kupiou evyevero aitn Kab gor Oavpacth év oplarpots

INTERNAL EVIDENCE. |

It will be observed in the foreguing extracts! that (up to verse 11 of Mark), besides the matter common to all three writers, Mark and Luke have a good deal of addi- tional matter in common (npgaro, the dat. term. (kop), tva amd, égarerreAay aiTov Kevdv, KaKeivov, Kat %Hrimacay, ayaryrov, Tpos, Nav, éXevoeTat Kat, Tos yewpyovs) ; Mark and Matthew have also much additional matter in common (kal repeOnkey ppayyov Kat dpvtev (b7r0)Anv(tov) Kat @kodd- pnoev mwipyov, Kat aBdovres, wadw amécrerev, dAXov), dméxtewav, mpos avtovs A€ywv, Eavt(ovs), cix(o)v, dedre, AaBovres, Tapa Kupiov éyéveTo aityn Kal eorw Oavpacty év

6pbarpmots yuav; but, in striking contrast, Matthew and Luke have no additional matter in common, except that in

verse 3 of Mark they insert of yewpyot for clearness; in'

verse 7 they insert idovres; and in verse 9 they insert ody. Are these facts compatible with the theory that Mark com- pounded his narrative out of Matthew and Luke?

We may begin by dismissing the three trifling words which Matthew and Luke agree in adding to the Triple Tradition (by which we mean the matter common to the three Gospels), as being words that any early editor of Mark might naturally insert. The insertion of the subject in verse 3, for clearness, requires no comment. The oiv in verse 9 softens an abruptness which (however character- istic of Mark) would naturally repel readers and editors. Again, in verse 7 the omission of some phrase to denote that the husbandmen saw the son approaching before they formed their plan, is so abrupt that iddvres or Oeacdmevor has been actually supplied in Mark by several manuscripts and ver- sions (possibly, of course, influenced by Matthew and Luke), and might naturally be supplied by still earlier editors, Having therefore accounted for these words, we are led to this result, that, from Mk. xii. 1 to Mk. xii. 11, Matthew and Luke contain nothing in common which is not also found in a slightly modified edition of Mark.? This being the case, it can be proved by reductio ad absurdum that Mark did not copy from Matthew and Luke. For sup- pose that he did so copy, it follows that he must not only have constructed a narrative based upon two others, borrowing here a piece from Matthew and here a piece from Luke, but that he must have deliberately determined to insert, and must have adapted his narrative so as to insert, every word that was common to Matthew and Luke. The difficulty of doing this is enormous, and will be patent to any one who will try to perform a similar literary feat himself. 'To embody the whole of even one document in a narrative of one's own, without copying it verbatim, and to do this in a free and natural manner, requires no little care. But to take two documents, to put them side by side and analyse their common matter, and then to write a narrative, graphic, abrupt, and in all respects the oppo- site of artificial, which shall contain

every phrase and word that is common to both—this would be a tour de force even for a skilful literary forger of these days, and

1 The ordinary type on page 790 exhibits the words and phrases common to all three writers, which we will henceforth call the ‘‘ Triple. Tradition’; the underlined type that which is common to each pair (in addition to the matter common to the three) ; and the spaced type that which each writer has peculiar to himself alone. The black type in the first column represents that which (in addition to the matter common to the three) is common to Matthew and Mark ; in the second column it represents that which is common to Luke and Matthew ; in the third coluwm, that which is common to Mark and Luke. It follows that the same words which are found as underlined type in the first, second, and third columus will be found as small black type in the second, third, and first colunins respectively.

2 The verse added in Matt. xxi. 44 is omitted by Tischendorf, and is perhaps not part of the text of Matthew. But, if genuine, it is a reference to the ‘‘ winnowing-stone” in Daniel ii. 44, 45, which might naturally be added by some early editor of the original tradition, and might readily be adopted into the subsequent editions of it, which arc known to us as the Gospels according to Matthew and Luke.

may be dismissed as an impossibility for the writer of the Second Gospel.

For example, Mark might have begun his narrative, Kat édeyev abrots, omitting rapaBoAyjv ; he might have borrowed oixodeordrys from Matthew and have dropped dvOpwzos ; he might have borrowed wéuas from Luke (ver. 11) instead of dwéoreAe. Had he done these things (all natural enough), we should have at once had, as additional “common matter” for Matthew and Luke, wrapaBoArjv, dvOpwros, and améoretXev, and all in the space of three verses, and ‘ com- mon matter” proportionally in the rest of the narrative. We may assume, therefore, that Mark did not copy Matthew and Luke in this passage, nor in other passages where a similar phenomenon occurs. But it occurs throughout by far the greater part of

Mark's narrative. We may, there- fore, regard it as absolutely certain that by far the greater part of Mark is not borrowed from Matthew and Luke, and that the duality of phrase, which is undoubtedly a characteristic of Mark, must be explained by other causes. (For other passages where Matthew and Luke have little or no additional matter in common, compare more espe- cially the passages parallel to Mk. ii. 13-17; iii. 1-6; v. 1-39; x. 17-31; xi. 1-10; xii. 13-27 ; xiii, 1-19; xiv. 1-16 ; xv. 1-11.)

The question remains, Were Matthew and Luke entirely Evidence dependent upon Mark for that part of their narrative of an

which covers the same ground as Mark ? difficult, from a comparison of the three columns above, to make it probable that both Matthew and Luke did not borrow from the complete Mark as we have it. For though each of the three additions otv, idovres, of yewpyot, is in itself natural enough, yet the hypothesis that Matthew and Luke independently adopted precisely these and no other additions is most improbable. From a comparison of many such passages the improbability of the borrowing hypothesis might be increased. But as the process of proof could not be complete, and would certainly be long, it will be better to bring forward some short passages which are wholly irreconcilable with the hypo- thesis of deliberate borrowing, and which point to an original source, either written or oral, round which the three narratives play. Those passages will be most con- vincing where there are traces that some original tradition has been differently understood by the different writers. (2) One natural error in interpreting a terse tradition (perhaps translated from Aramaic into Greek) would be to supply different subjects to the same verbs, as in the following important passages, which variously describe the message of the angel or angels to the women at the tomb of Jesus :— (1) Matt. xxviii. 7, mpodye: iuas eis thy Tadtdaiavy exet avroy dperGe: id0d, elmov Suiv—' behold, I have told ou." (2) Mk. xvi. 7, mpodye: buds eis thy Tadsvatay exe? adrdy BweaGe, nabs efmev Suiv—'* as He told you." On the other hand, Luke, who records several appearances of the Lord to the disciples in or near Jerusalem, and who does not take the Galilean view of the resurrection, finds the words eis r}y I. out of place in his narrative. Yet his memory or knowledge of the common tradition is too strong to allow him to omit all mention of Galilee, and he therefore inserts it, but differently. (8) Lu. xxiv.

6, uvnaOnre ds eAdaAnoer buiv eri dv ev 7H Tadsraig —‘‘ remember how He spake unto you while He was still in Galilee.” (8) (1) Matt. iii. 5, éferopevero mpds adrdy mepixwpos Tov lopdavov. (2) Mk. i. 5 (agreeing here with Matthew), efemopevero mpds avroy . . . maca 4 lovdaia xopa. (3) Lu. iii. 8, fAGev els nacay Thy mepixwpov Tov *lopddvov. (y) In some cases the confusion is so important as seriously to affect the context, as in— ; (1) Matt. xix. 16, AiSdcxade, th ayabdv mroinow—Which is

waca 7

It would not be original sour

ce,

followed (in the correct text) by ‘‘ Why askest thou me about the good ?”

(2) Mk. x. 17, Addoxadre aya0é, th movjow—which is fol- lowed by ‘‘ Why callest thou me good ?”

(3) Luke (xviii. 18) agrees with Mark: Aiddonare ayade, ri

mothoas. Note that a scribe has endeavoured to com- bine the two traditions by inserting dya0é in Matt.

xix. 16. In the following the confusions are between only two uar- ratives : — (5) (1) Mk. iv. 19, af wépmvar. . . eiomopevduevat cuvmviryouer

—‘‘cares, going into the heart, choke (the word).” (2) Lu. vili. 14, 69d pepimvav. . . mopevduevor cuvaviryovrat —‘‘(the men) going their way (or gradually, as in LXX.), are choked by cares, or under the influence of cares,” (e) In the following, Matthew and Mark concur in attributing “desire” and ‘‘fear;” but Matthew attributes the ‘¢ desire”? to Herod, Mark to Herodias; again, Matthew makes the object of the ‘‘fear” to be the “crowd,” Mark ‘‘ John the Baptist.” (1) Matt. xiv. 5, Kal @€awy adrdoy amonretvar epoBnOn Tv bx Ao. (2) Mk. vi. 19, ‘H 5€ ‘Hpwdidas .. .

HOeAev abroy amoxreivai, al ov« 75bvaro: 5 yap ‘Hpddns epoBeiro Tov Iwavuny. (¢) Ina record of dialogue, the phrases, ‘‘said he,” “‘

answered

they,” would naturally vary (as they do, Matthew,

Mark, and Luke having peculiarities in this respect),

and they might sometimes be omitted, with the im-

portant result of transmuting a statement of fact

(Mark) into an utterance of Jesus (Matthew), thus :—

(1) Matt. xxvi. 2, O¥8are Or: pera SU0 judpas Td mdoxa yiverat.

(2) Mk. xiv. 1,*Hy 887d mdoxa Kal Ta BCvpa pera S00 jucpas.?

(n) The following is another case of difference in the grammatical subject of the verb ; the resemblance will appear de- monstrative proof of confusion to those who compare the context, and who also remember that a&xodovbeiv is used habitually of others following Jesus, but not of Jesus following others.

(1) Matt. ix. 19, Kal éyep@els 5 *Incobs jKorovde: arte. (2) Mk. v. 24, Kal awqa@ev per’ abrov, Kal jrodovder abt@ bxAOs TOAUS.

(@) In the following there is a curious confusion from the omis- sion of some words by Luke, so that what is the apodosis in Matthew becomes the protasis in Luke :—

(1) Matt. xii. 26, Kal ei 6 Saravas [rbv Saravay éxBadrdei],

ed” éavtody eueplo dn was [ody] orabhoerat } BactActa

QUTOD ; (2) Lu. xi. 18, ef 5€ Kal d Saravas ed’ Eaurdy drenepicbn, ras oTabnoeTat BactArcia avrov ;

(.) The following suggests that some Aramaic word meaning to “question” and to ‘‘try” or ‘‘tempt” may have been diversely rendered by—

(1) Matt. xii. 10, Kal ernpwrnoay airdy, A€yovres ef Reore Ocpamevety. es
(2) Lu. vi. 7, Mapernpotyro 5& abrdy ci Oepamever.

(x) (1) Matt. xxvii. 49, Of S¢ Aoimu: rcyov, “Ades, TOwuey ef épxerat ‘HAlas céowy adroyv.

(2) Mk. xv. 36, Aéywu, “Agere, TSwuev ef Epxerat ‘HAlas KadeActy avrov.

Here (1) in Matthew the bystandcrs address the man who brings the drink to Jesus ; but (2) in Mark the man addresses the bystanders. In (1) the meaning is ‘‘desist from giving the drink;” in (2) it appears to be ‘‘desist from mocking.” But in any case, the meaning differs in Matthew and Mark.

Many other instances might be given (¢.g., Mat. xiv. 2; Mk. vit “16; Lu, ix.0: Mik ix. 5: Do. ix, 34); but we will conclude with one in which two traditional versions of a saying of our Lord, blended into one by Mark, appear to have caused a confusion : (a) ‘‘ Every sin and blasphemy shall be remitted to men, but blasphemy against the Spirit shall not be remitted ;” (b) ** Whosoever speaketh a word against the Son of Man, it shall be remitted to him; but whosoeve- speakcth against the Holy Spirit, it shall not be re- mitted to him.” Matthew gives both these versions, Luke one of them (with slight variations). But Mark,

1 Here, as elsewhere in this article, it has not been thought neces- sary to mention by name those critics whose statements are traversed. For a brief summary of the history of recent criticism on the Gospels, see the end of this article.

combining the former part of the first version with the latter part of the second, so as to omit the phrase ‘Son of Man,” and yet feeling that some mention of ‘*Son of Man” was made in the tradition, substitutes for ‘‘men” ‘‘sons of men,” a phrase that is not found elsewhere in the whole of the Gospels :—

(a, (1) Matt. xii. 31, 32, () (6: roirv0 Adyw Syiv, race cmaprta, Kal Bracdnuia apebjoetat tots avOpwmros, h dé 709 mvevpatos BAachnpla ok adeOhoera Kar] (b) bs eay einy Adyov Kata TOU viod Tot avOpdmov, adebhoetay adrt, ds 8 dy elmn xara rob mvevparos Tub aylov odx apebhoctat alt@ obte ev ToUTHY TE aidvi obre ey 7 HEAAOVTL.

(2) Lu. xii. 10 (using eis for nara, epe? for dy elmn, and borrowing from (@) the word BAacdnueiy), (b) kad mas bs épet Adyov eis Thy vidy TOD avOpdmou apebhaeras abt, TH SE eis TH Gyrov Tretua Bracdnunoavts odx apeOnoerat.

(3) Mk. iii. 28, 29 (probably transposing vids, and using the dative instead of kara or eis), (@) Aé-yw byiv bre wévra apebjoera trois viois tov dvOpdmoy 74 Guapriuara kal ai BAachyuia boa cay BAacHnunower ; (b) ds 8 by Bracdnunon eis Td mvedpa Td Gyov obK exer Kpeow eis TOV alava.

Even those who may reject this explanation of the drag Aeydpevov in Mark will probably feel that this passage, and all those previously quoted, poiut to some original tradition (whether written or oral) upon which our three synoptic Gospels are based. ‘These then are the results to which (so far) we are led :—(1) Mark certainly did not borrow from Matthew and Luke; (2) Matthew and Luke, though clearly influenced by some form of Mark, yet pro- bably borrowed, not from Mark, but from some original tradition upon which Mark also is based.

Ξ

The Nature of the Triple Tradition.—What was the The Triple original tradition upon which our three synoptic Gospels J™tition.

are based? Was it Aramaic or Greek? oral or written! single or manifold? Did the earliest of our synoptists receive it fresh: from its first source, or after it had passed through many recensions? Few or none of these ques- tions (to some of which reference will be made hereafter) can be answered. with absolute certainty ; but it is evident that, if Matthew, Mark, and Luke are all based upon an earlier original tradition, then those words and phrases

which are common to Matthew, Mark, and Luke (to which we have given the name of the Triple Tradition) must have a peculiar weight, as approximating to the original tradition itself. If it be found that these

scattered words and phrascs make up of themselves an

almost continuous narrative, we may fairly suppose that we are approximating very closely indeed to the original tradition. We shall not expect to find a perfectly con- tinuous narrative. On the contrary, a perfectly continuous narrative, identical in Matthew, Mark, and Luke, would imply, not a floating early variable tradition, but a docu- ment simply copicd by the authors of our Gospels. Anearly tradition, circulated perhaps in various churches, in Antioch, in Rome, in Ephesus, in Corinth, before being embodied in a document, will naturally have been modi- fied, supplemented, and sometimes (as above) confused. More especially in certain unimportant and coustantly re- curring words and phrases we may expect variations. The words " said," "answered," "went," "journeyed," "asked, ""'questioned," "tempted," "refused," " rebuked," &e., may naturally be expected to differ in the three versions. But greater differences will soon arise. One version will lay greater stress on the details of miracles ; another on the relations between Jesus and John the Baptist; another on the law; another on the forgiveness of sins; and this varying emphasis will produce certain modifications of the original tradition. Again, in the early times of the church, the Greek of slaves and freedmen may pass with- out offence ; but in later times an editor of the Gospel, writ-

ing for readers of higher rank and better education, Wl

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substitute less uncouth words for the original barbarisins. Thus, from varying causes, the different versions of the tradition will deviate; and when we come to compare three of them together, and to write down the words cominon to the three, we shall no longer find the origina] continuous tradition. Gaps in the sense will occur every now and then, owing to the omission of some necessary word. On the other hand, although the literary cement (so to speak) which fills up the interstices between the words and deeds of the Lord may naturally vary, we may expect that the words of the

Lord Himself will be more care- fully preserved, and more identically reported by all three synoptists, so that they will give a more continuous sense, and will enable us to approximate to the original tradi- tion. Let us now take the Gospel of Mark, and set down, froin the first two chapters of it, all such words as it contains in common with Matthew and Luke, merely adding in italics such words as may enable the reader to perceive the structure of each sentence; and let us see whether the words thus collected show any traces of a continuous narrative :—1

"*Ksaias | the prophet : || the voice of one erying in the wilder- ness, Prepare the way of the Lord, make His paths straight. | John | in the wilderness preaching | repen(t). | All | wen(t) forth | to be baptiz(ed) by him. || There cometh one stronger than I | whose shoe-latchet [Mat. shoes] | I am not worthy to loose [Mat. bear]. | I baptiz(e) you with water, He | shall baptize you with the Holy Spirit. || Jesu(s) was bapti(zed). || The heaven? | and the Spirit, as a dove, descend(ing) on Him. And a voic(e) from | heaven | My beloved Son, in Thee [Mat. whom]] am well pleased. | The Spirit drives Him; | in the wildern(ess) forty days tempt(ed) by [Satan; Lu. devil]. || He came into Galilee. || Com(eth) into the house of Simon [Mat. Peter]. | Stepmother sick of a fever. || And the feve® left her ; | she ministered to the(m). || He heale(d). || He preache(d) in the synagogu(es) of Galil(ee). || There came a leper | saying to Hi(m), If Thou wilt, Thou canst make me

clean. And stretching forth His hand, He touched him | I will, | be thou clean. And immediately there departed from hin the) leprosy. || And He satd to him, Tel(1) no one, but | show thyself to

the priest, and offer that which Moses ordained as a testimony to) them." Chap. ii. '|| And they brin(g) Hi(m) a paralyti©. |} And } seeing their faith, || He said, Thy sins are forgive(n). | he scribes | said, This man blasphem(eth). || Jesus said to the(m), | Why reason ye in your hearts? Which is easier, to say | Thy sins are for- give(n), or to say, Ris(e) | and walk. But that ye may know that | the Son of Man hath power on earth to forgive sins, He saith to the paralyti©, | Rise, take thy bed, | go to thy house. And | having taken it up, he went. || And they glorified) God. And He sww one sitting at the receipt of custom, and satd to him, | Follow Me, | and arising he followe(d) Him. | And he feasted Him) in his house, and man(y)

publican(s) | were feast(ing). || And the Pharisee(s) sai(d) to His disciple(s), W(hy) eat with publicans and | sinners? | H(e) | said to them, They that are strong [Lu. healthy])) have no need of a physician, but they that are sick. I cain(e) not) to call the righteous but sinners. | The disciples of John | say to | Hi(m):| The disciples of John and of the Pharisee(s) fas(t), but | Thin(e) do not. Jesus said to the(m), Ca(n) the son(s) of the j bride-chamber fast? | The bridegroom is with them. || But the days shall come when the bridegroom shall be taken from them. Then shall they fast. | No one putteth on a| patch upon an ol(d) garmen(t). No on(e) putte(th) new wine into old bottles, Else, it will burs(t) the bottle(s), and the wéne will peris(h) and the bottles also. But new wine into new bottles. || On the Sabbath, they were going through corn-fields; His disciples plucke(d) the |wheat-ears. | The Pharisee(s) said, They are doin(g) on the Sab- bat(h) that which is not lawful. He said to the(m), Have ye uot jread what David did when he was an hungered, and they that were jwith him? how he went into the house of God, | and ate the |shewbread, whic(h) it is not law(ful) to eat, save for the priest(s) ? || The Son of Man is Lord of the Sabbath." Few will have any difficulty in following the above inarrative which represents the Triple Tradition of the \synoptists. It will be generally admitted that, so far as

it extends, it omits little of importance: and its con-

1A gap in the narrative of Mark is signified by |, a longer gap jby ||. Bracketed parts of words signify that the word occurs in the jthree Gospels, but in different forms.

- Here Mark uses a strong word, meaning ''cleaving" or "rend- ing"; Matthew and Luke prefer the more usual word, meaning "opening." Hence the gap.

tinuity will commend it as likely to be, if not the original tradition, at all events a closer approximation to it than we are likely to find elsewhere. It therefore becomes an important business to consider the scope and

variations of the Triple Tradition, —where it is full and ample, where it 1s meagre, where it begins and where it ends.

The commencement of the Triple Tradition has been given in the specimen quoted above. It begins with the proclamation made by John the Baptist, of the advent of the Stronger One. Describing (Mk. iii.) the cure of the withered hand, the choice of the Twelve, the discourse on blasphemy against the Holy Spirit, and the answer to the question, "Who is My mother and My brethren 2" it passes (chap. iv.) to the parables of the sower and the mustard seed, which it gives very fully ; the rebuking of the wind and the exorcism of the legion (Mk. v.) are given as follows :—

Mk. iv. 35. "Let us go across to the other side. They took Hi(m) | in a boat. || They wak(e) Hi(m) say(ing), We perish : and He, arising, rebuked the win(d). || And there was a calm. Hesaid to them, | Your faith ! || They said, Who is this that even the wind obey(eth) Him?" Mk, v.1. "And they came across into the land of the [Gadarenes, Gerasenes, or Gergesenes]. There met Him | one [Mat. two] in the || tombs || crying, | What is there between me and Thee, Thou Son of God? || Torment me not. || And he [Mat. they] besought Him… into… || And He. .. them, | goin(g) forth, they come to (or into) the swine, and the herd rushed down the steep place into the sea [Lu. lake] and [were choked, Mat. perished]. | Those that were feeding them | fled and brought word into the city. || They came || Jesus. || And | they besought Him to depart from | them."

This is given as a specimen of those passages where the narrative is not so continuous, and where there is some ap- pearauce of confusion, The evidence of confusion is con- firmed (1) by the fact that a word is used here (Saiuwv) to denote "spirit" or "demon," which is not found once elsewhere in the whole of the Gospels, nor, indeed, any- where in the New Testament (except in the Apocalypse twice), whereas daudviov is used forty-five times, and mvedpa twenty-seven times in the three Gospels alone ; (2) by the difference of the names for the locality, Gadara, Gerasa, Gergesa; (3) by the fact that Matthew speaks of two demoniacs instead of one.®

The restoring to life of the daughter of a ruler (Mk. and Lu. ruler of a synagogue) is next thus briefly related: " He came into the house, | She is not dead, but sleepeth. And they mocked Him. || Having taken her by the

hand | Arise.” Then follow (chap. vi.) the mission of the twelve, Herod’s conjecture about the new prophet, and the feeding of the five thousand, which runs thus (Mk. vi. 44) :— a ae eee eee

3 It has been suggested (Abbott, Through Nature to Christ, p. 447) that this extremely difficult narrative may have arisen from a mis- understanding of the phenomena of possession. Compare the story iu the Lvangelium Infantice Arabicum (a Gospel which shows special traces of Mark’s influence) in which (chap. xi.) it is said of a certain demoniac that “demons, in the shape of crows and serpents, began to go forth, fleeing from out his mouth.” But it is perhaps more likely that the variation in the name of the place points to some mis- understanding as to the origin of the story. The name Gadara, W111, sometimes means a “sheepfold”; and gddar, though not a Syriac word, is yet given in the Syriac lexicons as Hebrew for “ flock.” Again, the correct reading in, Mark is probably “Gerasene,” not ““Gadarene” ; and the word W7) means ‘to cast out.” Lastly, the third reading, ‘‘Gergesa,” supported by Origen, is expressly said by that author (Comm, in Hv. Joann., vi. 24) to mean ** rapo.Kia éxBeBAn- xdrwy,” “the district of those who cast out”; and he suggests that the name was probably “prophetical, referring to our Lord’s expulsion from the district (éméyuuos obca téxa mpodntixas). Now, when a narrative of an event reported to have occurred at a certain place contains three different names of the place, and when each of the three names is adapted to the event, such a triple adaptation is obviously likely to be not a mere casual coincidence, but rather a convergence pointing to some misunderstanding or non-historical nucleus as the centre and origin of the narrative. What the misunderstanding was may be a matter of conjecture, but that there was some misunderstand- ing is a probability approaching to certainty.

X. — 100

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‘< Send them away, that they may go into villages. | Give ye them to eat. | We have five loaves and two fishes. || Having taken the five loaves and the two fishes, looking up to heaven, He blessed, and having broke(n) them, He gave them to the disciples. | And they all ate and were filled. | And they to(ok) up twelve bask(ets) of fragments. They were | five thousand men.”

The walking on the waves is much more briefly recorded (Mk. vi. 46-51). “He went to the moun- tain. | Zé was late. || hey see Him walking on the sea. || It is I; be not afraid.” Then follows a blank, in which Matthew and Mark generally agree, while Luke is altogether wanting; and, after this, the famous confes- sion of Peter, followed closely by the transfiguration.

Mk. viii. 27. ‘‘He aske(d) them, | saying, | Whom | do they gay that am? They answered, | John the Baptist; | others Elias ; but others a prophe(t). | He said, But whom do ye say that I am? Peter | answering said, Chris(t). Teli no one. He said that He niust needs | suffer many things | from the elders and chief priests and scribes, and be slain, and after three days {or, on the third day] He must be raised up (Mk. avaoriiva, Lu. and Mat. éyepOjva:.] || Zf any one wishes to come after Me, let him deny himself, and take up his cross and follow Me. For whosoever wishes to save his life shall lose it, but whosoever los(eth) his life for My sake shall save it. For what is a man profit(ed), to gai(n) the whole world, and be lost? || The Son of Man shald come in glory, with the augels.” || Mk. ix. *‘I say unto you, There are some of those stand(ing) here who shall not taste death till they see th(e) kingdo(m). | After six [Lu. eight] day(s) he take(th) | Peter and James and John | into a mountain. || His garment(s) become white. || And there appear(ed) Elias and Moses speak(ing) with Him. | Peter said to Jesu(s), It is good for us to be here; let us mak(e) three tabernacles, one for thee, and one for Moses, and one for Elias. || A cloud overshadow(ed) the(im), and there was a voice from the cloud, This is My Son: hear Him. | They saw Jesus alone.”

From Mark ix. 14 to x. 16 there is a break in the com- mon tradition, which here records little except three or four sayings of the Lord.

‘*O faithless generation, how long shall I be with you?” ‘‘ The Son of Man is to be betrayed into the hands of men.’’ ‘‘ Whoso- ever receiveth a child in My name receiveth Me.” ‘‘Jf any one cause one of these little ones to stumble, a mzll-stone round his neck, and let him be cast into the sc(a),” ‘‘Salt is good, but if the salt dose its savour, wherewith shall it be salted?” ‘‘Suffer the children ; forbid them not; for of such is the kingdom.”

In contrast to this discontinuity, Mark x. 17-52 gives a continuous tradition about the rich young man, the pro- mise of reward to the disciples, the

predictions of betrayal, and the healing of the blind mannear Jericho, The entry into Jerusalem and the purification of the temple (xi. 1-17) are also fairly continuous. The disputes in the temple touching the baptism of John (xi, 27-33), the wicked husbandmen (xti.1-12), and the tribute-money (xii. 13-17) are very continuous. A brief denunciation of the Phari- sees, who love the first seats in synagogues and at feasts, is found in Mark xii. 38-40. The Triple Tradition then touches on the second coming of Jesus. Luke has here omitted many important passages which are recorded by Matthew and Mark alone, and which will be given here- after (see p. 795). Here we will set down nothing but the common tradition, marking Luke's omissions.

Mk. xiil. 1. '* And || He said, || Not a stone shall be left on stone, which shall not be cast down. || They asked Him, || When shall these things be? And what is the sign? He answered, Take heed lest any deceiv(e) you. Many shall come in My name saying, I am He. || When ye hea® of wars, be not alarmed (Lu. substitutes the usual LXX. word awronéfre for the LXX. amat Acyouevoy, Opoctcbe, which is in Mat. and Mk.]. These things must needs come to pass, but the end is not yet. Nation shall rise against nation, and kingdom against kingdom. There shall be earthquakes in places, there shall be famines. || They shall deliver you to… for a witness… || And ye shall be hated by all men for My name's sake, but he that remain(eth) shall be saved. When ye see | desolat(ion), then let them that are in Judeea flee ¢o the mountains. || He that is on the house-top let him not descend,

| and he that is in the field let him not turn back. || But woe to

1 This passage is found in Matthew and Mark here, but in Luke elsewhere (xvii. 32).

GOSPELS

[SYNoPTICAr, them that are with child. and to them that give snck in those d

rey 7) [Here Luke leaves a blank in which Matthew and Mark viene ''false Christs" and 'the daikening of the sun.'"] 'And the

powers of (or iv) the heavens shall be shaken. And then shall they see the Son of Man coming in the cloud(s) with great power and glory. || From the fig-tree ye know that the summer ¢s near So also ye, when ye see these things. || Heaven and earth shall pass away ; but My words shall never pass away."

In Matthew and Mark there follows the avowal that '"'of that day or hour none knoweth, not even the angels in heaven, lor even the Son, but only the Father." But Luke omits this. The Triple Tradition passes to the be- trayal of Jesus. The traitor's compact (Mk. xiv. 10, 11) and the visit to the city to eat the Passover are briefly narrated. From this point the Triple Tradition becomes more and more scanty, till it leaves us at last little more than a few disconnected sayings of Jesus.

Mk. xiv. 21. 'The Son of Man goeth indeed, as it is written: but woe to that man by whom He is to be betrayed. |j Having taken bread, He brake it, and ga(ve) it. | Thisis My body. And taking the cup, This ts My blood of the testamen(t), that is shed ... || I say unto you, I] will never drink of the fruit of the vine until the kingdom, || And | they wen(t) forth to the Mount of Olives, || I say unto thee, Before the cock crow, thou shalt deny Me thrice. || He pray(ed), If zt be possible . .. || He sai(d), Fath(er), ¢ake this cup from Me ; || yet not as I wil(l), but as Thow wilt. || And having foun(d) them sleeping, He said, Pray, that ye enter not into temptation. || While He was still speaking, came Judas, | one of the twelve, | and a multitud(e) with him. || He kiss(ed) Him. || One smote [Mk. rare, for which Mat. and Lu, substitute the more appropriate and common word émdrage) the servant of the high priest, and cut off his ea®. | Jesus said, As against a thief have ye com(e) out with swords and staves? 1 was daily | in the temple; and ye took Me not. || They led Him to th(e) high pries(t). || Peter followe(d) afar off | and sat in | the hall. Art thou the Son of God [Mk. the Blessed]? || Thou shalt see the Son of Man seated on the right hand of the Power. || What need have we yet of witnesses? || They sai(d) unto Him, Prophesy. || A maid-servan(t) spake wnto Pete®. |] But he denied, saying, I do not know Him. || Verily thou art one of them, for… i] And Peter reincmbered, Before the cock crow, thou shalt deny Me thrice, and he wep(t)."

Mk. xv. ‘‘They led Him to Pilat(e), || He aske(d) Him, | Art Thou the King of the Jews? He said to him, Thou sayest ||... Barabbas . . . || Cruci(fy) Him. Why, what evil hath He done? | Crucif(y) Him. | Pilate released Barabbas, and delivered over Jesus. || And they le(a)d Him away. || They made Simon a Cyrenian carry the cross. || They came to the place of the Skull. || They divide(d) His garments and cast lots. || There was written up, The King of the Jews. || On the right hand and on the left… || He saved others; let Him save (Him)self. {| About the sixt(h) hou® there was darkness over the earth until the ninth hour. || Jesus with a loud voice emitted His breath. || And the women | who in {or from] Galilee had followed Him behel(d) [Mk. and Mat. Bewperv, Lu. dpav, reserving Oewpeiy for v. 55] these things from afar. || Joseph of Arimathea | cam(e) to Pilate and begged the body of Jesus, || and wound [Mk. évetanoev; Mat. and Lu. ever baikev] it in linen | and laid it in a tomb.”

At this point the tradition not only becomes discon- tinuous, but also shows marks of confusion. The tradi- tion appears to have been that the.women “ beheld,” or came to “behold” (another tradition added at “dawn”), and came to the tomb; but what “dawn” is meant, and what was the object of their beholding, is left uncertain.

(1) Matt. xxvii. 61; xxviii. 1. ‘There were there Mary Magdalene and the other Mary sitting over against the tomb. Late i the Sabbath, at the hour of dawning (77 émupwoxotan), before the ei day of the week, came Mary Magdalene and Mary to behol (GewpHoat) the tomb (rdgov).”’?

(2) Mk. xv. 47; xvi. 1. ‘Mary Magdalene and Mary the mother of Joses beheld (€@edépouv) where He was laid (reOerra:). When me Sabbath was passed, Mary Magdalene and Mary the aime os Ji ames and Salome brought spices that they might come and anoin Him.” ;

(3) Lu. xxiii. 54. ** And the Sabbath was dawning (emépwone) 5 and having followed Him (to the grave), the women who had ne with Him from Galilee beheld (é@edcavro) the tomb, and how 18 body was laid (ré@erra:), and returning they brought spices.

2 It may be observed that the same Syriac word is used to denote evening as well as morning twilight. See Gildemeister, De Evangelis

| in Arabicum e simplicé Syriaca translatis, Bonn, 1865, p. 20.

INTERNAL EVIDENCE. |

The only remaining words of the tradition are: “. . . the first day of the week… roll(ed) away [z.¢., the Stone at the opening of the tomb]... He is not here; He is risen… Galilee . . . they fled from the tomb.” Matthew and Mark continue for a few lines a narrative based upon some common tradition ; but even here there occurs the confusion mentioned above—Mark, “as //e told

found impossible to reduce the experiences and impres- sions of those who had seen Hini—impressions necessarily variable and transient, blended with fear and with an ex- citement bordering on ecstasy—to a consistent and histori- cal shape; and when it had not yet been found necessary to define and harden the narrative so as to adapt it for the purpose of meeting doubts and objections.

you;” Matthew, “ behold, Z told you ;” and the narrative of Mark ends at xvi. 9. The remaining verses of Mark are an appendix added by some later editor ; and henceforth the narratives of Matthew and Luke—having lost Mark—

The Additions common to Matthew and Mark.—The Additions additions to the Triple Tradition which are found in common

Matthew and Mark, but not in Luke, are the following :— f Nae

(1) The description of John the Baptist (Mat. iii. 4; Mk, i. 6); Mark.

present no further traces of agreement.

To sum up the contents of the common tradition, it omits the genealogies, miraculous incarnation, and the picturesque details of the infancy; it lays emphasis on the relations between John the Baptist and Jesus ; it contains none of the parables except the sower, the mustard seed, and the wicked

husbandmen, and few of the long discourses of Jesus, except an abridged prediction of the second coming. The disputes between Jesus and the Pharisees about the Sabbath, about fasting, about exorcism, about the baptism of John, and the tribute, and Christ the Son of David, and the dialogue with the Sadducees about the resurrection, are very fully given; and so also is the dia- logue with the rich young man. Indeed it is a collection of dialogues and anecdotes rather than a set treatise of doctrine or biography. The sayings of Jesus recorded in it are short, pithy, and abrupt,! and many of them are polemical. Only now and then do we find a sentence which goes down deep below all polemics, and reveals a deep-laid spiritual plan. But putting such sentences together we perceive that the Triple Tradition describes a prophet wholly different from any that had before ap- peared in Israel; a prophet who not only (like Isaiah) protested against sabbaths and purifications as ends in | themselves, but who also preached the Fatherhood of God in a manner entirely peculiar to Himself, and who set aside the Mosaic law of divorce (Mk. x. 2-11). He also in- | structed His disciples to enter into the kingdom as little | children (x. 15), and seems to have attached a certain symbolic mystery to childhood as representing Himself | (ix. 37). He taught His disciples further to devote their | lives to Him, and to ignore all life apart from Him (viii. 34), ("to confess Christ, to deny themselves"). From the first He claims the power of forgiving sins (ii. 7); and, as | soon as one of His disciples confessed Him to be the Messiah, He prepared for death, predicting that He should die, but rise again. Then, after prophesying the fall of the temple, and great distress in all nations, He predicted a final triumph for His disciples ; and after bequeathing | Himself, His body and His blood, as at a funeral feast, as | His final legacy to His disciples, He was arrested and put) to death. | Several miracles of healing are recorded, and, in addi-

tion to these, the exorcism of the Gadarene (in which, | however, great confusion is apparent), the stilling of the storm, the feeding of the five thousand, and the transfigura- tion. From the beginning of the discourse on the second | coming, Luke diverges more and more from Matthew and Mark. After the death of Jesus, Matthew aud Mark con- tinue to agree in words aud phrases, but a little confusion is apparent; and the tradition suddenly terminates with- | out any record of the appearance of Jesus to His disciples. However we may regret this, it is perhaps what may be | naturally

expected on the hypothesis that we have before } us an early tradition originated at a time when the | numerous manifestations of Jesus after His death were still attested by living witnesses ; when as yet it had been 1 Cf. Justin, Apol. 7, (Kirchhofer, p. 89), Bpaxets te kal otvropnor Tap avTod Adyou yeydvact.

(2) the ministering of the angels (Mat. iv. 11; Mk. i. 18); (8) the calling of the fishermen (Mat. iv. 18-22 ; Mk. i. 14-20); (4) the murmuring of His friends at Nazareth (Mat. xiii. 58-57 Vc ivae 1-4) ; (5) the influence of Herodias in procuring John's execu- tion (Mat. xiv, 8-138; Mk. vi. 25-29); (6) the walking on the water (Mat. xiv. 22-28; Mk. vi. 45-51); (7) the disputes with the scribes from Jerusalem (Mat. xv. 1-20; Mk. vii, 1-28); (8) the story of the Syro-Pheenician woman, which is narrated by Matthew and Mark in widely divergent language, but with an almost identical conclusion (Mat. xv. 21-28; Mk. vii. 24-80); (9) the feeding of the four thousand (Mat. xv. 32-38; Mk. viii. 1-9), and the comparison between this miracle and that of the five thousand (Mat. xvi. 5-12; Mk. viii. 14-21) ; (10) the saying of Jesus that Elias had already come (Mat. xvii. TOF evil ix, 118));° (11) the discussion of the enactments of Moses concerning divorce (Mat. xix. 4-8; Mk. x. 2-9); (12) the saying (but Luke inserts it elsewhere) that ''many that are first shall be last" (Mat. xix. 30; Mk. x. 31); (18) the petition of the sons of Zebedee for the chief places (Mat. xx. 20-28; Mk. x. 35-45); (14) the withering of the fig-tree (Mat. xxi. 18-22; Mk. xi. 18, 14, 20); (15) the introductory question of the lawyer, '' Which is the great com- mandment" (Mat. xxii. 86; Mk. xii. 28) ; (16) in the discourse on the last day, Luke omits reference to the '' consummation," ovy- tédera (Mat.), cuvteAcio@a (Mk.) ; '' these things are the begin- ning of troubles;" ''the abomination of desolation," &c. igulie that readeth let him understand ;" 'pray that your flight may not be in winter;" ''(tribulation) such as was not from the beginning till now, nor ever shall be ;" the expression about the ''shortening" of the days ''for the elects' sake ;" '' He shall send His angels, and gather together the elect ;" ''of this hour the Son knoweth not ;'"' (17) later on, Luke omits the anointing of Jesus "for His burial" (Mat. xxvi. 6-18; Mk. xiv. 3-9); (18) 'I will smite the Shepherd," &c., and "1 will go before you into Galilee' (Mat. xxvi. 31, 32; Mk. xiv. 27, 28); (19) the compact of Judas with the priests that a kiss should be the signal (Mat. xxvi. 48; Mk. xiv. 44); (20) the false witness about 'destroying the temple in three

days" (Mat. xxvi. 59, 62; Mk. xiv. 55-60); (21) the taunt ''Thou that destroyest the temple" (Mat. xxvii. 40; Mk, xv. 29); (22) the utterance of Jesus, "' My God, My God, why hast Thou forsaken Me?" with the consequent misunderstanding of the bystanders (Mat. xxvii. 46-49; Mk. xv. 34-86) ; (28) the utterance of the angel (or angels) at the tomb, '' He goeth before you into Galilee : there shall ye see Him" (Mat. xxviii. 7; Mk. Xvi. 7).

Tn considering these passages it is natural to ask whether any reason (besides ignorance of them) can be alleged why Luke should have omitted them. It is scarcely possible to fail to see design in some of these omissions, —for example, in those which relate to John the Baptist and Elias (1), (5), and (10). The author of the Acts of the Apostles is by general consent admitted to be identical with the author of the Third Gospel. Now remembering that Luke in the Acts (xix. 3) informs us that, many years after the death of Jesus, there were in Ephesus several disciples who were baptized with the baptism of John, and knew nothing of the Holy Spirit, we may well understand that the author of the Acts finds it necessary, when writing a gospel, to put in as clear a light as possible the sub- ordination of John to Jesus. Accordingly, in place of the graphic description of the austere food and garb of the prophet, he gives (iii. 10-14) a description of his teaching, as containing the elements of a simple and almost common- place morality, intended merely to prepare the way for a higher teaching, and he adds an express negative from the prophet in answer to those who doubted whether John were the Messiah. Repeatedly does Luke deviate from the common tradition of Matthew and Mark on the subject of

Elias; and in each case the object is apparent. Only a close inspection of a harmony of the Gospels will make this clear; but three or four passages may be mentioned which point in this direction. Luke has already (i. 17) declared that John will go before Jesus "in the spirit and power" of Elias, but he cautiously avoids committing himself to the tradition (Mk. ix. 13; Mat. xvii. 13) that John was Elias. The belief in an actual transmigration of souls he will allow the multitude to entertain (ix. 8, 19), but not Herod: for

whereas in Mark (vi. 16) Herod says, “Whom I beheaded, viz., John, this man (otros, corr. text), is risen from the dead,” Luke, by a slight transposition of the traditional words, converts the proposition into a ques- tion: “John I beheaded; but who is this man?” And, further, in order to prepare the way for the interview between Herod and the Lord—which he purposes to de- scribe at the end of his Gospel (xxiii. 8, 9), and to refer to in his continuation of the Gospel (Acts iv. 27)—he adds the words, ‘And he (Herod) was desirous to see Him.” Again Mark (ix. 6) tells us that Peter “not knowing what to answer,” proposed to build three tabernacles for Jesus, Moses, and Elias; but Luke reads (ix. 33), “not knowing what he said,” as if to caution the reader against supposing that Elias or Moses could be seriously placed on the same level as Jesus. For the same reason he omits the irreverent misunderstanding of the bystander who supposed that Jesus in his last moments called for Elias, and even the utterance itself (Mat. xxvii. 49; Mk. xv. 36).

With reference to many of the other omissions it will be noticed that Luke seems to have before him somewhat different versions of the narratives, which different ver- sions he inserts elsewhere. For example, he gives a version of the calling of the apostle-fishermen, which adds a miraculous draught of fishes, thereby approximat-

ing to the narrative in the Fourth Gospel (xxi. 6-11).

Again Luke places the murmuring of the Nazarenes much earlier, in the fore-front of the ministry of Jesus, as was very natural, and gives an entirely different version of it. The ministry of the angels after the temptation he omits ; but he alone records the ministry of the angel (xxii. 43) when Jesus was tempted in Gethsemane, for which tempta- tion he carefully prepares the way by saying (iv. 13) that the devil departed from Jesus only “for a season.” As regards the anointing “‘for the burial,” it is probable we have a different version of it in his story of the woman that was “a sinner” (vii. 37). The reasons for the omission of the feeding of the four thousand and the withering of the fig-tree are not so obvious. The omission could hardly have been dictated by any desire to minimize the supernatural (seeing that Luke contains many miracles peculiar to himself, and that he does not shrink from giving in full detail the exorcism of the Gadarene). It is possible that

he omitted the former as being too similar to the feeding of the five thousand to require to be repeated; and if he regarded it (as the author of the Fourth Gospel does) as having a sacramental meaning, one story of the kind may have seemed sufficient. If the story of the withered fig-tree was regarded by him in the same way (rather as emblematic than as historical), then it may have been replaced in his narrative by the story of the barren fig-tree (peculiar to Luke), to which the master came seeking fruit and finding none, It is also noticeable that the moral (on the power of faith) deduced from the withering of the fig.tree in Matthew and Mark is contained in Luke, but in a different form.

In Matthew and Mark it runs: 'If ye say to this moun-.

tain, Be raised up and cast into the sea ;" whereas in Luke (xvii. 6) it is, "Ye might have said to this sycamine tree, Be rooted up and planted in the sea." This perhaps slightly confirms the supposition that Luke regarded the

narrative of the fig-trec rather as a parable than as a fact But it is important to bear in mind that we have little more than the evidence of conjecture to explain some of Luke's omissions. For example, the story of the walking on the waves, as told by Matthew and Mark, represents the disciples as being alarmed by the thought that the apparition of the Lord was only a spirit (pdvracpa); unless Luke considered that the ground of this narrative was occupied by his account of a similar fear when the disciples bebeld the Lord after the resur- rection, it is hard to suggest any reason for its omission, This class of omissions may be terminated with that numbered (19) above—the compact of Judas concerning the signal. It is obvious here that Luke has another version of the tradition in his mind. He alone of the three records the words of Jesus, ' Betrayest thou the Son of Man with a kiss," thereby making it unnecessary to explain (with Matthew and Mark) that the kiss was a signal fixed by the traitor.

Another class of passages may possibly have been omitted as being not of interest to the Gentile world, or as being liable to misunderstanding or

perversion. The story of the Syro-Phcenician woman perbaps appeared to the editor of the Gentile Gospel to exhibit Jesus in too harsh a light; the application to Jesus of the prophecy “T will smite the Shepherd,” appeared more liable to misunderstanding than ‘‘He was reckoned with trans- gressors” (not found in Mark’s genuine text); the discus- sion of the law of divorce and of the regulations touching uncleanness, and the part played by Herodias in the exe- cution of the Baptist, may have seemed to lack interest for readers outside Palestine. In the discourse on the second coming it would be natural for an editor of the tradition writing after the siege of Jerusalem to sub- stitute “encircled by armies” for the “abomination of desolation”—a phrase that would perplex a Gentile reader, and also to modify some of the hyperbolic and emblematic expressions. Lastly, the mention of the “false witness” concerning the destruction of the temple, and the raising up of a new temple in three days, may have begun to present a difficulty in times when the temple actually had been destroyed, and when the Lord Jesus Himself had come to be regarded as the new temple not made with hands. Although therefore Luke does not go so far as the author of the Fourth Gospel (who exhibits Jesus as actually predicting the destruction of the temple and as promising to raise it up in three days), yet he not only omits the “ false witness,” but also the allusion to 1b contained in the taunts addressed to Jesus on the cross, “Thou that destroyest the temple and raisest it again in three days, save Thyself” (Mat. xxvii. 40; Mk, xv. QO).

The above explanation of Luke’s omissions may only partially commend itself to the reader; but few will fail to see that there is at least some method and motive In most of them. It is a matter of certainty that in the Triple Tradition many of Luke’s omissions and modifica- tions of phrases and words are not accidental but editorial : it is but natural therefore to suppose (especially when reasons can easily be assigned) that editorial reasons may also explain omissions and modifications of narratives and discourses. Of course it is not maintained that Luke, or any individual editor, made these changes on his own responsibility. Many of them are probably the result of a “Gentile use” which had gradually sprung up in certain churches, and which was not created but adopted and expressed by the author of the Third Gospel. Consequently we are not obliged to suppose that the omissions resulted from ignorance. The very fact that it is easy to supply motives and

reasons for the omission of these narratives increases their credibility, by diminishing the probability

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that they were late traditions unknown to the author of the Third Gospel. The passages omitted are generally in the style of the common tradition, and they contain incidents of a similar kind to the incidents of the common tradition. It only remains to add that (except in the story of the Syro-Phcenician woman, and, in a lesser degree, in the question of the lawyer about the great commandment) Matthew and Mark closely agree whenever Luke separates himself from them. This is also found frequently to be the case in the Triple Tradition.! In the midst of very similar context, if Mark is identical, or nearly so, with Matthew, in the expression of some action, it will be found that Luke often suddenly diverges, or makes some oniission, Thus—

(1) Mat. xxi. 12. Kal elofaOev ’Incoids els 7d iepby nad é&éBare mdvras ToUs mwrodyras Kad &yopdCorras ev T@ lep@, Kal tas Tpamélas TaY KOhAUBiOTGY KaréoTpee, Kal Tas KabeSpas TaY TwALbVTwY Tas TEploTepas.

(2) Mk. xi. 15. Ka) eloeaOdy els rd fepdv, Yptaro éxBddAew Tovs mwrovvras Kal Tos dyopdCovras ev r@ tee” Kad ras Tpamélas THY KoAAvBioTGy, Kal tds Kabédpas Tv mwrobvTwy Tas TEploTepas katéotpewe.

(3) Lu. xix. 45. Kal eiceaddy els 7d fepdy, Hptaro éxBdAaew Tovs mwdotvras, omitting the rest.

So, in the midst of the story of the rich young man, where Matthew and Mark have drjAde Avrovpevos, Hv yop exov KtHwara mokAd, Luke, suddenly diverging, has mepitvros éyeviOy’ hv yap TAovaws odddpo. CM %, 22); Mat. xix. 22; Lu. xviil. 23). Sometimes the divergence appears to arise from literary motives, and especially from the dislike of repetition (Lu. iv. 32; Mat. vii. 29 5 mk. i. 22); but in other cases it cannot be so explained : —Lu. v. 29, 30; Mat. ix. 10, 11; Mk. ii. 15, 16: Lu. v. 33, 34; Mat. ix. 14,15; Mk. ii, 18, 19 (see also, in a parable, Lu. v. 36; Mat. ix. 16; Mk. ii. a): Lin.

vi, 11 Mat, xii, 14; Mk. iii, 6: Lu viii 13; Mat. xiii. 21; Mk. iv. 17: Lu. viii. 44; Mat. ix. 21; Mk. v. 29. In some

henceforth nothing in common with Mark, except what is found in the Triple Tradition.

Most of the incidents common to Mark and Luke are so few and so simple that their omission by Matthew requires no explanation. It is possible that the names Jairus and Legion did not exist in the earliest tradition, as it presented itself to Matthew; the " authority" which Mark illustrates (compare i. 22 with i. 27) by exorcism, Matthew applies (and perhaps justly) rather to our Lord's method of teaching (vii. 28, 29); but it is difficult to suppose that any other cause than ignorance could have caused the omission of the saying of Jesus concerning the widow's mite. It is certain that, in some at least of these passages, Mark represents the earlier, and Luke a modified tradition. Luke (see below, p. 806), writing with a literary purpose, has softened many early irregularities, which in Mark retain their original harshness, For example, the ungrammatical ot karéoOovres (Mk. xii. 40) is altered (Tischendorf and Tregelles, pace Lachmann) into of careoOiover (Lu. xx. 47); and instead of OeAdvrwv before doracpovs (Mk. xii. 38 Luke inserts futowvrwy (Lu. xx. 46). In the story of the widow also, Luke, disapproving of the epithet ' beggar" (wrwx7H) applied to the poor widow, substitutes the more respectable weviypd, yet with a natural but inconsistent reverence declines to cancel the same epithet (rw) when (Lu. xxi. 3) it occurs in the words of the Lord. The rarer and less correct (ambiguous also when followed by the feminine airfjs) torepjoews (Mk. xii. 44) is altered into torepyparos (Lu. xxi. 4); and, lastly, the lengthy duality of Mark, "as many things as she had; all her livelihood" (which looks as if it had arisen from com- bining two different renderings of the same Aramaic original), is condensed by Luke (who takes one part of one rendering, and another part of the other) into "all the livelihood that she had." It is probable that not only in these but in all passages common to Mark and Luke alone,

of these cases the agreement between Matthew and Mark is so close as to suggest that both writers may have used Some common document (not oral tradition) which con- tained little more than certain words of the Lord in a scanty framework of narrative. But this common matter

wherever Mark and Luke differ, Mark represents an earlier, and Luke a later version of the original. And generally it may be said that Luke follows the tradition of Mark most faithfully when it deals with Galilee, and least when it deals with Jerusalem.

adds little to our knowledge of Christ. The most import- ant narrative in it is the story of the Syro-Pheenician, showing how Jesus, as it were, acknowledged in the

Additions common to Matthew and Luke.—These in- Additions troduce an altogether new element into the tradition, common Hitherto the Triple Tradition of Matthew, Mark, and Luke to Mat-

thew and

woman's persistent faith a divine revelation, extending His gospel even to the heathen. And this narrative is written in language so divergent as to indicate not a document but an oral tradition.

The Additions of Mark and Luke.—Additions of any length are very few : —

(1) An exorcism of an unclean spirit (Mk. i. 21-25 ; Lu. iv. 31-35); (2) the account of Jesus retiring to a solitary place, when He declares that He must carry the gospel elsewhere (Mk. i. 35-89 ; Iu. iv. 42-44); (8) the saying of John the son of Zebedee, ''Master, we saw one casting out devils in Thy name, and we forbade him," and the reply of Jesus (Mk. ix. 38-40; Lu. ix. 49, 50); (4) the short denunciation of the Pharisees that devour widows' houses (Mk. xii. 38-40; Lu. xx. 46, 47); (5) the story of the widow's mite (Mk. xii, 41-44; Lu. xxi. 1-4). Shorter similarities are—(6) a mention of Jesus as being in retirement (Mk. i. 45; Lu. v. 16); and (7) a mention of '"Tyre and Sidon" as places to which the fame of Jesus had spread (Mk. iii. 8; Lu. vi. Dy There is a close verbal agreement between Mark and Luke in

the exorcism of the “ legion” (a name that does not occur in Mark) : in the raising of the daughter of Jairus ; and in the stilling of the storm. But gradually as Matthew approximates to Mark, Luke deviates from Mark. There is a return to similarity in the pre- paration for the Passover (Mk. xiv. 12-16; Lu. xxii. 7-18) ; but from this point Luke deviates more and more, and, with the

exception of two words (crdois and ¢évos) in the incident of

Barabbas, and of a somewhat eloser approximation in the incident of Joseph of Arimathea, it may be almost said that Luke has

1 In the words of the Lord the three Gospels are often closely similar, but seldom in the deeds.

(as well as the double tradition of Matthew and Mark, ee.

and of Luke and Mark) has consisted mostly of short “‘words of the Lord,” set in a framework of short narratives, and very seldom agreeing exactly for more than seven or eight consecutive words. But we now come upon “ words of the Lord” in Matthew and Luke, some of which agree exactly for several sentences. What was the origin of this close agreement? In order to gain some view of the data for solving this problem, we must briefly consider the principal passages common to Matthew and Luke alone.

The temptation (Mat. iv. 1-10; Lu. iv. 1-12) and the healing of the centuriog’s servant (Mat. viii. 1-13; Lu. vii. 1-10) are the principal narratives of fact common to Matthew and Luke alone. They resemble the narra- tives of the Triple Tradition in agreeing so far as con- cerns the words of Jesus, and of those who address Him, much more than in the general narrative. In the narra- tive of facts, the story of the centurion in Luke differs altogether from that in Matthew; in the temptation, the difference is less. Dismissing these, we pass to the “words of the Lord.” As Luke’s avowed object was to write “in order,” we will adhere to his arrangement in our enumeration.

(1) Mat. iti, 8-10; Lu. iii. 8, 9. ‘Generation of vipers,” &c. ; this agrees verbatim, except that Luke has &ptno6e, where Matthew has défyre.

(2) After a break in which (Mk. intervening) Matthew and Luke have no more than a general agreement with Mark and one another, we come to another passage describing the purifying of the threshing-floor with fire unquenchable (Mat. iii. 12 ; Lu. lii. 17); the two agree verbatim.

(3) Mat. v., vi., vii.; Lu. vi. Here are some scattered sayings of the Sermon on the Mount, such as, ‘‘ Blessed are the poor,” “the hungry,” &c. In these the agreement is not verbatim. The only passage that agrees almost verbatim is that about the mote and the beain.?

(4) Mat. xii. 35; Lu, vi. 45. ‘The good man out of the good treasure of his heart,’ &c., nearly verbatim, but curiously trans- posed to suit the differing context.

(5) Mat. xi. 2-11; Lu. vii. 19-28. John the Baptist sends two of his disciples to say, “Art thou He that is tocome?” With the exception that Luke (a) introduces some cures wrought by our Lord, for the special purpose of convincing John’s disciples, and (b) avoids the repetition of év padakots iyarios by using ev tuatioup évddtp, this passage shows an agreement almost verbatim.

(6) Mat. xi. 16-19; Lu. vii. 831-35. ‘‘ We have piped unto you, and ye have not danced,” &c., almost verbatim, except that Matthew has érdWaode, Luke éxaadcare.

(7) Mat. (a) ix. 37, 88, and (6) x. 16; Lu. (a) x. 2, and (bd) x. 3. (a) ‘The harvest truly is great,” &c. ; (b) “I send you as sheep among wolves.” The agreement, though not verbatim, is considerable. But note (a) that Matthew takes the prayer for the increase of the labourers, as a preface to the choice of the twelve, while Luke places it after the choice of the twelve, and uses it as a preface to the choice of the seventy, an incident which he alone records; (b) Luke applies to the seventy the warning against danger which Matthew applies to the twelve.

(8) Mat. xi. 21-25 ; Lu. x. 12-15. ‘‘ Woe unto thee, Chorazin ;” almost verbatim, except that where Matthew has raraBjoe, ‘thou shalt come down,”

Luke has (if the reading be correct) xara- BiPacOhee:, ‘thou shalt be brought down.”

(9) In Matthew no interval occurs between the last and the fol- lowing passage ; but in Luke intervenes (x. 17-20) the return of the seventy, and a mention of a vision in which Satan was seen falling from heaven, together with the imparting of a power to tread on serpents (compare the late appendix to Mark’s Gospel, xvi. 18); then comes Mat, xi. 25-28; Lu. x. 21-22, ‘‘I thank thee, Father, Lord of heaven and earth,” &c. There is but a trifling exception to the agreement. Note also that Luke apparently con- siders the two sayings which are continuous in Matthew to have been discontinuous, for between vers. 21 and 22 he inserts (so Lachmann, Tischendorf, and Tregelles) ‘‘and turning to His disciples, He said.”

(10) Mat. xiii. 16,17; Lu. x. 28, 24, ‘‘ Blessed are the eyes,” &c. ; here, again Luke inserts his usual note of a discontinuous saying by inserting ‘and turning to His disciples, He said privately.” Matthew ére@tunoav, Luke 70éaAncay; Matthew dla, Luke Baotrcis. Otherwise verbatim.

(11) Mat. vi. 10-18; Lu. xi. 2-4. The Lord’s Prayer. Here, where (if anywhere) we should expect identity, there is consider- able difference. Luke, after Idrep, omits (a) nuav 6 év Tots obpayors, and (b) yevnOhra 7d OéAnud ov, ws ev ovpayG Ral én) Tis vis. Further, Luke substitutes © df50v for 50s; (d) 7d Kad’ nuépoy for ohpepov; (¢) Tas Gpaprias for ra dperAqpata; (/) &plouer for aphraper; (9) mdvrs TH dpetaoves for Tots dpetAéraus hav; and he also (h) omits the clause 4AAG pica juas ard Tov Tovnpov.

If any words of the Lord have been handed down by oral tradi-

1 It is noteworthy that, whereas Matthew explains “poor” or ‘‘hungry ” spiritually, ‘‘ Blessed are the poor in spirit; . . . Blessed are they that hunger and thirst after righteousness,” Luke, on the other hand, gives these sayings without Matthew’s explanations, ‘* Blessed are ye poor; blessed are ye that hunger now.” It is pos- sible that Luke lays greater stress than any of the other evangelists on the sin of covetousness (see the parables of Lazarus and Dives, the ‘rich fool,” the narrative of the “‘ would-be heir,” &c. ; and note also the evident gratification with which the author of this Gospel

records in the Acts (iv. 82) the communism of the early church in Jerusalem) ; and this might predispose us to attribute Luke's rejection of the spiritual niodification of these words to doctrinal grounds. But it must be borne in mind that the tendency in the history of the Gospels js everywhere to accretion and addition, rather than to rejection, so that shorter forms are generally more likely to be genuine than longer forms. Moreover, clsewhere Luke (xiv. 26) retains a stronger form of the words of Jesus, "If any man man hate not his father and mother," while Matthew (x. 37) has a weaker one. On the whole, therefore, it is more probable that Luke, in omitting the words, 'after righteousness," &c., represents the letter of the original words of Jesus more closely than Matthew (as perhaps also in the Lord's Prayer, see below), however much the latter may better represent the spirit of them.

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tion, the Lord's Prayer would seem necessarily to have handed down, and from tlic earliest ies Interval ome also leaves little doubt that here oral tradition, and not a Br ment, is the origin, and that Luke represents the original sce closely in his omissions, though not in his changes, If the Lord's Prayer had been early committed to writing, and had contained Matthew's additional clauses, it is inconceivable that Luke should have omitted them. The same tendency which led a later generation to insert (and us in modern times to retain) the interpretation, '' For thine is the kingdom, the power, and the glory," &c., would no doubt in the earliest times favour the inser- tion, rather than the rejection, of any appropriate clauses that had once gained a footing in the prayer. The abruptness of the simple Mdrep, which is distasteful to us, as implying too great familiarity would naturally commend to the early church Matthew's (a) inser- tion. Matthew's second insertion (b) is no less natural. It, or some- thing much like it, is found in 1 Mac. iii. 60, '' Whatsoever be His will in heaven, so let Him (or will He) do" (ds 8 &y # Oéanua év odpav@, ottws momoet) ; moreover, Luke himself assigns very similar words to our Lord Himself, xxii. 42 (uh 7d @éAnud pov GAAG Td ody yiweoOw), and to the friends of St Paul (Acts xxi. 14) The fact that our Lord Himself used this prayer may have seemed sufficient cause in the earliest times, and especially to Matthew who is in the habit of massing together doctrine of a certain kind, as in the Sermon on the Mount, for inserting it in the Lord's Prayer. (c) Luke's change of the aor. imperative into a present im- plies a desire to represent a continuous and not an isolated action, and (d) the change of ojpepov into ka 4uépay is explicable by the same motive. The word ériodoios, common both to Matthew and Luke, and not found elsewhere in the whole of Greek literature, seems to indicate that a Greek tradition, and not an Aramaic tradition, of this prayer, was the basis of both Matthew's and Luke's version. It is probably derived from 4 émotoa (Prov. xxvii. 1, ob yap oldas wi rékerat emiovoa (Di), ''Thou knowest not what the day will bring "), and, probably (though this is disputed), means " for the immediate future, the instant."! This meaning is consistent both with Matthew's ofpepov and with Luke's 7d ka tuépay. Luke's next three changes, (d), (¢), and (f), substitute the more intelligible word "sin" for the less intelligible '' debt,'

and the more intelligible present ‘‘ we forgive” for the less intelligible past ‘‘we forgave ;” and increase the emphasis by adding ‘‘ every one (that is our debtor).” In all these cases Matthew’s seems to be the earlier form ; for it is more likely that the comparatively difficult version of Matthew should have been altered into the comparatively easy version of Luke than wice versa. Besides, the retention of the metaphorical épefAovr: by Luke, in the second clause, indicates that the metaphor of ‘ debt,” appeared in the original (9). Matthew’s insertion of the clause “ deliver us from the evil” may naturally have arisen from the reluctance to end a prayer with a negative petition, “lead us not into temptation.” The inserted clause resembles many passages in the Psalms (xvii. 49, LXX.; A.Y. xviii. 48, ad avdpds ddlxov Puan we), and early commended itself to the church (2 Tim. iv. 18). In any case, there is no reason why Luke should omit such a clause, if it were known to him; and there are many reasons why such a clause should be introduced (even though it were not in the original), and why, when introduced, it should be speedily accepted. ‘To sum up the inferences from this most important passage: the variations (and the nature of the passage) indicate a source oral and not documentary, Greek and not Aramaic ; Matthew appears to have massed together a number of prayers taught by, or perhaps used by, the Lord Jesus, while Luke seems to have adhered to an earlier form, which, however, has received late modification for the purposes of daily use. Though, however, we may follow Luke here, as more closely ap roximating to the original form of the prayer, it does not result that on this account we must commit ourselves to the statement that the Lord’s Prayer was actually given at the exact time, and in the exact manner, which Luke describes, Justas Matthew supplies grouping, so Luke supplies motives and occasions. Often it may be more probable that the grouping and continuity of Matthew may be closer to the historical fact than the attempt at orderly arrangement, and at assignment of motive and cause and time, which characterizes Luke. Instances of this will be given hereafter. ; (12) Mat, vii. 7-12; Lu. xi. 34-36. ‘‘ Ask, and it shall be given unto you,” &c. Luke prefaces this by a patable peculiar to him- self, and of a peculiar type,—the argument being that if an indolent man grants requests, influenced by mere importunity, much more will the perfectly good God listen to earnest, pry™™ There is no reason, in the style or thought of this and similar parables, for supposing that we have the exact words of Jesus. Luke inserts in the part common to him and Matthew : about an ‘‘ege and scorpion ;” and where Matthew has *g00

1 There appears to be a reference to the manna which (Exod. x¥l- 4) the people of Israel were to gather from day to day. So Philo, Alleg,, iii. 57, “* Let the soul therefore collect the food of the day for the day (7d rhs Hucpas eis nucpay).”

INTERNAL EVIDENCE. |

things” Luke has ‘the Holy Spirit.’ the agreement is nearly verbatim.

(18) Mat. vi, 22-23; Lu. xi. 9-18. ‘The light of the body is the eye.” Similar in the first part; but varies (seemingly through confusion) towards the end.

(14) Mat. xii, 80, 48-45; Lu. xi. 238-26. ‘‘He that is not with Me is against Me, and he that gathereth not with Me seattereth,” followed by ‘‘When tho unclean spirit gocth forth from the man,” &c., nearly verbatim, but apparently better placed by Matthew than by Luke, who has transposed the passage into the neighbourhood of the discourse on Beelzebub, moved possibly by the superficial resemblance of subject (*‘unclean spirit’ and ‘‘Beelzebub”), not perhaps perceiving that it is the climax of a condemnation of ‘‘ this evil generation,” which last words (Mat. xii. 45) Luke omits.

(15) Mat. xii, 41, 42; Lu. xi. 31, 82. ‘‘The qneen of the south shall rise up,” &c. The queen of the south is placed by Luke before, by Matthew after, the ‘‘men of Nineveh;” and in one of the clauses (very curiously, but perhaps with a desire to bring out the antithesis between the ‘“‘ women’ and the ‘‘men”) Luke substitutes ‘‘ the men of this generation” for ‘‘ this genera-tion,” aud ‘‘them” for ‘‘it.” Otherwise the agreement is almost verbatim.

(16) Mat. xxiii. 28-39; Lu, xi. 37-52. A denunciation of those who tithed mint and anise, yet were the true children of the murderers of the prophets. Matthew makes this a part of a long and public denunciation of the Pharisees, in Jerusalem; Luke Fae it early, and as an utterance in the house of a Pharisce,

is host. It is certainly remarkable that here, and nowhere else, a Pharisee is addressed in the singular number, “Thou blind Pharisee” (Mat. xxiii. 26). The “ Pharisee” is clearly generic ; but if the use of the singular were

misunderstood, it might originate a tradition that the speech was delivered to a single Pharisee, in whose house Jesus was dining ; and though Luke does not insert the ‘‘ Pharisee,” he may have been influenced by this traditional misunderstanding. Internal evidence is here strongly for Matthew’s, and against Luke’s place and time. Luke has pro- bably been led to place this discourse at the table of a Pharisee, by the metaphor of the ‘‘cup and platter.” But the metaphor suits Matthew’s version equally well; and it is in defiance at once of good taste and probability, to attribute to Jesus such a denunciation of a host at his own table, and to place it so carly in our Lord’s ministry. The use (Lu. xi. 89) of 6 Kupios (see below, 22) makes it probable that this is a late tradition ; and, if it is rejected, there falls with it an accusation brought against Jesus, of neglecting the decencies of life, by coming to a repast with un- washed hands. The agrecment is here by no means verbatim ; and, besides other differences, Matthew has 7d évrds xaOdpicov, where Luke has ra évdvra Sdre cAenuoctyny (a change, as in the Lord’s Prayer, from the metaphorical to the real), The original and Judean expression gogovs kal yaaupwatets Luke alters into the Christian a&mrordaous ; he also omits the sonicwhat difficult orav- pécere. It is especially noteworthy that, whereas in Matthew Jesus says, ‘‘ Wherefore, behold J send unto you prophets,” &c., in Luke Jesus says, ‘‘ Wherefore, also the Wisdom of God said, 1 will send unto them prophets,” &c. Here Luke probably represents the earlier form, although the explanation may be doubtful. It is possible that the book containing the ‘‘words of the Lord,” from which Matthew and Luke borrowed this saying, gave to Jesus the name of ‘‘the Wisdom of God” (ef. 1 Cor. i. 24, ‘Christ the Wisdom of God”), and that this title was retained by Luke, but applied, uot to Jesus, but to the divine providence. Matthew adds to Zachariah the words ‘‘son of Barachiah;” Luke omits them. Here again Luke probably represents the earlier tradi- tion. The Zachariah here mentioned was the son of Jehoiada. But Matthew, whose manner it is to lay especial stress upon all matters connected with the prophets (Schenkel’s Bibel-Lexicon, “‘Sacharja”), having in his mind either Zechariah, the sou of Jebe- rechiah (Is. viii. 2), or Zechariah the prophet, the son of Berechiah (Zech. i. 1), inserted the erroneous words, The agreement here ig by no means verbatim. Matthew makes the utterance continuous, but Luke (xi. 45), introducing a remonstrance from a “lawyer,” turns the denunciation from the Pharisees to the ‘‘ lawyers.”

(17) Mat. x. 28-31; Lu. xii. 4-8. ‘‘Fear not them which kill the body,” &c. Instead of Matthew’s “shall fall to the earth without your father,” Luke has the more general phrase, ‘‘is for: gotten in the presence of God.” In other parts of the passage there is considerable dissimilarity.

(18) Mat. x. 32, 838; Lu. xii. 8, 9. ‘* Whosoever shall confess me before men,” &c. Not verbatim. Besides other differences, instead of Matthew’s Zumpoo@ev rob marpds wov, Luke has fumpoodev or evamioy Tay dyyéAwy Tod Geod twice. This expression occurs in another passage peculiar to Luke (xv. 10), and nowhcre else.

(19) Mat. vi. 25-84; Lu. xii. 22-34. ‘‘ Wherefore I say unto you, Take no thought,” &c. This is the second passage (see above, Mat. xxiii. 34; Lu. xi. 49) common to Matthew and Luke, intro. duced by ‘‘ wherefore,’ though the context is different. Matthew

With these exceptions,

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(vi. 25) introduces the passage by a single sentence, to the effect that no one can serve two masters, God and mammon. Luke, on the other hand, after narrating the refusal of Jesus to become a ‘‘“jurdge or a divider,” and after describing in language and thought peculiar to himself (for to Luke alone belong the parables of soliloquy) the death of the rich fool, continues thus: ‘‘ And He said unto His disciples, Therefore I say unto you, Take no thought,” &c. The comparison of this passage is most useful as illustrating the difference between Matthew’s and Luke’s hand- ling of their subject matter, and also as throwing light on the object (and perhaps on the origin) of many of the parables peculiar to Luke. They seem intended as tales to prepare the way for some famous saying of the Lord as the conclusion and moral. The agreement in language here is not verbatim. Besides other differences, Luke changes the mwerewd rod ovpavov into xédpaxas, moved perhaps by the memory of the ravens, for whom God ‘‘provideth food” (Job xxxviil. 41; Ps. exlvii, 9). But Luke’s kal wh MerewpiCeade, instead of 4 7)

mepiBarwucba, suggests some difference of original text, or some different rendering of the same original rather than a mere alteration,

(20) Mat. vi. 19-21; Lu. xii. 88, 84. ‘Lay not up for your- selves treasure,” &c. There is little exact similarity of language here, except in the last sentence.

(21) Mat. xxiv. 42-51; Lu. xii. 39-46. “ But know this, that if the goodman of the house had known,” &c. In Matthew this sentence comes towards the end of a long discourse on the second coming, uttered in Jerusalem ; in Luke it is spoken in Galilec, and it is preceded by a passage peculiar to Luke, and reminding one of the Epistles; ‘‘Let your loins be girded about, and your lights burning,” &c. With the exception of Matthew ecface, Luke apiixe (probably the original word), the passages agree almost verbatim.

(22) Mat. xxiv. 45; Lu. xij. 42. ‘‘ Who then is the faithful and just,” &c. Here there is precise agreement, except where Luke

as altered the text with an object. Finding this parable, in the book or tradition from which he extracted it, connected with the name of Peter, and desiring to distinguish the “steward” or upper “servant,” wha is placed over the household, from the common slaves, he (a) inserts a question of Peter, ‘‘Speakest Thou this parable unto us or even unto all?” (b) alters the first So0A0s5 (‘‘slave”’) into oixovdéuos (‘‘steward”); (c) alters oixerelas (“‘household,” the true reading of Matthew) into a word with somewhat higher associations, epamelas (‘‘ suite” or “ retinue”) ; and (d) changes ouvdovdous (‘‘ fellow-slaves”) into “the man- servants and maid-servants.” One or two other changes are also made (uevoreo@ai and re) to improve the text. Luke’s o:ronérpioy and ariorwy, for Matthew’s tpophy and broxpirév, might be early variations arising from the varying translation of some Aramaic original. There remains the curious fact that, in introducing this parable, Luke uses the rare Kipios (used not as a vocative in speech of address, but in narration), instead of “Inoods: ‘* The Lord said unto Peter,” This is an almost sure sign of a late addition to the Gospels, often of an interpolation. The word Képios is not used once thus in the correct text of Matthew. It is not used once in the genuine Mark ; but it is used twice in the short inter- polated appendix to Mark (xvi. 19, 20), In Luke it is used about twelve times, always in prefaces or other passages

peculiar to Luke, and of these twelve passages three are connected with Peter (xii. 42; xxii, 81; xxii. 61). ;

(23) Mat. x. 34-86; Lu. xii, 51-55. ‘‘Think ye that I came to send peace on earth?’’ The agreement is not verbatim, and suggests two independent translations from an Aramaic original. Instead of Matthew’s udxaipay, ‘‘a sword,” Luke has diapepiopdy, ‘¢division.” This might either be the divergence of translators (so 19N is translated in the LXX. both wayaipaand wéAeuos), or it might be a mannerism of Luke (cf émoiriopdy, ix. 12; tnariope, vii. 25; ix. 29, where Matthew has severally Bpduara, padand, and india). ed Mat. v, 25, 26; Lu. xii. 58, 59. ‘‘ Agree with thine adversary,” &c. This passage is not verbatim in Matthew and Luke, except in the last sentence. The word trayew in Luke (which Luke as a rule systematically alters or omits whenever it is found in the common tradition of Matthew and Luke [see Mk. i, 44; ii, 115 x. 215? xiv. 21]) indicates that therein Luke is following some early tradition: but k«aractpn, mpdxrwp, and Aewrev (Luke’s ‘‘ half-farthing,” instead of Matthew’s ‘‘ farthing”) seem all later touehes added to give graphic variety and climax.

(25) Mat. xiii. 833; Lu. xiii. 21. ‘‘The kingdom of heaven is like unto leaven,’ &, Nearly verbatim.

(26) Mat, viii, 11, 12; Lu. xiii. 28, 29. ‘‘Many shall come

1 It is curious that, in the only passage where Luke agrees with Mark in reading imdyere (Mk. xi. 2; Lu. xix. 30), Matthew differs (xxv. 2), using the word mropetec@ai. There may be noted a general tendency of Luke to diverge from Mark, and of Matthew to diverge from Mark, wherever Mark agrees exactly with the narrative (as dis- tinct from the words of the Lord) in Matthew and Luke respectively.

from the east and the west,” &c. In Matthew these words are uttered by Jesus as a comment upon the marvellous faith of the centurion. In Luke they follow a parable peculiar to himself. The clause ‘‘ there shall be weeping and gnashing of teeth ” (which, except in this instance, is peculiar

to Matthew) is transferred from the end to the beginning ; and there are other variations, seem- ingly purposed. The agreement is far from verbatim.

(27) Mat. xxiii. 87-89; Lu. xiii. 84,35. ‘‘Jerusalem, Jerusalem,” &c. This is a conspicuous instance of the manner in which Luke has sometimes deviated from the true chronological order. He represents these words to have been uttered in Galilee, when the Pharisees warn Jesus to flee from fear of Herod. But Matthew represents them as having been uttered in Jerusalem, and in the temple. The reason for Luke’s transposition is possibly contained in the last words, ‘‘Ye shall not see Me till the time come when ye shall say, Blessed is He that, cometh in the name of the Lord.” Now these very words, ‘‘ Blessed is He,” &c., were uttered by the crowd welcoming Jesus on His entrance into Jernsalem (xix. 39). Luke therefore, regarding the words of Jesus, ‘‘ Ye shall not see Me,” as a prediction necessarily preceding its fulfilment, is bound to place these words before the entry of Jesus into Jerusalem. But all internal evidence is on the side of Matthew’s order, and against Luke’s. The agrecment is very nearly verbatim, but Luke (whose arrangement does not require the word) dispenses with the ‘‘henceforth” of Matthew.

(28) Mat. xxii. 1-14; Lu. xiv. 15—24, ding feast. These parables differ entirely in language, and some what in thought. In Matthew those who are first invited slay the messengers, and are slain by the king; and, among those who are

The parable of the wed-

subsequently invited, one is rejected for being without a wedding | In Luke the guests are simply discourteous, and the |

garment, host merely invites others (the poor and the maimed, and then the wanderers in the streets) in the place of the first, Matthew’s parable is therefore political, Luke’s social. Note, however, that in the parable of the

there omits it. Clearly no common document nor even detailed tradition originated these parables. They are rather (as also are the parables of the talents and the pounds) of the nature of sermons or stories based upon short

‘“‘words of the Lord” as. texts. It is obvious that Matthew lays special stress upon the exclusion of the unfit intruder, Luke upon th

world.

(29) Mat. x. 87-89; Lu. xiv, 26, 27. ‘‘He that loveth father and mother more than Me,” &c. In Matthew these words are addressed by Jcsus to the twelve in Galilee; in Luke to the multi- tude following Him during His journey to Jerusalem. Here Luke seems to have preserved the older (because more difficult) form of the tradition: ‘‘ Whosoever hateth not ’ (Marcion altered pice? into karadelme:) ‘his father, ...,. yea, his own life also,” &c. It seems more probable that this was the original form than that Luke intensified the form by any alteration of his own. There is scarcely any agreement of language between Matthew and Luke here.

(30) Mat. xviii, 12-14; Lu. xv. 4-7. ‘What man having an hundred sheep,” &c. The thought is the same, but there is scarcely any similarity of language; and even the conclusion characteristically differs, Matthew having ‘‘it is not the will of your Father in heaven that one of these little ones should perish ;”’ Luke having ‘‘there is joy i heaven over one sinner that re- penteth.” The contrast between the negative (‘‘ not the will ’’) aud the positive (“joy”), between the ‘‘non-perishing” and the ‘‘re- penting,” is typical of the contrast between the whole of Matthew and the whole of Luke.

(81) Mat. vi. 24; Lu. xvi. 18. ‘‘ No (servant) can serve two masters,” &c. With the exception of ‘‘servant ” added by Luke Ee ene this saying is the same verbatim in Matthew and

uke.

(82) Mat. xi. 12 and v. 18; Lu. xvi. 16,17. ‘‘The law and the prophets were till John,” &c., and ‘‘ Not one tittle shall pass from the law.’’ There seems little connexion in these sayings as they stand in Luke, and there is very little similarity af language between Matthew and Luke.

(88) Mat. xxiv. 26-28, 37-41; Lu. xvii. 23-27, 34-87. These are scattered sayings on the second coming, likening it to the ‘“‘days of Noah” and to

“‘lightning,” and predicting the sever- ance of those who arc “‘at one mill” and ‘‘in one bed.” Luke, after his manner, introduces a question, ‘‘ Where, Lord?” to which the reply comes, ‘‘ Wheresoever the body is, thither will the eagles be gathered together.’’ Matthew, on the other hand, introduces the sentence in the midst of the discourse, ‘‘So shall also the coming of the Son of Man be, for wheresoever the body is,” &c. The agreement of language is not considerable, except in the last part.

(84) Mat. xxiii, 12; Lu. xviii. 14, and xiv. 11. ‘‘ Every one that exalteth himself shall be abased,” &c. This again furnishes a striking instance of the manner in which Luke utilizes words

ounds (Mat. talents, xxv.), Luke intro- | duces (xix. 27) the missing political element, whereas Matthew |

e inclusion of all the |

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of the Lord as texts for discourses. The saying is introduced by Matthew in the midst of the discourse against the Pharisees ; but

it is made by Luke the conclusion and moral of the parable of the ‘ publican and the Pharisee, and of the discourse on choosing the

lower room.

(35) Mat. xxv. 14-30; Lu. xix. 1-28. The parable of the talents or pounds. There is no similarity of language, except in the dialogue between the idle servant and the master. Luke, after his manner, inserts a question from the bystanders (“ And they said to him, Lord, he hath ten pounds”); and Luke here, as Matthew above (28), introduces a political element, making’ the master a king, and narrating a royal vengeance.

In the consideration of the passages quoted above, one fact strikes us at once, that the Lord’s Prayer is not verbatim, the same in Matthew and Luke.

If this is not identical, it might be thought that we cannot expect any words of the Lord to be identical. And indeed, as a matter not cf hypothesis but of fact, those words which have most strongly appealed to men's hearts, and have been most frequently on their lips, from the earliest times of the church ; those say- ings which have given the tone to Christian life, which have encouraged martyrs, and stimulated waverers, such as (17), ''Fear not them which kill the body ;" (18), " Whosoever shall confess," é&c.; (29), '' He that loveth father or mother more than Me," &c.—all these, though identical as regards thought, and similar as regards words, are nevertheless not exactly similar in Matthew and Luke, The exactly similar passages are of a very different nature: they are for the most part passages of a prophetic or historical rather than a doctrinal character with application to individuals. Some, (1), (2), (5), (6), describe the relations between John

the Baptist and Christ ; another, (8), calls down woe on

Chorazin ; another, (9), in language that reminds us of the thoughts, though not of the words, of the Fourth Gospel, thanks God for revealing to babes what He has hidden from the wise and prudent; another, (27), pours forth lamentations over doomed Jerusalem. All these passages, dealing as it were on a large scale with the will of God, as it affects religions and nations rather than as it affects individuals, are better fitted for reading in the services of the church than for being transmitted from mouth to mouth in the family from father to son, or from catechist to catechumen, for personal and individual guid- ance ; and consequently they seem more likely to have been handed down in a book than by means of oral tradition. The same conclusion applies to (21), " But know this, that if the goodman," de. and to (22), " Who then is the faithful and just steward," é&c.—both of which passages agree verbatim, and both of which appear to have an ecclesiastical rather than an individual reference, at all events in their primary application, In proportion as a rhetorical passage limits itself to individual application, it seems to have been modified by oral tradition so as to deviate from exact agreement : compare in (3) the "mote and the beam ;" also (12), "Ask, and it shall be given unto you ;" and (19), "Take na thought for the morrow." The only exception perhaps to this rule is in the denunciation of the Pharisees (16). This passage, being of the historical type, ought (according to our rule) to be identical; but Luke differs from Matthew considerably.

Possibly, in the earliest days of the church, and especially in the synagogues of Pales- tine a few years after the death of Christ, the angry con- flicts between the disciples of the Lord and the Pharisees

may have frequently reproduced and modified by tradi-

tional influences the original form of our Lord's denuncia- tion; so that perhaps this subject comes naturally under the head of traditional doctrine. It must also be remem- bered that, as Luke approaches the later period of the work of Christ in Judea, he deviates more and more both from Matthew and from Mark; perhaps because there was a Judean as well as a Galilean tradition of the life i Jesus, and Luke, in the latter part of his history, dependes

mainly on the former. These two considerations may ex- plain the deviation of Luke from Matthew in the denuncia- tion of the Pharisees.

That the parables should diverge is natural. Their length and number would prevent them from being remem- bered, or passed from mouth to mouth, with the same fidelity with which the shorter words of the Lord would be preserved ; and as they were probably often repeated by Jesus in varied shapes, no one particular shape of any parable would seem to claim a, place in the written docu- ment of the words of the Lord, as being of the same import- ance as the " Woe to Jerusalem," or the other strains of poetic prophecy. The parable of the sower, coming first in order, and being typical of the rest of the parables, and having appended to it an explanation of the motive of the parabolic teaching, would naturally attract attention from the earliest times, and consequently it found a place in the Triple Tradition; but this privilege was accorded to no other parable. There is therefore no ground whatever for infer- riug from the discrepancy of the language of a parable in Matthew and Luke (¢.g., the parable of the lost sheep) that it was not actually uttered by Jesus. The exact similarity of thought and sequence of incident in that parable, as re- corded by Matthew and Luke, proves to demonstration that the two records are derived from one source,

The following are our conclusions therefore about the addi- tions to the Triple Tradition made jointly by Matthew and Luke. (1.) Their omission by Mark furnishes no argumeut for their rejection, inasmuch as Mark also omits the Lord's Prayer, and obviously aims at narrating the acts rather than the sayings of the Lord. (2.) Of the additions, some appear to be based upon common tradition, or on documents modi- fied by tradition, —principally those short trenchant sayings (including the Lord's Prayer) which are of a universal and private application, (3.) Others appear to be based upon a common document; and in these documentary additions (as perhaps to some extent in the rest) Luke seems to have modified the original tradition, in words and phrases, with a view to purity of style and intelligibility, or to re- move difficulties, (4.) In chronological order and arrange- ment Matthew and Luke pursue divergent paths; Matthew's object being to group and mass the teaching of the Lord, while Luke aims at supplying motive, occasion, place, and time for each utterance. It is scarcely possible to doubt that the arrangement of neither is to be implicitly adopted. There is much reason to doubt whether what is called the Sermon on the Mount was actually delivered at one time in the shape in which Matthew presents it ; and itis equally questionable whether the lamentation over Jerusalem was delivered in a village of Galilee, and whether the denuncia- tion of the Scribes and Pharisees (as murderers, on whom should be avenged all the innocent blood shed from the beginning of the world) was uttered at the table of a Pharisee. (6.) As regards the parables, we have to de- pend—in our conjecture as to the degree to which the thoughts of Jesus have been preserved—mainly upon the presence in them of the same spiritual power and insight which are perceptible in His other recognized genuine say- ings. But the dissimilarity of the language of the parables in Matthew and Luke (where the thought is the same) gives no ground for denying that parables on the same subjects, and to the same effect, were actually delivered by Him. (7.) Since the hypothesis that Luke borrowed from Matthew is untenable, and since therefore we must suppose that Matthew and Luke borrowed these additions independently from some early document, we may infer that, before the times of Matthew and Luke, a document containing words of the Lord had existed long enough, and had acquired authority enough, to induce two editors or writers of Gospels, apparently representing different schools of thought

and writing for different churches, to borrow from it inde- pendently.

This last conclusion is of the greatest importance ; for though the document may be, and almost certainly was, later than the Triple Tradition, yet it would have the advan- tage of preserving the original utterances of the Lord com- paratively unimpaired by traditional transmutations. When to this consideration is added the authoritative nature of the words of the Lord in this document, their direct refer- ence to events, and the extreme improbability that any dis- ciple would have, or could have, invented them, —for which of the apostles or subordinate disciples could have invented the discourse on “the lilies of the field,” or the lamentation over Jerusalem, or the speech which likens John to “a reed shaken by the wind,” and pronounces him the greatest of the prophets, yet less than the least in the kingdom of God?— we are led to infer that in all probability we have in these additions of Matthew and Luke a very close approximation to some of the noblest and most impressive utterances of Jesus Himself. With the exception of the healing of the son of the centurion, and the narrative of the temptation, the additions common to Matthew and Luke introduce no new supernatural element,

The Additions and Peculiaritées of Mark.—It might Additions be expected that when we come to the additions peculiar peculiar to each of the three synoptists we should find some increase *° Mark.

to the accounts of supernatural events, Now it seems to be a striking proof of the antiquity of the Second Gospel that we find in it no additions of this kind, Not that Mark does not lay stress on what appears to be super- natural ; on the contrary, he records acts of instantaneous healing with greater minuteness of detail than any other evangelist (vii. 31-37; viii. 22-96; ix, 14-27); but we find in Mark no mention of our Lord’s birth or child- hood, and only the barest prediction of His resurrection, As an explanation of the deficiency of information on the resurrection, it has been frequently suggested that the latter part of the Gospel may have been lost; and, less frequently (Weiss, Marcusevangeliwm, p. 511), that the Gospel was

deliberately closed with the prediction of the resurrection by the mouth of an angel, because “the mani- festations of the risen Saviour belong (according to the earliest notions) no longer to the earthly sphere of the action of Jesus, and therefore do not fall within the province of the Gospel.” Few Greek scholars, however, will be induced to believe that the author of the Second Gospel deliberately chose to end a book on the good news of Christ with the words époBotvro ydép. From a literary point of view the yap, and from a moral point of view the ill-omened édofoivro, make it almost incredible that these words represent a deliberate termination assigned by an author to a composition of his own. Others have suggested that the last page of the MS. may have been accidentally de- stroyed, But this suggestion seems to overlook the con- sideration that the MS. was in all probability written not for a private library but for use in the church, and that it would immediately be multiplied by copies, Again, we know, from reference to Mat. xxviii. 8 and Lu. xxiv. 3, that the common tradition ceases with the return of the women from the Lord’s tomb, But it is precisely at this point that the genuine Mark (xvi. 8) also terminates. Now, that a page should have been torn out containing Just that part of Mark which followed after the close of the common tradition would be a most remarkable and unlikely coincidence. It seems far more probable that Mark ends his Gospel here because the common tradition ended here, and because he scrupled to add anything to the notes and traditions which he knew to rest upon a higher authority than his own. If this be the true explanation, it stamps with the seal of a higher authority such traditions X, — 101

as have been preserved to us by so scrupulous an author. We proceed therefore to an investigation of the peculiarities of Mark, with a confidence in him increased rather than diminished by the fact that he has neither the introduc- tions nor the appendices which are found in the rest of the Gospels.

The first thing that strikes us in Mark is his duality. Verbosity we might be tempted to call it at the first sight ; but though there is a certain disproportion in the space assigned to detail, duality, and not verbosity, is the better word. It is this duality which gave rise (see above, p. 789) to the

erroneous supposition that Mark had bor- rowed from Matthew and Luke. But it may be shown, by reference to passages where there can be no possibility that Mark borrowed from Matthew and Luke (Mk. ii 195 iit. 5; iii, 27; iii, 22, 30; v. 3,5; xii 44), that this duality is a part of Mark's style. In many cases, ¢9,, ili, 22, 30 (BeeAeBovdA éxeu and treipa dxdOaprov éxet), it is almost forced on the reader that the evangelist had before him two versions of one saying, and that in his "anxiety to omit nothing "! he inserted both. Whether there be any definite traces of translation in his Gospel will be considered here- after. But, so far, we merely note that some of Mark's dualities of expression might be explained as double render- ings of the same original. Only one parable is peculiar to Mark; it is one that illustrates (iv. 26-29) the spread of the kingdom of God by the quiet, unperceived, and gradual growth of corn. The subdued tone of this (one of the most interesting of all the parables) was perhaps the reason why it was not at first widely known, as it un- doubtedly is the reason why modern readers pay it too little attention, Mark also amplifies the story of the Baptist's execution (vi. 20-28), and the graphic story of the exorcism of the "legion." For the rest, the other additions peculiar to Mark consist either of dual expressions and amplifications of detail, or of realistic details which would naturally be subordinated in later times, as likely to be stumbling-blocks. For amplifications which treat of the resistance and ultimate submission of unclean spirits see i. 26, 27; i. 44; ini, 7- 12; ix. 14-27; for others which relate to the crowding of people round Jesus, the publicity of His work, and His desire for solitude, see i. 28; i. 35-87; i 45; ii. 1-4; ii. 15; iii, 10-12; vi. 32-33, &e. The narrative also, from first to last, abounds with expressions as to the manner and look and minute action of Jesus during dialogues or miracles (of, iii. 5; vii, 31-37, viii, 22-26), In many of these additions Aramaic words are given as the very utterances of Jesus, e.g,, V. 41, Tad0d Kotpe3 vil. 34, "Eddada ; xiv. 36, "ABBa; sometimes, also, names that are given by no other writer, e.g., Bartimzeus, Boanerges, and Dalmanutha.? Un- questionably, under ordinary circumstances, this elaboration of unimportant detail® (and especially the introduction of

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1 This is a quotation from Papias preserved by Eusebius (Kirch- hofer, p. 128): ''For he (Mark) took great care about one matter, viz., to omit nothing

of all that (udev dv) he heard." If Papias spoke of our Mark, it would seem that this must refer rather to the words than to the incidents recorded in his very scanty Gospel. It seems to be an apology for the disproportion of the narrative. In writing the narrative just as he took it down in notes (from Peter's discourses) '' Mark," says Papias, '' committed no error," but simply acted as a faithful reporter. We do not, of course, commit ourselves to the truth of this statement; we merely point out that the hypothesis that Mark's Gospel is a collection of " notes," will explain some of the peculiarities of its style.

2 Mark's custom of placing the Aramaic original side by side with the Greek translation is perhaps in part suggested by the Palestinian dialect of our Lord's time, in which (especially in certain phrases) Greek and Aramaic were blended together, as in the phrase '*my Lord," "WD "9, which stands for "12, xupre. See Lightfoot, Galat., p. 167, for this and other instances. But in Mark the reduplication for the most part is confined to passages expressive of strong emotion.

3 Take, as an instance, the wounding of the high priest's servant by Peter, Here Mark (xiv. 47) merely records the wound; Matthew

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"yight'"? ear, and adds that the servant's name was Malchus.

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names—for instances of which see the Apocryphal Gospels passim) is a mark of a late writer, and of a composer of fiction rather than history. But all the characteristics of

Mark support the belief that in his case they are rather the

excrescences and redundancies of one who trusted his memory rather than his judgment, and who preferred to

report rather than to select and arrange. One proof of the early composition of Mark is the rude.

ness and even vulgarity of his Greek. He uses a great

number of words which are expressly forbidden by the grammarians, For example, of Mark's phrase éoydrws exeu (Mk. v. 23), Phrynichus says (ed. Lobeck, p. 389), "only the canaille use it in this sense ;" the same grammarian also warns his readers against xpaBBaros (Mk. ii. 4, 9, 11, 12), Other words noted by Phrynichus, and used by Mark (some of which are also used by Matthew) but avoided by Luke, are povopbadpos (ix. 47); eboynpwv (for aAovovos, xv. 43); koAAvBiorai (xi. 15); Kopdovov (v. 41); dpxilo (v, 7); pdamurpa (xiv. 65); faidos (x. 25).4 Such words as these might naturally find their place in the mongrel Greek of the slaves and freedmen who formed the first congregations of the church in Rome; and they are therefore tokens of a date of composition earlier than that of Matthew and Luke. For it is not conceivable that such terms (some of which would so have jarred upon the ear of an educated Greek as almost to correspond to our " slang") should be substi- tuted in later times for a more tasteful vocabulary; whereas it is easily conceivable, and a priori probable, that better Greek should, in the prosperous days of the church, be substituted for worse.

It is a natural characteristic of an unpractised reporter that he lays undue stress on a few vivid expressions and striking words, and that he reproduces or exaggerates ana- colutha which, though not objectionable in a speech, are inconvenient in a book, because they tend to obscure or subordinate the subject matter. Many such words are inserted by Mark, and avoided by Matthew or Luke, or by both, ¢g., oxCopevors, 1. 10; dyvados, ii. 21; kwpomrodes, i. 38; dvadov, ix. 50. For irregular constructions see iv. 28 (aArpys airos, the correct reading); xii. 40, ot kat éaOovres (altered by Luke); v. 23, tva émiB7js ; note also the curious change of construction from iva to the infinitive in ili, 15, as compared with iii, 14. The Latinisms of this Gospel are well known: see xv. 15, 7d ixavov moujoa; vi. 99, Spa ToAA}; Vi. 27, omekovAdrwp; xv. 39, xevrupiov. The words mpairoprov (xv. 16), xqvoos (xii. 14), and ppayeddovv (xv, 15) Mark shares with Matthew. Other barbarisms are the use of éray with the indicative, and the use of ort to ask a question (ii 16; ix. 11; ix. 28), both of which idioms are common in the Acta Pilati, and perhaps indicate Latin influence.

A still more cogent proof of the early date of Mark is that this Gospel contains many expressions which would be likely to be stumbling-blocks in the way of weak believers, so that they are omitted in the later Gospels, and would not have been tolerated except in a Gospel of extreme antiquity. For example, the strong expression (vi. 5, 6), " He was not able to do there any mighty work ;" the statement (i. 92, 34) that all the sick were brought to Jesus, but that He healed only many, whereas Matthew (viii. 16) says that He healed all, and Luke (iv. 40) that He healed each one (évt éxdoTy) ; cee one ee ee ee

(xxvi. 52) adds the reproof addressed by Jesus to Peter; Luke (xxii. 50, 51) adds that it was the " right " ear, and that Jesus healed the man; lastly, the Fourth Gospel, while omitting the healing, retains : such a case it is impossible to feel certain that the simpler narrative 0 Mark nay not have been modified by later accretions. ' t 4 Such arguments as that " Hippocrates used papts " cannot al for anything against the general feeling of dislike for the ee expressed by the dictum of Phrynichus, "6h Bt padls Ti cori OUK oP

Tis yvoin."

INTERNAL EVIDENCE. |

the attempt of His mother and brethren to lay hands on Him on the ground that He was insane (iii. 20-21); the imputa- tion of an ambitious petition to James and J ohn, instead of (as Matthew) to their mother (x. 35); the mention of the marvel of Pilate at the speedy death of Jesus, which might have been perverted to support those who denied that Jesus had really died upon the cross (xv. 44); the statement that Jesus only gave power to His apostles to cast out devils (iii. 15, correct text), and not (as Mat. x. 1) to heal diseases ; the enumeration of the different stages by which J esus, at least on one occasion, effected a cure, and the description of the, at first, only partial cure (viii. 24); the statement that the fig-tree, instead of being withered up "immedi- ately" (as Matthew, wapaxpjjua, xxi. 19), was not observed to be withered till after the interval of a day ; the bare statement (xvi. 4) that the women found the stone rolled away from the sepulchre (which might have been used to support the statements of those who maintained that the friends or enemies of Jesus had stolen His body),

whereas Matthew (xxviii. 2) distinctly meets such an objection by asserting that an angel descended from heaven in the sight of the keepers and rolled away the stone ;—these, and pro- bably other expressions, indicate a very early date of com- position, and a disposition to record facts as they came, without emphasis or subordination. Mark neither masses similar sayings or deeds, as Matthew does, nor supplies motives and occasions, as Luke does. It is most interesting to note that the words “law,” ‘‘lawyer,” which played so prominent a part in Matthew and Luke, are not to be found at all in Mark’s narrative. His business is simply with the life of Christ. Again, whereas Matthew and (in a less de- gree) Luke are careful to point out that Jesus fulfilled the sayings of the prophets, Mark, on the other haud, though he recognizes in John the Baptist (i. 2) the messenger pre- dicted by the prophets, sees in Jesus a Being too absorbing aud interesting as a man to find much time for contempla- tion of Him as the mere fulfiller of prophecy. In a word, Mark writes of Jesus, not as the destroyer or fulfiller of the law, not as the Messiah predicted by the prophets, not as the refuge of the Gentiles, but rather as a man; subject to anger, and disappointment, and weariness; not knowing all things; not able to do all things; but endowed with strange powers of healing the souls and bodies of men; and carrying out a mysterious plan for the regeneration of the world, through a spirit of childlike obedience to God and brotherly love towards men ; lastly, a man who assumed for Himself and for His disciples a power of forgiving sins, and who based all the success of His plans upon His predicted death and resurrection, to be followed by a second coming,

True, Mark’s Gospel is disproportioned, inartistic, and uncouth —scarcely, indeed, to be called a book, but rather a collection of graphic anecdotes. Yet it has a unity derived from its naive simplicity and single-mindedness, in recording whatever it records as it was delivered from the earliest sources in its entirety; and possibly in that string of anec- dotes the development of Christ’s life and work may be traced with not less clearness than in the ampler and more artistic production of Luke.

The Additions and Peculiarities of Matthew.—The prin- cipal additions to the common tradition contributed by Matthew alone are the following :—

(1) i. 1-17, the genealogy of Jesus from David ; (2) i. 18-25, the annunciation, and the dream of Joseph ; (3) ii. 1-12, the adoration of the Magi ; (4) ii. 13-23, the massacre of children in Bethlehem | and the flight of the parents of Jesus to Egypt, together with their) return to Nazareth ; (5) iii. 13-17, the reluctance of John to baptize Jesus; (6) iv. 14-16, the fulfilment of the prophecy, ‘‘The people that sit in darkness,” &c.; (7) v. 5-10, the six beatitudes on the sorrowing, the meek, the merciful, the pure in heart, the peace- makers, the persecuted; (8) v. 17-48, the new law is more exacting than the old law; (9) vi. 1-18, warnings against Fea he almsgiving, prayer, and fasting ; (10) vi. 34, Sufficient for the

day is the evil thereof”; (11) vii. 6, ‘ Give not that which is holy to dogs,” &c.; (12) vii. 13, 14, ‘* Broad is the gate,” &c.; (18) vii. 22, ‘In thy name have we cast out devils,” &c.; (14) ix. 13 and xii. 7, the saying, ‘I will have mercy and not sacrifice ”; (15) ix. 27-34, the cure of two blind men and of a deaf man;! (16) x. 5-8, ‘Go not into any city of the Samaritans,” &c., instructions to the twelve; (17) x. 23, “* But when they pursue you in this city, flee unto the other; for verily I say unto you, Ye shall not have gone over the cities of Israel until the Son of Man be come”; (18) x. 25, “The servant is not above his master,” &c.; (19) xi. 28-30, ‘“Come unto Me, all ye that are weary,” &c.; (20) xii. 17-21, the prophecy of Isaiah, ‘‘ Behold my servant,” &., is fulfilled in Jesus; (21) xii. 22, 23, the healing of one that was both dumb and blind ; (22) xii. 33, ‘‘ Either make the tree sound and the fruit sound, or,” &c.; (23) xii. 36, 37, ‘‘ Every idle word,” &c.; (24) xii. 40, ‘As Jouas was in the whale’s belly,” &.; (25) xiii, 14, 15, the fulfilment of a prophecy of Isaiah in the misunderstanding of Christ’s teaching; (26) xiii. 24-30, the enemy and the tares; (27) xiii. 35, the fulfil- ment of prophecy in Christ’s teaching by parables ; (28) xiii. 36-48, the interpretation of the parable of the tares ; (29) xiii. 44-50, ‘‘ The kingdom of heaven is like (a) a treasure, (6) a merchant buying a pearl, (c)a net; (30) xiii, 51, 52, Every disciple to bring forth things new and old,” &c.; (31) xiv. 28-33, the attempt of Peter to walk upon the waves; (32) xv. 13, “Every plant that M y heavenly Father hath not planted shall be rooted up,” &c.;

(33) xvi. 17-19, the blessing on Peter; (34) xvii. 24-27, the tribute money ; (35) xviii. 3, 4, “If ye be not converted and become as little children, ye shall not enter,” &c.; (36) xviii. 10, ‘‘ Their angels do always behold,” &c.; (87) xviii. 12-14, the parable of the hundred sheep (given by Luke in similar language); (38) xviii. 15-18, “Tell it to the church,” &e., the course of procedure in case of quarrel ; (39) xvili, 21, 22, the question of Peter, ‘‘ How often shall my brother sin against me?” (40) xviii. 23-34, the parable of the unforgiving servant; (41) xix. 10-12, ‘‘ There are some eunuchs,”’ &.; (42) xx. 1-15, the labourers iu the vineyard; (48) xxi. 5, the fulfilment of the prophecy, ‘‘ Behold thy King cometh,” &c.; (44) xxi. 16, the fulfilment of the prophecy, ‘‘ Out of the mouth of babes and suck- lings,” &c.; (45) xxi. 28-32, “I go” and ‘‘I1 go not”; (46) xxi. 43, ‘The kingdom of God shall be taken from you, and shall be given to a nation that bringeth forth the fruits thereof”; (47) xxii. 1-14, the parable of the despiteful and murderous guests (very dissimilar in Luke); (48) xxiii, 1-3, ‘‘The Scribes and Pharisees sitin Moses’ seat, &c.; (49) xxiii, 7-125 2b. 15-22, “ Be not called Rabbi,” &c., ‘* He that sweareth by the altar,” &.; (50) xxv. 1-13, the parable of the ten virgins; (51) xxv. 14-28, the parable of the talents ; (52) xxv, 31-46, the parable of the sheep and the goats ; (58) xxvi. 51-54, “Put up thy sword,” and ‘‘ Thinkest thou not that I cannot now pray to My Father,” &c.; (54) xxvii. 3-10, the fulfilment of the prophecy, **‘And they took the thirty pieces of silver,” &c.; (55) xxvii, 19, ‘** Have thou nothing to do with that just man,” &e.; (56) xxvii. 24-25, Pilate washing his hands; (57) xxvii. 52, 53, ““ And many bodies of them that slept arose,” &c.; (58) xxvii. 62-66, the Jews seal the sepulchre; (59) xxviii. 2-5, the angel rolls the stone from the tomb of Jesus ; (60) xxviii. 9-15, the women elasp the feet of the risen Jesus; the soldiers are bribed to say that the disciples stole away the body ; (61) xxviii. 16-20, Jesus appears to the eleven disciples on a mountain in Galilee.

The preface (chaps. i. and ii.) reveals a part of the pur- pose of the whole Gospel, in tracing the genealogy of Jesus, not from David merely, who was under the law, but from Abraham, who was the receiver of the promise (Gal. iii. 16) and the father of the faithful (Gal. iii. 7). Such a genealogy is the fitting preface of a book which aims at exhibiting the law, not as trampled upon but as fulfilled and developed into a higher law of promise, in which all the families of the world were to be blessed (Gen. xii. 3), But

by this time also the church required some distinct affirmation concerning the divine origin of Jesus.. The gap left in the opening of Mark's Gospel needed to be filled up. The mere earthly pedigree from Abraham was insufficient ; nor did it suffice that Jesus should be declared to be spiritually the Son of God. It was necessary that the verity of the spiritual birth of Jesus from the Father should be embodied in a narrative so expressed as to be intelligible

to all.

The differences between the prefaces of Matthew and Additions Luke are obvious, and need no stress laid on them, except aah i as illustrations of the freedom which, at this period, was 5

allowed in the handling of the various introductions to the

1 Possibly these narratives may refer to events also described by Mark; but, as the language presents no similarity, they are placed here,

Gospel tradition. It is obvious, for example, that Luke re- gards Nazareth as the residence of J oseph and Mary from the first (i. 26 ; ii. 4), whereas Matthew seems to represent them as selecting Nazareth for their new home after the birth of Jesus and the return from Egypt, only because they were afraid to return to their old home in Judea, thereby fulfil- ling an ancient prophecy (ii. 23). Throughout his preface, as throughout his version of the Triple Tradition, Matthew always bears in mind that Jesus came to fulfil the prophets as well as the law. 'The birth from a virgin (i. 25), the birth in Bethlehem (ii. 6), the return from Egypt (ii. 15), the massacre of the children in Betlilehem (ii. 18), and the residence in Nazareth (ii. 23) are all spoken of as the con- sequences of prophecies. It is scarcely fanciful, also, to see some reference to the infancy of Moses, and the slaughter of the Israelitish children by Pharaoh in the massacre of the children of Bethlehem by Herod.

Passing next to Matthew's version of the Triple Tradition, we note first the prominence given to the law. Instead of giving a chronological account of

our Lord's acts and say- ings, Matthew prefers to collect a mass of doctrine into one continuous discourse, known from early times as the Sermon on the Mount. This discourse follows almost immediately (iv. 11; v. 1.) on the commencement of His public life ; and it contains the new law of the new kingdom. The Sermon on the Mount corresponds to tlie law given ou Mount Sinai, and a thread of contrast runs through the former, comparing in each case that which had been said 'of old time" with that which the New Lawgiver prescribed, and showing that in each case the new law, though more gentle, was also more stringent and more exacting than the old. 'Depart from Me, ye workers of iniquity" (Lu. xiii. 27) is expressed by Matthew (vii. 23), "Depart from Me, ye that work lawlessness ;" and this word "lawlessness" is found four times in Matthew, and not at all in the rest of the Gospels. Luke recognizes that no jot or tittle is to pass from the law till all be fulfilled ; but nowhere in Luke shall we find the strong language which declares (Mat. v. 19) that he who breaks, or teaches others to break, one of the least of the commandments of the law shall be called least in the kingdom of God.

The genealogy traced from Abraham, and the stress lnid on prophecy, as well as the prominence thus given to the law, all suggest that this book was primarily intended for Jewish readers; and this supposition is confirmed by the whole tenor of the Gospel. Matthew finds less space than Luke for the parables which point to the inclusion of the Gentiles, and more for those which point to the exclusion of the workers of lawlessness and of the unworthy Jews. He alone among the evangelists has the saying, "'Many are called but few chosen ;" and the distinction between the "called" («Ayrot) and "chosen" (éxXexro') is the more remarkable, because Paul uses the two words almost indifferently, and Luke (though he too has the parable of the unworthy guests) has not ventured to use xAyrot in Matthew's disparaging significa- tion. But Matthew, more than the rest of the evangelists, seems to move in evil days, and amid a race of backsliders, among dogs and swine who are unworthy of the pearls of truth, among the tares sown by the enemy, among fisher- men who have to cast back again many of the fish caught in the net of the gospel; the broad way is ever in his mind, and the multitude of those that go thereby, and the guest without the wedding garment, and the foolish virgins, and the goats as well as the sheep, and those who even " cast out devils" in the name of the Lord, and yet are

rejected by Him because they “work lawlessness.” Where Luke speaks exultantly of “joy in heaven” over one repentant sinner, Matthew in more negative and sober phrases declares that it is not the will of the Father that one

of the little ones should perish; and as a reason for not being distracted about the future it is alleged that “sufficient for the day is the evil thereof”: see above (10), (11), (12), 13), (28), (29 ¢), (50), (52). Tt is far. fetched to suppose that these subjects are selected or amplified in antagonism to the doctrine of Paul. The condition of the Jews, their increasing hostility to the Christians, and the wavering or retrogression of many Jewish converts when the hostility became intensified shortly before and during the siege of Jerusalem,—this may well explain one side of Matthew’s Gospel; and the other side (the condemnation of ‘‘ lawlessness ”) might find an ex- planation in a reference to Hellenizing Jews, who (like some of the Corinthians) considered that the new law set them free from all restraint, and who, in casting aside every vestige of nationality, wished to cast aside morality as well, Viewed in the light of the approaching fall of Jerusalem, and the wavering or retrogression of great masses of the nation, tlie introduction into the Lord’s Prayer of the words, “Deliver us from the evil,” and the prediction (xxiv. 12) that “by reason of the multiplying of lawlessness the love of many shall wax cold,” will seem not only appropriate, but typical of the character of the wholé of the First Gospel.

Besides the fulfilments of prophecy mentioned in the pre- face, Matthew sees several others (6), (25), (43), (44), (54) which are not mentioned in the Triple Tradition, and these applications of prophecy sometimes contain obvious confu- sions. For example, Matthew sees in our Lord’s entry into Jerusalem a fulfilment of the prophecy.: ‘‘ Thy king cometh . . . sitting upon an ass, and a colt the foal of an ass.” The repetition seems to denote one animal, after the manner of Hebrew poetry, and only one is mentioned by Mark and Luke; but Matthew, applying prophecy more closely, speaks of two, and adds (xxi. 7) “ they brought the ass and the foal and cast their clotlies upon them, and he sat upon them.” Again, n speaking of the “ potter’s field” (xxvii. 9), he quotes, as from Jeremiah, a prophecy that is really from Zechariah xi. 12 (the word translated “potter” is rendered by Ewald “treasury”; and (though Aquila has rrdoryv] the LXX. has

xwveurypuov, “foundry,” neither of which renderings will suit Matthew’s application). Again, though Luke speaks of the “ sign of Jonah,” Matthew alone makes Jesus publicly declare that, as Jonah was three days and three nights in the belly of the whale (xii. 40), so He shall be three days and three nights in the heart of the earth ; and such a declaration, exciting no questioning in the disciples, nor wonder in bystanders, appears in the highest degree improbable, and looks like a later application. It will be remembered that Matthew alone has the inac- curate statement that the murdered Zachariah was the son of Barachiah (xxiii. 35); and perhaps an inaccuracy result- ing from a lapse of memory may explain, not only the use of the name of Jeremiah above, but also the quotation “ He shall be called a Nazarene” (ii. 23), which is found in no existing book of prophecy. Similarly (perhaps) Mark, through lapse of memory on the part of those whose tradi- tion he records, quotes (i. 2), as from Isaiah, according to the correct reading (the A. V. reads “prophets”), a prophecy composed of two passages, the first of which is from Malachi, and only the second from Isaiah, It must be remembered that, without the modern means for rapid reference, verifica- tion was a much harder task then than now, and much more trust was necessarily given to memory. ‘

Few new miracles are introduced by Matthew into the body of his work (15), (21), (31), (34). Two of these con- sist of acts of healing ; and two are connected with Peter, viz., Peter’s partial success in walking upon the waves, and his (supposed) extraction of a stater from the mouth of @ fish. But the words implying the latter miracle have possibly arisen from a misunderstanding ; at all events

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they leave in the mind “a doubt whether, in this instance,

some essential particular may not have been either omitted

or left unexplained ” (Farrar’s Life of Christ, vol. ii. p. 46). In its moral teaching this Gospel lays special stress upon the sin of religious ostentation and hypocrisy.

described at greater length than in any of the other Gospels.

Yet this Gospel does not always dwell upon the dark side It preserves also some of the Lord's inost "comfortable" sayings : the blessings upon the meek and merciful; the saying that the angels of the little ones always behold the face of the Father ; and above all that saying which is a gospel in itself, "Come unto Me, all ye

of Christ's doctrine.

that labour, and are heavy laden," &. (xi. 28-30).

In speaking of the date of Matthew's Gospel, so far as it can be determined from internal evidence, we must remem- ber that, if the work be composite, the fact that some of Matthew's additions are clearly late will not show that others may notbe early. The saying, for example, that the disciples shall not have gone over the cities of Israel till the Son of Man shall have come (x. 23), seems to be an early and unaltered reminiscence of a saying of Jesus, which was not generally adopted in the tradition because of its recog- It is possible that Matthew may consider the coming of the Son of Man fulfilled prim- arily in the transfiguration ; for whereas in their prefaces to the transfiguration Mark and Luke write, "There are some standing here who shall not taste of death till they see

nized difficulty at a later date.

the kingdom of God" (Mark adds "coming in power"),

Matthew substitutes for " kingdom of God," &c., "the Son of Min coming in His kingdom." But, whatever may have been

Matthew's theory, the difficulty of the utterance in Matt. x. 23 implies its early date. late date seems implied in the expression " up to this day," which is twice found—once in the addition xxvii. 8 (the potter's field) and again in xxviii. 15 (the bribing of the guard by the chief priests). Yet these additions appear to be in the style of the writer both of the preface and the appendix, and of the other passages peculiar to Matthew.! Tt would follow that all these passages are of a late date, not added to the tradition till long after the

death of Christ. The interval must have been long enough to allow, for example, the “potter’s field”—and this argument holds whether the story of the potter’s field (xxvii. 8) be historical or not—first, to acquire the name of the Field of Blood, and

1 Want of space renders it impossible to state the grounds on which it seems probable that Matthew consists only of (1) the Triple Tradition ; (2) extracts from a book or tradition of the words of the Lord from which Luke also borrowed; and (3) an introduction, framework, and appendix, all added by one hand; though possibly the introduction and appendix, being borrowed, the formerfrom an Aramaic source, the latter from a Latin source, may show differences of idiom not wholly concealed by the overlying style of the author who works up the materials. A similar usc of the particles 5¢ and raf, and of participles, runs throughout almost all the non-traditional narrative parts of Matthew; and the rhythm of the sentences is very similar. But the linguistic evidence has not as yet been so selected, classified, and con- centrated as to obtain any certain results. And until this is done, inferences drawn from isolated phenomena are likely to be very misleading. For example, it has been inferred (Weiss, Matthdusevan- gelium, p. 502) that the use of the form ‘lepoveadfhw once only in Matthew (xxiii. 37, in a passage almost identical with Lu. xiii. 34, whereas Matthew uses ‘IepoodAvua eleven times) proves that Matthew borrowed the passage in which it occurs from an Aramaic source. Now it is true that other reasons make the hypothesis of an Aramaic source for the identical passages in Matthew and Luke extremely pro- bable; but this use of ‘IepovoadAhp is quite insufficient proof. For a comparison of Paul’s use of ‘lepoodéAupa (Gal. i. 17, 18; ii. 1) and ‘IepovoaAnm (Gal. iv. 25, 26) will show that the same author might use the one form geographically and the other in a higher style, theo- logically or rhetorically. And this may possibly be held to explain the use of ‘IepovcaAnun by Matthew in the highly rhetorical passage in which alone it is found,

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In a strong passage (xii. 33) consistent undissembling wickedness is preferred to dissembled wickedness, and the Pharisees are

On the other hand, a decidedly

secondly, to retain that name for so long a period (nearly at least a generation) as to make it possible for a writer to speak of the acquisition of the name as a far distant fact, writing that the name is still borne, even "to this day." The same expression in xxviii. 15,—where it is said that the false charge against the disciples, of stealing the body of Jesus, is commonly reported "unto this day" by "the Jews,"—warrants the same inference 3 and this inference is corroborated by the remarkable use of "the Jews." The author of the Fourth Gospel, writing at a much later date, habitually speaks of "the Jews" as an alien race, quite separated from the Christians; but this is not in the manner of the synoptistic tradition.

The uncertainty in which Mark left the resurrection of Jesus would naturally seem to later writers to require to be removed ; and accordingly we find that Matthew adds to the vision of angels (two instead of one) a manifestation of Jesus Himself. But the whole of this narrative (xxviii. 9-20), though apparently in Matthew's style (of, for example, the remarkable use of of Sé, without the oi pev, in the sense of "others," in xxviii, 17 with that in xxvi. 67), and though containing internal evidence of being composed long after the events narrated (xxviii. 15), is nevertheless strangely disjointed. Yet its very defects, its discounected- ness, incompleteness, and abruptness, indicate a date earlier than that of the more connected and completer narratives of the Third and Fourth Gospels. Matthew separates from Mark's narrative at the departure of the women from the tomb, having previously given an account (repeated by no other evangelist) of the resurrection from the dead of a great number of "saints," who "went into the holy city and appeared unto many." To Mark's simple statement that the women "found the stone rolled away" Matthew adds a graphic account of a glorious angel visibly descending from heaven, filling the keepers with fear, and rolling the stone away. Then, immediately after the women have departed with the angelic message, to bid the disciples to go to Galilee, Jesus suddenly appears to them. They clasp His feet, while He repeats over again the message that the disciples niust go to Galilee there to behold Him. Without any further mention of the place of meeting, the disciples are said to have gone to " ¢he mountain, where Jesus made agreement (érdégaro) with them (to meet them)." To avoid this dislocation, there has been suggested the

desperate remedy (Weiss, Matthdusevangelium, p. 582) of rendering éragaro, “laid down the law,” with reference to the Sermon on the Mount; but the probable solution is that Matthew here extracts aud separates from its context some ancient tradition which is obscured through want of its framework.? Again Matthew tells us that, upon this mountain, only the eleven were present, and that while some of them worshipped, others “doubted.” This statement is of value as evidence that it was acknowledged, even so late as the compilation of Matthew’s Gospel, that some at least of the manifestations of Jesus were of such a nature that, while they brought immediate conviction to some beholders, they did not at once convince others, even of His nearest disciples; in other words, the manifestation of Jesus depended upon other con- siderations than the mere physical sense of sight. But, on the other hand, the statement seems quite inconsistent with the supposition that in previous manifestations in or near Jerusalem Jesus had been recognized and worshipped by all the eleven. The last words of the Gospel represent Jesus as commissioning His disciples to go into all nations, preaching His gospel, and baptizing in the name of the Father, the Son, and the Holy Ghost. The thought con-

2 In a somewhat similar manner the author of the Second Epistle of Peter speaks of “the holy mount” (2 Pet. i. 18), assuming that his readers would understand the definite reference tv the mountain of the transfiguration. :

tained in these words furnishes a suitable termination to the Gospel; but there is every probability that we have not here the exact words of Jesus Himself. Not to speak of the introduction of the later baptismal formulary, “in the name of the Father, the Son, and the Holy Ghost,” the rest of the vocabulary is not found in the words of Jesus as recorded in the Triple Tradition, but is peculiar to Matthew. For example, (1) the word pa@yrevew (xxviii. 19) is used three times by Matthew, and nowhere else in the New Testament, except once in the Acts; (2) the expression cvvteAcias Tod aidvos (xxviii. 20) is found five times in Matthew, and nowhere else in the New Testa- ment, except once in the Epistle to the

Hebrews; and (3) the word rnpety (xxviii. 20), used by Matthew six times, is used once only by Mark, and not at all by Luke.

It is noteworthy that Matthew makes no express mention of the ascension of Jesus. But it is possible that he con-

siders this final manifestation on the mountain-top to have

terminated with the ascension; for Matthew, describing the farewell of Jesus, appears to have in his mind the picture, contemplated also by Daniel, of the Son of Man endowed with all power and seated on the clouds of heaven. Compare Daniel vii. 14, "ed66n aird éfoveia," with Matthew xxviii. 18, "é360y pou maoa efovoia." And this perhaps may explain the twice repeated saying of Matthew, that some of the disciples should see the Son of Man coming. The manifestation of Jesus upon the mountain in Galilee, commissioning His disciples to go forth to make disciples of all the world, and claiming all kingdoms for Himself, might well seem a fulfilment of these two prophecies (x, 23; xvi. 28), as well as a fitting close to the book of the Gospel.

Additions and Peculiarities of Luke.—The principal passages peculiar to Luke are :—

(1) i. 1-4, the dedication to Theophilus; (2) i. 5-25, tne vision of Zacharias; (3) i. 26-38, the annunciation; (4) i. 39-45, the neeting of Elisabeth and Mary; (5) i. 46-56, the song of Mary; (6) i. 57-80, the naming of John and the song of Zacharias; (7) ii. 1- 7, the journey of Mary to Bethlehem ; (8) ii. 8-20, the vision of the shepherds; (9) ii. 21-35, the song of Simeon; (10) ii. 36-40, the prophetess Anna; (11) ii. 41-52, the child Jesus found in the temple; (12) iii. 1, the precise date of the commencement of the public life of Jesus; (18) ili. 5-16 (except vers. 8 and 9), the teaching of John the Baptist; (14) iii. 18-20, Herod imprisons John; (15) ii. 23-38, the genealogy of Jesus from Adam; (16) iv. 18, the devil departs from Jesus ''for a season"; (17) iv. 14-30, Jesus preaches at Nazareth; (18) v. 1-11, the miraculous draught of fish and the call of Sinion ; (19) v. 17, preface to the healing of the paralytic ; (20) v. 39, "* No one having drunk old wine desireth new," &c.; (21) vi. 12-18, preface to the choice of the apostles; (22) vi. 24-26, '' Woe unto you that are rich," &c.; (23) vi. 82-35, '' Love your

enemies," &c. (in language peculiar to Luke); (24) vii. 1-10, the healing of the centurion's servant (in language peculiar to Luke); (25) vii. 11-17, the raising of the widow's son at Nain; (26) vii. 21, 22, the acts of healing wrought before Jolin's disciples; (27) vii. 36-50, the sinful woman and the parable of the two debtors; (28) viii. 1-8, the names of the women who accompanied Jesus; (29) ix. 51-56, James and John wish to call down fire on the Samaritans; (30) ix. 61, 62, '* No one having put his hand to the plough," &c.; (31) x. 1, the appointment of the seventy; (32) x. 17-20, ''I beheld Satan as lightning," &c.; (83) x. 25-37, the good Samaritan; (34) x. 38- 42, Martha and Mary; (35) xi. 1, ''Teach us to pray," &c.; (36) xi. 6-8, the friend persuaded by importunity; (37) xii. 13-21, the rich fool; (38) xi. 21-22, ''When the strong man armed," &c.; (39) xi. 27, 28, '' Blessed is the womb that bare Thee," &c.; (40) xii. 32, 33, '' Fear not, little flock," &c.; (41) xii. 35-38, '' Let your loins be girded about," &c.; (42) xii. 47, 48, '' But that ser- vant that knew not his lord's will," &c.; (48) xii. 49-50, ''I came to send fire on earth," &c.; (44) xii. 54-57, '' When ye see a cloud rising," &c.; (45) xiii. 1-9, the Galileans slain by Pilate, and the parable of the fig-tree; (46) xiii. 10-17, the healing of the woman bound by Satan; (47) xiii. 23-27, '' Are there few that be saved?" and the answer; (48) xiii. 31-34, ''Go tell that fox," &c.; (49) xiv. 1-6, the healing of the dropsical man on the sabbath; (50) xiv. 7-11, ''Sit not down in the highest room," &c.; (51) xiv. 12— 14, '' When thou makest a dinner," &c.; (52) xiv. 15-24, the dis- courteous guests; (53) xiv. 28-38, '' Which of you intending to build a tower," &c.; (54) xv. 1-10, the lost sheep (different in

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Matthew), and the lost piece of silver; (55) xv. 11-32, the pro. digal son; (56) xvi. 1-12, the unjust steward; (57) xvi. 14-3] Dives and Lazarus, with preface; (58) xvii. 7-10, the master must be served before the servant; (59) xvii. 11-19, the grateful Samaritan – (60) xvii. 20-22, 'The kingdom of God cometh not with obser. vation," &c.; (61) xvii. 28-30, '' It shall be as in the days of Lot," &e.; (62) xvili. 1-8, the unjust judge; (63) xviii. 9-14, the Pharisee and the publican; (64) xix. 1-10, Zaccheus; (65) xix, 11-27, the parable of the pounds (different in Matthew); (66) xix, 39-44, '*If thou

hadst. Las even thou," &c.; (67) xx. 18 '* Whosoever shall fall upon that stone shall be broken," kon (68) xxi. 18, ' There shall not an hair of your head perish;" (69) xxi. 23-26, '' There shall be great distress in the land," &c.; (70) xxi. 28, '' And wheu these things begin to come to pass, then look up," &c.; (71) xxi. 34-38, 'But take heed to yourselves lest at any time your hearts be overcharged with surfeiting," &c.; (72) xxii. 14-16, with parts of 17 and 19, '' With desire have I desired to eat this passover with you," &c.; (73) xxii. 31-34, "Simon, Simon, behold Satan hath desired to have you, &c.; (74) xxii, 35- 38, '* When I sent you without purse," &c.; (75)? xxii, 48, 44, the angel strengthening Jesus; (76) xxii. 48, 49, '' Betrayest thou the Son of Man with a kiss?" (77) xxii. 51, the healing of the wound of the high priest's servant, (78) xxiii. 5-12, Jesus is sent by Pilate to Herod; (79) xxiii. 13-15, Pilate proposes to release Jesus; (80) xxiii. 27-31, '' Daughters of Jerusalem, weep not for Me," &c.; (81) xxiii. 39-48, the penitent thief; (82) xxiii. 48, 49, the crowd beat their breasts and return; (83)? xxiv. 12, Peter sees the linen clothes in the open tomb; (84) xxiv. 13-35, the walk to Emmaus; (85) xxiv. 36-49, Jesus appears and eats in the presence of His disciples; (86) xxiv. 50-53, Jesus parts from the disciples near Bethany,' and they return to the temple.

Before speaking in detail of the passages peculiar to Luke, it will be convenient to consider his avowed purpose in writing, and some peculiarities of his style. The dedica- tion to Theophilus, a name which is now believed by many to be merely typical of every reader who is so far "loved of God" as to be admitted into the church of Christ, states that the author purposes to write an account " in order," and implies that many previous® " attempts" (éexetpyoay, a word implying impotence; of Acts ix. 2, 9; xix. 13) at similar compilations had not been 'in order"; further it informs us that the object of the treatise was not to tell the reader anything that was new, but rather to give him an ampler knowledge of the certainty of those things which were then and always had been fully believed in the church, even as they had been handed down by those who had been from the beginning eye- witnesses and ministers of the word. Without going so far as to affirm that the word handed down (zapédogar) excludes written tradition (Westcott's Introduction, 186, 203), it is at least remarkable that Luke distinguishes between the "eyewitnesses " and those whose attempts he disapproved,—saying that the latter attempted to draw up a " connected

narrative," whereas the former merely "hauded down" the facts. This amounts almost to a denial on the part of Luke that any "eyewitness " (that is to say, apostle) had up to that time written any narrative (so far as Luke knew) of the life of Christ. It implies also that the words and deeds of the Lord had been recorded by many without arrangement, and that the author purposed to arrange them. The literary and artistic purpose of the author appears In words and phrases, as well as in the conceptions. Writing perhaps principally for readers to whom the Greek of the

1 But possibly this passage is also found in Matt. xxi. 44,

2 The genuineness of this passage is doubtful.

3 The genuineness of this passage is doubtful. j

4 The clause describing the ascension is omitted by Tischendorf.

5 It is very doubtful whether the aorist tense (éwexelpnoay) ne sarily implies (Westcott, Gospels, p. 186) that "St Luke speaks of t e 'attempts' as of something which had no influence at the ie . . . . (attempted, not have attempted)." In the New Testamen the proper distinction between the aorist and perfect cannot oe be maintained as it can in classical Greek. For example (Mk. aa ; our A. V. rightly renders émoinaev, ''she hath done what she coul a and it would seem absurd to say that the aorist éwolncey represente an action 'which had no influence at the present," in the face of the following words, '' Throughout the whole world this also that she hath done (9 érolnaev) shall be spoken of for a memorial of her.

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original tradition would be in many respects distasteful, he substitutes more classical words for many that are used by Matthew and Mark in the Triple Tradition (see above, p. 796). Even the use of "sea" to denote the Lake of Gennesareth, is objectionable to him, and he always substitutes "lake." The Latinism xodpdvrys for farthing (Mat. v. 26 ; ME. xii. 42) is altered or omitted by Luke. He prefers Topevowar toimayw. Versed as he is, and as his readers would be, in the metamorphoses of the heathen stories, he shrinks from applying the word "metamorphosed" (Mat, xvii. 2; Mk. ix. 2)

to the transfiguration of Jesus, and substitutes (ix. 29) “became different.” He dislikes repetitions also, as much as he dislikes low-class words : compare v. 32, 33; vi. 10; viii. 21, 15, with the corresponding passages in Matthew and Mark; and note especially, in the cure of

only avoids the word kpd8Baros, for “bed” (noted by Phry- nichus as objectionable, Lobeck, p. 62), but also, to avoid repetition, uses three substitutes in succession,—(v. 18) kXtvys, (v. 19 and 24) kAwolw, (v. 25) éf’ @ (or 8) Karéxerro, where Mark is content to use the objectionable KpaBBaros four times. When writing in his own style he is fond of long and sonorous words, such as did8os for dés (Mat. xix. 21; Mk. x. 21; Lu. xviii. 22), StapepiLopan, duayoyyvlew, and the com-

pounds of éu¢ generally; compare also his use of TEpLTOLOUULAL

(xvii. 33, correct text), and of Lwoyoveiv (ib.) for cdl.

The question of Luke’s style is specially important . F : oe ; E : d d Le hke. because the striking differences between certain portions of | pe a Pe WAP cn de pres detent cy

his Gospel which are all, though in very different styles, found in his Gospel alone (occurring neither in the Triple Tradition, nor in the parts which Luke has in common with Matthew or in common with Mark), might naturally in- duce even a careful student to believe that they are com- posed by different authors. For example, take as a criterion the use of cai and dé. In classical Greek, and indeed in

almost every Greek except the ultra-Hebraic, the particle 3 |

is of constant occurrence. The fact that it does not occur more than six or seven times in the whole of the Apocalypse, and not at all in the first book of the Maccabees till chap. iii. 36, would naturally lead us readily to believe that the former was written by a Jew who knew little of Greek literature, and that Jerome was right in saying that the

first chapter, it occurs 16 times, while in the 19 verses of x, 25-42 it occurs 16 times ; or in other words, 8¢ is (pro- portionately) used more than four

times as often in the ninth chapter as in the first. that Luke's introduction has an Aramaic origin. But if we turn to the Acts we find that in the first chapter, containing

26 verses (or 19 verses of narrative and 7 of a speech), 5¢ |

occurs only twice ; whereas in the ninth chapter, which cou- tains 43 verses, dé occurs 35 times. Yet an Aramaic origin has not been thought, by any consensus of competent autho- rities, necessary or probable for the first chapter in the Acts.

Although, therefore, it is possible that the first two chapters of Luke may be a direct translation from an Aramaic original, yet there is an alternative. The alterna- tive is that Luke, a man of letters and skilled in composi- tion, consciously or unconsciously adapted his style to the subject, feeling that a different style was required on the one hand by the Magnificat and the Nune Dimittis, and on the other hand by the graceful domestic narrative of the contrast between the sisters Martha and Mary.

This will be made all the more probable if it can be shown that Luke had studied and imitated the LXX., and in particular the Greek Apocrypha. Words not used (or seldom) by Matthew and Mark, but by Luke and the Apocryphal writers, are ém{Saepov, dmoomacbevrwy, émiBddrez in the sense of "belonging," émotiouds,

the use of tiioros for God, otiyut, dyTiBadrew, etOeros, |

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| similar sentences in Luke.

: c a0 , that are in th ae i. sé the palsied man (Mat. ix.; Mk. ii; Lu. v.) how Luke not | . % a soci rot ie ee hie

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weptomacbat, Kaipds emicxonys, Soxh, and Avovreac?. But far

' More striking than mere words (for Matthew and Mark might be

shown to have some peculiar words in common with

the Apocrypha) are the sentences in the Apocrypha which seem to

have suggested For example, compare Luke's story of the rich fool (xii. 19) with the following passage from Sirach (xi. 18): 'There is one that gathereth wealth from his overheed and pinching; and this is the lot of his reward. In the hour when he sayeth, I have found rest, and now let me eat of my good things, even then he knoweth not what season shall pass away, and he shall leave these things unto others and aint perish," Again, in the parable of the unjust judge, there is a striking similarity between the words (xviii. 8) "Though he bear long with them (uaxpodvue?), I tell you He will avenge them speedily," and (Sirach xxii. 22), "And He will surely not delay ; nor will He bear long (maxpoduujoes) with them"; so also between (i. 42) "' Blessed art thou among women," and (Judith xiii. 17) ' Blessed. art thou, O daughter, by the Most High God, above all the women ye your enemies . and ye shall be the children of the Highest," and (Sirach iv. 10), '* Be as a father unto the fatherless . , . and thou shalt be as the son of the Highest." Occasional similarities of thought and even of words are found between Matthew and Mark and the LXX. Apocrypha ; but it cannot be said of either of them, as it can of the Third Gospel, that it is saturated with the LXX. diction. In many cases there is an allusive use of LXX. words. For example, Luke (xxiii. 51), telling us that Joseph of Arimathea had not '' consented to" the wicked decision of the Pharisees against Jesus, uses a word not elsewhere used in the whole of the New Testament. Why? Because the word is used by the LXX. (Exod, xxiii, 1) in a passage expressly prohibiting combinations for false judgment: ' Thou shalt not consent with (avyxaradhon) the unjust to become an unjust witness ; thou shalt not be with the stronger side to do ill ; thou

Again, when Luke (xxiii. 49), telling how the '' acquaintances" of

Jesus stood at a distance from the cross, uses the word " yyworol "

—not elsewhere found in the synoptists,—there can be little doubt that he has in his mind the passage from the LXX. (Ps. xxvii. 9), ''Thou hast put mine acquaintances (yyworods) far from me." Com- pare also the use of éyxaGérous, only found once in Luke (xx. 20), with the use of the word in

the LXX. (twice only) Job xix. 12; xxxi. 9, See also a similarity implied between the aged Abraham and Sarah on the one hand, and Zacharias and Elisabeth on the other, in the similarity between ‘‘ mpoBeByxdres fuepav” (Gen. xvii. 11) and mpoBeBnxdres ev Tats hucpas” (Lu. i. 7).

Our conclusion must be (1) that as Luke has modified the Triple Tradition, and the words of the Lord common to himself and Matthew, by alterations of words and phrases, so and much more has he modified other tradi- tions or documents which he has introduced into his

. +s -,, Work; and (2) that those portions of the part of the ni “ ke pl meee eal eo ‘ Applying | Gospel peculiar to himself which have a more archaic and = a grein lalla ea °* Judaic rhythm and vocabulary than the rest may be

either translations from Aramaic documents, or imitations, conscious or unconscious, of the books of the LXX.,—

This suggests the inference | natural adaptations of the style to the subject, like the

language of Shakespeare’s Julius Caesar as compared with the less simple and dignified language in his English plays of the same date, It is probable, however, that when the evidence is more thoroughly classified than it has hitherto been, it may at least demonstrate the existence of different documents in Luke, whether translations or not.

Impossible thongh it is here even to summarize the evidence, we may give the reader a conception of the nature of it, Attention has been called above to the use of the form 6 Kdpios, “ the Lord,” in narration, as being an indication of late authorship. But this form occurs several times in the body of Luke’s Gospel: namely, in the passages containing the raising of the widow’s son at Nain (vii. 13) ; the appointment of the seventy (x. 1); the rebuke of the Pharisees (xi. 39); the preface to the parable of the faithful and just steward (xii, 42); the healing of the daughter of Abraham bound by Satan (xiii. 15) ; the parable of the sycamore tree (xvii. 5, 6); the parable of the unjust judge (xviii. 6); the story of Zaccheus (xix. 8); warning to Simon Peter (xxii. 31); Christ’s look (xxii. 61); and the verse where it is said that they found not the body of the Lord Jesus (xxiv. 8). Many of the above

passages certainly show signs of translation; and when we remember that the Gospel of the Hebrews (see below, p. 818) always uses the form 6 Kipios, and never 6 “Ingods, we see herein a confirmation of the theory that these passages in Luke are translations from Aramaic. Another testing word is ‘Iepovoaajy. Luke uses ‘lepovoaahu about twenty-six times, ‘IepoodAvua only three times (ii. 22; xix. 28;

Peculi-

xxiii. 7). It has been shown above that the latter form is some- times used geographically by writers who use the former rhetori- eally or historically ; but it is certainly remarkable that in il. 22 and 41 the two forms should be used, apparently in the same sense, dviyayov abrody eis ‘lepordAupa. and émropevovto . . . eis ‘lepovoaahu. Many other test words might be mentioned, the converging evidence of which, added to the internal evidence of thought (and perhaps corroborated by the evidence of special forms, e.g., RAGay for HAGoy), may possibly hereafter enable future critics to distinguish with certainty between the different strata of Luke’s narrative. But no certainty is possible in the present condition of the evidence. There has been abundant labour but insufficient classification of evidence, and no attempt at all to represent it ina concentrated form.

Passing now to the consideration of Luke’s additional

arities of subject matter, and reserving the supernatural element.

Luke’s

to the last, we will speak first of the doctrine. The

Gospel: key-note is struck in the song of Zacharias, and repeated

in the first sermon of Jesus in Nazareth. The object of the messenger of Jesus is (i. 77) “to give us knowledge of salvation” by “the remission of sins,” by reason of “the tender mercy of our God, whereby the dayspring from on high hath visited us to give light to them that sit in darkness;” and

the object of Jesus Himself (iv. 18) is “to preach the gospel to the poor,” to “heal the broken-hearted, to preach deliverance to the captives, and recovering of sight to the blind.” All through the Gospel (or at least the parts peculiar to Luke) there appears to a greater degree than in the First or Second Gospel the con- trast between light and darkness, God and Satan, sin and remission of sins, culminating in the triumph of forgiveness and mercy ; so that in the very last words of Jesus to His disciples (xxiv. 47) the proclamation of ‘‘repentance and remission of sins” is made the prospect of the future gospel to all nations.

The law of Moses appears at first sight inconsistently magnified, almost in an Ebionitic spirit, throughout the first two introductory chapters of the Gospel, and afterwards put aside. But there is no inconsistency. Paul himself says that the Saviour placed Himself at His birth “under the law,” and hence it is that Luke, with an almost anxious elaboration, details the exact fulfilments of the law not only by the parents of Jesus, but also by those of His messenger, Hence also it is that in a single chapter of the introduction the word “law” occurs more often than in all the rest of the Gospel put together. For when Jesus attamed to manhood, He was no longer under the bondage of the old law, which had now attained its fulfilment in the new law of the remission of sins through love. Yet the law is not trampled on, but only superseded by development; it was only “until John ;” yet not “one tittle” of it can fail (xvi, 16, 17).! True to its principle of contrast, this book gives Satan a prominent position, When Satan departs from Jesus, he departs only “for a time” (iv. 13); Satan causes diseases and binds a daughter of Abraham ;? Satan is beheld by Jesus in a vision cast down from heaven ; he enters into Judas (xxii, 3, not mentioned by Matthew or Mark); he demands the Twelve that he may “sift” them; see above (16), (32), (46), (73). But this need not denote (as is thought by Keim) an Ebionitic source; the same recognition of the éfovcia tod oxdTovs appears in the Acts and the Epistles to the Ephesians and Colossians, which no one suspects of Ebionitic tendencies (Lu. xxii. 53; Acts xxvi. 18; Eph. ii, 2; vi. 12; Col. i, 13), Something more than the principle of contrast may, however, be re- quired to explain the sharp demarcation between rich and poor. We do not find in Luke that qualification of the

i 1 Compare the strong language of Luke xvi. 16, and the contrast there between the ‘‘law” and the ‘‘kingdom,” with the similar but much weaker language in Matt. xi. 12, 18, where the contrast is almost lost. 2 Note that Luke alone in the description of the cure of Simou’s mother-in-law (iv 39) tells us that Jesus rebuked the fever.

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epithet “poor” which Matthew (v. 3) inserts, “the poor in spirit.” He enforces the hampering disadvantages cf wealth, pronouncing a woe upon them that are rich; gently rebukes the ‘“cumbered” Martha; exhorts the rich to entertain the poor; and dooms the rich fool to a sudden and disappointing death, while Dives is consigned to un- alterable torment,—(21), (34), (46), (51), (57). But if this seems to savour of Ebionitic thought, let it be re-membered that the principle of contrast is even more systematically applied to illustrate the power of the genuine Pauline faith in the parables of forgiveness. As Lazarus is contrasted with Dives, and the grateful Samaritan with the ungrateful Jewish lepers, and the merciful Samaritan with the heartless priest and Levite, and even the trivial anxieties of Martha with the simple devotion of Mary,—so in the stories of forgiveness, the publican finds his foil in the Pharisee who prays by his side; the woman “which was a sinner,” and who “loved much,” contrasts with Simon, the churlish host, who loved little; the prodigal younger gon with the envious elder son; and the penitent thief on the right with the impenitent thief on the left. All these stories, as well as the tale of Zacchzeus, and the lost piece of silver, and the lost sheep (peculiar to Luke in language, though the same subject is found in Matthew), magnify the power of forgiveness, and repentance, and faith, for the most part ‘“ without works ”—contrasting the instantaneous and complete victories of emotional faith with the inferior results of a long life of ordinary and prudent respectability,—(27), (54), (55), (81), (66), (64).

The universality of the Gospel is more marked in Luke than in Matthew or Mark. The seventy missionaries appear to be emblematic of the preaching of the gospel to the seventy (or seventy-two, see Westcott’s Introduction, p. 374) nations of the earth. The preference of the Gentiles to the Jews wauld

seem to be indicated at the very outset of the public life of Jesus in the sermon at Nazareth (iv. 16-30), if we could accept this as chronologically and historically accurate. Besides the statement of Jesus in the Triple Tradition, that His kinsmen were those that. heard the word of God and did it (Luke prefers this expression to that of Matthew and Mark, "doing the will of God"), Luke gives us another assurance that God's special blessing is re- served, not for the mother of the Saviour, but for those who do the word of God. The inclusiveness of the author breaks down the barrier between Jesus and the Samaritans ; the sons of Zebedee are rebuked for desiring to call down fire on a Samaritan village ; a just Samaritan shames both priest and Levite; and a grateful Samaritan puts nine Jewish lepers to the blush,—see (31), (17), (39), (29), (33),

59).

: 4h connexion with this, the gentler and more inclusive side of the gospel teaching, it may be mentioned that Luke lays especial stress on the part played by women alike in discerning the providence of God, in ministering to Jesus, and in eliciting some of His most helpful utterances. The songs of Mary and of Elisabeth, and the testimony of the prophetess Anna, are found nowhere but in the Third Gospel ; in Luke, for the first time, the mother of the Lord begins to assume a wider province,—she it is, and not Joseph, that ponders in her heart the words of her divine Son, and her sufferings are made the subject of inspired prophecy (ii. 35). Luke alone thinks it worth while to record at some length the names of those women who accom- panied Jesus and contributed to His support; he alone knows of the devoted faith of Mary and the domestic anxieties of Martha; he alone records the cure of the afflicted "daughter of Abraham," the truth-eliciting exclama- tion of the woman who invoked a blessing upon the womb that bare Him, the story of the woman who "loved much,

and the parable of the woman rejoicing over the lost piece

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of silver. Luke alone holds up the fate of Lot's wife as a warning ; nor do we find in any other Gospel the touching utterance of Jesus to the weeping "daughters of Jerusalem." The other synoptists concur with Luke in

pronouncing a blessing on the man who gives up father or mother or lands or houses for Christ's sake, and the sense of fitness has induced the scribes of several MSS. to insert in Matthew and Mark the word "wife" as well as "mother"; but it has no legitimate place except in the version of Luke. It is true indeed that Luke, so far from giving to women the prominent part assigned to them by Matthew and the interpolated Mark, and even by the Fourth Gospel, in attesting the resurrection of Jesus, carefully places their evidence in the background; but the evidence of impression- able witnesses might naturally be subordinated by a writer (perhaps a physician too) who was collecting the traditions of the church into an historical narrative, In any case, it is noteworthy that the word "woman" occurs in Luke almost as many times as in Matthew and Mark put together. Probably the most perplexing part of Luke's doctrine is found in the parables of the unjust steward, the unjust judge, and the friend persuaded by importunity. In the last two of these the argument appears to be,—' Tf an un- just or indolent man can be goaded by importunity into granting requests, much more will assiduous prayer prevail with the Father in heaven;" in the first, ''If the fraudulent show forethought in providing for their earthly future, much more should the children of light show forethought for their eternal future." Although it is quite possible that our Lord drew a contrast (with something of irony) between the single-mindedness of earthly ambition and the scattered energies of those whose aim is righteousness, yet it is diffi- cult to believe that He uttered these parables in their pre- sent shape, or that they are entirely free from misunderstand- ing. The last two of these three parables (as they stand) seem at variance with His teaching in prayer, which bids us remember that the Father knoweth what things we need before we ask them; and the right moral to be drawn | from the unjust judge would seem to be, " Although the unjust judge may be won by importunity, do not suppose that importunity can prevail with the just Judge." It is to be observed, however, that the language and style of these parables (differing from that of the Triple Tradition) | make it somewhat improbable that we have here in Luke's narrative the exact words of Jesus; see (36), (56), (62). As regards the great day and the coming of the Lord, Luke appears to distinguish (more than Matthew and Mark) between the ultimate coming and the fall of J erusalem, which was to precede it. As Luke distributes the dis. courses which Matthew connects with the twelve into two parts,—one connected with the twelve and the other with the seventy, —so he

distributes the discourse on the coming (which Matthew reports as one continuous discourse uttered at Jerusalem) into two parts,—one uttered At Jerusalem, and dealing principally with the fall of Jerusalem (xxi, 6-38), the other uttered on the way to Jerusalem, and expressed in | More general terms (xvii. 20-37), Asa preparation for the coming, Luke lays stress on constancy and directness of pur- pose. No man who puts his hand on the plough must look back (30); better not to begin the tower than leave the tower | unfinished (53); remember Lot's wife (61). The coming is spoken of as possible at any moment—suddenly and | Without observation (60) ; and the disciples are exhorted to walt as servants for their master, with their loins girded (41 and 42), avoiding surfeit and drunkenness (71). When | the master or king returns, ignorant disobedience will be | less severely punished than the disobedience of knowledge | (42); and those who have not increased the " mina" or pound intrusted to them, will be less severely punished than the rebels (65), who will be slain.

Luke (like Matthew and Mark) predicts a time of trouble ; but he sees somewhat clearly, beyond it, the dawn which is to precede the rise of the kingdom. Destruction falls, not by chance, but on all that do not repent (45); all must strive to enter the strait gate (47), for not those that were first called shall enter in (52). Much more clearly than in Matthew and in Mark is the future fall of Jerusalem described, as the result of a siege and capture; and the slaughter of the citizens, the scattering of the nation, and trampling down of the city are mentioned, with details for Which we vainly look in the first two Gospels (59). It ig not concealed that the disciples have much tribulation in store, and that they must use all prudence to protect them- selves (74). Buta term is set for all these troubles ; Luke (omitting the remarkable saying of Matthew and Mark that the Son Himself knoweth not "the hour ") declares that the trampling down of Jerusalem will be only till " the times of the Gentiles are fulfilled." Then will come a time of " dis- tress," not, however, now for Israel but for the Gentiles (69); and amidst convulsions of nature the Son of Man will come. In the hope of this coming, the disciples are to lift up their heads (70), remembering that not a

hair of their heads will be injured (68), Certainly the compara- tively cheerful tone of the discourse on the coming, com- bined with the joyful and triumphant tone of the first two chapters of Luke's Gospel, indicates an author writing at a time when the fall of Jerusalem was an accepted fact, and the establishment of a new and spiritual Jerusalem recog- nized as a sufficient consolation,—a time when the church, not yet troubled by systematic persecution or by serious desertion (Keim, Jesus of Nazara, Engl. ed., vol. i. p, 96), was still sanguinely looking forward to the moment when the times of the Gentiles should be fulfilled, and the Son of Man should suddenly come.

The supernatural narratives peculiar to Luke, and found in the main body of his treatise, are the miraculous draught of fishes, the raising of the widow's son at N ain, the healing of the woman bound by Satan, the cure of the dropsical man, and the appearance of the angel strengthen- ing Jesus,—(18), (25), (46), (49), (75). The first two suggest to many minds a symbolical interpretation, and raise the question whether they (and possibly some of the other miracles) may be emblematical rather than historical. This question cannot suitably be discussed in these pages ; but one or two observations may be made. That Jesus wrought instantaneous cures cannot be contradicted, being proved by the whole texture of the Triple Tradition, as well as by the indirect testimony of Paul. That He also had the power of raising the dead no Jew could well doubt or dispute. Elijah had raised a child from the dead ; still more notably Elisha, even when dead himself ; some (interpreting the prophet literally) said that Ezekiel (Ez. xxxvii. 7) had done the same. But whatever the inferior prophets had done He who was at once the Prophet and Messiah could not fail to do, Still less could heathen converts suppose that Jesus was inferior in power to Aisculapius, It was therefore certain that, whether the traditions and books of the church contained or omitted any record of a raising from the dead, the church would believe from the first that Jesus possessed and employed this power. Different readers will give different weight to the considerations for and against the authenticity of Luke's narrative of the raising of the widow's son. Many will be so far influenced by the extreme beauty of the story (and perhaps by the fact that the custom of early burial among tle Jews might reduce this, like the case of Jairus's daughter, to the level of natural though marvellous events) as to believe that in it we have, not legend, but history ;

but no one who can weigh evidence at all will maintain thae the evidence for this miracle is equal-to > evidence for the

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The intro- ductory

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raising of Jairus’s daughter. Luke’s other principal miracle, the draught of fishes, is also considered by many to have arisen from metaphor misunderstvod. It is connected by Luke with the calling of Simon Peter, an incident men- tioned both by Matthew and by Mark; yet neither Matthew nor Mark describes or gives the slightest hint of any such miracle in connexion with the calling of Peter. In the next place, the metaphor describing the apostles as fishermen and converts as fish, borrowed from Jereiniah perhaps (xvi. 16), is applied by our Lord both to the apostles, as “fishers of men,” and to the preaching of the gospel, which he de- scribes as a “net” catching all sorts of fish, bad and good. As the sea in the Old Testament is regarded as the type of “sin,” everything favoured the addition and development of this metaphor, Accordingly Philo (Creation) describes fishes as typical of the lowest kind of unenlightened exist- ence; and Clement of Alexandria addresses a hymn to Christ, as the fisher of men catching fishes with the bait of eternal life from the hateful wave of the sea of vices (7’he Instructor, iii. 12). It is of course possible that the de- veloped symbolism which we find in Clement may have been entirely the effect, and in no degree the cause, of the narrative in Luke v. 6; and in any case the full discussion of this question would require more space than the limits of this article allow.

Passing now from the main body of Luke’s Gospel, we come to the introduction, which name we may give to the first two chapters, describing the birth and childhood of Jesus, and the birth of His forerunner John, the son of Zacharias. The doctrine of the miraculous incarnation, although

distinctly stated in Matthew's Gospel, nevertheless required further confirmation. This doctrine appears to have been spoken of from the earliest time, in language which might give rise to different conclusions, according as it was interpreted literally or metaphorically. For ex- ample, in the Apocalypse, "the Man Child who was to rule over all nations with a rod of iron" is said to have been born of a woman who was "clothed with the sun, and the moon under her feet, and upon her head a crown of twelve stars," who, after her son had been "caught up into heaven," fled "into the wilderness where she hath a place prepared of God" (Rev. xii. 1-6). It seems certain that the writer represents by the woman, not the Virgin Mary, but the Church—the Spiritual Israel; and in later times the letter of the Church of Lyons (Euseb., 1. #., v. 1) speaks of the "' Virgin Mother" as having her children re- stored to her from the dead (meaning that the church received back, as martyrs, those who had first recanted and then renounced their recantation). Justin Martyr also protests that, even though he should not be able to prove the pre-existence of Jesus, and even though it should appear that He was born man of men, yet it would still be true that He is Christ ; "for," adds he, in his dialogne with Trypho (chap. xlviii.; or, ed. Morell, p. 267), " there are some, O my friends, of our race,! who confess Him to be Christ, but who declare that He is man of men, to whom I do not assent : nor would very many that have formed the same opinions as I have say as they say, because we have been commanded by Christ Himself not to follow the teach- ings of men, but the proclamations made by the blessed prophets, and taught by Him." The expression " not very many" (ov zAcioror) indicates that (a) even in Justin's time (150 a.D.) a large though not very large number of Christians in Samaria or Judea believed that Christ was the son of Joseph, and that (6) a principal part of the evidence for the contrary belief was based upon "the proclamations of the prophets." On the other side, what

1 Another reading éuerepov would make Justin refer to Jewish Christians; but the inference would remain unaffected.

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[synopricar,

gernis of wild and fanciful doctrine were in the air may be inferred from the Gospel of the Hebrews, which wil] not allow that Jesus had even a human mother, but speaks of His mother as being the Holy Spirit (Kirchhofer, p. 451 and ¢f. p. 454). In opposition to these divergent but heterodox beliefs, it became increasingly necessary to maintain the doctrine that Jesus was at once a man, born of a human mother, and divine, born of the heaven

Father ; and this needed to be reaffirmed now, during me prosperity of the church, in a somewhat less apologetic tone than characterized the narrative of Matthew,

When we speak of Luke's ''supplying the deficiencies of Matthew," we must not be supposed to mean that Luke had before him, or even knew the existence of, Matthew's Gospel It has been shown above that he probably knew of no apostolic written narrative (see p. 806 above). Though Matthew's was probably written some years before Luke's Gospel, very many years might elapse before a treatise used in one chureh or province might be recognized as authori- tative beyond its original boundaries. But by " supply- ing the deficiencies" we mean that the conscience and faith of the church required in Luke's time some further and more vivid embodiment of the spiritual truth involved in the incarnation than was contained in the unsupple- mented narrative of Matthew.

For example, it was not a sufficient argument against the Jewish slanderers who asserted that Jesus was born of adultery, to say that Joseph, when purposing to put Mary away, was warned by an angel in a dream to give up his purpose. Something more positive, and in a higher tone, not a dream, but an angelic visitation, was needed to confirm the divine origin of the Son of God. Moreover, in order to set forth still more emphatically the subordination of John the Baptist to the Lord, it was needed that the church should know that the prophet (who himself also had his own birth heralded by angels) was from the first acknowledged by his parents as the mere forerunner and messenger of Him that was to come, to whom, even in his mother's womb, the inferior prophet did obeisance. Further, when Jesus was born, it was not enough that wise and learned men from the East should come to worship Him. It was necessary to show that the poor and simple toilers of the earth, typified by night- watching shepherds, were also

privileged to behold His glory, and were the first to hear with the ear of faith the divine message of the birth of the Redeemer.

The testimony offered to the divine Son of David by Zacharias, who represents the priestly tribe of Levi, and by Elisabeth, who was one of the daughters of Aaron,' and the blessing of Simeon, and of Anna who is said to have been of the distant tribe of Asher,—all this em- blematic homage from Israel to its Redeemer would be inadequately replaced by Matthew's brief story of the flight into Egypt; and, although refusing to feed a frivolous curiosity with frivolous legends on the child- hood of Jesus, the church would naturally cherish the story which told how the youthful Redeemer, when missed by Mary and Joseph, was found in His Father's house. A narrative of this kind, not vulgar nor colloquial, and yet not too refined or scholastic, but framed both in language SS

2 The importance attached to the co-operation of Levi with the "Lion of the tribe of Judah" is clearly seen in the very early (before 185 A.D.) apocryphal book entitled The Testaments of the Twelve Patriarchs (Sinker, p. 104), in which '' Christ is spoken of as coming forth from the two tribes of Judah and Levi, as typical of His twofold office of King and Priest." The symbolism of Origen, as regards Zacharias and Elisabeth is far more fanciful ; he sees (In Evang. Joann., i. 27) in the meanings of Elisabeth (''the oath of my God") and Zacharias (''memory") a reference to the birth of John ('the gift of God"): "6 x rhs wep) Ocod Myjuyns Kara Toy TOD Ocod jay "Opkov Tov Tep

sy ; Ca . « ravs warépas'"' (Luke i. 73).

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and in thought on the model of the best Greek Apocrypha, setting forth in the sacred vocabulary of the LXX. the earliest Christian psalms and hymns that had been com- mitted to writing, would be justly felt by all the churches

INTERNAL EVIDENCE. |

Language of the Original Tradition.—It is probable The lan-

that the Jews, and more especially those in Galilee, were eudgo.of

(like the Welsh in the present day) bilingual; and the th? 9

: : : . ginal question has therefore been raised whether our Lord, in His Poet

to tend to edification, and would soon find a place in every assembly for Christian worship.

But the resurrection, even more than the incarnation, required amplifications. If Matthew had left gaps in his introduction, still more serious were the deficiencies in his appendix to the traditional gospel. Although Mat- thew had added something to the mere suggestions of a resurrection contributed by Mark, he had not added enough. More proof was required, tangible proof, if possible, The women, it is true (according to the narra- tive of Mat. xxviii. 9), had held Jesus-by the feet, but the disciples themselves were not recorded to have: done so; and, besides, the increasing reverence of the church shrank from the thought that the body of the risen Saviour had been actually touched (Jo. xx. 17), even though He might have offered Himself to the touch of His disciples. As far therefore as the evidence went, it was open to the Jewish sceptic to call the manifestations of the Lord delusions, or at best visions, and to apply to them the words of the angel (Tobit xii. 19): " All those days I did but make myself visible unto you, and did neither eat nor drink; but ye beheld a vision." Against so formidable an objection, no proof could better com- mend itself to a close student of the LXX. (such as Luke assuredly was) than a narrative describing how Jesus ate in the presence of His disciples (xxiv. 43). Again, whereas the conclusion of Matthew's narrative leaves Jesus (except by inference) still on earth, Luke omitting the apologetic details which had now become un- necessary, or even liable to perversion (eg., the Jewish slander that the Lord's body had been stolen from the sepulchre, and the fact that some of the eleven disciples "doubted" when they saw the Lord, apparently for the last time, upon the mountain), describes how Jesus was not parted from His disciples till He had produced com- plete conviction in all of them, and liad opened their minds to understand the scriptures.

Still, even with these important additions, the appendix of Luke seemed to some, and perhaps to Luke himself, incomplete; and, accordingly, either Luke himself, or some early editor or very early scribes, inserted in the appendix several further additions :—(1) that Peter saw the grave-clothes of Jesus lying in the open tomb (xxiv. 12); (2) that Jesus proved His identity to His dis- ciples by showing them His hands and His feet ; (3) that He fed not only on the emblematic "fish" but also on the "honeycomb" (xxiv, 42); and lastly, (4) that He ascended into heaven (xxiv. 51). Perhaps the same hand added, in the account of the agony at Gethsemane, the description of the angel from heaven who appeared strengthening Jesus, and of drops as it were of blood falling from Him to the earth. It is by no means im- probable that Luke himself added these passages in a later edition of his own work, as authoritative tradi- tions which had subsequently become known to him; and two or three of them, in somewhat different shapes, will present themselves to us subsequently in the Fourth Gospel.?

+ It is most improbable that this passage has been interpolated in Luke from the Fourth Gospel (xx. 4-7); for the passage in the Fonrth Gospel is fuller than in Luke, and the tendency of copyists is rather to amplify than to curtail. Besides, there are traces that Luke and John are both different versions of the same tradition, differently understood.

2 Unless these additions were made by some authoritative hand, it is not easy to see why they should have been adopted by so many of the best MSS.; no such additions are found in the appendix of

teaching, spoke Greek or Aramaic, If He spoke Greek, then the Aramaic words Zalitha cumi and Ephphatha (Mk. v. 41; vii. 34) must be supposed to be specially addressed to the young and the illiterate, who would best understand the national dialect. But the names Cephas, Boanerges, given by our Lord to His Galilean disciples, and the use of Aramaic in His own prayer (" Abba, Father"), and in His last utterance (as re- corded by Mat, xxvii. 46; Mk. xv. 34), indicate that both for Himself and for His disciples Aramaic and not Greek was the natural tongue. Although therefore it cannot be denied that Greek, even in Jerusalem (see Acts xvii. 2, indicating that Greek would have been un- derstood, though they preferred "Hebrew)."

was generally intelligible, yet the scanty evidence derivable from our Lord's words is that He habitually used Aramaic.

The testimony of Josephus tends in the same direction. He, though a man of education, composed certain books first in his own tongue (pref. to Wars, 1). He also tells us that he found it a laborious task to render the history of his country in Greek, "an alien and strange language" (pref. to Antegz., 2). It is to be presumed that he wrote in Aramaic partly for his countrymen in Judea; but he adds that it was also for the sake of " Parthians, Baby-lonians, and remotest Arabians, and those of our nation beyond Euphrates, and the Adiabeni" (pref. to Wars, 2). Making every allowance for exaggeration, we are justified in drawing from the fact that Josephus thought it worth while to compose books first in Aramaic the inference that a large number of readers in the East would be more likely to read Aramaic than Greek.?

But it has been thought that the use of the LXX. in our Lord's quotations from the Old Testament shows that He spoke Greek. The answer is—(1) Even if all the quotations in the synoptists from the Old Testament exactly agreed with the LXX., the agreement would by no means prove that our Lord used the LXX.; for, in trans- lating Hebrew into Greek, the translator might naturally translate the Hebrew quotations from the Old Testament into the corresponding LXX. version, to which his readers were accustomed. This he might do, even though tlie LXX. did not quite accurately represent the Hebrew; just as, in translating into English a Latin book, with quotations from the Vulgate, we should naturally use our English version, without considering whether the English exactly represented the Latin. (2) But, in the second place, there is scarcely a single quotation* in the Gospels from the Old Testament that exactly agrees with the LXX. when the LXX. differs from the Hebrew; and many of the quotations differ slightly both from the

Matthew, Again, unless they are additions (not forming a part of the first edition of the Gospel), it is hard to see why any of the best MSS. shonld omit them, since they would recommend themselves to all readers and copyists.

3 The statement of Josephus (Contra Apion., i. 9), that ‘‘he alone understood (udvos a’tés cuvinv)” the information brought to the Romans by deserters from Jerusalem during the siege, must be regarded as a piece of bombast. For is it credible that a Roman army before a besieged city should have had with it no other interpreter besides one recently captured prisoner? Nevertheless, this exaggeration may be taken as an indication that the lower classes in Jerusalem could not, asa rnle, speak Greek; for Josephus assumes this, as a matter of course, Greek, of course, wonld have been perfectly intelligible to any educated Roman if the deserters had been able to speak it.

4 An exact illustration may be derived from the Latin translation, by Rufinus, of the Clementine Recognitions, in which (Sanday, Gospels, p. 161) “the quotations from the gospels have evidently been assimilated to the canonical text which Rufinus himself used.”

The hypo- thesis of trans- lation.

Hebrew and from the LXX., and even from the same quotations as elsewhere occurring in the New Testament. And this is just what we might expect. A Hellenist, translating a Hebrew document into Greek (in times when reference to books was far more cumbrous, and trust to memory far more common, than with us) would be likely to be guided principally by his memory of the LXX., but partly by the Hebrew before him. Hence would result translations slightly varying both from the Hebrew and from the LXX., and from other translations made by contemporaneous writers. This argument is, of course, unaffected whether the translation was originally made in a document or, as is more probable, in an oral tradition.

Some confirmation of this hypothesis is derived from the fact that, although the first book of Maccabees was with- out doubt originally written in Hebrew, yet the quotations in it from Scripture are not translations from the Hebrew version. On the contrary, if the quotation in 1 Mac. vii. 17 from Ps, Ixxviii. (Ixxix.) 2, 3, be compared with the latter passage in the LXX., it will be seen at once that the former, though not identical with the latter (nor with the Hebrew), could not have been written but by a writer familiar with the LX X. version ; compare also 1 Mac. ix. 23 with the LXX, version of

Ps. xci. (xcii.) 8. A similar inference would seem to be justified by the statement (De Wette, quoted by Roberts, Discussions on the Gospels, p. 50) that Josephus uses the LXX.° more than the Hebrew text.

Mistranslation of an Aramaic original may possibly explain in part some of the confusions in the comnion tradition noted above (p. 791). It cannot of course be denied that some of these con- fusions imply a confusion of Greek, not Hebrew, tradition (¢.g,, lodyyeaAot, Lu. xx. 86; ws ayyedAo, Mat. xxii. 830; Mk. xii. 25); but some of the changes of construction (¢.9., maoa 7 mepixwpos étemopedero, Mat. iii, 5 and Lu. iti. 8, #AGev ets macay Thy mepixwpov, Mk. i. 5) are more easily explicable on the hypothesis of translation. Some of the changes of words are also explicable thus, as may be illustrated by the Latin version. Commenting on the text, ‘‘Domine, ne in zra tua arguas me, nec in furore tuo corripias me,’’ Augustine (Ziegler, p. 10) says that in some codices of the Latin translations ‘‘ira” stands first, and ‘‘furor” second, in others ‘‘furor’? first and ‘‘ira’” second. Compare with this Mat. v. 40, r@ O€AovT: Aafey xiTOva Udes abt@ 7d indriov, and Lu. vi. 29, rot atpovrés cov 7d tuariosr wh KwAvons Tov xita@va, where the phenomena are precisely the same; and note that Mat. (xxvii. 65) has iudévia, where Mk. (xiv. 68) has yitvavas. Of somewhat the same type (perhaps) arc the passages Mat. vii. 16, amd axavOav orapvany, and Lu. vi. 44, éx Barov cradvany.

In the translations from Greck into the early Latin versions of the New Testament, one very common difference is (besides diver- gent rendering of single words) that one version uses participles where the other uses finite verbs, or relative pronouns where the other uses co-ordinate conjunctions. These same slight differ- ences are found in several sayings of our Lord where they happen to be twice recorded by the same evangelist. Compare (a) Lu. Vili. 18, ds yap ay @xn, and Lu. xix. 26, rdvri TG ExovTi (see also Mat. xiii, 12; xxv. 29); (0) Lu. viii. 17, ob ydp éoriw xpumrdy 8 od pavepdy yeynoero, and Lu. xii. 2, ovdtv Se cuyreradupuévoy éotiv 3 obk admoxaduPOnoera (see also Mat. x. 26); (c) Mat. x. 89, 5 eipdov thy puxyhy avtod amordeoe: avtiv, Kal 5 dmoAcoas Thy wuxhv abrod everev €uod edphoes avrny, and Mat. xvi. 25, ds yap cay OéAn Thy Wuxhy abtod caom amorgee arThy, ds 8 av a&moAEaN Thy Wuxhyv avrod everev euod eiphoe avrqy (and cf. Lu. ix. 24; xvii. 25); (Z) Mat. v. 82, was 5 droAdwv

Thy yuvaika abtod, &c., and Mat. xix. 9, 6s ay dmovdon, &c. (e) In the same two passages there appears to be a confusion between ‘‘canseth to commit adultery” and ‘‘committeth adultery,”—Mat. v. 32, mapexrds Adyou Twopveias, moet abthy porxevOqvar, and Mat. xix. 9, wh ém mopveia . . » « potxara; (7) Mat. v. 32, ds ey amoAeAumevnv younon, and Mat. xix. 9, 5 amodcAuudvny yauhoas. These pas- sages, so far as they go, would indicate that the compilers of the

1 Compare the Codex Corbeiensis and Brixianus (Migne, Patrologiee Curs. Compl., vol. xii. p. 147) ; of which (1) the former has (Mat. ii. 7) ‘‘Tunc Herodes, clam vocatis Magis diligenter didicit ab eis tempus stelle que apparuit eis; et mittens illos in Bethleem, dimit ‘ Ite et interrogate,’ &c.; while the latter has (2) Tunc Herodes occuite vocans Magos diligenter cxquisivit ab eis tempus guando apparuit eis stella, et misit illos in Bethleem, dicens, ‘ Huntes requirite,’” &c.

GOSPELS

| SYNopTicat.

First and Third Gospels did not themselves tran originals ; for if they had themselves been the t secm that they would have adopted a uniform rendering in trans lating the same or very similar words. Limited though the a dence is, it goes to prove that the compilers incorporated in thet, treatises Greek translations, not all made by themselves fr 2 Aramaic originals. ——

The phenomena of the ante-Jerome versions of the New Testa- ment deserve careful consideration in discussing the Possible

slate from Aramaic ranslators, it would

? ee U origin of our Greek synoptic tradition from an Aramaic original. In a well-known passage, Jerome (Ziegler, Dic Latetnischen Bibelitber.

selzungen vor Hicronymus, p. 12) complains that there were as man

texts as copies of the Latin versions (‘‘ tot sunt enim exemplar, pene quot codices”), and the occasionally great variety may be illustrated by

comparing an extract from the Codex Bobbiensis (Jahrbiicher d. Literatur, Vienna, 1847, ad Jin.) with the Vulgate version of Acts xxvii. 20, 21:—

BOBBIENSIS.

Neque sole neque stellis apparentibus per multos dies et hieme et tempestate minimia [sic] perseverante, jam ampu- tabatur spes omnis liberandi nos. £¢ cum jam diu sine eibo essent, tunc stans Paulus in medio ipsorum ait : Oportu- erat guidem vos obediri credentes mihi non navigare de Creta et lucrari hanc iyuriam et detrimentum,

VULGATR.

Neque autem sole neque sideribus apparentibus per plures dies et tempes- tate non exigua imminente, jam ablata erat spes omnis salutis nostra, Et cum multa jejunatio fuisset, tunc stans Paulus in medio eorum dixit ; Oporte- bat quidem, o viri, andito me, non tollere a Creta, lucrique facere injuriam hanc et jacturam.

It will be seen at once that there is some similarity between the thread common to these two Latin versions and the thread common to many passages in Matthew, Mark, and Luke ; though the re- semblance between any two of the three synoptists would generally exceed the resemblance of the two passages quoted above, In most cases, however, the ante-Jerome versions (as represented by the Codex Corbeiensis, Brixianus, Vercellensis, and Veronensis) agree much more closely together, even more closely than any two of the syhoptists agree together, and a portion more closely than the three synoptists agree. On the whole, taking into consideration the greater influence of differentiating causes in the earliest times of the church than in the times wlien the ante-Jerome versions were composed, we may fairly conclude that if in these later times so great a variety could occur in the process of translation from Greek, the greater variety found in the common tradition, as given by the three synoptists, ight well be partly explaincd in the same way, as originating in part from varieties of translation from Hebrew. But then the questions arise—(a) Were the ante-Jerome versions independent translations from the Greek text? (6) Or were they divergent corruptions of onc original Latin translation from the Greek text? (c) Or were they partly independent, but partly modified by some oral tradition or

‘‘ ecclesiastical use,’ which diminished the divergence? On these questions there is not at present a completc agrecment. Wiseman maintained that the second (0) answer was the right one; but in a recent work (quoted above) Ziegler (p. 123) maintains, with great probability, that the third © is correct —viz., that the oral catechizing and preaching in the Latin churches modified and assimilated translations otherwise independent. It 1s extremcly probable that the same hypothesis of combined causes—(1) translations from Aramaic documents, (2) influence of oral Greck tradition —may explain much of the agreement and variation in the passages common to the three synoptists.

The difference between the Triple Tradition of Matthew, Mark, and Luke, and the Double Tradition of Matthew and Luke will, at this stage, occur to us as an important feature in our evidence. The widely different phenomena of the Double and the Triple Traditions suggest different origins for the two traditions. Many of the passages common to Matthew and Luke agree together far more closely than even the Latin versions of the Greek Gospels. It would seem to follow that in such cases Matthew and Luke used one and the same Greek document—a translation of some Aramaic original—which document had not undergone much modification by oral tradition before passing into the several treatises of Matthew . Luke. On the other hand, the more varying language 0 the Triple Tradition, together with the additions and omis- sions of the three writers, suggests (2) independent trans- lations of an Aramaic original ; (b) occasional resemblances suggested by the general “usus ecclesiasticus 5 © os gences created by the local “usus ecclestasticus, oF DY the individual style of the editor or editors. ;

Date of the Synoptic Writers.—The composite nature

INTERNAL EVIDENCE. |

the synoptic Gospels makes it necessary to distinguish care- fully between the date of the compilation of each collective * treatise and the date of the composition of the several parts of which that treatise may be composed. The original tradition has been shown to have existed before any of the three synoptics; some common document of the words of the Lord has been shown to have probably existed before Matthew’s or Luke’s narrative; other docu- ments or traditions might also possibly be shown to exist

embedded in each of the synoptists, and the date of each |

of these parts would be earlier than the date of the whole. Therefore, even if the date of Matthew, or Mark, or Luke could be exactly determined, it would by no means deter. mine the date of the traditions which they contain. It is even possible that a later Gospel may retain in some cases an earlier version of the common tradition of the words of the Lord, as we have seen in the case of Luke's version of the Lord's Prayer (see p. 798 above).

There is no internal evidence for exactly determining the date of any one of the synoptics. The supposed references in Mark to the death of James, the capture of Jerusalem, or any special earthquakes which might deter- mine the date (Renan's Evangiles, p. 123), are so shadowy as scarcely to deserve consideration. The reference to the death of Zachariah the son of Baruch, shortly before the capture of Jerusalem (Joseph., B. J., iv. 5, 4), supposed to be fonnd in Mat. xxiii. 35, is still more improbable. Still the marked difference between the detailed prediction (in Lu. xxi. 18-25) of the fall of the city and the scatter- ing of the people, and the more general predictions in corresponding passages in Matthew and Mark, indicates that Luke's description is modified by reminiscences of the siege of Jerusalem; while Matthew's and Mark's accounts are not thus, or at all events not equally, modified. It is an almost certain inference that Luke compiled after 70 a.p. As regards Matthew and Mark inferences cannot be drawn with equal certainty; for of course a compiler may compile at a late date, and yet preserve traditions in their earliest shape; but it isat least a reasonable inference that the compilers of the First and Second Gospels wrote before Luke; and there is a balance of probability in favour of the supposition that they wrote before the fall of Jerusalem.

Coming to more general evidence, we find (see p 791) that (1) Mark, at least in many passages, includes the original tradition from which both Matthew and Luke borrowed; (2) his language, less polished than that of Matthew and Luke, appears more natural for an earlier Gospel in the first and rudest age of the church; (3) Mark's version of the tradition contains many expressions which might naturally be considered " stumbling-blocks," and which, in fact, were rejected or not inserted in the other

Gospels; (4) the omission of all account of the manifestations of Jesus after the resurrection indicates a very early date; and though it may be said that this omission arises from the fact that the Second Gospel was accidentally left incomplete, yet this answer will not account for the omission of the genealogies, and of all account of the birth and infancy of Jesus; (5) the inter- polated appendix describing the resurrection of Jesus, quoted as it is by Irenzus, shows that even in the time of Irenzeus (170 a.p.) the Gospel had been long enough n use to admit of widespread interpolations. All these facts lead to the inference that Mark was compiled earlier than any of the other Gospels, and probably some time before 70 a.p. It is almost impossible to fix any date (worth stating) after which the compilation must have taken place. Those who accept as literally true Mark's accounts of the feeding of the four thousand and five thousand, the

may naturally carry back his history to the first years of the Galilean church; and even those who interpret these accounts symbolically are ready to admit that a very short space of time is often quite sufficient, by misunderstanding and accretion, to erect supernatural narratives on a basis of natural and symbolic story. But any approximation to a date after which the Gospel was compiled must be deferred till we consider the external evidence.

The narrative of Matthew does not leave us quite so uncertain. The mention of "the Jews," which is so frequent in the Fourth Gospel, is justly regarded as a proof that the author was writing in times when the Christian church was regarded as definitely and antago- nistically separated from the Jewish nation. In the synoptists it is the "' Pharisees," not the " Jews," who are in conflict with Jesus. But in his account of the resur- rection Matthew (xxviii. 15) uses the word in this anta- gonistic sense. Further, he twice (xxvii. 8; xxviii. 15) uses the expression "even to this day," of events occurring shortly before or after the death of Jesus,—thereby showing that a loug interval had occurred between the death of Jesus and the compilation of the narrative. The tone of the Gospel, as compared with Luke, indicates a period when the Jews still existed as a nation, and when the abrogation of

the law and the destruction of the temple were not yet accepted as recognized facts ; but the number of parables upon the end of the world and the judgment, the tendency to dwell on exclusion rather than inclusion, on the “many” that are shut out rather than on the “few” that are chosen, and the atmosphere of gloom generally characterizing the Gospel, point perhaps to the crisis immediately preceding the siege of Jerusalem. The additions concerning the birth and incarnation may seem to imply a later date; but when we reflect how natural it was that in very early times the church should attach importance to these subjects, the wonder will be, not that these narratives were written so soon, but that they were deferred to so late a period as forty years after our Lord’s death. It is also extremely remarkable—and a mark of early date as compared with Luke—that even in this developed form of the Gospel the accounts of manifestatiou of our Lord after His resurrection should be so scanty, doubtful, and vague.

In Luke the signs of later date abound :—(1) the pre- existence and implied failure of many “attempts” to set forth continuous narratives of the things ‘‘ surely believed ;” (2) the mention of the “tradition” of the eye-witnesses and ministers of the word as past, not as present (zapedocar) (i. 2); (3) the dedication of the Gospel to a man of rank (fictitious or otherwise), who is supposed to have been “‘catechized” in Christian truth; (4) the attempt at literary style and at improvement of the “ usus ecclesiasti- cus” of the commion tradition; (5) the composition of something like the commencement of a Christian hymno- logy ; (6) the development of the genealogy and the higher tone of the narrative of the incarnation ; (7) the insertion vf many passages mentioning our Lord as 6 xvptos, not in address, but in narrative; (8) the distinction, more sharply drawn, between the fall of Jerusalem and the final coming ; (9) the detailed prediction of the fall of Jerusalem, implying reminiscences of its fulfilment; (10) the very great development of the manifestations of Jesus after the resurrection. The inference from all this evidence would be that Luke was not written till about 80 a p. at earliest. If it could be further demonstrated that Luke used any Greek Apocryphal book (Judith, for example), and if it could be shown that the book in question was written after a certain date (Renan suggests 80 a.D. for the date of the book of Judith), it might be necessary to place Luke much

walking on the waves, and the exorcism of the Gadarene, | later; but no such demonstration has been hitherto produced,

The earliest quota- tions from the Gospels.

External Evidence.

The composite nature of the synoptic Gospels will affect the inferences we shall draw from early quotations of passages found in them, where the authors of the Gospels are not expressly mentioned. If, for example, we find in Justin a passage (quoted as a saying of the Lord) which is found both in Matthew and Luke, Justin may indeed have quoted it from Matthew or from Luke; but it is also possible that he may have quoted it neither from Matthew nor from Luke, but either (a) from the common source whence Matthew and Luke derived the passage, or (0) from some other book or tradition, which, like Matthew and Luke, included the passage in its collection or compilation. The same applies to a quotation from the Triple Tradition. It may be quoted from Matthew or from Mark or from Luke ; but it is also possible that it may be drawu from none of these, but from the common tradition itself, or from some other treatise based on the Triple Tradition.

Taking the evidence chronologically, we come first to the testi- mony of Paul, who, in the First Epistle to the Corinthians, says (1 Cor. xi. 28), "1 received from the Lord that which also I de- livered to you ;" and then follows a description of the institution of the Lord's Supper, differing materially from Matthew and Mark, and agreeing in the main with Luke, except that Paul repeats twice the command, " Do this in remembrance of Me." It would seem unreasonable aud scarcely reverent to suppose that a special revelation revealed to Paul the exact words of the institution ; but comparing the passage with Gal. i. 9, 12, we see that Paul merely says here about this part of his teaching what in Gal. i. 9, 12 he says about the whole of it, viz., that he received it from the Lord and not from man. From Ananias, or from other elders of the church, he may have received the words of oral tradition of the church; but for the meaning and spiritual force of it, and the application of each part of it to the work of redemption, he

was indebted, not to the elders of the church in Damascus, but to the revelations given to him in the solitude of Arabia. The words of Paul, therefore, do not exclude (and the facts render probable) the use of oral tradition in this passage. This being so, it may seem remarkable that Paul follows the tradition contained in the latest of the three Gospels. It can hardly be that Luke has here preserved the earliest tradition. The insertion of ‘‘new”’ before “*testament’’ (not inserted in the correct text of Matthew and Mark), and the ampler narrative of Luke indicate a later, not an earlier, shape of the tradition. The word ‘‘ testament” appears to have been used by our Lord in the ordinary sense of ‘‘ will” and “‘testament,’’ indicating that in that funeral feast He was be- gueathing Himself to His disciples for ever.! The insertion of ‘‘new,” by a sort of play upon the double meaning of the word “testament,” introduces the sense of ‘‘ covenant,” and therewith a contrast betwceu the old and the new covenants, But this sug- gestive thought (highly characteristic of Paul) seems more likely to have been added to the original in process of explanation, than to have been dropped by Matthew and Mark through neglect, or discarded owing to difficulty. The probable solution therefore would seem to be that Luke has embodied, not the earliest tradi- tiou, but the later Pauline shape of the tradition. We have here therefore not Paul supporting the tradition of Luke, but Luke (in all probability) borrowing from Paul.2 The only other pas- sage in which Paul (in the Acts) quotes a saying of Jesus con- tains (Acts xx. 35) words not found in any of our Gospels, ‘‘It is more blessed to give than to receive.”

The Second Epistle of Peter (2 Pet. i. 17) contains a reference (apparently) to the transfiguration, of which the writer speaks as an eyc-witness, But this testimony, most important if genuine, is almost certainly spurious. The mention of the mount of transfiguration as ‘‘the Holy Mount,” and of Paul’s epistles as “scriptures,” would in itself suggest a late date; and Canon West- cott (Gospels, p. 175) justly says that ‘the comparative elaborateness

‘ Similarly it is used in the Epistle to the Hebrews (ix 17), d:aOxxn yap éwi vexpots BeBala* éei pijmore ioydbe bre Gi 6 Stabéuevos, This use of the word is also found in the title of the early apocryphal work, The Testaments of the Twelve Patriarchs. It is said by Mr Sinker, in his edition of that work (p. 32), that probably, by the time of the composition of the Testaments (i.e, before 185 A.D), “the word écabsjxn itself [‘2°T1] had been taken into Hebrew in the sense of “will” (Buxtorf, Lex. Rabb. s.v.). It would seem to follow that long before that date, the word d:a@yjxy was in. regular use, in Hebraic Greek, to render the meaning “ will” or ‘* testament, “although of course it also represents (and very much more frequently, owing to the more frequent repetition of the thought in the New Testament) the meaning “ covenant.”

2 If the similarity between Luke xxii. 20 and 1 Cor. xi 25 arises from an interpolation in the former, in that case the negative conclusion remains the same, that we have not here Paul supporting the tradition of Luke.

[SYNOPTICAr,

of the description (of the transfiguration) seems to offer an instruct. ive contrast to the simplicity of the earlier Gospel,” External evidence is also against the genuineness of this epistle, Up to th times of Clement of Alexandria ‘‘no trace has been found” of Pi existence (Westcott, Canon, p. 349); and neither Origen nor Eus : bius accepts it as canonical. To obtain a complete idea of the judgment of the church upon the canon, we must combine (West. cott, Canon, p. 264) the two canons of the East and West-by doin this ‘‘we obtain, with one exception, a perfect New ‘Testament without the admixture of any foreign element.” That “exception” js the Second Epistle of Peter. The only importance to be attached therefore to the testimony of an epistle thus rejected by the general consent of the early church is that which attaches itself to an ear] literary fabrication composed so early as to have found a place : our canon. Such a composition (mentioning Paul’s letters ag ‘scriptures ”) cannot have been written before the beginning of the second century; yet we find that, even at that date, the common tradition is quoted most inexactly. The voice from heaven, as given by the author of the spurious epistle, is, ‘O vids pou 8 dyannrds pou ourds éotiy eis by eye evddenoaw But in Matthey (xvii. 5) it is obrds éorw 6

vids pou 6 ayanntds ev @ evddenoa' akodvere avrod, Mark and Luke differ still more from the Epistle, for they both omit evSdxynoa. Theinaccuracy is the more serious because, in describing the baptism of Jesus, Matthew (iii. 17) speaks of a voice from heaven which almost exactly agrees with the words in the Epistle, omitting the words axovere abrov, In these circumstances it is impossible to say that the author of this spurious Epistle had Matthew before him. Much more probably he was quoting from memory, or from some document differing from any of our synoptic Gospels,

The next witness is Clement of Rome, whose Epistle to the Clement, Corinthians, probably written in or soon after 95 A.p. (Lightfoot's Clement of Rome, Appendix, p. 267), contains three passages which may indicate a use of our Gospels. (1) Iu chap. xiii. he blends together (Sanday, The Gospels in the Sceond Century, p. 921) pas- sages common to Matthew (v. 7; vi. 14; vii. 12; vil. 2), Mark (iv. 24; xi, 25), and Luke (vi. 36, 37, 31, 38, 37) ina terse, antithetical, and uniform style, inserting the words, 'Qs xpnorevecde oftws xpnorevdqoeta: Suiv. Dr Lightfoot has pointed out that the loose- ness of this quotation does not exceed the looseness with which (chap. 12) the same author quotes the narrative of Rahab, and therefore it is quite possible that here, as there, Clement may be simply quoting from memory with no other documents than Matthew and Luke in his mind; but to many the '' roundness, compactness, and balance of style" which Dr Sanday notices in the quotation will make it probable that Clement was quoting, not perhaps from any other document (for else how is it that no trace remains of a docu- mentary version of the word of the Lord so ''rounded and compact" in style, and used 95 A.D. by so eminent a man as Clement of Rome in writing to the church of Corinth ?), but with some tradition in his memory (which had perhaps served the purpose of preachers, teachers, and catechists in the Roman Church), blending and con- densing the versions of Matthew and Luke into a form adapted for the oral instruction of converts. (2) In another passage (chap. xxvi.) Clement combines Mat. xviii. 6 (Mk. ix. 42; Lu. xvii. 1, 2) and Matt. xxvi. 24 (Mk. xiv. 21; Lu. xxii. 22) in a manner which sug- gests quoting from memory. (8) A third passage (Sanday, p. 70) contains a quotation from Isaiah (xxix. 18) differing from the Hebrew and from the similar LXX, (which is, éyyie: por 6 Aads otros dv TG atduatt avtov, kal év ToIs xeidcow aUTOY Tmo

HE, H 8& Kapdla aitay wéppw améxe: dm’ euov), and substituting a condensed and antithetical form, obros 6 Aads Tors xelAeolv pe TING, 1 bt Kapdia ovtav wéppw améotw dm’ euod, which is also found in Matt. xv. 8 and Mk. vii. 6 (except that they read dméxe: for améotiv). The inference has been drawn that Clement is quoting from our Gospels. But this is not the only passage where quota- tions from the Old Testament in the New appear to have been influ- enced by an ‘‘ecclesiastical use,” arising in some cases from a desire to make the application closer (compare Jo. xix. 37 with the LXX, version of Zech. xii. 10, and note that this version is exactly quoted by Justin, and allusively by the author of the Apocalypse, 1. 7), in part from abridgment or othe: causes (compare Mat. i. 3; Mk. 1 3; Lu. iii, 4 with Isa. xl. 3). Therefore, even though the citation in Clement exactly coincided with the citation in Mark and Matthew, it would not follow that Clement cited it from them ; and as the quotation is not identical, the probability is that it 18 quoted by Clement, with a slight alteration, from memory of ‘ecclesiastical use.” There is also in chap ii. (“more gladly giving than receiving”) an allusion to the saying of Jesus men tioned in Acts xx. 35. Our conclusion is—(a) that Clement of Rome, about 95 a.p., is proved to have a knowledge of the several scattered sentences in our common tradition which he quotes as ‘words of the Lord,” but very loosely and freely; (6) that his quotation of the Old Testament appears on one occasion to be er enced by Christian ‘‘ecclesiastical use”; (c) that he uses (but whether as a quotation or not we have no means of determining) some Lae not found in our Gospels, which words are attributed to Jesus by the author of the Acts of the Apostles.

EXTERNAL EVIDENCE. |

Early in the second century we for the first time meet with a quotation from the addition to the common tradition which are peculiar to Matthew. The Curetonian or shorter version of the epistles of lgnatius (107 or 115 A.b.) uscs Matt. x. 16 almost verbatin, and possibly refers (Sanday, p. 79) to the star of Matthew (chap. ii.). The Vossian or longer version of the Ignatian epistles (which may be accepted as testimony for about 150 A.D.) contains, besides an aniple and somewhat exaggerated reference to the star in Matt. ii., three or four (Westcott, Canon, p. 60) short but striking phrases peculiar to Matthew. But none of these passages have marks of quotation, the words

of Matthew being in each case em- bedded in the writer's own words. lt is remarkable that the only words of the Lord expressly quoted by lgnatius are words not found in any of our synoptic writers: ''And when He came to those about (wepi) Peter, He said to them, Take, handle Me, and sce that 1 am not a bodiless demon." These words, although they have some likeness (the word WnAadjoare is in both) to Lu. xxiv. 39, are expressly said by Eusebius to be derived from some source unknown to him, and by Jerome to be derived from a Gospel which he had translated (from Hebrew), and which was read in his time by the Nazarenes (Kirchhofer, p. 449); and, according to Origen, the passage occurred in the teaching of Peter. It is, of course, impos- sible for us, upon this evidence, to determine whether Ignatius quoted from the Nazarenc gospel, or from the teaching of Peter, or from some other document or tradition enibodied before or after in both those documents. Our conclusion is that, by the middle of the second century, the writer of the Vossian version of the Ignatian epistles was familiar with the Gospel of Matthew, but that he also used other sources (not known to us) when quoting the words of the Lord in support of the material resurrection of Jesus.

In the Epistles of Barnabas (100-125 a.p.) is found (chap. iv.) the first apparent reference (if we except the reference in 2 Pet. iii. 16) to any passage of the New Testament as ''written": " Let us beware lest we be found, as it is written, many called, but few chosen," words almost exactly found in Matt, xxii. 14 alone (pro- bably interpolated in Matt. xx. 16). There is also an allusive quotation of the words in Matt. ix. 18; Mk. ii. 17; Lu. v. 82: '1 came not to call the rightcous, but sinners." The only words ex- pressly assigned to Jesus (chap. vii.) are not found in our Gospels: '*Kven so, saith He, they that would see Me and touch My king- dom, must take Me, through persecution and suffering."' 1t is most unfortunate that the inexactuess of the verifiable quotations in this epistle prevents us from laying much stress upon the author's statement as to the source of those which are unverifiable. For example, in chap, xvi., the author has, ''The scripture saith, And it shall come to pass in the last days, that the Lord will deliver up the sheep of His pasture, and their sheepfold and tower to destruction. And it so happened as the Lord had spoken." But we know of no '' scripture" containing these words ; and the probability is that the author was quoting from memory and erroneously, as when (chap. v.) he

combines Isa. iii. 9 and Wisdoin ii, 12, as follows: ‘‘ The prophet speaks against Israel, Woe to their soul because they have counselled an evil counsel against theinselves, saying, Let us bind the Just One, because He is displeasing to us.” Our conclusion is that, if Barnabas is deceived by his memory in attributing one passage to “ writing” or ‘ serip- ture,” he may be deceived about another, and that we consequently cannot feel sure that he is quoting Matt. xxii. 14 from a document and not from memory of oral tradition. But (a) that the author was acquainted with passages found in Matthew is certain ; and (0) it is also certain and noteworthy that the only words of the Lord quoted by him are quoted from sources not known to us

Polyearp (born about 69 A.D., died 155 or 156) quotes (chap. ii.) sentences from the Sermon on the Mount, similar to those quoted by Clement above, with the preface, ‘‘remembering those things which the Lord said (while) teaching, Judge not,” &c. The quotation, like Clement’s, is antithetical and conipressed, but neither in order nor in words agrees so far with Clement’s as to make it in the least degree probable that Polycarp and Clement are quoting from a written version differing from our synoptics. There is also a quotation from Mat. xxvi. 41 and Mk. xiv. 38, and a refer- ence to Mat. vi. 13, ‘‘ Asking the all-beholding God not to lead us into temptation; even as the Lord said, The spirit indeed is willing, but the flesh is weak.’’ Two other coincidences (chap. v. and vi.) secm to refer to Mat. xx. 28; Mat. ix. 35; Mat. vi. 12, 14; Lu. xi. 4. There are no supposed allusions to apocryphal writings in Polycarp (Westeott, Canon, p. 61). It will-be seen froin what has been said above that there is nothing remarkable in the great varia- tions with which the ‘ Scrmon on the Mount” was taught and quoted among the Christians in the first century. Like the “‘ Lord’s Prayer,” it has not a literary but a practical interest; and being much used in inany different churches from the earliest times, it may naturally have assumed many different shapes serviceable for catechists and preachers. This consideration (and the possi- bilities of variation arising from translation) may easily account for the variation between Clement and Polycarp, without necessitating or justifying, even as a working hypothesis, the supposition that

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Clement or Polycarp, in quoting the “Sermon on the Mount,” quoted from other docuinents than our existing Gospels.

The ‘‘ Shepherd” of Herinas, written about 135-40 a.D., ‘‘con- tains no distinct traces of any writing of Old or New Testament” (Sanday, Gospels). This is worth bearing in mind, as a warning that the nature of the subject will greatly affect the number of quotations from the scriptures in any early books. The allegorical nature of the ‘‘Shepherd,” intended more as a stimulating tale than as a polemical or hortatory discourse, dispenses with scriptural illustrations; and in the same way Justin, in his Second Apology, refrains from quoting the scriptures, while in his other works he multiplies quotations or references. 1n appealing to the heathen, Justin ‘‘ quotes the scriptures only when he must speak of things beyond the range of common history, preferring elsewhere to appeal to external documents such as the enrolment of Quirinus and the Acts of Pilate” (Westcott, Canon, p. 110).

Papias, who wrote about 130-140 a.p., composed five books, entitled ‘Exposition (é&yyfoews) of the Oracles! of the Lord.” It is (apparently) in an introduction to this work that he speaks (Kuseb., tii, 39) of traditions gathered from different sources: “ But I will not shrink from placing along with my interpretations (€punvelas) as many (traditions) as at any tine I learned well, and well stored up in memory from the elders.” The nonn “inter- pretations” (€punveias) may receive some light from Papias’s own use of the words épunveuras and épunvedw, as quoted in the same chapter of Eusebius, ‘* Maik,” he says, “was the interpreter of Peter (€punveuths Métpov yevoueros):”? again, ‘ Matthew wrote his scriptures (Adyia) in Hebrew, and each man interpreted them (npunvevae) as he best could.” So Eusebius himself in the preced- ing chapter tells us that some believe Clement to have ‘‘inter- preted” (€punvetwa:) Paul’s (Hebrew) Epistle to the Hebrews into Greek. Our conclusion would be that the word épuyvela: may here mean something mole than mere “‘eommentary”; it may imply that he, as others had done, wrote an interpretation of the ‘* Logia,” accompanied by comments and by supplementary tradi- tions, At all events he does not speak of any one Greek “interpretation” of Matthew as being as yet paramount and autho- ritative, so as to exclude the necessity of further

interpretations." Of Mark he speaks (in the person of ''the elder") almost apolo- getically, implying that his narrative had been censured for its incompleteness and unpolished style; and he defends it by quoting a tradition from 'the elder" (apparently, John the elder) thus :— "Mark, having becoine Peter's interpreter, wrote down accurately all that he remembered—not, however, in order—both the words and decds of Christ. For he neither heard the Lord, nor attached himself to Him, but later on, as I said, attached himself to Peter ; who used to adapt his lessons to the needs of the occasion, but not as though he were composing a connected treatise of the discourses (Adywr, V. Yr. Aoyiwv) of tlie Lord: so that Mark committed no error in writing down some matters just as he remembered them (aze- uvnudvevoe). For one object was in his thoughts (évds yap émocetro ampévorav)—to make no omissions and uo falsc statements in what he heard,"

Much of this exactly applies to our Mark, If we desire to know what is meant by Maik's not writing " in order," we have only to turn to Luke, who made it his object to write ''in order," and whose arrangement, clironologically as well as artistically, differs from Mark. It is true that we may be disposed to think Mark's '¢ order" not inferior to Luke's; but the fact is indisputable that Luke attempted to write ''in order," and that his ''order" differs considerably from that of Mark, who manifests no purpose except the desire to put down what he knew as he remembered it. It has been shown above (see p. 802) that Mark's Gospel is rather a col- lection of anecdotes than a connected narrative ; and of such a collection it would be natural to say that 1t was not written as an orderly narrative. To the single evidence of Papias, derived from an unknown elder, not much importance can be attached ; and it is very doubtful whether the most searching investigations will ever determine with certainty the name of the author or authors of any one of the synoptic Gospels. But at all events, it is only reasonable to admit that the hypothesis of " notes" taken froin oral discourses, and serving as the groundwork for the Second Gospel, would explain many of its phenomena. If these oral discourses embodied the early common Greek tradition, it would be easy to see how the First and Third Gospels came to resemble the Second Gospel, although all three Gospels are mutually independent. As regards the First Gospel, it has becn shown

above that internal evidence is against the theory of a very early authorship ; and we

1 No one word in English will exactly express the word Adyia, which was used both before and after Papias, to mean not merely “sayings” but ‘ Scriptures.”—-Lightfoot, Contemporary Review, Oct. 1875.

2 Cf. also Clem. Alex., Strom, vii. 17, 106, where certain heretics appcal to Glaucias rov Iléryou épunvéa; and Jerome suggests as an explanation of the difference in style between the First and Second Epistle of Peter that the apostle used different interpreters (Kirchhofer, p. 276). The point for consideration is, not whether the statements of Papias are correct, but what Papias mcant when he spoke of Mark as €ounveuTrjs, and of himself as writing éouryveiat,

must add that it exhibits no signs that the portion before the call of Matthew was written from hearsay, and that after the call of Matthew by an eye-witness. But there seems the following strong argument in favour of the tradition of Papias as to the authorship of Matthew: if there was no basis for it, if it was a mere fiction or guess, why not select, as the author, some more distinguished apostle, Peter, John, or James? This argument is neutralized by the following eonsideration. The apostles (Aets iv. 18) were known in the earliest days to have been unlearned and ignorant men ; and although the Holy Spirit gave them power to speak and teach, it was less natural that they should be inspired with power to write and to compose eonneeted treatises. But Matthew being a publican, and necessarily ready with his pen, might naturally be supposcd in the post- apostolic generation to be a skilful writer; so that if an early tradition with general apostolic authority was committed to writing, the church would naturally select Matthew the publican and ready writer as the special author of it. Nevertheless, the testimony of Papias is important as attesting the belief (1) in a Hebrew

origin for the Logia or the Gospel scriptures, and (2) in an early multiplicity of ‘‘interpretations.”

The apologetic tone in which Papias introduces the traditions, which he ‘‘ will not shrink from placing along with the interpreta- tions” of the scriptures, indicates that the written scriptures were gradually subordinating tradition. He nowhere expresses an opinion that the Logia are unauthoritative, but he implies that they require ‘‘ interpretation,” and adds (almost as though it were an idiosyncrasy) that he set a great store on supplementary tradi- tion from the sources nearest to the truth,—not only taking plea- sure in those who taught the commandments that came from the Lord (who was) the very truth (¢.c., the disciples of the Lord), but also questioning any who had ‘‘ attached themselves to the elders,” whom he used to exainine elosely on the utterances of Andrew, Peter, Philip, Thomas, James, John, Matthew, or any other of the disciples of the Lord, and on the sayings of Aristion and the elder John, the disciples of the Lord.

1 Eus., H. E,, tii. 39: Ovdn dxviicw 6€ cot kai 60a Toré Tapa THY TpEGC-Burépwy kadas euabov kal Karas énvnudvevoa, ovvtdtat Tals epun- velas, dtaBeBaovpevos Tepl a’rav adjVerav’ ob yap Tots Ta ToANG Aéyovow €xatpov, &orep ot WodXol, AAA Tots TAAOG dOdcKovow, ovdé Tots Tas d\NOTpias évrohds pynuovevova, GAA Tots Tas Tapa Tov Kupiov TH wiorer Sedopévas Kai dx’ abtis Twapayryvoménas Tijs ad\nOetas. el O€ rov kal TapnkorovOynKws Tis Tots TpEecBuTEpors EADoL, Tos tav mpecBuTépwy dvéxpivov Adyous’ Ti ‘Avdpéas h réi Jlérpos elev h th Pidummos t} Ti Owns fh LakwBos Th Iwavuns } Marbatos # tis repos THY TOU Kuplov pabyTav, & Te ’“Apiotiwy Kal 6 mpecfi- tepos ‘lwdvyys of Tov xuplov wabytal Aéyovcr. It is maintained by able scholars (from whom dissent can be expressed only with great diffidence) that the Aéyovor indicates that Aristion and John the elder were living, while the elev indicates that Andrew, Peter, John the apostle, Matthew, and all the rest of the apostles were dead at the time ‘‘ when Papias began his investiga- tions” (Westcott, Canon, p. 69). Now, John the apostle is supposed to have died at a very advanced age, about 98 a.p., and Papias (Lightfoot, Contemporary Review, May 1875) to have been born about 60-70 a.p., and to have written (Westcott, wt sup.) about 140-150 a.p. We have therefore to suppose on this hypothesis (@) that Papias did not ‘‘ begin his

investigations” till he was twenty- eight or thirty-eight ycars old (é.¢., not till seven or seventeen years after he had attained to manhood), although the apostle John was living all that time in his immediate neighbourhood; (0) that two personal disciples of Jesus outlived the aged apostle John for a period long enough to enable Papias to conduct a systematic investigation into their traditions during their lifetime. ‘* Impro- bable” is too mild a word for such a hypothesis. It seems very much more probable that Aéyovaty is simply the graphic present used for variety. Papias desires to make a distinction between the dicta of the apostles and the less authoritative utterances of Aristion and John the elder, who were not apostles. For this purpose he not only (I) mentions them scparatcly, but also (2) varics the construction, changing vé into & Te, and (8) etare into Aéyet. A hundred instances might be given from the Gospel of St John alone, where el7re and Aéyet are used indiffcrently and alternately for the mere purpose of variety; see John iv. 9, 10, 11, 13, 15, 17 (6¢s), and the whole of the gospel passim, And for the use of Xéyer in a dependent sentence following an imperf. indic., com- pare Plato, Apol. 21 B., #arépouv vi arore Neyer, “I was in doubt as to what (the oracle) meant.’ It is true that Euscbius, though he denies Irenzus’s assertion that Papias was a hearer of John the apostle, maintained that Papias heard John the elder. But he appears to have no evidence for this statement except the sentence just quoted, and the fact that Papias set down certain traditions of John the elder, mentioning him by name. Ilis words are: “’Apuo- tiwvos 6€ Kat Tov mpecBuTépou ‘Iwdvvov abtiikoov éavTov nol yevérOat. ‘Ovopacti youv wohAdkis abtay pynuovetcas év Tots avrov ovyypappact TiOjow a’rav Tapaddcets. This is quite insufficient in face of the great difficulties in such a supposition. The only tradition of an elder quoted by Eusebius from Papias with any words of preface begins thus: “ The elder said this also.” Such a preface is quite consistent with the supposi- tion that Papias had heard the tradition, not from the elder himself, but front one who had attached himself to the cldcr (rapnkxoXovlnkws Tw mpecfu- TEpa) ; and the above-quoted sentence of Papias itself better suits such a supposition, for the ‘‘ cross-examining of those who had attached themselves to the elders” naturally applies to al/ the names that follow, and more especially to John, since he is expressly included in the class of ‘‘clders”” “I used to cross-examine any that came in my way who had attached themselves to the

elders (asking them), what said Andrew, and about the sayings of Aristion and John the clder ;" surely the natural inference is that Aristion and

GOSPELS

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It must be added that Papias, besides recording the raising dcad man by Philip, and the drinking of poison viet ine Justus surnamed Barsabas, is said by Eusebius to have nage several ‘‘ strange parables and teachings of the Saviour," and other fabulous matters, originating from a literal understanding of figura- tive expressions. He also published ‘‘a story about a woman accused in the presence of the Lord for many sins, which is con- tained in the Gospel according to the Hebrews" (Euseb., 4 . Sit has been demonstrated by Dr Lightfoot that Eusebins, in treatin of the disputed and undisputed writings of the earlicst sine adopted one course for the former and another for the latter, (1) ihe to the disputed books, the antilegomena, he pledged himself to ‘record when any ancient writer employs any book belonging to their class;" but (2) as regards the undisputed canonical books, he only professes to mention them, ‘‘ when such a writer has something to tell about them" (riva wep) ray évb:abhnwy etpnrar) Contemporary Review, Jan. 1875. Weare not therefore to infer from the silence of Eusebius that Papias did not know or quote the Gospels of Luke and John, but only that he said nothing about them; which of course might arise from either of two causcs, either because he did not know of their existence, or because, knowing their existence, he "had nothing to say about them." What bearing this may have on the authorship of the Fourth Gospel we shall see hereafter. But, so far, we sce written scriptures still (1) supplanted by oral tradition; (2) freely criticized as inadequate; and (3) accompanied by memoirs of various interpretations from some Hebrew original; though rapidly emerging if they have not already emerged, to authoritative definiteness,

One fact is of the highest importance. We haveseen that Papias was of a eurious disposition, discontented with the written records before him, and anxious to supplement them by traditions. He was also, according to Eusebius, a man of no great judgment, fond of re- eording wonders, and, by his own account, fond of recording novelties, If therefore there had been any other non-canonical Gospel at that time, rivalling our present Gospels,

and known to Papias, it seems probable, if not certain, that he would have used such a book ; and, if he had done so, Eusebius could not (in the execution of his plan) have failed to mention such a use; but Eusebius makes no mention of the use of any non-canonical gospel by Papias. Even in the narrative of the sinful woman mentioned above, which was found in the Gospel according to the Hebrews, Eusebius expressly avoids saying that he derived the narrative from that Gospel. He merely says that Papias ‘‘has published a narrative which is contained in the Gospel according to the Hebrews ” (it is probably the narrative interpolated in Jo. viii. 1-11) ; whereas, almost in the same sen- tence, he says that Papias ‘‘has used testimonies from the First Epistle of John.” This negative evidence from the silence of Papias is strongly in favour of our Gospels.

In the works of Justin Martyr (who is supposed to have written Justin his Apologies and Dialogue with T’rypho, 145-147 A.D.; so Hort, Martyr.

quoted by Westcott, Canon, p. 98) we find definite and abundant mention of written documents containing the facts of the Gospel narratives, but no assigned names of authors. The Gospel is by him eonsidered as a whole, sometimes called ebayyéAto, sometimes ebayyéAvov, but frequently 7& drouvnuovedpata Tav dmooTdAuy, and once (when he is referring to Mark’s Gospel) 74 dmouynpoveb- para Wérpov. Bearing in mind Xenophon’s well-known émouvn- povetjuara Swxpdrous, from which title ‘the word had already been borrowed by several writers” (Westcott, Canon, 108), we might naturally infer that the memoirs were not written by the apostles, but about the apostles or rather about their teaching ; and this view is confirmed by what Papias says (above) about Mark, that he arepynudvevoe, “recorded from memory,” the teaching of Peter.? This probably was originally the meaning of the title as applied to our Gospels ; but it secms to have been understood differently by Justin, as though it meant ‘‘ written by the apostles. For in describing the descent of the Holy Spirit on Jesus at His baptism he uses the words, ‘‘‘The apostles wrote.” It might indeed be said that he has in his mind Matthew and John, for John also records

John are included in the “elders.” If this be so, every difficulty vanishes, Papias, though placed before Polycarp by Eusebius, may have been

naturally 80 placed because he dicd before the aged Polycarp, so that his work fell in a period preceding Polycarp; but he may have been born about the same time or later, say 80 A.D. In that case the last of the apostles would have passed away before Papias was nineteen; and when Papias began his investigations he would neces- sarily have to rely on the pupils of the elders, since the elders themselves, whether apostles, as Andrew and Peter, or mere elders, as Aristion and Joho, had all passed away. If, however, it should appear after allthat Papias did hear John the elder, it follows that, when Irenzus described Papias as ‘‘the lak John,” he either (1) meant John the elder, or (2) confused John the elder a John the apostle. In either case most important consequences might follow, bearing upon the authorship of the Fourth Gospel. For it follows that, if here, then on other occasions, when speaking of the authorship of the Fourth Gospel, Irenus either (1) may have meant John the elder where we at present i him’ to mean John the apostle, or (2) may have confused John the elder wit John the apostle.

2 cette of Alexandria (Eus., 7. Z., vi. 14) expressly says that Peter i : part in the composition, and did not even encourage it. There seems fo hav been an early and not unnatural tendency to depreciate the Second Gospel.

EXTERNAL EVIDENCE. |

this ; but St John’s Gospel is not once quoted in the whole of his works, and it is inconceivable that, in this latent fashion, he should have referred once to a writing as apostolic, which elsewhere he never quotes. It seems more likely that Justin considered that the &ropynmovevpara Merpov were written by Peter, so that the first two Gospels at all events were written by apostles ; or else that he con- sidercd the First Gospel not to have been written by one apostle, but to have been a joint apostolic production. Elsewhere, in de- scribing the agony of the Lord (Lu. xxii. 44), a passage peculiar to Luke, he seems to have been struck with the inapplicability of his favourite title to a work written by one who was only a follower of the apostles ; and instead of his usual formula, he here substi- tutes “The memoirs which I assert to have been written by the apostles, and by those who attached themselves to them ;” but even this more precise description would only hold good of the three Gospels used by Justin, on the

supposition that the “Memoirs of Peter” were written not by Mark but by Peter. The subject is important, as showing by what easy stages a work written by a pupil might be supposed (even in the face of direct evidence to the contrary) to be written by the teacher,

For a full discussion of Justin’s quotations from the Gospels the reader is referred to Westcott, On the Canon of the New Testament, pp. 95-175, and Sanday, The Gospels in the Seeond Century, pp. 88-137. Here it must suffice to state a few general conclusions deduced from an examination of his use of the Old and New Testament.

We must bear in mind then (1) that Justin is writing polemi- cally, and that (especially in his, dialogue with the Jew Trypho) a inain object with him is to show that ‘‘the prophets are fulfilled in Jesus ;” to the proof from prophecy he attaches more importance than to any other. (2) He is a most inexact quoter; and though he quotes long passages from the Old Testament accurately, shorter passages are quoted from meinory inexactly, while Messianic pas- sages, even when long, are modified (sometimes with a closer return to the Hebrew original) by Christian use and adaptation to Christ. (8) He often inserts words and notions of his own in the passages quoted from the Old Testament: for example, he says that Moses, in order to heal the children of Israel from the plague of serpeuts, ‘‘took brass and made an image of a cross, and set this in the holy tabernacle, and said to the people, Should you look on this image and believe on it, ye shall be saved” (Canon, p. 124). (4) He aseribes texts to wrong authors, and quotes the same text in various shapes, not only in different books, but even in the same book and at short intervals (7b. 127). This being the case, we shall naturally be prepared, in approaching the New Testament quotations of Justin, to find many inaccuracies, and some alterations of fact ; especially where a slight alteration can render some Old Testament prophecy more applicable to the New Testament nar- rative.

Reviewing the quotations from the apostolic fathers given above, we shall expect to find in Justin also a great nuniber of the words of the Lord and incidents in the life of Jcsus quoted from tradition, which are not found in our Gospels. Clement, we find, has two passages roughly quoted from our Gospels ; and one traditional saying quoted in Acts xx. 35, Ignatius

(Vossian) uses phrases or sentences from Matthew four times allusively, but quotes a ‘* word of the Lord” found in no Gospel. The author of the Epistle of Barnabas quotes Matthew once, aud a non-canonical word of the Lord once. Polycarp is the first apostolic father who, while four or five times quoting or alluding to sayings in our Gospels, quotes no non-canonical passages. Papias ‘‘ published” a narrative con- tained in the Gospel according to the Hebrews. If then, in the small modicum of quotation hitherto given, so large a proportion (say a fourth) is non-canonical, how much more non-canonical matter might we naturally expect to find in Justin, who in two works quotes our Gospels 67 times (Sanday, p. 116), and occasion- ally in long continuous passages? We shall also expect to find in Justin many misquotations of our Gospels, arising from intcrpola- tions and corruptions of the text, for ‘‘the worst corruptions to which the New Testament has ever been subjected originated within a hundred years after it was composed” (Scrivener, quoted by Sanday, p. 135), A generation after Justin, Irenzus will be found quoting the interpolated appendix of Mark, which the general consent of scholars now recognizes to be spurious ; and it has been pointed out that the differences of Justin from the ordinary text are little more than the differences of Codex D from the same text. ;

Bearing these considerations in mind, we onght to be surprised, not at the large, but at the small amount of extraneous matter which Justin has introduced into the Gospel narrative, and at the comparative accuracy with which he has quoted the Gospels. Treating of the variations of quotation, Dr Westcott has shown that, even where Justin’s misquotations are found in other authors, the resemblances are of such a kind as to be easily derivable from gome common tradition, or from some early but now obsolete text (Canon, pp. 148-156). The extraneous matter may readily be explained as arising either from sense of an omission or from the

niorbid desire to find in each incident of the life of Christ the ful- filment of some prophecy in the Old Testament. If, for example, (1) he speaks of the voice from heaven at the baptism as being, ‘Thou art My Son, this day have 1 begotten Thee ;” this is ex- plained (apart from the various reading in D,

which no doubt arose fron the same motive) by a desire to see in the voice a repeti- tion of Ps. ii. 7. (2) Ifa fire is said to have been kindled iu the Jordan at the Lord's baptism, was it not natural that He who came to baptize others with the higher baptism of fire, as well as that of water, should Himself receive the highest baptism ; or that the act which was already technically known as gwtiouds, ''enlighten- ment," should be accompanied (in the cage of the Lord of Light) by that symbol which was specially characteristic of the divine pre- sence? (8) If Mark recorded that Jesus was a ' carpenter" (a fact not then suppressed by the various reading in Mk. vi. 8, owing to sueh sneers as those of Celsus, Origen, Cont. Cels., v. 34), was it not fitting that the Carpenter, who bade men lay hand on the plough, and take His yoke on them, should have ''wrought, when among men, ploughs and yokes"? (4) If he speaks of the Magi as having come *'from Arabia," had it not been prophesied, Ps. Ixxi. (Ixxii.) 10, that '*the kings of the Arabians shall bring gifts'? (5) If the foal of the ass on which our Lord entered Jerusalem was said by Justin to have been '' bound toa vine," must it not needs have been so, secing that it was said of Judah (Gen. xlix. 11) that 'he bound his foal unto the vine"? (6) Lastly, since Isaiah predicted (xxxiti, 16 in LXX.) that "he shall dwell ina high cave of a strong rock," was it not necessary that the Messiah should not only be born in Bethlehem, but also, '"in a cave" ?

In all these additions there is absolutely nothing to make pro- bable, or even suggest (even though the "fire" at the baptism of Jesus is mentioned in an apocryphal Gospel) that Justin used any other written Gospel than those known to us. These thoughts aud others like them were floating in the atmosphere of every Christian church in those days. They were the results naturally developed from that habit of appeal to prophecy which has produced, even in our own canonical Gospels, not inconsiderable effects ; and there is nothing in Justin's additions that is not capable of being explained from the same method (developed a little further) as that by which we may explain Matthew's addition about the potter's field, and possibly some of the other passages peculiar to the First and Third Gospels. Nor does the omissign of the names Matthew, Mark, and Luke, by Justin, throw any doubt upon the supposition that he used the Gospels called by those names. It is quite possible that the names were given to these Gospels long after their composition. The very title, *'The Gospel aceording to Matthew," &c. (not of, or by, Matthew), indicates that, even at the time

when the titles were assigned, the compilers were regarded rather as editors of an old and reccived tradition than as authors of a new book. It is therefore quite possible that Justin (who mentions John by name as the author of the Apocalypse) may have used the first three Gospels, and yet have been ignorant of the names under which they are now current,

Three niost important facts remain to be mentioned. (a) Justin tells us that in his days the memoirs of the apostles were read with the books of the prophets in the service of the church. This public reading of the memoirs must have given, if not a complete security, at least a considerable guarantee, against material alterations. The fact that the new traditions were now placed on a level with the ancient and venerable writings or scriptures of the Old Testament was a still more effectual barrier against change. (6) Although Justin mentions sayings of our Lord and events in His life not found in our Gospels, yet ‘‘ he never does so when he proposes to quote the apostolic memoirs” (Westcott, Canon, p. 157). (ce) In describing the fire kindled in the Jordan and the voice from heaven, he not only does not quote the memoirs, but, by implication, dis- tinguishes these statements from other statements immediately fol- lowing, which are quoted from the memoirs (Canon, pp. 158-159).

To conclude, we find that, although Justin knew and used tradi- tions, yet (1) he set a special value on certain writings, which were publicly read in the churches; (2) he believed these to have been written by apostles, or the immediate disciples of apostles, and he repeatedly quotes them under this title; (8) though he does not lay stress on miracles (for miracles would be assumed by the Jew Trypho, accustomed to the miracles of Moses and Elisha, and they would be rather harmful than helpful to his cause in the eyes of educated Greeks and Romans), nor on the longer lessons involved in Christ’s parables, yet he covers the greater part of our Gospel history, and much of our Lord’s teaching through maxims; this he does to such an extent that it is possible (Sanday, pp. 91-98) to reconstruct from his quotations a fairly connected narrative of the incarnation, birth, teaching, crucifixion, resurrection, and ascen- sion of the Lord; (4) the whole of this narrative (with the exception of the few unimportant incidents mentioned above, and one or two

1 Perhaps we may also lay some stress on the fact that, in the seven passages in which Justin uses the phrase, “it is written,” as applied to the memoirs, he almost always agrees verbatim with Matthew or with Luke (Canon, p. 180).

traditional sayings of Jesus) is found in Matthew, or Mark, or Luke, or in all three ; and there is also a reference to an incident recorded by Mark alone; (5) he never, as from these memoirs, quotes any words, or alleges any incidents not found in our Matthew, Mark, or Luke; (6) he never quotes any rival Gospel, nor alleges any words or facts which make it probable he used a rival Gospel ; (7) such non-canonical sayings and facts as he mentions are readily explicable as the results of lapse of memory, general looseness and inaccuracy, extending to the use of the Old as well as the New Testament, and the desire to adapt the facts of the new scriptures to the prophecies of the old. Our conclusion is that the memoirs of the apostles which include so much that is contained in our first three Gospels, and which were continuously read in the services of the church from the time of Justin downwards, cannot have passed into oblivion a few years afterwards, so as to have given place to rival Gospels not known to Justin. They must be identical with the Gospels, to some or all of which testimony is successively borne by Marcion (140 A.p.) in spite of his arbitrary and entirely un- critical excisions; by the lcretical Clementine Homilies (160 A.b.?) in spite of occasional use of apocryphal sources; by the Muratorian fragment (170 A.D.); by Athenagoras and Ptolemeus, and the churches of Vienne and Lyons (177 A.p.); till the century closes with the affirmation of Ireneeus, who not only uses three synoptical Gospels with the Fourth so fully as to leave no doubt of the identity of his Gospels with ours, but also is so convinced of the essential necessity that there should be four and only four Gospels, that he discerns in the quadriform nature of the cherubim a type of the pre- ordained quadriform nature of the records of the life of Christ.?

In the foregoing remarks attention has been mainly directed to definite evidence, whether external or internal. Limits of space, as well as other considerations, prevent the discussion of that more indefinite evidence which might perhaps be called indirect external evidence, and which would treat of the influences amid which the Gospels grew up and by which they were likely to be moulded. For such a discussion it would be necessary that we should place ourselves in the position of a disciple in some early congregation of Jewish or Gentile Christians, and en- deavour to realize the influence exerted upon the Christian records—(1) by prophecy ; (2) by heathen religions; (3) by Eastern metaphor acting upon Western literalism ; (4)

1 As a good deal of stress has been Jaid upon the apocryphal Gospel of the Hebrews, from which (according to the testimony of Jerome, Kirchhofer, p. 449) Ignatius quoted, it may be well to show that this was later than our Gospels. (1) We have seen above (p. 807) that in the common tradition "Incot's is habitually employed, and that the use of 6 Kupuos, "the Lord," in narrative is a sure sign of later origin; but "'the Lerd" is habitually used in the narrative of the Gospel of the Hebrews (see Kirchhofer, pp. 450, 453, 454). (2) It softens moral difficulties: (a) in the story of the rich young man, the Lord says to him, 'Behold, many of the brethren, sons of Abraham, are covered with dung and dying for hunger, and thy house is full with many good things, and naught goeth forth at all from thee to them," thereby blunting the point of the young man's rejection; (6) after the words ''If thy brother shall sin against thec" (cf. Matt. xviii. 22), Jesus adds, in the Gospel of the Hebrews, 'in word, and {f he shall make thee amends"' (Jd. p. 454) (in verbo et satis tibt fecertt); (c) the error in Matt. xxiii 35, ''son of Barachiah," is corrected into "'filium Jojade," Jerome (Jb. p. 455). (8) It increases the marvellous element: (a) at the baptism of Jesus, 'It came to pass when the Lord wascome up from the water, the whole fountain of the Holy Spirit came down and rested upon Him, and said to Him, O My Son, in all the prophets I was awaiting Thee, that Thou mightest come, and that I might find rest in Thee; for Thou art My rest, Thou art My first-born Son, who reignest for ever " (Ib. p. 454), (b) hence the Holy Spirit is called the Mother of the Lord, and it is said by the Lord, " But now My Mother, the Holy Spirit, took Me by one of My hairs, and carricd Me away to the Mount Tabor" (7b. p.451); (c) after His resurrection, {t is added that the Lord

ordered a table and bread to be brought, and caused fis brother James to break his fast, when James had sworn not to eat bread till he had seen the Lord; in this story James is called ‘James the Just,” a title which in itself is a mark of late composition.

To this note we may add that Celsus, towards the end of the second century, speaks of ‘‘the writings ef the disciples of Jesus” {/d, p, 830) as the source of his information, and mentions nothing (so far as we know) of any importance that is not found in our Gospels, It is true that Origen (Cont, Cels., ii. 74), in answer to Celsnus’s boast that he had crushed the Christians with facts taken from thcir own writings, replies, “ But we showed (above) that there has been a great deal of nonsensical blundering, contrary (7 apa) to the writings of our Gospels,” &c,; ‘but if we refer to what has gone before, we find that Origen is referring (1) to Celsus’s unfair inaccuracy, eg. in saying that Jesus was etrayed, not by ene disciple, but by His disciples; (2) te such blunders as the confusion of ‘* Chaldeans” with ‘* Magi; ” (3) to his ignorance of the number of the disciples, &c. There is therefore every reason to believe—for if Celsus had attacked any apecryphal narratives as representing the faith of Christ, Origen could not have failed to take advantage of the triumphant rejoinder which such a mistake would have afforded him—that an assailant of Christianity, writing before the end of the second century, knew of no writings of the disciples of Christ upon which he could base any effective attacks against their religion, except our four Gospels.

GOSPEL®

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by the ritual and language of the Lord’s Su :

the universal predilection for the marvellous ; (6} {°) by fall of Jerusalem. The results thus obtained would a in : great measure conjectural ; but, compared step by step with the results deduced above, they would enable the reader to feel additional confidence in conclusions supported } the double confirmation of indirect as well ay cine, evidence. The best work in English bearing on this sub- ject is probably the translation of Keim’s Jesus

of Nazarg (London, 1876-79) ; and there is also much valuable in- formation in the Appendices to Canon Farrar's Life of Christ.

Tut FourtH Gospet, Authorship.

Evidence from earliest Tradition.—Before considering Eany the subject matter of this Gospel, it will be well to con- evidence sider the evidence, direct and indirect, bearing on the ° author. authorship. The author is not mentioned in the Gospel ee

by name, but only as "the disciple whom Jesus loved" (xxi. 24, 20), "which also leaned on His breast," and to whom Jesus commended His mother from the cross (xix. 26; xiii, 23). The first writer who mentions John as the author in connexion with a passage quoted from our Fourth Gospel is said to be Theophilus, who wrote towards the close of the second century (170-180 A.D.). The Muratorian fragment (170 .D.) speaks of the apostle as the author of a Gospel, but does not quote from it. But Theophilus quotes Jo. i. 1, as written by John, one of those "inspired by the Spirit" (xvevpatodédpov).? It is a natural inference that Theophilus (at so late a date), using the name thus without further definition, meant by "John," the "John" best known to his readers, z.e., John, the son of Zebedee, the apostle. But there is un- usually strong evidence to show that John the apostle wrote the Apocalypse, so strong that we may assume the apostolic authorship of that book with more confidence than the authorship of any other book in the New Tes- tament, except some of Paul's epistles. The question therefore arises, how far does the style of the Gospel, which was said by Theophilus (170-180 a.p.) to have been written by John (presumably the apostle), agree with the style of the Apocalypse, which we have so good reason for believing to have been written by the apostle John? If we assume John to have been four or five years younger than his Master, he would be, according to the commonly received date (68 A.D.) of the Apocalypse, about sixty- seven or sixty-eight years of age when he wrote that work. By that age (one would suppose) an author's style would, if ever, have reached its maturity. Even if he were ten years younger than Jesus, so that he was only a little over sixty years of age, yet his style would not be capable of a complete transformation. But when the Gospel is compared with the Apocalypse, in- stead of similarity, we find an almost complete

contrast. The vocabulary, the forms, the idioms, the rhythm, the thought—all is different. That the Apocalypse and the

® Such at least is the statement of Kirchhofer (p. 153), and it has been reproduced in modern books. But part of the period of Irenaus might precede part of the period of Theophilus ; and Ireneus quotes John's Gospel (xx. 81) as from " John the disciple of the Lord," in a passage of his work Against Heresies (III. xvi. 5, or ed. Grabe, iii. 18), a passage omitted by Kirchhofer. ;

3 It is not necessary, however, to deny that the Gospel exhibits traces of the Apocalyptic doctrine and thought. On the contrary, the impression left by a comparison of the two is, that the Gospel exhibits an attempt to refine and spiritualize some of the more material and concrete expressions of the Apocalypse. From this point of view, we may say that " the Gospel is the spiritual interpretation of the Apoca- lypse. . . , The active and manifold religious thought of Ephesus furnished the intellectual assistance which was needed to exhibit Christianity as the absolute and historical religion in contrast with Judaism and heathenism" (Westcott, Introd. to St John).

AUTHORSHIP. |

Fourth Gospel should have been written by the same author would be, we will not say impossible, but one of the most marvellous literary phenomena ever authenticated. The change in Shakespeare's style, or in the style of Burke, cannot be compared with this; for those changes can be in part explained by the transition from youth to maturity or old age. Here we have to explain how a writer could completely change language, style, and thought, after the age of sixty or sixty-seven years. It is possible, but a priort highly improbable.

It has indeed been suggested that this change of language may be explained by the lapse of more than thirty years, during which the author was living in the midst of a Gentile population. This assumes that the Apocalypse was written in 68 a.p., before John had resided in Ephesus, and that he wrote the Gospel at the age of ninety-eight. But (1) the minute knowledge of the Seven Churches (Rev. i. ii. iii.) makes it probable that the writer had resided for some time in their neighbourhood ; (2) the composition of such a work

as the Fourth Gospel at the age of ninety-ceight is in itself unlikely ; (3) it is by no means certain that the Apocalypse was written in 68 A.D., and not rather in 78 a.D., simultaneously with the fourth Sibylline Book (and the later the date of the Apocalypse the shorter the interval between it and the Fourth Gospel, and the more improbable becomes the theory of the change of style). An hypothesis based upon three hypotheses, themselves not proved or improbable, requires much evidence before it can be accepted.

There is yet another difficulty in the way of believing that John the apostle is the author: the words of Jesus in the Fourth Gospel (1) differ altogether in style and rhythm from the synoptic tradition of the words of the Lord, and (2) do not differ at all from the author's own remarks and observations. So great is the similarity between the words of the writer and the words which are assigned by him either to our Lord or to John the Baptist that Dr West- cott, commenting on Jo. iii, 10-21, 27-36, says (Introduc- tion to the Gospels, p. 292), "It is impossible not to feel that the evangelist is in fact commenting on and explain- ing the testimony which he records. The comments seem to begin respectively at verses 16 and 31." The words italicized (not by Dr Westcott) require little comment. It is obvious that a biographer, who so mixes the words of his characters with observations of his own that a most careful and scholarlike commentator is unable to feel sure where the words of the characters end and the observations of the author ''seem to begin," cannot be supposed to be exactly recording, scarcely even to be attempting to record with exactness, the words of the characters themselves. Yet it seems impossible that the "disciple whom Jesus loved" should either remember his Master's words so ill, or else deliberately transmute them into entirely different language of hisown. A work of this kind, notwithstanding the presence of historical elements, seems rather to deserve to be called a poem, or a drama, than a biography ; and accordingly the same careful commentator who is quoted above declares that '' the spirit of parallelism, the instinctive perception of symmetry in thought and expression, which is the essential and informing spirit of Hebrew poetry, runs through the whole record " (Introd. to the Gospel of St John). Such a work does not seem likely to have proceeded from one of the sons of Zebedee, a fisherman of the lake district of Galilee, not indeed a poor man, but still not a man of letters nor of any great literary culture.

‘The earliest account of the origins of the Gospel is already legendary” (Westcott, Introduction to the Gospels, p. 255), as given in the fragment of Muratori (a.p. 170). It is there said that, being requested by his fellow-disciples ‘and bishops to write, John desired them to fast for three

days, and then to relate to one another what revelation each had received either for or against the project. The same night it was revealed to Andrew, one of the apostles, that “‘while all called (the past) to mind (or while all revised,—‘ cunctis recognoscentibus’), John should write everything in his own name.” Legendary though this account may be, it curiously agrees with a passage in the Gospel itself which implies that others besides the author were revising,” or otherwise assisting in, the work: ‘ This is the disciple which testifieth of these things and wrote these things: and we know that his testimony is true” (xxi 24). Yet immediately afterwards—in a sentence which, though omitted by Tischendorf, is supported by the MSS. almost without exception—the singular number is resumed: “I suppose that the world could not contain the books that should be written.” This passage certainly seems to indicate some kind of joint authorship or revision, or at all events a desire to convey the impression of joint authorship or revision, such as the Muratorian fragment describes. The theory of joint authorship or revision is confirmed by evidence derivable from the 1st Epistle of John, which is justly regarded (Lightfoot, Contemp. Rev., 1875) as a kind of postscript to the Gospel. It begins (like the Gospel, and unlike the Apocalypse, as also unlike the 2d and 3d Epistles of John) without mention of the author’s name, and in the plural number: “That which was from the beginning, which we have heard, which we have seen with our eyes, which we have looked upon, and our hands have handled, declare we unto you, that ye also may have fellowship with us.” Yet at the conclusion of the first chapter, as though it were to be understood that the whole was written “in the name of John” (“suo nomine,” as the Muratorian fragment has it), the singular number is used, “these things write I unto you” (lhdiomaik Iyet, 12,13, 14,~~21;~~.. 16).1 Sonar therefore as we have gone, the evidence is very decidedly against the supposition that John the apostle was the sole author

of the Fourth Gospel. He may have written it (1) through an amanuensis or disciple, who translated his language (and possibly his thoughts also) in the process of expressing them (just as Paul is said by some to have written the Epistle to the Hebrews in Hebrew, and to have had it freely rendered by one of his followers) ;? or (2) it may have been an attempt on the part of a leading teacher of the Johannine school at Ephesus to reproduce the spirit of their Master's teaching after He had been taken from them by death, an attempt of one of the Ephesian elders to reproduce John once again in their church, surrounded by Andrew and Philip and Aristion and the rest of the disciples of the Lord, the former proclaiming and all the rest assenting to "that which they had heard, that which they had seen with their eyes." If during the latter years of his life John was infirm and bedridden, obliged to preach and teach by deputy,*' it is obvious that the " teach- ing of John" during the last eight years of his life, when the old man was now past ninety years of age, might be

1 Of course the '' we," whereby the writer identifies himself with his readers (ii. 8 and passim), is quite different from the "we"? men- tioned above.

2 The statement that Papias '' wrote out the Gospel at the dicta- tion of John," quoted by Westcott (Canon, p. 76) from an argunient prefixed to an MS. of the 9th century, is probably worthless, except as indicating an opinion much earlier than the MS., that John did not himself write the Gospel.

3 That a similar attempt was made to reproduce, as it were, the authority of Peter by a writer in the 2d century, we have seen above (p. 814) in the account of the Second Epistle of Peter. But the cir- cumstances and prolonged infirmities of the apostle John might make such an attempt far more successful and a far more accurate repre- sentation of spiritual truth.

4 Jerome, Comm. in Ep. ad Gal., vi. 10, quoted in Westcott's Lntrod. to St John.

Evidence from quota- tions. Papias.

very different in language, and even somewhat different in | thought and substance, from the teaching of the apostle

himself ; and a spiritual doctrine, taught in the Ephesian church, and based upon three or four traditions affirmed by the aged apostle, such as the tradition of blood and water, might, even in the lifetime of the apostle, become known, within a limited district, as the Gospel according to the apostle John. How different, in language if not in substance, may be a pupil's record of a master's teaching may be perceived from Plato's and Xenophon's records of the teaching of Socrates. But in any case, whatever may be the authorship of the book, it must be admitted to be, so far as we have gone, in the highest degree improbable that John the apostle wrote the Fourth Gospel with his own hand at the age of ninety or nearly a hundred, in the same way in which he wrote the Apocalypse at the age of sixty or seventy or eighty.

Evidence from Quotations. —But we pass now to the evi- dence of the early fathers, Theophilus and Irenzeus are the first to quote John by name, but earlier writers, who do not mention his name, quote words contained in the Fourth Gospel. We will take Papias first. He tells us (see above, p. 816) that he used to inquire about the dicta of Andrew, Peter, Philip, Thomas, James, John, Matthew, or any other disciples of the Lord, and also about the sayings of Aristion and the elder John, the disciples of the Lord. The order of names is remarkable, and it has been most ingeniously inferred (Lightfoot, Contemp. Rev., Oct. 1875) that John is placed, out of his order of precedence, along with Matthew, because the last two had left written Gospels ; moreover the order of the first three, " Andrew, Peter, Philip," quite unlike the synoptic order, is the order in Jo. i. 40-48, which suggests that Papias was aware at all events of the story of the calling of the apostles con- tained in the first chapter of the Fourth Gospel. We are also told by Eusebius that Papias 'used testimonies " from the Ist Epistle of John. This is, of course, no proof that Papias quoted the Epistle with John's name (for quotations of New Testament documents with the name of the author are not common in the earliest writings of the church); but it may be inferred that he regarded the Ist Epistle of John as an authoritative document ; and the Epistle is so closely connected with the Gospel that, if the apostle John is proved to be the author of the one, it must follow that he is the author of

the other also. But it is important to note that Papias recognized two Johns, both of whom were “disciples of the Lord ;” and Eusebius tells us that Papias quoted certain traditions of the non- apostolic John, distinguishing him as “the elder,”—“ the elder used to say,” &c. Now Irenzeus—who speaks highly of Papias, describing him (wrongly) as a “ hearer of John” (the apostle),—quotes Papias as one of ‘the elders who saw John the disciple of the Lord,” and who remembered how he (John) had repeated to them certain teachings of

the Lord Jesus, to the effect that “the days will come in >

which vines shall grow, having each 10,000 branches, and in each branch 10,000 twigs, and in each twig 10,000 shoots, and in every shoot 10,000 clusters, and in every cluster 10,000 grapes, and every grape when pressed will give 25 measures of wine. And when any one of the saints shall lay hold of a cluster, another shall cry out, ‘I am a better cluster, take me; bless the Lord through me,’” &¢. (Apostolic Futhers, Clark’s trans. p. 443). The question therefore arises, Which Jolin is. here meant? It seems certain from the context that Irenzus meant the famous John, the apostle: yet he calls him nothing but “disciple,” and the tradition imputed to John (though not out of accord perhaps with the imagery of thie Apocalypse) is quite unlike anything that we find in the Gospel or Ist Epistle called by John’s name. On the

not with John the apostle, but with “elders,” and

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other hand, a passage of the Fourth Gospel (xiv, 2) is quoted by Irenzeus (Adv. Her., V. xxxvi. 2) in connexion, as part of the doctrine communicated to Papian eal “elders ” (“the context makes it at least highly probable that the passage was quoted from Papias’s ‘ Exposition, ” Westcott, Zntrod. to the Gospel of St John). But, if Bois be so, «.¢., if a passage of the Fourth Gospel was communi. cated to Papias, not necessarily by John the apostle, but by ‘“‘elders,” then it follows that among the elders ” who communicated it to him may have been John the “elder.” Although this is, in great measure, conjectural, yet, even as a possibility, it becomes

deserving of atten- tion, when placed in juxtaposition with the certainty men-

tioned above ; (1) it is posszble that a saying in the Fourth

Gospel was communicated to Papias, not by John the apostle but by John the elder; (2) it is certain that the only passage quoted from Papias as coming from John (the apostle) is not to be found in the Fourth Gospel and in no way resembles the style or thought of the Fourth Gospel. Again, the 2d and 3d Epistles of John, which have the name of the author inserted, are written, not in the name of John the apostle, but in the name of ‘“‘the elder,” and they were so doubtfully regarded (per- haps on that account) by the church that Eusebius places them among the “impeached (dvriAeydmeva) writings,” while Origen speaks of them as only possibly genuine, and Jerome attributes them not to John the apostle but to John the elder. Yet Irenzeus quotes this 2d “im. peached” Epistle, not as the work of Jobn the elder, but (twice) as the work of “John the disciple of the Lord.” Evidently there is here, if not confusion, at least a danger of confusion, and one cause of confusion can be immedi- ately indicated. Papias tells us that both John the apostle and John the elder were “disciples of the Lord.” Now, for some reason or other, Irenzeus, though he quotes Matthew as “‘the apostle” (Adv. Her., III. ix. 1) and a speech of Peter as spoken by “the apostle” (Jd. xii. 1), appears not to quote the Fourth Gospel except as written by John “‘the disciple of the Lord,” or simply “John” (6. xi. 1, 2, 3, 7). It cannot indeed be assumed that Irenzus is here (unconsciously) referring to John the elder, and not

to John the apostle. On the contrary, the more probable

explanation is, that John the apostle was himself called by preference John “ the disciple of the Lord,” as being “the

disciple whom Jesus loved.”! Nevertheless it remains an unfortunate fact that Irenzeus and Theophilus, who are the first to quote John by name, give us no means of ascertaining

whether they refer to John the apostle or John the elder, both of whom are described by Papias as being “ disciples of the Lord.” In this state of

confusion we are naturally led to suspect that possibly the two Johns mentioned by Papias (neither of whom, as we have shown above, was probably known to Papias himself) may have really been one; and this suspicicn is confirmed by the testimony of Jerome, who informs us that though two tombs were shown in his time at Ephesus, one as the tomb of John the apostle, and the other as the tomb of John the elder, yet some considered the two persons to be identical ; 'nonnulli putant duas memorias ejusdem Joannis evan- gelistee esse" (Jerome, quoted by Kirchhofer, p. 159), We have not evidence to prove this theory, but neither have we evidence to disprove it; and we must therefore leave the question who was the author of the Fourth Gospel = Compare Fragments, iii, John the disciple of the Lord and the other apostles with whom he was conversant.'' Hippolytus doubles the title (Christ and Antichrist, ch. 36), ''Tell me, blessed John, apostle and disciple of the Lord." In speaking of the author of the Apocalypse, Ireneus (Adv. Hor., 1V. xx. 11) describes him not only as the 'disciple of the Lord" but also as the disciple "' upon whom Jesus had leaned at supper."

AUTHORSHIP].

(so far as the evidence of Papias and Irenus can help us) unanswered and unanswerable. Indeed it cannot be denied that the probability is that Papias did not know of its existence as an authoritative Gospel written by the son of Zebedee. For, had he known it, would he have had

"nothing to say" about its origin, about the contrast

between it and the Apocalypse, about the difference between it and the synoptic narrative, and about the interesting account of its composition given in the Mura- torian fragment and therefore current before 170 a.p.? That Papias should have "nothing to say" about Luke's Gospel is intelligible, because the dedication to Theophilus speaks for itself; but why he should describe the origin of the First and Second Gospels and pass over the Fourth, where there was so much to describe and where a joint authorship was not only suggested by tradition but also by internal evidence (John xxi. 24), is by no means easy to explain. In the face of this silence we cannot attach much value to the evidence in Papias for the apostolic authorship, derived from the association of John with Matthew in the list of

the apostles. Against that evidence, too, such as it is, must be set the fact that the only tradition detailed by Ireneus as coming through Papias from John the disciple of the Lord is one quite unlike the tone of the Fourth Gospel. The latter negative at least neutralizes the first positive; and the scale is thus left unaltered, pressed heavily downwards against the apostolic authorship by the discrepancy of style (when the Gospel is compared with the Apocalypse) and by the external and internal evidence of joint authorship. Evidence has been drawn from the epistle of Barnabas, the "Shepherd " of Hermas, the Ignatian letters, the epistle of Polycarp to the Philippians, the works of Justin, and the Clementine Homilies, to show that the authors of these writings used the Fourth Gospel (Westcott, Canon, passim; Sanday, Gospels in the Second Century, 273-298) ; and no candid mind can resist the proof that some of them knew and were influenced by the thoughts of the Fourth Gospel, while some even used its language. But it is by no means certain, indeed it is improbable, that they knew of it as a Gospel ; and it is still more improbable that they recognized

times and the Fourth Gospel once, or not at all?

Moreover, the apparent quotations of the Fourth Gospel in the apostolic fathers show not so much the use of a document from the first, as rather the influence of the common atmosphere of the Asian churches, the floating tradition of the Ephesian school, gradually merging into a definite document, Barnabas, for example, speaks of 'water,' with a certain mystery, associating it with the "cross"; as also Justin seems to do, mentioning the cross and baptism in consecutive chapters (Ix. Ixi.) of his First Apology. But the Clementine Homilies, amplifying the mysterious efficacy of water, as being the origin of all things, and the direct recipient of the impulses of the Spirit (ch. xxiv.), give a loose quotation of Jo. iii. 5, which seems adapted for the Clementine context by being blended with the baptismal formulary previously mentioned by the writer in xxviii. 19: "For thus the prophet has sworn to us, saying, Verily I say to you, Unless ye be regenerated by living water into the name of Father, Son, and Holy Spirit, ye shall not enter the kingdom of heaven." It can scarcely be an accident tliat this same passage is the only passage from the Fourth Gospel quoted in the whole of the works of Justin Martyr. Moreover, in Justin also, as in the Clementine Homilies, it is not so much the Gospel as rather the substance

of the Gospel that is given ; and this too in a shape not so developed as that which appears in the Fourth Gospel.

GOSPELS

821

It is worth while to sketch the growth of this passage, for the process is a typical one, and will illustrate many other theological developments. he doctrine of the new birth first appears (but only in its germ) in the synoptic Gospels: “ Except ye be converted, and become as little children, ye shall not enter the kingdom of ‘ heaven” (Mat. xviii. 3: of Mk. x. 15; Lu. xviii. 17). But Jesus clearly did not mean that His disciples were to become like little children by becoming ignorant, foolish, or helpless; but only that they must trust the Father in heaven, as earthly children trust their earthly parents; in other words, that they must become children of the heavenly Father, and therefore be born again with a heavenly birth. It was therefore a legitimate development of Christ’s teaching to remind Christians (1 Pet. i, 3, 23) that they had been ‘“begotten or born again” (dvayevvav); and Paul describes his converts as “ begotten” (yevvav) by himsclf in Christ spiritually, distinguishing such a birth from the ‘birth according to the flesh”’ (Gal. iv. 23, 29). It was inevitable that the Christians should early associate this spiritual birth with the rite of purification or baptism, with which they would naturally (as John had done) introduce their converts into the church. But further, as soon as the need of this spiritual ‘“ begetting ” became a part of the teaching of the church, it would have to be protected against the literalism of misrepresenting enemies and of dull unspiritual friends. Jews and Gentiles would argue, “‘ But it is impossible for a man who has once been born to enter a second time into his mother’s womb.” This argumentative objection would therefore be naturally placed (in the minds of the teachers and catechists of the first century) side by side with the doctrine of Christ. One teacher, treating the subject dramatically, might put the objection into the mouth of an objector in the shape of dialogue; another might state the answer to the objection in his own person. With this explanation we shall at once understand that Justin, though appearing (in the course of an argument upon baptism) to quote the Fourth Gospel once only (whereas he quotes Matthew fifty times), is not really quoting it, but

only the floating tradition of the Ephesian elders, when he writes as follows :—

Justin, Apol. J., 1xi,

"For Christ said, Except ye be born again (dvayevyay, Peter's word, 1 Pet, i. 3, 23), verily ye shall not enter into the kingdom of heaven, Now, that it is impossible for those who have once been born to re-enter the wombs of those that bare them is evident to all." [Here the quotation terminates, without making any refer- ence to water.]

John iii, 3-5,

"Jesus answered and said unto him, Verily, verily, I say unto thee, Except a man (yevynOy dvwlev) be born again (or from above) he cannot see the kingdom of God. Nicodemus saith unto Him, How can aman be born when he is old? Can he enter the second time into his mother's womb, and be born? Jesus answered, Verily, verily, 1 say unto thee, Except a man be born of water and the Spirit, he cannot enterinto the kingdom of God.""!

Note here the inexplicable omission—on the hypothesis that it

m4 iy herman ascaibelivenioowhaw-t read" is an omission. We must bear in mind that in the preceding 1t as a Gospel written y € aisciple whom Jesus loved." |

Else, how comes it that Justin quotes Matthew about fifty :

extract Justin is arguing for baptism by water. How obvious then to quote the words of Christ Himself, 'Except a man be born of water and the Spirit," &c. But Justin does no such thing. He gives as a reason for water-baptism the intention that men may not remain "the children of necessity and ignorance," which reason, he says, we have learned from the apostles. He also quotes, suit- ably euough, the saying of Isaiah, '' Wash you, make you clean." Lastly, he quotes a saying of Christ, and omits from it (supposing that he has the Fourth Gospel before him) the very words which tell with greatest force for him, and which indeed make all further argument unnecessary! It is possible, but most improbable, that Justin should quote

Matthew fifty times, and a Gospel which he knew to be written by the beloved disciple of the Lord only once; but it is more than improbable—it is inconceivable—that, in this single quotation, he should not only quote inaccurately, but omit the very words that were best adapted to support his argument. The probability is that Justin's quotation represents one stage, and the Fourth Gospel another stage, of the Christian doctrine of the new birth, and that the Ephesian ‘‘ usus ecclesiasticus ” had not yet come to his knowledge, or, if ithad, had not yet superseded the less developed tradition. The stages may be classified as follows: (1) Synoptists, “Except ye become as little children ;” (2) Jnstin, ‘Except ye be born again ;” (8) a third stage is implied in 1 Pet. i. 3, 28, and iii, 21, and it would run thus, ‘‘ Except a man be born of the Spirit as well as water” (a protest against the Essenistic overvaluing of ablutions, see also Sibylline Books, iv. 164-174); (4) the inevitable transition hence was to the form in the Fourth Gospel, ‘‘ Except a man be born of water and of the Spirit.” Here the authority of the Ephesian apostolic school arrested the develop- ment, which would else have issued in (5) the Clementine stage, ‘‘ Except ye be regenerated by living water into the name of Father,

1 The argument is not affected even though we adopt in John iii. 3 the reading dvayevynOy, which is unquestionably proved by the Latin renderings to have been a very early reading. Whichever be the reading, Justin's omission— as an omission—remains inexplicable.

afterwards, had denounced such a belief as being of Satan and of Antichrist, and if this was taught to the Ephesian catechumens, and preached in the Ephesian pulpits, in a form sanctioned by authoritative teaching and by repeated use, what more is wanting to explain the similarity between the Epistle of John and that of Polycarp %

Again, it is said that Justin (Dial., ch. 88) imitates Justin John (i. 23) in putting the words “The voice of one cry- Martyr,

Son, and the Holy Spirit, ye shall not enter the kingdom of heaven." If (6) "living" had subsequently been omitted, the development would have been completed in a sixth and last stage.

[rouRTH GOSPEL.

Take another case of the apparent use of the Fourth Gospel by Ignatius. "I desire bread of God, heavenly bread, bread of life, which is the flesh of Jesus Christ,

. and I desire drink of God, His blood, which is love imperishable, and ever-abiding life" (Zp. to the Romans,

Ignatius.

Polycarp.

ch. vii.). Now here it is true that we have a thought peculiar to the Fourth Gospel. Paul speaks of the "blood" always as sacrificial, the " blood of sprinkling ;" and indeed to a Jewish mind, taught to "abstain from blood," the thought of drinking "blood" would be at first extremely repulsive, even as a spiritual metaphor. It is very unlike anything in the Apocalypse, where blood is never "drunk," except by the scarlet woman and the murderers of the saints. But it is an image that must have suggested itself to the church as soon as the Gentiles, unfettered by Jewish associations, began to be imbued with eucharistic thought. Indeed, after the first repugnance had worn away, Jewish thought itself—even Pauline thought, and much more the thought of Jewish Christians trained in the school of Philo—would hasten the adoption of the eucharistic metaphor. For was not the blood " the life," according to Moses? And was not a Christian taught to believe, with Paul, that his individual life was merged and "hid" in Christ's life? Again, it would soon be felt that to speak merely of feeding on Christ's flesh was to present the New Testament in an unsym- metrical and almost maimed aspect. Moses had not only fed his people upon bread from the sky (the manna), but had also given them water to drink from the rock. What had the church to show against this symmetrical display of Mosaic power? It was not enough to say (with Paul) that that same "rock" was really Christ: it was necessary to show that the rock still supplied the faithful with divine drink. And for this

purpose, what was more appropriate than the cup of the Lord's blood? Regarded in this way, the metaphor would commend itself speedily even to the Jewish mind, Nay, to the cultivated Alex- andrian Jew, it would at once commend itself, as we may perceive from the works of Philo, who uses words so strikingly similar to Christian thought that they might almost seem, to a hasty reader, to have (of themselves) originated the eucharistic miracle of Cana. 'Who can pour over the happy soul (which proffers its own reason as the most sacred cup) the holy goblet of true joy, except the cup-bearer of God, the Master of the Feast, the Word ?" (On Dreams, ii. 38). When such thought as this was floating in the atmosphere of Ephesus and Alexandria, it is impossible to draw from the vague resemblance of the Ignatian passage quoted above any inference that Ignatius was quoting, or even referring to, the Fourth Gospel.

Nor can we infer any quotation of documents from the fact that Polycarp (Zp, to Philip., ch. vii.) men- tions Antichrist in language somewhat similar to 1 Jo. iv. 2, 3. 'Every one that doth not confess that Jesus Christ hath come in the flesh," writes Polycarp, "is Antichrist ; and whoso doth not confess the mystery of the cross is of the devil." The thought indeed is mani- festly similar, and the language so far similar as to show that both Polycarp and the author of the epistle lived amid identical traditions of Christian teaching. But the epistle itself testifies that the name " Antichrist," so far from being invented by the author of the epistle, was already current in the church: "Little children, ye have heard that Antichrist shall come." If, therefore, it was a fact that already in Asia there had arisen a sect denying that Christ had come "in the flesh," and that the Ephesian circle of apostles first, and the Ephesian school of elders

ing," &c., into the mouth of John the Baptist, instead of placing them as an evangelical comment (as the synoptists do) on the appearance of the Baptist (Mat. iii 3; Mk. i,

3; Lu. iii. 4). But this inference is unsound, as can be

shown by analogy; for Mark uses also as an evangelical

comment (i. 2), "I send My messenger before thy face ;"

but Matthew and Luke place it in the mouth of our Lord

(Mat. xi. 10; Lu. vii. 27); and therefore, according to the reasoning above, we must infer that Luke had copied Matthew, or Matthew had copied Luke, in taking the evangelical comment, and inserting it in a discourse of Jesus! How fallacious would be such a deduction! How much more reasonable to suppose that—in accordance with the inevitable tendency thus to take prophecy, as it were, out of the framework, and insert it in the picture—Matthew and Luke have independently adopted a tradition later than Mark, which transposed Mark's evangelistic application of prophecy, and inserted it in the words of the Lord! But if this is the more probable solution in the case of Matthew and Luke, why not also in the case of Justin and John, the circumstances being precisely the same? But it has been urged that, although Justin cannot be shown to have quoted the Fourth Gospel, yet his acquaint- ance with the Valentinians (Dial. 35)—" who freely used the Fourth Gospel" (Iren., Adv. Heer, I. viii. 5)—" shows that the Fourth Gospel could not have been unknown to him" (Westcott, Introd. to Gospel of St John). Justin's words are these: "' There are, and there were, many who, coming forward in the name of Jesus, taught both to speak and act blasphemous things, with whom we have nothing in common, since we know them to be atheists, Some are called Marcians, and some Valentinians, and some Basil- idians, and some Saturnilians, and others by other names." Now this mere mention of the Valentinians as one of a number of abhorred sects, with whom the writer has nothing in common, scarcely seems to prove any minute acquaintance on the part of Justin with the opinions or books in use among the Valentinians. But even if it be proved, what is the consequence? Surely this, that Justin, knowing the Fourth Gospel to be freely used by a sect which he stigmatizes by name, altogether abstained from using it himself. Irenzeus, who uses the Fourth Gospel, accuses the Valentinians of misusing it; Justin, who does not use the Gospel, brings no such accusation. The natural inference is (if any inference at all is to be drawn from such slight premises) that either he did not know of the existence of the Gospel or of its misuse, or that he knew of its existence and use but did not recognize its authonty. Two more instances must conclude the list. It is found that both Justin and John alter the quotations of Zech. xii. 10 from the LXX. version (érBAdhovrae mpos pe av? ov KaTWPXNTAVTO) into dyovrat eis Ov Cbexévryoar : "They shall

look on Him whom they pierced ;" and the Apoca- lypse (i. 7) also contains the same word in " they also which pierced Him." But this, as we have seen above, especially as it involves a return to the Hebrew text, is perfectly ex- plicable on the same grounds as those which explain pro- phecies similarly quoted by the synoptists—viz., a common " ecclesiastical use." Still less can anything but floating tradition be inferred from such an allusion as is contained in Polycarp's Epistle to the Philadelphians : "The Spirit, coming from God, is not to be deceived ; for it knowet

whence it cometh, and whither it goeth." Here, though the words ofdev wéOev epyerar Kal mod brdyer (urdye is a word specially disliked by Luke in his Gospel, and not used by Paul), being identical here and in John iii, do certainly, as Dr Sanday points out (Gospels, p. 275), imply "'an association of ideas," yet, as the same writer remarks, the thought is different. Polycarp says, "The Spirit knoweth whence it cometh ;" John says, "We know not whence the Spirit cometh." This indicates that Poly- carp is vaguely alluding to oral and traditional doctrines current in his province (familiar, perhaps, but by no means as yet authoritative), rather than quoting from a Gospel known to be written by one of the foremost of the apostles, the "beloved disciple of the Lord."!

But it is urged (1) that Justin has the doctrine of the Christian, as distinguished from the Alexandrian, Logos; (2) that he could not have had originality enough to develop this himself, and there- fore (3) he must have borrowed this method of thought from the Fourth Gospel. And the following expressions are quoted: '' Jesus Christ is, in the proper sense (id{ws), the only Son begotten of God, being His Word (Aédyos), and First-born, and Power (pwrdroros tat Advauis);" ' But His Son, who alone is rightly (xvpiws) called Son, who before all created things was with Him and begotten of Him as His Word, when in the beginning He created and ordered all things through Him," &c.; '' Now, next in order to the Father and Lord of all, the first Power (who indeed may also be called Son) is the Word, concerning whom we shall relate, in what fol- lows, how being made flesh (capxomoim@eis) He became man a 'The Word of God is His Son"

(Apol. L., xxiii., xxxii., lxiii. ; Apol. II., x., quoted by Sanday, Gospels, p. 284; see also Light- foot's Colossians, i. 15).

But it can be shown (1) that all these thoughts were suggested, and many of these expressions actually used, by Philo in Alexandria (40 A,b.), about a hundred years before Justin wrote; (2) that the personification of the Wisdom of God (and Logos means Wisdom as well as Word) in the books of Proverbs and Wisdom rendered it necessary for orthodox Christians, who accepted these books, to identify this personified Wisdom with Christ ; (3) that the generally recognized Messianic reference of Ps, Ixxxix. 27, ¢yo mpwrdroKov Ojooum adrdy, leading to the comment, '1 will make King Messiah a First-born," resulted in a recognition of ''the First-born" (6 Tpw-térokos, N25) used absolutely, as a title of the Messiah (Lightfoot, Col. i. 15); (4) that those elements of the Alexandrian theory of the Logos which are inconsistent with the Christian theory furnish no proof at all that the Christian theory was independent of the Alexandrian. It was inevitable that, when the Christians borrowed, they would adopt what was consistent, and discard what was in- consistent, with the belief in the incarnation of Christ.

There is abundant evidence to prove these propositions. Even before Paul wrote the Epistle to the Colossians, and a fortiori before the composition of the Fourth Gospel, that instinct which compcls men to set the First Cause of all at a distance from matter had impelled Alexandrian Judaism to adopt the belief that the supreme God did not Himself directly and immediately create the world, or manifest Himself to mankind, but indirectly and medi- ately, through some medium or inediator. 'The simplest and subtlest metaphor to express this mediateness was Word—more especially in the Greek language, where Word (Adyos) might mean reason as well as speech, the word in the thought as well as the word in the sound. Man manifests himself through deeds as well as words; but for the Supreme (with whom to speak is to do) the only necessary manifestation was the Word, the Logos. Dr Light- foot has shown (Col. i. 16) that Philo sometimes regards the Logos as a merely passive instrument, so that he allows himself to use the simple instrumental dative (6) to describe the relation of the Word to the Creator (§ kai rov door eipyd¢ero), " which mode of speak- ing is not found in the New Testament;" and elsewhere Philo, even where he uses the prepositional construction (8:' od), expressly likens the world to a house,

the Supreme to the builder, and the Logos to the dpyavoy or tool (Of Cain and his Birth, ch. xxxv.). Moreover, as a city, while as yet only existing in the conccption of the architect, may be said to be the reason of the architect, so the

world (regarded as perceptible only to the intellect) is said to be the | Logos or reason of God busying itself in the work of creation (The |

1 The writer is indebted to Dr Hort for the suggestion that the transition may be from (1) ‘thou knowest not whence He cometh,” to (2) “He alone knoweth,” &c., and thence, the “alone” belng understood, to (3)‘He knoweth,” &c. Yet, when all due weight is given to this suggestion, it will be difficult to deny that the context of John iii. 8 has little in common with the context in Polycarp, ‘‘the Spirit is not to be deceived,” and that Polycarp’s words indicate rather a vague reminiscence of tradition than a quotation from @ Gospel sup- ported by the authority of the apostle John.

World, vi.). Philo also describes the Logos as “the archetypal model, the idea of ideas.” These passages undoubtedly indicate a great gulf between the Christian and Alexandrian Logos. But other passages abound, which Christians could adopt unchanged, applying them to the incarnate Christ; in particular, the passage quoted above (On Dreams, ii. 38), where the Word of God is de- scribed as ‘‘the cup-bearer of God;” and here follow words which would be fraught with eucharistic meaning for a Christian—‘“ the Master of the feast . . . . not differing from the draught itself.” Again, the Word is said (Who is the Heir, ch. xxxix.) to divide in equal portions among all that are to use it the heavenly food of the soul which Moses calls manna; and the Word is ex- pressly said to be a Person in the following passage (Questions and Solutions, 62)—Question; ‘‘Why is it that He speaks as if of some other god, saying, He made man after the image of God, and not that He made him after His own image?” Solu- tion: ‘‘ Very appropriately and without any falsehood was this oracular sentence uttered by God; for no mortal thing could have been formed on the similitude of the supreme Father of the uni- verse, but only after the pattern of the second Deity, who

is the Word of the Supreme Being." Even where Philo describes the Word as the instrument of creation, he speaks of it or Him as ''the image (eixdy) of God" (On Monarchy, ii. 5): "The Image of God is the Word by whom all the world was framed (€5nusoupyeiro)." Further, the Word is frequently called by Philo the '* First- begotten (rpwréyovov) Son" and "' Eldest Son." The prophecy of Zechariah (vi. 12, according to the LXX.) '' Behold a man, the East is his name," which is twice applied by Justin (Dialogue, evi. and exxi.) to Jesus the Son of God, was applied with curious similarity and difference a hundred years before by Philo, who, although he finds it inappropriate for ''a man compounded of body and soul," sees in it a singular appropriateness to ''that incorporeal Being who in no respect differs from a divine image. , ... For the Father of the Universe has caused Him to spring up as the Eldest Son" (On the Confusion, &c., 24).2 Many of the very expressions which are sometimes used,to show that the Logos of the Alexan- drians was impersonal are found applied to God in the Old Testa- ment, or to Christ in the New. For example, if Philo calls the world the ''garment" of the Logos, the Psalmist also (Ps. civ. 2), appealing to the Lord his God, says, ''Thou coverest Thyself with light as with a garment;"' or if the Logos is described by Philo as the ''bond" which holds the world together, so also does Paul describe Christ as the Being in whom ''all things cohere" (7& wavta ouvestnnev, Col. i. 17), Nay, further, he attributes to the Logos that function of ''reproving" or '' convincing" (éréyyxeuv) which is so strikingly assigned in the Fourth Gospel to the Spirit of the ascended Christ (Jo. xvi. 8), 'And when He is come, He will reprove (éAéy&e:) the world of sin ;"? compare Philo—who also adds a remark that suggests the thought (Jo. i. 9) of '' the Light that lighteth every man"—'' As long as the divine Word has not come to our soul, all its actions are blameless; but when the priest, conviction (or ' reproval," &eyxos), enters our heart like a most pure ray of light, then we see that our actions are liable to blame" (On the Unchangeableness of God, 28),

In the face of all these passages (and many others might be quoted) the difficulty would seem to be, at first sight, not to prove that the Alexandrian theory of the Logos was the parent of the Christian theory, but to tind any difference between the two. The

'difference, however, is in reality very great, and very readily

explained. Philo looked on the manifestation of God through the Logos as being the old inferior dispensation, while the new dispen- sation was to be the manifestation of the Supreme as 7d dv, absolute Being. The Logos manifestation of Philo was a manifestation of God through visible creation; the higher manifestation was to be independent of visible objects. The former was the manifestation of ‘‘God as man’’—i.¢., as liable to anger, change, repentance, &c.; it was also (On the Unehangeableness of God, xi.) an appeal to fear through rewards and punishments, not strictly true, and not intended for the esoteric sage, but only for the unspiritual multitude. The latter, on the other hand, was the manifestation of God as not man—a fatherly revelation, appealing to love. It followed that Philo not only did not identify his Logos with the Messiah, but would have regarded any such identification with one who had ‘‘ become flesh” as a degradation. It followed also that,

| although Philo declared the highest revelation to be a revelation of

love, there was really no basis for love at all in it, Of God as 7d év, Philo conld not say that He was good, or holy, or loving, because He was superior to all goodness, holiness, and love: ‘‘ His existence indeed is a fact which we do comprehend concerning Him; but beyond the fact of His existence we can understand nothing”’ (On the Unchangeableness of God, 13).

2 Some degree of uncertainty whether to call the Word a person or not appears to be implied in the following passage (Questions, 54) : “* The expression ‘one of us’ (Gen. iii. 22) indicates a plurality of beings, unless we are to suppose that God is conversing with his own virtues; but Philo seems to incline to the personal theory.

Imagine the early Christian teachers and preachers, in the cities which were earliest influenced by Alexandria, brought into contact with the Alexandrian theory of the Logos, or possibly in some cases (as in that of Apollos perhaps) themselves trained up in the Alexandrian theory, and now superadding to it the belief in an incarnate Son of God—and what would be the consequence? Not, surely, that they would cast the Logos theory aside as baseless ; for how could they deny that, ‘‘ by the Word of the Lord were

the heavens made”? or how cancel the words of Wisdom in the book of Proverbs (viii. 22-30), ‘‘ The Lord possessed Me in the beginning of His way, before His works of old. . . . When He prepared the heavens I was there. . . . I was by Him as one brought up with Him; and I was daily His delight, rejoicing always before Him”? Paul might possibly eschew the actual use of the word Logos, as savouring of men’s philosophy, and alter the mpwrdyovos, “* First- begotten,” of Philo into tpwrédroxos, ‘ First-born,”’ to prevent the inference! derivable from the former title, that the Lord, being First-begotten, was not ‘‘Only-begotten ;” but how could he, or any Christian who believed Christ to be the Redeemer of all man- kind and the Eternal Son of God, do other than adopt the Old Testament theory about the Word of God, and at the same time Philo’s language, so far as it was personal, while discarding all that was impersonal? If Christ, was not identical with the Word of God and the Wisdom of God, then there seemed ta follow the intolerable inference that He must be inferior to it; but if He was identical with it, then the introduction of Philo’s felicitous Jan- guage into Christian thought was simply a matter of time.

The introduction would be a very easy process, requiring nothing but a few omissions of expressions implying passive instrumentality (e.g., the instrumental dative), and the addition of an emphatic protest that the manifestation of the Supreme as Love, even though it were through visible objects,—yes, even though it were through the Word of God becoming “ flesh,”—nevertheless constituted not an inferior but a superior revelation, the highest revelation of all. To the Logos theory of Philo, which stated that all men were made in the image of the Word, the Christians could add that, through forgiveness and by faith, fallen mankind was destined also to be raised up and conformed to that Word, so that He was the goal as well as the starting-point, the Q as well as the A; or, as Paul expresses it, ‘‘ All things are not only created in Him,” but “to Him (eis abrédv),” Col. i. 16 (Lightfoot). This is accordingly ex- pressed emphatically in the Fourth Gospel. Although ‘no man hath seen God at any time,” yet ‘‘the only begotten Son, who is in the bosom of the Father, He hath declared Him” (Jo. i. 18); and again, ‘‘Have I been so long with you, and hast thou not known Me, Philip? he that hath seen Me hath seen the Father” (Jo. xiv. 9).

This is the full Christian development of Philo's doctrine, as applied to the " First-born" becoming ""'flesh." But there is not only no evidence that Justin quotes from any written document exhibiting this development, but rather evidence to the contrary, that his doctrine of the Logos, though affected by the teaching of the Ephesian school, had not yet been imbued with it. For, in speaking of baptism, he calls attention to the fact that, in that rite, God is mentioned only by the name of "God the Father and Lord of the Universe; for," he continues, "no man can utter the name of the ineffable God; and if any one dare to say that there is a name he is incurably mad" (First Apology, lxi.). Looked at in the light of the context, thia word &ppyros, " ineffable," implies a conception of the revelation of God through Christ hardly reaching the level of the Ephesian doctrine, which teaches that, though God had never been seen, He had been, declared by the only begotten Son, so that whoso had seen Him had seen the Father. But it is in harmony with what Justin says soon afterwards (Jd. 1xiii.), that Jesus is also called "'' Angel" and " Apostle" (compare also Heb, iii. 1); and it harmonizes well too with the doctrine of Philo, that '*no mortal thing could have been framed in the similitude of the supreme Father of the universe, but only after the pattern of the oa Deity, who is the Word of the Supreme Being" (Solutions,

It appears therefore that, although Justin knew certain traditions embodied in the Fourth Gospel, yet (1) it was not read in the church services of the district in the same way as the " memoirs of the apostles"; (2) he did not use the Gospel as an authoritative document ; (3) his teaching exhibits less of development than the teaching of the Fourth Gospel. An inevitable inference follows that, if he knew of the existence of the Fourth Gospel as a document, he

did not believe it to be the work of the apostle John,

1 Paul nowhere uses the word Logos to denote Christ; but he uses the expression 6 Adyos Tod Xporov in one place (Col. iii. 16) to denote what is more commonly denoted bythe Spirit of Christ, the indwelling presence of Christ in the heart manifesting itself in word ; cf. Lu. xxi. 15, oréua nal copiay.

The general conclusion to which we are thus led by th external evidence of quotations is that, althongh ae See of the doctrine of the Fourth Gospel, expressed in ann cone similar to the words of the Fourth Gospel, was probably tations, current in the Ephesian church towards the end of the frst half of the second century, yet it was not by that time widely used, if at all, as an authoritative document; nor have we proof that it was so used till the times of Treneus, 2.¢e., towards the end of the second century, b which time the Gospel was authoritatively quoted if a work of John; and those who so quoted it probably meant by "John" John, the son of Zebedee, the apostle,

Internal Evidence.

The Fourth Gospel compared with the Synoptic Narrative, —In estimating the Fourth Gospel as a history, we must necessarily attach a special importance to those portions in it which cover the synoptic ground; for these will afford us the best means of judging how far the facts of the life of Christ, as well as the language of Christ. may have been transmuted by the author. We will therefore first consider those parts of the Fourth Gospel which afford us an opportunity of comparing it with the Gospels of the synoptists.

The first point of comparison is the greater scope of the Fourth Gospel as compared with the other three. It includes all past time in its prologue, and exhibits the incarnation of the divine Word as but one act in the drama of the universe.

Nor is its scope in space narrower than in time. The limited scenery of the synoptic stage—Galilee, Samaria, Judza,—is (in spirit, though not in letter) exchanged here for "the world." As Philo tells us that the tabernacle figured the universe, and that the robes of the high priest represented (JZoses, iii. 12) the different parts of the world, so the High Priest of the Fourth Gospel, though speaking or working in a narrow province of Syria, is always regarded as officiating at the altar steps of the universe, and bearing with Him the destinies of humanity. "The world" is continually on His lips; and John the Baptist is made to proclaim, even at the very outset of the Messiah's career, that the Lamb of God will take away the sins, not of "the Jews," but of "the world." It is true that Judaism is not ignored. Prophecy is constantly appealed to; and the motive of the Gospel is undoubtedly to

show that Jesus is “the Christ” (xx. 31), as well as to show that He is the Son of God. Yet nowhere in the Fourth Gospel is found any marked distinction between the Gentiles and Samaritans on the one side and the Jews on the other, as if the former must be neglected for a time (Matt. x. 5; Lu, ix. 52), and as if the latter were entitled to priority in the offer of salvation; on the con- trary, Christ is described, early in the narrative, as preach- ing to the Samaritans, and the Samaritan faith (far more general than the isolated case of the Samaritan leper in Luke) serves as a foil to the Jewish unbelief. “ The Jews,” go far as they are distinguished from others, appear throughout as a nation with whom the writer has no sympathy, as the emblem of rebellious, unspiritual sceptic- ism.2 Viewing the drama at a greater distance of time than the synoptists, and purposely withdrawing himself to a still more subjectively distant point of view, for the purpose of unity and compression, the author almost

2 The passages iv. 22; x. 16; xi. 52, though they give a kind of precedence to the Jews, yet treat of the passing of salvation from the Jews to the Gentiles, in the way of climax; and these two oF ist passages (which occur in dialogue and not in narrative) cannot coud for anything against the forty or fifty passages wherein the author, m his own person, speaks of “the Jews” as “ murmuring, woe to slay Jesus,” ‘taking up stones to stone Him,” and always syste matically opposing themselves to Jesus.

ignores the minor distinctions of Pharisees, Sadducees, Herodians, scribes, and lawyers, with which the synoptists have made us familiar.1 Palestine is seen no longer with the distinctions of a neighbouring diversified coast-line, but like a dark mass upon the horizon of the distant East, serving as a foil to the splendour of the rising Sun of Righteousness, which it strives in vain to. obscure.

In the miraculous part of our evangelist’s. narrative especially, there is visible this artistic power of selection and conipression. Few miracles are

described, not more than eight in all (including the post-resurrection miracle of the draught of fishes), and among these not a single case of exorcism. The element of mere wonder (which comes too prominently forward, at least for a pupil of Philo, in the synoptic miracle on the Gadarene) is carefully subordinated to the symbolical element. It is true that the whole Gospzl breathes a supernatural atmosphere.

Although the Logos, becoming "flesh" (i, 14), is imme- | that "blood " in all probability has (among other possible

diately afterwards called Jesus (i, 17) or the Son (i. 18), and is never henceforth mentioned by the name Logos throughout the whole of the Gospel, yet in reality it is still the Logos, rather than Jesus, that is described in the following pages. The Logos is never (as in Mark) "unable" to work miracles, never liable to "marvel," never "in an agony," never (with the single exception of thescene at the grave of Lazarus in which érdpagey éavrdv, John xi. 33) "sorrowful and very heavy ;" the words @dcos, éAcciy, omAayxvi€owar occur repeatedly in the synoptists, never in the Fourth Gospel; the Logos "knows what is in man," sees Nathaniel 'under the fig-tree," discerns from the first that one of the twelve whom He had chosen is "a devil ee when He asks advice from His followers, it is a mere form, merely "to prove them, for He Himself knew what He would do"; there is not in the drama of the Fourth Gospel (as in Mark) any development of thought or plan in the chief actor ; the development must be looked for in the drama taken as a whole, and including the creation, the fall, and all the preparation of the world for the conling of the Word as flesh ; but the life of Christ on earth is, in the Fourth Gospel, only one act as it were, in which the previous action of the drama is simply carried on and sustained ; the whole of the future, His destined "lifting up," His death, His rising in three days, all lie mapped out before the Saviour, so that He walks in a known country and in light, while all around, friends and foes alike, are stum- bling or groping in the dark. In this sense, therefore, it is true that the supernatural element is even more prominent in the Fourth Gospel than in the synoptists. But the miracles themselves are subordinated. Though frequent reference is made to the vast number of them (ide 22 5eitt, 2 joni. 2; vilySles ine ll6 ; xi 4% 5 oxi, 37 ; xx. 30), yet, not only are very few described, but even those few are described rather as "emblems" than as "mighty works." It is

remarkable that the word oypeta (‘“sigus”), which the synoptists almost always use in a bad sense (to denote the “sign from heaven” demanded by the Pharisees, or the “signs” which the false Christs shall work to deceive, if it were possible, even the elect, Mk. xiii. 22), is the very word selected by John to describe the miracles of Jesus ; while the word duvdues (‘mighty works”), which in the synoptists generally denotes the works of Jesus, is never used in the Fourth Gospel. Partly, no doubt, the author may have felt that

1 It has been ingeniously suggested that a distinction is drawn by the author between the “Jews” in the south and the “multitude” (dxAos) in Galilee (Westcott, Introd. to St John). Buttheterm 8xAos is also applied to the mixed multitude of pilgrims in Jerusalem at the Passover (xii. 12, 17, 18, 29, 34) ; and besides, if the author had in- tended to deny any such distinction, he could hardly have expressed hinself more cogently than in xii. 9, where he adds that this “multi- tude” was of the “Jews” (8xAos ToAbs ex roy *lovdaiwy).

miracles were made cheap by excessive enumeration, and that the narrative of a multitude of miracles without apparent motive created a stumbling-block rather than a help to philosophic and educated readers. Especially might this be felt in Ephesus, the home of wizards and wonders and “curious arts” (Acts xix. 19), where even

| the last-called of the apostles had worked cures and

exorcisms past. numbering (ib. 12). Accordingly the author, though he makes mention of very many miracles, describes none but. those which are obviously emblematic. It has been stated above that the Ist Epistle of John was not only written by the author of the Fourth Gospel, but must be considered as a kind of postscript or appendix, commending the Gospel to the church. Re- membering, therefore, the important passage in the Epistle (1 Jo. v. 8), which describes the three witnesses on earth as breath (or spirit), water, and blood, and bearing in mind

meanings) a reference to the eucharistic wine, we shall not be surprised that the first miracle of all describes the changing of the water into wine. Next is a miracle exemplifying the power of the word of Jesus, where faith is present (iv. 50, and ef, iv. 41); then the Messiah manifests (in the cure of the impotent man) the superiority of the ever-flowing fountain of hfe to the intermittent power of the pool of the law (v. 3); then comes the eucharistic feeding of the five thousand with bread and fishes, wherein "the Lord gave thanks," edyapurrijcavros

tod Kupiov (vi. 23), followed by the walking on the water,

which is also appended by Matthew and Mark to the eucharistic miracle; then the opening of the eyes of the blind by Him who was the Light of the world (ix. 5) ; the raising of Lazarus by Him who was the Resurrection

and the Life (xi. 25); and lastly, the miraculous draught ' of fishes, taken at the command of Him who had sent His

apostles to be fishers of men, and to cast the net of the gospel (xxi. 6).

In all these narratives, although the common people are exhibited as wonder-struck, yet the impression left on the reader is that, for the Word of God, such works are matters of course, and only important because of their inner spiritual meaning. Philo says (Life of Moses, i. 38) that such miracles as the preduction of the water from the rock by Moses and the like are the sports

| (watyvia.) of God, and not so really great or deserving of

serious attention as the revolutions of the planets. There is no trace of "sport" in any of the works of the Word of God narrated by the author of the Fourth Gospel; yet both he and Philo agree in looking through the letter of the narrative of every miracle to the spiritual essence contained in it, which alone constitutes the importance of the act. Now Philo, in speaking of the creation of Eve from the rib of Adam, declares at once that the literal meaning is fabulous (pyO@des); whereas he treats the emission of the water from the rock as historical, although he suggests, as a first

explanation, that possibly there may have been a latent spring in the rock. Yet Philo proceeds to deduce his spiritual inferences as freely

| from what he deems “fabulous” as from what he deems

historical. It is not necessary to assume in the author of the Fourth Gospel precisely the same indifference to the distinction between spiritual and historical narrative ; but

| it appears certain that, in his writings, as in Philo’s, the | historical is subordinated to the spiritual.

Not but that the picturesque incidents of each miracle receive from him due attention; but it seems to be for the most part the picturesqueness resulting from the skill of a graphic teacher, rather than from the memory of an eye-witness, Compare, for example, Mark’s with John’s account of the feeding of the five thousand. There ¢ less motive, less X. — 104

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art, about Mark’s detail than about J ohn’s. John’s omis- sions and additions all point to one object, the desire to heighten the Logos and to subordinate the disciples and the crowd. Mark begins by saying that “Jesus had compassion on the multitude;” but the Logos, knowing beforehand “what He would do,” determines His course at once as soon as He “lifts up His eyes” and discerns the multitude. In Mark, the disciples come to Jesus beg- ging Him to send the multitude away; in John, it is Jesus who first “proves” one of the disciples with the question, ‘‘Whence shall we buy bread that they may eat?” Then (giving a picturesque variety to the story) Andrew, as well as Philip, and a servant-lad (ao.ddprov) are introduced, the latter carrying the viaticum of the apostles. The loaves, a new circumstance not found in the synoptists, are of an inferior kind, ‘barley ;” and Andrew bases an expostulation on the smallness of the provision. After the command to “sit down,” Mark says that they sat ‘‘down on the green grass,” an epithet natural enough for a speaker perhaps, but inartistic, because too prominent, in a written narrative. John, on the other hand, turns a defect into an excellence, by judiciously con- necting the “grass” with the command to sit down, so as to enhance the forethought of the wise Master of the feast, who

made provision for the comfort of His guests in the minutest details: “Jesus said, Make the men sit down. Now there was much grass in the place.” Lastly, in the synoptic narrative, the gathering of the fragments is the spontaneous act of the disciples; but in John, the feast ends as it began, with the display of the wisdom of the Master, even in the smallest matters, “Gather up the fragments that remain, that nothing may be lost.” It is scarcely possible to deny that, in the symmetrical manner in which the story gathers itself around the Logos as its object and centre, the narrative of the Fourth Gospel is far superior to that of the synoptists, and that many of the additional touches of the former are dictated by what has been happily described by Canon Westcott as “an instinct- ive perception of symmetry in thought and expression.”? The same remark applies to the other miracle which John has in common with Matthew and Mark, viz., the healing of the “nobleman’s” son.? Every detail of difference in John heightens the dignity of the Saviour. In the synoptic account, Jesus offers to go to the house to heal the youth; in John, no such offer is made, and the nobleman and his companions are accosted with a rebuke, “Except ye see signs and wonders, ye will not believe.” In the synoptists, the man is represented as living at Capernaum, and Jesus as entering Capernaum, so that the father sends but a short distance ; in John, Jesus is represented as remaining at Cana, while the suppliant father journeys thither in person from Caper- naum, @ distance of twenty-five miles. In the synoptists, the father sends a message, praying Jesus not to trouble Himself to enter his roof, but to “speak the word only ;” in John, the father piteously supplicates the Saviour to ‘Come down, ere my child die.” In the synoptists, it is recorded that Jesus ‘“marvelled”; in the Fourth Gospel, He simply pronounces the authoritative words,

1 The only points in which this narrative can be illustrated by Philo’s remarks (Alleg., iii. 56-8) on the manna are two or perhaps three:—(1) As Philo says that the soul is fed not by earthly food but by ‘‘words,” so the Gospel says that “words” are the source of life (vi. 63); (2) Philo, speaking of the manna, praises those who seek the food for its own sake and not for ulterior advantage ; compare John vi. 26 on the “‘loaves and fishes ;” (3) Philo, speaking of the object of the miracle, quotes Exod. xvi. 4, “‘that I may prove them;” this may possibly, but not probably, illustrate John vi. 6.

2 It is here assumed (with Dr Sanday, Fourth Gospel, p. 100) that they are the same. The assumption of their difference involves even greater difficulties than the assumption of their identity.

GOSPELS

[FOURTH GosPEt,

“ Go thy way, thy son liveth.” In the synoptists, Jegug avails Himself of this incident to proclaim, almost as if it were (and probably it was) a development of His work suddenly revealed to Him by His Father, that many of the Gentiles shall be admitted into the Pee oe in the Fourth Gospel, which exhibits no development, these words would necessarily seem out of place and are omitted. Contrast could scarcely be more complete ; and it is not surprising that many commentators, rallies than identify such opposites, prefer to suppose that, about the same time in the life of Jesus, two men, both in hich positions, had sons at the point of death, in the same place (Capernaum), both of whom petitioned Jesus to heal their children, and both of whom obtained from Him miraculous cure, performed at a distance from the two patients. To some, however, as to the candid author of Lhe Authorship and Historical Character of the Fourth Gospel, it will appear more probable that we have the same event, differently described. But those who accept the theory of identity ought to consider how much is involved in it. For the defenders of the differ- ence of the two miracles are undoubtedly justified in drawing a contrast between them in almost every point of spiritual importance (Augustine, Hv. Joh. Tract., 16), If, therefore, the Fourth Gospel is historically accurate, then (on the supposition of the identity of these two narratives) the three synoptic Gospels are historically inaccurate; but if the synoptic narrative is historically accurate, the narrative of the Fourth Gospel must be considered rather a new dramatic version, than an inde- pendent historical account; and the same remark will necessarily apply to, and affect our estimate of, all the accounts of miracles in the Fourth Gospel.

Gaining light thus from the comparison of the Fourth Gospel with the synoptists, wherever they occupy common ground, we shall find it useful, before proceeding to the summary of the Fourth Gospel, first to touch on the few remaining points which the fourth has in common with one or more

of the three. Luke contains most of these. For example, if we accept the passages Lu. xxiv. 12, xxiv. 40, as being not interpolations, though perhaps additions made by the author to a subsequent edition of his Gospel, it will follow that, in the account of the resur- rection, Luke and John agree identically in adopting the traditions (1) that Peter "beheld the linen clothes laid by themselves in the sepulchre ;" (2) that the Lord showed His disciples, after His resurrection, His wounded body in token of His identity. In both these cases several minute details are added by John ; and this also applies to another important incident which Luke and John have in common, viz. the "entering of Satan" into Judas. Luke records it briefly in two words (xxil. 3), and makes the "entrance" occur some time before the last supper; but John, in a far more powerful scene, reserves the "entrance" for the moment when the "sop" is handed to the traitor by the Saviour, and the disciples seated at the last supper. Here again the incident is the same; but the treatment is very different. ;

The agony described by Luke (xxii, 44, and, without Luke's additions, in Mat. xxvi. 39 and Mk. xiv. 39, 36), when the Lord prayed that "the cup might pass from Him, and when an "angel" appeared from heaven strengthening Him, may seem, at first sight, to have no counterpart 1n John. And indeed the synoptic description of the agony in Gethsomane is not adapted for the Fourth Gospel Inserted in any page of that Gospel it could not fail to jar upon us as being out of harmony with the context Nevertheless, a remarkable passage in John (xii 27) appears to bear a striking resemblance to the account In Luke: "Now is My soul troubled." Thus the Saviour

avows a certain conflict in His heart, yet by the very deliberateness (as well as by the publicity) of the avowal takes from it something of the intense and almost pas- sionate humanity of the synoptic narrative, Immediately after these words the Saviour, in the Fourth Gospel, deliberately suggests to Himself the synoptic prayer, and tepeats it: 'What shall I say? 'Father, save Me from this hour? But for this cause came I to this hour." At once triumphing over the—from the point of view of the Fourth Gospel—unworthy suggestion, He exclaims, " Father, glorify Thy name." Upon this

comes the heaven-sent message, but not (as in Luke) an angel to " strengthen" one " in an agony praying more earnestly;" on the coutrary, the voice does but ratify the Saviour's utterance: "I have both glorified it, and will glorify it again." Finally, the author adds, as usual, the babble of the multitude, as a foil to the all-knowing wisdom of the Divine Word: " The people therefore that stood by and heard it said that it thundered ; others said, Au angel hath spoken to Him." No answer to their doubts and questionings is given by Jesus; but we are left under the impression that the "I" is uttered, neither by thunder nor by any mere angel of God, but by the Father Himself. to be saved from the trouble; the suppression of that prayer,

after more or less of conflict, and the substitution of

another prayer in its place; and lastly, a message or messenger (dyyedos) from heaven—the facts are much the same both in Luke and in John, yet how different is the treatment of the facts, and what a world of difference in the spiritual result !

Almost the only passage in which John adopts a few consecutive words of the synoptic narrative is the narrative of the anointing (xii, 8-8), There is much less similarity between Peter's confession, as recorded in Jo. vi. 68, and as recorded in Mat. xvi. 16; Mk. viii. 30; Lu. ix. 20; but the narratives appear to refer to the same event, and if so, the comparison between the two is most instructive. In Matthew and Mark the confession of Peter consti- tutes a turning-point in the life of Jesus; it is the sign which convinces Him that, the seed of a living faith hav- ing been sown, His work is now done, and that the hour of His departure is at hand: "From that time forth" (Mat. xvi. 21; Mk. viii. 31) "began Jesus to show unto His discipies how that He must go unto Jerusalem, and suffer," &c.; aud accordingly the Lord prepares the dis- ciples with the greatest care, and even tenderness, for the all-important answer to the question which He is to put to

them, " Whom say ye that I am?" and when the question |

is answered, pronounces a fervent blessing on Simon, the son of Jona, but better called Cephas, a rock, whose faith- ful confession is the token of the laying of the foundation stone of the new temple. If Jesus is to be regarded as a man, "who, though He were a Scn, yet learned obedience by the things

which He suffered" (Heb. v. 8), then in the whole synoptic narrative of the life of Christ there is not a more important crisis than this. But in the Johannine narrative crises are altogether out of place, where all is pre-ordained ; and instead of the tender questioning, the inspired confession, and the fervent blessing, we have simply an almost casual appeal of the Lord to His dis- ciples, 'Will ye also depart?" which, when a response has been made by Peter, is followed, not by a blessing, but by sad words conveying the assurance that the Word of God, who chose the twelve, knows all their weakness as well as their strength, and cannot be surprised either by confession or by betrayal: "' Jesus answered, Have not I chosen you twelve, and one of you isa devil?" Both in the Fourth Gospel and in the synoptists (Mat. xvi. 23; Mk. ix. 33), immediately after the blessing of Peter, mention is made of "Satan" or " Devil." To bless Peter, and to call him

"Satan" immediately afterwards, is consistent with the human Christ described by Mark and Matthew. 'The difficulty is avoided, in Luke, by omission; but the Fourth Gospel, retaining the traditional mention of the word " Satan," or "Devil," directs it to Judas; upon whom else- where the Fourth Gospel (xii. 4-8) concentrates the faults imputed by Matthew (xxvi. 8) not to Judas alone bnt to all the disciples,

Readers who may think that this last dislocation of the words of Jesus appears somewhat improbable should con- sider carefully the patent instance which follows. In the Synoptic account of the betrayal, Matthew and Mark represent Jesus as awaking the sleeping disciples (at the moment of the arrival of the traitor and his band), with the words, "Rise, let us be going (éye(pece, deywpev). Behold, he that betrayeth Me is at hand" (Mat. xxvi. 46; Mk. xiv. 42), Luke alters this; it is too human for him, seeming to imply flight; and therefore he substitutes a command, in the second person, " Rise up and pray, lest ye enter into temptation" (Lu. xxii. 46). But John, while averse to this change of the traditional words, neutralizes their

questionable effect by taking them com- pletely out of their context. Accordingly, he places them between the discourse on peace in ch. xiv. and the dis- course on the vine in ch. xv., just at, the point when we may suppose the Master with His disciples to be rising from the table, purposing shortly to pass quietly from the lighted upper-room where He had been celebrating the last supper down into the streets of Jerusalem, on His way to Gethsemane. Taken in this context, the words are free from all suspicion of haste or trepidation; on the contrary, they betoken authoritativeness and decision. Rising from the sacred meal, and going forth to welcome 'His hour," the Saviour says,—as if with the conscious- ness that He is the High Priest of the World, going forth to celebrate the sacrifice foreordained before the founda- tions of the world,—' But that the world may know that I love the Father, and as the Father gave Me command- ment, even so I do. Arise, let us go hence (éye(pecOe, dyopev évtedOev)."

The entry into Jerusalem, the crucifixion, and resurrec- tion, are almost the only remaining events common to the Fourth Gospel with the synoptists, The entry is much con- densed, and closely connected with the raising of Lazarus (xii. 18); the lengthy account of the sending for the ass is passed over in the words—'"' Jesus, when He had found a young ass, sat thereon"; and the acclamations of the multi- tude and the pomp of the procession are all omitted or lightly touched, as if the gleam of popular favour which so impressed the synoptists scarcely deserved the attention it had received from them. It wasa mere consequence of the raising of Lazarus: "For this cause the people also met Him, for that they heard that He had done this miracle." Yet in Matthew (xxi. 11), when the city asks "Who is this?" the crowd replies, '" This is Jesus, the prophet from Nazareth of Galilee"—making no mention of the wonder which—according to the Fourth Gospel—was the sole cause of the procession.

After this, John omits the purification of the temple, which he has placed earlier, at the first visit of Jesus to Jerusalem (ii. 15),1 and passes rapidly to the last supper. Here, as is well known, there are great difficulties in recon-

1 The purification of the temple, placed as Christ's first public act, is as suitable an introduction to the life of Christ in the Fourth Gospel as the sermon in Nazareth is to the life of Christ in the Third Gospel, In Luke (the

Gospel of mercy), the proclamation of the ‘‘ healing of the broken-hearted’ to His friends at Nazareth; in John (the Gospel of the Word of God, in which the words Acos, éAcev, cmAayxvi Copa, so often repeated by the synoptists, are altogether absent), the purify- ing of the temple of God,—is the most appropriate commencement of the Saviour’s public work. Besides, the prophecy of Malachi

ciling the account of the Fourth Gospel with that of the synoptists. Inthe synoptists the last supper is (apparently) the passover, in which the Lord bequeathes Himself to His disciples as their sacrifice, giving them His body and blood ; in John the last supper, so far as he describes it, is merely the last meal shared by the Master and His disciples, at which He washes their feet, and exhorts them to humility, patience, and peace ; and it is expressly described as being “before the feast of the passover” (John xiii. 1). Again, in the synoptists, Mark places the crucifixion at the third hour (9 a.m.), and the darkness is made by all the synoptists to last from 12 to 3 p.m, ; but John (who is describing in the crucifixion the sacrifice of the passover, the slaughter of the Lamb of God which was to take away the sins of the world) naturally places the crucifixion later, in order that the Lamb may be slain “between the two evenings,” as prescribed in the law; and therefore he does not place even the delivery of Pilate’s verdict till the sixth hour, 1.e., 12 o’clock, and the crucifixion, consequently, later still, The symbol- ism which prevails in the Fourth Gospel may incline us generally to acccpt the synoptists’ narrative in preference. But there are special reasons why, at a very early date, a slight misunderstanding, among the Gentile churches, of Jewish custom and of the common tradition may have led to an erroneous supposition that the last supper was the passover meal; and the explanation suggested by Canon Westcott (Introduction to the Study of the Gospels, p. 344) seems a very reasonable one. In this case, therefore, the Fourth Gospel must have the credit of dis- sipating an error which had very early crept into the synoptic narrative (namely, the insertion of the words “The first day of unleavened bread,” Mat. xxvi. 17; Mk.

xiv. 12; Lu. xxii 7); nor is it at all unlikely that this | But as.

rectification came from the apostle John himself. regards the hour of the crucifixion, it seems more likely that the account of Mark is correct, not only because it leaves more time for the burial before sunset, but also because the later hour implied in the Fourth Gospel appears naturally suggested by the same symbolism which after- wards finds in the wounde] body of Christ a fulfilment of

the two prophecies, ‘ A kone of Him shall not be broken,” |

and “They shall look on Him whom they pierced.” Passing now to those details of the crucifixion wherein the Fourth Gospel differs from the synoptists, we find in almost each case but one motive—to enhance the majesty of the Saviour. Even in the arrest of Jesus this motive appears, The synoptists tell us that He was arrested by a “crowd” (dyAos), servants, sent apparently from the houses of (mapd Mat.; dé Mk.) the chief priests and elders; and as the moon shone at the full, so brightly that the disciples could discern their Master from some dis- tance (a stone’s cast), and perceive His agony, as well as hear the words of His prayer in the stillness of the night, they do not think it necessary to make mention of “lights” or “torches.” The Fourth Gospel describes how the “ cohort ” of the citadel of Antonia is called out, together with the servants of the priests, making up in all, if the whole cohort

is meant, five or six hundred men; and these approach, not |

with “swords and clubs” (as Mk,), but with “ torches and lights and arms.” Jesus goes forward to meet them, and intrepidly declares that He is the person whom they are

(iii, 1), ‘180d ekamooreAdw Tov Uryyeddy pou, Kal émPrdperat 83ov mpd mpordmov pov (John the Baptist), cat ekalpyns ‘ker eis Tov vadv éavTov Kupios dv busis Cnre?re,—predicts a ‘‘sudden” coming of the Lord into the temple, following on the steps of his ‘‘ messenger.” This prophecy is better fulfilled, if the Lord comes to the temple immediately after the preparation of John the Baptist; and, besides, the ‘*sudden’’ coming is better fulfilled in the early entry of Jesus (John ii. 14) than by the later entry in the synoptists, which was pre- ceded by a public procession. Thus prophecy, as well as

appropriate- ness, might induce an account of an early purification of the temple.

GOSPELS

[FOURTH GosPEL,

seeking, upon which they "recoiled and fell to the ground," Nothing of all this is found in the synoptists. Though John agrees with Luke in the tradition that the servant's ear cut off by Peter was the "'right" ear,! he en- tirely omits Luke's narrative of Christ's examination before Herod ; but this is in accordance with his fixed purpose— while by no means neglecting graphic and picturesque detail—to ignore all petty local distinctions, and to draw none but large and clear outlines on his canvas. Rome and "the Jews" alone appear round Christ on the stage of his drama; not one of the Herods is so much as once men- tioned from the beginning to the end of it. The irony of providence, by which Pilate is made to proclaim that Jesus is "King of the Jews" (xix. 20), reminds us of the similar

irony by which Caiaphas, not speaking "of himself" but inspired by God, is forced to publish the suffering of the.

Saviour (xi. 51); and both passages are quite in the manner of the Fourth Gospel. So also is the very natural applica- tion of the prophecy, 'And for My raiment did they cast lots," to the seamless tunie of Christ. Remembering what stress is laid by our author's teacher, Philo, on the high priest's garments (Afoses, 14; Dreams, 37), which "represent the universe," we shall readily perceive that while the outer garment of Christ is freely given to the four quarters of the world, the inner seamless tunic (x:rév), that which He wears next to His heart, is not to be rent, representing as it does the regenerated world, "those who receive remission of sins through Him" (Dialogue liv.).?

The Motive of the Fourth Gospel illustrated by the First Epistle of John.—It has Epistle of John is most closely connected with the Gospel. The connexion is so close, in thought as well as in lan- guage, that the former may almost be called a summary of the latter. In the Epistle, even more clearly than in the Gospel, we see the author's habit of dealing rather with

elements than with nations or individuals. With the exception of the illustration of ‘‘ Cain,” which he possibly borrowed from Philo (who uses Cain and Abel to denote the earthly and the spiritual principle, Sacrifices of Cain and Abel, 1), he prefers to dispense with personal illus- trations of principles. He does not, like Paul, speak of Abraham, or Hagar, or Sinai, or Isaac, or Melchisedek, or the Jews, or the Gentiles; but of the world and the flesh, the water, the blood, and the spirit, light and darkness, life aud death. In the Epistle, as in the Gospel, we see the rejection of Christ explained, not as a casual outcome of individual caprice or wickedness, but as an inevitable result of the eternal antagonism between light and darkness. In the Epistle, as in the Gospel, the author insists that the new commandment of Christ to ‘love one another” is really an old commandment which men have had from the beginning : a commandment as old as the promptings of the Light which from the beginning has “‘ lighted every man coming into the world,’—an old commandment only so far made new as it has been brought home to the hearts of men with a quite new intensity by the manifestation of the incarnate Love of God. In the Epistle, as in the Gospel, it is recog- nized that the antagonism between the world and the spirit, vetween light and darkness, must go on without. truce till one has prevailed ; and each man must take one or other side, putting away all hope of compromise. There are two principles, says Philo, contrary to and at variance with one another,—the one represented by the God-loving Abel, the

1 Note also that the Fourth Gospel is the first to give the servant’s name, Malchus, In the same way the Acta Pilati for the first time give the names of the two thieves, Dysmas and Gestas. ,

2 Only the Fourth Gospel thus distinguishes between the [masa and the x:téy. But compare Lev. xvi. 4, where the xerdv jryearpevos 1S prescribed as the dress for the high priest on the day of atonement; and see also Philo (Dreams, 37); and especially note Philo’s remark

that this x:rév is ‘not easily rent” (appayéorepos).

Come

been said above that the 1st parison with First Epistle of

other by the self-loving Cain, which must needs be at vari- ance when born, "for it is impossible for enemies to dwell for ever together." In precisely the same way does our author illustrate the same antagonism by the same person- ality: "Not as Cain, who was of that wicked one, and slew his brother. And wherefore slew he him? Because his own works were evil and his brother's righteous"; and then, relapsing from the unfamiliar method of personal illustration into his habitual language about principles or elements, he substitutes for Cain the " world," and for Abel the "children of God," and bids his readers " marvel not if the world hate you."

In this continuous strife between light and darkness the victory is to be gained by faith,—but faith supported by witnesses; and we read in the Epistle that the object of our victorious faith is "He that came through (dd) water and blood, Jesus Christ ; not with the (év rd) water only, but witli the water and the blood 3 and the Spirit is that which beareth witness, because the Spirit is truth ; because they that bear witness are three, the spirit (or breath, rd wvedua) and tle water, and the blood, and the three are united so as to make up the one" (eis 70 & ion) (1 John v. 6-8).

Passing over many differences of interpretation, and ask- ing, What is the meaning of the water and the blood? we turn to the Gospel, and, in the account of the crucifixion, we find (xix. 34) especial stress laid upon the fact that from the side of Jesus "there came out blood and water 3 and he that hath seen hath born witness (wepaprupyKev), and his witness (uaprvpia) is genuine (dAn6vy), and he knoweth that lie saith true, that ye might believe." In what sense is the "blood " here to be understood? As nourishing ? or as cleansing? Almost certainly as cleansing; because above, in this very Epistle, the blood of Jesus is described (i. 7) as cleansing us from all sin. Inferring, then, that the blood signifies a superior purifying or baptismal influence, we necessarily infer simultaneously that the water signifies an in- ferior baptismal influence. Two purifications are mentioned in all the four Gospels, an inferior and preparatory, and a superior and final: the former is the baptism with water, the latter is the baptism with the Holy Spirit, or (as in Lu. iii. 16) with the Holy Spirit and fire (cf. also Lu. xii.

49). But the conception of “ baptism with fire,”— though it is based on the early history of Israel (Num. xxxi. 23), and appears occasionally in the shape of a “ fiery trial” of faith, as well as in the fiery tongues of Pentecost —was soon sup- planted by one of two other conceptions, either sprinkling with sacrificial blood, or baptism with the Spirit. This higher purification, or baptism with blood, Jesus brought into the world. He not only came working by means of it (dud with gen., as above in the passage quoted, 1 John v. 6), but also, in a certain sense, in it (év). That is to say, He himself underwent the higher baptism with blood as well as the lower purification with water, which He received from Jolin the Baptist. ‘‘Can ye be baptized with the baptism wherewith I shall be baptized ?”—He said to the sons of Zebedee (Mk. x. 38). The agony in Gethsemane, which was that baptism, was typified by Luke in an exuda- tion of “ sweat, as it were great drops of blood falling down to the ground” (Lu. xxii 44). But this baptism was scarcely public enough to be a sufficient fulfilment of the prophecy which predicted that “In that day there shall be a fountain opened to the house of David, and to the inhabitants of Jerusalem, for sin and for uncleanness” (Zech. xii. 1). When it became recognized that the Lord was this “fountain,” and that His blood was the cleansing stream, then the piercing of His side and the visible emis- sion of the purifying blood from the wound became an effective and almost necessary type of the spiritual purifica- tion, and the type of the blood of sprinkling, suggested

perhaps by Luke in his description of the agony, fell into the background, being supplanted by the more natural type of the pierced side.

Such a type would all the more commend itself because, without it, the crucifixion might almost seem incomplete. The mere piercing of the hands and the feet might seem an insufficient fulfilment of the prophecy of the “fountain”; and besides, since crucifixion was generally a lingering death ex- tending over many hours, and since the body of Jesus was taken down on the same day on which it had been attached to the cross (and, according to John, only three or four hours after the commencement of the

crucifixion), the record. of His death, without the spear wound, might seem to

justify the statements of those who maintained that Christ

never died at all, and that He was a man only in appear. ance. Therefore, as a proof of His humanity and of the reality of His death and sufferings, no less than as a fulfilment of the prophecy of the " fountain," it was natural that the latest Gospel should insert, and that the church should readily accept, the witness through blood as well as water, which is so emphatically related by the

'author of the Gospel, and here appealed to by the author

of the Epistle.

But the question remains, What is meant by the con- nexion of the water and the blood with the breath or spirit —''They that bear witness are tliree, the breath (or spirit), and the water, and the blood"? Philo may throw light both on the number and on the nature of the witnesses, Only to earthly matters did the rule apply that "in the mouth of two witnesses shall every word be established :" heavenly matters required, so Philo teaches, "three wit- nesses" (yoy S& mpaypa Soxydlerar 81d Tprdv papTupwv, Posterity of Cain, 27). He also calls attention to the fact that Moses declares with apparent inconsistency (1) in Leviticus (xvii. 11) that blood is the essence of life, (2) in Genesis (ii. 7) that breath is the essence of life; and he reconciles the two statements by assigning to men two kinds of life: (1) the irrational, which they have in common with beasts, which life has for its seat (€daye) blood ; (2) the rational, which flows from the fountain of reason (AoyeKis w™ryys), Which has for its seat breath (or spirit), ' not (mere) air in motion, but a kind of type and impress of that divine power which Moses calls by a nanie especially ap- propriated to it (kupim dyduar.), image (of God)" (The Worse plotting, &c., 23). Elsewhere (Who ¢s the Heir, 11) he says that blood is the essence of the entire soul, but divine spirit (veda Ociov) the essence of the dominant part of the soul. On the metaphor of the water also Philo throws light. Water and earth, he says, represent the origin, growth, and maturity of the human body ; consequently, he tells us, purification by water is that preliminary recog-

nition of one's own nature ("know thyself") which is re- quired from those who aspire to the higher purification. Hence purification by water, he asserts, was appointed by the law as a preparation for the purification by sacrificial blood ; and hence the Sacred Word thought meet that the high priest, whenever he purposed to perform the sacrifices ordained by law, should previously sprinkle himself with water and ashes (Dreams, 36, 37; Those who offer Sacrifice, 1 sett)

If now we could find in the Gospel narrative of the crucifixion some mention also of the breath or spirit, nothing would remain wanting to make up the triple puri- fication and triple witness mentioned in the Epistle, of 'the spirit and the water and the blood." Such a men- tion is probably intended in the willing surrender of the "breath" or " spirit," which is mentioned (xix. 30) in the Fourth Gospel alone [Mk. éééérvevoe, Mat. ddyjxe ; Luke (xxiii. 46) who comes nearest to John only describes the intention, not the fact, rapariPcuar]: "He bowed His head,

and gave up His breath" (or spirit). Thus the meaning both in the Gospel and in the Epistle appears to be the same. (1) Jesus took unto Himself not only (a) the dead fieshly nature of man, typified by water, but also (b) the life and passions of man, typified by blood, and © that higher life of man (in virtue of which he is described as made in the image of God), typified by the spirit. (2) In these three departments of existence He made three several sacrifices, pouring forth (a) water and (0) blood from His side, and giving up © His breath as the last sacrifice of all.} (3) Thus these three sacrifices betoken three several puri- fications: —(a) the purification, by water, of the body in baptism; (0) the purification of the soul by the death of the lower nature (what Paul calls "the old man"), which partakes in the death of Christ ; (c) the purified life of the soul rising from the dead through the Spirit, and living with, and in, the risen Saviour. The two latter purifications are two phases of the same (the former im- plying dying in the blood of Christ, the latter rising again and living in His Spirit); but there is sufficient difference to warrant a distinction. (4) These three purifications go to make up the one perfectly pure and ideal purification and sacrifice for sin, which is the Lamb of God, the Word (cis 75 & eiow)."

Stress has been laid upon this important passage in the Epistle because it appears to bea key to much that we shall find in the Gospel. It reveals an exaggerated notion of the importance of baptism with water, against which the author feels compelled to contend; “not by water only, but by water and blood.” Somewhat in the same way Paul uses uot water but earth (Philo using water and earth) to con- trast the natural man, the mere “living soul,” with the “Jifegiving breath, or spirit” (1 Cor. xv. 45, 47), But that which distinguishes John from Paui is the use of mystical imagery, arranged with a certain numerical syin- metry. Sometimes the imagery is dual, when it describes incompleteness, such as the conflict between the world and the children of God, between light and darkness, between God and the devil. But in other cases it is triple: he appeals to three classes, the children, the young men, the fathers; contending against three enemies, the lust of the flesh, the lust of the eyes, the imposture (adaLoveia) of life ; and strengthened in their faith by three witnesses on earth, the water, the blood, and the spirit—all of which dimly tends towards that other triple witness which ;has been inserted in the Epistle by later scribes (v. 7), the Father, the Word, and the Holy Spirit.

If we could be sure that the Second Epistle was from the same pen as the First, then the very great probability that the “elect lady” and the “elect sister” (2 John 1; 0b. 13) represent two churches might prepare us for similar per- sonifications in the Gospel; yet as this personification is disputed by some, we must not lay much stress on it.2 Nevertheless we have seen enough of the nature of the Epistle to be prepared (in passing to the larger work by the same author) for a Gospel of types and symbols, a Gospel of selection rather than of continuous narrative, a Gospel in which principles on a large scale rather than indi- vidual characters shall be represented, and in which light

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1 A somewhat similar compound sacrifice of “blood” and “mind” is described by Philo (Adleg., ii. 15), who represents the High Priest as “having put off the robe of opinion and fancy, and as coming dis- robed into (the Holy of Holies) to make an offering of the blood of life (ometoa 7d

Wuxixdy afwa) and to offer up as incense all his mind to the God of salvation."

2 No doubt these three sacrifices are also connected, in the author's mind, with the three gifts: (1) the water springing up into everlasting life ; (2) the wine of the Lord's blood; (3) the spirit which He breathed into the souls of His disciples.

3 Dr Lightfoot (Col. iii. 12) accepts the personification in 1 Pet. v. 13 as " probably" intended,

and darkness, death and life, the word and the world, the water and the spirit, and the spirit and the blood, shall play no inconsiderable part.*

Analysis of the Fourth Gospel. As was to be expected from a writer conversant with the

system and thought which, for brevity, we call the school

of Philo, the prologue of the Gospel opens with a protest

: ee : : hd against Philo's doctrine of an impersonal or quasi-impersonal

Logos. 'The Logos or Word is at once declared to be (i. 1), not the mere instrument by which the world was made, but the companion of God, and God; a Light,

from the beginning shining in darkness, received by some, to whom power was given to be born of God, but rejected

by others who were the children of the flesh. John the Baptist is introduced, in marked distinction from the Word, as a "man;" not the Light, but a witness to the Light ; and the Baptist declares at the very outset of the public life of Jesus (i. 16) that, though the law was given by Moses, the gifts of divine grace and truth came through Jesus, and that He, being the

only begotten Son in the bosom of the Father, has manifested the invisible God to men, ‘The baptism of Jesus by John is omitted ; but John bears witness to the visible descent of the Spirit upon Jesus, adding that it “abode upon Him,” and he bears record that his own baptism with water is but to prepare the way for Him who will baptize with the Holy Spirit; and that He on whom the Spirit thus descended is the Son of God, the Lamb ef God that is to take away the sins of the world. Here, then, at the very outset, we see the thoughts, and one may almost say the dramatis persone, of the Epistle re- introduced in the Gospel—light and darkness, the word and the world, the law and grace, the Father, the Spirit, and the Son. ‘The three grades of purification are not as yet mentioned; yet there is perhaps a side-reference to them in the three grades of the world, ze., of impure existence, which are alluded to in the contrast between those who are born “of God” (i. 18) and those who are born (1) of blood, (2) ef the will of the flesh, (3) of the will of man,

The narrative of the calling of mistakably that this book is not to follow the common tradition, nor to be a complete narrative, but rather a selec- tion; for it only narrates the calling of six of the twelve, and one of these, Nathanael (significantly described as a man of Cana, where two out of the eight miracles in this Gospel are to take place), is so far from being universally identified with one of the twelve that Augustine excluded him from the number. The earlier names are mentioned in the same order as in Papias (see above, p. 820), and suggest the inference that some of these apostles, or their disciples, dwelling in the neighbourhood of Ephesus, furnished some of the materials of which the Fourth Gospel is composed. Two points are further to be noted in this narrative. (1) In order to enhance the dignity of the central character, the writer causes the inferior characters to revolve around Jesus, conversing with and questioning one another, doubt- ing and erring, before venturing to obtrude themselves upon Him (see, besides this passage, 1v. 97, iv. 33, vii. 27, 40- 43, xi. 16, xi. 37, xii, 20-22, xiit. 24, xvi. 17; avd note how, both in xvi. 19 and in other passages, Jesus, after the manuer of a king, takes the initiative in addressing His dis- ciples, instead of their bringing their difficulties to Him un- bidden, as they do for the most part in the synoptists).

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4 The numerical symmetry that pervades this Gospel is fully recog; nized by Canon Westcott, who sees “three pairs of ideas running through the work, and “ seven witnesses ” corresponding to the seven times repeated “I am” (vi. 35; viii. 12; x. 73 x. 11; xi 255 ZIV. 6; xv. 1), and to the seven “sions” of Christ’s ministry om earth, follgwed by one “‘sign” of the risen Christ.

the disciples implies un- Calling

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(2) The second point is the error of Philip in saying, “We have found Him, of whom Moses in the law, and the pro- phets, did write, Jesus of Nazareth, the son of J oseph ” (i. 45). Philip introduced with this slightly pompous and erroneous statement—in a kind of irony highly character- istic of our evangelist—seems intended as a contrast to the humiliated and wiser Philip of the fourteenth chapter : “Have I been so long time with you, and yet hast thou not known Me, Philip?”

The next chapter (ii.) opens with a “ sign,” of which the symbolism is obvious! The water changed into wine evidently typifies the substitution of grace for the law. It was a common metaphor among the Jews to express the superiority of the oral tradition to the written law by saying that ‘the law is water, but the words of the scribes are wine”-———-a metaphor that exactly recalls the words of Origen about this very sign: “ Before Jesus the Scripture was water, but from the time of Jesus it has been made wine for us” (Comm, in Ev. Joann., xiii, 60). A somewhat similar comparison of old wine and new wine had been adopted by Jesus Himself to illustrate the differ- ence between His teaching and the law of Moses, The identity between the purifying blood of Christ’s sacrifice and the nourishing blood of His sacrament is understood even by Justin independently of the Fourth Gospel, and would be a natural inference from the Messianic prophecy (Gen. xlix. 11), which identified the cleansing stream that was to purify the robe of the Messiah with the blood of the grape, declaring that He should “ wash His robe (i.e., as Justin explains it, His church) in the blood of the grape.” Therefore, in changing water into wine, the Messiah is, by His first sign, striking the key-note of all that is to come, indicating the object and nature of His work, viz., the supersession of the law by the gospel, and the

introduction of a new spiritual nutriment and puri- fication, which shall at once cleanse and strengthen and gladden the soul—all this to be effected by and in Himself through His blood.?

The prediction here made of "the hour" when the "blood of the grape" should stream from His wounded side is at once followed by a second similar prophecy. After leaving Cana for the passover in Jerusalem (where He purifies the temple by expulsion of the money-changers ;

1 It is true that the symbolism of this ""'sign" is not indicated in the text in the same clear manner in which the symbolism of the feed- ing of the 5000 is avowed (vi. 32, 33); but there is a clear reference to it in the words (ii. 4) ''Mine hour is not yet come," which seem to look forward to the hour when the ''blood of the grape" should stream from the wounded side of Jesus. It may be necessary to point out, at the outset of this analysis, that the language of the Gospel may naturally have been affected, not only by the thought and lan- guage of Philo, but also by what was called the '' Asiatic" style, which was prone to metaphor and symbolism: see Lightfoot's Gala- tians, p. 362, where we find that Polycrates, bishop of Ephesus (born or converted about 130 s.p.) described John (probably metaphorically) as a priest, wearing the wéraAoy or high priest's mitre, and speaks of Melito as a "eunuch," meaning merely that Melito devoted him- self to Christ (''propter regnum Dei eunuchum''), It is noteworthy in this context, that the Epistle to the Ephesians is the only Epistle that appears to contain an extract from one of those early hymns which, as Pliny says, the Christians used to ''sing to Christ as a god," and this hymn, as is natural, deals in metaphor: ''Awake thou that sleepest, and arise from the dead, and Christ shall give thee light" (Eph. v.14), Probablyfrom some such Asiatic metaphor (that "John, though dead, still breathed in the church") arose the tradition, of which mention is made by Augustine, that the earth over the apostle's body still rose and fell with his breath.

2 This narrative may be abundantly illustrated from Philo. (1) He speaks of '' the veritable High Priest," who pours forth a libation of " pure wine, namely himself" (De Somniis, ii. 27) ; (2) he connects this High Priest with the Logos by describing the Logos as a priest having for his inheritance the Eternal (rdy dvra), a priest of the most high God (see also De Somniis, i.

37); (3) he speaks of this priest (under the type of Melchisedek) as substituting wine for water: ‘‘ Melchisedek shall bring forward wine instead of water, and give your souls to drink” (Allegories, iii. 26).

see above, p. 827), Jesus answers the request of the Jews fora sign with these words, “Destroy this temple, and in three days I will raise it up.” It is added that He “spake

| of the temple of His body.” It is interesting to note

four different stages of development in the expression of this prediction. The synoptists Matthew and Mark de- clare that a very similar charge (differing only in “I will destroy” and “T am able to destroy,” Mat. xxvi. 61; Mk. xiv, 58) was brought against Jesus by false witnesses ; and they give us no hint that the witnesses erred by a simple and natural misunderstanding, Luke, however, who not only wrote after the destruction of Jerusalem (when it would be a common saying that the Lord Jesus had destroyed the temple), but also modified his Gospel in many respects to suit it to the requirements of the changed times, makes no mention of any false accusation. In his subsequent treatise of the Acts he goes a step further; for there the accusation is repeated (Acts vi, 14), and not denied, Now, lastly, the author of the Fourth Gospel adopts the charge as in the main a true one, or at all events as an inevitable misunderstanding in which His disciples, as well as His enemies, participated. At the same time, this prophecy, like the symbol of the wine, prepares the way for Christ’s subsequent doctrine (xiv, 23) that every man is a temple of God, and that He Himself is that Temple in the highest sense. This doctrine had been taught even before Paul by Philo, who scouts the thought of preparing for the Supreme a “house of stone or wood,” and declares (Cain and his Birth, 20) that the invisible soul is the terrestrial habitation of the invisible God. Yet though Philo’s language may have influenced the language of the Fourth Gospel in such passages as xiv. 23, it is most certain that this doctrine is a necessary inference from the teaching of Christ Himself, whio taught us that the body must be “full of

light.” There is therefore no essential misrepresentation in this intro- duction of the Pauline doctrine of Christ the Temple or Church,

® An inference has been drawn from the words Tescepdxoyta kal ef ereaw grodoundn 6 vads obros (ii, 20), that because the year so indi- cated would be the same year as that assigned by Luke to our Lord’s commencement of His public work, therefore, by thcir coincidence, the two Gospels mutually support each other. But it seems natural that the writer of this Gospel, an educated Jew, should know both the date of the commencement of the temple and the date as given by Luke of the commencement of our Lord’s ministry; and it seems characteristic of the author, by details of this kind (and especially by numbers), to add picturesqueness and realism to his narrative: ¢f. the 200 pence (vi. 7), the 200 cubits (xxi. 8), &c. However, it must not be forgotten that Origen (Comm. in Ev. Joann., x. 22) throughout

- his long discussion of this passage assumes that the meaning is in”

not ‘‘during”* forty-six years. And this seems to be the natural trans- lation of the words—“ the temple was built in forty-six years” (although the dative may be used for duration of time, the aorist hardly permits the English version); and if so, the author is under a mistake in sup- posing that the temple was completed. Yet from this passage (ii. 20), and from other indications of a knowledge of Jewish customs, Mes- sianic expectations, and the geography of Palestine, it has been in- ferred that the author was a Palestinian Jew. A stronger argument is the author’s preference of the Hebrew rather than the LXX. version of the Old Testament (Canon Westcott quotes vi. 45; xiii, 18; xix. 37), which certainly shows either that he used the Hebrew version himself, or that the Ephesian doctrine was based upon that version. The knowledge of the country does not seem to exceed what might be attained by any Alexandrian Jew who had spent one or two passovers in Jerusalem and had travelled for a short time in Palestine; and the geographical argument has been unduly strained by such suggestions as that a “minute knowledge” of the relative positions of Cana and Capernaum is implied in the expression ‘‘ He went down” (ii. 12). The same argument would show that the author of the book of Jonah had a “minute knowledge” of the position of Joppa (Jonah i. 3), or that the author of the Acts of the Apostles had a ‘‘ minute knowledge” of the places from which he or Paul ‘‘

went down” to Attalia, Troas, or Antioch (xiv. 25 ; xvi. 8; xviii. 22). Any traveller might know that Capernaum was in the low-lying basin of the Jordan, down on the edge of the sea of Galilee, without having a “minute knowledge” of its position relatively to the inland villages of Galilee.

The doctrine of water.

Christ’s relations with John the Baptist.

The whole of the next chapter (iti.) deals with purification by water and the spirit. The learned but timid Nicodemus, “the teacher” of Israel (iii. 10), exhibits the blindness of carnal learning as contrasted with the knowledge that belongs to those who are born of the spirit. A third pre- diction of “the hour” is expressed through a third figure, the serpent in the wilderness. But this figure introduces a new conception, that of faith, an intense looking towards Christ, even as the children of Israel looked on the healing serpent.! This thought of faith as sight, illustrated per- haps by the statement that Nicodemus had come by night, introduces a few remarks on a subject hereafter to be more amply treated by the evangelist—-the difference between the children of light and the children of darkness (iii, 18-21). In the second section of this chapter the subject of water- purification is taken up again by the Baptist, who con- trasts his own inferior purification with the higher purifica- tion of the Messiah, and his own decrease with Christ’s in- crease, describing himself (almost in the language of Paul) as “earthly,” whereas the Messiah is “from heaven.” But the Baptist also introduces the subject of faith ; the path of life is through faith in the Son of God: ‘He that believeth in the Son hath everlasting life” (iii, 22-36).

Particularly to be noted is verse 24 of this chapter, in which it is expressly stated that “John was not yet cast into prison.” It will be remembered that the synoptists give no acaount of the public appearance of Jesus till after the imprisonment of John. It was therefore open to the enemies of the church to maintain that Jesus was but a pupil of the Baptist, and that He did not venture to teach till His master John had been shut up in prison. Much more might this be asserted in Ephesus, where, as we have seen, there were some who were baptized only with the baptism of John, and who knew nothing of the Holy Spirit. On this account probably it is that our author introduces Jesus as working by the side of John, before his imprison- ment, and even then inevitably, and against His own will, drawing multitudes from the Baptist to Himself. The apostle John himself is one of the first to leave the Baptist for the Greater Teacher (i, 37); but the Baptist also is made to witness, and to rejoice in, the desertion : “ He must increase, but I must decrease.” And finally, we are told that the superiority of Jesus over the

Baptist had become so manifest that the Pharisees had heard that Jesus made and baptized more disciples than John, and upon this, desiring to avoid this appearance of superiority, Jesus retired to Galilee? (iv. 1). It would not be possible more effectively to repel every suggestion of the pupilage of Jesus, or of his subordination—even His temporary sub-ordination—to John the Baptist.'

1 According to Philo, the brazen serpent represents temperance, the antidote of pleasure; and he who has strength to behold the beauty of temperance, and to ''discern God through the serpent * shall live (Allegories, ii. 20).

2 The insertion of the remark that '' Jesus himself baptized not, but his disciples," serves two purposes :—(1) to magnify the Messiah ; (2) to disparage the mere baptism with water.

3 It is, of course, possible that here (as in the matter of the last supper) the Fourth Gospel may have preserved some historical traditions concerning the acts of the Lord in Judwa, which have not been pre- served in the synoptic record. Nor is it denied that elsewhere, ¢.g., in the matter of the three passovers, the Fourth Gospel may be historical. There is scarcely evidence enough to admit of absolute demonstration on either side. All that is contended is that, whether historical or not, the incidents recorded in the Fourth Gospel are suggested (1) often by a clearly discernible motive in the mind of the writer contrasting forcibly with the motiveless, simple, inartistic narrative of St Mark; (2) sometimes by a desire to supplement, if not to correct, the previous narratives of the synoptists. The presence of such a motive and desire is not, of course, absolutely inconsistent with historical accuracy ; but, the more we consider the synoptic narrative to be objective, and the more we consider the Fourth Gospel to be subjective, the more we shall be disposed to believe that, in proportion as incidents in the latter are suggestible by motives and desires, in that proportion are

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Now follows (ch. iv.) what may be called the foreign Th section of the Gospel. We noticed that, even in Luke, the tale Samaritans assume a

prominent position, their faith ‘and of

unconventional goodness being twice contrasted with the carnal formalisin of the Pharisees, at one time in a miracle (Lu. xvii. 16), at another time in a parable (Lu. x. 33) We are now to see how the contrast between Samaria oud Judea is handled in the Fourth Gospel in the dialogue on the living water, which might fairly be called, from its sub- ject, as from its scenery, the “ Dialogue of the Well.” The well is a frequent figure in the books of Philo, To all men, says Philo (Planting of Noah, xix.), there is, in common, the desire to find drink; but some seek drink for the body, others for the soul. The seekers after truth are as those who dig wells, and many seekers have dug wells without finding water; and taking the LXX. version of Genesis xxvi. 32, ‘ We have noé found water,” he comments on the well of the oath (Beersheba), which is discovered to be “dry”; and he declares that the dry well illustrates the failure of all human search after knowledge, as compared with the ideal God-given knowledge which is like a gushing spring. Elsewhere (Dreams, ii. 2, et seq.) he says, even more explicitly, that the well is the emblem of knowledge; that its depth signifies the difficulty of the attainment of know- ledge ; and that concerning all knowledge the well-diggers have to make but one sad confession, ‘‘We can find no water.” Moses sits by the well “waiting to see what water God will send forth for his thirsty soul” (Alleg., ii. 4); Israel ‘sang the song of the well,” 2.¢., sang a song of triumph at the discovery of knowledge (Dreams, ii. 4); and the remark of the daugliter of Samaria (iv. 11) that “the well (dpéap) is deep,” followed by the contrast of the “fountain ” (any7) of water that “leaps up” (iv. 14), at once suggests Philo’s contrast between the bond-woman Hagar at “the deep wel/” and Rebecca who nourishes those who come to her with ‘‘the fountain that never fails” (Posterity of Cain, 41), Origen, in the same way, con- sidering Jacob’s well to mean the Old Testament, contrasts

Samaria leaving her dépia (the old implement of know-

ledge) with Rebecca at the fountain (Comm. in Ev, Joann., xiii. 10 and 29). The four wells dug by the patriarchs Abraham and Isaac represent (Dreams, ii. 3, 4) four departments of knowledge. The fourth and dry well represents the search after the fourth and incomprehen- sible immaterial element corresponding to the material heaven—a search that is necessarily fruitless.

This being Philo's interpretation (and he indignantly protests against any other, as being unworthy of wise men), we shall also see a singular propriety in placing the dialogue on the living water in the neighbourhood of "the parcel of ground that Jacob gave to his son Joseph" (tv. 5); for here also Philo has prescribed a metaphorical interpreta- tion, declaring that "Jacob gave Joseph Shechem, mean-

they likely to be nonshistorical, especially if they appear to be difficult to harmonize with the earlier narrative of the synoptists. It has been suggested that the lamentation over Jerusalem (Mat. xxiii, 37; Lu. xiii, 34), expressed in the words, "* How often did I desire to gather together thy children . , . and ye would not," implies many previons visits. These words were no doubt spoken in Jerusalem, where Matthew (not Luke, see p. 800, above) places them ; but still, may they not refer to the many occasions in Galilee where the Re- deemer, striving to "gather together" the children of Israel, had surely included the 'children of Jerusalem" in the scope of his efforts? Even if the words ''thy children" are to be taken literally, they may refer to the occasions when the scribes and Pharisees had come down from Jerusalem to test the Messiah, and Jesus had pro- claimed the new kingdom to them in vain. Though preaching 12 Galilee, Jesus was really conflicting with the spirit of J erusalem, and striving to '' gather together the children of Jerusalem.' In any case the supposition that moodkis refers to previous public visits to Jerusalem results in an incompatibility. For no one maintains that Jesus had made more than two previous public visits to Jerusalem 5 and it is impossible that '' how many times " can mean twice.

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ing thereby the bodily things which are the objects of the outward senses " (Allegories, iii. 8). But there is also an appropriateness in the use of the name (iv. 5) "Sychar." For whether the name be a corruption of "'Shechem" or of "Askar" (Sanday, Fourth Gospel, p. 93), in either case the name

contains a possible reference to “ drunkenness ” (Isaiah, xxviii. 1, 7; Dice. of Bible, s.v.), and serves as a suitable contrast to the Living Water. The next point for consideration is the “five husbands” of the woman of Samaria. Is there any special meaning in the number “five?” Turning again to Philo, we find, a little after the passage about wells quoted above, the statement that ‘the number five is appropriate to the outward sense” (Planting, 32), and that it represents material enjoyment, This is cer- tainly a natural use of the number, if it is to be used em- blematically.! Further, the number “five” is connected also by Philo, not indeed with “ husbands,” but with “seducers.” Philo (Allegories, iii. 88) says that the lawful husband is the mind (vots), the unlawful husband or seducer (pOopevs) is represented by the five objects of the senses working through the five senses.? Immediately before the passage, Philo adopts the more common metaphor of the Old Testa- ment in speaking, not of the mind, but of the Lord Himself, as the Husband, being the Father of the perfect nature, and sowing and begetting happiness in the soul. Samaria is supposed by Justin (Dial. Ixxviii.) to represent in Isaiah (viii, 4) “sinful and unjust power;” but here it rather typifies sense-wrapped ignorant unbelief. The whole of

uttered by Jesus in Galilee (Mat. xiii. 57; Mk. vi. 4; Lu. iv. 24) after the unexpected rejection of Him by His country- men ; and Mark adds one of those passages which were early “stumbling-blocks ” to the church, viz., that ‘He was not able to do there any mighty work, ... and He marvelled because of their unbelief.” Not content with Luke’s considerable modification of this passage, the author of the Fourth Gospel boldly places this saying of Jesus before the visit to Galilee, and assigns it as a reason for His going thither : “ After two days He departed thence (from Samaria) and went into Galilee ; for Jesus Himself testified that a prophet hath no honour in his own country ” (iv. 44). The motive is obvious: Jesus is desirous of escaping from notoriety. He has found that the Pharisees (iv. 1) are aware of His superiority to John the Baptist, and that His disciples exceed John’s in number ; and for this very reason He leaves Judzea, and comes to Samaria, a hostile district. Even here, however, He cannot help making converts. But

having made them, He leaves them and goes into Galilee, where at least He is sure to find “no honour.” Yet even here, adds the author, He was honoured ; for “the Galileans received Him, having seen all the things that He did at Jerusalem at the feast” (iv. 44). Thus skilfully, after his manner, the author takes those very sayings and traditions which had been turned against Jesus, and, by his delicate handling, uses them to enhance the glory of the Messiah, “who knew what was in man” (ii. 25).

this imagery seems so well connected and so appropriately

Passing over the cure of the nobleman’s son, which has The transferred from the pages of Philo to the pages of the

been discussed above, we come to the first “sign” wrought pool of Once more there is a contrast Beth

Fourth Gospel, that one hesitates to accept another ex- planation (Keim) which would otherwise seem extremely probable—an explanation borrowed from the five religions of the five nations of Samaria (2 Kings xvii. 30-37). In either case, the sixth “husband” may very well refer to Simon Magus, who, as we know from the Acts of the Apostles (Acts viii. 11), had very early in the history of the church “ for a long time” held the Samaritans ‘bound with his enchantments,”%

Like all the other narratives of our evangelist, this narrative is in the highest degree dramatic. From her previous repellent attitude, the woman of Samaria is led, first into wonder, then into interest, then into convic- tion of sin (becoming ashamed of her false husbands), and into admiration of the New Prophet; lastly, she receives from the Messiah a draught of that spiritual water which alone can satisfy the longing soul ; and in the climax she is brought to the very brink of the eternal fountain— ‘“‘T that speak unto thee am He.”

The journey into Galilee adds one more to the in- stances in which the Fourth Gospel corrects the synoptists. The saying that ‘a prophet is not without honour save in his own country” is stated by the synoptists to have been

1 Origen (Comm. in Ev. Joann., xiii. 9) speaks of ‘‘the five hus- bands as corresponding to the jive senses ;”’ and he says that Samaria is the type of a soul which has once been wedded to the objects of sense, but has recently divorced herself from these and allied herself to a “sixth husband,” a false semblance of spiritual truth. If this stood by itself, we might regard it as one of many other specimens of Origen’s baseless allegory ; but it assumes importance when we find Philo, who wrote long before the composition of this Dialogue of the Well, using nearly the same language as Origen, who wrote after it and (apparently) without any knowledge of Philo’s pre-existing metaphor.

2 Elsewhere (Migration of Abraham, 37) he says that the ‘five daughters” of Salpaad represent the “outward senses.” The same thing is represented (Abraham, 5) by ‘‘ the five cities of Sodom.”

3 Yet the “sixth husband ’ may possibly be illustrated by the con- trast which Philo (Abraham, 5) draws between the ‘‘ seventh power,” the ‘‘ power of peace,” and the “ six powers of turbulence,”’ which con- sist of “the five senses” and uttered “speech” (6 rpodopixds Adyos) which prates of things that should not be uttered (dyad orduatt pupla tev Hovxactéwy exAaA@r): see Rev. xiii. 5.

on the sabbath (v. 2-9). between the water of the law and the fountain of the Messiah. The rejection of this divine act of mercy, simply because it was wrought on the sabbath, introduces, almost for the first time, the conception of “judgment” or “ con- demnation.” The word “judgment” had been mentioned in the dialogue with Nicodemus, as a necessary result, though not an object, of the coming of the Light, which, by its very presence, distinguishes and “judges” those who love the darkness (iii, 17-21); and now we have an example of the way in which the Light divides all who hold it into two classes—those who love it, and those who hate it. This is in accordance with the spirit of the synoptists, who (Mat xxiii. 13; Mk. xii. 40; Lu. xx. 47) describe Jesus as addressing the sabbatarian sign- hindereras *‘hypocrite,” and as pronouncing on “hypocrites” greater “judgment” or condemnation (zepucodrepov Kpipa.). But that part of the discourse in which Christ describes Himself, in the presence of the multitude, as having received all power to judge and to quicken the dead, does not re- semble

anything in the synoptic narrative, except the dis- course—“ All things are delivered unto Me of My Father” (Mat. xi. 27; Lu. x. 22); and that was uttered privately to the disciples, after their returu from their mission. It is possible that the author here (as elsewhere) sets down, as a public discourse, some sayings that may have been uttered privately ; and the words “that all men should honour the Son, even as they honour the Father,” remind us at once of the synoptic saying, ‘‘ He that receiveth you receiveth Me, and He that receiveth Me receiveth Him that sent Me” (Mk. ix. 37, &c.); which again, in the synoptists, was a private, not a public saying,

The author’s fidelity to the spirit rather than to the letter of the words of Jesus appears also in the reference to the quickening and raising from the dead. Jesus had in Matthew (x. 8) bidden His disciples to “raise the dead,” and this precept is amplified, in the Fourth Gospel, into “The hour is coming and now is, when the dead shall hear the voice of the Son of God ; and they that hear shall live” (v. 25),—a saying that would i be inter-

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The doo preted in a purely spiritual sense’ No less spiritual is the trine of doctrine here enunciated on faith. As elsewhere in this

faith.

Gospel (i. 50; iii 1,2; iv. 39-41; xx. 29; and, if rightly considered, vi. 26), the author lightly esteems belief based on “mighty works” or wonders. The right faith is that of the Samaritans, who, rising out of the lower wonder-faith, attain to the higher faith which comes from hearing Christ (iv. 42). For to this, and to no other testimony, does Christ, in the Fourth Gospel, make His ultimate appeal. Christ does not indeed despise the testimony of John to Himself, but He does not accept it as a final basis for the true faith (v. 32-24). He appeals to the Scriptures, it is true, but rather as an unerring guide to the true source of faith than as being of themselves able to generate

faith in the reader (v. 39). What then is the living fiual testimony to which He appeals? It is to His " works,"—not the "mighty works," or "wonders," but all "the works (épya) which the Father hath given Me to do," meaning the whole of His life, and including both words and deeds. In other words, the Fourth Gospel appeals to that which we should call the influence of the life of Jesus, but which the evangelist better calls the " Spirit" of Jesus, passing from Jesus to His disciples, and from those disciples to others who had not seen Jesus—as the final testimony, convincing every honest heart, and generating in every conscience that loves the light a belief in Jesus as the true Light. In the synoptists, "faith" is, for the most part, that half physical thrill of trust in the presence of Jesus which enables the limbs of a paralysed man to make the due physical response to the emotional shock consequent on the word "arise," so that in the strength of that shock the paralytic is enabled to shake off the disease of many years; or, at the highest, it is a thrill through the inner being, whereby the soul shakes off the burden of sin. But in the Fourth Gospel faith implies even more than in Paul's Hpistles; it is a faculty that tests, transmutes, and develops the recipient soul; it means a trust in Christ, not only as a sacrifice, nor as propitiation, nor as miracle-worker, nor as Son of God, but as source and object of all love, and the be-all and end-all of every human life. If such a Being is best expressed by " Word," then the human receptiveuess of such a Being will be best expressed by the metaphor of "hearing." Accordingly the Samaritans believe, not because of miracles, nor because He told the woman "all that ever she did," but because they had enjoyed His pre- sence for two days, and had heard Him. '"'Now we believe, not because of thy saying; for we have heard Him our- selves, and know that this is indeed the Christ, the Saviour of the world." Here we have at last a doctrine not bor- rowed from Philo, a doctrine that constitutes the great differeuce between Philo's philosophy and the religion of the Fourth Gospel, making the latter a powerful and life- inspiring motive for all classes of men, while the former remains a barren philosophy fit only for meditative hermits. For in Philo, faith, as in the Old Testament (Lightfoot, Galatians, pp. 154-162), hasa passive meaning—trustworthi- ness, stability, constancy,—rather than the active meaning of trust, by which the lower nature is raised to the level of the higher; the "dog" to the level of "' man" (Bacon, Essays, xvi. 79); the man to the level of Christ, and, through Christ, to God (1 Cor. iii, 23). Faith, in Philo, is a prize rather than an effort, a harbour rather than a voyage ; it is

“the only sure and infallible good, the solace of life, the fulfilment of worthy hopes” (Lightfoot, @al., p. 158); whereas, in the New Testament, it is the faculty by which one is able to trust in Christ, to love Christ, and to serve Christ—a faculty implying continuous effort, loyal and enthusiastic service, and progressive activity. The

1 Compare Philo, De Profugis, 10, ‘Some that are living are dead ; and some that are dead live,”

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nearest approach in Philo to the Pauline and Johannine faith is perhaps in the words that describe it as “the entire amelioration of the soul which leans for support on Him who is the cause of all things, who is able to do all things and willeth to do those which are most excellent ” (ad. p. 158); but even this, though the same in theory, is very different in practice from the faith of the New Testament, F¥or—faith being neutral and colourless and taking its colour from its object—how differeut must needs be even the faith that is based upon the things that are “most excellent” from the faith that rises to the Father through such a one as Jesus of Nazareth, concerning whom even the most incredulous must admit that He made peace in man’s troubled heart, banished sin from those who trusted in Him and “constrained ” (2 Cor. v. 14) even His bitterest perse. cutor to join in laying the foundations of His empire.

In the discourse that follows the miracle of the feeding of the five thousand,® it is noteworthy that the author speaks of the eucharistic food not as the Lord’s body and blood, but as His “ flesh” and blood. Most characteristi- cally: for “flesh” is, as in Paul’s epistles, a principle, an element, and the author desires to show that the Lord’s flesh and blood are the only satisfying element for the human soul. He has before spoken of blood and flesh and man (i. 13) as antagonistic elements to the divine elements; now he wishes to point out the divine elements themselves, and they are the flesh and blood of the Word, who “became flesh” (i. 14, oap& éyévero) for men. Here, as before, we must add that the use of this language —“ Whoso eateth My flesh and drinketh My blood ”—in a public dis-

course is quite unlike anything in the synoptists, and though it represents the essence of the teaching of the Lord's supper, somewhat amplified, it can hardly be considered in its chronological, or even perbaps in its artistic place, as a public discourse here. Yet it is necessarily placed here to account for the desertion of many of His fol lowers. In the synoptists the desertion is otherwise ex- plained. There we see Jesus, as He develops the con- stitution of His Kingdom, alienating, step by step, the Pharisees, Herod, the patriots or Galileans, the followers of John the Baptist, and at last the whole of His country- men, till He is compelled to flee from Herod to the neighbourhood of Cssarea Philippi, where, as an exile with no more than twelve other outcast companious, He who had never revealed Himself to be the Messiah finds, upon questioning His disciples, that they have been led by the divine guidance to the sense that He and He alone must needs be their Redeemer; so that the seed of ee ts

2 It is aremarkable fact that this evangelist never uses the noun atoris, which is frequently used by the synoptists, while he uses the verb marevew about twice as often as itis used by all the synoptists put together. He appears to prefer to contemplate faith, not as in itself a

virtue, but rather as a mental act or state tuking its quality from its object. Note also that he seems to distinguish between morevety os and morever eis gue. The former is generally used in questions and negations (v. 38; viii. 45, 46; x. 38), or else of temporary and pro- gressive trust, e.g., trust in God, in the word of Jesus, Or In the Scriptures ; all of which are regarded as preparatory acts leading to that final state of trust which can only be obtained by coming to J esus (iv. 50; v. 24; v. 46; v. 47 (bis); x. 38). The latter (morevew cis) denotes the final state of fixed trust and repose on Jesus, and it 1s only once used by the synoptists (Matth. xviii. 6; ? Mk. ix. 42). ,

3 Nothing has been said here about the difference of John's chrono logy froin that of the synoptists, because, if the Fourth Gospel se spiritual rather than an historical composition, it is scarcely to 'ed expected that its chronology should be limited by historical ta derations; and, in any case, the subject is too large a one to be cussed here. Canon Westcott remarks (Gospels, p. 285) that "a sl strong case has been made out by Mr Browne

(Ordo Seeclorum) for ‘ limitation of the Lord’s ministry to a single year. If there we direct evidence for the omission of rd mdoxa in John vi. 4, his ~~ ments would appear to be convincing.” ‘The context sue = the words 7b rdoxa may not improbably be an insertion ei seuse of the spiritual meaning of the narrative rather than on history.

The con- fession of Peter,

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faith has at last begun to germinate, and He can now prepare to leave them, because He discerns already the temple of the new kingdom founded upon the inspired con- fession of Simon Peter. In the Fourth Gospel, on the other hand, the desertion of the disciples is represented as due to another cause, namely, their unspiritual dulness and their inability to understand the doctrines of their Master. Here and there in this discourse appear glimpses of the synoptic utterances,—for example, in the words “ No man can come unto Me except My Father draw him” (vi. 44) ; and in the words “It is the Spirit that quickeneth, the flesh profiteth nothing” (vi. 63), one seems to recognize a version of part of the blessing of Peter, “ Blessed art thou Simon, son of Jona, for flesh and blood hath not revealed it unto thee, but My Father which is in heaven,” But elsewhere, in the greater part of this discourse, the author departs entirely from the synoptists. In the con- fession of Peter, a very striking peculiarity is presented. Not only do we find brought out ina very touching manner what may be almost called the despairing faith of the con- fessing apostle—“ Lord, to whom shall we go?”—as though the disciples were driven in desperation to remain with Jesus because, if they deserted Him, they had no hope, no refuge, elsewhere; but we also find Peter avowing the cause of his belief, and it is the same cause as moved the believing Samaritans ; it is not the “signs” but the “words” of Jesus—“ Thou hast the words of eternal life.”!

Hitherto the Gospel has dealt with the Word as puri- fying and nourishing; now it has to speak of it as en- lightening. The types have hitherto been water (under various aspects), wine, flesh, blood, bread 3 Now we are to read of Jesus as Light. This is the highest or nearly the highest doctrine ; for it is another aspect of the doctrine of the Spirit. The two doctrines are closely connected in Philo, who (Creation of the World, 8) declares that

God assigned a ‘“‘pre-eminence to the elements of spirit (or breath or air) and light, calling the former the spirit of God because it is the most life-giving element, and God is the cause of life;” and the visible light Philo declares to be the image of the invisible light, which is the image of God. In the short summary of Christ’s doctrine set forth to Nicodemus (iii. 3-21), a brief suggestion of the doctrine of the light follows on the doctrine of baptism; now the higher doctrine is to be expanded. But light implies darkness, and therefore the development of the doctrine of light connects itself naturally with the period of conflict between light aud darkness, 7.¢., between the Word and “the Jews,”—a conflict that becomes from this time more and more prominent.

First of all, however, comes a climax of the doctrine of water, and a preparation for the doctrine of light. This section (vii. 2-40) begins with a very distinct indication,

’ differing widely from the synoptic treatment, of the rela-

tions between the Lord and his brethren. It is possible that the Ebionite school based their low views of Christ’s

nature upon traditions derived, or supposed to have been derived, from the Lord’s brethren, and that the author is here striking at a particular school of thought. Com- paring Mk, iii, 21 with Mk. iii, 31, we see clearly that the mother and brethren of J esus, alarmed per- haps for Eis safety, and deceived by false reports about His sanity, desired to place Him under restraint ; and Matthew and Luke unite in asserting that the mother as well as the brethren desired to speak to Him, and were rejected. But there is no mention of the mother in the Fourth Gospel as ever doubting or ever alarmed concerning her Son; the brethren alone doubt, and their doubt amounts almost to an antagonistic scepticism. They donot “believe in Him,” yet they urge Him to go to “ Judea that the disciples may see the works that Thou doest. Jf Thou doest these things, show Thyself to the world” (vii. 3-5), No reprvof could be more severe (from the point of view with which the Fourth Gospel regards the “world ”) than the reply of Jesus: “The world cannot hate you ; but Me it hateth.” So imbued are the Lord’s brethren in

fleshly worldliness, that the world recognizes in them that familiar darkness which it loves, because its works are dark, while it hates the convicting light. It is not surprising, after this, that Mary, who throughout this Gospel is regarded with affectionate reverence, is not committed to the guardianship of these sceptical brethren of the Lord.

The discourse itself is, as has been said, mainly pre- paratory. After one brief appeal to the conscience as the final test of the truth of His teaching (vii. 17), the conflict is predicted : "'Why go ye about to kill Me?" A hint of the synoptic saying "He casteth out devils through Beelzebub " is perhaps contained in the reply of the people, "Thou hast a devil ;" but the author deviates from the synoptists, in the justification of the sabbath-cure, not from the "ass" or the "ox" in the pit (Lu. xiv. 5), but from the practice of circumcision on the sabbath (vii. 22, 23). The violent spirit first manifested after the cure of the impotent man (v. 16, 18) now breaks out again, and a direct attempt made by the Pharisees to arrest Him (vii. 32), frustrated by the wonder of His words (vii. 46; and compare xVili. 6), leads Jesus once more to predict that He will soou pass away from them, and finally to conclude the " doctrine of water," by exclaiming in "the last day, the great day of the feast,...he that believeth in Me, as the scripture hath said, out of his belly shall flow rivers of living water"? (vii. 38). The spiritual climax thus given to the doctrine of water is very striking. The well of living water, before promised to the woman of Samaria, is now not merely to spring up in the believer, as there stated (iv. 14), but it is also to flow forth from Him to others, thus preparing the way for the higher doctrine of the Spirit of fellowship which the author touches ou in the next verse: "But this He spake of the Spirit, which they that believe on Him should receive" (vii. 39),

The method of the author is admirably illustrated by the Irony of

dialogue between the people (vii. 41, 42): "Others said, bee,

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1 Although the word used by Peter (b7jqa) is not the same as that 5 5 ¢ é used by the Samaritans (Adyov), yet a comparison of a great number | This is the Christ, But some said, Shall Christ come out

of passages in which the ‘‘ word” of Jesus (Adyos ou) is said to be the object of belief, and the source and province of spiritual life (ii. 22; iv. 50; v. 38, the word of God; viii. 31; viii. 37, 43, 51, 52; xii, 48; xiv. 28, 24) seems to show that the name Aédyos itself had some influence in leading the author to insist so frequeutly upon the ‘““‘ word” rather than ‘“ the works’’ as being the prime cause by which the incarnate Word generated faith in the souls of men. In the Fourth Gospel the plural Adyo: is only once used by Jesus of His words (xiv. 24); and there in a passage where (seemingly) it is desired to distinguish the separate from the collective ‘‘ words:” ‘O wh dyardy me TOUS Adyous wou ob TypEt Kal 6 Ad-yos dy dkoverE, ote eoriy éuds GAAG Tod meupayTds we rarpés. On the other hand, the synoptists frequently represent Jesus as speaking of ‘‘my words” and of “the word,” but never of ‘‘my word.” Note also the remarkable passage (xii. 48) where it is said that Jesus does not judge men, but that the word which He has spoken will judge them.

of Galilee? Hath not the scripture said that Christ cometh

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- These words have caused perplexity, as not being found in any book of the Old Testament; but they are probably a corrupt reading or reminiscence of the LXX. version of Isa. xliy. 3, 4, “I will give water in the midst of drought to them that walk in a waterless land ; I will place My spirit upon thy seed, and My blessings upon thy children—kal avaredodow &s dvd pécov USaros, &c.” The Greek words quoted above were probably separated from their context ; dvarehovow was taken transitively and connected with bSdp (bddp dvaréAAew, Pind. Js., 6 (5) 111, being a recognized phrase for ‘‘to make water gush forth”); and dv& uérov was rendered “the middle parts,” é« xoiAtas. Such corruptions of the Old Testament are readily paralleled from Barnabas and Justin, although altogether unlike the method of quoting the Scripture assigned to our Lord by the synop- tists.

The doc- trine of light.

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of the seed of David, and out of the town of Bethlehem where David was?" It is a curious instance of the degree to which the dramatic character of the Fourth Gospel has been ignored, that even an acute commentator has inferred from this passage that John "was not aware of the birth at Bethlehem." The fact is that the author uses these and similar errors and blind gropings of the people, the enemies, and even the disciples of the Lord, to enhance the majesty and insight of Him who walks above them all, high in the light of heaven, while they are creeping in the mist around His feet. He does not stop to correct these vulgar errors, for he presupposes that his readers are in the light, and. able to see through them all; and it is with a frequency almost betokening enjoyment that he repeats this device over and over again, in every case holding up the error in silence to the contempt or pity of his reader, and delighting to exhibit human folly glorifying the wisdom of God. In- stances of this device occur in this very chapter. ' Who goeth about to kill Thee?" says the ignorant multitude (vil. 20), at the very time when the arrest of Jesus is being planned by the Pharisees: "Out of Galilee ariseth no pro- phet," say the learned students of the law (vil 52), so blinded by their malignity that they cannot even read the books that describe the birthplaces of Elijah and Jonah ; 'We have found Him of whom Moses in the law, and the prophets, did write, Jesus of Nazareth, the son of J oseph," says Philip, happy in the completeness of his new-fledged knowledge (i. 45), and ignorant that a time will come when he will hear from "the son of Joseph" this humiliating rebuke, " Have I been with you so long, and hast thou not known Me, Philip?"

Passing over the story of the woman taken in adultery as being an interpolation, we are led to that section of the Gospel which treats of the doctrine of light. The mention of the Father and the Son, as being two witnesses, bearing witness to the Son—according to the saying of "'your law" that "the testimony of two men is true" (vill. 12-17)—is a subtle use of the words of Scripture, such as we look for vainly in the teaching of Christ as pre- served by the synoptists.! But the connexion between the light and the truth, and between truth and freedom, and

the dialogue that follows upon the genuine children of

Abraham, remind us, in part, of the synoptic version of the Baptist's teaching about the children of Abraham (Mat. iil. 8; Lu. iii. 8); in part, of the teaching of St Paul concern: ing the freedom of "Jerusalem which is above" (Gal, iv. 26; and compare Rom. vi. 16—20).?

The climax of hatred and insult of the Jews is most ap- propriately expressed. (viii. 48), "Say we not well that Thou art a Samaritan and hast a devil ?" and it is also appropriate to a discourse on "the Light that lighteth every man com- ing into the world" that the Jews should be informed that even Abraham saw that light and rejoiced. It is probable

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1 It appears to mean the Son, on the one side, manifesting Himself by %pya, and the Father, on the other side, abiding in the heart of the hearer, and influencing the conscience to acknowledge and believe in the Son.

2 Ver. 35 and 36 seem difficult to connect with ver. 34, " Whoso- ever committeth sin is the servant of sin. And the servant abideth (uévet) not in the house for ever, but the Son abideth ever; if the Son therefore shall make you free, ye shall be free indeed." The italicized words seem to confuse the thought. The argument that seems required is this. " No mere servant, such as Moses, is a safe patron for those slaves who desire the master of the house to enfranchise them ; the safe patron is the Son, whose influence in the house is permanent." Just such an argument is found in the Epistle to the Hebrews (iii. 5; viii. 3). "* Moses was faithful in all His house as a servant, . . . but Christ as a son over His own house, whose house are we ;" and in the same epistle Christ is said to " abide" (wévew) a priest continually, and to be able (Heb. vii. 24, 25) to save men to the uttermost, because He "abideth" (8: 7d pévecy avrov eis Tov aidva). It seems probable, therefore, that some early teaching of the church is here confused by the addition of the italicized words.

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that both here and in xii. 36 we ought (in spite of the LXX. usage) to translate éxp'Bn 'was hid" (cf. Lu. xix, 49- Heb. xi. 23), and that we must suppose the intervention of some supernatural agency in a judicial retribution hiding the Light from the children of darkness who seek destroy it.

The section on light terminates with an appropriate sign, The

the opening of the eyes of the blind man, who is sent to opening wash his eyes in the waters of a pool named Siloam. The °f the evangelist sees a mysterious meaning in the name of the? pool As the Baptist had baptized in Aunon near to Salim vn 2.¢., the "waters" near to and preparing the way for "peace" E age and the Samaritan woman had boasted of her well of Sychar or drunkenness, and the impotent man had been healed in Bethesda or the "' house of mercy," so now the opening of the eyes of the blind man is effected in part by the direct action of the Light of the world, but in part also by the instrumentality of water at a pool named " Sent,"— a word which may apply to an aqueduct, " miss¢o aquarum," or to Him whom the Jews expected as the "Sent," i.¢., the Messiah. 'The conclusion of the section on light (ix. 39), ''For judgment I am come into this world; that they which see not might see, and that they which see might be made blind," accords with the passage in Matthew and Luke where Christ acknowledges to the Father that it hath seemed good to Him to reveal these things to babes and to hide them from the wise and prudent (Mat. xi, 25; Lu. x. 21); and the climax appropriately introduces the Pharisees, confident in the "lamp of the law," asking, in a tone which suggests the utter impossibility of an affirmative answer, "'' Are we blind also?" The answer of Jesus distinguishes two kinds of darkness in the soul—the involuntary darkness arising from inexperience of the light, and the voluntary darkuess which arises from experience and rejection of the light. His answer explains the sense in which the word "hypocrite" was so often applied to the Pharisees by Jesus in the synoptists. The Pharisees were in darkness, and, like all other men, had received gleams from "the light which lighteth every man," convicting them of their darkness, and leading them to say, "We see not," if they had but been honest. But they persisted in saying, "Wesee."4 Therefore, it is said to them, "Your sin remaineth" (ix. 41). These latter words, whether uttered or not by Jesus in the exact shape in which the Fourth

Gospel gives them, are un- doubtedly true to the spirit of His teaching ; and they furnish a suitable end to the discourses on light, bringing prominently forward that “reproving” or “ convincing ” power of light which is one of the special attributes of that Holy Spirit to whom, step by step, the Fourth Gospel 18 leading us.

The metaphor of the good shepherd suggests an Im- The portant difference between the Fourth Gospel and the god Gospels of Matthew and Luke, viz, the absence of all alle- a gory and almost all parable in the former. Why did the author, who rejected so many other parabolic subjects, retain only this parable of the shepherd in common with them? The answer may be, partly that it is a parable based upon the teaching of Philo, who distinguishes between mere indulgent “ keepers of sheep ” and “shepherds,” some- what in the same way in which our parable distinguishes between “hirelings” and shepherds; and he adds that the Supreme Shepherd is God, who orders all His flock of created things through the Logos, His first-born Son (Plantatio, &c., 11). In part, perhaps, the author may have

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3 Philo (as well as the author of the Epistle to the Hebrews) emphasizes the fact that Melchisedek, the true High Priest, the giver of wine instead of water, is the King of Salim or peace (Alleg,, 11. 25).

4 Cf, Philo, Who is the Heir? 15, ‘Look up, so as to convict (eaéyxev) the blind race of common men, which, though seeming to sec, is blinded.”

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felt that the synoptic picture of the shepherd “leaving the ninety and nine sheep in the wilderness ” while He seeks the single wanderer, requires at least to be supplemented by the picture of Him who putteth forth His sheep, aud is followed by them, so that none of them wander. Buta

principal reason for introducing this parable at the conclu-

sion of the doctrine of light, and before the narration of the death of Christ, is exhibiting the reason for it in a clear light. It is true that Jesus has, before

now, predicted that He is to be “lifted up” (iii. 14, viii. 28) and slain (vii. 19, viii, 40); but it needs to be distinctly stated that Jesus will

not only be slain, but voluntarily slain; and the motive requires to he expressed. This is explained in the synop-

tists by saying that He came to give His life as a ransom (Avrpov) for many (Mat. xx, 28; Mk. x. 45). But to whom

was this “ransom” to be paid? To God or to the evil one ?

The question was a difficult one to answer ; and the Fourth Gospel avoids, though it does not solve, an insoluble diffi- culty by substituting a new metaphor for that of ransom: ‘Iam the Good Shepherd, The Good Shepherd giveth His life for the sheep.” Then, in a master-piece of deli- cate spiritual subtlety, while the expression “the Good Shepherd will even be slain by the wolf for the sheep’s sake ”—which would have introduced all sorts of intricate difficulties—is avoided, the same thing is, by antithesis, indirectly suggested—‘ But the hireling seeth the wolf com- ing, and leaveth the sheep, aud flecth.” A repetition of this statement leads to a more emphatic reiteration that the Shepherd will lay down His life of His own free will (the essence of sacrifice), “in order that He may take it again” (x. 17)—thus entirely neutralizing the suspicion (so carefully avoided above) that the Good Shepherd may be doomed to succumb to the wolf.}

Two points remain to be considered in this chapter (x.). The words, “ All that ever came hefore Me are thieves and robbers,” have naturally caused some difficulty ; but it is possible that some words, such as “in comparison with Me,” are to be understood ; and if the meaning was, “all pre- vious redeemers of mankind have bcen, in comparison with the true Redeemer, self-interested and ambitious,” then, such language becomes compatible with the author’s point of view; and, even looked at from the synoptic side, it presents little more difficulty than the saying that John the Baptist, though the greatest of the prophets, was less than the least in the kingdom of God.2 But the second point is of more importance. In defending Himself (x. 55) against the charge of making Himself God, Jesus is made by the author to argue that, if the judges of Israel in the Psalms are addressed as, in a certain sense, divine and gods,—“*] have said ye are gods,”—a fartior’ might He

Himself with- out blasphemy call Himself the Son of God, But, if this argument might be adopted, then it might be urged that the Son of God differed from other sons of God only in degree, or, if in anything else, only in pre-existence, and the special privilege of pre-existence has been already destroyed by the evangelist ; for, in the introduction to the healing of the blind man, he has caused the disciples of Jesus to take for granted, and Jesus not to impugn, the doctrine that all men exist before birth: “Master, who

1 The use of spody (“ exalt”) to denote what the synoptists (Mat. xx. 19; xxvi. 2; Lu. xxiv. 7) denoted by oravpowv (“crucify ”) is very remarkable. In the synoptists, bWouv always means “ to honour highly” (“every one that exalteth himself shall be abased ” (Mat. xxili. 12; Lu. xiv. 11); but, in the Fourth Gospel, Jesus uses it in addressing (viii, 28) His future murderers, “ When yeexalt (tvdonre) the Son of Man”: comp. viii. 40, “‘Ye seek to slay Me.” Strictly speaking, of course, we must say that ipovy is not the oravpody, but the result of it.

- Compare Philo, Abraham, 44, where a similar contrast is drawn

between the distinctive ‘‘kingdoms” of human rulers and the benefi- cent “kingdom” of the ideal man.

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to prepare the way for that death, by

judge,” He says (xii. 47), but

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did sin, this man or his parents, that he was born blind? Jesus answered, Neither this man nor his parents ; but that the works of God should be made manifest in him” (ix. 2,3), Butifall men pre-exist, and if to all men, in a certain sense, may be addressed the title of “God,” it would follow that even the Eternal Son of God, by whom the world was made, would be but the eldest among niany brethren. It is scarcely possible that the evangelist intended his readers to follow out this train of thought ; but it is

unquestionable that in spite of the readiness to admit supernatural incidents, the author's habit of referring all phenomena to the action of certain elements—water, spirit, light, darkness, flesh, blood, and the rest—leads him (perhaps unconsciously) into a habit of describing and perhaps even conceiving the life and work of Christ Himself as conforming itself to an unalterable law, which is none the less a law, because it is also a will, the will of our Father, The works that He does are " prepared by the Father." His sheep hear Him; those that are not His sheep do not hear Him, The same thought is expressed, whether the law be regarded as the fixed order of things or as the will of the Father: "No man can come unto Me except the Father which has seut Me draw him,"

Again and again He disclaims caprice, and even the exercise of an independent will ; "I came down from heaven not to do Mine own will but the will of Him that sent Me " (vi. 38), Though judgment is committed to Him by the Father, yet so rigidly is His power and desire to judge restrained by facts or laws (or by whatever other name the truth may be called), that He solemnly declares that He does not really judge, it is the facts that judge. '"T donot "the word that I have spoken shall judge him ;" and even where He accepts the task of

judging, He declares that He judges "as He hears " (v. 30),

and " with the Father that sent Him" (viii. 16), te. accord- ing to truth. The same conception of the work of the Word as being (like the working of the elements) universal, continuous (v. 17), and according to law, is expressed both in the prologue to the Gospel (John i. 1-9), and in the Epistle also, where the writer declares that the commandment which he gives to the church from Christ is "no new com- mandment," but an old commandment which men had had from the beginning,"

We come nowto the last of the pre-resurrection "signs" of The Jesus—the raising of Lazarus. Even those who maintain i the historical accuracy of every detail of this narrative will oe scarcely deny that its symbolic meaning goes down, and is ' intended to go down, to an act far deeper and far vaster than the revivification of the brother of Mary and Martha. Remembering the teaching of Paul (1 Cor. xv. 45) that there are two men,—the former the "living soul" or fleshly animal nature (ux? Gea), the latter

the “quickening or life-giving spirit” (avedpo. fworovodv) ; the former the first Adam, the latter the second Adam—we see at once in this miracle the second Adam raising up the first Adam from spiritual death, by imparting to him His own life. The very word used by Paul to describe the second Adam (Cworotetv) is used by our author to describe the preroga- tive of the Son —“the Son quickeneth (Cworrovet) whom He will” (v.21), Other meanings may, no doubt, be con- veyed beneath this central incident of the Fourth Gospel ; nor is it impossible that the author, before describing how the Saviour laid down His life for mankind, wished to give the best possible proof of the spontaneousness of the action (asseverated above, x. 17, 18) by showing that He was actually the source of life to others. Asa preparation for His resurrection on the third day, what could be better than that He should raise from the dead one who had been four days lying in the grave? If, also, a preparation was needed

for the doctrine of the Spirit, which is soon to come before

The doctrine of the Spirit.

us, the resurrection of Lazarus would serve this purpose too. For the Spirit is the source of life (Coruxdraroy, Philo calls it, Creation, 7); and, therefore, just as the doctrine of the living water is preceded by the miracle of the water changed into wine, and the doctrine of bread by the miracle of bread, and the doctrine of the supersession of the intermittent sabbath by the continuous loving activity of the Father and the Son (v. 17) is preceded by the miracle of sabbath- healing vouchsafed to the man to whom the intermittent spring was useless, and the doctrine of the Light of the world is preceded by the miracle of giving light to the blind, so is it natural, and, as it were, proportionate, that the doctrine of the quickening Spirit (¢/. vi. 63, 76 wveDud éor. 76 Lworowdv) should be preceded by some miracle of quickening the dead.!

The anointing and the triumphal entry into Jerusalem having been discussed above, we pass to the last discourses (xii. 20 to xvii. 26), The last discourses in the synoptists treat of the second coming of Jesus in the clouds of heaven, and of the day of judgment; the last discourses in the Fourth Gospel

treat rather of the continuous and increased presence of Jesus in the hearts of the disciples, of the re- proving or judgment of the world by the Holy Spirit, and generally of the function of the Spirit in the church. In other words, the Fourth Gospel exhibits in a spiritualized form that which the synoptists set forth through material imagery. The promise of the future presence of Christ had been expressed by the synoptists in the legacy of His body and blood, which Christ is described as bequeathing to His disciples. The Fourth Gospel, which omits this incident (possibly as being already sufficiently known and receiving sufficient attention), lays more stress on the presence of the Spirit as Christ's substitute, It is important to observe that both the synoptic account of the last supper, and the last discourses in the Fourth Gospel, are founded on one and the same basis of historical fact, viz., that Christ approached death with the expressed conviction that His work would not be frustrated by it, but that He would remain for ever a living power in the hearts of His disciples. There is also, even in the Gospel of St Mark, an intima- tion that His disciples were to be aided by a "Holy Spirit," which should speak for them before princes and kings: "And when they lead you away, betraying you, take no forethought what ye shall speak, neither rehearse it; but whatsoever shall be given to you in that hour, this speak : for it is not ye that speak, but the Holy Spirit" (Mk. xiii. 11). To the same effect Jesus speaks in the parallel passage of Luke (xxi. 14, 15), bidding His disciples not to rehearse their defence (zpomeAcrav drodoynOnvat), for He will give them "a mouth and wisdom," which their adversaries shall not beable to gainsay. Thus, even from our earliest Gospel, it would seem that to those unlettered Galilean peasants, diffi- dent (as Moseshad been before them) of the sufficiency of their rhetoric to plead their cause before the bar of the great ones of the earth, a promise had been made of a "mouth" that should plead for them. The Holy Spirit was to be their Advo- cate. It is not likely that Jesus should have uttered these two expressions (quoted above) and no more, about the Spirit which was to be His substitute. Therefore, if the author of the Fourth Gospel had access to any apostolic sayings and

1 The complete discussion of this, the crowning ''sign" in the Fourth Gospel, is not adapted for these pages. It would require a close examination of Lu. xvi. 20-31, together with Lightfoot's (Hore Hebraice) comment on '' Lazarus." On this point see also Wiinsche, Neue Beitrige zur Erliuterung

der Evangelien, p. 467 ; and com- pare Philo on the meaning of Eliezer (Lazarus) in Who ts the Heir ? 11, 12. The greater part of Origen's commentary on this portion of the Fourth Gospel has unfortunately perished ; but some light may be thrown on it by a study of his Comm. in Ev, Joann., xxviii. 5, 6, 9, as well as by Augustine, Jn Joann. Evang. Tract., 49. The reasons usually alleged for the omission of this '*sign'' by the synoptists would also require careful consideration.

[FOURTH GospEt,

traditions that illustrated the teaching of Christ during the last two or three days before His death, we might naturall

expect to find in these traditions something more about aE Spirit which was to be the Advocate of the disciples when pleading without their Master before the sauhedrin, and before princes and kings. Accordingly, finding in the last discourses of the Fourth Gospel an ampler doctrine on this subject, we have no ground, a priori, for regarding it with suspicion. True, the doctrine is set forth here, as elsewhere in the peculiar langnage of the writer, so that we are abso- lutely certain that we have not the exact words uttered by Jesus; but this need not hinder us from accepting the thoughts as the thouglits of Jesus, if we can throughout trace the synoptic ductrine. In the synoptists Jesus pre- dicts that He will "rise again"; obviously the letter of this prediction, though important, implies a still more important spiritual meaning beneath it, For this prediction would not have been satisfied by any amount of literal fulfil- ment if Jesus had merely walked from His grave and ex- hibited Himself alive, by tangible as well as ocular proof, to thousands of curious observers, hostile as well as friendly, unless He had at the same time poured a new influence or influent spirit into the hearts of those to whom He manifested Himself. It is characteristic of our evangelist that he realized (1) that tle essence of the resurrection of Christ consists in His spiritual resurrection and intensified presence in the hearts of His disciples; (2) that this resur- rection, triumphing over death, and making death the stepping-stone to a more active life, is as much in accord- ance with law, as is the growth of the corn of wheat which (xii. 24), "except it fall into the ground and die, abideth alone; but if it die, it bringeth forth much fruit." This law—illustrated daily by the increased influence of the

dead upon the living, no less than by the fruitful death of the “corn of wheat ”—a law so simple and yet so profound, like all the other laws enunciated by Jesus, can hardly have proceeded from any other than from Jesus Himself. The spiritual depth of the doctrine, and the similarity which it bears to the synoptic prediction (in spite of the difference of outward form), furnish strong arguments that, in the last discourses of the Fourth Gospel, we have much of our Lord’s own teaching, though modified by the medium through which it is conveyed to ns.

The doctrine of the Spirit, regarded not now as the purify- ing element in conjunction with water, but as the Advocate or Paraclete—being the highest and most esoteric doctrine of all—is reserved for the inner circle of His disciples. First, therefore, it is necessary to bring to an end the doctrine of Jesus to the outside world; and the battle between light and darkness, between Jesus and the Pharisees, ends with a recapitulation and conclusion of the doctrine of light. The Gentile world, appearing on the stage in the person of some inquiring Greeks, stretches out her hand to the Messiah (xii. 20); a voice from heaven attests His glory (xii. 28). The Son of God pronounces the fall of the evil one, and, almost in the same word, His own victorious death (xii. 31, 32), Then the light is hidden from the rebellious nation (xii. 36); the evangelist pronounces against them the sentence of con- demnation, that they are blinded because they loved dark- ness more than light, and the praise of men more thau the praise of God ; and for the last time the voice of Jesus 18 heard, as it were from behind a cloud, warning those whom He has left in darkness that in rejecting Him they have rejected the Father also (xii. 37-50). :

The esoteric doctrine begins with a parable of action, in which the Lord, by washing the feet of His disciples, teaches them humility. Two classes of heretics seem aimed at in this parable,—those who reject the washing of | Jesus, to whom Jesus replies, “If I wash thee not, thou

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hast no part with Me;” and those who laid stress on re- peated baptisms or purifications, “He that is (wholly) washed (AcAovyévos) needeth not save to wash (virrewv) his feet.” Now Judas, the child of darkness, goes forth from the chamber, and the evangelist seizes the moment to tell us that “it

was night ” (xiii, 30). Yet in this hour of dark- ness the hour of glorification is hailed by Jesus; and He conveys to His disciples, not indeed a new testament, but a new commandment, ‘that ye love one another ” (ver. 34). How could this be called a new commandment for those who had been commanded long ago by Jesus to love even their enemies, much more their friends? The answer is found in the context: “As I have loved you, that ye also love one another,” the meaning being, that after the death of Jesus, the memory of His love, euhanced in His absence, would spring up as an entirely new power within their hearts, so that “love” would assume a new meaning, and the command to love—though as old as the first influence of the Word, and therefore as the creation of man—would become essentially a new commandment, These words occur almost verbatim in the First Epistle of John (ii. 7), and, from their language, they can hardly be accepted as giving the letter of the words of Jesus ; but they go down to the very roots of His teaching. The importance here attached to this new commandment of love leads us to observe that, through- out the whole of these discourses, love, almost as much as the Spirit, occupies the thoughts; and, indeed, in chapters xlii., xiv., xv., and xvii! the word ayamay occurs 24 times, against 10 times in all the rest of the Gospel. The con- nexion is obvious: step by step we are being led up to God; and God is love. The doctrine of the Spirit can re- veal no higher manifestation of Him than this; and the Spirit itself is a Spirit of love, which will find its home only in the hearts of those that love.

Although Jesus has not expressly predicted His death, yet the warnings of betrayal and departure have troubled the hearts of His disciples. To comfort them Jesus pro- mises that He will return, and be still present with them. But neither is the path of His departure and return, nor is His presence itsel/—so He warns Thomas and Philip—to be regarded as material. He will (spiritually) be more present with them, when, and because, He will be (materi- ally) absent. Greater works will they do than He has done, because He, abiding with the Father above, will lift up their hearts to heaven—their home henceforth because their treasure, Christ, is there—and will make them one with Himself and with the Father, in will and in power. And here is repeated the saying, also found in the synoptists, that whatsoever the disciples pray for they shall obtain, — joined with the assurance that they shall do greater works (pya) than He Himself does (xiv. 12). Note here that

our evangelist brings out more clearly than the synoptists the spiritual meaning of the promise concerning prayer, and makes it evident that, as above, the works (épya) meant are not ‘“‘miracles” (dvvdjers),—not the casting of a material mountain into the sea, as might be inferred from a misinter- pretation of the synoptists,—but the Messianic “ works” of forgiveness and regeneration.

The nature of Christ’s future presence in the hearts of His disciples is differently described in different passages, At one time (xiv. 30) He declares that He Himself, together with the Father, will take up His abode in every heart that loves Him ; but more often He uses the word used by Mark above, and speaks of a Sjurit which shall be sent to them by the Father. He applies to the Spirit the very title we have been led to apply to the Spirit as described by Mark— the Advocate (IlapdxAnros, or Advocatus). Asa paracletus or advocatus was wout to explain the law to Greek or

Roman clients, and to put words into their mouths, or rather to be himself their spokesman, so the spiritual Para- clete or Advocate would not only put words into the mouths of the disciples when they stood before the bar of kings (Mk. xiii. 11), but would also teach them all things, and bring to their remembrance all the spiritual laws laid down by their lawgiver Christ (xiv. 26). In one sense, the Spirit is a witness, because He testifies of Christ (xv. 26); but even here He is in reality an advocate, for the testimony is regarded as not uttered by the Spirit directly, but indirectly through the mouths of the inspired disciples who are to be “martyrs” or witnesses (udptupes) for Christ (ev. 279 OH was very natural that that aspect of the advocate’s work which most impressed the editor of our earliest Gospel should retire into the background when the first brunt of the collision between the church and the world was over ; and that gradually the work of the advocate should assume a wider province than that of merely educating the disciples to plead. the cause of Christ in the presence of Gentile judges. Hence Paul regards the Spirit as teaching the disciples not so much what to say in their defence before earthly kings as rather in their prayers before the King of Kings: “We know not what we should pray for as we ought: but the Spirit itself maketh intercession for us with groanings which cannot be uttered ” (Rom. viii. 26); “The Spirit searcheth all things, yea, the deep things of God, —.. which things also we speak, not in the words which man’s wisdom teacheth, but

which the Holy Spirit teacheth" (1 Cor. ii, 10-13). But this conception, carried a stage further, makes the paraclete an advocate not revealing the laws of the celestial kingdom to the enfranchised citizen of it, nor yet revealing the will of the Father in heaven to the child on earth, but rather pleading the cause of the child before the offended Father; and in this sense Philo seems to use the word when he describes the high priest as clothed in the garb which is typical of the invisible universe, ze. typical of the Logos or Son of the Snpreme Father of the world—because it was necessary for the priest consecrated to the Father of the world that he should have as his paraclete the Son, in order (through Him) to obtain pardon of sins and supply of blessings (Life of Moses, 14); and he also introduces J oseph (ch. 40) saying to his brethren, "I forgive you; seek no other paraclete," 2.¢., no one to act between me and you as your advocate ; and lastly, in this sense, the First Epistle of John (i. 1, 2) seems to use the word in the passage, 'If any man sin, we have an advocate with the Father, Jesus Christ the righteous ; and He is the propitiation foroursins."2 But though our evangelist uses the word in this somewhat lower sense in the Epistle, in the Gospel he nowhere uses it thus. There the Paraclete's function is to be, as in Luke, "a mouth, a wisdom " (Lu. xxi. 15); to be a substitute for the helping presence of Christ (xiv. 16) ; to teach and remind (xiv. 26) ; to testify and to aid the disciple to testify (xv. 26) ; and to convict the world of sin (xvi. 8) ; —but nowhere to obtain forgiveness of sins from the Father by pleading the cause of the disciples in His presence. It is not an unreasonable inference that the evangelist's different use of this word in the Gospel and the Epistle may have arisen from the fact that in the former he is adhering more closely to the original use of it as handed down by Christ Himself.

Besides describing the work of the Paraclete as a con- sequence of the departure of the Son to the Father, the discourse touches upon the enmity which the disciples must be prepared to meet, and enforces the necessity of unity

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2 Cf. Schoettgen, vol. if. p. 659, where it is shown that the Jews adopted the Greek word ovvfyyopos (not in its classical sense of " pro- secutor," but in the sense of ''advocate for the defence"), under the form 14°)D, and applied

it to Michael, who defends Israel from the accusations brought aguinst him in the presence of God.

ee ee ee ee ae ee 1 Note the curious break in chapter xvi., where the word ayanay does not occur at all, and :Aciy is twice used, xvi. 27.

through love. Only in two points does the thouglit seem to suggest the influence of Philo; and in both of these Philo is rather corrected than followed. Philo says (Giants, 7) that it is impossible that the Spirit of God should remain for ever in the soul (though it may for a time) because of our inseparable connexion with the flesh ; he adds (in language which is at least liable to the interpre- tation of asceticism) that, as Moses fixed his tent outside the camp, so those who would have the Divine Spirit as a permanent tenant of their souls must put off all the things of creation; the safest course being to contemplate God, not even through the uttered word, but without utterance, as absolute, indivisible existence (¢b. 11, 12); with the mass of mankind the Spirit remains only for a moment, nor would it ever have visited them but to convict (SueA€yEau) them of choosing what is disgraceful instead of what is good (ib. 5).1 The Fourth Gospel emphasizes no less the work of the Spirit in " convicting " (éXéyxew) the world of sin; but it is also careful to say that the gift of the Spirit shall be permanent, "not as the world giveth give I unto you" (xiv. 27), and that the disciples are to remain in Jesus, while nevertheless not taken out of the world (xvii. 15). The Saviour is no more in the world, and the disciples are in the world (xvii. 11); yet He will not pray that they should be removed from the world, but only that they should be delivered from the evil (ver. 15). The discourse concludes with the prayer that all future believers may be knit together into one great body, which shall be in the Father and the Son, while at the same time the Father and the Son are in it (ver. 21, 23); and the last words of all, after innumerable periphrastic metaphors to describe the promised presence of Christ with His disciples, recur at last to the plain expression of His presence, 'and I in you"—not greatly differing from the promise in the First Gospel (Mat. xxviii. 20), "I am with you always." 2 There is doubtless a purpose in this accumulation of obviously inconsistent statements of the local relations be- tween the Father, the Son,

the Spirit, and the Church : ‘“T am in the Father, and the Father in Me;” “Ye in Me, and I in you;” “I go unto the Father;” “The Holy Spirit whom the Father will send in My name;” “The Comforter whom I will send unto you from the Father ;” “T came forth from the Father, and am come into the world ;”—the intention being to prevent the mind of the reader from attaching any importance to mere local relations between the Three Persons, and to force him to form spiritual conceptions instead of local by showing that the most opposite local relations may be simultaneously pre- dicated. Thus contradiction after contradiction leads the reader at last to pierce beneath the literal integuments to the spiritual truth concealed below them ; and, aided by the bold analogy (xvii. 21) derived from human unity (“that they all may be one; as Thou, Father, art in Me, and I in Thee, that they also may be one in us”), we are led at last to discern that the unity is not that of place,

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1 Comp. Philo, Quod Deus Immutabilis, 26: ‘“‘“When the high priest, conviction, like a pure ray of light,” flashes on our minds, we realize our pollution; and thus conviction may be said, as it were, to poilute our former imaginary and self-satisfied righteousness.

2 There is an attractive symmetry in the supposition of Canon Westcott (Introd. to St John’s Gospel), that these discourses (xiii, xiv., xv.), in which alone is any mention made of * commandments,” are intended to be a kind of Sermon in the Chamber, corresponding to the Sermon on the Mount. The Sermon on the Mount sets forth the new law of Christ; the Sermon in the Chamber vivifies the new law with the new Spirit. This supposition exactly corresponds with the “spiritual” (Muratorian fragment) motive of the Gospel; and the esoteric nature of the doctrine is not inconsistent with the statements which are said to be mainly ‘‘ based on direct knowledge of Papias’s book” (Westcott, Canon, p. 76), that Papias, ‘‘ a dear disciple of John,” wrote five books entitled ‘“exoterica.” For ‘‘exoterica” imply ** esoterica.”

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but of will; and that the bond of unity is not sight work- ing through material presence in material light, but Love working through spiritual sight or the spirit of truth independently of material presence. And s0, after all, the evangelist leads his reader to see that the coming éf the Paraclete (like all things else in his Gospel) is accord- ing to law; “If I go not away, the Comforter will not come unto you” (xvi. 7); “The Holy Spirit was not yet given, because that Jesus was not yet glorified ” (vii. 39), Not until the dead has passed away from us does the “idea of his life” creep into our minds-— ‘“« Apparelled in more precious habit, More moving-delicate and full of life Than when He lived indeed ;”

and the Eternal Word, who subjected Himself to the laws of human nature in birth and life, may be supposed without irreverence to have subjected Himself to, or perhaps rather we should say to have availed Himself of, the same laws of human nature whicli regulate God’s ordinance of death,

The crucifixion having been considered above, we pass to the narrative of the resurrection. Matthew and Mark imply that Jesus manifested Himself to the disciples in Galilee; Luke mentions none but manifestations in Judea; the Fourth Gospel mentions manifestations in both places. Compared with Matthew and Luke, the Fourth Gospel may be said to handle the subject more familiarly, taking the resurrection, so to speak, more as a matter of course, and representing Jesus as moving in more human fashion among His disciples after He had risen from the grave, helping them in their fishing, holding long con- versations with them, and, in a word, renewing almost without a break the intercourse of the days before the cruci- fixion, In Matthew, the Christ after death appears once, upon a mountain, doubtfully discerned by some, and emits one final message, sending His disciples to evangelize the world, and promising them His perpetual presence. In Luke the risen Christ “vanishes,” causes fear and terror to His disciples, and is supposed to be a “spirit” till He eats food in their presence; finally He is “parted from them.” In John, the ascension, though alluded to, is not described; and everything else that might give the manifestation a phantasmal character is studiously kept in the background. No mention is made of the angel who descends (Mat.

xxviii. 2) from heaven to roll away the stone from the sepulchre, terrifying the keepers of the grave, and bidding the women “fear not.” It is rather assumed that, by His own unaided strength, Christ burst the bars of the grave, and after leisurely laying aside the grave-clothes, and the “napkin in a place by itself” (John xx. 7), went forth to converse with His disciples. It is true that the Fourth Gospel does not attempt to conceal the fact that the manifestations of Jesus were more than once not recognized by His disciples at first; but, in the cases of non-recognition, it is suggested (as in Luke), not that the manifestation was faint or shadowy (as seemingly in Mat. xxviii. 17, “And when they saw Him, they worshipped Him ; but some doubted”), but that they mistook Him for a stranger (xx. 14; xxi. 4), That Jesus ate in the presence of His dis- ciples is not stated, nor can it be said to be implied ; but His familiar presence at the meal of the disciples (xxi. 13) suggests a real presence almost as effectively as the narrative of the eating of the fish and honeycomb in Luke. Addi- tional conviction is also obtained by taking one of the apostles, Thomas, as a type of resolute scepticism, refusing to believe unless he touches the body of the risen Saviour, and by describing how even such sceptivism as this was con- verted into certainty. Moreover, as the water and the blood were visibly given by Jesus on the cross, so—lest the giving up of the breath on the cross should be scarcely suffici- ently noticeable type of the gift of the holy breath or Spirit—

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our evangelist records that Jesus breathed on His disciples and said, “ Receive ye the holy breath” (or Spirit)—at the same time connecting with

this highest gift the highest activity for which a human soul can be inspired by God, the faculty of forgiving sins. It is probable that the Gospel

originally ended at xx. 31: “But these are written that |

ye might believe that Jesus is the Christ the Son of God, and that believing ye might have life through His name.” This is a most appropriate termination 3 and what follows bears every appearance of being an appendix added by the author, describing a miraculous draught of 153 fishes, and a meal of Jesus with seven of the disciples, followed by a dialogue between Jesus and Peter, in which the death of the latter is predicted, and the erroneous tradition that the beloved disciple should not die is shown to be baseless.

Three inferences seem probable from this last narrative :— (1) that there had been at Ephesus a tradition (arising perhaps from the extreme old age of John and from gone such expression as is recorded in John xxi, 22) that John would not die till the Lord had appeared ; (2) that John had died when this account was written (for if he were living and past his ninetieth year, at a time when the church daily expected the coming of the Lord, the Ephesian Chris- tians would not have needed any explanation or softening

away of a prediction which would seem to them very likely.

to be fulfilled); but (3) if John was dead, it must seem that the words “ we know” could not have been added (as they might be supposed to have been added, according to the Muratorian legend) by Andrew and Philip, who in all probability died before John died ; and if John was dead, it must seem that the words would not have been added by any elders of Ephesus representing the genera- tion after John; for how could they—who stood on a footing altogether subordinate and inferior in point of reputation, and with no opportunities of information— have ventured to ratify the testimony of the “beloved disciple?”

It is more easy to arrive at negative than at positive results, when evidence is so slight; but it seems probable that the author, attempting to give the spiritual essence of the gospel of Christ, as a gospel of love, and assigning the Ephesian Gospel to the beloved disciple who had presided over the

Ephesian church, by way of honour and respect (for the same reasons which induced the author of the 2d Epistle of Peter to assign that Epistle to the leading apostle), and being at the same time conscious that the book (though representing the Ephesian doctrine generally, and in part the traditions of John the apostle, as well as those of Andrew, Philip, Aristion, and John the elder) did not represent the exact words and teaching of the dis- ciple—added the words " We know, &c.," partly as a kind of imprimatur of Andrew, Philip, and the rest; partly in order to imply that other traditions besides those of John are set forth in the book ; partly to characterize the book as a Gospel of broader basis and greater authority than the less spiritual traditions issuing from nan-apostolic authors, which our evangelist desired to correct or supplement. Nor is it in the least unlikely that this Gospel does represent the teaching of Andrew and Philip, and Aristion and John the elder, as well as that of John. If Papias of Hierapolis gathered up the traditions of these apostles and elders, why not also our author, writing in Ephesus perhaps several years before Papias? It is assuredly not for nothing that the name of '' Matthew," mentioned in Matthew, Mark, and Luke, is not found in the Fourth Gospel ; nor is it without significance that the Gospel begins and ends with an inner apostolic circle. The "twelve" are indeed mentioned, but as in the background. The beloved disciple, Andrew and Peter, Philip and Nathanael,—these, and these only, are mentioned as called by Jesus in the beginning ; Peter and

Thomas, Nathanael and the sons of Zebedee, and two other disciples (presumably the same list as those above, with the addition of James, the son of Zebedee, and Thomas), are mentioned as alone admitted to the sacred meal which closes the Gospel. This fact marks the whole character of the book ; it is esoteric and eclectic, and designedly modifies the impression produced by the tradition previously recorded by the synoptics.

The criticism of the first three Gospels.—For fourteen centuries the Criticism

church was content to follow Angustine (De Consensu Evangelist- of

arum, i. 4) in believing that Mark was ‘‘as it were the humble synoptic companion (pedissequus) and abridger™ of Matthew. Towards the Gospels,

end of the 18th century this dogma was shaken, and two different hypotheses were put forward: (1) that the evangelists had borrowed from one another, either Matthew from Mark, or Mark from Luke, or even (so capricious and baseless were the hypotheses which now started into existence) Matthew and Mark from Luke ; (2) that all the three Gospels depended upon an original and common Gospel. The first of these hypotheses may for convenience be called the ‘‘ borrowing” hypothesis ; the second may be called the ‘‘traditional” hypothesis. Eichhorn was the first to systematize the ‘‘ traditional” hypothesis, maintaining (1794) that the original tradition was a written Aramaie Gospel, known to the three synoptists, but afterwards (1804) sa far modifying his views as to recognize that the Aramaic tradition had, been translated into Greek, and passed through several documentary stages, before it assumed the form preserved in the triple version of our synoptists.

Inside the circle of those who maintained the traditional hypo- thesis there now arose inner divisions upon the question, which evangelist most closely approximated to the ‘ original” tradition. Kichhorn had assigned (1804) the priority to Matthew, Griitz (1812) to Mark. Moreover, a new form of the hypothesis was shaped out by-Schleiermacher (1817), who maintained that our Gospels were composed on the basis of a number of disconnected documents ; while Gieseler (1818) showed that it must have been, in any case, oral tradition which served the needs of the earliest disciples, — tradition stereotyped by time, and reduced to some kind of similar pattern before being committed to writing by the synoptists. Still no certain conclusions were arrived at. De Wette (beginning from 1826) assumed a common oral tradition for Matthew and Luke, and treated Mark as an epitomizer. Credner (1836) joined Schleier- macher in tracing our oars back to a collection of words of the Lord, which he supposed Matthew to have combined with the oldest Gospel, viz., Mark ; similarly Lachmann (1885). Blcek (1862-1866) relapsed into. Griesbach’s view (1784-1790) that Mark was based on Matthew and Luke. —

All these conflicting hypotheses might naturally induce those who had not themselves closely studied the synoptic texts to believe that the truth of the matter was unattainable, and that, in any case, the synoptic narratives (not being the records of eye-witnesses, nor being preserved in unaltered documents written contemporanc- ously with or soon after the events) must necessarily be untrust- worthy. Accordingly, in 1835, Strauss maintained that the whole synoptic narrative was legendary or otherwise untrustworthy. The defenders of the synoptists against Strauss found little consideration, and the hypothesis that Mark contained the original Gospel was dis- credited by the extravagance of its'supporters. In 1846-7 Schweg- ler and Baur, recurring to the " borrowing hypothesis," issued it in a new form as an ''adapting hypothesis.' The original Gospel was now supposed. to be the Gospel of the Hebrews (see p. 818 above), which was imagined to contain in all its bare truthfulness the Ebionite doctrine of the early 'church. "Matthew combined this original Jewish-minded document with some other document of more liberal sentiments. Luke was at first a Pauline protest against Judaism, but was afterwards supplemented, in a conciliatory spirit, with passages coloured with Ebionitic and Jewish thought; Mark was treated as a neutral and colourless adapter of Matthew and Luke,—" pedissequus et breviator.% This was the Tibingen doctrine, sometimes called the ' tendency hypothesis," because the adaptations were supposed to proceed fram theological ''tendencies. "

Ewald (beginning from 1849) com bated the Titbingen theory, maintaining that (1) there was an original Gospel, perhaps composed by the evangelist Philip ; (2) in addition to this, there was a collec- tion of ''logia" made by Matthew; (3) and, out of both these docu- ments, or by an author acquainted with these documents, was formed Mark, or, at all events, Mark in its original shape; (4) Matthew con- tains (1) (2) and (3), together with extracts from a * book of higher history"; (5) three anonymous evangelists revived this narrative, which received its last form at the hands of Luke (see the account of Ewald's theory in Westcott's Gospels, p. 203). From this time the compilatory and artistic character of Luke began to be generally recognized ; and even the Tiihingen school gave up the theory that Mark had adapted Luke. Hilgenfeld, "in a five years' literary struggle with Baur" (see Holtzmann, in Schenkel's Bibel-Lenicon, art. ''Evangelien"), proved Mark's independence. Kostlin (1853)

advocated an original Mark as the groundwork of the synoptists ; together with a ‘ Gospel of Peter” as the basis for the parts common to Matthew and Luke. Ritschl (1851), recanting his former op- position, and Meyer (1853) became converted to the belief in an *¢ original Mark.” Volkmar (1857) and a number of other theolo- gians took the same view; Weiss (1861) advocated a parity of originality, or rather a common original source, from which Matthew aud Mark borrowed equally, while occasionally Matthew borrowed from Mark itself. But the work which most approximates to a proof of the originality of the tradition contained in Mark is Holtzmann’s Die Synoptischen Evangelien, &c., 1863, from whose summary of the criticism of the first three Gospels (Schenkel’s Bibel-Lexicon, “ Evangelien ”) these statements are mainly drawn. The author of Jesus of Nazara, Dr Keim, of whom, for the sake of that interesting work, we would speak with all respect, was almost alone in defying, in his last work (p. vii. Aus dem Urchristenthum, 1878), the “‘mane-shaking of the Mark lion;” but even he, with qualification (2b. p. 30).

The work of Dr Holtzmann last referred to is of great value; and so are Dr Weiss’s Marcuscvangeliwm (1872) and Matthdusevangehium (1876); but it is truly lamentable that nearly a century has passed in the accomplishment of so little. The reason is perhaps to be looked for (1) in the amount of personality which has been intro- duced into discussions of this kind; (2) in the haste with which theories have becn erected upon the basis of single causes; (3) in the general absence of attempt to classify and concentrate evidence ; (4) in the failure to recognize the distinction between probabilities and certainties, and the amount of labour necessary to attain certainty ; (5) most of all, in the absence of mechanical helps. It is probable that the publication of Bruder’s Concordance in the middle of this century has done more than all the rest of the hypothesis inventors, from Augustine to Hitzig, to forward the scientific study of the synoptic Comes. nor could Dr Holtzmann’s valuable work have been written but for the humble assistance of Bruder. It is lamentable to think how much industry, ink, and paper, and occasionally intel- lect as well, might have been saved if there

had been in common circulation from the beginning of this century, along with Bruder, a harmony of the Gospels, printed after the manner suggested above (p. 790), from which any one, almost without knowing Greek at all, could have seen at a glance that the ‘‘ pedissequus ” theory of Mark was not for a moment tenable, and that Mark contains—by no means, necessarily, is—the original tradition from which, at least in some places, Matthew and Luke independently borrowed.

There are signs that a similar waste of industry is to be appre- hended in the further discussion of the question whether the com- mon tradition is derived from oral or documentary sources. When, for exainple, we find so able a critic as Dr Holtzmann (Schenkel, “Eyangelien,” p. 210) laying stress on the irregular form amexareordOn occurring in the same place in all the three synoptists (Mat. xii. 13; Mk. iii. 5; Lu. vi. 10) as a convincing proof that the copying of documents (and not oral tradition) can alone explain so strange a similarity, we naturally suppose that this irregularity is nowhere else found in the Old or New Testament. But so far is this from being the case that the irregular form may be with greater truth said to be the only form current in the Old and New Testament, occurring not only in the three passages above, but also in Mk. viii. 25 (arexaréorn); in Jerem. xxili. 8; in. Exod. iv. 7; in var. inter-

ret. Gen. xxiii. 16 [Trommius quotes 3 (1) Esdr. i. 36 (?33), but Weshandart reads &réornoev] ; and the only passage in which the regular form is found, Gen, xl. 21, contains a var. lect. ameKaTéaTno ey, which, no doubt, ought to be inserted in the text. This may serve

GOSPELS

It is greatly to be desired that, in this ‘‘stru L ‘ putants may illustrate the subject in a somewhat ee “a than has been hitherto common. Different versions of the a original—tales, histories, ballads—transmitted through abodes. tary and oral sources should be compared together; and more ae cially the phenomena of the ante-Jerome versions of the New Testa. ment should receive the most careful study, before even the ab] “i comineutator should allow himself to use the dogmatic tone wie h unfortunately characterizes Dr Weiss’s Matthdusevangelium in i ciding against the oral theory. But this is a natural characteristic of an author who sees in a single

‘IepovoaAnu convincing proof of a Aramaic original (see p. 805 above), and to whom a ka} i800 settles all critical disputes. With this dogmatism the tone of Canon Westcott’s remarks on the oral Gospel contrasts advantageous] Nevertheless, it will probably be hereafter found that the mien. mena of our present synoptists are due not to one, but to all, of tho causes advocated by the various disputants of the 18th century Tradition, documents, theological tendencies, literary modifications. misunderstanding of metaphorical parable, misunderstanding of eucharistic language, misunderstanding of spiritual language—all these causes will be found to have contributed to produce the pre- sent synoptic result; and it will not improbably be found, as Dr Sanday shrewdly suggests, that early documents have been much more modified, and early oral traditions much less modified than modern associations might have led us to suppose. Future investigations will receive a considerable stimulus and help, as soon as a harmony of the synoptists showing the Triple Tradition as well as the double traditions (pp. 795-800 above) becomes a recognized text-book for all students of the Gospels. It will also be a useful check, if no demonstration of different documents (in Luke, for example) be recognized as sound until it has been tested by application to other authors. For example, the proof from kat, dé, Te, ele, A€yet, AaAE?, ‘lepovaadrhm, KUpios, evemov, ebOds, Kat ido0, is by no means to be despised ; but it requires expression in a clear picturesque way by the well-known means of curves; and no proof of this kind ought to be accepted until it (or corresponding proof) has been applied, —first (a) negatively, to several passages recognized as genuine productions of the same author (Plato, for example), and then (0), positively, to several passages, some of which are recognized as genuine,others as spurious. In the first case (a) the curves will exhibit no fluctuations; in the second (0) the curves will exhibit fluctuations corresponding to the fluctuations in Luke; and this will be a strong and clearly intelligible proof (even to those who know no Greek—for the same illustrative proof might be deduced from the application of the test to Titus Andronicus and to Hamlet) that the fluctuations of the curves are caused in each case by the incoming of different documentary strata. But perhaps, to do this thoroughly, it would be necessary to do it four or five times over for each of the four or five principal ancient MSS. (nor ought, perhaps, even varieties of spelling, and certainly not varieties of form, such as #A@ay, &c., to be neglected, as possibly pointing to the incoming of different

documents); and the labour is so great that, even with the avoidance of all broaching of hasty theories and all personalities, a single worker could hardly accomplish it with the devotion of a life,—at least that is the conclusion to which the present writer has been forced after devoting some years to this labour. Yet, in any case, one signal advantage will result from our keeping before ourselves a high standard of demonstration, viz., that, although we may bring forward theories for discussion, we shall draw a very distinct line between what is proved and not proved, and shall shrink with a just horror from short cuts to knowledge.

The Criticism of the Fourth Gospel.—No criticism of a systematic Criticism

as an example to show how ultimately circuitous the path must be J kind, says Dr Holtzmann (Schenkel's Bibcl-Leaicon), began till the of Fourth

through these attempted short cuts to certainty. The truth is that the question of oral or documentary sources is not to be settled with-

outa great deal more of labour and ofjudgment than the subject has hitherto received. For a statement of the oral hypothesis, which is generally adopted by English scholars, the reader is referred to Westcott's Introduction to the Gospels, pp. 161-208. It has been pointed out, however, by Dr Sanday (Academy, Sept. 21, 1878) that there has been of late an increasing tendency in the three theories— the Tiibingen or adaptation theory, the documentary Mark theory, the oral tradition theory—to approximate to each other ; so that the tendency theory has given less weight to dogmatic tendencies and more weight to literary considerations. The documentary Mark theory allows the previous influence of tradition, only stipulating for some lost documentary links between the oral tradition and our Mark; while the oral theory approaches to the documentary Mark theory in assuming that the oral Gospel is represented most nearly by our gel Mark. Nevertheless, says Dr Sanday, between the two ast theories (for the Tiibingen theory may be left out of account) "the struggle has yet to come. The division between these ig almost national. In Germany no one of any significance as a critic holds the oral theory. In England none of our prominent writers hold anything else. France is divided. Godet ranges himself on the side most popular in England. Reville was an early supporter

of a view similar to that which is gaining the ascendency in Ger- many; and the same is substantially adopted by M. Renan.”

publication of Bretschneider’s Probabilia (1820), which provoked so Gospel.

much opposition that the author retracted it. The apostolic author- ship was supported by Schleiermacher, and by Credner (1886), even while admitting that the Gospel could not be regarded as a urely objective work. Similarly De Wettc, after some doubt and hesita- tion (1837), and Reuss (1840-64) decided for the J ohannine author- ship,—the former being influenced by a comparison of the Fourth Gospel with the other works of the 2d century. The attack of Strauss, in his Life of Jesus, being passed over (as indicating no attempt, or possibly ability, to appreciate the depth of the spiritual doctrine in the Fourth Gospel, in spite of the suggestiveness and occasional accuracy of his method), we come to Baur (1847), who pronounced the Gospel to be a ee ideal poem, composed in the 2d century. A great number of writers accepted this theory ; among them, Zeller and Hilgenfeld, and Schenkel and Keim in their lives of Christ, together with Réville (1864) and Scholten. In the meantime an hypothesis of ‘‘ partial authorship ” had been suggested, some (Weisse in 1838, and Freytag in 1861) believing that. the discourses, others, as Renan (1863), believing that the historical narratives, were genuine ; while some wished to detach the Judean from the Galilean portion of the Gospel, as being, distinct in authorship and origin. Liicke, Ewald, Bruckner, and Wi a adopting in various forms the view of a divided authorship, recognizet in the Gospel a framework of historical fact, but noted also the prom-

nence of the ideal, the want of historical development, and the sub- |

jective colouring given by the author to the discourses of Christ— views which find a full expression in Weizsicker’s Untersuchungen tiber die evangelische Geschichte (1864). Canon Westcott, in his Zn- troduetion to the Gospels (5th ed., 1875), maintains apostolic author- ship, which is also in Character of the Fourth

Gospel, 1872) maintained by Dr Sanday. The latter work lays perh

aps somewhat too much emphasis on the geographical expressions which are used to prove that the author was a Jew of Palestine. Many of these would appear natural for an Alexandrian Jew who had spent two or three passovers at J erusalem, and had travelled through the country. Still more doubtful is the canon assumed throughout the treatise, that graphic details, parti- cularities of name, place, &c., imply an eye-witness—the contrary being suggested by the phenomena of the apocryphal Gospels. Nor does Dr Sanday make any attempt to illustrate the Fourth Gospel (except in respect of the Logos doctrine) by the teaching of Philo. Nevertheless the book is eminently candid, and there is no other book in English to compare with it for the light it throws, not only on the Fourth Gospel itself, but also on the history of its criticism. Dr Sanday also recognizes, even more fully than Canon Westcott, the subjective nature of the Gospel, at least so far as to

GOSPORT, a fortified seaport and market town of Tiampshire, England, on the western side of Portsmouth harbour, near its mouth, directly opposite and about a mile from Portsmouth, with which it is connected by a floating bridge moved by a steam engine working on two fixed chains. The old fortifications built at the end of last century are now obsolete, and a line of new forts has been erected about two miles from the town, extending from the Solent to the upper part of Portsmouth harbour, with accommo- dation for two regiments of infantry and a brigade of artillery. Near the town is the royal St Clarence victualling yard, with brewery, cooperage, powder-magazines, biscuit- baking establishment, and storehouses for various kinds of provisions for the royal navy. Adjoining this yard there are large Government powder magazines and a laboratory for making fusees and rockets. Within the old fortifica- tions a fine new barracks has been erected with accommo- dation for 1100 men, and another barracks with accommo-dation for 1600 men adjoining it. The principal other buildings are the town-hall and market-place, the church of Holy Trinity, erected in the time of William III, and the maguificent Haslar naval hospital, capable of containing 2000 patients. Gosport has an extensive establishment for the manufacture of anchors and chain cables, and it is also celebrated for its yacht-building and sail-making establish- ments, The coasting trade is considerable. The town is said to have received its name, Gosport or God’s

Port, from Bishop Henry de Blois, who put in here for shelter during a severe storm in 1158. It was then only a small fishing village. According to another supposition its original name was Gorse Port, and it was so called from the gorse and furze with which the commons in the neigh- bourhood were thickly covered. The population in 1871 was 7366,

GOSSART, Jan, born at Maubeuge towards the close of the 15th century, is better known to Englishmen by the name of Mabuse than by that of Jenni Gossart, with which he signed some of his pictures, or that of Jennyn van Hennegouwe (Hainault), under which he matriculated in the guild of St Luke, at Antwerp, in 1503. We know nothing of his life before he attained to manhood ; but his works at least tell us that he stood in his first period under the influence of artists to whom plastic models were familiar ; and this leads to the belief that he spent his youth on the French border rather than on the banks of the Scheldt. In no seat of artistic culture is this feature more conspicuous than at Tournai, Douai, or Valenciennes, and it may be that in one of these cities Mabuse learnt to com- mingle the study of architecture with the gaudy system of

| intermixed that it is impossible to tell where the for

a special treatise (Authorship and Historical —

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make this admission, that the words of Jesus himself and the words of the evangelist are, in more than one instance, so inextricably mer end and thie latter begin. In the Introduction to the Gospel of St John, published (1879) in the Speaker's Commentary, Canon Westcott has greatiy amplified the valuable remarks on the Fourth Gospel contained in | his Introduction to the Study of the Gospels, and states most for- cibly the views of those who see in the niultiplicity of detail in the Fourth Gospel one among mauy proofs that the Gospel was com- posed by an eye-witness of the events which it records. For the doctrine of the Logos Canon Westcott gives the following list:— Gfroerer, Philo u. d. Jud.-Alex. Theosophie, 1835 ; Dachne, Jud. – Alex, Religions-Philosophie, 1834 ; Dorner, Person of Christ (Eng. trans.) ; Jowett's "'St Paul and Philo" (Epistles of St Paul, § 363 ff.); Heinze, Die Lehre v. Logos in Griech. Philosophie, 1872; Siegfried, Philo von

Alexandria, 1875. Grossmann (Queestiones Philonece, 1829) gives a complete summary of the use of the word in Philo. An account of the Logos literature up to 1870 is given by Dr Abbot in his appendix to the article on " The Word " in the American edition of the Dictionary of the Bible, and Soulier in- cludes several later works in La doctrine du Logos chez Philon | @' Alexandrie, Turin, 1876. (E. A, A.)

colouring familiar to tinters of stone. Without the subtlety or power of Van der Weyden, he had this much in common with the great master of Tournai and Brussels, that his compositions were usually framed in architectural back- grounds ; and this marked characteristic is strongly dis- played in the pictures which he executed in the first years of the 16th century. But whilst Mabuse thus early betrays his dependence on the masters of the French frontier, he also confesses admiration for the great painters who first gave lustre to Antwerp; and in the large altar-pieces of Castle Howard and Scawby, he combines in a quaint and not unskilful medley the sentiment of Memling, the bright and decided contrasts of pigment peculiar to coloured reliefs, the cornered and packed drapery familiar to Van der Weyden, and the bold but Socratic cast of face remarkable in the works of Quentin Matsys, At Scawby he illustrates the legend of the count of Toulouse, who parted with his worldly goods to assume the frock of a hermit. At Oastle Howard he represents the Adoration of the Kings, and throws together some thirty figures on an architectural background, varied in detail, massive in shape, and fanciful in ornament. He surprises us by pompous costume and flaring contrasts of tone. His figures, like pieces on a chess-board, are often rigid and conventional, The land- Scape which shows through the colonnades is adorned with towers and steeples in the minute fashion of Van der Weyden. After a residence of a few years at Antwerp, Mabuse took service with Philip, bastard of Philip the Good, at that time Lord of Somerdyk and admiral of 4eeland. One of his pictures had already become celebrated——a Descent from the Cross (50 figures) on the high altar of the monastery of St Michael of Tongerloo. Philip of Burgundy ordered Mabuse to execute a replica for the church of Middleburg; and the value which was then set on the picture is apparent from the fact that Diirer came expressly to Middleburg (1521) to see it. In 1568 the altar-piece perished by fire. But its principal features were preserved in a large arras hanging, recently exhibited at the Archzo- logical Museum of Brussels. In 1508 Margaret of

Austria sent Philip of Burgundy to Italy to negotiate for the treaty of Cambrai. On this mission he was accompanied by Mabuse ; and by this accident an important revolution was effected in the art of the Netherlands. Mabuse appears to have chiefly studied in Italy the cold and polished works of the Leonardesques. He not only brought home a new style, but he also introduced the fashion of travelling to Italy ; and from that time till the age of Rubens and Van Dyck it was considered proper that all Flemish painters should visit the peninsula. The Flemings grafted Italian mannerisms

on their own stock; and the cross turned out so unfor- tunately that for a century Flemish art lost all trace of originality.

In the summer of 1509 Philip returned to the Nether- lands, and, retiring to his seat of Suytburg in Zeeland, sur- rendered himself to the pleasures of planning decorations for his castle and ordering pictures of Mabuse and Jacob of Barbari. Being in constant communication with the court of Margaret of Austria at Malines, he gave the artists in his employ fair chances of promotion. Barbari was made court painter to the regent, whilst Mabuse received less im- portant commissions. Records prove that Mabuse painted a portrait of Leonora of Portugal, and other small pieces, for Charles V. in 1516. But the only signed pictures of this period are the Neptune and Amphitrite of 1516 at Berlin, and the Madonna, with a portrait of Jean Caron- delet, of 1517, at the Louvre, in both of which we clearly discern that Vasari only spoke by hearsay of the progress made by Mabuse in “the true method of producing pictures full of nude figures and poesies.” It is difficult to find any- thing more coarse or misshapen than the Amphitrite, unless we except the grotesque and ungainly drayman who figures for Neptune. In later forms of the same subject—the Adam and Eve at Hampton Court, or its feebler replica at Berlin—we observe more nudity, combined with realism of the commonest type. Happily Mabuse was capable of higher efforts. His St Luke painting the portrait of the Virgin. in Sanct Veit at Prague, a variety of the same sub- ject in the Belvedere at Vienna, the Madonna of the Baring collection in London, or the numerous repetitions of Christ and the Scoffers (Ghent and Antwerp), all prove that travel had left many of Gossart’s fundamental peculiarities un- altered. His

figures still retain the character of stone; his architecture is as rich and varied, his tones are as strong as ever. But bright contrasts of gaudy tints are replaced by soberer greys; and a cold haze, the “sfumato” of the Milanese, pervades the surfaces. It is but seldom that these features fail to obtrude. When they least show, the master displays a brilliant palette combined with smooth surface and incisive outlines. In this form the Madonnas of Munich and Vienna (1527), the likeness of a girl weighing gold pieces (Berlin), and the portraits of the children of the king of Denmark at Hampton Court, are fair specimens of his skill.

Philip of Burgundy had been deputed in Italy (1515) to escort Charles V.’s sister, Isabella, to Denmark. She was the affianced bride of Christian II., whose subsequent attempt to unite Denmark and Sweden ended so fatally. Here a favourable opportunity was afforded for introducing Mabuse to the Danish court; and it is possible that the opportunity was not neglected. Yet Mabuse may have become acquainted with the Danish king at a later period. As early as 1523, when Christian came to Belgium, he asked Mabuse to paint the likenesses of his dwarfs. In 1528 he requested the artist to furnish to Jean de Hare the design for Isabella’s tomb jin the abbey of St Pierre near Ghent. It was no doubt at this time that Mabuse com- pleted the portraits of John, Dorothy, and Christine, children of Christian II., which came into the collection of Henry VIII No doubt, also, these portraits are identical with those of three children at Hampton Court, which were long known and often copied as likenesses of Prince Arthur, Prince Henry, and Princess Margaret of England. One of the copies at Wilton, inscribed with the forged name of ‘Hans Holbein, ye father,” and the false date of 1495, has often been cited as a proof that Mabuse came to England in the reign of Henry VII. ; but the statement, it is clear, rests on no foundation whatever. At the period when these portraits were executed Mabuse lived at Middleburg. But he dwelt at intervals elsewhere. When Philip of Burgundy

became bishop of Utrecht, and settled at Duerstede, near Wyck, in 1517, he was accompanied by Mabuse, who helped to decorate the new palace of his master. At Philip’s death in 1524, Mabuse designed and erected his tomb in the church of Wyck. He finally retired to Middleburg, where he took service

with Philip's brother, Adolph, lord of Veeren Van Mander's biography accuses Gossart of habitual drunkenness ; yet it describes the splendid appearance of the artist as, dressed in gold brocade, he accompanied Lucas of Leyden on a pleasure trip to Ghent, Malines, and Antwerp in 1527. The works of Mabuse are those of a hardworking and patient artist ; the number of his still extant pictures practically demonstrates that he was not a debauchee. The marriage of his daughter with the painter Henry Van der Heyden of Louvain proves that he had a home, and did not live habitually in taverns, as Van Mander suggests. His death at Antwerp, on the lst of October 1532, is recorded in the portrait engraved by Jerome Cock. GO. AMCs GOSSELIES, a town of Belgium, in the arrondissement of Charleroi and province of Hennegau, is picturesquely situated on the Piéton and on the Brussels and Charleroi canal, 8 miles N.W. from Charleroi. There are extensive coal-mines in the neighbourhood, and the town possesses breweries, tanneries, bleachworks, and manufactories of hats, knives, and nails. Here the French gained a victory over ~ Austrians, 26th June 1794. The population is about

7000. :

GOTHA (originally Gotegewe, or Gotawe, and later Gotaha, or Gothau), a town of Germany, formerly capital of the old duchy of Gotha, and now, alternately with Coburg, the residence of the duke of Saxe-Coburg. Gotha is situated on a canal of the Leina, and ou the Thuringian railway, about 6 miles north of the Thuringian Forest. It consists of the town proper and four suburbs, which are grouped in the shape of a half-moon to the north, west, and east of the hill on which, at the height of 1086 feet, stands the castle of Friedenstein. With the exception of those in the older portion of the town, the streets are handsome and spacious, and the beautiful gardens and promenades between the suburbs and the castle add greatly to the town's attractiveness, On the other side of the castle there is an extensive and finely adorned park. To the north-west of the town the Gulberg hill,—on which there is a public pleasure garden,—and to the south-west the Leeberg hill, rise to a height of over 1300 feet, and afford extensive views of a beautiful panorama. The castle, begun by Ernest the — Pious in 1643 and completed in 1654, occupies the site of the old fortress of Grimmenstein. It is a huge square building flanked with two wings, having towers rising to

the height of about 140 feet. It contains the ducal coin cabinet, and the ducal library of nearly 200,000 volumes, among which are several rare editions, and about 6900 manu-

‘scripts. The picture gallery, the cabinet of engravings, the

natural history museum, the Chinese museum, and the cabinet of art, which includes a collection of Egyptian, Etruscan, Roman, and German antiquities, are now included in a new building, completed in 1878, which stands on the southern terrace of the castle. The principal other public buildings are the Margaret church,—with a beautiful portal and a lofty tower,—founded in the 12th century, twice burnt down, and rebuilt in its present form in 1652; the Augustines or Cloister church, with an altar-piece by the painter Jacobs ; the theatre; the fire insurance bank and the life insurance bank; the ducal palace, in the Italian villa style, with a winter garden and picture gallery ; the buildings of the legislature of the duchy; the hospital ; the old town-house, dating from the 11th century ; the old dwelling-house of the painter Lucas Cranach, now used as a girls’ school; the ducal stable; and the Friedrichsthal

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palace. The educational establishments include excellent city schools, a gymnasium (founded in 1524, one of the most famous in Germany), a ladies’ school of the first order, a training school for teachers and another for female teachers, a free school, a trade school, and a com- mercial school Among the other institutions are a lying- in hospital, a surgical and eye hospital, a private lunatic asylum, an orphanage, a reformatory, a magdalen institute, and a school for the board and education of destitute girls. The observatory, erected by Duke Ernest IT. in 1787, was in 1857 transferred to a new site in the neighbourhood of the park. Formerly the town obtained its water supply

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Plan of Gotha.

1. Catholic Chapel. 9. Gymnasium (with | 14. Ducal Palace.

2. St Margaret's Church. Léffler's Monument), | 15. Telegraph Office.

8. Arnold's Monument, | 10. Cloister Church. 16. Perthes's Publishing 4. Theatre. ll. Téchterschule (Lucas ITouse.

5. Lunatic Asylum. Cranach's House). | 17. Friedrichsthal Palace. 6. Cathedral. 12. House of the States of | 18. Ducal Stables,

7. Town-Hall. the Duchy. 19. Observatory.

8. Post-Office. 13. Mint. 20. Ducal Burying-Place.

by means of the Leina canal, which was excavated in 1369, but water for drinking purposes has since 1874 been ob- tained from the Thuringian Forest. Gotha is one of the most active commercial towns of Thuringia, its manufac- tures including sausages, for which it has a great reputation, porcelain, tobacco, sugar, machinery, mechanical and sur- gical instruments, musical instruments, shoes, lamps, and toys. There are also a number of nurseries and market gardens. The book trade is represented by about a dozen firms, including that of the great geographical house of

Perthes, Population (1875), 22,928. – Gotha existed as a village in the time of Charlemagne. In 930 the Abbot Gotthard of Hersfeld surrounded it with walls. It was

known as a town as early as 1109, about which time it came into the possession of the landgraves of Thuringia. On the extinction of that line Gotha came into the possession of the electors of Saxony, and on the division of their estates between Frederick the Soft- hearted and William, it fell to the share of the latter, after whose death it was inherited by the Ernestine line of dukes. After the battle of Miihlberg in 1547, the castle of Grimmenstein was partly destroyed, but it was again restored in 1554. In 1566 the town was taken from Duke John Frederick by August of Saxony. After the death without issue of John Frederick's two sons, it came

into the possession of Duke Ernest the Pious, the fourth of the line of the dukes of Gotha ; and on the extinction of this line it was, in 1826, united, along with the dukedom, to Coburg.

See Gotha und seine Umgebung, Gotha, 1851; Kiihne, Bettrige zur Geschichte der Entwickelung der socialen Zustinde der Stadt und des Herzogthums Gotha, Gotha, 1862; Humbert, Les villes de la Thuringe, Paris, 1869; and Beck, Geschichte der Stadt Gotha, Gotha, 1870.

GOTHENBURG (Swedish, Goteborg), the second city and chief commercial town of Sweden, and the capital of a "lin" of the same name, is situated in a low valley sur- rounded by bare hills, on the south bank and 12 miles from the mouth of the Gétha river, 282 miles W.S.W. of Stock- holm by rail (by the Gotha Canal 370 miles). Gothenburg is well and regularly built, mostly of stone or brick, with wide and well-paved streets, and in its general appearance much resembles an English town. It consists of two main portions, the town proper and its suburbs,—together 54 square miles in extent. The first may be described as a semicircle extending south-eastward over a marshy flat from the bank of the Gétha as its diameter. This semicircle is crossed by the East and West Harbour Canals and from east to west by the Great Harbour Canal, which divides the town proper into two parts, a north and a south. The canals are enclosed with hewn stone, lined with trees, and crossed by 24 iron bridges. The finest streets of Gothen- burg are the North and South Harbour Streets. Gustavus Adolphus's Torg (market-place), with a bronze statue of Gustavus Adolphus by Fogelberg, occupies the centre of the town, while the principal market-place is now (since 1849) Kungstorget (the king's market-place). The favourite promenades are the Horticultural Society's Park, the King's Park, with Molin's group (the Beltbucklers) and the Vya Alléen (new alleys), situated on the south outskirts, Gothen- burg has seven Lutheran churches, of which the finest are the cathedral (Gustavii Domkyrka), called after Gustavus Adolphus, founded 1633, rebuilt after fires in 1742 and 1815, now a cruciform structure 173 feet high and 194 feet long by 75 feet broad, Haga church, erected. in 1856, and the German church, rebuilt 1747-1798 ; an English Episcopal church (1855); a Catholic chapel; and a synagogue (1855). The other chief buildings are the exchange, in Italian style (1844), with marble statues of Odin by Fogelberg (1855), and of Oscar I. by Molin

(1855); the residence house, built by Torstenson after the Thirty Years' War; the town- house, founded 1670, enlarged 1814; the old kronhus, where the diet of 1660 was held; the new custom-house (1866) ; the artillery barracks (1806) for 750 men ; the prison (1854); the railway station (1858); the arsenal (1860); the new theatre (1856-59) seated for 1030; and the Sahlgren new hospital (1848-55). Gothenburg is the seat of a bishop and of a provincial governor. It has 34 schools of various kinds, including two Latin schools, a school- teachers' seminary, an extensive Hlementdr-ldroverk, founded 1630, rebuilt 1859, with a library of 15,000 vols., a trade institute, the Chalmers' technical school (1869), another technical school (1848), a "real-gymnasium " (1844), and a navigation-school (1862). The museum, founded in 1833, contains collections for natural history, entomo- logy, anatomy, botany, archxology, and ethnography, a picture and sculpture gallery, and a collection of 6000 coins and medals. Gothenburg has numerous benevo- lent and charitable institutions, mainly supported by the munificence of private citizens. The industries are ship- building (carried on in four docks), linen and cotton weaving, brewing, and the mantfacture of furniture, machinery, lucifer-matches, paper, sugar, and tobacco. In 1877, 2213 ships of 532,127 tons (Swedish, 1221 of 270,900 tons; British, 267 of 130,219 tons) entered at the port, while 1781 ships of 526,352 tons (British, 264 of 118,236 tons) cleared. The mercantile fleet be-

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longing to Gothenburg consisted on January 1, 1878, of 65 steamships of 21,215 tons, and 156 sailing vessels of 63,913 tons. The exports in 1877 amounted in value to £2,437,200. These included 8,107,326 cubic feet of deals, boards, and battens (6,021,546 cubic feet to England) ; 6,065,408 cubic feet of pit-props and other timber, besides 7,246,056 pieces of oak and other staves, and laths and carpenters' work valued at £80,083 ; 90,460 tons of iron and steel (62,480 tons to England) ; 333,194 quarters of grain, chiefly oats (265,655 quarters to England) ; also beans and pease, lucifer matches, 2667 head of cattle, and 38,578 cwts. of butter. 'The imports in the same year amounted to £3,865,000, chiefly made up of cotton (14,540,996 tb) and cotton yarn (3,608,355 tb), wool and woollen yarn (3,397,757 tb),

raw sugar (17,289,777 tb), refined sugar (6,512,919 ib), coffee (8,239,346 Ib), molasses (4,883,021 Ib), rice (3,246,247 Ib), olive oil (2,443,804 tb), salt (796,208 cubic feet), coal and coke (246,205 tons), iron rails (32,059 tons), petroleum (13,243,408 ib), hides (2,346,577 tb), and paper (712,538 tb). Under the peculiar licensing system initiated in Gothenburg October 1, 1865, the town authorities contract for three years with a limited company, which takes the whole number of licences for selling brdndin, and hands over to the town treasury the net proceeds of its trade, These amounted to £40,103 in the year ending October 1, 1876, when the company sold 383,561 gallons of spirits, 178,133 gallons of which were consumed on the public-house premises, and realized a gross profit of £52,850. The licences issued have been reduced from 119 in 1865 to 56 in 1876. All “bars” are closed from 6 P.M. on Saturday to 8 a.m. on Monday, and in the period 1866-76 apprehensions for drunkenness have on the average decreased 22 per cent., though since 1870 there has been a slight increase (in 1876, 2357 persons were fined), usually attributed to the higher rate of wages and the greater efficiency of the police. The population of Gothenburg, including suburbs, was 71,707 in 1877.

Founded by Gustavus Adolphus in 1619, Gothenburg was from the first designed to be fortified, a town of the samc name fonnded on Hisingen (an island 44 square miles in area between the two arms of the Gotha river) having been destroyed by the Danes during the Calmar war. From 1621, when it was first chartered, it steadily increased, though it suffered greatly in the Danish wars of the last half of the 17th and the beginning of the 18th centuries, and from several extensive conflagrations (the last in 1813), which have de- stroyed important records of its history. The great development of its herring fishery in the latter part of the 18th century gave a new impulse to the city’s trade, which was kept up by the influence of the “ Continental System,” under which Gothenburg became a depot for the colonial merchandise of England. After the fall of Napoleon it began to decline, but since its closer connexion with the interior of the country by the Gotha Canal (opened 1882) and Western Railway it has rapidly advanced both in population and. trade. It isexpected that the great line now in course of construc- tion through the mining districts will very greatly increase the im- portance of Gothenburg. Since the demolition of its fortifications in 1807, it has been defended only by the two redoubts of Billingen and Rya

Rabbe. Gothenburg was the birthplace of the poet Bengt Lidner, and of two of Sweden's greatest sculptors, Fogelberg and Molin. After the French Revolution Gothenburg was for a time the residence of the Bourbon family.

See Octavia Carlén, Géteborg: Beskrifning dfver staden och dess narmaste omgtfningar (Stockholm, 1869), and the works thercin cited; also J. Hellstenius, Nagre blad ur Géteborgs historia (1b. 1870), Axelson and Pabst, Sveriges indus- triella etablissementer (ib. 1870, et seqg.); W. Malm, Beskrifning Gfver segelleden fran Stockholms kanalvagar till G6teborg (ib. 1873), Bidrag till kdnnedom om Géteborgs och Bohusldns fornminnen och historia, published by the Economic Society of the lin (Gothenb. and Stockh., 1874 e¢ seq.), and @éteborgs Kalendar, a yearly publication.

GOTHIC LANGUAGE. See under Gortus, p. 852.

GOTHOFRED or Goprrroy, the name of a noble French family, of which many members attained distinction as jurists or historians.

The first whose name is associated with the active study of jurisprudence, at the close of the 16th century, was Dents GopEFroy (1549-1621). He was born at Paris, and

studied law at the universities of Louvain, Cologne, and Heidelberg. Having embraced the Reformed religion he found Geneva a safer abode than Paris, and became pro- fessor of law there. Some years afterwards he obtained a public appointment in one of the districts in the Jura, but was driven from his home by the troops of the duke of Savoy and retired to Basel. Thence he was induced by the offer of a chair of Roman law to go to Strasburg, but soon changed his appointment for one at Altorf, which then pos- sessed a university celebrated for its late professor of law, Donneau. In 1600 the elector palatine appointed him professor of Roman law in Heidelberg, where he spent the greater portion of the remainder of his life, and was placed at the head of the faculty of law. The most flattering offers from several universities failed to induce him to leave his adopted country, but the invasion of the Palatinate by Tilly's troops forced him to take refuge again at Strasburg, where he died in 1621. His most important work is his

edition of the Corpus Juris. The text given by him was very generally adopted and used in quotation. More than twenty editions of the work were published in various towns of France, Germany, and Holland. Godefroy's other writ- ings are very numerous ; but they are for the most part either editions of classical authors or compilations which display great industry and learning, but are of little use to the modern student.

TuroporE Goperroy (1580-1649), the eldest son of Denis, forsook the religion which his father had adopted, and obtained the office of historiographer of France, as well as several important diplomatic posts. His historical works are very numerous. The character of his labours will be judged from the title of bis most elaborate pro- duction-—Le Cérémonial de France. Many of his smaller works are devoted to questions of genealogy.

Jacques GopEFRoy (1587-1652), the younger brother of Theodore, has a real claim to the remembrance of students of the history of Roman law, in his edition of the Theodosian Code, at which he laboured for thirty years. It was this code, and not the Corpus Juris prepared under the direc- tion of Justinian, which formed the principal, though not the only source from which the lawyers of the various countries which had formed the Western empire drew their knowledge of Roman law, at all events until the revival of the study of law in the 11th century at Bologna. Hence Godefroy's edition was of real value. Jacques Godefroy also completed the difficult and useful task of collecting and arranging those fragments of the Twelve Tables which can be discovered, and so an important step was taken towards representing the Roman law in its first definite form. His other works are very numerous, and are prin- cipally devoted to the discussion of various points of Roman law. He died in 1652, having served the republic. of Geneva botli as its principal magistrate and in undertaking important missions to the court of France.

A list of the works of the various members of the family of Godefroy, whose activity extends over a period of nearly 200 years, may be found in the Biographie Générale, and fuller particulars of its history in Moreri's Dictionnaire historique.

GOTHS. The historical position of the Gothic nation needs to be marked out with special care, both on account of various lax popular uses of the

Gothic name, and also on account of much legendary history and many rash ethno- logical speculations, ancient and modern, which have gathered round the true history of the Gothic people. An ignorant age used the words Goth and Gothic as vague names of contempt for anything that was thought rude and barbarous. A hardly less ignorant but better disposed age used the word Gothic in an equally vague way, but without the same feeling of contempt, for anything which was thought to be medieval or " romantic," as opposed to

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"classical." The name came also to be used as a philologi- eal or ethnological term; we heard of "Gothic nations," "Gothic languages," &c., meaning "Teutonic" in the widest sense. The name was also, first scornfully, then respect- fully, applied to a style of architecture which has some claim to be called Teutonic as opposed to Greek or Roman, but which has nothing whatever to do with the Goths as a nation. Long before this, two European sovereigns who had nothing whatever to do with the national Goths, took the title of King of the Goths out of a mere accidental like- ness of names. All these uses of the Gothic name must be carefully distinguished from the history of the true national Goths who play so great a part in Europe from the 3d to the 8th century of our era. The Goths may on many grounds claim the foremost place among the Teutonic nations which had a share in the break-up of the Roman power. They were among the earliest, if not quite the earliest, of the Teutonic nations to establish themselves within the empire, as distinguished from merely ravaging its frontiers. Their history too is closely connected with the geography of the whole empire. Their first historical appearance was in the Hast; their great historical settle- ments were made in the West. No Teutonic people fills so great a place in the political and military history of the 4th, 5th, and 6th centuries, and no Teutonic people has left behind it such early remains of a written native litera- ture. The real greatness of the Goths quite accounts for the many vague uses of the Gothic name. Alike in scorn and in honour, the Goths have been, not unreasonably, taken as the representatives of the whole Teutonic race. The wonderful thing is that a people who played so great a part for several ages should have wholly passed away. The Goths have not for many ages existed anywhere as a distinct nation, nor have they given-an

abiding name to any part of Europe. Franks, Angles, Saxons, Burgun- dians, Frisians, Thuringians, Lombards, Bavarians, perhaps Vandals, are all visible on the modern map. So several parts of Europe have at different times been known as Gothia; but the name was never borne by any large country, and it has nowhere lasted down to modern times.

The chief ancient authority for the early history of the Goths is their national historian Jordanis, who chiefly followed the Gothic history of Cassiodorus the minister of Theodoric, and the lost history of Ablavius. (On the value of Jordanis's writings see Pallmann, Geschichte der Vétker-wanderung, 1. 23.) But he is careless and uncritical, and, like other national historians, is full of mythical elements in the early part. He has to be tested throughout by the contemporary Roman and Greek writers from the 3d cen-tury to the 6th. Among these, perhaps the first place is due to Ammianus in the 4th century and to Procopius in the 6th.

The first certain historical appearance of the Goths is in the lands north of the lower Danube in the 3d century of our era. For any earlier account of them we have to go either to mythical stories or to ingenious guesses and infer- ences. There are a remarkable number of national and legendary names which have more or less of likeness to the name Goth; and this likeness has naturally led to an un- usual number of theories. The Goths first appear in history in the ancient land of the Getw; and this geographical fact, combined with the likeness of the names, has naturally caused Get and Goths to be looked on as the same people. The identification is as old as our first historical mention of the Goths (A%lius Spartianus, Ant. Car., 10). Claudian always speaks of the Goths as Gete. So does the national historian Jordanis (cap. v.). The identity is mentioned doubtingly by Procopius (Bell. Vand., i. 2; of. Bell. Goth., v. 4), It is strongly maintained by Jacob Grimm (Geschichte der Deutschen Sprache, capp. 1X., Xviil.), but is rejected by

nearly all later writers, A more famous legend, which has derived its chief currency from Jordanis, brings the Goths first of all from Scandinavia (see Gibbon, c. x.; Geijer's History of Sweden, c. x.). There is a so-called East and West Gothland in Sweden, but the connexion of these lands with the Goths of Roman history is more than doubtful. Ptolemy (ii. 11, 35) places

the otra in Scandia, and Procopius (Bell. Goth., ii. 15) knew the Tavroé among the inhabitants of Thoule; but he clearly did not look on them as Goths (see Zeuss, Die Deutschen, 500, 511; Grimm, p. 312). Then there is the god Gedt (see Kemble's Saxons wn England, i. 370), and the Gedtas, who figure in Beowulf, and elsewhere in Old-English writings. The Traveller's Song (34, 115, 177) distinctly distinguishes Goths and Gedtas, and couples the latter with the Swedes. Pliny (Nat. Hist., iv. 11) places Gete and Gaude together on the lower Danube. His Gaude may possibly be Goths ; if so, they are distinguished from the Getw. Then there are the Jutes of Old-English history, the Guttones, Gothones, Gothint (see Latham, Germania, Epilegomena xxxviii. et seqq.). Pytheas, according to Pliny (Wat. Hist., xxxvii. 7; cf. iv. 14) placed the Guttones on the south coast of the Baltic (that seems to be his meaning), and rules them to be a German people. This carries the name back to the time of Alexander. Ptolemy also (iii, 5, 20) has TvOwves in Sarmatia ou the Vistula, Tacitus (Germania, 43) distin- guishes the German G'othones in the same region from the Celtic Gothinit, whom he places seemingly nearer to the Carpathians. Tacitus moreover not only speaks of the Gothones or Glotones as a people, but mentions (An., ii. 62) a particular man of the nation, Catualda by name, as having restored the independence of his people after it had been overthrown by Maroboduus. With this hint, it is perhaps not too much to infer with Aschbach (Westgothen, 2d ed.) and Zeuss (136) that for Bovroves in Strabo (vii. 1), who are mentioned among the nations subject to Maroboduus, we should read T'ovroves. And there is no doubt that names like Getw, Gethe, Gudde, even Gothi, lived on almost to modern times, first as national names, then as names of contempt, in Poland, Lithuania, and Prussia (see Latham, and Zeuss, 672), Latham asserts the identity of the names Get, Gothi, and Glothones, but he holds (see especially p. 42 of his Epilegomena) that both Grothones and Grete were Lithuanian, and that the Teutonic Goths took the name of the people whom they had conquered. They would, on this view, be Goths only in the sense in which Englishmen are Britons,

On the whole, it seems that there is no trustworthy evidence for a migration of the Goths from Scandinavia, and that the idea was suggested only by the likeness of name between the true Goths and the Gauts or Gedtas of Swedish history. The application of the name Gothland to the island

Gotland, as well as to the couti- nental Gauthiod, isa further mistake. Nor does there seem to be any reason for making Goths and Getw the same. But the identification of the Goths with the Gothones, Tovroves, G'uttones, on the south coast of the Baltic (which is accepted by Pallmann and Dahn) has much more to be said for it. Gothi and G'othones are strictly the same name ; the double form is usual in the Latin shapes of Teutonic names. But the whole history of the Goths in their north- ern seats is summed up in the personal history of Catualda, who, after delivering his people from Maroboduus, was himself overthrown by the Hermunduri. The continuous and certain history of the Gothic nation begins in the Roman Dacia,

The question now comes, Which of the nations which are historically connected with the Goths had any closer connexion with them than that of common Teutonic origin ? Setting aside Getz and other doubtful theories, the real

Gothic name is used by the Greek and Latin writers in a wider and ina narrower sense. We must also bear in mind the vague way in which the ancient writers used national names, and their fondness for using obsolete names. Thus the Goths and other Teutonic nations are spoken of as Scythians and Samaritans. Procopius, in an evidently well- considered passage (Bell. Vand., i. 2), speaks of the Goths as having been formerly called Savpopdrat kat MeAdyxAavou, names which come out of Herodotus's description of the regions where the Goths first appear. But he gives it as the definite result of his own observations that Goths,—by this name he always means specially the East-Goths,— Vandals, West-Goths, and Gepide (Ijraides, with an evident intention to give the word a Greek meaning) were originally one nation, speaking one Gothic language. The only question is about the Vandals. The Gepide are com- monly acknowledged as a branch of the Goths, and Jor- danis (17) has a legend which implies their kindred. The Taifale (Ammianus, xxxi. 19), the Bastarne, Peucini, and other tribes are also reckoned among the Gothic races. In other passages Procopius speaks of several other nations, as the Alans, Rogi, and Scirri, as Gothic, but he does not seem to be in the same way pronouncing a definite judg- ment, Among all these, the historical

Goths, who. play a part in European history by that name, consist of the East and West Goths, and of the small division called Tetraxite. The division into East and West Goths does not appear in the earlier writers, as Ammianus and Zosimus, but we find it both in Procopius and in Jordanis. Instead of Hast- Goths and West-Goths, we read in Ammianus, Zosimus, and Claudian of Greuthungi and Tervingt. These seem to be (see Aschbach, 21; Zeuss, 406; Képke, 103) the strictly national names of the two divisions, which took the names of East and West Goths from their geographical position in the lands which they entered. There is an exact parallel in England, where the national name of the Gewissas gives way to the geographical name of West-Saxons. Jor- danis indeed doubts whether the East-Goths were so called from their eastern position, or from a king Ostrogotha. Strange to say, this Ostrogotha seems to be a real person, and not a mere mythical eponym. OvorprydrOos (Procop., Bell, Goth., iv. 27) is an historical person at a later date, and the name is borne in a feminine shape by one of the daughters of Theodoric. The history of the East and West Goths, as far as the empire is concerned, falls naturally into three periods, Inthe 3d century they are still settled out- side the empire, and appear as invaders and ravagers of the Roman territory from outside, After an interval in which they almost sink out of notice, they appear again within the bounds of the empire, in various relations of alliance and enmity, marching to and fro, but not making any last- ing settlement. It is not till the 5th century that they begin to form settled powers, During their wandering stage they appear mainly in the Eastern empire. But neither they nor any other Teutonic people founded any permanent settlement within its borders, The historical settlements of the Goths are the short and brilliant dominion of the East- Goths in Italy, and the more lasting dominion of the West-Goths in Gaul and Spain.

After the first vague mention of the Goths under Anto- ninus Caracalla, they begin to play a distinct part in the reign of Alexander Severus. They were then in Dacia, and received a tribute or subsidy of some kind (Petrus Patricius, 124, ed. Bonn). ‘The next emperor, Maximin, is claimed by Jordanis (15) as himself of Gothic birth, but we may suspect the usual confusion with the Getw. The narrative of Jordanis begins from this point to put on a more his- torical character, and his account is helped out by various

notices in the Augustan History. In the reign of Philip (244-248 A.D.) they passed the Danube and ravaged Meesia,

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and in 251 the emperor Decius fell in battle against them (see Zosimus, i. 19 et segg.). From this time they ravaced eastern Europe and western Asia far and wide (251-268) They carried on their warfare by sea, and reached as far east as Trebizond. And it seems to have been now that the first permanent Gothic settlement was made, though not strictly within the lands of the empire, This was in the Tauric Chersonesos or Crim. Here their settlement lasted for many ages, and they became allies rather than subjects of the empire in the reign of Justinian. Within the empire the Gothic inroads met with repulses at several points especially from the local forces of Athens under the his. torian Dexippus (Trebellius, Gallienus 13, and the fragment of Dexippus himself). At last, in 269, the Goths suffered a decisive defeat from the emperor Claudius at Naissus in Dardania, which formed an epoch in Gothic history. It auswers to the repulse of the Saxons from Britain by the elder Theodosius. ‘The first attempt at Gothic settlement south of the Danube had been premature. It had to be repeated at a later time with greater success.

Further victories over the Goths are attributed to Aure- lian. But the chief event of his reign was one which amounted to a legal acknowledgment of Gothic occupation north of the Danube. The Roman legions were withdrawn from Dacia, and the name of Trajan’s great conquest was transferred to the land south of the Danube (274). That is, tle great river was established as the boundary between the Roman and Gothic dominions. The wisdom of this cession

-is shown by its being followed by a period of ninety years

in which the peace between the Goths and the empire was seldom seriously broken. The chief interruption was during the reign of Constantine, when the Gothic king Araric invaded the empire, and, after some momentary successes, was driven back. In the middle of the 4th century a great power arose under the East-Gothic king Ermanaric (less correctly Hermanric; the name is the same as Hormenric, in the royal line of Kent), of the house of

the Amali, which was reckoned to be the noblest among the Goths. Erman- aric has become a great figure in Teutonic legend, and it is not easy to say how far legend has built upon history, and how far so-called history has drawn from legend. But that Ermanaric was a real man, and the founder of a great dominion, is plain from the few words of Ammianus (xxxi. 3). Yet there is something unsatisfactory in the way in which we read vague accounts of the greatness of his power, with hardly a glimpse of himself personally. The period assigned to his reign is full of stirring events, in which we get a clear conception of much lesser Gothic chiefs, but none of Ermanaric himself. Jordanis (23) claims for him a vast dominion stretching from the Danube to the Baltic, and he is specially emphatic on the subjection of the Slavonic nations to the rule of the Gothic over- lord. With regard to the Gothic nations, we can see that the rule of Ermanaric was a mere overlordship. The West-Goths appear as a distinct people, with the power of making war and peace on their own account. But they had no kings; their great chief Athanaric appears only as "judge" (Ammianus, xxvii. 5 ; xxxi. 3), answering to our ealdorman or heretoga (cf. Jordanis, 26); and along with him are other West-Gothic chiefs, specially his rival Frithi- gern. We hear of a civil war between these two rivals (Socrates, iv. 33), and it is more certain that Athanaric made war within the Roman border as an ally of the usur- per of Procopius in 365, and afterwards made peace with the emperor Valens. By this time Christianity was mak- ing swift advances among the Goths. According to the view of some modern writers (Képke, 123; Pallmann, ii. 63), the outlying Gothic settlement in Crim had been Christian and Catholic from the beginning; but now Christianity in its Arian form began to be gradually accepted by the great

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This was mainly the work of

mass of the Gothic nation. the teaching of Ulfila (sce Utrita), the Gothic apostle and

translator of the Scriptures into the Gothic tongue (Sozomen, iv, 24),

are hence known Minores of Jordanis, 51).

the Christians, while Frithigern is their friend (Sozomen, vi. 37 ; Socrates, iv. 33),

some time, embraced Arianism long before the end of the 5th century, while the Goths of Crim seem to have remained Catholic,

and received Catholic bishops from Saint John Chrysostom,

and afterwards from Justinian.

Towards the end of the reign of Ermanaric several causes

joined together to break his great dominion asunder. There were clearly sigus of division between East and West

Goths, between Christians and heathens, as well as discon-

tents among the subject nations. These causes of division were now strengthened by pressure from without. Now began the first of those movements of the Turanian races into

the lands north of the Danube, which have had such an effect

on the history of south-eastern Europe down to our own time, The Huns pressed on the new dominion of the Goths, which was already beginning to break in pieces. Ermanaric died at the age, it is said, of 110, by the hands of subject princes stirred danis, 24). All thought of a lasting Gothic dominion north of the Danube died with him. With his fall the move- ments south of that river begin again on a great scale,

From this time the history of the East and West Goths parts asunder, to be joined together again only incidentally and for a season. ‘The great mass of the East-Goths stayed north of the Danube, and passed under the overlordship of the Hun. They do not for the present play any import- ant part in the affairs of the empire. The great mass of the West-Goths crossed the Danube into the Roman pro- vinces, and there played a most important part in various characters of alliance and enmity. The great migration was in 376, when they were allowed to pass as peaceful settlers under their chief

Frithigern. His rival Athanaric seems to have tried to maintain his party for a while north of the Danube in defiance of the Huns; but he had presently to follow the example of the great mass of the natiou. The peaceful designs of Frithigern were meanwhile thwarted by the ill-treatment which the Goths suffered from the Roman officials, which led first to disputes and then to open war. In 378 the Goths won the great battle of Adrianople, in which the emperor Valens was killed. His successor Theodosius the Great made terms with them in 381, and the mass of the Gothic warriors entered the Roman service as foederati. Many of their chiefs were in high favour ; but it seems that the orthodox Theodosius showed more favour to the still remaining heathen party among the Goths than to the larger part of them who had embraced Arian Christianity. Athanaric himself came to Constan- tinople in 381 ; he was received with high honours, and had a solemn funeral when he died. His saying is worth re- cording, as an example of the effect which Roman civiliza- tion had on the Teutonic mind. “The emperor,” he said, “was a god upon earth, and he who resisted him would have his blood on his own head.”

The death of Theodosius in 395 broke up the union between the West-Goths and the empire. Dissensions arose between them and the ministers of Arcadius ; the Goths threw off their allegiance, and chose Alaric as their

According to some accounts (Pallmann, i. 71), he had, to avoid persecution, led a Christian colony south of the Danube (348), who settled peaceably at Nicopolis, and a3 Moesogoths (seemingly the Gothi Later, in 370, there was another great persecution, in which Athanaric, the special enemy of everything Roman, appears also as the enemy of

The distinction between Chris-

tian and heathen Goths remains of political importance for But both East and West Goths had fully

to wrath by his cruelties (Jor-

king. This was a restoration alike of national unity and of national independence. The royal title had not been borne by their leaders in the Roman service. Alaric's position is quite different from that of several Goths in the Roman service, who appear as simple rebels (see Képke, 128). He was of the great West-Gothic house of the Balti (bold), a house second in nobility only to that of the Amali. fis whole career was taken up with marchings to and fro within the lands, first of the Eastern, then of the Western empire. The Goths are under him an independent people under a national king .; their independence is in no way interfered with if the Gothic king, in a moment of peace, accepts the office and titles of a Roman general. But under Alaric the Goths make no lasting settlement. In the long tale of in- trigue and warfare between the Goths and the two imperial courts which fills up this whole time, cessions of territory are offered to the Goths, provinces are occupied by them, but as yet they do not take root anywhere; no Western land as yet becomes Gothia. Alaric's designs of settlement seem in his first stage to have still kept east of the Adriatic, in Illyricum, possibly in Greece. Towards the end of his career his eyes seem fixed on Africa (sce Képke, 128),

Greece was the scene of his great campaign in 396, the second Gothic invasion of that country. In this campaign the religious position of the Goths ig strongly marked, The Arian appeared as an enemy alike to the pagan majority and the Catholic minority; but he came surrounded by monks, and his chief wrath was directed against the heathen temples (Hertzberg, Geschichte Griechenlands, iii. 391). His Italian campaigns fall into two great divisions, that of 402-3, when he was driven back by Stilicho, and that of 408-10, after Stilicho's death. In this second war he thrice besieged Rome (408, 409, 410). The second time it suited a momentary policy to set up a puppet emperor of his own, and even to accept a military commission from him. The third time he sacked the city, the first time since Brennus that Rome had been taken by an army of utter foreign- ers, The intricate political and military details of these campaigns are of less importance in the history of the Gothic nation than the stage which Alaric's reign marks in the history of that nation. It stands between two periods of settlement within the empire and of service under the empire, Under Alaric there is no settlement, and service is quite secondary and precarious; after his death in 410 the two begin again in new shapes.

Contemporary with the campaigns of Alaric was a bar- barian invasion of Italy, which, according to one view, again brings the East and West Goths together. The great mass of the East-Goths, as has been already said, became one of the many nations which were under vassalage to the Huns; but their relation was one merely of vassalage. They remained a distinct people under kings of their own, kings of the house of the Amali and of the kindred of Ermanaric (Jordanis, 48). They had to follow the lead of the Huns in war, but they were also able to carry on wars of their own ; and it has been held (see Képke, 139 ; Pallmann, ii. 173, 277) that among these separate East- Gothic enterprises we are to place the invasion of Italy in 405 by Radagaisus (whom Pallmann writes Ratiger, and takes him for the chief of the heathen part of the East- Goths), One chronicler, Prosper, makes this invasion pre- ceded by another in 400, in which Alaric and Radagaisus appear as partners. 'The paganism of Radagaisus is certain. The presence of Goths in his army is certain, but it seems dangerous to infer that his invasion was a national Gothic enterprise.

Under Ataulf, the brother-in-law and successor of Alaric, another era opens, the beginning of enterprises which did in the end lead to the establishment of a settled Gothic monarchy in the West. 'The-position of Ataulf is well

marked by the speech put into his mouth by Orosius. He liad at one time dreamed of destroying the Roman power, of turning Romania into Gothia, and putting Ataulf in the stead of Augustus ; but he had learned that the world could be governed only by the laws of Ronie, and he had deter- mined to use the Gothic arms for the support of the Roman power. And in the confused and contradictory accounts of his actions (for the story in Jordanis cannot be reconciled with the accounts in Olympiodorus and the chroniclers), we can see something of this principle at work throughout. Gaul and Spain were overrun both by barbarian invaders and by rival emperors. back the lost lands for Rome. And, amid many shiftings of allegiance, Ataulf seems never to have wholly given up the position of an ally of the empire. Placidia, the daughter of the great Theodosius, was taken

as the seal of the union between Goth and Roman, and, had their son Theodosius lived, a dynasty might have arisen

uniting both claims. But the career of Ataulf was cut

short at Barcelona in 415, by his murder at the hands of

another faction of the Goths. The reign of Sigeric was momentary. Under Wallia in 418 a more settled state of things was established. The empire received again, as the prize of Gothic victories, the Tarraconensis in Spain, and Novempopulana and the Narbonensis in Gaul. The "second Aquitaine," with the sea-coast from the mouth of the Garonne to the moutb of the Loire, became the West- Gothic kingdom of Toulouse. The dominion of the Goths was now strictly Gaulish ; their lasting Spanish dominion does not yet begin.

The reign of the first West-Gothic Theodoric (418-451) shows a shifting state of relations betweu the Roman and Gothic powers ; but, after defeats and successes both ways, the older relation of alliance against common enemies was again established. At last Goth and Roman had to join together against the common enemy of Europe and Chris- tendom, Attila the Hun. But they met Gothic warriors in his army. By the terms of their subjection to the Huns, the East-Goths came to fight for Attila against Christendom at Chalons, just as the Servians came to fight for Bajazet against Christendom at Nicopolis. Theodoric fell in the battle (451). After this momentary meeting, the history of the East and West Goths again separates for a while. The kingdom of Toulouse grew within Gaul at the expense of the empire, and in Spain at the expense of the Suevi. Under Euric (466-488) the West-Gothic power again became largely a Spanish power. The kingdom of Toulouse took in nearly all Gaul south of the Loire and west of the Rhone, with all Spain, except the north-west corner, which was still held by the Suevi. Provence alone remained to the empire. 'The West-Gothic kings largely adopted Roman manners and culture; but, as they still kept to their original Arian creed, their rule never becaine thoroughly acceptable to their Catholic subjects. They stood therefore at a great disadvantage when a new and aggressive Catholic power appeared in Gaul through the conversion of the Frank Chlodwig. Toulouse was, as in days long after, the seat of an heretical power, against which the forces of northern Gaul marched as ona

crusade. In 597 the West- Gothic king Alaric fell before the Frankish arms at Bouglé, near Poitiers, and his kingdom, as a great power north of the Alps, fell with him. That Spain and a fragment of Gaul still remained to form a West-Gothic kingdom was owing to the intervention of the East-Goths under the rule of the greatest man in Gothic history.

When the Hunnish power broke in pieces on the death of Attila, the East-Goths recovered their full independence. They now entered into relations with the empire, and were settled on lands in Pannonia. During the greater part of the latter half of the 5th century, the East-Goths play in

The sword of the Goth was to win

His marriage with

GOTHS

south-eastern Europe nearly the same part which the West- Goths played in the century before. They are seen going to and fro, in every conceivable relation of friendship and enmity with the Eastern Roman power, till, just as the West-Goths had done before them, they pass from the East to the West. They are still ruled by kings of the house of the Amali, and from that house there now steps forward a great figure, famous alike in history and in romance, in the person of Theodoric son of Theodemir. Born about 454 his childhood was spent at Constantinople as a hostage, where he was carefully educated. The former part of iis life is taken up with various disputes, intrigues, and wars within the Eastern empire, in which he has as his rival another Theodoric, son of Triarius, and surnamed Strabo. This older but lesser Theodoric seems to have been the chief (not king) of that branch of the East-Goths which had settled within the empire at an earlier time. Theodoric the Great, as he is sometimes distinguished, is sometimes the friend, sometimes the enemy, of the empire. In the former case he is clothed with various Roman titles and offices, as patrician and consul; but in all cases alike he remains the national East-Gothic king. It was in both characters together that he set out in 488, by commission from the emperor Zeno, to recover Italy from Odoacer. By 493 Ravenna was taken; Odoacer was killed by Theodoric's own hand; and the East-Gothic power was fully estab- lished over Italy, Sicily, Dalmatia, and the lands to the north of Italy.

In this war the history of the East and West Goths begins again to unite, if we may accept the witness of one writer (Anon. Vales. 728) that Theodoric was helped by West-Gothic auxiliaries. The two branches of the nation were soon brought much more closely together, when, through the overthrow of the West-Gothic kingdom of Toulouse, the powerof Theodoric was practically extended over a large part of Gaul and over nearly the whole of Spain. A time of confusion followed the fall of Alaric, and, as that prince was the son-in-law of Theodoric, the East- Gothic king stepped in as the guardian of his grandson Amalaric, and preserved for him all his Spanish and a fragment of his Gaulish dominion. Toulouse passed away to the Frank ; but the Goth kept Narbonne and its district, the land of Septimania—the land which, as the last part of Gaul held by the Goths, kept the name of Gothia for many ages. While Theodoric lived, the West-Gothic king- dom was practically united to his own dominion. He seems also to have claimed a kind of protectorate over the Teutonic powers generally, and indeed to have practically exercised it, except in the case of the Franks.

The East-Gothic dominion was now again as great in extent, and far more splendid, than it could have been in the time of Ermanaric. But it was now of a whoily dif- ferent character. The dominion of Theodoric was not @ barbarian but a civilized power. His twofold position ran through everything. He was at once national king of the Goths, and successor, though without any imperial titles, of the Roman emperors of the West. The two nations, dif- fering in manners, language, and religion, lived side by side on the soil of Italy; each was ruled according to its own law, by the prince who was, in his two separate characters, the common sovereign of both. The picture of Theodoric's rule is drawn for us in the state papers drawn up In his name and in the names of his successors by his Roman minister Cassiodorus. The Goths seem to have been thick on the ground in northern Italy ; in the south they formed little more than garrisons. In Theodoric's theory the Goth was the armed protector of the peaceful Roman ; the Gothic king had the toil of government, while the Roman consul had the honour. All the forms of the Roman administration went on, and the Roman polity and Roman culture had great influence on the Goths themselves. The

rule of the prince over two distinct nations in the same land was necessarily despotic; the old Teutonic freedom was necessarily lost. Such a system as that which Theodoric established needed a Theodoric to carry it on. It broke in pieces after his death.

On the death of Theodoric (526) the East and West Goths were again separated. The few instances in which they are found acting together after this time are as scattered and incidental as they were before. Amalaric succeeded to the West-Gothic kingdom in Spain and Septimania. Provence was added to the dominion of the new East-Gothic king Athalaric, the grandson of Theodoric through his daughter Amalasontha, The weakness of the East-Gothic position in Italy now showed itself. The long wars of Justinian's reign (535-555) recovered Italy for the empire, and the Gothic name died out on Italian soil The chance of forming a national state in Italy by the union of Roman and Teutonic elements, such as those which arose in Gaul, in Spain, and in parts of Italy under Lombard rule, was thus lost. The East-Gothic kingdom was destroyed before Goths and Italians had at all mingled together. The war of course made the distinction stronger ; under the kings who were chosen for the purposes of the war national Gothic feel-

ing had revived. The Goths were now again, if not a wander-

ing people, yet an armed host, no longer the protectors but the enemies of the Roman people of Italy. The East-Gothic dominion and the East-Gothic name wholly passed away. The nation had followed Theodoric. It is only once or twice after his expedition that we hear of Goths, or even of Gothic leaders, in the eastern provinces. From the soil of Italy the nation passed away almost without a trace, while the next Teutonic conquerors stamped their name on the two ends of the land, one of which keeps it to this day.

The West-Gothic kingdom lasted much longer, and came much uearer to establishing itself as a national power in the lands which it took in. But the difference of race and faith between the Arian Goths and the Catholic Romans of Gaul and Spain influenced the history of the West-Gothic kingdom for a long time. The Arian Goths ruled over Catholic subjects, and were surrounded by Catholic neighbours. The Franks were Catholics from their first conversion; the Suevi became Catholics much earlier than the Goths. The African conquests of Belisarius gave the Goths of Spain, instead

of the Arian Vandals, another Catholic neighbour in the form of the restored Roman power. The Catholics everywhere preferred either Roman, Suevian, or Frankish rule to that of the heretical Goths ; even the unconquerable mountaineers of Cantabria seem for a while to have received a Frankish governor. In some other mountain districts the Roman inhabitants long maintained their independence, and in 534 a large part of the south of Spain, including the great cities of Cadiz, Cordova, Seville, and New Carthage, was, with the good will of its Roman inhabitants, reunited to the empire, which kept some peints on the coast as late as 624. That is to say, the same work which the empire was carrying on in Italy against the East-Goths was at the same moment carried on in Spain against the West-Goths. But in Italy the whole land was for a while won back, and the Gothic power passed away for ever. In Spain the Gothic power outlived the Roman power, but it outlived it only by itself becoming in some measure Roman. The greatest period of the Gothic power as such was in the reign of Leovigild (567-586). He reunited the Gaulish and Spanish parts of the kingdom which had been parted for a moment; he united the Suevian dominion to his own; he overcame some of the independent districts, and won back part of the recovered Roman province in southern Spain. He further established the power of the crown over the Gothic nobles, who were beginning to grow into territorial lords,

The next reign, that of his son Recared (586-601), was marked by a change which took away the great hindrance which had thus far stood in the way of any national union between Goths and Romans, The king and the greater part of the Gothic people embraced the Catholic faith. A vast degree of influence now fell into the hands of the Catholic bisbops ; the two nations began to unite; the Goths were gradually Romanized, and the Gothic language began to go out of use. In short, the Romance nation and the Romance speech of Spain began to be formed, The Goths supplied the Teutonic infusion into the Roman mass, The king- dom, however, still remained a Gothic kingdom. “Gothic,” not “Roman” or “Spanish,” is its formal title ; only a single late instance of the use of the formula “regnum Hispanic” is known, In the first half of the 7th century that name became for the first time geographically applicable by the conquest of the still

Roman coast of soutliern Spain. The empire was then engaged in the great struggle with the Avars aud Persians, and, now that the Gothic kings were Catholic, the great objection to their rule on the part of the Roman inhabitants was taken away. The Gothic nobility still remained a distinct class, and held, along with the Catholic prelacy, the right of choosing the king. Union with the Catholic Church was accompanied by the introduction of the ecclesiastical ceremony of anointing, a change de- cidedly favourable to elective rule. The growth of those later ideas which tended again to favour the hereditary doc- trine had not time to grow up in Spain before the Maho- metan conquest (711). The West-Gothic crown therefore remained elective till the end, The modern Spanish nation is the growth of the long struggle with the Mussulmans ; but it has a direct connexion with the West-Gothic king- dom. We see at once that the Goths hold altogether a different place in Spanish memory from that which they hold in Italian memory. In Italy the Goth was but a momentary invader and ruler; the Teutonic element in Italy comes from other sources. In Spain the Goth sup- Plies an important element in the modern nation, And that element has been neither forgotten nor despised. Part of the unconquered region of northern Spain, the land of Asturia, kept for a while the name of Gothia, as did the Gothic possessions in Gaul and in Crim. The name of the people who played so great a part in all southern Europe, and whio actually ruled over so large a part of it, has now wholly passed away; but it is in Spain that its historical impress is to be looked for.

Of Gothic literature in the Gothic language we have the Bible of Ulfila, and some other religious writings and frag- ments (see notice of Gothic Language below). Of Gothic legislation in Latin, we have the edict of Theodoric of the year 500, lately edited by Bluhme in the Monwmenta Ger- manic Historica; and the books of Varice of Cassiodorus may pass as a collection of the state papers of Theodoric and his immediate successors. Among the West-Goths written Jaws had already been put forth by Huric (466-484), The second Alaric (484-507) put forth a Breviarium of Roman law for his Roman subjects; but the great collection of West- Gothic laws dates from the later days of the monarchy, being put forth by King Rekisvinth about 654. This code gave occasion to some well-known comments by Mont- esquieu and Gibbon, and have been discussed by Savigny (Geschichte des Rémischen Rechts, ii, 65) and various other

writers. They are printed in the old collections of Linden- brog and Heineccius. They do not seem to have been yet reprinted in the Monumenta Germanic, Of special Gothic histories, besides that of Jordanis, already so often quoted, there is the Gothic history of Isidor, archbishop of Seville, @ special source of the history of the West-Gothic kings down to Siunthala (621-631). But all the Latin and . Greek writers contemporary with the days of Gothic pre-

dominance make their constant contributions. Not for special facts, but for a general estimate, no writer is more instructive than Salvian of Marseilles in the 5th century, whose work De Gubernatione Dei is full of passages con-trasting the vices of the Romans with the virtues of the barbarians, especially of the Goths. In all such pictures we must allow a good deal for exaggeration both ways, but there must be a ground-work of truth, The chief virtues which the Catholic presbyter praises in the Arian Goths are their chastity, their piety according to their own creed, their tolerance towards the Catholics under their rule, and their general good treatment of their Roman subjects. He even ventures to hope that such good people may be saved, notwithstanding their heresy. All this must have had some ground-work of truth in the 5th century, but it is not very wonderful if the later West-Goths of Spain had a good deal fallen away from the doubtless somewhat ideal picture of Salvian.

Of modern writers dealing specially with Gothic history may be mentioned Manso (Geschichte des Ost-Gothischen Reiches in Italien, Breslau, 1824); Aschbach (Geschichte der Westgothen, Frankfort, 1827); Képke (Die Anfinge des Kénigsthwms bet den Gothen, Berlin, 1854; Dahn (Die Kénige der Germanen, Munich and Wiirzburg, 1861-1871); Pallmann (Geschichte der Vo blkerwanderung, Gotha and Weimar, 1863-1864). It is hard to find any work in English dealing specially with Gothic history, though much may be learned from writers like Gibbon and Milman, who deal with the Goths simply as part of some larger subject. Several chapters in the third book of Milman’s History of Latin Christianity are of special importance in this way. (E. A. F.)

Gotuic LANGUAGE.

By this name, which may be taken generally as denoting the idioms of the various divisions of the Gothic nation, is more particularly meant the language exhibited in certain fragments of a translation of the Bible and other minor documents, which, although preserved in manuscripts not dating farther back than perhaps the 5th century, and clearly written in Italy during the rule of the East-Goths, are commonly assumed to have originated among the West- Goths at the time when they were seated in Mcesia, and to be therefore older by at least a century than the manu- scripts themselves. that the more distinctive name of Mesogothic language is often used, in England and elsewhere, as well as the simpler Gothic. The latter name, however, seems to be more appro- priate, in spite of the great probability of the assumption referred to,—since it is, for obvious reasons, utterly impos- sible to prove that the language of the West-Goths at that time differed from that of the East-Goths, or, even if there was any difference, to show that our manuscripts represent the original forms of the speech of their supposed West- Gothicauthor. Indeed, according to a fragment of a Gothic calendar preserved in one of the Milan manuscripts, which gives the name of the Gothic people as G'ut-thiuda! (thiuda, "people "), the most correct form of the name would be Gotic. This spelling at least has obviously greater claims to authenticity than Gothi, Gotthi, or T'orOo1, and other similar forms most commonly (although not exclusively) used by Latin and Greek writers, whose want of familiarity with the sounds of the Gothic language is often abundantly manifest. From G'ut-thiuda we may infer with certainty that the Goths called themselves Gutds, the corresponding adjective being gutisks.

We have no direct evidence of the character of the Gothic language until the time of the above-mentioned manuscripts ; but some conclusions regarding a more archaic state of the

4 The same form of the name seems to occur a second time in the Runic inscription of the Bucharest ring, Gut-anném hailag, "dedicated to the Goths' treasure.'' Cf. H. F. Massmann, in Pfeiffer's Germania (Vienna, 1857), ii. p. 209 sg.; and Ludvy. Wimmer, Aarbiger for nordisk Oldkyndighed og Historie (Copenhagen, 1867), p. 45.

It is chiefly due to this assumption.

language may be drawn from a careful examination of the numerous words borrowed from Gothic at a much earlier period by some of the Finnish tribes originally dwelling in the interior of Russia.2 It may be safely assumed that some at least of these words still retain forms of the Gothic language from as early a period as perhaps the Ist or 2d century B.c. By the same date the Goths, as well as the other Teutonic nations, were no doubt already in possession of the Runic alphabet, an adaptation of a parti- cular form of the Latin characters to their special wants and uses.2 No traces of this alphabet, however, have been left, except the already mentioned short inscription of the Bucharest ring, a list of the Gothic names of these runes, preserved in a Vienna manuscript of the 9th century,* and some letters in Ulfila's Gothic alphabet, which soon sup- planted the less convenient Runic characters, and so helped to inaugurate the short literary period of the Gothic language so closely connected with the name of that prelate.

Ulfila, or rather Vulfila (310-380 a.p., see ULrFiua), was a man of the most profound learning. He not only invented, as has been said, a new alphabet for his literary purposes, but was also able to preach and to write in Latin and Greek as well as in his native Gothic language, and he is reported to have left behind him a great number of tracts and translations in these three idioms. The principal work of his life, however, was his translation of the Bible, parts of which seem to have reached us in the famous Codex Argenteus, now at Upsala, and in several minor fragments at Wolfenbiittel (Codex Carolinus) and Milan (Codices Ambrosiani, including some leaves now kept at Rome and Turin). In this way we possess the greater part of the gospels, considerable portions of the epistles, and a few fragments of the Old Testament ; there is also a fragment of a commentary on St John's gospel, commonly called Sketreins (or explanation"), and the fragment of a calendar which has been already mentioned as containing the ori- ginal form of the name of the Gothic people. As to the authorship of the last two fragments nothing can be said with certainty; and certain differences in language and manner of translation make it doubtful even whether the fragments of the Old Testament can be traced to the same origin as those of the New. The bulk of the whole, how- ever, may safely be ascribed to Ulfila, for it can hardly be assumed that the same work would have been

done twice over in so short a space of time as that lying between the days of Ulfila and the date of our manuscripts. The whole character of the translation too seems to indicate a man of Ulfila's mental power and theological learning. Although it cannot be denied that several alterations of the original have been introduced into our texts at a later time, it is certain both that the author carefully interpreted the Greek text (which was of course the fundamental source of his work), and also that he consulted, and in not a few places followed, the old Latin versions where his own ideas seemed to differ from those of his Greek authorities.®

As a specimen of the language, and of Ulfila's mode of translation, we may insert here his version of the Lord's prayer :— .

Atta unsar thu in himinam. Weihnai namo thein. Qimai thiudinassus theins. Wairthai wilja theins swe in himina jah ana

2 See Dr Wilh, Thomsen, Ueber den Kinfluss der Germanischen Sprachen auf die Finnisch-Lappischen (Halle, 1870).

3 See especially Dr Ludv. Wimmer, Runeskriftens Oprindelse og Udvikling i Norden, Copenhagen, 1874.

4 J. Zacher, Das Gothische Alphabet Vulfilas und das Runen- alphabet, Leipsic, 1855.

5 A few Gothic words and names occur among the subscriptions to two Latin charters, one of which is now preserved at Naples; the other, formerly kept at Arezzo, is now lost. ;

6 For fuller particulars see the two principal editions of the Gothic texts by V. d. Gabelentz und Loebe (8 vols., Altenburg and Leipsic, 1843-76), and by E, Bernhardt (Halle, 1875).

GO TF iis

airthai. Hlaif unsarana thana sinteinan gif uns himma daga. Jah aflet uns thatei skulans sijaima, swaswe jah weis afletam thaim skulam unsaraim, Jah ni briggais uns in fraistubnjai, ak lausais uns af thamma ubilin.

The Gothic language did not very long survive the times of Ulfila, From Mecesia, where it had gained its highest literary culture, it disappeared together with the Goths, when they were driven from these parts by later migrations. In the western portions of Europe, that is, in Italy, France, and Spain, whither it had been carried by the emigrants, the Gothic language seems to have died out even sooner than the Gothic nationality, giving way to the overpowering influence of Latin, and leaving behind it only a few indis- tinct relics in some proper names and other words that had been received into that victorious language. It was only in a remote spot of the Crimea that it continued to exist until the 16th century, when the last remains of a Gothic people were detected, and a few specimens of their language were gathered by Augerius de Busbeck, a Dutch traveller, who visited the eastern parts of Europe in the years 1554-1564.1

It is well known that the literary remains of Gothic are (with the exception, perhaps, of a few Runic inscriptions belonging to the Scandinavian languages) by several centuries the oldest specimens of Teutonic speech, and therefore have a particular value for the student of the history of that family of languages. Notwithstand- ing this fact, it would be altogether wrong to regard Gothic as the common source of the more modern stages of these idioms. Although very archaic in many of its forms and sounds, it is in these still far removed from the original features of the common language, as that was spoken before any separation of Teutonic tribes had taken place. Most nearly related to it seem to have been the Scandinavian languages, which are now generally assumed to have formed, together with Gothic, the so-called eastern branch? of the Teutonic family, while English, Frisian, and Low and High German belonged to a western division. The latter is chiefly marked by the introduction of a considerable number of forms and sounds of a less archaic pee while the eastern idioms are found to have adhered more closely to the original forms. Thus, almost the only distinct inno- vation in the sound-system of the eastern branch is the insertion of ag sound into the groups uw, auw, ww in accented syllables, as in Gothic triggws, Old Norse tryggr, compared with Old High Ger- man and Old Saxon ¢riuwi, Old English treowe, trywe, “true” ; or Old Norse héggva, to hew, Old High German and Old Saxon hauwan, Old English heawan. Western Teutonic, on the other hand, is at once discernible by its doubling all single consonants ending a short root-syllable before y (w, 7, 1); thus

Old English thecean, Old Saxon thekkian, Old High German deeken, to cover (literally ‘‘to thatch”), but Gothic thakjan, Old Norse thekja; or Old English sel/an, Old Saxon sellian, Old High German sellen, to sell, but Gothic saljan, Old Norse selja. As to the inflexional system, the accusative plural of nouns has in Western Teutonic been replaced by the nominative form, asin Old English dagas, Old Saxon dagos, Old High German tagda, days; Gothic still has dagés for the nominative, and dagans for the accusative, the Old Norse forms being dagar and daga respectively. The same change is found in the adjectives, as Old English and Old Saxon blinde, Old High German blinte, blind (ece?), corresponding to both Gothic blindai and blindans, Old Norse blindir and blinda. On the other hand, the formation of the plural of certain neutral substantives by adding an 7, asin Old English dombru, lambs, Old High German Tembir (still extant in the English plural ehdldren) is entirely lost in Eastern Teutonic (Gothic Jamba, Old Norse lémb). Another instance of change is to be seen in the loss of the dative case of the reflective pronoun (Gothic sis, Old Norse sér) in Western Teutonic, the corre- sponding forms of the personal pronoun of the 3d person being used instead (Old English him, hire, &c’) Western Teutonic has also introduced the use of the genitive forms of the same personal pronoun instead of the possessive pronoun (Gothic seins, Old Norse sinn) when the possessor is denoted by a feminine or a plural (Old English has gone even farther by dropping the possessive pro- noun altogether). In the verb, Western Teutonic has replaced the original form of the 2d person singular of the past indicative

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1 See his report and word-lists, reprinted by Massmann, in Zeit. schrift fiir Deutsches Alterthum, i. p. 845 seg. The words contained in these lists are not all intelligible, and some of them are clearly of Slavonic or Iranian origin, but others are decidedly Gothic as regards their form, thus schlipen, to sleep; criten, to weep; fyder, four; the correct Gothic forms being slépan, grétan, fidvor.

2H. Zimmer, “ Ostgermanen und Westgermanen,” in Zeitschrift fiir Deutsches Alterthum, xix. p. 393 sq.

ending in -¢ (asin Gothic and Old Norse wast, gaft, thou wert, gavest) by the corresponding form of the subjunctive (Old English were, gedfe, Old Saxon and Old High German wari, gabi). Western Teutonic has also lost the faculty of deriving passive or intransitive verbs from active verbs or adjectives by adding the syllable ~~na~~ after the root-syllable, as in Gothic Julinan, Old Norse fulina, to be filled, as compared with Gothic fulls, Old Norse Julir, full; or Gothic fulljan, Old Norse fylla, to fill. Only a very few instances of this formation are left in Western Teutonic, such as Old English weenan, to awaken [intrans.], or leornian, German lernen, to learn (¢f. Old English weecan, German wecken, to awaken [trans.], and German lehren, to teach). As to the vocabulary, we may mention the loss of the verb dén, to do, in Gothic and Scandi- navian. The most conspicuous peculiarity in the syntax is the frequent use of the dative (or perhaps originally the instrumental case) instead of the accusative in Eastern Teutonic.

Among the Teutonic languages Gothic holds by far the foremost rank as regards the regularity of its sound-system and its inflexions. The vowel system is remarkable for the absence of the short ¢ and 0 sounds, except in a few places where ¥and 8 (spelt az and au) occur under certain consonantal influences, Umlaut, or assimilation of root-vowels to a following a-, 4-, or u- sound, is not discernible in Gothic. Thus we find only five short vowels, a, (at), z, (au), 3 five long vowels d, @, % (spelt et), 6, &; and three diphthongs ai, au, and iw. There may have been other distinctions of vowel. qualities besides those expressed in spelling, but we have no means of definitely settling this question ; so much, however, can be said, that the long vowels, and especially 2 and 6, probably had the close sounds, since these are often interchanged with e¢ and wu in our manuscripts. The spelling of the consonantal system is also very simple. Besides y, w, r, 7 and three nasal sounds (the guttural nasal being expresssed by g after the Greek fashion), we find three voiceless stops, p, t, k (gq being only a combination of kw); three voiced stops, b, d, g; four voiceless spirants, 7, s, th, h; and only one distinct sign for a voiced spirant, 2. This system of spelling, however, is obviously insufficient to express all the sounds of the language, —an insufficiency partly due to the fact that the transcrip- tion of the Gothic speech-sounds was chiefly an imitation of the Greek graphic system, which, at least in Ulfila's time, had become rather imperfect, inasmuch as different sounds developed out of one sound of an earlier period were still

often expressed by the same sign (just as in the English orthography of the present day). It is highly probable, for instance, that the signs of b, d, g of the Gothic alphabet not only expressed the sounds of voiced stop consonants (medic), but also represented the sounds of voiced spirants, such as English » and soft th, or North German g after a vowel (these values being the only ones left to the Modern Greek signs B, ¥, 3). Hence the regular change of b, d final after a vowel into J, th, as in gaf, I gave, from giban, to give; or bath, I bade, from bidjan, to bid.'

Great regularity prevails also in the inflexional system. In the substantival and adjectival declensions the instrumental case has become extinct by an early confusion with the dative (the case commonly called dative being, in fact, a mixture of forms of the origina] dative and the instrumental and local cases), while in the Western branch of Teutonic it was stillin frequent use. At the same time, Gothic is the only Teutonic idiom that has still pre-served, in a few cases, the vocative in a form distinct from that of the nominative (fisks, fish, for instance, has jisk in the voc.). The adjectival declension is remarkable for the retention of special forms of the 7- and w-stems, which in all other Teutonic languages have been transferred to the inflexion of the ja- stems. In the pro- nominal inflexion the instrumental case has been kept distinct in a few instances, such as ¢hé, hvé (the latter form being the same as Eng- lish why). There are also some relics of the dual number left in the Ist and 2d personal pronouns, As for the verb, Gothic is quite unique in retaining the old formation of the passive voice by means of simple derivation (as in bairada, batranda, he is, they are borne, Greek pépera, pépovra:), the dual number of the Ist and 2d persons throughout the whole active voice (bairés, bairats, we, you two bear, in the indicative, or bairaiva, bairaits in the subjunctive, or béru, béruts, we, you two bore [ind.], and béreiva, bereits [subj.] along with the plural forms bairam, bairith, &c.), and the 3d person of the imperative (as bairadau, bairandau, he, they shall bear, Greck pepérw, pepdvrwv). The different verbal classes are of course the same as in the other cognate idioms; but they are kept more completely distinct in Gothic, for it is only there that the reduplication has been preserved intact in the past of the redupli- cative verbs, Gothic hathald, I held, for instance, corresponding to such shortened forms as Old Norse helt, Old English keold, Old Saxon held, and Old High German hélt, healt, hielt. Gothic again is the only language that seems to

give us a clue to the explanation of the formation of the past in weak verbs. There we find such

3 See W. Weingaertner, Die Aussprache des Gothischen (Leipsic, 1658) ; F. Dietrich, Ueber die Aussprache des Gothischen (Marburg, 1862) ; H. Paul, ‘* Zur Lautverschiebung,” in Bettrige zur Geschichte der Deutschen Sprache und Literatur, i, 147 sg. (Halle, 1874).

plural forms as hausi-dadum, we heard, while in Old Norse we have simple heyr-Sum, in Old English hier-don, &c. Now, this -dédwum would be exactly the corresponding form of the verb dén, to do (lost in Gothic, as mentioned above), so that hausi-dédwm must once have meant ‘‘ we did hear.”

Notwithstanding all these instances of great antiquity we must be on our guard against the assumption that Gothic in all its features bears the same archaic stamp. In fact, it often goes farther than the other cognate idioms in dropping short final vowels. There are no traces left of the short vowels originally ending a- or 7- stems in declension; thus, dags from daga-, day; haurn from horna-, horn; gasts from gasti-, guest; hugs from higi-, mind; but there are many instances of the preservation of these vowels in the other languages, such as dagar, horna, gastir in Old Scandinavian Runic inscriptions, or hyge in Old English, or hwgt in Old Saxon and Old High German.! Even the regularity of the inflexional system is often not archaic, but due to later assimilations of forms originally more distaut than in Gothic. The most striking instance of this is perhaps the loss, in the verbal system, of the so-called grammatical change, that is, the transferring of a voiceless spirant into a voiced spirant after a syllable unaccented in the earliest time before the general Teutonic rule of fixing the accent on the root-syllables had come into use.? This change (still dis- cernible in such English forms as IJ was, we were) was fully de- veloped in all other cognate idioms, as for instance in Old English, of. tc woes, we weeron, oY ceosan, to choose, te ceas, we curon, gecorei, &e., these forms standing for was, wézim, &e. Gothic has given up the voiced sound altogether, forming simply was, wéswm, or kiusan, kaus, kusum, gokusans. It is only in some isolated words (such as fadar and brdthar, corresponding to Sanskrit pitdr

and bhraiar), and some derivatives that even traces of this fundamental rule are now to be found in the Gothic language. (E. SI.)

GOTTFRIED. Meister Gottfried of Strasburg, the most brilliant German poet of the Middle Ages, flourished about the end of the 12th and beginning of the 13th century. Of his life and position we have no certain in- formation, for he has told us next to nothing about him- self, and contemporary records are dubious and confusing. It would seem, however, that he was a man of good birth and position, who filled an important municipal office in his native town of Strasburg. His chief work was written about 1210, and we may confidently place his death between 1210 and 1220. We know from his writings that he was a man of high culture, but it is almost certain that he was not a priest. Of this his occasional sneers at the clergy are perhaps a better proof than the dubious morality of much of his work. Gottfried wrote one great poem, Tristan und Isolt. The story is of Celtic origin ; it came frst from Britain and Ireland, thence was carried to France, and thence to Germany. Few stories have been so often treated or have had so wide an influence upon literature. A very few words will suffice to give Gottfried's version of it) King Mark of Cornwall has a nephew named Tristan, whom he sends to woo vicariously, and bring home as queen of Cornwall, the beautiful Isolt, princess of Ireland. The young man goes on his mission, is suc- cessful, and sets out with Isolt on the homeward journey. Before they reach Cornwall, however, they unfortunately drink a love potion which Isolt's mother had intended to be given to her daughter by the king of Cornwall. The con- sequence of the mistake is that the young people fall madly and hopelessly in love with one another. The wild force of their passion soon causes them to disregard morality and prudence alike, and the bulk of the poem is devoted to an account of the numerous complications which in time arose. Ofcourse the king soon becomes suspicious, and at last his suspicions become certainties. Tristan withdraws to Nor- mandy, and enters into an alliance with a princess of the land, whose very name—lsolt, the white-handed—has a strange charm for him. But he finds that he really cares

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1 B, Sievers, in Beitrdge zur Geschichte der Deutschen Sprache und Literatur, v. 101 sq. (Halle, 1878).

2 W. Braune, “ Ueber den grammatischen Wechsel,’ in Beitrige, &c., i. 513 sg.; K. Verner, “ Ueber eine Ausnahme der ersten Laut- verschiebung,” in Zeitschrift fir vergieichende Sprachwissenschaft, xxiii. 97 sq. (Berlin, 1877).

nothing for this new Isolt; the memory of his old love rises powerfully in his soul; and he gives utterances to his doubts and perplexities in a soliloquy, with which the poem abruptly concludes.

Tristan is thus an unfinished work; stillit is a tolerably long one, as it consists of 19,552 short rhymed lines, The style is highly finished. There is’ an artistic choice of fit words, a frequent use of antithesis and word-play, and a skilful management of the versification. But these are, of course, only side matters. The permanent interest of the poem consists in its representation of human passion, and in the knowledge it shows of the human heart. The plain rude story, when told by Gottfried, takes a depth od pathos that are hardly its own. All is described, too, with such clear, bright touches, and such vivid force, that the poem seems somehow a tale of our own time. Its morality indeed is not high; but this objection did not probably occur to those who first read it. If we judge it by a purely art standard, we must pronounce it worthy of an important place in the literature of Europe. Tristan was not allowed to remain a fragment. Ulrich von Tiirheim (about 1236) and Heinrich von Freiberg (about 1270) both wrote continuations and conclusions of the work, which certainly fell far short of the original.

Of Gottfried’s other writings, only some lyrics in the ordinary style of the minnesingers remain to us. Two longer poems, entitled Lobgesang auf die Jungfrau Maria and Gedicht von der Armuth, were long attributed to him, but recent criticism has conclusively proved that they are the work of others. ,Gottfried’s influence on German literature was very great, and a proof of this is the number of poets who treated the same subject after the plan he had laid down. All these, from Hans Sachs (1494-1576) to Immermann (1796-1840), may fairly be claimed as his followers.

The chief editions of Gottfried's Tristan are those of Fr. Heinrich y. d. Hagen (a complete edition, with the continuations, Bresl., 1823), Groote (Berlin, 1821), Massmann (Leip., 1848), and Bechstein

(containing a very able and complete introduction, 2d ed., 2 vols., Leip., 1873). See also the translations into modern German, with continuations, &., by Herm. Kurz (Stuttg,, 1844, 3d ed., 1877), and Karl Simrock (2d ed., Leip., 1875). For what is known of the life of Gottfried see Kurz's 'Zum Leben Gottfried von Strassburg i (in the Augsburg. Allgemeine Zeitung for 1868, and Germania, 15 Jahrgang); and as to the sources of the story, Franck's Tristan et Isowll (Paris, 1865), and F, Compart, Die Sagemiberlicfer- angen in den Tristan-Hpen Hilharts von Oberge und Gottfrieds von Strassburg (Gustrow, 1876).

GOTTINGEN, the chief town of a circle of the same name in the land-drostei of Hildesheim and province of Hanover, Prussia, is pleasantly situated at the foot of the Hainberg in the fertile valley of the Leine, about 67 miles to the south of Hanover, on the Hanover and Cassel railway. It is traversed by the Leine, which separates the Altstadt from the Neustadt and Masch; and it is surrounded by ramparts which are planted with lime trees and form an agreeable promenade. 'The streets in the older part of the town are for the most part crooked and narrow, but the newer portions are spaciously and regularly built. Apart from the churches and the numerous university buildings, it has few structures of any public importance. There are several thriving industries, including, besides the various branches of the publishing trade, the manufacture of woollen and cotton goods, and of physical and mathema- tical instruments. The university, the famous Georgia Augusta, founded by George II. in 1734, and opened in 1737, rapidly attained a leading position, and in the year 1823 its students numbered 1547. Political disturbances, in which both professors and students were implicated, lowered the attendance to 860 in 1834; and the expulsion of the famous seven professors (Albrecht, Dahlmann, Ewald, Gervinus, Weber, and the brothers Grimm) in 1837 atill

further reduced its prosperity. The events of 1848, on the other hand, told somewhat in its favour; and since the annexation of Hanover in 1866 it has been carefully cherished by the Prussian Government, In the winter session 1877-78, its students numbered 909, and the teach- ing staff 124,—its numerical strength thus entitling it to rank as the eighth on the list of German universities. The present professoriate includes, among other distinguished names, those of Benfey, Lagarde, Lotze, Ritschl, and Weber. Amongst those who have been teachers within its walls may be mentioned, besides the seven already named, Haller, Gesner, Gatterer, Sprengel, Heyne, Blumenbach, Herbart, Heeren, O. Miiller, K, F. Hermann, and Eichhorn,

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Plan of Gottingen.

1. Observatory.

2. Chemical Labora- tory.

8. Reading Room.

4, Catholic Church.

10. St James's Chureh. 11. Lecture Rooms,

12. Reformed Church. 13. Synagogue.

14, Library and Museum.

Neander, Ewald, and the distinguished chemist Bunsen, it may be added, were natives of Gottingen. The university library contains upwards of 500,000 printed volumes and 5000 manuscripts. There is a good chemical laboratory, as well as adequate zoological, ethnographical, and minera- logical collections, the most remarkable being Blumenbach's famous collection of skulls. The other establishments more or less connected with the university, such as the observatory, botanical garden, and various hospitals, do not call for special notice. The Gesellschaft der Wis-

senschaften publishes the long-established and well known Gottingische Gelehrte Anzeigen. The population in 1875 uumbered 17,057.

The earliest mention of a village of Goding or Gutingi occurs in documents of about 950 a.p. The place received municipal rights from the emperor Otho IV. about 1210, and from 1286 to 1463 it was the seat of the princely house of Braunschweig-Géttingen. During this period it held a high place among the towns of the Hanseatic League. In 1531 it joined the Reformation movement, aud in the following century it suffered considerably by the Thirty Years' War, having been taken by Tilly in 1626, after a siege of 25 days, and recaptured by the Swedes in 1632. After a century of decay, it was anew brought into importance by the establishment of its university; and a marked increase in its industrial and com- mercial prosperity has again taken place in recent years.

See Schmidt, Urkundenbuch der Stadt Gottingen 1400-1500 (1867); Piitter, Versuch einer akademischen Gelehriengeschichte der Universitat Gottingen (1765-88), continued by Saalfeld (1820) and by Oesterley (1838); Unger, Géttingen und 'die Georgia Augusta,

1872.

6, St John's Church. 7. Townhouse.

8. Gymnasium.

9. University.

5. University Church.

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GOTTISCHALK, or GorescHatcus, surnamed Fut- GENTIUS, a prominent figure in one of the most important theological controversies of the 9th century, was the son of Berno, a Saxon count, and, having been devoted (oblatus) from infancy by his parents to the monastic life, was trained at the monastery of Fulda, during the abbacy of Hrabanus Maurus, and while Walafridus Strabus was a member of the fraternity. At the approach of

manhood he made strenuous efforts to be released fron his vows 5 and he actually succeeded in obtaining from a synod held at Mainz in 829 the necessary dispensation; but through the hostile influence of his abbot this was afterwards cancelled by Louis the Pious, though as a slight mitigation of the harshness of this treatment he was permitted to remove to the monastery of Orbais, in the diocese of Soissons. Here he devoted himself to ardent study of the writings of Augustine, with the result that he became an enthusiastic believer in the doctrine of absolute predestination, in one point going even beyond his master—Gottschalk believing in a predestination to condemnation as well as in a predes- tination to salvation, while Augustine had contented him- self with a doctrine of preterition as complementary to his doctrine of election. While returning froma pilgriniage to Rome in the year 847, Gottschalk, happening to pass a night at a hospice in Friuli, came into contact with N otting, the newly elected bishop of Verona, and expounded to him his peculiar views. The bishop, apparently without saying much at the time, carried word to Hrabanus Maurus, who, meanwhile, had become archbishop of Mainz; the latter lost no time in issuing two letters, one to his informant and another to Count Eberhard of Friuli, in both which he denounced the opinions of Gottschalk with some reckless- ness and great violence. On the one hand, he accused his adversary of neglecting the distinction between foreknow- ledge and foreordination ; on the other hand, he himself refused to recognize any difference between predestination to punishment and predestination to sin. At asynod held in Mainz in presence of the emperor in 848, Gottschalk presented himself with a written explanation and defence of his views; he was, however, very summarily found guilty of heresy, and handed over to his ecclesiastical superior, Hincmar of Rheims, to be dealt with as hig crime might deserve. Having again assumed the defensive in an assembly at Chiersy in 849, he was once more condemned, —on this occasion not only as a heretic, but also as a de- spiser of authority, and as a disturber of the church's peace, ~and sentenced to be whipped severely and rigorously imprisoned (durissimis verberibus castigari et secundum ecclesiasticas regulas ergastulo retrudi). The place selected for his captivity was the monastery of Hautvilliers in the diocese of Rheims, and here he languished throughout the remainder of his life, a period of twenty years, notwithstand ing the efforts of influential friends and his own pitiful appeals. Prudentius of Troyes, Wenilo of Sens, and Florus of Lyons successively expressed

opinions more or less in favour of his views ; nor did Hincmar derive much real aid from the dialectical skill of Erigena, whom he had called in as an authority on the other side. Various synods met, reached widely discrepant opinions on the burning question, and ultimately postponed its settlement to a future counctl in less troubled times, The summons of Pope Nicholas I., in 869, calling Hincmar to account for his harsh conduct, unfortunately never took effect ; and the result was that, after many renewed attempts at conviction and persuasion on the part of Gottschalk—he even proposed to settle the question by ordeal of fire—he was suffered to die unheeded in 868, and, by orders of his inhuman adversary, was buried in unconsecrated ground. It may be added that Gottschalk

had attempted to establish a counter charge of heresy

against Hincmar, on account of the latter's substitution

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of "Sancta Deitas " for " Trina Deitas" in a current hymn. This was thought to savour of Sabellianism; but the ortho- dox archbishop succeeded at once in purging himself from such an imputation of heretical pravity.

The story of Gottschalk has been told with great fulness by Neander and Gieseler. See also Gfrirer's Untersuchung tber.Alter, Ursprung, und Zweck der Dekretalen des falschen Isidorus, 1848.

GOTTSCHED, Jouann. Curistora (1700-1766), a German author and critic of considerable influence in his own time, was born, 2d February 1700, at J udithenkirch, near Konigsberg. ~~He studied philosophy and literature at Konigsberg, was appointed professor, first of poetry (1730), afterwards of logic and metaphysics (1734), at Leipsic, filled various other important offices in connexion with the university, and died 12th December 1766. His chief works were a tragedy entitled Der sterbende Cato (Leipsic, 1732) — poor enough rubbish, though it had great but short~~ lived popularity; Deutsche Schaubtihne (1740-45), a col- lection of plays, some of which were written by himself, his wife, J. C. Schlegel, and their friends, whilst others were translated from the French classical dramatists q Nothiger Vorrath zur Gesichte der deutschen dramatischen Dichtkunst (1757-1765),

intended to contain an account of all previous German plays. Though not complete, the last is a very valuable and important work. Besides these, Gottsched wrote a number of educational works, and edited several journals devoted to literary criticism. He was a pedant, but there is no doubt that he did good and lasting service to German literature. When he began to write, the stage was occupied by plays in which extra- vagant rant did duty for eloquence, coarse vulgarity for wit, and the wildest improbabilities for inventive incident. In the writings of the second Silesian school the utmost extent of absurdity was reached. Gottsched set his face against such productions. He enunciated rules by which the playwright must be bound; he insisted on the observance of the dramatic unities, and pointed to the French drama as the best possible model for the German stage ; moreover,

herself an authoress of reputation,

his criticism did much to regulate and purify the German language. Unfortunately he went too far. He placed himself in opposition to the Swiss writers Bodmer and Breitinger, who were bringing before the German public several of the great English writers, more especially Milton ; he refused to recognize the rising genius of Klopstock and Lessing, and still went on enunciating rules when the time for that was past, and praising mediocre writers as if they had been great geniuses. So it came to pass that his in- fluence speedily declined, and that before his death lis name became almost proverbial for pedantic folly. Of all lots his was the hardest, for he outlived his own reputa- tion, . His wife, Luise Adelgunde Victorie Kulmus (1713- 1762), was his faithful helper in his literary labours, and Among other works she translated the Spectator (9 vols., 1739-43) and Pope's Rape of the Lock (1744, new ed. 1772). After her death her husband edited her Gedichte, with a memoir (1763), See Danzel's Gottsched und seine Zeit, Leipsic, 1848.

GOTZ, Jonann Nixonavs (1721-1 781), a minor German poet, born at Worms, 9th July 1721, studied theology at Halle (1739-1742), where he became intimate with Gleim and Uz, acted for some years as military chaplain, and afterwards filled various other ecclestiastical offices. He died at Winterberg, 4th November 1781. The writings of Gotz consist of a

number of short lyrics and several trans- lations, of which the best is a rendering of Anacreon. His original compositions are light, lively, and sparkling, and are animated rather by French wit than by German depth of sentiment. They give easy expression to some un- expected whim or conceit, and, though utterly destitute of depth or force, are yet very pretty specimens of elegant trifling. Of that sort of work it would be difficult to find more favourable examples than Thamire an die Rosen and An eine Romansleserin. See Gotz's collected works, with biography by Ramler (Mannheim, 1785, new ed., 1807) ; also J. H. Voss, Briefe tiber Gotz und Ramler (Mannheim,

1809).

END OF VOLUME TENTH.

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PLATES, VOL. X.—DIRECTIONS To BINDER.

When insertion throughout the text is desired, the Plates to be placed opposite

the following pages :—

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- r t Matt. WWebb, det ENCYCLOPADIA BRITANNICA, NINTH EDITION

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The story of Gottschalk has been told with great fulness by Neander and Gieseler. See also Gfrorer’s Untersuchung tiber. Alter, Ursprung, und Zweck der Dekretalen des falschen Isidorus, 1848.

GOTTSCHED, Jowann CuristopH (1700-1766), a German author and critic of considerable influence in his own time, was born, 2d February 1700, at Judithenkirch, near Konigsberg. ~~He studied philosophy and literature at Konigsberg, was appointed professor, first of poetry (1730), afterwards of logic and metaphysics (1734), at Leipsic, filled various other important offices in connexion with the university, and died 12th December 1766, His chief works were a tragedy entitled Der sterbende Cato (Leipsic, 1732) — poor enough rubbish, though it had great but short~~ lived popularity; Deutsche Schaubiihne (1740-45), a col-

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language. Unfortunately he went too far. He placed himself in opposition to the Swiss writers Bodmer aud Breitinger, who were bringing before the

German public several of the great English writers, more especially Milton ; he refused to recognize the rising genius of Klopstock and Lessing, and still went on enunciating rules when the time for that was past, and praising mediocre writers as if they had been great geniuses. So it came to pass that his in- fluence speedily declined, and that before his death lis name became almost proverbial for pedantic folly. Of all lots his was the hardest, for he outlived his own reputa- tion. . His wife, Luise Adelgunde Victorie Kulmus (1713- 1762), was his faithful helper in his literary labours, and

herself an authoress of reputation. Among other works

she translated the Spectator (9 vols, 1739-43) and Pope's Rape of the Lock (1744, new ed. 1772). After her death her husband edited her Gedichte, with a memoir (1763).

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ENCYCLOPADIA

BRITANNICA.

GOU—-GOU

OUDA, or Ter GouweE, a town of the Netherlands in

the province of South Holland, at the confluence of

the Gouw with the Yssel, 12 miles N.E. of Rotterdam, at the junction of the railway from that city with the line between the Hague and Utrecht. The town is for the most part laid out in an open and lightsome manner, and like the other towns of Holland is intersected by numerous canals. Portions of

the old fortifications are changed into promen- ades, and the suburban quarters, Fluweelensingel, Bleekers- singel, Kattensingel, and Turfsingel, are adorned with fine trees. The Groote Markt is the largest market square in Holland. Among the churches—five of which are Pro- testant, two Roman Catholic, and one Old Catholic—the first place belongs to the church of St John (Janskerk), a building of the 16th century, which replaced an earlier structure of the 15th, and which is not only remarkable for its dimensions, 345 feet in length and 150 feet broad, but possesses a celebrated organ, and a series of splendid painted windows, several of which are the workmanship of Dirk and Wouter Krabeth (1555-1603). (Compare Zx- planation of the Famous and Renowned Glass Work, &c., Gouda, 1876, reprinted from an older volume, 1718.) Of the other public buildings it is sufficient to mention the town-house, with a fine Gothic fagade, founded in 1449, but rebuilt in 1690, the weigh-house, the house of correction for women, the gymnasium, St Catherine's hospital, and the music hall. A public library containing many rare and valuable works is kept in St John's church, and a muni- cipal museum of antiquities was opened in 1874. In the time of the counts the wealth of Gouda was mainly derived from brewing and cloth weaving: about 1510, for example, the breweries numbered 156, and upwards of 1000 pieces of cloth were made in the course of the year; but at a later date the niaking of tobacco pipes became the staple trade, and in the middle of the 18th century gave employment to 3000 men. Though this industry has in turn declined, Gouda still possesses large pipe works and potteries; and among its other establishments are a celebrated manufactory of stearine candles, a yarn factory, an oil refinery, and cigar factories. It has also a good transit and shipping trade, and its market for cheese has made its name widely known throughout Europe. The population of the commune was, in 1796, 11,715; in 1830, 14,878; in 1850, 13,788 ; in

1860, 14,843 ; and in 1870, after a slight addition of area, 16,233, At the last date the town proper numbered 15,174 inhabitants. The greater proportion belong to the Dutch Reformed Church, but nearly 5000 are Roman Catholics. Gouda received its constitution as a town from Count Floris V. in 1272. In 1382 it had only 820 houses ; but it rapidly increased, and in the 14th century it was the fifth in size of the towns of Holland. The rise of Amsterdam made it only the sixth; but it retained this position till the revolution of 1795. The principal facts in its history are the attack by the

people of Utrecht in 1488; the repulse of the Spaniards in 1574; the de- struction of the castle of the lords of Gouda in 1577; the voluntary flooding of the surrounding country as a defence against the French in 1672; the great inundation of November 1775 ; and the riots of 1787.

GOUDIMEL, Cravupz, composer of the 16th century, must be named amongst the founders of modern music. The French and the Belgians claim him as their country- man, and the place of his birth is not sufficiently established. In all probability, however, he was born at Vaison near Avignon, about the year 1510. As to his early education we know little or nothing, but the excellent Latin in which some of his letters were written prove that, in addition to his musical knowledge, he also acquired a good classical training. In 1540 we find him established in Rome at the head of a music-school, and here, amongst many other cele- brated musicians, Palestrina, the greatest master of the early Italian school, and one of the greatest masters of all schools, was amongst his pupils. About the middle of the century he seems to have left Rome for Paris, where, in con- junction with Jean Duchemin, he published, in 1555, a setting of Horace's Odes, entitled, Horatii Flacet ode omnes quotquot carminum generibus diferunt ad rhythmos musicos redacte. Infinitely more important is another collection of vocal pieces, a setting of the celebrated French version of the Psalms by Marot and Beza (Les Psaumes de Danid, mis en rime Francaise par Clement Marot et Théodore de Boze, mis en musique par Claude Goudimel), published in 1565. It is written in four parts, the melody being assigned to the tenor. Some of the tunes were probably of popular origin, and they are still used by the French Protestant Church. Others were adopted py the German

Lutherans, a German imitation of the French versions of the Psalms in the same metres having been published at an early date. There is little doubt that, at the time of the last-named composition, Goudimel had em- braced the new faith, although the French version of the Psalms was at first used by Catholics as well as Protestants. Seven years later he fell a victim to religious fanaticism during the St Bartholomew massacres at Lyons (24th

August 1572), his death, it is stated, being due to "les ennemis de la gloire de Dieu et quelques méchants envieux de Vhonneur qu'il avait acquis." In addition to the collec- tions already named, many of his works are preserved. Masses and motets belonging to his Roman period are found in the Vatican library, and in the archives of various churches in Rome; others were published. Thus the work entitled Miss tres a Claudio Goudime preestan- tissimo musico auctore, nunc primum in lucem editce, contains one mass by the learned editor himself, the other two being by Claudius Sermisy and Jean Maillard respectively. Another collection, La jleur des chansons des deux plus excellens musiciens de nostre temps, consists of part songs by Goudimel and Orlando di Lasso. Burney gives a motet of Goudimel's, Domine quid multiplicati sunt, in his history.

GOUGH, Hucu Goven, Viscount (1779-1869), British field-marshal, was of Irish origin, and was a descendant of Francis Gough, who was made bishop of Limerick in 1626. He was born at Woodstown, Limerick, November 3, 1779. After holding for a short time a commission in his father's regiment of militia, he was transferred to the line as ensign in August 1794, and was very soon after promoted lieutenant. In the following year he served with the 78th Highlanders at the Cape of Good Hope, taking part in the capture of Cape Town and of the Dutch fleet inSaldanha Bay. His next service was in the West Indies, where, with the 87th (Royal Irish Fusiliers), he shared in the attack on Porto Rico, the capture of Surinam, and the brigand war in St Lucia. In 1809 he was called to take part in the Peninsular War, and, joining the army under Wellington, commanded his regiment as major in the operations before Oporto, by which the town was taken from the French. At Talavera he was severely wounded, and had his horse shot under him. For his conduct on this occasion he was afterwards promoted lieutenant-colonel, his commission, on the recommendation of Wellington, being antedated from the day of the duke's despatch. He was thus, as pointed out in Hart's Army List, the first officer who ever received brevet rank for services performed in the field at the head of a regiment, He was next engaged at the battle of Barossa, at which his regiment captured a French eagle. At the defence of Tarifa the post of danger was assigned to him, and he compelled the enemy to raise the siege. At Vittoria, where Gough again distinguished himself, his regiment captured the baton of Marshal Jourdan. He was again severely wounded at Nivelle, and was soon

after created a knight of St Charles by the king of Spain. In recognition of his services the citizens of Dublin presented him with the freedom of the city and with a costly sword, At the close of the war he returned home and enjoyed a respite of some years from active service. He next took command of a regiment stationed in the south of Ireland, discharging at the same time the duties of a magistrate during a period of agitation. Gough did not attain the rank of field-officer till 1830, when he was pro- moted major-general. Seven years later a new epoch opened for him ; he was sent to India to take command of the Mysore division of the army. But not long after his arrival in India, the difficulties which had arisen between the Chinese and British Governments, and which led to the first Chinese war, made the presence of an energetic general

‘was then concluded at Gwalior.

on the scene indispensable, and Gough was appointed commander-in-chief of the British forces in China. This post he held during all the operations of the war; and by his great achievements and numerous victories in thie face of immense difficulties, he at length enabled the English plenipotentiary, Sir H. Pottinger, to dictate peace on his own terms, and on terms of perfect equality with the emperor. After the conclusion of the treaty of Nanking in August 1842 the British forces were withdrawn; and before the close of the year Gough was created a baronet, and was invested with the grand cross of the Bath. He also received the thanks of both Houses of Parliament. Returning to India, he was appointed (August 1843) commander-in- chief of the British forces in India. In December 1843 he took the command in person against the Mahrattas, and defeated them at Maharajpore, capturing more than fifty guns. He defeated them again at Punniar, and peace In 1845 occurred the rupture with the Sikhs, who crossed the Sutlej in large numbers, and Sir Hugh Gough conducted the operations against them. In this campaign he was well supported by Lord Hardinge, the governor -general, who had been his comrade in the Peninsula, and now volunteered to serve under him, The Sikhs were defeated in three great battles in rapid succession—at Moodkee, Ferozeshah, and Sobraon,—and submitted to make peace soon after at Lahore. . The services of Sir Hugh Gougli on these occasions were rewarded by a vote of thanks from both Houses of Parliament, and by his elevation to the peerage of the United

Kingdom as Baron Gough (April 1846). The war broke out again in 1848, and again Lord Gough took the field. With unabated energy he defeated the Sikhs at Ramnuggar, and at Chillianwallah, and finally broke their power by his decisive victory at Gujrat (February 1849), He was now succeeded as commander-in-chief by Sir Charles Napier, and, returning to England, was raised to a vis- countcy, and for the third time received the thanks of both Houses of Parliament. A pension of £2000 per annum was granted to him by parliament, and an equal pension by the East India Company. He did not again see active service. In 1854 he was appointed colonel of the Royal Horse Guards, and two years later he was sent to the Crimea to invest Marshal Pelissier and other officers witli the insignia of the Bath. Honours were multiplied upon him during his latter years. He was made a knight of St Patrick, being the first knight of the order who did not hold an Irish peerage, was sworn a privy councillor, was named a knight grand commander of the Star of India, and in November 1862 was made field-marshal. He was twice married, and left children by both his wives. He died at his seat near Dublin, March 2, 1869.

GOUGH, Ricuarp (1735-1809), an English antiquary, was the son of a wealthy East India director, and was born in London, October 1, 1735. He received his early educa- tion privately, and his literary talents developed with such precocity that, at the age of twelve and a half years, he had completed the translation of a history of the Bible from the French, which his mother printed for private circulation ; at the age of fifteen he wrote a translation of Fleury's work on the customs of the Israelites; and at sixteen he had published an elaborate work entitled Atlas Re- novatus, or Geography modernized. In 1752 he entered Benet College, Cambridge, where his taste for antiquarian research received additional impulse, and where he com- menced his work on British topography, which was pub- lished in 1768. After leaving Cambridge in 1756, he began a series of antiquarian excursions in various parts of Great Britain, the fruit of which was seen in the volumes which he subsequently published, In 1773 he began to prepare an edition in English of Camden's Britannia, but

the work did not appear till 1789. Meantime he pub- lished, in 1786, the first volume of his splendid work, the Sepulchral Monuments of Great Britain, applred to illustrate the history of families, manners, habits, and arts at the dif- ferent periods from the Norman Conquest to the Seventeenth Century. This volume, which contained the first four cen- turies, was followed in 1796 by a second volume containing the 15th century, and an introduction to the second volume appeared in 1799. Society of Antiquaries of London in 1767, and from 1771 to 1791 he was its director. He was elected F.R.S. in 1775. He died at his residence at Enfield, 20th February 1809. His books and manuscripts relating to Anglo-Saxon and northern literature, all his collections in the department of British topography, and a large number of his drawings and engravings of other archeological remains, were be- queathed to the university of Oxford.

Among the minor works of Gough are An Account of the Bedford Missal (in MS.); A Catalogue of the Court of Canute, King of Den- mark, 1777; History of Pleshy in Hsscx, 1803; An Account of the Coins of the Seleucidee, Kings of Syria, 1803; and History of the Society of Antiquaries of London, prefixed to their Archwologia. He also published several new editions of antiquarian works by other authors.

GOUJET, Craupz Pierre (1697-1767), a French abbé and litterateur, was born at Paris, 19th October 1697. He studied at the college of the Jesuits, and at the Collége Mazarin, but he nevertheless became a strong Jansenist. In 1705 he assumed the ecclesiastical habit, in 1719 entered the order of Oratorians, and soon afterwards was named canon of St. Jacques Hopital. On account of his ex- treme Jansenist opinions he suffered considerable persecu- tion from the Jesuits, and several of his works were sup- pressed at their instigation. In his latter years his health began to fail, and he lost his eyesight. As he received little remuneration for his writings, he came also to be in circumstances of great poverty, and was compelled to sell his library, a sacrifice which hastened his death, which took place at Paris, 1st. February 1767.

He is the author of a large number of works, of which the prin- cipal are :— Supplément au Dictionnaire de Moréri, Paris, 1735, and a Nouveau Supplément to a subsequent edition of the work; Bzblo- théeque francaise,

ow Histoire littéraire de la. France, 18. vols., Paris, 1740-1759; Vics des Saints, 7 vols., 1730; Mémoires historiques ct littéraires sur le Collége royal de France, 3 vols., Paris, 1758; His- toire des Inqutsitions, Paris, 1752; and an edition of the Diction-

naire, of which he has also given an abridgment. See Mémoires hist. et Wtt. de V_Abbé Gouget, 1767.

GOUJON, Juan, was. the most distinguished sculptor produced by France during the 16th century. Although some evidence has been offered in favour of the date 1520 (Archives de l Art francats, vol. iii. p. 350), the time and place of his birth are still uncertain. The first mention of his name occurs in the accounts of the church of St Maclou at Rouen in the year 1540, and in the following year he was employed at the cathedral of the same town, where he added to the tomb of Cardinal d'Amboise a statue of his nephew Georges, afterwards removed. The tomb of Louis de Brezé, executed some time after 1545, has also been attributed to Goujon, but there is no evidence in point, nor even any tradition, of the fact. On leaving Rouen, Goujon was employed by Pierre Lescot, the celebrated architect of the Louvre, on the restorations of St Germain l'Auxerrois ; the building accounts—some of which for the years 1542- 44 were discovered by M. de Laborde on a piece of parch- ment binding—specify as his work, not only the carvings of the pulpit (Louvre), but also a Notre Dame de Piété, now lost. In 1547 appeared Martin's French translation of Vitruvius, the illustrations of which were due, the translator tellsus in his "Dedicationto the King" to Goujon, "naguéres architecte de Monseigneur le Connétable, et maintenant un des votres." We learn from this statement, not only that Goujon had been taken into the royal service on the acces-

Gough was chosen a fellow of the.

sion of Henry II., but also that he had been previously em- ployed under Bullant on the chateau of Kcouen. At the Louvre, Goujon, under the direction of Lescot, executed the carvings of the south-west angle of the court, the reliefs of the Escalier Henri II., and the Tribune des Cariatidcs. About a year before the execution of the Caryatides, for which Goujon

received 737 livres on September 5, 1550, he produced, according to unbroken tradition, the reliefs of the Fontaine des Innocents (Louvre, and in site); after which he is supposed to have been occupied in work des- tined for the decoration of the chateau of Anet, then building for Diana of Poitiers. Unfortunately the building accounts of Anet have disappeared, but tradition not only ascribes to Goujon the chef d'euvre of French sculpture, the Diane Chasseresse now in the Louvre, but asserts that he also executed a vast number of other works of equal importance, destroyed or lost since 1792. In 1555 his name appears again in the Louvre accounts, and continues to do so every succeeding year up to 1561, when all trace of him is lost. In the course of this year an attempt was made to turn out of the royal employment all those who were suspected of Huguenot tendencies. Goujon has always been claimed as a Reformer; it is consequently possible that he was one of the victims of this attack. We should therefore probably ascribe the work attributed to him in the Hétel Carnavalet (cm situ), together with much else executed in various parts of Paris—but now dispersed or destroyed—to a period intervening between the date of his dismissal from the Louvre and his death (of which there is no evidence), which is said to have taken place during the St Bartholomew massacre in 1572. Goujon's work is remarkable—as may be observed in the sculpture of the Louvre—for its perfect harmony with the areli- tectural lines which it was intended to enrich or accompany, and is distinguished in a supreme degree by that elegance which was the leading characteristic of the school of which he was the chief representative. His treatment of the nude (Diane Chasseresse), both in style of line and choice of forms, attains a degree of accomplished perfection which, in its complete fulfilment of the proposed—though very different—ideal, comes nearer to the character of tranquil achievement, which marks all classic art, than any other work of modern times.

Engravings after Goujon will be found in Cicognara's Storia della Scultura, and in M. de Clarac's Musée du Lowvre. M. Berty has given a brief notice of his life and works in Grands architectes Francais de la Renatssance ; and a fuller account will be found in Mrs Pattison's Renaissance of Art in Franee.

GOULD, Avcusrus Appison (1805-1866), American conchologist, was born at New Ipswich, New Hampshire, April 23, 1805, graduated at Harvard College in 1825, and took his degree of doctor of medicine in 1830." Thrown from boyhood on his own exertions, it was only by industry, perseverance, and self-denial that he obtained the means to pursue his earlier and later studies. Establishing himself in Boston, he devoted himself to the practice of medicine, and finally rese to high professional rank and social posi- tion, He became president of the Massachusetts Medical Society, and was employed as authority in editing the vital statistics of the state. As a conchologist his repu- tation is world-wide. With Say, Conrad, Adams, Anthony, Lee, Binney, and others, he was a pioneer of the science in America. His writings fill many pages of the publica- tions of the Boston Society of Natural History (see vol. xi. p. 197 for a list) and other periodicals. He published with Agassiz the Principles of Zoology ; he edited the Terrestrial Air-breathing Mollusks of Binney; he translated Lamarck's Genera of Shells. The two most important monuments to his scientific work, however, are The Jfol- lusks and Shells of the United States exploring expedition under Commodore Wilkes, published by the Government,

and the Report on the Invertebrata published by order of | quently planted at intervals among the maize that consti-

the legislature of Massachusetts in 1841. A second edition of the latter work was authorized in 1865, and published in 1870 after the author's death, which took place at Boston, September 18, 1866. Gould was an active member of the Boston Society of Natural History, and a corre- sponding member of all the prominent American scientific societies, and many of those of Europe, including the English Royal Society.

GOUR. See Gaur.

GOURD, a name given to various plants of the order Cucurbitaceew, but more strictly applied to those belonging to the genus Cucurbita, moneecious trailing herbs of annual duration, with long succulent stems furnished with tendrils, and large, rough, palmately-lobed leaves ; the flowers, reti- culated with veins, are generally large and of a bright yellow

or orange colour, the barren ones with the stamens united ; the fertile are followed by the large, succulent fruit that gives the gourds their chief economic value. Many varieties of Cucurbita are under cultivation in tropical and temperate climates, especially in southern Asia; but it is extremely difficult to refer them to definite specific groups, on account of the facility with which they hybridize ; while it is very doubtful whether any of the original forms now exist in the wild state. M. Naudin, who made a careful and interesting series of observations upon this genus, came to the conclusion that all varieties known in European gardens might be referred to six original species ; probably three, or at most four, have furnished the edible kinds in ordinary cultivation ; and, as all these appear occasionally to hybridize, their limits must be regarded as very uncertain. Adopting the specific names usually given to the more familiar forms, the most important of the gourds, from an economic point of view, is perhaps C. maxima, the Potiron Jaune of the French, the red and yellow gourd of British gardeners, the spheroidal fruit of which is remarkable for its enormous size: the colour of the somewhat rough rind varies from white to bright yellow, while in some kinds it remains green; the fleshy interior is of a deep yellow or orange tint. This valuable gourd is grown extensively in southern Asia and Europe. In Turkey and Asia Minor it yields, at some periods of the year, an important article of diet to the people; immense quantities are sold in the markets of Constantinople, where in the winter the heaps of one variety with a white rind are described by Walsh as resembling mounds of snowballs. The yellow kind attains occasionally a weight of upwards of 240 ib. It grows well in central Europe and the United States, while in the south of England it will produce its gigantic fruit in perfection in hot summers. The yellow flesh of this gourd and its numerous varieties yields a considerable amount of nutri- ment, and is the more valuable as the fruit can be kept, even in warm climates, for a long time. In France and in the East it is much used in soups and ragouts, while simply boiled it forms a substitute for other table vegetables ; the taste has been compared to that of a young carrot. In some countries the larger kinds are employed as cattle food. The seeds yield by expression a large quantity of a bland oil, which is used for the same purposes as that of the poppy and olive. The "mammoth" gourds of English and American gardeners appear to belong to this species, or to hybrids between it and another valuable member of the group, the pumpkin, C'. Pepo, well known in English cottage gardens, and largely

cultivated in continental Europe and North America. The pumpkin varies much in form, being sometimes nearly globular, but more generally oblong or ovoid in shape; the rind is smooth, and very variable in colour. This gourd is a useful plant to the American back- woods farmer, yielding, both in the ripe and unripe condi- tion, a valuable fodder for his cattle and pigs, being fre-

tutes his chief crop. The larger kinds acquire a weight of from 40 to 80 tb, but smaller varieties are in more esteem for garden culture. When ripe, the pumpkin is boiled or baked, or made into various kinds of pie, alone or mixed with other fruit; while small and green, it may be eaten like the vegetable marrow. Some of the varieties of C. maxima and Pepo contain a considerable quantity of sugar, amounting in the sweetest kinds to 4 or 5 per cent., and in the hot plains of Hungary efforts have been made to make use of them as a commercial source of sugar. The young shoots of both these large gourds may be given to cattle, and admit of being eaten as a green vegetable when boiled. The vegetable marrow, C'. ovifera, regarded by Naudin as a variety of C. Pepo, is much esteemed in England for the delicate flavour of its fruit, which is eaten boiled, in the immature state, as a pleasant summer vegetable. A large number of varieties are in cultivation, —the larger oblong or pear-shaped kinds growing a foot or more in length, while some are comparatively small. This useful esculent will succeed in any warm and open situation, if planted over a small trench filled with manure; it is often trained over the fences of cottage gardens, and may be sometimes seen flourishing on the sunny side of railway cuttings in the south of England. C. Melopepo, is the squash or bush gourd, a favourite vegetable in the United States and in parts of continental Europe, but less cultivated in Britain than the preceding. It hasa somewhat different habit from most of the family, having more rigid shoots and a tendency towards a shrubby mode of growth; the fruit, yellowish when ripe, is smaller than the pumpkin, and of various shapes, usually with many angles or projections; some sorts resemble a turban, others many-cornered hats, whence fan- ciful names have been applied to them. The number of kinds is considerable, especially in the United States, where the squashes are much cultivated; the larger kinds are grown as food for pigs and cattle, besides being valued as table esculents ; for cooking they should be used in the unripe condition. Many smaller gourds are cultivated in India and other hot climates, and

some have been introduced into English gardens, rather for the beauty of their fruit and foliage than for their esculent qualities. Among these is C. Aurantia, the orange gourd, bearing a spheroidal fruit, like a large orange in form and colour; in Britain it is generally too bitter to be palatable, though applied to culinary purposes in Turkey and.the Levant. C. pyrt-formis, C. verrucosa, and C'. moschata are likewise occasion- ally eaten, especially in the immature state; and several other gourds are used as esculents in India and the neigh- bouring countries,

The bottle-gourds are now generally placed in a separate genus, Lagenarva, chiefly differing from Cucurbita in the anthers being free instead of adherent. The bottle-gourd properly so-called, LZ, vulgaris, is a climbing plant with downy, heart-shaped leaves and beautiful white flowers: the remarkable fruit first begins to grow in the form of an elongated cylinder, but gradually widens towards the ex- tremity, until, when ripe, it resembles a flask with a narrow neck and large rounded bulb ; it sometimes attains a length of 7 feet. When ripe, the pulp is removed from the neck, and the interior cleared by leaving water standing in it ; the woody rind that remains is used as a bottle: or the lower part is cut off and cleared out, forming a basin-like vessel applied to the same domestic purposes as the cala- bash (Crescentia) of the West Indies; the smaller varieties, divided length-wise, form spoons. 'The ripe fruit is apt to be bitter and cathartic, but while immature it is eaten by the Arabs and Turks. When about the "size of a small cucumber," Lane says, it is stuffed with rice and minced meat, flavoured with pepper, onions, &c., and then boiled,

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forming a favourite dish with Eastern epicures. The elongated snake-gourds of India and China (Z'richosanthes) are said to be used in curries and stews.

All the. gourds have a tendency to secrete the cathartic principle colocynthin, and in many varieties of Cucurbita and the allied genera it is often elaborated to such an extent as to render them unwholesome, or even poisonous. The seeds of some species possess rather strong anthelmintic properties ; those of the common pumpkin are frequently administered in America as a vermifuge, The cultivation of gourds commenced far beyond

the dawn of history, and the esculent species have become so modified by culture that the original plants from which they have descended can no longer be traced. The abundance of varieties in India would seem to indicate that part of Asia as the birth- place of the present edible forms; but some appear to have been cultivated in all the hotter regions of that continent, and in North Africa, from the earliest ages, while the Romans were familiar with at least certain kinds of Cucur- dita, and with the bottle-gourd. It is even doubtful whether the culture of gourds had not spread to the American continent before its discovery by Europeans ; for the Indian tribes of the interior were certainly in possession of some kinds at a date so early that it is difficult to believe they had received them from the settlers. Dr Asa Gray has even suggested that some of these esculent forms may possibly have been indigenous to the American plains.

Most of the annual gourds may be grown successfully in Britain. They are usually raised in hotbeds or under frames, and planted out iu rich soil in the early summer as soon as the nights become warm. The more ornamental kinds may be trained over trellis-work, a favourite mode of displaying them in the East ; but the situation must be sheltered and sunny. Even the Lagenarie will sometimes produce fine fruit when so treated in the southern counties. (c. P. J.)

GOURGAUD, Gasparp, Baron (1783-1852), a French general of artillery, was born at Versailles, 14th September 1783. After studying at the polytechnic school and at the artillery school of Chalons, he joined the artillery in 1802, and, having acquitted himself with distinction in several campaigns, he received in 1807 the cross of honour and the grade of captain. He served in the subsequent Spanish and Austrian campaigns, and in 1811 he was sent to report on the strength of the fortifications of Dantzic, a mission which he fulfilled so much to the satisfaction of Napoleon that he was named one of the emperor's ordnance officers. During the Russian campaign he was the first toenter the Kremlin at Moscow, where he removed the match from a large quantity of powder the explosion of which would in all pro- bability have destroyed the emperor's life. For this service he received the title of baron. He accompanied the em- peror in his subsequent campaigns, and in 1814, at the battle of Brienne, was again successful in delivering him from imminent peril. After the accession of

Louis XVIII. he was named chief of the staff of the first artillery division, but on the return of Napoleon from Elba he was neverthe- less named by him adjutant and general, and took part in the battle of Waterloo. Being one of the three French officers chosen by Napoleon to accompany him to St Helena, he was employed there in collecting materials for a history of Napoleon's campaigns, but on account of some misunder- standing with Montholon, he left the island, and went to England. He published in 1818 La Campagne de 1815, and he also endeavoured to interest the emperors of Russia and Austria in Napoleon's behalf. Shortly afterwards he was expelled from England as aspy of Napoleon's. Return- ing to France in 1821, he published, along with Montholon, in 1823, Mémoires de Napoléon & Sainte-Héléne. His re- ply in 1825 to Ségur's Histoire de la Grande Armée was the occasion of a duel between the two authors; and he also,

in 1827, became involved in a controversy with Sir Walter Scott regarding some statements made by the latter in his life of Napoleon. After the July revolution of 1830, Gourgaud was appointed to the command of the artillery of Paris and Vincennes ; in 1832 he was named aide-de-camp of the king, and in 1835 lieutenant-general. In 1840 he was one of the commissioners sent to bring the remains of Napoleon to France. On the occurrence of the revolution of February 1848 his name was struck off the list of generals, but after the events of the following June he was chosen colonel of the first legion of the national guard of Paris. In 1849 he was elected representative of the legisla- tive assembly for the department of Deux-Sévres. He died 25th July 1852.

GOUT, a specific constitutional disorder connected with excess of uric acid in the blood, and manifesting itself by inflammation of joints, with' deposition therein of urate of soda, and also by morbid changes in various important organs.

The term gout, which was first used about the end of the 13th century, is derived through the French goudte from the Latin gutta, a drop, in allusion to the old pathological doc- trine (which in the present case seems to be essentially the correct one) of the dropping of a morbid material from the blood within the joints. The disease was known and de- scribed by the ancient Greek physicians under various terms, which, however, appear to

have been applied by them alike to rheumatism and gout. The general term arthritis (dpOpov, a joint) was employed when many joints were the seat of inflammation; while in those instances where the disease was limited to one part the terms used bore refer- ence to such locality; hence podagra (zoddypa, from zovs, the foot, and dypa, a seizure), chiragra (xeip, the hand), gonagra (yévv, the knee), &e.

Hippocrates in his Aphorisms speaks of gout as occurring most commonly in spring and autumn, and mentions the fact that women are less liable to it than men. He also gives directions as to treatment. Celsus gives a similar account of the disease. Galen regarded gout as an un- natural accumulation of humours in a part, and the chalk- stones as the concretions of these, and he attributed the disease to over-indulgence and luxury. Gout is alluded to in the works of Ovid and Pliny, and Seneca in his 95th epistle mentions the prevalence of gout among the Roman ladies of his day as one of the results of their high-living and debauchery. Lucian in his Zragopodagra gives an amusing account of the remedies employed for the cure of gout.

In all times this disease has engaged a large share of the attention of physicians, from its wide prevalence, and from the amount of suffering which it entails. Sydenham, the famous English physician of the 17th century, wrote an important treatise on the subject, and his description of the gouty paroxysm, all the more vivid from his having himself been afflicted with the disease for thirty-four years, is still quoted by writers as the most graphic and exhaustive account of the symptomatology of gout. Subsequently Cullen, recognizing gout as capable of manifesting itself in various ways, divided the disease into regular gout, which affects the joints only, and ¢rregular gout, where the gouty disposition exhibits itself in other forms; and the latter variety he subdivided into atonde gout, where the most pro- minent symptoms are throughout referable to the stomach and alimentary canal; retrocedent gout, where the inflam- matory attack suddenly disappears from an affected joint and serious disturbance takes place in some internal organ, generally the stomach or heart ; and misplaced gout, where from the first the disease does not appear externally, but reveals itself by an inflammatory attack of some internal part. Dr Garrod, one of the most eminent living authorities

on gout, adopts a division somewhat similar to though simpler than that of Cullen, namely, regular gout, which affects the joints alone, and is either acute or chronic, and irregular gout, affecting non-articular tissues, or disturbing the functions of various organs.

It is often stated that the attack of gout comes on with. out any previous warning; but, while this is true in many instances, the reverse is probably as frequently the case, and the premonitory symptoms, especially in those who have previously suffered from the disease, may be sufficiently precise to indicate the impending seizure. Among the more common of these may be mentioned marked disorders of the digestive organs, with a feeble and capricious appetite, flatulence and pain after eating, and uneasiness in the right side in the region of the liver. A remarkable tendency to gnashing of the teeth is sometimes observed. This symp- tom was first noticed by Dr Graves, who connected it with irritation in the urinary organs, which also is present as one of the premonitory indications of the gouty attack. Various forms of nervous disturbance also present themselves in the form of general discomfort, extreme irritability of temper, aud various perverted sensations, such as that of numbness and coldness in the limbs. These symptoms may persist for many days and then undergo amelioration immediately before the impending paroxysm. On the night of the attack the patient retires to rest apparently well, but about two or three o'clock in the morning is awoke with a painful feeling in the foot, most commonly in the ball of the great toe, but it may be in the instep or heel, or in the thumb. With the pain there often occurs a distinct shivering followed by feverishness. The pain soon becomes of the most agonizing character: in the words of Sydenham, "now it is a violent stretching and tearing of the ligaments, now it is a gnawing pain, and now a pressure and tightening; so exquisite aud lively meanwhile is the part affected that it cannot bear the weight of the bedclothes, nor the jar of a person walking in the room."

When the affected part is examined it is found to be swollen and of a deep red hue, The superjacent skin is tense and glistening, and the surrounding veins are more or less distended. After a few hours there is a remission of the pain, slight perspiration takes place, and the patient may fall asleep.

The pain may continue moderate during the day but returns as night advances, and the patient goes through a similar experience of suffering to that of the previous night, followed with a like abatement towards morning, These nocturnal exacerbations occur with greater or less severity during the continuance of the attack, which generally lasts for a week or ten days. As the symptoms decline the swelling and tenderness of the affected joint abate, but the skin over it pits on pressure for a time, and with this there is often associated slight desquamation of the cuticle. During the attacks there is much constitu- tional disturbance. The patient is restless and extremely irritable, and suffers from cramp in the limbs and from dyspepsia, thirst, and constipation. The urine is scanty and high-coloured, with a copious deposit, consisting chiefly of urates. During the continuance of the symptoms the inflammation may leave the one foot and affect the other, or both may suffer at the same time, After the attack is over the patient feels quite well and fancies himself better than he had been for a long time before; hence the once popular notion that a fit of the gout was capable of remov- ing all other ailments. Any such idea, however, is sadly belied in the experience of most sufferers from this disease. It is rare that the first is the only attack of gout, and another is apt to occur within a year, although by care and treatment it may be warded off. The disease, however, undoubtedly tends to take a firmer hold on the constitution and to return. In the earlier recurrences the same joints

as were formerly the seat of the gouty inflammatior suffer again, but in course of time others become implicated, until in advanced cases scarcely any articulation escapes, and the disease thus becomes chronic. It is to be noticed that when gout assumes this form the frequently recurring attacks are usually attended with less pain than the earlier ones, but their disastrous effects are evidenced alike by the disturb- ance of various important organs, especially the stomach, liver, kidneys, and heart, and by the remarkable changes which take place in the joints from the formation of the so- called chalk-stones or tophi. These deposits, which are highly characteristic of gout, appear at first to take place in the form of a semifluid

material, consisting for the most part of urate of soda, which gradually becomes more dense, and ultimately quite hard. When any quantity of this is deposited in the structures of a joint the effect is to produce stiffening, and, as deposits appear to take place to a greater or less amount in connexion with every attack, permanent thickeniug and deformity of the parts is apt to be the con- sequence. The extent of this depends of course on the amount of the deposits, which, however, would seem to be in no necessary relation to the severity of the attack, being in some cases even of chronic gout so slight as to be barely appreciable externally, but on the other hand occasionally causing great enlargement of the joints, and fixing them in a flexed or extended position which renders them entirely useless. Dr Garrod describes the appearance of a hand in an extreme case of this kind, and likens its shape to a bundle of French carrots with their heads forward, the nails corresponding to the stalks. Any of the joints may be thus affected, but most commonly those of the hands and feet. The deposits take place in other structures besides those of joints, such as along the course of tendons, underneath the skin and periosteum, in the sclerotic coat of the eye, and especially on the cartilages of the external ear. When largely deposited in joints an abscess sometimes forms, the skin gives way, and the concretion isexposed, Sir Thomas Watson quotes a case of this kind where the patient wlen playing at cards was accustomed to chalk the score of the game upon the table with his gouty knuckles,

The recognition of what is termed irregular gout is less easy than that form above described, where the disease gives abundant external evidence of its presence; but that other parts than joints suffer from gouty attacks is beyond question. 'The diagnosis may often be made in cases where in an attack of ordinary gout the disease suddenly leaves the affected joints and some new series of symptoms arises. It hag been often observed when cold has been applied to an inflamed joint that the pain and inflammation in the part ceased, but that some sudden and alarming seizure re- ferable to the stomach, brain, heart, or lungs supervened. Such attacks, which correspond to what is termed by Cullen retrocedent gout, often terminate favourably, more especi- ally if the disease again returns to the joints. Further, the gouty nature of some long-continued internal or cutane- ous disorder may be rendered apparent by its disappearance on the outbreak of the paroxysm in thejoints. Gout, when of long standing, is often found associated with

degenerative changes in the heart and large arteries, the liver, and especi- ally the kidneys, which are apt to assume the contracted granular condition already alluded to as one of the forms of Bright's disease (see Bricut's Disgass). A variety of urinary catculus—the uric acid—formed by concretions of this substance in the kidneys is a not unfrequent occurrence in connexion with gout; hence the well-known association of this disease and gravel,

As regards the pathology of gout, all inquiry agrees in connecting it closely with an altered state of the blood, more particularly with the presence in that fluid in excessive amount of uric acid, and its subsequent deposition in the

joints in the form of urate of soda. Uric acid is formed in the system in the processes of nutrition, and is excreted by the kidneys, the amount passing off by the urine being esti- mated at about 8 grains daily. In the healthy ,human subject the blood contains the merest trace of this acid, but in gout it may be detected in abundance in the blood-serum both prior to and during the acute attack, while in chronic gout it becomes a constant constituent of the blood and of other fluids of the body, both natural and morbid. Accord- ing to Dr Garrod it is not merely the presence of the uric acid in the blood but its deposition in the inflamed part that gives rise to the attack of gout, the inflammation being the effect and not the cause of the deposit. The gouty paroxysm thus induced appears to rid the system to a certain extent of the accumulated uric acid, although such relief is generally of but temporary duration.

Whether the accumulation of urates in the blood be due, as some affirm, to their excessive formation in the system as the result of functional derangement of the liver, or, as others hold, depends simply on the defective excreting power of the kidneys of the daily amount, is disputed, although it has been often observed during an attack of gout that the amount of uricacid excreted was markedly deficient. The likelihood is that both these conditions concur, and that while the kidneys retain their functional integrity even an excessive amount of uric acid in the system may be got rid of, but that these organs, becoming themselves affected by the deposition of

urates in their tubular struc- ture, lose to a large extent their excreting power, and thus the blood is overcharged with the product which the kidneys can no longer entirely remove. Another view of the patho- logy of gout recently advanced regards the disease as re- sulting from special degenerative changes in the fibrous textures of the body, one of the effects of which is the deposition of urates in the affected parts whence they pass into the blood. This theory has not, however, as yet been extensively supported, and the weight of opinion remains on the whole in favour of the views of Dr Garrod. It must nevertheless be admitted that many points in the pathology of this disease still remain unexplained, for, as remarked by Tronsseau, '" the production in excess of uric acid and urates is a pathological phenomenon inherent like all others in the disease ; and like all the others it is domin- ated by a specific cause, which we know only by its effects, and which we term the gouty diathesis." This subject of diathesis (habit, or organic predisposition of individuals), which is universally admitted as an essential element in the pathology of gout, naturally suggests the question as to whether, besides being inherited, such a peculiarity may also be acquired, and this leads to a consideration of the causes which are recognized as influential in favouring the occurrence of this disease.

It is beyond dispute that gout is in a marked degree hereditary, fully more than half the number of cases being, according to Sir C. Scudamore and Dr Garrod, of this character. But it is no less certain that there are habits and modes of life the observance of which may induce the disease even where no hereditary tendencies can be traced, and the avoidance of which may on the other hand go far towards weakening or neutralizing the influence of inherited liability. Gout is said to affect the sedentary more readily than the active, but this cannot be taken as a very constant tule. If, however, inadequate exercise be combined with a luxurious manner of living, with habitual over-indulgence in animal food and rich dishes, and especially in alcoholic beverages, then undoubtedly the chief factors in the pro- duction of the disease are present.

Much has been written upon the relative influence of various forms of alcoholic drinks in promoting the develop- ment of gout. It is generally stated that fermented are

more injurious than distilled liquors, and that, in particular, the stronger wines, such as port, sherry, and madeira, are much more potent in their gout-producing action than the lighter class of wines, such as hock, moselle, &c., while malt liquors are fully as hurtful as strong wines. If this alleged difference in their tendency to induce gout be correct, it cannot be said that any satisfactory explanation of it has been furnished; but indeed the point has not been clearly proved, and it may be fairly questioned whether, other things being equal, an individual in abandoning the use of wines and substituting that of spirits would improve his position in relation to this disease. It seems quite as pro- bable that over-indulgence in any form of alcohol, when associated with the other conditions already adverted to, will have very much the same effect in developing gout. Even those who affirm the mischievous effects of fermented liquors in this way are obliged to admit that they are injurious in proportion to the amount of alcohol they con- tain. The comparative absence of gout in countries where spirituous liquors are chiefly used, such as Scotland, is cited as showing their relatively slight effect in encouraging that disease; but it is to be noticed that in such countries there is on the whole a less marked tendency to excess in tho other pleasures of the table, which in no degree less than alcohol are chargeable with inducing the gouty habit. Gout is not a common disease among the poor and labouring classes, and when it does occur may often be connected even in them with errors in living. It is not very rare to meet gout in butlers, coachmen, &c., who are apt to live luxuri- ously while leading comparatively easy lives.

Gout, it must ever be borne in mind, may also affect persons who observe the strictest temperance in living, and whose only excesses are in the direction of over-work, either physical or intellectual. Many of the great names in his- tory in all times have had their existence embittered by this malady, and have died from its effects. The influence of hereditary tendency may often be traced in such instances, and is doubtless called into activity by the depressing consequences of over-work. It may, notwitlistanding, be affirmed as generally true that those who lead regular lives aud are moderate in the use of animal food and alcoholic drinks, or still better abstain from the latter altogether, are little likely to be the victims of gout even where an un- doubted inherited tendency exists.

Gout is more common in mature age than in the earlier years of life, the greatest number of cases in one decennial period being between the ages of thirty and forty, next between twenty and thirty, and thirdly between forty and fifty. It may occasionally affect very young persons, but such cases are generally in a marked degree hereditary. After middle life gout rarely appears for the first time. Women are much less the subjects of gout than men, apparently from their less exposure to the influences (except- ing of course that of heredity) which tend to develop the disease, and doubtless also from the differing circumstances of their physical constitution. It most frequently appears in females after the cessation of the menses. Persons exposed to the influence of lead poisoning, such as plumbers, painters, &c., are apt to suffer from gout; and it would seem that impregnation of the system with this metal markedly interferes with the uric-acid-excreting function of the kidneys. — ;

Attacks of gout are readily excited in those predisposed to the disease. Exposure to cold, disorders of digestion, fatigue, and irritation or injuries of particular joints will often precipitate the gouty paroxysm.

With respect to the treatment of gout the greatest variety of opinion has prevailed and practice been pursued, from the numerous quaint nostrums detailed by Lucian to the " expectant" or do-nothing system recommended by Syden-

ham and gravely advocated by a few among eminent modern physicians, who regard the disease as beyond the reach of remedies. But that gout, although, as has been shown, a malady of a most severe and intractable character, may nevertheless be successfully dealt with by appropriate medicinal and hygienic measures is a belief largely entertained, and one which happily guides the practice of the physician, The general plan of treatment can be here only briefly indicated. During the acute attack the affected part should be kept at perfect rest, and have applied to it warm opiate fomentations or poultices, or, what answers fully better, be enveloped in cotton wool covered in with oil silk. The diet of the patient should be light, without animal food or stimulants, The administration of some simple laxative will be of service, as well as the free use of alkaline diur- etics,

such as the bicarbonate or acetate of potash. The medicinal agent most to be relied on in the treatment of gout is colchicum, which manifestly exercises a powerful action on the disease. This drug (Colchicum autumnale), which is believed to correspond to the hermodactyl of the ancients, was introduced as a remedy for gout about a century ago, and has proved of such efficacy in modifying the attacks that, as observed by Dr Garrod, "we may safely assert that colchicum possesses as specific a control over the gouty inflammation as cinchona barks or their alkaloids over intermittent fever." The mode of action of colchicum in gout is by no means determined, since it would appear to have no certain effect upon the uric acid excreted fron the system; and the general opinion seems to be that this drug has a special sedative effect on the gouty inflammation. It is usually administered in the form of the wine in doses of 10~30 drops every four or six hours, or in pill as the acetous extract (gr. 4-gr. 1.). The effect of colchicum in subduing the pain of gout is generally so prompt and marked that it is unnecessary to have recourse to opiates ; but its action requires to be carefully watched by the physician from its well-known nauseating and de- pressing consequences, which, should they appear, render the suspension of the drug necessary. Otherwise the remedy may be continued in gradually diminishing doses for some days after the disappearance of the gouty inflam- mation. The statements often made that colchicum tends to encourage the speedy return of the disease do not seem to be well founded. Should gout give evidence of its pre- sence in an irregular form by attacking internal organs, besides the medicinal treatment above mentioned, the use of frictions and mustard applications to the joints is indi- cated with the view of exciting its appearance there.

When gout has become chronic, colchicum, although of less service than in acute gout, is yet valuable, particularly when the inflammatory attacks recur. More benefit, how- ever, appears to be derived from iodide of potassium, guaiacum, and more especially from the alkalis potash and lithia. This latter drug is strongly recommended by Dr Garrod from its solvent action upon the urates. It is usu- ally administered in the form of the carbonate (gr. v., freely diluted).

The treatment and regimen to be employed in the inter- vals of the gouty attacks are of the highest importance. These bear reference for the most

part to the habits and mode of life of the patient. Restriction must be laid upon the amount and quality of the food, and equally, or still more, upon the alcoholic stimulants, “‘The instances,” says Sir Thomas Watson, “are not few of men of good sense, and masters of themselves, who, being warned by one visita- tion of the gout, have thenceforward resolutely abstained from rich living and from wine and strong drinks of all kinds, and who have been rewarded for their prudence and self-denial by complete immunity from any return of the disease, or upon whom, at any rate, its future assaults have

been fewand feeble.” The same eminent authority adds— ‘“‘T am sure it is worth any young man’s while, who has had the gout, to become a teetotaller.” By those more advanced in life who, from long continued habit, are unable entirely to relinquish the use of stimulants, the strictest possible temperance must be observed. Regular but moderate exercise in the form of walking or riding, in the case of those who lead sedentary lives, is of great advantage, and all over-work, either physical or mental, should be avoided. Unfortunately the complete carrying out of such directions, even by those who feel their importance, is too often ren- dered difficult or impossible by circumstances of occupation and otherwise, and at most only an approximation can be made. ‘The effect upon the gouty constitution of certain mineral waters and baths is well known. The particular place must in each case be determined by the physician, and special caution must be observed in recommending this plan of treatment in persons whose gout is complicated by organic disease of any kind. (J. 0. &.) GOUVION SAINT CYR, Laurent, Marquis DE(1764- 1830), a French marshal, was born at Toul, 13th April 1764. At the age of eighteen he went to Rome with the view of prosecuting the study of painting, but, although he continued his artistic studies after his return to Paris in 1784, he never definitely adopted the profession of a painter. In 1792 he was chosen a captain in the chasseurs républi- cains, and served on the staff of Genera] Custine. His pro- motion rapidly followed, and in the c.urse of two years he had become a general of division. In 1796 he commanded the centre division of Moreau’s army in the campaign of the Rhine, and by coolness and sagacity greatly aided him in his brilliant defence against superior numbers, and in his subsequent celebrated retreat. In 1798 he was appointed to the command of the army of Italy, the officers of which had revolted against their general Massena, and

he was speedily successful in obtaining the complete re- establishment of discipline. In the following year he com- manded the left wing of Jourdan's army in Germany; but when Jourdan was succeeded by Massena, he joined the army of Moreau in Italy, where, in face of great difficulties, he was not only completely successful in his defensive tactics, but gained, on the 13th December, an important victory at Albano. When Moreau, in 1800, was appointed to the command of the army of the Rhine, Gouvion St Cyr was named his first lieutenant, and on the 9th May gained a victory over General Kray at Biberach. In 1801 he was sent to Spain to command the army intended for the inva- sion of Portugal, and was named grand officer of the Jegion of honour. When a treaty of peace was shortly afterwards concluded with Portugal, he succeeded Lucien Bonaparte as ambassador at Madrid. In 1803 he was appointed to the command of an army corps in Italy, and he gained in 1805 a victory over the Austrians at Castel Franco. He took part in the Prussian and Polish campaigns of 1807, and in 1808 he commanded an army corps with some success in Catalonia ; but, not wishing to comply with certain orders he received from Paris, he resigned his command, and remained in disgrace till 1811. On the opening of the Russian campaign he received command of the 6th army corps, and on the 7th August 1812 obtained a victory over the Russians at Polosk, in recognition of which he was created a marshal of France, He distinguished himself at the battle of Dresden, 26th and 27th August 1813, but, after a stubborn resistance, capitulated there to the allies on the 11th November following, and remained for some time a prisoner in Hungary. On the restoration of the Bourbons he was created a peer of France, and in July 1815 was appointed war minister, but resigned his office in the November following. In June 1817 he was appointed minister of marine, and in September following again re-

sumed the duties of war minister, which he continued to discharge till November 1819. He died 17th March 1830. Gouvion St Cyr was a prudent and cautious rather than a brilliant general, but he would doubtless have obtained better opportunities of acquiring distinction had he shown himself more blindly devoted to the interests of Napoleon.

He is the author of the following works :—-Journal des opérations de Varmée de Catalogne en 1868 et 1809, Paris, 1821; Mémoires sur les Cumpagnes des armées de Rhin et de Rhin-et-Moselle de 1794 a 1797, Paris, 1829; and Mémoires pour servir & Uhistoire militaire sous le Directoire, le Consulat, et Empire, 1831. Vernon's Vie de Gouvion Saint-Cyr, 1857.

GOVERNMENT. Without attempting to discriminate by verbal definitions the various shades of meaning which this word assumes, we shall use it in this article in its widest sense—that of the ruling power in a political society. The conception of society which this use of the word implies may be illustrated by two well-known theories.

In John Austin's celebrated analysis of law, the first step is the proposition that a law isa command issued by a superior to a subject and enforced by a sanction or penalty. The laws of God with reference to the conduct of men, the laws of a private club or association of men with reference to the conduct of its members, and the laws of a political society, are all, according to Austin's definition, laws pro- perly so called. The laws of nature are laws not properly so called. They are generalizations as to the uniform course of nature, and have 1% analogy to laws properly so called except in point of unitormity. Positive law, again, is dis- tinguished from other laws, properly so called, as the com- mand of the sovereign of an independent political com- munity. A sovereign is a person, or a determinate body of persons, to whom the bulk of the community is habitu- ally obedient. Every word in this definition has its precise meaning, which is developed by Austin with admirable clearness. The faculty "of untying knots" on which he prided himself is nowhere more conspicuously manifested than in the analysis which lays bare the real meaning of the common phrases used to describe the fundamental parts of society. It is not our purpose to examine the value of this analysis here, but simply to call attention to the assunip- tion that in every society of men there is a determinate body (whether consisting of one individual, or a few or many individuals) whose commands the rest of the community obey. This sovereign body is what in more popular phrase is termed the Government of the country, and the varieties which may exist in its constitution are known as forms of government.

Mr Herbert Spencer, approaching the study of society under the influence of conceptions derived from the study of physical organisms, brings us to very much the same result. The union of men in society is itself an organic structure, having parts and functions corresponding to the parts and functions of an animal or a plant. Mr Spencer pursues this analogy so fully and minutely as to leave the impression that he believes it to be something more than an analogy,—that it isa general law from which true deduc- tions regarding society may be drawn. The veins and arteries correspond to our railroads and highways; the nerves, communicating intelligence to the brain, are paral- leled by the telegraph wires; the centralized action of society at the seat of government is the same thing as the regulative activity of the brain. Government is here repre- sented by the regulative functions of a living organism, and forms of government are so many varieties in the structure. Austin, for the purposes of jurisprudence, finds it convenient toregard society as moulded by the will of a dominant body. Spencer exhibits the regulative parts of society as bound up with the rest in one organism. With both the existence of a government is necessary to the conception of society. In the one theory the element of command, in the other that

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of regulation, is conspicuous. If to these we adda third, that of simple agency, we shall have a tolerably complete view of the relations between Government and society. Besides commanding the conduct of individuals, besides regulating the relations of the various members of society, Government may be conceived of as merely the instrument of society, Where men are 'united in groups there arises from their union the necessity of action on behalf of the group. That part of society which attends to the business of the whole is the Governmeut.

'wo main lines of inquiry divide the subject. The first relates to varieties in the structure of the governing body— forms of government. 'The second relates to the functions of the governing body, the sphere of government, the things which fall within the province of state action. In both lines we have to deal with the ascertained facts of the past history and present condition of human societies. In both we have also to notice the speculative opinions

of political thinkers. Notwithstanding the apparent confusion it will probably be found more convenient not to separate the his- torical from the speculative treatment of the subject. What is the best form of government ? —is not quite the same ques- tion as What was the constitution of Athens or Rome? What are the proper limits of state interference —is not the same question as What are the functions of the state in France or England? And yet the same answer may often serve for both sets of questions. Ideal constitutions have a suspicious resemblance to the constitutions with which their authors are most familiar. The political speculations of Plato and of Cicero are based on the state systems of Greece and Italy. Cicero's ideal code in the treatise De Legibus is simply an adaptation of the Twelve Tables. On the other hand, the form of political speculation is often determined by, and in turn determines, the practical politics of the time. The intimate connexion between speculation and practice in politics is strikingly illustrated in the period of controversy which culminated in the Revolution of 1688. The irreconcilable claims of crown and parliament threw the mind back on first principles. Never had theorists a better chance. Popular government and absolute govern- meut each sought to establish itself on a basis of reason and nature. Filmer founds kingly authority on the natural subjection of mankind and the lineal succession of the king to Adam, the first and divinely appointed head of mankind. Locke's general theories of civil government were, in his own opinion, sufficient "to establish the throne of our great restorer or present king, William, to make good his title in the consent of the people, which, being the only one of all lawful governments, he has more fully and clearly than any prince in Christendom." We all know how the political issue was decided. The practical was not more complete than the speculative victory. For two centuries the specu- lations invented to support the popular cause against abso- lutism have been the accepted commonplaces of Englishmen on the constitution of civil society. A more recent example may be given from modern politics. During the digcus- sions which preceded the passing of the Reform Act of 1867, no question was more hotly disputed than that of the real nature of the franchise. Was it a right or was it a privilege? In form this is a scientific or, if we like, a metaphysical question, But the answer to it depended on another question altogether—whether you wished the franchise to be extended to a larger class or not,

Origin of Government.—A preliminary question, formerly of vast theoretical importance, would be, What is the origin of government? How did government come into existence? Asa question of historical fact, it demands for its solution a knowledge of the whole past of the human race. It has been answered over and over again in times when historical knowledge could hardly be said to exist,

and it has therefore been answered without any refer- ence to history. The answers which have satisfied the minds of men may be' distinguished broadly into three classes. The first class would comprehend the legendary accounts which nations have given in primitive times of their own forms of government. These are always attri- buted to the mind of a single lawgiver. The government of Sparta was the invention of Lycurgus. Solon, Moses, Numa, and Alfred in like manner shaped the government of their respective nations. There was no curiosity about the institutions of other nations,— about the origin of governments in general; and each nation was perfectly ready to accept the traditional vopoféro. of any other.

The second may be called the logical or metaphysical account of the origin of government. It contained no overt reference to any particular form of government, what- ever its covert references may have been. It answered the question, How government in general came into existence ; and it answered it by a logical analysis of the elements of society. The phenomenon to be accounted for being govern- ment and laws, it abstracted government and laws, and con- templated mankind as existing without them. The charac- teristic feature of this kind of speculation is that it reflects how contemporary men would behave if all government were removed, and infers that men must have behaved so before government came into existence. Society without government resolves itself into a number of individuals each following his own aims, and therefore, in the days before government, each man followed his own aims, It is easy to see how this kind of reasoning should lead to very different views of the nature of the supposed original state. With Hobbes, it is a state of war, and government is the result of an agreement among men to keep the peace.

With Locke, it is a state of liberty and equality,—it is not a state of war; it is governed by its own law,—the law of nature, which is the same thing as the law of reason. The state of nature is brought to an end by the voluntary agree- ment of individuals to surrender their natural liberty, and submit themselves to one supreme Government. In the words of Locke, '"' Men being by nature all free, equal, and independent, no one can be put out of this estate and sub- jected to the political power of another without his own consent. The only way whereby any one divests himself of his natural liberty, and puts on the bonds of civil socrety, is by agreeing with other men to join and unite into a com- munity" (On Civil Government, c. viil.). Locke boldly defends his theory as founded on historical fact, and it is amusing to compare his demonstration of the baselessness of Filmer's speculations with the scanty and doubtful ex- amples which he accepts as the foundation of his own. But in general the various forms of the hypothesis eliminate the question of time altogether. The original contract from which government sprung is likewise the subsisting contract on which civil society continues to be based. The histori- cal weakness of the theory was probably always recognized. Its logical inadequacy was conclusively demonstrated by Austin. But it still clings to speculations on the principles of government.

The "social compact " is the most famous of the metaphy- sical explanations of government. It has had the largest history, the widest influence, and the most complete develop- ment. To the same class belong the various forms of the theory that governments exist by divine appointment. Of all that has been written about the divine right of kings, a great deal must be set down to the mere flatteries of courtiers and ecclesiastics. But there remains a genuine belief that men are bound to obey their rulers because their rulers have been appointed by God. Like the social compact, the theory of divine appointment avoided the question of historical fact.

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The application of the historical method to the phenomena of society has changed the aspect of the question and robbed it of its political interest. The student of the history of society has no formula to express the law by which govern- ment is born. All that he can do is to trace governmental forms

through various stages of social development. The more complex and the larger the society, the more distinct is the separation between the governing part and the rest, and the more elaborate is the subdivision of functions in the government. The primitive type of ruler is king, judge, priest, and general. At the same time, his way of life differs little from that of his followers and subjects. The metaphysical theories were so far right iu imputing greater equality of social conditions to more primitive times. In- crease of bulk brings with it a more complex social organ- ization, War tends to develop the strength of the goveru- mental organization; peace relaxes it. All societies of men exhibit the germs of government; but there would appear to be races of men so low that they cannot be said to live together in society at all. Recent investigations have illustrated very fully the importance of the family in primitive societies, and the belief in a common descent has much to do with the social cohesion of a tribe. The govern- ment of a tribe resembles the government of a household ; the head of the family is the ruler. But we cannot affirm that political government has its origin in family govern- ment, or that there may not have been states of society in which government of some sort existed while the family did not.

I. Forms ofr GoVERNMENT.

Three Standard Forms.—Political writers from the time of Aristotle have been singularly unanimous in their classi- fication of the forms of government. 'There are three ways in which states may be governed. They may be governed by oue man, or by a number of men, small in proportion to the whole number of men in the state, or by a number large in proportion to the whole number of men in the state. The government may be a monarchy, an aristocracy, ora democracy. The samme terms are used by Austin as were used by Aristotle, and in very nearly the same sense. The determining quality in governments in both writers, and it may safely be said in all intermediate writers, is the numerical relation between the constituent members of the government and the population of the state. There were, of course, enormous differences between the state-systems present to the mind of the Greek philosopher and the English jurist. Aristotle was thinking of the small in- dependent states of Greece, Austin of the great peoples of modern Europe. The unit of government in the one case was a city, in the other a nation. of itself enough to invalidate all

generalization founded on the common terminology. But on one point there is a complete parallel between the politics of Aristotle and the politics of Austin. The Greek cities were to the rest of the world very much what European nations and European colonies are to the rest of the world now. They were the only communities in which the governed visibly took some share in the work of government. Outside the European system, as outside the Greek system, we have only the stereotyped uniformity of despotism, whether savage or civilized. The question of forms of government, therefore, belongs entirely to the European races. The virtues and defects of monarchy, aristocracy, and democracy are the virtues and defects manifested by the historical Governments of Europe. The generality of the language used by political writers must not blind us to the fact that they are thinking only of a comparatively small portion of mankind,

Greek Politics.— Aristotle divides governments according

to two principles.' In all states the governing power seeks

This difference is

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either its own advantage or the advantage of the whole state, and the government is bad or good accordingly, In all states the governing power is one man, or a few men, or many men. Hence six varieties of government, three of which are bad and three good. Each excellent form has a corresponding depraved form, thus :—

The good government of one (Monarcliy) corresponds to

the depraved form (Tyranny).

The good government of few (Aristocracy) correspouds

to the depraved form (Oligarchy).

The good government of many (Commonwealth) corre-

sponds to the depraved form (Democracy).

The fault of the depraved forms is that the governors act unjustly where their own interests are concerned. The worst of the depraved forms is tyranny, the next oligarchy, and the least bad democracy.! Each of the three leading types exhibits a number of varieties. Thus in monarchy we have the heroic, the barbaric, the elective dictatorship, the Lacedemonian (hereditary generalship, orparyyia), and absolute monarchy. So democracy and oligarchy exhibit four corresponding varieties. The best type of democracy is that of a community mainly agricultural, whose citizens, therefore, have not leisure for political affairs, and allow the law to rule. The best oligarchy is that in which a considerable number of small proprietors have the power ; here, too, the laws prevail. The worst democracy consists of a larger citizen class having leisure for politics ; and the worst oligarchy is that of a small number of very rich and influential men. In both the sphere of law is reduced to a minimum. A good government is one in which as much as possible ts left to the laws, and as little as possible to the will of the governor.

The Politics of Aristotle, from which these principles are taken, presents a striking picture of the variety and activity of political life in the free communities of Greece. The king and council of heroic times had disappeared, and self- government in some form or other was the general rule. It is to be noticed, however, that the Governments of Greece were essentially unstable. The political philosophers could lay down the law of development by which one form of government gives birth to another. Aristotle devotes a large portion of his work to the consideration of the causes of revolutions. The dread of tyranny was kept alive by the facility with which an over-powerful and unscrupulous citizen could seize the whole machinery of government. Communities oscillated between some form of oligarchy and some form of democracy, The security of each was constantly imperilled by the conspiracies of the opposing factions. Hence, although political life exhibits that exu- berant variety of form and expression which characterizes all the intellectual products of Greece, it lacks the quality of persistent progress. Then there was no approximation to a national government, even of the federal type. The varying confederacies and hegemonies are the nearest approach to anything of the kind. What kind of national government would ultimately have arisen if Greece had not been crushed it is needless to conjecture; the true interest of Greek politics lies in

the fact that the free citizens were, in the strictest sense of the word, self-governed. Lach citizen took his turn at the common busi- ness of the state. He spoke his own views in the agora, and from time to time in his own person acted as magis- trate or judge. Citizenship in Athens was a liberal educa- tion, such as it never can be made under any representative system.

The Government of Rome.—During the whole period of freedom the government of Rome was, in theory at least, municipal self-government. Each citizen had

? Aristotle elsewhere speaks of the error of those who think that any one of the depraved forms is better than any other.

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a right to vote laws in his own person in the comitia of the centuries or the tribes. The administrative powers of government were, however, in the hands of a bureau- cratic assembly, recruited from the holders of high public office. The senate represented capacity and experi- ence rather than rank and wealth. Without sonie such instrument the city government of Rome could never have made the conquest of the world. The gradual extension of the citizenship to other Italians changed the character of Roman government. The distant citizens could not come to the voting booths ; the device of representation was not discovered; and the comitia fell into the power of the town voters. In the last stage of the Roman republic, the inhabitants of one town wielded the resources of a world- wide empire. We can imagine what would be the effect of leaving to the people of London or Paris the supreme con- trol of the British empire or of France,—irresistible temp- tation, inevitable corruption. The rabble of the capital learn to live on the rest of the empire.? The favour of the effeminate masters of the world is purchased by panem et cercenses. That capable officers and victorious armies should long be content to serve such masters was impossible. A conspiracy of generals placed itself at the head of affairs, and the most capable of them made himself sole master. Under Cesar, Augustus, and Tiberius, the Roman people became habituated to a new form of government, which is best described by the name of Cesarism. The outward forms of republican government remained, but one man united in his own person all the leading offices, and used them to give a seemingly legal title

to what was essentially military despotism. There is no more interesting constitu- tional study than the chapters in which Tacitus traces the growth of the new system under the subtle and dissimulat- ing intellect of Tiberius. The new Roman empire was as full of fictions as the English constitution of the present day. The master of the world posed as the humble servant of a menial senate. Deprecating the outward symbols of sovereignty, he was satisfied with the modest powers of a consul or a tribunus plebis. The reign of Tiberius, little capable as he was by personal character of captivating the favour of the multitude, did more for imperialism than was done by his more famous predecessors. Henceforward free government all over the world lay crushed beneath the military despotism of Rome. Czsarism remained true to the character imposed upon it by its origin. The Ceasar was an elective not an hereditary king. The real founda- tion of his power was the army, and the army in course of time openly assumed the right of nominating the sovereign. The characteristic weakness of the Roman empire was the uncertainty of the succession. The nomination of a Cesar in the lifetime of the emperor was an ineffective remedy. Rival emperors were elected by different armies; and nothing less than the force of arms could decide the question between them. Modern Governments—Feudalism.—The Roman empire bequeathed to modern Europe the theory of universal dominion. The nationalities which grew up after its fall arranged themselves on the basis of territorial sove- reignty. Leaving out of account the free municipalities of the Middle Ages, the problem of government had now to be solved, not for small urban communities, but for large territorial nations. The medieval form of government was feudal. One common type pervaded all the relations of life. The relation of king and lord

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2 None of the free states of Greece ever made extensive or permanent conquests ; but the tribute sometimes paid by one state to another (as by the Adginetans to the Athenians) was a manifest source of cor- ruption. Compare the remarks of Hume (Essays, part i. 8, That Politics may be reduced to a Science), “ free governments are the most

! ruinous and oppressive for their provinces,”’

was Jike the relation between lord and vassal (see Frup- ALismM). The bond between them was the tenure of land. In England there had been, before the Norman Conquest, an approximation to a feudal system. In the earlier English constitution, the most striking features were the power of the witan, and the common property of the nation in a large portion of the soil. The steady development of the power of the king kept pace with the aggregation of the English tribes under one king. 'The conception that the land belonged primarily to the people gave way to the concep- tion that everything belonged primarily to the king! The Norman Conquest imposed on England the already highly developed feudalism of France, and out of this feudalism the free governments of modern Europe have grown. One or two of the leading steps in this process may be indicated here. The first, and perhaps the most important, was the device of representation. For anaccount of its origin, and for instances of its use in England before its application to politics, we must be content to refer to Canon Stubbs's Constitutional History, vol. ii. The problem of combin- ing a large area of sovereiguty with some degree of self- government, which had proved fatal to ancient common- wealths, was henceforward solved. From that time some form of representation has been deemed essential to every constitution professing, however remotely, to be free,

The connexion between representation and the feudal system of estates must be shortly noticed. The feudal theory gave the king a limited right to military service and to certain aids, both of which were utterly inadequate to meet the expenses of the government, especially in time of war. The king therefore had to get contributions from his people, and he consulted them in their respective orders, The three estates were simply the three natural divisions of the people, and Canon Stubbs has pointed out that, in the occasional treaties between a necessitous king and the order of merchants or lawyers, we have examples of inchoate estates or sub-estates of the realm. The right of representa- tion was thus in its origin a right to consent to taxation. The pure theory of feudalism had from the beginning been broken by William the Conqueror causing all free-holders to take an oath of direct allegiance to himself. The institu- tion of parliaments, and the association of the king's smaller tenants 7 capete with other commoners, still further re- moved the government from the purely feudal type, in which the mesne lord stands between the inferior vassal and the king.

Parliamentary Government.— The English System.—The right of the commons to share the power of the king and lords in legislation, the exclusive right of the commons to impose taxes, the disappearance of the clergy as a separate order, were all important steps in the movement towards popular government. 'The extinction of the old feudal nobility in the dynastic wars of the 15th century simplified the question by leaving the crown face to face with parliament. 'The immediate result was no doubt an increase in the power of the crown, which probably never stood higher than it did in the reigns of Henry VIII. and Elizabeth; but even these powerful monarchs were studious in their regard for parliamentary conventionalities. After a long period of speculative controversy and civil war, the settlement of 1688 established limited monarchy as the government of England. Since that time the external form of government has remained unchanged, and, so far as legal

1 Ultimately, in the theory of English law, the king may be said to have become the universal successor of the people. Some of the pecu- liarities of the prerogative rights seem to be explainable only on this view, €.9., the curious distinction between wrecks come to land and wrecks still on water. The common right to wreckage was no doubt the origin of the prerogative right to the former. Every ancient com-

mon right has come to be a right of the crown or a right held of the crown by a vassal.

; as a check upon the others.

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description goes, the constitution of William ITI. might be taken for the same system as that which still exists. The silent changes have, however, been enormous. The most striking of these, and that which has produced the most salient features of the English system, is the growth of cabinet government. Intimately connected with this is the rise of the two great historical parties of English poli- tics. The normal state of government in England is that the cabinet of the day shall represent that which is, for the time, the stronger of the two. Before the Revolution the king's ministers liad begun to act as a united body; but even after the Revolution the union was

still feeble and fluctuating, and each individual minister was bound to the others only by the tie of common service to the king. Under the Hanoverian sovereigns the ministry became con- solidated, the position of the cabinet became definite, and its dependence on parliament, and more particularly on the House of Commons, was established. Ministers were chosen exclusively from one house or the other, and they assumed complete responsibility for every act done in the name of the crown, 'The simplicity of English politics has divided parliament into two nearly equal parties, and the party in opposition has been steadied by the consciousness that it, too, has constitutional functions of high importance. Criti- cism is sobered by being made responsible. Along with this movement went the withdrawal of the personal action of the monarch in politics. No king has attempted to veto a bill since the Scotch Militia Bill was vetoed by Queen Anne. No ministry has been dismissed by the sovereign since 1834. Whatever the power of the monarch may be, it is unquestionably limited to his personal influence over his ministers. And it must be remembered that ministers are responsible ultimately, not to parliament, but to the House of Commons.

Apart, therefore, from the democratic changes of 1832 and 1867, we find that the House of Commons, as a body, had gradually made itself the centre of the government. Since the area of the constitution has been enlarged, it may be doubted whether the orthodox descriptions of the govern- ment any longer apply. 'The earlier constitutional writers, such as Blackstone and Delolme, regard it as a wonderful compound of the three standard forms,— monarchy, aris- tocracy, and democracy. Hach has its place, and each acts Hume, discussing the ques- tion "Whether the British government inclines more to absolute monarchy or to a republic," decides in favour of the former alternative. 'The tide has run long and with some rapidity to the side of popular government, and is just beginning to turn toward monarchy." And he gives it as

-his own opinion that absolute monarchy would be the

easiest death, the true euthanasia of the English constitu- tion. These views of the English Government in the 18th century may be contrasted with Mr Bagehot's sketch of the modern government as a working instrument.?

Leading Features of Parliamentary Government.—The parliamentary government developed by England out of feudal materials has been deliberately accepted as the type of constitutional government all over the world. Nearly all the European states and nearly all the Euro- pean colonies, dependent or independent, have adopted, more or less fully, the leading features of the English system—that is to say, popular representation more or less extensive, a bicameral legislature, and a cabinet or consoli- dated ministry. In connexion with all of these, numberless questions of the highest practical importance have arisen, the bare enumeration of which would surpass the limits of our space. We shall confine ourselves to a few very gene- ral considerations.

2 See Bagehot's Lnglish Constitution.

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The Two Chambers.—First, as to the double chamber. This, which is perhgps more accidental than any other portion of the EngliSh system, has been the most widely imitated. In most European countries, in the English colonies, in the United States congress, and in tle sepa- rate States of the Union,! there are two houses of legis- lature. This result has been brought about partly by natural imitation of the accepted type of free govern- ment, partly from a conviction that the second chamber will moderate the democratic tendencies of the first. The theoretical question would take too long to argue, but it is easy to show that the elements of the English original cannot be reproduced to order under different conditions.? There have, indeed, been a few attempts to imitate the special character of hereditary nobility attaching to the English House of Lords, and these few have failed. The complete solidarity existing between the English nobility and at least the politically privileged, if not the whole mass, of their countrymen, is a result not to be attempted by the framers of constitutions. The English system, too, after its own way, obviates any danger of collision between the Houses,—the standihg and obvious danger of the bicameral system. In England there is no doubt where the real sovereignty lies. The actual ministers of the day must possess the confidence of the House of Commons; they need not—in fact they often do not—possess the confidence of the House of Lords. It is only in legislation that the Lower House really shares

its powers with the Upper ; and the con- stitution possesses, in the unlimited power of nominating peers, a well-understood last resource should the House of Lords persist in refusing important measures demanded by the representatives of the people. In all but measures of first-class importance, however, the House of Lords is a real second chamber, and in these there is little danger of a collision between the Houses. There is the widest€pggsible difference between the English and any othe nd chamber. In the United States the senate (constituted on the system of equal representation of States) is the more important of the two Houses, and the only one whose con- trol of the executive can be compared to that exercised by the British House of Commons. In the English colonies a dead-lock between the two Houses is a matter of frequent occurrence. In France, it is an anticipated if not an in- tended source of danger to the new republican constitution.

The real strength of popular government in England lies in the ultimate supremacy of the House of Commons, That supremacy had been acquired, perhaps to its full extent, before the extension of the suffrage made the constituencies democratic. Foreign imitators, it may be observed, have been more ready to accept a wide basis of representation than to confer real power on the representative body. In all the monarchical countries of Europe, however unre- stricted the right of suffrage may be, the real victory of con- stitutional government has yet to be won. Where the suffrage means little or nothing, there is little or no reason for guarding it against abuse. The independence of the executive in the United States brings that country, from one point of view, more near to the Continental than to the English state system. The people make a more complete surrender of power to the Government than is done in England.

Cabinet Government.—The peculiar functions of the English cabinet are not easily matched in any foreign system. They are a mystery even to most educated

1 The double government in the last case was founded, says Sir G. C. Lewis, on the English municipal system, and corresponded to the difference between aldermen and common-council men.

- *Sweden, a few years since, reduced her four medieval estates to two houses, and is more like Great Britain in the composition of the new parliament than any other state in Europe.*

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Englishmen. The cabinet in England is much more than a body consisting of chiefs of departments. It is the inner council of the empire, the arbiter of national policy, foreign or domestic, the sovereign in commission. The whole power of the House of Commons is concentrated in its hands. At the same time, it has no place whatever in the legal constitution. Its numbers and its constitution are not fixed even by any rule of practice. It keeps no record of its proceedings. The relations of an individual minister to the cabinet, and of the cabinet to its head and creator, the premier, are things known only to the initiated.3 With the doubtful exception of France, no other system of government presents us with anything like its equivalent. In the United States, as in the European monarchies, we have a council of ministers surrounding the chief of the state.

Change of Power in the English System.—One of the most difficult problems of government is how to provide for the devolution of political power, and perhaps no other question is so generally and justly applied as the test of a working constitution. If the transmission works smoothly, the constitution, whatever may be its other de- fects, may at least be pronounced stable. It would be tedious to enumerate all the contrivances which this problem has suggested to political societies. Here, as usual, Oriental despotism stands at the bottom of the scale. When sovereign power is imputed to one family, and the law of succession fails to designate exclusively the individual en- titled to succeed, assassination becomes almost a necessary measure of precaution. The prince whom chance or intrigue has promoted to the throne of a father or an uncle, must make himself safe from his relatives and competitors. Hence the scenes which shock the European conscience when '" Amurath an Amurath succeeds." Constantinople, Afghanistan, and Burmah have all recently illustrated the standing difficulty of the succession in Oriental despotisms. The strong monarchical governments of Europe have been saved from this evil by an indisputable law of succession, which marks out from his infancy the next

successor to the throne. The king names his ministers, and the law names the king. In popular or constitutional govern- ments far more elaborate precautions are required. It is one of the real merits of the English constitution that it has solved this problem—in a roundabout way perhaps, after its fashion—but with perfect success. The ostensible seat of power is the throne, and down to a time not long distant the demise of the crown suspended all the other powers of the state. In point of fact, however, the real change of power occurs on a change of ministry. The con- stitutional practice of this century has settled, beyond the reach of controversy, the occasions on which a ministry is bound to retire. It must resign or dissolve when it is defeated in the House of Commons, and if after a dissolution it is beaten again, it must resign without alternative. It mayresign if it thinks its majority in the House of Commons not sufficiently large. The dormant functions of the crown now come into existence. It receives back political power from the old ministry in order to transmit it to the new. When the new ministry is to be formed, and how it is to be formed, is also clearly settled by established practice. The out-going premier names his successor by recommend- ing the king to consult him; and that successor must be the recognized leader of his successful rivals. All this is a matter of custom, not of law; and it is doubtful if any two authorities could agree in describing the custom in

3 See Bagehot's English Constitution, which exhibits a working view of this and other parts of the constitution as they appear to an out- sider, Mr Gladstone's political essays, in the collection entitled Gleanings of Past Years, contain much valuable information at first hand.

language of precision. It is certain that the intervention of the crown facilitates the transfer of power from one party to another, by giving it the appearance of a mere change of servants. The real disturbance is that caused by the appeal to the electors. A general election is always a struggle between the two great political parties for the possession of the powers of government. It may be noted that recent practice goes far to establish the rule that a ministry beaten at the hustings should resign at once without waiting for a formal defeat in the House of Commons.

The English custom makes the ministry dependent on the will of the House of Commons ; and, on the other hand, the House of Commons itself is dependent on the will of the ministry. In the last result both depend on the will of the constituencies, as expressed at the general election. There is no fixity in either direction in the tenure of a ministry. It may be challenged at any moment, and it lasts until it is challenged and beaten. And that there should be a ministry and a House of Commons in harmony with each other but out of harmony with the people is rendered all but impossible by the law and the practice as to the duration of parliaments.

Change of Power im the United States.—The United States offers a very different solution of the problem. The American president is at once king and prime minister; and there is no titular superior to act as a conduit-pipe between him and his successor, His crown is rigidly fixed; unshakable for four years, after four years he ceases to reign. No hostile vote can affect his power as the head of the administration, and it is difficult to resist his will even in legislation. But the day of his demise is known from the first day of his govern- ment ; and almost before he begins to reign the political forces of the country are shaping out a new struggle for the succession. Further, a change of government in America means a change of the entire administrative staff. The commotion caused by a presidential election in the United States is thus infinitely greater than that caused by a general election in England. A change of power in Eng- land affects comparatively few personal intcrests, and absorbs

the attention of the country for a comparatively short space

of time. In the United States it is long foreseen and elaborately prepared for, and when it comes it invelves the personal fortunes of large numbers of citizens. And yet the English constitution is more democratic than the American, in the sense that the popular will can more speedily be brought to bear upon the government.

Change of Power in France.—The established practice of England and America may be compared with the nascent constitutionalism of France. Here the problem presents different conditions. The head of the state is neither a premier of the English, nor a president of the American type. He is served by a prime minister and a cabinet, who, like an English ministry,

hold office on the condition of parliamentary confidence ; but he holds office himself on the same terms, and is, in fact, a minister like the others. So far as the transmission of power from cabinet to cabinet is concerned, he discharges the functions of an English king. But the transmission of power between himself and his successor is protected by no constitutional devices whatever, and recent experience would seem to show that no such devices are really necessary. Of course it is foo soon to talk about the constitutional practice in France, but this much seems clear, that some rearrangement of the relations of the president and the cabinet must soon take place. It seems difficult to distinguish between a parlia- mentary president and a parliamentary ministry, or to see why they should not stand or fall together. As yet the new French constitution has not had time to exhibit that which is a constant feature of the English constitutign, viz.,

a government headed by the chief of the dominant political party. When that time comes the office of premier ought, one would suppose, to merge in the office of president. Possibly the existence of numerous political parties, and tle open disloyalty to the existing constitution professed by some of them, may retard the simplification of the French governmental system. Other European countries professing constitutional government appear to follow the English practice. The Swiss republic is so peculiarly situated that it is hardly fair to compare it with any other. But it is interesting to note that, while the rulers of the states are elected annually, the same persons are generally re-elected.

Representation.—The questions connected with repre- sentation are too numerous to be discussed with advantage here. Two recent changes of great importance may be noticed in the English system,—the vote by ballot, and the partial introduction of what is called the minority vote. By the latter, in a constituency returning three members, each elector has only two votes, and a minority exceeding one-third can thus elect at least one of the three. The representation of minorities is a device of political theorists, and the chief result of its partial application has been to weaken the influence of the large constituencies. The chief anomalies of the English system are the inequality of electoral districts and the multiplicity of votes. A town of 200

electors returns as many candidates as a constituency of ten times that number. On the other hand, while one man has a single vote only, his neighbour, by various qualifications, may be an elector in several constituencies. In each case there is a revolution of the only theory on which the representative system as a whole can be founded —the equality of the voters. The first of these anomalies is admittedly waiting the convenience of political parties. The second has been recently aggravated by the creation of new university constituencies, consisting almost entirely of persons who had alrcady the right of voting under the ordinary qualification. The anomaly becomes a gross abuse in the practice of creating what are known as faggot votes. The simple remedy would be to require that each elector should be registcred in one constituency only.

The Relation between Government and Laws.—It might be supposed that, if any general proposition could be estab- lished about government, it would be one establishing some constant relation between the form of a government and the character of the laws which it enforces. The technical language of the English school of jurists is certainly of-a kind to encourage such a supposition. The entire body of law in force in a country at any moment is regarded as ex- isting solely by the fiat of the governing power. There is no maxim more entirely in the spirit of this jurisprudence than the following :—'"The real legislator is not he by whom the law was first ordained, but he by whose will it continues to be law." The whole of the vast repertory of rules which make up the law of England—the rules of practice in the courts, the local customs of a county or a manor, the principles formulated by the sagacity of genera- tions of judges, equally with the statutes for the year, are conceived of by the school of Austin as created by the will of the sovereign and the two Houses of Parliament, or so much of them as would now satisfy the definition of sove- reignty. It would be out of place to examine here the diffi- culties which embarrass this definition, but the statement we have made carries on its face a demonstration of its own falsity in fact. There is probably no government in the world of which it could be said that it might change at will the substantive laws of the country and still remain a government. However well it may suit the purposes of analytical jurisprudence to define a law as a command set by sovereign to subject, we must not forget that this is only a definition, and that the assumption it rests upon is,

to the student of society, anything but a universal fact. From his point of view the cause of a particular law is not one but many, and of the many the deliberate will of a legislator may not beone. Sir Henry Maine has illustrated this point by the case of the great tax-gathering empires of the East, in which the absolute master of millions of men never dreams of making anything in the nature of a law at all. This view is no doubt as strange to the English statesman as to the English jurist. The most conspicuous work of government in his view is that of parliamentary legislation. For a large portion of the year the attention of the whole people is bent on the operations of a body of men who are constantly engaged in making new laws. It is natural for us, therefore, to think of law as a factitious thing, made and unmade by the people who happen for the time being to constitute parliament. We forget how small a proportion the laws actually devised by parliament are of the law actually prevailing in the land. No European country has undergone so many changes in the form of government as France. Republic, constitutional monarchy, and empire have there succeeded each other again and again in the courseof a century. It is surprising how little effect these political revolutions have had on the body of French law. The change from empire to republic is not marked by greater legislative effects than the change from a Conservative to a Liberal ininistry in England would be.

These reflexions should make us cautious in accepting any general proposition about fornis of government and the spirit of their laws. We must remember, also, that the classifica- tion of governments according to the numerical proportion between governors and governed supplies but a small basis for generalization. What parallel can be drawn between a small town, in which half the population are slaves, and every freeman has a direct voice in the government, and a great modern state, in which there is not a single slave, while freemen exercise their sovereign powers at long intervals, and through the action of delegates and representatives ? Propositions as vague as those of Montesquieu may indeed be asserted with more or less plausibility. But to take any leading head of positive law, and to say that monarchies treat it in one way, aristocracies and democracies in another, is a different matter. Laws affecting trade might be ex- pected to

depend on the more or less popular character of the government. Yet would it be safe to say that monarchy discourages, that democracy encourages, free trade? France under the empire was more free-trading than France under the republic. If there is any difference at all between Great Britain and her colonies it is that the latter are generally supposed to be more democratic than the mother country, Yet protection rules the young democracies, while free trade reigns at home. The principle has indeed been broadly laid down that oligarchical governments interfere more actively and more extensively in the affairs of their subjects than popular governments. We shall have occasion to show directly that the popularization of government in England has up to this time been attended by a striking increase in the sphere of state action.

II. SpHere or GovERNMENT.

We may now ask, What is the appropriate sphere of government? What kind of business does it undertake, and what kind of business ought it to undertake? By what limits is its action to be restricted? Here too the field is occupied by disputed theories and diversified practice. And the sphere assigned to state action in different ages and countries varies as widely as the form of government.

The action of the state, or sovereign power, or govern- ment in a civilized community shapes itself into the three- fold functions of legislation, judicature, and administration. The two first are perfectly well defined, and the last includes

all the kinds of state action not included in the other two. It is with reference to legislation and administration that: the line of permissible state-action requires to be drawn. There is no doubt about the province of the judicature, and that function of government may therefore be dismissed with a very few observations.

The complete separation of the three functions marks a high point of social organization. In simple societies the same officers discharge all the duties which we divide between the legislator, the administrator, and the judge.

The acts themselves are not consciously recognized as being of dif- ferent kinds, The evolution of all the parts of a highly complex government from one original is illustrated in a striking way by the history of English institutions. All the couspicuous parts of the modern government, however little they may resemble each cther now, can be followed back without a break to their common origin. Parliament, the cabinet, tlie privy council, the courts of law, all carry us back to the same nzdus in the council of the feudal king.

Judicature.—The business of judicature, requiring as it does the possession of a high degree of technical skill and knowledge, is generally entrusted by the sovereign body or people to a separate and independent class of functionaries. In England, the appellate jurisdiction of the House of Lords still maintains in theory the connexion between the supreme legislative and the supreme judicial functions. It is only receutly that the important subject of divorce passed from the legislative chambers to the courts of law. In some of the States of the American Union the judicial functions of the upper house are still maintained after the example of the English constitution as it existed when these States were founded. In England there is also still a consider- able amount of judicial work in which the people takes its share. The inferior magistracies, except in populous places, are in the hands of private persons. And by the jury system the ascertainment of fact has been committed in very large measure to persons selected indiscriminately from the mass of the people, subject to a small property quali- fication. But the higher functions of the judicature are exercised by persons whom the law has jealously fenced off from external interference and control, The independence of the bench distinguishes the English system from every other, It was established in principle as a barrier against monarchical power, and hence has become one of the tra- ditional ensigns of popular government. In many of the American States, the spirit of democracy has demanded the subjection of the judiciary to popular control. The judges are elected directly by the people, and hold office for a short term, instead of being appointed, as in England, by the responsible executive, and removable only by a vote of the two Houses. There is not the smallest sign that. de- mocratic opinion in England is tending in this direction. At the same time the constitution of the United States has assigned to the supreme court of the Union a perfectly unique position, standing in singular contrast*

to the de- praved condition of many of the State judicatorics. The supreme court is the guardian of the constitution. It has to judge whether a measure passed by the legislative powers is not void by reason of being unconstitutional, and it may therefore have to veto the deliberate resolutions of both Houses of Congress and the president. It is admitted that this singular experiment in government has been completely justified by its success.

1 It is worth noting that direct election to offices—supposed to be characteristic of the democratic spirit—has no place in English political ideas. The few instances in which it occurs are regarded with indiffer- ence. 'The election of the coroner by the freeholders is universally condemned. In the few parishes where the clergyman may be ap- pointed by the parishioners, the right is often left to be exercised by the bishop.

Limits of State Interference in Legislationand Administra- tion.—The question of the limits of state action does not arise witli reference to the judiciary. The enforcement of the laws is a duty which the sovereign power must of absolute necessity take upon itself. But to what conduct of the citizens the laws shall extend is the most perplexing of all political questions. The correlative question with regard to the executive would be what works of public convenience should the state undertake through its own servants. The whole question of the spliere of government may be stated in tliese two questions :—What should the state do for its citizens? aud How far should the state interfere with the action of its citizens? These questions are the direct out- come of modern popular government; they are equally unknown to the small democracies of ancient times and to despotic governments at all times. Accordingly ancient political philosophy, rich as it is in all kinds of suggestions, has very little to say that has any bearing on the sphere of government. The conception that the power of the state can be and ought to be limited belongs to the times of "government by discussion," to use Mr Bagehot's expres- sion,—to the time when the sovereign number is divided by class interests, and when the action of the majority has to be carried out in the face of strong minorities, capable of making themselves heard. Aristotle does indeed dwell on one aspect of the question. He would

limit the action of the government in the sense of leaving as little as possible to the personal will of the governors, whether one or many. His maxim is that the law should reign. But that the sphere of law itself should be restricted, otherwise than by general principles of morality, is a cousideration wholly foreign to ancient philosophy. The state is conceived as acting like a just man, and justice in the state is the same thing as justice in the individual. The Greek institutions which the philosophers are unanimous in commending are precisely those which themost state-ridden nations of modern times would agree in repudiating.

Importance of this Question in English Politics — Limitation, then, being a principle known only to free governments, we naturally look to English political history for its elucidation ; and the speculative and practical treat- ment of this question is perhaps the most valuable contri- bution made by England to political science. From the time of the Revolution, the principle that there is a limit to the permissible action of government has been tacitly admitted. The theories which restricted the powers of the constitutional king by founding them on popular consent tended also to the restriction of the sphere of government in general, The connexion between the two may be seen very clearly in Locke. Government was created by the voluntary union of men in political society, and the object for which they agreed to unite was the preservation of their property. The scope of government is therefore limited by this its original object. " Though men, when they enter into society, give up the liberty, equality, and executive power they had in the state of nature into the hands of society, to be so far disposed of by the legislature as the good of society shall require, yet, it being only with an intention in every one the better to preserve himself, his liberty, and property, . . . the power of the society or legis- lature constituted by them can never be supposed to extend further than the common good." The practical application of these principles is to be found in his essay on Toleration. The business of the state being the protection of body and goods, it has no right to interfere with the religious worship or opinions of its citizens. The existence of religious dis- sent on a large scale kept up the practical importance of this theory. Even in the extreme absolutism of the parti- sans of monarchy, the curious doctrine of passive obedience recognizes the same principle. Although the will of the

sovereign ought never to be resisted, there is a line of action beyond which he onght never to pass.

Another historical fact of some importance is the long- continued alienation of the aristocratic classes from the reigning family during the post-Revolution period. In the 18th century the natural champions of monarchical power were in opposition. Their vast local influence, which might otherwise have gone to aggrandize tlie influence of the crown, was really employed to thwart it. There thus sprang up in the most conservative classes of society a strong feeling of jealousy for local independence, and a standing dislike of Government interference. Squire Western, in Vom Jones, may be taken as the type of the country party of the period. His idea of intellectual conversation is abusing the Govern- ment over a bottle. Nothing in the new-fangled notions of his sister disgusts him more than her affected sympathy with the politicians then in power. The sullen disaffection of the most powerful section of society wasa most effectual bulwark against any extension of the central power. It has been remarked by an acute observer! that the weakness of government in the 18th century suffered even public insti- tutions to assert their local independence. Corporations of every kind enjoyed the most complete liberty of action, and, freed from state control, became the private patrimony of their members. The same sort of resistance to state action has been repeated in the 19th century. The natural adherents of the crown, and the leaders of provincial society, the aristocracy, the county gentry, and the clergy, have generally been in opposition to ministers. It is a fact not without significance that the first constitutional question of this reign was raised by Sir Robert Peel, the leader of the Conservative party.

Again, the exhaustive discussion of all political measures, which for two centuries has been a fixed habit of English public life, has of itself established the principle that there are assignable limits to the action of the state. Not that the limits ever have been assigned in terms, but popular sentiment has more or less vaguely fenced off departments of conduct as sacred from the interference of the law. Phrases like "the liberty of the subject," the "sanctity of private property," "(an Englishman's house is his

castle," "the rights of conscience," are the commonplaces of political discussion, and tell the state, "Thus far shalt thou go and no further."

State and Church.—The side on which the legitimate province of government has been most debated is that on which it comes in contact with religion. High eccle- siastical theories draw the lines of restriction as clearly as voluntaryism, but what they exclude is state control and not state support. The Roman Catholics, the High Church party in England, and the Free Church in Scot- land, all unite in protesting against the intrusion of the secular government into spiritual affairs. This assertion of a spiritual domain lying beyond the sphere of govern- ment, and sacred from its interference, unfortunately implies that there is another authority from which, on religious matters, the Government ought to take its instructions. The duty of a national recognition of religion—implying com- pulsion of the most personal character—is strongly asserted by the very persons who denounce state control as illegiti- mate and tyrannical. The exclusion of the state from the spiritual domain is, in fact, not founded on any reasoned theory of the functions of government at all, but on the belief in a divinely appointed order for spiritual things, which it is the duty of the state to enforce. An attempt to base this position on general principles has, indeed, been made by Mr Gladstone in his work on Church and State. Holding that the state is a moral person, he argues that its 2S See eee

- *Mr Mark Pattison in Essays and Reviews.*

GOVER

action must be reguluted by conscience, and that its religious obligations are the same as those of the individual man. It must therefore recognize and practise a religion, and the true religion is that of the Christian Church, of which the English Establishment isa branch. That religion, with its divinely organized system of Episcopacy, the state should enforce inevery way short of physical persecution. Itshould exclude heretics from office and privilege, but it should not put them in prison. Mr Gladstone's book was the occasion of a controversy which doubtless had some effect on sub- sequent political events. Macaulay! stated the Whig view of the subject—holding that while the state may justi- fiably endow an established church, it may not persecute for dissent in any way whatever. Government has princi- pally to

deal with the material wants of society, and with the protection of lifeand property. While this is the main end of government, it nay pursue such secondary ends as the promotion of education and religion, the encouragment of arts, &c., but the primary end must not be sacrificed to the secondary end. The state is therefore not a moral person at all, any more than a railway company or a hospital ; and government is certainly not an institution for the pro- motion of religion; but, if it finds it expedient, it may justly support Presbyterianism in Scotland, Protestant Episcopacy in England, and Roman Catholicism in Ireland. It is ueedless to say that Macaulay makes no attempt to define the limits within which the government may thus provide for the good of society. These may be said to have been the views of Liberal politicians and latitudinarian ehurch- men. On the other hand, the religious theory of govern- ment, as expounded in Dr Arnold's Oxford Lectures on ITistory, is based on the conception that the ideal church and state are one. Here there ean be no bounds to the legitimate action of the state except its conformity with religious truth, And Dr Arnold does not hesitate to fore- cast an ideal state of society in which disbelief in the Christian religion shall so outrage the moral sense of the community that it may fittingly be put down by the strong arm of the law. The weakness of all theological specula- tions about government is that they are fitted only for local use. The theory of government cannot well be discussed to much purpose with a disputant who requires a series of theological propositions to be taken for granted.

The Laissez-faire Theory.—Mill.—A more profitable line of inquiry has been followed by writers of the economical school. The most important of these is John Stuart Mill, whose essay on Liberty, together with the concluding chapters of his treatise on Political Economy, gives a tolerably complete view of the principles of government. The leaning of political economists is towards what is called the laissez-faire or non-interference doctrine. There is a general presumption against the interference of Govern- ment, which is only to be overcome by very strong evidence of necessity. Governmental action is generally less effective than voluntary action. The necessary duties of Govern- ment are so burdensome, that to increase them destroys its efficiency. Its powers are already so great that indi- vidual freedom is constantly in danger. Asa general rule, nothing which can be done by the voluntary agency of individuals should be left to

the state, Each man is the best judge of his own interests. But, on the other hand, when the thing itself is admitted to be useful or necessary, and it cannot be effected by voluntary agency, or when it is of such a nature that the consumer cannot be considered eapable of judging of the quality supplied, then Mr Mill would allow the state to interpose. Thus. the education of children, and even of adults, would fairly come within the province of the state. Mr Mill even goes so far as to

1 Critical and Historical Essays, vol. i.

admit that, where a restriction of the hours of labour, or the establishment of a periodical holiday, is proved to be beneficial to labourers as a class, but cannot be earried out voluntarily on account of the refusal of individuals to eo-operate, Government may justifiably compel them to eo-operate. Still further, Mr Mill would desire to see some control exercised by the Government over the operations of those voluntary associations which, consisting of large numbers of shareholders, necessarily leave their affairs in the hands of one or a few persons. In short, Mr Mill's general rule against state action admits of many important exceptions, founded on no principle less vague than that of public expediency. The essay on Liberty is mainly concerned with freedom of individual character, and its arguments applygt0 control exercised, not ouly by the state, but by society in the form of public opinion. The leading principle is that of Humboldt, "the absolute and essential importance of human development in its richest diversity." Humboldt broadly excluded education, religion, and morals froin the action, direct and indirect, of the state. Mill, as we have seen, conceives education to be within the province of the state, but he would confine its action to compelling parents to educate their children.

Herbert Spencer.—The most thoroughgoing opponent of state action, however, is Mr Herbert Spencer. In his Social Statics, published in 1850, he holds it to be the essential duty of Government to protect—to maintain men's rights to life, to personal liberty, and to property; aud the theory that the Government ought to undertake other offices besides that of protector he regards as an untenable theory. Each man has a right to the fullest exercise of all his faculties, compatible with the same rightiv others. This is

the funda- mental law of equal freedom, which it is the duty and the only duty of the state toenforce. If the state goes beyond this duty, it becomes, not a protector, but an aggressor. Thus all state regulations of commerce, all religious estab- lishments, all Government relief of the poor, all state systems of education and of sanitary superintendence, even the state currency and the post-office, stand condemned, not only as ineffective for their respective purposes, but as involving violations of man's natural liberty. Many of the principles enunciated in this book are not reconcilable with the later views of the author, but he would still appear to maintain his theory of government to the fullest extent. Thus, in the Principles of Sociology, published in 1877, he distinguishes between the militant type of society and the industrial type. The former is framed on the priuciple of compulsory co-operation, while the latter is framed on the principle of voluntary co-operation, He vaguely indicates 'Ca possible future social type, differing as much from the industrial as this does from the militant,—a type which, having a sustaining system more fully developed than any one known at present, will use the products of industry neither for maintaining a militant organization nor ex- elusively for material aggrandizement, but will devote them to tle earrying on of higher activities." Of the two actually existing types, the militant is distinguished by a strong and the industrial by a feeble Governmental system. Reversing the analogy suggested by individual organisms, he holds the latter to be a higher and better type than the former.? And he maintains that military activity in a state dis- tinguished by a high degree of industrial development produces a recurrence to the militant type of institutions generally. Thus, in Germany, the dealings of Bismarck with the ecclesiastical powers, and the measures taken for

2 Principles of Sociology, vol. i., London, 1877. In a postseript to part ii, Mr Spencer explains the "' origin of this seeming incongruity." Individual organisms, high or low, have to maintain their lives by offensive or defensive activities or both; social organisms, except during the militant stage of their evolution, have not.

centralizing the state control of railways, are instances of a more coercive régeme established by war. In England, the peaceful period from 1815 to 1850 is contrasted with the militant period since 1850. The latter has been marked by the usurpations of military officialism, by sanitary dic- tation, by coercive philantliropy, by compulsory education, by an unhesitating faith in state-judgment, and by a general disregard of the principles of free government, even on the side of the party which in the previous period effected changes in the direction of freedom.

Lendency of recent Legislation.—Turning from political theory to political practice, let us see how the legislation of the last fifty years in England has drawn the line between legitimate and illegitimate state action. The period that has elapsed since the passing of the Reform Act of 1832 has been one of great legislative activity. In no former period has legislation been so completely under the control of public opinion, or so directly affected by open discussion of the principles of projected measures. It will be of some interest, therefore, to inquire how the most enlightened political community in the world has, during the period of its fullest freedom, defined the business of government.

Reduction of State Action.—Religion.—The cases in which Government interference has been abolished or greatly limited during this period are mainly two—in matters of opinion (especially religious opinion), and in matters of con- tract. The principle that the state ought to maintain some form of religion has been surrendered by the disestablish- ment of the Irish Church. The disqualifications, political and civil, of dissenters, have, with a very few and not very important exceptions, been removed. The last remnant of the old rule, making witnesses incompetent on religious grounds, was removed by the Act enabling persons to give evidence without an oath. A few statutes making various forms of irreligion punishable still remain, but they are never enforced, and any attempt to enforce them would almost certainly end in their formal repeal. State prosecu- tions for expression of opinion have almost entirely ceased, and practically the only instrument of control now left is the law of libel. Under the influence of the judges, that law has, during the period in question, been uniformly interpreted in a sense favourable to the freedom of discus- sion. One of the few remaining restrictions on religious freedom is the principle, acted on in

several recent cases, that a contract may be broken if its object is to facilitate the expression of irreligious opinions.}

At the same time there appears to be a tendency to dis- tinguish between merely irreligious opinions and opinions prononnced to be immoral. Convictions have lately been obtained for publishing and selling books advocating opinions on certain moral and social questions which appeared to a jury to be calculated to deprave the morals of the people. But here again the distinction has been authoritatively drawn between such views when presented in a scientific form, and adapted to a scientific audience, and the same views offered openly to the unscientific public. Untenable as such distinctions are, they manifest a ten- dency on the part of the courts to confine the prosecntion of opinion within the principle of the law against indecent publications, It may further be added that, with one not- able exception,—the Public Worship Regulation Act,—the dealings of the state with the church have been confined Within a very narrow compass. The endowment of new sees, for instance, although sanctioned by the state, is left to the voluntary contributions of the public.

Contract.—Freedom of contract, in general, has been greatly advanced by the success of the free-trade agitation in 1843, which was not so much a protest against state regula-

‘ fi.g., a contract to let a hall for a lecture advocating atheistic principles.

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tion as a demand for a cheap supply of food. Since that time, the principle that the state should leave men to make what bargains they please, without attempting to encourage any particular industry or to favour any special class, has taken rank as a maxim of universal application. One class of contracts—those between master and servant—long remained an exception to the generalrule. Breach of such contracts by the servant was treated as a criminal offence, and the combination of servants to obtain a rise of wages as a conspiracy. A series of statutes, the last of which was passed a few years ago, has abolished the criminal character of the breach of the contract of service, except in a few cases, The abolition of the laws against usury in 1857 is another instance ; the authorization of trading companies with limited liability is another. The last great legislative measure before parliament (the Criminal Code Bill of 1879) proposes to do away with the

old offences of maintenance and champerty. Besides the classes regarded by law as under disability to contract (infants, lunatics, and married women), a few doubtful instances of protected persons might still be named. Thus expectant heirs are treated in the spirit of the old laws against usury. Seamen are not allowed to make a charge upon their wages. In certain employments specified in the Truck Act wages are not allowed to be paid otherwise than in coin. The principle of free trade is outraged in its own name by the legal rule which vitiates contracts made 'in restraint of trade."

Increase of State Action,—The enumeration of new restrictive measures, and instances of increased state inter- ference within the same period, would occupy a much more formidable list. A rough classification only will be here attempted. We shall take first, interference for the pro- tection of definite classes of persons.

Education of Children.—This is perhaps the most con- spicuous, as it is certainly the most beneficial and the least disputed, of the recent encroachments of the state. The progress of opinion and legislation on this subject has been singularly rapid. Beginning with Government grants in aid of education, strenuously resisted on grounds going to the very root of the question of legitimate state interference, the system has now culminated in a net-work of state-supported and state-administered schools spread over the whole coun- try. That the state should compel parents to educate their children would only be a slight departure, if any, from the general principle imposing duties on parents and disabilities on children, Under the present system the state not only compels the parent to educate, but itself provides, and in great measure pays for, the education. A generation of dis- cussion has, however, drawn very distinctly the line beyond which this advance of state authority must not proceed. Compulsory state education is for children only, and may be justified by the general argument which justifies state protection to the helpless; it is elementary only; and it is secular only.

Regulation of the Labour of Children and Women,—The long series of Factory Acts is the best example of the steady and persistent advance of Government control in this direc- tion. Here the line of protection is considerably advanced, but is again carefully drawn under male adults, although these of necessity share in the benefits of the protection in all

employments where their work requires the co-operation of women and children. See Factory Acts.

Regulation of Dangerous Employments.—Of these the Mines Regulation Acts are perhaps the best example. Here the Government actually lays down the rules under which alone these employments are suffered to be carried on. Here the principle that adults are capable of looking after themselves is overruled by the dangerous character of the employment.

In all these cases the action of the state is defended on

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the ground that the persons protected are unable sufficiently to protect themselves ; and the principle adopted is that of prevention instead of mere punishment for breach of duty. Hence an enormous army of inspectors is required for the work of control.

Another class of interferences is justified on the ground of public health, and these, in respect of the amount of state supervision required, stand next to the protective measures already enumerated. The common law of nuisance recog- nizes the principle that any source of contagion or discom- fort set up by an individual is an injury to those who may be affected by it, which they may call upon the state to suppress. 'The Sanitary Acts interpose the remedy at an earlier stage, and by the usual apparatus of Government inspectors and detectives. The largest measure on this subject is the Public Health Act, and the most extreme development of the principle is the lending of money by the Government to municipalities for the erection of healthy dwelling-louses for labourers. Personal freedom is more directly affected by measures like the Vaccination Act, for which, however, the duuble ground of the helplessness. of the subjects and the prevention of danger amounting to nuisance may be taken. The least defensible of all the measures of this class are those relating to the adulteration of various kinds of food. The fraudulent or negligent supply of food injurious to health is an injury which may be appropriately punished by awarding compensation to the person injured, and inflicting punishment on the delinquent. But under the last Act (Sale of Food and Drugs Act, 1875) it is a criminal offence to sell goods of a quality not asked for, and the usual staff of analysts and

inspectors is estab- lished to facilitate detection. The mighty engine of Govern- ment determines the exact percentage of water which the dairyman may put in his milk and the publican in his gin.

Next come the cases in which the Government either aids or itself undertakes works of public convenience. The state monopoly of the post-office is the most conspicuous example, and we have recently seen it extended by the acquisition of the telegraphs. Less directly the state has acquired control of the locomotive system, by granting compulsory powers of various sorts and a partial monopoly to railway comipanies, and by imposing certain regulations on them. This department of state activity has been greatly increased by the operations of the Public Works Loans Commission, which lends money to local bodies for such purposes as the' erection of baths and wash-houses, improving rivers, harbours, and towns, building light- houses and public libraries, and the like.

The assertion of state control over endowments is another marked feature of the period. Except in this way, Govern- ment has not, in England at least, interfered with the higher sort of education to any great extent. But most of the endowed schools and the universities have been subjected to inquiry, and remodelled according to what are under- stood to be the demands of theage. Almost every kind of corporation has been revised in the same way, the most notable and scandalous exception being the numerous and wealthy corporations of the city of London. The history of these reforms reveals a perfectly clear rationale of the relations existing between an endowed institution and the state, All endowments are privileges created by the state in the way of exception to the universal rule of law against perpetuities—the rule which limits the operation of dead men's wills, and makes each generation master of its exist- ing resources. When the purposes of an institution cease to be useful, or its organization is seen to be defective, it is the right and duty of the state to withdraw the privilege altogether, or continue it under new conditions. All endowments become, in virtue of this rule, the property of the state; and how it shall deal with them becomes a

question of statesmanship, not of interference with private interests. Under the name of "vested interests," all existing rights of individuals are

stringently preserved. These two correlative principles—the right of the state to revise all endowments, and the obligation to respect vested interests in any such revision—have ceased to be disputable in English politics.

A similar extension of state control is to be seen in the organization of the professions—i.e., persons licensed to practise particular arts. The church, like the army, is not, properly speaking, a profession, and its regulations belong to the same class as those of the army or the civil service. The true professions are the various grades of lawyers and medical men. They have an exclusive monopoly of the arts which they profess. The protection of this monopoly was long the only connexion between them and the Government. They were left to the management of self-governing societies or corporations, Within our own generation there has been, not only a marked increase of state control over the professions, but a marked tendency to extend it to occupations hitherto uncontrolled. The system of medical licentiation is year by year becoming more stringent and more centralized. A recent Act provides for the more efficient testing of the qualifications of solici- tors. The bar, which has hitherto with immense practical wisdom governed itself by means of voluntary societies, is threatened with a parliamentary constitution, settling the conditions of admission, examination, discipline, and dis- missal, The free professions are demanding the like recog- nition and supervision by the state. A bill is now (1879) before parliament for organiziug the professions of school- masters in the higher class of schools; and elementary schoolmasters are claiming to be included inits scope. The ~ business of buying and selling stocks and shares has narrowly escaped, if it has escaped, the rules and regula- tions of an act of parliament. A commission was actually appointed a few years ago to investigate the practices of brokers and jobbers, and one of its recommendations was that the Stock Exchange should forthwith become a cor- poration, The last interference of this sort was the appointment of a committee of the House of Commons, at the instance of the London retail traders, to inquire into the working of what are called co-operative stores. Inquiry does not of course imply interference, and a committee or a commission is often a convenient way of stopping the mouths of agitators whom it might not be convenient to ignore altogether. Futile as the remedy may be, the first thought of every aggrieved class is to lay its wrongs before parliament.

Protection of things from Excessive Consumption.—A nother class of interferences may be described, in the most general terms, as measures taken for the protection of things which would otherwise perish, or greatly diminish, by reason of excessive use. Statutes of this sort have greatly multi- plied during the last fifty years, There is hardly any kind of animal, which men think worth catching or eating, without its statutory close-time. The ostensible reason for this kind of legislation is that salmon, let us say, or oysters, are a very important article of food, and unless men are restrained from pursuing them to excess, the whole breed would ultimately be extinguished, or so reduced in number as to be of little use. Another and less avowed reason is that animals of the protected order are necessary for the recreation of a certain class of gentlemen, who, in tlie interest of their own pleasures, must be restrained from carrying them to excess. Thus no gun must be lifted against grouse before the 12th of August, or against partridges before the lst of September, so that next year there may still be grouse and partridges in the land. The great majority of these enactments belong in spirit to the

game-laws, but many of them are genuinely intended for the perpetuation of perishable supplies of food. Some of them, like the Seabirds Protection Act, or the Small Birds Pro- tection Act, are dictated by some sentimental fear of the extinction of such animals. Asa whole, they are among the least defensible of the modern extensions of state power.

Coercion for Moral Purposes.—The measures hitherto noticed may in general be justified either on the ground of the inability of the persons protected to help them- selves, or on the ground that some good to society as a whole, or to large portions of it, is secured thereby. An- other class of measures openly aims at the moral im- provement of the individuals affected by them, and in this class there has been an amazing and alarming increase. The laws against gaming are one of the bestexamples. At common law a wager was a contract, enforceable by the tribunals like any other. Not content with declining to enforce wagers, the state went further, and tried to put them down altogether. It made lotteries illegal. It visited with heavy penalties the keeping of betting-houses, all betting in public places, the

publication of betting lists, &e. Gaines which lead to betting are put under the restraint of a licensing system, and in some parts of the provinces the state orders its citizens not to play billiards after eleven o'clock at night. To this class belongs the severe code regulating what is called the liquor traffic, Through the agency of licensing magistrates, the state first of all limits the number of public-houses; then it dictates directly the hours during which liquor may be bought and sold; and in Scotland and Ireland it goesfurther, and prohibits altogether the sale of liquer on Sunday. Acommittce of the House of Lords has touched the highest point of government control in proposing to empower local authorities to buy up all the public houses in their districts, and carry on the business for themselves. There is a simultaneously increasing tendency to interfere with people's amusements : fairs are being put down as immoral, music and dancing require licences very charily granted, the grip of the lerd chamberlain over the London theatres is tightened, aud so on. The course of moral legislation, in fact, threatens to sweep away every barrier to the encroachments of the state. The extended range of Government interference in other things has been accompanied, as we have seen, by a very distinct recog: nition of limits, either in the rights of the individual con- science, or in the capacity of adult manhood to manage its own affairs. But Acts of Parliament for improving the moral characters of men seem to recognize no limit at all, And it isa singular faet that, while this kind of legislation, under existing social arrangements, fails to affect the well- to-do classes, and presses chiefly on the comparatively poor, it is becoming more and more identified with the popular party in politics, and gathers strength with every addition to the popular element in government.

We have hitherto confined our attention to simple as opposed to compound forms of government, and to the supreme as opposed to the suberdinate functions of govern- ment. 'The complete treatment of the subject would require us to take some notice of the (1) association of several com- munities, with separate governments under one sovereignty, and (2) of the subordinate organizations for carrying on the government of localities, under the supreme government.

1. Federal Government.—As this is the subject of a Separate article (vol. ix. p. 61), we need only notice here the case in which one of the associated

Governments is the ultimate seat of sovereign power—the others being its colonies or dependencies. England is, of course, by far the most illustrious example of a country so situated, and her relations with the subordinate communities exhibit much variety of form. One leading distinction may be

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drawn,—namely, between the communities which are allowed to govern themselves and tliose which, either as being unfit for self-government, like India and Fiji, or on account of the military necessities of the situation, as Malta and Gibraltar, are governed by the officers of the English Government. In the subject dependencies, as the latter may be called, the government is usually carricd on by a governor and council, nominated by the crown, and holding office for various terms of years. The council, asa general rule, consists of the higher officers of the dependency, such as the chief-justice or the attorney-general. The governor and council are strictly the delegates of the home Govern- ment aud have no legal or constitutional status of their own. The recently acquired island of Cyprus occupies an anomalous position in the British state system. Tlie English Government holds it, not as sovereign, but as lieutenant-general of the sovereign, the sultan of Turkey. The government of the island is vested in a commissioner who takes his orders, not from the colonial, but from the foreign office. As a general rule the relations between the mother country and her dependencies are under the charge of a special department of state—the colonial office.

In free dependencies the alternative is between some kind of confederation with the mother country, whereby the dependency shall have a representative voice in the supreme government, and the practical independence of the dependency in all but international affairs. In the French system the deputies of Algiers and other colonies sit in the supreme legislature along with the other representatives of France. In the English system distance alone would render sucha scheme impracticable ; and, even where distance would be little or no hindrance, there has been no desire on either side for any such connexion. Dependencies like the Isle of Man and the Channel Islands are as completely sepa- rated from England as New Zealand and Canada. The free dependencies have local constitutions framed on the model of the home Government—two chambers

of legis- lature, a governor nominated by the crown, and a ministry dependent on parliament. The governor is supposed to stand te the ministry and parliament as the crown to the ministry and parliament at home; but it is to be remem- bered that the governor is, properly speaking, the representa- tive not of the English crown but of the English Govern- ment, It is from the colonial secretary that the governor takes his instructions, and the colonial secretary and his colleagues take their instructions from the House of Commons. And, just as the practice of the constitution has made it impossible for the monarch to resist the wishes of parliament, so it is established that the governor, as representing England, shall not veto enactments of the colonial legislature. Just as in England the House of Commons invariably determines the fate of a ministry, so does the lower or popular house in a colonial legislature. It is needless to say that this is a very great advance ou the old theory of colonial relations. Beginning in special grants or charters granted to individuals or corporations, the English colonies in North America held their liberties by the grace of the crown. The successful revolt of the colonies taught the mother country the folly of supposing that Englishmen in America would consent to be governed by Englishmen at home.

Although colonial institutions are modelled as nearly as may be after the original type, they are not entirely free from questions of fundamental difficulty. The central question of government—Whese will is to prevail?—has at the present time (1879) been agitating two of the greatest of the colonies, a deadlock between the council and the assembly in Victoria being referred to England, and the governor-general of Canada refusing to dismiss a lieu- tenant-governor on the advice of his responsible ministry.

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The subjection of colonies to the home Government is still retained in two important cases. The colonies have no voice whatever in determining the nature of their relatious with other communities ; the question of peace or war is decided for them by the home Government. Again, all the colonies, whatever may be their powers of local self- government, seck justice in the last resort from the sove- reign in council.

2. Local Government.—As the business of society at large must be undertaken by the supreme government, so the local business of the subdivisions of society must be undertaken by local sub-governments. Local government repeats on a small scale the features of the supreme government, but its business is chiefly judicial aud adminis- trative. The most marked distinction here is between rural and urban communities—between the county and the borough. Self-government or representative govern- meut is the rule in the latter, the exception in the former. In England, since the Municipal Corporations Act, the affairs of all urban communities, except the city of London and a few unimportant boroughs, are managed by the direct representatives of the inhabitants. In the counties the control of affairs rests with the justices of the peace, who are nominated by the crown exclusively from the class of gentry.

The degree of control exercised by the supreme govern- ment over local governments is a point of first-rate import- ance in the constitution ofa country. Among free countries England and France stand at opposite ends of the scale,—

England being characterized by great local independence, –

France by strict central control. Thus itis said that, even under the republic, the minister of education can say that at a given hour all the children 'in all the schools of France are learning the same lesson. The habitual dependence of the French people upon the action of the state has been described as a survival from the times of imperial despotism which may be expected to disappear gradually under the influence offreedom. Avstepin this direction has certainly been taken in the proposal to allow communes to elect their own maire; and the abuse of the prefectoral system by a recent ministry ought to lead to some diminution of its euormous powers, On the other hand the inereased activity of the state, which, as we have already seen, has accompanied the establishment of popular government ou a wide basis in England, has shown itself also in increased centralization. The new functions—educational, sanitary, and other— imposed on local bodies are controlled by the supreme government through central boards. In 1871 the local government board was constituted to take over the powers of control over local boards hitherto exercised by various high officers of state, the

poor law board, and the privy council. More recently the Prisons Act of 1877 has traus- ferred to the secretary of state the powers hitherto exercised by the local prison authorities, and has made the cost of maintaining local prisons a burden ou the public funds. As we have already said, the work of local governments generally embraces very little that can properly be called legislation. They have a power of making bye-laws for carrying out within their district the purposes of a general law, and over that power the courts of justice exercise a vigilant control. Parliament in England has hitherto looked with great distrust on subordinate legislatures, and it is a common saying that the jealousy of the House of Commons is one of the reasons why the metropolis remains without municipal government. But it would now be generally admitted that the legislation demanded of parliament every year is greatly beyond its effective powers. There are in- dications of an approach to something that may be described as home rule —a name which inspires more distrust than the reality. Parliament makes no pretence of consistency

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in legislating separately for England, Scotland, and Ireland. To take only notorious examples,—the Irish Land Act, the Disestablisliment Act, and the Sunday Liquor Actof Ireland, and the Forbes Mackenzie Act of Scotland are instances of legislation according to the supposed wishes of the people specially affected. Irish and Scotch business tends in the House of Commons more and more to fall into the hands of Irish and Scotch members, and the interference of others is not unfrequently resented asan intrusion. Again, private bill legislation, regulated as it is by ascertained general principles, has come to be in fact, as in form, a purely judicial proceeding, which might well be relegated, as it no doubt one day will be relegated, to local tribunals. Another indication of the same tendency is to be found in what is called permissive legislation, which leaves to local authorities tle responsibility of deciding how far a given principle shall be applied. (2B) GOWER, Joun (13251-1408), one of the best of the English minor poets, was born in or about the year 1325 ; but the date is not exactly known. It has been conclu-

sively shown by Sir Harris Nicolas that he belonged

to the county of Kent. His family was wealthy; and he seems to have had various country houses. So far as we know he did not marry till 1397, when he was united to Agnes Groundolf. He was an intimate friend of Chaucer; but there is no evidence to prove that they were fellow- students. A few years after his marriage, Gower became blind, and had to give up writing. He spent his declining years in the priory of St Mary Overies, or, as it is now called, St Saviour's, in Southwark, where his monument is still to be seen.

Near the close of the Coxfessio Amantis, Gower puts thc following compliment toChaucer into the mouth of Venus:—

"© And greet weel Chaucer when -ye meet,

As my disciple and my poet ;

For in the fioures of his youth,

In sundry wise, as he well couth

Of ditties. and of songes glade,

The which 'he for my sake made,

The land fulfilled is over all;" &c. in these lines he was merely requiting a compliment that liad been paid him some years before by his brother-poet, who, in dedicating to him his 7'rowdus and Cressida, addressed him as "O moral Gower," an epithet which, though not remarkably happy, has stuck to him. Gower died in 1408, In his will the leaves a number of religious legacies to various ecelesiastical persons and institutions, and £100, along «vith the rents of his manors, to his wife Agnes. The beautiful church in which Gower lies was rebuilt in great part at his expense, and proves, among other things, that he must have been exempt from one of the usual misfortunes of poets—poverty.

Gower's poetical works are fourin number—Dalades and other Poems, in French, printed in 1818 for the Roxburghe Club ; the Speculum Meditantis, a treatise .on the duties of married life, written in French verse, and divided

into ten books; Vox Clamantis, a narrative in Latin elegiacs, of the insurrection of the commons in the reign of Richard IL ; and the Confessio Amantis. The second of these works is believed to have perished ; of the third there is a good edition by the Rev. H. O. Coxe, printed for the Roxburghe Club in 1850; and the fourth was first printed by Caxton in 1483. 'The Confessio Amantrs, or Lover's Confession, is a huge miscellaneous collection of physical, metaphysical, and moral reflexions, and of stories culled from the common repertories of the Middle Ages, A kind of unity is given to these apparently incongruous materials by the form of the poem, which is a dialogue between a lover and his confessor, who isa priest of Venus, and is called Genius. In the moral part of his theme, Cower is confessedly wise, impressive, and sometimes almost

sublime. But, as Ellis, in his Specimens of the Larly English Poets, observes, " His narrative is often quite petrifying ; and when we read in his works the tales with which we have been familiarized in the poems of Ovid, we feel a mixture of surprise and despair at the perverse industry employed in removing every detail on which the imagination had been accustomed to fasten. The author of the Metamorphoses was a poet, and at least sufficiently fond of ornament. Gower considers him as a mere annalist, scrupulously preserves his facts, relates them with great perspicuity, and is fully satisfied when he has extracted from them as much morality as they can reasonably be ex- pected to furnish," As Professor Lowell has well remarked, Gower "has positively raised tediousness to the precision of ascience." Though his descriptions are often extremely agreeable, and his diction easy and smooth, his prolixity, and the prosaic feebleness of the conceptions, will prevent the Lover's Confession from ever rivalling the writings of Chaucer, or even approximating them in popularity.

See Todd's Illustrations of the Lives and Writings of Gower and Chaucer; Ellis's Speeimens of the Early English Poets; Craik's ist. Lit.; Wartou's Hist. Eng. Poetry; Godwin's Life of Chaueer ; Morley's English Writers; Sir Harris Nicolas's Life of Chaucer; Mrs Masson's Three Centuries of English Poetry; Retrospective Review for 1828, where Sir Harris Nicolas throws fresh light ou the subject ; Observations on the Language of Chauecr's

Canter- bury Tales, and Gower's Confessio Amantis, by F. J. Child; Minto's Characteristics of English Poets; and, above all, Dr Rein- hold Pauli's scholarly cdition of the Confessio Amantis (London, 1857), which contains a notice of Gower, and an account of the MSS. and editions of the poem.

GOYA, a town of the Argentine Republic, in the province of Corrientes, near the junction of a small stream with the Parana, about 100 miles 8. of Corrientes. The streets are about 60 feet wide, and the houses, built of brick, are often two stories high. One side of the handsome plaza is occu- pied by a large church erected by local subscription, and in the centre there is a pyramid 50 feet high. Hides, wool, cheese, and oranges are the principal articles of trade, the cheese especially finding a good market at Buenos Ayres and elsewhere. The town was founded in 1807 by the national Government, and is said to have derived its name from Goya or Gregoria, the wife of the Portuguese cattle- farmer who was formerly settled on the spot. The popu- lation, which includes a large foreign element,—Italians, Basques, and French,—amounted to 10,907 in 1869. See Mulhall's Handbook of the River Plate.

GOYANNA, a city of Brazil, in the province of Pernam- buco, on a river of its own name, about 10 miles from the sea. It isa well-built place, and carries on a trade in cotton, sugar, rum, hides, timber, dye-stuffs, oils, and other pro- ducts of the fertile region in which it lies. Most of its exports are sent to Recife for shipment, its own port being ouly deep enough for the larger class of coasting vessels, The population is about 12,000.

GOYA Y LUCIENTES, Francisco (1746-1829), Spanish painter, was born in 1746 at Fuendetodos, a small Aragonese village near Saragossa. At an early age he com- menced his artistic career under the direction of José Luzan Martinez, who had studied painting at Naples under Mastroleo. It is clear that the accuracy in drawing Luzan is said to have acquired by diligent study of the best Italian masters did not much influence his erratic pupil. Goya, a true son of his province, was bold, capricious, head- strong, and obstinate. He took a prominent part on more than one occasion in those rival religious processions at Saragossa which often ended in unseemly frays; and his friends were led in consequence to despatch him in his nineteenth year to Madrid, where, prior to his departure for Rome, his

mode of life appears to have been anything but that of a quiet orderly citizen. Being a good musician, aud gifted with a voice, he sallied forth nightly, serenading

the caged beauties of the capital, with whom he seems to have been a very general favonrite.

Lacking the necessary royal patronage, and probably scandalizing by his mode of life the sedate court officials, he did not receive—perhaps did not seek—the usual honorarium accorded to those students who visited Rome for the purpose of study. Finding it convenient to retire for a time from Madrid, he decided to visit Rome at his own cost ; and being without resources he joined a " quad- rilla" of bull-fighters, passing from town to town until he reached the shores of the Mediterranean. We next hear of him reaching Rome, broken in health and financi- ally bankrupt. In 1772 he was awarded the second prize in a competition initiated by the academy of Parma, styling himself "pupil to Bayeu, painter to the king of Spain." Compelled to quit Rome somewhat suddenly, he appears again in Madrid in 1775, the husband of Bayeu's daughter, and father of a son. About this time he appears to have visited his parents at Fuendetodos, no doubt noting much which later on he utilized in his genre works. On return- ing to Madrid he commenced painting canvasses for the tapestry factory of Santa Barbara, in which the king took much interest. Between 1776 and 1780 he appears to have supplied thirty examples, receiving about £1200 for them. Soon after the revolution of 1868, an official was appointed to take an inventory of all works of art belong- ing to the nation, and in one of the cellars of the Madrid palace were discovered forty-three of these works of Goya on rolls forgotten and neglected (see Los T'apices de Goya; por Cruzado Villaamil, Madrid, 1870),

His originality and talent were soon recognized by Mengs, the king's painter, and royal favour naturally followed. His career now becomes intimately connected with the court life of his time. He was commissioned by the king to design a series of frescos for the church of St Anthony of Florida, Madrid, and he also produced works for Sara- gossa, Valencia, and Toledo. Ecclesiastical art was not his forte, and although he cannot be

said to have failed in any of his work, his fame was not enhanced by his religious subjects.

In portraiture, without doubt, Goya excelled: his por- traits are evidently lifelike and unexaggerated, and he disdained flattery. He worked rapidly, and during his long stay at Madrid painted, amongst many others, the portraits of four sovereigns of Spain—Charles III. and IV., Ferdinand VII., and "King Joseph." The duke of Wellington also sat to him; but on his making some remark which raised the artist's choler, Goya seized a plaster cast and hurled it at the head of the duke. There are extant two pencil sketches of Wellington, one in the British Museum, the other in a private collection. One of his best portraits is that of the lovely Andalusian duchess of Alva. He now became the spoiled child of fortune, and acquired, at any rate externally, much of the polish of court manners. He still worked industriously upon his own lines, and, while there is a stiffness almost ungainly in the pose of some of his portraits, the stern individuality is always preserved.

Including the designs for tapestry, Goya's genre works are numerous and varied, both in style and feeling, from his Watteau-like Al Fresco Breakfast, Romeria de San Isidro, to the Curate feeding the Devil's Lamp, the Meson del Gallo, and the painfully realistic massacre of the Dos de Mayo (1808). Goya's versatility is proverbial? in his hands the pencil, brush, and graver are equally powerful. Some of his crayon sketches of scenes in the bull ring are full of force and character, slight but full of meaning, He was in his thirty-second year when he commenced his etchings from Velasquez, whose influence may, however, be traced in his work at an earlier date. A careful ex-

amination of some of the drawings made for these etchings indicates a steadiness of purpose not usually discovered in Goya's craft as draughtsman. He is much more widely known by his etchings than his oils; the latter necessarily must be sought in public and private collections principally in Spain, while the former are known and prized in every capital of Europe. The etched collections by which Goya is best known include Los Caprichos, which have a satirical meaning known only to the few; they are

bold, weird, and full of force. Los Proverbios are also supposed to have some hidden intention. Los Desastres de la Guerra may fairly claim to depict Spain during the French invasion. In the bull fight series, Goya is evidently at home; he was a skilled master of the barbarous art, and no doubt every sketch is true to nature, and from life,

Goya retired from Madrid, desiring probably during his latter years to escape the trying climate of that capital. He died at Bordeaux in his eighty-third year, and a monument has been erected there over his remains. Whether his influence produced the art of Fortuny and the modern Spanish school may be matter for discussion; but, from the deaths of Velasquez and Murillo to the advent of Fortuny, Goya's name is the only important one found in the history of Spanish art, Paul Lefort and Yriarte may be consulted for fuller details of his life and works.

GOYAZ, or, as it was formerly called, Villa Boa de Goyaz, the chief town of the province of Goyaz in Brazil, in the valley of the auriferous Velmelho, a right-hand tribu- tary of the Araguaia. It lies about 650 miles N.W. of Rio de Janeiro, and 700 miles 8.W, of San Salvador. Asa bishop's see, the seat of the provincial assembly, and the residence of a civil president and a military governor, it is a place of considerable importance ; and with its broad streets, wide squares, and well-built houses it ranks as one of the most attractive towns of Brazil. The public build- ings comprise the legislative chambers, a court-house, a hospital, a prison, an institution for the assaying of gold, and a municipal slaughter-house. Goyaz was founded in 1736 under the name of Santa Anna, and it received its present designation about three years later when it was raised tothe rank of acity. The population is about 8000.

GOYEN, Jan Josrpuszoon van (1596-1656), was born at Leyden on the 13th of January 1596, learned painting under several masters at Leyden and Haarlem, married in 1618, and settled at the Hague about 1631. One of the few Dutch painters who failed to captivate English taste, his influence was great on Dutch art; and he was one of the first to emancipate himself from the traditions of minute imitation embodied in the works of Breughel and Savery. Though he preserved the dun scale of tone peculiar to those painters, he studied atmo- spheric effects in black and white with

considerable skill. He formed Solomon Ruysdael and Pieter Potter, forced attention from Rembrandt, and bequeathed some of his precepts to Pieter de Molyn, Coelenbier, Saftleven, Van der Kabel, and even Berghem. His life at the Hague for twenty-five years was very prosperous, and he rose in 1640 to be president of his guild. A friend of Van Dyck and Bartholomew van der Helst, he sat to both these artists for his likeness. His daughter Margaret married Jan Steen, and he had steady patrons in the stadtholder Frederick Henry, and the chiefs of the municipality of the Hague. He died at the Hague in 1656, possessed of land and houses to the amount of 15,000 florins,

Between 1610 and 1616 Van Goyen wandered from one school to the other. He was first apprenticed to Isaak Swanenburgh ; he then passed through the workshops of De Man, Klok, and De Hoorn. In 1616 he took a decisive step and joined Esaias van der Velde at Harlem ; amongst his earlier pictures, some of 1621 (Berlin Museum) and

1623 (Brunswick Gallery) show the influence of Esaias very perceptibly. The landscape is minute. Details of brancli- ing and foliage are given, and the figures are important in relation to the distances. After 1625 these peculiarities gradually disappear. Atmospheric effect in landscapes of cool tints varying from grey green to pearl or brown and yellow dun is the principal object which Van Goyen holds in view, and he succeeds admirably in light skies with drift- ing misty cloud, and downs with cottages and scanty shrub- bery or stunted trees. Neglecting all detail of foliage he now works in a thin diluted medium, laying on rubbings as of sepia or Indian ink, and finishing without loss of transparence or lucidity. Throwing his foreground into darkness, he casts alternate light and shade upon the more distant planes, and realizes most pleasing views of large expanse. In buildings and water, with shipping near the banks, he sometimes has the strength if not the colour of Albert Cuyp, The defect of his work is chiefly want of solidity. But even this had its charm for Van Goyen's con- temporaries, and some time elapsed before Cuyp, who imi- tated him, restricted his method of transparent tinting to the foliage of foreground trees,

Van Goyen's pictures are comparatively rare in English collections. Unrepresented in the national galleries, he is seen to advantage abroad, and chiefly at the Louvre, and in Berlin, Gotha, Vienna, Munich, and Augsburg. Twenty- eight of his works were exhibited together at Vienna in 1873. His panels fell in value during the 17th century, when they fetched prices as low as 10 and seldom as high as 100 florins. – Now they are worth ten times more than in 1700. Though he visited France once or twice, Van Goyen chiefly confined himself to the scenery of Holland and the Rhine. Nine times from 1633 to 1655 he painted views of Dordrecht, Nimeguen was one of his favourite resorts, But he was alsofond of Haarlem and Amsterdam, and he did not neglect Arnheim or Utrecht, One of his largest pieces is a view of the Hague, executed in 1651 for the municipality, and now in the town collection of that city. Most of his panels represent reaches of the Rhine, the Waal, and the Maese. But he sometimes sketched the downs of Scheveningen, or the sea at the mouth of the Rhine and Scheldt; and he liked to depict the calm inshore, and rarely ventured upon seas stirred by more than a curling breeze or the swell of a coming squall. He often painted winter scenes, with ice and skaters and sledges, in the style familiar to Isaac van Ostade, There arc numerous varisties of these subjects in the master's works from 1621 to 1653. One historical picture has been 'assigned to Van Goyen—the embarkation of Charles IJ. in the Bute collection. But this canvas was executed after Van Goyen's death. When he tried this form of art he properly mistrusted his own powers. But he produced little in partnership with his contemporaries, and we can only except the Watering-place in the gallery of Vienna, where the landscape is enlivened with horses and cattle by Philip Wouvermans. Even Jan Steen, who was his son-in-law, only painted figures for one of his pictures, and it is probable that this piece was com- pleted after Van Goyen's death. More than 250 of Van Goyen's pictures are known and accessible, Of this number little more than 70 are undated, None exist without the full name or monogram, and yet there is no painter whose hand it is easier to trace without the help of these adjuncts. An etcher, but a poor one, Van Goyen has only bequeathed to us two very rare plates.

GOZLAN, L&£on, a French novelist and play writer, was born at Marseilles in 1803, and died in 1866. When he was still a boy, his father, who had made a large fortune as a ship-broker, met with adverse

circumstances, and Léon, before completing his education, had to go to sea in order to earn a living. He went several trading voyages to Algiers

and to Senegal, without, it would seem, much profit. Tn the meantime his literary tastes gradually developed, and lie abandoned mercantile pursuits for the modest employ- iment of a teacher in Marseilles. He, however, did not remain long there, and in 1828 we find him in Paris, de- termined to run the risks of literary life. His townsman, Joseph Méry, who was then making himself famous by his political satires, smoothed his way, and introduced him to several newspapers. But Gozlan did not sacrifice litera- ture to politics. Though he contributed many essays to the reviews, it is as a fertile and ingenious author of novels and plays that he is best known. His first novel was Les Mémoires d'un Apothicaire (1828), and this was followed by numberless others, among which may be men- tioned Le Notaire de Chantilly, Aristide Froissart (one of the most curious and celebrated of his productions), Les Nauztts du Pére-Lachaise, Le Tapis Vert, Georges ITI., La Folle du logis, La famille Lambert, Les Hmotions de Polydore Marasquin, &. His principal works for the theatre are— La Goutte de Lait, La Pluie et le beau temps, Le Lion empaillé, Pied-de-Fer, Louise de Nanteuil, Le Gateau des Reines, Les Paniers dela Comtesse, Le Diamant et le Verre, and adaptations of several of his own novels to the stage. Gozlan also wrote a romantic and picturesque description of the old manors and mansions of lus country, entitled Les Chateaux de France, 4 vols. (1844), and a biographical essay on the great novelist Balzac (1861). He was made a member of the legion of honour in 1846, and in 1859 an officer of that order. Louis Huart has published a sketch of his life.

Of the many novels which uninterruptedly dropped, as it were, from Gozlan's pen during a period of thirty-eight years, very few have the qualities which commend a work of fiction to posterity ; but nearly all are pleasant to read, and some will no doubt survive as an interesting and lively picture of French manners during the first half of this century. He holds an honourable place in the second rank of French novelists.

GOZO. See Matta.

GOZZI, Carto, Count (1722-1806), an Italian drama- tist, was descended from an old Venetian family, and was born in March 1722. Compelled by the embarrassed con- dition of his father's affairs to procure the means of self. support, he, at the age of sixteen, joined the army in Dalmatia ; but three years afterwards he returned to Venice where he soon made a reputation for himself as the wittiest member of the Granelleschi society, to which the publication of several satirical pieces had gained him admission, This society, nominally devoted to conviviality and wit, had also serious literary aims, and was especially zealous to preserve the Tuscan literature pure and untainted by foreign in- fluences. The displacement of the old Italian comedy by the dramas of Chiari and Goldoni founded on French models threatened defeat to all their efforts; and in 1757 Gozzi came to the rescue by publishing a satirical poem Tartana deglr wnflussi per Vanno bisestile, and in 1761 by his comedy, Meaba dell'amore delle tre melarancie, a parody of the manner of the two obnoxious poets, founded on a fairy tale. For its representation he obtained the services of the Sacchi company of players, who, on account of the popularity of the comedies of Chiari and Goldoni—which afforded no scope for the display of their peculiar talents— had been left without employment; and as their satirical powers were thus sharpened by personal enmity, the play met with extraordinary success. Struck by the effect pro- duced on the audience by the introduction of the super- natural or mythical element, which he had merely used as a convenient medium for his satirical purposes, Gozzi now produced a series of dramatic pieces based on fairy tales, which for a period obtained great popularity, but after the

breaking up of the Sacchi company were completely dis- regarded. They have, however, obtained high praise from Goethe, Schlegel, Madame de Staél, and Sismondi; and one of them, Re Z'urandote, was translated by Schiller. In his later years Gozzi set himself to the production of tragedies in whieh the comic element was largely introduced ; but as this innovation proved unacceptable to the critics, he had recourse to the Spanish drama,

from which he obtained models for various pieces which, however, met with only equivocal success. He died 4th April 1806.

His collected works were published under his own supcrintend- ence, at Venice, in 1792, in 10 volumes; and his dramatic works, translated into German by Werthes, were published at Bern in 1795. See Gozzi's work, Alemorie inutili della vita di Carlo Gozzi, 3 vols., Venice, 1797, translated into French by Paul de Mussct, Paris, 1848; F. Horn, Ueber Gozzis dramatisehe Poesie, Venice, 1803; Gherardini, Vita di Gasp. Gozzi, 1821; " Charles Gozzi," by Paul de Musset, in the Revue des Dewx Mondes for 15th November 1844; and Magrini, Carlo Gozzi e la fiabe: saggi storict, biografiei, ¢ eritiet, Cremona, 1876.

GOZZI, Gasparo, Count (1713-1786), eldest brother of Carlo Gozzi, was born 4th December 1713. In 1739 he married the poetess Luise Bergalli, and she undertook the management of the theatre of San Angelo, Venice, lic supplying the performers with dramas chiefly translated from the French. The speculation proved unfortunate, but meantime he had attained a high reputation for his con- tributions to the Gazzetta Veneta, and he soon eame to be known as one of the ablest eritics and purest and most elegant stylists in Italy. For a considerable period he was censor of the press in Venice, and in 1774 he was appointed to reorganize the university system at Padua. He died at Padua, 26th December 1786.

His principal writings are Osservatore Veneta Periodico, on the model of the English Spectator, and distinguished by its high moral tone and its light and pleasant satire ; Lettere famigliari, a collec- tion of short racy pieces in prose and verse, on subjects of general interest ; Scrmont, poems in blank verse after the manncr of Horace; Il mondo morale, a personification of human passions with inwoven dialogucs in the style of Lucian; and Giudizio degli antichi poeti sopra la moderna censura di Dante, a defence of the great poet against the attacks of Bettinelli. He also translated various works from the French and English, including Marmontel's Zales and Pope's Essay on Criticism. His colleeted works were published at Venice, 1794-98, in 12 volumes, and several editions have appeared simcc,

GOZZOLI, Benozzo, an eminent painter, was born in Florence in 1424, or perhaps 1420, and in the early part of his career assisted Fra Angelico,

whom he followed to Rome, and worked with at Orvieto. While in Rome, he executed, in the Cappella at Araceli, a fresco of St Anthony and Two Angels. In 1449 he left Angelico, and went to Montefalco, near Foligno in Umbria. In S. Fortunato, near Montefalco, he painted a Madonna and Child with Saints and Angels,and three other works. One of these, tlie altar-piece representing St Thomas receiving the Girdle of the Virgin, is now in the Lateran Museum, and shows the affinity of Gozzoli's early style to Angelico's. He next painted in the monastery of St Francis, Montefalco, filling the choir with a triple course of subjects from the life of the saint, with various accessories, including heads of Dante, Petrarch, and Giotto. This work was completed in 1452, and is still marked by the style of Angelico, crossed here and there with a more distinctly Giottesque influence. In the same church, in the chapel of St Jerome, is a fresco by Gozzoli of the, Virgin and Saints, the Crucifixion, and other subjects. He remained at Montefalco probably till 1456, employing Mesastris as assistant. Thence he went to Perugia, and painted in a church a Virgin and Saints, now in the local academy, and soon afterwards to his native Florence, the headquarters of art. By the end of 1459 he had nearly finished his important labour in the chapel of the Palazzo Riccardi, the Journey of the Magi to Bethlehem, and, in the tribune of this chapel, a composition of Angels

ina Paradise. His picture in the London National Gallery, a Virgin and Child with Saints, 1461, belongs also to the period of his Florentine sojourn. Another small picture in the same gallery, the Rape of Helen, is of dubious authen- ticity. In 1464 Gozzoli left Florence for 8. Gemignano, where lie executed some extensive works; in the church of St Augustine, a composition of St Sebastian protecting the City from the Plague of this same year, 1464; over the entire choir of the church, a triple course of scenes from the legends of St Augustine, from the time of his entering the school of Tegaste on to his burial, seventeen chief subjects, with some accessories ; in the Pieve di 8. Gemignano, the Martyrdom of Sebastian, and other subjects, and some further works in the city and its vicinity. Here his style combined something of Lippo Lippi with its original elements, and he received co-operation from Giusto d'Andrea, He stayed in this city till 1467, and then

began, in the Campo Santo of Pisa, from 1469, the vast series of mural paintings with which his name is specially identified. These are twenty-four subjects from the Old Testament, from the Invention of Wine by Noah to the Visit of the Queen of Sheba to Solomon. He contracted to paint three subjects per year, for about ten ducats each—a sum which may be regarded as equivalent to £100 at the present day. It appears, however, that this contract was not strictly adhered to, for the actual rate of painting was only three pictures in

two years. Perhaps the great multitude of figures and acces- °

sories was accepted as a set-off against the slower rate of production. By January 1470 he had executed the fresco of Noah and his Family,—followed by the Curse of Ham, the Building of the Tower of Babel (which contains por- traits of Cosmo de' Medici, the young Lorenzo, Poliziano, and others), the Destruction of Sodom, the Victory of Abraham, the Marriages of Rebecca and of Rachel, the Life of Moses, &c. In the Cappella Ammannati, facing a gate of the Campo Santo, he painted also an Adoration of the Magi, wlierein appears a portrait of himself. All this enormous mass of work, in which Gozzoli was probably assisted by Zanobi Macchiavelli, was performed, in addition to several other pictures during his stay in Pisa (we need only specify the Glory of St Thomas Aquinas, now in the Louvre), in sixteen years, lasting up to 1485. This is the latest date which can with certainty be assigned to any work from his hand, although he is known to have been alive up to 1496, if not afterwards. In 1478 the Pisan authorities had given him, as a token of their regard, a tomb in the Campo Santo. He had likewise a house of his own in Pisa, and houses and land in Florence. In rectitude of life he is said to have been worthy of his first master, Fra Angelico.

The art of Gozzoli does not rival that of his greatest con- temporaries either in elevation or in strength, but is pre- eminently attractive by its sense of what is rich, winning, lively, and abundant, in the aspects of men and things. His landscapes, thronged with birds and quadrupeds, especially dogs, are more varied, circumstantial, and allur- ing than those of any predecessor; his compositions are crowded with figures, more characteristically true when happily and gracefully occupied than when the

demands of the subject require tragic or dramatic intensity, or turmoil of action; his colour is bright, vivacious, and festive. Gozzoli's genius was, on the whole, more versatile and assimilative than vigorously original ; his drawing not free from considerable imperfections, especially in the extremities and articulations, and in the perspective of his gorgeously-schemed buildings. In fresco-painting he used the methods of tempera, and the decay of his works has been severe in proportion. Of his untiring industry the recital of his labours, and the number of works produced, are the most forcible attestation.

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GRAAL. See Gram.

GRABE, Jonann Ernst (1666-1711), a learned divine of the Anglican Church, was born July 10, 1666, at Konigs- berg, where his father, the author of some treatises now forgotten, was professor of theology and history. In the course of his theological studies Grabe succeeded in persuading himself of the schismatical character of the Refor- mation of the 16th century, and accordingly presented to the consistory at Samland a memorial in which he compared the position of the evangelical Protestant churches with that of the Simonians, Novatians, and other ancient schismatics. Hardly, however, had he resolved to join the Church of Rome, when his peace was again disturbed by Spener and others, who had pointed out some flaws in his written argument, and called his attention to the English Church as apparently possessing that apostolic succession, and manifesting that fidelity to ancient institutions, which he desired. In 1697, accordingly, he removed to London, and received priest's orders, attaching himself to the non- juring party. The learned labours to which the remainder of his life was devoted were rewarded with an Oxford de- gree and a royal pension. He died on the 3d of November 1711, and in 1726 a monument was erected to him by Lord Oxford in Westminster Abbey.

Some account of Grabe's life is given by Dr Hickes in a discourse prefixed to the pamphlet against Whiston's Collection of Testimontes against the True Deity of the Son and of the Holy Ghost. His works, which show him to have been learned and laborious but somewhat deficient in critical acumen, include a Spietlegium SS. Patrum et Heereticorum (1698-99), which was

designed to cover the first three centuries of the Christian church, but never was continued beyond the close of the second ; editions of Justin's Apologia Prima (1700), of Ireneus, Adversus omnes Hocreses (1702), and of the Septuagint (Vet. Test. juxta LXX. interpretes, 4 vols. fol., 1707-1720); also some polemical pieces now of little importance.

GRABOW, a town of Pomerania, Prussia, government district of Stettin and circle of Randow, is situated on the Oder below Stettin, and closely adjoining its suburbs. Shipbuilding and the manufacture of machinery are the principal industries, and there is also a considerable ship- ping trade. Grabow did not acquire the rank of a town till 1855. The population in 1875 was 10,238.

GRACCHUS is the name of a family of the Gens Sempronia. To this family there attaches a remarkably sweet and lovable nature, which, combined with their high character and ability, makes their history the most charming page in the Roman annals. Tiberius Sempronius Gracchus was appointed magister equitum after the battle of Canna, and held the consulship in 215 and 213 B.c. During the great weakness that followed the defeat at Cannz the re- solute and judicious generalship by which he ably seconded Fabius did much to maintain a courageous attitude at Rome. He raised some legions of slaves; and his generous conduct kept them together and made them important in the war. After several successes he was betrayed by a Lucanian into the hands of Mago, and having fallen in the battle that ensued, he was honoured with a magnificent burial by Hannibal, Another Tiberius, born about 210, married Cornelia, the daughter of Scipio Africanus, who is fainous as the highest type of Roman matron. As preetor and pro- preetor, Gracchus governed Hither Spain from 181 to 178. He conquered the Celtiberi, and by his magnanimous and kindly treatment of the Spaniards made a lasting impression onthem. He wasconsulin 177 and 163. In 169, as censor, his review of the senate and equites was very strict ; but though his colleague became unpopular, Gracchus remained as much esteemed as ever. He enjoyed a high reputation for his power of calming down internal seditions and con- ciliating foreign enemies of the state. One of his daughters became the wife of Scipio Africanus the younger ; while his two sons, Tiberius and Gaius, famous besides for having de- termined the history of Rome at a critical point, are as re-

markable for the charm of their personal character and for the careful education given them by their widowed mother. Tiberius served as queestor in Spain in 137; and the respect still entertained by the Spaniards for his father's name enabled him to save the Roman army from utter ruin after its defeat by the Numantines. See Roman History. GRACES is the name generally given to the Greek goddesses Charites. The chief seat of their worship was the ancient Beeotian city Orchomenus. They were three in number, but their names were not known ; and stones fallen from heaven stood in their temple as symbols of the goddesses (Paus., ix. 35). Their worship was instituted by a king Eteocles, whose three daughters fell into a well while dancing in honour of the Charites (Westermann, Myth. Gr., p. 387). In no Greek legend is the pre-Greek Indo-Germanic character more strongly marked. Eteocles, he whose glory is real, is the Vedic Satyacravas, the sun ; and his genealogy consists of a string of epithets for sun and dawn, Charis (Skt. Aart, bright), is an old adjective, originally an epithet of the light-illumined clouds which seem to escort the dawn, often applied in the Rig-Veda to the horses of the dawn or of the sun, and at last growing into a distinct deity who preserves the char- acter of the ancient dawn-goddess (see Miiller, Lect. Lang., ii.; Sonne in Kuhn, Z/t., x.). The burning bright vasas (Ushas, js, Aurora, with a different suffix Ostara, Easter) — who restores the blessings lost during the night, who lights up what was dark and reveals the hidden wrong, who gives active labour and wealth to men, growth and fertility to plants—had been from the earliest time the centre of a great worship To appearance these religious ceremonies have been lost in Greece ; and in a people so retentive of all that relates to religion, this implies merely that the worship of the dawn has been changed in out- ward form. Eos is of slight importance; but Charis, Hebe, Aphrodite (in so far as the genuine Greek goddess has not given way to the Oriental deity) preserve and develop the original idea. Charis then was the goddess of the freshness and vigour of life, of fertility and growth; like Aphrodite, she closely resembles Persephone (see Gerhard, Venus Proserpina), and in later art the Graces often hold corn ears in their hands; like Hebe, she is often associated with Hera (see Welcker, (r. Gott., iii. 174). The single

goddess grew into a triad, as occurs often in Greek mythology; in Sparta, however, and in Athens only two Charites were known. Rites of peculiar antique character beloug to the worship of the Charites : in Orchomenus nightly dances took place in their honour (compare the legend of Eteocles's daughters, who obviously are bye-forms of the goddesses); in Paros their worship was celebrated without music or garlands ; in Messene they were worshipped along with the Eumenides ; in Athens their rites secret from the vulgar were held at the entrance of the Acropolis ; one swore by the Charites ag one did by the deities of the lower world (Pollux, viii. 106). Far as these characteristics seem removed from the nature of a dawn-goddess we find a similar double character in many other cases, such as Artemis-Hecate. They are thus brought into the cycle of older more purely nature worship, which we find in Greece alongside of the more moral religion of the Olympian deities, and which has in mythology its counterpart in the older generation of Titans destroyed by the younger gods. The Charites were received into the Olympian Pantheon only in a subordinate character. In Homer we have a transitional stage ; they appear some- times as distinct independent beings, one being wife of Hephaestus, another of Sleep (Zl, xviii. 382, xiv. 231) ; often they are a set of nymphs attending on Aphrodite, herself then wife of Hephwstus (Od., viii. 364, &c.). The dawn is naturally the wife of Hepheestus, the fire of the sun

in heaven and of the morning sacrifice on earth. In later literature this second form prevails. Obviously the noun charis and the connected verbs and substantives, which existed alongside of the mythological name, exercised a continually growing influence on it. The Charites become then the impersonation of the bloom of all sensuous ap- pearance, of grace and cheerfulness, both in nature and in moral action. They form part of the train attendant on the greater gods, especially Aphrodite and Apollo. Their names, Aglaia, Euphrosyne, and Thalia, occur first in Hesiod (Zheog., 907). Pindar, however, following the Beeotian belief, celebrates them (Ol., xiv.) as the queens of glittering Orchomenus and as the guardian-goddesses of the ancient Minyz. In art they were represented in earlier time as draped goddesses with varying attributes; gradually the one well-known conception predominated of the three beautiful nude figures gracefully

intertwined. Jacobi (Worterb. d. Myth.) gives a very complete list of ancient authorities.

GRACKLE (Latin, Graceulus or Graculus), a word which has been much used in ornithology, but generally in a vague seuse, though restricted to members of the families Sturnidce belonging to the Old World, and Jcteride belonging to the New. Of the former those to which it has been most commonly applied are the species variously known as Mynas, Mainas, and Minors of India and the adjacent countries, and especially the Gracula religiosa of Linneus, who, according to Jerdon and others, was very probably led to confer this epithet upon it by confounding it with the Sturnus or Acridotheres tristis,' which is regarded by the Hindus as sacred to Ram Deo, one of their deities, while

Gracula religiosa.

the true Gracula religiosa does not seem to be anywhere held in veneration. This last is about 10 inches in length, clothed in a plumage of glossy black, with purple and green reflexions, and a conspicuous patch of white on the quill- feathers of the wings. 'The bill is orange and the legs yellow, but the bird's most characteristic feature is afforded by the curious wattles of bright yellow, which, beginning behind the eyes, run backwards in form of a lappet on each side, and then return in a narrow stripe to the top of the head, Beneath each eye also is a bare patch of the same colour. This species is common in southern India, and is represented

further to the north, in Ceylon, Burmah, and some of the

' By some writers the birds of the genera

Malay Islands by cognate forms. They are all frugivorous, and, being easily tamed and learning to pronounce words very distinctly, are favourite cage-birds.}

In the New World the name Grackle has been applied to several species of the genera Scolecophagus and Quiscalus, though these are more commonly

called in the United States and Canada ‘ Blackbirds,” and some of them “ Boat-tails.” They all belong to the family Zcteride. The best known of these are the Rusty Grackle, S. ferrugineus, which pervades almost the whole of North America, and Q. purpureus, the Purple Grackle or Crow-Blackbird, of more limited range, for though abundant enough in most parts to the east of the Rocky Mountains, it seems not to appear on the Pacific side. ‘There is also Brewer’s or the Blue-headed Grackle, S. cyanocephalus, which has a more western range, not oc- curring to the eastward of Kansas and Minnesota, A fourth species, Q. major, is also found to inhabit the Atlantic States as far as North Carolina, All these birds are of exceedingly omnivorous habit, and though undoubtedly destroying large numbers of pernicious insects are in many places held in bad repute from the mischief they do to the corn-crops. (A. N.)

GRACIAN, Barrazar (1584-1658), one of the princi- pal “‘cultistas” or Spanish prose writers of the school of Gongora, was born at Calatayud, Aragon, in 1584. Little is known of his personal history except that on attaining to manhood he entered the Society of Jesus, and that ulti- mately he became rector of the Jesuit College at Tarragona, where he died in 1658. His principal works are El Héroe (1630), written in short compact seutences, which has been described as a sort of recipe for making a hero; La Agudeza, y Arte de Ingenio (1848), a sort of art of poetry or system of rhetoric in which the principles of “Gongorism” are inculeated ; Criticon (1650-53), an allegory in which, under the imagery of the seasons of the year, the course of human life is described; H/ Discreto, a delineation of the typical character of a courtier ; Oraculo Manual, a system of rules for the conduct of life. His works, which have been often reprinted in Spanish under the name of his brother Lorenzo, have also for the most part been translated into French and Italian. The Oraculo Manual has been translated into German by A. Schopenhauer (1862), and into English anonymously (Courtier’s Manual Oracle, 1684). ‘The Hero also occurs in English (from the French, 1726), Gracian’s merits as a writer have been very differently estimated by his critics, and it is probable that from none of them has he received strict justice. If his style is hardly so bombastic, involved, and obscure as his enemies represent it, neither can he in fairness receive all that credit for depth and originality of thought which is claimed for him by his friends. As examples of the widely differing appreciations

which have been passed upon him, see Ticknor's Spanish Lnterature, vol. iii., and Mr Grant Duff's Af iscellantes (1878).

GRADISCA, a town of Austria, in the principality of Girz and Gradisca, situated about 10 miles §.W, of Gorz, on the right bank of the Isonzo. It was formerly a strongly fortified place, but its citadel is now occupied as a prison. The inhabitants of the commune, who numbered in 1869 rather more than 3000, are engaged in silk-spinning. Be- tween 1471 and 1481 Gradisca was fortified by the Venetians, but in 1511 they surrendered it to the imperial forces. In 1647 Qradisca and its territory, including Aquileia and forty-three smaller places, was erected into a prince-countship in favour of the prince of Eggenberg. It lapsed in 1717 to the imperial crown, and in 1754 was completely incorporated with Girz. The name was revived by the constitution of 1861, which established the crown- land of the countship of Gérz and Gradisca. See Gorz.

1 For a valuable monograph on the various species of Gracula and

its allies see Prof. Schlegel's Bijdrage tot de Kennis van het Gesch- lacht Beo (Nederlandsch Tijdschrift voor de Dierkunde, i. pp. 1-9).

GRADUATION is the name given to the art of dividing straight scales, circular arcs, or whole circumferences into any required number of equal parts. It is the most im- portant and difficult part of the work of the mathematical instrument maker, and is required in the construction of most physical, astronomical, nautical, and surveying instru- ments, such as thermometer scales, linear measuring instru- ments, quadrants, sextants, mural circles, theodolites, dc.

The art was, undoubtedly, first practised by clockmakers for cutting the teeth of their wheels at regular intervals ; but so long as it was confined to them, no particular delicacy or accurate nicety in its performance was required. 'This only arose when astronomy began to be seriously studied, and the exact position of the heavenly bodies to be deter- mined, which created the necessity for strictly accurate means of measuring linear and angular magnitude. Then graduation began to be looked upon as an art which required special talents and training, and hence we find that all the best artists have spent their best efforts on the perfecting of astronomical

instruments. Of these may be named Abraham Sharp, Bird, Smeaton, Ramsden, the Duc de Chaulnes, John and Edward Troughton, Simms, and Ross.

It is obvious that the first graduated instrument must have been done by the hand and eye alone, whether it was in the form of a straight-edge with equal divisions, or a screw, or a divided plate; but, once in the possession of one such divided instrument, it was a comparatively easy matter to employ it as a standard, and copy its divisions on aly ather article that might bedesired. Hence graduation naturally divides itself into two distinct branches, original graduation and copying, which latter may be done either by the hand or by a machine called a dividing engine. We may thus speak of graduation under the three heads of orginal graduation, copying, and machine graduation.

Original Graduation.—This is by far the most difficult part of the art—so difficult, indeed, and requiring snch accuracy of hand and eye, that but few in any generation have been completely competent for the task. The earlier astronomers graduated their own instruments, and, from the examples that have come down to us, it must have been very roughly done as compared with modern work.

In regard to the graduation of straight scales, we have, by elementary geometry, the means, theoretically, of divid- ing a straight line into any number of equal parts ; but the practical carrying out of the geometrical construction is so beset with difficulties as to render the method untrustworthy. This method, which employs the common diagonal scale, was used in dividing a quadrant of 3 feet radius, which belonged to Napier of Merchiston, and which only read to minutes—a result, say Thomson and Tait (Nat. Phil.), "giving no greater accuracy than is now attainable by the pocket sextants of Troughton and Simms, the radius of whose arc is little more than an inch."

The original graduation of a straight line is, in practice, done either by the method of continual bisection or by stepping. In continual bisection the entire length of the line is first laid down. 'Then, as nearly as possible, half that distance is taken in the beam-compass and marked off by faint arcs from each eud of the line. 'Should these marks coincide the exact middle

point of the line is obtained. If not, ag will almost always be the case, the distance between the marks is carefully bisected by hand with the aid of a magnifying glass. The same process is again applied to the halves thus obtained, and so on in succession, dividing the line into parts represented by 2, 4, 8, 16, &c., till the desired divisions are reached. In the method of stepping the smallest division required is first taken, as accurately as possible, by spring dividers, and that distance is then laid off, by successive steps, from one end of the line. It is evident that, in this method, any error at starting will be

multiplied at each division by the number of that division. Errors so made are usually adjusted by the dots being put either back or forward a little by means of the dividing punch guided bya magnifying glass, This is an extremely tedious process, as the dots, when so altered several times, are apt to get insufferably large and shapeless.

The division of circular arcs is essentially the same in principle as the graduation of straight lines, and of this we

shall now give some examples.

The first example of note is the 8-feet mural circle which was graduated by Graham for the National Observatory in 1725. In this two concentric ares of radii 96°85 and 95°8 inches respectively were first described by the beam-compass. On the inner of these the arc of 90° was to be divided into degrees and 12th parts of a degroe, while the same on the outer was to be divided into 96 equal parts, and these again into 16th parts. The reason for adopting the latter was that, 96 and 16 being both powers of 2, the divisions could be got at by continual bisection alone, which, in Graham's opinion, who first employed it, is the only accurate method, and would thus serve as a check upon the accuracy of the divisions of the outer arc. With the same distance on the bcam-compass as was used to describe the inner arc, laid off from 0°, the point 60° was at once determined. With the points 0° and 60° as centres successively, and a distance on the bcam-conipass very nearly bisecting the are of 60°, two slight marks were made on the arc ; the distance between these marks was carefully divided by the hand aided by a

lens, and this gave the point 30°. The chord of 60° laid off from the point 30° gave the point 90°, and the quadrant was now divided into three equal parts. Each of these parts was similarly bisected, and the resulting divisions again trisected, giving 18 parts of 5° each. Each of these quinquesected gave degrees, the 12th parts of which were arrived at by bisecting and trisecting as before. The outer arc was divided by continual bisection alone, and a table was constructed by which the readings of the one arc could be converted into those of the other. After the dots indi- cating the required divisions were obtained, either straight strokes all directed towards the centre were drawn through them by tlie dividing knife, or sometimes small arcs were drawn through them by the beam-compass having its fixed point somewhere on the line which was a tangent to the quadrantal arc at the point where a division was to be marked.

The next important example of graduation was done by Bird in 1767. His quadrant, which was also 8 feet radius, was divided into degrees and 12th parts of a degree. He employed the method of continual bisection aided by chords taken from an exact scale of equal parts, which could read to '001 of an inch, and which he had previously graduated by continual bisections. "With the beam- compass an arc of radius 95°9388 inches was first drawn. From this radius the chords of 30°, 15°, 10° 20', 4° 40', and 42° 40' were coni- puted, and each of them by means of the scale of equal parts laid off on a separate beam-compass to be ready. The radius laid off from 0° gave the point 60°; by the chord of 30° the arc of 60° was bisected ; from the point 30° the radius laid off gave the point 90° ; the chord of 15° laid off backwards from 90° gave the point 75°;

from 75° was laid off forwards the chord of 10° 20'; and from 90°,

was laid off backwards the chord of 4° 40' ; and these were found to coincide in the point 85° 20'. Now 85° 20' being =5' x 1024 =5' x 210 the final divisions of 85° 20' were found by continual bisections. For the remainder of the quadrant beyond 85° 20', containing 56 divi- sions of 5' each, the chord of 64 such divisions was laid off from the point 85° 40', and the corresponding are divided by continual bisections as before. There was thus a severe check upon the accuracy of the points already found, viz., 15°, 30°, 60°, 75°, 90° which, however, were found to coincide with the

corresponding points obtained by continual bisections. The short lines through the dots were drawn in the way already mentioned. os The next eminent artists in original graduation are the brothers John and Edward Troughton. The former was the first to devise a means of graduating the quadrant by continual bisection without the aid of such a scale of equal parts as was used by Bird. His method was as follows:—The radius of the quadrant laid off from 0° gave the point 60°. This are bisected and the half laid off from 60" gave the point 90°. The arc between 60° and 90° bisected gave 75°; the arc between 75° and 90° bisected gave the point 82° 30’ and the are between 82° 30’ and 90° bisected gave the point 86° 15" Further, the are between 82° 30’ and 86° 15’ trisected, and two- thirds of it taken beyond 82° 80’, gave the point 85°, while the arc between 85° and 86° 15’ also trisected, and one-third part laid off beyond 85”, gave the point 85° 25’ Lastly, the are between 85° pits) me ag ML that and four-fifths taken beyond 85°, , Whicn as before is = 5’ x 2} divided by continual bisection. Be A SRE NE Edward Troughton’s Method.—The method of original i discovered by Edward Troughton is fully dso in ee sophical Transactions for 1809, as employed by himself to divide a*

meridian circle of 4 feet radius. The circle was first accurately turned both on its face and its inner and outer edges. A roller was next provided, of such diameter that it revolved 16 times on its own axis while made to roll once round the outer edge of the circle. This roller, made movable on pivots, was attached to a frame-work, which could be slid freely, yet tightly, along the circle, the roller meanwhile revolving, by nieans of frictional contact, on the outer edge. The roller was also, after having been properly adjusted as to size, divided as accurately as possible into 16 equal parts by lines parallel to its axis. While the frame carrying the roller was moved once round along the circle, the points of contact of the roller-divisions with the circle were accurately obscrved by two microscopes attached to the frame, one of which (which we shall call H) commanded the ring on the circle near its edge, which was to receive the divisions, and the other viewed the roller-divisions. The exact points of contact thus ascertained were marked with faint dots, and the meridian circle thereby divided into 256 very nearly equal parts. a

The next part of the operation was to find out and tabulate the errors of these dots, which are called apparent errors, in conse- quence of the error of each dot being ascertained on the supposition of its neighbours being all correct. For this purpose two micro- scopes (which we shall call A and B) were taken, with cross wires and micrometer adjustments, consisting of a screw and head divided into 100 divisions, 50 of which read in the one and 50 in the opposite direction. These microscopes, A and B, were fixed so that their cross-wires respectively bisected the dots 0 and 128, which were supposed to be diametrically opposite. 'Ihe circle was now turned half-way round on its axis, so that dot 128 coincided with the wire of A, and, should dot 0 be found to coincide with B, then the two dots were sure to be 180° apart. If not, the cross wire of B was moved till it coincided with dot 0, and the number of divisions of the micrometer head noted. Half this number gave clearly the error of dot 128, and it was tabulated + or — according as the arcual distance between 0 and 128 was found to exceed or fall short of the remaining part of the circumference. The micro- scope B was now shifted, A remaining opposite dot 0 as before, till its wire bisected dot 64, and, by giving the circle one quarter of a turn on its axis, the difference of the arcs between dots 0 and 64 and between 64 and 128 was obtained. The half of this difference gave the apparent error of dot 64, which was tabulated with its proper sign. With the microscope A still in the same position the error of dot 192 was obtained, and in the same way by shifting B to dot 32 the errors of dots 32, 96, 160, and 224 were successively ascertained. "By proceeding in this way the apparent errors of all the 256 dots were tabulated.

From this table of apparent errors a table of real errors was drawn up by employing the following formula :—

4(2a +2) +2=the real error of dot 8,

where x, is the real error of dot a, x, the real error of dot c, and z the apparent error of dot b midway between a andc. Thns having got the real errors of any two dots, the table of apparent errors gives the means of finding the real errors of all the other dots.

The above formula is easily derived as follows :—

Let a@ and ¢ be the number of micrometer divisions from 0 to dots a and ¢ respectively; and let 6 be the number of similar divisions from 0 to the point 8, supposed to be midway between a and c. Also let x, and x, be the rcal errors of dots @ and ec, aud 2 the apparent error of b. Then we have

2=b—-a-—4k(c—a)=b-}ate). Now the real positions of a and ¢c are a— %q and c- x, respectively.

Therefore the real position of 6, the point midway between a and and ¢, is

= ~%ath{c-x_-—(a-aa)} =4(a+c)—-4(@at Xe). Therefore the real error of b =b-—real position of D =b-Batec) that) =2+4 (Cat Xe).

Having obtained the 256 dots and their real errors, the third and last part of Troughton's process was to employ them to cut the final divisions of the circle, which were to be spaces of 5' each. Now the mean interval between any two dots is — = 5'× 164, and hence, in the final division, this interval must be divided into 16% equal parts. In order to accomplish this a small instrument, called a subdividing sector, was provided. It was formed of thin brass and had a radius about four times that of the roller, but made adjustable as to length. The sector was placed concentrically on the axis, and rested on the upper end of the roller. It turned by frictional adhesion along with the roller, but at the same time was sufficiently loose to allow of its being moved back by hand to any position without affecting the roller. Now it is evident that, while the roller passes over an angular space equal to the mean interval

Cie puUA TION

between two dots, any point of the sector must pass over 16 times that interval, that is to say, over an angle represented by

360° . 16 22° 30'.

256

a space equal to 16 of the parts taken. This was laid off on the arc of the sector and carefully divided into 16 equal parts, each equal to 1° 20'; and,

in order to provide for the necessary §ths of a division, there was laid off at each end of the sector, and beyond the 16 equal parts, two of these parts each subdivided into 8 equal parts. A microscope with cross wires, which we shall call I was placed on the main frame, so as to command a view of the sector divisions, just as the microscope H vicwed the final divisions of the circle. Before the first or zero mark was cut, the zero of the sector was brought under I and then the division cut at the point on the circle indicated by H, which also coincided with the dot 0. The frame was then slipped along the circle by the slow screw motion provided for the purpose, till the first sector-division, by the action of the roller, was brought under I. The second mark was then cut on the circle at the point indicated by H. That the marks thus obtained are 5' apart, as they should be, is evident when we reflect that the distance between them must be ~,th of a division on the section which by construction is 1° 20'. By proceeding in this way the first 16 divisions were cut; but before cutting the 17th it was necessary to adjust the micrometer wires of H to the real error of dot 1, as indicated by the table, and bring back the sector, not to zero, but to 3th short of zero. Starting from this position the divisions between dots 1 and 2 were next filled in, and then H was adjusted to the real error of dot 2, and the sector brought back to its proper division before commencing the third course. By pro- ceeding in this manner through the whole circle, the microscope H was finally found with its wire at zero, and the sector with its 16th division under its microscope indicating that the circle had been accurately divided.

Copying.—In graduation by copying the first requisite is a pattern, which must be either an accurately divided straight scale, or an accurately divided circle, commonly called a dividing plate.

In copying a straight scale the pattern and scale to be divided, usually called the work, are first fixed side by side, with their upper faces in the same plane. The dividing square, which closely resembles an ordinary joiner's square, is then laid across both, and the point of the dividing knife dropped into the zero division of the pattern. The square is now moved up close to the point of the knife; and, while it is held firmly in this position by the left hand, the first division on the work is made by drawing the knife along the edge of the square with the right hand. Great care must be taken

that the knife is held exactly in the same position in cutting the division and in setting the square.

Tt frequently happens that the divisions required on a scale are either greater or less than those on the pattern. To meet this case, and still use the same pattern, the work must be fixed at a certain angle of inclination with the pattern. This angle is easily found in the following way. Take the exact ratio of a division on the pattern to the re- quired division on the scale. Call this ratio a. Then, if the required divisions are longer than those of the pattern, the angle is cos—1a, but, if shorter, the angle is secla. In the former case two operations are required before the divi- sions are cut: first, the square is laid on the pattern, and the corresponding divisions merely notched very faintly on the edge of the work; and, secondly, the square is applied to the work and the final divisions drawn opposite each faint notch. In the second case, that is, when the angle is sec~4a, the dividing square is applied to the work, and the divisions cut when the edge of the square coincides with the end of each division on the pattern.

In copying circles use is made of the dividing plate. This is a circular plate of brass, of 36 inches or more in diameter, carefully graduated near its outer edge. It is turned quite flat, and has a steel pin fixed exactly in its centre, and at right angles to its plane. For guiding the dividing knife an instrument called an index is employed. This consists of a straight bar of thin steel of length equal to the radius of the plate. A piece of metal, having a \ notch With its angle a right angle, is riveted to one end of the bar

This interval was therefore divided by 16%, and

a0

in such a position that the vertex of the notch is exactly in a line with the edge of the steel bar. In this way, when the index is laid on the plate, with the notch grasping the cen- tral pin, the straight edge of the steel bar lies exactly along a radius. The work to be graduated is laid flat on the divid- ing plate, and fixed by two clamps ina position exactly con- centric with it. The index is now laid on, with its edge coinciding with any required division on the dividing plate, and the corresponding division on the work is cut by draw- ing the dividing knife along the straight edge of the index.

Machine Graduation.—The first dividing engine was probably that of Henry Hindley of York, constructed in 1740, and used for the most part by him for cutting the teeth of clock wheels. This was followed shortly after by an engine devised by the Duc de Chaulnes; but the first engine which obtained distinct notoriety was that made by Ramsden, of which an account was published by the Board of Longitude in 1777. He was rewarded by that board with a sum of £300, and a further sum of £315 was given to him on condition that he would divide, at a certain fixed rate, the instruments of other makers. The essential principles of Ramsden's machine have been repeated in almost all succeeding engines for dividing circles, and it will be well, therefore, to give a brief description of it.

It consisted of a large brass plate 45 inches in diameter, carefully turned, and movable on a vertical axis. The edge of the plate was ratched with 2160 teeth, into which a tangent screw worked, by means of which the plate could be made to turn through any required angle. Thus six turns of the screw moved the plate through 1°, and goth of a turn through 335th of a degree. On the axis of the tangent screw was placed a cylinder having a spiral groove cut on its surface. A ratchet-wheel containing 60 teeth was attached to this cylinder, and was so arranged that, when the cylinder moved in one direction, it carried the tangent screw with it, and so turned the plate, but when it moved in the opposite direction, it left the tangent screw, and with it the plate, stationary. Round the spiral groove of the cylinder a catgut band was would, one end of which was attached to a treadle and the other to a counterpoise weight. When the treadle was depressed the tangent screw turned round, and when the pressure was removed it returned, in obedience to the weight, to its former posi- tion without affecting the screw. Provision was also made whereby certain stops could be placed in the way of the screw, which only allowed it the requisite amount of turning according to the gradua- tion required. The work to be divided was firmly fixed on the plate, and made concentric with it. The divisions were cut, while the screw was stationary, by means of a dividing knife attached to a swing frame, which allowed it to have only a radial motion. In this way the artist could divide very rapidly by alternately depress- ing the treadle and working the dividing knife.

Ramsden also constructed a linear dividing engine on essentially the same principle. If we imagine the rim of the circular plate with its notches stretched out into a straight line and made movable in a straight slot, the screw, treadle, &c., remaining as before, we shall get a very good idea of the linear engine.

In 1793 Edward Troughton finished a circular dividing engine, of which the plate was smaller than in Ramsden's, and which differed considerably otherwise in simplifying matters of detail. The plate was originally divided by Troughton's own ingenious method, already described, and the divisions so obtained were employed to ratch the edge of the plate for receiving the tangent screw with great accuracy.

In the Transactions of the Society of Arts for 1830-31 there is a full description, with illustrative figures, of a dividing engine, constructed by Andrew Ross, which differs considerably from those of Ramsden and Troughton.

The essential point of difference is that, in Ross's engine, the tangent screw does not turn the engine plate ; that is done by an independent apparatus, and the function of the tangent screw is only to stop the plate after it has passed through the required angular interval between two divisions on the work to be graduated. Round the circumference of the plate are fixed 48 projections which just look as if the circumference had been divided into as many deep and somewhat peculiarly shaped notches or tecth. Through each of these tecth a hole is bored parallel to the plane of the plate

and also to a tangent to its circumference. Into these holes are screwed steel screws with capstan heads and flat ends. The tangent screw consists only of a single turn of a large square thread which works in the teeth or notches of the plate. This thread is pierced by 90 equally distant holes, all parallel to the axis of the screw, and at the same distance from it. Into each of these holes is inserted a steel screw exactly similar to thoso in the teeth, but with its end rounded. It is the rounded and flat ends of these sets of screws coming together that stop the engine plate at the desired position, and the exact point can be nicely adjusted by suitably turning the screws.

In the Memoirs of the Astronomical Society, of date June 1843, a description is given of a dividing engine made by William Simms. From experience he became convinced that to copy upon smaller circles the divisions which had been put upon a large plate with very great accuracy was not only more expeditious but better than original graduation, and hence he determined to construct a machine which would do this work as perfectly as possible. That machine involved essentially the same principle as Troughton's, and, with some slight modifications, is at present to be seen at work in the workshop of the eminent firm of Troughton & Simms at Charlton near London, The accompanying figure is taken by permission from a photograph of that instrument.

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Dividing Engine.

The plate A is 46 inchesin diameter, and is composcd of gun-metal cast in one solid piece, It has two sets of 5' divisions—onc very faint on an inlaid ring of silver, and the other stronger on the gun metal, These were put on by original graduation, mainly on the plan of

Edward Troughton. One very great improvement in this engine is that the axis B is tubular, as seenat 0. The object of this hollow is to receive the axis of the circle to be divided, so that it can be fixed flat to the plate by the clamps E, without having first to be de- tached from the axis and other

parts to which it has already been carefully fitted. This obviates the necessity for resetting, which can hardly be done without some error. D is the tangent screw, and F the frame carrying it, which turns on carefully polished steel pivots. The screw is pressed against the edge of the plate by a spiral spring acting under the end of the lever G, and by screwing the lever down the screw can' be altogether removed from contact with the plate. The cdge of the plate ig ratched by 4820 teeth which were cut opposite the original division by a circular cutter attached to the serew frame. H is the spiral barrel round which the catgut band is wound, one end of which is attracted to the crank L on the end of the axis J and the other to a counterpoise weight not seen. On the other end of J is another crank inclined to L and carrying a band and counterpoise weight seen at K. The gbject of this weight is to balance the former and give steadiness to the motion. On the axis J is seen a pair of bevelled wheels which move the rod I, which, by another pair of bevelled wheels attached to the box N, gives motion to the axis M, on the end of which is an eccentric for moving the bent lever O, which actuates the bar carrying the cutter. Between the eccentric and the point of the screw P is an undulating plate by which long divisions, at required intervals, can be cut, It will be

scen that the cutting apparatus is supported upon the two parallel rails which can be elevated or depressed at pleasure by the nuts Q. Also the cutting apparatus can be moved forward or backward upon these rails to suit circles of different diameters. The box N is mov- able upon the bar R, and the rod I is also adjustable as to length by having a kind of telescope joint. The engine is quite self-acting, and can be driven either by hand or by a steam-engine or other motive power. When driven by the latter it can be thrown in or out of gear at once bya handle seen at 8. MrSimms has also provided an ingenious arrangement whereby that is done automatically directly any piece of work was finished.

Space permits of but the mere mention of Donkin's linear dividing engine, in which the principle employed is a compensating arrangement whereby great accuracy is obtained notwithstanding the inequalitics of the screw

used to advance the cutting tool. Dividing engines have also been made by Reichenbach and others in Germany, and Gambey in Paris,

In addition to those already mentioned, the following references may be given :—Bird, Method of dividing Astronomical Instru- ments, London, 1767 ; Duc de Chaulnes, Nouvelle Méthode pour diviscr les Instruments de Mathematique et d' Astronomie, 1768; Ramsden, Description of an Engine for dividing Mathematical Instruments, London, 1777 ; Troughton's memoir, Phil. Trans., 1809 ; Memoirs of the Royal Astronomical Society, vol. v. p. 825,

vol. vill. p. 141, vol. ix. pp. 17 and 35; Holtzapffel, Zurning and Mechanical Manipulation, pp. 651-955. (J. BL.)

GRACIA, Macna (} peydAn "EAAds), was the name given to the Greek cities along the coast of South Italy, while the people were called Italiotes ('IraAc@rac). Like most Greek colonies, they were established first as trading stations, which grew into independent cities. At a very early time a trade in copper was carried on between Greece and the Terinean Gulf (Homer, Od., i. 181). The trade for long lay chiefly in the hands of the Eubceans; and Cyme in Campania was founded far back in the pre-historic time, when the Eubcean Cyme was still a great city. To strengthen the connexion with the far off Cynie, the Chal- cidians, who became early the leaders of Eubcean enterprise, established Rhegium (about 730 B.c.). After this the energy of Chalcis went onward to Sicily, and the states of the Corinthian Gulf carried out the colonization of Italy. Sybaris (720) and Crotona (710) were Achgan settlements ; Locri Epizephyrii (about 710) wag settled by Ozolian Locrians, and when (about 708) the Spartans wished to get rid of a band of unruly citizens, the connexion formed by the trade in purple that was common to the shores of Laconia and Tarentum directed their colony thither. Tonian Greeks fleeing from foreign invasion founded Siris and, much later, Elea (540).

The Italian colonies were planted among friendly, almost kindred, races (comp. the legend in Herod., vii. 183), and grew much more rapidly than the Sicilian Greek states, which had to contend against the power of Carthage. After the Achzan cities had combined to destroy the Ionic Siris, and had founded Metapontum as a counterpoise to the Dorian Tarentum,

there seems to have been little strife among the Italiotes. An amphictyonic league, meeting in common rites at the temple of Hera on the Lacinian pro- montory, fostered a feeling of unity among them, In the 7th and 6th centuries B.c., they reached such a pitch of wealth and power as to justify the name Great Greece in contrast to the poor and weak mother country. The Pythagorean and Eleatie systems of philosophy had their chief seat in Magna Grecia. Other Taeea of litera- ture do not seem to have been so much cultivated among them. The poet Ibycus, though a native of Rhegium, led @ very wandering life. They maintained some social inter- course with Greece proper (Herod., iii, 131) and sent com- petitors to the Olympic games (among them the famous Milo) ; but politically they appear to have generally kept themselves separate. One ship of Crotona, however, fought at Salamis, though it is not recorded that Grecce asked the Ttaliotes for help when it sent ambassadors to Gelon of

Syracuse. Mutual discord first sapped the prosperity of Magna Grecia, In 510 Crotona, having defeated the Sybarites. in a great battle, totally destroyed their city. Crotona maintained alone the leading position which had belonged jointly to the Achzean cities (Diod., xiv. 103) ; but from that time Magna Grecia steadily declined. Foreign eneniies pressed leavily on it. The Lucanians and Bruttians on the north captured one town after another. Dionysius of Syracuse attacked them from the south ; and after he defeated the Crotoniate league (389 B.c.), Tarentum remained the only powerful city. Henceforth the history of Magna Grecia is only a record of the vicissitudes of Tarentum (see TarENTUM). Repeated expeditions from Sparta and Epirus tried in vain to prop up the decaying Greek states against the Lucanians aud Bruttians ; and when in 282 the Romans appeared in the Tarentine Gulf the end was close at hand. The aid which Pyrrhus brought did little good to the Tarentines, and his final departure in 274 left them defenceless. During these con- stant wars the Greek cities had been steadily decaying ; and' in the second Punic war, when most of them seized the opportunity of revolting from Rome, their very existence was in some cases annihilated, Malaria, which never affects a well-peopled city, increased in strength as the population diminished, We are told by Cicero (De Am., 4), " Magna Greecia nunc quidem deleta est." Many of the cities com- pletely

disappeared ; some, like Tarentum, maintained a feeble existence into modern times,

GRA VIUS (1632-1703). Johann Georg Grife, Greffe, or Grevius, one of the great classical scholars of the 17th century, was born at Naumburg, Saxony, 29th January 1632, and after receiving the usual school educa- tion at the gymnasium of Pforta became a student of law in the university of Leipsic, During a casual visit to Deventer in his eighteenth year, he became acquainted with Gronovius ; and this circumstance greatly stimulated a taste for pure scholarship which he had already begun to display somewhat to the detriment of his professional prospects. Finally abandoning jurisprudence shortly afterwards, he studied philology for two years under Gronovius, and subsequently sat under Heinsius at Leyden, and under Morus and Blondel at Amsterdam, During his residence in the last-named city he abandoned Lutheranism and joined the Reformed Church ; and in 1656 he was called by the elector of Brandenburg to the chair of belles lettres in the university of Duisburg. Two years after- wards he was, on the recommendation of Gronovius, chosen to succeed that scholar at Deventer; and in 1662 he was translated to the university of Utrecht, where he occupied first the chair of rhetoric, and afterwards from 1667 until his death (January 11, 1703) that of history and politics. During the later years of his life he enjoyed a great and European reputation, and repeated attempts, which, however, he steadfastly resisted, were made to induce him to transfer his services to other universities and Governments. His lecture-room was crowded by pupils, many of them of distinguished rank, from all parts of the civilized world; and by Louis XIV., as well as by other sovereigns, he was now and again honoured with special recognition.

Of his works the two most important are the Thesaurus Anti- quitatum Romanarum, published in 12 volumes at Utrecht (1694- 1699), and, the Thesaurus Antiquitatum et Historiarwn Italie, published after his death, and continued by Burmann (1704-1725). His editions of the elassics, although at the time of their appear- anee they marked a distinet advanee in scholarship, are now for the most part superseded. They inelude Hesiodi Ascrwt quce extant Opera (1667), Luciani Pseudosophista (1668), Justint Historia Philippicee (1669), Suctonius (1672), Catullus, Tibullus, et Pro- pertius (1680), and several of the works of Cicero. The Oratio

Funebris by P. Burmann (Utrecht, 1703) contains an exhaustive -list of the works of this scholar. .

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GRAFE, ALbrecur von (1828-1870), German oculist, son of Karl Ferdinand von Griife, noticed below, was boru at Berlin in May 1828. At an early age he manifested a pre- ference for the study of mathematics, but this was gradually superseded by an interest in natural science, which led him ultimately to the study of medicine. After obtaining Government licence at Berlin, he prosecuted his studies at Vienna, Prague, and Paris, devoting special attention to ophthalmology. In 1850 he began practice as an oculist in Berlin, where he founded a private institution for the treatment of the eyes, which became the model of many similar ones in Germany and Switzerland. In 1853 he was appointed teacher of ophthalmology in Berlin university, in 1856 extraordinary professor, aud in 1866 ordinary pro- fessor. Von Grafe contributed largely to the perfection of the science of ophthalmology, especially by the establish- ment in 1855 of his Archiv fiir Ophthalmologie, in which he had Arlt and Donders as collaborateurs. Perhaps his two most important discoveries are his method of treatment for glaucoma, until then deemed incurable, and his new method of operation for the extraction of cataract, by which the danger of the operation became minimized. He was also regarded as an authority in diseases of the nerves and brain. He died at Berlin 20th August 1870. See Alfred Grife, fin Wort zur Erinnerung an Albrecht von Grdfe, Halle,

1870,

GRAFE, Heinricu (1802-1868), educationist, was born at Buttstiidt in Weimar, 3d May 1802, studied mathematics and theology at Jena, and in 1823 obtained a curacy in the stadtkirche of Weimar. Thence he was transferred to Jena as rector of the town school in 1825; in 1840 he was also appointed extraordinary professor of the science of educa- tion (Padagogik) in that university ; and in 1842 he became head of the biirgerschule in Cassel. After reorganizing the schools of the town, he became director of the new realschule in 1843; and, devoting himself with great zeal and energy to the interests of educational reform in electoral Hesse, he became in 1849 a member of the school commission, and also

entered tle house of representatives, where he attached himself to the democratic party and made himself some- what formidable as an agitator. In 1852 for having been implicated in the September riots and in the movement against the unpopular minister Hassenpflug (who had dis- solved the school commission) he was condemned to three years' imprisonment, a sentence which was afterwards re- duced to one of twelve months. On his release he with- drew to Geneva, where he engaged in educational work till 1855, when he was appointed director of the scliool of in- dustry at Bremen. He died in that city 21st July 1868.

Besides being the author of many text-books and occasional papers on edueational subjeets, he wrote Das Rechtsvcrhdltniss der Volksschule von innen u. ausscn (1829) ; Die Schulreform (1884) ; Schule u. Unterricht (1839); Allgemeine Pddagogik (1845); Die Deutsche Volkschule (1847). Along with Naumann, he also edited the Archiv fiir das praktische Volkschulwesen (1828-35).

GRAFE, Karu Ferpinanp von (1787-1840), German surgeon, was born at Warsaw, 8th March 1787. Hestudied medicine at Halle and Leipsic, and after obtaining licence from the latter university, he was in 1807 appointed private physician to Duke Alexius of Anhalt-Bernburg. In 1811 he became professor of surgery at Berlin, and during the war with Napoleon he was superintendent of the military hospitals. When peace was concluded in 1815, he resumed his professorial duties. He was also appointed to the medical staff of the army, and he became a director of the Frederick-William Institute, and of the Medico-Chirurgical Academy. He died suddenly, 4th July 1840, at Hanover, whither he had been called to operate on the eyes of the crown-prince. Von Griafe did much to advance the practice of surgery in Germany, especially in the case of wounds, both by the invention of new instruments and the discovery

of new methods of treatment. He improved the rhino- plastic process, and its revival was chiefly due tohim. His lectures at the university of Berlin attracted students from all parts of Europe.

The following are his principal works :—Normen fiir die Ablésung grosser Gliedmassen, Berlin, 1812; Rhinoplastik, 1818; Neue Bei- trdge zur Kunst Theile des Angesichts organisch zu ersetzen, 1821; Die epidemisch-kontagidse Augenblennorrhie Algyptens in den europdischen Befreiungsheeren, 1824; Jahresberichte iiber das klin- isch-chirurgisch-augeniratliche Institut der Universitat zw Berlin, 1817-34. Healso edited, along with Ph. von Walther, the Journal Sir Chirurgie und Augenheilkunde.

GRAFRATH, a town of Rhenish Prussia, government district of Diisseldorf, circle of Solingen, situated on the small river Itter, 14 miles E. of Diisseldorf. It has iron foundries, and manufactures of steel wares, chemicals, cotton, and ribbons. The population in 1875 was 5604.

GRAGNANO, a town of Italy, in the province of Naples and circle of Castellamare, about 23 miles E. of Castellamare. It is the seat of a bishop and has a collegiate church, manufactures cloth and maccaroni, and exports an excellent red wine which is well known at Naples. In earlier times it was surrounded with walls and defended by a castle. Population (1871) of town 7321, of commune 12,278.

GRAHAM, Sir James Gzorce Roper, Bart. (1792- 1861), a well-known British statesman, was born at Naworth, Cumberland, lst June 1792. From Westminster school he duly passed to Queen's College, Cambridge ; and shortly after quitting the university, while making the "grand tour" abroad, he became private secretary to the British minister in Sicily, in which capacity he not only acquired much use- ful experience but also rendered some important services. Shortly after his return to England he, in 1818, after a contest of extraordinary keenness, was returned to parlia- ment as member for Hull in the Whig interest; but he was unseated at the election of 1820. In 1824 he succeeded to the baronetcy on his father's death; and in 1826 he again entered parliament as representative for Carlisle. In the same year he published a pamphlet entitled Corn and Currency, which brought him into considerable prominence in the political world as a man of advanced Liberal opinions ; and having been returned in 1830 for the county of Cum- berland, he became one of the most energetic advocates in parliament of the Reform Bill. On the formation of Earl Grey's administration he received the post of first lord of the admiralty, with a seat

in the cabinet. From 1832 to 1837 he sat for the eastern division of the county of Cum- berland ; but dissensions on the Irish Church question led to his withdrawal from the ministry in 1834, and ultimately to his joining the Conservative party. Rejected by his former constituents in 1837, he was in 1838 elected for Pembroke, and in 1841 for Dorchester. In the latter year he took office under Sir Robert Peel as secretary of state for the home department, and this post he retained until 1846. Ashome secretary he incurred considerable odium, in Scotland at least, by his unconciliating policy on the church question prior to the 'disruption " of 1843 ; and in 1844 the detention and opening of letters at the post-office by his warrant raised a storm of public indignation, which was hardly allayed by the favourable report of a parlia- mentary committee of investigation. From 1846 to 1852 he was out of office ; but in the latter year he joined Lord Aberdeen's cabinet as first lord of the admiralty, in which capacity he acted also for a short time in the Palmerston ministry of 1855, until the appointment of a select com- mo ua aa into the conduct of the Russian war put he os os na and ultimately led to his withdrawal ee 'et e continued, however, as a private

© a considerable influence on parliamen-

tary opinion until his death, which Cumberland, 26th October 1861, 9 nt Netherby,

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GRAHAM, Tuomas (1804-1869), born at Glasgow on the 21st of December 1804, was the son of a merchant of that city. In 1819 he entered the university of Glasgow, and graduated in 1824. At this time the chair of chemistry was held by Dr Thomas Thomson, whose researches bear- ing on the atomic theory cannot fail to have had much influence in turning Graham's thoughts to the study of molecular physics to which he so patiently devoted his life. The beginning of his career appears to have been much embittered by his father's opposition, who wished him to become a minister of the Established Church. His own views, however, prevailed, and he worked for two years in the laboratory of Dr Hope of Edinburgh before returning to Glasgow, where he taught mathematics, and subsequently chemistry, until the year 1829, when he was appointed lecturer in the

Mechanics' Institute. In 1830 he succeeded Dr Ure as professor of chemistry in the Andersonian Insti- tution, and, on the death of Dr Edward Turner, he was transferred to the chair of chemistry in University College, London. He presided over the chemical section of the British Association at the Birmingham meeting in 1839, and in 1841 was chosen as the first president of the Chemi- cal Society of London. He resigned his professorship on being appointed to succeed Sir John Herschel as Master of the Mint, a post he held until his death in September 1869, This appointment was doubtless offered to him by Govern- ment in recognition of his scientific services, but the onerous duties of the important office severely tried his energies ; and it is unfortunate. that, in quitting a purely scientific career, he should have been subjected to the cares of official life for which he was by temperament singularly unfit. The researches, however, which he conducted between 1861 and 1869 were as brilliant as any of those in which he engaged. Graham was elected a fellow of the Royal Society in 1837, a corresponding member of the Institute of France in 1847, and doctor of civil law in 1855. The presidency of the Royal Society was offered him towards the close of his life, but his failing health caused him to shrink from accepting the honour.

The persistency with which he traced and developed the laws of atomic motion was remarkable. It is interesting therefore to remember that his future work must. have been indicated in no small measure by the researches of the illustrious Black, who, at the beginning of the century, rejected the definitions of chemistry proposed by Stahl, Boerhaave, and Fourcroy, and lectured "on the effects produced by heat and mixture in all bodies or mixtures of bodies natural or artificial." Graham communicated papers to the Philosophical Society of Glasgow before the work of that society was recorded in Transactions, but his first published paper, "On the Absorption of Gases by Liquids," appeared in the Annals of Philosophy for 1826, and is of special interest, as in it he speaks of the liquefaction of gases in much the same terms as those employed in the last paper he wrote. The subject with which his name will always be most prominently associated is the molecular mobility of gases. Priestley observed in 1799 that hydrogen escaped from a fissured glass jar in exchange for external air which "had nothing inflammable in it," and Dalton proved in 1806 that gases confined in glass phials, connected by glass tubes, intermix even

against the action of gravity. Graham in his first paper on this subject (1829) thus summarizes the knowledge experiment had afforded as to the laws which regulate the movement of gases. "Fruitful as the miscibility of gases has been in interesting speculations, the experimental infor- mation we possess on the subject amounts to little more than the well-established fact that gases of a different nature, when brought into contact, do not arrange themselves according to their density, but they spontaneously diffuse

through each other so as to remain in an intimate state of mixture for any length of time." For the fissured jar of Priestley and Débereiner he substituted a glass tube closed by a plug of plaster of Paris, and with this simple ap- pliance he developed his now well-known law "that the diffusion rate of gases is inversely as the square root of their density."

With regard to the special importance of Graham's law to the chemist and physicist, it may be sufficient to point out that a great number of chemical as well as physical facts are co-ordinated by the assumption that all substances in the state of gas have the same molecular volume or contain the same number of molecules in a given space (Avogadro's law); and, in the second place, it has become evident that the phenomena of heat are simply the manifestations of mole- cular motion. According to this view the absolute tempera- ture of a gas is proportional to the wis viva of its molecules ; and since all molecules at a given temperature have the same vis viva, it follows that the molecules must move with velocities which are inversely proportional to the square roots of the molecular weights. Moreover, since the mole- cular volumes are equal, and the molecular weights are therefore proportional to the densities of the aeriform bodies in which the molecules are active units, it also follows that the average velocities of the molecules in any two gases are inversely proportional to the square roots of their respective densities. Thus the simple numerical relations first ob- served in the phenomena of diffusion are the direct result of molecular motion, and it is now seen that Graham's empirical law is included under the fundamental law of motion,

Graham also studied the passage of gases by transpiration through fine tubes, and by effusion through a minute hole in a platinum disc, and was enabled to show that gas niay enter a vacuum in three different ways: (1) by the molecular movement of diffusion, in virtue of which a gas penetrates through the pores of a disc of compressed graphite ; (2) by effusion through an orifice of sensible dimensions in a platinum disc (the relative times of the effusion of gases in mass being similar to those of the molecular diffusion, although a gas is usually carried by the former kind of im- pulse with a velocity many thousand times as great as is demonstrable by the latter) ; and (3) by the peculiar rate of passage due to transpiration through fine tubes, in which the ratios appear to be in direct relation with no other known property of the same gases,—thus hydrogen has exactly double the transpiration rate of nitrogen, the relation of those gases as to density being as 1: 14.

He subsequently examined the passage of gases through septa or partitions of india-rubber, and plates of non- crystalline metals such as palladium, and proved that gases pass through these septa neither by diffusion, effusion, nor transpiration, but in virtue of a selective absorption which the septa appear to exert on the gases in contact with them. By this means he was enabled partially to separate oxygen from air, and to calculate the density of metallic- hydrogen from the remarkable expansion which attends the absorption of hydrogen by palladium, The experiments led him to believe that palladium with its occluded hydrogen was an alloy, a view that has been greatly strengthened by the recent experiments of MM. Cailletet and Pictet.

His early work on the movements of gases led him to examine the spontaneous movements of liquids, and as a result of the experiments he divided bodies into two classes,—crystalloids, such as common salt, and colloids, of which gum-arabic is a type,—the former having high and the latter low diffusibility. He also proved, by a series of beautiful experiments, that the process of liquid diffusion actually causes partial decomposition of certain chemical compounds, the sulphate of potash, for instance,

being separated rrom the sulphate of alumina in alum by the higher diffusibility of the former salt.

He also extended his work on the transpiration of gases to liquids, adopting the method of manipulation de- vised by Poiseuille. He found that dilution with water does not eifect proportionate alteration in the transpiration velocities of different liquids, and a certain determinable degree of dilution retards the transpiration velocity. Thus in the case of alcohol the greatest retardation is with six equivalents of water, nitric acid with three, and acetone with as much as twelve equivalents.

It is only possible here to indicate the prominent features of Graham's more purely chemical labours. In 1833 he showed that the various compounds of phosphoric acid and water constitute distinct salts, in each of which the hydrogen may be displaced by other metals. He was the first, there- fore, to establish the existence of polybasic compounds, in each of which one or more equivalents of hydrogen are replaceable by certain metals, and he further showed that by heating biphosphate of soda a metaphosphate is formed, and from this he obtained a corresponding hydrated acid. In 1824 he demonstrated that the spontaneous inflamma- bility of one variety of phosphuretted hydrogen is due to its admixture with a very small proportion of an oxide of nitrogen, probably nitrous acid. In 1835 he published the results of an examination of the properties of water as a constituent of salts. Not the least interesting part of this inquiry was the discovery of certain definite salts with alcohol analogous to hydrates, to which the name of alco- holates was given. A brief paper entitled Speculative Ideas on the Constitution of Matter deserves notice as possessing special interest in connexion with work done since Graham's death. In it he expressed the view that the various kinds of matter now recognized as dif- ferent elementary substances may possess one and tle same ultimate or atomic molecule in different conditions of move- ment.

Graham's work, viewed as a whole, is remarkable alike for its originality and for the singular simplicity of the methods employed in obtaining most important results.

Biographical notices of Graham will be found in the Proceedings of the Royal Society, xviii., 1870, p. xviii. ; Proceedings of the Royal Society of

Edinburgh, vii., 1872, p. 15; Proceedings of the Royat Institution, vi., 1872, p. 15; Deutsch. Chem. Gesellschaft, Berlin, li., 1869, p. 753; Minehen Akad. Sitewngsb., 1870, 1., p. 408; American Journal of Seience, i., 1871, p. 115; Smithsonian Reports, 1871, p..177; Proceedings of American Academy, viii., 1870, p- 230. His works have been collected and printed by Dr James Young and Dr Angus Smith, the latter contributing to the volume a valuable preface and analysis of its contents. (W. C. RB.) :

GRAHAME, Jamzs (1765-1811), author of The Sabbath and other poems, was born at Glasgow, April 22, 1765. His father was a successful lawyer, and, by a very common error, he conceived that no other profession could be so suitable or so advantageous for his son. James, dutiful, and shrinking from opposition, as he did all through life, obeyed the parental wish, and after completing his literary course at the university of his native city, went in 1784 to Edinburgh where he studied law, first to qualify himself for the business of writer to the signet, and subsequently for the Scottish bar, of which he was elected a member in 1795. His inclinations, however, were all for retirement and literature; and finally, when he had reached the mature age of forty-four, he took orders in the English Church, and became curate first at Shipton, Gloucester- shire, and then at Sedgefield in the county of Durham. He did not long enjoy an office which he adorned by his pious and eloquent ministrations. Ill health compelled him to try the renovating effects of his native air, but he died shortly after his return, September 14, 1811. The works of Grahame consist of a dramatic poem Mary

Queen of Scots (published in 1801), The Sabbath (1804), XIL— 5

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British Georgics (1804), The Birds of Scotland (1806), and Poems on the Abolition of the Slave Trade (1810). His principal work is Zhe Sabbath—a sacred and descriptive poem in blank verse, characterized by a fine vein of tender and devotional feeling, and by the happy delineation of Scottish scenery. He is the Cowper of Scotland, but wants Cowper's mastery of versification and easy idiomatic vigour of style. The blank verse of Grahame is often hard and constrained, though at times it swells out into periods of striking imagery and prophet-like earnestness. His descrip- tion of the solemn stillness and unbroken calm of "the hallowed day " in the

rural districts of Scotland, and of the Scottish Sabbath preachings among the hills in times of persecution, when "The scattered few would meet in some deep dell By rocks o'er-canopied,"

are finished pictures that will never fade from our poetry. In his Georgics he tried the wider field of rural occupations and manners, and produced some pleasing daguerreotypes of nature,—for he was a careful as well as loving student,— but descended too much into minute and undignified detail. In the notes to his poems he expresses:~~manly and enliglit~~ ened views on popular education, the criminal Jaw, and other public questions. He was emphatically a friend of humanity—a philanthropist as well as a poet.

GRAHAM'S TOWN, the metropolis of the eastern dis-

tricts of the Cape Colony, South Africa, is situated in the division of Albany, 80 miles inland from Algoa Bay, 40 miles inland from Port Alfred, and 600 miles from Cape Town. In 1812 the site of the town was first chosen as the headquarters of the British troops engaged in protecting the frontier of the colony from the inroads of the Kaffre tribes, and it was named after Colonel Graham, then com- manding the forces. In 1819 an attempt was made by the Kafres to surprise the place, and a body of 10,000 men attacked it, but were gallantly repulsed by the garrison, which numbered not more than 320 men, infantry and artillery, under Colonel Willshire. From 1820 Graham's Town was the centre of what was termed the '" Albany Settlement," and it soon became the chief emporium of frontier trade. The town is built in a basin of the grassy hills forming the spurs of the Zuurberg mountain range, 1760 feet above sea-level. It isa pleasant place of resi- dence, and is regarded as the most English-like town in the colony. The streets are broad, and most of them lined with trees. The principal thoroughfare is the High Street, where stand St George's English Cathedral, built from designs by Sir Gilbert Scott, and Commemoration Chapel, the chief place of worship of the Wesleyans, erected by the British emigrants of 1820. There are no fewer than twelve churches and chapels in Graham's Town— Church of England, Roman Catholic, Wesleyan, Presby- terian, Baptist, and Independent. It is the seat of the Eastern Districts' Court, presided over by a chief judge and two puisne judges. Among the institutions of the town are an excellent public hospital, a lunatic asylum, colleges and grammar schools, a museum

and natural history society, a public library, a club, and masonic, templar, and other societies. There is also a botanic garden, in which there 1s a memorial of Colonel Fordyce of the 74th regiment, who fell in the Kaffre war of 1851. The population of Graham's Town, according to the last census, is 7000. It is the centre of trade for an extensive pastoral and agricultural country, and has easy communication both with Port Alfred, at the mouth of the Kowie River, and with Port Elizabeth on Algoa Bay.

GRAIL, or Grayrz, Taz Hoy (Saint Graal, Seynt oe Sangreal, Sank Ryal), the name given to the legendary an er-working vessel said to have been brought by Joseph of Arimathea to Britain. The correct spelling is " Graal."

GRAS eh aA

In the present article the subject will be considered under the following four heads :—(1) the meaning of the Graal conception ; (2) the authorship of the conception; (3) the meaning of the word; (4) the spread of the conception from the land of its origin to other countries.

1. The "Saint Graal" was the name given—if not originally, yet very soon after the conception was started— to the dish, or shallow bowl (in French, escuedle), from which Jesus Christ was said to have eaten the paschal lamb on the evening of the Last Supper with his disciples. In the French prose romance of the Saint Graal, it is said that Joseph of Arimathea, having obtained leave from Pilate to take down the body of Jesus from the cross, proceeded first to the upper room where the supper was held and found there this vessel; then, as he took down the Lord's dead body, he received into the vessel many drops of blood which issued from the still open wounds in his feet, hands, and side. This last feature, which Tennyson in his beautiful idyll The Holy Grail has overlooked, is obviously of the essence of the conception. According to Catholic theology, where the body or the blood of Christ is, there, by virtue of the hypostatic union, are His soul and His divinity. That the Graal, such being its contents, should be marvellous—divine—mysterious, was but logical and natural. The Graal was "the commencement of all bold emprise, the occasion of all prowess and heroic deeds, the investigation of all the sciences, . . . the demonstration of great wonders, the end of all bounty and goodness, the marvel of all other

marvels." Nasciens, taking off the paten which covered the Graal, comprehends innumerable marvels, but is struck blind. By the Graal Joseph's life is sustained in prison during forty-two years without food, while as an oracle it instructs him in heavenly knowledge. Nothing could be more fantastic and extravagant than all this, were the Graal conceived of merely as a relic, however venerable ; but all is altered when it is brought into close relations, according to the design of its inventors, with the mystery of the eucharist.

2. The authorship of the conception involves one of the most difficult of literary questions. Mr Price, in the able and eloquent dissertation prefixed to vol. i. of Warton's Lfistory of English Poetry, seems to maintain the view that it can be attributed to no individual, but was the spontane- ous outgrowth of a group of widely prevalent superstitions, in all which a magical cup or divining bowl was the central object. Others, as Fauriel, Simrock, and Schulz, find the original home of the legend in Provence. M. Paulin Paris, who has been eugaged for nearly forty years in the study of Arthurian romauce, and whose latest speculations (Romans dela Table Ronde, v. 352) bear the recent date of 1876, is of opinionthat the original conception came from some Welsh monk or hermit who lived early in the 8th century; that its guiding and essential import was an assertion for the British Church of an independent derivation of its Christi- anity direct from Palestine, and not through Rome ; that the conception was embodied in a book, called Liber Gradalis or De Gradali ; that this book was kept in abeyance by the British clergy for more than 300 years, from a fear lest it should bring them into collision with the hierarchy and make their orthodoxy suspected; that it came to be known and read in the second half of the 12th century ; that a French poet, Robert de Boron, who probably had not seen the book, but received information about it, was the first to embody the conception in a vernacular literary form by writing his poem of Josephe d' Arimathie; and that, after Boron, Walter Map and others came into the field. Lastly, it is maintained, by English writers generally, that the conception arose certainly on British ground, but in the 12th century, not in the 8th ; that it was introduced by some master-hand, pro- bably that of Walter Map, into every branch of Arthurian

romance; and that if Map was not the author of the con- ception, as seems highly probable, he first, by writing the French romances of the Saint Graal, the second part of Lancelot, and Mort Artur, invested it in literary form.

These theories cannot be discussed here ; but it may be remarked that, in order to pave the way for any rational theory, it is indispensable to have a clear view of the con- dition of romance literature at and before the time when the conception arose. The legend of Arthur, which barely rises to the surface in the narrative of Gildas, had in the time of Nennius (9th century) attained to considerable consistency, and through the appearance of the Historia Britonum of Geoffrey of Monmouth, which everywhere excited an extraordinary sensation, had become European. To the Norman and French poets it had become known, long before the appearance of Geoffrey's book, through the Breton lays; and the mysticism, the tender depths of senti- ment, the wild flights of imagination and fancy which were found in these lays, had so captivated and dazzled them as to induce them almost to desert their own rough Chansons de Geste, of which Charlemagne was the chief figure, for this new field. A succession of startling inci- dents, in which giants, knights, dwarfs, fairies, and goblius were actors, and a nature in mystic sympathy with man was the background, appealed to the feelings of wonder and awe; the instinct of revenge and the lust of war were gratified by battle-recitals innumerable, while around the chief characters of the legends there floated the rapture and the hyperbole of amorous passion. In the Brut of Wace, founded on Geoffrey's work, we find the story of Arthur in ample proportions, and the " Round Table" appears for the first time—

" Fist reis Ertur la Runde Table, Dunt Bretun dient meinte fable."

The exuberance of invention here attributed to the Bretons was faithfully imitated by the poets of northern France. Chrestien of Troyes, born near the middle of the 12th century, besides versifying many tales from Qvid, re-produced parts of the Arthur legend in his poem on Aing Mark and Yseult the Blonde, and the Chevalier au Lion. In these, however, there is no mention of the Graal. Sud- denly a narrative, possibly in Latin but more probably in French prose, makes its appearance, containing the story of the commission of the Holy Graal to Joseph of Arima- thea, as given above, of

his subsequent adventures in Syria and elsewhere, and of the ultimate arrival of his son, his brother-in-law, and others of his kindred, in Britain, where they settle in the island of Avallon. The birth of Arthur is prophesied in this narrative, but otherwise he is scarcely mentioned. About the same time, the prose romances of Lancelot (part i.) and Tristan, containing rich develop- ments of the Arthurian legend, made their appearance and were warmly welcomed. 'The first is ascribed in the MSS. to Walter Map, and the second to Luc or Luces de Gast 3 but both statements, in the opinion of M. Paulin Paris, are extremely doubtful. At any rate, if Map wrote the first part of Lancelot, he continued and finished it in a totally different spirit. The first part is mere love and chivalry, 'the most secular," says M. Paulin Paris, "of all romances" : while the second part is the most mystical of all. The first part contains no allusion to the Graal; in the second it is an element of overpowering interest. Lancelot joins in the quest for the Graal, fails to see it or only half sees it, repents, becomes a holy hermit, and dies. Zristan in its original form was the legend of a favourite Breton hero ig was then connected with the cycle of Arthur; lastly, per- haps by the same powerful hand that transmuted Lancelot, it was brought within the sweep of the Graal conception.

But who invented the story of J oseph of Arimathea? or rather, who connected that story with the Graal legend, and

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both with Arthur? The importance of a work of William of Malmesbury in assisting us to answer this question has been somewhat overlooked. In his treatise De Antiquitate Glastoniensis Heclesice, written probably soon after Henry of Blois, abbot of Glastonbury, to whom it is dedicated, was raised to the see of Winchester (1129), Malmesbury records with considerable detail the legend which brought Joseph to Glastonbury, and made him the first preacher of Christianity to the Britons. Everything connected with Glastonbury had a duodenary character; Joseph was sent to Britain by St Philip the evangelist as the chief among twelve missioners; the holy men who afterwards tenanted the abbey always sought to maintain the number of twelve ; Glasteing, from whom the place was named, was one of twelve brothers ; the chief estate of the abbey was called "the Twelve Hides," &c.

This same feature distinctly reappears in the Graal legend, where Bron, the brother-in- law of Joseph, has twelve sons, who are all sent to Britain, but one among them, Alain, who renounces marriage, is set over the rest. Again, we read in Malmesbury that Avallon is another name for Glastonbury ; and in the Graal legend we read that Joseph's kindred are directed by a divine voice to seek, in the far west, the "valleys of Avaron." Lastly, in the strange story about the altar called "sapphirus," which angels brought from Palestine to St David, and which after a long disappearance was rediscovered in Malmesbury's own day, we seem to lay our finger, as it were, on the origin, the rudimentary suggestion, of the Graal conception.

Now if we accept the 'general testimony of the MSS., and assume without further proof that Map composed, whether in Latin or in French, the original book of the Saint Graal, the genesis of the work seems not difficult to trace. In early life Map was a canon of Salisbury (see Wright's preface to the De Nugis Curialium) ; either after- wards or at the same time he was parish priest of Westbury near Bristol. Gloucestershire and Wiltshire are both neigh- bouring counties to Somersetshire, in which Glastonbury was the most sacred and celebrated spot. Visiting that ancient abbey, Map would have become acquainted with the legend of Joseph of Arimathea in all its details; and he would have seen the altar said to have been transported by angels from Palestine, and which, long hidden from mortal sight on account of the wickedness of the times, had lately been revealed and reinstated. His versatile and capacious: mind would, as a matter of course, have been familiar with the whole Arthur legend as it then (1170-1180) existed, if for no other reason, because he lived in the very part of England which was studded with Arthurian sites. He fully answers to the description of the "great clerks" who, according to Robert de Boron first made and told the his- tory of the Graal. He seems to have conceived the vast design of steeping the Arthurian legend, and through it the whole imaginative literature of the age, in the doctrine of the Christian sacrifice. He is generally credited in the MSS. with the composition of the Saint Graal (containing the legend of Joseph of Arimathea), of the Quest of the Saint Graal, of Lancelot in whole or in part, and of the Mort Artur. But it appears that no MS. of any of these romances now exists of an earlier date than 1274, and it is certain that a set of "arrangers" and continuators (like the

rhapsodists and cyclic poets of the Homeric epos) com- menced their confusing operations on the legend at an early period. Hence it seems impossible now to recover the exact order in which the different romances were composed.

3. On the origin of the word Graal, the opinion of M. Paulin Paris seems to be satisfactory. He thinks that graal is a corruption of gradale, or graduale, the Latiu name for a liturgical collection of psalms and texts of scripture, so called " quod in gradibus canitur," as the priest is passing

from the epistle to the gospel side of the altar. The author of the Graal conception meant by graal, or gradale, not the sacred dish (escuelle), but the mysterious book revealed to the supposed hermit of 717, in which he finds the history of the escuelle. Robert de Boron, mistaking this, transfers the name to the dish, and connects it with gré (gratus, gratia) on account of the inward solace connected with it (see Romans de la T. R., i. 143). The word rapidly became popular in the sense of bowl, or shallow cup, so that Hélinand (1204) could say, ' Dicitur vulgari nomine graalz, quia grata et acceptabilis est in ea comedenti." This etymology is the same as Boron's. The older French word gréel, meaning service-book (Ducange, article " Gradale "), was displaced by the new graal or greal. On the other hand, M. Fauriel derives graal from an old Provengal word fora cup, grazal. But this grazal, according to the article in Ducange, seems to be of Armorican origin ; anyhow M. Fauriel has not proved its use in the sense of cup ata period earlier than the rise of the Graal legend.

4, The spread and ascendency to which the Graal con- ception rapidly attained in all Christian countries made the creations of Arthurian romance the delight of all cultivated minds, from Caerleon to Venice, and from Iceland to the Straits of Gibraltar. From England, which we must regard as the land of its origin, the Graal legend at once passed to France, and found an enthusiastic and capable interpreter in Robert or Robiers de Boron. This Boron was no Englishman of Nottinghamshire, as some English writers have pretended, but, as Paulin Paris conclusively proves, a French poet of the county of Montbeliard in the region of the Vosges, Chrestien de Troyes in his Percival (written before 1191, for it is dedicated to Count Philip of

Flanders who died in that year), gives in a metrical dress the legend of Percival, one of the knights of the round table, under the transformation which the introduction of the Graal conception had effected. The continuations of the poem, by Denet and Manessier, come down to about 1240. The famous Mid-German poem of Parzival, by Wolfram von Eschenbach, which appeared near the begin- ning of the 13th century, is founded partly on Chrestien's Percival, but partly also on some other, perhaps Provengal, source, which is now lost. A rude English metrical version of the French prose romance of the Saint Graal, by one Harry Lonelich, dating from the reign of Henry VI., has been recently edited by Mr Furnivall for the Roxburghe Club. Flemish, Icelandic, and Welsh reproductions of the Graal romances have been found to exist. One of the first employments of the printing press in England, France, and Germany was to multiply poems or romances embodying this legend. Hence Caxton printed for Sir Thomas Malory (1485) The Historve of King Arthur and his Noble Knightes, a version in English prose of the French romances of Merlin, Lancelot, Tristan, the Quéte du Saint Graal, and Mort Artur, or at any rate based upon them. An early French edition of the Z'ristan, of which there is a copy in the British Museum, is dated 1489. Lancelot du Lac was printed at Paris in 1513; and not long afterwards editions of the Z'ristan and other portions of the Arthur cycle, always as interpenetrated by the Graal legend, appeared both in Italy and Spain (Schulz's Hssay, p. 114).

See Paulin Paris, Les Manuserits de la Bibliotheque Royale, 1836, and Les Romans de la Table Ronde, 1868-77; Madden's Sir Gawayne, edited for the Bannatyne Club, 1839; the Seynt Graal (part i.), edited by F. Furnivall, with a prefatory essay on the Graal-saga by San' Marte (Schulz), 1861~3; several MSS. of the King's Library in the British Museum, Reg. 14 E. iii., 19 C. xii, 20 C. vi, &¢.; Fauriel, Hist. de la Poésie Provengale; Wolfram von Eschenbach, Parzival und Titurel, edited by Pfeiffer, 1870 ; Warton's History of English Poetry, vol. i., La Franee Littératre, vol. xv.; Helinand's "Chronicles" (in Migne's Patrologie, vol.

cexii.) ; Schulz's Essay on the Influence of Welsh Tradition, Llan- dovery, 1841, &c., &c. (ERAY

and reaches under cultivation a length of 5 inches.

gin, and cordials. dealer in beer shall have in his possession or use grains of paradise, under a penalty of £200 for each offence ; and no

GRAINS OF PARADISE, Guinza Grarss, or MELE-

curta Pepper (German, Paradveskérner ; French, Graznes de Paradis, Maniguette), the semana cardamomi majoris or piper melegueta of pharmaceutists, are the seeds of Amomum _ Melegueta, Roscoe, a reed-like plant of the natural order — Zingiberacec, which is a native of tropical western Africa, and of Princes and St Thomas's Islands in the Gulf of

Guinea, is cultivated in British Guiana, and may with ease be grown in hot-houses in England. The plant has a

branched horizontal rhizome ; smooth, nearly sessile, alter- nate leaves, with the blade oblong-lanceolate ; large, white,

pale pink, or purplish flowers; and an ovate-oblong fruit, ensheathed in bracts, which is of a scarlet colour when fresh, The seeds are contained in the acid pulp of the fruit, are com- monly wedge-shaped and bluntly angular, are about 14

line in diameter, and have a glossy dark-brown husk, with a conical light-coloured membranous caruncle at the base, and a white kernel. They contain, according to Flickiger and Hanbury, 0°3 per cent. of a faintly yellowish neutral

essential oil, having an aromatic, not acrid taste, and

a specific gravity at 15°5° C. of 0°825, and giving on analysis the formula Cy 9H3.0, or Cy)Hyy + CoH 1,0 ; also

5°83 per cent. of an intensely. pungent, viscid, brown resin. Grains of paradise were formerly officinal in British phar-

macopeeias, and in the 13th and succeeding centuries were used as a drug and a spice, the wine known as hippocras being flavoured with them and with ginger and cinnamon. In 1629 they were employed among the ingredients of the twenty-four herring pies which were the ancient fee-

favour of the city of Norwich, ordained to be carried to court by the lord of the manor of Carleton (Johnston and Church,

Chem. of Common Life, p. 355, 1879). Grains of paradise were in past times brought overland from West Africa to

the Mediterranean ports of the Barbary States, to be shipped for Italy. the Gold Coast.

They are now exported almost exclusively from The amount received by Great Britain in 1871 was upwards of 760 cwts. Grains of paradise are

to some extent used in veterinary practice, but for the most

part illegally to give a fictitious strength to malt liquors, By 56 Geo, III. c. 58, no brewer or

druggist shall sell the same to a brewer under a penalty of £500. They are, however, devoid of any injurious physio-

logical action, and are much esteemed asa spice by the

natives of Guinea. ;

"See Bentley and Trimen, Medicinal Plants, part 30, tab. 268; Lanessan, Hist. des Drogues, pp. 456-460, 1878.

GRAM, or Curck-pea, called also Egyptian Pea, or Bengal Gram (Hindi, chand ; Bengali, chhold ; Italian, cece ; Spanish, garbanzo), an herbaceous, annual, leguminous plant, the Cicer arietinum of Linnzeus, so named from the resem- blance of its seed to a ram's head, is a native of the south of Europe and India. Its leaves are imparipinnate, with ovate, equal, and serrate leaflets ; the flowers are axillary, and of a bluish-purple colour, and bloom in India from Septeniber to October ; and the pods have a length of 1 to 14 inch, and contain either one or two somewhat pointed and commonly pale yellow seeds, about 3 lines long. Gram is largely cultivated in the East, where the seeds are eaten raw, or cooked and prepared in various ways, both in their ripe and unripe condition, and when roasted and

ground are made to subserve the same purposes as ordinary flour. In Europe the seeds are used as an ingredient in soups. They contain, in 100 parts without husks, nitrogenous substances 22:7, fat 3°76, starch 63°18, mineral matters 2°6 parts, with water (Forbes Watson, quoted in Parkes's Hygiene). 'The liquid which exudes from the glandular hairs clothing the leaves and stems of the plant, more

especially during the cold season, when the seeds ripen, contains a notable proportion of oxalic acid, and is said to be very injurious to the leather shoes of those who walk In Mysore the dew containing it is collected by means of cloths spread on the plant over night, and is valued as a remedy for dyspepsia, indiges- The steam of water in which the fresh plant is immersed is in the Deccan resorted to by the Portuguese for the treatment of dysmenorrhea. The seed of Phaseolus Mungo, Linn., or green gram (Hind. and Beng., moong), a variety of which plant, P. Mungo melano-

through fields of gram.

tion, and costiveness,

spermus (P. Max, Roxb.), is termed black gram, is an important article of diet among the labouring classes in

India, and is annually exported in large quantities from Madras. Soup made from it is considered to be especially The meal is an excellent substi-

suited to sick persons. tute for soap, and is stated by Elliot to be an invariable concomitant of the Hindu bath. P. Roxburghii, W. and

Arn., or P. radiatus, Roxb. (Hind., urid; Beng., mdsh-

kaldi), which also is known as green gram, is perhaps the most esteemed of the leguminous plants of India, where the meal of its seed enters into the composition of the more delicate cakes and dishes, and is used in medicine both ex- ternally and internally. P. aconitifolius goes by the name of Turkish gram. Horse gram, Dolichos uniflorus, Lam. (Hind. and Beng., kulthi),

*which supplies in Madras the place of the chick-pea, affords seed which, when boiled, is exten- sively employed as a food for horses and cattle in South India, where also it is eaten in curries, and, made into poultices or pastes, is applied to medicinal purposes. Turkish gram is the Dolichos Catjang of Roxburgh. White gram, Glycine (Saja) hispida, produces the beans from which soy is made. The quantity of gram exported from India in 1876-77, chiefly to Mauritius, Ceylon, and the Straits, amounted to 316,592 cwt., against 322,661 ewt. in the previous year. See W. Elliot, '*On the Farinaceous Grains and the various kinds of Pulses used in Southern India," Edin. New Phil. Journ.,*

1862, vol. xvi. p. 16 sq.; H. Drury, The Useful Plants of India, 1873; U. C. Dutt, Materia Medica of the Hindus, Calcutta, 1877.

GRAMMAR. By the grammar of a language is meant either the relations borne by the words of a sentence and by sentences themselves one to another, or the sys- tematized exposition of these. The exposition may be, and frequently is, incorrect; but it always presupposes the existence of certain customary uses of words when in combination. In what follows, therefore, grammar will be generally employed in its primary sense, as denot- ing the mode in which words are connected together in order to express a complete thought, or, as it is termed in logic, a proposition.

The object of latiguage is to convey thought, and so long as this object is attained the machinery for attaining it is of comparatively slight importance. The way in which we combine our words and sentences matters but little, pro- vided that our meaning is clear to others, The expressions "horseflesh " and " flesh of a horse," are equally intelligible to an Englishman and therefore are equally recognized by English grammar. The Chinese manner of denoting a genitive is by placing the defining word before that which it defines, as in Lowe jin, "man of the kingdom," literally "kingdom man," and the only reason why it would be incorrect in French or Italian is that such a combination would be unintelligible to a Frenchman or an Italian. Hence it is evident that the grammatical correctness or incorrect- ness of an expression depends upon its intelligibility, that is to say, upon the ordinary use and custom of a particular language. Whatever is so unfamiliar as not to be generally

understood is also ungrammatical. In other words, it is contrary to the habit of a language, as determined by com- mon usage and consent.

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In this way we can explain how it happens that the grammar of a cultivated dialect and that of a local dialect in the same country so frequently disagree. Thus, in the dialect of West Somerset, thee is the nominative of the second personal pronoun, while in cultivated English the plural accusative you (Anglo-Saxon, cow) has come to re- present a nominative singular. Both are grammatically correct within the sphere of their respective dialects, but no further. You would be ag ungrammatical in West Somerset as thee is in classical English ; and both you and thee, as nominatives singular, would have been equally un- grammatical in Early English. Grammatical propriety is nothing more than the established usage of a particular body of speakers at a particular time in their history.

It follows from this that the grammar of a people changes, like its pronunciation, from age to age. Anglo-Saxon or Early English grammar is not the grammar of Modern English, any more than Latin grammar is the grammar of modern Italian ; and to defend an unusual construction or inflexion on the ground that it once existed in literary Anglo- Saxon, is as wrong as to import a peculiarity of some local dialect into the grammar of the cultivated speech. It further follows that different languages will have different grammars, and that the differences will be more or less according to the nearer or remoter relationship of the languages themselves, and the modes of thought of those who speak them. Consequently, to force the grammatical framework of one language upon another is to misconceive the whole nature of the latter, and seriously to mislead the learner. Chinese grammar, for instance, can never be understood until we discard, not only the terminology of European grammar, but the very conceptions which underlie it, while the polysynthetic idioms of America defy all attempts to discover in them "the parts of speech" and the various grammatical ideas which occupy so large a place in our school-grammars. The endeavour to find the dis- tinctions of Latin grammar in that of English has only resulted in grotesque errors, and a total misapprehension of the usage of the English language.

It is to the Latin grammarians,—or, more correctly, to Sub-

the Greek grammarians, upon whose labours those of the division of Latin writers were based,—that we owe the classification of gtammar.

the subjects with which grammar is commonly supposed to deal. The grammar of Dionysius Thrax, which he wrote for Roman schoolboys in the time of Pompey, has formed the starting-point for the innumerable school-grammars which have since seen the light, and suggested that division of the matter treated of which they have followed, He defines grammar as a practical acquaintance with the language of literary men, and as divided into six parts,—accentuation and phonology, explanation of figurative expressions, definition, etymology, general rules of flexion, and critical canons. Of these, phonology and accentuation, or prosody, can properly be included in grammar only in so far as the construction of a sentence and the grammatical meaning of a word are determined by accent or letter-change; the accentual difference in English, for example, between incense and incénse belongs to the province of grammar, since it indicates a difference between noun and verb; and the changes of vowel in the Semitic languages, by which various nominal and verbal forms are distinguished from one an- other, constitute a very important part of their grammatical machinery. But where accent and pronunciation do not serve to express the relations of words in a sentence, they fall into the domain of phonology, not of grammar. The explanation of figurative expressions, again, must be left to the rhetorician, and definition to the lexicographer ; the grammarian has no more to do with them than he has with the canons of criticism.

In fact, the old subdivision of grammar, inherited from

the grammarians of Rome and Alexandria, must be given up, and a new one put in its place. What grammar really deals with are all those contrivances whereby the relations of words and sentences are pointed out. Sometimes it is position, sometimes phonetic symbolization, sometimes com- position, sometimes flexion, sometimes the use of auxiliaries, which enables the speaker to combine his words together so that they shall be intelligible to another. Grammar may accordingly be divided into the three departments of

composition or " word-building," syntax, and accidence, by which is meant an exposition of the means adopted by language for expressing the relations of grammar when re- course is not had to composition or simple position.

GRAMMAR

is to determine the ideas that underlie all grammar whatso- ever, as distinct from those that are peculiar to special families of speech. Universal grammar is sometimes known as "the metaphysics of language," and it has to decide such questions as the nature of gender, or of the verb, the true purport of the genitive relation, or the origin of grammar itself. Such questions, it is clear, can only be answered by comparing the results gained by the comparative treatment of the grammars of various groups of language. What his- torical grammar is to comparative grammar, comparative grammar is to universal grammar.

Universal grammar, as founded on the results of the Universal scientific study of speech, is thus essentially different from gtammar.

Modesof A systematized exposition of grammar may be intended | that " universal grammar" so much in vogue at the begin- treat- for the purely practical purpose of teaching the mechanism | ning of the present century, which consisted of a series of ment,

of a foreign language. In this case, all that is necessary is a correct and complete statement of the facts. But a correct and complete statement of the facts is by no means SO easy a matter as might appear at first sight. The facts will be distorted by a false theory in regard to them, while they will certainly not be presented in a complete form if the grammarian is ignorant of the true theory they presup- pose. The Semitic verb, for example, remains unintelligible so long as the explanation of its forms is sought in the con- jugation of the Aryan verb, since it has no tenses in the Aryan sense of the word, but denotes relation and not time,

A good practical grammar of a language, therefore, should be based ona correct appreciation of the facts which it expounds, and a correct appreciation of the facts is only possible where they are examined and co-

ordinated in ac- cordance with the scientific method. A practical grammar ought, wherever it is possible, to be preceded by a scientific grammar.

Comparison is the instrument with which science works, and a scientific grammar, accordingly, is one in which the comparative method has been applied to the relations of speech. If we would understand the origin and real nature of grammatical forms, and of the relations which they represent, we must compare them with similar forms in kindred dialects and languages, as well as with the forms

a priort assumptions based on the peculiarities of European grammar and illustrated from the same source. But uni- versal grammar, as conceived by modern science, is as yet in its infancy ; its materials are still in the process of being collected. The comparative grammar of the Aryan lan- guages is alone in an advanced state, those of the Semitic idioms, of the Ugro-Altaic tongues, and of the Ba-ntu or Kaffre dialects of southern Africa, are still in a backward condition ; and the other families of speech existing in the world, with the exception of the Malayo-Polynesian, and the Sonorian of North America, have not as yet been treated scientifically. Chinese, it is true, possesses an historical grammar, and Mr Van Eys, in his comparative grammar of Basque, has endeavoured to solve the problems of that interesting language by a comparison of its various dialects 5 but in both cases the area of comparison is too small for more than a limited success to be attainable. Instead of attempting the questions of universal grammar therefore, it will be better to confine our attention to three points, — the fundamental differences in the grammatical conceptions of different groups of languages, the main results of a scien- tific investigation of Aryan grammar, and the light thrown by comparative philology upon the grammar of our own tongue.

The proposition or sentence is the unit and starting-point Differences of speech, and grammar, as we have seen, consists in the in gram- relations of its several parts one to another, together with ™” of

F 5 z unallied the expression of them. These relations may be regarded

under which they appeared themselves at an earlier period of their history. We shall thus have a comparative gram-

mar and an historical grammar, the latter being devoted to languages.

tracing the history of grammatical forms and usages in the same language. Of course, an historical grammar is only possible where a succession of written records exists ; where a language possesses no older literature, we must be content with a comparative grammar only, and look to cognate idioms to throw light upon its grammatical peculiarities, In this case we have frequently to leave whole forms un- explained, or at most conjecturally interpreted, since the machinery by means of which the relations of grammar are symbolized is often changed so completely during the growth of a language as to cause its earlier shape and character to be unrecognizable. Moreover, our area of com- parison must be as wide as possible; where we have but two or three languages to compare, we are in danger of building up conclusions on insufficient evidence. The grammatical errors of the classical philologists of the last century were in great measure due to the fact that their area of comparison was confined to Latin and Greek.

The historical grammar of a single language or dialect, Which traces the grammatical forms and usages of the language as far back as documentary evidence allows, affords material to the comparative grammarian, whose task it is to compare the grammatical forms and usages of an allied group of tongues, and thereby reduce them to their earliest forms and senses. The work thus carried out by the com- parative grammarian within a particular family of languages is made use of by universal grammar, the object of which

from various 'points of view. In the polysynthetic lan- guages of America the sentence is conceived as a whole, not composed of independent words, but, like the thought which it expresses, one and indivisible. What we should denote by a series of words is consequently denoted by a single long compound,—kuligatchis in Delaware, for instance, signi- fying 'give me your pretty little paw," and aglekkigiartor- asuarnipok, in Eskimo, "he goes away hastily and exerts himself to write." Individual words can be, and often are, extracted from the sentence; but in this case they stand, as it were, outside it, being represented by a pronoun within the sentence itself. Thus, in Mexican, we can say not only ni-sotst-temoa, "T look for flowers,"

but also n7-k-temoa sotsitl, where the interpolated guttural is the objective pro- noun. As a necessary result of this conception of the sen- tence the American languages possess no true verb, each act being expressed as a whole by a single word. In Cherokee, for example, while there is no verb signifying "to wash " in the abstract, no less than thirteen words are used to signify every conceivable mode and object of washing. In the incorporating languages, again, of which Basque may be taken as a type, the object cannot be conceived except as contained in the verbalaction. Hence every verbal form embodies an objective pronoun, even though the object may be separately expressed. If we pass to an isolating lan- guage like Chinese, we find the exact converse of that which meets us in the polysynthetic tongues. Here each proposi-

tion or thought is analysed into its several elements, and these are set over against one another as so many inde- pendent words, The relations of grammar are consequently denoted by position, the particular position of two or more words determining the relation they bear to each other. The analysis of the sentence has not been carried so far in agelutinative languages like Turkish. In these the relations of grammar are represented by individual words, which, however, are subordinated to the words expressing the main ideas intended to be in relation to one another. The de- fining words, or indices of grammatical relations, are, in a large number of instances, placed after the words which they define ; in some cases, however, as, for example, in the Ba-ntu languages of southern Africa, the relation is con- ceived from the opposite point of view, the defining words being prefixed. The inflexional languages call in the aid of a new principle. The relations of grammar are denoted symbolically either by a change of vowel or by a change of termination, more rarely by a change at the beginning of a word. Each idea, together with the relation which it bears to the other ideas of a proposition, is thus represented by a single word ; that is to say, the ideas which make up the elements of a sentence are not conceived severally and independently, as in Chinese, but as always having a certain connexion with one another. Inflexional languages, how- ever, tend to become analytical by the logical separation of the flexion from the idea to which it is attached, though the primitive point of view is never

altogether discarded, and traces of flexion remain even in English and Persian. In fact, there is no example of a language which has wholly

forsaken the conception of the sentence and the relation of

its elements with which it started, although each class of languages occasionally trespasses on the grammatical usages of the others. In language, as elsewhere in nature, there

are no sharp lines of division, no sudden leaps ; species At the same time the several types of speech—polysynthetic, isolating, agglutinative, and inflexional—remain clear and fixed; and

passes insensibly into species, class into class.

even where two languages belong to the same general type,

as, for instance, an Aryan and a Semitic language in the

inflexional group, or a Kaffre and a Turkish language in

the agglutinative group, we find no certain example of

grammatical interchange. A mixed grammar, in which the grammatical procedure of two distinct families of speech is intermingled, is almost, if not altogether, unknown.

It is obvious, therefore, that grammar constitutes the surest and most important basis for a classification of lan- guages. Words may be borrowed freely by one dialect from another, or, though originally unrelated, may, by the action of phonetic decay, come to assume the same forms, while the limited number of articulate sounds and conceptions out of which language was first developed, and the similarity of the circumstances by which the first speakers were every- where surrounded, naturally produce a resemblance between the roots of many unconnected tongues. Where, however, the fundamental conceptions of grammar, and the machinery by which they are expressed are the same, we may have no hesitation in inferring a common origin.

The main results of scientific inquiry into the origin and primitive meaning of the forms of Aryan or Indo-European grammar may be summed up as follows. We start with stems or themes, by which are meant words of two or more syllables which terminate in a limited number of sounds. These stems can be classed in groups of two kinds, one in which the groups consist of stems of similar meanings and similar initial syllables, and another in which the final syllables alone coincide. In the first case we have what are termed roots, the simplest elements into which words can be decomposed ; in the second case stems proper, which may he described as consisting of suffixes attached to roots.

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Roots, therefore, are merely the materials out of which speech can be made, the embodiments of isolated conceptions with which the lexicographer alone has to deal, whereas stems present us with words already combined in a sentence and embodying the relations of grammar. If we would rightly understand primitive Aryan grammar, we must con- ceive it as having been expressed or implied in the suffixes of the stems, and in the order according to which the stems were arranged in a sentence. In other words, the relations of grammar were denoted partly by juxtaposition or syntax, partly by the suffixes of stems.

These suffixes were probably at first unmeaning, or rather clothed with vague significations, which changed according to the place occupied in the sentence by the stem to which they were joined. Gradually this vagueness of signification disappeared, and particular suffixes came to be set apart to represent particular relations of grammar. What had hitherto been expressed by mere position now attached itself to the terminations or suffixes of stems, which accord- ingly became full-grown words. Some of the suffixes denoted purely grammatical ideas, that is to say, were flexions ; others were classificatory, serving to distinguish nouns from verbs, presents from aorists, objects from agents, and the like; while others, again, remained unmeaning adjuncts of the root. This origin of the flexions explains the otherwise strange fact that the same suffix may sym- bolize wholly different grammatical relations. In Latin, for instance, the context and dictionary will alone tell us that mus-as is the accusative plural of a

noun, and am-as the second person singular of a verb, or that mus-a is the nomin- ative singular of a feminine substantive, bon-a the accusa- tive plural of a neuter adjective. In short, the flexions were originally merely the terminations of stems which were adapted to express the various relations of words to each other in a sentence, as these gradually presented themselves to the consciousness and were extracted from what had been previously implied by position. N ecessarily, the same suffix might be used sometimes in a classificatory, some- times in a flexional sense, and sometimes without any definite sense at all. Inthe Greek dative-locative 700-€0-C, for example, the suffix ~~es is classificatory ; in the nomina~~ tive wd0-es, it is flexional.

When a particular termination or suffix once acquired a special sense, it would be separated in thought from the stem to which it belonged, and attached in the same senso to other stems and other terminations. Thus in modern English we can attach the suffix -ize to almost any word whatsoever, in order to give the latter a transitive meaning, and the Greek édeco1, quoted above, really contains no less than three suffixes, -cs, -ov, and -t, the last two both denoting the locative, and coalescing, through oft, into a single syllable ~~ox. The latter instance shows us how two or more suffixes denoting exactly the same idea may be tacked on one to another, if the original force and significa~~ tion of the first of them comes to be forgotten. Thus, in Old English sang-estre was the feminine of sang-ere, "singer," but the meaning of the termination has so entirely died out of the memory that we have to add the Romanic ~~ess to it if we would still distinguish it from the masculine singer. A familiar example of the way in which the full sense of the exponent of a grammatical idea fades from the mind and has to be supplied by a new exponent is afforded by the use of expletives in conversational English to denote the superlative. ' Very warm" expresses little more than the positive, and to represent the intensity of his feelings the Englishman has recourse to such expressions as " horri~~ bly warm" like the German "schrecklich warm."

Such words as "very," "horribly," "schrecklich," illus- trate a second mode in which Aryan grammar has found means of expression. Words may lose their true significa-

tion and become the mere exponents of grammatical ideas. Professor Earle divides all words into presentive and sym- bolic, the former denoting objects and conceptions, the latter the relations which exist between these. Symbolic words, therefore, ure what the Chinese grammarians call "empty words,"—words, that is, which liave been divested of their proper signification and serve a grammatical purpose only. Many of the classificatory and some of the flexional suffixes of Aryan speech can be shown to have had this origin. Thus the suffix tar, which denotes names of kiuship and agency, seems to come from the same root as the Latin terminus and trans, our through, the Sanskrit tar-dme, "I pass over," and to have primarily signified "one that goes through " a thing. Thus, too, the Engiish head or hood, in words like godhead and brotherhood, is the Anglo-Saxon hdd, " character" or "rank ;" dom, in kingdom, the Anglo-Saxon dém, 'judgment ;" and lock or ledge, in wedlock and know- ledge, the Anglo-Saxon /de, "sport" or "gift." In all these cases the 'empty words," after first losing every trace of their original significance, have followed the general analogy of the language and assumed the form and functions of the suffixes with which they had been confused.

A third mode of representing the relations of grammar is by the symbolic use of vowels and diphthongs. In Greek, for instance, the distinction between the reduplicated present didwue and the reduplicated perfect dédwxa is indicated by a distinction of vowel, and in primitive Aryan grammar the vowel @ seems to have been set apart to denote the subjunc- tive mood just as ya or ¢ was set apart.to denote the poten- tial. So, too, according to M. Hovelacque, the change of a into 7 or w in the parent-Aryan symbolized a change of meaning from passive to active. This symbolic use of the vowels, which is the purest application of the principle of flexion, is far less extensively carried out in the Aryan than in the Semitic languages. The Semitic family of speech is therefore a much more characteristic type of the inflexional languages than is the Aryan.

The primitive Aryan noun possessed at least eight cases, —nominative, accusative, vocative, instrumental, dative, genitive, ablative, andlocative. M. Bergaigne hasattempted to show that the first three of these, the "strong

cases" as they are termed, are really abstracts formed by the suffixes -as (-8), ~~an~~, -m, -t,~~4~~, -d, and -ya (-i), the plural being nothing more than an abstract singular, as may be readily seen by comparing words like the Greek éro-s and éze-s, which mean precisely the same. The remaining " weak " cases, formed by the suffixes -sma, -sya, -syd, -yd, -i, -an, -t, -bhi, -su, ~, -a, and ~~d, are really adjectives aud adverbs. No distinction, for example, can be drawn between "a cup of gold" and "a golden cup," and the instrumental, the dative, the ablative, and the locative are, when closely ex~~ amined, merely adverbs attached toa verb. The terniin- ations of the strong cases do not displace the accent of the stem to which they are suffixed ; tlie suffixes of the weak cases, on the other hand, generally draw the accent upon themselves.

According to Hiibschmann, the nominative, accusative, and genitive cases are purely grammatical, distinguished from one another through the exigencies of the sentence only, whereas the locative, ablative, and instrumental have a logical origin and determine the logical relation which the three other cases bear to each other and the verb. The nature of the dative is left undecided. The locative primarily denotes rest in a place, the ablative motion from a place, and the instrumental the means or concomitance of an action, The dative Hiibschmana regards as "the case of the participant object." Like Hiibschmann, Holz- weissig divides the cases into two classes, —the one gram- matical and the other logical ; and his analysis of their primitive meaning is the same as that of Hiibschmann,

except as regards the dative, the primary sense of which he thinks to have been motion towards a place. This is also the view of Delbriick, who makes it denote tendency towards an object. Delbriick, however, holds that the primary sense of the ablative was that of separation, the instrumental originally indicating concomitance, while there was a double locative, one used like the ablative absolute in Latin, the other being a locative of the object.

The dual was older than the plural, and after the develop- ment of the latter survived as a merely useless encumbrance, of which most of the Aryan languages contrived in time to get rid. There are still many savage idioms in

which the conception of plurality has not advanced beyond that of duality. In the Bushman dialects, for instance, the plural, or rather that which is more than one, is expressed by repeating the word ; thus ¢w is " mouth," ¢utw '" mouths." It may be shown that most of the suffixes of the Aryan dual are the longer and 'more primitive forms of those of the plural which have grown out of them by the help of phonetic decay. The plural of the weak cases, on the other hand (the accusative alone excepted), was identical with the singular of abstract nouns; so far as both form and meaning are concerned, nv distinction can be drawn between oes and ézos. Similarly, humanity and men signify one and tle same thing, and the use of English words like sheep or jish for both singular and plural shows to what an extent our appreciation of number is determined by the context rather than by the form of the noun, The so-called "broken plurals" of Arabic and Ethiopic are really singular collectives employed to denote the plural.

Gender is the product partly of analogy, partly of pho- netic decay. In many languages such as Eskimo and Chock-

taw, its place is taken by a division of objects into animate

and inanimate, while in other languages they are separated into rational and irrational. There are many indications that the parent-Aryan in an early stage of its existence had no signs of gender at all. The terminations of the names of father and mother, pater and mater, for example, are exactly the same, and in Latin and Greek many diph- thongal stems, as well as stems in ¢ or ya and u (like vats and véxus, wddts and dis), may be indifferently masculine and feminine. Even stems in o and a@ (of the second and first declensions), though the first are generally masculine and the second generally feminine, by no means invariably maintain the rule ; and feminines like humus and 68és, or masculines like advena and zrodirys, show that there was a time when these stems also indicated no particular gender, but owed their subsequent adaptation, the one to mark the masculine and the other to mark the feminine, to the in- fluence of analogy. The idea of gender was first suggested by the difference between man and woman, male and female, and, as in so many languages at the present day, was represented not by any outward sign but by the meaning of the words themselves. When once arrived at, the concep- tion of gender was extended

to other objects besides those to which it properly belonged. The primitive Aryan did not distinguish between subject and object, butpersonified objects by ascribing to them the motives and powers of living beings. Accordingly they were referred to by different pronouns, one class denoting the masculine and another class the feminine, and the distinction that existed between these two classes of pronouns was after a time transferred to the nouns. As soon as the preponderant number of stems in o in daily use had come to be regarded as masculine on account of their meaning, other stems in o, whatever might be their signification, were made to follow the general ana- logy, and were similarly classed as masculines. In the same way, the suffix ¢ or ya acquired a feminine sense, and was set apart to represent the feminine gender. Unlike the Semites, the Aryans were not satisfied with these two

genders, masculine aud feminine. As soon as object and subject, patient and agent, were clearly distinguished from each other, there arose a need fora third gender, which should be neither masculine nor feminine, but denote things without life. This third gender was fittingly expressed either by the objective case used as a nominative (29%, regnum), or by a stem without any case ending at all (e.g., virus).

The adverbial meaning of somany of the cases explains the readiness with which they became crystallized into adverbs and prepositions. An adverb is the attribute of an attri- bute,—" the rose smells sweetly," for example, being resolv- able into "the rose has the attribute of scent with the further attribute of sweetness." In our own language once, twice, needs, are all genitives; seldom isa dative. The Latin and Greek humi and xapai are locatives, facillime (facil- lumed) and eiruxds ablatives, révrn aud dua instrumentals, mapos, éfys, and ryAod genitives. The frequency with which particular cases of particular nouns were used in a speci- fically attributive sense caused them to become, as it were, petrified, the other cases of the nouns in question passing out of use, and the original force of those that were retained being gradually forgotten. Prepositions are adverbs em- ployed to define nouns instead of verbs and adjectives. Their appearance in the Aryan languages is comparatively late, and the Homeric poems allow

us to trace their growth in Greek, The adverb, originally intended to define the verb, came to be construed with the noun, and the govern- ment of the case with which it was construed was accord- ingly transferred from the verb to the noun. Thus when we read in the Odyssey (iv. 43), adrods 8" eionyyov Oetov Sdmov, we see that eis is still an adverb, and that the accusative is governed by the verh ; it is quite otherwise, however, with

a line like "Atpetdns ya yépovtas aoAXéas nye "Axavdv és

khuoinv (Zl., i. 89.) where the adverb has passed into a preposition. going on in English, where we can say indifferently, "' What

are you looking at?" using "at" as an adverb, and govern- ing the pronoun by the verb, and "At what are you look- ing?" where "at" has become a preposition. With the growth and increase of prepositions the need of the case- endings diminished, and in some languages the latter dis-

appeared altogether.

Like prepositions, conjunctions also are primarily adverbs used in a demonstrative and relative sense. Hence most of the conjunctions are petrified cases of pronouns. The relation between two sentences was originally expressed by simply setting them side by side, afterwards by employing a demonstrative at the beginning of the second clause to refer to the whole preceding one. The relative pronoun can be shown to have been in the first instance a demonstrative 4 indeed, we can still use that in English in a relative sense. Since the demonstrative at the beginning of the second clause represented the first clause, and was consequently an attribute of the second, it had to stand in some case, and this case became a conjunction. How closely allied the adverb and the conjunction are may be seen from Greek and Latin, where és or guwm can be used as either the one or the other. Our own and, it may be observed, has pro- bably the same root as the Greek locative adverb ér, and originally signified " going further,"

Another form of adverb is the infinitive, the adverbial force of which appears clearly in such a phrase as "A wonderful thing to see," Various cases, such as the loca- tive, the dative, or the instrumental, are employed in Vedic Sanskrit in the sense of the infinitive, besides the bare stem or

neuter formed by the suffixes man and van. In Greek the neuter stem and the dative case were alone retained for the purpose. The first is found in infinitives like ddmev and éepew (for an earlier pepe-Fev), the second in the infinitives

The same process of transformation is still

in -at. Thus the Greek dSodva: answers letter for letter to the Vedic dative ddvdne, "to give," and the form WevderOur is explained by the Vedic vayodhat, for vayds-dhai, liter- ally "to do living," dhai being the dative of a noun from the root dhd, "to place" or "do." When the form Wed- deoGou had once come into existence, analogy was ready to create such false imitations as ypawacdau or ypapOycer Oat. The Latin infinitive in -re for ~~*se has the same origin, amare, for instance, being the dative of an old stem amas. In jiert for sieret or fiese', from the same root as our English be, the original length of the final syllable is pre*~~ *served. 'The suffix in* ~~*wm is an accusative, like the corre*~~ *sponding infinitive of classical Sunskrit. This origin of the infinitive explains the Latin construction of the accusative and infinitive. When the Roman said, "Miror te ad me nihil scribere," all that he meant at first was, "I wonder at you for writing nothing to me," where the infinitive was merely a dative case used adverbially.*

The history of the infinitive makes it clear how little dis- tinction must have been felt at the outset between the noun and the verb. Indeed, the growth of the verb was a slow process. There was a time in the history of Aryan speech when it had not as yet risen to the consciousness of the speaker, and in the period when the noun did not possess a plural there was as yet also no verb. The attachment of the first and second personal pronouns, or of suffixes re- sembling them, to certain stems, was the first stage in the development of the latter. Like the Semitic verb, the Aryan verb seems primarily to have denoted relation only, and to have been attached as an attribute to the subject. The idea of time, however, was soon put into it, and two tenses were created, the one expressing a present or con- tinuous action, the other an aoristic or momentary one. The distinction of sense was symbolized by a distinction of pronunciation, the root-syllable of the aorist being an abbreviated form of that of the present. This abbreviation was due

to a change in the position of the accent (which was shifted from the stem-syllable to the termination), and this change again was probably occasioned by the prefixing of the so-called augment to the aorist, which survived into historical times only in Sanskrit, Zend, and Greek, and the origin of which is still a mystery. The weight of the first syllable in the aorist further caused the person-endings to be shortened, and so two sets of person-endings, usually termed primary and secondary, sprang into existence. By reduplicating the root-syllable of the present tense a perfect was formed; but originally no distinction was made between present and perfect, and Greek verbs like dieu and jw are memorials of a time when the difference between "I am come" and "I have come" was not yet felt. Reduplication was further adapted to the expression of intensity and desire (in the so-called intensive and desiderative forms). By the side of the aorist stood the imperfect, which differed from the aorist, so far as outward forni was concerned, only in possessing the longer and more original stem of the pre- sent. Indeed, as Benfey first saw, the aorist itself was primitively-an imperfect, and the distinction between aorist and imperfect is not older than the period when the stem- syllables of certain imperfects were shortened through the influence"of the accent, and this differentiation of forms appropriated to denote a difference between the sense of the aorist and the imperfect which was beginning to be felt. After the analogy of the imperfect, a pluperfect was created out of the perfect by prefixing the augment (of which the Greek éuéuyxov is an illustration) ; though the pluperfect, too, was originally an imperfect formed from the redupli- cated present.

Besides time, mood was also expressed by the primitive Aryan verb, recourse being had to symbolization for the purpose. 'The imperative was represented by the bare stem,

like the vocative, the accent being drawn back to the first syllable, though other modes of denoting it soon came into vogue. Possibility was symbolized by the attachment of the suftix -ya to the stem, probability by the attachment of -4 and -é, and in this way the optative and conjunctive moods first arose. The creation of a future by the help of the suffix ~~*sya seems to*~~

~~belong to the same period in the history of the verb. This suffix is probably identical with that used to form a large class of adjectives and genitives (like the Greek imzo.o for iow) ; in this case future time will have been regarded as an attribute of the subject, no distinction being drawn, for instance, between " rising sun ad and 'the sun will rise." It is possible, however, that the auxiliary verb as, "to be," enters into the composition of the future; if so, the future will be the product of the second stage in the development of the Aryan verb when new forms were created by means of composition. The sigmatic or first aorist is in favour of this view, as it cer~~ tainly belongs to the age of Aryan unity, and may be a compound of the verbal stem with the auxiliary as.

After the separation of the Aryan languages, composition

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sentence which reaches its culminating point in the involved periods of Latin literature. Our own language still remains true, however, to the syntax of the parent-Aryan when it sets both adjective and genitive before the nouns which they define. In course of time a distinction came to be made between an attribute used as a mere qualificative and an attribute used predicatively, and this distinction was expressed by placing the predicate in opposition to the subject and accordingly after it. The opposition was of itself sufficient to indicate the logical copula, or substantive verb ; indeed, the word which afterwards commonly stood for the latter at first signified "existence," and it was only through the wear and tear of time that a phrase like Deus bonus est, 'God exists as good," came to mean simply 'God is good." It is needless to observe that neither of the two articles was known to the parent-Aryan ; indeed, the definite article, which is merely a decayed demonstrative pronoun, has not yet been developed in several of the languages of the Aryan family.

We must now glance briefly at the results of a scientific

investigation of English grammar and the modifications pation of they necessitate in our conception of it. The idea that the English free use of speech is tied down by the rules of the gram- grammar.

was largely employed in the formation of new tenses, Thus in Latin we have perfects like scrip-st and ama-vi, formed

by the help of the auxiliaries as (swm) and fuo, while such forms as amaveram (amavi-eram) or amarem (ama-sem) bear their origin on their face. So, too, the future in Latin and Old Celtic (amabo, Irish carub) is based upon the subsfan- tive verb fuo, "to be," and the English preterite in -ed goes back toa suffixed did, the reduplicated perfect of do. New tenses and moods, however, were created by the aid of suffixes as well as by the aid of composition, or rather were formed from nouns whose stems terminated in the suffixes in question. Thus in Greek we have aorists and perfects in ~~xa, and the characteristics of the two passive aorists, ye and the, are more probably the suffixes of nominal stems than the roots of the two verbs ya, "to go," and dhd, " to place," as Bopp supposed. HOw late some of these new formations were may be seen in Greek, where the HOmeric poems are still ignorant of the weak future passive, the optative future, and the aspirated perfect, and where the strong future passive occurs but once and the desiderative but twice. On the other hand, many of the older tenses were disused and lost. In classical Sanskrit, for instance, of the modal aorist forms the precative and benedictive almost alone remain, while the pluperfect, of which Del~~ briick has found traces in the Veda, has wholly disappeared.

The passive voice did not exist in the parent-Aryan speech. No need for it had arisen, since such a sentence as "I am pleased" could be as well represented by "' This pleases me," or "TI please myself." It was long before the spcaker was able to imagine an action without an object, and when he did so, it was a neuter or substantival rather than a passive verb that he formed. The passive, in fact, grew out of the middle or reflexive, and, except in the two aorists, continued to be represented by tlie middle in Greek. So, too, in Latin the second person plural is really the middle participle with estis understood, and the whole class of deponent or reflexive verbs proves that the characteristic ry which Latin shares with Celtic could have had at the out- set no passive force.

Much light has been thrown on the character and con- struction of the primitive Aryan sentence by comparative syntax. In contradistinction to

Semitic, where the defining word follows that which is defined, the Aryan languages place that which is defined after that which defines it ; and Bergaigne has made it clear that the original order of the sentence was (1) object, (2) verb, and (3) subject. Greater complication of thought and its expression, the connexion of sentences by the aid of conjunctions, and rhetorical inversion caused that dislocation of the criginal order of the

marian must first be given up; all that the grammarian can do is to forniulate the current uses of his time, which are determined by habit and custom, and are accordingly in a perpetual state of flux. We must next get rid of the notion that English grammar should be modelled after that of ancient Rome ; until we do so we shall never understand even the elementary principles upon which it is based. We cannot speak of declensions, since English has no genders except in the pronouns of the third person, and no cases except the genitive and a few faint traces of an old dative. Its verbal conjugation is essentially different from that of an inflexional language like Latin, and cannot be com- pressed into the same categories. In English the syntax has been enlarged at the expense of the accidence ; position has taken the place of forms. 'To speak of an adjective "agreeing " with its substantive is as misleading as to speak of a verb "governing" a case. In fact, the distinction between noun and adjective is inapplicable tc English grammar, and should be replaced by a distinction between objective and attributive words. Ina phrase like "this is a cannon," cannon is objective ; in a phrase like "a cannon- ball," it is attributive ; and to call it a substantive in the one case and an adjective in the other, is only to introduce confusion. With the exception of the nominative, the various forms of the noun are all attributive ; there is no difference, for example, between "doing a thing" and "doing badly." Apart from the personal pronouns, the accusative of the classical languages can be represented only by position ; but if we were to say that a noun which follows a verb is in the accusative case we should have to define "king" as an accusative in such sentences as "he became king" or "he is king." In conversational English " it is me" is as correct as "'c'est moi" in French, or "det er mig" in Danish ; the literary "it isI" is due to the in- fluence of classical graminar. The combination of noun or pronoun and preposition results in a compound attribute. As for the verb, Mr Sweet has well said that "the really characteristic feature of the English finite verb is its in- ability

to stand alone without a pronominal prefix." Thus "dream" by itself isa noun; "JI dream" isa verb, The place of the pronominal prefix may be taken by a noun, though both poetry and vulgar English frequently insert the pronoun even when the-noun precedes. The number of inflected verbal forms is but small, beiug confined to the third person singular and the special forms of the preterite and past participle, though the latter may with more justice be regarded as belonging to the province of the lexicographer

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rather than to that of the grammarian. The inflected sub- junctive (be, were, save in 'God save the Queen," &c.) is rapidly disappearing. New inflected forms, however, are coming into existence; at all events, we have as good aright to consider wont, shant, cant new inflected forms as the French aimerai (amare habeo), aimerais (amare habebam). If the ordinary grammars are correct in treating forms like "TY am loving," "I was loving," "I did love," as separate tenses, they are strangely inconsistent in omitting to notice the equally important emphatic form "I do love" or the negative form "Ido not love ("I don't love"), as well as the semi-inflexional "T'll love," "he's loving." 'It is true that these latter contracted forms are heard only in conversation and not seen in books; but the grammar of a language, it must be remembered, is made by those who speak it and not by the printers.

Our school grammars are the inheritance we have received from Greece and Rome. The necessities of rhetoric obliged the Sophists to investigate the structure of the Greek language, and to them was accordingly due the first analysis of Greek grammar. Protagoras distinguished the three genders and the verbal moods, while Prodicus busied himself with the definition of synonyms. Aristotle, taking the side of Democritus, who had held that the meaning of words is put into them by the speaker, and that there is no necessary connexion between sound and sense, laid down that words "' symbolize " objects according to the will of those who use them, and added to the dvoya or "noun," and the fna or "verb," the cvvdecpos or

“particle.” He also introduced the term aréous, “case,” to denote any flexion whatsoever. He further divided nouns into simple and compound, invented for the neuter another name than that given by Protagoras, and starting from the termination of the nominative singular, endeavoured to ascertain the rules for indicating a difference of gender. Aristotle was followed by the Stoics, who separated the dpOpov or “article” from the particles, determined a fifth part of speech, the wavdéxrns or “adverb,” confined the term “case” to the flexions of the nouns, distinguishing the four principal cases by names, and divided the verb into its tenses, moods, and classes, Meanwhile the Alex- andrian critics were studying the language of Homer and the Attic writers, and comparing it with the language of their own day, the result being a minute examination of the facts and rules of grammar. Two schools of gram- marians sprang up,—the Analogists, headed by Aristarchus, who held that a strict law of analogy existed between idea and word, and refused to admit exceptions to the gram- matical rules they laid down, and the Anomalists, who denied general rules of any kind, except in so far as they were consecrated by custom. Foremost among the Anoma- lists was Crates of Mallos, the leader of the Pergamenian school, to whom we owe the first formal Greek grammar and collection of the grammatical facts obtained by the labours of the Alexandrian critics, as well as an attempt to reform Greek orthography. The immediate cause of this grammar seems to have been a comparison of Latin with Greek, Crates having lectured on the subject while ambas- sador of Attalus at Rome in 159 8.c. The zeal with which the Romans threw themselves into the study of Greek re- sulted in the school grammar of Dionysius Thrax, a pupil of Aristarchus, which he published at Rome in the time of Pompey, and which is still in existence. Latin grammars Were soon modelled upon it, and the attempt to translate the technical terms of the Greek grammarians into Latin was productive of numerous blunders which have been per- petuated to our own day. Thus tenues is a mistranslation of the Greek yAd, “unaspirated ; ” genetivus of yeviky, the case “of the genus;” accusativus of airvatuxy, the case “of the object ;” infinitivus of dapéudaros, “without a second-

ary meaning ” of tense or person. Newnames were coined to denote forms possessed by Latin and not by Greek ; ablative, for instance, was invented by Julius Cesar, who also wrote a treatise De Analogia. By the 2d century of the Christian era the dispute between the Anomalists and the Analogists was finally settled, analogy being recognized as the principle that underlies language, though every rule admits of exceptions. Two eminent grammarians of Alex- andria, Apollonius Dyscolus and his son Herodian, summed up the labours and controversies of their predecessors, and upon their works were based the Latin grammar composed by Ailius Donatus in the 4th century, and the eighteen books on grammar compiled by Priscian in the age of Justinian. The grammar of Donatus dominated the schools of the Middle Ages, and, along with the productions of Priscian, formed the type and source of the Latin and Greek school-grammars of modern Europe.

A few words remain to be said, in conclusion, on the Learning

bearing of a scientific study of grammar upon the practical task of teaching and learning foreign languages. The grammar of a language is not to be confined within the rules laid down by grammarians, much less is it the creation of grammarians, and consequently the usual mode of making the pupil learn by heart certain fixed rules and paradigms not only gives a false idea of what grammar really is, but also throws obstacles in the way of acquiring it. The unit of-speech is the sentence; and it is with the sentence therefore, and not with lists of words and forms, that the pupil should begin. When once a sufficient number of sentences has been, so to speak, assimilated, it will be easy to analyse them into their component parts, to show the relations that these bear to one another, and to indicate the nature and varieties of the latter. In this way the learner will be prevented from regarding grammar as a piece of dead mechanism or a Chinese puzzle, of which the parts must be fitted together in accordance with certain artificial rules, and will realize that it is a living organism which has a history and a reason of its own. The method of nature and science alike is analytic; and if we would learn a foreign language properly we must Jearn it as we did our mother- tongue, by first mastering the expression of a complete thought and then breaking up this expression into its several elements.

See Steinthal, Charakteristik der hauptstchlichsten Typen des Sprachbaues, Berlin, 1860; Schleicher, Compendiwm of the Com- parative Grammar of the Indo-Huropean Languages, translated by H. Bendall, London, 1874; Pezzi, Aryan Philology according to the most recent Rescarches, translated by E. 8. Roberts, London, 1879; Sayce, Introduction to the Science of Language, London, 1879; Lersch, Die Sprachphilosophie der Alten, Bonn, 1838-41; Steinthal, Geschichte der Sprachwissenschaft bei den Griechen und Romern mit besondcrer Riicksicht auf die Logik, Berlin, 1863; Delbriick, Ablativ Localis Instrumentalis in Altindischen, Lateinischen, Gricchischen, und Deutschen, Berlin, 1864; Jolly, Hin Kapitel vergicichendcr Syntax, Munich, 1873; Hiibschmann, Zur Casusichre, Munich, 1875; Holzweissig, Wahrheit und Irrthum der localistischen Casws- theoric, Leipsic, 1877; Draeger, Historische Syntax der Latcinischen Sprache, Leipsic, 1874-76; Sweet, Words, Logic, and Grammar, London, 1876. (A. H. 8.)

GRAMMONT (Belgian, Geeraerdsbergen), a town of Belgium, province of East Flanders, is situated on both sides of the Dender, 21 miles 8.S.E. of Ghent. It is sur- rounded by walls and possesses a college, a town-hall, and a hospital. Its principal manufactures are lace, cotton, and woollen goods, leather, beer, paper, and tobacco ; and there are also bleaching and dyeing works, The population in 1866 was 8861.

GRAMONT, Patipert, Count pE (1621-1707). A happy accident has preserved for the instruction of mankind rather than for their edification the portrait and the history of a man who entirely represents one section, fortunately a small section, of the society of his day. Of good family, rich, a gallant soldier, endowed with every kind of clever-

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ness, the Count de Gramont endeavoured to live the life of unrestrained enjoyment. In this he so far succeeded that, although the following century furnished more numerous examples of his kind, he may be taken as the most finished specimen. His ideal man was a being without conscience, without principle, without religion, without a soul. At the court of Charles II. he

found companions like himself, —women without virtue, men without honour, yet disguised and adorned with courtly manners and that external refine- ment which did duty for principle; and had it not been that his brother-in-law, Hamilton, conceived the design of writing the memoirs which have made him famous, Gramont would have been ag entirely forgotten as most of his friends, save for a brief mention by St Evremond and another by Bussy Rabutin in that little-visited gallery of portraits, the Mistoire Amoureuse. His grandfather had the distinction of being husband to Diane d'Andouins, la belle Corisande, one of the mistresses of Henry IV. The grandson always regretted that the king had not acknowledged his father for his own son, lamenting even in the presence of Louis XIV. that his family had missed the chance of becoming, in this illegitimate fashion, a branch of the royal line, The anecdote is entirely char- acteristic. It was at first proposed to enter him in the church, but he speedily perceived that his vocation was not ecclesiastical, and joined the army, in which he saw a great deal of active service, and was rewarded with the governorship of the Pays d'Aunis, and with other small posts. He crossed over to England during the protectorate of Cromwell. Inthe year 1662, two years after the restora- tion of Charles IT., he was exiled from the French court and again repaired to London, where he found such a welcome as was due to his manners, his gaiety, his extraordinary good spirits, and his love of gambling, intrigue, gallantry, and pleasure. It is the period of his residence at the English court which forms the greater part of Hamilton's memoirs. He is described by Bussy Rabutin as having "laughing eyes, a well formed nose, a pretty mouth, a little dimple in the chin which gave an agreeable effect to the whole face, a certain finesse in his countenance, and a fairly good stature but for a stoop." In the whole English court there was no one more full of wit, more avid of pleasure, more devoid of all moral restraint, not even Rochester himself, than the Count de Gramont. Naturally, the court being what it was, there was no one more popular. In a court where the women vied with each other for the king's favour, where the men habitually cheated at play, seduced their friends' wives, and corrupted their friends' daughters, that man would be most popular in whom the absence of principle became, by reason of his grace, esprit, and elegance, in itself a recommendation, Gramont was as purely a sensualist as any Roman of the later empire.

He married, in London, but on compulsion, the sister of his future biographer, Miss Hamilton, who, her brother tells us in the memoirs, was able to fix his affections. The state- ment must be received with some qualifications. The count, it is true, was by no means young when he married. At the same time, he " galantisait" for many years afterwards, and, in fact, to the very end of a long life. He was the only old man, says Ninon de l'Enclos, who could affect the follies of youth without being ridiculous. In fact, Gramont, like La Fontaine, was a spoiled child, to whom everything was allowed, and who repaid indulgence by perpetual high spirits, and a continual flow of wit and bons mots, At the age of seventy-five he had a dangerous illness, during which he became reconciled, in his way, to the church, but on recovery relapsed into his old habits. At cighty he cither dictated or revised his own memoirs, written by his brother- in-law Antony Hamilton. When they were finished he sold

the manuscript for 1500 francs and kept most of the money himself. Fontenelle, then censor of the press, refused to license the work, from considerations of respect to the old man who had so strangely exposed in its pages the whole of his character. These scruples were overcome by the count himself, who had the pleasure of seeing his biography appear in his own lifetime, and of laughing with the rest of the world at his own rogueries at cards, his amorous adventures, and his secret intrigues.

He died at the great age of cighty-six. His biographer Hamilton died thirteen years later at the age of seventy- four. The memoirs of the Count de Gramont are not to be recommended for general reading ; yet they have the merit of being true; in no other work is the reality of that profligate society of St James's so vividly ex- pressed ; in no other contemporary memoirs is there so much wit, such grace of style, such skill in portraiture. Numerous editions and translations have been issued of this work, whose popularity seems destined to continue and

row.

GRAMPUS (Orca gladiator, Lacep.), a cetacean belong- ing to the Delphinide or dolphin family, and characterized by its rounded head without distinct beak, its high dorsal fin, and its large conical permanent teeth. Its upper part is of a nearly uniform glossy black colour, and the under part white, with a strip of the same colour over each eye. The name " grampus" is derived from the French grand porsson, through the Norman grapois, It is also known as the "killer," in allusion to its ferocity in attacking its prey, which consists largely of seals, porpoises, and the smaller species of dolphins. Its fierceness is only equalled by its voracity, which is such that in a specimen measuring 21 feet in length, dissected by Professor Eschricht, the remains of fourteen seals and thirteen porpoises were found, while the animal appeared to have been choked in the endeavour to swallow another seal, the skin of which was found en- tangled in its teeth. They also pursue and commit great havoc among the bulky but gentle belugas or white whales, which sometimes throw themselves ashore in order to escape from their remorseless persecutors. The grampus is au inhabitant of northern seas, occurring on the shores of Greenland, and having been caught, although rarely, as far south as the Mediterranean, It is not common, although there are numerous instances of its capture, on the British coasts. The latest of these occurred in March 1876, about a mile to the west of Granton, on the Firth of Forth. The creature on being dragged ashore, while still alive, was said by the onlookers to have given forth shrill piercing cries somewhat resembling in their sharpness a woman's voice. The specimen was an adult male, and measured 21 feet 10 inches along the curve of the back, with a girth of 13 feet. It had 24 teeth in each jaw, the front tooth on each side of the lower jaw being exceedingly small and almost hidden by the overlapping of the gum, while the two immediately succeeding these on each side were worn down almost to the level of the gum. A striking feature in the grampus is the high dorsal fin, which in the specimen mentioned measured within 2 inches of 4 feet in height.

GRAN (the ancient Jstrogranum, whence Hungarian Esztergom, and Latin Strigonium), the capital of a county of the same name, seat of the prince primate, and formerly a royal free city, is situated on the right bank of the Danube, nearly opposite the confluence of the Garam (Gran), 29 miles north-west of Buda, 47° 46' N. lat., 18° 44' E. long. It may be generally divided into the town proper, the episcopal quarter, also called Vizivéros

(Watertown), and the communes of St Thomas and of St George. The finest terraces and public buildings are to be found in the two first-named portions of the town. On an elevated and commanding position, where once a fortress stood, are the

seminary and theological institute for the education of priests, the residences of the chapter, and the basilica. This cathedral, commenced in 1821, consecrated in 1856, and completed in 1870, is built after the model of St Peter's at Rome, and is one of the finest churches in Hungary. Among the other public edifices and educa- tional establishments, besides several churches and two monastic houses, are the archiepiscopal residence, the county and town halls, a training school for teachers, an upper gymnasium, a hospital, a library, a savings-bank, &c. The population in 1870 was 8780, chiefly employed in cloth- weaving, wine-making, and agricultural pursuits. There is connexion with the market-town of Parkdény on the left bank of the Danube by means of a bridge of boats.

Gran is one of the oldest towns of Hungary, and is famous as the birthplace of St Stephen, the first prince crowned " apostolic king" of Hungary. During the early times of the Hungarian monarchy it was the most important mercantile centre in the country, and it was the meeting place of the diets of 1016, 1111, 1114, and 1256. It was almost completely destroyed by Tartar hordes in 1241, but was rebuilt and fortified by King Bela IV. In 1543 it fell into the hands of the Turks, from whom it was recovered, in 1595, by Carl von Mansfeld. In 1604 it reverted to the Turks, who held it till 1683, when it was regained by the united forces of John Sobieski, king of Poland, and Prince Charles of Lorraine. In 1708 it was declared a free city by Joseph I. On the 138th April 1818 it was partly destroyed by fire. Gran lay in the direct route of the victorious revolutionary campaign of April 1849. Since 1876 its civil privileges have been of a corporate character.

GRANADA, a modern province of Spain, consisting of the central portion of the old kingdom of the same name, is bounded on the N. and N.E. by Jaen, Albacete, and Murcia, on the E. by Almeria, on the 8. by the Mediter- ranean, and on the W. by Malaga and Cordova, having an area of 4937 English square miles and an estiniated popula- tion (1870) of 485,346. It

includes, and indeed chiefly consists of, the western and loftier portion of the Sierra Nevada, which in the peaks Cerro de Mulhacen and Picacho de la Veleta, overlooking the town of Granada, attains the heights of 11,781 and 11,597 feet respectively. From the central chain of this Sierra all the principal rivers of the province take their rise :—the Guadianamenor which, flowing past Guadix in a northerly direction, falls into the Guadal-quivir in the neighbourhood of Ubeda; the Genil which, after traversing the vega of Granada, leaves the province a little to the westward of Loja, and joins the Guadalquivir betwixt Cordova and Seville; and the Rio Grande which falls into the Mediterranean at Motril. The climate in the lower valleys and the narrow fringe along the coast is warm, but on the higher grounds of the interior is somewhat severe; and the vegetation varies accordingly from the subtropical to the alpine. The soil of the plains is very productive, and that of the vega of Granada is considered the richest in the whole peninsula; from the days of the Moors it has been subjected to most careful and systematic irrigation, and it continues to yield in great abundance and in good quality wheat, barley, maize, wine, oil, sugar, flax, cotton, silk, and almost every variety of fruit. There are productive mines of lead, silver, copper, zinc, and man- ganese, which in 1866 gave employment to 1099 persons ; mining indeed, with various agricultural and horticultural operations, including bee-farming, constitutes the staple industry of the province. In the mountains immediately surrounding the city of Granada occur many kinds of ala- baster, some of which are very fine ; there are also quanti- ties of jasper and other precious stones in considerable variety. Mineral waters, chiefly chalybeate and sulphurous, are abundant, the most important springs being those of Alhama, which have a temperature of 118° Fahr. The chief centres of population are, besides Granada, the capital, Motril, Alhama, Loja, Guadix, and Huescar. Apart from the great highways traversing the province, which are ex-

cellent, the means of communication are few, and on the whole bad. The only railway is that which connects Granada with Bobadilla on the Malaga and Cordova line. During the Roman period, Granada from the time of Augustus formed an undistinguished portion of the province of Betica, of which the four conventus jwridict were Cadiz, Cordova, Ecija, and Seville.

Along with the rest of Andalucia, as a result of the great invasion from the north in the 5th century, it fell to the lot of the Vandals. Under the caliphs of Cordova, onwards from the 8th century, the town of Granada rapidly gained in importance, and ultimately became the seat of a provincial government, which, after the fall of the Ommiades (1038), ranked with Seville, Jaen, and others as an independent principality. By the conquests of St Ferdinand in the first half of the 13th century, Granada was left the sole representative of the Mahometan power in Spain; and even it was compelled to pay tribute to the sovereigns of Castile. The limits of the kingdom at that time were nearly identical with those of the province prior to 1833, the modern provinces of Malaga and Almeria being until that date included. It is said to have contained a population of 3,000,C00, and to have had considerable commerce, especially with Italy in silk. On the capitulation of Boabdil in January 1492, Granada was united to the crown of Castile, but with special privileges which were afterwards treacherously withdrawn.

GRANADA, the capital of the above province, is situated at the confluence of the Darro and the Genil, not far from the base of the Sierra Nevada (37° 13' N. lat., 3° 41' W. long.). Different suggestions have been made as to the etymology of the name, which is rather obscure,—the least

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Plan of Granada.

probable being that it is derived from granada, “a pome- granate,” in allusion to the abundance of pomegranate trees in its neighbourhood. The Moors called it Karnattah or Karnatthh-al-Yahoud, and possibly the name

is composed of the Arabic words kurn, ‘a hill,” and nattah, “stranger” — the “city” or “hill of strangers.” Granada is built

partly on level ground near the Genil and partly on the slopes of two adjacent hills, at an elevation of about 2300 feet above the sea, The more ancient quarters of the town still retain much of the Moorish style, but the modern part is somewhat commonplace. It contains several squares, of which the most remarkable is the Bibarrambla, where tournaments were formerly held. There is also a beautiful shady walk, called the Alameda, which is one of the most frequented promenades. The old city comprises the faubourgs of Antequeruela, Alcazaba, Alhambra, and Albaicin, the last being named after the settlers who came from Baeza, after the capture of that city by St Ferdinand. For a detailed account of the Alhambra the reader is referred to the special article, vol. i. p. 570. The Antequeruela and Albaicin are mostly inhabited by the working classes. In the cemetery of the latter there are still a few ruins of an ancient mosque. The town proper contains a great number of churches and other public edifices. The cathedral, a somewhat heavy and irregular building, was begun in 1529 by Diego de Siloe, and finished in 1639. It is profusely ornamented with jasper and coloured marble and surmounted by a dome; and it contaius several valuable paintings by Alonso Cano, portraits of Ferdinand and Isabella by Rincon, and marble statues of several kings and queens of Spain. In one of its numerous chapels (the Chapel Royal) are buried their “Catholic Majesties,” and Philip and Juana. The church of Nuestra Seiiora de las Angustias has a splendid high altar and fine towers. That of St José is au elegant modern building. Other remark- able edifices are the monastery of St Gerdnimo, founded by Gonzalo de Cordova, who is buried there; the Cartlusian convent (Cartuja) adorned with paintings by Murillo, Morales, and Cano; the university, founded in 1531 by Charles V.; and the library. Granada is the birthplace of many eminent writers and artists, both Mahometan and Christian ; among the latter may be mentioned Fray Luis de Granada (1505); Hurtado de Mendoza (1505), the historian of the war of Granada; Alonso Cano (1601), the great painter ; and Moya (1610), who was both painter and sculptor. ‘The climate of the town is pleasant and healthy, especially during the spring and summer months. Its manu-

factures are unimportant, the chief being coarse woollen stuffs, hats, paper, saltpetre, and gunpowder. Silk-weaving was once extensively carried on, and large quantities of silk were exported to Italy, France, Germany, and even America ; but the production now is very limited. The education of the lower classes is much neglected, the city having onlya few insignificant schools. In the year 1878 the population amounted to about 75,000.

The history of Granada does not go back far, if at all, into the Roman period (for it is not to be confounded with the ancient Illiberis); and even under the Moors it held a place of very subordinate importance until the period of the conquests of St Ferdinand, when it became the exclusive seat of Islam in Spain, and rose to almost unparalleled splendour, under Mohammed-Ebn- Alahmar, the builder of the Alhambra. It is said in its best days to have had 400,000 inhabitants, 70,000 houses, and 60,000 warriors, but this is probably an exaggeration. In the 15th cen- tury it was the last stronghold of the Moors against the Christian forces undcr Ferdinand and Isabella, aud after a long siege it was surrendered by Boabdil on 2d January 1492. From that time

Grauada's wealth and magnificence rapidly decreased till 1610, when the Moors were expelled from Spain.

GRANADA, a city of Central America, state of Nicar- agua, is situated on the N.W. bank of the Lake of Nicar- agua, 30 miles N.N.W. of the town of that name. The suburbs are composed of cane huts occupied by the poorer inhabitants, but the city proper is formed of one-storied houses built of adobes or sun-dried bricks, roofed with tiles. They have balconied windows, and are surrounded by court- yards with ornamental gateways. It possesses several old churches and the remains of ancient fortifications. By

means of the lake and the river San Juan, it communicates with the Caribbean Sea, and carries on a considerable trade in cocoa, cochineal, indigo, and hides. The steamer "Coburg" in the end of 1878, after several unsuccessful attempts, forced a passage up the river San Juan from the sea

to Lake Nicaragua, thus establishing steam navigation between Granada, the Bay de la Vierge, San George, and other towns, aud direct communication between Greyton and Granada. The feat is of importance in view of the project of constructing an oceanic canal by this route.

Granada was founded by Francisco Fernandez de Cordova in 1522, aud he crected a fort for its protection. At an early pcriod it surpassed Leon in importance, and was one of the richest cities in North America. It suffered greatly from the attacks of pirates in the latter half of the 17th century, and in 1606 was completely sacked by them. In 1855 it was taken by the filibuster William Walker, and partially destroyed by fire, and though retaken in 1857 it has never recovered its former prosperity, a great part of it being still in ruins. The population is about 10,000.

GRANADA, Luis pz (1504-1588), a Spanish preacher and ascetic writer, was born of poor parents at Granada in 1504. At five years of age he was left an orphan, but the Conde de Tendilla, alcalde of Alhambra, having accident- ally observed his singular intelligence, took him under his protection and had him educated with his own sons. At the age of nineteen he entered the Dominican convent of Santa Cruz, Granada, whence he went to the college of St Gregcry, Valladolid. After completing his theological edu- cation he was named prior of the convent of Scala Ceeli, where he exercised his preaching gifts under the direction of the celebrated orator Juan de Avila, whom he subse- quently rivalled, if he did not surpass him, in eloquence. Having been invited by Cardinal Henry, infanta of Portugal and archbishop of Evora, to Badajoz in 1555, he founded a monastery there, and two years later was elected provincial of Portugal. He was also appointed confessor and councillor to the queen regent, but he declined promo- tion to the archbishopric of Braga, and on the expiry of his provincial office in 1561 he retired to a Dominican convent at Lisbon, where he died in 1588. Luis de Granada en- joyed the reputation of being the first ecclesiastical orator of his day, and his description of the " descent into hell" is one of the finest specimens of eloquence in the Spanish language. He also acquired great fame as a mystic writer, his Guia de Pecadores, or Guide to Sinners, first published in 1556, being still a favourite book of devotion in Spain, and having been translated into nearly every European language.

His principal other works are Libro de la Oracion y Meditacton, Salamanca, 1567; Introduccion al simbolo de la Fé, Salamanca, 1582; Rhetorice Keclesiastice, sive deratione concionandi, Libri VI., Lisbon, 1576; Silva locorwm communium omnibus verbt conctona- toribus necessaria, 1582; and several series of sermons. A collected edition of the works of Luis de Granada was published by Planta at Antwerp, in 1572, at the expensc of the duke of Alva, and by Luis Mciiozal, Madrid, in 1657, afterwards reprinted at various periods. See preface to this edition of his works; preface to Guia de Pecadores, Madrid, 1781; Biblioteca de Autorcs Esp., tom. vi., viii., xi.; Ticknor's History of Spanish Literature; and Eug. Baret, Hist. de la litt. espagnole, Paris, 1863.

GRANADILLA, the name applied to Passiflora qua- drangularis, Linn., a plant of the natural order Passiflorec, a native of tropical America, having smooth, cordate, ovate, or acuminate leaves ; petioles bearing from 4 to 6 glands ; an emetic and narcotic root ; scented flowers; and a large, oblong fruit, containing numerous seeds, imbedded in a subacid edible pulp. The granadilla is sometimes grown in British hothouses. The fruits of several other species of Passiflora are eaten. P. laurifolia is the "water lemon," and P. maliformis the "sweet calabash" of the West Indies,

GRAN CHACO, an extensive region in the heart of South America, which stretches from 20° to 29° of 8, lat., and

'belongs partly to Bolivia and partly to the Argentine

Republic, the boundary between the two states coinciding

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with the parallel 272°, The area is estimated at about 425,000 square miles, or more than twice the area of Frauce, and the greater portion is still unexplored. It all belongs to the La Plata basin and in general terms may be described as a plain inclining towards the S.E. and watered by the Pilcomayo, the Vermejo, and other tributaries of the Para- guay. 'The northern portion, iying within the region of tropical rains, has a profusion of marshes and lakes, while the southern portion is a dry cactus-growing steppe, except in the neighbourhood of the rivers, which annually sub-

merge large areas with the surplus water they bring from the north. The whole of the Gran Chaco is still in the hands of the Indians, who are just beginning to learn a little agriculture,—to grow pumpkins, water melons, and maize; but the richness and extent of its forests and pas- tures will certainly secure the country a prosperous fnture. It possesses more timber suitable for every purpose than the whole of Europe; it already exports large numbers of cattle to the neighbouring states ; and, according to Major Host, it will be able to furnish abundant supplies of petroleum. "'At the foot of the western slope of the Santa Barbara range, 25 leagues from the confluence of the San Francisco river and the Vermejo, there is an extensive petroleum basin ealled the Laguna de la brea de San Miguel del Rastro, capable of yielding 2000 gallons per day."

See Von Reden, " Die Staaten im Strom-Gebiet des La Plata," in Petermann's Mitth., 1856; Petcrmann and Burmeister, Die Siid-amerikanischen Republiken, Argentina, &c., 1875; Major Host in La Plata Monatschrift, 1873.

GRAND'COMBE, a town of France, in the department of Gard and arrondissement of Alais, is situated on the Gardon, 35 miles N.W. of Nimes. In the neighbourhood there are very extensive coal-mines, and the town possesses manufactures of zinc, lead, and glass. The population in 1876 was 5342.

GRAND HAVEN, a city of the United States, capital of Ottawa county, Michigan, is situated on Lake Michigan, at the mouth of Grand River, opposite Milwaukee, to which, as well as to the principal other towns on the lake, several steamers ply daily. It is a station of the Grand Haven Railway, and the terminus of the Detroit, Grand Haven, and Milwaukee line. On account of its fine situa- tion and its medicinal springs, Grand Haven is becoming a favourite summer resort. It has saw and shingle mills, and manufactories of agricultural implements, of sashes and blinds, and of windmills. Shipbuilding is also carried on. In the neighbourhood there are extensive peach forests. Lumber and fruit are the principal shipments. Grand Haven was laid out in 1836, and became a city in 1867. Population (1870) 3147, now about 5000,

GRANDIMONTANES, or GrammonTINEs (Ordo Grandi- montensis), a small religious order confined almost entirely to France. Its origin, which can be traced to about the close of the 11th century, is involved in some obscurity. The founder, St Stephen of Tigerno or Thiers, was born at Chatean Thiers, in Auvergne, in 1046, was educated for the church partly at Benevento and partly at Rome, and, returning home about 1073, in obedience to the solicitations of an inner voice which had been making itself heard for years, embraced a life of solitary asceticism. The scene of his retreat was the lonely glen of Muret, about a league eastward from Limoges; as his reputation for piety ex- tended, his cell became a favourite resort with many like- minded persons, and ultimately a community large enough to excite public attention was formed. The nature of the rule observed by them at that time is not accurately known ; a reply which, according to tradition, Stephen gave to the papal legates when asked to give some account of himself, forbids alike the belief that he identified himself with any of the religious orders then in existence and the assumption

that he had already received permission to establish a new one. Shortly after his death, which occurred on the 8th of February 1124, the lands at Muret were claimed by the neigh- bouring Augustinian friars of Ambazac,— a: circumstance which in 1154 compelled the followers of Stephen to remove their abode, under the leadership of their second "corrector," some miles further eastward, to Grammont or Grandmont, whence the order subsequently took its name. So far as can be ascertained, the rule by which the community was governed wa3 not reduced to writing until the time of Stephen of Lisiac, its fourth corrector. This rule, which was confirmed by Urban ITI. in 1186, was characterized by considerable severity, especially in the matters of silence, fasting, and flagellation ; its rigour, however, was mitigated by Innocent IV. in 1247, and again by Clement V. in 1309. Under Stephen of Lisiac the order greatly flourished in Aquitania, Anjou, and Normandy, where the number of its establishments in 1170 is said to have exceeded sixty. The first Grandimontane house within the dominions of the king of France was that founded at Vincennes near Paris by Louis VII. in 1164; it soon acquired a position of con- siderable importance. Stephen of Thiers was, at the re- quest of Henry IT. of England, canonized by Clement IIi. in 1189; and the bestowal of this honour seems to have marked a

culminating point in the history of the order which he had originated. The Grandimontanes (sometimes also like the followers of Francisco de Paola called Les bons- hommes), owing to an almost endless series of internal disputes at once symptomatic and productive of disunion and disorganization, failed to achieve any considerable place in history, and were finally pensioned off and disbanded in 1769. To them belonged, until 1463, the priory of Cres- well in Herefordshire, and also until 1441 that of Alber-

bury or Abberbury in Shropshire.

The Annales of the order were published at Troyes in 1662; and the Regula, sometimes attributed, though erroneously, to Stephen of Thiers, was first printed in the 17th century. A collection of maxims or instructious, professedly by the same author, has also been largely circulated in France since 1704. See Helyot, Histoire des Ordres Monastiques, vol. vi.

GRAND RAPIDS, a city of the United States, capital of Kent county, Michigan, is picturesquely situated on both sides of the Grand River near the rapids, 30 miles E. of Lake Michigan. The river is navigable up to this point, and steamers connect the city with Grand Haven and the navigation of Lake Michigan. The city is also the point of intersection of six railways. It possesses two public parks, a county jail, a central school, a large public library, and a scientific institute. It is the seat of the United States circuit and district courts for the western district of Michigan. The manufactures include a great variety of woodware (especially furniture, carriages, and waggons), agricultural implements, machinery, chemical substances, leather, beer, fruit, bricks of a very fine quality, and gypsum, which is very abundant in the neighbourhood. There is also a very extensive trade in lumber. The fall of the river at the rapids is about 18 feet in 14 miles, and this water power has been taken advantage of for many of the manufactories. Grand Rapids was settled in 1833 and incorporated in 1850. The population has been rapidly increasing ; while in 1850 it was only 2686, it was 16,507 in 1870, of whom 5725 were foreigners,

GRANDSON. See GRanson.

GRANDVILLE. See Gerarp, JEAN I. I.

GRANET, Francois Marius (1777-1849), was the first painter who felt and attempted to render the esthetic charm of Middle Age and Renaissance architecture. He was born at Aix in Provence, on the 17th December 1777 ; his father was a small builder, but the boy's own strong desires led his parents to place him—after some preliminary teaching from a passing Italian artist—in a free school of art directed

by M. Constantin, a 1andscape painter of some reputation who lived in the town. In 1793 Granet followed the volunteers of Aix to the siege of Toulon, at the close of which he obtained employment as a decorator in the arsenal. Whilst yet a lad he had, at Aix, made the acquaintance of the young Comte de Forbin, and it was upon his invitation that Granet, in the course of the year 1797, proceeded to Paris. De Forbin was one of the pupils of David, and Granet entered the same studio. Later on he got posses- sion of a cell in the convent of Capuchins, which, having served for a manufactory of assignats during the Revolution, was afterwards inhabited almost exclusively by artists. In the changing lights and shadows of the corridors of the Capuchins, Granet found the materials for that one picture to the painting of which, with varying success, he devoted his life. In 1802 he left Paris for Rome, where he remained until 1819, when he returned to Paris, bringing with him besides various other works one of fourteen repetitions of his celebrated Chceur des Capucins, executed in 1811. The figures of the monks celebrating mass are taken in this subject as a substantive part of the architectural effect, and this is the case with all Granet's works, even with those in which the figure subject would seem to assert its import- ance, and its historical or romantic interest. Stella painting a Madonna on his Prison Wall, 1810 (Leuchtenberg collec- tion) ; Sodoma & l'Hopital, 1815 (Louvre); Basilique basse de St Frangois d'Assise, 1823 (Louvre); Rachat de Prison- niers, 1831 (Louvre); Mort de Poussin, 1834 (Villa Demidoff, Florence), are among his principal works ; all are marked by the same peculiarities, everything is sacrificed to tone. In 1819 Louis Philippe decorated Granet, and afterwards named him Chevalier de l'Ordre St Michel, and Conservateur des tableaux de Versailles (1826). He be- came member of the Institute in 1830; but in spite of these honours, and the ties which bound him to M. de Forbin, then director of the Louvre, Granet

constantly returned to Rome. After 1848, he retired to Aix, immediately lost his wife, and died himself on the 21st November 1849. He bequeathed to his native town the greater part of his fortune and all his collections; these are now exhibited in the Musée, together with a very fine portrait of the donor painted by Ingres in 1811. M. Delécluze, in Louis David et son temps, devotes a few pages to Granet and his friend the Comte de Forbin.

GRANITE, a rock so named from the Latin granum, a grain, in allusion to the granular texture of many of its varieties, The term appears to have been introduced by the early Italian antiquaries, and it is believed that the first recorded use of the word occurs iu a description of Rome by Flaminius Vacca, an Italian sculptor of the 16th century. This description was published by Montfaucon in his Diariwm Italicum, where we reid of certain columns "ex marmore granito Aigyptio " (cap. xvii.), and of others "ex marmore granito Aithaliz insule" (cap. xviii.), showing that the Romans of Vacca's day were acquainted with granite from Egyptand from Elba. Granite is also referred to by Cesalpinus in his treatise De Metallicis (1596), and by Tournefort in his Rélation dun Voyage au Levant (1698); indeed the latter has been cited by Emmerling (Lehrb. d. Mineral.) as the first author who uses the term. By these early writers, however, the name was loosely applied to several distinct kinds of granular rock, and it remained for Werner to give it that precise meaning which it at present possesses as the specific designation of a rock.

Granite is a crystalline-granular rock consisting, in its typical varieties, of orthoclase, quartz, and mica, to which a plagioclastic felspar is usually added. These minerals are aggregated together without the presence of any matrix or connecting medium. Thin sections of a true granite, examined under the microscope by transmitted light, show

no trace of any amorphous or crypto-crystalline ground- mass, The chemical composition of the rock will, of course, vary with its mineralogical constitution, For an average analysis see GEOLOGY, vol. x. p.233. The proportion of silica varies from 62 to 81 percent. Granite belongs therefore to Bunsen's class of acid rocks, or those which contain more than 60 per cent. of silica. Dr Haughton has found an exceptionally low proportion of

this oxide in some of the Irish granites (58°44 per cent., e.g., insome Donegal granite, Quart. Journ. Geol. Soc., xviii., 1862, p. 408). The specific gravity of granite varies from 2°59 to 2°73.

Orthoclase, or potash felspar, is the principal constituent of most granites. This mineral occurs either in simple crystals, or in twins formed on what is known as the "Carlsbad type," such crystals being common at Carlsbad in Bohemia. In porphyritic granites, such as those of Cornwall and Devon, the orthoclase crystals may attain to a length of several inches, and the twinning is marked on the fractured crystals by a line running longitudinally down the middle, and dividing the crystal into two halves. In colour the orthoclase generally varies between snow-white and flesh-red. The green felspar known as Amazon stone, which occurs in certain granites, has lately been shown by Des Cloiseaux to belong to the species microcline, and not, as previously supposed, to orthoclase (Annales d. Ch., 5 ser., ix., 1876, p. 433). The plagioclastic, anorthic, or triclinic felspar of granite occurs in crystals which are generally smaller than those of the orthoclase, and which exhibit, even to the naked eye, their characteristic twin striation. Moreover the lustre is frequently resinous or fatty, while that of the orthoclase is pearly on the cleavage-planes. In most cases the plagioclase is the soda-lime felspar called oligoclase ; but in some granites it is albite or soda felspar, as shown by Haughton in many of the Irish and Cornish granites (Proc. Foy. Soc., xvii, 1869, p. 209). When a granite becomes weathered, the felspar may decompose into kaolin or china-clay ; the commencement of this alteration is indicated under the microscope by the turbidity of the felspar, by the ill-defined edges of the crystals, and in the case of plagioclase by disappearance of the characteristic striae.

The quartz of granite occurs generally in irregularly- shaped angular grains ; but occasionally in distinct crystals which are double hexagonal pyramids with or without the corresponding prism. Colourless quartz is most common, but grey, brown, or bluish varieties also occur. Whatever its colour, it is as a rule transparent in microscopic sections, though sometimes rendered milky by the presence of vast numbers of minute cavities containing liquid (see Gronoay, ut supra, and for Sorby's original researches Quart. Journ. Geol. Soc., xiv. p. 453). In many granites the quartz fills up the spaces between the crystals of felspar and of mica, and

receives impressions from these minerals, This fact has been advanced against the view that granite has existed in a state of fusion; since it is assumed that, as the quartz is the most infusible of the three component minerals, it would have been the first to solidify on the cooling of the magma, whereas the relation of the quartz to the associated minerals in most cases shows that it must have solidified after the crystallization of the felspar and mica. In some granites, however, the quartz is developed in free crystals, thus pointing to an early solidification of this mineral. The mica, which is usually the least abundant constituent of the granite, occurs in thin scales of irregular shape or in hexagonal plates. It is either a white biaxial potash mica (muscovite) or a dark-brown magnesian mica, generally uniaxial (diotite). Both species may occur in the same granite. Haughton has shown that some of the white mica of the Cornish granites is lepidolite, or lithia mica ; while some of the black mica in the same rocks is the iron-

potash mica, lepedomelane (Proc. Roy. Soc., xvii. p. 209). Professor Heddle finds that the black mica of most Scottish granites is a distinct species, which he calls Waughtonite (Mineralog. Mag., No. 13,1879, p. 72). A large number of accessory minerals occur in granite, no fewer than forty-four being cited by Zirkel (Lehrd. d. Petrog.,i. p.481). Upon the presence of these supplementary minerals numerous varie- ties of granite have been founded. Thus, if tourmaline be present, the rock is a schorlaceous or tourmaline granite ; when cassiterite or tin-stone occurs, it forms a stanniferous granite; the presence of epidote gives rise to an epidote granite ; and so on with other minerals. The most cominon accessory constituent of granite is hornblende, a mineral which appears to replace to some extent the mica, and thus produces a hornblendic or syenttic granite. This rock was formerly, and by some petrographers is still, termed syenite ; it is the syenites of Pliny, so named from Syene in Upper Egypt, where a smiliar rock was quarried by the ancient Hgyptians. By modern petrographers, however, the term syenite is usually restricted to a rock which is an aggregate of orthoclase and hornblende,—in other words, a granite in which the quartz has disappeared while the mica has been superseded by hornblende. A beautiful schorla- ceous rock, which is apparently a variety of granite, has been described by Pisani under the name of lu«ulliancte

(Com- ptes Rendus, lix., 1864, p. 913). It occurs in the parish of Luxullian, near Lostwithiel, in Cornwall, where it is found in the form of boulders, but has not been detected zn situ. This rock is composed of tourmaline, or schorl, with quartz and orthoclase ; the last named mineral occurring in large flesh-coloured crystals, which by contrast with the dark base produce a very beautiful effect. Two varieties of tourmaline, one brown and the other bluish, have been detected by Professor Bonney (Mineralog. Mag., No. 7, 1877, p. 215). The sarcophagus of the duke of Wellington, in St Paul's Cathedral, is wrought out of a splendid block of luxullianite. Many varieties of granite are founded upon structural characteristics. Occasionally the constitu- ents are developed in such large individuals as to form a giant granite. Crystals of orthoclase, associated with quartz in a peculiar parallel arrangement, produce the variety known as graphic granite or Lapis Judaicus—names which refer to the resemblance which the rock presents, when cut in certain directions, to lines of Hebrew charac- ters. Graphic granite was termed by Hauy pegmatite, but this name is now generally applied to a coarse admixture of orthoclase, quartz, and silvery mica. When any of the component minerals occur in large crystals, embedded in a fine-grained base, a porphyritic granite is produced. Gene- rally the crystals are those of orthoclase, as in many of the West of England granites, and in the characteristic rock of Shap Fell in Westmoreland. Granitcte is a name applied to a variety of granite made up of orthoclase and quartz, with more or less plagioclase and a small proportion of mica. A granite composed of only felspar and quartz is called haplite or semi-granite. Some of the micaless varieties are known as granulite. When, instead of the mica disappear- ing, the felspar is absent, the resulting aggregate of quartz and mica is termed greisen ; it is frequently a tin-bearing rock, Occasionally the granite, when fine in grain, loses its mica, and an intimate mixture of orthoclage and quartz is thus obtained; such a rock is known as a felstone. Crystals of orthoclase disseminated through a felsitic matrix, either compact or microcrystalline, give rise to a felspar porphyry ; while crystals or rounded grains of quartz in a similar felsitic base produce a quartz-porphyry or quartz-fel- site. By Cornish miners these quartz-porphyries are termed elvans (elvanite of Jukes); but this name is also applied to fine-grained granites and to almost any rock which occurs as a dyke running through the killas or clay slate.

Few questions have been more warmly discussed than the origin of granite. When this rock is found forcing its way through older rocks, and appearing at the surface in large bosses from which veius are sent forth in all directions, there can be little doubt of its eruptive character. The small width of some of these granitic veins, or apophyses, suggests that the rock must have existed in a condition of perfect fusion or complete liquidity, and not simply as a viscous paste, before it could have been injected into such narrow fissures as those which are now occupied by granite. In many cases, the rocks which are penetrated by the granitic veins are altered in such a manner as to indicate a considerable elevation of temperature: a limestone in the neighbourhood of tlie veins may become saccharoidal, and shales may become indurated or even converted into horn- stone, while new minerals are often developed in the vicinity of the intruded veins. In these veins the granite is apt to change its mineralogical constitution, becoming either fine-grained or felsitic, or even reduced at the extre- mities of the vein to quartz. From the days of Hutton it has been generally admitted that most granite is of igneous origin. Since it appears to have been solidified at great depths beneath the surface, it has been distinguished as a plutonic rock, while those eruptive rocks which have risen to the surface, and have there consolidated, are termed volcanic rocks. The older geologists regarded granite as the primitive rock of the earth's crust, forming the floor of all stratified deposits and the nucleus of mountain chains. Such a view, however, has been long exploded. It is known indeed that granite, so far from being in all cases an original rock, may be cf almost any geological age. Some is undoubtedly as old as the Silurian period, while other granites are certainly as young as the Tertiary rocks, and perhaps of even more recent date. By many field-geologists granite has of late years been regarded as a metamorphic rather than as a truly igneous rock. Meta- morphism, however, is a term which has been so vaguely used that most of our eruptive rocks may, in a certain sense, be said to be metamorphic. Still, in the case of granite, it has often been pointed out that a passage may be traced from this rock into gneiss, and that gneiss itself may be regarded as an altered sedimentary rock. Thus so experi- enced an observer as Professor Ramsay expresses his opinion that ' granite is sometimes merely gneiss still further meta- morphosed by heat in the presence of moisture"

(Phys. Geol. of Gt. Brit., 5 ed., 1878, p. 42). For a number of instances in which granite is said to pass into gneissose rocks, and these in turn, by numerous gradations, into un- doubtedly stratified deposits, see Green's Geology, part i. p. 307, and also Groxoey, vol. x., p. 309.

Chemists have also brought forward arguments against the igneous origin of granite. Thus it has been argued that the specific gravity of the quartz of granite is about 2°6, while that of silica after fusion is only 2:2. It must be remembered, however, that the quartz of granite has solidified under great pressure, as proved by Mr Sorby's observations, and it is probable that such pressure would increase the density of the silica. Moreover, it has been pointed out by the late D. Forbes (Geol. Mag., iv., No. 10, 1867, p. 443) that the siliceous tests of certain infusoria, which assuredly have not been fused, are as low as 2:2. Another argument which has been advanced against the igneous origin of granitic rocks is based on the fact that they contain minerals of a basic character which could not have existed ina state of fusion in the presence of free silica, without forming a combination with the latter. Again, some of the accessory minerals in granite would suffer change by an elevation of temperature, while many of them contain water which, it is assumed, would be expelled on fusion. Probably, however, these minerals are in most

cases of secondary origin, and have been produced by the alteration of the granite. The mere presence of water is not incompatible with a pyrognostic origin; and Forbes has asserted (op. cit.) that specimens of lava, taken from a current on Etna while the lava was still flowing, contained crystals of stilbite, a mineral containing 16 per cent. of water. Mr Sorby has shown, too, that the quartz of vol- canic rocks contains microscopic cavities enclosing liquid. It appears, indeed, that in the fusion of all eruptive rocks water has played a very important part. Dr Haughton has sought to reconcile the opposing views as to the origin of granite by admitting what he calls a hydrometamorphic origin for this rock. He believes that the rock, having been poured into veins and dykes when ina state of fusion, was subsequently altered by the action of water at tempera- tures which, though

high, were insufficient for the fusion of the granite (Ou the Origin of Granite: an Address to the Geol. Soc. of Dublin, 1862).

Granitic rocks are extensively used for constructive and decorative purposes, though their industrial applications are necessarily restricted by the expense of working so hard a material. Although some granites are apt to decompose on exposure to atmospheric influences, the felspar passing into china-clay, other varieties are remarkable for their extreme durability, as attested by the monuments of ancient Egypt, on which the incised hieroglyphics still retain their sharpness. It appears that in England granite was not brought into extensive use much before the beginning of the present century (Creasy). It is now largely employed for massive structures, such as bridges and sea-walls, as also for kerbs and paving-sets. The best known granites are the grey variety from Aberdeen and the red granite of Peter-head, 30 miles north of Aberdeen. The granite of Dart- moor in Devonshire, and of the huge bosses which protrude through the clay slate of Cornwall, are largely worked as building and ornamental stones (for description of these granites see Sir H. T. de la Beche's Report on the Geol. of Cornwall and Devon). In Ireland there is much fine granite, which is quarried to a limited extent,—the Castle- wellan granite having been used in the Albert Memorial in Hyde Park (Hull's Building and Ornam. Stones, 1872). 'The horublendic varieties of granite are remarkably tough, and are largely employed for road-metal. For this purpose great quantities are quarried in the Channel Islands. Red granite occurs in abundance on the coasts of Maine, U.S., as well as in New Brunswick, and grey granite at Quincy and elsewhere in Massachusetts. Granite is fre- quently polished when used for monumental and decorative purposes. The polishing is effected by an iron tool, worked first with sand and water, then with emery, and lastly with putty-powder or oxide of tin; when the emery and putty are used, a surface of flannel is interposed between the granite and the iron tool (" On Granite Working," by Geo. W. Muir, Journ, Soc. Arts, xiv., 1866, p. 470).

As an element of scenery granite generally forms rounded hills, scantily clad with vegetation; but it sometimes rises into sharp pinnacles, as in the aiguilles of the Alps. By denudation the rock may break up into cuboidal blocks, which often remain piled upon each other, forming the characteristic "tors" of Cornwall and Devon. Hills of granite are

frequently surmounted by masses of weathered rock of spheroidal form, such as the Cornish rocking-stones or logan stones, The weathering of granite often produces boulder-shaped masses in such numbers as to form, around the summit of the hill, a "sea of rocks" (Felsenmeer).

In addition to the references given in the body of this article, the following authorities may be cited :—Lehrbuch der Petrographie, by F. Zirkel, 2 vols., Bonn, 1866; Elemente der Petrographic, by Von Lasaulx, Bonn, 1875; Cotta's Lithology, translated by P. H.

Lawrence, 2d ed., London, 1878: The Stud ' , , y of Rocks, by F. Rutley, London, 1879; and the numerous contributions by the

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Rev. Prof. Haughton in Proc. Irish Acad., and Quart. Journ, Geol. Soc. Lond. Yor chemical composition of Cleopatra's Needle, by G. W. Wigner, see the Analyst, 1878, p. 882. (F. W. R.)*

GRANMICHELE, or GRAMMICUELE, a market-town of Sicily, in the province of Catania, about 8 miles from Caltagirone on the road to Catania. It lies on the side of a hill, the summit of which is crowned by a castle which, along with the town itself, was formerly a fief of the Brancatelli Butera family. Beautiful marble is found in the vicinity, and the inhabitants, who in 1871 numbered 10,058, trade in oil.

GRANSON, Granpson, or GRANDSEE, a small town in Switzerland, canton of Vaud, is situated near the south- western extremity of the Lake of Neufchatel. It possesses the ruins of an old castle, containing a collection of anti- quities, and has a very ancient church, once connected witha Benedictine abbey, with a number of pre-Cliristian images. The town is of Roman origin. It was captured in 1475 by the Eidgenossen, and retaken in the following year by Charles the Bold; but in March of that year the Eidgenossen again defeated him near Granson with great slaughter. From that time till 1803 it was one of their lordships. The site of the battle is

marked by three great blocks of marble. The population of the town in 1870 was 1587.

GRANT, Mrs Annu (1755-1838), a Scottish authoress, generally known as Mrs Grant of Laggan, was born at Glasgow, 21st February 1755. Her father, Duncan MacVicar, who held a commission in the army, went in 1757 with his regiment to America, and his family followed him in 1758. Hereceived an allotment of land on retiring from the army in 1765, but ill health compelled him to return to Scotland in 1768, and after the outbreak of thie revolutionary war his lands were confiscated. In 1779 Anne married the Rev. Mr Grant of Laggan, near Fort Augustus, Inveruess, and ou his death in 1801 she was left with a large family and only avery smallincome. It being known to several of her friends that she occasionally wrote verses, a proposal was made that she should publish a volume of poems, and this being acceded to, the names of as many as 3000 subscribers were obtained. The volume appeared in 1803 under the title of Original Poems, with some Translations from the Gaelic, and met with a rather favourable reception, on account of its easy versifi- cation and the truth and tenderness of the sentiment of some of its smaller pieces. In 1806 she published Letters from the Mountains, being a Selection from the Author's Correspondence with her Intumate Friends from 1773 to 1804, which, by its spirited descriptions of Highland scenery, character, and legends, awakened a large amount of interest. Her other works are Jfemoirs of an American Lady, with Sketches of Manners and Scenery in America as they existed previous to the Revolution (1808), containing reminiscences of her stay with Mrs Schuyler, the lady with whom she spent four years of her childhood in America; Essays on the Superstitions of the Highlanders of Scotland (1811); and Highteen Hundred and Thirteen, a Poem (1814). After the death of her husband, Mrs Grant resided for some time on a small farm near Laggan ; but in 1803 she removed to Woodend near Stirling, in 1806 to Stirling, and in 1810 to Edinburgh, in the society of which she was until her death a prominent figure, being much esteemed for her conversational powers, her tact aud good sense, her cheerfulness of disposition, and her thorough kindness of heart. For the last twelve years of her life she received a pension from Government ; and this, along with her other sources of income, not only placed her in easy circumstances, but enabled her to gratify her generosity by giving to others. She died November 7, 1838.

See Memoir and Correspondence of Mrs Grant of Laggan, edited by her son J. P. Grant, 8 vols., 1844.

GRA—GRA

GRANT, Sir Francis (1803-1878), an English portrait painter, and president of the Royal Academy in London, was the fourth son of Francis Grant of Kilgraston, Perth- shire, and was born at Edinburgh in 1803. He was educated for the bar, and, according to the testimony of Sir Walter Scott in his diary, it was originally his intention after spending his small patrimony in field sports to make his fortune by the law. By the time, however, that the first part of his purpose had been accomplished, he had resolved to adopt painting in preference to law as his pro- fessiou, and at the age of twenty-four he began at Edinburgh systematically to study the practice of art. On completing a course of instruction he removed to London, and as early as 1843 exhibited at the Royal Academy. At the beginning of his career he utilized his sporting experiences by painting groups of huntsmen, horses, and hounds, such as the Meet of H.M. Staghounds and the Melton Hunt; and doubtless if he had chosen to devote himself to the careful treatment of this class of subjects his success might have been more thorough and permanent, if less brilliant and lucrative, than it was. If, however, the reputation he acquired asa fashion- able portrait-painter was aided by his social position and gentlemanly manners, it rested also on certain special artistic qualifications. The first and chief of these was his power of thoroughly reproducing the outward tone and manner of fashionable life, or, as Sir Walter Scott called it, his 'sense of beauty derived from the best source, that is, the observa- tion of really good society." If also his execution was superficial] and thin, it was bright, clear, facile, and uncon- strained. In drapery he had the taste of a connoisseur, and rendered the minutest details of costume with felicitous accuracy. In female portraiture he achieved considerable success, although rather in depicting the highborn graces and external characteristics than the true and individual personality. Among his portraits of this class may be mentioned Lady Glenlyon, the marchioness of Waterford, Lady Rodney, and Mrs Beauclerk. In his protraits of generals and sportsmen he proved himself more equal to his subjects than in those of statesmen and men of letters. He painted many of the principal celebrities of the time— especially those

occupying high social position—including Scott, Macaulay, Lockhart, Disraeli, Hardinge, Gough, Derby, Palmerston, and Russell, his brother Sir J. Hope Graut, and his friend Sir Edwin Landseer. From the first his career was rapidly prosperous, and his recognition by the Academy fully kept pace with his reputation as an artist. In 1842 he was elected an associate, and in 1851 an Academician ; and in 1866 he was chosen to succeed Sir C. Eastlake in the post of president, for which his chief recommendations were his social distinction, tact, urbanity, and friendly and liberal consideration of his brother artists ; and its difficult and often invidious duties he performed so as both to increase the harmony and influence of the institution and to enhance its efficiency. Shortly after his election as president he received the honour of knight- hood, and in 1870 the degree of D.C.L. was conferred ean oo by the university of Oxford. He died October

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GRANT, Sir James Hops (1808-1875), an English general, brother of the preceding, and fifth and youngest son of Francis Grant of Kilgraston, Perthshire, was born July 22, 1808. He entered the army in 1826 as cornet in the 9th Lancers, and became lieutenant in 1828 and captain in 1835. In 1842 he acted as brigade-major to Lord Saltoun in the Chinese War, and specially distinguished himself at the capture of Chin-Keang, after which he re- ceived the rank of major and was nominated companion of the bath. In the first Sikh War of 1845-46 he took part in the battle of Sobraon ; and in the Punjab campaign of 1848-49 he held command of his old regiment the 9th

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Lancers, and won high reputation in the battles of Chillian- walla and Gujrat. In 1854 he became brevet-colonel, and in 1856 brigadier of cavalry. He took a leading part in the suppression of the Indian mutiny of 1857, holding for some time the command of the cavalry division, and afterwards of a movable column of horse and foot. After rendering valuable service in the operations before Delhi and in the final assault on the city, he directed the victori- ous march of the cavalry and horse artillery despatched in the direction of Cawnpore to open up communication with the commander-in-chief Sir Colin Campbell, whom he met near the Alumbagh, and who raised

him to the rank of brigadier-general, and placed the whole force under his command during what remained of the perilous march to Lucknow for the relief of the residency. After the retire- ment towards Cawnpore he greatly aided in effecting there the total rout of the rebel troops, by making a detour which threatened their rear; and following in pursuit with a flying column, he defeated them with the loss of nearly all their guns at Serai Ghat. He also took part in the opera- tions connected with the recapture of Lucknow, shortly after which he was promoted to the rank of major-general, and appointed to the command of the force employed for the final pacification of India, a position in which his unwearied energy, and his vigilance and caution united to high personal daring, rendered very valuable service. Before the work of pacification was quite completed he was created K.C.B. In 1859 he was appointed to the command of the British land forces in the united French and British expedition against China, whose object was accomplished three mouths subsequent to the landing of the forces at Peli-tang, lst August 1860, Pekin having surrendered at discretion after the Chinese army had thrice suffered defeat in the open and the Taku forts had been carried by assault. For his conduct in this, which has been called "most successful aud the best carried out of England's little wars," he received the thanks of parliament, and was gazetted G.C.B. In 1861 he was made lieutenant- general and appointed commander-in-chief of the army of Madras; on his return to England in 1865 he was made quartermaster-general at headquarters; and in 1872 he was transferred to the command of the camp at Aldershot. In the same year he was gazetted general. He died at London, March 7, 1875.

Ineidents in the Sepoy War of 1857-58, compiled from the Private Journal of General Sir Hope Grant, K.C.B., together with some explanatory chapters by Capt. H. Knollys, Royal Artillery, was published in 1873, and Incidents in the China War of 1860 appeared posthumously under the same editorship in 1875.

GRANTHAM, a municipal and parliamentary borough and market-town of England, county of Lincoln, is situ- ated on both sides of the Witham, at the junction of several railways with the Great Northern line, 105 miles N.N.E. of London and 22 miles §$.8.W. of Lincoln. The parish church, a spacious Gothic edifice of the 13th century, has been restored by Sir G. G. Scott. It is

sur- mounted by an elegant spire 274 feet high, and has an elaborately carved front, and some splendid monuments. At the free grammar school, founded by Bishop Fox in 1528, Sir Isaac Newton received part of his education. Among the other public buildings are the guild-hall, with a spacious assembly-room, the two exchanges, the town-hall, the literary institution, the gaol, the dispensary, and the workhouse. A bronze statue of Sir Isaac Newton was erected in 1858. The principal trade is that of malting, which is carried on to a considerable extent. There are also tanneries and coach factories, and a large agricultural implement factory and iron foundry. Grantham returns two members to parliament. The population of the municipal borough (area, 406 acres) in 1871 was 5028, and of the parliamentary borough (area, 5811 acres) 13,250,

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GRANVELLA, ANToINE PERRENOT, CARDINAL DE (1517-1586), one of the ablest aud most influential of the princes of the church during the great political and ecclesi- astical movements which immediately followed the appear- ance of Protestantism in Europe, was born 20th August, 1517, at Ornans, Burgundy, where his father, Nicolas Perrenct de Granvella, who afterwards became chancellor of the empire under Charles V., was at that time engaged in practice as a junior at the provincial bar. On the com- pletion of his studies in law at Padua and in divinity at Louvain, he for a short time held a canonry at Besangon, but his talents had already marked him for a higher sphere, and he was promoted to the bishopric of Arras when barely twenty-three (1540). In his episcopal capacity he attended several diets of the empire, as well as the opening meetings of the council of Trent; and the influence of his father, now become chancellor, led to his being entrusted with many difficult and delicate pieces of public business, in the execution of which he developed a rare native talent for diplomacy, and at the same time acquired an intimate acquaintance with most of the currents of European politics. One of his specially noteworthy performances was the settle- ment of the terms of peace after the defeat of the Smalkaldic league at Miihlberg in 1547, a settlement in which, to say the least, some particularly sharp practice was exhibited. In 1550 he succeeded his father in the offices of secretary of state and chancellor of the empire; in this capacity he attended Charles in the war with Maurice,

accompanied him in the flight from Innsbruck, and afterwards drew up the treaty of Passau (August 1552). In the following year he conducted the negotiations for the marriage of Mary of England and Philip of Spain, to whom in 1555, on the abdication of the emperor, he transferred his services. In April 1559 Granvella was one of the Spanish commissioners who arranged the peace of Cateau Cambrésis, and on Philip's withdrawal from the Netherlands in August of the same year he was appointed prime minister to the regent, Margaret of Parma. The policy of repression which in this capacity he pursued during the next five years secured for him many tangible rewards; in 1560 he was elevated to the archi- episcopal see of Malines, and in 1561 he received the cardinal's hat ; but the growing hostility of a people whose moral and religious convictions he had studiously set him- self to trample under foot, ultimately made it impossible for him to continue in the Low Countries; aud by the advice of his royal master he in 1564 retired to Franche Comté. Nominally this withdrawal was only of a tem- porary character, but it proved to be final. The following six years were spent in comparative quiet, which was devoted chiefly to study and to the society of learned men; but in 1570 Granvella, at the call of Philip, resumed public life by accepting a mission to Rome as representative of the interests of Spain in framing the proposed treaty of alliance with Venice and the papal see against the Turks. In the same year he was advanced to the viceroyalty of Naples, a post of some difficulty and danger, which for five years he occupied with ability and success. Summoned to Madrid in 1575, to be president of the supreme council of Italy and afterwards of that of Castile, he still continued to find ample scope for his rare aptitudes. Among the more delicate negotiations of his later years were those of 1580, which had for their object the ultimate union of the crowns of Spain and Portugal, and those of 1584, which resulted in a check to France by the marriage of the Spanish infanta to Duke Philip of Savoy. Inthe same year he was made archbishop of Besangon, but meanwhile a lingering disease had laid an unrelenting grasp upon his iron frame ; he never was enthroned, but died at Madrid, 21st September

1586. His body was removed to Besancon, where his father had been buried before him. ;

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Numerous letters and memoirs of Granvella are preserved in the archives of Gesangon. These were to some extent made use of by Prosper Levéque in his Afémoires pour servir (1753), as well as by the Abbé Boisot in the Z'resor de Granvella, A commission for publishing the whole of the letters and memoirs was appointed by Guizot in 1834, and the result has been the issue of nine volumes of the Papiers d'Etat du Cardinal de Granvelle, edited by Weiss (1841-1852). They form a part of the Colleetion de docurients inédits sur Vhistotre de France. See also the anonymous Histoire du Cardinal de Granville, attributed to Courchetet D'Esnans (Paris, 1761), aud Motley's Rise of the Dutch Republic.

GRANVILLE, a fortified seaport town of France, de- partment of Manche, is situated at the mouth of the Bosq and at the foot of a steep rocky promontory projecting into the English Channel, 30 miles 8.W. of St L6. It is sur- rounded by strong walls, and is built principally of granite, and its streets are mostly steep and narrow. 'The parish church dates from the 15th ceutury. Among the other public buildings are the tribunal of commerce, the hospital, the public baths, and the naval school. Granville occupies the seventh place in point of importance among the seaports of France, and the harbour is accessible to vessels of the largest tonnage. There is regular steain communication with Jersey and Guernsey. The principal exports are fruits, vegetables, oysters, fish, corn, wood, and cattle. A large number of the inhabitants are engaged in the cod and oyster fisheries, and among the other industries are the manufacture of brandy, chemicals, cod-liver oil, and leather. Shipbuilding is also carried on. Granville was founded by the English in the beginning of the 15th century, taken by the French in 1450, bombarded and burned by the English in 1695, and partly destroyed by the Vendean troops in 1793. The population in 1876 was 12,372.

GRANVILLE, Joun Carteret, Earn (1690-1763), English statesman, son of George, Lord Carteret, was born 22d April 1690, and in his fifth year succeeded to his father's title. He was educated at Westminster school and at Christ Church, Oxford, and even early in life had acquired a knowledge of the classics, of philosophy, of general literature, and of modern languages, which rendered him perhaps superior to all his contemporaries in the extent of his intellectual accomplishments. Soon after taking his seat in the House of Lords in 1711, he began to distinguish himself by his

eloquent advocacy of the Protestant succes- sion, and his zeal was rewarded when George I. came to the throne, by the appointment in 1715 of bailiff of the island of Jersey, and in 1716 of lord-lieutenant of Devon; and his mother was also created countess of Granville. In 1719 he was sent on an embassy to Sweden; and in 1720 he was named ambassador-extraordinary to the congress of Cambray. In May of the following year he was appointed secretary of state under Walpole's administration; but Walpole's jealousy of his influence with the king led to his resignation on the 3d April 1724, and on the same day he was appointed lord-lieutenant of Ireland, an office which he held till 1730, when differences with the ministry led to his resignation. After his return he became the leader of the opposition, the duties of which office he discharged with great versatility of resource and with frequent effectiveness, but with a negligent rashness which rendered him almost as dangerous to his friends as to his opponents. In 1742 he was at last successful in overthrowing Sir Robert Walpole's Government, and was immediately thereafter appointed secretary of state. He now obtained a complete ascendency over the mind of George II., whose German policy he carried out irrespective of the opinions of his colleagues ; but his imperiousness soon gained him both their enmity and the hatred of the people, and enabled his opponents, for whom he cherished unmitigated contempt, to effect his political annihilation. Pitt, afterwards earl of Chatham, spoke of him as "an execrable, a sole minister, who had renounced the British nation, and seemed to have

drunk of the potion described in poetic fiction, which made men forget their country." In 1744 he found it necessary, from the resignation of his colleagues and his inability to find proper successors, to tender his resignation; and, ac- cording to Horace Walpole, he "retired from St James's laughing." Shortly before this he had, by the death of his mother, become Earl Granville. His administration was popularly distinguished by the epithet "drunken "—a title which had reference to his character both asa politician and as a private individual. Notwithstanding his want of polli- tical success, contemporary opinion is unanimous in affirming that he was not only the most brilliant debater but the ablest statesman of his time. Chatham declared that he owed all that he was to his friendship and

instruction, and Swift, Snollett, Chesterfield, and Horace Walpole have borne equally laudatory testimony to his abilities. He was besides regarded as an authority in questions of scholarship by the most eminent classicists of his time, and Bentley was greatly indebted to his assistance in preparing his edition of Homer. His fatal defects appear to have been his careless arrogance and his deficiency in definite politi- cal principle and purpose. After the resignation of the Pelham ministry he was again appointed secretary of state, but almost immediately resigned, holding office, according to a political squib, for only forty-eight hours, three quar- ters, seven minutes, and eleven seconds. In 1749 he was created knight of the garter and appointed president of the council; but, thongh he retained his influence with the king, the part he thenceforth played in English politics was indirect and subordinate. He died January 2, 1763. Various information regarding Earl Granville will be found in Chesterfield's Characters; Lord Hervey's Memours of the Reign of George IT.; Horace Walpole's Letters and Memoirs of the Reign of

George II.; and the Autobiography of Shelburne. See also Lecky's History of England in the Highteenth Century.

GRAPE. See Vinu, GRAPHITE. See Carpoy, vol. v. p. 86, and Furnace, vol. ix. p. 843.

GRAPHOTYPE is a name which has been given to an ingenious process of autographic engraving, by which typo- graphic printing blocks are produced. The general prin- ciples of the process are as follows. A block of chalk or some similar material is reduced to a level surface, and on this surface a design is drawn with a glutinous ink, this ink being sufficiently fluid to penetrate some little distance into the porous chalk. The ink having become dry, gentle fric- tion is applied to the surface of the block, so as gradually to rub away those parts of the chalk which are not indurated by the glutinousink. The lines of the drawing being thus

left in relief, a perfect model of the required printing block |

is obtained, and this model is next hardened by immersion in a bath containing a solution of an alkaline silicate, after which it is dried and reproduced by the stereotype or the electrotype process. This method of

typographic engraving was brought to a practical form, and patented in 1860 (No, 2309) by an American wood engraver, Mr de Witt Clinton Hitchcock. The first step in his process is to reduce French chalk or talc to an extremely fine state of division by repeated grindings, elutriations, and siftings, after which a layer of the material, rather over an eighth of an inch in thickness, is forced down upon, and made to adhere to, a thick zinc plate, —the necessary pressure being obtained by means of an hydraulic press, the platen of which 1s faced with a polished steel plate, so as to communicate a good surface to the layer of compressed French chalk. The device is now drawn (of course, reversed) on the pre- pared block with an ink consisting of a weak solution of glue coloured by lamp black or some other pigment. In drawing on the prepared block care must be taken not to damage the somewhat tender surface of the compressed chalk, and the safest instrument with which to apply the

glutinous ink isa fine sable brush, but an ordinary pen may be employed if the operation of drawing is performed with caution.

GRASLITZ, or Grasstirz (Bohemian K'7aslice), a town in the north-west of Bohemia, near the Saxon frontier, in the circle of Elbogen, 88 iniles N.W. of Prague, 50° 21' N. lat., 12° 27' E. long., is advantageously situated in a valley between high hills, at the confluence of the Silberbach and Zwoda. It is the headquarters of a military district, the seat of a court of justice, and has a custom-house, a handsome church built in 1618 and dedicated to Corpus Christi, and several manufactories of cotton and woollen stuffs, and of musica] and mathematical instruments, look- ing-glasses, brass, copper, and wire goods, and paper. Graslitz is one of the most important industriel towns in Bohemia, and the centre of the lace-weaving districts of the Erzgebirge, In 1869 the population, inclusive of the small suburb of Glasberg, amounted to 6549.

GRASSE, a town of France, capital of an arrondissement in the department of Alpes-Maritimes, 20 miles W. of Nice. It occupies a picturesque situation on the southern declivity of a hill facing the Mediterranean, from which it is about 7 miles distant ; and it possesses a climate remark- ably mild and salubrious, It is well supplied with water from arivulet which rises above it.

The streets are narrow, steep, and winding, but the houses are generally well built. The town was formerly the seat of a bishop, and possesses a Gothic cathedral with a beautiful tower, an old chapel dating from the 11th century, now used as a powder magazine, a hospital, a town-hall, an exchange, a theatre, a communal college, and a public library. The chapel of the hospital contains three pictures by Rubens. Next to Paris, Grasse carrieson the largest manufacture of perfumery in France. Citrons, oranges, lemons, figs, pomegranates, and the flowers used by the perfumers, are grown in the gardens of the town and neighbourhood, and fine marble, alabaster, and jasper are found in the vicinity. Grasse was founded in the 6th century by Jews from Sardinia. The population in 1876 was 9673.

GRASSES (Graminee—Gramina)are monocotyledonous flowering-plants, possessing certain characters in common, and constituting the order Graminew. No plant is cor- rectly termed a grass which is not a member of this family, but the word is in common language also used, generally in combination, for many plants of widely different affinities which possess some resemblance (often slight) in foliage to truly graminaceous species ; e.g., knot-grass (Polygonum aviculare), cotton-grass (Hriophorum), rib-grass (Plantago), scorpion-grass (Myosotis), sea-grass (Zostera). In agricul- ture the word has an extended signification to include the various fodder-plants, chiefly leguminous, often called "artificial grasses" (see AGRICULTURE). Indeed, formerly grass (also spelt gers, gres, gyrs, in the old herbals) meant any green herbaceous plant of small size.

Yet the first attempts at a classification of plants recognized and separated a group—considered even of primary value—of Gramina, and this, though bounded by nothing more definite than habit and general appearance, contained the Graminew of modern botanists. The older group, however, even with such systematists as Ray (1703), Scheuchzer (1719), and Micheli (1729), embraced in addition the Cyperacew, Juncacece, and some other mono-

cotyledons with inconspicuous flowers. Singularly enough, the sexual system of Linnzus (1735) served to mark off more distinctly the true grasses

from these allies, since very nearly all of the former then known fell under his Triandria Digynia, whilst the latter found themselves under other of his artificial classes and orders.

I. Srructure.—The general type of true grasses is familiar in the cultivated cereals of temperate climates— wheat, barley, rye, oats, and in the smaller plants which make up our pastures and meadows and form a principal factor of the turf of natural downs. Less familiar are the grains of warmer climes—rice, maize, millet, and sorgho, or the sugar cane. Still further removed are the bamboos of India and America, the columnar stems of which reach to the height of forest trees. All are, however, formed on a common type, which we proceed to examine.

Root.—Most cereals and many other grasses are annual, and possess a tuft of very numerous slender root-fibres, much branched, and of great length. The greater part of the order are of longer duration, and have the roots also fibrous, but fewer, thicker, and less branched. In such cases they are very generally given off from just above each node (often in a circle) of the lower part of the stem or rhizome, perforating the leaf-sheatls. In some bamboos they arc very numerous from the lower nodes of the erect culms, and pass downwards to the soil around them, whilst those from the upper nodes shrivel up and form circles of spiny fibres.

Stem.—The root-stock of perennial grasses is usually well developed, and often forms very long creeping or sub- terranean rhizomes, with elongated internodes and sheathing scales; it is also frequently short, with the nodes crowded. The very large root-stock of the bamboos (fig. 1) is a strik-

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Fia. 1.—Rhizome of Bamboo. A,B, C, D, successive serics of axes, the last bearing aerial culms.

ing example of "definite" growth; it is much branched, the short thick curved branches being given off below the apex of the older ones and at right angles to them, the whole forming a series of connected arched axes, truncate at their ends which were formerly continued into leafy culms. The root-stock is always solid, and has the usual internal struc- ture of the monocotyledonous stem.

The aerial leaf-bearing branches (culms) are a character- istic feature of grasses. They are generally numerous, erect, cylindrical (rarely flattened), and conspicuously jointed with evident nodes. The nodes are solid, a strong plate of tissue passing across the stem, but the internodes are commonly hollow, although examples of completely solid stems are not uncommon (many Andropogons, sugar- cane). The general character is thus not unlike that of Umbellifere. The exterior of the culms is more or less concealed by the leaf-sheaths ; it is usually smooth and often highly polished, the epidermal cells containing an amount of silica sufficient to leave after burning a distinct skeleton of their structure. Tabasheer isa white substance

larged and sub-globular, forming nutriment-stores, and grasses sochanged are termed "bulbous" (Arrhenatherum, Poa bulbosa, &c.). In internal structure grass-culms, save in being hollow, conform to that usual in monocotyledons ; the vascular bundles run parallel in the internodes, but a horizontal interlacement occurs at the partitions. Nearly all grasses branch to some extent, and many extcnsively ; the branches are strictly distichous, and many buds are abortive, or the resulting branches short and stunted. In many bamboos they are long and spreading or drooping and copiously ramified, in others reduced to hooked spines. Dinochloa is truly scandent, and climbs over trees 100 feet or more in height. Olyra latifolia is also a climber on a humbler scale.

Grass-culms grow with great rapidity, as is most strik- ingly seen in bamboos, where a height of over 100 feet is attained in from two to three months, and many species grow two, three, or even more feet in twenty-four hours. Silicic hardening does not commence till the full height is nearly attained. The largest bamboo recorded is 170 feet, and the diameter is usually reckoned at about 4 inches to each 50 feet. A specimen in the British Museum is over 8 inches in diameter. In the same collection are some remarkable monstrosities, in which the septa are oblique and the inter- nodes triangular or rhomboidal ; Kurz has also figured one in the Calcutta Museum in which the cavities are confluent into a continuous spiral.

Leaves.—These present special characters usually suffi- cient for ordinal determination. They are always solitary at each node and strictly distichous, and consist of two dis- tinct portions, the sheath and the blade. The sheath is often of great length, and generally completely surrounds the culm; as a rule it is split down its whole length, thus differing from that of Cyperacee, which is almost invariably (Zriospora is an exception) a complete tube. In a few grasses (Melica, Bromus) the edges are soldered together as in the latter order. The sheaths are much dilated in Alopecurus vaginatus and in a species of Potmaochloa, in the latter serving as floats. At the summit of the sheath, above the origin of the blade, is the digule, a usually mem- branous process of small size (occasionally reaching an inch in length) erect and pressed around the culm. It is rarely quite absent, but may be represented by a tuft of hairs (very conspicuous in Pariana). Melica

uniflora possesses, in addition to the ligule, a green erect tongue- like process, from the line of junction of the edges of the sheath.

The blade is frequently wanting or small and imperfect in the basal leaves, but in the rest is long and set on to the sheath at an angle. The usual form is familiar,—sessile, more or less ribbon-shaped, tapering to a point, and entire at the edge. The chief modifications are the articulation of the (deciduous) blade on to the sheath, which occurs in all the Bambusew (except Planotia) and in Spartina stricta, and the interposition of a petiole between the sheath and the blade, as in Leptaspis, Pharus, Pariana, Lophatherum, &c. In the latter case the form of the leaf usually becomes oval, ovate, or even cordate or sagittate, but these forms are found in sessile leaves also (Olyra, Panicum). The venation is strictly parallel, the midrib usually strong, and the other ribs more slender. In Anomochloa there are several nearly equal ribs, and in some broad-leaved grasses (Bambusece, Pharus, Leptaspis) the venation becomes tesse- lated by transverse connecting veins. The thick prominent veins in Agropyrwm occupy the whole upper surface of the leaf. Epidermal appendages are rare, the most frequent being marginal, saw-like, cartilaginous teeth, usually minute, but occasionally (Danthonia scabra, Panicum serratum) so

mainly composed of silica, found in the joints of several | large as to give the margin a serrate appearance. Alope- bamboos. A few of the lower internodes may become en- | curus /anatus and one or two Panicums have woolly leaves.

GRASSES

Inflorescence.—This possesses an exceptional import- ance in grasses, since, their floral envelopes being much reduced and the sexual organs of very great uniformity, the characters employed for classification are mainly derived from the arrangement of the flowers and their investing bracts. The subject also presents unusual difficulties from the various interpretations which have been given to these glumaceous organs and the different terms employed for them by various writers. It may, however, be now con- sidered as settled that the whole of the bodies known as glumes aud palez, and distichously arranged externally to the flower, form no part of the floral envelopes, but are of the nature of bracts, 'These are so arranged round the

small flowers as to form spekelets (locusts), and each spikelet may contain one, two, three, or a greater number of flowers (in some species of Hragrost's nearly 60). The flowers are, as a rule, placed laterally on the axis (rachis) of the spikelet, but in uniflorous spikelets they appear to be terminal, and are probably really so in Anthoxanthum (fig. 9, 2) and in two anomalous genera, Anomochloa and Streptochate.

In immediate relation with the flower itself, and often entirely concealing it, is the palea or pale ("upper pale" of most systematic agrostologists; "paleola interior," Dumortier ; "spathella," Doll). This organ (fig. 3, 1) is peculiar to grasses among Glwmifere, and is almost always present, certain Oryzee and Phalaridee being the only exceptions. It is of thin membranous consistence, usually obtuse, often bifid, and possesses no central rib or nerve, but is furnished with two lateral ones, one on either side ; the margins are frequently folded in at the ribs, which thus become placed at the sharp angles. This structure points to the fusion of two organs, and the pale was by R. Brown considered to represent two portions soldered together of a trimerous perianth-whorl, the third portion being the 'lower pale," to be immediately mentioned. By Bentham tle homology of the organ is suggested to be with the two bracteoles found in Hypolytrum pungens and Platylepis, and with the perigynium of the female flower of Carex in Cyperacece. It is rarely (I'riachyrum, Diachy- rium) found split into two separate organs.

The flower with its pale is sessile, and is placed in the axil of another bract in such a way that the pale is exactly opposed to it, though at a slightly higher level. It is this second bract which has been generally called by systemat- ists the "lower pale," and with the "upper pale" con- sidered to form an outer floral envelope (' calyx," Jussieu ; "' perianthium," Brown ; "stragulum," Palisot de Beauvois; "glumella," Dumortier). In the writings of most botanists even though this view is not held, yet, where the term 'flower " is employed, it includes these organs. It is, how- ever, certain that the two bracts are on different axes, one secondary to the other, and cannot therefore be parts of one whorl of organs. This was made out from the study of so- called "viviparous" grasses, in which the lower pales become transformed into ordinary foliage leaves, first by Von Mohl in 1845, and more clearly by Germain de St

Pierre in 1852, who terms the lower pale the "glume |.

fertile." Déll and Bentham have also independently ar- rived at the same result, and the latter in 1858 first published the terminology here adopted, and used for the same organ the name flowering glume. The two bracts are usually quite unlike one another, but in some genera (e.g., most Hestucacee) they are considerably similar in shape and appearance.

The flowering glume has generally a more or less boat- shaped form, is of firm consistence, and possesses a well- marked central midrib and frequently several lateral ones. The midrib ina large proportion of genera extends into an appendage termed the awn (fig. 10, 2), and the lateral veins

do

more rarely extend beyond the glume as sharp points (e.9., Pappophorum). The form of the flowering-glume is very various, this organ being plastic and extensively modified in different genera. In Leptaspisit is formed into a closed cavity by the union of its edges, and encloses the flower, the styles projecting through the pervious summit. Valu- able characters are obtained from the awn. This presents itself variously developed froma mere subulate point to an organ several inches in length, and when complete (as in Andropogonece, Avene, and Stipew) consists of two well- marked portions, a lower twisted part and a terminal straight portion, usually set in at an angle with the former sometimes trifid and occasionally beautifully feathery. The lower part is most often suppressed, and in the large group of the Panzcee awns of any sort are very rarely seen. The awn may be either terminal or may come off from the back of the flowering-glume, and Duval Jouve's observations have shown that it represents the blade of the leaf of which the portion of the flowering-glume below its origin is the sheath; the twisted part (so often suppressed) cor- responds with the petiole, and the portion of the glume extending beyond the origiu of the awn (very long in some species, ¢.g., of Danthonia) with the ligule of the developed foliage-leaf. When terminal the awn has three fibro-vascular bundles, when dorsal only one ; it is covered with stomate-bearing epidermis.

The flower with its palea is thus sessile in the axil of a floriferous glume, and in a few grasses (Leersia (fig. 2), Coleanthus, Nardus) the spikelet

consists of nothing more, but usually (even in uniflorous spikelets) other glumes are present. Of these the two placed distichously opposite each other at the base of the spikelet never bear any flower in their axils, and are called the basal or empty glumes (fig. 10,1). They are the "glumes" of most writers ("palee" of Dumortier), and together form what was called the "gluma" by R. Brown (" tegmen," Palisot de Beauvois). They rarely differ much frem one another, but one may be smaller or quite absent (Panicum (fig. 8, 2), Vulpia, Paspalum, Lolium), or both be altogether suppressed, as above noticed. They are commonly firm and strong, often enclose the spikelet, and are rarely provided with long points or imperfect awus. Generally speaking they do not share in the special modifications of the flower- ing glumes, and but rarely themselves undergo modifica- tion, chiefly in hardening of portions (Sclerachne, Manisuris, Antephora, Peltophorum), so as to afford greater protection to the flowers or fruit. But it is usual to find, besides the basal glumes, a few other empty ones, and these are in two- or more-flowered spikelets (fig. 11, 2) at the extremity (numerous in Lophatherum), or in uniflorous ones (fig. 8, 2) below, interposed between the floral glume and the basal pair. Descriptive writers have been accustomed to call these empty glumes " barren" or '"'neutral flowers," a misleading use of terms.

The axis of the spikelet, when short and rounded, has been termed the callus, when long the rachzllus. Itis fre- quently jointed and breaks up into articulations above each flower. Tufts or borders of hairs are frequently present (Calamagrostis, Phragmites, Andropogon), often so long as to surround and conceal the flowers. The axis is often continued beyond the last flower or glume as a bristle or stalk.

Involucres or organs outside the spikelets are not unfre- quent, the morphology of which is various. Thus in Setarda, Pennisetum, &c., the one or more circles of simple or feathery hairs represent abortive branches of the inflor- escence ; in Cenchrus these become consolidated, and the

Fig. 2.—Spikelet of Leersia.

inner ones flattened out so as to form a very hard globular spiny case to the spikelets. The cup-shaped involucre of Cornucopre is a dilatation of the axis into a hollow recep- tacle with a raised border. In Cynosurus the pectinate involucre which conceals the spikelet is a barren or abortive spikelet. True bracts of a more general character subtend- ing branches of the inflorescence are singularly rare in Graminee, in marked contrast with Cyperacee, where they are so conspicuous. They however occur in a whole sec- tion of Andropogon, in Anomochloa, and at the base of the spike in Sesleria. The remarkable ovoid involucre of Coix, which becomes of stony hardness, white, and polished (then known as " Job's tears"), is also a modified bract or leaf-sheath. It is entirely closed except at the apex, and contains the female spikelet, the stalks of the male inflorescence and the long styles emerging through the small apical orifice.

Any number of spikelets may compose the inflorescence, and their arrangement is very various. In the spicate forms, with sessile spikelets on the main axis, the latter is often dilated and flattened (Paspalum), or is more or less thickened and hollowed out (Stenotaphrum, Rottboellia, Tripsacum), when the spikelets are sunk and buried within the cavities, Every variety of racemose and paniculate inflorescence obtains, and the number of spikelets composing those of the large kinds is often immense. Rarely the inflorescence consists of very few flowers; thus Lygeum Spartum, the most anomalous of European grasses, has but two or three large uniflorous spikelets, which are fused together at the base, and have no basal glumes, but are enveloped in a large hooded spathe-like bract.

Fflower,—This is characterized by remarkable uniformity. The perianth is represented by very rudimentary, small, fleshy, hypogynous scales called Jodicwles ("squamule,"

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Hy W) Fic. 3.—Flowers of Grasses. 1, Piptatherum, with the palea; 2, Poa; 8, Oryza. Kunth ; "nectarium," Schreber); they are elongated or truncate, sometimes fringed with hairs, and are in contact with the ovary. Their usual number is two, and they are placed collaterally at the anterior side of the

flower, that is, within the flowering glume. They are generally considered to represent the inner whorl of the ordinary monocoty- ledonous (liliaceous) perianth, the outer whorl of these being suppressed as well as the posterior member of the inner whorl. This latter is present almost constantly in Stipee and Bambusew, which have three lodicules, and in the latter group they are occasionally more numerous (five, spreading and persistent in Pseudostachyum; six to eight in Beesha). In Anomochloa they are represented by hairs. In Streptochcete, according to Doll, there are six lodicules, alternately arranged in two whorls. They are often quite absent. In some cases lodicules are of the nature of stipules to the palea, and appear as though split off from its sides at the base. Such stipular lodicules often co-exist along

with the perianthial ones, and are then either free from oz combined with the two anterior ones.

Sexual Organs.—-Grass-flowers are usually hermaphro- dite, but there are very many exceptions. Thus it is very common to find one or more imperfect (usually male) flowers in the same spikelet with bisexual ones, and their relative position is important in classification. Holcuws and Arrhen- atherum are examples in English grasses; and as a rule in species of temperate regions separation of the sexes is not carried further. In warmer countries monecious and dicecious grasses are more frequent. In such cases the male and female spikelets and inflorescence may be very dissimilar, as in the maize, Job's tears, Huchlena, Spinifex, &c.; and in some dicecious species this dissimilarity has led to the two sexes being referred to different genera (e.¢., Antephora axilylora, Steud., is the female of Buchloe dactyloides, Engelm., and Neurachne paradoxa, Br., of a species of Spinifex). In other grasses, however, with the sexes in different plants (e.g., Brizopyrum, Destichlis, Era- grostis capitata, Gynerium), no such dimorphism obtains. Amphicarpum is remarkable in having cleistogamic flowers borne on long radical subterranean peduncles which are fertile, whilst the conspicuous upper paniculate ones, though apparently perfect, never produce fruit. Something similar occurs in Leersia oryzoides, where the fertile spikelets are concealed within the leaf-sheaths.

Andreecitum.—In the vast majority there are three stamens alternating with the lodicules, and therefore one anterior, z.e., opposite the flowering glume, the other two being pos- terior and in contact with the palea. They are hypogynous, and have long and very delicate filaments, and large, linear or oblong two-celled anthers, dorsifixed and ultimately very versatile, deeply indented at each end, and commonly exserted and pendulous. Suppression of the anterior stamen sometimes occurs (¢.g., Anthoxanthum), or the two posterior ones may be absent (Uniola, Cinna, Phippsia, Festuca bromoides), On the other hand there is in some genera (Oryza, most Bambusew) another row of three stamens, making six in all (fig. 3, 3); and Anomochloa and Tetrarrhena possess four. The stamens become numerous (ten to forty) in the male flowers of a few moncecious genera (Pariana, Luziola). In Beesha they vary from

seven to thirty, and in Gigantochloa they are monadelphous.

Gynecium.—-There is but little variation here from a bicarpellary pistil, with a small rounded one-celled ovary containing a single laterally attached or ascending ovule, capped by two styles quite distinct or connate at the base,

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Fic. 4.—Pistils of Grasses. 1, Alopecurus; 2, Bromus; 8, Arrhenatherum ; 4, Glyceria; 5, Melica; 6, Mibora; 7, Nardus.

and with densely hairy or feathery stigmas (fig. 4). Occa- sionally there is but a single style (Wardus, Lygeum), and this may attain to a great length (6 inches in the maize) ; or three styles may be present (some Bambusece, Leptaspis, Streptochete). Nees has described a case in which three complete carpels were found in Schedonorus elatior.

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We thus see that, comparing the flower of Graminewe with the normal liliaceous plan (fig. 5), it differs in the complete suppression of the outer row and the posterior member of the inner row of the perianth-leaves, of the whole inner row

of stamens, and of the anterior carpel, whilst the remain-

Fic. 5.—Diagrams of the ordinary grass-flower. 1, actual condition; 2, theoretical,

with the suppressed organs supplied, a, axis; 6, flowering glume; c, palea;

d, outer row of perianth leaves; e, inner row; J, outer row of stamens; g, inner

row; A, pistil. ing members of the perianth are in a rudimentary condition. But each or any of the usually missing organs are to be found normally in different genera, or as occasional de- velopments.

Fruit.—The ovary ripens into a usually small ovoid or rounded fruit, which is entirely occupied by the single large seed, from which it is not to be distinguished, the thin pericarp being completely united to its surface: To this peculiar fruit the term caryopsis has been applied (more familiarly "'grain"); it is commonly furrowed longitudinally down one side (usually the inner, but in Coiz and its allies, the outer), and an additional covering is not unfrequently provided by the adherence of the persistent palea, or even also of the flowering glume (" chaff " of cereals). From this type are a few deviations; thus in Sporobolus, &e. (fig. 6), the pericarp is not united with the seed but is quite distinct, dehisces, and allows the loose seed to escape. Sometimes the pericarp is mem- branous, sometimes hard and brittle, whilst, on the other hand, in some genera of Bambusee, WW it becomes thick and fleshy, forming a " berry," wie, 6—Fruit or rather adrupe. In Melocanna baccifera this a, forms a fruit 3 or 4 inches long, with a pointed dekioce inert. beak of 2 inches more; it is indehiscent, and ©? and secd. the small seed germinates whilst the fruit is still attached to the tree, putting out a tuft of roots and a shoot, and not falling till the latter is 6 inches long. A similar germina- tion also occurs in Pseudostachyum compactum, which has the largest fruit of the order.

Seed.—The testa is thin and membranous but occasion. ally coloured, and the embryo small, the great bulk of the seed being occupied by the hard farinaceous endosperm (albumen) on which the nutritive value of the grain depends.

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Fig. 7.—A grain of wheat, 1,back, and 2, front view; 8,vertical section, showing () the endosperm, and (a) embryo; 4, commencement of germination, showing (0) the pileola and © the secondary rootlets surrounded by their coleorrhize.

The embryo presents many points of interest, Its position

18 Temarkable, closely applied to the surface of the endo-

Sperm at the base of its outer side. This character is abso-

lute for the whole order, and effectually separates Graminew

from Cyperacee. The part in contact with the endosperm

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is flat and plate-like, and is known as the scutellum. Some difference of opinion is held on the nature of this; but it is probably correctly regarded (as by Van Tieghem) as the main portion of the cotyledon, the white epigceal sheath (pileola) protecting the plumule—which is often described as the cotyledon—being the ligule only of that organ greatly developed. The radicle is inferior, broad, and blunt; the primary root is very slightly developed in germination, but several secondary lateral ones burst through above its point, and thus become surrounded at their base with little sheaths (coleorrhizz),

II. Crassirication.—Graminee are thus sharply de- fined from all other plants, and there are no genera as to which it is possible to feel a doubt whether they should be referred to it or not. The only order closely allied is Cyperacee, and the points of difference between the two have been alluded to above, but may be here brought together. The best distinctions are found in the position of the embryo in relation to the endo- sperm—lateral in grasses, basal in Cyperacewe—and in the possession by Graminece of the 2-nerved palea below each flower. Less absolute characters, but generally trust- worthy and more easily observed, are the feathery stigmas, the always

distichous arrangement of the glumes, the usual absence of more general bracts in the inflorescence, the split leaf-sheaths, and the hollow, cylindrical, jointed culms,—some or all of which are wanting in all Cyperacee. The same characters will distinguish grasses from the other glumiferous orders, Restiaceee, Hriocaulonece, and Desvausi- acece, which are besides further removed by their capsular fruit and pendulous ovules. To other monocotyledonous families the resemblances are merely of adaptive or vege- tative characters. Some Commelynacee and Marantacee approach grasses in foliage; the leaves of Allium, &c., possess a ligule; the habit of some palms reminds one of the bamboos ; and Juncacece and a few Liliacee possess an inconspicuous scarious perianth.

The great uniformity among the very numerous species of this vast family renders its class¢/ication very difficult. The difficulty has been increased by the confusion resulting from the multiplication of genera founded on slight characters, and from the description of identical plants under several different genera in consequence of their wide distribution.

No characters for main divisions can be obtained from the flower proper or fruit; though both Kunth and Reich- enbach have used them—especially the form of the styles aud stigmas, the lodicules and the caryopsis—they have not been generally employed by botanists, who have found it necessary to trust to characters derived froni the usually less important inflorescence and bracts.

The earlier authors made the general arrangement of the spikelets (spicate, paniculate, dsc.) the basis of their classi- fications. Palisot de Beauvois's main divisions are founded on the existence in the same inflorescence of similar or diverse spikelets. Fries has proposed a division into Eury- anthee and Clisanthece, according to the condition of the flowering glume and pale, separated or close during inflor- escence. Dumortier gives a classification into Rachidee, fachilliflore, and Calliflore ; the first with the spikelets inserted into excavations of the rachis, the second with the flowers of the free spikelet inserted on its axis (rachillus), and the last with the flower or flowers borne on the short callus of the glumes. Both these systems, and others which have been suggested, possess merits of their own, but they have not as yet been found capable of application to the order as a

whole, having been framed for the accommodation mainly of European genera. :

For such general treatment no better primary divisions have been found than those proposed by Robert Brown in 1810 and further elaborated in 1814, which have

been accepted by Munro (1868) and Bentham (1878) in their most recent revisions of the Cape and Australian genera. The basis of Brown's division of the whole order into Panicee and Poacew is the position of the most perfect flower in the spikelet ; this is the upper (apparently) terminal one in the first, whilst in the second it occupies the lower position, the more imperfect ones (if any) being above it. Munro has supplemented this by another character easier of verification, and of even greater constancy, in the articulation of the pedicel in the Panicew immediately below the glumes; whilst in Poacew this does not occur, but the axis of the spikelet frequently articulates above the pair of empty basal glumes. Neither of these two great divisions will well accommodate certain genera allied to Phalaris, for which Brown proposed tentatively a third group (since named Phalaridec); this, or at least the greater part of it, is placed by Bentham under the Poacee.

The following arrangement is based on the writings of these authors, but it cannot be considered very satisfactory. Probably no serial disposition can represent the tangled network of genera related in different ways and various degrees which make up this very natural but complicated family, and though some of the following tribes are fairly natural, the limits of others are but ill-defined, and the position of many genera uncertain. I. Pawtcaces.—Pedicel articulated below the glumes. Spikelet

with one or two flowers, the more perfect fertile one above, the male or barren one, if present, below it.

6. Olyrece.—Spikelets moncecious, or some hermaphrodite and some male in the same panicle ; the flowering glume large, sometimes utricular. Stamens three, six, or more. Leaves often broad and petiolate.

ExaMPLes :—Leptaspis, Pharus, Olyra, Pariana.

ll. PHALARIDES.—Pedicel either articulated below the glumes or not, but the rachis of the spikelet articulated above the two lowestones. Spikelets with (one or) three flowers, the perfect fertile one above, the two male, if present, below it. Two- nerved palea usually absent.

EXAMPLES :—Phalaris, Anthoxanthum, Ehrharta, Hierochloe

Alopecurus, Phleum, Crypsis, Lygeum (2).

Fic. 9.—Phalaridee. 1, spikelet of Hierochloe; 2, spikelet of Anthoxanthum.

LI. Poacnm.—Pcdicel not articulated below the glumes. Rachis of spikelet often articulated above the two lowest glumes. Spikelets with one, two, or more fertile flowers, the male or imperfect ones (if any) above them. Rachis of spikclet often continucd as a point or bristle beyond the flowers.

1. Oryzew.—Spikelets one-flowered. Empty basal glumes very small or wanting. Two-nerved palea usually absent. Stamens usually six.

EXAMPLES :—Oryza, Leersia, Potamophila, Zizania, Anomo- chloa (?).

2. Stipece.—Spikclets ouc-flowered. Flowering glume with a terminal twisted and bent awn. Palca small and thin. Lodicules thrce.

ExAMp.es :—Stipa, Aristida, Piptatherum.

3. Agrostidece. Spikelets one-flowered. Flowering glume usually with a terminal or dorsal bent awn. Palea small and thin. Lodicules two.

ExAMPLEs:— Agrostis, Deyeuxia, Calamagrostis, Coleanthus(?).

Fia. 8.—Panicacee. 1, a pair of spikelets of Andropogon; 2, spikelet of Seéaria, with an abortive branch beneath it.

1. Panicee.—Spikelets with an apparently terminal hermaphrodite or female flower with or without a male one beneath it. Glumes three or four, the upper flowering one of a firm texture, the lowest usually small, sometimes absent. Awns rarely found ; if present, neither twisted nor kneed. Fruit enclosed in the hardened flowering glume and palea.

EXAMPLES :—Paspalum, Panieum, Setaria, Pennisetum, An- thephora, Thouarea, Spinifex.

2. Tristegince.—Spikelets as in Paniecce, but flowering-glume with a twisted and bent awn.

EXAMPLES :—Arundinella, Tristaehya, Polypogon(?).

3. Andropogonee.—Spikelets as in the last, but usually in pairs (rarely three or solitary), one being sessile and fertile, the other stalkedand usually maleorneuter. Glumes four (rarely fewer), one of the outer ones the largest and enclosing the fruit, the upper flowering one very thin and transparent, usually bear- ing a twisted and bent awn or reduced to the awn.

EXAMPLES :—Isehemum, Pollinia, Andropogon, Imperata, Sorghum, Anthistiria, Erianthus, Eulalia, Saecharum.

4, Rottboelliew.—Spikelcts as in the last; one of each pair fertile, sessile, and sunk in alternate notches or cavities of the jointed simple rachis, the other stalked or absent ; no awns.

EXAMPLES :—Hemarthria, Manisuris, Rottboellia, Ophiurus, Psilurus, Lepturus.

5. Mayadece, —Spikelets moncecious, very unlike, the male numer- ous In a terminal panicle, the female few at the base of the male inflorescence or more numerous in a separate one.

EXAMPLES :—Coix, Zea, Chionaehne, Tripsacum, Sclerachne.

Fig. 10.Poacee. 1, spikelet of Agrostis; 2, spikelet of Aira,

4, Avenece. Spikelets generally two- rarely three- or more-flowered. Flowering glumes with a terminal or dorsal bent and twisted Pa Palea large, enclosing with the flowering glume the

ruit. ExampLes :—Atra, Holeus, Arrhenatherum, Avena, Trisetum, Danthonia, Lagurus. [2, 3, and 4 together form Bentham's tribe Streptatheree. |

5. Pappophorece.—Spikelets one- or several-flowered. Flowering glumes rounded on the back, terminating in three or more teeth often carried out into straight awns.

EXAMPLES :—Pappophorum, Triraphts, Cottea, Triodia.

6. Chiloridece. Spikelets one- or several-flowered, sessile on onc-

sided spikes. Flowering glumes rarely awned.

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ExAMPLEs :—Cynodon, Chloris, Eleusine, Leptochloa, Spartina, Ctenium, Nardus.

7. Miliece.—Spikelets one- or several-flowered, paniculate. Flower-

ing glumes usually rounded and unawned. Palea large. EXAMPLEs :—Milium, Cwlachne, Sporobolus.

8. Festucee.—Spikelets several- or many-flowered, stalked, panicu- late or capitate. Flowering glumes entire, obtuse or acute, or with a straight awn; one or more empty ones above the fertile flowers.

ExamPLes :—Festuea, Bromus, Lamarkia, Briza, Poa, Era- grostis, Daetylis, Cynosurus, Arundo, Phragmites, Melica.

Fic. 11.—Poacee. 1, spikelet of Briza; 2, spikelet of Triticum.

9. Bambusew.—Spikelcts one-, several-, or many-flowered, usually sessile, paniculate or capitate. Lodicules three. Stamens generally six. Stems very

large and tall (called arbore- ous or shrubby). Blade of leaf articulated with the sheath.

EXAMPLES :—Arundinaria, Chusquea, Nastus, Bambusa, Melo- canna, Beesha.

10. Hordee.—Spikelets onc- or several-flowered, sessile on the opposite sides of the main axis of the spike. Otherwise asin Hestucec.

EXAMPLEs : — Hordewm, Agropyrum, Lolium, Lepturus, Elymus. [5 to 10 compose Bentham's tribe Astrepta.]

III, Distrisution.—Grasses are the most universally diffused over the globe of all flowering-plants. There is no district in which they do not occur, and in nearly all they are a leading and dominant feature of the flora. In actual number of species Graminew comes considerably after Com- posite and Leguminose, the two most numerous orders of phanerogams, but in number of individual plants it pro- bably far exceeds either; whilst from the wide extension of many of its species, the proportion of Graminee to other orders in the various floras of the world is much higher than its whole number of species would lead one to expect. This number can, however, scarcely be put much below 6000, which is probably somewhat more than a fifth of all monocotyledons. This is only about .,th of the phanero- gams as a whole, yet in any given locality, with a very few exceptions, this proportion is largely exceeded. In tropical regions, where Leguwminose is the leading order, grasses closely follow as the second, whilst in the warm and temperate regions of the northern hemisphere, in which Composite takes the lead, Graminew again occupies the second position. As the colder latitudes are entered the grasses become relatively more numerous, and are the lead- ing family in Arctic and Antarctic regions. The only countries where the order plays a distinctly subordinate part are some extra-tropical regions of the southern hemisphere, Australia, the Cape, Chili, &. The actual proportion of graminaceous species to the whole phanerogamic flora in different countries is found to vary from nearly ith in the Arctic regions to about ,th at the Cape; inthe British Isles it is about 2th. The following are proportions per cent. in various floras, from Decandolle's Geogr. Botanique, which must, however, be taken as merely approximations In most cases :—

In the tropics :—Cape Verd Islands, 13; Abyssinia and Nubia, 12; Mexico, 10; Hawaiian Islands, 10; Congo, 8; Mauritius, 8; ep ueirhood of Quito, 10; Barbados, 6; Surinam, 6; Tunis, 6;

ew Guinea, 4; New Grenada, 4. In temperate regions of the northern hemisphere :—Banda and some other districts of India, 15 to 17; Egypt, 12; Texas, 12; Azores, 12; Madeira, 11; Algeria, 94; Canaries, 8; United States, 8; Sardinia, 9; Holland, 10;

Aigilops, Triticum,

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Sweden, 83; Great Britain, 84; France, 74; Germany, 7; China, 8; Altai, 54; Japan, 54. In northern regions (beyond 60° N. lat.): —Melville Island, 21; Spitzbergen, 18; Iceland, 11. In extra- san regions of the southern hemisphere:— Chili, 6; Cape Colony, 44; Swan River district, 2. In Antarctic islands:—Ker- guelen, 25; Tristan da Cunha, 15.

The principal climatic cause influencing the number of graminaceous species appears to be amount of moisture; it is only in very dry countries that they become distinctly less numerous. A remarkable feature of the distribution of grasses is its uniformity ; there are no great centres for the order, as in Composite, where a marked preponderance of endemic species exists; and the genera, except some of the smallest or monotypic ones, have usually a wide distri- bution. Speaking generally, however, the Panicacee are tropical and warm temperate plants, whilst the grasses of temperate and colder regions are members of the Poacee. The former are very sparingly represented in Europe by a few species of the vast tropical genera Andropogon and Panicum. Poacew, on the other hand, form a fair pro- portion of tropical Graminee, especially in the higher dis- tricts where, as in the mountains of Abyssinia, are several endemic genera and many species. The largest tropical genus of Poacee is Hragrostis.

The distribution of the tropical tribe Bambusew is in- teresting. There are 170 or more species, which are about equally divided between the Indo-Malayan region and tropical America, only one species being common to both. Apparently there is but a single native species on the African

continent, where it has a wide range, and none are recorded for Australia, though species may perhaps occur on the northern coast. One species of Arwndinaria reaches north- wards as far as Virginia, and the elevation attained in the Andes by some species of Chusquea is very remarkable,—one, C'. aristata, being abundant from 15,000 feet up to nearly the level of perpetual snow.

Many grasses are almost cosmopolitan, such as our common reed, Phragmites communis; and many range throughout the warm regions of the globe, ¢.g., Cynodon Dactylon, Eleusine indica, Imperata arundinacea, Sporobolus endicus, &c., and such weeds of cultivation as species of Setaria, Echinochloa, which are found over both Old and New Worlds. The recent masterly revision of the whole of the Australian species by Bentham well exhibits the wide range of the genera of the order in a flora generally so peculiar and restricted as that of Australia. Thus of the 90 indigenous genera (many monotypic or very small) only 14 are endemic, 1 extends to South Africa, 3 are common to Australia and New Zealand, 18 extend also into Asia, whilst no less than 54 are found in both the Old and New Worlds, 26 being chiefly tropical and 28 chiefly extra-tropical.

Of specially remarkable species Zygeuwm is found on the sea-sand of the eastern half of the Mediterranean basin, and the minute Coleanthus has only occasionally occurred at intervals in three or four isolated spots in Europe (Norway, Bohemia, Normandy). Manyremarkable endemic genera occur in tropical America, including Anomochloa of Brazil, and most of the large aquatic species with separated sexes are found in thisregion. The only genus of flowering plants peculiar to the arctic regions is the beautiful and rare grass Pleuropogon Sabinii, R. Br., of Melville Island.

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GRASSHOPPER (French Sawterelle, Italian Grillo, German G@rashiipfer, Heuschrecke, Swedish Grdshoppa), a collectiveterm applied to certain orthopterous insects belong- ing to the families Locustide and Acrydiide, according to the now generally received classificatory views. They are especially remarkable for their saltatory powers, due to the great development of the hind legs, which are much longer than the others and have stout and powerful thighs, and also for their stridulation, which is not always an attribute with them of the male only. The distinctions between the two families may be briefly stated as follows :—the Locustide have very long thread-like antenne, and four- jointed tarsi; the Acrydiide have short stout antenne, and three-jointed tarsi. As the term "grasshopper" is almost synonymous with Locust, the subject will be more extensively treated under the latter heading (¢. ».). Under both "grasshopper" and "locust" are included members of both families above-noticed, but the majority belong to the Acrydiide in both cases. In Britain the term is chiefly applicable to the large green grasshopper (Locusta viridissima) common in most parts of the south of England, and to smaller and more obscure species of the genera Stenobothrus, Gomphocerus, and Tettix, the latter remarkable for the great extension of the pronotum, which often reaches beyond the extremity of the body. All are vegetable feeders, and, as in all orthopterous insects, have an incomplete metamorphosis, so that their destructive powers are continuous from the niomeut of emergence from the egg till death. The notorious migratory locnst (Pachy- tylus migratortus) may be considered only an exaggerated grasshopper, and the too-famous Rocky Mountain locust (Caloptenus spretus) is still more entitled to the name. In Britain the species are not of sufficient size, nor of suffi. cient numerical importance, to do any great damage, and their cheerful "song" more than counteracts the slight mischief they may cause in devouring grasses and other plants. The colours of many of them assimilate greatly to those of their habitats ; the

green of the Locusta viridissima is wonderfully similar to that of the herbage amongst which it lives, and those species that frequent more arid spots are protected in the same mauner. Yet many species have brilliantly coloured under-wings (though scarcely so in English forms), and during flight are almost as conspicuous as butterflies ; but when settled it is nearly impossible to detect them, even although the spot where they dropped may have been carefully marked; and they rise again almost under the feet of the observer. Those that belong to the Acrydiide mostly lay their eggs in more or less cylindrical masses, surrounded by a glutinous secretion, in the ground, Some of the Locustide also lay their eggs in the ground, but others deposit tlem in fissures in trees and low plants, in which the female is aided by a long flattened ovipositor, or process at the extremity of the abdomen, whereas in the Acrydiide there is only an apparatus of valves. The stridulation or "song" is mainly produced by friction of the hind legs against portions of the wings or wing- covers; but variation exists in the exact method. To a practised ear it is perhaps possible to distinguish the "song " of even closely allied species, and some are said to produce a sound differing by day and night. The British species are not numerous ; Lut in some parts of the world (and. even in Europe) their numbers are very great, both in species and individuals,

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GRATIANUS, Avaustus (359-383), Roman emperor, son of Valentinianus I,, was born in 359. In the ninth year of his age he received from his father the title of Augustus, but on his father's death in 375 he was compelled to share the Western empire with his infant brother, Valentinianus II., of whom he was appointed guardian, while his uncle Valens ruled over the Eastern empire. In 378 he gained a victory over the Alemanni near the site of tle present town of Colmar. Through the death of Valens in the same year, there devolved upon him the government of the Eastern empire, but feeling himself unable to resist unaided the incursions of the barbarians, he ceded it to Theodosius, January 19, 379. For some years Gratianus conducted the government of his empire with energy and success, but gradually he sank into indolence and occupied himself chietly with the pleasures of the chase. By adopt- ing as the guards of his person a body of the Alani, aud appearing in public in the dress of a Scythian warrior, he awakened the

contempt and resentment of his Roman troops. A Roman named Maximus took advantage of this feeling to raise the standard of revolt in Britain, and invaded Gaul with a large army, upon which Gratianus, who was then in Paris, being deserted by his troops, fled to Lyons, where, through the treachery of tlie governor, he was delivered over to one of the rebel generals and assassinated, August 25, 383.

GRATIANUS, Franciscus, compiler of the Concordia discordantium Canonum or Decretum Gratiant, and founder of the science of canon law, was born about the end of the 11th century at Chiusi in Tuscany or, according to another account, at Carraria near Orvieto. In early life he appears to have been received into the Camaldulian monastery of Classe near Ravenna, whence he afterwards _ removed to that of San Felice in Bologna, where he spent many years in the preparation of the Concordia. The precise date of this important work cannot be ascer- tained, but it contains references to the decisions of the Laterau council of 1139, and the statement is vouched for by tolerably good authority that it was completed while Pope Alexander ITI. was still simply professor of theology at Bologna,—in other words, prior to 1150. The labours of Gratian are said to have been rewarded with the bishopric of Chiusi, but if so he appears never to have been consecrated ; at least his name is not to be found in any authentie list of those who have occupied that see. The year of his death is unknown.

For some account of the Deerctum Gratiani and its history see Canon Law. The latest edition is that of Friedberg (Corpus Juris Canonici, Leipsie, 1876). Compare Schulte, Zwr Geschichte der Literatur itber das Deeret Gratians (1870), Die Glosse zum Decret Gratians (1872), and Geschichte der Quellen und Literatur des Kanonischen Reehts (1875).

GRATIUS FALISCUS, a Roman poet, contemporary with Virgil and Ovid, and author of a poem on hunting (Cynegetica), of which somewhat more than 536 lines have been preserved. Of his personal history nothing is known ; but it has been doubtfully conjectured from his cognomen that he was a native of Falerii. The only reference to him to be met with in any writer of antiquity (Ovid, Pont., iv. 16, 33) is of the most incidental kind, and his poem seems very early to have fallen into comparative oblivion.

Our knowledge of it is derived chiefly from a manuscript of the 10th century, preserved at Vienna, but partly also from one of nearly the same age at Paris. It describes, some- what after the manner of Xenophon, various‘kinds of game, the means to be employed for their pursuit and capture, the best breeds of horses and dogs; and in doing so it seldom rises above the dull level of the driest technicality, although occasionally there are faint reminiscences of Virgil.

The cditio princeps of this author was published in Venice in 1534; his work was also ineluded by Ulitius (1645-55) and Haver- camp (1728) in their editions of Auetores Rei Venaticw, as well as by

Burmann (1731) and Warnsdorf (1780) in the Poete Latini Minores, and by Weber in the Corpus Poctarwm Latinorum. The most recent editions are those of Stern (1832) and Haupt (1838). A rendering into English verse was published by Christopher Wase in 1654; there is also a German translation by Perlet (1826). GRATTAN, Henry (1746-1820), Irish statesman and orator, was born 3d July 1746. His father, a Protestant, was for many years recorder of the city of Dublin, and from 1761 to 1766 its representative in the Irish parliament ; and his mother was a daughter of Thomas Marlay, chief justice of Ireland. Both at school and at Trinity College, Dublin, which he entered in 1763, young Grattan greatly distinguished himself, especially in the study of the classics; and several well-authenticated anecdotes indicate also that the more prominent moral characteristics displayed in his public career had begun to assert their strength at a very early period. While still attending the university lhe discarded the Tory principles of his father, who, dying in 1766 before his irritation had time to moderate, testified his resentment by depriving him of the paternal mansion, and of all property not secured by settlement. Having in- herited, however, a smallinalienable patrimony he resolved to study for the bar, and in 1767 he entered the Middle Temple, London. He was called to the Irish bar in 1772, but never obtained a large practice; and indeed from the time that he left the university he seems to have concen- trated his attention chiefly on politics and the study of popular oratory. He early acquired a passionate admira- tion of the great orators of Greece and Rome, and while in London

he spent the most of his evenings in the galleries of the House of Commons or at the bar of the Lords, anxious to profit by every opportunity of obtaining an

insight into the art of eloquence, his enthusiasm for which |

had received additional stimulus from the genius of Lord Chatham. Of the eloquence of Chatham he has given a detailed and graphic description in one of his letters, aud he also wrote an admirable portraiture of his character, which was inserted as a note in the political publication Barataria conducted by Sir Hercules Langrishe. The knowledge obtained from the study of the best specimens of ancient and modern oratory, and that gained from wit- nessing the debates in the English parliament, Grattan began sedulously to apply to the purposes of his own dis- cipline. By the constant practice of recitation to imaginary audiences, and by taking part frequently in private theatri- cals, he succeeded in overcoming to a remarkable extent his great physical defects, so as to acquire a clear and rounded articulation, an emphasis in some respects admir- ably consonant with his meaning, and a certain ease in a style of elocution which was effective partly by reason of its very singularity. At the same time, by practising the habit of writing out the principal passages of his speeches, and subjecting them to a constant mental revision, he attained to the possessiou of a diction which for clearness, epigrammatic vigour, polished beauty of phrase, and the power of illuminating a whole subject by sudden flashes of meaning conveyed in a single sentence, is unsurpassed in modern oratory. He was equally diligent also in per- fecting his political knowledge by a careful study of the history and political constitution both of ancient and modern nations; and the minor accomplishment of pro- ficiency as a pistol shot, at that time essential to every Irish politician who would be prepared for all emergencies, was cultivated by him with the same dogged perseverance which he displayed in other matters.

When therefore, under the auspices of Lord Charlemont, Grattan in 1775 entered the Irish parliament, he had already all his powers under full command, and had so trained and disciplined his natural genius that it was able to exert its influence with untrammelled freedom. The period at which he began public life was one of the

most critical in his country's history; and it is within the limits of strict truth to affirm that he inaugurated a new era in her political condition, and that, whether for good or for evil, and whether by the direct success of his efforts or by the modifying or opposing influences they called into exercise, he has had a greater share than any other indi- vidual in determining her present relation to the United Kingdom. Through the writings of Molyneux and Swift, the beginnings of a true national sentiment had been pre- viously awakened; and the first step in the path of constitu- tional reform had been taken, when by the advocacy of Flood the Octenuial Bill of 1768 was passed, which limited the duration of parliaments to eight years, instead of as formerly making their continuance depend upon the life of the sovereign; but Flood himself—whose friendship and influence were a powerful element in determining Grattan to adopt a political career—had, like less formid- able agitators, succumbed to the intrigues of the "castle," and, although possessed of a private fortune which placed him beyond the suspicion of being governed chiefly by mer- cenary considerations, had consented to hamper his political action by accepting a sinecure office; and it seemed as if the germs of a better future had already begun to rot ina soil of such political corruption. The difficulty of the task which Grattan had set before him was also increased by a peculiarity in the case of Ireland which requires to be em- phasized. Her political constitution, and, with the excep- tion of the restrictions which paralysed her trade, the laws which were inflicting upon ler such moral and physical misery, did not nominally differ to any great extent from those of the country by which she was in reality governed. She possessed intact her separate nationality ; she was blessed with the boon of a national parliament; she had a lega] administration of her own, including the right of trial by jury ; aud she enjoyed something resembling the privi- leges of municipal government. She possessed these things, however, scarcely more than in form; and she possessed them in such a form that, instead of being the guarantees of her liberty, they increased her sense of bondage, and directly fostered discontent and chronic mutiny. Though the Test Act and the penal laws were actually enforced with less rigour than in England, yet from the numbers who came within their sweep their disastrons influence was incal- culably increased. They excluded four-fifths of her other- wise eligible population from the

jury box and from muni- cipal and parliamentary suffrage ; they had produced con- fiscations on almost a national scale with all the evils consequent on absenteeism ; and from their operation there had resulted an ignorance, a poverty, a violation of the rights of conscience, not confined to a few thousands, helplessly dispersed throughout the kingdom, but afflicting the great mass of the people, and both by their direct and their reflex action poisoning the springs of the whole national life. Her judges besides were liable to dismissal at pleasure, and her parliament had no independent authority, and by its very constitution was subject to corrupt influences far exceeding those in operation in the English parliament, and such as virtually to deprive it of independence of vote, almost as completely as it had been deprived of the power of legislation. Still that parliament constituted a kind of centre for political discussion and for the propagation and diffusion of political ideas, and it was by means of it that Grattan and his associates determined to work out the political and social regeneration of their country. Almost as soon as he entered parliament, Grattan became the acknowledged leader of the opposition, not only from the influence exerted by his oratory within the House, but from its power to kindle the enthusiasm of the people, and to create out of the chaos of shapeless and discordant elements the united sympathy and purpose of a true

national life. In this he received an assistance from ex- ternal events which was embarrassing as well as helpful ;— from the American rebellion, which was the result of a struggle for rights similar to those he was contending for ; from the war with France, which led to the creation of a volunteer army in Ireland that became a kind of political convention ; and ultimately from the French Revolution, which in Ireland, more than in any other country of Europe, aroused wild desires after political freedom.

In February 1778 Grattan moved an address to the crown, to the effect that the condition of Ireland was no longer endurable, and although the motion was supported by only a small minority, the discussion bore fruit in the same year by the concession of free export of all produce except woollens, and by the modification of the penal laws to the extent of allowing the Catholics to hold leases for 999 years. In the following year the volunteers

by their deter- mined attitude crowned with success his efforts, along with Flood and Burgh, to effect the total repeal of the restriction Acts, and the same ycar saw also the repeal of the Test Act. With a view to increase and take advantage of the risin tide of national sentiment, Grattan on April 19th 1780 moved his famous resolutions that the " king with the con- sent of the parliament of Ireland was alone competent to enact laws to bind Ireland, and that Great Britain and Ireland were indissolubly united, but only under a common sovereign ;" but so satisfied was he with the tone of the debate that, unwilling needlessly to irritate or embarrass the English Government, he did not press his motion to a division. An agitation was, however, begun in the follow- ing year against Poyning's Act and the Mutiny Act, and Grattan besides supported the introduction of a bill per- mitting the Catholics to inherit and hold property on the same terms as other subjects. In order also to bring pressure to bear on the English Government, Grattan, Flood, and Charlemont met privately in the beginning of 1782, and drew up for the consideration of the volunteers' dele- gates two resolutions in reference to independence ; and to these Grattan, on his own responsibility and without the knowledge of Flood and Charlemont, added a third in favour of the measure for the relaxation of the penal laws against the Catholics. All these resolutions were adopted by the delegates unanimously, and Grattan, strong in armed sup- port, repeated his motion for a declaration of independence, which, although it was lost, aroused such general enthusiasm that, when on the 16th April he rose to move a Declara- tion of Rights, he in a brilliant oration congratulated his hearers and his country on the triumphant issue of the struggle, his first words being—" I am now about to address a free people." So completely did his eloquence rise to what was deemed the greatness of the occasion that its effect has seldom been equalled in the annals of oratory ; and in the state of high- wrought excitement that prevailed, the Government, then doubtful as to the result of the siege of Gibraltar by the French and Spaniards, did not dare to refuse the boon which had already been in reality appro- priated without their permission, and on the 17th May resolutions were passed unanimously, pledging the English parliament to redress the grievances complained of. In recognition of Grattan's services the Irish parliament was prepared to have voted him a grant of £100,000; but he was with difficulty persuaded to accept half that sum, and only agreed to do so from the consideration that, by reliev- ing him from the necessity of practising at the

bar, it would enable him to devote the whole of his energies to politics. He determined, however, that this gift should not in any way bias his political action, and when Flood, supported by the volunteer convention, brought forward his motion for repeal, he at the expense of his popularity moved its rejection—a procedure which also gave rise to an extraordinary scene of

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mutual recrimination between the two orators. For the next ten years Grattan carried on the struggle for the re- form of Irish abuses with almost no success; and his Place and Pension Bill, and bills to make the great officers of government responsible for their proceedings, to prevent revenue officers from voting at elections, and to abolish ecclesiastical tithes, were all rejected. Pitt, at one time disposed to promote emancipation, became lukewarm in his zeal after the rejection in 1785 of Mr Orde's bill for the removal of trade restrictions, which, on account of a clause binding the parliament to re-enact England's navigation laws, was opposed by Grattan as involving a principle that implied a revocation of the constitution ; nor did the action of the Irish parliament in the regency dispute of 1789 tend to smooth the relations between the two countries. At last in 1793 parliamentary suffrage was conceded to the Catho- lics as a sop to the fury of the United Irishmen; but the concession served only to whet the appetite for further redress, and when the hope of obtaining this, after reaching the verge of certainty by the appointment of Fitzwilliam as lord-lieutenant, was suddenly dashed by his recall, the spirit of brooding discontent increased until ultimately it resulted in the bloody rebellion of 1798. Previous to its occurrence Grattan had withdrawn from parliament. It has been surmised by Mr Froude that in urging on the question of emancipation Grattan wished to effect a complete

'separation from England, and perhaps calculated, though

a Protestant, on obtaining as the reward of his services the first place in the new commonwealth ; but besides that the conjecture is unnecessary, since it was quite a possible supposition that emancipation might have proved the best method of confirming the loyalty of the Catholics,—and it was most certainly a better method than union without emancipation,—it is without a shadow of proof to support it, and would also have implied treachery on his

part of the blackest kind, while treachery of any kind is belied by the whole course of his political life. In 1800 Grattan, though in feeble health, entered the Irish parliament as member for Wicklow, specially to oppose the motion for union, a measure whose bitterness was not rendered less distasteful to him from the time, manner, and means employed for its accomplishment. He regarded its suc- cess as almost the nullification of Ireland's partial freedom, and the indefinite postponement of the attempt to remedy her wrongs. Though knowing from the beginning that to contend against the influence of the Government was hopeless, he exerted all his eloquence in condemnation of the measure ; and his last words in the Irish Parliament were—'"'T will remain anchored here with fidelity to the fortunes of my country, faithful to her freedom, faithful to her fall." In the course of these debates Grattan was three times virulently attacked by Mr Corry, chancellor of the exchequer, but at last retaliated with overwhelming effect. In the duel which followed Corry was wounded. After the Union Grattan withdrew for a time from public life, but, in order to lend his assistance to the pass- ing of the Catholic Relief Bill, he in 1805 entered the English parliament as member for Malton; and in the following year he was returned by Dublin, which he had formerly represented in the Irish parliament. Although his speeches in the new arena did not detract from his fame, the union had effected so great a change in his political standpoint that the inspiration which had for- merly given to his eloquence such a glow of confident ardour, and had braced his powers to such supreme efforts, was no longer present. He refused to take office in the Fox ministry, but he nevertheless gave the Whigs his sup- port on all important occasions; and by voting with the Government onthe Irish Insurrection Bill of 1807, he showed that his regard for the general welfare of the empire was

unaffected by the great political disappointment of his life. After the rejection of the Catholic Relief Bill of 1813, which was accompanied bya clause reserving to the English sove- reign the power of veto in the election of Catholic bishops, the Catholic board repudiated the proposed compromise and declined to entrust Grattan further with their cause. He, however, gave it the saine energetic support as formerly, and after 1815 he never spoke in the English parliament on any other subject. In 1819 his

motion was defeated by the small majority of two; and on the reassembling of parliament in the following May, he undertook, con- trary to the advice of his physician, a journey to London in order again to bring forward the subject, but died a few days after his arrival, 4th June 1820. He received the honour of a public funeral and a grave in Westminster Abbey, where he lies near the tombs of Pitt and Fox.

Lord Byron, who had heard Grattan only in the English House of Commons, says that he would have come near to his ideal of a perfect orator but for his harlequin manner ; and he also states that Curran was in the habit of taking him off by bowing to the very ground and thanking God that he had no peculiarities of gesture or appearance. His features were large and plain, and he was low in stature and so awkwardly formed that probably he never could have acquired a very graceful gesture ; but the gravity and impressiveness of his bearing banished all sense of the ridiculous, and perhaps even the oddness and violence of his attitudes assisted to dissipate the feeling in his hearers of his personal insignificance. His voice, though uot harsh, was deficient both in mellowness and volume, and when not elevated by emotion into shrillness had a low drawling accent. He succeeded, however, by virtue of appropriate emphasis and of concentrated energy, in bring- ing home to his hearers all the various shades of the passion and purpose of his discourse, and this perhaps with greater vividness than if it had been accomplished by means of an elocution which, if less faulty, would not have expressed so well his own peculiar individuality. In private life he was simple, genial, and courteous, and the felicity of his language, flavoured by an enuuciation and manner that were all his own, lent to his conversation a rare and peculiar charm.

His speeches suffer much from imperfect reporting, but their leading characteristics can be determined with con- siderable accuracy. Great labour, direct aud indirect, was bestowed on their preparation, and few speeches show so many traces of art; but it is art transfused and palpitating with enthusiasm, and therefore, though defective in ease and simplicity, they cannot be charged with artificiality or affectation. In regard to the chief fault of his style,—the excessive use of epigram,—it must be remembered that he made it supply the place both of wit and of direct argumenit ; and that it never wearied his audience by a monotony of stilted smartness, but,

by its incisive vigour and its startling originality, rendered his speeches perhaps unequalled for sustained brilliancy and interest. His oratorical triumphs were won, not by the stately marshalling of arguinents and illustrations towards a climax, but by sudden surprises from so many directions, and so closely following each other that resistance to his attacks soon became impossible. In regard to subject-matter his speeches do not suffer from compari- son even with those of Burke. His favourite method of enforcing his arguments was by illustrations either of simi- larity or of contrast drawn from history or from contem- porary events ; and while in this way he exhibited, in every possible light the plausibility of his contentions, he gave dignity and elevation to his theme by removing it from the narrow sphere of party politics, and connecting it with principles of universal and permanent consequence. Much of the effect of his eloquence was due to the boldness of his

statements and of his allusions and imagery, a boldness which, though often amounting to hardihood, never over- stepped the boundaries between the sublime and the ridi- culous. In remarkable coutrast to other Irish orators, and especially to his great contemporary Curran, he possessed neither wit nor humour, aud this no doubt accounts for the sustained and pitiless vehemence of his invectives against opponents who had thoroughly roused his anger. These attacks were rendered the more formidable from his power of delineating character by epithets, the graphic force of which had an almost electrical effect. This power he ex- ercised, however, more frequently for purposes of laudation than censure, and perhaps the finest examples of it in his speeches are two short incidental allusions to Fox and Burke. A remarkable union of boldness with moderation and restraint characterized his statesmanship as it did his oratory, for while he embraced within his scheme of reform the whole circle of Ireland's wrongs and disabilities, and was prepared to face the consequences of all constitutional changes, however great, which justice seemed to demand, his unswerving aim, in the face both of strong provocation from the Government and of the powerful assaults of popular clamour, was not to loosen but to cement the ties which bound Ireland to Great Britain. That his political couduct was governed too much by abstractions, and had too little regard to expediency, is a

conclusion which has been both affirmed and denied, but in any case it will be admitted by most that his beneficial influence on Trish politics has been less felt by the direct accomplishment of his aims than through the moral effect of his eulightened and incorruptible patriotism, and the gradual change which has taken place in the mental attitude of English statesmen towards his country. Grattan's Speeches, with prefatory observations, the whole com- prising a brief review of the most important political events in the history of Ireland were published at Dublin in 1811. His Speeches in the Irish and in the Imperial Parliament, edited by his son, in 4 volumes, appeared at Loudon in 1822, and his Afiscellancous Works also in the same year. See his Memoirs by his son Heury Grattan, Esq., M.P., in 5 volumes, London, 1839-46; Lecky's Leaders of Publie Opinion in Ireland, 2d edition, 1872; and, among various notices by contemporaries, especially that in vol. vii. of the Dublin University Magazine, which, notwithstanding political bias, gives a remarkably unprejudiced representation of his character and abilities, and that by Lord Brougham in the 1st vol. of his collected works. The political events of the period are of course graphically narrated by Mr Froude in his English in Ireland, vols. ii. and iii., but his principal design is to show the pernicious effects of Grattan's efforts. Among the ablest criticisms of Mr Froude's work is that by W. E. H. Lecky in Macmillan's Magazine for January 1873 and June 1874. (T. F. H.) GRATZ, or Graz,! the capital of the Austrian crownland of Styria, is situated in the broad and fertile valley of the Mur, and the beauty of its position has given rise to the punning French description, La ville des Graces sur la rwiére de VAmour. From Vienna it is distant about 90 miles as the crow flies, and about 139 miles by rail. Its latitude is 47° 49' N., its longitude 15° 27' E., and its height above the sea 1499 feet. The main town lies on the left bank of the river, at the foot of the Schlossberg or castle-hill, but two of the principal suburbs, Lend and Gries, occupy an extensive area on the right bank, and communication is maintained by four bridges besides the railway bridge. Among the numerous churches of the city the most im- portant is the Gothic cathedral of St Aigidius, founded by the emperor Frederick III. in 1450-1462, on the site of a previous church mentioned as early as 1157. It has been several times modified and redecorated, more particularly

1 The name was frequently written Gratz, Gretz, or Grez, but in 1848 it was decided, through the influence mainly of Hammer-Purg- stall, that the

official form should be Graz, in accordance at once with the local pronunciation and the derivation of the word, which was originally, it is believed, the Slavonic for “ little castle,’ Gradats or Gratsa in Servian, and Hradek in Bohemian..

in 1718. The present copper spire dates from 1663. The interior, which measures 200 feet in length by 92 feet in breadth, is richly adorned with stained glass win- dows of modern date, costly shrines, paintings, and tombs. In the immediate neighbourhood of the cathedral is the mausoleum church of St Catherine’s, erected by Ferdinand II. as a burial-place for himself and his family. It has an imposing facade with Corinthian columns, two cupolas, and a tower. Worthy of mention also are the church of the Sacred Blood, which has been the municipal church since 1585, and which possesses an altar-piece by Tintoretto ; the Augustinian cliurch, commonly called Stiegenkirche, appropriated to the service of the university since 1827; and the church of St Anthony of Padua, connected with the lunatic asylum, and popularly known as the Narren- thurmkirche, Besides the old imperial castle, formerly the resideuce of the Styrian princes, and now the seat of the statthalterei, Gratz contains the palace of the prince-bishop of Seckau, the palace of Count Attem, with a fine picture- gallery, and the old palace of the archduke John, now in

Plan of Gratz.

1, Citadel. 5, Mausoleum. 10. Municipal church,

2. Franzen’s Platz and 6. University. 11. Picture gallery, Monument, 7. Rathhaus, 12. City theatre.

3. Theatre. 8. Landhaus, 13, Barracks.

4. Cathedral. 9. Joanneum.

possession of the counts of Meran. The iandhaus, where the estates hold their sittings, was erected in the 16th century; among its curiosities are the Styrian hat and the great silver cup called the Landschadenbund. The

rathhaus, built by Stadler between 1802 and 1807, is of interest mainly for its collection of instruments of torture. At the head of the educational institutions is the university, founded in 1586 by Charles Francis, and restored in 1817 after an interruption of forty-five years, The old buildings dating from between 1573 and 1609 are being replaced by a fine modern erection. Of greater celebrity than the university is the Joanneum, originally instituted in 1811 by the archduke John Baptist as a national museum, but now developed into a complex organization for the higher education, with a regular professorate, a library of 50,000 volumes, archives peculiarly rich in Oriental MSS., a botanical garden, and other auxiliary departments. Mohs, Schrotten, and Unger are among the eminent names asso- ciated with its chairs. The Styrian hospital, fonnded in 1788, the town hospital, the civic hospital, the military

hospital, the children's hospital, and the lunatic asylum are among the principal benevolent institutions. An official raouey-lending establishment has been in existence since 1755. Of the minor institutions of various kinds which prove the prosperity of the town the list would be along one. An active trade, fostered by abundant railway commuuication both with north and south, is combined with no small manufacturing industry in the departments of iron and steel wares, paper, chemicals, sugar, vinegar, liqueurs, watches, and mathematical instruments. Few towns are better supplied with public pleasure grounds and holiday resorts. The Schlossberg, which rises 380 feet above the valley, was laid out by General Welden shortly after the destruction of the castle; and a great park of 42 acres has been made almost to encompass the inner city. The Calvarienberg lies in the north-west of the town; and not far off is the castle of Eggenberg. The population of Gratz, in spite of a high rate of mortality which prevailed for some time, amounted in 1869 to 81,119, exclusive of the garrison of 4000 men. In 1875 the total, civil and military, was estimated at 90,000.

History.—Gratz may possibly have been a Roman site, but the first mention of it under its present name is in a document of 881 A.D. Ottocar V. of Traungau chose it as his residence in 1056, and in 1163 it is designated for the first time the Landesfiirstliche Stadt. Its privileges were confirmed by King Rudolf in 1281. Surrounded with walls and fosses in 1485, it was able in 1481 to de- fend itself against the Hungarians under Matthias Corvinus,

who attempted to get possession of his promised bride at refuge within. In 1529 and 1532 the Turks attacked it with as little success. As early as 1580 the Lutheran doctrine was preached in Gratz by Seifried and Jacob von Eggenberg, and in 1540 Eggenberg founded the Paradies or Lutheran school in which Kepler afterwards taught. But Charles II. burned 20,000 Protestant books in the square of the present lunatic asylum, and succeeded by his oppres- sive measures in bringing the city again under the authority of Rome. New fortifications were constructed in the end of the 16th century by Franz von Poppendorf, and in 1644 the town afforded an asylum to the family of Ferdinand III. The French were in possession of the place in 1797 and again in 1805; and in 1809 Marshal Macdonald, having in terms of the peace of Vienna entered the citadel which he had vainly besieged, blew it all up with the exception of the bell-tower and the citizens' or clock tower.

See Benditsch, Thopographische Kunde der Hauptstadt Gritz, Gritz, 1808; Polsterer, Graz und seine Umgebungen, Gritz, 1827; Baldauf, Geschichte der merk- wtirdigsten Begebenhetten in Gritz, Gritz, 1843; Schreincr, istor.-statist.-topogr, Gemdlde der Stadt Gratz und seine Umgebung, Gratz, 1843; Weidmann, J/lust.

Fremdenfiihrer durch Grdtz, 1856; Uwof and Peters, Griz: Geschichte und Topo-~ graphie, Gratz, 1876.

GRAUBUNDEN. See Grisons.

GRAUDENZ (Polish G'rudziadz), a town of Prussia, chief town of a circle in the province of West Prussia, government district of Marienwerder, is situated on the right bank of the Vistula, which is here crossed by a railway bridge, 18 miles §.8.W. of Marienwerder and 40 miles N.N.E. of Thorn. It has a Protestant and a Catholic church, a garrison church, two synagogues, a royal gym- nasium, a Catholic normal school, an Evangelical normal school, a city school of the middle grade, a higher female school, three hospitals, three orphanages, and a reformatory. The industries include ironfounding, brewing, dyeing, wool- spinning, and the manufacture of tapestry, cigars, shoes, and brushes. The population of the town in 1875 was 14,522, and including the fortress, 16,615.

Graudenz was founded about 1250, and received town rights in 1291. At the peace of Thorn in 1466 it came under the lordship of Poland. From 1665 to 1759 it was held by Sweden, and in 1772 it came into the possession of Prussia. The fortress of Graudenz, which since 1873 has been used merely as a barracks and a military depot and prison, is situated on a steep eminence about 13 miles north of the town and outside its limits. It was com- pleted by Frederick the Great in 1776, and has been rendered famous through its defence by Courbitre against the French in 1807.

GRAUN, Cart Hernricu (1701-1759), a celebrated composer, was born May 7, 1701, at Wahrenbriick in Saxony, the youngest of three brothers, all more or less musical. His father held a small post under Government, but he gave his children a careful education, Graun's

GR A=aGPRA

beautiful soprano voice was noticed at the school where he was educated, and soon secured him an appointment in the choir of the city of Dresden. His masters were Grundig and Petzold, and at an early age he composed a number of sacred cantatas and other pieces for the church service. He completed his studies under Schmidt, and profited much by the Italian operas which were performed at Dresden under Lotti, the celebrated composer. After his voice had changed to a tenor, he made his début at the opera of Brunswick, in a work by Schurmann, an inferior composer of the day ; but not being satisfied with the arias assigned him he re-wrote them, so much to the satisfaction of the court that he was commissioned to write an opera for the next season. This work, Pollzdoro (1726), and five other operas written for Brunswick, spread his fame all over Germany. Other works, mostly of a sacred character, including two settings of the Passion, also belong to the Brunswick period. It was there that Frederick the Great, at that time crown prince of Prussia, heard the singer, and immediately engaged him for his private chapel at Castle Reinsberg. There Graun remained for five years, and wrote a number of cantatas, mostly to words written by Frederick himself in French, and translated into Italian by Boltarelli. On his accession to the throne in 1740, Frederick sent Graun to Italy to engage singers for a new opera to be established at Berlin. Graun remained a year on his travels, earning universal applause as a singer in

the chief cities of Italy. After his return to Berlin he was appointed royal chapel-master, with a salary of 2000 thalers (£300). In this capacity he wrote twenty-eight operas, all to Italian words, of which the last, Merope (1756), is perhaps the most perfect. But of infinitely greater importance than these is his oratorio the Death of Jesus, which is still annually performed at Berlin. It is here that Graun shows his skill as a contrapuntist, and his originality of melodious invention. In the Italian operas he imitates the florid style of his time, but there also considerable dramatic power is occasionally shown in the recitatives. Graun died on the 8th of August 1759, at Berlin, in the same house in which, thirty-two years later, Meyerbeer was born.

GRAVELINES (Flemish Gravelinghe, German Grave- lingen), a fortified seaport town of France, in the depart- ment of Nord and arrondissement of Dunkirk, is situated near the mouth of the Aa, 11 miles S.W. of Dunkirk. The principal buildings are a church of the 16th century, the magazine, and the town hall. The harbour is only accessible at flood tide, but there is a considerable shipping trade,in fish, apples, vegetables, and eggs. Shipbuilding is also carried on, and there are salt refineries, sail and linen manufactories, saw millsand meal mills. The fortifications were constructed anew by Vauban in the reign of Louis XIV. For its defence the land, to the distance of a mile all round, can be laid under water at pleasure. The population in 1876 was 4182,

Gravelines was formed in 1160 by Count Thierry of Flanders, was conquered by the English in 1383, and came into the possession of the duke of Burgundy in 1405. It is celebrated for the victory gained by the Spanish under Egmont over the French under Mar- shal de Thermes, 13th July 1558. It was taken by the duke of Orleans in 1644, retaken by Archduke Leopold in 1652, and again taken by the French under Vauban in 1658, after which it was confirmed to France by the treaty of the Pyrenees in 1659.

_ GRAVESEND, a municipal and parliamentary borough, river-port, and market-town in the county of Kent, England, 18 Situated on the right bank of the Thames opposite Tilbury Fort, 30 miles below London by the river, and 24 miles by rail. It extends about 2 miles along the river bank,

occupying a slight acclivity which reaches its summit at Windmill Hill, whence extensive views are obtained of the river, with its windings and shipping. The older and lower part of the town is irregularly built, with narrow

and inconvenient streets, but the upper and newer portion contains several handsome streets, squares, and terraces. Gravesend is the boundary of the port of London, It has three piers, the town pier, erected in 1836, and belonging to the corporation, the terrace pier, built about 1840, and a new pier and station lately erected by the London, Til- bury, and Southend Railway Company. The town is a favourite resort of the inhabitants of London, both for excursions and as a summer residence. The principal buildings are the town-hall, a neat and conspicuous Doric edifice erected in 1836; the parish church of Gravesend, erected on the site of an ancient building destroyed by fire in 1727; Milton parish church, in the Late Decorated style, erected in the time of Edward II. ; the county courts, the clubhouse of the Royal Thames Yacht Club, thecustom-house, the assembly-rooms, the workmen's hall, the free grammar school, the almshouses for aged persons, and the dispensary and infirmary. East of the town are the earthworks designed to assist Tilbury Fort in obstructing the passage of an enemy's force. They were originally constructed on Vauban's system in the reign of Charles II., and some years ago they were strengthened at the cost of nearly £150,000. Gravesend has some import trade in coal and timber, and fishing, especially of shrimps, is carried on extensively. The principal other industries are boat-building, ironfounding, brewing, and soap-boiling. Fruit and vegetables are largely grown in the neighbourhood for the London market. Since 1867 Gravesend has returned a member to parliament. The municipal borough includes the parishes of Gravesend and Milton. The population of the municipal borough in 1871 was 21,265, and of the parliamentary 27,493.

Gravesend occurs in Domesday Book under the name Gravesham. It was burnt by the French in 1877. In 1573 it obtained a charter of incorporation from Queen Elizabeth, who also renewed the right, first conferred by Richard II., of regulating the " Long Ferry " (or passage from London) and

enacting a fee from the “ barges, till-boats, light-horsemen (hobellers), and wherries ” on the river.

GRAVINA, a city of Italy, in the province of Bari, is situated on a hill to the left of the river Gravina, 7 miles from Altamura, and 37 §.W. of Bari. It is surrounded by tower-flanked walls, and has a cathedral, and a castle which belongs to the Orsini family, of which the eldest branch still keeps the title of duke of Gravina. A great cattle fair is held in the town on April 20; a fine breed of horses is raised in the neighbourhood ; nitre is collected from the tufa rock of the district ; and cheese, macaroni, and earthen- ware are manufactured. Population in 1871, 14,194.

GRAVINA, Gtovannt Vincenzo (1664-1718), an Italian litterateur and jurisconsult, was born at Roggiano, a small town near Cosenza in Calabria, January 20, 1664. He was descended from a distinguished family, and under the direction of his maternal uncle, Gregorio Caloprese, who possessed some reputation as a poet and philosopher, re- ceived a learned education, after which he studied at Naples civil and canon law. In 1689 he came to Rome, where in 1695 he united with several others of literary tastes in forming the Academy of Arcadians. A schism occurred in the academy in 1711, and Gravina and his followers founded in opposition to it the Academy of Quirina. From Innocent XII. Gravina received the offer of various ecclesiastical honours, but declined them from a, disinclination to enter the clerical profession. In 1699 he was appointed to the chair of civil law in the college of La Sapienza, and in 1703 he was transferred to the chair of canon law. He died at Rome January 6,1718. He was the adoptive father of Metastasio.

Gravina is the author of a number of works of great erudition, the principal being his Origines Juris Civilis, completed in 3 vols. in 1718, and his De Romano Imperio, 1712. A French translation of the former appeared in 1775, of which a second edition was pub- lished in 1822, His collected works were published at Leipsic in 1737, and at Naples, with notes by Mascovius, in 1756.

GRAVITATION

I. GRAVITATION AT THE SURFACE OF THE EARTH. T is a matter of universal experience all over the earth that a heavy body tends to fall to the ground. Let us inquire into this in the first place by taking such a general view of the phenomenon as would be presented to an imaginary spectator who was sufficiently removed from the earth to be able to take a general view.

Fig. 1 represents a section of the earth bya plane which is drawn through its centre QO, Then, the earth being sufficiently near a sphere for our purpose, we may regard the section PQRS as a circle, where the points P,Q, R, 8 are the intersections of the lines OA, OB, OC, OD with the surface of the earth. If a A stone be dropped from a point A

above the surface of the earth, it

will fall to the ground at P. The

spectator would also notice that,

if a stone were dropped from B

or C or D, it would fall upon the

ground at the points Q, R, S re- ? Noh we 5 spectively, From A the stone

would appear to fall downwards,

from C it appears to move up-

wards, from B_ the spectator C

would see the stone moving to ‘

the left, while from D it appears Big: 4,

to move to the right. One feature of these motions could not fail to be noticed: they all tend to the centre of the earth. The spectator might

therefore sum up his experi- ence in the following statement :—

A body dropped from a point above the surface of the earth always falls in a straight line which ts directed to- wards the centre of the earth.

§ 1. Attraction.—The familiar instance of the action of a magnet upon a piece of iron will suffice to illustrate what is meant by the word attraction. In virtue of certain properties possessed by the iron and the magnet, they are drawn together. The magnet draws the iron, and the iron draws the magnet This particular kind of attraction is of a very special character, Thus, for example, the magnet appears to have no appreciable influence on a piece of wood or a sheet of paper, and has indeed no considerable influence on any known substance except iron.

By the attraction of gravitation, every body attracts every other body, whatever be the materials of which each is composed. In this we see a wide difference between the attractions of gravitation and that form of attraction which is known as magnetic attraction, Nor is the contrast between the ixtensities of these two different attractions less striking. 'The keeper of a magnet is drawn to the magnet by two different forces of attraction. The first of these is the gravitative attraction, which, so far as we know at present, would be equally exerted, whether the magnetism were present or not, The second is the magnetic attraction. The latter is enormously greater than the former ; in fact, under ordinary circumstances as to intensity aud dimensions, the intensity of the attraction of gravitation will not be nearly so much as a millionth part of the magnetic attrac- tion.

The intensity of the attraction of gravitation is indeed so small that, with one conspicuous exception, we can only become aware of its existence by refined and elaborate in- quiries. That any two objects—for example, two books lying on the table—do actually attract each other, there can be no doubt whatever ; but the intensity of this is so small that the attractive force cannot overcome the friction of the

table, and consequently we do not find that tle books are drawn together. It has, however, been found that the in- tensity of the attraction of gravitation between two masses is directly proportional to the product of those masses. Hence though the force is so small as to be. almost inappreciable between

two bodies of moderate dimensions, yet when the masses of the two bodies, or of even one of them, are enormously great, the intensity of the force will be sufficiently large to be readily discernible. In this way it is that the existence of the attraction of gravitation has been made known to us, and is, in fact, identified with our daily experience,—indeed, with our actual existence. The mass of the earth is so enormous that the attraction of gravitation which exists between it and an object near the surface is readily appreciable. It is this attraction of gravitation between the earth and any object which constitutes that force which is referred to when we speak of the weight of the body. It is the attraction of gravitation which causes bodies to fall to the surface of the earth; and it is easy to show that the facts already presented with respect to the direction in which a falling body moves are readily explained by the supposition that the motions are due to an attractive influence exerted by the earth, or, tospeak more correctly, to a mutual attraction subsisting between the earth and the body.

Let O be the centre of the earth, supposed to bea sphere, and let A be the position of a body above its surface. Then, when the body is released, the attraction must evi- dently cause the body to move along the line OA, The line OA, in fact, is directed along a diameter of the sphere, and there is really no reason why the stone should move to one side of the line more than to another. We thus see that attraction would always tend to draw objects in a direction poiuting towards the centre of the earth. The observed facts are therefore explained by the supposition that the earth possesses a power of attraction.

§ 2. Movement of a Falling Body.—Our knowledge of the force of gravitation being ultimately founded on observation and experiment, it will be convenient at this point to de- scribe the experiments by which a knowledge of the laws of motion of a falling body may be ascertained. We shall first describe these experiments, and then we shall discuss the laws to which we are conducted by their aid.

A beginner is apt to be surprised when he is told that a

| heavy body and a light body will fall to the ground in the

same time if let drop from the same height. Yet nothing can be easier than to prove this important fact experiment- ally, Take a piece of cork in one hand and a bullet in the other, and drop these two objects at the same moment from the same height. They will reach the ground together. Nor will the results be different if we try a stone and a piece of wood, If, however, one of the objects were a feather and the other were a stone, then no doubt the latter would reach the ground long before the former. But this arises from a cause quite different from gravity. It is the resistance of the air which retards the motion of the feather. Even the stone is retarded to a certain extent by the resistance of the air; but the feather, on account of its greater surface in proportion to its mass, is much more retarded. If we could get rid of the influence of the air, the stone and the feather would be found to fall to the ground in the same time, This can actually be veri- fied by performing the experiment (or a similar one) in a space from which the greater portion of the air has been withdrawn by the aid of an air-pump. But the same thing can also be shown in a much more simple manner.

GRAVITATION

Lay a small flat feather upon the top of a penny piece held horizontally. Then let the penny fall; it will be followed with equal rapidity by the feather, which will be found to remain in contact with the penny throughout the entire descent. In this case the penny piece displaces the air, and thus to a great extent shields the feather from the resistance to which it would be exposed without such pro- tection ; it is thus found that the two objects fall to the ground from the same height at the same tinue.

The various experiments to which we have referred suffice to establish the very important result that the tame occupied by a body in falling to the surface of the earth, af dropped from a point above tt, is independent of the mass of the body as well as of the materials of which the body 1s composed.

There are, no doubt, certain apparent exceptions to the generality of this statement. The law, as we have stated it, does surely not apply to the case of a balloon or a live bird. In each of these cases the air is made, directly or indirectly, to supply a force which overcomes the force of gravity and neutralizes its effects; but of there were no air, then the balloon and the bird would fall to the ground in precisely the same time as a 56 ib weight would

do when dropped from the same height. It will not be necessary for us to introduce any further reference to the resistance of the air, and we shall discuss the phenomena presented by falling bodies as they would occur in a space from which the air has been removed.

We have by these considerations cleared the way for a very important quantitative determination. Taking a given interval of time,—for example, one seoond,—we see that the height through which a heavy body will fall in one second depends neither upon the mass of the body nor on the materials of which it is composed. This is therefore a constant at any given place on the earth's surface for every description of body, and it is of fundamental importance to determine that quantity accurately. By an indirect method, founded on pendulum observations, it is possible to deter- mine this quantity with far greater accuracy than would be attainable by actually making the experiment. The value as thus found is slightly different at different parts of the earth though constant at each one. At any part of the United Kingdom it may be taken as 16:1 feet.

When the distance which the falling body moves over in the first second has been ascertained, it is possible to find the distance which will be accomplished in two seconds, or indeed in any number. The difficulty of the question arises from the circumstance that, as the velocity of the falling body is gradually increasing, the distance moved over inthe second second is greater than it was in the first, and generally that the distance in any second is greater than the distance accomplished in any previous second. Imagine the "lift" in a hotel to be a room 16:1 feet high ; then when the lift is at rest, a stone will take one second to fall from the top of the room to the floor. But now Suppose the experiment to be repeated, when the lift is either ascending or descending. It will be found that no matter what be the velocity of the lift, provided it remains uniform for a second, and no matter whether the lift be ascending or descending, the stone will still take exactly one second to fall from the ceiling to the floor.

To illustrate the important conclusions which can be drawn from this experiment, let us make some suppositions with reference to the velocity of the lift. Suppose that the lift is descending with a velocity of 5 feet per second. Then since it is found that the stone will reach the floor in one

second, it is manifest that during that second the stone must actually have fallen through a distance equal to the height of the room augmented by the 5 feet through which the floor of the room has descended. 'The total dis-

tance traversed by the stone is therefore 16°1+5= 21-1 feet. It is, however, to be observed that at starting the stone must necessarily have had the same velocity as the lift, z.e., 5 feet per second. The observed facts can therefore be explained by supposing that the stone retained its initial velocity of 5 feet per second, and that gravity acted upon the stone so as to draw it 16-1 feet nearer the earth than it would have been had gravity not acted. On the other hand, suppose that at the time when the experiment was made the lift was ascending with an uniform velocity of 5 feet per second. Then the actual distance travelled by the stone in falling will be less than the height of the ceiling by the distance through which the floor has been raised, 2.¢., 16°1-5=11:1 feet. Observation nevertheless shows that the time occupied in falling from the ceiling to the floor is still one second. The observed facts cau be explained by remembering that at the moment of starting, the stone must actually have had the same velocity as the lift, 7.e., an upward velocity of 5 feet persecond., If there- fore gravity had not acted, the stone would in one second have ascended through a vertical distance of 5 feet. The observations are therefore explained by supposing that gravity in this case also draws the body 16:1 feet nearer the earth in one second than the body would have been had gravity not acted.

By suitable contrivances it is possible to ascertain that a body dropped from rest will in a time of two seconds move over a space of 64°4 feet. We have already seen that during the first second the body will fall 16°1 feet. It follows that in the second second the space described by a body falling freely from rest is 64:4-16°1=48°3. It is thus obvious that the space described in the second second is three times as great as the space described in the first second. To what is this difference to be ascribed? At the commencenient of the first second the body was at rest; at the conclusion of the first second the body had attained a certain velocity, and with this velocity the body com- menced its motion during the second second. The total distance of 48°3 feet acconiplished during the second

second is partly due to the velocity possessed by the body at the commencement, and partly to the action of gravity during that second. By the principle just ex- plained, we are able to discriminate tle amounts due to each cause. It appears, from the experiments already re- ferred to, that during the second second as during the first the effect of gravity is simply to make the body 16°1 feet nearer the earth than it could otherwise have been. But the body moves altogether 48-3 feet in the second second, and as the action of gravity during that second will only account for 16:1 feet, it follows that the residue, amounting to 48°3 — 16°1 = 32:2 feet, must be attributed to the velocity accumulated during the first second.

We are therefore led to the very important result that a body falling freely from rest in the United Kingdom will have acquired a velocity of 32:2 feet per second when oue second has elapsed. It need not be a matter for surprise that, though at the close of the first second the velocity acquired is 32‘2, the distance moved over during that second is only 16°1. It will be remembered that the body starts from rest, and that while in the act of falling its velocity is gradually increasing. The body, therefore, moves much further in the last half of the second than it did in the first half, and consequently the total distance travelled must be less than the distance which would have been accomplished had the body been moving during the whole second with the velocity acquired at its termination.

It might not be easy to arrange a direct experiment to show how far the body will fall during the third second ; we can, however, deduce the result by reasoning from what we have already learned, Let us suppose that the lift

already referred to is descending with an uniform velocity of 32°2 feet per second.

The results at which we have arrived may be summarily stated in the following propositions :—

A body falling freely from rest acquires a velocity which as equal to the product of 32‘2 and the number of seconds during which the motion has

lasted.

A body falling freely from rest moves over spaces propor- tional to the consecutive odd numbers (1, 3, 5, 7, &c.) in each of the consecutive seconds during which the motion lasts.

A body falling freely from rest will, in a given number of seconds, move over a distance which is found by multiplying the square of the number of seconds by 161.

§ 3. Values of g.—The velocity acquired by a body in one second is usually denoted by the symbol g. The following are values of g at different parts of the earth (adapted from Everett On C.G.S. Units, p. 12):—

Value of g in |} Length in Feet

Feet per of Pendulum Second. |beating Seconds,

Latitude. |

IGMMAOTD:ccrnmen) sonessseeeer ae 0° 0’ 32°091 3°2514 Teatitude 45° oo. ec cas oe 45 0 32°173 3°2597 Viet Clipe …...aaeerneeeenet ete. 48 9 Sasi 3°2607 IPEWIEY Sagpsamensenoes. no aecadanee 32°183 3°2609 Taetan cies Soles aetna 32°191 3°2616

Mier Avid eee 32°191 8°2616 ieiiciesleceneeetie esses 82°194 3°2619 32°196 3‘2621

naan skanees 82°196 3°2622

Raaioits viveaeeacc ceive 82°199 8 ‘°2625 Teh ya oe OY Sracacannsqaobanoobe 55 57 32°2038 8‘2629 AD@rdCEH 4 sec ceesose se weeers 57 9 32°206 326382 PAOD CHOC ronan na 82°255 3°2682

The value of g in feet at a station of which the latitude is a, and

which is feet above the level of the sea, is in feet

9g =82°‘173 — 0°082 cos 2A —0°000003A. _ The length of the pendulum in feet which vibrates in one second

18

1=3°2597 — 0°0083 cos 2a — 0°000000A. g is really the excess of gravitation over the centrifugal force arising from the earth’s rotation. The value of gravitation alone is given by the following expression :—

32°225 —0°026 cos 2a.

§ 4. Algebratcal Formule.—The employment of the symbols and

operations of algebra will enable us to express very concisely the results at which we have arrived.

GRA VTP ATION

J.et v denote the velocity acquired in ¢ seconds by a body which has been dropped from a state of rest. Let s denote the number of feet over which the body has moved. The laws we have arrived at may be thus expressed :—

O=aGEe Ss oge: From these equations we can eliminate ¢ and obtain vr = 298.

This expresses the velocity acquired in terms of the distance through which the force has acted.

We have hitherto considered the movement of a falling body which was simply dropped, It remains to determine the effect on the movement of the body which would be produced by a certain initial velocity. Let us for simplicity take the case of a body thrown vertically downwards, ants calculate the distance through which the body will move in a certain time, as well as the velocity which it will acquire. Inthe act of throwing the hand moves with a certain velocity, and the body when released starts off with that velocity. It will thus be observed that the act of throwing is merely to impart initial velocity to the body. Let v’ be the initial velocity with which the body leaves the hand, Then the velocity of the body at the moment of

starting is precisely the same as it would have been had it been dropped from rest v'~-g seconds previ- ously. The velocity acquired at the end of ¢ seconds is therefore the same as would have been acquired by a body which fell from rest for a period of (v'+-g+¢) seconds ; whence we have.

v=9(v +g+t) =v' + gt The distance must obviously be equal to the difference between the distance through which the body would drop from rest in (v'+-g+#) seconds and the distance through which a body would drop from rest in og seconds; whence s='bg(v'~~g t) — '5g(v'~~-gP

*= '5g(v? +9? + Qvt+g 4+ t?) — *5g(v'2+-9")*

=v't+ 'bgt?

The case of a body projected vertically upwards scems at first to present somewhat greater difficulties, but this is not really the case. Such problems can always be readily solved by the help of the following general principle : —

A body moving vertically for t seconds will, at the end of that time, be '5gt? feet nearer the earth than ut would have been had gravity not aeted,

If the body be projected vertically upwards with an initial velocity v', then, if the influence of gravity were suspended, the body would in ¢ seconds ascend to a height ot in accordance with the first law of motion. The effect of gravity will be to reduce the height actually obtained by the amount '5gi7. Whence we have

s=vt— '5gt? This expression may be written in the form s=V2+ 2g — '5o(t-—v'+g). It is therefore obvious that the greatest altitude / is attained when*

t=v'-+9 ; in which case

h=v?—29, or v?= 29h.

As an illustration we may take the case of a body thrown verti- cally upwards with an initial velocity of 40 feet per second, and in- quire where that body will be at the end of two seconds. Had gravity not acted, the body

would, in two seconds, have ascended to a height 2× 40=80 feet. The action of gravity will reduce this by ‘592?=2g feet, and hence the actual height of the body will be 80 — 2g feet, =15°6 if g be taken at 32:2.

§ 5. Motion of a Projectile.—We have hitherto referred only to the motion of a falling body in a vertical line ; it will now be neces. sary to examine some cases in which the motion of the body is not sorestricted. From a pointon the mast of a steamer g—2 feet above the deck a ball is dropped, which falls upon the deck at a certain point. When the steamer is at rest the time taken by the ball to fall will of course be one second, and its path will be vertical ; but when the steamer is moving with uniform velocity it is found that the ball still falls precisely on the same spot of the deck as when the steamer was at rest, and that the time occupicd in the descent is still one second. It is obvious that in this case the ball does not move in a straight line at all, but in a curved path due to the motion of the vessel compounded with the actual falling motion. We there- fore see that the effect of the motion of the vessel on the ball was to project that ball with a certain initial horizontal velocity, but that notwithstanding that initial velocity the ball still reaches the a in onesecond. We are therefore led to the general conclusion

at ;

A body projected horizontally will, at the end of t seconds, have fallen through a space of 16°1 t? feet.

An experiment illustrating this result may be made in an exceed- ingly simple manner. Take a marble in each hand, and throw one of the marbles horizontally at the same time as you drop the other

from the same height ; you will find that the two marbles reach the ground together. Suppose for simplicity that the height at the moment when the marbles are released is 4 feet, then the time taken by one of the marbles in falling is half a second. But as both marbles reach the ground together, the experiment has really proved to us that a body at the height of 4 feet from the ground will if pro- jected horizontally reach the ground in half a second.

This is equally true whatever be the magnitude of the velocity, ¢.¢., whether it be 5, 10, or any other number of feet per second.

We have now studied the effect of gravity upon a body which has been projected either in a vertical line orin a horizontal line. We have found that in each case the effect of gravity is to bring the body '5gé? feet nearer the surface of the earth in ¢ seconds than it would have been had gravity not acted. We are therefore tempted to inquire whether the same statement would not be true for a body projected in any direction. In every way in which this suggestion can be tested it has been found to be verified, and there cannot there- fore be the slightest doubt that it is true.

To illustrate this principle we may apply it to the case of a body projected in any direction, and deduce the form of the path in which the body moves. Let O (fig. 2) be the point from: which the body is projected, and let OP be the direction in which the body would move after projection if it were not for gravi- tation. In consequence of the first law of mo- tion, we should find that if it had not been for the action of gravity the ball would reach P, in one second, P, in two seconds, &c., where OP, =P,P, =P. P; eee Gravitation will, how- ever, make the body ere from the direc- tion. OP,|P,, &c., 80 . that at the end of one Fig. 2. second the body is really found at the point A,, at the end of two seconds at A», at the end of three seconds at As, &c. The curve drawn through the points A,, Ay, A3, &c., which is actually de- scribed by the body, can be readily constructed. Take, for example, t=3. If gravity had not been acting, the body would in three seconds have reached the point Ps. We can find where the body actually is by taking a point Aj, which is vertically beneath Ps at the distance 16°1 × 3? feet. Similarly we can find where the body is after any other specified number of seconds, and thus we obtain the points A,, A,, &c.

The equation of the curve is thus found. Take the line OP as the axis of x, and let x denote the number of seconds during which the motion has lasted ; then, if y denote the vertical distance through which the body has been deflected by gravity, we must have

y=v'" — '5gx?, This curve, being of the second degree, represents a conic section ; and as the highest terms form a perfect square, the conic section must be a parabola.

II. Toe CentTreE oF GRAVITY.

§ 6. Centre of Gravity of a Plate.—In studying the effect of gravity upon a body which is at rest, it will be convenient to commence with a simple illustrative experiment which can be easily tried. Out of a piece of cardboard or tin plate a figure of any shape, ABCDE (fig. 8), is to be cut. A few holes, A, B, C, D, E, are to be punched quite at random in this plate. In the wall is a nail, and the plate can be suspended by passing the nail through any of the holes A, B, and C. From the nail is suspended, in front of the plate, a cord AH, which is kept in the vertical direction by the plummet attached to it at H. As the plate is not supported in any other way, it hangs quite freely from the nail; and if it be displaced and then released, it will, after a few oscillations, settle down again in the position which it occupied at the first. In order to mark this position, it is desirable to draw a line on the plate in the i direction AP, indicated by the plummet line Fig. 6. which is hanging in front. If the plate be blackened, this can be neatly done by chalking the plummet line and then giving it a flip against the plate.

When the line has been drawn the plate may be removed from the nail, and again suspended by one of the other holes in its margin, for example B. The plate again assumes a definite position, and again the line and plummet is to be hung on, and a second line drawn as be- fore. The two lines drawn on the plate intersect ata point P. When

the plate is hung from a third hole, C, and a third plummet line is drawn, a very remarkable result is perceived. It is found that the line drawn on the third occasion passes through the intersection of the two former lines,—that is to say, all the three lines pass through the point P. Repeating the operation, with other holes, D, E, &c., it is found that all the lines drawn in the way we have described pos- sess the remarkable property of passing through one definite point of the plate. It is therefore manifest that the point P possesses a very special property, for it is always situated vertically beneath the point of suspension when the plate is hanging at rest.

If a hole be actually punched at the position of the point P, and if the plate be suspended by passing this hole over the nail, we then find that the plate

will remain at rest in any position whatever. This peculiarity of the point P will be more readily perceived if we make a hole in the plate at a point Q near to P. When the plate is sus- pended from g it will only be at rest in one position, 7.c., when P is vertically beneath Q.

It must surely be regarded as a matter worthy of careful notice that any plate of any figure, regular or irregular, should contain one specific point which enjoys the unique properties which the experi- ments show to be possessed by the point P. This point has received a name ; it is called the centre of gravity.

§ 7. Centre of Gravity of a Rigid Body.—In the illustration we have just given, we have spoken merely of a thin plate, because the experiments were more easily conducted in a body of this nature than in one of entirely irregular form. It must not, however, be supposed that a thin plate of uniform thickness is the only kind of body which possesses a point having the properties we have de- scribed. Nomatter what be the shape or materials of which a rigid body is composed, it possesses a centre of gravity. Jet ADBC (fig. 4) be a body of any kind, and let it be suspended by a cord from a point A. Then when the body is at rest it assumes a certain position. We may suppose that a verti- cal hole AB is drilled through the body in the direction of the cord by which the body is suspended. If we now suspend c the body by another point on its surface, C, the body will come to rest in the position

which is represented in fig. 5. A

It will be found that these two Ac : straight holes intersect in the © D

interior of the body at G. In

fact, if we thrust a knitting S D needle through one of the Fig. 4. Fig. 5.

holes, and then attempt to thrust a second knitting needle through the other hole, we shall find that the way is stopped in the interior of the body by the first knitting needle. If the body be now suspended from any other point on its surface, and if asimilar hole be made through the point and in the direction of the string by which the body is suspended, it will be found that

this hole also passes through the intersection of the two former holes. From each and every point of suspension the same result is obtained, and thus we are led to the conclusion that in a rigid body of any shape or materials whatever there is one point which possesses the remarkable property thus stated :—

When a body suspended by a cord from a fixed point is at rest, there is one special point which is always vertically beneath the point of sus- pension, whatever may be the point of the body to whieh the cord is atiached. This point is called the centre of gravity.

In the case of a homogeneous body of regular shape, the centre of gravity is determined from the most simple considerations of symmetry. In the case of a sphere it is obvious that the centre of gravity must lie at the centre, for there is no other point symmetri- cally related to the figure. In the case of a parallelepiped the centre of gravity is also situated at the centre of volume. This is found by joining the opposite corners of the figure, and thus making a diagonal ; joining another pair of opposite corners we have a second diagonal; and the intersection of these two lines gives the centre of gravity of the mass.

§ 8. Gravitation of a Rigid Body reduced to One Foree.—A body of any description may be considered to be composed of an innumerable multitude of small particles of matter. Each of these particles is acted upon by the attraction of the earth. Each particle is there- fore urged towards the earth by a certain force which tends towards the earth's centre. The centre of the earth being nearly 4000 miles distant, the directions of these forces may, for all practical pur- poses, be regarded as parallel. Even if two particles were a mile distant, the inclination of the directions of the two forces is under a minute. We may therefore treat the forces as parallel without making any appreciable error. Two parallel forces may be com- pounded into a single force which is parallel to the two components. The forces acting on the two particles of the body may therefore be replaced by a single force. This force may be similarly compounded with the force acting on a third particle of the body, this resultant with the force on a fourth particle, and so on until all the particles

have been included. We thus come to the important conclusion that the effect of gravity upon a body of any shape is to produce one force which acts vertically downwards. It remains to be shown that the direction of this force passes through the centre of gravity of the body. Suspend a body of any shape by a cord, then when the body is at rest the centre of gravity must lie vertically beneath the point of suspension. If the direction of that one force which constitutes the effect of gravity does not pass through the centre of gravity, then its line of action cannot coincide with the direction of the cord of sus- pension ; but it is impossible that two forces should equilibrate unless their lines of action are coincident, whence we are led to the import- ant conclusion that the effect of the attraction of the earth upon a rigid body is to produce a single force which passes througn the centre of gravity of the body and acts vertically downwards.

III. UNIVERSAL GRAVITATION.

§ 9. Law of Gravitation between Two Masses.—Investigations of the motions of the planets have conducted us tothe conclusion that each planet is attracted towards the sun by a force which varies according to the inverse square of the distance. We likewise see that each of the satellites appears to be attracted towards the correspond- ing primary planet by a force which obeys the same law. We are therefore tempted to generalize these results into the proposition that any two masses in the universe attract each other with a force which varies according to the inverse square of the distance. Obser- vations of the most widely different character have combined to show us that this law, which was discovered by Sir Isaac Newton, is true. It is called the law of Gravitation.

We suppose that the distance between the two bodies is so exceed- ingly great compared with their dimensions that we may practically consider each of the bodies as a particle.

Let m, 7’ be the masses of the two bodies, and let 7 be the dis- tance. The force with which m attracts m’ is equal in magnitude though opposite in direction to the force with which m’ attracts m. The reader may perhaps feel some difficulty at first in Ss the truth of this statement. We speak so often of the effets which the attraction of the sun produces on the planets that it may seem strange to hear that each planet reacts on the sun with a force pre-

cisely equal and opposite to the force with which the sun acts upon the planets. We can, however, by the aid of a simple illustration, chow that such is really the case. Suppose the sun and the earth to be placed aé rest in space, and abandoned to the influence of their mutual gravitation. It is evident that the two bodies would begin moving towards each other, and would after a certain time come into collision. If, however, the earth and the sun had been separated by a — rod, it would then be impossible for the two bodies to move closer to each other, so we must consider whether any other motion could be produced by their mutual attraction. As the two bodies were initially at rest, it is clear that there will be no tendency of the rod to move out of the line in which it was originally placed, and consequently if the rod begin to move at all it must move in that line, and carry with it the earth at one end, and the sun at the other. As, however, the earth and the sun would remain separated at a constant distance, the statical energy due to their separation would remain constant, and therefore if they began to move we should have the kinetic energy of their motion created out of nothing, which is now well known to be impossible, It therefore follows that, under the cirsumstances we have assumed, the rod would remain for ever at rest. But what are the forces which act upon the rod? At one end of the rod the earth presses upon it with a force which is equal to the attraction of the sun upon the earth, At the other end the sun presses upon the rod with a force which is equal to the attraction of the earth upon the sun, But since the rod remains at rest, these two forces must be equal and opposite, and hence the force with which the sun attracts the earth must be equal and opposite to the force with which the earth attracts the sun,

If we express the gravitation of two masses in the form

Sm, mr", then m and m' must enter symmetrically into the expression, for if the two masses were interchanged the gravitation must not be altered.

We should here also advert to a circumstance connected with gravitation which is of the very highest importance. Suppose we take two definite masses (for simplicity, two pounds) separated at a definite distance (for simplicity, one foot), then the gravitation of these two masses to each other is a certain definite force (which we shall subsequently calculate). What we want here to lay special stress upon is that, so far as we know at present,

this force appears to be the same whatever be the material of which the two masses are composed. Thus two pounds of iron at a distance of one foot attract each other with the same force as a pound of iron would attract a pound of lead at the same distance. The signifi- cance, or perhaps it should be said the vast importance, of this statement is apt to be lost sight of from a somewhat peculiar cause. It must never be forgotten that, when it is asserted that two masses are equal to each other, what is really meant is that, if equal

forces were to act upon each of the masses for the same time, the masses would receive the same velocity. As this test of the equality of masses is not practically convenient, the weighing scales have come into use for the purpose ; and though it appears to be true that when two masses have equal " weights," as tested by the scales, then the masses are themselves equal, yet this is so far from being an obvious or necessary truth that it really is the most remarkable phenomenon connected with gravitation. The expression for the gravitation of two attracting masses must therefore depend solely upon their masses, upon their distance, and upon some specific con- stant which is characteristic of the intensity of gravitation. Experiment shows that the gravitation of a body towards the earth is directly proportional to its mass, and hence we see that the

expression ' Sym!) 19

must be proportional to m, and as f (m, m') must be unaltered by the interchange of m and m', it appears finally that the gravitation of the two masses is FF

emm' <-r?, whence ¢ is a numerical constant which is equal to the gravitation of two units of mass placed at the unit of distance. To form a de- finite conception of the intensity of this force, we take some specific instances. It can be shown that two masses A and B, each contain- ing 415,000 tons of matter, and situated at a distance of one statute mile apart, will attract each other with a force of one pound. If the masses of A and B remain the same, and if the distance between them be increased to two miles, then the intensity of the force with which the two masses gravitate

together is reduced to one quarter of a pound. If either of the masses were doubled, the distance being unaltered, then the force would be doubled. If both the masses were doubled, then the force would be quadrupled.

§ 10. Motion of a Planet round the Sun.—The effect of gravi- tation when the bodies are in actual motion must next receive our attention. It may so happen that in consequence of the attrac- tion of gravitation one of the bodies will actually describe a circle around the other, so that, notwithstanding the effect of the attrac- tion, the distance between the two bodies remains constant. We shall first explain, by elementary considerations, how it is possible for a planet to continue to revolve in a circular or nearly circular orbit about the sun in its centre ; and then we shall proceed to the more exact consideration of the form of the orbit, and the laws according to which that orbit is described.

Let S represent the sun (fig. 6), and let T be the initial position of the planet. If the planet be simply released, it will immediately begin to fall along the line TS into the sun. If, on the other hand, the planet were initially projected _ along the line TZ perpendicular to Z Ca TS, the attraction of the sun at S will defiect the planet from the line TZ which it would otherwise have followed, and compel the planet to move in a curved line. The parti- cular form of curve which the planet will describe depends upon the initial velocity. With a small initial velo- city the deflecting power of the sun will have a more speedy effect than Fic. 6 is possible when the initial velocity 1a Ve is considerable. The rapidly curving path TX will therefore cor- respond to a small initial velocity, while the flatter curve TY may be the orbit when the initial velocity is considerable. As the move- ment proceeds, the velocity of the planet will generally alter. Ifthe

lanet were moving along the curve TY, it is at every instant after eaving T going farther away from the sun. It is manifest that the planet is thus going against the sun's attraction, and therefore its velocity must be diminishing. On the other hand, when the planet is moving along the curve TX, it is constantly getting nearer tho sun, and the effect of the sun's attraction is to increase the velocity. It is therefore plain that for a path somewhere between TX and TY the velocity of the planet must be unaltered by the sun's at- traction. With centre S and radius ST describe a circle, and take a point

P on that circle exceedingly near to T. With a certain initial velocity it is possible to project the planet so that it shall describe the are TP. The attraction of the sun always acts along the radius, and hence in describing the arc TP the planet has at every instant been moving perpendicularly to the sun's attraction. It is manifest that under such circumstances the sun's attraction cannot have altered the velocity, for it would be impossible to give a reason for the velocity having been accelerated which could not be rebutted by an equally valid reason for the velocity having been retarded. We thus see that the planet reaches P with an unchanged velocity, and at that point the Siveteion of the motion is perpendi- cular to the radius. It is therefore clear that after passing P the planet will again describe a small portion of the circle, which will again be followed by another, and so on, 7.e., the planet will con- tinue to move in a circular orbit. We have therefore shown that, if a planet were originally projected with a certain specific velocity

in a direction at right angles to the radius connecting the planet and the sun, then the planet would continue for ever to describe a circle around the sun.

§ 11. On the Elliptic Motion of the Planets.—The laws of the motions of the planets were discovered by Kepler by means of cal- culations founded upon observations. They may be thus stated :—

1. Each planet moves in an ellipse in one focus of which the sun as situated.

2. The radius vector drawn from the sun to the planet sweeps over equal areas in equal times.

8. The squares of the periodic times of the motions of the planets round the sun are in the same ratio as the cubes of their mean distances.

These three laws form the foundations of that branch of astronomy which is called Physical Astronomy, and they are generally known as Kepler's Laws.

The sun and the planets are all very nearly spherical, and for the present, whenever we speak of the motions of the sun or the planets, we are to understand the motions of the centres of the corresponding spheres. Indeed the diameters of these spheres are so small in comparison with the distances at which they are separated from each other, that we may generally regard them as mere physical points. Thus though the diameter of the sun is ten times greater than the diameter of the greatest planet, Jupiter, yet the sun's dia- meter is only the forty-second part of its distance from the nearest planet, Mercury, and it is less than the three-thousandth part of its distance from the outermost planet, Neptune.

The orbits of the planets are so little eccentric that at a first glance the majority of them appear to be circular. Among the larger planets the orbits of Mercury and of Mars have the greatest eccen- tricity, being about } and ¥, respectively. Next to these comes the orbit of Saturn, which has an eccentricity of fy. Nextin order come Jupiter, Uranus, the Earth, Neptune, and Venus, with eccentricities of +, 7, vy, rts, ris respectively. The orbits of some of the minor planets are, however, much more ecceutric.

§ 12. The Hodograph.—In discussing the actual motion of a planet around the sun, it is very convenient to introduce the elegant con- ception of the hodograph. The use of this curve is originally due to

A

Fig. 7. Bradley, but for its practical development we are principally indebted

to Sir W. R. Hamilton. Let AB (fig. 7) bea portion o particle P acted upon by any forees. From any point O draw radii vectores OR,, OR,, ORs, OR, (fig. 8), parallel to the tan- gents to the curve AB drawn at the gmap yp itrag gs kas) ACL equal to the velocities at those oints. Thenthecurve R,R,R,R, s the hodograph of the orbit of P. To each position P of the 9 particle in the path there is a corresponding point R in the hodograph ; and simultaneously with the motion of P in its orbit we have the motion of R in the hodograph.

The utility of the hodograph depends upon the theorem that the force which acts upon the particle is at any time equal and parallel to the velocity of the

corresponding point in the hodograph. This theorem is thus proved. Let P, and Ps, and therefore R, and Ry, be very close together. The velocity imparted to the particle in passing from Py to P; in the small time 8¢ must, when compounded with the velocity OR,, produce the velocity OR;. This increment of velocity must therefore be equal and parallel to R,R3. If there- fore v denote the velocity of R, we have vdt for the velocity ac- quired in the time 8¢. The force acting on P must therefore, by the second law of motion, be equal to v and parallel to the line R,R,, "Se ultimately coincides with the tangent. The theorem is there-

ore proved.

a ps 3 s second law states that in the movement of a planet around

4 sun the radius vector from the sun to the planet describes equal eas in equal times, It can be shown that when this is the case

the path of a Ry

*Sa neweees**"*

iRe

Fig. 8.

71

the force which acts upon the planet must necessarily be directed towards the sun. Let the planet be supposed to move from P to P' (fig. 9) in the time ¢ with the velocity v. Then, since equal areas are described in equal times, we must have the area OPP' equal to hat, where h is a constant which represents the area described in the unit of time, Let fall OT perpendicular upon the tangent at P, then v'OT=2h. We therefore infer that the velocity of a planet is

Q

0

Fig. 9.

inversely proportional to the perpendicular .et fall from the centre of the sun upon the tangent to the orbit. Produce OT to Q, so that OT x OQ is constant ; the radius vector OQ will therefore be pro- portional to the velocity ; and as OQ is perpendicular to the tangent at P, it follows that the locus of Q must be simply the hodograph turned round through 90°. Draw two consecutive tangents to the orbit, and let Q, and Q, be the corresponding points (fig. 10). Then since OT, x OQ, = OT, x 0Q,, the quadrilateral T,Q,0,", is inscrib-

able in a circle, and therefore the engles 0Q,Q, and OT,T, are Q,

oO Fig. 10.

equal; whence it is easily seen that Q,Q, is perpendicular to OP. It follows from the principle of the Listogapk: that the force on P must be directed along OP.

Let F (fig. 11) be the focus of the ellipse in which, according to Kepler's first law, the planet is moving, then, from a well-known property of the ellipse, the foot of the perpendicular FT let fall from Ff on the tangent drawn to the ellipse at the point P lies on the circle of which the diameter is the axis major of the ellipse. The line FT cuts the circle again at Q, and as FT x FQ is constant, the radius vector FQ must be con- stantly proportional to the velocity, and there- fore the hodograph will be the circle TAQ turned round through 90°. We | have already shown that the tangent to the hodo- graph is parallel to the force. The line CQ must therefore be parallel to FP. If6@ be the angle PFC, then, in conse- quence of the law of equal description of areas in equal times, FP2d@ + dt must be con-

Fig. 11.

stant, and therefore d@+dt must vary inversely as FP?; but the velocity of Q will be proportional to d@+dt ; hence the velocity of Q, and therefore the force, will be inversely proportional to FP?. In this way it is shown that the planets are attracted by the sun with a force which varies inversely as the square of the distance.

§ 13. The Problem of Three Bodies. —We have pointed out that the motion of a planet is determined by the mutual attraction which ex- ists between the planet and the sun. It follows, however, as a necessary consequence from the law of universal gravitation, that each planet is attracted not only by the sun but by every other planet, and indeed, so far as we know, by every other body in the universe. The effect of the attraction of the sun preponder- ates so enormously over the other attractions that the obedience of the planets to Kepler's laws, which would be perfect were the sources of disturbance absent, is still so nearly perfect that the departure therefrom can only be perceived either by very accurate or by very long-continued observations. The refinements of modern observations have, however, brought to light a very large number of perturbations, as they are called, in the motions of the planets and their satellites, which are due to the interference of other bodies. The explanation of these different perturbations by the law of universal gravitation has proved in the great majority of cases triumphantly successful.

In any problem where perturbations are involved, we have at least three bodies, viz., the principal body 8, a body P which circu- lates around 8, and a disturbing body P'. If we had only the two bodies 8S and P to consider, then P would describe around 8 a conic section, of which S was the focus, and the radius vector SP would sweep over equal areas in equal times. By the introduction of the third body P', which attracts both the former bodies S and P, the motion is deranged, the orbit which P describes is no longer a conic section, and its radius vector has ceased to describe equal areas in cqual times. The general case of this problem, as we have here described it, is one of excessive complexity. It is, however, a fortu- nate circumstance that, up to the present time, astronomers have had but little occasion to attack the problem in its general form,' In the solar system we have a great number of different problems of perturbations to discuss, but there is one feature common to all these problems. This feature is that the perturbing force ts very small in comparison vith the primary force, by which the motion of the disturbed body ts controlled. In consequence of this peculiarity, the problems of perturbations in the solar system become greatly simplified. The circumstances of the orbits of the planets and their

satellites are also happily such as to furnish additional facilities in the solution of the problems of perturba-~ tions. The eccentricities of the orbits are small, and in nearly every case the inclinations are small also. The problems of perturba- tions in the solar system are consequently adapted for the methods of successive approximation; but we should perhaps warn the reader that, even with the assistance so fortunately rendered by the circumstances of the case, the problems are still among the most difficult to which analysis has ever been applied.

Tet 8, P, P (fig. 12) denote the three bodies of which the masses are M, m, m'. Let the dis- tances SP, SP', S PP' be denoted by # pe Te

Fig. 12. spectively; then if ¢ denotes, as before, the gravitation between two units of mass separated by the unit of distance, we have

on § the forces 'es and i along SP and SP' respectively ;

,

on P the forces Pe and pal along PS and PP" respeotively ; r p

lg c

on P' the forces ro and — along P'S and P'P respectively. p

In the problem of the perturbation of a planet which is moving

around the sun, the absolute motion of the planet in space is not

what we are concerned with; what we do require is the relative

motion of the planet with respect to the sun.

Suppose that we apply to cach wnit of mass of the three bodies, forces equal to emr- parallel to PS and em'r'-? parallel to P'S, then it is clear that, from the second law of motion, each unit of mass of the system will receive in a small time, so far as these forces are concerned, equal and parallel velocities, and therefore the rela-*

tive motions of the three bodies will not be altered by the introduc- tion of these forces.

1 There can be little doubt that in the case of multiple stars the problem of three or more bodies would often have to be faced in all its ruggedness, but the observations which would be required are certainly wanting, and probably unattainable.

GRaAaVYiT ATION

But these forces will, so far as the body S is concerned, amount to eMm-+7r? and eMm'—r" in the directions PS and P'S respectively, and will therefore neutralize the attractions of P and P' upon 8. It follows that, so far as the relative motions only are concerned, we may consider the body S as fixed, while the body P is acted upon by the forces

em(M+m)~+7? on PS enum' +p? on PP' emm'-—_r'? parallel to P'S, with of course similar expressions for the forces on FP".

The problem of perturbation is therefore reduced to the determina- ee a motion of P in obedience to these forces, while 8 regarded as fixed.

It is plain that, in order to find the motion of P, we should know the motion of P', which is itself disturbed by P; but as the effect of the perturbation is small, we may, without appreciable error, use the place of P', derived on the supposition that the motion of P' is undisturbed, for the purpose of calculating disturbances caused by P' in the motion of P. We shall therefore suppose that the orbit of P' is an ellipse which is described around the focus 8 in consequence of an attractive force em(M-+m")+r" directed towards 8.

In computing the disturbed motion of P we transform the three given forces into three equivalent forces, which will be more con- venient for our purpose. We take first a force T directed along the radius vector ; secondly, a force V perpendicular to the radius vector, and lying in the plane of the orbit ; and, thirdly, a force W, which is normal to the plane of the orbit. Tis to be regarded as positive when it endeavours to increase the distance between P and 8; V is to be regarded as positive when it tends to move P to

the same side of the line PS as that in which the direction of its motion tends to carry it; and W is to be regarded as positive when it tends to raise P to the north of the plane of its orbit,

p’

oo 2

Fig. 13.

From P’ (fig. 13) let fall a perpendicular P’Q upon the plane of the undisturbed orbit of P, and let fall from Q a perpendicular QR upon the line SP. The force along PP’ can be resolved into a com- ponent parallel to QP’ and another parallel to QP; and the latter can again be decomposed into components parallel to RQ and RP. Hence we have, as the equivalents to the force on PP’, the following three forces which form parts of T, V, W respectively :—

mum! mum’ mm —a PR; ~“F OR; + OP In a similar manner we find for the components of the force parallel

to SP, the following three forces which form parts of T, V, W respectively :—

emm

+ — a QR ‘

Hence we deduce the following expressions :—

enun! os

mm! SR; – ye QP j

— em({M +m) _ em DR -. EMM or

Po) pe 73 _ emn’ emm’ v= ~ —5-QR + —-QR.

p emm’ emn’ w= + QP TOP.

Let the line SO, from which the longitudes are reckoned, be drawn in the plane of the undisturbed orbit of P. Let the longi- tudes of P and P' be J, l' respectively, ard let the angle P'SQ or the latitude of P' be denoted by 0', then we have

QP'=7' sin 0'; SQ=7' cos U'.

RQ =S8Q sin (/'— 1) =r' cos 0' sin (W'- 2). SR =SQ cos (Z —2)=7" cos 8' cos (1'~ 1), PR=r-r' cos U' cos (Z'- 2).

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With these substitutions, we have for the values of T, V, W, the following expressions :—

,

T= — tal ema za)" cos b cos (1-1) -S2 r es ; '

Va enm'(5 – za)? cos 0' sin (J -—7'). W= enm'(– aye sin 0', p

It will be noticed that the first term of the expression for T con- sists of the force which corresponds to the purely elliptic motion. The two remaining terms in T, as well as the whole of V and W, depend upon the disturbing force, as is evident from the circum- stance that they contain m' as a factor, and would vanish if m' were equal to zero. As 0' is small, we may neglect its squares and higher powers, so that

cos b'=1 and sin b'=0'.

When these substitutions are made, we see that the expressions for T and V are both independent of 0'; and consequently we may, so far as these forces are concerned, consider the motions of the dis- turbing and the disturbed body to take place in the same plane.

The expression for W contains, however, the first power of the latitude of the disturbing body. This is of course connected with the circumstance that it is only in consequence of the disturbing force W that the disturbed body is induced to leave the plane of its undisturbed motion at all.

§ 14. Calculation of Disturbed Motion.—Observation has shown that, notwithstanding the perturbations, the orbit of each planet differs but little from a circle, of which the sun is the centre. It is further shown by observation that, though the rate at which a planet moves in its orbit is not quite constant, it is still very nearly so. We may make a similar statement with reference to the motion of the moon around the earth. The orbit of the moon is nearly a circle, of which the earth is the centre, and the velocity of the moon in its orbit is nearly constant. These features of the motions of the planets and the moon enable us to replace the more exact formule by approximate expressions which are much more convenient, while still sufficiently correct.

Let p, @ be the polar co-ordinates of a celestial body which moves nearly uniformly in a nearly circular orbit. The form of the orbit may be expressed by an equation of the type

I (p, 9) =0. It will, however, be more convenient to employ two equations, by means of which the coordinates are each expressed directly in terms of the time. We thus write two equations of the form

p=Si(t), O=falt) 5 and by elimination of ¢ from these equations the ordinary equation in polar coordinates is ascertained. With reference to the forms of the functions 7, and f,, we shall make an assumption.

Let x1, X2, &c., be arbitrary angles ; w,, we, &c., arbitrary angu- lar velocities; a, a, &c., small arbitrary linear magnitudes; and 7, M2, &c., small numerical factors. a@ is an arbitrary linear magni- tude, and w is an arbitrary angular velocity. We shall asswme that

p=A4+a, COS (wb-+ x1) g COS (wat- Xq) +, &e. O=wt+m, Sin (wt + x1) +g Sin (web+xX~) +, &e.

To justify our employment of these equations it would really be sufficient for us to state that, as a matter of fact, the motions of all the heavenly bodies which are at present under consideration are capable of being expressed in the forms we have written. It may, however, facilitate the reader in admitting the legitimacy of this assumption, if we point out how exccedingly plausible are the a priori arguments which can be adduced in its favour.

The orbits of the celestial bodies are approximately circular, and consequently p must remain approximately constant. The value of p 18, in fact, incessantly fluctuating between certain narrow limits which it does not transcend. Thus p is what is called a periodic Junction of the time. It is necessary that the mode in which the time ¢ enters into the expression for p must fulfil the condition of confining pwithin narrow limits, notwithstanding the indefinitely great increase of which t is susceptible. It is obvious that this con- dition is fulfilled in the form we have assumed for p. Under all circumstances

P= PAF Fd_F, &e.;

p=

By similar reasoning we can justify the equation for 6, for we can show that the angular velocity of the celestial body to which it

refers must be approximately uniform By differentiation, ri

—_— =

GE 2 TMM COS (wt + x4) + Nywe COS (wat X_), Ke.

Under all circumstances we must have ae Ge OF M209 F > &e. 5

ade dé. =

and as 7, m2, &¢., are all small quantitics, it is obvious that e is

confined within narrow limits, notwithstanding the indefinite augmentation of the time.

In addition to the reasons already adduced in justification of the expressions of p and @, it isto be remarked that the number of dis- posable constants a, a, &., x, Xo, &C.» Mm, No, &C., wy, Wey KC, a, w is practically indefinite, and that consequently the equations can be compelled to exhibit faithfully the peculiarities of any approximately circular orbit described by a particle moving with approximate uniformity.

§ 15. Determination of the Forees.—The orbit which is described by a planet or other celestial body being given by the equations

p=a+ Ea, cos (wt+ x), itis a determinate problem to ascertain the forces by which the motion of the planet is controlled. In making this calculation we shall assume that the squares and higher powers, and also the pro- ducts of the small quantities @,, a, &., 7, 7, &c., may be dis- carded. Tis to be computed from the well-known formula

where we have

a — Za-w, sin (wt+ x) ;

2

e— — Za,,” Cos (wt + xX);

dé ,

qe 8 t 2mm COS (wyt+ x) 5

2

i =w? + 2En, ww, Cos (w,t+ x) ;

ae? 2 2 t e Pa = dw” + E(2n aww, ,Z) Cos (@t x) §

whence by substitution T = — maw? — Em(a,0,? + Zn aww, + ,w”) cos (wt + x}). To compute V, the force perpendicular to the radius vector, we proceed as follows :— p?=a + S2aa, cos (wf +x); dg ast Em, COS («yb + x3) 5 whence we find eo ae Aw + (20a, + 7 07w,) cos (wt + X1): Differentiating we bave oh et) = — 3 (2a, wo, + 070) sin (t+ x).*

Substituting this in the ordinary formula

we have finally V= -— 3m(2a,ww, + 74,7) sin (wt +x). Let us assume, for the sake of brevity, Ay wbt x15 Ag=w@qltxXe; Ke. OF, = ay (w? + w”) + 2 Aww ; aGy = 2a, ww, + Aw,” ; AF, = a,(w? + wo”) + 2ygdwar 5 AG = 2h_warg + Nolbwy? 5 &e. &e. then the result to which we have been

conducted may be thus stated :— If a body be moving in a nearly circular orbit under the influence of a radial force equal to — Maw? — mazF, cos ry and a force perpendicular to the radius vector equal to — mazGy, sin Aj, then the path which the body describes is defined by the equations T= A+ Za, COS Ay} 6=wt+ Zn, SiN Aj. $16. Deductions from these Expressions.— We proceed to point out a few of the more remarkable deductions from this theorem. If asa first approximation we neglect entirely the small quantities Qy, yy &C., My Ng, &C., We have r=a; O=wt; T=-maw; V=0. In this case the orbit described by the body isa circle of which the radius is a The angle made by the radius vector to the particle with a fixed axis is proportional to the time. It follows that the velocity with which the particle moves "4 its orbit is uni- « == LO*

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form. Since the angle swept out by the particle in one unit of time is equal to », it follows that the angular velocity of the particle is equal to w; since the radius is a, the actual velocity with which the particle is moving in its orbit is wa. In the case now under consideration the force V perpendicular to the radius vector is con- stantly equal to zero. Hence the total force which acts upon the particle is always directed along the radius vector, and is equal to —maw. The sign—merely expresses that the force which acts upon the particle must be constantly directed towards the centre.*

Let p denote the periodic time of the motion of the particle in its orbit. Then we must find the angular velocity by dividing the angle 2m described in the time y by the time p, whence

Qa — =o. P By substituting this value for w in the expression for T, we deduce

2

T=- ma

This proves that the force must vary directly as the radius of the orbit of the particle and inversely as the square of the periodic time in which the orbit is described.

Let us now consider the case in which a, and 7, are retained, while the remaining quantities a, a3, &c., no, ng, &c., are all equal to zero. The formule then are

T=A+a, COS A, ; T= — naw" —maF, cos A, 3 6=ot+n, sina,; V=-maG, sina, ; where F, =a; (w?+,7)+2nawa, ; AG) =2d,wa, +a, 0,". It is clear in the first place that the orbit is not a circle, for ag A, depends upon #¢, it will follow that cos A, may vary between the limits +1 and -1, so that the radius vector r may also vary between the extreme values a+a, and a—a,. As a is extremely small, it appears that the orbit is still nearly circular with a radius a, but that the particle may sometimes be found at a distance a, on the inside or outside of the circle.

We shall similarly find that the angular velocity with which the radius vector sweeps round is not quite uniform. The average angular velocity is no doubt w, but the actual position of the radius vector differs by the quantity 7, sin A, from what it would have been had its motion been uniform. As 7, sin A, must vary between the limits +7, and — 7, it follows that the radius vector can never be at an angle greater than 7, from its mean place, 7.¢., the place which it would have occupied had it continued to move uniformly.

The orbit is completely defined by the two equations—

6=wt+ay, sin (@t+,) ;

r=a+an, cos (w,t+ x). If from these two equations the time ¢ could be eliminated, the result would be the equation in polar coordinates of the path which the particle described. Owing, however, to the fact that the quantity ¢ occurs separately, and also under the form of a sine and cosine, this elimination would be transcendental.

If, however, we take advantage of the smallness of /, and g,, we can eliminate ¢ with sufficient accuracy for all practical purposes.

As is nearly equal to wt, we may assume for ¢ as the first approximation the value +w. If we consider the squares or higher

powers of a and », negligible, this value of t may be substi- tuted for ¢ under the sine and cosine, and we have

r=a+7, COs (21+x:) @

This equation in general denotes a curve undulating about the circumference of the circle of which the radius is a.

We must now briefly consider the case where the motion of the particle is not confined to a plane. Suppose a third axis OC be drawn through the point O perpendicular to the plane which con- tains the undisturbed orbit. Let 2 be the coordinate of the particle parallel to the line OC which is called the axis of z, while x, y denote as usual the coordinates referred to two other rectangular axes. We shall suppose that the motion of the particle is such that the coordinate 2 can be expressed by the equation

g=fy, sin B, h, sin B,, &c., where hj, hy, &c., are lines of constant length; B,, B,, &c., are angles of the form pé+&, Pott ko, &C. 5 My, Yo, &C., &, &, &e., are constants ; and ¢ denotes the time.

Let W denote the force which acts upon the particle P in a direction parallel to the axis of z. Then we have

ae W mas Differentiating the equation 2=h, sin B, h sin B,, &e.,

dz d ad we pe an hy cos pie + hy cos Bye, &e.; dp d but ge ; aaa &e. ; ti dz whence — Py, 008 B, +Pohy cos By +, &e.

Cmayei Trai oN

Differentiating again

*A = —p,*h, sin p,— p,“h? sin By -, &e.3 whence, finally, | = —mp,“h, sin 8, -—mp,“h, sin B.—, &e.*

§ 17. The Motion of the Moon.—One of the most important pro- blems to which we may apply the expressions to which we have been conducted is to au examination of the disturbances which the moon experiences in its motion round the earth. The moon would describe a purely elliptic motion

around the earth in one of the foci were it not that the presence of the sun disturbs the motion and pro- duces certain irregularities. Notwithstanding the vast mass of the sun, these disturbing causes still only slightly derange the moon's motion from what it would be were these disturbing causes absent. The reason of this is that the sun is about 400 times as far from the earth as the moon, and consequently the difference of the effects of the sun upon the earth and the moon is comparatively small.

In applying the formule to the case of the moon we denote by S, P, P' the earth, the moon, and the sun respectively ;

M, m™, m' signify the masses of the earth, moon, and sun;

vr, 7 are the distances of the moon and the sun from the earth; is the distance from the moon to the sun; 1,' are the longitudes of the moon and the sun measured in

the moon's orbit.

T, V, W are the forces acting upon the moon, whereof T is along the radius vector, V is perpendicular to the radins vector, and W is perpendicular to the plane of the moon's orbit.

Since r+7' is very nearly equal to 1+-400, we may regard this frac-

tion as so small that its squares and higher powers are negligible.

Hence, since cos b'=1, a

, ir , WE (a of, cos (1-1) + o)

— ee _ y i "(1 7 C08 (2 r));

whence psar'(14 985 cos ae 1»), ee! iP or eee cos (J-1').

With these substitutions we have, after a few simple transformations, rm _em(M+m) 1 emm'r ; Se +5 a7 143 cos 2(7-7') };

3 emm'r .. ' a 5 sin 2(1-1');

w= cos (1- 7') sin U.

§ 18. The Variation.— The inequality in the motion of the moon which is known as the variation is independent both of the eccen- tricity of the orbit of the moon and of that of the earth. As we shall at present only discuss irregularities in longitude and radius vector, and as we shall neglect small quantities of an order higher than the second, we may assume that the plane of the orbit of the sun coincides with the plane of the orbit of the moon.

The radius vector and the longitude may be expressed by the formulee

r=A4+4+ af, COS A} We shall assume that

2(U' ~~l)=a,; and since r~2=a~~(1 — 2f, cos Aj), we have im 2 em(M+m) ,1 emm'a a a oP ae em(m+M) , 3 emma : + (9S a) – Als but from § 15, m being the mean motion of the moon, T=—- mr?a- maF, cos Aj;*

whence, by identifying the two expressions we have from the portions independent of the time,

e(M+m)_ 1 ema 6= —___ = =".

a 2a

This is a very important formula, inasmuch as it gives the re- lation between the mean motion 7 and the mean distance a in the disturbed orbit.

Suppose that there were no disturbing influence, and that a satellite moved uniformly around the earth in a circular orbit of radius @ with a mean motion %), then we have

e(M+m)=n,2a,3. Assuming also that the earth moves uniformly round the sun in a circular orbit of radius a' with a mean motion 7', then

e((M+m') =n,

n

GRA—GRA

or, since M is negligible in comparison with m', em =1/2q'3, With these substitutions, and making w=7?+n?, we have finally nae =1)7a3{ 1 – =).

If we identify the coefficients of cos A, in the two expressions for T, we have

em(M+m) , 3 emma ,

er re

whence, by substitution and by neglecting small quantitics,

— ma = 2%;

Ffiln +2) + 2gyny = = Bfyn? — Seon?,

We have also for V the two expressions 3 emm'r

2 78

and —maG, sin Ay;

whence by identifying the coefficients

sin Aj,

38

2fnn, + gyn? = gun, where m, denotes the rate at which A, alters. Solving the two equations, we deduce the following expressions :— fla 8w nn, +23 , 3w n(n? + 2nn, + 8n) 1 = —w ——— e*

2 np-n'n, ' a> M2(24? — 0?) We can now calculate the value of f, and g, numerically. For My _ gan — 9365 '256 — 27°322 _,, n n 365°256 ont a nd also ae ' = Were" from these we deduce f= -0°007204

9, = +0°01024 =35"20.1 The results at which we have arrived may be thus summarily stated, using, however, a more accurate valuc of g, than that which is formed by this method :—

If we suppose the orbit of the moon to coincide with the plane of the ecliptic, and if we neglect the ellipticity of the orbit of the earth around the sun and that of the moon around the earth ; if n' denotes the mean motion of the earth around the sun, and 7 the mean motion of the moon around the earth ; and, finally, if x and a be connected by the equation

nas = 0°9972 e(M+m) ;—

then we have for the motion of the moon the equations

r=a{ 1-—0°007204 cos (2né—- 2n't)),

1=nt + 39'30" sin (2nt— 2n't), We thus see that the motion of the moon, on the hypothesis which we have assumed, is different from a uniform circular motion. The distance from the moon to the earth is sometimes 1-139th part greater or less than its mean value. And the longitude of the moon is sometimes 39' 80" in advance of or behind what it would be on the supposition that the moon was moving uniformly. When the distance is the greatest, we have cos (2né—2n't)= -1;

whence Qt — Qn't=m or 87 ;

ee en nn eee ee

(6)

and it follows that the distance of the moon from the earth is great- est at quadratures, When the distance is least, then

cos (2n¢ – 20't)= +1, whence

2nt —2n't=0 or Qw ;

consequently the moon is nearest to the earth at syzygy. It thus appears that the orbit of the moon as modified by the disturbing influence of the variation resembles an oval of which the earth is the centre, and of which the minor axis is constantly in the line of syzygies.

ts mean longitude of the moon and the true longitude coincide when

sin (2nt— 2n’t)=0.

This condition is fulfilled both at syzygy and quadrature; conse- quently the mean place of the moon and its true place coincide when the moon is either in syzygy or in quadrature. The true place of the moon is at its greatest distance in advance of the mean place when

sin (2nt— 2n’t)=1.

This condition is fulfilled at the middle points of the first and third quadrants, while at the middle points of the second and fourth quadrants

sin (2né-2n’t)= -1;

and therefore the moon is behind its mean place in the second and fourth quadrants.

After new moon, the distance between the moon and the earth gradually increases, and the apparent velocity of the moon also in- creases until, when the moon is three or four days old, it has ad- vanced 39’ beyond its mean place; the velocity then begins to diminish, though the distance goes on increasing, until at first quarter the distance has attained a maximum. After first quarter the distance diminishes, and the moon falls behind its mean place, the maximum distance of 39’ behind the mean place being reached about 11 days after new moon. At full moon the distance has become a minimum, and the mean place and true placc coincide. At 18 days the true place has again gained 39’ on the mean place, but the distance increases, and at third quarter the distance is again amaximum, and the true and the mean place coincide. After passing third quarter the distance diminishes, and the true place falls behind the mean place, the difference attaining a maximum on the 26th day, after which the true place gains on the mean place, with which it coincides at new moon, when also the distance is again a minimum.

Since the amount of this irregularity in longitude is so consider- able, being in fact larger than the diameter of the moon itself, it is very appreciable even in comparatively coarse observations. It was discovered by observation by Tycho Brahe, by whom it was named the variation.

It would lead us too far to endeavour to trace out any of the other irregularities by which the motion of the moon is deranged. We have taken the variation merely as an illustration of one of the numerous corrections which the law of gravitation has explained. The accordance which subsists between the values of these correc- tions as computed by theory and as determined by observation affords the most conclusive cvidence of the truth of the law of uni- versal gravitation. (R. 8. B.)

GRAVITY, Speciric. See HypropyNamics.

GRAY, the chief town of an arrondissement in the department of Haute-Sadéne, is situated on the declivity of a hill on the left bank of the Sadne, 37 miles S.W. of Vesoul by rail. Its streets are narrow and steep, but it possesses broad and beautiful quays, and the Allée des Capucins is a fine promenade. The principal buildings are the old castle of the duke of Burgundy, the church in the style of the Renaissance, the communal college (with a library of 15,000 volumes and a natural history museum), the theatre, and the barracks. The town possesses very large flour-mills, and among the other industries are ship- building, dyeing, tanning, haircloth-weaving, plaster-cast- ing, and the manufacture of machinery, oils, and starch. There is also a considerable trade in iron, corn, provisions, vegetables, wine, and wood. The population in 1876 was 7305. Gray was founded in the 7th century. Its former

u When the approximation is carried sufficiently far it is found that the coefficient of the variation is 39’ 30”.

defensive works were destroyed by Louis XIV. in 1688. During the Franco-Prussian war General von Werder con- centrated his army corps in the town, and held it fora month, making it the point d’appui of movements towards Dijon and Langres, as well as towards Besangon.

GRAY, Davip (1838-1861), Scottish poet, was the son of a hand-loom weaver, and was born at Merkland, a small village on the banks of the Luggie, about 8 miles from Glas- gow, January 29, 1838. His parents, observing his fond- ness for study and his exceptional cleverness, resolved to educate him for the church, and through their self-denial and his own exertions as a pupil teacher and private tutor, he was able, after receiving

the rudiments of education at the parish school of Kirkintilloch, to complete a course of four sessions at the university of Glasgow. It soon, how- ever, became evident that the vision of poetry and world fame had begun to lure him away from the path which his parents' desires had marked out for him. His most inti- mate companion at this time was Robert Buchanan, the now

well-known poet ; and in May 1860 the two agreed to pro- ceed to London, with the indefinite purpose of finding some kind of employment in connexion with literature. Shortly after his arrival in London Gray introduced himself to Mr Monckton Milnes, now Lord Houghton, with whom he had previously corresponded, who, though unsuccessful in his application for a place for Gray's poem, 'The Luggie," in the Cornhill Magazine, gave him some light literary work. He also showed him great attention when a cold which had seized him assumed the serious form of consumption, and procured him the means of staying for a time in the south of England ; but as the disease made rapid progress, an irresistible longing seized Gray to return to Merkland, where he arrived in January 1861, and died on the 3d December following, having the day before had the gratifi- cation of seeing a printed specimen copy of his poem Zhe LIuggie. Yee was buried in the Auld Aisle Churchyard, Kirkintilloch, where in 1865 a monument was erected by "friends far and near" to his memory.

The Luggie, the principal poem of Gray, is a kind of reverie in which the scenes and events of his childhood and his early aspirations are mingled with the music of the stream which he celebrates. The series of sonnets Jn the Shadows, composed during the latter part of his illness, possess, without the smallest taint of morbidness, a touching and solemn beauty in keeping with the circumstances in which they were written. Most of his poems necessarily bear traces of immaturity, and lines may frequently be found in them which are mere echoes from Thomson, Wordsworth, or Tennyson, but they possess, nevertheless, the distinct individuality of true genius. They nearly all have a direct or indirect reference to phases of outward nature, and they give evidence of an underlying wealth of imagination and sentiment, of a true and vigorous power of conception, and of a gift ofclear and strong, yet subtle and tender, musical utterance, which apparently only

required to have been mellowed by time and experience in order to have fashioned a poetry which would have given him an enduring name in English literature.

The Luggie and other Poems, with an introduction by R. Monckton Milnes, and a brief memoir by James Hedderwick, was published in 1862, and a new and enlarged edition of Gray's Poetical Works, edited by the late Sheriff Glassford Bell, appeared in 1874, See also the " Essay on David Gray," published originally in Cornhill Magazine, and reprinted in David Gray and other Essays, by Robert Buchanan, 1868, and the poem on David Gray, reprinted there from Idyls and Legends of Inverburn.

GRAY, Joun Epwarp (1800-1875), a distinguished English naturalist, born at Walsall, Staffordshire, in 1800, was the eldest of the three sons of Mr S. F. Gray, of that town, druggist and writer on botany, author of the Supplement to the Pharmacopeia, &c., and grandson of Mr 8. Gray, who translated for Lee the Philosophia Botanica of Linnzus, and assisted in the composition of the Introduction to Botany. Gray studied at St Bartholomew's and other hospitals for the medical profession, but was attracted to the more enlivening pursuit of botany, on which he wrote and lectured. At an early age he assisted his father by collecting notes on botany and comparative anatomy and zoology in Sir Joseph Banks's library at the British Museum, aided by Dr W. E. Leach, assistant-keeper. The systematic synopsis of the Natural Arrangement of British Plants, 2 vols., 1821, was prepared by him, his father writing the preface and introduction only. This work, which introduced the natural system of plants on Jussieu's plan to the student of English botany, gave offence to the Linnean Society, who rejected Gray's application for a fellowship in 1822. Chafed at this unmerited rebuff, he turned to the study of zoology, writing on zoophytes, shells, Afollusca, and Papilionide, still aided by Dr Leach at the British Museum. In December 1824 Gray obtained the post of

assistant in that institution; and from that date to December 1839, when Mr J. G. Children retired from the keepership, he had so zealously applied himself to the study, classification, and improvement of the national collection of zoology that he was selected as the fittest person to be

entrusted with its charge. Immediately on his appoint- ment as keeper, Gray took in hand the revision of the systematic arrangement of the collections ; scientific cata- logues followed in rapid succession; the department was raised in importance; its poverty as well as its wealth became known, and whilst increased grants, donations, and exchanges made good many deficiencies, great num- bers of students, foreign as well as English, availed them- selves of its resources to enlarge the knowledge of zoology in all its branches. Gray found the representatives of the animal kingdom confusedly huddled together in old Montagu House; and the science of zoology was just then emerging from infancy, with little public support to foster it. But, in spite of numerous obstacles, he worked up the department, within a few years of his appointment as keeper, to such a state of excellence as to make it the rival of the cabinets of Leyden, Paris, and Berlin; and later on it was raised under his management to the dignity of the largest and most complete zoological collection in the world. The extensive acquaintance which he had obtained with practical zoology, his love of the subject, close application, and original views, his skill and accu- racy of observation, his readiness to impart the informa- tion he had acquired to any one who sought it, and above all his marvellous industry, place Gray in the foremost rank of naturalists. It has been said that he tried to accomplish too much, that he wrote hurriedly and paid little attention to anatomy ; but it must be remembered that he laboured for the past generation, not among the one-subject men of the present age. He did his work nobly, though somewhat roughly; and it will ever be appreciated by generous men of science. His eagerness for controversy, and the outspoken plainness with which he asserted his views, sometimes brought him into unpleasant relations with those he had to do with. Of this the cata- logue dispute with Panizzi, and the gorilla dispute with Du Chaillu, Owen, and others, are well-known instances. Although seized with paralysis in 1870, Gray continued to discharge the functions of keeper of zoology, and to con- tribute papers to the Annals of Natural History, his favourite journal, and to the transactions of a few of the learned societies. At Christmas 1874, having completed half a century of official work, he resigned office ; and on the 7th of March 1875 this indefatigable naturalist expired. Gray was elected a fellow of the Royal Society in 1832; in 1852 the honorary degree of doctor of philosophy of the university of Munich was conferred upon him, in recognition of his formation of the largest zoological collection in Europe; and in 1860 the

king of Wiurtemberg, desiring to mark the estimation in which he held Gray, who had declined an offer of knighthood, bestowed upon him the gold medal of merit. He was a president of the Entomological Society, vice-president of the Zoological and Microscopical Societies, fellow of the Geographical and Palxontological Society, in the for- mation of which he took part; he was president of the Botanical Society, and also a fellow of the Linnean and Geological Societies ; he founded the Greenwich Society of Useful Knowledge; and he was an honorary or corresponding member of numerous foreign societies and academies. He was deputy-chairman of the section of the animal and vegetable substances of the Exhibition of 1851, and a juror of the educational section of the Exhibition of 1862. He took an active part in questions of public importance of his day, such as slave emancipation, prison discipline, abolition of iraprisonment for _ debt, sanitary and municipal organizations, the decimal system, pub- lic education, extension of the opening of public institutions, &c. Works.—Dr Gray commenced to publish in 1820, and continued till the year of hisdeath. He began with an Historical Sketch of thé Improvemenis in Comparative Anatomy and Zoology in 1819, and ended with a paper "On the Madagascar River-Hog (Potamocherus), and ou the skulls of the three species of the genus," Ann. NV. H., xv., 1875. The titles of the books, memoirs, and miscellaneous

papers written by him, accompanied by a few notes, fill a privately printed list of 56 octavo pages. The more important of the hooks, besides those already mentioned, are :—Synopsis of the species of the class Mammalia, 1827 (Griffith's Cuvier, vol. v.); Lllustrations of Indian Zoology, 2 vols., 1830-35; A Synopsis of the species of the class Reptilia, 18380 (Cuvier, ix.); Zoological Miscellany, 1831-45; Synopsis Reptilium, 1831; A Deseriptive Catalogue of Recent and Fossil. Shells, 1882; Turton's Manual of the Land and Freshwater Shells of the British Islands (new ed.), 1840; Lvst of the Specimens of Mammalia in the British Museum, 1843; Catalogue of Tortoises, &e., 1844; Systematic Catalogue of British Land and Freshwater Shells, 1844; Catalogue of Specimens of Lizards, 1845; Gleanings from the

Menagerie and Aviary at Knowsley Hall (superintended at the request of the late earl of Derby), 1846-50; Lost of the genera of recent Mollusca, 1847; List of Osteological Specimens, 1847, of British Sponges, Radiated Animals (Centronie), of British Radiata, separate, 1848; Catalogue of Mollusca, 1849-50 ; Catalogue of Kep- tiles (Snakes), 1849; Catalogue of Fish (Chondropterygia), 1850; Catalogue of Mammalia (Cetacea, Seals, Hoofed Quadrupeds), 1850- 1852; Catalogue of Amphibia, 1850 ; Catalogue of Bivalve Mollusca, 1850-53; List of Fish (Cartilaginous), of British Fish, separate, 1851; List of British Mollusea and Shells, 1851; Catalogue of Echi- nide or Scea-Eggs, 1851; Catalogue of Phaneropnewmona (with L. Pfeiffer), 1852; Catalogue of Fish collected and described by L. T. Gronov, 1854; Catalogue of Shield Reptiles, 1855-72; Catalogue of the recent Echinida, 1855; Catalogue of Pulmonata (with L. Pfeiffer), 1855 ; Guide to the collection of Mollusca, 1856; Catalogue of Apodal Fish, by Dr J. J. Kuup, translated and edited by Gray, 1856; Catalogue of Auriculide, 1857; Systematic arrangement of figures of Conchifera and Brachiopoda, 1857; List of Mollusca, 1858; Handbook of British Waterweeds, or Alge (with W. Car- ruthers), 1864; Salisbury's Genera of Plants, edited by Gray, 1866; Catalogue of Seals and Whales, 1866-71; Synopsis of Species of Starfish, 1866; Synopsis of species of Whales and Dolphins, 1868 ; Catalogue of Carnivorous, Pachydermatous, and Edentate Mam- malia, 1869; Catalogue of Monkeys, Lemurs, and Fruit-eating Bats, 1870; Tortoises, Terrapins, and Turtles, 1872 (re-edited); Hand- list of Seals, Morses, Sea-Lions, and Sea-Bears, 1874.

GRAY, THomas (1716-1771), the author of the cele- brated Elegy written in a Country Churchyard, was born in Cornhill, London, December 26, 1716. His father, Philip Gray, an exchange broker and scrivener, was a wealthy and nominally respectable citizen; but he treated his family with brutal severity and neglect, and the poet was alto- gether indebted for the advantages of a learned education to the affectionate care and industry of his mother, whose maiden name was Antrobus, and who, in conjunction with a maiden sister, kept a millinery shop. A brother of Mrs Gray was assistant to the master of Eton, and was also a fellow of Pembroke College, Cambridge. Under his pro- tection the poet was educated at Eton, and thence went to Peterhouse, Cambridge, attending college from 1734 to Sep- tember 1738. At Eton he had as contemporaries Richard West, son of the

lord chancellor of Ireland, and Horace Walpole, son of the triumphant Whig minister, Sir Robert Walpole. West died early in his 26th year, but his genius and virtues and his sorrows will for ever live in the corre- spondence of his friend. In the spring of 1739 Gray was invited by Horace Walpole to accompany him as travelling companion ina tour through France and Italy. They made the usual tour, and Gray wrote remarks on all he saw in Florence, Rome, Naples, &c. His observations on arts and antiquities, and his sketches of foreign manners, evince his admirable taste, learning, and discrimination. Since Milton, no such accomplished English traveller had visited those classic shores. In their journey through Dauphiné, Gray's attention was strongly arrested by the wild and picturesque site of the Grande Chartreuse, surrounded by its dense forest of beech and fir, its enormous precipices, cliffs, and cascades. He visited it a second time on his return, and in the album of the mountain convent he wrote his famous Alcaic Ode. At Reggio the travellers quarrelled and parted. Walpole took the whole blame on himself. He was fond of pleasure and amusements, "intoxicated by vanity, indulg- ence, and the insolence of bis situation as a prime minister's son," —his own confession,—while Gray was studious, of a Serious disposition, and independent spirit. The immediate

V7 cause of the rupture is said to have been Walpole's clan- destinely opening, reading, and resealing a letter addressed to Gray, in which he expected to find a confirmation of his suspicions that Gray had been writing unfavourably of him to some friends in England. A partial reconciliation was effected about three years afterwards by the intervention of a lady, and Walpole redeemed his youthful error by a life-long sincere admiration and respect for his friend. From Reggio Gray proceeded to Venice, and thence travelled home- wards, attended by a laguais de voyage. He arrived in England in September 1741, having been absent abont two years and a half. His father died in November, and it was found that the poet's fortune would not enable him to prosecute the study of the law. He therefore retired to Cambridge, and fixed his residence at the university. There he continued for the remainder of his life, with the exception of about two years spent in London, when the treasures of the British Museum were thrown open. At Cambridge he had the range of noble libraries. His happi- ness consisted in study, and he perused with critical atten- tion the Greek and Roman poets, philosophers, historians, and orators. Plato and the Anthologia le read and

anno- tated with great care, as if for publication. He compiled tables of Greek chronology, added nvtes to Linnzeus and other naturalists, wrote geographical disquisitions on Strabo, and, besides being familiar with French and Italian litera- ture, was a zealous archeological student, and profoundly versed in architecture, botany, painting, and music. In all departments of human learning, excepting mathematics, he was a master. But it follows that one so studious, so critical, and so fastidious could not be a voluminous writer. A few poems include all the original compositions of Gray— the quintessence, as it were, of thirty years of ceaseless study and contemplation, irradiated by bright and fitful gleams of inspiration. In 1742 Gray composed his Ode to Spring, his Ode on a Distant Prospect of Eton College, and his Ode to Adversity,—productions which most readers of poetry can repeat from memory. He commenced a didactic poem, On the Alliance of Education and Government, but wrote only about a hundred lines. Every reader must regret that this philosophical poem is but a fragment. It is in the style and measure of Dryden, of whom Gray was an ardent admirer and close student. His Elegy written in a Country Churchyard was completed and published in 1751. In the form of asixpenny brochure it circulated rapidly, four editions being exhausted the first year, and within the same period it also appeared in three maga- zines—the Magazine of Magazines for February, the London Magazine for March, and the Grand Magazine of Magazines for April. This popularity surprised the poet. He said sarcastically that it was owing entirely to the subject, and that the public would have received it as well if it had been written in prose. The solemn and affecting nature of the poem, applicable to all ranks and classes, no doubt aided its sale; it required high poetic sensibility and a cultivated taste to appreciate the rapid transitions, the. figurative language, and lyrical magnificence of the odeg but the elegy went home to all hears'; while its musical harmony, originality, and pathetic_trein of, sentiment and feeling render it one of the mas ct of English poems. No Vicissitudes of taste or fashion best ested its popularity. When the original manuscript ofthe poem was offered for sale in 1854, it brought,theulmost incredible sum of £131. The two great odes of Gy y, the Progress of Poetry and The Bard, were published in 1757, and were but coldly received. His name, however, stood high, and, on the death of Cibber the same year, he was offered the laureateship, which he wisely declined. He was ambitious, however, of

obtaining the more congenial and dignified appointment of professor of modern history in the university of Cambridge, which

fell vacant in 1762, and, by the advice of his friends, he made application to Lord Bute, but was unsuccessful. Lord Butc had designed it for the tutor of his son-in-law, Sir James Lowther. No one had heard of the tutor, but the Bute influence was all-prevailing. In 1765 Gray took a journey into Scotland, penetrating as far north as Dunkeld and the Pass of Killiecrankic ; and his account of his tour, in letters to his friends, is replete with interest and with touches of his peculiar humour and graphic description. One other poem proceeded from his pen. In 1768 the professorship of modern history was again vacant, and the duke of Grafton bestowed it upon Gray.

The literary habits and personal peculiarities of Gray are familiar to us from the numerous representations and allusions of his friends. It is easy to fancy the recluse poet sitting in his college-chambers in the old quadrangle of Pembroke Hall, His windows are ornamented with mignonette and choice flowers in China vases, but outside may be discerned some iron-work intended to be service- able as a fire-escape, for he has a horror of fire. His furniture is neat and select ; his books, rather for use than show, are disposed around him. He has a harpsichord in the room. Ina corner of one of the apartments is a trunk containing his deceased mother's dresses, carefully folded up and preserved. His fastidiousness, bordering upon effeminacy, is visible in his gait and manner,—in his hand- some features and small well-dressed person, especially when he walks abroad and sinks the author and hard student in

1 A claim has been put up for the churchyard of Granchester, about two miles from Cambridge, the great bell of St Mary's serving for the "curfew." But Stoke Pogis is more likely to have been the spot, if any individual locality were indicated. The poet often visited the village, his aunt and mother residing there, and his aunt was interred in the churchyard of the place. Gray's epitaph on his mother is characterized, not only by the tenderness with which he always regarded her memory, but by his style and cast of thought. It runs thus:— ' Beside her friend and sister here sleep the remains of Dorothy Gray, widow, the careful tender mother of many*

children, one of whom alone had the misfortune to survive her. She died March 11, 1753, aged 72." She had lived to read the Hlegy, which was perhaps an ample recompense for her maternal cares and affection. Mrs Gray's will commences in a similar touching strain:—" In the name of God, ameu. 'This is the last will and desire of Dorothy Gray to her son Thomas Gray."" They were allin alltocach other. The father's cruelty and neglect, their straitened circumstances, the sacrifices made by the mother to maintain her son at the university, her pride in the talents and conduct of that son, and the increasing gratitude and affection of the latter, nursed in his scholastic and cloistered solitude—these form an affecting but noble record in the history of genius.

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"the gentleman who sometimes writes for his amusement." He writes always with a crow quill, speaks slowly and sententiously, and shuns the crew of dissonant college re- vellers who call him '"'a prig," and seek to annoy him. Long mornings of study, aud nights feverish from ill-health, are spent in those chambers ; he is often listless and in low spirits ; yet his natural temper is not desponding, and he delights in employment. He has always something to learn or to communicate, some sally of humour or quiet stroke of satire for his friends and correspondents, some note on natural history to enter in his journal, some passage of Plato to unfold and illustrate, some golden thought of classic inspiration to inlay on his page, some bold image to tone down, some verse to retouch and harmonize. His life is on the whole innocent and happy, and a feeling of thankfulness to the Great Giver is breathed over all. Various editions of the collected works of Gray have been pub- lished. The first, including memoirs of his life and his corre- spondence, edited by his friend, the Rev. W. Mason, appeared in 1775. It has been often reprinted, and forms the groundwork of the editions by Mathias (1814) and Mitford (1816). Mr Mitford, in 1843, published Gray's correspondence with the Rev. Norton Nicholls, and in 1854 his correspondence with Mason, from which Mason had made only a partial selection in his memoirs of Gray.

A second edition of the correspondence with additional notes was published in 1855.? (R. CA.)

GRAYLING (Zhymallus) are fishes belonging to the family of Salmonide, which resemble the vendace and gwyniad (Coregonus) in having scales of considerable size, and a narrow mouth with very small teeth. They are distinguished by their large, wing-like, dorsal fin. Only a few species are known, which inhabit clear streams of the north of Europe, Asia, and North America. The best known are the "Poisson bleu" of the Canadian voyageurs, and the European species, Zhymallus vulgaris (the Asch or Aesche of Germany, Ombre of France, and Z'emola of Upper Italy). This latter species is esteemed on account of its agreeable colours (especially of the dorsal fin), its well-flavoured flesh, and the sport it affords to anglers. It is very fastidious in the choice of the rivers it inhabits. In England it is found in the Test, the Avon, the Dove, the Lug, the Wye, the Irvon, the Teme, the Clun, the Hodder, the Trent, the Dee, the Wiske, the Wharfe, the Ure, the Ribble, and the Derwent; but it is not found either in Scotland or in Ireland. It is more generally distributed in Scandinavia and Russia, and the mountain streams of central Europe southwards to the Alpine waters of Upper Italy. Specimens attaining to a weight of four pounds are very scarce. See IcuTHyoLoay.

GRAZALEMA (the Roman Lacidulermium), a town of Spain, in the province of Cadiz, is situated on the great road from Cadiz to Ronda, 60 miles E.N.E. of Cadiz. It stands in a very strong position on a rocky hill, and to capture it was reckoned one of the chief feats of the esforzado Rodrigo Ponce de Leon. It possesses three hermitages, a parish church, anda convent. The manufactures are chiefly woollen, linen, leather, and soap, and there is considerable trade in sheep and swine from the neighbouring sierra of the same name. Inscriptions and other Roman antiquities still exist in the town. The population is about 6000.

GRAZZINI, Antonrrancesco (1503-1583), an Italian author, was born at Florence, March 22, 1503, of good family both by his father's and mother's side. Of his youth and education all record appears to be lost, but he probably began early to practise as an apothecary. In 1540 he was one of the founders of the Academy of the Humid (degli Umidi), and about forty-two years afterwards he took a prominent part in the formal establishment of the more famous Accademia della Crusca. In both societies he

2 A volume of the original autograph letters of Gray addressed to Dr Thomas Wharton, fellow of Pembroke Hall, Cambridge, and latterly of London and Old Park, near Darlington, was added in 1877 to the Egerton library of manuscripts in the British Museum.

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was known as // Lasca or Leuciscus, and this pseudonym is still frequently substituted for his proper name. His temper was what the French happily call a difficult one, and his life was consequently enlivened or disturbed by various literary quarrels. His Humid brethren went so far as to expel him for a time from the society,—the chief ground of offence being apparently his ruthless criticism of the " Arameans," a party of the academicians who maintained that the Florentine or Tuscan tongue was derived from the Hebrew, the Chaldee, or some other branch of the Semitic. He was readmitted in 1566, when his friend Salviati was "consul" of the academy. His death took place on February 18, 1583. Il Lasca ranks as one of the great masters of Tuscan prose. His style is copious and flexible : abundantly idiomatic, but without any affectation of being so, it carries with it the force and freshness of popular speech, while it lacks not at the same time a flavour of academic culture. His principal works are Le Cene, a col- lection of stories in the manner of Boccaccio, and a number of prose comedies, La Gelosia, La Spiritata, I Parentadt, La Arenga, La Sibilla, La Pinzochera, L'Arzigogolo. The stories, though of no special merit as far as the plots are concerned, are told with verve and interest. A number of miscellaneous poems, a few letters, and Four Orations to the Cross complete the list of Grazzini's extant works. He also edited the works of Berni, and collected Tutti i Trionfi, Larri, Mascherate, e Canti Carnascialascht, andati per Firenze dal tempo del magnifico Lorenzo de' Medici fino al? anno 1559. In 1868 Adamo Rossi published in his Ricerche per le biblioteche di Perugia three " novelle" by Grazzini, from a MS. of the 16th cen- tury in the " Comunale" of Perugia; and in 1870 a small collec- tion of those poems which have beeu left unpublished by previous editors appeared at Poggibonsi, Alcune poesie incdite. See Pietro

Fanfani's " Vita del Lasca," prefixed to his edition of the Opere di A. Grazzini, Florence, 1857.

Kinapom or, has been since January 1, 1801, the official title of the political unity composed of England, Scotland, and Ireland. Great Britain was employed as a formal designation from the time of the union of the kingdoms of England and Scotland in 1707. Although the name (which apparently had its origin in Britannia Major, the name given to the island to distinguish it from Britannia Minor or Brittany) had, in earlier times, been often used both by English and by foreign writers, especially for rhetorical and poetical purposes, it was not till aftér the accession of James I. that it became a recognized part of the royal style. Its adoption was due to the king him- self, who was anxious to give expression to the fact that he was sovereign of the undivided island, and not only of England or Scotland. As early as 1559 the Scottish Congregation had formally proposed through Maitland the union of the two crowns, and the adoption of the name of Great Britain for the common country (Teulet, i., " Mém. Caillé & M. de la Mothe," Dec. 20). But in England the Innovation at first met with great opposition. Various objections, sentimental and practical, were urged against it in parliament ; and the judges, when appealed to by the king, declared that the adoption of the title would invali- date all legal processes, At length, on the 20th October 1604, the king, weary of the discussion, cut the knot by assuming the title by royal proclamation, and in due course the inscription "J. D. G. Mag. Brit. F. et H. Rex" appeared on his coins. The proclamation declared that Great Britain was "the true and ancient name which God and time have imposed upon this Ile, extant and received in histories, in all mappes and cartes wherein this ile is described, and in ordinary letters to ourselfe from divers foreign princes, warranted also by authentical charters, exemplifications under seals, and other records of great antiquitie." In November 1604 we find the king in- structing the Lords Commissioners of the Gunpowder Plot

to try and discover if the prisoner was the author of a most "eruel pasquil" against him for assuming the name of Britain. For further details see Calendar of State Papers, Domestic Series, and Spedding, Letters and Life of Lord Bacon, vol. iii.

GREAVES, Joun (1602-1652), a mathematician and antiquary, was the eldest son of John Greaves, rector of Colemore, near Alresford in Hampshire, and was born in 1602. He was educated at Balliol College, Oxford, and in 1830 was chosen professor of geometry in Gresham College, London. After travelling in Europe, he in 1637 visited the East, where he collected a considerable number of Arabic, Persic, and Greek manuscripts, and made a more accurate survey of the pyramids of Egypt than any traveller who had preceded him. On his return to Europe he visited a second time several parts of Italy, and during his stay at Rome instituted inquiries into the ancient weights and measures. oon after his arrival in England, he was appointed to the Savilian professorship of astronomy at Oxford, but he was deprived of his Gresham professorship for having neglected its duties, In 1648 he lost both his fellowship and his Savilian chair on account of his adherence to the royalist party. But his private fortune more than sufficed for all his wants till his death in 1652.

Besides his papers in the Philosophical Transactions, the prin- cipal works of Greaves are Pyramidoyraphia, or a Description of the Pyramids in Egypt, 1646; A Discourse on the Roman Foot and Denarius, 1649; and Elementa Linguwe Persicw, 1649. His mis- cellaneous works were published in 1787 by Dr Birch, with a

biographical notice of the author. See also Smith's Vita quorun- dam erudit. virorum, and Ward's Gresham Professors.

GREBE (French Gréve), the generally accepted name for all the birds of the Family Podicipedide,) belonging to the group Pygopodes of Illiger, members of which inhabit almost all parts of the world. Some systematic writers have

Great Crested Grebe.

distributed them into several so-called genera, but, with one exception, these seem to be insufficiently defined, and here it will be enough to allow but two—Latham's Podiceps and the Centropelma of Messrs Sclater and Salvin. Grebes are at once distinguishable from all other Water-birds by their

1 Often, but erroneously, written Podicipide. The word Podiceps being a contracted form of Podicipes (¢f. Gloger, Journal fiir Orni- thologie, 1854, p. 430, note), a combination of podex, podicis, and pes, pedis, its further compounds must be in accordance with its derivation.

Plates I. and IT,

very short body, and the peculiar structure of their feet, which are not only placed far behind, but have the tarsi flat- tened and elongated toes furnished with broad lobes of skin.

In Europe we have five well-marked species of Podiceps, the commonest and smallest of which is the very well-known Dabchick of our ponds, P. fluviatis or minor, the Little Grebe of ornithologists, found throughout the British Islands, and with a wide range in the Old World. Next in size are two species known as the Eared and Horned Grebes, the former of which, P. nigricollis, is a visitor from the south, only occasionally showing itself in Britain, while the latter, P. curitus, has a more northern range, breeding plentifully in Iceland, and is a not uncommon winter- visitant. Then there is the larger Red-necked Grebe, P. griseigena, also a northern bird, and a native of the subarctic parts of both Europe and America, while lastly the Great Crested Grebe, P. cristatus, or Gaunt—known as the Loou on the meres and broads of East Anglia, and some other parts of England, is also widely spread over both Worlds, and though apparently not found within the tropics, is known in the extreme south as a native of Australia and New Zealand. North America is credited with seven species of Grebes, of which three (P. cristatus, P. griseigena, and P, auritus) are admitted to be specifically inseparable from those already named, and two (P. occidentalis and P. californicus) appear to be but local forms; the remaining two (P. dominicus and P. ludovicianus) may, however, be accounted good species, and the last differs so much from other Grebes that many systematists make it the type of a distinct genus, Podilymbus. South America seems to possess four or five more species, one of which, the P. micropterus of Mr Gould (Proc. Zool. Society, 1858, p. 220), has been deservedly separated from the genus Podiceps by Messrs Sclater and Salvin (Hxot. Ornithology, p. 189, pl. xcv.), owing to the form of its bill, and the aborted condition of its wings,

which seem to render it absolutely flightless. Lake Titicaca in Bolivia is, so far as is known at present, its only habitat. Grebes in general, though averse fron taking wing, have much greater power of flight than would seem possible on examination of their alar organs, and are capable of prolonged aerial journeys. Their plumage is short and close. Above it is commonly of some shade of brown, but beneath it is invariably white, and so glossy as to be in much request for muffs and the trimming of ladies' dresses. Some species are remarkable for the crests or tippets, generally of a golden-chestnut colour, they assume in the breeding season. PP, auritus is particularly remarkable in this respect, and when in its full nuptial attire presents an extraordinary aspect, the head (being

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GRE surrounded, as it were, by a n¢mbus or aurevle, such as that with which painters adorn saintly characters), reflecting the rays of light, glitters with a glory that passes description. All the species seem to have similar habits of nidification. Water-weeds are pulled from the bottom of the pool, and piled on a convenient foundation, often a seminatant growth of bog-bean (Menyanthes), till they form a large mass, in the centre of which a shallow cup is formed, and the eggs, with a chalky white shell almost equally pointed at each end, are laid—the parent covering them, whenever she has time to do so, before leaving the nest. Young Grebes are beautiful objects, clothed with black, white, and brown hair, disposed in streaks, and their bill often brilliantly tinted with orange or yellow. When taken from the nest and placed on dry ground, it is curious to observe the way in which they progress—using the wings almost as fore-feet, and suggesting the notion that they must be quadrupeds instead of birds. In water, however, they equal if not surpass their parents in the power of diving, which is a special accomplishment of all Grebes. (A. VN.) GRECO, Et. Domenico Theotocopuli, commonly called El Greco, was a native of Greece, where he was born about the year 1545. He appears to have studied art at Venice, where it is alleged that Titian was his master. The date of his removal to Spain is unknown; but in 1577 we find him at Toledo, engaged on one of his most admired paintings, that on the parting of the raiment of Jesus. Until now he had been coutent to follow closely in the footsteps of the Venetian school, and he is generally ad- mitted in his earlier works frequently to

have approached the style of some of its best representatives ; but in 1579, having been summoned, along with other artists of repute, by Philip II, to contribute to the decoration of the Escorial, he began to aim at greater originality of style with very unfortunate results. The first work in his new manner, having for its subject the martyrdom of St Maurice, was executed in 1579 ; in this, as in all his subsequent produc- tions, a dull ashen monotony of colour combines with stiff and unnatural drawing to produce an effect which is at no

time very pleasant, and is sometimes absolutely repulsive. ©

El Greco, however, continued to be held in considerable repute in the peninsula; sonnets in his honour are to be found in the writings both of Gongora and Pallavicino; and he became the founder of a school in which many of the disciples excelled their master. He practised sculpture and architecture as well as painting, and is said by Pacheco to have written with great learning and ability upon all these arts; none of his books, however, have come down to our time. He died at Toledo in 1625.

GREECE

PART I—GEOGRAPHY AND STATISTICS.

REECE is aEuropean kingdom, occupying the southern (F portion of the most easterly of the three peninsulas which Europe projects into the Mediterranean. By its own inhabitants it is called Hellas, as it was also in antiquity, and the name Greece, by which in one form or other it is known in most European languages, was given to it by the Romans, and was not used by any Greek writer, so far as we know, before Aristotle. Why the Romans called it so is an obscure point, but the most probable and usually accepted explanation is that they gained their first knowledge of the country from a tribe in the north-west of Greece who were called Greeci ([parkoi), and that they accordingly gave the name of that tribe to the whole country. The name Greece or Hellas has been applied at different times to territory of widely different extent. At first Hellas denoted

nothing but the spot in Thessaly where the tribe of Extent)

Hellenes dwelt, and in later times, after Philip of Macedon obtained a seat at the Amphictyonic council, it meant the whole peninsula south of the Balkan mountains (Hemus) including Macedonia and Thrace; but at the period of its greatest distinction it excluded these two regions, and was restricted to the part of the peninsula to the south of the Cambunian range and the islands of the surrounding seas. Tts ancient limits, however, cannot be rigidly defined, for (1) its northern frontier seems never to have been precisely settled, some writers excluding Thessaly which was generally taken in, and others including part of Epirus which was

generally left out ; and (2) the name Hellas expressed not.

so much a geographical as an ethnological unity. It was the country of the Hellenes. Wherever Greeks settled

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there was Hellas, and a Greek colony in Sicily or Africa was thought to participate as essentially in all that con- stituted Hellas as either Attica or Lacedeemon. Still the name was usually applied to the land which formed the geographical centre of the race, of which the greatest length was 250 miles and the greatest breadth 180, and which had an area, exclusive of Epirus (4690 square miles) but including Eubcea (1410 square miles), of 21,121 square miles. This territory comprised (1) Northern Greece, all north of the Maliac (Zeitoum) and Ambracian (Arta) Gulfs ; (2) Central

Greece, extending from these gulfs to the isthmus of Corinth ; (3) the peninsula of the Peloponnesus (Morea) to the south of the isthmus; (4) the following islands, —Eubcea (Negropont) in the east, the Ionian Islands in the Ionian Sea on the west, Crete and Cyprus in the south, and the Cyclades and Sporades across the mouth of the Augean from the south-east headlands of Attica and Euboea, Continental Greece—z.e., all the country now specified, exclusive of the islands—consists of a series of natural cantons, hedged from one another and from the outer world by mountain ranges from 5000 to 8000 feet high, and so was almost by a physical necessity occupied in the times of its ancieut political independence by seven- teen separate states, none of which was larger than an ordinary English county. The whole eight states of the Peloponnesus covered less area than York and Lancaster together; and Attica, the most celebrated state of antiquity, was less than Cornwall. These states, which are noticed separately under the special headings, were—Thessaly in North Greece; Acarnania, AStolia, Locris, Doris, Phocis, Megaris, Beeotia, and Attica in Central Greece; and Corinthia, Sicyonia, Achaia, Elis, Messenia, Laconia, Argolis, and Arcadia in tne Peloponnesus.

Modern Greece is of smaller extent, and its mits are strictly determined by the arrangement between Great Britain, France, Russia, aud Turkey, concluded at Con- stantinople on the 21st [9th] July 1832, which finally settled the question of frontier between Greece and Turkey. It left to Turkey the fertile Greek-speaking province of Thessaly and part of Acarnania, and fixed the northern boundary of Greece at a line running from the Gulf of Arta (Sinus Ambracius) to the Gulf of Volo (S. Pagaszeus), keep- ing along the crest of the Othrys mountain range. The pass of Khlomo was to belong entirely to Greece, and the fort of Punta (Actium) at the southern head of the Gulf of Arta was to continue to belong to Turkey, though Greek vessels Were required to have free entry into the gulf. The Tonian islands, consisting of Corfu (Corcyra), Paxo (Paxos), Santa Maura (Leucas), Cephalonia, Thiake (Ithaca), and Zante (Zacynthus) on the west coast of Greece, and Cerigo (Cythera) on the south, which had remained under British protectorate for 50 years, were voluntarily ceded by Britain to Greece in 1864, after the accession of king George. Modern Greece is not more than two-thirds the size of Scotland; it is 200 miles long from north to south, and 180 broad from east to west, and has an entire area of 19,353

square miles, of which 8288 square miles are in the Morea, 7558 in the northern part of continental Greece, 2500 in the islands of the Augean, and 1007 in the Ionian Islands.

Its most obvious geographical peculiarity is its remark- able richness in mountains, bays, and islands, which give it unexampled natural defences, unusual maritime facili- ties, and quite a peculiar variety of climate, vegetation, and scenery. In this respect it but gathers into a smaller page and expresses in distincter type the structural peculiarities of the continent to which it belongs. In the complexity of its make and the variety of its natural features Greece excels every country of Europe, as Europe excels every continent of the world. No part of Gresce is 40 miles

from the sea or 10 from the hills. Though not much more than half the size of Portugal, it has a coast-line greater – than that of Spain and Portugal together, and that coast- line is broken everywhere into all manner of gulfs, and bays, and inlets, affording a rich supply of good natural harbours. The country is divided by its mountain chains into a num- ber of independent parts, the capture of one of which by an enemy is but a single step towards possession of the whole. The small basins of arable land between these hills maintained comparatively isolated populations, on ac- count of the difficulty of inland intercommunication, and naturally developed that individuality of character, that local patriotism, and that political independence, which marked tlle ancient Greek communities. And the great variety of pursuit, interest, and stimulus which the geographical fea- tures of the country created could not fail to conduce to the uncommon mental vigour, quickness, and versatility which the people exhibited. The Greeks therefore owed their great- ness largely to the country it was their fortune to dwell in.

The ruling feature in the mountain system of ancient Moun- Greece—anid, to a certain extent, in modern Greece also—is tains.

the great chain of Pindus, which takes its rise in the Balkans (Hemus), and runs like a backbone through the entire length of the northern half of the peninsula, throwing out various branches to the east and the west on its way. At about 40° N. lat. the Cambunians leave it and go east, forming the boundary between Macedonia (Roumelia) and Thessaly, and as they approach the coast they turn in a southerly direction at the lofty and famous Mount Olympus, the highest mountain in ancient Greece, and are continued at intervals, on the other side of the vale of Tempe, by Ossa (Kissovo), Pelion (Zagora), and the hills of Eubea. At 39° the Othrys chain (Helloro), whose chief elevation is the conical Mount Veluchi (Tymphrestus), is sent out also to the east, and forms the northern bulwark of the present kingdom. A little further south the Cita range (Katavothra) goes in the same direction, and reaches the Gulf of Zeitoum (Maliac Gulf) at the celebrated pass of Thermopylae. The Cambunian chain intersects Pindus at Mount Lacmon (Zygo), and thence westward the chain passes under the name of Tzenarus and the Ceraunian Hills (Montes Acroceraunii) till it enters the sea at the Acro- ceraunian promontory (Cape Linguetta). From the point of junction with the Othrys, the Pindus chain is con- tinued southwards in a series of separate peaks— Parnassus (Liakura), Helicon, Cithzron, Parnes, and Hymettus, on to the promontory of Sunium (Cape Colonna) in the south- east of Attica. Parnes divides Attica from Beotia. The mountains of the Morea have no connexion with the niountain system of Northern Greece ; they do not run in chains, but rather cluster in knots. The most important of these are Ziria (Cyllene), Khelmos, Olonos, and the range of Pentedaktylon (Taygetus), which stretches from the centre of Arcadia through the length of Laconia to Cape Matapan (Tznarum), and is the most imposing of all the mountains of Greece. The hegemony of Sparta in the Pelopomnesus is attributed by some to its possessing both sides of this chain. Its highest poin) is Mount St Elias, called, like several other Greek mountains, after the prophet Elijah. None of the mountains of Greece is within the line of perpetual snow, though the tops of several are white for some months in the year. What is peculiar to Greece is not the presence of any one hill of pre-eminent height, but the great number it pos- sesses of considerable and nearly equal elevation. Modern Greece has no summit so high as Olympus (9754 feet), but within its narrow area it has twenty-six hills above 3000 feet, of which eight are above 7000 feet, viz., Parnassus

(8068), Taygetus (7904), Tymphrestus (7610), kta (7071), the three summits of Cyllene in Arcadia (7788), and Corax

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Tiivers.

Plains.

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in Atolia. The noted fortified hills of Greece were Acrocorinthus (1686 feet) which guards the isthmus, Ithomie (2631 feet) at Messene, Larissa (900 feet) at Argos, and the Acropolis (150) at Athens.

Greece has few rivers, and these small, rapid, and, as a rule, turbid, as they could not help being in a country where they rise in high mountains and have no space to grow in before they reach the sea, They are either perennial rivers or torrents, the white beds of the latter being dry in summer, and only filled with water after the autumn rains. 'The chief rivers (none of which are navigable) are the Hellada (Sperchius) in Phthiotis, the Aspro Potamo (Achelous) in Adtolia, and the Roufia (Alpheus) and Vasiliko (Eurotas) in the Morea. Of the famous rivers of Athens, the one, the Ilissus, is ouly a chain of pools all summer, and the other, the Cephissus, though never absolutely dry, does not reach the sea, but is drawn off in numerous artificial channels to irrigate the neighbouring olive groves. The waters of both are clear and delicious to the taste. A frequent peculiarity of the Greek rivers is their sudden disappearance in subterranean chasms and reappearance on the surface again, such as gave rise to the fabled course of the Alpheus under the sea, and its emergence again in the fountain of Arethusa in Syracuse. Some of these chasms— Katavothras"—are merely sieves with herbage and gravel in the bottom, but others are large caverns through which thie course of the river may be easily followed. Floods are frequent, especially in autumn, and natural fountains abound and gush out even from the tops of the hills. Aganippe rises high up among the peaks of Helicon, and Feirene flows from the summit of Acro- corinthus. It is surprising that

there are no waterfalls in Greece, the only one worth mentioning being the famous Styx in Arcadia, which has a fall of 500 feet. During part of the year it is lost in the snow, and it is at all times almost inaccessible. Lakes are numerous, but few are of any size, and many merely marshes in summer. The largest are Trichonis in Adtolia, Copais in Beeotia, and Stymphalus in Arcadia.

The valleys are generally narrow, and the plains small in extent, deep basins walled in among the hills or more free at the mouths of the rivers. The principal plains are those of Thessaly (which is not in modern Greece), Beeotia, Messenia, Argos, and Marathon. The bottom of these plains consists of an alluvial soil, the most fertile in Greece. In some of tle mountainous regions, especially in the Morea, are extensive table-lands. The plain of Mantinea is 2000 feet high, and the upland district of Sciritis, between Sparta and Tegea, is in some parts 3000 feet.

Strabo said that the guiding thing in the geography of Greece was the sea, which presses in upon it at all parts with a thousand arms. From the Gulf of Arta on the one side to the Gulf of ;Volo on the other tlie coast is indented with a succession of natural bays and gulfs. The most important are the Gulfs of AZgina (Saronicus) and Lepanto (Corinthiacus), which come in between the Morea and the northern mainland of Greece,—the first from the Xgean, the second from the Ionian Sea,—and are only prevented from joining their waters by the high land of the narrow isthmus of Corinth (34 miles wide). The outer portion of the Gulf of Lepanto is called the Gulf of Patras, and the inner part the Bay of Corinth, and a narrow bay on the north side of the same gulf, called the Bay of Salona, penetrates northwards into Phocis so far that it is within 24 geographical miles of the Gulf of Zeitoum on the north- east coast of Greece. The width of the entrance to the gulf of Lepanto is subject to singular changes, which are ascribed to the formation of alluvial deposits by certain marine currents, and their removal again by others. At

the time of the Peloponnesian war this channel was 1200 yards broad ; in the time of Strabo it was only 850; and in our own day it has again increased to 2200. On the coast of the Morea there are several large gulfs, that of Arcadia (Cyparissus) on the west, Kalamatia (Messeniacus) and

Kolokythia (Laconicus) on the south, and Nauplia (Argolicus) on the east. Then between Eubcoea and the mainland lie the channel of Talanti (Euboicum Mare) and the channel of Egripo, which are connected by tlie strait of Egripo (Euripus). This strait, which is spanned by a bridge, is 120 feet wide, and is remarkable for the unex- plained eccentricity of its tide, which has puzzled ancients and moderns alike. The current runs at the rate of 8 miles an hour, but continues only for a short time in one direction, changing its course, it is said, ten or twelve times in a day.

There are no volcanoes on the mainland of Greece, but Volomi everywhere traces of volcanic action and frequently visita- action tions of earthquakes, for it lies near a centre of volcanic agency, the island of Santorin, which has been within recent years in a state of eruption. There is an extinct , crater at Mount Laphystium in Boeotia. The mountain of Methane, on the coast of Argolis, was produced by a volcanic eruption in 282 B.c. An earthquake laid Thebes in ruins in 1853, another destroyed every house in Corinth in 1858, and a third filled up the Castalian spring in 1870. There are hot springs at Thermopyle and other places, which are used for sanitary purposes. Various parts of the coast exhibit indications of upheaval within historical times. On the coast of Elisfour rocky inletsare now joined to the land, which were separate from it in the days of ancient Greece. There are traces of earlier sea- beaches at Corinth, and on the coast of the Morea, and at the mouth of the Hellada. The land has gained so much that the pass of Thermopyle, which was extremely narrow in the time of Leonidas and his three hundred, is now wide enough for the motions of a whole army.

The whole chain of the Pindus and some of the moun- Ceologs tains of the Morea are composed of Primitive rocks,— granite, serpentine, porphyry, mica, and other schists,—but greater part of the country consists of Secondary forma- tions, especially of a compact grey limestone, which hardens often into the purest marble. All Parnassus and Helicon consist of this rock. In the vicinity of Athens the lime- stone rests on mica schist, which prevails also in other parts of Attica, and in Eubcea, Laconia, and the Cyclades. Clay slate is found in some districts, and coal, equal to two-thirds of an equal weight of Newcastle coal, is found at Kumi in Eubcea, and of an inferior quality at Marco- poneo in Beeotia. Greece is not rich in minerals. Gold exists, but not in sufficient quantity to cover the expense of working.

Copper is abundant, and silver, lead, iron, emery, antimony, cobalt, manganese, sulphur, and salt are found. Gypsum and porphyry are quarried. Marble is abundant, the chief kinds being the white marble of Pentelicus, of which the Parthenon was made, the blue marble of Hymettus, the green and red marble of the Morea, and the green and white of Caryste. In Mount Taygetus are beds of verd-antique jasper.

The scenery of Greece excites the warmest admiration Scent! of all travellers, mainly from three causes:—(1) its un- usually rich variety ; (2) its exquisite sensibility to every modification of the light of the sky; and (3) the graceful and almost severely classical outline of its hills.

The vegetation of Greece may be described as belonging to Vegett four distinct zones. (1) Up to 500 feet above the sea is a region tion. growing corn, vines, olives, oranges, melons, pomegranates, and other fruits ; (2) from 1500 feet to 3500 feet is the region of the oak ; (3) from 3500 feet to 5000 feet is the region of the beech

and pine, interspersed still with a few corn fields; (4) above 5000 feet is a sub-alpine region yielding only a few wild plants

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INHABITANTS. |

Most travellers are struck with the comparative scarcity of wood in Greece. But though most of the ancient forests have disappeared, more of tlic surface still remains woodland than travellers realize. Close on 15 per cent. of it was under forest in 1860, which is only 1 per cent. less than in Spain, and is 12 per cent. more than in Britain. The most common tree is the pine, but the oak, plane, walnut, chestnut, and olive are also abundant. The beech is said to be a madern invader from the north, where it covers the whole of the Pindus range, and in some places, as on Mount Pelion, which were covered with other kinds of trees in historical times, the beech seems now to have driven them entirely out. Thc palm thrives in Messenia, and finds a home even in Attica. Myrtles flourish in the west, and oleanders brighten the river beds.

The wild animals still to be found occasionally in Greece are the boar, wolf, bear, lynx, wild cat, jackal, and fox. The wild goat, which has disappeared from the rest of Europe, finds a last asylum in some of the islands of the Greek archipelago, Game is abund- ant,—red deer, fallow deer, roe, hares, rabbits. It is said that hares and rabbits never occupy the same island, except in the case of Andros, whcre the hares arc found in the north and the rabbits in the south. The birds are the eagle, vulture, hawk, owl, hoopoe, egret, pelican, pheasant, bustard, partridge, woodcock, nightingale, &c. Quails come in April. The domestic animals are the horse, ox, ass, mule, sheep, goat, pig, dog, and poultry. Poisonous snakes are only found in some few places, but mosquitos and gnats are everywhere sourees of annoyance.

The climate of Greece, which ancient writers praised for its equableness, presents to modern observers two peculiarities which do not possess that character. One is a greater intensity of heat in summer and of cold in winter than obtains in Spain, Italy, and other countries which lie within the same latitudes, and arc even less open to the tempcring influences of the sea. This peculiarity is due to the exposure of the country to the cold winds from the snow hills in close proximity to it on the north, and to the exhaust- ing sirocco from the sands of Africa on the south. The other peculiarity is the remarkable local contrasts and rapid transitions which the climate manifests, and which are a natural effect of the diversity of the geographical configuration. The remark of Gell is often quoted, that in travelling through the Morea in March he found summer in Messenia, spring in Laconia, and wintcr in Arcadia, without moving beyond aradius of 50 miles. There is great diver- sity in the rainfall in different parts of Greece. Asa rule, rain is more prevalent in the west than in the east, which accounts for the fertile look of the hills of Elis and the barren aspect of thosc of Argolis. Attica is the driest part of Greece, and Bootia has still the same heavy moist atmosphere it had of old; and, what is re- markable, the old contrast between the people of those two provinces, which was proverbial when both were Greek by blood, still holds good when they are both certainly Albanian, the Atticans of the present day being still quick and lively, and the Beotians dull and phlcgmatic. According to statistics kept by Julius Schmidt, director of the observatory of Athens, and pub- lished in his Bettrdge zur physikalischen Gcographie von Griechen- land (1864-70), there werc in 1859 only twenty-five days on which enough rain fell at

Athens to be measured by the rain gauge. The mean annual temperature of Greece is 64° Fahr. The coldest months of the year are January and February. Snow seldom falls in Athens. The corn is a considerable height in March, and is cut in May. Vines and olives bud in March, and almonds are then in blossom. Winters are, however, severe on the table- lands, and in some of the plains of the interior which are shaded from sun and sea by high hills. Dr Clarke was informed that the Perens at the foot of Cithewron, in Boeotia, were confined to their houses sometimes for several wecks by snow. Kruse says the north wind blows ten months of the year, but Schmidt's statistics show this to be an error ; there are really both northerly and southerly winds every month, though now the one is more prevalent and now the other. The bird winds (so called because they bring the birds of passage) are a periodical variety of the south-west, and blow thirty days from the end of April. ' The Etesian winds are periodi- eal winds from the north-east, which blow regularly about the time of the dog days, and temper the heat of that season in the whole region of the Archipelago. Columella says they begin on the Ist August and continue till the 30th ; and Kruse, on the other hand, says they begin in July and blow for fifty-five days (Hellas, i. 265) ; but neithcr of these statements is borne out by Schmidt's figures. In 1862 the only winds which blew at Athens during July and August were north-east and south-west, and out of the sixty-two days the north-east blew for thirty-four, and the south-west for twenty-cight,—the north-east blowing twenty-two days in July and twelve in August, and the south-west nine in July and nine- teen in August. Malaria prevails largely from the neglect of drainage and the consequent creation of marshes in many parts, and the malaria causes fever, which is very fatal among chil- dren, and leaves debilitating effects in the adults, and altogether

imposes a very serious ch or i conning. ry us check on the growth of the Pomaiauon of

GREECE

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The modern Greeks are of very composite origin, yet are Inhabi- Out of tants.

an extremely compact and homogeneous people. the million and a half which constitute the present popula- tion of the country, only 67,941 speak any other language than Greek, and only 16,084 profess any other religion than the Orthodox ; and all draw well together, glorying with one another in the same memories of a common deliverance, and sharing in the same ambition of a great future. There are in the narrow bounds of Greece three distinct races, speaking different languages, wearing different costumes, observing different customs, and holding little social inter- course with one another. These races are the Greek, the Albanian, and the Wallachian. All three are probably much mixed in blood, and, in fact, the descent of each of them has been a very vexed problem in ethnology. But, on the whole, the suggestion of Freeman seems the most likely account of the matter,—that, taking them all in all, these three races are the direct representatives of the three races which occupied Greek territory at the time of its conquest by the Romans. Since that time their blood has certainly been mingled with other elements, but still sub- stantially the base of the modern Greek is the ancient Greek, the base of the modern Albanian is the ancient Illyrian, and the base of the modern Wallachian is the ancient Thracian.

Of these races the least numerous in Greecc is the Wal- lachian or Roumanian. They are found chicfly in the mountainous regions in the northern parts of Greece, on the slopes of Othrys, in the neighbourhood of Zeitoum, on the hills of Acarnania and Aitolia, and even so far south as the banks of the Boeotian Cephissus. They pursue a nomadic shepherd life, wear black shaggy capotes made to imitate sheep-skin, and speak Roumanian,—a modified Latin, —the language of their race, and also Greek, thc language of the country. They belong to the Greek Church, and sometimes marry Greek girls, but almost never give their own daughters in marriage to Greeks. In 1851 Finlay says there were 50,000 Wallachians in the modern kingdom of Greece; but they are rapidly becoming completely Hel- lenized, and in 1870 there were only 1217 Wallachians in Greece who did not speak Greek. Most of the brigands that used to infest Greece were Wallachians.

The Albanians, Skipetars (¢.¢., Highlanders), or Arnaouts, occupy at present more than a fourth of modern Greece,— all Attica and Megaris (except the capitals), most part of Bosotia and part of Locris, the southern

half of Eubcea, part of Aigina and Andros, the whole of the islands of Salamis, Poros, Hydra, and Spezzia, and considerable districts in Argolis, Sicyonia, Arcadia, Laconia, Messenia, and Elis. They speak a language of their own, which certainly belongs to the Aryan family, but philologists are at a loss whether to count it an independent member of the family, or merely a corruption of one of the better known branches. In districts where they exist in small bodies they are losing their own tongue and adopting Greek ; but in places like Attica and Hydra, where they exist in larger numbers, they still keep it up, and if the men understand Greek the women do not. In 1851 Finlay states there were 200,000 Albanians in Greece, and in 1870 there were only 37,598 left who did not speak Greek. The Albanians who dwell in Greece all belong to the Greek Church. They are mostly agriculturists, and seein to care little for political or professional life. They wear a peculiar dress, which was adopted by them mostly from the Slavs, and was regarded as the national costume of Greece after the Revolution,— a red fez, a silk jacket embroidered with gold, a white fustanella or petticoat, and gaiters,

The rest of the population, comprising the great bulk of it, are Greeks,—a people speaking the Greek language, practising the Greek rite, and claiming descent from the

National character.

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ancient Greek race. This claim, which seems to rest naturally on the obvious evidence of language and feature, was warmly contested on historical grounds by Fallmerayer, who held that during the Slavonic occupation of the country the ancient Greeks were completely extirpated, and that the present inhabitants are merely Slavonians Byzantinized. But his arguments liave been conclusively confuted by Hopf, Finlay, and others, and it may be said to be now universally admitted that, while the blood of the population contains a considerable Slav admixture, its base is still that of the ancient race of Hellas. ;

It is curious that the two sections of the population of Greece whom Fallmerayer credited with the purest Greek descent-—the Mainotes and the Tshakones, who inhabit the two mountain ranges of Laconia—are thouglit

by Hopf to be the only two remnants of the Slavs that still exist. The Tshakones, whose name is commonly supposed, contrary to all etymological analogy, to be a corruption of Lacones, speak a peculiar dialect of Greek, and still live very much by themselves. They now occupy only seven villages, and number 1500 families, The Mainotes, celebrated by Byron, live in Maina, on the western mountain chain of Laconia. They also speak a particular dialect, and are remarkable for their personal beauty and independent spirit. Their houses are fortified keeps, and they were never subdued by the Turks. They practise the vendetta, but are simple and truthful above their neighbours,

Other nationalities are represented in Greece, but so slightly as hardly to be worth mentioning. They num- bered only 29,126 in all in 1870. The Jews, who were never favoured by the Greeks, are found only in the Ionian Islands, where they obtained a footing during tlie British protectorate, and numbered, in 1870, 2528. Important remains of the old Venetian colonists still exist in the Tonian and some of the other islands.

In physique, the Greeks are generally tall and well made, if perhaps rather meagre, with oval face, long and arched nose, fine teeth, and eyes full of animation. Obesity is unknown, and their form is supple, graceful in its move- ments, and remains erect and elastic till past the age of 70. The best physical types are to be found in the islands and in some parts of the Morea, and there, many travellers remark, you may meet every day in the streets or highways women and boys who might have formed the models of Phidias.

The national character of the Greeks is a matter upon which authorities take very contrary views, some idealizing them foolishly, and others depreciating them most unjustly. They seem to have the faults and the excellences of their famous ancestors. They have their quickness of parts and their moderation of character. They are inquisitive, full of mental activity, fond of excitement, as keen for discus- sion as in the days of Plato, and as eager after novelty as in those of Paul. Their thirst for knowledge is indeed quite remarkable, as well as their aptness to learn. Boys will put themselves to any discomfort in order to get to school; students at the university never missed a day from their classes during the Revolution of 1863, but regularly attended the lectures with the arms of the national

guard in their hands; and domestic servants are often found in spare hours learning their letters or doing their sums. They excel in tact, in astuteness, in—what Tuckerman calls the most distinctive thing about them —-finesse, which degenerates often into cunning, that weapon of the weak which could not fail to be forged under their long Turkish oppression. They are cour- teous and very sunny in disposition, and entirely strangers to melancholy, so that both suicide and insanity are uuknown among them, They are the most temperate of Christian nations, and the chastest. Though they make

a good deal of strong wine, they drink little, and they eat as sparingly as they drink. The common people live on one meal a day, and the richer on two, and an English labourer will consume at one meal what would serve a Greek family of six forthe day. A little maize and vegetables steeped in oil make the staple fare. Their rate of illegitimacy is lower than that of any other European country, which may perhaps be ascribed to the fact that Greece is the only country in Europe where the males outnumber the females, and that this circumstance com- bines with the frugal habits of living of the people to en- courage early marriages. In other countries from 3 to 22 per cent. of the births are illegitimate, in Greece only 1°40 percent. are so. 'T'wo striking characteristics of the Greeks are their patriotism,—their local attachment to their country, which stands out in the stronger relief because it is a quality in which their neighbours the Turks are entirely awantiug,—and their love not only of liberty but specially of equality. They are in spirit the most demo- cratic European nation. They have no nobility —as of old, to be a Greek is itself to be noble; and Mahaffy says that 'every common mule-boy is a gentleman (xvpuos) aud fully your equal, sitting in the room at meals, and joining in the conversation at dinner ;" and such is their jealousy of social superiorities that he was often told by Greeks that the only reason why they tolerated a foreign king was that they could not endure to be under one of them- selves. It is the same temper as ostracized Aristides, and doubtless it springs largely from their vanity and egotism, which even the most favourable witnesses own to be among their prominent faults. They have a deep belief, which they take no pains no conceal, in

their own superiority over other nations ; and the point in which they conceive their superiority more especially to dwell is in their intellectual gifts. There are two other qualities in which the Greeks are strong, and which, though they are often abused, are yet main agents in human advancement,—ambition and the love of money. These have given a stimulus to their commerce, and made them thrifty and saving. The faults of which the Greeks are oftenest accused are cowardice and dishonesty, and both charges are equally unwarranted. Their bravery was proved on many a field during the War of Independence. Dishonesty is not a national vice, though it seems certainly to be characteristic of the classes of Greeks who more than the rest are thrown under the observation of foreigners, particularly the low mongrel Greeks of the Levant ports and the venal public officials of Greece, who have consequently helped to blacken the reputation of their countrymen in general,

The Greeks have few peculiar customs worth noting. Customs.

Their national costume is now giving place almost univer- sally to the less picturesque dress of the Franks, They still adhere to the unreformed calendar, and their dates are accordingly calculated according to old style. They marry early,—young women from thirteen years of age to fifteen, and young men from sixteen to twenty. The marriage is arranged by the parents of the parties, is in all cases a religious ceremony, and may be severed by legal divorce. One is allowed to marry three times, but a fourth marriage is forbidden. The bride brings a dowry —houses, furniture, or money—and many unmarried girls wear their whole dowry in pieces of money as a head- dress. The prohibited degrees are those of canon law.

The population of Greece in 1879, when the last census popule- was taken, was 1,679,775, or an average of 84 persons to tion –

the square mile. The islands are the most densely peopled portions of the kingdom, especially the Ionian Islands, which have a population of 231,174, or 229 to the square mile. In continental Greece the rate is only 59 per square mile, and in the Morea 89. Greece is more thickly peopled:

mo: ~~minis~~ tion.

than any country of Europe, except Prussia and Sweden. The population has doubled since 1832. It was then (exclusive of the Ionian Islands) only 612,608, and it is now (also excluding the Ionian Islands) 1,448,601. The males outnumber the females in Greece by 82,385. The only reason we have seen assigned for this is that large numbers of the women go out of the country as domestic servants, and are not counted in the census, while sailors, who are also at work out of the country, are counted. But this seems an inadequate explanation, for in 1870 the number of sailors not present in the country was only 5180. The disproportion between men and women appears, too, to be increasing, for there were 50,468 more men than women in Greece in 1870, when the whole population was 220,000 less than it was in 1879. The average birth-rate for the four years 1870-73 was 1 in 34; the average death-rate for the same period was 1 in 45. The largest towns in Greece are—Athens, with a population in 1870 of 59,000; Patras, with 26,000 ; Corfu, with 24,000; Hermopolis or Syra, 21,000; Zante, with 20,500 ; Chalcis, 11,000 ; Sparta, with 10,700 ; and Argos, with 10,600.

The kingdom of Greece is an hereditary constitutional monarchy, descending by primogeniture from male to niale, female succession being only allowed in the event of the absolute failure of legitimate heirs male. The title of the sovereign at first (according to the convention of London, May 1832) was king of Greece, but it was altered by the conference of London, August 1863, to king of the Hellenes. The king attains his majority at eighteen years of age. Both he and the heir-apparent are required to belong to the Greek orthodox church, but a special excep- tion is made for the present king, whois a Lutheran. The king receives an annual income of £52,179, of which £40,179 comes from the civil list, and £12,000 from personal donations of £4,000 from each of the three pro- tecting powers. He has a palace in Athens—built by Otho at a cost of £500,000—and a summer residence at Corfu. The legislative power is shared by the king with a single chamber called the boule,—-a house of repre- sentatives which is elected for four years by the people ; its numbers cannot fall below 150, and amounted in 1872 to 188. The election is by universal (manhood) suffrage, protected by the ballot. The boule elects its own president, and its members are paid £9 a month during the session. The executive is vested in the king,

who, however, is personally irresponsible, and rules by ministers cllosen by himself aud responsible to the legislature, in whose deliberations they also take part. They are seven in number, and their several departments of administation are—foreign affairs, home affairs, justice, finance, education and worship, army, and navy. A minister's salary is £428 a year. The king appoints all public officials,— civil, naval, and military,—sanctions and proclaims laws, calls and prorogues parliament, grants pardon or amnesty, coins money, and confers decorations. 'There are 18,860 public offices in the patronage of the ministry, and, as in America, a large number of them change hands with every change of administration. The effect of this in a country where politics is an open profession, and where there is a plethora of well-educated men who can find nothing to do, has been to poison political life to an unusual degree with the vice of place-hunting,—to create several active political parties in the state, which, instead of being the representatives of any policy or cause, tend too much to degenerate into mere rings of post-mongers, and conduce, by their constant strife, to an excessive frequency of minis- terial crises which greatly checks the national progress of the country.

For purposes of local government Greece is divided into

ADMINISTRATION. |

ECE 85

13 nomarchies, under officers called nomarchs, whose duties correspond with those of the French prefects; the nomarchies are subdivided into 59 eparchies under eparchs, corresponding to French sub-prefects ; and the eparchies are further subdivided into 351 demarchies, under demarchs or mayors. The following is a list of the nomarchies, with their areas, populations, and capitals :—

8q. Miles. | Pop. in 1870,

Capitals. A.In Northern Greece— 1. Attica and Beeotia ….

2481 1574 2053 3025

185,364

95,136 128,440 138,444

Athens, Chalcis. Lamia. Mesolonghi.

83. Phthiotis and Phocis 4, Acarnania and Aitolia B. In Morea— 5. Achaia and Elis 6. Arcadia 7. Laconia 8. Messenia 9. Argolis and Corinthia C. In the Islands— 10. Cyclades 11. Corfu 12. Cephalonia 13. Zante

1908 2028 1678 1226 1448

Patras. Tripolitza. Sparta. Kalamata.

181,632 148,905 121,116 155,760 136,081

Nauplia.

Syra. Corfu. Argostoli. Zante.

132,020 106,169 80,548

si 44,522

The demarchs are elected by the people for four years ; the nomarchs and eparchs are elected by the Government without fixed terms. The nomarchs are assisted in the administration of the province by a council elected by universal secret suffrage for four years, which manages the police, roads, and other local business, and imposes the assessments. The local accounts must be sent once a year to Athens to be audited by a court of Government officials. The demarchies vary in size, but, in 1861, out of 280 that then existed, only 57 were under 2000 in population, and only 7 above 10,000.

Greece has an admirable legal system, which is the one Judicial It is based on system.

good thing it has got from the Bavarians. the old Roman law, with modifications drawn from the Bavarian and French. Liberty of person and domicile is inviolate ; no one can be apprehended, no house can be entered,

and no letter can be opened without a judicial warrant. Criminal and political offences and delinquencies of the press are tried by jury. The commercial code is identical with that of France. The civil law is administered by a supreme court of cassation (the Areopagus) ; 4 courts of appeal; 17 courts of first instance, with jurisdiction up to 500 drachmas; 191 judges of the peace, with jurisdic- tion up to 30 drachimas, or, with an appeal, to 300 drach- mas ; and 4 commercial courts (at Syra, Nauplia, Patras, and Corfu), with jurisdiction up to 800 drachmas. To be a judge, it is necessary to have graduated as doctor of laws at Athens or some other European university; a judge cannot hold any other salaried appointment at the same time except that of professor in the university. Judges are appointed by the crown, and are as yet removable. Criminal courts are held in connexion with those of the peace, of first instance, and of appeal; in the last the judicial authority is vested in a jury of twelve, with three accessory judges selected from those of the inferior courts, who apply the law in accordance with the jury's verdict. The crown is prosecutor in all criminal cases, and punish- ments are by fines, imprisonment, and, in the case of capital offences, death by guillotine. The prisons are extremely defective in construction and administration, except that of Corfu; improvements are often projected but constantly put off from want of funds to carry them out. There is no Habeas Corpus Act, and an accused person may be detained indefinitely before being brought to trial. Judicial conimissions and extraordinary courts of judicature cannot be established under any pretext.

Army.

Navy.

Religion.

The courts of law are open to the public, except when the interests of good morals or public order demand the contrary. Naval and military offences are tried by naval and military courts, and offences of ministers of the crown by special courts, in accordance with the constitution of

1864.

Crime is proportionately less common in Greece than elsewhere, for the people are more temperate, and, on tle whole, more contented. The peculiar Greek crime is—or, as we may happily now say, was—brigandage, the form of robbery which is natural to a mountainous 'and thinly- peopled country without roads. According to the latest consular reports, the country is at present completely free from brigands. But it will never be secure against their reappearance until it obtains good roads, which will operate against the brigands both by tending to increase the rural population and by affording better facilities for the capture of criminals.

The strength of the Greek army on a peace footing was, at the census in 1870, 12,490, including upwards of 2000 gendarmes; but since the Servian war with the Turks in 1876 the Government has resolved to raise it to 24,376, exclusive of 2508 mounted gendarmes. This, with the national guard and the reserves aud volunteers, would make their total strength on a war footing over 150,000. The national guard is composed of all citizens capable of serving and under the age of 50; it is designed for purposes of defence only. The reserves consist of those who have served out their time in the regular army. The army is recruited by lot from all capable of serving, with the alternative, which is largely used, of providing a sub- stitute; and the period of service is three years in thie line, three years in the first reserve, and six in the second. The navy consists of two small ironclads and a few wooden gunboats and vessels for coast-guard purposes, which are manned by 2500 men, raised, as a rule, by conscription from the inhabitants of the coast, though volunteering is encouraged. The Greek flag is a white cross on blue ground—-the Bavarian colours and the Greek cross.

The religion of the people and of the state is that of the Orthodox Greek Church. In fact, the Greek rite is not only the national religion, but perhaps the deepest and most creative factor in the nationality of Greece itself. Men of Greek blood who do not belong to the Greek Church do not identify themselves with the Greek people. The Moslems of Crete were the sternest oppressors the Greeks knew, and the Latins of Syros sided at the revolution with the Turks, yet both were of the purest Greek descent. And what makes the Greek and Skipetar and Wallach of the modern kingdom all equally Greek in their sympathies to-day is their common profession of the Greek

rite. But all other religions are tolerated in Greece. There is a Moslem mosque at Chalcis ; there is a Jewish synagogue at Corfu; and, whatever a man's religion may be, it entails on him in Greece no civil disabilities of any kind. A Catholic or a Mahometan may rise to the highest offices of state; both Turks and Jews are at present members of municipal councils ; and Jews and Catholics are buried in the same cemetery with the Orthodox at Athens. The Church of Greece, which became virtually independent at the time of the revolution, was organized upon the model of the Russian Church. Its supreme power is vested in a synod consisting of five members, who are appointed annually by the king, and the majority of whom must be prelates. The metropolitan (archbishop of Athens) is ex officio president ; two royal commissioners attend and deliberate without voting, and the synod's resolutions require to be confirmed by them in the king's name. In all purely spiritual matters the synod has entire independ- ence; but on questions having a civil side,—as marriage,

[EDUCATION,

divorce, excommunication of laymen, the appointment of feasts and fasts, and the religious censorship of the press and of religious pictures,—it can only act in concert with the Government. Excluding the Ionian Islands, which have five archbishops, there are eleven archbishops and thirteen bishops in Greece, who are chosen by the king out of a list of three candidates presented by the synod, and can only be deposed by common consent of king and synod, and in conformity with canon law. The clergy numbered 5102 in 1861. The immense majority of the population belongs to the Greek Church. In 1870 the number of other Christians in Greece was 12,585, most of whom were Roman Catholics ; of Jews, 2582; and of all other religions, 917. There are two Roman Catholic archbishops and four bishops. The revenue from the property of the Greek Church in 1877 was £10,571. The prelates receive a salary from the state,—the bishops £145, and the archbishops £180. The inferior clergy receive none, but are entirely dependent on the fees they carn for various spiritual services and superstitious observances,-— praying for the sick, exorcising the evil eye, consecrating a new house or fishing boat, or purifying one bought from a Turk. There are 1600 monks and 1500 nuns in Greece. Popular education is widely diffused in Greece.

jealously fostered ever since, till they have now an exceed- ingly complete national system of education, which is perhaps the most striking product of the new kingdom. The latest statistics we have on the subject are those of the year 1872, given in Watson's report of that year (Reports of H.M. Secretaries of Kmbassy and Legation, No. i. 1872), From these figures we learn that there were then 1141 primary or demotic schools, 136 grammar or Hellenic schools, 7 gymnasia, and finally, the crown of the whole, the university of Athens ; besides 6 nautical schools, a polytechnic school, 4 theological seminaries of the Greek Church, and various private institutions main- tained by Catholic or Protestant societies. At the primary schools, the usual elementary branches only are taught,— reading, writing, arithmetic, the catechism, grammar, history, geography, natural history, agriculture, and draw- ing. Inthe Hellenic schools instruction is given besides in the least difficult of the ancient Greek authors; and in the gymnasia, a niore thorough acquaintance is made with ancient Greek, and with Latin and French, mathematics, logic, anatomy, physics, and natural history. The teachers of the primary schools are educated at a training institu- tion in Athens; those of the Hellenic schools must be licentiates of a university ; and those of the gymnasia must have the degree of Ph.D. The primary schools are main- tained at the expense of the communes, with a subsidy, in certain particular cases, from the state, The total amount spent by the communes for this object comes to about one- sixth part of their income, or over £40,000 in all, and the whole Government grant for primary education in 1872 was £4171. At these schools a small fee is charged, runniug from 1d. to 5d. a month, from all who are able to pay it. The grammar schools, the gymnasia, and the university are maintained entirely by the state, the ex- pense in 1877 exceeding £35,000 for the two classes of secondary schools, and £18,000 for the university; at these schools and the university education is entirely gratuitous, and is furthermore encouraged by the existence of various exhibitions for meritorious pupils, won by competition. The university was erected at a cost of £10,000, raised by private subscription from Greeks all over the world, and is furnished with excellent laboratories and muscums, a library of 150,000 volurnes, medical hospitals, an astronomical observatory, and a botanical garden. It has 4 faculties—-arts, medicine, law, and theology—52_pro-

It was Educa the first care of the newly-liberated people, and has been tion.

gri-

‘ilture.

GR E

fessors, 12 fellows, and, after a curriculum of 4 years, confers the degrees of licentiate and doctor, which are indispensable for those who contemplate becoming lawyers, medical men, or teachers in the higher schools. It was opened in 1835 with 52 students; in 1854 it had 648 ; it now has 1400. In 1872 it had 1244,—of whom 26 were students of theology, 622 of law, 423 of medicine, 120 of arts, and 53 of pharmacy. The small number of theologi- cal students is partly accounted for by the existence of four other theological seminaries in Greece, supported by private funds,—one at Athens and three in the provinces, —and partly by the scandalous neglect of clerical educa- tion that obtains in Greece. In 1867 there were only 115 students at these four theological seminaries. A large pro- portion of the students at the university have always been foreign Greeks, for professional men are trained there not only for Greece itself but for the whole region of the Levant. Out of the 1244 students who attended in 1872, 249 were Greeks from foreign parts, —124 of these being students of medicine, 66 of law, and 6 of theology. No one is admitted as a studeut who has not completed his education at a gymnasium. ‘The salary of a professor hardly amounts to £200 a-year. There is no school inspection beyond that of the demarch.

Education is by law compulsory for children from seven to twelve years of age, but this law is not enforced, for it does not require to be; and the results of education in Greece are the more remarkable as being the fruits of what is practically purely voluntary attendance. Every eighteenth person in Greece is at school; in Russia only every seventy-seventh is so. In 1872 the total number of pupils was 81,197,—of whom 65,111 were males and only 16,086 females. Boys and girls are taught at sepa- rate schools ; of the primary schools, 942 are for boys, with 1009 male teachers and 52,943 pupils, and only 199 for girls, with 221 female teachers and 11,035 pupils. The Hellenic schools and gymnasia are for boys only, and in 1872 had 6055 and 1942 pupils respectively. There are, however, various private schools for girls, with an aggregate attendance of 5000. ‘These figures show that

there is a serious defect in female education, for which neither the Government of Greece nor the people have due solicitude. It ought to be mentioned, hawever, that there is one phase of female education in which Greece is in advance of many other European countries, for the medical school of Athens is open to female students, who num- bered 42 in 1879.

We have no exact statistics as to the numbers engaged in each branch of industry severally, but Bikelas gives in the Journal of the Statistical Society of London for 1868 an estimate for the year 1861, according to which nearly half the population (49°37 per cent.) were agricul- turists and shepherds, aud more than a third of the remainder (or 18°66 per cent. of the whole population) in the liberal professions. 13°87 per cent. were engaged in industrial pursuits, 8°43 per cent. in trade, 5°40 per cent. were doniestic servants, and only 4:27 per cent. were persons of independent means. Government officials and their families comprise a twelfth part of the population. There is great want of employers with considerable capital, and the amount of labour done and wages earned by the workmen is much diminished by the extraordinary number of ecclesiastical holidays they are required to observe. There are 195 fast days in Greece, and the number of working days in the year never exceeds 265. There are no paupers in Greece, no poor-law or poor-rate, and no religious associations for charitable purposes. Beggars are very rare, and absolute destitution may be said not to exist.

Agriculture is still in its infancy. A larger proportion of its area is uncultivated than obtains in any country

in Europe except Russia; but that is explained by the unusually large part of it which is occupied by mountains. We have no exact statistics since 1860, but then only one- seventh was under cultivation. Its entire area (exclusive of the Ionian Islands, not then part of it), was 45,699,248 stremmas,—a stremma being a little over a quarter of an acre. Of these only 17,824,000 were capable of cultiva- tion, and only 6,076,000 actually under it, and half of this amount is always fallow from their system of working it. By universal

testimony the country might grow food for three times its present population, yet it has to import cereals every year to an amount exceeding a third of its own produce, and over £1,000,000 in value. But agricul- ture contends with many difficulties in Greece, most of them, like the vicious land-tax, the want of roads, and the imperfect agricultural methods, being happily remediable.

The soil is, as a rule, light and thin. In many places there is great lack of rain and running water, but the people are expert in irrigation. The chief products are corn, wine, fruit, and oil. Six different kinds of wheat are grown, producing, in a favourable season, as mucli as 10 or 13 returns, and after a dry spring from 3 to 5. Good crops are got of rye, barley, and maize ; oats do not grow so well, and potatoes not at all. Pulse thrives everywhere, and rice is produced in the plains of Marathon and Argos, and in marshy land elsewhere. Cotton and tobacco have been introduced in our own day, and give good returns.

Greece is still in want of one of the first requisites to agricultural prosperity,—a resident proprietary. The modern kingdom began with almost no proprietors. Under the Turks two-thirds of the land belonged to the sultan, and became at the revolution simply national property, which the Government has been selling ever since to pri- vate owners on more or less reasonable terms. The peasants are showing a passion for land, and save up to buy their crofts, and in this way a large class of small freeholders is being created, with what effect upon agricul- ture we have no means as yet of determining. 'There were 16,122 proprietors in 1861. The relation between land- lord and tenant is the metayer system of taking as rent or usufruct a share of the net produce, usually a third, but in the case of Government land 15 per cent. Great part of the agricultural labourers are uot Greek subjects, but are Mahometan Albanians from Thessaly and Epirus, who come into Greece annually in harvest-time, in bands of 30 or 40 under a captain, who work at lower rates than Greeks and work longer, for they have no feasts to observe, and who contrive by frugal living to carry back three-fourths of their earnings to their families at home.

The methods of cultivation in use are still primitive. Modern implements are not employed to any great extent, though their manufacture is carried on at

Syra and the Pirzeus, and though even the steam plough has been actually introduced in Elis. The Greek plough is still that of Homer, which the husbandman carries about his croft on his shoulder, and which hardly does more than scrape the surface of the ground. It is wrought by oxen, Greek horses—the old Thessalian breed—being small and unfit for farm work. 'There is no system of rotation of crops. Fields are cropped till they are exhausted, and then left fallow for a year or two. The farmers have no idea of manure or drainage. There are few enclosures, and even the laying out of the fields is slovenly,—a patch of this crop here, and a patch of that there. The houses of the peasantry are sheds of wood or huts of mud, without either chimney or window, but always with a picture of the Virgin inside.

With all the defects in the Greek system of cultivation, agricultural returns show gradual though slow progress. In 1846 the yield for the year of wheat, barley, and maize

Wines.

Currants.

Other products.

was estimated at 6,000,000 kilots, a kilot being nearly 7'3 gallons; in 1876, 12,000,000. In 1860 there were 2,287,645 stremmas—z.e., 565,048 acres—under cereal crops, Which yielded 9,512,993 kilots of grain—ze., 1,165,807 quarters, or 2 quarters an acre.

Vineyards are numerous, but the wine is poor, with little body, and is ruined for European use by the resin put in to preserve 1t. All provinces produce wine, but the best is that of Santorin, which is shipped largely to Russia. There is still a Malvoisie wine, though it is no longer that which was once so celebrated under the nae of Malmsey ; and the Kephissia wine of Attica and the red wine of Zante are in good repute. There has been a large increase in the number of vineyards, and a marked improveinent in the manufac- ture of wine since the kingdom began, and Greek wines have been

of some commercial importance since 1858. In 1830 there were only 25,000 stremmas under vines ; there are now 700,000.

A grape peculiar to Greece is that of Corinth, which, from the |

place where it oe is called the currant. It constitutes the largest export of Greece, and goes alinost exclusively to England to make the national plum-pudding. Its cultivation has been largely increased of late. In 1820 only 10,000,000 tb were raised, and in 1831, after the destruction of the vines by Ibrahim Pasha, only 5,000,000 tb, but in 1851 there were 57,000,000 tb, and in 1876 195,000,000 1b,—valued at £1,400,000. There are now 40,000 acres of ground under cnrrants alone, and this probably cannot be much increased, for the Corinthian vine is fastidious, and grows only on the northern and western shores of the Morea, on some of the Ionian Islands, and at Mesolonghi, and nowhere else in Greece or in the world. The vines bear in their sixth year, but do not attain full perfection till their twelfth. The grapes are gathered in August, dried in the sun, and packed,

The olive and the mulberry are very important products of culti- vation. The oil of Attica has still its ancient reputation. It is calculated that in Greece in 1876 there were 12,000,000 olive trees, which yielded 19,000,000 okes of oil. In 1834 there were only

2,300,000 trees, yielding 1,000,000 okes. The mulberry grows best

in the south of the Morea, and there the house of almost every peasant is given up in part to rearing the silk-worm, the eggs being nestled in the bosoms of the women. There were in 1833 only 300,000 mulberry trees in Greece ; in 1876 there were 2,000,000.

A natural production of Greece of great importance is valonia, the husk of the acorn of the Quercus Agilops, an oak of which con- siderable forests exist in Arcadia, Attica, the island Zea, and other places. Valonia is valuable on account of the amount of tannin it contains, and is much exported to England and Italy for use in dyeing and tanning. Another species of oak, the Quercus coccifera, which grows largely on Mount Taygetus, breeds the insect called kermes, which, when dried, looks like a

berry, and is used in dyeing the red fez of the country. Turpentine is obtained in large quanti- ties from the pines of Citheron and elsewhere.

Cotton and tobacco are the only products whose cultivation is free from taxation, the exemption being made with a view to the encouragement of their cultivation. Cotton is now grown to a considerable extent, its culture having received a great impetus during the American civil war. It is produced particularly on the marshy lands of Levadia, and Phthiotis in northern Greece. In 1862 the produce was 28,537 quintals; in 1864, 193,615 quintals. The annual yield of tobacco is 4,000,000 okes. Opium, madder, and flax are grown in the northern parts of Greece.

Greece is rich in fruits. The figs of Attica have not degenerated, and they are produced to a considerable extent in other parts also, especially Messenia. In 1834 there were but 50,000 fig-trees ; in 1861, 300,000. Apricots, oranges, lemons, pomegranates, and citrons grow well in the islands, and the fruit trade might be largely increased.

Though there is much excellent timber in the Greek forests, it is practically useless from want of roads, so that it is cheaper to import wood from abroad. In 1860 there were 7,000,000 stremmas of land under forest, and it is estimated that now only 5,500,000 are so.

The herds are chiefly bred on the mountain pastures, and are mainly sheep aud goats. Most of the cattle are used in agricultural labour. In 1865 the total number of sheep in the country subject to taxation was 1,778,729 ; of goats, 2,289,123 ; of cattle, 226,737— of which 168,927 were work oxen ; of horses, 69,787 ; of mules, 29,687; of asses, 64,051; of swine, 55,776; and of camels, 72. Cows' milk and butter are considered unwholesome in Greece (Kruse, Hellas, i. p. 368), and the butter and cheese in use are from ewes' and goats' milk. The honey of Greece is not equal to that of other countries; even that of Hymettus,—so famous in ancient days when honey was exceptionally prized, because men were ignorant of sugar, and which is still one of the best kinds in Greece,—could not compete with French in the English market., But over £35,000 worth of honey is produced in Greece every year, and goes chiefly to Turkey. There are extensive fisheries on some parts of the coasts.

GREECE

The land tax is still the Turkish system of exacting a percentage— Land generally a tenth—of the gross produce of the land; and though, tax,

[pRoDUCTS.

in the case of the vineyards, a money commutation, based on the planter's declaration, is coming into use, the tax is, as a rule, paid in kind. This system is rendered more objectionable by the tax being farmed out to private contractors. The cultivator cannot reap his crop, though it be ripe, till the day appointed by the tax collector, and he must cut it then, thongh it be green. When cut, he must carry the whole crop on pack animals (there being no roads for waggons), sometimes for miles, to the particular public threshing-floor which the collector fixes upon, and he must wait with it there till the collector can find time to see it threshed and take his tithe, which is often weeks, sometimes, it is said, even as as long as three months. Proposals for the abolition of this method of taxation have often been introduced into the chamber of deputies, but the mattcr has always been deferred till they should have a register of lands, which, however, they seem to takc no steps to make.

When Capodistria assumed the government of Greece fifty years Roads,

ago, he said there were two things he meant to give the nation,— roads aud education. The system of education has been very satis- ~~*factorily built up since that time, but its roads are still to make. We have no recent statistics on the subject, but Rangabe says that in 1867 nineteen roads had been made since the kingdom was estab*~~ *lished, with a total length of 380 kilometres ; and Watson, writing in 1872, complains that, from want of roads at that time, it cost more to carry grain from Marathon to Athens (25 miles) than to bring it from the Black Sea, while highly fertile tracts of country, not far from seaport towns, were left entirely uncultivated because of the expense of the transit of their produce. Every man in Greece is by law obliged to give at least three days' labour in the year, or its equivalent in money, for road-making ; and a law was passed in 1876 to apply one-fifth of the proceeds from the sale of state lands to making roads.*

Manufacturing industries are steadily advancing. According to a Manu report issued in 1876 by Mansolas, director of the statistical bureau factures,

at Athens, there are in Greece 95 steam-mills and factories, with

a total of 1967 horse-power; the most important of these have

been established since 1869. They include 35 flour-mills, 12 for

cotton-weaving, 2 for cotton-spinning, 4 for ginning, 6 for sillk- weaving, 10 oil-mills, 9 for constructing machinery, 4 for making

wines and spirits, 3 tanneries, 2 metal-foundries, 1 powder-mill,

and 7 others of various kinds. Shipbuilding is carried on at the seaports. The Greeks excel in tailoring, confectioncry, and "embroidery. As an index to the industrial progress of the nation it may be noted that in the International Exhibition of 1851 there were only 35 Greek exhibitors ; in 1862, 295 ; and in 1878, 1000.

Greece has established a scries of industrial exhibitions of its own,

—the new Olympic games, as they are termed, which a wealthy Greek left £3000 a year to found,—which combine literary, scien-

tific, and athletic competitions with those of industry, and which occur, like the old Olympic games, every four years. The cotton

industry is making decided progress. 'he annual export of raw

cotton is diminishing, and its importation is increasing ; and, to

encourage the trade, there is no duty on native cotton, unless

exported, while the import duty on raw cotton was reduced in 1875.

Leather is made chiefly at Syra.

The marble quarries of Pentelicus, Caryste, and Paros are im- Mines.

portant works. The coals of Kubcea are not much used, as their heat-giving capacity is small. The only mining operations in the country are those of the Laurium Company, which, by help of improved modern appliances, extracts treasure from the waste which the ancient workers of the mines threw away, and which has been roughly guessed to contain still 120,000 tons of lead. The scorie or refuse heaps of Laurium are dug up and carried on trucks, by a short line of rail belonging to the company, to the town of Ergasteria, near Cape Colonna, built by themselves to 'be their workshop and port; there these scorie are re-smelted, and yield annually nearly 10,000 tons of lead, and a large quantity of silver. There are 3000 operatives engaged in this work at Ergasteria. The value of the export in 1875 was £150,513.

But the most conspicuous success of Greece has been in her Comr maritime commerce, for which the situation and configuration meree.

of the country afford unusual facilities. In 1821 Greece had only 440 vessels, with a total tonnage of 61,450 tons, whereas in 1875 she had 5440 vessels, 27 of them steamers, with a tonnage in all of 262,032 tons, and employing 26,760 mcn. In 1830 there was hardly a harbour in all Greece worth the name, the Pireus being then barely accessible to fishing boats ; there are now 65 good ports. It had only one lighthouse in 1847; it has now 46, but more are still urgently needed.

The straits of Euripus have been cleared, deepened, and widened, and an iron bridge thrown across. There are five chambers of commerce. The chief ports are Hermopolis (Syra), Hydra, Spezzia, Corfu, Zante, Pireus, Patras, Mesolonghi, Nauplia, Santorin, Naxos, Corinth.

The commerce of Greece is usually divided into general and

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special, —general including all exports and imports whatever, and special taking in only imports meant for home consumption and exports of commodities produced in the country. The special com- merce amounts

usually to 80 per cent. of the general. The general commerce of Greece in 1875 amounted to £8,374,198, of which £5,196,629 were imports and £3,177,569 exports. An idea of the remarkable progress of its comnierce may be obtained by comparing these figures with the following :—In 1833 the total Greek com- merce amounted to £671,499, and in 1840 to £1,036,374 ; in 1860 it was £3,147,000, and in 1870 £5,354,000. England occupics the first place among countries trading with Greece, its transactions being more than double those of any other country, and amounting in 1873 to 41 per cent,, and in 1875 to 38 per cent., of the whole commerce of Greeco, Taking the average of the six years ending 1874, Wyndham calculates that 60°75 per cent. of the exports of Greece go to England, and that 28°85 per cent. of its imports come from England. Turkey and Austria, its nearest neighbours, stand next. 25 per cent. of its imports are cereals and flour, —the cercals from Russia, Turkey, and Roumania, the flour from France; and 20 per cent. are tissues, inainly from England, Though timber is so abundant, it still is one of the largest imports, amounting to £187,778 in 1875. The other chief imports are cattle, salt meat, rice, coals, butter, iron, and paper. The principal item of ex- port, amounting to half the whole, is currants; this in 1875 was £1,350,467, of which £1,083,482 went to England ; then come oil, hides, lead, figs, valonia, wines and spirits, tobacco, cotton yarn, &c.

The Greek coasting trade is not open to foreigners.. The steamers of the Hellenic Company possess a monopoly of the coastage of those waters, the object being to encourage the development of native steam navigation,

There is only oue railway in Greece, if we except the private one already mentioned belonging to the Laurium Company. It is from Pireus to Athens, is 74 miles long, belongs to Government, and carries passengers only. Another railway is projected from the Pireus to Lamia (Zeitoum) in the north (140 miles), with the view of connecting Grecce with the general railway system of Europe. There were 1235 miles of telegraph in Greece in 1875, the property of Government, and worked at a cousiderable loss. The postal system isa Government und ertaking, and has been a source of profit only since 1861, when pastage stamps were introduced. [1 1875 there were 131 post-officesin Greece. There are twa banks,—the National, with its head office at Athens, and the Ionian, with its hea office at Corfu. The

National had in 1868 a paid-up capital of £540,000, with a reserve fund of £215,000.

The currency of Greece is that of the Latin monetary league, which it joined in 1868, and which allows it to strike 26,000,000 silver francs and as much' gold as it thinks proper. Under Otho, Greece had a coinage of its own, on the basis of a double standard and the decimal} system, the unit being the drachnia (equal to 84d.), which was divided into 100 cqual parts called leptas. Coins of various values were struck, but only £4000 in gold pieces, and only £36,000 in silver, an amount quite inadequate for the trade of the country, and quickly disappearing altogether, so that there is probably uot a single coin of them now left in Greece. It became necessary therefore to declare the gold and silver coins of other eountries a legal tender in Greece ; and these, with the notes of the National and Ionian Banks, became, and still remain, the practical currency of the country, so that the simplest payment may require a puzzling arithmetical calculation, for peoplo have to pay i sovereigns and thalers prices stated in drachmas and leptas. Though the unit of the Latin currency is tho franc, tho official accounts of Greece are still reckoned in old drachmas, in distinction from which the frane is termed the new drachma, There are 28 old and 25 new drachmas in the pound sterling.

The system of weights and measures is the Turkish. Their measures of length are—the pique, which is equal to 27 inches ; the royal pit, equal to 1 metre, or 3'2808 feet ; the stadion, equal to 10°62 English miles. Their measures of superficial extent are—the stremma, equal to one-fourth of an English acre, and the hectare equal to 10 stremmas. Their standard of weight is the cantar or quintal, equal to 123 tb avoirdupois. It is divided into 44 okes, an oke being equal to 2°84 tb, and subdivided into 400 old and 1280 royal drams, A kilo, used for weighing corn, is half a cantar, or 22 okes. 816 kilos are equal to 100 quarters.

FINANCES. |

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The financial condition of Grecce is uusatisfactory. Its annual Finances.

expenditure usually exceeds its income, and it is deeply in debt. The new kingdom was born in debt, and contracted to pay the expenses of the revolution that gave it being, and to that original burden it has from time to time added fresh liabilities, till it has now no longer any credit in the money markets of Europe, and is deeper in debt in proportion to its revenue than any Kuropean country except Spain. The total debt of Greece was £15, 360,103, according to Mr Malet's report in 1875, and, what with the accumu- lation of interest and the contraction of a fresh debt for army extension during the Servian insurrection of 1876, it must now be over £16,000,000. This debt consists of two kinds—foreign and internal. The foreign debt is of two parts. There are first the original two loans, amounting between them to £2,300,000, which were negotiated by the revolutionists in 1824 and 1825 with two English houses at 59 and 55 per cent., and whose coupons are now held mainly by Dutch speculators. On this Greece has never paid a farthing of interest. The Greck treasury, although it accepts the obligation, puts it off from year to year under the heading 'Deferred Debt." With accumulating interest at 5 per ceut., it had increased to £8,084,500 in 1874. The second part of the foreign debt is a loan of £2,400,000 guaranteed by the three protecting powers on the accession of Otho in 1832, and negotiated with Rothschild at 94. On this Greece paid interest for a few years, but its payment has so fallen into arrear that in 1874 this debt had grown to £3,870,000. There is also a simall debt due to the Bavarian Government, amounting now to £250,000, and there are some still smaller debts to other foreign creditors. The internal debt of the country consists partly of indemnity due to sufferers in the War of Independence, partly of loans contracted with capitalists within the kingdom after its credit abroad was gone; it now amounts in all to £5,270,339.,

The revenue for 1877, according to the estimate in the budgct, was £1,401,687, and the expenditure £1,466,708. 'The actual receipts usually fall short of the budget estimate, for Greece per- mits her subjects to fall much into arrear with the payment of their taxes ; and in 1867 it was calculated there was an aggregate of arrears of taxes amounting to £2,226,000. This revenue is received partly from direct taxes on land and property ; partly from indirect taxes ; partly from the public services, the post-office, telegraplis, and printing ; partly from the rent of the public

domains, mines, quarries, hot springs, salt, fisheries, fruits, olive gardens, vineyards, and currant plantations ; and partly from the sale of national lands aud the ecclesiastical revenucs. The largest sources of revenue are the land tax, which brought in 8,500,000 drachmas in 1877; the customs, 13,400,000; and the stamps, 4,200,000. The cost of collecting the land tax is very extravagant, It takes £25 to collect £100, or ten times more than it does in France. The Greeks are not sorely taxed. Rangabe estimates that they pay 23°43 drachmas (about 17s.) each in the year ag taxes.

Of the expenditure of Greece, nearly one-fourth part goes to pay interest on its debt, another fourtli to maintain its army and navy, and a large suin (£136,384) to pay pensions to persons who suffered in the revolution, or who possessed interests in the Ionian Islands at the time of their cession, The education and worship of the country cost £75,427, and the foreign office and diplomatic service only £40,257, The administration of justice takes £107,716, and the department of the interior, including the post-office and many other outlays, £171,526. 'lhe salaries of members of the chambers of deputies come to £16,071.

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PART IL.—GREEK HISTORY.

Section I.—Grezk History to tue DEATH OF ALEXANDER THE GREAT. :

The early history of Greece is the first chapter in the politica] and intellectual life of Europe. In contrast with nations still in the tribal the life

of cities –

of the East they recognize the principle that no personal

stage the Greeks have already | the definition of dnties and the protection of rights. ; In contrast with the despotic monarchies | the intellectual sphere it leads them to explore causes, to

rule should be unlimited. From the first they appear as a people obedient to reason and to a native instinct of measure. In the political sphere this leads them to aim at a due balance of powers and tendencies in the state, at

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interpret thought in clear forms, to find graceful expression XI. — 12

Primitive Indo- Huropean civiliza- tion.

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for the social feelings aud sympathies. The historical interest of Greece does not begin therefore only at the point where details and dates become approximately certain, but with the first glimpses of that ordered life out of which the civilization of Europe arose. Ata later stage the Greek commonwealth offer the most instructive study which the ancient world affords in the working of oligarchic and democratic institutions. Then, as the Roman power rises, culminates, and declines, Greek history assumes a new character and a new interest. From Alexander the Great dates the beginning of a modern Greek nation, one, not in blood, but in speech and manners. 'Two main threads link together the earlier and later history of civilized man, One passes through Rome, and is Latin ; the other passes through the new Rome in the east, and is Greek.

In a sketch like the present it would be impossible to attempt a detailed narrative of facts, which, besides, fall to be considered under particular headings. The aim here will be rather to trace in outline the general course of the development, and to indicate, so far as a rapid survey permits, the leading causes and tendencies which were at work in its successive stages.

Six periods may be distinguished. I. The prehistoric period, down to the close of the great migrations. IT. The early history of the leading states down to about 500 B.c. TII. The Ionic revolt and the Persian wars, 502-479. IV. The period of Athenian supremacy, 478-431. V. The Peloponnesian War, 431-404, followed by the period of Spartan and then of Theban ascendency, 404-362. VI. The reigns of Philip and Alexander, 359-323 B.c.

L The Prehistoric Period, down to the close of the great Migrations.

'" Ancient Hellas," says Aristotle, "is the country about Dodona and the Achelous,.... for the Selloi lived there, and the people then called the Graikoi, but now the Hellenes " (Meteor., i. 14). The name Graikoi probably meant the "old" or "honourable" folk (Curtius, Htym., 130). The Italians may have enlarged the application of this name, which they found on the eastern side of the Tonian Gulf. The moderns have followed the Romans in giving it to the whole people who, from very early times, have always called themselves JZedlenes.

The evidence of language tells something as to tlie point of civilization which had been reached by the ancestors of the Indo-European nations before the Hellenes parted from the common stock in Central Asia. They had words for "' father," '" mother," " brother," ' sister," "son," " daughter," and also for certain affinities by marriage, as " father- in-law," " brother-in-law," " daughter-in-law." They lived in houses ; they wore clothes made of wool or skins; as arms they had the sword and the bow; they had flocks and herds, goats and dogs; they drove, if they did not ride, horses. They were a pastoral rather than an agri- cultural people. They knew how to work gold, silver, and copper; they could count up to a hundred; they reckoned time by the lunar month ; they spoke of the sky as the Heaven-father. The first great migration fron: the common home was that which carried the ancestors of the Teutonic, Slavonic, and Lithuanian tribes into north-western Europe. The next was that which carried the ancestors of Greeks, Italians, and Celts into southern and south-western Europe.

Language indicates that there must have been a period during which the forefathers of Greeks and Italians, after the Celts had parted from them, lived together as one people. Again, the Greek language, unique in its

character- istic development, tells that the Hellenes, after the Italians had left them, must have long remained an undivided people. But to us this primitive Hellenic unity is prehis-

toric. two great branches, each with well-marked characteristics of its own, —Dorians and Jonzans ; while those who have been less affected by tlie special causes which produced these divergences from an earlier common type are regarded as forming a third branch, and are called collectively Zolvans. Further, we hear of a people distingnished indeed from the Hellenes, yet apparently felt (as by Thucydides) to be not wholly alien from them,—a people represented as having been before them in Greece proper, on the coasts, and in the islands of the Augean,—the Pelasgians.

name Pelasgoi denotes a tribe of Achean or Atolian Greeks living in Thessaly (Ziad, ii. 681; xvi. 233). In other poetical texts of later date, and repeatedly in Hero- dotus, Pelasgot is a general designation for people of whom the Greeks knew little definitely, except that they had preceded the Hellenic dwellers in the land. In this second and vague use, "Pelasgian" is virtually equivalent to " prehistoric."

The highlands of Phrygia have the best claim to be Earliest ©

regarded as the point of departure for the distinctively Hellenic migrations. In these fertile regions of north- western Asia Minor, the Hellenes, after the Italians had left them, may have lived, first as a part of the Phrygian nation, and afterwards as a separate people.

the Hellespont into Europe a population which diffused itself through Greece and the Peloponnesus, as well as over the coasts and islands of the archipelago. In after ages, when the kinship, though perhaps dimly suspected, was no longer recognized, the Hellenes called these earlier occu- paiits of the land Pelasgians. It has been conjectured that in Pelasgos we have combined the roots of wépay and ete (na). The name would then mean "the further-goer," "the emigrant." It would thus be appropriate as

the name given by the Hellenes, who had remained behind in Phry- gia, to the kinsmen who had passed over into [urope before them.

Thesecond epoch of migration from the Phrygian high- Second lands appears to have been one by which single Hellenic poo

tribes, with special gifts and qualities, were carried forth to become the quickeners of historic life among inert masses of population, among those ‘ Pelasgians” who had long been content to follow the calm routine of husbandmen or herdsmen, ‘The ancestors of the Ionians went down to the coasts of Asia Minor, and became the founders of a race whose distinctive powers found scope in maritime enter- prise and in commerce. The ancestors of the Dorians passed into the highlands of Northern Greece, and there developed the type of hardy mountaineer which united the robust vigour of hunter and warrior with a firm loyalty to ancestral traditions in religion and in civil government.

Of these two branches,—the Ionian and the Dorian,— the Ionian was that which most actively influenced the early development of Greece.

source. Those Canaanites or “lowlanders” of Syria, whom we call by the Greek name of Phoenicians, inhabited the

‘long narrow strip of territory between Lebanon and the

sea. Pheenicia, called “‘ Keft” by the Egyptians, had at a remote period contributed Semitic settlers to the Delta or “‘Tsle of Caphtor ;” and it would appear from the evidence of the Egyptian monuments that the Kefa, or Phoenicians, were a great commercial people as early as the 16th century B.c. Cyprus, visible from the heights of Lebanon, was the first stage of the Phoenician advance into the. Western waters ; and to the last there was in Cyprus a Semitic element side by side with the Indo-European, From Cyprus the Pheenician navigators proceeded to the southern

We first know the Hellenes as a race divided into Hellenes,

In Pelas: some Homeric passages, and those among the oldest, the 511s.

From these First seats a great wave of migration seems to have carried over epoch

But tle Ionians themselves Phen derived the first impulses of their progress from a foreign “™

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PREHISTORIC PERIOD. |

coasts of Asia Minor, where Phoenician colonists gradually blended with the natives, until the entire seaboard had become in a great measure subject to Phoenician influences. Thus the Solymi, settled in Lycia, were akin to the Canaan- ites; and the Carians, originally kinsmen of the Greeks, were strongly affected by Phcenician contact. It was at Miletus especially that the Ionian Greeks came into com- mercial intercourse with the Phoenicians. Unlike the dwellers on the southern seaboard of Asia Minor, they showed no tendency to merge their nationality in that of the Syrian strangers. But they learned from them much that concerned the art of navigation, as, for instance, the use of the round-built merchant vessels called yatAo, and probably also a system of weights and measures, as well as the rudiments of some useful arts. The Phcenicians had been first drawn to the coasts of Greece in quest of the purple-fish which was found in abundance off the coasts of the Peloponnesus and of Beeotia; other attractions were furnished by the plentiful timber for shipbuilding which the Greek forests supplied, and by veins of silver, iron, and copper ore.

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Leleges, who are associated especially with Lycia, Miletus, and the Troad, and who, as compared with the " Carians," are the representatives of a more advanced civilization. In the east the seafaring Ionians gave their name to the whole Greek people, as in the Hebrew Scriptures the Greeks are "the sons of Javan,"—the Uinim of the Egyptians, the Iauna of the Persians. It does not appear that the European Greeks of early days used "Jonian" in this way as a collective name for the Asiatic Greeks. But such names as Jasion, lason, [asian Argos point to a sense that the civilization which came from Asia Minor was connected with Ionia. Ata later time the Greeks forgot the Ionians and Pheenicians who had brought an Eastern civilization to the western side of the Augean. Vividly impressed by the great antiquity of this civilization itself, especially in Egypt, they preferred to suppose that they had derived it directly from the source.

. The appearance of new elemeuts in religious worship is Religion.

one great mark of the period during which Greece in Europe was still being changed by influences, Greek or foreign, from the East. The worship which the fathers of

'v0 Two periods of Pheenician influence on early Greece t

Be may be distinguished: first, a period during which they 10e=

the Hellenes had brought with them from the common home in Asia was the worship of the " Heaven-father," the unseen father who dwells in ether, whose temple is the sky,

cian trading settlements in the islands or on the coasts of the Greek seas, when their influence became more penetra- ting and thorough. It was probably early in this second period,—perhaps about the end of the 9th century B.c.,— that the Phcenician alphabet became diffused through Greece. This alphabet was itself derived from the alpha- bet of the Egyptian hieroglyphics, which was brought into Pheenicia by the Phoenician settlers in the Delta. It was imported into Greece, probably, by the Aramzeo-Pheenicians of the Gulf of Antioch,—not by the Phcenicians of Tyre and Sidon,—and seems to have superseded, in Asia Minor and the islands, a syllabary of some seventy characters, which continued to be used in Cyprus

down to a late time. The direct Phoenician influence on Greece lasted to about 600 Bc. Commerce and navigation were the provinces in which the Phcenician influence, strictly so called, was most felt by the Greeks. In art and science, in everything that concerned the higher culture, the Phoenicians seem to have been little more than carriers from East to West of

and whose altar is most fitly raised on the mountain top, as the ancicnt shrine of the Arcadian Zeus was the grove on the summit of Mount Lyczus. This is the " Pelasgian Zeus, dwelling afar," to whom the Homeric Achilles prays. But as the united Hellenic race parted into tribes, so to the first simple worship of the Heaven-father was added a variety of local cults. And as mariners from other lands began to visit the coasts, they brought in their own gods with them. Thus Melcarth, the city-god of Tyre, is re- cognized in Melicertes as worshipped at the isthmus of Corinth. In one Greek form of tle worship of Heracles, Astarte—the goddess of the Pheeniciau sailors—hbecomes Aphrodite, who spriugs from the sea. 'The myth of Adonis, the worship of the Achzan Denieter, are other examples. There are, again, other divinities who came to European Greece, not directly from the non-Hellenic East, but as deities already at home among the Ionians. Such was Poseidon, and, above all, Apollo, whose coming is every- where a promise of light and joy.

*Little precise knowledge of the earliest kingdoms and The states can be extractcd from the legends as they have come early down to us, but some general inferences are warranted. St*es- The tradition that Minos cleared the archipelago of pirates Crete. and established a wide maritime dominion, that he was*

Kgyptian, Assyrian, or Babylonian ideas.

nce 'The legends of European Greece speak clearly of foreign } 'ae elements in civilization and in religious worship which came Tropean 1 from the East. But they do not constrain us to suppose

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that those who brought in these new elements were always, or as a rule, strangers to the people among whom they brought them. On the contrary the myths constantly say, or imply, that the new comers were akin to the people among whom they came ; as the sons of Aigyptus are first cousins to the daughters of Danaus ; as Cadmus and Pelops, though nominally of foreign origin, are thoroughly national heroes and founders. Hence it appears reasonable to con- clude that the East by which European Hellas was most directly and vitally influenced was not the Semitic but the Hellenic East ; that the Ionian Greeks of Asia Minor, after having themselves been in intercourse with Phoenicia and Egypt, were the chief agents in diffusing the new ideas among their kinsmen on the western side of the "ligean. Asiatic Greeks, who had settled among Egyptians in the Delta, or who had lived amid Pheenician colonies in Asia Minor, would easily be confounded, in popular rumour, with Egyptians or Phoenicians. The Asiatic Greeks, as ploneers of civilization in European Greece, appear some- times under the name of Carians,—when they are little more than teachers of certain improvements in the art of war, and have a decidedly foreign character,—sometimes as

the first to sacrifice to the Charites, and that Dedalus wrought for him, may be taken at least as indicating that Crete played a prominent part in the early history of Greek culture, and that there was a time when Cretan kings were strong enough to protect commerce in the figean waters. passed into the region of fable, there are reasonable grounds for the belief that the ancient kings of Phrygia once exercised dominion over Asia Minor. whose origin Semitic and Aryan elements appear to have been mingled, have a twofold interest in this dawn of Hellenic history. First, they represent the earliest kingdom in Asia Minor of which anything is certainly known. Secondly, they are on land what the Phoenicians are on the sea,—carriers or mediators between the Greeks and the East. the Dardani—whose ancestor is described as worshipping the Pelasgian Zeus—founded the kingdom of the Troas, the land of Troy. It has been remarked that the double names of the Trojan heroes,—Alexander, Paris,—-Hector, Darius,—point to the twofold relationship of the Trojans, on the one side to Hellas, on the other to Asia, In

Again, though Gordius and Midas have Phrygia.

The Lydians, in Lydia.

In the north-west corner of Asia Minor, a branch of Troy,

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The European Greece we find the race known as the Minye, Minye. whose early glories are linked with the story of " Jason and the Argonauts" moving southward from the shores of the Gulf of Pagasze into the valley of Lake Copais, and found- ing the Boeotian Orcliomenus. The early greatness of Thebes. Thebes is associated with the name of Cadmus, the king- priest who introduces the art of writing, who builds tlie citadel, who founds a system of artificial irrigation. The Achzean princes, whose chivalrous spirit is expressed in the Pelidx in Homeric Achilles, rule in the fertile valley of the Thessalian Thessaly. Phthiotis. In the Peloponnesus the Pelopide at Mycene Pelopide reign over Achwzans; and Agamemnon is said to rule, not at My- only "all Argos," but "many islands." The principle on con®. —_ which such legends as that of Agamemnon's sovereignty may best be estimated has been well stated by Mr Freeman :—1

""The legend of Charlemagne, amidst infinite perversions, pre- serves a certain groundwork of real history ; I should expeet to find in the legend of Agamemnon a similar groundwork of real history. There is, of eourse, the all-important ditferenee that we ean test the one story, and that we cannot test the other, by the eertain evidence of contemporary documents. This gives us certainty in one case, while we cannot get beyond high probability in the other… . Later Greeian history would never lead us to believe that there had been once a single dynasty reigning, if not as sovereigns, at least as suzerains, over a large portion of insular and peninsular Greece. So later mediseval history would never lead us to believe that there had once been a Latin or Teutonie emperor, whosedominionsstretched from the Eider to the Ebro, But we know that the Carolingian legend is thus far eonfirmed by history; there is, therefore, no a priort objection to the analogous features of the Pelopid legend. The truth is that the idea of sueh an extensive dominion would not have oecurred to a later romancer, unless some real history or tradi- tion had suggested ittohim. So, again, without some such ground- work of history or tradition, no one would have fixed upon Mykéné, a place utterly insignificant in later history, as the capital of

this extensive empire. ‘he romances have transferred the capital of Karl from Aachen to Paris ; had it really been Paris, no one would have transferred it to Aachen. . Whether Agamemnon be a real man or not, the combination of internal and external evidence leads us to set down the Pelopid dynasty at Mykéné as an estab- lished fact.”

We now come to a phase in the development of early Greece which tradition represents as following, but at no great interval, the age in which a Pelopid dynasty ruled at Mycenz and fought against Troy. This is the period of great displacements of population within the mainland of European Greece. The first of these migrations is that 1. Change of the people afterwards known as Thessalians. A fierce of popu- tribe of mounted warriors, they passed from Thesprotia in ateeely, Epirus over the range of Pindus, and subdued or drove out

an Holic population who dwelt about Arné, in the fertile lowlands of southern Thessaly. Those of the Holians who

2. had not submitted to the conquerors passed southward Beeotia. into the land thenceforth called Boeotia, where, between Orchomenus and Thebes, they founded a new home.

Their conquest of Boeotia appears to have been difficult and gradual; and even after the fall of Orchomenus and Thebes, Plateea is said to have maintained its independ-

ence. The legend placed these events about 1124 B.c., or

3. In the sixty years after the fall of Troy. About twenty years ee later in the mythical chronology occurs the third and more “famous migration, known as the return of the Heraclide. We need not enter here into the details of the myth. It

will be enough to indicate the results to which an examina-

tion of the legend leads. The Dorians, migrating south-

ward from the highlands of Macedonia, had established themselves at the northern foot of Parnassus, in the fertile district between that range and (Eta, which was thenceforth

called Doris. In setting out from these seats to conquer

the Peloponnesus the Dorians were associated with other

tribes. Among these were the Hylleans, who were believed

to be of Acheean origin, and who traced their descont from

DST Mythical and Romantie Elements in Early English History," Lissays, 1st series, p. 29.

Tradi- tional migration in Greece proper.

GREECH

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the hero Hyllus, son of the Tirynthian Heracles. The Hyllean chiefs of the expedition represénted themselves, accordingly, as seeking to reconquer that royal dominion of Heracles in the Peloponnesus of which his descendants had been wrongfully deprived by Eurystheus. Hence the Dorian migration itself came to be called the " Return of the "Ther. Heraclide." The migration had two main results :—(1) tumof the Dorians, under leaders claiming Heraclid descent, over- Ys threw the Achzan dynasties in the Peloponnesus, and© ~~ either expelled or subjugated the Achwan folk; (2) a por- | tion of the Achzeans, retiring northward before the Dorian invaders in the south, drove the Ionians on the coast of the Corinthian Gulf out of the strip of territory which was thenceforth called Achaia; and these Ionians sought refuge | with their kinsfolk in Attica. It is in the nature of the heroic myths to represent changes of this kind, which may] have been the gradual work of generations, as effected by |

| | sudden blows. Some comparative mythologers have maiu- | | tained with much ingenuity that the " Return of the |

Heraclidze" is merely one of those alternations which balance –

each other in the hundred forms of the solar myth. It appears more consistent with reason to believe that there

was really a great southward movement of population, which resulted in the substitution of Dorian for Achzan ascend-

ency in the Peloponnesus. We cannot pretend to fix either the exact time at which it commenced or the period which was required for its completion. One thing may, however, be affirmed with probability. It cannot have

been done all at once, as the myth says that it was. The displacement of the Acleans was accomplished only by degrees, and perhaps after the lapse of centuries.

The same remark applies to those three streams of Tradi-

migration from European Greece to the coasts of Asia tional Minor, which are represented as having ensued on the Sttious

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Dorian conquest of the Peloponnesus, and which may Greece naturally be connected with the disturbance of populations proper to which the southward advance of the Dorians caused. Asia The Achzans, driven from their old seats in the south, Mit" moved northwards ; and, reinforced by Molic kinsmen 1. The from Boeotia and Thessaly, established themselves on the "lie m north-west coast of Asia Minor, where Lesbos and Cyme 8¥" became their strongholds. By degrees their dominion spread inland, until they had become masters of Mysia and

the Troad. The AZolic migration which thus created an Asiatic Molis was unquestionably the slow work of genera- tions. The imimediate cause of the Ionic migration, 2. The which began later than the /Kolic, appears to have been Ionic. the overcrowding of Attica by the TIonians driven out of Achaia. The AXolic settlements had been the work of a people migrating in large masses. The Ionic colonization seems to have been effected rather by

smaller numbers of warlike adventurers, sprung from the noble Ionian families

of Attica and the Peloponnesus, who claimed to rule over

the Ionic communities already established on the Asiatic coast. The Dorian colonists, following the southward 3. The direction of their previous conquests, settled on the south- Dorie west coast of Asia Minor. The islands of Cos and Rhedes received Dorian settlers ; and, after what was probably a

long struggle, the Dorians subdued Crete.

While the populations had thus been settling down into The the places which they were to occupy during the historical i age of Greece, a movement had been in progress on the — European mainland which tended to quicken among the various tribes a sense of the unity of the race. This was the establishment of local associations among neighbouring tribes for the common worship of the same god. These associations were of a federal character: that is, while the members of the association were independent in other matters, they were subject to a common central authority in all that concerned religious worship. Such a federal

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association was called an amphictyony, that is, a league of neighbours. The most important of such leagues was the Delphic amphictyony, of which the object was to conserve the worship of Apollo at Delphi. This league

EARLY STATES. |

- arose in Thessaly, where the conquerors who had come in

from Epirus sought to establish themselves more firmly by embracing the cult of Apollo. It was afterwards extended through the southern districts until it included most of the tribes dwelling about Gita and Parnassus. The members of the Delphic amphictyony gave a new meaning and value to the federal compact by applying it to enforce certain obligations of humanity in

war. Tley took an oath that they would not raze each other's towns, nor, during a siege, cut off the supply of water. It was in con- nexion with the Delphic amplictyony that the name

[name Jfellene appears to have been first distinctly recognized as ene.

the national name. The earliest collective name of the race, in Greek tradition, had been Graikot. The members of the Delphic amphictyony chose as their federal name that of Hellenes,—a name of sacred associations, if we may connect it with that of the Sellot or felloz, the priests of the Pelasgian Zeus at Dodona,—in the region which, according to Aristotle, was the most ancient Hellas. The circumstances which gave currency to Hellene as acommon appellative have lefta reminiscence in the myth that Hellen was nearly related to Amphictyon.

The Homeric poems may be regarded by the student of

ic history as great pictures of political and social life,

illustrating the whole variety of Greek experience down to the close of that age which saw the tides of /olic, Ionic, and Doric migration flow from the west to the east of the figean. It is a distinct question how far recoverable. his- torical fact is embedded in their text, or how far trustworthy inferences may be drawn from them in regard to asupposed series of events. But at least the legends of the Achzean princes and warriors are there, as they came through /Eolic minstrels to the poets of Ionia; and, various as may be the ages and sources of the interwoven materials, the total result may be taken as a portraiture, true in its main lines, of the age from which these legends had come down. In the political life described by the Homeric poems the king rules by divine and hereditary right. But he is not, like an Eastern monarch, even practically despotic; he is hound, first, by themistes, the traditional customs of his people; next, he must consult the boule, the council of nobles and elders ; and, lastly, his proposals require to be ratified by the agora, or popular assembly. The social life is the counterpart of this. Itis a patriarchal life, in which the head of the family stands to his dependants in a relation like that of the king to his subjects. It is, within the family pale, eminently humane ; and the absence of a charity which should include all mankind is in some measure compensated by the principle and

practice of hos- pitality. The position of free-born women is high,—higher than in the historical ages; and polygamy is unknown among Greeks. Many of the pictures of manners, especially in the Odyssey, have the refinement of a noble simplicity in thought and feeling, and of a genuine courtesy which is peculiarly Hellenic. The useful arts are still in an early stage. The use of the principal metals is known, but not, apparently, the art of smelting or soldering them. Money 1S not mentioned, oxen being the usual measure of value ; and there is no certain allusion to the art of writing.

Il. The Early History of the leading States down to about 500 B.c.

in the history of the Peloponnesus after the Dorian im-

"migration we begin to be on firmer ground. There may

still be large room for doubt as to particular dates or names, but the age left permanent records in the institu-

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tions which survived it. The first thing which should be borne in mind with regard to the Dorian immigration is

that its direct influence was confined to three districts of Results Argolis, Laconia, and Messenia were of the

the Peloponnesus. thoroughly Dorianized. Of the other three districts, Arcadia remained almost wholly unaffected, Elis and Achaia were affected only indirectly, through the influx of the populations which the Dorians had displaced. The

first rank in the Peloponnesus was long retained by Argos. Argos.

The ancient primacy of its Achzean princes was inherited by its Dorian rulers ; and now, under the dynasty of the Temenid, Argos acquired a new prestige as the head of a federative Dorian hexapolis, of which the other members were Phlius, Sicyon, Treezene, Epidaurus, and Corinth. It was only by slow degrees that the power arose which was destined to eclipse

Argos. valley of Eurotas, they found " hollow Lacedzemon " already shared among people of other tribes. Leleges, Minyans, and Achzeans had been there before them, Both Afolian and Achsan elements remained in the land. The settle- meut of the Dorians was made in a strong position under Mount Taygetus, on the right or western bank of the Eurotas ; and the fact that, unlike most Greek cities, it was not founded on a rocky base, but on arable soil, was expressed by tlie name Sparte (sown land). It was indeed less a city than a group of rude hamlets,—the camp of a military occupation, And, as a natural stronghold, defended by an alert garrison, it dispensed with walls. Sparta was at first only one member of a Laconian hexa- polis. It was at a later stage that Sparta became the head-town of the country, and the seat of a central govern- ment. The origin of the dual kingship may probably be traced to this period. Such a dualism has no parallel else- where among Dorians; and, as regards one at least of the two royal lines, we know that the Agiade Cleomenes proclaimed himself an Acbzean. The two royal lines of the Agiadee and Eurypontids may have taken their beginning from a coalition or compromise between Dorian and Achzean houses. Afterwards, when it was desired to ex- plain the dualism and to refer both lines to a common source, Agis and Eurypon were represented as descended from the twin sons of Aristodemus, Eurystheus and Procles.

The spread of Spartan power in the Peloponnesus was The Spar- preceded by the building up of that political and social tan insti-

system which made the Spartan citizens a compact aristo- cracy, exclusively devoted to the exercises of war. The

personality of Lycurgus is shadowy. He has even been Lycurgus.

classed with those beings who, like Prometheus, Hermes, and Phoroneus, bestow on men that gift of fire without which they could not have attained to a high civilization. But the charge of excessive credulity can scarcely be brought against those who hold, with E. Curtius, that "there really lived and worked in the first half of the 9th century B.c. a legislator of the name of Lycurgus, a man who, as a born Heraclide, was called to take part in public affairs." It is another question whether he was the author of all the institutions which were afterwards ascribed to him. The example of another legislator who stands in a far clearer light of history,—the Athenian Solon,

—whom the orators sometimes credit with the work of Clisthenes in addition to his own, may serve to show how loose such ascriptions often were. But at least the work of Lycurgus may be assumed to have marked an epoch in the history of the Spartan system. This system rested, first, on a dis- tinction of three orders. Dorians alone were Spartiatat, citizens of Sparta, as opposed to mere Lacedzemonii, and to them belonged all political power. Lycurgus, said the tradition, assigned nine thousand lots of land to as many Spartiatee ; the land descended from father to eldest son, and, failing issue, reverted to the state. The older or non-

When the Dorians entered the Sparta.

Dorian population, settled chiefly on the mountain slopes around the Spartan lands, were called Perrotko:. They were free farmers, who had no share in the government, and were not required to perform military service. Lastly, the JZelots cultivated the lands of the Spartans, not as slaves belonging to private masters, but as serfs of the commonwealth ; hence no Spartan citizen could sell a Helot or remove him from the land. From each farm the Helots had to produce annually a certain quantity of barley, oil, and wine; if there was a surplus, they could keep it for themselves. The condition of the Helots was thus in some respects better than that of ordinary Greek slaves. But it was such as constantly to remind them that they had once been a free peasantry. It was this, as much per- haps as positive ill-usage, which made it so peculiarly galling. The hatred of the Helots was a standing menace

Character to the Spartan commonwealth, As Aristotle says, the

Spartan kingship meant practically a life-tenure of the chief military command. The government was essentially an official oligarchy, in which the power of the irresponsible ephors was not importantly modified by the gerousia, while the popular assembly played a part hardly more active than that of the Homeric agora, with its formal privilege of

The social simple affirmation or veto. The military training, from

childhood upwards, to which the whole social life of Sparta was made subservient, was at first a necessity; but it soon became thoroughly identified with the ambition and with the pride of an exclusive warrior-caste. Sparta was sharply marked off from the other Greek cominunities by this systematic treatment of war as the business of life. When the military prestige of Sparta began to decline in the course of the 4th century B.c., it was remarked that this was due to the increased attention which other states had begun to pay to the art of war, whereas in old days the Spartans had been like professional soldiers matched against civilians.

The mountain wall of Taygetus had set a barrier between Laconia and Messenia, which might have seemed to forbid the extension of Spartan power towards the west. If the Dorians in Messenia had fully preserved the warlike character of the race, they would probably have had little to fear. But they seem to have been in some measure enervated by the natural wealth of a country which, at the same time, excited the envy of their neighbours. Myths have grown thickly around the story of the two Messenian wars. This, at least, appears certain: the gradual con- quest of Messenia by Sparta occupied not less than a hundred years (about 750-650 B.c.). The legend that, at a critical time, the stirring war-songs of the Attic Tyrtaus raised the sinking spirit of Sparta, agrees with tlie tradition of a long and doubtful struggle. Nor was the strife confined to the two chief combatants. Messenia was aided by other Peloponnesian states which dreaded a like fate for themselves,—Argos, Sicyon, Arcadia. Sparta was helped by Elis and Corinth. When Messenia had been con- quered and the Dorian inhabitants reduced to the state of Helots, Sparta had overcome the most difficult obstacle to her ambition. By conquests, of which the details are obscure, she won from Argolis a strip of territory on the eastern coast of the Peloponnesus, and finally carried her north-eastern border to Thyrea. In southern Arcadia alone the Spartan arms were decisively repulsed by Tegea ; and the Tegeans, accepting the supremacy of Sparta, were enrolled, about 560 B.c,, as honoured allies of the power which they had checked.

The repulse warned Sparta that it was better to aim at leading the Peloponnesus than at conquering it ; and an opportunity was found of asserting this leadership in a manner far more effective than any military demonstration. At Olympia, in the valley through which the Alpheus

passes to the western coast, there was an aucient sanctuary of the Pelasgian Zeus. An amphictyony, or league of neighbouring towns, held sacrifice and games there once in four years, the management of the festival being shared between Pisa and Elis.

For political reasons Dorian Sparta had always cherished Trans the traditions of the Achwan princes; but the monarchy ton fig of the Achwau age, if it still existed anywhere, was a rare} 7), |

é to oli survival. The form of government which had generally attiy

succeeded to it was oligarchy, that is, the rule of a group of noble families claiming descent from the heroes, possessing certain religious rites in which no aliens parti- cipated, and claiming to be, by a divine authority, the interpreters of the unwritten law. These noble families made up the state. The commons, who lived in or around the city as artisans, labourers, or farmers, were free men, but had no political rights). The Dorian asceudency in the Peloponnesus was peculiarly favourable to oligarchies. Sparta was, in fact, such an oligarchy, though not of the closest kind,—the Dorian citizens being the privileged class, while the Periceci answered to the commons else- where. It was a fortunate circumstance for the political development of Greece that oligarchy did not, as a rule, pass directly into democracy. A period of transition was needed, during which the people, hitherto debarred from all chance of political education, should learn the meaning of membership in the state.

This was afforded, at least in some measure, by that The peculiar phase in the life of the Greek commonwealths ty™" which intervenes between oligarchy and democracy,—the ™™ age of the tyrannies. A ¢wrannos meant one whose power is both superior and contrary to the laws. An absolute ruler is not a ¢twrannos if the constitution of the state gives him absolute power; nor is a ruler unauthorized by the laws less a twrannos because he rules mildly. The genesis of the tyrant was different in different cases. Most often he is a member of the privileged class, who comes forward as the chanipion of the people against his peers, overthrows the oligarchy with the help of the people, and establishes his own rule in its stead. Such was Pisistratus at Athens. Sometimes he is himself one of the people ; this was the case with Orthagoras, who (about 676 B.c.) overthrew

the Dorian oligarchy at Sicyon. The case of Cypselus at Corinth is intermediate between these two; for he belonged to a noble Dorian house, though not to the inner circle of those Bacchiadee whose rule he overthrew. Or the tyrant is one who raises himself to absolute power from the stepping-stone of some office with which the oligarchy itself had entrusted him. An example is supplied by Phalaris of Agrigentum, and by the tyrants of some Ionic cities in Asia Minor. Lastly, the tyrant might be a king who had overstepped his constitutional prerogative. Phei- don, king of Argos, is adduced by Aristotle as an instance of this rarer case. In all cases the tyrant properly so- called must be distinguished from a ruler whom a com- munity has voluntarily placed above the law, either tem- porarily or for his life. Such was properly called an

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aisumnetes or dictator,—a3 Pittacus of Mitylene. The benefits conferred on the Greek commonwealths by the tyrapnies were chiefly of two kinds. (1) The tyrant often instituted new religious festivals, in which the whole body of the citizens might take part. A feeling of civic unity was thus created, which could not exist while the nobles formed a separate caste, as exclusive in their worship as in their other privileges. (2) The court of the tyrant became a centre to which poets and artists were attracted. Such a man as Periander of Corinth (625-585) might aim at resembling an Eastern despot, but his encourage- ment of liberal arts must still have given an impulse to the higher civilization of Corinth. Polycrates of Samos, the friend of Anacreon, welcomed all men of fiue gifts to his court ; Pisistratus showed a like care for poetry, and for the artistic embellishment of Athens. The root of evil in the tyranny was its unlawful origin, and its consequent reliance upon force, frequently leading the tyrant to aim at keeping the citizens in a state of helplessness and mutual mistrust. with some inborn qualities for command, and the baser forms of oppression were not required until he had given place to a weaker successor.

The age of the oligarchies and tyrannies coincides with the most active period of Greek colonization, which re- ceived an impulse both from redundant population and from political troubles at home. The two centuries from 750 to 550 Bc. saw most of the Greek colonies founded. Sicily received settlements from both the two great branches of the Greek race. Naxos, founded by the Chalcidians of Eubeea (735 3B.c.), with Leoutini and Catana, founded soon afterwards by Naxos, formed a group of Ionic communities on the eastern side of the island. Syracuse, founded by Corinth (734 B.c.), Gela, colonized by Rhodians and Cretans (690 3B.c.), aud Agrigentum, of which Gela was the parent city (582 B.c.), were among the chief of the Dorian commonwealths on the south-eastern and south-western coasts. These Siceliot cities formed a fringe round the Siceli and Sicani of the interior; but, though in the presence of non-Hellenic populations, they uever lost among themselves the sharp distinction between Dorian and Ionian (or " Chaleidic "), a distinction which was long the key- uote to the inner history of the Siceliots. The earliest of the Greek settlements in Italy was the Ionic Cums, on the coast near Cape Misenum, a

little to the north-west of Naples, It was founded by Chalcidians of Eubcea, as early, aceording to the tradition, as 1050 n.c. The Dorian Tarentum,—a colony of Sparta,—and the Achwan (Aiolic) settlements of Sybaris and Croton, dated from the latter part of the 8th century B.c. Poseidonia (Peestum) was founded by Sybaris. Locri, an A¥olic settlement near Cape Zephyrium (whence its epithet "Epizephyrian "), and the Ionic Rhegium, founded from Chalcis, complete the series of flourishing cities which made south-western Italy appear as a new and richer land of the Hellenes, as Megale Hellas, Magna Grecia. The turning-point in its prosperity was the war between the two foremost of the Achzan cities, ending in the destruction of Sybaris by Croton (510 B.C.). By this event, just at the time when the Ionians of Asia Minor were passing under the sway of Persia, the Greeks of Italy were rendered less able to make head against the native tribes of the peninsula. The name Megale Hellas remained, but its old significance was gone; the spirit of confident progress had been quenched.

The distinctive character of Greek colonization is seen less vividly where, as in Sicily and Italy, Greek com- munities clustered together, than at those lonely outposts : Hellenic life where a single city stood in barbarian lands. Atassalia (Marseilles) was founded by the Ionians of Phoczea about 600 B.c., and became the parent of colonies on the

But the founder of a tyranny was usually a man |

east coast of Spain. If Carthage had not fulfilled thie purpose for which it was founded, by serving as the jealous guardian of Phoenician commerce in the western Mediter- ranean, Greek settlements would probably have multiplied on those shores as rapidly as elsewhere. Cyrene, on the African coast, was a Dorian colony (630 B.c.) from Thera, itself colonized by Sparta, and became the founder of Barca. Corcyra was colonized by Corinth about 700 B.c., and joined with the mother-city in founding settlements (among others, Epidamnus) on the coast of Epirus. The northern shores of the Augean and the Propontis were dotted with colonies, from the group of towns planted by Chalcis in the peninsula thence called

Chalcidice, to Byzan- tium,—which, like Selymbria, was founded by Megara (657 B.c.). Among the colonies on the western coast of Asia Minor, Miletus was especially active in creating other settlements, particularly for purposes of commerce. Nau- cratis, in the delta of the Nile, was a trading colony from Miletus, and flourished from 550 3B.c. On the southern shores of the Propontis and the Euxine, Cyzicus and Sinope (itself the parent city of Trapezus) were daughters of Miletus. Here too were the remotest of Greek settle- ments,—Panticapeum (Kertch in the Crimea), afterwards the capital of the Greek kings of the Bosporus ; Olbia (or Borysthenes) on the adjacent mainland ; and Istria, at the mouth of the Danube. The above enumeration, though not exhaustive, will serve to mark the wide extent of the area included by Greek colonization. As the city was the highest unit in the political conception of the Greeks, so each colony contained within itself the essentials of a com- plete political life. Its relation to the parent-city was one of filial piety, uot of constitutional dependence. In so far as the cult of the gods and heroes whom it worshipped was localized in the mother-country, it was needful that a link should exist between the religious rites of the colony and those of its parent ; and this religious continuity was symbolized by the sacred fire which the founder (oixecr7s) carried with him from the public hearth to the new settle- ment. For the rest, Massalia and Olbia were cities of Hellas in as full sense as Athens or Sparta. It was due to the self-sufficing character (atrapxea) of the Hellenic city as such that Hellas was not a geographical expression.

When Attica first comes into the view of history, it already forms a single state of which Athens is the capital : the kingly period is over, and, though a close oligarchy still exists, there are signs of comingchange. But the hints of poetical legend, and sometimes the surer evidence of the ground itself, enable us to go further back, and to form at least a general conception of earlier chapters in the story of the land. Of the three plains on the northern shore of the Saronic gulf,—those of Megara, Eleusis, and Athens, — the Attic plain is that which offered the greatest advantage to settlers. It isthe most spacious; it Js the best watered ; it holds the most central position in the district which stretches south-east from the chains of Cithsron and Parnes to the A®gean; it has the best seaboard for navigation and commerce ; and it contains the best site for a city. Traces of early immigrants of various stocks sur- vived in the names of places, in worships,

and in legends. Eleusis, Pireeus, Phaleron, are Minyan names; the myths and cults tell also of Carians, Leleges, Cretans, Tyrrhenians. But the chief influence which came to Attica from beyond sea must have been that of the Pheenician settlement at Salamis (Salama, the place of peace), a name which, as in the Cyprian worship of Zeus Salaminios (Baal-Salam), points to the Phoenician effort to establish friendly inter- course between alien races.

Nature of the Greek

colony.

Early his-

tory of Attica,

Herodotus (viii. 44) distin- The four

guishes four periods in the early history of Attica, with @ppella-

each of which he connects an appellative. In the first the inhabitants were " Pelasgoi called Kranaoi," in the

1Ves,

Character of the Attic popula- tion.

Classes.

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second ' Kekropide," in the third "' Athenians," in the fourth "Ionians." The extensive series of rock-dwellings found on the south and south-west of the Acropolis are, by the ingenious and probable conjecture of E. Curtius, connected with the first of these periods. This primitive Pelasgic settlement was the Rock-town (xpavaai); its inhabitants were Kranaoi, the dwellers in the rocks. The second period was one in which the Acropolis became the seat of a small number of nobles, and of a princely family claiming descent from the earth-born Cecrops, The cita- del becomes the centre of religious

and political life ; beneath it dwell Pelasgic bondmen, who work for the Cecropidse as the Cyclopes worked for the Perseide at Argos. The city of the Cecropide—no longer of the Kranaoi—becomes the head of the twelve cities among which the Attic land was divided. As the leading families are drawn towards the Cecropid city, rivalries ensue, which are mythically represented by the strife of rival gods on the Acropolis. Zeus, the Pelasgic god, has priority of possession. But his honours are disputed by Poseidon, the deity of the Thracians settled on the gulf of Salamis, and of their priestly clan, the Eumolpide. The third clainiant is Athena, the divinity of a race possessing a higher culture, the giver of the olive to the land, The final victory falls to Athena. But Zeus keeps the place of honour as protector of the whole community,—Polieus ; and Athena shares her sanctuary with Poseidon. The mythical Erechtheus,—represeuting at once the ancient Poseidon and the nursling of Athena,—is the symbol of the victory and the conciliation. This is the third period of Herodotus ; "Erechtheus having succeeded to power," the Cecropide become Athenians, The fourth and last period is that in which Ionian settlers press forward from their earlier seat on the bay of Marathon, and establish themselves—not without opposition —on the banks of the Ilissus. The wor- ship of the Ionian Apollo takes its place beside that of Zeus and Athena, The Ionic settlement on the Ilissus was in- cluded in an enlarged Athens, and the close of the epoch was marked by that union (euvotxa) of Attica into a single state which Attic tradition ascribed to the hero king Theseus. The light soil of Attica had protected it from such whole- sale changes of population as had passed over Thessaly, Bosotia, and the Peloponnesus. In contrast with the oc- cupisrs of those lands the Attic population claimed to be indigenous ; and the claim was true in this sense that the basis of the population was an element which had been there from prehistoric times. On the other hand the maritime advantages of Attica had been sufficient to attract foreign immigrants. Thus in Attica no one type of life and character prevailed to the same extent as the Dorian in the Peloponnesus or the A{olian in Beeotia, The Ionian element was tempered by others older than itself, This fact is the key to that equable and harmonious development which so remarkably distinguished the Attic people alike in culture and in politics, The institutions which are found existing in Attica in the 7th century B,c. may be regarded as dating from the age which tradition called that of Theseus,— the age, namely, in which the loose canton- system of Attica was knit

together into a single state. The inhabitants of Attica form three classes,—the Eupatridv or nobles; the Geomori, free husbandmen; and the Demiurgi, or handicraftsmen. The government was wholly in the hands of the Eupatride, who alone were citizens in the proper sense. The Eupatrid order was divided into four tribes, called after the sons of Ion,—Geleon, Hoples, Eigicoreus, Argadeus. Each tribe contained three phra- érvav or clans, and each clan thirty gene or houses. The members of each clan were united by the worship of an heroic ancestor, and all the clans were bound together by the common worship of Zcus Herkeios and Apollo Patrous.

HOC i

The transition from monarchy to oligarchy was more gradual at Athens than it seems to have been elsewhere. First, the priestly office of the king was taken away ; and, as the old name basileus implied religious as well as civil authority, he was henceforth called simply the ruler, archon. But the office of archon was still held for life, and was hereditary. The second step was to appoint the archon for ten years only. The third and last step was to divide the old regal power among nine archons appointed annually (683 3.c,), The first archon, called Eponymos, because his name marked the date of official documents, had a general supervision of affairs, and in particular re- presented the state as the guardian of orphans and minors; the second archon was high priest (basileus); the third was commander-in-chief (polemarch) ; the remaining six were the custodians of the laws (“thesmothete ”). After this reform, two events are the chief landmarks of Attic history before Solon. The first is the legislation of Draco, the second is the revolution of Cylon. Hitherto the Eupatride had been the depositaries and sole interpreters of an un- written law. Draco, himself a Eupatrid, was now com- missioned, not to frame a new code, but to write down the laws as they existed in oral tradition, To a later age the laws of Draco became a proverb of severity ; but their severity was that of the rude age from which they had come down, not of the man who was employed to tabulate them, By this code (620 B.c.), and by the establishment of a court of fifty-one judges (épérau) in capital cases, the people were so far secured against abuse of the judicial office, But the existence of serious popular discontent a few years later is shown by the attempt of Cylon (612 B.c.). Stimulated by the example of his father-in-law, Theagenes, the tyrant of Megara, he

resolved to seize the supreme power at Athens. Promises of relief and of a new agrarian law gained him adherents aniong the distressed classes; but when he had succeeded in seizing the Acropolis, he found himself disappointed of popular support and surrounded by the troops of the archons. He escaped. His partisans surrendered, on the promise of the archon Megacles that their lives should: be spared; but, when they had left the altars, they were cut down, The "Cylonian crime" was denounced by the people as having brought a pollution upon the city, and the punishment of the whole clan of the Alemzonide—to which Megacles belonged—was de- manded as an expiation, The Eupatridee refused to yield, until Solon, one of their order, prevailed on the Alemxonide to stand a trial before three hundred of their peers. They were found guilty of sacrilege, and were banished.

Solon was now to come forward as the umpire of still graver issues. The influence of his ardent and lofty nature

[HISTORY.

on the people is expressed in the legend that his recitation "°

of his elegy, " Salamis," fired them to strike the blow by which "the fair island" was won back from the Megarians. The part which he had taken in the Alemeonid affair was well fitted to make him trusted both by the nobles and by the people, His legislation had a twofold scope. In the

first place he aimed at giving immediate relief to a class Relic As there was little money in 4"

whose plight was desperate. the land, those in whose hands it was had been able to force up the rate of interest as they pleased. The small farmers (geomori) were being crushed out of existence by a load of debt, mortgaging their farms to their creditors, who, in default of land, could even sell the debtor as a slave. Solon depreciated the value of the silver drachma by 27 per cent., so that a debt of 100 old drachmas could be paid with 73; debts to the state were cancelled alto- gcther. In a fine iambic fragment, Solon calls as witness of his work " the greatest of Olympian

deities, the black earth, wherefrom I took up of yore the pillars that had been set in many a place,'—these (dpor) being the stones

Kings |

—arch ship,

Draco

Cylon)

Legis tion ¢

n's

anny of a successful demagogue.

Biss locally divided into three classes,—the Diacrii or the

EARLY ATTICA. |

that marked a mortgaged homestead. Secondly, Solon aimed at establishing a permanent equilibrium between classes. He classed the citizens by their rated property as (1) Pentakosio-medimnoi, (2) Hippeis, (3) Zeugitai, (4) Thetes. The first class alone could hold the archonship ; the fourth had no political privilege except that of voting

J lesia. in the assembly. But Solon made the assembly (éxxAnoia)

what it had never before been, a real power. He gave to it (1) the right of passing laws, (2) the right of calling magistrates to account, (3) the right of electing archons.

(incil. At the same time he created a couucil of four hundred, to

be elected annually by the people, through which all business should be introduced to the assembly. He

popa- strengthened the old Eupatrid Areopagus, by adding to its

jurisdiction in homicide a general power of moral censor- ship, and provided that the archons of each year should, if found worthy, pass at the end of it into this senate. Athenians of a later age often described Solon as the founder of the democracy. This was not his own concep- tion of his work. We have his own description of it :—

vacant "7 cave the people as much strength as is enough, without | sown

taking away from their due share (ry7s), or adding thereto. But as for those who had power and the splendour of riches, to them also I gave counsel, even that they should not uphold violence. And TI stood with my strong shield spread over both, and suffered neither to prevail by wrong." Solon was not a champion of popular rights, but a philo- sophic mediator between classes.

The removal of the urgent pressure of usury, the sub- stitution of wealth for birth as the canon of privilege, and the bestowal of strictly limited political power on the people were Solon's achievements. It is no proof of their inadequacy that they were soon followed by the appearance The Attic population was

"highlanders " of the north-east district (the poorest) ; the Parali, the boatmen and fishermen of the coast ; and the " Pedieis," the richer farmers of the Attic plain. Each of these classes formed a political faction, with an ambitious noble at its head. The Diacrii were led by Pisistratus, the Parali by Megacles, the Pedieis by Lycurgus. On the pretence that he had been murderously assaulted by the enemies of the people, Pisistratus obtained a guard of 50 men, It was presently increased to 400. He then seized the Acropolis (560 B.c). After having been twice driven out by the combined factions of the Plain and the Shore, he finally established himself as tyrant in 545 B.c., and reigned till his death in 527 8.0. He did not abolish Solon's con- stitution, though he reserved some of the higher offices for members of his own house. His government appears to have been mild and wise. He set the example of submis- sion tothe laws. By many new enactments he promoted good order and morality, The convenience of the citizens and the beauty of Athens were consulted by the construc- tion of new buildings, roads, and aqueducts. There were but two things to remind Athenians that this paternal rule had been founded in force,—the presence of hired troops,

and the levy of tithes on private lands. Pisistratus was suc- ceeded by his eldest son Hippias. In 514 z.c. Hipparchus, the brother of Hippias, was murdered by Harmodius and Aristogiton, in revenge for an affront offered to the sister of Harmodius. The rule of Hippias, which had hitherto resembled that of his father, now became cruel. The Alemzonide—who had been in banishment since the final return of Pisistratus in 545—had won the favour of the Delphic priesthood by an act of liberality. The temple at Delphi having been burned down, they had undertaken to rebuild it, and, instead of common limestone, which would have satisfied the contract, used Parian marble for the east side of the temple. They now exerted their influence.

GRE

ECE I7 Whenever Sparta or a Spartan consulted the oracle, the response always included a conimand to set Athens free.

At last Cleomenes, king of Sparta, took the field. The children of Hippias fell into his hands, and, to save them, Hippias voluntarily withdrew from Athens (510 8.c.). The End of rule of the Pisistratid house was now at an end. In the Pisistra- phrase of the song which gave ill-merited glory to Harmo- #i4 mule. dius and Aristogiton, Athens was once more under equal

laws.

*But there was a vehement strife of factions. The Eupatrid party, under Isagoras, wished to restore the aris- tocracy of pre-Solonian days. The party of popular rights was supported by the Alemzonide, and led by Clisthenes, whose father, Megacles, had married the daughter of Clisthenes, tyrant of Sicyon. Clisthenes, in the words Reforms of Herodotus, took the people into partnership, and by of Clis- his reforms became the real founder of tlie democracy, *e¢s. Abolishing the four Ionic tribes, which had included the Eupatride, he instituted ten new tribes, which included all The ten the free inhabitants of Attica. Each tribe was composed tribes. of several demes (townships) not adjacent to each other,— thus securing that the old clans should be thoroughly broken up among the new tribes. The number of the Council (Boule) was raised from 400 to 500,—50 members The _ being elected from each of the ten new tribes. Further, it Council. was*

arranged that each tribal contingent of 50 should take it in turn to actasa committee (zpurdves) of the council,—

a board of presidents (zpdedpor), and the chairman of the

day, being again chosen in rotation from the committee. A

new office was also instituted. The command of the army

was given to a board of ten Generals (strategi), one being Generals, elected by each of the tribes. In later times the strategi became ministers of foreign affairs. Jury courts of citizens

were organized out of the assembly, to share the adminis- Jury- tration of justice, which had hitherto belonged to the courts. archons and the Areopagus. As a safeguard for the state against party struggles, it was provided that, if the Council Ostra- and the Ecclesia should declare the commonwealth to be in cism. danger, each citizen might be summoned to indicate by ballot the name of any man whom he thought dangerous,

and that, if the same name was written on 6000 tickets (6oTpaxa), the man so indicated should go into exile for ten years, without, however, losing his civic rights or his pro- perty. This was the institution of ostracism. Finally, choice by lot was substituted for voting in the election to

the archonship, thus diminishing the danger of factious partisanship.

Isagoras, the leader of the party opposed to these Strife of reforms, had a zealous ally in Cleomenes, king of Sparta, factions. Clisthenes, they alleged, was aiming at a tyranny such as that of his grandfather and namesake at Sicyon. Sparta, the leading Dorian state, was in a manner the recognized champion of aristocracy against revolution. The Spartan herald summoned the Athenians to banish the accursed Alemxonidz, and Clisthenes voluntarily left Attica. Cleomenes arrived at Athens with his army. Isagoras was made archon; seven hundred " democratic " families were banished ; the newly constituted Council of five hundred was dissolved. But now the people rose inarms. Cleo- menes and Isagoras were besieged on the Acropolis. On the third day of the siege they surrendered. Cleomenes and

his troops were allowed to withdraw. Isagoras escaped, but his Athenian adherents were put to death. Clisthenes now returned to Athens. He seems, however, to have excited popular indignation by promoting a treaty with Persia, by which the supremacy of the Persian king was acknowledged. He thus lent colour to the accusation of his enemies that he was aiming at a tyranny; and he was banished. Cleomenes presently invaded Attica a second time, with the Peloponnesian allies, But the other Spartan

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king, Demaratus, was opposed to his designs. The Corin- thians refused to follow him, and his army broke up when it had advanced no further than Eleusis. Meanwhile the Thebans and the Chalcidians of Euboea had been induced to take up arms against Athens. Freed from the danger of the Peloponnesian invasion, the Athenians marched against the Thebans. They found them on the shore of the Euripus, and routed them. Crossing the strait into Eubcea, they defeated the Chalcidians on the same day. The lands of the Chalcidian knights (Hippobote) were divided in equal lots among four thousand Athenians, who occupied them, not as colonists forming a new city, but as The first non-resident citizens of Athens. This was the first kleru-

ca

little more than an ideal. The only great enterprise in which Greeks had made common cause against barbarians belonged to legend, The first historical event in which the unity of Greece found active expression was thie struggle with Persia.

TIL. The Ionic Revolt and the Persian Wars, 502-479 B.c.

The twelve Ionian cities on the western coast of Asia Minor formed a community which kept itself thoroughly distinct from the AXolian colonists

to the north and the Dorians to the south. The Pan-Ionic festivals preserved the memory of the common descent, The Ionian life and culture had a character of its own.

But the Ionian cities The had no political cohesion, nor had they any recognized Ionian

kleruchia. chia, The Spartans, incited by Cleomenes, now made a om leader. One after another they became tributary to the "%

final effort to repress the democratic strength of Athens.

Hippias was invited from his retreat on the Hellespont to Lacedeemon, aud a Peloponnesian congress was convened at Sparta to discuss a project for restoring him to Athens as tyrant. The representative of Corinth urged that it would be shameful if Sparta, the enemy of tyrannies, should help to set up a new one. The congress was of his mind. The scheme failed, and Hippias went back to Sigeum.

Athens — In these five years (510-505) which followed the fall of

afree the Pisistratidee the future of Athens was decided. Athens

common- had become a free commonwealth, in which class grievances

wealth. 4 ite ° ° no longer hindered the citizens from acting together with vigorous spirit. The results were soon to appear in work done by the Athenians, not for Athens only, but for all Greece. '

Elements The time was now drawing near when Greece was to

oh Hel- gystain its first historical conflict with the barbarian world. ety. There was not, in the modern sense, an Hellenic nation. But there were common elements of religion, manners, and culture, which together constituted an Hellenic civilization, and were the basis of a common Hellenic character. The Graikoi of Epirus, united in the worship of the Pelasgian Zeus, had become the Hellenes of Thessaly, united in the Delphi. worship of Apollo. The shrine of Delphi, at first the centre of the most

important amphictyony, had now become the religious centre of all Hellas. It was acknowledged as such by foreigners, by the kings of Phrygia and Lydia in the east, by the Etruscan Tarquinii in the west, as after- wards by the Roman republic. In political matters also Delphi was a common centre for the Greek states, mediat- ing or advising in feuds between factions or cities, and The na- giving the final sanction to constitutional changes. A tional sense of Hellenic unity was further promoted by the great games. festivals. It has already been seen how Sparta lent new brilliancy to the gatherings at Olympia, The Pythian fes- tival was revived with a fresh lustre after the first Sacred War (595-585), in which Clisthenes, tyrant of Sicyon, and his allies destroyed Crisa, the foe of Delphi. A little later two other festivals were established, the Isthmian and the Nemean, at about the time when the tyranny of the Cypselidee was overthrown at Corinth, and that of the Orthagorides at Sicyon. The games of Nemea and of the Isthmus were new assertions of the Dorian sentiment which was so strongly opposed to tyrannies, and they exemplify the manner in which such festivals were fitted to express Art and and strengthen nationalsympathy. In the gradual growth, poetry. too, of Hellenic art,—with a stamp of its own distinct from that of Assyria, Babylon, Pheenicia, or Egypt,—the Greeks found a bond of union, and the temples were centres at which the growth of such an art was encouraged and recorded. Above all, the Homeric poetry, in which the legends of the heroic age took a form that appealed to every branch of the Greek race, was a witness to the contrast between Greek and barbarian. It was the interpretation of this contrast which made Homer so peculiarly the national poet. Still the unity of Greece had hitherto been

kings of Lydia. The process of subjugation commenced at the time when the Lydian dynasty of the Mermnadz (about 716 B.c.) began to make themselves independent of Assyria. It was completed by Croesus, to whom, about 550 B.c., all the Ionian cities had became subject.

and enriched its shrines; he welcomed distinguished Greeks to Sardis. All that was exacted from the Ionians by Croesus was that they should acknowledge him as their suzerain, and pay @ fixed tribute. The Persians, under Cyrus, defeated Croesus and conquered Lydia about 547 p.c. The whole coast-line of Asia Minor was afterwards reduced by Harpagus, the general of Cyrus. zealous monotheists, destroyed the Greek temples. was

not till the reign of Darius, who succeeded Cambyses in 521 B.c., that the Jonians felt the whole weight of the Persian yoke. Darius, the able organizer of the Persian empire, preferred that each Ionian city should be ruled by one man whom he could trust. He therefore gave system- atic support to tyrannies,

It is characteristic of the political condition of Ionia that The Ju the revolt was not a popular movement, but was the work revolt.

of two men, each of whom had private ends toserve. His- tissus, tyrant of Miletus, had rendered a vital service to Darius during his Scythian expedition (510 B.c.) by dis- suading the other Greek leaders from breaking down the bridge over the Danube, which secured the retreat of the Persian army. Having been rewarded with a principality in Thrace, he presently became suspected of ambitious designs. Darius sent for him to Susa, and detained him there on the pretext that he could not live without his friend. Meanwhile Aristagoras, the son-in-law of Histizeus, ruled at Miletus. In 502 Aristagoras undertook to restore the exiled oligarchs of Naxos, and for this purpose ob- tained 200 Persian ships from Artaphernes, the satrap of western Asia Minor. The enterprise miscarried. Aris- tagoras, dreading the anger of Artaphernes, now began to meditate revolt, He was encouraged by secret messages from Histizeus, who hoped to escape from Susa by being sent to suppress the rising. Aristagoras laid down his tyranny, and called on the people of Miletus to throw off the Persian yoke. The other Ionian cities followed the example. They deposed their tyrants and declared them- selves free. The AXolian and Dorian settlements made common cause with them. Cyprus also joined in the revolt (500 Bo.) Aristagoras next sought aid beyond the figean. Sparta held aloof, but five ships were sent by the Eretrians, and twenty by the Athenians, The united Greek force surprised Sardis, and set fire to it, but was presently driven back to the coast. The Athenians then went home. Darius was deeply incensed by this outrage. The whole Persian force was brought to bear on Ionia, and Miletus was invested by land and sea. In a sea fight off Lade, an island near Miletus, the Ionians were decisively defeated by a Persian fleet of nearly twice their number,

Croesus under was friendly to the Greeks: he respected their religion, lydia;

The Persians, under But it Persia

ltiades,

_ own vassals in Ionia.

GRE

partly through the shameful desertion of the Samians and Lesbians during the battle (496 B.c.). The Persians soon afterwards took Miletus by storm (495 B.c.). The Greek cities of the Asiatic sea board and of the Thracian Cher- sonese successively fell before them.

But the vengeance of Darius was not yet complete. He could not forget that Greeks from beyond the sea had

PERSIAN Wars. |

- helped to burn Sardis, and he resolved that the punishment

of Athens and Eretria should be as signal as that of his A Persian army, under Mardonius, crossed the Hellespont and advanced through Thrace. But the Persian fleet which accompanied it was shattered by a storm in rounding Mount Athos. The progress of Mar- donius was also checked by the Thracians, and he retreated to Asia.

The ambition of Mardonius had been to bring all European Hellas under the rule of the Achzmenidz. The

~ second, Persian expedition, guided by more cautious counsel,

had a narrower scope. It was directed strictly against those states which the great king had vowed to punish. The intrigues of the Pisistratidze were busy in promoting it, and Hippias was to lend his personal guidance to its leaders. But before the new force set out Persian agents were sent through Greece to demand the symbols of sub- mission from the cities. Most of the islands feared to re- fuse. Aigina, now a prosperous maritime power, complied from another motive than fear. Even Persia was welcome to heras anally against Athens. The Athenians called upon Sparta, whom they thus recognized as the head of Greece, to punish this treason to the Hellenic

cause; and Cleo- menes, after overcoming the opposition of his royal col- league, Demaratus, took an arbitrary revenge on the Aaginetans by depositing ten men of their chief families in the hands of the Athenians.

In 490 Bc, the second Persian expedition crossed the figean under the command of Datis and Artaphernes. Naxos was sacked, Eretria was betrayed. It seemed hardly doubtful that Athens too must fall. The Persians landed in the bay of Marathon, enclosed by the spurs of Brilessus (Pentelicus) and the hills of the Diacria. They thus avoided the dangers of a voyage round a rocky coast ; and no part of Attica, Hippias told them, was so favourable to cavalry, The Athenians had sent for help to Sparta; but a religious scruple forbade the Spartans to march before the time of the full moon. Nine thousand Athenian citizens, with the slaves who carried their shields, went forth to meet the Persians at Marathon. On the way they were joined by a thousand Platzeans,—the whole force of that city,—who came to stand by their old protectors. Miltiades, formerly the ruler of the Chersonese, was one of the ten Athenian generals. Five of these voted for awaiting Spartan help. The other five, led by Miltiades, were for giving battle at once ; and the vote of the polemarch, Callimachus, turned the scale in their favour. The Greeks charged down from the hillside upon the Persians, The Greek centre was driven in, but the Greek wings prevailed, and then closed upon the Persian centre. The Persians fled to their ships. Six thousand Persians fell. The Greek loss was about 192. Believing that traitors at Athens had signalled to the Persians to surprise the city while undefended, the army hastened back. The Persian fleet soon approached, but Seeing troops on the shore, sailed away for Asia.

After the victory of Marathon Miltiades was all-power- ful at Athens. He asked the people to give him a fleet, in order that he might strike another blow at Persia while the effects of Marathon were fresh. His demand was granted, But he employed the fleet in an attempt to wreak a private grudge on the island of Paros. At the end of twenty-six days he returned to Athens baffled, and suffering from a wound in the thigh, He was indicted for

having deceived the people, and was sentenced to a fine of about £12,000. Being unable to pay it, hc was disfran- chised as a public debtor. His wound

mortified, and he died, leaving debt and dishonour to his son Cimon. Aristides was now the most influential man at Atheus, as Themistocles was the ablest. Themistocles foresaw that the Persians would return, and that Athens could resist them only on the sea. He aimed therefore at creating an Athenian navy. Already (491 3.c.) he had persuaded the Athenians to sct about fortifying the peninsula of the Pirzeus, which, with its three harbours commanded by the height of Munychia, offered greater advantages than the open roadstead of Phalerum. He now urged that the revenues from the silver mines of Laurium should be applied to building a fleet. The frequent hostilities between Athens and Aigina enforced the advice. Before 480 p.c. Athens had acquired 200 triremes. Aristides was at the head of a party who viewed this movement with alarm. Had not the naval empire of Miletus, Chios, and Samos been transient? The land-holding citizens who had fought at Marathon would give place to a mob of sailors and traders, Au unstable democracy would carry the state out of the ancient ways. 'The strife of parties came to an issue. An ostracism was held, and Aristides was banished,—probably in 484 or 483 3.c. Themistocles remained the leader of Athens in the new path which he himself had opened. Athens was now the first maritime power of Greece.

The repulse at Marathon had probably not prevented the Persian commanders from representing their expedition as in a great measure successful. 'Darius resolved on the complete subjugation of Greece. But, when vast prepara- tions had been in progress for three years, he died, leaving the throne to Xerxes, the eldest of his four sons by Atossa, the daughter of Cyrus (485 B.c.). Xerxes was not, like his father, a born ruler or a trained warrior. But he was profoundly convinced that all human beings were the natural slaves of the Persian king ; and he was influenced by a strong war-party in the palace, with Atossa and Mardonius at its head. The house of Pisistratus, the ambitious Aleuadee of Thessaly, and Demaratus, thie exiled king of Sparta, united in urging an invasion of Greece. It was in vain that Artabanus, the uncle of the king, argued on behalf of the moderate party at the court. Orders were giveu to raise such an armament as the world had never seen, a host which should display the whole resources of the empire from the Indus to the A%gean, from the Danube to the Nile. Forty-six nations were represented by the forces which wintered at Sardis in 481 B.c.

Greece was probably never stronger than it was at this time. The population of the Peloponnesus may have been about two millions. Athens, according to Herodotus, had 30,000 citizens, The Boeotian towns and the islands were prosperous. The proportion of slaves to freemen varied from perhaps four to one at Athens to as much as ten to one at Corinth or Augina. Life was still simple and vigorous. Society was not divided into rich classes ener- vated by luxury and poor classes enfeebled by want. The public paleestras were schools of physical training for war. But that which Greece lacked was political unity. Aristocracy and democracy were already rival forces.

Policy of Themis-

tocles.

Xerxes.

Third Persian expedi- tion.

Condition of Greece,

Political

Everywhere the aristocrats felt that a victory over Persia divisions.

must have a national character, and must so far be a victory for the people. They inclined therefore to tlie Persian cause; and the stand in defence of Greece was

Plan of

defence.

100

eventually made bya few states only. Sparta, as the lead- ing city of Greece, took the first step towards the forma- tion of a national party, by convening a congress at the isthmus of Corinth in the autumn of 481. Here Them- istocles showed his statesmanship by prevailing on the Athenians to abstain from disputing the hegemony of Sparta. Most of the Peloponnesian cities

were represented at the congress. But Argos and Achaia, jealous of Sparta, held aloof. In Beeotia, Thebes,—the enemy of Athens,— favoured Persia. In Thessaly the dynasty of the Aleuade were the active allies of the invader. Gelon of Syracuse refused to aid unless he were to lead. The Corcyreans promised sixty ships, but did not send them. Crete also failed to help. The states which fought against Persia were then these only,—Sparta with her Pelopon- nesian allies, Athens, Augina, Megara, Platzea, Thespicze. This national league expressed indeed the principle of Greek unity, but Greece was far from being united. The "medizing" party was strong, and it counted some adher- ents in many even of the patriotic cities. Wherever democracy had enemies Persia had friends.

The first idea of the national defence was to arrest the torrent of invasion at some northerly point which could be held against great numerical odds. Tempe proving unten- able, it was resolved to make a stand at Thermopyle. When Leonidas had fallen with his 300 Spartans and the 700 Thespians who shared their heroic death, the next ob- ject of the Peloponnesian allies was to guard the isthmus

Athens. of Corinth. The peculiar misfortune of Athens in the war

Rattle of battle of Salamis was fought. Salamis.

Lessons of the Persian wars.

was her position between two gates, the first of which had been forced by the enemy. 'The Greek leaders seem to have assumed at first that it was vain to oppose the Persian land forces in an open field. Xerxes occupied Athens, and the flames which destroyed its houses and temples at last avenged the burning of Sardis. The Greek ships, which had gained some advantage over the Persian fleet at Artemisium in the northern waters of the Eubcean strait, had moved to Salamis as soon as it was known that the Persians had passed Thermopyle. The homeless popula- tion of Athens had been conveyed to Salamis, Aigina, and Troezen before the arrival of Xerxes, And now the fore- cast of Themistocles was verified. Athens, and Greece itself, were saved chiefly by the Athenian ships,—200 in number out of a total of 366. The Peloponnesian leaders wished to withdraw the fleet to the isthmus. Themistocles suw that if it left Salamis it would disperse. He sent

word to Xerxes that the Greeks meditated escape. The Persian fleet surrounded them in the night. Next day the Of 1000 Persian ships, 200 were destroyed; the rest fled. It was on the same day that Gelon of Syracuse defeated the Carthaginians at Himera in Sicily (480 3.c.). Xerxes lost heart and re- treated to Asia, leaving Mardonius with 300,000 men to finish the war. In the summer of 479 Athens was again occupied and destroyed by the Persians. Now at length Sparta came to the rescue, Pausanias, the guardian of the young son of Leonidas, led 110,000 of the allies into Beeotia, and utterly defeated the army of Mardonius near Platwa (479 B.c.). On the same day the troops of the Greek fleet defeated those of the Persian fleet in a battle on the shore at Mycale near Miletus. This victory set Ionia free from Persia.

The Persian wars had revealed both the weakness and the strength of Greece. The hereditary aristocracy of Thessaly had shown that they were eager to establish the supremacy of their house with the help of Asiatic despotism. Such states as Argos and Thebes had not been ashamed to indulge jealousy and party spirit by betrayal of the com- mon cause. Even Sparta and the Peloponnesian allies had been disposed to confine their endeavours to the defence of

their own peninsula, leaving Athens and the northern cities to their fate. On the other hand the struggle had brought into strong relief the contrast between absolute monarchy and constitutional freedom. This appeared in two things: the Greek strategy was superior; and the Greek troops fought better. Athens, in particular, had shown how both the intelligence and the spirit of citizens are raised by equal laws. The mistakes of the invaders,—which, to a Greek mind, might well have seemed the work of Ate,—were such as are natural when a vast force is directed by the intemperance of a single will. Artemisia and Demaratus advised Xerxes to occupy Cythera. The Thebans advised Mardonius to sow dissension among the Greeks by means of bribes. Both counsels were judicious, and both were neglected. 'Time is, in war, the surest ally of superior numbers and resources; but the impatience of the Persian commanders staked everything on a few pitched

battles. Again, the Persians, unlike the Lydians of old, destroyed the Greek temples. They thus conferred an immense moral advantage on their antagonist. Hecould no longer doubt that he was helped by his gods.

IV. The Period of Athenian Supremacy, 478-404 B.c.

In the space from the Persian to the Peloponnesian War the central interest belongs to Athens. The growth of Athenian empire, the successive phases through which it passed, and its influence on the rest of Greece, the inner development of Athenian life, political, intellectual, social,—these are the salient features in a period of about fifty years. The first care of Themistocles after the repulse of the Persian invasion was to restore the fortifi- cations of Athens. The jealous interference of Sparta, instigated by Aigina and Corinth, was defeated by his ingenuity. A wall of larger circuit than the old one was built round Athens, and a strong wall was also carried round the Pireus. The Persians had been driven out of Tonia, but they still held many places on the Thracian and Asiatic coasts. Greek fleet, took Byzantium from the Persians in 478. He now formed the design of making himself a despot, and his adoption of the manners of a Persian grandee became so offensive to the Greek captains that they requested the Athenian commanders to assume the leadership of the fleet. Pausanias was recalled to Sparta, and his successor found that the hegemony had already changed hands. The league, of which Athens now became the head (477 B.¢.), was intended to continue the national defence against Persia. Its special purpose was to guard the Aigean., Aristides was chosen to assess the rate of contribution for the members. The representatives of the several cities met at the temple of Apollo in Delos, where the common fund

was also deposited. Hence the league was called the Con- Confei It was only gradually that this free racy confederacy, with Athens for a president, passed into an Del |

federacy of Delos.

Athenian empire over tributary cities. At first each city contributed ships to the common fleet. But the practice arose of allowing some cities to contribute money instead of ships. A city which did this had no control over

Athens, and no protection against attack. One after Gradual'

another of the discontented allies revolted from Athens, chans? — n

*and was forcibly reduced to the condition of a subject. * Naxos was the earliest example (466 3B.c.); Thasos was the next (465 B.c.); and as early as 449 3.c. only three insular allies remained free,—Samos, Lesbos, and Chios. The transfer of the common fund from Delos to Athens (about 459 B.c.) was merely the outward sign of a change in which most members of the original league had already been compelled to acquiesce. In the earlier years of the Confederacy the work for which it had been formed was not neglected. Of the successes gained against Persia the*

The Spartan Pausanias, commanding the Pausanid

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most notable was the victory of Cimon over the Persians, both by land and by sea, at the mouth of Eurymedon (466 Bc.) But, as Athens assumed more and more distinctly an imperial character, the common fund came to be regarded as a tribute which could be applied to exclusively Athenian objects. This was the grievance which made the very name of the "tribute " (pdpos) so hateful. 'mina- The years 457-455 3B.c. may be taken as marking the tof oreatest extension of the Athenian empire. It was in 457 /-

Between the conclusion of the Thirty Years' Truce and the events which led to the Peloponnesian War the most important incidents were—first, the revolt of Samos and its reduction by Athens (440 3B.c.); next, the foundation by Athens of two settlements, Thurii, on the site of Sybaris in southern Italy, and Amphipolis, on the Strymon, in Thrace.

'tit: Meanwhile the inner political life of Athens had passed [4 through great changes. Soon after the Persian wars, the Tat (hens, £0Urth or poorest class of the Solonian timocracy had been

made eligible to the archonship. ‘This was done on the proposal of Aristides himself. The maritime population of the Piraeus was now large, and it had become impossible to exclude the main body of the citizens from the chief offices of the state. The development of Athenian demo- cracy had been secured by that loyal unity of civic action and feeling which the Persian wars had produced, Them- istocles, whose policy had been the source of those new im- pulses, did not remain to direct them ; he was accused of complicity in the Persian intrigues of Pausanias, and ostra- cized (about 471 w.c.). Aristides died in 468, Cimon, the son of Miltiades, was now at the head of a conservative party. ‘The other party, which was rather progressive than properly democratic, was led by Pericles, an Alemezonid, and Ephialtes. A blow was dealt to the influence of Cimon and his party when the Spartans insultingly dis- missed an Athenian force which had marched, under Cimon, to help them in reducing the insurgent Helots on Mount Ithome (464 3.c.). Soon afterwards some important re- orms were proposed and carried by Ephialtes. The powers of the Areopagus were diminished. Probably it lost its general censorial power and its veto upon legislation, re- taining its jurisdiction in homicide. ‘The archons and generals were deprived of their discretionary judicial powers. Henceforth the people was to be the final judge both in criminal and in civil causes. The juries chosen from the Heliza. were now organized as a permanent system of courts, every juror receiving a fee from the state for each day of his attendance. Cimon was ostracized; and the exasperation of the conservative party was sliown by the

assassination of Ephialtes (457 b.c.). Cimon was succeeded in the leadership by his kinsman Thucydides, son of Melesias ; and when, in 443 B.c., Thucydides also was ostracized, there was no longer any disciplined resistance to the policy of Pericles. Athens was now strengthened and embellished by a series of public works. Already in Public 457-456 two

long walls had been built, one from Athens works. to Phalerum, the other from Athens to the Piraeus; and about 445 a third or intermediate wall, parallel to the latter, was built on the proposal of Pericles. The Odeion, a theatre for musical performances, arose on the east side of the theatre of Dionysus, under the Acropolis. On the Acropolis itself the Erectheion, the shrine of Athene Polias, which had been burned by the Persians, was rebuilt on a greater scale ; and the Parthenon, the magnificent temple of the Virgin Athene, containing the chryselephantine statue of the goddess by Phidias, was constructed under his superintendence from the plans of Ictinus and Calli- crates (438 B.c.). The Propyleea or portals, forming a colon- naded entrance to the Acropolis on the western side, were completed a few years later.

The period known as "the age of Pericles" may be Pericles. roughly defined as the years from 460 to 430 B.c. The idea which pervades the whole work of Pericles is that the Athenian people, having been called upon by circumstances to rule over a wide alliance, must be trained to rule worthily. Pericles was opposed to extending the empire of Athens; but he was resolved to hold it, because he saw the danger of giving it up. And, in order that it should be held securely, he saw that the people must be educated, first, politically, by constitutional freedom, and next, intellectually and socially, by general cultiva- tion. The theoricon, or money given to the citizen to pay for his seat at the theatre, was doubtless a party expedient, like the pay provided for the juror and for the citizen-soldier ; it belonged to a plan for breaking the ex- clusive power of wealth. But it also fitted into the system by which Pericles sought to bring the citizens collectively under the influence of art in all its noblest forms. Painting, music, sculpture, architecture, had each its place in this scheme; but for the statesman's object no single instru- ment was perhaps so potent as the drama. It was a time of contending forces, in which one chief peril was lest the generation to which a larger future was opening should lose its hold on what was best in the past. The religious tradition and the new ethical subtlety were nowhere re- conciled in so lofty an ideal as by Sophocles ; nor could any presentment of art rival the theatre in its power of quickening a sympathetic enthusiasm.

The “age of Pericles ” would have produced better results for the political future of Athens if Pericles himself had been less great. As Thucydides says, the nominal democracy was virtually the ruleof one man. The informal sovereignty of Pericles hindered the rise of those who might otherwise have been trained to succeed him. Dur- ing his lifetime the need of a restraining force was not felt in the reformed institutions, for that force was supplied by a singlemind. But when he was gone it was seen that tlie new equilibrium of the state depended on a Pericles being at its head. Probably Pericles himself believed that there were men who could continue what he had begun ; and if he was wrong, that cannot detract from the glory of what he did for his own time.

V. The Peloponnesian War, 431-404 Bc, The Period of Spartan and then of Theban Ascendency, 404-362 B.c.

In examining the causes which led to the breach of the Causes of Thirty Years’ Truce, and to the Peloponnesian War which Pelopon- followed it, Thucydides distinguishes two alleged or im- 70"

‘ . . ar. mediate causes from a third cause which was not alleged,

First period of the war, 431-42] B.C.

Second period,

421-413

B.C.

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but which lay deeper than either of the others. The two alleged causes were —(1) the active help given by Athens to the Corcyraeans in their quarrel with Corinth concerning Epidamnus, a colony of Corcyra; (2) the Athenian blockade of Potidsea, a Corinthian colony which had revolted from Athens. The more essential cause was the growth of Athenian power, and the alarm which this caused to the Lacedzmonians. In truth the affair of Epidamnus and the affair of Potideea were merely the sparks which hap- pened to

kindle the flame. That long conflict which we call the Peloponnesian War had been prepared from the time when the Athenian democracy, founded by Clis- thenes, had become a power in Greece through the suc- cessful struggle against Persia. From that time there were two antagonistic principles, represented by two rival cities, —oligarchy by Sparta, democracy by Athens. The other cities grouped themselves naturally around these. All Greece was divided between these two ideas. The Peloponnesian War is the collision between them. It would be inconsistent with the limits and the scope of this sketch to enumerate the details of the war in each of its twenty- seven years. Yet we must aim at indicating the periods into which it falls, the leading characteristics and tenden- cies which it presents,

1. The first period of the Peloponnesian War comprises the years from its commencement in 431 B.c. to the peace of Nicias in 421,—hence sometimes called the Ten Years' War. As one of its main features was the frequent invasion of Attica by the Peloponnesians, the latter called it the Attic War. The result of it was that Sparta had gained nothing, and that Athens had lost nothing except Amphipolis. By the peace of Nicias Athens kept all places which had surrendered voluntarily. Those allies of Sparta from which these places had been taken were naturally discontented. Corinth and Thebes especially were aggrieved. In spite of all the mistakes of Athens, —in spite of the desolating plague,—in spite of such reverses as the defeats at Delium and Amphipolis, and the loss of the Chalcidic towns,—Athens remained on the whole triumphant; and against what Brasidas had done for Sparta might be set the victories of Phormio and the capture of Sphacteria. On the other hand the peace of Nicias had brought disaffection into the Spartan confed- eracy.

2. The second period of the war extends from the peace of Nicias in 421 to the catastrophe of the Sicilian expedi- tion in 413. The four years immediately following the peace of Nicias are the only years during which the great fundamental antithesis on which the whole war rested was temporarily obscured. Many of the allies of Sparta were discontented, and the intrigues of Alcibiades were active among them. But it was in vain that oligarchical allies were gained for the moment to the democratic cause. The normal relations were soon restored. Then came the Athenian expedition to Sicily, ending in a crushing disaster. Thucydides thinks that the mistake lay,

not so much in an original miscalculation of strength, as in the failure at Athens to support the expedition after it had gone. It is indeed possible that with other guidance

Athens might have conquered Syracuse. But at least it

was essential that Athens should put forth its whole strength, if only for the reason that no people resembled the Athenians so closely as the Syracusans. Yet never had the Athenians fought under greater disadvantages. The Athenian forte was in attack ; at Syracuse they had to act on the defensive. The bold and versatile Alcibiades was made a public enemy. Nicias, timid and in weak health, is opposed to Gylippus, who unites a Dorian energy of hatred to Athens with something like Ionian command of resource. And, when everything had been lost except

a chance of saving the army, the perversity of Nicias defeated the prudence of Demosthenes. The Sicilian disaster was the turning-point of the war. Pericles had warned the Athenians against needless ventures and a policy of aggrandizement. They had incurred a needless risk of tremendous magnitude, and had lost. If they had won, Alcibiades would probably have raised a tyranny on the ruins of their democracy.

3. The third and last period of the war is from the Thin Sicilian defeat in 413 to the taking of Athens by Lysander period, in 404, a few months after the battle of Agospotami, 41?! This is the period called the Decelean War, because q Decelea in Attica was occupied by the Spartans in 413, and continued to be a permanent base of their operations against Athens. As the sea board of Asia Minor was the scene of much of the fighting, it is sometimes also called the Jonian War. In this last chapter the war takes a new char- acter. After the Sicilian overthrow Athens was really doomed. The Decelean War is a prolonged agony of Athenian despair. Athens had now no hope but in her ships; and the leaders had to find thcir own supplies. The Spartan treasury was alsoempty. This want of money on both sides gave the mastcry of the situation to Persia. And it was due to the factious treason of Alcibiades that the aid of Persia was given to Sparta. Athens was ulti- mately conquered, not by the Spartan confederacy, but by

the disloyalty of Athenians bent on ruining political oppo- nents. The ‘ Revolution of the Four Hundred,” with its brief success, greatly contributed to the exhaustion of the city. Even at Aigospotami, even when Lysander was before Athens, it was the baneful influence of Athenian faction that turned the scale. When Athens had been taken and the walls destroyed, Sparta was once more the first power in Greece. When Thrasybulus and the patriotic exiles had overtlirown the rule of the Thirty Tyrants, they restored the Athenian democracy, but they could not re- store the old Athenian power.

had taught a simple reliance on disciplined ‘nee Tn chara the Peloponnesian War Sparta had won the victory with #% Persian gold. Already the love of money had found its way into the state which had once been so carefully protected from it. Differences of degree had arisen between the citizens, whose equality had been the very basis of the old Spartan life. Citizens who had been impoverished by the rise of prices, and who could no longer pay their share of the public tables, were now distinguished as “inferiors” (Srropedoves) from those who retained their full civic rights (duovot). Spartan commanders abroad were not always inaccessible to bribes. The habit of military discipline indeed remained, Spartans were still distinguished, as a rule, by gallantry in the field, by care for the dead, and by attention to the ritual of the gods. Nor had the valley of the Eurotas remained closed to the higher culture of Greece. The old type of Spartan leader—the rough soldier incap- able of eloquence or of finesse—had ceased to be the only type. An Athenian might have envied the powers of persuasion and the diplomatic tact of such Spartans as Brasidas, Lysander, or Gylippus. But the qualities of the old Sparta were seldom fused into a perfect harmony with the new accomplishments. Such men as Lichas and Cal- licratidas were rare. The balance of political power, as it existed in the old constitution, had also been unsettled. The kings were still, as of old, the commanders-in-chief on land. But the new office of the admiral (vavapyos) was invested with the chief command at sea. The supreme control of the state had passed more and more into the hands of the ephors, and the ephors, chosen annually, were not always incorruptible.

Sparta had waged the Peloponnesian War in the name

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of freedom. ‘The Greek cities were to be liberated from the all-absorbing tyranny of Athens. Now, however, Sparta altogether failed to redeem these pledges. On the contrary she aimed at setting up a tyranny of her own. Oligarchical governments were established, controlled in each city by a Spartan garrison under a Spartan harmost or military governor. The earliest and one of the worst cases was the tyranny of the thirty tyrants at Athens, set up by Lysander, and supported by Spartan arms until, after eight months, the Athenian exiles under Thrasybulus marched from Phyle upon Athens. The Athenian democracy was formally restored in September 403 B.o. ; and the liberators used their victory with a wise moderation. Four years later Socrates was put to death, because a party blindly zealous for the old beliefs of Athens could not see that such thought as his led to the only firm basis for a new social order.

The retreat of the 10,000 Greeks under Xenophon, in 401 1 gc, marks a turning-point in the relations of Greece to Persia. It was to the Greeks a striking revelation of Persian weakness, an encouragement to schemes of invasion which would before have seemed wild. Sparta now began a war against the Persians in Asia Minor—partly to escape from the reproach of having abandoned Asiatic Hellas to the barbarian. Agesilaus, on whom the lesson of the famous retreat had not been lost, was encouraged by success to plan a bolder campaign. But in 394 3.o. the Athenian Conon, commanding the fleet raised by the satrap Pharna- Soon

PELOPONNESIAN WAR.]

were restored. The Spartan power in Asia Minor was at anend. The oligarchies were overthrown, and the Spartan governors expelled. rinth. The reverses of Sparta did not end here. At the in- War. stigation of Persia an alliance was formed between Athens, Thebes, Argos, and Corinth, In the territory of the latter state the allies waged war on Sparta, to whose aid Agesilaus was recalled from Asia. When the Corinthian War had ace of

lasted six years, the peace of Antalcidas was negotiated tal- between Sparta and Persia (387 B.c.). By it the Greek cities in Asia, with Cyprus, were given up to Persia. Lemnos, Imbros, and Scyros were assigned to Athens. All other Greek cities were declared independent. The meaning of this was that they were to be independent of each other-— isolated for purposes of defence—-and all alike dependent on the Great King. The Corinthian War had begun from Persian intrigue ; it ended with a peace dictated by Persia. But the Spartan policy had gained its own ends. The so- called "autonomy " of the Greck cities disarmed the rivals of Sparta. Now, as at the end of the Peloponnesian War, a prospect of dominion was opened to her, The Persian king, whom this disgraceful peace practically recognized a8 suzerain of Greece, was to be merely the guarantor of terms under which Spartan ambition might be securely pursued,

A few years later these designs met with their first serious check. In 382 8.0, the Spartans treacherously seized the Cadmea or citadel of Thebes. They held Thebes for three years. Butin 379 a party of Theban exiles, under Pelopidas, surprised the Spartan garrison and recovered the city. A still greater discouragement to Sparta was the establishment of a new Athenian Confederacy—precautions being taken against the members passing, as under the Delian Confederacy, into the condition of mere tributaries. Thebes joined the new confederacy, and presently suc- ceeded in restoring the old Beeotian league, of which Thebes was the head. But the rise of Thebes had excited Athenian Jealousy. Peace was made in 371 between Athens and Sparta, Thebes, thus isolated, was at onco attacked by the Lacedeemonians. _ They invaded Beeotia, but were de-

volu- n at ebes,

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feated by the Thebans under Epaminondas at Leuctra, Theban 371 B.c. This destroyed Spartan power outside of the victory Peloponnesus. Epaniinondas next invaded the Pelopon- at Leuc- nesus itself. He resolved to set up rivals to Sparta on her

own borders. He therefore united the cities of Arcadia Epami- into a league, with a new oity, Megalopolis, for its capital ; nondas. and he gave independence to Messenia, which for three centuries had been subject to Sparta—laying the found- ations of a new capital, Messene, around the great natural citadel of Ithome. The Arcadian league did not long hold together. Mantinea led a group of Arcadian towns favour-

able to Sparta. In 362 B.o. a battle was fought near Mantinea between the Spartans and the Thebans. The Thebans were victorious, but Epaminondas fell. With

his death the temporary supremacy of Thebes came to an

end, Sparta had, however, been reduced from the rank

of a leading state. Menoplion closes his L/ellenica with

these words :—" There was more confusion (dxpicia) and tumult in Greece after the battle than before."

Political confusion is indeed the general characteristic General

of the period between the end of the Peloponnesian War and character the Macedonian conquest of Greece. In the preceding st century Athens and Sparta had been the vigorous represent- 494-333 atives of two distinct principles. The oligarchic cities 3.c. rallied round Sparta, the democratic round Athens. But at the end of the Peloponnesian War Athens was exhausted. Sparta, now predominant, but suffering from inner decay, exercised her power in such a manner as to estrange her natural allies. Thus both the normal groups of states were broken up. New and arbitrary combinations succeeded, seldom lasting long, since they were prompted merely by the interest or impulse of the hour, In this period of un- stable politics the moment most promising, perliaps, for the future of Greece was when Athens had formed a new naval confederacy, aud was also allied with the Bceotian league. But the alliance was broken by Athenian jealousy of Thebes,—not to be renewed until Greek independence was on the eve of receiving its death-blow. The work of Work of Epaminondas in one sense died with him; the brief Fpami- hegemony of Thebes passed away. But in

another sense an the results which he achieved were enduring, He had been for Thebes such a man as Pericles was for Athens—a ruling personal influence in a democratic commonwealth ; and he had raised Theban policy to the old Athenian level. The aims of Thebans were no longer confined to the circle of Theban interests; Thebes now aspired to be what Athens had been—the champion of national freedom and greatness. The power founded by Epaminondas was transient; but this large Hellenic patriotism made itself felt in some degree as a permanent inspiration, preparing the Thebans to stand by the Athenians in the last struggle for Greek freedom.

VI. The reigns of Philip and Alexander, 359-323 B,0.

Three years after the death of Epaminondas Philip came to the throne of Macedon. His power rapidly grew. A warlike people, ruled by an able and ambitious king, was now the northern neighbour of Greece, The most obvious vice of Greek. politics at this period was disunion ; but the disunion itself was only the symptom of a deeper decay. No one city of Greece any longer retained the vigour re- quired in a leader. Had either Athens or Sparta now possessed such vital force as they showed in the Persian wars, no local or temporary feuds would have prevented the organization of national defence. Nothing marks the decay of the Greek commonwealths more significantly than the fact that they did not even recognize the urgency of the danger. Demosthenes had the old Greek spirit; but he Demo- stood almost alone. The principles on which he constantly sthenes. insisted, and which give unity to his entire career, are mainly

Deeay of of Greek civic life.

Philip.

First,

two :—first, the duty of the Athenian citizen to sacrifice personal ease and gain to the service of Athens; secondly, the duty of Athens, as the natural head of free Greece, to consult the interests of all the Greek cities. The energy of Demosthenes was not first roused by the progress of Philip.

Before there was danger from the quarter of Macedon, Demosthenes had seen clearly that the decay of public spirit threatened the destruction of Hellenic life. As he said to the Athenians afterwards, if Philip had not existed they would have made another Philip for themselves. And the condition of Athens was at least not worse than that of any other city which could have aspired to lead.

A strategist so keen-sighted as Philip must early have perceived that he had little to fear from combined resistance, so long as he was careful not to attack too many separate interests at the same time. Greeks, he saw, were past fighting for each other as Greeks. This was the key-note of his policy to the last. While making aggressions on one Greek city or group of cities, he always contrived to have others on his side.

Philip's career in relation to Greece has two periods.

period of The end of the first period is marked by his admission to

his rela- tions to Greece,

the Amphictyonic Council; the end of the second, by tlie battle of Chzeronea. During the first period Philip is still

359-846 a foreign power threatening Greece from outside. He takes

B.C.

Second | period,

346-338

Bic;

Philip

Amphipolis from the Athenians ; he destroys Potidea; he acquires towns on the Thracian and Messalian coasts; he defeats the Phociaus under Onomarchus, and even advances to Thermopyle, to find the pass guarded by the Athenians; finally, he destroys Olynthus and the thirty-two towns of

its confederacy. In the second period he is no longer a foreign power. Having intervened in the Sacred War and crushed the Phocians, le has taken the place of Phocis in the Amphictyonic Council, and bas thereby been admitted within the circle of the Greek states. The First Philippic and the three Olynthiac speeches of Demosthenes belong to the first of these periods. The speeches On the Peace, On the Embassy, On the Chersonese, and the two later Philippics, belong to the second. In the Third Philippic, the climax of his efforts before Charonea, Demosthenes reviews the progress of Philip from the Hellenic, not merely from the Athenian, point of view. Philip has destroyed Olynthus, he has ruined Phocis, he has sown dissensions in Thessaly; Thebes is afraid of him; he has gained Eubcea and the Peloponnesus ; lie is supreme from the Adriatic to the Hellespont; and the last hope of Greece is in Athens. Demosthenes succeeded in winning back Byzantium to the Athenian alliance, and in persuading Thebans to fight by the side of Athenians; but he could not avert the cata- strophe of Chzronea.

After the victory which made him master of Greece,

pe Philip deprived Sparta of her conquests in the Pelopon- or an ‘

Hellenic league.

nesus. The Messeuians, Arcadians, Argives, recovered their old possessions. A congress was then summoned at the isthmus of Corinth. Macedonia and the Greek states were united in a federal league. A federal council was constituted to guard the federal laws ; and the Delphic Amphictyony was recognized as a tribunal to which this council should refer any breach of those laws. Philip,

representing Macedonia, the most important member of |

the league, was ackuowledged as its head or president. His position in regard to tlie Greek cities was thus in form much the same as that of Athens or Sparta in former days. It was nominally an hegemony, with somewhat more stringent powers, corresponding to the more systematic organization of the league; in practice it was military kingship over Greece, Yet Demosthenes had not failed. The condition of the Greek states under Philip

was favour- able in proportion as they had given him trouble. Thessaly had actively helped him, and had been completely subju-

gated. The Peloponnesian rivals of Sparta had not been active either in helping or resisting him, and they were now more dependent on Philip than they liad formerly been on Sparta. Athens alone had effectively resisted him, and Athens was treated by him with the prudent respect due to a serious autagonist. ,

If Greek liberty had received a fatal blow in Greece Sicily, proper, there was another part of Hellas in which, almost, Timoley simultaneously, it liad been vindicated with splendid suc- cess. While Demosthenes was making his heroic resistance to the designs of Macedon, the enemies of Hellenic free- dom in Sicily had been encountered with equal vigour and happier fortune by Timoleon. A few years after the defeat of the Athenian armament in 413, Sicily had suffered two invasions of the Carthaginians. Selinus and Himera, Agrigentum, Gela, and Camarina, had successively fallen.

The first Dionysius, in consolidating his own tyranny at 405-907 Syracuse, had been content to leave half the island in the Be. hands of the foreign foe. The feeble misrule of his son, Dionysius IT., produced a series of revolutions. A party

at Syracuse invoked the aid of Corinth. Timoleon was

sent with only 1200 men (343 z.c.). His first work was

to deliver Syracuse from the contending forces of Dionysius

and a rival named Hicetas, and to restore the Syracusan democracy. His next work was to drive the Carthaginians

out of Sicily. He defeated them with crushing effect at

the river Crimesus (340 B.c.). The Sicilian Greeks were

now free, Sicily entered on a new period of prosperity, which lasted until Agathocles became tyrant of Syracuse (317 B.c.). Thus the brightest days, perhaps, of Hellenic Sicily coincided with those in which the cities of the | Hellenic mainland were learning to bear the Macedonian yoke.

The time seemed now to have come for an enterprise which, since the retreat of the Ten Thousand, had been the dream of many Greek captains, but which none had yet been in a position to attempt. Philip, in the forty-seventh year of his age, had declared war against Persia, and was preparing to invade Asia at the head of an army gathered from all Greece, when he was assassinated by a young | Macedonian noble in revenge for a private affront (336 B.c.). Death. Alexander, Philip's son and successor, was only twenty, Philp Marching into Greece, he promptly repressed an insurrec- Alex: _ tionary movement, and was recognized by a new assembly ander at Corinth as commander-in-chief of the Greek armies. He next marched against the tribes on the northern borders of Macedonia. While he was absent on this expedition, the Thebans rose against the Macedonian garrison. Alexander returned, took Thebes, and razed it to the ground (335 8.¢.). At Corinth he received the homage of the Greek states, and then returned to Macedonia.

Alexander was now free to execute the design of Philip. As captain-general of Hellas, he sets forth to invade the Persian empire, and to avenge the wrongs suffered by Greece at the hands of the first Darius and of Xerxes. The | army with which he crossed the Hellespont in 334 3c, Alex | numbered perhaps about 30,000 infantry and 4000 cavalry. ander It was composed of Macedonians, Greeks, and auxiliaries ra from the barbarian tribes on the Macedonian borders. The devotion of native Macedonians to their hereditary king was combined with the enthusiasm of soldiers for a great gene- ral. Even if the military genius of Alexander had not been of the first order, his personal authority over his Macedonian troops, and through them over the rest, would still have been greater than was ever possessed by a Greek citizen commanding fellow-citizens,

Alexander's career of conquest has three stages, marked Three by his three great battles. The victory at the Granicus vee (334 B.c.) gave him Asia

Minor. The victory at Issus (333 Satecr. | B.C.) opened his path into Syria and Egypt. The victory

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PHILIP AND ALEXANDER. |

at Arbela (331 B.c.) made him temporary master of the whole East. In accomplishing the first two of these stages Alexander was not compelled to assume any new character. The king of Macedon, the elective captain-general of Greece, needed no other titles by which to hold the lands to which le came as a deliverer from Persia. The later history of these lands is tlie proof. Asia Minor was by degrees thoroughly Hellenized, and remained Greek till the Turks came in the llth century. Syria and Egypt were not indeed Hellenized as whole countries, but their capital cities, Antioch and Alexandria, were Hellenic; and the control established by Alexander was retained by Macedonia or by Rome for centuries. At the third stage, however, Alexander's conquests entered upon an entirely new phase, and compelled him to take up an altogether new position. Neither in his Hellenic nor in his Macedonian capacity could he put forward any effective claim to hold the Persian empire proper,—the empire stripped of its Egyptian, Pheenician, and Hellenic dependencies. He could hold Persia only as a Persian king, as the successor of those Achemenid kings whose dynasty he had overthrown. The constitutional king of Macedonia, with limited prerogatives, the elective captain of Greece, must now assume a third and distinct character. He must be also a Persian king, a constitutional despot. The merely European influcnces re- presented by Alexander might leaven the East, but they could not lastingly possess or transformit. Hellenic culti. vation, like Roman power, was not permanently introduced Over any wide area east of the Euphrates. This fact is enough to illustrate the enormous difficulty of the task which Alexander had undertaken. It seems not impossible that policy may liave been mingled with vanity in his ex- action of divine honours. Greeks or Macedonians could never pay him the slavish homage which Persian subjects rendered to their king. But the contrast between European and Asiatic royalty would at least

be less glaring if the master of Persia were also acknowledged as the son of Zeus Ammon.

The colonies planted by Alexander in his progress . through Asia make the beginning of a new period in

Hellenic history. Hitherto we have had to do with a people whose Hellenic unity rests, not merely on community of language and civilization, but also upon community of blood. Now, by the side of this natural Hellenic nation, there arises an artificial Hellenic nation, with a common language and civilization, but not exclusively of Hellenic blood. The Macedonians may be regarded as the founders of this artificial nationality. 'They were doubtless of a stock kindred to the Hellenic; in what degree, it is less easy to say—but (with the exception of their kings) they were generally regarded by the Greeks as standing half-way between Greeks and barbarians. Philip did much to Hellenize Macedonia; and the Macedonian colonies of Alexander became in their turn centres from which the influence of Hellenic civilization was diffused through Asia. | Henceforth there are two Hellenic types: the Greek of Greece proper, who preserves in some degree the marked individuality of the old Greek character ; and the Asiatic Greek, more readily affected by foreign surroundings, more pliant and less independent. The history of the modern Greek nationality dates from the days of Alexander.

The results of Alexander's conquests were beneficent chiefly in two ways: first, by liberating the hoarded treasures of the Eastern kings, and so stimulating industry | and commerce ; secondly, by opening Asia to a new civiliza- tion, which helped to promote intellectual and moral pro- gress, even in those places where its influence was limited or transient. In the process of doing this much that was valuable may have been destroyed. But it can hardly be questioned that on the whole the gain far outweighed the |

loss. If Alexander had not died at the age of thirty-two, leaving lis work unfinished, it would perhaps have been easier to judge how far he deserves

the credit of having con- templated these benefits to mankind. There is nothing to show that he intended to govern otherwise than as an absolute ruler, with a better machinery for controlling his subordinates than had been possessed by the Persian kings. Such a view is not inconsistent with the fact that his colonies enjoyed municipal freedom. Nor can it be proved that he meant his colonies to be anything more than military strong- holds or commercial centres. But it may at least be said that, if his object had been to diffuse Hellenic cultivation over Asia, he could have adopted no more effectual means. It is conceivable that, in his vision of that complex empire which imposed such almost irreconcilable tasks upon its ruler, the idea of engrafting Eastern absolutism on Greek politics may have co-existed with the idea of Hellenizing Asiatic society.

In that period of Hellenic history which closes with Alexander we are tracing the gradual development of a race with special gifts of mind and body, which strongly distinguish it from all other races. The Tellenes set the Hellenic stamp on everything which they create,—first, on their language itself, then on their politics, their literature, and their manners. Every element of their life receives its mature shape from themselves, even when the germ has been borrowed ; the Hellenes are an original people in the sense that they either invent or transform. At a very early time they have the political life of cities, and they never rise from the conception of the city to the higher unity of the nation. 'Their love of clear outline and their sense of measure shrink from every vague abstraction; the principle of order itself is by them identified with " the limit"; the indefinite is a synonym for disorder and evil. The city, an easily comprehended whole, satisfies this instinct ; but there is room within its framework for the gradations of monarchy, oligarchy, democracy ; for the various modes of acting and thinking which characterize Achzeans, Dorians, Ionians, As the leading commonwealths grow to maturity, two principles of government stand out in contrast,—oligarchy and democracy. Each is represented by a great city round which the lesser states are grouped. The inevitable collision comes, and the representative of democracy is at last vanquished But in the hour of victory oligarchy is discredited by the selfish ambition of its cham- pion. A time of political confusion follows, in which no one city can keep a leading place. Separate interests prevail over principles; public spirit declines. The disunion of the cities—incurable, because arising from a deep inner decay

—enables the crafty king of a half-barbarian country to make himself the military dictator of Greece. But just when the better days of Hellenic civilization seem to be over, a new career is opened to it. Men who are not of Hellenic blood help to diffuse the Hellenic language, thought, and manners over a wider field; and the life of the modcrn Greek nation begins. (R. C. J.)

Srection IJ.— Post-CLassicaAL GREEK HIsTory.

The later history of the Greeks, from the end of Alexander the Great's reign to the taking of Constantinople by the Turks, may be divided most naturally into five periods, vizi—I. The period of Greek subjection: from the death of Alexander to the accession of Constantine the Great as sole emperor, $23 B,c. to 823 a.p. II, The period of Greek revival: from Constantine the Great to Leo III. (the Isaurian), 323-716 a.p. IIL The period of Byzantine prosperity: from Leo III. to Isaac I. (Comnenus), 716— 1057 a.pv. IV. The period of Byzantine decline: from Isaac I. to the taking of Constantinople by the Latins,

1057-1204 a.p. V. The period of Greek survival: from the taking of Constantinople by the Latins to its conquest by the Turks, 1204-1453 a.p.

In the limited space of an article like the following, it is impossible to enter into detail with reference to the events of any of these periods. It may be well therefore if we turn our attention especially to the causes which were from time to time at work, to the characteristics and tendencies of various ages, and to the changes that came over society.

Import- The history which we thus enter upon is of importance and ance of interest in a different way from that of the classical age of the i. Greece. That age was a unique development in respect ieee, of national life and character, of social and political institu- tions, and of every form of cultivation, and was marked by concentrated energy and intense vigour. The later period is important because of its wide-reaching influence on the

world at large, and because it is one, and that the more continuous, of the two great chains of events, in eastern and western Europe respectively, which connect the earlier and later history of civilized man. Tv the younger student, who is already acquainted with the previous history of Greece and Rome, and has learnt something of the condi- tion of the modern world through the history of England, no other period is probably so instructive and suggestive. He is led into byways of history and remote countries, which have in themselves an element of romance, He comes into contact with races from every branch of the human family in the fresliness of their early vigour ; and amongst many other lessons he learns one, which cannot be learnt too early, and which historians and students of history are disposed to overlook, that the unfortunate are not therefore to be despised. To more advanced students its value consists in its explaining the existing state of things in a considerable part of Europe and Asia, which cannot be explained otherwise ; and still more in the illus- trations it affords, both by way of similarity and contrast, to circumstances in the history of western Europe; such, for instance, as the abolition of serfdom, the relations of immigrant races to the original inhabitants, and systems of law and finance. Besides this, so much civilization filtrated from the East to the West in the course of the Middle Ages that a knowledge of Byzantine history is necessary to a proper understanding of that of western Europe. It will suggest also, if properly studied, that while battles, sieges, and other salient events may be the turning-points of history, the inhabitants of any particular country are more affected by influences which lie below the surface—by alterations of trade-routes and changes in the tenure of land, by the effects of judicious or injudicious taxation, by the adminis- tration of justice, and by the relations of different classes to one another. Miscon- It is desirable at starting to notice two misconceptions ceptions. which have prevailed, and in a less degree still prevail, Charac- with regard to different portions of this period. The first ter of the : jater of these concerns the character of the Greeks during the Greeks. time of their subjection to the Romans, and in particular under the early emperors, in which age they are often sup- posed to have been a demoralized and unprincipled race. Such expressions as the "Greeculus esuriens" and " Grecia mendax" of Juvenal, and similar ones which are found in Tacitus and other writers of that time, have become pro- verbial, and have been taken to describe, as those authors undoubtedly intended them to describe, the people at large. There

was some justification for the retort of Lucian, that the Romans spoke truth only once in their lives, and that was when they made their wills. The fact is that these descriptions represented faithfully enough the lower class of Greek adventurers who came to Rome from Alexandria and the Asiatic cities to seek their fortunes; and the Roman writers, with their usual contemptuous ignorance of

everything provincial, confused these with the Greek nation. The later Greeks no doubt had degenerated from their great forefathers ; but it is only fair to remember that this was to a great extent the result of their circumstances. The rapid growth of Greek culture and Greek political ideas was naturally followed by rapid decay. In sculpture the early archaic style developed in a few decades of years into the manly and perfect style of Phidias, and the change was equally rapid to the luxurious style of Praxiteles, in which the elements of decadence were already traceable. The same thing is apparent in the history of the drama. And in like manner in politics, the constitutions of the various states, which were so well suited to the development of Greek individuality, contained in themselves no element of permanence, owing to the opposing elements which were brought face to face within so narrow an area ; and in their relations to one another, all combination on a large scale was prevented by what has been aptly called the "centri- fugal" character of Greek politics, so that they were destined inevitably to fall under the dominion of any great empire that should arise in their neighbourhood. Again, it must never be forgotten that the splendid products of Greek genius and Greek character sprang from the black soil of slavery, and could not have existed without it; so that here too we find an element of rottenness, which was sure in the end to produce decay. Consequently, from the

_time the Greeks lost their liberty, they ought in all fairness

to be judged by a different standard from their predecessors, and we ought to be satisfied if we find in them such good qualities as characterize a more ordinary people—industry, respectability, intelligence, good citizenship,

capacity for local self-government, and readiness to make the most of their opportunities. In all these respects the Greeks were among the best of the provincials of the Roman empire. The other misconception relates to the Byzantine empire, which has been commonly regarded as a period of steady decline and feebleness and decrepitude. The author who is mainly responsible for the prevalence of this view is Gibbon; and it is strange that a writer who was gifted with such profound historical insight should not have per- ceived that the state which accomplished such great things could not have been powerless. The passage in which he expresses himself on this subject is well known. "I should have abandoned without regret," he says, " the Greek slaves and their servile historians, had I not reflected that the fate of the Byzantine monarchy is passively connected with the most splendid and important revolutions which have changed the state of the world." Yet it was this same enipire which beat back for centuries, and ultimately sur- vived, first the Saracens and afterwards the Seljuks, both of which peoples would otherwise have overrun Europe, and which, even in its decline, kept at bay, for more than a hundred years, the Ottomans when at the height of their power, thereby providing the Western nations with a breath- ing space, without which the career of Turkish conquest would certainly not have been arrested at Vienna, but might have extended to the Elbe or the Seine. During the 8th, 9th, and 10th centuries its military power was the strongest in Europe, and the individual prowess of its aristocracy was unrivalled, while at the same time its long succession of able emperors and administrators is such as no other mon- archical government can show. Its influence is further shown by its missionary efforts, resulting in the conversion to Christianity of the south Slavonic nations and the Russians, and the consequent spread of civilization through- out the countries they inhabited; by its widely extended commerce both by land and sea; and by its art, especially its architecture, which contributed to the formation of other styles from Egypt to the north of Russia, and from India to Spain. Finally, its social and political excellence

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appears in the state of education, in the regularity of its administration, especially in the matter of justice, and, above all, in the legal standard of the coinage being main- tained invariable from first to last, which is a rare proof of a highly organized system. When its situation in the midst of barbarous nations is considered, and the inter- mediate position it occupied between Asia and western Europe, it may safely be pronounced one of the most powerful civilizing agencies that the world has seen.

I, Period of Greek Subjection: from the Death of Alexander to the Accession of Constantine the Great as sole Emperor, 323 B.c. to 323 A.D.

GREEK SUBJECTION. |

The conquests of Alexander the Great differed from those of almost every other great conqueror in this that they were followed up by a scheme of civil government, the object of which was to secure tlie well-being and promote the civilization of all his subjects. That he was not the ambitious madman which he is often represented as being isamply proved by the forethought with which his cam- paigns were planned, and by his attention to the commis- sariat and to other details connected with the transport and maintenance of his vast armies. But his true greatness is most clearly shown by lis endeavouring to introduce unity into his vast empire, not by subjecting one race to another, or crushing out the hope of furtlier resistance by an iron rule, but by establishing in it centres of permanent institu- tions and commoa culture. These were the Greek colonies with municipal government which he founded at intervals throughout Asia. By these the subject countries, without being forced into a common mould, or organized in defiance of their feelings and prejudices and without reference to their national institutions, were gradually leavened by the system that existed among them, and obtained a certain infusion of the Hellenic character and Hellenic modes of thought. Though Alexander himself did not survive to complete his project, yet enough had been accomplished at the time of his death to leave its influence firmly imprinted, even when his empire fell to pieces and was partitioned among his generals. The

consequences of this to Asia were of incalculable importance, and continued unimpaired until the tide of Mahometan conquest swept over the country; and even then it was from Greek literature and

art that the Arabs obtained the culture for which they have

been celebrated. But its effect was hardly less marked on the Greeks themselves. The Hellenic world was henceforth divided into two sections—the Greeks of Greece proper, and the Macedonian Greeks of Asia and Egypt. Between these there existed a common bond in similarity of educa- tion, religion, and social feelings, in the possession of a com- mon language and literature, and in their exclusiveness, whether as a free population ruling a large slave element,

or as a privileged class in tle midst of less favoured races ;

but the differences were equally striking. The former re- tained more of the independent spirit of the ancient Greeks, of their moral character and patriotism; the latter were more cosmopolitan, more subservient, more ready to take the impress of those among whom they were thrown; in them the Ulysses type of Greek character, if we may so speak—its astuteness and versatility—became predominant. This distinction is all-important for the subsequent history, Since, in the earlier period, it is rather the Greeks of Hellas who attract our attention, whereas after the foundation of Constantinople the Macedonian Greeks occupy the most prominent position. At the same time a change passed over the Greek language; while the ancient dialects were retained, more or less, in the provinces of Greece proper, the Attic dialect became the court language of the Macedonian monarchs, and was used almost exclusively by prose writers. Gradually Macedonian and other provincial-

isms crept into it, and it was modified by simpler expres- sions, and words in more general use, being substituted for those preferred by the classic writers of Athens ; and thus was formed what was called the common or generally used dialect. The non-Greek inhabitants of the countries iu which the Greeks were settled were described as ‘ Hel- lenizing,” and

consequently their language, such as we find it in the Septuagint and the New Testament, was called Hellenistic Greek. The literary spirit also migrated to Alexandria, which became for a time the home of the principal Greek culture, and nurtured the genius of Thev- critus, the first of pastoral poets, the taste and erudition of Aratus and Apollonius Rhodius, and tlie research of Aristarchus and other eminent Homeric critics.

The period of somewhat less than two centuries (323-146 Events B.c.) which intervened between the death of Alexander and during

between liberty and subjection. The Lamian War, as the contest between a number of the Grecian states, with Athens at their head, and Antipater, one of Alexander's immediate successors in Macedonia, was called from the siege of Lamia, which was its most prominent event, soon convinced the Greeks that it was idle for them to struggle single-handed with their great neighbour. After that the country formed a bone of contention between the neighbouring potentates in Macedonia, Asia Minor, Syria, and Egypt ; and most of the states, with the exception of Sparta, were in the power sometimes of one sometimes of another of them, though the contests of their masters secured them from time to time a partial independence. At length the constant danger to which their liberties were exposed suggested the necessity of some kind of combination on the part of the separate states, and the famous Achzan league arose (280 B.c.), which revived the dying energies of the Greeks, and has thrown a lustre over their period of decline, For the origin of this federation we must go back to the early history of the district of Achaia in northern Peloponnesus, the inhabit- ants of which, from being isolated from other races by their position between the Arcadian mountains and the Corinthian Gulf, and occupying a succession of valleys and small plains, found a federal union to be the most natural political system by which they could be held together. Throughout the greater part of their history this people exercised little influence on the fortunes of Greece, but in her time of greatest need they came forward as her champions. The league was now revived, with a more definite organization and a wider political object, and under the leadership of Aratus, the greatest of its early "strategi," it wrested Sicyon from the power of its tyrant, and Corinth from the hands of the Macedonians, until at last it embraced Athens, and almost the whole of the Peloponnesus. Unfortunately Sparta held aloof. That city,

which had succeeded in maintaining its independence, had fallen into the hands of a narrow oligarchy of wealthy proprietors, who rose in violent opposition to their reforming kings—men whose names would be a glory to any period—Agis and Cleomenes, and succeeded in putting the first to death, while the latter was enabled to overpower them through the influence won by his military successes. But circumstances involved Aratus in a war with Sparta, and here the old Greek spirit of discord betrays itself. When hard pressed by Cleomenes, the Achzan leader applied to the Macedonians, and the result was that Antigonus Doson invaded the country, and at Sellasia inflicted a final and crushing blow on the Spartan power (221 B.c.). The same spirit appears in the Social War, which occurred shortly after this between the Achzans and the Atolian league, a similar confederation in northern Greece, and was fomented by Philip V. of Macedon. Sub- sequently, when the Romans made war on Philip for assist- ing the Carthaginians in the Second Punic War, the consul

the conquest of Greece by tle Romans was a sort of twilight eral

Roman con- quests in the

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Flamininus persuaded both these powers to join in attacking him. At Cynoscephalz in Thessaly, not far from the scene of a greater battle, Pharsalia, the power of the Macedonian monarchy was broken (197 B.c.), and Philip renounced his supremacy over the Greeks, to whom Flamininus proclaimed their freedom at the ensuing Isthmian games. The final overthrow came in the time of Perseus, the son of Philip, who was defeated at Pydna (168 B.c.), and his dominions, with the adjacent parts of Greece, were reduced to the form of a Roman province. The later years of the Achwan league had been illumined by the leadership of Philopcemen, "the last of the Greeks," as Plutarch has called him, iu whose time the whole of the Peloponnesus, including even Sparta, was for a time included in the alliance. But the days of Greece were numbered, and the only question was how soon the remainder should be absorbed by the advancing tide of Roman conquest. At last a pretext for interference presented itself, and the reduction of the country to bond- age was signalized by the pillage and destruction of Corinth under Mummius (146 B.c.). The entire area

southward of Macedonia and Epirus was constituted the province of Achaia, the title of wlich thus perpetuated the name of the Achzean league. The struggles in which that and the AMtolian confederation had taken part are an evidence of the revival of a spirit of patriotism in the breasts of the Greeks, and we may well lament over the ruin of their in- dependence ; but the truth must be told that this was not the feeling of the majority of the population at the time. The selfishness aud cupidity of the Greek aristocracy, such as those whom we have already noticed at Sparta, had imposed so heavy burdens on the people that the great body of them cheerfully acquiesced in the Roman rule. Polybius has preserved to us the saying which expressed the sentiment of the time: "If we had not been quickly ruined, we should not have been saved."

From the time of the Roman conquest the existence of Greece was inerged in that of a greater political unity, so that for the next four centuries, until the commencement of

Westana the barbarian inroads, it can hardly be said to have a his-

East.

tory of its own. But we must not on this account suppose that the Greeks occupied exactly the same position as the rest of the Roman provincials. In this respect there is a marked difference between the results of the Roman con- quests in the West and the East. The inhabitants of the western portion of the empire were at the time of their sub- jection in a low state of civilization, and destitute of any element of strength in their social and national life. It was natural, therefore, that nations so undeveloped should easily receive the impress of Roman institutions, and should adopt the manners and ideas of their conquerors. The Romans in fact treated them for the most part as inferior beings and did not at first even regard them as absolute proprietors of the lands they cultivated. But in the East the case was different. There the Romans met with a civilization more advanced than their own, which they had already learned to respect, and an elaborate system of civil government and social usages which could not be set aside without under. mining the whole fabric of society. Hence the Greeks, while subjected to the Roman administration, were allowed to retain a great part of their institutions, together with their property and private rights, and,

from their superiority to the other conquered peoples, remained the dominant power in the East. Even in Asia the despotism of Rome was much modified by the municipal system of the Greek colonies aud by the influence of Greek culture. Thus it came to pass that, while the Western nations were assimi- lated to Rome, in the East the Roman empire became Greek, though the Greek nation in name became Roman. The effects of this are visible at every turn in the subsequent history, and to this cause must be referred many anomalies

GREECE

[HISTORY.

which are traceable at the present day in the condition of eastern Europe.

It was a part of the Roman policy, in dealing with con- Roman quered countries, to treat them at first with mildness, until Tule in

they became inured to the yoke, and when this was the case, and precautionary measures had been adopted to prevent the possibility of successful revolt, to deal with them more harshly and increase their burdens. This was what happened in the case of Greece. For some time the people at large had no reason to regret the change. 'The fact of their subjection was uot impressed too forcibly upon them, aud several cities, such as Athens and Sparta, were allowed to rank as allied states. Their taxes were not increased, and they did not at once perceive the difference caused by the money that was levied being taken out of the country instead of being spent in it. This was, however, the most systematically ruinous part of the Roman system. The Government never paid attention to the provinces for their own sake, but regarded them as an instrument for maintain- ing the greatness and power of Rome. The immense sums that were drained from them never returned, but were

expended in the maintenance of the Roman army, and in.

the public games and architectural embellishment of the metropolis, Objects of local usefulness, such as roads, ports, and aqueducts, received no attention from the central authorities, and no money was supplied towards

their maintenance. Withina century also, when these evils were beginning to make tliemselves felt, the Roman rule becaine very oppressive. Though the custom duties were not un- reasonable in their nominal amount, they became exorbitant through the system of farming and subletting, and as a special tribunal existed for the enforcement of the collectors' claims, the farmers exercised a most tyrannical power. over tle mercantile population of the shores of the Mediterranean. In the wake of these harpies followed the usurers, to meet whose claims proprietors had constantly to sell their posses- sions.' The direct weight of the public burdens was further increased by the exemptions enjoyed by Roman citizens in the provinces, and by privileges and monopolies which were granted to merchants and manufacturers; and large sums had to be paid to the Roman governors, both for the main- tenance of their establishments, and to obtain exemption from the quartering of troops. But these more or less 'authorized exactions bore no proportion to the illegal extor- tions of the proconsuls, who simply pillaged the provincials. No more perfect scheme could have been devised for pro- moting oppression than that under which these officers were appointed. While on the one hand they superintended the financial administration, on the other they exercised the judicial power ; and the only tribunal to which they were responsible was that very senate by which they were appointed, and of which they themselves were members. A governor like Verres had it in his power to ruin a pro- vince for several generations, and such instances were not rare. The treatment of Greece in this respect was no ex- ception to the general rule.

The period, however, during which the greatest injury was inflicted on Greece was that of the Mithradatic War (86 B.c.). At the commencement of that struggle many of the leading men and states declared in favour of Mithradates, thinking that under his auspices they might regain their freedom. But the appearance of Sulla with an army soon undeceived them, and they laid down their arms, with the exception of Athens, which was only reduced after an obstinate defence. When the city was at last taken by storm, the majority of the citizens were put to the sword, their possessions seized by the soldiers, the Pirseus utterly destroyed, and Attica ravaged. In the same campaign Delphi and the other principal shrines were plundered, and an immense amount of property was ruined throughout the

Greece,

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country. Great injury was also inflicted by the Cilician pirates. The existence of these was a result of the jealousy with which the Roman Government regarded the mainten- ance of armed forces by the provincials, either by land or sea, lest they should be made an instrument of revolt ; and since they had no interest in maintaining order, except where their own authority was threatened, the subject nations were so far from profiting by their protection that they were exposed to attack without possessing the power of defending themselves. The confined seas and numerous bays and islands of Greece have always been favourable to piracy, and at this time the evil reached such a height that the welfare of the state was threatened, and Pompey was entrusted with the office of eradicating it; but before this was accomplished many of tlie wealthiest cities in Greece and Asia Minor had been attacked and pillaged. With the accession of Augustus a brighter era seemed to have dawned ; aud under the early emperors, who desired to strengthen themselves against the senate, the interests of the provincials were more considered. Greater regularity also was intro- duced into the taxation, by the land and capitation taxes being regulated by a periodical census. But the old evils to a great extent remained, and tliese were further aggra- vated at a later time by the depreciation of the coinage, which proceeded with fearful rapidity, and caused wide- spread distress among the commercial and labouring classes.

The result of these changes is traceable in the condition and character of the Greek people. The conquests of Alexander the Great suddenly threw into circulation the , accumulated treasures of the Persian empire, and a great part of these passed into the hands of the Greeks, both in Asia and Europe. The facilities thus created for obtaining wealth increased the material prosperity of the Greek race at large, so that in all probability it never was more numer- ous tlian during the period immediately preceding its sub- jugation by the Romans. Though all calculations respect- ing tlle numbers of the population in ancient states are necessarily hazardous, yet it seems probable that the Grecks at that time may have amounted to more than seven millions, But with Greece proper the case was different. There the

increase of wealth raised the standard of living considerably above what it had been in earlier and more frugal times, so that the less moneyed class were tempted to emigrate in large numbers to seek their fortunes in the great Asiatic cities, and in the service of the Eastern monarchs, where so great openings presented themselves. The decrease of this class produced a larger accumulation of property in the hands of large owners, and greatly aug- mented the number of slaves. Under the Romans tle Wealth of the country, great as it was, was soon dissipated by fiscal exactions, by plunder in war and the private pillage of officials, and by the confiscation of the possessions of in- dividuals, with a view to which a system of accusations was regularly promoted. The natural result of this, com- bined with the self-indulgent habits which had grown up among the upper classes, was a steady diminution of the Population. The first of the Romans who perceived the evils arising from this state of things, and endeavoured to remedy them, was the emperor Hadrian, who had the merit of personally visiting the provinces, and whose tastes natur- ally led him to sympathize with the Greeks. Though much of the money which he expended in the country in the construction of temples and other splendid edifices tended to the gratification of his private fancies, yet a real improvement in the condition of the people was effected by his restoration of the roads which had fallen out of repair, and the erection of baths and aqueducts, He also lightened the taxation, and raised the Greeks to the rights of Roman citizenship, thereby anticipating the edict of Caracalla, by which that privilege was extended to all the free inhabitants

of the empire (212 a.p.). The depopulation of Greece, however, continued; but while in this way the power of the nation was being weakened, and its material resources diminished by the loss of much of the capital that had been invested in the improvement of the country, the actual con- dition of the inhabitants was for the time improved, be- cause the decrease in their numbers had been more rapid than the destruction of property. Possessing the necessaries of life in abundance, and having but little money to spend

on anything beyond, they sank into that condition of in- difference and ease in which at last the barbarian nations found them.

It has already been remarked that the character of the Greeks at this period ought not to be judged from the pre- judiced statements of Roman writers, nor by reference to the standard of their great forefathers. The introduction of the wealth of Persia had undoubtedly a demoralizing effect on the nation, both in Asia and Europe; but when we consider that throughout a great part of the area that they occupied they were long the doninant class, and had hardly any check to restrain them in the indulgence of their passions, it is rather a matter for wonder that they resisted temptation so far as they did. At least they never sank to such a depth of degradation as the Romans of the imperial times, and in Europe the struggles of the Achaan league show that a value was still set on manly virtues. After this the Greeks became the educators of the Romans, whose upper classes resorted for instruction to the univer- sity of Athens; and if the rhetoric and philosophy which was taught there partook sometimes of the nature of liter- ary trifling, and the instructors themselves were character- ized by vanity and pedantry, they maintained at all events the standard of cultivation in the world at that time. The love of art still prevailed amongst them, and the quiet, studious life of the Greek cities formed in the eyes of many a favourable contrast to the violent struggles and inordinate passions of Rome. But the disbelief in the national religion which had grown up among the educated classes, notwith- standing the maintenance of the temples and their worship, tended to cause a separation between the upper and lower grades of society ; and this, together with the isolation pro- duced by the great size of the estates, which withdrew individuals from the scrutiny of their fellow citizens, weakened the force of public opinion, and thus lowered the moral standard. It can hardly be doubted that the con- sciousness of this, and the feeling of the need of a higher morality, was one main cause of the eagerness with which philosophy continued to be pursued by the Greeks, since in it they hoped to find the groundwork of truth and justice. Thus during a period of six centuries the European Greeks had gradually degenerated, though for the most part from causes external to themselves; they seemed to have become an insignificant and almost commonplace people. Yet tlie outline of the character was the same, though the colours had faded ; and considering tlie length of the time, and the agencies at work, we may be surprised at finding

that the change had not been greater. It remained to be shown that the finer qualities and more vigorous elements wero only dormant ; and this was brought to light in the latter half of the third century by two influences, which we must now proceed to explain.

The first of these was the invasions of the Goths.

Roman frontier, and the defeat and death of the emperor Decius in Meesia (251 a.p.), and the subsequent incursions of the Goths into Thrace and Macedonia, warned the Greeks of the peril that impended' over them. Immedi- ately the walls of Athens were repaired, the fortifications across the isthmus of Corinth restored, and vigorous pre- parations made for defence. The invaders soon made their

These Gothic 3 were the earliest of the barbarians to break through the invasions.

Chris- tianity.

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appearance both by land and sea, and one division, landing at the Pirseus, succeeded in carrying Athens by storm, but an Athenian of rank called Dexippus, afterwards the his- torian of these events, succeeded in assembling a sufficient force to compel them to retire. This reverse was the prelude to their total overthrow, for succours were meanwhile arriv- ing from Italy, by which their separate bands were attacked in detail and destroyed. Some years later, after other inroads, during which many cities of Greece successfully defended themselves, the power of the Goths was broken by tiie emperor Claudius II. at the great battle of Naissus (269 a.p.). But it was clearly proved at this time that the spirit of the Greeks, which had had no opportunity of dis- playing itself since the siege of Athens by Sulla, was not extinct, and that, if they had been unwarlike in the interval, it was mainly because their masters had denied them the use of arms. It is not to be overlooked that, when the same barbarians subsequently attacked the Western empire, it went down before them, the reason being that the nations of the West had no such distinctive nationality as the Greeks, and no such

municipal institutions to rally round. Anyhow the Greek character was benefited by tle public

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spirit thus evoked, and by the activity infused into society by the feeling that every man might be called on to defend his person and property.

The other and far more important influence which re- gencrated the Greeks at this time was Christianity. This religion, which had long been working in secret, though in ways which it is almost impossible to trace, now began to produce a marked impression on Greek society. Its power was the greater because it had worked from below upward, and had permeated to a great extent the lower and middle

classes. It improved the moral condition of the Greeks by elevating their views of life, by quickening the conscience, and by infusing earnestness into the character ; and it reno- vated their social condition by pointing out to them their duties to one another, by encouraging corporate feeling, and in particular by purifying the domestic relations through its influence on the female sex. At the same time the habit of meeting for the administration of their communities

accustomed the Christians to discussion and action in com- mon, and the fact that they formed a powerful corporation independent of the state, which was the reason why they were persecuted by the Roman authorities, was in itself a means of political education. Such an influence, which not merely pervaded every relation of life, but penetrated also to tlhe motives and springs of action, is sufficient of itself to account for the regeneration of the Greeks, which the liis- torian traces in its effects at the end of the 3d century. The scene now changes, and from the land of Hellas our attention is transferred to the city of Constantinople.

II. Period of Greek Revival: from Constantine the Great to Leo ILI. (the Isaurian), 323-716 a.v.

The principal events of the first half of this period, the two centuries which intervened between Constantine and Justinian, are—tle foundation of

Constantinople (330 a.p). ; the emperor Julian's attempted restoration of Paganism (361); the defeat of Valens by the Goths near Adrianople, and his death (378); the establishment of Chiristianity by Theodosius the Great as the religion of the empire (388) ; the partition of the Roman empire between Arcadius and Honorius (395); the publication of the Theodosian code (438) ; and the extinction of the empire of the West (476). The reign of Justinian (527-565) comprises the great cam- paigns of Belisarius and Narses, whereby the kingdom of the Vandals in Africa was overthrown, and Sicily, Italy, and southern Spain were recovered to the Roman empire, the Greek possessions in Italy being henceforth governed by an exarch, who resided at Ravenna; the building of

the church of St Sophia at Constantinople; and the reformation of the Roman law. Finally, in the century and a half between Justinian's death and the accession of Leo III., occurred the birth of Mahomet (571); the victori- ous expeditions of Heraclius against the Persians (622-8); and the seven years' siege of Constantinople by the Saracens in the reign of Constantine Pogonatus (668-675).

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The reforms effected by Constantine formed one of thie Reform; greatest revolutions the world has ever seen, and his sagacity of Con. is shown by the completeness with which they were carried Sutin

out, and by the permanence of their effects, for from them proceeded both the strength and the injuriousness of the Byzantine system, which lasted even to the latest days of the empire. To describe them in brief,—he centralized the executive power in the emperor, and constituted a bureau- cracy for the administration of public business; he consoli- dated the dispensation of justice throughout his dominions ; he rendered the military power, which had hitherto been the terror and bane of tlie state, subservient to the civil power; he adopted a new religion, and established a new capital. Henceforth the world was ruled by the emperor and his household,

and this administration was wholly irre- sponsible ; and as the interests of the Government were un- connected with those of any nationality and any class of its subjects, there was sure to be a continual struggle between the rulers and those whom they governed. In order that the emperor might be regarded as a being of a different order from tlie people, lie and his court were surrounded by lavish splendour; and in order to check the ever im- minent danger of rebellion through pretenders to the throne, the offices of the court were made magnificent prizes, so that ambitious persons might feel that advancement could be obtained by a safer method than civil war. But to meet these expenses, and at the same time to maintain a power- ful army, an elaborate system of taxation was necessary ; taxation, in fact, came to be regarded as the first aim of government, and the inhabitants of the empire were im- poverished for objects in which they had no direct concern. The principal instrument which Constantine used for en- forcing this was the Roman municipal system, and this he introduced into Greece, notwithstanding the existence of a national and traditional organization. According to this, each town, with the agricultural district in its neighbour- hood, was administered by an oligarchical senate called the curia, elected from among the landed proprietors ; by them the municipal officers were appointed, and the land-tax eollected, for the amount of wlich they were made respon-

sible; while those who did not possess land, such as

merchants aud artisans, paid the capitation tax, and formed an inferior class.

property of members of the curta was confiscated when the required amount was not forthcoming; and hence, in order to prevent a further diminution of the revenue, an elaborate caste-system was subsequently introduced, which fixed the condition of every class, and required a son to follow the calling of his father, lest the number of persons liable to a certain kind of taxation should decrease. With the same view, the free rural population came to be tied to the soil, to prevent the ground from falling out of cultivation. Since, however, it was foreseen that such a system would produce discontent, the people everywhere were carefully disarmed, and the possession of arms was made a thing apart, the military class being separated from all others. For the same reason barbarians were much used as troops, because they could have no sympathy with the citizens. The harsh- ness of this system caused general poverty, and deep-seated hatred of the central government, often resulting in a dis- position to call in the barbarians; while its jealousy was the origin of the weakness of the empire, because the pro-

As wealth declined, the oppressiveness of Evils | | this system was more and more felt, especially as the private his _*

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arits.

GREEK REVIVAL. |

vincials, who were really stronger than their invaders, were never allowed to defend themselves. In the West it contri- buted greatly to the overthrow of the empire, and in the East it repressed the spirit of Hellenic life by interfering with the ancient city communities ; and though the force of the Greek character, and the social condition of the countries they inhabited, saved them from destruction, yet, as we look down the long vista of succeeding ages, we may see its baneful effects producing ever-increasing

misery. Yet we must not overlook the strong points of Constan- tine's system. The first of these was the regular adminis- tration of justice which he introduced. This the inhabi- tants of the empire felt they could not obtain elsewhere, and the possession of it reconciled them to many other- wise intolerable grievances. So conscious were succeeding emperors of this that we find strictness observed in this matter until quite a late age of the Byzantine empire. Another was the amount of ability and experience which it secured for the public service. We have called the adminis- trators of public affairs a bureaucracy, and the household of the emperor, but they were not the less a body of most highly trained officials, thoroughly organized in their various services. Each department of the state formed a profession of itself, as completely subdivided, and requiring as special an education, as the legal profession at the present day. The perfection of this machinery accounts for the empire not having fallen to pieces in times of internal dissension, sometimes accompanied by foreign invasion; and the facilities it afforded for developing talent are seen in the long succession of able administrators which the system pro- duced, and which came to an end at the commencement of the 11th century, when it began to be disused. And besides this, though the rigorously oppressive taxation was injudicious as well as injurious, yet it may be doubted whether any other system than the high-handed centraliza- tion which has been described could have prevented dissolu- tion, Its force is certainly proved by its vitality, and the first great dismemberment in particular was brought about, not by internal causes, but by the power of the Saracens. The choice of the site of New Rome—which is perhaps

- *the finest position in the world, as it commands the meeting-*

point of two great seas and two great continents, and rises in seven hills on its triangular promontory between the Pro- pontis and its land-locked harbour the Golden Horn—is an additional proof of the penetration of Constantine ; and the event justified his selection, for on numerous occasions no- thing else than the impregnability of the seat of government could have saved the empire from destruction. Though the establishment of a new capital was in itself a consummate stroke of genius, yet to some extent it was forced upon tlie emperor by his conversion to Christianity, for this placed him in direct antagonism to Old Rome, which was still the head-

quarters of paganism. And whatever might be the feelings of the people, on the part of the administrators themselves the prepossessions to be overcome in deciding on such a change were less than might be supposed, for the govern- ment, absorbed as it was in the unceasing care of maintain- ing and defending the empire, had long ceased to be Roman in its sympathies, and had become cosmopolitan. The new city at the time of its foundation was Roman : its Senators were transported thither from Rome ; the language of the court was Latin ; and the condition of the lower classes was assimilated to that of the old capital by their being exempted from taxation and supported by distribu- fons of grain. But from the first it was destined to become Greek ; for the Greeks, who now began to call themselves Romans, an appellation which they have ever since retained, held fast to their language, manners, and prejudices, while they availed themselves to the full of their rights as Roman citizens. Hence, in Justinian's time, we find all the highest

offices in the hands of Greeks—not Hellenic Greeks, but a Greeco-Rtoman caste, the descendants of the Macedonian conquerors of Asia ; and Greek was the prevailing language. The turning-point in this respect was the separation of the East and West in the time of Arcadius and Honorius. Still the Roman system remained permanent, especially in the community of interest created between the emperors and the populace by the largesses and the expenditure on public armusements, the money for which was drained from the provinces; and this fact explains the antagonism that remained between the provincials and the inhabitants of the capital, and the toleration which the latter showed of the tyranny of their rulers. How deeply these abuses were rooted in tlie city of Constantinople is shown by the circum- stance that Heraclius, in despair of otherwise carrying out his schemes of retrenchment and reform, conceived the design of removing the seat of government to Carthage—a plan which he would have carried out had he not been pre- vented by the unanimous opposition of the Greeks.

Whether the conversion of Constantine to Christianity The was due to sincere belief or to policy, or, as is perhaps most Greek likely, to a

combination of the two motives, there can be no Chweh-

doubt that religion had before that time obtained a great in- fluence over the Greeks, and that the cause of the Christian Church and that of the Greek nation were already closely interwoven. Nothing could slow more clearly the mastery obtained by the new faith than the subsequent failure of the emperor Julian to revive paganism. We have already seen how life and energy were restored to Greek society by this influence before the end of the 3d century; it was also the unanimity with which it was adopted by that people which inspired them to combine in self-defence, and saved them from the fate of the disunited Western empire. From that early period dates the feeling of brotherhood which pervaded the Greek Church, and the strong attachment which has always existed between the Greek clergy and their flocks, further cemented as it was at a later period by the influence which the clergy exercised in maintaining the people's rights and defending them against aggression. Paganism, however, continued to be recognized until the time of Theodosius the Great, when Christianity was substituted for it by legislative enactments. But the orthodoxy of the Eastern Church, which came to be, and still is, its most distinctive feature, and the identification of the Orthodox Church with the Greek nation, dates from a different time, viz., from the reigns of the Arian successors of Constantine, to whose personal opinions the people were strongly opposed. The political effect of this union ulti- mately became very great, and resulted in the loss of im- portant provinces to the empire. When the Orthodox had the upper hand, they soon began to clamour for the perse- cution of heretics, and the emperors being on the same side acceded to their demand. 'The natural effect of this was disaffection in those regions, such as Syria and Egypt, where the majority of tle population were either Nestorians or Eutychians; and the evil was aggravated by the suspicion to which the provincial clergy were exposed, because they were not Greeks, of being heterodox. The alienation from the central government thus produced greatly facilitated the conquest of those countries by the Saracens. It should also be noted that from the time of Constantine the emperors claimed, and were acknowledged, to be supreme over the church in all civil and external matters—a power which, as we shall see, proved to be of great importance at the time of the iconoclastic controversy ; and the extensive judicial and administrative authority which Theodosius conferred on the bishops was

the origin of that political subserviency, and at the same time of tliose simoniacal practices, which have been the opprobrium of their order in the Eastern Church,

Reign of Justinian

Barbarian invasions.

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The reign of Justinian, which, from the important events which it eontained, has naturally much attracted the notice of historians, was a period of false brilliancy. The char- acter of that emperor in many respects resembles that of Louis XIV. Both were men of moderate ability, gifted with great industry and application to business, and with a remarkable power of employing the talents of others ; both were fond of splendour and foreign eonquest ; and both impoverished and ruined their subjects. At the time of his accession Justinian found in the exchequer a large sum of money amassed by Anastasius I., and had he employed this in lightening taxation and improving the position of his subjects, instead of wasting it in wars of his own seek- ing and lavish expenditure on public buildings, he would have greatly strengthened his kingdom. No doubt the eonquests of his generals were splendid, and testify to the greatness of the armies of the empire at this time. No doubt also the compilation of the Pandects, Code, and Institutes was a magnificent work, which has left indelible traces on the legal systems of Europe. And itis an honour to any age to have developed the Byzantine style of archii- tecture, a style thoroughly Greek in its unity and propor- tion; for, whereas the Romans had borrowed the ancient Greek style, and, adding to it the arch, had used it for wholly incongruous purposes, the Greeks in turn appropri- ated the arch and dome, and created a new and harmonious style. But the effects of his reign on his dominions were ruinous. He riveted tighter the fetters which Constantine had invented, but he lacked the penetration of Constantine in perceiving the needs of his time. He dissolved the pro- vincial militia, which to some extent still existed in Greece. The population were ground down by taxation, the revenues of the free eities in Greece were seized, and at last the fortifications fell into disrepair, and a great part of the army was disbanded, so that when Zabergan, king of the Kutigur Huns, invaded the eountry from the north ia

the year 559, he was able to approach within 17 miles of Con- stantinople. How great the demoralization was is shown by the state of the empire under Justinian's immediate successors, Within less than twenty years after his death the eonviction of a great change impending was so widely spread that a story was rife that it was revealed to the emperor Tiberius II. in a dream that on account of his virtues the days of anarchy should not eommence during his reign. The condition of things has been described as 'universal political palsy."

The 400 years whicli elapsed between Constantine and Leo III. were the great period of the barbarian invasions. The Goths, who, as we have seen, had overrun Greece in the latter half of the 3d century after their great defeat at Naissus (Nisch), were more or less kept in eheck, and became in some degree a eivilized and Christian people in the country of Dacia, to the north of the Danube, which they had permanently occupied after the Roman colonies in that country were withdrawn by Aurelian. But in the reign of Valens, when the Huns were overrunning Europe, they were pressed onwards by those invaders, and occupied Mcesia between the Danube and the Balkan, which province was peacefully eeded to them. It was

only in consequence of treacherous treatment by the

Romans that they afterwards entered the empire as enemies, and fought the campaign which ended in the defeat and death of that emperor (378). They were again ehecked by Theodosius, and persuaded to enlist in great numbers in the imperial service; but during the reign of his suecessor Arcadius, the famous Alaric roused the spirit of his countrymen, and ravaged the whole of Greece even to the Peloponnesus (395), before he turned his thoughts to the invasion of Italy For a time both Goths and Romans were the victims of Attila, who with

' desire of military renown ; but the effects of it were disas-

his hordes of Huns swept over the lands south of the Danube (442-7), and was only induced to retire by an agreement on the part of Theodosius II, to pay him an annual tribute. But again, in the reign of Zeno (475), the empire

was in imminent danger from the Goths under Theodoric, who, like Alaric, had lived at Constantinople, and like him also withdrew into Italy. Towards the beginning of the 6th century the Goths make way for more barbarous invaders, Bulgarians of Turanian origin, and various Slavonic tribes, for whose pastoral habits the now depopulated country was better suited than for a more eivilized population. But they in turn were soon swallowed up by the Avars, whose vast monarchy occupied a great part of eastern Europe, and whose armies, in the time of Heraclius, threatened Constantinople itself. It was in order to impose a perinanent check on that people that this emperor induced the Servians and Croatians tu occupy the districts eastward of tle Adriatic, Dalmatia and Illyrieum, which were deserted, owing to their eonstant inroads, These Slavonic settlers paid allegiance to the empire, and as they formed agricultural eommunities, introduced an element of permanence into the country. The Avar power disappeared as suddenly as it lad risen, and at the end of the 7th century its place is taken by the Bulgarian kingdom, which lasted for nearly 350 years, and was the great antagonist of the Byzantine empire in its most flourishing period. At the elose of this long enumeration of invasions, we cannot help being astonished at tlie successful resistance that was offered to them. No doubt the conformation of the European provinces of the Eastern empire, with their successive mountain barriers, was a source of strength from the ease with whieh they eould be defended; but this could hardly have saved the Greeks, had it not been for the number of their walled cities, their superiority in the art of war, the courage of the people when ealled out by eircnm- stances, and the strong position of the eapital. On the side of Asia, during the same period, a long Persia struggle was maintained with Persia. The dynasty of the was Sassanides, which arose on the ruins of the old Parthian | kingdom, had raised that eountry to great power and pros- | | |

perity. The second in order of its princes, Sapor IL. had taken the emperor Valerian prisoner (257), and a cen- tury later Julian lost his life when fighting in Persia. The ill success of Justinian in his Persian wars ought fairly to be ascribed as much to the ability of his great opponent, | Chosroes Nushirvan, as to his own shorteomings; but the 1 fact remains that even Belisarius won small glory from those contests, and after a struggle of twenty years' dura- tion a treaty was concluded, which required the European monarch to pay an annual subsidy of thirty thousand pieces of

gold. War, however, continued during the reigns of his successors Justin II. and Tiberius IT., until an honourable peace was concluded by Maurice, the son-in-law of the last named emperor, at wliose eourt Chosroes IL., the rightful sovereign, had been received when he was an exile. This prince, when he was reinstated on his paternal throne, showed his gratitude to the Romans, But when Maurice was dethroned by the rebel Phocas, the Persian monarch declared war, professedly with the design of avenging his benefactor. The greater part of the Asiatic provinces were laid waste, and a Persian army was for a time encamped on the shores of the Bosphorus, so that it seemed as if the Roman empire was about to be conquered by Persia. From this it was saved by Heraelius, who was not only one of the ablest of the emperors, but one of the greatest of military leaders. He warded off the impending danger, and in seven campaigns, by a series of brilliant victories, dealt a death- blow to the Persian power. The struggle was unavoidable, and Heraclius, in entering upon it, was actuated by no vain

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trous to the Romans also. The period when it occurred was that of the rise of the Saracens, and the exhaustion caused by it contributed in no slight degree to the exten- sion of their power. We turn now to the condition of the Greeks during this period. In the interval between the first Gothic invasions "and the accession of Constantine the material prosperity of Greece had increased, owing partly to the devastation of the provinces to the north of that country, the wealthy inhabi- tants of which were forced to take refuge in Greece, and partly to the insecurity of the Red Sea, Egypt, and Syria, which caused the commerce of Central Asia to take the route of the Black Sea, whence the trade of the Mediter- ranean passed once more into the hands of the Greeks. It cau hardly be said that the reforms of Constantine benefited the population, because of the severe exactions they intro- duced ; for, as has been already mentioned, the rich were forced to supply from their own incomes any deficiency that might occur in their district, and by this means, before Justinian's time, the class of great landed proprietors had been extinguished. But the fixed position which the clergy and the lawyers obtained under Constantine's system was a general advantage,

because this constitutional check modified the oppressiveness of the Government in its dealings with the people. In the case of the latter of these two orders the effect would have been greater, had not Latin been the language of legal business until after the time of Justinian. The period of 120 years between the death of Arcadius and that emperor's accession was a time of improvement. During the long reign of Theodosius II. the power was in the hands of his sister, the philanthropic Pulcheria, and of his ministers, and these seem to have ruled judiciously ; and the five succeeding emperors, Marcian, Leo I., Zeno the Isaurian, Anastasius, and Justin, were all men born in the middle or lower class of society, and of provincial origin, and had come to the throne at a matureage. The sympathy which they thus had with the body of their subjects accounts for their economy, and for their endeavours to restore the re- sources of the empire and alleviate its burdens, and generally to introduce regular forms of procedure into public business. Far different was the case with Justinian, whose severe demands for money distressed all classes of his subjects. – But it was on Athens that his hand was most heavily laid. That city was still a literary capital where Hellenic learning was cultivated; and if the Hero and Leander of Museeus and that graceful pastoral romance, the Daphnis and Chloe of Longus, are to be assigned to so late a date as the fifth century, the spirit of the ancient literature had not long been extinct among the Greeks. The ancient buildings still existed in all their splendour ; the citizens lived a life of quiet, self-complacent ease ; and the paganism, of which it Was now the centre, had been purified from its vices by the maxims of philosophy and the influence of Christianity. It remained for Justinian, in his merciless centralization, to close its schools and confiscate their revenues. At the same time the Olympian games were brought to an end, From this time onward the inhabitants of Hellas are but little heard of, and at the beginning of the 8th century we find them Spoken of by Byzantine writers under the contemp- tuous title of Helladici, while the Greek nation is represented by the Population of Constantinople and Asia Minor. Yet this period was not wholly disadvantageous to Greece. As the danger from the invading barbarians increased, its citizens regained the power of using arms, and revived a municipal administration to direct their efforts. It was also In Justinian's reign that silkworms were introduced from China, and the manufacture of silk became a profitable Source of revenue to Thebes

and other towns. One result of the financial legislation of this time was a change which, though the lawgivers certainly did not foresee

it, was most beneficial in its effects,

This was the gradual Extine-

extinction of slavery in the Eastern empire. The power tion of that effected this was not Christianity, for that religion had Slavery:

recognized slavery as an institution, nor yet civilization, for that among the Greeks was intimately connected with the employment of slaves, It was rather produced by an alteration that was taking place in the condition of certain classes, which annihilated the distinction between the free- man and the slave. When the oppressiveness of taxation had destroyed the wealthy proprietors, and, in order to pre- vent the land from falling out of cultivation and thus diminishing the revenue, the cultivators of the land were tied to the soil, the poorer class of freemen began to sink down into the condition of serfs. On the other hand the slaves who were employed in agriculture became for the same reason an object of solicitude to the legislature, and their proprietors were forbidden to alienate them. They thus acquired a recognized position, not far removed from serfdom ; and when all the lower class were reduced to the same state of poverty, the difference in the political status of the two orders came to be obliterated. Many centuries elapsed before this change fully worked itself out. The slave trade was still an important branch of commerce in the Roman empire, and freemen were sold as slaves if they failed to pay their taxes; but henceforth the system was doomed to ultimate extinction. When we consider the ex- tent to which slavery prevailed in the ancient world, and the misery which it caused, we cannot regret the circum- stances which caused it to disappear, even though they were accompanied by much suffering.

It is important also to remark, now that we are approaching the period of change from ancient to modern society, that the decline of civilization in the

later Roman empire was not owing to degeneration in the people them- selves, or to an inevitable downward tendency in highly civilized communities. It is a mistake to attribute to decay in human character changes that are clearly trace- able to the need of such external resources as are indis- pensable for its development. The prohibition to carry arms necessarily renders a people unwarlike. Where muuicipal institutions are discouraged, public opinion soon becomes powerless. When the resources which might be employed in constructing roads are withdrawn, communica- tion ceases, and with it the interchange of ideas and other influences by which the intellect is quickened. The degra- dation was produced by the injustice of the Government, which pillaged its subjects, and systematically destroyed all independence among them. Whenever the iron hand was removed, they showed signs of renewed life and vigour, but the strength of the central power was too great to encourage any hope of resisting it successfully. They had no choice but to sit down under it, aud suffer it to drain their life-blood by slow degrees,

The sys- tem, not the

people,

at fault.

At the commencement of the 8th century the extinction Threat-

of the empire of the East appeared to be imminent. same causes which had overthrown the Western empire were threatening it with destruction. 'lhe Saracens had overrun all its Asiatic possessions, and had attacked the capital itself, while in Europe it was threatened by the Bulgarians, The provinces were falling off: Syria, Egypt, Africa, and the conquered provinces of Spain were wholly lost, and in Italy the dominions of the exarchate were greatly circum- scribed by. the Lombards. At home rebellion prevailed in the army, and anarchy in the government, six emperors having been dethroned within the space of twenty-one years. It seemed as if the Greek race itself would be destroyed ; in the countries conquered by the Saracens the Greeks were almost exterminated, and Greek civilization proscribed, while Hellas was threatened with occupation by the bar- barians. But at this moment the helm of the state was XI, — 15

The ened ex- tinction

of the empire.

The By- zantine empire.

Reforms of Leo TH.

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seized by a man who, by his force of character and his great abilities, inaugurated a new state of things, and gave the empire a new lease of life. This man was Leo the Isaurian.

Ill. Period of Byzantine Prosperity: from Leo ITI. to Isaac I, (Comnenus), 716-1057 a.v.

Considerable difference cf opinion has existed as to the precise time at which the Roman empire of the east may be said to have ended, and the Byzantine empire to have commenced. Gibbon remarks that "Tiberius by the Arabs, and Maurice by the Italians, are distinguished as the first of the Greek Czesars, as the founders of a new dynasty and empire." The question turns on modifications of the old Roman system of administration, and the introduction. of a new order of things, which lasted until the overthrow of the state. These commenced, no doubt, shortly after the death of Heraclius, and were closely connected with the victorious advance of the Saracens, which necessitated a reform, and at the same time concentrated the empire, and confined it more and more within the districts inhakited by Greeks. But the altered state of things did not become apparent, nor were the changes systematized, until the time of Leo III., and therefore he may most rightly be regarded as having inaugurated the Byzantine empire. The first cen- tury and a half of the present period embraces the icono- clastic controversy, while the two remaining centuries coincide with the rule of the Basilian dynasty. It was a time of great men and great achievements, both in gover- ment and war, and tlie events it contains amply suffice to defend the Byzantine empire from the imputation of feeble- ness and decrepitude ; and those who delight to find in history strongly marked characters and stirring incidents will be amply rewarded here. Few personages stand out in

stronger relief than the ruthless, yet ascetic, warrior Basil, tlie slayer of the Bulgarians ; and few occurrences are more romantic than the death of Leo the Armenian, who defends himself with the crucifix in lis chapel, where he was chanting the prayers in the early morning, while his successor lies in fetters in the neighbouring dungeon.

We must first notice the reforms, which caused the reign of Leo III. to be an era in the history of the empire. These extended to almost every branch of the administra- tion. In respect of the army, he reorganized the military establishment by placing the various bodies of soldiers in the different "themes," or departments, each with a general of its own, thereby providing for local defence, and avoiding the danger of rendering the military commanders too influ- ential—a system which defended the empire for five cen- turies. The geographical arrangement in themes was intro- duced by Heraclius, but reorganized by Leo, and bore somewhat the same relation to the previous division into provinces that the departments in France bear to the earlier distribution of that country. In respect of finance, he brought the taxation immediately under the emperor's cognizance, so that thenceforth the emperors were their own finance ministers. All local agencies for collecting the taxes were abolished, and their functions transferred to the im- perial officers, who took census regularly. By this means he raised more money than his predecessors, but the increased prosperity of the people showed that the burden did not fall so heavily. In respect of justice, in order to obviate the difficulties which had arisen in the administration of Justinian's elaborate laws, especially since the facilities for communication throughout the empire had decreased, he published in Greek an abridged manual called the Zeloga, and codified the military, agricultural, and maritime laws. In respect of religion, he aimed at counteracting the ele- ment of superstition which had crept into the church, and through it was corrupting the public mind. But this last

point calls for separate consideration, since the worship or prohibition of images became the burning question of the age.

The history of iconoclasm is the history of Constantinople Icono. during the 8th century and the first half of the 9th, and clasm

involved a great part of the empire in its distractions, There can be little doubt that, in his opposition to image worship, Leo represented the opinion of a large part of the enlightened laymen of his time, while the great body of the clergy, but especially the monks, together with the mass of the population, were passionately attached to the statues and pictures, as objects of reverence, not to say of adoration. But the fact that the stronghold of iconoclasm was Asia Minor, and especially that part of it which bordered on the countries occupied by the Saracens, suggests that it was in part owing to the spread of Mahometanism, the rigidly guarded spirituality of which creed was a stand ing protest against more material conceptions of religion. Nor should we overlook the deeply rooted feeling in the mind of Orientals of the opposition between spirit and matter, which would naturally cause them to be alive to such questions of controversy. The emperors of this time were those of the Isaurian, Armenian, and Amorian dynas- ties, all which names remind us that they came from the Asiatic provinces; whereas the great restorer of images, the empress Irene, during whose regency the second council of Niceea in their favour was held (787 a.D.), was an Athenian. But the matter was complicated by a further issue; the question of images was closely connected in the minds of the emperors, and especially of Leo III. and his

'hard-handed son Constantine Copronymus, with that of

their supremacy in matters of religion. They viewed with jealousy the independent power of the church, and were glad of the opportunity this controversy afforded of strength- ening their control over this department, and claiming to the full those ecclesiastical rights which, from the time of Constantine the Great onward, had attached to the im- perial authority. As this move was only part of a system of centralization, the monks and others who supported image worship were from one point of view the assertors of liberty against aggression, and they were recognized as sucht by a certain number of thinking men, who watched with anxiety the growth of despotism. As toleration was un- known to the age, persecution was carried on by both sides with equal fierceness, and the contest swayed to and fro, until it was

brought to an end by the final restoration of images under Michael III., the last of the Amorian line (842). Its effects on society had been remarkable. At first its influence was bracing, as was shown by the re- newed vigour which pervaded the empire ; for both sides were thoroughly in earnest, and among tlie iconoclasts in particular an element of Puritan energy wasevolved. But in its later stages, when the people at large were weary of the strife, and the struggle was felt to be in reality one between church and state, the prevalent hypocrisy generated disrespect for religion, and this was followed by general immorality. It further caused the loss to the empire of its dominions in central Italy. So great was the alienation produced by this movement in the minds of the popes Gregory II. and ITI. that thenceforward the holy see was for the most part either active in its opposition to the Byzantine power or lukewarm in support of it. At last, in 751, Ravenna was captured by the Lombards, and the Greek exarch retired to Naples.

The subsequent ecclesiastical affairs of this period must Subs be briefly dismissed, though they exercised an important P influence on the fortunes of the Greeks. The final separa tical tion of the Eastern and Western Churches took place im affais 1053, though events had long before been leading up toit. Already in the middle of the 9th century, when the pope

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interfered between the rival patriarchs Ignatius and Photius, a rupture was very nearly occurring; and at last, though the formal causes of division

were theological, yet the assumptions of the see of Rome and political antagonisms were in reality more influential motives. The bitterness thus created culminated in the capture of Constantinople by the Latins at the time of 'the fourth crusade; and the subsequent refusal of aid by the Western nations to the Greeks greatly facilitated the success of the Ottomans. From this, the greatest breach in the Christian world, we turn with thankfulness to the missionary efforts of this age. In the middle of the 9th century two brothers, Cyril and Methodius, preached the gospel to the southern Slavonians, and converted them to Christianity. By Cyril the alphabet called Cyrillic was invented, which was generally adopted by the Slavonic peoples. About the same time the Bul- garians renounced their paganism, through the influence of a sister of their king, Bogoris, who had been educated as a prisoner at Constantinople, and afterwards restored to her native country. The rest of the nation had been prepared for this change by the numerous Christian slaves who had previously been carried off by them in war. A century later Christianity was introduced by Greek influence among the Russians, whose capital was now at Kieff, and who Were among the most dreaded foes of the Eastern empire. If the missionary spirit is the best evidence of the vitality of a church, it is clear that that of Constantinople, however much corrupted by formalism, was still animated by the spirit of true religion.

The Persian monarchy, which for 400 years had been the rival of the Roman power in Asia, had now succumbed to the victorious arms of the Saracens; and that people again, during the next four centuries, were engaged in almost con- tinual war with the Byzantine empire. In the reign of Constantine Pogonatus, the caliph Moawyah besieged Con- stantinople for seven years by land and sea, the invaders retiring to Cyzicus for the winter (672-9); but, owing in great measure to the newly invented Greek fire, he was obliged at last to desist from the attempt, and almost the whole of his force was destroyed. Notwithstanding this reverse, the attempt was renewed within a year after Leo III.'s accession by Moslemah, brother of the caliph Suleiman, with an enormous host; but the skill of the Byzantines in military defence, which was equal to that of the Romans in their best days, baffled his attempts, and a winter of extraordinary severity ensuing ruined the attack- ing army. The importance of this result was incalculable to Europe —far greater than that of the victory of Charles Martel at Tours, The

Saracen empire was now at its height, and reached from the Indus to the Atlantic; and it was the full brunt of this power, now in full tide of conquest, which was resisted at Constantinople. Had that city fallen, there was no power that could have prevented it from overrunning Europe. After this, Asia Minor con- tinued for ages to be the battle-ground of the two opposing empires, until it was so devastated and depopulated by suc- cessive campaigns as to be fit only for the occupation of the nomad tribes who were to succeed. In the midst of these Struggles the invasions of Haroun al Rashid, the splendour of whose court obtained for him a reputation in the West which he did not enjoy among his contemporaries in the Kast, appear hardly more than plundering incursions. The

yzantine nobles, who were trained in this school of war,

BYZANTINE PROSPERITY. |

were distinguished for their military spirit and personal |

Prowess ; aud the troops of which the armies were composed Were so powerful and well-disciplined that the Saracens would never meet them in the field except with far superior oo. By sea, however, the empire was less successful than by land, __ During the first half of the 9th century both Crete and Sicily were conquered by these enemies, and in

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the year 904 occurred the memorable sack of Thessalonica. A Saracen fleet appeared before that city, and, after storm- ing the sea-wall, pillaged the whole place and butchered the citizens without respect of sex or age. The most famous successes were those of Nicephorus Phocas and his successor John Zimisces. The former of these great commanders, who before he became emperor had reconquered the island of Crete, at the end of a brilliant campaign in Syria obtained possession of Antioch (968) after it had been in the hands of the Mahometans for 328 years. Five years later Zimisces carried his victorious arms even to the banks of the Tigris. But while the disorganized state of the caliphate of Baghdad, in the early part of the 11th century, removed all fears from that quarter, a new enemy began to appear on the eastern frontier of the empire—the Seljuk Turks.

Unfortunately, at this critical conjuncture, a fatal mistake was made. 'The safety of that frontier had long been guaranteed by the Armenian kingdom of the Bagra- tians, whose country was admirably adapted for defence, and wliose population were a hardy race of Christian mountaineers. In the year 1045 the emperor Constantine IX. destroyed this kingdom, and thereby laid his dominions open to the invaders.

In Europe, at the same time, the empire was exposed to Bulgarian the attacks of a foe hardly less formidable, and in closer Wars.

proximity—the Bulgarians. After the extinction of the Avars, this people, who had long been in subjection to them, had founded an important monarchy in the ancient Meesia at the end of the 7th century; and henceforward the Byzan- tines had to defend their European possessions, not as before against a succession of migratory tribes, but against the concentrated force of a single nation. Inthe time of Con- stantine Copronymus we find that it required all the energy and military talents of that emperor to keep them at bay, and on one occasion they carried their ravages up to the neighbourhood of the capital. In the beginning of the 9th century their king, Crumn, defeated and slew the emperor Nicephorus I., who had invaded his territory, in a night attack on his camp, and converted his skull into a drinking- cup for his table. We have already noticed how, later in that century, the nation embraced Christianity, and at the same time a tract of country on the southern side of the Balkan range was ceded to them, and received from them the name of Zagora. By this time also they had imper- ceptibly changed their nationality and their language, for by intermingling with the more numerous Slavonian tribes of the countries in which they settled, they lost the traces of their Hunnish origin, and became to all intents and pur- poses a Slavonic race. By the neighbourhood of Constan- tinople, and the trade between that city and the German and Scandinavian peoples which passed through their country, they became a commercial nation, and advanced in the arts of life. But the rapacity of the Greeks in im- posing heavy customs on their traders involved them again in war with the empire, and when peace was re-established, the treaty between Romanus I. and their king, Simeon, was made under the very walls of Constantinople (923). In the reign of Nicephorus Phocas the Russians, who had not long before appeared on the scene of action, were invited by the

Greeks to invade Bulgaria, and they so effectually crushed the Bulgarians (968) that his successor, John Zimisces, was obliged to come to their aid, in order to save his own territory from falling a prey to the new comers. It was shortly after this that the great and final struggle commenced. Under their chief, Samuel, a man of great vigour and ability, they extended their conquests over Macedonia and Thessaly, and made plundering incursions into Greece and the Peloponnesus, But finding that the plains of Bulgaria were unfavourable to him as a seat of war, on account of the superior discipline of the imperial

The Rus- sians.

Consti- tutional changes.

forces, Samuel transferred his seat of government to Achrida, on the confines of Macedonia and Albania, and thence he extended his kingdom from the Adriatic to the Augean, so that the country he ruled was as extensive as the European portion of the Byzantine empire. But these events coincided with the culminating period of Byzantine greatness, and Samuel found a worthy rival in Basil IL, wno from his subsequent victories obtained the title of

"Slayer of the Bulgarians." By him the Bulgarian power |

was brought to an end ; and the whole people submitted to the dominion of the Greeks (1018). The third people with whom the empire had to contend

at this time was the Russians. In the reign of Michael |

IIL, the last of the Amorian dynasty (865), the inhabi- tants of Constantinople were astonished by tlie appearance in the neighbourhood of the city of a fleet of 200 small vessels, which passed down the Bosphorus from the Black Sea. The enemy contained in these was the Russians, who not long before had established themselves at Kieff on the Dnieper, and whose restless spirit and love of plunder prompted them to attack the strongest city in the world. Their ignorance of the art of war rendered them

no for- midable foe to the Byzantine forces, but their daring and cruelty produced a profound impression on the civilized and peaceful citizens. Similar attacks were made in 907 by Oleg and in 941 by Igor, but the influence of trade and the introduction of Christianity into Russia gradually promoted more peaceful relations, and the Byzantines em- ployed the powerful tribe of the Patzinaks, who occupied the northern shores of the Black Sea, to counterbalance their opponents. But the campaign of John Zimisces on the Danube in 971, which followed on the negotiations of his predecessor for the subjugation of the Bulgarians, showed how important a military power the Russians had become, for he found in their chief, Swatoslav, an enter- prising and powerful adversary, whom it required all his skill to overcome. Once more, in the time of Constantine IX. (1043), the Scandinavian Varangians, by whom the Russians were mostly represented in their marauding ex- peditions, appeared before Constantinople, but with no better success than before ; and from this period the alliance of that people with the Byzantines was long uninterrupted, and the two nations were bound together more and more by religious sympathy. In the days of the Comneni the Varangians regularly formed the bodyguard of the emperor.

Constitutional changes were usually of slow growth in the Byzantine empire, yet at the end of this period we find con- siderable alterations to have been effected. Under the early iconoclastic emperors there was a tendency towards the greater concentration of power in the hands of the sovereign, but Basil I. converted the government into a pure despotism. 'This he effected by abolishing the legislative functions of the senate, which body, though now a shadow of its former self, had existed in one form or another all along, and exercised a certain influence in controlling the absolute power of the emperor. When this restraint was removed, and the senate reduced to an administrative council, no further check remained except the fear of revolu- tion. Basil also tacitly introduced what, strange to say, had never existed in the Roman empire, and even now was only partially recognized—the principle.of legitimacy in succession. With a view to this he established the custom that his descendants should be born in the " porphyry chamber," so that the name Porphyrogenitus might become a title of legitimacy. In this way a partial antidote was created to that inveterate disease of the Byzantine empire which a French writer has called

la maladie du tréne—the ambition to be emperor at all hazards, notwithstanding the risks involved both in the attempt and the possession of the office. The growth of the idea is proved by the loyalty

shown a century and a half later to the empress Zoe, an aged, profligate, and incapable woman, on account of the legitimacy of her descent. But the greatest change of all, and one that contributed greatly to the subsequent decline of the empire, was effected at the end of this period. This was the abolition of the system of training officials to con- duct the various departments of the state, and the entrust- ing those offices to eunuchs of the imperial household. The | object of this was to lessen the power of the territorial aristocracy, and to diminish the chance of rebellion, by placing the government in the hands of men who could not found a dynasty ; but from this time onward the efficiency of the administration began to wane. It was thie disregard | of the aristocracy involved in this change that caused the conspiracy of the nobles in Asia Minor which set Isaac Comnenus on the throne. It should also be noticed that few of the emperors throughout this period were Greeks, most of them being either Armenian or Slavonian by extrac- tion. This circumstance accounts for a certain freedom from prejudice and independence of view which may be traced in their actions, but at the same time it caused them

to be wanting in sympathy with their subjects.

During a considerable part of this period, notwithstand- Cont: ing the desolating wars which we have described, the pros- tioned perity of the inhabitants of the empire was very great. ¥ 4 Finlay, who is excellently qualified to judge in a matter of i this kind, gives it as his opinion that under the iconoclast | emperors their moral condition was superior, not only to | that of all contemporary kingdoms, but to that of any equal | | number of the human race in any preceding period. The i | society of this time has been too much judged of by the murders and mutilations which were rife in consequence of the struggles for the throne; but it should be remembered that these were confined almost entirely to the court and its surroundings, and did not affect the mass of the people. And their material prosperity was equally great. The emperor Theophilus, notwithstanding his lavish expendi- ture, is recorded to have left at his death a sum equal to five million

sovereigns—au amount of money which could hardly have been extorted from a people otherwise than wealthy. This was the result of the commerce of their immense mercantile marine, which had in its hands the whole of the carrying trade between Asia and western Europe. To this it should be added that, under Basil the Macedonian and his successors, care was taken to moderate the burden of taxation, a policy that accounts in great measure for the duration of his dynasty, which occupied the tlirone of Constantinople longer than any other. Unfortu- nately the riches thus obtained tended after a time to accu- |

mulate in the hands of the few, and from the reign of Basil | II. the middle class, that element which society can least of | all afford to dispense with, began rapidly to diminish. As | a consequence of this, in the 11th century manufactures

declined in the cities, while in the country the immense estates of the aristocracy were cultivated by Mahometan | slaves or Slavonian serfs ; and this higher class itself began to feel the lethargy of wealth, and though still unconscious

of coming change, was on the eve of impending decline. In the year 747, during the reign of Constantine an Copronymus, the empire was visited by a fearful pestilence, cre which, both in the mortality and the demoralization of ality. . | society it produced, must have rivalled, to judge by the | accounts left us by the Byzantine historians, those of Florence and London, of which Boccaccio and Defoe have drawn such vivid pictures. As this calamity was the primary cause of the immigration of foreign settlers into Greece, it is intimately connected with the question of modern Greek nationality ; and consequently the present appears a fitting place briefly to discuss this subject, on which great differences of opinion, turning mainly on the

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BYZANTINE DECLINE. |

medieval history of the country, have prevailed. The controversy originated in the famous thesis of Professor Fallmerayer of Munich, that, owing to the great influx first of Slavonian and afterwards of Albanian colonists, not a

single drop of Hellenic blood flows in the veins of the Greeks at the present day. The discussion of this point has enlisted much ability and learning on both sides, but the question appears now to have been pretty well set at rest by the abandonment of Fallmerayer's hypothesis. How early barbarian settlements began to take place in Greece it is difficult to determine; but though the occupation of the Peloponnese by Avars and Slavonians at the end of the 6th century, on which much stress has been laid, is doubt- fully historical, yet colonies of those races probably estab- lished themselves in the northern part of Greece. But that the great change in this respect was produced by the pesti- lence is shown by the oblivion of Hellenic names of places which dates from that time. For, though a fair number of ancient names of seaport towns, such as Patra, Corinth, and Epidaurus, and some names cven in a district so ex- tensively occupied by Slavonians as Arcadia, have been pre- served to the present day, yet the great majority of the modern names are now, and have been since the 8th century, either Slavonic or of later Greek origin. Not only was the country greatly depopulated by the plague, but a consider- able portion of the native middle class was induced by the emperor to migrate to the capital, in order to fill up the void in the inhabitants which had been caused by its ravages. The districts which were thus left vacant were soon after occupied by Slavonian tribes, so that until the middle of the 9th century they formed a large part of the population. But in the latter part of that century the Greeks began to recover a numerical superiority, and from this period dates the process of the absorption and Helleniz- ing of the Slavonians, so as to form the mixed race of which the greater part of the population of Greece is now composed. In effecting this change the Greek Church played an important part. The affinity between the ancient and modern Greeks has been traced by several lines of reasoning. It has been pointed out how great is the resem- blance of character between them, and that too in points presenting the sharpest contrast to the character of the Slavonic races. The survival of old beliefs and classical superstitions at the present day has been carefully observed. The language is a lineal descendant of the ancient speech, and contains next to no Slavonic element ; and lest it should be thought that this language had been imported into the provinces from one or more great centres, and had not sur- vived in the districts themselves, it is proved that numerous classical words and forms, which have been lost to the language at large, still survive in the local dialects. Tus, though the physical

connexion between the modern Greeks and the ancient Hellenes, in certain districts at all events, may be slight, as seems to be implied by the difference of physiognomy, yet in all that really constitutes a people, their character, feelings, and ideas, the fornier are the lineal descendants of the latter.

IV. Period of Byzantine Decline: from Isaac I. to the taking of Constantinople by the Latins, 1057—- 1204 ap.

At the commencement of the preceding period there was a prevailing fear among the inhabitants of the empire that its extinction was imminent, and we have seen how this was followed by an age of unexampled prosperity. The feeling of the time on which we now enter was completely the opposite of this, and yet it was a period of decline. The long duration of the empire, notwithstanding numerous Vicissitudes, its superiority to contemporary nations in

power and wealth, and its apparent security from foreign

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enemies, inspired the people with a belief in its permanency, and blinded them to the seeds of disease that were already working. Yet before the end of the 11th century the Seljouk Turks had occupied all the inland part of Asia Minor, and had established their capital at Niczea, in the immediate neighbourhood of Constantinople. It would, however, be a mistake to suppose that, in its external relations at all events, the whole of the Comnenian period was a time of decay. On the contrary, during a consider- able period it witnessed a remarkable revival; and the three great emperors of that dynasty, Alexius, John, and Manuel Comnenus, whose long reigns extend over an entire century (1081-1180), were men who would be conspicu- ous figures in any age. All of them were distinguished by personal courage and skill in war, by literary culture, and by sagacity in politics; but in other respects they re- presented very different types. The first, Alexius, was in- defatigable in business, patient in maturing lis schemes, and active in carrying them ont, but vainglorious, unprin- cipled, and fond of artifice. From this Ulyssean phase of Greek character we turn to a true Achilles, his

son Jolin, the most amiable character that ever occupied the Byzantine throne—a man irreproachable in morals, open-hearted, generous in action, prudent in council, and pious without superstition. The last of the three, Manuel, presents us with a nature spoiled by the early possession of absolute power, but gifted with most of the features admired by his contemporaries—handsome in person, tall of stature, and so powerful that, at a tournament at Antioch in which the chivalry of the West took part, he unhorsed every antago- nist—but passionate in temper and ill-regulated in mind. In an age which produccd men like these it may well be inquired, What were the sources of decline?

In the first place, the emperors were almost the only Causes of This was the natural effect of the central- decline.

capable men. ization of the system. The neglect of the education of persons intended to be employed in the administration, and the employment of creatures of the court for offices of trust, were now bearing their fruit. Everything depended on the existing sovereign ; and it only required the vices of a thoroughly profligate man like Andronicus Comnenus, the last of his dynasty, to ruin the state. As might be ex- pected also under these circumstances, disorder soon crept into every branch of the public service. The census, which for eleven centuries had been carefully compiled, was now neglected ; justice, which more than anything else had united the provinces to the empire, was more imperfectly administered ; and the army became inferior to those of Western nations. This last change was produced partly by the degeneracy of the nobles in military spirit, owing to the growth of luxury, partly by the officers being appointed by favouritism, and the habit of disbanding troops at the end of a campaign, in order to save money to defray the expenses of the court. At the same time the great diminu- tion of the middle class, owing to the extension of the large properties, lessened the number of those who were willing to defend their liberties against invaders. The privileges also, in respect of trade, which were conceded by Alexius I. to the Venetians and by Manuel to the Genoese and Pisans, to the detriment of the native merchants, commenced the decline of Greek commerce ; and this was accelerated by the piracy that arose, when the money that had been contributed by the commercial communities for the main- tenance of local squadrons of galleys was

ordered to be re- mitted to Constantinople. To all this must be added the influence of the higher Greek clergy, whose subserviency to the state had increased since the separation from the Western Church, and the conservatism of whose ideas discouraged all attempts at progress on the part of the people.

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crusades.

The Sel- juks.

The age of the Comneni is the time of the crusades. Those famous expeditions will produce a very different im- pression on the mind according as they are regarded from the point of view of the East orthe West. From the latter point of view they may be regarded as bringing to a focus the religious and martial enthusiasm of the time, as forming a safety-valve for restlessness, as enlarging the ideas and elevating the spirit of the people. But to the great mass of the Easterns they appeared as hardly better than maraud- ing expeditions, and as producing unmitigated evil. Though the first crusade (1095) was partly undertaken in conse- quence of the solicitations of Alexius for aid against the Seljuks, yet as soon as the first undisciplined bands entered the country they pillaged the natives ; and when the more organized companies followed, though many of their leaders, like Godfrey and Tancred, were men of the highest char- acter, yet it required all the address of the Byzantine monarch to transmit these armies into Asia without some irreparable injury being done to his capital. No doubt the faults were not all on one side, for the suspicion and falsity of Alexius gave just ground of complaint to the crusaders. But he had a very difficult part to play. Had he placed himself, as was proposed, at the head of the crusade, he had no reason to expect obedience on the part of the feudal nobles, while at the same time he left his kingdom exposed to the danger of rivals at home and fresh bands from abroad. Accordingly he chose the ignoble part, and followed in their footsteps with the view of regaining what he could to his dominions. The second and third of these expedi- tions passed through the empire with comparatively little injury,

though in the latter of the two the island of Cyprus was lost to Richard of England; but the ill-will that was manifested by the Greeks on those occasions ripened in the minds of the Westerns those seeds of hatred which at last bore fruit in the great buccaneering expedition which is commonly called the fourth crusade (1204). This event, of which a narrative has been left us from both sides, by the Greek historian Nicetas and the Frank chronicler Villehardouin, is certainly one of the most disgraceful trans-actions in history. A certain lustre has been shed over it by the age and blindness of the doge Dandolo, who was one of the principal leaders; but that a Christian force assembled for the purpose of fighting the infidels should turn its arms against the most important Christian city of the time is an act of unparalleled baseness; nor can any- thing be conceived more deliberately mean than the treaty by which the spoil of the empire was partitioned beforehand between the nations who took part in the attack. From this blow Constantinople never recovered, though it is fair to add that hardly less injury had been caused by the storm and plunder of the city during the rebellion which set Alexius Comnenus on the throne.

In Asia this period opens with a great disaster, the defeat of Romanus IV. by Alp Arslan, in the battle of Manzikert in Armenia (1071). Gibbon has eloquently described the scene, in which the Seljuk sultan, after placing his foot on the neck of the captive emperor, spares his life, and hospitably entertains him. The Seljuk race of Turks were already masters of a great part of western Asia, and in the reign of Malekshah, Alp Arslan's successor, their dominions extended from the banks of the Jaxartes to the Mediter-ranean. 'T'he.empire had now entered on the third great struggle of four centuries' duration, which it maintained in the East—first with the Persians, next with the Saracens, and finally with the Turks, whether Seljuk or Ottoman. But the present contest was commenced under altered circumstances. It was soon felt how fatal was the policy which had denuded the Armenian frontier of its native defenders, and how few obstacles were presented in Asia Minor to an Invading force when a large portion of the free

population had disappeared. And the character of the invaders also had changed; for, whereas the Persians and Saracens had felt an interest in civilization, the Turkish hordes were composed of nomad barbarians, whose

object in war was plunder, and who occupied the countries they con- quered as pastoral tribes. Hence their system of warfare consisted in exterminating the agricultural population by successive inroads, until one district after another lay open for their permanent settlemeut. Within three years after the battle of Manzikert, the Seljuk power extended over the greater part of Asia Minor ; aud when, in the year 1080, Nica fell into their hands, that place became the capital of a separate kingdom, which was called the sultanate of Roum, that is, of Rome. From thence they were driven back by the crusaders at the time of the first crusade, and transferred their seat of government to Iconium, in a more remote position in the south-east of the country. After this they carried on a succession of wars with the Byzantine Government, the most remarkable event in which was the great battle at Myriocephalus, on the borders of Phrygia, in which the emperor Manuel was signally defeated. During the distractions that prevailed at Constantinople shortly before the fourth crusade, it might have been in the power of the Seljuks to seize that city, and so to anticipate the Latins; but at this time the kingdom was divided between the ten sons of the sultan, Kilidji-Arslan II., and thenceforward the power of the Seljuks was less formidable.

Meanwhile the European dominions of the emperors had been assailed by a variety of foes, among whom the Nor- mans were the most conspicuous. In the year 1071 Robert Guiscard succeeded in expelling the Byzantines from their remaining possessions in southern Italy, and fired by the am- bition of rivalling his great compatriot, who four years and a half before this had made himself master of England, he ~ conceived the design of conquering the Byzantine empire. With the object of carrying this into execution, he laid siege to Dyrrhachium, the most important Greek city on the Adriatic, and after defeating Alexius Comnenus, who had come to its relief, succeeded in making himself master of the place. Being forced to quit the country, he entrusted the campaign to his son Bohemund, who was de- feated by the emperor, and withdrew into Italy. Fortune, however, ordained that these two chieftains should once more be brought into collision in Syria, and hence arose another Norman war, in which Bohemund was foiled by the strength of Dyrrhachium. At a later period, in the reign of Manuel, Greece was invaded by King Roger, who had received an affront from that emperor, and the cities of Thebes and Corinth were sacked in the most barbarous manner.

But the most famous of these inroads was iu 1185, and resulted in the siege of Thessalonica, which | place was taken by the Normans, and treated with a cruelty

that almost rivalled that of the Saracens in the former | siege. Besides these wars, there were others with the | Patzinaks, the Hungarians, the Servians, and the Venetians. But towards the eud of this period the empire received a Bulgar blow from the revolt of a people who on this one occasion Walle appear prominently in history—the Wallachiaus. This“!

‘ ‘ king- race, who, like the Greeks, claimed the name of Romans or FA

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‘ Roumans, were the descendants of the Roman colonists in

Dacia, whom the emperor Aurelian transplanted to the southern side of the Danube. ‘There it is probable they intermingled with the natives, but they retained the Latin tongue, from which the modern language is derived. About the 13th century, it would seem, the great body of the nation once more migrated northward to the seats they now occupy; but those of whom we are speaking here were settled on the Balkan, where they had maintained them- selves in their mountain fastnesses, owning an allegiance more or less qualified to Constantinople. In the reign of

| tate of

reece.

The modern language

and litera-

ture,

- migration.

GREEK SURVIVAL.]

Isaac Angelus (1186), however, when they were heavily taxed, robbed of their cattle, and misused in other ways, they rose under the leadership of three brothers, Peter, Asan, and John, and having made a league with the Bulgarians, raised the standard of revolt, and established what is called the Bulgaro-Wallachian kingdom. Its suc- cessive rulers contended with varied fortune against the Byzantine Government, but succeeded in maintaining their position in Thrace and Macedonia, to which countries for a time Thessaly also was added, forming, however, an inde- pendent province, witha governor of its own. The emperor Baldwin, the first of the Latin emperors of Constantinople, was captured by them in battle, and put to death. The kingdom continued to exist until the Turks made their ap- pearance on the scene, when, in common with the other in- dependent sovereignties in these regions, it was finally overthrown.

The period from the end of the 9th century to the fourth crusade was to Greece a time of prosperity, Though its inhabitants were looked down upon as provincials by the people of Constantinople, and the country itself was treated with neglect (Basil II. was the only emperor who for sev- eral ayes visited Athens), yet in material well-being it was one of the most flourishing parts of the empire. Though barbarian inroads were still not wholly unknown,—one of the Uzes in particular is mentioned in 1065,—yet security generally prevailed, and from the middle of the 11th century the coasts had nothing to fear from Saracen corsairs. The land produced corn in abundance, so that it even supplied the capital in a time of dearth. The silk manufactures of Thebes, Athens, and Corinth were a source of great wealth, and much of the commerce of the time was in the hands of the people of Greece. The port of Monemvasia, in eastern Laconia, which gave its name to the Malmsey wine, was especially famous as a medieval emporium, How far Hellenic feeling and Hellenic traditions survived among the Greeks we have no means of discovering, but the proba- bility is that these to a great extent perished, along with the Hellenic names, at the time of the great Slavonic im- The whole population had become Christian, though as late as the 9th century paganism existed among the inhabitants of the mountainous regions of Laconia, But in the latter half of the 12th century decline was ready toset in. Their commerce was passing into the hands of the Western traders ; the silk manufacture was transferred by the Norman Roger to Palermo; and the profits of in- dustry were absorbed by

taxation, so that no surplus remained to be invested in works of public utility. The writings of Michael Acominatus, the noble and learned archbishop of Athens at the time of the fourth crusade, give clear evidence that in that city the decay had already commenced.

It is during the 12th century that we first meet with compositions in the popular Greek tongue, among the earliest specimens being poems by a monk called Ptochopro- dromus, addressed to the emperor Manuel Comnenus. The literary language of this time was still the same which had been used throughout the Byzantine period—the '"com- mon" dialect of the Macedonian Greeks, as it had been transmitted with various modifications by the later Greek Writers and the fathers of the church. The Byzantine histories and other works which were composed in it are usually stilted and pedantic in style, and conventional in their ideas and their treatment of events ; but it is possible to treat them too slightingly. . Some of the writers, like Michael Psellus and Eustathius of Thessalonica, were men of undoubted ability and learning ; and, besides this, it was the taste for these subjects, however faulty, which main- – the high level of cultivation that distinguished the

yzantines from the people of all other contemporary states

during the Middle Ages, and caused the ancient literature to be preserved. This language was also that spoken at court, so that it is not till the time of the Palologi that we find the highest circles and polite composition invaded by the vulgartongue. But from the 4th century after Christ, if not earlier, there had been a divergence between the written and the spoken language, so that the two formed, so to speak, an upper and a lowerstratum. Until the time of the iconoclasts, in all probability, the ancient speech was generally intelligible, but from the end of the 9th century it was a dead language to the great bulk of the nation. The change which the popular idiom was passing through, as might be expected, was twofold, arising, first, from the usual tendency of speech to become more analytical and of words to modify their meaning, and, secondly, from the loss of vocabulary, the mutilation of

grammatical forms, and the confusion of syntax, which is produced by want of cultivation. At the same time it passed through no such violent process of disintegration as befell Latin in its change into the Romance languages, so that its historical con- tinuity was never broken, But when it emerges to view in the compositions of the 12th century it is already a modern language, and its forms differ little from those of the Romaic of the present century, though of course the voca- bulary was as yet free from the intrusive elements—Italian, Albanian, and Turkish—which subsequently crept into it. The metre in which these poems were composed was regu- lated entirely by accent, and not by the quantity of the syllables, and the verse usually employed was the so-called "political," ¢.¢., popular verse, which corresponds to some of our longer ballad metres. The favourite subject was romances, and in the treatment of these, as well as to some extent in the stories themselves, subsequently to the Frankish occupation the influence of the French romances is clearly traceable.

V. Period of Greek Survival : from the taking of Con- stantinople by the Latins to tts Conquest by the Turks, 1204-1453 a.p.

The empire of the East never recovered from the effects of the fourth crusade. It was then broken into a number of separate fragments, and though some of these recovered their cohesion, and the end did not arrive for two centuries and a half, yet the strength of the system was gone, and paralysis crept more and more over the enfeebled frame. In accordance with the provisions of the partition treaty, a Latin emperor was set up at Constantinople, and Baldwin, count of Flanders, was elected to the office ; Latin kingdoms were established in different provinces,—one at Thessa- lonica, which was of short duration, another at Athens under the family of De la Roche, and a third in the Pelo- ponnesus under Champlitte and Villehardouin, which was called the principality of Achaia or the Morea. Of the occupation of the last-named of these countries an account is given in one of the most curious of medieval Greek poems, Whe Book of the Conquest, the French original of which also exists. But even the districts which remained in the hands of the Greeks did not continue united. An independent empire was established at Trebizond on the Black Sea by a scion of the house of Comnenus. Another principality was founded in Epirus, the despot of which, after overthrowing the Latin state of

Thessalonica, estab- lished at that place anempire of his own. But the head-quarters of the legitimate Greek monarchy were at Nica, the original capital of the Seljuk sultans in Asia Minor. Theodore Lascaris, a man of no mean ability, who had been acknowledged as emperor before the capture of Constanti- nople, having taken up his abode in that place, succeeded in maintaining himself in opposition to the crusaders, the Seljuks of Iconium, and the Greeks of Trebizond ; and his

Partition of the empire.

Empire of Nicwa.

The Paleo- logi.

The Otto- mans.

successors continued to reside there for nearly sixty years. When the difticulties of the Westerns in Constantinople became increasingly greater, and their downfall appeared imminent, it was for a time a question whether that city should become the prize of the emperor of Nicwa, or of the emperor of Thessalonica, or of the Bulgaro-Wallachian sovereign ; and this rivalry involved many alliances and wars. The man who ultimately decided it in favour of Nica was Michael Paleologus, who became the founder of the last dynasty that ruled the Greek empire

1261).

oh character of Michael, which was too faithfully re- flected by many of his successors, represented most of the unfavourable qualities of the Greek race. Though a brave soldier, he was intriguing, selfish, and unscrupulous, as he soon showed by the deposition and blinding of the young emperor, whose guardian and colleague he was appointed to be. He entered on the possession of a ruined capital, which the barbarism of the Western nobles had reduced to a state of poverty and filth, and his attempts to restore it were misdirected and unsuccessful. His one object, when he had established himself on the throne, was to maintain his despotism ; and while he

recovered part of the Pelo- ponnesus to the empire, he ruined his subjects financially by debasing the coinage, and commercially by allowing the Genoese and Venetians to appropriate most of the carrying trade of the Greeks. But the act by which he gave the deepest offence was the reunion of the Eastern and Western Churches, which amounted to the submission of the Greek Church to the pope, to which he consented at the council of Lyons (1274), in order to persuade Gregory X. to pro- hibit Charles of Anjou from invading the empire. 'The narrowness of the thevlogical spirit among the Greeks at this period was greater than we can well conceive, but it was a not unnatural outburst of national feeling which roused the people in opposition to this measure. The sub- sequent attempt in the same direction at the councils of Florence and Ferrara (1438-9), when the nation was reduced to the direst straits, met with no better reception at home. Under the successors of Michael the empire con- tinued for 170 years, but the whole of this time was a long death sickness. The doom of the empire was forecast by the powers that came to prey on its weakness—the Cata- Jans, who plundered those whom they had undertaken to aid ; the knights of St John, who seized Rhodes, a con- quest which they rendered memorable by their gallant de- fence of that island against the Mahometans; and the Ser- vians, who, under Stephen Dushan, established an important enipire, which lasted until it was destroyed by Sultan Amurath at the great battle of Cossova (1389). Even the emperors themselves, from the endowments and gifts which they lavishly bestowed on mouasteries, especially those of Athos, seemed to be providing beforehand for a day when their possessions would pass into the hands of others.

The nation was now arriving at the maturity which was to bring this time- worn empire to an end. Shortly before the Greeks regained possession of Constantinople, the Mongols, whose vast hordes had overrun a great part of Europe and Asia and had destroyed the caliphate of Baghdad, entered Anatolia, and shattered the power of the Seljuks of Iconium. But on the ruins of this dynasty another and far more terrible dominion arose. Towards the end of the 13th century Othman, the chief of a Turkish tribe in north- em Phrygia, penetrated through the passes of Mount pone, which the Jealous policy of Michael Paleologus

enuded of the protection of the warlike mountaineers who occupied them, and descended into the lowlands of Bithynia. By his son, Orchan, the city of Broussa was captured, which becanie thenceforth the capital of the

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Ottoman race, The extraordinarily rapid rise of this people to be one of the greatest powers that the world has seen was due in great measure to the remarkable ability of its successive rulers, but in no slight degree also to the in- stitution of the Janissaries—an inhuman but most efficient system, by which Christian children were torn from their homes and educated as Mahometans in the household of the sultans, to whose personal service, as a bodyguard, they were for life devoted. As early as the year 1346 we find Cantacuzene, then the prime minister of Jolin V., and after- wards himself emperor, entering into alliance with Orchan, and giving him his daughter in marriage. The first step towards a permanent settlement of the Turks in Europe was made in 1354, when Gallipoli was occupied by Orchan's son, Suleiman. Seven years from this time Amurath J, made himself master of Adrianople, and before his death that sultan saw the Greek emperor his vassal and tributary. It seemed now as if the fall of Constantinople could not long be delayed, when, with one of those turns of the wheel of fortune which form the surprises of history, Bajazet, the most powerful of all the Ottoman rulers, was defeated and taken prisoner by Timur the Tartar at the battle of Angora (1402), and civil war setting in between his sons gave the Eastern empire a new lease of existence. But within twenty years again the capital was besieged by Amurath Il., though he failed to take it, owing partly to the strength of its fortifications, and partly to a rebellion that broke out in his family. The empire was now reduced to Thessalonica, a part of the Peloponnesus, the city of Constantinople, and a few neighbouring towns.

[HISTORY.

In the midst of the gloom which hangs over this last End of period, it is consoling to find a ray of light that illumines the em its closing scene, in the heroic end of the last Constantine. Pi

The story isa sad one. The city was beleaguered by land and sea by the warlike hosts of Mahomet II.; no further succour could be expected from the West ; and the emperor, who had adopted the Latin rite, was thereby estranged from the great mass of his subjects. But he had determined not to survive his empire, and he died in a manner worthy of the greatest of his predecessors. On the eve of the tinal assault he rode round the positions occupied by his troops, to cheer them by his presence; and then, having partaken of the eucharist in St Sophia's after the Latin form, and having solemnly asked pardon of the members of his house- hold for any offences, he proceeded to occupy his station at the great breach. There on the following morning, after a desperate resistance, he fell fighting amidst a heap of slain, and the young sultan passed his lifeless body as he rode into the captured city.

We have thus passed in review the fortunes of the Greeks during a period of nearly eighteen centuries. We have seen how the Roman system of government and the Greek character and social institutions, mutually influencing and modifying one another, produced the characteristic features of the Eastern empire. We have watched that empire maintaining a conflict on the one side with the invading barbarians, the Bulgarians, and the Western nations, on the other with the Persians, the Saracens, and the Turks, until to the last of these peoples it finally succumbed.

The following are the principal histories of this period :—in English, Gibbon's Deeline and Fall of the Roman Empire, which, from its comprehensiveness and grasp of the subject, can never be superseded, and Finlay's History of Greece, which is the chief authority on the Byzantine empire ; in French, Le Beau's Histoire du Bas-Empire ; in German, Carl Hopf's Gesehichtc Griechenlands vom Beginn des Mittelaltcrs, published in Ersch and Gruber's Eneyclopiidic, and re-issued in vols. vi. and vii. of Brockhaus's Griechenland (a work of great erudition, which has cleared up many disputed questions), and Hertzberg's Geschichte Griechenlands unter der Herrsehaft der Romer, and Geschichte Gricehenlands seit dem EES)

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VENETIAN DOMINATION. |

Section IIJ.—Recent History.

The history of Greece from the fall of Constantinople to the present day suggests a problem of profound historic interest. From the year 1453 till the end of the 18th century almost all the occasions on which the Greek people appear on the page of the historian are occasions on which we read of them that they were butchered or sold into

slavery. Records tell only of their annihilation or disper-

sion. Yet in the commencement of the 19th century this apparently annihilated and dispersed people can summon energy enough to resist the Turks, and although in all pro- bability they would have failed to overcome their oppres- sors if they had been coinpelled to struggle unaided, yet the courage aud self-devotion which they showed in the conflict were such as to gain for them the sympathies of Europe, and they came forth triumphant. But in reading even of their war for independence we are astonished that a remnant was left. Thousands upon thousands perished, and their victcry seemed only less terrible than utter defeat. Yet the spirit of life remained. The kingdom of Greece was established, and within forty years, notwithstanding deplorable mistakes in its management, the population is doubled, and the country becomes consolidated into a con- stitutional realm. To trace how these events were possible and how they actually came to pass is the task of the historian of Modern Greece.

The external events in this history are necessarily few. Greece was during the most of these centuries under the sway of foreigners, and the external history of Greece is formed merely by episodes in the history of these foreigners. Wheu Mahomet II. became master of Constantinople, he did not thereby become master of the Greek empire. The Palzologi had held only a small portion of the territory which had constituted the Greek empire. Most of the islands of the Algean were under the rule of Italian princes Who acted as independent rulers. Rhodes was governed by the knights of St John. But especially the Venetians owned large possessions in Greece and were also powerful by sea. The external history of Greece is occupied mainly with the efforts of Mahomet II. and his successors to spread their conquests. Mahomet himself conquered the kingdoms of Trebizond, Albania, Eubrea, Greece proper, and part of the Peloponnesus. He was also

successful in expeditious against several of the islands of the Aigean, but he failed in his attack on Rhodes. It was not till the end of 1522 that the knights of St John capitulated to Suleiman I. after standing a siege in which they showed the greatest bravery, and in which the Ottomans, it is said, lost about 100,000 men. On the Ist of January the knights left the island, to go first to Crete and then to Malta. Cyprus and Crete remained still longer in the hands of the Westerns. In 1489 Catherine Cornara ceded the island of Cyprus to the Venetians, who retained possession of it till, in 1570, Piali and Lala Mustapha attacked it. Nikosia fell in September 1570, and Famagosta in August 1571, after a brave defence conducted by Marcantonio Bragadino. The Turks received a severe defeat at Lepanto from Don Juan @ Austria in command of the combined fleets of Spain and Italy, in which they lost 130 ships and 30,000 men. But the blow was merely temporary. The helpers of Venice Were not united among themselves. Again the Turks became the rulers of the /igean Sea, and in 1573 Venice had to conclude a humiliating treaty in which she gave up Cyprus. In the case of Crete Venice had to pay for her Own severity. That island remained for a long time undis- turbed in thie possession of the queen of the seas, as far as the Ottomans were concerned. But internal commotions agitated it, The Sphakiots or mountaineers of the south- west of Crete—a bold, brave, and independent race of men—

rebelled against the rule of the Westerns; and the Venetians had recourse to the most shameful cruelties and atrocities on all their Greek subjects in order to crush the rebellious spirit. The result was tliat the Greeks hated the Venetians with the bitterest hatred, and would have gladly welcomed a change to the rule of the Turks. The Venetians saw that they had gone too far, and sent a wise politician, Giacomo Foscarini, to bring matters toa better state. Many prudent reforms were inaugurated, the Sphakiots were reconciled, and all seemed to promise well. But Foscarini died before his reforms got firm hold of the people. The. Sphakiots indeed from that day to this have never submitted to the Turkish yoke, but the rest of the people were far from willing subjects of the Venetians and favoured an invasion by the Turks. The Turks knew their opportunity, and began an effort to possess the island which, though the Venetians resisted with great perseverance and

were backed by other Italians and by the French, ended in the treaty of 6th September 1669, in which they ceded Crete to the Turks. This last acquisition rendered the whole of Greece subject to the Turks with the exception of the Ionian and a few other small islands, which still remained in the hands of the Venetians. The Venetians, however, did not resign their hold on Greece without a final effort to recover possession of it. For this purpose they not only levied soldiers from their own and other Italian communities, but also hired generals and soldiers from Germany. The war began in 1689. The management of it was en- trusted to one of the greatest men whom Venice produced, Francesco Morosini, who was ably assisted by a Swedish general, Konigsmark. The contest was carried on with great vigour until at length the Turks were driven from the Peloponnesus. The Venetians wished also to regain possession of Eubcea, but in this they were unsuccessful. The war was brought to an end by the peace of Carlowitz, which left Venice in possession of the Peloponnesus, and the islands of A%gina and Santa Maura. One incident in this war has especially attracted the attention of the civilized world. Morosini, finding his efforts successful in the Morea, resolved to advance towards Eubcea. Athens lay in his way. It was garrisoned by the Turks, who, however, on lis approach quitted the lower city and, occupying the Acropolis, prepared to defend it at all hazards. They planted one of their batteries in a breach of the temple of Nike Apteros, and they placed a portion of their powder and many of their valuables in the Parthenon. The Venetians showed no respect for the most beautiful of all buildings; and one of their bombs, falling on the powder in the Parthenon, blew many of the masterpieces of art into a thousand frag- ments, and utterly defaced the noble building which had remained up till that time very nearly in the condition in which the original architect and sculptor had left it. The Venetians tried to introduce reforms into the Feloponnesus, aud had made considerable progress when in 1715 Ali Kumurgi, at the head of a very large Ottoman army, entered the Peloponnesus. The Venetians were unprepared, and they could not easily get assistance from others. The con- sequence was that in a very short time Kumurgi drove them out of the whole of the peninsula. The Turks got involved at this time in war with Austria ; and when peace was finally concluded at Passarowitz, Venice had to give up the Morea as well as the island of A%gina, and practically she dis- appears from the history of Greece except as the possessor of Santa Maura. But a great change had

now begun to take place in European politics. At an early period after the capture of Constantinople the Turks came into collision with their neighbours on the north, the empires of Austria and Russia, and we find these two powers united in resisting the inroads of the Ottomans. Even so late as 1683 the Turks were so bold as to advance as far as Vienna and lay

siege to it. But in the 18th century the policy of Russia attracted the attention of the rest of Europe, and caused a considerable change of attitude. Early in that century Peter the Great had declared his resolution to force his way into Constantinople, and though he was completely baulked in his aim, and had to sign an inglorious peace (1711), the desire to have the city on the Bosphorus continued to animate the Russians. It is to Count Miinnich, field- marshal and counsellor of the Russian empress Anna, that historians attribute the suggestion that Russia should systematically stir up the Greek Christians against their Turkish masters, and from his time (1736) onward we find Russia continually scheming to rouse the Greeks to insur- rection. Most famous amongst these efforts were those of the empress Catharine II. who, influenced partly by the Philhellenism of Voltaire, partly by a desire to withdraw the attention of her subjects from domestic 'affairs, but principally: by a wish to gratify her favourite Orloff, formed the project of emancipating the Greeks from the yoke of the Turks (1769). But all the efforts made to effect this object were exceedingly inadequate. The Greeks were soon taught also that Russia, while willing to free them from the Ottoman yoke, was determined to assist none but those who would readily become Russian sub- jects. And the expedition to the Peloponnesus undertaken by Orloff was followed by most disastrous consequences to the Greeks. The Russians were more successful in their contests with the Turks in the north, and in 1774 compelled the sultan to accept a peace, called the peace of Kainardji, which contained several provisions bearing upon the Greeks, In some of these the sultan promised to protect the Christian religion and Christian churches, and though no special mention was made of Russia, her statesmen saw in this stipulation au opening for endless opportunities to interfere. And from this time forward Russia has claimed to be the champion of the Christians against the Turks. But the other states of

Europe, especially France and England, became suspicious of the designs of Russia, and holding to the balance of power as an essential principle of European statesmanship, they determined to maintain the integrity of the Turkish empire. Austria had frequently joined with Russia in opposing the Turks and had again and again hoped to come in for a share of the spoil when Turkey should be partitioned. But towards the end of the 18th century the increasing power and influence of Russia began to alarm her, and when the Greeks rose to assert their independence, no power more tenaciously adhered to the doctrine that the integrity of the Turkish empire was demanded by the balance of power in Europe. Thus up to the time of the establishment of the Greek kingdom the affairs of the Greeks have been mixed up with those of foreigners,—Ottomans, Venetians, Austrians Russians, and the other European powers.

The notable fact in Greek history during these ages is the disappearance and the apparent destruction of the nation. Whoever might hold the supreme power in Greece the Greeks were sure to be the sufferers. When the Turks spread their conquests from Constantinople on to the rest of the empire, every capture of a city was followed by the slaughter of the able-bodied men and the carrying off of the women and children to the harem or slave market. And the Western Christians were not a whit more tender than the Ottomans, The Venetians were wroth with the Greeks, because they did not acknowledge the pope, and in the island of Crete perpetrated the most abominable barbarities on the innocent population. The Turks punished the ges because they submitted to the Venetians, and the ee them because they submitted to the ~

» Whether Turks or Italians or Greeks, had

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no mercy on the peaceful inhabitants of the mainland. Human life was disregarded, and men and women were of value only in so far as they were saleable articles in the slave market, If one were to enumerate all the instances in which historians tell us of the utter destruction or transference of the Greek population, a vivid idea might be presented of how terribly hard were the sufferings of the Greek people. We have to add to this record of destruction that vast masses of the people removed to Italy or

Sicily or some other place of refuge. Almost all the famous families that ruled the islands of the Aigean escaped from them when they were attacked by the Turks. The knights of St John, for instance, left Rhodes to find a final settlement in Malta. Among the number who thus left their native land were nearly all the learned men, who sought in the West a refuge from Turkish rule, and opportunities for the pur- suit of learning.

Yet notwithstanding these destructive forces the Greek people survived. To understand this phenomenon we have to examine into the mode of civil administration adopted by the Ottomans. The Ottomans were pre-eminently a warlike people. Their profession was that of arms. Their two great objects in life were to conquer and enjoy their conquests. They were brave and always ready to fight, but after battle was over they wished to enjoy the luxury and repose which they had earned by arms. They were therefore utterly disinclined to meddle with civil matters. If they got their revenues, and could enjoy their harems and slaves, it was a matter of no consequence to them how the subject races procured the means of paying the taxes, orin what way they governed themselves. The same spirit showed itself in the sultans, To them all Turks as well as Greeks were practically slaves. The sultans saw in the Turks the right hand that could bring them suc- cess in war, and in the Greeks or other subject nations the means of ministering to their wealth and enjoyment. Provided they had a sufficiently numerous and brave army and ample supplies of money, they were comparatively indifferent how or by whom local affairs were managed. This freedom from bias and this singleness of purpose et- abled them to continue their power for a much longer time than they could possibly have done had they been swayed by national aims or particular ambitions. They had no hesi- tation in selecting for their purposes the best men they could get, and consequently many of the subject races rose to places of high eminence in the Turkish army and admiuis- tration. A large proportion of the viziers of the Sublime Porte have been Greeks, Many of the generals that sub- dued Greece were Greeks. There was thus a constant accession to the ranks of the Turks from the subject nations, Those who thus entered the Turkish service could not do so without adopting Mahometanism. It was the essential condition. But many Greeks found no difficulty in chang- ing their faith. They saw that it was their one hope of rising to eminence. And these men reached such high positions as to arouse the jealousy of the Turks; for

the sultans preferred the converts to the original Mahometans. They felt more confidence in them as instruments of their own domination. Indeed at one time there seemed a likeli- hood that large portions of Greece would become entirely Mahometan. They were urged to it by two opposite influences—by the high position which Malometan converts from Greece could attain, and by the utterly wretched con- dition of those who remained attached to the Christian religion. We have a curious instance of the effect of the latter motive in the conduct of the Caramuratades who occupied about thirty-six villages in the valley of the Aous in Albania, The inhabitants of these villages had long been oppressed by the Mahometans, but had remained Christian until 1760, In that year matters came to a crisis.

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TURKISH RULE. |

The Caramuratades could stand their distress no longer. They argued that either Cliristianity was not true or it ought to put them in a better position. They resolved to give it one chance more, and to try to conciliate the Divine Being by the most rigid fasts. If He did not listen to them, then they would feel assured that He did not wish them to remain Christians. The chief priest protested against the impiety of this resolution, but the Caramuratades would not listen to him. They observed Lent with the most rigorous severity, and prayed much. No improvement followed in their lot ; and accordingly, on Easter day, they told the priests to retire, accused the sacred images of being indifferent to their distress, and in one body went over to the faith of Islam. A very few indeed refused to join their brethren, but they had to retire with the priests, At an earlier period, from 1620 to 1650, the Christian population of a part of Albania fell from 350,000 to 50,000 ; and to the present day a portion of the Albanians have remained firmly attached to Islamism, and have been the readiest tools in the hands of the Turkish Government, while the other portion have stood by the Greeks in their struggles for independence, and have done great and valuable service to the cause. In fact, so great was the inclination of the Greeks to adopt Mahometanism through the combined motives already mentioned that the sultans were alarmed lest they should have no tribute-paying people at all,

and accordingly they became kindlier in their treatment of the rayahs or subject Christians, and did much to reconcile them to their government. .

Another mode in which the Greeks passed over to Islamism has been already noticed. Even before the taking of Constantinople Orkhan had ordained that the children of Christians should be taken from them, should be specially trained for military service, and should enjoy such privileges and immunities that they would feel them- selves specially bound to the sultan. The practice was continued and extended by Mahomet II. Every fifth Christian child had to be surrendered to the service of the sultan. All connexion with his parents was cut off, and he was set apart and trained for warfare, In this way was formed the corps of the Janissaries. The Janissaries were not at first permitted to marry. Their ranks were constantly recruited from the Christian children. History speaks in the highest terms of the discipline and ccurage of this body of troops while it flourished, The Janissaries forgot altogether, if they ever knew, their homes and their hearths, and they were equally savage to Turk and Christian in their devotion to the sultan, This hateful sacrifice imposed upon the Christians gradually came to be regarded as an honour. The parents knew that their children were to be removed from the degradation of Christian slavery, and were to occupy the best positions that were open to Mahometans, and the Turks themselves so much envied the honour for their children that they bargained with the Greeks to take their children and give them for Janissaries instead of their own, A change took place at length in the composition of the Janissarics. They were allowed to marry; by degrees a position in the body became heredi- tary; and thence is dated the falling off of the corps. The tribute children were no longer required, and in the reign of Mahomet IV. (1649-1687) the tribute ceased.

In all these instances the Greeks were practically lost to their own nation. They disappeared from the nation of Greeks and Christians and became Turks and Mahometans. At the same time we cannot help supposing that by this intermixture a new element of progress, or at any rate of restlessness, was thus introduced into the dominant race. _ the Greeks attained to positions of eminence in which 3 €y were not compelled to abandon their nationality.

etween the Turks and the Greeks existed irreconcilable

differences, Not only was their religion different, but they differed widely in their social customs. There was no hope of amalgamating the two races. The Turks could only convert or exterminate the Christians. They did not ven- ture to dream that they could convert all the Greeks by persuasion, and forcible conversion after the age of twelve was forbidden by the Koran. The only other alternative was extermination, and one of the sultans came to the resolution to destroy every Christian. But the Turks saw that such a policy was ruinous to themselves. Every Christian paid a poll-tax from which every Turk was exempt. The Christians cultivated the lands for the benefit of the Turks. The Christians were the drudges of the Turks, The next best thing to extermination then was to get as much out of the Christians as possible while coming as little as possible into personal contact with them. This was the plan adopted. Immediately on the conquest of Constantinople, Mahomet spread the Turkish system of administration over the whole of Greece. The Turkish warriors received lands during their life on condition of being ready to serve in war. These had captains who received the liferent of larger portions of land, and finally pashas acted as military and civil rulers of still larger portions. All these were ready to keep the Greeks in sub- jection, and crush every effort at rebellion, and they guaranteed the taxes to the sultan. Turkish courts of justice were also established. But Mahomet II. did not disturb the Greek niodes of civil administration which he found in force. They merely became subject to his pur- poses, and appeal could always be made from a Greek to an Ottoman institution. Mahomet II. especially made use of the Greek clergy as his tools for keeping the Greek people quiet and submissive in paying taxes. The Greek emperor had perished in the sack of Constantinople, and the nobles had either fallen or fled or been butchered shortly after. But the Greek Church still remained. The Greek people were devoted totheirchurch. Their quarrels with the pope had only strengthened their attachmeut to it. Here was an instrument that Mahomet thought might be of great use. Accordingly he made the patriarch of Con- stantinople the representative of the entire Greek people. He gave him privileges and

honours, but he. made him responsible for the conduct of the Greeks. The Greck clergy had long before taken an active part in the adminis- tration of justice. The bishops had the decision of all questions connected with marriages and wills. They were consulted by their people not merely in spiritual but in nearly all civil matters. The sultan had hold of this clerical influence through the patriarch. He practically appointed the patriarch, the patriarch appointed the bishops. All the great officials of the church thus held their positions under the sanction of the sultan, and could be removed by him. There is no doubt that patriarch and bishops and higher clergy, thus playing the humiliating part of keeping their fellow-countrymen in due subjection to the Porte, did not and could not display very high virtues. They soon contracted all the vices which defile men who have to play a double part ; they were true neither to the sultan nor to the Greeks; and they were animated generally by a mean and selfish ambition. By degrees the patriarchate came to be bought from the sultan by higher and higher prices. The patriarch made up his losses by selling the bishoprics, and simony thus became universally prevalent. Notwith- standing all these drawbacks the maintenance of the Greek Church helped to keep the Greeks together, and when a better time came, the high positions which the clergy held enabled them to accomplish much for the spread of enlighten- ment and the awakening of true national feeling. Even in the darkest times patriarchs appeared who were capable of the greatest sacrifices for their church and nation, and in

the war of independence several of the clergy stood in the forernost rank. 'The inferior clergy throughout the whole time were true to their people; but as they were to a large extent uneducated, and had to maintain themselves by some handicraft, they differed in no respect from the great body of the people, to whose industry and real worth the perma- nence of the nation is mainly due.

Another circumstance favourable to the Greeks was that the Ottomans allowed them to retain the communal system which had existed in earlier times. By this system, which, however, did not prevail in all parts of Greece, and where it did exist was not carried out always to the same extent, all the

males of full age in each district elected a man who was to take special charge of local affairs. These men went by various names, such as demogerontes, gerontes, archontes, proesti, and epitropi. The Ottomans found the systein helpful. The proesti had to keep on good terms with the Turks, and were indeed frequently farmers of the taxes from the Turks. They were also often exceedingly ambitious and cruel. But they were often men of intelligence and influence; and when the war of independence broke out, some of them took a prominent part. There cannot be a doubt also that the local self-government which was thus allowed to exist helped to keep up the longing for liberty and to prepare the nation for a constitutional government.

The Greeks showed their aptitude for combination and self-covernment also in mercantile affairs. From an early period they had taken to mercantile pursuits, and their position was in many respects advantageous for trading. The Turks were not successsful in trade, and indeed did not care to pursue it. They therefore willingly left it in the hands of the Greeks, and various events and circum- stances had favoured them. The Turks imposed a heavier duty on goods exported or imported by Greeks than on those possessed by Turks. The result of this regulation was that the sultan saw it to be his interest to encourage Greek rather than Turkish traders, as his revenue from the former was much greater than from the latter. Various privileges were gained by the Russians for their own traders, and the Greeks were permitted to enjoy these under the Russian flag. Then, during the war which France waged against all Europe, Turkey was for a long time neutral, and the subjects of Turkey could trade where no others could. Under these and similar conditions the Greek traders spread themselves over the whole of the Mediter- ranean, and many of them became very wealthy. In this prosperous state of matters various Greeks combined and formed large joint stock companies. Thus the association of Ampelakia, employed principally on cotton fabrics, embraced twenty-two villages. All the inhabitants of twenty-five years and upwards had a right to vote in the election of the five directors who managed the different departments of the company's activity. The profits were divided at the end of each year according to certain rules. Similar com- mercial communities existed in Philippopolis, Mademochoria, Calarryta, Soracos, Chios, and Cydonia. Most famous among such combinations were the unions among the sailors of Hydra, Spezzia, and

Psara, by which those islands rose to great wealth and importance, and formed most powerful auxiliaries in the struggle for independence.

There were other positions of still greater eminence to which the Greeks rose. The Ottomans for a considerable time after the fall of Constantinople were characterized by a strong literary spirit and a desire for culture, but this spirit declined, and the pursuit of learning was left to the Greeks, But a European Government requires men of cul- ture, if for no other purpose, at least that it may hold inter- course and enter into negotiations with the other European powers. The Ottomans felt this necessity, and accordingly in 1666 they appointed Panayiotes Nicouses dragoman or

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interpreter. He was succeeded in this vffice by Alexander Mavrocordatus, who highly distinguished himself in various political transactions of great importance. The office of dra- goman became permanent; a Greek was always appointed; and thus Greeks came to have rare opportunities of influenc- ing the sultan. Not long after the establishment of this office another was instituted, that of dragoman or inter- preter to the capitan pasha or chief Turkish admiral, whose business if was to arrange all matters connected with the fleet. Still further, the Turks thought it advantageous that the northern provinces of Wallachia and Moldavia should be ruled by Greeks, and generally those who had acted as interpreters to the sultan or to the capitan pasha were appointed as waiwodes or hospodars of Wallachia. These men became practically kings of these provinces, and Greeks from all parts flocked to hold offices under them. The Greeks who received these high appointments lived, when their duties did not call them away, in the part of Constantinople called Phanarion in which the patriarchate was placed, and hence they were called "Phanariots." They increased greatly in number, and at length formed a large, powerful, and wealthy community in the city of the sultan. The character of these phanariots has not been painted in bright colours by historians, but their circumstances were strongly antagonistic to the development of a high moral tone. They had above all to gain the favour of the sultan, and to stand. well with the influential Turks, They could accomplish this only through double-dealing and through extortion. They

were also ambitious, and had no scruple as to the means employed in attaining the objects of theirambition. It is affirmed that the Wallachians and Moldavians detested their rule even worse than that of the Turks ; but this can be accounted for satisfactorily by the consideration that nothing could be more humiliating than to be ruled by men who had the appearance of princes but were in reality slaves, without our supposing that their rule was more than ordinarily cruel and rapacious. And much has to besaid in their favour. They had the strong Greek love of culture. They sent their sons to the best univer- sities in Europe, and in this way the phanariots became men of great refinement and intelligence. Many of them take a distinguished place in the history of their country's literature. 'They also established schools everywhere, and vigorously supported those they found existing. The schools or rather colleges of Bucharest and Jassy rivalled that of Jannina in the number of able men they trained to guide and animate their country in its seasons of perplexity.

It was through these and similar instruments that the Greeks were being prepared during the Turkish and Venetian rule to struggle for their independence. Some of the Greek tribes had never been perfectly subject to the Ottomans, especially the Mainotes of the Peloponnesus and the Sphakiots of Crete. Many Greeks had led an inde- pendent life as pirates or as klephts. Piracy was indeed put down by the European Governments ; but the klephts or brigands remained living on plunder of Greek and Turk alike, proud of their liberty, in their hill fastnesses. There were also in Albania, Thessaly, and Greece proper bodies of Christian warriors, called armatoli, who acted as bands of armed police, but whose actions came often to be con- founded with those of the klephts. In regard to the other Greeks it must be affirmed that they were broken in spirit. Finlay asserts that they never once rose against their oppressors. Paparrhegopoulos tries to show that the very opposite was the case; but all he proves is that the Greeks were ever ready to take up arms against the Turks at the instigation of any foreign power. 'They rose up incited by

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France, by Spain, by the Venetians; and in later times they

were continually rising through the secret instigations of Russia. But they never once rose of their own accord.

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The reason was that they had no means of taking com- bined action. 'The great bond of sympathy which attached the various Greeks together during the 16th and 17th cen- turies was their religion. Buta new inspiration came with the advance of culture in the end of the 18th and the begin- ning of the 19th century. They began to be animated by the feeling of nationality. The French Revolution roused their minds into activity, and they were ashamed that a nation which had played such a grand part in the early civilization of mankind should be the slaves of an illiterate and barbarous horde of aliens. Circumstances favoured tlie movement. Especially prominent amougst these was the conduct of Ali Pasha, tle tyrant of Jannina. This daring and unscrupulous despot conceived the idca of cutting his counexion with the sultan aud assuming the absolute govern- ment of Albania. His effort showed how weak the Turkish empire was, and how loosely it held together. Stimulating also was the conduct of the Suliotes, who performed pro- digies of valour in their resolution to defend their homes aud their liberties. A secret society was formed to make ready for a rising of the people. 'The people were stimu- lated by patriotic songs, especially those of Rhigas of Velestino; and the agents of Russia were everywhere. Accordingly in 1821 the war for independence broke out. It would be impossible in the limits of an article like this to give a proper account of the various conflicts between treeks and Turks, of tle quarrels among the Greeks them- selves, and the windings of European diplomacy iu its interference in the contest. The principal events may be shortly noted. The insurrection was begun by Prince Alexander Hypsilantes, a phanariot in the service of Russia, who had been elected head of the chief secret society (the giixy éroupefa). He crossed the Pruth March 6, 1821, with a few followers, and was soon joined by several men of great bravery at the head of considerable troops. But the expedition was badly managed, and in June Hypsilantes fled to Austria, having entirely failed in his object. And in all the efforts to overthrow the power of the Turks in the northern provinces the Greeks failed, though some

men fought very bravely. In tle Pelopounesus the insurrection broke out also in March in several places, and most promi- nent among the first movers was Germanos, archbishop of Patras. Everywhere the Greeks drove the Turks before them ; they were so successful that in January 1822 the independence of Greece was proclaimed. But they soon began to quarrel among themselves. Several assemblies were held. Mavrocordatos, one of the phanariots, was appointed president. But the aspirants for honours and rewards were numberless, and they could not agree, Ac- cordingly a civil war raged in 1823 and 1824, inspired by Colocotronis, a chief of klephts who attained great in- fluence, and in 1824 another civil war of short duration, called the War of the Primates. During this period the Greek fleet was very active, and did good service. It .was ably led by Miaonlis, a man of firm cliaracter and great skill, And he was well seconded by the intrepid Canaris, Whose fire ships did immense damage to the Turkish fleet, and filed the Turkish sailors with indescribable terror. For the ravages of the Greek fleet the Turks wreaked fear- ful vengeance on the innocent inhabitants of the lovely island of Chios (April 1822), butchering in cold blood multitudes of its peaceful inhabitants, and carrying off others to the slave market. The savage atrocities then perpetrated caused a thrill of horror throughout the civilized world. Two years after they perpetrated similar outrages On the islands of Kasos and Psara, 'Lhe sultan now invoked the aid of Mechemet Ali, pasha of Egypt, and his stepson Ibrahim landed on the Peloponnesus with a band of well-disciplined Arabs in 1824. Ibrahim carried overything before him, and the Greeks lost nearly every

place that they had acquired. Some towns offered a strong resistance, and especially famous is the siege of Mesolonghi, which lasted from 27th April 1825 to 22d April 1826. Nothing could exceed the firmness and bravery displayed by Greek men and women during that siege; and their glorious deeds and sad fate attracted the attention of all Europe. The interest in the Greeks, which had been to some extent aroused by Lord Byron and other English Philhellenes in 1823, now became intense, and volunteers appeared from France and Germany as well as from England and America. Lord

Cochrane was appointed admiral of the Greek fleet, and Sir Richard Church generalissimo of the land forces, but they did not prevent the capture of Athens by the Turks, 2d June 1827. Most of the European Governments had remained indifferent, or had actually discouraged the outbreak of the Greeks. Russia had disowned Hypsilantes. The monarchs of Europe were afraid that the rising of the Greeks was only another eruption of democratic feeling fostered by the French Revolution, and thought that it ought to be suppressed. But the vast masses of the people were now interested, and demanded from their Governments a more liberal treatment of Greece. Canning inaugurated in 1823, and now carried out this new policy in England. An accident came to the aid of the Greeks. The fleets of England, France, and Russia were cruising about the coasts of the Peloponnesus, to prevent the Turkish fleet ravaging the Greek islands or mainland. Winter coming on, the admirals thought it more prudent to anchor in the Bay of Navarino, where the Turkish fleet lay. The Turks regarded their approach as prompted by hostile feelings and commenced firing on them, whereupon a general engage- ment ensued, in which the Turkish fleet was annihilated, 20th October 1827. Shortly after (18th January 1828) Capodistrias, who had been in the service of Russia, was appointed president of Greece for seven years, the French cleared' the Morea of hostile Turks, and Greece was practically independent. But several years had to elapse ere affairs reached a settled condition. Capodistrias was Russian in his ideas of government, and, ruling with a high hand, gave great offence to the masses of the people; and his rule came to an untimely end by his assassination on 9th October 1831. Anarchy followed, but at length Otho of Bavaria was made king, and the protecting powers signed a convention by which the present limits were definitely assigned to the new kingdom (1832). Henceforth Greece has existed asa recognized independent kingdom. Through- out the whole of the war of independence in Greece, the people behaved with great bravery and self-sacrifice. They showed a steady adherence to the idea of liberty. They were sometimes savage in their conduct to the Turks, and barbarities occurred which stain their history. Yet on the whole tlie historian has much to praise and little to blame in the great mass, especially of tle agricultural population. But no single man arose during the period capable of being in all respects a worthy leader. Nor can this be wondered at. All the men who took a prominent part in the move- ments had received their training in

schools where consti- tutionalism was the last doctrine that was likely to be im- pressed on them. Several of them had been in the service of Russia, and had full faith only in arbitrary power. Many of them were phanariots, accustomed to double deal- ing, ambitious and avaricious. Some of them had been brought up at the court of Ali Pasha of Jannina, and had become familiar with savage acts of reckless despotism. Others had been and indeed remained during the continu- ance of the war chiefs of klephts, having but little respect for human life, and habituated to scenes of cruelty and plunder. Some of them also came from the Mainotes, who owed their independence to the habitual use of arms, and

who were not troubled by many scruples. It could not be expected that such men would act with great mercy or prudence in dealing with Turks who had butchered or en- slaved their kinsmen and kinswomen for generations. Even amongst the foreigners who volunteered to aid the Greeks, few if any were found of supreme ability, and after the kingdom was established the Greeks were unfortunate in the strangers who came to direct them. Otho had been brought up in a despotic court, aud knew no other method of ruling. He brought along with him Bavarians, to whom he entrusted the entire power, and the Greeks had the mortification of knowing that, though their kingdom was independent, no Greek had a chance of being elevated to any ministerial office of importance. Accordingly a revolu- tion broke out in 1843; the Bavarians were dismissed, and Otho agreed to rule through responsible ministers and a representative assembly. But he failed to fulfil his promise. Discontent reached its height in 1862, when another revolu- tion broke out and Otho had to leave Greece. The great mass of the people longed for a constitutional monarchy, and gave a striking proof of this by electing Prince Alfred king of Greece, This choice was determined by universal suffrage, and out of 241,202 Greek citizens who voted 230,016 recorded their votes in favour of the English prince. The vote meant simply that the Greek people were tired of unconstitutional princes, and hoped that they would end their troubles if they had a prince accustomed to see parliamentary government respected and enforced. The three protecting powers,—England, France, and Russia,—had however bound themselves to allow no one related to their own ruling families to become king of Greece.

When the Greek people received this news, they begged England to name a king, and after several refusals England found one in Prince William of Schleswig-Holstein, son of the king of Denmark. The Greek people accepted him, and in 1863 he became king with the name of George I. Britain added the Ionian islands ta his kingdom, In 1875 the ministry gave great offence to the Greek people by its unconstitutional procedure, but the king persisted in stand- ing by it, The people, however, persevered in the use of

legitimate means to oust the ministry; the king at last prudently yielded ; and thus a revolution was prevented. The effort of the Greeks to extend their boundaries is the last phase of their history, and is still in progress. In 1853 when the Crimean war broke out, the Greeks sided with the Russians, and in 1854 they made inroads into Thessaly and Epirus, but English and French troops landed at the Pirzeus, and forcibly put an end to the Russian alliance aud to Greek ideas of acquiring additional territory. In 1866 to 1869 the Cretans struggled bravely but unsuccess- fully to throw off the Turkish yoke and become a part of the Greek kingdom. And recently when the Russians made war on the Turks the Greeks were eager to enter Thessaly and Epirus to aid their fellow-countrymen in asserting their freedom. But England interfered with the promise that Greece would gain more by maintaining a peaceful attitude. -A clause in the Berlin Treaty affords a basis for the fulfilment of this promise ; but the promise has still to be fulfilled. The Greeks themselves believe that with the extension of their boundaries there will be less occasion far intrigue, ministries will be more permanent, and the Greeks who now flock from all parts to the little kingdom of Greece for official employment will have a wider sphere and will be more contented.

The authorities for this section, some of which have been men- tioned in the previous article, are very numerous. See, ¢.g., the ioropta of Paparrhegopoulos, vols. v. and vi., and his French work Mistoire de la civilisation Hellénique; Finlay, vols. v. vi. and vii.; Herzberg, vols. iii. and iv.; Karl Mendelssohn Bartholdy's Geschichte Griechenlands von der Eriberung Konstantinopels durch die Tiirken im Jahre 1453 bis aufunsere

Tage; Sathas, ‘EAAds Touproxparouneévn, and the Chroniclers in his Bibliotheca Greca Medti vi; and Gervinus, Geschichte des newnzchnten Jahrhunderts, vols. v. and vi. For the Greek Revolution, besides the four first mentioned, there are Gordon and (in modern Greek) Trikoupis. There are many treatises on special portions, such as those of Philemon, Perrhevos, Phrantzes, Colocotronis, Von Maurer, Prokesch-Osten, Parish, and many monographs on the history of the various islands. More recent English works are an article by Mr Gladstone, “The Hellenic Factor in the Eastcrn Problem,” published first in the Contemporary Revicw, and now in his Gleanings; Freeman’s Qttoman Powcr in Europe; Sargeant’s New Grecec; and “Mr Gladstone and the Greek Question,” being iii. of Diplomatic Sketches by an Outsider. (J. D.)

PART TIL—GREEK LANGUAGE,

The possession of a common language was always re- garded by the Greeks themselves as the most significant and important of the bonds which united the scattered mem- bers of the Hellenic nationality, Wherever there was a cominunity speaking the Greek tongue, whether in Europe, Asia, or Africa, from Olbia on the Hypanis to Cyrene in Libya, from Salamis in Cyprus to Meelaca near the Pillars of Hercules, there was a portion of the Hellenic people linked to the rest by mutual intelligibility, and sharply marked off from the jabbering and inarticulate BapBapor who surrounded them. The earliest written records of this speech are probably to be found in what was at the same time the most precious common possession of this great nationality, the poems that bear the name of Homer. It is possible indeed that, in the form in which they have come down to us, they are later than the fragments of the earliest elegiac and iambic poets, such as Callinus, Mimnermus, Archilochus, and Simonides of Amorgus ; but it cannot be doubted that in substance they go back to an earlier date. These, however, are ina literary language,—a language which bears the most evident marks of a freo combination for artistic purposes of various popular dialects, along with many reminiscences of archaic forms and usages, and not a few formations due only to false analogy. For the early history of the Greek language we are obliged to have recourse to the reconstructions of linguistic science,

Origin of the Greek Language.

Comparative philology shows us that there was a time The when the ancestors of the various nations which speak comm

what are generally known as Indo-Germanic! languages lived together and had a common speech. From the extent and character of the agreement between these various languages at the time when they first become known to us from written records, it is possible to a certain extent to determine which groups remained the longest in con- nexion with each other, and which parted off the soonest from the common stock. Unfortunately scholars are as yet by no means at one as to the results to which this method of inquiry leads us. Schleicher, e.g., held that the agreement between the Aryan or Asiatic group of languages and the South-European (in which he includes not only Greek and Italian, but also Celtic) is closer and more significant than that between the latter and the North-European, 7.e., the Teutonic and the Letto- Slavonic group. Max Miiller and Joh. Schmidt maintain that the relations of the various languages are so compli- cated that it is impossible to establish any " genealogical

1 The numerous and forcible objections to the term " Aryan" have been often pointed out, and the word finds little favour with most philologists. For the most recent defence of it see Zimmer in Bezzen- berger's Beitrége, vol. iii. pp. 187-158. The name " Indo-European" is apparently, but not really, more exact.

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| tree," or to determine the order in which they separated from each other (see Schmidt's Die Verwandtschajts- | verhiltnisse der Indogermanischen Sprachen, Weimar, 1872). | But the prevailing view is still that of Lottner, Curtius, . Jolly, Fick, and Scherer, that we may with confidence assume the

first division to have been that between the . Aryan or Asiatic (Indo-Persian) and the European groups, and that there are sufficient points of agreement between all the European languages to warrant us in assuming that there was a period of some duration during which the European peoples remained united. r Of these points of agrecment the most important are the

amon following :— | wopean

1. The vowel ais found to have "'split" on European soil into | guage : P q oD 2

the three vowels e, a, 0,—that is to say, there are numerous i instances in which the European languages agree in degrading a primitive a into e or o when the Asiatic tongues either retain the a i or weaken it quite independently into 7. | 2. The Europeans agree in softening a primitive 7 into 7, where the Asiatics have retained 7.

8. There are a large number of new words, and apparently even some new roots, common to most, if not to all, the European lan- guages, of which no trace is to be found among the Indo-Persians.!

| These facts cannot be set aside by instances of agreement | in inflexion or syntax between Greek and Sanskrit, for example, for it is much easier to believe that at the com- paratively late date at which any Teutonic language is known to us,—and much more so, at the far later date of | the earliest Celtic records,—the inflexions which they pre- sumably once had in common with Greek had become to a | large extent worn away and unrecognizable and the syn- tactic constructions modified, than to suppose that such numerous instances of agreement were wholly fortuitous. sie A similar course of argument fairly leads to the pre- | bo sumption of a common Greco-Italic nationality. The agree- jaguage ment in vocabulary is still closer than that between the _~ ~ various members of the united European group: for in- | stance, while the general terms for agriculture are shared not only by Greeks and Italians, but also by Teutons, Celts, Slavs (though not by Indo-Persians), there are many special terms which are only found on Greek and Italian soil, the most interesting among them being perhaps the words for wine and oil. Other words, again, which are used

with a more indefinite meaning by the Europeans generally are specialized and differentiated in Greeco-Italic (Fick, Vergi. Worterb., ii. pp. 1-288; Curtius's Principles, 230b, 234, 597, &c.). Whcther we may also assume (as is done, e.g., by Professor E. Curtius, History of Greece, vol. i. p. 19) that there was a common Greco-Italic law of accentuation is very doubtful, in face of the arguments advanced by Corssen in favour of a freer law of accents in the earlier times, both in Greek and in Latin. It is much more probable that the Tigidity of the Latin system, and the exquisite flexibility and harmony of the Greek, were developed quite separately from a more fluid state. But undoubtedly there is a far greater similarity in the inflexional system of Greek and Latin than can be established between either of these and scar any other member of the group.? te Ps At the time when the common Indo-European unity was ent in Ltst broken up, the language had reached a stage of develop- iflexion, Ment which may be given with some confidence as follows. he steps assumed are those which have been established by Professor Curtis in his monograph, Zur Chronologie der ae mentachen Sprachforschung (2d edition, Leipsic, » 1a Spite of the criticisms to which this scheme has

1 .

ee Curtius, Ueber die Spaltung des A-Lautes, Leipsic, 1864; Fick, lays ee Spracheinheit der Indogermanen Europas, Gottingen, hee ergleichendes Worterbuch der Indogermanischen Sprachen, a, ~ Gottingen, 1876, where the list of common European words – hoe pp. 471-843, Compare Grundziige, p. 98. ee leicher s doctrine as to the close relation of the Latin and eltic inflexions is not now generally accepted.

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been subjected, by far the most important of which are those by Max Miiller and Ascoli, it may fairly be said to maintain its ground, and it is reasserted with full confidence in Curtius's admirable work on the Greek verb.

We start with the period in which roots alone were em- ployed as words. As to the origin of these roots, philology is as yet quite unable to speak with any positiveness: all that can be said is that the imitative or onomatopoetic theory has not been proved to be capable of producing all the roots which

we are compelled to postulate, while, on the other land, no theory has been generally recognized as fit to be regarded as a serious rival. It is clear, however, that we inust admit an extremely early, if not an absolutely primitive, distinction of roots into verbal and pronominal roots, 2.é., (1) such combinations of sound as were significant, and carried with them a notion which was vague and general, if not philosophically abstract, and (2) such as had no mean- ing in themselves, but only served to denote relations.

The second stage is that of the ‘“‘determination” of roots, wherein, by the addition of different phonetic elements, they acquired a differentiated meaning—e.g., when the very vague ju, “join,” became ju-g, “join together,” ju-dh, “join in battle.” (It may here, however, be open to question whether the fuller forms were developed from the shorter by additions, or the shorter abstracted from the group of similar fuller forms, as Max Miiller is rather inclined to hold.)

The third stage is that of the formation of verbs, by the close combination of a verbal root with one or more prono- minal roots, to denote the character of the subject of the verb. It is in the nature of this combination that we find the distinguishing feature of the Indo-Germanic stock of languages. At the same time we find (1) the “ strengthen- ing” of the vowel of the root, by the addition of the simplest vowel-sound a, to denote repeated or continuous as distinct from momentary action; (2) reduplication, originally producing the same effect, but afterwards, in a specialized form, denoting the continued result in the present of an act done in the past; (3) the augment, a particle, originally demonstrative in its nature, prefixed to a verb to denote.that the action expressed by the verb took place at a time removed from the present, 2.¢., in the past. To the same stage (though possibly to a later part of it) belongs the further development of terminations, so as to mark an action as having a special reference to the subject ; this produces what is in Greek conventionally called the middle voice, but what is really a reflexive formation. We may take as types of the words created during this stage such formsas da-ta, “ give there,” 7.¢., he gives; da-da-ta, “he is giving;” a-da-m, “I gave;” da-da-mat, ‘I give with a view to myself.” ;

Roots.

*Roots *¢ deter- mined,”*

Verbs.

In a fourth stage we get the expansion of the root Stems.

into a stem, occasioned apparently, in the first instance, by the increasing need of distinguishing the noun from the verb. The earliest method of forming a stem was by the addition of a "'thematic vowel" a to the root, to convey the notion of a continuous action; thus from bhar, " carry," came bhar-a, "carrying." Sometimes the vovel of the root was "strengthened" along with the addition of the thematic vowel; thus rik, "leave;" raika, "leaving." Afterwards other similar formative elements (or pronominal roots) such as ta, na, ma, tra, &c., were added to produce nominal stems of many various kinds. There is no reason to sup- pose that these were at first strictly differentiated in mean- ing; thus par-nu- is "filled" not "fillmg," but su-nw- may be taken either actively or passively, "the begetter" or "the begotten," and ¢ap-nu- is "the burning" fever. Sub- sequently the instinct of language availed itself of varia- tions in form to distinguish various relations, especially of gender. Again, when noun-stems came to be used, as the roots had previously been used, to form verbs by the addi-

Com- pound stems.

tion of the personal terminations, this modification of the stem served to distinguish mood. Thus when the vowel a was added to a root from which a verb was already formed, the inflexions of this extended root or stem denoted an action zntended to be performed, and thus acquired the force of a conjunctive mood. The addition of the vowel having thus obtained this differentiating power, it was afterwards atlixed with the same force to stems already provided with a, the contraction of a+a giving 4; hence, just as han-ti is "he kills," han-a-te, "let him kill," so we get bhara-tz, 'he is carryiug," bhard-ti, "let him be carrying." .

In a fifth stage compound verbal forms make their appearance, 7.e., tense-stems are produced by the union of primary verb-stems with the roots of verbs which have become simply auxiliary. That this must have been at a later stage than the preceding processes is clear from the fact that verbs

only gradually lose their full meaning, and sink into auxiliaries. The verbs so used are (1) as, originally "breathe," afterwards "be"; (2) ja, "go"; (3) dha, "do." From the composition of the first with a verb-stem we get forms like those of the compound or so-called first aorist—— e.g., a-dik-sa-t, "he pointed" (= é-derx-ce-r). Here we have the union of a root (in this case acting as a noun-stem) with the auxiliary verbs in the third person, preceded by the augment; a-dvk-sa-¢ is to the earlier form a-da-t much as "tum dicens erat" is to "tum dans." These formations belong to the earliest stratum of this period, inasmuch as the stem appears in its simplest form, For a like reason we must assign to the same stratum the compounds of ya with the simple stem. This auxiliary is used to denote relations which were at first somewhat indefinite but were afterwards more precisely differentiated. There is (1) the present of duration : e.g., svid-ja-mi, "I am sweating ;" (2) the passive force thus derived, as in Sanskrit ja is a sign of the passive: eg. bédh-a-ti, "he knows," bodh-ja-t2, "he is known ;" (3) the tendency to doa thing, ze, the optative mood: as in as-jd-m, the primitive form of siém (sim) and «inv. There is also to be noted, as belonging to this stage, the very important present of duration from the root as, i.e., asjd-mi, which acquired for itself, and when affixed to roots or stems gave to them, the force of a future. With regard to the root dha, the widely varying force which its compounds have in the different cognate languages prevents us from determining with certainty the manner in which it was originally employed in composition (¢f, Curtius, Das Verbum, ii, 352). Toa second stratum of the same period must be assigned those compound verbal formations in which the stem is not a pure root, but has already been developed into a stem which has the character of a noun. If we com- pare, eg., bhara-ja-mi (= hopejo-), "Tam bearing," with suid ja-mi, we find in the first a nominal theme employed for composition and inflexion, in the second a simple root. It is of much importance to notice that here too the verbal formation must have preceded the formation of cases, Had the accusative bhdra-m been in use, it would have been im- possible not to employ it in connexion with a verb-form like ja-mi, just as the Romans said venum dare, datum iri, and the like, and as Sanskrit forms the periphrastic perfect of the tenth conjugation, by uniting the auxiliary verb with the accusative—e.g., k'érajam Kakdra, bodhajam babhiva, c&e. Weare led to the same conclusion by considering forms like a-dik-sant, by which the absence of plural inflexion is not less clearly indicated than the lack of case-inflexions

by vee eels ne has been urged, e9., by Professor Max specu ein . et 1s a weak one, because our es WL, fear Eee elt the need for clearly distinguishing

I e singular, and the nominative from the accusative, before the need for denoting the differences between the persons. To this it may be replied (1) that

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the argument from what must have been is one of the most dangerous that can possibly be used in philology; conelu- sions a@ proort have again and again been disproved by a more complete acquaintance with the facts of the history of language; (2) that, as a fact, incompletely developed languages do find it more easy to do without distinct marks of the cases than to dispense with personal inflexions, and that this is confirmed by languages like Euglish and French, which have returned to an uninflected state more com- pletely in the case of nouns than in that of verbs ; (3) that in the inflexion of nouns the sign of tlie plural is added to the case-suffix and not vice versa (eg., AVKovs = AvKov-5 = varka-m-s), so that the use of the sign of case must have preceded that of the sign of number, although the latter might have seemed to us the more indispensable. Professor Miiller's argument that composition might have taken place in times subsequent to nominal inflexion, because the stem-forms show themselves in certain cases of declension, and therefore might have remained present in the conscious- ness of those using the language, breaks down upon the essential distinction between the nature of the composition of the verbal forms in primitive times and of the construc- tion of compound verbs within the historical period. We may therefore safely follow Curtius in holding it as at least highly probable that verbs were already inflected according to person, tense, mood, and voice at a time when nouns were still in the state either of simple roots (¢.g., vék) or nominal themes (bhara, akva, sunu, pate, and the like). The needs of language at this stage were probably helped out (as at present in uninflected languages) by the position of the words, by the stress of the voice, and by a free use of pro- nominal roots, which may have been already acquiring somewhat of a prepositional force.

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tion. The form which the elements of compounds take, rarely (and apparently never in any early word) appearing with any case-inflexion of the first element (as in ovdevdcwpa, Sutpepys, dupopeaddpos), but presenting themselves simply as stems (Aoyo-ypado-s, &c.), shows that at any rate the mould in which they were cast, the analogy on which later compounds were freely fashioned, was constructed at a time when nouns were not inflected. The various relations which the factors of the compounds bear to each other point to the same fact. We findin Greek, according to the very clear and careful statement of Curtius (Grammar,§ 359; cf. Elucidations, pp. 172-178) three kinds of compounds: (1) determinative, in which the second factor is the principal, which, without altering its meaning, has it defined by the first; e@g., axpomods = dkpa modus ; (2) attributive, where the first factor defines the second, but so as to alter its mean- ing, the two combining to form a new idea; e.g., paxpd-xeip = paKkpas xetpas exwv ; (3) objective, in which one of the two words is grammatically governed by the other, so that in paraphrasing one of the two must be put in an oblique case; €9., Hvi-oyo-s=Ta Avid exwv, Pidd-povgo-s=6 TAS Movoas piAdv, d&td-Aoyo-s = Adyou déios, Oeo-BAaBys = bro Geod BeBdAappévos, xeipo-rointo-s = xepat mowntds. (Simi- larly Max Miller, Sanskrit Grammar, § 513, gives six classes of Tatpurusha compounds, according as the first element stands in an accusative, instrumental, dative, ablative, genitive, or locative relation to the second, with numerous examples.) Curtius justly calls attention to the epithet Tatpopovna as applied in the Odyssey to Adgistheus in re- lation to Orestes, "one who had slain his father." It is evident that composition, used as freely as forms like these indicate, could have taken very largely the place of case inflexions.

The origin of the cases, which marks a sixth stage, pre- Cases.

sents much more difficulty than the origin of verbal flexion. But one broad division may at once be made. The voca-

But one of the most Com- important means of expression was undoubtedly composi- pounds

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tive, nominative, and accusative are connected together much more closely than the remaining cases ; they coincide in the neuter gender, and no one of them ever interchanges with or becomes equivalent to any one of the other group. On the other hand, in Sanskrit the ablative often coincides with the genitive, and the locative (in the dual) with the genitive or dative, while in Greek the instrumental is re- placed by the dative, in Latin by the ablative ; dative and genitive coincide in the Greek dual, dative and ablative in the Latin plural, and the locative always in Latin coincides in form with genitive, dative, or ablative. The vocative may be regarded as a relic of the preceding uninflected stage. The nominative and accusative are closely connected with theme-formation, and seem to have been but a new develop- ment of the same principle. From a root svap, "sleep," came, as has been seen, at an early stage svap-na, "'sleep- ing"; from kar, "make," came kar- ta, "made." It was only an extension of the same method when the pro- nominal sa and ma were added to thie themes thus formed. Nominal inflexion was created as soon as it came to be re- cognized that the last additions were movable, and that the same stem might, according to circumstances, appear with one or the other or with neither. The fact that -m is found as the suffix of the nominative in some pronouns (eg. Sanskrit aha-m = éys-v, tva-m=rvvy, &c.) seems to point to a time when this was used as a determinative for nominative and accusative alike; but it soon became specialized as a characteristic of the latter. There is reason to believe that this process was facilitated, if not occasioned, by the use of the m-suffix to denote gender, or more strictly the absence of gender, in neuter nouns. It was only natural that the same suffix which distinguished the theme as a living being should be applied to mark it out as the subject or source of anaction, while, conversely, that which denoted the absence of life should be used to mark the object. It is no improbable conjecture which finds in this accusative character of tlie sign of the neuter the ex- planation of the ordinary Greek idiom which constructs a neuter plural substantive with a singular verb; 7a foo rpéxe, "the animals are running." Further, the wide and varied usage of the accusative case in Greek appears to point to a time when it was the only oblique case. At a later period the second group of cases made its appearance ; this includes at least the genitive, ablative, dative, locative, instrumental, and sociative. Whether we are also to regard

the various terminations which appear in some adverbs, which cannot be referred to any one of these, as originally case-suflixes is a question not easy to determine, and one which is, after all, rather one of terminology than of any real importance, The theory of the purely local force of the cases, attractive as it is at first sight from its simplicity, aud its apparent conformity with the sound theory which bids us, in dealing with language, proceed from tlie concrete to the abstract, and not wice versa, breaks down when we come to apply it in detail. For the genitive, at any rate, it 1s much safer to postulate an original adjectival force, a view borne out both by striking similarity of formation in some instances (c/., ¢.9., dyu0-cr0, the earlier form of the Homeric Synovo, the Attic diov, and Sypd-cto-s, " belong- ing to the people") and by numerous analogies from various languages, It has even been conjectured, though perhaps On inadequate grounds, that the genitive had originally the final s, which was dropped only when the sense of its origin became obscured. In the ablative we have apparently a use of the pronominal element -ta corresponding to that of -sa in the genitive, and originally in the nominative, the a being afterwards dropped, so that vak-a-s = vocis is to vak-a-t = voce(d) as ja-s = is is to ja-t = i-d. The Syntactic force of the ablative may often be represented a3 adjectival ; and the differentiation of the two cases may

well be a product of later times. The earliest forms of the other cases, the formation of which has not hitherto been satisfactorily explained, will be pointed out below.

In the seventh period assumed by Curtius we have thie Adverbs petrifaction of some forms of particular themes with case- and pre- suffixes, which were no longer declined throughout, and Positions. thus gave rise to adverbs and prepositions. The adverbial force was undoubtedly the earlier, as we can see from in- dications in the Homeric poems; the prepositional force came later, first perhaps in connexion with verbs, and afterwards as governing cases. To the same period pro- Infini- bably belongs the singularly interesting form of petrified tives. cases presented by infinitives. 'These have long been re- cognized as cases of verbal nouns (nomena actionis) no longer inflected throughout. The agreement of the cognate languages in the use of this device for extending the range of language seems to be a sufficient indication that it had been introduced before the original unity

broke up. At the same time the great variety of the forms actually selected by different languages as the basis of this con- struction is a clear proof that no well-defined system of infinitives had then been brought into use.

Such were the stages by which, according to our greatest Recon- living authority, that language grew which was destined struction to be the mother, not only of Greek and Latin, but of al- the

c – Indo- most all the tongues in which human culture has found an Gemanic utterance. It is by no means impossible to reconstruct it, lan- at least in outline, as it must have been spoken before the guages. original unity broke up. This task has been attempted, so far as its phonetic laws and inflexional forms are concerned, by Schleicher in his well-known Compendium der ver- gleichenden Grammatik der Indogermanischen Sprachen (3d edition, Weimar, 1871); and its vocabulary has been recon- structed by Fick in his Vergleichendes Worterbuch already referred to, Schleicher indeed ventured to narrate a brief story in this primitive language (Kuhn's Beitrdge, vol. v. pp. 206 sqq.).1 On particular points he may well have been mistaken. The tendency of modern philology is to admit within the period of the united national life a fuller develop- ment than that assumed by Schleicher. Several scholars, working along different lines of research and entirely independently, have established the great probability of a bifurcation of the gutturals ; and it is by no means certain that the vowel system was not already becoming more rich and varied. We have probably to admit that dialectic dif- ferences already existed, such as could hardly have failed to arise, even before the nation broke up completely, so soon as it attained any considerable magnitude. And above all it must never be forgotten that we are dealing with the pro- ducts of a period to which chronological limits cannot well be fixed, but which language gives us strong reasons to be- lieve must have been at least as long as that to which the data of other branches of anthropology appear to point.

It is impossible to be sure that all the elements which are introduced were ever strictly contemporaneous. Our review of the history of the language thus far is enough to show that one form may have begun to show traces of phonetic decay at a time when another form was not yet created. Hence M. Bréal (Jfélanges, p. 376) does well to warn us against the common error of

philologists in endeavouring to get more out of the reconstructed " primi- tive speech" than the facts on which it is based will warrant. But used with discretion it affords a highly con- venient means for stating the results to which the com-

1 Mr J. P. Postgate has published a similar composition (Academy,

June 14, 1879), re-written by Mr T. C. Snow (i., June 28) on the principles of Brugman and De Saussure, XL — 17

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Indo- Germanic sounds.

Changes in time of Greco- Italic unity.

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guage thus revealed to us and the language itself as given in its earliest records, by neting the common Greco-italic modifications of the primitive speech.

The original sounds' of Indo-Germanic speech may be

conveniently tabulated thus :— Consonants. Momentary. Continuous. Vowels.

Unaspirated. | Aspirated. Spirant. Nasal.

Surd, |Sonant.} Sonant. | Surd. | Sonant. Guttural | & g gh Ae ca tw Palate | 2.< sie "Ao Jy) Sey elle ite! Lingual .| ... as ie aes Pan | ax Dental…| ¢ d dh 8 Pitas Yi. ee Labial…) b(?) bh v (w) | m uw aU

That the later surd aspirates (4h, th, ph) were developed from the sonant by the influence of the aspiration seems to have been clearly proved by the very careful researches of Curtius. The fact that while Greek has surd (y, 6, 4) the Latin representatives of the same are initially the pure aspirate (2) or the spirant fand medially the correspond- ing sonants (6, d, g) is enough to show that they had not lost their sonant character in Greeco-Italic times.

On the whole the mutes must have remained unchanged. The numerous modifications of the & found in Greek (k, y, 7, 7) are not to be traced in Latin, and although p often replaces it in Oscan and Umbrian, the fact that it rarely if ever does in Latin proves that the guttural was unchanged at the time of the separation except in the way of generating a parasitic w (v) or y (/).

In the same way Latin shows no trace of the change of g to B, though it has the parasitic » which sometimes causes the loss of the g; thus Bios and wus point to a Greco-Italic guigva-s. It isdoubtful whether the primitive language ever used b unaccompanied by the aspiration ; but Greek and Latin furnish us with sufficient words agreeing in this respect—Fick quotes 25—to make it clear that this letter was so used before the separation.

If Schleicher is right in denying Z to the primitive lan- guage—and this seems very doubtful in face of the facts collected by Curtius (Principles, ii. 174)—there can be no doubt that this was abundantly developed by the European unity ; and there seems to be no single instance of an 7 retained in Latin where Greek has \, while vid/us as com- pared with épov is the only case of the converse, The spirants undoubtedly remained in their full vigour.

But while the Greeco-Italic consonants are on the whole the same as those of the primitive tongue, there is a highly important and significant change in the vowel-system. The original a, retained for the most part in Sanskrit, and modified in Zend only under conditions which make it plain that this is not a phenomenon of very ancient date there, has in Europe undergone a change in two directions. The very valuable paper by Curtius previously mentioned con- tains five tables, from which it clearly appears that a

(1) is retained in 106 Greek and Latin words ;

(2) becomes e (7) in 102 ;

(3) becomes o (zw) in 56;

(4) (a) is retained in Greek, becoming ¢ (i) in Latin in 21 :

(6) ditto, becoming o (w) in Latin in 18; (c) remains in Latin, but becomes ¢ in Greek in 18; (d) ditto, becoming o in Greek in 11; while there are (¢) 19 words in which Greek ¢ (t) answers to Latin o (w), and (f) 10 in which Greek o answers to Latin e (i). o pee it is abundantly plain that the "thinning" é . 6 ag a toe and its 'dulling " too must have aiken place in the great. majority of instances during the

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Greeco-Italic period. The instances of agreement are three times as numerous as those of disagreement, and most of the latter are to be ascribed to the operation of well-known phonetic tendencies distinctive of the two stocks after their separation. It is worth noticing as to the other members of the European stock that, while there is a striking agree: ment in the cases of the retention of the a or of its weak- ening into e, this is not found with the third process, the dulling of a into o ; itis therefore legitimate to assume that the first was common to the European family, while the second was specifically Greeco-Italic. Thus the numeral octo, the roots gno, "know," mor, "die," od, "smell," ok (op), "see," and the words ovi-s, pott-s, porko-s, ovo-m, are all Greeco-Italic but not Kuropean.

The inflexion of nouns was complete before the time of Infex We have no reason to believe of nov 'that any new case-form was developed either in the Euro-

the separation of languages,

pean unity or in any individual nation after this date. The changes are wholly in the direction of loss. 'The cases which can be shown to have existed, and the terminations by which they were denoted, were as follows : —

Plural. Dual.

-(s)a(s),

te] bhjam-s. -aus(?).

| Singular, (s)a-s am-s bhjam-s (s)adm-s 4 sva(s)

} -bhjam-s

Nominative : -8 Accusative -am Ablative -at

Genitive -as (asja)

Locative na bhjam-s.

“3 ” -bhi-s if

Instrumental (i.) .... Instrumental (ii.) ... (Sociative)

Vocative

In some cases these were modified according to the ter- mination of the stem to which they were suffixed ; and the stems themselves suffered phonetic adaptation to the ter- mination. Otherwise there was no distinction of declen- sion, except that the fuller form of the genitive was used for the most part in the case of a-stems,

If we examine the changes which may be assumed for Grec the Greeco-Italic period we find (1) the first instrumental Italic’

case is retained only in a few Greek and (possibly) Latin ad-

verbs, so that this may be supposed to have dropped out of

ordinary flexion ; (2) the ablative is retained in Latin, and —

hence it was a Greco-Italic case, though it appears in his- toric Greek only in adverbs (xadés, és, &c.) ; (3) the loss of the dual in Latin makes it impossible for us to determine exactly the form of its inflexions at this period ; probably they had already become worn down to something like the form in which we find them in Greek; (4) the existence of a final s in the nom. plur. of o-stems in some Italian dia- lects (Old Latin eguzs, Oscan -os,

Umbrian -ds, Oscan fem. -as, Umbrian -as, ~~ar) shows that the analogy of the pro~~ nominal declension had notyet established exclusively the-o2, -at terminations, though these were doubtless already in use.

In the flexion of adjective pronouns there is an agree- ment in the nom. plur. (¢f. roé, rat, 2s-td, is-te) which may be a Graeco-Italic development, the origin of the termin- ation being obscure.

In the declension of the personal pronouns it is to be noticed that the complete distinction of the stems used in the first and second persons plural (dppe- jjue-, Uupe- bye-, a8 compared with 20s, vos) proves that the parallel forms asma-, nas, and jusma-, vas to which Sanskrit points as concur- rently existing, were still used side by side.

The comparison of adjectives was made by the employ- ment of the same stem-suffixes (jans or tara, and ¢a, tama, é&c.), though a different selection became the normal one in Greek and in Latin.

The inflexion of verbs underwent far greater clanges than that of nouns, after the separation, but mainly in the

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inctive

DEVELOPMENT. |

way of a fuller development. In Latin, however, we must | assume a very extensive replacing of earlicr formations by those of later origin; for of many inflexions which are shown to have been Greeco-Italic by the cvuincidence of Greek and Sanskrit, there are few if any traces to be found in Latin. The following principles of verbal flexion, thie chief stages of whose development we have noticed above, had been established in the parent language :—

1, Stems were inflected by the use of suffixes denoting the three persons of the three numbers—singular, dual, and plural.

9. Themes variously expanded were used instead of roots for stems, e.g., bhara-ti by the side of as-ti7. Greek and Latin agree essen- tially in the methods used for forming present themes.

. Middle or reflexive infiexions were developed by the side of those of the active voice. In Latin this system appears to have lost its siguificance by the gradual wear and tear of infiexions, and to have been replaced by one based on a wholly different principle.

4, A distinction grew up between primary inflexions, used for present and future tenses, and secondary inflexions, used for past tenses, where the increased length given to the word by the use of the anginent caused the lightening of the termina- tion, usually by the loss of the final vowel.

. To form the conjunctive and optative moods @ and ja (7) were added to the tense-stems before inflexion.

6. A past tense was formed by the use of the augment and the secondary terminations, This became differentiated afterwards in Greck into (1) past imperfect, (2) simple aorist, according as the theme was or was uot used without modification for the present tense. In Latin this tense was as a rule dropped in favour of the compounded past imperfect or perfect, but Curtius has discovered some traces of it still in use.

. Acompound aorist was formed by the help of the verbal root as. This is also replaced in Latin by a tense of later creation— the perfect; but its occurrence in Sanskrit establishes it as Greco-Italic.

. A future was formed by the combination of the roots as and ja. Of this, again, there are but slight traces in Latin, the ordinary future being either a later compound with the root bhu, or an optative in origin; but the agreement of Sanskrit and Greek establishes it for this period.

9. Participles or verbal adjectives were formed by the use of the suffixes ant, vant for the active and mana (meno), ta for the reflexive respectively.

10. The dative or (possibly) locative case of a neuter verbal sub- stantive was used as an infinitive. It is certain that Latin in all cases adopted a substantive with the suffix as (giving -asat =eré), while Greek in some instances employed one with the suffix man or an (giving -ueva, -ev, and perhaps in the accusative form ey); it is not clear whether the more common Greek termination -e: is closely connected with the Latin -ere (Aéyeww=Aeye(o)ev=legese=legere) as Curtius is inclined to think, or is of distinct origin.

The researches of Curtius on the Greeco-Italic vowel- system enable us to determine with some confidence the phonetic character assumed by these inflexions. We may give as the common possession, not bharami, &e., but

bherdmt, bherest, bhereti,

bheromes, bheretes, bherontt ; not akvos, &c., but

ekvos, ckvom, ckvod, ekvois, ekvut, ekvét, ekve, &e. It was at this stage of inflexional development, and with a stock of roots and words which can still be ascertained with

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fGreck, S°Me approach to completeness, that the Greek language

started on its separate career and commenced its independ- ent history. The shape which it has assumed when it first becomes known to us from literary and epigraphic records is due to the action of its characteristic laws, some purely phonetic, and some due rather to the intellectual tendencies

of those who used it. Of the phonetic laws four are especially distinctive :—

1. Loss of Spirants.—This is most extensive and important in its results : 7 (y) has entirely disappeared from the written lan- guage, and its existence is only to be detected from isolated traces in Homer, and perhaps in some inscriptions where F 1s probably used to denote it; v (w) in the form of F is found on some of the older inscriptions, and its introduction into the text of Homer is often required by the metre; but it is unkuown to the ordinary written language ; s remains when

final, and when in immediate contact with mutes, and also

when it has assimilated to itself another consonant; but before vowels it passes into the rongh breathing, and between vowels it is as a rule entirely dropped. Instances of the etlect of this loss of the spirants abound; as an example we may take the primitive navasja, which becomes veFoojo, veowo, veoo, and so veou.

2. Softening of the Cutturals by Labialism.—It has been calculated that not less than one-sixth of the roots originally containing k or g present w or Bin Greck. Hence the reduplicated past tense (1st sing.) from vak, " speak," avavakam, in Greek be- comes efeFemov, the Homeric Zerov, Attic elroy.

3. Liyhtening of the Endings.—Greek allows no consonants to end a word except s, v, and p, and shows a marked preference for vowel endings. Hence we often find one or more consonants dropped at the end. This gives a liquid flow to the language in which it has few rivals.

4. Rich Development of the Vowel System.—In this again Greek is almost unrivalled. While Latin shared with it the original splitting of the a, by its tendency to the loss of the diphthongs this language soon impaired the variety and expressiveuess of its vocalisation, while Greek retained the full range undimin- ished. This was an advantage not merely for the euphony of the language, it added greatly to its expressiveness. Curtius has shown by many exainples (Comparative Philology and Clas- steal Seholarship, p. 38

fai how easily distinctions in meaning were given by this variety of vowels, which are expressed far more clumsily in other languages,

We may notice here also the wide influences of zetactsm. This is not limited to Greek, as Schleicher showed in the essay which first set forth its importance properly ; but it is more operative in Greek than in any language owing to the more complete disappearance of the j, which coalesces with some other consonant, usually a d, original, modified, or parasitic, to produce it. Thus sad-ja-maz became efcpar, vargja-mi, pelo, &e.

While these laws act naturally, and, so to say, mechani- cally, we must ascribe to the intellectual character of the Greeks another marked feature of this language, the enor- mous development given to their verbal system. Six wholly new tenses were created after the separation from the Italian stock,—the future perfect, the compound plu- perfect, two passive aorists, and two future passives. Be- sides, the whole system was worked out with wonderful completeness ; so that while an ordinary Latin verb has 143 possible inflexions, a corresponding Greek verb has no less than 507. In some instances we can see the creative pro- cess still at work, as, e.g., in the case of the perfects in -xa, which are all but unkuown to Homer,

The Historic Stage of Greek.+

The legend of the sons of Hellen, as we find it in Apolio- dorus, is of course entirely destitute of historical authority, but it serves as an indication of what the Greeks felt to be a natural division of their race ; and from this point of view itis largely confirmed by language. The story runs that Hellen left his kingdom to A%olus his eldest son, while he sent forth Dorus and Xuthus, the father of Ion, to make con- quests in different lands. We see from this that the A®olic dialect was regarded as the oldest representative of Hellenic speech, that the Dorian came next to it, and that the Tonian, out of which the Attic subsequently sprung, was regarded as belonging properly to a later period. On the whole this view is not misleading; but it requires some qualification. In the first place this division is more satis- factory for literature than for history ; the names Atolic, Doric, Ionic, and Attic cover well enough the written lite- rature of Greece, but are hardly comprehensive enough for all the spoken dialects. These were literally innumerable, —we

are told that the tiny island of Peparethus had three clearly distinct,—and they shaded off one into another by

1 In dealing with this part of the subject no attempt has been made to record the ordinary forms of inflexion as given in grammars, a knowledge of which is assumed. For the Greek alphabet reference may be made to the article ALPHABET, vol. i., especially pp. 609-610. Much which is closely connected with the history of the language finds its place more properly under the head of Literature.

New cre- ation of

verbal forms.

Divisions

of the Greek race.

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slight gradations. 'The influence of mixed populations is often seen to tell upon their language; and sometimes race distinctions do not tally with those of dialect; thus the /Miolians of the Peloponnesus adopted a dialect essentially Dorian, while the Dorians of Halicarnassus spoke Ionian. It is often a matter of dispute under which head a partic- ular dialect shall be placed, and whatever division may be made, connecting links are sure to be found between mem- bers of different groups.

JEouIc.—This is usually subdivided into four chief dialects :—(1) Lesbian, (2) Thessalian and (?) Macedonian, (8) Beeotian, (4) Elean and Arcadian. It has been maintained by some high authorities, e.g., by Kirclihoff, that Lesbian alone ought to be considered Aolic, and that not only Klean and Arcadian, which Ahrens admits coie nearer to Dorie, but even Beeotian and Thessalian ought to be ranked as Doric. On the other hand, Professor E.

Curtius denies to Molic the character ofa dialect, and holds that it is rather a name for those remains, preserved in different localities, of the more ancient form of the language, and that everything which was not Doric or Ionie was called by the ancients Molic. We shall find, however, that some of the distinctive features of the Lesbian dialect, which has the fullest right to be called Molie, were certainly not primitive, but of latcr origin, so that we can hardly accept this vicw. The extent to which various dialects admit of being grouped together will be best examined after a survey of their special characteristics.

Lesbio- MHolic.—The sources for this dialect are (1) inscriptions, and (2) the statements of grammarians, bascd mainly upon quotations from Aleezus and Sappho. Of the former, there are only three of great importance, —one found at Mytilene, recording the return of some exiles in the time of Alexander the Great (Corpus Inscrip. Grec., No. 2166); another found at Pordoselena, an island close to Lesbos, of a few years later (¢b., 2166c); and a third, of the same date as the first, found at Eresus and edited by Conze and Sauppe. The poets are of great value, because they appear to have written in the pure dialect of thcir country, and not to have framed a conventional language for themselves. 'The 28th and 29th idylls of Theocritus, called by the scholiast Holic, are naturally a more suspicious source.

*The grammarians with one accord lay stress upon the tendency to barytone pronunciation as a mark of Alolism. The word is accented on the last syllable: for codds, Ouuds, *AXtAAEUS, Bapts, and the like, the Lesbians said odos, 05uos, "AxtAdeus, Bdépus. This tendency has often been adduced, along with the loss of the dual, to prove a closer connexion of Aolic than of any other Greek dialect with Latin; it is rather a striking proof of the danger of drawing such deductions from phenomena of purely independent origin (cf. Schrader in Curtius's Studien, x. 259). The grammarians also tell us that Molic did not use the rough breathing. The in- scriptions date from a time when the aspirate was not written ; and the MSS. are not sufficiently trustworthy to give us much help. But there are instances enough in which a tenuis preceding a syllable which in ordinary Greek begins with the rough breathing appears in /Kolic as an aspirate—Ahrens quotes nine, besides the article and the demonstrative and relative—*

to show that aspiration was not unknown. It is to be noticed that in all these instances the rough breathing represents a primitive s or j. The same authorities assert that Aolic was distinguished by its retention of the digamma, and hence this letter is called by Quintilian and Priscian " Molium digammon ;" but inscriptions show that, though more common in Molic than in Ionic, it was much less faithfully retained in the former than among the Beotians and Dorians, Before p it was commonly hardened into B, between vowels vocalized into v. Of the distinctively Molic phonetic laws, the following deserve special notice. When in other dialects ¢ has originated in §/, it usnally appears as o8; Bptoda=fica. Liquids are very frequently doubled, usually as a result of assimilation: €.9-, v¥=vo OY av, aS eyévvato, KTévvas, ufos (Cf. mensis), Eupt, ipyevvos; vw=yJ, as kévvos, KAlvyw (s0 POEppw); vy=vf, as yévvo0s= yovvds. Xo is retained, where primitive, while Attic often drops It: péooos, Facovrat, tooos, 1 assimilates a following yu instead of being assimilated by it: drmara=Supara (dm-para), yponmata= yeanuara (ypap-yara). Before a, v generally passes into 1, forming a diphthong with a preceding vowel : rdaas, Att. réaas for Tahav-s ; mais, Att, was for Tavt-s; SO mpetoloas=mperort-Jar-s, odpats Att. codds for copav-s, A€youot, Att. A€youan. _ Of the vowels, « is sometimes retained, when it has been "dulled" in Attic, ¢.9., ta (=8re), Smd=tad ; but more commonly it passes into 0, especially when in contact with liquids, ¢.g., orpdéros, 2pOop- Bat, ouvacOny (=dvaurnoOfvar)—this may be regarded as a char- ee mark of olism ; o often becomes v, ¢.9, tados=8os; so Fee Sed as in Ionic, when Ionic has n, but 7 has

: : re it has originated in a lengthened e, ¢.g., MaTnp, Tan wéAW, orddAaY (=orhanv). For es and ov n and w are

ECE

commonly used: cupdepny, xhp, Kivos, épavos, k@pos. The « of diphthongs is often omitted : éAd@ca=dANOera ; Aaxdny for Aaxolnv (of. the popular Attic woeiv). In contraction ao becomes a, Kpovida; co ev, BéAeus; 00 w, dvOpmmw. The apparent dieresis of diphthongs is sometimes due to a retention of the uncontracted form ; some- times, as in éi6a in Alceus, a in inscriptions, it is real,

In noun-inficxion, besides the changes produced by these phonetic laws, we may notice the loss of the dual, and also a tendency to metaphrastic forms, especially the accusative in v from consonantal stems.

In verb-inflexion there is a 2d sing. in -oa, %xe1o0a, but not the Doric 1st plur. in -wes ; the 8d plur. ends in -101 (as noticcd above); and contracted verbs commonly follow the earlier conjugation in -y1, pian, Soxiuwus (the grammarians add, but probably incorrectly, yéeAatt).

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the Lesbians and the Beeotians was in Thessaly.

The Beotian dialect is known mainly frominscriptions. Thescanty fragments of Corinna have come down to us mixed with Ionic forms; and the specimens of the Beotian dialect given by Aristophanes in the Acharnians and Eubulus in his Antiopa are still more corrupted byan intermixture of Attic. The Boeotians differed fromthe Lesbians in many not unimportant points. (1) They had no tendency to throw the accent back. (2) They liked the rough breathing. (8) They retained an earlier 7, or changed it into 6, where the Lesbians hado. (4) A Lesbian 03 (=¢) appears in Beeotian as 8. (5) The Lesbian doubling of liquids and change of vs to 1s are unknown in Beotian. (6) In inflexion Beeotian retains -ao and -awy, which Lesbian contracts. (7) The Beeotian genitives are éeyots, reods, éovs, tlic Lesbian guedev, oder, ev. Further, Boeotian changes e tos before vowels, v to ov, n to e, es tor, and o to v, all which changes are unknown to Lesbian; ¢f., ¢.g., Boeot. O:ds, Kodves, ovmes, avedeke, moelras, BactAlos, TO Sduo, Fuxid, &c. As against these numerous differences there are but few points of resemblance, except such as would be shared by all the Dorian dialects. A few peculiar words shared by both arc noticed by Beerman (Curt., Stud., ix. p. 85), and he lays stress upon their agreement in -yey (1 plu.) as contrasted with the Doric -wes, on the feminine terminations -1s and -w ("AAeéts, Sdrgdw, Mavro, &c.), and on the common use of patronymic adjectives instead of the genitive of the father's name. But it may fairly be said that these would not have been regarded as snfficieut indications of a close connexion, unless the traditional evidence in its favour had been so strong. We must assume that the Lesbian emigrants changed their language more rapidly than those who had moved less far from their earlier home.

The Elcan dialect is represented by Strabo (viii. p. 383) as being Hlean.

also Molic. This tradition is decidedly rejected by Ahrens, and is very doubtful. The most recent discussion of the question (by Schrader in Curtius's Studien, x. 267 sqq.) advocates the theory that the Kleans separated from the rest of the Greeks at a time ante- cedent to the distinction between Molic and Doric. This practically coincides with the view of Ahrens that, while it has many points of contact with Doric, and especially with Laconian, it is really a dis- tinct dialect, and is confirmed by the iuscriptions, of which the most important are the ancient bronze plate brought back from Olympia by Sir W. Gell (C. I. G. 11) recording a treaty between the Kleansand the Hereans, and the recently discovered inscription of Damocrates, edited by Kirchhoff (Archeol. Zcit., 1876). It agrees with Lesbian in the nom. sing. masc. in a, reAéora, and the acc. plur. masc. in ots (-op) for ov-s. It resembles the northern Doric in the use of ey with the acc., in the apocope of zepl to map, and in a heteroclite dat. plur. in ~~*o1s (a4yévorp), and Laconian in a complete retention of the digamma, (changed in the later inscrip*~~ *tions to 8), in the change of final s into p (¢.g., Totp, &AAoup, mpokévoip, Boxtap=Forrlas), and in the change of a medial s into the rough breathing (roficoa=morhoacba:). The last two, and also the use of B for Ff, are much less usual in the early than in the later inscriptions ; and the same is the case with Laconian ; hence the phenomena point rather to a later action of one dialect upon the other than to a close original connexion. Much light may be*

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expected to be cast upon the Elean dialect by the rescarches at Olympia, which are bringing to light almost every week forms of great philological interest.

The Arcadian dialect rests almost wholly upon inscriptions, of which the most important is one found at Piali near Tegea in 1859, edited by Bergk, and afterwards by Michaelis, with valuable notes py Curtius. 'he very careful examination of this dialect by Schrader (Curtins's Studien, x. 273-280) shows that it has more points in com- mon with Doric than with Aolic, —inideed that there is no single point in which it agrees with all the dialects of the latter, where it does not also agree with the former. Its agreement with Lesbian especially is only on minute points, which seem to be of independ- ent origin. Hence its Molic character may be definitely given up. Among the more interesting phenomena which it presents, we may notice -av for the gen. sing. masc. of a-nouns, -o: as the dative (or possibly locative) sing. of o-nouns, iv used for eis and év, -ror as the

found at Andania, dealing with the cultus of certain deities; itis of comparatively late date (probably 93 B.c.) and in a much modificd Doric, but it contains some striking forms.

The Corinthian dialect is learnt mainly from inscriptions at its colonies of Coreyra and Syracuse, both of which cities supply some very ancient and valuable records. In the same way the Doric of Megara is preserved most fully on Byzantine inseriptions. For this we have also the Megarian in the Achariians of Aristophanes,

For the Zocrian dialect Ahrens had but few and fragmentary in- scriptions and no literary evidence ; recently a bronze tablet con- taining a treaty between Chaleion and (Hantheia (of the 4th century B.C.) has been dug up at the latter place; and also a tablet contain- ing the regulations for founding a colony at Naupactus (¢f. Curt., Stud., ii, 441-449, iii. 205-279). These throw mueh new light on the dialect, and enable us to set it down with confidence as a link between Doric and Molic.

inflexion of the 3d sing. middle (¢.g., yivntor, Séaro1) and -nuevos as the ending of the participle of verbs in ~~éw (a5.cquevos ; cf Kada~~ Anuévp=xaradnroupéve in the Elean treaty; Lesb. raatpevos, &c.).

The general character of the Doric dialect was that of a slow, de- General liberate, and emphatic speech ; it is the speech of the warrior and Dorie char- the ruler, not of the orator orimerchant. The rAaaretaouds, which the acteristies.

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The Cyprian dialect may be mentioned here ; for the results of its examination entirely confirm the statements of Herodotus (vil. 90) and Pausanias (viii. 5, 2) that Arcadians were among the colonists of Cyprus. This was first asserted by Bergk on_ the strength of a few glosses ; but recently the inscriptions have been deciphered by Dr Birch, followed with more complete success by Brandis, Schmidt, and Deecke and Siegismund. They are not written in Greek eharacters, but in an alphabet of their own, which is syllabic in its character, ¢.¢., each sign represents a consonant followed by a vowel. Of these signs there are 56 as yet identified ; there isno distinction between tenues, medials, and aspirates, nor is there any mark of rough or smooth breathing ; the signs therefore stand for a, ¢, 7, 0, y, ka, ke, ki, ko, ky, pa, &c., ta, &c., ma, &e., na, &¢., ra, &e., la, &c., sa, &c., and va, &e. The number is made up by ja, je, ji (jo and jy not having yet been discovered), sse, za, and zo. lf a word ends in a consonant, the sign of that consonant when followed by ¢ is used ; but an article or a preposition is often treated as coalescing with its noun. When two consonants come together, the first is denoted by the sign of that syllable which it makes either with the vowel attached to the second consonant (¢.9., po-to-line=nrédrw) or with the preceding vowel (¢.g., a-ra-ky- ro=apyipw). A nasal is always omitted before an explosive (a-to- 70-po-se=tvOpwmros), Cyprian agrees with Arcadian in the geni- tive in -av, in dd for dad

(sometimes followed in both by the dative), in the preposition iv (often with acc.), and in many less unportant points.

Doric.—The Dorian dialect was divided by Ahrens, following the Greek grammarians, into two main groups—(1) the severer Doric, (2) the milder, the one being more closely conneeted with Molic, the other with Ionic. To the former belonged the speech of Laconia, Crete, Cyrene, and the Greek colonies in Italy; to the latter the lan- guage of Argolis, Messenia, Megara, and northern Greece, and the colonies of Asia Minor and Sicily. The basis of this distinction is the use of w and 7 in the severer as against ov and e: in the milder dialect. But the division can hardly be maintained in practice, and hence it is abandoned by most modern scholars. 'he northern Doric, for instance, which is ascribed by Ahrens to the second di- vision, has been shown by Merzdorf (Sprachwissensch. Abhandl. &c. Leipsic, 1874, pp. 23-42) to form a bridge between Molic and Doric. Again, while we find ov in use at Thera, at Cyrene, a colony of Thera, w is retained ; hence this cannot point to a deep division. We may notice first the authorities for the particular dialects, and then the characteristics of Doric generally.

The Laconian dialect is known from few and unimportant in- scriptions, from the fragments of Aleman, which, however, are in a language much modified for poetic purposes, and from the specimens in the Lysistrata of Aristophanes and in other Attic comedies. There are also a large number of Laconian glosses in Hesychius, and Thucydides (v. 77) gives a treaty in the Spartan dialect. Our knowledge is largely supplemented by the famons tables of Heraclea, a colony of Tarentum, which itself was founded by Sparta. These were found in the bed of the river Cavone in 1732 and 1735, and are now partly in the Museo Borbonico at Naples and partly in the British Museum.

From Crete there are numcrous important inscriptions, chiefly treaties between various towns. Itis curious that some of the most Valuable of these were found in the ruins of the splendid temple of Dionysus in the island of Teos; this temple enjoyed the rights of an asylum, and the inscriptions are mainly treaties acknowledging these rights on the part of various Cretan cities. They contain some highly interesting archaisms of form.

For Thera there is an important inscription containing the will of a wealthy lady Epicteta (C. Z. G., 2448); for its more famous colony,

yrene, there are only brief and fragmentary reeords.

The Argolic dialeet appears on a very ancient helmet found at Olympia (C. 7. G., 29) and on an inscription very recently dug up at the same place, as well as on several others of less inrportance.

From Messenia there is a long and very interesting inscription

ancient authorities ascribe to the Dorians, is not distinctive of them, but was shared by the Beotians and other olians ; it is to be re- garded rather as a mark of an earlier stage of the language, which was retained like many other similar characteristics by the Dorians much more extensively than by contemporary Jonians. It is quite the exception for any Doric eharaeteristic to be of recent origin. A natural hypothesis finds in the full and broad sounds of the dialeet of these "men of the mountain-forests " signs of the chest strength- encd by mountain air and mountain life. To pass to details : —

In accentuation Doric showed no inclination to the barytone pro- nunciation of Lesbos ; on the contrary, it has more oxytone forms even than Attic. In many words the Doricaccent is of especial in- terest as bearing valuable testimony to the origin of the inflexions ; we find not only ayyéAo, avOpémor, and tuTropévor, but also éréyor, éavoav, waides, mradkas, and dumedos (acc. plur.),—these forms all pointing back to a time when the final syllable was long, and thus demanding from philology an account of this length.

In vowels ashort ais often retained where Attic has (iapds, rpddw, Tpaxw) or o(Fekati= efxoot): vin Laconian became ov, but probably only as an indication that the earlier pronunciation of the vowel was retained, when in ordinary Greek it had sunk into #. Wherever 7 in Ionic has come from an earlier a, Doric retains &, but where it has ori- ginated in e, 7 is retained as in Lesbio-Molic (warfp, Bot. marelp) 5 it is also retained in augments (jpxduav), and as a contraction for ae (évikn). On the other hand ao and aw contract into a (Arpefda, yedav). The contractions of co, ew, vary much in

different dialects. The sevcrer Doric gives y for e: and w for ov: fs for eis, quer for Zopev, tywoa, Mooa, éyfnrnOlwyti—éterdnbdo1, Bwdad (Lesb. BdbAAa), K&pos, &c. A noteworthy phenomenon is presented by the shortening of long final syllables, almost exclusively where the length is due to compensatory lengthening in the place of a lost consonant (Snudras, kara Tos véuos, mpdéas, mds [= W05-s], Aéyes, Tierev, TeKEv) ; of all forms of the dialect the Cretan especially favoured this.

Of the consonants, the digamma was retained longer by the Doric than by any other dialect, but we find it gradually disappearing. It is used in the old Laconian, Argolic, Corinthian, and Corcyrean inscriptions, but not in the Cretan, with the exception of the proper name fatro:; on the Heraclean tables it is very common, but there are some strange exceptions, as oixid, épydfopmat, and apépyw ; some have held that it is there wrongly inserted in fe¢, but this is really a valuable confirmation of the labial spirant to which other lan- guages also bear witness. The digamma is often changed to B (as in Elean), but never before p, as in Molic; whether it ever actually passed into y, or whether the numerous forms which give thisin the place of an earlier digamma arc all due to the mistakes of copyists, is a question still under discussion (Curtius's Princ., ii. 229 ff). Tis constantly retained, where the Ionians have weakened it into o, especially in t+: gatl= nol; so rémtovTi=TITTOVOL, rlbevri=rE0e101; Cf. TAATLOS, TAOUTIOS, BOTIS, BedtvouvT ior.

Three changes characteristic of Laconian came in at a compara- Laconian tively late date ; for they do not appear in the Heraclean tables, peeuliari- and consequently they must be later than the foundation of Taren- ties.

tum. (1) © becomes o; this is very common in the Spartan of the Lysistrata ; ¢.g., c€ret, ovyv (= Oryeiv), otds (=0e6s); of. 78 1 oipartos (Thue. v. 77), cetos avhp (Ar., Eth. Nic., vil. 1). (2) Final s becomes p ; this is still later, and does not appear In Aristophanes, but is very common in the more recent inscriptions. (3) Medial o between vowels becomes'; this is found in Aristophanes (Méa, waa, &c.) and in later inscriptions (MooiSa:), but not in Aleman. The traditional change of y into 6 is denied by Ahrens and Curtius, who altogether reject, with very good reason, the asserted identity of 84 and y#. The appearance of ¢ in the future and com- pound aorist of

verbs in ~~¢w (¢.9., Soxiudtovri, éuépitay, &c. in the Tabb. Heracl., pvolta in Aristoph., Lysist.) has been rightly explained by Curtius (Princ., ii. 248) as a hardening of the original spirant y (j) before the o, the only possible alternative to its com~~ plete loss, which we find in the ordinary Greek Soxiyudéow. The change of ¢ into 08, ascribed by the grammarians to Doric, is more

Tonic.

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properly Lesbian, and is unknown to pure Doric; here ¢ is asa

rule retained, but in the Laconian dialect when initial it becomes

5 (Souds=Cwuds), when medial 53 (uvolS8w=pv9iCw, morddder= mpood¢et). : a f A double o is retained where this is the more ancient form,

changed in ordinary Greek into o ; thus the Heraclcan tables give

dooos, uéooos, ooovra, &c. The oo often found in Dorian inscrip-

tions (and sometimes in the earlier Attic also), where there is

no historical explanation of its presence, seems to be an attempt to represent the sound of the earlier sibilant san, which was retained by the side of sigma. For the earlier guttural koppa, the

distinctive sign P is found in old inseriptions, almost, but not

quite exclusively before 0, ¢.9., Popiv0dGer, bpPos. , , We may notice finally a free use of assimilation especially in Laconian (rotupa=nvyywh, Kdppwr=Kpeloowy, t.¢., Kaptioy, ackdp=

aoxds), and on the other hand the retention of vs by the Argives

and Cretans (révs, udvaa, évs, T10évs, Tlpuvs, &e.).

The characteristic Dorian inflexions are almost entirely such as

are due to these phonetic laws, or to the tendency to metaphrastic or heteroclite formations, already noticed.

Ionic. —The Jonie dialect is commonly divided into three stages, —

the Old Ionic or Epic dialect, the New Ionic, represented most com- pletely by Herodotus and Hippocrates, and the Attic. This division 1s not satisfactory ; for, in the first place, the Epic is a mixed dialect or more properly a style, and cannot be taken as a faithful represen- tative of a spoken language ; and, in the second place, Attic is not a later stage of the New Ionic, but in many respects remains faithful to forms in which even the Old Ionic has departed from the earlier usage. The three swb-dialccts, however, agree on the whole much more closcly than any one of them does with either Holic or Doric, and they may therefore be grouped together. We know from an express statement of Herodotus (i. 142) that there were many sub- ordinate varieties of the ordinary Ionic; he mentions four within a comparatively narrow extent; but neither;the extant inseriptions nor the statements of grammarians enable us to distinguish these with any precision. It is probable that the differences lay rather in slight shades of pronunciation than in any extensive variations, and that, on the whole, the varieties closely resembled each other. As the general character of Doric is due, at least in a measure, to the hardy mountain life of the Dorians, so the Ionic type was determined by the easier and more effeminate life of the Ionians. All harshuess is carefully avoided ; the spirants, especially the £, were dropt here earlier and more completely than in any other dialect ; the ais more extensively changed into ¢ and 0; aspiration is frequently lost or transposed so as to be casier to pronounce ; 7, especially before :, regularly passes into « ; gutturals are replaced by dentals or labials. The vowel-system is especially rich and free ; sometimes an easy flow is given by the avoidance of contraction ; sometimes again a full colouring is produeed by the variety of the diphthongs. The varied literary activity of the Ionians in different directions gave a, manifold development to their language, which makes it especially well adapted to poetry, and adds not a little of poetieal charm even to their prose.

Epic Dialect.—The language of the Homeric poems is doubtless based upon the popular spoken dialect of the distriet in the midst of which they grew up.

But as every scholar would now admit that they were constructed out of a large mass of previously existing material, however widely opinions may differ as to the person or school to which they owe their present form, and as much of this material must have dated from a great antiquity, it need not sur- prise us to find in the midst of a dialect, which is of a much more recent type than Holic or Doric, traces of archaisins, earlier in some respects than anything to be found elsewhere, It is one of the greatest services whieh comparative philology has done for the in- terpretation of these poems, that it has enabled us to recognize as relics of an older language much which had been previously set down as poetic licence, or held to be inexplicable.

One of the most interesting of these relics is the effect produced by the earlier existence of a spirant, no longer written, upon the quantity of a preecding syllable. As late as the time of I. Bekker all sueh cases were unhesitatingly aseribed to the digamma; and this accounts for many instances ; but in others the cognate Tanguages point to o orj: e.g., we find not only pira Feluara dtow, ofrw Sh Fotkorvde, and hundreds of similar cases (La Roche gives 84 Homeric words with the digainma), some of very common occurrence, but also Geds (7)bs, Foleade (A)iJemever, eri yap (o)éxov (o)@A7o, and many other On the other hand, the occasional neglect of the is most certainly estab- as some have argued, to a later ; this occurs, but to a fluctuating een to though much more extensive than our own poetic use o and loves, forméd and Jorm'd, my and Baie. hich the poems now appear, it is often a © remember that they must have been tran-

comparatively late date from the earlier into the later

ABET, vol. i. p. 610), and that doubtless

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many words were inaccurately represented. The limits of this sketch do not admit of a statement of the characteristic epic forms, They will be found given with very full refercnces in the introduc- tion to La Roche's school edition of the Zliad (Berlin, 1870), and with admirable clearness and

scientific exactness in the sketch of Homeric grammar prefixed by Mr D. B. Monro to his edition of the First Book of the Zdiad (Oxford, 1879).

The New Jonic dialect is found first in the writings of the iambic elegiac poets, Arehilochus, Callinus, and Mimnermus (where the digamma has already entirely disappeared), and is known more completely from Herodotus and Hippocrates. We are told that the language of the former was varied (momiAn) as compared with the pure (xadaph) Ionic of preceding logographers ; this seems to refer to the occasional introduction of epic forms and expressions, which give a delightful poetic tinge to his language (cf. Quintil., ix. 4, 18, Lum ipsa didrexros habet cai iucunditatem, ut latentes cttam nwmeros complexa videatur) and not to any dialectic variations. Besides the general tendencies of Ionic mentioned above we may notice the retention of the earlier « for 7 in interrogative and relative words (kotos, dxduos, &c.), the interchange of e: and ov with the simple vowels (elpoua, xewds, teivos, but ud(wr, déEw, Taxea; and podvos, obvoua, Td odpos, vodaos), the contraction of on into w (BGoa, éBdbee, évyvmoas), the use of ni for et (BaciAntn, savrniov), the Ionic crasis in aynp, GdAou, &c., the entire absence of the appended v, the gen, plur. in -ewyv for Homer's -dwy, Att. -6v, and the use of -aTal, -aTo for -yra and ~~*yro wherever these are added directly to the tense*~~ *stems (¢f, éoxevddarai, dmixarat, BeBrA€aTm, TiWeaTat, ayolaro, &e.). The dialect of Herodotus has been most fully discussed by Bredow, Queestionum criticarum de dialecto Herod. libre duo, 1846); there are some excellent remarks upon it by Mr Woods in an introduction to his edition of Book i. pp. 40-45. "The text of Hippoerates is in too unsettled a state, and the genuineness of many of the treatises ascribed to him too doubtful, to make it possible for us to build much upon his authority. From inscriptions but little can be gained. See Erman in Curtius's Studien, vol. v. pp. 250 77.*

The Aitic dialect may be regarded as on the wholea slightly modi- fied representative of the Ionic spoken before the fonndation of the Ionic colonies. It is not so much a daughter of Ionic as its mother, as Bergk justly calls it. In Ionic the tendeney to soften the lan- guage which had alrcady commenced before the separation went on its way unrestrained in the luxurious life of the Asiatic cities}, In Attica, possibly owing to the free admission of non-Ionie citizens by Solon and Cleisthenes, this tendency was

ehecked, and there are even some signs of a reaction in the direction of the earlier and more vigorous speech. here is a celebrated inseription found at Sigeum in the Toad (0. J. @., 8), the antiquity of which, though attacked by Boeckh, has been established by Kirchhoff ; this is in two parts,—the upper in Ionic dialect, the lower (which is probably a little later, but also belonging to the time of Pisistratus) in Attic, and we can already see the reaction at work. The Attic dia lect thus adapted itself admirably to the character of the Athenian people, which knew better than any other Hellenic coinmunity how to unite energy and dignity with grace and refinement, to preserve the ceuvdrns of the Dorian without sacrificing the xdpis of the Tonian. The Attie of the inscriptions may be most conveniently divided aceording as these are written in the old alphabet of sixtcen letters or in the so-called Ionic alphabet of twenty-four. The latter was introduced for public documents in the archonship of Euclides (4038 B.C.);_the inscriptions written before that date have been collected and edited by Kirehhoff in the first volume of the new Berlin Corpus Inscriptionum Grecarum, and their linguistic peculiarities well com- mented upon by Cauer in Curtius's Studien, vol. viii. pp. 223-301 and 399-442. The Attic of literature is divided into the Old and the New, the point of division being earlier than the archonship of Euelides, and eoinciding more nearly with the beginning of the Peloponnesian War (431 B.c.). The division is, however, not strictly a chronological one, for, while Thucydides and the tragedians adhere to the older forms, contemporary comic writers adopt the later ones; in Plato both are found side by side; but in the orators the change to the new is fully established. The difference is not deeply marked, and lies for the most part in minute details. In some cases these seem to point to the adoption in literature of popular forms which had always been current, and which were really older than the forms that (probably owing to the influence of the Ionic poets and historians) had become fashionable with older writers. 'Thus the 77 which in New Attic supplants oo cannot possibly have come from this weaker sound?; they are both independent modifications of an earlier xj or 77 ; and the inscriptions show clearly (cf. Cauer, p. 284 sg.) that oo was never used except under Jonic influence. In other cases there are undoubtedly indications of the weakening

1 The tablets of Styra, engraved not later than 480 B.c. (Kirehhoff, Zur Geschichte der Griech. Alph., p. 139 sq.), give an interesting example of

Ionie of a Jess complete development.

2 On this question, however, the arguments of Aseoli deserve eareful eousideration, They have considerably modified the judgment of Curtius ia the fifth edition of the Grundziige, of. pp. 666 ff.

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of sound which marks the ordinary course of language : ¢.9., ody for tiv, pp for po ; the same is probable in the instances where a simple vowel represents an earlier diphthong, as in del, aetds, éAda, and woeiv, and inthe tendency to allow ce (7) to sink into ¢7 («:), ¢.9., Bactrcis, KActOpov, Aver, eteaov, and the duals oxéAes, Cevye: for oxédn, Cevyn. It is less easy to account for the change of fy (éav) to ay.

In the New Attic the Greek language may be said to have reached its zenith of grace, expressiveness, and symmetry ; and hence this is the proper place for a few remarks on the qualities which have

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. coufessedly made the Greek language quite unrivalled as a means

for the expression of human thought.

In the first place we may notice its purity and consequent trans- parency. The Greeks felt themselves to be sharply marked off from the barbarians around them, and in consequence rarely allowed their language to' be contaminated by foreign influences. Latin teems with borrowed words, often ill-adapted to the genius of the language; Greek has very few, and these almost invariably Hellenized in form. Hence the etymologist fcels himself to have a far firmer footing in Greek than on Italian soil. Hence too the or- ganic structure of Greek retains its regularity, and the orthography is well

established and rarely fluctuating. hen there is the phon- etic harmony of the language. Dissonance was everywhere avoided; there is no undue predominance of consonants, as in Latin and still

more strikingly in Etruscan. The endings of the words are light, no

final consonant being endured, except the liquids » and p and the spirant s. The brightest of the vowels, a, ¢, 0, are far more common than the harder and thinner ¢ and w, Greek here again contrasting sharply with Latin. The abundance of diphthongs—practically lost in the modern pronunciation of Greek—gives a rich variety of sound, besides supplying admirable means for the differentiation of mean- ings. The careful observation of accent, by the side of and quite dis- tinct from the due marking of quantity, lent a varied modulation to the rhythm, which the rapid utterance of the Athenians especially prevented from ever becoming wearisome. The range of different forms at the disposal of poets and the freedom allowed in the order of words permitted the writer to choose the rhythmical effect most conducive to the harmony of his period. With regard again to the expressiveness of the language, the completeness of theyerbal inflexion enabled various shades of meaning to be expressed with unrivalled precision and terseness. It is perhaps inrpossible to estimate with any approach to accuracy the extent of the vocabulary of a language known to us only from a literature which, in some of its most imn- portant branches, has come down to us in a sadly fragmentary state; but some approximation may be made from the fact that Herodian is said to have determined the accent of 60,000 words. But the free power of word-formation and composition to which this marvellous richness was largely due was no mechanical process. It sprang from the lively fancy of the most poetic of nations,—a fancy which shows itself alike in the significant individual names borne by every Greek citizen, which contrast so sharply with the obscure, trivial, and stereotyped hereditary labels of the Romans, and in the charac- teristic and often sportive appellations of plants and animals. Nor can we omit that which was according to Aristotle the despair of the barbarian of old, as it is of the modern schoolboy, the exquisitely exact and delicate use of the particles. Of all the qualities which make Greek really untranslatable, even into German, the only one of modern languages which approaches it in this respect, perhaps the most characteristic is the abundance of these tiny atoms of

*speech, not one of which can be neglected with impunity, while it 1s inpossible to reproduce them all except at an expenditure of our means of expression which ruins the lightness and grace of the sen- tence, The history of the development of the period, that device in which the symmetry of form is inseparably wedded to the artistic balance of thought,—a device which is found in no language which has not derived it directly or mediately from Grecce,—belongs to the region of literature rather than language. But many a construction, for which formal syntax finds it hard to discover a name and a classi- fication, can only be understood aright if we look upon it as the utterance of a national life unrivalled in its bold and vivid freshness, delighting in variety, and shaping at its will a language still fluid anil plastie. With regard to the pronunciation of Greek, the best modern scholars are at one in regarding the modern pronunciation, advo- 'sam at the revival of learning by Reuchlin, as wholly misleading 'or an earlier period. On the other hand, the current pronunciation in England 3s hardly more correct than the conventional pronunci- oe of Latin ; and even the Continental pronunciation, as estab- ished by Erasmus, needs to be modified on many points. The . aud consonants present no difficulty : a, d, n, €, i, t, w, o Were * oubtedly pronounced as the corresponding vowels are now in each, German, or Italian ; § and were the French @ and Mt, 1.6, : 4 aly the German we, The consonants may be pronounced as a ae "1 a being however always hard, and ¢ being dz, while, a a already, the aspirates ¢, 0, x=p-h, t-h, e-h. It is much Und ifficult to determine the pronunciation of the diphthongs. ndoubtedly they were originally strictly diphthongal, é.¢., the*

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two vowels were cach pronounced, but ran rapidly one into the other : of. mais and the Homeric wais, ofs and dis. But at an early period the diphthongal pronunciation was lost, and in modern Greek the sound ¢ is given alike to a, «:, aud o:. This cannot be correct for the Attic period ; it probably began to creep in in the time of the Dia- dochi ; o: at this date began to pass into #, and much later sank into @; ov had always the force of our 00, and is used even when the syllable is short: ¢.g., in Beeot. xouves it was pronounced as uw in "put." It is altogether erroneous to pronounce v in diphthongs as v, as is done in niodern Greek; vz was doubtless pronounced much as wee, but with more stress laid on the first element.

The dialects long continued to exist in the mouths of the common History of people ; but the influence of extended commercial intercourse, and later especially of the commanding position which Athens had gained as Greek.

the centre of education and the home of science, literature, and philosophy, gave an increasing predominance to one, the Attic dia- lect. 'The Ionic was the first to disappear ; there are but few traces of this after the Peloponnesian War ; the Holic and the Doric are found, but always in diminishing extent, as late as the time of the Roman emperors. But Attic lost in purity as it gained in range ; new words and constructions crept in especially from the increasing influence of the East ; until at last the grammarians gave the dis- tinctive name of 7 kowh Biddexros to the language popularly current. The rise of the Alexandrian school of critics gave a new stimulus to the study of literary Attic; on the other hand the vulgar spcech continued its own course of free combination and assimilation from various quarters. Thus in the Roman times we have three main divisfons of Greek :—(1) the revived Attic of the schools, the purity of which was jealously guarded by grammarians such as Phrynichus; (2) the common (ow?) literary language, employed by such writers as Polybius and Plutarch ; and (3) the popular spoken language, which much more freely absorbed foreign clements than the row, and which may be described as Hellenistic. This is the basis of the diction of the Septuagint and the New Testament. Of course the dividing lines cannot be sharply drawn. Of the authors belonging to this period some, like Lucian, en- deavoured to approach as closely as possible to the standard of pure Attic ; others, like Babrius, came nearer to the popular diction. The peculiarities of this stage of the language cousist rather in new words and new inflexions than in extensive syntactical changes. The former are too nuincrous to state here (cf Winer's Grammar, part ii. pp. 69-128, ed. Moulton) ; of the latter we may uotice—

j. A negligent use of the moods with particles ; ¢.9., ray with a past indicative, e? with the conjunctive, fva with the present indicative.

2. A construction of verbs with cases unknown in Attic: ¢.g., yeveoOa: With accusative, mpookuvety and mrpordwveivy with dative, &c.

8. The extension of the genitive of the infinitive (rod motetv) beyond its original and natural limits.

4, The use of the conjunctive for the optative after past tenses, and the gradual disuse of the latter mood, which has wholly dis- appeared in modern Greek, (J0., p. 38.)

Under the Greek empire, the language of literature was still based upon an artificial and often a lamentably unsuccessful imitation of Attic ; and an interesting parallel night be worked out in detail between the Greck and the Latin writers of this period. But, just as in the Western empire, the popular dialect went on its way, for the most part unrecognized in literature, but constantly exerting its effect upon the written language, and from time to time coming to the surface. The first writer who boldly adopted the popular dialect was Theodorus Ptochoprodromus, a monk of Constantinople who lived under the emperor Manuel Coimnenus (1143-1180) ;_ his language, though with some traccs of the more ancient forms, is essentially modern Greek. To the same period belongs Sinton Sethos, a chronicler, the first prose writer of the modern language. In the 14th century we have the romauce in verse, Belthandros and Chrysantza, a work highly spoken of for imaginative power and free command of the language in its new form. The poems of Gorgilas (cent. xv.), Chortakes and Kornaros (cent. xvii), and Rhegasg (cent. xviii.) suffice to show that the popular language never entirely ceased to be used as an organ of literary utterance. An epoch in the history pf modern Greek is marked by the long and fruitful activity of the illustrious scholar aud patriot Coracs (1748- 1833). He made it his object to purify the popular dialect, not by an artificial resuscitation of the ancient Attic, but by a strenuous endeavour to preserve and to render current all classical forms not wholly extinct, and to replace foreign and barbarous words by genuine Greek ones, often freshly coined for the purpose. Greece now can number poets, historians, scholars, and orators who bring forth from their native language no feble echoes of the immortal notes with which its prime was made musical for every age.

Authorities. —For all that concerns the formation and history of Authori- the Greek language the writings of Professor G. Curtius of Leipsic ties.

are unrivalled in sound sobriety of judgment and full mastery of all the results of modern philological science, which owes to him some of its most important advances. The chief are Graundziige der

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Griechischen Etymologic (5th edition, Leipsic, 1879, translated into English by A. 8. Wilkins and E. B. England, 2 vols. 1875-6); Das Verbum der Gricchischen Sprache (vol. i. 2d edition, 1877, vol. ii. 1876; English translation in one volume, 1880); a School Grammar (8th English edition, 1876) and Hlueidations of the same (2d English edition, 1876). The fullest storehouse of the facts of inflexion and of syntax is Kiihner's Ausfihrliche Grammatik (2d edition, 1871). For the Greek dialects Ahrens's De Grae: Linguce Dialectis (2 vols. 1839, 1848) remains the best work ; but recent discoveries have made it necessary to supplement it in many places; indispensable

PART IV.—GREEK LITERATURE.

The history of Greek literature has had three great stages: —the Old Literature, from the earliest times to 529 a.D., when the edict of Justinian closed the schools of pagan philosophy; the Byzantine Literature, from 529 a.p. to the taking of Constantinople by the Turks in 1453; and the Modern Literature, which may be said to have begun with the satirical poetry of Theodorus Prodromus in the 12th century.

Section I.—Tuae OLD Greek LITERATURE.

The Old Literature, to 529 a.p., falls into three periods. I. The Early Literature, to about 475 B.c. Epic, elegiac, iambic, and lyric poetry ; the beginnings of literary prose. IL, The Attic Literature, 475-300 B.c. Tragic and comic drama ; historical, oratorical, and philosophical prose. III. The Interature of the Decadence, 300.B.c. to 529 A.D.,— which may again be divided into (1) the Alexandrian period, 300-146 B.c., and (2) the Graeco-Roman period, 146 B.c, to 529 A.D. ;

It is not the purpose of the present article to enter into details regarding particular works or the lives of their authors. These will be found in the separate articles devoted to the principal Greek writers. The object of the following pages will be to sketch the literary development as a whole, to show how its successive periods were related to eee other, and to mark the dominant characteristics of each.

I. The Early Literature.

A process of natural growth may be traced through all the best work of the Greek genius. The Greeks were not literary imitators of foreign models; the forms of poetry and prose in which they attained to such unequalled excel- lence were first developed by themselves. Their literature had its roots in their political and social life; it is the spontaneous expression of that life in youth, maturity, and decay ; and the order in which its several fruits are pro- duced is not the result of accident or caprice. The series of its seasons is as much the result of natural laws as the sequence of spring, summer, and autumn. Further, the old Greek literature has a striking completeness, due to the fact that each great branch of the Hellenic race bore a characteristic part in its development. JIonians, AKolians, Dorians, in turn contributed their share. Each dialect corresponded to a certain aspect of Hellenic life and char- acter, Hach found its appropriate work.

The Ionians on the coast of Asia Minor—a lively and genial people, delighting in adventure, and keenly sensitive to everything bright and joyous—created artistic epic poetry out of the lays in which A®olic minstrels sang of the old Achean wars. And among the Jonians arose elegiac poetry, the first variation on the epic type. These found a fitting instrument in the harmonious [onic dialect, the flexible utterance of a quick and versatile intelligence. The AXolians of Lesbos next created the lyric of personal passion, in which the traits of their race—its chivalrous pride, its bold but sensuous fancy—found a fitting voice in the fiery strength and tenderness of Aolic speech. The Dorians of

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material for this is furnished by the serics of monographs in Curtius's Studien zur Griechischen und Lateinischen Grammatik (10 vols, Leipsic, 1868-78) and in many scattered programmes and disserta- tions. Mr Merry's Specimens of Greck Dialcets (Clarendon Press, 1875) contains admirably clear and useful introductions for junior students. Bergk's Gricchische Litcraturgeschichte contains much that is useful, but needs to be used with caution. For modern Greek the standard works are Sophocles's Glossary of Later and Byzantine Greek (Boston, 1870), and Mullach's Grammatik der Gricchischen Vulgarsprache (Berlin, 1856). (A. 8. W.)

the Peloponnesus, Sicily, and Magna Greaecia then perfected the choral lyric for festivals and religious worship ; and here again an earnest faith, a strong pride in Dorian usage and renown, had an apt interpreter in the massive and sonorous Doric. Finally, the Attic branch of the Ionian stock produced the draina, blending elements of all the other kinds, and developed an artistic literary prose in history, oratory, and philosophy. It is in the Attic litera- ture that the Greek mind receives its niost complete inter- pretation.

A natural affinity was felt to exist between each dialect and that species of composition for which it had been speci- ally used. Hence the dialect of the Ionian epic poets would be adopted with more or less thoroughness even by epic or elegiac poets who were not Ionians. Thus the Molian Hesiod uses it in epos, the Dorian Theognis in elegy, though not without alloy. Similarly, the Dorian Theocritus wrote love-songs in Adolic. The Attic Tyrtzeus used Doric forms for his marching songs. All the faculties and tones of the language were thus gradually brought out by the co-operation of the dialects. Old Greek literature has an essential unity—the unity of a living organism; and this unity comprehends a number of distinct types, each of which is complete in its own kind.

Extant Greek literature begins with the Homeric poems. Pre- These are works of art which imply a long period of antece- Homer dent poetical cultivation. Of the pre-Homeric poetry we PY) have no remains, and very little knowledge. Such glimpses as we get of it connect it with two different stages in the religion of the prehistoric Hellenes. The first of these stages is that in which the agencies or forms of external nature were personified

indeed, yet with the consciousness that the personal names were only symbols. Some very ancient Greek songs of which mention is made may have Songs | belonged to this stage—as the songs of Linus, Talemus, and # a . Hylas. Linus, the fair youth killed by dogs, seems to be“ the spring passing away before Sirius. Such songs have been aptly called “songs of the seasons.” The second stage is that in which the Hellenes have now definitively personi- fied the powers which they worship. Apollo, Demeter, Dionysus, Cybele, have now become to them beings with clearly conceived attributes. To this second stage belong the hymns connected with the names of the legendary bards, Byms) such as Orpheus, Museus, Eumolpus, who are themselves | associated with the worship of the Pierian Muses and the Attic ritual of Demeter. The seats of this early sacred } poetry are not ouly ‘Thracian ”—z.e., on the borders of | northern Greece—but also ‘ Phrygian” and “Cretan.” It | belongs, that is, presumably to an age when the ancestors of the Hellenes had left the Indo-European home in central Asia, but had not yet taken full possession of the lands which were afterwards Hellenic. Some of their tribes were still in Asia; others were settling in the islands of the] fEgean ; others were passing through the lands on its northern sea board. If there was a period when the Greeks possessed no poetry but hymns forming part of a religious ritual, it may be conjectured that it was not of long duration. Already in the Ziad a secular character belongs to the

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GRE marriage hymn and to the dirge for the dead, which in ancient India were chanted by the priest. The bent of the Greeks was to claim poetry and music as public joys ; they would not long have suffered them to remain sacerdotal mysteries. And among the earliest themes on which the lay artist in poetry was employed were probably war-ballads, sung by minstrels in the houses of the chiefs whose ancestors they celebrated.

Such war-ballads were the materials from which the earliest epic poetry of Greece was constructed. By an “epic” poem the Greeks meant a narrative

of heroic action in hexameter verse. The term epe meant at first simply "verses"; it acquired its special meaning only when mele, lyric songs set to music, came to be distinguished from epe, verses not set to music, but merely recited. Epic poetry is the only kind of extant Greek poetry which is older than about 700 B.c. The early epos of Greece is repre- sented by the Ziad and the Odyssey, Hesiod, and the Homeric hymns ; also by some fragments of the "Cyclic"

oets. : After the Dorian conquest of the Peloponnesus, the AAolian emigrants who settled in the north-west of Asia

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- *Minor brought with them the warlike legends of their chiefs,*

the Achzan princes of old. These legends lived in the ballads of the Advlic minstrels, and from them passed southward into Ionia, where the Ionian poets gradually shaped them into higher artistic forms. Among the seven places which claimed to be the birthplace of Homer, that which has the best title is Smyrna. Homer himself is called "son of Meles"—the stream which flowed though old Smyrna, on the border between AXolia and Ionia. The tradition is significant in regard to the origin and character of the //iad, for in the Ziad we have Achean ballads worked up by Ionian art. A preponderance of evidence is in favour of the view that the Odyssey also, at least in its earliest form, was composed on the Ionian, coast of Asia Minor, According to the Spartan account, Lycurgus was the first to bring to Greece a complete copy of the Homeric poems, Which he had obtained from the Creophylide, a clan or guild of poets in Samos. A better authenticated tradition connects Athens with early attempts to preserve the chief poetical treasure of the nation. Pisistratus is said to have charged some learned men with the task of collecting all "the poems of Homer"; but it is difficult to decide how much was comprehended under this last phrase, or whether the province of the commission went beyond the mere task of collecting, Nor cau it be determined what exactly it was that Solon and Hipparchus respectively did for the Homeric poems, Solon, it has been thought, enacted that the poems should be recited from an authorized text (e€ troBoXjjs); Hipparchus, that they should be recited in a regular order (éé éoArjwews). At any rate, we know that In the 6th century z.c. a recitation of the poems of

Homer Was one of the established competitions at the Panathenza, held once in four years. The reciter was called a rhapsodist, ~Properly one whio weaves a long, smoothly-flowing chant, then an epic poet who chants his own or another's poem. The rhapsodist did not, like the early minstrel, use the accom- Paniment of the harp ; he gave the verses in a flowing recita- tive, bearing in his hand a branch of laurel, the symbol of Apollo's Inspiration. In the 5th century Bc. we find that various Greek cities had their own editions (ai wodurixal éxddcrets) of the poems, for recitation at their festivals. Among these were the editions of Massilia, of Chios, and of Argos.

here were also editions bearing the name of the individual editor (ai Kar' avSpa),—the best known being that which Aristotle prepared for Alexander. The recension of the poems by Aristarchus (156 B.C.) became the standard one, and is probably that on which the existing text is based. The oldest Homeric MS, extant, Venetus A of the Ziad,

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is of the 10th century ; the first printea edition of Homer was that edited by the Byzantine Demetrius Chalcondyles (Florence, 1488). The first Aldine edition appeared twelve years later,

The ancient Greeks were almost unanimous in believing The the Iliad and the Odyssey to be the work of one man, Homeric Homer, to whom they also ascribed some extant hymns, and (°es#ion-

probably much more besides. Aristotle and Aristarchus seem to have put Homer's date about 1044 3.c., Herodotus about 850 B.c. It was not till abcut 170 B.c. that the grammarians Hellanicus and Xenon put forward the view that Homer was the author of the Jliad, but not of the Odyssey. Those who followed them in assigning different authors to the two poems were called the Separaters (or Chorizontes). Aristarchus combated "the paradox of Xenon," and it does not seem to have had much acceptance in antiquity. Vico, a Neapolitan (1668-1744), seenis to have been the first modern to suggest the composite author- ship and oral tradition of the Homeric poems; but this was a pure conjecture in support of his theory that the names of ancient lawgivers and poets are often meresymbols. F, A. Wolf, in

the Prolegomena to his edition (1795), was the founder of a scientific scepticism. The Jliad, he said (for he recoguized the comparative unity and consistency of the Odyssey), was pieced together from many small unwritten poems by various hands, and was first committed to writing in the time of Pisistratus. This view was in harmony with the tone of German criticism at the time; it was welcomed as a new testimony to the superiority of popular poetry, springing from fresh natural sources, to elaborate works of art; and it at once found enthusiastic adherents. For the course of Homeric controversy since Wolf the reader is referred to the article Homer. The general result has been, not to prove any precise theory of authorship, but rather to establish certain general propositions, and so far to limit the question. It is now generally admitted that the Jliad and the Odyssey, whatever their absolute or rela- tive ages, must at least be regarded as belonging to the maturity of a poetical school in Ionia, which had gradually created an epic style. Next, it can no longer be doubted that the Z/ad contains elements of various age and origin ; the form and the matter alike show this, though we cannot with certainty point to any one group of these elements as the original nucleus around which our Z/iad grew. Compar- ing the Odyssey with the Iliad, we perceive greater unity of design and of colouring, and indications of a somewhat later time ; but not even here can we affirm that the poem, as we have it, is the work of one man.

The Ionian school of epos produeed a number of poems Cyclic founded on the legends of the Trojan war, and intended as Poems.

introductions or continuations to the /liad and the Odyssey. The grammarian Proclus (140 a.p.) has preserved the names and subjects of some of these; but the fragments are very scanty. The Nostoi or Homeward Voyages, by Agias of Troezen, filled up the gap of ten years between the Iliad and the Odyssey; the Lay of Telegonus, by Eugammon of Cyrene, continued the story of the Odyssey to the death of Odysseus by the hand of Telegonus, the son whom Circe bore to him. Similarly the Cyprian Lays, by Stasinus of Cyprus, was introductory to the Ziad; the dthiopis and the Sack of Troy, by Arctinus of Miletus, and the Zvttle Iliad, by Lesches of Mitylene, were supplementary to it. These and many other names of lost epics—some taken also from the Theban myths—serve to show how prolific was that epic school of which only two great examples remain. The name of epic cycle

was properly applied to a prose com- pilation of abstracts from these epics, pieced together in the order of the events. The compilers were called "cyclic " writers ; and the term has now been transferred to the epic poets whom they used.

XI. — 18

Hesiodic epos,

The Homeric Hymns,

The epic poetry of Ionia celebrated the great deeds of heroes in the old wars. But in Greece proper there arose another school of epos, which busied itself with religious lore and ethical precepts, especially in relation to the rural life of Boeotia. This school is represented by the name of Hesiod. The legend spoke of him as vanquishing Homer in a poetical contest at Chalcis in Eubcea; and it expresses the fact that, to the old Greek mind, these two names stood for two contrasted epic types. Nothing is certainly known of his date, except that it must have been subsequent to the maturity of Ionian epos. He is conjecturally placed about 850-800 B.c. ; but some would refer him to the early part of the 7th century B.c. His home was at Ascra, a village in a valley under Helicon, whither his father had migrated from Cyme in A®olis on the coast of Asia Minor. In Hesiod's Works and Days we have the earliest example of a didactic poem. The seasons and the labours of the Beeotian farmer's year are followed by a list of the days which are lucky or unlucky for work. The Zheogony, or "Origin of the Gods," describes first how the visible order of nature arose out of chaos; next, how the gods were born. Though it never possessed the character of a sacred book, it remained a standard authority on the genealogies of the gods. So far asa corrupt and confused text warrants a judgment, the poet was piecing together—not always in- telligently—the fragments of a very old cosmogonic system, using for this purpose both the hymns preserved in the temples and the myths which lived in folklore. The epic lay in 480 lines called the Shield of Heracles—partly imi- tated from the 18th book of the Z/iad—is the work of an author or authors later than Hesiod. In the Hesiodic poetry, as represented by the Works and Days and

the Theogony, we see the influence of the temple at Delphi. Hesiod recognizes the existence of daimones—spirits of the departed who haunt the earth as the invisible guardians of justice; and he connects the office of the poet with that of the prophet. The poet is one whom the gods have authorized to impress doctrine and practical duties on men. A religious purpose was essentially characteristic of the Hesiodic school. Its poets treated the old legends as relics of a sacred history, and not merely, in the Ionian manner, as subjects of ideal- izing art. Such titles as the Maxims of Oheiron and the Lay of Melampus, the seer—lost poems of the Hesiodic school—illustrate its ethical and its mystic tendencies.

The Homeric Hymns form a collection of thirty-three pieces, some of them very short, in hexameter verse. Their traditional title is—Hymns or Preludes of Homer and the Homeride, The second of the alternative designations is the true one. The pieces are not " hymns" used in formal worship, but "preludes" or prefatory addresses (pooipia) with which the rhapsodists ushered in their recitations of epic poetry. The "prelude" might be addressed to the presiding god of the festival, or to any local deity whom the reciter wished to honour. The pieces range in date perhaps from 750 to 500 B.c., and it is probable that the collection was formed in Attica, for the use of rliapsodists. The style is that of the Ionian or Homeric epos; but there are also several traces of the Hesiodic or Boeotian school. The five principal "hymns" are those (1) to the Delian Apollo, i. 1-177; (2) to the Pythian Apollo, i. 178 to end ; (3) to Hermes, ii; (4) to Aphrodite, iii; and (5) to Demeter, v. The hymn to the Delian Apollo, quoted by Thucydides (iii. 104) as Homer's, is of peculiar interest on account of the lines describing the Ionian festival at Delos. Two celebrated pieces of a sportive kind passed under el Shame, The Margites—a comic poem on one " who =|. many things but knew them all badly "»—is regarded

y Aristotle as the earliest germ of comedy, and was possibly as old as 700 Bc, Only a few lines remain. The Battle of the Frogs and Mice probably belongs to the decline of

Greek literature, perhaps to the 2d century B.c. About 300 verses of it are extant. .

In the Ziad and the Odyssey the personal opinions or sym- Tran; pathies of the poet may sometimes be conjectured, but they tonf are not declared, or even hinted. Hesiod, indeed, some- P% times gives us a glimpse of his own troubles or views. Yet" Hesiod is, on the whole, essentially a prophet. The message which he delivers is not from himself; the truths which he imparts have not been discovered by his own search. He is the mouthpiece of the Delphian Apollo. Personal opinion and feeling may tinge his utterance, but they do not deter- mine its general complexion. The egotism is a single thread ; it is not the basis of the texture. Epic poetry was in Greece the foundation of all other poetry; for many centuries no other kind was generally cultivated, no other could speak to the whole people. Politically, the age was monarchical or aristocratic; intellectually, it was too simple for the analysis of thought or emotion. Kings and princes loved to hear of the great deeds of their ancestors; common men loved to hear of them too, for they had no other interest. The mind of Greece found no subject of contem- plation so attractive as the warlike past of the race, or so useful as that lore which experience and tradition had be- — queathed. But in the course of the 8th century B.c. the rule of hereditary princes began to disappear. Monarchy gave place to oligarchy, and this—often after the inter- mediate phase of a tyranny—todemocracy. Such a change was necessarily favourable to the growth of reflection. The private citizen is no longer a mere cipher, the Homeric vis,

a unit in the dim multitude of the king-ruled folk ; he gains more power of independent action, his mental horizon is widened, his life becomes fuller and more interesting. He begins to feel the need of expressing the thoughts and feel- ings that are stirred in him. But as yet a prose literature does not exist ; the new thoughts, like the old heroic stories, must still be told in verse. The forms of verse created by | this need were the Elegiac and the Iambic.

The elegiac metre is, in form, a simple variation on the Eleg, epic metre, obtained by docking the second of two hexa- meters so as to make it a verse of five feet or measures, But the poetical capabilities of the elegiac couplet are of a wholly different kind from those of heroic verse. legos seems to be the Greek form of a name given by the Carians and Lydians to a lament for the dead. This was accom- panied by the soft music of the Lydian flute, which con- tinued to be associated with Greek elegy. The non- Hellenic origin of elegy is indicated by this very fact. The flute was to the Greeks an Asiatic instrument,—string instruments were those which they made their own,—and it would hardly have been wedded by them to a species of poetry which had arisen among themselves. The early elegiac poetry of Greece was by no means confined to mourn- ing for thedead. War, love, politics, proverbial philosophy, were in turn its themes; it dealt, in fact, with the chief interest of the poet and his friends, whatever that might be at the time. It is the direct expression of the poet's own thoughts, addressed to a sympathizing society. Thisisits | first characteristic. The second is that, even when most pathetic or most spirited, it still preserves, on the whole, | the tone of conversation or of narrative. Greek elegy stops short of lyric passion. English elegy, whether funereal as in Dryden and Pope, or reflective as in Gray, is usually true to the same normal type. Roman elegy is not equally true to it, but sometimes tends to trench on the lyric province For Roman elegy is mainly amatory or sentimental ; and its masters imitated, as a rule, not the early Greek elegists, not. Tyrtzeus or Theognis, but the later Alexandrian elegists, such as Callimachus or Philetas. Catullus introduced the metre to Latin literature, and used it with more fidelity than his followers to its genuine Greek inspiration.

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Elegy, as we have seen, was the first slight deviation from epos. But almost at the same time another species arose which had nothing in common witli epos, either in form or in spirit. This was the iambic. The word zambos (vapto, to dart or shoot) was used in reference to the licensed raillery at the festivals of Demeter ; it was the maiden Jambe, the myth said, who drew the first smile from the mourning goddess. The iambic metre was at first used for satire ; and it was in this strain that it was chiefly employed by its earliest master of note, Archilochus of Paros (670 B.c.). But it was adapted to the expression generally of any pointed thought. Thus it was suitable to fables. Elegiac and iambic poetry both belong to the borderland between epic and lyric. While, however, elegy stands nearer to epos, iambic stands nearer to the lyric. Iambic poetry can express the personal feeling of the poet with greater intensity than elegy does; on the other hand, it has not the lyric flexibility, self-abandonment, or glow. As we see in the case of Solon, iambic verse could serve for the expression of that deeper thought, that more inward self-communing, fur which the elegiac form would have been inappropriate.

But these two forms of poetry, both Ionian, the elegiac and the iambic, belong essentially to the same stage of the literature. They stand between the Ionian epos and the lyric poetry of the Aolians and Dorians. The earliest of the Greek elegists, Callinus and Tyrtzus, use elegy to rouse a warlike spirit in sinking hearts. Archi- lochus too wrote warlike elegy, but used it also in other strains, as inlament forthe dead. The elegy of Mimnermus is the plaintive farewell of an ease-loving Ionian to the days of Ionian freedom. In Solon elegy takes a higher range ; it becomes political and ethical. Theognis represents the maturer union of politics with a proverbial philosophy, Xenophanes gives a philosophic strain to elegy. With Simonides of Ceos it reverts, in an exquisite form, to its earliest destination, and becomes the vehicle of epitaph on those who fell in the Persian wars. Iambic verse was used by Simonides of Amorgus, as by Archilochus, for satire,—but satire directed against classes rather than persons. Solon's iambics so far preserve the old associations of the metre that they represent the polemical or controver- sial side of his political poetry. Hipponax of Ephesus was another iambic satirist—using the "scazon" or " limping " verse, produced by substituting a spondee for an iambus in the last place.

But it was not until the rise of the Attic drama that the full capabilities of iambic verse were seen,

The lyric poctry of early Greece may be regarded as the final form of that effort at self-expression which in the elegiac and iambicis still incomplete. The lyric expression 1s deeper and more impassioned. Its intimate union with music and with the rhythmical movement of the dance gives to it more of an ideal character. At the same time the continuity of the music permits pauses to the voice, —pauses necessary as reliefs after a climax. Before lyric poetry could be effective, it was necessary that some progress Should have been made in the art of music. The instru- ment used by the Greeks to accompany the voice was the four-stringed lyre, and the first great epoch in Greek music was when Terpander of Lesbos (660 B.C.), by adding three Strings, gave the lyre the compass of the octave, Further improvements are ascribed to Olympus and Thaletas. By 500 Bc, Greek music had probably acquired all the powers of expression which the lyric poet could demand. The Period of Greek lyric poetry may be roughly defined as from 670 to 440 no, 'Two different parts in its develop- ment were taken by the Alolians and the Dorians.

The lyric poetry of the Alolians—especially of Lesbos— was essentially the utterance of personal feeling, and was usually intended for a single voice, not for a chorus.

EARLY POETRY. |

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Lesbos, in the 7th century Bc., had attained some naval and commercial importance. But the strife of oligarchy and democracy was active; the Lesbian nobles were often driven by revolution to exchange their luxurious home-life for the hardships of exile. It is such a life of contrasts and excitements, working on a sensuous and fiery temperament, that is reflected in the fragments of Alceus. In these glimpses of war and love, of anxiety for the storm-tossed state and of careless festivity, there is much of the cavalier spirit ; if Archilochus is in certain aspects a Greek Byron, Alexus might be compared to Lovelace. The other great representative of the /Molian lyric is Sappho, the only woman of Greek race who is known to have possessed

poeti- cal genius of the first order. Intensity and melody are the characteristics of the fragments that remain to us. Pro-

bably no poet ever surpassed Sappho as an interpreter of

passion in exquisitely subtle harmonies of form and sound. Anacreon of Teos, in Ionia, may be classed with the A°olian lyrists in so far as the matter and form of his work resem- bled theirs, though the dialect in which he wrote was mainly the Ionian. A few fragments remain from his hymns to the gods, from love-poems and festive songs. The collection of sixty short pieces which passes current under his name dates only from the 10th century. The short poems which it comprises are of various age and authorship, —all of them probably of the Christian era. They have not the pure style, the flexible grace, or the sweetness of the classical fragments ; but the verses, though somewhat mechanical, are often pretty.

The Dorian lyric poetry, in contrast with the Aolian, had more of a public than of a personal character, and was for the most part choral. Hymns or choruses for the public worship of the gods, and odes to be sung at festivals on occasions of public interest, were its characteristic forms. Its central inspiration was the pride of the Dorians in the Dorian past, in their traditions of worship, government, and social usage. The history of the Dorian lyric poetry does not present us with vivid expressions of personal character, like those of Alczeus and Sappho, but rather with a series of artists whose names are associated with improvements of form. Thus Aleman (660 B.c.) is said to have introduced the balanced movement of strophe and antistrophe. Stesi- chorus, of Himera in Sicily, added the epode, sung by the chorus while stationary after these movements; Arion gave a finished form to the choral hymn ("dithyramb") in honour of Dionysus, and organized the "cyclic" or circular chorus which sang it at the altar.

The culmination of the lyric poetry is marked by two great names, Simonides and Pindar. Simonides was an Ionian of the island of Ceos, but his lyrics belonged by form to the choral Dorian school. Many of his subjects were taken from the events of the Persian wars: his epitaphs on those who fell at Thermopyle and Salamis were celebrated. In him the lyric art of the Dorians is inter- preted by Jonian genius, and Athens—where part of his life was passed—is the point at which they meet. Simonides is the

first Greek lyrist whose significance is not merely folian or Dorian but Panhellenic. The same character belongs even more completely to his younger contemporary. Pindar was born in Boeotia of a Dorian stock; thus, as Ionian and Dorian elements meet in Simonides, so Dorian and AMolian elements meet in Pindar.. Simonides was perhaps the most tender and most exquisite of the lyric poets. Pindar was the boldest, the most fervid, and the most sublime. His extant fragments represent almost every branch of the lyric art. But he is known to us mainly by forty-four Hpnicia, or odes of victory, for the Olympian, Pythian, Nemean, and Isthmian festivals. The general characteristic of the treatment is that the particular victory is made the occasion of introducing heroic legends connected

Dorian school

Simonides

and Pindar,

Origin of

drama.

Tragedy.

Aischylus,

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with the family or city of the victor, and of inculcating the moral lessons which they teach. No Greek lyric poetry can be completely appreciated apart from the music, now lost, to which it was set. Pindar's odes were, further, essentially occasional poems; they abound in allusions of which the effect is partly or wholly lost on us; and the glories which they celebrate belong to a life which we can but imperfectly realize. Of all the great Greek poets, Pindar is perhaps the one to whom it is hardest for us to do justice ; yet we can at least recognize his splendour of imagination, his strong rapidity, and his soaring flight.

Il. The Attic Literature.

The Ionians of Asia Minor, the Aolians, and tlie Dorians had now performed their special parts in the development of Greek literature. Epic poetry had interpreted the heroic legends of warlike deeds done by Zeus-nourished kings and chiefs. Then, as the individual life became more and more, elegiac and iambic poetry had become the social expression of that life in all its varied interests and feelings. Lastly, lyric poetry had arisen to satisfy a twofold need—to be the more intense utterance of personal emotion, or to give choral voice, at stirring moments, to the faith or fame, the triumph or the sorrow, of a city ora race. A new form of poetry was now to be created, with elements borrowed from all the rest. And this was to be achieved by the people of Attica, in whose character and language the distinctive traits of an Ionian descent were tempered with some of the best qualities of the Dorian stock.

The drama arose from the festivals of Dionysus, the god of wine, which were held at intervals from the beginning of winter to the beginning of spring. A troop of rustic worshippers would gather around the altar of the god, and sing a hymn in his honour, telling of his victories or sufferings in his progress over the earth. "Tragedy " meant 'the goat-song," a goat being sacrificed to Dionysus before the hymn was sung. "Comedy," "the village-song," is the same hymn regarded as an occasion for rustic jest. Then the leader of the chorus would assume the part of a messenger from Dionysus, or even that of the god himself, and recite an adventure to the worshippers, who made choral response. The next step was to arrange a dialogue between the leader (corypheus) and one chosen member of the chorus, hence called "the answerer " (hypocrites, afterwards the ordinary word for "actor "). This last improvement is ascribed to the Attic Thespis (about 536 B.c.). The elements of drama were now ready. The choral hymn to Dionysus (the '"dithyramb ") had received an artistic form from the Dorians ; dialogue, though only between the leader of the chorus and a single actor, had been introduced in Attica. Phrynichus, an Athenian, celebrated in this manner some events of the Persian wars ; but in his "drama" there was still only one actor.

Aischylus (born 525 B.c.) became the real founder of tragedy by introducing a second actor, and thus rendering the dialogue independent of the chorus. At the same time the choral song—hitherto the principal part of the performance—became subordinate to the dialogue; and drama was mature. schylus is also said to have made various improvements of detail in costume and the like; and it was early in his career that the theatre of Dionysus under the acropolis was commenced—the first permanent home of Greek drama, in place of the temporary wooden platforms which had hitherto been used. The system of the "trilogy" and the "tetralogy" is further ascribed to féschylus,—the " trilogy" being properly a series of three tragedies connected in subject, such as the Agamemnon, pc Humenides, which together form the Oresteia, or we of Orestes. The "tetralogy" is such a triad with a

yric drama " added—that is, a drama in which " satyrs,"

the grotesque woodland beings who attended on Dionysus, formed the chorus, as in the earlier dithyramb from which drama sprang. The Cyclops of Kuripides is a satyric drama. In the seven tragedies which alone remain of the seventy which Aeschylus is said to have composed, the forms of kings and heroes have a grandeur which is truly Homeric ; there is a spirit of Panhellenic patriotism such as the Persian wars in which he fought might well quicken in a soldier-poet ; and, pervading all, there is a strain of speculative thought which seeks to reconcile the apparent conflicts between the gods of heaven and of the underworld by the doctrine that both alike, constrained by necessity, are working out the law of righteousness. ZEschylus (495 B.c.), is the most perfect artist of the ancient drama. WNo one before or after him gave to Greek tragedy so high a degree of ideal beauty, or appreciated so finely the possibilities and the limitations of its sphere. He excels especially in drawing character; his Antigone, his Ajaa, his @dipus—aindeed, all the chief persons of his dramas— are typical studies in the great primary emotions of human nature. He gavea freer scope to tragic dialogue by adding a third actor; and in one of his later plays, the Wdipus at Colonus, a fourth actor is required. From the time

when he won the tragic prize against Auschylus in 468 to his death in 405 3.c. he was the favourite dramatist of Athens; and for us he is not only a great dramatist, but also the most spiritual representative of the age of Pericles. The

distinctive interest of Euripides is of another kind. He Ewipid

was only fifteen years younger than Sophocles; but when he entered on his poetical career, the old inspirations of tragedy were already failing. Euripides marks a period of transition in the tragic art, and is, in fact, the mediator between the classical and the romanticdrama. The myths and traditions with which the elder dramatists had dealt no longer commanded an unquestioning faith. Euripides him- self was imbued with the new intellectual scepticism of the day ; and the speculative views which were conflicting in his own mind are reflected in his plays. He had much picturesque and pathetic power; he wasa master of expres- sion; and he shows ingenuity in devising fresh resources for tragedy—especially in his management of the choral songs. /lschylus is Panhellenic, Sophocles is Athenian, Euripides is cosmopolitan. He stands nearer to the modern world than either of his predecessors; and though with him Attic tragedy loses its highest beauty, it acquires new elements of familiar human interest.

In Attica, as in England, a period of rather less than fifty years sufficed for the complete development of the tragic art. The two distinctive characteristics of Athenian drama are its originality and its abundance. The Greeks of Attica were not the only inventors of drama, but they were the first people who made drama a complete work of art. And the great tragic poets of Attica were remark- ably prolific. A%schylus was the reputed author of 70 tragedies, Sophocles of 113, Euripides of 92; and there were others whose productiveness was equally great.

Comedy represented the lighter side, as tragedy the Comed,

graver side, of the Dionysiac worship; it was the joy of spring following the gloom of winter. The process of growth was nearly the same as in tragedy; but the Dorians, not the Ionians of Attica, were the first who added dialogue to the comic chorus, Susarion, a Dorian of Megara, ex- hibited about 580 B.c. pieces of the kind known as "Megarian farces." 'The more

artistic form of comedy seems, however, to have been developed in Attica. The greatest names before Aristophanes are those of Cratinus and Eupolis; but from about 470 B.c. there seems to have been a continuous succession of comic dramatists.

Aristo- Arist

Sophocles, who was born thirty years after Sophoc

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. ° eg F phanes came forward as a comic poet in 427 B.c., and re- —-.

tained his popularity for about forty years. He presets

ATTIC LITERATURE. |

a perhaps unique union of bold fancy, exquisite humour, critical acumen, and lyrical power. His eleven extant comedies may be divided into three groups, according as the licence of political satire becomes more and more restricted. In the Acharnians, Knights, Clouds, Wasps, and Peace (425-421) the poet uses unrestrained freedom. In the Birds, Lysistrata, Thesmophoriazuse, and rogs (414-405) a greater reserve may be perceived. Lastly, in the Acclesiazuse and the Plutus (392-388) personal satire is almost wholly avoided. The same general tendency continued. The so-called "Middle Comedy" (390-320) represents the transition from the Old Comedy, or political satire, to satire of a literary or social nature. The " New Comedy" (320-250) resembled the modern " comedy of manners." These successive periods cannot be sharply or precisely marked off. The

change which gradually passed over the comic drama was simply the reflexion of the change which passed over the political and social life of Athens. The Old Comedy, as we see it in the earlier plays of Aristo-

- phanes, was probably the most powerful engine of public

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criticism that has ever existed in any community. Unspar- ing personality was its essence. The comic poet used this recognized right on an occasion at once festive and sacred,

in a society where every man of any note was known by

name and sight to the rest. The same thousands who heard a policy or a character denounced or lauded in the theatre might be required to pass sentence on it in the popular assembly or in the courts of law.

iterary The development of Greek poetry had been completed

before a prose literature had begun to exist. The earliest name in extant Greek prose literature is that of Herodotus ; and, when he wrote, the Attic drama had already passed its prime. 'There had been, indeed, writers of prose before Herodotus ; but there had not been, in the proper sense of the term, a prose literature. The causes of this compara- tively late origin of Greek literary prose are indepeudent of the question as to the time at which the art of writing began to be generally used for literary purposes. Epic poetry exercised for a very long period a sovereign spell over the Greek mind. In it was deposited all that the race possessed of history, theology, philosophy, oratory. Even after an age of reflexion had begun, elegiac poetry, the first offshoot of epic, was, with iambic verse, the vehicle of much

which among other races would have been com- mitted to prose. The basis of Greck culture was essentially poetical. A political cause worked in the same direction. In the Eastern monarchies the king was the centre of all, and the royal records afforded the elements of history from a remote date. The Greek nation was broken up into small states, each busied with its own affairs and its own men. It was the collision between the Greek and the barbarian World which first provided a national subject for a Greek historian. The work of Hercdotus, in its relation to Greek prose, is so far analogous to the Z/iad in its relation to Greek poetry, that it is the earliest work of art, and that it bears a Pauhellenic stamp.

'The sense and the degree in which Herodotus was original May be inferred from what is known of earlier Prose-writers. For about a century before Herodotus there had been a series of writers in philosophy, mytho- logy, geography, and history. The earliest, or among the earliest, of the philosophical writers were Phere- cydes of Syros (550 B.c.) and the Ionian Anaximenes and Anaximander. The Jonian writers, especially called logographi, "narrators in prose" (as distinguished from €popow, makers of verse), were those who compiled the myths, especially in genealogies, or who described foreign Countries, their physical features, usages, and traditions. Hecateus of Miletus (500 8.c.) is the best-known repre- sentative of the logographi in both these branches. Hel-

lanicus of Mitylene (450 B.c.), among whose works was a history of Attica, appears to have made a nearer approach to the character of a systematic historian.

Herodotus was born in 484 B.c.; and his history was Hero- probably not completed before the beginning of the Pelo- dotus.

ponnesian War (431 3.c.). His subject is the struggle between Greece and Asia, which he deduces from the legendary rape of the Argive Io by Phcenicians, and traces down to the final victory of the Greeks over the invading host of Xerxes. His literary kinship with the historical or

geographical writers who had preceded him is seen mainly in two things. First, though he draws a line between the mythological and the historical age, he still holds that myths, as such, are worthy to be reported, and that in certain cases it is part of his duty to report them. Secondly, he follows the example of such writers as Hecateus in describing the natural and social features of countries. He seeks to combine the part of the geographer or intelligent traveller with his proper part as historian. But when we turn from these minor traits to the larger aspects of his work, Herodotus stands forth as an artist whose conception and whose method were his own. His history has an epic unity. Various as are the subor- dinate parts, the action narrated is one, great and complete; and the unity is due to this that Herodotus refers all events of human history to the principle of divine Nemesis. If Sophocles had told the story of Gidipus in the Gdipus Tyrannus alone, and had not added to it the Wdipus at Colonus, it would have been comparable to the story of Xerxes as told by Herodotus. Great as an artist, great too in the largeness of his historical conception, Herodotus fails chiefly by lack of insight into political cause and effect, and by a general silence in regard to the history of political institutions. Both his strength and his weakness are seen most clearly when he is contrasted with that other historian who was strictly his coutemporary, and who yct seems divided from him by centuries.

Thucydides was only thirteen years younger than Thuey- Herodotus; but the intellectual space between the men dides.

is so great that they scem to belong to different ages. Herodotus is the first artist in historical writing ; Thucy- dides is the first thinker. Herodotus interweaves two threads of causation—human agency, represented by the good or bad qualities of men, and divine agency, represented by the vigilance of the gods on behalf of justice. Thucydides concentrates his attention on the human agency (without, however, denying the other), and strives to trace its exact course. The subject of Thucydides is the Peloponnesian War. In resolving to write its history, he was moved, he says, by these considerations. It was probably the greatest movement which had ever affected Hellas collectively. It was possible for him as a contem- porary to record it with approximate accuracy. And this record was likely to have a general value, over and above its particular interest as a record,

seeing that the political future was likely to resemble the political past. This is what Thucydides means when he calls his work "a possession for ever." The speeches which he ascribes to the persons of the history are, as regards form, his own essays in rhetoric of the school to which Antiphon belongs. As regards matter, they are always so far dramatic that the thoughts and senti- ments are such as he conceived possible for the supposed speaker. Thucydides abstains, as a rule, from moral com- ment; but he tells his story as no one could have told it who did not profoundly feel its tragic force ; and his gene- ral claim to the merit of impartiality is not invalidated by the possible exceptions—difficult to estimate—in the cases of Cleon and Hyperbolus.

Strong as is the contrast between Herodotus and Xeno- Thucydides, their works have yet a character which dis- phon.

Oratory.

The Attic orators.

tinguish both alike from the historical work of Xeno- phon in the Anabasis and the Mellenica. Herodotus gives us a vivid drama with the unity of an epic. Thucy- dides takes a great chapter of contemporary history and traces the causes which are at work throughout it, so as to give the whole a scientific unity. Xenophon has not the grasp either of the dramatist or of the philosopher. His work does not possess the higher unity either of art or of science. The true distinction of Xenophon consists in his thorough combination of the practical with the literary character, He was an accomplished soldier, who had done and seen much. He was also a good writer, who could make a story both clear and lively. But the several parts of the story are not grouped around any central idea, such as a divine Nemesis is for Herodotus, or such as Thucydides finds in the nature of political man, The seven books of the Hellenica form a supplement to the history of Thucy- dides, beginning in 411 and going down to 362 B.c. The chief blot on the LHellenica is the author's partiality to Sparta, and in particular to Agesilaus. Some of the greatest achievements of Epaminondas and Pelopidas are passed over in silence. Onthe whole, Xenophon is

perhaps seen at his best in his narrative of the Jetreat of the Ten Thousand —a subject which exactly suits him. The Cyro- pedia isa romance of little historical worth, but with many good passages, Zhe Recollections of Socrates, on the other hand, derive their principal value from being uniformly matter-of-fact. In his minor pieces on various subjects Xenophon appears as the earliest essayist. It may be noted that one of the essays erroneously ascribed to him—that On the Athenian Polity—is probably the oldest specimen in existence of literary Attic prose.

The steps by which an Attic prose style was developed, and the principal forms which it assumed, can be traccd most clearly in the Attic orators. Every Athenian citizen who aspired to take part in the affairs of the city, or even to be qualified for self-defence before a law-court, required to have some degree of skill in public speaking; and an Athenian audience looked upon public debate, whether political or forensic, as a competitive trial of proficiency in a fine art. Hence the speaker, no less than the writer, was necessarily a student of finished expression ; and oratory had a more direct influence on the general structure of literary prose than has ever perhaps been the case else- where, A systematic rhetoric took its rise in Sicily, where Corax of Syracuse (466 B,c.) devised his Art of Words to assist those who were pleading before the law-courts ; and it was brought to Athens by his disciple Tisias. The teach- ing of the Sophists, again, directed attention, though in a superficial and imperfect way, to the elements of grammar and logic; and Gorgias of Leontini—whose declamation, however turgid, must have been striking—gave an impulse at Athens to the taste for elaborate rhetorical brilliancy,

Antiphon represents the earliest, and what has been called the grand, style of Attic prose; its chief characteristics are a grave, dignified movement, a frequent emphasis on verbal contrasts, and a certain austere elevation, The interest of Andocides is mainly historical ; but he has graphic power. Lysias, the representative of the "plain style," breaks through the rigid mannerism of the elder school, and uses the language of daily life with an ease and grace which, though the result of study, do not betray their art. He is, in his own way, the canon of an Attic style; and his speeches, written for others, exhibit also a high degree of dramatic skill. Isocrates, whose manner may be regarded as intermediate between that of Antiphon and that

of Lysias, wrote for readers rather than for hearers. The type of literary prose which he founded is distinguished by ample periods, by studied smoothness, and by the temperate use of rhetorical ornament. From the middle of the 4th century B.c. the

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Tsocratic style of prose became general in Greek literature, From the school of Rhodes, in which it became more florid, it passed to Cicero, and through him it has helped to shape the literary prose of the modern world. The speeches of Iszeus in will-cases are interesting,—apart from their bearing on Attic life,—because in them we see, as Dionysius says, ‘“‘the seeds and the beginnings” of that technical mastery in rhetorical argument which Demosthenes carries to perfection. Iszeus has also, in a degree, some of the qualities of Lysias.

[LITERATURE,

his political speeches, his orations in public or private causes, show his consummate and versatile command over all the resources of the language. In him the development of Attic prose is completed, and the best elements in each of its earlier phases are united. The modern world can more easily appreciate Demosthenes as a great natural orator than as an elaborate artist. But, in order to appre- hend his place in the history of Attic prose, we must re- member that the ancients felt him to be both; and that he was even reproached by detractors with excessive study of effect. Adschines is the most theatrical of the Greek orators; he is vehement, and often brilliant, but seldom persuasive. Hyperides was, after Demosthenes, probably the most effect- ive; he had much of the grace of Lysias, but alsa a wit, a fire, and a pathos which were his own. The one oration of Lycurgus which remains to us is earnest and stately, re- minding us both of Antiphon and of Isocrates. Dinarchus was merely a bad imitator of Demosthenes. There seems more reason to regret that Demades is not represented by larger fragments. The decline of Attic oratory may be dated from Demetrius of Phalerum (318 B.c.), the pupil of Aristotle. Cicero names him as the first who impaired the vigour of the earlier eloquence, “ preferring his own

‘sweetness to the weight and dignity of his predecessors,”

as unique as his place in the history of Greek thought. literary genius shown in the dialogues is many-sided: it

faculty of satire, and, generally, a command over the finer tones of language. In passages of continuous exposition, where the argument rises into the higher regions of discus- sion, Plato's prose takes a more decidedly poetical colouring —never florid or sentimental, however, but lofty and austere. In Plato's later works—such, for instance, as the Laws, Timeus, Crituas—we can perceive that his style did not remain unaffected by the smooth literary prose which con- temporary writers had developed. Aristotle's influence on the form of Attic prose literature would probably have been considerable if his 2hetoric had been published while Attic oratory had still a vigorous life before it. But in this, as in other departments of mental effort, it was Aristotle's lot to set in order what the Greek intellect had done in that creative period which had now come to an end. His own chief contribution to the original achievements of the race was the most fitting one that could have been made by him in whase lifetime they were closed. He bequeathed an instrument by which analysis could be carried further, he founded a science of reasoning, and left those who fol lowed him to apply it in all those provinces of knowledge which he had mapped out. Theophrastus, his pupil and his successor in the Lyceum, opens the new age of research and scientific classification with his extant works on botany, but is better known to modern readers by his lively Characters, the prototypes of such sketches in our own literature as those of Hall, Overbury, and Earle.

III. The Literature of the Decadence.

The period of decadence in Greek literature begins with the extinction of free political life in the Greek cities, So

Demosthenes excels all other Demo. masters of Greek prose not only in power but in variety ; sthenes

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: long as the Greek commonwealths were independent and vigorous, Greek life rested on the identity of the man with the citizen. The city was the

highest unit of social organ- ization; the whole training and character of the man were _viewed relatively to his membership of the city. The market-place, the assembly, the theatre, were places of fre- quent meeting, where the sense of citizenship was quickened, where common standards of opinion or feeling were formed. Poetry, music, sculpture, literature, art, in all their forms, were matters of public interest. Every citizen had some degree of acquaintance with them, and was in some measure capable of judging them. The poet and the musician, the historian and the sculptor, did not live a life of studious seclusion or engrossing professional work. They were, as a rule, in full sympathy with the practical interests of their time. Their art, whatever its form might be, was the concentrated and ennobled expression of their political existence. Aischylus breathed into tragedy the inspiration of one who had himself fought the great fight of national liberation. Sophocles was the colleague of Pericles in a high military command. Thucydides de- scribes the operations of the Peloponnesian War with the practical knowledge of one who had been in charge of a fleet. Ictinus and Phidias gave shape in stone, not to mere visions of the studio, but to the more glorious, because more real and vivid, perceptions which had been quickened in them by a living communion with the Athenian spirit, by a daily contemplation of Athenian greatness, in the theatre where tragic poets idealized the legends of the past, in the ecclesia where every citizen had his vote on the policy of the state, or in that free and gracious society, full of beauty, yet exempt from vexatious constraint, which belonged to the age of Pericles. The tribunal which judged these works of literature or art was such as was best fitted to preserve the favourable conditions under which they arose. Criticism was not in the hands of a literary clique or of a social caste. The influence of jealousy or male- volence, and the more fatal influence of affectation, had little power to affect the verdict. The verdict was pro- nounced by the whole body of the citizens, The success or failure of a tragedy was decided, not by the minor circum- Stance that it gained the first or second prize, but by the collective opinion of the citizens assembled in the theatre of Dionysus. A work of architecture or sculpture was approved or condemned, not by the sentence of a few whom the multitude blindly followed, but by the general judgment of some twenty thousand persons, each of whom was in some degree qualified by education and by habit to form an in- dependent estimate. The artist worked for all his fellow-citizens, and knew that he would be judged by all. The soul of his work was

the fresh and living inspiration of nature ; it was the ennobled expression of his own life ; and the public opinion before which it came was free, in- telligent, and sincere. Philip of Macedon did not take away the municipal inde- _ pendence of the Greek cities, but he dealt a death-blow to the old political life. The Athenian poet, historian, artist, might still do good work, but he could never again have = which used to be the very mainspring of all such activity,—the daily experience and consciousness of partici- pation in the affairs of an independent state. He could no onger breathe the invigorating air of constitutional freedom, : of the social intercourse to which that freedom lent eae as grace. 'Then came Alexander's conquests ; a vilization was diffused over Asia and the East by eans of Greek colonies in which Asiatic and Greek ele- —r were mingled. The life of such settlements, under ae. into which Alexander's empire broke up, ae e animated by the spirit of the Greek common- alths in the old days of political freedom. But the ex-

ternals of Greek life were there,—the temples, the statues, the theatres, the porticos, Ceremonies and festivals were conducted in the Greek manner. In private life Greek usages prevailed. Greek was the language most used ; Greek books were in demand. The mixture of races would always in some measure distinguish even the outward life of such acommunity from that of a pure Greek state ; and the facility with which Greek civilization was adopted would vary in different places. Syria, for example, was rapidly and completely Hellenized. Judea resisted the process to the last. In Egypt a Greek aristocracy of office, birth, and intellect existed side by side with a distinct native life. But, viewed in its broadest aspect, this new civilization may be called Hellenism, As hellenizo means "'to do like a Hellene," Hellenism means the adoption of Hellenic ways ; aud it is properly applied to a civilization, generally Hellenic in external things, pervading people not necessarily or exclusively Hellenic by race. What the Hel- lenic literature was to Hellas, that the Hellenistic literature was to Hellenism. The literature of Hellenism has the Hellenic form without the Hellenic soul. The literature of Hellas was creative; the literature of Hellenism is derivative.

1. Alexandria was the centre of Greek intellectual ac- The Alex- Its “Museum” or andrian

tivity from Alexander to Augustus. college, and its library, both founded by the first Ptolemy (Soter), gave it such attractions for learned men as no other city could rival. The labours of research or arrangement are those which characterize the Alexandrian period. Even

in its poetry spontaneous motive was replaced by erudite Poetry.

skill, as in the hymns, epigrams, and elegies of Callimachus, in the enigmatic verses of Lycophron, in the highly finished epic of Apollonius Rhodius, and in the versified lore, astronomical or medical, of Aratus and Nicander. The pastoral poetry of the age—Dorian by origin—was the most pleasing ; for this, if it is to please at all, must have its spring in the contemplation of nature. Theocritus is not exempt from the artificialism of the Hellenizing literature ; but his true sense of natural beauty entitles him to a place in the first rank of pastoral poets. Bion of Jonia and Moschus of Syracuse also charm by the music and often by the pathos of their bucolic verse. But it is not for its poetry of any kind that this period of Greek literature is memorable.

in revising and interpreting the ancient texts, aud may in this sense be said to have become the founder of scientific scholarship. The eritical studies of Alexandria, carried on by the followers of Aristarchus, gradually formed the basis for ascience of grammar. ‘Translation was another province of work which employed the learued of Alexandria,—where the Septuagint version of the Old Testament was begun, probably about 300-250 B.c. Chronology was treated scien- tifically by Eratosthenes, and was combined with history by Manetho in his chronicles of Egypt, and by Berosus in his chronicles of Chaldza. reign of Ptolemy Soter. The general results of the Alex- andrian period might perhaps be stated thus. Alexandria produced a few eminent men of science, some learned poets (in afew cases, of great literary merit), and many able scholars. The preservation of the best Greek literature was due chiefly to the unremitting care of the Alexandrian critics, whose appreciation of it partly compensated for the decay of the old Greek pexceptions in literature and art, and who did their utmost to hand it down in a form as free as possible from the errors of copyists. On the whole, the

patronage of letters by the Ptolemies had probably as large a measure of success as was possible under the existing conditions ; and it was afforded at a time when there was special danger that a true literary tradition might die out of the world.

Its true work was in erudition and science. Erudition Aristarchus (156 3.¢.), the greatest in a long line of Alex- 274 andrian critics, set the example of a more thorough method °%”°

Euclid was at Alexandria in the Summary.

The

Greeco- Roman period.

First part:

146-30

B.C.

Second part: 30 B.C,

529

A.D.

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2. The Grzeco-Roman period in the literature of Hellen- ism may be dated from the Roman subjugation of Greece. “Greece made a captive of tle rough conqueror,” but it did not follow from this intellectual conquest that Athens became once more the intellectual centre of the world. Under the empire, indeed, the university of Atliens long enjoyed a pre-eminent reputation. But Rome gradually became the point to which the greatest workers in every kind were drawn. Greek literature had already made a home there before the close of the 2d century B.c. Sulla brought a Greek library from Athens to Rome. Such men as Cicero and Atticus were indefatigable collectors and readers of Greek books. The power of speaking

and writing the Greek language became an indispensable accomplish- ment for highly educated Romans. The library planned by Julius Cesar and founded by Augustus had two prin- cipal departments, one for Latin, the other for Greek works. Tiberius, Vespasian, Domitian, and Trajan contributed to enlarge the collection. Rome became more and more the rival of Alexandria, not only as possessing great libraries, but also as a seat of learning at which Greek men of letters found appreciation and encouragement. Greek poetry, especially in its higher forms, rhetoric and literary criticism, history and philosophy, were all cultivated by Greek writers at Rome.

The first part of the Graeco-Roman period may be defined as extending from 146 B.c. to the close of the Roman re- public. At its commencement stands the name of one who had more real affinity than any of his contemporaries with the great writers of old Athens, and who, at the same time, saw most clearly how the empire of the world was passing to Rome. The subject of Polybius was the history of Roman conquest from 264 to 146 B.c. His style, plain and straightforward, is free from the florid rhetoric of the time. But the distinction of Polybius is that he is the last Greek writer who in some measure retains the spirit of the old citizen-life. He chose his subject, not because it gave scope to learning or literary skill, but with a motive akin to that which prompted the history of Thucydides—namely, because, as a Greek citizen, he felt intensely the political importance of those wars which had given Rome the mas- tery of the world. The chief historical work which the following century producod—the Universal Listory of Dio- dorus Siculus—resembled that of Polybius in recognizing Rome as the political centre of the earth, as the point on which all earlier series of events converged. In all else Diodorus represents the new age in which the Greek his- torian had no longer the practical knowledge and insight of a traveller, a soldier, or a statesman, but only the diligence, and usually the dulness, of a laborious compiler.

The Greek literature of the Roman empire, from Augustus to Justinian, was enormously prolific, The area over which the Greek language was diffused —either as a medium of intercourse or as an established branch of the higher educa- tion—was co-extensive with the empire itself, Animmense store of materials had now been accumulated, on which critics,

commentators, compilers, imitators, were employed with incessant industry. In very many of its forms, the work of composition or adaptation had been reduced to a mechanical knack. If there is any one characteristic which broadly distinguishes the Greek literature of these five cen- turies, it is the absence of originality either in form or in matter. Lucian is, in his way, a rare exception; and his great popularity—he is the only Greek writer of this period, except Plutarch, who has been widely popular—illustrates the flatness of the arid level above which he stands out. The Sustaimed abundance of literary production under the empire was partly due to the fact that there was no open political career, Never, probably, was literature so im- portant as a resource for educated men ; and the habit of

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reciting before friendly or obsequious audiences swelled the number of writers whose taste had been cultivated to a point just short of perceiving that they ought not to write.

[LITERATURE,

In the manifold prose work of this period, four principal Depart. departments may be distinguished. (1) History, with ments o:

Biography, and Geography. It would exceed the limits of the present summary to notice in detail the works which belong to this and to the other provinces ; but it may be useful, for purposes of reference and classification, to give some chief namesineach. History is represented by Diony- sius of Halicarnassus,—also memorable for his criticisms on the orators and his effort to revive a true standard of Attic prose,—by Josephus, Arrian, Appian, and Herodian. In biography, the foremost names are Plutarch, Diogenes Laertius, and Philostratus; in geography, Strabo and Pausanias. (2) Lrudition and Science. The learned labours of the Alexandrian schools were continued in all their various fields. Under this head may be mentioned such works as the lexicon of Julius Pollux ; the commen- taries of Galen on Plato and on Hippocrates ; the learned miscellanies of Athenzeus, A‘lian, and Stobseus; and the Stratagems of Polyzenus. (3) Jhetorice and Belles Lettres, The most popular writers on the theory of rhetoric were

; Hermogenes, Aphthonius, and Cassius Longinus—the last

the reputed author of the essay On Sublimity. Among the most renowned teachers of rhetoric——now distinctively called " Sophists," or rhetoricians—were Dion Chrysostom, Atlius Aristides, Themistius, Himerius, Libanius, and Herodes Atticus. Akin to the rhetorical exercises were various forms of ornamental or imaginative prose—dialogues, letters, essays, ornovels. Lucian, in his dialogues, exhibits more of the classical style and of the classical spirit than any writer of the later age; he has also a remarkable affinity with the tone of modern satire, as in Swift or Voltaire. His Attic prose, though necessarily artificial, was at least the best that had been written for four centuries. The emperor Julian was the author both of orations and of satirical pieces. The chief of the Greek novelists are Xenophon of Ephesus and Longus, representing a purely Greek type of romance, and Heliodorus,—with his imitators Achilles Tatius and Chariton, —representing a school influenced by Oriental fiction. There were also many Christian romances in Greek, usually of a religious tendency. Alciphron's ficti- tious Letters—founded largely on the New Comedy of Athens—represent the same kind of industry which pro- duced the letters of Phalaris and many similar collections. (4) Philosophy is represented chiefly by Epictetus and Marcus Aurelius, in both of whom the Stoic element is the prevailing one; by the Neoplatonists, such as Plotinus, Porphyry, Iamblichus; and by Proclus, of that eclectic school which arose at Athens in the 5th century A.D.

The Greek poetry of this period presents no work of high merit. Babrius versified the Alsopic fables ; Oppian wrote didactic poems on fishing and hunting; Nonnus and Quin- tus Smyrnzeus made elaborate essays in epic verse ; and the Orphic lore inspired some poems and hymns of a mystic character. The so-called Sibylline Oracles, in hexameter verse, range in date from about 170 B.o. to 700 «.p., and are partly the expression of the Jewish longings for the re- storation of Israel, partly predictions of the triumph of Christianity. By far the most pleasing compositions In yerse which have come to us from this age are some of the short poems in the Greek Anthology, which includes some pieces as early as the beginning of the 5th century B.c., and some as late as the 6th century of the Christian era.

The 4th century may be said to mark the beginning of the last stage in the decay of literary Hellenism. From that point the decline was rapid and nearly continuous. The atti- tude of the church towards it was no longer that which bad

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been held by Clement of Alexindria, by Justin Martyr, or by Origen. 'There was now a Christian Greek literature, and a Christian Greek eloquence of extraordinary power. The laity became more and more estranged from the Greek literature—however intrinsically pure and noble—of the pagan past. At the same time the Greek langnage—which

BYZANTINE. |

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The character of the Byzantine period is seen in the kind Poetry.

of poetry that it produced. There were some good epigram writers in the reign of Justinian, but after his time the anthology received very few additions. The first versifier of importance that we meet in the progress of time is Georgius of Pisidia, who was deacon of the church of St

had maintained its purity in Italian seats—was becoming Sophia in the reign of the emperor Heraclius (610-641).

corrupted in the new Greek Rome of the East. In 529 a.p. Justinian put forth an edict by which the schools of heathen philosophy were formally closed. The act had at least a symbolical meaning. It is necessary to guard against the supposition that such assumed landmarks in political or literary history always mark a definite transition from one order of things to another. But it is practically convenient, or necessary, to use such landmarks. a line is to be drawn at any one point between the Old and the Byzantine literature, it may be said that the edict of

Justinian was the official record of the fact that the old |

literature of Greece was dead. Then came the Byzantine age, with its massive but formless erudition, its comment- aries, annals, and lexicons, represented by such works as those of Eustathius, Photius, and Suidas. The golden time of the Byzantine literature was from about 850 to 1200 a.p. Just as this was drawing to an end, a poetry—at first satirical —arose in the popular dialect, which had now decidedly diverged from the literary ; and thus the link was made

which connects the Byzantine period with the Greek litera- |

ture of to-day. The Greek language has never died, and the continuity of Greek literature has never been broken.

See History of the Literature of Ancient Greece, by K. O. Miiller, continued by J. W. Donaldson ; Critical History of the Language and Literature of Ancient Greece, by William Mure; Histoire de la Littérature Greeque, by Emile Burnouf (1869); Griechische Literaturgeschichte, by Theodor Bergk (1872); Grundriss der

griechischen Litteratur, by G. Bernhardy (1872-1876) ; Gricchisehe |

Literaturgeschichtc, by R. Nieolai (1878~1876) ; Primer of Greek Literature, in Macmillan's Series, by R. C. Jebb. (RB. C. J.)

Section JJ.—Tue Byzantine LITERATURE.

The literature of the Byzantine period, from the death of Justinian to the capture of Constantinople by the Turks, is singularly destitute of interest for the general reader. There is not a single work of intense human passion. Not one man appeared gifted with anything like genius. The most notable books are books of history written by those who were themselves actors in the scenes, or at the least were contemporaries or nearly contemporaries of the events recorded. There is always a sense of reality about such works, however hazy our general conception of the times may be. Of these historians a full account is given in the article Byzantine Historians. Some of these writers discussed other subjects. Remarkable amongst these is Constantine VIL, Porphyrogenitus, who wrote or caused to be written a whole series of books, treating of the administration of the empire, the ceremonies of the court, War, and jurisprudence. He got up a cyclopeedia of his- tory and politics, of agricultural science, of the veterinary art, and of medicine, and ordered the preparation of an epitome of Aristotle's work on animals, of a collection of Greek epigrams, and a collection of the histories of saints. Constantine's works do not give so much an insight into What he could do as into what he wished to do. Some of the historians were really men of wide culture. Nicephorus Gregoras (born 1295) received a liberal education in rhetoric, astronomy, and other subjects, and his literary activity ranged over the entire field of human knowledge. Others again combined the study of rhetoric or philosophy with that of history. Pachymeres, for instance, wrote declamations of a pedantic and frigid nature on historical

subjects, blending imagination with what he gathered from history,

And, in this case, if |

His muse celebrates various wars in iambic verse, such as the war against the Persians, the Avaric war, and the ex- ploits of Heraclius. He also wrote several Christian pieces. Leo VI., called the Wise, who was emperor from 886 to 912, versified astronomical and ecclesiastical subjects, and wrote some prose works besides, most of which, if not all, deserve to he in oblivion. Theodosius, deacon in the church of St Sophia towards the end of the 10th century, used the

iambic trimeter to narrate the capture of Crete, a work

which derives all its value from the historical matter con- tained in it. Theodorus Prodromus is perhaps of all the Byzantine writers the one that comes nearest to the rank of a poet, yet even this approach is made only in some of his poems in the popular dialect, which have a strong satiric turn and a vein of humour. His more ambitious efforts have no claim to the title of poetry. The subjects are of wide range and various form—epistles, congratulatory addresses, historical and didactic poems. Some of them are in a dramatic form, such as the Catamyomachia, recently edited by Hercher in the Teubner Bibliotheca, in which besides the ordinary characters Prodromus introduces a chorus and semi-chorus, and the xjpvé and dyyeAos so common in ancient plays. His largest poem is a romance called ra kata 'PoddvOny kat AoorxAéa, consisting of nine books in iambic trimeter. It is entirely destitute of origin- ality, and overladen with rhetorical and unpoetic passages. It is given by Hercher in ltis Scriptores Hrotict. Prodronius flourished in the reign of Manuel I., Comnenus (1143-1180). Another Byzantine, Nicetas Eugenianus, apparently of the same age, wrote a fictitious poem, ra kara ApdotAdar kat XapixAéa, which bears traces on every page of a close con- nexion with the similar work of Prodromns. Constantine Manasses also lived during the reign of Manuel I, Comnenus, and wrote a fiction in the versus politicus, characterized by absurdity and poverty of thought and expression. Both of these romances are given in Hercher's Scriptores Hroticz. Verse was during this period used for the most prosaic purposes. Michael Psellus the younger, about 1018 sa.p., employed it to give a synopsis of laws, Tzetzes to give an exposition of history. The work of Tzetzes is now called Chiliades, from its being divided into books of a thousand lines. It is written in the versus politicus, and is a very heterogeneous mixture of fact and fiction, but occasionally contains references to customs and incidents which are not handed down to us elsewhere. Another critic, Joannes Pediasimus, wrote iambic verses, wept yvvatkos kakys Kal dya0js 7 Tlebos. Such were the subjects which the Byzantine muse treated, and as we have given a rather full catalogne of the poetical works produced in the Byzantine period in the ancient language, nothing re- quires to be said of the sterile nature of the poets and their poetry.

Dramatic poetry was also neglected, but enough was pro- Drama.

duced to keep up the continuity in the tradition of the drania. Sathas has tried to show that dramas were acted up to the latest period of the Byzantine empire, and though the notices are not numerous nor very conclusive, he seems to ns to have proved his point (K. N. 3a@a ioropuxsy Soxiusov wept Tod Oeatpod Kat Tis Movouxys rev Bulavrivev, Venice, 1878). We have already seen that Prodromus com- posed dramas. The most voluminous writer in this depart- ment is Manuel Philes of Ephesus, who flourished from about 1280 to 1330, and who himself probably acted on AL. — 19

the stage. His dramas are occupied with the exhibition of the great deeds of his patrons, or resemble in some respects our Moralities, making characters of the various virtues. The Byzantine period produced a considerable number of hymn writers. Among them may be mentioned Germanus, who was patriarch of Constantinople in the reign of Leo the Isaurian ; Theodorus Studites, a theologian of some mark (759-826); the emperors Constantine Porphyrogenitus and Leo the king; and Photius, patriarch of Constantinople. The hymn writers who stand highest are Cosmas, who flourished in the 8th century, and whom W. Christ calls "princeps melodorum Gracorum" ; Joannes Damascenus, a contemporary of Cosmas; and Theophanes 6 I'parrds, who lived nearly a hundred years after Cosmas (see Anthologia Graeca Carminum Christi- anorum adornaverunt W. Christ et M. Paranikas, Leipsic,

1871).

ie Byzantines occupied themselves with collectious of poems, but the works of Cephalas and Planudes Maximus of this nature have already been discussed in the article ANTHOLOGY. Prose When we pass from poetry to prose we meet with the writings. same want of creative power. The Byzantines collect the writings of others and annotate, but they give us no original works. They performed two services to literature. They handed down the forms of literary expression, and by their indefatigable energy in excerpting and embodying in their own works the works of others, they have

preserved for us many valuable documents of antiquity, or at least portions of them. During the Byzantine period there were also various phases of literary life. After the death of Justinian literary activity became gradually less, until in the time of the Iconoclasts intellectual culture was repressed, manuscripts were destroyed, and literature fell into disre- pute and neglect. A revival took place under the Mace- donian dynasty, but when the Latin empire was established in Constantinople, a relapse into semi-barbarism again took place. Under the Paleologi the literary spirit once more came to life. Amidst these changes it was impossible for a vigorous creative literature to flourish, and the bright periods are mainly characterized by efforts to destroy the effects of the previous dark era by gathering together all kinds of information. Hence arose the compilations of Porphyrogenitus that have been already mentioned, and similar attempts were made at similar periods. Several of the Byzantines attained to high eminence in the cultivation of science, but sometimes their exertions took a fruitless direction, especially when they aimed at dis- covering the method of converting the baser metals into gold. It is in the study of grammar, in the production of lexicons and the annotation of the classical writers, that their best men have gained for themselves a name. " The works of the writers on these subjects are of no interest to the common reader, but they furnish the scholar with many attractive problems. Who were the authors from whom the Byzantines borrowed? How far are their works inter- polated? How far are the original authorities mutilated ? These aud such like inquiries crop up in connexion with almost every one of these writings. The writers who are best known as contributing to our knowledge of the ancients are Tzetzes, Eustathius, Moschopulus, Thomas Magister, Joannes Pediasimus, and Demetrius Triclinius, Tzetzes (probably the same word as Ceecius) lived in Con- stantinople about the year 1180. His Chiliades have been already mentioned. He wrote notes on Homer, Hesiod, and 4aschylus, but he was especially copious on Aristophanes. Eustathius is well known to scholars for an elaborate commentary on Homer. He was brought up in Constanti- nople, and in 1160 became archbishop of Thessalonica and in 1174 archbishop of Myra in Lycia. Besides his labours

Hymns.

Antho- logy.

Commen- taries.

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on Homer he wrote many theological and several historical works. Manuel Moschopulus belonged to the 13th century. He wrote many works on different points of grammar, and scholia on Pindar, the Tragedians, and Theocritus. Thomas Magister of Thessalonica flourished in the reign of Andronicus II. (1283-1332), and composed articles on ancient literary history, and scholia on A'schylus and other Greek writers. Joannes Pediasimus, who lived towards the end of the 14th century, is best known by his scholia on Hesiod; and Triclinius, who taught grammar in Con- stantinople at the same period, wrote scholia on Hesiod, Pindar, and the Tragedians. Nothing can exceed the stupidity of these writers and their fellow scholiasts of the Byzantine era. They misunderstand the acute remarks of their Alexandrian predecessors or bury them in verbiage They are utterly uncritical in their discussion of historical questions ; they are continually going wrong in their gram- matical expositions; and they are passionately fond of nonsense. Perhaps nowhere, to take one instance, in the whole of literature could wilder etymologies be found in greater numbers than in the scholia on the Plutus of Aristo- phanes. Yet these men thought highly of their work, and Triclinius tells us, in regard to a trivial book which he wrote on metres, that he accomplished the task only through divine inspiration. Notwithstanding this, they have pre- served for us within the quantities of rubbish many valuable facts and expositions derived from earlier writers.

Ignatius, deacon in the reign of Michael IT. (820-829), Gram- Gregorius, archbishop of Corinth in the second half of the ma 12th century, Holobolus, in the reign of Michael VIIL., and Joannes Glycas, patriarch of Constantinople in 1316, are the principal writers on grammar. Of these Gregorius is best known, for his work on the Greek dialects, though full of mistakes, has deservedly attracted the attention of scholars.

Of the writers of lexicons Suidas is the best known. He Lexie flourished in the 10th century. His work contains notonly explanations of words but

biographies of men. It isan | undigested mass of statements which are often contra- | dictory, but is of great value, for he has incorporated facts and expositions from early writers possessed of accurate knowledge.

originally, but was added by Musurus, its first editor, or Calliergis, its first printer. Gaisford in his edition has discussed this and other matters concerning the Etymologr- cum. Amuch smaller work by Philemon is a Z'echnological Dictionary, written in the second half of the 12th century. Among the lexicon-writers is Photius, who was patriarch of Constantinople, and died in an Armenian convent about the year 891. Photius was a man of marked individuality, and his history is mixed up with that of his country. A more detailed account of him will therefore be found in @ separate article. Porson prepared an edition of the Lesicon, which was published after his death by Dobree. The Leipsic edition contains a review by Blomfield (Zdin. Lew, xlii., 1813) of Hermann's edition of Photius, in which the English reader will find a full discussion of the sources and value of the Lexicon. Photius also prepared a work gene- rally called Photii Bibliotheca, containing extracts and notices | | of 280 books which he read while acting as ambassador .

Syria. The nature of this work awaits more minute investi- gation than it has yet received ; but there can scarcely be a doubt that some of the articles are the productions of a dishonest man, or of a late interpolator, or of both. His Letters, recently edited by Valettas, are of great importance for a knowledge of the times.

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BYZANTINE. |

during the Byzantine period. Only one work has come down to us of this nature, The Loves of Hysmine and Hysminias, by Eustathius the Macrembolite. Hilberg, the last editor of the work, has tried to show with some Success that Eustathius lived some time between 852 and

988. The work is full of imitations, and displays no in- ventive power.

GREECH

{ sie Several scholars of tlle Byzantine period wrote on the | A very full account is given of most of the writers here mentioned, ‘1 music and metres of the ancients. Their works abound in ee a oe and gre the later volumes tre, errors, but they preserve fragments of earlier writers which | ffarles, Hamburg, i Ae vol. W700 71800; wo elec ae eee are interesting and valuable. The work of Psellus the | torwm Eeclesiasticorwm Historia Literaria; Gibbon, Deeline and H younger, called Sivraypa cis ras Téocapas pabnparicds | Fall of the Roman Empire ; Miiller and Donaldson’s History of Greek ‘ émurripas, contains large fragments of Aristoxenus (West- ring Cot gee Pe ape a Op eel ithe Literary geseneliey Wel | phal, 2 ragmente der ihythmiker, supplement to the first only in PilSood eepeukllly those of Willéebn, Boteonwle, Caatteh volume of his Jf etrik) ; and Manuel Bryennius (about the Bekker, and Sathas, and often these editors investigate the history year 1330) wrote three books on harmonics, which contain | of the writers. Sathas has thrown much new light on the life of among other things an exposition of the later Byzantine | Psellus. (J. D.) musical system (see Westphal, Afetrik, vol. i. p. 319). ‘etoric. Of ae ahi a very few doulas a Section ITJ.—Mopern Greek Lirerature. Joannes Doxopater, who flourished in the reign of Alexius L., In narrating the history of modern Greek literature Peculiar Comnenus (1081-1118), wrote several works of a rhetorical several difficulties of a peculiar nature present themselves nature of nature, which are to be found in Walz’s Rhetores Greci. | which do not emerge in an account of the literature of a All that can be said of then is that they prove that he was | previous periods. The literature is no longer homogeneous, ae a man of culture and refinement, and did not deserve the | and we have to answer for ourselves the question whether ture, neglect and poverty which fell to his lot. A cluster of | we are to record the literary efforts made by Greeks or the rhetoricians appeared in the reigns of Michael VIII. and | literary efforts madein Greek. If we adopt the first course, Andronicus IJ., of whom the principal were Georgius of | we have to take notice of books written in Italian, French, Cyprus, Nicephorus Chumnus, and Theodorus of Hyrtace. German, and English, as well as in Greek, for the Greeks The emperor Manuel II., Paleeologus, wrote several works of | like the Jews were, during the three centuries of Turkish the nature of essays, and a large number of

letters, several | domination, a dispersed people. They found refuge far of which were addressed to Demetrius Cydones of Thessa- | away from their native land ; they spoke the languages of lonica, the author of a treatise on the Contempt of Death | strange peoples, and, when they published books, frequently which has attracted some attention. used these languages. Few, however, forgot their native iilo- The study of philosophy was, generally speaking, | tongue, and there are consequently very few authors who, "phy. neglected, but there were some who acquired renown as | however copiously they may have written in the languages philosophers. Foremost amongst these was Michael Psellus | of the countries in which they settled, did not leave at least the younger. He was born about the year 1018, and died | one work written in Greek. Even since the kingdom of shortly after the year 1105, after a chequered career. He | Greece has been established, many of her most distinguished was called by the men of his own age "Chief of Philo- | men have written some of their best works in French, . sophers." His works range over the entire field of human | German, or English, in order to obtain a wider audience learning. He wrote onthe sciences, mathematical, physical, | than they could expect if they had used modern Greek. medical, on grammar and metres and music, on the | We have to divide even those who used Greek into two Works doctrines of Plato and Aristotle, on psychology and dialec- | classes,—those who used the ancient language and those who in the tic; and very recently Sathas has edited a work of his | used the modern, though many have used both forms. The 2ncient called A Century of Byzantine History, which entitles him | ancient language was still the literary language at the time — toa place among historians, a series of his letters which | of the capture of Constaptinople, and the use of it asa" throw much light on the life of the Byzantines, and various | vehicle of literature has been handed down in unbroken discourses, panegyric and funereal. He lost the favour of | tradition to the present day. This has been specially the the court and was supplanted by Joannes Italus, who also | case with ecclesiastical writers. The church service is in succeeded to the title of " Chief of Philosophers." Several | ancient Greek. The New Testament is still read in the of his scholars attained distinction as authors, or rather | original language in Greek churches. The learned priests compilers, of commentaries on the Greek philosophers. were familiar with the ancient language, and in learned 'heo The theologians were to a large extent philosophers. treatises

felt bound by a firmly impressed tradition to use BY. The most famous among them was John of Damascus, who only the language which the great fathers of the church had lived in the reign of Leo the Isaurian (718-741). He used, Cultivated Greeks in all lands still continued to wrote on a great variety of subjects, theological and philo- | make verses in imitation of the ancients. A change took sophical. The work by which he is best known is his | place when Greece revived in the 19th century. All the Sacra Parallela, in which he has collected numerous | great writers felt that it was pedantic to adopt many of the passages from the writings of the fathers on such topics ag | old forms of inflexion and construction,—that, in one word, repentance, faith, &c. The work is valuable as containing | the ancient language was not fitted to be the vehicle of fragments of works which are not now extant. Alzog calls | modern civilization. They therefore resolved to adapt it, Damascenus the last of the Greek theologians. In subse- | to omit what might fetter the full and free expression of quent times few appear worthy of attention, and it may | modern thought, but to retain at the same time the body suffice here to mention Nicephorus Callistus, "the Ecclesi- | and substance of the language. And hence arose a form astical Thucydides," who lived in the 14th century. THe | of the language which is practically identical with the compiled an Ecclesiastical History from Eusebius, Socrates, | ancient, but transfused with modern ideas, and fitted for _Sozomenus, and the other earlier ecclesiastical historians, | the clear and rapid expression of modern literature. The endeavouring at the same time to make his style more | influence of the ancient language on the modern is manifest ia elegant than that of his predecessors, in every part of it. And it could not be otherwise. Educa- on. We find almost no attempt at light literature in prose | tion is spread over every corner of free Greece. But in

education the Greek child does not learn the grammar of

the modern language but of the ancient. He often reads ancient books, and every cultivated Greek becomes as familiar with Xenophon and Plutarch as an Englishman is The with Shakespeare and Milton. Before entering on the modem history of modern Greek literature, it is necessary to trace eee the modern language through its various stages, Historians a ad

Earliest modern Greek works,

of the Greck language acknowledge that alongside of the literary language there existed a conversational, which must have varied in diffcrent localities. We have the clearest traces of this language in the New Testament, as noticed under GREEK LancuaGE, p. 135, and some ecclesiastical writers of a later date bear equally unmistakable indi- cations of it. The Pastor of Hermas is specially marked by such featurcs, and the form of it given in the Codex Stnaiticus is a8 far advanced towards the modern as we find in several works of the 12th century written in the popular language. Very distinct approximations to the modern forms are also to be found in some of the apocry- phal gospels, and in tlie Testaments of the Twelve Patriarchs, but especially in the Apocryphal Acts and Apocalypses pub- lished by Tischendorf. All these writings tend to show that it is impossible to fix on any period when the modern language may be said to be definitely formed. It grew out of the conversational language of earlier times. Till very recently some poems of Theodorus Prodromus (often called Ptochoprodromus) were supposed to be the earliest distinct specimens of the modern language; but recent researches among the libraries have brought to light the fact that between the 10th and 15th centuries various works were produced in the modern form of the language. These researches are not yet concluded, and any results that are attained must be deemcd merely provisional. The work which is now regarded as the earliest specimen of the new form is the Lxploits of Basilios Digenis Acritas, written according to Legrand in the second half of the 10th century. The writer of this work unquestionably knew classical Greek well, and most of the lines would be perfectly intelligible to every scholar. But now and then words and construc- tions purely modern intervene. Yet there is a wide and marked difference between the language of this poem and that of the two poems of Prodromus, belonging to the 12th century, published by Corais; or the three more recently discovered by E. Miller, and published by him in his Afélanges, and subsequently by Legrand. In every line of these the scholar comes upon forms which are quite strange.

The difference will be best appreciated if we quote some lines from each of the writers. We take a passage from

the Digenis, which contains more than the usual number of modern peculiarities.

Ka) yap 6 Huxpds adeApds kar' Ivap cide TadTa: Mera TKoTIs ayelperat, A€yer Tors adeApots Tov: '0 apa, eldov, adeAdo), ev TavTn TH éomépa leparés jot epdvnoay ém) Neues THs TET PAS, Kal aeTos Xpuodmrepos weptoTepay SidKwv "Aor pny Kabdmep Xtova, K ea€Bn's 7d KouBovkAuy, Ev @ kotmara 5 yauBpds werd ris adeAPIs was. Tiere the accent of cxorid, rov for avrov, . . > ' a . ing white, 's for eis, xovBotkAw from cubi wee Bae 3 for jv, are the novel peculiarities, and none of tlem need puzzle the scholar. As a contrast we take a few lines from one of the poems of Prodromus published by Miller. "Opynoe Tdxare Kaye Td vd yer Tlayydpns, Mh va. XopTdow 7d ouly 7d Adyouy apart Cy, AAAG Th pecoKdBapoy 7d rAé-youcr Tis Léons, T émiPumoby Ypaypartxol kal KadooTixowAdbKoL. Kal Tews yupevoy nipnka ad réprapoy ékdrov, K' €daxa to x' Hrydpaca covyaly amd Tlayydpny. , The lines are thus translated by Miller :~~— " Et moi aussi, Jai essayé de la cordomnerie, non pag pour me rassasier de pain de gruau, mais de ce pain bis, dit de moyenne qualité, qui fait envie aux grammairiens et aux versificateurs de talent, Apres maintes recherches, j'ai trouvé une menue aaa Je Pai donnée pour prix d'une aléne de cordon~~ va = se the fall of Constantinople some of the learned

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so ri a interest in the popular form of the language, ~ 4 ' ee Sophianos, composed a grammar in the Ol the 16th century, which Legrand has published,

dowpos signify- culum, and pas

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along with a translation by the same scholar of Plutarch's treatise On the Lducation of the Young, into modern Greek, This grammar proves that the popular form of Greek was by that time fully developed, and it might still be taken as a good exposition of the ordinary spoken language of illiter- ate

Greeks. Of course there were great varieties in this popular form. Almost every small district and every island had inflexions, constructions, and words peculiar to them- selves. Kavasilas wrote to Martin Crusius in the end of the 16th century that there were upwards of seventy modern dialects, of which that of the Athenians was the worst, But however many dialects there may have been, there is no reason to suppose that the difference was such as to prevent a Greek residing in one part of Greece from understanding a Greek residing in any other part. Since that time changes have taken place in the popular forms. Turkish words were introduced to a larger extent, but the language has remained substantially the same. There are indeed still a considerable variety of forms in the different districts, and one of the most amusing of modern Greek comedies, "H BaBvdwvia 7% Kata Térovs Siadopa ris 'EAAnuKns yAdoors, by D. K. Byzantios, is based upon the different dialects spoken by the Greek of Asia Minor and the Peloponnesian, the Chian, Cretan, and Cypriote, the Albanian and Heptanesian. This language is no longer the

language of cultivated Greek society, of literature, or of Neo When Greece was stirred with new life, no Hellenic

science. question agitated the patriotic Greeks more intensely than that of the form which the language should take. Some, led by Chrysopoulos, maintained that the popular language was really ancient, that it was a mixture of AZolic and Doric, and that it ought therefore to be retained. Others, with Giconomos as their champion, were for adopting the classical langnage with a few slight modifications which could claim the sanction of some of the best Byzantine writers. A third party, headed by Corais, were for steering a middle course, and they have ultimately triumphed. Colonel Leake has well described the present language. 'This style," he says, "may with tolerable accuracy be defined to cousist in Hellenic words, arranged in the syntax of modern Europe, with a graminar partly Hellenic and partly modern. Inversions and transpositions occur with almost the same degree of frequency as in Italian, and the arrangement in general is not much more complex than that of our own language" (Jesearches, p. 54). We extract a specimen of it from the sixth volume or " Epilogos" of the Tistory of Greece by Paparrhegopoulos.

“Ore T@ 1790 rpets rod ZOvovs avtimpdowmot naduméBadov eis THY peyadny Aixateplvay thy alrnow rod va Katameuln roy eyyovov avTis Kwvotaytivoy ws abtoxpdtopa, of &vdpes ovror Sty Trapéornoay wréov &s “Pwpator) kal dmAGS Xprotiavod GAAG ws EAAnves Kad amd= yovot TGV’ AOnvalwy nal Tov Aakedatpovlwr.

In this sentence all the words are ancient. Two of them are contracted, va for iva and dev for ofdéy, and some have had their meanings modified. The remarks of Paparrhego- poulos relate to a subject which demands a brief notice. The Greeks at the time of the capture of Constantinople were proud of being “Pwyato: or Romans, and the term included all the Christians who formed the subjects of the Greek empire. Hence the term Romaic was the name given to the popular language. But during all the period of the Turkish domination the Greeks occasionally spoke of themselves as Tpasxoé and “EAAnves, and when the period of revival came, they cast off the old name of ‘Pwyato. and ‘Pwpaxy, and spoke only of “EAAyves and “EXAQuKy. Accordingly the Greek language is now spoken of as the Hellenic tongue. When it is necessary to distinguish the modern from the ancient, the language of cultivated men is called Neo-Hellenic, veoeAAnvixy, and the popular form 1s styled dzAoeAAqvixy (see especially Dr Clyde’s Romaic and Modern G’reek, Edin. 1855).

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In narrating the history of this literature, we have at the | pared Plato with Aristotle. Cardinal Bessarion was a native

the earliest stage to treat separately those who used the classical | of Trebizond. He received his education in Constantinople. penais- Janguage and those who used the vulgar. In both cases | In 1425 he went to the Peloponnesus to hear Gemistos e. we cannot draw a fast line at the date of the fall of Con- | expound the philosophy of Plato. In 1439 he removed to ‘ie fall stantinople, for, though that event is of great importance in | Italy, after he had been made archbishop of Nica, because ‘Con- the history of

the Greeks as a people, it does not constitute | the Greeks bitterly resented his attachment to the party janti- 9 break in the literary history. It is often imagined that | which saw no difficulty in a union between the Western ple the dispersion of the Grecks in 1453 stood in close con- | and Eastern Churches. He rose to great honour in the

nexion with the revival of literature in Western Europe. But the fact isthat the Greeks had come into contact with the Westerns long before, and their influence had become decided before the Turks seized the capital of the Greek

West, obtaining the cardinal's hat. He died in Ravenna in 1472. He was passionately attached to the classical literature of his country, and took a profound interest in the education of his fellow-countrymen. He aided in the

empire. The crusades had brought Greeks and Latins | most liberal manner all the men of ability who came from together. The Latin empire in Constantinople had made | Greece. He made a large collection of manuscripts. He

the contact still more frequent. Greeks and Latins had entered into keen discussion on the truth of the dogmas in regard to which they differed. Some of the Greeks had

translated portions of Xenophon, Aristotle, Theophrastus, and other Greek writers, and he wrote on the theological questions of the day.

become converts to Roman Catholicism, or at least desired the union of the Eastern and Western Churches. In these circumstances they often left their native land to seek pre- ferment in the church in which they could labour with greater sympathy. Many of them also had become connected

The Greeks who were most prominent in spreading a The knowledge of Greek in Europe after the fall of Constanti- Greeks nople are Joannes Argyropoulos, Demetrios Chalcocondyles, =e Constantine and John Lascaris, and Marcus Musuros. cop.

Argyropoulos was a native of Constantinople, and there stanti-

by marriage or other ties with the Italian nobles who ruled in the Aigean, and circumstances led them to settle in Italy. Of the Greeks who thus found their way to the West before the taking of Constantinople, the most prominent were Leon or Leontios Pilatos, Georgios Gemistos Plethon, Manuel and John Chrysoloras, Theodoros Gazis, Georgios Trape- zuntios, and Cardinal Bessarion. Hody has given a full account of most of these men in his work De Greevs alus- tribus Linguee Greece Literarumque Tumaniorum Instaura- toribus (London, 1742). Pilatos was a native of Thessalo- nica and a pupil of Barlaam, a Calabrian monk who taught Petrarch Greek. Pilatos himself taught Boccaccio his native language, and expounded Homer in Florence. He died in 1364. Gemistos was a native of Lacedemon. He taught in Constantinople, Athens, and Florence, and had in all places a large number of pupils who eagerly imbibed his Platonic teachings. His works were numerous, but most of them still lie hid in the great libraries of Europe unpub- lished. Manuel Chrysoloras was one of the pupils of Gemistos, and is famous as the translator of Homer. and Plato. Both he and his brother John had many illustrious men as their pupils in Greek. Manuel taught in Milan, Venice, Padua,and Rome. Hehasthe merit of composing the first Greek grammar that appeared in the West (€pwrjara), published for the first time in Venice (1484). He made his first visit to Italy in 1393 in the capacity of ambassador from the Greek emperor to seek aid against the Turks, and he returned to Italy on the accomplishment of his mission that he might spread the knowledge of Greek literature. He was sent as deputy to the council of Con- stance, and he died in Italy in 1415. Theodoros Gazis, a native of Thessalonica, fled from his native place in 1430, and became a teacher of Greek in Ferrara, Rome, and Florence. He prepared a Greek grammar in four books (first published in Venice 1495), which continued for a long time to be a text-book in Greece and other countries. He translated many of the classical writers, and wrote on the Ancient history of the Turks and on theological subjects. He died in 1478 in Calabria, where he had settled in his old age. Georgios Trapezuntios was born in Crete in 1396. He received the appellation of Trapezuntios because his family had come from Trebizond. A Venetian noble took him to Venice to teach Greck in 1428. He removed to Rome in 1440, where he remained till 1450, at first highly honoured, but subsequently, through the bitterness of his temper, falling Into disgrace, After that he led a

wandering and miserable life, and died in 1486, He translated many of the Greek Writers into Latin, and wrote a treatise in which he com-

taught Constantine Lascaris. various times in Padua (1434), Florence (1456), and Rome (1471), and had amongst his scholars Angelus Politianus and Reuchlin. He translated many of the works of Aristotle. Chalcocondyles was a native of Athens and became teacher of Greek in Florence in 1471; after some time he removed to Milan, where he died in 1511. He edited very many of the Greek authors. Constantine Lascaris, descended from a noble Bithynian family, taught Greek in various Italian cities, and finally settled in Sicily, where he died about 1500. He wrote a large number of works, most of them still unpublished. His best known work is his Grammar. He also transcribed manuscripts, and made a large collection of them. His name is well known to modern readers through the romance of Villemain (Lascaris ou les Grecs du XV" siécle). John was probably the younger brother of Constantine. He was principally employed in collecting manuscripts for the great men of the day, wrote several works, and edited several Greek books for the first time. He died at Rome in 1535.

Almost all these men were rather employed about litera- ture than engaged in producing it. They taught Greek ; several of them wrote Greek grammars; they transcribed and edited Greek classical writers; and they collected manuscripts. Bessarion laid the foundation of the library of St Markin Venice. The collections of Constantine Lascaris formed the nucleus of the Escorial library ; John Lascaris and his pupil Budeeus gathered the first stores for the national library in Paris ; and Pope Nicholas V. employed the services of Bessarion, Gazis, and C. Lascaris in establishing the Vatican library. But almost none of these men accomplished much in literature strictly so-called. The question which most deeply interested them was the philosophy of Plato and Aristotle. Somehow or other the championship of Plato was undertaken by those Greeks who eagerly desired the union of the Greek and Latin churches, and the philosophy of Aristotle was upheld by the opposite party. Gennadios, whom Mahomet IT. appointed as patriarch of Constantinople after the capture of the city, showed himself a keen partisan of the Sta- girite, and hurled his thunderbolts against the Platonists. Gemistos Plethon was the chief defender of the Platonic philosophy, and received unmeasured abuse from George of Trebizond for

his heterodox opinions. The works on these subjects were numerous, but beyond these theological questions (for they were theological rather than philosophi- cal) there is not much. Scholarship continued to survive in Greece or among the Greeks for a long time after the

In the West he taught at nople.

Turks began to rule in Greece, and a considcrable list might be adduced, including the names of Apostolios, whose collection of Greek Proverbs is well known to scholars, and his son Arsenius, metropolitan of Monemvasia. Among the few who still used the Greek language for literary purposes Leo Allatius is prominent. His Greek verses show skill and cleverness. Mention also should be made of Constantine Rhodocanakis, honorary physician to Charles II. of England. He wrote verses on the return of Charles to England not without merit (see a very curious life of C. Rhodocanakis published in Athens, 1872). Early We now return to the literature in the modern language, works in and here again we have to go back several centuries before eel the fall of Constantinople. We have already seen that the Romantic Catliest production is the Exploits of Digenis Acritas, so poems. called because he was the son of a Turk and a Greek, and because he spent a large portion of his tine in watching the frontiers. There is reason to believe that his adven- tures formed the subject of poems in many parts of Greece. Some have called him a Cyprian Hercules, and believe him a kind of mythological character, while others regard him as a genuinely historical personage. The poem published by Legrand describing his adventures is imperfect. Many of the incidents are of a purely romantic nature. From the 12th to the 16th century many pvems were composed in the popular language. Our knowledge of these works is stillincomplete. Several of them lie hidden in the great libraries of Europe; but much is now doing to increase our knowledge. Many have been already published in the collections of Mavrophrydis, Sathas (dvexdora), Wagner (Carmina Medii divi), and especially Legrand. They all breathe the spirit of chivalry, and are full of romantic adventures and tales of love. M. Gidel has the special inerit of drawing attention to these poems in his Htudes sur la Lttérature Grecque Moderne (Paris, 1866), and he has gone further into the subject in

his Nouvelles Etudes sur la Lottérature Grecque Moderne (Paris, 1878). He has proved that the romances which delighted the knights of France and Italy found their way probably through the Genoese and Venetians and some French families into Greece, especially into the islands. The Greek minstrels took them and adapted them for their Greek audiences. He has given an analysis of the various poems and com- pared them with the Western forms. The most important in modern Greek are "The Old Knight" (12th century), a tale of the Round Table; "The Story of Belthander and Chrysantza" (probably 12th century); "The Loves of Lybistros and Rhodamne " (probably 12th century); 'The War of Troy," taken from the Guerre de Trote of Benoit de Sainte-More, who wrote in the second half of the 12th cen- tury (the Greek translation was made some time before the fall of Constantinople); "Flore and Blanchefleur ? and the " History of Imberios and Margarona." 'There are various other poems belonging to this period of a different character, such as the "Oracles" of Leo the Wise, imita- tions of Leineke Fuchs, and " Physiologus." The history of Alexander the Great was a favourite theme, and there is a Greek version of Apollonius of Tyre. We donot know the authors of any of these poems. But about the time of the fall of Constantinople we meet with the names of some versifiers. Papaspondylos Zoticos described the battle of Varna (1444) in verse, and from the poem we gather that he was present at it. We have three poems written by Georgilas Limenitis (1450-1500), one "On the Deeds of the great Commander of the Romans, Belisarius ;" another 'On the Plague in Rhodes," which took place in 1498; and a third, "A Complaint on the Fall of Constantinople." Some have been inclined to think that this last cannot be the work of Georgilas, From an examination of the poems of Georgilas and some other phenomena, Corais, in the pro-

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legomena to the second volume of the "Araxra, came to the conclusion that rhyme was unknown to Greek poems before the fall of Constantinople, and had become established as a feature of them when Georgilas wrote on the Rhodian plague. Gidel has accepted this as giving a clue to the dates of Greek poems. A third versifier was Jacobos Trivolis of Corfu, who lived in the beginning of the 16th century. He wrote the history of Tagiapiera, a Venetian noble, and the history of the king of Scotland and the queen of

England, a tale taken from Boccaccio. Almost none of these poems have poetical merit; but they are interesting as specimens of the popular language, and curiots as throw ing light on the manners and thoughts of the Greeks of those days.

From the earliest times the Greeks were in the habit of Historical. putting into verse any remarkable occurrence that stirred poems — their feelings. Crusius tells us that in his time Greeks, especially on the islands, contended with each other in repeating or extemporizing verses, and the custom has re- mained down to the present day. Accordingly the Greek popular poetry is'rich in historical subjects: we have already noticed the poems on the battle of Varna and on the taking of Constantinople. There is also a chronicle of the con- quest of the Morea (given by Ellissen in his Analecten). There are several lamentations over the fall of Constanti- nople. And the klephtic ballads relate real adventures. Almost every leader in the war of independence had his song in his honour. Some have thought that the largest portion of the ballad poetry of the Greeks is recent; but Legrand's collection lately published shows that some of them belong to very early times, being edited from a manu- script of the 16th century. There are two or three famous historical poems connected with the islands. Especially noteworthy is one on the exploits of Mercurios Boua by Coronzeos.

There are three poems belonging to the 16th and 17th Early © centuries which have obtained wide popularity among the populat _ Greeks. The first is the Hrotocritos, the epic poem of PO™ | modern Greece, of about 11,400 lines. Of its author Vincenzo Cornaro, a Cretan, we know almost nothing ; but it is probable that he belonged to a noble Venetian family and lived in the middle or towards the end of the 16th cen- |

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tury. The tale is one of two lovers who, after many trials of their fidelity to each other, are at last united and blessed. There is genuine poetry in the work. Many of the scenes are charming, and, as M. Gidel remarks, there is

not a single situation which shocks propriety nor a single senti- ment which is not modest and of rare purity. The second | poem is a drama called Hrophile, and its theme is the love 1 of Panaretos and Erophile. The author of it was Georgios Chortakis, who was brouglit up in Rhethymnos, a Cretan town, and lived towards the end of the 16th and beginning 1] of the 17th century. It was thought to be nearly the only drama of this period ; but Sathas has brought to light the fact that there was a considerable number of them, and he has already published three, Zeno, Stathes, and G'yparis, in | addition to the Erophile. Some of them are translations, and all of them are closely connected with Italian dramas of the same period. The Frophile has interludes to each act, dealing with an entirely different theme, and most { | probably written by a different author. The third poem, The Shepherdess, is a charming idyll written by Nicolaos Demetrios, a native of Apocorone in Crete, who lived in the beginning of the 17th century. | There are few prose productions of any importance Barly belonging to the early period of modern Greek literature. P?%? Crusius mentions works written by Malaxos, Zigomalas, and i it Caunavoutzis. Sathas has more recently brought to light a } number of chroniclers, such as those in the second volume of his Bibliotheca Greeca Medii ivi, that relate the history:

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of Cyprus, Leontios Machaira, in the beginning of the 15th century, and Georgios Boustronios, whose narrative extends fron 1456 to 1501. His sixth volume contains curious documents (the assizes of Cyprus, Cretan wills, &e.), which afford insight into the forms of modern Greek prevalent among the Cypriotes and Cretans, though a con- siderable number of them are written in classical Greek. Miklosisch and Miller have made a similar

collection of documents, Acta et Diplomata Greca Medii divi. Even in the 18th century we find the classical language used much more frequently than the modern. Meletios, the man whose naine stands most prominent in this period, wrote his Ecclesiastical History from the time of Christ to the year 1700 in ancient Greek, and his work had to be translated into modern Greek to give it currency among the masses. Another ecclesiastical history by Sergios Makraios, given in the collection of Sathas (from 1750 to 1800), is written in the same language, and we find some writers like Caisarios Dapoute and Meletios using sometimes the ancient and sometimes the modern form. We have almost no attempts at elegant literature in the modern Greek prose of this period. But it is possible that manuscripts containing such works may be hid among private family documents. One has recently been edited by Innocente Damaria (Turin, 1872), The Loves of Erogelos and Erasmia, by Holophilos, which was most probably written between the 12th and 15th centuries, but which might have been written by any one of the Scriptores Erotici, as the language discloses morern forms only in one or two sentences.

In the 18th century a revival of enthusiasm for educa- tion and literature took place among the Greeks, Schools were established in every important Greek city, school books and translations from Continental languages poured forth from the presses af Venice, Trieste, Vienna, and other places where the Greeks had influence. The leaders in this move- ment were Eugenios Bulgaris, Nikephoros Theotokis, and Adamantios Corais. The first two, both natives of Corfu, were devout adherents of the Greek Orthodox Church, warm partisans of Russia, and both became archbishops in the Russo-Greek Church. They were true but narrow patriots. They wrote much in defence of Greek orthodoxy as against Latin heresy. Bulgaris also.wrote on philosophy an Theotokis on physics, and the latter prepared or trans- lated educational treatises on physics, mathematics, and geography. Far before these stands Adamantios Corais, who was above everything a Greek of widest aim and of the greatest culture. He was born in Smyrna in April 1748. He studied nearly every branch of learning, medicine, theology, and literature, in the universities of Italy and France, and then devoted his life to the resuscita- tion of his country from ignorance and servitude. He edited a very great number of the classical writers, with admirable critical notes, and generally with prolegomena, Which tried to awaken the interest of his

countrymen in their past glories, and strove to rouse them to emulate their ancestors, He also devoted his attention to the modern language, especially in his 'Araxra, discussed the writings which had appeared in it, prepared a provisional dictionary of it, and determined the mode in which the popular dialect might become the basis of a literary language.

From the time of Corais we may date a new era in the history of the literature. Henceforth the works become exceedingly numerous, and efforts are made in every direc- tion of literary activity. Perhaps no nation now produces so much literature in proportion to its numbers. The as seem restless in their desire to give expression to

elr thoughts. They have indeed great difficulties to con- tend With in the way of publishing. The number of Teaders 1s necessarily small, owing to the smallness of the nation. To take an instance, one of their most important

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periodicals, the "A@yvacoy, containing articles on arclizology and literary history, which should be known to all scholars, had not more than 150 subscribers in 1876, as we are informed in the preface; 600 copies were published, of which 100 were sent by the university of Athens to the various libraries in Europe and America, 150 were distri- buted free, and only 150 were subscribed and paid for. The number of subscribers had not increased in August 1879. In these circumstances many rich Greeks have come nobly forward and published books at their own expense; and much credit is due to the Zosimades, the Ralli, and the other Greeks who have served their country in this way. Very frequently scholars produce their best works for periodicals or even newspapers ; andsome most valuable treatises have been published as supplements to Greek periodicals. Trans- lations of many of the best French novels have also been given away with these periodicals, and occasionally some of our most esteemed English writers have been thus

made known to the Greeks; for instance, a translation of the Bride of Lammermoor was published by the editors of the Pandora. These circumstances, while impeding tlie pro- duction of Greek books, also tend to prevent foreigners from knowing exactly what the Greeks have done. Another circumstance that marks this period deserves notice. Almost every literary man of eminence makes efforts in every literary direction. Theologians, scholars, physicians, are all found in the list of poets. The same persons write school-books, histories, dramas, lyrics, and novels. It would be impossible to give even a notion of this endless activity. All that can be done is to point out a few of the principal writers,

In the early part of tliis period two poets claim our notice, Rhegas of Velestino in Thessaly, and Christopoulos. Rhegas was the poet of liberty, and his great war song, Acire matées tév "EAAjvuv, is well known to English readers through Byron's trauslation. He wrote many songs or hymns calculated to rouse his fellow-countrymen, but acting rashly he was seized and shot at Belgrade in 1798 at the age of forty-four. Christopoulos was born in Macedonia in 1770, and died in 1847. He devoted himself to songs of love and wine, and many of his anacreontics are melodious, graceful,and charming. Somewhat later than Christopoulos comes Jacobos Rizos Neroulos, who was born in Constanti- nople in 1778, and died in 1850. Neroulos wrote lyrics, tragedies, and comedies with considerable success, but his best known book is a work published at Geneva in French in 1826—Cours de la littérature Grecque moderne—-and admirably trauslated into modern Greek by Miss Olympia Abbot of Thessalonica. It is an interesting account of modern Greek literature up to the time at which the lectures were delivered, and is written in a bright and forcible style. It is perhaps rather too favourable to the phanariots, to whom Neroulos himself belonged, but it is an honest de- fence; and it has to be remembered, on the other hand, that he lashed the vices of the phanariots with great boldness in his comedies. roi these writers we pass to the era of the independence of Greece. During this last period three writers have appeared who have established for themselves a permanent place in the history of mankind as men of true genius, Panagiotis Soutsos, AlexanderSontsos, and Alexander Rizos Rangabé. Panagiotis and Alexander Sontsos were brothers, and belonged to the phanariots. They were born in Constantinople in the first quarter of this century, and were educated first in Chios and then in tlie

universities of Italy and France. They threw all their energies into the war for independence, and sang of its glories. But they conceived a determined dislike to Capodistrias. They were still more bitter against Otho, and, adopting extremeopinions and always discontented, they fell out of sympathy with Panagiotis received high posts of

Poetry.

Sontsos.

Rangabé.

honour at the end of the war of independence, and Alexander was offered grcat literary distinctions; but the unmitigated abuse and contempt which they both, but especially Alexander, heaped on all men in authority rendered absence from their country a necessity. Alexander died in Smyrna in a hospital in 1863, and Panagiotis died at Athens in utter obscurity in 1868. Both tried various forms of poetry, but as nearly all critics have remarked, Panagiotis was always lyrical and Alexander continually returned to satire, whatever his subject might be. Both had a rich command of musical language, were highly ideal in their conceptions, were strongly patriotic, and possessed an ardent love of liberty. Of the two the muse of Panagiotis strove more after the sublime, but was less steady, less uniformly excel- lent than that of Alexander. Both were deficient in giving unity to their poems, or in forming asustained and original plot. 'The plays of Panagiotis remind one of such works as Bailey's Mestus, where thera is a profusion of poetical conceptions but no coherent whole. Many passages in the works of both brothers bear a strong resemblance to lines which are to be found in the writings of poets whom they admired, especially Lamartine, Béranger, and Byron. The spirit of Byron pervades both. The principal works of Panagiotis are "Odourdpos (The Traveller), a drama in five acts, for which Byron's Afanfred stood as model ; Mecoias }) ta 7dOn "Inocod Xpiorod (The Messiah), also a drama in five acts; and three other plays Vlachavas, Caraiscakis, and The Unknown, in all of which there is an utter want of character and plot, and a rich store of poetry; a novel, Leandros, and many lyrics, especially "H Ku6dpa, first pub- lished in 1835. He tried

in his later days to strike out a new style in modern Greek, but his effort was unsuccessful. Alexander's principal works are—Ilavdpapa ris "EAXdS8os, a collection of poems for the most part bitterly satirical, recently republished by Legrand at the end of his grammar ; 'O IepuAavdpevos (The Wanderer), a poem which was sug- gested by and contains many direct imitations of Byron's Childe Harold ; and several comedies, The Pradigal, The Premer, The Untamed Poet, and The Constitutional School, and numerous odes and lyrical pieces. He also wrote one comico-tragic novel, "Eépiurros rod 1831, or The Banished One of 1831.

The other great poet that regenerated Greece has pro- duced is Alexander Rizos Rangabé, He was born in Con- stantinople early in the century, and belonged like the Sontzos to a phanariot family, He thus describes his own career :—" A pupil of Vardalachos and Geunadios, he com- pleted lus studies at the military school and at the univer- sity of Munich. In his own country he was at first an artillery officer, then a councillor in the ministry of public instruction and also in that of the interior, professor of archeology in the university (of Athens), minister for foreign affairs, deputy, and later ou representative of his country in different foreign countries." His works are of wide range. THe has written a grammar of modern Greek, con- tributed to a dictionary and a cyclopedia, composed a history of ancient Grecce, and edited many school-books. He has written an able work on ancient art, and an exceed- ingly valuable and scholarly work on inscriptions, Antiquités Lelléniques. He has contributed much to the Pandora, the Archeological Journal, and the Hranistes. He has narrated the results of his travels, and disoussed mathemati- cal problems. He hagalso composed several novels, And he has written a history of the literature of madern Greece, —bright, genial, sparkling, and full of true and sometimes trenchant criticism. It is on his poems, however, that his claims to remembrance will specially rest. In these he shows fine poetic feeling, a rare command of exquisite and harmonious language, and a singular beauty and purity of thought and sentiment. His poetical works consist of a

with its prolegomena, has deservedly attracted much atten-

large collection of hymns, odes, and songs; long narrative poems ; ballads ; four tragedies and three comiedies ; trans- lations of the Antigone of Sophocles, and of three plays of Aristophanes.

Besides these three poets there is a great number of Other writers who have composed poetry of considerable merit, poets. but we can only mention the names of a few,—Valaoritis, Zalacostas, Salomos, Vlachos, Cokkinakis, Carasoutsas, Tantalides, Zampelios, Orphanides, Cleon and E. Rangabé, Euphrosyne Samartsidis, and Antoniadis. Elias Tantalides, who for a long time was blind and who died a few years ago, published an interesting collection of songs, including nursery rhymes and school songs, with music (Athens, 1876). The production of poetry was much stimulated by an annual poetical contest. A sum of money was set aside for prizes, poems were sent in, judges were named, and when all was ready, a speech was delivered in the university by the convener of the judges, assigning their reasons for their decision and giving criticisms of the poems. The envelope of the successful candidate was then opened, and he received the laurel wreath with a thousand drachms. From what is stated in the Athenaion of Athens for May, June, July, and August 1878, where the exposition of the contest of 1877 is given, it would seem that probably that of 1877 was to be the last. Amongst the pocts of recent days special mention should be made of Chrestos A. Parmenides, who while in Manchester did much to make the works of his fcllow-countrymen known to Englishmen, and the best works in recent English literature to Greece. Among other things he translated Roscoe's Life of Lorenzo dé Medici, Byron's Sardanapalus, Villemain's Lascaris, and poems of Goldsmith, Bryant, Burns, Goethe, and Victor Hugo. He also wrote original poems of great merit, and a novel called E'yevia, Two writers have distinguished themseives by poetic compositions in ancient Greek, Leukias and Philippos-Joannes.

The drama is a form of poetry to which the Greeks feel Drama. peculiarly prone. Rangabé gives a list of ninety writers of dramas in his //tstory of Modern Greek Literature, and the list he says is incomplete. Out of these writers we may select for notice Demetrios N. Bernardakis, whose Mapia Aogararpy, "Maria, the daughter of Doxapater,"

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tion and been analysed by Gidel, 1} In prose there is no department of literature which is not History, well represented. In history the Greeks are particularly strong. Pecrrhaevoshas described with great vigour the ex- ploits of Suli, Tricoupis's /Zistory of the Revolution isa masterly work. Philemon has given the Russian side of the revolutionary movements with great earnestness ; and nearly every man who took a part in the movements has handed down his recollections, or, as in the case of Coloco- tronis, who, was illiterate, has dictated them to somc one who could put them into shape. The Greeks have been particularly active in investigating the history of the Byzantine empire, of the Venetian domination, and of special localities, The history of Paparrhegopoulos is especially valuable in regard to the later periods, and its style is singularly clear and flowing. Along with him should be mentioned Sakellion, Sakellarios, Sathas, Byzan- : tios, Monstoxydes, Dragonmis, Triantaphyllis, and Paspatis. In theology GEconomos stands forth as the first of preachers, occupying the place which Miniatis held asa popular orator in the 17th century. Contogonis is well known by his Llistory of Patristic Literature down to the Fourth Century, and Bryennios by his edition of Clemens Romanus. Braila Philo- | stands first among Greek philosophers for profoundness and sophy.) originality. Along with him may be mentioned Vamvas and Renieri. Greeks have also distinguished themselves in medicine, but very frequently they write their scientific |

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books in French. They have also produced many treatises «on law, political economy, and on mathematics and the physical sciences. Little has been accomplished in the way of original novel-writing. We have seen that Panagiotis and Alexander Sontsos and Rangabé wrote novels, and others have done so likewise, but with moderate success. One recent work, 'H Wdmricca Iudvva, by Roidos, has gained considerable popularity, and is written in an attractive and vigorous style. Another novelist, Stephanos Xenos, is known to English readers by his work on the Ionian Islands called Hast and West. He is the author of a novel called the Devil in Turkey, and he wrote in Greek an interesting account of the Exhibition in London in 1851. Several ladies have distinguished themselves iu the field of Greek literature. Especially deserving of mention is Dora

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a ors. d'Istria, whose work on the Women of the West, contributed

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to the Pandora and forming a pendant to her Women of the East, written in French, shows remarkable powers of research, exposition, and criticism. The Greeks, as might have been expected, have produced good editions of the classical writers. They have also done much to elucidate

Sieo- the archeology of their country, though most of their works

on this subject are written in foreign languages. Among these works especially deserving mention are Ancient Athens of Pittakis, in French; the Gravestanes of the Ancient Greeks, by Pervanoglous, in German; the Hellenic Antiquities, by Rangabé, in French; the Sepulohral Inscrip- tions of Attica, by Coumanoudis, in modern Greek; and Dodona and its Ruins, by Carapanos, in French. The works of Lambros on numismatics are of great value, The Greeks have also contributed much to a knowledge of the ancient Greek language. Asopios has gained a great name in this direction, and the contributions of Constantinos Contos are very valuable. They have also done much to collect materials for a knowledge of existing dialects. Investigations have been made into the dialects of the

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and lists of peculiar words and forms to be found in Cythera, Chios, Crete, Cyprus, Locris, and other places, have appeared in Pandora and other journals. Castorchis has written much and well on Latin literature. The Greeks have a very large number of newspapers and journals, if we consider the number of the population; but, as might be expected, their existence is precarious, and many are

short lived. Translations abound in modern Greek, especi- Transla- ally from the French, but the Greeks have also translated tions.

classical English and German works, and novels of all kinds. The translations include those of Miiller and Donaldson's History of Greek Literature by Valettas, and Shakespeare's Romeo and Juliet, Hamlet, and Macbeth by Bikelas.

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Athens, 1854-57; Constantinos Sathas, NeoeAAnvixh S:rorAoyla, Athens, 1868; the work of Rizos Neroulos, and the collections of Mavophrydis, Legrand, Wagncr, and Sathas mentioned above; Leake, Aescarches in Greece, London, 1814; short sketches of the literature in J. Donaldson's Modern Greck Grammar, Edin,, 1853, in Geldart, The Modern Greek Language, 1870, and in Sargeant's New Greece. A full account of modern Greek grammars is given in Mullach's Grammatik der Griechischen Vulgarsprache, Berlin, 1856, and in the prefaces by Legrand to the Grammar of Sophianos, Paris, 1874, and his own Grammaire Greeque Moderne, Paris, 1878. Dictionaries:—Kind, Modern Greek and German; Byzantios and Dehéque, Modern Greek and French; Contopoulos, Modern Greek and English; Sophocles, Byzantine Greekand English, Collections of Modern Greek Poetry :—Chantseris, Néos 'EAAnvikds Mapvacods, Athens, 1841; Tepharikis, Napvaccés, Athens, 1868; Antonio Manaraki, Newgriechischer Parnass, Berlin, 1879. Selections of poems:—Kind's Neugricehische Anthologie, Leipsic, 1847; J. Donaldson, Lyra Graea, Edin., 1854; Felton's Selections from Modern Greck Writers in Prose and Poetry, Cam- bridge, U. S., 1857; Vincent and Dickson, Handbook of Modern Greck, London, 1879. Collections of ballads by Fauriel, Zampelios, Passow, Tepharikis, Legrand, and of Cretan ballads by Anton Jeannaraki. Discussion of the modern Greek language and of ballads in Professor Blackie's Hore Helleniew, 1874, and of the baliads in

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GREEK CHURCH, Tus, or more properly the Eastern Church, is both the source and background of the Western. Christianity arose in the Hast, and Greek was the language of the Scriptures and early services of the church, but when Latin Christianity established itself in Europe and Africa, and when the old Roman empire fell in two, and the eastern half became separate in government, interests, and ideas from the western, the term Greek or Eastern Church acquired gradually a fixed meaning. It denoted

the church which included the patriarchates of Antioch, Alexandria, Jerusalem, and Constantinople, and their dependencies. The

ecclesiastical division of the early church, at least within

the empire, was based upon the civil. Constantine intro- duced a new partition of the empire into dioceses, and the church adopted a similar division. The bishop of the chief city in each diocese naturally rose to a pre-eminence, and was commonly called exarch—a title borrowed from the civil jurisdiction, In process of time the common title patriarch was restricted to the most eminent of these exarchs, and councils decided who were worthy of the dignity. The council of Nicaea recognized three patriarchs —the bishops of Rome, Alexandria, and Antioch. To these were afterwards added the bishops of Constantinople and Jerusalem. When the empire was divided, there was one patriarch in the West, the bishop of Rome, while in the East there were at first two, then four, and latterly five. This geographical fact has had a great deal to do in determining the character of the Eastern Church. It is not a despotic monarchy governed from one centre and by a monarch in whom plenitude of power resides. It is an oligarchy of patriarchs. It is based, of course, on the great body of bishops ; but episcopal rule, through the various grades of metropolitan, primate, exarch, attains to sovereignty only in the five patriarchal thrones. Each patriarch is, within his diocese, what the Gallican theory makes the pope in the universal church. He is supreme, and not amenable to any of his brother patriarchs, but is within the jurisdiction of an cecumenical synod. This makes the Greek Church quite distinct in government and traditions of polity from the Western. It has ever been the policy of Rome to efface national distinctions, but under the shadow of the Eastern Church national churches have grown and flourished. Revolts against Rome have always implied a repudiation of the ruling principles of Ultramontanism; but the schismatic churches of the East have always reproduced the ecclesi- astical polity of the church which they have deserted.

The Greek Church, like the Roman, soon spread out far beyond the imperial dioceses which at first fixed its bound- aries, but, unlike the Roman, it did not keep for Christianity all the lands it had once laid hold of. What Rome Christian- ized, with the exception of Africa, remained Christian. The old

empire was overrun by the barbarians, but the con- quered empire imposed its law and its religion upon its con- querors, and pagan and heretic became in the end Catholic Christians. In the East it was otherwise. The empire maintained itself long and died hard ; but its decline and fall meant not merely the overthrow of the supremacy of the emperors of the East, it meant also the destruction of civilization and the submergence of Christianity. In the West, German and Saxon, and Goth and Lombard, became Christian law-abiding peoples. In the East Arab and Kurd, the Seljuk and Ottoman Turk, remained what they were before they swarmed over the Eastern empire, and could never be taught either law or gospel. It is true that the Eastern Church more than made up for her losses by her missionary enterprise, but she never conquered her con- querors, and the historian is too apt to speak of her past glories and forget her present strength. The same reason also makes it difficult to describe, with any accuracy, the extent of the Greek Church. She has shifted her position

gv often that to describe her extent at any one period must be misleading. The church never at any one period occu- pied all the territories she has possessed.

The patriarchate of Constantinople included the imperial dioceses of Pontus, Asia, Thrace, and Eastern Illyricum—z.e., speaking roughly, the greater part of Asia Minor, European Turkey, and Greece, with a small portion of Austria. The imperial diocese of Pontus was governed by the exarch of Cesarea, who ruled over thirteen metropolitans with more than 100 suffragans; now there are nine metropolitans (Kaisarieh, Nisi, Angouri, Niksar, Amasia, Isinid, Kadi- kiov, Broussa, Iznik), and one archbishopric (Trebizond), but the suffragans seem to have disappeared. Asia was governed by the exarch of Ephesus, who ruled over twelve metropolitans with more than 350 suffragan bishops. Of these there remain Ephesus, with its suffragans Aidene and Chisme, Smyrna, Artaki, Marmora, Allah Shehr, Rhodes, Samos, Khio, Cos, Paronaxia, Santorina, Andro, Milo, Lero, Scarpanto, Sephanto, Imbro, Lemno, Metelini, Molivo, Myra, and Konieh. In Asia Minor the church maintains but a small remnant of her former greatness ; in Europe it is otherwise. The old outlines, however, are effaced

wher- ever the Christian races have emancipated themselves from the Turkish rule, and the national churches of Greece, Servia, and Roumania have reorganized themselves on a new basis. Where the Turkish rule still prevails the church retains her old organization, but greatly impaired. The national churches of Russia, Georgia, and Armenia are offshoots from the patriarchate of Constantinople, but quite independent of its jurisdiction.

The patriarchate of Antioch has undergone most changes in extent of jurisdiction, arising from the transfer of sees to Jerusalem, from the progress of the schismatic churches of the East, and from the conquests of the Mahometans. At the height of his power the patriarch of Antioch ruled over 12 metropolitans and 250 suffragan bishops. In the time of the first crusade 153 still survived ; now there are scarcely 20. Most of those that remain are called either metropolitan or archiepiscopal sees, but they have few or no suffragans. In Syria there are still Antioch, Aleppo, Laodicea, aud Arcadia; in Phcenicia, Tyre and Sidon, Beyrout, Tripolis, Emesa, and Heliopolis ; in Cilicia, Adana; in Syria, Epiphania; in Isauria, Seleucia; in Cyprus, Famagosta, with Piscopa, Baffo, Neapolis, Limasol, and Nicosia as suffragan sees. Cyprus has been independ- ent of Antioch, however, since the council of Epliesus. Antioch also had jurisdiction beyond the bounds of the empire over Chaldza and India, and the missionaries of Antioch seem to have preached Christianity in the borders . of China. The Chaldean Church now, however, is almost entirely Nestorian. The Thomas Christians of India do not belong to the Orthodox Greek Church. In Syria the Jacobites are more numerous than the Orthodox ; while the Maronites of Lebanon have become subject to Rome.

In the earlier period of the church, ecclesiastical followed civil divisions so closely that Jerusalem, in spite of the sacred associations connected with it, was merely an ordi- nary bishopric dependent on the metropolitan of Ceesarea. Ambitious prelates had from time to time endeavoured to advance the pretensions of their see, but it was not until the council of Chalcedon, in 451, that Jerusalem was made a patriarchate with jurisdiction over Palestine. From this time on to the inroad of the Saracens, the patriarchate of Jerusalem was highly prosperous. It ruled over three metro- politans with eighty suffragans. The modern patriarch has seven suffragans, all of whon: enjoy the titles of metropolitan or archbishop,—

Czsarea, Scythopolis (Bethshan), Petra, Ptolemais, Sinai, Nablous, Samaria. The patriarchs, how- ever, are non-resident (they live in Constantinople), and the primate of Palestine is the metropolitan of Cesarea.

GREEK CHURCH

The patriarch of Alexandria in ancient times possessed much more power than the others, and the church ruled by him was much more centralized. He had no metropolitans, His hundred suffragans were ordinary bishops. This perhaps in part accounts for the decay of the Orthodox church il Egypt; at present there is no bishop but the patriarch, The Christians in Egypt are for the most part Monophysites. The church of Nubia has been blotted out. The cliurch of ZEthiopia or Abyssinia is Monophysite, and acknowledges the Jacobite patriarch of Cairo.

History.—Controversies and Schisms.—To describe the controversies of the Greek Church is to write the history of the church of the first five centuries; in a short sketch like this all that can be done is to mention those causes of division which led (1) to the formation of the schismatic churches of the East, and (2) to the open rupture with Latin Christianity.

The great dogmatic work of the Greek Church was the definition of that portion of the creed of Christendom which concerns theology proper,—the doctrines of the essential nature of the Godhead, and the doctrine of the Godhead in relation with manhood in the incarnation, while it fell to the Latin Church to define anthropology, or the doctrine of man's nature and needs. The controversies which concern

us are all about the person of Christ, the Theanthropos, for | they alone are represented in the schismatic churches of the |

East, These controversies are most easily described, at least for our purpose, by reference to the cecumenical councils of the ancient and undivided church.

Rise of Sects. —All the churches of the East, schismatic

as well as orthodox, accept unreservedly the decrees of the

first two councils, The schismatic churches protest against the additions made to the creeds of Nicza and Constant- inople by succeeding councils. The Niczeo-Constantin- opolitan creed declared that Christ was consubstantial (6uoovcws) with the Father, and that He had become man (¢vavOpwryoas). Disputes arose when theologians tried to explain the latter phrase. These differences took two separate and extreme types, the one of which forcibly separ- ated the two natures so as to deny anything like a real union, while the other insisted upon a mixture of the two, or an absorption of the human in the divine. The former was the creed of Chaldza and the latter the creed of Egypt ;

Chaldzea was the home of Nestorianism, Egypt the land of | Monophysitism. The Nestorians accept the decisions of |

the first two councils, and reject the decrees of all the rest as unwarranted alterations of the creed of Nicwa, The Monophysites accept the first three councils, but reject the decree of Chalcedon and all that come after it.

The council of Ephesus, the third cecumenical, had insisted upon applying the term Theotokos to the Virgin Mary, and this was repeated in the symbol of Chalcedon, which says that Christ was born of the Virgin Mary, the Theotokos, "according to the manhood." The same symbolalso declares that Christ is "to be acknowledged in two natures, ... in- divisibly and inseparably." Hence the Nestorians, who insisted upon the duality of the natures to such a degree as to lose sight of the unity of the person, and who rejected the term Theotokos, repudiated the decrees both of Ephesus and of Chalcedon, and upon the promulgation of the decrees of Chalcedon formally separated from the church. Nestori- anism had sprung from an exaggeration of the theology of the school of Antioch, and the schism weakened that patri- archate and its dependencies. It took root in Chaldxa, and became very powerful. No small part of the literature and sclence of the Mahometan Arabs came from Nestorian teachers, and Nestorian Christianity spread widely. 'It a successfully preached to the Bactrians, the Huns, the me the Indians, the Persarmenians, the Medes, the

amites, 'The barbaric churches from the Gulf of Persia

to the Caspian Sea were almost infinite… . The Malabar coast and the Isles of the Ocean, Zocotra and Ceylon, were peopled with an increasing number of Christians. The missionaries of Balkh aud Samarcand pursued without fear the footsteps of the roving Tartar, and insinuated them- selves into the valleys of the Imaus and the banks of the Selinga." Their principal bishop took the title of patriarch of Babylon. His seat was later removed to Baghdad and then to Mosul; it is now at Julamerik in Kurdistan. In the 11th century he ruled over twenty-five metropolitans, and his jurisdiction extended from the Tigris to China, from Lake Baikal to South India. Persecutions weakened the church, Timur almost extirpated it. In the 16th cen- tury a schism occurred; many of the Nestorians yielded obedience to Rome. The Roman Nestorians are usually called Chaldeans, though all lay claim to the title. At present the patriarch rules over two metropolitans and sixteen suffragan bishops. The Nestorians dwell princi- pally in Kurdistan, though many are found in Mesopotamia and in India. In the latter country they are numerous ou the Malabar coast, and are called Thomas Christians.

The council of Chalcedon, the fourth cecumenical, de- clared that Christ is to be acknowledged "in two natures— unconfusedly, unchangeably," and therefore decided against the opinions of all who either believed that the divinity is the sole nature of Christ, or who, rejecting this, taught only one composite nature of Christ (one nature and one person, instead of two natures and one person). The advocates of the one nature theory were called Monoplysites, and they gave rise to numerous sects, and to at least three separate national churches—-the Jacobites of Syria, the Copts of Egypt, and the Abyssinian Church.

The term "Jacobite" (from Jacobus Baradzeus, a Syrian theologian) is properly confined to the Syrian Monophysites, but is sometimes used to denote all the various divisions of this heresy, 'The Jacobites therefore accept the first tliree councils and reject those that follow. The Armenian Church does the same, and it is common to class the Armenians with the Jacobites, while some theologians have made them more heretical than the Jacobites of Syria and Egypt (Neale, Holy Eastern Church, Patriarchate of Aleaandria, pp. 8-10). This, however, seems a wrong opinion, and the

Armenians ought to be reckoned as Ortho- dox (see ARMENIAN CHuRcH). Apart, however, from theo- logical criticism, the Jacobites are arranged under three patriarchates—Antioch, Alexandria,and Armenia. Antioch and Alexandria have intercommunion, but Armenia, in spite of times of reconciliation, stands apart. Under the patri- arch of Alexandria is the metran or metropolitan of Abys- sinia, and under the patriarch of Antioch the maphrian or primate of the East. The Jacobites or Copts of Egypt greatly outnumber the members of the Orthodox Greek Church there. The patriarch assumes jurisdiction over Egypt, Jerusalem, Nubia, Abyssinia, and the Pentapolis. He now resides in Cairo, and is chosen by lot in a council of all the bishops from a number of monks recommended by four conveuts to whom belongs this privilege. He has for suffragans the bishops of Menouf, Sherkeyeh, Behnese, Fayoum, Miniyeh, Senabau, Manfalout, Siout, Abuteg, Aschumin, Esne, Kauss and Nekada, and Khartoum. He has besides jurisdiction over twenty-six monasteries, and rules nominally over the Church of Abyssinia.

The Syrian Jacobites also form a_patriarchate—the patriarchate of Antioch. While Antioch belonged to the empire the persecution of the state drove the Jacobite patriarch from the city. He settled at Amida, now called Caramit, which is still the ecclesiastical centre. The second dignitary is the maphrian (fruitbearer) of the East, who was originally a missionary bishop to the regions east of the Tigris. He is now settled at Mosul. The Syrian Jacobites

could at one time boast 20 metropolitans and 103 bishops ; now there are only 5 metropolitans (Caramit, Mosul, Maadan, Aleppo, and Jerusalem) without suffragans.

The decisions of Chalcedon, which were the occasion of the formation of all these sects outside, did not put an end to Christological controversy inside the Orthodox Greek Church. 'The most prominent question which emerged in attempting to define further the person of Christ was whether the will belonged to the nature or the person, or, as it came to be stated, whether Christ had two wills or only one. The church in the sixth cecumenical council at Constantinople declared that Christ had two wills. The

Monotheletes refused to submit, and the result was the formation of another schismatic church—the Maronite Church of the Lebanon range. The Maronites, however, in the 12th century were reconciled to Rome, and cannot now be said to belong to the Greek Church.

Conflict with Rome.—The relation of the Greek Church to the Roman may be described as one of growing estrange- ment from the 5th to the 11th century, and a series of abortive attempts at reconciliation since the latter date. The estrangement and final rupture may be traced to the overweening pretensions of the Roman bishops and to Western innovation in the doctrine of the Holy Spirit, accompanied by an alteration of creed. In the early church three bishops stood forth prominently, principally from the political eminence of the cities in which they rnled—the bishops of Rome, Alexandria, and Antioch. The transfer of the seat of empire from Rome to Constantinople gave the bishops of Rome a possible rival in the patriarch of Constantinople, but the absence of an overawing court and meddling statesmen did more than recoup the loss to the head of the Roman Church. The theological calniness of the West, amid the violent theological disputes which troubled the Eastern patriarchates, and the statesmanlike wisdom of Rome's greater bishops, combined to give a unique position to the pope, which councils in vain strove to shake, and which in time of difficulty the Eastern patri- archs were fain to acknowledge and make use of, however they might protest against it and the conclusions deduced from it. But this pre-eminence, or rather the Roman idea of what was involved in it, was never ackuowledged in the Kast; to press it upon the Eastern patriarchs was to pre- pare the way for separation, to insist upon it in times of irritation was to cause a schism. The theological genius of the East was different from that of the West. The Greek theology had its roots in Greek philosophy, while a great deal of Western theology was based on Roman law. The Greek fathers succeeded the Sophists, the Latin theologians succeeded the Roman advocates (Stanley's Hast, Ch., ch. 1): This gave rise to misunderstandings, and at last led to two widely separate ways of regarding and defining one import- ant doctrine—the procession of the Holy Spirit from the Father orfrom the Father and the Son. Political jealousies and interests intensified the disputes, and at last, after many premonitory symptoms, the final break came in 1054, when Leo. IX. smote Michael Cerularius and the whole of the Eastern Church with an excommunication. There had been mutual

excommunications before, but they had not resulted in permanent schisms. 'It was scarce two centuries since anathemas had been exchanged between Adrian I, and Photius, between Photius and Nicholas IL The sixth council had formally anathematized Honorius I. by name. There had been great violence of language in the 6th century between Gregory L and John the Faster, and not many years before that the name of Vigilius had been de- liberately erased from every one of the diptychs of the Eastern Church" (Ffoulkes's Christendom's Divisions, i, § 17). Now, however, the separation was final, and the ostensible cause of its finality was the introduction by the

Latins of two words filioqgue into the creed. It is this addition which was and which still remains the permanent cause of separation. Jfoulkes has pointed out in his second volume (ch. 1-3) that there was a resumption of inter- course more than once between Rome and Constantinople after 1054, and that the overbearing character of the Norman crusaders, and finally the horrors of the sack of Constantinople in the fourth crusade, were the real causes of the permanent estrangement. It is undeniable, however, that the jilzogue question has always come up to bar the way in any subsequent attempts at intercommunion. The theological question involved is a very small one, but it brings out clearly the opposing characteristics of Eastern and Western theolugy, and so has acquired an importance far beyond its own worth. The question is really one about the relations subsisting between the persons of the Trinity and their hypostatical properties. affirms that the Holy Spirit " proceeds from" the Father and from the Son. It believes that the Spirit of the Father must be the Spirit of the Son also. Such a theory seems alone able to satisfy the practical instincts of the West, which did not concern itself with the metaphysical aspect of the Trinity, but with Godhead in its relation to redeemed humanity. The Eastern Church affirms that the Holy Spirit proceeds from the Father only. The Eastern theologian thinks that the Western double procession degrades the Deity and destroys the perfection of the Trinity. The double procession, in his eyes, means two active principles (airia.) in the Deity, and it means also that there is a confusion be- tween the hypostatical properties ; a property possessed by the Father and distinctive of the First Person is attributed also to the Second. This is the theological, and there is con- joined with it an

historical and moral dispute. The Greeks allege that the addition of the words filiogue was made, not only without authority, and therefore unwarrantably, but also for the purpose of forcing a rupture between East and West in the interests of the barbarian empire of the West.

Attempts at reconciliation were made from time to time afterwards, but were always wrecked on the two points of papal supremacy, when it meant the right to impose Western usages upon the East, and of the addition to the creed. First there was the negotiation between Pope Gregory IX. and the Greek patriarch Germanus. The Latin condi- tions were practically recognition of papal jurisdiction, the use of unleavened bread enforced on the Greeks, and the Greeks to be permitted to omit filiogue on condition that they burnt all books written against the Western doc- trine. The Greek patriarch refused the terms. Then came negotiations under Innocent IV. and Clement IV., in which the popes proposed the same conditions as Gregory IX., with additions. These proposals were rejected by the Greeks, who regarded them as attempts to enforce new creeds on their church.

The negotiations at the council of Lyons (1274) were, strictly speaking, between the pope and the Greek emperor, and were more political than ecclesiastical. Michael Palzo- logus ruled in Constantinople while Baldwin II., the last of the Latin emperors, was an exile in Europe. Paleologus wished the pope to acknowledge his title to be emperor of the East, and in return promised submission to the papal supremacy and the union of the Greek with the Latin Church on the pope's own terms. This enforced union lasted only during the lifetime of the emperor. The only other attempt at union which requires to be mentioned is that made at the council of Florence. It was really sug- gested by the political weakness of the Byzantine empire and the dread of the approach of the Turks. John Palzologus the emperor, Joseph the patriarch of Constantinople, and several Greek bishops came to Italy and appeared at the council of Florence—the papal council, the rival of the

council of Basel. As on former occasions the Greeks were at first deceived by false representations ; they were betrayed into recognition of papal supremacy, and tricked into signing what could afterwards be represented as a submission to Western doctrine. The natural consequences followed, — a repudiation of what had been done ; and the Greek bishops ou their way home took care to make emphatic their ritual- istic differences from Rome. Constantinople, and with this event an end to the political reasons for the submission of the Greek clergy. Rome's schemes for a uniou which meant an unconditional submis- sion on the part of the Greeks did not cease, however, but they were no longer attempted ona grand scale. Jesuit missionaries after the Reformation stirred up schisms in some parts of the Eastern Church, aud in Austria aud Poland many of the Greeks were compelled to submit them- selves to the see of Rome. The result of these schemes has been what is called the Una, or the United Greeks. These various unions have commonly arisen from dissensions among the Greeks themselves when a portion of the dis- sentients have made submission to Rome. Rome commonly promised to allow them to enjoy their own liturgies and rites of worship, but usually broke her promises. This was done so systematically that the college of the Propaganda prints what profess to be the old liturgies of the Eastern churches, which are really so interpolated as to bring them 'surreptitiously into harmony with the Western rites. This is done so universally that it is impossible to trust to any professedly Eastern creed or service-book printed at the office of the Propaganda in Rome.

Differentiation of National Churches included in the Orthodox Greek Church.—Mr Finlay, in his Listory of Greece, has shown that there has been always a very close relation between the church and national life. Christianity from the first connected itself with the social organization of the people, and therefore in every province assumed the language and the usages of the locality. In this way it was able to command at once individual attachment and universal power. 'This feeling died down to some extent when Constantine made use of the church to consolidate his empire. But it revived under the persecution of the Arian emperors. The struggle against Arianism was not merely a struggle for orthodoxy. Athanasius was really at the head of a national,Greek party resisting the domina- tion of a Latin-speaking court. From this time onwards Greek patriotism and Greek orthodoxy have been almost convertible terms, and this led naturally to

revolts against Greek supremacy in the days of Justinian and other em- perors. Dean Stanley is probably correct when he describes the heretical churches of the East as the ancient national churches of Egypt, Syria, and Armenia in revolt against supposed innovations in the earlier faith imposed on them by Greek supremacy. In the East, as in Scotland, the history of the church is the key to the history of the nation, and in the freedom of the church the Greek saw the freedom and supremacy of his race. For this very reason Orthodox Kastern Christians of alien race felt compelled to resist Greek domination by means of independent ecclesiastical organization, and the structure of the church rather favoured than interfered with the coexistence of separate national churches professing the same faith. Another circumstance favoured the creation of separate national churches. While the Greek empire lasted the Greek emperors had a right of Mvestiture on the election of a new patriarch, and this right was retained by the Turkish sultans after the conquest of Constantinople.. The Russian people, for example, could not contemplate with calmness as the head of their church a bishop appointed by the hereditary enemy of their country. Tn this way the jealousies of race and the necessities of nations have produced various national churches which are

Soon after came the fall of.

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independent or autocephalous, and yet are one in doctrine with the Orthodox Greek Church. The most important of these are the churches of Russia, Georgia, Servia, Roumania, Greece, and Montenegro. The churches of Russia and Georgia have been united.

The Church of Russia dates from 992, when Prince Vladimir

Russian

and his people accepted Christianity. The metropolitan, who was Church.

subject to the patriarch of Constantinople, resided at Kieff on the Dnieper. During the Tartar invasion the metropolis was destroyed, and Vladimir became the ecclesiastical capital. In 1820 the metro- politans fixed their

seat at Moscow. In 1582 Jeremiah, patriarch of Constantinople, raised Job, 46th metropolitan, to the patriarchal dignity ; and the act was afterwards confirmed by a general council of the East. In this way the Russian Church became autocepha- lous, and its patriarch had immense power. In 1781 Peter the Great forbade the election of a new patriarch, and in 1721 he estab- lished the Holy Governing Synod to supply the place of the patriarch. This body now governs the Russian Church, and con- sists of five or six bishops, one or two other ecclesiastics of dignity, and several laymen, all appointed by the emperor. The Church of Georgia, which has existed from a very early period, and was dependent first on the patriarch of Antioch and then on the patriarch of Constantinople, has since 1801 been incorporated in the Russian Church. Its head, the archbishop of Tiflis, isa member of the Holy Governing Synod, with the title of exarch, and having under him four suffragans. Russia is divided for ecclesiastical purposes into eparchies of three classes, each of which is ruled over by a bishop. There are three cparchies of the first class, ruled by the metropolitans of Kieff, Novogorod and St Petersburg, and Moscow. The steady increase of the Russian Church makes it difficult to detail with exactness the nuniber of bishops belonging to the three classes; but, according to the report presented to the Holy Governing Synod in 1876, there arc, in addition to the three eparchies of the first class, twenty-one of the second, thirty-three of the third, and six vicariates. These sixty-three bishops possess diocesan authority; and there are besides, excluding the exarchate of Georgia, fifty-six bisliops ruling over monasteries.

The Church of Servia has nndergone great changes. times, when Servia was a strong kingdom, the head of the church invariably claimed the title and authority of patriarch. In 1810, when Kara George achieved the independence of the kingdom, the archbishop of Carlowitz in Hungary was recognized as the head of the church, but in 1880 the national church was reconstituted and declared to be autocephalous. In 1838 the seat of government was removed to Belgrade, and the metropolitan of Belgrade is now the head of the Servian Church, though his right is still disputed by the archbishop of Carlowitz. He has under him as suffragans the bishops of Shabatz, Csatsiik, and Uschize, the last of whom resides at Karanowatz. Election to the episcopate is subject to the veto of the prince and of the

patriarch of Constantinople. The extension of Servia under the provisions of the treaty of Berlin will probably cause some ecclesiastical changes.

Before the union of the two provinces of Moldavia and Wallachia, the Orthodox Greek Church was ruled by two metropolitans—the one at Jassy and the other at Bucharest. Since the independence of the united provinces there has been along-continued conflict, which had for its design, not merely to throw off the supremacy of the patriarch of Constantinople, but to curb the influence of the higher clergy, and to assert the pre-eminence of the Slavonic over the Greck element. The result has been that the state, aided by the lower clergy and the people, has thrown off the supremacy of Constantin- ople, united the church under one metropolitan of Roumania, who has under him the metropolitan of Moldavia and six bishops, con- fiscated the property of most of the convents, which were centres of Greek influence, published liturgies either in the Slavonic or in the Roumanian language, and asserted the supremacy of the state.

The constitution of the Church of Modern Greece is the result of the peculiar position of the patriarch of Constantinople. The war of liberation was sympathized in, not merely by the inhabitants of Greece, but by all the Greek-speaking Christians in the East. But the patriarch was in the hands of the Turks; he had been appointed by the sultan, and he was compelled by the Turkish authorities to ban the movement for freedom. When the Greeks achieved inde- pendence they refused to be subject ecclesiastically to a patriarch who was nominated by the sultan (June 9, 1828); and, to add to their difficulties, there were in the country twenty-two bishops who had been consecrated by the patriarch, twelve bishops who had been consecrated irregularly during the war, and about twenty bishops who had been deprived of their sees during the troubles— 7.¢., fifty-three bishops claimed to be provided for. In these cir- cumstances the Government and people resolved that there should be ten diocesan bishops and forty additional provisional sees. They algo resolved. that the church should be governed after the fashion of the Russian Church by a synod ; and they decreed that the king of Greece was to be head of the church. All these ideas were

In medieval Servian.

Rouma-y nian.

Hellenic.,

Monte- negrin,

Bulgarian,

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carried out with some modifications, and gradually. The patriarch of Constantinople in 1850 acknowledged the independence of the church, which gradually grew to be more independent of the state. The provisional sees were not all merged in the ten proposed dioceses. Greece at present is divided into four exarchies:—(1) the Continent and Eubcea—divided into eight sees, of four archbishops and four bishops; (2) the Peloponnesus—divided into twelve sees, of six archbishops and six bishops; (8) the islands of the Aigean Sea—governed by one archbishop and three bishops; and (4) the Tonian Islands—governed by five archbishops. The Greek Church in Greece includes a good many monasteries ; but tlhe number has been diminished since the war of liberation, and a great many of those that remain have been made use of for the purposes of educa- tion. Many of these convents are dependent on the celebrated ancient monasteries of Athos, Sinai, and Jerusalem. The Greek Church has done and is doing a great deal for the cause of education in Greece.

The bitter enmity which subsists between the people of the Black Mountain and the Turks made them from the beginning repudiate the authority of the patriarch of Constantinople, and the church is nominally independent. It is, however, very closely allied to the Russian Church. Up to the year 1852 the spiritual and the civil authority were vested in one individual, and the prince-bishops were always chosen from the family of Petrowitsch, but in that year the prince-bishop Danilo married, and demitted his episcopal functions. Since then there has been a bishop of Montenegro who has metropolitan functions. He has no suffragan bishops, but rules over three arch-pricsts and a large number of inferior clergy. He is consecrated by the Holy Governing Synod of the Russian Church.

The Church of Bulgaria demanded independence about fifteen years ago, and has practically enjoyed it since 1858, although it has not yet obtained recognition. It is governed by an exarch who, while recognizing the supremacy of the patriarch of Constantinople, refuses to allow him to interfere in any way in the internal govern- ment of the church. It is still under excommunication by the patriarch. The new rights which Bulgaria has acquired under the treaty of Berlin will probably lcad to a rearrangement of the church.

DocTRINES AND CREEDs.—The Greek Church has no creeds in the modern Western use of the word, no normative summaries of what must be believed. It has preserved the older idea that a creed is an adoring confession of the church engaged in worship ; and, when occasion called for more, the belief of the church was expressed more by way of public testimony than in symbolical books. Still the doctrines of the church can be gathered from these confes- sions of faith. The Greek creeds may be roughly placed in two classes,—the cecumenical creeds of the early undivided church, and later testimonies defining the position of the Orthodox Church of tho East with regard to the belief of the Roman Catholic and of Protestant Churches, These testimonies were called forth mainly by the protest of Greek theologians against Jesuitism on the one hand and against the reforming tendencies of Cyril Lucaris on the other. The Orthodox Greek Church adopts the doctrinal decisions of the seven cecumenical councils, together with the canons of the Concilium Quinisextum or second Trullan council : and they further hold that all these definitions and canons are simply explanations and enforcements of the Nicseo-Cion- stantinopolitan creed and the decrees of the first council of Nicsea. The first four councils settled the orthodox faith on the doctrines of the Trinity and of the Incarnation ; the fifth supplemented the decisions of the first four. The sixth declared against Monotheletism; the seventh sanctioned the worship (dovAca not déAnOw7) Aarpeia) of images ; the council held in the Trullus (a saloon in the palace at Constantinople) supplemented by canons of discipline the doctrinal decrees of the fifth and sixth councils.

The Reformation of the 16th century was not without effect on the Greek Church. Some of the Reformers, not- ably Melanchthon, expected to effect a reunion of Christen- dom by means of the Greeks, cherishing the same

hopes as the modern Old Catholic divines and their English sympa- thizers. Melanchthon himself sent a Greek translation of the Augsburg Confession tod oasaph, patriarch of Constantin- ople, and some years afterwards Jacob Andrez and Martin Crusius began a correspondence with Jeremiah, patriarch of Constantinople, in which they asked an official expression of his opinions about Lutheran doctrine. The result was

that Jeremiah answered in his Censura Orientalis Ecclesice condemning the distinctive principles of Lutheranism.

The reformatory movement of Cyril Lucaris brought the Greek Church face to face with Reformation theology, Cyril was a learned Cretan, who, having travelled exten- sively in Europe, and having become acquainted with and devoted to the Reformed faith, was afterwards elected patri- arch of Alexandria in 1602 and patriarch of Constantinople in 1621. He conceived the plan of reforming the Eastern Church by bringing its doctrines into harmony with those of Calvinism, and by sending able young Greek theologians to Switzerland, Holland, and England to study Protestant theology. His scheme of reform was opposed chiefly by the intrigues of the Jesuits. He was five times deposed, and five times reinstated. In the end he was murdered by the Turks at the instigation of the Jesuits. The church anathematized his doctrines, and in its later testimonies repudiated his confession on the one hand and Jesuit ideas on the other. The most important of these testimonies are (1) the Orthodox confession or catechism of Peter Mogilas, confirmed by the Eastern patriarchs and by the synod of Jerusalem (1643), and (2) the decree of the synod of Jerusalem or the confession of Dositheus (1672). Besides these, the catechisms of the Russian Church should be con- sulted, especially the catechism of Philaret, which since 1839 has been used in all the churches and schools in Russia. Founding on these doctrinal sources the teach- ing of the Orthodox Greek Church is :—1

Christianity is a Divine revelation communicated to mankind through Christ ; its saving truths are to be learned froni the Bible and tradition, the former having been written, and the Jatter main- taincd uncorrupted through the influence of the Holy Spirit; the interpretation of the Bible

belongs to the Church, which ts taught by the Holy Spirit, but every believer may read the Scriptures.

According to the Christian revelation, God is a Trinity, that is, the Divine Essence exists in Three Persons, perfectly equal in nature and dignity, the Father, the Son, and the Holy Ghost ; raz Hoty GHOST PROCEEDS FROM THE FATHER ONLY. Besides the Triune God there is no other object of divine worship, but homage (imep- dovAla) may be paid to the Virgin Mary, and reverence (SovAta) to the saints and to their pictures and relics.

Man is born with a corrupt bias which was not his at crcation ; the first man, when created, possessed IMMORTALITY, PERFECT WIS- DOM, AND A WILL REGULATED BY REASON. Through the first sin Adain and his posterity lost IMMORTALITY, AND HIS WILL RECEIVED A BIAS TOWARDS EVIL. In this natural state man, who even before he actually sins is a sinner before God by original or inherited sin, commits manifold actual transgressions ; but he is not absolutely without power of will towards good, and is not always doing evil.

Christ, the Son of God, became man in two natures, which in- ternally and inseparably united make One Person, and, according to the eternal purpose of God, has obtained for man reconciliation with God, and eternal life, inasmuch as He by His vicarious death has made satisfaction to God for the world's sins, and this satisfac- tion was PERFECTLY COMMENSURATE WITH THE SINS OF THE WORLD. Man is made partaker of reconciliation in spiritual regeneration, which he attains to, being led and kept by the Holy Ghost. This divine help is offered to all men without distinction, and may be rejected. In order to attain to salvation, man is justified, and when so justified CAN DO NO MORE THAN THE COMMANDS OF Gop. He may fall from a state of grace through mortal sin.

Regeneration is offered by the word of God and in the sacraments, which under visible signs communicate God's invisible grace to Christians when administered cwm intentione. There are seven mysteries or sacraments. Baptism entirely destroys original sin. In the Eucharist the true body and blood of Christ are substantially present, and the elements are changed into the substance of Christ, whose body and blood are corporeally partaken of by communicants. AuL Christians should receive the bread and the WINE.

The Eucharist is also an expiatory sacrifice. The new birth when lost may be restored through repentance, which is not merely (1) sincere sorrow, but also (2) confession of each individual sin to the priest, and (8) the discharge of penances imposed by the priest for the removal of the temporal punishment which may have been imposed by God and the Church. Penance accompanied by the judicial absolu- tion of the priest makes a true sacrament.

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- *This summary has been taken, with corrections, from Winer. Small capitals denote differences from Roman Catholic, italics differ- ences from Protestant doctrine.*

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GRE—GRE

The Church of Christ is the fellowship of ALL THOSE WHO ACCEPT AND PROFESS ALL THE ARTICLES OF FAITH TRANSMITTED BY THE ApoOsTLES AND APPROVED BY GENERAL Synops. Without this visible Church there is no salvation. It is under the abiding influ- ence of the Holy Ghost, and therefore cannot err in matters of faith. Specially appointed persons are necessary in the service of the Church, aud they form a threefold order, distinct jurc divino from other Christians, of Bishops, Priests, and Deacons, THE FOUR PATRIARCHS, OF EQUAL DIGNITY, HAVE THE HIGHEST RANK AMONG THE BISHOPS, AND THE BISHOPS wnited in a General Council repre- sent the Church and infallibly decide, under the guidance of the Holy Ghost, all matters of faith and ecclesiastical life. All ministers of Christ must be regularly called and appointed to their office, and are consecrated by the sacrament of orders. Bishops must be unmarried, and PRIESTS AND DEACONS MUST NOT CONTRACT A SECOND MARRIAGE. To all priests in common belongs, besides the preaching of the word, the administration of the six sacra- MENTS,—BAPTISM, CONFIRMATION, PENANCE, EUCHARIST, MATRI- MONY, UNCTION OF THE sIcK. The bishops alone can administer the sacrament of orders.

Ecclesiastical ceremonics are part of the divine service ; most of them have apostolic origin; and those connected with the sacrament must not be omittcd by priests under pain of mortal sin.

Lituray anD Worsuip.—The ancient liturgies of the Eastern Church were very numerous, and have been fre- quently classified. Neale makes three divisions—the liturgy of Jerusalem or of St James, that of Alexandria or of St Mark, and that of Edessa or of St Thaddeus ; and Daniel substantially agrees with him. The same _pas- sion for uniformity which suppressed the Gallican and Mozarabic liturgies in the West led to the almost exclusive use of the liturgy of St James in the East. It is used in two forms, a shorter revised by Chrysostom, and a longer called the liturgy of St Basil. This liturgy and the service generally are either in Old Greek or in Old Slavonic —and frequent disputes have arisen in particular districts about the language tobe employed. Both sacred languages differ from the language of the people, but it cannot be said that in the Eastern Church worship is conducted in an unknown tongue,—"the actual difference," says Neale, "'may be about that between Chaucer's English and our own."

Monastic Lirze.—Monastic life was introduced into Christianity in the East, and has always remained a pro- minent feature in Greek Christianity. The monks usually follow the rule of St Basil, but some monasteries, notably that of Sinai, obey the rule of St Anthony. The monks are of three classes : —-korvoSiaxot, who live together in a monas- tery ruled over by a wyovpevos or dpytpavdpirns; dvaxwpytai, who live either in a cloister apart from the other monks or among the laity ; and doxyrat, who are hermits. The nuns, virgins or widows, all follow the rule of St Basil. There are three great convents—at Jerusalem, Sinai, and Mount Athos; each has a great number of daughter monasteries throughout the East. Many monasteries are presided over by bishops, and many monks are in priests' and deacons' orders, Monks alone are eligible for election to bishoprics and the higher offices in the Eastern Church.

Number of Adhercnts.—These can only be given approximately :—

Orthodox Greek Church in ee ee ee 10,000,000 a9 – VOMMIMANIIA vic. sscivenesaceceveans 4,529,000 2) 2 POSING: csc cuiscarecaees erent

*1,345,000 ”» Ff MUOTVCMARO 2… .ccecc eee sac aes 130; 000 ” ms Gee COM APR: cette canes 1,310,000 * 38 OTS hn oe eee 8,000,000*

Russia (including Poland, Siberia, and the Caucasus) 58,000,000

0 29

1 78,314,000

To these may be added :— ie Russian Dissenters ….....ccccccssese sccescecesceeccecceceeceee 1,051,000 Mnetians…..... 3,000,000 : ; Bere ce Mate sauces ie csneadeencase ,000, Nestorians (including the Thomas Christians of India)... 360,000 oo ok i 90,000 (ac ca ees ee a 121,000 eee ancssad soci dccsccciucicessssaees caves 1,200, 000

- 5,822,000

United Greeks (chiefly in Austria and else)... cscs… 4,670,000

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See the common books on Church History, as those of Neander, Gieseler, Robertson, &c. Special mention may be made of Schrockh’s Christliche Kurchengeschichtc, and the various collections of councils, e.g., Mansi’s or, for English readers, Hefele’s History of the Coun- cils, translated in Clark’s series. J or the controversies which gave rise to the schismatic churches, consult F. C. Baur, Die Christliche Lehre von der Dreieinigkeit; Dorner, History of the Doctrine of the Person of Christ, translated in Clark’s series; J. H. Newman, The Arians of the Fourth Century; Swainson, The Apostles’ and Nicene Creeds. For the Filioque controversy Walch, Historia Con- troversie de Processu Spiritus Sancti, and the works of Swete and Langen, may be referred to, also Schaff’s History of the Creeds of Christendom. The following are devoted specially to the history and condition of the Eastern Church:—M. Le Quien, Oriens Christianus; Asseman, Bibliotheca Orientalis; Stanley’s Hastern Church; and, above all, J. M. Neale, The Holy Eastern Church (General Introduction, 2 vols.; Patriarchate of Alexandria, 2 vols.; and, published posthumously in 1873, Patriarchate of Antioch, lvol.). For liturgy, see Daniel, Codex Liturgicus Eccl. Univ, in Epitomen

redactus, 4 vols., 1847-55, and the shorter works of Neale and Littledale; Renaudot, Collectio Liturgiarum Orient.; Leo Allatius, De libris et rebus Eccles. Grecarwm Disscrtationes. For hymnology, see Daniel, Thesawrus Hymnologicus, 4 vols., and Neale's translations of Hastern Hymns ; and for creeds, the collcc- tions of Kimmel, Gass, and Schaff. (T. M. L.)

GREEK EMPIRE. See Greece, p. 114 sqq.

GREEK FIRE is properly the name applied to the inflammable and destructive compounds used in warfare in the Middle Ages, and particularly by the Byzantine Greeks at the sieges of Constantinople. It was the precursor of gun- powder, and of such modern compositions as dynamite and nitroglycerin, and was frequently accessory to gunpowder for many years after its invention. But combustible mineral substances were employed in war much earlier than the Middle Ages. Greek fire has borne the names wildfire, maritime fire, wet fire, fire-rain ; called by the French few grégeois, by the Germans griechisches Feuer, it was "the oil of cruel fire" of the Chinese, the olewm incendiarum of tle Romans, and the wip dypév, liquid fire, of the Greeks. Procopius designates it "Medea's oil." Cinnamus (12th century) describes it as wip Mydcxov, Median fire, thie black clays of Media and Persia supplying the principal con- stituent. Used chiefly at sieges and in naval engagements, it was poured from cauldrons and ladles on the besiegers and their engines, or vomited through long copper tubes from the mouths of hideous figures set in the prows of ships. Sometimes flax was twisted and saturated with the liquid, then fired, and projected on arrows, lances, and javelins. At sea it was often flung in pots and phials. The heavy ballista and other military engines were pressed into the service in early times for scattering this destructive compound in large quantities, often in barrels. Owing to the viscid nature of Greek fire it adhered to whatever it touched. It is described as producing a thick smoke, a loud explosion, and a fierce flame, and as being quickened by the element of water. Sea-water is specially mentioned as intensifying its inflam- mability ; and whenever it fell among ignitible materials terrible havoc was occasioned. The sight and sound of the engine discharging the torrent of fire carried dismay into many a warrior's breast. The devastating consequences pictured by early writers are probably overdrawn, but there can be no doubt that they were formidable. Liquid fire has been used in

warfare from very remote times, as may be seen in the Assyrian bas-reliefs in the British Museum. Greek fire, properly so called, is said to have been employed for the first time against the Saracens in the siege of Constantinople, 673-679, the inventor being a Syrian named Callinicus. The art of compounding Greek fire was concealed at Constantinople with the most jealous care ; indeed it was to Greek fire, while the secret of its manu- facture was kept, that the city owed in great measure its safety. In 1755 two Frenchmen, Gaubert and Dupré, are reported to have rediscovered the art so carefully concealed by the Byzantine Greeks ; but they were prohibited from making it known. Various projects for the use of this or

similar preparations have been advocated in recent times. The ingredients and relative proportious of the com- position are not exactly known, the secret having been very successfully preserved. The Syrian historian Michael applies the name naphtha to the "newly invented" Greek fire ; and this probably was the destructive agent of the Assyrians, Persians, and other Eastern nations, springs of naphtha abounding in their territories. According to the author of L'Hsprit des Croissades, Greek fire was com- pounded of the gum of the pine and other resinous trees reduced to powder, with the addition of brimstone, naphtha, and other bitumens. Fanciful substances were included, such as the water of a particular fountain in the Hast, duck's grease, &c. Friar Bacon mentions two of the in- gredients, saltpetre and sulphur, but conceals the rest. Giambattista Porta states that Greek fire is made by boil- ing together willow charcoal, salt, ardent aqua vite, sulphur, pitch, frankincense, threads of soft Ethiopian wool, and camphor. In a Spanish MS. of the 13th century in the Bodleian library a different receipt is given; and others will be found in the Liber ignium a Marco Greco preescriptus, é&c., Sloane MS. (Brit. Mus.) 323 ; in the Sloane MS. 7, Modus faciendi ignem grecum, &c. From all that has been said it appears that naphtha—otherwise petroleum, rock oil, or Rangoon tar—and sulphur, and sometimes nitre, were the principal constituents; and the use of these, or two of them, in varying quantities, with the charcoal mentioned by Porta, no doubt gave birth to gunpowder. An invention by Niepce comprised benzol and potassium, in the propor- tion of 600 to 1,

placed in a glass vessel; and Disney's is believed to have included a solution of phosphorus in sulphide of carbon or chloride of sulphur. But of all the spontaneously combustible liquids, Bunsen's kakodyl, As,(CH;),, is probably the most deadly, while it is far in advance of the old Greek fire as a destroyer of life. A combustible used at the siege of Charleston, U.S., in 1863 consisted of (1) saltpetre, sulphur, and lampblack, pressed into small tubes, and (2) coal-tar naphtha, placed in shells or pumped through hose. The best military authorities appear now to agree that Greek fire is unsuitable for pur- poses of war, and comparatively little use has been made of it in recent times.

For further details see Recepta varia de preparatione ignis Greet, Sloane MS. 282; also Arundel MS. 164; Beckmann, Gesch. der Er fin- dungen ; Dufresne, Lsprit des Croissades, Amsterdam, 1780; Gibbon f Grose, Mil. Antig.; Hoefer, Hist. de la Chimie; Joinville, Memoirs, 1807; Libri, Hist. des setences math. en Italie; Mechanics' Magazine 18th August 1844; Napoleon III., Etudes sur… . U'Artilleric « Poggendorff, Geseh, d. Physik, 1879 ; Roy. Instit. Quart. Journ., xiv. : Scoffern, Projectile Weapons, 1858 ; and the writings of the Byzan- tine historians.

HORACE GREELEY

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ORACE GREELEY, an eminent American editor,

was born at Amherst, New Hampshire, February 3, 1811. His parents were of Scotch-Irish descent, but the ancestors of both had been in New England for several generations, He was the third of seven children. His father, Zaccheus Greeley, owned a farm of 50 acres of stony, sterile land, from. which a bare support was wrung. Horace was a feeble and precocious lad, taking little in- terest in the ordinary sports of childhood, learning to read before he was able to talk plainly, and being the prodigy of the neighbourhood for accurate spelling. Before he was ten years old his father, through bad management and endorsing for his neighbours, became bankrupt, and his home was sold by the sheriff, while Zaccheus Greeley himself fled the State to escape arrest for debt. The family Soon removed to

West Haven, Vermont, where, all working together, they made a scanty living as day

labourers. Horace Greeley from childhood desired to be a printer, and, when barely eleven years old, tried to be taken as an apprentice in a village office, but was rejected on account of his youth. After three years more with the family as a day labourer at West Haven, he succeeded, with his father's consent, in being apprenticed in the office of The Northern Spectator, at East Poultney, Vermont. Here he soon became a good workman, developed a passion for politics, and especially for political statistics, came to be depended upon for more or less of the editing of the paper, and was a figure in the village debating society. He received only $40 a year, but he spent almost nothing himself, and sent most of his money to his father. In his twentieth year The Northern Spectator was suspended. Meantime his father had removed to a small tract of wild land in the dense forests of Western Pennsylvania, 30 miles from Erie. The released apprentice now visited his parents, and worked for a little time with them on the farm, meanwhile seeking employment in various printing offices, and, when he got it, giving nearly his whole earn- ings to his father. At last, with no further prospect of work nearer home, he started for New York. He travelled on foot and by canal-boat, entering New York in August 1831, with all his clothes in a bundle carried over his back with a stick, and with but $10 in his pocket. More than half of this sum was exhausted while he made vain efforts to find employment. Many refused, in the belief that he was a runaway apprentice, and his poor, ill-fitting apparel and rustic look were everywhere greatly against him. At last he found work on a 82mo New Testament, set in agate, double columns, with a middle column of notes in pearl. It was so difficult and so poorly paid that other printers had all abandoned it. He barely succeeded in making enough to pay his board bill, but he finished the task, and thus found subsequent employment easier to get.

In January 1833 Greeley formed a partnership with Francis V. Story, a fellow-workman. Their combined capital amounted to $150. Procuring their type on credit, they opened a small office, and undertook the printing of the first cheap paper published in New York. Its projector, Dr H. D. Sheppard,

*meant to sell it for one cent, but under the arguments of Greeley he was persuaded to fix the price at two cents. The paper failed in three weeks, the printers only losing $50 or $60 by the experiment. They still had a '*Bank Note Reporter" to print, and soon got some lottery printing. Within six months Story was drowned, but his brothers in-law, James Winchester, took his place in the firm. Greeley was now asked by James Gordon Bennett to go into partnership with him in starting The Herald. He declined the venture, but recom- mended the partner whom Bennett subsequently took. On the 22d of March 1834, Greeley and Winchester issued the first number of The New Yorker, a weekly literary and news paper, the firm then supposing itself to be worth about $3000. Of the first number they sold about 100 copies; of the second, nearly 200. 'I'here was an average increase for the next month of about 100 copies per week. The second volume began with a circulation of about 4550 copies, and with a loss on the first year's publication of $3000. The second year ended with 7000 subscribers, and a further loss of $2000. By the end of the third year The New Yorker had reached a cirenlation of 9500 copies, and a total loss of $7000. It was pub- lished nearly seven years and was never profitable, but it was widely popular, and it gave Greeley, who was its sole editor, much prominence. On the 5th of July 1836 Greeley married Miss Mary Y. Cheney, a Connecticut school teacher, whom he had met ina Grahamite (vegetarian) boarding-house in New York.*

During the publication of The New Yorker he added to the scanty income which the job printing brought him by supplying editorials to The Daily Whig and various other publications. In 1838 he had gained such standing as a writer that he was selected by Thurlow Weed, William H. Seward, and other leaders of the Whig party, for the editorship of a campaign paper entitled The Jeffersonian, published at Albany. He continued The New Yorker, and travelled between Albany and New York each week to edit the two papers. The Jeffersonian was a quiet and instructive rather than a vehement campaign sheet, and the Whigs believed that it had a great effect upon the elections of the next year. When, on the 2d of May 1840, some time after the nomination by the Whig party of William Henry Harrison for the Presidency, Greeley began

the publication of a new weekly campaign paper, The Log Cabin, it sprang at once into a great circulation ; 48,000 copies of the first number were sold, and it finally rose to 90,000. It was considered a brilliant political success, but it was not profitable. On April 3, 1841, Greeley announced that on the following Saturday he would begin the publication of a daily newspaper of the same general principles, to be ealled The Tribune. He was now entirely without money. From a personal friend, Mr James Coggeshall, he bor- rowed $1000, on which capital and the editor's reputation The Tribune was founded. It began with 600 subscribers. The first week's expeuses were $525 and the receipts $92. By the end of the fourth week it had run up a circulation of 6000, and by the seventh reached 11,000, which was then the full capacity of its press. It was alert, cheerful, and aggressive, was greatly helped by the attacks of rival papers, and promised success almost from the start.

From this time Greeley was popularly identified with Fhe Tribune, and its share in the public discussion of the time is his history. It soon became moderately prosperous, and his assured income should have placed him beyond pecuniary worry. In a period of twenty-four years The Tribune divided between its owners the sum of $1,240,000, besides a surplus of $381,939 earned and invested in real estate and improved machinery. The average annual dividend on each share (representing ;}, of the property) was $516.66. Greeley's income was long above $15,000 per year, frequently as much as $35,000 or more. But {he lacked business thrift, inherited a disposition to endorse for his friends, and was often unable to distinguish between deserving applicants for aid and adventurers. He was thus frequently straitened, and, as his necessities pressed, he sold successive interests in his newspaper. At the outset he owned the whole of it. When it was already clearly established, he took in Thomas M'Elrath as an equal partner, upon the contribution of $2000 to the common fund. By the 1st of January 1849 he had reduced his interest to 314 shares out of 100; by July 2, 1860, to 15 shares ; in 1868 he owned only 9; and in 1872, only 6. In 1867 the stock sold for $6500 per share, and his last sale was for $9600. He bought wild lands, took stock in mining companies, desiccated egg companies, patent looms, photo-lithographic companies, gave away profusely, lent to plausible rascals, and was the ready prey of every new

inventor who chanced to find him with money or with property that he could readily convert into money.

In the autumn of 1851 Greeley merged his weekly papers, The Log Cabin and The New Yorker, into the The Weekly Tribune, Which soon attained as wide circulation as its predecessors, and was much more profitable. It rose in a time of great politieal excite- ment to a total circulation of a quarter of a million, and it some- times had for successive years 140,000 to 150,000. For several years it was rarely much below 100,000. Its subscribers were found throughout all quarters of the northern half of the Union from Maine to Oregon, large packages going to remote rural dis- tricts beyond the Mississippi or Missouri, whose only connexion with the outside world was through a weekly or semi-weekly mail. The readers of this weekly paper acquired a personal affection for its editor, and he was thus for many years the American writer most widely known and most popular ainong the rural classes. The circulation of The Daily Tribune was never proportionately great— its advocacy of a protective tariff, prohibitory liquor legislation, and other peculiarities, repelling a large support which it might otherwise have commanded in New York. It rose within a short time after its establishment to a circulation of 20,000, reached 59,000 and 60,000 during the war for the Union, and thereafter ranged at from 30,000 to 45,000. A semi-weekly edition was also printed, which ultimately reached a steady circulation of from 15,000 to 25,000.

From the outset it was a cardinal principle with Greeley to hear all sides, and to extend a special hospitality to new ideas. In The Lribune's first year it began to give one column daily toa dis- cussion of the doctrines of Charles Fourier, contributed by Albert Brisbane. Gradually Greeley came to advocate some of these doc- trines editorially. In 1846 he had a sharp discussion upon them with a former subordinate, Henry J. Raymond, then employed upon a rival journal. It continued through twelve articles on each side, and was subsequently published in book form. Greeley became personally interested in one of the Fourierite associations, the American Phalanx, at Red Bank, N. J. (1843-50), while the influence of his discussions doubtless led to other socialistic experiments. One of these was that at Brook Farm, which embraced Ralph Waldo Emerson and Nathaniel Hawthorne es its members. When this was abandoned, its presi-

ent, George Ripley, with one or two other members, sought pet yment from Greeley upon The Tribune. Greeley dissented a many of Fourier's propositions, and in later years was careful o explain that the principle of association for the common good of oso men and the elevation of labour was the chief feature r hich attracted him. Co-operation among working men he con- ae to urge throughout his life. In 1848 the Fox Sisters, on

8 wife's invitation, spent some time at his house. His attitude

toward their "rappings" and "spiritual manifestations" was one of observation and inquiry ; and, while he never pronounced all the manifestations fraudulent, he distrusted most of them, and declared that as yet he saw no good in them, and nothing specially requiring the attention of intelligent men. From boyhood he had believed in a protective tariff, and throughout his active life he was its most trenchant advocate and propagandist. Besides constantly urging it in the columns of The Tribune, he appeared as early as 1843 in a public debate on "' The Grounds of Protection," with Samuel J. Tilden and Parke Godwin as his opponents. A series of popular essays on the subject were published over his own signature in The Tribune in 1869, and subsequently republished in book form, with a title-page describing protection to home industry as a system of national co-operation for the elevation of labour. He opposed woman suffrage on the ground that the majority of women did not want it and never would, but aided practical efforts for extending the sphere of woman's employments. He opposed the theatres, and for a time refused to publish their advertisements. He held the most rigid views on the sanctity of marriage and against casy divorce, and vehemently defended them in controversies with Robert Dale Owen and others. He practised and pertinaciously advocated total abstinence from spirituous liquors, but did not regard prohibitory laws as always wise. He denounced the re- pudiation of State debts or the failure to pay interest on them. He was zealous for Irish repeal, once held a place in the " Directory of the Friends of Ireland," and contributed liberally to its support. He used the occasion of Dickens's first visit to America to urge international copyright, and was one of the few editors to avoid alike the flunkeyism with which Dickens was first received,

and the ferocity with which he was assailed after the publication of his American Notes. On the occasion of Dickens's second visit to America Greeley presided at the great banquet given him by the press of the country. He made the first elaborate reports of popular scientific lectures by Agassiz and other authorities. He gave ample hearing to the advocates of phonography and of pho- netic spelling. He was one of the most conspicuous advocates of the Pacific railroads, and of many other internal improvements.

But it is as an anti-slavery leader, aud as pels the chief agency in educating the mass of the Northern people to that oppo- sition through legal forms to the extension of slavery which culmi- nated in the election of Abraham Lincoln and the War of the Rebellion, that Greeley's main work was done. Incidents in it were his vehement opposition to the Mexican war as a scheme for more slave territory, the assault made upon him in Washington by Congressman Albert Rust of Arkansas in 1856, an indictment in Virginia in the same year for circulating incendiary documents, perpetual denunciation of him in Southern newspapers and speeches, and the hostility of the Abolitionists, who regarded his course as too conservative. His anti-slavery work culminated in his appeal to President Lincoln, entitled "The Prayer of Twenty Millions," in which he urged "that all attempts to put down the rebellion and at the same time uphold its inciting cause" were "preposterous and futile," and that "every hour of deference to slavery " was "an hour of added and deepened peril to the Union." President Lincoln in his reply said :—"My paramount object is to save the Union, and not either to save or destroy slavery… . What I do about slavery and the coloured race, I do because I believe it helps to save this Union ; and what I forbear, I forbear because I do not believe it would help to save the Union. .... I have here stated my purpose according to my views of official duty; and I intend no modification of my oft-expressed personal wish that all men everywhere could be free." Precisely one month after the date of this reply the Emancipation Proclamation was issued.

Greeley's political activity, first as a Whig, and then as one of the founders of the Republican party, was incessant ; but he held few offices. In 1848-9 he served a three months' term in Con- gress, filling a vacancy. He introduced the first bill for giving small tracts of Government land free to

actual settlers, and pub- lished an exposure of abuses in the allowance of mileage to members, which correeted the evil but brought him much personal obloquy. In the National Republican Convention in 1860, not being sent by the Republicans of his own State on account of his opposition to Governor Seward as a candidate, he was made a delegate for Oregon. His active hostility to Seward did much to prevent the success of that statesman, and to bring about instead the nomination of Abraham Lincoln. This was attributed by his opponents to personal motives, and a letter from Greeley to Seward, the publica- tion of which he challenged, was produced, to show that in his struggling days he had been wounded at Seward's failure to offer him office. In 1861 he was a candidate for United States Senator, his principal opponent being William M. Evarts. When it was clear that Mr Evarts could not be elected, his supporters threw their votes for a third candidate, Ira Harris, who was thus chosen over Greeley by a small majority. At the outbreak of the war he favoured allowing the Southern States to secede, provided a majority of their people at a fair election should so decide, declaring 'that

he hoped never to live in a Republic whercof one section was piuned to the other by bayonets." When the war began he urged the most vigorous prosecution of it. The "On to Richmond" appeal, which appeared day after day in The Tribune, was incorrectly attributed to him, and it did not wholly meet his approval ; but after the defeat at Bull Run he was widely blamed for it. In 1864 he urged negotiations for peace with representatives of the Southern Confederacy in Canada, and was sent by President Lincoln to confer with them. They were found to have no sufficient authority. In 1864 he was one of the Lincoln Presidential electors for New York. At the close of the war, contrary to the general feeling of his party, he urged universal amnesty and impartial suffrage as the basis of reconstruction. In 1867 his friends again wished to elect him to the Senate of the United States, and the indications were all in his favour. But he refused to be elected under any mis- apprehension of his attitude, and with what his friends thought unnecessary candour restated his obnoxious views on universal amnesty at

length, just before the time for the election, with the certainty that this would prevent his success. Some months later he signed the bail bond of Jefferson Davis, and this provoked a torrent of public indignation. – He had written a popular history of the late war, the first volume having an immense sale and bringing him unusually large profits, subscribers, in their anger, refused by thousands to receive it. The Union League Club, of New York, gave him notice, through its President, John Jay, of a special meeting called to consider his conduct. In an indignant letter he refused to attend the meeting, and challenged the club to a direct issue. " Your attempt," he wrote, "to base a great, enduring party on the hate and wrath necessarily engendered by a bloody civil war is as though you should plant a colony on an iceberg which had somehow drifted into a tropical ocean. I tell you here that, out of a life earnestly devoted to the good of human kind, your children will select my going to Richmond and signing that bail bond as the wisest act.

. .. All I care for is that you make this a square, stand-up fight, and record your judgment by yeas and nays. I care not how few vote with me, nor how many vote against me ; for I know that the latte will repent it in dust and ashes before three years have passed. .

The effort to expel him failed. In 1867 he was elected delegate at large to the Convention for the revision of the State constitution. In 1869 he was the Republican candidate for State Controller. There was no hope that any one on the ticket that year could be elected, but he received more votes than most of his associates. In 1870 he was nominated for Congress in a Democratic district. His illness prevented his making any canvass, but his nomination re- duced the Democratic majority from 2700 two years before to about 1000, and he ran 300 ahead of the Republican candidate for Governor.

He was dissatisfied with the conduct of General Grant's adminis- tration, and became its sharp critic. The discontent which he did much to develop ended in the organization of the " Liberal Republi- can" party, which held its National Convention at Cincinnati in 1872, and was confidently expected to nominate Charles Francis Adams for the presidency. Greeley, however, had unexpected strength, especially among the Southern

delegates, and on the sixth ballot received 332 votes against 324 for Adams, —immediate changes reducing the Adams vote still further, so that as the ballot was recorded it stood—Greeley, 482; Adams, 187. For a time the tide of feeling ran strongly in his favour. It was first checked by the action of his life-long opponents, the Democrats, who also nominated him at their National Convention. He expected their support, on account of his attitude towards the South and hostility to Grant, but he thought it a mistake to give him their formal nomination, The event proved his wisdom. Many Republicans who had sympathized with his criticisms of the administration, and with the declaration of principles adopted at the first convention, were repelled by the coalition. This feeling grew stronger until the election. His old party associates regarded him as a renegade, and the Democrats gave him a half-hearted support. The tone of the canvass was one of unusual bitterness, amounting sometimes to actual ferocity. In August, on representations of the alarming state of the contest, he took the field in person, and made a series of campaign speeches, beginning in New England and extending throughout Pennsylvania, Ohio, and Indiana, which aroused great enthusiasm, and were regarded at the time by both friends and opponents as the most brilliant continuous exhibition of varied intellectual power ever made by a candidate in a presidential can- vass. General Grant received in the election 3,597,070 votes, Greeley 2,834,079. The only States Greeley carried were Georgia, Kentucky, Maryland, Missouri, Tennessce, and Texas.

He had resigned his editorship of The Tribune immediately after the nomination ; he now resumed it cheerfully ; but it was soon apparent that his powers had been overstrained. For years he had suffered greatly from sleeplessness. During the intense excitement of the campaign the difficulty was increased. Returning from his campaign tour, he went immediately to the bedside of his dying

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The second was just issued, and the

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wife, and for some weeks had practically no sleep at all. This resulted in an inflammation of the upper menibrane of the brain, delirium, and death. He expired on the 29th of November 1872. His funeral was a simple but impressive public pageant. The body lay in state in the City Hall, where it was surrounded by crowds of many thousands. The ceremonies were attended by the president and vice-president of the United States, the chief-justice of the supreme court, and a large number of eminent public men of both parties, who followed the hearse in a solemn procession, preceded by the mayor and other civic authorities, down Broadway. He had been the target of constant attack during his life, and his personal foibles, careless dress, and mental eccentricities were the theme of endless ridicule. But his death revealed the high regard in whieh he was generally held as a leader of opinion and faithful public servant. " Our later Franklin" Whittier called him, and it is in some such light his countrymen remember him.

In 1851 Greeley visited Europe for the first time, serving as a juryman at the Crystal Palace Exhibition, appearing before a com- mittee of the House of Commons on newspaper taxes, and urging the repeal of the stamp duty on advertisements. In 1855 he made a second trip to Europe. In Paris he was arrested on the suit of a sculptor, whose statue had been injured in the New York World's Fair (of which he had been a director), and spent two days in Clichy, of which he gave an amusing account. In 1859 he visited California by the overland route, and had numerous public recep- tions. In 1871 he visited Texas, and his trip through the southern country, where he had once been so odious, was an ovation. About 1852 he purchased a farm at Chappaqua, New York, where he afterwards habitually spent his Saturdays, and experimented in agriculture. He was in constant demand as a lecturer from 1848, when he made his first appearance on the platform, always drew large audiences, aud, in spite of his bad management in money matters, received considerable sums, sometimes $6000 or $7000 for a single winter's lecturing. He was also much sought for as a con- tributor, over his own signature, to the weekly newspapers, and was sometimes largely paid for these articles. In religious faith he was from boyhood a Universalist, and for many years a conspicuous member of the leading Universalist church in New York.

His published works are :—Hints Toward Reforms (New York, 1850); Glances at Europe (1851); History of the Struggle for Slavery Extension (1856); Overland Journey to San Francisco (1860); The American Conflict (2 vols., Hartford, 1864-66, pp. 648 and 782, dedicated to " John Bright, British Commoner and Christian States- man, the friend of my country because the friend of mankind"); Recollections of a Busy Life (New York, 1868; new edition, with appendix containing an account of his later years, his Argument on Marriage and Divorce with Robert Dale Owen, and Miscellanies, New York, 1873); Essays on Political Economy (Boston, 1870) ; What I know of Farnving (New York, 1871). He also assisted his brother-in-law, Jolin F. Cleveland, in editing A Political Teaxt-Book (New York, 1860), and supervised for many years the annual issues of The Whig Almanac and The Tribune Almanac, comprising ex- tensive political statistics.

Lives of Greeley have been written by James Parton (New York, 1855 ; new editions, 1868, and Boston, 1872), L. U. Reavis (New York, 1872), and L. D. Ingersoll (Chicago, 1873). There is also a Memorial of Horace Giceley (New York, 1873).

GREEN BAY, a city of the United States, capital of Brown county, Wisconsin, is situated at the head of Green Bay, an inlet on the west shore of Lake Michigan. The bay is 100 miles long, from 15 to 35 miles wide, and of considerable depth. The city stands near the mouth of Fox River, with a small stream known as the East River on the other side, its situation affording it a secure har- bour. Itis 242 miles N. of Chicago, 114 N. of Milwaukee, and 120 N.E. of Madison, the capital of the State. By the completion of a canal connecting the Fox and Wis- consin rivers at Portage City, Green Bay has become the terminus of the inland water-system which unites the great lakes with the Mississippi and the Gulf of St Lawrence with the Gulf of Mexico. The nearness of Green Bay to the forests of the State makes it a centre of the Jumber trade, and it exports annually large quantities of planks, boards, shingles, staves, and headings. It has several other manufactories, an iron furnace, a foundry, machine- shops, tanneries, planing-mills, and breweries. The fishing interests, especially in white-fish and lake-trout, are important. Three lines of railway and the largest lake steamers minister to its commerce. Though the French formed settlements

on the bay as early as 17 45, the site of the present city was not laid out until 1830

and 1835, when the villages of Navarino and Astor were founded. In 1839 these were incorporated under the name of Green Bay, and in 1854 a city charter was granted. It was in 1868 created a bishop's see by Pius IX., and a handsome cathedral church in the Romanesque style has been erected since. The growth of the place has been rapid even for an American city. The population in 1860 numbered 2275, and 4666 in 1870, exclusive of Fort Howard across the river, with its population of 2462, which commercially may well be regarded as part of the city. In 1875 the State census gave 8037 to Green Bay

'and 3610 to Fort Howard.

GREENE, Maurice, an English composer, was born in London towards the close of the 17th century (about 1696, it is generally stated). He was the son of a clergyman in the city of London, and soon became a chorister of St Paul's Cathedral, where he studied under Charles King, and subsequently under Richard Brind, organist of the cathedral from 1707 to 1718, whom, on his death in the last-named year, he succeeded. Nine years later he became organist and composer to the chapel royal, on the death of Dr Croft. In 1730 he was elected to the chair of music in the uni- versity of Cambridge, and had the degree of doctor of music conferred on him. Dr Greene was a voluminous composer of church music, and his collection of Morty Select Anthems is a standard work of its kind. He also wrote a Z'e Deum, several oratorios, a masque, The Judgment of Hercules, and a pastoral opera, Phebe (1748). He is also among the writers of glees and catches, a form of music peculiar to English composers (see Gure); and a collection of Catches and Canons for Three and Four Voices is amongst his com- positions, In addition to this he wrote many occasional pieces for the king's birthday, having been appointed master of the king's band in 1735. But it is as a composer of church music that Greene will be chiefly remembered. It is here that his contrapuntal skill and his sound musical scholarship are chiefly shown. The influence of Handel is, however, discernible in his compositions. With that great master Greene was

originally on intimate terms, but his equal friendship for Buononcini, Handel's rival, estranged the German master's feelings from him, and all personal intercourse between them ceased. Greene, in conjunction with Festing and others, originated that excellent institution, the Society of Musicians, for the support of poor artists and their families. He died September 1, 1755.

GREENE, Natganart (1742-1786), an American general, son of a Quaker who followed the joint occupation of a farmer and smith, was born at Potowhommet, Warwick county, Rhode Island, May 27, 1742. From his early years he was employed in assisting his father, but he suc- ceeded, notwithstanding this, in acquiring a large amount of general information, and made a special study of mathe- matics, history, and law. At Coventry, where he removed to take charge of a forge of his own, he was the first to establish a public school; and in 1770 he was chosen a member of the legislature of Rhode Island. Sympathizing strongly with the revolutionists he in 1774 joined the

'Kentish Guards," and on this account was expelled from the Society of Friends, In 1775 he was appointed to the command of the contingent of 1000 men raised by Rhode Island, and after joining Washington before Boston he was named brigadier-general. In 1776 he obtained the rank of major-general and accompanied Washington to New Jersey, where he took part in the battles of Trenton and fete: At the urgent request of Washington he in

8 accepted the office of quartermaster-general, on the understanding, however, that he should retain the right to command in the field, a right of which he took advantage at the battle of Monmouth, 24th June of the same year,

and at the battle of Springfield, 23d June 1780. In August following he resigned his office, and on the 2d of December he succeeded Gates in the command of the Southern army. In this position he was soon successful in restoring the demoralized and helpless troops to a con- dition of thorough vigour and efficiency ; and though not always technically victorious in the

combats in which he engaged, he conducted operations in such a masterly manner that the enemy gained little advantage from any victories they obtained, and were never able to baffle him in what was essential in his plans. At the beginning of the cam- paign he detached General Morgan to attack the enemy at Cowpens, with a result that was brilliantly successful. Then followed a series of clever retreats to avoid engaging superior forces, until he deemed himself strong enough to attack the enemy at Guilford Court House; and although he here suffered defeat, the British army a few days afterwards retreated towards Wilmington. After following a short distance in pursuit he changed his line of march, and advancing into South Carolina attacked Lord Rawdon at Camden, and again suffered a defeat. But this reverse also failed to impede his energy, and after capturing a number of forts he again engaged Lord Rawdon at the battle of Eutaw Springs, which, though a drawn combat, resulted in the British abandoning South Carolina. For his services in the campaign he was presented with two pieces of captured ordnance, a British standard, and a gold medal. Georgia and North and South Carolina also made him valuable grants of land. He died from sunstroke at his estate of Mulberry Grove, Savannah, June 19, 1786. His Life and Letters, 3 vols., edited by G. W. Greene, were published in 1867-71.

GREENE, Rosert (1560-1592), dramatist and miscel- laneous writer, was born at Norwich about the year 1560. As an eastern counties man (to one of whose plays, Har Bacon, the Norfolk and Suffolk borderland owes a lasting poetic commemoration) he naturally received his education at Cambridge, where he took his B.A. from St John's College in 1578, proceeding M.A. in 1583 from Clare Hall, where it is possible that he had expectations of a fellow- ship. In 1588 he was incorporated at Oxford, so that on some of his title-pages he 'styles himself ' utriusque Academize in Artibus Magister," and Nash humorously refers to him as "utriusque Academiz Roberius Greene." Between the years 1578 and 1583 he had travelled abroad, according to his own account very extensively, visiting France, Germany, Poland, and Denmark, and learning at first hand to "hate the pride of Italie" and to know the taste of that poet's fruit, "Spanish mirabolanes." Whether on his return he took holy orders, the evidence ou the sub- ject is insufficient to determine ; according to the title-page of a pamphlet published by him in 1585 he was then a 'student in phisicke." Already,

however, after taking his M.A. degree, he had according to his own account begun his London life, and engaged in pursuits more congenial to his tastes. He became "an author of playes and a penner of love-pamphlets, so that I soone grew famous in that qualitie, that who for that trade growne so ordinary about London as Robin Greene?" He rapidly sank into" the worst debaucheries of the town, though not without being inspired by a passing impulse towards a better life, and de- rided in consequence by his associates as a ' Puritane and Presizian." His marriage, which soon after this took place, failed to steady him; if Francesco, in Greene's pamphlet Never too late, is intended for the author himself, it had been a runaway match; but the fiction and the autobio- graphical sketch in the Repentance agree in their account of the unfaithfulness which followed on the part of the husband. He lived with his wife fora while; "but for- asmuch as she would perswade me from my wilfull wicked-

nes, after I had a child by her, I cast her off, having spent up the marriage-money which I obtained by her. Then left I her at six or seven, who went into Lincolnshire, and I to London," where his reputation as a playwright and writer of pamphlets "of love and vaine fantasyes " con- tinued to increase, and where his life was a feverish alter- nation of labour and debauchery. He tells us how in the end he was friendless " except it were in a fewe alehouses," where he was respected on account of the score he had run up. When the end came he was a dependant on the charity of the poor and the pitying love of the unfortunate. Henri Murger has drawn no picture more sickening and more pitiful than the story of Greene's death, as told by his Puritan adversary, Gabriel Harvey—a veracious though not an unprejudiced narrator. (Greene had stung his vanity by an allusion to his paternal origin in the prose-tract of A Quip for an Upstart Courtier.) After a banquet where the chief guest had been the dramatist Nash,—an old associate and perhaps a college friend of Greene's, any great intimacy with whom, however, he seems to have been anxious to disclaim,—Greene had fallen sick "of a surfeit of pickle herringe and Rennish wine." At the house of a poor shoemaker near Dowgate, deserted by all except his compassionate hosts and two women,—one of them the mother of his illegitimate son, Fortunatus Greene,—he died, September 2, 1592. Shortly

before his death, he wrote under a bond for ten pounds which he had given to the good shoemaker, the following words addressed to his long-forsaken wife :—‘ Doll, I charge thee, by the loue of our youth and by my soules rest, that thou wilte see this man paide ; for if hee and his wife had not succoured me, I had died in the streetes.—Ropert GREENE.”

Shortly after Greene’s death the dramatist Henry Chettle published a pamphlet from the hand of the unhappy man, entitled Gireene’s Groat’s-worth of Wit bought with a Million of Repentance. This ill-starred production may almost be said to have done more to excite the resentment of pos- terity against Greene’s name than all the errors for which he so unctuously professed his (doubtless sincere) repent- ance. For in it he chose to point the fact of his own con- version by exhorting three of his guordam acquaintance to go and do likewise. Of these three Marlowe was one—to whom and to whose creation of “that Atheist Tamber- laine” (perhaps to both author and hero under the name of the latter) he had repeatedly alluded or referred in previous pamphlets. The second was Peele, the third pro- bably Nash. But the passage addressed to Peele contained a transparent allusion to a fourth dramatist, who was an actor likewise, and of whom Greene accordingly thought himself entitled to speak with insolent arrogance as of “an vpstart crow beautified with our feathers, that with his Tygres heart wrapt in a player’s hyde supposes hee is as well able to bombast out a blanke-verse as the best of you ; and being an absolute Iohannes-fac-totum, is in his owne conceyt the onely shake-scene in a countrey.” The phrase italicized parodies a passage occurring in The True Tragedie of Richard, Duke of Yorke, &c., and retained in Part III. of Henry VI. If Greene (as many eminent critics have thought) had a hand in The True Tragedie, he must here have intended a charge of plagiarism against Shakespeare. But it seems more probable that, while (as Mr R. Simpson suggested) the upstart crow beautified with the feathers of the three dramatists is a sneering description of the actor who declaimed their verse, the animus of the whole attack (as Dr Ingleby explains it) is revealed in its concluding phrases. This “‘ shake-scene,” ae, this actor, had ventured to intrude upon the domain of the regular staff of play-wrights—their monopoly was in danger !

Altogether not less than thirty-five prose-tracts are as-

cribed to Greene's prolific pen. To these, which are by no means all of a personal or even controversial character, he owed in his lifetime a great part of his celebrity. Nearly all of them are interspersed with verses ; in their themes they range from the " misticall" wonders of the heavens to the familiar but " pernitious sleights" of the sharpers of Lon- don. But the most widely attractive of his prose publi- cations were no doubt those to which he more especially refers under the designation of ' love-pamphlets," and which, as he tells us, brought upon him the outcry of Puritan censors. In these popular productions he appears very distinctly as a follower of the fashionable euphuistic style, indeed two of them are by their titles announced as a kind of sequel to the mother romance. But though Greene's style shows the same balanced oscillation to aud fro, and his diction the same elaborate ornateness, as those of Lyly, he contrives to interest by the matter as well as to attract attention by the manner of his narratives. It is known that on his Pandosto, the Triumph of Time (1588) Shake- speare founded his A WVinter's Tale; in fact, the novel con- tains the entire plot of the comedy, though some of the subordinate characters in the latter (including the immortal Autolycus) were added by Shakespeare.

In Greene's Never too late, announced in its author's unctuous variety of the euphuistic manner as a " Powder of Experience : sent to all youthfull gentlemen" for their benefit, the hero of the Palmer's story is in all probability intended for Greene himself ; and this episodical narrative has a vivacity and truthfulness of manner which savour of an 18th century novel rather than of an Elizabethan tale concerning the days of "' Palmerin, King of Great Britaine." The experiences of the Roberto of Greene's Groat's- worth of Wit are even more palpably the experiences of the author himself, though they are possibly overdrawn—for a born rhetorician exaggerates everything, even his own sins. Much that might be enlarged upon in Greene's manner as a writer of prose fiction shows how already in the Eliza- bethan age there was a possibility of the English novel anticipating what proved the slow course of its actual de- velopment.

For us, however, Greene's name lives chiefly if not solely as that of a dramatist. Only four plays remain to us of which he was indisputably the

sole author. The earliest of these seems to be The History of Orlando Furioso, one of the Twelve Peeres of France—which has (on unsatisfactory evidence) been dated as before 1586, and is known to have been acted on February 21, 1592. It is a free dramatic adaptation of Ariosto (who in one passage is textually quoted), and contains a large variety of characters and a superabundance of action. Fairly lucid in arrangement and fluent in style, it lacks in the treatment of its main situ- ation—the madness of Orlando—the tragic power to which in truth its author was a stranger. Greene's Orlando has been described as "a stepping stone to Lear and Hamlet," but its priority to Kyd's Spanish Tragedy (to which the author of this observation likewise refers) is not proved. Very few dramatists between Sophocles and Shakespeare have succeeded in subordinating the grotesque -effect of madness to the tragic; and Greene (the close of whose play is tameness itself) is not among the number.

Of the Comical History of Alphonsus, King of Arragon, Henslowe's Diary contains no trace. Butit can hardly have been first acted long after the production of Marlowe's Tamburlaine, which had been brought on the stage at least three years before. For this play—which is oddly enough called "comical," though it contains not a single comic character, and is surely unintentionally humorous in the effect of some of its passages—was manifestly written in emulation of Marlowe's tragedy. While Greene cannot have thought himself capable of surpassing Marlowe as 2

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tragic poet, he very probably wished to outdo him in "business," and to equal him in the rant which, since there has been an English theatre, has been sure to bring down at least part of the house. Alphonsus is accordingly not less sensational than Z'amburlaine, and supplied its share of quotations to ancient Pistol. It is a hestory proper,—a dra- matized chronicle or narrative of warlike events,—and a very effective one of its kind. Its fame could never equal that of Marlowe's tragedy ; but its composition showed that Greene could seek to rival the most popular drama of the day, without falling very far short of his model.

In the Honourable Wistory of Friar Bacon and Friar Bungay (not known to have been acted before February 1592, but very possibly written by 1588) Greene once more attempted to emulate Marlowe ; but on this occasion, while producing something very different from the play with which he placed his own in competition, he succeeded in producing a masterpiece of his own, Marlowe's Doctor Faustus, which there is every reason to believe suggested the composition of Greene's comedy, is a work which, even in the form in which it has come down to us, reveals the mighty tragic genius of its author; and it was fortunate for Greene's fame that he resolved on an altogether distinct treatment of a cognate theme. Interweaving with the popular tale of Friar Bacon and his wondrous doings a charming idyl (so far as we know, of his own invention), the story of Prince Edward (I.)'s love for the Fair Maid of Fressingfield, he produced a comedy brimful of amusing action and genial fun, aud at the same time containing a dramatic love-story of unsurpassed freshness and brightness, Friar Lacon remains a dramatic picture of English life with which Zhe Aferry Wives alone can vie; and not even the ultra-classicism in the similes of its diction can destroy the naturalness which constitutes its perennial charm.

In The Scottish Historie of James IV. (not printed till 1598, acted by 1592) Greene seems to have reached the climax of his dramatic powers. The " historical " character of this play is pure pretence, so that one wonders how a Tudor dramatist could have dared toinvent a fictitious name and unreal experiences (of a painful kind) for King Henry VII.'s daughter Its theme is the illicit passion of King James for the chaste lady Ida, to obtain whose hand he endeavours, at the suggestion of a villain called Ateukin, to make away with hisown wife. She escapes in doublet and hose, attended by her faithful dwarf ; but on her father's making war upon her husband to avenge her wrongs, she effects a reconciliation between them. Not only is this well-constructed story effectively worked out, but the char- acters are vigorously drawn, and in Ateukin there is a touch of Iago. The fooling by Slipper, the clown of the piece, is unexceptionable ; and lest even so the play should hang heavy on the audience, its action is carried off by a "pleasant comedie "—7.¢., a prelude and some dances be- tween the acts—"presented by Oboram, King of Fayeries" —the Oberon of A Midsummer Night's Dream (probably later in date than Greene's play).

It is hard to have to abandon the belief that George-a- Greene the Pinner of Wakefield (printed 1599), a delightful picture of English life fully worthy of the author of friar Bungay, has been rightly attributed to him. Of the comedy of Fair Hm, which resembles Friar Bacon in more than one point, it is most improbable that Greene was the author. The disputed question as to his supposed share in the plays on which the Second and Third Parts of Henry VI. are founded has been already referred to. He Was certainly joint author with Thomas Lodge of the curi- ous drama called A Looking Glasse for London and Lingland (printed 1594)—a dramatic apologue conveying to the

tving generation of Englishmen the warning of Nineveh's corruption and prophesied doom. The lesson was fre-

quently repeated in the streets of London by the '" Nine- vitical motions" of the puppets; but there are both fire and wealth of language in Greene and Lodge's oratory. The comic element is not absent, being supplied in abundance by Adam, the clown of the piece, who belongs to the family of Slipper and of Friar Bacon's servant, Miles.

Greene's dramatic genius has nothing in it of the inten- sity of Marlowe's tragic muse ; nor perhaps are there any passages in his poetry equalling certain of Peele's when at his best. On the other hand, of none of Shakespeare's pre- decessors or contemporaries can it be said, as of Greene, that his dramatic poetry is occasionally animated with the breezy freshness which no artifice can simulate, but which nothing but obtuseness can mistake. He can construct neatly and with facility, though of course belonging to a period of our dramatic literature when the art of construc- tion was still in its infancy, He has created no character of comnianding power—unless Ateukin be excepted ; but his personages are living men and women, and marked out from one another with a vigorous but far from rude hand. Elis comic humour is undeniable, and he unites a spirit of true farcical fun with a capacity for light and graceful dia- logue. His diction is overloaded with classical ornament ; but even this he frequently employs with pleasing aptness. His versification is easy and fluent ; and its cadence is at times singularly sweet. He creates his best effects, like a true artist, by

the simplest means ; and he is indisputably one of the most gifted and one of the most pleasing among our early dramatic authors.

The best account of Greene and his writings (including a list of all his prose tracts) is that by the late Mr Dyce, prefixed to his edition of Zhe Dramatic and Poetical Works of Robert Grecne, 1 vol., 1861; the 2 vol. edition was published in 1831. It contains copious extracts from Pandosto, and from other prose-writings by Greene. Greene's Groat's-worth of Wit is printed in part 1. of Dr Ingleby s Shakespeare Allusion-Books (New Shakespeare Society's Publications, 1874). Dr Ingleby's general introduction, and a sup- plement by the late Mr Richard Simpson, as well as the observa- tions in Mr Simpson's School of Shakespeare, will be of great value to readers of Greene. W. Bernhardi's Robert Greene's Leben und Schriften (Leipsic, 1874) is an essay full of useful research ; and Prof. J. M. Brown of Christchurch, New Zealand, has contiibuted a spirited, but at the same time judicious, criticism of Greene to the New Zealand Magazine for April 1877. A Russian mono- graph on him by N. I. Storozhenko (Moscow, 1878) is described as perhaps the fullest hitherto published. Friar Bacon and Friar Bungay has been edited, together with Marlowe's Doctor Faustus, for the Oxford Clarendon Press (1878). (A. W. W.)

GREENFINCH (German @rtinjink) or GREEN LINNET, as it is very often called, a common European bird, the Fringilla chloris of Linneeus, ranked by many systematists with one section of Hawfinches, Coccothraustes, but appar- ently more nearly allied to the other section /espertphona (cf. Fron, vol. ix. p. 192), and perhaps justifiably deemed the type of a distinct genus, to which the name Chloris or Ligurinus has been applied. The cock, in his plumage of green and gold, is one of the most finely coloured of our common birds, but he is rather heavily built, and his song is hardly commended. The hen is much less brightly tinted. Throughout Britain, as a rule, this species is one of the most plentiful birds, and is found at all seasons of the year. It pervades almost the whole of Europe, and in Asia reaches the river Ob. It visits Pales- tine, but is unknown in Egypt. It is, however, abundant in Mauritania, whence specimens are so brightly coloured that they have been deemed to form a distinct species, the Ligurinus aurantiventris of Dr Cabanis, but that view is now generally abandoned. In the north-east of Asia and its adjacent islands occur two

allied species—the Fringilla sinica of Linneeus, and the /. kawarahiba of Temminck, No species of Greenfinch is found in America. (A, N.

GREENHEART, one of the most valuable of timbers, is the produce of Vectandra Rodicet. nat ord. Lauracece, a tree

which grows toa height of 70 feet, native of Guiana, where, inland, it exists in great abundance. The Indian name of the tree is Sipiri or Bibiru, and from its bark and fruits is obtained the febrifuge principle Bibirine (see BrBiRiNez). Greenheart wood is of a dark green colour, sap wood and heart wood being so much alike that they can with diffi- culty be distinguished from each other. 'The heart wood is one of the most durable of all timbers, and its value is greatly enhanced by the fact that it is proof against the ravages of many marine borers which rapidly destroy piles and other submarine structures of most other kinds of wood available for such purposes. In the Kelvingrove Museum, Glasgow, there are two pieces of planking from a wreck submerged during eighteen years on the west coast of Scotland. The one specimen—greenheart—is merely slightly pitted on the surface, the body of the wood being perfectly sound and untouched ; while the other—teak—is almost entirely eaten away. Greenheart, tested either by transverse or by tensile strain, is one of the strongest of all woods, and it is also exceedingly dense, its specific gravity being about 1150. It is one of the few woods included in the first class of Lloyd's Register for shipbuilding purposes, and it is exten- sively used for keelsons, beams, engine-bearers, and plank- ing, &c., as well as in the general engineering arts, but its excessive weight unfits it for many purposes for which its other properties would render it eminently suitable.

GREENLAND, or GR6NLAND, is the name applied to a large continental island, the greater portion of which lies within the Arctic Circle, and all of which is arctic in character (see vol. i, Plate X.). It is entirely unconnected with any portion of Europe or America, though in the extreme north only separated from the latter by the narrow strait which lies between it and the outlying portion of America known as Grinnell Land. From Europe it is divided by the North and Greenland Seas,—the Faroe Isles, Jan Mayen Island, Iceland, and part of Shetland being the only lands between it and

Norway. Denmark Strait is the sea between it and Iceland, and itis more than probable that Spitzbergen is the only great group of islands lying to the east of its northern portion. On the west, Davis Strait and Baffin's Bay separate it from the opposite shore. The latter sea narrows to the north into the gulf generally known as Smith Sound, though, in reality, Kane Sea, Kennedy Channel, Hall Basin, and Robeson Channel are the names which have been successively applied in the progress of exploration to the northern continuations of the sound so named more than two hundred years ago by William Baffin. The exact northern termination of Green- land is not known, the country never having been doubled on the north ; but we know enough from the explorations of Markham, Beaumont, and other officers of Nares's expedi- tion, to lead to the conclusion that the ice-encumbered Polar Ocean circles around the headlands of the broken country which forms its supposed limits in about 83° N. lat,

From Cape Farewell, or Kangersuak,—an island lying about 18 miles from Pamiagdluk, the most southern Danish post on the west,—to Cape Britannia, is about 1380 miles ; and the greatest breadth of Greenland is about 77° 30' N. lat. —690 miles from the one coast to the other. The shore-line is fully 3400 miles long; butso little is the country known with accuracy, and so broken is it by fjords and coast-lying islands, that any accurate estimate of its area is impossible. Thus Dr Rink, who has been connected with the govern- ment in various capacities for upwards of thirty years, esti- mates its area at 512,000 square miles. This estimate allows 192,000 square miles for what has been called the outskirts—or islands uncovered by ice—with their fjords, and 320,000 for the interior, believed to be almost entirely covered by a glacier ice-cap.

On the east coast, Cape Bismarck, in 76° 47' N, lat., marks

the limits of exploration; though as early as 1670 Lambert is said to have sighted land several degrees further north. From Cape Bismarck south to Cape Fare- well (59° 35' N, lat.) the coast is very imperfectly known, whole stretches being entirely uncharted, even in the rudest fashion. This arises from the Spitzbergen ice-stream con- tinually pouring down that shore, rendering it possible to approach within siglit of it only on rare occasions,

and to land still more rarely. Yet, from the explorations of Hall and Lindenow in early times, and those in this century by Scoresby,! Graah,? the German expedition,? and Mourier (1879), we know its general features. These are—high beetling cliffs, great glaciers creeping down to the sea, and deep inlets, like Scoresby Sound and Franz Josef Fjord, penetrating the land for distances which cannot as yet be definitely stated. A number of islands also are dotted over the chart here; but there are few "ice fjords," the slope of the inland ice being evidently chiefly towards the west coast. The west coast is of-much the same character,— only, on this side, the fjords with which it is intersected have been nearly all followed to their heads. Many of them stretch several miles into the interior, and the greater number are ended by glacier prolongations of the " inland ice," which discharge icebergs; these are known as "ice fjords." The Greenland fjords, like those of Norway, British Columbia, and other countries with a western tx- posure, bear every mark of having been at one time the beds of glaciers, when the climate and physical geography of the country were different from what they are at present. The country cannot be said to be mountainous, yet heights of from 3000 to 4000 feet are common, and the aspect which the coast presents is that of high cliffs;—black when steep, white where the snow can lie ; snow for eight or nine months in the year on even the lower lands ; icebergs and broken floe-ice floating off the coast; an "ice-foot" attached to the shore early in the spring; and glaciers peeping down through the valleys between the cliffs and fjelds. There are one or two still higher points, such as Petermann's Peak—near the shores of Franz Josef Fjord on the east coast (11,000 feet), Payer's Peak, Sukkertoppen, and the familiar Sanderson's Hope. With the exception of Disco, there are no large islands; but the bays, fjords, straits, and peninsulas of this extremely broken coast are so numerous that it is needless mentioning them by name. The Interior Ice-covering.—The Danes divide Greenland into two physical divisions—the " outskirts " and the "inland ice." The first comprises the coast-lying land, the latter the interior. If we ascend any considerable eminence on the west coast, and look eastward, we do not find mountains and valleys as in most other countries, but only one huge, seemingly endless, expanse of glacier ice gradually rising towards the east, until the view is bounded by a white horizon, If we cross the coast-lying land, which varies in breadth from a few miles to twenty, or in a few cases much more, we come to this "inland ice, " generally in the form of a glacier offshoot of

it which has crept down into a fjord, or is making its way to the sea in one of the mossy valleys lying between two high cliffs, noisy with mollemokes or with the weird scream of cor- morants, which at various sheltered places have colonies in these "skarvefjelde." In the former case the glacier usually presents a steep wall facing the sea, from which great fragments of ice are continually breaking off, or the icebergs being detached by the force of the sea; then it 1s "sermik soak "—the " great ice wall '—-of the Eskimo. In the latter case, it presents a slope on which the explorer

- *Journal of a Voyage to the Northern Whale Fishery (1823).*
- *Reise til Ostkysten af Gronland (1832; trans. by G. Gordon Macdougall, 1837).*

3 Koldeway, Die zweite deutsche Nordpolarfahrt (1873-75).

ean climb, and ascend into the interior over the inland ice, of which it is a prolongation, A little way eastward, the covering is found to be hard glacier ice, rising by a gentle slope,—covered in the winter and spring with a thick coating of snow, which partially melts during the summer, forming considerable lakelets on the surface of the ice, or courses over it in the shape of streanis that thunder down the deep crevasses which divide it here and there as in ordinary glaciers. No sign of living thing is seen on it, save patches here and there of a low order of plants identical with or allied to the "red snow" (Ancylonema Nordenskjéldii,! Protococcus vulgaris, P. nivalis, and Scy- tonema gracilis); uo moraine of any description, show-

ing that the ice could not have impinged on land in its

travels; and no sign of the ice having come in contact with any other physical influence save that of the atmosphere, unless the presence here and there in hollows of the minute powder-like mineral "kryokonite" is to be considered anexception. The few explorers who have ever attempted to penetrate this terrible waste all give the same account.? Travel eastward, and nothing but ice—rough, crevasse- torn, white, earthless, moraineless, lifeless—is seen, until, in the far distance, the view is bounded by a dim,

misty horizon of ice, which, at a distance of about 30 miles inland, rises to a height of 2000 feet above the sea. North is ice; south is ice; and behind are seen the “ out- skirts,” or ice-bare islands. The only exception to this general statement is to be found in the fact that here and there the ice has licked in and surrounded, but not yet covered, bits of high land near the coast, which stand out black amid the surrounding icy whiteness. Such an island in the ice is known to the Greenlanders as a ‘ nunatak.” A noted one has long been known to exist some 50 miles east of the westward edge of the inland ice north of Frederiks- haab. It was long supposed to be merely the east coast mountains, the country being narrow at this point; but the explorations of Lieut. Jensen, R.D.N., in July and August 1878, prove it to be a peak 5000 feet high,— ae, about 3000 feet above the surrounding ice, —entirely isolated. On the other side of this mountain ridge the glacier field was observed stretching without interruption as far as the eye could see, the plateau apparently rising higher and higher to the east,? which may account for the fact that the German explorers did not notice the inland ice in their explorations of Franz Josef Fjord. The high peak only proves that, though in the course of ages the winter snow, unmelted by the summer heats, has got compressed into the glacier sheet which has covered the interior, and is partially discharging its surplus in the form of icebergs on the coast, it has not yet accumulated to such depths as to overwhelm these elevated places. It may, however, do SOin time ; for, though it is clear that at one time the climate of Greenland was very different from what it is now, it is equally evident that at no very distant date the lce overspread much of the now uncovered outskirts. The so-called “ glaciers ” which reach the sea are long or short, broad or narrow, according to the character of the valley through which they creep seaward. Thus a coast “ glacier,” 80 called, may be 40 miles broad, like the Great Glacier of Humboldt, or only a few yards, like most of the others in Greenland. When the glacier reaches the sea it ploughs along the bottom, until, by the force of the water, its end is buoyed up and finally broken off in the shape of an ice- berg, which is carried by the winds and currents out to a pctgeten, Ofv. Kongl. Vet. Akad. Forh., 1871, p. 293. Pa – ee of these explorations are given by Brown in Arctic aie (1875), and in “ Das Innere von Gronland ” 1 (quarter: ? euungen, 1871), as well as in “ Physics of Arctic 2G y Journal of the Geol. Soc., 1869). cograph. Magazine, 1878, p. 282 ; Deutsche Geog. Blitter, 1878 ;

sea to be in time again melted and absorbed into the ocean whence it originally sprang. If, on the contrary, the sea is shallow, the glacier will protrude for a considerable

distatice, as in the case of the Isblink, a little north of the

fishing-station of Avigait (62° 32’ N. lat.), which is a low sandy beach projecting about 8 miles in front of the inland ice, aud forming a breakwater against the force of the waves. From under the Arctic glacier pours, as in the Alpine ones, a muddy stream, which silts up some of the fjords, and forms deposits identical with the laminated glacial clays of Britain. Such, in brief, is the inland ice of Greenland, which has been known since the days of Fabricius, but has only been recently generally recognized, and even yet is imperfectly understood in its all-important bearings on the study of ancient glacial remains.*

Geology.—So far as made out, the structure of explored Greenland is as follows :—

(1.) Laurentian gneiss forms the greatest mass of the exposed rocks of the country bare of ice. They are found on both sides of Smith Sound, rising to heights of 2000 feet, and underlie the Miocene and Cretaceous rocks of Disco Island, Noursoak Peninsula, and the Oolites of Pendulum Island in East Greenland. It is pos- sible that some of these rocks are also of Huronian age, but it is doubtful whether the rocks so designated by the geologists of the “Alert” and “ Discovery” expedition arc really the rocks so known in Canada, or are a continuous portion of the fundamental or oldest gneiss of the north-west of Scotland and the Western Isles.

(2.) Silurian.—Upper Silurian, having a strong relation to the Wenlock group of Britain, but with an American facies, and Lower Silurian, with a succession much the same as in British North America, are found on the shores of Smith Sound, but not as yct so far south as the Danish possessions.

(3.) Devonian rocks are believed to occur in Igaliko and Tunnu- diorbik Fjords, in 8S.W. Greenland, but as they are unfossiliferous sandstone, rapidly disintegrating, this cannot be known. It is, however, likely that this formation occurs in Greenland, for in Dana Bay, Capt. Feilden found a species of Spirifera, and Productus mesolobus or costatus, though it is possible that these fossils represent the " Ursa stage'"' (Heer) of the Lower Carboniferous. But a few Devonian forms have also been recorded from the Parry Archipelago, which tends to confirm belief in the existence of a sporadic Devonian formation in Greenland.

(4.) Carbonifcrous.—In erratic blocks of sandstone, found on the Disco shore of the Waigatt, have been detected a Sigillaria and a species of either Pecopteris or Glcichenia, perhaps of this age ; and probably much of the extreme northern coast of Grinnell Land, and therefore, in all likclihood, the opposite Greenland shorc, contains a clearly developed Carboniferous Limestone fauna, identical with that so widely distributed over the North American continent, and referable also to British and Spitzbergen species. Of the Coal Measures above these, if they occur, we know nothing at present. Capt. Feilden notes as suggestive that, though the explorers have not met with this formation on the northern shores of Greenland, yet it was observed that a continuation of the direction of the known strike of the limestones of Feilden peninsula, carried over the polar area, passcs through the neighbourhood of Spitzbergen, where the forma- tion occurs, and contains certain species identical with those of the Grinnell Land rocks of this horizon. The facies of the fossils is, according to Mr Ethcridge, North American and Canadian, though many of the species are British. The corals arc few in number, but the MMolluscoida (Polyzoa) are more numerous in species and individuals. No Secondary rocks have been discovered in the extreme northern parts of West Greenland, but they are present on the east and west coasts in more southerly latitudes than Smith Sound.

(5.) Jurassics.—These do not occur on the west coast, but on the east coast the German expedition discovered marls and sandstones on Kuhn Island, resembling those of the Russian Jurassics, charac- terized by the presence of the genus Aucella, an ammonite (Perisphinctes Paycri), A. striolaris, Bclemnitcs Pandcrianus, B. volgensis, B. absolutus, and a Cyprina near to

C. syssole. On the south coast of the same island are coarse-grained, brownish micaccous, and light-coloured calcareous sandstone and marls, con- taining fossils, which render it probable that they are of the same

4 Fauna Groenlandica (1780), p. 4; Nordenskjdld, Redogirelse for en Expedition till Grénland dr 1870 (1871), also translated in Geolog. Mag. (1873), and Nordenskjild's Arctic Voyages (1879) ; Rink, " Om Grénlands Inland" (No. 9, Fra Videnskabens Verden, 1875), Danish Grecniand (1877), and Grénland geographisk og statistisk beskrevet (1857); Helland, Ueber die Gletscher Nordgrinlands und die Bildung der Eisberge (1877); and the various works and memoirs cited by Brown in Aretic Papers of R. G. S. (1875).

age as the coal-bearing Jurassics of Brora, Skye, and Mull (Scotland), and the Middle Dogger of Yorkshire. There is also coal on Kuhn Island.

(6.) Cretaceous.—Beds of this age, consisting of sandstones and coal, are found on the northern coast of Disco Island, and the southern side of the Noursoak Peninsula, the, beds in the former locality, "the Kome strata" of Nordenskjold, being the oldest. They reach 1000 feet in thickness, oecupying undulating hollows in the underlying gneiss, aud dip towards the Noursoak Peninsula at 20°, when the overlying Atanakerdluk strata come in. Both these series contain numerous plant remains, evergreen oaks, magnolias, aralias, &c., and seams of lignite (coal), which is burnt; but in neither occur the marine beds of the United States. Still, the presence of dicotyledonous leaves, such as Magnolia alternans, in the Atan- akerdluk strata, proves their close alliance with the Dakota series of the United States. The underlying Kome beds are not present in the American series. They are characterized by fine cycads (Zamites arcticus, and Glossozamites Hoheneggert), which also occur in the Urgonian strata of Wernsdorff.

(7.) Miocene, —This formation, one of the most widely spread in polar lands, though the most local in Greenland, is also the best known feature in its geology. It is limited to Disco Island, and perhaps to a small part of the Noursoak Peninsula, and the neighbouring country, and consists of numerous thin beds of sand- stone, shale, and coal,—the sideritic shale

containing immense quantities of leaves, stems, fruit, &c., as well as some insects, and the coal pieces of retinite. The study of these plant and insect remains shows that forests containing a vegetation very similar to that of California and the southern United States, in some instances even the species of trees being all but identical, flourished in 70° N, lat. during geological periods comparatively recent. These beds, as well as the Cretaceous series, from which they are as yet only im- perfectly distinguished, are associated with sheets of basalt, which penetrate them in great dykes, and in some places, owing to the wearing away of the softer sedimentary rocks, stand out in long walls running across the beds. These Miocene strata have not been found further north on the Greenland shore than the region men- tioned ; but in Lady Franklin Bay, on the Grinnell Land side of Smith Sound, they again appear, so that the chances are they will be found on the opposite coast, though doubtless the great disintegra- tion Greenland ie undergone and is undergoing has destroyed many of the softer beds of fossiliferous rocks. On the east coast, more particularly in Hochstettcr Foreland, the Miocene beds again appear, and we may add that there are traces of them even on the west coast, between Sonntag Bay and Foulke Fjord, at the entrance to Smith Sound. It thus appears that since early Tertiary times there has been a great change in the climate of Greenland.

(8.) Post-Tertiary Beds.—These consist of raised sea-beaches found along the whole coast of Greenland, containing Mollusca and other organic remains, identical with those living in the neighbouring sea. These terraces are very marked on the shores of Smith Sound, and are believed to be proof of the gradual elevation of the land in that quarter, such elevation being Known to be going on all round the polar basin. Within the Danish possessions, however, the coast is falling,—places, the site of hamlets within the memory of man, being no louger habitable, and other localities whicli when the Danes first came to the country a century and a half ago, were bare being now covered at the lowest tides, ,

Mines.—In addition to the formations named, there are numer- ous other rocks—primitive or metamorphic—which it is impossible to classify accurately, in which are found numerous minerals, either in veins or scattered. Few of these are of economic importance. Graphite is found in

great abundance, particularly on an island off Upernivik, but the mining of it has proved unprofitable. Cryoliéte is found in quantity in Greenland only, and is at present the only mineral mined there for the European and American markets (see CRYOLITE). It is found only in one spot, Ivigtut, on the shore of Arsut Fjord in 61° 10' N. lat., traversing a granitic- like gneiss in veins, associated with argentiferous lead, copper, zine, tin, tantalite, molybdenite, zircon, fluor spar, &c.; but none of the metallic ores have been found profitable to work. The number of labourers employed usually amounts to 100 in summer and 30 in winter, in addition to the officials and theirfamilies. In the nine years succeeding 1857, when a licence was granted to a private company to work the cryolite, 14,000 tons were exported, and during the next nine years 70,000 tons, or, on an average, 26 ship-loads per annum. Steatite or soap-stone has been long used by the natives for the manufacture of their lamps and other vessels. Native iron is found in various places; the most remarkable of these finds were the great nodules of Uvifak on Disco Island,—the weight of the largest of which was calculated at 46,200 Tb,—at one time believed to be areolites, but now known to be simply native iron of the same quality as that scattered in the gneiss on which the masses were found superimposed. Copper has been found in several places, but only in nodules and lamine of very limited extent. Coal of poor quality, associated with the Cretaccous and

Miocene beds, is found in the districts about Disco Bay and Umenak Fjord, but it is only mined to the extent of 40 or 50 tons per annum, for use in the houses of the Danish officers, unless when an exploring ship refills with it. The coal of Kuhn island is Jurassic.!

Climate.—The southern part has a climate much the same as the northern shores of Norway and Iceland; further north the tem- perature decreases with the increase of latitude, while the severity of the winter season is intensified by the country being shrouded for several montlis in the year in darkness,—in the far north seldom even relieved by the rare displays of the aurora, though the starlight and moonlight are brilliant beyond what the inhabitants of lower latitudes are accustomed to. Again, during the summer there is an equally long continuanee of the sun above the horizon. Spring

and autumn are disagreeable, rain, sleet, and snow being frequent, while, the sea not being frozen over, travelling becomes difficult. In North Greenland sledging along the ice-covered coast is pleasant during the winter, but in the south the sea is not continuously congealed; hence no dogs are kept, and the winter exercise of the sometimes scurvied residents is confined to within a few yards of the houses, when the great depth of snow will admit even of this. The climate is very uneertain—the weather changing suddenly from bright sunshine, with swarms of mosquitos enjoying their brief holiday, to dense fog, driving in clouds around the headlands, and even heavy falls of suow accompanied by icy cold winds, At Julianehaab the mean annual temperature is about 33° Fahr., and at Upernivik, 13°. In January, at Van Rensselaer harbour, Kane experienced as low a temperature as —66°5° Fahr. At Sabine Island, on the east coast, the temperature is much the same at the same periods as on the opposite west coast, except in the month of December. Again, at Upernivik the mean temperature of the three summer months is 38°; at Julianchaab it is 48°; and for the three winter months respectively —7° and 20°. The winter at Juliane- haab is not much colder than that of Norway and Sweden in the same latitude, but its mean temperature for the whole year is like that of Norway 600 miles further north. In other words, its winter is not severe but its summer is arctic, and, so far as the summer goes, the same generalization may be made regarding all Greenland. In the most northern settlements a temperature of 52° is oppressive, but until the thermometer falls to — 28° no one eom- plains of extreme cold. At Upernivik (72° 48' N. lat.) the highest temperature that has been noted is 59°, At Julianehaab 68° has once been recorded, perhaps the highest known Greenland heat. Often in January and February a peculiar warm wind or "'fohu" begins to blow, raising the temperature to 42°. On the other hand, at Upernivik, in July a day was observed with a mean temperature below 32°, and a single observation in the same month has shown 274° Fahr. The prevailing winds —the " fohn,"? which blows from points between true E.S.E. and true E.N.E., excepted—follow the direction of the coast, " blowing from the south with snow and rain, and from the north clearing the sky, or in summer frequently accompanied by mist." Mirage, parhelia, paraselene, anthelia, and auroral displays are common. There is less snow in the north than in the south. At Julianehaab it once snowed in June con- tinuously for thirty-six hours, and in 64° N. lat, not a single drop of rain fell from September

27, 1862, to May 20, 1863, on which day the snow had obtained a depth between the houses of from 8 to 20 feet.? The temperature of the soil at Godthaab, 4 feet under the ground, only varied between the extremes 31°5 in March and 40°1 Fahr. in September (Rink).

Animals and Plants——The flora and fauna are essentially European, notwithstanding the proximity of the country to America. This fact renders it probable that Davis Strait and Baffin's Bay are gulfs of old date, and points to the likelihood of East Greenland having been connected with Europe in a comparatively recent geological period. Possibly the islands between Norway and Greenland are remains of this land-bridge, over which the Lapland plants and animals found their way to Greenland. With one not-able exception—the musk ox—the plants and animals of the east eoast are more European than those of the west, though this eon- sists rather in the absence of European animals and plants on the

1 Analyses in Heer's Flora Fossilis Arctica, vol. i. p. 5, and Brown, Trans, Geol. Soc. Glasgow, vol. v. p. 48. See also Moss, Proe. Roy. Dub. Soc., 1877, and Feilden and Ranee, Quart. Journ. Geol. Soc., 1878, p. 563; Appendix to Koldeway, Zweite deutsche Nordpolarfahrt, vol. ii. p. 510; K. J. V. Steenstrup, Viddenskab. Medd. fra den naturhistoriske Forening i Kjébenhavn, 1874, p. 77, and 1875, p. 284; Rink, Om den geog. Beskaffenhed af de danske Handelsdistrikter 0 | Nordgrénland (1852); Giesecke's Mineralogiske Rejse % Grinland, by Professor Johnstrup (1878), &e.

2 Hofimeyer, Geog. Mag., 1877, p. 225; Nares, Idid., p. 316.

3 For additional details regarding temperature, see Rink, lid. eit. (1877), pp. 56, 372; the Collectanea Meteorologica of the Copenhagen Meteorological Institute; the Admiralty's Manual and Instruetions for the Arctic Expedition of 1875, pp. 6138~749; and Nordenskjold, Oesterreich. Ges. Met, Zeit., 1872, pp. 114-142.

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Jatter shore than in the presence of American ones. The manimals of Greenland are—the wolf (one, apparently a straggler from _the opposite shores, being killed in 1869), the dog, fox (white and blue varieties), white bear, ermine, walrus, five or six species of seals, the lemming, the arctic hare, the musk ox, the reindecr, the right whale, four specics of fin-whale, the sperm-whale (very rare), the pottle-nose, white whale, narwhal, caaing whale, porpoise, euphro- syne dolphin, two species of Lagenorhynchus, and the sword-fish. Of these the ermine, lemming, and musk ox are not found as far south as the Danish possessions. They inhabit the shores of Smith Sound and East Greenland in about the same latitude, but do not stretch farther south, so that the probabilitics are that they have migrated round the northern end of the country, and are kept from spreading southward by the glaciers. The mouse, goat, sheep, and ox have been introduced, and the cat is domesticated as far north as Danish women have wandered. Goats, sheep, and oxen live only in the little greenish valleys of the extreme south; in the north there are none. A few pigs are kept at Ivigtut. The right whale is now rarely killed off the coast of Greenland, the whalers merely passing up the coast to the fishing grounds further north and west. The Eskimo at Holstensborg still occasionally harpoon one or tivo, but the industry is a mere shadow of what it once was. The humpback, one of the fin-whales, is now and then killed, but the narwhal and white whale form the staple "fishery " of the Greenlanders. Of seals it has been calculated that there are annually captured 51,000 of the floe-rat (Phoca hispida), between 1000 and 2000 of the kasigiak (P. vitulina), 23,000 saddlebacks (P. Greenlandica), 1000 of the ugsuk or thong-seal (P. barbata, the ground or " grown" seal of the English sealers), and 3000 of the bladdernose (Cystophora cristata). About 200 walruses, 600 white whales, 100 narwhals, a few porpoises, on an average one right- whale (in the season from December to March, when it goes as near the coast as the ice will permit in the south), and two or three humpbacks (Magaptera longimana), are killed. The other whales are rare, and are captured only under peculiar circumstanecs, The average catch of the Greenlanders thus amounts to 89,000 seals, 700 white whales and narwhals, and 2 or 3 large whales. Of these seals it may be stated that 38,000 have been caught with harpoons and bladders, 38,000 killed by fire-arms, and 13,000 caught in nets. The polar bear is almost extinct,—about 50 being annually killed in the north, or in the south when they have floated from the east coast on the

Spitzbergen heavy ice which doubles Cape Farewell and impinges on the coast south of 69° N. lat., or occasionally in the intervening space where a wandering bear has been carried, south on a broken-up floe. The reindeer, once killed in enormous quantities, is sharing the' fate of the bear. Between 1845 and 1849 about 25,000 were shot annually, and 16,000 skins were exported. In 1872 there were not more than 1000 killed, and only 6 skins exported. It is now rarely scen in Mid Greenland. The number of foxes trapped averages 1500 per annum ; in 1874 5000 were caught, chiefly between 60° and 61° N. lat. About 1000 white hares are killed. The true bird denizens of Greenland cannot be given at higher than 63, while 62 others are reported as stragglers. .Of the denizens 5 belong to the Old World, 11 to the New World, 45 are common to both worlds, and 2 are doubtful.4 Only the raven, ptarmigan, hawk, owl, and a few sea-birds are resident all the year round; the rest are migratory. The ptarmigan is killed for food to the extent of about 12,000 per annum, while the nwmber of cider ducks destroyed is so enormous that the export of eider down has fallen within the last twenty years from 5600 to 2000ib. Rink estimates the number killed annually at 20,000, and that of auks and smaller ser-fowl at 50,000. The eggs taken yearly, chiefly those of eider ducks, has been estimated at 50,000. Of the 79 or 80 fishes described from Greenland very few are peculiar to it; of these the shark (Somniosus microcephalus) is caught for the sake of the oil extracted froin its liver, to the extent of from 16,000 to 20,000 per annuin. The cod is a migratory fish, and is caught on the banks to the extent of 200,000 per annum, chiefly by the natives. A few salmon trout (Salmo carpio). are caught in the little lakes aud brooks, while the large and small holibut, the red fish (Sebastes), and the nepisak (Cyclopterus lwmpus) form a considerable portion of the food of the natives. The capelin (Afallotus villosus).is caught 10 enormous quantities (over 14 million tb are dried annually), while a few smaller fish and mussels complete the tribute which the Eskimo take from the sea laving their barren shores. There are no reptiles or amphibians in Greenland, and the lists of invertebrata contain little of general interest. ?

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i Newton, Manual and Instructions (1875), p. 94.

See Manual and Instructions for the Arctic Expedition of 1875, and the papers there by Brown, Newton, Liitken, Reinhardt, Schjddte, Morch, and others, abstracted with corrections in the appendix to Rink, lib. cit. (1877), numerous memoirs and papers in the Danish scientific ¢ imals and transactions, Jefirey's and Carpenter's report of the oe expedition (Proc. Roy. Soc., vol. xxv.), the appendix to

'ares's Voyage to Polur Seas, 1875-76, and the references in these works and in appendix to Nordenskjild's Voyages, 1879.

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The vegetation in the height of summer is, in favourable situa- tions, profuse in individual plants, but scanty in species. The plants are of the usual arctic type, and identical with or allied to those found in Lapland or on the summits of the highest British hills. Forest there is none in all the country. In the north, where the lichen-covered or ice-shaven rocks do not protrude, the ground is covered with a carpet of mosses, creeping dwarf willows, crowberries, bilberries, and similar plants, while the flowers most common are the andromeda, the yellow poppy, pedicularis, pyrola, the Alpine rose (rhododendron), saxifrages (12 species), drabas, dryas, &c.; but in South Greenland there 1s something in the shape of bush,—the dwarf birches even rising a few feet in very sheltered places, and the vegetation is less arctie and more abundant. Altogether, 361 flowering plants, ferns, horse-tails, quillworts, and club mosses have been described, while the lists of cryptogamic plants, though very imperfect, show a profuse vegetation of the lowlier orders.? No crops, in the strict acceptation of the term, are cultivated in Greenland, but at Godthaab attempts have been made to grow turnips, radishes, lettuce, and chervil in little gardens made with earth brought from the site of old Eskimo houses. Potatoes never grow larger than small marbles, while pease only produce seeds barely recognizable. At Nanortalik strawberries have been produced in a forcing frame, carrots matured tolerably well, and turnips have been grown weighing half a pound. Rhu- barb grew vigorously, but could not be raised from sced, while cab- bage Tears: under the most favourable circumstances, were poor and flavourless. In the north, radishes represent the highest triumph which

horticulture has achieved. Flowers, owing to the long sunlight, grow very well indoors, but require great care, other- wise they soon die.

Government.—Excluding the extreme northern parts of Greenland, and the north-east coast,—which may be claimed by the English, American, and Germans " by right of discovery,"—-the trade of Greenland isa strict monopoly of the Danish crown, dating from 1774, and is at present administered in Copenhagen by a Governinent board,—the 'Kongelige Grénlandske Handel,"—and in the country by various officials in Government pay. In order to meet the double purposes of government and trade, the west coast, up to nearly 74° N. lat., is divided into two inspectorates, —the southern extending to 67° 40' lat., the northern comprising the rest of the country,—their respective seats of government being at Godthaab and Godhavn. These inspectorates are ruled by two superior officials or governors responsible to the director of the board im Copenhagen. Each of the " inspectorates" is divided into " districts," each district having, in addition to the capital or "coloni" (a hamlet containing three or four Danish dwellings, a storehouse, blubber-boiling house, in a few cases a Lutheran '"'missionair" or clergyman, a teacher, and a physician), several outlying posts and Eskimo hunting stations, each presided over by an '"'udligger," who is responsible to the "

3 See the appendix to Rink, ib. cit., the references to papers there given, those printed in the Mfanwal already referred to, and the memoirs of Berggren, Fries, and Agardh in the Transactions of the Upsala and Stockholin Academies, 1861-74. A flora of Greenland is in preparation by Prof, Lange. wT £2

dealers, on paying freight for them at the rate of 24d. per 10 tb, or 1s. 6d. per cubic foot. The prices to be paid for European articles are fixed every year, the prices current in Danish and Eskimo being printed and distributed by the Government. According to a calculation, founded on the average of the last few years, about 22 per cent. of the value in the European market is paid for the products in Greenland. Out of the payment five-sixths are given to the sellers, and one-sixth devoted to the Greenlander's public fund, spent in "public works," in charity, and on other unforeseen contingencies. The

object of the monopoly is solely for the good of the Greenlanders,—to prevent spirits being sold to them, and the vice, disease, and misery, which usually attend the collision between civilization of the trader's type and barbarism, being introduced into the primitive arctic community. The inspectors are, in addi- tion to being trade superintendents, magistrates, but serious crime is practically unknown; while the cases of theft which have occurred within a decade are so few that they are held in recollection as historical events. The 'vices of civilization " are few, and its diseases unknown. The Danish: officials are mostly men of considerable intelligence, and all of good character, though their pay is small. The inspector receives £328 and a residence; the average salaries of the 11 " colonibestyrere" are £250, of the 18 clerks—" assistants" or "voluntcers "—£106, besides residence, fucl, and attendance. In addition there are about 182 "udliggers," seamen, mechanics, &e., each re- ceiving an average of £25 a year, besides, in the case of the outpost traders, a percentage on their trade. Though the officials are all-powerful, yet, owing to the exertions of Dr Rink, local councils or " parsissaet " were organized in 1857 in every district. To these parish parliaments delegates are sent from every station,—shrewd men, wise in council, and well acquainted with the wants of the Greenlanders. These " parsissoks "—elected at the rate of about one representative to 120 voters—wear a cap with a badge (a bear rampant), and aid the European members of the council in distributing the surplus profit apportioned to each district, and generally in advising as to the welfare of that part of Greenland under their partial control. In 1873 there were deposited, in a savings bank established in Greenland, £200 as contributions for the support of illegitimate children ; £199, 10s., sums gained by inherit- ance or by other unforeseen circumstances ; £791, savings from wages, chiefly those of the Europeans; and £121, savings of the Eskimo, or half-bloods. But thrift is the least prominent feature in the Eskimo character. The "municipal council" has the disposal of 20 per cent. of the annual profits made ou produce purchased within the con- fines of each district. It holds two sessions every year, and the discussions are entirely in the Eskimo language. In addition to their functions as guardians of the poor, the parish M.P.'s have to investigate crimes and punish mis- demeanours, settle litigations and divide inheritances, They can impose fines for small offences not worth sending before the inspector, and, in cases of high misdemeanour, have the power of inflicting corporal punishment.

During the first ten or twelve years the following causes were sub- mitted to trial:—one single case of having in passion occasioned the death of a person, and another of openly threatening; five or six instances of grosser theft or cheating, and as many of concealment of birth and crimes relating to matrimony ; every year a few petty thefts, and instances of making use of the tools of others without permission, or of like disorders ; and several trifling litigations.

Trade.—The trade of Greenland is entirely confined to that part of the coast colonized by the Danes,—the rude natives of Smith Sound and the east Coast contributing nothing to the world's riches. Neither do the civilized people of any other nation trade on the coast, the English "Greenland seal and whale fishery" being a mis-

nomer, for the " fisheries" are pursued on the west coast of Davis Strait and Baffin's Bay, and in the sea between Jan Mayen and Spitz- bergen, and occasionally within sight of the east coast of Greenland. Taking the Greenland trade as confined to the west coast, we find,

according to the calculations of Rink, that the earnings of the 1877

families of Eskimo under the Danish crown are on an average £15,016 per annum,—giving each family an average annual income of £8 from the produce of the hunt sold to the royal officials. These payments are made in paper notes used as a currency in Greenland. During the twenty years 1853-72, excluding cryolite, the average annual exports cousisted of 1185 tuns of oil, 35,489 seal-skins, 1436 fox-skins, 41 bear-skins, 811 waterproof jackets, 1003 waterproof trousers, 3533 Ib raw eider down, 6900 fb feathers, 2300 ib whale- bone, 550 tb narwhal ivory, 87 Ib walrus ivory, 1817 reindeer hides, During the period 1870-74 the mean annual value of the produets received from Grecnland was £45,600; that of the cargoes sent thither, £23,844; and the mean expenditure on the ships and crews, £8897. Not including the royalty paid by the company which exports the cryolite (from 1853 to 1874 equal to £58,924), the average profit of the Greenland trade was, for the 21} years between 1853 and 1874, about £6600 yearly. The capital sunk in the "royal trade" is calculated at £64,426 ; and, taking

the whole amount of net revenues from the present trade during the period between 1790 to 1875, the interest on the capital as well as the income from the cryolite royalty being subtracted, the present " direktor" of the Kongelige Gailanidake Handel considers that £160,000 has been earned. Trading Districts and Census.—A Danish "coloni" in Green- land is not at the best of times a cheerful place, though, in the long days of summer, some of those in the fjords of South Greenland are coniparatively pleasant. The houses are almost invariably built of wood, pitched over, and built more for warmth than for appearance, In addition to the three or four Danish houses —the usual number at the chief settlement—there are from 20 or 30 to 300 or 400 Eskimo at the place. They usually live in huts built of turf and stone, each entered by a short tunnel, which in most respects are an improvement over the primitive dwellings of the race elsewhere (sce Eskimo). In South Greenland there are seven trading districts; in North Greenland five. From Cape Farewell northward these are as follows. Julianchaad had in 1870 2570 inhabitants, and 8 trading stations. Of the inhabitants, 1056 belonged in 1872 to the Moravian mission settlements, which do not extend much farther north, the other clergy being members of the Danish Church, be- tween whom and the " Herrnhutians" something of the odium theologicum exists. In this district also are the remains of the old Norse settlements of Red Erik, his contemporaries, and his suc- cessors, 'rederikshaab has six trading stations, which collect about 68 tuns of oil and 1000 seal-skins annually. The population in 1870 was 821; at Ivigtut, in this district, are the cryolite mines, Godthaab has 999 people, 6 stations, and a trade return of 74 tuns of oil and 1000 seal-skins annually. It is the most southern station for eider down, and formerly also for reindeer skins. Cod-fish were also once caught here in great abundance, but this business is now almost abandoned. Godthaab "coloni" is the chief settlement in Greenland. " Besides the usual trade officials, one or two Danish missionaries who manage the seminary, and two or three Moravian missionaries [at Ny Herrnhut], the royal inspector of South Green- land, and the physician for the northern part of it reside in this place. In addition to the seminary, Godthaab has a church, of rather imposing appearance for Greenland, but too large for the community, aud built of bricks, a material very little suited to the country. The houses of the natives, almost all with sloping roofs of boards, look very pretty, but at Ny Herrnhut they offer a sad appearance. The latter station has a two-storied building, containing accommodation for

the missionaries, schoolroom, and church or 'meeting hall' as itis called." At Lichtenfels is another Moravian settlement, but the community has within the last thirty years decreased to one- half, and, owing chiefly to the indiscreet asceticism demanded from their floek by these unworldly men and women, is perhaps the most destitute of material comfort of any in Greenland. In this district are also found Norse ruins, part of the region having been the Vester Bygd of the Icelanders, just as that further south was their Oster Bygd. Sukkertoppen is one of the loftiest and most picturesque districts. It yields about 92 tuns of oil and 1000 seal-skins, also some cod-fish, a few reindeer, and most of the eider down of the country. It has six trading posts and 765 people. Holstenborg has four trading posts, and now yields about 60 tuns of oil and 400 seal-skins, besides whalebone and eider down. There are 545 in habitants. In 67° 40' N. lat. N agsutok or North Strom Fjord forms the boundary between South and North Greenland ; the settlements which follow are therefore in the latter inspectorate. Hgedesminde 1s in a state of decadence, the present production being about 74 tuns of oil and 3400 seal-skins collected annually by six stations. In 1870 the population was 1008, the greater number living at the chief settlement of the same name. Christianshaab has four trading posts, which collect from 481 inhabitants 110 tuns of oil and 1700 seal-skins. Christianshaab is one of the pleasantest dis-

triets in North Greenland, the valley on the opposite side of the harbour from the "'coloni'" abounding with crowberries and bil-

berries, and bright in July with the blue and yellow arctic flowers. °

Claushavn is the chief post, and derives its support from the seals killed among the enormous crop of icebergs poured out by the great Jakobshavn ice fjord. Many of the bergs ground here until they are lifted by spring tides and carried by the wind out into Baftin's Bay. Jakobshavn has eight stations, collecting 104 tuns of oil and 900 seal-skins from 424 people. Godhavn, on Disco Island, was at one time a seat of the whale trade, in 1798 no less than 20 whales having been caught there; but this industry has now entirely ceased, the last whale caught by the Government officials being in 1851. Its chief importance is in the fact that Godhavn (or Lievely)

is the seat of the Governinent of North Greenland, and the place at which exploring and whaling vessels often call. Its trade is insignificant, the district returning on an average only about 30 tuns of oil and 400 seal-skins; the settlement has for many years been actually a loss to the Government. There are in the district 245 people, who are perhaps the least industrious and self-reliant of all the Greenlanders. Ritenbenk has five stations, returning 116 tuns of oil and 3500 seal-skins, collected by 447 people. Umanak is oue of the most profitable districts,—the "coloni" with its six outposts returning to the "royal trade" about 180 tuns of oil and 8300 seal-skins, collected from 798 people. Upernivik is the most northern district, its limits being tliose of the natives belonging to the Danish scttlements. It is very profitable,—its average return being 148 tuns of oil and 6500 seal-skins, besides eider down and bear- skins, with formerly a considerable quantity of reindeer-skins. In 1870 there were 702 people in the district, the chief of the outposts being Proven ('the experiment"), and 'Tasiusak (73° 24' N. lat.), the most northern Danish trading post, and the most northcrn per- manent abode of civilized men or women, for the trader has a Danish wife with him. "To a European female," writes the dircc- tor of the Royal Greenland Board of Trade, "this indeed seems to be one of the most melancholy places of residence that can be found." In the service of the Danish mission there were in 1870 53 appointed teachers, besides several other teachers classed as seal hunters or fishers. In the service of the royal trade were 12 outpost traders, 15 head men and " boatswains," 14 carpenters and smiths, 19 coopers, 15 cooks, 54 sailors and labourers, besides 10 pensioners and 33 midwives; 5 officers were cnumerated as natives, but 3 of them are more properly Europeans. In the same year the Euro- beans numbered 237, of whom 95 were engaged in the trade, 8 were

anish and 11 Moravian missionarics, and 38 lived at the cryolite mine; the rest were women and ehildren.4 Altogether there were in 1870 9825 people in Danish Greenland (including 9408 natives), aud in 1878 9800. The details of the latter census are not published, but they do not in any material manner alter those just given. The inhabitants of the east coast are not believed to exceed 800 if so many, and yearly this number is being lessened by imini- gration to the Danish settlements on the west coast. The natives of the shores of Smith Sound, north of Mclville Bay, number about 200; and it is satisfactory to learn that of late these érxara avipdy are not

decreasing.? Their most northern settlement is Ktah. From the information of the Eskimo, Hans Hendrik, it appears that Dr Kane was in error in asserting that the Smith Sound es knew nothing of those to the south of the glaciers of Mel- ville Bay.

History.—Greenland was first landed on about the year 986 by Erikr Rauthi or Red Erik, a banished Icelandic jarl, though some tine previously the country had been sighted by Ulf Kraku, another Icelander. Erik and his house early settled at Brattelid,—the present Eskimo station of Igaliko,—situated on an isthmus between two fjords, believed to be the Erik's and Kinar's Fjords of the old sagas, where to this day can be traced the walls of about seventeen dwellings, one of which bears evidence of having been Erik's house. Other settlers followed, and among these was Bjarni, son of Herjulf, one of Evik's companions, whose home was probably at Herjulf's Ness, opposite the Moravian settle:nent of Frederiksdal, where have been found tombs containing wooden coffins, with skeletons wrapped mM coarse hairy cloth, and both pagan and Christian tombstones with Tunic inscriptions. This Bjarni, in his wanderings, discovered the continent of America (Vinland), aud, among these who were pied hither was Leif, who went ashore near where the town of oc now stands. After this there is said to have been a con- sMlerable trade between Norway and Ainerica, and between both eos and the Greenland colonists. The latter even penetrated .. . lat. as early as the year 1235, and left a small runic stone

ng the event? Christianity was introduced, and Arnold

TI . &. Danish Greenland (1877), p. 855, eorreeted by recent Government ae and private correspondence, eae Appendix to Nares, ib. eit., vol. ii. p. 187; Z aed N. Polar Expedition, p. 477, &e. 18 stone, not much bigger than a hone, was until recently in the

C ee Tuagen Museum of Northern Antiquities. It was stolen, how- er, an 4

Narrative

appointed the first bishop, in 1126; and Greenland, like Iceland, had a republican organization up to the year 1261, when Hakon Hakonsen, king of Norway, induced the Greenlanders to swear allegiance to him. Henceforth they were Norwegian subjects, and their country one of the queen's domains. From that day may be dated the beginning of their decay and final disappearance as colonists, though the black death, foreign enemies, and the attacks of the Eskimo, who about this period burst upon the colonies from the north, had something to do withit. These settlements were called respectively the Haster Bygd or Building and the Wester Bygd, both being now known to be on the west coast, though for long the view was persistently held that the first was on the east coast, and numerous eXpeditions have been sent in search of these 'lost colonies" and theirimaginary survivors. The last bishop appointed to Greenland died in 1540, but long before that date those appointed had never reached their sees. The conntry had also been visited by a hostile fleet (believed to be English), and about the end of the 15th century it would appear that all colonization had ceased. When in 1585 John Davis visited it there was no sign of any people save the Eskimo, among whose traditions are one or two relating to the old Norsemen. For more than 200 years Greenland seems to have been neglected—almost forgotten. It was visited by whalers, chiefly Dutch, but nothing in the form of permanent settlements was established until the year 1721, when the first missionary, Hans Egede, landed. Amid many hardships and discouragements he persevered ;4 and at the present day the remnant of the native race is civilized and Christianized, instead of wild and pagan, as they were when he arrived among them. The colonists of the 18th century were, many of them, convicts and other offenders; and the trade was a monopoly in the hands of private individuals. In 1733-34 there was a dreadful epidemic of small-pox which destroyed an immense number of the people. In 1774 the trade ceased to be profitable as a private monopoly, and to prevent it being abandoned the Government took it over. In 1807-14, owing to the war, communication was cut off with Denmark; but since that date the country has been prospering in a languid fashion, though, if the Government ceased its fostering care, the Eskimo, and with them what trade is carried on, must become extinct.

Of late years, the northern part of the country has been explored by Inglefield (1852), Kane (1853-55), Hayes (1860-61), Hall (1871-78), and to some extent by Nares (1875-76), whose dis- covery of the probable northern termination of the country in about 83° N. lat. had been already presaged theoretically.® The east coast has been explored by Scoresby (1822), Clavering (1823), Graah (1829-80), the German expedition (1869-70), and Mourier (1879), while the interior has been penetrated for a short way by the Danes, Americans, English, and Swedes whose names have been noted above, and by others. In like manner, the scientific history of the country has been investigated by a host of savants from the days of Fabricius to our own, whose names are too numerous to recount, though, in the works above quoted, thesc arc given either directly or indirectly. For further information see the articles Eskimo and Potar REGIONS. (R. B.)

GREENLEAF, Simon (1783-1853), American jurist, was born at Newburyport, Massachusetts, December 5, 1783, After studying law in Massachusetts and Maine, he began in 1806 to practise at Standish in the latter State, proceeding finally to Portland in 1818. There, after two years, he became reporter of the supreme court of Maine, and during his twelve years of office published nine volumes of Reports. Resigning in 1832, Greenleaf became in 1833 Royale professor, and in 1846 Dane professor of Jaw in Harvard University, where he received the degree of doctor of laws. He retired in 1848 from his active duties, becom- ing emeritus professor, and after being for some years president of the Massachusetts Bible Society died at Cam- bridge, Mass., October 6, 1853.

Greenleaf's principal work is a Treatise on the Law of Evidence, 1842-53. He published also 4 Full Collection of Cases Overruled, Denied, Doubted, or Limited in their Application, taken from American and English Reports, in 1840, expanded afterwards to 3 yolumes; and an Examination of the Testimony of the Four

Evangelists by the Rules of Evidence administered in the Courts of J saistee with an Aecount of the Trial of Jesus, 1846. This was

republished in England in 1847.

ne 4Fenger, Bidrag til Hans Egedes og den grinlandske Missions Historie, 1721-1760 (1879).

5 Brown, Arctic Papers of R. G. 8. (1875), p. 70.

6 ‘The Physical Strueture of Greenland” (Arctie Papers of R. G. 8., pp. 1-78); see also for history the works catalogued in Chavannes, Karpfs, and Le Monnicrs, Die Literatur tuber die Polar-Regionen der

d the priceless monument is now only represented by a model. | Erde (1878).

GREENOCK, a seaport town of Renfrewshire, Scotland, on the south bank of the Firth of Clyde, 32 miles below Glasgow, in 55° 57’ 2” N. lat. and 4° 45’ 30” W. long. In front of the town there is a fine and extensive bay, formerly known by the name of the Bay of St Lawrence, from a religious house that anciently stood there. Behind the town the land rises into a picturesque ridge of hills, about 800 feet high, between which and the bay Greenock stretches for upwards of two miles and a half along the shore.

Greenock is an irregularly built town. The western part is occupied by spacious streets and numerous fine villas, but the central and busier part is composed of narrow and rather mean and overcrowded streets and lanes. The board of police are taking measures, however, to have some of these opened up and occupied with an improved

i ie as il d = a ||

Plan of Greenock,

class of buildings. The view from the heights behind the town is exceedingly striking and picturesque; and notwith- standing the steep slopes towards the south, the town is steadily progressing in that direction, as well as along the shore, where premises for shipbuilding and various public works, and also dwelling-houses, are extending the town both east and west. Amongst noticeable structures may be enumerated the custom-house, a handsome

Doric edifice, and the Watt Monument, a building erected to the memory of the celebrated James Watt, whom with just pride the town claims as a native. The latter contains an exquisite statue of the philosopher by Chantrey, and accommodates a public library founded in 1783, having now upwards of 15,000 volumes. Associated with it is also a mnseum and lecture hall, built at the expense of the late Mr James M'Lean, and opened in 1876. The town also contains several elegant churches, a spacious academy, and various

other educational and charitable institutions, the chief of the latter being the public hospital and infirmary, and the Wood mariners' asylum, an institution founded by Sir Gabriel Wood for the benefit of decayed seamen belonging to Clyde ports. The corporation is about to erect a suite of municipal buildings fronting the principal street of the town, on which it is proposed to expend not less than £80,000. Greenock possesses two public parks ; and in 1866 a magnificent esplanade, a mile and a quarter in length, skirting the shore, was laid off at an expense of £20,000, and is now a favourite promenade and recreation ground. A new carriage-drive is being constructed, at a cost of about £10,000, across the heights to the south-west of the town.

The water supply is derived from two enormous reservoirs in the high lands behind the town called Loch Thom and Loch Gryfe. The Loch Thom works were completed in 1828, and the Gryfe works were added in 1873. The Loch Thom works are so constructed that they not only supply water to the town, but provide also in their course power to drive the machinery of a number of mills of great size, the water descending from mill to mill till it reaches the level of ordinary supply. Street tramways were introduced in 1873, and connect the town with Gourock. The gas- works of the town, which were originally situated in a populous district, have recently been removed to a small island, Inchgreen, on which a commodious establishment has been erected. The principal industries are shipbuilding and sugar-refining. Many of the steamers of the Cunard Company, the Peninsular and Oriental Company, and the Allan Line have been built at Greenock, and the excellence of the iron sailing ships of Greenock yards

has become almost proverbial. There are eighteen large sugar refin- eries in the town, some of which turn out 1000 tons of refined sugar per week. Greenock is connected wa Paisley with Glasgow by two competing lines of railway, by one of which there is also direct communication with Ayrshire and the south-west. All the important Clyde passenger steamers call at or sail from Greenock; indeed for pas- senger traffic by steamer it is a more important town than Glasgow, as the greater portion of the travelling public, to save time and avoid the unsavoury odour of the upper reaches of the river, make the journey between Glasgow and Greenock by rail. A large amount of passenger and goods traffic is also carried on between Greenock and Belfast, Londonderry, Dublin, Liverpool, &c.

In the earlier part of the 17th century Greenock was an obscure fishing village, consisting of one row of thatched cottages; and in 1716 there were only six slated houses in the place. In 1741 the population of Greenock was 4100; a century later it was 38,846; in 1851, 89,391; in 1861, 42,785; in 1871, 57,825; and in the middle of 1879 it was estimated in the Registrar-General's reports at 76,955. In 1685 'the town or village of Greenock" was erected by Charles I. into a burgh of barony under a charter granted in favour of John Schaw and Helen Houston, his spouse, and down to 1741 the government of the burgh was administered by the baron-bailie appointed by the superior. In 1741 and 1751 charters were granted by Sir John Schaw, under which feuars and sub- feuars were empowered to elect a town council of nine members— two bailies, a treasurer, and six councillors—for the good government of the town. Under these charters Greenock possessed the most liberal burghal constitution enjoyed by any Scotch burgh till the passing of the Reform Act—the first municipal election under the provisions of which took place in 1833. Greenock was then advanced to the position of a parliamentary burgh, with the right to return one representative to parliament. Municipally the town is divided into five wards, and the town council consists of @ provost, six bailies, a treasurer, and eight councillors,

The beginning of the harbour of Greenock was made by Jobn Schaw, already mentioned as the first superior of the burgh. Till the commencement of the 18th century, however, it was little more than an insecure landing-place; but in 1703 an agreement was entered into between the superior and feuars of the town, whereby

he advanced money and they submitted to a voluntary assessment for the extension and improvement of harbour accommodation.

The harbour constructed under this agreement was not finished till 1710, in which year Greenock was established as a custom- house port. In 1751 an Act of Parliament was obtained whcreby a duty of 2d Scots was imposed on every Scots pint of ale or beer 'brewed, brought in, tapped, or sold'' within the town 'for cleaning, deepening, building, and repairing" the harbour and piers. 'Till the year 1772 the harbour was simply leased to the town by the supcrior, but in that year and in 1773 the magistrates and town council received a feu-right to it from John Shaw Stewart the owner of the Greenock estate. From that date down to the present time the additions made to the harbour by parliamentary authority have been very numerous. The dock and quay accom- modation now amounts to eighty acres. In addition there is in course of construction an immense dock to be named thie '' James Watt Dock," which is intended to afford accommodation to vessels of the largest tonnage, and maintain them watcr-borne in all states of the tide. The estimated cost of this dock, with warehouses and sheds, is £250,000. The harbour trustees who now have the managc- ment of the docks consist of the town council and nine elective members chosen by the local shipowners and harbour ratepayers.

The commercial prosperity of Greenock received its first great impetus from the Treaty of Union in 1707. 'he earliest trade seems to have been in herrings, a trade which, however, has long been extinct. Trading in tobacco was also carried on at a very early period. It was first brought from the colonies, and then exported to the Continent. The Greenland whale-fishing com- menced as far back as 1762, but it never rose to be of any import- ance, and is now discontinued. The American war greatly iuter- rupted the progress of Greenock, as the principal trade of the port was then with that country; but after the peace in 1783 it speedily revived, and within the seven following years the shipping trade was trebled in amount. At present the principal intercourse is with the East and West Indies, Australia, and the United States and Canada. Newfoundland and South America have also em- ployed a considerable quantity of shipping. The gradual increase of

trade is shown by the following table of the number and tonnage of vessels that entered and cleared from and to foreign ports in various years since 1784 :—

INWARDS, | OUTWARDS. British. Foreign. British. Foreign,

No. | Tons. | No.

Tons. | No. | Tons. No. | Tons, 1784 | 52| 6,569] 4] 530] 63| 7,297 3 | 620 1804 |165| 30,802! 25) 5,120]155| 31,896 | 20 | 5,965 1824 | 188} 46,162} 11] 3,054 |188| 46,857} 9 | 2,699 1853 ark 94,575 | 44] 18,764 | 153| 55,630 | 45 111,975 1878 | 428 219,521 | 178| 64,918 | 419 198,267

Interesting historical details will be found in Memorials of James Watt, by G. Williamson, 1856. The first volume of Historical Sketches of the Town and Harbours gf Greenock, by Dugald Campbell, appeared in 1879. (J. PA.)

GREENOUGH, Horatio (1805-1852), an American sculptor, son of a Boston merchant, was born at Boston, September 6, 1805. At the age of sixteen he entered Harvard College ; but while there he devoted his principal attention to art, and in the autumn of 1825 he went to Rome, where he enjoyed the advantage of instruction from Thorwaldsen. After a short visit in 1826 to Boston, where he executed busts of John Quincy Adams and other persons of distinction, he returned to Italy and took up his residence at Florence. Here one of his first commissions was from James Fenimore Cooper for a group of Chanting Cherubs; and the success of this work, joined to the strong recom- mendation of Cooper, Dana, Everett, and others, led to his being chosen by the Government to execute the colossal statue of Washington for the national capital. It was unveiled in 1843 ; and as an accurate likeness, conceived in a lofty and truly poetical spirit, it is entitled to high rank among modern works of asimilar kind. Shortly afterwards he received a second commission from Government for a colossal group, the "' Rescue," intended to represent the conflict between the Anglo-Saxon and Indian races. In 1851 he returned to Washington to superintend its erection, and In the autumn of 1852 he was attacked by brain fever, of which he died, 18th December, Among other works of

Greenough may be mentioned a bust of Lafayette, the Medora, and the Venus Victrix in the gallery of the

Boston Athenssum. Greenough was aman of wide culture, and his occasional productions in prose and verse gave evidence of a capacity to attain the same eminence in literature as in art. See Afemoir of Horatio Greenough, by H. T. Tuckermann, 1853,

GREENSHANK, one of the largest of the birds com- monly known as Sandpipers, the Z'otanus glottis of most ornithological writers. Some exercise of the imagination is however needed to see in the dingy olive-coloured legs of this species a justification of the English name by which it goes, and the application of that name, which seems to be due to Pennant, was probably by way of distinguishing it from two allied but perfectly distinct species of Zotanus (7. calidris and 7'. fuscus), having red legs and usually called Redshanks. The Greenshank is a native of the northern parts of the Old World, but in winter it wanders far to the south, and occurs regularly at the Cape of Good Hope, in India, and thence througliout the Indo-Malay Archipelago to Australia. It has also been recorded from North America, but its appearance there must be considered accidental. Almost as bulky as a Woodcock, it is of a much more slender build, and its long legs and neck give it a graceful appearance, which is enhanced by the activity of itsactions. Disturbed from the moor or marsh, where it has its nest, it rises swiftly into the air, conspicuous by its white back and rump, and uttering shrill cries flies round the intruder. It will perch on the topmost bough of a tree, if a tree be near, to watch his proceedings, and the cock exhibits all the astounding gesticulations in which the males of somany other Lzmzcole indulge during the breeding- season——with certain variations, however, that are peculiarly its own. It breeds in no small numbers in the Hebrides, and parts of the Scottish Highlands from Argyllshire to Sutherland, as well as in the more elevated or more north- ern districts of Norway, Sweden, and Finland, and probably also from thence to Kamchatka. In North America it is represented by two species, Z'otanus semipalmatus and 7. melanoleucus, there called Willets, Telltales, or Tattlers, which in general habits resemble the Greenshank of the Old World. (A. N.)

GREENWICH, a market-town and_ parliamentary borough in the county of Kent, England, is pleasantly situated on the right bank of the Thames, 6 miles 8.E of London Bridge by the river. The streets towards the river are narrow and irregular, but in the higher situations there are many fine terraces and villas. The town has manu- factories of various kinds, including the works of the telegraph maintenance company, engineering works, soap work, chemical works, and a brewery. On account of its picturesque views, its fine air, and its public park and other attractions, it is one of the favourite resorts of Londoners.

Fronting the river stands the splendid range of buildings in the Grecian style of architecture, formerly known as Greenwich Hospital, but now the Royal Naval College. It occupies the site of an ancient royal palace called Green- wich house, which was a favourite royal residence as early as 1300, but was granted by Henry V. to Thomas Beaufort, duke of Exeter, from whom it passed to Humphrey, duke of Gloucester ; and it did not revert to the crown till his death in 1433. It was the birthplace of Henry VIII, Queen Mary, and Queen Elizabeth. The building was en- larged by Edward IV., by Henry VIII, who made it his chief residence and named it Placentia, by James I., and by Charles I, who erected the "Queen's House" for Henrietta Maria. Along with other royal palaces it was at the Revolution appropriated by the Protector, but it reverted to the crown on the restoration of Charles II., by whom it was pulled down, and the west wing of the present hospital was erected as part of an extensive design which was not further carried out. In its unfinished state it

was assigned by the patent of William and Mary to cer- tain of the great officers of state, as commissioners for its conversion into a hospital for seamen. As it now stands, the building consists of four blocks. Behind a terrace 860 feet in length, stretching along the river side, are the buildings erected in the time of Charles II. by Webb

from Inigo Jones's designs, and in that of Queen Anne |

from designs by Sir Christopher Wren ; and behind these buildings are on the west those of King William and on the east those of Queen Mary, both

from Wren's designs. In the King William range is the painted hall. Its walls and ceiling were painted by Sir Thomas Thornhill with various emblematic devices, and it is hung with portraits of the most distinguished admirals, and paintings of the chief naval battles of England. In the centre of the principal quadrangle of the hospital there is a statue of George II. by Rysbrack, sculptured out of a single block of marble taken from the French by Admiral Sir George Rooke. The oldest part of the building was in some measure rebuilt in 1811, and the present chapel was erected to replace one destroyed by fire in 1779. The endowments of the hospital were increased at various periods from bequests and for- feited estates. Formerly 3000 retired seamen were boarded within it, and 5000 or 6000 others, called out-pensioners, received stipends at various rates out of its funds; but in 1865 an Act was passed empowering the Admiralty to grant liberal pensions in lieu of food and lodging to such of the inmates as were willing to quit the hospital, and in 1869 another Act was passed making their leaving

on these conditions compulsory. It has since been devoted | to the accommodation of the students of the Royal Naval |

College, for which purpose it was formally opened in 1873. Behind the College is the Royal Hospital School, where 1000 boys, sons of petty officers and seamen, are boarded.

Another of the attractions of Greenwich is the park, 190 acres in extent, in which is situated the Royal Observatory. It was enclosed by Humphrey, duke of Gloucester, in 1438, and laid out by Charles IIL It still contains a fine avenue of Spanish chestnuts planted in his time; and the hill rising towards the south commands a fine prospect over London, the Thames, and the plains of Essex. The Royal Observa- tory was built in 1675, for the advancement of uaviga- tion and nautical astronomy. From it the exact time is conveyed at one o'clock every day by electric current to London and all the other chief towns of the kingdom; and English geographers reckon longitude from its meridian. Adjoining Greenwich Park is Blackheath, an open common much frequented by excursionists, and also used for golf and cricket.

Greenwich possesses a considerable number of almshouses

mentioned Queen Elizabeth's College; Trinity Hospital, founded by Henry Howard, earl of Northampton, in 1613 ; the Jubilee Almshouses, founded by subscription of the inhabitants in 1809 in commemoration of the fiftieth anni- versary of George III. ; the Green Coat School, the Grey Coat School, and the Orphan Girl's School. The parish church is dedicated to St Alphege, archbishop of Canter- bury, who suffered martyrdom at Greenwich.

Greenwich is first noticed in the reign of Ethelred, when it was from 1011 to 1014 the station of the Danish fleet. place of debarkation of many illustrious personages, as well as in 1806, after the battle of Trafalgar, of the remains of Lord Nelson, which lay in state in the painted hall of the hospital previous to their removal for interment in St Paul's Cathedral. In 1577 it returned two burgesses to parliament, but it was not again repre- sented till the same privilege was conferred on it by the Reform Act of 1832. The population of the parish in 1871 was 40,412. The population of the parliamentary borough—whose limits were ex- tended in 1868, and inelude the parishes of Charlton next Woolwich, Plumstead, and St Nicholas and St Paul, Deptford, and part of Wool- wich—is 169,361, and the area 8581 acres, of which 657 are in Surrey.

It has been the |

GRE—GRE

GREGOIRE, Hewrr (1750-1831), bishop of Blois and French revolutionist, was born at Vého near Lunéville, 4th December 1750. After studying at Metz and Nancy, he became curé of Embermesnil and professor at the college of Pont-'-Mousson. In 1783 he was crowned by the academy of Nancy for his Hloge de la Poésie, and in 1788 by that of Metz for an Essai sur la régénération physique et morale des Juifs. He was chosen in 1789 by the clergy of the district of Nancy to represent them in the states- general, where he took a leading part in the deliberations, and gave energetic support to the republicans. Along with four other curés he abandoned his order and joined that of the tiers état ; he presided at the permanent sitting of sixty- two hours while the Bastile was being attacked by the people, and made a vehement speech against the enemies of the republic ; and he subsequently took a prominent share in abolishing the privileges of birth and religion. Under the new constitution of the clergy he was chosen bishop

by the departinent of Loir-et-Cher, taking the title of bishop of Blois. Asa member of the national assembly he pro- posed the motion for the abolition of the kingly office, which was carried by acclamation. During the trial of Louis XVI, being absent with other three colleagues on a mission for the union of Saxony to France, he along with them wrote a letter urging the condemnation of the king, but omitting the words @ mort; and he endeavoured to save the life of the king by proposing in the assembly that the penalty of death be suspended. His subsequent action was very influential in moderating extreme republican views: he opposed the national renunciation of Christianity, and was the first to advocate the reopening of the churches; exerted himself to get measures put in execution for re- straining the vandalistic fury against the monuments of art ; extended his protection to artists and men of letters, and obtained for them pecuniary encouragement from the state; and devoted much of his attention to the reorganization of the public libraries, the establishment of botanic gardens, and the improvement of technical education. He also took a great interest in negro emancipation, and on his motion men of colour in the French colonies were admitted to the same rights as whites. On the establishment of the new constitution, Grégoire was elected to the council of 500, and after the 18th Brumaire he became a member of the new legislativeassembly, In this capacity he voted in the minority of five against the proclamation of the empire, and opposed the creation of the new nobility and the divorce

_ of Napoleon from Josephine ; but notwithstanding this he _ was subsequently created a count of the empire and officer

of the legion of honour. During the later years of

; | Napoleon's reign he travelled in England and Germany, and other charitable foundations, among which may be |

but in 1814 he had returned to France and was one of the chief instigators of the action that was taken against the empire. After the second restoration he was excluded from the Institute, and when in 1819 he was elected to the assembly by the department of Iseére, his election was annulled. From that time, therefore, he lived in retire- ment, occupying himself in literary pursuits and conducting a voluminous correspondence with most of the

eminent savants of Europe; but as he had been deprived of his bishopric and of his pension as a senator, he was compelled to sell his library to obtain the means of support. He died at Paris, May 20, 1831. As he had remained steadfast to his republican principles the ecclesiastical authorities refused him the last offices of religion, and the rites of Christian sepulture, but through the intervention of the civil power mass was said over his body in the church of the Abbaye aux Bois by a proscribed priest ; and after the hearse set out from the church the populace unyoked the horses and themselves drew it to the cemetery of Mont Parnasse. Grégoire forms a striking exception to most of the Frenelt

revolutionists in combining zeal for republicanism with a moderation which sought to check every form of licence, and with a steadfast adherence to the religion of which he was a priest ; and it was further a remarkable feature of his character that, though a sincere Roman Catholic, he was thoroughly tolerant of the religious views of others.

Besides several political pamphlets, Grégoire was the author of Histoire des sectes réligicuses, depuis les commencement du siécle dernier jusqu'a Cépoqgue actuelle, 2 vols., 1810; Essat historique sur les libertes de Véglise gallicane, 1818; De Vinfluence du Chris- tianisme sur la condition des femmes, 1821; Histoire des confesseurs, des empereurs, des rois, et d'autres princes, 1824; Histoire du ma- riage des prétres en France, 1826. Grégoireana, ou résumé général de la conduite, des actions, et des écrits de M. Le Comte Henri Gréyoire, preceded by a biographical notice by Cousin d'Avallon, was pub- lished in 1821; and the Jlémoires ecelesiastiques, politiques, et littéraires de Grégoire, with a biographical notice by H. Carnot, appeared in 1840.

GREGORIAN CHANT. See Prainsone.

GREGORAS, NicepHorus. See Byzantine Huis- TORIANS, vol, iv. p. 613.

GREGORY, St, surnamed THE Gruat (c. 540-604), the first pope of that name, and one of the four doctors of the Latin Church (Ambrose, Augustine, and Jerome being the other three), was born at Rome about the year 540.

His father Gordianus possessed senatorial rank, and his mother Sylvia is said to have been remarkable for her mental endowments. Educated for the legal profession, Gregory about his thirtieth year was chosen by the citizens to the high position of praetor urbanus; this post he is said to have occupied for three years (571-574), discharging its duties with great pomp and magnificence ; but on the death of his father, having become deeply impressed with a sense of the transitoriness and vanity of all earthly things, he retired from public life and gave up his whole fortune to pious uses, building six monasteries in Sicily and one in Rome; in this last, which was dedicated by him to St Andrew, he embraced the Benedictine rule, and divided his whole time between works of charity and the exercises of fasting, meditation, and prayer. It was while he was still a simple monk of St Andrew that the often repeated inci- dent related by Bede is believed to have occurred. Having seen some English slaves of striking beauty exposed for sale in the public market, "non Angli sed Angeli," he set his heart upon the evangelization of Britain, and was only prevented by the command of his ecclesiastical superiors from setting out in person to seek the realization of his Pious wish. About 578 or 579 he was appointed abbot of his monastery, and likewise one of the seven deacons (regionarii) of the Roman Church ; and in 582 he was sent by Pelagius IL. to Constantinople as papal apocrisiarius or responsalis at the imperial court. There he remained for upwards of three years, during which he negotiated several matters of importance and delicacy; but amid his diplo- matic and other engagements he found time to begin, if not even to complete, one of his largest works, the Joralia, or exposition of the book of Job. A few years after his return from the Eastern capital, the death of Pelagius (590) caused a vacancy in the papal chair, and the choice of the clergy, senate, and people unanimously fell upon Gregory.

strongly deprecated the bestowal of this honour, and Wrote to the emperor (Maurice) imploring him not to con- firm the nomination, A pious fraud, committed by the city pretor then in office, prevented the letter from reach- ing its destination ; and though Gregory hid himself for a time, he was at length obliged to yield to the urgency of a friends by accepting the papal crown (September 590). : @ pontificate of fourteen years which followed was marked — vigour and activity, which made them- ee. Geta almost every department of the Gaiech ' ooo and worship of the entire Western

. y means of earnest prayer and wisely ex-

pended pains the aggressions of the Lombards were checked, and order and tranquillity were speedily restored to Rome ; in Italy and France he tightened the too long relaxed reins of ecclesiastical discipline ; in England, Spain, and Africa the powers of Paganism, Arianism, and Donatism were perceptibly weakened ; as against the Eastern emperor and the patriarch of Constantinople the prerogatives of the bishop of Rome were asserted with a vigour previously un- witnessed ; the ceremonies of the church were regulated and extended, the liturgy further developed. The anniver- sary of Gregory's death, which took place at Rome on the 12th of March 604, is observed as a duplex by the Latin Church, and even in the Greek Church his wisdom and sanctity continue to be commemorated. The hyperbolical panegyrics of those ecclesiastical writers wlio lived nearest his time (such as Gregory of Tours and Isidore of Seville) must of course be taken with considerable reservation ; but they are interesting as showing how powerful and profound was the impression he left upon his contemporaries and immediate successors—an impression and an influence well entitling him to the epithet of "great." Of the personal qualities of Gregory, the most obtrusive are beyond all question the singular strength and energy of his character. Firmly and intensely convinced of the divineness of the Christian doctrine and life as these had presented them- selves to his mind and heart, he suffered no obstacle and no discouragement to triumph over his determination to give them all the currency and prevalence that were possi- ble in his day. Having clearly seen the end he had in view, he with equal discernment made choice of his measures for its attainment. The refinements alike of literature and of art had for him no place in the Christian scheme ; it is needless to say that he therefore despised them both for himself and for others. There is some room for hoping indeed that the burning of the books of the Palatine library was due to some ruder pontiff ; but there is no possibility of mistake as to the literary taste of the man who could write (pref. to Jferalia)—"non metacismi collisionem fugio, non barbarismi confusionem devito, situs motusque etiam et preepositionum casus servare contemno, quia indignum vehementer existimo ut verba ccelestis oraculi restringam sub regulis Donati." The uniformity of the

Roman ritual, the ascendency of the Roman hierarchy, the prevalency of the Catholic dogma,—these were not merely the highest, they were the only, ideals he had ever caught sight of. It ought not therefore to surprise us if in striv- ing towards them he sometimes was tempted, and yielded to the temptation, to sacrifice truthfulness to what he con- ceived to be the truth, aud the mere claims of humanity to the demands of what he regarded as a higher love. Never purely selfish, he was, apart from the exigencies of his ecclesiastical position, singularly tolerant, liberal, and kindly.

Of the numerous extant works attributed to Gregory the Great the following are undisputed:—the J/oralia, in thirty-five books, being an exposition of the book of Job, composed between 580 and 590; the twenty-two Homilies on Ezckiel (about 595), and the forty Homilies on the Gospels (about 592); the Regula (or Cura) Pastoralis, dedicated to John, archbishop of Ravenna (about 590); the Dia- logues with Peter the deacon, in four books, on the lives and miracles of the Italian saints (593 or 594); and the Ze¢ters, in four- teen " registers," arranged according to the years of his pontificate. He was also tlie author of various rhymed hymns, nine of which are still extant and appear in the collected editions of his works. They are characterized more by simplicity of language than by depth of feeling. The Concordia quorundam testimontorum sacra- rum scripturarum, and also the Commentarics on 1 Kings, Canticles, and the seven penitential psalms usually ascribed to him, are spurious. His liturgical works, the Sacramentarium and Antiphon- arium, have been considerably tampered with by medieval collec- tors and revisers; and even the Letters are not wholly free from interpolations. Of Gregory's merits as an expositor little necd be said; he avowedly adopts in all cases the allegorical method, which in his hands is unflinchingly carried out, with, in many cases,

sufficiently astounding results. As Milman has remarked, 'It may safely be said that, according to Gregory's licence of interpre- tation, there is nothing which might not be found in any book ever written." In practical honiiletics, however, he is very often just and profound as well as high-toned ; but it would be too much to say that he was superior to the prejudices of his time ; in parti- cular his preference for the monastic and

ascetic forms of the Christian life is carried to a heiglit which a wider observation of the conditions of human usefulness and happiness will never cease to regard as excessive. His Dialogucs, which have been translated into Anglo-Saxon, Greek, and even Arabic, describe the most astonishing miracles with an artless simplicity which, as suggestive of entire belief, is certainly interesting to the student; yet it is difficult (as Gibbon has pointed out) to free the lavish dispenser of miraculous filings from the chains of St Peter from the suspicion of some degree of pious insincerity. The Letéers are, as might be expected, of great importance from the light they throw upon the history of those times.

The complete editions of the works of this great father of the Latin Church have been, as was to be expected, numerous. The earliest was that of Lyons (1516), which was rapidly followed by those of Paris (1518-39), Basel (1551), and Rome (1588). The best edition is the Benedictine (Paris, 1705), in 4 vols, fol., reprinted at Venice (1768-76), in 17 vols. 4to, and in Mignie's Patro- logy, vol. lxxv.—Ixxix. See Wiggers, De Gregorio Magno (1838-40); Marggraf, De Greg. M. Vita (1844); Lau, Gregor. d. Grosse naeh 8. Leben u. Lehre dargestellt (1845); Pfahler, Gregor der Grosse u. seine Zeit (1852); and Baxmann, Politik der Pipste von Gregor I. bis Gregor VII. (1868-69). There is a convenicnt edition of the Cura Pastoralis by Westhotf (1860).

GREGORY IL, St, pope from 715 or 716 to 731, suc- ceeded Constantine [., his election being variously dated May 19, 715, and March 21, 716. Having, it is said, bought off the Lombards for thirty pounds of gold, he used the tranquillity thus obtained for vigorous missionary effort in Germany, and for strengthening the papal authority in the churches of England and Ireland. By excommunicat- ing Leo the Isaurian, he prepared the way for a long serics of revolts and civil wars, which tended greatly to the estab- lishment of the temporal power of the popes. He died in 731, and subsequently attained the honour of canonization, February 13th being the day consecrated to his memory in the Martyrology.

GREGORY III., St, pope from 731 to 741, a Syrian by birth, succeeded Gregory IL. in March 731. His pontificate, like that of his predecessor, was disturbed by the icono- clastic controversy, in which he vainly invoked the

inter- vention of Charles Martel. During his reign also it was that Boniface in Germany, on whom he conferred the pallium, Wilibald in Bohemia, and Bede in England carried on their most successful missionary labours. He died 29th November 741, and was succeeded by Zacharias I.

GREGORY IV., pope from 827 to 844, was chosen to succeed Valentinus in December 827, on which occasion he recognized the supremacy of the Frankish emperor in the most unequivocal manner. His name is chiefly associ- ated with the quarrels between Lothaire and Louis the Debonaire, in which he espoused the cause of the former for whom, in the Campus Mendacii, as it is usually called (833), he secured by his treachery a temporary advantage. The institution of the feast of All Saints is usually attri- buted to this pope. He died January 25, 844, and was succeeded by Sergius IT.

GREGORY V., pope from 996 to 999, a grandson of the emperor Otho the Great, succeeded John XV. when only twenty-four years of age, and until the council of Pavia (997) had a rival in the person of the antipope John XVI., whom the people of Rome in revolt against the will of the youthful emperor Otho III., Gregory's cousin, had chosen. The most memorable acts of his pontificate were those arising out of the contumacy of the French king, Robert, who was ultimately brought to submission by the rigorous infliction of a sentence of excommunication. He died suddenly, and not without suspicion of foul play, 18th February 999. His successor was Silvester IT.

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GREGORY VI., pope from 1044 to 1046, who as Johannes Gratianus had earned a high reputation for learn- ing and probity, succeeded Benedict IX., having bought off the antipopes Sylvester III. and John XX. Ina council held by the emperor Henry III. at Sutri, in 1046, he was accused of simony, and his election was found to have been informal. This led to his degradation, and was followed by his withdrawal into Germany, where he died in the following year (1047). He was succeeded by Clement II,

GREGORY VIL, St, one of the greatest of the Roman pontiffs, was born about the year 1015 at Soano or Saona, a small town in Tuscany, where his

father, Bonic or Bonizon, is said to have followed the trade of a carpenter. His own name, Hildebrand or Hellebrand, is suggestive of a German extraction ; but of his remoter ancestry nothing is recorded. His youth was passed at Rome in the monastery of St Mary on the Aventine, where a relative was at that time prior; here the archpriest Johannes Gratianus (afterwards Gregory VI.) was one of his instructors, and the youthful scholar early attracted the attention of such visitors as Laurentius of Amalfi and Odilon of Clugny. There is some reason to believe that, after passing his novitiate in Rome, Hildebrand removed for some years to the great Burgundian cloister, at that time under the charge of the last-named ecclesiastic; but all the earlier years of his life are involved in consider able obscurity. In 1046 he became one of the chaplains of the newly elected pope, Gregory VI., whom he shortly afterwards accompanied into his German exile ; and on the death of that pontiff, some two years later, he retired to Clugny, where his learning and sanctity made a deep im pression, and where, according to some accounts, he was ultimately promoted to the office of prior. As a monk of Clugny he appears to have oftener than once visited the imperial court for the transaction of ecclesiastical business ; and in 1049 he is said in a very special way to have come under the notice of Brano, bishop of Toul, then on his way to Rome to take possession of the chair of St Peter, which he occupied for some years under the title of Leo IX. It was at Hildebrand's instance that Bruno, who had been nominated by the emperor merely, consented to refrain from assuming the pontifical vestments, and to present himself to the Romans in the garb of a simple pilgrim, until he should have been elected in a more regular manner. The ascendency which Hildebrand had thus acquired over this pope he never afterwards lost ; in 1050 he became cardinal subdeacon, and in following years he was entrusted with various, missions of great importance, taking also a promi- nent part in the important synods of Rheims and Mainz, as well as in those of Rome. On the death of Leo IX. in 1054 the Roman people had signified a desire that the subdeacon should succeed him; this honour and responsi- bility however Hildebrand declined; but he was one of three legates who went to Germany to consult with the emperor about the choice of asuccessor. The negotiations, which lasted eleven months, ultimately issued in the elec- tion of Gebhard of Eichstidt, a relative of the emperor, who up to that time had followed a distinctly antipapal policy, but who, immediately after his reception and consecration at Rome as Victor II. (13th

April 1055), became as entirely a tool in the hand of Hildebrand as Leo had been. It was during this pontificate that Hildebrand, as papal legate, attended the French synods held for the purpose of repres- sing the heresy of Berengarius. On the election of Pope Stephen IX. (X.), Hildebrand was again seut to Germany to defend the choice before the empress Agnes; in this mission, which was ultimately successful, several months were spent. Again, in 1058, he succeeded in defeating the hostile party of Benedict X. and in securing the tiara for Nicholas II.; and once more, in 1061, he successfully laboured for the election of Alexander II. to the papal

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chair. At length, in 1073, on the death of Alexander, Hildebrand was himself as it were compelled by the tumul- tuous demands of the mob to accept the vacant tiara (22d April); but he refused to receive consecration until the sanction of the emperor had been obtained. This did not arrive for more than a month, although meanwhile he had been practically exercising many of the papal functions ; finally, however, he was ordained to the priesthood, and some days afterwards (30th June) solemnly consecrated pope by the title of Gregory VII., a name which he chose in testimony of his veneration for the memory and character of his earliest patron, Gregory VI! Once firmly established on the papal throne, Gregory lost no time in giving the utmost possible practical effect to the two leading ideas of his life, the establishment of the supremacy of the papacy within the church, and the effective assertion of the supre- macy of the church over the state. In March 1074 a synod was held in Rome which condemned the simony that had grown so prevalent throughout the church, and also enacted the old stringent laws of celibacy which had become almost a dead letter, especially in Germany and in the north of Italy; simoniacal or married priests were declared to be deposed and their priestly functions invalid. The resistance of the clergy to these decrees was utterly in vain; papal legates visited every country, and, supported by the popular voice, compelled submission. At a second synod held in Rome in February 1075 the decrees of the first were confirmed, and the first blow was struck which after- wards resulted in the long protracted wars of investitures. At that synod it was determined that any ecclesiastic who in future should accept office from the hands of a layman incurred the penalty of deposition, while the secular lord

who bestowed investiture was to be excommunicated. The decree was aimed immediately at certain German bishops, Henry's personal advisers, but hardly less directly at Henry himself, The emperor, finding his hands at the moment fully occupied with the suppression of a revolt among the Saxons, was politic enough to conceal his resentment for the time, and to dismiss his advisers ; but as soon as the war had been brought to a close, his defiance found ample expres- sion. Meanwhile Gregory was not unopposed even in Italy, and during the Christmas festivities of 1075 a revolt in Rome itself was organized by Cencius, who had placed himself at the head of those nobles who were opposed to reform ; the pope, however, had the popular enthusiasm on his side, and ultimately the insurgents were compelled to fly. A papal embassy was next sent, early in 1076, to Henry at Goslar, citing him to appear personally at Rome ata council to be held in the second week of Lent, and there answer for his simony, sacrilege, and oppression. Henry's rage at this knew no bounds; he dismissed the legates with insult, and at a diet held at Worms (24th January 1076) replied by declaring Gregory deposed on charges of tyranny, magio, and adultery, by sending noti- fication of this fact to the Roman clergy, and by taking Steps for appointing a successor to the dethroned pontiff. Gregory now lost: no time in excommunicating all the bishops who had attended the diet of Worms, in solemnly deposing and excommunicating the emperor, and in absolv- Ing his subjects from their oath of allegiance (22d Febru-

ary 1076). This counter action produced a powerful effect i the German princes and people, many of whom had

h good cause to resent Henry's tyrannies; one by one '0 bishops who had announced their withdrawal from cee S obedience now signified their contrition, and at a let held at Tribur (September 1076) the election of a new ee ebreechiea of Bnew

1 ft . . — oo the rich historical associations connected with the Fegory, its etymology (from éyphyopa), so suggestive of

sleepless Vigilance, had prob methi ome : . abl this and so m any athe Shes. y so ething to do with its selection by

lira emperor began to be discussed. Resistance being in the meantime impossible, Henry resolved upon humbling him- self to the utmost; in the dead of winter he set out to make his submission; Gregory was in waiting for him at Canossa, where (25th to 27th January 1077) that famous penance which Europe has not yet forgotten was imposed (see vol. x. p. 488). Absolved only on condition of his not assuming the royal dignity till his case had been investi- gated and decided, Henry had no sooner left the papal presence than he began to plot his revenge. Throwing him- self upon the generosity of his Lombard vassals, he took courage to face the papal excommunication which was renewed in November 1078 ; and in the wars which ensued his arms were finally successful. Rudolf of Swabia having died soon after the battle of Merseburg in 1080, the emperor proceeded with a powerful army to escort into Italy Guibert of Ravenna, who had been chosen at Brixen (June 1080) as Gregory's successor. In three successive summers the attack on Rome was renewed, but it was not until 1084 (March 21) that the treachery of some of the nobles of the city opened the gate to the invader. Gregory was now at last compelled to take refuge in the castle of St Angelo, while Guibert was established on the pontifical throne as his successor with the title of Clement III. After receiving coronation from Clement, Henry determined to return at once to Germany, especially as Robert Guiscard was known to be approaching. Released accordingly. by the arrival of the Norman duke, Gregory excommunicated once more bath Henryand Clement; but not deeming himself secure at Rome, where he had reason to know that his power was no longer what it once had been, hein May 1084 placed himself under Robert's protection at Salerno, where he died, May 25, 1085, after a comparatively brief pontificate of not much more than ten years. His last words are reported to have been, "I have loved righteousness and hated iniquity, and therefore I die in exile." His festival (duplex) is ob- served throughout the Roman Church on the anniversary of his death. His successor was Victor III.

The lifework of Hildebrand may be thus summed up in the words of Sir James Stephen :—" He found the papacy dependent on the empire; he sustained her by alliances almost commensurate with the Italian peninsula. He found the papacy electoral by the Roman people and clergy ; he lcft it electoral by a college of papal nomination. He found the emperor the virtual patron of the holy see ; he wrested that power from his hands, He

found the secular clergy the allies and dependants of the secular power ; he converted them into the inalienable auxiliaries of his own. He found the higher ecclesiastics in servitude to the temporal sovereigns; he delivered them from that yoke to subjugate them to the Roman tiara. He found the patronage of the cliurch the mere desecrated spoil and merchandize of princes; he reduced it within the dominion of the supreme pontiff. He is celebrated as the reformer of the impure and profane abuses of his age; he is more justly entitled to the praise of having left the impress of his own gigantic character on the history of all the ages which have succeeded him."'

Unlike Gregory the Great, Hildebrand was no author ; his literary remains are all comprised in eleven books or " Registers" of letters, which have often been printed. The XXVIJ dictatus often attributed to him are not now regarded as genuine. Among the numerous earlier biographies may be mentioned those of Paul of Bernriet, Pandulf of Pisa, Nicolas of Aragon, and Cardinal Bruno; among later monographs the most important are those of Voigt (Hildebrand als Gregor VIL. wu. sein Zeitalter, 1815; 2d ed. 1846; French translation, with introduction and notes, by Jager, 1834; 4th ed, 1854), Bowden (The Life and Pontifieate of Gregory VIT., 1840), Séltl (Gregor VIL, 1847), Helfenstein (Gregor' s VIL. Bestrebungen nach den Streitschriften seiner Zeit, 1856), _Gfrorer (Papst Gregor VII. u. sein Zeitalter, 7 vols., 1859-61), Villemain (Histoire de Gregoire VII., 1873; English translation by Brockley, 1874), Langeron (Gregoire VII. et les origines de la politique ultra- montane, 1874), and Meltzer (Gregor VII. u. die Bischofswahlen, 1876). The events of the period are also very fully treated by W. Giesebrecht in his Gesehiehte der deutschen Kotserzeit, and in other works. For the epistles, see S. Gregorit VII. epistole et diplomata pontifieta, acc. vita ejusdem pontificis et appendices anrplissimee veterum et recentiorum monumenta perplurima Gregorit VII. apologetica complectentes (1877).

GREGORY VIII. (Albert de Mora), who as papal legate had in 1172 attended the council of Avranches, which absolved Henry II. of England

from the guilt of the murder of Thomas & Beckett, was consecrated pope in room of Urban IIL. October 25th, 1187, and died of fever on December 17th of the same year. Clement III. was his successor.

GREGORY IX., pope from 1227 to 1241, the suc- cessor of Honorius III., fully inherited the traditions of Gregory VII. and of his uncle Innocent III, and zealously gave himself up to the perpetuation of their policy. Qne of the first acts of his pontificate was to suspend the emperor Frederick IL, then lying sick at Otranto, for dilatoriness in carrying out his promised crusade ; the suspension was followed by excommunica- tion and threats of deposition after Frederick had written to the sovereigns of Europe complaining of his treat- ment, A consequent invasion of the patrimony of St Peter at the instance of Frederick in 1228 having proved unsuccessful, the emperor was constrained to give in his submission and beg for absolution. Although peace was thus secured (August 1230) for a season, the Roman people were far from satisfied; driven by a revolt from his own capital in July 1232, the pope was compelled to take refuge at Anagni and invoke the aid of Frederick. A new out- break of hostility led to a fresh excommunication of the emperor in 1239, and to a prolonged war which was only terminated by the death of Gregory (August 22, 1241). This pope, who was a remarkably skilful and learned lawyer, caused to be prepared in 1234 the well known Nova Compilatio Decretalium, printed at Mainz in 1473. He' it was who canonized Saints Elizabeth, Dominic, and Antony of Padua, aud also Francis of Assisi, of whom he had been a personal friend. His encroachments upon the rights of the English Church during the ignominious reign of Henry III. are well known; but similar attempts against the liberties of the national church of France only served to call forth the celebrated Pragmatic Sanction of St Louis. Gregory IX. was succeeded by Celestine IV.

GREGORY X., pope from 1271 to 1276, succeeded Clement IV. after the papal chair had been three years vacant; his election occurred while he was engaged in a pilgrimage to Saint Jean-d'Acre. On his arrival at Rome his first act was to summon the council which met at Lyons in 1274 for the purpose of considering the Eastern schism, the condition of the Holy Land, and the abuses of the Catholic Church. It was while returning from that council that he died at Arezzo on the 10th of January 1276. To him is duc

the bull which, subsequently incorporated into the code of canon law, continues to regulate all conclaves for papal elections. He was succeeded by Innocent V.

GREGORY XI. (Pierre Roger de Beaufort), pope from 1370 to 1378, born in Limousin in 1336, succeeded Urban V. in 1370 as one of the Avignon popes. During his pontificate vigorous measures were taken against the "heresies " which had broken out in Germany, England, and other parts of Europe; a sincere effort was also made to bring about a reformation in the various monastic orders. The nineteen propositions of Wick- liffe and the thirteen articles of the '" Sachsenspiegel " were formally condemned by him in 1373. His energy was largely stimulated by the stirring words of Catherine of Siena (see vol. v. p. 231), to whom in particular the transference of the papal see back to Italy, January 27, 1377, was almost entirely due. He did not long survive this removal, dying on March 27, 1378. His successor was Urban VI., but the antipope Clement VII. also received much support, and the schism lasted forty years.

GREGORY XII (Angelo Corario or Corraro), pope from 1406 to 1409, born at Venice about 1326, suc-

ceeded Innocent VII. on 30th November 1406, having been chosen at Rome by a conclave consisting of only fifteen cardinals, under the express condition that, should Benedict XIII. of Avignon renounce all claim to the papacy, he also would renounce his, so that a fresh election might be made by the no longer divided church. Along with Benedict he was deposed by the council of Pisa in March 1409 as schismatical, heretical, perjured, and scandalous; but it was not till after the council of Constance had set aside John XXIII. (1415) that through his ambassador he formally renounced the title and dignity of lawful pope. The rest of his life was spent in peaceful obscurity as cardinal-bishop of Porto and legate of the mark of Ancona. He died October 18, 1417, having been suc- ceeded in 1409 by Alexander V.

GREGORY XIII. (Ugo Buoncompagno), pope from 1572 to 1585, was born February 7, 1502, at Bologna, where he studied law and graduated in 1530, and after- wards taught jurisprudence for some years, Alexander Farnese

and Charles Borromeo being among his pupils. At the age of thirty-six he was summoned to Rome by Paul III., under whom he held successive appointments as first judge of the capital, abbreviator, and vice-chan- cellor of the campagna; by Paul IV. he was attached as datarius to the suite of Cardinal Carafa; and by Pius IV. he was created cardinal priest and sent to the council of Trent. On the death of Pius V. in May 1572, the choice of the conclave fell upon Buoncompagno, who assumed the name of Gregory XIII. His intervention in the affairs of Britain through Ireland and by means of his tool

Philip IL, and also the league which he sought to cement,

against France (the massacre of the St Bartholomew had taken place in September 1572), are matters which belong to the history of those countries, In order to raise funds for these and similar objects, he confiscated a large propor- tion of the houses and properties throughout the states of the church,—a measure which enriched his treasury, indeed, for a time, but by alienating the great body of the nobility and gentry, revived old factions, created new ones, and ultimately plunged his temporal dominions into a state bordering upon anarchy. Such was the position of matters at the time of his death, which took place on the 10th of April 1585. He was a liberal patron of the Jesuit order, for which he founded many new colleges ; the new and greatly improved edition of the Corpus juris canontet was also due to his care; but the work with which the name of Gregory XIII. is most intimately and honourably associated is that of the reformation of the calendar, which has been already described under that heading (vol. iv. p. 671). Gregory XIII. was succeeded by Sixtus V. GREGORY XIV. (Niccolo Sfondrato), pope from 1590 to 1591, a native of Cremona, succeeded Urban VIL, 5th December 1590. As a monk he had been eminent for the decency and sobriety of his life ; but his brief pontificate was marked by no important occurrence, except that, in- stigated by the king of Spain and the duke of Mayenne, he excommunicated Henry IV. of France, declaring him, as 4 heretic and persecutor, to be deprived of his dominions, and also levied an army for the invasion of France, The history of that country records how this proceeding was regarded alike by clergy, parliament, and people. The biographers mention as a curious personal trait of Gregory XIV. a nervous tendency to laughter which occasionally became irresistible, and which

manifested itself even at his coronation. He was succeeded by Innocent IX. GREGORY XV. (Alessandro Ludovisio), pope from 1621 to 1623, born at Bologna in 1554, succeeded Paul V. on the 9th of February 1621. Beyond assisting the German emperor against the Protestants, and the king of Poland against the Turks, he interfered little in European

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politics. He was a learned divine and manifested a reforming spirit ; and his pontificate was marked by the canonization of St Theresa, Francis Xavier, Ignatius Loyola, and Philip Neri. He died on the 18th of July 1623, and was succeeded by Urban VIII.

GREGORY XVI. (Bartolommeo Alberto Cappellari), pope from 1831 to 1846, was born at Belluno on September 18, 1765, and at an early age entered the order of the Camaldoli, among whom he rapidly gained distinction for his theological and linguistic acquirements. His first appearance before a wider public was in 1799, when he published against the Italian Jansenists a con- troversial work entitled Z'rionfo della Santa Sede, which, besides passing through several editions in Italy, was translated into several European languages. In 1800 he became a member of the Academy of the Catholic Religion, founded by Pius VIL, to which he contributed a number of memoirs on theological and philosophical questions. When Pius VII. was carried off from Rome in 1809, Cappellari withdrew to the monastery of San Michele at Murano, near Venice, and in 1814, with some other members of his order, he removed to Padua; but soon after the restoration of the pope he was recalled to Rome, where he received successive appointments as vicar-general of the Cainaldoli, councillor of the Inquisi- tion, prefect of the Propaganda, and examiner of bishops. Tn March 1825 he was created cardinal by Leo XII., and shortly afterwards was entrusted with an important mission to adjust a concordat regardiug the interests of the Catholics of Belgium and the Protestants of Holland. On the 2d February 1831 he was, after sixty-four days' conclave, unexpectedly chosen to succeed Pius VIII. in the papal chair. The revolution of 1830 had

just inflicted a severe blow on the ecclesiastical party in France, and it seemed as if similar disasters to the papal cause were imminent in other parts of Europe, when Gregory XVI. entered upon his fifteen years' pontificate. Almost the first act of the new Government of France was to unfurl the tricolor at Ancona; and the immediate effect was to throw all Italy, and particularly the Papal States, into a state of excitement such as seemed to call for strongly repressive measures. In the course of the struggle which ensued, the temporal reign of Gregory was marked accordingly by executions, banish- ments, imprisonments, to an extent which makes it im- possible for the candid reader to absolve him from the charges of cruelty and bigotry which were so frequently raised at the time. The embarrassed financial condition in which he left the States of the Church also makes it doubt- ful how far his lavish expenditure in architectural and engineering works, and his magnificent patronage of learn- Ing in the hands of Mai, Mezzofanti, and others, were for the real benefit of his subjects. The years of his pontificate were marked by the steady development and diffusion of those ultramontane ideas which were ultimately formulated under the presidency of his successor Pius IX, by the council of the Vatican. He died 1st June 1846.

GREGORY, St, THE ILLUMINATOR (in Armenian Gregor Lusarovitch, in Greek Gregorios Phoster or Photistes), the founder and patron saint of the Armenian Church, was born about 257 a.p. He belonged to the royal race of the Arsacides, being the son of a certain Prince Anak, who assassinated Chosroes of Armenia, and thus brought ruin on himself and hisfamily. His mother's name was Okohe, and the Armenian biographers tell how the first Christian Influence he received was at the time of his conception, Which took place near the monument raised to the memory ol tls Thaddeus. Educated by a Christian

» Huthalius, in Cyxsarea in Cappadocia, Gregory sought, when he came to man's estate, to introduce the Christian doctrine into his native land. At that time

Tiridates I., a son of Chosroes, sat on the throne, and, influ- enced partly it may be by the fact that Gregory was the son of his father's enemy, he

subjected him to much cruel usage, and imprisoned him for fourteen years. It would he useless to relate the various forms of torture which the orthodox accounts represent the saint to have endured with- out permanent hurt ; almost any one of his twelve trials would have been certain death to an ordinary mortal. But vengeance and madness fell on the king, and at length Gregory was called forth from his pit to restore his royal persecutor to reason by virtue of his saintly intercession. The cause of Christianity was now secured; king and princes and people vied with each other in obedience to Gregory's instruction, aud convents, churches, and scliools were estab- lished. Gregory in 302 received consecration as patriarch of Armenia from Leontius of Caesarea, and in 318 he appointed his son Aristax to be his successor. About 331 he withdrew to a cave in the mountain Sebuh in the pro- vince of Daranalia in Upper Armenia, and there he died a few years afterwards unattended and unobserved. When it was discovered that he was dead his corpse was removed to the village of Thordanum or Thortan. The remains of the saint were scattered far and near in the reign of Zeno. His head is said to be now in Italy, his right hand at Etchmiadzin, and his left at Sis. It is almost impossible to get at Gregory's real personality through the tangled growth of ecclesiastical legend; but he would appear to have possessed some of that consideration for expediency which is so frequently of service to the reformer. While he did his best to undermine their system, he left the pagan priests in enjoyment of their accustomed revenues.

A number of homilies, possibly spurious, several prayers, and about thirty of the canons of the Armenian Church are ascribed to Gregory. 'The homilies appeared for the first time in a work called Haschachapadum at Constantinople in 1737; a ceutury afterwards a Greek translation was published at Venice by the Mekhiterists; and they have since been edited in German by J. M. Schmid (Ratisbon, 1872). The original authorities for Gregory's life are Agathangelos, whose History of Tiridates was published by the Mekhitarists in 1835; Moses of Chorene, Historie Armenice; and Simeon Meta- phrastes. A Life of Gregory by the vartabed Matthew, published in Armenian at Venice in 1749, was translated into English by Rev. 8. C. Malan, 1868. See also Bonucci, fstoria della vita di 8. Gregorio, 1717; Neumann, Gesch. der Armenischen Literatur, res ; and Dulaurier, Hist. des dogmes, dc., de Véglise Armenienne,

1859.

GREGORY, 81, or Nazianzus, surnamed THEOLOGUS, one of the four great fathers of the Eastern Church, was born about the year 329 a.p., at or near Nazianzus, Cappadocia. His father, also named Gregory, a convert from Hypsistari- anism, had lately become bishop of the diocese ; his mother Nonna, an eminently pious woman, by whom he was dedi- cated to the service of God from his birth, appears to have exercised a powerful influence over the religious convictions of both father and son. In pursuit of a more liberal and extended culture than could be procured in the insignificant town of Nazianzus, Gregory visited successively the two Ceesareas, Alexandria, and Athens, as a student of grammar, mathematics, rhetoric, and philosophy ; at the last-named seat of learning, where he prolonged his stay until he had entered his thirtieth year, he enjoyed the society and friend- ship of Basil, who afterwards became the famous bishop of Ceesarea; the prince Julian, destined soon afterwards to play so prominent a part in the world's history, was also a fellow-student. Shortly after his return to his father's house at Nazianzus (about the year 360) Gregory received bap- tism, and renewed his dedication to the service of religion ; he still continued, however, for some time, and indeed more or less throughout his whole life, in a state of hesitation as to the form which that service ought to take. Strongly inclined by nature and education to a contemplative life spent among books and in the society of congenial friends, he was yet continually urged by outward circumstances,

and doubtless also by some inward call, to active pastoral labour. The spirit of refined intellectual monasticism, which clung to him through life and never ceased to struggle for the ascendency, was about that time strongly encouraged by his intercourse with Basil, who was then revelling in the exalted pleasures of his retirement in Pontus; the prepara- tion of the `Aoxadfa, a sort of chrestomathy compiled by the two friends from the writings of Origen, belongs to this period. But the events which were at that time stirring the political and ecclesiastical life of Cappadocia, and indeed of the whole Roman world, made a career of learned Jeisure difficult if not`

impossible to a man of Gregory’s position and temperament. The emperor Constantius, having by a course of artful intrigue and intimidation succeeded in thrusting a semi-Arian formula upon the Western bishops assembled at Ariminum in Italy, had next attempted to fol- low the same course with the Eastern episcopate. The aged bishop of Nazianzus having yielded to the imperial threats, a great storm arose among the monks of the diocese, which was only quelled by the influence of the younger Gregory, who shortly afterwards (about 361) was ordained to the priesthood. After a vain attempt to evade his new duties and responsibilities by flight, he appears to have continued to act as a presbyter in his father’s diocese without inter- ruption for some considerable time ; and it is probable that his two Invectives against Julian are to be assigned to this period. Subsequently (about 372), under a pressure which he somewhat resented, he allowed himself to be nominated by Basil as bishop of Sasima, a miserable little village some 32 miles from Tyana; but he seems hardly, if at all, to have assumed the duties of this diocese, for after another interval of ‘ flight” we find him once more (about 372-3) at Nazianzus, assisting his aged father, on whose death (374) he retired to Seleucia in Isauria for a period of some years. Meanwhile a more important field for his activities was opening up. Towards 378-9 the small and depressed remnant of the orthodox party in Constantinople sent him an urgent summons to undertake the task of resuscitating the catholic cause, so long persecuted and borne down by the Arians of the capital. With the accession of Theodosius to the imperial throne, the prospect of success to the Nicene doctrine had dawned, if only it could find some cour- ageous and devoted champion. The fame of Gregory as a learned and eloquent disciple of Origen, and still more of Athanasius, pointed him out as such a defender ; nor could he resist the appeal made to him, although he took the step sorely against his will, Once arrived in Constantinople, he laboured so zealously and well that the orthodox party speedily gathered strength; and the small apartment in which they had been accustomed to meet was soon ex- changed for a vast and celebrated church which

received the significant name of Anastasia, the Church of the Resur- rection, Among the hearers of Gregory were to be found, not only churchmen like Jerome and Evagrius, but also heretics and heathens; and it says much for the sound wisdom and practical tact of the preacher that from the outset he set himself less to build up and defend a doctrinal position than to urge his flock to the cultivation of the loving Christian spirit which cherishes higher aims than mere heresy hunting or endless disputation. Doctrinal, nevertheless, he was, as is abundantly shown by the famous five discourses on the Trinity, which earned for him the distinctive appel- lation of eoddyos (OeoAoyia being here used in the stricter sense to designate the doctrine of Christ's divinity, as distin- guished from oixovoyéa, which denotes the doctrine of His incarnation). He continued to labour in the Eastern capital till the arrival of Theodosius, and the visible triumph of the orthodox cause ; the metropolitan see was then con- ferred upon him, and after the assembling of the second

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Meletius. In consequence, however, of a spirit of discord and envy which had manifested itself in connexion with this promotion, he soon afterwards, in an oration, not without some bitterness of tone, resigned his dignity, and withdrew into comparative retirement. The rest of his days were spent partly at Nazianzus, where he appears still to have mixed himself in ecclesiastical affairs, and partly on his patrimonial estate at Arianzus, where he devoted himself to his favourite literary pursuits, and especially to poetical composition, until his death, which occurred in 389 or 390, His festival is celebrated in the Eastern Church on January 25th and 30th, in the Western on 9th May (duplex),

His extant works consist of poems, epistles, and orations. The poems, which include epigrams, elegies, and an autobiographical sketch, have been frequently printed, the editio princcps being the Aldine (1504). Other editions are those of Tollius (1696) and Muratori (1709); a volume of Carmina Selecta also has been edited by Dronke (1840). The tragedy entitled ypiords wdoxwv usually included is certainly not genuine. Of

Gregory's poetry there is not much to be said. His best energies were not devoted to it; it was adopted in his later years as a recreation rather than as a serious pursuit; thus it is occasionally delicate, graphic, beautiful, as could not fail to be the case with a writer of his culture and power, but it is not sustained. Of the hymns none have passed into ecclesiastical use. The letters are entitled toa higher place in literature. They are always easy and natural; and there is no forced in the manner in which their acute, witty, and profoun sayings are introduced. As an orator he is held to have surpassed all his contemporaries "in the purity of his words, the nobleness of his expressions, the ornaments of his discourse, the variety of his figures, the justness of his comparisous, the beauty of his reasonings, and the sublimity of his thoughts." Thus, though ri neither of Basil's gift of government nor of Gregory of

yssa's power of speculative thought, he worthily takes a place in that triumvirate of Cappadocians whom the Catholic Church grate- fully recognizes as having been, during the critical struggles in the latter half of the 4th century, the best defenders of its faith. The Opera Omnia were first published by Hervagius (Basel, 1550); the subsequent editions have been those of Billius (Paris, 1609, 1611; aucta ex interpretatione Morelli, 1630), of the Benedictines (begun in 1778, but interrupted by the French Revolution and not completed until 1840, Caillau being the final editor), and of Migne.

Scattered notices of the life of Gregory Nazianzen are to be found in the writings of Socrates, Sozomcn, Theodoret, and Rufinus, as well as in his own letters and poems. The data derived from these sources do not always harmonize with the account of Suidas, The earlier modern authorities, such as Tillemont (Mem, Ecci., t. ix.) and Leclere (Bid. Univ., t. xviii.) have been made use of by Gibbon in his brief but able sketch of this father. Among recent monographs may be mentioned those of Ullmann (Gregorius von Nazianz, den Theologe, 1825; Eng. transl. by G. F. Cox, M.A., 1857), Benoit, (St Grégotre de Nazianze; sa v1, Ses ccuvres, et son épogue, 1877), and Montaut (Revue critique de quelques questions historiques se rapportant a St Grégoire de Nazianze, 1879).

GREGORY, St, or Nyssa, one of the great Cappadocians, and designated by one of the later cecumenical councils as "a father of fathers," was a younger brother of St Basil, and was born (probably) at Neoczsarea about 331 A.D.

For his education, which was the best that could be got at

that time, he appears to have been chiefly indebted to his elder brother. Atacomparatively early age he entered the church, and held for some time the office of anagnost or reader ; subsequently he manifested a desire to devote him- self to the secular life as a rhetorician; but this impulse was checked by the earnest remonstrances of Gregory Nazianzen. Finally, in 371 or 372 he was ordained by his brother Basil to the bishopric of Nyssa, a small town in Cappadocia. Here he is usually said (but on inadequate data) to have adopted the opinion then gaining ground in favour of the celibacy of the clergy, and to have separated from his wife Theosebia, who became a deaconess in the church. His strict orthodoxy on the subject of the Trinity and the Incarnation, together with his vigorous eloquence, combined to make him peculiarly obnoxious to the Arian faction, which was at that time in the ascendant through the pro- tection of the emperor Valens; and in 375, on the ground of alleged irregularities in his election, and in the adminis- tration of the finances of his diocese, he was driven into exile, whence he did not return till the publication of the

cecumsenical council in 381 he received consecration from | edict of Gratian in 3878. Shortly afterwards he took part

in the proceedings of the synod which met at Antioch in Caria, principally in connexion with the Meletian schism. At the great cecumenical council held at Constantinople in 381, he was a conspicuous champion of the orthodox faith ; according to Nicephorus, indeed,' the additions made to the Nicene creed were entirely due to his suggestion, but this statement is of doubtful authority. That his eloquence was highly appreciated is shown by the facts that he pro- nounced the discourse at the consecration of Gregory of Nazianzus, and that he was chosen to deliver the funeral oration on the death of Meletius the first president of the council. In the following year,

moreover (382), he was commissioned by the council to inspect and set in order the churches of Arabia, in connexion with which mission he also visited Jerusalem. The impressions he gathered from this journey may, in part at least, be gathered from his famous letter De Huntibus Hierosolyma, in which an opinion strongly unfavourable to pilgrimages is expressed. In 383 he was probably again in Constantinople; where in 385 he pronounced the funeral orations of the princess Pulcheria and afterwards of the empress Placilla. Once more we read of him in 394 as having been present in that metro- polis at the synod held under the presidency of Nectarius to settle a controversy which had arisen among the bishops of Arabia; in the same year he assisted at the consecration of the fine new church of the apostles at Chalcedon, on which occasion there is reason to believe that his discourse com- monly but wrongly known as that eis tiv éavrod xetporoviav was delivered. The exact date of his death is unknown; some authorities refer it to 396, others to 400. His festival is observed by the Greek Church on January 10th; in the Western martyrologies he is commemorated on March 9th.

Gregory of Nyssa is generally admitted to have excelled both his brother Basil and Gregory of Nazianzus alike in the natural vigour of his intellect and in the wide extent of his acquirements. His teaching though strictly trinitarian, shows considerable freedom and originality of thought; in many points his mental and spiritual affinities with Origen show themselves with advantage; though in one particular—namely, in his doctrine of aroxardoracts or final restoration—his views have since been repudiated by the orthodox. His style has been frequently praised by competent authorities for sweetness, richness, and elegance. His numerous works may be classified under five heads:—(1.) Treatiscs in doctrinal and polemical theology. Of these the most important is that Against Hunomius in twelve books, Its doctrinal thesis (which is supported with great philosophic acumen and rhetorical power) is the divinity and consubstantiality of the Word; ineidentélly the character of Basil, which Eunomius had aspersed, is vindicated, and the heretic him- self is held up to scorn and contempt. This is the work which, most probably in a shorter draft, was read by its author when at Constantinople before Gregory Nazianzen and Jerome in 381 (Jerome, De Vir. Ii., 128). To the same class belong the treatise fo Ablawius, against the tritheists; On Faith, against the Arians; On Common Notions, in

explanation of the terms in current employment with regard to the Trinity; Zen Syllogisms, against the Manichwans; Zo Theophilus, against the Apollinarians; an Antirrhetic against the same; Against Fate, a disputation with a heathen philosopher; the Oratio Catechetica Magna; and the dialogue De Anima et Resurrectione. (2.) Practical treatises. To this category belong the tracts On Virginity and On Pilgrimages; as also the Canonical Epistle upon the rules of penance. (8.) Ex- pository and homiletical works, including the Hexaémeron, and several series of discourses On the Workmanship of Man, On the Inseriptions of the Psalms, On the Sixth Psalm, On the first three Chapters of Ecclesiastes, On Canticles, On the Lord's Praycr, and On the Hight Beatitudes, (4.) Biographical, consisting chicfly of funeral orations. (5.) Letters. The only complete editions of the whole works are those by Fronton le Duc (Fronto Duceus, Paris, 1615; With additions, 1618 and 1638) and by Migne. Of the new edition projected by F. Oehler only the first volume, containing the Opera Dogmatica, has appeared (1865). Thcre have been numerous editions of several single treatises, as for example of the Oratio Catechetica, De Preeatione, and De Anima et Resurrectione. Sce the monograph by Rupp (@regors, des Bischofs von Nyssa, Leben bie Meinungen, Leipsic, 1834), and compare Heyns (Disputatio gO theologica de Greg. Nyss., 1835), Moller (Gregoriit Nyss.

octrinam de hominis natura e illustravit et cum Origeniana com-

Puravit, 1854), and Stigler, Die Psychologie des h. Gregors von Nyssa (Ratisbon, 1857). ao il

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GREGORY, St, surnamed in later ecclesiastical tradition THAUMATURGUS (the miracle-worker), was born of noble and wealthy heathen parents at N eoczesarea, towards the begin- ning of the 3d century of the Christian era. His original name was Theodorus. Destined by his parents for the bar, he studied civil law at Athens, Alexandria, and Berytus, it is said; he afterwards (about 231) accompanied his sister to Cesarea in Palestine, where he became the pupil and finally the convert of Origen. In returning to Cappadocia some five years after his conversion, it had been his original intention to live a retired ascetic life (Euseb., H. Z., vi. 30); but

this wish he was not permitted to gratify. Urged by Origen, and at last almost compelled by Pheedimus of Amasia, his metropolitan, neither of whom was willing to see so much learning, piety, and masculine energy practi- cally lost to the church, he, after many attempts to evade the dignity, was consecrated bishop of his native town (about 240). His episcopate, which lasted some thirty years, was characterized by great zeal, and by so mucli success that, according to the (doubtless somewhat rhetori- cal) statement of Gregory of Nyssa, whereas at the outset of his labours there were only seventeen Christians in the city, there were at his death only seventeen persons in all who had not embraced Christianity. This result he achieved in spite of the Decian persecution (250), during which he had felt it to be his 'duty to absent himself from his diocese, and notwithstanding the demoralizing effects of an irruption of barbarians who laid waste the diocese in 260. Gregory, although he has not always escaped the charge of Sabellianism, now holds an undisputed place among the fathers of the church; and although the turn of his mind was practical rather than speculative, he is known to have taken an energetic part in most of the doctrinal controversies of his time. He was active at the synods of Antioch which investigated and condemned the heresies of Paul; and the rapid spread in Pontus of a Trinitarianism approaching the Nicene type is attributed in large measure to the weight of his influence. Gregory is believed to have died in the reign of Aurelian, about the year 270, though some accounts place his death six yearsearlier. His festival (semiduplex) is observed by the Church of Rome on the 17th of November. For the facts of his biography our earliest and best authority is the Lefe or rather Panegyric by Gregory of Nyssa; but there are also incidental notices of him in the writings of Basil the Great. Both these writers represent him as having wrought miracles of a very startling description ; but nothing related by them comes near the astounding narratives given in the MZartyrologies, or even in the Breviariwn Romanum, in connexion with his name.

The principal works of Gregory Thaumaturgus are the Panegyri- cus in Origenem (eis 'Qpuyévny wavnyupixds Adyos), which he wrote when on the point of leaving the school of that great mastcr; a Metaphrasis in Heelesiasten, characterized by Jerome as " short but useful"; and an Epistola Canonica, which treats of the discipline to be undergone by those

Christians who under pressure of persecution had relapsed into paganism, but desired to be restored to the privi- leges of the church. An Expositio Fidei, usually attributed to Gregory, and traditionally alleged to have bcen received by him immediately in vision from the apostle John himself, is of doubt- ful authenticity. There have been several editions of the works of this father; of these may be mentioned that of Gerard Voss, in Greek and Latin (Mainz, 1604); the Paris edition of 1622; and that contained in the third volume of Galland's Bibliotheca Patrum (Paris, 1788). They are also to be found in a Latin translation in Migne's Patrologia Greeea, vol. vii. A separate reprint of the Panegyricus in Origenem was published by Bengel in 1722. The life of Gregory has been written by Pallavicini (Rome, 1644) and by Boye (Jena, 1708).

GREGORY, Sr, or Tours (c. 540-594), historian of the Franks, was born at Clermont, Auvergne, not earlier than 539 and not later than 543 a.p. He was the youngest son of Florentius, a provincial senator, and head

of one of the oldest and most powerful Christian families in the country; at his baptism he received the name of George, that of Gregory not having been assumed until his consecration at least thirty years afterwards. He received his education under the superintendence of his uncle Gallus, at that time bishop of Clermont, and afterwards under Avitus, who succeeded to that see. Having been ordained a deacon on attaining the canonical age, the youthful Georgius Florentius fora time attended in some ecclesiasti- cal capacity the court of Sigebert of Austrasia; and when in 573 a vacancy occurred in the see of Tours, which had been occupied by many of his kindred, his reputation for piety and wisdom led to his being immediately designated as a suitable successor to that bishopric. Circumstances soon occurred which brought into great prominence his peculiar fitness for this post; first in 575, when Guntran had taken refuge from Chilperic in the sanctuary of St Martin, and afterwards in 577,. when Pretextatus of Rouen had been unjustly condemned by the rest of his brethren. The firmness and courage which be showed on these and other occasions brought upon him the bitter hostility of the strong-minded Queen Fredegond, who caused him to be sum- moned before a council at Braine on a charge of treason, of

which, however, he wasacquitted. In 581 he took a lead- ing part in adjusting that arrangement between Chilperic and Childebert which gave peace to France for many years. During the later years of his life he used his political influ- ence and prestige, which were now immense, with singular unselfishness aud judgment in the interest alike of his diocese and of the whole country. He died at Tours on the 17th of November 594, and subsequently attained the honours of beatification and canonization, his day in the calendar (semiduplex) being November 17th.

*Of his writings, besides the Historia Francorwm in ten books, we possess a treatise De Miraculis in seven books, containing the miracles of Christ and his apostles, those of Julian, of Martin, and also of others. Other treatises which he mentions have perished. The De Miraeulis appears to have occupied him at intervals during the whole of his prelacy; of the Historia Francorum he is supposed to have written as far as to about the middle of the fifth book by 577 ; the eighth book was completed before 585, and the tenth about 591, the epilogue being of still later date. This work, which gives Gregory of 'l'ours a just title to be called the father of French history, has no pretensions to elegance or even grammatical aecuracy of style, it is wholly uncritical, and betrays in every page the prejudice and ignorance of the age to whichit belongs. But it is honestly and truthfully written from the point of view of one whose avowed intention was to trace '*the wars of kings with hostile nations, of martyrs with pagans, of churches with heretics;" and as an original source for the period af 174 years which it covers it is still, notwithstanding the unfavourable judgment which Gibbon has expressed, invaluable.*

The edition of the works of Gregory of Tours, which appeared at Paris in 1511-12, has been entirely superseded by that of Ruinart (Paris, 1699). It includes the not very valuable life of the saint by Odo. The 71st volume of Migue's Patrology adds to a reprint of Ruinart an ZHistoria Septem Dormientiwm which is sometiines (but improperly) attributed to Gregory. Translations by Bonnet, Guizot, and others into French have been frequently reprinted; a German version appeared at Wiirzburg in 1847-49 ; it was followed by Giesebrecht's in 1851, See Kries, De Greg. Tur. epise. vita et seriptis (Breslau, 1839); Lobell, Gregor v. Tours u. seine Zeit

(Breslau, 1839; 2d ed. Leipsic, 1869); and an article in the Mémoires de V Académie, t. Xxvi.

GREGORY, the name of a Scottish family, many mem- bers of which attained high eminence in various depart- ments of science, sixteen having held professorships. Of the most distinguished of their number a notice is given below.

I. Davin Grecory (1628-1720), eldest son of the Rev. John Gregory of Drumoak, Aberdeenshire, was born in 1628. For some time he was connected with a mercantile house in Holland, but on succeeding to the family estate of Kinardie he returned to Scotland, and occupied most of his time In scientific pursuits, freely giving his poorer neigh- bours the benefit of his medical skill. He is said to have been the first possessor of a barometer in the north of

Scotland; and on account of his success by means of it in predicting changes in the weather, he was accused of witch- craft before the presbytery of Aberdeen, but he succeeded in convincing that body of hisinnocence. He died in 1720,

IT. James Grecory (1638-1675), the author of import- ant discoveries in mathematics and optics, younger brother of the preceding, was born in 1638. He was educated at the grammar school of Aberdeen and at Marischal College of that city. At an early period he manifested a strong inclination and capacity for mathematics and kindred sciences; and before completing his twenty-third year he published his famous treatise Optica Promota, in which he made known his great invention the Gregorian reflecting telescope. About 1665 he went to the university of Padua, where he studied for some years, and in 1667 published Vera Circuli et Hyperbole Quadratura, in which he pro- pounded his method of an infinitely converging series for the areas of the circle and hyperbola. In the following year he published also at Padua Geometric Pars Unwersalis, in which he laid down a series of rules for the transmutation of curves and the measurement of their solids of revolution. On his return to England in this year he was elected a member of the Royal Society; in the following year he

became professor of mathematics in the university of St Andrews; and in 1674 he was transferred to the chair of mathematics in Edinburgh. In October 1675, while show- ing the satellites of the planet Jupiter to some of his students through one of his telescopes, he was suddenly struck with blindness ; and he died a few days afterwards at the early age of thirty-seven.

Besides the works already mentioned Gregory is the author of Exercitationes Geometrice, 1668, and, it is alleged, of a satirical tract entitled The Great and New Art of Weighing Vanity, intended to ridicule certain fallacies of a conteniporary writer on hydraulics, and published at Glasgow in 1672, professedly by " Patrick Mathers, archbeadle of the university of St Andrews."

III. Davin Grecory (1661-1708), nephew of the pre- ceding and son of the David Gregory above mentioned, was boru in Aberdeen in 1661. He was educated partly in his native city and partly in Edinburgh, where at the age of twenty-three he became professor of mathematics. In 1691 he was appointed Savilian professor of astronomy at Oxford, an office which he held till his death in 1708. His principal works are Hauercitatio Greometrica de dimen- stone figurarum (1684), Catoptricee et Dioptrice Sphoericee Elementa (1695), and Astronomice Physice et Geometrice Elementa (1702),—the last a work highly esteemed by Newton, of whose system it is an illustratiou and a defence. A Treatise on Practical Geometry which he left in manu- script was translated from the Latin and published in 1745. He was succeeded in the chair of mathematics in Edin- burgh by his brother James; another brother, Charles, was in 1707 appointed professor of mathematics in the uni-

-| versity of St Andrews ; and his eldest son, David, became

professor of modern history at Oxford, and canon and latterly dean of Christ Church.

IV. Joun Grecory (1724-1773), professor of medicine in the university of Edinburgh, grandson of James Gregory, the inventor of the Gregorian telescope, and youngest son of Dr James Gregory, professor of medicine in King's College, Aberdeen, was born at Aberdeen, June 3, 1724. After

studying at the grammar school of Aberdeen, and completing his literary course at King's College in that city, be attended the medical classes at Edinburgh university. In 1745 he went to Leyden to complete his medical studies, and during his stay there he received without solicitation the degree of doctor of medicine from King's College, Aberdeen. On his return from Holland he was elected professor of philo- sophy at King's College, but in 1749 he resigned his pro- fessorship on account of its duties interfering too much with his practice as a physician. In 1754 he proceeded to

London, whiere lie madc the acquaintance of many persons of distinction, and the same year was chosen fellow of the Royal Socicty. On the death in November 1755 of his brother Dr James Gregory, who had succeeded his father as professor of medicine in King's College, Aberdeen, he was appointed to that office. In 1764 he removed to Edinburgh in the hope of obtaining a more extended field of practice as a physician, and in 1766 he was appointed professor of the practice of physic in the university of Edinburgh, to whose eminence as a medical school he largely contributed. From his eighteenth ycar Dr Gregory had been subject at irregular intervals to attacks of gout, and on the morning of February 10th, 1773, he was found dead in bed apparently from the results of this disease.

He is the author of 4 Comparative View of the State and Facul- ties of Man with those of the Animal World, 1765; Observations on the Duties, Offices, and Qualifications of a Physician, 1772; Elements of the Practice of Physic, 1772; and A Father's Legacy to his Daughters, 1774. His Whole Works, with a life by Mr Tytler es Lord Woodhouselee), were published at Edinburgh in

1788.

V. James Grecory (1753-1821), professor of the practice of medicine in the university of Edinburgh, eldest son of the preceding, was born at Aberdeen in 1753, and received there the rudiments of his education. He accom- panied his father to Edinburgh in 1764, and after going through the usual course of literary studies at that uni- versity, he was for a short time a student at Christ Church, Oxford. It was there probably that he acquired

that taste for classical learning which afterwards distinguished him. He then entered on the study of medicine at Edin- burgh, and, after graduating doctor of medicine in 1774, speut the greater part of the next two years in Holland, France, and Italy. Shortly after his return to Scotland he was appointed in 1776 to the chair his father had formerly held, and in the following year he also entered on thie duties of teacher of clinical medicine in the Royal Infirmary. On the illness of Dr Cullen in 1790 he was appointed Joiut-professor of the practice of medicine; he became sole professor on the death of Dr Cullen in the same year ; and he continued to deliver lectures on that subject, to audiences almost regularly increasing, until his Jast illness In 1821. He died on the 2d April of that year. Asa medical practitioner Dr Gregory was for the last ten years of his life decidedly at the head of the profession in Scotland ; and as a professor his quickness and command. ing energy of intellect, his power of perspicuous and elegant exposition, and his genuine sense of humour gave him a remarkable asceudency over the minds of his pupils.

Besides his Conspeetus Medicine Theoretiece, published in 1788 as

a text-book for his lectures on the institutes, Dr Gregory was the author of " A Theory of the Moods of Verbs," published in the Edin. Phil. Trans., 1787, and of Literary and Philosophical Essays, published in two volumes in 1792. _ VL Wittram Grecory (1803-1858), son of the preced- ing, was born 25th December 1803. In 1837 he became professor of chemistry at the Andcrsonian Institution, Glasgow, in 1839 at King's College, Aberdeen, and in 1844 at Edinburgh University. He died April 24, 1858. Gregory was one of the first in England to advocate the theories of Liebig, and translated several of his works. He 1s also the author of Outlines of Chemistry, 1845, and an Elementary Treatise on Chemistry reprinted from the Encyclopedia Britannica, 1855.

VIL. Duncan Farqunarson Grecory (1813-1844), brother of the preceding, was born 13th April 1813. After studying at the university of Edinburgh he in 1833 entered Trinity College, Cambridge, where he was for a time assistant professor of chemistry, and was one of the founders of the chemical society. He latterly devoted his chief attention to mathematics, in which he made some important discoveries. He died 23d February 1844.

The Cambridge Mathematical Journal was originated, and for some time edited, by Gregory; and he also published a Collection of Examples of Processes in the Differential and Integral Caleulus, 1841. A Treatise on the Application of Analysis to Solid Geometry, which he left unfinished, was completed by W. Walton, and pub- lished posthumously in 1846. His Mathematical Writings, edited by W. Walton, with a biographical memoir by Robert Leslie Ellis, appeared in 1865.

GREGORY, Ouintuus, LL.D. (1774-1841), was born 29th January 1774 at Yaxley, in Huntingdonshire. He was only nineteen when he published Lessons Astronomical and Philosophical (1793), and soon after, by a manuscript on the "Use of the Sliding Rule," he was fortunate enough to excite the interest of Dr Hutton, professor of mathe- matics at the Royal Military Academy of Woolwich. Having settled at Cambridge in 1798, Gregory first acted as subeditor of a provincial newspaper, and then opened a bookseller's shop ; but before long he found that he would be better off es a private teacher of mathematics. In 1802 he obtained an appointment as mathematical master at Woolwich through the influence of Hutton; and when Hutton resigned in 1807, Gregory succeeded him in the professorship. Failing health obliged him to retire in 1838, and he died at Woolwich 2d February 1841.

Of Gregory's numerous mathematical works it is enough to men- tion Hints for the Use of Tcachers of Elementary Mathematics (1840; new edition, 1853), and Jfathematics for Practical Men (1825), which was revised and enlarged by Henry Law in 1848, and again by J. R. Young in 1862. His Letters on the Evidences of Chris- tianity (1815) have been scveral times reprinted, and an abridg- ment was published by the Religions Tract Society in 1858. He will probably be longest remembered for his Biography of Robert Hall, which first appeared in the collected edition of Hall's works, was published separately in 1833, and has since passed through several editions. The minor importance of his Memoir of John Mason Good (1828) is due to the narrower fame of the subject. Gregory was one of the founders of the Royal Astronomical Society. In 1802 he was appointed editor of the

Gentlemen's Diary, and in 1818 editor of the Ladies' Diary and superintendent of the almanacs of the Stationers' Company.

GREIFENBERG, the chief town of a circle in the Prussian province of Pomerania and government of Stettin, is situated on the Rega, 45 miles N.E. of Stettin. It possesses a royal gymnasium and a higher girls' school. Agriculture, linen-weaving, and the manufacture of stoves are the principal industries. Griefenberg possessed town rights as early as 1262, and in the 14th and 15th centuries had a considerable shipping trade, but lost much of its prosperity during the Thirty Years' War. Including the garrison, the population in 1875 was 5631. See Riemann, Geschichte der Stadt Greifenberg in Pommern, 1862.

GREIFENHAGEN, the chief town of a circle in the Prussian province of Pomerauia and government of Stettin, is situated on the Reglitz, 12 miles 8.8. W. of Stettin. Its prosperity depends chiefly on agriculture, and it has a con- siderable cattle trade. There are also linen manufactories and saw-mills. Greifenhagen was built in 1230, and was raised to the rank of a town and fortified in]262, In the Thirty Years' War it was taken both by the imperialists and the Swedes, and in 1675 it was captured by the Branden-burgers, into whose possession it came finally in 1679. The population in 1875 was 6759.

GREIFSWALD, or Greirswapr, the chief town of a circle in the Prussian province of Pomerania and govern- roent of Stralsund, is situated on the Ryck, 3 miles from its mouth in the Baltic, and 20 miles 8. by E. of Stralsund. It has wide and regular streets, and is surrounded by pro-menades formed out of its old ramparts. It is the seat of a court of appeal for the government district of Stralsund. The university, founded in 1456, is attended by nearly 500 students, about one-half of whom belong to the medical faculty ; connected with it are an anatomical theatre, an infirmary, a chemical laboratory, a pathological institute, and a library containing nearly 140,000 volumes. The

principal other buildings are the church of St Nicholas (with a tower 330 feet high and a valuable library), the old town-house, the theatre, the

gymnasium, the orphanage, and the lunatic asylum. There is a considerable shipping trade in Pomeranian corn with England, France, and the Mediterranean ports. Fish-curing, shipbuilding, and the manufacture of machines, railway waggons, needles, soap, tobacco, and oil, are the principal other industries. The population in 1875 was 18,022.

Greifswald was founded about 1240 by mechanics and merchants from the Netherlands. In 1250 it received a town constitution and Liibeck rights from Duke Wratislaus of Pomerania. In 1270 it formed a league with the Hanse towns, Stralsund, Rostock, Wisinar, and Liibeck ; and it took part in the wars which thcy carricd on against the kings of Denmark and Norway. During the Thirty Years' War it was formed into a fortress by the imperialists, but they vacated it in 1631 to the Swedcs, in whose possession it remained after the peace of Westphalia. In 1678 it was captured by the elector of Brandenburg, but it was restored to the Swedes in the following year; in 1713 it was desolated by the Russians; in 1715 it came into the possession of Denmark; and in 1721 it was again restored to Sweden, under whose protection it remained till 1815, when, along with the whole of Swedish Pomerania, it came into the possession of Prussia, See Kosegarten, Geschichte der Uni- versitdt Greifswald, 1856; and Gesterding, Beitrag zur Geschichte der Stadt Greifswald, 8 vols., 1827-29.

GREIZ, or Grerrz (formerly Grewitz or Grewz), a town of Germany, capital of the principality of Reuss-Greiz, is situated in a pleasant valley on the right bank of the White Elster, near the borders of Saxony, and 14 miles W. by S. of Zwickau. It is surrounded by walls, and is tolerably well built. The principal buildings are the prince's palace surrounded by a fine park, the old " residence" castle on a rock overlooking the town, the summer palace with a fine garden, the old town church dating from 1225 and possess- ing a beautiful tower, the town-house, the city school build- ings, the normal seminary for the principality, and the lower city school, The industries include dyeing, tanning, and the manufacture of woollen, cotton, and silk cloth, shawls, coverlets, and paper. The population in 1875 was

12,657.

Greiz is apparently of Slavic origin. From the 12th century it was governed by bailiffs, but in 1236 it came into the possession of Gera, and in 1550 of

the younger line of the house of Plauen. It was wholly destroyed by fire in 1494, and almost wholly in 1802. See Wilke, Greiz wad seine Uingebung, 1875,

GRENADA, the most southern island of the Antilles, lies between 11° 58' and. 12° 30', N. lat, and 61° 20' and 61° 35' W. long. It is 30 leagues S.W. of Barbados, and about 60 miles from the nearest point of South America. Its length from north to south is about 24 miles, and its greatest breadth is 12 miles. Thearea is 133 square miles.

Grenada is rendered highly picturesque by ridges of hills covered with trees and brushwood, and by an irregular but continuous range of mountains which traverses the island from north to sonth, in some parts rising to 3000 feet above the level of the sea, Lesser ridges branch off, form- ing rich and picturesque valleys. The mountains and some parts of the lowlands consist of red aud gray sandstone, greywacke, hornblende, and argillaceous schist, The strata are much diversified and irregular. Sulphur and fuller's earth are found. Porphyry, limestone, and basaltic rocks occur at certain places. Rivers are numerous, but not large, In the centre of the island, 1740 feet above the level of the sea, is the Grand Ftang, a circular lake 2 miles in cir- cumference and 14 feet deep, feeding numerous small rivers. Lake Antoine is another remarkable natural feature. There are several hot chalybeate and sulphurous springs. Along the coast are numerous excellent bays and harbours. The waters abound with fish ; game and birds of various species are found. Hurricanes are compara- tively unfrequent, but earthquake shocks are sometimes experienced. The average temperature is 82° Fahr., but the higher parts are cooler. Considerable rain falls. The

soil is extraordinarily fertile; but cotton, indigo, and tobacco are not now cultivated. Fruits and some kinds of European vegetables grow luxuriantly. Sugar cultivation is not ex- tending, but cocoa is now making rapid strides. The island is divided into six parishes. Formerly it had a house of assembly, but is now a crown colony under the general government of the Windward Islands. It has a lieutenant-governor and a council consisting of officials and members nominated by the crown,

The capital, St George's (population about 5000), is built upon a peninsula projecting into a spacious bay on the west side of the island, near the southern extremity. The houses are of brick or stone, and stand on high ground which rises from the bay, The town is divided by a ridge running into the sea, forming on one side the careenage, a large basin of water, where ships lie landlocked, close to wharves and stores.

Between Grenada and St Vincent there are several small islands called Grenadines, some being included in the government of Grenada. Of these Carriacou is the most important, It is about 19 miles in circumference, and con- tains 3071 inhabitants. Ground provisions, live stock, and some cocoa are cultivated.

The exports in 1877 were—cocoa, 1244 tons; whale oil, 6720 galls. ; rum, 53,609 galls. ; sugar, 2792 tons. The cocoa cxports in 1878 were 1900 tous, an amount considerably exceeded in 1879. The total value of imports amounted in 1877 to £127,204,—includ- ing £60,201 from the United Kingdom, and £46,724 from the British West Indies, The value of exports to the United Kingdom was £122,821, and to other countries, £23,085 ;—total, £145,906. The revenue was £29,084, of which customs produced £18,460, and the expenditure was £29,581. Population (1877), 41,355. About 400 Coolic immigrants were introduced in 1877. Considcrable immigra- tion takes place from Barbados. The legislature grants £1200 annually for education, distributed among 30 schools,—16 Anglican, 5 Wesleyan, 9 Roman Catholic,—with 2908 scholars.

Grenada was discovered by Columbus in 1498. The Spaniards, however, did not form a settlement there. The island is one of the "Caribbces"' granted to the earl of Carlisle in 1627; but it was inhabited only by warlike Caribs until 1650-51, when Du Parquet, et of Martinique, organized two expeditions to it. The

reuchmen were at first well received by the natives, but great cruelty was exercised in the extirpation of the latter. The island made little progress until after 1700. In 1714 the French West India Company acquired their property in Grenada ; commercial intercourse sprang up with Martinique ; and when the company was dissolved the island became vested in the crown of France. In 1753 it contained 1262 whites, 11,991 slaves, and 83 sugar

planta- tions. In 1762 Grenada capitulated to the British forces, and it was forinally ceded in the treaty of peace of 1763, It was, however, retaken by the French in 1779, and not finally restored to Great Britain in 1788 till the general peace.

GRENOBLE, a fortified city of France, formerly the chief town of Dauphiné and now of the department of the Istre, lies 58 miles E, of Lyons, in 45° 11/57' N. lat. and 5° 43' 29" FE. long. Few of the cities of France have 4 finer situation, The Istre unites with the Drac a few miles further down, and the broad and fertile valley through which the rivers flow is encompassed by a fine panoranla of hills and mountains. From the botanic gardens, for ex- ample, the eastward view comprises the Savoy Alps with the summit of Mount Blanc, and the westward the mountains of St Nizier, while more to the north the hills rise directly above the town, and are crowned by the fort of the Bastille. The beauty of the Isére itself is enhanced by fine bridges

and quays. With the exception of its more modern por- tions, the town of Grenoble is characterized by the tortuous and crowded streets usual in places that have long been con- fined within strong fortifications. The cathedral of Notre Dame, a vast brick building of various periods from the 10th to the 17th century, the foundation of which is tradi- tionally ascribed to Charles the Great ; the church of St Laurence, with a remarkable crypt of the 11th century, long believed to be an old temple of A®sculapius; and the church of St André, founded by the dauphin Guigues André about 1220, and frequently visited for the sake of the tomb of Bayard removed thither in 1822, are the most noteworthy of the ecclesiastical edifices. The palais de justice is a striking erection of the 15th and 16th centuries occupying the site of the old castle of the dauphins, and in front is a statue of Bayard dating from 1823. The old

town-hall has nothing remarkable about it; but the new. prefecture, built at a cost of 1,404,000 francs about 1867, isa handsome structure. with the

Besides its university or academy,

three faculties of law, science, and literature,

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Plan of Grenoble.

5. Church of St André. 6. Notre Dame.

7. Market.

8. College.

Grenoble possesses a lyceum, an episcopal seminary, a school of artillery of the first class, two normal schools, and @ great variety of special educational institutions. The library, which since 1868 has been located along with the Museum in a building which cost more than 1,500,000 francs, 1s a noble collection of upwards of 178,875 volumes, on which the town has expended 2,000,000 francs. Among the numerous societies of Grenoble it is enough to mention the Académie delphinale (1772), the statistical society, the society of the friends of the arts, the society of agriculture, and the zoological society of the Alps, which maintains ‘ Zoological gardens. At the head of the benevolent institu- tons is the general hospital, originally founded by Aimon Chissay in 1424, and now comprising civil and military departments, an orphanage, and an asylum for the aged and Infirm. It was in Grenoble that the first mutual benefit Society was founded in 1803, and the number of such associations in the town was upwards of 40 about 1870. Tn 1836 M. Berriat Saint Prix established a society for the extinction of mendicity, and in 1851 M. Frédéric originated

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See Gariel, La Bibliothaque de Grenoble, 1772-1878, Paris, 1878.

1. Church of St Laurence 2. Church of St Marie.

3, Palais de Justice.

4, Theatre,

9. Museum and Library. 10. School of Artillery. 11. New Prefecture,

12. New Prison.

an association alimentaire for the purpose of providing the poorer classes with good food at the cheapest possible rate. The staple industry of Grenoble is the making of gloves; 115 establishments, employing 2000 workmen and 20,000 needlewomen in the town and neighbourhood, turn out annually 850,000 dozen pairs. Liqueurs, leather, straw hats, paper, lime, and cement hold a principal place among the miscellaneous products. The population of Grenoble was 26,852 in 1851, 35,280 in 1872, and 43,054 in

1876.

Grenoble occupies the site of Cularo, a village of the Allobroges which first became of importance when it was fortified by Diocletian and Maximian. Its present name is a corruption of Gratianopolis, a title assumed in honour of Gratian, who had strengthened the walls, From the Burgundians who gained possession in 467 the little town passed under the Franks, and on the dismemberment of the empire of Charles the Great it was included in the limits of Cisjuran Burgundy. After the 10th century its bishops grew into power, but they were finally supplanted in the 13th century by the counts of Albon, afterwards known as the Dauphins. Though it was ceded in 1349 to France along with Dauphiné, the city continued to enjoy special privileges. In 1563 it was sacked by the Baron des Adrets, but in 1572 the energy of its governor De Gorde saved it from sharing in the massacre of St Bartholomew. Lesdiguitres (Roi des Mon- tagnes) took the town by siege in 1590 in name of Henry IV., and he afterwards made his governorship

memorable by his fortifications, quays, and other serviceable enterpriscs. In the close of the 18th century the name of Grenoble appears in the van of the revolution- ary movement ; the attempt of the Government to substitute a new judicial régime for that of the too independent provincial parliament roused the people to arms and the " day of the tiles" (7th wt 1788) is memorable for the defeat of the royal forces. Grenoble was the first town to open its gates to Napoleon on his return from Elba in 1815, but a few months afterwards it was obliged to surrender to the Austrians. Owing to its situation Grenoble is subject to inun- dations ; in 1219 it was almost swept away, and from that date to 1856 no fewer than 15 similar disasters are enumerated. The great flood of 1778 is known as the " Déluge de la Saint Crépin."" In 1859 the water was 3 feet deep throughout the town. Among the celebrated natives of Grenoble are Vaucanson, Mably, Condillac, Beyle (Stendhal), Barnave, and Casimir Perier.

See Champollion Figeac, Antiquités de Grenoble, (Grenoble, 1807); Pitot, Hist. de Grenoble et de ses environs (Grenoble, 1829).

GRENVILLE, Grorcr (1712-1770), an English states- man, second son of Richard Grenville and Hester Temple, afterwards Countess Temple, was born October 14th, 1712. He was educated at Eton and at Christ Church, Oxford, and in his twenty-fifth year was called to the bar. The habits of industry, the technical knowledge, and the in- tellectual discipline which he acquired in connexion with his legal training were of great advantage to him in his political career, and for a considerable period sufficiently

| compensated for the absence of every oratorical gift except

inexhaustible fluency, and of all but the merest rudiment- ary qualities of statesmanship. He entered Parliament in 1741 as member for Buckingham, and continued to repre- sent that borough till his death in 1770. In December 1744 he became a lord of the admiralty, in June 1747 a lord of the treasury, and in 1754 treasurer of the navy and privy councillor. He remained in office in 1761, when his brother Lord Temple and his brother-in-law Pitt resigned upon the question of the war with Spain, and in the administration of Lord Bute he was entrusted with the leadership of the House of Commons. In May 1762 he was appointed secretary of state, and in October first lord of the admiralty ; and in April 1763 he became first

lord of the treasury and chancellor of the exchequer. The most prominent measures of his administration were the prose- cution of Wilkes and the passing of the American Stamp Act, which led to the first symptoms of alienation between America and the mother country. During the latter period of his term of office he was on a very unsatisfactory footing with the young king George III., who gradually came to feel a kind of horror of the interminable persistency of his conversation, and whom he endeavoured to make use of as the mere puppet of the ministry. The king made XI. — 24

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various attempts to induce Pitt to come to his reseue by forming a ministry, but without success, and at last had recourse to the marquis of Rockingham, on whose agreeing to accept office Grenville was dismissed July 1765. He never again held office, and died 13th November 1770. In 1749 he was married to Elizabeth, daughter of Sir William Wyndham, by whom he had a large family. His son, the second Earl Temple, was created Marquis, and his grand- son Duke, of Buckingham.

A contemptuous application by Pitt to Grenville of the lines 'Gentle Shepherd, tell me where," caused him to be dubbed the "gentle shepherd" for the remainder of his life ; and this would seem to indicate a deficiency in the personal characteristics which insure any high degree of general respect. Exemplary in the observance of all the deceucies of private life, and upright and honourable in all his political relations, he yet possessed none of those attrac- tive or commanding qualities which are sometimes found an advantageous substitute for strict moral integrity, and which the possessor of moral integrity cannot afford to despise. He was moreover under the dominion of an ambition ludicrously out of proportion to his abilities, and the self-confidence with which he pursued his own purposes can be attributed only to the narrow range of his political vision. Though few excelled him ina knowledge of the forms of the House or in mastery of administrative details, his tact in dealing with men and with affairs was so defec- tive that there is perhaps no one who has been at the head of an English administration to whom a lower place can be assigned asa statesman. The Grenville Papers, being the Correspondence of Richard

Grenville, Earl Temple, K.G.,and the Right Hon. George Grenville, their Friends and Con- temporaries, was published at London in 1852.

GRENVILLE, Wittram WynpuaM GRENVILLE, Lorp (1759-1834), English statesman, son of the preceding, was born 25th October 1759. He was educated at Etori and Oxford, and for some time studied at the Inns of Court, but never practised at the bar. In February 1782 he was elected a member of parliament for the county of Buck- ingham, and in the September following he became secretary to his brother the marquis of Buckingham, who had been named lord-lieutenant of Ireland. On the overthrow of the cabinet of Lord Shelburne in the following year he returned to England, and in December he was appointed by his cousin Pitt paymaster-general of the forces. In 1789 he was chosen speaker of the House of Commons, but he vacated the chair in the same year, and was transferred to the Upper House with the title of Lord Grenville, on being appointed secretary of state. He exchanged this office in 1791 for that of secretary of foreign affairs, being regarded by Pitt as the person best fitted to carry out his policy in reference to France. Along with Pitt he resigned office in 1801, on account of the king declining to grant any conces- sions to the Catholics; and when Pitt, on accepting office in 1804, did not stipulate for Catholic emancipation he declined to join his ministry, and entered into a close alliance with Fox. On the death of Pitt in 1806 he became the nominal head of the Government of " All the Talents," whose military projects resulted very unsuccessfully, but which deserves to be remembered with honour on account of the Act for the abolition of the slave trade. Its influence was, however, considerably weakened by the death of Fox F and as the king in March 1807 demanded from Grenville an assurance that he would initiate no measures for the relief of the Catholics he and his colleagues found it necessar to resign, Hi ; : y

esign. His colleagues were not unanimous in ap- proving of his conscientiousness, and Sheridan expressed = Opinion of more than himself when he remarked : I have known many men knock their heads against a wall, but I never before heard of a man collecting bricks

and building a wall for the express purpose of knocking out his own brains against it." Lord Grenville never again held office. He continued to be one of the principal supporters of Catholic emancipation, and during the re- mainder of his political career generally voted with the Whigs, although in 1815 he separated himself from Lord Grey and supported the warlike policy of Lord Liverpool. In 1819, wheu the marquis of Lansdowne brought forward his motion for an inquiry into the cause of the distress and discontent in the manufacturing districts, Grenville delivered an alarmist speech in which he advocated the adoption of severely repressive measures. He died at his residence, Dropmore, Buckinghamshire, 12th January

1834.

Though the talents of Lord Grenville were not of a high order, his straightforwardness, great industry, political knowledge, firmness of mind, and moderate opinions secured him considerable political influence. He canalso lay claim to be enrolled among those English statesmen whio have distinguished themselves in literature. Besides editing the letters of the earl of Chatham to his nephew Thomas Pitt, afterwards Lord Camelford, he printed for private circulation an edition of Homer with annotations, and also a small volume entitled Vugw Metricw, consisting of trans- lations into Latin from Greek, English, and Italian. In 1809 he was chosen chancellor of the university of Oxford. He married in 1792 Anne Pitt, daughter of Lord Camelford, but had no issue, and the title became extinct.

GRESHAM, Sir Tuomas (1519-1579), a London mer- chant, the founder of the Royal Exchange and of Gresham College, London, was born in 1519. Descended from an old Norfolk family, he was the only son of Sir Richard Gresham, a leading London merchant, who for some time held the office of lord mayor and for his services as agent of Henry VIII. in negotiating loans with foreign merchants received the honour of knighthood. Though his father intended him to follow his own profession, he nevertheless sent him for some time to Caius College, Cambridge, but there is no information as to the duration of his residence. It is uncertain also whether it was before or after this that he was apprenticed to his uncle Sir John Gresham, who was also a merchant, but we have his own testimony that he served an apprenticeship of eight years. In 1543 at the age of twenty-four he was

admitted a member of the Mercers' Company, and in the same year he went to the Low Countries, where, either on his own account or on that of his father or uncle, he both carried on business as a merchant and acted in various matters as an agent for Henry VIII. In 1544 he married the widow of William Read, a London merchant, but he still continued to reside principally in the Low Countries, having his headquarters at Antwerp. When in 1551 the mismanagement of Sir William Dansell, "'king's merchant " in the Low Countries, had brought the English Government into great financial embarrassment, Gresham was called in to give his advice, and chosen to carry out his own proposals. Their leading feature was the adoption of various methods—highly in- genious, but quite arbitrary and unfair—for raising the value of the pound sterling on the " bourse" of Antwerp, and it was so successful that in a few years nearly all King Edward's debts were discharged. The advice of Gresham was likewise sought by the Government in all their money difficulties, and he was also frequently employed in various diplomatic missions. He had no stated salary, but in reward of his services received from Edward various grants of lands, the annual value of which at that time was ultimately about £400 a year. On the accession of Mary the council resolved on his recall, but before the letter was sent they changed their opinion ; and as he professed his zealous desire to serve the queen, and manifested great adroitness both in negoti-

ating loans and in smuggling money, arms, and foreign goods, not only were his services retained throughout her reign, but besides his salary of twenty shillings per diem he received grants of church lands to the yearly value of £200. Under Queen Elizabeth, besides continuing to act as financial agent of the crown, he was for some time ambassador at the court of the duchess of Parma. In 1559 he received the honour of knighthood. By the outbreak of the war in the Low Countries he was compelled to leave Antwerp on the 19th March 1567; but, though he spent the remainder of his life in London, he continued his business as merchant and financial agent of the Government in much the same way as formerly. Elizabeth also found him useful in a great variety of other ways, among which was that of acting as jailer to Lady Mary Grey, who, as a punishment for marrying Thomas Keys the sergeant porter, remained a prisoner in his house from June 1569

to the end of 1572. In 1565 Gresham made a proposal to the court of aldermen of London to build at his own expense a bourse or exchange, on condition that they purchased for this purpose a piece of suitable ground. In this proposal he seems to have had an eye to his own interest as well as to the general good of the merchants, for by a yearly rental of £700 obtained for the shops in the upper part of the building he received a sufficient return for his trouble and expense. Gresham died suddenly, apparently of apoplexy, 21st November 1579. His only son predeceased him, and his illegitimate daughter Anne he married to Sir Nicolas Bacon, brother of the great Lord Bacon. With the exception of a number of small sums bequeathed to the support of various charities, the bulk of his property, consisting of estates in various parts of England of the annual value of more than £2300, was bequeathed to his widow and her heirs with the stipulation that. after her decease his residence in Bishopsgate Street, as well as the rents arising from the Royal Exchange, should be vested in the hands of the corporation of London and the Mercers' Company, for the purpose of instituting a college in which seven professors should read lectures successively,—one each day of the week,—on astronomy, physic, law, divinity, rhetoric, and music. The lectures were begun in 1597, and were delivered in the original building until 1768, when, on the ground that the trustees were losers by the gift, it was made over to the crown fora yearly rent of £500, and con- verted into an excise office. From that time a room in the Royal Exchange was used for the lectures until in 1843 the present building was erected at a cost of £7000. It contains a large library, professors' rooms, and a theatre capable of holding 500 persons.

A notice of Gresham is contained in Fuller's Worthics and Ward's Gresham Professors; but the fullest account of him, as well as of the history of the Exchange and Gresham College is that by J. M. Burgon in his Life and Times of Sir Thomas Gresham, 2 vols., 1839. See

also a Brief Memoir of Sir Thomas Gresham, 1833 ; and The Life of Sir Thomas Gresham, Founder of the Royal Exchange, 1845.

_GRESSET, Jean Baptiste (1709-1777). The literary history of Gresset might be dismissed with the simple state- ment that he wrote Vert Vert. By that one poem he is remembered. His life is, however, interesting from

another fact, that he, who almost alone among French poets wrote nothing of which a moralist need be ashamed, spent the last twenty-five years of his life in regretting the frivolity which enabled him to produce the most eharming of poems. He was born at Amiens, and brought up by the Jesuits of that place. As a boy he displayed such great promise that, according to the usual custom of the society, the fathers resolved to receive him among themselves. He was accepted as a novice at the age of sixteen, and sent to pursue his Studies at the Collége Louis le Grand in Paris. After completing his course he was appointed, being then under twenty years of age, to a post as professor or assistant master

in a college at Rouen. He was, it must be remembered, a son of the society of Jesus ; as such he had been drilled and disciplined to perfect obedience ; in every point except that of orders he was an ecclesiastic. Probably it was not the intention of the society that he should become a priest. They reckoned upon his continuing a lay brother, and help- ing the cause by his position as a teacher. From such a mind so trained, so taught to regard everything from the priestly point of view, devoted to the most severe studies, occupied in the grave and responsible work of teaching, what literary fruit was to be expected? Perhaps a treatise on a Greek particle, an essay on Latin style, a grammatical thesis, anything but that which really appeared,—the graceful, pleasant poem by which he will ever be remem- bered. He published Vert Vert at Rouen, being then twenty-four years ofage. It is a story, in itself exceedingly humorous, showing how a parrot, the delight of a convent, whose talk was all of prayers and pious ejaculations, was conveyed to another convent as a visitor to please the nuns. On the way he falls among bad companions, forgets his convent language, and shocks the sisters on arrival by pro- fane swearing. He is sent back in disgrace, punished by solitude and plain bread, presently repents, reforms, and is killed by kindness. The story, however, is nothing. The treatment of the subject, the atmosphere which surrounds it, the delicacy in which the little prattling ways of the nuns, their jealousies, their tiny trifles, are presented, takes the reader entirely by surprise. The poem stands absolutely unrivalled, even among French contes en vers,

Gresset found bimself famous. He left Rouen, went up to Paris, where he found refuge in the same garret which had sheltered him when a boy at the Collége Louis le Grand, and there wrote his second poem, Ma Chartreuse. Then trouble came upon him; complaints were made to the fathers of the alleged licentiousness of verses which were as innocent as any school-girl's novel, the real cause of complaint being the ridicule which Vert Vert seemed tothrow upon the whole raceof nuns. An example, it was urged, must be made; Gresset was expelled the order. Men of robust mind would have been glad to get rid of such a yoke. Gresset, who had never been taught to stand alone, went forth weeping. He became a man of letters ; he wrote many other poems, none of which made any mark. He never in fact attained the same level as Vert Vert. He wrote two or three comedies. One, called Le Aféchant, still keeps the stage, though it is difficult to assign it much merit. He was admitted to the Academy. And then, still young, he retired to Amiens, where he fell into the hands of the priests, and became their abject slave. His brief relapse from the discipline of the church became the subject of the deepest remorse. He repented of his poems, and even went so far as to address to the bishop an abjuration of his title of dramatist, and to implore pardon of the Virgin for having written plays. The history of French literature presents many examples of poets in old age repenting the sins of their youth; the example of Gresset is unique as beginning, while in full manhood, a senile repentance for having even in so pleasant and innocent a way brought into ridicule the institutions of the church.

GRETRY, Anpri Ernest Mopeste (1741-1813), a eelebrated composer of French opera, was born at Liége, February 11,1741. He received his first musical educa- tion in the matérise of the college of St Denis, where his father, a poor musician, occasionally acted as violinist. Le- clerc and Renekin were his early masters. But of greater importance was the practical tuition he received by attend- ing the performance of an Italian opera company. Here he heard the operas of Galuppi, Perogolese, and other masters ; and the desire of completing his own studies in Italy was the immediate result. To find the necessary

means he composed in 1759 a mass which he dedicated to the canons of the Liége cathedral, who in return sent him to the Collége de Liége at Rome, founded by a citizen of Liége for the benefit of his townsmen studying in Rome. Here Grétry resided for five years, studiously employed in completing his musical education under Casali. His proficiency in harmony and counterpoint was, however, according to his own confession, at all times very moderate. Neither was any deep scholarship required for the style of composition to which he soon exclusively devoted himself. His first great success was achieved by an Italian intermezzo or operetta, Le vendemiatrict, composed for the Aliberti theatre in Rome, and received with universal applause. It is said that the study of the score of one of Monsigny's operas, lent to him by a secretary of the French embassy in Rome, decided Grétry to devote himself to French comic opera. On New-Year's Day 1767 he accordingly left Rome, and after a short stay at Geneva (where he made the acquaintance of Voltaire, and produced another operetta) went to Paris. There for two years he had to contend with the difficulties incident to poverty and obscurity. He was, however, not without friends, and by the intercession of one of these, Count Creutz, the Swedish ambassador, Grétry obtained a libretto from the celebrated Marmontel, which he set to music in less than six weeks, and which, on its performance in August 1768, met with unparalleled suc- cess. The name of the opera was Le Huron. Two others, Lucile and Le Tableau Parlant, soon followed, and thence- forth Grétry's position as the leading composer of comic opera was safely established. Of the fifty operas which embody his musical activity only two or three have sur- vived, and perhaps as many more are worth remembering. His masterpieces are Zémire et Azor and Richard Ceur de Lion,—the first produced in 1771, the second in 1784. The latter in an indirect way became connected with a great historic event. In it occurs the celebrated romance, O Richard, 6 mon rot, lunivers t'‘abandonne, which was sung at the banquet—‘ fatal as that of Thyestes," reniarks Carlyle—given by the bodyguard to the officers of the Versailles garrison on October 3, 1789. The Marsedllacse not long afterwards became the reply of the people to the expression of loyalty borrowed from Grétry's opera. The composer himself was not uninflueuced by the great events he witnessed, and the titles of some of his operas, such as La Rosiére Républicaine and La Féte de la Raison sufiici- ently indicate the epoch to which they belong; but they are mere piéces de circonstance, and the republican enthu- siasm

displayed is not genuine. Little more successful was Grétry in his dealings with classical subjects, and none of his operas belonging to that class are worth remembering. His genuine power lies in the delineation of character, and in the expression of tender and typically French sentiment. For the first-named purpose the careful and truly admirable fidelity with which his music is wedded to the words is invaluable. In this respect Grétry's works are indeed representative of French operatic music at its best. The structure of his concerted pieces on the other hand is fre- quently flimsy, and his instrumentation so feeble that the orchestral parts of some of his works had to be rewritten by other composers, in order to make them acceptable to modern audiences. Of his deficiencies of harmonization Grétry himself was well aware, and his confessions in this respect are strangely at variance with the self-sufficient tone which pervades his literary effusions on musical and even on political and social topics. During the Revolution Grétry lost much of his property, but the successive Govern- ments of France vied in favouring the composer, regardless of political differences. From the old conrt he received distinctions and rewards of all kinds ; the republic made him an inspector of the Conservatoire; Napoleon granted him

the cross of the legion of honour anda pension. Grétry died September 24, 1813, at the Hermitage in Montmorency, formerly the house of Rousseau. Fifteen years later his heart was transferred to his birthplace, permission having been obtained after a tedious lawsuit. In 1842 Grétry's colossal statue in bronze was inaugurated at Lidge. GREUZE, Jean Baptiste (1725-1805), in the full tide of the 18th century, when professional distinction ap- peared to be reserved exclusively for those who devoted themselves to the production of historical or allegorical sub- jects, achieved an immense reputation as a painter of scenes of domestic life. He was born at Tournus in 1725, and is generally said to have formed his own talent ; this is, how- ever, true only in the most limited sense, for at an early age his inclinations, though thwarted by his father, were en- couraged by a Lyonnese artist named Grandon or Grondom who enjoyed during his lifetime considerable reputation as a portrait-painter. Grandon not only persuaded the father of Greuze to give way to his son's wishes, and permit the lad to accompany him as his pupil to Lyons, but when at a later date he himself left Lyons for

Paris—where his son- in-law Grétry the celebrated composer enjoyed the height of favour—Grandon carried young Greuze with him. Settled in Paris, Greuze worked from the living model in the school of the Royal Academy, but did not attract the attention of his teachers; and when he produced his first picture, Le Pere de Famille expliquant la Bible 4 ses Enfants, considerable doubt was felt and shown as to his share in its production. By other and more remarkable works of the same class Greuze soon established his claims beyond contest, and won for himself the notice and support of the well-known connoisseur La Live de Jully, the brother-in- law of Madame d' Epinay. In 1755 Greuze exhibited his Aveugle Trompé, upon which, presented by Pigalle the sculptor, he was immediately agréé by the Academy. Towards the close of the same year he left France for Italy, in company with the Abbé Louis Gougenot, who had deserted from the magistrature,—although he had obtained the post of " conseillier au Chatelet,"—in order to take the ' petit collet." Gougenot had some acquaintance with the arts, and was highly valued by the Academicians,—who, during his journey with Greuze elected him an honorary member of their body—on account of his studies in mytho- logy and allegory ; his acquirements in these respects are said to have been largely utilized by them, but to Greuze they were of doubtful advantage, and he lost rather than gained by this visit to Italy in Gougenot's company. He had undertaken it probably in order to silence those who taxed him with ignorance of 'great models of style," but the Italian subjects which formed the entirety of his contri- butions to the Salon of 1757 showed that he had been put on a false track, and he speedily returned to the source of his first inspiration. In 1759, 1761 (L'Accordée de Village, —Louvre), and 1763 Greuze exhibited with ever increasing success ; in 1765 he reached the zenith of his powers and reputation. In that year he was represented with no less than thirteen works, amongst which may be cited La Jeune Fille qui pleure son Oiseau mort, La Boune Mére, Le Mauvais Fils puni (Louvre), and La Malédiction Paternelle (Louvre), The Academy took occasion to press Greuze for his diploma picture, the execution of which had been long delayed, and forbade him to exhibit on their walls until he had complied with their regulations. "J'ai vu la lettre," says Diderot, " qui est un modéle d' honnéteté et d'estime ; jai vu la réponse de Greuze qui est un modéle de vanité et d'impertinence: il fallait appuyer cela d'un chef-d'ceuvre, et e'est ce que Greuze n'd pas fait." Greuze wished to be received as an historical painter,*

and produced a work which he intended to vindicate his right to despise his qualifica- tions as a peintre de genre. This unfortunate canvas,—

Sevére et Caracalla (Louvre),—was exhibited in 1769 side by side with Greuze's portrait of Jeaurat (Louvre), and his admirable Petite Fille au Chien Noir. The Academicians received their new member with all due honours, but at the close of the ceremonies the Director addressed Greuze in these words—" Monsieur, l' Académie vous a recu, mais c'est comme peintre de genre; elle a eu égard 4 vos anciennes productions, qui sont excellentes, et elle a fermé les yeux sur celle-ci, qui n'est digne ni d'elle ni de vous." Greuze, greatly incensed, quarrelled with his confréres, and ceased to exhibit until, in 1804, the Revolution had thrown open the doors of the Academy to all the world. In the following year, on 4th March 1805, he died in the Louvre in great poverty. He had been in receipt of considerable wealth, which he had dissipated by extravagance and bad manage- ment, so that during his closing years he was forced even to solicit commissions which his enfeebled powers no longer enabled him to carry out with success. The brilliant re- putation which Greuze acquired seems to have been due, not to his acquirements as a painter,—for his practice is evi- dently that current in his own day,—but to the character of the subjects which he treated. That return to nature which inspired Rousseau's attacks upon an artificial civiliza- tion demanded expression in art. Diderot in Le Fils Natural et le Pere de Famille tried to turn the vein of domestic drama to account on the stage; that which he tried and failed to do, Greuze, in painting, achieved with extraordinary success, although his works, like the plays of Diderot, were affected by that very artificiality against which they protested. The touch of melodramatic exag- geration, however, which runs through them finds an apology in the firm and brilliant play of line, in the freshness and vigour of the flesh tints, in the enticing softness of expres- sion (often obtained by almost an abuse of méplats), by the alluring air of health and youth, by the sensuous attractions, in short, with which Greuze invests his lessons of bourgeois morality. As Diderot said of La Bonne Mére, "ca préche la population ;" and a certain piquancy of contrast is the result which never fails to obtain admirers. La Jeune Fille & 'Agneau fetched, indeed, at the Pourtalis sale in 1865 no less than 1,000,200 francs.

One of Greuze's pupils, Madame Le Doux, imitated with success the manner of her master; his daughter and granddaughter, Madame de Valory, also inherited some traditions of his talent. Madame de Valory published in 1813 a Comédie-vaude- ville, Greuze, ow l'Accordée de Village, to which she pre- fixed a notice of her grandfather's life and works, and the Salons of Diderot also contain, besides many other particulars, the story at full length of Greuze's quarrel with the Academy. Four of the most distinguished engravers of that date, Massard pére, Flipart, Gaillard, and Levasseur, were specially entrusted by Greuze with the reproduction of his subjects, but there are also excellent prints by other engravers, notably by Cars and Le Bas. (E. F. 8. P.) GREVILLE, Cuartus CavenpisH Fuuxe (1794-1865), a great grandson by his father of the fifth earl of Warwick, and son of Lady Charlotte Bentinck, daughter of the duke of Portland, formerly a leader of the Whig party, and first minister of the crown. Greville was born 2d April 1794. Much of his childhood was spent at his grandfather's house at Bulstrode. He was one of the pages of George III., and was educated at Eton and Christ Church, Oxford; but he left the university early, having been appointed private secre- tary to Earl Bathurst before he was twenty. The interest of the duke of Portland had secured for him the secretary- ship of the island of Jamaica, which was a sinecure office, the duties being performed by a deputy, and the reversion of the clerkship of the council, Greville entered upon the discharge of the duties of clerk of the council in ordi- nary in 1821, and continued to perform them for nearly

forty years. He therefore served under three successive sovereigns,—George IV., William IV., and Victoria,—and although no political or confidential functions are attached to that office, it is one which brings a man into habitual intercourse with the chiefs of all the parties in the state. Well-born, well-bred, handsome, and accomplished, Gre- ville led the easy life of a man of fashion, taking an occasional part in the transactions: of his day and much consulted in the affairs of private life. But the celebrity which now attaches to his name is entirely due to the posthumous publication of a portion of a Journal or Diary which it was his practice to keep during the greater part of his life. These papers were given by him to his friend Mr Reeve a short time before his death (which took place on the 18th January

1865), with an injunction that they should be published, as far as was feasible, at not too remote a period after the writer's death. The journals of the reigns of George IV. and William IV. (extending from 1820 to 1837) were accordingly so published in obedience to his directions about ten years after that event. Few publications have been received with greater interest by the public ; five large editions were sold in little more than a year, and the demand in America was as great as in Eng- land. These journals were regarded as a faithful record of the impressions made on the mind of a competent observer, at the time, by the events he witnessed and the persons with whom he associated. Their characteristic is the love of truth, of justice, and of sincerity. The court was irri- tated at the scornful disclosure of the vices and follies of former sovereigns, and fashionable society was annoyed at the writer's absolute indifference to its pretensions. But Greville did not stoop to collect or record private scandal. His object appears to have been to leave behind him some of the materials of history, by which the men and actions of his own time would be judged. He records not so much public events as the private causes which led to them; and perhaps no English memoir-writer has left behind him a more valuable contribution to the history of this century. Greville published anonymously, in 1845, a volume on the policy of England to Ireland, in which he advocated the payment of the Roman Catholic clergy; and he was also the author of several pamphlets on the events of his day. GREW, Nesemian (1628-1711), the earliest vegetable anatomist and physiologist of England, was the son of Obadiah Grew, nonconformist divine of St Michael's, Coventry. At the Restoration, his father being ejected from his living, he went to a foreign university, where he took the degree of doctor of physic. Returning to Coventry, his native town, he commenced a series of observations on the physiology of plants, communicating the results to tho Royal Society, by which they were so well received that he was induced to remove to London (1672). There ho acquired an extensive practice as a physician. He was elected a fellow of the Royal Society on the recommen- dation of Bishop Wilkins, and in 1677 he succeeded Mr Oldenburg as secretary, in which capacity he prepared a descriptive catalogue of the rarities preserved at Gresham College (1681). The following year appeared his celebrated work on the Anatomy of Plants, in which he displayed great originality as an investigator, especially in pointing out the sex-differences of plants. Linnzus named a genus of plants Grewia (natural family of 7iléacece) in his honour.

He edited the Philosophical Transaetions, begun in 1665, and wrote treatises on Sea-Water made Fresh, which passed through several editions, and on the Nature and Use of the Salt contain'd in Epsom and such other Waters (1697), a rendering of the Tractatus de Salis, &c., Usu (1695). Besides the Anatomy of Plants, he wrote a Comparative Anatomy of Trunks (1675), and an Idea of a Phytologieal History (1673), as well as Cosmologia Saera (1701). There is also a Disputatio de liquore nervoso by him (1672), and

Reeucil Mexpériences…. sur le combat qui procede du mélange des corps (1679).

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GREY, Ear (1764-1845). Charles, second Earl Grey, was the eldest surviving son of General Sir Charles Grey, afterwards first Earl Grey. He was born at his father's residence, Fallodon, near Alnwick, March 13, 1764. General Grey, who was a younger son of the house of Grey of Howick, one of the most considerable territorial families in Northumberland, had already begun a career of active service which, like the political career of his son, covered nearly half a century. Before the latter was born, General Grey had served on the staff of Prince Ferdinand of Bruns- wick in the Seven Years' War, and had been wounded at Minden. While the son was making verses at Eton, the father was serving against the revolted colonists in Pennsyl- vania and New Jersey, and while the young member for Northumberland was denouncing Pitt's war against the Convention, the veteran soldier was destroying the remnant of the French colonial empire by the capture of Martinique and Guadaloupe. When Napoleon threatened an invasion, General Grey took the command of the southern district, and at the peace of Amiens he was rewarded with a peer- age. His elder brother, Sir Henry Grey of Howick, the head of the family, had supported the Government in parliament, But the political career of young Grey, who was heir-presumptive to the family estates, took a different complexion, which needs to be explained by the circum- stances in which it began,

Young Grey expected to reoccupy the seat which had been his uncle's; and his early years were spent in prepara- tion for a parliamentary career. He

was sent to Eton, and proceeded thence to Cambridge. William Pitt, a youth five years older, was then in residence as a master of arts, studi- ously paying court to the Whigs of the university; and at the general election of 1780 he came forward asa candidate for the academical seat. His name stood last on the poll, but he was brought in elsewhere, and his first speech proved him a man of the first mark. The unparalleled successes which followed portended grave changes. Pitt's elevation to the premiership, his brilliant and hard-fought battle in the house, and his complete rout of the Whig party at the general election of 1784, when he came in for Cambridge at the head of the poll, threatened the great territorial interest with nothing less than extinction. It was to this interest that Grey belonged ; and hence, when at length re- turned for Northumberland in 1786, he at once came for- ward as a vigorous assailant of the Government of Pitt. Tle was hailed by the opposition, and associated with Fox, Burke, and Sheridan as a manager in the Hastings im- peachment. During the nineteen years which remained of the career of Fox, ho followed the great Whig statesman with absolute fidelity, and succeeded him as leader of the party. The shortcomings of Fox's statesmanship were inherited by Grey. Both were equally devoid of political originality, shunned the severer labours of the politician, and instinctively feared any deviation from the traditions of their party. Such mon cannot save a party in its de- cadence, and the history of Fox and Grey has been aptly termed the history of the decline and fall of Whiggism.

The stunning blow of 1784 was the first incident in this history. Its full significance was not at once perceived. An opposition, however weak in the beginning, generally has a tendency to revive, and Grey's early successes in the house helped to revive the Foxites. The European situa- tion became favourable to this revival. Tho struggle in France for popular rights, culminating in the great Revolu- tion, was watched by Fox with interested sympathy. He affected to regard the domination of Pitt as the domina- tion of the crown, and as leading logically to absolutism, aud. saw in that popular sympathy for the French Revolution which naturally arose in England an instrument which might be employed to overthrow this domination.

GREY

But Pitt gathered the fruits of the windfall. The spread of "Jacobinism," or " French principles," became the pre- text on which the stronger half of the opposition went over to the Government. Burke led the movement in the Commons, the duke of Portland and Lord Fitzwilliam in the Lords, and with this second incident in the Whig decline began the difficulties of Grey's career. The domina- tion of the premier had already stirred the keenest resent- ment in the younger and more ambitious members of the Whig party. Freed from the restraint of the steadier politicians under Burke and Portland, the residuum under Fox fell into a series of grave mistakes. Of this residuum Grey became the moving spirit, for though Fox did not check their activity, he disclaimed the responsibility of their policy. Fox had refused to condemn " French principles," and denounced the war with France; but he would take no part in exciting agitation in England. It was otherwise with the restless spirits among whom Grey was found. Enraged by the attitude of Pitt, which was grounded on the support of the constituencies as they then stood, the residuum plotted an ill-timed agitation for parliamentary reform.

The demand for parliamentary reform was as yet in a rudimentary stage. Forty years later it had become the demand of an unenfranchised nation, disabused by a sudden spread of political and economical knowledge. It was as yet but the occasional instrument of the scheming politician. Chatham had employed the cry in this sense. The Middlesex agitators had done the same; even the. premier of the time, after his accession to power, had sought to strengthen his hands in the same way. But Pitt's hands were now strengthened abundantly ; whereas the opposition had nothing to lose and much to gain by such a measure, The cry for reform thus became their natural expedient. Powerless to carry reform in the House, they sought to overawe parliament by external agitation, and formed the Society of the Friends of the People, des- tined to unite the forces of all the " patriotic" societies which already existed in the country, and to pour their violence irresistibly on a terrified parliament. Grey and his friends were enrolled in this portentous association, and presented in parliament its menacing petitions. Such petitions, which were in fact violent impeachments of parliament itself, proceeding from voluntary associations having no corporate existence, had been hitherto unknown in the English parliament. They had been well-known in the French assembly. They had heralded and

furthered the victory of the Jacobins, the dissolution of the con- stitution, the calling of the Convention, and the fall of the monarchy. ;

The Society of the Friends of the People was originally an after-dinner folly, extemporized at the house of a man who afterwards gained an earldom by denouncing it as seditious. Fox discountenanced it, though he did not directly condemn it; but Grey was overborne by the fierce Jacobinism of Lauderdale, and avowed himself the parlia- mentary mouthpiece of this dangerous agitation, But Pitt, strong in his position, cut the ground from under Grey's feet by suppressing the agitation with a strong hand. The suspension of the Habeas Corpus Act, the Gagging Acts, and the state prosecutions form a painful historical episode. But the discredit belongs as much to Grey and Lander- dale as to Pitt. Grey always spoke regretfully of his share in the movement. 'One word from Fox," he said, " would have kept me out of all the mess of the Friends of the People. But he never spoke it."

It was Grey who moved the impeachment of Pitt, and he next promoted the equally foolish "Secession." Since the parliament did not properly represent the nation, and refused to reform itself or to impeach the minister, nothing remained but to disown it; and the opposition announced

their intention of "seceding," or systematically absenting themselves from their places in parliament. This futile movement was originated by Grey, Lauderdale, and the duke of Bedford. It obtained a somewhat wider support. It suited the languor of some dispirited politicians, like Fox, and the avarice of some lawyers in large practice, like Erskine ; but sensible politicians at once condemned it. It directly ignored parliamentary government,and amounted to nothing but a pettish threat of revolution. ' Secession," said Lord Lansdowne, with characteristic shrewdness, "either means rebellion, or it is nonsense." Pitt easily dashed this feeble weapon from the hands of his opponents. He roused jealousy in the absent by praising the parts and the patriotism of the rest, and thus gradually brought them back. Grey himself reappeared to protest against the union with Ireland.

When Pitt died in 1806, nothing could prevent the re- united opposition from coming into power, and thus the Broad-bottom ministry was formed

undcr Fox. On bis death, Grenville became premier, and Grey, now Lord Howick, Foreign Secretary, and leader of the House of Commons. Disunion, always the bane of English Liberal- ism, lurked in the coalition, and the Foxites and Grenvillites were only ostensibly at one. Grey opposed the war policy of Grenville; and this policy was not more successful than it had been in the handsof Pitt. And the changefromthe leadership of Fox t6 that of Grenville was only too perceptible. Both in court and country Grenville affected the role of Pitt, and assumed a stiff and peremptory attitude which ill became him, An ill-advised dissolution weakened their majority ; they lost ground by the "delicate investigation" into the conduct of the Princess of Wales; Lord Henry Petty's budget was too specious to command confidence ; and the king, fully aware of their weak situation, resolved to get rid of them. When they proposed to concede a portion of the Catholic claims, George refused, and demanded of them an undertaking never to propose such a measure again. This was refused, and the Grenville-Grey cabinet retired in March 1807. Inthe same year Grey's father died, and Grey went to the Upper House. Opposition united Grey and Grenville for a time, but the parties finally split on the old war question. When Napoleon returned from Elba in 1815, and once more seized the government of France, the same question arose which had arisen in 1792, Was England to go to war for the restoration of the Bourbons? Grenville followed the traditions of Pitt, and supported the ministry in at once renewing hostilities. Grey followed those of Fox, and maintained the right of France to choose her own governors, and the impossibility of checking the reaction in the emperor's favour. The victory of Waterloo put an end to the dispute, but the disruption became permanent. The termination of the war, and the cessation of all action in common, reduced the 'power of the opposition to nothing. Grenville retired from public life, and his ad- herents reinforced the ministry. Little remained for the Whigs to do. But the scandalous persecution of the queen afforded an opportunity of showing that the ministry were not omnipotent ; and the part taken on that occasion by Grey won him at once the increased respect of the nation and the undying aversion of George IV. It sealed the exclusion of himself and his few friends from office during the king's life; and when in 1827 Grey came forth to denounce the ministry of Canning, he declared that he stood alone in the political world. His words were soon justified, for when ee Goderich resigned, the remnant which had hitherto supported Grey hastened to

support the ministry of the duke of Wellington. Thus was the original Whig party dissolved, after a series of struggles which had begun with the longest reign upon record, and had outlasted it.

TOT

We now reach the principal episode in Grey's career. In 1827 he seemed to stand forth the solitary and powerless relic of an extinct party. In 1832 we find that party re- stored to its old numbers and activity, supreme in parliament, popular in the nation, and Lord Grey at its head. The duke of Wellington's foolish declaration against parlia- mentary reform, made in a season of great popular excite- ment, suddenly deprived him of the confidence of the country, and a coalition of the Whigs and Canningites became inevitable. The Whigs had in 1827 supported the Canningites ; the latter now supported the Whigs, of whom Grey remained the traditional head. George IV. was dead, and no obstacle existed to Grey's elevation. Grey was sent for by William IV. in November 1830, and formed a coalition cabinet, pledged to carry on the work in which the duke of Wellington had faltered. But Grey himself was the mere instrument of the times. An old-fashioned Whig, he had little personal sympathy with the popular cause, though he had sometimes indicated a certain measure of reform as necessary. When he took office, he guessed neither the extent to which the Reform Act would go, nor the means by which it would be carried. That he procured for the country a measure of constitutional reform for which he had agitated in his youth was little more than a coincidence. In his youth he had put himself at the head of a frantic agitation against parliament, because he there found himself powerless. In his old age the case was reversed. Suddenly raised to a position of authority in the country, he boldly stood between parliament, as then constituted, and the formidable agitation which now threatened it,and by a forced reform saved it from revolution. In his youth he had assailed Pitt's administration because Pitt's administration threatened with extinction the political monopoly of that landed interest to which he belonged. In his old age, on the contrary, unable to check the progress of the wave, he swam with it, and headed the movement which compelled that landed interest to surrender its monopoly.

The second reading of the first Reform Bill was carried in tlle Commons by a majority of one. This was equivalent to a defeat, and further failures precipitated a dissolution. The confidence which the bold action of the ministry had won was soon plainly proved, for the second reading was carried in the new parliament by a majority of 136. When the bill had at length passed the Commons after months of debate, it was Grey's task to introduce it to the Lords. It was rejected by a majority of 41. The safety of the country now depended on the prudence and courage of the ministry. The resignation of Grey and his colleagues was dreaded even by the opposition, and they remained in office with the intention of introducing a third Reform Bill in the next session. The last months of 1831 were the beginning of a political crisis such as England had not seen since 1688. The two extreme parties, the Ultra- Radicals and the Ultra-Tories, were ready for civil war. Between them stood the ministry and the majority of intelligent peace-loving Englishmen ; and their course of action was soon decided. The bill must be passed, and there were but two ways of passing it. One was to declare the consent of the House of Lords unnecessary to the measure, the other to create, if necessary, new peers in sufficient number to outvote the opposition. These two expedients did not in reality differ. To swamp the house in the way proposed would have been to destroy it. The question whether the ministry should demand the king's consent to such a creation, if necessary, was debated in the cabinet in September. Brougham proposed it, and gradually a majority of the cabinet were won over. Grey had at first refused to employ even the threat of so unconstitutional a device as a meatus to the proposed end. But his continued refusal would have broken up the ministry, and the breaking

up of the ministry must now have been the signal for revo- lution. The second reading in the Commons was passed in December by a majority of 162, and on New-Year's Day 1832 the majority of the cabinet resolved on demanding power to carry it in the Lords by a creation of peers. Grey carried the resolution to the king. Some time still remained before the bill could be committed and read a third time. It was not until the 9th of April that Grey moved the second reading in the Lords. A_ sufficient number of the opposition temporized; and the second reading was allowed to pass by a

majority of nine. Their intention was to mutilate the bill in committee. The Ultra-Tories, headed by the duke of Wellington, had entered a protest against the second reading, but they were now politically powerless. The struggle had become a struggle on the one hand for the whole bill, to be carried by a creation of peers, and ou the other for some mutilated measure. Grey's instinct divined that the crisis was approaching. Either the king must consent to swamp the House, or the ministry must cease to stand in the breach between the peers and the country. The king, a weak and inexperienced politician, had in the meantime been wrouglit upon by the temporizing leaders in the Lords. He was induced to believe that if the Commons should reject the mutilated bill when it was returned to them, and the ministry should consequently retire, the mutilated bill

might be reintroduced and passed by a Tory ministry. |

He was deaf to all representations of the state of public opinion ; and to the surprise of the ministry, and the terror and indignation of every man of sense in the country, he rejected their proposal, and accepted their resignation, May 9, 1832. The duke of Wellington undertook the hopeless task of constructing a ministry which should pass a restricted or sham Reform Bill, The only man who could have made the success of such a ministry even probable was Peel, and Peel's conscience and good sense forbade the attempt. He refused, and after a week of the profoundest agitation throughout the country, the king, beaten and mortified, was forced to send for Grey and Brougham. On being told that his consent to the creation of psers was the only condition on which they could undertake the Government, he angrily and reluctantly yielded. The chancellor, with cool forethought, demanded this consent in writing. Grey thought such a demand harsh and unnecessary. "I wonder," he said to Brougham, when the interview was over, "you could have had the heart to press it." But Brougham was inexorable, and the king signed the following paper :—' The king grants permission to Earl Grey, and to his Chancellor, Lord Brougham, to create such a number of peers as will be sufficient to ensure the passing of the Reform Bill, first calling up peers' eldest sons.——- Wint1aMm R., Windsor, May 17, 1832." This brief paper may be called the Magna Charta of responsible government. It established the right of a

ministry to break down, by some convenient means, a factious opposition in the Lords; and this right has never since been practically disputed.

Grey had now won the game. There was no danger that he would have to resort to the expedient which he was authorized toemploy. The introduction of sixty new peers would have destroyed the opposition, but it would have been equivalent to the abolition of the House. The king's consent made known, a sufficient number of peers were sure to withdraw to enable the bill to pass, and thus the dignity of both king and peerage would be saved, The

duke of Wellington headed this movement on the part of | the opposition ; and the third reading of the bill was |

carried in the Lords by a majority of 84. It is well known that in after years both Grey and Brougham disclaimed any intention of executing their

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threat, If this were so, they must have merely pretended to brave a danger which they secretly feared to face, and intended to avoid ; and the credit of rescuing the country would belong to the duke of Wellington and the peers who seceded with him. To argue such cowardice in them from statements made when the crisis was long past, and when they were naturally willing to palliate the rough policy which they were forced to adopt, would be to set up a need- less and unjustifiable paradox. Nothing else in the career of either Grey or Brougham leads us to suppose them cap- able of the moral baseness of yielding up the helm of state, in an hour of darkness and peril, to reckless and unskilled hands. Such would have been the result if they had lacked the determination to carry out their programme to the end. The influence of every statesman in the country would then have been extinguished, and the United Kingdom would have been absolutely in the hands of O'Connell and Orator Hunt.

Grey took but little part in directing the legislation of the reformed parliament. Never anxious for power, he had executed the arduous task of 1831-2 rather as a matter of duty than of inclination, and wished for an opportunity of retiring. Such an opportunity very shortly presented itself. The Irish policy of the ministry had not conciliated the Trish people, and

O'Connell denounced them with the greatest bitterness. On the renewal of the customary Coercion Bill, the ministry was divided on the question whether to continue to the lord-lieutenant the power of suppressing public meetings. Mr Littleton, the Irish secre- tary, was for abolishing it; and with the view of con- ciliating O'Connell, he informed him that the ministry intended to abandon it. But the result proved him to have been mistaken, and O'Connell, with some reason sup- posing himself to have been duped, called on Mr Littleton to resign his seat in the cabinet. It had also transpired in the discussion that Lord Althorp, the leader of the House of Commons, was privately opposed to retaining those clauses which it was his duty to push through the house. Lord Althorp therefore resigned, and Grey, who had lately passed his seventieth year, took the opportunity of resigning also. It was his opinion, it appeared, which had overborne the cabinet in favour of the public meeting clauses; and his voluntary withdrawal enabled Lord Althorp to return to his post, and to proceed with the bill in its milderform. Grey was succeeded by Lord Melbourne; but no other change was made in the cabinet. Grey took no further part in politics. During most of his remaining years he coutinued to live in retirement at Howick, where he died on the 17th of July 1845, in his eighty-second year. By his wife Mary Elizabeth, only daughter of the first Lord Ponsonby, whom he married November 18, 1794, he became the father of ten sons and five daughters, of whom eight sons and four daughters survived him.

In public life, Grey could always be upon occasion bold, strenuous, and self-sacrificing ; but he was little disposed for the active work of the politician. He was not one of those who took the statesman's duty "as a pleasure he was to enjoy." A certain stiffness and reserve ever seemed in the popular eye to hedge him in; nor was his oratory of the kind which stirs enthusiasm and delight. A tall, stately figure, fine voice, and calm aristocratic bearing reminded the listener of Pitt rather than of Fox, and his speeches were constructed on the Attic rather than the Asiatic model. Though simple and straightforward, they never lack either point or dignity; and they were admirably adapted to the audience to which they were addressed. The scrupulous uprightness of Grey's political and private character com- pleted the ascendency which he gained ; and no politician could be named who, without being a statesman of the highest class, has left a name more enviably placed in English history. @ 37P)

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GREY

GREY, Lapy Jane (1537-1554), a person remarkable no less for her accomplishments than for her misfortunes, was the great-granddaughter of Henry VII. of England. Her descent from that king was traced through a line of females. His second daughter Mary, after being left a widow by Louis XII. of France, married Charles Brandon, duke of Suffolk, who was a favourite with her brother King Henry VIII. Of this marriage came two daughters, the elder of whom, Lady Frances Brandon, was married to Henry Grey, marquis of Dorset; and their issue, again, consisted of daugliters only. Lady Jane, the subject of this article, was the eldest of three whom the marquis had by Lady Frances. Thus it will appear that even if the crown of England had ever fallen into the female line of descent from Henry VIL, she could not have put in a rightful claim unless the issue of his elder daughter, Margaret, had become extinct. But Margaret had married James LV. of Scotland; and, though her descendant, James VI., was ultimately called to the English throne, Henry VIII. had placed her family after that of his second sister in the succession ; so that, failing the lawful issue of Henry himself, Lady Jane would, according to this arrangement, have succeeded. It was to these circumstances that she owed her exceptional position in history, and became the victim of an ambition which was not her own.

She was born at her father's seat named Broadgate in Leicestershire, about the year 1537. Her parents, though severe disciplinarians, bestowed more than ordinary care upon her education, and she herself was so teachable, and delighted so much in study, that she became the marvel of the age for her acquirements. She not only excelled in needlework and in music, both vocal and instrumental, but while still very young she had thoroughly mastered Latin, Greek, French, and Italian. She was able to speak aud write both Greek and Latin with an accuracy that satisfied even such critics as Ascham and her tutor Dr Aylmer, after- wards bishop of London. She had also acquired some knowledge of at least three Oriental tongues, Hebrew, Chaldee, and Arabic. In Ascham's Schoolmaster is given a touching account of the devotion with which she pursued her studies and the harshness she experienced from her parents. The love of learning was her

solace ; in reading Demosthenes and Plato she found a refuge from domestic unhappiness. After the fashion of those days she was, when about ten years old, placed for a time in the house- hold of Thomas, Lord Seymour, who induced her parents to let her stay with him by promising to marry her to his nephew King Edward VI. Lord Seymour, however, was attainted of high treason and beheaded in 1549, and his brother, the duke of Somerset, made some overtures to the Marquis of Dorset to marry her to his son the earl of Hertford. These projects, however, came to nothing. The duke of Somerset in his turn fell a victim to the ambition of Dudley duke of Northuinberland, and was beheaded three years after his brother. Meanwhile, the dukedom of Suffolk having become extinct by the deaths of Charles Brandon and his two sons, the title was conferred upon the marquis of Dorset, Lady Jane's father. Northumberland, who was now all-powerful, fearing a great reverse of fortune in case of the king's death, whose health soon began visibly to decline, endeavoured to strengthen himself by marriages between his family and those of other powerful noblemen, especially of the new-made duke of Suffolk. His three eldest sons being already married, the fourth, who was named Lord Guildford Dudley, was accordingly wedded to Lady Jane Grey about the end of May 1553. The match received the full approval of the king, who furnished the wedding apparel of the parties by royal warrant. But Edward's state of health warned Northumberland that he must lose no time in putting the rest of his project into

execution. He persuaded the king that if the crown should descend tohis sister Mary, the work of the Reformation would be undone and the liberties of the kingdom would be in danger. Besides, both Mary and her sister Elizabeth had been declared illegitimate by separate Acts of Parlia- ment, and the objections to Mary Queen of Scots did not require to be pointed out. Edward was easily persuaded to break through his father's will and make a new settle- ment of the crown by deed. The document was witnessed by the signatures of all the council and of all but one of the judges; but those of the latter body were not obtained without difficulty by threats and intimidation.

Edward VI. died on the 6th July 1553, and it was announced to Lady Jane that she was queen. She was then but sixteen years of age. The news came upon her as a most unwelcome surprise, and for some time she resisted all persuasions to accept the fatal dignity ; but at length slie yielded to the entreaties of her father, her father-in-law, and her husband. The better to mature their plans the cabal had kept the king's death secret for some days, but they pro- claimed Queen Jane in the city on the 10th. The people received the announcement with manifest coldness, and a vintner's boy was even so bold as to raise a cry for Queen Mary, for which he next day had his ears nailed to the pillory and afterwards cut off. Mary, however, had received early intimation of her brother's death, and, retiring from Hunsdon into Norfolk, gathered round her the nobility and commons of those parts. Northumberland was despatched thither with an army to oppose her; but after reaching Newmarket he complained that the council had not sent him forces in sufficient numbers, and his followers began to desert. News also came that the earl of Oxford had declared for Queen Mary; and as most of the council themselves were only seeking an opportunity to wash their hands of rebellion, they procured a meeting at Baynard's Castle, revoked their former acts as done under coercion, and caused the lord mayor to proclaim Queen Mary, which he did amid the shouts of the citizens. The duke of Suffolk was obliged to tell his daughter that she must lay aside her royal dignity and become a private person once more. She replied that she relinquished most willingly a crown that she had only accepted out of obedience to him and her mother; and her ten days' reign was over.

The leading actors in the conspiracy were now called to answer for their deeds. Northumberland was brought up to London a prisoner, tried and sent to the block, along with some of his partisans. The duke of Suffolk and Lady Jane were also committed to the Tower; but the former, by the influence of his duchess, procured a pardon. Lady Jane and her husband Lord Guildford Dudley were also tried, and received sentence of death for treason. This, however, was not immediately carried out; on the contrary the queen seems to have wished to spare their lives, and mitigated the rigour of their confinement. Unfortunately, owing to the general dislike of the queen's marriage with Philip of Spain, Sir Thomas Wyatt soon after raised a rebellion in which the duke of Suffolk and his brothers took part, and on its suppression the queen was persuaded that it was unsafe to spare the lives of

Lady Jane and her husband any longer. On hearing that they were to die, Lady Jane declined a parting interview with her husband lest it should increase their pain, and prepared to meet her fate with Christian fortitude. She and her husband were executed on the same day, February 12, 1554, her husband on Tower Hill, and herself within the Tower an hour afterwards, amidst universal sympathy and compassion.

See Ascham's Schoolmaster; Biog. Brit.; Burnet's History of the

Reformation; Howard's Lady Jane Grey; Nicolas's Literary Remains of Lady Jane Grey. (J. GA.)

GREYTOWN, or more correctly San Juan del Norte, a small town of Nicaragua, worthy of note as the only port of the republic on the coast of the Atlantic and as the eastern terminus proposed for the Nicaraguan inter-oceanic canal. According to the survey of Commanders Hatfield and Lull, U.S.N., in 1872-3, the church is situated in 10° 55' 14" N. lat. and 83° 42' 18" W. long. The town lies along the seaward side of a narrow peninsula formed by the windings of the San Juan river, and most of its build- ings are insignificant erections raised 2 or 3 feet on piles. Though it is still a port of call for mail steamers, and monopolizes the export and import trade of Nicaragua, Greytown is in a decadent condition. Its fine harbour has become almost useless. Between 1832 and 1848 the Arenas Point, which formed one of its boundaries, ad- vanced westward nearly a nautical mile, and now the whole seaward frontage of the bay. is a moving sand-bank. In 1853 the channel of entrance was still about one-third of a mile in width and had 23 to 25 feet of water in the bar, so that even vessels of war were able to take shelter within the harbour; but by 1801 the channel was only 100 yards wide and 12 feet deep, and in 1875 the passage was sometimes practically closed, with at the most only 5 feet of water. The inhabitants of the town, however, have increased from 955 in 1863 to about 1200 in 1875. As the vicinity of their town is unfitted for agriculture, they are almost

entirely dependent for provisions on supplies from the interior or abroad, and sometimes the commonest articles of consumption are exceedingly scarce. In terms of the treaty of 1860 trial by jury is maintained in all civil and criminal cases, and there is perfect freedom of religious worship, both private and public. The seventh article, however, by which Greytown was to re- main a free port has become a dead letter. A duty of 5 per cent. was allowed by the merchants on all imports consumed in the place in order to provide means for con- structing a lighthouse; and in 1863 the central Govern- ment of the republic imposed another 5 per cent., so that all goods really pay 10 per cent. ad valorem. The imports in 1875 and 1876 respectively were £25,850 and £105,000, and the exports £60,500 and £145,000.

The harbour of San Juan, first discovered by Columbus, was brought into further notice by Captain Diego Machuca, who in 1529 sailed down the river from the Lake of Nicaragua. The date of thie first Spanish settlement on the spot is not known, but in the 17th century there were fortifications at the mouth of the river. In 1796 San Juan was made a port of entry by royal charter, and new defences were erected in 1821. The patriots of Nicaragua seized the place at the revolution, but they were expelled in January 1848 by the British, who, claiming the district in name of the 'king of the Mosquito Indians," continued in possession till the treaty of 1860. In 1854 the town was bombarded by the United States forces for an

alleged insult,

GRIBOYEDOFF, ALexanper Sercurevicn (1795- 1829), was born in 1795 at Moscow, where he studied at the university from 1810 to 1812. He then obtained a commission in a hussar regiment, but resigned it in 1816, Next year he entered the civil service, and in 1818 was appointed secretary of the Russian legation in Persia, whence he was transferred to Georgia. There he began the drama which has made him famous. He had com- menced writing early, and had produced on the stage at St Petersburg in 1816 a comedy in verse, translated from the French, called Zhe Young Spouses, which was followed by some other pieces of thesame kind. But neither these, nor the essays and verses which he wrote for periodicals, would have been long remembered, but for the immense success gained by his comedy in verse,

Goré ot uma, or " Misfortune from Intelligence," A satire upon Russian society, or, as a high official styled it, "A pasquinade on Moscow," its

See Doc, vol. vii. p. 327, and

plot is slight, its merits consisting in its accurate representa- tion of certain social and official types,—such as Famousoff, the lover of old abuses, the hater of reforms ; his secretary, Molchanin, servile fawner upon all in office ; the aristocratic young liberal and Anglomaniac, Repetiloff ; contrasted with whom is the hero of the piece, Tchatsky, the ironical satirist, Just returned from the west of Europe, who ex- poses and ridicules the weaknesses of the rest, his words echoing that outcry of the young generation of 1820 which reached its climax in the military insurrection of 1825, and was then sternly silenced by Nicholas. Griboyedoff spent the summer of 1823 in Russia, completed his play, and took it to St Petersburg. There it was rejected by the censorship. Manycopies were made and privately circulated, but Griboyedoff never saw it published. The first edition was printed in 1833, four years after hisdeath. Only once did he see it on the stage, when it was acted by the officers of the garrison at Erivan. Soured by disappointment he returned to Georgia, made himself useful by his linguistic knowledge to his relative Count Paskievitch-Erivansky during a campaign against Persia, and was sent to St

Petersburg with the treaty of 1828. Brilliantly received .

there, he thought of devoting himself to literature, and commenced a romantic drama, A Georgian Night. But he was suddenly sent to Persia as minister-plenipotentiary. Soon after his arrival at Teheran a tumult arose, caused by the anger of the populace against some Georgian and Armenian captives,—Russian subjects,—who had taken refuge in the Russian embassy. It was stormed, Griboyedoff was killed (February 11, 1829), and his body was for three days so ill-treated by the mob that it was at last recognized only by an old scar on the hand, due to a wound received ina duel. It was taken to Tiflis, and buried in the monastery of St David. There a monument was erected to his memory by his widow, to whom he had been but a few months married. But his memory is best preserved by his play Goré ot wma, which has since his death been re- peatedly published and performed, and will always be quoted as one of the masterpieces of Russian

literature. An English translation by N. Benardaky appeared in London in 1857.

GRIESBACH, Jowann Jaxon (1745-1812), one of the most distinguished of the band of scholars to whom the modern science of New Testament textual criticism owes its origin, was born at Butzbach, a small town of Hesse-Darmstadt, where his father was pastor, on the 4th of January 1745. He received his school education at Frank- fort-on-the-Main, and carried on his university studies at Tiibingen and Leipsic, but especially at Halle, where he became one of Semler's most ardent disciples. At the close of his undergraduate career, he undertook a literary tour which, apart from the advantages of stimulative contact with many of the most distinguished scholars of England, France, and Holland, as well as of his own country, was of great utility to him in providing him with materials for the great work of his subsequent life. On his return to Halle, he acted for some time as " privat-docent," but in 1773 was appointed to a professorial chair ; in 1775 he was translated to Jena, where the remainder of his life was spent in ever- increasing usefulness and honour, and where he died 24th March 1812.

Griesbach's critical edition of the New Testament first appeared at Halle, in three volumes, in 1774-75. The first volume contained the first three gospels, synoptically arranged ; the second, the fourth gospel and the Acts of the Apostles. All the historical books were reprinted in one volume in 1777, the synoptical arrangement of the gospels having been abandoned as inconvenient. Of the second edition, very considerably enlarged and improved, the first volume appeared in 1796 and the second in 1806 (Halle and- London). Of a. third edition, edited by Schulz, only the first volume, containing the four gospels, has appeared (1827). ,

For the construction of his critical text Gricsbach took as his

basis the Elzcvir edition, from which he departed only when valid reasons secmed to require it. In all such cases he placed the Elzevir reading on the inner margin along with such other readings as he thought worthy of special consideration (these last, however, being printed in smaller type).

To all the readings on this margin he attached special marks indicating the precise degree of probability in his opinion attaching to each. In weighing these probabilities he proceeded upon a particular theory which in its leading features he had derived from Bengel and Semler, dividing all the MSS. into three great families or recensions—the Alexandrian, the Western, and the Byzantine. The Alexandrian recension had (as the name implied) originated in Alexandria, and thence had spread over Egypt and the Hast ; it is characterized by a general tendency to tone down all Hebraisms, inelegancies, and inaccuracies. The Western on the other hand had retained the Hebraisms unimpaired, but had incorporated many glosses, as well as interpolations from parallel passages, with the purpose of making the text more intelligible (Grammaticum egit Alexandrinus censor, interpretem occidentalis). The Byzantine he regarded as much later, and as combining and ex- aggerating the peculiarities of both the others. A reading that was supported by only one recension he considered as having only onc witness in its favour ; those readings on the other hand which were supported by all the three recensions, or even by two of them, especially if these two were the Alexandrian and the Western, he uuhesitatingly accepts as genuine. Only when each of the three re- censions gives a different reading does he proceed to discuss the question on other grounds. See his Symbol critic: ad supplendas et corrigendas variarwm Novi Testamenti lectionwm collectiones : accodit multorum N. T. codiewm Greeeorum descriptio et examen, 2 vols. (Halle, 1785, 17938), and his Commentarius criticus in textum Greewm N. T., which extends to the end of Mark, and discusses the more important various readings with great care and thoroughness (Jena, 1798-1811). Among the other works of Griesbach (which are comparatively unimportant, however) may be mentioned his uni- versity thesis De codicibus quatuor evangelistarum Origenianis (Halle, 1771) and a work upon systematic theology (Anleitwng zur Kenntniss der populéren Dogmatik, Jena, 1779). His Opusewla, con- sisting chiefly of university " programs" and addresses, were edited by Gabler, in 2 vols. (Jena, 1824).

GRIFFIN, or GrypHon (gryphus, ypvy), in the natural history of the ancients, the name of an imaginary rapacious creature of the eagle species, represented with four legs, wings, and a beak,—the fore part resembling an eagle, and the hinder a lion. In addition, some writers describe the tailas a serpent. This animal, which was supposed to watch over gold mines and

hidden treasures, and to be the enemy of the horse, was consecrated to the Sun; and the ancient painters represented the chariot of the Sun as drawn by griffins. According to Spanheim, those of Jupiter and Nemesis were similarly provided, The griffin of Scripture is probably that species of the eagle called in Latin Ossifraga, orosprey. The griffin is related to inhabit Asiatic Scythia, where the lands abound in gold and precious stones; and when strangers approach to gather these the creatures leap upon them and tear them in pieces, thus showing their use in chastising human avarice and greed. The one-eyed Arimaspi wage constant war with them, according to Probus and Servius. The celebrated Sir John de Mandeville, in his Travels, described a griffin as eight times larger than a lion. The griffin is frequently seen on early seals and medals, aud is still borne as a favourite device on seals and as a charge in heraldry. Papworth, in his laborious Ordinary of British Armorials, ascribes this creature to several hundred family coats, as a single charge, and in connexion with other heraldic devices the griffin was con- stantly borne in English and especially in Welsh armoury. Berry in his Encyclopedia Heraldica declares that the combination of the eagle and lion signified strength and swiftness conjoined ; if this be so, the reason of its almost universal adoption as an emblem by a military and chivalric people is not far to seek. The seals of Baldwin de Redvers, second earl of Devon (1137-1155), and his son William de Vernun, sixth earl, exhibit two most curious examples of the griffin, and being anterior to the consolidation of heraldic rules and a succession of heraldic devices from father to Son, are yet proofs that particular devices or emblems were in use with powerful lords of the 12th and 13th centuries,

and retained by the members of the family as carefully and as conventionally as the true heraldic bearings of the following century were. Quillim blazons this monster as rampant, alleging that any very fierce animal may be so blazoned as wellas the lion ; but Sylvester, Morgan, Burke, Berry, and other writers upon heraldic subjects, use the term segreant, 2.¢., se greant, pluming or arranging himself by lifting himself up and flapping his wings, as all birds do occasionally, instead of rampant. Palliot, one of the most interesting of all writers on arms, in his Vraye et Parfaite Science des Armoires, describes this creature as generally

rampant, and points out its connexion with the Minotaur, Centaurs, and Chimera, "fronte Leo, postremo Draco, medioque Chimera." The same writer, in reference to the possibility of such productions of nature, describes a curious monster of similar character, called a hippocervus, presented in 1534 by Frederick, duke of Mantua, to Francis the Great, the fore part being that of a horse, the hind part that of a stag, which could be saddled and bridled, but always threw his rider and trampled on him. Much might be written on the subject of hybrids and fabulous monsters such as these, but the various aspects of natural history and archeology which they illustrate have never been yet worked out. The griffin was also an architectural ornament among the Greeks, and was copied from them, with other architectural embellishments, by the Romans. A fine example of the Assyrian griffin occurs on the sculptured slabs from Kouyunjik, now in the British Museum. The Dictionary of Early Drawings and Illuminations, by W. de Gray Birch and H. Jenner, gives a collection of references to the finest examples of these creatures among the manu- scripts from the Saxon age to the close of the 15th century.

GRIFFIN, Gerarp (1803-1840), an Irish novelist and dramatic writer, was descended from a family of good position, and was born at Limerick 12th December 1803. He was the youngest of nine sons. After attending for sonie time the school of an eccentric preceptor in Limerick, he, on the removal of the family in 1810 to Fairy Lawn, a country place on the banks of the Shannon, was placed under the instruction of a private tutor, but in 1814 he returned to Limerick to attend a classical school. In his youth his devotion seems to have been pretty equally divided between books and out-door recreations with the rod and gun. His parents and a portion of the family emigrated in 1820 to America, but he and some others were left with an elder brother who was settled as a medical practitioner at Adare near Limerick, and under his direction Gerald made some progress in medical studies with the view of adopting that profession. It would appear, however, that very soon his intentions underwent a change, for, besides devoting a large part of his time to literary composition, he as early as his eighteenth year undertook for a short time the editorship of a newspaper in Limerick. Having completed a tragedy, Aguire, which was highly lauded by his friends, he finally in 1823 set out for London with the purpose of " revolu- tionizing the dramatic taste of the time by writing for the stage."

Notwithstanding, however, the efforts and recom- mendations of the novelist Banim, who showed him great kindness, he found no manager willing to accept any of his plays ; and for a considerable period he had such a hard and wearisome struggle with poverty and disappoint- ment as permanently to injure his health. For some time he barely supported himself by reporting trials for the newspapers and by various kinds of hack work ; but his prospects began to brighten a little when he obtained occupa- tion as a parliamentary reporter, and gradually the Ziterary Gazette, the News of Literature, and other periodicals of standing began to look upon his contributions with favour. Some of his dramatic pieces were accepted also by one of the theatres ; and the publication in 1827 of a series of

tales under the title of Holland Tide was so successful that he at once set about the preparation of a similar series, which appeared the same year in two volumes under the title of Zales of the Munster Festivals, and were still more popular. In 1828 appeared the Collegians, afterwards so successfully adapted for the stage under the title of the Colleen Bawn. It is said to have been the favourite novel of O'Connell; aud, besides exhibiting that masterly delineation of both the pathetic and the humorous features of Irish character already shown in his other works, it was written with a verve and a dramatic intensity and realism far sur- passing all his previous or subsequent efforts. His principal other works are Zhe Invasion, The Rwals, Tracey's Ambition, and The Tales of Five Senses. He is also the author of a uumber of lyrics which are generally pervaded by a tender aud sad cast of sentiment. When Griffin appeared to have achieved the literary success for which he had had such a hard struggle, he began to feel a growing distaste for his profession. He became doubtful as to the moral influence of his writings, and as to whether on that account he had not been '" misspending his time ; " and ultimately he came to the conclusion that his true sphere of duty was to be found within the walls of a monastery,—a resolve doubtless partly attributable to the state of his health. He was admitted into a Dublin monastery in September 1838 under the name of Brother Joseph, and in the following summer he removed to Cork, where he died of typhus fever 12th June 1840. Previous to adopting the monastic habit he burned all his manuscripts; but Gisippus, a tragedy which he had composed in his twenty-

fifth year, accidentally escaped destruction, and in 1842 was put on the Drury Lane stage by Mr Macready, and acted with great success. The collected works of Gerald Griffin were published in 1843 in eight volumes, with a memoir by his brother. See also Dublin University Magazine for February 1844. GRILLPARZER, Franz (1791-1872), a distinguished German dramatist, was bora in Vienna on the 15th January 1791. His father, a respectable advocate, destined him for his own profession ; but on the conclusion of his legal studies, in 1811, Grillparzer became a tutor in a noble family, and two years afterwards accepted a subordinate post in the civil service. He rose slowly in his profession, but in 1833 was made director of the archives in the court chamber (Hofkammer). He retired in 1856, receiving the title of Hofrath, a title which was replaced in 1861 by the higher one of Reichsrath. In 1847 he was made a member of the Academy of Sciences. From early youth he dis- played a strong literary impulse. He devoted especial attention to the Spanish drama, and nearly all his writings bear marks of the influence of Calderon. When he began to write, the German stage was dominated by the wild plays of Werner, Miillner, and other authors of the so-called "'fate-tragedies." His first play, Die Ahnfraw (The Ancestress), published in 1816, was penetrated by their spirit. A lady, who has been slain by her husband for infidelity, is doomed to visit "the glimpses of the moon " till her house is extinguished, and this end is reached in the tragedy amid scenes of violence and horror. Some of Grillparzer's admirers draw a sharp distinction between this play and the works with which it is usually classed, and in doing so they follow his own example. But its general character is exactly similar to that of Werner's dramas; it only differs from them in containing individual passages of much force and beauty. It at once became extremely popular, and Grillparzer was encouraged to write a second tragedy, Sappho (1819), the most artistically finished of his productions. An Italian rendering of this play fell into the hands of Lord Byron, who, although the translation was very bad, expressed his conviction that the author's name would be held in reverence by posterity. It is full of the

aspiration of the Romantic school, but its form is classic, and its chastened style presents a striking contrast to the noise and fury of the Ahnfrau. The

problem of the play has some resemblance to that of Goethe's Zorquato Tasso, for in both we find the struggies of a poetic nature which is unable to reconcile itself to the conditions of the actual world. Grillparzer's conceptions are not so clearly defined as Goethe's, nor is his diction so varied and harmonious ; but the play has the stamp of genius, and ranks as one of the best of those works in which an attempt has been made to combine the passion and sentiment of modern life with the simplicity and grace of ancient masterpieces. Another and more ambitious work in the classic style was Das goldene Vilies (The Golden Fleece), a trilogy published in 1822. Of its three parts the greatest is Medea, which some critics consider his highest achievement. 'There is delicate art in the delineation of the mingled fascination and repulsion which Medea and Jason feel for each other, and when at last repulsion becomes the dominant force, the dramatist gives splendid utterance to the rage of the dis-appointed wife and mother. In Des Afeeres und der Liebe Wellen (Waves of the Sea and of Love), which appeared in 1840, Grillparzer again formed his work on classic models ; but in this instance his feeling is so distinctly modern that it does not find adequate expression in his carefully measured verse. The subject is the story of Hero and Leander, and it has never been more happily treated than in some passages, which, however, are marked rather by lyrical than dramatic qualities.

In 1825 Grillparzer published AGnig Ottokar's Gliick und Ende (King Ottocar's Fortune and End). It appealed strongly to the patriotic sympathies of Vienna, dealing as it does with one. of the proudest periods of Austrian history,—the time of Rudolf I., the founder of the house of Hapsburg. In a harsh criticism of Grillparzer, which appeared in the Foreign Review in 1829, and is now included in his Miscellanies, Mr Carlyle said that Schiller's Peccolo- mint differed from Ottokar as "a living rose [differs] from a mass of dead rose leaves, or even of broken Italian gum- flowers." This judgment has not been confirmed by later criticism. It cannot, indeed, be said that the materials of the play are welded into a compact whole, but the charac- ters are vigorously conceived, and there is a fine dramatic contrast between the brilliant, restless, and unscrupulous Ottocar and the calm, upright, and ultimately triumphant Rudolf. Another historical play, Ain treuer Diener sernes Herrn (A faithful Servant of his Lord), appeared in 1830, and brought down upon the author a storm of

abuse from the liberals, who accused him of servility. On the other hand, the play displeased the court, and its repre- sentation was stopped. It hardly deserved to be made the subject of so much contention, for it is one of the least powerful of Grillparzer's later dramas. A more pleasing work was the dramatic study Der Z'raum, evn Leben (The Dream, a Life), which is to some extent a direct imita- tion of Calderon, and has something of his brilliance and charm. In the same year in which this was issued (1840) Grillparzer published Wehe dem der liigt (Woe to him who Lies), a comedy. It was so badly received that he wrote no more for the stage. Several dramatic fragments, however, composed at a later time, appeared among his posthumous writings.

Grillparzer was a lyrical as wellas a dramatic poet. He used to say that all his lyrics were written for the purpose of obtaining relief from feelings by which he happened to be oppressed. The same thing was said of himself by Goethe ; but Goethe's emotion in passing into verse was purified and generalized; Grillparzer's remained for the most part strictly personal, and rarely touches the deepest sympathies. He is more successful in epigram, in which

he often gives sharp expression to a keen, biting humour. He wrote also several prose tales, one ot which, Der Spiel- mann (The Musician), is marked by delicate and graceful fancy. His autobiography, which was written in 1853 and brings down the narrative of his life to 1836, is a model of clear, simple, and elegant prose; and it throws much interesting light both on his personal character and on the tendencies of his time. Among his posthumous writings are many fragments of literary, philosophic, and political criticism, all of them indicating a strong and inde- pendent spirit, not invariably just, but distinct, pene- trating, and suggestive. It is characteristic of him that he expresses extreme dislike of Hegel's philosophy on the ground that its terms are unintelligible On the other hand, he gives evidence of careful and sympathetic study of Kant. Of modern literary critics Gervinus was most repugnant to him, mainly because of the tendency of this writer to attribute moral aims to authors who created solely for art's sake. He rather maliciously says that Gervinus had one advantage and one

disadvantage in writing his history of German Literature,—the advantage of common sense, the disadvantage of knowing nothing of his subject.

Of a quiet contemplative nature, Grillparzer shunned general society. He never married. Toastranger he seemed cold and distant, but in conversation with any one he liked his real disposition revealed itself ; his manner became ani- mated, his eyes brightened, and a sarcastic but not ill- natured smile would play upon his lips. It was one of his sayings that the art of writing poetry can neither be taught nor learned, but he also held that inspiration will not visit a poet who neglects to make himself master of his subject, Hence before writing a play he worked hard, striving to comprehend the spirit of the age he wished to represent. He was exceedingly fond of travel, and at different times visited all the leading European countries. After 1840, when his solitary comedy was rejected by the public, he almost passed from the memory of his contemporaries. Fortunately for him, Heinrich Laube, an admirer of his genius, settled in Vienna in 1849 as artistic director of the court theatre. By and by Laube reintroduced on the stage some of the forgotten works, and their success was imme- diate and profound. To his own surprise, Grillparzer became the most popular author of the day ; he was ranked with Goethe and Schiller, and lauded as the national poet of Austria. On the eightieth anniversary of his birthday all classes from the court downwards united to do him honour ; never, probably, did Vienna exert herself so much to prove her respect for a private citizen. He died on the 21st January 1872, and was buried with an amount of ceremony that surpassed even the pomp displayed at Klopstock's funeral. A monument of him has recently been erected at Baden, near Vienna.

After his death an admirable edition of his works, in ten volumes, was issued by Heinrich Laube and J. Weilen. There are several English renderings of Sappho, and Medea has also been translated. For biographical and critical notices see Kuh, Zwet Dichter Oester- rewhs (Pesth, 1872); Betty Paoli, Grillparzer wnd seine Werke (Stuttgart, 1875); and Gottschall, "Franz Grillparzer," and "Franz Grillparzers Nachlass," in Unsere Zeit for 1872 and 1878. (J. ST.)

GRIMALDI, Giovann1 Francesco (1606-1680), an architect and painter, named I] Bolognese from the place of his birth, was a relative of the Caracci family, under whom it is presumed he studied first, and afterwards under Albano. He went to Rome, and was appointed architect to Pope Paul V., and patronized by succeeding popes also. Towards 1648 he was invited to France by Cardinal Mazarin, and for about two years was employed in buildings for that minister and for Louis XIV, and in fresco-painting inthe Louvre. His colour was strong, somewhat excessive In the use of green; his touch light. He painted at once

history, portraits, and landscape,—the last with predilec- tion, especially in his advanced years,—and executed en- gravings and etchings from his own landscapes, and from those of Titian and the Caracci. Returning to Rome, he was made president of the Academy of St Luke; and in that city he died on 28th November 1680, in high repute not only for his artistic skill but for his upright and charit- able deeds as weli. His son Alessandro assisted him both in painting and in engraving. Paintings by Grimaldi are preserved in the Quirinal and Vatican palaces, and in the church of 8. Martino a' Monti; there is also a series of his landscapes in the Colonna Gallery.

GRIMM, Frieprich Mretcnior, Baron von (1723- 1807), the author of the celebrated Correspondance littéraire, was, though a naturalized Frenchman, both of German descent and a native of Germany, having been born of poor parents at Ratisbon, 26th December 1723. He studied at the university of Leipsic, where he had as professor the celebrated Ernesti, to whom he was doubtless in no small degree indebted for his critical appreciation of classical literature. On completing his studies he made his literary début by a tragedy which was received with ridicule by the audience and by the critics, including Lessing, and which is now forgotten even in Germany. In all probability it was this disappointment which led him to think of seeking his fortune in Paris, whither he accompanied the count of Schonberg as tutor to his sons, and where afterwards, at a small salary, he was for some time reader to the young hereditary prince of Saxe-Gotha. In 1749 he made the acquaintanceship of J. J. Rousseau, which, through a mutual sympathy in regard to musical matters, soon ripened into

intimate friendship. Throngh Rousseau he was introduced to the Encyclopedists, and about the same time he became secretary to Count Friesen, nephew of Marshal Saxe, which gained him admission to the most brilliant society of Paris. Endowed with more than average intellectual abilities, thoroughly versed in all current topics of interest in litera- ture, science, and art, gifted with remarkable insight into character, possessing engaging manners and great social tact, and actuated in all his conduct by a keen regard to his own interest, he won almost immediately general appre- ciation and respect. He rapidly obtained a thorough knowledge of the French language, and acquired so perfectly the tone and sentiments of the society in which he moved that all marks of his foreign origin and training seemed completely effaced. A witty painphlet entitled Le petit Prophéte de Boehmischbroda, written by him on the respective merits of the Italian and French operas, a subject which at that time greatly exercised the society of Paris and on which he sided with the Italian section, at once firmly established his literary reputation. Itis possible that the origin of the pamphlet is partly to be accounted for by his admiration of Mdlle. Fel, the prima donna of the Italian company. This admiration quickly developed into a passion so vehement that he was seized with a kind of catalepsy which continued for several days, but from which lhe suddenly awoke completely recovered both in body and mind. In 1753 Grimm was engaged by the Abbé Raynal to aid him in conducting his literary correspondence with Gerinan sovereigns; and this opened up to him that sphere for his ambition which perhaps was most in accordance with his peculiar tastes, and in which his abilities best fitted him to excel. Although from the beginning he had the principal share in the work, it was probably conducted until 1759 in the name of the Abbé Raynal. With the aid of friends during his temporary absences from France, he carried it on until 1790, and it latterly extended to six sovereigns, including the empress of Russia, the king of Sweden, and the king of Poland. It was probably in 1754 that Grimm was introduced by Rousseau to Madame

d'Epinay, his relations with whom led to an irreconcilable rupture between him and Rousseau. The exact amount of Grimm's blameworthiness itis impossible to determine, and the whole matter would be of little

consequence but for the fact that Rousseau allowed his resentment to gain such a complete possession of his mind as to induce him to give in his Confessions a wholly mendacious portrait of Grimm's character, by which his reputation was for a consider- able time injuriously affected. After the death of Count Friesen Grinim obtained the patronage of the duke of Orleans, through whom he was appointed secretary to Marshal d'Estrées during the campaigu of Westphalia in 1756-57. Subsequently he was named minister of Saxe- Gotha at the court of France, but he was deprived of that office on account of having criticized rather caustically certain French ministers in a despatch that was intercepted by Louis XV. His introduction to Catherine II. of Russia took place in 1773, when he accompanied the suite of the landgrave of Hesse-Darmstadt to St Petersburg on occasion of the marriage of a daughter of that prince to the only son of Catherine. After the Revolution Grimm retired to Gotha, and in 1792 he emigrated to Russia, where he enjoyed high favour at the court of Catherine, and had assigned him the nominal and agreeable duty of entertaining her for so many hours a day by his conversation. This state of things came, however, to an end in 1795, when, notwithstanding his supplications to be retained at court if only as one of her majesty's dogs, he was appointed minister of Russia at Hamburg, He died at Gotha, 19th December

1807.

The correspondence of Grimm forms perhaps the most valuable of existing records of any important literary period. It embraces nearly the whole period from 1750 to 1790, and although parts of it during his absence from France were written by Diderot, Madame d'Hpinay, and others, the work as a whole may be regarded as substantially bis. At first he contented himself with enumerating in the simplest manner the chief current views iu literature and art, and indicating ouly very slightly the contents of the principal new books, but gradually his criticisms became more extended and trenchant, and he touched on nearly every subject—political, literary, artistic, social, and religious—which interested the Parisian society of the time —his narrative, which moves lightly and easily from one theme to another, being frequently seasoned by piquant anecdotes or witty reflexions, Not only, however, did he aim to give a truthful and just account of the subjects on which he wrote; his purpose extended considerably beyond that

of affording a few hours' amusement to his royal patrons, and his descriptions and criticisms were fitted to satisfy more than a superficial curiosity. His notices of contemporaries are somewhat severe, and he exhibits in all the nakedness of truth the foibles and selfishness of the society in which he moved; but he appears to have been unbiassed in his literary judgments, and such is their just- ness and penetration that time has only served to confirm them. 'In style and manner of expression he is thoroughly French. He is generally somewhat cold in his appreciation, but his literary taste is delicate and subtle; and it is the opinion of Sainte-Beuve that the quality of his thought in his best moments will compare not unfavourably even with that of Voltaire. His religious and philosophical opinions were entirely negative, and his references to Christianity generally assume the form of cither a sneer or a witticism,

Grimm's Correspondance littératre, premttre plurtie de 1753 a 1770, was published at Paris in 1813 in 6 vols. 8vo; deuxiéme partie de 1771 & 1782, in 1812 in 5 vols. 8vo; and trotsiéme partie, pendant wne partie des années 1775 ct 1776, et pendant les années 1782 & 1790 tnelusivement, in 1818 in 5 vols. 8vo. A

supplementary volume appeared in 1814; the whole correspond- ence was collected and published by M. Jules Taschereau in a

GRIMM

Nouvelle édition, revue et mise dans un meilleur ordre, avee des notes et des éclaireissements, et ot se trouvent rétablies pour la premiere fois les phrases supprimées par la censure impériale, Paris, 1829- 1831, 15 vols. 8vo; and the Correspondance inédite, et recueil de lettres, poésies, morecaux, et fragments retranchés par la censure impériale en 1812 et 1813 was published in 1829. Grimm's Mémoire historique sur Vorigine et les swites de mon attachement pour Vimpératrice Catherine II. jusqw au déees de sa majesté impértale, and Catherine's correspondence with Grimm to September 1774, have been published in the Collection of the Russian Imperial Historical Society. She treats him very familiarly, and calls him Heraclite, George Dandin, &c. He signs himself " Pleureur." See alsoMme. d'Bpinay's Mémoires; Rousseau's Confessions; the notice by Galgues in the introduction to the second part of the Correspond- anee, and that by

Taschereau in the introduction to the new edition ; Sainte-Beuve, Cawserics du lundi, vol. vii.

GRIMM, Jacos Lupwic Cart (1785-1863), was born ou the 4th of January 1785 at Hanau, in Hesse-Cassel. His father, who was a lawyer, died while he was still.a child, and the mother was left with very small means; but her sister, who was lady of the chamber to the landgravine of Hesse, helped to support and educate her numerous family. Jacob with his younger brother Wilhelm (born on the 24th of February 1786) was sent in 1798 to the public school at Cassel. In 1802 he proceeded to the university of Marburg, where he applied himself to the study of law, a profession for which he had always been destined by his father, and which seemed to offer the best prospect of speedy independence. His brother joined him at Marburg a year later, having just recovered from a long and severe illuess, and likewise began the study of law. Up to this time Grimm had been actuated only by a general thirst for knowledge and the instinct of intellectual activity, and his energies had not found any aim beyond the practical one of: making himself a position in life. The first definite impulse came from the lectures of Savigny, the celebrated investi- gator of Roman law, who, as Grimm himself says (in the preface to the Deutsche Grammatik), first taught him to realize what it meant to study any science, whether that of law or any other. Saviguy's lectures at the same time awakened in him that love for historical and antiquarian investigation which forms the basis of all his work. Then followed personal acquaintance, and it was in Savigny's well- provided library that Grimm first turned over the leaves of Bodmer's edition of tle Old German minnesingers and other early texts, and felt an eager desire to penetrate further into the obscurities and half-revealed mysteries of their language. In the beginning of 1805 he received an invitation from Savigny, who had removed to Paris to continue his researches among the libraries there, to join him and help him in his literary work. This offer was joyfully accepted by young Grimm, who passed a very happy time in Paris, enjoying the society of Savigny, and strengthening his taste for the literatures of the Middle Ages by his studies in the Paris libraries, Towards the close of the year he returned to Cassel, where his mother and Wilhelin had settled, the latter having finished his studies. The next year he obtained a situation in the war office with the very small salary of 100 thalers. One of his grievances was, as he himself tells us in his autobiography, that he had to

exchange his stylish Paris suit for a stiff uniform and pigtail. But he had full leisure for the prosecution of his studies. In 1808, soon after the death of his mother, he was appointed superin- tendent of the private library of Jerome Buonaparte, king of Westphalia, into which Hesse-Cassel had been incorpor- ated by Napoleon. He was treated with marked favour by the king, who appointed him an auditor to the state council, while he still retained his other post. His salary was increased in a short interval from 2000 to 4000 franes, which removed all anxiety as to the means of subsistence, and his official duties were hardly more than nominal. After the expulsion of Jerome and the reinstalment of an elector, Grimm was appointed in 1818 secretary of legation,

to accompany the Hessian minister to the headquarters of the allied army. In 1814 he was sent to Paris to demand restitution of the books carried off by the French, and in 1814-15 he attended the congress of Vienna as secretary of legation. On his return he was again sent to Paris on the same errand as before. Meanwhile Wilhelm had received an appointment in the Cassel library, and in 1816 Jacob was made second librarian under Volkel. On the death of Volkel in 1828 the brothers expected to be ad- vanced to the first and second librarianships respectively, and were much dissatisfied when the first place was given to Rommel, keeper of the archives. So they removed next year to Gottingen, where Jacob received the appointment of professor and librarian, Wilhelm that of under-librarian. Jacob Grimm lectured on legal antiquities, historical grammar, literary history, and diplomatics, explained Old German poems, and comniented on the Germania of Tacitus. At this period he is described as small and lively in figure, with a harsh voice, speaking a broad Hessian dialect. His powerful memory enabled him to dispense with the " heft " which most German professors rely on, and he spoke extem- pore, referring only occasionally to a few names and dates written on a slip of paper. He himself regretted that he had begun the work of teaching so late in life, and asa lecturer he was not successful ; he had no idea of digesting his facts and suiting them to the comprehension of his hearers ; and even the brilliant, terse, and eloquent passages which abound in his writings lost much of their effect when jerked out in the midst of a long array of dry facts. In 1837, being one of the seven

professors who signed a protest against the king of Hanover's abrogation of the constitution which had been established some years before, lie was disinissed from his professorship, and banished from the kingdom of Hanover. He returned to his native Cassel together with his brother, who had also signed the protest, and remained there till, in 1840, they accepted an invitation from the king of Prussia to remove to Berlin, where they both received professorships, and were elected members of the Academy of Sciences. Not being under any obligation to lecture, Jacob very seldom did so, but together with his brother worked at the great dictionary, the plan of which had already been partly developed. During their stay at Cassel Jacob regularly attended the meetings of the academy, where he read papers on the most varied subjects. The best known of these are those on Lachmann, Schiller, and his brother Wilhelm (who died in 1859), on old age, and on the origin of language. He also described his im- pressions of Italian and Scandinavian travel, interspersing his more general observations with linguistic details, as is the case in all his works. Hedied in 1863, working up to the last.

Grimm's physical constitution was an excellent one. He possessed in the highest degee that Teutomic energy and endurance which are as essential to the sedentary student as to the pioneer in other regions of human activity. He was uever ill, and worked on all day, without haste and without pause. He himself (in his biography) speaks of his " iron industry." He was not at all impatient of interruption, but seemed rather to be refreshed by it, returning to his work Without effort. He wrote for press with great rapidity, and hardly ever made corrections. He never revised what he had written, remarking with a certain wonder of his brother, "Wilhelm reads his manuscripts over again before sending them to press!" He often started on a journey which he had determined upon only the day before. His tempera- ment was uniformly cheerful, and he was easily amused. He took a keen interest in politics, and when the newspapers arrived, he would often read them through at once, break- ing off his work for the purpose. Outside his own special work he had a marked taste for botany, and always liked

to have flowers about him while working, a taste which was shared by his brother. The spirit which animated his work is best described by himself at the end of his autobiography. '" Nearly all my labours have been devoted, either directly or indirectly, to the investigation of our earlier language, poetry, and laws. These studies may have appeared to many, and may still appear, useless ; to me they have always seemed a noble and earnest task, definitely and inseparably connected with our common fatherland, and calculated to foster the love of it. My principle has always been in these investigations to under- value nothing, but to utilize the small for the illustration of the great, the popular tradition for the elucidation of the written monuments." We may, in fact, sum up Grimm's tendencies by saying that lre was inspired by an intense enthusiasm for research, guided into definite channels by a not less entliusiastic love and veneration for everything German,—this word including, in its widest sense, all the great brotherhood of the Teutonic nations,—and limited by his decided predilection for history and antiquities. It will be observed that, whenever he refers to living dialects or traditions, it is in order to throw light on the past, not the reverse. Even in his great German dictionary the historical tendency strongly predominates.

The purely scientific side of Grimm's character developed itself but slowly, and it was long before he applied to the study of etymology and inflexions the system and method Savigny had taught him to develop in legal history. He seems to have felt the want of definite principles of ety- mology without being able to discover them, and indeed even in the first edition of his grammar (1819) he seems to be often groping in the dark, and to have but a vague idea of the necessity of rigorous principles of letter-comparison. As early as 1815 we find A. W. Schlegel reviewing the Altdeutsche Wilder (a periodical published by the two brothers) very severely, condemning the lawless etymologi- cal combinations it contained, and insisting on the necessity of strict philological method and a fundamental investi- gation of the laws of language, especially in the corre- spondence of sounds. This criticism is said to have had a considerable influence on the direction of Grimm's studies.

The first work he published, Ueber den altdeutschen Meistergesang (1811), was of a purely literary character. But even here we see the difference

between the more passive contemplation of the esthetic literary critic and the activity of the investigator who is always seeking definite results and definite laws. In this essay Grimm showed that JMinnesang and Merstersang were really one form of poetry, of which they merely represented different stages of development, and also announced his important discovery of the invariable division of the Zed into three strophic

arts. His text-editions were mostly prepared in common with his brother. In 1812 they published the two ancient frag- ments of the Lildebrandslied and the Weissenbrunner Cebet, Jacob having discovered what till then had never been suspected—the alliteration in these poems. However, Jacob had but little taste for text-editing, and, as he him- self confessed, the evolving of a critical text gave him little pleasure. He therefore left this department to others, especially Lachmann, who soon turned his brilhant critical genius, trained in the severe school of classical philology, to Old and Middle High German poetry and metre. Both brothers were attracted from the beginning by all national poetry, whether in the form of epics, ballads, or popular tales. They published in 1816-18 an analysis and critical sifting of the oldest epic traditions of the Germanic races under the title of Deutsche Sagen. At the same time they collected all the popular tales they could find, partly from

the mouths of the people, partly from manuscripts and books, and published in 1812-15 the first edition of those Kinder- und Haus-Mdrchen which have carried the name of the brothers Grimm into every liousehold of the civilized world, and founded the science of what is now called folk- lore. The closely allied subject of the satirical beast epic of the Middle Ages also had a great charm for Jacob Grimm, and he published an edition of the Reinhart Luchs in 1834, His first contribution to mythology was the first ‘volume of an edition of the Eddaic songs, undertaken con- jointly with his brother, published in 1815, which, however, was not followed by any more. The first edition of his Deutsche Mythologie appeared in 1835. This great work covers the whole range of the subject, tracing the mytho- logy and superstitions of the old Teutons back to the very dawn of direct evidence,

and following their decay and loss down to the popular traditions, tales, and expressions in which they still linger.

Although by the introduction of the Code Napoléon into Westphalia Grimm's legal studies were made practically barren, he never lost his interest in the scientific study of law and national institutions, as the truest exponents of the life and character of a people. By the publication (in 1828) of his Rechtsalterthiimer he laid the foundations of that historical study of the old Teutonic laws and constitu- tions which has been continued with brilliant success by Maurer and others. In this work Grimm showed the im- portance of a linguistic study of the old laws, and the light that can be thrown on many a dark passage in them by a comparison of the corresponding words and expressions in the other old cognate dialects. He also knew how—and this is perhaps the most original and valuable part of his work—to trace the spirit of the laws in countless allusions and sayings which occur in the old poems and sagas, or even survive in modern colloquialisms.

Of all his more general works the boldest and most far- reaching is unquestionably his Geschichte der deutschen Sprache, where at the same time the linguistic element is most distinctly brought forward. The subject of the work is, indeed, nothing less than the history which lies hidden in the words of the German language—the oldest national history of the Teutonic tribes determined by means of language. For this purpose he laboriously collects the scattered words and allusions to be found in classical writers, and endeavours to determine the relations in which the German language stood to those of the Geta, Thracians, Scythians, and many other nations whose languages are known to us only by doubtfully identified, often extremely corrupted remains preserved by Greek and Latin authors. It need hardly be said that Grimm's results have been greatly modified by the wider range of comparison and im- proved methods of investigation which now characterize linguistic science, while, on the other hand, many of the questions raised by him will probably for ever remain obscure; but his book will always be one of the most fruitful and suggestive that have been ever written.

We now come to his purely philological work, of which his famous Deutsche Grammatik was the outcome. We have already seen how slowly and with what difficulty he attained a sound method of etymological and grammatical investigation. Nevertheless the time was a favourable one for his work. The persevering labours of past generations —from the humanists onwards—had collected an enormous mass of materials in the shape of text-editions, dictionaries, and grammars, although most of it was uncritical and often untrustworthy. Something had even been done in the way of comparison and the determination of general laws, and the conception of a comparative Teutonic grammar had been clearly grasped by the illustrious Englishman Hickes, at the beginning of the last century, and partly carried out by

him in his Thesaurus. Ten Kate in Holland had after- wards made valuable contributions to the history and com- parison of the Teutonic languages. Even Grimm himself did not at first intend to include all the languages in his grammar; but he soon found that Old High German postu- lated Gothic, that the later stages of German could not be understood without the help of the Low German dialects, including English, and that the rich literature of Scandi- navia could as little be ignored. The first edition of the first part of the Grammar, which appeared in 1819, and is now extremely rare, treated of the inflexions of all these languages, together with a general introduction, in which he vindicated the importance of a historical study of the German language against the a prior, quasi-philosophical methods then in vogue.

In 1822 this volume appeared in a second edition— really a totally new work, for, as Grimm himself says in the preface, it cost him little reflexion to mow down the first crop to the ground. The wide distance between the two stages of Grimm's development in these two edi- tions is significantly shown by the fact that while the first edition gives only the inflexions, in the second volume phonology takes up no less than 600 pages, more than half of the whole volume. Grimm had, at last, awakened to the full conviction that all sound philology must be based on rigorous adhesion to the laws of sound-change, and he never afterwards swerved from this principle, which gave to

all his investigations, even in their boldest flights, that iron-bound cousistency, and that force of conviction which distinguishes science from dilettanteism ; up to Grimin's time philology was—as it still is in England—nothing but a more or less laborious and conscientious dilettanteism, with occasional flashes of scientific inspiration ; he made it into a science. His advance must be attributed maiuly to the influence of his contemporary Rask. Rask was born two years later than Grimm, but his remarkable precocity gave him somewhat the start. Even in his first edition Grimm's Icelandic paradigms are based entirely on Rask's grammar, and in his second edition he has relied almost entirely on Rask for Old English. His debt to Rask can only be estimated at its true value by comparing his treat- ment of Old English in the two editions; the difference is very great. Thus in the first edition he declines deg, dveges, plural degas, not having observed the law of vowel- change pointed out by Rask. There can be little doubt that the appearance of Rask's Old English grammar was a main inducement for him to recast his work from the beginning. To Rask also belongs the merit of having first distinctly formulated the laws of sound-correspond- ence in the different languages, especially in the vowels, those more fleeting elements of speech which had hitherto been ignored by etymologists.

This leads us to a question which has been the subject of much controversy, —Who discovered Grimm's law? The law of the correspondence of consonants in the older Indo- germanic, Low, and High German languages respectively was first fully stated by Grimm in the second edition of the first part of hisgrammar. The correspondence of single consonants had been more or less clearly recognized by several of his predecessors ; but the one who came nearest to the discovery of the complete law was the Swede Ihre, who established a considerable number of " literarum per- mutationes," such as 6 for f, with the examples bera= Jerre, befwer = fiber. Rask, in his essay on the origin of the Icelandic language, gives the same comparisons, with a few additions and corrections, and even the very same examples in most cases. As Grimm in the preface to his first edition expressly mentions this essay of Rask, there is every pro- bability that it gave the first impulse to his own investiga- tions. But there is a wide difference between the isolated

permutations of his predecessors and the comprehensive generalizations under which he himself ranged them. The extension of the law to High German is also entirely his own. The only fact that can be adduced in support of the assertion that Grimm wished to deprive Rask of his claims to priority is that he does not expressly mention Rask's results in his second edition. But this is part of the plan of his work, made absolutely necessary by its enormous extent, viz., to refrain from all controversy or reference to the works of others, leaving his readers to assign to each investigator his due. In his first edition he expressly calls attention to Rask's essay, and praises it most ungrudgingly. Rask himself refers as little to Ihre, merely alluding ina general way to Ihre's permutations, although his own debt to Ihre is infinitely greater than that of Grimm to Rask or anyone else. It is true that a certain bitterness of feeling afterwards sprang up between Grimm and Rask, but this was the fault of the latter, who, impatient of contradiction and irritable in controversy, refused to acknowledge the value of Grimm's views when they involved modification of his own. The importance of Grimm's generalization in the history of philology cannot be overestimated, and even the mystic completeness and symmetry of its formulation, although it has proved a hindrance to the correct explana- tion of the causes of the changes, was well calculated to strike the popular mind, and give it a vivid idea of the paramount importance of law, and the necessity of disre- garding mere superficial resemblance. Even the lawless English etymologist bows down to the authority of Grimm's law, though it must be confessed he honours it almost as much in the breach as in the observance.

The grammar was continued in three volumes, treating |

principally of derivation, composition, and syntax, which last was left unfinished. Grimm then began a third edition, of which only one part, comprisiug the vowels, appeared in 1840, his time being afterwards taken up mainly by the dictionary. Of the grammar as a whole we can only say that it stands quite alone in the anuals of science for com- prehensiveness, method, and fulness of detail. Every law, every letter, every syllable of inflexion in the different languages, is illustrated by an almost exhaustive mass of material, drawn from every period and every dialect. It has served as a model for all succeeding investigators. Diez's grammar of the Romance

languages is founded entirely on its methods, which have also exerted a pro- found influence on the wider study of the Indo-Germanic languages in general.

In the great German dictionary Grimm undertook a task for which he was hardly suited. His exclusively historical tendencies made it impossible for him to do justice to the individuality of a living language ; and the disconnected

statement of the facts of language in an ordinary alphabeti-

eal dictionary fatally mars its scientific character. It was

also undertaken on so. large a scale as to.make it impossible | he was strong and healthy, but as he grew up he was attacked by a long and severe illness, which left him weak

for him and his brother to complete it themselves, We may describe the dictionary, as far as it was worked out

by Grimm himself, as a collection of disconnected anti- quarian essays of, it need hardly be remarked, high |

value.

In summing up Grimm's scientific character we are struck }

by its combination of breadth and unity. He was as far removed from the narrowness of the specialist who has no

ideas, no sympathies beyond some one author, period, or |

narrow corner of science, as from the shallow dabbler who feverishly attempts to master the details of half a dozen discordant pursuits, which have no central point of interest round which to rally. Even within his own special studics there is the same wise concentration; no Mezzofanti-like parrot display of useless polyglottism. The very founda- tions of his nature were harmonious: his patriotism and

| Schriften, Berlin, 1864-70, 5. vols.

love of historical investigation received their fullest satis- faction in the study of the language, traditions, mythology, laws, and literature of his own countrymen and their nearest kindred. But from this centre lis investigations were pursued in every direction as far as his unerring instinct of healthy limitation would allow. He was equally fortun- ate in the harmony that subsisted between his intellectual and moral nature. He made cheerfully the heavy sacrifices that science demands from its disciples, without feeling any of that envy and bitterness which often torment weaker natures ; and although he lived apart from lis fellow men, he was full of human sympathies, and no man has ever exercised a profounder influence on the destinies of mankind than he has—an influence which is still only in its infancy. His was the very ideal of the noblest type of German character.

The following is a complete list of his separately published works, those which he published in common with his brother being marked with a star. For a list of his essays in periodicals, &c., see vol. v. of his Kleinere Schriften, from which the present list is taken. His life is best studied in his own " Selbstbiographie," in vol. i, of the Kleinere Schriften. There is also a brief memoir by

Dr Gédeke in Géttinger Professoren, Gotha (Perthes), 1872.

*Ueber den altdeutschen Meistergesang, Gottingen, 1811, *Ainder- und LJaus- Méarchen, Berlin, 1812-15 (many editions); *Das Lied von MMildebrand und das Wetssenbrunner Gebet, Cassel, 1812; Altdeutsche Walder, Cassel, Franktort, 1813-16, 8 vols.; *Der arme Ileinrich von Hartmann von der Aue, Berlin, 1815; Irmen- strasse und Frmensdule, Vienna, 1815; *Die Lieder der alten Edda, Berlin, 1815, Silva de ronances viejos, Vienna, 1815; *Deutsche Sagen, Berlin, 1816-18, 2d ed., Berlin, 4865-66; Deutsche Grammatik, Gottingen, 1819, 2d ed., Gottingen, 1822-40, reprinted 1870 by W. Seherer, Berlin ; Wuk Stephanovitsch's Kleine serbische Gram- matik, verdeutscht mit einer Vorrede, Leipsie and Berlin, 1824; Zur Recension der deutschen Grammattk, Cassel, 1826; *Jrische Elfenmdrchen, aus dem englischen, Leipsie, 1826; Deutsche*

Rechtsalterthiimer, Gottingen, 1828, 2d ed., 1854; Mymno- rum veteris ecclesice XX VI interpretatio Theodisca, Géttingen, 1830; Leinhart Fuchs,

| Berlin, 1884; Deutsche Mythologte, G&ttingen, 1835, 3d ed., 1854, 2 vols.; Tacttz

*Germania edidit, Gottingen, 1835; Ueber neine Eatlassung, Basel, 1838; (together with Sehmeller) Lateinische Gedichte des X, und XI, Jahrhunderts, Gottingen, 1838; Sendschreiben an Karl Lachmann tiber Reinhart Fuchs, Berlin, 1840; Weisthumer, th. i., Géttingen, 1840 (continued, partly by others, in 5 parts, 1840-69); Andreas und Elene, Cassel, 1840; Frau Aventure, Berlin, 1842: Geschichte der deutschen Sprache, Leipsie, 1848, 3d ed., 1868, 2 vols.; Das Wort des Besitzes, Berlin, 1850 ; *Deutsches Worterbuch, bd. i., Leipsic, 1854 (still in progress); Rede auf Wilhelm Grimm und Rede tiber das Alter, Beriin, 1868, 3d ed., — ear' Hi. SW.)*

GRIMM, Wituetm Cari (1786-1859). The chief events in the life of Wilhelm Grimm have been narrated in last article. The two brothers were indeed so inti- mately associated both in their lives and in their works

| that a separate biography of the younger is almost super-

fluous. As Jacob himself said in his celebrated address to the Berlin Academy on the death of his brother, the whole of their lives were passed together. In their school- days they had one bed and one table in common, as students they had two beds and two tables in the same room, and they always lived under one roof, and had their books. and property in common. Nor did Wilhelm's marriage in any way disturb their harmony. As Clcasby

| said ("Life of Cleasby," prefixed to his Zcelandic Dictionary, | p. Ixix.), "they both live in the same house, and in such

harmony and community that one might almost imagine the children. were common property." Wilhelm's character was a complete contrast to that of lis brother. As a boy

all his life. His was a less comprehensive and energetic mind than that of his brother, and he had less of the spirit of investigation in him, preferring to confine himself to some limited and definitely bounded field of work; he utilized everything that bore directly on his own studies, and ignored the rest. These studies were almost always of a literary nature, and the majority of his works, including those he carried on in common with his brother, are con- cerned either with literary problems, or popular traditions, or else are text-editions. It is characteristic of his more esthetic nature that he took great delight in music, for which his brother had but a moderate liking, and had a remarkable gift of story-telling. Cleasby, in the account of his visit to the brothers, quoted above, tells that XI. — 26

" Wilhelm read a sort of farce written in the Frankfort dialect, depicting the 'imalheurs' of a rich Frankfort trades- man on a holiday jaunt on Sunday. It was very droll, and he read it admirably." Cleasby describes him as "an uncommonly animated, jovial fellow." He was, accord- ingly, much sought in society, which he frequented much more than his brother.

His first work was a spirited translation of the Danish Kempe- viser (Altdinische Heldenlieder), published in 1811-13, which attracted great attention, and made his name at first more widely known thanthat of his brother. The most important of his text- editions are—Ruolandslict, Gottingen, 1838; Konrad von Wiirz- burg's Goldene Schmiede, Berlin, 1840; Grave Ruodol/, Gottingen, 1844 (2d ed.); Athis wid Prophilias, Berlin, 1846;

GRIMMA, a town in the circle of Leipsic, Saxony, is situated on the left bank of the Mulde, 19 miles S.E. of Leipsic. In the Middle Ages it was an important com- mercial town, but agriculture is now its principal industry, although its manufactures have for some time been increas- ing. Besides large flour-mills there are yarn-bleaching and dyeing works, and outside the town are the Golzermihle, which include an iron foundry and manufactories of paper and machinery. The principal buildings are the old castle, founded in the 12th century, in which the margraves of Meissen and the electors of Saxony often held court ; the town-house, dating from 1442 ; the two normal semi- naries ; the real school of the second order ; and the

famous Friirstenschule (Illustre Moldanum) erected by the elector Maurice on the site of the former Augustine monastery and consecrated in 1550, having provision for 104 free scholars and 22 boarders, and a library now numbering 10,000 volumes, In the immediate neighbourhood are the Cistercian monastery in which Catherine von Bora lived, and the village of Diében, with an old castle in which Albert the Proud kept his father Otto the Rich prisoner. Grimma is of Sorbian origin, and came into the possession of Germany through the emperor Henry I. The population in 1875 was 7273.

GRIMSBY, Great, a municipal and parliamentary borough and seaport town of England, county of Lincoln, is situated on the south side of the estuary of the Humber nearly opposite Spurn Head, and 17 miles E.S,E. of Hull. Since the opening in 1852, under the auspices of the Manchester, Sheffield, and Lincolnshire Railway Company, of extensive docks occupying a space of 140 acres reclaimed from the sca, the shipping trade of Grimsby has largely increased, A new dock connecting the royal dock with the old dock was opened by the Prince of Wales July 22, 1879.

conveying ice from Norway for the use of the fisheries. Further particulars regarding the fishing trade of Grimsby will be found under the article FisHERIEs, vol. ix. pp. 249, 250. The principal other industries are shipbuilding, iron and brass founding, brewing, and tanning. The chief buildings, besides the large warehouses extending along the docks, are the fine old parish church restored in 1859, the free grammar school, the custom-house, the mechanics' institute, the hospital, the corn exchange, and the town- hall, A statue of the Prince Consort was unveiled 22d July 1879. The population of the municipal borough in 1861 was 11,067, and of the parliamentary borough 15,060; in 1871 the numbers were 20,244 and 26,982. The area of the former is 1737, and of the latter 16,330 acres.

Grimsby is supposed to have: been the spot where the Danes landed on their first invasion of Britain. It is a borough by pre- scription, and one of the most ancient in the kingdom. . In the reign of Edward III. it was a considerable seaport, and in 1346 it furnished that monarch with 11 ships and 170 mariners for the siege of Calais. After that period its trade fell into decay through the gradual blocking up of the harbour by the accumulation

of mud and sand, until the erection of new docks about the beginning of the present century. By the Act of 238d Edward I. the town obtained the privilege of returning two members to parliament, but since the Reform Act of 1832 it has returned only one.

tRINDAL, Epmunp (c. 1519-1583), archbishop of Canterbury, was born at Hensingham in the parish of St Bees, Cumberland, about 1519. He was educated at Cambridge, where he became fellow of Pembroke Hall in 1538, and president in 1549. In the following year he was appointed chaplain to Bishop Ridley, in August 1551 precentor of St Paul's, in November chaplain to Edward VI., and in July 1552 prebendary of Westminster. On the accession of Mary in 1553 he took refuge on the Con- tinent, staying chiefly at Strasburg, where he acquired a competent knowledge of German, and occupied himself also in collecting the "writings and stories of the learned and pious sufferers in England,"—the result of his inquiries being afterwards communicated to John Foxe, and incor- porated by him in his Book of Martyrs. Returning to England under the new regime in 1558, he assisted in the preparation of the new liturgy, and was also one of the eight Protestant divines chosen to hold public disputes with the popish prelates. In 1559 he was appointed to the mastership of Pembroke Hall, and in the same year he succeeded Bonner as bishop of London, in which capacity he, along with Archbishop Parker, shared in 1565 in the responsibility of suspending those of the London clergy who refused to submit to the Act of Uniformity, on which account an indignant mob of clergymen's wives appeared before his house at St Paul's, and were with difficulty per- suaded by one of the suspended clergymen to go away quietly. In 1570 Grindal was appointed to the see of York, from which he was translated to Canterbury in February 1576. Having in the same year incurred the royal dis- pleasure by refusing to suppress the meetings held among the clergy for "the exercise of prophesying," he was ulti- niately, in June 1577, by order of the Star Chamber con- fined to his house and sequestered for six months. As in November he refused to make a formal submission to the queen, his suspension was continued for several years ; but though a petition for his restoration, which was drawn up by convocation in 1580, was not immediately granted, it would appear that in 1582 he had resumed, at least partially, the exercise of his ecclesiastical functions. About the end of this year the queen, on account of his blindness, re- quested him to retire on a

pension, but the negotiations connected with his resignation were not completed till April 1583, and it was only after his death at Croydon, July 6th of the same year, that Whitgift, who had been nominated his successor, entered upon the see. Though

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Grindal yielded to the peremptory orders of Elizabeth in regard to the clergy who refused to sign the Act of Uni- formity, le seems on all other occasions, while conducting himself with great moderation and manifesting unvarying courtesy and an earnest desire to avoid every cause of offence, to have strenuously upheld the spiritual independ- ence of his office. His aims were on the whole noble and unselfish, and he was zealous in his endeavours to reform the abuses of his predecessor, to improve the moral and intellectual status of the clergy, and as far as possible to conciliate and reclaim the Puritans. He was sincerely attached to Protestantism, and laid much stress on the function of preaching, a " gift" in which he himself is said to have excelled. Grindal is alluded to (as Algrind) in the seventh "«glogue" of Spenser's Shepheards Calender.

His literary remains, which are unimportant, have been published by the Parker Society, with a biographical notice by the Rev. Wm. Nicholson, 1853. See also Strype's Life of Grindal, London, 1710, Oxford, 1821; A Brief and True Account of Edmund Grindal, 1710; Memorials regarding his Suspension, &c., supposed by some to have been written by Sacheverel, 1710; Fuller's Worthies; and Hook's Lives of the Archbishops of Canterbury, vol. viii.

GRINDSTONE. Sandstones which possess the property of abrading steel and other hard substances are extensively used in arts and manufactures under the name of grind- stones. In its simplest form a grindstone consists of a stone disc, more or less circular, mounted on a horizontal iron spindle carried on the tops of two wooden posts fixed in the ground. A winch handle, or occasionally a rude crank with treadle, provides the means of giving a slow rotation to the stone, against the cylindrical face of which the steel or other substance which is to be ground is held. Such grindstones—possessing neither truth of figure nor the means of obtaining it—are unsuitable for any but the roughest purposes ; and although by mounting

them in a frame to which a rest can be attached it is possible to keep them true and tolerably efficient, they are always slow in their action.

Cutlers employ grindstones which are roughly mounted but which act well, being driven at a much higher speed by a strap froma large wheel or pulley, and they carefully preserve the truth of the cylindrical face. And in many manufacturing processes the surface speed of the face is still further increased by employing very large stones, and giving them the greatest number of revolutions per minute that is compatible with safety,—this limit even being some- times exceeded, when the centrifugal force overcomes the rather slight cohesive strength of the stones, and breaks them up into fragments which fly to great distances with disastrous results. Sandstone suitable for grindstones of various degrees of hardness and fineness is found in the coal districts of the north of England, and also in those of the midland counties. A favourite stone for tool-grinding at a low speed is quarried at Bilston in Staffordshire. The neighbourhood of Sheffield also affords some useful qualities of grindstone.

Artificial grindstones closely resembling thenatural stones, but of perfectly uniform texture, which the natural ones frequently are not, were made a few years ago by Mr Ransome's ingenious process. Their manufacture has been discontinued, but artificial grindstones of another kind, made with emery instead of sand, are now effecting a com- plete revolution in the art of the machinist. By means of these emery grinders, to which great variety of size and form can be given so as to suit the particular purposes for which they are intended, the operation of trueing up metal surfaces by hand, whether they are large or small, curved or flat, can in very many kinds of work be entirely dis- Pensed with,—the results being superior in truth of figure, uniform in all cases, and obtained ina mere fraction of the time which the most skilful workman would require. The

extensive use of these grinders in America (where the im- portance of labour-saving machines is properly appreciated) renders it certain that the system will gradually make its way also in England, and that hand-filing will thus to a large extent be superseded,—files being costly instru- ments in

themselves, and many times more costly in their use, owing to the skill which they demand on the part of the workman who handles them.

Artificial wheels made with emery are by no means a new invention. In India and China they have been used for centuries ; but, being made with lac and similar fusible materials, such wheels are not capable of being run at the high rate of speed which is a first essential to their effici- ency. Others, however, which were not liable to these objections were made and patented in England more than thirty years ago; and it is surprising that these have not been more generally used. The chief advantage of those now made,—some of which are manufactured in the United States, some on the continent of Europe, and some in England,—is that they can be obtained of large size—up to about 3 feet in diameter—and that they are strong enough to be driven at a very high speed without breaking. At a surface speed of 5000 or 6000 feet per minute these wheels cut tempered steel readily, when used either wet or dry, and by their means it can be shaped, if necessary, in its hardest condition, with a facility previously unattainable. Asin the case of common grindstones, truth of form is most important to their efficient working, and it is therefore desirable that the work under treatment should be held perfectly rigid, by means of some form of sliding rest, or otherwise. When so used the wear of the emery wheel, which is exceedingly slow, keeps it constantly true without attention. If from any cause this truth of figure be lost, or if it be desired to alter the form of the face, recourse must be had to turning it up with a diamond, nothing else in nature being sufficiently hard for the purpose.

GRINGOIRE, or Grincon, Prerre (c. 1480-1544), was the last of the medieval poets. He lived to see the old methods which he was taught to believe unchangeable entirely superseded. He was born about the time when King René, the last of the princely trowvéres, died ; he finished his career when Marot had already introduced a new and natural genre which he could not understand, and when Ronsard and Baif were beginning those studies which would interpose a barrier between the old language and the new. Itwas not to be expected that he should ever fall in with the new movements, or that he should understand the enormous value of the changes which were destined to con- sign his own works to oblivion,

The place of his birth is uncertain. Perhaps it was Lorraine, perhaps Normandy. His real name was Gringon, which he changed to Gringoire, for the poetical reason that it sounded better. His early history is almost entirely un- known; at the age of nineteen or twenty he produced his first poem, Le Chateau de Labour, in which he is supposed to have narrated his own experiences. Most probably he did. René, Charles of Orleans, Froissart, Deschamps, all the poets whose works he would study, began with a poetical exposition of their own experiences. 'There are, in Gringoire's poem, the personages common to all medizval allegories, Raison, Bonne Volonté, Talent de beau faire, for friends, and Souct, Tromperie, and the rest, for enemies, Finding that the trade in allegorical poems was ruined for want of demand, and discovering an opening in the direc- tion of mysteries, Gringoire began to produce those dramas, and joined the "' Enfants de Sans Souci." The fraternity advanced him to the dignity of "Mére Sotte," and after- wards to the highest honour of the guild, that of " Prince des Sots." For twenty years Gringoire seems to have been

at the head of this illustrious confrérie, writing for them farces, soties, and satires. In this capacity of dramatist he exercised an extraordinary iufluence. At no time was the stage, rude and coarse as it was, more popular as a true exponent of the popular mind. Gringoire's success lay in the fact that he followed, but did uot attempt to lead ; on his stage the people saw exhibited their passions, their

judgments of the moment, their jealousies, their hatreds,

and their ambitions. Brotherhoods of the kind existed all over France. In Paris there were the "Enfans Sans Souci," the " Basochiens," the '"Confrérie de la Passion," and the "Souverain Empire de Galilée"; at Dijon there were the " Mére Folle" and her family; in Flanders the " Société des Arbaletriers" played comedies; at Rouen the ' Cornards" or " Conards" yielded to none in vigour and fearlessness of satire. There is every reason, therefore, to believe that Gringoire enjoyed considerable distinction as the leading spirit among the satirists of the capital. He adopted for his device, Tout par Raison, Raison par Tout, Par tout Raison. He has been called the '" Aristophanes des Halles." In one respect at least

he resembles Aristo- planes. He is serious in his merriment ; there is purpose behind his extravagancies. Among his principal works are Les Folles Enterprises aud Les Abus du Monde,— poems in which everything under the sun is criticized, — certain political pieces, such as La Chasse du Cerf des Cenfs (Serf des Serfs, t.e., servus servorum), under which title that of the pope is thinly veiled, and Za AMeére Sotte, with all her literary offspring. During the last twenty years of a long life he became orthodox, and contributed the Blason des Hereticques to orthodox literature. It was during this period also that he wrote the work by which he is best known, the Mystere de la Vie de Saint Louzs, of which an analysis may be found in M. Leroy's Etudes sur les Mysteres. After more than 300 years of oblivion this poet has been republished, not so much on account of his own merits as because of the position which he occupies in the history of dramatic literature.

GRIQUALAND WEST, a province in South Africa, comprising the territory formerly belonging to the western division of the Griqua people, which was annexed to the British empire October 27, 1871. The extent of the pro- vince is 17,800 square miles. It is bounded on the S. by the Orange River (which separates it from the Cape Colony), on the N. and N.E. by territory occupied by the Bechuana tribes and the Transvaal settlement, and on the E. by the Orange Free State. The general elevation of the country is about 3000 feet above sea-level ; its character- istic features are undulating grassy plains, alternating with low ranges of rocky hills and sandy downs. The Vaal river flows through the principal districts, receiving in its course the Hart River and Modder River, with its affluent the Riet River, before its junction with the Orange River. A portion of the territory is adapted for sheep-farming, and the river basing contain fertile lands suitable for agri- cultural purposes. But the great wealth of the country is in its diamond mines. Since the first discovery of diamonds, in 1867, the total value of the gems exported from the province up to the close of the year 1878 is esti- mated at £20,000,000. Digging operations were at first confined to the alluvial deposits on the banks of the Vaal River, but in 1871 mines were opened in the locality known as the "dry diggings," which have since received the names of Kimberley, De Beer's, Du Toit's Pan, and Bultfontein, all situated within a radius of a few miles. The area of the diamond- producing ground at each of these places is dis- tinctly defined. At

Kimberley the mine covers only 9 acres, at De Beer's 14 acres, at Du Toit's Pan 41 acres, and at Bultfontein 22 acres. These circular areas appear to be

throats" or "pipes" through which the volcanic and

serpentinous matter containing the sparkling gems have been erupted ; the surrounding rock consists of sandstones and shales entirely barren of diamonds. Kimberley, the chief centre of the mining industry, is the capital of the proviuce and the seat of government. There is a resident lieutenant-governor or administrator, who is assisted by an executive council, and a legislative council composed of members partly elective and partly nominated by the crown. There is also a high court of justice presided over by a resident recorder. The other towns are Du Toit's Pan (including Bultfontein), Barkly, and Griqua Town. The villages and native locations are Hebron, Likatlong, Boetsap, Campbell, and Douglas. Among the river diggings or encampments are Pniel, Waldek's Plant, Sifonell, and Setlacomie's. A census taken in 1877 showed the total population of Griqualand West at that time to be 45,277, of whom 12,347 were Europeans.

GRISONS (German, Graubiinden) is the largest and easternmost of the Swiss cantons. It is 80 miles in length from E.N.E. to W.S.W., and 45 in breadth, and has an area of 2963 square miles. On the N.E. and E. it abuts against the little principality of Liechtenstein, and the Austrian provinces of Tyrol and Vorarlberg, on the S. on the Italian provinces of Val Tellina and Como, and on the W. and N. on the Swiss cantons of Ticino, Uri, Glarus, and St Gall.

The whole canton is mountainous, and, with the excep- tion of the Rhine valley below Reichenau and the Italian valleys, which still form part of it, has a severe alpine climate and vegetation. One-tenth of the surface is covered by glaciers. The five principal glacier groups are those of the Tédi, N.; the Medelser Gebirge and the Rheinwald or Adula Gebirge, containing the chief source of the Rhine, S.W.; the Bernina group, the largest and loftiest, S.E.; and the Silvretta Gebirge, E. The principal valleys are the Vorder and Hinter Rheinthiler, with their side-valleys the Valserthal, Averserthal, Oberhalbstein, and Pritigau, forming together the upper basin

of the Rhine. Besides these, the canton includes the long narrow trough of the upper Inn, and the Italian valleys of Misocco, Bregaglia, aud Poschiavo, whose streams join the Ticino or the Adda. The high average elevation of the country, with the absence of any large lake, renders the scenery more severe than that of central Switzerland, and the mountain summits less im- posing. The most fertile valleys are the Pratigau and Rheinthal below Ilanz. The lower chains are rent by many great gorges. The Via Mala, the Rofla, and the Schyn are the best known, but those of the Ziige, the Averserthal, Medelserthal, and Valserthal are almost equal to them in grandeur. In the Rheinthal below Chur the vine flourishes and good wine is produced, and the Cisalpine territory bears the usual products of the southern slope of the Alps, maize and chestnuts. At Poschiavo tobacco is cultivated to some extent. The inner valleys are the highest of Central Europe, containing several villages at an elevation of about 6000 feet (St Moritz, Engadine, 6080; Bivio, Oberhalb- stein, 5827; Cresta, in the Averserthal, 6394 ; snow hes there for six or seven months in the year, and corn will not ripeu. The hay-harvest is the great agricultural event of the year, and is so large that great numbers of Italian labourers are annually employed init. The forests and pasturages are the chief source of wealth. The lower Alps maintain a fine breed of cows; the upper are let to Bergamasque shepherds, who drive yearly immense flocks of sheep from North Italy for the summer pasturage. There are many mineral springs in the country; the most frequented are at Alveneu, Fideris, Le Prese, and San Ber- nardino, besides those in the Engadine (see ENGADINE).

The Grisons is sparely peopled. The pupulation in 1870 amounted to 91,782,—39,843 Protestants and 51,877

Catholics. 36,000 speak German and 12,000 Italian. The remainder use the Romansch or the Ladin dialect, probably corrupt descendants of the old "lingua rustica" of the Roman empire. The former is dying out in some districts on the Tyrolese frontier, and German is now everywhere taught in the schools. A large portion of the population find occupation and profit in the summer in attending to the wants of the numerous visitors attracted by the scenery or the mineral waters. There is a considerable transport trade

with Italy, particularly in Val Tellina wines. Many of the young men seek their fortunes abroad as confec- tioners and coffee-house keepers.

Since Roman times the passes of the Grisons have been among the most frequented routes across the Alps. The Julier and Bernina, the Septimer, Spliigen, and Lukmanier, were the most used in the Middle Ages. In 1818-23 the great road of the San Bernardino was made, and it was soon rivalled by the Spliigen. The internal communica- tions of the canton have been greatly developed in the last twenty years. The following are the principal carriage roads:—(1) the Ober Alp, Vorderrheinthal to Uri; (2) the Valserberg, Ilanz to Hinterrhein ; (3) the Schyn, Julier, Albula, and Fluela Passes, connecting the Rhine valley and Davos district with the Engadine; (4) the Maloya and Bernina Passes, counecting the Upper Engadine with Chiavenna and Val Tellina respectively; (5) the Ofen Pass and the road following the gorge of the Inn to Fin- stermuntz, leading into Tyrol.

Two districts, the Upper Engadine and Davos, have lately acquired European fame as health resorts. Davos now receives every winter over 1000 consumptive patients. Statistics show that diseases of the lungs are very rare iu high mountain districts, and local doctors observed that inhabitants who had contracted them in the plain recovered speedily on their return home. Davos is singu- larly well situated for a sanatarium for these diseases. The climate, owing to its distance from the warm currents rising from the Italian plain, is, though severe, singularly dry and equable in winter, and the valley is open and sunny. Many good hotels offer every comfort to invalids.

History.—The Rheeti, the original inhabitants of the region now known as Graubiinden, who were conquered under Augustus by the Romans, are reputed to have been an Etruscan race who had emigrated thither 500 years B.c. The Romans established numer- ous roads through the country, and held it in subjection until the downfall of their empire. In 496 a.p. Theodoric the Great settled some Alemanniin Rhetia. In 807 the district was incorporated by Charles the Great in his empire, and placed under a temporal count. In the middle of the 11th century, in the confusion conse- quent on the fall of the duchy of Alemannia, the bishop of Chur regained part of the temporal authority some of his predecessors had already held

before 807, and in the early Middle Ages he appears as the most powerful among the petty rulers who disputed among themselves the right of oppressing the peasantry. Towards the end of the 14th century, the bishop of Chur supported the league formed by the neighbouring districts to resist the encroachment of the lay nobles. This was known as the Gotteshaushbund, and had Chur (sce Corre) as its chief town. In 1424 the Oberbund, sometimes called, perhaps from the grey coats of the delegates who assembled at Trons to confirm it, the Grauebund, was formed with the aid of the abbot of Disscntis and a party among the nobles in the Vorder Rheinthal. In 1436 the districts bordering on Tyrol, Which had been vassals of the counts of Toggenburg (till the extinction of the line in that year), concluded, in imitation of their neighbours, a league known as the Zehngerichtenbund, with Davos for its centre. In 1450 the Zehngerichte formed an alliance with the Gotteshausbund, in 1471 with the Grauebund; but of the so- called "perpetual alliance" at Vazerol near Tiefenkasten there exists no authentic cvidence in the oldest chronicles, It is certain, however, that several diets were held at Vazerol. Unhappily for the whole Grisons, nearly all the possessions of the Toggenburg family had fallen by 1489 to the house of Austria, to which an excuse was thus given for interferencein thecountry. In 1497 the Grauebund and in 1498 the Gotteshausbund entered into alliance with the seven Swiss cantons. In 1499 the contest with Austria broke out. The memorable victory of the Malserheide or Calveu, i which the impcrial troops were defeated with a loss of 5000 men,

coupled with other disasters to his arms in North Switzerland weakened the authority of Maximilian, but the rights of Austria in the Zehngerichtenbund were only extinguished by purchase in 1652. In 1512 the Grisons took advantage of the war in Italy to lay hands on Val Tellina, Bormio, Chiavenna, and Val Misocco.

These acquisitions attracted, a hundred years later, the cupidity of the Spanish governor of Milan. The Grisons, torn between the French and tlie Spanish, the Reformed and Catholic parties, offered a favourable field for his intrigues. In 1620 the Protestants of Val Tellina were cruelly massacred, the Spaniards gained the district, and an Austrian force occupied the

greater part of the Grisons, The Austrians were expelled in 1635 by the French, but the Grisons did not recover their full authority over their Italian possessions till 1639. They finally lost them when Napoleon annexed these districts to his Cisalpine republic, a measure confirmed by the con- gress of Vienna.

The obscure quarrels of the Planta and De Salis factions, dating from the 17th century, were put an end to by the Napoleonic wars and the appearance of great armies—French, Austrian, and Russian—upon the mountains. The incursion of the French was marked by the wanton destruction of the great convent of Dissentis, in which perished the chronicle of Dissentis, dating from the 7th century, and many of the MSS. of Placidus a Spescha, one of the first systematic explorers of his native Alps. In 1808 the Grisons, by virtue of Napoleou's act of mediation, became a member of the Swiss Confederation, retaining its internal government. This con- sists of a great council elected by universal suffrage, and meeting every year. Three citizens, elected yearly, form the executive government, A committee of 12 members assist them in weighty matters and in preparing bills for the chamber. Large powers of self-government are left to the separate communities. The consti- tution was last completely revised in 1853, but a further reform in an extreme democratic sense is now (1879) under debate.

For a list of ancient works on the Graubiinden, see Réder & Tscharner's Grau- biinden, Bern, 1838, and Georg of Basel's Bibliotheca Alpina Tertia, 1878. See also Theobald's Bundner Oberland and Naturdilder aus den Rhdtischen Alpen; Berlepsch's Graubtinden, Leipsic, 1858; Leonhardi's Das Poschiavino Thal, Leipsic, 1859; Lechner Das Thal Bergell, Leipsic, 1865; Coxe's Zravels in Switzer- land, 1780; Mrs H. Freshfield's Summer Tour in the Grisons, 1862; Conradin von Moor's Geschichte von Currdtien, Chur, 1870-74; P. C. Planta's Das alte Rdtien, Berlin, 1872; Davos by one who knows tt, 1878; Fortnightly Review, July 1878, Nov. 1879; Ball's Alpine Guide; and articles ALps and Engaping. (D. W. F.)

GRIVEGNEE, a town of Belgium in the arrondissement and province of Liége, is situated on the Ourthe about a mile and a half 8.W. of Liége. There are coal-mines in tlie neighbourhood, and the town posesses iron foundries

and manufactories of brass-wire, nails, and iron boats. The population is about 6000.

GROCYN, Witiram, an English scholar of the 15th century, was born at Bristol about 1442, Designed by his parents for the church, he was sent to Winchester College, and there he remained till his twenty-second year, when he was elected to a scholarship at New College, Oxford. In 1467 he became a fellow, and though in 1479 he accepted the rectory of Newton Longville in Buckinghamshire, he continued to reside in the university city. Having been chosen reader in divinity in Magdalen College in 1483, it fell to his lot to maintain a disputation with John Taylor, professor of divinity, in presence of King Richard ITI., and so well did he carry himself in the matter that tlie king sent him a buck and five marks. About 1488 Grocyn left England for Italy, and before his return in 1492 he had visited Florence, Rome, and Padua, and studied Greek and Latin under Demetrius Chalchondyles and Politian. As lecturer in Exeter College he found an opportunity of indoctrinating his countrymen in the new learning, and had the honour of teaching Greek not only to Sir Thomas More but to Erasmus himself, who was indebted to him also for an introduction to Archbishop Warham. When, some time afterwards, Grocyn removed to London, he was chosen by Dean Colet to deliver lectures in St Paul's; and in connexion with this engagement he gave asingular proof of his honesty. Having at first denounced all who impugned the authenticity of the Mverarchia Ecclesiastica ascribed to Dionysius the Areopagite, he was led to modify his views as he advanced in his investiga- tion of the subject, and at length openly declared that he had been completely mistaken. About this time he was evidently in straitened circumstances, and though in 1506

he was appointed on Archbishop Warham's recommenda- tion master or warden of All Hallow's College at Maidstone in Kent, we find him still obliged to borrow from his friends, and even to pledge his plate asa security. He died probably in 1519, and was buried in the collegiate church at Maidstone. With the exception of a few lines of Latin verse, and a letter to Aldus Manutius at the head of Linacre's translation of Proclus's Sphera (Venice, 1499), Grocyn has left no literary proof of his scholarship or

abilities. He was a great admirer of Aristotle, but his proposal to execute a translation of the philosopher in com- pany with Linacre and Latimer was never carried out. By Erasmus he has been described as " vir severissimee castis- sime vite, ecclesiasticarum constitutionum observantissimus pene usque ad superstitionem, scholastice theologiz ad un- guem doctus ac natura etiam acerrimi judicii, demum in

omni disciplinarum genere exacte versatus" (Declarationes

ad Censuras Facultatis Theologie Parisiane, 1522),

See John Noble Johnson, Life of Thomas Linacre, London, 1835; Wood's Athenee Oxonienses; Cunningham, Lives of Eminent Eng- lishmen, vol. it., 1885; Knight, Life of Erasmus.

GRODNO, a western province or government of Russia in Europe, lying between 52° and 54° N. lat., 23° and 26° E. long., and bounded N. by Vilna, E. by Minsk, 8. by Volhynia, and W. by the former kingdom of Poland ; area 14,961 square miles. The country is a wide plain, in some parts very swampy and covered with large pine forests. Of these that of Bieloviecza in the district of Prushana, comprising a circuit of over 100 miles, deserves notice, for here bisons are preserved, The navigable rivers are the Niemen, Bug, Narev, and Bobra. 'There are also several canals, among which those of Augustow and Oginsky are the most important. The soil, being chiefly alluvial deposit intermixed with sand, is favourable for agriculture and the rearing of cattle and bees. The atmosphere is damp and misty, and the climate in winter is cold. Large quantities of rye, barley, oats, hops, hemp, and flax are raised, but the amount of fruit and vegetables grown is small. The mineral products are insignificant. The manufactures consist of woollen cloths, hats, leather, paper, and spirits; there is also a good export trade in grain, wool, cattle, and timber. Some forty fairs are held annually in the province. Grodno is divided into nine districts, viz., Grodno, Brest, Bielostock, Bielsk, Volkovysk, Kobryn, Prushana, Slonim, and Sokolka. The administration of the whole province is in the hands of a governor appointed by the crown. In 1870 the popu- lation was 1,008,521, comprising Lithuanians, Russians, Poles, Tartars, and a few German colonists.

GRODNO, capital of the province of the same name, stands on the right bank of the Niemen in 53° 40'N, lat.,.23° 50' E. long., and is connected by railway with St Petersburg, Moscow, and Warsaw. It is the seat of the provincial government, and contains eight Roman Catholic, a Greek Eastern and two United Greek Catholic churches, a Lutheran chapel, and two Jewish synagogues. The Govern- ment office is a splendid edifice. There are two fine palaces erected respectively by Stephen Batory, who died here in 1586, and Augustus ITI., kings of Poland.. Among the other buildings are a public library, a school of medicine, a& gymnasium, and several seminaries. 'The inhabitants (24,789) are engaged in the manufacture of woollens, silks, hats, paper, and the preparation of wax. Three fairs are held annually. Grodno was built in the 12th century, and at the commencement of the 13th was annexed to Poland. The Polish diet held there in 1793 ratified the second partition of Poland. Two years later Stanislaus Augustus, the last king, signed his abdication there.

GROEN VAN PRINSTERER, WinnEL™ (1801-1876), Dutch statesman, historian, and publicist, was born at Voorburg, on August 21, 1801, received his grammar school

education at the Hague, and studied law, philosophy, and history at the university of Leyden. At the age of twenty- five he published a volume of miscellaneous essays (Vers- preide Geschriften, 1826), and in 1827 he was appointed private secretary to King William {. From this post he retired in 1833, in order that he might devote himself with less interruption to the historical researches which resulted in the gradual publication of his Archives ou Correspondance inédite de la Maison d'Orange-Nassau, in fifteen volumes (Leyden, 1835-64). An ardent conservative cn all the ecclesiastical and political questions of the day, he entered the chamber of representatives in 1840, and took part with both tongue and pen in all the more important discussions of the years that followed, especially in those of 1848 and 1849. Between 1849 and 1865 he frequently sat in the second chamber, and from 1850 to 1855 the anti-liberal newspaper WVederlander was managed by him. The mortifi- cation which European events in 1864 and 1866 had caused him found expression in the occasional writings entitled La Prusse et les Pays-Bas, A mes amis a Berlin, and L' Empire Prussien et L' Apocalypse (1867). Shortly afterwards he withdrew entirely

from public affairs, but continued his literary pursuits, his latest production Maurice et Barnevelt, an able vindication of the Calvinistic prince as against the Arminian statesman, having been completed (1875) only a short time before his death, which occurred 19th May 1876. Among other works of this author may be mentioned a Handboek der Geschiedenis van het Vaterland (1835), and an essay entitled Ongeloof en Revolutie (1847); but his sole claim to European celebrity rests upon the Archives, with their able if one-sided Prolegomena. The letters and docu- ments comprised in the series are of extraordinary interest and value for the whole of the important period which elapsed between the outbreak of the revolution in the Netherlands and the establishment of the commercial oligarchy upon the death of William II.

GRONINGEN, a town of the Netherlands, in the province of the same name, is situated on the Hunse at the influx of the Aa, 45§ miles in an eastward direction from Harlingen. The central and more ancient part of the town is still sur- rounded by the old ditch, and communication is maintained with the outer portions by eighteen bridges. In the centre of the old town lies a group of open places, of which the greatest, the Breedemarkt, is one of the most spacious in the Netherlands. Five of the principal streets bear the name of as many ancient families—the Boterings, the Ebbings, the Gelkings, the Huddings, and the Folkings. Among the public buildings of Groningen the town-house (Radhuis) is one of the finest. It was built between 1793 and 1810 according to the plans of Jacob Otten Husley, and was ex- tended in 1873. The administrative offices of the province of Groningen also occupy a fine building, which received a splendid front in 1870-1871. The provincial court of justice, transformed in the middle of the 18th century ; the corn exchange, dating from 1825; and the weigh-house, completed in 1874; the so-called Ommelanderhuis, or house formerly devoted to the adininistration of the surrounding district ; the civil and military prison ; and the arsenal, are also all worthy of mention. 'There are twelve churches in Groningen, including two for the Roman Catholics, and five for the Reformed Church of the Netherlands, as well as a Jewish synagogue. St Martin's, the Aa Church, and the New Church (all Reformed) are the principal. Of these the first is a Gothic building founded in 1253, and the last dates from the 17th century. The university of Groningen was founded in 1614, and its buildings were erected in 1847-1850. According to

the Annales Academici (Leyden, 1877), the number of the students in 1874 was only 178, the strongest faculty being that of the physical sciences with 57, It has a library, an observatory, botanical

gardens, an antiquarian museum, and a hospital among its auxiliary establishments. A fine deaf and dumb institu- tion, founded by Henri Daniel Guyot, a gyninasium, a normal college, a school.of navigation, a school of design, and a musical school are among the secondary educational establishments. A society pro excolendo jure patris has been In existence since 1761 ; an academy of fine arts was formed in 1830 by the incorporation of two older societies of similar character; and the same year saw the formal establishment of the society for the advancement of natural science, which may be traced back to the association started by Van Swinderen in 1801. Groningen maintains a con- siderable trade, and engages in a variety of industries. It manufactures salt, beer, vinegar, soap, earthenware, and ropes, weaves cotton and woollen stuffs, spins flax, makes brushes, furniture, mirrors, organs, and pianos, and has numerous goldsmiths and silversmiths. In 1840 the town and the suburbs comprised a population of 31,782. In 1870 the number of people in the commune, including 1248 on shipboard, was 37,894, and four years later it had increased to 39,284.

Mention is made of the Villa Cruoninga in a deed of gift from Henry III. to the chureh of Utrecht in 1040. In 1110 the town was surrounded with walls, but the bishop of Utrecht caused them to be dismantled in 1112, and it was not till 1255 that the defences began to be restored. The compass of the town, which at this time was about 13,000 feet, received considerable extension in 1469, when the walls were strengthened with six massive towers, and a ditch was dug. A further increase of defensive capabilities was effected in the course of the Gueldres war of 1514-36, and again under William Louis of Nassau between 1608 and 1624. The early history of Grouingen consists mainly of struggles with the bishops of Utrecht. In the course of the 13th century there is evidence that the commercial activity of its population was finding outlet in various directions, and in the 14th it attained to no small political influence as the chief city of Friesland.

Maximilian I. assigned Groningen to Albert of Saxony, but the citizens preferred to accept the protection of the bishop of Utrecht ; and when Albert's son George attempted in 1505 to seize the town, they recognized the lordship of Edzart of East Frisia. On George's renewal of hos- tilities they transferred their allegiance to Duke Charles of Guelder- land, and his position was sanctioned in 1515 by the emperor Charles V. In the course of the great wars of the 16th century the city had an eventful history, passing from hand to hand, and suffering all the miseries of siege and military occupation; but at length, in 1594, it was finally secured for the United Netherlands by Prince Maurice of Nassau. The dissensions between the citizens proper and the inhabitants of the "Ommelanden" continued, how- ever, in spite of the decree of the states in 1597, which was intended to set them at rest. In 1672 the town was besieged by the bishop of Miinster, but it was successfully defended, and in 1698 its forti- fications were improved under Coehorn's direction. The French tepublicans planted their tree of liberty in the Great Market on February 14, 1795, and they continued in authority till 16th November 1814. The fortifications of the city were doomed to destruction by the law of 18th April 1874. Among the numerous men of mark who have been natives of Groningen it is enough to mention J. D. Bernoulli the mathematician, Surenhusius and Schultens the Orientalists, and Hemsterhuis the philologist.

See Oudheden en Gestichten van Groningen uyt het Latin vertaald, door H. V. R., Leyden, 1724; Kronyk van Groningen ende Omme- landen tot op dezen Jaare 1748, Groningen, 1748; E. J. D. Lorgion, Geschiedkundige Beschrijving der Stad Groningen, Groningen, 1852-57 ; Album der Stad Groningen, Groningen, 1860 ; Wynne, Handel en Ontwikkeling van Stad en Provineie Groningen, Gron- ingen, 1865 ; Theodor Wenzelberker, in Ersch and Gruber's Encyclo- ar sub voce, 1872; Witkamp, Aardrijkskundig Woordenbock,

GRONOVIUS, or GRONOV, Jaxon (1645-1716), one of the very great scholars of the 17th century, was born 20th October 1645 at Deventer, where his father, J. F. GRovovius (¢.v.), was at that time professor of rhetoric and history. On the completion of his studies at Leyden, where he had early distinguished himself by his powers of intellectual acquisition, he in 1698 visited England, where he became acquainted with Pocock,

Pearson, and Mery Casaubon, and where he devoted several months to the collation of rare manuscripts at Oxford and Cambridge. His edition of Polybius, published at Leyden in 1670, iu

addition to his own and variorum notes, contained those which Casaubon on his deathbed had bequeathed to him. Declining an invitation to a chair at Deventer, he in 1671 visited France, and was brought into intimate relations with D'Herbelot, Thevenot, and other distinguished scholars ; and after another brief interval at Leyden he in 1672 travelled in Spain, whence he passed into Italy. There he accepted from the grand duke of Tuscany a chair at the university of Pisa, which, however, he resigned at the end of two years. Having returned to Deventer by way of Germany, he had settled down with the purpose of working uninterruptedly at an edition of Livy, when in 1679 he was invited by the curators of the university of Leyden to occupy a professorial chair. Here, untempted by several pressing invitations to various foreign universities, he spent the remaining years of his life, in which the calmness which normally characterizes even the most ardent scholarly research was unfortunately too often broken by literary quarrels conducted on his part with excessive violence and scurrility. He died 21st October 1716,

The most celebrated as well as the most important of the works of J. Grouovius is the Thesaurus Antiquitatum Gracarum (Leyden, 1608-1702, in 13 vols. fol., and Venice 1732-1737, also in 18 vols. fol.) For this invaluable collection he adopted the plan traced out by Grevius in the Thesaurus Antiquitatum Romanarum. Gro- novius published new editions of several authors commented on by his father, such as Seneca, Phedrus, and others ; and he also edited Macrobius, Polybius, Tacitus, Cicero, Ammianus Marcellinus, Quintus Curtius, Suetonius, Arrian, Minutius Felix, Herodotus, Cebes, and some ancient geographers ; the poem of Manetho, on the stars ; the Dactylotheca of Gorleus ; the Lexicon of Harpocration, &c. The other productions of Gronovius consist of theses, dis- courses, and diatribes, of which a list will be found in the Diction- natre of Chauffepié.

GRONOVIUS, or GRONOV, Joann Fariepricu (1613-1671), scholar and critic, was born at Hamburg, 20th September 1613. He went through his

early studies with great distinction at Bremen, and afterwards attended the universities of Leipsic, Jena, and Altorf, whence he extended his travels into France and Italy. In 1643 he was appointed professor of rhetoric and history at Deventer, and in 1658 he succeeded Daniel Heinsius in the Greek chair at Leyden, where he died on the 28th of December

1671.

Besides editing, with notes, Statius, Plautus, Livy, Pliny, Taci- tus, Aulus Gellius, and Seneca's tragedies, he was the author of numerous works which have been exhaustively catalogued by Chauffepié and others. They include De Sestertits, sive subsecivorwm Pecunice veteris Greece et oman Libri IV (1648), and notes upou Seneca, Phedrus, &c., which were subsequently utilized by his son Jacobus Gronovius in his editions of those authors.

GROOT, Gertarp (1340-1384), in Latin Gerardus Magnus, founder of the society of 'Brethren of the Common Life," was born in October, 1340, at Deventer, where his father held a good civic position. Other forms of the family name are Groote, Groct, and Groete. At the close of his school education, received partly at Deventer and partly at Aix-la-Chapelle and Cologne, Gerhard (" Gerrit" or " Geert") in his fifteenth year entered the university of Paris, where he became'firmly attached to the nominalism then in vogue, and where he made distinguished progress in almost all the branches of learning then cultivated,—canon law, medicine, astrology, and even magic being added to the theology and philosophy of the schoolmen. Shortly after his graduation in 1358, he returned to his father's house at Deventer, where, however, his stay was compara- tively brief. We next hear of him as learning and teaching in Cologne ; according to one account he studied also at Prague ; and in 1366 he visited, on public business it is presumed, the papal court at. Avignon. About this time he was appointed io a couple of canonries at Utrecht and Aix-la-Chapelle respectively, and the life of the brilliant young scholar was rapidly becoming luxurious, secular, and selfish, when a great spiritual change passed over him which

resulted in a final renunciation of every worldly enjoyment. This conversion, which took place in 1374, appears to have been due partly to the effects of a dangerous illness, and partly to the influence of the learned and pious prior of the Carthusian monastery at Munnikhuizen near Arnheim, who had seriously remonstrated with him on the vanity of his life. During the next five years he devoted a considerable portion of his time to repeated and prolonged visits to the monastery of the Augustinian canons regular at Viridis Vallis (Groenendael near Brussels), whose prior, Johann Ruysbroeck, a man of deep though somewhat mystical piety and of considerable literary power, could not fail to impress those who came in contact with him, and many of whose special views are unmistakably reproduced in the writings of Groot and his "fratres devoti." Between 1374 and 1379 Gerhard had also spent some three years in all at Munnikhuizen in study and prayer; and in the course of the last-mentioned year he left the privacy of the cloister, and having received ordination as a deacon, became a missionary preacher within the diocese of Utrecht. The success which followed his labours, not only in the town of Utrecht itself, but also in Zwolle, Kampen, Leyden, Delft, Gouda, Amsterdam, and many other places, was immense ; according to Thomas a Kempis, the people left their business and their meals to hear his sermons, so that the churches could not hold the crowds that flocked wherever he came. The impartiality of the censures, however, which he directed, not. only against the prevailing sins of the laity, but also against the heresy, simony, avarice, and impurity of the secular and regular clergy, soon provoked the un- compromising hostility of the entire body of the latter ; and accusations of heterodoxy speedily began to be brought against him. It was in vain that Groot emitted a Publica Protestatio, in which he declared that Jesus Christ was the great subject of his discourses, that in all of them he believed himself to be in harmony with the Catholic doctrine, and that he willingly subjected them to the candid judgment of the Roman Church. By a skilfully framed episcopal edict of 1883, which excluded from the pulpit all who had not received priest's orders, his public preaching was brought abruptly to an end; an appeal to Urban VI. was made in vain. Compelled thus to search for some other field of usefulness, Groot, in conjunction with his friend Florentius, a canon of Utrecht, began to superintend the labours of certain young men who employed themselves in transcribing manuscripts of church fathers and other authors ; from time to time as they met to receive payment for their

work, he sought to edify them with religious exhortation. Ultimately the idea suggested itself that the little band might throw their earnings into a common fund and live together according to a fixed rule. The house of Florentius forth- with became a cloister of "fratres vita communis," who were speedily joined by many new members, both clerical and lay, practised in a considerable variety of handicrafts ; the general rule of the Augustinian order was adopted ; it was also agreed that their daily bread should be shared in common, and that it should be earned, not begged. Groot's private estate sufficed for the establishment on like principles of a sisterhood who supported themselves by spinning, weaving, and needlework. After a com- paratively brief life of singular energy, patience, and self- denial, Groot fell a victim to the plague at Deventer on the 20th of August 1384. Within fifty years of his death the " Brethren of the Common Life," also called " Fratres bone voluntatis" or "Fratres Collationarii," numbered seventeen collegiate churches in the Netherlands, and con- tributed somewhat extensively to theological literature. Thomas a Kempis, who wrote a Vita Gerhardt Magni, was trained under Gerhard himself at Deventer. The order disappeared at the time of the Reformation.

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For a very clear and full account of the life of Groot, with an analytic and exhaustive catalogue of his extant works, reference may be made to the article on the " Brethren of the Common Life," by Hirsche, in Herzog's Real Eneyklopddie, ii. 679-696 (1878). The principal original authority is the work of Thomas a Kempis already referred to. See also Ullmann's Reformers before the Reformation, whose somewhat ex parte exposition of Groot's theological views, however, must be taken with reservations.*

GROS, ANToInE JEAN, Baron (1771-1835), the pupil of David and the forerunner of Géricault, occupies a peculiar position between the classic and romantic schools which divided opinion at the beginning of the present century. He was born at Paris in 1771. His father, who was a miniature painter, began seriously to teach him to draw at the early age of six, and showed himself from the first an exacting master. Towards the close of 1785 Gros, by his own choice, entered the studio of David, which he frequented

assiduously, continuing at the same time to follow the classes of the Collége Mazarin. The death of his father, whose

‘circumstances had been embarrassed by the Revolution,

threw Gros, in 1791, upon his own resources. He now devoted himself wholly to his profession, and competed in 1792 for the grand prix, but unsuccessfully. About this time he was, however, on the recommendation of the Iicole des Beaux Arts, employed on the execution of portraits of the members of the Convention, and wheu— disturbed by the development of the Revolution—Gros in 1793 left France for Italy, he supported himself at Genoa by the same means, producing a great quantity of miniatures and fixés. He visited Florence, but returning to Genoa made the acquaintance of Josephine, and followed her to Milan, where he was well received by her husband. On November 15, 1796, Gros was present with the army near Arcola when Bonaparte planted the tricolor on the bridge. Gros seized on this incident, and showed by his treatment of it that be had found his vocation. Bonaparte at once gave him the post of “inspecteur aux revues,” which en- abled him to follow the army, and in 1797 nominated him on the commission charged to select the spoils which should enrich the Louvre. In 1799, having escaped from the besieged city of Genoa, Gros made his way to Paris, and in the beginning of 1801 took up his quarters in the Capucins. His ‘esquisse” (Musée de Nantes) of the Battle of Nazareth gained the prize offered in 1802 by the consuls, but was not carried out, owing it is said to the jealousy of Junot felt by Napoleon; but he indemnified Gros by commissioning him to paint his own visit to the pest-house of Jaffa. Les Pestiférés de Jaffa (Louvre) was followed by the Battle of Aboukir 1806 (Versailles), and the Battle of Eylau, 1808 (Louvre). These three subjects—the popular leader facing the pesti- lence unmoved, challenging the splendid instant of victory, heart-sick with the bitter cost of a hard-won field—gave to Gros his chief titles to fame. As long as the military clement remained bound up with French national life, Gros received from it a fresh and energetic inspira- tion which carried him to the very heart of the events which he depicted; but as the army and its general separated from the people, Gros, called on to illustrate episodes representative only of the fulfilment of personal ambition, ceased to find the nourishment necessary to his genius, and the defect of his artistic position became evident. Trained in

the sect of the Classicists, he was shackled by their rules, even when—by his naturalistic treatment of types, and appeal to picturesque effect in colour and tone— he seemed to run couuter to them. In 1810 his Madrid and Napoleon at the Pyramids (Versailles) show that his star had deserted him. His Francis I. and Charles Vex 1812 (Louvre), had considerable success ; but the decora- tion of the dome of St Genevidve (begun in 1811 and com- pleted in 1824) is the only work of Gros's later years which

shows his early force and vigour, as well as his skill. The Departure of Louis XVIII. (Versailles), the Embarkation of Madame d'Angouléme (Bordeaux), the plafond of the Egyptian room in the Louvre, and finally his Hercules and Diomedes, exhibited in 1835, testify only that Gros's efforts — in accordance with the frequent councils of his old master David—-to stem the rising tide of Romanticism served but to damage his once brilliant reputation. Exasperated by criticism and the consciousness of failure, Gros sought refuge in the grosser pleasures of life, but suddenly his vital forces failed him, and on the 25th June 1835 he was found drowned on the shores of the Seine near Sévres. From a paper which he had placed in his hat it became known that "Jas de Ja vie, et trahi par les derniéres facultés qui la lui rendaient supportable, il avait résolu de s'en défaire." The number of Gros's pupils was very great, and was consider- ably augmented when, in 1815, David quitting Paris made over his own classes to him. Gros was decorated and named baron of the empire by Napoleon, after the Salon of 1808, at which he had exhibited the Battle of Eylau. Under the Restoration he became a member of the Institute, professor at the Kcole des Beaux Arts, and was named chevalier of the order of St Michel.

M. Delécluze gives a brief notice of his life in Louis David et Son Temps, and Julius Meyer's Geschichte der modernen franzisischen Malerei contains an excellent criticism on his works.

GROSBEAK (French, Grosbec), aname very indefinitely applied to many birds belonging to the families Pringillide and Plocecde of modern ornithologists, and perhaps to some members of the Emberizide and Tanagride, but always to birds distinguished by the great size of their bill.

Taken alone it is commonly a synonym of HawrFtnou (¢.v.), but a prefix is most usnally added to indicate the species, as

Pine-Grosbeak, Cardinal-Grosbeak, and the like. By earlier.

writers the word was generally given as an equivalent of the Linnean Loxia, but that genus, as first established, has been found to include many forms which, according to more recent notions, cannot possibly be placed in the same Family.

The Prvz-GrosBeak (Pinicola enucleator) is, with the exception of the Hawfinch just mentioned, the best known species to which the name is applied. It inhabits the conifer-zone of both the Old and the New Worlds, seeking, in Europe and probably elsewhere, a lower latitude as winter approaches —often journeying in large flocks ; and stragglers have occasionally reached the British Islands, though the records of not more than half a dozen such occurrences can be wholly trusted (Yarrell, Br. Birds, ed. 4, ii. pp. 177- 179). Instructure and some of its habits much resembling a Bullfinch (see Fincu, vol. ix. p. 192), but much exceed- ing that bird in size, it has the plumage of a Crossbill (vol. vi. p. 614), and appears to undergo exactly the same changes as do the members of the restricted genus Loxia,— the young being of a dull greenish-grey: streaked with brownish-black, the adult hens tinged with golden-green, and the cocks glowing with crimson-red on nearly all the body-feathers, this last colour being replaced after moulting in confinement by bright yellow. Nests of this species were found in 1821 by Zetterstedt near Juckasjirwi in Swedish Lapland, but little was really known with certainty concerning its nidification until 1855, when the late Mr Wolley, after two years' ineffectual search, succeeded in obtaining in the not very distant district of Muonioniska well-authenticated specimens with the eggs, both of which are like exaggerated Bullfinches'. The food of this species seems to consist of the seeds and buds of many sorts of trees, though the staple may very possibly be those of some kind of pine. The cock has a clear and pleasing song, which makes him in many countries a favourite cage-bird ; and the notes of the hen may even be deemed to qualify her as a musician of no small merit.

Allied to the Pine-Grosbeak are a number of species of smaller size, but its equals in beauty of plumage! These have been referred to several genera, such as Carpodacus, Propasser, Bycanetes, Uragus, and others; but possibly Carpodacus is sufficient to contain all. Most of them are natives of the Old World, and chiefly of its eastern division, but several inhabit the western portion of North America, and one, C'. githagineus (of which there seem to be at least two local races), is an especial native of the deserts, or their borders, of Arabia and North Africa, extending even to some of the Canary Islands—a singular modification in the habitat of a form which one would be apt to associate exclusively with forest trees, and especially conifers.

The VirGINIAN GROSBEAK, or Virginian Nightingale of many writers, Cardinalis virginianus, next claims notice here, though doubts may be entertained as to the family to which it really belongs. No less remarkable for its bright carniine attire, and the additional embellishment of an elongated crest of the same colour, than for its fine song, it has been an object of attraction almost ever since the settlement of its native country by Europeans. All American ornithologists speak of its easy capture and its ready adaptation to confinement, which for nearly three centuries have helped to make it a popular cage-bird on both sides of the Atlantic. The vocal powers possessed by the cock are to some extent shared by the hen, though she is denied the vivid hues of her partner, and her plumage, with exception of the wings and tail, which are of a dull red, is light olive above and brownish-yellow beneath. This species inhabits the eastern parts of the United States southward of 40° N. lat., and also occurs in the Bermudas. It is represented in the south-west of North America by other forms that by some writers are deemed species, and in the northern parts of South America by the C. pheeniceus, which would really seem entitled to distinction. Another kindred bird, placed from its short and broad bill in a different genus, and known as Pyrrhuloxia sinuata or the Texan Cardinal, is found on the southern borders of the United States and in Mexico; while among North American " Grosbeaks " must also be named the birds belonging to the genera Gutraca and Hedymeles—the former especially exeniplified by the beautiful blue G. cwrulea, and the latter by the brilliant rose-breasted H. ludovicianus, which last extends its range into Canada.

The species of the Old World which, though commonly called "'Grosbeaks," certainly belong to the family Ploceide, may be in this work more conveniently treated under the title of WEAVER-BIRDS (gq. .). (a. N.)

GROSE, Francis (c. 1730-1791), a celebrated English antiquary, son of a wealthy Swiss jeweller settled in England, was born at Greenford in Middlesex, about the year 1730. The bias of his mind towards heraldry and antiquities showed itself early ; and his father, indulging it, procured him a position in the Herald's College. In 1763, being then Richmond Herald, he sold his tabard, and shortly afterwards became adjutant and paymaster of the Hamp- shire militia, where, as he himself humorously observed, the only account-books he kept were his right and left pockets, into the one of which he received, and from the other of which he paid. This carelessness exposed him to serious losses; and after a vain attempt to repair them by accepting a captaincy in the Surrey militia, the competency left him by his father being squandered, he began to turn to account his excellent education and his powers as a draughts-

1 Many of them are described and beautifully figured in the Mono- graphie des Loxiens of the late Prince C. L. Bonaparte and Professor Schlegel (Leyden and Diisseldorf, 1850), a work which includes, how- ever, all the Crossbilis, Redpolls, and Linnets then known to the authors, while it excludes many birds that an English writer would have to call " Grosbeaks,"" M2097

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man. In 1757 he had been elected fellow of the Society of Antiquaries. In 1773 he began to publish his Antique ties of England and Wales, a work which brought him money as wellas fame. This, with its supplementary parts relating to the Channel Islands, was not completed till 1787. In 1789 he set out on an antiquarian tour through Scotland, and in the course of this journey met Burns, who composed in his honour the famous song beginning " Ken ye aught o' Captain Grose," and in that other poem, still more famous, "Hear, land o' cakes, and brither Scots," warned all Scotchmen of this "chield amang them taking notes." In 1790 he began to publish the results of what Burns called "his peregrinations through Scotland ;" but he had not finished the work when he bethought himself of going over to

Ireland and doing for that country what he had already done for Great Britain. About a month after his arrival, however, while in Dublin at the table of his friend Hone, he was seized with an apoplectic fit, and died in a moment, June 12, 1791.

Grose was a sort of antiquarian Falstaff,—-at least he possessed in a striking degree the knight's physical pecu- liarities ; but he was a man of true honour and charity, a valuable friend, "overlooking little faults and seeking out greater virtues," and an inimitable boon companion. His professional merits were far from contemptible ; he was a clever draughtsman, and had considerable power of pictorial composition, While most of his writings concern only the learned, others exhibit strong satiric power. But he showed to greatest advantage as a social being; his humour, his varied knowledge, and his good nature were all eminently calculated to make him a favourite in society. As Burns says of him—

' But wad ye see him in his glee,

For meikle glee and fun has he, Then set him down, and twa or three Gude fellows wi' him ;

And port, O port/ shine thou a wee, And THEN ye'll see him!"

Grose published The Antiquities of England and Wales, 6 vols. fol., 1773-87. In 1782 appeared Advice to the Officers of the British Army, a satire in the manner of Swift's Directions to Ser- vants, which is very confidently attributed to Grose ; in 1783, 4 Guide to Health, Beauty, Riches, and Honour, a collection of advertisements of the period, with characteristic satiric preface; in 1785, A Classical Dictionary of the Vulgar Tongue, 8vo; 1785-89, A Treatise on Ancient Armour and Weapons; in 1786, Darrell's History of Dover; 1786-88, Military Antiquities, 2 vols. 4to; 1787, A Provincial Glossary; 1788, Rules for Drawing Caricatures, 8vo; 1789-91, The Antiquities of Scotland, 2 vols. 4to; 1791, Antiquities of Ireland, 2 vols. 4to, edited and partly written by Ledwich. Zhe Grumbler, sixtecn clever humorous essays by Grose appeared in 1791 after his death ; and in 1793 The Olio, a collection of essays, jests, and small pieces of poetry, highly characteristic of Grose, though certainly not all by him, was put together from his papers by his publisher, who was also his executor. A capital full-

length portrait of Grose by Dance is in the first volume of the Antiquities of England and Wales, and another is among Kay's Portraits. A versified sketch of him appeared in the Gentleman's Magazine, vol. 1xi. p. 660. See Gentleman's Magazine, vol. 1xi. pp. 498, 582; Noble's Hist. of the College of Arms, p. 434. ~

GROSSENHAIN, a town in the circle of Dresden, Saxony, is situated on the Réder, an affluent of the Elbe, 20 miles N.W. of Dresden. It lias manufactures of woollen and cotton stuffs, buckskin, silk thread, and waxcloth, The principal buildings are the church of Our Lady com- pleted in 1748, the real school of the second order, the new town-house completed in 1876, the infirmary, and the poorhouse. The population in 1875, including the gar- rison, was 10,686.

Rac owes its origin to the Sorbs, and obtained the rank of a town in the 10th century. It was for a time possessed by the Bohemians, by whom it was strongly fortified. It afterwards came into the possession of the counts of Meissen, from whom it was taken in 1312 by the margraves Waldemar and John of Branden-

burg. It suffered considerably in all t r i 1744 was nearly destroyed by ee oe

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GROSSETESTE, Rosert (c. 1175—i253), in some respects the most distinguished of all the English medizval prelates as regards his personal influence both over the men of his time and on its literature, was born of humble parents at Stradbrook in Suffolk about the year 1175. All that is known of his early years is (from his own account) that he studied the characters of the best menin the Scrip- tures, and endeavoured to conform his actions to theirs. He was sent by his friends to Oxford, where he studied law and medicine, and seems to have finished his education at Paris, where he probably laid the foundation of his knowledge of Greek and Hebrew. His first patron was William de Vere, bishop of Hereford, to whom he was introduced by Giraldus Cambrensis, but who died in 1199, and thus had little opportunity of assisting the young scholar. From Paris he returned to Oxford, graduated in divinity, and became master of the schools (rector scolarum) or chancellor. He also became the first rector of the Franciscans

at Oxford. Here he probably wrote his commentaries on Aristotle, and laid the foundations of his fameas a preacher. His earliest preferment of which we can speak with certainty was the archdeaconry of Wilts, which he held in 1214 and 1220; he was archdeacon of Northampton in 1221, holding at the same time the prebend of Empingham, which belonged to thearchdeaconry. This he exchanged for the archdeaconry of Leicester, which he probably held till 1232. In May 1225 he was collated by Hugh de Wells, bishop of Lincoln, to the church of Abbotsley, Hunts, and at one time he held the rectory of St Margaret's, Leicester. In 1231 he probably wrote his treatise De Cessatione Legaliwm with the view of converting the Jews, for whose benefit the Domus conver- sorum was established in London this year. A fever in November 1232 induced him to resign all his preferments excepting his Lincoln prebend, and the leisure he thus obtained was spent at Oxford, and probably employed in writing his mathematical treatises and his theological Dicta. On the death of Bishop Hugh de Wells in February 1235, the chapter of Lincoln elected Grosseteste to the see; the election took place on March 27, and he was consecrated at Reading onJune 17. His administration of his diocese, then the most extensive in the country, was characterized by great vigour. Within a year of his consecration he visited the monasteries, removing seven abbots and four priors ; and in 1238 he issued his constitutions, embodying the points discussed at the great council of the Church of Englaud held in London in 1237, concerning which he had already written to his archdeacons; at the same time, as diocesan of Oxford, he exercised a watcliful supervision over the university, protecting the scholars who were in trouble for their attack on the legate Otho in 1238, and even entering into such matters of detail as the place where the university chest should be kept. His energy in his visita- tions did not pass without opposition; an attempt on his life by poison was made in 1237, from which he recovered with difficulty through the help of John de 8. Giles; and in 1239 began the quarrel with the chapter of Lincoln, which lasted six years, and was only quieted by the decision of the pope himself. They claimed exemption from episcopal visitation, and spoke of the bishop's demanding what had never from the earliest times been the custom. He would not tolerate an imperium in tmperio, a body of men joined by common interests, who declined to submit to his juris- diction, and who might be in need of visitation and correc- tion as much as auy others. Full details are given in the bishop's letters of the progress of the quarrel;

appeals to Canterbury and the Roman court were followed by excom- munications on both sides, the chapter even condescending to exhibit a forged paper as to the history of the church and see of Lincoln. The question was at length settled by a personal appeal to Pope Innocent IV. at Lyons. In a

pull of August 25, 1245, he decided almost all the points at issue in favour of the bishop, who lost no time in putting his powers into execution. Of his own view of the matter a very curious exemplification is given in the letter or pamphlet sent to the chapter (epist. 127), where his right to visit them is proved by all kinds of mystical arguments and scriptural examples. In 1242, with the help of one Nicholas, a Greek, clerk of the abbey of St Alban's, he translated the V'estamenta XII Patriarcharum, which had been brought from Athens by John of Basingstoke. In 1243 occurred the serious quarrel with the chapter of Canterbury (the see being practically vacant, as Boniface was not yet consecrated) respecting the abbey of Bardney, —the bishop deposing the abbot in spite of his appeal to Canterbury, and the monks in an especially solemn manner excommunicating the bishop. On receiving the letters from the convent, he threw them on the ground, in spite of the seal containing the effigy of St Thomas, and paid no attention whatever to the sentence. Both parties appealed to the pope, and an arrangement was made between them. In 1244, being one of a committee of twelve chosen to determine what answer should be given to the king's demand of a subsidy, his influence kept the members from being separately won over by the king's endeavours to make parties among them; and the council broke up without giving way to the royal demands. The same year his examination of Robert Passelew, who through the king's influence had been elected bishop of Chichester, though utterly unfit, caused the election to be annulled. On return- ing from Lyons we find Grosseteste executing various com- missions with which he was entrusted by the pope; urging on tle archbishop of York the claims of the bishop of Cervia; endorsing aud sending round the papal letter allowing Arch- bishop Boniface the revenues of all benefices in his province that should fall vacant within the next seven years till 10,000 marks should be collected, in order to free the see from its debts; and insisting on the bishops paying the sub- sidy demanded by the

pope, in spite of the king's opposi- tion. In this year (1245) he obtained a bull to prevent any of the Oxford scholars graduating in arts without passing through the usual examinations secundum morem Parisiensem, and without having been approved by the bishop himself or one appointed by him. In 1247 he delivered an address vindicating the genuineness of the relic (a portion of our Lord's blood) presented by the king to Westminster. His visitation of his diocese, especially of the monasteries in it, and his superintendence of the studies of Oxford, which went on without interruption during these years, while inducing others of the bishops to follow his example, were not accomplished without serious troubles, embroiling him even with the king. Thus, in 1250, his visitation having proved that many of the re- ligious houses had converted to their own uses certain possessions which belonged to the parishes, which were thus impoverished and left without resident priests, he procured a papal letter authorizing him to revoke what they had thus obtained, citing all the beneficed monks in his diocese to hear the letter. Those who had exemptions appealed to the pope, and Grosseteste again crossed the sea to lay the case before him. But the gold of the religious orders had been at Lyons before him, and the pope sent him away from his presence in confusion, hopelessly exclaiming against the power of money at the Roman court. He was not, however, downhearted, but busied himself in other affairs, and delivered before the pope and certain cardinals his celebrated sermon on the abuses of the papal court. Here he stayed till the end of September, and then returned in sad plight to England, almost thinking of resigning his see in despair. But he soon recovered from this, and pursued his visitation of the monasteries with still greater vigour, so as to be

accused by Matthew Paris of tyranny such as to make him be thought, "' not severe, but rather austere and inhuman." In 1251 he was suspended by the pope in consequence of his refusing to admit an Italian ignorant of English to a rich benefice in his diocese. The suspension was short, as he officiated at Hales this year, on the dedication of the church founded by Richard of Cornwall, his position among the bishops being shown by his celebrating mass at the high altar. In 1252 he obtained a papal letter authorizing the appointment of vicars, and their payment out of the

revenues of their livings; and in the same year his influ- ence kept the bishops together in their resistance to the royal demands of a tenth of church revenues for three years granted by the pope, nominally for the king's necessities on his intended crusade. He had also this year a calculation made of the revenues of the foreigners in England, which amounted to more than 70,000 marks. In 1253 the pope ordered him to induct by provision his nephew Frederick di Lavagna into a canonry at Lincoln ; the bishop's answer to the requisition sent to the papal commissioners (the arch- deacon of Canterbury, and Innocent, the pope's notary), though of less importance than many of his other letters, has done more to make his fame popular and permanent than any of his works. He is very decided in refusing to institute the candidate from his unfitness, at the same time that he expresses the utmost reverence for the pope and the Roman see. The letter made the pope very angry, and he was only quieted by the advice of the cardinals, who spoke in the highest terms of the bishop's character and position. Grosseteste was present at the parliament in May, when the violators of Magna Charta were again excommunicated; not content with this, he had the sentence read in every parish in the diocese of Lincoln. In October he fell ill at his manor of Buckden, where he died on October 9th. He was buried on October 13th in Lincoln Cathedral, the arch- bishop performing the service and many other bishops assisting. Bells were said to have been heard in the air on the night of his death, and miracles to have taken place at his tomb. The pope is said to have expressed joy at his death, and to have desired to have his bones cast out of the church. The story of the pope's dream, that the bishop appeared to him and struck him in such a manner as to cause his death, shows what the popular estimation of the two was. It is perhaps not to be wondered at that the attempt to procure the canonization of the bishop in 1307 failed.

How great the personal influence of Bishop Grosseteste was may be chiefly learnt from his letters: he was the instructor of the king (e.g., in one of his letters on the value of the royal anointing), the friend of the queen, the tutor of Simon de Montfort's sons, his warner and consoler at different times, the correspondent of Adam de Marisco, the referee of many as to spiritual difficulties. Of those who speak of him, one is especially struck by his courage, another by his universal knowledge, a third by his subtlety in interpreting scripture, a fourth by his frequent preach- ing. Even Matthew

Paris, no favourable judge, warms into admiration in speaking of his character (Chron. Maj. v. p. 408). The popularity of Grosseteste as an author is proved by the number of manuscripts remaining of his works, and from the fact that very few writers for the two centuries following his death do not contain quotations from Lincolniensis. His determination to root out all abuses is seen in his opposition to unjust de- mands of the king or the archbishop, to unfit nominees of the pope, indeed to the whole system of papal pro- visions. That he was of a hasty temper, and harsh and severe at times, is true; but no one ever more thoroughly tried to do his duty, probably few have effected more.

The chief sources for the facts of his life are his own letters, those of Adam de Marisco, the History of Matthew Paris, andthe Annals of Dunstable. Of his works, a fragment of the De Cessatione Legaliwm was printed in London, 1658; a selection of his letters was printed by E. Brown in the Appendix to his Fasciculus Rerum Expetendarum et Fugiendarwm, 1690, and a complete edition in the Rolls series of chronicles and memorials, 1861, by H. R. Luard. Brown printed also some of his sermons. The tract De moribus pueri ad mensam was printed by W. de Worde, and that "De phisicis, lineis, angulis, et figuris per quas omnes actiones naturales complentur" at Nuremberg, 1503; and others of his mathematical treatises are in print. His French poem Le Chastel @ Amour, and an English version called The Castel of Love, have been printed for the Caxton and Philological Societies. Separate lives of him have been written by Samuel Pegge, 1793, and G. G. Perry, 1871. Complete lists of his works are given by Oudin, Tanner, Fabricius, &c. In Pegge's life, the list fills 23 quarto pages. (H. R. L.)

GROSSETO, a town of Italy, at the head of the province of the same name, is situated in the Maremma district, near the right bank of the Ombrone-Senese, with a station on the railway between Florence and Rome. It is well built and surrounded with solid walls about 2 miles in circuit, and among its public edifices is a spacious cathedral with a marble facade; but the principal interest of the place results from the great hydraulic labours by which the surrounding swamp——the Lacus Prelius of Cicero— has

gradually been drained and rendered capable of tillage. Drinking water, of which the town was formerly almost destitute, has been supplied by an artesian well of enor- mous depth, bored since 1833. About 34 miles to the N.E. lie the sulphurous baths of Roselle (Aque Lusel- larum), and about 2 miles further off are the ruins of the ancient Htruscan city of Rusella, the walls of which are about 2 miles in circumference. Roselle continued to be inhabited till the close of the 13th century, but its uulealthi- ness gradually constrained the inhabitants to remove to Grosseto, which is first distinctly mentioned in 830 in a document of Louis I., and became a bishop's see in 1138. For some time Grosseto was under the sway of the Aldo- brandini family, and it was afterwards subject to the republic of Siena, which treated it badly. Francis I. furnished it with a fortress and walls, and Ferdinand I. made it a regular place of arms. At present the climate is so unhealthy in summer that the provincial authorities remove to Scansano. The population of Grosseto in 1871 was 3290 in the town proper, 4151 including the suburbs, and 6316 in the commune.

GROSSI, Tommaso (1791-1853), Lombard poet and novelist, was born at Bellano, on the Lake of Como, January 20, 1791. He took his degree in law at Pavia in 1810, and proceeded thence to Milan to exercise his profession ; but the Austrian Government, suspecting the young bar- rister's loyalty, interfered with his prospects, and thus it happened that Grossi was a simple notary all his life. That the suspicion was well grounded he soon showed by writing in the Milanese dialect the battle poem La Prineide, in which he described with vivid colours the tragical death of Prina, chief treasurer during the empire, whom the people of Milan, instigated by Austrian agi- tators, had torn to pieces and dragged through the streets of the town (1814). The poem, being anonymous, was first attributed to the celebrated Porta, but Grossi of his own accord acknowledged himself the author. In 1816 he published other two poems, written likewise in Milanese —The Golden Rain (La Pioggia d'Oro) and The Fugitive (La F uggitiva). These compositions secured him the friendship of Porta and Manzoni, and the three poets came to form a sort of romantic literary triumvirate. Grossi ioe ee of the popularity of his Milanese poems Soa a ; ili pe ee which he sought to introduce the ati eco Se ah ad. given such satisfaction in his

3 and in this he was entirely successful

with his poem J/degonda (1814), He next set about writing an epic poem, entitled 7'he Lombards in the First Crusade, a work of which Manzoni makes honourable mention in his Betrothed. This composition, which was published by subscription (1826), attained a success that has not been equalled by that of any other Italian poem within the century. The example of Manzoni, who had meanwhile published Zhe Betrothed (1827), induced his friend Grossi to enter the same arena with an historical novel entitled Marco Visconti (1834)—a work which contains passages of fine description and deep pathos. A little later Grossi published a tale in verse, Ulrico and Lida, but with this publication his poetical activity ceased. After his marriage in 1838 he continued to employ himself as a notary in Milan till his death on December 10, 1853.

GROSSWARDEIN (Hungarian, Vagy-Varad), a royal free city, and capital of the county of Bihar in the Trans- Tibiscan circle, Hungary, is situated in a beautiful plain on the banks of the river Sebeskorés, 47° 3' N. lat., 21° 53' E. long, It is the seat of a Roman Catholic and of a Greek (Old-United) bishopric, of a royal court of justice, of the county assizes, and of a board of assessment, and is the headquarters of the divisional regiments and militia (honvéd). The town consists of Nagy-Varad proper, with Varad-Olaszi, Varad-Velencze, and Vdarad-Varalja. The streets and squares are well laid out, and adorned with many fine public and private buildings. Among tliese are sixteen Roman Catholic churches, of which the most striking is the cathedral ; two Calvinist, one Lutheran, one Old-United and two Orthodox Greek churches, and a Jews' synagogue. The other noteworthy edifices comprise the county and town halls, two episcopal palaces, chapter and clergy houses, hospitals, cloisters belonging to the Compassionate Brothers, and a convent for Ursula nuns, several manu- factories, a large and handsome railway station, a prison, and barracks. Among the educational establishments are the royal law academy, a Roman Catholic gymnasium and seminary for the education of priests, a Calvinist school, and a gymnasium for adherents of the Old-United or Catholic Greek confession, two institutes for training teachers, a military academy, a real-school, and an orphan asylum. 'The inhabitants are chiefly employed in industrial and commercial pursuits ; and the neighbourhood yields a good

supply of wine, fruit, and agricultural produce. The great fairs periodically held in the town attract strangers from a considerable distance. Grosswardein is the point of junction of the Alfold-Fiume, Tibiscan, and Hungarian Eastern railroads. Not far from the town are the much-frequented warm springs of Piispékfiirdé (Bishop's-bath). In 1870 the population was 28,700, of whom the majority were native Magyars, the rest chiefly Germans aud Wallachs.

Grosswardein is one of the oldest towns in Hungary. Its Roman Catholic bishopric was founded by St Stephen of Hungary at the commencement of the 11th century. It was there that peace was concluded on 24th February 1538, between Ferdinand I. of Austria and his rival John Zapolya, waiwode of Transylvania. In 1556 it passed into the possession of Transylvania, but afterwards reverted to Austria. In 1598 the fortress was unsuccessfully besieged by the Turks ; in 1660, however, it fell into their hands, and was ceded to them by the treaty of Vasvar (Hisenburg), 10th August, 1664. In 1692 it was recovered by the Austrians. The Greek Old-United or Catholic bishopric was founded in 1776. From its vicinity to Debreczin, the temporary seat of the Hungarian revolutionary government during the early part of the year 1849, Grosswardein became for a time invested with additional importance, as the depository of the state archives, bank-note press, and arms manu- factory.

GROTE, Gzorce (1794-1871), the historian of Greece, eminent also as a philosopher, a politician, and a labourer in the advancement of university education, was born on the 17th of November 1794, at Clay Hill, near Beckenham in Kent. He drew his lineage from a Dutch, or, more strictly speaking, a Low German family. 'The name (Groot,

equivalent to "'great,") is the same as that of Hugo Grotius, with whom the Grotes would gladly have traced a relation- ship, but the evidence was wanting. George Grote's grand- father, Andreas (born in 1710), a merchant of Bremen, removed to England, and after some years of successful business joined Mr George Prescott in founding the banking- house of " Grote,

Prescott, & Company " (January 1, 1766). He was married twice. His eldest son by his second marriage, George (born in 1762), was married (in 1793) to Selina, daughter of the Rev. Dr Peckwell, one of the countess of Huntingdon's chaplains, whose portrait is pre- served in the vestry of the chapel at Chichester, where he ministered. Dr Peckwell was descended on the mother's side from the French Protestant family of De Blosset, who had left Touraine in consequence of the revocation of the edict of Nantes ; and thus the historian, who was the son of George Grote and Selina Peckwell, had a share of that Huguenot blood which has been a rich source of intellectual as well as industrial life in England.

Like many other eminent men, George Grote owed much of his future intellectual greatness to his mother's careful training. Having a strong desire to see her son excel in learning, she taught him reading and writing herself, and even grounded him in the elements of Latin before he was sent to the grammar school at Sevenoaks, in his sixth year (1800). The four years spent there gave an earnest of his whole future life. In the language of his biographer, who has lately attained the end of a life inseparably interwoven with his, " he evinced a decided aptitude for study, being rarely found behindband with his tasks, and ranking habitually above boys of his age in the class to which he belonged." In his tenth year he was removed to the Charter-house, the

headmaster of which, Dr Raine, had the honour of training, |

along with George Grote, Connop Thirlwall, Dean Wad- dington and his brother Horace, Sir Cresswell Cresswell, Sir Henry Havelock, and other men of future distinction. Grote was not allowed to share the course of most of his schoolfellows at a university ; but this great privation was turned into a pre-eminent distinction by the resolution with which his own strong will and untiring industry supplied the loss. The supposed advantage of an early application to business led the father to take George into the bank at the age of sixteen. But his six years at the Charter-house had not only imbued him with a strong taste for classical learning, but had supplied him with that motive to high culture, which forms the most convincing argument in its favour, and to which he remained faithful through a half century of educational disputes and heresies. It was not as an alternative to a life of

business, but as its proper complement, that he chose and advocated ancient learning. " Looking forward," says his biographer, "to a commercial course of life, certain to prove uninteresting in itself, he resolved to provide for himself the higher resources of intellectual occupation." Engaged in the bank throughout the day, he devoted his early mornings and evenings to a systematic course of reading, of which the chief subjects were the ancient classics, history, metaphysics, and political economy, to the last of which he was attracted by the writings of David Ricardo, whose personal acquaintance he formed in 1817. To these studies he added the learning of German by the aid of a Lutheran clergyman, which, together with his knowledge of French and Italian, placed the stores of Continental scholarship within his reach. His chief recreation was music, and he learned to play the violoncello, to accompany his mother, who was a fine musician. Arrived at the age of manhood (in the winter of 1814-1815), he formed the acquaintance of the young lady who afterwards became his wife, devoted to and worthy of him, the very complement of his life, intellectual as well as social, and finally his biographer in a spirit of loving but

not indiscriminate admiration. This was Miss Harriet Lewin, the daughter of Mr Thomas Lewin, of Bexley, in Kent, a gentleman of old family and independent fortune. She was born at Southampton, July 1, 1792, and was consequently nearly two years older than Grote. From canses which need not be related here their intimacy was suspended for three years, during which Grote's studies made steady progress. To this period belongs his earliest literary composition, an essay on his favourite Lucretius, which still exists in MS. His letters also record the careful study of Aristotle, his final estimate of whom formed his last unfinished work. But the most interesting light is thrown on the method and course of his studies in the diary which he kept for Miss Lewin's information. This record bears witness, not only to the wide diversity of his studies in ancient and modern literature, philosophy, and political economy, but also to the fact that he read the authors themselves whom he wished to know,—read them as a whole, instead of merely reading what others had written about them.

An epoch, perhaps the most critical turning-point of Grote's intellectual life, was formed by his introduction, through David Ricardo, to James Mill, who was then com- posing his metaphysical work entitled An Analysts of the fluman Mind. Already attracted to this study, Grote became Mill's admiring disciple in mental and _ political philosophy. From this time he adopted the fixed principles, from which he never receded, of experience as the source of all knowledge, and utility as the foundation of morals. The views derived from Mill were confirmed by the teaching of Jeremy Bentham, and by intercourse with a band of young disciples, over whom tle two philosophers wielded an unbounded influence. Among these John Stuart Mill began now to make his appearance as a boy of twelve years old. It is important to note the influence which the study of metaphysics exercised upon the development of Grote's intellectual character. To the general public he is chiefly known as an historian; but he was equally dis- tinguished asa metaphysical philosopher. To the teaching of James Mill may also be traced his democratic principles and his zeal for freedom of thought, hardening into in- tolerance of all religious systems and their ministers. But, however they may have determined his course upou certain occasions, these antipathies never struck their root down into the real soil of his gentle and courteous nature.

In 1820, at the age of twenty-four, he was married to Miss Harriet Lewin. They lived at first at the banking- house in Threadneedle Street. The confined situation soon told on Mrs Grote's health, and the death of her only child, a week after its birth, was followed by a dangerous illness. It was at her bedside at Hampstead, during her slow recovery, that Grote composed the first work he pub- lished, an Essay on Parliamentary Reform, in reply to an article by Sir James Mackintosh in the Edinburgh Remew, No. 61 (1821). The pamphlet is a vigorous assertion of the broadest principles of popular representation, in oppo- sition to a scheme of class representation sketched by the reviewer. It proclaimed Grote's adherence to those political views held by the party afterwards called the "philosophic radicals," and it strongly pleaded for the vote by ballot, of which he afterwards became the parliamentary advocate. The most important parts of this paniphlet were embodied in his later essay on the Hssentials of Parlia- mentary Reform (1831), reprinted in his Minor Works.

In April 1822 Grote sent a vigorous letter to the Morning Chronicle in reply to Canning's speech against Lord John Russell's motion for reform. In the same year he spent much time upon some MSS. of Jeremy Bentham, which the aged philosopher entrusted to his young disciple to put into areadable form. After carefully digesting and

arranging them, he published them anonymously in a small 8vo volume, entitled Analysis of the Influence of Natural Religion on the Temporal Happiness of Mankind, by Philip Beauchamp. Meanwhile the quiet course of life went on in Threadneedle Street. The scanty leisure of each day was devoted to the joint studies of husband and wife, for "Mrs George Grote was habitually studious, after her fashion, under the direction of her husband, who laid great stress upon her cultivating the ratiocinative vein of instruc- tion—above all, logic, metaphysics, and politics ; and she accordingly strove to master these subjects, out of deference to his wish, and in order to qualify herself to be associated with his intellectual tastes and labours as time wore on." Their pleasures were likewise in common; the wife, who was an accomplished musician, learnt the violoncello to accompany her husband; but he dropped his music in 1830. A circle of

congenial minds frequented the house in Threadneedle Street from 1822 to 1830. Within that choice society there was a narrower circle of students, who met there twice a week at half-past eight in the morning for an hour or two's reading. Among others were John Stuart Mill, Charles Buller, and John Arthur Roebuck. They read the most recent works on metaphysics and kindred subjects in the light of their adored teachers, Bentham and James Mill, beyond whom they believed all to be in Cimmerian darkness.

The year 1823 marks the epoch of the first conception of Grote's great work; and an extant letter shows the spirit in which he approached it. On January 14th he writes :—" I am at present engaged in the fabulous ages of Greece, which I find will be required to be illustrated by bringing together a large mass of analogical matter from other early histories, in order to show the entire uncertainty and worthlessness of tales to which early associations have so long familiarized all classical minds. I am quite amazed to discover the extraordinary greediness and facility with which men assert, believe, re-assert, and are believed. The weakness appears to be next to universal, and I really think that one ought to write on the walls of one's dressing-room the caution of the poet Epicharmus :—

Nijpe, kal wéuvno' amiorety, &p0pa ravTa Tav ppévav.

The subject ever present to his thoughts came up so often in the discussions with his friends as to suggest to his wife's sympathy and ambition for his fame the definite work of his future life. One day she said to him—" You are always studying the ancient authors whenever you have a moment's leisure, now here would be a fine subject for you to treat. Suppose you try your hand!" "The idea" (she adds) " proved acceptable to the young student, and, after reflecting for some time, he came to the resolution of enter- ing upon the work." Henceforth this definite aim prevailed amidst the still wide range of reading which threw new light from all quarters upon the central object, and the mass of notes and extracts still preserved attest the diligence with which he prepared for it, Happily for himself and for the world, he was diverted from the work till he could resume it, not only with that clearer mental perspective in which a long meditated object appears when we return to it afresh, but with the enlarged experience of nearly twenty years occupied in practical politics and converse with statesmen, abroad as well

asat home. Mean- while he gave the world an earnest of his work in an ex- haustive review of Mitford's History of Greece in the West- minster Review for April 1826,—one result of which was a letter from Niebuhr, clearly designating Grote as the historian of Greece, and inviting lim to a visit which events never permitted him to pay.

From 1825 to 1827 Grote took part in the scheme of founding the " University of London " in Gower Street, with the management of which institution he became after-

wards intimately connected. As the political crisis of 1830 approached, public and private events conspired te draw Grote into the vortex of politics. The failure of his father's health gave him a new position in the bank; and in the spring of 1830 he was able to arrange for a visit to the Continent, which brought him into connexion with the liberal politicians of Paris on the eve of the revolution, An interesting record of the state of affairs and of the impressions of this visit are preserved in Mrs Grote's Life of Ary Scheffer, published in 1860. The travellers were recalled in June by the illness of Grote's father, who died before their arrival, at the age of 70.

Thus, in his 36th year, George Grote, now the head of the family, found himself master of his own affairs, and of about £40,000 personal property, besides the family estates in Lincolnshire and Oxfordshire. His business and studies alike led him to fix his residence in London ; and the first use he made of his wealth was to subscribe £500 to the revolutionary committee of the Hotel de Ville, with an offer to come himself to Paris if his presence would be of any ase. The pressure of business as his father's executor kept him, in spite of strong solicitations, out of any active part in the agitation for reform, but did not prevent the steady progress of the History, which Mrs Grote writes (February 1, 1831), "mast be given to the public before he can embark in any active scheme of a political kind." He refused an invitation to stand for the city in 1831; but he made an able contribution to the argument in a statement of the Essentials of Parliamentary Reform, published this year, to which reference has already been made. His reluctance to enter parliament was overcome after the passing of the Reform Act in 1832; and, being returned at the head of the poll, he appeared as one of the members for the city of London in the first reformed

parliament, which met on February 4, 1833, He at once gave notice of a motion for the vote by ballot in parliamentary elections, which he brought before the house on the 25th of April following. His speech on that occasion was prepared with great care, and displayed that cogent reason and calm earnest eloquence which marked all his efforts in debate. The substance of the argument, and a notice of his principal speeches in parliament, will be found in Professor Bain's sketch of his character and writings prefixed to his "minor works." Earnest as were his political convictions, and faithfully as he discharged the duties which he had undertaken, Grote's parliamentary career forms only an episode in his life, but an episode which contributed to refresh and qualify him for his main work. He sat in three succes- sive parliaments, from 1833 to 1841, witnessing the gradual passage from the first triumphs of reform to the Conser- vative reaction under Sir Robert Peel, and the steady decay of his own sect of philosophic radicalism, which never had a root in popular opinion. He was returned the last time by a bare majority of six, and his party numbered just the same figure. Charles Buller said to him one evening: "I see what we are coming to, Grote; in no very long time from this, youand I shall be left to 'tell' Molesworth."

During the eight years and a half of his parliamentary life, Grote kept up his varied reading, and formed a grow- ing desire for a knowledge of physical science. But the staff of his mental diet, and his refuge from all meaner objects of thought, was still the same. In the weary intervals of attendance on parliament a Tauchnitz copy of Plato was ready in his pocket, and when snowed up in the country during the vacation he writes —'" A Greek book is the only refuge." His hospitalities expanded with his social position ; and among his new friendships the one he most valued was that formed in 1835 with Mr (afterwards Sir) George Cornewall Lewis, the letters exchanged with whom on various points in classics and philosophy enrich

the narrative of his Zife. Among the other objects of his literary interest at that time was Sir William Molesworth's collected edition of the works of

Hobbes, dedicated to Grote, whose review of the first two volumes in the Spectator (1839) is reprinted among the Minor Works.

During the whole period of Whig decay, and especially from the beginning of the present reign, Grote felt a declining interest in politics, and accordingly, on the dis- solution in June 1841, he determined to retire from parlia- ment. Thusat the age of forty-six he was set free to spend the remaining thirty years of his life in the work long pre- pared and contemplated. In half that period the History of Greece was finished ; the remaining half was devoted to the two works on Plato and Aristotle, which made up the Hellenic "trilogy" of his life-long studies.

After a six months' holiday (1841-1842) for the long desired purpose of visiting Italy and studying the anti- quities of Rome upon the spot, he returned to his business at the bank, and set vigorously to work on the new plan for the first two volumes of his History—reperusing the authorities, revising his notes, and rewriting the whole. The greater part of these two volumes was occupied with the first division of his subject, which was now for the first time severed from actual history, and placed in its proper mythical light, under the title of " Legendary Greece." The closing months of 1842 were employed in sending forth a sort of " pilot-vessel" in the form of a review of Niebuhr's Griechische IHeroen-Geschichte, which appeared in the Westminster Review (May 1843) under the title of "Grecian Legends and Early History," and is reprinted in the Minor Works. His biographer states that, " this article, wherein the collected store of Grote's long and assiduous studies on the subject found a vent, was written with uncommon zest, and he anticipated with lively curiosity the effect it would produce over the learned world." It was received as a striking promise of the new light in which he was about to place the primeval ages of Grecian history. It is important to record an incidental remark, which shows that, amidst his uncompromising severance of legend from real history, Grote adhered to the great principle avowed alike by Herodotus and by Bede: "An historian is bound to produce the materials upon which he builds, be they never so fantastic, absurd, or incredible."

With the beginning of 1843, exactly ten years after the interruption caused by his entrance into parliament, the com- position of the first volume for the

press was vigorously begun; and at midsummer he further cleared his path by retiring from the banking-house of Prescott, Grote, & Company. While still at work upon the Iistory, he published in the Classical Museum (1843) an important essay on ancient weights and measures, reviewing Boeckh's Metrologische Un- tersuchungen, which is reprinted among his Afinor Works,

The first two volumes of the History were completed early in 1845, and published in March 1846. Their reception is well known; and the effect of their success upon Grote himself was thoroughly characteristic of the man : —" From all sides congratulation and eulogy flowed In upon the author, insomuch that he himself now began to feel something like confidence in the success of his long-cherished work. Thus I became" (writes Mrs Grote) "For once witness of a state of feeling on his part approach- Ing to gratified self-love, which at times would pierce through that imperturbable veil of modesty habitually present with him." The first volume and nearly half of the second are occupied with " Legendary Greece"; the latter half of the second volume begins "' Historical Greece," and consequently contains only a small portion of the real history. These volumes were reviewed with great praise by John Stuart Mill in the Hdinburgh Review, and by Dean Milman in the Quarterly Review.

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The success of the first two volumes incited Grote to prosecute the work with redoubled ardour ; and such pro- gress had been already made that the third and fourth volumes, bringing the narrative down to the battle of Mara- thon, and containing an account of Grecian poetry and philosophy in its earlier stages, appeared in the following year (1847). Two more volumes, the fifth and sixth, coming down to the eleventh year of the Peloponnesian war, were published in 1849. These two volumes, together with the two preceding ones, were reviewed in the Edinburgh feview by Sir George Cornewall Lewis. The seventh and eighth volumes, which brought the Peloponnesian war to tlle end, and which contained the striking and original view of the Sophists and of Socrates, appeared in 1850. Two articles in the Quarterly Review upon this portion of the work, one upon the history, and the other upon Socrates and the Sophists, were written by Dean

Stanley. The ninth and tenth volumes were published in 1852, the eleventh in 1853, and the last and twelfth in 1856, just ten years after the appearance of the first two volumes. The work closes with the generation contemporary with Alex- ander the Great, "an epoch," the historian observes, "' from whence dates not only the extinction of Grecian political freedom and self-action, but also the decay of productive genius, and the debasement of that consummate literary and rhetorical excellence which the 4th century B.c. had seen exhibited in Plato and Demosthenes."

The peculiar merits of Grote as an historian are dis- cussed at length by the writer of the present notice in a review of the whole work in the Quarterly Review in 1856. It is sufficient to state here that the quality in which he surpassed all his predecessors in Grecian history, and which achieved for him a success that can never be undone or superseded, lies in his placing his whole subject in the full light of historic truth apart from partial judgments, looking at the actions of men from their own points of view and not only from ours, and having constant regard to those ethical principles of human nature which his twofold training as a philosopher and politician qualified him to estimate. Many of his details may be disproved and his judgments reversed, but his work will last for ever. The opinion of scholars may be summed up in Bishop Thirlwall's "hearty congratulations on the completion of this glorious monument of learning, genius, and thought, to which I believe no other literature can exhibit a parallel."

*An episode during the progress of the History is charac- teristic of the wide range of political observation which Grote brought to bear upon his work. In the Swiss dissensions during 1847, which led to the war of the "*Sonderbund," he saw so close a resemblance to the con- flicts of the Greek republics that he resolved to study the question on the spot. His Letters on the subject, which originally appeared in the Spectator newspaper, were collected into a volume, which was reprinted in 1876 by- Mrs Grote, with the addition of a letter written by him to M. de Tocqueville after the termination of the war.*

On the completion of the History, Grote contributed to the Hdinburgh Review (1856) a criticism of Sir George Cornewall Lewis's Hnquiry into the Credibility of the early Roman History, which is reprinted in his Minor

Works, a most interesting study of the points in which the two scholars agreed and differed, Grote stopping short of his friend's scepticism in some cases.

After a well-earned holiday on the Continent in the summer of 1856, Grote set steadily to work upon his Plato, which occnpied him nine years, and appeared in 1865 in three volumes 8vo, under the title of Plato and the other Companions of Sokrates, when the author had completed his

seventieth year. This work, he remarks, was "intended as a sequel and supplement to his History of Greece." After giving an exhaustive review of early Greek philosophy, from Thales to Democritus, and an account of the life of Plato, of the Platonic Canon, and of Platonic compositions generally, he analyses at great length each of the dialogues, with illustrative remarks, unfolding a number of his own philosophical views. The work concludes with two chapters, one on the "Other Companions of Sokrates," and auother on " Xenophon."

On the completion of this work, Grote wrote in the Westminster Review (1866) an elaborate criticism of John Stuart Mill's Lamination of Str William Hamilton's Philosophy." At the same time, though in his seventy-first year, he set to work upon Aristotle, hopeful in the coutinu- auce of those powers which he thus described tliree years later :—" My power of doing work is sadly diminished as to quantity, as my physical powers in walking are; but as to quality (both perspicacity, memory, and suggestive association bringing up new communications), I am sure that my intellect is as good as it ever was," and all who knew him well can attest the accuracy of this judgment. But he did not live to complete the third portion of his "trilogy," though he had been studying the Aristotelian treatises from his earliest manhood. The fragment of his Aristotelian labours was published in 1872, the year after his death, in two volumes, edited by Professors Bain and Robertson. Besides the life of Aristotle and the canon of his works, these volumes are chiefly occupied with an examination of the logical treatises of the great philosopher ; but the editors have been able to give, from the MSS. of tlhe author and from the contributions which he made to Professor Bain's Manual of Mental and Moral Science, some account of

Aristotle's other works. There are also two valuable essays on the ethics and politics of Aristotle, found amoug the author's MSS. after the publication of Aristotle, which were printed in 1876 in the Fragments on Ethical Subjects by the late George Grote.

During the composition of the Plato and the Aristotle Grote resided in London, at 12 Savile Row, and in two country houses, which he occupied in succession, first at Barrow Green in Kent from 1859 to 1863 (where Jeremy Bentham had once lived), and afterwards at Shiere among the Surrey hills, in which places his day was divided between regular work, exercise as regular, and the society of con- genial friends. Many a work of social duty and benevolence found prompt performance ; and he paid unremitting atten- tion to the business of his three favourite institutions—the University of Loudoun, University College, and the British Museum, of which last he became a trustee on the death of Henry Hallam in 1859. But his connexion with the two former bodies was so close, and he made their adminis- tration so completely the chief business of his life after his literary works, that a few words upon the subject are necessary.

It has been already mentioned that he took an active part in the foundation of the university of London in Gower Street. He was a member of the original council of that institution from 1827 to 1831, from which he retired upon entering parliament. This institution exchanged its name for that of " University College" before the foundation in 1836 of the " University of London," which now conducts its business in Burlington House. Grote joined again the council of University College in 1849, and from that time till his death he took a leading part in the adminis- tration of its affairs, He became treasurer in 1860, and president in 1868, on the death of Lord Brougham. Grote was one of the seven new members added by the crown to the senate of the "University of London" in 1850. From 1862, when he was elected vice-chancellor, on the

resignation of Sir John Shaw Lefevre, he became the leading spirit of the university.

In both University College and the university of London he was the constant advocate of the threefold cord of know- ledge—literature, philosophy, science,—which he held to be ruined by tampering with any one of them,—earnestly up- holding what he regarded as sound metaphysics, supporting the establishinent of degrees in science, and opposing, to the last of his life and strength, the omission of Greek from the examination for matriculation. He left his library to the university ; and he showed his attachment to the college and to metaphysical studies by bequeathing to it a sum of £6000 for the endowment of a professorship of mental philosophy. He continued to labour in the discharge of his duties to these institutions, even when far gone in the malady which appeared in 1870, and carried him off on the 18th of June 1871, in his seventy-seventh year. He found his fit resting-place in Westminster Abbey, just beneath Camden's monument, and near Macaulay's grave. His portrait by Mr Millais, taken the year before his death, is preserved in the senate-room of the university of London.

Grote's great literary merits received due and fitting acknowledgment from his contemporaries. He was elected a fellow of the Royal Society, received from the university of Oxford the honorary degree of D.C.L., and from that of Cambridge the honorary degree of LL.D., was made a foreign member of the French Institute in the place of Macaulay, and lastly was offered a peerage by Mr Gladstone in 1869, an honour which he declined. His personal character cannot be better described than in the words of his friend Professor Bain :—" In the depths of his character there was a fund of sympathy, generosity, and self-denial rarely equalled among men; on the exterior, his courtesy, affability, and delicate consideration for the feelings of others were indelibly impressed upon every beholder; yet this amiability of demeanour was never used to mislead, and in no case relaxed his determination for what he thought right. Punctual and exact in his engagements, he inspired a degree of coufidence and respect which acted most beneficially on all the institutions and trusts that he took a share in administering ; and his loss to them was a positive calamity."

The authorities for Grote's life are — The Personal Life of George Grote, by Mrs Grote, 1873, and the Critical Remarks on his Intel- lectual Character, Writings, and Speechcs (170 pages), by Professor Bain, prefixed to Grote's Minor Works, 1873.

*The following is a list of Grote's works, most of which have been noticed in the course of the preceding memoir :—A History of Grecce, in 12 vols. 8vo, 1846-1856, reprinted in 1862 in 8 vols. 8vo, in 1869 in 12 vols. 12mo, and lastly in 1871 in 10 vols. 8vo; Plato and the other Companions of Sokrates, in 3 vols. 8vo, 1865, reprinted in the same form in 1867, and a third time in 1874; Aristotle, edited by Alexander Bain and G. Croom Robertson, 2 vols. 8vo, 1872; The Minor Works of George Grote, edited by Professor Bain, 1873, con- taining—(1) " Essentials of Parliamentary Reform ;" (2) " Notice of Sir William Molesworth's edition of the Works of Hobbes;" (8) 'Grecian Legends and Early History ;" (4) "' Review of Boeckh on Ancient Weights, Coins, and Measures;" (5) "' Presidential Address, in commemoration of the twenty-first Anniversary of the London Scientific Institution ;" (6) "Address.on delivering the prizes at University College ;" (7) *' Review of Sir G. C. Lewis on the Credibility of Early Roman History ;" (8) " Plato's Doctrine respecting the Rotation of the Earth, and Aristotle's Comment upon that Doctrine;" (9) " Review of John Stuart Mill on the Philo- sophy of Sir William Hamilton," (10) " Papers on Philosophy ;" Seven Letters concerning the Politics of Switzerland, pending the Outbreak of the Civil War in 1847, 1847, reprinted in 1876, with the addition of an unpublished letter written by the author to M. de Tocqueville shortly after the termination of the war; /rag- ments on Ethical Subjects, 1876 (a selection from his posthumous*

papers).

Mrs Grove survived her husband upwards of seven years, and died on the 29th of December 1878, at her residence in Shiere. She was one of the most remarkable

Englishwomen of the present century. Endowed in youth with great personal beauty, which matured into a grand expression and noble presence in advanced age, she possessed intellectual powers of the highest order, combined with a lofty sense of duty and the strictest regard to truth. The chief events of her life have been already related in the preceding notice of herhusband. Her own writings, besides the biography of Mr Grote, are A Memoir of the Life of Ary Scheffer (1860), and Collected Papers (original

and re- printed) in Prose and Verse (1862), of which the most important are a "'Review of M. Lavergne's Essay on the Rural Economy of England," "' Case of the Poor against the Rich correctly stated," a "' Review of Thomas Moore's Life and Works," and the "History of East Burnham." But though she wrote lucidly and powerfully, it has been well observed by one of her friends that "her writings fail to give a just idea of the irresistible fascination of her con- versation. Z'hat she never succeeded in fully transmitting to paper; and it remains a thing of unapproachable excel- lence and tender memory, only understood by those to whom it offered the highest mental enjoyment." (wW. SM. GROTEFEND, Grore Frieprich (1775-1853), to whose patience and ingenuity the decipherment of the cuneiform inscriptions was originally due, was born at Miinden in Hanover, June 9, 1775. He was educated partly in his native town, partly at Ilfeld, where he remained till 1795, when he entered the university of Gottingen, and there became the friend of Heyne, Tychsen, and Heeren. Heyne's recommendation procured for him au assistant mastership in the Gottingen gymnasium in 1797. While there he published his work De Pasigraphia sive Scriptura Universali (1799), which first brought him into notice, and led to his appointment in 1803 as prorector of the gym- nasium of Frankfort-on-the-Main, and shortly afterwards as conrector. Grotefend was best known during his lifetime as a Latin and Italian philologist, though the attention he paid to his own language is shown by his Anfangsgriinde der deutschen Poeste, published in 1815, and his foundation of a society for investigating the German tongue in 1817. In 1821 he became director of the gymnasium at Hanover, a post which he retained till his retirement in 1849, four years before his death. In 1823-4 appeared his revised edition of Wenck's Latin grammar, in two volumes, followed by a smaller grammar for the use of schools in 1826 ; in 1835-8 a systematic attempt to explain the fragmentary remains of the Umbrian dialect, entitled Rudimenta Linguce Umbrice ex Inscriptionibus antiquis enodata(in eight parts) ; and in 1839 a work of similar character upon Oscan (Ltudimenta Linguce Osc). In the same year he published an important memoir on the coins of Bactria, under the name of Die Miinzen der griechischen, parthischen, und indoskythischen Konige von Bactrien und den Léndern am Indus. Hesoon, however, returned to his favourite subject, and brought out a work in five parts, Zur Geographie und Geschichte von Altitalien (1840-2). Previously, in 1836, he had written a preface to Wagenfeld's translation of the Spurious Saxchoniathon of Philo

Byblius, which professed to have been discovered in the preceding year in the Portuguese convent of Santa Maria de Merinhao. But it was in the East rather than in the West that Grotefend did the work which has given him a lasting name. The mysterious cuneiform inscriptions of Persia had for some time been attracting attention in Europe; exact copies of them had been published by the elder Niebuhr, who lost his eyesight over the work ; and Grotefend's friend, Tychsen of Rostock, believed that he had ascertained the characters in the column now known to be Persian to be alphabetic. At this point Grotefend took the matter up. His first discovery was communicated to the Royal Society of Gottingen in 1800, and reviewed by Tychsen two years

afterwards. In 1815 he gave an account of it in Heeren's great work on ancient history, and in 1837 published his Neue Beitrage zur Erlduterung der persepolitanischen Keil- schrift. 'Three years later appeared his Neue Beitriige zur Lrlduterung der babylonischen Keilschrift. His discovery may be summed up as follows:—(1) that the Persian inscriptions contain three different forms of cuneiform writing, so that the decipherment of the one would give the key to the decipherment of the others; (2) that the characters of the Persian column are alphabetic and not syllabic; (3) that they must be read from left to right ; (4) that the alphabet consists of forty letters, including signs for long and short vowels; and (5) that the Perse- politan inscriptions are written in Zend (which, however, is not the case), and must be ascribed to the age of the Achemenian princes, The process whereby Grotefend arrived at these conclusions is a prominent illustration of persevering genius. History made it clear that the monu- ments to which the inscriptions were attached belonged to Cyrus and his successors, whose names ought accordingly to be found in them. By a comparison of texts Grotefend determined the groups of characters by which these names were expressed, and by further observing what characters were common to the several groups, and of how many characters each group consisted, he was able to assign the conjectural values of D-A-R-H-E-U-scH or Darius to the letters of a frequently recurring one. The native pronunciation of Darius was furnished by Strabo and the Old Testament. The names of Xerxes and Artaxerxes were next deciphered, and the phonetic powers of a good many

characters were thus ascertained. The correctness of the decipherment was verified, not only by the fact that the right letters were always found in the right places in each name, but also by the discovery that the word which invariably followed each name, and therefore presumably meant "king," when read by the new alphabet, presented the same form as the Zend term for "monarch." It was clear that a solid basis had been laid for the interpretation of the Persian inscriptions, and all that remained was to work out the results of Grotefend's brilliant discovery, a task ably performed by Burnouf, Lassen, and Rawlinson. Grotefend died the 15th of December 1853.

GROTIUS, Huco (1583-1645), in his native country Huig van Groot, but known to the rest of Europe by the Latinized form of the name, was one of the famous men of the 17th century, almost equally eminent for public services and as a writer. He was born at Delft on Easter day, 10th April 1583. The Groots were a branch of a family of distinction, which had been noble in France, but had removed to the Low Countries more than a century before. Their French name was De Cornets, and this cadet branch had taken the name of Groot on the marriage of Hugo's great-grandfather with a Dutch heiress. The father of Hugo was a lawyer in considerable practice, who had four times served the office of burgomaster of Leyden, and was one of the three curators of the university of that

lace. '. In the annals of precocious genius there is no greater prodigy on record than Hugo Grotius, who was able to make good Latin verses at nine, was ripe for the university at twelve, and at fifteen edited the encyclopzedic work of Marcianus Capella. At Leyden he was much noticed by J. J. Scaliger, whose habit it was to engage his young friends in the editing of some classical text, less for the sake of the book so produced than as a valuable education for themselves. At fifteen Grotius accompanied Count Justin of Nassau, and the grand pensionary Oldenbarne- velt on their special embassy to the court of France. After a year profitably spent in that country in acquiring the language and making acquaintance with the leading XI, — 28

men, Grotius returned home. He took the degree of doctor of law at Leyden, and entered on practice as an advocate.

Notwithstanding his successes in his profession, which seemed to open the most brilliant career to his ambition, he was in secret hankering after the pleasures of literature. In 1600 he edited the remains of Aratus, with the versions of Cicero, Germanicus, and Avienus. Of the Germanicus Scaliger says—" A better text than that which Grotius has given, it is impossible to give;" but it is probable that Scaliger had himself been the reviser. Grotius vied with the Latinists of his day in the composition of Latin verses. Some lines on the siege of Ostend were greatly admired, and spread his fame beyond the circle of the learned. He wrote three dramas in Latin :— Christus Patiens ; Sophom- phaneas, on the story of Joseph and his brethren ; and 'Adamus Exul, a production which is still remembered as having given hints to Milton. The Sophomphaneas was translated into Dutch by Vondel, and into English by Francis Goldsmith (1652); the Christus Patiens into English by George Sandys (1640).

In 1603 the United Provinces, desiring to transmit to posterity some account of their struggle with Spain, deter- mined to appoint a historiographer. Several candidates appeared, Dominicus Bandius of course among them. But the choice of the states fell upon Grotius, though only twenty years of age, and not having offered himself for the post.

There was some talk at this time in Paris of calling Grotius to be librarian of the royal library. But it was never meant seriously. It was a ruse of the Jesuit party, who wished to persuade the public that the opposition to the appointment of Isaac Casaubon did not proceed from theological motives, since they were ready to appoint a Protestant in the person of Grotius.

His next preferment was that of advocate-general of the fisc for the provinces of Holland and Zeeland. This was followed by his marriage, in 1608, to Mary van Reigesberg, a lady of family in Zeeland, a woman of great capacity and noble disposition, who proved every way worthy to be the wife of Grotius,

He had already passed from occupation with the classics to studies more immediately connected with his profession. In the winter of 1604 he

composed a treatise entitled De jure prede. This treatise he did not publish, and the MS. of it remained unknown to all the biographers of Grotius till 1868, when it was brought to light, and printed at the Hague under the auspices of Professor Fruin, It discovers to us that the principles and the plan of the celebrated De jure belli, which was not composed till 1625, more than twenty years after, had already been conceived by a youth of twenty-one, It has always been a question among the biographers what it was that determined Grotius, when an exile in Paris in 1625, to that particular subject, and various explanations have been offered ; among others we have been referred to a casual suggestion of Peirese in a letter of early date. The discovery of the MS. of the De jure pred discloses to us the whole history of Grotius's ideas, and shows us that from youth upwards he had steadily read and meditated in one direction, that, namely, of which the famous De jure belli was the mature product. In the De jure prede of 1604 we have much more than the germ of the later treatise De jure bellz, Its main prin- ciples, and the whole system of thought implied in the later, are anticipated in the earlier work. The arrangement even is the same. The chief difference between the two treatises is one which twenty years' experience in affairs could not but bring,—the substitution of more cautious and guarded language, less dogmatic affirmation, more allowance for exceptions and deviations. The Jus pacis

grounds of the lawfulness of war in general.

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was an addition introduced first in the later work, an insertion which is the cause of not a little of the confused arrangement which has been found fault with in the De jure belli.

We learn further from the De jure prede that Grotius

was originally determined to this subject, not by any speculative intellectual interest, but by a special occasion presented by his professional engagements. tained by the Dutch East India Company as their advocate. The company had been formed for the peaceful purposes of commerce, but had found itself compelled by the aggressions of the Portuguese to repel force by force. captains, Heemskirk, had captured a rich Portuguese

galleon in the Straits of Malacca. company to make prizes was hotly contested in Holland, and denied by the stricter religionists, especially the Men- nonites, who considered all war unlawful. took to prove that Heemskirk's prize had been lawfully

He was re-

One of their

The right of a private

Grotius under- captured. In doing this he was led to investigate the Such was the casual origin of a book which long enjoyed such celebrity

that it used to be said, with some exaggeration indeed, that it had founded a new science.

A short treatise which was printed in 1609, Grotius says without his permission, under the title of Mare Liberum, is nothing more than a chapter —the 12th—of the De juré

pred, It was necessary to Grotius's defence of Heemskirk

that he should show that the Portuguese pretence that Eastern waters were their private property was untenable. Grotius maintains that the ocean is free to all, and cannot be appropriated by any one nation. The occasional char- acter of this piece explains the fact that at the time of its appearance it made no sensation, It was not till many years afterwards that the jealousies between England and Holland gave importance to the novel doctrine broached in the tract by Grotius, a doctrine which Selden set himself to refute in his Mare clausum, 1632.

Equally due to the circumstances of the time was his small contribution to constitutional history entitled De antiquitate reipublicee Batave (1610). In this he vindi- cates, on grounds of right, prescriptive and natural, the revolt of the United Provinces against the sovereignty of Spain.

“08 the death of Elias Oldenbarnevelt, Grotius, though only thirty, succeeded him as pensionary of the city of Rotterdam. Foreseeing the troubles impending from the growing theological fermentation, he made the stipulation that he should be irremovable by the municipal authorities —a stipulation certain not to be respected should it ever be wanted for his protection.

In 1613 he formed one of a deputation to the court of England, for the purpose of adjusting those differences which were already beginning to arise between the two young maritime powers, and which gave rise afterwards to a naval struggle disastrous to Holland. He was received by James with every mark of distinction due to his rising reputation. He also cultivated the acquaintance of the Anglican ecclesiastics Overal and Andrewes, and was much in the society of the celebrated scholar Isaac Casaubon, with whom he had been in correspondence by letter for many years. Though the mediating views in the great religious conflict between Catholic and Protestant, by which Grotius was afterwards known, had been arrived at by him by independent reflexion, yet it could not but be that he would be confirmed in them by finding in England a developed school of thought of the same character already in existence. How highly Casaubon esteemed Grotius appears from a letter of his to Daniel Heinsius, dated London, 13th April 1613. “I cannot say how happy I esteem myself in having seen so much of one so truly great

as Grotius. A wonderful man! This I knew hiin to be before I had seen him; but the rare excellence of that divine genius no one can sufficiently feel who does not see his face, and hear him speak. Probity is stamped on his features; his conversation savours of true piety and pro- found learning, It is not only upon me that he has made this impression ; all the pious and learned to whom he has been here introduced have felt the same towards him; the king especially so!”

After Grotius’s return from England the exasperation of theological parties in Holland gradually rose to such a pitch that it became clear that an appeal to force would sooner or later be made. This Grotius must have foreseen, but he could hardly have anticipated that he himself would be one

of the first and principal victims. Grotius was not suffi- cient of a philogopher to rise above the level of a mere theo- logical wrangle. But from a natural moderation of temper he sought to find some mean term in which the two hostile parties of Remonstrants and Anti-remonstrants, or as they were subsequently called Arminians and Gomarists (see RemonstRANts), might agree. A form of edict drawn by Grotius was published by the states, reeommending mutual toleration, and forbidding ministers in the pulpit from handling the disputed dogmas. To the orthodox Calvinists the word toleration was insupportable. They had the populace on their side. This fact determined the stadt- holder, Maurice of Nassau, to support the orthodox party— a party to which he inclined the more readily that Olden- barnevelt, the grand pensionary, the man whose uprightness and abilities he most dreaded, sided with the Remonstrants.

In 1618 Prince Maurice set out on a sort of pacific campaign, disbanding the civic guards in the various cities of Guelders, Holland, and Zeeland, and occupying the places with troops on whom he could rely. The states of Holland sent a commission, of which Grotius was chairman, to Utrecht, with the view of strengthening the hands of their friends, the Remonstrant party, in that city. Feeble plans were formed, but not carried into effect, for shutting the gates upon the stadtholder, who entered the city with troops on the night of 26th July 1618. There were con- ferences in which Grotius met Prince Maurice face to face, and taught him that Oldenbarnevelt was not the only man of capacity in the ranks of the Remonstrants whom he had to fear. On the early morning of 31st July the prince's coup d'état against the liberties of Utrecht and of Holland was carried out; the civic guard was disarmed,—Grotius and his colleagues saving themselves by a precipitate flight. But it was only a reprieve. The grand pensionary, Olden- barnevelt, the leader of the Remonstrant party, Grotius, and Hoogeoberz were arrested by order of the stadtholder, brought to.trial, and condemned,—Oldenbarnevelt to death, and Grotius to imprisonment for life and confiscation of his property. In June 1617 he was immured in the fortress of Lovestein near Gorcum. His confinement was rigorous, but after a time his wife obtained permission to share his captivity, on the condition that if she came out, she should not be suffered to return.

Grotius had now before him, at thirty-six, no prospect but that of a lifelong captivity. He did not abandon himself to despair, but sought refuge in returning to the classical pursuits' of his youth. Several of his translations (into Latin) from the Greek tragedians and other writers, made

at this time, have been printed. They are without any |

philological value, and only prove his taste and facility in = classical languages. "The Muses," he writes to Voss, were now his consolation, and appeared more amiable than ever. The address and ingenuity of Madame Grotius at length devised a mode of escape. It had grown into a custom to send, at stated intervals, the books which he had done with,

in a chest, along with his linen to be washed at Gorcum. For many months the warders of the fortress were very exact in searching the chest. But never finding anything but books and linen they grew careless, and began to let the chest pass without opening it. Madame Grotius, per- ceiving this, prevailed on her husband to allow himself to be shut up in it at the usual time. The two soldiers who carried the chest out complained that it was so heavy "there must be an Arminian in it." 'There are indeed," said Madame Grotius, " Arminian books in it." The chest was carried by canal to Gorcum. When it came there they wanted to put it on a sledge; but the maid telling the boatmen there were some brittle things in it, it was put on a horse, and so carried to the house of a friend, where it was opened, and Grotius released. He was then dressed up like a mason with hod and trowel, and so conveyed in disguise over the frontier. His first place of refuge was Antwerp, from which he proceeded to Paris, where he arrived in April 1621. In October he was joined by his wife. There he was presented to the king, Louis XJIL, and a pension of 3000 livres conferred upon him. French pensions were easily granted, all the more so as they were never paid. Grotius was now reduced to great straits. He had not the means of procuring the bare necessaries of life. His family was a growing one, and it was with difficulty that he procured them clothes. His relations in Holland sent him occasionally small remittances in money, clothes, or Dutch butter. He looked about for any opening through which he might earn a living. There was talk of something in Denmark; or he would settle in Spire, and

practise in the court there. Some little relief he got through the intervention of D'Aligre, the new chancellor, who procured a royal mandate which enabled Grotius to draw, not all, but a large part of his pension. In 1623 the president Henri de Méme lent him his chateau of Balagni near Senlis (dep. Oise), and there Grotius passed the spring and summer of that year. De Thou gave him facilities to borrow books from the superb library formed by his father.

Under these circumstances the De jure belli et pacis was composed. The biographers are naturally astonished by the fact that a work of such immense reading, consisting in great part of quotation, could have been written in little more than a year, The achievement would have been, not wonderful, but impossible, but for the fact above mentioned that Grotius had with him the first draft of the work made in 1604. He had also got his brother William, when he was reading his classics, to mark down all the passages which touched upon law, public or private. In March 1625 the printing of the De jure belli, which had taken four months, was completed, and the edition despatched to the fair at Frankfort. His own honorarium as author consisted of 200 copies, of which, however, he had to give away many to friends, to the king, the principal courtiers, the papal nuncio, &c. What remained he sold for his own profit, at the price of a crown each, but the sale did not recoup him his outlay. But though his book brought him no profit it brought him reputation, so widely spread, and of such long endurance, as no other legal treatise has ever enjoyed.

Grotius naturally hoped that his fame would soften the hostility of his foes, and that his country would recall hin to her service. In this he was disappointed. Theological rancour prevailed over all other sentiments, After some fruitless attempts to re-establish himself in Holland, Grotius was fain to accept service under the crown of Sweden, in the capacity of ambassador to the court of France. He was not very successful in negotiating the treaty on behalf of the Protestant interest in Germany, Richelieu having a special dislike to him. He never enjoyed the confidence

of the court to which he was accredited, and frittered away his influence in disputes about precedence, which seem little worthy of his reputation.

In 1645 he demanded and obtained his recall. He was received at Stockholm with all the honours due to him. But neither the climate nor the tone of the court suited him, and he demanded permission to leave. He was driven by a storm on the coast near Dantzic. He got as far as Rostock, where he found himself very ill. Stockman, a Scotch physician who was sent for, thought it was only weakness, and that rest would restore the patient. But Grotius sank rapidly, and died on 29th August 1645.

Grotius was a man of varied interests and accomplish- ments, combining a wide circle of general knowledge with a profound study of one branch of law. History, theology, jurisprudence, politics, classics, poetry,—all these fields he cultivated, and has left numerous works in each kind.

His commentaries on the Scriptures were the first appli- cation on an extensive scale of the principle affirmed by Scaliger, that, namely, of interpretation by the rules of grammar without dogmatic assumptions. Grotius's philo- logical skill, however, was not sufficient to enable him to work up to this ideal.

As in many other points Grotius inevitably recalls to us Erasmus, so he does in his attitude towards the great schism. Grotius was indeed a man of profound religious sentiment, which Erasmus was not; but he had an indifference to dogma equal to that of Erasmus, although his disregard sprang from another source. Erasmus felt the contempt of a man of letters for the barbarous dissonance of the monkish wrangle. Grotius was animated by an ardent desire for peace and concord. He thought that a basis for reconciliation of Protestant and Catholic might be found in a common piety, combined with reticence upon discrep- ancies of doctrinal statement. His De veritate relogionis Christiane (1627), a presentment of the evidences, is so written as to form a code of common Christianity, irrespec- tive of sect. The little treatise diffused itself rapidly over Christendom, gaining rather than losing popularity in the 18th century. It became the classical manual of apologetics in Protestant colleges, and was translated for missionary purposes into Arabic (by Pococke, 1660), Persian, Chinese, &e. His Via et votum ad pacem ecclesiasticam (1642) was a detailed proposal of a scheme of accommodation. Of course, like all men of moderate and mediating views, he was charged by both sides with

vacillation. An Amsterdam minister, James Laurent, published his Grrotius paprzans (1642), and it was continually being announced from Paris that Grotius had " gone over." Hallam, who has collected all the passages from Grotius's letters in which the pre- judices and narrow tenets of the Reformed clergy are con- demned, thought he had a "bias towards popery" (Lit. of Europe, ii. 312). The true interpretation of Grotius's mind appears to be an indifference to dogmatic proposi- tions, produced by a profound sentiment of piety. He rose above the separatist bigotry of the vulgar theologian, but did not ascend into that philosophical region in which dogma is transcended and dissolved. He approached parties as a statesman approaches them, as facts which have to be dealt with, and governed, not suppressed in the interests of some one of their number.

His editions and translations of the classics were either juvenile exercises prescribed by Scaliger, or "'lusus poetici," the amusement of vacant hours. Grotius read the classics as a humanist, for the sake of their contents, not as a pro- fessional scholar.

His Annals of the Low Countries was begun as an official duty while he held the appointment of historiographer, and was being continued and retouched by him to the last. It was not published till 1657, by his sons Peter and Cornclius.

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But the high reputation which Grotius attained in his lifetime, though it rests in part, like that of Erasmus, on the diversity of his accomplishments and the comprehensive- ness of his literary view, had also a scientific basis in a professional specialty. Grotius was a great jurist, and his De jure belli et pacis (Paris, 1625), though not by any means the first attempt in modern times to ascertain the principles of jurisprudence, went far more fundamentally into the discussion than anyone had done beforehim. The title of the work was so far misleading that the jus bell: was a very small part of his comprehensive scheme. In his treatment of this narrower question he had the works of Albericus Gentilis (1588) and Ayala (1597) before him, and has acknowledged his obligations to them, But it is in the larger questions to which he opened the way that the merit of Grotius consists. His was the first attempt to obtain a principle of right, and a basis

for society and government, outside the church or the Bible. The distinction between religion on the one hand and law and morality on the other is not indeed clearly conceived by Grotius, but he wrestles with it in such a way as to make it easy for those who followed him to seize it. The law of nature is unalterable; God Himself cannot alter it any more than He can alter a mathematical axiom. This law has its source in the nature of man asa social being; it would be valid even were there no God, or if God did not interfere in the government of the world. These positions, though Grotius's religious temper did not allow him to rely unreservedly upon them, yet, even in the partial application they find in his book, entitle him to the honour of being held the founder of the modern science of the law of nature and nations. The De jure exerted little influence on the practice of belligerents, yet its publication was an epoch in the science. The elegance of his diction," says Blunt- schli, "the pearls from classical antiquity with which he adorned his pages, the temper of humanity which pervaded his argument, his effort to mitigate the horrors of the Thirty Years' War in the midst of which he wrote, and the warmth of his general sympathy for a moral as opposed to a material order, enlisted men's 'hearts on the side of his reasoning, while the deficiencies of his doctrine were not as yet detected." These defects are probably now, at 250 years' distance of time, more palpable than the merits of the work. But only in the heat and impertinence of irresponsible periodical criticism could it be said, as De Quincey has said, that the book is equally divided between "empty truisms and time-serving Dutch falsehoods," For a saner judgment and a brief abstract of the contents of the De jure, the reader is referred to Bluntschli, Geschachte des allgemeinen Staatsrechts (Munich, 1864). A fuller analysis, and some notice of the predecessors of Grotius, will be found in Hély, Ltude sur le droit de la guerre de Grotius (Paris, 1875). The writer, however, with the usual un- acquaintance of Frenchmen with everything which goes on outside France, has never heard of the Dejure prada, published in 1868. Hallam, Lit. of Europe, ii. p. 548, has an abstract done with his usual conscientious pains. Dugald Stewart (Collected Works, i. 370) has dwelt upon the confusion and defects of Grotius's theory. Mackintosh ({Miscell. Works, p. 166) has defended Grotius, affirming that his work "is perhaps the most complete that the world has yet owed, at so early a stage in the progress of any science, to the genius and learning of one man."

The chief writings of Grotius have been named in the course of our article. For a complete bibliography of his works, published and unpublished, the reader is referred to Lehmann, Hugonts Grotts manes vindicati, Delft, 1727, which also contains a' full biography. Of this Latin life De Burigny published a réchauffée in French, 2 vols. 8vo, Paris, 1752. Other lives are:-—Van

Brandt, Historie van het Leven H. de Groot, 2 vols. 8vo, Dordrecht, 1727; Von Luden, Hugo Grotius nach seinen Sehicksalen wna

Schriften dargestellt, 8vo, Berlin, 1806; Life of Hugo Grotius, by Charles Butler of Lincoln's Inn, 8vo, London, 1826. The work of the Abbé Hely already mentioned contains a life of Grotius. Grotius's theological works were collected in 3 vols. fol. at Amster- dam, 1644-46 (reprinted London, 1660; Amsterdam, 1679; and again Amsterdam, 1698). His letters were printed first in a selection, Epistole ad Gallos, 12mo, Leyden, 1648, abounding, though an Elzevir, in errors of press. They were collected in H. Grotti Epistole quotquot reperirt potuerunt, fol., Amsterdam, 1687. A few may be found scattered in other collections of Zpistole. Supplements to the large collection of 1687 were published at Haarlem, 1806; Leyden, 1809; and Haarlem, 1829. The De jure belli was translated into English by Whewell, 3 vols. 8vo, Camb., 1853 ; into French by Barbeyrac, 2 vols. 4to, Amst., 1724; into German in Kirehmann's Philosophische Bibliothek, 3 vols. 12mo, Leipsic, 1879. (M. P.)

GROTON, a post town of New London county, Con- necticut, U.S., is situated on the rivers Mystic and Pequon- nock, opposite New London, and on the east side of the river Thames at its junction with Long Island Sound. 'There are granite quarries in the neighbourhood, and the town possesses manufactures of cotton goods, britannia ware, carriages, and sashes and blinds, and brass and iron foundries. There is also a considerable coasting trade, and shipping and fishing are carried on to a small extent. On the heights behind the town stands Fort Griswold, which surrendered to the British troops, September 6, 1781. The majority of its defenders, including the commander Colonel Ledyard, were put to death after they had

surrendered ; and a granite monument was erected in the town to their memory in 1830, The population in 1870 was 5124.

GROTTAGLIE, a small city of Italy, in the province of Lecce and circondario of Taranto, about 14 miles N.E. of Taranto. It probably occupies the site of Rudix, the birth- place of the Latin poet Ennius, afterwards known as Castel Rodelle. The name Grottaglie is due to the number of caves in the vicinity. In modern times the place is worthy of note mainly because it has given birth to several men of considerable national eminence, as is set forth in detail in Pignatelli's history of the town. An excellent red clay for the manufacture of earthenware is found at Grottaglie. The inhabitants numbered 8747 in 1871,

GROUND NUT (synonyms, Earth Nut, Pistache de Terre, Monkey Nut, Pea Nut, Manilla Nut), a nut or pod the produce of the Arachis hypogewa, L. (Nat. Ord. Leguminose). The plant isan annual of diffuse habit, with hairy stem, with two-paired, abruptly pinnate leaflets. The flowers above ground are sterile, and the pods or legumes are stalked, oblong, cylindrical, about 1 inch in length, the thin reticulated sheil containing one or two irregularly ovoid seeds, After the flower withers, the stalk of the ovary has the peculiarity of elongating and bending down, forcing the young pod under ground, and thus the seeds become matured at some distance below the surface. Hence the specific and vernacular names of the plant. Two varieties are recognized in Malacca and J ava, a white and a brown, and the seeds are known as minyak katjang (oil bean). Of the history of this plant much has been written. Monardes in 1596 writes of having seen it largely used about the river Marajion in Brazil, and Marcgraf in 1648 gave a description and figure of it. To M. Jaubert, how- ever, a colonist at Gorée near Cape Verd, seems to belong the honour of first recommending it as of commercial value. As to its native country the opinions of botanists are divided between Africa and America. It is extensively cultivated in all tropical and subtropical countries, especially in America, Africa, India, the Malayan Archipelago, and China. The plant affects a light sandy soil, and is very prolific, yielding in some instances 30 to 38 bushels of nuts per acre. 'The pods when ripe are dug up and dried. The seeds when fresh are largely eaten in tropical countries, and in taste are almost equal to almonds ; when roasted they are used as a substitute for chocolate. Even in England large

quantities of these “monkey nuts” are consumed by the poorer children. By expression the seeds yield a large quantity of oil, which is used by natives for lamps, as a fish or curry oil, and for medicinal purposes. The leaves form an excellent food for cattle, being very like clover.

Large quantities of seeds are imported to Europe, chiefly to Marseilles, London, Hamburg, and Berlin, for the sake of their contained oil. The seeds yield from 42 to 50 per cent. of oil by cold expression, but a larger quantity is obtained by heat, although of an inferior quality. The seeds being soft facilitate mechanical expression, and where bisulphide of carbon or other solvent is used, a very pure oil is obtained.

The expressed oil is limpid, of a light yellowish or straw colour, having a faint smell and bland taste; it forms an excellent substitute for olive oil, although in a slight degree more prone to rancidity than the latter. Its specific gravity is 0916 to 0°918; it becomes turbid at 3° C., concretes at + 3° to— 4° C., and hardens at+7°C. It is a non-drying oil, Ground nut oil consists of (1) oleic acid (C,,H,,0,) ; (2) hypogeic acid (C,,H,,0,), by some supposed to be identical with a fatty acid found in whale oil; (3) palmitic acid (C,,H,0,); and (4) arachic acid (C,)H,.O,). The oil is officinal in the Indian pharmacopeeia, replacing olive oil, and it is also used in the adulteration of gingelly oil. In 1874 about 145 million fb of ground nuts, valued at £1,040,000, were exported from the west coast of Africa, chiefly to Marseilles, London, Hamburg, and Berlin.

GROUNDSEL (German, Aveuzkraut; French, Senecon), Senecio vulgaris, Linn., is an annual, glabrous or more or less woolly plant of the natural order Composite, series Lubulifloree and tribe Senecionidec, having a branched succulent stem 6 to 15 inches in height; pinnatifid and irregularly and coarsely-toothed leaves ; flowers in separate corymbs, with involucres of about 20 equal and several external and smaller bracts, and florets yellow and tubular, rarely ligulate in the marginal row ; and ribbed and silky fruit. The plant is indigenous to Europe, whence it has been introduced into all temperate climates, It isa trouble- some weed, flowering throughout the year, and propagating itself rapidly by means of its light feathery fruits ; it has its use, however, as a food for cage-birds, Senecio sylvaticus and S. wiscosus are known respectively as mountain groundsel and stinking

groundsel. Many species of the genus are' handsome florists' plants. The groundsel tree, Baccharis halimifolia, Linn., a native of the North American sea-coast from Massachusetts southward, is a Composite shrub, attaining 6 to 12 feet in height, and having angular branches, obovate or oblong-cuneate, somewhat scurfy leaves, and flowers larger than but similar to those of common groundsel. The long white pappus of the female plant renders it a conspicuous object in autumn. The groundsel tree has been cultivated in British gardens since 1683.

See Loudon, Arboretum, vol. ii., 1838; Syme, Sowerdy's English Botany, vol. v., 3d ed., 1866.

GROUSE, a word of uncertain origin,! now used gene- rally by ornithologists to include all the ' rough-footed" Gallinaceous birds, but in common speech applied almost

1 Jt seems first to occur (fide O. Salusbury Brereton, Archeologia, iii. p. 157) as " grows"' in an ordinance for the regulation of the royal household dated " apud Eltham, mens. Jan. 22 Hen. VIII.," z.¢., 1531, and considering the locality must refer to Black game. It is found in an Act of Parliament 1 Jac. I. cap. 27, § 2, z.e., 1608, and, as re- printed in the Statutes at Large, stands asnow commonly spelt, but by many writers or printers the final e is now omitted. In 1611 Cotgrave had " Poule griesche. A Moore-henne; the henneof the Grice [in ed, 1673 " Griece "] or Mooregame"' (Dictionarie of the French and Eng- lish Tongues, sub voce Poule). The most likely derivation seems to be from the old French word Griesche, Greoche, or Griais (meaning speckled, and cognate with griseus, grisly or grey), which was applied to some kind of Partridge, or according to Brunetto Latini (Trés., p. 211) to a Quail, " porce que ele fu premiers trovée en Grece,"?

exclusively, when used alone, to the Z'etrao scoticus of Lin- neus, the Lagopus scoticus of modern systematists—more particularly called in English the Red Grouse, but not a century ago almost invariably spoken of as the Moor-fowl or Moor-game. The effect which this species is supposed to have on the British legislature, and therefore on history, is well known,

for it is the common belief that parliament in these days always rises when the season for Grouse- shooting begins ; but even of old time it seems to have excited on one occasion a curious kind of influence, for we may read in the Orkneyinga Saga (ed. Jonzus, p. 356 ; ed. Anderson, p. 168) that events of some importance in the annals of North Britain followed from its pursuit in Caithness in the year 1157, The Red Grouse is found on moors from Monmouthshire and Derbyshire northward to the Orkneys, as well as in most of the Hebrides. It likewise inhabits similar situations throughout Wales and Treland, but it does not naturally occur beyond the limits of the British Islands,! and is the only species among birds peculiar to them. The word "species" may in this case be used advisedly (since the Red Grouse invariably "breeds true," it admits of an easy diagnosis, and it has a definite geographical range); but scarcely any zoologist wha looks further into the matter can doubt of its common origin

Red Grouse.

with the Willow-Grouse, Lagopus albus (L. subalpinus or L. saliceti of some authors), that inhabits a subarctic zone from Norway across the whole continent of Europe and Asia, as well as North America from the Aleutian Islands to Newfoundland. The Red Grouse indeed ig rarely or never found away from the heather on which chiefly it sub- sists, and with which in most men's minds it is associated; while the Willow-Grouse in many parts of the Old World seems to prefer the shrubby growth of berry-bearing plants (Vaccinium and others) that, often thickly interspersed with willows and birches, clothes the higher levels or the lower mountain-slopes, and it contrives to flourish in the New World where heather scarcely exists, and a "heath" in its strict sense is unknown. It is true likewise that the Willow-Grouse always becomes white in winter, which the Red Grouse never does ; but then we find that in summer there is a considerable resemblance between the two species, the cock Willow-Grouse having his head, neck, and breast of nearly the same rich chestnut-brown as his British

> It has been successfully, though with much trouble, introduced by r Oscar Dickson on a tract of land near Gottenburg in Sweden (Svenska Jaégarforbundets Nya Tidskrift, 1868, p. 64 e¢ alibi), and

seems likely to maintain itself there, so long at least as the care hitherto bestowed upon it is continued.

GROUSE

representative, and, though his back be lighter in colour, as is also the whole plumage of his mate, than is found in the Red Grouse, in other respects than those named above the two species are precisely alike. No distinction can be dis- covered in their voice, their eggs, their build, nor in their anatomical details, so far as these have been investigated and compared.? In connexion too with this matter it should not be overlooked that the Red Grouse, restricted as is its range, varies in colour not inconsiderably according to locality, so that game-dealers of experience are able to

ronounce at sight the native district of almost any bird that comes to their hands.

Other peculiarities of the Red Grouse—the excellence of its flesh, and its economic importance, which is perhaps greater than that of any other wild bird in the world— hardly need notice here, and there is not space to dwell upon that dire and mysterious malady to which it is from time to time subject, primarily induced, in the opinion of many, by the overstocking of its haunts and the pro- pagation of diseased offspring by depauperized parents.®

Though the Red Grouse does not, after the manner of other members of the genus Lagopus, become white in winter, Scotland possesses a species of the genus which does. This is the Ptarmigan, Z. mutus or L. alpinus, which differs far more in structure, station, and habits from the Red Grouse than that does from the Willow-Grouse, and in Scot- land is far less abundant, haunting only the highest and most barren mountains. It is said to have formerly inhabited both Wales and England, but there is no evidence of its appearance in Ireland. On the continent of Europe it is found most numerously in Norway, but at an elevation far above the growth of trees, and it occurs on the Pyrenees, and on the Alps. It also inhabits northern Russia, but its eastern limit is unknown. In North America, Greenland, and*

Iceland it is represented by a very nearly allied form— so much so indeed that it is only at certain seasons that

2 A very interesting subject for discussion would be whether Lagopus scoticus or L. albus has varied most from the common stock of both. Wecan here but briefly indicate the more salient points that might arise. Looking to the fact that the former is the only species of the genus which does not assume white clothing in winter, an evolutionist might at first deem the variation greatest in its case; but then it must be borne in mind that the species of Lagopus which turn white differ in that respect from all other groups of the family Tetraonidw. Further- more it must be remembered that every species of Lagopus (even L. leucurus, the whitest of all) has its first set of remiges coloured brown. These are dropped when the bird is about half-grown, and in all the species but L. scoticus white remiges are then produced. If therefore, as is generally held, the successive phases assumed by any animal in the course of its progress to maturity indicate the phases through which the species has passed, there may have been a time when all the species of Lagopus wore a brown livery even when adult, and the white dress donned in winter has been imposed upon the wearers by causes that can be easily suggested, for it has been freely admitted by naturalists of all schools that the white plumage of the birds of this group protects them from danger during the snows of a protracted winter. On the other hand it is not at all inconceivable that the Red Grouse, instead of perpetuating directly the more ancient properties of an original Lagopus that underwent no great seasonal change of plumage, may de- rive its ancestry from the widely-ranging Willow-Grouse, which in an epoch comparatively recent (in the geological sense) may have stocked Britain, and left descendants that, under conditions in which the assumption of a white garb would be almost fatal to the preservation of the species, have reverted (though doubtless with some modi- fications) ta a comparative immutability essentially the same as that of the primal Lagopus,

3 On the Grouse-disease the papers of Prof. Young in Proc. Nat. Hist. Soc. Glasgow, i. p. 225, and Dr Farquharson, Edinb. Med. Journal, No. 268, p. 222, may be advantageously consulted.

4 James I. (as quoted by Mr Gray, B. W. Scotland, p 280) writing from Whitehall in 1617 spelt the word " Termigant," and in this form it appears in one of the Scots Acts in 1621. Taylor the " water poet," who (in 1680) seems to have been the first Englishman to use the word, has " Termagant." Howthe unnecessary initial letter has crept into the name is more than the writer knows. The word is admittedly from the Gaelic Tarmachan, meaning, according to some, "a dweller upon heights," but thought by Dr T. M 'Lauchlan to refer possibly to the noise made by the bird's wings in taking flight. –

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the slight difference between them can be detected. This | Hebrides, nor in Ireland. On the continent of Europe it

form is the Z. rupestres of authors, and it would appear to be found also in Siberia (Jdis, 1879, p. 148). Spitsbergen

is inhabited by a large form which has received recognition as L. hemileucurus, and the northern end of the chain of the Rocky Mountains is tenanted by a very distinct species,

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Ptarmigan,

the smallest and perhaps the most beautiful of the genus, L, leucurus, which has all the feathers of the tail white

The very curious and still hardly understood question of

the moulting of the Ptarmigan could not possibly be dis cussed within these limits—reference has already been made to it in another article (Brrps, vol. iii. p. 776).

The bird, however, to which the name of Grouse in all strictness belongs! is probably the Tetrao tetrix of Linnzus

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Blackcock,

—the Blackcock and Greyhen, as the sexes are with us re- spectively called. It is distributed over most of the heath- country of England, except in East Anglia, where attempts to introduce it have been only partially successful. It also occurs in North Wales, and very generally throughout Scotland, though not in Orkney, Shetland, or the Outer

1 See footnote, p. 217.

has a very wide range, and it extends into Siberia. In Georgia its place is taken by a distinct species, on which a Polish naturalist (Proc. Zool. Society, 1875, p. 267) has un- happily conferred the name of 7. mlokostewiczi. Both these birds have much in common with their larger congener the Capercally (see vol. v. p. 53) and its eastern representative. We must then notice the species of the genus Bonasa, of which the European JB. sylvestris is the type. This does not inhabit the British Islands ; unfortunately so, for it is perhaps the most delicate game-bird that comes to table. It is the Gelinotte of the French, the MHaselhuhn of Germans, and Hyerpe of Scandinavians. Like its trans- atlantic congener B. wmbellus, the Ruffed Grouse or Birch- Partridge (of which there are two other local forms, 2. umbelloides and B. sabinit), it is purely a forest-bird. The same may be said of the species of Canace, of which two forms are found in America, C. canadensis, the Spruce- Partridge, and C. franklini, and also of the Siberian C. falcipennis. Nearly allied to these birds is the group known as Dendragapus, containing three large and fine forms D. obscurus, D. fuliginosus, and D. richardsoni—all peculiar to North America. Then we have Centrocercus urophasianus, the Sage-cock of the plains of Columbia and California, and Pediacetes, the Sharp-tailed Grouse, with its two forms P. phasianellus and P. columbianus, while finally Cupidonia, the Prairie-hen, also with two local forms, C cupido and C. pallidicincta, is a bird that

in the United States of America possesses considerable economic value, as witness the enormous numbers that are not only consumed there, but exported to Europe. It will be seen that the great majority of Grouse belong to the northern part of the New World, and it is much to be regretted that space here fails to do justice to these beautiful and important birds, by enlarging on their interesting distinctions. They are nearly all figured in Elliot's Monograph of the Tetraonine, and an excellent account of the American species is given in Baird, Brewer, and Ridgway's Worth American Birds (iii. pp. 414-465). (A. N.) GROVE. The almost universal occurrence, at one stage or another in the religious and social development of the races of mankind, of the practice of worshipping by pre- ference under or among trees to which a peculiarly sacred and inviolable character is attached, is a fact too well known to require particular illustration here. Its explana- tion is to be sought partly in obvious considerations of physical convenience, but even more in certain psychical phenomena which may still be made matters of direct observation and experience (" Lucos, et in iis silentia ipsa adoramus," Pliny, #.., xii. 1; "Secretum luci. .. et admiratio umbre fidem tibi numinis facit," Sen., Hp. xli.). It does not appear to have any necessary connexion: with tree-worship, another very widely diffused practice, on which, and on its possible connexion with ancestor-worship, some suggestive remarks will be found in Spencer's Principles of Sociology. It has sometimes been alleged as a character- istic difference between the Semitic and the Aryan races that the former show a tendency to select single trees for sanctuaries, while the latter are generally found worshipping in groves; and this generalization, though liable to many exceptions, is really borne out at least by the familiar in- dications to be met with in Scripture. The word "grove" so often met with in the authorized version of the Bible, is nowhere there correctly employed. In Gen. xxi, 33 and 1 Sam. xxii. 6 (margin) it is used as a rendering of the Hebrew word °Y8 of which " tamarisk" is the proper trans- lation. In every other instance in which it oecurs (Ex. xxxiv. 13; Deut. xii 3; xvi. 21; Judg. iii, 7; vi. 25, 28; Isa. xvii. 8 ; Mic. v. 14 ; and often in Kings and Chronicles), where the LXX. translate dAcos, and the Vulgate Jucus, the

original is invariably Asherah (TV), meaning a tree or post (see Baat, vol. iii. p. 175), The "plain" of Moreh, or Mamre also, in Gen. xii. 6 and xiii. 18, represents iy, which all modern interpreters render "terebinth."

GRUBER, Joann Gortrriep (1774-1851), a learned German author, was born at Naumburg on the Saale, 29th November 1774. He received his education at the town school of Naumburg and the university of Leipsic, after which he resided successively at Géttingen, Leipsic, Jena, and Weimar, occupying himself partly in teaching and partly in various literary enterprises, and enjoying in Weimar the friendship of Herder, Wieland, and Goethe. In 1811 he was appointed professor at the university of Wittenberg, and after the division of Saxony he was sent by the senate to Berlin in connexion with the negotiations for the union of the university of Wittenberg to that of Halle. After the union was effected he became in 1815 professor of philosophy at Halle. On the death of Hufeland he was associated with Ersch in the editorship of the great work Allgemeine Encyklopidie der Wissenschaften und Kiinste ; and after the death of Ersch he continued the first section from vol. xviii, to vol. liv. He also succeeded Ersch in the editorship of the Allgemeine Literaturzeitung. He died 7th August 1851. a

Gruber was the author of a large number of works, the principal of which are Charakteristik Herders, in conjunction with Danz, Leipsic, 1805; Geschichte des Menschlichen Geschicchts, 2 vols., Leipsic, 1806; MWérterbuch der Altclassischen Mythologie, 3 vols., Weimar, 1810-15; Wiclands Leben, 2 parts, Weimar, 1815-16; and Klopstocks Leben, Weimar, 1832. A completed biography of Wieland was prefixed to Gruber's edition of Wieland's Sanymtliche Werke, Leipsic, 1818-28.

GRUN, Anastasius (1806-1876), pseudonym for Anton Alexander, count of Auersperg, who was born April 11,1806, at Laibach, the capital of the Austrian duchy of Carniola. He received his university education first at Gratz and then at Vienna, where he studied jurisprudence. In 1832 the title of " Imperia] Chamberlain " was conferred upon him, and in 1839 he married the daughter of Count Attems. He accepted no official post, and devoted himself chiefly to literary pursuits. When the "March Revolution" broke out in 1848 at Vienna, the count entered the political arena, and represented the district of Laibach at the National Assembly at Frankfort-

on-the-Main. After a few months, however, he resigned his seat, and again retired into private life. In 1860, when a fresh impulse was given to political life in Austria, he resumed his activity as a politician, and greatly distinguished himself in the Austrian House of Lords as one of the most intrepid and influential supporters of the cause of liberalism, both in political and religious matters, until his death in 1876. Count Auersperg acquired great fame as a poet, as which he is known under the pseudonym of Anastasius Griin. His first publication, Bldtter der Inebe, " Leaves of Love" (1830), showed little originality ; but his second production, Der letzte Lutter, "The last Knight " (1830), brought to light his eminence asa poet. It celebrates the deeds and adventures of the emperor Maximilian I. (1493-1519), and contains exquisite poetical descriptions tinged with playful humour. His next poetical productions, Spaziergdnge eines Wiener Poeten, "Walks of a Vienna Poet " (1831), and Schutt, " Ruins" (1835), quite electrified the whole of Germany by the bold- ness and originality of their conception and by their decided liberal tendency. His Collected Poems (1837) increased his reputation as a poet, but not so his epics, Die Wibelungen im Frack (1843) and Der Pfaf' vom Kahlemberg (1850). He also produced masterly translations of the popular Slovenic songs current in Carniola (1850), and of the English poems relating to "Robin Hood " (1869). Anastasius Griin may be called the originator of the modern

school of political lyric poetry in Germany. His language

is sonorous and majestic, and his descriptions, though some- times overcrowded with imagery, bear the stamp of great poetical originality. He loved to employ the stately " Nibelungen measure," which imparted considerable vigour to some of his productions. Of his shorter poems Der letzte Dichter, "The last Poet," is deservedly the most popular.

GRUN, Hans Batpune (c 1470-1545), commonly called Griin, a painter of the age of Diirer, was born about 1470 at Gmiind in Swabia, and spent the greater part of his life at Strasburg and Freiburg in Breisgau. The earliest pictures assigned to him are altarpieces with the monogram. H. B. interlaced, and the date of 1496, in the monastery chapel of Lichtenthal near Baden. Another early work isa portrait of the emperor Maximilian,

drawn in 1501 ona leaf of a sketch-book now in the print-room at Carlsruhe. The Martyrdom of St Sebastian and thie Epiphany (Berlin Museum), fruits of his labour in 1507, were painted for the market-church of Hallein Saxony. In 1509 Griin purchased the freedom of the city of Strasburg, and resided there till 1513, when he moved to Freiburg in Breisgau. There he began a series of large compositions, which he finished in 1516, and placed on the high altar of the Freiburg cathedral. He purchased anew the freedom of Strasburg in 1517, resided in that city as his domicile, and died a member of its great town council 1545.

Though nothing is known of Griin's youth and education, it may be inferred from his style that he was no stranger to the scliool of which Diirer was the chief. Gmiind is but 50 miles distant on either side from Augsburg and Nuremberg. Griin's prints were often mistaken for those of Diirer; and Diirer himself was well acquainted with Griin's woodcuts and copper-plates, in which he traded during his trip to the Netherlands (1520). prints, though Diireresque, are far below Diirer, and his paintings are below his prints. Without absolute correct- ness as a draughtsman, his conception of human form is often very unpleasant, whilst a questionable taste is shown in ornament equally profuse and "baroque." Nothing is more remarkable in his pictures than the pug-like shape of the faces, unless we except tlie coarseness of the extremities. No trace is apparent of any feeling for atmosphere or light and shade, Though Griin has been commonly called the Correggio of the north, his compositions are a curious medley of glaring and heterogeneous colours, in which pure black is contrasted with pale yellow, dirty grey, impure red, and glowing green. Flesh is a mere glaze under which the features are indicated by lines. No wonder that English collectors should have neglected him. There is not one of his pictures in the whole of Great Britain, unless we accept as genuine a" Youth and Old Age" in the Liverpool Institution, bought by Roscoe as a masterpiece of Antonello da Messina. Even Germans express but slight esteem for Griin; and if his works have any claims to attention at all, it is merely because of the wild and fantastic strength which some of them display. We may pass lightly over the Epiphany of 1507, the Crucifixion of 1512, or the Stoning of Stephen of 1522, in the Berlin Museum. There is some force in the Dance of Death of 1517, in the museum of Basel, or the Madonna of 1530, in the Lichtenstein Gallery at Vienna. Griin's best effort is the altarpiece of Freiburg, where the

Coronation of the Virgin, andthe Twelve Apostles, the Annunciation, Visitation, Nativity, and Flight into Egypt, and the Crucifixion, with portraits of donors, are executed with some of that fanciful power which Martin Schin bequeathed to the Swabian school. As a portrait painter he is well known. He drew the likeness of Charles V., as well as that of Maximilian; and his bust of Margrave Philip in the Munich Gallery tells us that he was connected with the reigning family of Baden as

But Griin's ,

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early as 1514. At a later period he had sittings from Margrave Christopher of Baden, Ottilia his wife, and all their children, and the picture containing these portraits is still in the grand-ducal gallery at Carlsruhe. Like Direr and Cranach, Griin became a hearty supporter of the Reformation, He was present at the diet of Augsburg in 1518, and one of his woodcuts represents Luther under the protection of the Holy Ghost, which hovers over him in the shape of a dove,

GRUNBERG, or GrineBerc, a town of Prussian Silesia, chief town of a circle in the government district of Liegnitz, is beautifully situated on an affluent of the Oder, and on the railway from Breslau to Stettin by Kiistrin, 36 niles N.N.W. of Glogau. It has a real-school of the first order, a higher female school, and a trade school. The prosperity of the town depends chiefly on the vine culture in the neighbourhood, from which, besides the exportation of a large quantity of grapes, about 700,000 gallons of wine are mauufactured annually. The wine is a kind of cham- pagune, and is largely exported to Russia. There are also manufactures of machinery, cloth, preserved fruits, and lignite. The population of the town in 1875 was 12,200.

GRUNDTVIG, Nrxoxar FrepertK Sxvertn (1783- 1872), the Danish poet, statesman, and divine, was born at Udby on the 8th of September 1783; in

1791 he was sent to live at the house of a priest in Jutland, and studied at the free school of Aarhuus until he went up to the uni- versity of Copenhagen in 1800. At the close of his uni- versity life he made Icelandic his special study, until in 1805 he took the position of tutor in a house on the island of Langeland. The next three years were spent in the study of Shakespeare, Schiller, and Fichte. His cousin, the philosopher Henrik Steffens, had returned to Copen- hagen in 1802 full of the teaching of Schelling, and his lectures and the early poetry of Oehlenschlager opened the eyes of Grundtvig to the new era in literature that was commencing. The latter began to essay writing himself, but his first work, Ox the Songs in the Edda, attracted no attention. Returning to Copenhagen in 1808, he achieved a greater success with his Northern Mythology, and in 1809 with his Decline of the Heroic Life in the North, The boldness of his theological views having provoked opposi- tion, he retired to a country parsonage for a while, but soon returned to pursue a literary career with extraordinary earnestness. From 1812 to 1817 he published five or six works, of which the Rhyme of Roeskilde is the most remark- able, From 1816 to 1819 he was editor of a polemical journal entitled Dannevirke, and in 1818 to 1822 appeared his Danish paraphrases of Saxo Grammaticus and Snorre. During these years he was preaching to an enthusiastic con- gregation in Copenhagen, but he accepted in 1821 the country living of Preesté, only to return to the metropolis the year after. His theological career was, however, presently stopped, for, having in 1825 published a brochure, The Church's Reply, against the popular Dr Clausen, he Was publicly prosecuted and fined, or seven years he was forbidden to preach, years which he spent in publishing a collection of his theological works, in paying two visits to England, and in studying Anglo-Saxon. In 1832 he ob- tained permission to preach again, and in 1839 he became priest of the workhouse church of Vartou Hospital, a post he continued to hold until his death. In 1837 he published Songs for the Danish Church, a rich collection of spiritual poems ; in 1838 he brought out a selection of early Scandi- navian verse ; in 1840 he edited the Anglo-Saxon poem of the Phenix, witha Danish translation. He visited England a third time in 1843, From 1844 until after the first German war Grundtvig took a very prominent part in politics. In 1861 he received the titular rank of bishop, but without a see. He went on Writing occasional poems

till 1866, and preached in the Vartou every Sunday until a mouth before his death. He was married thrice, the last time in his seventy-sixth year, and left children by each marriage. He died September 2, 1872. Grundtvig holds a unique position in the literature of his country; he has been styled the Danish Carlyle. He was above all things a man of action, not an artist ; and the formless vehemence of his writings, which have had a great influence over his own countrymen, is hardly agreeable or intelligible to a foreigner. His spiritual poems are among the best that the North has produced, but they are apt to be too long. The writings of Grundtvig have not yet been collected in a permanent form, but the best of his poetical works were published in a selection by his eldest son, Svend Grundtvig, the eminent comparative mythologist, in 1869, with a critical memoir by the poet Hostrup, who belongs to the religious body denominated Grundtvigians, GRUNEWALD, Martutas. The accounts which are given of this painter, a native of Aschaffenburg, are curi- ously contradictory. Between 1518 and 1530, according to statements adopted by Waagen and Passavant, he was commissioned by Albert of Brandenburg, elector and arcli- bishop of Mainz, to produce an altarpiece for the collegiate church of St Maurice and Mary Magdalen at Halle on the Saale; and he acquitted himself of this duty with such cleverness that the prelate in after years caused the picture to be rescued from the Reformers and brought back to Aschaffenburg. From one of the churches of that city it was taken to the Pinakothek of Munich in 1836, It represents St Maurice and Mary Magdalen between four saints, and displays a style so markedly characteristic, and so like that of Lucas Cranach, that Waagen was induced to call Grunewald Cranach's master. He also traced the same hand and technical execution in the great altarpieces of Annaberg and Heilbronn, and in various panels exhibited in the museums of Mainz, Darm- stadt, Aschaffenburg, Vienna, and Berlin. A later race of critics, declining to accept the statements of Waagen and Passavant, affirm that there is no documentary evidence to connect Grunewald with the pictures of Halle and Annaberg, and they quote Sandrart and Bernhard Jobin of Strasburg to show that Grunewald is the painter of pictures of a different class. They prove that he finished before 1516 the large altarpiece of Issenheim, at present in the museum of Colmar, and starting from these premises they connect the artist with Altdorfer and

Diirer to the exclusion of Cranach. Thata native of the Palatinate should have been asked to execute pictures for a church in Saxony can scarcely be accounted strange, since we observe that Hans Baldung was entrusted with a commission of this kind. But that a painter of Aschaffenburg should display the style of Cranach is strange and indeed incredible, unless vouched for by first class evidence. In this case documents are altogether wanting, whilst on the other hand it is beyond the possibility of doubt, even according to Waagen, that the altarpiece of Issenheim is the creation of a man whose teaching was altogether different from that of the painter of the pictures of Halle and Annaberg. At this stage the controversy now stands; and it is needless to do more than observe that the altarpiece of Issenheim is a fine and powerful work, completed as local records show before 1516 by a Swabian, whose distinguishing mark is that he fol- lowed the traditions of Martin Schongauer, and came under the influence of Altdorfer and Direr. Asa work of art the altarpiece is important, being a poliptych of eleven panels, a carved central shrine covered with a double set of wings, and two side pieces containing the Temptation of St Anthony, the hermits Anthony and Paul in converse, the Virgin adored by Angels, the Resurrection, the Annunciation, the Crucifixion, St Sebastian, St Anthony, and the Marys XI. — 29

wailing over the dead body of Christ. The author of these compositions is also the painter of a series of monochromes described by Sandrart in the Dominican convent, and now in part in the Saalhof at Frankfort, and a Resurrection in the museum of Basel, registered in Amerbach's inventory as the work of Grunewald.

GRUTER, or Gruytéer, Jan (1560-1627), a critic and scholar of Dutch parentage by his father's side and English by his mother's, was born at Antwerp, December 3, 1560, To avoid religious persecution his parents while he was still young came to England; and for some years he prosecuted his studies at Cambridge, after which he went to Leyden, where he graduated M.A. In 1586 he was appointed professor of history at Wittenberg, but as he refused to subscribe the formula concordice he was unable to retain his office. From 1589 to 1592 he taught at Rostock, after

which he went to Heidelberg, where in 1602 he was appointed librarian to the university, He died at Heidelberg, September 20, 1627, The chief service rendered by Gruter to classical learning was in the department of inscriptions, his principal work on which is Inscriptiones antique totius orbis Romani, in 2 vols., Heidelberg, 1603. He also published editions of most of the Latin classics, but as his critical faculty bore little pro- portion to his erudition these are of small value.

GRUYERE, or Groyires (German, Greyerz), is a small pastoral district in the Swiss canton of Freiburg, noted for its cheese (see CHEESE and FrerpurG), which was at one time a separate countship. It forms part of the basin of the Saane. The old town of Gruyére, where the counts had their castle, had only 1997 inhabit- ants according to the census of 1870, while the neighbour- ing town of Bulle had 2274. There is no mention by that name of the counts or countship of Gruyére in any document previous to the 12th century, but the same family with the title of count of Ogo, ¢.e., Hoch- gau, have been traced, though not without interruption, as far back as 923. The new designation was due, it would appear, to the fact that the counts of Ogo had held the post of gruyer (gruerius) or warden of the woods and forests to one of the later kings of Burgundy, the name of office, as in the case of the Scotch Stewarts, gradually passing into a regular family name. The counts of Gruycre were for the most part a vigorous and warlike line, and their banner, with the figure of a grwe or crane, was not only a familiar object in the local conflicts of Savoy and Switzerland but saw good service in distant fields, Their last representative died in exile, his possessions having been seized by hig creditors and sold to Bern in 1554.

The fortunes of the house are related with much detail in Hisely's 'Histoire du Comté de Gruyére," which oecupies vols. ix., x., and xi. of the Afémotres de la Soc. d'histoire de la Suisse Romande, Jau- sanne, 1838, &c. See also Bonstetten, Briefe iiber ein Schweizer- isches Hirtenland, Basel, 1782; H. Charles, Cowrrse dans La Gruyere, Paris, 1826.

GRYNAZUS, or Gryver, Jonann Jaxon (1540-1617), a learned theologian of the period immediately succeeding the Reformation, was born, October 1, 1540, at Bern, where his father Thomas, nephew of Simon Gryneus, was at that time a teacher of theology, was educated at Basel, and in 1559 received

an appointment as curate to his father who had become pastor of Rételn in Baden, In 1563 he proceeded to Tiibingen for the purpose of completing his theological studies, and in 1565 he re- turned to Rételn as successor to his father. Here, as the result of much reading and reflexion, he felt com- pelled to abjure the Lutheran doctrine of the Lord's Supper, and to renounce the Mormula Concordie. Called in 1575 to the chair of Old Testament exegesis at Basel, he became involved in unpleasant controversy with Simon Sulzer and other champions of Lutheran orthodoxy; and in 1584 he

was glad to accept an invitation to Heidelberg, where two years were spent. Returning to Basel in 1586 as antistes or superintendent of the church there, he exerted for upwards of twenty-five years a very considerable influence upon both the church and the state affairs of that com- munity, and acquired a wide reputation as a skilful theo- logian of the school of Zwingli. Five years before his death, which occurred August 13, 1617, be had the mis- fortune to become totally blind, but he continued to preach and lecture to the last.

His numerous works inelude commentaries on various books of the Old and New Testament, Theologica theoremata et problemata

(1588), and a collection of patristic literature entitled Afonumenta S. Patrum Orthodoxographa (2 vols. fol., 1569),

GRYNALUS, Simon (1493-1541), a learned theologian of the Reformation, was born in 1493 at Vehringen, in his fourteenth year was sent to school at Pforzheim, and sub- sequently studied at the university of Vienna, where he graduated as master of arts, and for some time acted as tutor. He next became rector of a school at Ofen (Buda), but as an avowed sympathizer with Reuchlin and Erasmus he was not permitted by the Dominicans to retain this post long. After an interval spent at Wittenberg with his old school friend Melanchthon, he became professor of Greek in the university of Heidelberg in 1525; with the duties of this post he from 1526 combined those also of the Latin chair. In 1529 the friendship of Cicolampadius obtained for him a call to Basel as successor of Erasmus; the com- pletely disorganized state of the university at that time gave him abundant leisure

not only for private study but also for a tour to England, where he charged himself with the task of obtaining the opinions of the Reformed theologians upon the subject of the king's divorce, On his return to Basel in 1531, the year of the death both of Zwingli and of Gicolampadius, he began as theological professor to give exegetical lectures on the New Testament ; and in 1534 he was summoned by Duke Ulrich of Wiirtemberg to assist in the reformation there, and especially in the reorganization of the university of Tiibingen. In 1536 he took an active part in the framing of the first Helvetic confession, and also in the conferences held with the purpose of inducing the Swiss to accept the concord of Wittenberg, which had also been drawn up in that year. He was the sole repre- sentative of the Swiss churches at the conference of Worms in 1540. His death took place suddenly at Basel on August 1, 1541. In Greek philology Grynzus was one of the first scholars of his day. In theology he was more of a theoretical than of a practical turn; but his profound erudition and singularly penetrating judgment gave him great influence among the more active spirits of the time. In literature his chief contributions were translations into Latin of Plutarch, Aristotle, and Chrysostom. See Streu- ber's Simonis Gryncer Epistole (1847), where a full list of his works is given.

GRYPHIUS, Anprzas (1616-1664), German poet, was born at Grossglogau, Silesia, on the 11th of October, 1616. His youth fell in the period of the Thirty Years' War, which began in 1618, when he was two years old. After spending five years at school in various towns, he returned to his native place in 1636, and became tutor in the family of Palsgrave George von Schénborn, who crowned him laureate and granted him a patent of nobility. In 1632 he went to the university of Leyden, where he spent six years, at first as a student, afterwards as a tutor. Having travelled through France and Italy in association with a young Pomeranian, and lived a year in Strasburg, he went back to Silesia, and in 1650, at the age of thirty- four, was made syndic of the principality of Glogau. This office, the duties of which he faithfully discharged, he held till his death in 1664. He wasa man of deeply melancholy

temperainent, and his natural tendencies were fostered both by private misfortune and by the terrible public calamities of his age. Like most German writers in the first half of the 17th century, he was profoundly influenced by the critical doctrines of Opitz, on which account he is usually classed with the first Silesian school, although by some of his characteristics he is more closely allied to the second Silesian school. His best works are his comedies, one of which, Peter Squenz, is based on the comic episode of A Midsummer Night's Dream. Die geliebte Dornrose (The Beloved Wildrose), which is written in a Silesian dialect, contains many touches of natural simplicity and grace, and still ranks high among the comparatively small number of genuine comedies of which German literature can boast. Horribiliscribrifax is a rather laboured attack ou pedantry. Besides these three comedies, Gryphius wrote five tragedies. Inall of them his tendency is to become wild and bombastic, but he had the merit of at least attempting to work out artistically conceived plans, aud there are occasional flashes both of passion and of imagination. His models seem to have been Seneca, and the great Dutch poet Vondel. He had the courage, in Carolus Stuardus, to deal with events of his own day; his other tragedies are Leo Arminius, Katharina von Georgien, Cardenio und Celinda, and Pampinianus. The lyrics of Gryphius give utterance to his despairing views of life, and are not without power; but it is as a dramatist that he is mainly important. No German dramatic writer before him had risen to so high a level, nor had he worthy successors until about the middle of the 18th century. A selection from his lyrics will be found in W. Miiller's Bibliothek der deutschen Dichter des 17 Jahrhunderts (Bd. 2), and a selection from his dramatic writings in Tittmann's Deutsche Dichter des 17' Jahrhunderts.

See Klopp, Andreas Gryphius als Dramatiker (1851); and Herr- mann, Ueber Andreas Gryphius (1851).

GUACHARO,! the Spanish-American name of what English writers have lately taken to calling the O1t-Brep, the Steatornis caripensis of ornithologists, a very remarkable bird, first described by Alexander von Humboldt (Voy. aux Rég. Equinoxiales, i. p. 413, Engl. transl, iii. p. 119; Obs. Zoologie, ii. p. 141, pl. xliv.) from his own observation and from examples obtained by Bonpland, on the visit of those two travellers, in September 1799, to a cave near Caripé (at that time a monastery of

Aragonese Capuchins) in the Venezuelan province of Cumana on the northern coast of South America. A few years later it was discovered, says Latham (Gen. Hist. Birds, 1823, vii. p. 365), to inhabit Trinidad, where it appears to bear the name of Diablotin;? and much more recently, by the receipt of specimens pro- cured at Sarayacu in Ecuador, Caxamarca in the Peruvian Andes, and Antioquia in New Grenada (Proc, Zool. Society, 1878, pp. 139, 140; 1879, p. 532), its range has been shown to be much greater than had been supposed. The singularity of its structure, its curious habits, and its peculiar economical value have naturally attracted no little attention, and it has formed the subject of investigation by a considerable number of zoologists both British and foreign. First referring it to the genus Caprimulgus, its original describer soon saw that it was no true Goatsucker. It was subsequently separated as forming a Subfamily, and has at last been regarded as the type of a distinct Family, Steator- nithide—a view which, though not put forth till 1870 (Zool. Record, vi. p. 67), seems now to be generally deemed correct. Its systematic position, however, can scarcely be considered settled, for though on the whole its predominat-

is This is said to be an obsolete Spanish word signifying one that cries, moans, or laments loudly.

2 Not to be confounded with the bird so called in the Freneh Antilles, whieh is a Petrel (@strelata).

ing alliance may be with the Caprimulgide, nearly as much affinity may be traced to the Strigid@, while it possesses some characters in which it differs from both (Proc. Zool. Society, 1873, pp. 526-535). About as big as a Crow, its plumage exhibits. the blended tints of chocolate-colour and grey, barred and pencilled with dark brown or black, and spotted. in places with white, that prevail in the two families just named. The beak is hard, strong, and deeply notched, the nostrils are prominent, and the gape is fur- nished with twelve long hairs on each side. The legs and toes are comparatively feeble, but the wings are large. In habits the Guacharo is wholly nocturnal, slumbering by day in deep and dark caverns which it frequents in vast nnm- bers. Towards evening it arouses itself, and, with croaking and clattering which has been likened to that of castanets, it approaches the exit of its retreat, whence at nightfall it issues in search of its food, which, so far as is

known, con- sists entirely of oily nuts or fruits, belonging especially to the genera Achras, Aiphanas, Laurus, and Lsichotria, some of them sought, it would seem, at a very great distance, for M. Funck (Lull. Acad. Sc. Bruxelles, xi. pt. 2, pp. 371- 377) states that in the stomach of one he obtained at Caripé he found the seed of a tree which he believed did not grow nearer than 80 leagues. The hard, indigestible seeds swallowed by the Guacharo are found in quantities on the floor and the ledges of the caverns it frequents, where many of them for a time vegetate, the plants thus growing being eticlated from want of light, and, according to travellers, forming a singular feature of the gloomy scene which these places present. The Guacharo is said to build a bowl-like nest of clay, in which it lays from two to four white eggs, with a smooth but lustreless surface, resembling those of some Owls. The young soon after they are hatched become a perfect mass of fat, and while yet in the nest are sought by the Indians, who at Caripé, and perhaps elsewhere, make a special business of taking tllem and ex- tracting the oil they contain. This is done about mid- summer, when by the aid of torches and long poles many thousands of the young birds are slaughtered, while their parents in alarm and rage hover over the destroyers' heads, uttering harsh and deafening cries. The grease is melted over fires kindled at the cavern's mouth, run into earthen pots, and preserved for use in cooking as well as for the lighting of lamps. It is said to be pure and limpid, free from any disagreeable taste or smell, and capable of being kept for a year without turning rancid. In Trinidad the young are esteemed a great delicacy for the table by many, though some persons object to their peculiar scent, which, says Léotaud (Ois. de la Z'rinidad, p. 68) resembles that of a Cockroach (Blatta), and consequently refuse to eat them. The old birds also, according to Mr E. C. Taylor (lis, 1864, p. 90) have a strong Crow-like odour. But one species of the genus Steatornis is known.

In addition to the works above quoted valuable information about this eurious bird may be found under the following referenees :-— L'Herminier, Ann. Sc. Nat., 1836, p. 60, and Nouv. Ann. Mus., 1838, p. 321; Hautessier, Rev. Zool., 1838, p. 164; J. Miiller, Monatsb. Berl. Acad., 1841, p. 172, and Archiv fiir Anat., 1862, pp. 1-11: Des Murs, Rev. Zool., 1848, p. 82, and Ool. Orn., pp. 260- 263; Blanehard, Ann. Dfus., 1859, xi. pl. 4, fig. 30 ;

Konig- Wart- hausen, Journ. fiir Orn., 1868, pp. 384-387 ; Goering, Vargasia, 1869, pp. 124-128 ; Murie, Ibis, 1878, pp. 81-86. (A. N,)

GUACO, Hvaco, or Gvuao, also Vejuco and Bejuco, terms applied to various Central and South American and West Indian plants, in repute for alexipharmic and curative virtues. The Indians and negroes of New Granada believe the plants known to them as guaco to have been so named after a species of kite, thus designated in imitation of its cry, which they say attracts to it the snakes that serve it principally for food; they further hold the tradition that their antidotal qualities were discovered through the obser-

vation that the bird eats of their leaves, and even spreads the juice of the same on its wings, during contests with its prey. The disputes that have arisen as to what is "the true guaco" are to be attributed mainly to the fact that the names of the American Indians for all natural objects are generic, and their genera not always in coincidence with those of naturalists. Thus any twining plant with a heart- shaped leaf, white and green above and purple beneath, is called by them guaco (R. Spruce, in Howard's Neueva Quinologia, "Cinchona succirubra," p. 22, note). What is most commonly recognized in New Granada as guaco, or Vejuco del guaco, would appear to be the Mikania Guaco of Humboldt and Bonpland (Pi. Lquinoz., ii. 86, pl. 105, 1809; D. C., Prodr., v. 193), a climbing Composite plant of the tribe Hupatoriacew, affecting moist and shady situa- tions, and having a much-branched and deep-growing root, variegated, serrate, opposite leaves, and dull-white flowers, in axillary corymbs. The whole plant emits a disagreeable odour. J. Fauré (Journ. de Pharm, xxii. 291, 1836) obtained from leaves of a Mexican guaco, besides a wax- like matter, a substance analogous to tannin, and other bodies, a light-brown bitter resin, gwacin, soluble in alcohol and partly so in water, and stated by Pettenkofer to possess emetic properties, and to give off an intoxicating odour when triturated with sulphuric acid (Watts, Dict. of Chem., ii. 945). Guaco has been highly recommended for the treatment of bites of venomous reptiles and insects, and in cholera, chronic dysentery, gonorrhceal and syphilitic affec- tions, atonic deafness, abscess, sciatica, sprains, gout, and other

conplaints. Its efficacy against poisoning by snakes, first carefully experimented on by Mutis! about 1787, has been frequently since attested; and in parts of New Granada much infested by those pests, a kind of inocula- tion with it is practised by some persons, the juice of the leaves being applied, at intervals of a fortnight during several months, to incisions in the hands, feet, and sides of the chest, two large teaspoonfuls of the same juice having beforehand been administered internally.? It is stated that the Indians of Central America, after having " guaconized" themselves, 7.¢., taken guaco, catch with impunity the most dangerous snakes, which writhe in their hands as though touched by a hot iron (B. Seemann, Hooker's Journ. of Bot., v. 76, 1853). The odour alone of guaco has been said to cause in snakes. a state of stupor and torpidity; and Humboldt, who observed that the near approach of a rod steeped in guaco-juice was obnoxious to the venomous Coluber corallinus, was of opinion that inoculation with it imparts to the perspiration an odour which makes reptiles unwilling to bite.

The huaco hembra and huaco macho of Mexico are the species Mikania angulata and M. repanda, La L1., respectively. Among the best remedies for snakc-bites, according to Martins (Reise, i. 279, 1823; Syst. Mat. Med. Brasil., p. 44, 1843), is the recently expressed juice of Zupatorium Ayapana, Ventenat (D. C., Prodr., v. 169), a native of the Amazons. On the Orinoco the most esteemed guaco is an Aristolochia, distinguished often as guaco del monte from the Mikaniz, or guaco del rastrojo, so called from their trailing about stubble and deserted "chacras." A similar plant, with highly aromatic root and stem, is known in the Andes as Machdcin-hudsca, or snake-vine. The guaco denominated in the Peruvian Andes bejwco (climber) de la estrella, and contrayerba (counter-herb, or antidote) de bejwco, is the Aristolochia Jragran- tissima of Ruiz (Howard, loc. cit., p. 9; D. ©., Prodr., xv., pt. i, 463). The tincture of the root and stem of a Mexican guaco (Pharm. Society's Coll., 497a), also an Aristolochia, is administered in hydrophobia. Among allied species accredited with the pro- perties of guaco are A. anguicida, L., a native of Cartagena in Colombia; 4. cymbifera, Mart.; A. macroura, Gomez; A. trilo- bata, L.; A. sempervirens, L., supposed to be the plant with which

: Mutis's plant is believed by N. Pascal to have probably been the above mentioned Mtkania Guaco, and not, as supposed by Guillemin, ual Spilunthes ciliata of Kunth, called guaco in Central America.

According to J. Hancock (Observations on Brit. Guiana, p. 24, 1835), the operation is not of Indian origin.

the Egyptian jugglers stupefy snakes; 4. Serpentaria, L., or Vir- ginian snake-root; Asarwm canadense, L., the Canada snake-root, or "wild ginger"; and Asari virginiewm, Willd. The guaco or arbol of Panama is the species Crateva tapioides, D. C., called tetlathian by the Mexican Indians, In the West Indies and Mexico Comocladia dentata, Juss., is employed as guaco; C. integrifolia, L., the brésidlet of some authors, resembles it in properties. According to E. Otto (Retseerrinerungen an Cuba, &e., pp. 75, 76, 1843), C. ilicifolia, Swartz, a small tree with excessively noxious sap, is the guaco of Trinidad in Cuba, where it is nsed in cholera and yellow fever.

See, besides the works above quoted, P. d'Orbies y Vargas, Tilloch's Phil. Mag., xii. 36, 1802; Le Guevel de la Combe, Jowrn. GAGTION. we des Pays-Bas, xv. 90, 1823; J. L. Alibert, Nowe. Elém. de Thérap., ii. 583, 5th ed., 1826; Descourtilz, Flore pit- toresque et médicale des Antilles, iii. 11, pl. 197, 1827; ' Du Guaco," &e., Bull. de Thérap., ix. 331, 1835; J. L. Chabert, A pzates sobre ef Chélera-Morbus, y su curacion con la Mikania-huaco 6 Giuico, &e., Mexico, 1850; B. Secmann, Die Volksnamen d. Amertk. Pflanzen, Han., 1851; Orfila, Traité de Towicol., ii. 868, 5th ed., 1852; E. W. Pritchard, Med. Times, 1852, ii. 522, 651; and Pharm. Jowrn., 2d ser., iii, 288, 1862; A. Stokes, Med. Circular, Dec. 15, 1852, p. 474; Lindley, Veg. Kingd., p. 793, 1853; T. K. Chambers and R. Temple, Journ. Soc. Arts, 1856-57, p. 44; T. Redwood, Srppl. to the Pharmacopwia, p. 469, 1857; M. T. Parola, Afed. Times, 1859, i. 643; EF. Reclus, Rev. des Dewx Mondes, March 15, 1860, p 446; N. Pascal, Du Guaco… dans les Muladics Vénéricnnes, &e., 1863 (1st cd. 1861); and A. Bonniére, Notice sur le Guaco, &c., 1868. (F. H. B.)*

GUADALAJARA, a province of Spain, in New Castile, bounded on the N. by the provinces of Segovia, Soria, and Saragossa, on the E. by Saragossa and

Teruel, on the 8S. by Cuenca, and on the W. by Madrid. In the north are some of the loftiest summits of the Guadarrama range, having their culminating point in the Pefia de la Bodera ; the rest of the province, forming the upper basin of the Tagus, and watered by its affluents the Alblanqueja, Tajuiia, Henares, and Jarama, is comparatively level. The soil varies con- siderably, but is generally of a good character. Pasture occupies the larger part of the surface on the higher tracts ; and the mountains, though unduly denuded, still bear con- siderable forests of oak and cork. The plain around Tamajon is specially adapted for cereals; and the neigh- bourhood of Alcarria matures all kinds of crops proper to the latitude. Iron and lead are the only minerals; the former is very abundant and has been worked from the remotest periods ; the latter occurs but in small quantities. The principal productions are wheat, barley, oil, wine, silk, saffron, and flax; but the chief wealth of the province consists in sheep and wool. Manufactures and trade have been declining for many years. The province is divided into nine administrative districts; but besides Guadala- jara, the capital, it has no town of importance except the episcopal: see of Siguenza. The area is 4869 English square miles; and in 1870 the estimated population was

208,638.

GUADALAJARA, a city of Spain, capital of the pro- vince of the same name, is situated on an elevation not far from the eastern bank of the river Henares, which is here spanned by a stone bridge built on Roman foundations in 1758. It isa station on the Madrid and Saragossa Railway, 38 miles N.E. from Madrid, and 2395 feet above the level of the sea. It hasten churches, several convents, including that of San Francisco, founded originally by Dotia Beren- guela for the Templars in 1200, handsome town and county buildings (casas consistoriales) built in 1585, and a college of engineers ; besides the usual hospitals, barracks, and schools. There is also a fine palace of the ducal house del Infantado, built in 1451; and the Panteon or burying- place of the dukes of Mendoza, begun in 1696 and finished in 1720 at a cost of £180,000, rivals in its richness the tombs of the Escorial. An extensive Roman aqueduct supplies public fountains ; and there are four alamedas or promenades. The principal manufactures are soap, earthen- ware, and woollens. The cloth manufaeture, whicli was

formerly carried on in behalf of the Government, is now in private hands. The trade of the place is chiefly in grain, flax, fruit, cloth, and silk. Population, 7900. Guadalajara is the Arriaca or Caraca of the Romans; when taken by the invading Moors it was called Wada-l-hajarah (the river of stones), of which its present name (sometimes in the medi- eval chronicles spelt Godelfare) is a corruption. It was recaptured in the days of the Cid.

GUADALAJARA, or in the older spelling Guapat- AXARA, a city of Mexico, the capital of the state of Jalisco, is situated in the Atemarac valley not far from the Rio Grande de Santiago, about 280 miles W.N.W. of the city of Mexico, in 20° 41' 10" N. lat. and 103° 21' 15" W. long. Owing to its considerable elevation above the sea- level (according to the Boletin del Munisterio de Fomentos, 1876, 1552 metres, but according to older authorities 1580 metres), Guadalajara enjoys an excellent climate. On the whole it is well laid out, and its streets are kept in tolerably good condition. All the houses, whether built of stone, brick, or adobe, are plastered and whitewashed, and hardly a dozen of them attain the height of three stories. In the outskirts of the town the buildings are of an inferior type. The Plaza Mayor is a square about 300 feet in each direc- tion, one side of whicli is occupied by the cathedral, another side by the casa de gobierno del estado or state buildings, and the remaining sides by portales or arches in the shelter of which are some of the main shops of the city. The cathedral, commenced in 1571 and finished in 1618, is a rather fine structure with two steeples and a large dome between them covered with figures in coloured tiles. The interior is gloomy but impressive. No small interest attaches to the Hospital de San Miguel de Belen, which comprises, not only a hospital proper with male and female wards, but a lunatic asylum and a school for little children. Contiguous to it is the principal cemetery of the city, which is arranged in rather an unusual fashion : three sides of the area are bounded by walls and colonnades, and the inner surface of the walls is divided into six tiers of niches or gavetas in which the dead are deposited. Another remark- able institution is the hospicio, occupying twenty-four large blocks of building, and not only affording an asylum for found- lings and orphans, for the blind, the deaf and dumb, and the infirm of all ages, for old people

unable to secure a liveli- hood, but also serving as a reformatory and training school. It presents a fine appearance with its dome and pillared portico. Its inmates number upwards of 1000, 700 being children, and 200 old men and women. Among the other public buildings and institutions of Guadalajara are the university (formerly the Jesuit college), eleven conventual establishments, a theological seminary, an academy for the fine arts, a mint, a theatre, and a bull-ring. The favourite promenade is the paseo which runs for a mile and a quarter through the city, and terminates northward in the alameda or public garden. Guadalajara is a fairly busy town, with paper-mills and woollen and cotton factories; but all the principal establishments are in the handsof Frenchmen, Ger- mans, or Englishmen. The confectionery of the town is held in high repute, and the Indians of the neighbourhood are remarkable for the artistic ability with which they mould figures in clay or rags. The silk embroidery produced in the hospicio is also worthy of mention. Guadalajara was founded in 1531 by Nuiiez Guzman, and was made a bishop's see in 1549. The population, which was only 19,500 in 1800, had increased to 46,804 by 1841, and to 70,947 by 1870. At Puente Grande in the neighbourhood, the Rio Grande forms a magnificent waterfall; and the bridge of Calderon is famous for the defeat of the insurgents under Hidalgo in June 1811. Several excellent views of Guadalajara will be found in Geiger, A Peep at Mexico. On the 11th of March 1875 Guadalajara was visited by a

severe earthquake, which did damage to nearly every large building in the town. An account of the mint of Guada- lajara, founded in 1811, is given in Bol. Soc. de geogr. de la rep. Mexicana for 1871. In 1877 the value of the new coin was 1,467,660 piastres or dollars, 5000 piastres being in copper and the rest in silver. New machinery driven by steam was imported from France in 1878. The total im- port trade of the town was reckoned at 3,280,000 piastres in 1878,—Great Britain having about 40 per cent. of the amount, France 25 per cent., the United States 10, and Germany 8. Full details on the money transactions of the city will be found in the Preussisches Handelsarchiv, 1879. GUADELOUPE, an island of the Antilles in the West Indies, belonging to France, is situated 62 miles from Martinique, between 15° 59' 30" and 16° 20' 18" N. lat. and between 61°

31’ 23” and 61° 50’ 32” W. long. The sailing distance from Brest is 3750 nautical miles. A narrow channel, called La Riviére Salée, or Salt Stream, with a width of from 100 to 400 feet, separates the island into two portions, Guadeloupe proper or Basse Terre and Grande Terre. The former or western portion measures 28 miles from N. to §., and from 12 to 15 miles from E. to W., and its coast-line is estimated at 87 miles. The latter or eastern portion measures 22 miles from N. to S. and 34 from §.E. to N.W., and its coast-line is estimated at 106 miles. Basse Terre has a mountainous surface of voleanic origin, attaining its greatest altitude in La Sou- friére, a still active volcano, 4870 feet in height; while Grande Terre is generally flat, with no elevations higher than 115 feet, and consists entirely of calcareous forma- tions. In the rainy season the streams are subject to floods or “spates,” which, according to M. Casponi (Rev. Alar. et Coloniale, 1871), come on so suddenly that it is hardly safe to travel in the dry beds, lest, to use the local phrase, the galion descend. Basse Terre, as is natural, is traversed by a considerable number of streams,—the Goyave, the Lézarde, the Moustic, the Petite Goyave, the Sainte Marie, the Trou au Chien, the Capsteire, &c.,—while Grande Terre is almost destitute of springs, and both men and cattle are dependent for their water supply on the ponds and marshes. The mean temperature of the island is 79° Fahr.,— the maximum in the shade ranging from 86° to 91°, aud the minimum from 68° to 72°. July, August, and Septem- ber are the hottest months. At Basse Terre, about 180 feet above the sea-level, the thermometer in July shows a mean of 80°8° Fahr., in August 82°5°, and in September 82°6°. Like the rest of the West Indian islands, Guadeloupe is subject to terrible storms. That of 1825 almost entirely destroyed the town of Basse Terre, and that of 1865 proved equally disastrous to Grand Bourg. The rainfall is very heavy, on the coast no less than 86 inches per annum. Along with its dependencies, the smaller islands of Marie Galante, Désirade, and Les Saintes, Guadeloupe

forms a separate colonial government. The following table gives the area of the several portions :— a Hectares. Acres

Guadeloupe or Basse Terre…….. + 94,681 = 233,844 (Cishnals
TNEVORS nop sanontne ooo edeedaEnonagnec. 65,631 = 162,181
IMEMIOMGAIAMLG ...cccecesersnes sm cerssoesr 14,927 = 37,067
TOVesindl See Bpoasonecnacamedccnr atnenmnoncscnge 2,720 = 6,720

ILGSS UOAVES) qppneonboosnbondopepneouso cao anATec 1,422 = 3,514 TPivani “INETOre Gapseppnoconpessbeccppnenopecnecsdc 343 = 848

Saint Martin (French portion) ..... .-

MUON Moncopononce Pipodemonbone 184,851 =

456,949

Of the total area 85,248 acres were under cultivation in 1873; 1932 acres were hattes or cattle-farms, 30,640 acres savanuahs, and 106,258 acres woods and forests; while 69,689 acres were fallow. ‘To the sugar-cane, which is the staple of the colony, 48,711 acres were devoted; to coffee, 8659 acres; to cotton, 1855 acres; to cocoa, 1146 acres ;

to rocou or arnatto, 1632 acres ; and to tobacco, 294 acres. Manioc, which forms one of the principal sources of food in the colony, occupied 11,614 acres; and 11,246 acres were assigned to other articles of direct consumption. In the same year (1873) it was calculated that 43,780 people were employed in the sugar plantations, 5160 in the coffee plantations, 504 in the cotton plantations, and 1088 in the rocou plantations. The whole value of the ground is stated at about £200,000, of the buildings and plants at £1,560,000, and of the live stock at £263,2000. The total produce of sugar of all kinds was 679,300 cwts. ; the syrup and molasses amounted to 568,326 gallons, and the tafia or rum to 298,850 gallons. The produce of coffee, cocoa, and rocou was respectively 13,564, 2102, and 10,663 cwts. The manioc or cassava amounted to 282,412 cwts., and the other food substances, such as yams, bananas, arrow-root, &c., to 118,340 cwts. Tobacco, vanilla, and cloves were also produced in small quantity, as well as 4542 cwts. of campeachy wood. The value of the whole was estimated at £1,134,226, and the net value at £298,437. Administratively the colony is divided into three arrondissements of Basse Terre, Pointe 4 Pitre, and Marie Galante. The town of Basse Terre, situated in 15° 59’ 30” N. lat. and 66° 24’ 31” W. long., with a population of 12,000, is the capital, and the seat of the bishopric, which was founded in 1850 ; and Pointe a Pitre,

situated in 16° 14° 12” N. lat. and 66° 11’ 41” W. long., and containing a population of 16,000, is the principal port. A fine military harbour, popularly known as the Gibraltar of the Antilles, is situated in the group of Les Saintes. There is a militia, originally constituted in 1832, partly dissolved in 1851, and re-established in 1870.

During the twenty-five years from 1848 to 1872 the population of the colony remained almost stationary, the mean being only 132,000. Between 1873 and 1875 there was a notable increase, the mean for these years being 141,000. Owing probably to the influence of immigration, the masculine element is on the increase,—there being now 92 men to 100 women instead of 90 as formerly. Married people form only 20 per cent. of the popula- tion. According to Dr Charles Walther, with every 1000 European immigrants in 1864 there were introduced 25 women ; for every 1000 Africans, 496 women; for every 100 Indians, 253; and for every 1000 Chinese, 9. Between 1848 and 1872 there have been 30 births to every 1000 of the population, except during the five years from 1863 to 1867 when the ratio was only 27°6. If the non-repro- ductive part of the population be excluded, the births range from 41 to 46 per 1000, while in England the corresponding number is 61. It is estimated that probably 25 per cent. of the births are illegitimate. During the years from 1848 to 1852, immediately after the abolition of slavery, there Were a great many marriages, especially among the liberated population—as many indeed as 2000 per annum; but, to use the words of Dr Rey, “‘cette belle ardeur matrimoniale” soon came to an end. In 1870, 1871, and 1872 there were only three marriages to 1000 inhabitants.

History.—Guadcloupe was discovered by Columbus in 1493, and received its name in honour of Santa Maria de Guadalupe in Estre- madura in Spain. In June 1635 L’Olive and Duplessis took posses- sion of the island in the name of the French Company of the Islands of America, and after Duplessis’s death about six months later 1/Olive engaged in a war of extermination against the Carib inhabit- ants. In 1674 Guadeloupe was united to the domains of the crown, and for a long time it remained a dependency of Martinique. Suc- cessful resistance was made to attacks by the English in 1666, 1691, and 1703, but on 27th April 1759 the inhabitants capitulated to Admiral Moore and General Barington, and the island

remained in British possession till 17638. On 12th April 1782 the French under Admiral de Grasse were defeated by Rodney in the neighbourhood of the island. In 1775 Guadeloupe was finally separated from Martinique, but it remained under the common authority of the governor-general of the Windward Islands. The English under Sir

John Grey and John Jervis obtained possession on 21st April 1794, but they were expelled on the 2d of June by Chrétien and Victor Hugues, commissioners of the National Convention, who were powerfully supported by the native population (see "Délivrance de la Guadeloupe en 1794" in Rev. Mar. et Col., 1870). About this tine the island contained about 107,226 inhabitants, and the com- merce was worth £1,274,600. After the peace of Amiens the first consul sent an expedition under General Richepanse for the purpose of re-establishing slavery in Guadeloupe, but the negroes heroically defended their liberty for months. A new period of British possession was begun by the victory of February 3, 1810, and though by the treaty of March 1813 the island was made over to Sweden, and in the course of 1814 the French general Boyer de Peyrcleau gained a temporary footing, in terms of the first peace of Paris, it was not till July 1816 that Britain finally withdrew her forces, Between 1816 and 1825 a special code of laws for Guadeloupe was printed. Municipal institutions were introduced into the island in 1837 (November 20).

See Moreau de Jonnes, Histoire Physique des Antilles ; Boyer de Peyreleau, Les Antilles francaises et partieuliérement la Guadeloupe, Paris, 1828, 3 vols; A. Budan, La Guadeloupe Pittoresque, Paris, 1863, folio, a fine series of views with descriptive text ; P. S. Dupuy, Eaux thermo-minerales de la Guadeloupe; "Guadeloupe et dépendances," in Rev. Maritime et Coloniale, 1876 (tome 48)+ H. Rey, 'Etudes sur la colonie de la Guadeloupe, topographie médi- cale, climatologie, demographie," in Rev. Mar. e Col., 1878; ' La Guadeloupe 4 l'exposition" in Journal du commerce maritime, 1878 ; Annuaire de la Guadeloupe, 1868, &c.; Gaffarel, Les Colonies Francaises, Paris, 1880.

GUADIX, a city of Spain, in the province of Granada, situated on an elevated plateau on the northern slope of the Sierra Nevada, and above the left bank of the river Guadix. It is surrounded by ancient walls, and was

formerly dominated by a Moorish castle, now in ruins. It is said to have been the first episcopal see erected in Spain ; it still is a bishopric, suffragan to Granada, but the cathedral is architecturally unimportant. The town was once famous for its cutlery; but its modern manufactures (chiefly earthenware, hempen goods, and hats) are inconsiderable. It has some trade in wool, cotton, flax, corn, and liqueurs. The population is estimated at 10,150. The warm mineral springs of Graena, much frequented by Spaniards during the summer season, afe situated 44 miles to the westward. Guadix, along with Almeria and other places constituting the domain of El Zagal, was formally surrendered without a siege to Ferdinand the Catholic in December 1489.

GUADUAS, a town of Colombia, South America, state of Cundinamarca, is situated in the beautiful valley of the Magdalena, on the road between Bogota and Honda, 45 miles N.W. of the former town, and more than 8000 feet above sea-level. The name signifies in the original the bamboo cane, a plant which grows in great abundance in the neighbourhood. The town possesses a pretty church, and an old monastery now used asa prison. The staple articles of trade are sugar, coffee, cochineal, and oranges and other fruits. The population is about 8000.

GUAIACUM, a genus of trees of the natural order Zygophyllece. The guaiacum or lignuni vite tree (Germ., Guajakbaum, Franzosenbaum, Pockenholzbaum; Fr., Gayac, Gaiac), G. officinale, L., is a native of the West Indies and the north coast of South America, where it attains a height of 20 to 30 feet. Its branches are numerous, flexuous, and knotted ; the leaves opposite and pinnate, with caducous stipules, and entire, glabrous, obovate or oval leaflets, arranged in 2 or, more rarely, 3 pairs; the flowers are in axillary cymes, and have 5 oval pubescent sepals, 5 distinct pale-blue! petals three times the length of the sepals, 10 stamens, and a 2-celled superior ovary; and the fruit is about # inch long, with a leathery pericarp, and contains in each of its two cells asingleseed. G@. sanctum, L., grows in the Bahamas and Cuba, and at Key West in Florida. It may be distinguished from G. officinale by its smaller and narrow

1 The guaiacum tree is described by Garcias da Horta (Aromad. et Simpl. Hist.), and by Antonius Gallus (Luisinus, De Morbo Gallieo, p. 392, Ven.,

1566, fol.), as having yellow flowers.

GUATA CU M

leaflets, which are in 4 to 5 pairs, by its shorter and glabrous sepals, and mucronate quinquelocular and 5-winged fruit. G. arboreum, DC., the guaiacum tree of Colombo, is found in the valley of the Magdalena up to altitudes 800 metres (2625 feet) above sea-level, and reaches considerable dimen- sions. Its wood is of a yellow colour merging into green, and has an almost pulverulent fracture; the flowers are yellow and conspicuous ; and the fruit is dry and 4-winged (J. Triana and J. HE. Planchon, " Prodromus Flore Novo- Granatensis," Anz. des Sci. Nat., Bot., me sér., tom. xv.). The lignum vite of commerce, so named on account of its high repute as a medicinal agent in past times, when also it was known as lignum sanctum and lignum Indicum, lignum guaycanum, or simply guayacan, is procured from G, opficinale, and in smaller amount from G. sanctum. Tt is exported in large logs or blocks, generally divested of bark, and presents in transverse section very slightly marked concentric rings of growth, and scarcely any traces of pith ; with the aid of a magnifying glass the medullary rays are seen to be equidistant and very numerous. The outer wuod, the sapwood or alburnum, is of a pale yellow hue, and devoid of resin; the inner, the heartwood or dura- men, which is by far the larger proportion, is of a dark greenish-brown, contains in its pores 26 per cent. of resin, and has a specific gravity of 1333, and therefore sinks in water, on which the alburnum floats. Owing to the diagonal and oblique arrangement of the successive layers of its fibres, the wood cannot be split; and on account of its hardness, density, and durability it is much valued for the manufacture of ships' pulleys, rulers, skittle-balls, mallets, and other articles. Chips or turnings of the heartwood of G. officinale (guaiaci lignwm) are employed in the preparation of the decoctum sarsce compositum of British pharmacy. They may be recognized by being either yellow or greenish-brown in colour, and by turning bluish-green when treated with nitric acid, or when heated with corrosive sublimate, and green with solution of chloride of lime. They are occasion- ally adulterated with boxwood shavings. Lignum vite is imported chiefly from St Domingo, the Bahamas, and Jamaica, The foliage of guaiacum trees is stated by Dr Asa Gray to be employed in the West Indies instead of soap to scour and whiten

floors. The bark was formerly used in medicine ; it contains much calcium oxalate, and yields on incineration 23 per cent. of ash. Guaiacum resin, the guatact resina of pharmacopceias, is obtained from the wood as an exudation from natural fissures or from incisions; by heating billets about 3 feet in length, bored to permit of the outflow of the resin ; or by boiling chips and raspings in water to which salt has been added to raise the tempera- ture of ebullition. It occurs in rounded or oval tears, commonly coated with a greyish-green dust, and supposed to be the produce of G. sanctum, or in large brownish or greenish-brown masses, translucent at the edges; fuses at 85° C. ; is brittle, and has a vitreous fracture, a specific gravity of 1-2289 (W. Brande, Phil. Z'rans., 1806, p. 89), and a slightly balsamic odour, increased by pulverization and by heat; and is at first tasteless when chewed, but produces subsequently a sense of heat in the throat. It is readily soluble in alcohol, ether, chloroform, creasote, oil of cloves, and solutions of caustic alkalies; and its solution gives a blue colour with gluten, raw potato parings, and the roots of horse-radish, carrot, and various other plants. The alcoholic tincture becomes green with sodium hypo- chlorite, and with nitric acid turns in succession green, blue, and brown. With glycerin it gives a clear solution (B. Squire, Pharm. Jowrn., May 3, 1879, p. 894), and With nitrous ether a bluish-green gelatinous mass. It is blued by various oxidizing agents, é.g., ozone, and, as Schénbein discovered, by the juice of certain fungi.

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To test for blood or hemoglobin, the tincture, which may be pre- pared from 1 part of the resin to 6 parts of 80 per cent. alcohol (Med. Limes, 1878, i. p. 660), is employed according to the method first suggested by Dr John Day, of Geelong, Australia. A drop of the tincture is added to a small quantity of the liquid to be examined, and with this a few drops of ozonic ether (solution of hydrogen per- oxide in ether) are then shaken. The ether dissolves the resin, which, acted on by the hemoglobin, becomes of a bright blue colour. Misleading reactions may sometimes result from the use of white bibulous paper, or from the presence of bile, when the test is applied in cases of hematuria ilo Clinical Manual, p. 891, 1878). Guaiacum resin, according to Hadelich (Erdmann's Journ. J. prakt. Chemie, \xxxvii., 1862, pp. 321-343), has the following 'percentage composition :—guaiaconic

acid, CggH4 0,9, a substance giving a transient blue colour with oxidizing agents, 70°35; guaiaretic acid, CopHg04, 10°5 ; guaiac bcta-resin, 9°76 ; gum 3°7; insoluble ash constituents ‘79; minute quantities of guaiacic acid, C,.H,,0., with guaiac ycllow and impurities, 4°9. Acted on by heat it yields the decomposition products guatacenc, C;H,O, and guaiacol, C7H,O0,, and kreasol C,H, ,0., the first at 118° C., and the other two at 205°-210° ©. (of. CHEMISTRY, vol. v. p. 564), and, at a still higher temperature, pyroguaiacin, CygH 4,0,.

Guaiacum wood was first introduced into Europe by the Spaniards in 1508, and Nicolaus Poll, writing in 1517 (see Luisinus, De Morbo Gallico, p. 210, Ven., 1566), states that some three thousand persons in Spain had already been restored to health by it. The virtues of the resin, however, were not known until a later period, and in Thomas Paynel’s translation (Of the Wood called Guaiacum, &c., p. 9, ed. of 1540) of Ulrich von Hutten’s treatise De Morbi Gallict curatione per administrationem ligni guatact (1519) we read of the wood :—“ There foloweth fro it, whan it bourneth a gomme, which we yet knowe not, for what pourpose it serueth.” Fliickiger and Hanbury (Pharmacographia, p. 95) state that the first edition of the London Pharmacopeia in which they find the resin mentioned is that of 1677. The decoction of the wood was administered in gout, the stone, palsy, leprosy, dropsy, epilepsy, and other diseascs, but principally in the “morbus gallicus,” or syphilis, for which it was reckoned a certain specific, insomuch that at first “ the physitions wolde not allowe it, perceyuynge that theyr profite wolde decay therby” (Paynel, op. cit., p. 8). Minute instructions are given in old works as to the mode of administering guaiacum. The patient was confined in a closed and heated chamber, was saul on the lowest possible diet, and, after liberal purgation, was made twice a day to drink a milk-warm decoction of the wood. The use of salt was specially to be avoided. A decoction of 1 fb of guai- acum was held to be sufficient for the four first days of the treatment. The carlier opinions as to the efficacy of guaiacum came to be much modified in the course of time, and Dr Pearson (Obscrvations on the Effects of Various Articles of the Mat. Mcd. in the Cure of Lucs Venercea, chap. i., 2d ed., 1807) says :—“I neyer saw one single instance in which the powers of this medicine eradicated the venereal virus.”’ He found its beneficial effects to be most marked in cases of secondary symptoms. Guaiacum resin is an ingredient in the mistura

guaiact, tinctura guaiact ammontata, and pilula hydrargyrt subchloridi composita of the British Pharmacopeia. It is administered in cutaneous diseases, more especially those of a syphilitic character ; for long-standing gouty and rheumatic affec- tions, as in the nostrum knownas "Chelsea pensioner ;" insome forms of neuralgia ; in sciatica (Lancct, 1864, i. p. 459) ; bronchorrheea ; tonsillitis (see inter alja, Lancct, 1864, ii. p, 735); and in sorc- throat, or in incipient sore-throat of whatever kind, in the form of the simple resin (Broadbent, Lancet, 1867, i. p. 898); and has been found serviceablein amenorrhcea and ovarian complaints of inflamma- tory origin (Cleland, Braithw. Retrosp., 1873, i. p. 347); and formerly (Graily Hewitt, Dis. of Women, p. 387, 3d ed., 1872) was much employed in dysmenorrhea. Copland (Mcd. Dict., ii. 656) regards the decoction or tincture of guaiacum as the best of diaphoretics, especially when the skin is cool as well as dry. Pearson found that if a patient exposed himself freely to the air, guaiacum acted asa diuretic, instead of as a diaphorctic. Guai- acum causes, when administered, dryness in the mouth, thirst, and a feeling of warmth in the stomach. According to Pearson, it increases the temperature of the skin and quickens the pulse. It has, seemingly, a considerable influence in lessening cxcessive sccre- tion from mucous surfaces. In large doses it occasions headache,

yrexia, great heat at the epigastrium, and purging and vomiting.

uaiacum resin is sometimes adulterated with common resin, and has itself been used to sophisticate the resin of scammony and of OE cai the above-quoted works, Macfadyen, The Flora of Jamaica, p. 187, 1837; J. Lindley, Flora Medica, p. 214, 1838; Asa Gray, Genera of the Plants of the United States, vol. ii. p. 121, pl. 148 and 149, 1849; Berg and Schmidt, Ofizin. Gewiichse, ii. pl. xiv.b, 1863; Grisebach, Flora of the Brit. West Ind. Islands, p. 134, 1864; E. J. Waring, Manual of Practical Therapeutics, 30 ed., 1871; Bentley and Redwood, Peretra's Elem. of Mat. Med. and Therap., p. 892, 1874; Bentley and Trimen, Medicinal Plants, pt. 30, tab. 41, 1878; and Lanessan, ist. des Drogues, i. pp 194-201, 1878. For lists of numerous carly treatises on guai- aeum, sec Reuss, Repertorium, tom. xi. p, 142, 1816,and E, J, Waring, Bibliotheca Therapeutica, ii., New. Syd. Soc., 1879. F, H. B.)

GUALDO TADINO, a town of Italy, in the province

of Perugia and circondario of Foligno, with a station on the line from Ancona to Rome about 58 miles froin the former city. It is picturesquely situated in the lap of the Apennines on the post-road that leads to the Furlo Pass. The cathedral and several of the other churches possess paintings by Nicolo and Matteo da Foligno of the 15th century. In 1871 the inhabitants of the commune num- bered 7799. Gualdo has inherited the distinctive epithet of Tadino (which prevents it being confounded with Gualdo near Macerata, or Gualdo Cattaneo near Spoleto) from the ancient Roman town of Tadinum, the ruins of which, dis- covered in 1750, are situated in the vicinity, not far from the church of Sta Maria Tadina. It was near Tadinum that Narses gained his famous victory over Totila in 552, Recovering from the effects of the Gothic and Lombard invasions, the town, which even then was defended by walls, became for a time an independent commune; but it ulti- mately passed under the control of Perugia. In 1815 it was incorporated with the Roman States, and in 1833 it was made a city by Gregory XVI.

GUALEGUAY, a town of the Argentine republic, department of Entre-Rios, is situated on the Gualeguay river, which falls into the Parana, and is navigable up to this point, 120 miles N.N.W. of Buenos Ayres. It isa prosperous and increasing town, and has an active shipping trade in beef, mutton, hides, wool, tallow, and timber. In 1874 the total value of exports was £268,970. The population is about 10,000.

GUALEGUAYOHU, a city of the Argentine republic, department of Entre-Rios, is situated on the Gualeguaychu river, which there falls into the Uruguay, 120 miles north of Buenos Ayres. Like Gualeguay, it depends for its pro- sperity chiefly on the sheep and cattle grazed in the neighbouring country, and its export trade includes beef, mutton, hides, wool, tallow, and bone manure, The total value of the exports in 1874 was £163,968. The popula- tion is about 20,000.

GUAMANGA. See HUAMANGA.

GUAN, a word apparently first introduced into the ornithologist's vocabulary about 1743 by Edwards,! who said that a bird he figured (Wat. Hist. Uncommon Birds, pl. xiii.) was "so called in the West Indies," and the name has hence been generally applied to all the members of the Subfamily Penelopine, which are distinguished from the kindred Subfamily Cracine or Curassows by the broad postacetabular area of the pelvis, as pointed out by Prof. Huxley (Proc. Zool. Society, 1868, p. 297), as well as by their maxilla being wider than it is high, with its culmen depressed, the crown feathered, and the nostrils bare—the last two characters separating the Penelopinee from the Oreophasine, which form the third Subfamily of the Cracide,? a Family belonging to that taxonomer's division Peristeropodes® of the Order Galline.

The Penelopinc have been separated into seven genera, of

1 Edwards also gives " Quan" as an alternative spelling, and this may be nearer the original form, since we find Dampier in 1676 writing (Voy., ii. pt. 2, p. 66) of what was doubtless an allied if not the same bird as the " Quam.'"' The species represented by Edwards does not seem to have been identified by the latest authorities.

: See the excellent Synopsis, extensively laid under contribution for this article, by Messrs Sclater and Salvin in the Proceedings of the Zoological Society for 1870 (pp. 504-544), while further information on the Cracinc has since been given by the former of those gentlemen in the Transactions of the same society (ix. pp. 273-288, pls. xl.-liii.). Some additions have since been made toa the knowledge of 'a family, but none of very great importance.

It would be here out of place to dwell upon the important bearings on the question of geographical distribution which the establishment of this division has tended to shew. For this reference must be made to Prof. Huxley's original paper (ut supra), or to the epitome of it given in the Zoological Record (v. pp. 84 and 99)

which Penelope and Ortalida (properly Ortalis), containing respectively about sixteen and nineteen species, are the largest, the others numbering from one to three only. Into their minute differences it would be useless to enter: nearly all have the throat bare of feathers, and from that of many of them hangs a wattle; but one form, Chame- petes, has neither of these features, and Stegnolaema, though wattled, has the throat clothed. With few exceptions the Guans are confined to the South-American continent ; one species of Penelope is however found in Mexico and at Mazatlan, Pipile cumanensis inhabits Trinidad as well as the mainland, while three species of Ortalis occur in Mexico or Texas, and one, which is also common to Venezuela, in Tobago. Like Curassows, Guans are in great measure of arboreal habit. They also readily become tame, but all attempts to domesticate them in the full sense of the word have wholly failed, and the cases in which they have even been induced to breed and the young have been reared in confinement are very few. Yet it would seem that Guans and Curassows will interbreed with poultry (Ibis, 1866, p. 24; Bull. Soc. Imp. d'Acclimatation, 1868, p. 559; 1869, p. 357), and what is more extraordinary is that in Texas the hybrids between the Chiacalacca (Ortalis vetula) and the domestic Fowl are asserted to be far superior to ordinary Game-cocks for fighting purposes. More information on this subject is very desirable. (a. WN.) GUANACO (Auchenta guanacus), one of the four species of ruminant animals which represent in South America the camels of the East, and which resemble them in the posses- sion of canine teeth in both lower and upper jaws. The Guanaco is the largest species, standing nearly 4 feet high at the shoulders. It isan elegant creature, with gracefully curved neck and long slender legs; its body is covered with long soft hair of a fawn colour above and almost pure white beneath. It is found throughout the southern half of South America, from Peru in the north to Cape Horn in the south, but occurs in greatest abundance in Patagonia. It lives in herds usually of from six to thirty, although these occa- sionally contain several hundreds, while solitary individuals are sometimes met with. They are exceedingly timid, and therefore wary and difficult of approach ; like many other ruminants, however, their curiosity sometimes overcomes their timidity, so as to bring them within range of the hunter's rifle. Their cry is peculiar, being described by Cunningham (Natural LMistory of the Strait of Magellan, 1871) as something between the belling of a deer and the neigh of a horse. The chief enemies of the guanaco, according to the same*

authority, are the Patagonian Indians and the puma, as it forms the principal food of both. Its flesh is palatable although wanting in fat, while its skin forms the chief clothing material of the gigantic Patagonians. According to Darwin, who studied it in its native wilds, the guanaco is readily domesticated, and in this state be- comes very bold and will attack man, striking him from behind with both knees. In the wild state, however, they never seek to defend themselves, and if approached from different points, according to the Indian fashion of hunting them, they get completely bewildered and fall an easy prey. They take readily to the water, and have been observed. swimming from one island to another, while Byron in his Narrative states that he has seen them drinking salt-water. They have a singular habit of dropping their dung during successive days on the same spot—a habit which is greatly appreciated by the Peruvian Indians, who use those deposits for fuel. They seem also to have favourite locali-

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4 Of Dixon (The Dovecote and the Aviary, pp. 223-278, London, 1857), who argues that the reported success of the Dutch towards the end of the last century in domesticating these birds was an exaggera- tion or altogether a mistake. His two chapters are well worth reading.

ties in which to die, as appears from the great heaps of bones bearing no sign of having been gnawed by the puma, which have been found in particular spots.

GUANAJUATO, or Santa Fz pe Guanasvato, a city of Mexico, capital of the state of Guanajuato, is situated in 21° 0° 50” N. lat. and 100° 54’ 27” W. long., at a height of 7200 feet above the sea. Built as it is at the meeting-place of three mountain gorges, and obliged by lack of space to climb the underfalls of the surrounding heights, Guanajuato has a highly picturesque appearance. The houses of the lower town are four or five stories in height, most of the streets are narrow and tortuous, and the prin- cipal is small though beautiful. The cathedral, the Jesuit church, the mint dating from 1812, the new theatre built in 1874, the university, and the gymnasium are wortliy of mention. The Alhondiga de Granaditas, originally a corn

magazine, was occupied as a fort in the War of Independ- ence, and acquired peculiar interest as the spot where the patriot Hidalgo met his death. Guanajuato, founded in 1554, owed its existence and prosperity to the fact that it is the centre of the greatest silver-mining district in the world. Of the individual mines perhaps the most famous is the Valenciana, with a shaft 2000 feet deep, which is in process of being cleared of the water by which it has long been flooded. The population, which includes a consider- able number of foreigners, formerly amounted to 100,000, but in 1869 was only 63,500.

GUANCAVELICA. See HvANCAVELICA.

GUANO. The deposits of guano, or huano, known locally as huaneras, are found in characteristic condition and abundance upon a large number of the islands lying off Peru and upon certain parts of the mainland. They occur in Bolivia and to the north of Peru also, but are there generally poorer in quality, if not always less in quantity. For the production and preservation of good guano twoconditions are requisite—a rainless or nearly rainless climate and abund- ance of fish in the waters of the ocean. Both conditions are fulfilled on parts of the Bolivian and Peruvian coasts. The penguins, gannets, divers, cranes, cormorants, flamingoes, and other fish-eating birds thus find ample supplies of food; while their excreta retain their soluble and more valuable constituents. But even Peruvian guano is not exclusively excrementitious, nor wholly the produce of birds. These marine aud maritime huaneras are the breeding-places, the resorts, and the cemeteries not only of sea-birds, but of many other sea-animals,—seals, sea-lions, éc., frequenting many guano lands and islands, and adding considerably during life and when dead to the deposits. In Peruvian guano, it is true, the evidences of its origin are often obscure, but the somewhat complex sources of this material are well shown in the West-African guano islands. On these Mr T. R. Eden found (1845) three varieties of guano, the lowest being a crust or rock guano, the next above this being a seal guano, containing much seal-fur, and the uppermost layer being a bird guano, in which there were many mum- mified bird skins and large quantities of feathers.

The dung of bats, which has been found in large quantities in many caverns, both in Europe and in certain parts of France, the Pyrenees and Italy, in New Zealand, and on the North American continent, has been designated "bat-gnano."! Further, the term guano, even when em- ployed to describe the marine and maritime deposits previously mentioned, includes a considerable variety of substances very different in chemical composition and in manure value. For the deposits of guano occurring on the rainless or nearly rainless islands and coasts of Peru vary much in the proportion of their constituents—such varia- tion being due less to differences in the origin of the deposits —— en Bt Gr eFences In Lhe origin of the deposits

- *This bat guano generally contains much water (over 60 per cent.) with about 5 per cent, of phosphates, and 8 to 7 per cent. ammonia.*

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than to subsequent changes. Exposure to the action of the sea and of sea-mist, and the pressure of superincumbent layers, are not without influence on the nature of the guano, very different qualities being found at different depths.

Although allusions to guano occur in the writings of travellers in the 17th and 18th? centuries, the credit of directing the attention of Europe to this curious and use- ful product is due to Humboldt. In 1804 he brought from the Chincha Islands a specimen which Klaproth and then Fourcroy and Vauquelin analysed. But it was not until the publication in 1840 of Liebig's work on chemistry in its relations to agriculture and physiology had demon-strated the importance of artificial manures that a lively interest in this Peruvian fertilizer was awakened. In that year a firm of merchants of Lima sent a large cargo of guano to England; but it was not until 1842 that the regular trade in guano began. Messrs Gibbs & Co. imported 182 tons in that year, while in 1862 the amount was no less than 435,000 tons. The price was lowest (£9 per ton) in 1848-9. Tt rose successively, in the years 1854 to 1856, from £10 to £13, and has since remained at about the last sum for the best qualities. Happily the Peruvian Guano Company are now permitted to sell this manure according to the results of analysis, and not, as before, at a fixed price irrespective of the variable qualities of different cargoes. Each unit per cent. of nitrogen is set down as worth 19s, 2d. per

ton; while the phosphates, calculated as tricalcic phosphate, are reckoned as worth 2s. 34d. per unit per ton. The only drawback to this plan lies in the rather exaggerated price which it assigns to the low qualities of Peruvian guano, namely, those which are poor in nitrogen but rich in phosphates—containing perhaps 40 to 60 per cent. of these compounds, which may be much more cheaply purchased in other forms. Still it must be urged that the phosphates of Peruvian guano are moré useful than those from most other sources, on account of their physical condition, and their solubility. After all, however, the high phosphatic guanos are not much ap- preciated by farmers, who prefer to use bones and super- phosphates as manure for grass lands and root crops.

For a long time the group of Peruvian islands known as the Chinchas furnished nearly all the guano that found its way to Europe. When these deposits, amounting to 7 million tons or more, were practically exhausted, —only 150,000 tons of deep deposits remaining in 1872,—their further working was stopped except for use in Peru itself. Then the guanos on the Macabi and Huanape islands were exported to Europe, in four years (1870 to 1874) about 1 million tons having been shipped and about half a million tons remaining in 1875. Since then the Lobos islands, situated about 70 miles north of Macabi, have been worked, as have also the islands of the Ballestas group. Even in 1871 three-fourths of the cargoes of nitrogenous guano were from Huanape, but the amount of nitrogen generally present in them was rather low, often not exceeding 19 per cent. of "potential" ammonia, while the percentage of water was remarkably high—-sometimes not less than 25 per cent. 'The Ballestas guanos of the same year were drier and contained one-third more nitrogen.

In spite of many testings and surveys, the amount of Peruvian guano still remaining to be exported has not been even approximately determined. Not only do contiguous deposits differ much in composition, but it is frequently impossible to ascertain what is guano and what is sand or rock. Sometimes the layers of guano are too thin to be worth removing, in other places they fill up ravines to a much greater depth than would be imagined. An estimate of the total quantity of Peruvian guano remaining in 1877

2 The Art of Metalls, by A.A. Barba, published in an English trans- lation in 1670 in London, mentions guano from Arica and Iqueyque. .

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a GUANO

gave over 2 million tons available for commerce, but this figure presumably includes all varieties, both nitrogenous and phosphatic. Most of the guano lately and now exported comes from the following groups of: islands, or places on the coast—Macabi, Huanape, Ballestas, Punta de Lobos, Pabellon de Pica, and Huanillos, and, since 1877, particu- larly from the last two localities.

In the article AGRICULTURE (vol. i. p. 347) some statistics of guano imports were given. According to -the British Consular Reports (1878, No. iv. pp. 525-539) the quan- tities of Peruvian guano sold of late years were, in tons—

ILE) ocaonononnooon coooooon6oae 574,790 Tbh scc ace sescoeessrase oes ENO Ee WFO cicsccs sete ries se so cee MOG OOL | UBTD vy .cce0 cece ee sveeeennsnne 873,688 Te! coponounsapascovooouas sane 363,200 | 1876…..0 0 cece eeneeeeeern ens 878,663 W872 soco noc sepsoqeongEbosoace 402,097 | 1877 ..crcrescrronseeecorces os 310,042 WES .consnoocosaenneepasncena 842,425

The amounts of Peruvian guano taken by different countries during 1876 and 1877 were as follows :—

1876. 1877.

England and her colonics ,,.....+++ 130,598 100,954 France and her colonies ….....0s1++» 102,165 72,067 GOTMGDY 6606… cneeeeteeereeseverccensetees 63,724 23,455 Bel PAW Measles :..scvverenssaveneaaares. reves 48,246 71,478 BAUME: diasiaina sani osienien. Siren ourengp deine «nena 28,359 23,455 TitvallyFnopngmuaa oo aossc0cdcun nonadadodgapaeube 8,594 5,440 PGW ATO se sr eciciere nein Peer caiiceae re neoc 1,977 8,658

In 1872, when tho number of countries contributing guano was very large, the imports into the United King- dom were as follows :—

Tons. Tons. Rerueee se: Rca vere 74,401 | Australia…..... fering Pacilic Islands…..... ohn 17,475 | British West Indies,,,..... 1,050 TByolbivaia, SAMO rossogeemence , 14,068 | St Belena…...00.+..cc0es vam 981 West Coast of Africa…... POLIT Gl uilblgageoweadne tic cdoonaneoace 503 Duteh West Indies…..... 4 915562) United Stateslrc. msc. 458 Brawls as seas Mattes 1;282:| Otlwerpplaces .cccscsiwes ..-+s 2,545

The following are amongst the more obvious character- istics of good Peruvian guanv. Although at the present time it is by no means of uniform appearance or of constant composition, yet it may be stated that the best qualities, which most closely resemble the former supplies from the Chinchas, are light in colour, do not weigh much more than 60 lb per bushel, are friable, and do not cohere strongly when pressed between the fingers. Small soft lumps are often observed in good samples; when these are broken a white or pale-coloured substance is seen in the centre. This lighter-coloured matter contains carbonate and other am- moniacal salts; in some adulterated samples its appear- ance is imitated by means of gypsum. The hard lumps found in guano aro of very varying composition, some being highly phosphatic and others highly siliceous. The ash left on burning a good Peruvian guano is white or grey; a red ash generally indicates adulteration with ochre or ferrugin- ous earth. An unusual proportion of water commonly points to damage by sea-wator or rain, a kind of injury which is the more serious, since it is usually accompanied by a con- siderable loss of ammonia. If more than a mere trace of chlorine be found in a sample of guano, damage by sea- water may be suspected.

Although a good guano com- monly contains more than half its weight of organic matter and of other substances driven off by a red heat, yet when a still larger quantity of such volatile matters is found their presence may be, and often is, a sign of admixture with peat,

Guanos have been often submitted to analysis,x—much more frequently, however, for the sake of determining their agricultural value than their precise chemical components. manure practically depends, so far as analysis can show, upon their richness in nitrogen and phosphates. The nitrogen, we know, exists in several forms, of which uric acid or rather urates, with salts of ammonia (the urate, oxalate, carbonate, and phosphate), are the most important. But besides these compounds a peculiar base or animal alkaloid known as guanine (C;H,N,O) is present in most samples of Peruvian guano; it is not unlikely that the

nitrogen of this body is capable of direct assimilation by plants. A considerable though variable quantity of nitrates and nitrites

Their worth as |

‘ has been recognized in some guanos, ranging, when expressed as | potassiuin nitrate, from no more than 75 per cent. up to 5 and even 6 per cent. Other nitrogenous compounds present are those indeterminate substances which originate from the decay of the osseids of bone, skin, cartilage, and feathers, and of the proteids of flesh. These intermediate products of decay are ultimately resolved into ammonia salts and nitrates. Some guanos, notably those of the West-African coast (Ichaboe, for example), contain many un- decomposed feathers, which cannot possibly yield their nitrogen to vegetation for some time. On this account less than half of the 8 to 12 per cent. of so-called “‘ potential” ammonia in these gnanos is as effective as that in the genuine Peruvian samples. The phosphates of guano are numerous, including tricalcic, dicalcic, ammonio-magnesic, and ammonic phosphates. The solubility of great part of the phosphates in guano helps to make its action more intense and immediate; as much as 10 to 13 per cent. of phosphorus pentoxide has been found to be soluble in some instances. Such is said to be often the case with the guano of Tarapaca; Baker Island and Jarvis Island guanos aresimilar. This solubility arises partly from the composition of the phosphates present,

some of which are naturally moderately soluble in ordinary water; but it arises partly also from the presence of ammonium oxalate, by which the solubility of the calcic phosphates is increased. The carbon dioxide which the decaying organic matter of guano continually evolves also aids in effecting the solution of those phos- phates which are not soluble in pure water.

As at least part of the nitrogen of guano exists in the form of the volatile carbonate, it will be found that this manure deteriorates sometimes very much on being kept. One sample of Chincha guano imported in 1865 contained nitrogen equal to 203 per ccnt. of ammonia ; of this 10} per cent. was lost when the guano was exposed to the heat of boiling water, and 94 per cent. when the sample was merely kept for a year in a powdered condition in an ordinary bottle. With so strongly ammoniacal a guano as this, the fixation of the volatile nitrogenous compounds by means of an acid is highly desirable. Oil of vitriol is employed in different propor- tions and in different ways for this purpose. About 5 or 6 Ib of oil of vitriol diluted with water and mixed with sand or peat may be added to each ewt. of guano. Such a process was patented in 1859 by Dr Richardson of Newcastle. In this way the ammonia of the volatile carbonate is fixed in the form of sulphate, the oxalates and phosphates of the guano remaining unaficcted. But sometimes, as in the manufacture of 'dissolved guano," a larger quantity of oil of vitriol is used—say 25 to 80 tb to each cwt. of raw guano. In this case a kind of rich ee is obtained in which 20 per cent. or thereabouts of "' bone-phosphate made soluble " ig present in association with nitrogen equal to 9 or 10 per cent. of ammonia, Such a preparation is Ohlendorff's dissolved Peruvian

*uano, while "'sulphated" and "ammonia-fixed" guanos contain ess oil of vitriol, and generally some inert substance like saw- dust, which reduces their concentration as manures considerably. "Phospho guano" is in reality a superphosphate made from Mejillones or other phosphatic guano, and enriched by the addition of ammonium sulphate. This Mejillones (Bolivian) guano contains about 4 per cent. of nitrogen and 55 per cent. phosphates. "'N ative guano" is a term applied to the dried and prepared sludge or deposit obtained in the treatment of town sewage by the '*A. B.C."*

rocess—one of the many precipitation processes now in use. It te little in common with trne guano, "Fish guano" is prepared chiefly from the refuse of the cod of the Newfoundland and Nor- wegian fisheries. It is rich both in nitrogen and in phosphates, often containing 8 per cent. of the former and 30 per cent. of the latter ; but its oily nature causes its action as manure to be un- certain and slow.

Althongh it is usual and convenient to alae guanos into two groups according to their richness in nitrogen or phosphates respect- ively, there is no sharp line of demarcation between these classes. Indeed the guano from a single spot may show every gradation from nitrogenous to phosphatic. For instance, three samples taken from a deposit at Punta de Lobos gave amounts of nitrogen corresponding to the following percentage of ammonia in the several layers—surface, 81 per cent.; middle, 3°15 per cent.; deepest, 15°67 per cent. Three samples from another working in the same huanera gave these figures—3 per cent, ammonia at 8 feet, 8 per cent. at 20 feet, and 12 at 40 feet. _A cargo averaging 12 per cent. of potential ammonia, that is, containing an amount of nitrogen which, if expressed as ammonia, equals 12 parts in the hundred of guano, may be regarded as satisfactory ; but immense quantities of guano are now exported from Peru, containing not more than 8 or 10 percent. of ammonia. And there are lower qualities still, with 6 to 8 per cent. of ammonia ; and these pass into more phosphatic varieties, with but little organic matter and nitrogen, but yet from their softness and fine state of division capable of being applied, without previous mechanical or chemical treatment, to the land. But when we are dealing with what are called "rock" or "crust" guanos, we not only have an almost complete absence of nitrogen and of organic matter, but the hard-

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ness of the material is such as to involve its being first ground and then treated with oil of vitriol to turn it into a superphosphate before it can become available as manure. With the highly phos- phatie yet powdery and soft guanos of Peru and Bolivia such treat- uient is rarely necessary, but it

is essential with Navassa (Caribbean Sea) and with the Sombrero Island (Gulf of Mexico) guanos. The latter variety contains no nitrogen, and is very hard, but contains on au average no less than 75 per cent. of tricalcie phosphate. It has been said that the imports into Great Britain of this Sombrero phosphate have beeu so large that tlie whole island has been trans- ported thither.

Some notion of the main constitnents of Peruvian and Bolivian guanos may be gathered from the following figures, which roughly represent the nature and percentage proportions of the chief con- stituents of fair samples from several localities :—

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PR eh dis cee ile ss -s odeeoeldediosiesedees 17/16 | 13 Organic matter and coinbined water ….| 53 45 |34 | 23 Whereof is nitrogen equal to animonia} 17°5 2 | 7-5) 4 Piieaicic Plosphate,.....5.0cececccense ses 19 19 | 29 | 42 Phosphorus pentoxide in alkaline salts 41/3] 8 Alkalies, &c., by difference…..... TA | als) |) ale

One specimen of Angamos guano actually contained 25 per cent. potential ammonia and but 6 per cent. phosphates reckoned as tricalcic phosphate. It will indeed be seen how generally with the diminution of the nitrogenous organic matter the phosphates in- erease, and vice versa. Analyses of guanos from many different countries exhibit the same feature. But even the phosphatic guanos are less rich in phosphates than one might expect, owing to the intrusion of siliceous matter. In some guanos analysed by Nesbit more than 30 per cent. of sand occurred, Californian guanos gave this analyst from 14 to 84 per cent. ammonia, and about 30 per cent. phosphates. In Falkland Island guano he found about q to 23 per cent. ammonia and 20 to 25 per cent. phosphates, In the case of so variable a material as guano neither analyses of indi- vidual specimens nor averages can be considcred as really repre- sentative, But it is instructive to note how low a proportion of nitrogen is present in many of the guanos from different countries :— Algoa Bay, ‘5 per cent. of potential ammonia ; Ascension Island, 60;

Queensland, 1:0 ; Chili, 1:4; Ecuador, °8; Mexico, ‘4; Pata- gonia, 2‘7; Tasmania, 2°5.

In the guanos imported during 1847-48 Mr J. T. Way found the following average percentages of ammonia (calculated from total nitrogen) and of phosphates (calculated as tricalcic phosphate) :—

, Ammonia. Phosphates, Peru (13 samples)..... pono 7 7a 24°12 Ichaboe Cia lik eee 7°30 30°30 Patagonia Oe poe 2°54 44°60 Paldanha Bay (20… 45)ssorsccescerees 1°62 56°40

Dr Voelcker’s analyses of samples taken in 1874 from the under- mentioned places gave about 25 per cent, phosphates, and of ammonia 8 to 12 per cent. in guanos from Pabellon de Pica, 3 to 12 per cent. from Lobos, and 8 to 124 per cent. from Huanillos.

The Lobos guanos, having since then become of generally inferior quality, have been but sparingly imported during the last few years. The percentage of ammonia in recent cargoes of guano from Punta de Lobos has been 5 to 6, from Huanillos 9, and from Pabellon de Pica 11 to 12.

_ The analysis of guano for commercial purposes is generally limited to the quantitative determination of three constituents, — the nitrogen, the soluble phosphorus pentoxide, and the insoluble phosphates ; the latter are usually reckoned as tricalcic phosphate. The processes of analysis require a few special precautions. One of these consists in mixing the guano in the combustion tube itself when making a nitrogen determination by Will and Varrentrapp’s method ; otherwise a loss of ammonia may occur.

Asa manure the nitrogenous guano of Peru is rich, active, and stimulating. It has a decided tendency to cause an excessive development of foliage, and is therefore peculiarly fitted for appli- cation to grass and to other plants the development of the stem and leaf of which is desired, Its effects on clover are less marked. Mixed with superphosphate it may be applied to potatoes or root-crops, and to most of the plants of the kitchen garden ; for many plants cultivated for their flowers it may be used also, but with great care and moderation, mixed with water or dry soil. On light and cal- Careous lands sown with swedes, turnips, or mangolds, guano has

frequently been found to burn and destroy the young plants or even to prevent the germination of the seed ; ‘dissolved ” guano is less liable to cause this injury.

Guano, with another very useful natural product, namely, nitrate of soda, constitutes the chief source of revenue for Peru.

The following papers and reports in the Journal of the Royal Agricultural Society contain interesting information on guano, ser. i. vols. ii, p. 301; x. p. 196; xxv. p. 186; ser. ii. vols. i, oe cles v. 92; v1. 142, 403 ; vii. 367; vili. 220; ix. 261; x. 541. Native guano is discussed, ser. ii. vol. vi. p. 415. The Jahresbericht der A grieultur-Chemie contains a digest of most of the important papers on guaio published on the Continent; see, ¢. g., 1858-9, pp. 231-238; 1860-1, pp. 186-191; 1862-3, pp. 150-157 ; 1867, p. 189; 1870-2, pp. 190-195 ; 1873-4, iii. pp. 10-26. A pamphlet published in 1874 by Dunlop & Co., London, gives some important statistics and reports on the Peruvian guano then remaining ; as also does the Commercial Blue Book, No. 23, 1878, pp. 525 to 539, (A. H. C.)

GUARANA, so called from the Guaranis, an aboriginal American tribe, the plant Paullinia sorbilis, Mart., of the natural order Sapindacee and tribe Sapindee, indigenous to the north and west of Brazil, It has a sinooth erect stem ; large pinnate alternate leaves, composed of 5 oblong-oval leaflets ; inflorescence in narrow panicles of short-stalked flowers, having 4 or 5 sepals and 4 petals, 8 stamens, and a

| cylindrical 3-celled ovary; and fruit ovoid or pyriform,

about as large as a grape, and containing usually one seed only, which is shaped like a minute horse-chestnut. What is commonly known as guarana, guarana bread, or Brazilian cocoa, is prepared from the seeds as follows. In October and November, at which time they become ripe, the seeds are removed from their capsules, and sun-dried, so as to admit of the ready removal by hand of the white aril; they are next ground in a stone mortar or deep dish of hard sandstone; the powder, moistened by the addition of a small quantity of water, or by exposure to the dews, is then made into a paste with a certain proportion of whole or broken seeds, and worked up sometimes into balls, but usually into rolls not unlike German sausages, 5

to 8 inches in length, and 12 to 16 oz. in weight. After drying by artificial or solar heat, the guarana is packed between broad leaves in sacks or baskets, Thus prepared, it is of extreme hardness, and has a brown hue, a bitter astringent taste, and an odour faintly resembling that of roasted coffes. An inferior kind, softer and of a lighter colour, is manufactured by admixture of cocoa or cassava. Rasped or grated into sugar and water, guarana forms a beverage largely consumed in §. America. Its manufacture, originally confined to the

Mauhés Indians, has spread into various parts of Brazil.

The properties of guarana as a nervous stimulant and restorative are due to the presence of what was described as a new principle, and termed guaranine, by Dr T. Martius, but which was proved by Berthemot and Deschastelus (Journ. de Pharm, vol. xxvi., 1840, p, 518 sg.) to be identical with caffeine or theine, CgH1)N,0, +H,0. Of this alkaloid guarana yields 5°07 per cent., against 2°13 in good black tea, '8 to 1 in coffee beans, and 1°2 in maté or Paraguay tea (Stenhouse, Pharm. Journ., xvi. p. 218) ; for medical purposes it may in fact be regarded as "practically a convenient form of impure caffeine" (F. E. Anstie, Bratthw. Retrosp., 1873, i. p. 35). Besides this substance, which is stated to exist in it in the form of tannate, guarana yields on analysis the glucoside saponin, with tannin, starch, gum, three volatile oils, and an acrid green fixed oi] (Fournier, Journ. de Pharm., vol. xXxxix., 1861, p. 291), As a medicine, guarana was first described in 1817 by Cadet de Gassicourt, to whom a specimen was sent from Brazil (see Bull. Gén. de Thérap., lii., 1857, p. 497 sq.), in which country it is in popular repute as a stomachic, febrifuge, and aphrodisiac, and more especially as a specific for dysentery and diarrhea, in which latter disease it is given in very large doses—4 to 8 or 19 grammes (Bull. Gén. de Thérap., liii. p. 139). It is said by Martius (Syst. Aad. Med. Veget. Brasiliensis, p. 59, Leipsic, 1848) to diminish fever by its tonic effects on the nerves, to invigorate the stomach and intes- tines, to restrain excessive mucous discharges, to increase the action of the arteries and heart, and to promote diaphoresis. In migraine, or sick-headache, it has oftentimes been found a most serviceable remedy (see inter alia, Brit. Med. Jowrn., 1872, i. pp. 421 and 426 ; Practitioner, Aug. and Sept. 1873, pp. 100-102, 16Us1 75) ; and it has been recommended in lumbago when the pain is of a stinging nature

(Rawson, Braithw. Retrosp., 1874, ii. p. 38), and in sciatica and blennorrheea.

See Spix and Martius, Reise in Brasilien, vol. iti. pp. 1061 and 1098, Munich, 1831; Hooker's Journ. of Botany, vol. lii., 1851, pp. 198-4; Bentley and Trimen, Medicinal Plants, pt. 4, tab. 67, 1876; and, on the preparation of " Guaranine," Journ. de Pharm., 4th ser., xviii. p. 224. On the 'Antagonism between Guaranine

and Meconate of Morphia," see J. H. Bennett, Rep. on the Antag. of Medicines, p. 86, 1875. Further bibliographical referenees will be found in Prof. P. Mantegazza's excellent article, " Del guarand, nuovo alimento nervoso," Ann. Univ. di Med., April to June 1865, vol. 192, pp. 99-153. |

GUARANTEE, or Guaranty, in English law, is a promise to be answerable for the debt of another should he fail to make payment, or generally to be answerable for the performance of any duty by another person. The debt or duty must be owing by another, who is primarily bound,

and the guarantor is only liable in the event of his failure |

of performance. Guarantees are required to be in writing by the Statute of Frauds (29 Car. IL ¢. 3), which enacts (§ 4) that "no action shall be brought whereby to charge the defendant upon any special promise to answer for the debt, default, or miscarriage of another, unless the agree- ment upon which such action shall be brought shall be in writing, signed by the parties to be charged by the contract, or some other person thereunto by him lawfully authorized." The test of the applicability of this section is whether the original debtor continues liable. If his liability is gone, and the person promising to pay the debt becomes immedi- ately and primarily liable, then the promise need not be in writing, Thus where a debtor had been taken in execution for a debt, and a third person promised to pay the debt if the debtor were discharged from custody, it was held that writing was not necessary, inasmuch as the discharge operated as a satisfaction of the. original debt, and the person making the promise alone remained liable. The default for which liability may be assumed by another person

includes any case of breach of duty, aud is not con- fined to cases of non-performance of contracts. A promise to guarantee comes under the general rule which requires enforceable agreements to be founded on consideration, 7.¢., a corresponding promise or performance on the other side (see Contract). It was formerly held that the considera- tion must appear in the memorandum of writing, not necessarily in express terms, but at any rate as a matter of fair and reasonable inference. 'Thus a promise to pay for goods to be supplied to another was held to disclose a con- sideration, viz., the future supply of goods. But when the promise was to pay for goods already supplied, no considera- tion was disclosed, By the Mercantile Law Amendment Act (19 and 20 Vict. c, 97), passed in consequence of re-presentations made by merchants in Scotland and the North of England, who found the difference between Scotch and English law as to written contracts a source of great incon- venience, this section of the Statute of Frauds was repealed, 'The Mercantile Law Amendment Act also declares that a guarantee given to or for a firm shall cease on any change taking place in the persons constituting the firm, unless a continuance of the promise is expressly stipulated or of necessity to be inferred. 'The corresponding Act for Scotland (19 and 20 Vict. c. 60) requires all guarantees, securities, or cautionary obligations, and all representations as to the character of any person made with the view of obtaining credit, money, &c., for such person to be in writing in order to be binding, and establishes the same rule as the English Act with reference to guarantees to or for a firm.

GUARATINGUETA, a town of Brazil, in the province of Sdo Paulo, situated near the right bank of the Parahiba, about 40 miles N.E. of the city of Sao Paulo. It was founded in 1651 by the Captain Mor Dionizio da Costa. The houses are almost all constructed of mud, and there are few buildings of any note except the churches, of which the chief is dedicated to St Anthony. A considerable traffic is fostered by the fertile character of the surround-ing district and the situation of Guaratingueta on the road between Sao Paulo and Rio de Janeiro. Population 7400, According to Spix and Martius the name of the

town is equivalent to "the place where the sun turns," and refers to its vicinity to the tropic of Capricorn. See

-Millict de Saint-Adolphe, Diccton. Geogr. do wmperto do

Brazil, 1870.

GUARDI, Francesco (1712-1793), a Venetian painter, was a pupil of Canaletto, and followed his' style so closely that his pictures are very frequently attributed to his more celebrated master. Nevertheless, the diversity, when once perceived, is sufficiently marked,—Canaletto being morefirm, solid, distinct, well-grounded, and on the whole the higher master, while Guardi is noticeable for spirited touch, sparkling colour, and picturesquely sketched figures—in these respects being fully equal to Canaletto. Guardi sometimes coloured Canaletto's designs. He had extra-ordinary facility, three or four days being enough for pro- ducing an entire work. The number of his performances is large in proportion to this facility, and to the love of gain which characterized our painter. Many of his works are to be found in England; seven in the Louvre; four, of exceptional merit, in the Manfrini Palace, Venice.

GUARDIAN AND WARD, See Inrant.

GUARIENTO, sometimes incorrectly named Guerriero, was the first Paduan painter who distinguished himself. The only date distinctly known in his career is 1365, when, having already acquired high renown in his native city, he was invited by the Venetian authorities to paint a Paradise, and some incidents of the war of Spoleto, in the great council-hall of Venice. 'These works were greatly admired at the time, but have long ago disappeared under repaint- ings. His works in Padua have suffered much. In the church of the Eremitani are allegories of the Planets, and, in its choir, some small sacred histories in dead colour, such as an Ecce Homo; also, on the upper walls, the life of St Augustine, with some other subjects. A few fragments of other paintings by Guariento are still extant in Padua. In the gallery of Bassano is a Crucifixion, carefully executed, and somewhat superior to a merely traditional method of handling, although on the whole

Guariento must rather be classed in that school of art which preceded Cimabue than as having advanced in his vestiges ; likewise two other works in Bassano, ascribed to the same hand, The painter is buricd in the church of 8. Bernardino, Padua.

GUARINI, Grovannt Barrista (1537-1612), the author of the Pastor Fido, was born at Ferrara on the 10th of December 1537, just seven years before the birth of Tasso. He was descended from Guarino of Verona (see next article). The young Battista studied both at Pisa and Padua, whence he was called, when not yet twenty, to profess moral philosophy in the schools of his native city, He inherited considerable wealth, and was able early in life to marry Taddea de' Bendedei, a lady of good birth. In 1567 he entered the service of Alphonso II, duke of Ferrara, thus beginning the court career which was destined to prove a constant source of disappointment and annoyanceto him, Though he cultivated poetry for pastime, Guarini aimed at state employment as the serious business of his life, and managed to be sent on various embassies and missions by his ducal master. There was, however, at the end of the 16th century no opportunity for a man of energy and intellectual ability to distinguish himself in the petty sphere of Italian diplomacy. The time too had passed when the profession of a courtier, painted in such glowing terms by Castiglione, could confer either profit or honour, It is true that the court of Alphonso presented a brilliant spectacle to Europe, with Tasso for titular poet, and an attractive circle of accomplished ladies. But the last duke of Ferrara was an illiberal patron, feeding his servants with promises, and ever ready to treat them with the brutality that condemned the author of the Gerusalemme Liberata toa madhouse. Guarini spent his time and money

to little purpose, suffered from the spite and ill-will of two successive secretaries, —Pigna and Montecatini,—quarrelled with his old friend Tasso, and at the end of fourteen years of service found himself half-ruined, with a large family and no prospects. When Tasso was condemued to S. Anna, the duke promoted Guarini to the vacant post of court poet. There is an interesting letter extant from the latter to his friend Cornelio Bentivoglio, describing the efforts he made to fill this place appropriately. "I strove to

transform my- self into another person, and, like a player, reassumed the character, costume, and feelings of my youth. Advanced in mauhood, I forced myself to look young; I turned my uatural melancholy into artificial gaiety, affected loves Idid not feel, exchanged wisdom for folly, and, in a word, passed from a philosopher into'a poet." How ill-adapted he felt himself to this masquerade life may be gathered from the following sentence: "I am already in my forty-fourth year, the father of eight children, two of whom are old enough to be my censors, while my daughters are of an age to marry." Abandoning so uncongenial a strain upon his faculties, Guarini retired in 1582 to his ancestral farm, the Villa Guarina, in the lovely country that lies between the Adige and Po, where he gave liimself up to the cares of his family, the nursing of his dilapidated' fortunes, and the composition of the Pastor Mido. He was not happy in his domestic lot; for he had lost his wife young, and quarrelled with his elder sons about the division of his estate. Litiga- tion seems to have been an inveterate vice with Guarini; nor was he ever free from legal troubles. After studying his biography, the conclusion is forced upon our minds that he was originally a mau of robust and virile intellect, ambi- tious of greatness, confident in his own powers, and well qualified for serious affairs, whose energies found no proper scope for their exercise. Literary work offered but a poor sphere for such a character, while the enforced inactivity of court life soured a naturally capricious and choleric temper. Of poetry he spoke with a certain tone of con- descension, professing to practise it only in his leisure moments; nor are his miscellaneous verses of a quality to secure for their author a very lasting reputation. It is therefore not a little remarkable that the fruit of his retire- ment—a disappointed courtier past the prime of early man- hood—should have been a dramatic masterpiece worthy to be ranked with the classics of Italian literature. Deferring a further account of the Pastor Fido for the present, the remaining incidents of Guarini's restless life may be briefly told. In 1585 he was at Turin superintending the first public performance of his drama, whence Alphonso recalled him to Ferrara, and gave him thie office of secretary of state. This reconciliation between the poet and his patron did not last long. Guarini moved to Florence, then to Rome, and back again to Florence, where he established himself as the courtier of Ferdinand de' Medici. A dishonourable mar- riage, pressed upon his son Guarino by the grand-duke, Toused the natural resentment of Guarini, always scrupulous upon the point of honour. He abandoned the

Medicean court, and took refuge with Francesco Maria of Urbino, the last scion of the Montefeltro-della-Rovere house. Yet he found no satisfaction at Urbino. "The old court is a dead Institution," he writes toa friend; "one may see a shadow of it, but not the substance in Italy of to-day. Ours is an age of appearances, and one goes a-masquerading all the year." This was true enough. Those dwindling deadly- lively little residence towns of Italian ducal families, whose day of glory was over, and who were waiting to be slowly absorbed by the capacious appetite of Austria, were no fit Places for a man of energy and independence. Guarini finally took refuge in his native Ferrara, which, since the death of Alphonso, had now devolved to the papal see. Here, and at the Villa Guarina, his last years were passed in study,

lawsuits, and polemical disputes with his contemporary critics, until 1612, when he died at Venice in his seventy-

fifth year.

The Pastor Fido is a pastoral drama composed not with- out reminiscences of Tasso's Aminta. The scene is laid in Arcadia, where Guarini supposes it to have been the custom to sacrifice a maideu yearly to Diana. But an oracle has declared that when two scions of divine lineage are united

'in marriage, and a faithful shepherd has atoned for the

ancient error of a faithless woman, this inhuman rite shall cease. 'The plct turns upon the unexpected fulfilment of this prophecy, contrary to all the schemes which had been devised for bringing it to accomplishment, and in despite of appareut improbabilities of divers kinds, It is extremely elaborate, and, regarded as a piece of cunning mechanism, leaves nothing to be desired. Each motive has been care- fully prepared, each situation amply developed. Yet, con- sidered as a play, the Pastor Fido disappoints a reader trained in the school of Sophocles or Shakespeare. The action itself seems to take place off the stage, and only the results of action, stationary tableaux representing the move- ment of the drama, are put before us in the scenes. The art is lyrical, not merely in form but in spirit, and in adap- tation to the requirements of music which demands statiou- ary expressions

of emotion for development. The charac- ters have been well considered, aud are exhibited with great truth and vividness; the cold and eager hunter Silvio con- trasting with the tender and romantic Mirtillo, and Corisca's meretricious arts enhancing the pure affection of Amarilli. Dorinda presents another type of love so impulsive that it prevails over a niaiden's sense of shame, while the courtier Carino brings the corruption of towns into comparison with the innocence of the country. In Carino the poet paiuted his own experience, and here his satire upon the court of Ferrara is none the less biting because it is gravely measured. In Corisca he delineated a woman vitiated by the same town life, and a very hideous portrait has he drawn. Though a satirical element was thus introduced into the Pastor Fido in order to relieve its ideal picture of Arcadia, the whole lay is but a study of contemporary feeling in Italian society. here is no true rusticity whatever in the drama, This correspondence with the spirit of the age secured its success during Guarini's lifetime; this made it so dangerously seductive that Cardinal Bellarmine told the poet he had done more harm to Christendom by his blandishments than Luther by his heresy, Without anywhere transgressing the limits of decorum, the Pastor Fido is steeped in sensuous- ness; and the immodesty of its pictures is enhanced by rhetorical concealments more provocative than nudity. Moreover, the love described is effeminate and wanton, felt less as passion than as lust enveloped in a veil of sentiment. We divine the coming age of cicisbec and castrati, Of Guarini's style it would be difficult to speak in terms of too high praise. The thought and experience of a lifetime have been condensed in these five acts, and have found expression in language brilliant, classical, chiselled to perfection, Here and there the taste of the 17th century makes itself felt in frigid conceitsand forced antitheses ; nor does Guaryiniabstain from sententious maxims which reveal the moralist rather than the poet. Yet these are but minor blemishes in a masterpiece of diction, glittering and faultless like a polished bas-relief of hard Corinthian bronze. Thata single pastoral should occupy so proniinent a place in the history of litera- ture seems astonishing, until we reflect that Italy, upon the close of the 16th century, expressed itself in the Pustor Fido, and that the influence of this drama was felt through all the art of Europe till the epoch of the Revolution. It is not a mere play. The sensual refinement proper to an age of social decadence found in it the most exact embodiment, and made it the code of gallantry for the next two centuries.

The best edition of the Pastor Fido is that of Venice (Ciotti), 1602. The most convenient is that of Barbéra, Florence, 1866. For Guarini's miscellaneous Rime, the Ferrara edition, in 4 vols., 1737, may be consulted. His polemical writings, Verato Primo and Secondo, and his prose comedy ealled Jdropicw, were published at Venice, Florence, and Rome, between 1588 and 1614. (J. A. 8.)

GUARINO, or Guarinus (1370-1460), of Verona, one of the Italian restorers of classical learning, was born in 1370 at Verona, and studied Greek at Constantinople, where for five years he was the pupil of Manuel Chrysoloras. When he set out on his return to Italy he was the happy possessor of two cases of precious Greek MSS. which he had been at great pains to collect; it is said that the loss of one of these by shipwreck caused him such distress that his hair turned grey in a single night. He employed him- self as a teacher of Greek, first at Verona and afterwards in Venice and Florence; in 1436 he became, through the patronage of Lionel, marquis of Este, professor of Greek at Ferrara; and in 1438 and following years he acted as interpreter for the Greeks at the councils of Ferrara and Florence. He died at Ferrara 14th December 1460, aged ninety.

His principal works are translations of Strabo and of some of the Lives of Plutarch, a compendium of the Greek grammar of Chrysoloras, and a series of commentaries on Persius, Juveual, Martial, and on some of the writings of Aristotle and Cicero. See Rosmini, Vita ¢ Disciplina di Guarino (Breseia, 1805-6).

GUARINO, also known as VARINus, and surnamed from his birthplace Favorinus, PHAvortnus, or CAMERS (¢. 1450-1537), lexicographer and scholar, was born at Favora near Camerino about 1450, studied Greek and Latin at Florence under Politian, and afterwards became for a time the pupil of Lascaris. Having entered the Benedictine order, he now gave himself with great zeal to Greek lexico- graphy ; and in 1496 published his Thesawrus cornucopre et horti Adonidis, a collection of thirty-four grammatical tracts in Greek. He for some time acted as tutor to Giovanni dei Medici (afterwards Leo X.), and also held the appoint- ment of keeper of the Medicean library at Florence. In 1514 Leo appointed him bishop of

Nocera. In 1517 he published a translation of the Apophthegmata of Joannes Stobzeus, and in 1523 appeared his Ltymologicum Magnum, sive Thesaurus universe lingue Groce ex multis varvisque autoribus collectus, a compilation which has been frequently repriuted, and which has laid subsequent scholars under great though not always acknowledged obligations. Guarino died in 1537.

GUASTALLA, a town of Italy, in the province of Reggio, at the influx of the Crostolo into the Po, about 24 miles N.E, of Parma. It is the seat of a bishop, and possesses a cathedral, San Pietro, an extensive but ruined castle of the 16th century, eight churches, a civil hospital, a gymnasium, a public library (La Biblioteca Muldott?) with 18,000 vols., a school of music, and a theatre. A statue of Ferrante I. of Gonzaga, by Leone Leoni of Arezzo, adorns the market-place. The inhabitants are largely engaged in the growing of rice, for which the marshy land around the town is specially adapted ; and they also manufacture silk, flannel, and linen. In 1871 the population of the town proper was only 2809, but that of the commune was 10,618.

Guastalla, or, as the older forms of the name appear, Guarstalla or Wardstalla, was founded by the Lombards in the 7th century. It aequired some fame in the Middle Ages as the seat of the council held by Paschalis II. in 1106. In 1807 it is said to have been deprived ofits fortifications by Giberto of Correggio, and they were not restored till 1636. Maria Visconti of Milan, to whose territory it belonged, raised the town and district to the rank of a count- ship, and bestowed it on Guido Torelli, the husband of his cousin. In 1539 the Torelli family was displaced by Ferrante (Ferdinand) of Gonzaga, and in 1541 the new oceupant got Charles V. to make the countship immediately dependent on the empire. In 1621 it was made a duchy. The last duke of Guastalla of the Gonzaga family died in 1746 ; and though the Spaniards had in the previous year taken possession of the town in the name of Qucen Elizabeth,

Maria Thercsa made good her claim to the imperial fief. At the peace of Aix-la-Chapelle it was ceded to the duke of Parma ; and its subsequent history is practically that of Parma and Piacenza. In 1796 it was incorporated in the French Cisalpine Republic, and in 1805 it gave the title

of princess to Napoleon's sister Pauline. Parma, Piacenza, and Guastalla were handed over by the peace of Vienna to Marie Louise, the wife of Napoleon; and on her death they passed to Charles of Bourbon. In 1848 Guastalla was added to Modena; and in 1859 along with Modena it was incorporated with Italy. The area of the duchy was about 125 square miles.

GUATEMALA, or more rarely GuatTIMaLa, was for- PlateTIl, merly a captain-generalcy of Spanish America, which included the fifteen provinces of Chiapas, Suchitepeques, Escuintla, Sonsonate, San Salvador, Vera Paz and Peten, Chiquimula, Honduras, Nicaragua, Costa Rica, Totonicapan, | Quesaltenango, Solola, Chimaltenango, and Sacatepeques,— or, in other words, the whole of Central America and part of the present territory of Mexico. The name is now restricted to a small part of the area which constitutes an independent republic.

The republic of Guatemala is situated between 13° 42' and 18° N. lat., and between 88° and 93° 5" W. long. Conterminous on the N. with Mexico and Yucatan, it is bounded towards the E. and §8.E. by Belize or British Honduras, the Gulf of Honduras, and the republics of Honduras and San Salvador; and towards the S.W. it is washed by the Pacific. The Yucatan frontier is only partially fixed, and though the Mexican frontier was nominally determined as early as 1772, the interpretation of the terms of the agreement is still open to much debate.} Towards British Honduras the boundary is fixed by the treaty of April 30, 1858, according to which it runs up the mid-channel of the river Sarstoon to the Gracias a Dios Falls, thence in a right line to Garbutt's Falls on the river Belize, and thence again in a right line due north to the Mexican frontier. The area of Guatemala is estimatcd at from 40,000 to over 50,000 square miles; an accurate statement is impossible, not only on account of the dubiety of frontier, but from the fact that the surveys are very imperfect. All the maps of the country contain a great deal of hypothetical material, especially in the filling up of the orographical details.

Mountains. —A large proportion of Guatemala may be generally described as mountainous. The main or central chain, which is usually considered a continuation of the Andes, runs in a wavy line from south-east to north-west, keeping on the whole parallel with the Pacific coast at a distance of

40 or 45 milcs. Its mean elevation is about 7000 feet, but none of its summits attain to 14,000. Though it forms the main watershed of the country between the Pacific and the Atlantic versant or slope, it is pierced in one or two places by rivers. In the neighbourhood of the capital it bears the name of Sierra de las Nubes ; in the north-west it is known as the Sierra Madre ; and it enters the Mexican (ex- Guatemalian) state of Chiapas as the mountains of Istatan. A range called the Sierra de Chama, which, however, changes its name frequently from place to place, strikes eastward from the Sierra Madre towards Belize, where it is known as the Cockscomb ; another similar range, the Sierra de Santa Cruz, continues east to Cape Cocoli between the Rio Dulce and the Sarstoou ; and a third, the Sierra de las Minas or in its eastern portion Sierra del Mico stretches between the Rie Dulce and the Rio Motagua. Between Honduras and Guatemala the frontier is formed by the Sierra de Copan. There are no real plateaus in Guatemala such as give its character to the Mexican region, the so-called plateaus of Quesaltenango, Pacicia, Guatemala, d&c., being merely broad valleys amid the mountains ; but the general relief of the country is of the most varied description, the mountains

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1 The question is argned at length in Boletin de la Sociedad de Geografia Mexicana, 1875.

descending in all kinds of terraces and underfalls. The number of volcanic summits is very great: Bernouilli gives a list of 14 or 15, and Foledo makes the number no less than 31. The following are those that are decidedly active :—Pacaya, in 14° 21’ 30” N. lat. and 90° 44’ 34” E, long., on the southern shores of lake Amitlan, with its cone on tlie southern slope ; Volcan de Fuego, 12,821 feet in height, in 14° 27’ 25” N. lat. and 90° 53’ 30” E. long.,

near Old Guatemala ; Atitlan, 11,849 feet in height, in 14°.

36’ N. lat. and 91° 14° E. long.; Quesaltenango, 9358 feet in height, in 14° 53’ 30” N. lat. and 91° 53’ 30” E,

long. ; and Tajumulco, in 15° 9’ 58” N. lat. and 92° 6’ 7” E. long. The last was observed in eruption by Bernouilli

on occasion of the great earthquake of 1863. Like Ques- altenaugo, which is surrounded by an extensive malpais, it furnishes great supplies of sulphur. More famous, how- ever, than any of these is the Volcan de Agua or Water Volcano, so called because in 1541 it destroyed the city of Old Guatemala by a deluge of water. It issituated in 14° 26’ 48” N. lat. and 90° 53’ 30” E. long, The statenient of Humboldt that it rises above the snow-line is a mistake, for that would be a height of about 14,500 feet, whereas the actual height of the mountain, according to Poggendorff’s revision of Captain Hall’s trigonometrical measurement, is ouly 13,108 feet. When Dr Scherzer and Dr Wagner ascended the mountain on August 4, 1854, they found no traces of snow or ice, and though three weeks later a thin coating of snow appeared on the outer slopes of the crater, it was gone again in four days. Thesource of the great flood of water was probably a crateral lake,

Aivers.—Guatemala is richly watered. On the western side of the sierras the versant is short, and the streams, while very numerous, are consequently small and rapid ; but on the western side a number of the rivers attain a very considerable development, The Motagua, whose principal head stream is called the Rio Grande, has a course of about 250 miles, and is navigable to within 90 miles of the capital, which is situated on one of its confluents the Rio de las Vacas. It forms a delta on the south of the Gulf of Honduras. Of similar importance is the Polochic, which is about 180 miles in length, and navigable about 20 miles above the river-port of Telem4n. Before reaching the Golfo Amatico it passes through the Izabal Lake and the Golfete Dulce. A vast number of streams, among which are the Clisoy, the Guadalupe, the Rio dela Pasion, unite to form the Usumacinta, whose noble current passes along the Mexican frontier, and flowing on through Chiapas and Tabasco, falls into the bay of Campeachy. ‘The Chiapas follows a similar course,

Lakes.—There are several extensive lakes in Guatemala. The Lake of Peten or Laguna de Flores, in the centre of the department of Peten, is an irregular basin about 27 miles long, with an extreme breadth of 13. In an island in the western portion stands Flores the capital of the department,

well known to American autiquaries for the uumber of ancient idols which have been recovered from its soil, On the shore of the lake is the stalactite cave of Jobitsinal, of great local celebrity; and in its depths, accord- ing to the popular legend, may still be discerned the stone Image of a horse that belonged to Cortes, The Lake of Tzabal, already mentioned as the terminus of the Polochic 'iver, 1s about 36 miles long, and would be of considerable value as a harbour if the bar at the mouth of the Rio Dulce did not prevent the upward passage of seafaring vessels. As a contrast the Lake of Atitlan is a land-locked basin encompassed with lofty mountains and possessing no visible outlet for its waters, which are replenished by numer- ous streams. It is about 18 miles long, with a maximum

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1 7 ° . . ° . . See Wagner, Wissenschaftlichen Reisen tm tropischen Amerika.

breadth of 9 or 10 miles, and it lies about 5300 feet above the sea-level. "On its banks," says Mr Boddam Whetham, "stand eleven villages, whose situations are so varied that their climates and productions are those of thie cold, the temperate, and the tropical regions, and whose inhabitants speak different dialects."? About 8 or 9 miles south of the capital lies the Lake of Amatitlan, with the town of the same name at its western extremity. It lies about 3980 feet above the sea, and hasa length of 9 miles anda breadth of about 3, On the borders of San Salvador and Guatemala there is the lake of Guija, about 20 miles long and 12 broad, at a height of 2100 feet above the sea. It is connected by the river Ostuma with the Lake of Ayarza which lies about 1000 feet higher at the foot of the Andes. The large lakes, according to Dollfus, are not of crateral origin. Geology and Mines,—-The best and indeed the only elaborate account of the geology of the country is given by Dollfus and Montserrat,' who were members of the great French expedition for the exploration of the Mexican region. According to these savants, who, however, confess that their studies are only provisional, the basis rock is the granite which, along with trachytes and porphyries of very various character, intermingled with and overlaid by directly volcanic products, constitutes the great band of the Sierra Madre, From the main ridge towards the Atlantic there is a rich development of mica schists and

calcareous formations of sedimentary origin and probably Jurassic age, while the versant of the Pacific is almost covered with modern allu- vium washed down along the rapid slopes. Mastodont and elephant remains have been discovered in the tuffs, The country as a whole may be said to owe its shape to the porphyries, Though some of the strata are essentially metal- liferous, Guatemala possesses few mines of importance. During the Spanish rule about 40 million pesos of silver were obtained at Alotepeque in Chiquimula; and the works are still carried on, though with poorer results, Lead is found extensively in Huehuetenango and Verapaz; beds of excellent coal exist in Izabal; marble is quarried at San Juan in Guatemala, and on the Rio Hondo in Zacapa; and litho- graphic stone is met with in the last-mentioned department. Climate.—Except in the marshy lagoons along the Pacific, which are inhabited by groups of fishers and salt-gatherers, the climate of Guatemala is considered a healthy one. The peculiar relief of the country gives rise to a large amount of local differences in the matter of heat and cold; but the whole may be rudely divided into a tropical or low-lying region, a temperate or middle region, and a cold or elevated region, The tropical region, or tierra caliente, extends from the level of the sea to an elevation of about 1300 feet ; the temperate, or tierra templada, from 1300 to 4900 feet ; and the cold, or téerra fria, from 4900 to 8200 feet. Fortunately for the future of Guateniala the templada is by far the most extensive. In the caliente the rainy reason lasts four months, During that period the south-west wind prevails, and is often tempestuous like the Cordonazo de San Francisco, or " flagellation of St Francis," on the coast of Mexico; during the dry season the uorth wind is the most usual, The rainy season lengthens as we ascend to the templada: the Boca Costa district indeed has a rainy season of seven months, from May to N ovember, and the dry season is not completely dry. Higher still, in the tierra fria, the rain lasts five months, from May to October, and the dry season is quite worthy of the name. At Guatemala, the only place where meteorological observations have been made through a long series of years, the minimum thermo- meter readings varied from 41° to 45° Fahr. in the five years 1859 to 1863, and the maximum from 84° to 87°,

2 See Across Central America, 1877, p. 108. % Voy. géol. dans les républiques de Guatemala et San Salvador, Paris, 1868.

The hottest months are Apriland May. In the summer, or rainy season, the morning has usually a clear sky ; about 2 or 3 o'clock in the afternoon the clouds begin to gather in great cumulus masses; suddenly the lightning flashes out and the rain crashes down; and by evening the sky is clear and starry. In the middle of the rainy season there is often a pause of two or three weeks. At Guatemala the mean annual rainfall for the five years 1859 to 1863 was 54 inches; at Boca Costa it is upwards of 78 inches.!

Animals.—The fauna of Guatemala is more closely connected

with the fauna of South than with that of North America. As the country is a small one, and its limits are purcly conventional, there are comparatively few species that it can claim as peculiarly its own. It is almost entirely free from the presence of animals that are dangerous to man. Of the cat tribe it possesses the jaguar (Felis onza), popularly called the tiger; the cuguar (felis coneolor), popularly called the lion; the tigrillo (Felis tigr ina), which is some- times kept tame ; and four other species. Several species of mon- keys (Mycetes and Ateles) are sufficiently numerous in the warm coast region. The Mexican deer (Cervus mexicanus) has a wide range both in the lowlands and highlands. Besides the tapir there are two pigs, the marrano de monte (Sus torauatus) and the jabali or javali (Sus labiatus javalt), The Edentata are rcpresentcd by a species of armadillo, the " oso colimenero " or honey-bear (J/yrme- cophaga tamandus) and the Myrmecophaga didaetyla; and among the rodents may be meutioned, besides rats, hares, and rabbits, the fruit-eating cotorra and tepescuinte (Dasyprocta aguti and Celo- genys paca), aud the troublesome Geomys mexicana. The Hydro- cheerus capybara is common in all the larger streams. Much aunoy- ance is caused to the agriculturist by the little marsupial called the tacuacine, or the Didelphys careinora, its allied species. The bats are so numerous that villages have sometimes had to be left to their undisputed occupancy. For the bird collector there is a rich harvest in Guatemala. As the seasons change it is visited by a great variety of birds of passage, and it possesses a great many resident species besides. In the city of Coban there are several families which live by preparing bird-skins for sale and export (Bernouilli). From forty to fifty species of birds of prey are already known; among which

it is sufficient to mention Corogyps atratus, the commonest of the vultures, which acts as a universal scavenger, the Cathartes aura, the beautiful Polyborus vulgaris, and the king of the vultures (Sarcorhamphus papa). Neither the condor of the southern continent nor the great eagles of the northern are known in Guatemala. Of the great passerine order there are upwards of 400 species, including 36 species of humming-birds, 13 of wood- peckers, and 8 of the trogons. One of this last genus, the quetzal, quijal, or quesal (Trogon resplendens) is of special note, not only froni the fact that its yellow tail-feathers, 2 fect long, were formerly worn as insignia by the Indian princes, but because it has been adopted as the embleniatical figure on the national arms of Guate- mala, The gallinaceous order is well represented, and comprises several peculiar species, as the pavo de cacho, and the Peten turkey (Meleagris ocellata), which has a bronze sheen on its plumage ; and the palmipeds, it is almost needless to add, are unusually numerous 1n a country so richly furnished with lagoons and rivers and lakes. « _ There are two species of alligator, one in the Pacific and the other in the Atlantic versant. Snakes are met with in great variety, but only about a fourth of the species are venomous, and even the bite of the rattlesnake is said to be less deadly than in the north. Lhe Crotalus horridus is one of the most comnion. Five species of salamanders are known, 9 of the frogs, and 5 of the toads. Fourteen species of fish have been found in Lake Peten, 7 in Lake Amatitlan, 13 in the river Motagua, 10 in the Polochic, and 13 in the Usuimacinta.

The general character of the country induces a rich profusion of insect life, Of the Coleoptera, the Camelicorns, the Longicorns the Curculionids, and the Chrysomelines are said to be best repre- sented, and of the Lepidoptera the prevalent genera are—Ageronia, Papilio, Heliconia, Sphynx, and Bombyx. 'Theve are five species of bees, and the European honey-bee, known as aveja de Castilla or bee of Castile, has been naturalized. Ants are common, and may sometimes be seen marching in a column 8 or 4 miles long. Mos- quitoes unfortunately are in several districts equally abundant.

Most of the domestic animals of Guatemala—the horse, the ox, the goat, the sheep, the pig, the dog, the rabbit, the common fowl, the peacock, and the pigeon—are of European origin, and are popu- larly grouped together as animales de Castilla, Horses are small but excellent. Cattle are largely

imported from Soconusco and Honduras. The favourite swine is the black. Singing-birds are commonly kept in the Guatemalian houses, and the species most

la : See Dollfus, Voy. géol., and 'Versuch einer wissenschaftl. Be-

griindung der klim, Verhiiltnisse Central Amerikas," i ¢ it- schrijt f. Erdieunde, 1869, ral Amerikas," in Koner's Zeit

sought after are the sensontle, the guarda-barranco (JMvyiadestes obseurus), the pitureal, and the caraban. The last of these is as good as a watch-dog, as "no strangcr can euter the yard without being greeted by its shrill cries." ?

Industrial Produee.—As may be judged from the description of the configuration of the country and its climate the natural produc- tions of Guatemala are sufficiently varied. Foledo gives a list of upwards of 100 kinds of timber trees. Maize and haricot beans (frijol), which form tlie main sustenance of the people, are grown in all the departments, and in some places there are two harvests a year. Rice and wheat are less extensively distributed. For the foreign trade the coffee plant is the most important product. While in 1859 the whole export was only 390 cwt., by 1876 it lad increased to upwards of 185,200 cwt. Meanwhile the cultivation of indigo (afiil or jiquilitc) and cochineal, which were formerly the principal sources of wealth, is losing ground. Cocoa is most cultivated in the north-west ; the nibs are used as small change throughout the country. Good tobacco is grown, but the quantity is small. Sugar is rising into favour. Vanilla, chile, alocs, agave, rhubarb, ipeca- cuanha, castor oil, scammony, and colocynth are all obtained in the country. Thc absence of capitalists is one of the cliief hindrances to the development of industry and trade.

Politieal Divisions.—The following table from Foledo exhibits the 20 departments into which the republic of Guatemala is divided, their estimated arcas, their respective capitals, their popu- lation, and the population of the capitals. Altogether the republic contains 10 cities, 22 towns, 304 townships, and 1794 hamlets, &c.

Area, Popula- Sq. Miles. tion.

Department, Capitals,

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Chiquimula…..... Zacapa

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Administration.—The constitution of Guatemala is republican and representative. The council of state consists of 24 members elected by the house of representatives, which consists of 52 mem- bers elected by the people. The parliamentary period, and the term of office for the president, who is the head of the executive, is four years. The revenue, which in 1874 amounted to 2,601,000 dollars or £520,000, is mainly derived from import duties, domains, and monopolies; a large part of the expenditure, 2,542,600 dollars or £508,520, is occasioned by the army, which has a nominal strength of 3000, besides a militia of 18,000. The public debt, including the English loan of £500,000 raised in 1859, amounted in 1875 to 4,363,227 dollars ov £872,645.

Religion and Edueation.—The national religion is the Roman Catholic, but there is absolute toleration of other creeds. The Government pays a regular subvention to the church. In the 17 vicariates into whicli the country is divided there are 111 parishes. Since the risc of the liberal government great progress has been made in educational matters. In 1871 there were 253 schools, with 61380 male and 1944 female pupils ; by 1874 the schools had increased to 541, the male pupils to 14,216, and the female to 6312.

Population.—Out of the total population of 1,200,000 it is calcu- lated that about 720,000 are Indians, 800,000 Ladinos, and 180,000 whites. According to Foledo (1874) the foreigners did not exceed 829,—of whom 191 were Mexicans, 164 Spaniards, 103 Frenchmen, 71 Italians, 64 Germans, and 50 Englishmen. The native popula- tion is naturally of a quiet and inoffensive disposition. Crimes of violence are rare. A certain easy fatalism is the prevailing mood ; but during political excitement it gives way to fanatical outbursts. "Viva la relijion, y mueran los estranjeros" is then the cry. Cock fighting and bull baiting are the favourite amusements.

Roads.—The means of communication between one part of the country and another are very poor. In the whole republic it was calculated that in 1874 there were 1365 miles of carriagcable reads, and the number of bridges was stated at 432. Buta great propor- tion of the roads, while hardly passable in the dry season, become little better than mitigated swamps in the rainy scason; and many

2 The naturalists who have done most for Guatemalian exploration are Salvin, Morclet, Sumichrast, Bocourt, Sallé, and Bernoui'li.

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GUATEMALA

of the bridges are of the slightest construction and in a pitiable state of repair. Nearly a week is the time taken by the ordinary waggons to accomplish the journey from San José to Escuintla, a distance of about 90 miles. with the Government, a railroad between San José and Escuintla was begun in 1875, but it is still uncompleted. The tclegraph has been more extensively introduced. In 1874 there were in all ten lines, with 398 miles in operation and 511 in course of construction.

Harbours. —The country is poorly furnished with ports, —Izabal, Santo Tomas, Livingston, Gualan, and Panzos exhausting the list on the Atlantic; and San José, Barra de los Ksclavos, Tecojale, San Geronimo, San Luis, and Champerico that on the Pacific. Tzabal, situated in 15° 24' N. lat. and 89° 9' W. long., is of little use, as it is separated from the sea by the bar of the Rio Dulce. Santo Tomas, in 15°38' 3" N. lat. and 88° 36'6" W. long., hasa fine position at the southern extremity of the Golfo Amatico, which is at once spacious aud well protected. Livingston is at the mouth of the Rio Dulee, in 15° 48' N. lat. and 88° 46' W, long. Gualan is a river port in the Motagua, and Panzos lies below Teleman on the Polochic. Of the Pacific ports San José is the most noteworthy as the usual landing-place for strangers on their way to the capital. It is situated in 13° 56' N. lat. and 90° 42' W. long, A finc pier was built in 1868, but vessels have usually to anchor about a mile out, and the roadstead is not very secure. Champerico, opened to foreign trade in 1870, is also a simple roadstead. It is situated in the department of Suchitepequez, in 14° 17' N. lat. and 91° 57' W. long. Istapa, formerly, the principal port on the north coast, has been almost abandoned since 1853.

Antiquities. —Though it has no ancient remains so remarkable as those of Copan in Honduras, or Palenque in Chiapas, Guatemala preserves many traces of its earlier inhabitants, A careful summary of what is known in regard to them is given in Bancroft's Native Races of the Pacific States of North America, vol. iv. On the left bank of the Montagua are the ruins of an ancicnt city visited in 1840 by Mr Catherwood and in 1854 by Dr Scherzer. They resemble the ruins of Copan, and contain mounds, terraces, colossal heads, idols, pillars, and altars, Ruins are also to be seen at Chapulco and Chinamita inthe same valley, at Cinaca Mecallo, andat the Pecicnda of Carrizal about 20 miles north of Guatemala. A few leagues to the west are the ruins of Mexica witha vast cave divided into chambers. An ancient aqueduct is mentioned at Rosario, 8 or 10 miles south of Lake Amatitlan and another at the foot of the Volean de Fuego. Solold is said to occupy the site of Tecpan Atitlan; and in the neighbourhood of Tecpan Guatemala are the substructions and debris of Patmamit, the old Cakchiquel capital. Utatlan, the Quiche capital has left near Santa Cruz del Quiché sufficient to con- firm the carly Spanish accounts of its greatness. The absence of sculptures isa striking feature. Rude mounds mark the site of Zakuleu, the

chief town of the Mams, near Huehuetenango. At the junction of the Pacalah with the Chisoy Brasscur de Bourbourg in 1856 found pyramidal mounds and long lines of fortifications, 'The half-explored country of Peten.is reputed to conceal many evidences of its former civilization, and about 40 miles north-east of the lake about a league is occupied by the ruins of Tikal,}

History.—In 1820 Guatemala began to shake off the Spanish yoke, and in 1822-28 it supported the Mexican patriot Iturbide. A confederation of the Central American states was effected in 1824, slavery was abolished, anda democratic constitution was established. On the assassination of the vice-president Flores in 1827 the San- Salvadorians marched against the city of Guatemala; and though they were repulsed then they returned in 1829, and after a severe battle established their general Morazan as president. Guatemala recovered its independence under Carrera, who in 1851 defeated the Hondurians and Salvadorians at La Arada, near Chiquimula, and was recognized as the pacificator of the republic, In 1851 the new con-stitution still in force was promulgated, and Carrera was appointed president till 1856, a dignity which was afterwards in 1854 bestowed upon him for life. His rivalry with Barrios, president of Salvador, resulted in open war in 1868. In the battle of Coatepeque the Guatemalians suffered a severe defeat, which was followed by a truce. Honduras now joined with San Salvador, and Nicaragua and Costa Rica with Guatemala. The contest was finally settled in favour of Carrera, who besieged' and occupied the San Salvador eapital, and made himself dominant also in Honduras and Nicaragua. During the rest of his rule, which lasted till his death in April 1865, he con- tinued to act in concert with the clerical party, and endeavoured to maintain friendly relations with the European Governments. Carrera's successor was General Cerna, who had been recommended by him for election. In the struggle between Spain and Chili Guatemala maintained a strict neutrality, The liberal party began to rise in influence about 1870, and in May 1871 Cerna was deposed by. Granados. The archbishop of Guatemala and the Jesuits were

miven Into exile as intriguers in the interests of the clerical party ; and General Barrios having becn chosen president in 1872 the order was declared cxtinct and its property confiscated. All cities except

? Compare Bastian, Reisen, &c., Berlin, 1878.

According to the terms of a contract

those on the frontier of Chiapas, San Salvador, and Honduras, were opened to foreign commerce. An alliance was formed with San Salvador for offence and defence. In 1876 Barrios invited repre- sentatives from the other Central American republics to meet at Guatemala to deliberate on their amalgamation ; but the com- mission separated amid a clash of arms, and war was soon raging between Guatemala, San Salvador, and Honduras. Guatemala was

enabled by her superior resources to come forth victorious from the conflict.

Besides the numerous works of Brasseur de Bourbourg and Squier, who have devoted so much attention to Central Amcrica, see the interesting narrative of Thomas Gage, the English missionary; Juarros, Compendio de la historia de Guatemala, 1808-1818, 2 vols. (new ed., 1857), which in Bailly's English trans- lation (Lond., 1823) long formed the chief authority; Larrazabal, Apuntamientos sobre la agricultura y commercio del reyno de Guatemala, N. Guat., 1811; Obert, Mém….., Statistique de [état de Guatemala, Brussels, 1840; Ximencz, Las

historias del origen de los Indios de Guatemala, Vienna, 1857; Gayarrete, Cate- cismo de Geografia de la repub, de Guatemala, 1860 (republished by the Sociedad Economica); Alfred de Valois, Mexique, Havana, et Guatemala, Paris, 1862; Orozco y Berra, Geografia de las linguas y Carta etnograyica de Mexico, Mexico, 1866; Mechlin & Warren, Report of a Journey from Belize to the City of Guate- mala, Belize, 1872; Foledo, Geografia de Centro America, Guatemala, 1874; Laferritre, De Paris & Guatemala, Paris, 1877. The most valuable maps of Guatemala are Van der Gehucht's Mapa general, &c, (New York, 1859), Bour- geois and Feusier's appended to Foledo's Geografia (1874), and Au's (Hamburg, 1876). The last is perhaps the best. A geological map is given by Dollfus and Montserrat. (H. A. W.)

GUATEMALA, properly SanTIAGo DE GUATEMALA, or GUATEMALA LE Nueva, or the New, is the capital of the above republic. It is situated ata height of 5270 feet above the sea in a fertile meseta or plateau, which is crossed by the valley of the Rio de las Vacas or Cow River, so called from the first. specimens of the bovine race introduced by the Spaniards, On almost all sides it is surrounded by barrancas or ravines. The latitude is stated as either 14° 36' or 14° 37' N., and the longitude as 90° 24' or 90° 30' W. of Greenwich. Like most Spanish American towns it is laid out in wide and regular. streets, and it has extensive suburbs. The houses, though usually of only one story, are solidly and comfortably constructed, and many of them are furnished with large gardens and courts, Among the open spaces the chief are the Plaza Major, which contains the cathedral, erected in 1730, the archiepiscapal palace, the Government buildings, the mint, aud other public offices, and the Plaza de la Concordia, recently laid out by the Ministerio de Fomento, and now the favourite resort of the inhabitants. The theatre, founded in 1858, which is one of the best of Central America, is situated in the middle of another square. Desides the cathedral, the most important churches are those of San Francisco, La Recoleccion or church of the La Recollets, La Merces, with a black image of the Virgin, greatly reverenced by the Indians, and Santo Domingo, the oldest church in the town. The educational and benevolent institutions comprise the uni- versity, the normal schocl, the national school for girls founded in 1875, the polytechnic school, the general hospital, the orphanage, the hospicio, the maternity hospital, and the Colegio de Belen for the education of girls. The military college is located in the old convent of the Recol- lets, An excellent museum, founded in 1831, is maintained by the Sociedad Economica, which in various ways has done great service to the city and the country. There are two fortresses in the city, the Castello Matamoros, built by Carrera, and the Castello de San José, used as a state prison. Water is brought from a distance of about 8 miles by two old aqueducts. The general prosperity of Guate- mala has procured it the name of the Paris of Central America. Though it has neither railway nor river com- munication with either coast, it carries on a busy trade; and it also possesses cigar factories, wool and cottou factories, breweries, and other industrial establishments, The population is stated at from 30,000 to 45,000. It ig only since 1775 that New Guatemala has been in existence,

Old Guatemala, frequently called merely Antigua, was destroyed by the Volcan de Agua in 1774, but still remains the chief town of the department of Sacatepequez. It is situated in a beautiful valley in 14° 32’ 58” N. lat. and 90° 44’ 5" W. long. Till the fatal outbreak of the volcanic

forces it was one of the richest and most beautiful cities of Spanish America, possessing about 100 churches aud con- vents and more than 60,000 inhabitants. The ruins are still almost majestic, and many of the buildings appear as if they had been fortresses, Among those best preserved are the ancient residence of the Spanish governors, now occupied by the administration, and the university building, now the national college. Great damage was done to the place by the earthquake of September 1874, The popula- tion is about 20,000. An older Guatemala was situated at Ciudad Vieja or Almalonga, but seventeen years after it was founded by Alvaredo it was carried away by the great inundation to which the Volean de Agua owes its name. GUAVA (from the Mexican guayaba) is the name applied to the fruits of species of Psidium, a genus belong- ing to the natural order Myrtacew. The species which produces the bulk of the guava fruits of commerce is Psidium Guayava, Radd., a small tree from 15 to 20 feet high, a native of the tropical parts of America and the West Indies. It bears short-stalked egg-shaped or oblong leaves, with strongly marked veins, and covered with a soft tomentum or down. The flowers are borne on axillary stalks, and the fruits vary very much in size, shape, and colour, numerous forms and varieties being known and cultivated. The variety whose fruits are most valued is that which is sometimes called the white guava (P. G’wayava, var. pyriferum). The fruits are pear-shaped, about the size of a hen’s egg, covered with a thin bright yellow or whitish skin filled with soft pulp, also of a light yellowish tinge, and having a pleasant sweet-acid and somewhat aromatic flavour. P. Guayava, var. pomiferum, produces a more globular or apple-shaped fruit, sometimes called the red guava. The pulp of this variety is mostly of a darker colour than the former and not of so fine a flavour, there- fore the first named is most esteemed for eating in a raw state ; both, however, are used in the preparation of two kinds of preserve

known as guava jelly and guava cheese, which are made in the West Indies, and imported thence to England ; the fruits are of much too perishable a nature to allow of their importation in their natural state. The two varieties here mentioned have been described by some botanists as distinct species. They have both been intro- duced into various parts of India, as well as in other countries of the East, where they have become perfectly naturalized. Though of course much too tender for out- door planting in England, the guava thrives there in hot- houses or stoves. Psidium Cattleyanum, Sab., a tree of from 10 to 20 feet high, supposed to be a native of Brazil, but originally brought to Europe from China, is known as the purple guava. The fruit, which is very abundantly produced in the axils of the leaves, is large, spherical, of a fine deep claret colour ; the rind is pitted, and the pulp is soft, fleshy, purplish, reddish next the skin, but becoming paler towards the middle, and in the centre almost or quite white. It has a very agreeable acid-sweet flavour, which has been likened to that of a strawberry. | GUAYAQUIL, or SANTIAGO DE GUAYAQUIL, the prin- cipal seaport of the republic of Ecuador, South America, is situated on the western bank of the Guayaquil river, about 29 miles from its mouth, in 2° 12' 24" S. lat. and 79° 51' 24" W. long. The site forms part of a low and level tract of ground bounded on the north by the hills of Santa Ana ; and the streets are for the most part laid out with great regularity. To the north lies the old town, mainly inhabited by the poorer classes; to the south the new town. As the houses are generally built of wood or bamboo and mud, the risk of conflagrations is unusually great; and a strong fire-brigade is maintained. Since 1870 the town

has been drained, the river has been dredged, and an

abundant supply of good water has been brought from a distance. 'The principal streets are lighted with gas. None

of the public buildings are of any architectural interest. All the churches, with the exception of Santo Domingo,

are built of wood, There are two colleges (San Vicente and San Ygnacio), a civil hospital (De la Caridad), a new and commodions military hospital, municipal buildings,

and a custom-house. As its harbour is one of the best on the Pacific coast, and permits

vessels of large tonnage to come up to the town, Guayaquil is the

centre of the foreign trade not only of Ecuador but of part of Peru, and has regular steamship communication both with American and European ports. Bamboos, cocoa, coffee, hides, india-rubber, ivory- nuts, orchilla, and Panama hats are the staple articles tor the outgoing cargoes ; and there is a demand for pine apples, oranges, and other fresh fruits for Chili and Peru. The average value of the exports in the five years from 1867 to 1871 was £520,785; and the value of the imports increased from £434,860 in 1867 to £1,168, 656 in 1871. In 1876 there entcred 79 British vessels, other 57 foreign vessels, and 30 national vessels, with a tonnage respectively of 118,560, 25,979, and 2222. One of the greatest hindrances to a development of the export trade is the want of proper roads from the interior. It is only recently that the carriage road to Quito has been completed. Below the town there is a large astillero or ship- building yard of great repute on the Pacific coast. The Guayaquil bank, with a capital of $1,000,000 in native currency, dates from 1868, and the Banco de Credito Hipotecario, with a capital of $500,000, from 1872. The population of the town is from 20,000 to 22,000, mainly mulattos, mestizos, and Indians.

Santiago de Guayaquil was so called because it was founded on St James's Day, 25th July 1531. Declared a city by Charles V. on October 6, 1535, it was officially constituted the same ycar by Balaleazar ; and two years later it was restored by Francesco Orellana. In the course of the 17th and 18th centuries the main facts in its history are the attacks of pirates and disasters by fire. The Dutchman Jacob Clerk was the assailant in 1624, the French-man David in 1686-7, William Dampierre in 1707, and Clapperton in 1709. As late as 1741 the only defences were three indifferent forts in the river ; but in 1763 the town was made the seat of a governor, and a good castle and other fortifications were constructed. The following year a great fire destroyed property to the value of 2,000,000 pesos. In 1837 Guayaquil was made the see of a bishop.

See Villavicencio, Geographia del Eewador,

GUAYRA, LA, or La Guarra, a town of Venezuela, in the province of Caracas, about 8 miles from the city of Caracas, in 10° 36’ N. lat. and 71° 46’ W. long, It is situated on a low-lying strip of coast, but at the same time has a certain amount of picturesqueness as seen against the background of the Cordilleras, Being one of the four principal ports (puertos habilitados) of the country, it enjoys a degree of commercial prosperity; but its trade, which is mainly in the hands of Germans, is almost exclusively of the transit description. Its imports are principally from Hamburg and Bremen. ‘There is regular steamboat com- munication with Puerto Cabello, Maracaibo, and St Thomas. The population is about 4000. The railway to Caracas, though contracted for, has been stopped. The municipality maintaius 19 schools, in which 370 boys and 260 girls are educated free of expense.

GUBBIO, a city of Italy, in the province of Umbria, about 20 miles N. of Perugio. Built along the western ledges of Monte Calvo, it shares alike in the grandeur of the mountains and the beauty of the plain, and its churches and palaces are brought into relief by the varying elevation of the site. Its ancient walls are still retained, and a certain medieval impress lingers abont the place. Besides the cathedral of SS. Mariano and Giacomo, which consists of a small single nave and has a fine wheel window, San Francisco may be mentioned for the sake of the Conception by Fr. Signorelli, 5. Agostino for a Madonna del Soccorso by Ottaviano Nelli, and §, Maria Nova with the same artist’s finest work—a votive fresco. Portions still remain of the old palace of the dukes of Urbino, built for Federigo by Luciano Lauranna. The palazzo municipale or del commune is a fine building erected between 1332 and 1346 after the designs of Matteo Giovanello, surnamed Gattapone.

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GUB—GUE

Like Urbino and Faenza, Gubbio was formerly noted for its majolica, and it was Maestro Giorgio of Gubbio who re- discovered the ruby glazing for which this ware is remark- able. The manufacture has been resumed in modern times. In the neighbourhood of the town there is a great reservoir, La Bottacione, capable of containing 4,720,000 cubic feet of water. The

population of Gubbio in 1871 was 5343 in the town and 22,757 in the commune,

The ancient Umbrian city of Ikuvio, Iguvium, or Eugubium oceupicd a site a little further out in the plain, to the left of the Via Flaminia. There is no mention of it in Roman history till the time of its subjugation. It was the placc selected by the senate for the detention of the Illyrian king Gentius and his sons, and it was an important post in the wars betweeen Cesar and Pompey. The site is still marked by ruins, among which are those of the theatre dis- covered in 1789 by Ranghiasci (Discoprimento, Perugia, 1790), and further explored in 1863 (Boll. del? Institut. di corr. areh., tom. xii.). Itisalso known that the town possessed temples to Diana, to Vesta, to Janus, to Pallas, and to the Sunand Apollo; and about 8 miles to the north was the celebrated temple of the Apennine Jove. The modern city was raised from the decay into which it had fallen by Otto the Great, whose charter may be secn in Reposati's Della Zecca di Gubbio, Bologna, 1773, In 1155 it was besieged by Frederick Bar- barossa, but was saved by the intercession of St Ubaldo, The temporal government of the town, which had previously been in the hands of the papal legate, the bishop, or the prior of the cathedral, was then placed by the emperor in the hands of the people. The first podesta appears in 1163. During the 14th century the prosperity of Gubbio was greatly advanced ; it obtained jurisdiction over 130 castles, had great influence over the neighbouring cities, and possessed about 30,000 inhabitants. In 1384 it surrendered to Montefeltro, and thus became incorporated with the duchy of Urbino. An account of the school of painting which flourished in Gubbio in the 15th century is given by Ranghiasci Sebastiani in vol. iy. of the Siena edition of Vasari, and by Amico Ricci in his Memorie di belle arti in Gubbio, Bologna, 1831. Reference may also be made to Statuta civitatis Hugubit, Gerona, 1686; Greffolini, De gestis Hugubinorum; Sarti, De Episcopis Hugubinis, 1755; and the Marchese Brancaleoni, "Dei palazzi municipali e pretario di Gubbio" in Archivio Storico, 1867.

_GUBEN, a town of Brandenburg, Prussia, capital of a circle in the government district of Frankfort, is situated at the confluence of the Lubist with the Neisse and at the junction of three different railways, 28 miles S.S.E. of Frankfort, It is the seat of a circle court and of a district office,

and possesses three evangelical churches, an Old Lutheran church, a Catholic church, a synagogue, a gym- nasium, a real-school of 'the first order, two higher female schools, an infirmary, and a theatre. The principal industries are the spinning and weaving of wool, dyeing, tanning, and the manufacture of pottery ware, hats, and Machinery. The vine is cultivated in the neighbourhood to some extent, and there is also some trade in fruit and vegetables, The population in 1875 was 23,704,

Guben is of Wendish origin. It is mentioned in the time of the emperor Henry II., and received town rights in 12385, It was surrounded by walls in 1311, about which time it came into the pos- Session of the margrave of Brandenburg, from whom it passed to Bohemia in 1367. It was twice devastated by the Hussites, and in 1631 and 1635 it was occupied by the Swedes, In the latter year it came into the possession of the electorate of Saxony, and in 1815 it Was, along with the rest of Lower Lausatia, united to Prussia.

GUDGEON (Gobio), a small fish of the family Cypri- nde (see IcaTHyaLocy), with narrow, cylindrical body, and with a small barbel at each corner of the mouth. These fishes are generally distributed over Europe, the most com- mon being Gobio fluviatilis, called "goujon" in France, " grissling " or " griindling" in Germany, and " gobione" in Italy. They thrive in streams as well as lakes, always keeping to the bottom, and scarcely exceeding a length of Sinches. Gudgeons differing but little from the European are equally common in China and J apan.

GUELDERLAND, GELDERLAND, or GuxEnpErs (in Dutch Gerderland or Gelre, in German Geldern, and in Latin Geldria), formerly a duchy of the empire, bounded by Friesland, Westphalia, Brabant, Holland, and the Zuydersee. Atthe beginning of the Christian era the land was held by Batavians and Chamavians, and a few centuries

later both Saxons and Franks were added to its population. The Carolingian kings ruled over it by means of a number of counts, among whom those of Hameland, Teisterbant (Testrebante), and Nimeguen were the most prominent ; but hitherto it has not been discovered how these

counts are connected with the later dynasty of the counts of Guelder- land and Zutphen, which makes its appearance in the 11th century. There is documentary proof at Braunweiler of the existence of a Count Otto at the end of the 10th century, and a charter of 1096 is sealed by Gerhard of Gelder. Count Gerhard II. of Gelder married Ermgard of Zutphen, and their son Henry succeeded to the double inheritance. Both Henry (1131-1182) and his son and successor Otto I. (1182-1207) considerably extended their domains, and Otto deserves to be remembered for the civic rights which by a happy innovation he bestowed on the town of Zutphen in 1190, Gerhard IIT. (1207-1229) obtained from the emperor Frederick II. the right of removing the toll of Arnheim to Lobith, where it long proved the principal source of income to the countship. Otto II., son of Gerhard IIL., greatly augmented his power and territory, and secured the internal stability of his government by erecting numerous free communes, such as Harderwijk, Arnheim, Emmerich, Lochem, &c. Reinald J. (1271-1326) had the chagrin of seeing the dukedom of Limberg, which fell to him by the death of his father-in-law, seized by Jolin I. of Brabant in 1288; but from the emperor Henry VII. he received, in 1310, the right of bestowing full municipal privileges on any free communities he might establish, and in 1317 he was raised to the rank of prince of the empire by Frederick of Austria, which implied possession of legislative authority and liberty to coin his own money. A steady increase of power rewarded the exertions of Reinald II. (1326- 1339), and shortly before his death (Marchi 19, 1339) he received the hereditary title of duke of Guelderland from the emperor Louis of Bavaria, The new duchy, however, had an ill beginning of its history. MReinald III, the natural successor, found a bitter rival in his brother Edward, and in 1361, after a contest of eleven years, he was completely defeated in the battle of Tiel ; and though ten years later, on Edward's death, he recovered his right- ful position, he survived his restoration only three months. A protracted contest between the hostile factions was at length decided in favour of William a nephew of the last duke, and son of William of Juliers, who succeeded in 1378, but did not receive imperial recognition till 1383, Between 1384 and 1386 he assisted the Teutonic knights against the Prussians; and in 1393 he became duke of Juliers by the death of his father. He died 16th February 1402, and was followed by his brother Reinald IV., whose reign of three and twenty years was mainly noticeable for several contests with Holland, the surrender of Emmerich

and other portions of territory, and the gradual consolida- tion of the Guelderland states. Reinald IV. dying childless in 1423, the coronet passed to his grand-nephew Arnold, the son of John of Egmond. Arnold of Egmond was at first recognized by the emperor Sigismund in 1424, but in 1425 the emperor revoked his sanction, and gave his support to Adolphus of Cleves. In the war that followed the people of Guelderland stood true to Arnold, but his extravagance and carelessness brought the financial affairs of his duchy into confusion; and at length, in 1444, after the defeat of his forces by Adolphus at Linnich, he was constrained to pawn part of his territory to Cleves. The states had com- plained of the maladministration ina diet of 1436, and the malcontents ultimately, in 1456, found a leader in the duke's own son Adolphus, who, after an apparent recon- ciliation with his father made the old man a prisoner in January 1465, and confined him in the castle of Biiren. A civil war now broke out, and Charles the Bold of Burgundy

seized the opportunity for his own advantage; in 1471 Adolphus was forced to set his father at liberty; and Arnold, in return for the service done him, made over his duchy to the Burgundian duke for 20,000 gulden, only reserving the usufruct till the close of his own life. On 23d February 1473 Arnold died, and Charles was duke of Guelderland. The town of Nimeguen made an heroic effort to oppose the Burgundian accession, but it fell after a lengthened siege. On Charles's death at the battle of Nancy in 1477, a party in the powerful city of Ghent became anxious to marry Charles of Egmont to their princess, Mary of Burgundy. Before the year was out, however (29th June 1477), the young man had perished before the walls of Tournay, against which he had led an army of Burgundians and Flemings to recover it from the French. By his marriage with the Princess Mary, Maxi- milian of Austria considered himsclf the rightful possessor of Guelderland, and he succeeded by 1482 in quelling all opposition. But ten years Jater young Charles of Egmond, the son of Adolphus, set foot once more in his native country ; the people soon flocked to his standard; and victorious campaigns proved the capacity of the leader and the enthusiasm of the soldiers. The fierce contest con- tinued for years, and Charles carried the war into the enemy's territories. In 1507 he pushed inte Holland and Brabant, in 1512

appeared before Amsterdam, and in 1514 nade capture of Groningen. It was not till 1528 that Charles V. granted him the lifelong occupation of Guelder- land, Zutphen, Groningen, Coevorden, and Drenthe. In return he agreed that if he died childless his possessions should revert to the emperor; but such was his hatred of the house of Austria that towards the close of his life he planned to make France his heir. This, however, was prevented by the states of Guelderland insisting on his appointing as his successor William, the youthful son of the duke of Cleves and Juliers. Charles died 30th"June 1538, and William assumed the title of duke. But Charles V. was not disposed to give up the rights secured by the treaty of Gorinchem, and after a contest in which much damage was done to various parts of the Low Countries, William was obliged to surrender his claims on 7th September 1543. On the rise of the Dutch republics most of Guelderland threw off the Spanish yoke. One "quarter" only, that of Roermonde, continued subject, and it received the name of Spanish Gelderland; the other three " quarters," Nimeguen, Zutphen, and Arnheim, became Dutch Guelderland, and had their provincial diets twicea year. By the peace of Utrecht Spanish Guelderland or the Upper Quarter (Overkwartier) passed to Prussia, in- cluding the town of Guelders, but excluding Venloo, which went to the Netherlands, and Roermonde, which went to Austria. By the peace of Paris (1814) the temporary divi- sious of the French revolutionary period were abolished, and all Guelderland was incorporated with Holland except the portion which still forms the Prussian circle of Diisseldorf.

GUELDERLAND, the modern province of the Netherlands, has an area of 1932 square miles, and its population in 1821, 1835, 1840, 1860, and 1873 was respectively 269,926, 323,167, 345,762, 401,864, and 437,778 The largest towns are Nimeguen (23,509 in 1876), Arnheim (38,017), Zutphen (14,513), Apeldoorn (13,851), Ede (10,982), aud Rheden (10,536); and there are at least eighteen other communes with more than 5000 inhabitants.

See Pontanus, Historie Geldriew (Harderwijck, 1639); Van Spaen, 18f, estorie van Gelderland (Utrecht, 1814); Nijhoff, Gedankwaardig- heden wit de Geschiedenis van Gelderland (Arnheim, 1880, &c.,6 vols.); Nijhoff, Het cornaemste wit de geschiedenis von Gelderland (Arnheim, 1869); J.C.

Kremer, De Graven van Hameland, en de Oorsprong der Graven van Nassau, Gelre, Cleve, en Zutphen (Arnheim, 1873); Baron Sloet, Oorkondenbock der Graafschappen Gelre en Zutfen; P. H. Witkamp, Aardrijkskundiq Woordenbock van Nederland, 1877.

GUELDER ROSE, so called from Guelderland, its sup- posed source, termed also Marsh Elder, Rose Elder, Water Elder (Germ., Wasserholder, Schneeball ; Fr., Veorne-Obier, V'Obier d Europe), the Viburnum Opulus of Linnzeus, is a shrub or small tree of the natural order Caprifoliacea, anda native of Britain and other parts of Europe, and of Russian Asia. It is common in Ireland, but rare in Scotland. In height it is from 6 to 12 feet, and it thrives best in moist situations. The leaves are smooth, 2 to 3 inches broad, with 3to 5 unequal serrate lobes, and glandular adnate stipules. In autumn the leaves change their normal bright green for a pink or crimson hue. The flowers, which appear in June and July, are small, white, and arranged in cymes 2 to 4 inclies in diameter. The outer blossoms in the wild plant have an enlarged corolla, ? inch in diameter, and are devoid of stamens or pistils; in the comnion cultivated variety all the flowers are sterile, and the inflorescence is globular, hence the term " Snowball Tree" applied to the plant, the appearance of which at the time of flowering has been prettily described by Cowper in his Winter Walk at Noon. The guelder rose bears juicy, red, elliptical berries, 4 lines in length, which ripen in September, and contain each a single compressed seed. In northern Europe these are eaten, aud in Siberia, after fermentation with flour, they are distilled for spirit. The plant has, however, emetic, pur: gative, and narcotic properties ; and Taylor (Jfed. Jurisp., vol. i, p. 448, 2d ed., 1873) has recorded an instance of the fatal poisoning of a child by the berries. Both they and the bark contain valerianic acid. The woody shoots of the guelder rose are manufactured into various small articles in Sweden and Russia. See Loudon, Arboretum, vol. ii., 1838; and Syme, Lng. Bot., iv. p. 202, pl. 629.

GUELDERS, or GELDERN, a town of Rhenish Prussia, in the government district of Diisseldorf, chief and only town of the circle of Geldern, is situated on the Niers, 28 miles N.W. of Diisseldorf. Its industries include the manufacture of cloth and hats, wool-spinning, and wool, silk, and linen weaving. It has a Catholic and a Protestant church and two convents. The

town was built in 1097, and was till 1343 the residence of the counts and dukes of Guelderland. It was fortified by Philip II., but its fortifications were razed by Frederick II. of Prussia in 1764. The population in 1875 was 5184.

GUELFS anp GHIBELLINES. The names Guelfo and Ghibellino, as applied to parties in Italy, are Italianized forms of names which at an earlier period designated parties in Germany. Guelfo is the Italian form of Welf, and Ghibellino the Italian form of Waiblingen, a castle of the emperor Conrad. In Germany these names, which are said to have been first used as battle-cries at the battle of Weins- berg in 1140, designated the struggle between the Welfs of Altdorf and the imperial line of the Hohenstaufen. In Italy the names acquired a different meaning, being generally applied respectively to the party of the pope and the party of the emperor. Theconflict between the authority of the emperor and the independence of the Italian towns began before the names were used in Germany. 'These parties first came into prominence in the Lombard league of 1167. In the war which followed we find the following distribution of parties: on the Ghibellin side were Cremona, Pavia, Genoa, Tortona, Asti, Alba, Acqui, Turin, Ivrea, Venti- miglia, Savona, Albenga, Imola, Faenza, Ravenna, Forli, Cesena, Rimini, the marquis of Montferrat, the counts of Lomello, Guasto, Bosio, &c.; on the side of the Guelfs were Venice, Treviso, Padua, Vicenza, Verona, Brescia, Ferrara, Mantua, Bergamo, Lodi, Milan, Novara, Vercelli, Alessandria, Piacenza, Parma, Reggio, Modena, Bologna. These names spread further in consequence of the bitter rivalry which existed between several pairs of Italian towns, for instance, between Rome and Tusculum, Pisa and Genoa,

Ferrara and Mantua, Bergamo and Brescia. A further j extinguished the last hope of uniting Italy under the

step in this direction was the division of the towns them- selves into Guelf and Ghibellin parties. The struggle for the imperial throne between Philip of Swabia and Otto of Brunswick (1198-1208) enlisted the sympathies of

Italy. The Guelfic towns Milan, Piacenza, Brescia, Reggio, Modena, took the part of the Welf Otto. The 13th century witnessed a great increase of the jealousies between rival towns, and more serious divisions of the leading families in the towns themselves. Examples of this were the quarrels between the Montecchiand Capelletti at Verona, the Lambertazzi and Geremei at Bologna, the Rossi and Coreggiat Parma, the Doria and Spinola, the Grimaldi and Fieschi at Genoa, the Buondelmonti and Amedei, the Donati and Uberti at Florence, the Colonna and Orsini at Rome, the Bagnacavalli and Polenta at Ravenna, the Delle Torre and Visconti at Milan, the Cancellieri and Panciatichi at Pistoia, the Salimbeni and Tolomei at Siena.

Of the principal towns in North and Central Italy, Arezzo was generally Ghibellin. Bergamo was torn in sunder by party quarrels: the Suardi fought against the Coleoni, and afterwards both these against the Rivoli and Bonghi; it was generally more Guelf than Ghibellin. Bologna was generally Guelf. Brescia was much divided. It was generally Guelf, but was conquered by the Ghibellins in 1322. It came under the power of the Visconti of Milan in 1337. Cremona was generally Guelf, but eccasion- ally Ghibellin. Always unhappy, it was wasted by the most violent party conflicts. The family of Cavalcabd led the Guelf party in this town in the 14th century. Ferrara was Ghibellin under the Torelli; it became Guelf under the Este. Florence, after 1158, was the chief support of the Guelfs. The struggles which desolated it were between different branches of the Guelf—the Bianchi, and Neri, and others. Forli was Guelf till 1315, afterwards Ghibellin under the Ordelaffi. Genoa was divided between the two parties. Lucca was generally Ghibellin, but had hard work to maintain its position against the attacks of Florence. Mantua was Guelf up to 1220, afterwards mainly Ghibellin. Padua was the enemy of Venice; in 1227 it was Guelf, fighting against the Ghibellin Vicenza; about 1318 it became Ghibellin under the house of Carrara. Parma was divided in its sympathies. It was generally more Guelf than Ghibellin. Pavia was Ghibellin unless compelled to be otherwise. Perugia became Guelf in 1198. It was much torn by party quarrels. Piacenza was generally Guelf. Pisa was chiefly Ghibellin during a great part of its history. Pistaia was divided up to 1267, after which time it became mainly Guelf. Ravenna was chiefly Guelf under the family of Polenta. Rimini belonged to the family of Malatesta, which was

divided between Guelf and Ghibellin. Siena was at first Ghibellin; in 1270 it became Guelf. Venice was Searcely touched by these party quarrels. Verona was much divided. Up to 1259 it was mainly Guelf; under the Della Scala it was Ghibellin. Vicenza was Ghibellin after 1227 ; at a later period it followed the fortunes of Padua. Viterbo was Ghibellin after 1328.

It would be generally true to assert the principle that the Guelfs were more attached to liberty than the Ghibellins. The town of Alessandria was the creation of the Lombard league, a protest against the reduction of Italy under a German sovereign. Yet Dante, the keenest patriot, the most ardent aspirant towards the unity of Italy, was a Ghibellin. With him Ghibellinism meant (1) unity under a strong head, and (2) the abolition of the temporal power of the popes. No one, he thought, but an emperor could sit firmly in the saddle or guide the reins of so fierce a steed. The best hope of obtaining this object lay in Henry VII. of Luxembourg. But the object itself was probably impos- sible of realization. The death of Henry at Buonconvento

supremacy of Ceesar.

To give a full account of the party quarrels of Guelf and Ghibellin would be to write the history of medizval Italy. The names began to die out gradually at the beginning of the 15th century. Twenty years before the two parties had united in opposing John of Bohemia. The expedition of Charles IV. into Italy destroyed what shreds still remained of respect for the authority of the empire, and with the extinction of Ghibellinism Guelfism perished also; yet we find the name of Guelf appearing in Milan in 1404, after the death of Gian Galeazzo Visconti, and also in 1447, in the struggle between Ludovico Sforza and the Duchess Bona of Savoy. In the conquest of Milan by Louis XIL, in the beginning of the 16th century, we find the sup- porters of the emperor and Sforza called Ghibellins by Roman writers, and the French party called Guelf.

Of the literary supporters of either cause we can only mention a few. Brunetto Latini, the master of Dante, was a Guelf. Dante himself, as we have seen above, was a Ghibellin ; so was his friend Guido Cavalcanti. Petrarch was a Guelf; the three historians Villaniare singularly impartial. For further information, see Wachsmuth, @e- schichte der Politischen Partetungen, vol. ii. (0. B.)

GUELPH, the chief town of Wellington county, Ontario, Canada, is situated in a fine agricultural district on an elevation on the river Speed, a branch of the Grand River, and on the Grand Trunk Railway and the Wellington, Grey, and Bruce division of the Great Western Railway, 45 miles west by south of Toronto. The river is navigable at this point, and there is a considerable shipping trade in wheat. Abundant water power is obtained for flour-mills, saw-mills, and woollen-mills, and there are also breweries, tanneries, and manufactories for agricultural instruments and sewing machines. 'The population in 1871 was 6878.

GUERCINO. See Barsrert.

GUERET, a town of France, chief town of the depart- ment of Creuse, is situated on a mountain declivity near the Creuse, about 250 miles south from Paris. It has a church of the 13th century, a communal college, a normal school, two hospitals, a botanical garden, a library, a picture-gallery, and a museum for natural history and antiquities. The principal industries are the manufacture of beer, leather, potash, combs, and buttons; and there is a consider- able trade in wood and cattle. Guéret grew up in the 8th century round an abbey founded by Clotaire in 720. The population in 1876 was 4973.

GUERICKE, Orro von (1602-1686), an experimental philosopher, distinguished by his original discoveries of the properties of air, was born at Magdeburg, in Prussian Saxony, November 20, 1602. Having studied law at Leipsic, Helmstadt, and Jena, and mathematics, especially geometry and mechanics, at Leyden, he visited France and England, and, returning to Saxony, took up the profession of engineer-in-chief at Erfurt. In 1627 he was elected alderman of Magdeburg, and in 1646 mayor of that city, and a magistrate of Brandenburg. It was whilst holding these offices that Guericke devoted his leisure to scientific pursuits, especially in pneumatics. Incited by the dis- coveries of Galileo, Pascal, and Torricelli, he attempted the creation of a vacuum, a desideratum in science from before Aristotle. He began by experimenting with a pump on water placed in a barrel, but found that when the water was drawn off the air permeated the wood. He then took a globe of copper fitted with pump and stopcock, and dis- covered that he could pump out air as well as water. Thus Guericke became the

inventor of the air-pump (1650). This important discovery was publicly explained before the emperor Ferdinand IIT. at the imperial diet which assem- bled at Ratisbon in 1651, Guericke at the same time

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illustrated in a simple but effective way the force of atmo- spheric pressure. Placing side by side two hollow hemi- spheres of copper, he exhausted the air from between them by means of pump and stopcock, and it is recorded that thirty horses, fifteen back to back, were unable to pull them asunder. The apparatus used on this occasion is still preserved in the imperial and royal library at Berlin. Guericke further demonstrated, by the aid of the air-pump, that in a vacuum all bodies fall equally fast, that animals cannot exist therein, and other phenomena. He also invented the air-balance, and the anemoscope, a species of weathercock. 'The discovery of the property of electro- repulsion is also attributed to him; and he made successful researches in astronomy, predicting the periodicity of the return of comets. In 1681 he gave up office, and retired to Hamburg, where he died May 11, 1686,

His principal observations are given in his work, Experimenta nova, ut vocant, Magdeburgica de vacuo spatio (Amsterdam, 1672). He is also the author of a Geschichte der Belagerung und Eroberung vor Magdeburg. See Hoffmann, Otto von Guericke, Magdeburg,

1874.

GUERIN, Grorcrs Maurice pz (1810-1839), a French poet, whose few compositions in prose and verse, published posthumously, show him to have possessed a true and yare genius, was descended from a noble but poor family, and was born at the chateau of Le Cayla in Languedoc, 4th August 1810. He was educated with a view to the church at a religious seminary at Toulouse, aud then at the Collége Stanislas, Paris, after which he procured entrance to the society at La Chesnaye in Brittany, founded by Lamennais, bishop of Rennes. Here his most intimate companions were persons whose tastes were literary rather than ecclesi- astical ; and his dreamy and meditative temperament found its solace and happiness more in intercourse with nature than in theological study or the exercises of piety. It was

therefore only after great hesitation, and without being satisfied as to his religious vocation, that under the influ. ence of Lamennais he joined the new religious order in August 1833 ; and when, in September of the same year, Lamennais, who had come under the displeasure of Rome, severed connexion with the society, Guérin's doubts as to his vocation returned in full force, and on the 7th October he renounced his novitiate. Early in the following year lhe went to Paris, where he obtained an engagement on the periodical press, but finding it impossible to submit to the mental drudgery of continuous literary work he became a teacher at the Cullége Stanislas. Ip November 1838 he married a Creole lady of some fortune; but a few months afterwards he was attacked by a malady which proved to be consumption, and which terminated by death his short period of leisure and happiness, 19th July 1839. In the Revue des Deux Mondes for May 15, 1840, there appeared a notice of Guérin by George Sand, to which she added two fragments of his writings—one a composition in prose entitled the Centaur, and the other a short poem. THis Reliquice, including the Centaur, his journal, a number of his letters, and several poems edited by G. S. Trébutien, and accompanied with a biographical and critical notice by Sainte-Beuve, appeared in 1860 in two volumes; and a translation of it was published at New York in 1867. Though Guérin was essentially a poet, his prose is more striking and original than his poetry. Its peculiar and unique charm arises from his strong and absorbing passion for nature, a passion whose intensity reached almost to adoration and worship, but in which the pagan was more prominent than the moral element. According to Sainte- Beuve, "no French poet or painter has rendered so well the feeling for nature—the feeling not so much for details as for the ensemble and the divine universality, the feeling for the origin of things and the sovereign principle of life."

The name of Evciniz pe Guten (1805-1848), the

sister of Maurice, cannot be omitted from any notice of him, if only on account of the ties of love that united them ; but her Journals, published in 1861, English translation 1865, and her Lettres, published in 1864, English transla- tion 1865, indicated the possession of gifts of as rare an order as

those of her brother, though of a somewhat differ- ent kind. In her case mysticism assumed a form more strictly religious, and she continued to mourn her brother's loss of his early Catholic faith, Five years older than

le, she cherished a love for him which was blended with a somewhat motherly anxiety, In him she centred her chief earthly hopes, and after his death her only remaining earthly purpose was to rescue his name from oblivion by the collection and publication of the scattered fragments of his writings.. She died, however, on the 31st May 1848, before her task was completed.

See the notices by George Sand and Sainte-Beuve referred to above; Sainte-Beuve, Cawseries du lundi, vol. xii,, and Nouveaux lundis, vol. iii.; G. Merlet, Causeries sur les femmes et les livres, Paris, 1865; Selden, L' Esprit des fenvines de notre temps, Paris, 1864; Marelle, Hugénie et Maurice de Guérin, Berlin, 1869; Harriet Parr, M. and E. de Guérin,' a monograph, London, 1870; and Matthew Arnold's essays on Maurice and Eugénie de Guérin, in his Essays in Criticism.

GUERIN, Jean Baptiste Pavuin (1783-1855), French painter, belongs to the group who specially represent the Restoration. Born at Toulon, on the 25th March 1783, of poor parents, he learnt, as a lad, his father's trade of a lock- smith, whilst, at the same time, he followed the classes of the free school of art, Having sold some copies to a local amateur, Guérin started for Paris, where he came under the notice of Vincent, whose counsels were of material service. In 1810 Guérin made his first appearance at the Salon with some portraits, which had a certain success. Iu 1812 he exhibited Cain after the murder of Abel (formerly in Luxembourg), and, on the return of the Bourbons, was much employed in works of restoration and decoration at Versailles. His Dead Christ (Cathedral, Baltimore) ob- tained a medal in 1817, and this success was followed up by a long series of works, of which the following are the more noteworthy :—Christ on the knees of the Virgin, 1819; Anchises and Venus, 1822 (formerly in Luxem- bourg) ; Ulysses and Minerva, 1824 (Musée de Rennes) ; the Holy Family, 1829 (Cathedral, Toulon); and Saint Catherine, 1838 (St Roch). In his treatment of subject, Guérin attempted to realize rococo graces of conception, the liveliness of which was lost in the strenuous effort to be correct. His chief successes

were attained by portraits, and those of Charles Nodier and the Abbé Lamennais became widely popular. Guérin died January 19, 1859, We possess no account of his life and works beyond that which is afforded by brief notices in contemporary bio- graphical dictionaries.

GUERIN, Pierre Narcisse (1774-1833), French painter, was born at Paris, May 13, 1774, The artistic ideal of the first empire found complete expression in his work, the most famous examples of which show a peculiar combination of the dry pseudo-classic style, then popular, with stage pathos of a highly exaggerated character ; yet from his atelier went forth, as if in necessary protest against the defects of their master, the leaders of the Romantic and Realistic movements,—Delacroix and Géricault. The first teacher of Guérin was Nicolas Brenet, whom he left to place himself under Jean Baptiste Regnault, the representative, as contrasted with David, of a distinct form of the elassic re- action modified by a tincture of Italian tradition. Guérin became the most distinguished of his pupils, and carried off one of the three "grands prix" offered in 1796, in con- sequence of the competition not having taken place since 1793. The pension was not indeed re-established, but Guérin fulfilled at Paris the conditions imposed upon a penstonnatre,

and produced various works, oue of which brought him prominently before the public. This work, Marcus Sextus (Louvre), exhibited at the Salon of 1799, excited wild enthusiasm, partly due to the subject—a victim of Sulla's proscription returning to Rome to find his wife dead and his house in mourning—in which an allusion was found to the actual situation of the émigrés. Guérin on this occasion was publicly crowned by the president of the Institute, and before his departure for Rome (on the re-establishment of the Ecole under Suvée) a banquet was given to him by the most distinguished artists of Paris, In 1800, unable to remain in Rome on account of his health, he went to Naples, where he painted the Grave of Amyntas, In 1802 Guérin produced Phxdra and Hippolytus (Louvre); in 1810, after his return to Paris, he again achieved a great success with Andromache and Pyrrhus (Louvre); and in tlie same year also exhibited Cephalus and Aurora (Collection Sommariva) aud Bonaparte and the

Rebels of Cairo (Versailles), The Restoration brought to Guérin fresh honours; he had received from the first consul in 1803 the cross of the legion of honour, and in 1815 Louis XVIII. named him Academician. The success of Guérin's Hippolytus, of Andro- mache, of Phaedra, and of Clyteemnestra (Louvre) had been ensured by the skilful selection of highly melodramatic situations, treated with the strained and pompous dignity proper to the art of the first empire ; in A'neas relating to Dido the disasters of Troy (Louvre), which appeared side by side with Clytzemnestra at the Salon of 1817, the in- fluence of the Restoration is plainly to be traced. In this work Guérin sought to captivate the public by an appeal to those sensuous charms which he had previously rejected, and by the introduction of picturesque elements of interest which, even now, distract attention from the artificial man- nerism too painfully apparent in his treatment of tragic subject. But with this work Guérin's public successes came toa close. He was, iudeed, commissioned to paint for the Madeleine a scene from the history of St Louis, but his health prevented him from accomplishing what he had begun, and in 1822 he accepted the post of director of the cole de Rome, which in 1816 he had refused. On returning to Paris in 1828, Guérin, who had previously been made chevalier of the order of St Michiel, was ennobled. He now attempted to complete Pyrrhus and Priam, a work which he had begun at Rome, but in vain ; his health had finally broken down, and in the hope of improvement he returned to Italy with Horace Vernet. Shortly after his arrival at Rome Baron Guérin died, on July 6, 1833, and was buried in the church of La Trinita de'? Monti by the side of Claude Lorraine. A careful analysis and criticism of his principal works will be found in Meyer's Geschichte der Franzisischen Maleret, but his life has not yet been made the subject of special treatment. GUERNSEY, the second in size of the Channel Islands, is situated between 49° 25' and 49° 31' N. lat. and between 2° 30' and 2° 41' W. long., 30 miles W. of Normandy, and 51 miles §. of Portsmouth. The total area at low water Is estimated at 15,560 acres, or rather more than 24 square miles, and of this about 10,000 acres are under cultivation. Gradually rising from the north to the south, the island attains its maximum elevation of 349 feet above mean tide at Haut Nez, above Point Icart. According to J. A. Bird's "Geology of the Channel Islands" in The Geological Magazine, London, 1878, it consists geologically of three very unequal portions, one characterized by a very felspathic syenite and gneiss, another by a hornblendic " granital,"

and a third by a micaceous syenite. The felspathic portion yields magnificent crystals of felspar, surpassing those of the porphyritic granites of Cornwall or Cumber- land; and the hornblendic portion occasionally affords crystals of black hornblende in similar 'perfection. No

Secondary or Tertiary rocks are found in position, but post- Tertiary clays containing flints are found all round the island and even on its summit, and Mr Bird is disposed to assign them to the interglacial period of submergence. The soil of Guernsey is generally a light sandy loam, and the subsoil consists for the most part of angular gravel, except in certain places occupied by a curious clay, chiefly composed of a silicate of alumina, which proves destructive to vegetable life. While the island does not grow sufficient grain for its own consumption, it has a large export of fruits and other garden produce. Parsnips were formerly one of the principal items, but they are now less extensively culti- vated, having been supplanted by potatoes and turnips. Grapes, which were exported to the amount of 50 tons in 1873, are the source of an increasing trade. Granite is largely shipped at St Sampson.

For administrative purposes Guernsey is united with Alderney, Sark, Herm, and the adjacent islands in the baili- wick of Guernsey. The island proper is divided into the ten parishes of St Peter Port, St Sampson, Vale, Catel, St Saviour, St Andrew, St Martin, Forest, St Peter du Bois, and Torteval. The administration is under the supervision of a lieutenant-governor appointed by the crown; and the parliamentary assembly consists of a bailiff, twelve jurats, a procureur or attorney-general, the beneficed clergy, and twelve delegates elected by the people. Taxation is very light, and the annual revenue amounts to about £10,000. Kcclesiastically the island is a deanery of the Winchester diocese of the Church of England.

The only town of any great importance is St Peter Port on the eastern coast. In 1861 it had a population of 16,388 (6968 males and 9420 females), and in 1871, 16,166 (6731 males and 9435 females), The sea frontage of the town extends for about a mile, and is protected in nearly all its length by a wall with an esplanade. On the improvement of the harbour, which was begun in the 13th century by order of King Edward I., a sum of £285,000 has been expended since 1854, It is formed by two piers, which enclose an

area of 73 acres, the southernmost of the two running out to Castle Cornet and then sending out a breakwater for about 3000 yards. The whole of the works are of the most massive description. Among the principal buildings of the town, which has been greatly improved by the formation of a new street from the harbour up to the hill, are the Government house, the court-house, Elizabeth college, the town hospital, St Stephen's church built in 1866, the Roman Catholic church designed by Pugin, and the new vegetable market constructed at a cost of £16,000. On the higher ground above the town is 2 monument in memory of the Queen's visit to the island in 1846, and on the pier there was erected in 1863 a monument to the Prince Consort by Mr Durham, a copy of the monument in the gardens of the Horticultural Society at South Kensington. St Sampson, which is the only port besides St Peter Port, is situated at the eastern end of the Braye du Val, a depression which at no distant date used to form an arm of the sea at high tides, cutting the island into two unequal parts. The harbour accommodation has been improved at St Sampson contemporaneously with that of St Peter Port. To the south of the latter is the strong fort of St George's with barracks for 5000 men, and smaller forts, batteries, and martello towers are to be found on suit- able points all round the coast.

By the old Guernsey laws, all the male population from sixteen to sixty are obliged to serve in the militia; but the custom of paying exemption fines has gradually become so common that the real force is very far below its nominal limit. Guernsey is both populous and wealthy, and the wealth is very evenly distributed among the people. In 1873 the assessment value of the town parish was

£3,564,750, or £2262 per head, and that of the rural parishes £1,831,620, or £1233 per head. Like the neighbouring part of France, Guernsey still possesses numerous traces of its early inhabitants, in the form of sepulchral caves, dolmens, and maenhirs. The most remark- able group of the second class is in the north at Ancresse. Details will be found in Mr Lukis's paper in vol. i. of the Archeological Journal, and in vols. i. and viii. of the Journal of the Archeological Association, as well as in the special chapter in Dr Ansted's Channel Islands. The island is usually identified with the Sarnia of

the latter Roman writers. Its present name would appear to be a corruption of the Norse for Green Isle. For details on its history see CHANNEL Istanps. An account of a number of its more eminent natives, many of whom have served with high distinction in the British army, will be found in Sarnia, or brief Memorials of many of her Sons, Guernsey, 1862. Among the better known families are the Sau- marezes, the Tuppers, and the Careys.

Besides the works referred to under CHANNEL ISLANDS, see Documents rélatifs & Vile de Guernsey, Guernsey, 1814 ; Views of Guernsey, with descriptive letterpress, Edinburgh, 1867; John Jacob, Annals of the Bailiwick of Guernsey, London, 1830 ; Le Marchant, Laws and Customs of Normandy as used in Royal Court of Guernsey.

GUERRAZZI, Francesco Domenico (1804-1873), Italian writer and politician, was born at Leghorn, August 12, 1804. He studied law at Pisa, and happened to become acquainted there with Byron, who produced'a very strong impression on his lively imagination. Having taken his degree in law, he went back to Leghorn to practise his pro- fession, but engaged at the same time in literary pursuits. In 1827 he published his first novel, Zhe Battle of Benevento, a work displaying powerful imagination and strong patriotic feeling. While exiled in 1834 to Portoferraio, on the island of Elba, he wrote Zsabella Orsini and The Stege of Florence, the latter producing great enthusiasm in Italy. The two compositions which followed, Veronica Cibo and The New Tartufes, are of inferior value. In 1844 Guerrazzi was again exiled to Portoferraio, When the revolution broke out in 1848, he was named deputy, then president of the counsel of ministers, and finally, in the beginning of 1849, along with Montanelli and Mazzoni, triumvir and dictator of Tuscany. He had to expiate these few months of power by years of imprisonment and exile. He was banished first to Corsica, where he wrote Beatrice Cenct, The Tower of Nonza, and Fides ; and then to Genoa, where he composed the Memento Homo, The Hole in the Wall, Messer Artotto Mainardi, Paolo Pellicione, The Italian Plutarch, Fhe Lives of Andrea Doria, Francesco Fer- ruccto, Pasquale Paoli, The Siege of Rome, and The Ass (L'Asino), a humorous work. When the kingdom of Italy was constituted, Guerrazzi was several times sent to parlia- ment as deputy. 'Towards the end of his life he with- drew to a villa

he had on the sea-shore, near Cecina, not far from Leghorn, where he wrote his novel entitled Zhe Dying Century. Te died there on the 25th September 1873, and was buried in the church of Montenero, near Leghorn. His letters are being collected for publication under the direction of the poet Joseph Carducci.

See Guerrazzi's own Apology, Florence, 1851; Bosio, F. D, Guer- razzi and his Works; De Gubernatis, Ricordi Biografict, Florence, 1878; and Corona, F. D. Guerrazzi, Biclla, 1878.

GUERRERO, formerly TrxTLA, the chief town of the state of Guerrero, Mexico, is situated at an elevation of about 5000 feet in a narrow and unhealthy valley in the Sierra Madre, 28 miles from the coast and 150 miles 8. W. of Mexico. Mining is carried on, but not to any great extent, and coarse cloth is manufactured. The population in 1869 was 6501.

GUESCLIN. See Du Gusscrin.

GUEVARA, Antonio pE (c. 1490-1545), Spanish chronicler and moralist, was a native of the province of Alava, and passed some of his earlier years at the court of Queen Isabella. In 1528 he entered the Franciscan order, and he afterwards accompanied Charles V. during his journeys and residencies in Italy and in other parts of Europe. After having held successively the offices of court preacher, court historiographer, bishop of Guadix, and bishop of Mondofiedo, he died in 1545. His earliest work, entitled Relox de principes, o Marco Aurelio, published in 1529, and, according to its author, the fruit of eleven years' labour, is a kind of romance designed, after the manner of Xenophon's Cyropedia, to delineate in a somewhat ideal way for the benefit of modern sovereigns the life and char- acter of an ancient prince distinguished for wisdom and virtue. It was very often reprinted in Spanish; and before the close of the century had also been translated into Latin, Italian, French, and English. It is difficult now to account for its extraordinary popularity,—its thought being neither just nor profound, while its style is stiffand affected. It gave rise to a literary controversy, however, of great bitterness aud violence, the author having ventured without warrant to claim for it an historical character, appealing to an imaginary "manuscript in Florence." Other works of Guevara are the Decada de los Césares, or "' Lives of the Ten Roman Emperors," in

imitation of the manner of Plutarch and Suetonius; and the L£pistolas Familiares, sometimes called "The Golden Epistles," often printed in Spain, and translated into all the principal Janguages of Europe. They are in reality a collection of stiff and formal essays which have long ago fallen into merited oblivion (see Ticknor, Hist. of Span. Zat., vol. ii.).

In Spanish literature occurs also the name of Luis VELEZ DE GuEvARA (1570-1644), who is said to have written nearly 400 comedies, of which however only a few, aud these of little value, have been preserved. 'This Guevara is chiefly noteworthy as having been the author of a prose romance entitled Zl Diablo Cojuelo, which suggested to Le Sage the ideas and materials of his Diable Botteux.

GUGLIELMI. There are several Italian musicians of this name, the most celebrated of them being Pietro, born at Massa Carrara in May 1727. He received his first musical education from his father, and afterwards studied under Durante at the Conservatorio di San Loretto, Naples. His first operatic work was produced at Turin in 1756, and the success was such as falls to the lot of few primary efforts. Guglielmi's reputation was thenceforth established, and soon his fame spread beyond the limits of his own country, so that in 1762 be was called to Dresden to conduct the celebrated opera there. He remained for some years in Germany, where his works met with much success, but the greatest triumphs were reserved for him in England. He went to London in 1772, and stayed there five years, returning to Naplesin 1777. He still continued to produce operas at an astounding rate, but was unable to compete successfully with the younger masters of the day. In 1793 he became maestro di capella at St Peter's Cathedral, and died at Rome, November 19, 1804. He was a very prolific composer, and occupies a respectable if not absolutely first- rate position among the earlier masters of Italian comic opera. 'here is indeed in most of his scores a vein of humour and natural gaiety not surpassed by Cimarosa him- self. In serious opera he was less successful. But here also he betrays at least the qualities of a competent musician. Considering the enormous number of his works, his unequal workmanship and the frequent instances of mechanical and slip-shod writing in his music need not surprise us. The following are among the most celebrated of his operas :— I due gemelli, La serva inamorata, La pastorella nobile, La

bella peccatrice, Rinaldo, Artasesse, Didone, and Eneo e Lavina. He also wrote oratorios and miscellaneous pieces of orchestral and chamber music. Of his eight sons two at least acquired fame as musicians—Pietro Carlo (1763— 1817), a successful imitator of his father's operatic style, aud Giacomo, an excellent singer.

GUIANA, Guyana, or GuAYANA, an extensive territory in the north-eastern part of South America, comprehending in its widest acceptation all the extent of country lying between the rivers Amazon and Orinoco from 3° 30' S. to 8° 40' N. lat., and from 50° 22' to 68° 10' W. long. It is bounded on the N. by the Orinoco and the Atlantic, E. by the Atlantic, S. by the rivers Negro and Amazon, and W. by the Orinoco and the Cassiquiare, Its greatest length from east to west is about 1200 miles, its greatest breadth, from the mouth of the Orinoco to the confluence of the Rio Negro with the Amazon, about 800 miles; and the estimated area is 690,000 square miles. This vast territory is divided into Brazilian (formerly Portuguese) Guiana, Venezuelan (formerly Spanish) Guiana, and Colonial Guiana. The first two divisions, comprising about five- sixths of the entire region, are claimed by or included in Brazil and Venezuela respectively ; and stretching eastward from the mouth of the Orinoco towards that of the Amazon lie the territories of British, Dutch, and French Guiana, which are in that order noticed below.

Vea} hl

Columbus in 1498 decided that the Orinoco must flow

through some vast continent. Vincent Yanez Pinzon, a Spanish navigator, is believed to have first sailed up the Amazon from the coast. Vasco Nuiiez landed on the coast of Guiana in 1504, but the discovery is also claimed for Diego de Ordas, one of the captains of Cortez in the con- quest of Mexico in 1531. Sir Walter Raleigh ascended the Orinoco in 1595 in search of the El Dorado. The first settlement is stated to be that of some Dutch people in 1580 near the river Pomeroon. This possession was contested by the Spaniards, but in 1613 a colony of Zealanders on the banks of the Essequibo was reported in a flourishing condition. English and

subsequently French colonization was attempted up the Surinam river. The English returned in 1652 to Paramaribo, and in 1662 the whole colony was granted by Charles II. to Lord Wil- loughby. In 1669, however, Dutch Guiana covered all the territory now divided into British, Dutch, and French. In 1712 the French attacked the settlement and exacted a contribution. In 1732 Berbice reccived a constitution

from the states-general, and in 1763 there was a formid- able insurrection of negro slaves who had been introduced from Africa. In 1781 Rodney took possession; aud though the colonies were restored to Holland in 1783, they sur- rendered again to the British in 1796. The Dutch resumed authority in 1802, and in 1803 the proper history of British Guiana began.

I. Brrrish Guiana, when finally acquired in 1803, and formally ceded in 1814, consisted of the three colonies, Demerara, Essequibo, and Berbice, so named after the principal rivers which drain them. These were consolidated into one colony in July 1831. It is bounded on the N. and N.E. by the Atlantic, E. by Dutch Guiana, from which it is separated by the river Corantyn, 8. by Brazil, and W. by Venezuela. It lies between 0° 40’ and 8° 40’ N. lat., and 57° and 61° W. long., and has an estiniated area of 76,000 square miles, but the boundaries are still dis- puted by Venezuela and Brazil. An engagement, however, exists between the British and Venezuelan Governments that neither shall occupy territory claimed by both. The colony has now three divisions, called counties:—Berbice, extending from the Corantyn about 95 miles along the sea-coast ; Demerara, from the Abari about 65 miles, in- cluding Georgetown, the capital ; and Essequibo, from the river of that name about 120 miles to the Barima near the Orinoco mouth. There is thus a length of coast of 280 miles, with an extent inland varying from 300 to 450 miles.

Surface.—From the coast-line seaward the ocean deepens very gradually, and at low tide extensive mud-flats and sandbanks are left bare. Traced inland, this fluvio-marine deposit is found to rise to 10 or 12 feet above high-water mark, and to end at an older deposit of sand and clay beds, which forms an extensive undulating country, rising to not more than 150 feet above the sea, and stretching back to where the solid rock strata

underlying it crop out, Upon the rich alluvial soil of the depressed coast-land, and for a few miles up the rivers, the sugar estates are situated. They are not only protected by dams from the sea, but, as in wet weather water rapidly accumulates in the savannahs behind, they are similarly defended on that side also. A narrow sand reef, some little distance farther inland, run- ning parallel with the coast-line, marks a previous sea limit, and still farther back a higher range of coarse white sand probably marks a yet earlier coast. The eastern portion of the colony from the sources of the Corantyn and Essequibo is a rough inclined plane, sloping down to the sea-level from a height of about 800 feet, the most elevated part being mountainous and rising to 2000 feet above the sea. This plain extends westward and northward, broken by ranges of mountains, its western portion constituting part of the extensive savannah which stretches eastward from Brazil. Two great parallel mountain systems cross the colony from west to east, the greater being that of the Pacaraima and Merumé mountains, and the lesser including the Canucu, Cumucumu, and Coratamung mountains, while the Sierra Acarai, a densely wooded chain rising to 2500 feet, forms the southern boundary of Guiana and the watershed be- tween the Essequibo and the tributaries of the Amazon. The Pacaraima mountains, a wide extent of rough country traversed by broad valleys, extend from about 4° to 5° 30' N. lat., and rise to 3000 feet between the Potaro and Siparuni rivers, and to 7500 feet at Roraima mountain, which rises, a perpendicular inaccessible wall of red sand- stone, at the extreme western limits of the colony. The southern portion of Pacaraima shows rugged hills and valleys strewn with rocks, but to the north, where the sandstone assumes table-shaped forms, there are dense forests, and the scenery is of extraordinary grandeur. The Imataca range lies between the Cuyuni and Barima

rivers in 7° to 8° N. lat. A sandstone formation can be traced from the northern Pacaraima mountains on the west to the Corantyn on the east. Interbedded with it are three great layers of greenstone. The surface of a very large portion of the colony is composed of gneiss, which is seen in

large rounded bosses in the river beds. Schist of different kinds is associated with gneiss in many localities. Quartz-porphyry and felstone occupy extensive areas over the surface of the granite and underlying the gneiss. A large proportion of the surface rock in the interior is granite. The white sand at the sandhills on the Demerara and elsewhere is very pure and well-adapted for glass-making. Gold has been found about 40 miles up the Cuyuni river, Attempts to work it have met with small success, and have been complicated with questions of boundary. Rivers.—-The colony is traversed by numerous large rivers, the principal being the Essequibo, Corantyn, Mazaruni, Cuyuni, Berbice, and Demerara. The Corantyn forms the boundary between British and Dutch Guiana. It rises in 2° N. lat., 100 miles eastward of the Essequibo, flows generally northward, and falls into the Atlantic by a broad estuary in 6° N, lat., 57° W. long. It is navigable for small vessels for 150 miles from its mouth, aud is remarkable for its magnificent cataracts. The Cuyuni, coming from Venezuela, runs a course of 120 miles through territory claimed as British, The Essequibo rises in the Sierra Acarai, 0° 40' N. lat., and after a course of at least 600 miles discharges itself into the ocean by an estuary 15 miles in width, in 7° N. lat., 58° 40' W. long. In this estuary are a group of islands where sugar is grown, several being from 12 to 15 miles long and 3 miles broad. The principal are Hog Island, Wakenaam, and Leguan; a smaller one is named Tiger Island. The entrance of the Essequibo is diflicult owing to deposits of mud and sand. Its course lies through forests of gigantic vegetation. About 43 miles from its mouth it is joined by the Mazaruni, which is itself joined by the Cuyuni at 8 miles from its mouth. The cataracts, of which one of the greatest is the King William's Cataract of Schomburgk, in 3° 14' 35" N. lat., put a stop to the navigation of the Esseqnibo by large vessels about 50 miles up. In 3° 57' 30" N. lat. and 58° 3' W. long. it receives the Rupununi, which has a course of 220 miles. Another large tributary is the Potaro, upon which is the celebrated Kaieteur (Old Maun's) Fall, so named from an Indian legend, and discovered on April 24, 1870, by Mr C. B. Brown of the Geological Survey, who, owing to cataracts, took a fortnight to reach the fall from the coast up the Essequibo and Potaro. This fall, in 5° 8' N. lat. and 59° 19' W. long., is produced by the river flowing over a sandstone and conglomerate table-land 822 feet into a deep valley below. For the first 741 feet the water falls perpendicularly, as one great continuous whitish column, circled by rainbows, into a basin below, con- tinuing thence over a

sloping cataract 88 feet in height, and through the interstices of great blocks of rock, to the river- bed below. The head of the fall is 1130 feet above the sea. The river 200 yards above the fall is 400 feet wide, and the width of the fall itself varies, according to the season, from 240 to 370 feet. The Demerara or Demerary rises probably near 5° N. lat., and after a northward course nearly parallel with the Essequibo for more than 200 miles, enters the Atlantic near 6° 50' N. lat. and 58° 20' W. long. Itis navigable for 85 miles, and at its mouth at Georgetown is 1} miles across. A bar, or deposit of mud and sand, prevents the entrance of large vessels at low tide. Farther east is the Berbice, whose source is probably about 3° 40' N. lat. It is 24 miles wide at its mouth in 6° 21' N, lat., 57° 12' W. long., and is navigable for 175 miles by vessels drawing 7 feet of water. The Canje creek falls into the Berbice near its mouth. Several large streams called creeks fall

directly into the Atlantic between the Berbice and the Demerara. The Boerasiri creek divides the counties of Demerara and Essequibo, and between the Essequibo and the Barima are the rivers or creeks Pomeroon, Morucca, and Waini.

Climate.—The climate, especially in the interior, is healthy. The even temperature is considered suitable for pulmonary complaints ; and tubercular consumption is un- known. There are no hurricanes, and gales are not frequent. Occasionally there is a long drought, but the following order of seasons is generally maintained. From the middle of April to June there is a long season of heavy rains, which decrease in July; the long dry season lasts from August to November; December and January comprise the short rainy season, and February and March the short dry season. The winds during the rains are generally westerly. In the dry seasons they blow from the ocean and modify the heat. The thermometer seldom rises above 90° or falls below 75° Fahr, At Georgetown the mean annual tempera- ture is 81° 2'. The rainfall in 1878 was 69°94 inches, the average having been 74 inches for 1873-77.

Population.—The census of 1871 was as follows :— 113,570 born in British Guiana (including 70,000 to 80,000 negroes, 10,000 born of Indian and

Chinese parents, and the "coloured" population), 42,68] immigrants from India, 6295 Chinese, 7925 from Madeira and Azores, 13,385 negroes from West-Indian Islands, and 9635 Europeaus and others ; total 193,491, exclusive of aborigines, estimated at 7000. The estimated total population on 31st December 1876 was 225,365, and further explorations have increased the esti- mated number of aboriginal Indians. The aborigines are remnants of Indian tribes, such as the Arawaks, Warraus, Caribs, and many others, scattered in the interior of the country. They maintain themselves by fishing and hunt- ing. Traces of "Indian picture-writing," or sculptured figures, have been fuund in some granite blocks up the Essequibo. On December 31, 1877, 22,500 East Indian immigrants were working under a five years' indenture on the estates, and 26,000 not under indenture. Since 1857, 10,315 East Indian coolies (including women and children), with savings amounting to £260,479, have availed themselves of their right to return passage. A number re-emigrate to the colony. The Indian Government supervises the emigration. In the colony an immigration department regulates labour, wages, and general treatment. About 5000 are now annually introduced. Chinese have also been introduced with and without indenture.

Vegetation.—The vegetation is most luxuriant. The interior affords an exhaustless supply of valuable timber, such as the mora and greenhieart, largely used for shipbuilding. The climate insures a continuous succession of tropical flowers and fruits. Many of the trees yicld gums, febrifuges, oils, and juices of more or less value, among which may be mentioned caoutchouc, and a gum called " balata," with properties intermediate between those of caoutchouc and gutta percha. The bark of the crab tree is used for tanning. The silk-cotton tree, which grows 100 feet high and 12 feet round, yields a light-grey silky cotton uscd for stuffing pillows. Among the palin- trees are the picturesque mountain cabbage palm, growing to the height of 100 feet ; the cocoa-nut palm; the sago palm; the eta palm, much esteemed for its beauty and frnit; and the cockarite palm, which produces the most dclicate cabbage of all the palin species. The mangrove tree, 15 to 20 feet high, skirts the sca-coast. The tobacco plant grows wild, and indigenous cottons arc numerous. A little rice is grown. The fruit of the plantain and banana is largely used for food, and the stems furnish fibre for paper-making. Orange, lime, guava, cashew, and pine-apple are among the

fruits. Indigo used to be cultivated. Arnotto, from which the well-known dye is obtained, is indigenous ; and logwood and vanilla are also found. Maize, cassava, yams, papaw tree fruit, sweet potatoes, peppers, and other productions are valuable for food or medicine. The largest of the water lilies, the Victoria regia, was first dis- covered in Guiana.

Animals.—Among the wild animals arc the tapir or bush cow, the manatee (the flesh of which is sometimes eaten), the jaguar or "tiger," three kinds of ant-bear, the sloth, opossum, armadillo,

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avouri (or hare), numerous monkeys, and vampires, measuring 30 inches from point to point of extended wing. The cayman, alligator, or erveodile of South Ameriea, 15 to 20 feet long, abounds in the rivers and canals. Among other reptiles are the iguana (the flesh of which is said to be suitable for eating), many lizards, and snakes (some venomous). Tortoises and turtles are common ou the banks of the streams and in sandy districts of the coast. The bird, insect, aud fish life of Guiana is of indescribable richness and variety.

Produce, Industries, and Commeree.—There are 120 sugar and 12 small coffee estates in the colony. Cotton was formerly exported, but the cultivation has now ceased, Coffee, the export of whieh in 1830 was 94 million tb, is not now produced for the foreign market. The deep rich soil has induced large investments in the formation of sugar estates; but the industry has undergone great fluctuations. Exports in 1839, when negro apprenticeship terminated, fell from an average of 66,000 to 38,443 hhds. The equalization of the English duties on free and slave-grown sugar still further restricted cultiva- tion, exports in 1849 being only 32,000 hhds. In 1854 matters had begun to mend. The prospect of obtaining coolie labourers from India and China caused new capital to be introdnced and fresh energy einployed. Cultivation was improved and extended, vacuum pans came to be more used, steam ploughs and tile draining were suc-

cessfully introduced. The value of machinery imported from 1867 to 1876 was £850,000. A quantity of 2 to 3 hhds. (of about 17 ewts.) per acre is often obtained, but the average is 30 ewts. The juice expressed by the powerful rollers is about 60 per eent. of the weight of canes. The " Demarara crystals" are very popular for their purity and saccharine strength, and command high prices. The sugar exports in 1876 were 119,891 hhds., fully equal to 100,000 tons ; in 1877, 111,156 hhds, ; and in 1878 (a year with prolonged drought), 86,075 hhds. Nearly all this last quantity went to the United Kingdom, but 20,000 and 32,000 hhds. went to the United States in 1876 and 1877 respectively. The rum exported in 1876 was 36,000 puncheons; in 1877 it was 32,531, and in 1878 28,752. The quantity of rum issued for consumption in the colony in 1878 was 330,392 gallons. The export of molasses (of which less is made as the quality of the sugar improves) is principally to the United States and British provinces, the quantity being 14,320, 19,862, and 17,084 casks in 1876, 1877, 1878. The same years the timber exports (nearly all to the United Kingdom) were 464,436, 357,430, and 303,693 cubic feet. The woodcutting industry, under Goverument licence, is a considerable one, as is shown by the export of about 5 million shingles annually. Up the rivers and ereeks charcoal-burning is carried on; 32,266, 35,631, and 46,746 barrels of charcoal were exported in 1876, 1877, 1878, There are 1,250,000 cocoa-nuts exported yearly. In 1858 the total value of imports was £847,183; in 1877, £2,229,908 (£1,079,898 from the United Kingdom); in 1878, £2,150,714. The exports were in 1853, £1,014,944; in 1877, £3,049,157 (£1,954,766 to the United King- ak and in 1878, £2,507,571. The tonnage, inwards and out- wards, was 234,089 tons in 18538, and 519,986 tons in 1877.

Government.—The government is vested in a governor appointed by the British crown and a court of policy, originally instituted by the Dutch in 1778 for Demerara, and including Esseqnibo in 1789. Berbice had until 1831 a separate constitution. The unofficial members of the court were elected by a college of kiezers or electors, who were themselves elected by duly qualified inhabitants. In 1795 this college eommissioned some of their own members to act with the court of policy in financial matters. This resulted in an independent body, called financial representatives, being elected by the inhabitants who were qualified to vote for kiezers. The financial representatives and the court of policy meet in annual session as

the "combined court," to discuss finance and pass the annual tax ordinance. The civil list is not permanent, being renewed every seven years. All other ordinances or lc .al laws are passed by the court of policy,—every ordinance being subject to confirmation by the queen, The colony is divided into five elec- toral districts, with a total of 868 registered electors, These districts elect for life one or two kiezers, seven in all, and one or two financial representatives, six in all. Whena vacancy occurs in the court of policy the seven kiezers nominate two persons, one of Whom is selected by the court. There are five unofficial members chosen as above, and five official members, viz., the governor, attorney-general, Government secretary, auditor-general, and immi- gration agent-general. The public revenue in 1853 was £250,017, and the expenditure £236,557. In 1877 the revenue was £389,872, and in 1878 £405,092. Half of this revenue is derived from import duties, and the remainder principally from wine and spirit duties, rum duty, and retail spirit licences. The expenditure in 1877 was £380,566, and in 1878 £417,995. The public debt in 1877 was £323,563. Public and mercantile accounts are kept in dollars (4s, 2d. sterling) and cents.

The Roman Dutch law is in force in civil cases, modified by orders in council and local ordinances ; the criminal law is based on that of Great Britain, and administered in the same way, except that there 1s no grand jury. The supreine conrt consists of the ehief justice and two puisne judges. Appeal in cases involving

£500 and upwards lies to the privy council. There are an inferior court of civil justice, courts of admiralty and vice-admiralty, of petty debt (conducted by stipendiary magistrates), of bail and review (of magistrates' decisions). One judge sits in the supreme criminal court ; and there is an inferior criminal court. Qnestions of law are decided by three judges in the court of crown cases reserved. Besides a poliee magistrate for Georgetown, there are thirteen districts. each with a stipendiary magistrate appointed by the secretary of state.

Towns.—For a notice of GEorGETOWN, the capital (resident population about 40,000), see vol. x. p. 430. The lighthonse, with revolving light visible for many miles, is at the north end, near the month of the river. The lightship is 11 miles off in 6° 56” N. lat. and 58°13’ W. long. The chief town of Berbice is New Amsterdam, on the east bank of the Berbice river. It is well laid out, and has a population of 6000. The Berbice lightship is in 6° 29’ 10” N. lat. and 57° 28’ 40” W. long.

Religion and Education.—The diocese of Guiana was established in 1842. The official list shows—1 bishop, 1 archdeacon, 10 rectors, 14 euratcs, 2 incumbents, and several missionary clergymen and. chaplains to institutions. The Church of England has 69 cluurclies or chapels, The Coolie Mission Association and Diocesan Society maintain missionaries and catechists. The Church of England claims 90,000 members. The Church of Scotland has 10 ministers. The Roman Catholics also have several churches and mission stations. The Church of England receives an annual grant of £10,000 from the public revenue, the bishop’s salary (£2000) being paid from imperial funds ; the Church of Scotland has £5000, and the Roman Catholic Church £2500 from public revenue. There are also 14 Wesleyan Methodist ministers, a Moravian mission, and several chapels of Congregational Dissenters and others belonging to the London Missionary Society. The system of education supported by the general revenne is denominational. There are 177 schools sauctioned by the board of education. The estimate for primary education in 1879 was £29,695. The Church of England has 81 schools, exclusive of those on estates for coolies.

*Sce Schomburgk's British Guiana; Martin's British Colonies; Dalton's History of British Guiana, 1855; Waterton's Wanderings in South America, 18525 Geological Survey Reports; J. G. Sawkins, **On Geology of British Guiana" in Quarterly Journ. of Geolog. Soe., London, 1871; Brown's Canoe and Camp Life in British Guiana, 1876; Brett's Indian Tribes of Gutana, 1876; Colonial Office List; British Guiana Directory; Bennet's British Guiana; Boddam-Whcetham's Roraima, 1879. (J. L. 0.)*

II. Dutcn Guiana, or SuRINAM, lies to the E. of British Guiana, from which it is separated by the Corantiju or Corantyn in 57° 5' W, long. Its coast extends for upwards of 220 miles to the mouth of the Maroni or Marowijne, which forms the boundary towards French Guiana. The Dutch claim possession of 58,530 square miles ; but of this exten- sive area, equal to more than four times that of Holland, not more than 3230, according to Wolbers, had been explored in 1868, the colonial territory did not comprise more than 640 square miles, and the actual area under cultivation was little over 200. In 1875 this last was 29,852 acres (47 square miles), and in 1876, 22,180. The principal settlements have been made in the lower valley of the Surinam, or between that river and the Saramacca on the W. and the Commewijne on the E. At its mouth tlic Surinam is 3 miles broad, and at Paramaribo, the capital, about half a mile. Ships of from 18 to 19 feet of draught can reach the anchorage in front of the town, which has room for 100 vessels. The water is of a dirty yellow

| colour with brown bubbles on its surface, and its current

can be traced far out at sea. As yet no one has seen the source of the Surinam, but it is understood to be high up in the Tumac Humac hills. The principal tributaries are the navigable Para on the left hand and the Paulus Creek on the right, both of which join it about 6 or 7 miles above Paramaribo.! The Marowijne or Maroui is a much larger river than the Surinam. Its water is clear as crystal, so that stones can be distinguished at a depth of 12 feet. Unfortunately its mouth, though about 4 miles broad, is full of sand-banks, and consequently it has been less visited than might have been expected from the excellent character of the country through which it flows. The banks are high

1 An interesting aeeount of a voyage up the Surinam by Zimmer- mann, with a good map on a large seale, will be found in Tijdschrift van het Aardrijkskundig Genootsehap, 1877.

enough to confine the floods, though at Armina, about 45 miles inland, the difference of level between the dry and the rainy season is 23 feet. Between the rivers of Dutch Guiana there are remarkable cross channels available during the floods at least. The Maroni is even connected with the Corantyn on the one hand (though there is 200 miles of country between) and with the Oyapock on the other. As it communicates with the Cottica, which is in turn a tributary of the Commewijne, a boat can pass from the Maroni to Paramaribo; thence by the Sommelsdijk canal it can reach the Saramacca; and from the Saramacca it can proceed up the Coppename, and by means of the Nickerie find its way to the Corantyn.

Climate.—The climate of Surinam has long enjoyed a reputation for exceptional unhealthiness which it does not appear to deserve. Though hot and moist like a Turkish bath, it seems congenial even to the European constitution. The mean teniperature of the year is 80°4° Fahr., that of the coldest month 78° and that of the warmest 99°. On the average of the eight years from 1847 to 1854 the rainfall at Monbijou is 129 inches, at Paramaribo 101, at Gelderland 108, at Groningen 91, and at Nickerie 67. According to the tables at the end of the Jaarboek of the Kon. Nederlandsch Meteor. Instit. (Utrecht), the greatest quantity falls in May, June, July, September, and December. There are no endemic diseases ; and though cholera, fevers, and small-pox have appeared from time to time, they are not more violent than in more temperate regions. Leprosy and elephantiasis, introduced it is believed from Barbados, are not infrequent among the negro population. The former is locally known as boassi. In 1790 there were only 7 patients in the lazaretto of Voorzoorg, but by 1797 they had increased to 300, and in 1812 to 500. A new estab- lishment was founded at Batavia on the right bank of the Coppename in 1823. Between 1831 and 1839 an average of 103 suspected persons were examined yearly, and 46 declared infected. In 1853 there were 448 inhabitants (216 males and 232 females) in

the settlement; of these however 112 were personally free from the disease, though born and brought up among the patients.

Population. —Between 1838 and 1852 the free popula- tion of Surinam increased from 8893 (4242 males and 4651 females) to 13,193 (6709 males and 6484 females). In 1855 the total number of slaves was 31,780, of whom 27,914 (13,556 males and 14,358 females) were on the plantations and 3866 (2027 males and 1839 females) in private service. Since the abolition in 1863 many attempts have been made to augment the working popu- lation of the colony. Up till 1874 the total number of immigrants was 9049, of whom at least 2028 died. In 1870 a convention was signed between Holland and England for the regulation of the coolie traffic, and a Dutch Government agent for Surinam was appointed at Calcutta. In 1873 2448 immigrants arrived from British India, and 1405 in 1874; but owing to dissatisfac- tion on the part of England with the Dntch arrangements there were none in 1875 and 1876. In December 1875 the whole population was stated at 51,329 (26,074 males and 25,255 females), exclusive of about 17,000 bush negroes and an uncertain number of Indians. There were 706 Euro- peans besides the soldiers and seamen in garrison and har- bour, and the immigrants amounted to 4007 (2834 males and 1173 females), and comprised 2959 from British India, 598 from the West Indies, 352 Chinese from China, and 67 from the Dutch Indies, and 37 settlers from the Netherlands.

The bush negroes (bosch-negers) are the descendants of runaway slaves. They consist of three tribes—the Aukanians, the Saramaccans, and the Bekou or Moesinga. The first, who number from 3000 to 4000, have their chief settlements in the district near the junction of the Lava

and the Tapanahoni with the Upper Marowijne, but they are also settled on the Sara Creek, on the Upper Cottika, and on the Curmotibo. The Saramaccans, who are numerically about as important, dwell between the Saramacca and the Upper Surinam. The bush negroes retain curious traces of their former connexion with Christianity, though they are and consider themselves pagans. Their chief god is Gran Gado (grand-god), his wife is Maria, and his son Jesi Kist. Various minor deities are also worshipped,

Ampuka the bush-god, Toni the water-god, &c. Among themselves they speak a language based on a bastard English, mingled with many Dutch, Portuguese, and native elements. The Moravian missionaries have promoted its cultivation, but it is almost certain to give way before the Dutch.?

Vegetation.—A large portion of Dutch Guiana is covered with primeval forests ; but hitherto the lack of labour and cost of tran- sport have prevented the utilization of its vast supplies of timber and cabinet wood. In some years indeed the export of these materials is actually exceeded by the import. An idea of the wealth that awaits the future prospector may be obtained from Focke's paper in the West Indié for 1855, where a list is given of 77 different kinds. Among the more important are the bolletric (Lucuma mammosum), known in the Netherlands as paardenfleesch or horse-flesh ; the bruinhart (Vowacapoua americana, Aubl.); the barklak (Zccythis ollaria), which is never attacked by worms ; the geelhart (Nectandra Rodici, Schomb.); the male and female letterwood; the purpuurhart (Copaifera bracteata, L.) ; the kankan tree (Bombax Ceiba) ; the locust or courbaril, which is good both for timber work and furniture ; and the kopie (Goupia tomentosa), largely used for flooring. Besides the banana, to which the negro is indebted for a large part of his sustenance, maize, sorghum, or Curagoa maize, yams, kayers (Arum esculentum), arrowroot, okro or gumbo, the ground nut or pienda (Arachis hypogea), Spanish pepper, the antrua (Solanum macrocarpum), the bilambi, the zuurzak (Anona muricata), the pomme de Cythtre (Spondias cytherea), and the Mammea americana may be mentioned from the vast list of plants of interest for their edible products.? ~

Commerce.—The great staple of Surinam industry was formerly sugar. Between 1849 and 1863 the average quantity exported was 302,857 cwts.; in 1865, two years after the emancipation of the slaves, it sank as low as 151,842 ewts.; and though it has again inereased, the average between 1864 and 1874 is only 212,906 ewts. In 1876 the production was 218,115 ewts., and the export 198,274 ewts. The first cocoa from Surinam was sent to Amsterdam in 1733 ; but it is only since about 1855 or 1860 that it has risen into favour with the colonists. In 1876 the production was no less than 262,907 ewts., and the export 26,062 ewts. Cotton and. coffee are next in

order, the former having a yield in 1876 of 3806 cwts. and the latter of 245 cwts. The total exports of the colony had a value of 2,762,568 gulden or florins ; of which Great Britain took 969,945, the United States 872,277, and the Netherlands 505,064. Of the total imports, valued at 3,183,252 gulden, the mother country furnished the value of 1,228,408.

Minerals.—The gold-diggings of Surinam are beginning to attract attention, the commission of 1874 having found a rich auriferous district about the Marowijne. By May 1876, 519,000 acres of land had been rented to private persons, and a fair amount of success has attended their labours. The lead, silver, and iron ores may yet prove of importance.

Admvinistration.—In 1865 several changes were introduced into the government of Surinam. The Code Napoléon was adopted, subject to modification from time to time by orders in council. A house of assembly was constituted, the members of which were never to be less than nine nor more than thirteen,— four being appointed by the Government and the others by the electors. The franchise was given to all eitizens paying 40 gulden of taxes. Elected members serve for six years. The ordinances of the governor in council become law only if passed in the assembly and sanctioned by the king; but a royal decree may overrule the strongest opposition of the assembly, and not unfrequently the national assembly of the Netherlands disallows what has been in- serted in the budget by the colonial assemblies. Besides the supreme

1 Seventeen publications are mentioned by Wullschlaegel in his Kuregefasste Neger-Englische Grammatik (Bantzen, 1854). Focke issued a Neger-Englisch Woordenboek (Leyden, 1855), and Wull- schlaegel a Deutsch Neger-Englisches Wérterbuch (Lébau, 1865).

2 Further information on the rich tropical flora of the colony will be found in Teenstra, Landbouw in de Kolonie Suriname, Groningen, 1835; Van Fermin, Hist. Nat. dela Hollande équinoziale, Amsterdam, 1765; Dozy and Molkenboer, " Prodromus Flore bryologice Surina- mensis," in Verhandl. von de Holl. Maatsch. der Wetensch. te Haar- lem; and A. C. Focke, "De quibusdam orchideis Surinamensibus," in Mohl and Schlechtendal's Botan. Zeitung, 1853.

court at Paramaribo, there are tliree eantonal and three district courts. The president and four permanent members of the supreme court are nominated by the crown.' " The king," says Mr Palgrave, "is almost everything ;" the " Lords," in a consultative capacity, are something ; and the " Commons" are merely honorary.

History. —The Dutch began to visit the coasts of Guiana about 1580, and we find Adriaan ter Haaf sending vessels thither in 1599. In 1614 the states of Holland granted to any Dutch citizen four years' monopoly of any harbour or place of eommerce which he might discover in that region. The first settlement, however, in Surinam (in 1630) was made by an Englishman, whose name is still preserved by Marshal's Creek. When Cayenne was taken by the French in 1664 a number of Jews who had settled in that part of Guiana removed to the Surinam district, where they soon consti- tuted an important and flourishing community. In 1666 the Eng- lish settlement was taken by storm by the Zealanders under Crijnssen or Krijnssen (the name is spelt in various ways), and 100,000 ib of sugar were exacted as a ransom. By the peace of Breda the Dutch were formally recognized as masters of Guiana, and though the Willoughbys, who considered their rights infringed, did all they could to weaken the colony and draw off a large part of its English population to Jamaica, it continued to flourish, and was confirmed to the Dutch by the treaty of Westminster in 1674. For some time the Zealanders claimed that they alone had right to the country, but it was ultimately decided that the possession was a national one in the full sense of the word. The New Dutch West Indian Company, founded in 1674 to replace the older company which had failed, received Guiana by ehartcr from the states general in 1682.7 in the following year the company sold one-third of their territory to the city of Amsterdam, and another third to Cornelis van Aerssens, lord of Sommelsdijk. The new owncrs and the company incorporated themselves as the Chartered Society of Surinam, and Sommelsdijk agrecd to fill the post of governor of the colony at his own expense. The lucrative trade in slaves was retained by the West Indian Company, but the society could im- port them on its own account by paying

a fine to the company. Sommelsdijk's rule was marked by rare wisdom and energy. He repressed and a the Indian tribes; he erected forts and disciplined the soldiery; he constructed the canal which still bears his name; he established a high court of justice; he introduced the cultivation of the cocoa-nut; and in short he devoted himself in all ways to the welfare of the colony. But on 17th June 1688 he was massacred in a mutiny of the Saldions The " third" which Som- melsdijk possessed was offered by his widow to William JI]. of England, but it was ultimately purchased by the city of Amsterdam for 700,000 fl. In 1712 the French, under Cassard, sailed up the tiver and put Paramaribo to ransom; and after their departure there was hot dispute between the Society and the colonists as to who should pay the indemnity. During the rest of the 18th eentury the chief troubles of Surinam were the bush negroes and the slaves. Peace with the Aukan negroes was made in 1760, and with the Saramaccans in 1762; but in 1776 the governor N epveu still found it necessary to surround the colony with a military cordon against the attacks of the Bonui tribe. By the spring of 1786 pacification was complete. In 1795 the Society was abrogated, and the affairs of Surinam placed under a committee of twenty-one members. The English, who had assnmed the protectorate of the colony from 1799 to 1802, took actnal possession in 1804, and appointed Sir Charles Green governor. In 1807 the slave trade was abolished. At the restoration of the Dutch authority in 1815 the colonists of the district of Nickerie sought to remain under English rule, or at least to receive the right of trading with English colonies. In 1825 the privileges of the Jews were annulled, and the rights of ordinary citizens bestowed on them instead, Surinam and the West Indies were placed under a eommon government in 1828, bnt the governor was to reside at Paramaribo, In 1832 several negro slaves who had set fire to the city were publicly burned alive. The administration of Surinam was separated from that of the West Indics in 1845. Baron van Raders, who assumed the governorship in that year, had the honour of greatly improving the state of the slave-laws, and of declaring the commerce of Guiana open to all nations at peace with the Netherlands. The suppression of slavery and the organization of immigration, as already indicated, are the main moments of the recent history of the colony.

Among the older works on Surinam the first rank is held by Hartsinck's masterly Besehrijving van Guiana of de Wilde Kust m Zuid Amerika, 2 vols.

4to, Amsterdam, 1770. A valuable Geschiedenis der Kolonie van Suriname, by a number of "learned Jews," was published at Amsterdam in 1791; and it has been supplemented and so far superseded by Wolbers, Gesehicdenis van Suriname, Amsterdam, 1861. Sketches of Surinam life are Siven in the form of a tale in Schaik's De Manja. Familie Tafercet

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' Compare Mr Cohen's Report in Parliamentary Papers [C 1861}, 1877.

- *See the Octroy or Charter in Hartsinck, or in Verzameling van*

Stukken aangaande de Surinacmsche Adangelegenheden, &c., The Hague, 1845.

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uit het Surinaamsche Votlksleben, Arnheim, 1866 ; and a number of ex- cellent pictorial illustrations will be found in A. Halberstadt's Koloni- satie van Europeanen te Suriname, Leyden, 187 2, fol. The English reader is indebted to W. G. Palgrave fora brilliant study on Dutch Guiana, London, 1876, reprinted from the Contemporary Review. Sec also the Jaarboekje of the Letterliebende Genootsehap " Oefning Kweekt Kennis," at Paramaribo; the Staatkundig Jaarboekje, pub- lished by the Vereeniging voor de Statistick in Nederland (Amster- dam); and the Swrinaamsehe Almanak, published by the Afaatseh. tot Nut van't Algemeen, Leyden and Aimsterdani. (H. A. W.)

JI. Frencu Guiana is bounded on the west by the Maroni or Marowijne, which separates it from Dutch Guiana. Towards the south and east its limits are still uncertain. According to the treaty of Utrecht in 1713 it was to bo bounded towards Brazil by the river of St Vincent Pinzon, but the identification of this river has never been officially determined? The Oyapock is accepted provisionally by both countries, but the French claim that the Arouari is the real St Vincent Pinzon, and consequently that they have a right to the country for 100 miles further south along the coast.

Between the Maroni and the Oyapock the coast-line is about 130 miles. The fourteen quarters of the colony are estimated to have an area of 1,308,739 hectares, Le, about 3,233,893 acres, or 5052 square miles, nearly as much as half the area of Belgium ; but if the frontier be pushed back to the watershed, the whole area of the country could not be less than 53,000 square miles.

Surface.—A considerable portion of the low coast-land of French Guiana is occupied by swamps and marshes, the most deeply submerged of which are covered with a dense growth of mangroves, and receive the name of pripris, while the drier stretches are occupied by the pinot or wassay palm (Luterpe oleracea), and are designated pinotiéres. In a few places, as in the Sinnamary quarter, there are peat bogs in process of formation. About 40 or 50 miles inland, where the land begins to rise, the traveller reaches the outskirts of those primeval forests which stretch back vast and vague towards the mountains, Between the narrow maritime selvage, so to speak, and the commencement of the high- lands are undulating plains or savannahs. Hitherto the colony has confined itself almost exclusively to the littoral and alluvial region, with its fertile mud-banks. The savannahs are still in a state of nature; and though the earlier colonists made clearings in the highlands, they soon grew disappointed with the barrenness of the cold granitic soil. The mountains behind Guiana do not exceed 3000 or 4000 feet of elevation; the principal range indeed, the Tumac Humace, was estimated by M, Creveaux, who crossed it in 1877, at no more than 1312 feet above the sea-level. But the dense tropical forests attract so much moisture from the ocean winds that the highlands are the birthplace of a large number of rivers which in the rainy season especially pour down vast volumes of water, Upwards of twenty are counted between the Maroni and the Oyapock, United as they often are in their navigable sections by cross channels, they constitute a valuable means of communication from dis- trict to district. Omitting the Maroni already described under Dutch Guiana, the first of importance as we proceed southwards is the Mana, which is navigable for large vessels 10 miles from its mouth, and for smaller vessels 27 miles further. Passing the Sinnamary and the Kourou we next come to the Cayenne, at the mouth of which lies the island on which the colonial capital is built. Abouta dozen lakes,of which Mepecucu, Macari, and Mapaare the largest, have been counted in the French territory.

Climate.—The rainy season begins in November or December, and lasts till the latter part of June; but there are usually three or four weeks of good weather in March.

3 See " Memoria sobre os limites do Brasil com a Guyana Franceza," by J. Caetano da Silva in Revista trimensal de Hist. e Geogr., Rio de Janeiro, 1850,*

were obtained in 1872 ; 46,044 oz., equal to 4 million francs, were exported from Cayenne in 1874; and in 1875 and 1876 the yield was

During the rest of the year there is often hardly a drop of rain for months. At Cayenne the annual rainfall amounts on an average to from 10 to 11 feet, and it is naturally heavier in the interior. It has been calculated indeed that, if all the fluvial outlets were blocked, a single winter would be sufficient to submerge the whole colony to adepth of 15 or 16 feet. During the hotter part of the year—August, September, October—the temperature usually rises to about 86° F., but it almost never exceeds 88°; in the colder season the mean is 79°, and it seldom sinks so low as 70°. Between day and night there is very little thermo- metric difference. The longest: day is 12 hours 18 minutes, the shortest 11 hours 42 minutes. The prevailing winds are the N.N.E. and the S.E.; and the most violent are those of the N.E. During the rainy season the winds keep between N. and E., and during the dry season between Sand E. Hurricanes are unknown. Sudden rises of the sea are occasionally experienced in November and December. Within the present century there have been three earthquakes (1821, 1843, and 1877), none of which did much damage.

Population.—The population of French Guiana consists of a few pure whites, negroes from Africa, mulattoes, coolies, a decreasing number of Indians, convicts from France and its colonies (among whom are many Araks from Algeria), and Chinese, Hindu, and Anamite immigrants. In 1877 the fixed population was stated at 17,230, and the floating population included 2300 aboriginal Indians, a military force of 1084, 338 Government officials and ecclesiastics, 4750 workmen connected with the commerce of immigra- tion, and 1380 convicts outside of the penitentiaries

; so that in round numbers the total amounted to 27,000. Of the fixed population the males were 7972, and the females 9258. The widows were 1108, while the widowers were 298.

Vegetation.—French Guiana has a rich varicty of trees, and several of them are attracting increasing attention from their economic value. The Leguminose are abundantly represented, including the gayac (Cowmarowne odorata, Aubl.), the courbaril or locust-tree of Surinam, which grows 70 or 80 feet high without branching, the angélique (Dicorenia paracnsis), the bois violet or amaranthe (Copa- ifera bractcata), the pois sabre or oily wapa (Eperua falcata, Aubl.), the wacapou or épi de blé (Andira Aublctti, Benth.), the Robinia Panacoco, the Saint Martin, and the Macharium Schomburghii or tiger wood. To the family of the Myrtacce belong the Psidinm pomiferum or guava, the Couratourt guiancnsis, the Lecythis grandt- flora or monkey-pot tree of British Guiana, the Lecythis ollaria, and other species of Lecythis ; to the Sapotacce, the Mimusops Balata, the jaune d'couf or Lucuma Rivicoa, and the bartaballi or Lucuma Bonplandit. Of tho Laurince it is enough to mention the black cedar (Nectandre Pisi), the taoub, the bois canelle or cinnamon wood, an several specics of Acrodiclidiwm. Among the palins arc the cocoa-palm, the oil-palm of Africa, and thedate-palm. The timber of the courbaril, the bois violet, and the balata has been found to be of very high excellence. Caoutchoue (Hevea guwancnsis) is com- mon in the contested territory in the south ; the elemi-tree (Jcica clemigera) and the I. Aracouchini, which also yields a medical resin, are abundant in the colony. Large quantities of oleaginous secds might be collected from the yayamadou (Virola scbifcra) and the crab-wood (Caropa gutanensis).

The manioc is the principal source of food in French Guiana ; rice is becoming an important object of cultivation ; and maize, yams, arrowroot, bananas, and the bread-fruit are also known. The Guiana cocoa is excellent ; coffec, introduced in 1716, is extensively grown ; and vanilla is one of the common wild plants of the country. The clove-tree has been acclimatized, and in the latter years of the empire it formed a good source of wealth ; the cinnamon tree was also successfully introduced in 1772, but like that of the pepper-tree and the nutmeg its cultivation is neglected.

Mincrals.—Gyeat interest attaches to the gold of Guiana, which promises, or threatens, to modify the life of the colony. Indian traditions affirmed the presence of the precious metal, and Hum- boldt and Buffon agreed that the geological character of the country indicated the probability of auriferous deposits ; but it was not till 1819 that Felix Couy, at the instigation of a Portuguese Indian named Paoline, discovered and opened the first "placer." In 1856 the Approuague company was formed ; but, thongh 5762 oz. were collected between 1857 and 1860, it soon after sold its rights. The Martaroni company has becn more successful : 23,342 oz. of gold

4823 oz. per month. As various ferruginous minerals are abundant

in some places, it is possible that iron ores may exist.

Conumercc.—The total value of the imports into French Guiana in 1871 was 5,903,413 francs ; and it exported to the value of 2,556,158

francs to France, 10,600 frances to the French colonies, and 148,839

francs abroad. It is with Martinique that it stands in closest eom-

mercial relations, but the inrposition in 1872 of a duty on eau de vie from that island has almost put a stop to its importation.

Several small steamers maintain communication between different

parts of the colony.

Convict Establishments. —It was in 1851 that Guiana was recom- mended to the French Government by a special commission of inquiry asa suitable place for criminal penitentiaries. In February 1852 transportation thither was offered as a favour to the convicts then under sentence, and more than 8000 of them accepted the change. As the minister of the colonies is allowed by a decree of 1853 to send to Guiana any Asiatics or Africans who are condemned

'to hard labour or solitary confinement, and as it has been deemed

better since 1864 to take the European conviets to New Caledonia, theactual inhabitants of the penitentiary districts are mainly negroes, Arabs, and Anamitcs. 'The principal establishments are those of Cayenne, of the three fles du Salut, of the Kourou, and of the Maroni. The little island La Mbére is reserved for the aged, the infirm, and the convalescent. At Saint Laurent on the Maroni there is almost a little town of wooden houses built on brick pillars. The convicts carry on their several trades as carpenters, tanners, bakers, &e. After two years in the colony, those whose conduct has been satisfactory are allowed to contract marriage, to send home for their families, to have a piece of ground assigned to them for culti- vation, and to receive the necessary implements. A tramway has been constructed for the use of the "concessions.'"' (See Rev. Col. ct Mar., 1876.)

Administration.—Besides the governor and the military com- mandant, the administrative personnel comprises an ordonnatcur, a director of the interior, and a procurator-general, as well as a privy council and a director of the penitentiary service. There isa court of appeal anda tribunal of first instance, and justices of peace are appointed for each canton. Cayenne is administered by a municipal council. Religious affairs are under an apostolic prefect.

History.— According even to the French writers, the history of Guiana is little better than a series of disasters. La Revardierc, sent out in 1604 by Henry IV. to reconnoitre the country, brought back a favourable report ; but the death of the king pnt a stop to the projects of formal colonization. In 1626 a small body of traders from Ronen scttled on the Sinnamary, and in 1634 a similar band took up their quartcrs at Cayenne. The Compagnie du Cap Nord, founded by the people of Ronen in 1648, the Compagnie de la France Equinoxiale, established in 1645, and the second Com- pagnie de la France Equinoxiale, or Compagnie des Douze Seigneurs, established in 1652, were so many lamentable failures, the result of incompetenee, mismanagement, and misfortune. The Compagnie des Indes Occidentales, chartered in 1664 with a monopoly of Guiana commerce for forty years, proved hardly more successful ; but in 1674 the colony passed under the direct eontrol of the crown, and the able administration of Colbert began to tell favourably on its progress. The year 1763 was marked by a terrible disaster. Choiseul, the prime minister, having obtained for himself and his

cousin Praslin a eoneession of the country between the Kourou and the Maroni, sent out about 12,000 volunteer eolonists, mainly from Alsace and Lorraine. They were landed at the mouth of the Kourou, where no preparation had been made for their reception, and where even water was not to be obtained. Mismanagement had reached its grotesqnest limits ; there was a shop for skates (!), and the necessary tools for tillage were wanting. By 1765 no more than 918 colonists remained alive, and these were a famished fever-stricken band. long investigation by the parliament of Paris proved only that some one had blundered. Several minor attempts at colonization in Gniana were made in the latter part of the century ; but they all seemed to suffer from the same fatal prestige of failure. During the terrible times of the Revolution band after band of political prisoners were transported to Guiana. The fate of the royalists, nearly 600 in number, who were exiled on the 18th Fructidor, was especially sad. Landed on the Sinnamary without shelter or food, two-thirds of them perished miserably. In 1800 Victor Hugues was appointed governor, and he managed to put the colony ina better state; but in 1809 his career was brought to a elose by the invasion of the Portuguese and British. Thongh French Guiana was nominally restored to the French in 1814, it was not really sur- rendered by the Portuguese till 1817. In 1823, at the suggestion of M. Catineau Laroche, an attempt was made to settle a colony of French agriculturists in the basin of the Mana ; but they were soon driven by fevers from the town of Nouvelle Angouléme, which they had founded. Since that date the principal facts in the history of the unfortunate country are the discovery of its gold-fields and the introduction of the convict establishments.

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A detailed bibliography of French Guiana will be found in Ternaux-Compans, Notice Historique de la Guyane francaise, 1848, and in Victor de Nouvion, Extraits des auteurs et voyageurs qui ont écrit sur la Guyane, 1844. Among the works of the present century are—Le Chevalier, Commission de la colonisation de la Guiane frangaise, 1843; Bernard, Coup d'wil sur la sitwat. agricole de la Guyane frangaise, 1843; Motézon, Mission de Cayenne, 1857; Vidal, "' Voy. d'expl. dans le haut Maroni," in

Rev. mar. et col., 1862; Gouy, Renseign. sur la navig. des ebtes et des rivieres de la Guyane frangaise, 1865 (Dépot de la marine) ; Bouyer, Notes ef Souvenirs, 1867; Sagot, " Exploitation des foréts," in Rev. mar, a col., 1868, and Agriculture de la Guyane francaise, 1874; Delteil, Voy. chez les Indiens, 1870; Alfred de Saint Queutin, Introduction & Vhist. de Cayenne, 1872; Barveaux, "L'or & la

Guyane frangaise," in Rev. mar. et col., 1878; Mouri¢, La Guyane |

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GUIBERT (1053-1124), of Nogent, a theological and historical writer, who flourished at the close of the 11th and the beginning of the 12th century, was born of rich and noble parents at Clermont-en-Beauvoisis on Easter Eve 1053. Dedicated from infancy to the service of God and the Virgin, he received his early education at the Benedictine abbey of Fley (Flaviacum) or St Germer, in the diocese of Beauvais ; there he gave himself with great zeal to study, but chiefly of the secular poets, until a severe illness brought about a crisis in his spiritual life, in consequence of which he began to fix his attention almost exclusively upon the Holy Scriptures and the writings of the fathers, especially of Augustine and Gregory the Great. About this period he was largely influenced by personal intercourse with Anselm, afterwards of Canterbury, who at that time was head of the priory of Bec in the neighbourhood of St Germer's. Encouraged by his friend he now devoted his energies to Old Testament exegesis, and wrote a commen-

tary upon the narrative of the creation; this was followed

by other literary works both in verse and in prose. In '1104, when he had completed his fiftieth year, he was chosen to be head of the abbey of Notre Dame de N ogent, and there the remainder of his life was spent in a high degree of theological and ecclesiastical activity. He died in 1124. .

His works, edited by D'Achery, were first published in 1651, in one volume folio, at Paris (Venerabilis Guiberti Abbatis B. Marte de Novigento Opera

Omnia) ; they include, besides minor works, a treatise on homiletics (Liber quo ordine sermo Jeri debeat); ten books of Moralia on Genesis, begun in 1084, but not completed until 1116, composed on the model of Gregory the Great's Moralia in Jobum ; five books of Tropologie on Hosea, Amos, and the Lamentations ; a treatise on the Inearnation, against the Jews ; four books De Pignoribus Sanetorum, a remarkably free criticism on the abuses of saint and relic worship ; eight books of the Historia que dieitur Gesta Det per Franeos, sive Historia Hiero- solymitana, a history of the first crusade, which constitutes one of our best authorities on the events with which it deals ; and three

books De Vita Sua, sive Monodiarum. Sec Migne's Patrologie Latine, vols. clvi. and clxxxiv.

GUIBERT, or Wrperr (c. 1030-1100), of Ravenna, better known as the antipope Clement IIL, was born of noble parents in the 11th century at Parma, where, on attaining the canonical age, he entered the priesthood. During the minority of Henry, Guibert was appointed by the empress Agnes to the chancellorship of the kingdom of Italy ; and in this capacity he steadfastly resisted, in the Interests of the crown, the innovations of Hildebrand Zin relation to papal elections. For his services in this he was rewarded with the archbishopric of Ravenna, to which he was consecrated in 1073; his fidelity to Henry during the struggles which followed Hildebrand's accession to the papal throne as Gregory VIL led to his being ecclesias- tically suspended in 1075. By thirty bishops of the Imperialist party he was elected pope at Brixen in 1080, an election which was confirmed by the synod which Henry had convened in Rome in 1084, Guibert assuming the title

of Clement III. Although it was from his hands that Henry received his coronation, Clement III. met with scant recognition from the clergy and exercised few papal functions ; and his name is not enrolled in any list of popes. He died in September 1100, and was buried at Ravenna ; by the order of Paschalis IT. his ashes were afterwards disinterred and scattered to the winds. See Giesebrecht's Kaisergeschichte, vol. iii.

GUICCIARDINI, Francesco (1483-1540), the cele- brated Italian historian and statesman, was born at Florence in the year 1483, when Marsilio Ficino held him at the font of baptism. His family was illustrious and noble ; and

his ancestors for many generations had held the highest

posts of honour in the state, as may be seen in his own genealogical Ricordi (Op. Ined., vol. x.), After the usual education of a boy in grammar and elementary classical studies, his father, Piero, sent him to the universities of Ferrara and Padua, where he stayed until the year 1505, The death of an uncle, who had occupied the see of Cortona with great pomp, induced the young Guicciardini to hanker after an ecclesiastical career. He already saw the scarlet of a cardinal awaiting him, and to this eminence he would assuredly have risen, His father, however, checked this ambition, declaring that, though he had five sons, he would not suffer oue of them to enter the church in its then state of corruption and debasement. Guicciardini, whose motives were confessedly ambitious (see Aztobiogr. Ricordi, Op. Ined., x. p. 68), turned his attention to law, and at the age of twenty-three was appointed by the signoria of Florence to read the Jnstitutes in public. Shortly afterwards he en- gaged himself in marriage to Maria, daughter of Alamanno de' Salviati, prompted, as he frankly tells us, by the political support which an alliance with that great family would bring him (2, x. 71). He was then practising at the bar, where he won so much distinction that the signoria, in 1512, entrusted him with an embassy to the court of Ferdinand the Catholic. Thus he entered on the real work of his lifo as a diplomatist and statesman. His conduct upon that legation was afterwards severely criticized ; for his political antagonists accused him of betraying the true interests of the commonwealth, and using his influence for the restoration of the exiled Casa Medici to power. His Spanish correspond- ence with the signoria (Op. Ined., vol. vi.) reveals the extra- ordinary power of observation and analysis which was a chief quality of his mind; and in Ferdinand, hypocritical and profoundly dissimulative, he found a proper object for his scientific study. To suppose that the young statesman learned his frigid statecraft in Spain would be perhaps too simple a solution of the problem offered by his character, and scarcely fair to the Italian proficients in perfidy. It is clear from Guicciardini's autobiographical memoirs that he

was ambitious, calculating, avaricious, and power-loving from his earliest years ; and in Spain he had no more than an opportunity of studying on a large scale those political vices which already ruled the minor potentates of Italy. Still the school was pregnant with instructions for SO apt a pupil. Quicciardini issued from this first trial of his skill with an assured reputation for diplomatic ability, as that was understood in Italy. To unravel plots and weave counter- plots ; to meet treachery with fraud ; to parry force with sleights of hand; to credit human nature with the basest motives, while the blackest crimes were contemplated with cold enthusiasm for their cleverness, was reckoned then the height of political sagacity. Guicciardini could play the game to perfection. In 1515 Leo X. took him into service, and made him governor of Reggio and Modena. In 1521 Parma was added to his rule, and in 1523 he was appointed viceregent of Romagna by Clement VII. These high offices rendered Guicciardini the virtual master of the papal states beyond the Apennines, during a period of great bewilder-

ment and difficulty. The copious correspondence relating to his administration has recently been published (Op. Jned., vols. vii, viii.). In 1526 Clement gave him still higher rank as lieutenant-general of the papal army. While holding this commission, he had the humiliation of witnessing from a distance the sack of Rome and the imprisonment of Clement, without being able to rouse the perfidious duke of Urbino into activity. The blame of Clement's downfall did not rest with him ; for it was merely his duty to attend the camp, and keep his master informed of the proceedings of the generals (see the Correspondence, Op. Ined., vols. iv., v.). Yet Quicciardini's conscience accused him, for he had previously counselled the pope to declare war, as he notes in a curious letter to himself written in 1527 (Op. Ined., x. 104), Clement did not, however, withdraw his confidence, and in 1531 Quicciardini was advanced to the governorship of Bologna, the most important of all the papal lord- lieutenancies (Correspondence, Op. Jned., vol, ix.). This post he resigned in 1534 on the election of Paul III, pre-ferring to follow the fortunes of the Medicean princes. It may here be noticed that though Guicciardini served three popes through a period of twenty years, or perhaps because of this, he hated the papacy with a deep and frozen bitter- ness, attributing the woes of Italy to the ambition of the

church, and declaring he had seen enough of sacerdotal abominations to make him a Lutheran (see Op. Ined., vol. i. 27, 104, 96, and Jst. d' It., ed. Ros., ii, 218). The same discord between his private opinions and his public actions may be traced in his conduct subsequent to 1534. AS a political theorist, Guicciardini believed that the best form of government was a commonwealth administered upon the type of the Venetian constitution (Op. Jned., 1.96; i. 130 sg.); and we have ample evidence to prove that he had judged the tyranny of the Medici at its true worth (Op. Ined., vol. i. 171, on the tyrant; the whole Storia Fiorentina and Reggimento di Firenze, 1b. i. and iii., on the Medici). Yethe did not hesitate to place his powers at the disposal of the most vicious members of that house for the enslavement of Florence. In 1527 he had been declared a rebel by the signoria on account of his well-known Medicean prejudices ; and in 1530, deputed, by Clement to punish the citizens after their revolt, he revenged himself with a cruelty and an avarice that were long and bitterly remembered. When, therefore, he returned to inhabit Florence in 1534, he did so as the creature of the dissolute Alessandro de' Medici. GQuicciardini pushed his servility so far as to defend this infamous despot at Naples in 1535, before the bar of Charles V., from the accusations brought against him by the Florentine exiles (Op. Ined., vol. ix.). He won his cause; but in the eyes of all posterity he justified the re- proaches of his contemporaries, who describe him as a cruel, venal, grasping seeker after power, eager to support a despotism for the sake of honours, offices, and emoluments secured for himself by a bargain with the oppressors of his country. Varchi, Pitti, Segni, and Nardi are unanimous upon this point; but it is only the recent publication of Guicciardini's private MSS. that has made us understand the force of their invectives. To plead loyalty or honest political conviction in defence of his Medicean partisanship is now impossible, face to face with the opinions expressed in the Ricordi Politici and the Storia Fiorentina. Like Macchiavelli, but on a lower level, Guicciardini was willing to "roll stones," or to do any dirty work for masters whom, in the depth of his soul, he detested and despised. After the murder of Duke Alessandro in 1537, Guicciardini espoused the cause of Cosimo de' Medici, a boy addicted to field sports, and unused to the game of statecraft.

this inexperienced princeling. He was mistaken, however, in his schemes, for Cosimo displayed the genius of his family

: The wily old diplomatist hoped to rule Florence as grand vizier under

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for politics, and coldly dismissed his would-be lord-protector, Guicciardini retired in disgrace to his villa, where he spent his last years in the composition of the Istoria @ Italia. He died in 1540 without male heirs.

Guicciardini was the product of a cynical and selfish

age, and his life illustrated its sordid influences. Of a cold and worldly temperament, devoid of passion, blame- less in his conduct as the father of a family, faithful as the servant of his papal patrons, severe in the administra- tion of the provinces committed to his charge, and indis- putably able in his conduct of affairs, he was at the same time, and in spite of these qualities, a man whose moral nature inspires a sentiment of liveliest repugnance. It is not merely that he was ambitious, cruel, revengeful, and avaricious, for these vices have existed in men far less antipathetic than Guicciardini. faults, which made him odious to his fellow-citizens, we trace in him a meanness that our century is less willing to condone. His phleginatic and persistent egotism, his sacrifice of truth and honour to self-interest, his acquiescence in the worst conditions of the world, if only he could use them for his own advantage, combined with the glaring dis- cord between his opinions and his practice, form a character which would be contemptible in our eyes were it not so sinister. where patriotism was unknown, and only selfishness sur- vived of all the motives that rouse men to action, found its representative and exponent in Guicciardini. When we turn from the man to the author, the decadence of the age and race that could develop a political philosophy so arid in its cynical despair of any good in human nature forces itself

Over and above those

The social and political decrepitude of Italy,

vividly upon our notice. Guicciardini seems to glory in his disillusionment, and uses his vast intellectual ability for the analysis of the corruption he had helped to make incurable. If one single treatise of that century should

be chosen to represent the spirit of the Italian people in the last phase of the Renaissance, the historian might hesitate between the Principe of Macchiavelli and the Recordi Politics of Guicci- ardini. The latter is perhaps preferable to the former on the score of comprehensiveness. It is, moreover, more ex- actly adequate to the actual situation, for the Principe has a divine spark of patriotism yet lingering in the cinders of its frigid science, an idealistic enthusiasm surviving in its moral aberrations; whereas a great Italian critic of this decade has justly described the Ricordi as " Italian corrup- tion codified and elevated to a rule of life." Guicciardini is, however, better known as the author of the Storva a Italia, that vast and detailed picture of his country's suffer- ings between the years 1494 and 1532. Judging him by this masterpiece of scientific history, he deserves less com- mendation as a writer than as a thinker and an analyst. The style is wearisome and prolix, attaining to precision at the expense of circumlocution, and setting forth the smallest particulars with the same distinctness as the main features of the narrative. The whole tangled skein of Italian politics, in that involved and stormy period, is unravelled with a patience and an insight that are above praise. It is the crowning merit of the author that he never ceases to be an impartial spectator,—a cold and curious critic. We might compare him to an anatomist, with knife and scalpel dis secting the dead body of Italy, and pointing out the symp- toms of her manifold diseases with the indifferent analysis of one who has no moral sensibility. This want of feeling, while it renders Guicciardini a model for the scientific student, has impaired the interest of his history. Though he lived through that agony of the Italian people, he does not seem to be aware that he is writing a great historical tragedy. He takes as much pains in laying bare the trifling causes of a petty war with Pisa es in probing the deep- seated ulcer of the papacy. Nor is he capable of painting

the events in which he took a part, in their totality as a drama. Whatever he touches, lies already dead on the dis- secting table, and his skill is that of the analytical patho- logist. Consequently, he fails to understand the essential magnitude of the task, or to appreciate the vital vigour of the forces contending in Europe for mastery. This is very noticeable in what he writes about the Reformation. Not- withstanding these defects, inevitable in

a writer of Guicci- ardini's temperament, the Storca d' /talva was undoubtedly the greatest historical work that had appeared since the beginning of the modern era, It remains the most solid monument of the Italian reason in the 16th century, the final triumph of that Florentine school of philosophical historians which numbered Macchiavelli and Vettori, Segui, Pitti, Nardi, Nerli, Varchi, and Giannotti. Up to the year 1857 the fame of Guicciardini as a writer, and the estima- tion of him as a man, depended almost entirely upon the History of Italy, and on a few ill-edited extracts from his aphorisms. At that date his representatives, the Counts Piero and Luigi Guicciardini, opened their family archives, and committed to Signor Giuseppe Canestrini tle publication of his hitherto inedited MSS. in teu important volumes. The vast mass of documents and finished literary work thus given to the world has thrown a flood of light upon Guic- ciardini, whether we consider him as author or as citizen. It has raised his reputation as a political philosopher into the first rank, where he now disputes the place of intellec- tual supremacy with his friend Macchiavelli; but it has coloured our moral judgment of his character and conduct with darker dyes. From the stores of valuable materials contained in those ten volumes, it will be enough here to cite (1) the Ricordi Politic', already noticed, consisting of about 400 aphorisms on political and social topics; (2) the observations on Macchiavelli's Dzscorsi, which bring into re-markable relief the views of Italy's two great theorists on statecraft in the 16th century, and show that Guicciardini regarded Macchiavelli somewhat as an amiable visionary or political enthusiast; (3) the Stor?a Fiorentina, an early work of the author, distinguished by its animation of style, brilli-ancy of portraiture, and liberality of judgment ; and (4) the Dialogo del Reggimento di Firenze, also in all probability an early work, in which the various forms of government suited to an Italian commonwealth are discussed with in- finite subtlety, contrasted, and illustrated from the vicissi-tudes of Florence up to the year 1494. To these may be added a series of short essays, entitled Discors: Polrtice, composed during Guicciardini's Spanish legation. It is only after a careful perusal of these minor works that the student of history may claim to have comprehended Guic- ciardini, ani may feel that he brings with him to the con- sideration of the Storcad Italia the requisite knowledge of the author's private thoughts and jealously guarded opinions. Indeed, it may be confidently affirmed that those who desire to gain an insight into the true principles and feelings of the men who

made and wrote history in the 16th century will find it here far more than in the work designed for publication by the writer. Taken in combination with Macchiavelli's treatises, the Opere Inedite furnish a compre- hensive body of Italian political philosophy anterior to the date of Fra Paolo Sarpi.

The student may be referred to Rosini's edition of the Storia @ Italia, Pisa, 1819, 10 vols., and to the Opere Inedite, in 10 vols.,

published at Florence, 1857. These two books place him in posses- sion of all that is extant of Guicciardini. (Gig ANS TSS)

GUIDI, Carto Atxssanpro (1650-1712), Italian lyric poet, was born at Pavia in 1650. As chief founder of the well-known Roman academy called " L'Arcadia," he had a considerable share in the reform of Italian poetry, corrupted at that time by the extravagance and bad taste of the poets Marini and Achillini and their school. The

poet Guidi and the critic and jurisconsult Gravina checked this evil by their influence and example. The genius of Guidi was lyric in the highest degree ; his songs are written with singular force, and charm the reader, in spite of touches of bombast. His most celebrated song is that en- titled Alla Fortuna (To Fortune), which certainly is one of the most beautiful pieces of poetry of the 17th century. Cuidi was squint-eyed, huimpbacked, and of a delicate constitution, but possessed undoubted literary ability. His poems were printed at Parma in 1671, and at Rome in 1704. In 1681 he published at Parma his lyric tragedy Amalasunta im Italy, and two pastoral dramas Daphne and Hndymion. The last had the honour of being men- tioned as a model by the critic Gravina, in his treatise on poetry. Less fortunate was Guidi's poetical version of the six homilies of Pope Clement XI, first as having been severely criticized by the satirist Settano, and next as hav- ing proved to be the indirect cause of the authior's death. A splendid edition of this version had been printed in 1712, and, the pope being then in San Gandolfo, Guidi went there to present him with a copy. On the way he found out a serious typographical error, which he took so much to heart that he was seized with an apoplectic fit at Frascati and died on the spot. Guidi

was honoured with the special protection of Ranuccio II., duke of Parma, and of Queen Christina of Sweden.

GUIDICCIONI, Griovannt, one of the best Italian poets of the first half of the 16th century, was born at Lucca in 1480, and died at Macerata in 1541. He occupied a high position, being bishop of Fossombrone and president of Romagna. 'The latter office nearly cost him his life; a murderer attempted to kill him, and had already touched his breast with his dagger when, conquered by the resolute calmness of the prelate, he threw away the weapon and fell at his feet, asking forgiveness. The Jtvme and Letters of Guidiccioni are models of elegant and natural Italian style. The best editions are those of Genoa (1749), Bergamo (1753), and that recently published at Florence.

GUIDO or Arezzo, an Italian monk of the 11th century, has by many been called the father of modern music, and a portrait of him in the refectory of the monastery of Avellana bears the inscription " Beatus Guido, inventor musice." Although these statements are manifestly ex- aggerated, it is none the less true that Guido's reforms mark an enormous progress in the notation as well as in the teaching of music. Of his life little is known, and that little is chiefly derived from the dedicatory letters prefixed to two of his treatises and addressed respectively to Bishop Theodald (not Theobald, as Burney writes the name) of Arezzo, and Michael, a monk of Pomposa and Guido's pupil and friend. Occasional references to the celebrated musician in the works of his contemporaries are, however, by uo means rare, and from these it may be conjectured with all but absolute certainty that Guido was born in the last decade of the 10th century. The place of his birth is, beyond a doubt, Arezzo; for on the title-page of all his works he is styled Guido Aretinus, or simply Aretinus. At his first appearance in history Guido was a monk in the Benedictine monastery of Pomposa, and it was there that he invented his educational method, by means of which, according to his own statement, a pupil might learn within five months what formerly it would have taken him ten years to acquire. Envy and jealousy, however, were his only reward, and by these he was compelled to leave his monastery —" inde est, quod me vides prolixis finibus exulatum," as he says himself in the second of the letters above referred to. According to one account, he travelled as far as Bremen, called there by Archbishop Hermann in order to

reform the musical service. But this statement has been doubted, for chronological and other reasons.

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Certain it is that not long after his flight from Pomposa Guido was living at Arezzo, and it was here that, about 1030, he received an invitation to Rome from Pope John XIX. He obeyed the summons, and the pope himself became his first and apparently one of his most proficient pupils. But in spite of his success Guido could not be induced tov remain in Rome, the insalubrious air of which seems to have affected his health. In Rome he met again his former saperior, the abbot of Pomposa, who seems to have repented of his conduct towards Guido, and to have induced him to return to Pomposa; and here all authentic records of Guido's life cease. We only know that he died, on May 17, 1050, as prior of Avellana, a monastery of the Camaldulians ; such at least is the statement of the chroni- clers of that order. It ought, however, to be added that the Camaldulians claim the celebrated musician as wholly their own, and altogether deny his connexion with the Benedic- tines. It is quite in accordance with the semi-mythical char- acter of Guido's life that a great many inventions belonging to earlier aswell as to later times have been attributed to him, in the same wayas Charlemagne, Arthur, and Roland have been mide responsible for the deeds and exploits of other kings and heroes. His eulogists declare that before him church music was in a state of utter barbarism, wholly ignoring the achievements of Gregory the Great, Hucbald, and others. The notation of music by means of the newme also, although very imperfect for practical purposes, at any rate served to give permanence to the composer's thoughts. There is, however, no doubt that in the latter respect Guido's method shows an enormous progress. It was he who invented, or at least for the first time systematically used, the lines of the staff, and the intervals or spatia between them, and' thus fixed the principle of modern notation ; and the value of this innovation for educational and general artistic purposes cannot be overrated. There is also little doubt that the names of the first six notes of the scale, ut, re, mi, fa, sol, la, still in use among Romance natious, were introduced by Guido, although le seems to have used them in a relative rather than in an absolute

sense. Jt is well known that these words are the first syllables of six lines of a hymn addressed to St Joli the Baptist, which may be given here :—

Ut queant laxis

Mira gestorumn = =—s famuli tuorum,

Solve polluti labii reatum,

Sancte Joannes.

In addition to this Guido is generally credited with the introduction of the F clef. But perhaps more important than all this is the thoroughly practical tone which Guido assumes in his theoretical writings, and which differs greatly from the clumsy scholasticism of his contemporaries and predecessors,

The most important of Guido's treatises, and those which arc generally acknowledged to be authentic, are Alicrologus Guidonis de disciplina artis nusice, dedicated to Bishop Theodald of Arezzo, and comprising a complete theory of music, in 20 chapters; JLusice Guidonis regule rhythmice in antiphonarti sui prologum prolate, written in trochaic decasyllabics of anything but classical structure ; Alice Guidonis regule de ignoto cantu, identidem in antiphonarti sui prologum prolate; and the Epistola Giudonis ALichaeli monacho de ignoto cant, already referred to. These are published in the second volume of Gerbert's Scriptores ecclesiastict de musica sacra. Avery important manuscript unknown to Gerbert (the Codex Bibliothecce Uticensis, in the Paris library) contains, besides minor treatises, an antiphonarium and gradual undoubtedly belonging to Guido. A comprehensive but very uncritical life of Guido has been written by Luigi Angeloni (Sopra la vita, &c., di Guido d' Arezzo). Of in- finitely greater importance are the studies on the subject by Herr Kiesewetter and by M. Bottée de Toulmon. Burncy's General History of Music, and Fétis's Biographie des Musiciens should also be consulted.

GUIDO RENI. See Rent.

resonare fibris

GUIDO OF SIENA. The name of this painter is of considcrable interest in the history of art, on the ground that, if certain assumptions regarding him could be accepted as true, he would be entitled to share with Cimabue, or rather indeed to supersede him in, the honour of having given the first onward impulse to the art of painting. The case stands thus. In the church of 8. Domenico in Siena is a large painting of the Virgin and Child enthroned, with six angels above, and in the Benedictine convent of thesame city is a triangular pinnacle, once a portion of the same com- position, representing the Saviour in benediction, with two angels; the entire work was originally a triptych, but is not so now. 'The principal section of this picture has a rhymed Latin inscription, giving the painter's name as Gu… ode Senis, with the date 1221: the genuineness of the inscription is not, however, free from doubt. In the general treatment of the picture there is nothing to distin- guish it particularly from other work of the same early peliod; but the heads of the Virgin and Child are indis- putably very superior, in natural character and graceful dignity, to anything to be found anterior to Cimabue. The question therefore arises, Are these leads really the work of a man who painted in 1221? The best informed con- noisseurship of recent years (see especially the discussion of the matter in Messrs Crowe and Cavalvaselle's work, vol. i.) pronounces in the negative, concluding that the heads are repainted, and are, as they now stand, due to some artist of the 14th century, perhaps Ugolino da Siena; thus the claims of Cimabue would remain undisturbed and in their pristine vigour. Beyond this, little is known of Guido da Siena. There is in the Academy of Siena a picture assigned to him, a half-figure of the Virgin and Child, with two angels, dating probably between 1250 and 1300; also in the church of 8. Bernardino in the same city a Madonna dated 1262. Milanesi thinks that the work in 8. Domenico is due to Guido Graziani, of whom no other record remains earlier than 1278, when he is mentioned as the painter of a banner. Guido da Siena appears always to have painted on panel, not in fresco on the wall. He has been termed, very dubiously, a pupil of Pietrolino, and the master of Diotisalvi, Mino da Turrita, and Berlinghieri da Lucca. _

GUIENNE, an old French province, whose name until the 10th century was Aquitania, and whose history until it came into the possession of England in 1152 is given under the heading Aquirania. It was bounded by the Pyrenees, Languedoc, Auvergne, Angoumois, Saintonge, and the sea of Gascony ; and

out of it are now formed'the departments of Gironde, Dordogne, Lot, Aveyron, Lot-et-Garonne, Tarn, Landes, Gers, Upper Pyrenees, Ariége, and Lower Pyrenees. The chief town was Bordeaux. Soon after it was joined to the English crown the nobles twice revolted, but were each time subdued, and in 1169 Henry IT. of England bequeathed it to his son Richard (Coeur de Lion), who after quelling all symptoms of revolt added in 1186 and 1188 Toulouse and Rochelle to his French possessions. In 1196 he bequeathed it to his nephew Otto of Brunswick, but he resumed its possession in 1198, when Otto was chosen king of Germany. After the death of Richard in 1199, his mother Eleanor retained possession of it during her lifetime. It was recon- quered by the French in the reign of Edward I. of England, but at the peace of 1303 it was again ceded to the English, with whom it remained till 1451, when it was conquered and finally united to France by Charles VII. In 1469 Louis IX. gave it in exchange for Champagne and Brie to his brother the duke of Berri, after whose death in 1472 it was again united to the French crown.

GUIGNES, Joszpn pE (1721-1800), a French Orien- talist, born at Pontoise October 19, 1721, became in his fifteenth year a student of Oriental languages, and especially of Chinese, at the Collége Royal under the celebrated

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Fourmont, whom in 1745 he succeeded at the Royal Library as secretary interpreter of the Eastern languages, A Mémoire Ilstorique sur V Origine des Huns et des Tures, published by De Guignes in 1748, having brought his name with some prominence before the learned world, he was admitted a member of the Royal Society of London in 1752 and an associate of the French Academy of Inscriptions in 1754, Two years later he gave to the world the first two volumes of his learned and laborious LWistoire Générale des Huns, des Mongoles, des T'urcs, et des autres Tartares occidentaux ; and in 1757 he was appointed to succeed Jault in the chair of Syriac at the Collége Royal. The completion of the Histoire by the publication of the three remaining volumes in 1758 was followed in 1759 by the publication of a Mémoire in which he propounded and endeavoured to prove the

untenable and absurd theory that the Chinese natiou had originated in Egyptian colonization, an opinion to which, in spite of every argument, lie to the last obstinately clung. To its support, as also to the further elucidation of the chronology and arrangement of his iMistoire, which had been, not without some justice, un- favourably criticized, he devoted several learned papers which are to be found in the Mémoires of tho Academy of Inscriptions ; and among his other literary labours, an improved edition of an old translation of the Shoo-king is

worthy of special mention. The Revolution, while permit-

ting De Guignes to retain some insignificant pensions. which had been conferred upon him, deprived him of various posts, such as those of keeper of the antiquities in the Louvre and editor of the Journals des Savans, on which he was chiefly dependent for his income; and his later years. are said to have brought to him considerable personal hardship, from which his sole refuge was in redoubled application to.study. He died at Paris, March 19,1800. The Histoire had been translated into German by Dihnert (1768-71). De tuignes left a son, Christian Louis Joseph (1759-1845), who, after learning Chinese from his father, went as consul to Canton, where he spent seventeen years. On his return to France he was. charged by the Government with the work of preparing a Chinese-French-Latin dictionary. Though bearing his name alone on the title-page (1813), it was in reality only a new edition of the work of Glemona. He was also the author of a large work of travels (Voyages & Péhin, Manille, et ULle de Lrance, 1808).

GUILD. The spirit of association has in, all ages induced men to Join, together for the pleasures of mutual enjoyment or for the attainment of some common purpose for which the support of numbers was necessary. The idea has taken shape in various ways, influenced by the tem- perament, of race, the policy of Governments, the social condition of classes, or the need for a special object. In- dependently of the, organization of peoples, of their consti- tution into towns, proviuces, and states as units in a system, whether of self-government or of imposed government,—in- dependently too of those great associations or brotherhoods, the church, the orders of knighthood, the greater and lesser monastic orders, and gecret societies,—there is a third kind of association upon a basis distinct from these. The

public Welfare of a community within certain territorial limits is the great object of Governments, local or imperial ; the pur- Suit of some great moral, religious, or equitable thought, touching the hearts of men in general without regard to nation, was the animating principle of the chivalric and re- ligious orders ; but when men began to form theinselves Into guilds, the benefit of each one in his individual and Social capacity was concerned, naturally confined within the bounds of neighbourhood. A guild was a voluntary associ- ation of those living near together who joined for a com Mon purpose, paying contributions, worshipping together, feasting together periodically, helping one another in sick.

ness and poverty, and frequently united for the pursuit of a special object.

The true history of these institutions has been till recently unnoticed, their value and importance, especially in connexion with the life of towns and villages, having been but imperfectly investigated or understood. Guilds have, however, been numerous, and their influence most im- portant, in Europe from an early period ; they attained their highest prosperity and development in the Teutonic countries, and especially in England during the Middle Ages, and they have been widely spread aniong thie tomance nations.

The meaning of the word guild or gild is closely con- nected with the origin of the institution, Gild or geld was Old English for a set payment or contribution, from zeldan or zyldan, to pay (whence also the present yield); the primary meaning was payment, and the company of those who paid became known by this chief title to mem- bership. There. are. also, guide, Danish and Low German, in the sense of a contributory company of this kind; gjalda and gildi, Icelandic, a, payment, and galdi, also a banquet.

The word therefore, thus. derived, is better spelt (as most

old authorities have it) without the «5; a colour is, how- ever, given for the. ordinary modern form guid, by deriving it (as Wedgwood, Lnglish Etymology) from the Welsh or Breton gouil, a feast or holiday, gwylad, keeping a festival. The essential principle. of the guild is the banding

together for mutual help, mutual enjoyment, and mutual encouragement in good endeavour. The spirit which di- rected itself to the.inner business and life of each society and its members is the true mark, in some degree, of all bodies, ancient or modern, that can claim the character of guilds. The. peace-guild of the North in the 10th century had this character in.common with the great trading guild of the 13th and 14th centuries, or the little social or reli- gious guild of an English country village of a century later, Some German. scholars find the origin of the first guilds in the banquets and sacrificial assemblies of the heathen German tribes. Wilda, Dr L. Brentano, and others, connect- ing these with what is known of the importance of family relations among the Teutonie nations, find in the family union the germ from which the guild was developed, and show that when Christianity was brought from the south of Europe "the spirit. of association received a mighty impulse, and, the gilds spread themselves rapidly under the influence of Christian doctrine" (Brentano). It is maintained by others that the guilds have sprung from the collegia, in those countries where the Romans bore sway. The.Romans exercised the right of association from early times; it is attributed to Numa that he encouraged the for- mation of craft guilds, of which Plutarch enumerates nine; there also existed early religions societies among them. Exercised voluntarily under the republic, this right became erippled under the empire, and tlie collegia were obliged to seek autliorization from the state for the narrower objects to which the imperial decrees, attempted to limit them. These societies were numerous, not only at Rome, but throughout the empire, especially in the East, in Italy, and in Gaul; a large number were trade corporations, devoted to the interest of their erafts ; others were united for good- fellowship, religion, and many especially to provide for burial. In the provinces, besides merchants and others, the highest persons were glad at times to belong to them ; those in Rome under the empire appear to have aes. principally of workmen, freedmen, slaves, and persons of the humbler classes. All appear to have had the same general features ; they chose their own masters and officers, made rules for self-government, paid contributions to a common fund, met and feasted together at stated periods, ~~—the freedom of social intercourse being particularly ap~~

preciated among the poorer companies. They formed rules for good behaviour at table, and admitted women as members ; they "affirmed their cxistence by a common worship," choosing a patron god. From these and other resemblances Mr H. C. Coote contends that there is an identity between the Roman collegia and the guilds of Saxon growth; and M. Raynouard was an advocate of a similar descent in France and Italy. But though analogous in many respects, as far as is known they lacked the essential element of the guild, that of mutual help in sickness and poverty; the soldiers' colleges, formed in spite of the law which forbade them, approach the nearest to this character, in providing their members with travelling expenses and retiring pensions. The evidence against the connexion between the collegium and the guild is regarded by the ablest German writers who have investigated the subject as conclusive, but this interesting historical question has not yet been fully worked out.'

The Greeks also, in the 2d and 3d centuries B.C., had their associations of the same kind, called Hranov or Thiasot, which were numerous at Rhodes, in the islands of the Archipelago, at the Piraeus, and in other important places. These societies partook more nearly of the char- acter of the medieval guilds than did the Roman; the members paid contributions to a general fund, aided onc another in necessity, provided for funerals, met in assembly to deliberate on their affairs, and celebrated feasts and religious sacrifices in common. Strict rules against disorderly conduct were to be enforced by fine ; he who did not pay his yearly quota to the society was excluded, unless he could show good cause of poverty or sickness. Women could be members, and were admitted to the meetings. Some of these societics concerned themselves with religion, others with politics or commerce ; in the cause of liberal as opposed to official religion, they appear to have done good service.

It is perhaps of little use attempting to ascribe to any one country or race the special initiative of these institu- tions, any more than it would be to say that the custom of men to congregate in towns originated with this or that nation. Human nature is the same everywhere, and two motives induce men to join together :—weakness, seeking the power of numbers for resisting oppression, or for mutual assistance ; and the affinity which those pursuing the same occupation and possessing the same interests have for each othcr.

These motives are sufficient to account for the existence of the Hranot in Greece, contem- porary with the Collegia of the Romans ; they are sufficient to explain why, although the collegia opyficum, or artisans' guilds, are found as late as the code of J ustinian, and that 50 or 60 years later, in the 6th century, we have record of a soap-makers' craft in Naples (Letter of Pope Gregory the Great, lib. x. epist. 26; Migne's Pat, Curs., vol. Ixxvii.), the guilds in the towns of Italy should begin a new life in the 10th century (Hegel) ; they can cxplain why in England we find from the 7th to the 10th century other guilds actively in existence, while in Norway they were instituted in the 11th century. These societies "may thus have one history in China, another in India, another in Greece or Rome, another in the Europe of the Middle Ages ; the like needs will require the like kinds of help, and develop insti- tutions which, amid whatever diversities of outward garb, will substantially fulfil the same ends" (J. M. Ludlow).

In the Middle Ages guilds are recognized as belonging to three or four classes. In the north of Europe the frith

. + For a valuable sketch of the Collegia, including trade-guilds and urial-guilds, see " Les sociétés ouvritres 4 Rome," by Gaston Boissier,

ftevue des Deus Mondes, December 1871; also 'The Friendly Societies of Antiquity," by H. Tompkins, Oddfellows' Magazine, April

1868, and the article CLus.

or peace-guild was an important form, widely spread in early times. upon mutual obligations, "sworn communities for the pro- tection of right and the preservation of liberty ; traces of them in England from the laws of Ina (7th cen- tury) down to the '""Dooms" of London in Athielstan's time (10th century). guild are thus shortly described by Prof. Stubbs :—

These were associations for defence, based

" we see

These statutes of the old London peace-

‘A monthly meeting is directed, at which there is to be bytt-

fylling and a refection, the remains of which are to be bestowed in alms : on the death of a member each brother gives a loaf, and sings or pays for the singing of fifty psalms. ....- Each member pays fourpence for common purposes, towards a sort of insurance fund from which the guild makes good the losses of members, and a con- tribution of a shilling towards the pursuit of the thief. The members are arranged in bodies of ten, one of whom is the head- inan; these again are classed in tens under a common leader, who with the other head-men acts as treasurcr and adviser of the hundred members.”

The early English recognized the responsibility of the guild

for the actions of its members and their mutual liability, __the fundamental principle of English institutions for keeping the peace; besides this, the rules still exist of Saxon guilds at Abbotsbury, Woodbury, Cambridge, and Exeter, and show by the many points in common with the social guilds of later English growth whence these derived their descent.

Abroad, the frith guilds in the 11th and 12th centuries extended over the Continent; one of the

most remarkable was founded at Roeskild, under king Canute, for the suppression of the piracy of the vikings. Others, as in Schleswig, Artois, Flensburg, &c., joined for hindering violence and maintaining peace, by all means that law and custom allowed, even against kings. became of such importance that in many places their law grew to be that of the commune or town (see BorovueH). In France the great development of town governments at this period was frequently but the acknowledgment of an already existing defensive guild, or of the important mer-

These guilds

chant or craft guilds, At Montpellier and Paris, in the

beginning of the 13th century, the trade guilds took part

in the watch and ward of the city, and thus were a recog- nized part of the commune. The same was the case in Tondon in early times.? Even as late as the 15th century a guild was founded at Ghent, composed of the culverineers, arquebusiers, and gunners, in order to teach the burgesses the use of firearms, so as to be able to defend the town or suppress troubles. It became the chief guild of the city, had public festivities, admitted women as "consceurs," and possessed many of the featuresof both peaceand social guilds,

In the Frankish empire guilds were numerous for defence, for conviviality, and for religious and social duties, among the serfs and the clergy as well as others; but under Charlemagne and his successors they suffered great oppres- sion, and were persecuted by both ecclesiastical and secular authorities. In later times the clergy formed special societies called Guilds of Kalenders, so named from their meeting day having originally been on the kalends of each month (Brentano); these were to be found in many towns on the Continent, sometimes we read of the major and niinor guilds for the higher and lower clergy. The only company that is known to have partaken of this character in England was the ancient Guild of the Kalenders at Bristol, which kept the records of that town and other places, and in its later years supported a school for Jews.

A class of guilds widely spread in the Middle Ages, especially in England, were those which have been distin- guished by the name of Soccal (Toulmin Smith) or Pelegzous

2The custom of 'setting out the watch," or the 'marching watch," in London, Bristol, Worcester, &c., on midsummer €Ve ori- ginated in the part taken in the defence of the city by the trade enilds or companies of those places; it was a kind of " military muster" (Herbert).

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(Brentano). These were the small and numerous societies that sprung up all over the country in every village, in small or large towns, at different times as the need arose, or for good neighbourhood's sake. Their objects included

“not only devotions and orisons, but also every exercise of Christian charity, and therefore, above all things, mutual assistance of the gild-brothers in every exigency, especially in old age, in sickness, in cases of impoverishment,—if not brought on by their own folly,—and of wrongful imprison- ment, in losses by fire, water, or shipwreck, aid by loans, provision of work, and lastly, the burial of the dead. It included further the assistance of the poor and sick, and the visitation and comfort of prisoners not belonging to the gild” (Brentano). These societies were composed of men and women of all ranks, and when, as in some instances, they grew into wealth and popularity, kings and princes did not disdain to become guild-brethren. Henry IV. and Henry VI. were members of the guild of the Trinity at Coventry ; Heury VIII. and his queen’ were members of the guild of St Barbara, of St Katherine’s church next the Tower, London. Another prince belonged to the famous guild of St George at Norwich. One guild, however, who said they were “of the rank of common and middling folks,” would not admit even a mayor or a bailiff.

Each member took an oath, and paid an admission fee and yearly contribution; they held regular business meet- ings or “morn-speech,” and had an annual “guild-day.” Every guild had its livery, which the members were expected to wear at funerals, feasts, &c.; and they had strict rules for good life and behaviour. The little parochial guilds met ina room or in members’ houses; if the guild was rich enough it had a hall or ‘guild-house ;” legacies and gifts were made to them, and they lent out of their stock to poor members, or devoted it to some public or charitable object. Schools and churches were founded or helped by these private guilds, as some of the colleges at Cambridge, schools at Coventry, Worcester, Brayles, Sleaford, Ludlow, Bristol, and elsewhere ; forty guilds of Bodmin (of which only five were craft guilds) joined in the repair of the church there. Bridges aud town-walls were repaired, both in England and in France—in which latter country M. Giry finds some relics of these social guilds. The perform- ing of miracle and other plays, setting out of pageants, and providing of minstrels were undertaken by many of the social as well as by the craft guilds, and in many towns formed an important adjunct to the municipal proceedings, as at Coventry, York, Durham, Norwich, &c.; the Lord Mayor’s show of London owes its origin to this custom.2

These local social guilds were very numerous in England and in the Teutonic countries ; it is believed that they were so in France, but little is known of them elsewhere, There Were 50 such guilds in the county of Cambridge, 909 in – Norfolk, 42 in Bodmin, 80 in Cologne, 70 at Liibeck, é&ec.

At the time of the Reformation these guilds were abolished in Protestant countries, under pretence of their being superstitious foundations; in Denmark and North Germany their property was devoted to public service, but in England it was handed over to the king and his courtiers, their guild-halls became poor-houses, their pageants were laid aside. A very few of these societies escaped ; St George's guild at Norwich continued to live on many years.

Wickliffe, in the 14th century, had complained of the abuses among the guilds, including those of trades. In 1389 returns were made into Chancery of the social and other guilds in England ; these, though imperfect, give a valuable body of details, and draw the distinction between the two eee ee

1 Probably the numerous societies in France and Flanders of the 12th and 13th centuries for keeping the poetic and musical foundation of Le Feste de Pui belonged to the class of social guilds. One of them was set up in London (Riley's Liber Custumarumnr).

great classes of social and trade guilds. The trade guilds liave in all countries attracted more attention than the rest, on accouut of their wealth and importance; they are of two orders, gutlds-merchant and craft-guilds. The guild- merchant arose in this way; the same men who in the growth of towns became citizens by reason of possessing town-land, frequently were also traders ; the uncertain state of society in early times naturally caused them to unite for protection of their trade interests in a gilda mercatoria, which made internal laws akin to those of other guilds ; the success of these private interests enlarged their import- ance ; and when the towns and boroughs obtained confirma: tion of their municipal life by charter, they took care to have it included that the men of the place should also have their guild-merchant.? Thus these guilds obtained the recognition of the

state ; in their origin they had been as other guilds, partaking especially of the character of peace-guilds, but now "the citizens and the guild became identical, and what was guild-law" often became the law of the town. In great cities, such ag London and Florence, we do not hear of merchant guilds (Norton) ; there the separate occupations or crafts early asserted their associating power and independence, and the craft-guilds gradually took a place in the organization of the town government. Many craft-guilds, the heads of which were concerned in the government of the commune, are found in Italy between the 9th and the 12th centuries (Perrens, Mist. de Florence), But in England and the north of Europe the guilds-merchant during this period, having grown rich aud tyrannical, excluded the landless men of the handicrafts; these then uniting among themselves, there arose everywhere by the side of the guilds-merchant the craft-guilds, which gained the upper hand on the Continent in the struggle for liberty in the 13th and 14th centuries. In England these companies usually existed side by side with the old town or merchant guild; until at length their increasing importance caused the decay of the old guilds, and the adoption of these crafts as part of the constitution of the towns (13th to 15th century), The separation of the richer aud perhaps the older from the poorer of the companies occurred, and thus arose the paramount influence of a few,—as the twelve great Companies of London, the Arti Majort of Florence, and others.

The constitution of the trade-guilds was formed on the model of other guilds ; they appointed a master or alderman and other officers, made ordinances, including provisions for religious observance, mutual help, and burial; the town ordinances yet remaining of many places, as of Berwick, Southampton, and Worcester, show traces of the trade laws of the old guilds-merchant. As their principal objects, "the craft-gildmen provided for the maintenance of the customs of their craft, framed further ordinances for its regulation, (including care against fraudulent workman- ship), saw these ordinances properly executed, and punished the gild-brothers who infringed them." '" Though the craft. gilds, as voluntary associations, did not need confirmation by the authorities at their birth, yet this confirmation be- came afterwards of the greatest importance, when these gilds wanted to be recognized as special and independent associations, which were thenceforth to regulate the trade instead of the authorities of the town" (Brentano). Hence obtained the practice of procuring a charter in confirmation and

recognition of their laws, in return for which certain taxes were paid to the king or other authority. It is therefore erroneous to state, as is sometimes done, that these companies owe their origin to royal charter, or that they required a licence.

Few important towns in Great Britain have been with-

- *There are numerous examples of this among the borough records of England and Scotland,*

out @ more or less number of craft-guilds. London, |

York, Exeter, Norwich, Bristol, Coventry, &c., teemed with their life and pageantry. But the Reformation shook these as it destroyed others; the exactions they suffered, and the altered conditions of social economy and labour have contributed to their decay ; "all that remains of the ancient gilds in the livery companies of to-day is the common eating and drinking." In the centres of industry of Italy, Franze, Germany, even in Constantinople, they once formed the strength of commerce, but, abused or decayed, in France they were abolished on 4th August 1789; in Germany their last remnants died in 1869.1 In Constantinople numerous trade guilds were flourishing up till the war of 1877-78. In Russia there are no true spontancous guilds; the trade companies were imposed by the imperial orders of Catherine and Peter the Great.

See L. Brentano, On the History and Development of Gilds, 1870; English Gilds, Original Ordinances, &e., by Toulmin Smith, 1870; Wilda, Das Gildenwesen im Mittelalter, 1831; F. T. Perrens, Histoire de Florence, 1877; G. Schmoller, Geschiehte der Tueher- und Weber- zunft in Strassburg, 1879; G. Schauz, Zur Gesehiehte der Deutschen Gesellen-Verbinde im Mittelalter, 1877; G. Fagniez, L' Industrie & Paris aw 132me et au 142me siecle, 1877 ; Herbert's Twelve great Livery Companies of London, 1836; G. Norton's Commentaries on the History of London, 1869 ; works by the German writers Carl Hegel, Arnold, Maurer, and Gierke; and the artiele Cus. (L. T. 8.)

GUILDFORD, a municipal and parliamentary borough and market-town of England, capital of the county of Surrey, is beautifully situated on a gentle acclivity of the northern chalk downs and on the river Wye, crossed there. by a bridge of five arches, 30 miles S.S.W. of London. It consists chiefly of one long, wide, and well-built street, and contains a number of old picturesque gabled houses, with quaint lattices and curious doorways. The principal build- ings are the ruins of an old castle, erected soon after the Norman conquest, and for a long time used as the county jail; the town-hall, erected in 1683, containing a number of interesting pictures; the corn market-house, erected in 1818; the county hall and assize court in the domestic Gothic style, erected in 1862; the Abbots Hospital, founded by Archbishop Abbot for decayed tradesmen and decayed tradesmen's widows ; the county hospital, opened in 1866, erected as a memorial to the Prince Consort; the Royal Free Grammar School, founded in 1509; the Institutc, formed in 1844, with museum, library, and reading and lecture rooms; the church of St Mary, in the Anglo-Norman style, of very early origin, and restored in 1863; the church of St Nicholas, iu the Gothic style, erected on the site of an ancient structure of Saxon origin ; and Holy Trinity church, a red brick structure erected 1749-63, with a square embattled tower. Guildford has corn mills, iron foundries, and breweries. There is considerable trade in corn, and fairs are held for cattle, sheep, horses, and pigs. Guild- ford first returned members to Parliament in the reign of Edward I. Formerly it had two members, but since the Reform Act of 1867 it returns only one. The population of the municipal and parliamentary borough in 1861, when the municipal and parliamentary limits were coex-tensive, was 8020; in 1871 the population of the muni-

cipal borough (area 5543 acres) was 9106, and that of the

parliamentary borough (644 acres) 9801.

It is probable that Guildford is of. Roman origin, but it is first mentioned in the will of King Alfred, who bequeathed it to his nephew Ethelwald. Near it took place, in 1039, the murder of Alfred, youngest son of King Ethelred, and his Roman retinue, by

the men of Earl Godwine. It was an occasional residence of, the.

English kings, and a portion of it remaincd attached to, tho. royal demesnes until 1630, when the whole of the crown lands at Guild- ford were vested in Murray, earl of Annandale. After various

changes they passed in 1736 to the Onslow family, with whom they still remain.

1 There is, however, a lively movement for the revival of craft-guilds in Germany at the prescut time (1879)

GUILLEMOT (French, G'willemot), the name accepted by nearly all modern authors for a Sea-bird, the Colymbus trowle of Linneus and the Urea trove of Latham, which nowadays it seems seldom if ever to bear among those who, from their vocation, are most conversant with it, though, according to Willughby and Ray his translator, it was in their time so called "by those of Northumberland and Durham." Around the coasts of Britain it is variously known as the Frowl, Kiddaw or Skiddaw, Langy (cf. Ice- landic, Langvia), Lavy, Marrock, Murre, Scout (cf. Coot, vol. vi. p. 341), Scuttock, Strany, Tinker or Tinkershire, and Willock. The number of local names testifies to the abundance of this bird, at least of old time, in different places, but it should be observed that in certain districts some of them are the common property of this species and the Razor-bill. In former days the Guillemot yearly fre- quented the cliffs on many parts of the British coasts in countless multitudes, and this is still the ease in the northern parts of the United Kingdom; but more to the southward nearly all its smaller settlements have been rendered utterly desolate by the wanton and eruel destruc- tion of their tenants during the breeding season, and even the inhabitants of those which were more crowded had become so thinned that, but for the intervention of the Sea Birds Preservation Act (32 and 33 Vict. cap. 17), which provided under penalty for the safety of this and certain other species at the time of year when they were most exposed to danger, they would unquestionably by this time have been exterminated so far as England is concerned. The slaughter, which, before the passing of that Act, took place annually on the cliffs of the Isle of Wight, near Flam- borough Head, and at such other stations frequented by this species and its allies the Razor-bill and Puffin, and the Kittiwake-Gull, as could be easily reached by excursionists from London and the large manufacturing towns, was in the*

highest degree brutal. No use whatever could be made of the bodies of the victims, which indeed those who indulged in their massacre were rarely at the trouble to pick out of the water; the birds shot were all engaged in breeding ; and most of them had young, which of course starved to. death through the destruction of their parents, intercepted in the performance of the most sacred duty of nature, and butchered to gratify the murderous lust of those who sheltered themselves under the name of "sportsmen."

Part of the Guillemot's history is still little understood. We know that it arrives at its wonted breeding stations on its accustomed day in spring, that it remains there till, towards the cnd of summer, its young are hatched and able, as they soon are, to encounter the perils of a scafaring life, when away go all, parents and progeny. After that time it commonly happens that a few examples are occasion- ally met with in bays and shallow waters. Tempestuous weather will drive ashore a large numbcr in a state of utter destitution—many of them indeed are not unfrequently washed up dead—but what becomes. of the bulk of the birds, not merely the comparatively few thousands that are natives of Britain, but the tens and hundreds of thousands, not to say millions, that arc in summer denizens of more northern latitudes, no one can yet say. This mystery is not peculiar to the. Guillemot, but is sharcd by all the Alcide that inhabit the Atlantic Ocean. Examples stray every season across the Bay of Biscay, are found off the coasts of Spain and Portugal, enter the Mediterranean and

2 The word, however, seems to be eognate with or derived from the Welsh and Manx Guillem, or Gwilym as Pennant spells it. The asso- ciation may have no real meaning, but one cannot help comparing the resemblance between the French Guillemot and Guillaume with that between the English Willock (another name for the bird, as will be seen by the text) and William.

reach Italian waters, or, keeping further south, may even touch the Madeiras, Canaries, or Azores; but these bear no proportion whatever to the mighty hosts of whom they are literally the "scouts," and whose position and movements they no more reveal than do the vedettes of a well-

appointed army. The common Guillemot of both sides of the Atlantic is replaced further northward by a species with a stouter bill, the U. arra or U. bruenniché of ornithologists, and on the west coast of North America by the UW. californica. The habits of all these are essentially the same, and the structural resemblance between all of them and the Auks is so great that of late several systematists have relegated them to the genus Alca, confining the genus Uria to the Guillemots of another group, of which the type is the U. grylla, the Black Guillemot of British authors, the Dovekey or Greenland Dove of sailors, the Tysty of Shetlanders. This bird assumes in summer an entirely black plumage with the exception of a white patch on each wing, while in winter it is beautifully marbled with white and black. Allied to it as species or geographical races are the U. manidtt, U. columba, and U. carbo. All these differ from the larger Guillemots by laying two or three eges, which. are generally placed in some secure niche, while the members of the other group lay but a single egg, which is invariably exposed on a bare ledge. (A. WN.) GUILLOTINE, the instrument for inflicting capital punishment by decapitation, introduced into France at the period of the Revolution. It consists of two upright posts surmounted by a cross beam, and grooved so as to guide an oblique-edged knife, the back of which is heavily weighted to make it fall swiftly and with force when the cord by which it is held aloft is let go. Some ascribe the invention of the machine to the Persians 3 and previous to the period when it obtained notoriety under its present name it had been in use in Scotland, England, and various parts of the Continent. There is still preserved in the Antiquarian Museam of Edinburgh the rude guillotine called the "maiden" by which the regent Mortun was decapi- tated in 1581. The last persons decapitated by the Scotch "maiden" were the marquis of Argyll in 1661 and his son the earl of Argyll in 1685. It would appear that no similar machine was ever in general use in England ; but until 1650 there cxisted in the forest of Hardwick, which was coextensive with the parish of Halifax, West Riding, Yorkshire, a mode of trial and execution called the gibbet law, by which a felon convicted of theft within the liberty was sentenced to be decapitated by a machine called the Halifax gibbet. A print of it is contained in a small book called Halifax and tts Gibbet Luw (1708), and in Gibson's edition of Camden's Britannia (1722). In Germany the machine was in general use during the Middle Ages, under the name of the Déele, the Hobel, or the Dolabra. Two old German engravings, the one by George Penez, who died

in 1550, and the other by Heinrich Aldegrever, with the date 1553, represent the death of a son of Titus Manlius by a similar instrument, and its employment for the execution of a Spartan is the subject of the engraving of the eighteenth symbol in the volume entitled Symbolice Queestiones de Universo Genere, by Achilles Bocchi (1555). From the 13th century it was used in Italy under the name of Mannaia, for the execution of criminals of noble birth. The Chronique de Jean d'Anton, first published in 1835, gives minute details of an execution in which it was employed at Genoa in 1507 ; and it is elaborately described by Pére Labat in his Voyage en Espagne et en Italie en 1730. It is mentioned by Puységur in his AZémozres as in use in the south of France, and he describes the execution by it of Marshal Montmorency at Toulouse in 1632. For about a century it had, however, fallen into general disuse on the Continent ; and Dr Guillotine, who first suggested its

use in modern times, is said to have obtained his information regarding it from the description of an execution that took place at Milan in 1702, contained in an anonymous work entitled Voyage LHistorique et Politique de Suisse, @Itahe, et d' Allemagne.

Guillotine, who was born at Saintes, May 28, 1738, and clected to the Constituent Assembly in 1789, brought forward on the Ist December of that year two proposi- tions regarding capital punishment, the second of which was that, "in all cases of capital punishment it shall be of the same kind—that is, decapitation—and it shall be executed by means of a machine." 'The reasons urged in support of this proposition were that in cases of capital punishment the privilege of execution by decapitation should no longer be confined to the nobles, and that it was desirable to render the process of execution as swift and painless as possible. The debate was brought to a sudden termination in peals of laughter caused by an indiscreet reference of Dr Guillotine to his machine, but his ideas seem gradually to have leavened the minds of the assembly, and after various debates decapitation was adopted as the method of execution in the penal code which became law on the 6th October 1791. At first it was intended that decapitation should be by the sword, but on account of a memorandum

by M. Sanson, the exccutioner, pointing out the expense and certain other inconveniences attending that method, the assembly referred the question to a committee, at whose request Dr Antoine Louis, secretary to the academy of surgeons, prepared a memorandum on the subject. With- out mentioning the name of Guillotine, it recommended the adoption ofan instrument similar to that which was formerly suggested by him. The assembly decided in favour of the report, and the contract was offered to the person who usually provided the instruments of justice; but,as his terms were considered exorbitant, an agreement was ultimately come to with a German of the name of Schmidt, who, under the direction of M. Louis, furnished a machine for cach of the French departments. After satisfactory experiments had been made with the machine on several dead bodies in the hospital of Bicétre, it was erected on the Place de Gréve for the execution of the highwayman Pelletier on the 25th April 1792. While the experiments regarding the machine were being carried on, it received the name Lowisette or La Petite Louison, but the mind of the nation seems soon to have reverted to Guillotine, who first suggested its use : and in the Journal des Révolutions de Paris for 28th April 1792, it is mentioned as a guillotine, a name which it thenceforth bore both popularly and officially. In 1795 the question was much debated as to whether or not death by the guillotine was instantaneous, and in sup- port of the negative side the case of Charlotte Corday was adduced whose countenance, it is said, blushed as if with indignation when the executioner, holding up the head to the public gaze, struck it with his fist. The connexion of the instrument with the horrors of the Revolution has hindered its introduction into other countries, but in 1853 it was adopted under the name of allschwert or Fallbeil by the kingdom of Saxony, and it has been subsequently introduced into several other German states. It has often been stated that Dr Guillotine perished by the instrument which bears his name, but it is beyond question that he survived the Revolution, and died a natural death in 1814,

See Sédillot, Réflexions historiques et physiologiques sur le supplice de la guillotine, 1795; Sue, Opinion sur le supplice de la guillotine, 1796; Réveillé-Parise, Htude biographique sur guillotin, Paris, 1851; Notice historique et physiologique sur le supplice de la guil- lotine, Paris, 1830; Louis Dubois, Recherehes historiques et physio- logiques sur la guillotine et détails sur Sanson, Paris, 1843; and a paper by J. W. Croker in the

Quarterly Review for December 1848, reprinted separately in 1850 under the title The Guillotine, a his- torteal Essay.

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GUIMARAES, a fortified city of Portugal, province of Minho, government district of Braga, is beautifully situated on the Ave, 12 miles south-east of Braga. It stands on an acclivity,and with its Moorish towers has a very picturesque appearance. An old castle which was the birthplace of Alphonso, the first king of Portugal, is still in a state of good preservation. Among the four churches may be mentioned the Colegiata, founded in 1385, and although modernized still retaining intact its beautiful choir. The principal manufactures are knives and other steel wares, leather, paper, and table linen. In the neighbourhood there are sulphurous springs, with a temperature of 164° Fahr., frequented since the origin of the city in the 4th century. Guimariies was made the chief town of the countship of Portugal in the 11th century by Henry of Burgundy, and retained that honour till 1511, when it was conferred by King Emanuel on Lisbon. The population is about 10,000.

GUINEA, the general name applied by Europeans to part of the western coast region of intertropical Africa. Like many other geographical designations the use of which is controlled neither by natural nor political boundaries, it has been very differently employed by different writers and at different periods. Inthe widest acceptation of the term, the Guinea coast may be said to extend from 11° N. lat. to 16° S. lat., or in other words, from the neighbourhood of Cape Verga to Cape Negro. Southern or Lower Guinea comprises the coasts of Loango, Congo, Angola, and Ren- guela; and Northern or Upper Guinea comprises part of Senegambia, the Sierra Leone district, the Grain Coast, the Ivory Coast, the Gold Coast, the Slave Coast, the Niger Delta, and the Calabar district. The Cameroon mountains may be accepted as the limit of the two divisions, though some writers prefer the river Gambia or the equator. In a narrower and perhaps more common use of the name, Guinea is the coast only from Cape Palmas to the Gaboon. Originally, on the other hand, Guinea was supposed to com- mence as far north as Cape Nun opposite the Canary Islands ; and Azurara is said to be the first authority who brings the boundary south to the

Senegal, The name is derived from Ginnie, Genna, or Jinnie, a town and kingdom in the Niger district ; and, though it appears on a map as early as 1351, it did not come into general use till the close of the 15th century. Few questions in historical geography have been more keenly discussed than that of the first dis- covery of Guinea by the navigators of modern Europe. It appears from the testimony of Jacopo Doria that two Geno- ese, Ugolino and Guido de Vivaldi, were sailing south along the African coast in 1291, but there is almost no further record of their voyage. The French claim that in the latter part of the 14th century the people of Dieppe sent out several expeditions to Guinea; and Jean de Bethencourt, who settled in the Canaries about 1402, made explorations towards the south. At length, in the latter half of the 15th century, the consecutive efforts of the navigators employed by Prince Henry of Portugal, Cadamosto, Usodimare, and Diogo Gomes, made the whole region familiar to Europeans.

See Azurara, Chronica de descobrimento e conquista de Guiné, pub- lished, with an introduction, by Barros de Santarem, Paris, 1841 ; Villault de Bellefond, Relation des Costes d Afrique appellécs Guinée, Paris, 1679; Desmarquets, J/ém. chron. pour servir a Vhist. de Dieppe, 1875; Major, Life of Prince Henry the Navigator, London, 1868; and the elaborate review of Major's work by M. Codine in the Bulletin de la Soc. de Géogr., 1878.

GUINEA FOWL, a well-known domestic gallinaceous bird, so called from the country whence in modern times it was brought to Europe, the Meleagris and Avis or Gallina Numidica of ancient authors! Little is positively known of the wild stock to which we owe our tame birds, nor can

: Columella (De Re Rustica, viii., cap. 2) distinguishes the Afeica- gris from the Gallina Africana or Numidica, the latter having, he says, a red wattle (palea, a reading obviously preferable to galea),

the period of its reintroduction (for there is apparently no evidence of its domestication being continuous from the time of the Romans) be assigned more than roughly to that of the African discoveries of the Portuguese. It does not seem to have been commonly known till the middle of the 16th century, when Caius sent a description and figure, with the name of Gallus Mauritanus, to Gesner, who pub- lished both in his Paralipomena in 1555, and in the same year Belon also gave a notice and woodcut under the name

of Poulle de la Guinée; but while the former authors properly referred their bird to the ancient Meleagris, the latter confounded the Jfeleagris and the Turkey.

The ordinary Guinea Fowl of our poultry-yards is the Numida meleagris of ornithologists, and is too common a bird to need description. The chief or only changes which domestication seenis to have induced in its appearance are a tendency to albinism generally shown in the plumage of its lower parts, and frequently, though not always, the con- version of the colour of its legs and feet from dark greyish- brown to bright orange. That the home of this species is West Africa from the Gambia? to the Gaboon is certain, but its range in the interior is quite unknown. It appears to have been imported early into the Cape Verd Islands, where, as also in some of the Greater Antilles and in Ascen- sion, it has run wild. Representing the species in South Africa we have the WV. coronata, which is very numerous from the Cape Colony to Ovampoland, and the WV. cornuta of Drs Finsch and Hartlaub, which replaces it in the west as far as the Zambesi. Madagascar also kas its peculiar species, distinguishable by its red crown, the WV. mitrata of Pallas, a name which has often been misapplied to the last. This bird has been introduced to Rodriguez, where it is now found wild. Abyssinia is inhabited by another species, the V. ptilorhyncha,' which differs from all the foregoing by the absence of any red colouring about the head. Very different from all of them, and the finest species known, is the WV. vulturina of Zanzibar, conspicuous by the bright blue in its plumage, the hackles that adorn the lower part of its neck, and its long tail. By some writers it is thought to form a separate genus, Acryliiwm. All these Guinea Fowls are characterized by having the crown bare of feathers and elevated into a bony "helmet," but there is another group (to which the name G'uttera has been given) in which a thick tuft of feathers ornaments the top of the head. This contains four or five species, all inhabiting some part or other of Africa, the best known being the NV. cristata from Sierra Leone and other places on the western coast. This bird, apparently mentioned by Mare- grave more than 200 years ago, but first described by Pallas, is remarkable for the structure—unique, if not possessed by its representative forms—of its furcwla, where the head, instead of being the thin plate found in all other Galline, is a hollow cup opening upwards, into which the trachea dips, and then emerges on its way to the lungs. Allied to the genus

MVumida, but readily distinguished therefrom among other characters by the possession of spurs, are two very rare forms, Agelastes and Phasidus, both from Western Africa. Of their habits nothing is known. All these birds are beautifully figured in Mr Elliot's Monograph of the Phasianide, from drawings by Mr Wolf. (e sa while it was blue in the former. This would look as if the Meleagris had sprung from what is now called Numida ptilorhyncha, while the Gallina Africana originated in the V. meleagris,—species which, as will be seen by the text, have a different range, and if so the fact would point to two distinct introductions—one by Greeks, the other by Latins.

2 Specimens from the Gambia are said to be smaller, and have been described as distinct under the name of W. rendaili.

3 Mr Darwin (Anim. and Pl. under Domestication, i. Pp. 994), gives this as the original stock of our modern domestie birds, but herein the writer ventures to think he has been misled. As before observed, it may possibly have been the true werewypls of the Greeks.

GUI—-GUI

GUINEA-PIG. See Cavy.

GUINGAMP, a town of France, capital of an arrondis- sement in the department of Cétes-du-Nord, is situated in a large and rich valley on the right bank of the Trieux, 20 miles W.N.W. of St Brieuc. It was formerly surrounded by walls, portions of which still exist. It has a library, a museum, a prison, and a hospital dating from the 17th century, enlarged in 1830, and having within its grounds an old oak of immense size. There are also several old buildings of interest, including the beautiful church of Notre Dame du Bon-Secours, portions of which date from the 13th, 14th, 15th, and 16th centuries respectively, and which has been lately restored ; four pillars of the tower of the chapel of Saint Leonard, dating from the 11th century ; and the Ursuline convent, dating from the 17th century, now used as a cavalry depot. 'he beautiful fountain in the Place de Plomb, constructed by Italian artists in the 15th century, was replaced in 1743 by the present struc- ture. The town has manufactures of ginghams (to which it gives the name), linen fabrics, thread, leather, and hats ; and there is some

trade in wine, brandy, cattle, and agri- cultural produce. Guingamp originally belonged to the dukes of Penthievre, and was inherited from them by King Louis Philippe. The population in 1876 was 7895,

GUIPUZCOA, the smallest and most densely peopled of the three Basque provinces of Spain, is bounded on the N. by the Bay of Biscay, on the W. by the province of Bis- cay, on the S. and 8.E. by Alava and Navarre, and on the N.E. by the Bidasoa, which separates it from France. Its area is nearly 728 square miles, and in 1870 its estimated population was 180,743. Situated on the northern slope of the great Cantabrian chain, the province has a great variety of surface in mountain, hill, and valley; and the scenery accordingly is highly picturesque and romantic. The coast is much indented, and has numerous harbours, but none of very great importance ; the chief are those of San Sebastian, Los Pasajes, Guetaria, Deva, and Fuenterrabia. 'The rivers (Deva, Urola, Oria, Urumea, Bidasoa) are all short, rapid, and unnavigable. The mountaias are for the most part covered with forests of oak, chestnut, or pine; holly and arbutus are also common, with furze and heath in the poorer parts. The soil in the lower valleys is generally of hard clay and unfertile ; it is cultivated with great care, but the grain raised falls considerably short of what is required for home consumption. The climate though moist, 1s mild, pleasant, and healthy ; fruit is produced in con- siderable quantities, especially apples for manufacture into "zaragua" or cider. The chief wealth of the province arises from its mineral stores (iron, argentiferous lead, copper) and from its excellent fisheries, which supply the neighbouring provinces (cod, tunny, sardines, oysters). The Iron, which is of excellent quality, is smelted with wood. There are also considerable manufactures of woollen and cotton fabrics, paper, and lucifer matches, The people are remarkable for their fine physique, and bold manly spirit, united with honesty, industry, energy, and enterprise. The capital of the province is San Sebastian, with a population of 17,902 in 1876. All the other towns are small, Tolosa alone having a population at all exceeding 5000 ; Fuenter- rabia no longer retains its former importance ; Mondragon 1s entirely dependent on the rich iron mines in its vicinity, and Salinas, on the Deva, on its salt works. A small island in the Bidasoa, called La Isla de los Faisanes, or V'Isle de la Conférence, is celebrated as the place where the marriage of the duke of Guienne was arranged between Lous XI. and Henry

IV. in 1463, where Francis J. the prisoner of Charles V. was exchanged for his two sons in 1526, and where in 1659 “the peace of the Pyrenees”

Was concluded between D., Luis de Haro and Cardinal Mazarin.

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_ The early history of Guipuzcoa, as of the other Basque provinces, is still the subject of much learned research. Never wholly sub- dued by the Romans, the Celtiberi in their mountain fastnesscs continued to preserve their independence after the fall of the Western Empire until the times of the West-Gothic kings Leovigild (580) and Wamba (672-681). Nominally subject to Charlemagne at a later period, they were prompt to avail themselves of the first opportunity to assert their full Independence ; their alliance with the Moors, and its results at Roncesvalles are prominent facts in medieval history. About the 11th century the inhabitants of the Basque districts emerge as organized into a somewhat free con- fedcration of detached republics, owning allegiance to a sefior or lord, but under definite constitutional guarantees (fucros). In 1202 Guipuzcoa accepted as its lord Alphonso VIII. of Castile, and for many centuries it ranked as a distinct “‘sefiorio” attached to the Spanish crown. The last of its distinctive fucros was abolished in July 1876.

GUISBOROUGH, or Gissoroves, a market-town of England, North Riding of Yorkshire, is situated in a narrow but fertile valley at the foot of the Cleveland Hills, 4 miles from the mouth of the Tees and 10 miles E.S.E. of Middles- borough. It consists chiefly of one wide and handsome street, having many good houses. The principal buildings are the parish church, which though partly rebuilt in 1791 and thoroughly renovated in 1875, has some remains of an ancient structure; the free grammar school, founded in 1561; the town-hall, recently much improved and enlarged; the mechanics’ institute, the hospital for old men and women, and the hospital for accidents erected lately by Admiral Chaloner. The ruins of the Austin priory, founded in 1129, are beautifully situated near the eastern extremity of the town. The accumulation of rubbish has been recently removed from its foundations and floors, and a large number of interesting relics discovered. Among the

historic person- ages who were buried within its walls was Robert the Bruce, lord of Annandale, the competitor for the throne of Scot- land with John Baliol, and the grandfather of King Robert Bruce. The town within late years has been rapidly in- creasiug, on account of the iron mines in its neighbourhood ; and it has also tanneries and breweries. Alum works were established in the reign of Queen Elizabeth by Sir Thomas Chaloner, who introduced the manufacture of alum into England from Italy ; but they have becn long discontinued. About a mile south-east of the town there is a sulphurous spring discovered in 1822, efficacious in cutaneous, rheu- matic, and bilious complaints. The population of the town in 1871 was 5202, and in 1879 about 6500.

GUISCARD. See Rospert Guiscarp.

GUISE, a fortified town of France, department of the Aisne, arrondissement of Vervins, is situated on the left bank of the Oise, 13 miles N.W. of Vervins. It was for- merly the chief town of the Thiérache, a district in the extreme north of France, bordering on Hainault. It has an old castle dating from the 16th century, and a palatial familistére with accommodation for 400 families. The principal industries are woollen and cotton weaving, iron and copper founding, tanning, and the manufacture of chicory and sugar. The population in 1876 was 6242.

GUISE, House or. The House of Guise, which in the 16th century suddenly rose to an eminence unrivalled in Europe, takes title from the place noticed above. The countship of Guise, a fief under the French crown, was carried in 1333 by its holder, Marie of Blois, as her dower to Rodolf, duke of Lorraine. In 1508 Rene IL, the con- queror of Charles the Bold, divided his territories between his sons Antony, who became duke of Lorraine, and re- ceived the Germanic part, and Claude, who had the French fief, including Guise. :

Claude of Lorraine thus became founder of a great and well-marked family, which occupied the place that had in the fifteenth century been held by the princes of the lilies. Generation after generation we have a duke and a cardinal side by side: they illustrate with singular XI. — 34

fidelity the movements of the period from its Catholic side: the first duke and cardinal belonged to the Re- naissance; the second pair threw themselves into the Catholic reaction, and led the resistance to the Reformation in Franec; the third pair showed the decay of the religious movement, and its transit into political activities, being among the most ambitious statesmen of the later years of the century; while the fourth and last pair feel the breath of Richelieu's absolutism. The family has throughout characteristic qualities,—bravery, ambition, a certain nobleness of sentiment, an imposing presence, and winning manners; they stand between nobility and royalty,—always greater than the one, sometimes even overtopping the other. They seem never to forget that in their veins runs the blood of those who wore or claimed the crowns of Jerusalem and Naples, of Sicily and Hun- gary. Claude of Lorraine, born in 1496, succeeded in 1508 to a group of lordships, which by their names testify to the high fortunes of the house: besides Guise itself, he had Elbeuf, Aumale, Mayenne, Joinville, Harcourt, Longiu- meau, Boves, Sablé, Lambesc, and others. In addition to these, the family gathered to itself relations with Eu, Sully, Ventadour, Aiguillon, Mercceur, Joyeuse, and Nevers; a cardinal's hat, together with a group of splendid church dignities, also went with the house of Guise; the arch- bishopric of Rheims, the bishopric of Metz, and several other bishoprics were family benefices, which enabled younger members to take an important share in the fortunes of the family. The shicld of Claude expresses the pride of the race: we find there not only the Lorraine spread-eagle, the German bird, but also the quarterings of eight sovereign houses, those of the kings of Hungary, Naples, Jerusalem, and Aragon, and of the sovereign lords of Anjou, Guelderland, Flanders, and Bar. This young prince, who claimed so much, aud did so much, who both exercised his rights as a foreign prince and took pre- cedence of the proudest in France, attached himself closely to Francis J. He was the most brilliant among the " young men" who displaced the older wisdom of the court of Louis XII. Jn 1513 he married Antoinette of Bourbon, the duke of Vendéme's daughter and great-aunt of Henry IV.; in 1515 he accompanied Francis to Italy, and showed the mettle of his race at Marignano, where his brother Ferry was killed. From that time he sagaciously avoided the Italian expeditions, and stayed in France, winning popu- larity as protector of the realm. Thus in 1521 he was on the Spanish frontier, and helped to take Fuenterrabia; in 1522 he opposed the English in the north, covering Paris ; next, he

defended Champagne from the Germans, clearing that rich district with equal glory and gain. in 1525 he avoided the expedition which ended in the disaster of Pavia, wherein another of his brothers, Francis, was slain; and during the captivity of Francis I. at Madrid, he became virtual head of the regency under the queen, Louise of Savoy. In these dark days he crushed the rising of the peasants of Lorraine and Swabia, which threatened all the east of France. After the king's return, Claude was made (in 1527) duke of Guise, and peer, and governor of Champagne; fresh territory and wealth were added to these honours. He had now reached his highest point ; henceforth it is clear that Francis J. regarded him with more jealousy than favour: his ambitious views as to the crown of the "good king René," and hopes of a revived Angevin dynasty, offended the French king, though they were only dreams of the past; for the new spirit of monarchy and national life in the 16th century made any creation of lesser kingdoms on the borderlands of France and Germany impossible. Claude was a man of harsh and narrow character: cautious and persistent, he saw his way, and walked carefully along it all his days. In an age in

which wealth was becoming the most effective of all means of power, he gathered riches in all ways, fair or foul; and though willing to spend for his own advancement, he won and deserved the character of a grasping and greedy prince. His brother John, first cardinal of Lorraine, seconded him in every way; he was as greedy as the duke, though much more open-handed, Accepting the new ideas of the time, he became a splendid Renaissance prelate, tlie friend of Erasmus and Rabelais, and even of Marot, while, at the same time, he only too faithfully reflected the worst vices of the movement. His church preferment was enormous ; he shamelessly took all he could get. He and his brother have the distinction of giving a bad name to a whole country ; for, thanks to their rapacity, the Lorrainers got that reputation for avarice and greediness which has un- justly clung to them even to our days, After 1527 the cleverness of the cardinal rather than the prudence of the duke advanced the family. Claude had twelve children, a splendid group of princely youths, who inherited the hand- some featuresand figure of their father, with even greater abilities and a more effective ambition, Francis, the eldest of those who grew up, was born in 1519, and became the second duke; Charles, born in 1524, was the second car- dinal of Lorraine, a man as intelligent and depraved as his uncle, and

more vigorous and ambitious ; Claude, the next, was created duke of Aumale; Louis, archbishop of Sens and cardinal of Guise; René, marquis of Elbeuf. The daughters made brilliant matches: above all, the eldest, Marie, widow of the duke of Longueville, was married in 1538 to James V. of Scotland, and lad a stormy career as regent to her daughter, Mary Stuart, quecn of Scots. In his later days Claude of Guise withdrew somewhat from public life; he stood aloof from the intrigues of the reign, while the cardinal attached himself to the "black court," the court of Diana of Poitiers, and promoted the interests of his nephews without stint. From this time all leanings towards either Renaissance or reform were at an end: henceforth the Guises became the heads of the opposition to the Huguenots, the strength and support of the new Jesuit movement, and, later, the leaders of the League. Claude of Guise died in 1550, leaving his digni- ties to his son Francis, "le grand Guise," who had already won great credit for bravery, and had shown that dashing contempt for all rules of military prudence which gives a captain undying popularity. The ghastly wound in the face, which his rashness won for him in 1545 at the hands of the English near Boulogne, got him the name of the first " Balafré 7'? it was the outward symbol of his devotion to his country, and greatly raised his repute among .the people. He had too the essential qualities of popularity, a majestic presence, and friendly manners in camp; he was chivalrous, liberal, humane, discerning. In 1552, as lieutenant-general in the three bishoprics, he withstood at the siege of Metz the last efforts of Charles V., and saved France from a terrible invasion. 'Thanks to the jealousy of the Montmorencies, he was sent in 1557 to conquer Naples, and would have added another to the long roll of reputa- tions ruined by Italy, had he not been suddenly recalled to protect his country after the disaster of St Quentin. With happy boldness, instead of watching the victorious allies, he suddenly attacked and took Calais, ending the English occupation of French soil, and raising his own renown to the highest point. Then, with his brother Charles, second cardinal of Lorraine, he wielded unlimited power through- out the reign of Francis IJ. Under Charles IX: his influ- ence abated, and he withdrew into Alsace. On his return thence in 1562, he was, however unwillingly, for he was not inhumane, the cause of the massacre of Vassy, which began the civil wars. In the first war he won the battle of Dreux (1562), and thence passing southward besieged

the Huguenots in Orleans. There, early in 1563, he was assassinated. If lie was the noblest of the Guises, his brother the cardinal was the ablest. In his earlier days the cardinal had shown some sympathy with the Reformers; in later life he vigorously repressed them, and took a leading part in the council of Trent, where he is said to have sketched the first lines of the famous League. Like all early friends of the Jesuits, he did his best for education, and patronized men of letters, while he coerced independ- ence of thought and aimed at introducing the Inquisition. He died in 1574. His younger brother Charles, cardinal of Guise, "le cardinal des bouteilles," was a grand pluralist, an easy-going personage, whose quiet life was in striking contrast to the feverish energy of his brothers. René, marquis of Elbeuf, another brother, is the stem of the great houses of Elbeuf, Harcourt, and Lislebonne.

Henry of Guise, eldest son of Duke Francis, born in 1550, was with his father at Orleans, and saw his death. The boy therefore began his public life with an inextin- guishable hatred against Huguenots, eager to distinguish himself in civil war. With his brother Louis, second cardinal of Guise, he entered into all the intrigues of the succession question, and bitterly opposed Henry of Navarre. He was at Jarnac, and, in the victory of Dormans (1575) over the German invaders, he too won the title of "le Balafré." He soon became the idol of Paris: manly, handsome, and decided, he won all hearts, and was at oncea popular hero. Fortune too favoured him by bringing him into contrast with the wretched Henry III., and with his portly cautious brother the duke of Mayenne. In 1576 he was recognized as head of the League, supported by Philip IL. and the papacy. Ambitious of the crown of France, he worked subtly for it behind the screen of old Cardinal Bourbon's name, In the war of the three Henries (Henry III., Henry of Navarre, Henry of Guise) he again drove the Germans out of France; and, when invited to the capital by the "Sixteen," ruled there unopposed, the "King of Paris." Henry III., whom he had compelled to sign the Edict of Union, found his supremacy intolerable; and just before Christmas (1588), the duke and the cardinal his brother Were assassinated by the royal orders.

His eldest son Charles, born in 1571, was arrested at the time of the double murder, but escaped in 1591, and was welcomed with enthusiasm by the Paris mob, which hoped he would wed the infanta of Spain, and with the help of Philip I. secure for himself the throne of France. But the opposition of his uncle Mayenne proved fatal to the scheme. At the end of the struggle, both he and Mayenne submitted to Henry IV., helped him to reduce the nobles in Languedoc, and received the government of Provence. In Richelieu's days he sided with the queen mother, and was compelled to withdraw in 1631 to Italy, where he died in 1640. By his side also was a cardinal brother, the third of Guise, who ended by abandoning the ecclesiastical state, – and marrying one of the mistresses of Henry IV.

Henry, fourth son of Charles, born in 1614, had already Succeeded to that family benefice, the archbishopric of Rheims, when the death of his elder brother made him head of the family, and in 1640 fifth duke. He too went against the absolutism of the age, and joined the count of Soissons. Condemned to lose his head he fled to Brussels, and took command of the Austrian troops against France,— noble traitors to their country being then not uncommon. In 1643, however, after Richelieu's death, he returned to France; but being chosen their chief by the Neapolitans, at the time of Masaniello's revolt, and dazzled by this Opening for his ambition, he betook himself to Naples. There his failure was complete; he was defeated and carried prisoner to Madrid. Delivered thence by the inter- cession of the Great Condé, he again attempted Naples,

and failed again. After this he spent the rest of his romantic ill-ordered life at the French court, and died in 1664 leaving no issue; his sisters never married, and of all his brothers, one only, Louis, duke of J oyeuse, left a son, born in 1650, who became sixth duke of Guise. He died of small-pox in 1671, leaving an infant son, Francis J oseph, seventh duke, a sickly babe, with whom, four years later, the direct line of the house of Guise expired. The other branches had early died out, saving the family of the seventh son of Claude first duke, René, marquis of Elbeutf 5 the marquis of Lambese, wlio died in 1826, was the last descendant of this branch, and with him the family finally became extinct.

The authorities for the house of Guise are René de Bouillé, B%ts- totre des Dues de Guise, 4 vols., 1853, the most complete account of the family; Valincour, Vie de Francois de Lorraine, Due de Guise, 1664; Guillemin, Histoire du Cardinal de Lorraine; the Bio- graphic Oniverselle, art. "Guise;" and Forneron's Dues de Guise et leur époque, 2 vols.

Genealogical Table of the House of Guise,

René II. (who united the two branches of the house of Lorraine), duke of Lorraine, and Philippa of Guelders, had (besides two older boys who died in childhood, and four unmarried daughters)—

| | | | | Antoine, Claude, Ist John, Ist Ferry, Louis,

Francis, duke of dukeofGuise cardinalof killed at killedat killed at Lorraine. =Antoinette Lorraine. Marignano. N aples. Pavia, of Bourbon, ae lye I | |. | | { Framcis,2d Charles,2d Claude, Louis, René, Marie= And duke of card.of marquis of Ist marquis James V. Bix Guise= Lorraine. Mayenne, cardinal of of others. Anne of andduke ofGuise. Elbeuf. Scotland. Este, of Aumale. ¢ 1563. Mary [Se Stuart, T |] Q. of Scots. Henry,8d Charles, _— Louis, 24 And Charles, | duke= duke of cardinal five duke of Catherine Mayenne, of Guise, others, Elbeuf. of Cleves +1611. $1588, | (and had 4 children), Henry, $1588. duke of Mayenne, ¢ 1621. | i | Charles, Louis, 8d And 4th duke cardinal of twelve of Guise, Guise= more, ¢ 1640, Charlotte des Essarts. | IP | Henry,archb. Louis, duke And of Rheims, of Joyeuse, eight anddth duke, ¢ 1654. more. ¢ 1664, Louis-Joseph, 6th duke of Guise, ¢ 1671. Francis- Joseph, 7th (and last) duke of Guise, +1675. (G. W. K.)

GUITAR, a stringed instrument of Eastern origin. The name no doubt is derived from the Greek xiOépa, but the instrument itself we owe to the Arabs, who introduced it into Spain. In the 16th century it became known in Italy and France, and about 1790 a German instrument-maker of the name of Cetto greatly increased its power by adding a sixth string to the five formerly in use. The genuine Spanish guitar was introduced into England after the Penin- gular War by Ferdinand Sor, a Spaniard who was both a composer for and a player on the instrument. About the same time the guitar was very much in fashion on the Continent, and even Paganini cultivated it. But this circumstance was due to the romantic associations

rather than to the intrinsic merits of the instrnment, and accord- ingly it soon relapsed into comparative oblivion. It is, how- ever, occasionally employed in the orchestra and for the accompaniment of simple vocal pieces, and for these pur- poses it has no doubt its merits. The guitar isa flat-backed instrument, the sides of which turn inwards. The sound- board, pierced by a round sound-hole, is generally made of

pine, maple or cherry-wood being used for the sides and the back. The modern guitar, as already stated, has six strings, while the original £7 Awd of the Arabs had only four, subsequently increased to five. They are tuned to the notes E, A, D, G, B natural, and E. In the more remote keys transposition by means of a capo tasto, or nut, is effected. In this manner a basis of flat instead of natural keys may be substituted without any change of fingering. In the East, especially in Arabia, India, China, and Japan, many varieties of the guitar and its congeners are in use, the number of strings varying from two to five. For the technique of the guitar Madame Sidney Pratten's treatise, Learning the Guitar simpliyied, may be consulted.

GUIZOT, Francors Prerre GQuittaume (17 87-1874), historian, orator, and statesman, was born at Nimes on the 4th October 1787, of an honourable Protestant family belonging to the bourgeoisie of that city, It is character- istic of the cruel disabilities which still weighed upon the Protestants of France before the Revolution, that his parents, at the time of their union, could not be publicly or legally married by their own pastors, and that the ceremony was clandestine. The liberal opinions of his family did not, however, save it from the sanguinary intolerance of the Reign of Terror, and on the 8th April 1794 his father perished at Nimes upon the scaffold, Thenceforth the education of thefuture minister devolved entirely upon his mother, a woman of slight appearance and of homely manners, but endowed with great strength of character and clearness of judgment. Madame Guizot was a living type of the French Hugucnots of the 16th century, stern in her principles and her faith, immovable in her convictions and her sense of duty. She formed the character of her illustri- ous son and shared every vicissitude of his life. In the days of his power her simple figure, always clad in deep mourning for her martyred husband, was not absent from the

splendid circle of his political friends. In the days of his exile in 1848 sbe followed him to London, and there at avery advanced age closed her life and was buried at Kensal Green. Driven from Nimes by the Revolution, Madame Guizot and her son repaired to Geneva, where he received his education. In spite of her decided Calvinistic opinions, the theories of Rousseau, then much in fashion, were not without their influence on Madame Guizot. She was a strong liberal, and she even adopted the notion inculeated in the mile that every man ought to learn a manual trade or craft. Young Guizot was taught to be a carpenter, and he so far succeeded in his work that he made a table with his own hands, which is still preserved at Val Richer by his children. Of the progress of his graver studies little is known, for in the work which he entitled Afemoirs of my own Times Guizot omitted all personal details of his earlier life. But his literary attain- ments must have been precocious and considerable, for when he arrived in Paris in 1805 to pursue his studies in the faculty of laws, he entered at eighteen as tutor into the family of M. Stapfer, formerly Swiss minister in France, and he soon began to write in a journal edited by M. Suard, the Publiciste. This connexion introduced him to the literary society of Paris. In October 1809, being then twenty-two, he wrote a review of M. de Chateaubriand's Martyrs, which procured for him the approbation and cordial thanks of that eminent person, and he continued to contribute largely to the periodical press. At Suard's he had made the acquaintance of Mademoiselle de Meulan, an accomplished lady of good family, some fourteen years older than himself, who also was engaged to contribute a series of articles to Suard's journal. These contributions were interrupted by her illness, but immediately resumed and continued by an unknown hand. It was discovered

that Francois Guizot had quietly supphed the deficiency on her behalf. The acquaintance thus begun ripened into friendship and love, aud in 1812 Mademoiselle de Meulan consented to marry her youthful ally. She was the mother of his eldest son, a young man of great promise, who died of consumption in 1837.' Madame Guizot, his first wife, died in 1827; she was the authoress of many esteemed works on female education.

During this period of his life Guizot, entirely devoted to literary pursuits, published a collection of French synonyms (1809), an essay on the fine arts (1811), and a translation of Gibbon with additional notes in 1812. These

works recommended him to the notice of M. de Fontanes, then grand-master of the university of France, and there was some question of attaching him in a subordi- nate office to the council of state. But on political subjects a radical antagonism existed between the young constitu-tional publicist and the spirit of the empire. This did not prevent M. de Fontanes from selecting Guizot for the chair of modern history in Paris in 1812. His first lecture (which is reprinted in his Memoirs) was delivered on the 11th December of that year. The customary compliment to the all-powerful empcror he declined to insert in it, in spite of the hints given him by his patron. He had now acquired a considerable position in the society of Paris, and the friend- ship of Royer-Collard and the leading members of the liberal party, including the yourg Duc de Broglie. Absent from Paris at the moment of the fall of Napoleon in 1814, he was at once selected, on the recommendation of Royer-Collard, to serve the Government of Louis XVIII. in the capacity of secretary-general of the ministry of the interior, under the Abbé de Montesquiou. Upon the return of Napoleon from Elba he immediately resigned, on the 25th March 1815 (the statement that he retained office under General Carnot is incorrect), and returned to luis literary pursuits. The liberal professions of the emperor during the Hundred Days, though backed by Benjamin Constant, did not for a moment impose on Guizot. He was convinced that Napoleon would never govern on Jiberal principles, and that his power could not last. He was equally convinced that a second restoration of the Bourbons was the only mode by which constitutional monarchy could be established in France. He therefore applied himself to promote that object, and repaired to Ghent, where he saw Louis XVIII., and in the name of the liberal party pointed out to his majesty that a frank adoption of a liberal policy could alone secure the duration of the restored monarchy—advice which was ill-received by M. de Blacas and the king's confidential advisers. This visit to Ghent, at the time when France was a prey to a second invasion, was made a subject of bitter reproach to Guizot in after life by his political opponents, as an unpatriotic action. "The Man of Ghent" was one of the terms of insult fre- quently hurled against him in the days of his power. But the reproach appears to be wholly unfounded. The true interests of France were not in the defence of the falling empire, but in establishing a liberal policy on a monarchical basis and in combating the reactionary tendencies of the ultra-royalists. It is at any rate a remarkable circumstance that a young professor of twenty-seven,

with none of the advantages of birth or political experience, should have been selected to convey so important a message to the ears of the king of France, and a proof, if any were wanting, that the Revolution had, as Guizot said, "done its work."

On the second restoration Guizot resumed office as secretary-general of the ministry of justice under M. de Marbois, but this minister resigned in 1816, and the young statesman was promoted to the council of state and to the general directorship of the departmental and communal administration of the kingdom. But the reactionary spirit

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of the chamber of deputies, of the royalist party, and of the successive Governments of Louis XVIII, was extremely opposed to tle views of Guizot and his friends. Then it was that they endeavoured by their writings and by their speeches to apply broader principles of parlia- mentary government to France, and to found the party which was known by the title of the " Doctrinaires." The opinions of the doctrinaires had more of the rigour of a sect than the elasticity of a political party. Adhering to the great principles of liberty and toleration, they were sternly opposed to the anarchical traditions of the Revolu- tion. They knew that the elements of anarchy were still fermenting in the country ; these they hoped to subdue, not by reactionary measures, but by the firm application of the power of a limited constitution, based on the suffrages of the middle class and defended by the highest literary talent of the times. Their motives were honourable. Their views were philosophical. But they were opposed alike to the democratical spirit of the age, to the military traditions of the empire, and to the bigotry and absolutism of the court. The fate of such a party might be foreseen. They lived by a policy of resistance; they perished by another revolution. They are remembered more for their constant opposition to popular

demands than by the ser- vices they undoubtedly rendered to the cause of temperate freedom.

In the eyes of this celebrated party, and in the sanguine spirit of the times, the French Revolution had run its course. It liad exhausted the popular excesses of the con- vention and the military despotism of the empire. The victory of the Revolution over the arbitrary powers of the crown and the unjust privileges of the aristocracy was com- plete. Power was transferred to the middle classes of society, and their leaders hoped to establish on the basis of a limited suffrage all the essential rights and liberties of a free people. They hoped at the same time, by the diffusion of education amongst tle people, to qualify them more and more for the exercise of these rights. They combated the reactionary and intolerant influence of tlie church. They opposed the high prerogative doctrines of the ministers of the crown. Their policy was described by the term "juste milieu"—a via media between royal authority and popular government. In those days none foresaw that they were building on the sand, and that before another generation had passed away, their scientific structure of government would crumble into ruins, and France would again traverse the dreary cycle of popular revolutions and imperial despotism. In 1821, when the reaction was at its height after the murder of the Duc de Berri, and the fall of the ministry of Duc Decazes, Guizot's relations to the Government of M. de Villéle became decidedly hostile. He was deprived of all his offices, and in 1825 even his course of lectures was interdicted. During the five succeeding years he played an important part among the leaders of the liberal opposition to the Govern- ment of Charles X., although he had not yet entered parliament, and this was also the time of his greatest literary activity. Within this period he published his lectures on representative government ; a work on capital punishment for political offences; a collection of memoirs of the history of England in 26 volumes, and of memoirs of the history of France in 31 volumes; and a revised transla- tion of Shakespeare. The most remarkable work from his Own pen was the first part of his History of the English Revolution from the Accession of Charles I. to that of Charles IT.,—a book of great merit and impartiality, which he re- sumed and completed during his exile in England after 1848. The Martignac administration restored Guizot in 1828 to his professor's chair and to the council of state. Then it was that he delivered the celebrated courses of lectures

which raised his reputation as an historian to the highest point of fame, and placed him amongst the best writers of France and of Europe. These lectures formed the basis of his general J/istory of Civilization in Europe, and of his History of Civilization in France. Our space does not allow us to offer any remark on these well-known publica- tions. But they must ever be regarded as classics of modern historical research, and precursors of the great advance in the treatment of modern history which has marked tlie last half century.

Hitherto Guizot's fame rested on his merits as a writer on public affairs and as a lecturer on modern history. He had attained the age of forty-three before he entered upon the full display of his oratorical strength. In January 1830 he was elected for the first time by the town of Lisieux to the chamber of deputies, and he retained that seat during the whole of his political life, that is, for eighteen years. The moment was critical for a representative of liberal principles and an aspirant for power. The Polignac ministry had engaged in a mortal contest between Charles X. and the national legislature, and the election of a popular man of letters by an important constituency was hailed as a triumph of the liberal cause.

Guizot immediately assumed an important position in the representative assembly, and the first speech he delivered was in defence of the celebrated address of the 221, in answer to the menacing speech from the throne, which was followed by the dissolution of the chamber, and was the precursor of another revolution. On his return- ing to Paris from Nimes on the 27th July, the fall of Charles X. was already imminent. Guizot was called upon by his friends Casimir Périer, Laffitte, Villemain, and Dupin to draw up the protest of the liberal deputies against the royal ordinances of July, whilst he applied himself with tllem to control the revolutionary character of the late con- test. Personally, Guizot was always of opinion that it was a great misfortune for the cause of parliamentary govern- ment in France that the infatuation and ineptitude of Charles X. and Prince Polignac rendered a change in the hereditary line of succession inevitable. The chamber of deputies assumed the powers of a convention, and placed the duke of Orleans on the throne. A ministry was formed under M. Laffitte,

and although it comiprised the great names of Count Molé, Marshal Gérard, Casimir Périer, and the Dac de Broglie, the department of the interior, then the niost difficult and important in the state, was allotted to Guizot. Nor was his an inactive administration. The waves of the great tempest which had just passed over France were to be stilled, the lives of the fallen ministers to be saved, stability to be given to the throne, contidence in the maintenance of peace to Europe; and, although the Laffitte cabinet was of short duration, these objects were attained. In 1831 Casimir Périer formed a more vigorous and compact administration, which was terminated in May 1832 by his death; the summer of that year was marked by a formidable republican rising in Paris, and it was not till the 11th October 1832 that a stable Govern- ment was formed, in which Marshal Soult was first minister, the Due de Broglie took the foreign office, Thiers the home department, and Guizot contented himself with the department of public instruction. This ministry, which lasted for nearly four years, was by far the ablest and most comprehensive that ever served Louis Philippe; it combined men of the highest talents and character, and it rendered incalculable services to the nation and the crown. Guizot, however, was already marked with the stigma of unpopularity by the more advanced liberal party. He remained unpopular all his life, "not," said he, "that I court unpopularity, but that I think nothing about it." Yet never were his great abilities more useful to his

country than whilst he filled this office of secondary rank but of primary importance in the department of public instruction. 'The duties it imposed on him were entirely congenial to his literary tastes, and he was master of the subjects they concerned. He applied himself in the first instance to carry a large measure for the education of the people, and to a great extent founded the existing educational establishments of the people of France. In fifteen years, under the influence of this law, the number of primary schools rose from ten to twenty-three thousand ; normil schools for teachers, and a general system of inspec- tion, were introduced; and boards of education, under mixed lay and clerical authority, were created. The second- ary class of schools and the university of France were equally the subject of his enlightened protection and care, and a prodigious impulse was given to

philosophical study and historical research. The branch of the Institute of France known as the " Académie des Sciences Morales et Politiques," which had been suppressed by Napoleon, was revived by Guizot. Some of the old members of this learned body—Talleyrand, Si¢yés, Roederer, and Lakanal —again took their seats there, and a host of more recent celebrities were added by election for the free discussion of the great problems of political and social science. The "Société de VHistoire de France" was founded for the publication of historical works ; and a vast publication of medieval chronicles and diplomatic papers was undertaken at the expense of the state.

The object of the cabinet of October 1832 was to organize a conservative party, and to carry on a policy of resistance to the republican faction which threatened the existence of the monarchy. It was their pride and their boast that their measures never exceeded the limits of the law, and by the exercise of legal power alone they put down an insur- rection amounting to civil war in Lyons and a sanguinary revolt in Paris. The real strength of the ministry lay not in its nominal heads, but in the fact that in this Govern- ment and this alone Guizot and Thiers acted in cordial cooperation. The two great rivals in French parliamentary eloquence followed for a time the same path; but neither of them could submit to the supremacy of the other, and cir- cumstances threw Thiers almost continuously on a course of opposition, whilst Guizot bore the graver responsibilities of power.

Once again indeed, in 1839, they were united, but it was in opposition to M. Molé, who had formed an inter- mediate Government, and this coalition between Guizot and the leaders of the left centre and the left, Thiers and Odilon Barrot, is justly regarded as one of the chief inconsistencies of his life. Victory was secured at the expense of principle; but none of the three chiefs of that alliance took ministerial office, and Guizot was not sorry to accept the post of antbassador in London, which withdrew him for a time from parliamentary contests. This was in the spring of 1840, and Thiers succeeded shortly after- wards to the ministry of foreign affairs.

Guizot was received with marked distinction by the queen and by the society of London. His literary works were highly esteemed, his character was respected, and France was never more worthily represented abroad than by

one of her greatest orators. He was known to be well-versed in the history and the literature of England, and sincerely attached to the alliance of the two nations and the cause of peace. But, as he himself remarked, he was a stranger to England and a novice in diplomacy ; and unhappily the embroiled state of the Syrian question, on which the French Government had separated itself from the joint policy of Europe, and possibly the absence of entire confidence between the ambassador and the minister of foreign affairs, placed him in an embarrassing and even

false position. The warnings he transmitted to Thiers were not believed. The warlike policy of Thiers was opposed to his own convictions. The treaty of the 15th July was signed without his knowledge and executed in the teetl of his remonstrances. For some weeks Europe seemed to be on the brink of war, until the king put an end to the crisis by refusing his assent to the military pre- parations of Thiers, and by summoning Guizot from Lon- don to form a ministry and to aid his Majesty in what he termed "ma lutte tenace contre l'anarchie." Thus began, under dark and adverse circumstances, on the 29th October 1840, the important administration in which Guizot remained the master-spirit for nearly eight years. He himself took the office of minister for foreign affairs, to which he added some years later, on the retirement of Marshal Soult, the ostensible rank of prime minister. His first care was the maintenance of peace and the restoration of amicable relations with the other powers of Europe. If he succeeded, as he did succeed, in calming the troubled elements and healing the wounded pride of France, the result was due mainly to the indomitable courage and splendid eloquence with which he faced a raging opposition, gave unity and strength to the conservative party, who now felt that they had a great leader at their head, and appealed to the thrift and prudence of the nation, rather than to their vanity and their ambition. In his pacific task he was fortunately seconded by the formation of Sir Robert Peel's administration in England, in the autumn of 1841. Between Lord Palmerston and Guizot there existed unhappily an incompatibility of character exceedingly dangerous in the foreign ministers of two great and in some respects rival countries. With Lord Palmerston in office, Guizot felt that he had a bitter and active antag- onist in every British agent throughout the world; the combative element

was strong in his own disposition ; and the result was a system of perpetual conflict and counter- intrigues. Lord Palmerston held (as it appears from his own letters) that war between England and France was, sooner or later, inevitable. Guizot held that such a war would be the greatest of all calamities, and certainly never contemplated it. In Lord Aberdeen, the foreign secretary of Sir Robert Peel, Guizot found a friend and an ally perfectly congenial to himself. Their acquaintance in London had been slight, but it soon ripened into mutual regard and confidence. They were both men of high principles and honour; the Scotch Presbyterianism which had moulded the faith of Lord Aberdeen was reflected in the Huguenot minister of France; both were men of ex- treme simplicity of taste, joined to the refinement of scholar- ship and culture; both had an intense aversion to war and felt themselves ill-qualified to carry on those adventurous operations which inflamed the imagination of their respec- tive opponents. In the eyes of Lord Palmerston and Thiers their policy was mean and pitiful; but it was a policy which secured peace to the world, aud united the two great and free nations of the West in what was termed the entente cordiale. Neither of them would have stooped to snatch an advantage at the expense of the other; they held the common interest of peace and friendship to be paramount ; and when differences arose, as they did arise, in remote parts of the world,—in Tahiti, in Morocco, on the Gold Coast,-—they were reduced by this principle to their proper insignificance. The opposition in France denounced Guizot's foreign policy as basely subservient to England. He replied in terms of unmeasured contempt, —"You may raise the pile of calumny as high as you will; vous m'arriverez jamais & la hauteur de mon dédain!" The opposition in England attacked Lord Aberdeen with the same reproaches, but in vain. King Louis Philippe visited Windsor. The queen of England (in 1843) stayed at the

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Chateau d'Eu. In 1845 British and French troops fought side by side for the first time in an expedition to the River Plate.

The fall of Sir Robert Peel's Government in 1846 changed these intimate relations; and the return of Lord Palmerston to the foreign office led Guizot to believe that he was again exposed to the passionate rivalry of the British cabinet. A fricndly understanding had been established at Eu between the two courts with reference to the future marriage of the young queen of Spain. The language of Lord Palmerston and the conduct of Sir Henry Bulwer at Madrid led Guizot to believe that this understanding was broken, and that it was intended to place a Coburg on the throne of Spain. Determined to resist any such intrigue, Guizot and the king plunged headlong into a counter- intrigue, wholly inconsistent with their previous engage- ments to England, and fatal to the happiness of the queen of Spain. By their influence she was urged into a marriage with a despicable offset of the house of Bourbon, and her sister was at the same time married to the youngest son of the French king, in direct violation of Louis Philippe's promises. This transaction, although it was hailed at the time as a triumph of the policy of France, was in truth as fatal to the monarch as it was discreditable to the minister, It was accomplished by a mixture of secrecy and violence. It was defended by subterfuges. By the dispassionate judgment of history it has been universally condemned. Its immediate effect was to destroy the Anglo-French alliance, and to throw Guizot into closer relations with the reactionary policy of Metternich and the Northern courts.

The history of Guizot's administration, the longest and the last which existed under the constitutional monarchy of France, bears the stamp of the great qualities and the great defects of his political character, for he was throughout the master-spirit of that Government. His first object was to unite and discipline the conservative party, which hal been broken up by previous dissensions and ministerial changes. In this he entirely succeeded by his courage and eloquence as a parliamentary leader, and by the use of all those means of influence which France too liber- ally supplies to a dominant minister. No one ever doubted the purity and disinterestedness of Guizot's own conduct, He despised money ; he lived and died poor; and

though he encouraged the fever of money-getting in the French nation, his own habits retained their primitive simplicity. But he did not disdain to use in others the baser passions from which he was himself free. Some of his instruments Were mein; lle employed them to deal with meanness after its kind. Gross abuses and breaches of trust came to light even in the ranks of the Government, and under an incor- ruptible minister the administration was denounced as corrupt. Licet uti alieno vitio is a proposition as false in politics as it is in divinity.

Of his parliamentary eloquence it is impossible to speak too highly. It was terse, austere, demonstrative, and com- manding,—not persuasive, not humorous, seldom adorned, but condensed with the force of a supreme authority in the fewest words. He has been heard to say that he sel- dom had occasion to address the chambers for more than twenty minutes at a time, except when despatches were read. The consequence was that the audience hung upon his words with breathless attention. Not a syllable, not an inflexion of the voice was lost,—nothing was repeated ; and when he ceased, it seemed as if the waves of an ocean had been spell-bound by his voice. He was essentially a Ministerial speaker, far more powerful in defence than in Opposition. Like Pitt he was the type of authority and resistance, unmoved by the brilliant charges, the wit, the gaiety, the irony, and the discursive power of his great rival. Nor was he less a master of parliamentary tactics,

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and of those sudden changes and movements in debate, which, as in a battle, sometimes change the fortune of the day. His confidence in himself, and in the majority of the chamber which he had moulded to his will, was unbounded ; and long success and the habit of authority led him to forget that in a country like France there was a people out- side the chamber elected by a small constituency, to which the minister and the king himself were held responsible,

A Government based on the principle of resistance and repression and marked by dread and distrust of popular power, a system of diplomacy which sought to revive the traditions of the old French monarchy, a sovereign who largely exceeded the bounds of constitutional power and

whose obstinacy augmented with years, a minister who, though far removed from the servility of the courtier, was too obsequious to the personal influence of the king, were all singularly at variance with the promises of the Revolution of July, and they narrowed the policy of the administration. Guizot's view of politics was essentially historical and philo- sophical. His tastes and his acquirements gave him little insight into the practical business of administrative govern- ment. Of finance he knew nothing; trade and comnierce were strange to him, and he has been heard to express astonishment at the paramount importance Sir Robert Peel attached to his commercial policy ; military and naval affairs were unfamiliar to him; all these subjects he dealt with by second hand through his friends Dumon, Duchatel, or Marshal Bugeaud. The consequence was that few measures of practical improvement were carried by his administration. Still less did the Government lend an ear to the cry for parliamentary reform. On this subject the king's prejudices were insurmountable, and his ministers had the weakness to give way to them. Being asked after the Revolution of 1848 whether he thought the action and extra-constitutional influence of King Louis Philippe had been beneficial or injurious to the monarchy, Guizot replied that in the earlier years of the king's reign it had been of great use in strengthening the government and restoring order, but that in the later years it had been injurious to constitutional government and to the monarchy itself, It obviously drew down upon the king that re- sponsibility which should have rested entirely on his minis- ters; and on the question of reform he was even more to be blamed than they were. It was impossible to defend a system which confined the suffrage to 200,000 citizens, and returned a chamber of whom half were placemen. Nothing would have been easier than to strengthen the conservative party by attaching the suffrage to the possession of land in France, but blank resistance was the sole answer of the Government to the just and moderate demands of the opposition. Warning after warning was addressed to them in vain by friends and by foes alike; and they re- mained profoundly unconscious of their danger till the moment when it overwhelmed them. It was the old old story of a hopeless conflict between a court, obstinately addicted to an effete theory of government, and the ris- ing will of a nation, when a little timely and honest con- cession would have arrested the catastrophe. Strange to say, Guizot never acknowledged either at the time or to his dying day the nature of this error; and he speaks of himself in his memoirs as the much enduring

champion of liberal government and constitutional law. He utterly fails to perceive that a more enlarged view of the liberal destinies of France and a less intense confidence in his own specific theory might have preserved the constitutional monarchy and averted a vast series of calamities, which were in the end fatal to every priuciple he most cherished. But with the stubborn conviction of absolute truth he dauntlessly adhered to his own doctrines to the end. The last scene of his political life was singularly characteristic

of his inflexible adherence to a lost cause. In the afternoon of February 23, 1848, the king summoned his minister from the chamber, which was then sitting, and informed him that the aspect of Paris and the couutry during the banquet agitation for reform, and the alarm and division of opinion in the royal family, led him to doubt whether he could retain his ministry. That doubt, replied Guizot, is decisive of the question, and instantly resigned, returning to the chamber only to announce that the administration was at an end, and that Molé had been sent for by the king. Molé failed in the attempt to form a Government, and between midnight and one in the morning Guizot, who had according to his custom retired early to rest, was again sent for to the Tuileries. The king asked his advice. 'We are no longer the ministers of your Majesty," replied Guizot; "it rests with others to decide on the course to be pursued. But one thing appears to be evident: this street riot must be put down; these barricades must be taken; and for this purpose my opinion is that Marshal Bugeaud should be invested with full power, and ordered to take the necessary military measures, and as your Majesty has at this moment no minister, J am ready to draw up and countersign such an order." The marshal, who was present, undertook the task, saying, "I have never been beaten yet, and I shall not begin to-morrow. The barricades shall be carried before dawn." After this dis- play of energy the king hesitated, and soon added: "I ought to tell you that M. Thiers and his friends are in the next room forming a Government!" Upon this Guizot rejoined, "Then it rests with them to do what they think fit," and left the palace. Thiers and Barrot decided to with- draw the troops. The kiug and Guizot next met at Claremont. This was the most perilous conjuncture of Guizot's life, but fortunately he found a safe refuge in Paris for some days in the lodging of a humble miniature painter whom he had

befriended, and shortly afterwards effected his escape across the Belgian frontier and thence to London, where he arrived on the 8d March. His mother and daughters had preceded him, avd he was speedily installed in a modest habitation in Pelham Crescent, Brompton.

The society of England, though many persons disapproved of much of his recent policy, received the fallen statesman with as much distinction and respect as they had shown eight years before to the king's ambassador. Sums of money were placed at his disposal, which he declined, A professorship at Oxford was spoken of, which he was un- able to accept. His old friends resumed their relations with him. For himself, serene and undisturbed by a catastrophe which had shaken Europe, he immediately collected a few books and resumed the narrative of the Britisl common-wealth, until he brought it down to Monk and Richard Cromwell.

Guizot survived the fall of the monarchy and the government he had served twenty-six years, He passed abruptly from the condition of one of the most powerful and active statesmen in Europe to the condition of a philo-sophical and patriotic spectator of haman affairs. He was aware that the link between himself aud public life was broken for ever; and he never made the slightest attempt to renew it. He was of no party, a member of no political body; no murmnr of disappointed ambition, no language of asperity, ever passed his lips; it seemed as if the fever of oratorical debate and ministerial power had passed from him and left him a greater man than he had been before, in the pursuit of letters, in the conversation of his friends, and as head of the patriarchal circle of those he loved. The greater part of the year he spent at his residence at Val Richer, an Augustine monastery near Lisieux in Normandy, which had heen sold at the time of the first

kept his house.

Revolution. His two daughters, who mairied two descend- ants of the illustrious Dutch family of De Witt, so con-

genial in faith and manners to the Huguenots of France, One of his sons-in-law farmed the estate. And here Guizot devoted his later years with undiminished energy to literary labour, which was in fact his chief means of

subsistence. Proud, independent, simple, and con- tented he remained to the last; and these years of retire- ment were perhaps the happiest and most serene portion of his life.

Two institutions may be said even under the second empire to have retained their freedom—the Institute of France and the Protestant Consistory. In both of these Guizot continued to the last to take an active part. He was a member of three of the five academies into which the Institute of France is divided. The Academy of Moral and Political Science owed its restoration to him, and he became in 1832 one of its first associates. The Academy of Inscriptions and Belles Lettres elected him in 1833 as the successor to M. Dacier; andin 1836 he was chosen a member of the French Academy, the highest literary dis- tinction of the country. In these learned bodies Guizot continued for nearly forty years to take a lively interest and to exercise a powerful influence. He was the jealous champion of their independence. His voice had the greatest weight in the choice of new candidates; the younger gene- ration of French writers never looked in vain to him for encouragement; and his constant aim was to maintain the dignity and purity of the profession of letters.

In the consistory of the Protestant church in Paris Guizot exercised a similar influence. His early education and his experience of life conspired to strengthen the con- victions of a religious temperament. He remained through life a firm believer in the truths of revelation, and a volume of Meditations on the Christian Religion was one of his latest works. But thongh he adhered inflexibly to the church of his fathers and combated the rationalist ten- dencies of the age, which seemed to threaten it with destruc- tion, he retained not a tinge of the intolerance or asperity of the Calvinistic creed. He respected in the Church of Rome the faith of the majority of his countrymen ; and the writings of the great Catholic prelates, Bossuet and Bonr- daloue, were as familiar and as dear to him as those of his own persuasion, and were commonly used by him in the daily exercises of family worship.

In these literary pursnits and in the retirement of Val Richer years passed smoothly and rapidly away; and as his grandchildren grew up around him, he began to direct their attention to the history of their country. From these

lessons sprang his last and not his least work, the Z/istovre de France racontée & mes petits enfants, for although this publication assumed a popular form, it is not less complete and profound than it is simple and attractive. The work extends to five large volumes, and has been brought down to the present time by his accomplished daughter Madame Guizot de Witt, from ler father's notes.

Down to the summer of 1874 Guizot's mental vigour and activity were unimpaired. His frame, temperate in all things, was blessed with a singular immunity from infirmity and disease ; but in the month of September of that year the vital power ebbed away, and he passed gently, reciting now and then a verse of Corneille or a text of Scripture, into his rest.

Public life, ambition, the love of power, and the triumph of debate no doubt shook and agitated lis carcer, and some- times misdirected it ; but they produced no effect upon the solid structure of his character, which remained throughout perfectly simple, indifferent to wealth, and prouder of its own integrity than of all the honour the world could bestow. "M. Guizot will be remembered in history less by

what he did as a politician than by what he wrote as a man of letters, and by what he was as aman; and in these respects he takes rank amongst the most illustrious repre- sentatives of his nation and his age, (H. R.)

GUJARAT. See Guzerar,

GUJRANWALA, a British district in the Punjab, lying between 31° 32' and 32° 33' N, lat., and between 73° 11' 30" and 74° 28°15" E. long., with an area (1877) of 2563 square iniles, and population (1868) of 550,576. It is bounded on the N.W. by the river Chendb, on the S. and 8.E. by the districts of Jhang and Lahore, and on the E. by the district of Sialkot. This district forms the central portion of the Rechna Dodb, intermediate between the fertile submontane plains of Sidlkot and the desert expanses of Jhang. On the northern frontier, a belt of alluvial land, some 2 to 6 miles in breadth, fringes the Chenab through- out its course. The southern portion of the plateau has a rich soil, with accessible water ; the villages here lie close

together, while the people are careful and industrious cultivators. But further south the ground becomes harder and drier until in the extreme south the ddr, a flat expanse of barren land, passes slowly into the desert of J hang. In the south-east corner of the district, the little river Degh irrigates and fertilizes a tiny valley of its own. Two or tliree minor watercourses are used for the purposes of irrigation in the villages through which they pass. The country is very bare of trees, and the scenery throughout is tame and in the central plateau becomes very monotonous.

The district of Gujrinwala is essentially a modern one ; yet it can claim considerable relics of the past, constructed during an early period of prosperity. It seems likely that the district once contained the capital of the Punjab, at an epoch when Lahore had not begun to exist, We learn from the Chinese Buddhist pilgrim, Hiouen Thsang, that about the year 630 he visited a town known as Tse-kia (or Taki), the metropolis of the whole country of the five rivers. A mound near the modern village of Asazur has been identified as the site of the ancient capital. Until the Mahometan invasions little is known of Gujranwala except that Taki had fallen into oblivion and Lahore had become the chief city. Under Mahometan rule the district flour- ished for a time; but a mysterious depopulation fell upon the tract, and the whole region seems to have been almost entirely abandoned. At the first beginning of the Sikh war, the waste plains of Gujrdnwdla were seized by vari- ous military adventurers. Charat Sinh took possession of the village of Gujranwala, and here his grandson the great mahdrajaé Ranjit Sinh was born. The Sikh rule, which was elsewhere so disastrous, appears to have been an unmitigated benefit to this district. Ranjit Sinh settled large colonies in the various villages, and encouraged culti- vation throughout the depopulated plain. In 1847 the district came under British influence, in connexion with the regency at Lahore; and in 1849 it was included in the territory annexed after the second Sikh war. Since that time Gujranwéla has enjoyed an immunity from the cata- strophes of history, with the exception of the events of 1857, which belong to the general annals of India.

The population in 1868 numbered 550,576 persons, —306, 296 males and 244,280 females. In religion, the district is mainly Mahometan. There were five towns, namely, Gujranwala, Wazirabad, Ramnagar, Eminabad, and Akalgarh, with a population aggregating 54,458 Persons. The total

cultivated area of the district. amounts to 567,849 acres, while the cultivable margin reaches the high figure of 701,761 acres. The staple crop is wheat, which occupies one- third of the cultivated area. The other products arc—barley, gram, tobaceo, oil-sceds, vegetables, rice, Indian eorn, pulses, cotton, and sugarcane. Irrigation is very general, 327,832 acres being artificially watered. The trade of the district is unimportant. The chief exports are agricultural produce, brass vessels, leathern bottles, and timber. The imports consist of salt, iron, cattle, spices, and English piece-goods, A great religious fair is held at Dhonkal.

| courts.

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The principal channel of communication is the Northern State Railway from Lahore to Peshawar. The Grand Trunk road, con- necting the same two places, traverses the distriet for 42 miles, There are 1055 miles of unmetalled road in Gujranwala, besides a number of local by-ways. The Chen4b is navigable throughout for the boats of the country. 'The revenue in 1871 was £53, 560. In 1872-73 the district contained 192 civil and 19 magisterial

The total police force numbered 593 men, supplemented by 1092 village watchmen. Education is still very backward ; the pupils in 1873 numbered in all 5818, maintained at a cost of £2469, 'The mean monthly temperature in 1867 ranged from 53° in January to 95° in June. The average rainfall for the eleven years ending 1867 was 24 inches. The prevalent diseases are inter- nuttent fever and small-pox. The death-rate in 1872 amounted to 12,592, or 23 per thousand of the population.

GusRANWwALa, the chief town and administrative head- quarters of tlie above district, in 32° 9' 30" N. lat. and 74° 14' E. long., with a population in 1868 of 19,381, The town is situated on the Grand Trunk road and Northern State Railway, 40 miles north of Lahore. It is of modern creation, and owes its importance to the father and grand- father of Maharaja Ranjit Sinh, whose capital it formed during the early period of the Sikh power. There is a mausoleum to Mahan Sinh, father of Ranjit Sinh, and a lofty cupola covers a portion of the ashes of the maharaja himself. The civil

station lies a mile south-east of the native town. It contains the court-house, treasury, jail, dispensary, post-office, staging bungalow, and church.

GUJRAT, or Goosrat, a British district in the Punjab, lying between 32° 10' 30" and 33° N. lat., and between 73° 20' and 74° 31' E. long. ; area (1877), 2029 square miles ; population (1868), 616,347 souls. It is bounded on the N.E. by the native state of Kashmir, on the N.W. by the river Jhilam, on the W. by Shahpur district, and on the S.E. by the rivers Tavi and Chendb. The district of Gujrat comprises a narrow wedge of sub-Himdlayan plain country, possessing few natural advantages. From the basin of the Chendb on the south the general level rises rapidly towards the interior, which, owing to the great distance of the water beneath the surface, assumes a dreary and desert aspect. A range of low hills, known as the Pabbi, traverses the northern angle of Gujrat. They are composed of a friable Tertiary sandstone and conglomerate, totally destitute of vegetation, and presenting to the view a mere barren chaos of naked rock, deeply scored with pre- cipitous ravines. Immediately below the Pabbi stretches a high plateau, terminating abruptly in a precipitous bluff some 200 feet in height. At the foot of this plateau is a plain, which forms the actual valley of the Chentb and participates in the irrigation from the river bed. The district as a whole is well wooded, and great attention has been paid to arboriculture.

Numerous relics of antiquity stud the surface of Gujrat district. Mounds of ancient construction yield numbers of early coins, and bricks are found whose size and type prove them to belong to the prehistoric period of Hindu architec- ture. A mound now occupied by the village of Moga or Mong has been identified as the site of Nicwa, the city built by Alexander the Great on the field of his victory over Porus. The Delhi empire established its authority in this district under Bahlol Lodi (1450-1488). A cen- tury later it was visited by Akbar, who founded Gujrat as the seat of government. During the decay of the Mughal power, the Ghakkars of Rawal Pindi overran this portion of the Punjab and established themselves in Gujrat about 1741. Meanwhile the Sikh power had been asserting itself in the eastern Punjab, and in 1765 the Ghakkar chief was defeated by Sardar Gujar Sinh, chief of the Bhangi con- federacy. On his death, his son succeeded him, but after a few months' warfare, in 1798, he submitted

himself as vassal to the mahdrdjé Ranjit Sinh. In 1846 Gujrat first came under the supervision of British officials, Two years

later the district became the theatre for the important engagements which decided the event of the second Sikh war. After several bloody battles in which the British were unsuccessful, the Sikh power was irretrievably broken at the engagement which took place at Gujrat on the 22d of February 1849. The Punjab lay at the feet of the con- querors, and passed by annexation under British rule.

The census of 1868 disclosed a population of 616,347 persons,— 331,919 males, and 284,428 females,—of whom 587,696 were Mahometans, 53,174 Hindus, and 20,653 Sikhs. In 1875-76 the district contained four municipal towns with a population exceeding 5000—Gujrat, 17,391; Jalalpur, 14,022; Kunjah, 5354; and Dinga, 5077. Wheat forms the staple product of the district, while barley, gram, rice, pulses, oil-seeds, and cotton also cover considerable areas. Of the 708,868 acres under cultivation, 267,893 acres are provided with artificial irrigation. The chief exports are grain, ght, wool, and other agricultural produce. The imports come chiefly from Lahore, Amritsar, Jammu, and Pind Dadan Khan. The Northern State Railway passes through the district from south-east to north- west, and affords a new outlet for traffic. Good branch lines of road connect Gujrat with all surrounding centres. The revenue in 1875-76 was £64,425. In the same year there were 11 civil and revenue judges. The police force (1875-76) numbered 514 men, supplemented by a body of 620 village watchmen. The number of state-supported schools amounted to 47 in 1875-76, having a joint roll of 3600 pupils. The cost of education is returned at £1613. The district school at Gujrdt ranks as one of the eight '¢higher class " schools of the Punjab. Gujrat bears the reputation of being a healthy district ; small-pox, fever, and ague occasionally prevail. The death rate (1875-76) was 18 per thousand of the population. The district contains 6 charitable dispensaries, giving relief in 1875 to 31,788 persons. The annual average rainfall dur- ing eight years ending 1873-74 was 28°5 inches. The fall is regular, and the district on the whole does not suffer much from drought.

GusrAt, the chief town and administrative headquarters of the above district, in 32° 34’ 30” N. lat. and 74° 7’ 15" E. long., with a population of 17,391, stands upon an ancient site, formerly occupied, according to tradition, by two successive cities, the second of which is supposed to have been destroyed in 1303, the year of an early Mughal invasion of Delhi. Nearly 200 years later Sher Shah turned his attention to the surrounding country, and either he or Akbar founded the existing town. Though standing in the midst of a JAt neighbourhood, the fort was first garrisoned by Gujars, and took the name of Gujrat Akbardbad. The town was rendered memorable during the second Sikh war by the battle which takes its name from this site, and which decided the fate of the campaign, bringing the whole Punjab at once under British rule. Akbar’s fort, largely improved by Gujar Sinh, stands in the centre of the town. The civil station lies to the north of the native city, and contains the court-house, treasury, jail, dispensary, police-lines, staging bungalow, and post-office. The trade of Gujrat is inconsiderable.

GULF STREAM. See ATLANTIC.

GULL (Welsh, Gwylan; French, Goéland), the name commonly adopted, to the almost entire exclusion of the old English Mrw (Icelandic, Mdfur; Danish, Maage ; Swedish, Mase; German, Meve; Dutch, Meeww; French, Mouette), for a group of Sea-birds widely and commonly known, all belonging to the genus Larus of Linnzus, which subsequent systematists have broken up in a very arbitrary and often absurd fashion. The Family Laride is composed of two chief groups, Zaring and Sternina—the Gulls and the Terns, though two other Subfamilies are frequently counted, the Skuas (Stercorarwne), and that formed by the single genus Rhynchops, the Skimmers ; but there seems no strong reason why the former should not be referred to the Larine and the latter to the Sternine.

Taking the Gulls in their restricted sense, Mr Howard Saunders, who has lately subjected the group to a rigorous revision (Proc. Zool. Society, 1878, pp. 155-211), admits forty-nine species of them, whicli he places in five genera instead of the many which some prior investigators had sought to establish. Of the genera recognized by him,

Pagophila and Rhodostethia have but one species each, Rissa and Xema two, while the rest belong to Larus. The Pagophila is the so-called Ivory-Gull, P. eburnea, names which hardly do justice to the extreme whiteness of its plumage, to which its jet-black legs offer a strong contrast. The young, however, are spotted with black. An inhabit- ant of the most northern seas, examples, most commonly young birds of the year, find their way in winter to more temperate shores. Its breeding-place has seldom been dis- covered, and the first of its eggs ever seen by ornithologists was brought home by Sir L. M'Clintock in 1853 from Cape Krabbe (Journ. R. Dubl. Society, i. p. 60, pl. 1); others were subsequently obtained by Dr Malmgren in Spits- bergen. Of the species of /issa, one is the abundant and well-known Kittiwake, R. tridactyla, of cireumpolar range, breeding, however, also in comparatively low latitudes, as on the coasts of Britain, and in winter frequenting southern waters. The other is 2. brevirostris, limited to the North Pacific, between Alaska and Kamchatka. The singular fact requires to be noticed that in both these species the hind toe is generally deficient, but that examples of each are occasionally found in which this functionless member has not wholly disappeared. We have then the genus Larus, which ornithologists have hitherto attempted most unsuccessfully to subdivide. It contains the largest as well as the smallest of Gulls. In some species the adults assume a dark-coloured head every breeding-season, in others any trace of dark colour is the mark of immaturity. The larger species prey fiercely on other kinds of birds, while the smaller content themselves with a diet of insects and worms. But however diverse be the appearance, struc- ture, or habits of the extremities of the series of species, they are so closely connected by intermediate forms that it is hard to find a gap between them that would justify a generic division. Of the forty-three species of this genus recognized by Mr Saunders it would be impossible within the limits of this article to attempt to point out the peculiarities. About fifteen belong to Europe and fourteen to North America, of which (excluding stragglers) some five only are common to both countries. Our knowledge of the geogra- phical distribution of several of them is still incomplete. Some have a very wide range, others very much the reverse, as witness L. fuliginosus, believed to be confined to the Galapagos, and Z. scopulinus and L. bullert to New Zealand,—the last indeed perhaps only to the South Island. The largest

species of the group are the Glaucous and Greater Black-backed Gulls, Z. glaucus and L. marinus, of which the former is circumpolar, and the latter nearly so— not being hitherto found between Labrador and Japan. The smallest species is the European Z. minutus, though the North-American L. philadelphia does not much exceed it in size. Many of the Gulls congregate in vast numbers to breed, whether on rocky cliffs of the sea-coast or on heathy islands in inland waters. Some of the settlements of the Black-headed or " Peewit " Gull, Z. ridibundus, are a source of no small profit to their proprietors,—the eggs, which are rightly accounted a great delicacy, being taken on an orderly system up to a certain day, and the birds carefully protected. Ross's or the Roseate Gull, Rhodostethia rosea, forms a well-marked genus, distinguished not so much by the pink tint of its plumage (for that is found in other species) but byits small Dove-like bill and wedge-shaped tail, It is an exceedingly scarce bird, little more than a dozen examples being known to exist in collections. Beyond its having an Arctic habitat, little has yet been ascertained about it. More rare still is one of the species of Xema, A. furcatum, of which only two specimens, both believed to have come from the Galapagos, have been seen. Its smaller congener Sabine's Gull, XY. sabinii, is more common, and has been found breeding both in Arctic America and

in Siberia, and several examples, chiefly immature birds, have been obtained in the British Islands. Both species of Xema are readily distinguished from all other Gulls by their forked tails, A. N.)

GUM exists in the juices of almost all plants, but is produced in its purest form by various species of Acacia, eg., Acacia Verek (Guil. and Perrottet), A. horrida, A. arabica (Wildenow), A. Seyel (Delile), and A. stenocarpa (Hochst.). The name is applied to those exudations from plants, stems, branches, or fruits which are entirely soluble or soften in water, and form with it a thick glutinous liquid or mucilage insoluble in alcohol of 60 per cent., and yield mucic and oxalic acids when treated with nitric acid. In structure gum is quite amorphous, being neither organized like starch nor crystallized like sugar, According to Trecul, the acacias and the Rosacee yield their gums most abundantly when sickly and in an abnormal state,

caused by a fulness of sap in the young tissues, whereby the new cells are softened and finally disorganized ; the cavities thus formed fill with liquid, which exudes, dries, and con- stitutes the gum.

The chief varieties have hitherto been divided as follows :—(1) gum arabic, (2) gum tragacanth, (3) cherry tree gum, (4) gum of Bassora, (5) mucilage. The artificial gum dextrin has been already treated of, vol. vii, p. 146.

Gum Arabic may be taken as the type of the gums entirely soluble in water. The principal kinds are dis- tinguished as Turkey Picked Gum, Gedda, Amrad, Gheziri, Senegal, Talca, Australian, Barbary, Cape, and East India (from Bombay and Aden), Another variety, spoken of as likely, from its abundance, to be soon in the market, is obtained from the Prosopis dulcis, a leguminous plant, and is called gum mesquite or mezquite ; it comes from Western Texas and Mexico, and is yellowish in colour, very brittle, and quite soluble in water (Pharm. Journ. (3), vol. vi. p. 942).

Gum arabic occurs in pieces of varying size, and some kinds are full of minute cracks. The specific gravity of Turkey picked gum (the purest variety) is 1°487, or, when dried at HOO" C., 1°525. It is solyble in water to an indefinite extent ; boiled with dilute sulphuric acid it is converted first into dextrin, and then into a fermentable variety of sugar. Moderately strong nitric acid changes it into mucic, saccharic, tartaric, and oxalic acids. Under the influence of yeast it does not enter into the alcoholic fermentation, but Berthelot, by digesting with chalk and cheese, obtained from it 12 per cent. of its weight of alcohol, along with lactate of calcium, but uo appreciable uantity of sugar. According to Frémy, gum arabic may be vega asa potassium and calcium salt of gummic or arabic acid, of the formula Cak CoH 9.01). 6CyoH.0,)- Graham (Chemical and Physical Re- searches) gives dialysis as the simplest and best mode of preparing gummie acid, and states that the power of gum to penetrate the colloid septum is 400 times less than that of chloride of sodium, and further that by mixing the gum with substances of the crystalloid class the diffusibility is lowered, and may be even reduced to nothing. The mucilage must be acidulated with hydrochloric acid before dialysing, to set free the gummic acid. Gummic acid reddens litmus, its reaction being about equal to carbonic acid. When solutions of gum arabic and gelatin are mixed, oily drops of 4 compound of

the two are precipitated, which on standing form a nearly colourless jelly, melting at 25° C., or by the heat of the hand.

Ms substance can be washed without decomposition. Gummic acid is soluble in water; when well dried at 100° C., it becomes transformed into metagummic acid, which is insoluble, but swells up in water like gum tragacanth,

Gum arabic, when heated to 150°C. with two parts of acetic anhydride, swells up toa mass which, when washed with boiling water, and then with alcohol, gives a white amorphous insoluble powder called acetyl arabin CsH,(C,H,0).0;. It is saponified by alkalies, with reproduction of soluble gum. Gum arabic is not Precipitated from solution by alum, stannous chloride, sulphate or nitrate of copper, or neutral lead acetate ; with basic lead acetate it forms a white jelly, with ferric chloride it yields a stiff clear gelatinoid mass, and its solutions are also precipitated by borax.

| > ° ° . ® he finer varieties are used as an emollient and demulcent In medicine, and in the manufacture of confectionery ; the commoner qualities are used as an adhesive paste, for

giving lustre to crape, silk, &e., in cloth finishing to stiffen the fibres, and in calico-printing. For labels, &e., it is usual to mix sugar or glycerin with it to prevent it from cracking,

Physiologically nothing is yet definitely known of gum as a food material. Animals fed thereon soon die of inanition. Lehmann says it is not absorbed by the system, but according to Pavy, it is to a slight extent, as shown by the formation of amyloid substance in the liver of subjects fed on gum.

Gum senegal, a variety of gum arabic produced by A. Verek, occurs in pieces generally rounded, of the size of a pigeon's egg, and of a reddish or yellow colour, and Specific gravity 1-436. It gives with water a somewhat stronger mucilage than gum arabic, from which it is distinguished by its clear interior, fewer cracks, and greater toughness. It is imported from the

river Gambia, and from Senegal and Bathurst, and is collected in December and March yearly.

Chagual gum, a new variety brought from St Iago de Chili, resembles gum senegal. About 75 per cent. is soluble in water. Its solution is not thickened by borax, and is precipitated by neutral lead acetate 3 and dilute sul- phuric acid converts it into dextro-glucose.

The imports of gum arabic into England during 1878 (including all the varieties) may be estimated as follows :-—

Tons, Value,

Imports to London, about…..... 1064 £40,000 9 Liverpool, 5 …..... 1554 77,000 2618 £117,000

Of this about one-half is exported. These figures are only approximate, as, since the repeal of the duties in 1845, the returns do not discriminate between the various descriptions which are all classed together under the head of gum.!-

Gum Tragacanth, familiarly called gum dragon, exudes from the stem, the lower part especially, of the various species of Astragalus, and is collected in Asia Minor, the chief port of shipment being Smyrna. Formerly only what exuded spontaneously was gathered ; this was often of a brownish colour; but now the flow of the gum is

| aided by incisions cut near the root, and the product is

tle fine, white, flaky variety so much valued in com- merce. The chief flow of gum takes place during the night, and hot and dry weather is the most favourable for its production.

In colour gum tragacanth is of a dull white ; it occurs in horny, flexible, and tough, thin, twisted flakes, translucent, and with peculiar wavy lines on the surface. When dried at temperatures under 100° C. it loses about 14 per cent. of water, and is then easily powdered. Its specific gravity is 1°384. With water it swells by absorption, and with even fifty times its weight of

that liquid forms a thick mucilage. Part of it only is soluble in water, and that resembles gummic acid in being precipitated by alcohol and ammonium oxalate, but differs from it in giving a precipitate with neutral lead acetate'and none with borax. The insoluble part of the gum is a calcium salt of bassorin (C,,H» 0,9), which is devoid of taste and smell, forms a gelatinoid mass with water, but by con- tinued boiling is rendered soluble, owing, according to M. Giraud, to its being changed into pectin. A small quantity of starch is always naturally present in gum tragacanth. 'The composition of gum tragacanth is generally given as arabin 53 per cent., bassorin and starch 83, water 11 (but M. Giraud considers its composition to be water 20 per cent.), mineral matter 3, a pectinous principle (apparently identical with the pectose of Fremy) 60, soluble gum 10, cellulose 3, starch 8, mineral matter 3, with traces of nitro- genous matter. Graham (Chemical and Physical Researches, p. 589) speaks of its being likely that native gums insoluble in water are the pectous form of soluble gum, and Giraud's experiments point to the correctness of that surmise.

2 = See ee

1 For varieties of gum arabic, see Pharmacographia, pp. 209, 210; Catalogue Museum Pharm. Soc., pp. 37, 38; also Pereira, Mat. Med., vol. ii., pt. iL, p. 884 ; for physiological properties, Pavy, Moods and Dietetics, 2d ed., pp. 112, 488 ; and for chemistry, Watts's Dictionary, vol. ii. p. 953.

Gum tragacanth is used in calico-printing as a thickener of colours and mordants; in medicine as a demulcent and vehicle for insoluble powders, and as an excipient in pills; and for setting and mending beetles and other insects. The imports during 1878 were—

Packages. Value. Towlbondoneeseseccctee 1. eaten Coe 2570 £46,200 To Liverpool, about….. Sorcerer 1200 21,600

3770 £67,800

Gum kuteera resembles in appearance gum tragacanth, for which the attempt has occasionally been made to substitute it. It is said to be the

product of Sterculea wrens, a plant of the natural order Sterculdacece, and is un- known to British commerce.

Cherry Tree Gum is an exudation from trees of the genera Prunus and Cerasus. It occurs in shiny reddish lumps, resembling the commoner kinds of gum arabic. With water, in which it is only partially soluble, it forms a thick mucilage. The soluble portion is arabin, the insoluble cerasin, which according to Frémy is a calcium salt of meta- gummi acid (C,,H,,0,,). It is not used commercially.

Gum of Bassora, from Bassora or Bussorah in Asia, is sometimes imported into the London market under the name of the hog tragacanth, It is insipid, crackles between the teeth, occurs in variable-sized pieces, is tough, of a yellowish-white colour, and opaque, aud has properties similar to gum tragacanth. Its specific gravity is 1°3591. It contains only 1 per cent. of soluble gum or arabin.

Under the name of Caramania gum it is mixed with:

inferior kinds of gum tragacanth before exportation.

Mucilage—Very many seeds, roots, &c., when infused in boiling water, yield mucilages which, for the most part, consist of bassorin. Linseed, quince seed, and marsh- mallow root yield it in large quantity (see also GuMBo). In their reactions the different kinds of mucilage present differences ; ¢.g., quince seed yields only oxalic acid when treated with nitric acid, and with a solution of iodine in zinc iodide it gives, after some time, a beautiful red tint. Linseed does not give the latter reaction; by treat- = with boiling nitric acid it yields mucic and oxalic acids.

Gum Resins. —This term is applied to the inspissated milky juices of certain plants, which consist of gum soluble in water, resin and essential oil soluble in alcohol, other vegetable matter, and a small amount of mineral matter. They are generally opaque and solid, and often brittle. Their chief uses are in medicine. They include the follow- ing :—ammoniacum, asafcetida, bdellium, euphorbium, frankincense or olibanum, galbanum, gamboge, myrrh, opoponax, sagapanum, and scammony. Several of the resins are often improperly called gums; ¢g., benzoin or ben- jamin, copal, dammar,

elemi or animi, kawrie or cowdie or Australian copal, mastic, sandrac, and shellac. (J. st.)

GUMBINNEN, the chief town of a government district of the same name in the Prussian province of East Prussia, is situated on the Pissa, an affluent of the Pregel, and on the Eastern Railway, 22 miles south-west of Eydtkuhnen on the Russian boundaries. The surrounding ccuntry is pleasant and fruitful, and the town is well built, with spacious and regular streets shaded by linden trees. It has three Evangelical churches, a synagogue, a gymnasium, a higher burgher school, a public library, a hospital, and an infirmary. In the market square there is a statue by Rauch of Frederick William I., who in 1724 raised Gum- binnen to the rank of a town, and in 1732 brought to it a number of persons who had been driven from Salzburg by religious persecution. On the bridge over the Pissa a monument has been erected to those of the inhabitants who fell in the Franco-German war of 1870-71. Iron founding and the manufacture of machinery, wool, cotton,

and linen weaving, stocking-making, tanning, brewing, and brandy-making are the principal industries, 'There are horse and cattle markets, and some trade in corn and linseed. The population in 1875 was, including the garrison, 9114.

GUMBO, or Oxra, termed also Okro, Ochro, Ketmia, Gubbo, and Syrian Mallow (Sanskrit, 7%ndisa; Bengali, Dheras; Persian, Baémiyah—the Lammia of Prosper Alpinus ; French, Gombaut, or better Gombo, and Ketime comestible), Hibiscus esculentus, L. (LF. longifolius, Roxb. ; Abelmoschus esculentus, Guill. aud Perr.), an herbaceous hairy annual plant of the natural order JJalvacee, a native of the Old World, and now naturalized or cultivated in all tropical countries. The leaves are cordate, and 3 to 5- lobed, and the flowers yellow, with a crimson centre; the ovary is 5-celled, and the fruit or pod, the Bendi-Kai of the Europeans of southern India, is a tapering, 10-angled, loculicidal capsule, 4 to 10 inches in length, except in the dwarf varieties of the plant, and contains numerous oval dark-coloured seeds, hairy at the base. Three distinct varieties of the gumbo (Quiabo and Quimgombo) in Brazil have been described by Pacheco. The unripe fruit is eaten either pickled, or prepared like asparagus. It is also an

ingredient in various dishes, ¢g., the gumbo of the Southern United States, and the calalow of Jamaica; and on account of the large amount of mucilage it contains, it is extensively consumed, both fresh and in the form of the prepared powder, for the thickening of broths and soups. For winter use it is salted, or sliced and dried. The fruit is grown on a very large scale in tle vicinity of Constanti- nople. It was one of the esculents of Egypt in the time of Abnl-Abbas el-Nebati, who journeyed to Alexandria in 1216 (Wiistenfeld, Gesch. d. Arab. Aerzte, p. 118, Gott, 1840), and, according to Popp, is still cultivated by the Egyptians, who called it Bammgé. |

The seeds of the gumbo are used as a substitute for coffee. From their demulcent and emollieut properties, the leaves and immature fruit have long been in repute in the East for the preparation of poultices and fomentations. Alpinus (1592) mentions the employment of their decoction in Egypt in ophthalmia, and in uteriue and other complaints. In the Pharmacopeia of India the decoction of the fruit is recommended in catarrh, and in diseases of the genito- urinary tract, and its hot vapour in affections of the throat and fauces.

The Musk Okra (Sanskrit, Latdkasturikd, of. the Greek kdotwp ; Bengali, Latdkasturi; German, Biswmkérncrstrauch ; French, Ket- mie musquée), Hibiscus Abelmoschus, L. (Abelmoschus moschatus. Meh.), indigenous to India, and, it is said, to Guiana and Central America, and cultivated in most warm regions of the globe, is a suffruticose plant, bearing a conical 5-ridged pod about 8 inches in length, within which are numerous brown reniform seeds, smaller than those of H. esculentws. The seeds possess a musky odour, due to an oleo-resin present in the integument, and are known to per- fumers under the name of ambrette asa substitute for musk, instead of which drug it has been proposed to employ them medicinally. They are stated to be used by the Arabs for scenting coffee. In India they are employed for perfuming medicinal oils, and being regarded as tonic and carminative form part of sundry pharmaceu- tical preparations. The seeds (in the Fantee language, /ncromda- hom), as we learn from Mr E. M. Holmes, are used in Africa as beads ; and powdered and steeped in rum they are valued in the West Indies as a remedy for snake-bites. The plant yields an exeellent fibre, and, being rich in mucilage, is employed in Upper

India for the clarifying of sugar. The best-perfumed seeds are reported to eome from Martinique.

*See P. Alpinus, De Plantis Aigypti, eap. xxvii. p. 88, Ven., 1592; Macfadyen, The Flora of Jamaica, p. 67, 1837; J. Sontheimer's Abd Allah thn Ahmad, &e., as p. 118, Stuttg., 1840-42; P. P. Pacheco, "La Ketmie Potagere ou Comestible,' La Belgique Horticole, iv. p. 63,1853; Della Sudda, ** De ' Emploi & Constantinople de la Racine de l'Hibiscus esculentus," Répert. de Pharm., Jan. 1880, p, 2293 Bentham and Hooker, Gen. Plant., i. pp. 207, 208, 1862; Grisebach, Flora of the Brit. West ind. Js. p. 84, 1864; E. J. Waring, Pharm. of India, p. 35, 1868; O. Popp, "Ueber die Aschenbestandtheile der Samen yon Acacia nilotica und Hibiscus esculentus in Aegypten," Arch. der Pharm., excv. p. 140, 1871; Hooker, Flora of Brit. india, i. pp. 342, 848, 1872; Drury, The Useful Plants of India,)P- 1, 2, 2d edit., 1873; U. C. Dutt, The Mat. Med. of the Hindus, pp. 128, 321, 1817; and Lanessan, /ist. des Drogues, i. pp. 181-184, 1878.*

GUM—GUN

GUMRI, or as it is now more frequently called ALEXx- ANDROPOL, in honour of the erapress Alexandra, a town of Russian Armenia in the province of Erivan, on the old frontier of the Turkish territory which was formed by the river Arpachai. It is situated at a height of 5268 (accord- ing to Abich, 4819) feet above the sea, On an eminence which commands the environs but is somewhat defective ina military point of view because the neighbouring valleys forma kind of screened approaches. The fortifications, erected in 1837 by command of Nicholas I., are the strongest in that part of Asia with the exception of those of Kars, and would be quite impregnable to an Eastern army. Like the ordinary houses of the town, they are built of limestone; and they consist of regular bastions case- mated and mounted with guns and surrounded with a ditch. There are several handsome Armenian churches in Gumri, one of the finest of which was built in 1872. The town passed to Russia by the peace of Adrianople. In 1840 it was made a district town of the Gruzeno-Imeritian govern- ment, and in 1850 it was incorporated with the Erivan government. In 1832 it contained only about 60 houses, but they had increased to 1200 in 1838. At present its population is about 16,000.

GUM-TREE. See Eucatyrrus.

GUN-COTION (Pyroxilin, Coton poudre, Fulmé coton, Schiessbaumwolle). In 1838 Pélouze observed that when cotton fabrics or paper were immersed in cold concentrated nitric acid for a short time, the free acid being subsequently removed by washing, these materials became, without im- portant alteration of structure, converted into substances possessed of explosive properties. These were at the time accepted as closely allied to the substance named xyloidin, described some years previously by Braconnet, which is obtained by adding water toa solution of starch in cold nitric acid. But subsequent observation established the identity of these explosive products with the explosive cotton, or gun-cotton, of which in 1845 Schénbein an- nounced the discovery, and which he at once proposed as a substitute for gunpowder. Soon after this announcement Béttger and Otto published the method of producing gun- cotton by immersing carded cotton in cold concentrated nitric acid, and subsequently Knop introduced the more advantageous method of treating the cotton wool with a mixture of nitric and sulphuric acids, the latter being used as a dehydrater of the nitric acid, and as an absorbent of the water eliminated by the nitrification of the cellulose or cotton fibre. 'The composition of gun-cotton was subse- quently made the subject of study by Bottger, Pélouze, Peligot, Von Kirchhoff, Sobrero, Béchamp, Porret, Crum, Gladstone, Hadow, and others, and various formule were proposed as representing its composition. The divergence of opinion on this point arose partly from difficulties attend- ing the preparation of uniform products, and the obtaining of trustworthy analytical results with these, and partly from differences of opinion regarding the nature of the chemical reaction, whereby the cellulose becomes converted into an explosive body. The products obtained in the earlier Investigations differed very much as regards their solubility in mixtures of alcohol and ether, and also with respect to the proportion which their weight bore to that of the cotton wool employed in the experimental operations. Crum was the first to entertain the view that gun-cotton might be re- garded as cellulose, in which the two or three atoms of lydrogen are replaced by their equivalent of nitric peroxide. This view was afterwards also advanced by Gerhardt, and it received strong support from the researches of Hadow, Whose results established the fact that several distinct varieties of pyroxilin could be produced by varying the pro- Portions of

nitric and sulphuric acids used, and who definitely established the composition of three of these, the

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most explosive of which eonstituted the chief proportion of the product ordinarily obtained as gun-cotton, and had the composition expressed by the name trinitrocellulose. This highest nitro-product in its pure state is insoluble in mix- tures of ether and alcohol, whereas the lower products (one of which is the so-called collodion gun-cotton, used for photo- graphic purposes, see CoLLopION, vol. vi. p. 149) differed in regard to their ready solubility in different mixtures of those solvents. Crum's formula for pyroxilin, thus con- firmed by Hadow, was afterwards strongly supported by Schrotter, Redtenbacher, and Schneider, in their joint investigation of gun-cotton manufactured in Austria by the improved process of Von Lenk, and though again disputed by Pélouze and Maury, and by Champion and Pellet, the correctness of the formula C,H,N,O,; (or C,H,O,3N Bs originally proposed by Crum, was conclusively established in 1866 by the exhaustive analytical and synthetical experi- ments of Abel. In the manufacture of gun-cotton, even when most carefully conducted, the most explosive product, trinitrocellulose, is never obtained in a condition even approaching purity ; it always contains an admixture (rang- ing from 4 to 10 per cent. in the products of highest quality) of the lower nitrocellulose products, ze, the soluble varieties of gun-cotton. In addition to these im- purities it contains, even when the cotton employed has been submitted to purification by treatment with alkali, small proportions of nitrogenized matters, soluble in alcohol, formed from resinous or fatty substances retained within the cotton fibre. These substances are very much more prone to undergo decomposition (with development of nitrogen acids) by exposure to heat or light than the cellulose derivatives themselves; and Abel's experiments demonstrated that the uncertain stability of gun-cotton, which bronght this material into bad repute not long after its discovery, from the occurrence of disastrous explosions arising apparently from its spontaneous decomposition, was ascribable primarily to the development of free acid in the gun-cotton by the action of comparatively moderate heat or of light upon these impurities.

The occurrence of a violent explosion at the works of Messrs Hall of Faversham, not long after they had com- tmenced the manufacture of Schénbein's gun-cotton wool, followed by a similar casualty in France, led to the abandon- ment of endeavours to apply this substance, within a brief period of its discovery, except in Austria, where Von Lenk persevered in attempts to devise means for obtaining it in a purer and therefore more stable condition, as well as for bringing its explosive action sufficiently under control to permit of its advantageous employment as a substitute for gunpowder, not only for destructive but also for projectile purposes, The system of manufacture elaborated by Von Lenk consisted in loosely spinning long staple cotton into yarn of various sizes and different compactness ; this yarn was converted into gun-cotton by very careful treatment with a large excess of the strongest nitric and sulphuric acids, the product being immersed for many weeks in run- ning water, and then treated with weak alkali; the gun- cotton yarn and thread were either wound more or less compactly on reels or cores, for employment in firearms, or made up into very compact ropes with hollow cores, or into plaits, of lamp-wick form, for employment in shells or mines. The rapidity of explosion of the gun-cotton, in open air, or under sliglit confinement, was thus brought to a great extent under control, but if the resistance opposed to the expansion of the highly heated gases upon the first ignition of the confined gun-cotton developed sufficient pressure to cause them at once to penetrate the inner struc- ture of gun-cotton fibre which composed a charge, a sudden and violent explosion was thus brought about. Hence no practical advance was made in the reduction of the violence

of action of gun-cotton by Von Lenk's researches. By the system which Abel has more recently elaborated the fibre after its conversion into gun-cotton is reduced to a very fine state of division ; when in this condition the explosive substance is readily converted into sheets or granules, or by compression into homogeneous masses of various degrees of compactness, and of any desired form. In this manner the rapidity of action or explosion of gun-cotton may be reduced to a minimum, though uniformity of action in fire-arms is still very difficult to attain with it. As the reduc- tion of the gun-cotton fibre to a very fine state of division greatly facilitates the removal by

washing, and by alkaline treatment, of the small quantities of unstable impurities already spoken of, the stability of gun-cotton as now manu- factured is much greater than that of former products. Compressed gun- cotton needs, like the other forms in which this explosive has been used, very strong confinement for the development of violent explosion, but this can be readily accomplished without any confinement of the substance, through the agency of an initiative detonation; the explosion of 2 grains of strongly confined mercuric fulminate 2 close contact with the compressed material suffices to ensure this result (see Detonation, article EXPLosIvEs, vol. viii. p. 809). Gun-cotton contains in the normal (air dry) condition 2 per cent. of water. The compressed material of the ordinary density (= about 1) contains from 25 to 30 per cent. of water when saturated; even with 15 per cent. it is uninflammable, and when containing 17-20 per cent. it may be cut and drilled with perfect safety. If gun-cotton contains more than the normal 2 per cent. of water it can no longer be detonated by the minimum quantity of fulminate, and the strength of the initiative detonation has to be increased in proportion to the amount of water it contains; when it contains 17 per cent. of water, its detonation cannot be accomplished with less than 200 grains of confined ful- minate. An initiative charge of 1 ounce of air dry gun- cotton (detonated by means of an ordinary fulminate fuze) suffices, however, to ensure the detonation of wet gun-cotton (as used in mines, torpedoes, rockets, &c.). The suscep- tibility of gun-cotton to detonation when wet (and there- fore perfectly uninflammable) gives this substance a great advantage over other explosive agents, as it may be stored in a perfectly harmless condition (wet gun-cotton being quite unalterable) and at once used in that state as a powerful destructive agent through the agency of a deton- ating charge. The explosive action of wet gun-cotton is somewhat sharper than that of the dry material, the deton- ation being transmitted through its mass with greater

rapidity in consequence of the displacement of air in its pores by the incompressible liquid. Gun-cotton, if it con- sists entirely of trinitrocellulose, does not contain sufficient oxygen for the complete oxidation of its carbon ; hence more work can be accomplished with a given weight of gun-cotton if a solid oxidizing agent (a nitrate ora chlorate)

be incorporated with it in proportion sufficient for complete oxidation. The compressed preparations (chlorated or nitrated gun-cotton) are as sensitive to detonation as gun- cotton itself, but are less sudden or sharp in their action. These preparations, first manufactured by Abel, were extensively experimented with some years ago, and one of them, prepared with barium nitrate, is now manufactured under the name of tonzte for blasting purposes. Prepara- tions allied to gun-cotton, in the production of which wood- fibre is used as the starting point, are manufactured for sporting and blasting purposes under the name of Schulze's powder, sawdust powder, and patent gunpowder. (F. A. A.) GUNDULITSCH, Ivan (1588-1638), called Giovanni Gonpo.a, one of the most celebrated Dalmatian poets, was born August 8, 1588, at Ragusa. His early education was superintended by two Jesuits, 8. Muzzi and R. Ricasoli, the latter of whom instructed him in philosophy. At the age of twenty Gundulitsch applied himself to the study of jurisprudence ; and three years afterwards he was

entrusted witha high official post in the Ragusan republic.

Farther particulars of his life are not known; he died December 8, 1638. Among his numerous poems the greatest is an epic entitled Osman u dvadeset prevanjah (Osman in twenty cantos), printed for the first time at Ragusa in 1826, and reprinted at Agram in 1854, witha biographical sketch of the author by A. T. It was written to celebrate the victory of the Poles over the Turks and Tartars in the campaign of 1621. Cantos 14 and 15 are lost, having been suppressed by the Government of Ragusa on account of their writer's animosity against the Turks; but in their place others have been added by P. Sargo. An Italian version of this poem appeared in 1827. Of Gundulitsch's other poems, the Hymn on the Greatness of God and the Zears of the Afflicted Son, and his dramas the Rape of Proserpine and the Sacrifice of Love, deserve notice. He also made several metrical translations from the Italian poets. Gundulitsch's poems, besides their literary value, are specially interesting to a student of history, as they give a faithful picture of the time in which they were composed. A complete edition of his works, edited by V. Babukich, was published by the Illyrian university in 2 vols., Agram, 1847. GUNDWANA, a form of the name GonDWaNa (g. 2).

GUNMAKING

Ve DER this head falls the manufacture of every

description of firearm, from the pistol to the 100- ton gun. The term “small arms” includes sporting and military weapons carried by the shooter ; instruments fitted for firing a rapid succession of bullets through one or more barrels from a rest are termed “ machine guns;” while the heavier pieces, used exclusively in war, are denominated “ ordnance.” ;

. SMALL ARMS.

The date and circumstances of the introduction of port- able firearms are involved in obscurity. No doubt many attempts were inade and failed previously, but gunpowder does not appear to have come into practical use as a rival to the crossbow for the propulsion of bolts or bullets till the reign of Edward IIL; in 1375 mention is made of

men armed with “gonnes” at an attack made on a York- shire manor-house.

rough weapon was introduced much earlier. The hand-gun (fig. 1) was used by both infantry and cavalry; it consisted of a simple iron or brass tube with touch-hole at the top, — fixed on a straight stock of wood ; when used on foot, the soldier held it tirmly by passing the stock under the arm ; when used on horseback the stock was shortened to butt against the breast, the barrel resting on a fork secured to the saddle bow. About the beginning of the reign of Henry VII. the hand-gun was improved by the addition of a cock, which was brought down by a trigger to a pan at the side of the barrel ; this cock held a match which ignited a priming in the pan, the priming communicating with the charge by a small hole. The next alteration consisted in the introduction of the wheel-lock, in which a steel wheel, rasped at the edge, protruded into the priming pan. Into the cock was fitted a piece of sulphuret of iron (pyrites)

The arquebuse & méche was employed | instead of a match; this was kept down to the priming pan —

in Germany in 1378, and it is therefore probable that some | by a spring; another spring, when wound up, acted on the

SMALL ARMS. |

~ wheel, which, when released by the trigger, spun round,

rubbing against the pyrites and causing sparks, which set fire to the priming. The wheel-lock was, however, found to be complicated, expensive, and uncertain, so that the match-lock remained in use till the middle of the 17th century, when it was displaced by the flint-lock, the earliest form of which, the "snaphaunce," seems to have been invented about the end of the 16th century in Germany. In this lock the priming pan was provided with a steel cover and the cock held a flint; on pulling the trigger the cock fell, the flint struck the steel cover, forcing it back from the pan, evolving at the same time sparks, which fired

the priming. During these developments of the lock the

.and the flint-lock was entirely superseded.

shape of the barrel was gradually changed ; in 1621 the length of that of the musket was 4 feet, and the size of the bore such that twelve bullets weighed 1 Ib. Soon after this the infantry soldier was supplied with a dagger,

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Fia, 1.—Hand-Gun. which fitted into the muzzle and served as a pike. This was improved at Bayonne into the bayonet, and during the latter part of the 17th century was still farther improved by the addition of a socket, so that the musket could be fired while the bayonet was fixed ready for use. Little change in firearms took place in the 18th century, but in 1807 a Scotch

clergyman named Forsyth obtained a patent for priming with fulminating powder, an invention which, though it slumbered till 1834, was destined to cause a complete revolution in the mechanism of firearms. Early In the present reign its value-was fully recognized; the magazine of detonating composition and the priming pan used by Mr Forsyth were improved into the cap and nipple, At this point, the progress of invention renders it necessary for us to treat Separately the two branches of the subject, and to divide

- Sporting from military arms.

Sporting guns,

For sporting purposes smooth-bored shot-guns and grooved rifles areemployed. Both are nearly always double-

gether into a solid bar, which is afterwards rolled into rods, having a section about 3 inch square. The rod thus formed is raised to a brightish red heat, and one end of it is placed in a revolving chuck, while the other remains fixed ; the turning of the chuck subjects the rod to a severe twisting throughout its whole length, so that at last it acquires the appearance of a screw haviuga very fine thread. Three of these rods are then placed together, the twist of one being in a contrary direction to that of the other two. They are then welded together into a bar, and rolled into a strip about # inch in width. The thickness of this strip depends on the part of the barrel it is intended to form ; if for the breech end it is made 4 inch thick, if for the centre ,°, inch, if for the muzzle } inch, These strips are now ready for coiling, which is performed by raising the strip to a bright red heat, fixing one: end of it toa hook projecting from a taper mandril, which is placed in a machine and provided with a handle. On turning the handle the strip is wound round the mandril into a coil about 10 inches in length. 'The coil is then welded by about 3 inches at a time till the spirals unite to form a hollow cylinder ; it is then hammered on 'a small mandril till the welding is complete. Three coils welded together end to end form a barrel, to which

the three different thicknesses of metal above mentioned give a slightly conical form, approximating to the ultimate shape. About three- fourths.of the material is cut away in the making; 16 b of iron are used in the first instance to make a pair of barrels, which weigh only 8 Ib when the welding is finished, and only between 3 and 4 ib after boring and grinding In the manufacture of laminated steel barrels the best quality of steel scrap, after thorough cleaning in a revolv- ing drum, is mixed with a small proportion of charcoal iron. The mixture is heated in a furnace, and puddled into a ball, which is well worked up undera forge hammer. It is then drawn out under a tilt bammer, and rolled into strips of the required length and thickness, after which it is treated as above described. This material is much esteemed for its hardness and closeness of grain, but it does not possess the elegant marking and appearance of the Damascus twist. Stub iron for barrels was formerly made by putting a quan- tity of old horse-shoes or stubs into an iron ring, welding them into a solid mass, and then rolling them out to strips of the requisite dimensions. Nowa mixture of best wrought scrap, and sometimes steel scrap with stubs, is preferred, as giving more hardness and durability to the barrels. A description of 'the manufacture of cast-steel barrels will be found below, in connexion with military rifles.

In the rough state just described the barrels are sent Boring from the forge to the gunmaker, who bores them carefully 224 strip- out to nearly the finished size.. He then turns them ?"

barrelled, and of late years the old muzzle-loaders have been almost entirely supplanted by the many breech-loading systems recently invented, which enable the sportsman to

Barrels

. placed one upon another ; usually six of each kind are thus:

reload with greatly increased rapidity and uniformity, the latter quality being specially important in rifle shooting. The chief parts composing the arm are the barrel, the lock, and the stock. Barrels for sporting arms are made of four difterent kinds of material—Damascus twist, laminated steel, stub iron, and mild cast-steel; besides these, common material is worked up

into cheap barrels for exportation. Damascus twist consists of alternate rods of iron and steel

arranged ; they are then forged and thoroughly welded to-

down at intervals, obtaining correct surfaces by means of inside and outside gauges. The barrels are then " stripped" —that is, turned down the whole length to correspond with the bore. For double guns two barrels are now brazed together, near the muzzle and near the middle. At the breech the barrels are separated by a "steel lump." The axes of the barrels are not quite parallel to each other, but are usually adjusted to cross at about 40 yards from the gun. When packed together, a rib is soldered on down the

entire length, and they are sent to be proved at the proof-

Proof.

Stocks.

Locks,

Furni- ture,

Breech- loaders.

house of the Company of Gunmakers at Whitechapel or Birmingham. 'The scale of proof is fixed by Act of Parlia- ment, according to the size of the bore; it is considerably more than double the ordinary shooting charge. For the provisional proof, muzzle-loaders have the breech screwed in before firing; breech-loading barrels are pressed against a false breech. The second or definitive proof is less severe, and is carried out at a later stage, when the action of the breech-loader, or the percussion fitting of the muzzle-loader, is completed.

The best stocks are made of English or Italian walnut, pieces of which reach the gunmaker roughly shaped. 'They are so cut that the grain shall run lengthways down the stock, and the wood is dried and seasuned to prevent

warping. For expensive guns, much attention is paid to beauty of mottling and depth of colour. A con- siderable variety of tools is employed in shaping the stocks and cutting out the beds for locks, processes which, for sporting pieces, are performed by hand. All parts of the lock except the plate are of steel, and reach the gunmaker hammered into shape. The lock-plate is of wrought iron, case-hardened. The parts are worked to fit by hand with a number of special tools. Bar locks are those which have a forward action, arranged so that the main-spring fits under the bar below the breech end of the barrels; back- action locks have the spring reversed, so as to extend down

Fic. 2.—Early breech-loader. C, pinfire cartridge; 8, single grip.

the hand or grip of the stock. The remaining portions of the gun are termed the furniture. They are the heel- plate which covers the butt, the break-off into which the breeching hooks for muzzle-loaders, the

trigger plate, the trigger guard, the ham- |

NAN p mers, the escutcheons, and bolt fastening |>oRs

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the barrel to the stock, &c. For breech-) ROAR oe

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part of the furniture. The ingenuity of | Qoyeeeee ° . fy 3% 6'

gunmakers has devised an immense /& Basse Soa zaa

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variety of actions, and every day sees S8oenee roses

progress made in strength and simplicity. M. Lefaucheux is entitled to the credit of inventing the modern sporting breech- loader. He first hit on the combination of a pair of barrels open at the breech, playing on a hinge and abutting against //f a false breech (fig. 2), with a strong-based [4 cartridge-case containing powder and shot {7 ready for firing, and supplied with its }/ ¥ea own means of ignition. His early guns were found weak in the fastening of the barrels to the stock, while the mode of yyq, 3.—Central-fire igniting the charge was far from perfect. cartridge.

It consisted of a pin passing through the upper part of the cartridge case, the point resting just above a percus- sion cap placed at the centre of the base of the charge; the hammer fell on the head of the pin, driving the point into

the cap, and exploding the detonating composition. The gas was found to escape through the pin hole, the ex- traction was sometimes difficult, and a fall on hard ground would occasionally explode the cartridge ; for these reasons the pin system was superseded by the central-fire method (fig. 3), in which tie base of the cartridge case was made to hold a small anvil, on to which the cap was driven by a needle or striker passing through the false breech, and receiving the blow of the hammer. Fig. 4 shows a central-

fire gun, having the action considerably strengthened by the double grip. In this system the extraction is accomplished

Fra. 4.—Central-fire Gun. ©, central-fire cartridge ; L, lever ; W, washer ; §, screw. automatically, by a piece of steel fitting between the two barrels, and so cut as to clip the rims of both cartridges. To this extractor is attached a rod which runs down between the barrels through a hole in the steel lump as far as the hinge ; on opening the joint the rod is driven

backward, carrying with it the head and forcing the cartridge cases out of the barrels. Guns on the central-fire system afford no indication of being loaded; extraction and loading are, how- ever, so rapid and easy that every sportsman should invari- ably withdraw the cartridges on laying down his gun, and reload on again taking the field. Hammers sometimes

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Fig. 5.—Improved breech-loading action.

catch in the brambles, or even in the clothes of the shooter ; even the double grip has been known to yield under the effect of the heavy charges now used. The latest guns leave little room for improvement in respect to the action. Fig 5 shows one of the newest developments. The hammers are abolished altogether, the striker being a needle in the interior, which is driven against the cap of a central-fire cartridge by a spring when the trigger is pressed; a lever on the top is pushed aside by the thumb, liberating the catch which holds the barrels against the false breech ; the barrels then drop from the hinge, and are open for loading. On raising the barrels, the action snaps to, and holds them fast; the dropping of the barrels causes an extractor to withdraw the empty cartridge cases. A key at the side regulates the cocking and safety of the lock and striker.

SPORTING GUNS. |

The sizes of barrels are designated according to the weight of thesolid spherical lead ball which will just fit them, and hence their diameters vary inversely as the cube roots of their numbers. Inthe case of No 12 bore, the ball fitting it weighs 12 to the pound, and measures ‘729 in. in diameter. Ounce bullets (No. 16) fit a bore of °662 in. in diameter. Barrels were formerly bored cylindrically, but the experi- ments of gunmakers led them to

suppose that better shoot- ing could be obtained by boring to shapes departing in various ways from the simple cylinder. The first modi- fication introduced consisted in enlarging the breech end slightly for about 10 inches; subsequently the last few inches at the muzzle were enlarged also, so that the barrel really consisted of two frusta of cones, having the smaller ends together,—the position of the narrowest part, like

many other matters, was dependent on the fancy of the'

gunmaker. Of late an attempt has been made to reduce the interior form of the barrel to something like a system, and several kinds of " choke" boring have been introduced. The object to be attained with a shot-gun is to so arrange the charge that the pellets shall be uniformly and thickly distributed round the mean trajectory, and shall also

_ Fig. 6.

occupy a small space longitudinally. In fig. 6 a side view of the charge as it passes through the air is given, ab being the mean trajectory. Exact experiments to determine the proportions of the cloud of shot fired from different guns do not exist, but, judging from observation, they will usually not depart greatly from those of the figure. In fig. 7 is seen the ap- e Be

pearance of the target after being struck by the charge. The test of excellence is regularity of pattern, combined ¢« with penetration; that is, a circle of 30 inches diameter should be so pitted by the shot at 40 yards range that gaps of the size of a small bird should no- where exist, while the individual pellets should retain force enough to penetrate a certain number of sheets of brown paper. As the shot pass along a barrel driven violently forward by the powder gas, it is probable that the edges of the charge are retarded by friction against the sides of the bore, so that the centre portion extricates itself rather sooner than the edges, and travels with a slightly higher velocity. Supposing the charge to retain an average velocity, on reaching the object fired at, of 300 feet per second, and the leading pellets to have gained 10 feet on the hindmost ones, so that the charge is distributed over a length of 10 feet, a period of time of gzioth of a second will elapse between the blows of the first and last pellet. If the object be stationary, this interval will be almost imperceptible, and the pattern made

on the target by the impact of the shot will exhibit no trace of it. But if the object be a bird flying across at the rate of 60

| devised for rifles firing heavy charges.

feet per second (about 40 miles an hour), it will traverse a space of 2 feet in the interval, and so will not receive the

EE A a rr a ae Fia. 8.—Plain choke.

14.75

12 BORE}

Fic. 10.—Greener's choke. charge at all in the manner shown on the target. Figs. 8, 9, 10 show some of the choke bores fancied by different makers,1+

The manufacture of sporting rifles does not greatly differ Sporting Greater strength and weight of rifles.

from that of shot-guns. barrel are necessary to resist the pressure of the charge, withstand the wedging action of the bullet, and deaden the recoil. The breech-closing action also demands greater strength, but the general arrangements are not different in principle. Rifles for sporting purposes differ from military pieces in being double-barrelled, and in requiring accuracy and penetration at short ranges, instead of a flat trajectory at very considerable distances. Hence they generally re- semble the shot-guns in their action, and fire more powder in proportion to the weight of the bullet than military rifles.

In fig. 11 the treble grip snap action is shown as specially In addition to the holding power thus provided, a piece is sometimes made to

Fic. 11.—Ireble grip snap action. extend from the rib between the barrels, terminating in a projection which catches in a recess in the top of the false

cn 1 No accurate or crucial experiments have as yet been carried out to determine the true action of these forms, but the editor of The Fiel@ is now preparing instruments and endeavouring to approach the sub- ject in a scientific manner. The general principles, as far as they can be gathered at present, are, that enlarging or relieving the barrel slightly reduces the friction and allows the shot to acquire greater velocity, while choking the barrel at the muzzle has the effect of directing the outer pellets inwards, and so concentrating the charge.

breech, when the barrels are closed ; or the catch shown in fig. 5 may be adopted. Some makers, instead of using the hinge principle introduced by Lefaucheux, close the breech in other ways; thus in the Henry action the barrel does not move, but is closed at the breech end by a sliding ver- tical block, which is depressed for the admission of the

cartridge by a lever underneath the trigger guard; the | | into the cone and expand it when forced home by the gas.

striker passes through the block, which on being lowered extracts the cartridge. The power of a modern rifle is limited only by the power of the shooter to withstand the effect of recoil and to use a heavy piece. The momentum of the bullet forwards up to the time of its leaving the muzzle is equal (neglecting the weight and motion of the gas generated by the powder charge) to that of the gun backwards at any instant. Supposing the gun to weigh 150 times as much as the bullet, it will acquire a velocity against the shoulder equal to the 150th part of that acquired by the bullet. Practically it is this velocity which measures the severity of tbe recoil, and the heavier the gun and the more powerful the shooter the more momentum can he afford to impart to his bullet. This momentum may be composed of high speed and low weight, or of low speed and high weight. A light bullet starting with a high velocity travels fast at first and drops but little at a short range ; itspeedily, however, suffers retardation by the resistance of the air, and

would soon be beaten by a heavier bullet of the same diameter starting with the same momen- tum, The Express rifles carry out {

this principle with great complete- ness, employing heavy powder charges and imparting very high speed to a light bullet, so that a range of about 130 to 150 yards is traversed with a drop not exceeding 1 foot. Fig. 12 shows the nature Fig. 12.

of bullet generally used for these pieces; the hollow in the centre permits the lead to expand and flatten out on strik- ing, inflicting a wound of great severity. Explosive bullets are also employed by some sportsmen. In fig, 13 are

Fie. 13.—Rifle cartridges.

shown rifle cartridges loaded ready for use brass-drawn case is now almost universally adopted, both

The solid

for sporting and military purposes. The Martini-Henry rifles used by the British army, however, still use the soft brass-crimped case.

Military Rifies—The principle of rifling small arms seems to have been discovered about the beginning of the 16th century, but does not appear to have been employed for warlike purposes till the middle of the 17th. In 1680 each troop of life-guards was supplied with eight rifled carbines. In 1800 the 95th regiment, now the rifle brigade, was armed with a 20-bore muzzle-loading rifle. The diffi- culty of loading a rifle after firing a few rounds was the great obstacle to its use in the field. Several methods were devised of providing anvils at the bottom of the bore on which a loose ball dropped in could be hammered to fit the gtooves, but the principle of expansion by the action of the

powder was not brought forward till 1836, when Mr Greener submitted an egg-shaped bullet, having an opening at one end to receive a conical plug, which when driven home by the gas expanded the bullet into the grooves. Shortly after this the French chasseurs were armed with a rifle throwing an elongated bullet with a hollow-coned base. This was improved by Captain Minié, who added an iron cup to fit

For this cup a wooden plug was substituted in the three- grooved Enfield rifle in 1855. About this time Sir J. Whitworth brought forward his hexagonal rifling, the guiding idea of which was that every part of the hexagon except the actual corner should do its share of the work of giving rotation. He proposed for a barrel 39 inches long a bore of '45 inch, having one turn in 20 inches. This was intended to be suitable either for an expanding bullet, or for one possessing an easy mechanical fit. The length of the bullet was increased, and the form thus modified suffered much less from the resistance of the air than the previous patterns. The question of breech-loading for military weapons now began to assume importance. About 184] the Prussians had adopted the needle gun, a breech-loader on the bolt principle. It was a rough weapon compared with the pieces lately introduced, but a great advance on any known atthe time. A conical bullet rested on a thick wad, behind which was packed the powder, the whole being enclosed in strong lubricated paper. The detonator was in the centre of the hinder surface of the wad, so that to ex- plode it a needle had to be driven forward from the breech through the base of the cartridge and through the powder. This was accornplished by the action of a spiral spring, when set free by the pulling of the trigger. This arrangement possessed many defects: the gas escaped freely at the breech ; the long needles rusted and broke; the springs failed ; and the weight of the piece was excessive. Such failings caused the sterling merit of the principle to be underrated, and it was not till 1864 that a committee of officers recommended the introduction of breech-loading arms for general adoption in the British army. The triumph of Prussia in the Seven Weeks' War with Austria in 1866 at once drew attention to the urgency of the case, and caused all civilized powers to re-arm their troops. In England the Enfield rifles (three-grooved expanding bullet muzzle-loaders) were converted into breech-loaders by the adoption of the Snider method, which consisted in cutting away 2 inches of the upper part of the breech end of the barrel soas to admit the cartridge,

which was pushed forward into a chamber formed by enlarging the end of the bore. A block, opening on a hinge, was then shut down to fill up the space behind, forming a false breech against which the base of the cartridge abutted. The striker consisted of a needle passing through this breech block; when struck from behind by the hammer it was driven against a cap in the base of the cartridge, exploding the charge. By this means the existing rifles were rapidly converted, and the army was provided with a breech-loader of satisfactory efficiency should any emergency arise. Proposals were then invited, and a

number of inventions submitted, the result of which was

that in 1869 the combination of the Martini breech action with the Henry barrel was decided on for future manu- facture, and the whole of the British army is now provided with these weapons (see figs. 14,15, 16,17). The general principles of manufacture are the same for all kinds of military breech-loading rifles. It will be sufficient to give the details of one zn extenso.

The manufacture of the Martini-Henry rifle, as carried out at the Government factory near Enfield, involves 2004 separate operations which have to be performed on each rifle before it is complete for issue. This number is subject to slight variations caused by changes of pattern from time

Barrel.

MILITARY RIFLES. |

to time. It will be sufficient if the principle of these operations are described, without entering minutely into details.

The rifle is composed of three parts :—the barrel, carrying the sights ; the stock, into which fits the cleaning rod ; the body, containing the lock and breech action. The soldier is also provided with a bayonet to fit on the muzzle.

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Fia. 14.—Martini breech action (closed). The barrel is made of mild steel manufactured on the

Siemens principle. Cylinders of this material, 16 inches long and 14 in. thick, are supplied by contract, and tests are made of a proportion from time to time. These cylinders are first rolled in the factory to a long cone, having slightly greater dimensions than the exterior of the

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Fig. 15.—Martini breech action (open).

finished barrel. The cylinder is heated in the furnace and passed straight through a series of eight pairs of roll; each pair is grooved to receive it, the grooves becoming narrower and shallower as each successive pair is reached. The pairs are alternately vertical and horizontal; when they are in full work they can roll about 250 cylinders per hour.

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The cone is next placed between friction rollers; these are set at a slight angle, so that in revolving they pass the cone along slowly. It emerges from their clutch polished with the compression, and showing their action by a close spiral traced on the surface. We lave now a solid piece of mild steel, slightly thicker than the barrel, fairly straight and thoroughly well-consolidated.

The next step is to obtain true bearings for boring the interior and turning the exterior. The cone is placed in a clamp milling machine, and the ends milled down. This operation requires some judgment ; the milling-down of the ends must be so performed that the centres shall be ap- proximately true centres; that is, the amount of metal to be sub- sequently turned down off the ex- . terior of the bar- < rel shall be about equal all round. The ends, when milled down, serve for bearings by which the cone is next held horizon- tally, and drilled in a double-acting machine for 14 in.; these act as centres when the barrel is placed vertically and drilled through from each end. Three tools are used, the last being of slightly greater diameter than the others, A shoulder is left in the centre to avoid the inconvenience of the tools from opposite ends not exactly meeting in the middle, as might be the case with the long slender drills necessarily employed. This shoulder is removed by a square tapered tool or "bit." We have now a cone slightly larger than the barrel, with a hole through it °433 in. in diameter. This hole is then bored out to 444 inch. Having now got a true inside, the next step is to obtain a true outside from it.

The cone is placed vertically in a machine, the lower end fitting accurately on a pin, the upper end passing loosely through a hollow chuck, which revolves round a centre in truth with the centre of the pin and the axis of the bore of the cone; the exterior of the cone, being slightly irregular, will be out of truth; sulphur therefore is melted and poured into the hollow chuck, filling up the space between the interior of the chuck and the exterior of the cone, and hardening on cooling. The chuck then holds the cone by the outside in truth, and serves as a bearing. The cone is then placed in a lathe, and two or three short cuts taken off the outside as bearings for the rough turning. This is called "spotting." It is now rough and finish turned, the outside becoming concentric with the inside ; and the cone becomes a barrel. .

It is next tested for truth of interior.

SS Hy » S

Fia. 17.—Henry rifling (true size and magnified).

placed in a rest, so arranged that the eye looking through the tube sees the straight line of the top of a window cutting horizontally across the aper- ture a little above the cen- tre. If the barrel is accu- rately straight and brightly polished, the shadow thrown by the dark window-frame down the tube appears as in fig. 18. The interior circle shows the window as seen through the barrel, with the dark frame cutting across ;

Fic. 18.—Testing by shading.

the next circle shows the shadow extending in a cone from Ato Band ©. This shadow is quite dark, and AB, AC are quite straight. BC is a portion of the arc cutting off the shadow sharply at a point half-way down the barrel.

Two tests are Testing employed,—the first being that by shading. The barrel is barrels.

Rifling.

Cartridge chamber

Proving.

There are, two outer circles extending to the eye, and approximately resembling the sketch in shading. If the barrel is untrue in interior surface, or bent, the cone will at once lose its regularity, and the sides AB, AC will no longer be straight. Should they be irregular, the barrel is “ set ” by striking with a hammer or ebonite mallet across a set- ting block.

The barrel is next placed in a machine, and a horizontal spindle is run through it; on this spindle are two close- fitting gauges, one in the centre and one at the end; the barrel is then caused to revolve on the spindle, and an indicator with a long arm recording small graduations is inserted at the free end between the spindle and the barrel ; any irregularity of turning is multiplied 200 times by the long arm, and becomes at once apparent.

After passing these tests the barrel is finish-turned; the back sight is soldered on and screwed, and the fore sight is brazed on; the size of bore is then gauged, after which the process of polishing is completed and the barrel is ready for rifling.

The rifling consists of seven grooves of the form shown in fig. 17. The twist is such that the bullet makes one complete revolution while travelling 22 inches ; that is, one turn in 49 calibres of 6°45 in., to employ the phraseology generally applied to the rifling of cannon. Each groove is cut separately by a tool which acts when pulled; it forms the groove by five successive cuts, being forced to project a little more at each cut; it thus passes thirty-five times up and down the barrel to complete the rifling, which can be done in half an hour The size of bore is now finally tested; it must lie between 0°449 and 0°451 inch. The rifling is similarly tested, and the twist gauged.

The breech end of the barrel is next chambered out to receive the cartridge, which is of the kind known as " bottle- shaped." The exterior of the breech end is of ' Nock's " form, the upper surface being a flat, true to the bore. This flat guides all the fittings ; the barrel is placed in a machine true to the flat, and the sights are gauged for line and elevation. No allowance is made for the deflexion due to twist of rifling, it being very slight. The barrel is lastly screwed at the breech end to fit the body.

Each barrel is twice subjected to proof by powder, once before rifling, once after. Sixteen are placed in a cast-iron frame; a temporary steel screw, furnished with a vent, closes each breech end, which rests against a leaden bar. The barrels are loaded from the muzzle ; a train of powder ignited by a cap fires them simultaneously ; the bullets are caught in a hollow cast-iron receiving frame, shaped like the shell of a snail. The charge for the first proof is 74 drs.

_ (= 205 grs.) of powder and a bullet weighing 715 grs.,

Stock.

secured by a half-inch cork wad forced down over it. The second proof is the same, except that only 5 drs. (=137 grs.) of powder are used. The

service charge is 85 grs. of powder with a bullet of 480 grs.

The barrel when finished is browned by being coated with browning mixture, and caused to rust in a steam tank; it is then brushed with wire brushes. This process is repeated four times, after which the exterior is oiled over. The browning mixture consists of —

Spumits"ofwine …....-. «0. 5 oz.| Corrosive sublimate…..... 4 oz. SpieitsvGhenitre:. ...161-s0cceem SPs eNO VATION: a5. cess cs ds

Tincture of steel …..... Sib a| WiGUER: cerccmonecacnoenesst set 1 gal. Nitriemeid …7..0n cee 4

The stock is in two parts,—the butt and the fore-end. They are of Italian walnut wood, and are supplied roughly shaped. They are tested for straightness of grain ; weight, as indicating strength; "shakes" or cracks ; "galls," caused by injuries over which the wood has grown ; saltness (which would cause absorption of moisture and consequent rusting), by putting a shaving into a solution of nitrate of silver ;

and also for appearance. 'Ihose accepted are thoroughly seasoned by keeping, or dried in a desiccating chamber, warmed by hot air; they then go to the shaping machines, where they are cut to size by revolving cutters, making 4000 revolutions per minute, and are afterwards turned in' copying lathes, hollowed out by copying gouges, and bored to take the fittings. They are then tested, machined, hand- finished, and oiled up.

The body is of mild steel; it is stamped out from the Body, bar ; it is then drifted through by a slightly tapered bar carrying a succession of cutters on it. The front part of the body is then screwed to suit the screw on the barrel, so that when home it shall fit accurately to the breech end. The lever, and indeed all parts except screws and springs, are stamped out of solid bar. Each part is milled by machinery toa correct fit ; every fitting is interchangeable, and nothing is marked for selection to fit anything else. Each part is browned in the same way as the barrels, or blued. |

On completion all parts are taken to the assembling room, where they are fitted together, screwed up, and turned | out as finished rifles; after which

they are taken to the practice ground, and tested for accuracy and extraction of cartridge by being fired from a rest at a target, the range | being 500 yards. |

The bayonet consists of a steel blade welded to 4 Bayonet. |

wrought-iron socket. Steel of a superior quality being used, it is supplied in bars, is cut into lengths, and is welded by the aid of borax toa short rod of rollediron. The two are so put together as to form a right angle; the steel bar is . put into a "Rydering" machine, which gives it a great . number of rapid blows, and shapes it roughly into a blade.

It is then rolled and cooled gradually under charcoal and coal-dust for annealing purposes. The socket is then drilled, | and the blade ground. They are then bent into position | and become a bayonet. Turning and finish-boring complete

the sockets, while the blades are fine-ground, hardened, tempered, tested, and polished. The sockets are then browned and adjusted to the rifles.

About 1400 operatives are employed at the Government factory ; each Martini-Henry rifle costs about 48s., all expenses reckoned; and to render the establishment thoroughly remunerative, the out-turn should be about a rifle a week per man.

The systems of breech-loading muskets employed by Varieties

*different nations are shown in the following table :— Hs fe kets. Se Country. Nature. on Action. 7 So a EXVGSOOU) apnodnee Wiemdll) vee… 5 | Block rotating sideways. [OE NERDIEM o cooonc SWIC CT rec scars 4 | Falling block. DenmMaae cc Remington ….. 5 | Block hinged to rear, sup- ported by a cam. England …... Martini-Henry | 4 | Falling block. Frameé:... ~~.i¢.| Geese. teenies, 4 | Sliding bolt. Germany ….2 Mauser…..... 4 Do. MCA casicnteoene Vetterli…..... 4 Do. (magazine gun). Russia …..... erdaner,. sss. 5 | Block hinged to front (old). , Sliding bolt (new). SMM... s0s.. Remington….. 5 | Block hinged to rear, sup~~ ported by a cam.

Sweden …..... WO.) sence: 5 Do. Switzerland…| Vetterli…..... 4 | Sliding bolt(magazinegun). Turkey…..... Martini-Henry| 4 | Falling block. United States | Springfield….. 5 | Block hinged to front.

Tt will be noticed that the Vetterli gun, used by the Italians and Swiss, is a repeater or magazine gun. It contains a supply of eleven cartridges, arranged in a tube running under the barrel, and forced by a spring into the loading position one by one, as the previously fired empty one is extracted. The arm can thus fire twelve rounds with great rapidity without reloading ; it can also be used as an

Pistols,

MILITARY RIFLES. |

ordinary breech-loader, a fresh cartridge being inserted at every round, and the magazine kept constantly full. This is no doubt a great advantage under certain circumstaaces, but entails grave inconveniences. Thus the Vetterli gun, with magazine full, weighs just half as much again as the Martini-Henry, and gives less energy to its bullet at the muzzle in the proportion of 5 to 8, a proportion which increases to the disadvantage of the magazine gun as the range increases. Still, for a mélée, and at short ranges, the Vetterli is no doubt a very formidable piece.

These considerations have led the Government of the United States to make trials of a number of magazine guns, of which one, the Hotchkiss, has been selected for adoption. The working of it is shown in fig. 19. The magazine is contained in the stock, and holds five cartridges, a sixth

- being in the chamber ready for loading. These cartridges are the same as those used for Government Springfield rifles ; they are pushed successively into the loading position by a spiral spring till the magazine is empty, or a fresh cartridge

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Fia.19.—Hotchkiss Magazine Gun.

can be inserted after each round as in an ordinary breech- loader. The action of bringing the knob-handle upright and withdrawing the bolt extracts and throws out the emptied cartridge to the side; the next cartridge is then pushed up into the loading position by the spring, and is forced into the barrel when the handle presses the bolt forward; this action also cocks the piece, but the striker cannot reach the cartridge till the knob-handle is turned down, and the bolt thus locked in position. The weight of the piece fully loaded is 9} tb. Trials of this weapon are about to be made by the English Government.

Of all the military rifles adopted by the various Govern- ments, the Martini-Henry is the most powerful; the practical test it underwent in Turkey, where a cheap gun of this pattern was supplied on contract by an American firm during the war of 1877-78, was most satisfactory.

Pistols.—These handy little weapons were formerly made as single or double-barrelled smooth-bored muzzle-loaders, and their system involved no departure in principle from the ordinary firearm of the day. The introduction of the revolver as a practical weapon was a great step in advance ; the idea is old, and roughly constructed weapons ou the same plan have long existed in museums of old arms; Colonel Colt of the United States revived it, and is the father of the modern revolver. In his pistol a revolving muzzle-loading cylinder contains a number of chambers, usually five or six, bored from the front parallel to the axis; the back of the cylinder is left solid, and forms the breech ; a nipple is screwed into each chamber. As the cylinder revolves, each chamber arrives at the top, and is then opposite to a barrel; the pistol is cocked by the thumb, an action which locks the chamber against the barrel, so that the two form a continuous bore; the trigger is pulled in the usual way, and the hammer brought down on the upper nipple, exploding the charge.in the top chamber. The action of recocking brings the next chamber into

position. When on half-cock, the cylinder revolves freely. Since Colt's time great improvements have been made in these handy weapons; the trigger was made to cock the hammer, turn the cylinder, and fire the charge by one continuous draw; this arrangement enabled the shooter to fire all the shots very rapidly without lowering his hand : the strength of mainspring required, however, rendered it very difficult to shoot with any degree cf accuracy, especially as the exact moment when the hammer would fall was hard to estimate. A second improvement gave the shooter the choice of cocking the hammer and firing it in the usual way, if he preferred it. The next step was to make the chambers breech-loading, by boring them right through, and packing the powder and bullet in a strong based cartridge, carrying its own ignition. In pistols constructed on this plan the chamber arriving at the top is brought against a false breech through which the striker is driven by the hammer. In the latest pattern of this pistol, the cylinder and barrel open away from the false breech on a hinge underneath; the action of opening throws out the empty cartridge-cases. If the user is on horseback, he thrusts the barrel muzzle downwards into his breast, belt, or holster, the hinge remaining open; fresh cartridges are taken out of the pouch and placed in the chambers; the breech is closed sharply on the hinge and is held by a snap-catch ; the pistol is then withdrawn ready for use. All this can be very quickly done with one hand at full gallop.
MACHINE GUNS.

This term comprehends all weapons made to fire a rapid succession of bullets from a stand or carriage, so that, while requiring but two or three men to work them, they may throw in a fire equal to that of a detachment of infantry. In the Franco-German war of 1870 a species

of mitrailleur was largely employed, and when used under Mitrail- It consisted leur.

favourable conditions attained fair success. of a number of barrels (usually 25 or 37) secured in a frame round an axis, and parallel to it. The barrels were open at the breech, and were loaded by a disc pierced to correspond with them containing a cartridge in each chamber. This disc was placed

against the breecli end of the barrels, the false breech containing the strikers was

Fic. 20.—Gatling Gun. © held firmly against it, and the whole of the charges were

exploded at once. This arrangement had many defects. The recoil of so many charges fired simultaneously required strength and weight; at short rapges the bullets all went to the same spot; the number. of rounds could not be regulated at pleasure ; and only volleys could be fired. The

Gatling machine gun, which first appeared in the United Gatling States, was vastly superior to the mitrailleur, and speedily gu.

obtained entrance into the armies of most of the civilized powers. Figs. 20 to 26 show the general construction of the weapon. In fig, 20 the Gatling is ready for firing. A block of ten barrels is secured round an axis, which is fixed ina frame aa. On turning the handle h (fig. 21), the

[MACHINE GUNs.

GUNMAKING

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the carrier, which consists of ten grooves or chambers M

The construction

It consists of a bolt, through

of the lock is shown in fig. 26.

, 24, 25) | (fig. 23) corresponding to the ten barrels.

A drum T (figs. 20

spindle gg causes the worm / to act on the pinion w, making

the axis and barrels revolve.

Fig. 24.

Fig. 23. which passes a striker driven by a spiral spring. AAAA

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pened out and . s revolve, the

s the circular construction o

sloping as in the drawing, which it must be under- As the barrels, carrier, and lock

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Fig. 22.

Fig. 21. is placed on the top at the breech end of the barrels over a

hopper, through a slot in which the cartridges drop into

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Fig. 26.—Lock of Gatling Gun.

At

mpress the spiral spring,

ge into the barrel. . shows the cartridge just , omitted in the previous

so that the bolt pushes the cartrid IV. the cocking cam R begins to co releasing it at V. Position VI after firing; the extracting hook

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225 3

oe a Gi es roe = 5 eS nei ae oo oH oS = Eek og « ORK Re aaa El ae a et G4 o > 3 Hi we o ° Sita BRE S Cc it ane) St 42 om ee a o

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ee ee RS

he MACHINE GUNS. |

positions, is here represented in the act of clutching the base of the cartridge case, which is withdrawn as the locks retreat down the slope of the cam, till at X it falls through an aperture to the ground. The line ad marks the com- mencement of the rifling. In fig. 20 the drum T consists of a number of vertical channels radiating from the centre. The cartridges are arranged horizontally, one above the

NVA 75 ASSESS STNG

Fia. 27.—Nordenfelt Machine Gun.

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other, in these channels, bullet ends inwards. The drum revolves on the pivot 6 (fig. 23), and the cartridges fall through the aperture B. When all the channels are emptied, a full drum is brought from the limber, and substituted for the empty one. Each barrel fires in turn as it comes to a certain position, so that by turning the handle quickly an almost continuous stream of bullets can be

1-10, parts of frame; 11, breech plug; 12, striker; 13, extractor ;

14, cartridge receiver; 15-18, 23-31, lock and trigger parts; 19-22, locking action; 82-35, load. ing action ; 36-39, cartridge receiver; 40, cover ; 41-44, parts of hand-lever ; 45-49, traversing action; 50-55, elevating and trailing action ; 56, 57, hopper and slide.

ejected. An experimental pattern of Gatling has been lately tried, fitted with a multiplying arrangement which could be made to fire nearly 1000 shots a minute. In fig. 21 an automatic traversing arrangement is shown, which can be put in or out of gear as desired, and by means of which the amount of traverse can be regulated. The spindle gg turns the wheel A, projections on which act on

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the arm F, and traverse the breech through a small are, thus spreading the bullets laterally over the required front.

Effective though this piece is for land service, especially in defending approaches, it is scarcely suitable for the navy, as the mobility of the boats or vessels carrying it causes immense waste of ammunition, it being impossible to tire more than a few rounds at the object before an important

Fig. 28.

Norden- change of direction occurs.

felt gun. shown in figs. 27 to 31, is found specially suitable under these circumstances. The barrels are here placed horizon- tally, and have no movement. A box containing the locks, bolts, strikers, and spiral springs, one of each correspond- ing to each barrel, moves straight back-

The Nordenfelt machine gun,

Fig. 29, wards and forwards when worked by the handle of the lever

on the right. When the box is drawn back the cartridges fall from the holder on the top into the carriers simul- taneously. When the box is pushed forward the bolts push the cartridges into the barrel, cocking-catches compress the spiral springs, the lever releases the catches one after the

other at very minute intervals of time, and the cartridges are fired in rapid succession. In this piece, careful aim can be taken from a moving platform, and at the right

Say A, SPE Cee =e ed

Fig, 31. moment the barrels can be fired at the object almost simul- | taneously ; they could be made to fire at the same instant,

Fig. 30

Ordnance.

Construc- tion.

Homo- geneous guns.

288

but in this case the advantage of being able to fire single shots would be lost, and the recoil would be increased. This gun would probably never be able to fire with such extreme rapidity as the experimental form of Gatling men- tioned above, but it could be made to fire six or seven hundred rounds

a minute. It is generally considered that a machine gun should be able to fire easily two hundred rounds in half a minute.

ORDNANCE.

The manufacture of ordnance is a much more scientific and complicated study than that of small arms. As the forces increase in magnitude and intensity, while the ultimate strength of material remains constant, the nicety of adapt- ation of means to ends grows pari passu with the guns. In producing a piece of ordnance, two distinct sets of conditions are involved —those belonging to its actual construction, and those by which its proportions are regu- lated. In constructing a gun, the material must be so selected and disposed as economically and safely to sustain the effect of the forces developed by the charge ; in design- ing a gun, it is necessary to know the nature and direction of the forces which will combine to produce the desired ballistic results. The two sets of conditions are as distinct as those involved in the separate operations of writing and printing this article.

Construction.— Nearlyall the accurate knowledge as yet obtained of the true action of gunpowder has been acquired within the last twenty years. The general idea previously held was that the explosion was instantaneous, and that the more violent the powder the greater would be the velocity of the projectile. The mode of proving the quality of the explosive was to place a small quantity in a short mortar, and to measure the distance to which it projected a light shell—a test altogether wrong in principle, as will be shown later on. No accurate idea had been formed of the true pressure of the powder gas on the bore during discharge ; but it was understood that a gun was subjected to two principal strains orstresses—a circumferential tension tending to split the gun open longitudinally, and a longi- tudinal tension tending to pull the gun apart in the direc- tion of its length.

When guns are made of cast metal, and are, in fact, homogeneous hollow cylinders, a limit is soon reached beyond which additional thickness is practically useless in giving strength to resist the circumferential tension. Supposing the metal employed to be incompressible, each concentric layer would take up a strain on discharge inversely proportionate to the square of its distance from the axis of the bore. Every metal, however, is compres-

sible as well as extensible, and hence the exterior always affords more support to the interior than the foregoing rule indicates. The great aim then of a gunmaker is so to select and arrange his material that the exterior shall take up as much as possible of the strain thrown upon the interior.

In America, Captain Rodman introduced a method of casting guns hollow and cooling them down from the interior, so that the inner portions being first solidified were compressed and supported by the contraction of the outer parts when they subsequently cooled down. Thus, on discharge, the compressed inner portions expanded under the action of the powder gas to or beyond their natural diameter, throwing at once the strain on the outer portions which were already in a state of tension. But however well cast-iron may be disposed, it is naturally too weak and brittle for use with heavy guns, and those nations which employ it thus do so because it is comparatively cheap and easy to manufacture, and not because it is the best material. Austria and Russia have of late years made light guns of

it. coiled bars of wrought iron welded into hoops and shrunk

bronze cast in chill, and subjected to the wedging action of steel mandrils driven through the bore. 'I'he several layers of the metal are thus placed in a state of tension as regards the exterior, and of compression as regards the interior. At the present day systems of building up guns have been devised so that each portion of the metal is made to bear its fair share of the strain.

The longitudinal tension is usually less important than the circumferential stress. It is considered to be provided

against in homogeneous guns if the metal is as thick over

the bottom of the bore as round the end. The strain is

now measured by calculating the total pressure of the

powder gas on the bottom of the bore, and comparing it with the area of the transverse section of the gun at the

same place. This is not absolutely correct; but, practically, the chief modes of gun construction now adopted leave a considerable margin of strength in this direction.

Sir William Armstrong first successfully employed the Built-up principle of initial tensions for all parts of a gun.

Jn his guns. system, wrought-iron coils are shrunk over one another, so that the inner tube is placed in a state of compression and the outer portions in a state of tension, an endeavour being

made to so regulate the amount of tension that each coil should perform its maximum duty in resisting the pressure

from within. Further, he arranged the fibre of the several

portions so as to be in the best positions for withstanding

the pressures. It must be noted that wrought-iron bar is about twice as strong in the direction of the fibre as across He therefore constructed the exterior of the gun of

one over the other, thus disposing the fibre to resist the circumferential strain. These outer coils were shrunk over a hollow cylinder of forged iron, having the fibre running lengthways so as to resist the longitudinal strain. Within this cylinder or forged breech-piece was placed a steel tube, gripped in like manner by shrinkage. principle of modern gun construction is carried out by turn- 2g°. ing the inner coil ina lathe to an exterior diameter slightly greater than the interior diameter to which the outer coil

is bored. The outer coil is expanded by the application

of heat, and slipped over the inner one. It contracts on cooling, and if the strength of the two coils is properly adjusted, the outer will remain in a state of tension, and the inner in a state of compression. On this view, the

ideal gun would be constructed of a vast number of exces- sively thin rings so shrunk over each other that, on discharge, each should be equally strained. An attempt has been made by Mr Longridge, M.1.C.E., to approximate to this condition by winding steel wire under tension round a steel tube. This system, though possessing much ingenuity, has never made way, and might possibly be found wanting

in longitudinal strength.

Great success attended the early introduction of the coil principle. Guns of considerable size were made: the largest weighed as much as 23 tons, and projected a 600-Ib shot with a fair velocity. It was found, however, that much difficulty attended the accurate shrinking of a number of thin rings, and that occasionally one or more of the outer ones would be strained to cracking, while the inner ones were intact. The original mode of construction was therefore modified, as experience was gained in the Govern- ment factory at Woolwich. Acting underGeneral Campbell, R.A., Mr Fraser, M.I.C.E., thickened the coils, and extended their use to the breech-piece, it being found that the longi- tudinal disposition of the fibre in that part was not required to sustain the longitudinal strain, and that the steel tube forming the bore was better supported by coils.

The manufacture of ordnance at Woolwich and Elswick may be briefly described as follows. Steel cylinders, slightly larger than the exterior dimensions of the inner

This grand shrink-

tubes, are supplied by contractors. They are tested for quality of metal, and toughened after being bored by being raised to the temperature shown by- the tests to be most suitable to the particular cylinder, and then plunged in oil. They are subsequently tested by water pressure at 4 tons

 and on cooling they grip each other as shown, while the 1B coil contracts on and slightly compresses the part of the tube within it.

*A method of strengthening and utilizing as rifled guns Con- some of the old cast-iron ordnance of the service has been verted largely employed to supply pieces of secondary power and 8””**

WHOL Coiled iron.

Coiling.

up

Building

=== Forged iron. = Steel.

Fig. 32.

per square inch. The tubes are not bored quite through for muzzle-loaders ; a solid end is left to form the bottom of the bore. Therest of the gun is made of wrought iron. The material is chiefly received from the contractor in the form of wrought scrap, but a certain proportion of iron

puddled in the works is used also, Blooms of these materials are rolled into flat bars, which are fagoted together and rolled into long bars of the section required for the part of the gun for which they are intended. These bars are then placed in a long narrow reverberatory furnace,

Fig. 34. and raised to a bright red heat. one end is drawn out and fixed to a revolving mandril, which pulls the bar out and winds it into a coil, like rope

When ready for coiling,

round a capstan. Sometimes a second bar is wound round vutside the first coil; in this case the mandril is made to

Fig. 35.

revolve in the opposite direction. . upright in a reverberatory furnace, and raised to a white or

The coil is next placed

‘“‘welding” heat. In this state it is placed under a steam hammer, and welded till it becomes a compact hollow cylinder. On cooling it is bored and turned to the proper

DW _.7

dimensions. Two parts of the gun are made of forged iron (not coiled),—the cascable screw which supports the breech end of the tube, and the hoop which carries the trunnions. The latter is either welded to the outer coil or shrunk on. Figs. 32-39 show the method of building up Woolwich

Uff

Tig. 37, ordnance as exemplified in the 80-ton guns. coils are hooked together by shoulders to prevent slipping

The various

or distortion from the shock of discharge. Thus, in fig. 36, shoulders are turned on the exterior of the breech-piece and inside the 1B coil; the latter is expanded by being raised to a dull red heat and slipped over the tube from the muzzle end. The expansion enables the shoulders to pass,

excellence for land fronts and for practice. It was brought forward in its present shape by Sir W. Palliser in 1863, and is now being much used in the United States’ gun factories. The cast-iron block or gun is bored out to the

ZZ LISS

LLU EELET AAA Ed tbr,

Fig. 38.

requisite dimensions, and a tube of coiled wrought iron is thrust into it; no shrinking is here employed, but a toler- able fit is ensured by accurate turning. When fitted, the tube is secured by a collar screwed in at the muzzle; a plug of iron passes through the under side of the gun into the tube

near the trunnions to prevent any shift of position. The tube is in two parts, the breech end being turned down and a second tube shrunk over it. The bottom of the bore

is formed by a wrought-iron cup, which is forged and stamped into shape under a steam hammer.

A screw is

Fig. 39.

cut on the outside of the cup and inside the end of the tube; the cup is then screwed tightly home. The tube is next severely tested by water pressure, after which the second tube is shrunk on. The whole tube is then fitted into the cast-iron casing, the greatest care being taken that the breech end bears firmly home. The gun is now ready for rifling, and, after that operation is performed, undergoes proof by firing heavy charges, which expand the tube closely against the cast-iron envelope, which then takes up the strain and affords the necessary support. The relation between the powers of the three classes of guns will be gathered from the following comparison ;—

Energy of | Energy of Projectile | Projectile at 1000 yards,

Weight | Weight | Weight of of Pro. of Gun. | jectile. | Charge.

Nature of Gun. Calibre.

at 2000 yards,

re

cwt.

95

Tb.

68

ins, a

812

foot-tons.

298

Th.

16

foot-tons, Cast-izon 68-pr.,) smooth bore, .f wi Palliser 80-pr, converted ton 100 10 602 488 68-pr. above, . Wrought – iron

7-in. Woolwich 90 gun, F

80 6°30

315 22 7°00

1042 | 814

The great German gunmaker, Krupp, employs nothing Steel His earlier guns.

but steel in the manufacture of his ordnance. pieces were bored from solid blocks of this metal forged under heavy hammers. They were homogeneous, and therefore the exterior did not assist the interior to bear the strain of the powder gas on discharge to the extent which scientific methods of construction admit. Still the excellent quality of the material enabled the artillerist to get results from these pieces which have been surpassed only by the coil guns, and by Krupp's later productions. As, how- ever, progress was made and the ratio of power to weight increased, it was found necessary to introduce a system of building up for steel ordnance also, and Krupp adopted the principle of shrinkage to which the English guns owed so XT — 37

Krupp's

much. ‘The interior of the recent German gun is a steel

construc- ¢ybe as in the Armstrong construction, but it is very much

tion.

thicker and forms the body of the piece, instead of being chiefly used to provide a sound surface for the bore. It is thickest over the powder and shot chambers, tapering towards the muzzle (fig. 40). Over the thickest part, and in some guns over.a considerable portion of the chase, hoops of cast steel are shrunk on,—the shrinkage being adjusted

SSN LLU

SN

SGCG,SGG6GCCCGG GW

Fia. 40.—Section of Krupp Gun.

to bring the strength of the outer hoops into play to sup- port the body of the gun on discharge. The number of hoops depends on the size of the gun and the severity of the strain it has to withstand ; they are usually much more numerous than the English coils, and the section of a heavy Krupp gun presents somewhat the appearance of a stone wall. It is believed that the steel is not toughened in oil, but the details of manufacture have not as yet been made public.

Steel of the excellent quality employed by Krupp is un- doubtedly a stronger material than wrought iron; its present trustworthinesss is, however, of late date, and it has hardly gained the general confidence accorded to wrought iron. Possibly the method of construction adopted by Krupp, containing as it does a number of unwelded joints, scarcely permits the several parts of the guns to support each other as efficiently as is the case with the magnificent forgings of the coil system; be this as it may, the German pieces, though made of stronger and more ex- pensive material than the English ones, are just as heavy for any given power, proportions and ammunition being similar.

In France and Italy a combination of cast iron and steel has been introduced with a view to economy. The interior of the gun is a moderately thick steel tube as in the coil guns ; over this is a thick cast-iron body, corresponding to the steel body of the Krupp guns. On the exterior are shrunk steel hoops.

Sir J. Whitworth uses his fluid-compressed steel for the manufacture of ordnance. He forces massive hoops over a central tube, and over one another by hydraulic pressure or by shrinkage.

Mr Vavasseur employs Firth's crucible steel for his guns, which are built up somewhat in the same way as Krupp's. He also uses exterior coils of wrought iron in some patterns.

Systems of Loading.—The comparative advantages of breech-loading and muzzle-loading for ordnance on service are fully discussed in the article GuNNERY. We have now to mention the principal modes of closing the breech, either permanently as in muzzle-loaders, or temporarily as in

breech-loaders. ‘The former is comparatively a simple matter. When the whole gun, or the interior of it, is formed of cast metal, iron, bronze, or steel, the block is merely bored to the required depth, and the end left un-bored to form the breech. Should the inner part of the gun be formed of wrought material, such as coils, it becomes necessary to close the end with some device which shall render it gas-tight and strong. Several kinds of cups and plugs have been tried for this purpose, the most successful of which is the cup already mentioned in the description of the converted guns. When we come to the temporary closing of the end of the bore demanded by breech-loading, a far more difficult problem presents itself. This problem

has been more or less satisfactorily solved in a great variety

of ways, but it will be sufficient to examine the three principal types or systems of breech-loading employed

in modern artillery. They are popularly known as the Armstrong, the Krupp, and the French systems.

The Armstrong system is the carliest of these in point of Arm-

date. In ita slot is cut. through the top of the breech of strong the gun into the tube at A (fig. 41); a breech block (fig bret

- *loading*

43), through which the vent is driven, is dropped into this system,

Fic. 41.—7-inch Armstrong Breech-loader.

slot, and is pressed firmly against the bore from behind by the breech screw (fig. 42), which is provided with two powerful lever handles for the purpose. Where the breech block, or vent piece, as it is usually called, presses against the lip of the bore, both surfaces are of copper, and are re- newed from time to time as channels are worn through between them by the rush of the escaping powder gas. There are many guns, from 6-pounders to 7-inch, made on

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Fic, 42.—Breech Screw. Fic. 43.—Vent Piece.

this plan in the British service, and at the time of their intro- duction they constituted a great advance in gun construc- tion. Experience in the field and at practice has, however, revealed many grave faults in them. No joint consisting simply of two abutting surfaces can be made so tight as to prevent the gas from escaping on the discharge of the piece ; the pressure in tle powder chamber is so great that a con- siderable expansion takes place for the moment, aud per- mits a fan of flame to flash out. The eroding effects of gas in motion at high pressure are extraordinarily destructive, and constant necessity for repair arises from this cause. It has also been found that in rapid firing the breech screw may be too quickly forced home, nipping the vent piece before it has fallen into its proper position ; the end of the bore is then not sealed, and important and perhaps danger- ous accidents occur. Moreover, even with moderate-sized ordnance, the vent piece becomes too heavy for convenient lifting. In the Krupp system (fig. 44), a slot is cut through both Krupp sides of the breech of the gun; in this slot, in the latest breech ® g ° : loading patterns, runs a cylindro-prismatic wedge, or, in other on words, a wedge of D section, the round side to the rear. — The flat side forms the bottom of the bore. For loading, the wedge is pulled out to the left side of the piece as far as the stop will allow it to go, the shell and cartridge are thrust up the gun from behind, the wedge is pushed in, and is pressed hard home and secured by an ingeniously-contrived screw with powerful handles. As was mentioned with regard to the Armstrong system, no amount of pressing home and securing would by itself be of any avail in pre-

Broad- well ring.

venting escape of gas at the breech, and a special] arrangement |

is therefore provided for this purpose (fig. 45). The end of the bore is enlarged, and into the recess thus formed fits a Broadwell ring, against which the face of the wedge abuts when forced home. The ring is so formed that it must always fit against the wedge, and be pressed firmly to it by

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me lnk "I y Hy

0 0

Fra, 44.—Krupp's breech action, cylindro-prismatic wedge.

the action of the gas on firing. This is accomplished by making the recessed. surface of the gun and the exterior surface of the ring portions of a sphere. In spite of the theoretical perfection of the system, and the excellence of manufacture attained, it has always been found that after a time—after firing a very variable number of rounds—gas would begin to escape, and then speedily cut a channel between the ring and the wedge. Krupp has fully recog- nized this, and has been sucecessful in minimizing and

localizing the injury thus

caused. The gas has two

ways of escape: it can pass

either between the ring C

and the body of the gun D,

and so out to Y; or from

X to Y. Several forms of LA Broadwell ring have been bd tried by Krupp; the form

shown in fig. 45 is now in ® Ba nig use. Wheu the gun is fired

the gas acts on the rounded

surface of the ring C, press-

ate : Fia. 45.—A, steel facing-plate; BB, ing it down hard against the copper dises; C, steel Broadwell

facing-plate A, and also ex- ying; D, body of gun; E, wedge; panding it against the body X, interior of gun; Y, exterior of thegunD. Thetendency of gun.

of the gas is also to expand the body of the gun away from the ring, and many bronze guns have been destroyed from this cause, having expanded more than the ring was able to follow. A recess is cut in the exterior of the ring, partly to give it greater spring and partly to afford a relief channel for any gas that may have forced its way in. The form of ring here shown appears to have overcome the efforts of the gas to escape in this direction.

Having stopped the gas from getting round the outside of the ring and injuring the gun, we have now to consider the results of escape from X to Y. A channel cut through here would disable ring and wedge, which, though not so bad as disabling ring and gun, would yet be productive of much inconvenience. The insertion of the steel facing-plate A at once saves the wedge and localizes the injury. It allows, moreover, of the introduction of copper discs behind the plate, for the purpose of making up for wear, compres- sion of metal of wedge, &c. Two relief channels are cut round that surface of the ring which abuts on the facing- plate. Spare Broadwell rings and facing-plates are supplied with the guns ; should wear set in and escape of gas ensue,

the defective fittings can be removed from the gun and new ‘

ones inserted in a couple of minutes. Each set should last on the average for several hundred rounds.

In the French system no slot is cut in the gun (fig. 46) French The breech is closed by a screw plug from the rear, which breech- swings on a hinge to the side when withdrawn, The male inion screw on the plug and the female

screw in the gunare" divided circumferentially into six parts, of which three have the threads cut away, so that the surface is alternately screw and plain cylinder. When the threads of the plug coincide with the plain parts in the gun, the plug can be moved straight in or out. When pushed in, one- sixth of a turn en- gages the threads, which thus give half the bearing of ail ordinary screw.

Dr This is called the

f interrupted screw

systenl. The plug Frc, 46.—French breech action, |

is larger than the interrupted screw,

bore, so as to afford room for the shell and cartridge to be thrust in. The end of the bore is recessed to take a ring against which the end of the plug abuts, somewhat as in Krupp's guns; or a cup of steel is fixed on the end of the plug, which is slightly convex; the pressure of the gas drives the flat back of the cup firmly against the con- vex surface, bending out the lips, which are at the same time pressed against the sides of the gun by the gas. This method has been lately introduced by the Elswick Company.

It is difficult to award superiority to the Krupp or the French system. Each appears to possess some little advan- tage over the other, and both have attained great success. The Krupp system has undergone the more thorough testing in the field, and has the merit of allowing the parts which become damaged by the escape of gas to be replaced with greater ease and quickness. The French system, on the other hand, takes up less of the gun, so that in a piece of given length the bore may be upwards of one calibre longer than with Krupp's. Inthe French system, also, the breech- fittings are less exposed to damage by the enemy's fire, being behind the gun instead of at the side.

Destcninc.—A gun, like all other machines, must be Gun de- designed to fulfil certain definite conditions. Its projectile signing. may be required to pierce a given thickness of armour at a given distance; or weight of piece may be the limit, and it may be wished to throw the most powerful shell or

shrapnel to a given distance with a given elevation, con- sistent with that limit. To work out problems of this nature, it is all-important to possess an accurate knowledge of the action of the charge inside the bore. By means of the Noble chronoscope and the crusher gauge (see Gunnery), this knowledge is obtained, and we shall now explain how the indications of these instruments are employed to assist in determining the proportions of ordnance. ,

Gunpowder is not properly so much an explosive as a substance burning and giving off gas with great rapidity. It offers in this respect a marked contrast to gun-cotton, dynamite, and other true explosives. If one of these agents be detonated, the detonation is immediately carried through the mass, whatever its size, and the whole at once turns into gas. Gunpowder, on the other hand, as far as is known at present, cannot be detonated, but simply evolves its gas by burning in layers from the outside to the inside. Thus a large grain will take longer to burn up and become

Pressure of powder gas,

entirely converted into gas than a small one will; hence the effect of enlarging the grains is to render the action of the charge less violent, the composition of the powder being the same in all yunclharges. The projectile is driven out of the bore by the pressure of the gas on its base,—that is, on an area which varies with the square of the calibre. The weight of projectiles of similar form varies with the cube of the calibre, Hence the Jarger the gun the heavier will be the column of metal or projectile driven by each square inch of its base; and the greater must be either the pressure applied, or the time of its application, if a given velocity is to be attained. The great object of the gunmaker is to obtain the highest possible ratio of muzzle velocity to breech pressure. His ideal would be a charge so arranged that a pressure equal to the amount the gun is constructed to bear should be uniformly maintained till the shot has left the muzzle. Science is still a long way from this, but has doue a good deal towards it in the last few years. A charge of

gunpowder, composed of service ingredients in service pro-_

portions, exploded in a closed vessel at a density of 1:00 (equal to that of water), sets up a pressure of 43 tons per square inch; ata density of 0°75, of 23:2 tons; at 0°50, of 113 tons. Supposing a gun cartridge to be rammed home to the density of water, and entirely converted into gas before the projectile began to move, the pressure in the bore would rise to 43 tons per square inch at the breech, and fall towards the muzzle, as the travel of the shot afforded increasing room for expansion behind it. The column of metal to be moved, even in the heaviest pro- jectiles yet known, is only a few pounds to the square inch of base, while the maximum pressure of the powder gas is measured in tons; it is clear therefore that the shot must get under way at some perivd antecedent to the setting up of the maximum pressure. In a breech-loader, where the projectile has to be forced through a bore slightly less than its greatest diameter, it will be detained longer than in a muzzle-loader, where it moves freely away, but the difference is insignificant as regards the present argument. The result of the shot's early motion is that space is at once given for expansion, and the normal 43 tons is never reached. Before these matters were fully understood, badly-proportioned charges of violent powder were found sometimes to set up what are known to artillerists as " wave pressures," which were dynamical in character, being caused by rushes of gas

chamber than in the centre.

from one end of the charge to the other, so that the gauges indicated far lugher pressures at the ends of the powder This has now been overcome,- and a great increase of both power and safety has been ob- tained. Several important improvements have been made of late years; the principal ones are three in number :— (1) a great stride was made in the manufacture of powder when pebbles, prisms, and 14-inch cubes were introduced ; (2) the discovery of the beneficial effect of '" chambering," that is, of boring out the powder chamber to a greater diameter than that of the rest of the bore; (3) the

method of "air spacing" the cartridge, so that a certain Air spac-

weight of powder should havea certain definitespace allotted ins. to it, irrespective of the actual volume of the powder grains, Thus in the 80-ton gun powder cubes of 14 in. edge are used, having an absolute density a little over 1°75, or about 15°7 cubic inches to the pound. If these grains were rammed tightly home in a silk-cloth bag, the space occupied behind the shot would be 24°6 cubic inches per pound ; as actually used, an air-space over and within the cartridge is left, so that the space behind the shot amounts to 34 cubic inches per pound. This density would set up a pressure in a closed vessel of 26°6 tons per square inch, but the relief afforded by the shot's motion reduces it to about 19 tons per square inch. the bore where the powder lies is practically to permit a ins small gun to consume effectively the charge of a larger one. The cartridge is shortened, and the mechanical conditions of burning are greatly improved, so that, with large charges, higher velocity with lower pressure is obtained from a chambered than from an unchambered gun. The above information is derived from the indications of the crusher gauge, which registers the pressure of the gas at various parts of the bore. The chronoscope measures the rate at which the projectile acquires velocity during its travel from the breech to the muzzle. Knowing the increment of velocity at any point, we can calculate the amount of pressure required to produce this increment, and thus con- firmation is obtained of the accuracy of the records obtained by the crusher gauge. The following table gives the increase obtained at successive stages in the development of the power of the 80-ton gun, which was first under-bored for experiment, and gradually brought to its present dimensions :—

Lable showing Experiments with 80-ton Gun. Powder, Service P, (14-inch cubes).

Density Weight Mean

Calibre. of of Pressure in F Projectile. | Chamber.

; bie ins.

ins. ae = ae 14°5 14°5 25°6 22°9 15-0 15°0 25°6 23°8 15°0 15:0 30°0 22°4 15°0 16°0 30°0 PIA) 16°0 16°0 a2 0 20°4 16°0 18°0 34°0 19°3 16°0 18°0 31°4 19°1

Muzzle Penetrating Thickness of Muzzle Muzzle Energy per Power into Armour which Veloeity. Energy. Ton of Mean Armour at would be pene- Pressure. 1000 yds.

trated at 1000 yds.

E

ft.-tons per in. of

ft.-tons. P shot's eircumf. a

19, 637- 857 °5 SHAG) ON 7 20,577 864°6 3883 aval 23,205 1036°0 433 25°1 24,493 1089°0 457 25°8 26,740 13811°0 466 oul 29,745 1543'0 523 28°1 31,527 1651°0 545 30°2

1 Mild prismatic powder (German).

It will be observed that each improvement has tended to facility of consumption of increased charges, so that, while the pressures are diminished, the penetrating power of the projectile is augmented, a heavier and more destruc- tive shell being driven through thicker armour.

The manner in which the various principles, of which an explanation has been above attempted, are practically applied is laborious and complicated ; the conditions are often con- flicting, and the ultimate dimensions of a piece of ordnance 1s commonly a compromise. A couple of simple examples will illustrate the modus operandi. Suppose that it is required

to design a gun which shall not exceed a given length, but | shall throw a projectile capable of piercing a given thickness of iron at a given range. There are several formule of a

more or less empirical nature for calculating the perforating Perfora-

power of a projectile moving with a known velocity. Pene- tion of > armour.

tration is by some regarded as a punching action, by some as a wedging action; probably it isa compound of the two. Recent experiments carried on

with the very high velocity of about 2000 f. s. have thrown some doubt on the sound- ness of any of the formule. That generally used in England is as follows :—

The effect of chambering out the end of Chamber-

Work done by gun- powder.

DESIGNING. |

Let W=weight of projectile in tons ; r=radius of do. in inches ; v=velocity of do. in feet per second ; oo We? | é decid Died "By OMEN of do. 1n foot tons;

t=thickness of plate perforated in inches ; E2520,

aur

then

This formula tells the gun-designer what energy is neces- sary to overcome the resistance of the plate. Guided by experience, he assumes for the moment a striking velocity; the other component of the energy, the weight of the projectile, is then directly arrived at. The proportions of armour-piercing shell are the same for all guns, so that the weight guides the dimensious, and the calibre of the gun follows. Should this appear to be in no way unsuit- able to the length already laid down in the conditions, the gun-designer calculates the loss of velocity in the given range and from the striking velocity deduces the muzzle velocity and the muzzle energy. The excellent labours (Researches on Explosives) of Captain A. Noble, F.R.8., of Elswick, and Professor Abel, F.R.S., have shown liow to calculate the amount of work done by a pound of powder for every volume of expansion its gas undergoes; the results of many careful experiments and much intricate calculation are embodied in the accompanying table, which

B Total work Gun- we' where B=content/ powder is capable of bore in cub. in.,) of performing per and C=vol. of {lb of charge burned,

charge at 27°7 in foot-tons. cud, in. per Ib.

Total work Gun-

where B=content | powder is capable

of bore in cub, in., and C=vol. of eharge at 27°7 cub, in. per tb.

of performing per Tb of charge burned, in foot-tons,

1:00 1:02

1°04

1:06 1:08

1°10

112

1°14 1°16 1°18 1°20 1°25 1°30 1°35

1:40

1°45 1°50 1°55 1°60 1°70 1°80 1°90 2°00 2°50 3°00 3°50

82°1

Sil

91°4

95°2

98°6 101°7 104°6 107°2 109°6 111°8 113°9 116°0 117°8 121°2 124°2 127°0 129°6 132°0 134°2 136°2 138 ‘1 139°9 141°6

149-0

154°8 159°7

ABOSDOAWODAERNOVIANHNOARWHOONMWHO WBWAMNHE ORE SGMORSENEV AO SRSNUADEOS ASONSOOBDNAUMKRWNHHOODMOONNIAA®AAMAA SSescsecodcod soe ss sooumsousanscuascuscas

NOOR RWWWOD DD DHMH ee

G2 OO BD RO HH ee ee ee et pe pe

affords the means of determining the total work performed by any chargein any gun. A certain portion of this work is expended in heating the gun and projectile, in giving rotation, and so forth ; the remainder appears as the energy of translation of the shot on leaving the muzzle. Large guns realize a greater proportion of the total work than small ones; the gunmaker knows very approximately by experience what percentage may be expected from certain classes of ordnance with certain descriptions of powder. Roughly the factor of effect may be put within the following limits:— for mountain guns, 45 to 50 per cent; field guns, 60 to 65 per cent.; medium guns, 70 to 80 per cent.; heavy guns, 85 to 95 per cent. The method of calculation will be best understood froma anexample. Suppose a charge of 425 ib of P, powder is to be fired from the 80-ton gun chambered to 18 inches diameter; the projectile weighs 1700 ib, and the space behind it is 14,450 cubic inches.

The whole content of the bore is 60,400 cubic inches, and the volume of the charge is (425 × 27:7) 11,773 cubic

iuches, the number of expansions therefore is 5°13; the Actionof table shows that powder gas expanding to this extent from charge a density equal to that of water can perform work amount- ™ °F

ing to 92:4 foot-tons per tb. Since, however, the charge burns up in and has to fill (425 × 34) 14,450 cubic inches before doing work, the energy due to this extent of expan- sion (1:227) is lost, and 17-7 foot-tons per ib must be

deducted, leaving (92°4-—17‘7) 74°7 foot-tons per b as the total work the charge is capable of performing under these conditions. It is known from the preliminary tests of the powder that in the 80-ton gun between 92 and 95 per cent, of the total work will be realized. Hence the energy of the projectile will lie between 29,210 and 30,155 foot-tons, and its muzzle velocity between 1581 and 1600f.8. A reference to the table on p. 292 will show that the result actually arrived at lies nearly midway between these limits. In this manner the charge required to impart the necessary energy to a shot of given weight in a given length of bore, and, conversely, the length of bore which will contain the re- quisite number of expansions of a given charge, are easily found ; hence the charge required to produce the necessary energy is readily found; the air-space and the dimensions of the powder cliamber follow, and the inside of the gun is settled. The gun designer now has to put walls round his bore, Guided by the knowledge previously mentioned as derived from the crusher gauge and the chronoscope, he lays down the pressures at each point of the interior, and calculates the amount and strength of the metal to be used, according to the special system of construction employed, and thus the exterior of the gun is settled. To give another instance :—let it be required to construct the most powerful howitzer that can be made for the siege train. The conditions are given thus :—recoil (of piece only) must not exceed 20 feet per second; weight of piece must not exceed 70 cwt.; limiting purposes are to breach at 1500 yards, with not more than 5° elevation, and to bombard at 5000 yards, with not more than 35° elevation, A piece weighing 70 cwt. and running back at 20 f. s. velocity gives 156,800 units of momentum (in pounds and foot- seconds); the initial momentum of the gun in recoiling is practically equal to the momeutum of the shot on leaving the muzzle. Hence the shell must have 156,800 units of momentum, which may be composed of high velocity and light weight, or low velocity and heavy weight. For breaching purposes, accuracy and penetration are essential qualities ; a shell varying in length from two and a half to three times its diameter will be suitable for the purpose. We have now a neat problem in ballistics, viz., To find the calibre of a shell of the proper length, of such a weight that, with the muzzle velocity required to give a range of 1500 yards at 5° elevation, the muzzle momentum shall be 156,800 units. This problem is readily solved by the methods indicated in the article GuNNERY, and it is found that a shell 8:0 in. in diameter, weighing 170 ib, and having a muzzle velocity of 940 f. s.,

will be slightly on the safe side of the limits. Proceeding in a similar manner, a shell 8-0 in. in diameter, weighing 230 hb, starting with a velocity of 675 f. 8., satisfies the conditions of bombard- ment. The calibre being thus settled, the proportions of the piece remain to be worked out. As there is no difficulty in obtaining a velocity so low as 940 f. s. with a small charge and low pressure, the length of the bore and the disposition of the metal can be adjusted to suit, not only the strain of discharge, but the conditions of service. In the gun now under consideration, the bore is made as long as possible, and the weight of metal thrown as far forward as possible consistently with preserving due strength at the breech. The reasons for this are threefold :—first, the longer

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Example of de- signing.

Princi- ples of vifling.

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the bore the less is the breech pressure required to produce a given muzzle velocity, and the less is the maximum strain thrown upon the studs, gas check, or other rotating agent ; next, the more forward the general disposition of the metal, the farther from the breech end will be the centre of gravity, and consequently the trunnions,—a position which favours steady shooting and absence of jump; thirdly, a siege howitzer, being always fired under cover, is little exposed except near the muzzle, which should therefore be made as strong as possible to avoid injury from anything less than a direct hit by unburst shell.

Rifling.—Spherical projectiles fired from smooth-bored guns seldom or never pursue the mean trajectory. The centre of the ball's figure will rarely coincide exactly with the centre of gravity, aud the pressure of the air during flight will then act with unequal effect on different parts of the surface. This inequality will be increased by accidental imperfections or roughness. The difference between the diameter of the bore and that of the projectile is termed "windage"; when this is considerable, it is a principal cause of error in shooting, as the ball rebounds from side to side against the

walls of the piece as it is driven along, its actual direction of departure depending on the effect of the last bump before it leaves the muzzle. Accuracy of manufacture may greatly mitigate these errors, but will never entirely remove them ; itis therefore found necessary to cause the projectile to rotate rapidly round an axis coincident with the axis of the gun; by this means the inequalities in the action of the pressure of the air, due to the imperfections above mentioned, take effect in all direc- tions in turn as the projectile rotates, and hence neutralize each other. Extending this principle, the stability im- parted to a shot by its moment of rotation is such that elongated projectiles can be employed and driven point first at high speed through the air. The course of the projectile from the time of its leaving the muzzle to the end of its flight belongs to Gunwery (q.v.). Here we have to con- sider the modes in which the interior of the gun is made to impart rotation to the projectile. Rotation is usually ex- pressed in angular velocity; a shot is said, in popular language, to make so many turns per second. Mathemati- cally, the unit of angular velocity consists of rotation through the unit of circular measure in one second; the unit of circular measure is the angle subtended by an arc equal to radius, viz, 57° 17' 44" 48'", If we call this angle o, a complete rotation will be expressed by 27w. In consider- ing the energy stored up in a shot's rotation, or, what is the same thing, the work done in producing that rotation, the weight of the projectile W, and its radius of gyration p, must be taken into account. The energy of a travelling

o We P ' ; body is me ; the weight of a rotating one is supposed to be

concentrated at the end of the radius of gyration; then if Q be the angular velocity, the velocity of a travelling body will correspond with pQ in a rotating one, and the energy

of rotation will be expressed by pro The propor-

tions of service projectiles differ for different guns, the thicknesses of sides and base and thie shape of head varying ; but roughly for common shell the value of p may be taken as 040d (d=diameter), for Palliser projectiles as 0°38d, and for shrapnel as 036d. For artillery purposes a pro- jectile is said to turn once in so many calibres, that is, to make one complete revolution in travelling a distance equal to so many times the diameter of

the bore. Supposing a given length of groove in the bore to make a known angle with a line parallel to the axis of the gun, determining the are through which the surface of the shot must turn while advancing the length of the groove, it is evident that the augular velocity attained by the shot will entirely depend

on the velocity of translation or forward movement. Again, the greater the diameter of the bore the less will be the proportion borne by the arc turned through to the whole circumference ; consequently the bigger the gun the less the angular velocity of the projectile, if the angle of rifling and the velocity of translation remain constant ; the velocity of rotation of a poiut on the surface will, uuder these condi- tions, always be uniform. It is generally considered that with studded muzzle-loading service projectiles, having a length equal to about 21 to 3 times their diameter, the velocity of rotation of a surface point of about 110 f. s. is sufficient to keep them steady, allowing for loss of spin by atmospheric friction up to any probable range. Supposing the interior of the gun to be opened out and laid flat, the groove (of a uniform twist) will be straight, and since the shot guided by it makes a complete revolution in x calibres, tlie angle made by the groove with a line parallel to the gun's

axis may be expressed by tan ae In designing the

piece, the muzzle velocity is determined on, and also the velocity of rotation to be communicated to the projectile ; the combination of the two fixes the final angle of the groove. Now it is easy to see that the spin of the shot on leaving the bore depends only on the conditions immedi- ately preceding. The rate at which the work of giving rotation is done during the travel of the projectile from breech to muzzle is an entirely different question. If a shot be rotating, its tendency is, putting friction aside for the moment, to continue to rotate with the same velocity. No work is doue in keeping up this rate of rotation, but work would be done in accelerating or retarding it. Thus in apportioning the work done on the shot in giving rotation at different parts of the bore, we have to consider, not the actual angular

velocity, but the increments of angular velocity. The work then can be distributed at pleasure over the whole length of the groove, by varying the angle it makes with a line parallel to the gun's axis, as it runs along the bore. Supposing, as before, the interior surface of the gun to be opened out and laid flat, then OU (fig 47) will represent a groove having a uniform twist, that is

U

◦

Fig. 47.

making a constant angle with a line OM parallel to the axis of the piece. O denotes the commencement of the rifling at the breech end of the bore, UPM the muzzle. Guns are rifled with any number of grooves exceeding two, but it is not necessary to consider more than one. With the groove OU, every increment of angular velocity im- parted to the shot is due to an increment in the velocity of translation; and therefore the pressure between the sides of the grooves, and the studs, gas check, lead coating, or whatever fitting on the shot is employed for the purpose, bears a constant relation to the pressure of the powder gas on the base of the shot driving it forward. The table given below shows the result of this with great clearness. In order to mitigate the unevenness of strain, recourse was had to the increasing twist ;,and a curved groove was employed which, when developed ds.in fig. 47, forms the parabola OP, begin- ning at the point O) parallel to OM, and terminating at P, parallel to OU. »The equation to OU is x=py; that to OP is x?=py. Since OP is a parabola having its vertex at O, and since the tangent at P is parallel to OU therefore

Uniform

and in- creasing twists.

UP=PM, which shows that the shot, though rotating in either case with equal angular velocity on leaving the muzzle, has, up to that moment, with

the parabolic twist turned through an angle half as great as would be the case with the uniform twist. The table below exemplifies the principle on which curves of rifling are, or should be, constructed. The first three columns speak for themselves; the fourth is arrived at by multiplying the area of the shot's base by the gas pressure per square inch recorded on the gauges, and given in the 5th column, Columns 6 and 7 are worked out from formule due to Captain Noble of Elswick ; in

column 6 the pressures due to a uniform twist are given. Pressures It will be seen that they bear a constant proportion to the on pressures of the gas recorded in columns 4 and 5, and that 8'°0°Ve-

the maximum rises to a considerable height soon after the shot has begun to move, while at the muzzle little work is done. In column 7 the calculations are made to suit a curve consisting of a portion of a parabola, starting from the vertex where the groove is parallel to the axis of the piece, and rising to the required twist at one foot from the muzzle, thence proceeding uniformly. In this curve the maximum strain is greatly reduced, the pressure gradually

Table showing Pressures of Grooves on Studs in the 38-ton Gun, with various Curves of Rifling. Charge, 180 tb.

Cubieal Powder of 1°25-ineh edge.

Travel of

Pressure per

Projectile, 800 tb. Calibre, 12°5 inches.

Pressure on Studs with Uniform Twist

Pressure on Studs, Parabola, Twist

Pressure on Studs, Semi-Cubical Para-

A Velocit . Poa : i Suet Eee Time of Travel. éeaiiteg. re agp square inch of of 1 ise, a 35 0 e Th 35 alt eG —

ft. secs, f.s. tons. tons, 0 00000 0 2000 (estimated) 16°3

‘1 00143 140 22203, 18°1

DB 00273 474 3320°3 27°0 10 00360 676 2060°6 16°8 2°0 00490 869 1394°1 11°4 3°0 00598 987 1095°0 8°9 4:0 00695 1074 908°8 74 50 00785 1142 746°4 6-1 60 00871 1195 668°3 54 70 00953 1242 592°8 4°8 80 01032 Pris 499°4 4-1 9°0 01109 1309 421°9 3°5 10°0 01184 1335 355‘6 2:9 IRD) 01258 1355 265°1 ag 12°0 01331 1369 188°7 15 13°0 01404 1379 131°6 Leal 14°0 01476 1385 120°9 10

rising with the increase of twist. The figures are derived

from another formula worked out by Captain Noble. Column 8 shows the pressures required to give the neces- sary rotation when the curve of groove is a semicubical parabola, having for equation «?=py. In the instance chosen, the early part of the curve is rejected, and it starts from 1 turn in 200 cals., arriving at the required twist at a foot from the muzzle as before. The figures are derived from a calculation worked out on the principle devised by Captain Noble. Here the maximum is yet further reduced, and some approach to uniformity of strain is made. The diagram in Plate IV. shows the pressures graphically. Let R=rotation pressure between studs and grooves ; G=gas pressure on base of shot ; »=coeflicient of friction ; h=piteh of rifling ; k=tan. of angle made by groove with plane traverse to axis ; g=angle turned through by shot ; é=angle made by groove with line parallel to axis ; p=radius of gyration ; z=travel of shot along bore; v=velocity of shot ; M=mass of ie le r=radius of shot. Then in a uniform twist (¢=kr¢) »_ Arp%(1 +2)? = hr(k- mw) +2ap(ukt+1) 0? in a parabolic twist (z2=kro) Re 20°42 +h) (Get Mo) ker®(ke — Quz) + 2p?2(22+ wk)’ in a semicubical twist (2? =kr@)

3p°(6 erie) e+

Lieut. Younghusband, R.N., gives the following formula, which is applicable to curves of any equation, and will be found much handier than the above

hy those familiar with differential calculus :—

Mv? he

2:

_ p(G tan 6+ 73Mv”) sec 6

R

;

r?(1 + tan ***6) — « tan 6 (r?— p)*** *NI +H?*

A radical difference exists between the rifling of muzzle- loaders and that usually employed for breech-loaders. When the projectile has to be pushed down the gun from the front, it must be smaller than the bore; when it is thrust home from behind, it may be rather larger than the bore. Hence the earlier muzzle-loading shells were provided with ribs or studs which fitted in the grooves, and guided the projectile in its rotatory course; while the earlier breech-loading shells were coated with lead, into which the lands of the bore bit sharply as the powder gas forced the projectile between them. All rifled ordnance were formerly rifled with a uniform twist ; indeed, it is clear that where ribs are cast or fixed on the projectile, or where they are formed in the soft envelope by the first action of the grooves, no alteration in the angle of rifling is possible, since the ribs can only make a constant angle with a line parallel to the axis of the piece, and cannot fit a groove making a varying angle with it. The smaller and earlier muzzle-loading rifled projectiles were fitted with two rows of studs, front and rear, and equal in size, so that a front and rear stud travelled in each groove, and practically con- stituted the ends of a rib. As the guns grew, it was found that the great strain of giving rotation at starting fre- quently forced the bronze studs out of the recesses machined for them in the sides of the shells, and scooped away the driving edges of the grooves even when the gun lining was of steel. The shell might have been cast with ribs on them, but certain difficulties of manufacture stood in the way, and the excessive strain would still have ex- isted though its effects might have been mitigated. The increasing twist was therefore devised, and the rows of studs increased in

number from two to three in the larger natures of projectiles. Three studs are allotted to each

Modes of giving rotation.

Studs.

Gas checks.

groove ; the rear one is the largest, the front one the smallest. They are so placed that the line of their loading sides is parallel to the angle made by the groove at the breach, while the line of their driving edges is parallel to the angle made by the groove at the muzzle. In Plate IV. fig. 1 shows their position when the shell is home, and also when about to leave the bore. Thus, theoretically, the middle and leading stud should never come into play till the last moment, and the rear stud should do all the work of rotation. Practically, however, the rear stud, being of bronze, wears down against the edge of the hard groove ; the centre stud obtains a bearing; the wear continues, and the leading stud takes up its share of duty; so that all tliree really act during the passage of the projectile through the bore. This method of employing the increasing twist necessitates wide grooves, and is unsuitable for small guns. A different plan therefore was devised to meet their case. Two rows of studs, front and rear, were so arranged that each ran in a groove of its own. Thecurveof the grooves belonging to the rear stud began at 0°, and reached the final angle at a distance from the muzzle equal to the dis- tance between the front and rear rows, after which it pro- ceeded in a straightline. Thecurve of the grooves belong- ing to the front studs began at 0°, at a distance in front of the commencement of the other grooves equal to the dis- tance between the rows, and reached its final angle at the muzzle. Thus the two curves were alike, but one was always a constant distance in front of the other, and every stud acted through the entire Jength. Fig. 2 in Plate IV. shows the position of the studs when the shot is home, and also when it is about to leave the bore.

Muzzle-loading rifling had reached this stage of progress at a time when the great wear caused by the rushi of gas over the shot necessitated the

adoption of some method of sealing the escape. After many trials, it was found that a flanged copper disc fitted on to the base of the projectile would expand under the first pressure of the gas, and cut off the windage completely. This saved the wear of thie guns, and added to their power. It was found, moreover, that the flanges of these "gas checks" expanded in the grooves, and being firmly attached to the shell afforded an additional means of giving rotation. The next step was to remove the studs altogether, using a smooth projectile, and substituting many small grooves for few large ones. This method of giving rotation has been adopted in all recently-designed pieces, and appears likely to give entire satisfaction. When muzzle-loading guns were first rifled, many attempts were made to give rotation by expanding projectiles, but they proved unsuccessful, because at that time the increas- ing twist was not known, and the action of a violent powder and the uniform twist was that the rotator had to expand into the grooves, and at the same instant to communicate a rapid spin to the shell. It was unable to combine these operations, and the projections driven out by the gas could never settle to their work, being constantly cut down by the edges of the grooves. The result was that the shell "stripped," and left the bore without regular rotation. In the case of the twist which begins at 0°, the projections have time to expand comfortably, and adapt themselves to the shape of the grooves before they are called on to perform the work of rotation. On the other hand, since the gas presses out the flanges against the bore and into the grooves, and affords them support in this position, it is desirable that its pressure should correspond with their pressure on the driving edges of the grooves. This would be exactly met by the uniform twist, but that is inadmissible for the reason Just given. The parabola, on the other hand, throws the principal rotating strain forward towards the muzzle, where the gas pressure is least (Plate IV.). The case is practically met by the semicubical parabola, which is the curve adopted

in the 80-ton gun. While progress was thus being made in the rifling of muzzle-loaders, the rival system had not

remained inactive; the use of lead coating had been found Lead to involve a loss of power in the projectile as regarded both coating.

the amount of bursting charge or bullets carried, and thie penetration into armour, on to the surface of which the lead flew forward ina splash, when the shell struck. Moreover, the lead envelope would not lend itself to the exigencies of the increasing twist. To meet these difficulties, two under- cut rings were machined round the smooth projectile, one near the base, the other near the shoulder. Into these slots were pressed stout copper wires, the rear one bringing up the diameter of the shell beyond that of the bore, so as to take the rifling when forced through the piece on discharge, the front one just fitting the lands, but not entering the grooves, so as to rotate irrespective of them, and thus keep the fore part of the shot steady. Projectiles thus fitted are more effective tlian the lead-coated ones, and are adapted to any twist of rifling. The latest breech-loaders made by the Elswick Company use the new arrangement described above for muzzle-loaders—the smooth shell with a gas clieck on the base. This appears to be the best form of projectile, and has the advantage of suiting either system. A few words on the section of groove best suited to various pur- poses will conclude the subject of rifling. The rotation is impressed on the projectile by a force acting tangentially to the surface. This principle would be represented in its extreme form by making the section of the shell to resemble a cog-wheel, the grooves and lands of the gun being bored to fit. With muzzle-loading systems where windage has been necessary, the sides of the projections on the projectile, and of the grooves in the bore, have been sloped to enable the projections to run up the sides of the grooves, and so distribute the windage equally all round. The extreme form of this principle is Lancaster's oval bore, the section of which departs but slightly from a circle. All attempts at "centring" the projectile by sloping the bearings tend to convert it into a wedge, which expends that part of the force resolved radially in a crushing action on the shell, and arending action on the gun. The slope may, however, be made of such a degree as to cause the projectile to centre fairly without exercising any important effect on the bore. In breech-loading systems, where the lands bite into the rotator, the driving edge strikes the projectile in, or nearly in, the prolongation of the radius, care being taken that the points of action are as many as possible consistently with leaving enough material between to stand the

wear and the strain. Where gas checks expand in the grooves, these should be broad and flat, so that a complete fit and a strong projection should result. The driving edges should here also form a prolongation of the radius of the projectile. Conclusion.—What may be the future of firearms it is impossible to predict, but it seems probable that the limit of power will be found to lie in the recoil. For shoulder guns, methods of withstanding increased velocities may be devised, but the weight of springs, pads, &c., will prevent the soldier or the sportsman from carrying this principle very far. For ordnance, the field artillery appear even now to be very near the limit of what power can be gained consistently with high mobility. Siege and heavy guns will no doubt gain by the increased application of hydraulics; but it is difficult to sec how progress can go much further except in the matter of size, to which there appears to be practically no limit. Accuracy may be improved by more perfect methods of range finding, but, as regards the actual shooting of the guns, it is already in advance of the difficul- ties of atmospheric irregularity, which affects the smaller projectiles greatly. The reader who wishes to study the subject closely and technically is referred to the list of works given at the end of the article on GuNNeERY. (=. M.)

Copper bands.

Cent- ring.

Conclu- sion.

Rarly views.

Tarta- glia.

Newton.

Robins.

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GUNNERY

N its early days this science might have been simply | defined as the art of determining the motions of pro- jectiles discharged from pieces of ordnance; in its present state it includes also the employment of projectiles specially adapted to the purpose in view, and the manipulation of artillery so as to enable the projectiles to produce the maximum efiect.

Lheory of Gunnery.—Instruments of great precision, mechanical construction of much accuracy, and a consider- able knowledge of the higher mathematics are necessary to obtain and make use of trustworthy data for the establish- ment of sound principles on which to base the theory of gunnery. It is therefore not surprising that, owing to the early discovery of gunpowder, the art was long practised in a rude manner, without any attempt being made to re- duce it toa science. Thus, though firearms appear to have been in use from the early part of the 14th century, little of value was understood of the laws regulating the flight of projectiles till the time of Nicholas Tartaglia, who published a treatise on the subject at Venice in 1587. About sixty years before that date, Leonardo da Vinci had enunciated some of the mathematical principles of trajec- tories in a manner which shows him to have possessed far nore insight than any of his contemporaries; but he did not pursue the inquiry, and Tartaglia may be regarded as the father of ballistics. He was a man of great talent and ingenuity, but unfortunately had no opportunities of observ- ing artillery practice; he was unable, therefore, to bring luis calculations and speculations to the test of fact, and failed to carry conviction to the minds of the philosophers of the age. Before his time it had been generally believed that a ball on leaving the bore of a gun proceeded for some distance in a straight path,—a fallacy which lurks in the phrase "point-blank," not yet expunged from popular speech. He saw, however, that "a piece of artillery cannot shoot one pace in a right line," and propounded the axiom that "the more swifter a pellet doth flic, the lesse crooked is his range,"—a truth expressed at the present day by the statement that a high velocity gives a flat trajectory. This eminent philosopher claimed the invention of the gunner's quadrant; he took into account in his calculations the resistance of the air, but placed the angle of elevation at which the maximum range would be obtained at 45°, which would only be the case iz vacuo. Galileo

was the next mathematician of note who investigated the subject. In his Dialogues on Motion, published in 1638, he recognized fully the resistance of the air, and pushed on the inquiry in the direction indicated by Tartaglia. It was not, however, till Newton's time that a substantial basis was laid down for a true theory of gunnery. The grand discovery of the law of gravitation revealed the hitherto unguessed secret of the projectile's fall to earth. The great improvements in mathematical methods of analysis invented by him rendered possible solutions of previously impracticable problems ; while the splendour of his achievements in natural science stimulated philosophers of all countries. Towards the end of the 17th century he investigated the trajectory of a pro- jectile on the supposition that the resistance of the air varied as the first power of the velocity. Bernoulli in 1718 gave a solution of the problem, on the supposition that the resistance varied as any given power of the velocity. This solution was, however, left in such a complicated state that no practical use can be made of it. No further progress was made till Benjamin Robins in 1742 published his Mew Principles of Gunnery, in which he furnishes a notable example of the manner in which theory should be

wedded to practice, and hypothesis to experiment. Had Robins been in the possession of accurate instruments he would probably have arrived at results of considerable correctness. He invented the ballistic pendulum, and was the first to ascertain experimentally with any degree of correctness the velocities of projectiles on leaving a gun. A "triangle " or gyn supported a pendulum of iron having a massive wooden bob; to the bob was fixed a steel ribbon which passed through a steel clamp set to the desired pressure. A bullet fired into the wooden bob caused the pendulum to swing; the length of the are described was recorded by the steel ribbon ; the weight of the bullet and the conditions of oscillation of the pendulum being known, the velocity of the bullet could be calculated from the length of the are. The weight of Robins's first pendulum was 56 ib, and it was therefore only suited for small arms. It could measure the velocity at only one point each round, and therefore, to ascertain the velocity lost by a ball in passing through the air, it was necessary to fire a series of rounds at one distance, and afterwards a similar series of rounds at another distance, Velocities of 1700 feet per second were measured, and the loss of velocity due to the resistance of the air, up to a distance of 250 feet from the muzzle, was approximately

ascertained. Robins discovered that the resistance of the air was greatly increased as soon as the ball travelled faster than sound, and attributed it to the creation of a vacuum behind the shot, into which the air could not rusli with speed greater than that of sound. Count Rumford in 1751 made use of the recoil to measure the velocities of bullets, on the principle that the momentum of the bullet forward was equal to the momentum of the gun backward. To carry this out, the gun was suspended as a pendulum, and the length of the are it described on firing measured, By firing a bullet from a gun thus suspended into the ballistic pendulum, two independent records were obtained, and it would have been easy to calculate the loss of velocity, from the muzzle to any range at whicli the pendulum could be hit, by the combination. The roughness of the methods unfortunately did not permit completely satisfactory results. Dr Hutton next took up the inquiry, and increased the weight of the pendulum and the bullets. No very great advance, however, seems to have been made till 1840, when experiments on the resist- ance of the air to the motion of spherical shot were carried on at Metz by the French Government. MM. Piobert, Morin, and Didion were the chief experimenters. They raised the weight of the receiving pendulum to nearly 6 tons, and fired into it 50-pound balls at a range of 330 fect. The information now obtained spread over a much wider field than that traversed by Robins. It was even found possible to construct the trajectories of projectiles with some approach to truth, and empirical formule were laid down by which ranges and times of flight could be approxi- mately calculated. It was not, however, till the introduc- tion of electricity as a means of determining the velocities of projectiles that accurate knowledge of the resistance of the air was obtained. In 1840 Professor Wheatstone invented an instrument for this purpose, called the electro- magnetic chronoscope. He has had many successors, whose

productions exhibit a great amount of ingenuity; those Electric from which the most valuable results have been obtained, Velocity

and which are in use at the present moment, are the Bash- forth chronograph, the Noble chronoscope, the Le Boulengé chronograph, and the Watkin chronograph. The general principle on which these four instruments are designed is that a projectile after leaving the gun shall XI. — 38

sever a fine wire stretched across a screen, thus breaking an

electric current, and causing a record to be made by the

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Fig. 1.—Bashforth Chronograph.

two records are necessary to obtain a velocity, reading the time taken by the shot to pass between two screens, the number of points of a shot’s flight at which an instrument is capable of indicating the velocity is one less than the number of screens employed. The chronograph invented by the Rev. F. Bashforth, late professor of mathematics to the Advanced Class of the Royal Artillery, is shown in fig. 1.

A is a fly-wheal, which, in revolving, carries with it K, a cylinder Bashforth covered with paper specially prepared to receive the records of the chrono-clock and screen. 3B is a toothed wheel which turns the drum M graph, and unwinds the string CD, thus allowing the platform 8 to descend slowly down the slide L. E, E’ are two electromagnets, whose keepers are supported by the frames d, d’; f, f are the ends of springs which act against the attraction of the electromagnets.

There are two distinct currents—one through the screens and K, the other through the clock and EF’, When these are interrupted, one by the shot cutting a screen, or the other by the clock beating seconds, so that the magnetism is destroyed, the spring f or / carries back its keeper, which, by*

means of the arm a or a’, givesa blow to the lever b or 0’, causing the marker m or m’ to depart from the uniform spiral it has been describing—a spiral consisting of a double line running round the cylinder. The apparatusis adjusted so that the platform L, and-consequently the eae m, m’, descend about

} inch for each revolution of the cylinder ; the folds of the spiral are thus } inch apart. The cylinder is made to revolve with considerable rapidity, so that the intervals between the successive clock marks indicating seconds measure from 20 to 25 inches ; hence the screen : marks indicating the moment of the severance of the wire by the shot can be allotted to their proper value in seconds with great accuracy. Thescreensare so contrived that the current, interrupted by the passage of the shot through one, is completed again before the next is reached. To accomplish this, the cutting of the wire is made to release a spring which makes a fresh contact ; thus any number of screens can be used and a corresponding number of records obtained.

The chronoscope invented by Captain Noble of Elswick, Noble late Royal Artillery (figs. 2, 3, 4), is constructed to furnish chrono- eight or more records, according to the number of discs, “°P® and is so excellently adapted for the measurement of exceed- ingly minute portions of time that it is usually employed to ascertain the velocity acquired by the shot in moving

instrument at the moment, The Le Boulengé is connected | from a state of rest inside the gun at different parts of the

with two wire screens only, the others with several. As

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INSTRUMENT ABOUT 757% GUN ABOUT 5&7"

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bore. It is thus intimately connected with gunmaking,

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Fires. 2, 8, 4.—Noble Chronoscope. ~~ — Lf

Cutting the shot passes, its plugs. foremost edge pushes

GUNNERY

but, having the same character as other velocity instruments, is described here. The screens used for recording the flight of the shot through the air are now discarded, and the

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“cutting plugs,” shown in figs. 5, 6, 7, are substituted for them. In figs. 5 and 6 B is the bore, and A a flat-headed shot or cylinder passing along it in the direction of the arrow. The plugs are screwed into the sides of the gun, as in fig. 7, which gives an end view of the bore. As

up the knife D, cut- ting the wire e, which passes in at one side of the plug C, then through a hole in the knife D, and out again at the other side of the plug. The ends of this wire are con- nected with the main wires leading to the instrament, and the Fic. 7.—Cutting plug, ready for firing.

knife D, in cutting it, interrupts the current. Fig. 4 shows a 10-inch gun pierced to receive cutting plugs in eighteen places. The main wires run from a plug to the primary of a Ruhmkorff coil, fig. 2, near the instrument, with which the secoudary communicates, Figs. 2 and 3

show the instrument in plan and elevation.

A, A are disks, 36 inches in circumference, fixed on a horizontal shaft S. This shaft is caused to rotate, so that the edge of the disks travel at ubout 1100 inches per second, by a series of toothed whecls F, F, gearing as shown, and worked into rapid motion by the handle C. This motion is kept up with regularity by the descent of the weight B acting on the hindmost she ft, the speed of which is multi- plied 200 times at the shaft S. At V is a vernier, reading a gradu- ated circle, which is fixcd on the shaft 8. The edges of the disks are covered with a coating of lampblack. One of the secondary wires G is brought from the coil, and placed in communication with the revolving disk; the other secondary wire H is fixed in a discharger Y, just clear of the edge of the disk. A stop-clock is placed on a stand D, and records the rate of revolution of one of the shafts. When the gun is fired the shot begins to move, and, as it travels along the bore, cuts the wires of the plugs in succession, breaking the primary currents, and causing sparks to pass in the secondary current from the-dischargers Y,Y, to the disks A, A, which are in rapid revolution. The sparks burn off the lampblack and record their positions on the disks by a minute spot. Now if the shot could cut all the plug-wires simultaneously, all the spots on the disks would be in a straight line, but it does not do so, and during the intervals between the cutting of successive plug-wires the disks continue to rotate, so that the line of spots forms a spiral round the cylinder represented by the disks, as is apparent on bring- ing the machine to rest. The shaft S is then turned so as to place each spot in succession opposite an index, and the spaces travelled by the circumferences of the disks between the spots are read off on the graduated circle. As the circumference of the disks is made to travel at the

rate of 1100 inches per second, and the vernier reads to thousandths of an inch, the machine indicates portions of time rather less than a millionth of a second ; it is, in fact, practically correct to hundred-thousandths of a second. A millionth is about the same fraction of a second as a second is of a fortnight. Thus

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the distance between two successive spots gives the actual time oc- eupied by the shot in moving over the portion of the bore between two corresponding successive p'ugs, and therefore the velocity acquired at some point of this travel. As the increment of velocity is constantly decreasing after the charge is fairly lighted, the point at which the measured velocity is acquired is very slightly behind the middle of the space between the two plugs. 'The observations are worked out, accidental errors eliminated, and the results put in the form shown in column 8 of "vable I.

The "crusher gauge " (fig. 8) is so closely associated in Crusher its use with the Noble chronoscope that it is convenient gauge.

to give a description of it here, though its indications are

Y EE ge Fia. 8.—Crusher gauge.

valuable to the gunmaker rather than to the gunner. In fig. 4 are shown three plugs, A, B, and ©, driven through the walls of the gun, and terminating flush with the bore. These plugs contain gauges for measuring directly the pressure of the gas on the surface of the bore. They are of the same diameter as the cutting plngs, and can be used in any of the twenty-one holes pierced in the gun. Fig. 8 shows the construction. The bottom of the plug is chambered out, and a steel anvil E is placed at the top of the chamber. Against this anvil is pressed a cylinder of pure copper A, carefully tested for quality, which is held in its place by a spring B, A piston C fits accurately the lower part of the chamber, any ingress of gas being prevented by the gas-check D,

TABLE I,

Mean of 4 Rounds.

Plug from

Distance of bottom of Bore.

ey which is flush with 2 53 the bore. When the $ 2 es gun is fired the pow- a | > | As der-gas presses the fs, f.s

tons per sq. in. piston hard against 23°8 the copper cylinder A, which yields and becomes shorter, ex- panding laterally. The plug is then removed from the gun, and the nozzle unscrewed; the cylinder is extracted and measured. Its compression is com- pared with those given in a table constructed from experiment, and the pressure of the gas per square inch re- corded. Withthe chro- noscope the velocities are obtained directly from the time shown by the instrument to have been taken by the shot in passing over the interval be- tween twocutter plugs. From these velocities calcenlation deduces the pressures required | to produce the increments of velocity. These calculated pressures are compared with and confirmed by those ob- tained directly from the indications of the crusher gauge. Table I. shows the nature of the information obtained from

23°8

22‘5

hee 14°2 11°6

70

3°8

2°9

Pressures and velo- cities in-

side bore.

Le Bou- lengé chrono- graph.

the combination of the two instruments, when used with a 38-ton gun, firing an 800-lb projectile, with 130 tb of 1°5-inch cubical powder.

The last velocity is calculated from that taken by a Le Boulengé instrument outside the gun. This chronograph,

the invention of an officer of the Belgian artillery, is shown a

aot

in figs.

9, 10, and its mode of application in

Fra. 9.—Le Boulengé Chronograph, Fic. 10.—Le Boulengé Chrono- side view. graph, front view.

The shot, after leaving the gun, cuts the wire of the first screen, and subsequently the wire of the second screen. The wire of the first screen conveys a current through an electromagnet A (figs. 9,10), which then supports a cylindrical rod C. This rod is sheathed with a zinc tube D, which is renewed from time to time as required ; several short zinc tubes are slipped on, instead of one long one, if no great variation in the velocities is expected, so as to save material. Directly the first screen is cut, the rod C,

27 Screen 19! Screen.

Fic. 11.—Mode of using Le Boulengé's Chronograph.

which is called the chronometer, drops. The wire of the second screen conveys a current through another electromagnet B, which supports a much shorter rod F, called the registrar. The shot, in cutting the second screen, releases this short rod, which falls on a disk 0, setting free a spring M. This spring carries a horizontal knife N, which flies forward and nicks the zine tube covering the long rod. The nick made by the knife, if released while the long rod is still suspended, is the zero point. The currents from both screens pass through a disjunctor by which they can be cut simul-

taneously. When this is done the long and the short rods fall at the same moment. A certain time is consumed by the short rod in reaching the disk, setting free the spring, and cutting a nick on the zinc. During this time the long rod is falling into a recess in the stand, deep enough to receive its full length. The instrument is so ad- justed that the nick thus made is 4°435 inches above the zero point, corresponding to0‘15sec. Thisis the disjunctor reading, and requires to be frequently corrected during experiments unless the weather is exceptionally favourable to the electrical conditions. Instead now of using the disjunctor to cut both currents simultaneously, suppose the shot to cut them in succession ; then the long rod will be fall- ing for a certain time, while the shot is travelling from one screen to the other, before the short rod is released. The longer the shot takes to travel this distance, the farther the long rod falls, and the higher up on it will be the nick made by the knife. A simple cal- culation connects the distance fallen through by the rod with the time occupied by the shot in travelling over the distance between the screens, and hence its velocity at the middle point is known. A graduated rule is generally supplied with each instrument, arranged for a certain distance between the screens ; from this any velocity obtained can be read off at once.

The electric chronograph, invented by Captain Watkin, Watkin

R.A. is shown in figs. 12, 13, 14.

Fie. 12.—Watkin Chronograph.

‘wo brass cylinders A, Arevolve on pivots B, B,C, C. Between them, at the top, hangsa brass weight (fig. 18), suspended freely by means of a piece of steel B, which pivotsin another piece A let into the base of the weight. Two arms E enter, on falling, two V springs on the bed of the instrument, which catch the weight, A finely-pointed brass wire, CD, enclosed through part of its length in an ebonite tube, passes through the upper end of the weight from side to side ; the piece B of the weight is placed between the ends A, C of the lever arms of the holder (fig. 14). The arm CD pivots on the pin F; AB is fixed. K, K is an electromagnet ; on its keeper H is fixed a strong

spring G,G. When this spring is placed between the ends B, D of the arms, it forces the opposite end C to

chrono- graph.

Se, tS

Com- parative velo- cities.

GUNNERY

press against A and to sustain the weight by gripping the piece B (fig. 13) of the weight. In this position the keeper H is at a short distance from the poles of the electromagnet. Directly the current is allowed to circulate, the keeper is attracted down to the magnet, the spring G, G is pulled away, a small spring L presses on the arm OD, the jaw AC flies open and the weight is released. The two cylinders A, A (fig. 12) form part of the circuit of a secondary induc- tion coil. The screens are similar to those employed for the Bash- forth chronograph ; they are traversed successively by the shot, which mcmentarily interrupts the primary eurrent, and thus causes an induced current to pass through the cylinders A, A. As these,

Fia. 13.—Weight. Fic. 14.—Holder.

however, are not in electrical connexion, the current has to pass across through the brass wire of the weight, which is in the act of falling. The cylinders are covered with smoked paper, and the passages of the spark in and out leave minute spots showing the exact position of the weight at the moment: any number of screens may be used, and a duplicate record is obtained in one experiment of the spacc fallen through by the weight, while the shot is trayers- ing each interval between the screens. As before, a simple calcn- lation connects time and space, and an ingenious scale enables the experimenter to read off the velocities whatever be the distance be- tween the screcns.

In all these instruments slight errors exist, arising from mechanical imperfection, or from irregularity in the electric currents ; still, the accuracy arrived at is sufficient for

practical purposes, as is well shown by the following table :—

TABLE I].— Velocities of Martini-Henry Bullets fired with two different Charges, observed with several Instruments.

Le Bonlengé. Watkin. Bash- ie Instrument Instrument | forth. Right Left A, B. Cylinder. Cylinder, 1167 1163 1163 1TP55 157

1141 1140 1143 1137 1136 1140 1138 1138 1129 1132 1136 1133 1141 1138 1139 1147 1145 1142 1140 1140

Means of eoumads 1146 1144 1146 1140 1141 1272 IFS 1269 1250 1259

1268 1264 1269 1267 1267

1270 1271 NO 1270 1268 Le77 1279 1287 1272

1285 1287 1290 1285 1290 1294 1280 1284 1264 1267 12638 1264 1287 1289 1291 1284

misama 04 } jy 1278 | 1275 1278

8 rounds

These instruments enable the experimenter to ascertain the velocity of a projectile up to considerable distances from the gun. With rifled ordnance no difficulty is found in hitting screens of moderate size at a range of 2000 yards; and, practically, the loss of velocity due to the resistance of the air can be determined for all ranges and all velocities.

It might be supposed that, having the means of acquiring this knowledge, the artillerist would find little difficulty in solving the grand problem of his art, which may be thus briefly stated :—Given a projectile of known weight and dimensions, starting with a known velocity at a known angle of elevation in a calm atmosphere of approximately

known density ; to find its range and time of flight, its velocity, direction, and position at any moment,—or, in other words, to construct its trajectory. This state of perfection has, however, not yet been reached; mathematics has hitherto proved unable to furnish complete formule satisfy- ing the conditions. The resistance of the air to slow move- ments of, say, 10 feet per second seems to vary with the first power of the velocity. Above this the ratio increases, and, as in the case of the wind, is usually reckoned to vary with the square of the velocity; beyond this it increases still farther, till at 1200 feet per second the resistance is found to vary as the cube of the velocity. The ratio of increase after this point is passed is supposed to diminish again; but thoroughly satisfactory data for its determination do not exist. From this it would appear that, as the motion of the shot increases in rapidity, the air finds continually greater difficulty in filling up the space left by the advanc- ing projectile, but that, when once a point is reached where the vacuum in rear is complete, further increase of speed only encounters additional difficulty in displacing the air in front. The difficulty of meeting the conditions by mathematical formule is very great, since the velocity of the projectile changes continually, and moreover is resisted by air continually varying in density as the shot rises and falls again. It is evident that the greater the weight of a shot in proportion to the column cf air displaced by it, ¢.e., to the square of its diameter, the less effect will the resist- ance of the atmosphere have upon its motion; thus very heavy projectiles moving with very low velocities will be but little retarded by this cause. It is desirable, therefore,

before proceeding to explain what has been done towards Trajec- the complete solution of the problem above stated, to estab- tory in lish the limit, and investigate the trajectory when the resist- Y”% ance of the air is neglected.

er

Fig. 15,

*Let v=muzzlc velocity of projectile ; e=anglc of elevation ; t=time of flight. * ay Let the projectile start with velocity v from the point O (fig. 15) in the direction OM, so that MOX is the angle of clevation. Let OM be the distance which would be traversed in a period of time ¢, if gravity did not*

act. Draw ON vertically downwards, equal to the distance through which the 'shot would fall in time ¢ under the action of gravity only. Completc the parallelogram OMPN. Then P will be the position of the projectile at the end of the time ¢. We have then— OM=vct, and ON=MP=3g??.

2,

Therefore OM?= Me.

Since OM? bears a constant ratio to MP, the trajectory is a para- bola, having its axis vertical, and OM for a tangent.

Again, the horizontal velocity=v cose, and remains uniform ; the initial vertical velocity=v sine, and is acted against by gravity. Then—

x2=OQ=v!t cos € y=PQ=vt sin e— dgt?.

Hélie's formula.

Bash- forth's methods.

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Eliminating ¢, we gct— gx Qu cos %e' which is the equation to the trajectory, and isa parabola. To find the range, put y=0; the two resulting values of x give the position*

gah of the gun, and the end of the range, thus, Oke Qe

y= tan € —

In Robins' experiments in 1742 and subsequent years, it became apparent that up to a certain point the resist- ance of the air increased with an increasing power of the velocity. Hutton in 1790 placed this point at 1600 f. s., and considered that the ratio decreased after this velocity was passed. He proposed as a formula for the resistance Ra av+bv% General Didion, in 1840, deduced from the experiments at Metz the formula Ra av?+6v°, The ex- periments with rifled projectiles carried on at Gavre in 1861 led Professor Hélie to the conclusion that the resistance of the air at practical

velocities was more nearly proportional to the cube of the velocity than to any other working ex- pression. He constructed a formula for the trajectory by empirically modifying the formula given above for the path of a projectile a vacuo thus—

ga (1, ke\, 2cos ev wv /’

from which he deduces an expression for the range which at low elevations for velocities between 800 f. s. and 1400 f. s. is very fairly accurate, and which furnishes the simplest method yet devised of roughly constructing a range

table :— iS . Qe” sin Qe ‘ Papal a/ 1+ zi 1);

r=range in feet ;

v=velocity in feet per second ; E=angle of elevation ;

= 0-0000000458 ©;

d=diameter of projectile in inches ; w=weight of projectile in pounds; g=ace. of gravity = 32°19,

The above value of & is given for ogival heads; with hemispherical, pointed, or flat heads a different coefficient of resistance would be, required. The ogival is the form which suffers least retardation from the air. The most complete and valuable series of experiments yet carried out is that of Professor Bashforth (1865 to 1370) at Woolwich and Shoeburyness. He found that, velocities and forms being equal and similar, the resistance varies exactly as the square of the diameter of the projectile. He further arrived at the conclusion that between 900 and 1100 f. s. Ra v%, between 1100 and 1350 f. s. Rac v3, and above 1350 f. gs, Reo v’, These results confirm in great measure those pre- viously obtained, but unfortunately do not lend themselves readily to the construction of mathematical formule. Bashforth adopted the cubic law as his basis, as it offers the least difficulty in manipulation, and, putting R =cv?, made the coefficient c a variable, the values of which he has tibulated. His method consists in building up the are of the trajectory bit by bit, taking each portion so that a mean value of ¢ for

that portion may be used without important error. The path of the proje:tile may thus be constructed with almost auy desired amount of accuracy, but the process is excessively laborious, and requires the use of a lengthy set of tables which cannot be reproduced here. For a com- plete knowledge of the subject the reader is referred to Mr Bashforth's work. Mr Bashforth, however, tabulated the loss of velocity due to the resistance of the air with regard to the time and distance of the shot's flight, and subse- quent experiments carried out by the War Office in 1878- 79 have now confirmed and extended the results he had previously obtained. As most of the problems of modern gunnery can be approximately solved by the use of these tables, we give in Table IIL an abstract with explanation.

y=u tan € —

where

GUNNERY

TABLE IITI.—Loss of Velocity of a Projectile in Times and Distances.

Feet. | Seconds. 24441 | 33:091 24481 | 33°113 24520 | 33°185 24560 | 33°157 24599 | 38°178 24638 | 33°200 24677 | 88°2911 24716 | 33°242 24755 | 38°262 24794 | 33°283 24832 | 33'308 24871 | 38°328 24909 | 33°343 24947 | 33°363 24985 | 33°383 25022 | 38°402 25060} 83°421 25097 | 88°440 251384 | 33°459 25171 | 88°477 25207 | 88°496 25248 | 33°514 25279 | 38°532 25315 | 88°549 25350 | 33°567 25385 | 83°584 25420 | 33:601 25455 | 33°617 25489 | 33°634 25523 | 33°650 25556 | 33°666 25590 | 33°682 25623 | 383°698 25656) 33°78 25688 | 33°728 25720 | 83°743 25752 | 33°758 25784 | 33°773 258115) 38°7 87 25847 | 83°802 25876 | 83'°816 25908 | 33°880 25939 | 33°844 25969 | 33°857 2240] 25999 | 83°871 82°460 |:2250| 26029 | 83°884 82 °488 2270 26058 | 33°897

F.S.| Feet. | Seconds. || F.S,

5000 |1100) 20898 | 30°531 6°028 |/1110) 20974 | 30°600 7008 |)1120) 21048 | 30°667 7928 1130} 21121 | 30°731 8'808 |1140) 21191 | 30°794 9°645 1150) 21261 | 30°855 10°4438 |, 1160} 21330 | 30°914 11°206

||1170) 21397 | 30°972 11-936 |1180) 214638 | 31:028 12°635 oT) G1628 31°083 13°306 |‘1200; 21592 | 31°137 13°951 ||/1210} 21655 | 31°189 14°570 ||1220| 21717 | 31°240 15168 ||1280) 21778 | 31°290 15°741 |/1240| 21838 | 81°338 ||1940 16°295 1250, 21897 | 31°386 |/1950 16°829 ||1260, 21955 | 31°432 1/1960 17°345 ||1270| 22012 | 31°477 |/1970 17 °844 ||1280| 22068 | 31°521 111980 18°327 ||1290) 22124 | 31°565 ||1990 18°796 |/1800! 22179 | 81°607 ||2000 19°250 ||1310| 22233 | 31°649 |/2010 19°690 ||1320} 22286 | 31°689 ||2020 20°118 ||13830) 22339 | 31°729 |/2030 20°588 ||1340| 22391 | 31°768 |/2040 20°986 ||1850| 22448 | 81°807 |/2050 21°‘364 ||1860} 22494 | 31°844 2060 18545 | 21°706 ||1370) 22544 | 31°881 ||2070 137938 | 22°074 |/1380) 22594 | 31:918 ||2080 14088 | 22°482 ||13890) 22644 | 31:953 ||2090 14280 | 22°781 ||1400} 22693 | 31:988 |. 2100 14519 | 23°120 |/1410; 22741 | 32:023 2110 14755 | 23°449 ||1420 22780] 32-057 2120 14987 | 23°769 |/1430| 22837 | 32°090 ||2130 15215 | 24°080

15440 | 24°388 15662 | 24°677 15880 | 24°962 16095 | 25239 16806 | 25°508 165138 | 25°769 16716 | 26021 16916 | 26267 17112 | 26°504 17808 | 26°734 17490 | 26°955 17672 | 27°169 17851 | 27°375 18025 | 27°575 18195 | 27°768 18362 | 27°954 18524 | 28°1385 18684 | 28°309 18839 | 28°478 18992 | 28°641 19141 | 28°799 19287 | 28°953 19431 | 29°104 19571 | 29°295 19701 | 29°385 19843 | 29°521 19975 | 29°652 20104 | 29°780 20230 | 29°902 20349 | 30°018 20459 | 30°123 20559 | 30°217 20651 | 30°303 20737 | 30°384 20819 | 80°459

Feet. FES.

‘1800 1810 1820 1830 1840 1850 1860 1870 1880 1890 1900 1910 1920 1930

Seeonds,

400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700

5000 5416 5820 62138 6595 6967 7330 7684 8031 8370 8701 9026 9345 9658 9965 10267 10563 10854 11141 11423 11702 11977 12247 12514 12778 13037 18293

1440 1450 1460 1470 1480 1490 1500 1510 1520 1530 1540 1550 1560 1570 1580 1590 1600 1610 1620 1630 1640 1650 1660 1670 1680 1690 1700 1710 1720 1730 1740 1750 1760

22884 22931 22978 23025 23071 23116 23162 23207 23252 23297 23342 23387 23431 23475 23519 23563 23607 23650 23693 23736 23779 23822 23864 23907 23949 23991 24038 24074 24116 24157 24198 24239 24280 1770) 24320

1780] 24361

1790) 24401

32°128 | 32°156 82°188 32°220 32°251 32°282 32°312 32°342 32°372 32°402 32°431

2140 2150 2160 2170 2180 2190 2200 2210 2220 2230

32°517 ||2270| 26088 ; 33°910 32°544 sp280 26117 | 33°923 82°572 |‘2290) 26145 | 33°935 82°599 112300

26174

bial ah i}

26202 26230 26258 26285 263138 263840 26367 26393 26420 26446 26472 26498 26523 26548 26574 26599 26623

83‘948 33960 33:972 33 ‘984

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34:007 34:019 34:030

84°041 34°053 34°064

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34°085 84°096 384°106 84°116 34°126 34°136 34°146 84°156 34°166

32°653 ||2320 32-680 | 2330 32°706 ||2340 32°732 |/2350 32°758 112360 32°788 |/2370 32°808 | 2380 32°833 ||2390 32°858 |‘2400 32882 ||2410 32°907 |‘2420 32-930 |/2430 32954 |‘2440 32°978 |/2450 33-001 ||2460 33°024 |‘2470 33:047 ||2480| 26648 33069 ||2490) 26672

2500) 26696

The rate of loss of velocity is here inversely recorded for an ogival projectile having a weight in pounds equal to the square of its diameter in inches. Thus a 9-pounder shell of 3-inch calibre starting with a velocity of 2500 f. s. would retain a velocity of 400 f. s. at a distance of (26,696 —-5000=) 21,696 feet after a time of

(84166 —5°000=) 29°166 seconds. As the value of : decreases the w

resistance of the air retards the projectile less; thus if the 3-inch shell weigh 18 tb it will overcome the resistance twice as well as

the 9-pounder, since its o=0% instead of 1:0.

Drift or deflexion.

Example 1.—The 80-ton gun fires at a vessel in motion at a range | which has the effect of a force in the direction DC, tends

of 2000 yards. The muzzle velocity is 1580 f. s., the calibre 16 inches, and the weight of projectile 1700 Ib. Required the velocity on im-

pact, and the time of flight. a iG? , Here <- =-——- =0°1506 w 1700

0°1506 × 6000 ft. =9083 ft.

Selecting the m. v. 1580 f. s. in the first column, the second column shows 23,519 ft. Subtracting, 23,519 – 903 = 22,616. Running up the second column and using proportional parts, this number corresponds to a velocity

of 1383 f. s., which is the velocity onimpact, showing the projectile to have lost 197 f. s. of its velo- city during flight. In the third column, opposite 22,616 feet, we find 31°929 seconds. Subtracting this from the time opposite 1580

2

feet, and dividing by “, we have

a7 0°1506 = 4084 seconds.

Example 2.—An observer in an earthwork notes the flash of a hostile gun ; in 3} seconds the shell (blind) buries itself in the parapet, followed in half a second by the report of the gun. The shell is dug out, and found to weigh 60 Ib, aud to measure 15 centi- metres in diameter. Required the range, the muzzle velocity, and the striking velocity.

The range is here given by the velocity of sound, which travels through air at an average rate of 1140 feet per second; so that

7 =3°75 × 1140=4275 ft; @ (15 cm.)? (4°91 ins.)? w 60 60 ad? ae 7r—— =2488 ft., and <—-—1°892 sec. w w

We have now to cousider what muzzle velovity will cause the pro- jectile to traverse the given distance in the given time. It must move at a mean speed of 1315 f. s. Assume the muzzle velocity to be 1600 f. s.; corresponding to this are found 23,607 feet and 32°599 seconds. Subtracting from these the reduced range and time, we have 21,119 feet and 30°707 seconds; if the velocity has been correctly assumed, it is clear that the range and the time of flight should result in the same terminal velocity. In the pre- sent instance, opposite 21,119 feet stands 11380 f. s., while opposite 30°707 seconds stands 1125 f. s. Thus it appears that the velocity has diminished more rapidly in the time travelled than in the dis- tance travelled. This shows that it is assumed too high. Trying 1584 f. s., and proceeding as before, each column indicates 1120 f. s., which therefore is the terminal velocity, showing that the projectile has lost 464 f. s. of its speed during flight. Drift.—Projectiles fired from rifled guns do not move in a vertical plane, but deviate to the right or to the left according to the direction of

their rotation. All nations have adopted the right-handed twist, probably because it happened to be selected first. If the observer stands in rear of the piece and looks at the gun when fired, the pro- jectile rotates in the same direction as the hands of a watch. It then steadily bears away to the right. The reason of this is not very clearly understood ; in fact, two rival theories are put forward to account for it. If there were no resistance of the air, the path of the shot would be a parabola, and the axis of an elongated projectile would remain parallel to its original direction. The resistance offered by the air causes the axis to tend to assume a position tangential to the trajectory. On leaving the gun the projectile moves in the direction of its axis, which is also the direction of the axis of the gun. The action of gravity soon causes the path of the shot to make a small angle with the original direction of the axis; that is, the trajectory soon deviates from a straight line; the axis of the projectile is urged by the resistance of the air to accommodate itself to the new path, but as the path is constantly changing, the axis is always too late, since the rotation tends to preserve its parallelism. Thus there is always an angle—depending in amount on the velocities of rotation and translation, weight of shot,

t (32-544 — 31929)

=0°5821;

and density of the air—between the axis of the shot GB |

and the trajectory CD (fig. 16). Thus far both theories agree as to the facts, but they differ as to the deductions. The first view is that the resultant resistance of the air,

to turn the shot about an axis passing through G, and per- pendicular to the plane containing BGD, so that if the shot had no rotation, it would turn end over end. But as it has a right-handed twist, this motion is combined with that which the resistance of the air tends to impart to the shot, and the point A is therefore slightly deflected to the right at first. Continuing the action, the axis GA describes a cone about CD, rotating in the same direction as the shot rotates about its own axis. The resultant of the air's resistance tends to increase the angle BGD, therefore the shot will have a sinuous motion; but as the first deflexion

Fig. 16.

is to the right, and afterwards the point is more to the right than to the left, the deviation will on the whole be to the right. The other view is that, as the axis of the shot is always directed a little above the trajectory, the resistance of the air meets the surface on the under side, on which therefore there is more pressure than on the upper side. The consequence of this is that the friction of the air with the rotating surface is greater below than above, and there- fore causes the projectile to roll bodily to the right while travelling forward. The path thus curves away from the vertical plane, and the resistance of the air tends to cause the axis to lose its parallelism with that vertical plane, though it is, as before, too slow in altering its direction to

Fie. 17.—Correction for deflexion.

become tangential to the curve described. Crucial experi- ments to set this point at rest are as yet wanting. The "drift" or "deflexion" is usually corrected in the British service by inclining the tangent sight. The result of this is that as the range increases, the higher the sight is raised, and the farther is the eye-notch to the left of the vertical plane containing the axisof the gun. In the German service the tangent sight is placed vertically in the gun, and the deflexion is allowed for by a graduated sliding leaf in the head. The same arrangement is used in those British guns, as the howitzers, which fire variable charges, as the slope of the tangent sight will accurately suit only one muzzle velocity.

To ascertain the correct slope, the actual deflexion is deter- mined for each gun on the practice ground at various ranges with a vertical sight; then, in fig. 17, AD is the line of sight when the axis of the gun is horizontal. CD is the line of sight with a vertical tangent sight set at the angle of eleva- tion ADC required for the range DF. Since the projectile deflects to the right, it is necessary that the line CD should point to E in order to hit F. This is accomplished by inclin- ing the tangent sight AB, so that BC shall give the requisite allowance. The relation is thus established. By similar triangles,

Smooth- bore pro- jection.

Rifled pro- jectiles.

BIOE aa then BC = AC tan BAC, and CD =AC cosee ADC, so ay PC ae ee Putting the angle ADC (the ele-

CD cosee ADC FD" vation)=«, the angle BAC (the slope of the tangent sight)=6, EF (the deflexion)=d, and DE (the range)=7, we have tan @=

@ Cosec e. vis

The action of the powder charge, the travel of the projectile along the bore, the rifling, and, speaking generally, what takes place inside a gun when fired, are matters specially connected with the designing and manufacture of ordnance, and are therefore treated under GUNMAKING.

Projectiles. —The requirements of modern artillery have necessitated many complications in the preparation and use of projectiles, which now vary greatly in their nature and in the purposes for which they are employed. A general description of the several kinds supplied to European armies will be found under AmmuNITION, and but few remarks will be required to connect them with the guns for which they are intended. Smooth-bored ordnance use solid round shot and case, common shell, and diaphragm shrapnel shell. Solid shot are used against masonry, wooden shipping, and miasses of men. They were at one time fired red hot at shipping. Roughly, the cube of the diameter in inches multiplied by 0°133 gives the weight of the shot in pounds. Case shot consist of iron balls packed in iron or tin cylin- drical cases. They are effective up to about 350 yards against troops, boats, and rigging, and are especially suitable for flanking ditches. Common shell are completely filled with powder, and are burst in flight by time fuzes, or, on striking, by percussion fuzes. They are used against men in masses, buildings, works, and material generally. Diaphragm shrapnel shell contain a small bursting charge and a number of balls. They are fitted with a time fuze which explodes the charge when they near the object, so that the released bullets fly forward. They are very destruc- tive against troops. In addition to the above projectiles, incendiary shells, called carcasses, filled with a violently burning composition, are thrown into villages and amongst shipping. Ground light balls cast among the enemy's working parties at night disclose their position, Parachute light balls contain a parachute tightly folded up, and a cup of illumining composition ; they are fired with a fuze timed to burst in the air, and they then remain

suspended for a time, throwing a light down on the enemy's working parties.

The great advantage of rifling was long recognized in small arms and sporting pieces before it was extended to ordnance. The first rifled arms threw bullets which, except for certain projections designed to fit the grooves of the barrel, were spherical. These guns surpassed smooth-bores in accuracy, but it was not till the introduction of elongated projectiles that a distinct gain in power was recognized, The gain in accuracy is due in great measure to the superior correctness with which the ball is centred in the bore by the action of the grooves, while the rotation imparted to it annuls or greatly lessens the disturbing effect of the pres- sure of the air on surface inequalities, or of variations in the position of the centre of gravity. An elongated shot is also enabled to travel point first, or nearly so, and as the resistance of the air depends upon the area of the transverse section, a far greater weight can be given to the long than to the round shot without increasing this resistance. Thus, in addition to greater accuracy, rifling confers a flatter trajectory and greater penetration. The elongated form permits a head of the best shape, an increase in the con- tents of the shell, and the use of fuzes which explode when the point strikes an object. guns are case shot, common shell, shrapnel shell, and Palliser shell.

for smooth-bore ordnance. Common shell are generally

The projectiles used with rifled —

The case shot differ little from those made |

cCwnnN ERY

from 24 to 3 calikres in length.

They are designed to Common

contain as much powder as possible, consistently with shell.

strength of wall to resist the shock of firing. Their effect is almost entirely due to explosion; velocity has little to do with it beyond conferring range

and penetration. Common shells are generally fuzed with percussion fuzes. They are effective for breaching, for setting fire to buildings, against troops if not much scattered, and especially against wooden or thinly plated vessels. The introduction of iron- clad ships is almost entirely due to the terribly destructive fire of shells. have a bursting charge only sufficient to open the case and release the contents, which then fly forward with the velocity possessed by the projectile before breaking up. The bullets and fragments very speedily lose this velocity after separation. It is therefore most important to judge the range correctly and to form an accurate estimate of the practice, so that the result of each round may guide the aiming and timing of the next. When the shrapnel is burst in the air by a time fuze, it is exceedingly difficult to judge its precision by the puff of smoke. The splashes or puffs of dust of the bullets striking the ground should therefore be carefully looked for. When the shrapnel is burst on striking the ground by a percussion fuze, it is much easier to estimate the accuracy of the shooting, and it is common therefore to get the range by firing a round or two with percussion fuzes before setting the time fuzes. If the ground is hard and the distance of the enemy such that the shell strikes at but a small angle of descent, percussion fuzes generally burst the shrapnel better than time-fuzes, which, in their turn, have tlie advantage at long ranges and over soft ground. For field service time-fuzed shrapnel should be burst at from 50 to 100 yards in front of the object, and about 10 to 15 feet above the ground. The cone of dispersion of the bullets and fragmients is con- sidered to be so proportioned that the diameter at any point of the axis is one-third of the distance of that point from the burst or apex. To get satisfactory results from time fuzes it is necessary to have a gun which shoots with great regularity, a fuze composition which burns evenly, and an accurate mode of setting the fuze. Of late years improvements in powder and design of ordnance have rendered the velocities practically uniform. The fuze com- position is somewhat liable to deterioration, but is tolerably satisfactory ; anda new fuze auger has just been introduced which can be set to any desired degree of accuracy. As the power of shrapnell shell is entirely due to the velocity pos- sessed by the bullets when freed from the envelope, it is of paramount importance in Jong-range firing that the sbell should start with a high velocity and retain as much of it as possible. It is considered that with field guns the velocity of the projectile at the moment of bursting should not fall below 800 f. s., otherwise tle

contents will have a much diminished effect. The bullets themselves should retain a velocity of about 500 f. s. on striking to be thoroughly effective. With the more modern field guns the effective range of shrapnel extends up to about 3000 yards ; with heavy guns to 4000 or even 5000 yards.

Palliser shells are made of a mixture of selected brands of iron, and are cast in moulds so constructed that the metal of the head is in contact with iron and that of the body with sand. The head is thus " chilled," as the rapid carrying off of the heat by the iron mould causes the particles of the metal to dispose themselves rigidly, and confers intense hardness, which property is essential for the penetration of iron plates. The head is of the ogival shape, that being found most effective in combining strength with sharpness (fig. 18). It is a moot point whether projectiles of hardened steel are more effective than those of chilled iron against armour. Probably the steel can get through a

Shrapnel shell are filled with bullets, and Shrapnel.

Armour- piercing

sneu.

Fuzes, position by exploding a detonator.

GUNNERY

greater thickness, but the damage done by the fragments of the Palliser after perforation is more serious. The cost of the steel shell is about five times that of the iron ones. The bodies are cast in sand, because extreme hardness is not there required, and a sounder casting is thus obtained. No fuzes are used with these shells; they are burst by the shock of impact on armour which explodes the powder charge. It is doubtful if they would explode on striking iron vessels not armour-plated, aud they would fail to burst on striking wooden ships. They are effective in destroying masonry, and have been driven through great thicknesses of stone. They hold about a quarter as much powder as common shell of the same diameter. The greatest pene- tration of armour yet known was obtained by the 80-ton gun at Shoeburyness in 1877. The target consisted of four 8-inch wrought-iron

plates, sandwiched with three 5-inch layers of teak, the whole put to- gether with immense strength. The pro- jectile perforated three plates and the teak, digging its nose about half-way into tbe last plate, which was much cracked and bulged. The 100-ton gun has perforated with ease 22 inches of solid wrought iron

Palliser shell. plate strongly backed, but failed to drive a hole through a

similar target when the plate was of steel. Very recently extraordinary penetration has been obtained by a 6-inch 70-pounder made by Sir W. G. Armstrong & Co. Fired with a velocity of nearly 2000 f. s., this small projectile pierced about 11 inches of wrought iron. The subject of penetration is treated under GUNMAKING.

A description of some of the fuzes and firing tubes used in gunnery will be found under AMMuniTion. The general principle guiding the selection of time or percussion fuzes is that when a shell is required to burst in the air a time fuze is employed, when on striking an object a percussion fuze is chosen. In muzzle-loading guns (not using gas- checks), time fuzes are ignited by the flash of discharge ; otherwise the shock is taken advantage of to light the coim- Percussion fuzes are sometimes found to act too rapidly; where it is desired that penctration to a certain depth in earth or other material shall take place before explosion, it is found necessary to slow the fuze by interposing a small column of composition, burning for, say, a quarter of a second, between the deton- ator and the bursting charge. In firing a heavy shell with high velocity at a weak vessel, the resistance of the side is so slight that it may happen that the fuse either fails to act (the shell not being sufficiently retarded to set it in action), or explodes the shell after it has passed through both sides. To meet this case a specially sensitive and rapidly-acting fuze has been devised.

Guns were formerly primed with loose powder and fired by a match, next by common quill tubes filled with com- position and ignited by a portfire, then by detonating tubes exploded by a hammer. Now friction tubes have superseded these methods for ordinary service. When it is desired to fire a gun from a distance, or to fire a number

Electric of guns absolutely at the same moment, Abel's electric tubes. tubes are employed.

In them two fine copper wires pass down through the head, insulated by gutta percha, except at the ends, which are separated by j',th of an inch of a composition of subphosphide and subsulphide of copper with chlorate of potash. The other ends of the wires are in contact with the copper lining of two holes in the head. The wires from the battery are placed in these holes ; when the current passes, the composition is heated to ignition and explodes the tube.

Service of Ordnance. —The general principles guiding the

employment and manipulation of artillery are applicable to the schemes of warfare of all civilized nations. Slight differences exist in calibres and weights; but it may be taken that the considerations which regulate the service of English guns have the same force elsewhere. The details of manufacture, the systems of loading, and the methods of rifling, are the chief points regarding which artillerists differ ; these matters are treated under GuNMakinG. Of two pieces constructed with equal skill to perform the same kind of work, the heavier will always be the more powerful. Thus weight is the chief controlling element in the employ- ment of guns, though cost and convenience of manipulation have often to be taken into account. The artillery of the present day is the outcome ofa long series of improvements, and the whole system of this important arm bears traces of frequent modification and continual compromise. The first introduction of firearms appears to have taken place in England in the reign of Edward III. On the Continent it was probably somewhat earlier, but the actual date and the circumstances attending their introduction are involved in obscurity. It is said that cannon were used in the English expedition against Scotland in 1327, and at the battle of Crécy in 1346. the Tower. be manufactured of copper, brass, or bronze, good castings of which were made long before the art of smelting iron ores was perfected. In the early part of the 16th century guns were sometimes made of wrought iron plates put together longitudinally and hooped with wrought iron. In 1545 cast iron ordnance were manufactured in England, aud supplanted pieces of all other materials

for a time. The growing needs of warfare, however, soon demanded guns possessed of fair mobility to accompany armies in the field, and the cast iron pieces used being found excessively cumbrous, bronze was once again resorted to for field artillery. From about the middle of the 17th century till the introduction of rifled cannon, all the heavier natures of ordnance—fortress, siege, and ship guns—were made of east iron; and all the lighter—field and boat guns—of bronze. In 1717 the bronze foundry was established at Woolwich, and most of the smooth-bored field pieces, howitzers, and mortars used in the service were made there. The heavy cast iron guns were supplied by contractors, and proved by Government officials, The long peace which suc- ceeded the Napoleonic wars was highly unfavourable to the progress of gunnery, but a great development took place in the arts and sciences, so that, on the breaking out of the Crimean War, the latest discoveries in metallurgy and tle excellence attained in machinery at once enabled inventors to make a great advance in artillery. At the transition period, a few wrought iron smooth-bores, throwing spherical shot of 150 and 100 ib, were manufactured to overcome the resistance of iron plates then recently introduced for armour- ing ships. These pieces were speedily discarded for rifled guns; and practically it may be said that the adoption of steel and wrought iron for guns coincided with the change from smooth-bores to rifles, both steps of progress beiug thoroughly established about 1860. In spite of the great superiority of the new ordnance, it cannot be said that the old pieces are yet superseded ; vast numbers of them exist over all parts of the world, and often form the only defence.

with them on land fronts; and though they are gradually disappearing, they yet claim notice. Bronze guns are now obsolete in the British service. Figs. 19 to 24 show typical kinds of cast iron ordnance. Those denominated acccording to the weight of their projectile are made strong enough to fire solid shot or shell; those called by the diameter of the bore fire shell only, It must be remembered that, with spherical projectiles, the solid must be heavier than the XI. — 39

In 1360 there were four copper guns in Early For about two centuries cannon continued to ordnance.

Fven the fortifications in England are still largely armed Smooth- bored

hollow kinds, which need not be the casa with rifled ordnance, as the projectile may be of any length. The guns are used for direct fire, the howitzers for curved fire, the mortars for vertical fire, z.¢., they are set at 45° eleva- tion, and the requisite range attained by vary- ing thecharge of powder, instead of firing at various degrees of ele- vation, as with guns and howitzers.

The old field smooth- bores were fairly effec- tive up to 1000 or 1200 yards, and so established a great superiority over the smooth-bored musket; but as soon as the rifled musket was generally adopted, an advance in artillery power became necessary if the arm was to retain its position in the scale of efficiency. After the Crimean War Napoleon IIL. rifled his bronze field guns on Treuille de Beaulieu's system, and the new pieces exhibited great merit at Magenta and Solferino in 1859. England, and indeed every

Fia, 19.—18-pounder Gun. E, vent-field; F, vent-field astragal and fillets; G, 1st reinforce ; H, 1st reinforce ring; I, 2d reinforce ; J, 2d reinforce ring and ogee ; K, patch for foresight ; L, chase ; M, muzzle astragal and fillets ; N, neck; O, swell of muzzle; P, muzzle mouldings.

and the 16-pounder of 12 cwt., of similar construction, was

being brought forward. Against these guns the Prussian

Fig, 20.—8-inch Howitzer. European power, was busily engaged in experimenting during this period. The early Armstrong guns in England, Broadwell's and Krupp's in Prussia, and imitations of the French plan in other countries, speedily caused field artillery

to regain its place in war. The northern kingdoms of Denmark and Norway and Sweden, favoured by specially

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Fia. 21.—32-pounder Carronade.

good iron ores, and free from the immediate alarm of war, retained cast iron as the material for light ordnance. Prussia had already begun to use steel for smooth-bores, . and naturally adhered to it for rifled guns, while the coil system brought forward by Armstrong was found cheap and enduring in England. The new Prussian guns were breech-

loaders, constructed on the double-wedge system ; they proved unsatisfactory, and since the Franco-Prussian war of 1870-71 have been abandoned in favour of a single-wedge

32.3 Lenerw of Gore system of Fist dubiiksimsae wees axisese7 great neatness and effici-

ency. The Armstrong ; guns were also breech- Fig. 22.—13-inch Mortar.

loaders, and when tested by land and sea, on actual service in China, New Zealand, and Japan, proved to be very powerful when compared with the old smooth-bores, but also exhibited many defects of construction, At this time no thoroughly successful breech-loader had been invented, and England reverted to muzzle-loading, while

GUNNERY

the Continental powers for the most part endeavoured to improve their methods of breech-loading. In 1872 – the: British wrought iron and steel muzzle-loading 9- pounder of 8 cwt. had been introduced into the service,

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10-75 LENCTH OF BoRE

A, button (cascable) ; B, breeching loop (do.)}; C, breech; D, base ring and ogee;

6-cwt. field breech-loader lad no chance. Its lightness was almost its only merit. Throwing common shell with percussion fuzes (which were useless on soft ground), having but a poor muzzle velocity, and suffering much from retard- ation by the air, its effect was feeble compared with that of the British 9-pounders, which threw with 200 f. s. more velocity a time-fuzed shrapnel of excellent construction, while the 16-pounder, though not equally fortunate with the 9-pounder in the arrangement of its projectile, yet by sheer power and weiglit of metal surpassed in.deadly effect every field gun in existence. England's field artillery was undoubtedly the most powerful known at that period. No one was more alive to this fact, or miore dissatisfied with

it, than the Germans. Their great gunmaker, Krupp, forth- with improved his breech-closing fittings, and instituted series upon series of experiments till he produced two guns —one for horse artillery, and one for field batteries, also

horsed—which were an enormous advance.on the weapons Field previously employed against the French. The lighter gun guns.

weighs 7 cwt,, and throws a shell of 11 hb weight, with a muzzle velocity of 1525 f. s.; the heavier weighs 9 cwt., and throws a shell of 17 ib weight, with a muzzle velocity of 1460 f.s. These are figures indicating power not to be attained by the English 8-cwt. gun, or even the newer pattern of 6 cwt. throwing a 9 ib shell with a muzzle velocityof 1380 f. s., and the 12-cwt. gun, throwing a 16 tb shell with a muzzle velocity of 1360 f. s, The immediate consequence 'se of the introduction of these bead

improved German pieces was Fic, 24.—Coehorn Howitzer. the instituting of a series of experiments in England which resulted in the production of a muzzle-loading field gun, weighting 8 cwt., and throwing a 13-hb projectile with a muzzle velocity of 1560 f. s. Shrapnel shell from this gun will retain velocity over 800 f. s. (the speed below which they cease to possess high efficiency) up to 3500 yards range. In this new gun advantage is taken of all the latest improvements, such as an enlarged powder chamber, in- creased

length of bore, polygroove rifling, rotation by gas- check, and powder specially adapted to the piece. Although the introduction of this field gun once more places English light-artillery in the van, further progress is near. Sir W.

Pererrey

GUNNERY 307

The history of the progress of siege guns would be in a Siege

G. Armstrong & Co. are now (1879) experimenting with great measure a repetition of that of the field artillery, guns.

field guns, both muzzle and breech-loading, yielding veloci-

ties of 20U0 f. s., and no doubt a fresh development of the new principles of air-spacing and chambering (already initiated in the Royal Gun Factories) is at hand (see GUNMAKING).

Briefly, the smooth-bored siege train of cast-iron 18-pounders and 8-inch howitzers was replaced in 1859-63 by one com- posed of 20-pounders, 40-pounders (figs. 25-28), and 7-inch rifled breech-loading pieces, with certain howitzers which

Fak 5OTTOM OF RIFLE GROVES

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Fig. 25.—40-pounder Armstrong Rifled Breech-loader.

neverearnedadoption. Subsequently the breech-loaders have been gradually ousted by 25-pounder, 40-pounder, and 64- pounder muzzle-loaders, with 8-inch, 6°6-inch, and 6°3-inch howitzers, new patterns of which latter pieces have just passed their early trials. The 64-pounders were introduced in 1864. For naval purposes the calibre was chosen so that

Fic, 26.—40-pounder Breech Screw.

32-pounder round shot could be fired from it on emergency. The 40-pounders are stronger, and fire much heavier charges than their breech-loading congeners. The 25-pounder was introduced in 1874 to supersede the 20-pounder breech- loader for light siege trains, and as a gun of position. Ever

but recently longer and more powerful shell-guns have been tried, throwing heavier projectiles with greater accuracy. In these new pieces polygroove rifling with gas-check rotation affords a hope that the necessary precision may be attained.

The "converted guns" must not be passed over, since Con- they are largely employed to arm our land fronts and to verted provide cheap and efficient pieces for practice by the reserve 8"™-*

forces. When first elongated rifled projectiles were intro- duced, a great many methods of strengthening the old cast iron ordnance were proposed. The most satisfactory was that put forward by Palliser, and consisted of

lining bored- out cast iron shells with wrought iron tubes. Some of the smaller men-of-war carry these pieces, but the great majority are used only for the secondary purposes above mentioned. The 32-pounders of 58 cwt., and the 8-inch shell-guns of 65 cwt., have thus become 64-pounders, and the 68-pounder of 95 cwt. has become an 80-pounder.

Important as are the land-service pieces of the army to England, yet, viewing her naval supremacy as one of the chief sources of her greatness, we must consider heavy ship and coast-defence ordnance to take the first place in modern gunnery. 'The contest between guns and armour has now continued with scarcely any intermission for upwards of twenty years, during which time the armour has increased in thickness from 4 to 24 inches, and the guns from 68- pounders to 2000-pounders ; that is, from the most power- ful of the old cast-iron smooth-bores to the 100-ton gun.

since 1853 experiments have been carried out by the Eng- | The first armour-piercing rifled guns were the 7-inch Arm- Armour strong breech-loaders, but their supremacy was of short piercing

duration. They were the heaviest made on that system, 8":

Fia. 27.—40-pounder Vent Piece.

lish and other nations for the improvement of mortars and howitzers, first in a smooth-bored and then in a rifled state. These experiments are still in progress, and it can- not be said that the art of throwing heavy shell at high angles has as yet arrived at perfection. In 1872 short pieces throwing shells of 180 tb and 64 Ib were adopted,

Fic. 28.—40-pounder Vent Piece (section).

and were speedily succeeded by far more powerful muzzle- loaders. In 1867 8-inch and 9-inch guns had already been introduced. The 9-inch Woolwich rifled gun of 12 tons was tried in competition with the xv-inch American smooth-bore, which weighed nearly half as much again, againstarmour. The British piece gained a decisive victory. In 1868 it was decided to introduce a 10-inch gun of the same character. Since that time progress has been con- tinual, and the latest productions of the three great gun- producing

establishments of the world are the 71-ton steel breech-loader, recently tested, of the German maker (Krupp), the 80-ton muzzle-loader of Woolwich, and the 100-ton muzzle-loader of the Elswick firm (Sir W. G. Armstrong & Co.).

“ables IV. and V. show all the principal rifled guns in the land and seaservices of Great Britain. It has always been an object with the authorities to assimilate the guns of the two services as far aS their respective requirements will permit, and so to avoid multiplication of stores at the numerous home and foreign stations where supplies are made ; but still it will be observed that considerable differ-

Land service rifled guns.

Sea service rifled guns,

ences exist, and, judging from the progress of events, it | of gun is more exactly fitted to the performance of the appears likely that these differences will increase, because, special work for which it is intended, and therefore less as the science of gunnery becomes developed, each new kind suitable for other purposes.

Taste IV.—Land Serviee Rifled Guns.

: ae A Perforati t Bursting Nature, Weight, foae, se Class. “1000 yas. . eg a How Mounted. Calibre, é&e. Projectile. Velocity. Npout a cor ; Muzzle-loading. Tb. f.s. ins. tb. 02Z. 17°75 of WOU tons<.....~~, 2000 1600 30°0 66 0 En barbette. WS) art 10) THES coop anaanocce 1700 1600 ‘ 280 58 0 In turrets. 12" Of SMEONS asec oes cece: 800 1420 ae 16:0 48 0 In casemates, on sliding carriage on tra~~ 5 ep versing platform on. racers.

12” 0 off 35 tons…..... E &p iy 40 0 | En barbetie on ditto, ditto. TOZZOLOTMOD NEOUS ac se ves ee 600 1800 ope 10°3 38 0 In casemates on do., and en barbeite. TOL’) Git HSS HOTS papaepeconeae 585 1815 2 11°9 30 0 Do. do. do. TOO) wre AUS} TWO Gensabpenonce 400 1365 a iil 20 0 Do. do. do.

OS Vnet 12 TORS «6.0.20. .0505 250 1420 88 19 0 Do. do. do.

OGL, TOMS... cer vvinensss 115 1560 s 9 0 En barbette, sliding carriages on travers-

Bie | aaeeeas piercing ing platform. Moncrieff carriages. We a ° i ; ee ele 90 1165 er a projectiles not 6 0 Do. do. 22 ina are a : -_ BO pr. (6”2)-5 toms…..... 80 1240 ae supplied for these e 0 Sliding carrs. on traversing platform. Fi cutie 1230 Se and smaller guus. ©

64 pr. (6”°8) 58 owt. 64 1245 & 7 0 Standing and Moncrieff carriages. 64 pr. (6”°3) 64 cwt.!..... 90 1365 ue Travelling carriages (siege). 40 pr. (47°75) 35 ewt…..... 40 1360 23 to 25 ft. from 3 0 Do. (siege and batteries of position). 25 pr. (250) TS Cito… 25 1320 point of shaft to 2 0 Do. | do. ;

80 howr. 46 cwt. ..... 180 790 muzzle of gun. 14 0 Do. (siege); also on beds for siege.

for bombarding. for breaching. for bombarding. for breaching.

8”-0 howr. 70 cwt.?....

Siege-train. guns

6”°6 howr. 36 cwt.!...

63 owes TOtCwt…..... 7 0 Travelling carriages (siege).

i 2 Field gun carriages, with limbers.

6 pr. (oO) eet… 0:55. ra, | About 23 ft. from

13 ye. G0) Wiews. ..... 13 1560 e 8 point of shaft to| 0 14 Do. do.

9 pr. (60) 6 Wt. ..... 9 1390 F Eo muzzle of gun. @ 4 Do. do.

pres “O00 2.002% a aes 0 6 Mountain service, on travelling car- oad riages. Siege, ou beds.

*7 pr. (3”°0) 150 Th…..... yf * 675 BB & 0 6 Do. do.*

=

1 Special projectiles for penetrating masonry.

TABLE V.—Sea Service Rifled Guns.

‘ Weicht of Max. Servi Perforation at Bursting charge lacie): ail heaviest “Muzzle ne 1000 yds. of com. shell. How Mounted. rojectile, Velocity. About About Seaiaieioading, tb. f.s. ins, tb. 02. 16”°0 Of SOtomSee.. ges.… 1700 1600 280 58 0 In turrets. SOL DO UONS ..icadsenss 800 1420 16‘0 43 0 In wind loading by hydraulic 4 machinery. 1270 OLBSMONS .....105….. 700 1340 13°7 40 0 In turrets, loading by hand gear. 12””°0 OO ONtONS)...0..5-.~~+5~~ 600 1300 10°8 38 0 Do., do., and broadside. DE ORG r 2 LODE si… 0.0 s00ns 535 1815 11-9 30 0 Broadside, revolving, and on turn- table en barbetie. MOA OV OPUS MONS. .0..4..50+0- 400 1863 a2 20 0 Broadside, revolving, in turrets, and gunboats. 970 Ot B2CTONSW sean cccstes 250 1420 8°8 19 O Broadside and revolving. Sue LOI SUONS eererer saencrie 180 1415 a 14 0 Broadside. / Armour-piercing projec- 7 : UO GOPHONE cece sn: 115 1525 nee eee ae 9 0 | Broadside. 70 of 90 (OAR yegoaneonadcs 115 1250 Pa mee pe ae Wiel 9 0 Broadside. of less than 8” calibre. 64 pr. (6”°3) of 64 cwt….. 64 1885 : Broadside. 64 pr. (67°38) of 71 cwt. ... 64 1230 7 0 Broadside. 9 pr. (8 O) cfs owt… 9 1380 Q 7@ Boat. 9 pr. (37°0) of 6 CWE... 9 1235 0 7 Boat. 7 pr. (8”°0) of 200 M…..... ff 970 0 6 Boat. Breech-loading. 20 pr. (3°75) of 18 ewt…. 21 1000 1 2 Gun vessel and upper decks of iron- clads against torpedo vessels. 12 pr. (8”0)@P Sew. ..%. 12 1170 0 8 Boat, nearly obsolete. 9) prs (8’<0) olen a 1060 0 6 Do.

Table IV. shows five distinct classes of rifled ordnance. | function is to protect the British shores from the attack of 1. The heavy armour-piercing guns (figs. 29, 30) are mounted | ironclad ships, wooden vessels, and boats, They are accord- round our coasts in casemates and barbette batteries. Their | ingly provided with Palliser projectiles, common shells, and

Watkin’s In it the wholenavi-

map system.

GUNNERY

a small proportion of shrapnel shell. In order-to strike vessels steaming past at high speed, great accuracy, com- bined with rapidity of fire, is requisite.

| coast. The guns are | estimates the range, gives the necessary elevation by meaus

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aimed either by eye or map, according to the nature of the In the former case, the detachment commander

nen!

of the tangent sight, directs the line of fire according to his judgment, jumps down and gives the word to fire—allowing for the vessel's motion and the time of the projectile's flight. The map system

has been recently perfected by Cap- tain Watkin, R.A.

able front com- manded by the bat- tery is plotted down in small squares numbered and lettered. Tables of the distances of the centres of these squares, the degree of training on the traversing arc required to lay the gun on the desired square, together with the actual elevation necessary to deposit the shot in that square, are constructed for each group of guns.

_Fia. 30.—100-ton Gun (section of groove).

Fic. 31.—Watkin Position-finder,

In fig. 31 F is a fort defending the channel; ABFC the line of shore; O the object to be hit, a vessel passing. A, B, and C are stations of observation. In a convenient spot the commanding officer of the artillery in the fort places the map, over which play two arms A'O', C'O' kept constantly parallel to the two lines of sight AO, CO, by means of mechanism actuated by currents of electricity transmitted by a cable connecting A and A', Cand 0'. As A'C'

repre- sents, on the scale of the map, the distance AC, the junction O' represents on the same scale the position and distance of the object O. Tell-tales are distributed in the casemates, which constantly exhibit the number of the square over which the vessel is passing, showing the position of the ship, so that when the gun, or group of guns, are loaded, they can be either laid in the ordinary way, taking the range from the tables, or, if the object is invisible from the casemate, by trailing the gun round till the number of degrees indicated by the tell-tale agrees with the reading on the traversing are, and giving elevation to suit the range. The arcs showing the direction of the guns are so arranged that guns

: Fre. 29.—100-ton Gun (section).

trailed to any given number of degrees are parallel with each other. Supposing that from smoke or other cause the object cannot be distinguished from C, an observer is placed at B, and the arm is shifted from C' to B'. The practical working of the system is as follows. The commanding officer watches the course of a vessel as indicated to him by the arms on the map, the observers at A and C con- stantly following the centre of the object with their glasses. He telegraphs to the battery orders to load and lay, in accordance with the instructions given for each square of the map, and transmitted to the tell-tales. As the vessel passes over the square for which the guns are laid, the commanding officer can fire electrically the group of guns by pressing a key with his finger, or he may direct each detachment to keep up independent practice, laying in accordance with the indications sent by him through the tell-tale. The arrangements for exploding submarine mines or fixed torpedoes, where hostile vessels are passing close to them, are somewhat of the same character as those above described.

2. The land-front guns of fortresses shown in the table Guns of are intended to overpower and quell the fire of any pieces defence.

which can be brought against them by a besieger. They are very largely supplemented in most fortified places by a number of the old 'smooth-bored guns and carronades, which are well adapted for the use of case shot at close quarters, for sweeping the glacis, and for the defence of ditches. The rifled guns throw common shell into the siege ~ works, and where possible

among the enemy's material., They harass his working parties and reliefs with shrapnel, and endeavour to cut down his parapets and dismount his artillery by direct fire.

3. Stege-train guns accompany an army on a campaign Guns of where great mobility is not required, and where it is neces- 4ttack.

sary to reduce fortified places. They should be the most powerful pieces which the means of transport will permit. In the more civilized parts of the world, where roads and climate are favourable, it is generally considered that about 70 ewt. is the heaviest weight of piece that can be carried withan army. In less favourable countries it is frequently impossible to transport more than half that weight. The early rifled siege-train guns were grouped into two classes. A unit of the heavy train comprised—

64 prs. of 64 CWt….. cece ee cere eeeeeeees 8 Ge tsi, Lec etenis, nh tomgerg le 8 8" howitzers of 46 cwh.. .....% se scene 14 (figs. 82, 33). A unit of the light train comprised— 40 prs. of 35 cwt…..... wis Geo scee: a 10 D5 ht OL USb Fie. imsisheeines ares ace even eae 10

63" howitzers of 18 cwt.

Lately 8-0" howitzers of 70 cwt. and 6°6" howitzers of 35 cwt. have been introduced, but their allotment has not yet been settled. Siege guns are supplied with special shell,

Breach- ing.

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somewhat similar to Palliser projectiles, for penetrating masonry ; also with comnion and shrapnel shell. The howit- zers rarely use shrapnel shell. On first attacking a fortress at a long range, the duty of the guns is to cut down the defender's parapets, dismount his artillery, dismantle his ramparts, aud subdue his fire, so as to facilitate the con-

pre reneettee

Fic. 32.—8-inch Howitzer, 46 ewt. (section).

struction of batteries nearer the place. In the meanwhile the howitzers lob heavy shell into his works, and bombard the town, if necessary. As soon as practicable, breaching batteries are thrown up in such spots as may be found

*suitable for the attack of a weak point. Itis rarely possible to breach by direct fire in the case of works of modern See js ace Se m | : : : WN i — QQ OFS **

- *« Fic. 33.—8-inch Howitzer (section of groove).*

design. Here it is that curved fire is so effective, and here it is that the accuracy of rifled howitzers becomes so neces- sary. In order to make a practicable breach up which an assault can be delivered, the masonry at B (fig. 34), must be cut away, and owing to the height of the cover at A the fire must be curved to reach a point sufficiently low. Direct fire—tir & plein fouet, as the French express it—-would strike too high up. Sometimes a work is so constructed that it is necessary to strike a point half-way down the masonry revetment to form a practicable breach. As it is desirable to strike with as much force as possible in breaching, it is evident that where the profile of the work requires the angle

of descent of the shell to be considerable, it is necessary:

Fic. 34.—Profile of Work.

to select a spot for the battery at the longest range com- patible with accuracy. For, given a certain angle of descent, the longer the trajectory (cet. par.) terminating in that angle, the greater will be the remaining velocity. Sometimes the guns of the siege train are employed with an army in the field to hold certain valuable ground against attack. They are then called guns of position, and are so placed as to com- mand the approaches most effectively, and yet, if possible, to be dragged away at the last moment in case of retreat. They will usually fire shrapnel shell when thus employed. 4, The all-important qualities of field guns (figs. 35, 36, 37) are mobility and shrapnel-throwing power. They must be able to make long marches

rapidly, to change position with celerity, to crush troops and the enemy's artillery with

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accnrate, well-sustained fire at high velocities, and to support rough usage without detriment to their efficiency. They are supplied with shrapnel and common shell, and case shot, of which shrapnel form by far the largest proportion.

5. The mountain-train guns are both 7-pounders ; they fire Moun. the same shell, but the heavier one uses a 12-oz. cartridge, tain

while 6 ounces is as much as can be fired from the lighter 8"™ are*

SSE a

z st S SS SS SS SSS

MUSES

K——-——-——- —— =e

Fic. 35.—13-pounder of 8 cwt. (section).

one. Both gunsare intended for mule transport, one mule taking the gun, another the carriage, and a third the wheels, &c.; but at the Cape of Good Hope the heavier 7-pounder is mounted on a light high field-carriage for transport as well as for firing, while in Ashantee the lighter 7-pounders were dragged ona kind of sleigh. The lighter gun is tolerably effective for nearly a mile, and the heavier for about a mile and a half. Some jointed guns, proposed by

Fie. 37.—18-pounder of 8 ewt. (section of groove).

Fia. 36.—18-pounder of 8 cwt. (front view).

an artillery officer, are now under trial. They are composed

of two pieces screwed together, and, being carried separately,

form a gun of about twice the weight of the ordinary

mountain gun. Great increase of power is expected from

this method of construction. Mountain guns are principally

employed to throw time-fuzed shrapnel at troops, and per-

cussion-fuzed common shell into bill works and woods

occupied by the enemy.

In Table V. the principal sea-service rifled guns are shown. Naval Three kinds of work are performed by them, viz., to pierce suns. ironclads and armoured forts, to attack unarmoured vessels, and to keep up a fire on troops on shore or on approaching boats. The heavy armour-piercing guns are well provided with common shill, as well as with chilled projectiles, so as to perform the first-and second duties, but they have a very small proportion of shrapnel shell, which is intended to be used by them against troops or boats only on emer- gency. 'The 7-inch and 64-pounder guns are supposed to be quite sufficient in ordinary cases for the second and third duties, assisted in the third case by the smaller boat guns. All these are well furnished with common shell and shrapnel.

Gun Carriages.—The development which has taken Carriages. place of late years in the power of artillery has necessitated corresponding changes in gun carriages. Formerly, every carriage was capable of travelling to some extent ; even the heaviest guns were mounted on carriages fitted with trucks, which permitted motion on the ramparts or about a deck. Later on, sloping traversing platforms were intro- duced, up which the gun carriage recoiled on firing. Extra means of checking recoil became necessary as the power of the guns grew; compressors, or friction plates, were introduced, and are now only partially superseded by the hydraulic buffer. Mobility of carriage has almost entirely been given up, except for field and mountain artillery. The heavier siege guns travel on platform waggons, not on their

firing carriages ; and it is possible that the traversing plat- form and slide principle will extend yet further.

Tables IV. and V. show how the various pieces in the British service are mounted. Differences of detail exist, but the general system is the same for all European

countries. Wrought iron is rapidly supplanting wood in the construction of carriages, aud there are signs that it will in its turn be in great measure superseded by a mild steel.

oll

the tire forms a frustum of a cone, instead of being a Field cylinder. The object of this form is to obtain lateral gun car- strength, especially in travelling on uneven ground. The "8°

The subject of gun carriages is too long and too complicated to be treated in detail here, but, as guns are of no use

Fic. 38.—9-pounder Field Gun Carriage (elevation).

without carriages from which to fire them, itis necessary to give some idea of the chief modes of mounting modern artillery. Figs. 38, 39 show the details of the 9-pounder rifled muzzle-loader carriage. It consists of three parts, the wheels, the axle, and the trail. The wheels have oaken

Fia. 39.—9-pounder Field Gun Carriage (plan).

spokes and ash felloes, the tire is of wrought iron, the nave and pipe box (which holds the end of the axletree arm) of

a mixture of copper, tin, and zine. The dish is consider- able, amounting to 2 inches in the 5-foot wheel. There is little strut, so that the lowest spoke is nearly vertical, and

—_

es,

| keyed fast.

axletree bed is of wrought iron, constituting, with the axle, a beam of box-girder section, the axletree forming the bottom. The trail consists of two side brackets, fixed by

‘

Fig. 40.—9-pounder Limber (elevation). two transoms, two bolts, and the trail piece carrying the trail eye. The brackets are made of plate iron, riveted to a frame of angle iron. The axle carries two seats for gunners ; into the trail are fitted the elevating screw and wheel, and the drag shoe with chain hangs below. Fig. 38 shows the gun and carriage in the firing position ; when it is desired to move it to any distance exceeding a

few yards, the point of the trail is raised, the limber is brought up, the trail eye is passed over the limber hook and

The gun carriage and limber then form a four- wheeled vehicle, and travel as such. Figs. 40, 41 show the limber, which consists of wheels and axletree similar to

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“ti yw

Fig, 42.—9-inch Gun Wrought Iron Carriage and

those of the gun carriage, ammunition boxes, platform, and | the near horse 3 the off wheel horse is between the shafts. a pair of shafts. In the British

service each gun carriage and | In some countries pole draught is preferred.

limber are drawn by three or four pairs of horses, according

Fig. 42 shows a 9-inch gun mounted on a wrought iron

to the nature of the piece. The driver of each pair mounts | carriage and dwarf platform. This arrangement. may be

Travers: considered typical of all sliding carriages on traversing plat- | the port P of the turret PR. The gun is then in the loading posi- ing forms. The direction of the gun is changed as required by tion. In the meanwhile the turret has been caused to revolve on slides. trainine the platform to the right or left, the trucks w —— the conical rollers H, H by hydraulic pressure till the muzzle of the rans I ae ? 5 | gun is brought opposite the loading apparatus, which is securely on the racers, front and rear, which are usually of wrought | housed below deck. The water power is taken down the am- iron, laid concentrically ou a bed of stone. 'The level of | munition hoist K, which raises a truck L, carrying a shell, on the the traversing platform rises towards the rear, so as to assist ee ee a Leena ar M. The : : é ; 7: ponge N, y dr: re, serves as a 1m absorbing the work of recoil eu firing, and to facilitate Aare also. To perform the operation of pee the sponge is running forward again after loading. The recoil is also | forced home through the bore of the gun against the bottom, by con- checked either by a system of friction plates, called a com- | tact with which a button on the head is pressed, setting free a rush pressor, or by an hydraulic buffer, placed parallel to and ote bape ce Sale he F apie us bore, and a : . e ~~agment remaining from betw sen the emies of the Sremeeelas platform, SS that tite the previous rome the somite is ee ea am, and fe am~~ carriage on recoil forces a piston into a cylinder containing | munition raised to M; the sponge now becomes a rammer, thrusts oil, which escapes, through holes cut through the piston | the cartridge into the muzzle of the gun, and is drawn back ; the head, into the space round the piston rod ; the size of the

Hae A pee ae Ga pe eel! heen he Poe . : into the muzzle, and rams home both cartridge and shell together ; pas aS aay ~ . He oil reg eee a wad previously placed on the head of the rammer is left behind, offered to recoil, and enable the gunner to stop P fast in the bore in front of the projectile, which is thus prevented the proper place. from moving forward. An indicator on the rammer shows whether Disap- Several kinds of carriages on the " disappearing " | the charge is home. The press B is then put in action to lower pearing principle have from time to time been put forward. In | the breech, raising the muzzle to the elevation required to suit the car- these the gun is exposed to the fire of the enemy only range of the object to be fired at; the gun 1s run forward to the riagcs. : : : : ; : : firing position K, and the turret Is revolved till the guns point at while being aimed and discharged ; loading is performed | the object. The sighting is not on the guns, but on the turret ; under cover. The Moncrieff carriages are the most success- | the captain of the battery looks through a hole in the roof R, ful of this class. In them the force of recoil is stored up behind the guns, and arrests the movement of the turret at the and employed to raise the gun from the loadiietorche firine correct place, when the line between the sights, which is parallel hd ploy § ' 5 ers 4 5 | to the axes of the guns, is directed to the object. The firing may position. Colonel Moncrieff applies his principle in two | be performed either in the usual way, or by electric tubes and wires

ways: the recoil either raises a counter-weight or forces a os i Sistas. Pe seounnens cane , ; P ; fo : i ate V., fig. 2, shows a -ton rifled muzzle-loading gun, Lee a iow! me seaeed Te OE eet cae mounted en barbette for coast defence, and adjusted for Tecinalie ph ¢ P ve: 8 loading. After being fired the gun is traversed round to the posi- ages are used to some extent in coast defence, and the | tion A, whcre its muzzle is brought opposite the loading apparatus hydro-pneumatic carriages are under trial for siege-train | G, which is contained in a recess in the parapet D. An hydraulic guns. Plate V. gives the details of the former. On a | hoist ae a ona ee… to the Pad plein,

" ' . ' > | apparatus is constructed on the right of the gun, which is traverse level OHREIEISS platform rolls a cone? elevator, ' Naaher at pleasure. The carriage B andes on the platform C, Mon- which places the gun in the required position either for | which pivots on P, a trunk through which is introduced the ee 8 loading or firing. The end of the elevator opposite to

that | hydraulic power for running the gun back and absorbing the recoil. system.

which carries the gun is weighted, so that the recoil causes the elevator to roll to the rear and the gun to descend, at the same time raising the weight, which is retained in the upward position till released after loading, when its descent again raises the gun. hus the elevator is a lever of the first order working on a shifting fulcrum, the curve (an involute) of the rolling surface being so adjusted that the resistance of the weight gradually increases as the gun recoils, and finally stops it smoothly and without violence. Conversely, by this form the gun is raised to the firing position gradually and without being jolted.

Hydraulic Gear for Guns.—As soon as the weights of ordnance increased so greatly that their service exceeded

Many other applications of hydraulic power to gunnery besides those just described are due to Mr G. Rendel of the great Elswick firm. One of the most novel is that adopted in H.M.S. "Témeraire," in which 25-ton guns are mounted on the disappearing principle in a turret having no roof and no ports; inside the turret is a turn-table carrying the gun by the trunnions on two arms, which are raised by hydraulic power, enabling the gun to fire en barbette over the wall of the turret. The recoil brings it down again, and it is placed opposite the loading gear by revolving the turn-table. The general principles are the same as those on which the previously described systems are constructed.

the power of manual labour, it became necessary to find some substitute. Steam power is always at hand in steam vessels, and it was quickly seen that it was best applied through the medium of water pressure. The simplicity and

Loading.—This article would be scarcely complete with- Muzzle- out a reference to the comparative advantages of the muzzle loading and breech-loading systems. Many have been much im- eed

i ad reech- pressed with the great superiority of breech-loaders as small joading,

compactness of hydraulic machinery, the circumstance of its direct action rendering toothed gear unnecessary, and the perfect control it gives over the motion of heavy weiglits, especially adapt it for the purpose.

arms, whether for sporting or military purposes, and have concluded that the same superiority must extend to ord- nance constructed on this plan. Others, having seen the difficulty of avoiding complication and accident to the parts in the early breech-loaders, have hastily condemned the

Rendel's Plate VI. represents the mode in which the system is applied to : :

*hy- the working of the 80-ton guns on board H.M.S. * Inflexible." .A | whole system. The truth, as is often the case, lies between draulic circular turret contains two guns placed side by side, and strictly | the two views, as will be seen from the following considera- systems. parallel as to line. The hydraulic pressure is conveyed through the | tions, The chief points of excellence to be attained by a*

trunk A by pipes to the presses in the turret. At B isa press for elevating the gun; this press also absorbs the force vertically given off during recoil.on the elevating beam C. Dis the gun-slide which carries the recoil press G for checking the recoil. This press is sup- plied with a tank T, up into which the water from the press G must escape through valves V loaded to the required pressure by springs. E is the gun run forward in the firing position ; its trunnion § is fixed to the end of a piston rod, the head of which enters the press G ; when the gun E is fired it recoils into the position F, shown by the

field gan are—(a) high ratio of power to weight; () im- munity from injury by its own fire; (c) immunity from injury by the enemy's fire ; (d) capability of supporting the accidents of service; (e) rapidity and facility of manipula- tion ; (/) efficiency of projectile. (a.) The power of a gun is most conveniently measured by the energy (in foot tons) communicated to the projectile on leaving the muzzle.

ee Pie isi S forces the piston home into The following table shows how the latest English and) , driving the water up into the tank; the trunnion fit- ; ; tings run along the gun-slide horizontally, and the attachment or German field guns compare together in this respect. The

saddle below the gun runs up the elevating beam C, which is pivoted at the fixed point T, so as to depress the muzzle outside

English guns are muzzle-loaders, the German ones breech- loaders.

| For field

use.

GUNNERY

Tasie VI.

Gun. Nation. | Weight. ae Energy. = | Remarks. pr. ewt. | f.s. fate : : :

9 |English.) 6 13880 119 397 Service 16 ” 12 1865 213 348 guns.

Under

13 8 | 1560 | 220 | 550 ~~ 11 |German.! 72 1525 181 467 Service 15 an 1460 DED 493 guns,

The English 9 and 16-pounders at the time of their introduction were the most powerful field guns known, but were after a time beaten by the new German guns, which will in their turn be beaten by the new English piece, the first supply of which was lately issued. Recently a trial was carried out of two field guns made by Sir W. Armstrong & Co. They were precisely similar in all respects, except that one was a breech-, the other a muzzle-loader. No dif- ference in their excellence could be detected. ‘Thus it may be considered as certain that the power of a gun is in no way affected by the mere fact of its being a muzzle-loader or a breech-loader. Should, however, the adoption of one system favour an iinproved construction, or lend itself more readily than the other to the use of improved ammuni- tion, this equality would disappear, and whichever system should gain a decided advantage in power, which cannot be obtained by ‘ts rival, must certainly prevail. It is almost impossible to overrate the importance of- high velocity, combined, of course, with efficiency of projectile. In the field it enables the gunner to place the enemy under fire at long ranges, and so to force him to

change his formations, and show his hand. It intensifies both the moral and physical effect of shell upon troops. It permits the guns to occupy good positions without the necessity of constaut moving to get within range. In entrenchment firing it is, if possible, of still greater importance. Low velocity pro- jectiles fired from field guns are almost harmless against earthworks. They have not sufficient bursting charge to do damage to the work by mere explosion, nor impetus enough to cut down the parapets; while the defenders hear the gun and crouch under cover as the shell comes. Thus it is not surprising that all our recent advances have been towards high velocities. Nothing has tended more to this end than the enlargement of the diameter of the powder chamber, which facilitates the profitable consumption of increased charges. This improvement is found to act dif- ferently on the two systems of loading. A chambered muzzle-loader requires an expanding cartridge (in field guns) ; a chambered breech-loader requires a breech-closing apparatus of increased size and weight. Supposing a satisfactory expanding cartridge to be devised, the muzzle-loader gains in ratio of power to weight. If this be found impracticable, the breech-loader secures an important advantage in this respect. Experiments are still in pro- gress, and it would be premature to pronounce definitely in favour of either at present, especially as some fresh discovery or new explosive may at any moment confer preponderance on either system. (0.) In the Franco- German War of 1870, a large number of old pattern double-wedge breech-loaders became unserviceable by their own fire. This difficulty appears to have been quite overcome in the newer patterns of Krupp field guns by the adoption of the cylindro-prismatic wedge, with Broadwell ring and steel facing-plate. It would probably be incorrect to affirm that a breech-loader has quite as great immunity from injury by its own fire as a muzzle-loader, since no joint, however well contrived, can be as strong as the solid-ended steel tube forming the breech of the latter. But, putting mathe- matical certainty of security out of the question, it may now be accepted that practically field guns can be made as

safe and enduring on one system as on the other. (c.) As regards immunity from injury by the enemy's fire, the miuzzle-loader has a decided advantage. It is difficult to estimate the real value of this advantage, depending as it

does partly on the manner in which artillery is employed, and partly on the doctrine of chances. During the Russo- Turkish War of 1877-78 but few guns were placed hors de combat by the enemy's fire. In such cases as did occur, the injuries were nearly always such as would not have effected muzzle-loaders. The wedge handles were usually bent up by the action of percussion fuze shell jamming the wedges. 'he Russian field guns were generally of a feeble class; the proportion of entrenchment fighting was un-usually large; and in the field the Turkish artillery habit- ually fired at long ranges. It may therefore be fairly concluded that the number of guns injured by the enemy's fire was not so great as to render the superior invulnerability of muzzle-loaders of much importance. These conditions will probably be reversed in any great war in which England may take part ; and hence the advantage gained by muzzle- loaders in hnmunity from damage by hostile fire must be carefully borne in mind in comparing the two systems of loading. (d.) In capability of supporting the accidents of service, there is not much to choose between the two rivals. The breech-loader is more liable to injury from being upset, and exposes more parts and finer fittings to the action of the weather. On the other hand, it is easier to clean, and the officer can better see that it 7s cleau. The jamming of projectiles in the bore when ramming home, which some- times occurs with muzzle-loaders, is impossible with breech- loaders. 'This defect, it is hoped, has been overcome in the new English field gun. The preservation of breech- loaders, especially in mountainous countries, necessitates a profuse expenditure of oil and grease. (¢.) In comparing the rapidity and facility of manipulation of the two methods of loading, it is necessary to consider the circumstances under which the guns are employed. Suppose a horsed battery of guns to gallop to an open spot whence they com- mand a body of hostile troops in motion. Coming into action, the gunners load and fire as rapidly as accuracy will permit, unhampered by parapets. It is evidently of great importance to throw as many projectiles as possible among the enemy. Here the muzzle-loader will have some advan- tage. With full detachments in the open it takes rather less time to load, aim, and fire a muzzle-loading field gun than a breech-loading one. The reason of this is that with the former the man laying the piece can manipulate the sight and usually take aim while the loading is being per- formed, while, when the projectile and cartridge are thrust in from behind, he has to wait till the loading is done before he can get to the sight. There is no practical difference in the time

occupied by the actual loading. In one case, the cartridge and shell are rammed down a long distance together; in the other, first the shell is put in a short distance, and afterwards the cartridge, and the wedge has also to be withdrawn and replaced. Next, suppose a commanding position to have been selected for a battery, and a light entrenehment to have been thrown up, over which the guns fire. Here the muzzle-loader will lose the advantage gained when firing in the open, as it must be loaded before being run up to the parapet, and aimed after- wards. Both natures of gun recoil, and it makes no differ- ence in time whether the ammunition be thrust home when the gun is back at the recoil position, or after it is run up. Here the breech-loader and the muzzle-loader stand upon equal terms. Thirdly, suppose—a rare case with field guns—that firing with reduced charges is required, that shell are being lobbed from behind a parapet at high angles into a work. Here we shall have little recoil, probably not cuough to permit loading at the muzzle without the gun XI. — 40

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being run back by hand. Loading at the breech will, however, be perfectly simple. In this case the breech-loader gains a very decided advantage over the muzzle-loader, since not only does it not require to be run back, but it has to be run up merely a very short distance. To this the advocate of muzzle-loading will probably reply that shells are lobbed with low velocities into works only at considerable

“ intervals of time, that rapidity is therefore of no use, and

For siege pur- poses.

that the advantage claimed is worthless. No doubt there is truth in this argument, but suppose the action of reduced charges on the gun to be imitated by the introduction of a brake which shall check the recoil within a short space, even when the gun is firing rapidly with high velocity, then the breech-loader behind entrenchmeuts gaius a distinct advantage. The German guns are supplied with powerful but clumsy brakes, more for travelling purposes than for firing, and it is doubtful how far they answer for the latter object. In the British service it has not been thought im- portant to check recoil, since a certain amount of it has been necessary for

loading behind parapets ; but trials have been made of brakes, &c., for the purpose of preventing guns from running backwards down a reverse slope when tired from the crest of a hill, or, more geuerally, for check- ing excessive recoil. Up to the present time (1879) no great success has attended these efforts, nor does it appear feasible to abolish recoil altogether by sinking the wheels in a ditch, since the strain on the carriage would then be much increased. There is no doubt the question offers grave difficulties, especially as lightuess is such an important feature in the construction of field gun carriages. As yet, then, the reduction or cliecking of recoil behind a parapet confers but a problematical superiority on breech-loaders, and cannot be held to counterbalance the advantage gained by muzzle-loaders in the open. (7) In the older pattern |

guns of both systems, where studs and windage were pitted against lead coating and no windage, the muzzle-loading projectile was able to take a better time-fuze than could be used in the breech-loader, but it did not possess the saine accuracy of shooting. Since the introduction of the poly-groove system, in which rotation is given and windage sealed by a copper-flanged ring or disc at the base of thie shell, the muzzle-loading projectile has lost the advantage of being able to use the simpler time-fuze, but has gained in several important respects. The breech-loading shell has also been improved by the substitution of two copper wires for the lead coating, but is probably inferior to the new muzzle-loading projectile, which, however, can be used equally well for breech-loaders. It may be said therefore that the systems are equal in respect to efficiency of pro- jectile.

Thus then, taking the six qualities named as chief ex- cellences to be sought for in field artillery, it appears that | in four of them there is practically little or no advantage gained by either system over the other, while, in the two remaining qualities, the muzzle-loader has slightly the best of it. On the whole it seems therefore that, at the present moment, the balance of evidence is in favour of | muzzle-loading for field guns.

In comparing the advantages of the rival methods of loading siege guns, the entirely different character of the two classes of pieces composing a train at once forces itself on the attention. One class consists of long guns, project-ing far over a parapet, and usually fired at low elevatious with heavy

charges ; the other of short guns, usually fired at high elevations with low charges, the muzzles on recoil | coming well within the emplacement. The Germans use — long and short 15-centimetre guns, both breech-loaders, and | both throwing shell of the same weight. The long gun, fired with heavy charges, weighs three times as much as the short gun, which is fired with light charges. Supposing

_ modern muzzle-loaders.

the dimensions of the short gun were increased, the propor- tions remaining unchanged, till its weight equalled that of the long gunn, then it would be able to fire shell of three times the weight. This is what is actually being done in the British service. Now all these heavy pieces, firing either heavy powder charges or heavy shell, require very strong and consequently very heavy carriages to bear the recoil, and it is found convenient to transport thé guns on com- paratively light platform waggons apart from their firing carriages. Hence there is no longer any necessity for con- structing firing carriages with a view to travelling purposes ; and it is probable that traversing slides will be introduced for all heavy siege pieces. It is not requisite to institute at length a comparison of the various qualities desired for siege guns. Rapidity is very rarely of importance with them; they are always fired under cover, and it may be at once assumed that, as far as power and endurance go, the two systems are practically equal. A fresh set of condi- tions comes into play: the projectiles are heavy ; and con- venience of loading, combined with safety to the gunners from the enemy's fire, should now be considered. As these points are connected with the form of carriage employed, it was necessary to call to mind in comparing breech with muzzle loading, that slides are likely to take the place of travelling carriages. When long guns are fired, in order to permit loading at the muzzle, it is requisite that the recoil should be great, and the emplacement deep. Many devices, such as flexible rope rammers, jointed staves, &c., have been tried, but have not proved perfectly successful in over- coming this difficulty. Breech-loading here has a consider- able advantage. Long guns are fired at low angles of eleva- tion, and no difficnlty therefore is experienced in thrusting the projectile home from behiud ina nearly

horizontal bore. High velocity is required, and the breecli-loading system lends itself readily to enlargement of the powder chamber, without necessitating the complications of an expanding cartridge. If slides are used the hydraulic buffer checks the recoil at once; on the other hand, the parapet affords rather better protection to men standing close to it at the muzzle than to men standing a little way off at the breech. These conditions are reversed with the short pieces. The rammiuer is short, and no great recoil is necessary to permit loading at the muzzle. The elevation is high, and it is much easier to drop a shell in from the front than to thrust it up from behind. Indeed this cannot usually be done, and a breech-loader has to be brought nearly horizontal for loading. High velocity is never required, and enlargement of powder chamber is not wanted. The men are in the most sheltered position at the muzzle. If these views be admitted as correct, it seems clear that the loug pieces of a siege train should be breech-loaders, and the short ones muzzle-loaders. To this it may be objected that uniformity would be sacrificed by such a combination. There is not much in this objection. The mere fact of two guns being loaded in different ways is surely of little consequence, and can easily be grasped by the dullest gunner. It is done every practice day on board ship, where the old pattern Armstrong vent-piece breech-loaders are combined with As regards the stores, a long and a short gun of the same weight would not under any circumstances fire the same ammunition, and even in cases where a heavy long gun is associated with a light short one having the same diameter of bore, as in the case of the German 15-centimetre pieces, there is no reason why the same projectile should not be used for both if desired ; that is, the new smooth muzzle-loading shell, with a gas- check on the base, would answer for both.

The question of breech-loading or muzzle-loading is obviously not only complicated, but is liable to alteration in its conditions with every advance made in the science of

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gunnery. ‘To decide that an army or a navy should have

heavy nothing but breech-loaders, or nothing but muzzle loaders, guns. would be to make a fetich of uniformity; there is plenty

of room for both systems. With regard to heavy fortress and ship guns, it is easy to suggest positions where it will probably be found that one system has a decided advantage over the other. Thus, taking the sea service first, in turrets the muzzle-loader is preferable. The loading can be performed with great facility outside the ports, and a turret of a given diameter will house a pair of bigger guns than when the loading has to be done inside at the breech, unless some method of exterior loading can be devised for the breech-loaders also. For broadside guns, on the other hand, it seems equally clear that breech-loading has the advantage, as muzzle-loaders have to be run in so far to permit loading that they must be too short for ballistic ex- cellence. For a small gun placed on a slide in the bow of a boat, it appears far more convenient to load at the breech. For those gunboats in which the vessel is simply the gun carriage and the line of fire is given by the helm, loading at the muzzle from below deck offers great advantages. Land service heavy guns, mounted on sea fronts for the protection of harbours, &c., present a great variety of con- ditions. In some cases the rocks or ground on which the battery is erected have such a form that a heavy gun loaded at the breech could be used where only a comparatively small one could be loaded at the muzzle. Sometimes a turret can be erected with loading gear outside, and then the conditions are reversed. In the case of very heavy guns, which once im situ are not intended ever to be moved, the argument from uniformity loses much of its cogency ; and the circumstances of every gun position could therefore be separately considered. The guns and howitzers arming land fronts of fortresses should follow the same rule as given for the siege train, the conditions of service in battery being very similar. The long pieces should be breech- loaders, the short ones muzzle-loaders. Wherever the com-

GUNNY. This name is applied to cloth or bags made of jute, and is supposed to be derived from ganga or gania of Rumphius, or from gonta, a vernacular name of the Crotolaria juncea—a plant common in Madras. One of the first notices of the term itself is to be found in Knox's Ceylon, in which he says: "The filaments at the bottom of the stem [coir from the cocoa-nut husk (Cocos nucifera) | may be made into a coarse cloth called

gunny, which is used for bags and similar purposes." JUTE (q.v.) is the fibre of two species of Corchorus, C. capsularis and C. olitorius, one species of which, probably the latter, has long been known as the Jew's mallow, from the fact that the leaves have long been used in Palestine, Egypt, and Arabia as a potherb.

The seeds of the jute plant are sown in April or May and the plant is cut down close to the roots just before flowering. The tops are then clipped off and the stems made into bundles, which are placed in tanks or ditches and covered with turf or other heavy substances to keep the bundles under water. Here they are watched anxiously day by day till the fibre separates easily from the central woody portion. The period of retching or soaking takes from eight to ten days; if allowed to remain too long, the fibre rapidly decays. In drying also the fibre generally becomes of a deeper colour. When the fibre is ready for manipulation, the operator descends into the tank or ditch, and taking 10 to 15 bundles, strips off the barky fibre and washes thoroughly, and by a dexterous movement of the wrist spreads and separates the fibres over the surface of the water. The fibre soon becomes clean, and is hung over

parative advantages of breecli-loading and muzzle-loading are nearly equal, the decision should be in favour of the muzzle-loaders as possessing the inherent advantages of siniplicity, solidity, and cheapness.

Conclusion.—The science of gunnery has received so many developments of late years, and is even now progress- ing so rapidly, that it is impossible to do justice to the subject within the limits of an article. The reader who wishes for more minute details, and who would study any part of the science thoroughly, is recommended to consult the following list of works :—

EneuisH.—Robins, New Prineiples of Gynnery; Gen. Boxer, Biblio— R.A., Treatise on Artillery ; Col. Owen, R.A., Modern Artillery ; graphy.

Majors Griffiths and Duncan, R.A., Artillerist's Manual ; Major Sladen, R.A., Principles of Gunnery; Rev. F. Bashforth, Afotion of Projectiles; W.D. Niven, On the Caleulation of the Trajectories of Shot; Capt. Noble and

Prof. Abel, Researches on Explosives ; W. W. Greencr, Modern Breech-Loaders and Chokebore Guns; Pro- ceedings of Royal Artillery Institution (quarterly) ; Lt.-Col. Strange, R.A., Manual of Field Artillery for Canada; Reports of Committee on Explosives ; Reports of Commuttee on High-Angle Fire ; Changes in Artillery Matériel and Stores; and the War Office publications— Proceedings of Ordnance Seleet Committee, Text-Book on Ordnanec ; Text-Book on Ammunition; Text-Book on Carriuges.

Frencu.—Gen. Didion, Zraité de Balistique ; Id., Lois de la Resistance de V Air; Prof. Hélie, Traité de Balistique Kaupéri- mentale; G. Piobert, Traitéd' Artillerie Théorique et Expérimentale ; Revue d' Artillerie (monthly).

ITALIAN. —RAivista Marittima (quarterly).

AmeERIcCAN.—Holley, Ordnance and Armor; Annual Reports of Chief of Ordnanee.

GeRMAN.—Handbuceh fiir die Offiziere der Kéniglichen Preussischen Artillerie, Berlin, 1877 ; Mittheilungen tiber Gegenstdinde des Artil- lerie und Genie- Wesens, Vienna (monthly); Handbuch fiir die K.K. Artillerie, Vienna (published in sections, 1871-77); Maj.-Gen. Count Bylandt-Rheidt, Der indirecte Schuss mit Hohlgeschossen, Vienna, 1874; Prof. Georg Kaiser, Theorie der Elasticitat und Festigheit réhrenformiger Korper, Vienna, 1876 ; Id., Ueber Laffcten- Construction, 1877; Militér-Wochenblatt, Berlin.; (E. M.)

Note.—The publishers are indebted to the kindness of H.M.'s Stationery Office and the Royal Artillery Institution for assistance in preparing some of the illustrations for the foregoing article.

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bamboo framework to dry. The fibre thus obtained is fine, long, and silky, but the short staple and the portion near the root held in the hand of the operator during wash- ing, which frequently has bark attached, are the portions generally selected to make gunny bags or cloth of.

The kind of cloth known as gunny, (tat, choti, &c., is woven in various lengths and widths for use as bedding, bags, &c., and formerly, more than at present, every man, woman, and child, boatmen, husbandmen, and others, in their spare moments, distaff in hand, wove gunny cloth. Even the Hindu widow, saved from death and despised by all, made her life less miserable by making gunny cloth, and thus rendering herself to an extent independent of her family. On the eastern frontier women are clothed in it, and the poor cover themselves with it at night. In the Malayan Archipelago it is no unusual sight to see a poor Chinese coolie with a dress made of gunny cloth. The great and most important use, however, to which gunny cloth is applied is in making bags wherein to pack rice, linseed, sugar, cotton, and other products for shipment. —

As soon as this cheap, strong, and serviceable material became known, the manufacture speedily assumed enormous proportions, and vast quantities of jute were imported into Dundee for the manufacture of gunny bags and cloth alone. The Dundee mills, in the early period of this trade, had only Indian hand-woven gunnies to compete with. The introduction of the latest machinery of the most approved patterns into Bengal, the chief seat of this industry in India, has, however, had the effect of giving India the opportunity of competing with the Dundee mills on advan-

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tageous terms, and now India supplies vast quantities of gunnies to Europe, Egypt, Ceylon, the Malayan Archipelago, China, and the United States. In America alone it is computed that the annual average outturn of cotton is 3,500,000 bales, each bale requiring 6 yards of wrapping materiul, and of tliis one-third at least is supplied in gunny cloth. In 1872-73 6,105,275 gunnies and 64,347 pieces were exported from India, whilst in 1876-77, during a period of eleven months, 30,110,616 gunny bags and 5,262,835 yards of gunny cloth were exported to foreign countries. These figures do

not include what is sent coast- wise or what is used for packing exported Indian produce.

GUN—GUWN

Bombay too has maclinery for weaving jute, but las not as yet done much to compete with Bengal, and indeed there appears little hope for Bombay unless large quantities of jute can be made to grow on the spot, since, apart from the cost of carriage, the juices in the jute plant, as in many other plants, become resinified by drying, and therefore require operating upon whilst perfectly fresh, being attended after treatment with more difficulty in manipulation and a less outturn of fibre. .

The excellent gunny bags sent to England are often used for repacking for exportation, and large quantities find their way to paper mills,

GUNPOWDER

PON the great importance of the invention of gun- powder it is needless to dwell. Not only has it revolutionized the art of war, and given the forces of civiliza- tion a vast advantage over mere numbers and savage valour, but we may even urge, paradoxical though it appears, that the very improvements by which modern science has ren- dered military machines more deadly tend to make war far more expensive, and therefore to prevent its being so fre- quently or so rashly undertaken as of old. Besides such indirect services to civilization, gunpowder has been and is of great use in the arts of 'peace, although of late years to a certain extent superseded by more potent explosive agents. Such being the case, it is not a little remarkable that the discovery of gunpowder should be veiled in- uncertainty, although this very obscurity seems proof of its great anti- quity. It is, however, certain that it was not invented, as has been often stated, by the German monk Bertholdus Schwartz, about 1320, although Wilkinson, in his Zngines of War, considers Schwartz may have suggested the use of a mortar, since the form as also the name of this piece of ordnance may well have been due to some accident in the laboratory. Roger Bacon, who was born in 1214, refers, circa 1267, to an explosive mixture of the nature of gunpowder as known before his time, as being employed for purposes of diversion, and as producing a noise like thunder, and flashes like lightning;

he even suggests its application to military purposes, and indulges in the supposition that some such composition might have been employed by Gideon to destroy the Midianites (Judges vii.). He elsewhere writes —" Ex hoc ludicro puerili quod fit in multis mundi partibus, scilicet, ut instrumento facto ad quantitatem pollicis humani, ex hoc violentia salis, qui salpetrae vocatur, tam horribilis sonus nascitur in ruptura tam modice pergamens, quod fertis tonitru rugitum et coruscationem maximam sui luminis jubar excedit" (see preface to Jebb's edition of Bacon's Opus Majus). In the above passage saltpetre is alone referred to as the violently explosive substance, but Bacon was well aware of the fact that saltpetre of itself will not explode, for in his previously written treatise, De Secretis Operibus Artis et Nature: et de Nullitate Magi, he says "'that from saltpetre and other ingredients we are able to make a fire that shall burn at any distance we please." In chap. xi. of tue same work these other ingredients are veiled in the disguise of an anagrain: "Sed tamen salis petree lura nope cum ubre et sulphuris, et sic facies tonitrum et coruscationem, si scias artificium;" the unmeaning words in italics have been translated as carbonum pulvere. Robins, in his work on gunnery (1742), and Dutens (Enquiry into the Origin of Discoveries attributed to the Moderns) suggest that Bacon may have derived his know- ledge from the MS. of Marcus Greecus, preserved in the National Library in Paris, entitled « Incipit Liber Ignium a Marco Greeco prescriptus, cujus virtus et efficacia est ad

comburendum hostes, tam in mari quam in terra." Marcus Graecus, who lived about the end of the 8th century, was therefore not ignorant of the military uses to which the composition might be put ; among other modes of launching fire upon an enemy he gives one to the following effect :— one pound of live sulphur, two of charcoal of willow, and six of saltpetre, reduced to a fine powder in a marble mortar and mixed together; a certain quantity is to be put into a long, narrow, and well compacted cover, and then discharged into the air. This is evidently the description of a rocket. It has also been suggested that Bacon may have learnt tle secret in Spain, in which country he is known to have travelled, and whose Moorish masters were then far in advance of the rest of Europe in science and literature. Albertus Magnus, in his treatise De Mirabilibus Mundi, repeats almost word for word several receipts in the work of Marcus Greecus; also, an epistle by Ferrarius, a Spanish monk, and a contemporary of Bacon, which

is preserved in the Bodleian Library at Oxford, gives receipts for Greek fire, rockets, and "thunder." There is a treatise on gunpowder in the library of the Escorial, written about 1250, which appears to describe both rockets and shells ; the Arabians are, from this and other authorities, supposed to have enclosed combustible or explosive com- positions in hollow globes of iron, which were discharged upon the foe either by hand, like the modern grenade, or from the warlike machines then in use; it has also been stated that towards the close of the 13th century they projected small balls from tubes carried in the hand, or attached to the end of a lance, and only used at close quarters, being in fact hand-guns. Rockets were employed during the reign of the Greek emperor Leo, about 880, and indeed seem to have been known in India from time immemorial, some of them having been made of great size.

The gloom of the dark ages precludes further attempt to trace back the history of gunpowder with any certainty, but Mr Dutens, in the work before quoted, adduces many passages from classical authors in support of his view that a composition of the nature of gunpowder was not unknown to the ancients, as, for example, the story of Salmoneus, king of Elis, who, according to Virgil (dnedd, vi. 585), for his audacity in attempting to imitate thunder and lightning, was slain by Jupiter; Mr Dutens considers he may have fallen a victim to his own experiments. Eustathius, a commentator on Homer, speaks of him as being so skilled in mechanics that he constructed machines to imitate thunder (Eustathius ad Odyss., X 234, p. 1682, 1. 1; see also Hyginus, Mabul., 61, 650; Valerius Flaccus, lib. i. 662). It is also narrated of Caligula by Dion Cassius (Hist. Rom., "Caligula," p. 662) that he had machines which imitated thunder and lightning, and emitted stones. See also Johannes Antiochinus, Chronica apud Perescrana Valesu, Paris, 1604, p. 804.

GUNPOWDER

According to Themistius (Orat., xxvii. p. 337) the Brahmins had similar machines. Philostratus, in his life of Apollonius Tyanzeus (lib. ii. cap. 14), written about 200 A.D., relates of a people of India, dwelling between the Hyphasis and the Ganges, whose country Alexander never entered: "Their cities he could never have taken, though he had led a thousand as braveas

Achilles, or three thousand such as Ajax, to the assault ; for they come not out to the field to fight those who attack them, but these holy men, beloved by the gods, overthrow their eneniies with tempests and thunderbolts shot from their walls."

From the mention by Vitruvius, and in Plutarch's life of Marcellus, that oue of his machines threw large stones with great noise, it has been thought that Archimedes used some explosive composition in the defence of Syracuse.

The most ancient reference of all is in the Gentoo code of laws (Halhed's translation), supposed by some authori- ties to be coeval with Moses. It runs thus: "The niagis- trate shall not make war with any deceitful machine, or witli poisoned weapons, or with cannon and guns, or any kind of firearms." The translator remarks that this pass- age may "serve to renew the suspicion, long since deemed absurd, that Alexander the Great did absolutely meet with some weapons of that kind in India, as a passage from Quintus Curtius seems to ascertain." The word translated firearms is literally a weapon of fire, and one species of it has been described as a dart or arrow tipped with fire and discharged fron a bamboo, so that the reference may not be to any propelling agent, but merely to some combustible or incendiary composition, of the nature of the so-called Greek fire.

It is almost certain that those authors who assert that the Arabians used gunpowder at the siege of Mecca, 690 A.D., having derived their knowledge of it from India or China, confound gunpowder with this Greek fire, which seems to have been the generic name given to several different combustible mixtures, although Arabian writers speak of them as Chinese fires. Greek fire was intro- duced into Constantinople from the East about the year 673; it was discharged upon the enemy by means of various engines of war, or in smaller quantities attached to arrows or darts, The Saracens used it against the Crusaders. Maimbourg, in his History of the Crusades, describes its effects ; and Joinville, who was an eye-witness, says "it was thrown from a petrary, and came forward as large as a barrel of verjuice, with a tail of fire as big as a great sword, making a noise like thunder, and seeming Jike a dragon flying in the air; the light it gave out from the great quantity of fire rendered the camp as bright as day, and such was the terror it occasioned

among the commanders in the army of St Louis that Gautier de Cariel, an experienced and valiant knight, advised that, as often as it was thrown, they should prostrate themselves upon their elbows and knees, and beseech the Lord to deliver them from that danger against which he alone could protect them." However, its actual destructive effect seems to have been very inadequate to the terror it occasioned. From the account of Geoffrey de Vinesauf, sand and earth, but especially vinegar, appear to have been considered the best extinguishers; water would not put it out. One description of this wildfire was composed of resin, sulphur, naphtha, and probably saltpetre, Bacon states that religions scruples hindered European nations from adopting Greek fire; but if so, they seem to have been gradually overcoine, for its use is mentioned by various writers, Anna Comnena, Pére Daniel, and Froissart among them. Similar scruples no doubt considerably retarded the introduction of gun- powder ; and the fear that its adoption would prove fatal to all knightly gallantry also caused it to be regarded with aversion. Firdousi, the famous Persian poet, describes in

his writings what were doubtless the effects of rockets and wildfire discharged upon the enemy, but he ascribes the whole to magic.

The researches of all authorities seem to point to the Far East as the birthplace of an explosive mixture of the nature of gunpowder; it was used there from time immeniorial, although doubtless its application as a propel-ling agent is of far later date. In all probability, the germ of the science of explosives lay in the accidental discovery of the peculiar properties of the nitre so plentifully found mixed with the soil upon the vast plains of India and China. By means of the charred embers of wood-fires, used for cooking, the two most active ingredients of gunpowder might easily be brouglit into contact, and, under the action of heat, more or less deflagration would ensue ; in fact, the accidental dropping of some of the crude saltpetre into the coals would show its remarkable power of supporting and accelerating combustion. The combination of saltpetre and charcoal in a more or less powerful mixture can therefore be easily conceived, the sulphur being an after addition, and not necessary to cause explosion. Our present gun-powder is only the improvement and perfection of such a mixture. Saltpetre

was early known as "Chinese snow," and some have supposed the use of gunpowder in cannon to have been known in China very soon after, if not before, the Christian era. But this seems to be an error, for Colonel Anderson, C.B., in his book on gunpowder (London, 1862), quotes a conversation held by John Bell of Antermony, who visited Peking in 1721, with the emperor's general of artillery, to the effect that from their records it had been used in fireworks, &c., for about 2000 years, but that its application to the propulsion of shot was a late introduction. Some of their compositions had such names as 'devouring fire," "earth thunder," &c. The Institutes of Timur, written about the middle of the 14th century, contain no mention of cannon or gunpowder, although full particulars are given of the equipment of his troops; it is, however, related that when Timur engaged the army of Mahmud under the walls of Delhi, men scattered wildfire and flung rockets in every direction, In this connexion it may be noted that, while the use of rockets was of very old date in India, the names given to pieces of artillery under the rule of Baber and the Mogul conquerors of Hindustan almost invariably point to a European, or at least to a Turkish origin. It is also well authenticated that Akbar and Aurungzebe had Englishmen and other Europeans in their service to teach the art of gun-nery. The analysis of the gunpowder made by the Chinese in the present day shows a composition almost identical with that employed in Europe, which has only been arrived at after centuries of experience, so that, in all probability, they have corrected their earlier formula from Western sources.

Whatever obscurity may hang over the early history of gunpowder, it seems most probable that its employment as a propelling agent originated among the Moors or Saracens,—whose civilization for several centuries con-trasted forcibly with the intellectual darkness of Christen- dom,—and from them spread eastward, as well as north- ward into Europe. Condé (Hist. Dom. Arabs in Spam) states that Ismail Ben Feraz, king of Grenada, who in 1325 besieged Baza, had among his machines "some that cast globes of fire with resounding thunders and lightnings resembling those of the resistless tempest ; all these missiles caused fearful injuries to the walls and towers of the city." The first reliable contemporary document relative to the use of gunpowder in Europe, a document still in existence, bears date Lith Febrnary 1326; it gives authority to the priors, the gonfalonier, and council

of twelve of Florence to appoint persons to superintend the manufacture of cannons

Eastern origin of gun- powder.

Its intro- duction into

Europe.

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of brass, and iron balls, for the defence of the commune, camps, and territory of the republic,

First use If the testimony of John Barbour, archdeacon of Aber-

in Eng- deen, who wrote in 1375, is to be believed, cannon, which

jand. he calls "'crakys of war," were employed during the invasion of Scotland by Edward III. in 1327; but they are not mentioned in the accouuts of the expenses of this war pre- served in the record office. An indenture, first published by Sir N. H. Nicolas in his ZZist. Royal Navy (London, 1847), and since by Lieut.~~Colonel H. Brackenbury (Proceedings R. A, Institution, 1865), stated to be of 12 Edward ITI, 1338, contains several references to small cannon as among the stores of the tower, aud also mentions "un petit barrell de gonpouder le quart'plein." If autheutic, this is certainly the first distinct mention of gunpowder in Great Britain we now possess, but doubts have since been thrown upon the date of this MS. It, however, seems certain, from a con~~ temporary document in the National Library in Paris, that, in this same year 1338, there existed in the marine arsenal at Rouen, an iron weapon, called " pot de fer," for pro- pelling bolts, together with some saltpetre and sulphur to make powder for the same ; at this period the ingredients were usually kept separate, and mixed when required. From the year 1345, 19 Edward III., we have, preserved in the Record Office, reliable accounts of the purchase of ingredients needed for the fabrication of gunpowder, and of the shipping of cannon for France. In 1346 Edward IIT. ordered all the saltpetre and sulphur that could be found to be bought up for him, but the quantities obtained were very small.

Whetlier it be true or not that cannon were used by the English at Crécy in that year belongs rather to the question of the employment of artillery in the field; it has been maintained that such was the case by Napoleon III. (Htudes sur le passé et Pavenix de ?Artillerie). It may be noted that Petrarch, about the year 1344, in his dialogues De remediis utriusque fortune, speaks of "brazen globes cast forth by the force of flame with a hor- rible sound of thunder" as having become as common as any other kind of weapon.

In the year 1377, being the first of Richard IT., Thomas Norbury was ordered to buy, amongst other munitions, sulphur, saltpetre, and charcoal to be sent to the castle of Brest. In 1414 Henry V. ordcred that no gunpowder should be taken out of the kingdom without special licence ; in the same year this monarch also ordered twenty pipes of powder made of willow charcoal, and various other articles for the use of the guns.

It was not, however, until the reign of Elizabeth that the manufacture of gunpowder can be said to have been estab- lished in England. The greater portion required had been previously imported from abroad, and the trade had been an open one; but the threatening attitude of Spain com- pelled the Government to provide more efficient means of defence, and patents were issued by the crown for the manu- facture of gunpowder, constituting it a monopoly. Early in this reign also, saltpetre began to be artificially produced in England, but the quantity so obtained formed a very small proportion of the supply needed, the remainder being brought from various parts of the Continent, and from Barbary. Again, in 1623, nominally in order to prevent the sale of weak or defective powder, a proclamation was issued by James I., prohibiting its manufacture, as well as that of saltpetre, except under the king's commission, and directing that all gunpowder should be proved and marked by the sworn proof-master. A little later, in 1626, the East India Company had commenced the importation of saltpetre, and had also erected powder works in Surrey. Their renewed chartet in 1693 contained a clause provid- ing that 500 tons of saltpetre were to be furnished to the ordnance annually, and from this time forward we hear of

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no difficulty, at least in England, of obtaining the chief ingredient of gunpowder, although on tlie Continent great attention has been paid to its artificial production ; this was especially the case in France during the reign of Napoleon J., when the supremacy of Great Britain at sea for many years prevented the importation of saltpetre by her enemies.

About the year 1590, George Evelyn, grandfather of the celebrated John Evelyn of Wooton, received the royal licence to set up powder mills at Long Ditton and Godstone ; the Evelyns are said to have brought the art from Holland. The works at Faversham, afterwards for so many years the Government gunpowder factory, date from Elizabeth's reign, but were then of secondary importance to those at Godstone. There seems reason, however, to suppose that powder mills existed at Waltham Abbey so far back as 1561, for in that year we find John Thomworth of Waltham in treaty, on behalf of Queen Elizabeth, for the purchase of saltpetre, sulphur, and staves for barrels. Fuller also refers (Znglish Worthies, i. 388) to the powder mills at Waltham Abbey, of which place he was appointed vicar in 1641. In 1787 they were sold to the crown by John Walton, and reorganized under the superintendence of the famous Sir William Congreve. The old royal factory at Faversham was given up after the peace of 1815, being first let and afterwards sold to the well-known firm of Messrs John Hall & Son; a third Government factory at Ballincollig was disposed of a few years later. The Waltham Abbey works have been greatly enlarged of recent years, and no expense has been spared to render them, by the introduction of new and improved machinery, the most complete as well as the safest in the world. It is impossible to describe in detail the various improvements which have been made in tle manu- facture of gunpowder, but the most important will be briefly stated when describing the successive processes to which the ingredients are subjected.

Ture INGREDIENTS AND THEIR ACTION.

The objects to be attained in the production of an Objects explosive agent for artillery and small arms are—(a) the to be 4 maximum of propelling force ; (6) the minimum of ¢nitial "De® pressure in the bore of gun; (c) uniformity of action ; (d) freedom from fouling, especially in small-arm powders ; (e) durability, ¢.e., power to bear transport and keep well in

store. Of all explosive substances at present known, gun- powder alone can be said to fulfil the first three conditions.

Its advantages may be summed up as follows :—(a) the Advan-

rate of combustion of gunpowder is gradual compared with tages of

that of most other explosives ; and, both by adjusting the ee eee: , : ; ._, powder,

proportions of the ingredients and varying the mechanical

processes of manufacture, its explosiveness can be modified

so as to suit every description of weapon ; (6) the ingredients

are easily procured, and are comparatively cheap ; (c) with

proper precautions, it is comparatively safe in manufacture,

in store, and in transport ; it also keeps well in a moderately

dry atmosphere.

The earliest gunpowder used in cannon in Europe con- Com- sisted of equal parts of saltpetre, charcoal, and sulphur, position. ground up and mixed together as required, and must have proved a mixture far inferior in strength to that given in the MS. of Marcus Greecus. To account for the use of such a very weak composition long after better proportions had been ascertained, it must be remembered that the earliest cannon were composed of iron staves roughly hooped together'; and tubes of thin iron, or even of wood or leather, with rope coiled round them, were sometimes used. Indeed the effective application of gunpowder as a propelling agent involves a whole series of inventions, and it was doubtless chiefly owing to the backward state of mechanical science during the Middle Ages that such weak powders were employed. The slow growth of artillery science in Europe

for five centuries, and its rapid development in very recent years, are facts which support this presumption. Even about 1410 the proportions were still but 3 saltpetre, 2 sulphur, and 2 charcoal. The relative amount of saltpetre was gradually increased, and Tartaglia (Quesitd e Liventione diversi, Venice, 1546) mentions twenty-three various com- positions as having been used at different times ; the gun- powders of his days were—

Saltpetre. | Charcoal. | Sulphur.

WATIMGN DOWEL .....0cccccecevcesveeeee 4 1 Wuidhkeg, i) sierra seeeeereenes 48 8

18 3

It is remarkable that Robins states the above proportions to have been very nearly those of his own day (1742), for there is a great deficiency of saltpetre in the cannon powder, and a considerable excess in that for muskets, com- pared with the relative quantities now employed in England. Fora long period of time it was the custom for the fine grain or musket powder to contain a larger proportion of saltpetre than that for canuon ; and, again, the amount of nitre was relatively reduced as the piece of ordnance became heavier, doubtless with the view of obtaining a slower burn- ing powder for large charges. However, we find that by the latter part of the last century, what was called " com- mon war powder" was almost universally composed of 6 saltpetre, 1 charcoal, and 1 sulphur, and these are the pro- portions still in use by many Continental nations (D'Antoni On Gunpowder, translated by Capt. Thompson, R.A., Lon- don, 1787).

So far back as the 16th century, Baptista Porta is said to have arrived at the proportions now used in France, which, however, were certainly not adopted until a comparatively recent period, Exhaustive experiments have also been carried out in that country by Beaunié, the Committee of Public Safety, Chaptal, and Proust, who fixed upon per- centages of saltpetre varying from 76 to 80, of charcoal from 13 to 16, and sulphur from 5 to 9. These may seem to give rather a wide margin, but this will surprise no one who is acquainted with the great differences in results given by comparatively slight variations in the conditions of ex- periment, with powder of the same composition. In the British Government service but one

scale of proportions has been employed for many years, and the very extensive trials of the "Committee on explosives" have shown that there is no good reason to depart from that scale ; for they have conclusively demonstrated that the variations in the mechanical and physical properties of gunpowder, produced by the processes of manufacture, exert even more influence upon its action than a comparatively considerable difference in composition ; this does not, however, apply to the small charges used in firearms. It will be seen, moreover, that one of the three ingredients—charcoal—can be so varied in quality as very materially to affect the results.

The following table gives the percentage composition of gunpowder as now made in different countries for military purposes :—

Saltpetre. | Charcoal, | Sulphur England, Royal Gunpowder Factory,| 75 15 10 I csc be sans nsaciemiawesnaancer 75 12°5 12°5

*The proportions of the ingredients in English commercial * gunpowders vary considerably according to the market for which they are intended. The best sporting powders*

_ture, are most injurious.

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have about the same composition as those made by Government. Wherever cheapness is the chief object in view, the quantity of nitre is diminished, and the other two components relatively increased. Some of the powder for the African trade, commonly called "nigger powder," does not contain much more than 50 per cent. of saltpetre, while other kinds are nearly as bad. Blasting powder contains a low proportion of saltpetre, from 60 to 62 per cent. ; but, although this reduction may originally have been made in order to manufacture a cheaper article, yet it is also the most effective for the object desired in many cases, which is to remove large masses of earth or soft rock, and this can best be done by using a comparatively weak or slow-burning powder. The element of time is here of great importance; a very quick-burning or violent explosive would not displace such large masses of

a soft material, although the local effect would be more destructive (see BuastinG and Exprnosives).

Before proceeding further, it will be as well briefly to consider the properties of the three ingredients of which gunpowder is composed, and the part played by each.

Saltpetre, or nitrate of potash (KNO,), occurs as a Saltpetre.

natural production on or near the surface of the earth in several warm climates, especially the plains of India and China. When it arrives in England, it has only been partially separated from the earthy and foreign saline matters with which it was combined when found, and is quite unfit for the manufacture of gunpowder ; the salts of sodium: especially, from their property of absorbing mois- In this state the saltpetre is known as " grough" nitre, the impurities commonly present being the chlorides of potassium and sodium, and the sulphates of potash, soda, and lime, together with sand and organic matter; they do not usually exceed 5 tb per ewt., the exact proportion of impurities in any sample being termed the "refraction" of the saltpetre, and allowed for in the price. The nitrate of soda, called " cubical nitre" or Chili saltpetre, which is found abundantly in South America, although chemically adapted to supply the place of potassium nitrate, cannot be employed in the manufac- ture of gunpowder, owing to its very deliquescent properties. This salt is, however, largely converted into saltpetre by the action of chloride of potassium. In France and Germany, also, nitre is produced artificially (see SALTPETRE).

Saltpetre, which is a compound of 54 parts of nitric acid and 46 of potash, acts as a magazine of oxygen in a solid form, one volume of saltpetre containing as much oxygen as about 3000 volumes of atmospheric air. This oxygen, with which it readily parts when raised to a certain temperature, combines violently with the carbon to form carbonic acid and a proportion of carbonic oxide; these with free nitrogen constitute the chief gaseous products of com- bustion, The potassium is found combined in the solid residue,

Wood charcoal is the charred woody fibre or residue Char- which remains after the liquid and more volatile parts have °al.

been driven off by destructive distillation. The object of charring wood is the removal of moisture, and, which is of great importance, the expulsion of those matters which become volatile before they are burned, and which would absorb a large amount of heat. It may be charred in the ordinary way in pits; but the usual mode of preparing charcoal for gunpowder is by heating it in large iron cylinders or retorts, as hereafter described. By this latter method, the operation is performed with more uniformity and economy, and the charcoal kept more free from par- ticles of grit orearthy matter. Charcoal is best fitted for the manufacture of gunpowder when prepared from light spongy wood, containing a very small proportion of mineral sub- stances; itshould be sound, and of not much more than ten

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years' growth. The quality of the charcoal exercises the greatest influence upon the rate of combustion, so that both the description of wood used and the mode of burning are of the utmost importance.

By a series of experiments first made by Proust, and since repeated by English chemists, it has been found that 12 grains of various charcoals, mixed with 60 grains of saltpetre, give the following average volumes of gas :—

Cubic a

Dogwood (Rhamnus Frangula) ... ciccccccceecceeees 82 AAO Thess (US UE! | ee separ tC AIBIOR, oooncnadnibdoanodedontonede cade ROG She nannER eeceanaosocdd 74 EUs reer errs alice sooo cwisieccwlsae ne sincere vslsdentanee's 72 MmCrOeEMt, WRZEL.. Meade… cs. ccecee ns eneanonnenee 66 Ovenheatedmmillow charcoal… .o0….c0sessereee sae 63

The production of the strongest powder does not depend alone upon the evolution of the largest volume of gas, but the above table is of interest since the three descriptions of wood which head the list have long been considered by universal consent as the best adapted for the manufacture of charcoal for gunpowder. Dogwood (so-called, but in reality it is alder-buckthorn, Rhamnus Prangula, the French bourdaine) is an underwood of slow growth, usually obtained from Snssex, Belgium, or Prussia; it is cut

about an inch in diameter, and packed in bundles 6 feet long. This wood is now used, both in England and on the Continent, for all military small-arm powders, as well as the best descriptions of sporting gunpowder. It has been found, moreover, that cannon powders made from dogwood charcoal are, other things being equal, much more violent in action than those manufactured with willow or alder charcoal. with powder made from dogwood cliarcoal have usually proved more destructive than those made with any other description. Alder and willow charcoalis used for making gunpowders for field and heavy ordnance, as well as for the commoner kinds of commercial powders; these woods are obtained from various parts of England, and should measure about 4 inches in diameter. The willow used is the Salix alba, one of the softest and lightest of English woods, white in colour, aud of very rapid growth; the pith is circular, and tolerably large. Alder is considerably harder and denser in texture, and of slower growth ; its colour is reddish-yellow, and the small pith triangular or bayonet-shaped in section. Dogwood has a very large pith in pro- portion to its size, circular, and of a red colour, which is preserved even after the wood is converted into charcoal.

The temperature at which the wood is charred exercises the most powerful influence upon the inflammability of the charcoal, and consequently upon the ‘ explosiveness,” or rate of combustion, of the gunpowder made from it. The higher the temperature the larger the proportion of liydrogen and oxygen expelled, and the nearer the approach of the charcoal to pure carbon ; at the same time, it becomes more dense and incombustible, and the gunpowder made from it is comparatively slow in action, and gives a low initial velocity Charcoal prepared at a low teniperature is softer and more inflammable, and contains more volatile constituents ; it makes a quicker burning powder, giving a higher velocity to the projectile, but also producing more strain or pressure upon the metal of the gun. The chief defect, however, of this “slack-burnt ” charcoal, or charbon roux, as it is called from its reddish-brown colour, is its property of absorbing moisture more readily than denser charcoal; the powder manufactured from it is consequently more hygroscopic, and therefore more liable to deteriorate in strength from the effects of damp than that made with a more highly burnt charcoal. To show the great difference in inflammability caused by burning at low and high temperatures respect- ively, it may be stated that charcoal

prepared at 500° Fahr. readily ignites at about 640°, while, if burnt at 1800° Fahr., nearly double the heat previously mentioned is

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required to inflame it. The following table exhibits con- cisely the practical effects of ditferent modes of preparing charcoal for gunpowder, the same kind of wood being used in each case ; it shows (a) the analysis of the charcoals, and (>) the comparative initial velocities and pressures given by powders made in a precisely similar manner from thiose charcoals.

Mou: No. 2, No.3. Burnt 7 Burnt 4 | Burnt 3 hours at a | hoursata | hours at tow heat. | greater | very high heat. heat. [De PLCBEO ONO, Goonaacounanoasc per cent.| 78°23 81°23 87°55 S | Oxygen, and trace of j=) ° . . = nitrogen. adouacoanEe DE BO Lom i Leb MBI YC boxe quaonh,eaeo onc ar 3°67 3°31 29 sl coor _ 1°41 1887 1°25 Initial velocity (feet per second)..) 1417 13899 1853 Mean pressure in powder cham- . : ; ber (tons per square inch)..... BN a

For the manufacture of gunpowder, only the crystalline Sulphur,

electro-negative variety of sulphur soluble in bisulphide of carbon (see CHEMISTRY, vol. v. p. 498) is used. Sublimed sulphur, commonly called " flowers of sulphur," which con- sists of minute granules of insoluble sulphur enclosing the soluble variety, is considered unfit for gunpowder; the reason assigned has usually been that, from the mode of manufac- ture, it is impregnated with sulphurous and sulphuric acids, but Professor Bloxam points out that in all probability it is the fact of the sublimed sulphur consisting of the electro-positive insoluble variety, which exerts an injurious influence upon the gunpowder made from it. Sulphur performs the part of a second "'combustible" in gunpowder; but there is no doubt that its chief value as an ingredient thereof arises from its great inflammability, owing to its tendency to combine with oxygen at a moderate temperature; it inflames at about 560° Fahr., thus facilitating the ignition of the powder. Its oxidation by saltpetre appears also to produce a higher temperature than is obtained with charcoal, thus accelerat- ing combustion, and increasing by

expansion the volume of gas generated. An excess of sulphur would, however, be injurious by increasing the solid residue, in which the sulphur is found combined in various forms after the explosion. Some authorities have considered that, from its non-absorbent properties, sulphur renders gunpowder less hygroscopic, and more compact and durable.

Powders made from exactly the same materials, mixed Exylo- in the same proportions, yet differ greatly in ‘ explosive- siveness. ness,” which has been defined as the rate at which the powder burns or is converted into gas. This quality will depend chiefly upon the following properties :—(a) extent of iucorporation; (6) the density of the powder; (c) its hardness; (d) size of the grains or pieces; (e) shape of the grains; (f) amount of glaze. Although not altogether synonymous with strength, we may consider “ explosive- ness” as the quality upon which the value of gunpowder for any particular purpose chiefly depends.

Next to the selection of the precise description of char- Extent coal to be used, no point in the manufacture of gunpowder of incor requires such care and attention as the thorough inter- P70 mixture of the ingredients,—the object being in fact to form out of the three components a new substance as nearly homogeneous as possible. It is usually considered that there is a limit of time beyond which no advantage is gained by continuing the “ milling” or incorporating process; but it is certain that nothing that can be done to the powder afterwards will add to its strength, although we may modify its explosiveness, and that the very best powders, especially for small-arms, are milled the longest time. This question will be further treated under the head of manufacture.

GUNPOWDER

No physical property affects the explosiveness of gun- owder as much as its density. By density we mean the

vardness. quantity of matter actually present in a certain bulk of the

Size of grains.

powder. Thus, if different quantities of meal powder, con- taining the same proportion of moisture, be compressed into equal bulks, say, for example, into cylinders of equal size, that which contains the most meal will be the densest. Hardness has not necessarily a relation to density, for a substance may be hard, and yet possess little density. {ncrease of density can only be given by compressing the meal into a smaller bulk, while increase of hardness can be arrived at by pressing the meal in a moister coudition.

Other things being equal, increasing the density decreases the initial velocity, and, vice versa, a less dense powder gives a higher velocity, but also a greater strain to the metal of the gun. 'This is due to the less dense powder burning more rapidly than that with a dense close texture. If two grains, or pieces of powder, of equal size and similar shape but very unequal density, be burnt upon a glass plate, the less dense one will be entirely consumed before the denser one has finished burning.

Freedom from fouling is a very important property in small-arm powders. From the experience gained in select- ing a powder for the Martini-Henry rifle, it was found that, with the same description of charcoal, the slower the action of the charge the less fouling took place ; this modification of action was easily obtained by raising the density, at, however, a corresponding sacrifice of velocity in the bullet. The reason assigned was that the quicker-burning powder caused a rush of gas past the lubricating wad before the latter had time to act properly. A dense hard powder which will take a high polish or glaze will evidently keep better, and bear transport better, than a more porous and therefore more friable grain, which would easily form dust. It will thus be seen that many considerations enter into this question of density.

The size of grain is one of the most important points to be considered as modifying the explosiveness of powder. Although a charge of powder appears to explode instantane- ously, yet both ignition and combustion are comparatively gradual; the flame is communicated from one grain to another, and each burns in concentric layers until it is con- sumed, so that the combustion of the grains is not svmul- taneous. Meal-powder burns more slowly in air than when the powder is granulated, in consequence of the minute- ness of the interstices ; dust, especially in fine-grain powder,

retards ignition by filling up the interstices. To go to the other extreme, as showing the advantage gained by granulating the press-cake, we may quote an experiment made some years ago. A small piece weighing 1-06 oz. was placed in a mortar, and a light ball placed upon it; when it was fired, the ball was not thrown out. An equal quantity broken into 15 pieces, projected the ball 3°3 yards; broken into 50 pieces, the ball ranged 10°77 yards ; when the same weight of ordinary grained powder was used, the range was 56°86 yards. It is most unsafe to attempt to apply to the action of gunpowder, when fired under enormous pressure, and especially when employed in large charges, the conclusions arrived at from its combustion in air. We may, however, assert that the weight of charge, the density, and all other conditions being equal, a charge made up of large grains or pieces of gunpowder will burn more slowly, and exert a lesser initial strain upon the gun than one composed of small grains, owing to the total surface of combustion being diminished by increasing the size of the pieces; this has been abundantly verified by the results of experiments with heavy rifled ordnance. On the other hand, the larger grains afford larger interstices between them for the passage of the flame, thus facilitating the ignition of large charges. Hence, a gunpowder may

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possess a low rate of combustion and yet a high rate of ignition, and wee versa. For each gun, or charge of gun- powder, there is doubtless a size of grain which would pro- duce a maximum velocity with a minimum initial strain, but as each kind of cannon powder has to be employed in more than one piece of ordnance, it is necessary to select that size which will best suit all of them.

The same quantity of powder meal made into two grains of equal density, but different shapes, will take different times to burn; the larger the surface exposed the quicker will be the combustion of the grain. A sphere being the smallest form in which a given quantity of matter can be placed, it follows that a certain amount of meal powder compressed into a spherical form will take longer to burn than the same quantity made into the shape of a flat scale, exposing a largesurface. The rounded form of grain is the most favourable for the transmission of the flame, the interstices being larger

and more regular than in the case of elongated or flat grains fitting into one another. Hence we may conclude that, to secure uniformity, it is better to have the constituent grains as nearly as possible of the same shape, and the nearer this shape approaches a sphere the better.

The glazing process is one of considerable importance, both with reference to the explosiveness, and also the keeping qualities of the gunpowder. As regards the former point, it undoubtedly modifies the violence of the combustion, and this it probably does by slightly retarding the ignition, a powder with a rough porous surface affording a better hold to the flame than one possessing a highly polished exterior. With the large "cubical" powder, used for heavy rifled ordnance, there is little or no appearance of what is com- monly understood as glaze, or polish, from this process, but the corners and edges of the cubes are rubbed off, and the shape approximates more nearly to that of a sphere than is the case with the much lighter fine-grain powder; there seems to be 'also a certain hardening of the surface of the grains or pieces, partly the effects of friction, but probably due in part to the sweating the powder undergoes, a con- siderable amount of heat being generated in the glazing barrels, It is evident that, by taking away the sharp angles which would otherwise easily be converted into dust, and also by giving the grains a harder exterior, this process renders gunpowder the better able to bear transport, and to resist the deteriorating effect of a damp atmosphere. The addition of a thin coating of the purest graphite to cannon powders, although originally intended merely to

modify the explosiveness, also renders the surface of the

grains less absorbent. Military small-arm powders are never dressed with graphite; good fine-grain gunpowder will take a high finish without it, but, by its aid, a very inferior article can be polished up to a silvery brightness. Moisture in gunpowder reduces the explosiveness by using up a portion of the heat generated by the combustion, to get rid of the water; therefore the property of withstanding the absorption of moisture is a very important one for gunpowder to possess. All powder will take up from a normally dry atmosphere a certain amount of moisture, which will depend to some extent upon its density, but to a much greater degree upon the description of charcoal from which itis made. Slack-burnt or red charcoal is greatly more

hygroscopic than black charcoal, or that burnt at a high temperature ; and the absorbent properties of gun- powder made from the former are but little reduced by raising the density. Large cannon powder contains a greater percentage of water than the fine grain, and the actual amount present in any given sample will be affected by the prevailing state of the atmosphere, especially if kept in wooden barrels. To show the considerable effect upon the initial velocity of projectile, and es in bore of gun Pe Gee

Shape of grains.

Glazing.

Effect of moisture.

O22

caused by comparatively slight variations in the amount of moisture, the following results may be quoted from the

GUNPOWDER

pressure, about 280 times the volume of the original powder, and will give a pressure of about 6000 atmospheres,

or 40 tons per square inch. In view of the very different results which have been Researches arrived at by various eminent authorities who have experi- relative to mented upon fired gunpowder, the following brief account ved of their researches may be useful :— pow Robins, the father of scieutific gunnery, in 1748 read before Robins,

experiments of Noble and Abel. The samples of " pebble " powder used were specially prepared for the Committee on explosives, differing only in the amount of moisture con- tained in them.

Percentage of Muzzle Velocity. | Maximum Pressure.

ical he an lage ati ad ia the Royal Society a paper describing experiments which showed that 0-7 1545 22°02 gunpowder, when fired, generated permanent gases, which, at the 0°8 1537 21°38 ordinary temperature and

atmospheric pressure, occupied a volume 0-9 1530 20°77 244 times greater than that of the unexploded powder. He further 10 1523 20°18 considered that the heat evolved was such that the tension of the 11 1517 19°63 permanent gases would be increased fourfold, and hence deduced the 1-2 1512 19°12 maxinium pressure to be about 1000 atmosphcres. In 1778 Dr Hutton, 13 1507 18°63 Hutton communicated in the same manner an account of his cele- 1°4 1502 18°18 brated researches on the combustion of powder; he deduced the 15 1497 17°76 maximum pressure to be about twice that given by Robins, ora little

over 2000 atinospheres, differing from the latter chiefly as to the tem- perature, for he considered that the volume of gases generated would occupy, under ordinary conditions, 250 times that of the powder.

He also deduced formule for giving the pressure of the gas and velocity of the projectile at any point of the bore, but no allowance is

made for the loss of heat in proportion to the work done, that fun- damental principle of thermodynamics being then unknown ; the

error thus occasioned is, however, in part compensated for by the

heat stored np in the non-gaseous products. In 1797 Count Rum- Rum- ford sent to the Royal Society his experimental determinations of ford. the pressures given by fired gunpowder, which are remarkable as

being the first attempt to do this by direct observation. The closed

vessel he used was, however, very small, being able to hold but 28

grains when filled, and he only succecded in measuring the results

up toa charge of 18 grains. His plan of operation was to ascertain

by repeated trial the least weight which would just confine the pro-

ducts of explosion, and thence to calculate the pressure ; this he de-

duced from two series of experiments, which, however, gave some

very anomalous results, to be as high as 100,000 atmospheres for gunpowder exploded in its own space. In 1823 Gay-Lussac, the Gay- celebrated French cheniist, estimated the volume of the permanent Lussac gases evolved at 450 times that of the powder fired, but General Piobert assigns very probable reasons for supposing the quantity of

gas determined to have been doubled in crror. Gay-Lussac found

the percentage composition of the gaseous products to be 52°6 car-

bonic acid, 5 of carbonic oxide, and 42°4 nitrogen. In 1857 Bunsen Bunsen and Schiskoff published (Poggendorf's Annalen, vol. cii. p. 325) the and results of their very iniportant experiments ;. thcir determinations Schiskoff, were—(1) that the permanent gases represented only about 32 per

cent. of the weight of the charge, and occupied at the standard tem- perature and 1 ag about 193 times the volume of the original powder ; (2) that the heat generated by exploding gunpowder in a

close chamber is about 3340° C.; and (8) that hence the pressure

would be about 4374 atmospheres, or 29 tons per square incl.

Major Rodman (Boston, 1861) published the results of extensive Rodman. experiments carried on for the United States Government, in order

to ascertain the pressures given by different powders in the bores

Keeping gunpowder in a very damp atmosphere will tend to separate the ingredients by dissolving a portion of the saltpetre, which crystallizes upon the surface of the grains or pieces.

Firep GUNPOWDER.

In the explosion of gunpowder, the products of com- x- bustion are very materially affected by the conditions under plosiou.. which it is fired,— whether burnt in the open air, exploded under very great pressure in a tightly closed vessel, or the products allowed to expand in tlie bore of a gun. It may, however, be stated generally that the oxygen of the salt- petre

converts nearly all the carbon of the charcoal into carbonic acid (CO,), a portion of which combines with the potash of the nitre toform carbonate of potash (K,0.CO,), the remainder existing in the state of gas. The sulphur is for the most part converted into sulphuric acid (SO,), and forms sulphate of potash, a large proportion of which, pro- bably by secondary reactions, becomes hyposulphite and sulphide. The nitrogen of the saltpetre is almost entirely evolved in the free state, and the carbon not having been wholly burnt into carbonic acid, there is always a proportion of carbonic oxide (CO) present.

The decomposition is so complicated, and varies so con- siderably under different conditions of experiment, that it is impossible to represent the transformation by any single equation, but the following expression may give some idea of the primary reaction :—

4KNO, SF Cyt i) a K,0. CO, + K,0.S0, + N, + 2CO, + CO.

Products of ex-

There is a very large proportion of residue, which, on cooling, assumes the sol¢d form. The experiments of Noble and Abel prove that it is liguid very shortly after the explosion ; indeed, it is probable that at the moment of maximum temperature, the ultimately solid products are

of heavy guns. He employed a pressure gauge, which bears his name, and consists mainly of a pistou to which is attached a knife edge acting upon a piece of soft copper, contained in a small cylinder at right angles to, and communicating with, the bore of the gun ;'this apparatus he also used to ascertain the pres- sure given by powder exploded in a closed vessel. The chief value of his experiments consists in their having established the fact that

more or less in a state of vapour, being deposited in a very

ae the size of the grain should be proportionate to the length la- finely divided state as the temperature falls. tt Wands (0s gone a awa

meter of the bore of the gun. Von Karolyi (Poggendorff's Annalen, Von

Mechani- Whena charge of gunpowder is exploded in the chamber | April 1863) carried out experiments from which he estimated that, Karoly. cal of a gun, a large quantity of gaseous matter is evolved in Aa Sa ae the gases evolved occupied about 226 times effects. a highly condensed state ;—its tension, or expansive power, CE Cork ee ee ne eee

umes, Captain Andrew Noble, F.R.S., of Elswick, and Professor Noble Abel, C.B., F.R.S., chemist to the British War Department, and carried out a most extensive series of experiments on "' Fired Gun- Abel.

is, moreover, greatly increased by the heat generated during the transformation. The pressure being equal in all direc-

tions, the work done upon the projectile is due to the expansion of the permanent gases in the bore of the gun, which force is also considerably sustained—or the reduction of temperature due to the expansion in great measure com- pensated for—by the heat stored up in the ultimately solid residue. Any calculation which does not take this latter point into consideration will give far too low an estimate of the actual force of fired gunpowder (see EXPLOSIVES).

_ With our present state of knowledge, it may be stated in round numbers that the gases evolved by gunpowder, ¢f at entirely fills the close vessel in which it is exploded, will occupy at a temperature of 0° C. and 760 mm. barometric

powder" (Phil. Trans. Royal Soc., 1875), probably the most com- plete ever made, and undertaken collaterally with the Government 'Committee on Explosives;" their mean results may be summed up as follows :—

(A.) When Fired in a Confined Space.—(1) The products of com- bustion are about 57 per cent. by weight of wltimately solid matter, and 43 per cent. of permanent gases. (2) The latter occupy at 0° C. and 760 mm. barometric pressure about 280 times the volume of the original powder. (8) The tension of the products of combus- tion, when the powder entirely fills the space in which it is fired, is about 6400 atmospheres, or 42 tons per square inch. (4) The temperature of explosion is about 2200° C. (5) The chief gaseous products are carbonic acid, nitrogen, and carbonic oxide, with a little

sulphydric acid and hydrogen. (6) The solid residue is mainly com- posed of potassium carbonate, sulphate, hyposulphate, and sulphide.

Deter- mination of pres- sure in bore,

_ Dissocia- tion im- probable,

SUNTOW DER

(B.) When Fired in the Bore of a Gwn.—(1) The products of com- bustion, at all events so far as regards the proportions of solid and gaseous matters, are the same as in the case of powder fired in a close vessel. (2) The work on the projectile is effected by the elastic force due to the permanent gases. (3) The reduction of tempera- ture due to.the expansion of the permanent gases is in a great measure compensated by the heat stored up in the liquid (afterwards solid) residue. (4) An expression is obtained showing the law con- necting the tension of the products of combustion with the volume they occupy. (5) Equations are also deduced for the work that gun- powder is capable of peforming in expanding in a vessel impervious to heat, and for the temperature during expansion. Thence the ex- perimenters give a table showing the total work gunpowder is capable of performing in the bore of a gun, in terms of the density of the products of conibustion, or the number of volumes of expan- sion. (6) The total theoretic work of gunpowder when in- definitely cxpanded (for example, in a gun of infinite length) is about 486 foot-tons per pound of powder.

They further ascertained that—(a) the fine-grain powders furnish decidedly smaller portions of gaseous products than large grain or cannon gunpowders ; (0) the variations in the composition of the products of explosion, ina close vessel, furnished by one and the same powder under different couditions as regards pressure, and by two powders of similar composition under the same conditions of pressure, are so considerable that no chemical expression can be given for the metamorphosis of a gunpowder of normal composition ; and (¢) the proportions of the several constituents of the solid residue are quite as much effected by slight accidental conditions of explo- sion of one and the same powder in different experiments as by de- cided differences in the composition, as well as in the size of grain of different powders. It may, however, be remarked here that,

while the pressures given in the bore of a gun are very seriously affected by jie size of the grains or pieces of the powder, it was clearly demonstrated by these experiments that the force exerted by fired gunpowder is not affected by the apparent accidental variations in the nature of the secoudary chemical changes resulting from the explosions ; this fact renders the exact composition of the products of combustion of less practical importance.

The following table gives concisely the chief results arrived at:—

Volumes of

Heat Tension a Authority. a ent | Evolved by of the Piguet Generated. Combustion.| Gases.

Cent. Atmospheres| Per sq. in. nes 1000 ;

6°75 SonogaNDoposanSseacdondC™ Bs 2000 13 5 Gay-Lussac…..... 4501 1850° 2137 143 193 3340° 4374

Bunsen and Schiskoff…..

Noble and Abel…..... 2200° 6400

1 As before stated, Piobert gives reasons for halving these figures. M. de Saint Robert determined experimentally the amount of work lost by the heat communicated to the gun to be about 250 ramme-units per gramme of powder ¢n the ease of a rifled musket. rom the experiments of Noble and Abel this loss becomes reduced to as little as 25 gramme-units per gramme of powder in a 10-inch

*gun. They have also calculated the energy in foot-tons from thé initial velocity obtained, and hence deduced the percentage of the possible theoretic work which is actually realized for every rifled gun in the British service. This percentage, which they term the *‘factor of effect,” is found to be greatest, viz., 98 per cent., in the case of the 38-ton gun, and least, 50°5 per cent., in the 7-pounder mountain gun, weighing 150 tb.*

To determine the pressures, Noble and Abel employed two methods :—(1) direetly, by means of " crusher gauges," inserted at various points of the bore ; this is an improvement on the Rodman piston-gauge, the pressure being estimated by the amount of com- pression given to asmall cylinder of pure soft copper; (2) indireetly, by means of the chronoscope invented by Captain A. Noble, which measures the velocity of the projectile at given points in the bore, whence the pressure can be calculated (see GuNNERY). These pres- sures will vary greatly, other conditions being the same, according to the "explosiveness" of the powder ; the great object is to obtain a powder suited to the particular arm with which it is to be used.

Many foreign physicists are of opinion that the phenomenon of dissociation comes into play at the moment of maximum temperature, causing the carbonic acid gas (CO,) to be decomposed into carbonic oxide (CO) and oxygen. However, Noble and Abel show that, if such be supposed to occur, the loss of heat absorbed by the decomposition would more than compensate for the increase of volume.

PREPARATION AND PURIFICATION OF THE INGREDIENTS.

The three ingredients of gunpowder may be purchased in the market in a prepared or refined state, and this is done to a greater or less extent by many powder makers. However, the royal gun- powder factory, as well as some of the great private firms, prepare and purify the materials required fron the commencement, with the double object of insuring uniformity in the qualities of the

powders made, and of avoiding, so far as practicable, the introduc-

tion of the least particle of grit or other foreign matters, which

might cause serious accidents. The rationale of the refining

soluble in either. Water at 212° Fahr. holds about seven times as much nitrate of potash in solution as water at 70° Fahr.; if, there- fore, a saturated solution of saltpetre be made at a temperature of 212° Fahr., and

the chlorides of sodium and potassium are con- tained in the liquor, as the solution cools to 70° Fahr., six-sevenths of the nitre will be deposited in the form of crystals, which can casily be removed, whereas the foreign salts will still remain in solution. The following is a brief account of the improved mode of refining saltpetre, introduced some years back at Waltham Abbey, and now adopted at the chief private factories in England. The refining coppers are capable of holding about 500 gallons each, aud are fitted with false iron bottoms, which are perforated with holes to allow sand and other mechanical impurities to fall through. Being each charged with 280 gallons of water,—usually the "'washings"' of saltpetre previously refined, —and 40 ewt. of grough nitre, a fire is lighted beneath. In about two hours the greater part of the saltpetre is dissolved, and the solution begins to boil ; the thick scum formed on the surface is carefully taken off, and cold water from time to time thrown in to induce it to risc, the boiling being continued until there is no more scum ; the coppers are then filled up with cold water, and the solution again made to boil briskly for a few minutes, after which the fires are allowed to go down. In about two hours more the solution will have fallen to the proper temperature, 220° Fahr. '(sp. gr. 1°58), for pumping out ; it is then filtered through dowlas bags suspended on a frame, and conducted by troughs to the "'coolers" or crystallizing cis- terns at about 180° Fahr. These latter are large shallow pans of copper, in which the liquid is kept agitated either by long-handled wooden hoes, or by machinery ; as it cools, fine crystals fall to the bottom, and are from time to time thrown upon inclined draining frames by means of perforated-copper shovels. "When the tein- perature falls below 70° Fahr., the agitation is ceased, and any large crystals which may afterwards form are left in the mother liquor. After being thus allowed to get rid of some of the liquor, the crystallized saltpetre, having almost the appearance of snow, and technically called " flour," is raked into the " washing-cis-

| tern;" it is there subjected to three separate washings with pure

water, distilled being preferable, which is allowed to drain off through a plug hole at the bottom of the cistern. These " washi- ings" are carefully conducted to an underground tank, and kept either for using in the refining coppers, or boiled down in "eva- porating pots " holding about 300 gallons, until the liquid is suffi- ciently concentrated for the saltpetre to

crystallize, when it is run into small copper pans, and set aside to cool; this course is also pursued with the mother liquor from the large cooling cisterns, and the resulting crystals treated as grough nitre, for these large erystals always enclose liquid containing impurities. After drain- ing for a night the refined saltpetre is removed to store bins, and is ready for use without any further pulverization ; the amount of moisture remaining in it, from 3 to 5 per cent., is then carefully ascertained, and allowed for in the mixing house. Neither the solid residue from the pots and coppers nor the mother liquor from crystallizing pans is thrown away, but by repeated boilings and evaporations every ascertainable portion of saltpetre is extracted, and the residue sold ; it chiefly consists of chlorides of sodium and potassium, with some sulphates. The jute bags in which the salt- petre is imported are also boiled down. ;

The large percentage of saltpetre contained in damaged powder makes it worth while to extract the nitre by boiling in large cop- pers, filtering and crystallizing in small pans as before ; the re- siduum is again boiled, and then thrown away. The sweepings from the powder houses, in various stages of manufacture, are ‘“extracted”’ in the same manner. ;

Refined saltpetre for making gunpowder is tested as follows :— (1) with blue and red litmus paper, for acids or alkalies ; (2) for the presence of chlorides, with solution of nitrate of silver ; (83) for sulphates, with chloride of barium, forming the insoluble sulphate of baryta. ‘

By tite old method of refining the solution was left to crystallize in coolers, and the drained crystals fused or melted in iron pots at a heatof about 500° Falir.; the molten saltpetre was then poured into moulds, broken up when cold, and ground under edge runners.

The wood for charcoal is cut in spring, so that the bark may Charcoal strip off easily, and is stacked for about three years to season it, burning.

put a considerably shorter time will suffice. Being cut in lengths of 8 feet, the wood is packed in iron cylindrical cases termed ‘¢ slips,” which are then inserted in the es cylinders ” or retorts, the latter being built into the wall in sets of three with a furnace under- neath, arranged so as to allow of the complete regulation of the heat ; the flames surround the retorts as

nearly as possible. An opening is left in the rear end or lid of the slip, corresponding with a similar

: ng process is based upon the fact that Refining saltpetre is far more soluble in hot than in cold water, while the salt- chief saline impurities found in grough nitre are almost equally petre.

Charac- teristics of good charcoal.

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opening in the retort, through which, by means of pipes, the |

inflammable gases resulting from the charring of the wood are con- ducted into the furnace and there burnt; this saves a considerable amount of fuel. 'There are also pipes which receive and carry off the tar and pyroligneous acid produced. In the powder works of Messrs Hall & Son of Faversham, the retorts are disposed three on each side of the furnace, and the connecting pipes and dampers are so arranged that the gases from either set, or from any. single cylinder, can be utilized for the charring of the wood contained in any of the others; by this means it is claimed that little fuel is required beyond the quantity needed to warm the furnace and par- tially char the first set of retorts.

That the wood is sufficiently charred is shown by the blue colour of the gas flame, which indicates the formation of carbonic oxide; the door of the retort is then opened, and the slip is withdrawn by means of tackling, and placed in a large iron cooler having a close-fittin lid, where it is left a few hours till cool enough to be turned out an put into store. The charcoal is carefully picked over by hand, to en- sure its being of uniform quality, and is kept from ten days to a fort- night before being ground, to obviate the danger of spontaneous com- bustion, to which it is liable if ground too soon after burning; this arises from the heat generated by the very rapid absorption and con- densation of oxygen from the air by the finely powdcred charcoal.

Properly-made charcoal for gunpowder should be jet black in colour, and its fracture should show a clear velvet-like surface ; it should be light and

sonorous when dropped on a hard substance, and so soft as not to scratch polished copper. Slack-burnt charcoal, or that prepared at a very low temperarure, is at once known by its reddish-brown colour, especially when ground, and this peculiarity can be recognized in the powder made from it, when reduced to a fine state of division. Charcoal burnt at a very high temperature is known by its hardness, metallic ring, and greater density.

In France, charcoal is prepared by injecting superheated steam into the retorts for a certain period.

Grinding The charcoal mill in shape resembles an enlarged coffee mill ; a the char- cone works within a cylinder, both being provided with diagonal

coal,

Sulphur refining.

*teeth and ribs, wide apart at top, but gradually approaching one another below. The pulverized charcoal is thence' conducted by a simple mechanical arrangement direct into a cylindrical frame or '*reel," about 8 feet by 3 feet, set at a slope and covered with copper wire cloth of about 32 meshes to the inch; all that is fine enough to pass through the reel-covering falls into a bin which encases the reel, and the coarser particles pass on to a tub at the further end, in order that they may be ground over again. The ground charcoal store should always stand by itself, in case of spontaneous combustion taking place.*

The sulphur from Sicily known as ' Licara firsts" is employed for the best gunpowder ; it undergoes a rough purification before importation, leaving from 8 to 4 per cent. of earthy impurities. Formerly these were removed by simply melting the "grough" sulphur in an iron pot, and then ladling it into large wooden moulds or tubs, saturated with water to keep the sulphur out of the cracks ; when cool enough, these tubs were unhooped, and the top and bottom of each mould of sulphur cut off. In the present day, however, the sulphur is refined by distillation in a simple apparatus. A large iron " melting pot," or retort, is set in brick- work, about 3 feet above the floor, with a furnace underneath ; this retort has a heavy movable lid, which is luted into the pot with clay, and in the lid is also an opening, closed by an

iron conical plug. From the melting pot lead two pipes at right angles to one another, one to a large circular "dome," or subliming chamber, and a smaller pipe to an iron "receiving pot" placed on a lower level than the retort ; the latter pipe has an iron casing or " jacket" round it. through which cold water is allowed to circulate. The communica- tion of these pipes with the retort can be shut off or opened as occa- sion may require by means of valves worked from without.

A charge of about 54 cwt. of grough sulphur in small pieces being peo in the retort and the furnace lighted, the pipe leading to the

ome is left open, as well as the plug-hole in the lid, but that leading to the receiving pot is closed ; after about two hours, a pale ycllow vapour rises, when the plug in the lid is put in and the vapour allowed to pass into the dome, where it " sublimes" or con- denses on the sides and floor in the form of a fine powder, known as " flowers of sulphur." In about three hours from the commence- ment, the vapour becomes of a deep iodine colour, when the pipe leading into the dome is closed, and that into the receiving pot opened, at the same time cold water from a tank overhead being allowed to circulate through the jacket ; the vapour is then con- densed in the pipe, and runs into the receiving pot below in the form of a clear orange-coloured fluid. "When the jacket commences to get cold, the receiving pipe is closed, and the communication with the dome is reopened, so that the rest of the vapour may pass into it, the furnace doors being at the same time thrown back ; the impurities remain at the bottom of the melting pot, and are thrown away. The flowers of sulphur thus obtained, being unfit for the ae of gunpowder, are placed in the melting pot as grough sulphur.

GUNPOWDER

into a small wooden chamber lined with lead, in which any vapour

still remaining uncondensed may be deposited, as in the dome. The distilled sulphur is allowed to cool down to about 220° Fahr., when it is ladled into wooden moulds, as above described, and set aside to cool. The tests for refined sulphur are the following :—(1) burn a small quantity on porcelain, when the amount of residuum should not exceed 0°25 per cent ; (2) boil a

little with water; and test with blue litmus paper, which it should only very feebly redden.

The sulphur from the moulds, being broken into pieces, is ground under a pair of iron edge runners, similar to those of the incorporat- ing mills, but of less size ; after this, it is passed through a reel similar to that used for sifting the charcoal, but covered with even finer copper wire-cloth, having 44 meshes to the inch.

MANUFACTURE OF GUNPOWDER.

The following list will give a general idea of the chief processes of manufacture, properly so-called, through which gunpowder passes, although it will be understood that more or less variation takes place in some of the very different descriptions of powder now made :—(1) mixing the ingredi- ents ; (2) incorporation, or " milling ;" (3) breaking down the mill-cake; (4) pressing ; (5) granulating, or cutting the press-cake; (6) dusting; (7) glazing; (8) second dusting ; (9) stoving, or drying ; (10) finishing.

The following is the most approved method of mixing. The ingredients are carefully weighed out in the proper ingredients for a 50 tb mill-charge, with an extra amount of saltpetre according to the moisture found to be contained in it; they are then placed in the mixing machine, which consists of a cylindrical gun-metal or copper drum, with an axle passing through its centre, upon which are disposed several rows of gun-metal fork-shaped arms, called " flyers," the machinery being so arranged that the flyers and drum re- volve in opposite directions, and at different rates of speed.

After being mixed in this machine for about five minutes, the

composition is passed through a hand-sieve over a hopper,

falls into a bag placed below, and is tied up ready for the

incorporating mill; it is now called a "' green" charge.

Fig. 2.

Figs. 1 and 2.—A, sectional elevation of incorporating mill, showing one runner and ploughs (py, »); OC, curb of bed; M, machinery in tank, underground; D, drenching apparatus; 2, lever-board, or shutter ; ¢, tank; /, f, floor line. ~

_ The incorporating mill (see figs. 2 and 3) consists of a circular iron or stone bed, about 7 feet in diameter, firmly

Pulver- izing the sulphur.

Processes of manu- facture.

Mixing.

TIncor- poration.

GUNPOWDER

fixed in the floor of the building, whereon a pair of iron or 'stone cylindrical edge-runners revolve ; formerly, both were made of a dark grey limestone which took a high polish, but the newer mills have cast-iron beds and runners, the edges of the latter being now usually surface-chilled. The average diameter of the runners is 6 feet, and their width about 15 inches; they have a common axle, which rests in gun-metal bouches in a solid cross-head attached to a vertical shaft; this shaft passes through a bearing in the centre of the bed, and is in gear with the driving ma- chinery, which is placed above the runners in the old water mills, and beneath the bed in cast-iron tanks in the new steam mills. Each run- ner weighs about 4 tons, and the speed averages 8 revolu- 'tions per minute. The bed has a slup- ing rim on the outside, called the "curb," and on the inside an edge

Fig. 38.—Plan of runners and bed. formed by 'the "cheese," or bearing, through which the

vertical shaft passes. The runners are not equidistant from the centre of the bed, one working the part of the charge near the centre, and the other the outer portion, but their paths overlap. Two "ploughs" of wood, shod with leather, are attached to the cross-head by arms and brackets; one working

next the vertical shaft, and the other close to the curb, the ploughs throw the composition under the runners as it works away from the latter.

The charge, when spread evenly on the bed by means of a wooden rake, contains about 2 pints of water (the moisture of the saltpetre) and a further quantity of from 2 to 6 pints isadded from time to time, according to the state of the atmosphere, for the threefold purpose of preventing powder dust from flying about, facilitating the incorpora- tion, and reducing the effect of an explosion; if too wet, the runners would lick up the composition from the bed. During the time of working, the millman enters the mill occasionally, takes a wooden "shover," and pushes the outside of the charge into the middle of the path of the runners, so that every portion may be equally incorporated.

The action of the runners is a combination of rolling and twisting, and has, on a large scale, somewhat the effect of a pestle and mortar, crushing, rubbing, and mixing the ingredients, so as to effect an intimate union.

The time of milling depeuds upon the nature of the powder. For good fine-grain powders it varies from four to eight hours, but the very best sporting gunpowder is said to be as long as twelve hours under the runners ; blasting and cannon powders are incorporated from two to four hours, the period being rather longer where the lighter stone runners are used. It is of the greatest importance that the mills should be carefully attended to by experienced men, as the whole goodness and uniformity of the powder depends upon this process, and no after treatment can remedy defective incorporation.

When the composition, which has now become " mill- cake," is ready for removal from the bed, it should be homogeneous in appearance, without any visible specks of sulphur or saltpetre, and of a dark greyish or brownish colour, according to the charcoal used. The mill-cake is carefully tested to ascertain whether it contains the proper amount of moisture; this should be from 2 to 3 per cent. for

fine-grain powders, and 3 to 5 per cent. for the larger de- scriptions. Sometimes a small portion is roughly granu- lated, and "flashed" on plates of glass or porcelain ; a good powder should flash off, leaving nothing but some smoke marks, but, if badly incorporated, the plate will be coated with specks or beads of solid residue.

In former days the ingredients were incorporated in " stamp-mills," which were simply large mortars and pestles, the latter merely raised up by some cam arrangement and allowed to drop by their own weight, the charge being about 12 bb, and the weight of the stamp 50 ib or there- about. The stamp or pzlow mills are still used in France and Germany, as well as the moulins-d-tonneaua, in which the composition is put, with about an equal weight of brass or lignum vite balls, into large barrels, which are made to revolve for a certain time on their axes; this method of incorporation is sometimes employed in conjunction with edge runners.

There is more danger of an explosion during the milling than in any other process of manufacture ; but, owing to the limitation by law of the weight of charge permitted to be under the runners at one time to 50 ib, as well as to the great precautions taken, there is seldom any fatal result. The millmen only enter the mill occasionally to "liquor" the charge or give it a shove over, and at Waltham Abbey they wear incombustible clothing with a cap fitting over the ears, and gauntlets of the same material. The roof, and front and rear sides of the mills are usually constructed of very light boards, or even of canvas on a wood frame, while the partitions between each pair of runners are of solid masonry. The force of the explosion of a mill charge materiaily depends upon the length of time the incor- poration has been in progress.

Directly over the bed of each mill is a flat lever-board or "shutter" (see fig. 1) in gear with a tank of water, so arranged that, when the shutter is raised on its pivot by an explosion, the water is upset into the bed; a horizontal shaft connects all the'shutters in a group of mills, so that the ex- plosion of one mill at once drowns all the remaining charges. The set of tanks can also be pulled over by hand.

The process of breaking down, although a subsidiary one, Break-

is strictly necessary in order to reduce the mill-cake to a fine ei own.

meal, so that it may be conveniently loaded into the press box, and receive as uniform a pressure as possible. The breaking-down machine (see fig. 4) consists mainly of two pairs of gun-metal rollers, set in a strong frame of

Fic. 4.—Breaking-down machine. H, hopper; B, endless band ; R, rollers; M, boxes to receive meal.

the same material; one roller of each pair works in sliding bearings connected with a weighted lever, so that

any hard substance may pass through without dangerous friction. An endless canvas band, having strips of leather sewn across it, conveys the pieces of mill-cake from a hopper, capable of holding 500 ib to the top of the machine,

Pressing.

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where it falls between the first pairof rollers; after passing

through the second pair, which are directly below, the meal |

is received in wooden boxes, placed upon a carriage, and is ready for the press.

The press-box is usually of oak, with a strong gun-metal frame, and so constructed that three of the sides can turn back on hinges, or be screwed firmly together. Being laid sideways, the top temporarily closed by a board, and the uppermost side alone open, a number of copper plates are placed vertically in the box, and kept apart (at a distance depending upon the description of gunpow- der required) by two racks, which are afterwards: re- moved; the box is then loaded with some 800 ib of meal, which is rammed evenly down between the plates with wooden laths, and the racks withdrawn, so that the plates are only separated by the meal be- tween them. The present upper side of the box being firmly screwed down, the box

is turned over, and placed on the table of the hydraulic ram, under the fixed press-block, the plates being now horizontal (see fig. 5). The pumps which work the press (in a sepa- rate house) are then set in motion, and the press-block allowed to enter the box a certain distance, when the edge of the latter releases a spring catch and rings a bell as a signal to stop the pumps; the powder is kept under pressure a few minutes, after which the ram is lowered, and the box removed and un- loaded. For all granulated powders the press-cake is broken up into pieces and put into tubs, but for the cubical cannon powders the slabs are pressed to the exact thickness required, and are carefully kept whole.

The above mode of regulating the pressure is found to give more reliable results than trusting to the indicator gauge of the hydraulic press, for the reason that the elas- ticity, or resistance to pressure, of the meal varies with the amount of moisture present in it, and the state of the at- mosphere. To get uniform density, equal quantities of meal, containing equal amounts of moisture, must be pressed at the same rate into the same space. In practice, however, the moisture in the meal will slightly vary, whatever care be taken with the mill-cake, owing to the hygrometric state of the air causing a difference by the time it comes to the press. It is therefore necessary to alter the exact distance the press-block is allowed to enter the box, not only with the nature of the powder, but with the season of the year, and even according to the prevailing state of the weather.

On the Continent, the operation of pressing is sometimes altogether omitted, and the requisite density given merely by the weight of the runners revolving very slowly, the charges being worked with a considerable amount of mois- ture in them, and the less dense edges of the cake rejected ; by this plan it is, however, almost impossible to ensure unvformity in the powder produced. The meal is also Sometimes pressed by passing it, on an endless band, between large rollers revolving at a slow speed, the less dense edges of the cake being cut off by fixed knives.

Fie. 5.—Press.

A, press-box; B, press-block ; C, hydraulic ram.

GUNPOWDER

For some centuries, gunpowder remained in the form of Granu- dust or "meal," being, in fact, simply the ingredients lating.

ground up together. Granulating or " corning" the powder was a great step in advance, but it is doubtful whether this operation was intended to increase its strength, or merely to render it more convenient for charging small-arms, for which alone corned powder was used for many years, whilst meal powder was still employed for heavy guns ; the latter was called "' serpentine" powder in the time of Edward VI., probably in allusion to the name of cne of the pieces of ordnance then in use, However, during the reign of Elizabeth, the experience of the great additional strength imparted by the corning process,~~for the reasons already explained, led to the universal introduction of corned powder, except for priming,—both in cannon and small~~ arms,—for which purpose meal powder remained in use ag late as the reign of Charles I.

The old method of granulating was to place the press- cake in sieves, provided with two bottoms of thick parcli- ment prepared from bullock's hides, and perforated with holes, those in the lower bottom being much the smaller ; a large number of these sieves were attached to a wooden frame, hung by ropes from the ceiling, which received a violent shaking motion by means of a crank underneath. Into each sieve was put adisk of lignum vite, to break up the cake, and force it through the larger apertures; the grain produced was retained between the bottoms of the sieves, the dust passing through the fine holes in the lower ones, and falling on the floor of the house. The grain was afterwards separated into sizes by being passed through wire sieves. These machines were clumsy and dangerous; and the accidents which happened with them have caused them to be generally supplanted by better apparatus, although some of the old frames are still in use.

The granulating machines used in the royal factories in England and in India, as well as in the best private works, are constructed upon a principle introduced by Sir William Congreve, but since improved upon. Three or four pairs of gun-metal rollers with pyramidal-shaped teeth, are fixed obliquely one above the other in a strong framework (see fig. 6); the sizes of the teeth vary according to the kind of grain required, but decrease from the

top pair, and for fine-grain powders, the lowest pair would be smooth; one roller of each pair works in a sliding bearing, having a counterweight attached to prevent undue friction. Each pair of rollers is connected with that next below, by a short rectangular screen of copper wire, while, underneath all the rollers, are placed, at the same slope, two or more long wire- screens fixed in aframe having a wooden bottom ; both the frame and the short connecting screens are hung to the machine by strips of lance wood, and, when at work, a quick vibratory motion is given to all the screens by means of a polygonal wheel upon the main frame working against a loose smooth wheel attached to the screen-frame. A large hopper, which rises by the action of the machine, feeds the press-cake upon an endless canvas band, as in the breaking- down machine, and carries it to the top pair of rollers, whence it falls upon the first short screen ; all that is fine enough to pass through is sifted out by the shaking action of the long screens below, and travels down upon whichever screen has meshes fine enough to retain it; the pieces too large to pass through the short top screen are carried to the next pair of rollers, and so on. At the lower end of the long screens are placed boxes to receive the different sizes of grain; the "chucks," or pieces too large for any grain, are again passed through the machine, while the dust which falls upon the wooden bottom, and is received in the inner- most box, goes to the mills to be worked up for forty minutes as a dust charge. Formerly at Waltham Abbey both musket (F'.G.) and cannon powder (L.G.) were granu-

lated in the same machine at the same time, but dogwood charcoal being now used for small-arm powders, one descrip- tion only is usually made, so that but two long screens are required to define the higher and lower limits as to size of grain ; for example, all that will pass through a 12-mesh and be retained upon a 20-mesh screen would be "rifle- fine-grain" (R.F.G.) powder, suited as to size for the Snider and Martini rifles. Modifications of this machine are used by private makers, the grain being usually separ- ated into various sizes by hand-sieves.

Fra. 6.—Granulating machine.

A, hopper, with raising short screens ; E,E, long screens ; F, box for dust ; G, box for grain ; H, box for chucks ; K, bottom board.

between two laths of wood; they then drop from the board upon an endless canvas band a little below, travelling in a direction at right angles to their previous motion, and are conveyed endways to the second pair of rollers. To prevent the strips of cake from fouling one another, the board upon which they first fall has a reciprocating motion given to it by means of an endless chain, one link of which is studded

Fic. 7.—Rollers of cube-cutting machine, to a bracket underneath the board; consequently, as the board travels backwards, the strips are deposited at inter- vals, am echellon, upon the canvas band. The diagram (fig.

7) shows a portion of the machine. The cubes, &c., fall into a small reel fixed at a slope beneath the machine, which allows the dust and fragments to pass between its wires while the properly sized pebbles or citbes are delivered into boxes. The large 14-inch powder has, however, after- wards to be picked over by hand.

All grain from the granulating machine is called " foul- grain," and has to be deprived of its dust in reels, consisting of a cylindrical frame-work about 8 feet long by some 2 feet in diameter, covered with a dusting cloth or canvas of from 18 to 56 meshes to the linear inch, according to the size of grain. These reels ere either "horizontal" or "slope," accord- ing to the position in which they are fixed and the object in

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Pebble or cubical powders for heavy ordnance are granu- Cube- lated, or cut," in special machines which divide the press- cutting cake first into strips, and then again cross-ways, into cubes Machine.

of 3 inch and 1} inch length of edge respectively. This is effected by two pairs of gun-metal or phosphor-bronze rollers, which have straight cutting edges arranged at suit- able intervals along their surfaces, the slabs of press-cake being fed vertically between the first pair of rollers, The

resulting strips are carried along upon a board, by means of a skeleton band, which receives each strip of cake

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arrangement ; B, endless band; C,C,C,C, four pairs of rollers; D,D,D,

view. Slope-reels are open at both ends, fixed at an angle of about 4°, and are used for fine-grain powders as they come from the machine, when they contain more dust than the larger grain, especially if made from dogwood charcoal ; the powder is poured in at the higher end, and received in barrels at the other end. The larger grained powders are dusted for about half an hour in a horizontal reel, with closed ends, the charge being from 250 to 300 ib; one end of the reel is made to lower for the purpose of unloading. Both kinds of reel are enclosed in cases to receive the dust, which, as before, is sent back to the incorporating mills for 40 minutes or so.

The theory of glazing gunpowder has already been dis- Glazing.

cussed. All descriptions are glazed, for varying periods, in glazing barrels or "churns" (fig. 8), which are usually about

A, elevation, showing door of case ; C, hoppers for loading ; B, section through barrel (showing opening in dotted lines).

Fic. 8.—Glazing barrels.

5 feet long by 2 to 3 feet in diameter, and revolve some 34 times in a minute; however, barrels of much greater diameter aud less length are occasionally employed, revolv- ing ataslowerrate. The charge for each barrel is ordinarily 400 ib, and the fine-grain powders are mixed with a pro-

portion of the "chucks" or larger pieces, waich are after- wards sifted out. The glazing process causes a great alteration in the appearance of the

grain, especially in that made from dogwood; the dull brownish hue is replaced after a few hours by a fine black colour with more or less polish. Some powders are glazed from 10 to 12 hours, a considerable amount of heat being generated by the friction. Fine-grain powders are again passed through the slope reel after glazing.

All kinds of gunpowder are dried in the same manner. The "stove," or drying room, is fitted with open framework shelves or racks, the heat being produced by steam pipes underneath. The powder is spread upon either copper trays or wooden frames with canvas bottoms, each capable of holding about 12 tb, which are then placed upon the racks. Not more that 50 cwt. may be dried at one time. The length of time required for stoving depends upon the nature of the powder, and the proportion of moisture it contains; it varies from about twelve hours for fine-grain up to three or four days for the very large cannon powders ; the heat ranges from 120° to 145° Fahr., the temperature being gradually raised or lowered. It is most important that a stove should be well ventilated, so that a constant current of hot dry air may be supplied, and the air charged with vapour carried off; if this be not done effect- ually, the moisture would be recondensed upon the powder as the temperature was lowered.

Stoving.

Finish- ing. which it is necessary to remove; but the finishing process has, especially upon the fine-grain powder, a much more considerable effect than the mere removal of dust. It is usually finished by being run from two to three hours in a horizontal reel (see fig. 9), the charge being 300 tb, and acquires a very glossy appearance, if the quality be good, even without the addition of graphite, which is very com- monly added to sporting gunpowder. Large cannon powder, such as "pebble" and "cubical," is finished in large skeleton wooden reels, shaped like barrels, and enclosed in cases ; after being run for about three quarters of an hour,

Fic. 9.—Horizontal Dusting Reel (longitudinal section). A, cylindrical reel ; B, reel case; C, apparatus for lowering one end for unloading; D, hopper for loading; E, opening in reel for loading ; F, barrel for unloading into.

a small portion of the purest graphite (2 oz. to 400 bb of powder) is introduced in muslin bags, and the powder is

run for a short time longer. ‘This skeleton reel will hold a whole “ glazing,” as the contents of four glazing barrels is termed, being about 16 barrels of 100 tb each, and advantage is taken of this finishing process to mix together a number of glazings, so as to get a batch of 50 or 100 barrels giving uniform results at proof. These batches are afterwards: “ blended” together in four-way hoppers, with others of opposite character, should they not in all respects be up to specification, and any quantity of gunpowder so finished or blended as to give identical results at proof is termed a brand, and receives a distinctive number.

GUNPOWDER

The drying process produces a small portion of dust.

Upon the introduction of very heavy ordnance, firing large charges, it was found that the ordinary (L.G. or R.L.G.) cannon powder was too sudden in its action, owing Powder to the whole charge being consumed before the projectile for very had sensibly moved from its seat in the bore, thus causing heavy a most violent strain to the metal of the gun. To obviate &™”™ this defect, the grains or pieces were made much larger, so as to diminish the total surface of combustion, and, con- sequently, the volume of gas evolved at the first instant of explosion ; the powder was also given a considerably higher density, which retarded its combustion. These changes resulted in the adoption of the pebble and cubical powders, already mentioned, in England, and in America, of “ “Mammoth” powder, consisting of large, irregular-shaped American grains (k, fig. 10) from 0’°6 to 0”-9 in size ; an improvement mam- has since been made in this powder by pressing it in uni- — form-sized pieces, of the shape shown in 2, fig. 10, being the —d frusta of two hexagonal pyramids, separated by a pris- matic space left rough.

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Fig. 10.

*The figures a to & show the relative sizes and shapes of grain now commonly employed for military purposes in Europe and America, except that the three largest powders —pebble (e), prismatic (f, g), and cubical (2) —are figured half the real size to save space, whereas the remainder indicate the actual dimensions of the grains. Powder for small-arms is represented in a; all the other descriptions are intended for cannon of various sizes. _ The improvements above described materially lessen the Rodman's initial strain, at the expense of requiring a longer gun to Perlor- burn the powder completely, but it still remains true that, = * — even with a charge composed of large, dense pieces, the a evolution of gas is greatest at the commencement of com- bustion, and decreases as the grains burn away, although*

Pris- matic powder.

Mode of manu- facture.

GUNPOWDER

the space occupied by the gases increases as the shot travels along the bore. 'This is exactly the opposite of what should theoretically take place, and causes the maxi- mum pressure to be exerted before the inertia of the pro- jectile has been overcome. So far back as 1860, these con- siderations led General Rodman, the eminent American

artillerist, to employ, in the experiments with his 15-incl1 |

and 20-inch cast-iron guns, what he termed a " perforated cake cartridge," composed of discs of compressed powder from 1 to 2 inches thick, and of a diameter to fit the bore, pierced with holes running parallel to the axis of the gun. In his Properties of Metal for Cannon, and Qualities of Cannon- Powder (Boston, 1861), Rodman demonstrated mathematically that such an arrangement of the charge would relieve the initial strain by exposing a

minimum surface at the beginning of the combustion, while a greater volume of gas would be evolved from the increasing sur- faces of the cylindrical hollows as the space behind the pro- jectile became larger; this would tend to distribute the pressure more uniformly along the bore. The results of experiment perfectly bore out his theory, but he found it more convenient for several reasons to build up the charge in layers of hexagonal "prisms" of comparatively sinall size, fitting closely to one ancther, instead of having the cakes or discs as large as the bore.

The civil war in America most probably interfered with the further development of General Rodman's powder, but the idea was taken up by a Russian military mission in the United States, and resulted in the manufacture on a large scale by Russia of what is now known as " prismatic powder." It has since been adopted in Germany for use in all heavy rifled ordnance ; for the very largest guns, such as Krupp's 70-ton gun, this powder has been recently made with one central hole, having a higher density (1°78) than the original seven-hole prisms, which were about 1°68 ; the external dimensions are the same, | inch high by 1°36 in diameter. The prisms are so arranged in the cartridge that the hollows are continuous throughout.

Prismatic powder represents a distinct class, the peculiarity of which is that each grain or piece is pressed separately in a metal mould. In the British service, powder for heavy rifled guns, in the shape of small cylindrical pellets, with a hollow half-way through, was made some twelve years since, but has been superseded by the pebble or cubical powder cut up from press-cake. To make this class of gunpowder, whether prismatic or cylindrical, we need—(1) a mould in which to place the meal or granulated powder; usually a number of moulds are contained in one plate ; (2) a punch to fit each mould accurately with which to compress the powder, and needles to form the perforations; (3) an appliance for pressing the finished pellets or prisms out of the moulds; or this may be done by the punches themselves, if the moulds are closed by a removable upper plate.

The requisite pressure may be given either by hydraulic machinery, as at Waltham Abbey, or by means of a cam or eccentric on a shaft driven by steam or water power, as in the Russian and German prismatic machines.

By the former plan a large number of pieces may be pressed slowly at one operation, but by the latter only about six prisms can be formed at a time; the machine, however, works very quickly, and has a small hopper for the meal or grain, and a self-feeding apparatus, the mould plate sliding backwards and forwards, so as to be alternately underneath the hopperand punches. Self-feeding machines of this nature are found to get clogged when used with powder-meal, and this was doubtless the chief reason why granulated powder was first used; the size of grain is about that shown in fig. 10,4. It is probable that a more uniform density could be given to the prisms by hydraulic

pressure than by the cam arrangement; the latter is said to exert a maximum pressure of 2000 tb on the square inch. The prismatic powder only needs careful drying at a moderate heat to finish it.

It has been found that all powders thus made possess less explosiveness than those granulated or cut up from press-cake ; the smooth surfaces of the pieces apparently afford little hold for the flame, and thus they ignite slowly ; by some this is considered a defect, but by others an ad- vantage. For this reason, as well as those already detailed, prismatic powder strains the metal of the gun less, in pro- portion to the velocity obtained, than pebble or cubical, but, to give the projectile an equal velocity, the charge of prismatic must be considerably larger. The cost would probably be also greater, weight for weight.

Proor oF GUNPOWDER.

The tests to which powder is subjected are as follows :—

1. For proper Colour, amount of Glaze, sufficiently hard and crisp Teature,and Freedom from Dust.—-These points can be judged by the hand and eye alone, and require a certain amount of experience in the examiner. The cleanness of the powder is tested by pouring a quantity from a bowl held 2 or 3 feet above the barrel; if there be any dust it will be thus easily detected. If it is injured by damp there will be little or no dust, but the grain

will be "rotten," and may be broken between the fingers; minute crystals of salt- petre may be also detected on the surface in a good light.

2. For proper Incorporation.—By "flashing," that is, burning a small quantity on a glass, porcelain, or copper plate. The powder is put in a small copper cylinder, which is then inverted on tlie flashing plate ; this provides for the particles being arranged in nearly the same way each test, which is very important. If the powder be very large, it must be broken up and sifted to a certain size tlrough a small hand-sieve. Properly made gunpowder should flash," or puff off, when touched by a hot-iron, with few "lights" or sparks, leaving only some smoke marks on the plate. A badly incorporated powder will give out a quantity of sparks, and leave specks of uncombined salt- petre and sulphur, forming a dirty residue, Powder made from very slack-burnt charcoal, or which has been injured by damp, will always flash badly.

3. For Shape, Size, and Proportion of the Grains.— Shape can be judged by the eye only, and the size of large powders can be measured, or the number of pieces to 1 ib counted ; granulated powder may readily be sifted upon the two sieves which determine its higher and lower limits of size. The proportion of different sized grains is ascer- tained by using three or more sieves. For example, the Government small-arm powder is sifted with 12-mesh, 16- mesh, and 20-mesh sieves ; all must pass the first, not less than three quarters be retained upon the second, and only one-sixteenth part is allowed to pass the last-named sieve. |

4, Density. —Formerly this was ascertained by '"'cubing, or finding the exact weight of a carefully constructed box of known contents, when filled with powder in a particular manner. Butas this plan gave only an approximate result, . a mercurial densimeter has been substituted, by means of which the density can be ascertained to three places of decimals. Briefly, the machine determines with great accuracy the weight of a globe when it 1s (a) filled with mercury alone under a certain pressure, and (0) filled with a known weight (say 100 grammes) of powder and mercury under precisely similar conditions ; then, if 8 be the specific gravity of mercury at the time of experiment, W the weight of globe filled with mercury alone, and W' the weight when filled with powder and mercury,

S x 100 W- W'+100°

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Density =

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5. Moisture and Absorption of Moisture. —The amount | of water contained in gunpowder is found by drying a | carefully-weighed sample in a water oven for a certain period; from the weight lost, when allowed to cool out of contact with the air before weighing, the percentage of moisture can be calculated. The hygroscopic test consists in exposing a dried sample in a box, kept at a uniform temperature, to an atmosphere artificially saturated with moisture, and ascertaining the increase of weight in a cer- tain time.

6. Firing Proof.—The nature of this will depend upon the purpose for which the powder is intended. For sporting powders, it will consist in the " pattern" given by the shot upon a target at a given distance, or, if fired with a bullet, upon the "figure of merit," or mean radial deviation of a certain number of rounds; also upon the penetration it effects through boards. For military purposes the powder is now always fired from the rifle or piece of ordnauce with which it is to be used, and the initial or " muzzle" velocity ascertained by the Le Boulengé electric chronograph (see Gunnery), which measures the exact time the bullet or other projectile takes to traverse a known distance between two wire screens. By means of the "crusher gauges" alueady referred to, the exact pressure per square inch upon certain points in the interior of the bore can be found ; the maximum pressure can be considerably modified by increasing the cubic air-space given to the charge in the powder chamber. The figure of merit is also taken for small-arm powder.

All gunpowder made by or for the British Government is subjected to very strict limits of specification upon all the above-named points.

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GUNPOWDER PLOT. See Fawkes.

GUNS (Hungarian, Kdszeg), the second town in import- ance of the Hungarian megye or county of Vas (Hisenburg), near the Styrian frontier, is favourably situated on the Gyéngyés, 47° 23' N. lat., 16° 31' E. long. It is the see of a bishop, and from 1648 until the recent administrative changes of 1876 was a royal free town. Among the more noteworthy buildings are the cathedral, episcopal palace, a seminary for priests, a gymnasium, the county-hall, a hospital, three monastic houses, a museum of Roman anti- quities, a house of correction, and several manufactories of cloth and of earthenware. The agricultural products of the neighbourhood consist principally of fruit and wine; the trade in the latter especially is considerable. In 1870 the number of inhabitants was 6916, mostly of German extrac- tion. The heroic defence of the fortress of Giins by Nicolas Jurisics against the army of Sultan Soliman, in August 1532, has given the town a special historical interest. In 1621 it suffered from the attacks of Gabriel Bethlen's troops, and in 1705 the suburbs were plundered and burnt by the forces of Francis Rakéczy. In 1729 and 1777 the town suffered much from fire, and in 1813, 1814, and 1821 from floods. The Eszterhazy family long held valuable possessions in the neighbourhood, and one of their castles still stands at the northern end of the town.

_ GUNTER, Epmunp (1581-1626), was of Welsh extrac- tion, but was born in Hertfordshire in 1581. He was edu- cated on the royal foundation at Westminster school, and in

1599 was elected a student of Christ Church, Oxford, After

graduating bachelor and master of arts at the regular times,

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(art. “Gun- powder ”), 3d ed., London, 1875; Notes on Gunpowder and Gun Cotton, published by order of the Secretary of State for War, London, 1878. CW, W.)

he took orders, became a preacher in 1614, and in Novem- ber 1615 proceeded to the degree of bachelor in divinity. Mathematics, however, which had been his favourite study in youth, coutinued to engross his attention, and on 6th March 1619 he was appointed to the professorship of astronomy in Gresham College, London. This post he held till his death, which took place on 10th December 1626. With Gunter’s name are associated several useful inventions, descriptions of which are given in his treatises on the Sector, Cross-staff, Bow, Quadrant, and other Instruments. He had contrived his sector about the year 1606, and written a description of it in Latin. Many copies were transcribed and dispersed, but it was more than sixteen years afterwards ere he allowed the book to appearin English. In 1620 he published his Canon Triangulorum, a table of logarithmic sines and tangents (extended to 7 decimal places) for every degree and minute of the quadrant. In later editions an account of the general use of the canon is prefixed, and Briggs’s logarithms of the first 1000 numbers are appended. There is reason to believe that Gunter was the first to discover (in 1622 or 1625) that the magnetic needle does not retain the same declination in the same place at all times. By desire of James I. he published in 1624 Zhe Description and Use of His Majestie’s Dials in Whitehall Garden, the only one of his works which has not been reprinted. He introduced the words co-sine and co-tangent for sine and tangent of the complement, and he suggested to Briggs, his friend and colleague, the use of the arithmetical complement (see Briggs’s Arithmetica Logarithmica, cap. xv.). His practical inventions are briefly noticed below.

GUN—-GUR

Gunter’s Chain, the chain in common usc for measuring land, is 22 yards long and is divided into 100 links. Its usefulness arises from its decimal or centesimal division, and the fact that 10 square ehains make an acre.

Gunter’s Line, a logarithmic line, usually laid down upon scales, sectors, &c. It is also called the line of lines and the line of num- bers, being only the logarithms graduated upon a ruler, which therefore serves to solve

problems instrumentally in the same manner as logarithms do arithmetically.

Gunter's Quadrant, an instrument made of wood, brass, or other substance, containing a kind of stereographie projection of the sphere on the plane of the equinoctial, the eye being supposed to be placed in one of the poles, so that the tropic, ecliptic, and horizon form the ares of circles, but the hour circles are other curves, drawn by means of several altitudes of the sun for some particular latitude every year. This instrument is used to find the hour of the day, the sun's azimuth, &c., and other common problems of the sphere or globe, and also to take the altitude of an object in degrees.

Gunter's Scale (generally called by seamen the Gunter) is a large plane scale, usually 2 feet long by about 14 inches broad, and en- graved with various lines of numbers. On one side are placed the natural lines (as the line of chords, the line of sines, tangents, rhumbs, &c.), and on the other side the corresponding artificial or logarithmic ones. By means of this instrument questions in navi- gation, trigonometry, &c., are solved with the aid of a pair of compasses.

GUNTHER, Joann Curistian (1695-1723), German poet, was born at Striegau in Lower Silesia, on the 8th April 1695. After attending the academy at Schweidnitz, where he composed a number of verses of more than usual promise, he entered in 1715 the university of Wittenberg with the view of studying medicine; but he became idle and dissipated, contracted heavy debts, and came to a com- plete rupture with his father. In 1717 he went to Leipsic, where he obtained the friendship of Menck, and published a poem ou the peace of Passarowitz, which acquired him an immediate reputation. Menck recommended him to the king of Poland, but unhappily the first time he appeared at court he was ina state of intoxication. From that time he led an unsettled and dissipated life, depending for an un- certain subsistence partly on money obtained for occasional poems and partly on the charity of hisfriends. He died at Jena, 15th March 1723, when only in his 28th year. Goethe pronounces Giinther to have been a poet in the fullest sense of the term. Asa lyrical poet he stands alone among his contemporaries for freedom, spontaneity, and sincerity of utterance ; and bis works as a whole give evidence of deep and lively sensibility, fine

imagination, clever wit, and a true ear for melody audrhythm. An air of cynicism, how- ever, which was the necessary consequence of his aimless life, is more or less present in most of his poems, and dull, vulgar, or impure witticisms are not unfrequently found side by side with the purest inspirations of his genius.

His collected poems were published in four volumes, Breslau, 1728-1735. They are also included in Tittmann's Deutsche Dichter des 17ten Jahrh., Leipsic, 1874. A pretended autobiography of Giinther appeared at Schweidnitz in 1732, and a life of him by Siebrand at Leipsic in 1788. Sce also Hoffman, J. Ch. Giinther, ein literarisch-historischer Versueh, Breslau, 1833 ; and Roquette, Leben und Dichten J. Ch. Giimthers, Stuttgart, 1860.

GUNTOOR, a town in Kistna district, Madras, situated on the Grand Trunk road, about 46 miles from Masulipatam, 17° 42' N. lat., 80° 29' E. long. ; population 18,033. It is the headquarters cf the sub-collector and the district judge of Kistna; and there is a considerable trade in grain and cotton. Guntoor was formerly the capital of a Circar (Sarkar) under the Mahometans; it was ceded to tlie French by the nizim in 1753. At the time of the cession of the Circars to the English in 1766, Guntoor was specially exempted during the life of Bastlat Jang, whose personal jdgir it was. In 1788 it came into British possession, and was finally confirmed in 1803.

GURDASPUR, a British district in the lieutenant- governorship of the Punjab, lying between 52° 30' and 31 36' N. lat., and between 74° 56' and 75° 45' E. long. Bounded on the N. by the native Himalayan states of

dol

Kashmir and Chamba, on the E. by Kangra district and the river Bias, on the S.W. by Amritsar district, and on the W. by Sialkot, the district of Gurdaspur occupies the submontane portion of the Bari Déab or tract between the Bias and the Ravi. An intrusive spur of the British domiuions runs northward into the lower Himalayan ranges, to include the mountain sanatarium of Dalhousie. This station crowns the most westerly shoulder of a magnificent snowy range, tlhe Dhaola Dhar, between which and the plain two minor ranges intervene. Below the hills stretches a picturesque and undulating plateau covered with abundant timber and made green by a

copious rainfall, and watered by the streams of the Bari Doab, which, diverted by dams and embankments, now empty their waters into the Bias directly, in order that their channels may not interfere with the Bari Dodb canal. The district coutains several large and important jhils er swampy lakes. Jew facts can now be recovered with regard to the early annals of Gurdaspur. Our first distinct historical knowledge begins with the rise of the Sikh confederacy. The whole of the Punjab then was distributed to the chiefs who triumphed over the imperial governors. In the course of a few years, how- ever, the famous Ranjit Sinh acquired all the territory which those chiefs had held. Pathankot and the neighbour- ing villages in the plain, together with the whole hill portion of the district, formed part of the area ceded by the Sikhs to the East India Company after the first Sikh war in 1846. In 1861-62, after reveiving one or two additions, the district was brought into its present shape, having its headquarters at Gurdaspur.

Owing to the numerous transfers of territory which took place between the census of 1855 and 1868, it is impossible to give a de- tailed comparison of their results. The enumeration of 1868 was taken over an area of 1822 square miles, and it disclosed a total population of 906,126 persons,—males, 501,247 ; females, 404,879. Classified according to religion there are—Hindus, 303,107 ; Mahonietans, 422,196; Sikhs, 79,387; and "others," 101,436. Only six towns have a population exceeding 5000, namely, Batala, 26,897; Dera Manak, 7199; Dinanagar, 6626; Sujanpur, 6556 ; Kalanaur, 6030; and Srigovindpur, 5531. Gurdaspur, the chief town and administrative headquarters of the district, had only 4137 inhabitants in 1875. The sanatarium of Dalhousie, 7687 feet above sea-level, though only returned as containing 2019 inhabitants, has a large fluctuating population during the warmer months. The district possesses throughout an excellent soil, except in some small patches on the Bias side, where sand covers the surface. The chief agricultural staples comprise wheat, barley, and gram for the spring harvest, with rice, pulses, cotton, and sugar-cane for the autumn crop. Abundant means of irrigation exist where required, either from canals, wells, or mountain streams; but in no part of the Punjab province can better crops be produced without such artificial aid. In 1875-76 the total cultivated area amounted to 855,675 acres, of which 140,639 acres were protected by irrigation against the effects of drought. Tho trade of the district consists mainly in the export of its agricultural produce. The

imports are insig- nificant, —English piece-goods, salt, and fancy articles forming the main items. ‘The local traffic centres on Batdla. The principal road of the district connects Amritsar with Pathankot, at the foot of the hills, and passes through Batala, Gurdaspur, and Dinanagar. The total mileage of highways in 1875-76 showed 54 miles of metalled and 507 miles of unmetalled road. The total revenue in 1876 was £123,608. In 1875-76 the district contained. 12 civil and revenue judges; and 14 officers exercised inagisterial powers, In the same year the police force numbered 596 men, supplemented by a large body of rural watchmen. In 1875-76 there were 112 schools, having an aggregate roll of 5708 pupils. The climate of Gurdaspur is not unhealthy, but large swamps and excessive Tx gation expose some neighbourhoods to malarious fevers and ague, The mean temperature for 1871 was 86°85" in May and 53°8° in December at Gurdéspur, and 67°8° in May and 46°96" in December at Dalhousie. The average annual rainfall for eight years ending 1873-74 was 30°96 inches. Seven charitable dispensaries afforded relief (1875-76) to 80,614 persons.

GURGAON, or Goorcaon, a British district in the lieutenant-governorship of the Punjab, between 27° 39’ and 98° 30’ 45” N. lat., and 76° 20’ 45” and 77° 35’ E. long, Bounded on the N. by Rohtak, on the W. and 8.W. by

portions of the Ulwar, Nabha, and Jind native states, on the

S. by the Muttra district of the North-Western Provinces, on the E. by the river Jumna, and on the N.E. by Delhi, the district of Gurgaon comprises the southernmost corner of the Punjab province, and stretches away from the level plain towards the hills of Rajputana. Two low rocky ranges enter its borders from the south and run northward in a bare and unshaded mass toward the plain country. East of the western ridge the valley is wide and open, and essentially extends to the banks of the Jumna. To the west lies the subdivision of Rewari, consisting of a sandy plain dotted with isolated hills. Numerous torrents carry off the drainage from the upland ranges, and the most important among them empty themselves at last into the Najafgarh jail. ‘This swampy lake lies to the east of the civil station of Gurgdon, and stretches long arms into the neighbouring districts of Delhi and Rohtak. Salt is manu- factured from lime in wells at several villages. The mineral

products are iron ore, copper ore, plumbago, and ochre. |

Wolves, leopards, deer, jackals, hares, and foxes are found in the district. In 1803 Gurgaon district passed into the hands of the British after Lord Lake's conquests, and under their influence improvements made steady and rapid pro- gress, On the outbreak-of the mutiny at Delhi in May 1857, the nawdb of Farrukhnagar, the principal feudatory of the district, rose in rebellion. The Meos and many Rajput families followed his example. A faithful native officer preserved the public buildings and records at Rewari from destruction ; but with this exception, British authority became extinguished for a time throughout all Gurgaon. After the fall of the rebel capital, a force marched into the district and either captured or dispersed the leaders of rebellion. The territory of the naw4b was confiscated on account of his participation in the mutiny. Civil admini- stration was resumed under orders from the Punjab Govern- ment, to which province the district was formally annexed on the final pacification of the country.

The census of 1868 was taken over an area of 2015 square miles, and it disclosed a population of 696,646 persons—males, 370,251 ; females, 326,395. The Hindus number 480,307; Mahometans, 216,147; Sikhs, 130; and " others," 62. In 1875-76 there were four municipal towns, with populations as follows :—Rewari, 25,237 ; Ferozepore (Firozpur), 10,580; Palwal, 13,542; Farrukh- nagar, 10,611. Gurgaon, the administrative headquarters, had in 1868 a population of 3539. Out of a total arca of 1,267,335 acres, as many as 967,440 were returned in 1875-76 as under cultivation. The principal products are wheat, barley, jodr, bdjra, gram, oil-seeds, pulses, cotton, and tobacco. Owing to the deficiency of artificial irrigation, Gurgaon must always be exposed to drought. Seven periods of dearth have occurred since the disastrous year of 1783. In 1833 and 1837 many villages, according to report, lost their whole population through death and emigration. The traffic of Gurgaon district centres entirely upon the town of Rewari, which ranks as one of the chief trading emporiums in the Punjab. Its merchants transact a large part of the commerce between the states of Rajputana and the northern provinces of British India. Salt from the Sambhar Lake, together with iron, forms the principal import; sugar and English piece-goods form the chief items of the return trade. In 1871-72 the imports of Rewari were valued at £208,892, and the ex- ports

at £99,028. The means of communication are not of the highest order. Onc good metalled road traverses the district, from Delhi to Muttra, but the lines of greatest mercantile importance are unmetalled. The Rajputana State Railway now passes through the district, with stations at Gurgdon, Jharsa, Jataoli, Kalipur, and Rewari. The total revenue in 1875-76 was £111,885. In the same year 18 civil and revenue judges had jurisdiction, and the police force numbered 605 men, supplemented by a body of village watch- men. The number of schools was 66, with a joint roll of 3560 pupils. The summer heat of Gurgaon reaches a great intensity; no reeord of temperature, however, exists. The average annual rain- fall for the eight years ending 1873-4 was 23°52 inches. The

district eontained 4 charitable dispensaries, affording relief (1875) to 18,034 persons.

GURNALL, Wirt1am (1616-1679), author of the Christian in Complete Armour, was born in 1616 at Lynn, Norfolkshire. He was educated at the free grammar school of his native town, and in 1631 was nominated to the Lynn scholarship in Emmanuel College, Cambridge, where

he graduated B.A. in 1635 and M.A. in 1639. Nothing is known of his history from the time that he left the uni- versity till 1644, when he was made rector of Lavenham in Suffolk; but it would appear from one of his letters that when he received that appointment he was officiating as minister at Sudbury. At the Restoration he signed the declaration required by the Act of Uniformity, and on this account he was the subject of a libellous attack, published in 1665, entitled Covenant-Renouncers Desperate A postates. He died October 12, 1679, and was buried at Lavenham. The work by which Gurnall is principally known, The Christian in Complete Armour, was published in three separate volumes in 1655, 1658, and 1662, and soon became so popular that in 1679 a sixth edition had been called for. In consists of a series of sermons on the latter portion of the 6th chapter of Ephesians, and is more fully described in the title page as a "Treatise of the Saint's War against the Devil; wherein a discovery is made of that grand enemy of God and his people, in his policies, power, seat of his empire, wickedness, and chief designs he hath against the saints

;" and a "Magazine from whence the Christian is furnished with spiritual arms for the battle, helped on with his armour, and taught the use of his weapon; together with the happy issue of the whole war." The work is more practical than theological ; and its quaint fancy, graphic and pointed style, astonishing variety of scriptural application and allusion, and fervent religious tone render it still popular with a certain class of readers.

An Inquiry into the Life of the Rev. W. Gurnall, by H. M'Keon, appeared at Woodbridge in 1830, and a biographical introduction by the Rev. J. C. Ryle, chiefly founded on this pamphlet, was pre-

fixed to an edition of the Christian in Complete Armour published in London in 1865.

GURNARD (TZrigia). The gurnards form a group of the family of "mailed cheeks" (Z'riglide), and are easily recognized by three detached finger-like appendages in front of the pectoral fins, and by their large, angular, bony head, the sides of which are protected by strong, hard, and rough bones. The pectoral appendages are provided with strong nerves, and serve not only as organs of locomotion when the fish moves on the bottom, but also as organs of touch, by which it detects small animals on which it feeds. Gurnards are coast-fishes, generally distributed over the tropical and temperate areas; of the forty species known seven occur on the coast of Great Britain, viz., the red

Trigla pleuracanthica.

gurnard (7. pint), the streaked gurnard (7. lineata), the sapphirine gurnard (Z. hirundo), the grey gurnard (7'. gurnardus), Bloch's gurnard (7Z'. cuculus), the piper (7. lyra), and the long-finned gurnard (7'. obscura or 7'. lucerna). Although never found very far fron the coast, gurnards descend to depths of several hundred fathoms ; and as they are bottom-fish they are caught chiefly by means of the trawl. Not rarely, however, they may be seen floating on the surface of the water, with their broad, finely-coloured pectoral fins spread out like fans. In very young fishes, which abound in certain localities on the coast in the months of August and September, the pectorals are com- paratively much longer than in the adult, extending to the

end of the body; they are beautfully coloured and kept expanded, the little fishes looking like butterflies. When caught and taken out of the water, gurnards emit a grunt- ing noise, Their flesh is very white, firm, and wholesome.

GURWAL. See GarHwaAt.

GUSTAVUS I. (c. 1496-1560), king of Sweden, com- monly known as Gustavus Vasa, the surname being derived from the family arms, which were a bundle or sheaf, is justly celebrated as the founder of modern Sweden ; he delivered it from the yoke of Denmark, introduced the Reformation, established law and order, and laid the foun- dation of its industrial prosperity. His family name was Ericson ; he was born about 1496 of a noble house ; and he was related to the powerful family of Sture. Gustavus was at a very early age called upon to suffer for his country. Sweden was still joined to the other Scandinavian kingdoms under the union of Calmar, Denmark being the leading state. Sweden was a reluctant member of this union, and King Christian of Denmark was obliged to maintain his supremacy with a high hand. In an expedition to Stock- holm this king treacherously carried off the young Gustavus and other nobles as hostages to Denmark. After being de- tained in Jutland for above a year, Gustavus managed to escape in disguise to Liibeck, and the great Hanse town, ever jealous of the power of Denmark, furnished him with the means of returning to Sweden, where he landed in 1520. He had now formed the resolution to deliver his country from the oppression of the Danes. He went about from place to place trying to incite the people to revolt, but on all hauds he met with apathy and even resistance. For some time his life was in extreme danger; he was hunted by the Danish authorities, and worked in disguise on the farms and in the mines of Dalecarlia. The barn in which he threshed corn is preserved as a state monument. He was on the point of fleeing over the hills into Norway, when tidings came of the Blood-bath of Stockholm, in which ninety of the nobles and leading men of Sweden, in- cluding the father of Gustavus himself, were executed by the Danish king. This deed roused the slumbering patriotism of the Swedes, especially of the hardy people of Dalecarlia, who now chose Gustavus as their leader

(1520). They re- peatedly defeated the Danish forces, and took the principal towns. By 1523 Stockholm was taken and Sweden deliv- ered from the Danish yoke. Ata great diet heldat Strengnis in that year Gustavus was elected king of Sweden. Finland was speedily recovered. After liberating his country, Gustavus set himself to the far harder task of reforming and settling it. Sweden was ina very backward and disorderly condition, The nobles had great power and many selfish privileges ; the clergy were wealthy, and in the war of freedom had taken the side of the Danes; the peasauts were poor and discontented. There was little respect for law ; the whole country was demoralized and disorganized. The reforms of Gustavus began with the church. The two brothers Peterson had already introduced the doctrines of Luther, and the chancellor Anderson had translated the New Testament into the native tongue. Vasa encouraged their efforts ; in a great diet held at Westerds in 1527 he succeeded under the threat of abdicating in passing measures, by which the lands of the bishops were placed at his disposal, and full liberty was granted of preaching the gospel; but the support of the nobles had to be gained by a share of the spoils, The Reformation soon took deep root, but the troubles of Gustavus continued. He required to deal with a turbulent nobility ; he had to beat off the exiled king of Denmark ; thrice he needed to pacify a revolt in Dalecarlia; and he was forced to put forth the whole strength of his kingdom to quell a peasants' war in the south. The pretensions of Ltibeck, which had given him real help in the war of freedom, and to which lie owed a consider-

able sum of money, involved him in a war, by which he cur- tailed their commercial privileges. In all these difficulties Gustavus bore himself with equal energy and wisdom. In 1544 his position was so secure that the elective sove- reignty was changed by the diet into an hereditary one. From this time till his death in 1560, except an unim- portant war with Russia on the Finnish frontier, there was little to disturb the quiet progress of Sweden. Gustavus's home policy made an era in Swedish history. Law, order, and national spirit were encouraged and developed; schools were everywhere established, roads made, and foreign trade extended by advantageous commercial treaties with Eng- land and Holland. Nothing was too homely or minute for the supervision of the king ; he was ready to encourage,

| scold, or instruct, whenever an opportunity offered in any

department of industry. He even established model farms. His second and best-loved queen Margaret had a dairy farm on which twenty-two maidens tended the cows. While he avoided foreign war he did not neglect national defence ; he left an excellent army of 15,000 men, and he created a considerable naval force. Altogether, few kings have done so much for any country as Gustavus Vasa did for Sweden. He was succeeded by his son Eric.

See Geijer's History of the Swedes ; also an anonymous History of Gustavus Vasa, London, 1852.

GUSTAVUS IL, or Gustavus Apotpuus (1594-1632), the hero of Protestantism in the Thirty Years' War, and the first king of Sweden who played a great réle in European history, was the grandson of Gustavus Vasa, and the son of Charles IX. He was born at Stockholin in 1594, and received an excellent education. As we learn from his friend and chancellor Oxenstierna, he gained in his youth "a com- plete and ready knowledge of many foreign languages, so that he spoke Latin, German, Dutch, French, and Italian as purely as a native, and besides had some foretaste of the Russian and Polish tongue," Even during his busier years, after ascending the throne, it is said that he was fond of reading the great work of Grotius, De Jure Belli et Pacis ; also that he knew Greek, preferring Xenophon as a military historian to any other. He was introduced to the business of government at an carly age; when he was only ten, his father required his presence at meetings of council and at the audiences given to foreign ambassadors. This early experience was needed ; for, his father dying in 1611, he ascended the throne of Sweden in his eighteenth year. His position was a difficult one; after fifty years of civil strife, Sweden had lost the strong and compact organiza- tion which it had received from Gustavus Vasa; the finances were exhausted, the nobles were discontented, and the spirit of the people had declined. Abroad, Sweden was surrounded with enemies, Denmark, Russia, and Poland being in a state of chronic hostility with it.

To the difficult task before him the young king applied himself with equal skill and resolution. He attached the nobles to himself by his respect for

their privileges and his genial manner, showed them a more honourable field of activity in a patriotic war, and even induced them to bear their due share of its financial burdens. The administration was reformed in all its branches, industry encouraged, and education greatly improved. In this way the national spirit was wonderfully raised ; and Sweden was gradually prepared to play for the first time a great part in Europe,—a part which seemed so disproportionate to her natural resources. At his accession Gustavus was engaged iu a difficult war with Denmark, which, besides its supremacy over Norway, occupied what is now southern Sweden. The peace of 1613 left their respective frontiers very much as they had been before the war. The war with Russia ended much more advantageously for Gustavus in the peace of Stolbova (1617), by which Sweden was confirmed in the possession

of the Baltic provinces stretching from Finland to Livonia. Gustavus clearly foresaw the advantage to Russia and the danger to Sweden if the former power were allowed to plant itself on the Baltic coast ; and he now congratulated his country on a peace which assured her against such a risk. In 1620 Gustavus married a sister of the elector of Brandenburg, with whom he lived happily till his death.

After being for many years engaged in an intermittent war with Poland, Sweden (1621) entered upon a more active |

conflict with that power. With some interruptions the struggle lasted till 1629, aud proved an excellent training for Gustavus. Sigismund, king of Poland, was his cousin, and had at one time been king of Sweden, but had been forced to resign owing to his Catholic opinions. He still laid claim to the crown of Sweden. In this war Gustavus took Riga, and made many other conquests in Livonia as well as in Courland and Prussia, part of which he retained by the peace of Altmark, concluded under the mediation of Richelieu.

That great statesman wished to get Gustavus's hands free

for a more important conflict, in which the king himself

had long been cager to engage. While Gustavus had been involved in his Baltic war, the Catholic house of Austria had been swiftly raising itself on the ruins of German Pro- testantism to a position of absolute supremacy. In this early period of the Thirty Years' War which dates from 1618, the armies of Protestantism had been everywhere overthrown by Tilly and Wallenstein. The latter, raising a host at his own cost and bearing desolation wherever he went, garri- soned Brandenburg and Pomerania, occupied Mecklenburg, and overran the continental dominions of Denmark. The only town that successfully resisted the imperial general was Stralsund ; the king of Denmark was obliged to make peace. Such a colossus, with its gigantic force of oppression and devastation and its invincible armies, Gustavus now ven- tured to attack. Itseemed a foolhardy undertaking which excited the laughter of his enemies, when in midsummer 1630 he landed on the coast of Pomerania with his little army of 15,000 men. Yet there were many things in his favour,—the despair of the Protestant princes, who saw a great part of their lands threatened by the Edict of Restitu- tion ; the disunion of the Catholics, who forced the emperor to dismiss Wallenstein shortly after the landing of Gustavus;

the help of Richelieu, who now inaugurated the French |

policy of weakening Germany by dividing it. This help was formally assured him by the treaty of Barwalde (January 1631). Yet the German princes showed no haste to join Gustavus ; the duke Boguslav reluctantly consented to receive the Swedish army into his capital—Stettin. But the marvellous discipline of the Swedes, so different from the wild barbarism of the imperial army, soon gained the confidence of the German people ; robbery and licence were unknown; morning and evening the soldiers assembled for prayer round their regimental chaplains ; such an army had never been seen in Europe. It was not less distin- guished for its hardy bravery in war; keeping the field in winter as well as summer, it soon drove the imperialists out of Pomerania and the lower basin of the Oder, and stormed Frankfort-on-the-Oder. In the midst of those successes, Gustavus was greatly moved by the sack of

Magdeburg (May 1631). Fearful of being cut off from his |

basis of operations, he could not advance to the relief of the city without the cooperation or consent of the electors of

Brandenburg and Saxony. During the delay thus caused, |

Magdeburg was taken by Tilly, and became a scene of the most fearful atrocities. Too late Gustavus forced the elector of Brandenburg to hand over to him the fortresses

required ; a desolating invasion of Saxony by Tilly com- |

pelled even the Saxon elector to seek the aid of Sweden.

-and driving out the imperial garrisons.

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by the battle of Breitenfeld (near Leipsic), in which Tilly was completely overthrown, and the supremacy of Catholic Austria shattered at a single blow (September 1631). While the Saxons overran Bohemia, Gustavus, now hailed as the liberator of Protestantism, marched westwards towards the Rhine, gathering round him the friendly Germans, Wiirtzburg and Frankfort were occupied; at Oppenheim he forced the passage of the Rhine against the Spaniards; he spent Christmas in the ecclesiastical city of Mainz. Early next spring he advanced into Bavaria, forcing the passage of the Lech in the face of Tilly (who was mortally wounded). Munich had to pay a war contribution to the Swede.

In this overwhelming reverse of fortune, the emperor Ferdinand was obliged to invoke the aid of Wallenstein, who soon changed the course of the war. He gathered a mighty host, cleared the Saxons out of Bohemia, and marching westwards threatened the wealthy city of Nuren- berg. Afraid of a repetition of the horrors of Magdeburg, Gustavus hastened northwards and threw himself into the city with asmall force. In the neighbourhood Wallenstein threw np a fortified camp resolving to starve his rival out ; and here the great captains watched each other for several weeks. After drawing his scattered forces togetlier, Gustavus offered battle to the enemy, and when that was declined assaulted his intrenched position, but without effect.

Leaving a sufficient garrison to defend the exhausted city, he advanced a secoud time into Bavaria, where he hoped to draw Wallenstein after him, and thus transfer the seat of war to the enemy's country. But Wallenstein made a desolating march through Thuringia into Saxony, which he resolved to make his winter quarters ; and again Gustavus was obliged to leave his Bavarian conquests to save his ally from such a cruel guest. On a misty Nov- ember day (1632) he attacked the army of Wallenstein at Liitzen (near Leipsic). The numbers engaged were not great: according to Ranke, the Swedes were 14,000, the imperialists only 12,000 at the beginning of the conflict ; but the battle was one of the fiercest recorded in history. The Swedes had carried the strong positions of the enemy and turned his own cannon against him, wheu the cavalry of Pappenheim, which had left the main army shortly before the battle, appeared on the field. Tle Swedes were huried back ; and the king, too eagerly hurrying forward to re-form the battle, was separated from his guards and shot. Wild with rage and sorrow the Swedes renewed the attack, overthrew the enemy, and won his artillery again. With- out making any effort to recover it, Wallenstein retreated into Bohemia, while the Swedes carried the disfigured body of their king from the battlefield. It was laid to rest in the Riddarholm church at Stockholin.

Gustavus Adolphus is justly regarded as one of the noblest and greatest figures in history. Even in the art of war he made an epoch. To the huge and unwieldy masses of Tilly he opposed a light and flexible formation of three deep, which he manceuvred with unwonted rapidity. The activity of his movements was equalled by the dexterity with which his artillery and muskets were handled; at Leipsic his guns fired three shots for the enemy's one. The political plans which Gustavus enter- tained have been the subject of some discussion. That he aimed at founding a Swedish empire of the Baltic, and succeeded in doing so, is certain; he meant also to unite under his protection the corpus evangelicum of Germany. Probably too he aspired to become a candidate for the empire; and if so, he had only one disqualification, that he was a foreigner. Even with this drawback it would have been the best course available for Germany ; to have enjoyed fora generation the rule of such a man would have

The union of the Swedish and Saxon forces was followed ' been an unspeakable blessing, at any rate infinitely better

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than the supremacy of Austria, or that process of desola- tion and disunion which actually took place. In any case his premature death at the age of thirty-eight was an irre- parable loss for German Protestantism. The Thirty Years' War, which for two years had been rendered heroic by his presence, degenerated again into a scene of the wildest barbarism, by which Germany was reduced to a wilderness, and flung back at least a century in the march of civiliza- tion.

See Geijer, History of the Swedes; Fryxell, History of Sweden, English translation by Mary Howitt, Lond. 1844, and Gesehichte Gustav Adolfs, Leipsic, 1852; Gfrorer, Gustav Adolf, 4th ed., edited by Klopp, Stuttgart, 1863; Droysen, Gustaf Adolf, Leipsic, 1869- 70; Ranke, Gesehiechte Wallensteins, 3d ed., Leipsic, 1872; S. R. Gardiner, The Thirty Years' War; E. C. Otté, Seandinavian His- tory, Lond. 1875; Felix Esquirou de Parieu, Gustave Adolphe, Paris, 1875. Schiller's Geschichte des dreissigjdhrigen Kriegs is a brilliant production, but written without a careful study of the sources. (a Ke)

GUSTAVUS III, (1746-1792), king of Sweden, suc- ceeded his father Adolphus Frederick at the age of twenty- five. He was in Paris when his father died, and was an enthusiastic admirer of everything French. His manners were popular ; he was brave, resolute, and eloquent. At the beginning of his reign he found the royal power completely overshadowed by the nobles, who in the conncil virtually dictated the government of the country, and had involved it in frequent disturbance and disgrace. A revolt, contrived for the purpose by one of his adherents, gave Gustavus a pretext for marshalling his guards, whom he won over and employed to make a complete change in the consti- tution. As the nobles were disliked by the people, they were obliged to submit. Surrounded by soldiers, the diet accepted the new form of government, by which the entire administrative power including taxation was entrusted to the king. In many respects Gustavus made an excellent use of his great power; le improved the army and navy, reformed the administration of justice, abolished torture, and built hospitals. But his foolish aping of French fashions, aud his dream of reviving the kniglitly exercises and accomplishments, led him into great

extravagance. His arbitrary attempt to introduce a national dress, as well as the conversion of brandy, the national drink of Sweden, into a royal monopoly, lost him his popularity. In 1788 in his campaign against Russia, several nobles, officers of his army in Finland, refused to carry on the war because it had not been sanctioned by the estates. Angry at this Gustavus summoned the hardy Dalecarlians to his aid, de- prived the nobles of their exclusive privileges, and made his power absolute. He continued the Russian war with sreat bravery and even success till the peace of 1790, which made no change on the Finnish frontier. Gustavus's next project, which he prosecuted with his usual energy and dis- regard of consequences, was a war to save King Louis XVI. from the Revolution. This war the estates, already weary of his expensive undertakings, refused tosupport. To avert a new coup d'état some nobles formed a conspiracy against him ; and Ankarstrém, formerly an officer in the guard, shot him at a masked ball at Stockholm (1792).

GUSTAVUS IV. (1778-1837), king of Sweden, was son of the preceding. He was only fourteen years of age when his father was cut off, and his uncle Duke Charles acted as regent during the minority. Gustavus early gave proof of an obstinate strength of will and of a highly-wrought tem- perament bordering on insanity. Thus he went to St Petersburg, according to agreement, to marry a grand- daughter of the empress Catherine, and the whole court was assembled for the ceremony. The bridegroom how- ever did not appear, and the company dispersed after waiting several hours. Gustavus had drawn back at the eleventh hour, refusing to sign the marriage treaty because it bound him to grant his futnre queen the free exercise of

her religion. He spent his whole reign under the mastery of a fixed idea, that Napoleon was the Great Beast spoken of in the Apocalypse ; and he joined the great coalition of 1805 against the conqueror. In this war Swedish Pomerania was occupied by the French. Even after 'Tilsit, Gustavus prosecuted the war with unbroken resolution. Sweden suffered fearfully by this obstinacy of the king; the Russians conquered Finland; the Danes invaded the southern provinces; his English allies, wearied of his ir-

rational obstinacy, left him to his fate. Sweden also grew sick of his wrong-headed policy. The officers of the army conspired against him. He was dethroned and detained in captivity, while his uncle Duke Charles was elected to the crown (1809). After the new arrangements had been made, he was banished with the assurance of a considerable income. Under the name of Colonel Gustavson he passed a wandering life abroad, dying at St Gall in 1837. GUSTAVUS ADOLPHUS UNION (Gustav-Aporr- StirruNG, Gusta v-ADOLF-VEREIN, EVANGELISCHER V EREIN DER GUSTAV-ADOLF-STIFTUNG), a society formed of members of the Evangelical Protestant churches of Germany, which has for its object the aid of feeble sister churches, especially in Roman Catholic countries. The project of forming such a society was first broached, in connexion with thie bicentennial celebration of the battle of Liitzen, on the 6th of November 1832 ; a proposal to collect funds for a monn- ment to Gustavus Adolphus having been agreed to, it was suggested by Superintendent Grossmann that the best memorial to the great champion of Protestantism would be the formation of a union for propagating his ideas. For some years the society was somewhat limited in its area and operations, being practically confined to Leip- sic and Dresden, but at the Reformation festival in 1841 it received a new impulse through the euergy and elo- quence of the Hofprediger Zimmermann of Darmstadt, and in 1843 a general meeting was held at Frankfort-on- the-Main where no fewer than twenty-nine brancli associ- ations, belonging to all parts of Germany except Bavaria and Austria, were represented. The want of a positive creed on the part of tlie Union tended from the first, however, to make many of the stricter Protestant churchmen doubtful of its probable usefulness; though on the other hand its purely negative attitude in relation to Roman Catholicism secured for it the sympathy of the masses. At a general con- vention held in Berlin in September 1846 a keen dispute arose about the admission of the K6nigsberg delegate Rupp, the founder of the "Free Congregations"; his exclusion, which was carried by a majority, called forth many energetic protests, and at one time it seemed likely that the society would be completely broken up. A peace- ful solution of the difficulty, however, was reached at Darmstadt in 1847. Amid the complications of the Revolution of 1848 the whole movement fell into stagna- tion; but in 1849 another general convention (the seventh), held at Breslau, showed that, although the society had lost both in membership and income, it still was possessed of

considerable vitality. From that date the Gustav-Adolf- Verein has been more definitely " evangelical" in its tone than formerly ; and under the direction of Zimmermann of Darmstadt it has greatly increased both in numbers and in wealth. In 1853 the income was £13,500; in 1858 it had risen to £21,000; while in 1876 there was divided among 1406 congregations a sum of nearly £35,000. The total number of congregations assisted up to that date was 2558, and the sums distributed amounted to an aggregate of nearly £637,000. Apart from any influence it may have had in advancing the cause of Protestantism in places where it was struggling or weak, there can be no doubt that the Union has had a very great effect in helping the various separate Evangelical churches of Germany to

realize the number and importance of their common interests. It ought to be added that the stricter Lutherans still continue to hold aloof from it.

The Verein has numerous special organs, of which the most im- portant are the Darmstddter Bote des Evangelisehen Vereins der Gustav-Adolf-Stiftung and Fliegende Blitter. See Zimmermann's Geschichte des Gustav-Adolf-Vereins, Darmstadt, 1858. ©

GUSTROW, the chief town of the Wendian circle of the grand duchy of Mecklenburg-Schwerin, Northern Germany, is situated on the Nebel and on the railway from Liibeck to Stettin, 20 miles south of Rostock. The principal build- ings are the castle, erected in the middle of the 16th cen- tury, now used as a workhouse; the cathedral, dating from the 13th century, and lately renovated, containing many fine monuments and possessing a square tower 100 feet high ; the town-hall, dating from the 16th century; the court-houses, the music hall, and the theatre. Among the educational establishments are the ducal gymnasium, which possesses a library of 15,000 volumes, the town real-school, the city school, the trade school, and four female schools. The town is oue of the most prosperous in the dukedom, and has breweries, foundries, tanneries, sawmills, brandy distilleries, and manufactories of tobacco, glue, candles, and soap. There is also a considerable trade in wool, corn, wood, butter, and cattle, and an annual cattle show and horse races are held. Population (1875), 10,923.

Giistrow was a place of some importance as early as the 12th cen- wury, and in 1219 it became the residence of Prince Henry Burewin IL., from whom it received Schwerin privileges. From 1556 to 1695 it was the residence of the dukes of Mecklenburg-Giistrow. In 1628 it was occupied by the imperial troops; and Wallenstein resided in it during part of the years 1628 and 1629.

GUTENBERG, Joun, was born about 1410 at Mainz of noble parents, his father being Frielo zum Ginsfleisch, and his mother, whose name he adopted, Else zu Gudenberg. In 1420 the citizens of Mainz drove the patricians out of the city, and as Gutenberg's name appears about ten years later at Strasburg the family probably took refuge there. When the expelled families were recalled to Mainz, Gutenberg did not avail himself of the privilege. Wenext hear of him at Strasburg, where in 1434 he seized and imprisoned the town clerk of Mainz for a debt due by the corporation of that city, releasing him, however, at the urgent representations of the mayor and counsellors of Strasburg. In 1437 Gutenberg was sued before the ecclesi- astical court by Emmeline zu Iserne-Thiire for breach of promise of marriage, the case being settled by his making her his wife. The active mind of Gutenberg had adopted several plans for making money before he invented the art of printing with movable types, which is his great claim upon the gratitude of mankind. Before 1425 he engaged in some experiments requiring money, when Andrew Dritzehn, a fellow-citizen, became security for him; and the same year a partnership between them was arranged to carry out Gutenberg's new plan for polishing stones. Next came an improvement in the manufacture of looking-glasses, for which money was lent by other two friends. For these a lucrative sale was expected at the approacliing pilgrimage to Aix-la-Chapelle, which, however, was unfortunately postponed. In 1438 was arranged a partnership between Gutenberg, Andrew Dritzehn, Andrew Heilmann, and Anton Heilmann, and that this concerned the new art of printing appears from the long law proceedings which soon after followed. The action was brought by the brothers of Dritzehn, who was dead, to force Gutenberg to reveal the secrets of the partnership. The decision was in favour of Gutenberg, In January 1441 Gutenberg obtained 80 livres by mortgaging some house property, and again in 1442 he borrowed money of Martin Brether for carrying on his experiments. For four years after this nothing

is known of Gutenberg except that his wife paid taxes

in his name. He now returned to his native city, Mainz, where he borrowed 100 guilders of his kinsman Arnold Gelthus, and established himself in the house Zum Jungen, which was part of the family possessions. At this time Gutenberg must have been able to show some solid and convincing results of his new invention, for he obtained substantial aid from a shrewd goldsmith, John Fust or Faust, who advanced 800 guilders to promote the work, taking as security a mortgage on all the printing materials to be purchased. Gutenberg at once set to work upon a large folio Latin Bible, the printing of which was ended before August 1455. During the progress of this great undertaking several forms of indulgence and other small things were printed, the earliest with a date being the Indulgence of 1454 in the library at Althorp. But the new art was certainly not a success commercially, and again Fust had to come forward with another 800 guilders to preventa collapse. In November 1455 Fust determined to dissolve his connexion with Gutenberg, and demanded pay- ment of hisadvances. Gutenberg not being able to refund so large a sum, Fust took legal proceedings against him, and he was eventually compelled to yield up the whole of the printing materials, which at once were removed by Fust to his own house at Mainz. Here with the assistance of Peter Schéffer he continued to print until the sack of the city in 1462 by Adolphus II. Gutenberg, now in the evening of life, had to make a fresh start in the world, and fortun- ately in Dr Humery of Mainz found a friend who assisted him with capital. Embarrassment, however, still pursued him, and the press made slow progress. It is uncertain whether the new press of Gutenberg was in Mainz or at the neighbouring town of Eltvill, On January 17, 1465, Gutenberg accepted the post, at the court of Archbishop Adolphus, of salaried courtier. He received annually a suit of livery together with a fixed allowance of corn and wine. Meantime the printing materials were lent to the brothers Bechtermunze, who printed some inconsiderable works, and upon the death of Gutenberg were claimed and taken by Dr Humery. On February 2, 1468, died Gutenberg, poor, childless, and almost friendless, after laying the foundations of an art which was soon to dominate the world. Arnold Gelthus erected a monument to his memory near bis grave,

and forty years afterwards Ivo Wittig set up a memorial tablet at the legal college in Mainz.

No portrait of Gutenberg is known, those appearing upon medals, statues, or engraved plates being all fictitious. The latest authority upon his life and work is Gutenberg, by Dr Van der Linde.

GUTHRIE, Tuomas (1803-1873), Scottish clergyman and philanthropist, was born at Brechin, Forfarshire, on July 12, 1803. He entered the university of Edinburgh at the early age of twelve (November 1815), and continued to attend classes there for more than ten years. During that period he seems to have read widely in general litera- ture, although he did not distinguish himself as a student in the strict sense. On the 2d of February 1825 the presbytery of Brechin licensed him as a preacher in con- nexion with the Church of Scotland; but it was not till 1830 that he was inducted to his first charge, Arbirlot, in Forfar- shire, where he laboured for seven years. In 1837 he became the colleague of the Rev. John Sym in the pastorate of Old Greyfriars, Edinburgh, and at once attracted notice as a great pulpit orator. Towards the close of 1840 Guthrie was chosen minister of St John's Church, Victoria Street, Edinburgh. His increasing popularity brought him flattering invitations both from London and from India; but these he firmly declined. He was an en- thusiastic supporter of the movement which led to the Disruption of 1843; and his name is thenceforth asso- ciated with the Free Church. Jn 1847 he began the

greatest work of his life by the publication of his first Plea for Ragged Schools, This pamphlet, amid a multi- tude of other encomiums, elicited a beautiful and sympa- thetic letter from Lord Jeffrey. A ragged school was opened on the Castle Hill, which has been the parent of many similar institutions elsewhere. Guthrie insisted on bringing up all the children in his school as Protestants ; and he thus made his ragged schools not only educational but proselytizing institutions. This interference with religious liberty led to some controversy; and ultimately those who differed from Guthrie founded the United Indus- trial School, which is managed on the principle of com- bined secular and separate religious instruction. In April 1847 the degree of D.D. was conferred on Guthrie by the university of

Edinburgh; and in 1850 Dr Hanna, the biographer of Dr Chalmers, was inducted as his colleague in Free St John's Church.

In 1850 Guthrie published A Plea on behalf of Drunkards and against Drunkenness, which was followed by The Gospel in Ezekiel (1855); The City, its Sins and Sorrows (1857); Christ and the Inheritance of the Saints (1858) ; Seedtime and Harvest of Ragged Schools (1860),

consisting of his three Pleas for Ragged Schools; and The

Way to Life and Speaking to the Heart (1862). These _ works had an enormous sale, and carried his fame to distant parts of the world. Portions of them were trans- lated into French and Dutch. In 1862 he was moderator of the Free Church General Assembly ; but he seldom took a prominent part in the business of the Church courts. In connexion with the total abstinence movement he often appeared on the platform, where his oratorical talents, rich humour, genuine pathos, and inimitable power of story- telling eminently qualified him to shine. He was also greatly interested in the work of the Evangelical Alliance, of which he was one of the vice-presidents, In 1864, his health being seriously impaired, he resigned public work as pastor of Free St John's (May 17), although his nominal connexion with the congregation ceased only with his death. Guthrie had occasionally contributed papers to Good Words, and, about the time of his retirement from the ministry, he became editor of the Sunday Magazine, himself contributing several series of papers which were afterwards published separately. In 1865 he was presented with £5000 as a mark of appreciation from the public. His closing years were spent mostly in retirement; and after an illness of several months' duration he died at St Leonard's-on-Sea, February 24, 1873.

Dr Guthrie's fame rests on his labours as a social re- former and his extraordinary oratorical power as a preacher and platform speaker. He will always be remembered as one of the most successful and warm-hearted of Christian philanthropists ; and his influence over the masses of his countrymen was very great. His theology was the moderate Calvinism generally accepted by the Evangelical school. His style is distinguished by great graphic power and richness of illustration; but, although admirably

adapted for effect on a popular audience, it is far too florid and Asiatic in its rhetoric to please a sound literary critic.

See Artobiography of Thomas Guthrie, D.D., and Memoir by his sons, 2 vols., London, 1874-5.

GUTS MUTHS, JoHann Curistorn Friepricu (1759- 1839), a German teacher and the principal founder of the German school system of gymnastics, was born at Quedlin- burg 9th August 1759. He was educated at the gymnasium of his native town and at Halle university ; and in 1785 he went to Schnepfenthal, where he taught geography and gymnastics in Salzmann's academy. His method of teach- ing gymnastics was expounded by him in various hand- books ; and it was chiefly through them that gymnastics very soon came to occupy such an important position in

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the school system of Germany. He also did much to introduce a better method of instruction in geography. He died May 21, 1839.

His principal works are Gymnastik fiir die Jugend, 1793; Spiele zur Uebung und Erholung des Kérpers und Geistes fiir die Jugend, 1796 ; Turnbueh, 1817 ; Handbuch der Geographic, 1810; and a number of books constitutinga Bibliothek fiir Padagogik, Schulwesen, und die gesammte pidagogische Literatur Deutsehlands. He also contributed to the Vollsténdiges Handbuch der neuwesten Erd- beschreibung, and along with Jacobi published Deutsches Land vie deutsches Volk, the first part, Deutsches Land, being written

nim.

GUTTA PERCHA (Gutta TaBan, &c.). This name? is applied to the concreted or inspissated juice of various plants belonging to the natural order Sapotaceee, growing in the Malay Peninsula. 'To what particular tree the name "outta percha" properly belongs, there is no evidence to show ; but it has been generally given to Dichopsis Gutta (Bentley and Trimen) or Jsonandra Gutta (Hooker), the vernacular name of which is "' taban."?

The Dichopsis Gutta attains a height of 60 to 80 feet, with a diameter of 2to 4 feet. 'The leaves are obovate- oblong and entire, pale green on the upper side, and covered beneath with short reddish-brown shining down. The flowers are arranged in clusters of 3 or 4 in the axils of the leaves. The fruit, about an inch long, is of an ovoid shape, and is eaten by the Malays. In Siak (Sumatra) a vegetable butter is prepared from the seeds. The wood is soft, fibrous, spongy, of a pale colour, and marked with black lines, these being reservoirs of gutta percha.® The gutta, as it flows from the tree, is of a greyish hue, occasionally with a somewhat roseate tinge, probably arising from the colour vessels of the bark becoming ruptured through surcharge, and their contents mixing with the gutta. This species does not furnish all the gutta percha of commerce; indeed there are other trees which yield larger quantities: In all there are about thirty varieties known ; but some of the vernacular names in different dis- tricts may prove mere synonyms.

The geographical distribution of the trees producing gutta percha is very restricted. Giitzlaff defines the limits as 6° N. and S. lat. and 100° to 120° E. long.; whilst Captain Lingard (who has great personal experience on the subject) gives the limits as 4° N. and 3°S. lat., still further restrict- ing the finer varieties to 3° 50' N. and 1° S., with a temperature ranging between 66° and 90° Fahr., and a very moist atmosphere. 'These limits are well within the iso- therm of 80° Fahr. Many of the best varieties are found only on the hill slopes at a distance from the sea-coast, each variety forming a separate grove of from 200 to 500 trees, with high forest trees above them. They grow best in a rich light loam, with a rocky subsoil.

The collection of gutta percha generally takes place directly after the rainy season, as in the dry season the gutta does not flow so readily, while during the rains ague and jungle fever are most prevalent, and the gutta 1s liable to be washed away from the felled trees. The yield of a well- grown tree of the best variety is from 2 to 3 Ib of gutta percha, such a tree being about thirty years old, 30 to 40 feet high, and 1} to 3 feet in circumference. A full-grown tree sometimes measures 100 to 140 feet to its first branches,

1 Gutta, or asit is variously written gutah, gatta, gittah, gatta, is the Malayan term for gum, and Percha (pronounced as in perch, not hard as perka), accentuated variously as parcha, pertja, percha, is the name

of the tree; hence the term may be translated " gum of the percha tree." The old name of Sumatra was Pulo or Pulau Percha, 7.e., 'island (Pulau) of the percha tree."

8 Tuban, tiban, tab4n is the name of the tree, and, according to Logan, a new word has been added to the Malay language, viz., Menaban (Men(t]aban), z.c., to collect gutta taban. The greater num- ber of Malay nouns admit of conversion into verbs by a prefix.

3 For figures and botanical descriptions see Zond. Journ. Bot., 1848; De Vriese, De Handel in Getah-Pereha , and Bentley and Trimen's Medicinal Plants, part 35, p. 16 (1878).

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with a girth of 20 feet at a distance of 14 feet from the base, and may yield 50 to 60 lb of gutta percha, which loses in six months abont 35 per cent. of its weight in drying.

The methods of extracting the gutta percha are much tlie same amongst the Malays, Chinese, and Dyaks. The trees are cut down just above the buttresses, or banees, as they are called ; and for this purpose a staging about 14 to 16 feet high is erected. The tools used in felling are either " billiongs" or " parangs." A billiong is a kind of axe used by the Malays in felling, building, &c. The blade is of a chisel-like form, and the tang is secured at right angles to a handle by means of a Jashing of "ratan" or cane. The Chinese sometimes nse an axe perfectly wedge-shaped. The parang looks more like a sword-bayonet, and in the hands of a Malay is a box of tools in itself, as with it he can cut up his food, fell a tree, build a house, or defend himself.

When the tree is felled the branches are speedily lopped off, to prevent the ascent of the gutta to the leaves. Narrow strips of bark, about an inch broad and 6 inches apart, are theu removed, but not all round the tree, as its underpart in its fall becomes buried in the soft earth, much sap being thus lost. Some natives beat the bark with mallets to accelerate the flow of milk

or gutta. The milk flows slowly (changing colour the while) and rapidly concretes, and, according to its source, may vary from yellowish-white to reddish or even brownish in hue. The gutta asit flows is received into hollow bamboos, doubled- up leaves, spathes of palms, pieces of bark, cocoa-nut shells, or in holes scraped inthe ground. If the quantity obtained is small, it is prepared on the spot by rubbing it together in the hands into a block, in one end of which a hole is made to carry it by. In this state it is known in the market as "raw gutta" or "gutta muntah." If water gets mixed with the juice, the gutta becomes stringy and is considered deteriorated, but after boiling appears quite as good. Sometimes the gutta is kept in a raw state for a month or two, and then undergoes the next step in the pre- paration, that is, boiling. The boiling is generally con- ducted in a "kwali" or pan of cast or hammered iron, of about 15 inches in diameter and 6 inches deep. The boiling is either simply with water, or with the addition of lime juice or cocoa-nut oil. If one pint of lime juice be added to three gallons of gutta juice, the latter coagulates immediately on ebullition.

On arriving at the port of shipment the gutta, before exportation, generally undergoes examination and classifica- tion into parcels, according to quality. As received in the '"'godowns" or warehouses it presents great diversities in condition, shape, size, and colour,—from crumbling, hardly coherent, whitish or greyish "raw" or "getah muntah" fragments, to reddish or brownish blocks as bard as wood. Sometimes it is made up into all manner of grotesque shapes of animals, and it is nearly always largely adulter- ated with sago-flour, sawdust, clay, stones, &c. The Chinese are great adepts in assorting and classifying gutta, and frequently prepare from different varieties a certain "stand- ard sample" by cutting or chopping the material into thin slices and boiling with water in large shallow iron pans, keeping the contents constantly stirred with poles, and adding good gutta percha and even cocoa-nut oil to give a better appearance. When sufficiently boiled the gutta is pressed into large moulds, and is then ready for shipment. This process of reboiling is wholly unnecessary, and in some cases is done only to get rid of stuff which has no right to be called "gutta percha."

The amount and value of gutta percha imported into Great Britain in 1875-77 were as follows :—

1875. 1876. 1877.

ORs. ci 19,686 21,558 26,359 Valuc.. ... £149,684 £163,441 £238,327

Gites PERS BA

The price of gutta percha ranges from 4d. to 3s. per hb, according to quality and demand.

History.—The early history of the use of gutta percha is somewhat obscure ; the Malays and Chinese are said to have long known and used it. One of the earliest notices of it in England occurs in a catalogue of the collection of the famous Tradescants.1_ Dr Montgomerie, a surgeon in the East India Company's service, was the first to direct atten- tion to gutta percha as likely to prove of great utility in the arts aud manufactures. Having observed the substance in Singapore in 1822 in the form of whips, he commenced experimenting with it. In 1842, being again stationed at Singapore, he followed up the subject, and his recommenda- tion of it to the medical board of Calcutta as useful for making of splints and other surgical apparatus met with high approval. He also sent specimens, with relative in- formation, to the Society of Arts of London, which society warmly took up the subject, and on Montgomerie's return to England in 1844 presented him with its gold medal. Some have claimed the honour of introducing gutta percha to the notice of the commercial world for Dr (afterwards Sir) José D'Almeida, wlio sent a specimen merely as a curiosity to the Royal Asiatic Society in 1843, but careful investigation clearly decides the question of priority in favour of Montgomerie. The Society of Arts having requested him to lay before them the result of his experi- ments, he delivered a lecture in the autumn of 1844, and many patents were at once taken out, the chief being those of Mr C. Hancock, Mr Nickels, Mr Keene, Messrs Barlow and Forster, Mr E. W. Siemens, and others. After this the substance soon came into general use.?

Propertics.—Gutta percha, like many other milky juices, occurs in the laticiferous tissue of the plant, which exists in greatest abundance in the middle layer of the bark. See Borany, vol. iv.

wets

Gutta percha is resolvable into two resins, albin and fluavil. Like caoutchouc or india rubber, it is a hydrocarbon ; Soubeiran gives its composition as—carbon 87°80 and hydrogen 12°20. In commercial gutta percha we have this hydrocarbon or pure gutta, plus a soft resin, a resultant of oxidation of the hydrocarbon. M. Payen gives the following analysis of commercial gutta percha :—

Pure gutta (milk-white in colour and fusible), 75 to 82 per cent.

Resius soluble in boiling alcohol :—

1. Crystalbin or albin (C.9H3.0,), white, and crystallizing out of the alcohol as it cools, 6 to 14 per cent.

2. Fluavil (C.9H3,0), yellow, falling as an amorphous powder on the cooling of the alcohol, 6 to 14 per cent.

It is thus apparent that the change of pure gutta into a resin-like mass takes place naturally if means be not taken to stop it. Many a good parcel has been thus lost to commerce, and the only remedy seems to be thorough boiling as soon after collecting as possible. It must be remembered too that, in cutting through the bark to arrive at the laticiferous vessels, many other vessels and cells become ruptured, containing tannic and gallic acids, &c., and the presence of these no doubt accelerates oxidation. In opening bottles of the milky juice a turbidity and effervescence are often noticed, owing to the formation of a brownish liquid, the colour being probably due to the presence of gallic acid. In improperly prepared blocks of gutta also, these foreign substances induce the presence of a brown fermented and putrid liquid, which decomposes the internal mass. Many of these substances, being soluble in watcr, are removable by the process of boiling.

Gutta percha as met with in commerce is of a reddish or yellowish hue, but when quite pure is of a greyish-white colour. In this

1In the Museum Tradescantianum ; or, a Collection of Rarieties preserved at South Lambeth, neer London, by John Tradescant, .. . London, MpcLv1., the following entry occurs (p. 44):—“ VIII. Variety of Rarities. —The plyable mazer wood, being warmed, will work to any form.” This museum

became the nucleus of the Ashmolean Museum at Oxford. The word "mazer," variously spelt, often occurs in early English poetry, and is specially mentioned in old catalogues and wills. It is by no means impossible that mazer cups may have been made of gutta percha, as its lightness, strength, and non-liability to fracture would recommend it; and curiously enough onc of the vernacular names of the tree yielding gutta percha is "mazer wood tree."

**See Collins on "Gutta Percha" in British Manufacturing Industries (Stanford & Co.), and the very interesting volume of Specifications of Patents in Caoutchouc, Gutta Percha, &c. issued by the Patent Office.*

state it is nearly as hard as wood, only just receiving the impression | is drawn tlrou

of the nail, is of a porous structure, and when viewed under the microscope has the appearance of a series of variously hued prisms. When moulded, rolled into shects, or drawn into ropes, it assumes a fibrous character in the direction of its greatest length, in which direction consequently it can be stretched without rupture. If, however, a strip of a sheet be cut off across the fibre, it will be found that a redistribution of the tenacity of the slip takes place ; 7.c., the direction of the fibrous character is developed in an opposite direc- tion. The electrical properties of gutta percha were first noticed by Faraday. Ifa piece be subjected to friction, an electric spark can be obtained. On its relative electric conductivity, scc vol. viii. p. 58.

At a temperature of 32° to 77° Fahr., gutta percha has as mueh tenacity as thick leather, though inelastic and less flexible. In water at 110° Fahr. it becomes less hard; towards 120° Fahr. it becomes doughy, though still tough; and at from 145° to 150° it grows soft and pliable, allowing readily of being rolled and moulded. In this state it has all the elasticity of caoutchouc, but this it loses as it cools, gradually becoming hard and rigid again, and retaining any form impressed on it whilst in its plastic condition. It is highly inflammable, and burns with a bright flame, dropping a black residue like sealing wax. The specific gravity of gutta percha has been variously stated at from 0°96285 to 0°99923. It is insoluble in water,

alcohol, dilute acids, and alkalies, but dissolves in warm oil of turpentine, bisulphide of carbon, coal tar oil, caoutchin or oil of caoutchouc, and its own oil,—for it yields by destructive distillation an oil similar to that yielded by caoutchouc under the same treatment. Ether and some of the essential oils render it pasty, and it is softened by hot water, absorbing a small quantity of the water, which is slowly parted with in cooling.

Manufacture and Applications.—Gutta percha, as received in England, is in irregular clumps or blocks, and is frequently adul- terated with massive stones, sawdust, bark, sago flour, and other forcign matters ; and the first step in its manufacture is to cleanse it thoroughly. The blocks are first sliced by means of a powerful circular wheel driven by machinery, and having fixed in it two or three strong chisel-like knives, by which it is divided into thin slices. These are placed in wooden troughs filled with water and heated by steam. As soon as the gutta percha becomes soft, it is taken out in baskets and placed in a toothed irou cylinder, called a "devilling" machine, which tears it into fragmeuts ; these fall into a trough of water, and the impurities sink to the bottom, leaving the purified gutta floating in the form of a spongy mass. This mass is then taken out by means of perforated shovels, thoroughly washed in cold water, and driedin baskets. It is then packed in jacketed iron chests heated by steam, and left till it be- eomes soft, when it is at once removed, and kneaded or masticated by means of a cast-iron cylinder, with a movable lid and an internal revolving toothed iron axis,—the result being a homogeneous dough-like reddish-brown mass, Sometimes various substances are introduced into this machine, which is called a "masticator," to increase the hardness or density of the gutta, or to colour it,—such as orange or red lead, chrome, vermilion, yellow ochre, sulphur, caoutchouc, gypsum, or resin, care being taken to use such sub- stances only as are not affected by the heat necessary in the operation. The incorporation is conducted with great nicety, as at the will of the operator a soft and elastic or a hard and horny substance can be produced. When sufficiently masticated, the gutta is placed whilst still hot between two steel cylinders, and thoroughly rolled. By means of an endless band of felt the gutta is returned again to the cylinders, the distance between which is gradually diminished so as to compress and completely drive out any contained air from the gutta percha. There are various machines for cutting driving bands, &c., to a uniform width, and for rounding off the cdges and

finishing. Soles for boots are made by cutting a long strip of the requisite width, and then passing the strip under a hollow die.

In making piping a machine is used consisting of a cylinder, with a die-piece attached of tlie requisite size. By means of a piston the gutta percha, which is introduced into the cylinder in a plastic con- dition, is driven through the dic-piece, and the piston gives the inner diameter of the piping. As the piping issues from the machine, it passes immediately into a trough of water, which "sets" it, and prevents it from collapsing. The value of gutta percha piping 1s very great: it does not contaminate water as lead piping does; it withstands insects, damp, &c., and is easily manipulated, being shortened, lengthened, or repaired without trouble or expense ; and its acoustic properties have led to its employment largely in the manufacture of aural, stethoscopical, and other instruments. Gutta percha speaking -tubes are now to be seen in nearly every office. The substance too, from the fact that few acids and alkalies affect it, especially if dilute, is largely employed for funnels, siphons, and other chemical apparatus.

In telegraphy gutta percha is of the very highest importance, being a cheap, lasting, and powerful insulator, easily applied to telegraphie wires. The general method of coating telegraphie wire is by charging a cylinder with plastic gutta pereha, and forcing It through a die-piece, the wire forming a central core. As the wire

gh this "die" or "moulding"' piece, it becomes coated to the requisite thickness, and after passing through water it Is wound on drums ready to be eoated with tarred rope, and with galvanized iron wire if required for submarine eables,

_ The readiness with which gutta percha, whilst in its plastic con- dition, receives an impression, which it retains when cold, early led to its employment in the decorative and fiue arts, since it repro- duces the finest lines, as in the taking of moulds from electrotypes. See ELECTROMETALLURGY.

In the production of imitations of oak and other ornamental woods, gutta percha has been largely used, since by the admixture of various substances " graining" or ' marbling" can be ver naturally represented, and a coating of a solution of gutta percha gives a varnish of great brilliancy.

Substitutes. —Many substances have been recommended as sulsti- tutes for, or as supplementary to, gutta percha. Among these Balata gum undoubtedly holds the first place. It is obtained from the Mimusops Balata (Girtner), a tree found in British and French Guiana, Jamaica, &c. Prof. Bleekrod seems to have been the first to direct attention to this substance, by bringing it before the notice of the Socicty of Arts in 1857.1 The Balata gum combines in some degrce the elasticity of caoutchouc with the ductility of gutta percha, freely softening and becoming plastic, and being easily moulded like gutta percha, What small parcels have been sent to England have met with a ready sale, and were remarkably pure and free from adulteration. But unfortunately, through the diffi- culty of collection, the occupation being dangerous and unhealthy, the supply of this excellent article has fallen off. It is procured by making incisions in the bark of the tree about 7 feet from the ground, a ring of elay being placed around to catch the milk as it exudes.

Many of the euphorbias yield milky juices which have some at least of the properties of gutta percha. The chief amongst these are the cattimandoo (Euphorbia Cattimandoo, Elliot) and the Indian spurge tree (EZ. Tirucalli, Linn.) of India, and some euphorbias at the Cape of Good Hope. The alstonia or pala gum (Alstonia scho- laris, RK. Br.) and the mudar gum (Calatropis gigantca, R. Br.), have also been recommended as substitutes for gutta percha. But the at- tempts made to utilize these substances have as yet been unsuccessful.

Future Supplics.—A very important matter for consideration is the question of the future supplies of gutta percha. It is after all only a spontaneous natural product. If a Malay or Chinese wishes to plant pepper, gambier, &c., he burns down a portion of the forest, and when he has raised two or three crops he clears a new portion, and thus finely wooded spots become denuded of trees, and covered with rank grass rendering them unfit for further cultivation. Again, to obtain the gutta percha the trees are cut down,

and none are planted in their stead, so that in districts where they were in abundance one or two only are now preserved as curiosities. It is a wonder indeed that a single tree is left. A writer inthe Sarawak Gazette says that from 1854 to 1875 over 90,000 picnls (of 133} tb each) of gutta percha was exported from Sarawak alone, and this meant the death of at least 3,000,000 trees. In fact the only thing that preserves the tree at all is that it is of no use to cut one down till it is 25 to 30 years old. Sooner or later recourse must be had to cultivation and conservation. (J. CO.)

GUTZKOW, Kart (1811-1878), one of the most dis- tinguished of modern German novelists and dramatists, was born 17th March 1811 at Berlin, where his father held a clerkship in the war office. After completing his education at the Friedrichswerder gymnasium, he entered upon the study of theology and philosophy at the university of his native town, where, having had his interest awakened by the political and social questions of the time by the Paris revolution of July 1830, he, while still a student, began his chequered literary career by the publication in 1831 of a periodical entitled Yorum der Journalliteratur. Although, as was to be expected, the serial was a failure and was soon discontinued, it procured for him the notice of Wolfgang Menzel, who invited him to Stuttgart to assist him in the editorship of the Literaturblatt. At the same time he continued his university studies, first at Jena, then at Heidelberg, and latterly at Munich. In 1832 he published

anonymously at Hamburg Briefe eines Narren an eine

1 Journ. Soc. Arts, Oct.8,1857; also Aug. 24,1860, and March 4,1864, 2 Trinidad Chronicle, Sept, 2, 1873,

Narrin, and in 1838 appeared at Stuttgart Maha-Guru, Geschichte eines Gottes, a fantastic and satirical romance intended to ridicule the current conceptions of the divine. In 1835, on account of a difference with Menzel, he discon- tinued his contributions to the Zzteraturblatt, and went to Frankfort, where he became collaburateur with Duller on the Phéniz, and also founded the Deutsche Revue. In the same year appeared Wally, die Zweiflerin, from the publication of which may be said to date the school of

writers wlio, from their opposition not only to Romanticism but to all the time-honoured literary, social, and religious traditions, have received the name of " Young Germany." The work was directed specially against the institution of marriage and the belief in revelation; and whatever attention it might have attracted from its own merits was tenfold increased by the action of the Government, which, besides condemning its author to three months' imprisonment, decreed the suppression of all he had written or might yet write, and prohibited him from exercising the functions of editor within the states of the Bund. During his term of imprisonment Gutzkow employed himself in the composition of his treatise Zur philosophie der Geschichte, published at Hamburg in 1836, in which he opposed the Hegelian theory as to the nature and ends of history. On obtaining his freedom he went to Frankfort, where, shortly afterwards, he was married, and where he wrote several volumes on various subjects which he published at Hamburg and Stuttgart ; but finding himself hampered in his literary undertakings by the prohibitions of the Prussian Govern- ment, he removed in 1837 to Hamburg. Here he inaugur-

ated a new epoch of his literary activity by bringing out |

his tragedy Richard Savage, which immediately made the round of all the German theatres, and first decidedly won the ear of Germany for the modern drama. Of his numern- ous othes plays the majority are now neglected; but a few have obtained an established place in the repertory of the German theatre, especially the comedies Zopf und Schwert (1844) and Das Urbild des Tarttiffe (1847), and the tragedy Uriel Acosta (1847); the deep tragic interest, fine dramatic situations, and terse and pregnant diction of the last entitle it to rank among the best- dramas of modern times. In 1842 Gutzkow paid a visit to Paris, of which he gave an account in Briefe aus Paris (Leipsic, 1842). After his return to Germany he resumed his stay at Frankfort, where he was chiefly occupied in preparing for the press an edition of his collected works, published in 12 volumes, 1845-46 ; but in 1847 he went to Dresden, where he suc- ceeded Tieck as director of the court theatre. same time began that period of his literary activity to which belongs thé series of remarkable works of fiction intended to depict the action and tendency of the principal intellectual, social, and religious forces in modern society. The chief of these novels are Die Litter vom Geiste (9

vols., Leipsic, 1850-52) and Der Zauberer von Rom (9 vols., Leipsic, 1859-61). The latter, a study of Roman Catholic life in southern Germany, is generally regarded as his masterpiece ; and its vigorous and trenchant delineations of character are not more notable than its keen analysis of the motives underlying religious professions, and its subtle penetration into the characteristics and tendencies of the various forms of religious opinion. In regard, however, to both works, it may be objected that their great length, their somewhat tedious dallying over unimportant details, the intricate nature of their plots, and the hampering influence of their controversial purpose lessen considerably the legitimate effect of their many striking and original character portraits, their skilfully arranged dialogues and frequently powerfully dramatic scenes, and the cunning manner in which their incidents are blended into one whole. The success of Die fitter vom Geiste suggested to Gutzkow the establishment

of a journal on the model of Dickens's Household Words, entitled Unterhaltungen am hduslichen Herd, which first appeared in 1852, and was continued till 1862. In 1864 he had an attack of insanity, during which he made an attempt upon his life; and although after his recovery he continued to write as voluminously as formerly, his produc- tions slow henceforth decided traces of failing powers. To this period belong the historical novels Hohenschwangau (5 vols, 1868) and /ritz Lllrodt (3 vols. 1872); Lebenbilder (3 vols. 1870-72), consisting of autobiographic sketches ; and Die Séhne Pestalozzis (3 vols. 1870), the plot of which is founded on the story of Kaspar Hauser. On account of a return of his nervous malady, Gutzkow in 1873 made a journey to Italy, and on his return took up his residence in the country near Heidelberg. Although some time before his death he had been confined to his sick chamber at Frankfort, its occurrence, 16th December 1878, was due to accidental suffocation from smoke.

The writings of Gutzkow suffer in character from the controversy which embittered his life. His didactic purpose was too strong to allow his fine artistic faculty full freedom of action, and notwithstanding his true dramatic

insight, firm grasp of character, rich vein of original thought, and wonderful comprehension of the principles at work in modern society, he did not possess that command of his materials which is necessary to mould them into poetic com- pleteness. But although his popularity has not been com- mensurate even with his merits, no recent writer has ex- erted a more powerful influence on the opinions of modern Germany ; and if his works are not destined to live by virtue of their inherent value, many of them will always be of interest as the mirror in which the intellectual and social struggles of his time are best reflected.

An edition of Gutzkow's collected works appeared at Jena, 1873- 76. Since his death the issue of a popular edition has been under- taken, the first volume of which, containing the autobiography of his boyhood and his miscellaneous poems, has already appeared. His Riickblicke auf mein Leben, published in 1875, deals specially with that period of his life when he was director of the Dresden theatre. A complete biography by Johannes Proelss is now in pro- cess of preparation.

GUTZLAFF, Kart Frieprich Auveust (1803-1851), a missionary to China, was born at Pyritz in Pomerania, 8th July 1803. At an early age he cherished a strong desire to become a foreign missionary, but the poverty of his parents made it impossible for them to aid him in attaining his wishes, and he became apprentice to a saddler in Stettin. In 1821, however, he made known his inclin- ation to the king of Prussia, through whom he obtained admission to the Pidagogium at Halle, and afterwards to the mission institute of Jinike in Berlin. In 1826, under the auspices of the Netherlands Missionary Society, he went to Batavia, where by intercourse with the Chinese residents he perfected himself in the Chinese language. He, however, severed his connexion with the Netherlands Society in 1828, and went to Singapore; and in August of the same year he removed to Bangkok, the capital of Siam, where he occupied himself with translating the Bible into Siamese. In 1829 he married an English lady, who aided him in the preparation of a dictionary of Cochin China, but she died in August 1831 before its completion. Shortly after her death he sailed to Macao in China, where, and subse- quently at Hong Kong, he worked at a translation of the Bible into Chinese, published a Chinese monthly magazine, and wrote in Chinese various books on subjects of useful knowledge. He also at

different times undertook voyages on the coast of China, and in 1834 he published at London an account of them under the title Journal of Three Voyages along the Coast of China in 1831, 1832, and 1833. He was appointed in 1835 joint Chinese secretary to the English commission, and during the opium war and the negotiations

connected with the peace that followed he rendered valuable service by his knowledge of the country and people. On account of the continued refusal of the Chinese authorities to permit foreigners to penetrate into the interior, Giitzlaff in 1844 founded an institute for the training of native missionaries, which was so successful that during the first four years as many as forty-eight Chinese were sent out from it to carry on missionary labours among their fellow- countrymen. He died at Hong Kong, August 9, 1851,

Besides the works already mentioned, Giitzlaff is the author of A Sketch of Chinese History, Ancient and Modern, London, 1834; and a similar work published in German at Stuttgart in 1847 ; China Opened, 1838 ; and the Life of Taow-Kwang, 1851 (German edition published at Leipsic in 1852), A complete collection of his Chinese writings is contained in the library at Munich.

GUY, Tuomas (1644-1724), founder of Guy's Hospital, London, was the son of a lighterman and coal-dealer at Southwark, After serving an apprenticeship of eight years with a bookseller, he in 1668 began business on his own account. He dealt largely in Bibles, which had for many years been poorly and incorrectly printed in England. These he at first imported from Holland, but subsequently obtained from the university of Oxford the privilege of printing. Thus, and by an extremely thrifty mode of life, and more particularly by investment in Government securities, the subscription of these into the South Sea Company, and the subsequent sale of his stock in 1720, he became master of an immense fortune. He died un- married, Deeember 17, 1724. In 1707 he built three wards of St Thomas's Hospital, which institution lie other- wise subsequently benefited; and at a cost of £18,793, 16s. he erected Guy's Hospital, leaving for its endowment £219,499 ; he also endowed Christ's Hospital with £400 a year, aud in 1705 built almshouses at Tamworth, his mother's birthplace, which was

represented by him in parliament. The residue of his estate, which went to distant relatives, amounted to about £80,000.

See A True Copy of the Last Will and Testament of Thomas Guy, Esq., London, 1725; J. Noorthouck, A New Hist. of London, bk. iii., chap. i., p. 684, 1773; Nichols, Literary Ancedotes, vol. iii. p- 599, 1812 ; and Charles Knight, Shadows of the Old Booksellers, pp. 3-23, 1865.

GUY OF WARWICK, an old English metrical romance which is known to have existed in French as early as the end of the 13th century. Its authorship has been assigned to Walter of Exeter, a Franciscan monk of the 13th century, and, although this supposition has been generally disputed, Tanner regards it as probable. The romance has been retouched by some French or Anglo-Norman minstrel, but is evidently of Saxon origin, and is allied to the story of Guido Tyrius in the Gesta Romanorum, and probably to the romance Sir Guy, quoted by Chaucer in his Rime of Sir Topas. The hero of the story is Sir Guy of Warwick, who is said to have been the son of Siward, baron of Wallingford, to have married Felicia, the only daughter of Rohand, a famous Saxon warrior, to have become earl of Warwick in his wife's right, and after conquering Colbrond the Dane to have lived as a hermit till his death in 929. The earliest English chronicler who mentions the story as historical is John Harding. Tanner is of opinion that the _ first germ of the romance dates from the battle of Brunan- burgh, the "Vinheide" of the Zgilssaga, but though the story has some basis in tradition, the chief events of the hero's life are plainly mythical. Although the romance had once great popularity, it now appears dull and tedious, and has no other than an antiquarian interest.

An edition of the romance in French prose appeared at Paris in 1525 printed by Anthoine Couteau, and it is also referred to in the Old Spanish romance, J'erente el Blanco, written about 1430. The earliest English edition is that without date printed at London by William Copland, who died in 1568 or 1569. There exist also an edition printed at London by John Cawood without date, another by Samuel Rowlands in 1667, and three by C. Bates in 1700. The

earliest English manuscript of the romance is that contained in the Auchinleck MS. in the Advocates' Library, Edinburgh, which is, however, imperfect at the commencement and in the middle. It was printed for the Abbotsford Club in 1840. There is a perfect copy in the library of Caius College, Cambridge, and another in the Cambridge University Library. A fragment of the romance, from a MS. in the British Museum, was privately printed by Sir Thomas Philipps, 1838, and the same fragment was reprinted in the Abbotsford edition, The manuscript in the University Library, Cambridge, was printed for the first time in the Romance of Guy of Warwick, edited for the early English Text Society by Zupitza, 1875. All these English versions appear to have been translated from the Anglo-French version. There are, according to Zupitza, at least eight French MSS. in existence,—three in London, one at Oxford, two at Cambridge, one at Cheltenham, and one at Wolfenbiittel. There is also a copy in the Imperial Library of Paris ; and there was one at Bruges in 1467, and one at Brussels in 1487, A portion of the Wolfenbiittel MS. has been edited by G. A. Herbing in the Programm der grosscn Stadtschule zw Wismar als Einladung zur Michaelisprifung, 1872. See also Zupitza, Zur Litcratur- geschichte von Guy von Warwick, 18138; The Percy Folio MS., edited by Hales and Furnivall, vol. ii; and A. Tanner, Die Sage von Guy von Warwick, 1877.

GUYON, or Guion, JEANNE Marie Bouvirres DE LA Mortue (1648-1717), a leading exponent of the quietistic mysticism of the 17th century, was born of wealthy and aristocratic parents at Montargis (dep. Loiret), on the 13th of April 1648. From infancy a sickly and excitable child, she was at the age of two years and a half placed for a short time under the charge of the Ursuline nuns of Montargis, and in 1652 she became resident in the Benedictine convent for a somewhat longer period ; but the state of her health rendered it necessary that she should again be taken home, where fora time she was left almost exclusively to the care of domestics. From her seventh to her tenth year she was once more with the Ursulines, and after another short interval at home she next passed eight months in the Dominican cloister, where she spent much time in reading the Bible, and in committing large portions of it to memory. In her 12th year she communicated for the first time, and also began to form some acquaintance with the writings of St Francis de Sales and of his disciple Madanie de Chantal, 'la Sainte de Monthélon." In imitation of the latter, she tells us in

her autobiography that she at this time carried the name of the Saviour visibly inscribed on her person, subjected herself to severe bodily austerities, and made a solemn vow ever to aim at the highest perfection in an absolute surrender of her will to God. She earnestly wished also to take the veil, and in fact made an attempt, by means of a forged letter purporting to be signed by her mother, to gain admission into the order of the Visitation of Mary, but her father interfered. In 1663 she removed along with her parents to Paris, and went much into society, where her youth, beauty, and talent secured for her a very flattering reception; in the following year, before she was quite sixteen, she was married to M. Guyon, a man of some wealth and position, but of weak health, and twenty-two years lier senior. The union, on her side at least, had not been dictated by love; her husband's affection, though probably genuine enough, appears to have been of a some- what tepid kind; and disparity of age, as well as wide differences of taste and habit between herself and M. Guyon, combiued with other circumstances, such as the jealousy of her mother-in-law, and her own eager temper, to make her married life anything but happy. She " began to eat the bread of sorrow aud to mingle her drink with tears," and her lonely and desolate heart was not comforted until it found quiet in God. It was in her twenty-first year, on the 22d of July 1668, she tells us, that, after much reading of Thomas a Kempis, St Francis de Sales, and other religious writers, much spiritual couversation with those who knew best about the mysteries of the "inner life" and the happiness of the state of "recollection in God," much groping in deep darkness, and much wrestling in agonized

prayer, she at last experienced the change of heart which filled her with joy and peace in the life of faith. The words in which she describes that crisis, if indeed they are not coloured by later experiences, are interesting and important, as showing that thus early she had already reached all that was distinctive of her quietism. "' Nothing was more easy to me now than to practise prayer. Hours passed away like moments, while I could hardly do any- thing else but pray. The fervency of my love allowed me no intermission. It was a prayer of rejoicing and of pos- session, wherein the taste of God was so great, so pure, unblended, and uninterrupted, that it drew and absorbed the powers of the soul into a profound recollection, a

state of confiding and affectionate rest in God, existing without intellectual effort. For I had now no sight but of Jesus Christ alone. All else was excluded in order to love with greater purity and energy, without any motives or reasons for loving which were of a selfish nature." In the months and years that followed she learned by much experience how difficult it is to keep even such heights as the soul has already gained; but her aim, ever more clearly seen and more steadily followed, continued to be "entire consecra- tion," "perfect faith and love." Amongst those who were helpful to her during this period was Genevitve Granger, the prioress of a Benedictine community in Paris, under whose influence she, on July 22 (St Mary Magdalene's day), 1672, drew up a solemn act of consecration, sealed with her ring and signed with her blood, in which she surrendered herself to Christ as His spouse, accepting as a part of her marriage portion " the temptations and sorrows, the crosses and the contempt, which fell to Him." In the beginning of 1674 she passed into a state of "privation" or " desola- tion," which she considers to have continued with but slight variations for somewhat more than six years ; during the whole of this period, however, she had the benefit of the spiritual direction of Bertot, a kindred spirit, whose mystical writings she afterwards edited. On the 21st of July 1676 she was left a widow, with three surviving children,—two sons and an infant daughter,—and began to live a life of still deeper seclusion and isolation than before, interesting herself, however, in works of charity, and in the education of her family ; in connexion with the latter occupation she commenced and made some progress in the study of Latin. Her temptations and crosses continued nevertheless to multiply ; she began to lose hope, and to regard herself as wholly forsaken by God; in her deep despondency she began to correspond with Francis de la Combe, superior of the Barnabites at Thonon, Savoy, with whom she had ten years before become acquainted, and in whom she had even then recognized a sympathizing spirit. On the 22d of July 1680 she tells us her soul was delivered from all its pains. ' From the time of the first letter from Father La Combe, I began to recover a new life. I was then, indeed, only like a dead person raised up, who is in the beginning of his restoration, and is raised up to a life of hope rather than of actual possession ; but on this day I was restored, as it were, to perfect life and set wholly at liberty. I was no longer depressed, no longer borne down under the burden of sorrow. I had thought God lost, and lost for ever; but I found Him again. And He returned to me

with unspeakable magnificence and purity. In a wonderful manner, difficult to explain, all that which had been taken from me was not only restored, but restored with increase and with new advantages." In this changed state of feeling she began to revolve new plans for the disposal of the remainder of her earthly life. She for some time thought of winding up her worldly affairs and taking the veil; but her duty towards her children, especially the two younger, seemed to prohibit that step. Several proposals of marriage were also received, but re-

jected. Gradually, in the course of 1681, she had almost, though with hesitation, reached the conclusion that she was called to active religious work, and the field to which inward intimations seemed to point was that part of France and Savoy which borders on Geneva, if not Geneva itself. The advice of D'Aranthon, titular bishop of Geneva, was asked and obtained ; he approved of the proposal. After making some important arrangements with regard to ler property, and entrusting her two sons to tlie care of suitable guardians, she accordingly secretly left Paris accompanied only by three female attendants and her daughter, then a child of five years of age. The party arrived at Annecy on the 21st of July ; on the following day, at the tomb of St Francis de Sales, Madame Guyon renewed her spiritual marriage with the Redeemer ; and finally she fixed her abode at Gex under the spiritual care of D'Aranthon, by whom La Combe was assigned to her as her director in the place of Bertot, who had died some time before. Here she at once began her benevolent labours, tending the sick and poor, praying with them and giving them religious instruc- tion ; yet still it seemed to her as if the "seal of her mission was not yet broken." Something within her whispered that she had not yet found the great and special work to which God had been calling her. Amongst other things the state of her director caused her much solicitude. She saw that he had much, but felt that he ought to have more. Her vocation at last was revealed to her, to become to him a spiritual mother, and her efforts towards the fulfil- ment of that vocation were not in vain; La Combe at last became possessed with the doctrine of present sanctification by faith in the Saviour, and began to preach accordingly. Opposition and persecution almost immediately began ; Bishop D'Aranthon did not fail to take notice of the new doctrine, though on this occasion it escaped formal con- demnation by the authorities at Rome; seeing, however, that Madame Guyon was the real author of the

heresy, if heresy it was (and it certainly seemed to involve a theory of perfec- tionism hardly compatible with Catholicism), he resolved that she should not continue her activities within his diocese unless she should consent to accept a sphere where the facilities for doctrinal propagandism would be less than those for the exercise of ordinary benevolence. He accord- ingly proposed that she should give what property still remained within her control to a religious house at Gex, and that she should herself become prioress ; this proposal, how- ever, she declined, chiefly on the general ground that it did not seem to be in accordance with the designs of God in regard to her. The alienation of the bishop now made her stay at Gex to be far from comfortable ; and accordingly, at the close of a residence of rather more than six months, she removed early in 1682 to Thonon, apparently in the expectation of being near her adviser La Combe. Here she remained for upwards of two years, engaged in religious work of various kinds, especially in spiritual conversation with the people of the neighbourhood, and in tending a small hospital which, at the suggestion of her director and with the assistance of some benevolent ladies of Thonon, she had formed. Meanwhile her doctrines of 'pure love" and of that "'fixed state" which consists in the complete identifi- cation of the human will with the will of God were taking more definite shape; and in 1683 they first found literary expression in Les Torrens, probably the best of her writings, and really in some respects a fine performance, which describes the progress of the soul from the commencement of its inward life to its union with God, by a reference to "streams or torrents flowing from the mountain tops with greater or less rapidity and with greater or less directness, and mingling at last in the ocean." Although Madame Guyon was not herself conscious of any disharmony with the teaching and practice of the Catholic Church, her

doctrines could hardly fail to be regarded by the ordinary orthodoxy of that time as more or less hostile to the gene- rally accepted views as to the nature and mode of sancti- fication, and as to the normal state of the graciously re- newed heart ; at Thonon they soon gave deep offence, and ultimately it was intimated both to her and to La Combe, on the part of Bishop D'Aranthon, that both must leave the diocese. Her next resting

place for a few weeks was Turin, whence, in the autumn of 1684, she removed to Grenoble, where she again became a centre of attraction and influence. Here, for the direction of the many who flocked to her for instruction and advice, she wrote and circulated her Moyen court et trés facile de faire oraison, a treatise in which she pointed out, doubtless in a manner highly susceptible of misconstruction, that prayer might often well be both silent and wordless. The commencement of her commentaries on the Bible also dates from this stay in Grenoble. Her numerous and popular "conférences" or meetings for con- versation and prayer or "self-recollection in God," and the eftect produced by the Moyen court de faire oraison, how- ever, speedily excited ecclesiastical opposition similar to that which she had already encountered at Gex, and although the bishop (Camus) was himself disposed to be tolerant, if not friendly, she was ultimately constrained, in the spring of 1686, to yield to strong representations, and seek an abode elsewhere. Nice, Genoa, and Vercelli (where she again met La Combe) were visited in turn; but it was finally resolved, with the advice and concurrence of her friends, that Paris now offered itself as the field of labour most suited to her powers. Here accordingly she arrived on the 22d of July 1686, and soon she and her teaching began to meet with a very favourable reception in the higher circles of society. But meanwhile the doctrine of Molinos and the Guida Spirituale had been formally condemned by the Inquisition at Rome, and the sentence had been taken up as a signal, especially in France, for the persecution of all suspected quietists. In October 1687 LaCombe was suddenly arrested by a royal "'lettre de cachet " and committed to the Bastile i. and by the same authority Madame Guyon herself was, three months later (29th January 1688), ordered to be detained as a prisoner in the convent of St Marie in the Faubourg Sainte Antoine. The charges brought against her were the maintenance of heretical opinions; the holding of private religious assemblies, contrary to the practice and rules of the Catholic Church, for the spread of these opinions ; the publication of a dangerous book containing opinions similar to those of the Spiritual Guide of Molinos Z and correspondence with Molinos. These, however, were not destined to come toa definite issue, for through influence which friends succeeded in bringing to bear upon Madame de Maintenon a release was obtained in the following October. Madame Guyon now went to live for the most part with her daughter, who had become the Comtesse de Vaux, at the

family seat in the neighbourhood of Paris ; but while on a visit with the duchess of Charost she became acquainted with Fénelon, and a considerable correspondence began. Her influence continuing to make itself felt at Paris, Dijon, Versailles, and other places, especially in the institution of St Cyr, founded by Madame de Maintenon in 1686, the attention of theologians was drawn afresh to the "new spirituality," as it was called; and among others both the Port-Royalist Nicole and Bossuet, bishop of Meaux, sought personal interviews. The latter, to whom she had submitted not only all her printed works but also the manuscript of an autobiography which she had written when in confinement in 1688, after more than one long conference, is understood to have expressed himself as on the whole satisfied of her orthodoxy ; but the publication by Nicole of the Réfutation des principales Erreurs des Quietistes appears to have had an exciting influence on the

public mind; rumours prejudicial not only to the orthodoxy of Madam Guyon's faith, but also to the purity of her life, were industriously spread, and caused great scandal in the highest quarters, so that at last she was constrained to write to Madame de Maintenon requesting that a number of suitable persons might be selected for the purpose of judg- ing both of her doctrine and her morals, and offering at the same time to submit to any degree of confinement and restraint until it should please the king to appoint such persons. A commission was duly nominated, consisting of Bossuet, Bishop (afterwards Cardinal) De N oailles, and Tronson, the superior of St Sulpice. To this tribunal she at their request submitted the Moyen Court, Les Torrens, and the manuscripts of her commentaries along with her autobio- graphy, to which she added her Justification. The outcome of many deliberations, extending over some months, was the preparation of twenty-four articles, usually called the 'Articles of Issy," relating to the doctrine of ' pure love." Her refusal to sign a "condemnation of religious errors," as drawn up and presented to her by Bossuet in a pastoral ordinance and letter, now led to an open rupture which resulted in her reimprisonment, on this occasion at Vin- cennes, on the 27th of December 1695. Bossuet now set himself to prepare his Znstruction sur les états d'oraison, which he submitted before publication

to De Noailles, and, amongst others, to Fénelon for approval, The latter after reading the manuscript withheld his imprimatur, not on account of its doctrine (with which he did not disagree), but on account of its personalities, which he held to be uncalled for and unjust. Almost forced thus into the position of a champion of Madame Guyon, he published in 1697 his Maximes des Saintes, a statement of the leading principles Jaid down by approved writers on the subject of the higher inward experience and of holy living. In the course of the controversy which followed several important works appeared, which can only be alluded to here; the dispute, as is well known, issued in th formal condemnation of Fénclon (12th March 1699), in which achievement the hostility to Madame Guyon seems to have almost exhausted itself. She was not released, however, until 1702, in which year she was banished to Blois, where the remainder of her life was spent, Numbers of persons of all ranks, and many of them from foreign countries, visited her in this retirement ; and both in correspondence and conversation she continued to manifest considerable activity, although feeling herself "called on to glorify God by submission and by private prayer, rather than by active labours." She heard mass daily, received the sacrament every alternate day, and died in full communion with the Roman Catholic Church, after an illness of three months, on the 9th of June 1717.

La Vie de Madame de la Mothe Guyon, écrite par elle-méme, first appeared at Cologne in 1720. It is based upon the autobiography which at the instance of La Combe she is known to have written during her imprisonment in 1688; it afterwards received addi- tions and corrections from her own hands, and was finally entrusted to a confidential friend on the understanding that it should not be published until after her death. In addition to Les Torrens Spirituels, and the Moyen court ct trés facile de Saire oraison, which were published in the Opuscules Spirituels in 1704, there appeared in her lifetime the Poésics Spirituelics (1689); and La Bible, traduite en francais, avec des Explications et des Réflexions qui regardent la Vie Intérieure (1715). There are also several volumes of Lettres Chrétiennes ct Sptrituclles, addressed by her to Metter- nich, Fénelon, and other correspondents, many of them distin- euished. The edition of the collected @uvres extends to 40 vols. (1767-1791). English and German translations of the various works are numerous. Apart from the Autobiography, the only memoir of Madame Guyon as yet in existence, is

the diffusé but somewhat vague and meagre Lae, by Thomas C. Upham (1854). (J. 8. BL.)

GUYTON DE MORVEAU, Louis Bernarp, Baron (1737-1816), a distinguished French chemist, was born January 4, 1737, at Dijon, in the university of which town his father was professor of civil law. As a boy

he evinced a remarkable aptitude for practical mechanics. On leaving college at the age of sixteen he became a law student in the university of Dijon, and after three years he was sent to Paris to acquire a knowledge of practice at the bar. He obtained in his twenty-fourth year the office of advocate-general in the parliament of Dijon, of which he fulfilled the duties till 1782. Before long, piqued by a slighting remark of Dr Chardenon of Dijon, made in reply to a criticism at the close of a lecture on chemistry, De Morveau set himself to acquire a thorough knowledge of that science. With " practice for his master, and melted crucibles and retorts for tutors," as he once observed to Baumé, he speedily obtained such a mastery over his subject as to draw from Chardenon the public acknowledgment that he was "born to be an honour to chemistry." In 1772 he published at Dijon the Dagres- sions Académiques, in which were set forth his views with respect to phlogiston and the phenomena of crystallization ; and in 1773 he discovered the efficacy of hydrochloric acid gas as an atmospheric disinfectant.) He was the means, in 1774, of founding in Dijon courses of public lectures on mineralogy, materia medica, and chemistry, the last of which he himself during thirteen years gratuitously delivered. It would appear that his fellow-citizens were as yet far from holding exalted views with regard to the pre- rogatives of science. Accusing him of " presumptuously disarming the hand of the Supreme Being," they about this time sought to destroy his lightning conductors at the house of the academy, and were restrained from carrying out their intentions only by the assurance of M. Maret, the secretary of that institution, "that the astonishing virtue of the apparatus resided in the gilded point, which had purposely been seut from Rome by the Holy Father." In 1777-78 appeared the Elémens de Chymie Théorique et Pratique (3 vols. 12mo) of De

Morveau, Maret, and Durande, a work highly appreciated by their contemporaries. The chemical articles in vol. i. of the section "'Chymie, Pharmacie, et Metallurgie" of the Encyclopédie Méthodique (1786), as also some few of those of vol. i. (1792), were from the pen of De Morveau. Of these the longest is a masterly exposition of the facts and conclusions that had up to that time been arrived at by chemists on the subject of acids.

De Morveau's first essay on a new chemical nomenclature, the origin of the present system, was published in the Journal de Physique for May 1782, and was the subject of much adverse criticism. Repairing to Paris, the author successfully met the objections of his opponents; and in 1787, in conjunction with Lavoisier, Berthollet, and Fourcroy, he published A/éthode dune Nomenclature Chimique, the principles of which were speedily adopted by chemists throughout Europe. Constantly in communi- cation with the leaders of the Lavoisierian school of chemistry in Paris, which he frequently visited, De Morveau soon became convinced of the untenableness of the old phlogistic doctrines, his reasons for renouncing which are stated in his volume of the Encyclopédie Méthodique, p. 625, sqq. With Lavoisier, Laplace, Monge, Berthollet, and

1 Various French biographical works attribute to De Morveau, in 1773, the discovery of the efficacy of acid vapours in destroying con- tagious miasma. W. Boraston, however, had already in 1630 re- marked—" All acetosus and sower things doe so close the powers, and passages of the humours, that no venemons ayre can enter therein as by experience I have often found" (A Necessarie and Briefe Treatise of the Contagious Disease of the Pestilence, pp. 11, 12); and Dr George Thomson had in 1666 described how, preparing for the " dissection of a pestilent body,"' he got in readiness "a porringer containing Sulphur to burn under the Corps," and how, suspecting the entry into his hand during the operation of "'slie, insinuating, venemous Atoms," or, in modern phrase, septic germs, he sought to nullify their effects by holding the hand in the gas of burning brimstone (AOIMOTOMIA or the Pest Anatomized, pp. 71 and 77-79).

Fourcroy, he in 1788 produced a French translation of Kirwan's Essay on Phlogiston, with annotations effectually disposing of the author's arguments

against the new chemistry. The first manufactory of carbonate of soda in France was established by De Morveau in1783, In 1791 he represented the department of Cote d'Or in the Legis- lative Assembly, and next year in the National Convention, of which he was re-elected a member in 1795, Having already become famous for aeronautical experiments at Dijon in 1783-84, he was appointed in 1794 to superintend the construction of balloons for military purposes (see AERO- nautics, vol. i. p. 199). About the same time he rendered important service to his country by perfecting the processes for the manufacture of gunpowder and saltpetre. In 1796 De Morveau was made a member of the Institute. He retired from political life in 1797, and in 1798 became provisional director of the Polytechnic School, in the foun- dation of which he had been actively concerned. He held during 1800-14 the appointment of master of the mint, received in 1803 the cross of the legion of honour, and was made in 1805 an officer of the same order, and in 1811 a baron of the French empire. He died January 2, 1816.

Besides the above mentioned and other works, and numerous scientific papers in the Collection académique de Dijon, the Journ. de Physique, Journ. de I'Ecole Polytechnique, Mém. de V Institut, Journ. des Savants, Bull. des Sci. de la Soc. Philomatique, and Ann. de Chimie, to which last he was one of the principal contributors, De Morveau wrote—Mémoire sur Védueation publique, 1762; a satiri- cal poem entitled Le Rat Iconoclaste, ow le Jésuite croqué, 1763 ; Discours publics et Eloges, 1775-82 ; Plaidoyers sur plusicurs ques- tions de droit, 1785; Traité des moyens de désinfecter Pair, 1801, &e.; Rapport fait a l'Institut sur la restauration du tableaw de Raphaél connu sous le nom de la Vierge de Foligno (with Vincent, Tannay, and Berthollet), 1802; Além. sur Ics morticrs, &c., 1805 ; various governmental reports; and translations, with notes, of treatises by Bergman, Scheele, and Black.

See Berthollet, " Discours," Inst. R. de France, Funérailles, &c., 1816; A. B. Granville, An Account of the Life and Writings of Baron Guyton de Morveau, F.R.S., 1817; T. Thomson, Hist. of Chemistry, ii. 1831; Biog. Univ. et Portative des Con- temporains, iii. p. 701, 1834; and CHEMISTRY, vol. v. pp. 464, 466. (F. H. B.)

GUZERAT or GusarAt, the name given to the northern seaboard of the Bombay Presidency, extending from 20° to 24° 45' N. lat., and from 69° to 74° 20' E. long. It is to the northern part of the presidency what the Konkan is to the south, and is bounded on the N. by Rajputdna, on the E. by the spurs of the Vindhya and Satpura ranges, on the S. by the Konkan, and on the W. by the sea. On the mainland it comprises the British districts of Surat, Broach, Kaira, Panch Mahdls, and Ahmedabad, with a total area of 10,082 square miles, and a population (1872) of 2,810,522 ; together with the great but scattered territories of the Gaik- war of Baroda, and also the native states of the Mahi Kanta and Rewa Kanta agencies, Palanpur, Radhanpur, Balasinor, Cambay, Dang, Chaurar, Bansda, Peint, Dharampur, Tharad, Sachin, Wasravi, &c. The term Guzerat is some- times employed to include the peninsula of Kathiawar, with its 180 petty states. The total area, inclusive of the penin- sula of Kathidwar, is 41,536 square miles. For an account of the history, geography, é&c., of Guzerat, see the articles on the various states and districts. Guzerat gives its name to the vernacular of northern Bombay, viz., Gujardthi, one of the three great languages of that presidency.

GUZMICS, Izrpér (1786-1839), Hungarian theologian and scholar, was born 7th April 1786 at Vaémos-Csalad, in the county of Sopron. His early education was con- ducted at Készeg (Giins), Szombathely (Stein-am-Anger), and Sopron (Oedenburg) ; in the last-mentioned town he was instructed in the art of poetry by Paul Horvath. On the 28th October 1805 he entered the Benedictine order, but left it on the 30th August of the following year. Having almost immediately repented this step, he again assumed the monastic garb on the 10th November 1806. At the monastery of Pannonhegy he applied himself to the study of Greek under Farkas Téth. In 1808 we find him

at Gyér (Raab), in the middle school of which town he was teaching during the two following years. In 1811 he was again at Pannonhegy, whence in 1812 he was sent to Pesth to study theology. Here he became acquainted with the works of the best German and Hungarian authors, and also took part in the editorship of the Memzeti (National) Plutarkus, and in the

translation of Hiibner's Lexicon. After about four years' stay at Pesth, he obtained the degree of doctor of divinity, and returned to Pannonhegy, where lie devoted himself to dogmatic theology and literature. So great was his activity that it is said that there was hardly an Hungarian periodical to which Guzmics was not a contributor, The most important of his theological works are—A kath. anyaszentegyhdznak hitbeli tanitdsa ('The doctrinal teaching of the Holy Catholic Church), and A keresztényeknek valldsbeli egyestilésikrol (On Religious Unity among Christians), both published at Pesth in 1822; also a Latin treatise entitled Theologia Christiana fundamentalis et theologia dogmatica (Gyér, 1828-29, 4 vols.). Of the other literary labours of Guzmics the most meritorious is a translation of Theocritus in hexameters published in 1824. His versions of the @dipus of Sophocles and of the [phi- genta of Euripides were rewarded by the Hungarian Academy, of which in 1838 he was elected honorary meni- ber. From 1832 to the date of his death he was editor of the Lgyhdzi Tar (Ecclesiastical Treasury). In 1832 he was appointed abbot of the wealthy Benedictine house at Bakonybél, a village in the county of Veszprém. While there he built an asylum for 150 children, and founded a school of harmony and singing. He died at Bakonybél on the lst September 1839.

GWALIOR, a native state in political relationship with the Central India Agency and the Government of India, The state consists of several detached districts, the principal of which is bounded on the N.E. by the Chambal river, dividing it from the British districts of Agra and Etawah ; on the E. by Bundelkhand and Sagar (Saugor) districts ; on the S. by the states of Bhopal and Dhar; on the W. by those of Rajgarli, Jhalawar, and Kotah; and on the N.W. by the Chambal, separating it from Karauli (Kerowlee), and Dholpur in Rajputana. The extreme points of the Gwalior territory are in 23° 21' and 26° 52' N. lat., 76° 31' and 79° 21'E. long. Thearea, including part of the ancient province of Agra and most of Malwa, is 33,119 square miles. The extreme north-eastern part is generally level, bare, and of no great fertility. A little farther south the surface rises into hills. The country is dotted over with small hills, which start abruptly out of the level plain. On one of these stands the fortress of Gwalior. The geological forma- tion of these rocky eminences is a very fine-grained sand- stone, yielding an excellent building stone. The middle tract is a plateau, having probably an average elevation of about 1500 feet. The Mandu range running east and

west forms the southern boundary of the plateau, sloping gently northwards towards it, and dipping precipitously southwards towards the Narbaddé (Nerbudda). The state is watered by numerous rivers. The Nerbudda, flowing west, forms the boundary of the most southern part of the state. The greater part of the drainage is discharged into the Chambal, which forms the north-western and northern and eastern boundary. The Sind, with its tributaries the Kuwéari, Asar, Sankh, and other smaller streams, flows through the state. The chief products are opium, known as Malwa opium, wheat, gram, pulses of various kinds, jodr, bdjra, mug, maize, rice, linseed and other oil-seeds, garlic, tumeric, ginger, sugar-cane, indigo, al yielding a fine red dye, tobacco, and cotton. Many species of wild beasts and birds are found throughout the state. The rivers abound in fish, especially of the carp kind.

fine cottons, silks, and rich brocades. Iron ore is raised and smelted in many places. The principal imports are British woollens, cottons, silks, cutlery, cashmere shawls, pearls from the Persian Gulf, Ceylon diamonds, and agates from Bundelkhand, gold, silver, mercury, cupper, lead, and zine. The chief exports are opium, cotton, tobacco, dyes, and iron. The Indore and Ajmere narrow-gauge railway, now (1879) in course of construction, will pass through the west of Gwalior state, while a railway on the broad gauge, to con- nect Gwalior town with Agra, is approaching completion.

During the lot and dry seasons tlie climate is not un- healthy, but during the rainy season fevers prevail, especi- ally in the north. The range of the thermometer is un- usually small, except during the sultry season, when it sometimes rises to nearly 100° during the day. The aver- age rainfall during the rainy season is 50 inches.

The population of the north-eastern part of this territory is of many elements, comprising, besides Marhattas (the ruling race), Bundelas, Jats, and Rajputs, with some less distinctly defined divisions of Hindus and Mahometans, There is perhaps no part of India where the tribes of Bréhmans are so various and their number so great as in the southern and south-western parts. The Mahometan population is estimated at about a twentieth of the whole. Including the cessions to Sindhia under the treaty of

1860, the territories of the Gwalior state were in 1875 estimated to contain a population of about 2,500,000 souls. The total revenue in 1875 was £1,200,000. Education {s afforded by 92 schools attended by 3206 pupils.

The Gwalior family, whose armies and chiefs have played so conspicuous a part in the history of India, and whose representative now rules over a state larger than Scotland and Wales united, and richer than many independent kingdoms, was founded by Randji Sindhia, whose father was pdtel (head-man) of a Deccan village. Ouce in the household of the. peshwa, Randji's rise was rapid, and he was soon at the head of the bodygnard. After heading many Marhatta raids throngh Mahwa into Hindustan, he was at the time of his death the acknowledged possessor of lands whieh still form part of the Gwalior state. He was succeeded by his son Mahadaji Sindhia, whose ability as a statesman and a soldier has rarely been surpassed. At his death he was succeeded by his grand-nephew Daulat Rao Sindhia. The power of Sindhia was at this time most dangerous to the British Government, who now began to take measures to check the power of this chief. Sindhia entered into a league with the raja of Berar to defeat their aim, but their allied armies were defeated in 1803 at Assaye by a British force com- manded by General Sir Arthur Wellesley, subsequently duke of Wellington. By the end of the same year, the Marhattas were completely overthrown, and Sindhia was compelled to sue for peace and to sigu a treaty by which he resigned his conquered territories. Eventually, by a treaty coneluded in 1805, Gwalior and Gohad were ceded to Sindhia. Daulat Rao died at Gwalior in 1827 withont an heir. On his deathbed, he left the state and succession in the hands of the British Government. The succession of a boy of the Sindhia family, Mugat Rao, to whom it was thought the wishes of Daulat Rao turned, was admitted by the British Government. The young maharaja was subsequently married to the granddaughter of Daulat Rao, and took the name of Janakji Sindhia. In 1848 he died without issue. His widow, with the concurrence of the ehief nobles, adopted Bajirat Rao, a lad eight years of age. The British Government recognized the adoption, and Bajirat Rao, under the naine of Baji Rao Sindhia, succeeded, and is the present ruler (1879). Early in the regency disturbances took place, and the advance of British troops on Gwalior became necessary to restore order. Two battles, Maharajpur and Panniar, were fonght on the same day—the 29th December 1843—between

the British forces aud the mutinous army. They both resulted in the total defeat of the Gwalior troops. No event of historieal importance has taken place since, except the revolt between the Gwalior contingent and Sindhia's army in 1857. The maharaja's eonduct throughout has been conspicuous for its loyalty. In recognition of his services, the Goverument conferred upon him the right of adoption, together with lands yielding a revenue of £30,000.

Gwattor, the capital of Gwalior state, and fortress residence of the Maharaja Sindhia, is situated in 26° 13' N. lat. and 78° 12' E. long., 65 miles S. from Agra, and 277 N.W. of Allah4bad. Gwalior city has a threefold

Burhdnpur is the site of a considerable manufacture of | interest :—first, as a very ancient seat of Jain worship ;

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secondly, for its example of palace architecture of the best Hindu period (1486-1516) ; and thirdly, as the fortress capital of one of the greatest native chiefs of India.

Jain Remains.—There are several remarkable Hindu temples in Gwalior. One, known as the Sas Balu, understood to be of Jain

erection, is beautifully adorned with bas-reliefs, and is now resorted |

to both by the Vaishnav and Siva seets. It was finished in 1093 A.D., and, though mueh dilapidated, still forms a most pieturesque fragment. An older Jain temple has been used as a mosque. Another temple in the fortress of Gwalior is ealled the Zeli-ka- Mandir, or "Oilman's Temple." This building was originally dedicated to Vishnu, but afterwards converted to the worship of Siva. The most striking part of the Jain remains at Gwalior is a series of eaves or roek-eut sculptures, excavated in the rock on all sides, and numbering nearly a hundred, great and small. Most of them are mere niehes to eontain statues, though some are eells that

may have been originally intended for residenees. One curious fact ,

regarding them is that, aceording to inscriptious, they were all ex- eavated within the short period of about thirty-three years, between 1441 and 1474. Some of the fignres are of colossal size ; one, for instance, is 57 feet high, which is taller than any other in the north of India.

Hindu Palace Arehiteeture.—The palace built by Man Sinh (1486- 1516) forms the most interesting example of early Hindu work of its elass in India. Another palace of even greater extent

was added to this one in 1516; both Jahangir and Shah Jahan |

added palaces to these two,—the whole making a group of edifices uuequalled for pieturesqueness and interest by anything of their elass in Central India. Among the apartments in the palace was the eelebrated chamber, named the Bdraddrt, supported on 12 columns, and 45 feet square, with a stone roof, forming one of the most beautiful palaee-halls in the world. larly interesting from the expedients to which the Hindu arehiteet was foreed to resort to imitate the vaults of the Moslems. Of the bnildings, however, whieh so exeited the admiration of the emperor Babar, probably little now remains.

Rock Fortress.—The fort of Gwalior stands on an isolated roek. The face of the fort is perpendicular, and where the roek is naturally less preeipitous it has been searped. Its greatest length from northi- east to south-west is a mile and a half, and the greatest breadth 300 yards. The rock attains its maximum height of 342 feet at the northern end. A rampart, aceessible. by a steep road, and farther up by huge steps cut out of the roek, surrounds the fort. The citadel stands at the north-eastern corner of the enelosure, and presents a very picturesque appearanee. The old town of Gwalior, which is of eonsiderable size, but irregularly built, and extremely dirty, lies at the eastern base of the rock. It eontains the tontb of Muhammad Ghaus, which was erected during the early part of Akbar's reign. The fort of Gwalior, aceording to Wilford, was built in 773 A.D. by Surya Sen, the raja of the neighbouring eountry. In 1196 Gwalior was eaptured by Mahmud Ghori; it then passed into the hands of several ehiefs until in 1556 Akbar gained posses- sion of it, and made it a state prison for eaptives of rank. On the dismemberment of the Delhi empire, Gwalior was seized by the Jat rand of Gohad. Subsequently it was garrisoned by Sindhia, from whom it was wrested in 1780 by the forces of the East India Company.

GWILT, Josep (1784-1863), author of the Encyclo- podia of Architecture, was the younger son of George Gwilt, architect surveyor to the county of Surrey, and was born at Southwark, January 11, 1784. He was educated at St Paul's school, and after a short course of instruction in his father's office was in 1801 admitted a student of the Royal Academy, where in the same year he gained the silver medal for his drawing of the tower and steeple of St Dunstan-in-the-East. In 1811 he published a Treatise on the Equilibrium of Arches, and in 1815 he was elected a fellow of the Society of Antiquaries of London. After a visit to Italy in 1816, he published in 1818 Wotitia Archi- tectonica Italiana, or Concise Notices of the Buildings and Architects of Italy, In 1825 he published, with notes and valuable additions, an edition of Sir William Chambers's Preatise on Civil Architecture; and among his principal other contributions to the literature of his profession are a trans-

It was, besides, singu- |

‘ lation of the Architecture of Vitruvius (1826), a Treatise on the Rudiments of Architecture, Practical and Theoretical | (1826), and his valuable Zncyclopadia of Architecture(1842), | which has passed through a great many editions, and was published with additions by Wyatt Papworth in 1867. In recognition of Gwilt’s advocacy of the importance to archi- tects of a knowledge of matheniatics, he was in 1833 elected a member of the Royal Astronomical Society. In addition tothe sciences bearing on his profession he took a special interest in philology and music, and is the author of Rudi- ments of the Anglo-Saxon Tongue (1829), and of the article |“ Music” in the Lncyclopedia Metropolitana. His works as a practical architect are not of much importance, the principal being Markree Castle near Sligo in Ireland, and | St Thomas’s Church at Charlton in Kent. He succeeded his father as a surveyor of sewers for the county of Surrey, and held that office till 1848. He died September 14, 1863.

GWYNIAD is the name given toa fish of the genus Coregonus (C. clupeoides), inhabiting the large lakes of North Wales and the north of England. At Ullswater it is known by the name of “schelly,” at Loch Lomond by that of “powen.” It is tolerably abundant in Lake Bala, keeping to the deepest portion of the lake for the greater part of the year, but appearing in shoals near the shores at certain seasons. It is well flavoured, like all the species of Coregonus, but scarcely attains to the weight of a pound. The name gwyniad is a Welsh word, and signifies “shining”; and it is singular that a similar fish in British Columbia, also belonging to the family of Salmonoids, is called by the natives “quinnat,” from tlie | silvery lustre of its scales, the word having in their language the same meaning as the Welsh “ gwyniad.”

GYARMAT, a Magyar term signifying colony, and applied to several places in Hungary. Of these the following two towns have the largest number of inhabitants.

BaLassa-GYARMAT, capital of the Cis-Danubian county of Négrad, is situated on the Ipoly (Eipel), about 40 miles N.N.E. of Budapest, 48° 6’ N. lat., 19° 16’ E. long. It is the seat of a royal court of law and of the assizes, and has | Roman Catholic and Lutheran churches, also a Jews’ synagogue, a fine county hall, a house of correction, a religious institute for girls, and

tax, post, and telegraph offices. In 1870 the population was 6435, Magyars and Slavs by nationality.

FUzes-GyARMAT, a market-town in the Trans-Tibiscan county of Békés, is. somewhat unfavourably situated in the extensive marshy tract of country known as the Sdrrét, 47° 5’ N. lat., 21° 13’ E. long. The town has few noteworthy buildings, with the exception of the Calvinist church and some elegant private residences. The chief products of the rich, dark, alluvial soil of the neighbourhood are wheat, tobacco, hay, grapes, and other fruits. Horned cattle, pigs, and sheep (both merino and Hungarian) are bred on the wide-spreading pasture-lands, and numerous water-fowl and wading birds, especially herons, inhabit the reed-covered marshes, The water used for drinking purposes is, however, frequently muddy ana warm, and un-pleasant to the taste. In 1870 the population was 5735, of whom the great majority were Magyars.

GYARMATHA, a market-town in the county of Temes, Hungary, situated in a level but productive agricultural district to the north-east of Temesvar, 45° 50’ N. lat., 21° 17’ E. long. For some distance round the town the cultivation of wheat, barley, oats, maize, and the vine is largely carried on. Horse-breeding is another source of employment to many of the inhabitants. Gyarmatha has few buildings of special interest with the exception of a Roman Catholic church and the ruins of a fort. In 1870 the population amounted to 5125, consisting of Germans, Magyars, and Wallachs,

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GYERGYO-SZENT-MIKLOS, a market-town of Hun- | gary, in the Transylvanian county of Csik, is situated in a mountainous but well-wooded district, 96 miles E. of Klausenburg, and about 25 W. of the Moldavian frontier, 46° 42’ N. lat., 25° 33’ E, long, Among the more im- portant buildings are a Roman and a Greek Catholic church, a fine public school, a royal court of justice, and the post and telegraph offices. There are also cattle and timber trading houses, an office of woods, a financial commission agency, and a police station. Cattle and sheep are reared in great numbers in the surrounding country, which is noted | also for its cheeses, and for the preparation of gin. The number of inhabitants at the commencement of 1870 was 5645, consisting of Magyars, Wallachs; and

Magyarized Armenians, the descendants of a band of wanderers who | settled here in 1668.

GYGES, founder of tlie third dynasty, called Mermnad, of Lydian kings, reigned about 687-654 B.o. (v. Gelzer in Rhein. Mus., xxx.). The kindred name Gygea, applied by Homer (JI., ii. 684) to the Maconian lake, mother of the Maconian leaders, supports the statement of ancient his- torians that he belonged to an old Lydian family. In the reign of Candaules, Gyges, perhaps after banishment, attempted during the troubles caused by the Cimmerian invasions into Asia Minor, to gain the royal power. He was aided by foreign, especially Carian, mercenaries, but was strenuously resisted by the native population. At last it was agreed to refer the decision between the old Heraclid dynasty and the new claimant to the national god Heracles; | but, to ensure impartiality, they appealed to him under his | Greek form of Apollo. The Delphic oracle gave its answer in favour of Gyges, and the presents with which his gratitude enriched the shrine were seen and described by Herodotus. This story points to familiar and friendly intercourse between Lydia and the Greek states; and that the circumstance impressed itself on the Hellenic mind is shown by many romantic tales current about the fortunes of Gyges (Plato, Rep., ii. p. 369; Herod., i. 8). The contemporary poet Archilochus speaks of the riches of Gyges. Under the Heraclid dynasty Ionian settlers had occupied the whole coast of Lydia, and in friendly relation with the country had rapidly prospered, But the warrior king who now began to rule was not content to leave the sea-coast in the undisturbed possession of foreigners. He and his successors maintained almost constant war with the [onian cities. Gyges captured Magnesia and the lower city of Colophon ; but the inroads of the Cimmerians diverted his attention from conquest to the defence of his own capital. Atone time he was so hard pressed that he applied to Assyria for help (about 660 B.c.), and paid tribute to Assurbanipal in return for protection against these barbarians. But he afterwards threw off allegiance and assisted Psammetichus, who had revolted in Kigypt against the Assyrian rule. It is mentioned in an inscription of Assurbanipal that Gyges was slain in battle by the Cimmerians, and that his son Ardys renewed the tribute.*

For a full account of the reign of Gyges, and the ancient authori- ties for it, see Duncker, Gesch. d. Alterthwms, vol. ii.

GYLLEMBOURG-EHRENSVARD, Tuomastine Kais- TINE, Baroness (1773-1856), the most eminent female writer of Denmark, was born November 9, 1773, at Copen- hagen. Her maiden name was Buntzen. Her great beauty early attracted notice, and before she was seventeen she married the famous political writer Peter Andreas Heiberg. To him she bore in the following year a son, afterwards illustrious as the poet and critic Johan Ludvig Heiberg. In 1800 her husband was exiled and she obtained a divorce, marrying in December 1801 the Swedish Baron Ehrensvard, himself a political fugitive. Her second husband, who

presently adopted the name of Gyllembonrg, died in 1815. In 1822 she followed her son to Kiel, where he was appointed professor, and in 1825 she returned with him to Copenhagen. In 1827 she first appeared as an author by publishing her romance of The Polonius Family in her son's newspaper Zhe Flying Post. In 1828 the same journal contained The Magic Ring, which was immediately followed by An Everyday Story. The success of this anonymous work was so great thatthe authoress adopted until the end of her career the name of "the Author of An Everyday Story." From this time forward she took a foremost place among the writers of her time, but preserved her anonymity with entire success. In 1833-34 she published three volumes of Old and New Novels. New Stories followed in 1835 and 1836. In 1839 appeared two novels, Afontanus the Younger and Frcida; in 1840, One in All; in 1841, Near and Far; in 1843, A Correspondence ; in 1844, The Cross Ways; in 1845, Two Generations. From 1849 to 1851 the Baroness Ehrensvard-Gyllembourg was engaged in bringing out a library edition of her collected works in twelve volumes, On the 2d of July 1856 she died in her son's house at Copenhagen. Not until then did the secret of her author- ship transpire ; for throughout her life she had preserved the closest reticence on the subject even with her nearest friends. The style of Madame Ehrensviird-Gyllembourg is clear and sparkling ; for English readers no closer analogy can be found than between her and Mrs Gaskell, and Cranford might well have been written by the witty Danish authoress. She

introduced into the literature of her country a novel vein of rcalism and domestic humour, and, although she has had many imitators, she is still without a rival. GYMNASIUM was the name applied by the Greeks to a building designed for tle practice of physical exercises. From the earliest times we hear of athletic sports in honour of heroes and gods. Sometimes they are celebrated among the funeral rites of a deceased chief, sometimes they form part of a periodic festival. At first competitors exercised stript of their outer garments (yvpvoi); heuce arose the name gymnasium. Afterwards the habit of exercising naked became universal. In the continuance of their history the Greeks grew more attached to such sports ;

| their free active life, spent to a great extent in the open

air, fostered the liking almost into a passion. The victor in any athletic contest, though he gained no money prize, was rewarded with the honour and respect of his fellow- citizens; and a victory in the great religious festivals was counted an honour for the whole state. In these circum- stances the training of competitors for the greater games became a public concern; special buildings and officials were provided for the purpose by the state. But, as gym- nastics became more and more an institution of social life, the gymnasia were applied to other uses even more import- ant. The most interesting points are the connexion with education on the one hand, with medicine on the other. Due training of the body and maintenance of the health and strength of children were the chief part of earlier education. Except the time devoted to letters and music, the education of boys was conducted in the gymnasia, where their moral training was as carefully attended to by special officers as their physical exercises. As they grew older couversation and social intercourse took the place of tlie more systematic discipline. Philosophers and sophists assembled to talk and to lecture in the gymnasia, which became places of general resort for the purpose of all less systematic intellectual pursuits, as well as for pbysical exercises. Plato, when treating of education, devotes much consider- ation to gymnastics (see especially Zep. i. and various parts of Zeges). Gymnastic exercises proper were designed, not merely as in Sparta, to foster the taste for war and the activity and strength needed for using weapons, but also to

produce graceful carriage and healthy tone of the body. According to Plato, the sophist Prodicus first pointed ont | the connexion between gymnastics and health. found such exercises beneticial to his own weak health, he formulated a method which was adopted generally, and which Hippocrates improved on. Galen lays the greatest stress on the proper use of gymnastics, and throughout ancient medical writers we find that special exercises are prescribed as the cure for special diseases. The regulation of the gymnasium at Athens is attributed by Pausanias (1. 39, 3) to Theseus ; Solon made several laws on the subject ; but, according to Galen, it was reduced to a system in the time of Clisthenes. Ten gymnasiarchs, one from each tribe, were appointed annually. These performed in rotation the duties of their office, which were to maintain and pay the persons that were training for public contests, to conduct the games at the great Athenian festivals, to exercise general supervision over the morals of the youths (they could, for example, remove any philosopher whose teaching they thought injurious), and to adorn and keep up the gymnasium. This office was one of the ordinary Aeroupyiat, and great expense was entailed on the holders. Under them were ten sophroniste, with a salary of a drachma per day. Their duty was to watch the conduct of the youths at all times, and especially to be present at all their games. The practical teaching and selecting of the suitable exercises for each youth were in the hands of the pedotribe and gymnaste. The latter also superin- tended the effect on the constitution of the pupils, and prescribed for them when they were unwell. Alipte oiled and rubbed dust on the bodies of the youths, acted as surgeons, and administered the drugs prescribed.

The gymnasia built to suit these various purposes were large buildings which contained, not merely places for each kind of exercise, but also a stadium, baths, covered porticos for practice in bad weather, and outer porticos where the philosophers and men of letters read public lectures and held disputations. In Athens there were three great public gymnasia,—Academy, Lyceum, and Cynosarges,—and every Greek city of consequence seems to have possessed one. Ruins of them exist at Pergamus, Ephesus, Alexandria in Troas, &c., from which, and from the accounts of Vitruvius (v. 11), it would appear that all were constructed on much the same plan. The details will be found most clearly given in Rich's Dictionary of Greek and Roman Antiquities.

Much of the healthy buoyant elasticity of mind for which the Greek race is remarkable, as well as the active and beautiful physical development which no other race has ever equalled, is due to the love of gymnastics. The plastic art also owes its perfection in the treatment of the human form to the constant opportunity which artists had of observing the nude body in various attitudes. But abuses were liable to occur. The careful provisions made by Solon and later Icgislators to keep up the moral character of the gymnasia did not prevent them from fostering the vice which appears so much in Greek life. Though intro- duced in Rome, where Nero built the first public gymnasium, gymnastics did not suit Italian habits, and never became popular.

Gymnasium, in its modern use, generally signifies a school for gymnastic exercises, but it is sometimes used also to denote a higher school intended to give immediate pre- paration for the universities. The latter application of the term is specially prevalent in Germany.

GYMNASTICS, in the general acceptation of the term, denotes every exercise which tends to develop and invigorate the bodily powers, such as walking, running, riding, fencing, rowing, skating, dancing, and many others. In another sense gymnastics includes those manly and healthful games which have been encouraged by all high-minded nations

as calculated to improve the physical strength and keep alive the martial spirit of their people. In a more

Having | limited sense, the term has been employed to denote tlie

modern system of bodily exercises. Physical strength was the veritable god of antiquity, and we therefore find the elements of a system of gymnastics in most nations from the earliest times. In the infancy of society, when the individual was valued according to his personal strength and prowess, it was only natural that the utmost care should be bestowed on those arts which most surely led to distinction. All education then consisted chiefly in the practice of such exercises as were best caleulated to develop muscular strength and make the tenure of life as secure as possible. The first

gymnastic exercises, both of those nations that reached the highest civilization and of bar- barians, were the same, viz., running, leaping, swimming, and the throwing of missiles. These exercises were at a

‘very remote period systematized and reduced to a science

by the Greeks (see Gymnasium). Among the Romans of the republic, the games in the Campus Martius, thie duties of camp life, and the preliminary military exercises to which the soldier devoted himself, besides the enforced marches which were imposed upon him, and the part he took in the ercction of public edifices, served to take the place of the gymnastic exercises required by the Greeks. In the Middle Ages, chivalry with its jousts, its feats of horsemanship, and encouragement to the arts of fencing, single stick, &c., took the place of the ancient gymnastic exercises. The invention of gunpowder, which modified the system of warfare, and the increasing value of indi- vidual life.—in a word, the progress of civilization— closed the career of the champions and votaries of phy- sical strength, and gymnastic exercises in the course of time were neglected. Rousseau, in his Hmile, was the first to call attention to the injurious consequences of such indifference ; and it is in a large measure to his eloquent appeals that gymnastics have in recent times been held to constitute an integral part of school education, although it cannot be said that in every country the practical application of his views has met with much success. The good effects of the innovation which he advocated have nowhere been more strikingly exemplified than in Germany. When many parts of that country groaned under the iron yoke of Napoleon, Jahn and his followers, encouraged by the Prussian minister Stein, were establishing Z’urnpldtze or gymnastic schools, from which issued the well-trained youth who in due time drove the French legions across the Rhine.

Of late years public attention has been drawn to the increasing deterioration in the physique of the population of England, and several proposals have been put forward to check an evil which can no longer be concealed. These proposals may be arranged under the banners of two rival camps. The one maintains the opinion put forward ina work just published on exercise and training, in the follow-

ing words (Zxercise and Training, 1878) :—

“In our opinion the natural varieties of exercise of cricket, foot- ball, and rowing for boys, hunting, shooting, &c., for men, pursued at the different seasons of the year, are quite sufficient for a proper development of all parts of the body, in accordance with the uses of the different limbs, for the development of special muscles ; or, where a great variety of exercise cannot be procured, a system of gymnastics may be pursued. To the advocates for the adoption of systematic physical education by means of gymnasia at our schools, whilst we concede the immense value of such establishments in our large towns, where outdoor exercise and field sports are difficult of attainment, or in cases where from the physical debility the muscles have to be gradually developed, still we maintain that the national games played by the English schoolboy are infinitely superior to any system of artificial exercise ever devised.”

On the other side we have the advocates of physical education by means of regular gymnastic exercises superin- tended hy trained and educated teachers, the whole placed

GYHNAS TICS

under competent medical supervision. Among the staunch supporters of the latter view may be named Dr Roth, and Mrs Westlak2, a member of the London School Board. The following considerations appear to be of great weight as supporting the views put forward by the advocates of physical education. While the national games may seem

to some sufficient for the physical development of the |

ordinary youth and manhood of a country, it imust not

be forgotten that there is a vast and rapidly increasing | portiou of the population, especially in large cities, to whom |

the “national games” are quite unknown diversions, and that it is among this class that the most marked deteriora- tion in physical development is only too apparent.

dragged to undergo a certain amount of mental training, in many cases perhaps too severe to be sustained by their de- bilitated and enfcebled bodies. Whilst so much is being done for the mental culture of the rising generation, their physical culture is left very much to inclination or chance. But there is another source of danger put forward by those who advocate the sufficiency of the national games, viz., "the neglect of any classification of games at school, and allowing the weak and strong to engage in them indiscriminately, to the detriment of the physical wellbeing of the more delicate ;" an they proceed to show the injury that may be done by the present system of competitive outdoor sports unregulated by judicious restraint. Important information on this subject will be found in two papers published in the S¢ Georges Hospital Reports for 1874-76, by Mr C. Roberts, F.R.C.S., and by Mr Street, and another in the Zenth Annual Report of the State Board of Health of Massachusetts, by Professor Edward Hitchcock. Mr Roberts points cut that between the ages of fifteen and seventeen the greatest amount of physical development takes place, and that if at this period a boy is subjected toa great strain upon his strength his future growth may be interfercd with, or the foundation laid of constitutional disease. Prof. Hitchcock's paper-emboclies the experience of seventeen years of careful observation, Acting upon the well-grounded opinion that neither mental serenity nor mental development can exist with an unhealthy animal organization, and admonished by "the sad deaths of two promising young men, and the breaking down in health of others just at the end of their college courses," the authoritics of Amherst College were impelled to demand that the college officials should give a proper attention to physical health as well as to the culture

of those powers for which departments were ordinarily |

created and endowments made, In 1859 a department of physical education and hygiene was created, concerning which we read in the catalogue of 1861-62 that—

*'*Its design is to seeure healthful daily exercise and reereation to all students ; to instruet them in the use of the voeal organs, move- ments of the body, and manners, as eonneeted with oratory ; and to teach them, both*

theoretically and practically, the laws of health. This daily physieal training is a part of the regular eollege course.

The professor is an edueated physician, and has not only a general |

oversight of the health of the eollege, but students have the privi- lege of consulting him without charge. furnish opportunities for the highest physical training, the required excrcises will be sueh as ean be performed without undue effort or risk of injury."

Each class, at a stated hour on four days of the week appears at the gymnasium, and all perform their part in systematic and methodical exercises timed to music. statistics of this department show some interesting facts in reference to the duration of sickness among students. While the average amount of time lost on account of sick- ness by each labourer in Europe is found to be 19 or 20 days each year, the returns of Amherst College sick-list for term time give 2°64 days as an annual average of time lost to every student, and 11°36 days to each sick student for

The | children of this class dwell cooped up in narrow, ill-lighted, | and worse-ventilated courts, from which they are often |

While the gymnasium will |

The |

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17 years. A decrease in the amount of sickness during the course is also an important feature in the health of the college.

From replies to questions put by Dr Roth to the heads of the educational bodies, and also from the recorded personal experience of his son, Mr B. Roth, F.R.GS., it appears that considerable attention is now being paid to the best methods for improving the physical education of the people in nearly all the Continental states. The greatest activity is perhaps shown by Sweden, Germany, France, Belgium, and Italy; and even in Russia the question is attracting much public attention, Dr Berglind having been

ordered to write a special book on the subject. In Hungary also the Government has made physical education an obligatory part of the school curriculum. In Prussia gymnastic instruction was formally recognized by a cabinet order of June 1842, and by a royal order of 1862 a euide- book of gymnastic instruction was introduced into the primary schools and into the training colleges for teachers. In Sweden this subject appears to have earlier attracted attention, for in 1813 the Government, under the direction of P. H. Ling, founded the Royal Central Gymnastic Institute at Stockholm, where teachers of both sexes are gratuitously trained for two years, and receive a diploma after undergoing a theoretical and practical examination. In Belgium, under the united efforts of MM. Delcour and Emile Greyson, considerable progress has been made, although muck. has still to be done, owing to the opposition raised by the inunicipality of Brussels to the views put forward by the Government. In the girls' schools the exercises are accompanied by music, after the example set by Colonel Ameros, who about the beginning of this century introduced into France a series of gymnastic exercises adapted to a jingling rhyme and to music. The chanting governed the movements, marked the intervals of repose, and helped to strengthen the organs of the voice and respira- tion. In France the necessity for the physical education of the people began to attract attention about the year 1845, owing probably to the energy displayed by Jahn in Prussia. M. de Salvandy proposed to introduce the teach- ing of gymnastics into the Lycées of Paris and Versailles, and a commission was appointed by him, which, however, never presented a report. In 1850, 1851, 1855, and 1856 several attempts were made to enforce compulsory gymnastic training, but the principle was not accepted till 1869, when M. V. Duruy took for his basis of action the labours of the commission presided over by Dr Hillairet. After the fall of the empire, M. Jules Simon addressed the head masters of the colleges and schools in France as follows :—

"I beg you to assist me in introducing gymnastics into our habits in a profitable and earnest mauner. 'This is not only in the interest of publie health; a healthy child is better prepared for study, and especially for the battle of life. Morality gains by this education of the body ; much money is not wanted for the purpose ; and in case of need, exereises ean be performed without a trapeze or dumb-bells. Our medical men will help us to do our task ; if the children are once accustomed to, and take pleasure in,

these healthy exercises, we may be sure of a prompt amelioration of the race.'

In England we find that the first attempt to introduce scientific physical education among the people was made in parliament in 1862 by Lord Elcho. This attempt failed, as also did another made in 1875 by P. A. Taylor, M.P. for Leicester, although supported in an able speech by Mr Butler Johnstone. Lord Sandon, then vice-president of the committee of council on education, told Parliament that "the Government has done all that could be expected of them for physical education by taking steps to substitute military drill for ordinary drill." The substitution, it may be remarked, does not appear to have any advantage over the drill it displaced, as the military authorities declared the ordinary military drill to be insufficient for the re-

quirements of the soldier, and have during the last sixteen years instituted gymnasiums at Aldershott, Gibraltar, Malta, and elsewhere, the teachers in which have, for the most part, passed under the care of Mr Maclaren of Oxford, one of the principal authorities on the subject in England. Without entering into details, it may be admitted that the physical condition of the people, if not actually deteriorat- ing, is not improving, and it is a significant fact that within the last year or two it has been found neccessary to lower the standard in the British army, and that Dr Ord, in his report for 1869, states that out of 5567 boys 4410 were rejected as uuder the standard of width of chest and height. We have already referred to the tendency to rely on the casual outdoor sports for maintaining the physique of the population, and to a great extent to depreciate systematic gymnastic exercises and physical education. That in some quarters, however, this opinion is not entertained is shown from the fact that the London School Board has appointed Miss Lofving of the Stockholm Training College to instruct certain of their teachers so as to fit them for teaching the girls in the schools. It is to be regretted that in the blind asylums so little is done for the physical education of the inmates. An institution in Milan provides for the training of ricketty children by carefully regulated gymnastic exer- cises; but this institution secms to be the only one of its kind in Europe.

To show that the importance of gymnastics has not been overstated, we may describe the effects produced on twelve non-commissioned officers sent by the military authorities to be trained as teachers for the British army by Mr Maclaren. The men ranged from nineteen to twenty- nine years of age, and in height from 5 feet 5 inches to 6 feet. In Mr Maclaren's own words, " the muscular additions to the arms and shoulders and the expansion of the chest were so great as to have absolutely a ludicrous and embar- rassing result, for before the fourth month several of the men could not get intotheir jackets and tunics without assistance, and when they had got them on they could not get them to meet down the middle by a hand's breadth." In a month more they could not get into them at all, and uew clothing had to be procured, pending the arrival of which the men had to go to and from the gymnasium in their greatcoats.

Although there is some diversity of opinion among tcachers of gymuasties as to the relative value of the different exerciscs, some holding that "free exercises" are sufficient, others that certain mechanical appliances are necessary, yet all agree that, to ensure healthy and perfect development of the organs of the body, a course of gymnastics must commence with such simple exercises as walk- Ing, running, jumping, &c. The introductory course ordinarily consists of " movements and positions" and the use of dumb-bells and bar-bells. In some French gymnasiums, especially those presided over by M. Laisné of Paris, an instrument invented and ealled by him a "xylofer" is in use, consisting of a wooden stick strengthened and weighted with a rod of iron, and corresponding apparently to the bar-bell of English teachers. Another form of movable apparatus, also in use in some Continental schools, consists of sticks on which slide wooden spheres of from 6 to 7 inches diameter, prevented from slipping off by india-rubber rims at each end. The movements which accompany the use of the stick are intended to expand the chest and increase the power of the muscles of the back. In stretching the arms outwards from the bent position, the spheres fly outwards and very much increase the energy of the movement.

For the preliminary exercises with movable apparatus, the dumb- bell is that usually selected. It was in use in England in the time of Elizabeth. It has many advantages over the Indian club, the practice of the dumb-bell

requiring a less amount of room, and not presenting the risk the club does of overstraining the body by its unskilful use.

_ The dumb-bell admits of being exactly proportioned to the individual strength of each learner, and can be adjusted in weight as his strength increases. The exercises also that may be performed with it give employment to all parts of the body and to both sides equally. The bar is simply a two-handed dumb-bell. Next in order a iene running, and leaping, the exercises being so regulated > Sin : 5 1e distance and speed are gradually increased. The

pe is suspended from a beam, and enables the leaper to

clear a barrier at the same time that it gives employment to both the upper and lower limbs. The leaping pole is usually made of ash, and varies from 8 to 10 feet in length. Its use may be left to the pleasure of the pupil after he has acquired some dexterity with the leaping rope.

The horizontal beam is a round wooden beam so mounted that it may be moved up and down. The exercises on this are chiefly bal- ancing the body in the sitting and erect posture, and when moving along it.

The vaulting bar differs from the preceding in being somewhat thinner, so as to be easily grasped by the hand. The appropriate exercises on it have for their object the strengthening of the muscles of the upper extremity and loins. The vaulting horse allows of a wider range of exercises, and requires a greater amount of strength and dexterity. The muscles of the upper and lower limbs and trunk are all benefited by its use. The fixed parallel bars are used to develop the muscles of the trunk and upper limbs, but chiefly the former. The movable parallel bars may be used for the same exercises as the preceding. The trapeze consists of a horizontal bar suspended by ropes at a height of 4 or 5 fect from the floor. Considerable practice is required to perform the exercises on this machine with dexterity and neatness. The horizontal bar, the bridge ladder, the plank, the inelined planc, the prepared wall, and the mast, and several modifications of these that are used, permit of a great variety of exercises.

In “ calisthenics” the exercises are more directed to ensure grace and ease in the several movements of the body than muscular development, and are, therefore, closely allied to the. “ movements and positions” or “ free exercises” of the gymnast.. Among these exercises dancing takes a prominent part, being at once healthful and graceful.

See Combe’s Education, its Principles and Practice, edited by Jolly ; Maclaren’s Physical Education ; the various works (in French) of Prof. N. Laisné, Capt. Docx, and Dr Le Blond; and numerous pamphlets by Dr Roth. (H. A. H.)

GYMNOTUS. See Een and Exectriciry. GYNECOLOGY (from the Greek yvvy, yvvaikds, a

woman, and ddyos), that branch of medicine which con- cerns the pathology and treatment of affections peculiar to the female sex. See MEDICINE,

GYOMA, an old market-town in the Trans-Tibiscan county of Békés, Hungary, is situated on the banks of the K6rés main stream, 46° 57’ N. lat., 20° 50’ E. long, It has a fine town-hall, Roman Catholic, Calvinist, and Lutheran churches, a Jews’ synagogue, tax, post, and telegraph offices, a brewery, several elegant private resi- dences, aud a large station on the Szolnok-Arad Railway. The soil of the surrounding country, though in some places clayey, is in others of a rich and productive character, and the inhabitants succeed in raising plentiful crops of wheat, mangcorn, barley, millet, and maize, besides cultivating several kinds of orchard fruit and grapes. The more con- siderable landholders rear great numbers of sheep, pigs, and horned cattle. An abundant supply of fish and water- fowl is yielded by the Korés, which is here spanncd over by a wooden bridge and by the railway. Enormous quantities of firewood are floated down the stream on rafts. The fields are protected from floods by a large dike, whilst a similar service is rendered by the Nagy-Ivan, Csergetyii, Jokai, and Német trenches, which usually become dry during summer, In 1870 the population of Gyoma was 9907, by nationality Magyars. Before 1682 three other communes, viz., Ege, Pé, and Nyarszeg, stood on the wide- spreading tract belonging to Gyoma. In that year they were, however, completely destroyed, and now only traces of their former existence remain.

GYONGYOS, the second town in importance of Heves county, Hungary, is situated at the foot of the Matra, south-west of Eger (Erlau), and is connected by a branch line with the Budapest-Miskolez royal state railway, 47° 47’ N. lat., 19° 59’ E. long. Gyéngyds is the seat of a court of justice, and of a beard of taxes, and contains three churches, a large monastic establishment belonging to the Franciscans, 2 gymnasium, manufactories of leather, hats, and woollen cloth, and distilleries. The town carries on a brisk trade, especially in the Vissontaer and Egri (Erlauer) red wines, which are produced in great quantities in. the

neighbourhood. In 1870 the population was 15,830, mostly Magyars by nationality. The Hungarians defeated the Austrians at Gyéngyés on the 3d April 1849. GYONGYOSI, IsrvAn or StePHen (1620-1704), one of the most talented Hungarian poets of the 17th century, was born of poor but noble parents in 1620. The county of his birth is variously given as Gémér or Bons, the date as August 5 or November 3. His abilities early attracted the notice of Count Ferencz Wesselényi, who in 1640 appointed him to a post of confidence in Fiilek castle. Here he remained till 1653, wheu he married, and commenced his public career as an assessor of the judicial board. In 1681 he was elected as a representative of his county at the diet held at Soprony (Oedenburg). From 1686 to 1693, and again from 1700 to his death in 1704, he was deputy lord-lieutenant of the county of Gomor. Of his literary works the most famous is the epic poem Murdnyt Venus (Caschau, 1664), which hymns the praises of his benefactor’s wife Maria Szécsi, the heroine of Murany. Among his later productions the best known are — Ltézsa-Koszort%, or Rose-Wreath (1690), Kemény-Jénos (1693), Cupid (1695), Palinodia (1695), and Chariklia (1700). His poems are chietly remarkable for energy, feel- ing, and popular sentiment. The earliest edition of his collected poetical works is by Dugonics (Pressburg and Pesth, 1796); the best modern selection is that of Toldy, entitled Gydngydst Istvdén vdlogatott poétai munkdi (Select poetical works of Stephen Gyéngyési), 2 vols., 1864-65. GYPSUM, the hydrated sulphate of lime, CaSO,.2H,0, is a mineral substance occurring in various rock formations, especially in Tertiary deposits, in very considerable abund- ance and under varying conditions. In its transparent crystalline state it is known as selenite ; when

it presents a finely fibrous opalescent appearance, it is termed satin spar ; and the name alabaster is reserved for the pure milky white massive varieties. Gypsum is very generally disseminated, the most famous locality for the finer qualities worked into alabaster vases and figures being Castelino, about 30 miles from Leghorn; while Montmartre, Argenteuil, and other places in the environs of Paris, and in the neighbourhood of Derby in England, furnish inexhaustible supplies chiefly for the preparation of plaster of Paris and for agricultural use, &c. It is also found in large quantities in Nova Scotia, New York, Virginia, and Michigan. The application of gypsum as a manure is referred to under AGRICULTURE, Vol. i. p. 351, and its employment for ornamental purposes is described under ALABASTER, vol. i. p. 439. The preparation of plaster of Paris, so called from the fact that the industry chiefly centres in several Parisian suburbs, is the principal primary object of the quarrying or mining of gypsum. By the application of heat gypsum begins, at a temperature of about 175° Fahr., to part with its combined water. An increase of temperature causes the desiccation to proceed with great rapidity, and for manufacturing purposes the best results are obtained at from 230° to 250°. For making plaster of Paris, gypsum is burnt in kilns at about the latter temperatures, and subsequently it is powdered and ground to a fine uniform flour. So prepared it possesses the valuable property of recombining with water when mixed with it, aud setting, from a thin paste, into a solid mass, the phenomenon being accompanied with some ex- pansion and the evolution of heat. of recombining with water that the value of plaster of Paris is principally due. When, however, gypsum is burnt at a temperature of 480° and upwards, the sulphate rehydrates only with great difficulty, and at still higher temperatures it loses all power of absorbing water, and in this respect it then resembles anhydrite, the natural water-free sulphate of lime. Plaster of Paris is largely used for obtaining copies of statuary figures, coins, medals, sculptures, and

t is to thi ty | [Nik amen aad | similar instrument as being brought from Italy to Mr

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carvings, and also for taking casts from natural objects. It is also employed as the material for moulds for electro- deposits, and for the manufacture of embossed and pressed pottery ware. Still more extensively is it consumed in the finishing of internal plaster work in houses, and for making cornice mouldings and other architectural enrichments in positions sheltered from the weather. Plaster of Paris work is, like gypsum, soluble in water at a temperature of 32° to the extent of '205 per cent., rising to a maximum solubility of 254 at 95° Fahr. Plaster casts made simply with water are soft, porous, and easily injured, and various plans have been devised for producing a harder and more compact body with plaster. Keene's cement, which may be taken as a type of the hardened plasters, is made by treating the burnt gypsum in a solution of 1 part of alum to 12 of water at a temperature of about 95°. After about 3 hours the plaster is removed, dried, and rebaked in the furnace, and then thoroughly ground and powdered. Thus prepared, the plaster needs comparatively little water to slake it, and it sets much more slowly than the ordinary

| plaster, while the comparative tenacity of the two varieties |isas 1:5 to 1.

Parian cement is plaster hardened with water containing 10 per cent. of borax ; and stucco is plaster rendered tenacious by being prepared with a strong solution of glue. When water containing lime or a solution of gum-arabic is used to slake burnt gypsum, a hard plaster is also obtained, which by smoothing, colouring, and sub- sequent polishing with oil assumes a marble-like surface. A fair imitation of meerschaumis also made in hardened plaster by polishing, tinting the surface with a solution of gamboge and dragon's-blocd, and treating it with either melted paraffin or stearic acid. It is understood that the cheaper " meer- schaum " pipes and cigar-holders are thus prepared.

GYROSCOPE, GYROSTAT, are names given to instru- ments which are used to demonstrate certain properties of rigid bodies, when made to rotate rapidly about the axis round which they are kinetically symmetrical.

In some of its forms the gyroscope has beeu known for a very long time, and is, in all probability, of French or German invention. Almost the first instrument of the kind that we hear of, and of whicli the present gyroscope is merely a modification, is that of Bohnenberger, which was constructed as

early as 1810, and is described in Gilbert's Annalen for 1818 (lx. p. 60). It consisted of a heavy spheroid which could rotate inside a circular ring round its shorter axis,—the axis running on pivots situated at opposite ends of the ring's diameter. This ring, with its contained spheroid, was similarly made movable inside a second ring, and round an axis at right angles to the axis of the spheroid. In the same way this second ring, with its contents, could rotate inside a third ring, and round an axis at riglit angles to each of the others. From this it will be seen that the spheroid had all degrees of free rota- tion,—one point only within it being fixed, namely, the intersection of the three axes.

Under the title of precession instruments, various pieces of apparatus, involving the gyroscope principle, have been in use for a number of years for illustrating the precession of the equinoxes, and the parallelism of the earth's axis as it revolves round the sun. An instrument of this kind was given by Arago to Professor Playfair, which must have been in existence since 1816-17. Mention is made of a

Babbage in 1827. At the close of that year a notice of an instrument akin to the gyroscope made by Mr Henry Atkinson was read before the Astronomical Society. In 1836, in a paper read before the Royal Scottish Society of Arts, Mr Edward Sang, C.E., Edinburgh, suggested an ex- periment with an instrument exactly similar to the gyro- scope, by which the rotation of the earth on its axis could

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be directly proved. He says: " Whilt using Troughton's top an idea occurred to me that a similar principle might

be applied to the exhibition of the rotation of the earth. |

Conceive a large flat wheel, poised on several axes all passing exactly through its centre of gravity, and whose axis of motion is coincident with its principal axis of permanent rotation, to be put in very rapid motion. The direction of its axis would then remain unchanged. But the directions of all

surrounding objects varying, on account of the motion of the earth, it would result that the axis of the revolving wheel would appear to move slowly." This suggested experiment was actually carried out in 1852 by M. Leon Foucault, although, in all probability, knowledge on his part of Mr Sang's suggestion. Already, in 1851, Foucault, in his famous experiment with the pendulum atthe Pantheon in Paris, had shown how the constancy of the plane of a pendulum's vibration could be used to show the rotation of the earth, and now, in 1852, he applied the property of the "constancy of the plane of rotation" of a gyroscope for the same purpose. The name gyroscope was given to the instrument by Foucault at this

time, and in order to perform the experiment successfully |

the instrument bad to be constructed with the utmost exactness. The experiment was repeated at the Liverpool meeting of the British Association, and by causing a con- siderable sensation in the scientific world at the time was the means of bringing the gyroscope into public notoriety. In Poggendorf's Annalen for 1853 there is a description of a gyroscope made some time before by Fessel, and about the same time we hear of various modifications of the instrument introduced by Profs. Baden Powell, Wheatstone, and others. Quite recently, in 1878, there has appeared in the Scientific American an account of a new form of gyroscope made by Mr G. M. Hopkins. In this instrument the heavy fly-wheelisdriven by an electric current after the manner of an electromagnetic engine, and so its rotation can be kept up for any length of time.

Fig. 1.

The construction of the gyroscope will be readily under- stood from fig. 1, which is engraved from a photograph of a large instrument made by Mr Sang.

It consists of a fly-wheel, with a heavy rim accurately turned and balanced, which can rotate round an axis GC forming a

diameter of the ring K. This ring also can rotate about the axis AF which is at right angles to GC, and is a diameter of the ring L. Similarly this ring L can rotate about the vertical axis BH, which is perpendicular both to GC

and AF, and forms a diameter of the ring M, which is screwed to the heavy sole-plate N. In order to suit certain experiments the ring M, by means of a clamp arrangement seen at X, can be turned round to make the axis BH inclined at any angle with the vertical. With this instru- a the following among many interesting experiments may be made.

1. Either by a large fly-wheel and band, or by running out a long cord coiled several times round the Y-grooved wheel on the end of the axis, let a very rapid rotation be given to the fly-wheel round the axis OC, and in the positive direction (that is, counter- clock-wise as seen from C). Such a rotation can readily be given so rapid as to last along time. While so revolving let a weight be

direction, and it will then be observed that a slow rotation of the whole mass takes place about the vertical axis OB, but in the nega-

without any }

GYROSCOPE

tive direction. If the weight be put at C, the wheel rotating as before, the rotation round OB will be in the positive direction. Reversing the rotation of the wheel will in both cases produce a reversal of the rotation round OB.

2. The fly-wheel still rotating in the positive direction, let a positive rotation be given to the ring L round OB, and immediately the axis of the wheel OC will tilt up, rotating in the positive direc- tion round OA till it reach the vertical position, where it will remain, and then it will be observed that the fly-wheel is rotating in the positive direction round OB. Should the axis OC, in con-

sequence of inertia, be carried a little past the vertical, and the ©

direction of rotation round OB be then suddenly reversed, the axis OC will coutinue to revolve in the positive direction round OA, till it reaches the vertical pointing downwards, when it will again be stationary, and the whecl will now be rotating in the negative direction round OB. By gently oscillating the ring L at the instant the axis of the fly-wheel is passing the

vertical, a continuous rapid rotation round OA can be given to the ring K carrying the rotating fly-wheel with it.

3. Let the fly-wheel be now made. stationary, and, while in this position, let simultaneous rotations in the positive direction be given round both OA and OB; the fly-wheel will then be observed to begin to move in the negative direction round OC.

The explanation of all these experiments follows readily from the theory of the composition of rotations round different axes. Let the angular velocities about OA, OB, OC, be a, p, o respectively. If simultaneous angular velocities « and w be given about OC and OA in the positive direction, these can be compounded into an

_ angular velocity about a new axis OI, which divides the angle AOC

into two parts such that zw sin COI sin COI i 7 an AOL cos COL tan COI=tan @ (suppose).

OI is, therefore, the position of the instantaneous axis, and as OC will always tend to coincide with it, OC will move round the axis OB in the negative direction. .It will be noticed also that, a remaining the same, tan 0 will be less as o is greater. This shows that the rotation round OB, or the motion in azimuth, will be slower as the speed of the fly-wheel is greater. This accords with experi- ment. In precisely the same way by considering simultaneous angular velocities about OC and OB and OA and OB, can experi- ments 2 and 8 be explained.

Perhaps the most common form of gyroscope is that which has been largely sold under the name of the gyroscope top. It is a modification of the gyroscope intro- duced by Fessel. In it the ring containing the rotating wheel is either supported on a : vertical pivot at the end of the axis, or Tn this case, when the wheel is rapidly rota- Fig. 2. ted, and its axis initially inclined at an angle with the vertical, a slow motion round the vertical axis is observed to take place. This rotation is accom- panied by a feeble nutation of the axis, rotation in azimuth would continue unt- form if the velocity of the wheel re- mained constant, but it gradually increases in speed, the nuta- tion at the same time

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simply held suspended by a string attached to the same point, as represented in fig. 2. which is wnobserv-

able by the eye so

long as the wheel rotates rapidly. The |

Fig. 3.

placed at G so as to canse a rotation round OA, also in the positive | becoming more ap- om

parent as the velocity dies away, till the gyroscope finally settles with the axis of the wheel in the direction of the

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G Yeu Oren OP i

A short analytical |

prolongation of the supporting string. investigation of this particular case may serve to give sone idea of how problems on the gyroscope generally may be attacked. For clearness in the woodcut (fig. 3) we suppose the ring containing the wheel removed.

Let K represent the wheel of mass M; h the distance of the centre of gravity G from O; OC the axis of the wheel, supposcd of unit length ; OA, OB, two other axes through the fixed point O at right angles to OC and to each other; OX, OY, OZ, three rect- angular axes fixed in space, with which OA, OB, OC (axes movable with the body) initially coincide; y, ¢, 6, angles on the unit sphere which define the point C.

If A, B, C be the moments of inertia, and a, p, o the angular velocities about OA, OB, OC respectively, the equation of kinetic

energy T gives sy g T =}(Aw® + Bp? + Co) ; aw=dsin d-wWsin 6cos¢; p=6cos p+psin 6 sind ; a= cos 0+¢. Substituting and making A=B, as is clearly the case, wo have T=1A6?4Ad? sin 26 4C(p cos 0+ ¢)*. Applying Lagrange's equatious of motion, which are for this case*

but

@ a ag

dt dy dy '

da aY_ at

dt dg dp "'

a "Ge al : ae | ig ghsin 0,

we get (1) & } Ay sin %9+ C(dc0s 6 +4) cos 6 =;

(2) = C (pcos 0+¢) ¢ =0; (3) AG— Ay? sin @ cos 0+ C sin 6f(} cos 0+ ¢)=Mgh sin 0. Integrating (2), we get , WY cosd+¢=a constant=n, which represents the angular velocity about OC.

Now if the motion be steady we must have both @ and ¥ constants.

nt them be represented by a and yp respectively. Then equation 3) vive: oie — Ap? sin a cos a+Cun sin a=Mgh sin a. . , _Mgh+Ap? cos a

o oh a aa . By this formula we can calculate, for any particular instrument, the angular velocity in azimuth from having given the angular velocity of rotation of the fly-wheel and vice versa,

An important case of motion, and one also very interest- ing both mathematically and physically, is got by including a gyroscope in a pendulum bob and supporting the rod from a universal flexure joint This constitutes the gyroscopic pendulum. The joint is usually got by attaching a short length of fine steel wire rigidly to the end of the rod, and suspending the whole by means of the other end of this wire firmly clamped into a fixed support. When the gyroscope is rapidly rotated, and the pendulum drawn a

little aside from the vertical and then let go, its lower end is observed to describe a beautiful curve consisting of a series of equal closed loops, all equally near each other and radiating from a centre point. This curve, which is a species of hypotrochoid, is figured in Thomson and Tait's Natural Philosophy, where also the whole theory of the gyroscopic pendulum will be found.

As has been already mientioned, a remarkable apparent effect is produced by the earth's diurnal rotation upon a rapidly rotating gyroscope. This arises from what Foucault called the "fixity of the plane of rotation," and what Thomson and Tait have recently called "gyrostatic domi- nation." In virtue of this principle, the axis of the rotating fly-wheel tends always to preserve a fixed direction in space, and, in consequence, will appear to move in a direction opposite to that in which the earth's rotation is at each instant actually carrying it.

If we suppose the gyroscope represented at fig. 1 to have all de-

grees of free rotation round the point O, and to be in every way exactly balanced about that point, and also to have all its pivots

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nearly void of friction, then, at whatever part of the earth's surface it may be placed, the fly-wheel while rotating rapidly will te observed to move gradually and finally take up such a position that its axis OC is parallel to the earth's axis, and also that its direction of rotation round OC is the same as that of the earth round its axis, Should the ring K be fixed so that the axis GC can only move in a horizontal plane, then the ring L will move in azimuth till it has placed GC in the direction north and south and such that the direction of rotation of the fly-wheel coincides with that ofthe earth. Further, should the ring L be fixed in the plane of the meridian, so that GC can only move in altitude, then GC will be observed to tilt up till it is parallel to the earth's axis, the direction of rotation of the wheel being, as before, the same as that of the earth. 'These effects may be explained as follows :—

Let A be the latitude of the place, aud w the angular velocity of the earth on its axis; also, at starting, let the ring K be in the horizontal plane, and let OC make an angle a, in azimuth, with a horizontal line ON drawn from O northwards; further, let the rotation of the wheel round OC be positive. Now w can be resolved into three angular velocities at right angles to each other, viz. :—

si A round the vertical line, w cos A cos a round a line parallel to OC, and @ cOSASiN a round a line parallel to ON.

Of these wsinA gives the velocity in azimuth, » cosA cosa can only affect the velocity of the wheel, while #cosAsina gives the velocity of OC in altitude. These being the actual component velocities communicated to the gyroscope by the earth, the apparent velocities will be equal and opposite to them,

The apparatus actually employed by Foucault to demon- strate the rotation of the earth differed somewhat from that represented in fig. 1. In it the corresponding ring to L was suspended from a fixed stand by a thread without torsion, and rested at its lowest point by a pivot in an agate cup. Also the ring corresponding to K, which carried the fly-wheel, rested on knife edges within L, and could be removed at pleasure, in order that the rotation might be given to the fly-wheel. Great care was also taken to have every part thorouglily well balanced. It is stated that the experiment was several times successfully performed, and Foucault by means of his apparatus was thus able, without astronomical observation, to find out the latitude of the place, the east and west points, and the rate of the earth's motiou. The same experiment has lately, it is said, been successfully performed by Mr G. M. Hopkins. His fly- wheel, being driven by electricity, has the advantage of rotating at a uniform rate for any length of time. By attaching a small mirror to the frame which carries the revolving wheel, and using a spot of light reflected from it as an index, he has been able to make manifest the earth's rotation in a very short time.

An ingenious practical application of the gyroscope principle was suggested and carried into effect about the year 1856 by Professor Piazzi Smyth. His aim was to devise a telescope-stand which would always remain level on board ship, notwithstanding the pitching and rolling, and so

facilitate the taking of astronomical observations at sea. For this purpose the stand was supported on gimbals, and underneath it were placed on fine pivots several heavy fly-wheels which could be put in rapid rotation, some on vertical and some on horizontal axes. The complete appar- atus, involving many ingenious details as to driving the fly-wheels, &., was tested by Professor Smyth on board the yacht "Titania" during a voyage to Teneriffe, and found to work with perfect satisfaction. A full account of the method will be found in Trans. Royal Scottish Society of Arts, vol. iv. mai,

Gyrostat.—This is a modification of the gyroscope, devised by Sir William Thomson, which has been used by him as well as by Professor Tait for a number of years to illustrate the dynamics of rotating rigid bodies. It consists essentially of a fly-wheel, with a massive rim, fixed on the middle of an axis which can rotate on fine steel pivots inside a rigid case. The rigid case exactly resembles a similarly-shaped, but hollow, fly-wheel and axis closely surrounding the other but still leaving it freedom to move. Slits are made in the

containing case whereby a cord can be coiled several times round the axis for the purpose of setting the fly-wheel in motion. There is also attached to the rigid case, in the plane passing through the centre of gravity of the wheel at right angles to its axis, a thin flange of metal, which is called the bearing edge. The circumference of this flange is not a circle but a _ curvilinear polygon of sixteen or more equal sides. The object of mak- ing it so is to pre- vent the instrument from rolling like a wheel on the bearing edge when the fly- wheel is rotating rapidly. A draw- ing of the gyrostat, with a portion of the case removed to show the inside, is given in fig. 4. A represents the bearing edge upon which the whole balances. To suit certain experiments, a sharp conical steel point can be fixed on to the end B by means of a bayonet joint.

The gyrostat is a most instructive instrument, and with it many interesting experiments can be performed. We can only mention a few taken from

Thomson and Tait's Natural Philosophy, vol. i.. Part I., where the mathematics

of the whole subject will be found fully given.

1. Let the gyrostat be placed on a flat sheet of glass with its bearing edge in a vertical plane as represented in the figure. Neglecting translations, it has in that position clearly two free- doms, one in azimuth and the other inclinational. Of these, the first is neutral and the second unstable when the fly-wheel is still ; but when it rotates rapidly the second will become stable, the first remaining neutral. as before. When the fiy-wheel is spinning rapidly, the persistence with which the gyrostat keeps the erect position is very remarkable. A blow from the fist on the side of the case is met by a strong resistance, the instrument being thrown into a state of violent tremor, which subsides, however, after a few seconds. If, while the fly-wheel is still rapidly spinning, a weight be hung on at B, the whole apparatus will, like the gyroscope, immediately begin to move round a vertical axis.

2. Let the gyrostat be supported on knife-edge gimbals at its lower end, and with the axis vertical. In this position it has two freedoms each unstable, without rotation of the fly-wheel, but with it both stable. A similar result is obtained by supporting the gyrostat on a universal flexure joint, constituting an inverted gyroscopic pendulum.

3. Let the gyrostat be supported on two equally long stilts tan- gential to the bearing edge. In this position the two freedoms, one azimuthal the other inclinational, are both unstable without. but both stable with, rapid rotation of the fly-wheel. :

4, Let the gyrostat be attached to a bar of wood by thrusting the bearing edge through a narrow slot in the middle of the bar, and then let it be suspended by strings attached to the ends of the bar, the bar being horizontal. By this we have the means of slinging the gyrostat bifilarly in four different ways, two with the strings parallel and two with them crossed, the gyrostat being alternately above and below the wooden bar. Each of these ways has four freedoms, which can be reduced to three by a third string in each case. A little consideration will show in each case the stable and unstable modes without and with rotation of the fly-wheel.

It only remains to mention a very interesting and intricate gyrostatic problem which has been lately suggested by Sir William Thomson. He supposes a string of gyrostats to be formed with their axes all in the same straight line, and each attached to the other by a small universal flexure joint of thin steel wire. If this string be disturbed after the fly-wheels have all been put into rapid rotation, a remarkable cork-screw motion passes along the wire. For particulars we must refer to a paper announced by Sir William Thomson in the &. 8. £. Proceedings.

In addition to the references in the text the following will be found useful :— Ast. Notices, vol. i. ; Comptes Rendus, Sept. 1852 ;

Paper by Professor Magnus translated in Taylor's Foreign Setentifie |

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Memoirs, new ser., part 3, p. 210: Ast. Notices, vol. xiii. pp. 221-248; Theory of Foucault's Gyroscope Experiments, by the Rev. Baden Powell, F.R.S. ; Ast. Notices, vol. xv. ; articles by Major J. G. Barnard in Silliman's Journal, 2d ser., vols. xxiv. and xxv.; E. Hunt on " Rotatory Motion," Proe. Phil. Soc. Glasgow, vol. iv. ; J. Clerk Maxwell, "Ona Dynamical Top," Trans. R.S.E., vol. xxi.; Phil. Mag., 4th ser., vols. 7, 18, 14; Proc. Royal Irish Academy, vol. viii.; Sir William Thomson on " Gyrostat,"' Nature, vol. xv. p 297 ; Price's Infinitesimal Calculus, vol. iv. (J. BL.)

GYTHIUM was an ancient Achean town on the Laconian Gulf, south-west of the mouth of the Eurotas, near the site of the modern port Marathonisi. It lay opposite the island Crane, at the foot of the fertile valley of the Gythius. On its coins the common types are Apollo and Heracles, the founders of the city. Heracles, the Phoenician god Melkart, points to an early connexion with Tyre. The Pheenicians maintained a great trade with the shores of the Laconian Gulf, and Aphrodite Migonitis, the Pheenician Astarte, had a temple at Migonium, the modern Marathonisi. Aphrodite and Asclepius also occur on its coins, and the latter had a temple in the city.

GYULA, chief town of the Trans-Tibiscan county of Békés, Hungary, is favourably situated on the Fehér (White) Kéros, and has a well-built station on the Nagy-Varad (Grosswardein) and Eszék line of the Alféld-Fiume

Railway, in 46° 38’ N. lat., 21°17’ E. long. The outer ditch of the old ruined fortress, the tower of which serves as a prison, divides Gyula into two parts, named respectively Magyar- Varos (Hungarian-town) and Német-Varos (German-town). Stone bridges facilitate communication over the canals, which flow from the K6rés, and intersect the streets. Among the principal buildings are Roman Catholic, Old United Greek, Lutheran, and Calvinist churches, and a Jews’ synagogue, also a fine castle with gardens, a county hall, an ancient Turkish bath, many handsome private residences, and several oil-mills.) Gyula is, moreover, the seat of the county assemblies and administration, of a royal court of justice, of the assizes, and of a board of taxes, and has post and telegraph offices, and a savings-bank. The inhabitants are employed partly in industrial and commercial pursuits, partly in farming and cattle-breeding. The fairs are much resorted to for the purchase of corn, horned cattle, sheep, pigs, wooden wares, and gall-nuts. The chief agricultural products of the surrounding country are wheat, barley, oats, and maize; there is also a good supply of garden fruit, grapes, and vegetables. In 1870 the population amounted

to 18,495, consisting chiefly of Magyars, Wallachs, and Germans.

300

H

has varied in form from the Phoenician and old Hebrew symbol ff, called Cheth, only by the renioval of the upper and lower horizontal lines. (For the oldest forms of the letter see ALPHABET.) The closed form is sometimes found in old Greek inscriptions, and, though less frequently, in South Italy.

Its value in Pheenicia was probably a continuous guttural sound—-the sound which it had in Hebrew—resembling the German ch, and with no English counterpart. In Greece it represented nothing more than the spirant , so long as a separate symbol to denote that sound was felt to be necessary. Afterwards it was generally employed to denote a second e-sound, under the name of Hta; probably it had before been called Heta. The time of this change varied in different parts of Greece. In the alphabet of the island of Thera we find H representing e as early as the 40th Olympiad, though it still sometimes retained its old value. At Athens the date was 403 sB.c., and

here the practice did not vary. But in most of the alphabets of Greece proper, of Peloponnesus, and of the Italian colonies, H still remained as the rough breathing; and as such it consequently passed into the Latin alphabet. It is possible that A in a very few Latin words, when it occurs as a medial sound (e.g., traho, veho), was a continuous guttural. But generally it occurs at the beginning of a word, and can hardly have been more than a breathing. Even as this it early became evanescent. During the classical period of Latin literature it was retained in the speech of educated men, doubtless in part by Greek influence. But in the popular speech it was rapidly disappearing as an initial sound ; although it continued to be written, and indeed was often written wrongly, at the beginning of words where it had no place ; ¢.g., wmor was written humor, and the h has held its own in English spelling down to ourday. The sound is almost completely lost in modern Italian.

It is not settled beyond dispute by what mechanism the h-sound is produced. The old view (held by Lepsius and others) is that A has a distinct position of its own, further back in the throat than the gutturals, in fact, immediately above the larynx,—that it is a surd, to which the corre- sponding sonant is the slight gurgle heard between words of which the first ends and the second begins with the same sound (e.g., "go over"), if we take care to close the glottis between the two words but not to alter the position of the other vocal organs. A quite different view is held by Whitney, M. Bell, and others, that 4 has no distinct position of its own, but is sounded in or through the position of the following sound; for example, that in say- ing ha we do not put the vocal organs into two positions, one for 2 and one for a, but we put them into the position for a, and then produce the breath and the vowel without any change of position, the A being a mere expiration of breath through the open glottis ; similarly hz, hu, &c., are produced with the vocal organs in the position for 7, u, &c., respectively ; in each case the vocal chords vibrate for the vowel after the expiration of breath, but there is no change made within the orifice of the mouth between the h-sound and the vowel. This view is at least a plausible one.

HAARLEM, a city of the Netherlands, the chief town of the province of North Holland. By rail it is 11 miles W. of Amsterdam, 19 §. of Alkmaar, and 20 N. of Leyden. Distant about 5 miles from the German Ocean, it commu-

nicates with the Zuyder-Zee by the Spaarne and the Jj. The railway to Amsterdam was opened in 1839, and that to Alkmaar in 1867.

Haarlem is a typical Dutch town. The branches of the Spaarne and an extensive system of canals bring the ship- traffic into the heart of it, and turn its streets into so many quays. The roadways are paved with bricks; the houses have gable-ends with old-fashioned crow-steps; and every- thing wears a decent and quiet aspect, which to one man is dulness and to auother "aristocratic gravity and modest coquetry." What the city lacks in liveliness it makes up by the interest of its historical associations and the numberof its scientific and artistic institutions. The great market place especially has much that is worth seeing: the town-house and the cathedral of St Bavo ; the old meat market, a build- ing of the end of the 16th century in the old Dutch style ; the stadsdoelen, or place where in former times the burgesses used to assemble in arms; and the statue erected to Koster in 1856, when in Holland he was still generally considered the inventor of printing. St Bavo's is one of the most famous churches in the Netherlands. It is a cruciform structure completed in 1538, and makes a considerable impression on the spectator by the great length (about 426 feet) of its main axis and the height and steepness of the

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Plan of Haarlem.

4. The Cathedral of 2. Infirmary. St Bavo or Groote 3. Town-House. Kerk,

roof. The tower is about 255 feet high. Within the lofty vaulting is supported by twenty very light columns, and there is a good deal of beauty about the perspective of its aisles. The organ, built by Christian Muller of Amsterdam

between 1735 and 1738, was for some time the largest in the world, and is still celebrated for the sweetness of its tone, especially in the vox humana stop. It possesses

5. R.C. Ch. of St Joseph. 6. Barracks, 7. Teyler's Foundation.

1. Gas Works.

| four key-boards, 64 stops, and 5000 pipes, the largest of

|

|

which is 15 inches in diameter. Among the monuments in the church are those of Bilderdijk the poet and the hydraulic engineers Christiaan Brunings and Fredrik William Conrad, the latter the projector of the sluices at Katwijk. In the belfry are the damiaavjes, small bells presented to the town according to tradition by William I., the conqueror of Damietta. At the head of the scientific institutions of Haarlem may be placed the Dutch society of sciences (Hollandsche Maatschappy van Wetenschappen) founded in 1752, which possesses very valuable collections in botany, natural history, and geology. Teyler's found- ation (Teyler's Stichting), instituted in accordance with the last will of Pietre Teyler van der Hulst for the study of theology, natural philosophy, poetry, history, drawing, and

numismatics, lias various auxiliary collections in thefounder's | former residence. The Dutch society of industry, founded in 1777, is still active and flourishing, with branches estab- lished all over the country. In 1871 it instituted a colonial museum, which along with the royal museum of modern art is accommodated in the pavilion formerly the residence of an Amsterdam banker, Hope, and acquired for the crown by King Louis Napoleon. The colonial museum presents a complete survey of the manifold products of the Dutch possessions in the East Indian Archipelago, and the royal museum has a collection of 250 pictures. Among the benevolent

institutions of the city it is enough to mention the hospital for old men founded in 1608, and the beautiful Teyler's Hospital.

The staple industries of Haarlem have been greatly modified in the course of time. Under the counts of Holland cloth-weaving and brewing were in a very thriving condition; but under Charles V. they lost enormously in importance. While 2000 pieces of cloth had been manu- factured annually in the end of the 15th century, 800 or 900 was the number for 1515; and the breweries diminished from 120 in 1494 to 95 in 1503, and by 1513 were no more than 77. After the revocation of the edict of Nantes, silk, lace, and damask-weaving were introduced by French refugees, and in course of time these industries gave employ- ment to 10,000 of the population. About the close of the 18th century this remarkable prosperity was a thing of the past ; and it was not till after the Belgian revolution that Haarlem began to turn its attention to the various depart- ments of manufacture in which it is now engaged. Cotton factories, carriage-works, bleach-works, cotton and silk dye-works, a famous type-foundry, oil-works, soap-works, breweries, and a factory for preserved meats are among the more important establishments. The extensive workshops of the Dutch railway company are also of value to the town. One of the printing establishments has the reputation of being the oldest in the Netherlands, and publishes the oldest Dutch paper, De Opragte Haarlemmer Courant. As market gardening, especially in the flower department, is largely carried on in the immediate vicinity, Haarlem is the seat of a flourishing trade in '"' Dutch roots," especially in hya- cinths, tulips, fritillaries, spireeas, and japonicas. A con- siderable business is also done in the butter, cheese, and other agricultural produce from the surrounding country.

Though the population of Haarlem has been steadily increasing since the beginning of the present century, it has not become so great as it was inthe 17th. In 1570 the total was 20,772 souls, of whom 1836 were Dutchmen capable of bearing arms, 1215 Englishmen and Frenchmen, 1856 Germans, and 15,865 women and children. By 1622 it had increased to 39,455. A rapid decline took place in the 18th century ; from 26,281 in 1748 the number sank to 21,227 in 1796, and by 1815 it was not more than 17,432. Seven years later we find 18,453 inhabitants, 21,667 in 1830, 24,012 in 1840, 25,852 in 1850, and 27,534in 1860. The year 1874 showed 32,758,

and three years later the number was no less than 35,692. In 1869 -1870 there were 14,471 members of the Dutch Reformed Communion, 11,574 Roman Catholics, and 565 Jews.

Haarlem is mentioned in a register of the 10th century as Haralem. From Count William II. it obtained a charter iu 1245, and in the course of the following centuries it rapidly advanced in

prosperity. In 1492 the insurgents called the '"' bread and cheese folk" got possession of the town, but before the year was out it was recovered by the imperial general Duke Albert of Saxony. The year 1493 was witness of a great conflagration, and in 1509 the plague claimed its many vietims. In 1559 Haarlem became a bishop's see. The prominent part that its inhabitants took in the revolt of the Netherlands brought upon it an unparalleled disaster. Don Fred- erick son of the duke of Alva invested the town with 30,000 men in December 1573, and after a siege, in which the burghers defended themselves with admirable and pertinacious heroism, it was obliged

to capitulate in July 1573. The conquerors, in spite of their promise of mercy, took barbarous vengeance, and it was not till July 1677 that the town was recovered from their grasp by the prince of Orange. In its subsequent history the main events are the inuudations of 1775 and 1791, the arrival of the Prussians in 1787, aud the quatercentenary celebration of the invention of printing in 1823.

See F. Allan, Gesehiedenis en beschrijving van Haarlem van de vroogste tijden tot op onze dagen onder medewerking van Ekema, Enschede, en Geelings.

Haartem Lake, or HARLEMMER MEER, a commune of the pro- vince of North Holland, constituted by the law of 16th July 1855. It has anarea of about 46,000 acres, and its population has increased from 7000 in 1860 to 18,602 in 1878. As its name indicates, the commune was formerly a lake,

and, according to Amersfoordt, this lake waga relic of a northern arm of the Rhine which passed through the district in the time of the Romans. In 1531 the Haarlemmer Meer had an area of 6430 acres, and in its vicinity were three smaller sheets of water—the Leid'sche Meer or Leyden Lake, the Spiering Meer, and the Oude Meer or Old Lake—with a united area of about 7600 acres. The four lakes were ultimately incorporated into one by successive inundations, and by 1647 the new Haarlem Lake had an area of 36,400 acres, which by 1740 was increased to 42,000. As early as 1643 Jan Adriaanszoon Leeghwater proposed to endyke and drain the lake; and similar schemes, among which those of Nikolaas Samuel Cruquius in 1742 and of Baron van Lijnden van Hemmen in 1821 are worthy of special mention, were brought for- ward from time totime. But it was not till 1836, when one furious hurricane on the 9th of November drove the waters as far as the gates of Amsterdam, and another on the 25th of December sent them in the opposite direction to submerge the streets of Leyden, that the mind of the nation was turned seriously to the matter. In August 1837 the king appointed a royal commission of inquiry ; the scheme proposed by the commission received the sanction of the second chamber in March 1839, and in the following May the necessary law was passed. The first business was to dig a canal round the lake for the reception of the water and the accommodation of the great traffic which had previously been carried on. The canal was made 38 miles in length, with a depth of 9 feet, and a width of 130 feet on the west side of the lake and 115 feet on the east side. The preliminary works were not completed till 1845. The area enclosed by the canal was rather more than 70 square miles ; the average depth of the lake was 13 feet 1°44 inches ; and as the water had no natural outfall it was calculated that probably 1000 million tons would have to be raised by mechanical means. A gigantic steam-engine designed by Messrs J. Gibb and A. Dean of London was erected and named in honour of Leeghwater. It could raise 112% tons at each stroke and discharge 1,000,000 tons in 25} hours. The total weight of ivon used for the engine, pumps, &c., was 640 tons, and the cost of the machinery and buildings amounted to £36,000. Two other engines of equal size and power were aftcr- wards constructed by Messrs Harvey of Hayle and Messrs Fox and Co. of Perran, in Cornwall, the makers of the "Leeghwater."" They were named respectively the Crnquius and the Van Lijnden. Pumping commenced in 1848, and the lake was dry by the Ist of July 1852. At the first sale of the highest lands along

the banks on August 16, 1853, 784 hectares were bought for 575,000 florins, or 733 florins per hectare ; but the average price afterwards was less. The whole area of 42,000 acres recovered from the waters has brought in 9,400,000 florins or about £780,000, so that the actual cost to the nation has only been 4,400,000 florins or £300,000, though the expense of the enterprise amounted to 13,787,377 florins or £1,080,000. The soil is of various kinds, loam, clay, sand, and peat ; most of it is sufficiently fertile, though in the lower portions there are barren patches where the scanty vegetation is eovered with an ochreous deposit. Corn, seeds, cattle, butter, and cheese are the principal produce. The roads which traverse the commune are bordered by pleasant-looking farm-houses built after the various styles of Holland, Friesland, or Brabant. Hoofddorp, Venneperdorp or Nieuw Vennep, Abbenes, and the vicinities of the three great steam-engines are the spots where the population has clustered most thickly. The first church was built in 1855; in 1877 there were seven. In 1854 the city of Leyden laid claim to the possession of the new territory, but the courts decided in favour of the nation.

A list of works on the Haarlem Lake is given by Gevers van Ende- geest, Du desséchement du Lae de Harlem (The Hague, 1849-1861, 3 parts, with plates). See also J. P. Amersfoordt, Het Harlemmer- meer, Haarlem, 1857, published by the Amsterdam JMaatschappy

Feliz Meritis.

HABAKKUK (P3PIN), one of the minor prophets of the Old Testament, the eighth in order in the Massoretic text. The name of the prophet is peculiar to him, and occurs only in his own writing (i. 1; iii. 1), As to its meaning there is some uncertainty, but it is probably a formation from a verb signifying to entwine, to embrace

Hi Agee

(P27), and means “emmbraced” or simply “embrace” (Jerome, Pr. ad Hab.; Gesenius and Fiirst on the word). In the

Septuagint and with the Greek fathers it appears in the |

form of ’ApBaxovp, which would seem to indicate that the Hebrew was read and pronounced Habbakuk (?3P30),

the double 6 being changed for the sake of euphony into |

mb. The change of the & into m at the end of the word

Bleek says is without analogy; but in the change of | Beelzebub into Beelzebul we have an analogous instance |

of the substitution of a liquid for a mute,—probably because to the Greek ear it was not agreeable that a final syllable should begin and end with the same rough consonant. Of the prophet’s personal history nothing is certainly known. In the inscription of his book he is simply called “the prophet”; nor can we with certainty determine at what time he lived and prophesied. From the use of the word ““my” in the subscription to the psalm in chap. ili. “To the chief singer ou my stringed instrument” (ver. 19), it

has been inferred that lhe was of the tribe of Levi, inasmuch | as it is supposed from this that he held a place among |

those by whom officially the musical service of the temple was conducted, a place which only a Levite, it is alleged, could occupy. But this seems rather too much to build on the mere use of the word “my,” nor is it quite certain that only Levites took part with stringed instruments in the service of song in the temple. King Hezekiah, after luis recovery from his sickness, composed a psalm of thanks- giving, and in reference to it he says, “ We will sing my songs to the stringed instruments all the days of our life in the house of the Lord”; for he ‘had said, What is the sign that I shall go up to the house of the Lord?” (Isa.

xxXvill, 20, 22); from which it may be inferred that others |

besides Levites might take part in the liturgical music of the temple. Were there any truth in the assertion in the additions to Daniel in the Apocrypha that Habakkuk was sent by the Lord from Judea to Babylon with food for Daniel in the lions’ den, this would give us the date of the prophet’s activity

; but on such a manifest fiction nothing can be built. buried at Keilah in the tribe of Judah; according to another at Hukkok (now Yakuk) in the tribe of Naphtali.

The book of Habakkuk falls into two parts,—the former of which (chaps. i. and ii.) has the inscription, "' The burden which Habakkuk the prophet saw," and the latter (chap. iii.) the inscription, "Prayer" (or hymn) "of Habakkuk on Shigyonoth." Both parts have reference to the same subject, the invasion of Judah by the Chaldeans, who are expressly named (i. 6). In both this is regarded as a chastisement from the Lord upon the people for their sins; but whilst in the earlier part the prophet appears as a reprover and denouncer of evil, in the latter he gives utterance to emotions of reverence, confidence, and joy in God as the Saviour of His people. Inthe former part the prophecy is in the form of a dialogue between Jehovah and the prophet. The pro-

phet, deeply troubled because of the corruption of his people, |

| nezzar.

cries to God and asks how long such a state of things is to

coutinue (i. 2-4); to which God replies in effect that He ©

is about to bring on the sinful nation a heavy calamity by raising against them the Chaldeans—"that bitter and impetuous nation "—-whose fierce and terrible hosts should

According to one tradition the prophet was |

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safed to him which he may carry to his people.

Sie The word

_comes ; the Lord will uot suffer the ungodly, the trans-

gressor, and the idolater to escape; a five-fold woe is denounced against the enemies of God's people; the just

_ are encouraged to abide in faith, cheered with the assurance

that as a result of God's judgments on tle wicked the

_ knowledge of the glory of the Lord shall fill the earth as

the waters cover the sea; for God is in His holy temple, His purposes shall stand fast, therefore let all the earth be still and await His coming (ii. 1-20). The latter part of the book is a hymn of praise in which the prophet in his own name and that of the people celebrates the majesty and mighty deeds of the Lord, and gives exulting expression to the confidence and joy with which His true subjects rest in Him (ili, 1-19). This hymn is in form and style like one of the Psalms, and was doubtless intended for use in the temple service. To some it has appeared that this third chapter is wholly unconnected with the two preceding. But though different in character and style, it stands closely connected in substance with what goes before, and forms with this one whole. In the former part we have the kurden which the prophet had to bear to the people ; in the latter we have the utterance of the feelings produced by the con- templation of the facts and revelations therein set forth, viewed in the light of God's manifestations of Himself on behalf of His people in former times.

This book, which it is generally agreed was written by the prophet himself, forms one of the finest remains of ancient Hebrew literature. In conception and style it is not inferior to any prodnction of the most flourishing age of prophecy. The language is pure, the thouglit is lofty, and in the construction artistic skill is displayed. With the mantle of the prophet the author bears also the chaplet of the poet.

At what time Habakkuk prophesied remains uncertain. From i. 5, 6, where the invasion of Israel by the Chaldeans is represented

_ asa thing so strange as to be incredible when announced, it has

been inferred that the prophecy was uttered whilst as yet the people of Israel were unacquainted with the Chaldeans as a warlike power,—long, therefore, before the battle of Carchemish (606 B.c.), in which Necho, king of Egypt, was defeated by Nebuchadnezzar. The date of the prophecy has accordingly by some been relegated to the reign of Manasseh ; and this has been supposed to receive confirmation from the fact that during that reign there were pro- phets who foretold the coming on the nation of a calamity such as that the ears of all who heard of it should tingle (2 Kings xxi. 10 ff.) ; and of these prophets Habakkuk may have been one. The words of the prophet, however, do not necessarily imply that at the time he uttered his prophecy the people were so ignorant of the Chaldeans that they could not believe what he was commissioned to announce to them regarding an invasion of the country by that 'bitter and hasty" nation; it is rather the immediateness and terribleness of the catastrophe which he represents as what would pass belief, even when announced by a prophet of the Lord. _ It is further to be observed that his words imply that the calamity he was sent to announce would happen in the days of those to whom he spoke, which could hardly be said of a generation that had reached adult age during the latter half of Manassehi's reign, that is, fully sixty years before the invasion of Judah by Nebuchad- It may be added that it is very improbable that during

| the reign of Manassch, when idolatry had to such an extent super-

| time of Josiah, and this is accepted by Delitzseh and others.

devastate the land,—at the same time intimating that this

scourge should pass away, and that the invaders, though

the instruments of God's vengeance, should not be held»

guiltless (5-11). The prophet then appeals to God, the Everlasting and Holy One, and asks how the employment

of such ins infli i g le of | instruments to inflict punishment on the peop | (@ Kings xxii. 15-20). | much weight.

His choice is reconcilable with the divine rectitude and unchangeableness (12-17), but declares that he will stand

seded the worship of Jehovah, sueh a psalm as that of chap. in. would have been composed for the temple service by any one living in Judah. A later date, it wonld thus appear, must be assigned to the prophecy. Vitringa has suggested that it was uttered in – this it has been objectcd that the state of things described in the beginning of the book does not accord with what we know to have been the state of things in Josiah's reign, and moreover that the declaration that the calamity threatened should happen in the days of the existing generation does not tally with the assurance given by the prophetess Hnldah to King Josiah, that the evil the Lord was about to bring upon Jerusalem should not happen in his day Neither of these objections, however, has To the former it inay be replied that, though in the later part of Josiah's reign a better state of things than that described

on his watch-tower that he may learn what God will say | by the prophet prevailed, in the early part of it things were pro-

to him, hoping that some word of comfort may be vouch-

bably exactly such as he represents ; and to the latter it may be

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replied that the two declarations are not irreconcilable, for though the invasion of the Chaldeans might happen in the time of the exist- ing generation to whom the prophet spoke, it might be not till after the death of Josiah that Jerusalem should be taken ; which in point of fact was the case. A more serious objection is that the psalm in chap. iii. could not have been composed in the early part of

Josiah's reign before the reforms which he introduced had been |

~~begun, and that the first and second chapters could not have been uttered after these had been inaugurated, because then the state of things there described did not exist. To meet this it has been suggested that the two parts of the book may have been composed at different times, the earlier part in the beginning and the later after the middle of Josiah's reign. Thisis possible ; but the stand~~ point of the prophet is in both parts so much the same that it is not probable that any marked interval of time elapsed between the composition of the two. We are, however, so imperfectly acquainted with the minuter details of the history of the tines that for aught we can tell there may have been seasons during the reigu of Josiah when the good and the evil in the nation were so mixed that a prophet, whilst denouncing the wickedness he saw around him, and threaten- ing a woe on the nation because of it, might yet be inspired by the remembrance of God's dealings with his people in the past and the hope of better things for the future to give utterance to such a strain of adoration and exultant gladness as the hymn at the close of the book presents ; nor is there any reason to doubt that the pious king and such men as Hilkiah the high priest, and those associated with him as "rulers of the house of God" (2 Chron. xxxv. 8), would be soin sympathy with the prophet in this that they would readily approve of his psalm being consigned to " the chief singer" to be used in the temple service. An argument in favour of assigning the date of this prophecy to the reign of Josiah has been drawn fron the numerous coincidences in sentiment and phraseology between this book and those of Jeremiah and Zeph-

be held conclusive, for both these prophets began to prophesy in the later part of the reign of Josiah. De Wette, Hitzig, Ewald, Bleek, a others assigu the prophecy to the reign of Jehoiakim ; but for this there seems no good reason. (W. L. A.)

HABEAS CORPUS, in English law, is a writ issuing out of one of the superior courts, commanding the body of a prisoner to be brought before the court. There are various forms of this writ, according to the purposes for which it isintended. Thus habeas corpus ad respondendum is to bring up a prisoner confined by the process of an inferior court in order to charge him with a fresh action in the court above. Other forms are ad satisfaciendum (when judgment has been had against a prisoner in the

court below), ad faciendum et recipiendum, or cum causa (to remove the proceedings into the superior court, the de- fendant being under arrest), ad testificandum (when the prisoner is wanted as a witness), &c. These forms are now of little or no importance. The most famous form of the writ is the habeas corpus ad subjiciendum,—the well-known remedy for the violation of personal liberty. It is addressed to the person in whose custody another is detained, and

commands him to bring his prisoner before the court, with |

a statement of the day and cause of his capture and deten- tion,—"' ad faciendum, subjiciendum, et recipiendum, to do, submit to, and receive whatsoever the judge or courts awarding the writ may consider on that behalf." It is de- scribed asa high prerogative writ, 2.e., it is one of a number of extraordinary remedies, such as mandamus, prohibition, and the like, which the courts may grant on proper cause being shown. The writ of habeas corpus issues only after motion before the court or application to a judge, made on a sworn statement of facts setting up at least a probable case of illegal confinement. It is a common-law writ. 'From the earliest records of the English law," says Hallam, "no freeman could be detained in prison except upon a criminal charge or conviction, or for a civil debt. In the former it was always in his power to demand of the Court of King's Bench a writ of habeas corpus ad subjiciendum, directed to the person detaining him in custody, by which he was enjoined to bring up the body of the prisoner with

_ have none in vacation.

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the warrant of commitment that the court might judge of its sufficiency and remand the party, admit him to bail, or discharge him, according to the nature of the charge. The writ issued of right, and could not be refused by the court."1 Habeas corpus is, in fact, the appropriate instrument for enforcing the law of personal liberty, as declared in the Great Charter,—that no "freeman may be taken or im- prisoned but by the lawful judgment of his peers or by the

| law of the land."

In Darnel's case (3 Car. I., 1627) the judges held

that the command of the king was a sufficient answer to a _ writ of habeas corpus.

The House of Commons thereupon passed resolutions to the contrary, and after a conference with the House of Lords the measure known as the Petition of Right was passed, which, znter alia, recited that, contrary to the Great Charter and other statutes, divers of the king's subjects had been imprisoned without any cause shown, and when they were brought up on habeas corpus, and no cause was shown other than the special command of the king signified by the privy council, were nevertlieless remanded to prison, concluded "that no freeman in any such manner as is before mentioned be imprisoned or detained." In Jenkes's case, 1676, the lord chancellor (Lord Nottingham) refused to issue a habeas corpus in the vacation. Shortly afterwards was passed the famous Habeas Corpus Act (31 Car. II. c. 2), which is sometimes described as a

unialy (of Hab. i. 8 with Jer. 7. 6, iv. 18, aul zeae SCN | consequence of the harsh if not illegal refusal of the writ

i. 13 with Jer. xii. 1; Hab. ii. 9 with Jer. xlix. 16; Hab. ii. 13 | with Jer. li. 58; Hab. ii. 16 with Jer. xxv. 27; Hab. ii. 20 with | Zeph. i. 7, &c.); and if in these instances Jeremiah and Zephaniah | have imitated Habakkuk or qnoted from him, the argument must |

in Jenkes's case, but which, as Hallam shows, was really due to the arbitrary proceedings of Lord Clarendon. The Act itself passed the Lords after many similar measures sent up by the Commons had been rejected.

The Habeas Corpus Act recites that great delays have been used by sheriffs and jailers in making returns of writs of habeas corpus directed to them ; and for the preven- tion thereof, and the more speedy relief of all persons im. prisoned for criminal or supposed criminal matters, it enacts in substance as follows. (1) When a writ of habeas corpus is directed to a sheriff or other person in charge of a prisoner, he must within 3, 10, or 20

days, according to the distance of the place of commitment, bring the body of his prisoner to the court, with the true cause of his detainer or imprison- ment—unless the commitment was for treason or felony plainly expressed in the warrant of commitment. (2) If any person be committed for any crime— unless for treason or felony plainly expressed in the warrant—it shall be law- ful for such person or persons (other than persons convicted or in execution by legal process) tn time of vacation, to appeal to the lord chancellor as a judge, who shall issue a habeas corpus returnable immediately, and on the return thereof shall discharge the prisoner on giving security for his appearance before the proper court—unless the party so committed is detained upon a legal process or under a justice's warrant for a non-bailable offence. Persons neglecting for two terms to pray for a habeas corpus shall (3) Persons set at large on habeas corpus shall not be recommitted for the same offence unless by the legal order and process of the court having cog- nizance of the case. (4) A person committed to prison for treason or felony shall, if he requires it, in the first week of the next term or the first day of the next session of oyer and terminer, be indicted in that term or session or else admitted to bail, unless it appears on affidavit that the witnesses for the crown are not ready; and if he Is not indicted and tried in the second term or session after commitment, or if after trial he is acquitted, he shall be discharged from imprisonment. (5) No inhabitant of England (except persons contracting, or, after con- viction for felony, electing to be transported) shall be sent prisoner to Scotland, [reland, Jersey, d&c., or any place

' Constitutional History, vol. iii, c. 13.

beyond the seas. Stringent penalties are provided for offences against the Act. A judge delaying habeas corpus forfeits £500 to the party aggrieved. Illegal imprisonment beyond seas renders the offender liable in action by the injured party with treble costs and damages to the extent of not less than £500, besides subjecting him to the penalties of premunire and to other disabilities. 'The great rank of those who were likely to offend against this part of the statute was," says Hallam, "the cause of this unusual severity."

The Habeas Corpus Act, it will be seen, applies only to the case of persons imprisoned on criminal charges. In 1758 the question arose whether, in the case of an impress- nent for military service, a habeus corpus could be applied for under the Act, and other questions of some difficulty were raised as to its effect in particular cases. The judges who were consulted by the House of Lords differed in their opinions, and ultimately the Act 56 Geo. III. c. 100 was passed, 'for more effectually securing the liberty of the subject." It enacts (1) that a writ of habeus corpus shall be issued in vacation time in favour of a person restrained of his liberty (except persons imprisoned for debt or by civil process)—a privilege granted by the Act of Charles If. only in the case of commitments for criminal offences ; (2) that though the return to the writ be good and sufficieut in law, the judge shall examine into the truth of the facts set forth in such return, and if they appear doubtful the prisoner shall be bailed; (3) that the writ shall run to any harbour or road on the coast of England, although not within the body of any county. The last clause was intended to meet doubts on the applicability of habeas corpus in cases of illegal detention on board ship.

In Anderson's case, in 1861, the Court of Queen's Bench decided somewhat reluctantly that the writ runs to all the foreign dominions of the crown even when there are inde- pendent local judicatures. In consequence of this decision the Act 25 and 26 Vict. c. 20 was passed, enacting that "no writ of habeas corpus shall issue out of England, by authority of any judge or court of justice therein, into any colony or foreign dominion of the crown where her Majesty has a law- fully established court or courts of justice, having authority to grant and issue the said writ, and to ensure the due exe- cution thereof throughout such colony or dominion."

In times of public danger it has been found necessary to suspend the Habeas Corpus Act bya special statute. This was done in 1817 by the Act empowering the king to secure and detain such persons as his Majesty shall suspect are conspiring against lis person and government. More recently this extreme measure has been judged necessary in the case of Ireland (see 29 Vict. c. 1, continued for a short period by annual acts),

In the United States of America the law of habeas corpus has been inherited from England, and has been generally made to apply to commitments and

detentions of all kinds. Difficult questions, unknown to English law, have arisen from the peculiar features of the American State-system. Thus the constitution provides that "the privilege of the writ of habeas corpus shall not be suspended unless when, in cases of rebellion or invasions, the public safety may require it ;" and it has been the subject of much dispute whether the power of suspension under this provision is vested in the president or the congress. The weight of opinion seems to lean to the latter alternative. Again, conflicts have arisen between the courts of individual States and the courts of the Union. It seems that a State court has no right to issue a habeas corpus for the discharge of a person held under the authority of the Federal Government. On the other hand, the courts of the Union issue the writ only in those cases in which the power is expressly con- ferred on them by the constitution.

BOO HABINGTON, Wittram (1605-1654), one of the most

pleasing of English minor poets, was born at Hendlip in Worcestershire, on the 4th of November 1605. Tis father, Thomas Habington, was a prominent Catholic ; to his mother, Lady Mary Habington, was attributed the revela- tion of the Gunpowder Plot. The poet was educated first at St Omer, and refusing to become a Jesuit was removed to Paris. On his return to England he met and fell in love with Lady Lucy Herbert, second daughter of Lord Powis, whom he celebrated under the poetical name of Castara. After some opposition he won her hand, and they were married about the year 1632. In 1634 he first published his famous volume of lyrical poems entitled Castaru, which was reprinted in 1635 and 1640. In the Jatter year he also published a prose History of King Edward IV. and The Queen of Arragon, a tragi-comedy. This play was pub- lished at the request of his kinsman, the earl of Pembroke ; it was afterwards revived by Samuel Butler. The last work printed by Habington was Olservations upon History, 1641. In 1647 his father died ; and during the Common- wealth, as we learn from Anthony Wood, the poet "did run with the times, and was not unknown to Oliver the usurper." He died November 30, 1654, and was buried in the family vault at Hendlip. Habington possesses all the faults of his age except its impurity ; he is honourably known as the chastest of the Royalist lyrists. His genius was gently fantastic, nuld in its play of fancy, delicately ingenious, and of an unrufiled stately dignity. He never rises to sublimity or passion, but he is

always gentleman- hike and often extremely graceful. His best verses have a very modern tone, and remind the reader of the 18th rather than of the 17th century.

The works of Habington have not been collected. An excellent edition of Castara was published by Mr Arber in 1870, and The Queen of Arragon has been included in the Dodsley collection.

HACHETTE, Jean Nicoxtas Pierre (1769—1834), an eminent French mathematician, was born at Méziéres, where his father was a bookseller, on the 6th May 1769. For his early education he proceeded first to the college of Charleville, and afterwards to that of Rheims. In 1788 he returned to Méziéres, where he was attached to the school of engineering as draughtsman to the professors of pliysics and chemistry. When twenty-three years of age he suc- ceeded from among a number of candidates in gaining the professorship of hydrography at Collioure and Port-Vendre. While there he sent several able papers, in which some questions of navigation were treated geometrically, to Monge, at that time minister of marine, through whose influence he obtained an appointment in Paris. Thence he passed to a deputy-professorship, at Méziéres, and towards the close of 1794, when the Ecole Polytechnique was established, he was chosen one of its staff, being appointed along with Monge over the department of descriptive geometry. There he instructed some of the ablest Frenchmen of the day, among them Poisson, Arago, and Fresnel, Accompanying Guyton de Morveau in his expedition, earlier in the year, he was present at the battle of Fleurus, and entered Brussels with the French army. In 1816, on the accession of Lonis XVITI., he was expelled from his chair by Government, at the same time that his friend and fellow-worker Monge was removed from the Institute. He retained, however, till his death the office of professor in the faculty of sciences in the Kcole Normale, to which he had been appointed in 1810—the same year in which he married the daughter of the physician Maugras, The necessary royal assent was in 1823 refused to the election of Hachette to the Academy of Sciences, and it was not till 1831, after the Revolution, that he obtained that well-merited honour. He died at Paris, January 16, 1834. Hachette was held in high esteem for his private worth, as

well as for his scientific attainments and great public services. His labours were chiefly in the field of descriptive geometry, with its application to the arts and mechanical engineering. It was left to him to develop the geometry of Monge, and to him also is due in great measure the rapid advancement which France made soon after the establishment of the Ecole Polytechnique in the construc- tion of machinery. His writings on descriptive geometry are still of value.

Hachette's principal works are his Deux Suppléments a la Géomé- trie Descriptive de Monge, 1811 and 1818 ; Eléments de Géométrie a trois dimensions, 1817 ; Collection des Epures de Géométrie, &c., 1795 and 1817; Applications de Géométrie Deseriptive, 1817; Traité de Géométrie Descriptive, &c., 1822; Traité Elémentaire des Machines, 1811; Correspondance sur lV' Ecole Polytechnique, 1804- 1815. Healso contributed many valuable papers to the leading scicntific journals of his time.

HACHETTE, Lovis CurisropHE FRangots (1800- 1864), a French publisher, was born at Rethel in the Ardennes, May 5, 1800. After studying three years ata normal school with the view of becoming a teacher, he was in 1822 on political grounds expelled from thie seminary. He then devoted several years to the study of jurisprudence ; but in 1826 he resolved to establish in Paris a publishing business, the main object of which should be the issue of works adapted to improve the system of school instruction, or to promote the general culture of the community. The series of works which from that time were brought out by him included manuals in various departments of know- ledge, dictionaries of modern and ancient languages, educa- tional journals, and French, Latin, and Greek classics annotated with great care by the most eminent authorities. Subsequent to 1850 he, in conjunction with other partners, published a cheap railway library, scientific and miscel- laneous libraries, an illustrated library for the young, libraries of ancient literature, of modern foreign literature, and of modern foreign romance, a series of guide-books, and a series of dictionaries of universal reference. In 1855 he also founded Le Journal pour tous, a publication with a circulation of 150,000 weekly. There can be no questiou

that by his efforts to circulate such a variety of whole- some and instructive literature, Hachette is entitled to rank among the greatest benefactors of his country. He also manifested great interest in the formation of mutual friendly societies among the working classes, in the estab- lishment of benevolent institutions, and in other questions relating to the amelioration of the poor, on which sub- jects he wrote various pamphlets ; and le lent the weight of his influence towards a just settlement of the question he ok, literary copyright. He died 31st July

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HACKBERRY, a name given to the fruit of the Celtis occidentalis, L., belouging to the natural order Ulmacee. It is also known under the name of 'sugar berry," " beaver- wood," and "nettle tree." Tle hackberry tree is of middle size, attaining from 60 to 80 feet in height, and with the aspect of an elm. The leaves are ovate, cordate-ovate, and ovate-lanceolate, with a very long taper point,—mostly glabrous above, and usually soft-pubesceut beneath. The soft filmy flowers appear early in the spring before the expansion of the leaves. The fruit or berry, about the size of a bird-cherry, is of an obovate shape, of a reddish or yellowish colour when young, turning to a dark purple in autumn. 'This tree, together with other species of the same genus, is distributed through the deep shady forests bordering the river banks of New England to Wisconsin and even furthersouthward. The fruit has a sweetish and slightly astringent taste, and is largely eaten in the United States, and, although not officinal, has been highly recom- mended in cases of dysentery. The seeds contain an oil like that of almonds. The bark is tough and fibrous like

hemp, the wood is hard and compact aud heavy, and next to ebony and box has been spoken of as the best for durability, strength, and beauty; its tenacity and flexi- bility have led to its ernployment as shafts for carriages, hoops, &c. The root has been used asa dye for linens. The root, bark, and leaves of C'. ortentalis are employed in the East as a remedy in epilepsy.

HACO, or Haxon (c. 920-960), surnamed the Good, king of Norway, was the son of Harold Fairhair by a female slave, and was presented by Harold to King

_Athelstan of England, to mark his contempt for an insult

he had received. The child was placed by a Norse warrior on Atbelstan's knee, who was thus made to observe the symbol of adopting a child that was base born. Athelstan did not, however, take vengeance on the innocent cause of his anger, but brought him up as one of his own sons. On hearing of the death of Harold, he supplied Haco with men and ships, and sent him to Norway to wrest the throne from Eric, eldest son of Harold, whose violent and cruel reign had during the life of his father gained him the general hatred of his subjects. The news of Haco's arrival in Norway spread, says the saga, "like fire through dried grass." Eric at once took flight to Orkney and then to Eng- land, and Haco was choseu king at every "thing." Haco, though himself a Christian, found it impossible in his time to establish Christianity in Norway. He ruled his king- dom with great justice and prudence, and gained for it many victories over the Danes by land and sea, He was slain in a great fight against the Danes, led by the sons of Eric, about the year 960.

HACO V., surnamed the Old, king of Norway, son of Haco IV., was on the death of his father in 1204 excluded from the throne on the ground of supposed illegitimacy, and only become king in 1223, after his mother, to establish his rights, had undergone the ordeal of fire. He greatly increased the prosperity of Norway, and he also added to his kingdom Iceland and Greenland. As he had a dispute with Alexander III. of Scotland in regard to the sovereignty of the Hebrides, he set sail about 1263 on a great expedi- tion against the west of Scotland, where he took possession of Arran and Bute, but suffered such a severe defeat at Largs that he was compelled again to put to sea. After losing many ships by storm, he sailed to Orkney, where he died in the following winter. It is supposed by some that his fleet in his voyage north passed between Skye and the mainland, and that it is from this fact that the narrow sound of Kyle-Akin received its name.

For the kings named Haco see the Heimskringla of Snorro Sturluson, which, however, does not include the reign of Haco V., translated into English by Samuel Laing, London, 1844. The saga of Swerre and his successors was published by Unger under the title Konunga Sigur, Christiania, 1870-73. The Saga Hdkonar Héakonarsonar forms the 10th

vol. of the Fornmanna Ségur published at Copenhagen in 12 vols., 1825-39, and translated into Danish and Latin in 12 vols., 1828-46. See also Sturlunga

Saga, 2 vols., Oxford, 1878, and Carlyle's Early Kings of Norway, London, 1875.

HADAD, the name of a Syrian deity, is met with in Scripture as the name of several human persons ; it also occurs in the compounds Benhadad, Hadadrimmon, and Hadadezer. The etymology of the word, of which Hadar, Ader, and Arad appear to be incorrect variations, is ob- scure; the divinity primarily denoted by it, however, accord- ing to Philo of Byblos (Miiller, Fr. Hist. Gr., iii. 569 ; ef. Macrob., Saturn., i. 23), is the king of the gods, the greatest and highest, the sun; and these interpretations seem to point to some such radical meaning as wnicus. The Syrian kings of Damascus seem to have habitually assumed the title of Benhadad, or son of Hadad (three of this name are mentioned in Scripture), just as a series of Egyptian monarchs are known to have been accustomed to call themselves sons of Ammon-Ra. The word Hadadrimmon,

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for which the inferior reading Hadarrimmon is found in some MSS., in the phrase "the mourning of (or at) Hadadrimmon" (Zech. xii. 11), has been a subject of much discussion. According to Jerome and all the older Christian interpreters, the mourning for what occurred at a place called Hadadrimmon (Maximianopolis) in the valley of Megiddo is meant, the event alluded to being generally held to be the death of Josiah; but since Hitzig and Movers the opinion has been gaining ground that Hadadrimmon is merely another name for Adonis or Thammuz, the autumn sun-god, the allusion being to the mournings by which the Adonis festivals were usually accompanied (Hitzig on Zech. xii. 11, Isa. xvii. 8; Movers, Phdnizier, i. 196).

Full materials for the whole discussion will be found in Baudis- sin's Studien zur Sem. Religionsgesch. (1876), Abh. v. This author, however, has considerably moditied his views in Herzog and Plitt's R. £., s. v., having in his earlier essay been misled in important points by statements of Schrader

(Keilinsch. und A. T., pp. 101 seq.), which have since been found to require correction (see Gutschmidt, Neue Beitrdge, p. 47 seq.; Wellhauscn's criticism of

Baudissin in Gétt. Gel. Anz. (1877), Stiick 6 ; Schrader, Keilin. und Gesehichtsforsch. (1878), pp. 371 seg., 538 seq.

HADDINGTON, or East Lotuiayn, a maritime county of Scotland, lies between 55° 46' 10" and 56° 4' N, lat. and between 2° 8' and 2° 49' W. long. It is bounded ou the N. by the Firth of Forth, on the E. by the North Sea, on the 8. by Berwickshire, on the W. by Edinburghshire. Its seaboard is 312 miles. Its greatest length from east to west is 25 miles, its breadth from north to south about 16 miles. Its area covers 179,142 acres (280 square miles), of which 189} are under water, 5505 foreshore, and 1424 in "links." The general outline of the county is that of an irregular quadrilateral figure with its northern angle pro- jecting into the sea. Along a south-and-north line through the county town, the land slopes gradually up from the coast to the Garleton Hills, thence down to the Tyne valley, and then up again to the Lammermuir Hills, which occupy the southern district of the county. On the east and west the ground slopes from the Lammermuirs to the sea, but near the sea the fall is so gentle that the land has the appearance of a plain. Two almost isolated hills break the level,—North Berwick Law (940 feet) on the coast, and Traprain Law (700) in the eastern part of the Tyne valley. The chief summits of the Lanimermuir Hills are Spartleton (1534), Lammerlaw (1500), and Soutra Hill (1230). The only stream of any importance is the Tyne, which, after a course of 7 miles in Midlothian, flows through the county with a gentle current north-east past the town of Haddington, and falls into the sea at Tyne- mouth.

Geology and Mineralogy.—The Lammermuirs are com- posed chiefly of Lower Silurian strata, overlaid in part by Old Red Sandstone and conglomerate—one great mass of the latter extending south-east from Spott, with a breadth of 3 or 4 miles, across the hills into Berwickshire. Another belt of Old Red Sandstone rather more than 1 mile in breadth begins at the sea a little to the south of Dunbar, and stretches along the base of the Lammermuirs. Patches of Old Red Conglomerate occur also here and there in the Lammermuirs further to the west, and are seen in the upper

tributaries of Gifford and Humbie waters. The ground to the north of the Lammermuirs is occupied chiefly by rocks belonging to the Calciferous Sandstone and Carboniferous Limestone series of the Carboniferous formation. The Cal- ciferous Sandstones cover a wide area west and east of Haddington, extending south to the Lammermuirs, along the bass of which they trend south-west beyond the county boundary. They also appear in the lower reaches of the

O61 Tyne valley, covering a considerable area between Tynning- hame Links and Biel Water. Again they are seen on the shore between Torness Point and Dunglass Burn, whence they strike inland. The hilly tract between Haddington and North Berwick is made up of various voleanie rocks of Lower Carboniferous age, such as porphyrite, dolerite, and tuff. In the western part of the county the Carboniferous Limestone series occupies an extensive area and is rich in limestones and coalseams. This area forms the eastern margin of the Midlothian coal-field. A patcli of the Lime- stone series also appears upon the coast about a mile south of Dunbar. Besides these bedded aqueous and voleanic rocks, there are numerous intruded masses, dykes, and veins of felstone and basalt, and some pipes of tuff and agglomerate which mark thie sites of ancient volcanoes of Lower Carboniferous age. Granite is found at Priestlaw. Deposits of glacial origin are met with more or less abundantly, especially in the low-lying tracts. These con- sist of till or boulder-clay and mounds and sheets of sand and gravel, underneath which the older rocks are often concealed over wide areas. Alluvial deposits occur along the course of many streams, but the only considerable

| alluvial flats are those of the Tyne.

Coal of a very fair quality is extensively worked in the west. So long ago as 1200 the monks of Newbattle obtained this mineral from Prestongrange. Limestone is found throughout the greater part of the shire. A vein of liematite of a peculiarly fine character was discovered in 1866 at the Garleton Hills, and wrought for some years ; but froma variety of causes the works have been mean- while suspended.

Climate.—The climate is on the whole mild and equable. East winds, however, prevail in the months of March, April, and May, and from thie lie

of the county it is exposed to their fullsweep. The amount of rainfallis far below tlc average of Great Britain. During the period 1835-64 tle average annual rainfall was 24°85 inches, — the greatest fall being 32°7 in 1836, the least 17°3 in 1842. The average monthly fall is lowest in April (1°16) and highest in August (2°57). In 1872 the rainfall reached the exceptional amount of 41°51 inches.

Agriculture, &e.—The soils are various. The Lammermuirs arc of course unproductive, but the slopes to a considerable height are cultivated ; and for a considerable way down the land is very good. In the centre of the county there is "a tenacious yellow clay resting upon a tilly subsoil," and this land is not well suited for agricultural purposes. Along the margin of the Firth the soil is naturally of a sandy nature, but farther inland it is composed of rich loam and is very fertile. The most productive region is the land about Dunbar. The potatoes there are very good, and undcr the naine of " Dunbar reds" are highly estecmed in the London market, selling at times for as much as £45 an acre. From the beginning of the present cen- tury till within the past few years East Lothian agriculture has on the whole been held to be the best in Scotland. This is not somuch due to the natural fertility of the soil as to the enlightened enter- prise of its cultivators. Andrew Meikle here first Introduced the threshing mill (1787). Tile draining was first extensively used licre, and the reaping machine (now universally employed) and the steam plough were introduced ata comparatively early period of their his- tory. The high price of grain at the time of the Crimean War gave a great impctus to farming, and in consequence rents rose as much as from 15s. to £1 per aere ; this, with the increased cost of labour, which has risen 35 or 40 per ecnt. (about 10s. per acre) within the last seven or eight years, has sadly diminished the profits of the farmer. The sizeof the farms is above the average of Great Britain. The majority arc from 200 to 500 acres—a very few from 600 to 1200 acres. They are usually let on leases of nineteen years duration. The rotation of crops is generally the six-course shift, viz., (1) grass (pasture or hay), (2) oats, (3) potatoes, turnips, or beans, (4) wheat, (5) turnips, (6) barley. 7

According to the agricultural returns of 1879, of the total area of 179,142 acres 115,364 acres were under eultivation, distributed as follows :—corn crops, 44,719 (wheat, 7910; barley, 19,536 3 oats, 15,746) ; grcen crops,

25,656 (potatoes, 98385; turnips and swedes, 14,796); clover and grass, 27,194; permanent pasture, 16,000; bare fallow, 1075. Of live stock the numbers were—

1 See the Geology of East Lothian, by Howell, Gcikie, and Young, with Appendix on Fossils, by G. W. Salter. ther works are enumerated on p. 69 of this treatise.

*horses, 8818, or 3°38 for every 100 imperial acres as against a general average for Scotland of 4°2; cattle, 8205, or 7*1 as against 93°0; sheep, 108,672, or 94°2 as against 145°1 ; pigs, 2485, or 2°2 as against 2°7.1 Those eomparatively small averages are of eourse explained by the faet that the eounty is not a pastoral one. It deserves to be noted, however, that its flocks of Leiecster sheep have for years been justly celebrated, aud shorthorns of a very high class have been sueeessfully bred.*

Game is no great hindrauee to agriculture. A source of greater an- noyance is the immense number of wood pigeons which, in defiance of all efforts to hold them in cheek, cominit great havoe yearly.

The wages of farm servants average about 18s. weekly, the ‘ grieve” or farm overseer receiving a little more; but of this only from £20 to £25 per annum is given in moncy. The rest is paid in kind, and consists of meal, potatoes, a cow’s keep, a cottage, and pieee of ground. These cottages have been greatly improved of late years, and are now very fair dwellings indeed. The “bothy system iaals practically a thing of the past. Extra field labour is supplied by gangs of Irish or Highland workers, who dwell in the towns, but go out during the day to work in the country. The regular employés are hired for the most part at “ feeing-markets,” though advertisement and private arrangement are also often employed.*

According to the return for 1873-74, there were 1509 proprietors ’ in the county owning a total 171,789 of acres, of the annual value of £349,209.2 The average rental was £2, 0s, 8d. per acre,—that of all Scotland being £1.

There werc 1191 proprietors (79 per cent. of the whole) who owned less than 1 acre; from 1 to 188 owned 10 acres, and 47 from 10 to 100 ; and 9 owned between 5000 and 21,000, the largest proprietors being—Marquis of Tweeddale, Yester House, 20,486 acres; Lady Mary Hamilton, Biel, 14,345 ; Balfour of Whittinghame, 10,564; Earl of Wemyss, Gosford, 10,136; Sir G. Grant Suttie, Balgone, 8788; Earl of Haddington, Tynninghaine, 8302; Earl of Hopetoun, 7967 ; Hunter of Thurston, 6492; and Houston of Clerkington, 5148.8

Communication.—The county is well supplied with roads. The chief line of railway, however, runs along the coast, and tls, not-

at a serious disadvantage.

Population, &c.—The population of the county, which is divided | s pot q to the north; both run towards the Tyne, here crossed

| by three bridges, two of which connect the town with its

into 25 parishes, was 37,676 in 1871, showing an inerease of 78 over the number for 1861. It thus appears that the growth of the county town, of North Berwick, a thriving watering-place, and of the mining parishes does little more than counterbalance the decrease in purely agricultural parishes, which in some eases amounts to as muchas from 7 to 18 per cent. The chief towns and villages are—Haddington, the county town, 4004; Dunbar, 3422; North Berwick, 1418; Tranent, 2806; East Linton, Prestonpans, Aberlady, Gullane, and Dirleton. The county retwns one member to parliament, and the burghs of Haddington, Dunbar, and North Berwick unite with Lauder (Berwickshire) and Jedburgh (Roxburghshire) in returning another.

Educational Endowments.—Thie provision for education outside of the public sehool system is inconsiderable. Schaw's and Stiell's Hospitals in the parishes of Prestonpans and Tranent are charitable educational institutions. In Salton parish there is a fund for educational purposes, left by Gilbert Burnet, bishop of Salisbury. Aceording to the Endowed Schools' Report of 1875, the annual in- comes of these were £864, £812, and £97

respectively. School and college bursaries are given annually by the East Lothian Association.

History and Antiquities.—The early Celtic inhabitants of the district have left as memorials of their possession a few local names, and some traces of circular eamps (Garvald and Whittingham parishes) and hill forts (Bolton parish). The Romans built here no enduring edifices, and there are no certain remains of their camps but they brought the ground to a high degree of cultivation. The county afterwards formed part of the Saxon kingdom of Northumber- land, but it was joined to Scotland by Malcolm II. in 1020. 1t was fairly prosperons till the wars of Bruee and Balliol; but from that time till the union of the kingdoms it suffered from its proximity to the English border, and from eivil wars. In more modern times it was the scene of two great battles—that of Dunbar (1650) gained by Cromwell over Leslie and the Covenanters, and that of Prestonpans (1745) in which Prince Charles defeated Sir John Cope. The prosperity of the eounty, like that of many other parts of Scotland, is the growth of the present century.

The ehief ruins are—Hailes Castle, where Queen Mary of Seots resided for a brief period after herabduetion by Bothwell ; Dunbar Castle, defended in 1337 by Black Agnes against the earl of Salisbury ; Dirleton Castle, a venerable ruin of the 12th century, —

1 The statistics of the five preceding years do not show any very great variation from these figures.

**In 1878-79 the lands valuation of the county amounted to £368,173, 10s.*

® For further particulars as to the agriculturc, sce Scott Skirving's

prize essay printed in vol. v. (4th series, 1878) of the Highland and Agricultural Society's Transactions.

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taken in 1298 by Edward J. and again in 1650 by Cromweil's forces ; Innerwick Castle, near Dunbar ; the collegiate church of Seton in the parish of Tranent, built before 1890; North Berwick Abbey, founded about

the middle of the 12th century; and Tantallon Castle, opposite the Bass Rock, formerly the chief seat in the east of the Douglas family. The gemus of Scott has given to Tantallon a name in English literature greater even than its name in Scottish history ; and readers of AZarmton will also remember the name of Hobgoblin Hall, romantically situated near the village of Gifford (about six miles south of the county town), a place connected by name and legend with all manner of popular superstitions. Of modern mansions the chief are Broxmouth Park (Duke of Rox- burghe), Yester House (Marquis of Tweeddale), Tynninghame House (Earl of Haddington), Gosford and Amisfield House (Earl of Wemyss)—Gosford containing a fine collection of pictures, Lennoxlove House (Lord Blantyre), Biel and Archerfield (Lady M. Hamilton), Winton House (Lady Ruthven), and Salton Hall (Fletcher). A lofty column on one of the Garleton hills, erected to the memory of the fourth earl of Hopetoun, is seen from nearly every part of the county.

Of the eminent men born in or connected with the county the following may be mentioned :—Sivr David Lyndsay of the Mount was boru 1490 at Garleton Castle, an old keep now utterly ruinous ; William Dunbar was born at Biel about 1460; Blair, author of the Grave, and Home, author of Douglas, were successively ministers of Athelstaneford; David Calderwood, the historian of the Kirk of Scot- land, was minister at Pencaitland, and Principal William Robertson at Gladsmuir ; George Heriot, the famous goldsmith of James VI., is said to have been born in Gladsmuir. The historic families of Fletcher of Salton, Dalrymple of Hailes, Maitland of Lethington, and Hamilton of Preston belong to the county.

HAppDINGTON, a royal and parliamentary burgh, and the chief town of the above county, is situated on the banks of the Tyne, about 17 miles east of Edinburgh. It

_ occupies almost the centre of the shire to which it has given withstanding the aid of branch lines, places a considerable district _

the name. It consists of two main streets, which are wide and well built, — High Street to the south and Market Street

suburb of Nungate. This suburb consists of old and ruin- ous houses, and is inhabited for the most part by Irish agricultural labourers. The systems of drainage and water supply are excellent, but the want of manufactures and the inconvenience of its railway branch line have prevented the growth of the burgh.

The chief edifices are the county buildings, the corn ex- change, which next to that of Edinburgh is the largest in Scotland, the town-house adorned with a very elegant spire 150 feet high, and the district asylum for the insane. There is a monument of some pretensions to Robert Fer- gusson of Raith, and a somewhat trifling one to the memory of Home the author of Douglas. The chief structure, how- ever, is the church, an edifice probably dating from the 13th century It is 210 feet long, and is surmounted by a square tower 90 feet high. One part is used as the parish church ; the remainder, though ruinous, is now preserved with a care that makes some amends for centuries of neglect. To this church the name of Lucerna Laudonie has long been applied, but it seems probable that the edifice to which Fordun and Major applied that name was the church of the Franciscan Friars close to the Tyne, of which not a fragment now remains. The Nungate possesses the ruin of an old chapel of St Martin. The grammar school of Had- dington was established at a very early period, and carefully fostered by the burghal authorities. At one time it at- tained considerable eminence, but latterly fell into complete disuse. Under the name of the Knox Memorial Institute, a very handsome school building has been erected (1879), and with this the ancient burgh school is incorporated, The population of the burgh in 1861 was 3874and in 1871 4004.

Haddington is said to have been ereeted into a burgh by David I. It must have been a place of considerable importanee, for when the "Curia Quatuor Burgorum" subsisted there was an appeal from the sentences of burgh eourts to that of the chamberlain at Haddington. There arc also extant eharters in its favour from

Robert the Brnee and Robert II. Exposed as it was to the English attack it was frequently ravaged and burned. In 1548 it was forti-

fied by Lord Grey of Wilton, the English commander, but was | besieged in the following year by the Scotch and their French auxiliaries, who forced the garrison to abandou the town. As one result of all this struggle and suffering, it is impossible to dig far in any direction without coming on human remains. Haddington has also suffered frequently from floods. An inscrip- tion in the centre of the town commemorates one of the most notable of these (October 4, 1775), marking the point to which the water rose. John Knox was born (1505) at the Giffordgate in the Nuugate ; John Brown, a celebrated dissenting divine, several of whose descendants have bee eniinent in science and literature, had a charge in Haddington for many years; and Edward Irving was for some years mathematical master in the burgh scliool.

For the general history of the eounty see Chaliners's Caledonia, vol. ii.; also Dr Barclay's paper on " Haddington," in the lst vol. of the Zransactions of the Society of Antiquaries of Scotland, vol i. (1792); Hepburn's View of the Agricul- ture of Eust Lothian (1794); Somerville's Survey of East Lothian (1805); New Statistical Account of Scotland, vol. ii. (1845); History of Haddington, by James Miller (1844). The siege of the town is fully narrated in Histoire de la Guerre @ Escosse, by Jean de Beaugué. For an aceount of the burgh records, see Thomas Thomson's paper in the Proceedings of the Society of Antiquaries of Scotland, vol. ii. pt. iii, The question as to the birthplaees of Knox, Lyndsay, and Dunbar is fully diseussed in David Laing's editions of those writers. (F. WA.)

HADDOCK (Gadus ceglefinus, the Schell-fisch of the Germans, ZZadot of the French), a kind of cod-fish, distin- guished by a black lateral line and a blackish spot above the pectoral fin. It is common round the British and Irish coasts, and generally distributed along the shores of the North Sea, extending across the Atlantic to the coast of North America, The haddock is prone, however, to abandon for a longer or shorter period a locality frequented by it. It attains to a weight of 15 tb, and is one of the most valuable food fishes of Europe.

HADERSLEBEN (Danish, Haderslev), a town of Prussia, capital of a circle in the province of Schleswig-Holstein, is

situated 48 miles north of the town of that name, ina >

pleasant valley on the Hadersleben fiord, which is about 9 miles in length and communicates with the Little Belt. The principal buildings are the beautiful church of St Mary dating from the 13th century, the theological seminary established in 1870, the gymnasium, and the hospital. The industries include iron-founding, tanning, and the manu- facture of machines, tobacco, and gloves. The harbour, owing to the accumulation of mud, is only accessible to small vessels. The population in 1875, including the garrison, was 8356.

Hadersleben is first mentioned in 1228, and received town rights from Duke Waldemar II. in 1292. the wars between Schleswig and Holstein in the 15th century. In November 1864 it was ceded along with Schleswig to Prussia. Two Danish kings, Frederick II]. and Frederick III., were born at Hadersleben.

HADES. See Pruto and Escratotoey.

HADJI KHALFA. See Hagsr Kuatra.

HADRAMAUT. See Arasra.

HADRIAN, Roman emperor (117-138 a.p.), distin- guished for the peace and beneficent energy of his govern- ment, was born at Rome 76 a.p. His full name was Publius A'lius Hadrianus ; his ancestors, originally from Picenum, lad been settled at Italica in Spain since the time of the Scipios. He lost his father at the age of ten, and was placed under the guardianship of Trajan, a cousin of his father and also a native of Italica, who was already a conspicuous man in the Roman army. We know little of Hadrian's youth ; but he gave early promise of the readiness and versatility which distinguished him in later life, for he was so ardent a student of Greek that men nicknamed him Greeculus. At fifteen he entered on the practical career of war and government which befitted a Roman, and grew fond of the chase even to excess. Patronized by Trajan and assisted by powerful friends he rose rapidly, filling successively all the civil and military offices, which now, as under the republic, were open to young men of good birth. On Trajan's elevation to the empire Hadrian was the first to congratulate him. He served with distinction in both the Dacian campaigns; in the latter

Trajan presented him with the ring he had received from Nerva, a proof of his

It suffered considerably during |

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regard wluich justified him in aspiring to be his successor.

If Trajan was not always favourably disposed towards

Hadrian, the good-will of the empress Plotina never failed

| him, and was particularly helpful in some of the most criti-

cal turning points of his career. She it was who secured his alliance with Sabina, granddaughter of the emperor's sister, a marriage, however, which proved anything but happy. She, it was thought, did him still more effectual

| Service at Trajan's death, even determining the question of

the succession in his favour. When that emperor returned from his victorious war in Parthia, the succession was still undecided ; and we are assured on the express testimony of Dion Cassius that Plotina and her friends concealed his

_death for several days in order to facilitate the elevation of

Hadrian. Whatever may liave been the truth of such stories, Hadrian's claim to the empire rested on the unquestionable fact that he was the fittest man. His position as prefect of

_ Syria, aud commander of the legions with which Trajan had

prostrated the Parthian empire, made him supreme in the

, army, while his peaceful disposition and civil demeanour

must have made him acceptable to the senate. Yet he was not unconscious of the insecurity of his position; for he hastened to propitiate the army by a donation of twice the usual amount, and to excuse his abrupt elevation to the senate by alleging the impatient zeal of the soldiers and the welfare of the state, which could uot exist without an "'imperator." The first important act of Hadrian was to abaudon the late conquests of Trajan, and again to make the Euphrates the eastern boundary of theempire. At his elevation the provinces were unsettled, and the barbarians on the frontier restless and menacing. He was convinced that the old limits of Augustus offered the most defensible frontier, and that the energy of the emperor was sufficiently occupied in governing the provinces already won. This policy of renunciation was ascribed to jealousy of Trajan ; but history has recognized its wisdom. While arranging the affairs of the East, Hadrian had an opportunity of pardoning some eminent citizens who were accused of hostility to him, and after his return to Rome he confirmed his popularity by many gracious acts. Modestly declining

| the honours heaped upon himself, he carefully rendered the

last offices to the deceased emperor, and considerably lightened the burdens of the citizens. During an absence in Moesia, where he had gone to compose some troubles with the Sarmate and Roxolani, a formidable conspiracy was formed against him. The details are obscure; but four consular men, among the most eminent of Rome, were accused of being concerned in it, and were put to death. Some, however, went so far as to say that the con- spiracy was a scheme devised by Hadrian for getting rid of dreaded rivals. It was a dark transaction which threw a suspicion on his character. On his return to Rome he exerted himself to undo the evil effects of it by a generous and popular policy. Towards the senate he expressed the utmost deference and consideration ; he admitted the most eminent of its members to familiar intercourse, raised them to the highest honours, and supplied the indigent with means to maintain their position. He was equally liberal to the body of the people, granting them a large donation of money, remitting the arrears of taxes for the last fifteen years, and increasing the funds which Trajan had devoted to the alimentation of poor children. These measures of Hadrian might be criticized as the calculating policy of one who felt his position to be insecure, and who could afford to be generous to

the city out of the revenues of the empire But such a theory could not apply to what is most characteristic in his rule,—his unwearying care for the provinces and for the empire as a whole. He understood the true task of a Roman emperor better per- haps than any of his predecessors. More clearly than any of

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them he saw that the period of conquest was past, that an extension of the frontiers would only weaken the defen- sive power of the empire, that the time for consolidation and for softening the distinction between Rome and the provinces was come. While Trajan had been guilty of the anachronism of rivalling Alexander the Great, Hadrian made it the work of his life to become acquainted with the provinces, to learn their needs and resources, to improve and benefit them; he sought to be the effective ruler of the empire as a whole, and so was the first to realize the cosmopolitan task which his position im- posed. For this end he sought to obtain a personal knowledge of the people he had undertaken to govern. Leaving Rome in 119, he visited probably every pro- vince of the empire. After traversing Gaul he inspected the legions on the Rhine, and then crossed to Britain, where he built (121) the great rampart from the Tyne to the Solway which bears hisname. He returned througli Gaul into Spain, and then proceeded to Mauritania, where he suppressed an insurrection. We next find him in the East averting a war with Parthia by a timely interview with the king. From the Parthian frontier he travelled through Asia Minor and the islands to Athens, where he sojourned a considerable time, and so returned by Sicily to Rome, having made the circuit of the empire. After some stay at Rome he resumed his travels. It is impossible to fix the details of this second progress with any exactness. It was chiefly in the East; and he did not finally return to Rome till 134. Everywhere he left lasting traces of his restless and beneficent energy; he built aqueducts and temples, and raised fortifications in suitable places; he inspected the details of the administration, learned to know the officials, and made himself at home in the military encampments. He was accompanied by a body of architects and artizans organized like a legion, whom he employed to gratify his passion for building in a truly imperial manuer. Athens was the favoured scene of his architectural labours ; he added a new quarter to the city, and finished the temple of the

Olympian Zeus. While Hadrian spent his life in inspecting the provinces, and was not disinclined to purchase peace by a subsidy to the restless tribes on the frontiers, he did not neglect thearmy. All along the frontier his legions stood in constant preparation for battle. He maintained a rigorous discipline ; the rules he drew up for the army long served as a kind of military code. He trained them to the severest exercises, and anticipated all complaint by sharing in their fatigues, walking bare-headed on a march of 20 miles a day, and partaking of their coarse fare of cheese, lard, and sour wine. The only important war in which this army was tested was the great rebellion of the Jews, which broke out in 131, and lasted for several years. The founding of a Roman colony on the site of Jerusalem, and an order of Hadriau forbidding the rite of circumcision, were the causes of the war. The Jews fought with the most resolute despair, and they were crushed only by a powerful army commanded by the best general of the empire. According to Dion, 580,000 Jews fell in battle. The whole country was reduced to a wilderness. But the loss of the Roman legions was so severe that in writing to the senate Hadrian omitted the customary formula :—" If you and your children are well, it is well ; I and the army are well.' In the later years of his life Hadrian discon- tinued his travels, and lived at Rome or near it. His health, which had been impaired by long exposure to the extremes of heat and cold, began to fail; and, what was worse, the dark and suspicious moods which had broken out occasionally in his earlier years became more frequent and fatal. His aged brother-in-law Servianus fell a victim to his jealousy ;_his wife Sabina died, not without a rumour of poisoning. Most of those

friends, and had been raised by him to the highest offices, were superseded, or banished, or put to death. But his passion for architecture did not abate. He built for his residence the great villa of Tibur, which was eiglit miles in circuit, and was a kind of epitome of the world, with miniatures of the most celebrated places in tle provinces, and even of Hades. He built a splendid mausoleum, which has been the nucleus of the castle of St Angelo, and rebuilt several edifices at Rome. In these years he had to choose a successor. His first choice was Ailius Verus, who did nothing to justify such a distinction. The next was Antoninus Pius, so called from the filial

*assiduity with which he cherished the last days and the memory of his adopted father. Antoninus saved him from suicide, to which his physical sufferings impelled him, and from imbruing his hands in the blood of many noble Romans, who had provoked his moody and fickle temper. Hadrian died at Baiw, 138 a.p. The cruelty of lus latter life had so eclipsed the lustre of his early rule that the senate at first refused him divine honours, and were prevailed upon to grant them only at the urgent solicitation of Antoninus. In the travels and administrative energy of Hadrian we see only one side of his character. He had a versatile and many-sided mind, in which the faculty for command, specu- lative curiosity, and literary ambition were strangely blended. Not satisfied with the toils imposed on the laborious autocrat of the world, he sought to excel the Greek professors and artists each in his own special walk. In painting, sculpture, and music, in rhetoric and philo- sophy, he considered himself the competent rival and critic of men who had made these pursuits the work of a lifetime. The architect Apollodorus atoned for his frankness with his life. The more politic Favorinus, when reproached for yield- ing too readily to the emperor in some grammatical discus- sion, replied that it was unwise to dispute with the master of thirty legions. The product of Hadrian's pen which has been most celebrated is the dying address to his soul :— * Animula vagula, blandula,*

Hospes comesque corporis,

Que nunc abibis in loca

Pallidula, rigida, nudula ;

Nec, ut soles, dabis jocos ?"

Under Hadrian Salvius Julianus composed a " perpetual edict,' which is supposed to have been a fixed code of some kind, but the exact significance of the edict is disputed. Still there can be no doubt that Roman law owes much to Hadrian.

The sources for Hadrian's life are unsatisfactory ; the chief are Spartianus in the Scriptores Historie Auguste, and Dion Cassius as abridged by Xiphilinus, lib. lxix ; sec also Aurelius Victor De Cesaribus, and Eutropius;

for modern works consult Merivale's History of the Romans under the Empire; Gregorovius, Gesch.

Hadrians; and W. W. Capes's " Age of the Antonincs" in the serics Epochs of Ancient History. a

HADRIAN, Watt or. It is under this heading that it seems most convenient to give a short account of the stone wall and other works erected by the Romans ijn the north of England between the Solway and the Tyne, and commonly known as the Roman Wall. As will be after- wards seen, those who have written on the subject are by no means agreed that the name of Hadrian ouglit to be exclusively associated with this great fortification. But before touching on the question, it is necessary to describe the works themselves.

Viewed asa whole the Roman Wall, when entire, con- sisted of three parts : —(1) a stone wall, strengthened by a ditch or fosse, at a short distance from its northern base ; (2) three parallel earthen walls, with a ditch sloping down from the northern side of the second of these lines; (3) stations, castles, and turrets, placed at various intervals for the accommodation of troops, and communicating with

who had been his familiar } one another by a military way.

HA DRIA N'S

The Murus or stone wall extended from Wallsend on

the Tyne to Bowness on the Solway Firth, a distance of |

fully 73 English miles. No portion of it now remains as when finished, so that its original height cannot be accur- ately determined. Bede gives 12 feet, an estimate that

our chief modern authority on the Wall, Dr J. Collingwood |

Bruce, deems too low, for some parts of its course at least. Its thickness varies, being 6 feet in some places and 94 in others.

The northern face of the Wall was continuous, but the southern had numerous outsets and insets, as if portions of the work had been carried on at the same time but without definite instructions as to a uniform breadth. In this way when sections met differences in width often showed them- selves, though the junction was so managed that the irre- gularity was confined to one face. It is not improbable that a similar discretion was allowed as regards height. Both sides consisted of blocks of freestone 8 or 9 inches thick, 10 or 11 broad, and from 15 to 20 long. These had been sometimes quarried near the spot, sometimes brought from considerable distances. 'The interior was filled with rubble firmly cemented with mortar of a peculiar tenacity. In pursuing its course from sea to sea, the Wall seldom deviated from the shortest and straightest course it could follow, and then only with the evident design of seizing neighbouring elevations that would otherwise have com- manded its position. Along the whole length of its northern base, and adding greatly to its strengthasa defensive work, was drawn a ditch or fosse of varying breadth and depth,

36 and 15 feet respectively being probably its average dimensions, In some places the difficulties to be overcome by its excavators, owing to the rocky nature of the soil, must have been enormous in an age when blasting with gunpowder was unknown. But none of them have been shunned.

South of the Murus ran the earth wall or Vallum, con- sisting, as has been already stated, of three ramparts and a ditch. Of these mounds the most northerly was raised at a distance from the base of the stone wall varying, accord- ing to the nature of the country, from 30 yards to half a mile. Time and the spoiler liave dealt so hardly with it that its original dimensions cannot now be accurately stated. It seems, however, to have been about 20 feet broad at the base and at Jeast 10 feet high. The materials of which it was made up consisted of earth largely intermixed with fragments of stone of allsizesand shapes. 24 feet or so further south was a ditch apparently somewhat inferior in breadth and depth to the ditch of the Murus, though otherwise of the same character. On its southern edge was a rampart much smaller in size than the one just noticed, while the series was completed by a third mound, approaching in its dimensions the larger of the other two,

and raised at nearly the same distance as it from the centre of the included ditch. :

Along the wall, at intervals averaging 4 miles, were stationary camps strongly fortified. According to the Notitia Utriusque Imperit, which contains a brief record of the civil and military arrangement of the empires of the

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Plan of Hadrian's Wall.

East and West, and is supposed to have been compiled in the beginning of the 5th century of our era, there were 23 such stations. Thenames given areas follows:—Segedunum (Wallsend), Pons A®lii (Newcastle), Condercum (Benwell Hill), Vindobala (Rutchester), Hunnum (Halton Chester), Cilurnum (Chesters), Procolitia (Carrawburgh), Borcovicus (Housesteads), Vindolana (Chesterlolm), A!sica (Great Chesters), Magna (Carvoran), Amboglanna (Birdoswald), Petriana, Aballaba, Congavata, Axelodunum, Gabresentum, Tunocelum, Glannibanta, Alionis, Bremetenracum, Olen- acum, and Virosidum. It is somewhat strange that not a trace of one of these names survives in the local vocabulary of the present day, though the exact positions of a number of the stations have been identified beyond all doubt by other means. The sites had been chosen with great care, aud much labour must have been expended in their con- struction, They were in fact military cities, "suited," to use the words of Dr Bruce, "to be the residence of the chief who commanded the district, and providing secure lodgment for the powerful body of soldiery he had under him." It is not clear, however, that more than 18 of the 23 were situated per lineam valli, the others being probably supporting stations. The Wall was further strengthened by quadrangular buildings called mile-castles as well as by smaller watch-towers or sentry-boxes of stone; while con- necting the whole was a military way made in Roman fashion and protected by the other parts of the fortification. By means of this road the garrisons of the different stations

could be quickly and safely concentrated on any point along the line that was threatened by anenemy. 'It is some- times asked," remarks tlie

authority just quoted, " How long would the Wall be in building? From calculations that have been made, founded upon the experience gained by the construction of the vast works connected with modern railways, it is considered that, in the existing cir- cumstances of the country at the time, the Va/Zuwm and the Murus could not be reared in a shorter period than 10 years. The cost of it in our present currency would be about £1,000,000. Above 10,000 men would be required to garrison its stations" (Wallet Book of the Roman Wall, p. 37).

Several of the ancient writers allude to ramparts and lines of forts raised by the Romans across the island during the time they had a footing in it. Of these notices some refer to the barrier on the isthmus of the Forth and Clyde (see Antoninus, WALL oF, vol. ii. p. 139); the others probably apply to the more important works now described. In his Agricola Tacitus states that the Roman general during his operations in the north of England (79 a.p.) compelled many states hitherto hostile to lay down their arms and surrounded them with garrisons and castles. A hundred years later two contemporary historians, Dion Cassius (as abridged by Xiphiline) and Herodian, writing of events in Britain that occurred in their own day, both notice—tle former in two places—the existence of a wall in Britain, separating the Roman territory from the uncon-

quered tribes that dwelt beyond ; but neither of them men- tions when or by whom it was built. Another century onwards and Spartian, one of the Scriptores Historie Auguste, states that the emperor Hadrian was the first to rear a wall across Britain (circa 120 a.D.) as a defence against the northern barbarians. It was, he adds, 80 miles in length. The same author in lis life of Severus tells us that emperor also raised a wall from sea to sea (circa 208 a.D.). Aurelius Victor, who flourished about the year 360 A.D., ascribes to Severus the building of a wall in Britain, employing almost the words of Spartian ; while his con- temporary, Eutropius, makes a similar statement, adding, however, that this rampart was 32 (according to another reading, 132) miles loug, and erected for the defence of certain portions of the country, which Severus had recon- quered for Rome. Another possible wall-builder is intro- duced to us in the early years of the 5th century by the

poet Claudian, who represents Britain as indebted to Stilicho, the successful general of the emperors Theodosius I. and Honorius, for some protection of this nature against the attacks of the Scots, Picts, aud Saxons. Lastly, Gildas, our earliest native historian, asserts that the Britons them- selves built a wall to aid them in warding off the assaults of the Picts and Scots, and that another was constructed by the Romaus with native assistance, just before their final abandonment of the island. Both statements are repeated by Bede, who identifies the former of these struc- tures with Antonine's wall and the latter with the more famous fortification near his own monastery of Jarrow

Founding on such unsatisfactory if not conflicting data, modern writers have been led to give various answers to the questions—When and by whom was the Roman Wall built? The limits of the present article do not admit of any discussion of the subject, and those who wish to see these questions fully examined, as well as to read an account of the inscriptions and other antiquities discovered from time to time along the line of the Wall, are referred to the list of works given below, more especially to Dr J. C. Bruce's exhaustive treatise. For others the following summary may be sufficient.

Gordon, to whom we owe one of the earliest surveys of the Wall, is of opinion that the Vallum was the work of Hadrian, and the Murusof Severus. Horsley believed that the stations and the northern rampart of the Vallum were raised by Agricola, the ditch of the Vallum and its reniain- ing mounds by Hadrian, and the stone wall with its castles, towers, and its great military way by Severus. Dean Merivale, while admitting that camps aud mounds may have been erected on the isthmus by Hadrian and Severus, supposes that the stations were faced with masonry and the work planned as well as partly executed by Theodosius, his designs being afterwards fully carried out about 400 a.p. by Stilicho, in orders issued from Gaul. But others, and foremost among them Dr Bruce, see in the fortification a unity of design that points it out as the work of one period and one mind, and have come to the conclusion that Hadrian was the builder of the whole. This view, as it does not exclude tho probability that his engineers worked to some extent on lines already laid down by Agricola, and that Severus, before entering on his unfortunate campaign against the Caledonians, or after its close, repaired and strengthened the works of his predecessors,

seems most consistent with the statements of ancient writers, with the testimony of inscriptions, and with the appearances pre- sented by the relative position of the component parts of the fortification itself.

See Gordon's Itinerarium Septentrionale, London, 1727 ; Horsley's Lritannia Romana, London, 1782; Hutton's History of the Roman Wall, London, 1818; Hodgson's Roman Wall, &e., Newcastle, 1841; M'Lauchlan's Survey of the Roman Wall, made in the years 1852-54 ; Bruce's Roman Wall,3d ed.,London, 1868. (J. M'D.)

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HADRUMETUM, or AprumetuM (tle name appears in the Greek writers in a great variety of forms—Adpvpy, 'ASpvpns, Adptuyros, "Adpovpurros, "Adpdunros), a city on

'the African coast of the Mediterranean on the Sinus | Neapolitanus or Gulf of Hamamet.

A Pheenician colouy of earlier date than Carthage, in course of time it became subservient to the imperial city, and fell along with it under the power of the Romans. On the subdivision of the

toman province of Africa Propria, it became the capital of Byzacium. By Trajan it was made a colony, as is evidenced by the grandiloquent inscriptious preserved by Gruter—Col. Concordia Ulpia Trajana Augusta Frugifera Hadrumetina. From the devastation inflicted by the Vandals it was restored by Justinian, and in consequence it bore for some time the uame of Justinianopolis.

The identification of Hadrumetum is a matter of some difficulty. Most modern authorities agree in fixing it at Susa, but others con- tend that Hamamet is the true site. Hitherto no inscription has been discovered which satisfactorily settles the point in favour of either; for the fragments that are appealed to for the identification of Hamamet with Saigitis may possibly have becn brought to the place of their discovery. The arguments in favour

of each may be thus snmmarized. Susa agrees remarkably well, as Maltzan elabo- rately maintains, with the position assigned to Hadrumetum by the Notitia and other ancient works in which the distances from place to place are given. The remains of ancient buildings, though few, prove undoubtedly that Susa is the site of some city of considerable importance, and the rnins now known as Makluba or the Fallen may be those of a great temple. We know that in the time of El- Bekri Susa still possessed a cothon or inner harbour (one of the chief features of Hadrumetum as described by the author of the African War), which may be recognized in the existing sandy plain 1500 feet wide between the two ancient moles, now distinguished as the Quarantine Mole and Pointe du Mole. The figures found by M. Daux (Journ. Asiat., 1868) would of themselves have suggested that Susa was a Pheenician colony. Barth suggests that the name Susa is probably a corruption of Sé¢ovea. In favour of Hamamet Mr J. E. Davis argues that the scenery near Susa agrees with that of Ruspina described by the author of the African War ; that the ab- sence of ruins at Hamamet is accounted for by the clouds of sand swept down upon the site ; that there are clear traces of a cothon at Hamamet; and that the modern nanie Haimamot or Tent of Death corresponds exactly with the hypothetical Hedermot or Chamber of Death of the Pheenicians. On the whole the argument appears to be on the side of Susa.

For further details sce Barth, Wanderungen durch die Kiisten- liinder des Mittclnceres, 1840 ; Guérin, Voyage archéolegique dans la Régenee de Tunis, 1862; Nathan Davis, Ruined Cities, 1862 ; Maltzan, Reise in der Regentschaften Tunis und Tripoli, 1870.

HAMORRHOIDS (from aia, blood, and péw, to flow), commouly called piles, a frequent and distressing malady. Two varieties are described. They are named from their situation external and internal, as they are without or within the opening of the anus. The external pile is an overgrowth of the thin dark-coloured skin round the open- ing; there is most frequently more than one present; the skin, lax and redundant, hangs in folds. The internal pile lies altogether within the opening, although it may appear externally protruding through the anus when any pressure from above is applied, as when the patient strains at stool. It is covered by, and composed of an overgrowth of, the mucous membrane lining the bowel. There may be

several internal piles. The internal pile is sessile or pedunculated. The external pile is of a pale colour. The internal pile is moist, vascular, and of a cherry-red colour; it is apt to in- flame, aud the inflammation is associated with heat, pain, and general uneasiness. Ulceration and bleeding are common symptoms of the internal pile, hence the term " bleeding" or "bloody piles." Both varieties are probably due to the same primary cause—an enlargement of the veins in this region. Any cause which, by pressing on the large abdominal veins, retards the upward flow of blood to the heart will give rise to piles; such are constipation, disease of the liver, pregnancy. General weakness involving a want of tone in the blood-vessels may act as a predisposing cause. The exciting cause is frequently exposure to damp,

as from sitting on the wet ground. Piles are only a symptom, and in their treatment this should be kept in view ; remove the cause and the piles will disappear. The local treatment is palliative or radical. The palliative treat- ment consists in attention to the state of bowels, cold bath- ing, astringent injections, lotions, and ointments. The radical treatment consists in their removal; the external pile is cut off, the internal pile is tied or clamped and cauterized. Both methods have their advocates; the radical treatment should not be undertaken until palliative treatment has failed. When in a state of inflammation the treatment consists in hip baths, hot fomentations, and poultices. The introduction of a morphia suppository often relieves the uneasincss. Both varieties are often met with in the same individual ; when this is the case both should be removed by operation at onetime. The internal piles are apt to return if the predisposing cause is still in existence. Piles are apt to be confounded with other surgical diseases in this region, as fissure or ulcer, prolapse, polypus, or cancer. This is not the place to point out the distinguishing features of these different maladies; the patient should consult a surgeon. There is a form of pile situated just at the verge of the anus, where the skin joins the mucous membrane : its onset is sudden, and due to the rupture of a blood-vessel ; the blood is extravasated and clots; a small, tense, painful swelling of a bluish colour is seen at the edge of the anus. This may be relieved by hot fomentations, or the pile may be laid open and the clot turned out by gentle pressure.

HAFIZ. Muhammed Shamsuddin, better known by his takhallus or "nom de plume" of Hafiz, was onc of the most celebrated writers of Persian lyrical poetry. He was born at Shiraz, the capital of Fars, in the early part of the 8th century of the Mahometan era, that is to say, in the 14th of our own, The exact date of his birth is uncertain, but he is known to have attained a ripe old age and to have dicd in 791 a.n, (1388 a.p.). This is the date given in the chronogram which is engraved on his tomb, although several Persian biographers give a different year. Very little is actually known about his life, which appears to have been passed in quiet retirement and literary ease in his native city of Shiraz, of which he always speaks in terms of affectionate admiration. He was a snbject of the Muzaffar princes, who ruled in Shiraz, Yazd, Kirman, and Ispahan, until the dynasty was overthrown by Timur-lang (Tamerlane). Of these princes his especial patrons were Shah Shuja' and Shah Mansur. He early devoted himself to the study of poetry and theology, and also became learned in mystic philosophy, which he studied under Shaikh Mahmud 'Attar, chief of an order of dervishes. Hafiz after-wards enrolled himself in the same order and became a professor of Koranic exegesis in a college which his friend and patron Haji Kiwam-uddin, the vizier, specially founded for him. This was probably the reason of his adopting the sobriquet of Hafiz, which means "one who remembers," and is technically applied to any person who has learned the Koran by heart. The restraints of an ascetic life seem to have been very little to Hafiz's taste, and his loose conduct and wine-bibbing propensities drew upon him the severe censure of his monastic colleagues. In revenge lhe satirizes them unmercifully in his verses, and seldom loses an opportunity of alluding to their hypocrisy and religious pretensions. Hafiz's fame asa poet was soon rapidly spread throughout the Mahometan world, and several powerful monarchs sent him presents and pressing invitations to visit them. Amongst others he was invited by Mahmud Shah Bahmani, who reigned in the south of India, and set off with the intention of sojourning at the court of that sovereign. After crossing the Indus and passing through

vessel sent for him by the Indian prince. He seems, however, to have been a bad sailor, and, having invented an excuse for being put ashore, made the best of his way back to Shiraz. Some biographies narrate a story of an interview between Hafiz and the invader Timur. The latter sent for him and asked angrily, " Art thou he who was so bold as to offer my two great cities Samarcand and Bokhara for the black mole on thy mistress's cheek," alluding to a well-known verse in one of his odes, "Yes, sire," replied Hafiz, "and it is by such acts of generosity that I have brought myself to such a state of destitution that I have now to solicit your bounty." Timur was so pleased at the ready wit displayed in this answer that he dismissed the poet with a handsomie present. Unfortunately for the truth of this story Timur did not capture Shiraz till 1393 A.D., While the latest date that can be assigned to Hafiz's death is 1391, Of his private life little or nothing is known. One of his poems is said to record the death of his wife, another that of a favourite unmarricd son, and several others speak of his love for a girl called Shdkh i Nabat, " Sugar-cane branch," and this is almost all of his personal history that can be gathered from his writings. He was, like most Persians, a Shiah by religion, belicving in the transmission of the office of Imd4m, or head of the Muslim Church in the family of Ali, cousin of the prophet, and rejecting the /adith, or traditional sayings of Mahomet, which form the Sunneh or supplementary code of Mahometan ceremonial law. One of his odes which contains a verse in praise of Ali is engraved on the poet's tomb, but is omitted by Sudi, the Turkish editor and commentator, who was himself arigid Sunni. The same sectarian bigotry has influenced many other editors, and it is no unusual thing to find an Indian edition of the Divén emasculated by the excision of all the passages which can be construed as having the slightest allusion to the objects of Shiah veneration. That his tendencies were towards a rather extravagant and heretical form of theosophy may be deduced from his writings, and in one verse he even goes so far as to speak in terms of admiration of one Mansur of Halléj who was hanged, after being put to the most horrible tortures, on a charge of blasphemy, 309 a.u. This person professed a creed nearly approaching pure pantheism, and went about asserting that he was himself an incarnation of the omnipresent divinity, saying, Ana 'l Hakk, "1 am the Truth!" Hafiz in allusion to this says that his only fault was that he revealed the mystery. These heretical opinions and the dissipated life of the poet caused difficulties to be raised by the ecclesiastical authorities on his death as to

his interment in consecrated ground. The question was at length settled by Hafiz's own works, which had then already begun to be used as they arc now throughout the East for the purposes of divination, in the same manner as Virgil was employed in the Middle Ages for the divination called Sortes Virgiliane. Opening the book at random after pronouncing the customary formula asking for inspira- tion, the objectors hit upon the following verse —" Turn not away thy foot from the bier of Hafiz, for though immersed in sin, he will be admitted into Paradise." He was accordingly buried in the centre of a small cemetery at Shiraz, now included in an enclosure called the Hafiziyeh.

His principal work is the Divan, that is, a collection of short odes or sonnets called ghazals, and consisting of from five to sixteen dazts or couplets each, all the couplets in each ode having the same rhyme in the last hemistich, and the last couplet always introducing the poet's own nom de plume. The whole of these are arranged in alphabetical order, an arrangement which certainly facilitates reference but makes it absolutely impossible to ascertain their chrono- logical order, and therefore deteriorates from thcir valne as

Lahore he reached Ifurmuz, and embarked on board a | a means of throwing light upon the growth and develop-

ment of his genius or the incidents of his career. These "orient pearls at random strung," as a version of a passage from Hafiz in Sir William Jones's grammar calls them, are often held together by a very slender thread of continuous thought, and very few editions agree exactly in the order of the couplets which form the individual ghazals. Still, although they often appear at first sight extremely disconnected, a careful study of them, especially from the point of view indicated by the Sufiistic system of philosophy, will always show that a single idea does run through- out the whole. The nature of these poems has been the subject of much discussion in the West, some scholars seeing in their anacreontic utterances nothing but sensuality and materialism, while others, following the Oriental school, maintain that they are wholly and entirely mystic and philosophic. Something between the two would pro- bably be nearer the truth. It must be

remembered that Hafiz was a professed dervish and Sufi, and that lis ghazals were in all probability published from a taka, and arranged with at least a view to Sufiistic interpretation. At the same time it is ridiculous to suppose that the glowing imagery, the gorgeous and often tender descriptious of natural beauties, the fervent love passages, and the roystering drinking songs were coinposed in cool blood or witli deliberate ascetic purpose. The beauty of Hafiz's poetry is that itis natural. It is the outcome of a fervent soul and a lofty genius delighting in nature and enjoying life ; and it is the poet's misfortune that he lived in an age and amongst a people where rigid conventionality demanded that his free and spontaneous thouglits should be recast into an artificial mould.

The system of philosophy professed by Persian poets and dervishes, and in accordance with which the poems of Héfiz are allegorically interpreted, is called Sufiism (Zasawwif). It is derived usually from the word sf, which in Arabic means wool, and is supposed to refer to the woollen robes worn by the dervishes, aithough it is in all probability con-

nected with the Greek codds. Itis the ultimate outcome of | | poor circumstances a widow and two sons, of whom the ceremonials, and ideas of their Semitic conquerors, which

the protest of the conquered Aryan nations against the laws,

first found expression in the schism of the Shiahs, that is, of the Persian party who sided with the family of Ali Ibn Abi Talib, cousin and son-in-law of Mahomet, against the claims of Moawiyeh, who at the head of the Arab party claimed and held the caliphate. Forced by events to accept el Islam, and compelled to forsake the Magian and Zoro- astrian faiths, the Persian Shiahs rapidly developed a system which, while teaching openly the unity of God according to Moslem doctrine, secretly theorized and refined it away, until Pantheism became the esoteric religion of the sect. It teaches that God is the only real existence and that all other existences are hypothetical, that God existed alone and created the universe merely by His Will and by the utterance of the word "Be." The " Will" or "Order" and the "Be" are closely allied to the "Spirit " and "Word" of Christian theology. Man, the highest purpose of this creation, is therefore part and parcel of the Deity, and when sufficiently purified from the lower and grosser elements returns

to his source again. The circle of existence thus imagined is looked upon as a road which all

must travel, and this image is kept up throughout the |

terminology of the sect. Thus the doctrine is tarikat (the road), the student or disciple is the sd/ik (wayfarer), and the different stages of perfection are manzilhd (road-side Stations or inns). And since all differences in sect and religion are as nothing to the illuminated philosopher who ig Initiated into this mystery, and as the contemplation of the divinity of his own existence and of his ultimate resump- tion of his place as part and parcel of the Deity produces ecstacy and mental exaltation, and inasmuch as everything

that is beautiful, lovable, and pure is a purer and clearer manifestation of the Deity that runs through all,—therefore the Sufis speak of their real worship as paganism, their real devotion as love and drunkenness, and see a divine mystery in every phase of beauty in humanity or inanimate nature. Besides the Divdn, Hafiz wrote a number of other poems; the Leipsic edition of his works contains 573 ghazals (forming the Divén), 42 kitths or fragments, 69 rubdiydt or tetrastics, 6 masna- viydt or poems in rhyming couplets, 2 kasdid, idylls, or panegyrics, aud one mukhammes or poem in five-line strophes. Other editions contain several tarji-band or poems witha refrain. His works have never been completely translated into English ; a few rhyming ver- sions of single poems by Sir William Jones, Nott, Hindley, Falconer, &c., are to be found scattered through the pages of the Oricntal Miscellany and other periodicals, and a fine edition con- taining a verse rendering of the principal poems by the late H. Bicknell is published by Triibner and Co. (London, 1875). A prose version of a hundred selected odes was also published anonymously by Williams & Norgate (London, 1875). On the Continent the principal versions are by Von Hammer Purgstall; a rhyming and rhythmical translation of a large portion of Hafiz's works by Von Rosenzweig of Vicnna (3 vols. 8vo, Vienna, 1858), which contains also the Persian text and notes ; Der Divan des Schems- eddin Muham- med Hdfis, by Nesselmann (Berlin, 1875), in which the rhyming system of the original is imitated. Besides these, the reader may consult D'Herbelot, Bibliotheque Oricntalc, article " Hafiz ;" Sir William

Ouseley's Oriental Collection (3 vols. 4to, London, 1797-98); Specimens of Persian Poetry, or Odes of Hafiz, by John Richardson. (London, 1802) ; Biographical Notices of Persian Poets, by Sir Gore Ouseley (Oriental Translation Fund, 1846); and an excellent article by Professor E. B. Cowell in Macmillan's Magazine (No. 177, 3 uly 1874). The best edition of the text is perhaps that edited by Her- mann Brockhaus of Leipsic, 1854, which is based on the recension of the Turkish editor Sudi, and contains his commentary in Turkish on a considerable portion of the Divan. (Bid, JB)

HAGEDORN, Frrepricu von (1708-1755), one of the most distinguished German poets in the earlier half of last century, was born April 23, 1708, at Hamburg, whiere his father was Danish minister at the court of Lower Saxony. The father, a man of scientific and literary tastes, possessed a valuable library of French literature, and dabbled also in the science of alchemy. Having by this and other means lost a great part of his fortune, he died in 1722, leaving in

poet was the elder. He was educated at the gymnasium of Hamburg, and went later (1726) to study jurisprudence at Jena. Shortly after his return to Hamburg in 1729, he obtained the appointment of private secretary without | salary to the Danish ambassador in London, where he lived till 1731, and published two small works in English, His return to Hamburg was followed by a period of great poverty and hardship, a scanty income being derived from the posts which he held in the Hamburg cathedral and among the mining population in Klausthal. In 17338 Hagedorn became secretary to the so-called "English court" in Hamburg, a trading company founded in the 13th century, and formerly known as "Die Societat der Aventurier Kaufleute." He shortly afterwards married, and from this time, with a settled income and sufficient leisure to pursue his literary occupations, led a pleasant and congenial existence, surrounded by friends and admirers, till his death, at the early age of forty-seven, October 28,

1755.

Hagedorn is known as the author of satirical, didactic, and moral verses, epigrams, odes, fables, and songs. His popularity during his lifetime was great. Although he held himself aloof from any poetizal school, he

nevertheless exercised an important influence on the German poetry of his time; for, besides being a learned man and well-read

_in the ancient and modern classics, he was a special admirer

of French literature, the study of which gained for him an ease and mobility before unknown in German versification. He has been called the originator in Germany of the modern song, and some of his Lieder were set to music by the favourite composers of his day. His popularity, how-

ever, is now long past. His learning and his style have been eclipsed by later and greater poets, and he who was at one time the "allgemeine Bewunderung von Deutschland" now ranks only among the secondary German classics.

The first collection of Hagedorn's poems was published at Ham- burg shortly after his return from Jena in 1729, under thc title Versuch einiger Gedichte, oder erlesene Proben poctischcr Neben- stunden. In 1738 appeared Versuch in poetischen Fabeln und

Erzihlungen ; in 1747 a collection of his lyric poems, under the |

title Sammlung neuer Oden und Lieder; and his Movalische Gedichte in 1750. A collection of his entire works was published at Ham- burg after his death in 1756, and a smaller edition in 1767. The best is Eschenburg's edition, 5 vols., 1800, republished, with Hage- dorn's correspondence, in 1825. See C. H. Schmid, Biographie von Hagedorn.

HAGEN, a town of Prussia, at the head of a circle in the Arnsberg government of Westphalia, is situated at the confluence of the Empe with the Volme, and at the junc- tion of several railways, 26 miles W.S.W. from Arnsberg. It is the seat of a provincial office, a circle court, a chamber of commerce, a state railway commission, and an agricul- tural union. It has two Evangelical churches, a Catholic church, an Old Catholic church, a synagogue, a real-school of the first order, a royal provincial trade school, a higher female school, and twvu infirmaries. Hagen is one of the most

flourishing commercial towns in Westphalia, and possesses puddling works for iron and steel, iron foundries, cast-steel works, a large cotton print work, woollen and cotton factories, manufactures of leather, paper, tobacco, and iron and steel wares, breweries, and distilleries. There are large limestone quarries in the vicinity, and also an alabaster quarry. The population in 1875 was 24,335, or including Althagen 26,870.

HAGEN, Frieprich Hrtnrich Von DER (1780-1856), distinguished for his researches in Old German literature, was born at Schmiedeberg in Brandeuburg, 19th February 1780. After studying law at the university of Halle, he obtained a legal appointment in the state service at Berlin,

but in 1806 he resigned this office in order to devote him- |

self exclusively to the study of his choice. In 1810 he was appointed professor extraordinarius of German lan- guage and literature in the university of Berlin, in the following year was transferred to a similar professorship in Breslau, and in 1821 returned to Berlin as professor ordi- narius. He died at Berlin, 11th June 1856. To Hagen belongs the chief merit of awakening an interest in Old German poetry, of which he published several collections.

His principal publications are the Nibelunagenlied, of which he issued four editions, the first in 1810 and the last in 1842; the Minnesinger, Leipsic, 1838-52, 5 vols. ; Lieder der dltern Edda, Berlin, 1812 ; Altnordische Lieder wnd Sagcen, Breslau, 1814; a col- lection of Old German tales under the title Gesammtabenteuer, Stuttgart, 1850, 3 vols. He also published Ueber die dltesten Dar- stellungen der Faustsage, Berlin, 1844; and from 1835 he edited the Jahrbuch der Berlinischen Gesellschaft fiir deutsche Sprache und Alterthumskunde.

HAGENAYU, the chief town of a circle and canton in Alsace-Lorraine, Germany, district of Lower Alsace, is situated in the middle of the Hagenau Forest, on the Moder, and on the railway from Strasburg to Weissenburg, 10 miles N.N.E. of the former town. It has two ancient

Catholic churches, one dating from the 12th the other from |

the 13th century, a gymnasium, a reformatory for boys, a female penitentiary, a public library, a hospital, and a theatre. The principal industries are wool and cotton spinning, and the manufacture of porcelain, earthenware, soap, leather, oil, and beer. There is also considerable trade in hops, vegetables, and wine. Population (1875), 11,786.

Hagenau dates from the beginning of the 12th century, and owes its origin to the erection of a hunting lodge by the dukes of Swabia. Frederick Barbarossa surrounded it with walls and gave it a con- stitution. On the site of the hunting lodge he founded an imperial palace, in which were preserved the jewelled imperial crown, sceptre, imperial globe, and sword of Charlemagne, Subsequently

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_ the town obtained imperial rights, and after the extinction of the | Hohenstaufens it remained the capital of the bailiwick of Lower Alsace. In 1648 it came into the possession of France, and in 1673 Louis XIV. caused the fortifications to be razed. In 1675 it was

eaptured by imperial troops, but in 1677 it was retaken by the French and nearly all destroyed by fire. In 1871 it eame, along with the rest of Alsace-Lorraine, into the possession of Prussia, | HAGENBACH, Kart Rupotr (1801-187 4), distin- guished as a church historian and as an expounder of the so-called " Vermittelungstheologie," or mediation theology of Germany, was born March 4, 1801, at Basel, where his father, a man of considerable talent and scientific repute, 'was a practising physician. His preliminary education _ was received at a Pestalozzian school, and afterwards at the | gymnasium, whence in due course he passed to the newly | reorganized local university. Carefully brought up within a church in which the strictest orthodoxy still continued to hold undisputed sway, familiar at the same time from boy- hood with his father's expressions of approval of the | principles of the French Revolution, himself of an ardent, sympathetic, inquiring, and devout temperament, he early devoted himself to theological studies and to the service of the church, while at the same time clierishing and develop- ing broad " humanistic" tendencies which found expression in many ways and especially in an enthusiastic admiration for the writings of Herder. The years 1820-23 were spent first at Bonn, where Liicke exerted a powerful

influence on the formation of his opinions, and afterwards at Berlin, _where Schleiermacher, and still more Neander, became _permanently his masters, Returning in 1823 to Basel, where De Wette had recently been appointed to a theological chair, he distinguished himself greatly by his "labilitations-schrift" or trial-dissertation, entitled Observationes historico-hermeneutice circa Origents methodum interpretanda sacrw Scripture ; in the following year he became professor ex- traordinarius, and in 1829 professor ordinarius of theology. Apart from his special academic labours during many years in connexion with the history of dogma and of the church (which first owed to him their recognition as distinct branches of study at Basel), he lived a life of great and varied usefulness as a theologian, a preacher, and a citizen ; and at his "jubilee" in 1873, not only the university and town of Basel but also the various churches of Switzerland united to do him honour. He died at Basel, June 7, 1874.

Hagenbach was a voluminous author in many departments (as will be seen froin the list of his works which is given below), but it is as a writer cn church history that he is specially distinguished, and is likely to be longest and most widely known. Though ncither so learned and condensed as the contributions of Gieseler, nor so original and profound as those of Neander, his lectures are written with remarkable clearness and attractiveness, and are deservedly appreciated at once for their warm glow of sympathy with his sub- ject and for their entire freedom from narrow sectarian prejudice. In dogmatics, while avowedly a champion of the "mediation theology" based upon the fundamental conceptions of Herder and Schleiermacher, he was much less revolutionary in his aims and in his results than were many others of his school. To the last he sought to maintain the old confessional documents, and to make the objective and churehly prevail over the purely subjective manner of viewing theological questions. But he himself was aware that in the endeavour to do so he was not always successful, and that his ~~*delineations of Christian dogma often betrayed a vacillating and uncertain hand. His worksinclude a remarkably clear Tabellarische Uebersicht der Doginengeschichte (1828) ; Encyclopidie Ue Method*~~ *| ologie der theol. W issenschaften (1883) ; Vorlesungen tiber Wesen a. Geschichte der Reformation u. des Protestantsnius (1834-43); Lehrbuch der Dogmengeschichte (1840-41, 5th ed., 1867; English transl., 1850); Vorlesungen tiber die Geschichte der alten Kirche (1853-55); Vorlesungen*

iiber die Kirehengeschichte des Mittelalters (1860-61) ; Grundlinien der Homiletik u. Liturgik (1868); also biographies of (Ecolampadius and Myconius aud a Geschichte der theol. Schule Basels (1860). His Predigten have been published in nine volumes (1858-75), and he is also author of two volumes of poems entitled Luther w. seine Zeit (1838), and Gedichte (1846). The lectures on church history under the general title Vorlesungen diber die Kirchengeschichte von der diltesten Zeit bis zwm 19ten Johr-hundert have been recently reissued in seven volumes (1868-72).

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HAGERSTOWN, a city and township of Maryland, United States, capital of Washington county, is situated near the west bank of Antietam creek, 20 miles from its confluence with the Potomac river, and at tlie junetion point of three railways, 86 miles W.N.W. by rail from Baltimore. It is a well-built town with very few wooden houses, and possesses a fine new court-house, a male and a female academy, and a national and a state bank. It depends for its prosperity chiefly on agriculture, and has flour-mills, bone-mills, macliine shops, and a tannery, and considerable trade in agricultural produce. The population in 1850 was 3834; in 1860, 4132; and in 1870, 5779, of whom 869 were coloured. '

HAG-FISH, Grurinovs Hac, or Borez (Iysxine), a marine fish which forms with the lampreys one of the lowest orders of vertebrates (Cyclostomata). Similar in form to a lamprey, it is usually found within the body of dead cod or haddock, on the flesh of which it feeds after having buried itself in the abdomen. When eaught, it secretes a thick glutinous slime in such quantity that it is commonly believed to have the power of converting water into glue. It is oceasionally found in the North Atlantic and other temperate seas of the globe.

HAGGAI, the tenth in order of the minor prophets. The name Haggai ('20, Greek 'Ayyatos, whence Aggeus in the English version of the Apocrypha) is usually held to be an adjective meaning festive. But Wellhausen! is pro-bably right in taking the word asa eontraction for Hagariah (Jehovah hath

girded), just as Zaccai (Zaccheus) is known to be a contraction of Zechariah (cf. Derenbourg, LHis- toire de la Palestine, pp. 95, 150).

The book of Haggai contains four short prophecies delivered between the first day of the sixth month and the twenty-fourth day of the ninth month—that is, between September and December-—of the seeond year of Darius the king, The king in question must be Darius Hystaspis, who came to the throne 521 B.c. Sealiger, Drusius, and other older writers think of Darius Nothus (acc. 424 B.c.) ; but this is impossible, since in chap. 11. 3 Haggai speaks of old men as still alive who had seen the first temple in its splendour before 587 B.c.2 The language of the prophet suggests the probability that he was himself one of those whose memories reached across the seventy years of the captivity, and that his prophetic work began in extreme old age. This supposition agrees well with the shortness of the period covered by his book, and with the fact that Zechariah, who began to prophecy in the same autumn and was associated with Haggai's labours (Ezra v. 1), afterwards appears as the leading prophet in Jerusalem (Zeeh. vii. 1-4), We know nothing further of the personal history of Haggai from the Bible. Later traditions may be read in Carpzov's Introductio, pars 3, cap. xvi. On the mention of Haggai in the titles of several psalms in the Septuagint (Psalms cxxxvii., cxlv.—exlviii.) and other versions, see Koehler's Weissagungen Haggai's, p. 32. These titles are without value, and moreover vary in MSS. Eusebius did not find them in the Hexaplar Septuagint.?

In his first prophecy (i. 1-11) Haggai addresses Zerub- babel and Joshua, rebuking the people for leaving the temple unbuilt while they are busy in providing panelled houses for themselves. The prevalent famine and distress are due to God's indignation at such remissness. Let them build the house, and God will take pleasure in it and ee) OE ee eee

' In Bleek's Hinleitung, 4th ed., p. 434.

2 Darius Nothus was thought of because Ezra iv. 6-23 seems to require an Artaxerxes before him. But it is now generally admitted that these verses refer to the building of the wall of Jerusalem, and in chronological order should follow ehaps. v., vi. The Rabbinieal eom-

mentators with their usual ignorance on points of history make Darius the son of Ahasuerus and Esther.

3 See the note on Ps. cxly. i. in Field's Hexapla.

acknowledge the honour paid to Him. The rebuke took effect, and the people began to work at the temple, strengthened by the prophet's assurance that the Lord was with them (i. 12-15). In a second prophecy (ii 1-9) delivered in the following month, Haggai forbids the people to be disheartened by the apparent meanness of the new temple. The silver and gold are the Lord's. Tle will soon shake all nations and bring their choicest gifts to adorn His house. Its glory shall be greater than that of the former temple, and in this place He will give peace. A third prophecy (ii. 10-19) contains a promise, enforced by a figure drawn from the priestly ritual, that God will remove famine and bless the land from the day of the foundation of the temple onwards. Finally, in ii, 20-28, Zerubbabel is assured of God's special love and protection in the impend- ing catastrophe of kingdoms and nations to which the prophet had formerly pointed as preceding the glorification of God's house on Zion. In thus looking forward to a shaking of all nations Haggai agrees with earlier prophecies, especially Isa. xxiv.-xxvii., while his picture of the glory and peace of the new Zion and its temple is drawn from the great anonymous prophet who penned Isa. lx. and Ixvi. The characteristic features of the book are the importanee assigned to the personality of Zerubbabel and the almost sacramental signifieanee attached tothe temple. The hopes fixed on Zerubbabel, the chosen of the Lord, dear to Him as His signet ring (cf. Jer. xxii. 24), are a last echo in Old Testament prophecy of the theoeratic importance of the house of David. In the book of Zechariah Zerubbabel has already fallen into the background and the high priest is the leading figure of the Judean community. The stem of David is superseded by the house of Zadok, the kingship has yielded to the priesthood, and the extinction of national hopes gives new importance to that striet organization of the hierarchy for which Ezekiel had prepared the way by his sentence of disfraneliisement against the non-Zadokite priests,

If his attitude to Zerubbabel forms a link of connexion between Haggai and the prophets before the eaptivity, his post-exile standpoint is characteristically marked in the central importanee which he attaches to the temple. The prophets who spoke under the shadow of the first temple held quite another language® To Isaiah and Jeremiali the religion of Israel and the holiness of Jerusalem have little to do with the edifice of the temple. The city is holy because it is the seat of Jehovah's sovereignty on earth, exerted in His dealings with and for the state of Judah and the kingdom of David. The proof that Jehovah's throne is in Jerusalem lies in the history of what He has done for His people, or, if a visible pledge is needed, it must be sought not in the temple but, in aeeord- ance with antique ideas, in the ark (Jer. iii. 16) or in the altar with its sacred flame (Isa, xxix. 1; xxxi. 9). But, in the desolation of Jerusalem, the extinction of the politieal life with which all religion had till then been inseparably bound up gave a new meaning to the old prophetie doctrine that the service of Jehovah is the true vocation of Israel—a new signifieance to the ruined temple and all its ordinances of worship. 'The holy and beautiful house where our fathers praised Thee" (Isa. lxiv. 11) was a chief thought of the sorrowing exiles (Lamentations, passim), and to one anonymous writer the Lord's vengeance on Babylon appears eminently as vengeanee for His temple (Jer. 1 28). The great prophet of the captivity—the author of Isa. xl.—

After the foundation of the temple Zerubbabel disappears from his-

tory and lives only in legend, which continued to busy itself with his

story, as we see from the apoeryphal book of Esdras (¢f. Derenbourg, Hist. de la Palestine, chap. i.).

5 Compare for example Jer. vii.

§ Haggai (ii. 14) attaches no value to altar and sacrifice so long as the temple is unbuilt.

xvi.—pictures the Israel of the restoration no longer as an earthly state but as a world-priesthood, a mediatorial people gathered round the sanctuary

and holding forth amidst the nations the true pattern of the knowledge and service of the living God till all the ends of the earth shall look to Him and be saved. Under the limitations of the old dispensa- tion neither seer nor people could separate the realization of this great conception from the restoration of the visible centre of Israel's worship in the temple at Jerusalem. The prophet had pointed to Cyrus by name as the rebuilder of Jerusalem and the founder of the temple (Isa. xliv. 28 ; lii. 11); and the captives whose hearts were touched by his burning words, and who availed themselves of the decree of that monarch (536 B.c.) to repeople the desolate places of Judah, looked for the speedy advent of the time when the glory of Jehovah displayed in His house on Zion should draw to Jerusalem the willing homage of all nations (Isa. lvi.; lx. 7; Ixvi. 1-6). The actual experiences of the returning exiles fell as far short of these bright hopes as the Israel of Zerubbabel and Joshua fell short of the ideal regenerate nation to which the prophet had promised the heritage of Jehovah's glory. Scarcely was a settlement effected when difficulties and misfortunes began to thicken about the little colony. The anger of the Lord seemed stil] to rest on Jerusalem and the cities of Judah (Zech. i. 12), whose inhabitants soon ceased to find favour from the Persian court, and had to struggle with penury and famine as well as with the hostility of their neighbours. Amidst such discouragements the first zeal soon grew cool, and the work of rebuilding the sanctuary lay practically untouched till Haggai arose sixteen years Jater.

What had avtually been effected during these years for the restor- ation of the temple is a question of some difficulty. It seems safest to start from the explicit contemporary evidence of Hag. ii. 18 (ef. ii. 15 and Zech. viii. 9) which gives the ninth month of the second year of Darius—after Haggai had begun to preach—as the date when the temple was founded by Zerubbabel and Joshua. On the other hand, the book of Ezra, in its present shape as edited and partly composed by the much later author who wrote Chronicles, con- veys the impression that large gifts for the temple were offered by the leading Jews on their first return (Ezra ii. 68, 69), that the foundation of the house was laid by Joshua and Zerubbabel in the second year of the return (ch. iii.), and that the work was thereafter interrupted by the opposition of the Jews' eneinies till the reign of Darius. It appears probable, however, that the Chronicler has somewhat dislocated the order

of events, especially by taking the official correspondence in ch. iv. to refer to the temple, whereas it really refers to the building of the city walls. This oversight might readily involve the antedating of the foundation ceremony described in ili. 8-18, which seems to be identical with that which Haggai speaks of, since the actors are the same, and the chief feature in the description which does not belong to the usual liturgical scenery of the Chronicler recalls Hag. ii. 3, Zech. iv. 7-10. Again, the verses Ezra ii. 68, 69 seem really to refer to a collection made in the tine of Nehemiah, having been transcribed from a history of that period (part of which is preserved in the canonical book of Nehemiah) along with the ancient list which occupies the first part of Ezra ii. But they are not part of the list, as appears from a comparison of Ezra ii, 62-iii. 1 with Neh. vii. 64-viii. 1. If this criticism is just, the Tirshatha of Ezra ii. is Nehemiah, not Zerubbabel, and the usnal arguments for identifying the latter with Sheslibazzar—whon1 Cyrus, according to an Aramaic source preserved in Ezra v., appointed governor and charged with the restoration of the temple— fall to the ground.! Sheshbazzar was presumably a Persian official ; and the first hope of the Jewish colony, in accordance with Isa. xliv. 28, lx. 10, was, no doubt, that the Persians would effect the re- storation without effort of theirs. This hope was frustrated, Shesh- bazzar presumably having taken up his task with the usual conscientionsness of an Oriental governor, that is, having done nothing, though the work was nominally in hand all along (Ezra v. 16). The advancement of Zcrubbabel to the governorship may have given Haggai his opportunity.

In the confused state of the chronology of the book of Ezra it may also be a question when the Samaritans sought to join the Jews and were repnised. That the relation of Ezraiv. 1-4 is historical secms Ree en ee el,

1 Ezra ii. 2 seems to show that at the return Zerubbabel was merely one of the Jewish elders. The opposite impression is due solely to the punctuation.

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to be established against objections which have been taken to it by the reference to Esarhaddon, which A. v. Gutschmidt has vindicated by an ingenious historical combination with the aid of the Assyrian monuments (Neue Beitrdge, p. 145). Compare also Jer. xli. 5 for the antiquity of the

Samaritan claim to worship with the Jews. But from Ezra v., and especially from Zech. iii., it may be questioned

‘whether the opposition of the Samaritans arose before the time of

Haggai and Zechariah. See on the whole question Schrader, “ Die Dauer des zweiten Tempelbaues,” in the Studien und Kritiken, 1867.

Such indifference to the undertaking which held a chief place in the first ardour of the returning exiles hada deeper significance than at once occurs to our modern habits of thought. ‘The restoration of the temple and its worship was connected in every mind with the doctrine that the service of Jehovah was the true national vocation of Israel, and the apathy that Haggai rebukes showed the people to have forgotten in the struggle for material welfare their ideal calling as the nation of the true God. His reproofs touched the conscience of the Jews, and the book of Zechariah enables us in some measure to follow the course of a religious revival which, starting with the restoration of the temple, did not confine itself to matters of ceremony and ritual worship. On the other hand, Haggai’s treatment of his theme, practical and effective as it was for the pur- pose in hand, moves on a far lower level than the aspira- tions of the great evangelical prophet who inspired tlie people at their first return. ‘lo the latter the material temple is no more than a detail in the picture of a work of restoration eminently ideal and spiritual, and he expressly warns his hearers against attaching intrinsic importance to it (Isa. lxvi. 1). To Haggai the temple appears so essential that he teaches that while it lay waste the people and all their works and offerings were unclean (Hug. ii. 14). In this he betrays his affinity with Ezekiel, who taught that it is by the possession of the sanctuary that Israel is sanctified (Ezek. xxxvii. 28). In truth the new movement of re- ligious thought and feeling which started from the fall of the Hebrew state took two distinct lines, of which Ezekiel and the anonymous prophet of Isa. xl.~~lxvi. are the respec~~ tive representatives. While the latter developed his great picture of Israel the mediatorial nation, the systematic and priestly mind of Ezekiel had shaped a more material con- ception of the religious vocation of Israel in that picture of the new theocracy wliere the temple and its ritual occupy the largest place, with a sanctity which is set in express contrast to the older conception of the

holiness of the city of Jerusalem (cf. Ezek. xliii, 7 seg. with Jer. xxxi, 40, Isa. iv. 5), and with a supreme significance for the religious life of the people which is expressed in the figure of the living waters issuing from under the threshold of the house (Ezek. xlvii.). It was the conception of Ezekiel which permanently influenced the citizens of the new Jerusalem, and took final shape in the institutions of Ezra. To this consummation, with its necessary accompaniment in the extinction of prophecy, the book of Haggai already points.

Exegetical Helps. —The elaborate and valuable German commen- tary of A. Kéhler (Erlangen, 1860) forms the first part of his work on the Naehexilisehe Propheten. Reinke's Commentary (Miinster, 1868) is the work of a Roman Catholic. Haggai has generally been treated in works on all the prophets, as by Ewald (2d ed,, 1868 ; Eng. trans., vol. iii., 1878); or along with the other minor prophets, as by Hitzig (8d ed., Leipsic, 1863), Keil (1866 ; Eng. trans., Edinburgh, 1868), and Pusey (1875) ; or with the other post-exile prophets as by Koehler, Pressel (Gotha, 1870), Dods (1879), and others. The older literature will be found in books of introduction or in Rosenmiiller's still useful Seholia. The learned commentary of Marckius may be specially mentioned. On the place of Haggai in the history of Old Testament prophecy, see Duhm's Zheologie der Propheten (Bonn, 1875). (W. R. 8.)

HAGUE, Tue (in Dutch, 's G'ravenhage or den Haag ; in French, La Haye; and in Modern Latin, Haga Comitis), a town of the Netherlands, in the province of South Holland, 13 miles N.W. of Rotterdam, 10 miles 8.W. of Leyden,

and 2 miles inland from the German Ocean, It is con-

nected with both Rotterdam and Leyden by the " Holland Railway," and with Utrecht by the railway of the Rhine. Besides being the chief town of the province, the Hague is the usual residence of the court, and the seat of the Government, the states-general, the high council of the Netherlands, the council of state, the chamber of accounts, and various other administrative bodies. The character- istics of the town are quite in keeping with its political position, It is "the handsomest, the most fashionable, and the most modern-looking" town in the Netherlands. D'Amicis rightly describes it in his Olanda as half Dutch half French, Broad and regular streets, extensive avenues and drives, and spacious squares well planted with trees, are the main features of its general plan; large and beautiful buildings are numerous; and the population con- sists for the most part of Government officials and members of the nobility, the army, and the navy. A good idea

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Plan of the Hague. 1. Cavalry Barracks,| 9. Palace of Prince} 15, Statue of Wil- | 21. Muscum Mecr-

2, Artillery do. of Orange. liam I. manno – West –

3. De Boer's Bazaar. | 10. Royal Palace. 16. The Academy reenianum.

4, National Monu-| 11. Gevangenpoort. of Music, | 22. Palace of Prince ment, 12. Statue of Wil- &e. Alexander.

5, 6. Barracks. liam IT. 17. Nieuwe Kerk. | 23. Palace of Prince

7. St James' Church, | 13. CourtBuildings.| 18. Groote Kerk. Henry.

8. Office of the Min-] 14. Office of Minis-| 19. Town-Hall. 24, Palace of Prince ister of Finance, ter of Justice. | 20. Library. Frederick,

of the place is obtained by passing along the Vijverberg or Fishpond Hill, which takes its name from the large basin of water which it skirts, the Voorhout, and the Willems- park, next through Java Street and Sumatra Street, and then the Buitenhof or Outer Court, the Binnenhof or Inner Court, the Plein, the Kneuterdijk, and the Groote Markt. Willemspark was laid out by King William II., and in 1869 it was chosen as the site of the national monument In memory of the recovery of independence in 1813, executed by Waaijen, Pietersen, and Koelman. The Plein, a square bordered with the oftices of the various ministers and the high council, is adorned with a statue of William i, the "father of his people," by Louis Royer ; an equestrian statue of the same prince, by the count of Nieuwerkerke, 18 placed in front of the royal palace; and there is a statue of William II. by Georges in the Buitenhof,

The centre of the Hague, both historically and topo- graphically, is the buildings of the court. The oldest portion was founded by Count William IL, "king of the Romans," in 1249. A handsome Gothic building, with towers at each corner of the fagade, contains the great or knights' hall, a noble chamber 130 feet in length, 62 feet in breadth, and 69 in height, in which the states of the Netherlands abjured their allegiance to Philip II. of Spain, and in front of which the grey- headed Olden-Barneveldt Jost his life in 1619. To the south-east of the hall is the troonzaal, or throne room, in which the second chamber of the states-general holds its sittings; and to the west is the meeting-place of the first chamber. The archives of the kingdom and several Govern- ment offices are in the same range of buildings. The royal palace proper was purchased by the states of the Nether- lands in 1595, rebuilt by Prince William IIT., and extended by King William I. 'he palace of the prince of Orange was founded about 1720 by Count Unico William of Wassenaar Twiekels ; the palace of Prince Frederick of the Netherlands dates from 1825 to 1828 ; the palace of Prince Henry was erected in 1743 for the deputies of Rotterdam ; and the palace of Prince Alexander was in the 17th cen- tury the house of John de Witt, pensionary of the council. Among the public institutions of the Hague, the following are the most important :—the royal library, with upwards of 100,000 volumes, and a collection of manuscripts, coins, and gems, erected between 1734 and 1738; the Museum Meermanno- Westreenianum, comprising books, manuscripts, maps, plates, pictures, antiquities, and curiosities ; the royal

picture gallery in the Prins-Mauritz-Huis, which was founded in 1638 by Prince John Maurice of Nassau-Siegen, governor of Brazil; the Vijverberg hétel, with a collection of curiosities ; the town museum of antiquities and modern art; the zoological gardens, founded in 1862; the royal school of design and music ; and the new buildings for the arts and sciences, erected in 1874. Of the fourteen churches of the Hague five belong to the Dutch Reformed communion, six to the Roman Catholics, and one to the Old Catholics; one is Episcopalian, one German Evan- gelical, and two Apostolical. There are also two syna- gogues and one Greek chapel. Architecturally the Groote Kerk, under the patronage of St James, is the most note- worthy ; it is 300 feet long by 154 broad, and has a lofty tower and spire; in the interior are the sepulchral monu- ments of James Baron of Wassenaar Obdam, a Dutch naval hero, of Gerrit of Assendelft, and of Philip, landgrave of Hessen-Philipsthal. The Willemskerk was a present of William III. to the Reformed community of the Hague.

The principal industries of the town are iron-casting, copper and lead smelting, cannon-founding, the manufacture of furniture and carriages, silk-dyeing, liqueur-distilling, lithographing, and printing. In 1622 the population of the Hague was only 17,430; in 1732 it was estimated at 34,000 ; in 1796, inclusive of the inhabitants of Scheven- ingen,—a watering-place now connected with the town by a tramway line,—it was 41,266 ; in 1811, 42,150; in 1830, 56,105; in 1840, 58,521; and in 1850, 66,329. In 1860 it was 78,405, and in 1870, 91,328. At the last date 52,600 belonged to the Dutch Reformed Church ; 27,486 were Roman Catholics, 3471 Dutch Jews, and 148 Yortu- guese Jews, In 1874 the total was stated at 94,895.

The Hague, mentioned as early as 1097 in a document by Count Floris II., seems originally to have been a shooting lodge of the counts of Holland. Under William II. it became a residence of the court ; and in the 15th century it begins to be called a town, though for long after, down even to the time of Louis Napoleon, it was as frequently described as a village. In 1479 the soldiers of Maximilian of Austria put the place to ransom ; in 1525 it was the scene of the

martyrdom of Johannes Pistorius (Jan de Bakker of Woerd); in 1528 it was plundered by the people of Guelderland ; and in 1572, 1573,

and 1574 it was laid waste by the Spaniards. Restored by William

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I. in 1576, it was in 1584 the seat of the sessions of the States of | Wren, DPhal. Hist. Klasse, Bd. xi., Vienna, 1861. This

Holland. Fosses were constructed round the town in 1620. In 1672 it was the seene of the famous assassination of the brothers De Witt. It was at the Hague that the eonvention was arranged in 1710 be- tween the German emperor, the king of Prussia, the emperor of Russia, and the maritime powers, for the maintenance of the neu- trality of North Germany ; it was at the Hague that the Triple Alliance of 1717 was concluded, and that the peace of the same year was signed between Spain, Savoy, and Austria. From 1782 to1787 the town had its full share in the eivil disturbanees of the country. | 1808 it was made the seat of the Government administrative omees.

See Guide ow Nouvelle Description de la Haye, The Hague, 1785; Deseription suceinete de la ville de la Haye, The Hague, 1823; Morgen-wandelingen door en in den omtrek van's Gravenhage, The Hague, 1832; (ezigten van 's Gravenhagen, Amsterdam, 1845; Petit Guide de la Haye, The Hague, 1860; La Haye et Scheveningue photographiés, The Hague, 1860.

HAHN, Avcust (1792-1863), German Protestant theo- logian, was born March 27, 1792, at Grossosterhausen near Hisleben, and after attending the Eisleben gymnasium, entered the university of Leipsic as a student of theology in 1810. After holding an educational appointment in Wittenberg for some time, he in 1819 was nominated pro- fessor extraordinarius of theology at Kénigsberg, and in the following year received a pastoral charge and a superin- tendency in that city. These posts, however, he soon resigned on his promotion in 1821 to be professor ordin- arius. In 1826 he removed as professor of theology to Leipsic, where, hitherto distinguished only as editor of Bardesanes, Marcion, and Ephraem Syrus, he came into

extraordinary prominence as the author of a treatise, De rationalismi qui dicitur vera indole et qua cum naturalismo contineatur ratione (1827), and also of an Ofene Erkldrung an die Hvangelische Kirche zundchst in Sachsen u. Preussen (1827), in which he endeavoured to convince the ration- alists that it was their duty voluntarily and at once to withdraw from the national church. In 1833 Hahn was called to Breslau as theological professor and consistorial councillor, and in 1844 he became " general superintend- ent" of the province of Silesia. He died at Breslau on May 13, 1863. Though uncompromising in his " supra- naturalism," he did not altogether satisfy the men of his own school by his own doctrinal system. The first edition of his Lehrbuch des christlichen Glaubens (1828) was freely characterized as lacking in consistency and as detracting from the strength of the old positions in many important points. Many of these defects, however, he is considered to have remedied in his second edition (1857). Among the other literary labours by which Hahn is best known are his edition of the Hebrew Bible (1833) and his Bibliothek der Symbole und Glaubensregeln der apostolisch-katholischen Kirche (1842 ; 2d ed. 1877). A volume of Predigten was published in 1852.

HAHN, Jouann Grore von (1810-1869), an Austrian traveller, to whom we are indebted for most of our knowledge about the Albanians, was born at Jena in 1810. After travelling for some time under the auspices of the Vienna academy, he entered the Austrian consular service, in which he rose to be consul-general in Greece. He died at Jena 23d September 1869. In his great work Albanesi- schen Studien (Jena, 1854), he treats at once of the geo- graphy, the history, the archeology, the linguistic affinities,

'and the folk-lore of this remarkable country and people ;

and the book at once took rank as a scholarly and authori- tative production. He had previously (1851) published Bemerkungen tiber das Albanesische Alphabet (Vienna, 1851). In 1858 he undertook a journey along with Major F. Zach from Belgrade to Saloniki (Thessalonica), for the purpose mainly of ascertaining the feasibility of construct- ing a railway from the Danube to the Augean; and an account of their experiences was published in the Denk- schriften der Kaiserl. Akademie der Wissenschaften zu

paper, reprinted in 1871, contained valuable matter in regard to the Albanians, and especially in regard to their geographical distribution. Another journey undertaken in 1863 furnished material for a second contribution to the Denkschriften (Phil. Hist. Klasse, 1867)— Reise durch die Gebiete des Drin und Wardar." Since the author's death a large work has appeared under the title of Sagwissen- schaftliche Studien (Jena, 1872-73), in which le deals learnedly with numerous questions in comparative mytho- logy.*

HAHNEMANN, Samvet CurisTIan Frrepricu (1755- 1843), the founder of the homceopathic system of medicine, was born at Meissen in Saxony, 10th April 1755. He studied first at the 'elector's school" of Meissen, and thereafter as a student of medicine at Leipsic and Vienna. He took the degree of M.D. at Erlangen in 1779, and after acting as physician at various places he returned in 1789 to Leipsic, where he largely occupied himself in the translation of medical works. While working at Cullen's Materia Medica, he was struck by the contradictory account given of the properties of Peruvian bark. He had pre- viously meditated much on the unsatisfactory nature of the science of medicine ; and, after much reflexion and many experiments, he became convinced of the truth of the prin- ciple simelia similibus curantur (see HoM@oPATHY), 7.¢., the cure for a disease is the very drug that would in a healthy person produce the symptoms of such disease. Further experiments convinced him that the conventional doses produced symptoms of unnecessary and dangerous violence, and this led to another principle, that of minimuin doses, according to which the benefit to be derived from a medicine can be fully obtained by the administration of a very sinall quantity. Firmly convinced of the truth of these prin- ciples, Hahnemann spent the rest of his life in making them known to the world. He encountered much opposition, and in 1821 was forced to leave Leipsic, as he was not allowed to dispense his own prescriptions. The grand duke of Anhalt-Kéthen, however, appointed him his physi- cian, and at Kothen he resided till 1835 when he removed to Paris. He died 2d July 1843. Hahnemann was a mau of remarkable courage and perseverance. He not only sacrificed his immediate interests for the sake of his con- victions, but made many painful experiments upon his own person.

Hahnemann's chief work, in which he expounds his system, is his Organon der rationellen Heilkwnde (Dresden, 1810; 6th ed., Kothen, 1865; English translation by Dudgeon, London, 1849). His other important writings are Fragmenta de viribus medieamentorum positivis (2 vols., Leipsic, 1805); Reine Arzneimittellehre (6 vols., Dresden, 1811); Die ehronischen Krankheiten (4 vols., Dresden, 1828-30). His smaller writings have been edited by Stapf (2 vols., Dresden and Leipsic, 1829-34). See also Albreseht's Hahnemann's Leben und Wirken (2d ed., Leipsic, 1875).

HAIDARABAD. See HypEerapap.

HAIDINGER, WiLHELM VoN gpa 4 a minera- logist, geologist, and physicist of considerable note, was Ye February 5, 1795. His father, Karl Haidinger, contributed largely to the development of mineralogical science in the latter half of the last century. Having studied at the normal school of St Anne, and attended classes at the university, Wilhelm, at the age of seventeen, joined Professor Mohs at Gratz, and five years later accompanied the professor to Freiberg on the transfer of his labours to the mining academy of that Saxon E]- Dorado. In 1822 Haidinger visited France and England with Count Breunner, and, journeying northward, took up his abode in Edinburgh. He translated into English, with additions of his own, Mohs's Grundriss der Mineralogie, published at Edinburgh in three volumes under the title Treatise cn Mineralogy, 1825. After a tour in northern

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Europe, including the Scandinavian mining districts, he undertook the scientific direction of the porcelain works at Elnbogen, belonging to his brothers. In 1840 he was appointed counsellor of mines (Bergrath) at Vienna in the place of Professor Mohs, a post which included the charge of the imperial cabinet of minerals, &c. He devoted hini- self to the rearrangement and enrichment of the collections, and the cabinet becanie the first in Europe. Shortly after (1843) Haidinger commenced a series of lectures on minera- logy, which was given to the world under the title Hand- buch der bestimmenden Mineralogie (Vienna, 1845 ; tables, 1846). On the establishment of the imperial geological institution, he was chosen director (1849); aud this im- portant position he occupied for seventeen

years. On the completion of the geological survey of the Austrian dominions in 1862, he superintended the preparation of the maps which were issued. He was elected a member of the im- perial board of agriculture and mines, and a memiber of the imperial academy of sciences of Vienna. He organized the society of the friends of natural sciences. As a physicist Haidinger ranked high, and he was one of the most active promoters of scientific progress in Austria. He was the discoverer of the interesting optical appearances which have been called after him 'Haidinger's brushies." Knighted in 1865, the following year he retired to his estate at Dornbach near Vienna, where he died March 19,

1371.

In addition to the works already named, Haidinger published Anfangsgriinde der Mineralogie, Leipsic, 1829; Bericht tiber die Mineralien-Sammlang der KK. Hofkanmer im Miinz- und Berg- wesen, Vienna, 1843; Geoynostische Uebersichtskarte der Ocsterrcich. Monarehie, Vienna, 1847; Ucber den Zusammenhang der Korper- furben und der Oberflichenfarben, Vienna, 1852; Bemerkungen uber die Anordnung der kleinsten Theilehen in Christallen, Vieuna 1853; Niedriyste Hohe von Gewitterwolken, Vienna, 1853; Inter- ferenzlinien am Glimmer, Vienna, 1855 ; Vergleichungen von Argit und Amphibol, Vieuna, 1855; Diekonische Refraction am Diopsicd, Vienna, 1855. He also edited the Naturwissenschaftliche Abhand- langen, Vienna, 1847; the Berichte tiber die Mittheilungen von Freunden der Naturwissenschaften in Wien, Vieuna, 1847-51 ; and the Jahrbuch of the Vienna K.K'. Geologische Reichanstalt, 1850, &e. Some of his papers will be found in the Z'ransaetions of the Royal Soeiety of Edinburgh (vol. x.) and of the Wernerian Society (1822-23), Edinburgh Phil. Journal, Brewster's Journal of Science, and Poggendor ffs Annalen. :

HAIL. See Mretzoronocy.

HAILES, Str Davin Datrymptz, Bart., Lorp (1726- 1792), an eminent Scottish lawyer and historian, was born at Edinburgh, October 28, 1726. His father, Sir James Dalrymple of Hailes, in the county of Haddington, Bart., auditor-general of the exchequer in Scotland, was a grand- son of James, first Viscount Stair ; and his mother, Lady Christian Hamilton, was

a daughter of Thomas, sixth earl of Haddington. He received his school education at Eton, and thence proceeded to Utrecht for the study of law, being intended for the Scottish bar, to which he was admitted, shortly after his return to his native country, on the 24th of February 1748. As a pleader he attained neither high distinction nor very extensive practice, but he rapidly established a well-deserved reputation for sound knowledge, unwearied application, and strict probity ; aud in 1766 he was elevated to the bench, when he assumed the title of Lord Hailes. Ten years later he was appointed a lord of justiciary. His death took place on the 29th of November Lies

*His most important contribution to literature is the Annals of Scotland, of which the first volume, " From the accession of Maleolm III., surnamed Canmore, to the aceession of Robert I.," appeared in 1776, and the second, "From the accession of Robert I, sur- named Bruee, to the accession of the House of Stewart," in 1779. It is, as Dr J ohnson justly described this work at the time of its appearance, a *' Dictionary" of carefully siftel faets, in our lan- guage a new mode of history which tells all that is wanted and all*

that is known, but without any laboured splendour of language or affected subtlety of conjecture. The other works of Lord Hailes

inelude Historical Memotrs coneerning the Provineial Couneils of the Scottish Clergy (1769); An Hxamination of some of the argn- ments for the High Antiquity of Regiam Majestatem (1769); three volumes entitled Remains of Christian Antiquity (" Aeeount of the Martyrs of Smyrna and Lyons in the seeond eentury," 1776; " The Trials of Justin Martyr, Cyprian, &c.," 1778; "The History of the Martyrs of Palestine, translated from Eusebius," 1780); Disquisi- tions concerning the Antiquities of the Christian Church (1783) ; and editions or translations of portions of Laetantius, Tertullian, and Minueius Felix. In 1786 he published An Inguiry into the Secondary Causeswhich Mr Gibbon has assigned for the Rapid Growth of Christianity, a Dutch translation of whieh was published at Utreeht in 1793. Both by its aeuteness in detailed argument and by its freedom from theological rancour this controversial work is entitled to rank as one of the most respectable of the very many replies whieh were made to

the famous 15th and 16th ehapters of the Decline anu Fall of the Roman Empire ; but it has too mueh the eharacter of a collection of detached eritieal remarks, A " Memoir" of Lord Hailes is prefixed to the 1808 reprint of his Inquiry into the Secondary Carises.

HAINAN, or, as it is usually called in Chinese, Kiung- chow-foo, an island belonging to the Chinese province of Kwang-tung, and situated between the Chinese Sea and the Gulf of Tong-king from 20° 8' to 17° 52' N., lat. and from 108° 32' to 111° 15' E. long. It measures 160 miles from N.E. to §.W., and the average breadth is about 90 miles. The area is estimated at from 1200 to 1400 square miles, or two-thirds the size of Sicily. From the peninsula of Lei-chow on the north it is separated by the straits of Hainan, which have a breadth of 15 or 20 miles.

With the exception of a considerable area in the north, and broad tracts ou the north-east and north-west sides, the whole island is occupied by jungle-covered mountains, with rich valleys between. 'The central range bears the name of Li-mou Shan or Wu Tchi Shan (the Five-Finger Mountain), and attains a height of 6000 or 7000 feet. Its praises are celebrated in a glowing ode by Ch'iu, a native poet. The island appears to be well watered, and some of its rivers are not without importance as possible highways of com-merce ; but the details of its hydrography are very partially ascertained. A navigable channel extends in an irregular curve from the bay of Hai-Kow in the north to Tan-chow on tle west coast. Being exposed to the winter monsoon the northern parts of the island enjoy much the same sort of temperate climate as the neighbouring provincesof the main- land, but in the southern parts, protected from the monsoon by the mountain ranges, the climate is almost or entirely tropical, Suow falls so rarely that its appearance in 1684 is reported in the native chronicles asa remarkable event. Earthquakes area much more familiar phenomenon, having occurred, according to the same authority, in 1523, 1526,

1605, 1652, 1677, 1681, 1684, 1702, 1704, 1725, 1742,

1816, 1817, and 1822. Excellent timber of various kinds —eagle-wood, rose-wood, liquidambar, &c.—is one of the principal products of the island, and has even been specially transported to Peking for imperial purposes. The cocoa palni flourishes freely even in the north, and is to be found

growing in clumps with the Pinus sinensis. Rice, cotton, sugar, indigo, cinnamon, betel-nuts, sweet potatoes, ground- nuts, and tobacco areall cultivatedin varying quantities. The aboriginal inhabitants collect a kind of tea called tein-cha, or celestial tea, which looks like the leaves of a wild camellia, and has an earthy taste when infused. Lead, silver, copper, and iron occur in the Shih-luh Shan or "stone- green-hill"; the silver at least was worked till 1850, and the copper would probably pay fer its exploitation. Gold and lapis lazuli are found in other parts of the island.

The ordinary cattle of Hainan are apparently a cross between the little yellow cow of South China and the zebu of India. Buffalos are common, and in the neighbourhood of Nanleu at least they are frequently albinos. Horses are numerous but small. Hugs and deer are both common wild animals, and of the latter there are three species,

Cervus Lidi, Cervus hippelaphus, and Cervus vaginalis, Among the birds, of which 172 species are described by Mr Swinhoe in his paper in Zhe [bis, 1870, there are eagles, notably a new species Spdlornis Rutherfordi, buzzards, harriers, kites, owls, goatsuckers, and woodpeckers. The Upupa ceylonensis is familiar to the natives as the " bird of

cane bird."

Hainan, as already indicated, forms a foo or department of the province of Kwang-tung, though strictly it is only a portion of the island that is under Chinese administration, the remainder being still occupied by unsubjugated aborigines. Thedepartmentcontains three chow and ten hsien districts, — Kiung-chow-hsien, in which the capital is situ- ated ; Ting-an-lisien, the only inland district ; Wen-ch'ang- hsien, in thenorth-east of the island; Hui-tung-hsien, Lo-hui- hsien, Ling-shui-hsien, Wan-chow, Ai-chou (the southmost of all), Kan-en-hsien, Chang-hua-hsien, Tan-chow, Lin-kao-hsien, and Chang-mui-hsien. The capital Kiung-chow-foo is situated in the north about 10 li (or 3 miles) from the coast on the river. It is a well-built compact city, and its temples and examination halls are in good preservation. The population is frequently stated at 200,000, but, accord-ing to C. C. Stuhlmann in the Globus for 1876, it is only 100,000. Carved

articles in cocoa-nuts and scented woods are its principal industrial product. In1630 it was made the seat of a Roman Catholic mission by Benoit de Mathos a Portuguese Jesuit, and the old cemetery still coutains about 113 Christian graves. The port of Kiung-chow-foo at the mouth of the river, which is nearly dry at low water, is called

simply Hoi-how, or in the court dialect Hai-Kow, 7.e., sea- |

port. The two towns are united by a good road, along which a large traffic is maintained partly by coolie porters but more frequently by means of wheel-barrows, which serve the purpose of cabs and carts, The net value of the trade of the port, that is, the foreign and native imports minus the re-exports and the native imports of local origin, rose from 684,772 Hk. taels in 1876 to 1,215,056 in 1878. Out of 182 vessels engaged in the foreign trade in 1878 with a tonnage of 87,290 tons, 152 were British, with a tonnage of 70,078 tons. The exports comprised leather, hides, skins and tallow, sugar to the value of 204,427 taels, hemp, galangal, lung-ngan pulp, grass cloth, and silk, and sesamum to the value of 41,936 taels.

The inhabitants of Hainan may be divided into three classes, the Chinese immigrants, the civilized aborigines or Shu-li, and the wild aborigines or Sheng-li. The Chinese were for the most part originally from Keang-se and the neighbouring provinces, and they speak a peculiar dialect of which a detailed account by Mr Swinhoe is given in The Phenix, a Monthly Magazine for China, &c., 1870. The Shu-li as described by Mr Taintor are almost of the same stature as the Chinese, but have a more decided copper colour, higher cheek-bones, and more angular features, while their eyes are not oblique. Their hair is long, straight, and black, and their beards, if they have any, are very scanty, They till the soil and bring rice, fuel, timber, grass-cloth, &c., to the Chinese markets. The Sheng-li or Li proper, ealled also La, Le, or Lauy, are probably connected with the Laos of Siam, and the Lolos of China. Though not gratuitously aggressive, they are highly intractable, and have given great troubleto the Chinese authorities. Amongthem- selves they carry on deadly feuds, and revenge is a duty and an inheritance. Though they are mainly dependent on the chase for food, their weapons are still the spear and the bow, the latter being made of wood and strung with bamboo. In marriage no avoidance of similarity of name is

required. The bride's face is tattooed according to a pattern furnished by the bridegroom. Their funeral mourning consists of abstaining from drink and eating raw beef, and they use a

ow of

wooden log for a coffin. When sick they sacrifice oxen.

_ In the spring time there is a festival in which the men and _ women from neighbouring settlements move about in gay clothing hand in hand and singing songs. The whole

population of the island is estimated at about 23 millions.

_ At its first conquest 23,000 families were introduced from the Li matrons," and the Palwornis javanica as the " sugar- |

the mainland. In 1300 the Chinese authorities assign 166,257 inhabitants; in 1370, 291,000; and in Lolly, 250,524; and in 1835, 1,350,000.

lt was in 111 B.c. that Lu-Po-Teh, general of the emperor Wu- ti, first made the island of Hainan subject to the Chinese, who divided it into the two prefectures, Tan-urh or Drooping Ear in the south, so-called from the long ears of the native ' king," and Chu- yai or Pearl Shore in the north. During the decadence of the elder branch of the Han dynasty the Chinese supremacy was weakened, but in 43 A.D. the natives were led by the success of Ma-yuan in Tong-king to make a new tender of their allegiance. About this time the whole island took the name of Chu-yai. 1n 627 A.p. the name of Kiung-chow came into use. On its conquest by the gene- rals of Kublai Khan in 1278 the island was incorporated with the

| western part of the proviuce of Kwang-tung in a new satrapy Hai-

peh Hai-nan Tao, ¢,¢., the circnit north of the sea and south of the sea. It was thus that Hai-nan-Tao, or district south of the sea or strait, eame into use as the name of the island, which, however, has borne the official title of Kiung-chow-foo, probably derived from the Kiung-shan or Jade Monntajus, ever since 1370, the date of its erection into a department of Kwang-tung.

For a long time Hainan was the refuge of the turbulent classes of China and the place of deportation for delinquent officials. It was there, for example, that Su-She or Su-Tung-po was banished in 1097. From the 15th to the 19th century pirates made the intercomrse with the mainland dangerous, and in the 17th they were considered so formidable that merchauts were allowed to convey their goods across only by the narrow channel from Sen-wen. Since 1863 the presence of English men-of-war has put an end to this evil. According to the treaty of Tientsin, the capital Kiung-chow and the harbour Hai-Kow were

_ opened to European commerce ; but it was not till 1876 that advan-

tage was taken of the permission,

See Taintor In Votes and Queries on China and Japan, 1868; Mayers, "Hist. and Stat. Sketch of the Island of Hainan," in Journ. of V,, China Branch of Roy. As. Soc., new ser., No. vii, (1871-2); Dr F. Hirth, " Die Chinesische Provinz Kuang- tung," in Petermann's Mitthet/ungen, 1873; The China Review, Wong-Kong, 1876; Report on the newly-opened ports of Kiung-chow ({oihow) in Hainan, and of Hat- phong in Tonquin, by N. B, Dennys, Hong-Kong, 1876. (H. A. W.)

HAINAU (officially Haynav), a town in the Prussian province of Silesia, circle of Goldberg-Hainau and govern- ment district of Liegnitz, is situated on the Rapid Deichsel and on the railway from Breslau to Dresden, 12 miles N.W. of Liegnitz. It has an Evangelical and a Roman Catholic church, and manufactories of woollen and cotton cloth, gloves, leather, locks, and tin ware. Near Hainau the Prussian cavalry inflicted a defeat on the French rear- guard, 26th May 1813. The population of the town in 1875 was 5351,

HAINAULT, one of the nine provinces of the kingdom of Belgium, bounded E. and N. by Namur, Brabant, and Flanders, which are also Belgian provinces, and to the S. and W. by the French départment du Nord. The name? is doubtless derived from the little river Haine, which runs nearly due east and west past the town of Mons, and falls into the Scheldt not far from Condé. Hainault is well-wooded and hilly in the east and south-east, where it is partly covered by the Ardennes ; the rest of the pro- vince is a pleasantly diversified, fertile, and well-cultivated plain-land, which

produces all kinds of cereal crops, flax, tobacco, chicory, and beetroot. The long and narrow coal- field which, with some breaks, stretches from Aix-la-Chapelle to the sea near Boulogne, passes through the middle of Hainault, underlying a district of about 190,000 acres ; its centre is about Mons, whence it extends westward to Valenciennes, eastward to Charleroi. At this latter town, named after Charles IT. of Spain, who built it in 1666, are iron and copper works; marble and building-stone are also largely quarried in Hainault ; the manufactures of the province are vigorous and good; ironware and cutlery,

1 In German, Hennegau; Flemish, Zenagouwen; French, Hainaut ; the Comitatus Tenegavensis or Hannonia of Latin chroniclers,

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woollen and linen goods, glass, porcelain, and a variety of other articles are made, and are exported largely into France. Hainault, with a population of 956,354 inhabitants in 1876 (the largest in this respect of all the provinces), has an

area of near 1400 square miles, and is therefore somewhat | thickly peopled ; for administrative purposes it is divided ©

into six arrondissements, of which that of Mons is the chief; the others are Tournai, Charleroi, Ath, Soignies, and Thuin; these again are subdivided into thirty-two cantons. ,

Formerly the county was nearly twiee as large as the present pro- | | e in Germany. The special whiteness and excellence of the

vinee. In Cwsar's days it was inhabited by the Nervii, and did not get its present name till the 7th century, before whieh time it had become a county under its own lords. This dignity, at first more or less elective, beeame hereditary in the 9th eentury. Throughout the early Middle Ages Hainault was a purely agricultural district, owned by a numerous and very quarrelsome and disagreeable nobility ; it possessed also no less than fifteen abbeys. It was famous in legend and history as the chosen land of chivalry, and

Froissart, himself a native of Valenciennes, faithfully reflects the |

character of his fatherland. In the 11th century Baldwin V. of Flanders occupied it, and Baldwin VI., by marrying the heiress to the county, permanently added it to the territories of his house. It was his desecndaut Baldwin IX., count of Flanders and Hainault, who proclaimed himself first Latin emperor of Constantinople in 1204. In 1300 John of Avennes, count of Hainault, beeame also count of Holland by right of his mother Adelaide, sister of William Il. of Holland; it was his granddaughter Philippa who in 1326 married the Prince of Wales, afterwards Edward III. Hainault went with Flanders, till it was oeeupied by Philip " the Good" of Burgundy in the war which lasted from 1424 to 1427. It finally fell to the house of Burgundy on the death of the unfortunate Jacoba in 1436. With the other territories of Charles the Bold it passed with Mary of Burgundy in 1477 to the house of Austria, and remained theirs till the peace of the Pyrenees in 1659, when part of

the southern portion of the county was eeded to Louis XLV.—a |

cession confirmed and enlarged at Nimwegen in 1678. Thenceforth

there are two Hainaults, the French and the Austrian, the latter |

answering to the present Belgian province. Freneh Hainault (now

a part of the department du Nord) had as its aneient capital |

Valenciennes ; its other towns are Condé, Cambrai, Maubeuge, Le Quesnoy, Landréeies, Avesnes, Givet, Charlemont. Philippeville, which owes its name to Philip II. of Spain, having been transmuted

was restored to the Netherlands in 1815. Austrian Hainault was

ovetrun by the French in 1793, and annexed to Franee as the de- | aie: of Jemmapes in 1794 ; in 1814 it was made part of thc | ingdom of the Netherlands ; and in 1830, as a matter of eourse, in _,

the division of that kingdom, it became one of the provinces of the Belgian half.

The chief authorities are the Barou de Reiffenberg's Monwments

pour servir & Vhistoire des Provinces de Namur, de Hainault, et de | Luxembourg, 1844-1848, aud Jaeques de Guise's Antiquités du pays |

de Haynoult. HAINBURG, or Harmpure, a town of Austria, in the

|

|: 1683.

circle of Bruck, situated on the Danube 27 miles E.S.E. |

of Vienna, is the seat of a district court of justice and of a tax-office.

town Carnuntum, destroyed 251 a.p. 1827 Hainburg has been much improved, and is now a handsomely built town. walls, and has a gate guarded by two old towers, There are numerous Roman remains, among which may be men-

tioned the altar and tower at the town-house, on the latter |

of which is a statue, said to be of Attila. duct is still used to bring water tothe town. Hainburg has a military school for engineers. The two important manu- factures are tobacco, employing about 1700 hands, and needles, of which about 80 millions are annually turned out. On the neighbouring Hainberg is an old castle, built of Roman remains, which appears in German tradition under the name of Heimbure ; it was wrested from the Hungarians in 1042 by the emperor Henry TII. same hill is a castle of the 12th century, where Ottocar,

A Roman aque-

At the foot of the |

_ purposes. It occupies part of the site of the old Celtic | Since the fire of |

It is still surrounded by ancient —

of Bohemia, was married to Margaret of Austria in 1252; earlier it was the residence of the dukes of Babenberg. |

Outside the town, onan island in the Danube, is the ruined

nAt—HaAtT

Templars. Hainburg was besieged by the Hungarians in 1477, was captured by Matthias Corvinus in 1482, and was sacked, and its inhabitants massacred, by the Turks in Population (1869), 4178.

HAINICHEN, a town of Saxony, in the circle of Leipsic and the prefecture of Dobeln, is situated on the Little Striegis, 15 miles N.E. of Chemnitz by railway. Itis the seat of a royal court of justice, and has cigar and leather

_ manufactories and a school of weaving. Its most important

industry is the manufacture of flannels, baize, and similar fabrics ; indeed it may be called the centre of this industry

flannel made in Hainichen is due to the peculiar nature of the water used in the manufacture. There are 22 spinning- mills in the town and environs, with about 2500 looms, of which between 300 and 400 are mechanical. ‘There are also large dye-works and bleaching establishments. Large quantities of both wool and cotton are spun and woven, and yarn spun elsewhere is brought to Hainichen to be woven. About 3,850,000 tb of raw wool, worth about £600,000, is annually worked into material, some of which is exported to South America and eastern Asia. Coal is found in the neighbourhood, but does not repay the expense of working. Hainichen is the birthplace of Gellert, to whose memory a bronze statue was erected in the market-place in 1865. The Gellert institution for the poor was erected in 1815. Population (1875), 8468.

HAIR is a substance which, from its various pro- perties, and differences in stoutness, length, and strength, enters into a considerable variety of manufactures. _ Bristles are the stout elastic hairs obtained from the backs

of certain breeds of pigs. The finest qualities, and the greatest quantities as well, are obtained from Russia, where a variety of pig is reared principally on account of its bristles. The best and most costly bristles are used by shoemakers, secondary qualities being employed for toilet

, lip I. : and clothes-brushes, while inferior qualities are worked up out of a village called Corbigny into a town by Charles V. in 1555, |

into the commoner kinds of brushes used by painters and for many mechanical purposes. For artists' use and for decorative painting, brushes or pencils of hair from the sable, camel, badger, polecat, &c., are prepared. The hair of various animals which is too short for spinning into yarn is utilized for the manufacture of felt. or this use the hair of rabbits, hares, beavers, and of several other rodents is largely employed, especially in France, in making the finer qualities of felt hats. Cow hair, obtained from tanneries, is used in the preparation of roofing felts, and felt for covering boilers or steam-pipes, and for other similar It is also largely used by plasterers for binding the mortar of the walls and roofs of houses ; and of late years it has to some extent been woven up into coarse friezes, horse-cloths, railway rugs, and inferior blankets, The tail hair of oxen is also of value for stuffing cushions and other upholstery work, for which purpose, as well as for making the official wigs of law officers, barristers, &c., the tail and body hair of the yak or Thibet ox is also sometimes imported into Europe. The tail and mane hair of horses is in great demand for various purposes. The long tail hair is especially valuable for weaving into hair-cloth, mane hair and the short tail hair being, on the other hand, principally prepared and curled for stuffing the chairs, sofas, and couches which are covered with the cloth manu- factured fromthe long hair. The horse hair used in Great Britain is principally obtained from South America, Germany, and Russia, and its sorting, cleaning, and working up into the various manufactures dependent on the material are industries of some importance. In addition to the purposes already alluded to, horse hair is woven into crino- line for ladies' bonnets, plaited into fishing lines, woven into

castle of Rothelstein or Rothenstein, held by the Kuights | bags for oil and cider pressers, and into straining cloths for

brewers, &c., and for numerous other minor uses. The manufactures which arise in connexion with human hair are more peculiar than important, although occasionally fashions arise which cause a large demand for human hair. The fluctuations of such fashions determine thie value of hair; but at all times long tresses are of con- siderable value. Grey, light, pale, and auburn hair are distinguished as extra colours, and command much higher prices than the common shades, The value of hair also increases very rapidly with increasein length. Thus while 8-inch hair sells at about 1s. per oz., 36-inch hair will command a price as high as 30s. per oz. Lengths beyond 36 inches are exceptional and command fancy prices, the standard length in the hair trade being 18 inches. The light-coloured hair is chiefly obtained in Germany and Austria, aud the south of France is the principal source of the darker shades. In the south of France the cultivation and sale of heads of hair by peasant girls is a common practice; and hawkers attend fairs for the special purpose of engaging in this traffic. Hair 5 and even 6 feet long is sometimes obtained. Scarcely any of the “raw material” is obtained in the United Kingdom except in the form of ladies’ “‘combings.” Bleaching of hair by means of peroxide of hydrogen is now extensively practised, with the view of obtaining a supply of golden locks, or of preparing white hair for mixing to match grey shades; but in neither case is the result very successful. Human hair is worked up into a great variety of wigs, scalps, artificial fronts, frizzets, and curls, all for supplementing the scanty or failing re- sources of nature. The plaiting of human hair into articles of jewellery, watch guards, &c., forms a distinct branch of trade. For structure, properties, &c., of the human hair gee ANATOMY, vol i. p. 898.

HAIRBELL. See HAREBELL.

HAIR-TAIL (Zrichiurus lepturus), a marine fish, with a long band-like body terminating in a thread-like tail, and with strong prominent teeth in both jaws. Several species are known, of which one, common in the tropical Atlantic, not rarely reaches the British Islands.

HAITI See Hayvi.

HAJDUK, sometimes corrupted into HEyDUKE, is the plural form of the Magyar word Hajdi, and was formerly used as the collective name of the undermentioned towns (along with Vamos-Péres, population 3000) of the old privileged Hajduk district of Hungary, now included in the county of Hajdu.

Haspv Bészérmeény, the second town in importance of Hajdu county, lies about 11 miles to the N.W. of Debreczin, 47° 41' N. lat., 21° 31' E. long. It is the seat of a royal court of law, and was formerly the capital of the Hajduk district. Among the principal buildings are the old district court-house, a Greek Catholic and two Calvinist churches, a Protestant gymnasium, the post and telegraph offices, and the savings bank. The fairs periodically held in the town attract people from a considerable distance. Population

(1870) 19,208.

Haspu-Doroe is a market-town situated about 10 miles to the N. of Bészérmény, with a Greek Catholic and a Calvinist church. At Dorog the Magyar adherents of the Greek Catholic Church are met with in great numbers. Population 8216.

Haspu-Hapwz is a corporate town lying about 10 miles N of Debreczin. It has a Calvinist church, post and telegraph offices, and a station on the railway from Nyiregy- haza to Debreczin. Population 7024.

Haspt-NAwnAs is a market-town, about 24 miles N.N.W. of Debreczin, with a large Calvinist church, a high school for girls, and a Protestant gymnasium. The surrounding country, although on the whole productive, assumes 1n the west a generally swampy character. Population 13,198.

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Haspv-Szozosz.o is a corporate town, 12 miles to the S.W. of Debreczin, with which it is connected by railway. Among the principal buildings are a Calvinist chureli and school, and a royal law-court. Population 12,269.

The Hajduk district was made over to the Hajduks in 1605, with special privileges and the rights of nobility, by the Transylvanian prince Stephen Bocskay, as a reward for military service rendered him in his revolutionary campaigns. The inhabitants were econ- firmed in their possessions by the dict of 16138. From 1849 to 1860 the district was united to the county of North Bihar, but it afterwards received a separate cantonal organization, It now forms the prin- cipal portion of the new county of Hajdu, constituted in 1876, and in- cluding, along, with the old Hajduk district, portions of the neigh- bouring counties of Szaboles aud Bihar. Debreczin is the capital, and the population is computed at about 163,000, mostly Magyars.

HAJLPUR, a municipal town in Muzaffarpur district, Bengal, situated on the east bank of the Gandak, a short distance above its confluence with the Ganges opposite Patna, 25° 40' 50" N. lat., 85° 14' 24" E. long. It is said to have been founded about 500 years ago by one Haji Ilyas, the supposed ramparts of whose fort, enclosing an area of 360 bighds, are still visible. Hajipur figures con- spicuously in the history of the struggles between Akbar and his rebellious Afghan governors of Bengal, being twice besieged and captured by the imperial troops, in 1572 and again in 1574. Its command of water traffic in three directions makes the town a place of considerable com- mercial importance. Within the limits of the old fort is a small stone mosque, very plain, but of peculiar architecture, and attributed to Haji Ily4s. Two other mosques and a small Hindu and Buddhist temple are in the town or its immediate vicinity. Besides the ordinary courts, the town contains a school, post-office, charitable dispensary, and distillery. The population in 1872 numbered 22,306, of whom 18,765 were Hindus and 3510 Mahometans.

HAJJE KHALFA. Mustafa 'bn Abdallah, Katib Che- lepf_(c. 1600-1658), commonly known as Haji (or Hadji) Khalfa (more properly H4jji Khalifah), was the author of an encyclopedia in Arabic of Oriental biography and biblio- graphy. He was born at Constantinople about the begin- ning of the 17th century of the Christian era, and after passing the earlier part of his life in military service, studied under Cadhizddeh Effendi, a learned doctor at the Ottoman capital, and made great progress in Arabic literary and linguistic studies. In June 1633 he again accom- panied the army to Syria, but while the troops were in winter quarters at Aleppo, he himself

performed the pilgrimage to Mecca, whence he took the cognomen of Hajji, "Pilgrim." Returning in 1635 to Constantinople, he resumed his literary studies, and occupied himself with visiting all the libraries and book shops, and compiling an inventory of their contents, together with notices of the authors of the various works, In 1638 he attended the lectures of Sheikh A'raj Mustafazadah, whom he pro- posed to himself as an example to imitate in his future literary career. Besides his purely literary studies he also devoted himself assiduously to the sciences, and became well versed in logic, geometry, geography, astronomy, and the like. Nor were medicine and the occult sciences neglected by him, so that there were few of the subjects treated of in the works which he delighted to describe with which he was not more or less technically acquainted. About 1648 he was appointed assessor (khalifa) to the principal of the imperial college, whence he took the title of Khalfa, by which, with the prefix of Ilajji (Pilgrim), he is commonly designated. He died in September 1658.

Besides his great Bibliographical Lexicon, he composed several other works, chiefly geographical and historical ; of these the best known are Takwim "ttawdrikh or '¢Chronological Tables," T'uhfat el Kubir ft asfart Bahdr, a work on the science of naval warfare, Jehan Numé or " Mirror of the World," and one or two treatises on miscellaneous literary subjects. The language in whieh he wrote is Arabic, and the style is that which the nature of his studies would

lead us to cxpect,—correct and grammatical, fairly classical, and abounding in teclinical terms and phraseology. Of the amount of his learning and of his indefatigable application to study his Lexicon is a lasting memorial. There is scarcely a work in the whole range of Arabic, Persian, and Turkish literature, no matter on what subject or science, but it will be found described in this vast encyclopedia, with every piece of collateral information which it was possible to procure or useful to mention. When we remember that it is the Oriental habit to give fancy titles to books that often in no way indicate the nature of their contents, and that one 1s often obliged to read through pages of irrelevant matter before

arriving either at the author's name or the subject of the work, the labour expended on the production of Hajji Khalfa's book appears absolutely incredible. The work has always enjoyed a well-descrved reputation in the East, and has attracted the atten- tion of many European scholars, but we need only mention herc the magnificent edition in seven thick 8vo volumes by the eminent Arabic scholar Gustavus Fluegel published at Leipsic in 1885- 1858 for the Oriental Translation Fund of Great Britain and Ireland. This edition is accompanied by a Latin page-for-page translation, indices, and notes, and is an indispensable adjunct to every library in which a collection of Oriental books is found. The Arabic title of the lexicon is Kashfu zzeuntin'an Asdmt'l Kutub wa 'l funin, "The removal of doubts concerning the names of books and con- cerning sciences," and the Latin title adopted by Fluegel is Lexicon Bibliographicum et Encyclopedicum Haji Khalfe. After a short preface and an introduction of five chaptcrs comes the encyclopedia proper, the articles in which are arranged in the alphabetical order of the names of the works described. The title of each work is given, a concise account of its contents, the name of the author, and the date, when this could be ascertained; and in many cases the initial phrase is also added to facilitate its identification. Besides the general bibliography, Fluegel's edition contains several appendices of great value to Oriental scholars and librarians. Copious notes and indices complete this splendid edition, one of the finest znonuments of Orien- tal learning which Europe has produced.

HAKE (Merluccius vulgaris), a fish belonging to the family of cod-fishes (Gadide), differing from the common cod in having only two dorsal and one analfin. It is very common on the coasts of Europe and eastern North America, but its flesh is much less esteemed than that of the true Gadi. Specimens 4 feet in length are not searce. A closely allied fish inhabits the coasts of Chili and New Zealand.

HAKIM, or, as the full.title runs, En HAxki™m B1-AMRI- LAH ABoo 'ALEE Mansoor (985-1020), the sixth of the Fatimite caliphs, and the third of that dynasty ruling in Egypt, founder of the sect of the Druses, was born in 985 A.D., was designated heir apparent in 993, succeeded in 996, and died in 1020, For the principal events of his life and the leading features of

his character the reader is referred to the article Ecypr (vol. vii. p. 751). See also Druszs (vol. vii. p. 484).

HAKLUYT, Ricuarp (c. 1553-1616), geographer, was born of good family! in or near London about 1553. He was elected '" one of her Maiesties scholars at Westminster," and it was while there that the bent of his future studies was determined by a visit to his cousin and namesake, Richard Hakluyt of the Middle Temple. His cousin's dis- course, illustrated by "certain bookes of cosmegraphie, an universall mippe, and the Bible," had such an effect upon Hakluyt's mind that he resolved, if opportunity offered, to "prosecute that knowledge and kind of literature." Enter- ing Christ Church, Oxford, in 1570, "his exercises of duty first performed," he fcll to his intended course of reading, and by degrees perused all the printed or written voyages and discoverics that he could find. He took his degree of B.A. in 1573-74, and we learn from the Towneley MSS. that two years later he was selected twice in the same year to receive gifts of money.2 It is highly probable that, ? The Hakluyts were a family of Welsh extraction, not Dutch as has been supposed, They appear to have settled in Herefordshire as early as thel8thcentury. The family seat was at Eaton, 2 milesS. E. of Leominster. Hugo Hakelute was returned M, P. for that borough in the 82d parliament of Edward E.,1304-5. See Return of Members of Parliament, pt. i. p.18.

To one Mr Hakeluite, B.A. of Christ Colledge in Oxford, the

12 of May (1575), by Dr Humfrey (professor of divinity), 10s, To one

Mr Hackeluitt, the 4th of June, 2s. 6d," Hi Report, Appendix, p. 61 4), » 28, 6d." (Hist. MSS. Comm. 4th

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shortly aftcr taking his degree of M.A. (1577), he com- menced at Oxford the first public lecturesin geography that "'shewed both the old imperfectly composed and the new lately reformed mappes, globes, spheares, and other instruments of tls art."

Hakluyt's first published work was his Divers Voyages touching the Discoverie of America (London, 1582, 4to). By reason of his great knowledge of these matters and his acquaintance with "the chiefest captaines at sea, the greatest merchants, and the best mariners of our nation," he was selected in 1583, at the age of thirty, to accompany Sir Edward Stafford, the English ambassador, to Paris in the capacity of chaplain. In accordance with the instrue- tions of Secretary Walsingham, he occupied himself chiefly in collecting information of the Spanish and French move- ments, and " making diligent inquirie of such things as might yield any light unto our westerne discoverie in America." The first fruits of Hakluyt's labours in Paris are embodied in the most important production of his that has seen the light in modern times; it is entitled A particuler discourse concerning Westerne discoveries written in the yere 1584, by Richarde Hackluyt of Oxforde, at the requeste and direction of the righte worshipfull Mr Walter Raghly before the comynge home of his twoo barkes.4 This long-lost MS., after failing to find a resting-place in America, was finally acquired by Sir Thomas Phillipps, and is now the property of Rev. J. E. A. Fenwick of Thirlstane House, Cheltenham. The object of the Discourse was to recommend the enterprise of planting the English race in the unsettled parts of North America. Hakluyt's other works consist mainly of translations and compilations, relieved by his dedications and prefaces, which last, with a few letters, are the only material we possess out of which a biography of him can be framed.

Hakluyt returned to England in 1584, and during his short stay he had the honour of laying before Queen Elizabeth a copy of the Discourse "along with one in Latin upon Aristotle's Politicks," which won for him, two days before his departure again for Paris, the grant of the next vacant prebend at Bristol. In the spring of the following year, feeling anxious about the reversion of the prebend, he again visited England, and exhibited in person, onthe 24th May 1585, before the chapterof Bristol cathedral, the queen's

| mandate for the coveted vacancy already signed and sealed.

Before the close of the year the reversion of it fell to him, and in 1586 he was admitted to the prebend, which he held, with his other preferments, till the time of lis death.

While in Paris Hakluyt caused to be published the MS. journal of Laudonniére or Lvstoire notable de la Florida, edited by M. Bassanier (Paris, 1586, 8vo). This was tran- slated by Hakluyt and published in London under the title of A notable historie containing foure voyages made by cer- tayne French Captaynes into Florida (London, 1587, 4to). The same year De Orbe Novo Petrt Martyris Anglerw Decades octo illustrate, labore et industria Richardi Tackluytt, saw the light at Paris. This work contains the exceedingly rare copperplate map dedicated to Hakluyt and signed F. G. (supposed to be Francis Gualle) ; it is the first on which the name of " Virginia " appears.

In 1588 Hakluyt finally returned to England with Lady Stafford, after a residence in France of nearly five years. In 1589 he published The Principall Navigations, Vowages, and Discoveries of the English Nation (fol., London, 1 vol.). In the preface to this we have the announcement of the intended publication of the first terrestrial globe made in

3 That this was not in London is certain, as we know that the first lecture of the kind was delivered in the metropolis on the 4th of November 1588 by Thonias Hood.

- *Now first printed from a contemporary MS., with an introduction*

by Leonard Woods, LL.D., edited by Charles Deane, Collections of Maine Hist. Soc., Camb. (Mass.), 1877, 8vo.

England by Molyneux (see Guoze). On the 20th April 1590 he was instituted to the rectory of Witheringsett-cum- Brockford, Suffolk. The magnum opus of Hakluyt is 7he Principal Navigations, Voyages, Trafiques, and Discoveries of the English Nation (fol., London, 1598-1600, 3 vols.). Some few copies contain an exceedingly rare map,! the first on the Mercator projection made in England according to the true principles laid down by Edward Wright. Hakluyt's great work, though but little read, has been truly called the "prose epic of the modern English nation." It is an invaluable treasure of material for the history of geogra- phical discovery and colonization, which has secured for its author a lasting reputation for

research and industry.? In 1601 Hakluyt edited a translation from the Portuguese of Antonio Galvano, Zhe Discoveries of the World (Ato, London). On the 4th May 1602 he was installed pre- bendary of Westminister, and in the following year elected archdeacon of Westminster. In the licence of his second niarriage (30th March 1604) he is also described as one of the chaplains of the Savoy, and his will contains a reference to chambers occupied by him there up to the time of his death ; in another official document he is styled D.D.? His last publication was a translation of Fernando de Soto's discoveries in Florida, entitled Virginia richly valued (Lon- don, 1609, 4to). This work was intended to encourage the young colony of Virginia, of which Hakluyt was so zealous a promoter, 'to whom England is more indebted for its American possession than to any man of that age.' ;

A number of Hakluyt's MSS., sufficient to form a fourth volume of his collections of 1599-1600, fell into the hands of Samuel Purchas, who inserted them in an abridged form in his Pilgrimes (1625-26, fol.). Others are preserved at Oxford (Bib. Bod. MS., Seld. B. 8), which consist chiefly of notes gathered from contemporary authors. Hakluyt died in 1616, and was buried in Westminster Abbey (November 26); by an error in the abbey register it stands under the year 1626. His best monument is the society that flourishes under his name. Founded in 1846 for the purpose of printing rare and unpublished voyages and travels, 'it aims at opening by this means an easier access to sources of a branch of knowledge which yields to none in import- ance, and is superior to most in agreeable variety." The fifty-seven volumes that have been published by tlie society since its formation have been edited with great discrimi- nation and care, and have come to be regarded as the standard text-books upon their respective subjects. Some are out of print, and others have passed through two editions. The latest volume published is a reissue in a new form of The Hawkins Voyages, the first work published by the society. (O.8t…Cx)

HAKODADI, or Haxoparte, a seaport town of Japan, in the old province of Hokukaido, on the southern coast of the island of Yezo or Yesso, in 41° 49' N. lat. and 140° 47° E. long. Its general position, as has been frequently remarked, is not unlike that of Gibraltar, as the town is built along the north-western base of a rocky promontory (1100 feet in height) which forms

the eastern boundary of a spacious bay, and is united to the mainland by a narrow sandy isthmus. At the time of Captain Perry's visit in 1851 few of the buildings of Hakodadi, with the exception of its temples and fire-proof warehouses, were more than one story high, and the roofs were made of slight shingles protected against the effects of wind-storms by heavy stones.

' Supposed to be the "new map" of the Twelfth Night, act iii., scene 2. See Trans. of New Shakspere Soc., 1877-79, pt. 1, 8vo.

2 In 1809-12 was published a new edition of it by Woodfall & Evans in 5 vols, The last two contain pieces not comprised in the col- lection of 1598-1600.

3 Westminster Abbey Registers, edited by J.L. Chester, 1876, pp. 118.

4 Robertson, ZWist. of America, vol. iv. p. 171, 10th ed.

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Since that date the town has increased considerably in extent, and many of the more modern buildings, such as the new custoin-house and the residences of the Government officials, have been erected in a more solid European style. In 1870 there were four European hotels. A new bund or embankment has been constructed along the shore, and several quarters of the town have been laid out in better fashion by the local authorities. Hakodadi is the residence of the governor of Yezo, and the seat of an arsenal. There are four Buddhist and three Shinto temples,—the most important of the former being the Zhioghen-zhi, or Country's Protector, built about 1830. A medical college is main- tained in connexion with the Government hospital, and in the neighbourhood of the town an agricultural college has been erected since 1873. The Bay of Hakodadi, says Sir Rutherford Alcock, is completely land-locked, easy of access, and spacious enough for the largest navies to ride in it, with deep water almost up to the shore, and good holding- ground. The Russians have for a considerable time used it as a winter station for their ships, because their own harbours on the coast of Kamchatka are annually frozen up. Their establishment formerly comprised a handsome consular residence, a hospital, warehouses, and workshops, but the consulate was removed from the port in

1871. Hakodadi has a large local trade; but neither its exports nor its imports are very extensive, and as a commercial centre it will not improbably be superseded by Endermo. The exports comprise awabi, cuttlefish, sea-weed, béche-de- mer (iriko), sea-otter skins, and deer horns; as many as 30,000 pairs of the last being sometimes shipped in a year. Lead and coal mines exist in the neighbourhood. There is telegraphic communication with Tokio (Yedo); and a new road has been made to Sapporu (Satsuporu). The popula- tion of the town is estimated at 30,000; in 1872 the foreign settlement had 22 residents, Hakodadi, originally a fishing village belonging to a local daimio, was purchased by the Government and incorporated in the imperial fief of Matsmai. It was opened to American commerce in 1854 ; and there are now also Danish, German, and English con- suls. In 1868 the town was taken by the rebel fleet, but it was recovered by the mikado in 1869.

HAL, a town of Belgium, province of South Brabant, is situated on the Senne and the Charleroi canal, 9 miles 8.8.W. of Brussels. It has a beautiful Gothic churcli of the 14th century, very much resorted to by pilgrims on account of a famous miracle-working image of the Virgin. The church has been enriched by a large number of votive gifts, and contains a beautifully carved high altar of white marble. The principal industries are tanning, soap-boiling, the manufacture of paper, and salt-refining. The popula- tion in 1869 was 6406. ;

HALA, or Hatza (formerly known as Murtizabad), a town in Hyderabad district, Sind, India, situated on the Aliganj canal and immediately connected with the Trunk Road at two points, 25° 48’ 30” N. lat., 68° 27' 30° E. long. It was long famous for its glazed pottery and tiles, made from a fine clay obtained from the Indus, mixed with flints. The sdsis, or trouser-cloths, for which the town is also celebrated, are manufactured to the value of £750 yearly. Hala was built about 1800 in consequence of old Hala, 2 miles distant, being threatened with encroachment by the Indus. Among the antiquities round which the new town has grown up are the tomb and mosque of a pir or saint, who died in the 16th century, and in whose honour a fair, largely attended by Mahometans from all parts of the pro- vince, isheld twicea year. The local trade, chiefly of grain, piece goods, ghi, cotton, and sugar, 1s valued approximately at £3900; the transit trade (in

the same articles) at about £700. Population (1872), 4096, including 2646 Mahometans and 1234 Hindus.

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HALAS, a corporate town of Hungary, in the megye or county of Pest-Pilis-Solt-Kis-Kun, is situated about 76 miles S.S.E. from Budapest, in 46° 24' N. lat. and 19° 31' E. long. The most noteworthy buildings are the Calvinist and Roman Catholic churches, and the Jewish synagogue. Halas contains also a Protestant gymnasium, various literary institutions, and a local tribunal. The inhabitants of the town and neighbourhood are mostly engaged in _cattle- breeding and agricultural pursuits. Not far from Halas 1s a lake of the same name, containing an island which was once fortified, and served as a place of refuge to the 'nhabitants from the incursions of the Turks. Prior to 1876 Halas belonged to the old district of Little Cumania. In the spring of 1879 the town was much injured by floods. The population in 1870 amounted to 13,127, of whom the greater number were Magyars. ;

HALBERSTADT, the chief town of a circle in the government district of Magdeburg, Prussian province of Saxony, is situated in a beautiful and fertile country on the Holzemme, a tributary of the Pode, and at tlle junction point of four railways, 29 miles S.W. of Magdeburg. It has an antique appearance, and ina large number of the buildings the medieval wood-architecture is still preserved. About a mile and a half distant from Halberstadt are the Spiegel'sche Berge, from which tliere is obtained a fine view of the surrounding country. The town possesses a cathedral in the Pointed style, dating from the 13th and 14th centuries, and restored between 1850 and 1871, containing a rich Gothic screen of the date of 1510, other interesting antiquities, beautiful glass windows, and several valuable paintings, Of the remaining churches the only one of special interest is the Liebfrauenkirche, a basilica in the later Romanesque style, dating from the 12th and 13th centuries, and restored in 1848, containing noteworthy wall paintings and figures in relief. Among tle other old buildings may be mentioned the town-house, dating from the 14th century and restored in the 17th century; the town hall crypt, dating from the 15th century; and the Petershof, formerly the residence of the bishop, but now used as a custom house. 'The principal educational establishments are the

gymnasium—the new buildings for which were opened in 1875—with a library of 30,000 volumes; the real-school of the first order; the normal school, connected with which there is a deaf and dumb institute ; and the provincial trade school. Near the cathedral is a building called the temple of friendship which contains a collection of the portraits of the friends of tlie poet Gleim, who was a resident in the town, and whose house was the resort of a large circle of poets and scholars. In the same neigh- bourhood a beautiful monument in the Early Pointed style has been elected to the memory of those who fell in the late Franco-German war. The principal manufactures of the town are linen and woollen cloth, leather, paper, gloves, wadding, cigars, soap, oil, sugar, chemical products, brandy, and liqueurs. The population in 1875 was 27,757.

Halberstadt owes its origin to the foundation in the 9th century of the bishopric of which it became the seat. It reccived town rights from Bishop Arnulfin 998. It was burnt down in 1113 by the emperor Henry V., andin 1179 by Henry the Lion. At the peace of Westphalia in 1648 the bishopric was united as a princi- pality to Brandenburg. At the Tilsit peace in 1807 it was joined to Westphalia, butin 1813 it again came into the possession of Prussia.

Sce Lucanus, Der Dom zu Halberstadt, 1837, Wegweiser durch Halberstadt, 24 edition 1866, and Die Liebfrauenkirehe zu Halber- stadt, 1872 ; Scheffer, Insehriften wnd Legenden Halberstddtischer Bauten, 1864; Schmidt, Urkundenbuch der Stadt Halberstadt,

Halle, 1878.

HALBERT, Harparp (French, /Zalebarde), a weapon consisting of an axe-blade balanced by a pick and having an elongated pike-head at the end of the staff, which was usually about 5 or 6 feet in length. Various derivations have been suggested for the term, but M. Demmin seems to

have hit the right one in the German /Zalb-barthe, “ half battle-axe.” The earliest halberts represented in the minia- tures of the 14th century, or preserved in the collections of Switzerland and Germany, have the axe-

blade often pro- longed beyond the end of the staff, and thus resemble the English bill of the 15th century, Fauchet, in his Origines des Dignitez, printed in 1600, states that Louis XI. of France ordered certain new weapons of war called halle- bardes to be made at Angers and other places in 1475. The Swiss had a mixed armament of pikes and halbards at the battle of Morat in 1476. We find the same mixture cf billmen and halbardiers in the English army at the same period. Inthe 15th and 16th centuries the halbards became larger, and the blades were formed in many varieties of shape, often engraved, inlaid, or pierced in open work, and exquisitely finished as works of art. This weapon was in use in England from the reign of Henry VII. to the reign of George III., when it was still carried by sergeants in the guards and other infantry regiments. It is still retained as the symbol of authority borne before the magis- trates on public occasions in some of the burghs of Scotland. The Lochaber axe may be called a species of halbert fur- nished with a hook on the end of the staff at the back of the blade.

HALDANE, James ALEXANDER (1768-1851), whose disinterested labours in the cause of religion have secured for his name an honourable place in the ecclesiastical his- tory of Scotland, was the younger son of Captain James Haldane of Gleneagles, Perthshire, and was born at Dundee on July 14, 1768. Educated first at Dundee and after- wards at the High School and university of Edinburgh, he shortly after the completion of his sixteenth year entered the service for which he had been from his childhood destined, by joining the " Duke of Montrose" East India- man as a midshipman. After four voyages to India he in the summer of 1793 was nominated to the command of the Melville Castle"; but having, during a Jong and unex- pected detention of his ship, begun a careful study of the Bible, he came under deep religious impressions and, some- what abruptly resolving to quit the naval profession, ~ returned to Scotland before his ship had sailed. About the year 1796 he became acquainted with the celebrated evangelical divine, Simeon of Cambridge, in whose society he made throngh Scotland more than one tour, in the course of which he endeavoured by tract- distribution and other means to awaken others to somewhat of that interest in religious subjects which he himself so strongly felt. In May 1797 he preached, at Gilmerton near Edinburgh, his first sermon with a success which was considered to be very encouraging ; and during the next few

years he made re- peated missionary journeys, preaching wherever he could obtain hearers, and generally in the open air. Not originally disloyal to the Church of Scotland, he was gradu- ally driven by the hostility of the Assembly and the exigencies of his position into a separatistic attitude ; in 1799 he was ordained on the principles of Independency as pastor of a large congregation in Edinburgh, to which he continued gratuitously to minister for more than fifty years ; and in 1808 he made public avowal of his conversion to Baptist views. As advancing years compelled him to with- draw from the more exhausting labours of itineracy and open-air preaching, he sought more and more to influence the discussion of current religious and theological questions by- means of the press, and by numerous pamphlets took part in the controversies connected with the names of Edward Irving, Erskine of Linlathen, Campbell of Row, and others. His latest works were a treatise on the Doc- trine of the Atonement (1845) and an Exposition of the Epistle to the Galatians (1848). He died on the 8th of February 1851.

HAL—HAL o8l HALDANE, Rosert (1764-1842), elder brother of the | terms to the study of Aristotle and Calvin with a view to

preceding, and intimately associated with him in many of his labonrs, was born in London on February 28, 1764. After attending classes in the Dundee grammar school and in the High School and university of Edinburgh he in 1780 joined H.M.S. " Monarch," of which his uncle Lord Duncan was at that time in command, and in thie following year was transferred to the " Foudroyant," on board of which, during the night engagement with the " Pegase," he distinguished himself so much that Captain Jervis (afterwards Lord St Vincent) wrote to Admiral Duncan predicting a brilliant future for his nephew. Haldane was afterwards present at the relief of Gibraltar, but at the peace of 1783 he finally left the navy, and soon afterwards settled on his estate of Airthrey, near Stirling. The earlier phases of the French Revolution as they occurred attracted his attention and at first excited his deepest sympathy, a sympathy which induced him, at the cost of making many enemies, to avow his strong disapproval of the war with France. As his bright and oversanguine visions of a new order of things to be ushered in by political change disappeared, he, unlike Wordsworth's "Solitary," began to direct his thoughts to religious

subjects, and underwent a spiritual change which, while neither sudden nor violent, was decisive and complete. Resolving to devote himself and his means wholly to the advancement of Christianity, his first proposal for that end, made in 1796, was to organize a vast mission to Bengal, of which he was to provide the entire expense ; with this view the greater part of his estate was sold, but after every arrangement had been well nigh completed, the East India Company refused to sanction the scheme, which therefore had to be reluctantly abandoned. In December 1797 he joined his brother and some others in the formation of the " Society for the Propagation of the Gospel at Home"; and in building chapels or "tabernacles" for its congregations, in supporting its missionaries, and in maintaining institutions for the education of young men to carry on its work, he in the course of the twelve years which followed is stated on good authority to have expended upwards of £70,000. In 1816 he visited the Continent, and first at Geneva and afterwards in Montauban (1817) occupied himself in lectur- ing with surprising success to theological students, among whom were Malan, Monod, and Merle D'Aubigné. Return- ing to Scotland in 1819, he lived partly on his estate of Auchengray and partly in Edinburgh, and like his brother took an active part, chiefly through the press, in many of the religious controversies of the time. He died on the 12th of December 1842.

In 1816 he published a work on the Evidences and Authority of

Divine Revelation, and in 1819 the substance of his theological

relections in a Commentaire sur Epttre aux Romains. Among his later writings, besides numerous pamphlets on what was known as " the Apocrypha controversy " and on the sabbatarian question, are a treatise On the Inspiration of Sertpture (1828), which has passed through seven editions, and a later Exposition of the Epistle to the Romans (1835), which has been frequently reprinted, and has been translated into French and German. See Memoirs of R. and J. A. Haldane, by Alexander Haldane (1852).

HALE, Str Matruzew (1609-1676), lord chief-justice of England, was born on November 1, 1609, at Alderley in Gloucestershire, where his father, a retired barrister, had a small estate. His paternal grandfather was a rich

clothier of Wotton-under-Edge; on his mother's side he was con- nected with the noble family of tlie Poyntzes of Acton. Both his parents having died before he was five years old, the future chief-justice was placed by his guardian under the care of Mr Staunton, vicar of Wotton-under-Edge, through whose influence he became strongly imbued with puritanical principles. There he remained till he attained his sixteenth year, when he entered Magdalen Hall, Oxford, under the tuition of the puritanical but learned Obadiah Sedgwick. At Oxford Hale devoted himself for several

holy orders, and manifested that steadiness and applieation which in after years secured his reputation and advance- ment. But suddenly there came a change. The diligent student, at first attracted by a company of strolling players, threw aside his studies, and plunged carelessly into gay society. He svon decided to change his profession ; and resolved to trail a pike as a soldier under the prince of Orange in the Low Countries. Before going abroad, liow- ever, Hale found himself obliged to proceed to London in order to give instructions for his defence in a legal action which threatened to deprive him of his patrimony. His leading counsel was the celebrated Serjeant Glanville, who, perceiving in the acuteness and sagacity of his youthful client a peculiar fitness for the legal profession, succeeded, with much difficulty, in inducing him to renounce his mili- tary for a legal career, and on the 8th November 1629 Hale became a member of the honourable society of Lincoln's Inn.

He immediately resumed his habits of intense application, The rules which he laid down for himself, and which are still extant in his handwriting, prescribe sixteen hours a day of close application, and prove, not only the great mental power, but also the extraordinary physical strength he must have possessed, and for which indeed, during his residence at the university, he had been remarkable. During the period allotted to his preliminary studies, he read over and over again all the year-books, reports, and law treatises in print, and at the Tower of London and other antiquarian repositories examined and carefully studied the records from the foundation of the English monarchy down to his own time. Even the common-place book which he com- posed as the result of his study and research may, according to Lord Campbell, " be considered a corpus juris embracing and methodizing all that an English lawyer on any emergency

could desire to know." But Hale did not con- fine himself to law. He dedicated no small portion of his time to the study of pure mathematics, to investigations in physics and chemistry, and even to anatomy and architec- ture ; and there can be no doubt that this varied learning enhanced considerably the value of many of his judicial decisions.

Hale was called to the bar in 1637, and almost at once found himself in full practice. Thongh neither a fluent speaker nor bold pleader, in a very few years he was at the head of his profession.. He entered public life at perhaps the most critical period of English history. Two parties were contending in the state, and their obstinacy could not fail to produce a most direful collision. But ainidst the confusion Hale steered a middle course, rising in reputa- tion, and an object of solicitation from both parties. Taking Pomponius Atticus as his political model, he was persuaded that a man, a lawyer, and a judge could best serve his country and benefit his countrymen by holding aloof from partisanship and its violent prejudices, which are so apt to distort and confuse the judgment. But he is best vindi- cated from the charges of selfishness and cowardice by the thoughts and meditations contained in his private diaries and papers, where the purity and honour of his motives are clearly seen. It has been said, but without certainty, tlat Hale was engaged as counsel for the earl of Strafford; he certainly acted for Archbishop Laud, Lord Maguire, Christopher Love, the duke of Hamilton, and others. It is also said that he was ready to plead on the side of Charles I. had that monarch submitted to the court. The parliament having gained the ascendency, Hale signed the Solemn League and Covenant, and was a member of the famous Assembly of Divines at Westminster in 1644; but although he would undoubtedly have pre- ferred a Presbyterian form of church government, he had

no serious objection to the system of modified Episcopacy proposed by Ussher. Consistently with his desire to remain neutral, Hale took the engagement to the Commonwealth as he had done to the king, and in 1653, already serjeant, he became a judge in the Court of Common Pleas. Two years afterwards he sat in Cromwell's parliament as one of the members for Gloucestershire. After the death of the Protector, however, he declined to

act as a judge under Richard Cromwell, althuugh he represented Oxford in Richard's parliament. At the Restoration in 1660 Hale was very graciously received by Charles II., and in the same year was appointed chief baron of the exchequer, and accepted, with extreme reluctance, the honour of knighthood. After holding the office of chief baron for eleven years he was raised to the higher dignity of lord chief-justice, which he held till February 1676, when his failing health com- pelled him to resign. He retired to his native Alderley, where he died on December 25th of the same year. He was twice married, and survived all his ten children save two.

As a judge, Sir Matthew Hale discharged his duties with resolute independence and careful diligence. Lord Campbell says of him that "lie is certainly to be considered the most eminent judge who ever filled the office [of chief baron]; and being promoted to be chiefjustice of England, he gave new dignity to the supreme magistracy which had been illustrated by Gascoigne, by Fortescue, and by Coke." His sincere piety made him the intimate friend of Barrow, Tillotson, Wilkins, and Stillingfleet, as well as of the Non- conformist leader Baxter. He is chargeable, however, with the condemnation and execution of two poor women tried before him for witchcraft in 1664, a kind of judicial murder then falling under disuse. He is also reproached with having hastened the execution of a soldier for whom he had reason to believe a pardon was preparing.

Of Hale's legal works the only two of importance are his Historia Placitorum Corone, or History of the Pleas of the Crown, first published in 1739; and the Jdistory of the Common Law of England, with an Analysis of the Law, &c., 1718. Among his numerous religious writings the Contemplations, Moral and Divine, occupy the first place. Others are The Primitive Origina- tion of Man, 1677; Of the Nature of True Religion, &c., 1684; .A Brief Abstract of the Christian Religion, 1688. One of his most popular works is the collection of Letters of Advice to his Children and Grandchildren. He also wrote an Esssy touching the Gravita- tion and Nongravitation of Fluid Bodics, 1673; Dificiles Nuge, or Observations touching the Torriccllian Experiment, &c., 1675; and a translation of the Life of Pompontus Atticus, by Cornelius Nepos, His efforts in poetry were inauspicious. He left his valuable col- lection of MSS. and records to the library of Lincoln's Inn, His life has been written by Burnet, 1682; by

Williams, 1835; by Roscoe, in his Lives of Eminent Lawyers, in 1838; and by Lord Campbell, in his Lives of the Chief Justices, in 1849.

_ HALES, Srepnen (1677-1761), physiologist and inventor, was born at Beckesbourn in Kent, on the 7th September 1677. He was the sixth son of Thomas Hales, whose father, Sir Robert Hales, was created baronet by Charles II. in 1670. Of his early education little is known, but in June 1696 he was entered as a pensioner of Bene't (now Corpus Christi) College, Cambridge, with the view of taking holy orders. On 16th April 1702 he was elected and in February 1703 admitted to a fellow- ship. He received the degree of master of arts in 1703, and of bachelor of divinity in 1711. While at college one of his most intimate friends was William Stukeley, with whom he studied anatomy, chemistry, &c. In 1710 Hales was presented to the perpetual curacy of Teddington in Middlesex, where he remained all his life, notwithstand- ing that he was subsequently appointed rector of Porlock in Somerset, and later of Farringdon in Hampshire. In March 1717 he was elected fellow of the Royal Society, to whose Transactions he contributed many valuable papers. In 1732 he was named one of a committee for establishing

a colony in Georgia, and the next year he received the degree of doctor of divinity. He was appointed almoner to the princess-dowager of Wales in 1750. On the death of Sir Hans Sloane in 1753, Hales was chosen foreign asso- ciate of the French Academy of Sciences. He died at Teddington, January 4, 1761.

Hales is celebrated as the inventor of a ' ventilator," by means of which fresh air was introduced into jails, hospitals, mines, ships' holds, &c, In the four years (1749-52) after its introduction into the Savoy prison, only 4 prisoners died ; while previously the mortality had been from 50 to 100 per annum, The invention met with iminediate favour, especially in France. Hales was the designer of other inventions by means of which sea-water was distilled, corn cleaned and preserved, meat preserved on long voyages, &c.

His chief writings are his Statical Essays (see CHEMISTRY, vol. v. p. 461), consisting of Vegetable Staticks, or an Account of some Statical Experiments on the Sap in Vegetables (1727), and Hoemo- staticks, or an Account of Hydraulick and Hydrostatick Experi- urents made on the Blood and Blood-vessels of Animals (1788). His essay on The Means of Dissolving the Stone in the Bladder, &c., gained him the Copley gold medal in 1737. His Admonition to the Drinkers of Gin, Brandy, &c., appeared in 1734; the Vegetable Staticks, translated by Buffon, in 1735, and the Hamostaticks, by M. de Sauvages, in 1744. For sketch of his life, with portrait, sce Gardener's Chronicle, 1877, pp. 16-17.

HALEVY, Jacques Francois Fromentat (1799-1862), a celebrated French musician, was born May 27, 1799, at Paris. He studied at the Paris Conservatoire under Berton aud Cherubini, and in 1819 gained the grand prix de Rome with a cantata called Herminie. In accordance with the conditions of his scholarship he started for Rome, where he devoted himself to the study of Italian music, and wrote an opera and various minor works. His first opera pro- duced in Paris after his return from Italy was called LP' Artisan, which saw the light at the Thédtre Feydeau in 1827, apparently without much success. Other works of minor importance, and now forgotten, followed, amongst which only a ballet named Alanon Lescaut, produced in 1830, deserves mention. Five years later, in 1835, Halévy produced the tragic opera La Jutve and the comic opera L'Zclair, and on these works his immortality is mainly founded, Both have kept the stage to the present day, and will probably survive changes of taste even greater than those which music has undergone in France during the last forty years. Zhe Jewess is in every way representative of the French grand-opéra, the modern outgrowth of Gluck's music-drama with a strong admixture of the Italian element and of an excess of spectacular splendour wholly strange to the classic simplicity of the original. It is curious that the grand-opéra, although an essentially national product of France, was both initiated and brought to its highest perfection by two Germans— Gluck and Meyerbeer. The genius of the latter was fatal to Halévy'sfame. By the side of the Huguenots the merits of La Juive appear in almost diminutive proportions. At tue same time Halévy's work ought not to be treated with contempt. It is full of fine dramatic features, and especi- ally the introduction of the Jewish element—with which Halévy, himself a Jew, was

well acquainted—gives a peculiar interest on this score. L'Hclair is a curiosity of musical literature. It is written for two tenors and two soprani, without a chorus, and displays the composer's mastery over the most refined effects of instrumentation and vocalization in a favourable light. After these two works, to which Halévy owed his fame and his seat at the Institute, he wrote numerous operas of various genres, amongst which only La Reine de Chypre, a spectacular piece analysed by Wagner in one of his Paris letters (1841), and La Tempesta, in 3 acts, written for Her Majesty's Theatre, London (1850), need be referred to, In addition to his

productive work Halévy also rendered valuable services as a teacher. He was professor at the Conservatoire from 1827 till his death—some of the most successful amongst the younger composers in France, such as Gounod, Victor Massé, and Georges Bizet, the author of Carmen, being amongst his pupils. Halévy also tried his hand at literature, and there exists an agreeable volume of Souvenirs et Portraits fron his peu. He died at Nice, March 17, 1862.

HALIBURTON, THomas CHANDLER (1796-1865), long a judge of Nova Scotia, and a popular literary satirist, was born at Windsor, Nova Scotia, in 1796, and received his education there, at King's College. He was called to the bar in 1820, and took part in the legislature of his native province as a member of the House of Assembly. He distinguished himself as a barrister, and in 1828 was pro- moted to the beuch as a chief-justice of the conmon pleas. But it is as the brilliant humorist and satirist that he is now remembered ; for his labours alike as a barrister and a member of parliament were limited to his own province, and could scarcely beget anything beyond a local reputation. Yet confined as he thus was to so narrow a sphere, a true estimate of its disadvantages is necessary in order to do justice to the vigorous individuality of his writings. He was 2 native of what was then a small and isolated maritime province, detached from Canada. Its exports consisted chiefly of lumber and the produce of its fisheries; and with those trade was carried on with Great Britain, the West Indies, and the United States. Its entire population at the time when Haliburton was called to the bar, including Indians, African refugees from

the States, and the Acadian descendants of the original French population, did not amount to 97,000. The English settlers were largely composed of refugees from the former British colonies, animated by the strong Conservative sympathies of the old colonial loyalists. The French Acadians were Roman Catholics, and their national traditions and religion equally tended to alienate them from the neighbouring republic.

In politics Haliburton adhered through life to the Con- servative party; and the influence of his early associations is traceable in most of his writings. He was still at the bar when he wrote An Historical and Statistical Account of Nova Scotia, in 2 vols. Canada, it will be remembered, then consisted of Upper and Lower Canada only, and, with the French population of the latter and nearer province, was even stranger to the Nova Scotian than the New England States. The leisure which judicial duties secured admitted of literary relaxations in which Judge Haliburton's fine sense of the humorous had free play; and in 1835 he contributed anonymously to a local paper a series of letters professedly depicting the peculiarities of the genuine Yankee. These sketches, which abounded in clever pictur- ings of national and individual character, drawn with great satirical humour, were collected in 1837, and published under the title of The Clockmaker, or Sayings and Doings of Samuel Slick of Slickville. A second series followed in 1838, and a third in 1840. The Attaché, or Sam Slick in England (2 vols. 8vo), was the result of a visit there in 1841. This also was followed up by a second series in 1844. His other works include—T7he Old Judge, or Life in a Colony ; The Letter Bag of the Great Western: Rule and Misrule of the English in America; Traits of American Tumour ; and Nature and Human Nature.

While the judge was thus diligent in such literary recrea- tions, he continued to secure popular esteem in his judicial capacity. In 1840 he was promoted to be a judge of the supreme court ; but within two years he resigned his seat on the bench, removed to England, and after a time entered parliament as the representative of Launceston, in the Con- servative interest. His literary reputation awoke expecta-

tions which were not fulfilled. The bar has rarely proved to be an apt school for training the parliamentary debater, and he was too far advanced in life

to adapt himself to the novel requirements of the English House of Commons. The last time he spoke lie was listened to with interest on the Canadian defences. But the tenure of his seat for Launceston was brought to an end by the dissolution of the parliament in 1865, and he did not again offer himself to the constituency. His death followed in the month of August of the same year, at Gordon House, Isleworth, when he was in his seventieth year.}

HALIBUT. See Hottsut.

HALICARNASSUS, an ancient Greek city on the south- western coast of Asia Minor, built on a picturesque and advantageous site at the northern end of the Ceramic Gulf or Gulf of Cos. It originally occupied only the small island of Zephyria, close to the shore, but in course of time this island was united to the mainland and the city extended so as to incorporate Salmacis, an older town of the Leleges and Cariaus. About the foundation of Halicarnassus various traditions were current; but they agree in the main point as to its being a Dorian colony, and the figures ou its coins, such as the head of Medusa or Minerva, the head of Neptune, or the trident, give support to the state- ment that the mother cities were Troezen and Argos. The inhabitants appear to have accepted as the legendary founder Anthes, mentioned by Strabo, and were proud of the title of Antheade. At an early period Halicarnassus was a member of the Doric Hexapolis, which included Cos, Cnidus, Lindus, Camirus, and Ialysus; but one of the citizens, Agasicles, having taken home the prize tripod which he had won in the Triopian games instead of dedicating it according to custom to the Triopian Apollo, the city was cut off from the league. In the time of Xerxes we find Halicarnassus under the sway of a cer- tain Artemisia, who made herself famous by the assist- ance she rendered to the great Persian invader. Pigres, her brother or son, was the reputed author of the Batra- chomyomachia. Of Pisindalis, her son and successor in the sovereignty, little is known; but Lygdamis, who next attained to power, is notorious for having put to death the poet Panyasis and caused Herodotus, the greatest of the Halicarnassians, to leave his native city (c. 457 B.c.). About the close of the 5th century B.c., the power of Athens became predominant over Halicarnassus and other Dorian cities of Asia, but the peace of Antalcidas in 387 made them subservient to Persia ; and it was under Mausolus, a

Persian satrap of almost independent authority, that Halicarnassus attained its highest prosperity. Struck by the natural strength and beauty of its position, Mausolus removed thither from Mylasa, and increasing its population by the inhabitants of six towns of the Leleges, devoted himself to its embellishment and defence. On his death he was sneceeded by his widow and sister, Artemisia, whose military ability was shown by the stratagem by which she captured the Rhodian vessels attacking her city, and whose magnificence and taste have been perpetuated to all time by the " Mausoleum," the monument she erected to her husband's memory. In the execution of this wonderful enterprise she employed the architects Satyrus and Pythins, "Y Judge Haliburton was descended from the branch of the Newm ains and Merton family which figures in the genealogical memorials of the Haliburtons in their relation to that of Sir Walter Scott, whose paternal grandmother was Barbara Haliburton. The note of all the families of the name drawn up by the father of the poet and novelist was pre- pared in reply to inquiries of the father of J udge Haliburton, with a view to the establishment of his claims to certain family property. Of a younger branch of the Newmains family that went to Jamaica, one member removed to Massachusetts. A son of his, the father of the

judge, migrated to Nova Scotia, and there, in 1790, he revived old hereditary rights, and reclaimed relatiouship with the original Scottish

stock.

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and the sculptors Scopas, Leschares, Bryaxis, and Timotheus ; and thougli she died before its completion, they continued it with all the enthusiasm of artists. In the history of Hali- carnassus the next important events were connected with the conquests of Alexander the Great. Memnon, satrap of the west coast, having taken refuge within its walls after the battle of Granicus, it was besieged by the Macedonians, captured, and plundered. Not long afterwards we find the citizens receiving the present of a gymnasium from Ptolemy, and building in his honour a stoa or portico ; but the city never recovered altogether from the disasters of the siege, and Cicero describes it as almost deserted. The site 1s now occupied by the town of Budrun, but the ancient walls can still be traced in nearly all their

circuit, and the position of several of the temples and public buildings can be fixed with considerable certainty.

From the ruins of the Mausoleum sufficient has been recovered by the excavations carried out in 1867 by C. T. Newton to enable a fairly complete restoration of its design. According to Mr Pullan, Mr Newton's collaborator, the building consisted of five parts—a basement or podium, a pteron or enclosure of columns, a pyramid and pedestal, and a chariot group. The basement, probably 51 feet in height, and covering an area of 114 feet by 92, was built of blocks of greenstone and cased with marble, the monotony of the plain-courses being possibly broken by one or more belts of frieze. The pteron, 374 feet in height, consisted (according to Pliny) of thirty-six columns of the Ionic order, enclosing a square cella, the walls of which were relieved by friezes. From the portions that have been recovered it appears that the principal frieze of the pteron represented combats of Greeks and Amazons. '"'Throughout," says Mr Newton, "there is a skilful opposition of nude and draped male and female forms; but the groups and ficures are much less intermixed than in the Parthenon and Phigalian friezes. The whole surface was coloured, the ground of the relief being ultramarine and the flesh a din red, while the drapery and armour were picked out with various hues. " Fragments have been found of two other friezes of doubtful position in the monument, one representing a chariot race and the other a centaur fight. Above the pteron rose the pyramid, approximately 108 feet long and 86 feet wide at the base, and mounting by 24 steps to an apex or pedestal, which possibly had a length of 25 feet 6 inches and a breadth of 20 feet. On this apex stood the quadriga or chariot with the figure of Mausolus himself and an attendant deity acting as hischarioteer. The height of the statue of Mansolus—it has happily been preserved and forms part of the treasures of the British Museum —is 9 feet 94 inches without the plinth. 'The hair rising from the forehead falls in thick waves on each side of the face and descends nearly to the shoulder; the beard is short and close, the face square and massive, the eyes deep set under overhanging brows, the mouth well formed with settled calm about the lips. The drapery, consisting of a chiton and mantle, is grandly composed. Such are the main features of the great Mausoleum which deservedly ranked among the wonders of the world. The minor edifices and sculptural remains of Halicarnassus are of secondary moment. Of well-pre-

served inscriptions the number is comparatively few ; but one or two (such as that containing the names of Lygdamis and Panyasis) are of no small interest to the archeologist.

For further details see Rose, Reise durch den Inseln Griechenlands; Hamilton's

Researches in Asia Minor; and Newton's History of Discoveries at Halicarnassus, 1862-3, and his Zravels in the Levant, 165.

HALIFAX, a municipal and parliamentary borough and market-town of England, in the northern division of the West Riding of Yorkshire, is situated on a gentle acclivity almost surrounded by hills, on the small river Hebble near its junction with the Calder, 7 miles south-west of Bradford. Originally its streets were narrow and irregular, but many of the older houses have been pulled down and new streets opened up, while the constant additions made to it through the rapid increase of population have completely changed its appearance. The principal buildings are the parish churcli of St John, the restoration of which was completed in 1879 at a cost of £16,000, a structure in the Perpendicular style, of different dates, and having the western tower 117 feet in height ; All Souls Church, begun in 1859 from the designs of Sir Gilbert Scott, and erected at the expense of Mr Edward Akroyd, in theEarly Decorated style, very richly ornamented with statues and carvings in Italian marble, serpentine, and alabaster, and consisting of nave, aisles,

at the north-west angle 236 feet in height, and a sacristy at the north-east ; the Square Church, erected by the Con- gregationalists in 1857 at a cost of £16,000, an ornate cruciform building with a tower and elaborate crocketed spire rising to a height of 235 feet ; the town-hall, com- pleted in 1863 after the designs of Sir Charles Barry at a cost of £40,000 ; the infirmary, a large and elegant build- ing in which medical and surgical aid is afforded to outdoor as well as indoor patients; the Waterhouse charity school, a handsome set of buildings forming three sides of a quad- rangle, erected in 1855; the Crossley almshouses, erected and endowed by Sir Francis and Mr Joseph Crossley ; the piece- hall, a large quadrangular

structure occupying more than 2 acres of ground, erected in 1799 for the lodgment and sale of piece goods, but now used as a market for fish and vege- tables; the free grammar school, founded in 1585 under royal charter for instruction in the classical languages ; the Crossley orphan home and school, built by the Crossley

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Plan of Halifax.

1. Workhotse. 6. Square Church. 11, Theatre.

2. Oddfellows' Hall. 7. Piece Hall. 12. Prince Albert's Monu- 3. Town-Hall. 8. Post-Office. ment.

4, Mechanics' Institute. 9. Museum. 13. Crossley Orphan 6. St John's Church. 10, Infirmary. Home.

brothers at a cost of £46,000 ; the museum, the oddfellows' hall, the working men's college, the mechanics' institute, the assembly and concert rooms, and the theatre. There are three public parks, viz., Savile Park, 50 acres in extent; the People's Park, 124 acres, laid out in a highly ornamental style from the designs of Sir Joseph Paxton, and presented to the town in 1858 by Sir Francis Crossley; and the Shrogg's Park, 25 acres, opened in 1877. The North Bridge, a fine structure of iron, spans the Hebble valley in two arches. Halifax derives its importance from its manufactures of cloth, which began in the 15th century. It ranks in Yorkshire with Leeds, Bradford, and Huddersfield as a seat of the woollen and worsted manufacture. The principal staples are carpets, cashmeres, orleanses, coburgs, merinoes, lastings, alpacas, damasks, baizes, broad and narrow cloths, kerseymeres, blankets, muslin-de-laines, shalloons, and figured vestings. A considerable number of persons are employed in iron-

transepts, and chancel, with a very graceful tower and spire | works, machine works, and chemical works, and in the

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neighbouring coal-mines and stone quarries. sends two members to parliament. The parish is the largest in Great Britain, embracing 79,200 acres. The population of the municipal and parliamentary borough in 1861 was 37,014, and in 1871 (with an extended area of 3704 acres)

65,510.

Two derivations are given for the name Halifax. According to Camden it means " holy hair," and he accounts for the origin of the name from the fact that the head of a virgin who had bcen murdered by a wicked clerk was suspended on a tree in the neigh- bourhood, which came to be much resorted to by pilgrims. According to another account, the name means "holy facc," and is derived from an image of St John once preserved in a neighbouring hermitage. The first mention of the town is in the 12th century, when its church was granted by William, earl of Warren, to the priory of Lewes in Sussex. When its manufactures commenced in the beginning of the 15th century the number of its houses was only 15, but they had increased in 1540 to 520. It is said to have received a considerable accession to its inhabitants and impulse to its prosperity from the merchants who fled from the Netherlands to escape the persecution carried out under the auspices of the duke of Alva. In 1642 it was garrisoned by the forces of the parliament, and ncar it at a place still called the Bloody Field an engagement took place between them and the royalists. In the forest of Hardwick, then coextensive with the parish of Halifax, there at one time existed a custom called the '¢Gibbet Law," according to which any person suspected to be in the unlawful possession of goods to the value of 134d. was tried by the frith-burghers of the liberty, and if condemned was executed on a market day by a kind of axe resembling the modern guillotine. The last execution took place in 1650. A number of eminent men have been born in the town or neighbourhood of Halifax, including the mathematician Henry Briggs, Archbishop Tillotson, Sir Henry Savile, and John Foster. Daniel Defoe resided for some time in the town.

HALIFAX, a city and seaport of British North America, capital of Nova Scotia, is situated on the south-east coast of the province on the declivity of a hill about 250 feet in height, rising gradually from the south-west side of

Chebucto Bay or Halifax harbour, a deep inlet of the sea. The hill is commanded by a citadel about a mile in circumference and of great strength, and the harbour is defended by several forts and batteries. Originally the houses were chiefly of wood plastered or stuccoed, but the frequent recurrence of fires has led to a more general use of stone or brick as building materials. Many of them have an imposing and elegant appearance; and the streets are spacious and regularly laid out, crossing each other at right angles. Including its suburbs the city is from 2 to 3 miles long and about 1 mile broad. The principal build- ings are the Government house, the official residence of the lieutenant-governor of Nova Scotia, a solid sombre-looking structure at the south of the town; the provincial building, near the centre of the town, 140 feet long by 70 feet broad, with a fine Ionic colonnade, and comprising the Government offices, the post-office, the city library and the provincial museum; the parliament building, the court- house, the admiralty house, the exchange, the Roman Catholic cathedral of St Mary, the rooms of the young men's Christian association, the Wellington barracks, the military hospital, the lunatic asylum, the workhouse, the jail, and the penitentiary. The educational establishments include the Dalhousie college and university, the St Mary's Roman Catholic college, the Presbyterian theological college, the High School, the almshouse of industry for girls, two orphan asylums, a blind asylum, a lunatic asylum for the Lower Provinces, two industrial schools, and nearly twenty public schools. A lighthouse has been erected on the west side of the entrance to the harbour on a small island off Sambro Cape. After passing Sambro the course for large vessels is to the west of M'Nab's Island, on which a lighthouse has also been erected; but there is also a passage sufficient for small vessels to the east of the island. Recently a lighthouse has been erected on the west side of St George's Island opposite the city. Halifax is the seat of a considerable fishery. Its principal trade is with

In 1878 the number of ships that entered was 887, with a tonnage of 347,336. The value of imports was $4,991,205, and of exports $4,102,335. The imports are chiefly manu- factures from England, manufactures and produce from the United States, and sugar, molasses, rum, and other products from the West Indies ; the chief exports are dried and pickled fish,

timber, cattle, agricultural and dairy pro- duce, fur, and whale and seal oil. Halifax is now used instead of Portland in the State of Maine as the winter port (the St Lawrence being closed with ice) for the Dominion of Canada. The principal industries of Halifax are ironfounding, brewing, distilling, sugar-refining, and the manufacture of woollen and cotton goods, paper, leather, tobacco, gunpowder, agricultural and musical instruments, carriages, machinery, candles, and soap, On account of its fine air and the beautiful scenery of the neighbourhood, Halifax has a high reputation as a watering-place. An abundant supply of water for the city is obtained from two lakes 2 miles distant. The city is the seat of an Anglican bishop and a Roman Catholic archbishop. Nearly one- third of the population is Roman Catholic. It is named after the earl of Halifax, and was founded by Governor Corn- wallisin 1749. In 1790 it contained only 700 houses and 4000 inhabitants. It was declared a free port in 1817, at which time the number of houses was 1200. The popula- tion in 1861 was 25,026, and in 1871, 29,582. HALIFAX, CHartes Montacvus, Ear or (1661-1715), English statesman and poet, fourth son of the Honourable George Montague, who was fifth son of the first earl of Manchester, was born at Horton, Northamptonshire, on the 16th April 1661. In his fourteenth year he was sent to Westminster school, where he was chosen king's scholar in 1677, and distinguished himself in the composition of ex- tempore epigrams made according to custom upon theses appointed for king's scholars at the time of election. In 1682 he entered Trinity College, Cambridge, where he acquired a solid knowledge of the classics and surpassed all his contemporaries at the university in logic and ethics. Latterly, however, he preferred to the abstractions of Descartes the practical philosophy of Sir Isaac Newton ; and he was one of the small band of students who assisted Newton in forming the Philosophical Society of Cambridge. But it was his facility in verse-writing, and neither his scholarship nor his practical ability, that first opened up to him the way to fortune. His clever but absurdly panegyri- cal poem on the death of Charles II., which was published in the Book of Condolence and Congratulation presented by the university to James II., secured for him the notice of the earl of Dorset, who invited him to town and introduced him to the principal wits of the time; and in 1687 his joint authorship with Prior of the Town and Country Mouse, a happy parody of Dryden's Hind and Panther, not only increased his literary reputation but directly helped him to political influence. In 1688, through the patronage of

the earl of Dorset, he entered parliament as member for Maldon, and sat in the convention which resolved that William and Mary should be declared king and queen of England. About this time he married the countess-dowager of Manchester, and it would appear, according to Johnson, that it was still his intention to take orders ; but after the coronation he purchased a clerkship to the council, On being introduced by Earl Dorset to King William, after the publication of his poetical Epistle occasioned by his Majesty's Victory in Ireland, he was ordered to receive an immediate pension of £500 per annum, untilan opportunity should present itself of 'making a man of him." "In 1691 he was chosen chairman of the committee of the House of Commons appointed to confer with a committee of the Lords in regard to the Bill for cane Sail in cases of oo Ap

high treason ; and he displayed in these conferences such tact and debating power that he was made one of the com- missioners of the treasury and called to the privy council, It was during these debates that he had recourse to the peculiar oratorical device of losing his presence of mind, in order to give a practical illustration of the necessity of allowing the privilege of counsel to criminals before a court of justice. But his success as a politician was less due to his oratorical gifts than to his skill in finance, and in this respect he soon began to manifest such brilliant talents as completely eclipsed the painstaking abilities of Godolphin. Indeed it may be affirmed that no other statesman has initiated schemes which have left a more permanent mark on the financial history of England. Although perhaps it was inevitable that England should sooner or later adopt the Continental custom of lightening the annual taxation in times of war by contracting a national debt, the actual introduction of the expedient was due to Montague, who on the 15th December 1692 proposed to raise a million of money by way of loan. Previous to this a Scotchman named William Paterson had submitted to the Government his plan of a national bank, and when in the spring of 1694 the prolonged contest with France had rendered another large loan absolutely necessary, Montague intro- duced a Bill for the incorporation of the Bank of England. The bill after some opposition passed the House of Lords in May, and immediately after the prorogation of parlia- ment Montague was rewarded by the chancellorship of the

exchequer. In the following year he was triumphantly returned for the borough of Westminster to the new parlia- ment, and succeeded in passing his celebrated measure to remedy the depreciation which had taken place in the currency on account of dishonest manipulations. To pro- vide for the expense of recoinage, Montague, instead of reviving the old tax of hearth money, introduced the window tax, and the difficulties caused by the temporary absence of a metallic currency were avoided by the issue for the first time of exchequer bills. His other expedients for meeting the emergencies of the financial crisis were equally successful, and the rapid restoration of public credit secured him a commanding influence both in the House of Commons and at the board of the treasury ; but although Godolphin resigned office in October 1696, the king hesitated for some time between Montague and Sir Stephen Fox as his suc- cessor, and it was not till 1697 that the former was appointed first lord. In 1698 and 1699 he acted as one of the council of regency during the king's absence from England. When in February of the former year he had been accused of peculation in connexion with the issue of exchequer bills, not only had he been triumphantly acquitted but the House had declared that for his good services to the Government he had deserved his Majesty's favour ; and his reputation was still further increased in the same year by the extraordinary popularity of his project for a new East India Company. With the accumulation of his political successes his vanity and arrogance became, however, so offensive that latterly they utterly lost him the influence he had acquired by his administrative ability and his masterly eloquence ; and when his power began to be on the wane he set the seal to his political overthrow by conferring the lucrative sinecure office of auditor of the exchequer on his brother in trust for himself should he be compelled to retire from power. For some time after this in attempting to lead the House of Commons he had to submit to constant mortifications, often verging on personal insults, and after the return of the king in 1699 he resigned a ee —— Government and succeeded his brother in a at ar oe the accession of the Tories to power Da a in 1701 to the House of Lords by the title

ax. In the same year he was impeached for

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malpractices along with Lord' Somers and the earls of Portland and Orford, but all the charges were dismissed by the Lords ; and in 1703 a second attempt to impeach him was still more unsuccessful. He continued out of office during the reign of Queen Anne, but in 1706 he was named one of the commissioners to negotiate the union with Scotland ; and after the passing of the Act of Settlement in favour of the house of Hanover, he was appointed ambassador to the elector's court to convey the insignia of order of the garter to George I. On the death of Anne (1714) he was appointed one of the council of regency until the arrival of the king from Hanover ; and after the corona- tion he received the office of first lord of the treasury in the new ministry, being at the same time created Earl of Halifax and Viscount Sunbury. He died on the 15th May of the following year, and left no issue. His nephew succeeded to the barony, and was raised to the earldom ; he left it to his son George Dunk, a statesman of some eminence, with whose death witlout issue in 1771 the Halifax titles became extinct.

Montague's association with Prior in the travesty of Dryden's find and Panther has no doubt largely aided in preserving his literary reputation; but he is perhaps indebted for it chiefly to his subsequent influential position and to the fulsome flattery of the men of letters who en- joyed his friendship, and who, in return for his liberal dona- tions and the splendid banqueting which they occasionally enjoyed at his villa on the Thames, " fed him," as Pope says, " all day long with dedications." That, however, his beneficence to needy talent, if sometimes attributable to an itching ear for adulation, was at others prompted by a sincere appreciation of intellectual merit, is sufficiently attested by the manner in which he procured from Godol- phin a commissionership for Addison, and also by his life- long intimacy with Newton, for whom he obtained the mastership of the mint. The small fragments of poetry which he left behind him, and which were almost solely the composition of his early years, display a certain facility and vigour of diction, but their thought and fancy are never more than commonplace, and not unfrequently in striving to be eloquent and impressive he is only grotesquely and extravagantly absurd. In administrative talent he was the superior of all his contemporaries, and his only rival in parliamentary eloquence was Somers; but the skill with which he managed measures was superior to his tact in dealing with men, and the effect of his brilliant financial successes on his reputation was gradually

almost nullified by the affected arrogance of his manner and by the eccen- tricities of his sensitive vanity. So eager latterly was his thirst for fame and power that perhaps Marlborough did not exaggerate when he said that "he had no other principle but his ambition, so that he would put all in distraction rather than not gain his point."

Among the numerous notices of Halifax by contemporaries may be mentioned the eulogistic reference which concludes Addison's account of the " greatest of English poets"; the dedications by Steel to the second volume of the Spectator and to the fourth of the Tatler ; Pope's laudatory mention of him in the epilogue to his Satires and in the preface to the J/iad, and his portrait of him as " Full-blown Buffo " in the Epistle to Arbuthnott. Various allusions to him are to be found in Swift's works and in Marlborough's Letters. See also Burnet's History of his Own Times; The Parliamentary History; Howell's State Trials ; Johnson's Lives of the Poets ; and Macaulay's History of England. His Miscellaneous Works were published at London in 1704; his Life and Miscellaneous Works in 1715; and his Poetieal Works, to which also his " Life" is attached, in 1716. His poems were reprinted in the 9th volume of Johnson's English Poets.

HALIFAX, Grorce Savitz, Marquis or (c. 1630- 1695), English statesman and author, son of Sir William Savile, a Yorkshire baronet of ancient family, and of Anne, daughter of the lord-keeper Coventry and sister of the wife of the first earl of Shaftesbury, was born about 1630.

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He succeeded to the baronetcy on the death of his father, and, having taken an active part in the Restoration, he was in 1667 created Baron Savile and Viscount Halifax. Sub- sequently his political conduct gave deep offence to the king, but although, on his being mentioned in 1672 for a seat in the privy council, Charles at first "kicked at the lame," the necessities of the political situation induced him to yield to the solicitations of his advisers, whose arguments for the admission of Halifax were based upon "his family, his abilities, his state and credit, as well as talent to ridicule and unravel whatever he was spited at." Already he was known as one of the most brilliant orators in the House.of Lords, and although his political opinions seemed to be shifting and uncertain, the fascination of his manner aided his

formidable talents in gradually securing him the perma- nent favour of the king. In June 1672 he was sent to negotiate terms of peace with France, but he was kept in ignorance of the agreement between Charles and Louis in regard to the establishment of popery in England. He strenuously opposed the Test Bill introduced by Lord Danby in 1675, but continued to sit at the council board till the following year when, having provoked Lord Danby by a witticism in reference to his mild manner of refusing a bribe, the latter procured his dismissal. In 1679 he was, however, created an earl, and living become a member of the new council after the fall of Danby, he differed from the earl of Shaftesbury and his other colleagues in reference to the Exclusion Bill, and by an extraordinary manifestation of nearly all the resources of oratory was instrumental in causing its rejection by the Lords. On this account an address was presented by the Commons praying his '¢ dismissal from the king's person and councils for ever ;" but the king, whose confidence he had now completely won, retained him in the council, and in 1682 he was created a marquis and became lord privy seal. Although, however, chiefly instrumental in securing the duke of York's succession, his proposed limitations of James's authority when the crown should devolve upon him, as well as his subsequent leaning to Whig principles, awakened the duke's settled hostility, and this was further deepened by his exposure of the malversation of the earl of Rochester. After the accession of James he was accordingly removed from the office of privy seal to that of president of the council, a less important position; and when in 1685 he refused to give his vote for the repeal either of the Test Act or of the Habeas Corpus Act, he was dismissed from the cabinet. But though made privy to the negotiations entered into with the prince of Orange, Halifax, notwith- stauding his political humiliation, was opposed to armed inter- vention, and endeavoured to obtain such concessions from the king as would render this unnecessary. Even after the landing of the prince he consented to act as one of the three commissioners appointed to treat with him, and it was only the cowardly and traitorous flight of James that induced him finally to abandon his cause and to take measures for raising William to the throne. In the Con- vention Parliament he was chosen speaker of the Lords, and strongly opposed the motion fora regency. On the accession of William he was made lord privy seal, but the disasters of the Irish campaign gave such a plausible colour to the arguments of his opponents against his competency, and to their insinuations regarding his

political honesty, that, though still retaining the office of privy seal, he in October 1689 ceased to take part in the councils of the king. He succeeded before the committee of the House of Lords in clearing himself from all guilt in connexion with the murder of Russell and Sidney, but shortly afterwards re- signed his office. Irritated doubtless by the bitter animosity of the Whigs and by the coldness of William, he now at first joined himself to the opposition, and even weut so far

as to hold communications with St Germains; but either because his anger had cooled, or because he had become con- vinced of the hopelessness of the fortunes of the Stuarts, he gradually veered back to the support of the Government. He died somewhat suddenly, 20th April 1695. He was suc- ceeded by his son William, with whose death in 1699 the title became extinct in his family. A daughter by his second marriage was the mother of the fourth and celebrated earl of Chesterfield ; and from his natural son, Henry Carey the dramatist, was descended the celebrated Edmund Kean.

Halifax is portrayed in Dryden's Absalom and Achitophel as—

' Jotham of piercing wit and pregnant thought, Endued by nature and by learning taught To move assemblies."*

Of his speeches not the smallest fragment remains, but it is admitted that his highest efforts far excelled in effect even those of Shaftesbury, who was his only rival. 'Old men," says Macaulay, " who lived to admire the eloquence of Pulteney in its meridian and that of Pitt in its splendid dawn, still murmured that they had heard nothing like the great speeches of Lord Halifax on the Exclusion Bill." The key to the greater part of his political conduct is to be found in the pamplilet On the Character of a Trimmer, of which he was undoubtedly the author. He was a trimmer, but a trimmer in the best sense of the term; for though not insensible to worldly advantages, and, notwithstanding his philosophical professions, a lover of pomp and external honours, he was remarkably uncontaminated by the political corruption then almost universally prevalent, and was so emancipated both from party prejudice and selfish ambition as to be able generally to guide his political course by a regard to the best interests of the nation. His sudden changes from one side in politics to another, so far from indicating a loose political morality, were in reality due to the very opposite reason ; for

in times so unsettled violent and dangerous oscillations were apt to result from a tendency to extremes in both parties. But though his peculiar mental constitution enabled him to play a more important and beneficent part in the politics of his time than any of his contemporaries, it unfitted him for achieving suc- cess as a minister of the crown, and rendered his political career a seeming failure. His bent was philosophical rather than practical, and, notwithstanding his great prudence and judgment in several important emergencies, he was apt to be timid and indecisive when the chief burden of responsi- bility rested upon himself. His writings are neither large nor numerous ; but their pure, polished, and nervous English, acute reasoning, mature if somewhat worldly wisdom, apt and varied illustration, and clever and genial wit, fairly entitle them to a place among English classics. Privately he was, according to Burnet, "a man of a great and ready wit, full of life and very pleasant, much given to satire." He had the reputation of holding atheistical opinions, but on his deathbed " professed himself a sincere Christian.

“He was the author of The Anatomy of an Equivalent, printed in the collection of State Tracts, vol. ii.; A Letter to a Disscnter ; an Essay upon Taxes ; Advice to a Daughter ; The Character f a Trimmer, published anonymously ; Afaxims of State applicable to all Times ; Character of Bishop Burnet ; A Seasonable Address to both Houses of Parliament ; Cautions for Choice of Parliament Men; A Rough Draught of a New Model at Sea; Observations upon the Reigns of Edwards I., Ti, U1., and Richard TT.; and A Character of King Charles the Second, and Political, Moral, and Miscellaneous Thoughts and Reflections, first published in 1750. His Miscellamies, consisting of seven of the above pamphlets, appeared in 1700. A notice by the Hon. Hugh F. Elliot of a “ New Manuscript of George Savile, first marquis of Halifax,” will be found in Macmitlan’s Magazine for October 1877. He also left Memoirs of his Life, which were destroyed. See besides the histories of Hume, Fox, Lingard, and Macaulay ; Birch’s Lives ; Burnet’s History of his Own Times; Chesterfield’s Memoirs ; Walpole’s Royal and Noble Authors; Courtenay’s Life of Sir Wilkam Temple; and Seward’s Anecdotes,

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HALL, a town in northern Tyrol, Austria, governmeut district of Innsbruck, is picturesquely situated between two mountains on the left bank of the Inn, which is navigable there, and on the railway from Rosenheim to Innsbruck, 5 miles east of the latter. It is the seat of a district court, of a board of salt-works, and of a provincial board of mines. The beautiful Gothic parish church, dating from the 13th century, contains an altar-piece by a pupil of Rubens and the copy of a Christ by Albert Diirer. The principal other public buildings are several monasteries, the gymnasium, the deaf and dumb institute, and the lunatic asylum. The prosperity of the town depends chiefly upon its salt-works, which are supplied by pipes from the mines at Salzberg, 9 miles distant ; the annual yield of salt is from 15,000 to 16,000 tons. A considerable number of invalids visit the town on account of its salt-water baths. The principal other industries are the manufacture of woollen cloth, thread, paper, and substitutes for coffee. Hall obtained town rights in 1303. It suffered considerably from earthquakes in 1663 and 1670. In 1809 the

patriot Speckbacher on three separate occasions succeeded in storming the position of the Bavarians on the bridge which crosses the Inn at this point. The population in 1870 was 5010.

HALL (generally known as Swabian Hall), a town of Wiirtemberg, circle of Jagst, is situated in a deep valley on both sides of the Kocher, and on the railway from Heil- bronn to Krailsheim, 35 miles N.E. of Stuttgart. It is surrounded by strong walls, and possesses seven churches, one of them dating from the 15th century and having fine medizval carving ; a town-house, a lyceum, a real-school of the second order, a hospital, and a house of correction. A short distance south from the town is the old castle of Komburg, now used as a garrison for invalid soldiers, with a richly adorned Benedictine church dating from the 12th century. The town is chiefly known for its extensive salt- works, supplied by means of a pipe from Wilhelmsgliick mine, 5 miles distant. Connected with the salt-works there is a salt-bath and whey-diet establishment. The other industries of the town are cotton-spinning and weaving, and the manufacture of leather, soap, starch, sago, brushes, pencils, machines, carriages, and metal wares. The popu- lation in 1875 was 8430.

Hall originally belonged to the counts of Westheim, and later to the Knights Templars. It was made a free imperial city in the 14th century, and was afterwards included in the different leagues

of the cities, knights, and counts. In 1802 it came into the posses- sion of Wiirtemberg.

HALL, Basi (1788-1844), British traveller and mis- cellaneous writer, was born at Edinburgh, December 31, 1788. His father, Sir James Hall of Dunglass, was author of an essay on Gothic Architecture, and con- tributed to the Royal Society of Edinburgh, of which he for a time was president, several ingenious papers on geology, in support of Hutton's theory as against that of Werner. His mother was Helen, daughter of Dunbar, fourth earl of Selkirk. Basil Hall was educated at the High School of Edinburgh, and in 1802 entered the navy, where he rose to the rank of post-captain in 1817. By observing the ethnological as well as the physical peculiarities of the countries he visited, he collected the materials for a very large number of scientific papers, which he contributed to various journals and

encyclopedias. In 1816 he com- manded the sloop "Lyra," which accompanied Lord Amherst's embassy to China; and in this vessel he per- formed the cruise which he describes in the most popular and perhaps the most interesting of his works—An Account of a Voyage of Discovery to the West Coast of Corea and the Great Loo-choo Island in the Japan Sea (London, 1818). In 1820 he held a command on the Pacific coast of America, and in 1824 published two volumes of Extracts Srom a Journal written on the Coasts of Chili,

in the years 1820-21-22. Retiring on half-pay in 1824, Hall iu 1825 married a daughter of Sir John Hunter, and in her company travelled (1827-28) through the United States. In 1829 he published his Z'ravels in North America in the years 1827 and 1828, a book almost as popular as his first, less from its intrinsic merit than from the violence with which it was assailed by the American press for its views of American society. Schloss Hainfeld, or a Winter in Lower Styria (1836), is partly a romance, partly a description of a visit paid by the author to the castle of the Countess Purgstall. Spain and the Seat of War in Spain appeared in 1837. The Fragments of Voyages and Travels (9 vols.) were issued in three detach- ments between 1831 and 1840. Captain Hall was a fellow of the Royal Societies of London and Edinburgh, and a member of the Astronomical Society of London, and has left a number of scientific and miscellaneous writings besides those mentioned. His last work, a collection of sketches and tales under the name of Patchwork (1841), had not been long published before its author was seized with insanity, from which he was only released by his death, in Haslar Hospital, Portsmouth, September 11, 1844. HALL, Cuaries Francis (1821-1871), an Arctic explorer, was born at Rochester, New Hampshire, United States, in 1821. After following the trade of black- smith he became a journalist in Cincinnati, but his enthu- siasm for Arctic exploration led him in 1859 to volunteer to the American Geographical Society to "go in search of the bones of Franklin." With the proceeds of a subscrip- tion he was equipped for his modest expedition, and obtained a passage in May 1860 on board a New London whaling vessel commanded by Captain Buddington, the same who had picked up the English search- ship " Resolute." The whaler having become blocked up with ice, Hall took

up his abode with the Eskimo, living with them for two years, adopting their habits and acquiring their language, making special friends of two natives, man and wife, who had been in England and knew something of our language. He wandered about with the Eskimo in the region to the north of Hudson's Bay, acquiring much information, especially about the people. He published an account of his experiences in 1864, under the title of Arctic Researches, and Life among the Esquimaux. Having learned little or nothing, however, about the fate of the Franklin expedi- tion, he returned in 1864, remaining among the Eskimo till 1869. Unfortunately the full journal he kept of his five years' wanderings has never been published. The expedi- tion which brought Hall most prominently into notice was fitted out in 1871 in the steamer " Polaris," which was sent out at the expense of the United States Government, its object being to reach the supposed open Polar Sea, and if possible attain the Pole. Hall was in command, while Buddington was sailing master. 'There was a modest but competent scientific staff, and among the crew were Hall's two old Eskimo friends, who had became devoted to him. On June 29, 1871, the " Polaris" left New York, and making a remarkably rapid passage up Davis Straits and Smith Sound, reached on August 30 the lat, of 82° 16' N., until the last English expedition the highest northern latitude reached of which there is any authentic report. Hall and most of the officers and crew were for proceeding onwards, but they were overruled by Buddington, and went into winter quarters in a sheltered cove on the Greenland coast, named Polaris Bay, in 81° 38' N. On October 24th Hall returned from a successful sledge expedition to the north, and was suddenly seized by an illness of which he died on November 8th. As there were some suspicions of poison, an inquiry was made by the Navy Department, who found that there was no proof of foul play. Captain

Peru, and Mexico | Buddington, on whom the command devolved, determined

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in August of next year to return, but the "Polaris" was | Niagara, aud Fort Erie.

greatly hampered by the ice. 'The danger became so great that on October 15th boats and stores were put on the ice, on which nineteen of the crew

had disembarked. Suddenly the ship broke away, and the party on the ice drifted slowly southwards for 195 days, and were picked up off the coast of Labrador, in 53° 35' N., by a whaling steamer 2000 miles from where they had parted with the " Polaris." The party in the ship reached Littleton's Island, where they passed the winter, building two boats from the boards of the vessel, in which they set sail southwards in June 1873. On the 23d of that month they were picked up by a Dundee whaler, and were brought to that town, from which they ultimately reached the United States. The scientific results of the unfortunate Hall's last expedition were of considerable importance, and have been published by the United States Government, as also has an independent account in German by Dr Bessels, one of the scientific staff.

HALL, or Hartz, Epwarp (0d. 1547), an English lawyer who takes high rank among the earlier narrators of his country's history, was born in London about the close of the 15th century and died in 1547, the year of the death of King Henry VIII. Though his name has all the appearance of a purely English word, it is none the less of foreign origin, John Hall of Northall, in Shropshire, our author's father, tracing his lineage back to Frederick of Halle in Tyrol, natural son of Albert of Austria. From Eton Edward Hall passed to Cambridge, and according to some accounts it would appear that at a later date he was also a student at Oxford. Entering Gray's Inn he was duly called to the bar ; and we find him afterwards filling the offices of conimon sergeant, under-sheriff of the city of London, summer reader of Gray's Inn (1533), double reader in Lent (1540), and judge of the sheriff court. The date of the first appearance of his chronicle has been matter of question ; but it is generally agreed that there was no such edition as that of 1542 assigned by the older bibliographers to Berthelette. The real editio princeps is almost certainly that issued by Grafton in 1548, the year after Hall's death, with a continuation compiled mainly from the author's MSS. ; it is remarkable, says Mr Hazlitt (Collections and Notes), as having probably more variations in the copies than any book in the language. A reprint was published in 1809 under the supervision of Sir Henry Ellis, who, however, furnished neither introduction nor comment.

Hall's work deserves a higher title than that of chronicle ; partly, perhaps, by a happy accident, but partly also by the author's judicious management,

it possesses no small unity of theme and construction. Beginning with the famous combat at Coventry between Henry of Hereford and Thomas Mowbray, it follows the tragic progress of the strife between York and Lancaster till it is brought to a close by the marriage of Henry VII. with Margaret of York, and then it shows England united and at rest under Henry VIII. The policy of this monarch is presented under a very favourable light, and in the religious question the author sides emphatically and intolerantly with Protestantism. For all kinds of ceremonial in utterance and action he has all a lawyer's respect, and his pages are often adorned and encumbered with the pageantry and material garniture of his story. In his style he unites the redundant reduplication and pain- ful particularization of his profession with that evident effort after bal- ance of clauses and fanciful and forcible phraseology which not long afterwards resulted in "Euphuism."" On the whole the work is not only valuable but attractive. To the historian it furnishes what is evidently the testimony of an eye-witness on several matters of interest which are neglected by other narrators; and to the student of literature it has the exceptional charm of being one of the prime sources of Shakespeare's historical plays. Compare James Gairdner, Larly Chroniclers of Europe: England, London, 1879.

HALL, James (1793-1868), an American judge and the author of a number of books chiefly relating to the Western States, was born at Philadelphia, August 19, 1793. After for some time prosecuting the study of law, he in 1812 joined the army, and in the war with Great Britain distinguished himself in engagements at Lundy's Lane,

On the conclusion of the war he accompanied an expedition against Algiers, but in 1818 he resigned his commission, and continued the study of law at Pittsburg. In 1820 he removed to Shawneetown, Illinois, where he commenced practice at the bar and also edited the Jllinois Gazette. Soon after he was appointed public prosecutor of the circuit, and in 1824 legislature judge. On the abolition of thé latter office four years after- wards he was appointed State treasurer, but he continued at the same time his legal practice and also edited the Jilinois Intelligencer. Subsequently he became editor of the Western Souvenir, an aunual publication, and of the

Illinois Monthly Magazine, afterwards the Western Monthly Magazine. He died near Cincinnati, July 5, 1868.

The following are his principal works:—Letters from the West, originally contributed to the Portfolio, and collected and published in London in 1828 ; Legends of the West, 1832 ; The Soldier's Bride and other Tales, 1882; The Harpe's Head, a Legend of Kentucky, 1838 ; Sketches of the West, 2 vols., 1835; Tales of the Border, 1835; Notes on the Western States, 1888 ; History of the Indian Tribes, in conjunction with T. L. M'Keeney, 3 vols., 1888-44 ; The Wilderness and the War-Path, 1845 ; Romances of Western History, 1857.

HALL, Josers (1574-1656), bishop of Norwich, one of the wittiest as well as wisest writers of his century, was born at Bristow Park, parish of Ashby-de-la-Zouch, Leicester- shire, July 1,1574. Designed from infancy for the church, he received his early education at the school of his native place, whence in his fifteenth year he passed to Emmanuel College, Cambridge. After being chosen for two years in succession to read the rhetoric lectures in the public schools, Hall became a fellow of his college in 1595, and in the following year received the degree of master of arts, Having taken holy orders, he in 1601 became rector of Halstead in Suffolk, near Bury St Edmunds. Two years later he married ; and in 1605 he accompanied Sir Edmund Bacon to the Spanish Netherlands. In 1612 Hall was presented to the curacy of Waltham-Holy-Cross, in Essex, and about the same time received the degree of doctor of divinity. Meanwhile his talents as a preacher, and the ability shown in his controversial writings, had brought him into notice at court. He was appointed chaplain to Prince Henry and prebendary of Wolverhampton. The latter dignity he soon resigned. In 1616 Hall accompanied the earl of Carlisle on his mission to France, but was compelled by illness to return; in 1617 he went with James I. into Scotland, and in 1618 was appointed by him one of the English deputies to the synod at Dort; but he was again forced by sickness to return before the business of the assembly was finished. The year before (1617) he had been appointed dean of Worcester. In the years that followed Hall preached frequently before the court and took an active part in the controversies of the day, especi- ally in that between the Arminian and Calvinistic parties in the Church of England, to the latter of which he belonged. In 1624 he refused

the see of Gloucester, but in 1627 became bishop of Exeter. In this position, by his toleration of lecturings and his Calvinistic mode of preach- ing and administering his diocese, he incurred the suspicion of disaffection to episcopacy, and on three occasions ap- peared on his knees before the king, to answer for his puri- tanical practices. Hall felt bitterly these undeserved charges of Laud, and threatened to "cast up his rochet " rather than be subject to them. No better proof of his attachment to the Church of England is needed than his Lprscopacy by Divine Right Asserted, written in 1640 at the suggestion of Laud. In 1641 Hall was translated to the see of Norwich. The same year he joined eleven other bishops in presenting to parliament a protest against all laws passed in their enforced absence. Upon this the bishops were accused of high treason and thrown into the Tower. Hall in his Hard Measure relates the trials he underwent both at this time

and afterwards. The accusation fell to the ground, and in six months the bishops werereleased (June 1642), only, how- ever, on each finding security for £5000. Hall proceeded to Norwich, which he had not yet visited, and set about his pastoral duties ; but in April 1643 his revenues and personal property were sequestrated by parliament, a nominal allowance of £400 a year being made for his maintenance. Mrs Hall with great difficulty obtained a fifth of her husband's property. 'The bishop was next ejected from his palace, and the cathedral was dismantled. Having retired to a small estate at Higham near Norwich, which he had been able to buy, he there, with his books, bought for him by a friend, spent the rest of his life, writing and preaching "till he was first forbidden by men, and at last disabled by God." He died 8th September 1656, in his eighty-third year.

The great bulk of Bishop Hall's writings is controversial, and therefore of comparatively ephemeral interest; but some of them con- tinue to deserve attention. Hissatires, published under the name of Virgidemiarum Sixe Bookes, consist of three bookes of Toothlesse Sutyrs, subdivided into (1) Poetical, (2) Academical], and (3) Morall, published in 1597, and three bookes of Byting Satyrs, published in 1598. They appeared together in 1599. Hall claims to be the first English satirist, though Hallam disputes his title, and at the same time rather disparages the satires, which have on the

other hand been very highly praised by Campbell and Warton. In his Epistles (1608-11) Hall claims to be the introducer of that style of prose composition also into English ; but both Ascham and Howell an- ticipated him. The Contemplations upon the Principal Passages of the History of the New Testament (1612-15), a devout and pious work, one by which perhaps Hall is most generally known, are happily distinguished from most compositions of the class to which they belong by a shy and racy wit which not unfrequently puts the reader in mind of Thomas Fuller. Mundus Alter et Idem, a species of allegorical romance, published in 1643, was translated into English by John Healey, under the title of Discovery ofa New World. Other writings of this " English Seneca," as Sir Henry Wotton called him, are Explication of Hard Texts (1633-34), Christian Meditations (1640), and Henochismus, sive Tractatus de modo ambulandi cunt Deo, translated in 1769. An edition of his works was published in 1808 at London, in 10 vols., by the Rev. Josiah Pratt ; and a later and

better one, in 12 vols., at Oxford (1837-39), by the Rev. Peter Hall. A life of Bishop Hall by the Rev. John Jones appeared in 1826.

HALL, Marsuatt (1790-1857), the discoverer of the "' diastaltic nervous system," was born at Basford, Notts, February 18, 1790. His father, Robert Hall, a cotton manufacturer at that place, is well known as the introducer of the modern processes of bleaching on a large scale.

Having attended Blanchard's academy at Nottingham, where Kirke White was educated, Marshall Hall com- menced in 1809 his studies for the medical profession at Edinburgh university. In 1811 he was elected senior president of the Royal Medical Society ; the following year le took the M.D. degree, and was immediately appointed resident house physician to the Royal Infirmary, Edinburgh. This appointment he resigned after two years, when he visited Paris and its medical schools, and, on a walking tour, those also of Berlin, Gottingen, &c. In 1817, taking up his abode at Nottingham, he published his Diagnosis, in which he insisted that, before treatment, the exact nature of a malady should be ascertained. He rapidly acquired an extensive country practice, his improved method in puerperal cases and his disuse of the venesection then popular attracting many patients. In 1818 le wrote the Mdimoses, a work on the affections denominated bilious, nervous,

&c. The next year he was elected a fellow of the Royal Society of Edinburgh, and in 1825 he became physician to the Nottingham general hospital. In 1826 he removed to London, and in the following year he published his Commentaries on the more important diseases of females. He pursued his studies of the effects of blood- letting, and his Researches (issued in 1830) were acknow- ledged by the medical profession to be of vast practical value. Much practical good also resulted from his warn- ing against mistaking exhaustion for inflammation. Hall

married in 1829, and the same year he made the discovery which placed him in rank with Harvey. It is described in A Critical and Experimental Essay on the Circulation of the Blood in the Capillary Vessels, in which he showed that the blood-channels intermediate between arteries and veins serve the office of bringing the fluid blood into contact with the material tissues of the system. About this time he made his original investigations on quantity of respiration, detailed in Zhe Inverse [Ratio which subsists between the Respiration and Irritability in the Animal Kingdom, a work which led to the treatises on hibernation. In 1831 he proposed a simple and bloodless operation for the removal of vascular nevus. His most important discovery in physio- logy was the "diastaltic spinal system," his views being embodied in a paper on The reflex Function of the Medulla Oblongata and the Medulla Spinalis, 1832, in which year he was elected fellow of the Royal Society, London. This paper was supplemented in 1837 by another On the True Spinal Marrow, and the Excito-motor System of Nerves, in which he explained the real classification and distribution of the entire nervous system. The " reflex function" excited great attention in Germany and Holland, and M. Flourens described it as "a great epoch in physi- ology." Hallthus became the authority on the multiform deranged states of health referable toan abnormal condition of the nervous system, aud he made plain the obscure class of convulsive affections. The action of strychnia as a spinal tonic or excitant, the relief of the epileptic, trache- otomy in laryngismal epilepsy, and the "ready method" in asphyxia, were among the later objects of his investiga- tion. His "ready method"—sometimes called Marshall Hall's method—for resuscitation in drowning and other forms of suspended respiration—is perhaps the most popular of

his discoveries ; by it innumerable lives have been pre- served. Dr Hall lectured at various medical schools, at the college of physicians, and also at New York during his American tour. His papers in medical and scientific journals, including the Comptes endus, are remarkable for lucidity and brevity. He died at Brighton of a throat affec- tion, aggravated by lecturing, August 11, 1857. A list of his works, most of which have been translated into foreign languages, and details of his 'ready method," &e., are given in his Memoirs by his widow, London,

1861.

HALL, Rozert (1764-1831), one of the greatest of English pulpit orators, was born May 2, 1764, at Armsby near Leicester, where his father, a man whose cast of mind in some respects resembled closely that of the son, was pastor of a Baptist congregation. Robert was the youngest of a family of fourteen. In infancy his physical powers were so feeble that until two years of age he was unable to walk, and, although his expression and gestures indicated great mental vivacity, he was equally slow to acquire the faculty of articulate speech, It even appears that he had learned to read before he was able to imitate spoken sounds, his nurse having taught him the letters of the alphabet and the formation of words from the inscriptions on the tomb- stones of a churchyard adjoining his father's dwelling-house. When once the interest in this exercise had loosened his reluctant tongue his progress was remarkably rapid, and before he had attained his third year the fluency of his talk gave some indications of his future oratorical eminence. While still at the dame's school his passion for books absorbed the greater part of his time, and in the summer it was his custom after school hours to retire to the church- yard with a volume which he continued to peruse there till nightfall, making out the meaning of the more difficult words with the help of a pocket dictionary. From his sixth to his eleventh year he attended the school of Mr Simmons at Wigston, a village 4 miles from Arnsby.

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There his precocity assumed the exceptional form of an intense interest in metapliysics, partly perhaps on account of the restricted character of his father's library; and before he was nine years of age he had read and re-

read Jonathan Edwards's Z'reatise on the Will and Butler's Analogy. This incessant study at such an early period of life seems, how- ever, to lave had an injurious influence on his health, and may have been partly the cause of the disease from which he experienced such suffering in after life, and symptoms of whose existence began at this time to manifest them- selves. Occasionally he was already troubled with intense pain in the back, and after he left Mr Simmons's school his appearance was so sickly as to awaken fears of the presence of consumption. In order therefore to obtain the benefit of a change of air, he stayed for some time in the house of a gentleman near Kettering, who with an impropriety which Hall himself afterwards referred to as "egregious," prevailed upon the boy of eleven to give occasional addresses at prayer meetings. As his health seemed rapidly to recover, he was sent to a school at Nor- thampton conducted by the Rev. John Ryland, where he remained a year and a half, and "made great progress in Latin and Greek." On leaving school he for some time studied divinity under the direction of his father, and in October 1778 he entered the Bristol academy for the pre- paration of students for the Baptist ministry. Here the self-possession which had enabled him in his twelfth year to address unfalteringly various audiences of grown-up people seems to have strangely forsaken him; for when, in accordance with the arrangements of the academy, his turn came to deliver an address in the vestry of Broadmead Chapel, he broke down on two separate occasions and was unable to finish his discourse. On the 13th August 1780 he was set apart to the ministry, but he still continued his studies at the academy ; and in 1781, in accordance with the provisions of an exhibition which he held, he entered King's College, Aberdeen, where he took the degree of master of arts in March 1785. At the university he was without a rival of his own standing in any of the classes, distinguishing himself alike in classics, philosophy, and mathematics. He there formed the acquaintance of Mackintosh (afterwards Sir James), who, though a year his junior in age, was a year his senior as a student, and who be- came attached to him "because he could not help it." While they remained at Aberdeen the two were inseparable, reading together the best Greek authors, especially Plato, and discussing, either during their walks by the sea-shore and the banks of the Don or in their rooms until early morning, the most perplexed questions in philosophy and religion. The interest of their conversation seems to have lain more in the difference than the agreement of their opinions; but their controversies, so

far from causing any even temporary estrangement, tended only to cement more closely their friendship and to deepen in each the respect for the mental and moral qualities of the other.

During the vacation between his last two sessions at Aberdeen, Hall acted as assistant pastor to Dr Evans at Broadmead Chapel, Bristol, and three months after leaving the university he was appointed classical tutor in the Bristol academy, an office which he held for more than five years. Even at this period his extraordinary eloquence had excited an interest beyond the bounds of the denomination to which he belonged, and when he preached the chapel was gene- rally crowded to excess, the audience including many persons of intellectual tastes. It would appear, however, that, in the case of Mr Fuller, Dr Ryland, and other theo- logical authorities, his exuberant intellectual energy and his outspoken expression of tolerance for certain aspects of Socinianism caused trembling to be greatly mingled with their admiration; and ultimately, suspicions in regard

to his orthodoxy having in 1789 led to a misunderstanding with his colleague and a part of the congregation, he in July 1790 accepted an invitation to make trial of a congre- gation at Cambridge, of which he became pastor in J uly of the following year. From a statement of his opinions contained in a letter to the congregation which he left, it would appear that, while a firm believer in the proper divinity of Christ, he had at this time disowned the cardinal principles of Calvinism—the federal headship of Adam, and the doctrine of absolute election and reprobation ; and that he was so far a materialist as to " hold that man's thinking powers and faculties are the result of a certain organization of matter, and that after death he ceases to be conscious till the resurrection." It was during his Cambridge ministry, which extended over a period of fifteen years, that his oratory was most brilliant and most immediately powerful. At Cambridge the intellectual character of a large part of the audience supplied a stimulus which was wanting at Leicester and Bristol, but besides this his physical powers were then at their best, and were still un- affected by the constant pain which already so severely tested his powers of endurance and rendered the discharge of his duties such a marvellous

triumph of will. Above all it was not till near the close of this period that his intellectual pathway was crossed by the shadow of mental derangement, and an element of weakness and uncertainty introduced into his career which for some time clouded the horizon of his hopes and perhaps placed a permanent check on his highest form of intellectual enterprise. While at Cambridge he gave to the world some of the more important of the few and small publications which, although those who were his constant hearers have affirmed that several of his imperfectly reported sermons convey a juster impres- sion of the usual character of his oratory, are the only correct and properly authenticated records of his style of thought and composition. His first published compositions had a political origin. In1791 appeared Christianity con- sestent with the Love of Freedom, in which he defended the political conduct of dissenters against the attacks of the Rev. John Clayton, minister of Weighhouse, and gave eloquent expression to his hopes of great political and social ameliora- tions as destined to result nearly or remotely from the sub- version of old ideas and institutions in the maelstrom of the French Revolution. In 1793 he expounded his politi- cal sentiments in a powerful and more extended pamphlet entitled an Apology for the Freedom of the Press, which at once obtained an extensive circulation, and doubtless to some extent aided in the formation of that public opinion which has given birth in England to the present remarkable era of gradual and unswerving political progress. On account, however, of certain asperities into which the warmth of his feelings had betrayed him, and his conviction that he had treated his subject in too superficial a manner, he refused to permit the publication of the pamphlet beyond the third edition, until the references of political opponents and the circulation of copies without his sanction induced him in 1821 to prepare a new edition, from which he omitted the attack on Bishop Horsley, and to which he prefixed an advertisement stating that his political opinions had under- gone no substantial change. His other publications while at Cambridge were three sermons—On Modern Infidelity (1801), Reflections on War (1802), and Sentiments proper to the present Crisis(1803). From his first attack of insanity, which occurred in November 1804, he recovered so speedily that he was able to resume his duties in April 1805, but a more severe recurrence of the malady rendered it advisable for him on his second recovery to resign his pastoral office, which he did in March 1806. On

leaving Cambridge he paid a visit to his relatives in Leicestershire, and then for some time resided at Enderby, preaching occasionally in some of

the neighbouring villages. Latterly he ministered toa small congregation in Harvey Lane, Leicester, from whom at the close of 1806 he accepted a call to be their stated pastor. Inthe autumnof 1807 he changed his residencefrom Enderby to Leicester, and in 1808 he married the servant of a brother minister. His proposal of marriage had been made after an almost momentary acquaintance, and, according to the tra- ditionary account, in very abrupt and peculiar terms ; but, judging from his subscquent domestic life, hischoice did suffi- cient credit to his penetration and sagacity. His writings at Leicester embraced various tracts printed for private circula- tion; anumber of contributions tothe Eclectic Review, among which may be mentioned his articles on " Foster's Essays " and on "Zeal without Innovation"; several sermons, includ- ing those On the Advantages of Knowledge to the Lower Classes (1810), On the Death of the Princess Charlotte (1817), and On the Death of Dr Ryland (1825) ; and his pamphlet on Terms of Communion, in which he advocated intercum- munjon with all those who acknowledged the " essentials" of Christianity. In 1819 he published an edition in one volume of his sermons formerly printed. On the death of Dr Ryland, Hall was invited to return to the pastorate of Broadmead Chapel, Bristol, and as the peace of the congre- gation at Leiccster had been to some degree disturbed by @ controversy regarding several cases of discipline, he resolved to accept the invitation, and removed there in April 1826. About this period the malady—renal calculus —which had for.many years rendered his life an almost continual martyrdom, and whose influence he had triunrphed over with such marvellous fortitude, began to show signs of indirectly obtaining the mastery over his vigorous con- stitution; and henceforth increasing infirmities and suffer- ings, which rest and change of scene could do little to alleviate, surrounded with deepening external gloom the spirit whose cheerfulness and peace they seemed to leave almost totally uninjured. Gradually the inability to take proper exercise, by inducing a plethoric habit of body and impeding the circulation, led to a diseased condition of the heart, which resulted in his death, February 21, 1831.

The private manners of Hall were remarkably simple and unaffected; and if his method of expressing his opinions was frequently impetuous, and occasionally somewhat brusque and imperious, this was owing rather to his constitutional energy and straightforward impulsive honesty than to an overbear- ing and dogmatic temper. Though exercising his sarcastic powers with great unconstraint, he reserved his severity chiefly for errors which implied some kind of mioral culpa- bility, and he was always careful to be respectful to true worth even when concealed or deformed by many superficial defects, or coujoined with humble rank or weak mental capacity. In reality few were more unassuming or unselfish or more continuously actuated by feelings truly charitable and benevolent. His mental absorption led to the con- traction of many minor eccentricities, one of which was a frequent obliviousness to the flight of time and a con- sequent inability to remember his engagements. Towards the close of his Cambridge ministry he acquired the habit of smoking, and from that time his pipe was his almost constant companion and one of his principal solaces in his bodily suffering. Indeed talk and tobacco may be said to have supplied his chief means of recreation. In his conversation the calibre and idiosyncrasies of his genius were better displayed than in any of the writings he has left us; and it is said to have exercised an even more captivating charm than did his finest orations. Its most striking characteristics were keen, biting, and original wit, and wild and daring imaginative flights.

_ Both physically and mentally Hall possessed a rare com- bination of qualities fitting him to excel as a public speaker.

HALL

faults which hampered his capabilities were not of a formid- able cliaracter. He was of powerful and athletic build, and his great breadth of chest, while it lent an impression of massiveness to his bearing, indicated abundant capacity to sustain the kind of physical exertion which oratory entails. His voice was deficient in strength and volume, but exceptionally pure and melodious, and capable of. being thoroughly interpenetrated by emotion. Its inadequacy in tone was also compensated for by its great flexibility, which enabled him by the momentum of rapid utterance to obtain all the vocal force necessary to the highest oratorical effects. According to Foster, his

countenance " was formed as if on purpose for the most declared manifestation of power." The forchead was high and sloping, with well-arched brows, beneath which his dark and brilliant eye, in his more excited moments, burned and glowed with thought and passion. The lower part of his countenance indicated a vehement and headstrong temperament under the control of an iron will—doubtless powerfully reinforced by the strong moral sensibility which gave a peculiar elevation and dignity to features possessing no trait of grace or beauty. Perhaps the "stern, intense, and somewhat for- midable expression," which Foster referred to as wanting in the portrait accompanying his works, had its origin partly in his constant suffering.

His gestures in speaking were few and simple, and his manner seemed to be naturally determined by his mental emotions without conscious purpose on his part. He gave the impression of thorough self-forgetfulness and absorption in his subject, and during the latter part of an oration of being wholly possessed and dominated by the thoughts and sentiments which he uttered. It is generally affirmed that in his spoken sermons his style was more easy, graceful, and various than in any of the sermons which he prepared for the press. In the latter the structure of the sentences is often formal and laboured, the rhythm artificial and monotonous ; and idiomatic vigour is in some degree sacri- ficed to elegance and pomp. In the higher flights of his eloquence his language was, however, unsurpassed for purity and happy adaptation to the thought. Indeed one of his most remarkable gifts is said to have been his extempor- aneous command of a clear and felicitous vocabulary, which seemed to clothe every shade of his meaning with its appropriate expression, and whose musical cadences formed a not unimportant element in the fascination exer- cised by his oratory. It is true that in many cases his language had before he spoke undergone considerable mental elaboration, but he was nevertheless so little enslaved to his memory that, according to his own statement, he never entered the pulpit without omitting something which he wished to say and saying something which he wished to omit. In preaching his severe taste and deep sense of solemnity restrained every tendency to eccentricity or extravagance, and he never permitted his brilliant wit to emit even the faintest and most momentary sparkle. It may therefore be believed that on a secular platform his oratory would have been more racy and natural, and

from the scope afforded for the free exercise of all his powers would have attained to a more varied perfection. In his occasional reviews his style is clear and pointed, but apart from this it is his sarcasm that chiefly conveys the im- pression of more than average ability. The predominant element of his eloquence was reasoning. His statements and propositions were animated with passion and illuminated by a vivid and rich if not strikingly powerful and original imagination ; but in no instance did passion or imagination seem to obtain the chief sway. It was generally not till towards the close of his sermon that the spell of his elo- quence asserteditshighest influenceover hisaudience. Then

He did not attain success without effortand discipline, but the | the various trains of thought through which he had been

guiding them seemed to meet in an intense focus where reason, imagination, and passion were blended together, and in whose light the theme he had been expounding stood revealed in such vivid truth and beanty as to capti- vate for the moment every heart. But though stating truth chiefly in the form of reasoning, he constantly exhibited it rather in its moral than in its theological aspects. His eloquence was indeed morally more than intellectually powerful ; and its moral purpose was besides achieved not so much by thie direct inculecation of moral duties, or tlie detection and exposure of moral deformities, as by his unconscious exhibition of his own moral elevation and of the ardour and purity of his hopes and aims. Indeed in many of his sermons both the form and matter of his thought seemed to be determined rather by his own indivi- dual interest in his subject than by the consideration of the capacities and wants of his hearers, Though exhibiting a catholicity of spirit much in advance of his time, the range of his thought is completely included within the limits of traditional opinion. In treating of what he regarded as the cardinal truths of religion he is of course oratorically effective, but the dexterous and brilliant manner in which he wields the old controversial weapons does not com- pensate for their inherent inadequacy. He indulges too frequently in innuendoes against tle moral character and motives of his opponents, and fails to sound the full depth of the speculative problems upon which he attempts to dogmatize. His

sermons will always be esteemed by the student of English literature for their many passages of splendid and finished eloquence, but his theological writings as a whole are of course without that quaint interest attach- ing to representations of truth which though now old and effete originally exhibited it with the freshness and vividness of a discovery ; while on the other hand they have no suffi- cieut colouring from modern tendencies to give to them a more than superficial value in relation to those phases of reli- gious thought which are predominant at the present time.

See Works of Robert Hall, A.M., with a Brief Memoir of his Life, by Olinthus Gregory, LLL.D., and Observations on his Character as Preacher by John Foster, originally published in 6 vols., London, 1832; Reminiscences of the Rev. Robert Hall, A.M., by John Greene, London, 1832 ; Biographical Recollections of the Rev. Robert Hall, by J. W. Morris, 1848; Fifty Sermons of Robert Hall from Notes taken at the time of their Delivery, by the Rev. Thomas Grin- field, M.A., 1843 ; Reminiscences of College Life in Bristol during the Ministry of the Rev. Robert Hall, A.M., by Frederick Trestrail, 1879. @. FH)

HALLA., See Hata.

HALLAM, Henry, the celebrated English historian, was born at Windsor in the year 1777,—-some authorities make the date one year later,—and he died at Pickhurst, Kent, on the 21st of January 1859. Notwithstanding his great fame and recent death very little seems to be known of the personal history of Hallam. He was the son of a dean of Bristol, and was educated at Eton, and afterwards went to Christ Church, Oxford, where he took his degree in 1799. He was called to the bar by the Inner Temple, and afterwards became a bencher of that society, but he does not appear to have at any time attempted to obtain practice. arly in life he devoted himself to literary work, and became connected with the brilliant band of authors and politicians who then led the Whig party. A com- missionership of audits, obtained through that connexion, together with some private means, made him independent in point of worldly fortune, and enabled him to devote himself entirely to the studies of lis life. He took no active part in practical politics, and was in fact unsuited by nature for the rough work of party polemics. But he was an active supporter of many popular movements—

particularly of that which ended in the abolition of the slave trade ; and he was throughout his entire life sincerely and profoundly attached to the political principles of the

Whigs, both in their popular and in their aristocratic aspect. Hallam s earliest literary work was undertaken in connexion with the great organ of the Whig party, the Hdinburgh Lteview, where his review of Scott's Dryden attracted much notice. His first great work, Zhe View of the State of Europe during the Middle Ages, was produced in 1818, and was followed nine years later by the Constitutional INstory of England. In 1837 appeared the Jntroduction to the Literature of Hurope in the 15th, 16th, and 17th Centuries. These are the three works on which the fame of Hallam rests, They at once took a place in English literature which has never been seriously challenged. A volume of supplemental notes to his A/iddle Ages was pub- lished in 1848. These facts and dates represent nearly all the events of Hallam's career. The strongest personal interest in his life was the affliction which befell him in the loss of all his family, one after another. His eldest son, Arthur Henry Hallam,—the " A. H. H." of Tennyson's In Memoriam, and by the testimony of his contemporaries a man of the most brilliant promise,—died in 1833 at the age of twenty-two. Seventeen years later, his second son, Henry Fitzmaurice Hallam, was cut off like his brother at the very threshold of what might have been a great career. The premature death and high talents of these young men, and the association of one of them with the most popular poem of the age, have made Hallam's family afflictions better known than any other incidents of his life. He survived wife, daughter, and sons by many years. In 1834 Hallam published Zhe Lemains in Prose and Verse of Arthur Ienry Hallam, with a Sketch of his Life. In 1852 a selection of Literary Essays and Characters from the Literature of Europe was published. Hallani was a fellow of the Royal Society, and a trustee of the British Museum, and enjoyed many other appropriate distinctions. In 1830 he received the gold medal for history, founded by George III.

The Middle Ages is described by Hallam himself as a series of historical dissertations, a comprehensive survey of the chief circumstances that can

interest a philosophical inquirer during the period from the 5th to the 15th cen- tury. The work consists of nine long chapters, each of which is a complete treatise in itself. The history of France, of Italy, of Spain, of Germany, and of the Greek and Saracenic empires, sketched in rapid and general terms, is the subject of five separate chapters. Others deal with the great institutional features of medieval society— the development of the feudal system, of the ecclesiastical system, and of the free political system of England. The last chapter sketches the general state of society, the growth of commerce, manners, and literature in the Middle Ages. The book may be regarded as a general view of early modern history, preparatory to the more detailed treatment of special lines of inquiry carried out in his subsequent works, although Hallam's original intention was to continue the work on the seale on which it had been begun.

The Constitutional History of England takes up the sub- ject at the point at which it had been dropped in the View of the Middle Ages, viz., the accession of Henry VIL,} and carries it down to tlie accession of George III. Hallam stopped here for a cliaracteristic reason, which it is impos- sible not to respect and to regret. He was unwilling to excite the prejudices of modern politics which seemed to him to run back through the whole period of the reign of George III. As a matter of fact they ran back much further, as Hallam soon found. The sensitive impartiality which withheld him from touching perhaps the most interesting period in the history of the constitution did not save him from the charge of partisanship. The Quarterly

1 Lord Brougham, overlooking the constitutional chapter in the

Middle Ages, censured Hallam for making an arbitrary beginning at this point, and proposed to write a more complete history himself,

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Review for 1828 coutains an article on the Constitutional History, written by Southey, full of railing and reproach. The work, he says, is the " production of a decided partisan," who "rakes in the ashes of long-

forgotten and a thousand times buried slanders, for the means of heaping obloquy on all who supported the established institutions of the country." No accusation made by a critic ever fell so wide of the mark. Absolute justice is the standard which Hallam set himself and maintained. His view of consti- tutional history was that it should contain only so much of the political and general history of the time as bears directly on specific changes in the organization of the state, includ- ing therein judicial as well as ecclesiastical institutions. But while abstaining from irrelevant historical discussions, Hallam dealt with statesmen and policies with the calm and fearless impartiality of a judge. It was his cool treat- ment of such sanctified names as Charles, Cranmer, and Laud that provoked the indignation of Southey and the Quarterly, who forgot that the same impartial measure was extended to statesmen on the other side. If Hallam can ever be said to have deviated from perfect fairness, it was in the tacit assumption that the 19th century theory of the constitution was the right theory in previous centuries, and that those who departed from it on one side or the other were in the wrong. He did unconsciously antedate the consti- tution, and it is clear from incidental allusions in his last work that he did not regard with favour the democratic changes which he thought to be impending. Hallam, like Macaulay, ultimately referred all political questions to the standard of Whig constitutionalism. This prepossession may be connected with the legal tone that runs through all his political writings. The spirit of the English lawyer is as strong in Hallam as in Bentham, who, like him, was never a practising lawyer. It is no doubt owing to this quality that the. Constitutional [History has become one of the text-books of English politics. Hallam, like Black- stone, has become an authority to whom men of all parties appeal. The origin of English institutions has since been explored with greater elaborateness by Professor Stubbs, but our leading guide to the constitution in its maturity is still Hallam.

Like the Constitutional History, the Introduction to the Literature of Europe continues one of the branches of inquiry which had been opened in the View of the Middle Ages. In the first chapter of the Literature, which is to a great extent supplementary to the last chapter of the Middle Ages, Hallam sketches tlie state of literature in Europe down to the end of the 14th century :—the extinc- tion of ancient learning which followed the fall of the Roman empire and the rise of Christianity ; the preserva- tion of the Latin

language in the services of the church ; and the slow revival of letters, which began to show itself soon after the 7th century—"the nadir of the human wnind "——had been passed. For the first century and a half of his special period he is mainly occupied with a review of classical learning, and he adopts the plan of taking short decennial periods and noticing the most remarkable works which they produced. The rapid growth of literature in the 16th century compels him to resort to a classification of subjects. Thus in the period 1520-1550 we have separate chapers on ancient literature, theology, speculative philosophy and jurisprudence, the literature of taste, and scientific and miscellaneous literature ; and the subdivision of subjects is carried further of course in the later periods. Thus poetry, the drama, and polite literature form the subjects of separate chapters. One inconvenient result of this arrangement is that the same author is scattered over many chapters, according as his works fall within this category or that period of time. Names like Shakespeare, Grotius, Bacon, Hobbes, appear in half a dozen different

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places. The individuality of great authors is thus dis- sipated except when it has been preserved by an occasional sacrifice of the arrangement—and this defect, if it is to be esteemed a defect, is increased by the very sparing references to personal history and character with which Hallam was obliged to content himself. His plan excluded biographical history, nor is the work, he tells us, to be regarded as one of reference. It is rigidly an account of the books whicli would make a complete library of the period,! arranged according to the date of their publication and the nature of their subjects. The history of institutions like univer- sities and academies, and that of great popular movements like the Reformation, are of course noticed in their imme- diate connexion with literary results ; but Hallam had little taste for the spacious generalization which sucli subjects sug- gest. The great qualities displayed in this work have been universally acknowledged — conscientiousness, accuracy, judgment, and enormous reading. Not the least striking

| testimony to Hallam's powers is his mastery over so many

*diverse forms of intellectual activity. In science and theology, mathematics and poetry, metaphysicsand law, he is a competent and always a fair if not a profound critic. The bent of his own mind is manifest in his treatment of pure literature and of political speculation,—which seems to be inspired with stronger personal interest and a higlier sense of power than other parts of his work display. Not less worthy of notice in a literary history is the good sense by which both his learning and his tastes have been held in control. Probably no writer ever possessed a juster view of the relative importance of men and things. The labour devoted to an investigation is with Hallam no excuse for dwelling on the result, unless that is in itself important. He turns away contemptuously from the mere curiosities of literature, and is never tempted to make a display of trivial 'erudition. Nor do we find that his interest in special studies leads him to assign them a disproportionate place in his general view of the literature of a period. Hallam is generally described as a " philosophical his- torian." The description is justified not so much by any philosophical quality in his method as by the nature of his subject and his own temper. Hallam is a philosopher to this extent that both in political and in literary history he fixed his attention on results rather than on persons. His conception of history embraced the whole movement of society. Beside that conception the issue of battles and the fate of kings fall into comparative insignificance. *' We can trace the pedigree of princes," he reflects, " fill up the catalogue of towns besieged and provinces desolated, describe even the whole pageantry of coronations and festivals, but we cannot recover the genuine history of mankind." But, on the other hand, there is no trace in Hallam of anything like a philosophy of history or society. Wise and generally melancholy reflexions on human nature and political society are not infrequent in his writings, and they arise naturally and incidentally out of the subject he is discussing. His object is the attainment of truth in matters of fact. Sweeping theories of the movement of society, and broad characterizations of particular periods of history, seem to have no attraction for him. The view of mankind on which such generalizations are usually based, taking little account of individual character, was highly distasteful to him. Thus he objects to the use of statistics because they favour that tendency to regard all men as mentally and morally equal which is so unhappily strong in modern times. At the same time Hallam by no means assumes the tone of*

the mere scholar. He is even solicitous to show that his point of view is that of the cultivated gentleman and not of the specialist of any order. Thus

‘ Technical subjects like painting or English law have been ex- cluded by Hallam, and history and theology only partially treated.

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he tells us that Montaigne is the first French author whom an English gentleman is ashamed not to have read. In fact, allusions to the necessary studies of a gentleman meet us constantly, reminding us of the unlikely erudition of the schoolboy in Macaulay. Hallam’s prejudices, so far as he had any, belong to the same character. His criticism is apt to assume a tone of moral censure when he has to deal with certain extremes of human thought,—scepticism in philosophy, atheism in religion, and democracy in politics. Hallam’s style is singularly uniform throughout all his writings. It is sincere and straightforward, and obviously innocent of any motive beyond that: of clearly expressing the writer’s meaning. Inthe Lrterature of Europe there are many passages of great imaginative beauty. (E. R.) HALLE (formerly called, to distinguish it from other towns of the same name, Halle in Sachsen, but now generally known as Halle an der Saale), a city of Prussian Saxony, government district of Merseburg, is situated on the right bank of the Saale and at the junction of six rail- ways, 20 miles N.W. of Leipsic. It consists of the old town, or Halle proper, with five suburbs, and the two small towns of Glauchau and Neumarkt, which were added to it in 1817. Halleis under the immediate jurisdiction of the crown, and is the seat of the imperial chief office of mines for

Plan of Falla:

1, Penitentiary. 6. Theatre. 11. Red Clock Tower.

2, Observatory. 7. Gymnasium. 12. Cathedral.

8. Moritzburg. 8. Post-Office. 13. Church of St Mary. 4. Library. 9. District Court. 14, Church of St Maurice. 5. University. 10. Town-Hall.

the provinces of Saxony, Brandenburg, and Pomerania, of a head tax-office, of a circle court, and of a provincial office. The greater part of the town is irregularly built, and pre- sents a somewhat unattractive appearance to the eye of a stranger; but of late years it has been much improved by the construction of new promenades on the site of the old fortifications, and by the repaving of many of the streets and the addition of new buildings. Its well-known uni- versity was founded by King Frederick I, in 1694 in behalf of the jurist Thomasius, whom many students followed to Halle when he was expelled from Leipsic through the enmity of his fellow professors. It was closed by Napoleon in 1806, and again in 1813; and in 1815 it was united

with that of Wittenberg. It has faculties of theology, law, medicine, and philosophy. From the beginning it has been recognized as one of the principal schools of Protestant theology, and has numbered among its professors some of the most eminent names of Germany. Its maximumnumber of students occurred in 1829 when they exceeded 1300. Subsequently the number declined below 600, but at pre- sent the average attendance is between 900 and 1000. The present buildings were erected in 1834. In connexion with the university there are a botanical garden, a theological and normal seminary, a medical and surgical clinical institute, a maternity hospital, an observatory, and a library of over 100,000 volumes, which also contains collections of coins and engravings. The Sfrancke'sche Stiftungen—founded in 1691 by August Hermann Francke, a bronze statue of whom by Rauch was erected in 1829 in the inner court of the building—embrace an orphanage, a laboratory where medicines are prepared and distributed, a Bible press from which Bibles are issued at a cheap rate, and a number of schools of various grades, viz., a Latin school, a higher real- school, a citizen schoo), a higher female school, and a free school, attended in all by over 3000 pupils. 'The principal other institutions are the city gymnasium, the provincial trade school, the provincial lunatic asylum, the penitentiary, the town hospital and infirmary, and the deaf and dumb institute. Among the other public buildings may be men- tioned the church of St Mary, containing some fine paint- ings, an interesting Gothic structure of the 16th century, with four towers, two of which are connected

by a bridge ; the church of St Maurice, dating from the 12th century, with interesting wood-carvings and sculptures ; the church of St Ulrich, dating from the 14th century; the cathedral, founded in the 16th century, and containing an altar-piece representing Duke Augnstus of Saxony and his family ; the red clock tower in the market-place, 276 feet in height ; the old town-house ; the ruins of the castle of Moritzburg, erected in 1484, formerly the residence of the archbishops of Magdeburg, but destroyed by fire during the Thirty Years' War, with the exception of the left wing, which is now used for military purposes; the lodge of the free- masons ; and the theatre. In 1859 a bronze statue was erected in the market-place to Handel, who was born at Halle in 1685 ; and in the outskirts of the town there is a monument to the Germans who fell at the battle of Leipsic in 1813. The salt-springs of Halle have been known from a very early period. Some rise within the town and others on an island in the Saale; and together their annual yield of salt is about 12,000 tons. The workmen employed in connexion with the manufacture are a peculiar and distinct race known by the name of Halloren, probably descended from an old Frankish colony. They observe several ancient customs, and enjoy certain special exemptions and privileges. The principal other industries of Halle are the manufacture of starch, beetroot-sugar, chemicals, lignite, candles, pottery- wares, sausages, oil, machines and waggons, sugar-refining, brewing, printing, and bookbinding. Considerable trade, especially in corn, is now carried on by means of the railways, but the shipping trade is unimportant. The population has increased with great rapidity during the last quarter of a century, for while the numbers in 1831 were 25,594, they had risen in 1849 to 33,848 and in 1875 to 60,503.

Halle was first mentioned in 806 as the fortress of Halla erected by Charlemagne. The place was, however, in. existence before the Christian era, and owes its origin as well as its name to its salt- springs. Otto the Great presented it in 965 along with the salt- springs to the bishopric of Magdeburg, and in 981 Otto II. raised it to the rank of a town. At the beginning of the 12th century it had attained considerable importance, and in the 13th and 14th centuries as a member of the Hanseatic League it carried on successful wars with the archbishops of Magdeburg ; and in 1435 it resisted an army of 30,000 men under the clector of Saxony. On

account, how- ever, of internal feuds between the democracy and the patricians it

was subdued in 1478 by Archbishop Ernest, who in order to hold it in check built the castle of Moritzburg. Notwithstanding the efforts of the archbishops of Mainz and Magdeburg, the Refor- mation found an entrance into the city in 1522; and in 1541 a Lutheran superintendent was appointed. After the peace of West- phalia in 1648 the city came into the possession of the housc of Brandenburg. In 1806 it was stormed and taken by the French, after which, at the peace of Tilsit, it was united to the new kingdom of Westphalia. After the battle between the Prussians and French, May 2, 1813, it was taken by the Prussians. ‘ was for a long time hurtful to the prosperity of Halle, and its present rapid increase in population and trade is principally due to its position as the centre of a network of railways.

Sec Dreyhaupt, Ausfithrliche Beschreibung des Saalkreises, Halle, 2 vols., 1755 (2d edition, 1771-73; 3d edition, 1842-44) ; Hoff- bauer, Geschichte der Universitat zu Halle, 1806 ; Halle in Vorzett und Gegenwart, 1851 ; Knauth, Kurze Geschichte und Beschreibung der Stadt Halle, 3d edition, 1861; Vom Hagen, Die Stadt Halle, 1866- 67; Hertzberg, Geschichte der_Vercinigung der Universitdten von Wittenberg und Halle, 1867; Voss, Zur Geschichte der Autonomte der Stadt Halle, 1874 ; A. Kirchkoff, ‘ Ueber dic Lagenverhaltnisse der Stadt Halle,” in Afittheilungen des Vereins fir Erdkunde xu Halle, Halle, 1877.*

HALLECK, Frrzcreene (1790-1867), an American poet, was born at Guildford, Connecticut, July 8, 1790. By his mother he was descended from John Eliot, the “Apostle of the Indians.” At an early age he became

po : arly ag clerk in a store at Guildford, and at eighteen he entered a banking-housc in New York. Having made the acquaint- ance of Joseph Rodman Drake in 1819, he assisted him under the signature of “Croaker junior” in contributing to the New York Evening Post the humorous series of “Croaker Papers.” In 1821 he published his longest poem, Fanny, a satire on local politics and fashions in the measure of Byron’s Don Juan. He visited Europe in 1822-23, and after his return published anonymously in

1827 a volume of poems in which were included “ Alnwick Castle” and ‘“‘Burns.” From 1824 to 1849 he was confiden- tial agent of John Jacob Astor, who named him one of the trustees of the Astor Library, and left him an annuity of 200 dollars, on which he retired to Guildford, where he lived with an unmarried sister. In 1864 he published in the New York Ledger a poem of 300 lines entitled “ Young America.” He died at Guildford, November 19, 1867. The poems of Halleck are written with great care and finish, and manifest the possession of a fine sense of harmony and of genial and elevated sentiments.

Editions of his poems appeared in 1836, 1842, 1849, 1858, and 1860. He is also the author of an edition of Byron with notes and a memoir, and of two voluines of Sclections from the British Poets. His Life, by J. G. Wilson, appcared in 1869.

HALLECK, Henry Wacer (1815-1872), an American general, was born at Waterville, Oncida county, New York, January 15, 1815. After studying a short time at Union College, he in 1835 entered the West Point military academy, whence he was in 1839 promoted to the army as second lieutenant in the corps of engineers, being at the same time appointed assistant professor of engineering atthe academy. In thie following year he was made an assistant to the board of engineers at Washington, and from 1841 to 1844 he was employed in connexion with the fortification of New York harbour. In 1845 he was sent by the Government to examine the principal military establishments of Europe, and during his absence he was promoted to the rank of first lieutenant. After his return he in the winter of 1845-46 delivered at the Lowell Insti- tute, Boston, a course of twelve Jectures on the science of war, published in 1846 under the title Hlements of Military Art and Science, and republished with additions in 1861. On the outbreak of the Mexican war in 1846 he as military engineer accompanied the expedition to California and the Pacific coast, where he distinguished himself not only as an engineer but by his administrative skill as secretary of state, and by his presence of mind and bravery in several

The rise of Leipsic |

recognized by promotion to the rank of captain. He con- tinued for several years to act on the staff of General Riley in California, holding at the same time the office of secre- tary of state of the province; and he took a leading part in framing the State constitution of California, on its being admitted into the Union. In 1852 he was appointed inspector and engineer of lighthouses, and in 1853 he was promoted captain of engineers. He, however, in 1854 resigned his commission in order to devote his chief atten- tion to the practice of law, which he had already for some time carried on; and so great was his success in his profession that the firm of which he was senior partner soon obtained one of the largest legal businesses in theState. He was also from 1850 director of the New Almaden quicksilver mine, and in 1855 he became president of the Pacific and Atlantic Railroad from San Francisco to San José. On the out- break of the civil war he was in August 1861 appointed major-general of the United States army, and in the follow- ing November was appointed commander of the western department, where he conducted the campaign with great energy and with such uniform success against the Con- federates that in 1862 they evacuated Corinth, which they had strongly fortified. In July of the same year he was appointed general-in-chief of the armies of the United States —a position he held till March 1864, when he was suc- ceeded by Grant and was appointed chief of the staff. In April 1865 he held the command of the military division of the James and in August of the same year of the military division of the Lacific, which he retained till March 1869, when he was transferred to that of the south, a position he held till his death at Louisville, January

9, 1872:

Besides his work on the Science of War, General Halleck was the author of Bitumen, its Varictics, Propertics, and Uses, 1841; The Mining Laws of Spain and Mexico, 1859 ; a translation of De Fooz On the Law of Mines, with an introduction, 1860; International Law, 1861; a translation of Jomini's Life of Napolcon, 1864; and a Treatise on International Law and the Laws of War, prepared for the use of Schools and Colleges, 1866.

HALLER, Atsrecut von (1708-1777), one of the greatest of the anatomists and physiologists of the 18th century, was born of an old Swiss family at Bern, October 16, 1708. Prevented by long-continued ill-health from taking

part in boyish sports, he had the more opportunity for the development of his precocious mind. At the age of four, it is said, he used to read and expound the Bible to his father's servants ; before he was ten he had sketched a Chaldee grammar, prepared a Greek and a Hebrew vocabulary, com- piled a collection of twothousand biographies of famous men and women on the model of the great works of Bayle and Moreri, and written in Latin verse a satire on his tutor, who had warned him against a too great excursiveness. hen still hardly fifteen he was already the author of numerous metrical translations from Ovid, Horace, and Virgil, as well as of original lyrics, dramas, and an epic of four thousand lines on the origin of the Swiss confederation, writings which he is said on one occasion to have rescued from a fire at the risk of his life, only, however, to burn them a little later (1729) with his own hand. Hialler's attention had been directed to the profession of medicine while he was residing in the house of a physician at Biel after his father's death in 1721; and, following the choice then made, he while still a sickly and excessively shy youth went in his sixteenth year to the university of Tiibingen (December 1723), where he studied under Camerarius and Duvernoy. Dissatisfied with his progress, he in 1725 exchanged Tiibingen for Leyden, where Boerhaave was in the zenith of his fame, and where Albinus had already begun to lecture inanatomy. At that university he graduated in May 1727, undertaking successfully in his thesis to prove that the sv-

skirmishes with the enemy. In 1847 his services were | called salivary duct, claimed as a recent discovery by

Coscliwitz, was nothing more than a blood-vessel. Haller then visited London, making the acquaintance of Sir Hans Sloane, Cheselden, Pringle, Douglas, and other scientific men; next, after a short stay in Oxford, he visited Paris, where he studied under Ledran and Winslow ; and in 1728 he proceeded to Basel, where he devoted himself to the study of the higher mathematics under John Bernoulli. It was during his stay there also that his first great interest in botany was awakened ; and, in the course of a tour through Savoy, Baden, and several of the Swiss cantons, he began a collection of plants which was afterwards the basis of his great work on the

flora of Switzerland. In 1729 he returned to Bern and began to practise as a physician ;

his best energies, however, were devoted to tlie botanical and |

anatomical researches which rapidly gave him a European reputation, and procured for him from George II. in 1736 a call to the chair of medicine, anatomy, botany, and surgery, in the newly-founded university of Gdttingen. The quantity of work achieved by Haller in the seventeen years during which he occupied this post was immense. Apart from the ordinary work of his classes, which entailed upon him the task of newly organizing a botanical garden, an anatomical theatre and museum, an obstetrical schwol, and similar institutions, he carried on without interruption those original investigations in botany and physiology, the results of whichare preserved in tle numerous works asso- ciated with his name; he continued also to persevere in his youthful habit of poetical composition, while at the same time he conducted a monthly scientific journal to which he is said to have contributed twelve thousand articles relating to almost every branch of human knowledge. He also warmly interested himself in most of the religious questions, both ephemeral and permanent, of his day ; and the erection of the Reformed church in Géttingen was mainly due to his unwearied energy. Notwithstanding all this variety of absorbing interests he never felt at home in Gottingen ; his untravelled heart kept ever turning towards his native Bern (where he had been elected a member of the great council in 1745), and in 1753 he resolved to resign his chair and return to Switzerland. The twenty-one years of his life which followed were largely occupied in the dis- charge of his duties as ""amman," to which honourable office he liad been chosen by his fellow-citizens, and in the preparation of his Bibliotheca Medica, the botanical, surgi- cal, and anatomical parts of which lie lived to complete ; but he also found time to write the three philosophical romances, —Usong (1771), Alfred (1773), and Fabius and Cato (1774),—in which his views as to the respective merits of despotism, of limited monarchy, and of aristocratic republi- cin government are fully set forth. About 1773 the state of his health rendered necessary his entire withdrawal from public business; for some time he supported his failing strength by means of opium, on the use of which he com- municated a paper to the Proceedings of the Gottingen Royal Society in 1776; the

excessive use of the drug is believed, however, to have hastened his death, which occurred on the 17th of December 1777. Haller, who had been three times married, left eight children, the eldest of whom, Gottlieb Emanuel, attained to some distinction as a botanist and as a writer on Swiss history.

For some account of Haller's contributions to the sciences of which he was especially an ornament, see the articles ANATOMY (vol. i. p. 814) and PuysioLocy. Subjoined is a classified but by no means an exhaustive list of his very numerous works in various branches of science and litcrature :— (1) Anatomical :—Jcones ana- tomice (1748-54); Disputationes anatomice seleetiores (1746-52); and Opera acad. minora anatomiei argumenti (1762-68). (2) Physiological:— De respiratione eaperimentaanatomica (1747); Prime linee phystologie (1747); and Elementa physiologic corporis human (1757-60). (8) Pathological and surgical:— Opuseula patho-

logica (1755); Disputationum ehirurg. collectio (1777); also earcful editions of Boerhaave's Praclectiones academiew in proprias instt-

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tutiones rei mediew (1789), and of the Artis medice principia of the same author (1769-74). (4) Botanical :—Enumeratio stirpium Hel- veticarum (1742); Opuseula botanica (1749); Bibliotheca botanica (1771). (5) Theological :— Briefe uber die wichtigsten Wahrheiten der Offenbarung (1772); and Briefe zur Vertheidigung der Offen- barung (1775-77). (6) Poetical :—Gedichte (1732, 12th ed. 1777). His three romances have been already mentioned. Several volumes of lectures and " Tagebticher" or journals were published post- humously.

Sce J. G. Zimmermann, Das Leben des HWerrn von Maller (1765), and the articles by Forster and Seiler in Evsch and Gruber's Encyklopddie.

HALLEY, Epmunp (1656-1742), an eminent astro- nomer, was born at Haggerston, near London, October 29, 1656. His father, a wealthy soapboiler, desiring to give his only son an education suitable to his promising genius, placed him at St Paul's School, where he was equally dis- tinguished for classical as for mathematical ability. Before leaving it for Queen's College, Oxford, which he entered as commoner in 1673, he had

observed the cliange in the variation of the compass, and, at the age of nineteen, he supplied a new and improved method of determining the elements of the planetary orbits. His detection of consider- able errors in the tables then in use led him to the con- clusion that a more accurate ascertainment of the places of the fixed stars was indispensable to the progress of astronomy ; and, finding that Flamsteed and Hevelius had already undertaken to catalogue those visible in northern latitudes, lie assumed to himself the task of making observa- tions in the southern hemisphere. A recommendation from Charles II. to the East India Company procured for him an apparently suitable, though, as it proved, ill-chosen station, and in November 1676 he embarked for St Helena. On the voyage he noticed tlie retardation of the pendulum in approaching the equator; and during his stay on the island he observed the transit of Mercury, which sug- gested to him the important idea of employing similar phenomena for the calculation of the solar distance. He returned to England in November 1678, having by the registration of 360 stars won the title of the "Southern Tycho," and by the translation to the heavens of the 'Royal Oak," earned a degree of master of arts, conferred at Oxford by the king's command December 3, 1678, almost simultaneously with his election as fellow of the Royal Society. Six months later, the indefatigable astro- nomer started for Dantzic to set at rest a dispute of long standing between Hooke and Hevelins as to the respective merits of plain or telescopic siglits; and towards the end of 1680 he proceeded on a Continental tour. In Paris he observed with Cassini the great comet of 1680 after its perihelion passage; and having returned to England, he married in 1682 Mary, daugliter of Mr Tooke, auditor of the exchequer, with whom he lived harmoniously for fifty- five years. He now fixed his residence at Islington, engaged chiefly upon lunar observations, with a view to the great desideratum of a method of finding the longitude at sea. His mind, however, was also busy with the momentous pro- blem of gravity. Having reached so far as to perceive that the central force of the solar system must decrease inversely as the square of the distance, and applied vainly to Wren and Hooke for further elucidation, he made in August 1684 that journey to Cambridge for the purpose of consulting Newton, which resulted in the publication of the Princapia. The labour and expense of passing this great work through the press devolved upon Halley, who also wrote the prefixed hexameters ending with the well-known line—

Nec fas est propius mortali attingere divos.

In 1696 he was, although a zealous Tory, appointed comp- troller of the mint at Chester, and (August 19, 1698) he received a commission as captain of the " Paramour Pink" for the purpose of making extensive observations on the conditions of terrestrial magnetism. This task he accom- plished in a voyage which lasted two years, and extended

to the 52d degree of §. latitude. The results were pub- lished ina General Chart of the Variation of the Compass in 1701; and immediately afterwards heexecuted by royal com- mand a careful survey of the tides and coasts of the British Channel, an elaborate map of which he produced in 1702. On his return from a journey to Dalmatia, for the purpose of selecting and fortifying the port of Trieste, he was nomi- nated, November 1703, Savilian professor of geometry at Oxford, and received an honorary degree of doctor of laws. Between 1713 and 1721 he acted as secretary to the Royal Society, having previously during eight years (1685-93) filled the same office, and early in 1720 he succeeded Flamsteed as astronomer-royal. Although in his sixty- fourth year, he undertook to observe the moon through an entire revolution of her nodes (eighteen years), and actually carried out his purpose. He died in the full possession of his faculties, January 14, 1742, at the age of eighty-five.

Halley's most notable scientific achievements were—his detection of the "'long inequality" of Jupiter and Saturn, and of the acceleration of the moon's mean motion; his dis- covery of the proper motions of the fixed stars ; his theory of variation, including the hypothesis of four magnetic poles, revived by Hansteen in 1819, and his suggestion of the magnetic origin of the aurora borealis ; his calculation of the orbit of the 1682 comet (the first ever attempted), coupled with a prediction of its return, strikingly verified in 1759 and 1835; and his indication (in 1716, Phal. Trans., No. 348) of a method still used for determining the solar parallax by ineans of the transits of Venus.

His principal works are Catalogus Stcllarum Australiwm, London, 1679, the substance of which was embodied in vol. iii. of Flamsteed's Historia

Ceelestis, 1725; Synopsis Astronomie Cometicw, Oxford, 1705 ; Astronomical Tables, London, 1752; also eighty-one mis- cellaneous papers of considerable interest, scattered through the Philosophical Transactions. To these should be added his version from the Arabic (which language he acquired on the purpose) of the treatise of Apollonius De scctione rationis, with a restoration of his two lost books De scctione spatii, both published at Oxford in 1706; also his fine edition of the Conzcs of Apollonius, with the treatise by Serenus De scctione cylindré ct cont, Oxford, 1710, folio, His edition of the Spherics of Menelaus was published by his friend Dr Costard in 1758.

HALLOWEVEN or Hattowe'en, the vigil of Hallow- mas or All Saints' Day. For some account of the singular observances by which it used to be, and to some extent still is, distinguished in Scotland and elsewhere, reference may be made to such works as Brand's Popular Antiquities, Chambers's Book of Days, or better still to the well-known poem of Burns. 'Though sometimes neglected in modern practice, the most essential part of Hallowe'en ritual seems to consist in the lighting by each household of a bonfire at nightfall. This points to the very ancient and widely- diffused practice of kindling sacred fires at certain seasons of the year. While the Germanic uations had their Oster- feuer and Johaunisfeuer, the Celtic had their Bealtine or Beiltine (see BELTANE) and Samhtheine, the former on the eve of May 1, and the latter on tlie eve of November 1. Probably the winter as well as the summer festival was from the beginning regarded as a season at which the fairies were both unusually active and unusually propi- tious; but there is no evidence to show that the methods of divination at present usually resorted to, although of great antiquity, were originally regarded as limited in their efficacy to any one day. See Grimm's Deutsche Mythologie, ch, xx. (Elemente), and ch. xxxiv. (Aberglaube).

HALLUIN, a town of France, in the department of Nord and arrondissement of Lille, and 11 miles N.N.E. of Lille, 1s situated near the right bank of the Lys. It contains several religious and benevolent institutions, including a hospital. The manufactures comprise linen and cotton goods, bricks, and oil. The family of Halluin or Halowin 1s mentioned as early as 1266. Baron Walter II. was one

of the forty hostages sent to England in 1360 in exchange for the French King John. George of Halluin or Halowin was a geueral in the service of Henry V., and an ambassador to England. He died in 1537, leaving several treatises in Latin. The family, to which the title of duke had been granted in 1581, became extinct about the middle of the 17th century. Population of the town (1876),

8584.

HALMSTAD, the chief town of the Swedish lin Halland or Halmstad, is situated on the east shore of the Cattegat, about 76 miles $.8.E. of Gothenburg, and at the mouth of the river Nissa. The castle is the residence of the gover- nor of the province. Mention of the church of Halmstad occurs as early as 1462, and the fortifications are men- tioned first in 1225. The latter were demolished in 1736. The Dominican and Franciscan monasteries, formerly in the town, are now quite destroyed. The harbour, built in 1837-40, at a cost of about £5250, admits ships of 10 feet draught, by means of which some trade in deals, pitch, and tar is carried on. The salmon-fishery is important. An archeological society holds its meetings in Halmstad, and the popular magazine Svenska Family Journalen is pub- lished there. There are both mineral and sea-water baths in the neighbourhood. The oldest town-privileges of Halmstad date from 1307, while the first recorded event in its military history is the battle of Nissa, between Harold

Hardrada and Sven Ulfsson. During the revolt of the miner Engelbrekt, it twice fell into the hands of the rebels —in 1434 and 1436, The town appears to have been frequently chosen as the meeting-place of the rulers and delegates of the three northern kingdoms; and under the union of Calmar it was appointed to be the place for the election of a new Scandinavian monarch whenever necessary. The lin of Halland formed part of the territory of Denmark in Sweden, and accordingly, in 1534, during his war with the Danes, Gustavus Vasa assaulted and took its chief town. In

1660, by the treaty of Copenhagen, the whole district was ceded to Sweden. In 1676 Charles XII. defeated

near Halmstad a Danish army, which was attempting to retake the district, and since that time Halland has formed part of Sweden. The population of the town in 1875 was

7136.

HALO (Latin, halo; Greek, ddws), a luminous circle of light surrounding one of the heavenly bodies. A better definition perhaps would be "a ring of coloured light formed by refraction, on the passage of light from one of the heavenly bodies through the aqueous vapour surrounding the earth." This would include corone and rainbows, and similar phenomena.

Halos may be divided into the following classes :—

A. Simple. Te Eneircbinge:.. csises 90%. B. Compound, 7.¢., halo systcms. C. Corone. a. Rainbows. } B. Fog-bows and mist halos. y. Mountain spectres.

They are usually seen surrounding the sun or the moon, but in the tropics small halos were observed by Humboldt round the planet Venus. The formation of encircling halos of the classes A and B is generally attributed to refraction and reflexion of the rays of light by the presence of minute snow crystals in the upper strata of the air, and they occur usually when cirrus or cirro-stratus clouds exist. This theory was originated by Descartes, and was adopted by Marriotte (in 1686), and subsequently followed by Dr Young and Sir Isaac Newton. Itis, however, probable that some halos and certainly all coronz (class C) are formed by refraction of light from globules of water suspended in the atmosphere. Simple halos are either about 224 degrees or 47 degrees in diameter. The ice or snow crystals, being

| hexagonal in form, somtimees produce a double refraction,

BO PPOsibey…0..Jcterseseee

and then the large and small halos are seen at the same time, and, reflexion taking place from the surfaces of the | crystals, additional halos or parts of halos are formed as in

Fig. 1.—Solar halos and parhelia seen at Brighton, June 5, 1875, by F.E. Sawyer, from 4 to 5.45 p.m. The halo a was a large one, having the zenith for its centre and going entirely round the heavens. It wasa white band, and passed through the sun and the mock suns. The parhelia were of prismatic colours and had flaming tails.

figs. 1 and 2. At the points of intersection of the halos,

images of the sun or moon sometimes appear; when seen

with the former, they are called parhelia or mock-suns, and when with the latter,

paraselene or mock-

moons. They are some-

times accompanied with WY

flaming tails, and are SY .

usually of prismatic

colours, as also are the

halos and corone., The

latter are seen when

fleecy clouds or mist aut

intervene between the °

spectator and the sun

or moon, to which they “°R‘4°N

in i i yxj- Fie. 2—Halo system observed at Aberdeen are in immediate proxy January 23, 1870, at 2 1.m. (sce Symons’s

mity, thereby being Monthly Meteorological Magazine, 1870, pp. 1 distinguished from the “4°, and frontispiece).

halos, which are formed at a distance from those luminaries. The predominating colour in corone is red or orange.

The second principal division of halus includes those which are seen opposite to the sun and moon. The first class of these comprises rainbows (a), which are occasioned | by refraction of the light from the sun or moon, produced by falling rain, causing a bow with the prismatic colours in concentric bands and arranged as they appear in the solar spectrum. When the rain is abundant an inner bow is formed, the colours in which are in inverted order. Rainbows when seen from mountain tops and the topmasts of ships are completely circular. Fog-bows and mist halos (8) are somewhat similar. The former are frequently white in colour, and are seen in the English Channel, and also off the banks of Newfound- land, being called by sailors “ fog-eaters,” from their in- |

Fig. 3.—A mountain spectre as seen by F. E. Sawyer on the Rigi, shortly after sunrise, August 18, 1877.

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dicating a dispersion of the fog or mist. They appear to be formed in a horizontal or very oblique plane. Mist halos are seen in the vapour of fountains or waterfalls, and resemble rainbows. Mountain spectres(y) are caused by reflexion, and often appear accompanied by chromatic halos (see fig. 3). They generally occur on mountains when the sky between the observer and the sun is clear and there is a mist or cloud on the side of the mountain opposite to the sun, on which the summit of the mountain and the buildings and persons standing near are reflected. The most notable of

mountain spectres is that of the Brocken, in the Harz mountains. Howitt says of this :—

***1f the fog is very dry, you see not only yourself but your neigh- bour; if very damp, only yourself, surrounded by a rainbow-coloured glory, which becomes niore lustrous and beautiful the damper and thicker the fog is, and the nearer it approaches."*

Many of the ancient descriptions of miraculous appear- ances in the heavens may be attributed to the phenomena before mentioned. Among the chief of these is the appear- auce of a cross which the emperor Constantine alleged he saw in the leavens about noon when marching against Maxentius (about 313 a.p.), and which was the cause of

Fig, 4.—A system of lunar halos and paraselene figured in Buchan's Meteorology, p. 193

his conversion to Christianity (Eusebius, Vita Constant., i. 27). Some writers have doubted the occurrence; but it is quite possible Constantine saw part of a system of solar halos, and two of these at right angles would form a cross (see fig. 4). The Brighton Herald of April 10, 1852, records a similar phenomenon on April Ist of that year at Brighton :—

' Sun setting, evening very fine with slight haze westward, when a ray of brilliant light shot upwards about 20 degrees above the horizon, directly perpendicular from the sun, and soon after its appearance it was crossed by a horizontal band of light of a paler colour, but about the some breadth. It formed a perfect cross, and lasted half an hour." %*

Halos and rainbows are considered valuable prognostica- tions of future weather. Fragments of rainbows seen on detached clouds are called wind-dogs, and are said to be a sign of wind. When the diameter of a corona contracts it shows the water particles are uniting into larger ones which may fall in rain, whereas if the corona extends, the particles are growing smaller, indicating increasing dryness. The open side of a halo is in some places considered to foretell

the quarter from which bad weather may be expected.

See M. A. Bravais, “ Mémoire sur les Halos et les Phénoménes

| optiques qui les accompagnent”’ (Jowrnal de l’Ecole Royale Polytech-

nique, 31 cahier, tome 18, Paris, 1847); Buchan, Introductory Text- Book of Meteorology, 1871; Proc. Met. Soc., 1875, vol. ii., new ser., pp. 438 to 444. (F. E. S.) HALS, Frans, was born at Antwerp according to most authorities in 1584, and died at Haarlem in 1666. Asa portrait painter second only to Rembrandt, he displayed extraordinary talent and quickness in the exercise of his art coupled withimprovidence in the use ofthe means which that art secured tohim. Ata time when the Dutch nation fought for independence and won it, Hals appears in the ranks of its military guilds.) He was also a member of the chamber

of rhetoric, and (1644) chairman of the painters’ corporation at Haarlem. But as a man he had failings unhappily coin- mon to persons of his professon in that age. He so ill- treated his first wife that she died prematurely in 1616 ; and he barely saved the character of his second by marry- ing her in 1617. Another defect was partiality to drink, which led him into low company. Still he brought up and supported a family of ten children with success till 1654, when the forced sale of his pictures and furniture, at the suit of a baker to whom he was indebted for bread and money, brought him to absvlute penury. Subse- quently to this he was reduced to still greater straits, and his rent and firing were paid by the municipality, which afterwards gave him (1664) an annuity of 200 florins. We may admire the spirit which enabled him under these circumstances to produce some of his most striking produc- tions. We regret to find his widow seeking outdoor relief from the guardians of the poor and dying obscurely ina hospital.

Hals’s pictures illustrate the various strata of society into which his misfortunes led him. His banquets or meetings of officers, of sharpshooters, and guildsmen are the most interesting of his works. But they are not more characteristic than his low-life pictures of itinerant players and singers. His portraits of gentlefolk are true and noble, but hardly so expressive as those of fishwives and tavern heroes. His first master was Van Mander the painter

and historian,' of whom he possessed some pictures which went to pay the debt of the baker above alluded to. But he soon left behind him the practice of the time illustrated by Schoreel and Moro, and, emancipating himself gradually from tradition, produced pictures remarkable for truth and dexterity of hand. We prize in Rembrandt the golden glow of effects based upon artificial contrasts of low light in immeasurable gloom. Hals was fond of day- light of silvery sheen. Both men were painters of touch, but of touch on different keys. Rembrandt was the bass, Hals the treble. The latter is perhaps more expressive than the former. He seizes with rare intuition a moment in the life of his sitters. What nature displays in that moment, he reproduces thoroughly in a very delicate scale of colour, and with a perfect mastery over every form of expression. He becomes so clever at last that exact tone, light and shade, and modelling are all obtained with a few marked and fluid strokes of the brush.

In every form of his art we can distinguish his earlier style froin that of later years. Two Boys Playing and

pinging in the gallery of Cassel, and a Banquet of Officers 1616) in the museum of Haarlem, exbibit him as a careful draughtsman capable of great finish, yet spirited withal. His flesh, less clear than it afterwards becomes, is pastose and burnished. Further on he becomes more effective, displays more freedom of hand, and a greater command of effect. At this period we note the beautiful full length of a young lady of the Berensteyn family in the house of that name at Haarlem, and a splendid full length of a Patrician leaning on a Sword in the Lichtenstein collection at Vienna. Both these pictures are equalled by the Banquets of Officers of 1627, and a Meeting of the Company of St George of 1633 in the Haarlem Museum. A picture of the same kind in the town-hall of Amsterdam, with the date of 1637, suggests some study of the masterpieces of Rembrandt, and a similar influence is apparent in a picture of 1641 at Haarlem, representing tlie "Regents" of the Company of St Elizabeth. But Rembrandt's example did not create a lasting impression on Hals. and silvery harmonies of tone; and two of his canvases, executed in 1664, the Regents and Regentesses of the Oudemannenhuis at Haarlem, are masterpieces of colour, taough in substance all but monochromes.

He gradually dropped more and more into grey |

HAL—HAL

There are portraits by Hals in many Continental galleries. Comparatively few have found their way to England. Sir Riehard Wallaee's Cavalier, Lord Chesterfield's Toper, Lord Radnor's Like- nesses of an Old Man and Woman, are the best that we ean point out. Abroad a better selection may be found. At Amsterdam is the celebrated Flute Player, onee in the Dupper collection at Dort, aud the pair ealled Hals and his Wife; at Brussels, the patrician Heythuysen; at the Louvre, Descartes; at Dresden, the painter Van der Vinne. Hals's sitters were taken in every elass of society, —admirals, generals, and burgomasters pairing with merehants, lawyers, elerks. To register all that we find in publie galleries would involve mueh spaee. There are nine portraits at Berlin, five at Frankfort, six at Cassel, five at St Petersburg, three at the Louvre, two at Brussels, four at Dresden, two at Gotha. In private colleetions, ehiefly in Paris, Haarlem, and Vienna, we find an equally important number. Amongst his most sueeessful repre- sentations of fishwives and termagants we should distinguish the Hille Bobbe of the Berlin Museum, and the Hille Bobbe with her Son in the Dresden Gallery. Itinerant players are best illustrated in the Neville-Goldsinith colleetion at the Hague, and the Six eol- leetion at Amsterdam. Boys and girls singing, playing, or laugh- ing, or men drinking, are to be found in the gallery ot Sehwerin, in the Arenberg eolleetion, and in the royal palace at Brussels. The latest works of Hals in each of these branehes are distinguished by comparatively black shadow.

Of the master's numerous family none has left a name except Frans Hals the younger, born about 1622, who died in1669. His pictures represent cottages and poultry; and the Vanitas at Berlin, a table laden with gold and silver dishes, cups, glasses, and books is one of his finest works aud deserving of a passing glance.

Quite in another form, and with much of the freedom of the elder Hals, Dirk Hals, his brother (born at Haarlem, died 1656), isa painter of festivals and ball-rooms. But Dirk had too much of tlie freedom and too little of the skill in drawing which characterized his brother. He remains second ou his own ground to Palamedes. A fair specimen of his art is a Lady playing a

Harpsichord to a Young Girl and her Lover in the Van der Hoop collection at Amsterdam. More characteristic, but not better, is a large company of gentlefolk rising from dinner, in the academy at Vienna.

HALSTEAD, a market-town of England, county of Essex, is situated on the Colne Valley Railway and on a steep acclivity rising from the river Colne, 48 miles N.E. of London. Though irregularly built it has a neat appearance, and most of the streets are wide and clean. 'The principal buildings are the parish church, a fine Gothic edifice in the Perpendicular style, containing a monument supposed to be that of Sir Robert Bourchier, lord chancellor to Edward TIL; the church of the Holy Trinity, in the Early English style, erected in 1844; the Lady Mary Ramsay's grammar school, tle mechanics' institute, and the corn exchange. The principal industries are the manufacture of silk, crape, and velvet. Straw plaiting, at one time the principal occupation of the women, is now nearly extinct. The population of the town in 1871 was 5783, and of the parish

6904,

HALYBURTON, Tuomas (1674-1712), a distinguished Scottish divine, was born at Dupplin, near Perth, on the 25th of December 1674. His father, one of the ejected ministers, having died in 1682, he was taken by his mother in 1685 to Rotterdam, where he for some time attended with advantage the school founded by Erasmus. On his return to his native country in 1687 he completed his elementary education at Perth and Edinburgh, and in 1692 entered the university of St Andrews. In 1700 he was ordained minister of the parish of Ceres, and in 1710 he | was recommended by the synod of Fife for the chair of theology in St Leonard's College, St Andrews, to which accordingly he was appointed by Queen Anne. After a brief term of active professorial life he died in 1712. The works by which he continues to be known, especially | in Scotland, were all of them published aftcr his death.

HAM—HAM

The treatise entitled Natural Religion Insufficient, and Nevealed Necessary, to Man's Happiness in his present State (1714) is an able reply to some of the arguments of Lord Herbert and of Blount; the Great Concern of Salvation (1721), still read, handles questions of practical and experi-

mental religion with great earnestness and in a manner that exhibits favourably one of the best types of piety current in his time; the Afemoirs written by himself, which have been frequently reprinted, are similarly interesting and valuable.

HAM (8M), the second son of Noah (Gen. v. 32), and the progenitor of Cush, Mizraim, Phut, and Canaan (Gen. x. 6). On the assumption that these early genealogies are geographical rather than personal or even ethnological, the name Ham, which in Hebrew radically signifies ‘ hot,” would seem to indicate the torrid zone ; and this inference, though not supported, so far as has been hitherto dis- covered, by any corresponding explanation of the names of Shem and Japheth, at least harmonizes well with the fact that on the whole Shem seems intended to denote the in- termediate and Japheth the northern regions of the world as known to the compiler of the Book of Genesis. The attempt has sometimes been made to identify Ham with Keme or Chemi, an old native name of Egypt, signifying “ black,” and having reference, it is supposed, to the colour of the soil. But tliis identification has no adequate etymo- logical support (see Lepsius in Herzog and Plitt’s Zncyhl., i. 166); and the allusions in several of the Psalms to Egypt as the land of Ham (Ps. ev. 23, evi. 22) are not inconsistent with the belief that the latter name was primarily used in a much wider and less local sense. The solitary incident regarding Ham related in Gen. ix. 20-27 seems intended to indicate, from the Israelite point of view, tle immodest and sensual tendencies of the Canaanites and other “ Hamitic ” peoples.

HAM, a small town of France, in a marshy district on

the left bank of the Somme, about 40 miles south-east |

of Amiens, on the railway between Amiens and Rheims. It had in 1876 a population of only 3122 ; but historically it is a place of very considerable importance. From the 9th century onwards it appears as the seat of a lordship which, after the extinction of its hereditary line, passed in succession to the houses of Coucy, Enghien, Luxembourg, Rohan, Vendéme, and Navarre, and was finally united to the French crown on the accession of Henry IV. In 1108 an abbey of canons regular of the congregation of France was founded at Ham; and it continued to exist till the great Revolution, the revenue of its abbot about that time amounting to 15,000

livres. The abbey church (Notre Dame) dates from the 12th century, but in April 1760 all the inflammable portions of the building were destroyed by a conflagration caused by lightning, and during the present century a process of restoration has been carried out under the direction of M. Corroyer. Of special note are the bas reliefs of the nave and choir, executed in the 17th and 18th centuries, and the crypt of the 11th century, which contains the sepulchral effigies of Odo of Ham and his wife Isabella of Béthencourt. The castle, founded by Odo in the 12th century, was rebuilt in the 13th and extended in the 14th, and its present appearance is mainly due to Louis of Luxembourg, count of St Pol, who between 1436 and 1470 not only furnished it with outworks, but gave such a thickness to the towers and curtains, and more especially to the great tower or donjon which still bears his motto Mon Myeux, that they would offer a long resistance even to modern artillery (Viollet-le-Duc). It forms a rectangle 395 feet long by 263 feet broad, with a round tower at each angle and two square towers protecting the curtains. The eastern and western sides are each defended by a demi-lune. The Constable's Tower, for so the great tower is

usually called in memory of St Pol, has a height of about 100 feet, and the thickness of the walls is 36 feet ; the interior is occupied by three large hexagonal chambers in as many stories. As the castle of Ham has frequently been used as a state prison both in ancient and modern times, the list of those who have tasted its hospitality is an interesting one, including Joan of Arc, Louis of Bourbon, the ministers of Charles X., Louis Napoleon, Cavaignac, and Lamoriciére. Louis Napoleon was there for six years, and at last effected his escape in the disguise of a workman. During 1870-71 Ham was several times captured and recaptured by the belligereuts.

A view and plan of the town will be found in Caspar Merian's Topographia Gallic, Frankfort, 1656 ; and the former is copied in

the Gentleman's Magazine, 1831. See also De Feuillide, Le Chdicau de Ham, 1842; and Ch. Gomart, Ham, son chdteau, 1864.

HAMADAN, a town of Persia, in the province of Irak- Adjemi, 162 miles W.S.W. of Teheran, in the district of the Djebal at the foot of the Elvend or

Arwand Mountain, the Orontes of the ancients. Itisa busy place of about 50,000 inhabitants, and has large and well-stocked bazaars. Its principal industry is the manufacture of copper wares. Gold is collected in the streams traversing the town, and the surrounding country is remarkable for its beauty and fertility. Every quarter is shut off from its neighbours by gates which are closed at night. The chief objects of interest are the tombs of Esther and Mordecai, and of the Arabian philosopher Avicenna. The former, constructed of black woced, are adorned witli Hebrew inscriptions which may be seen figured in Ker Porter's 7ravels, According to tliese, the pavilion or temple over the tombs was erected in the year of the creation 4474. The ordinary inhabitants of Hainadan attach more importance to a stone image ofa lion which they assert was set up by Belinas a magician, to mitigate the cold from which their city suffers severely. " Hamadan," says Hamadani, echoing a common [Persian complaint, "is the most hateful of towns; its children are old men for ugliness, and 'its old men are children for silliness." At the same time the town has produced many eminent men, among whom are Abu 71 Fadhl Ahmed Hamadani hiinself, Zafer ed Din the Persian poet, and Zamiri. The origin of the city is carried back by Hischam el Kelbi to Hamadan a grandson of Shem, but other writers are contented with a less antiquity. Its claims to be identified with the Ecbatana of the classical authors have been treated of under Ecpatana. The present town has almost no ancient remains, and especially there are no sculptured works. See Meynard, Dictionnaire géo- graphique de la Perse.

HAMAH, the Hamatb of the Bible, one of the oldest cities of Syria (Gen. x. 18), situated in the valley of the Orontes, 110 English miles N. (byE.) of Damascus. It finds a place among the northern boundaries of the Holy Land (Num. xxxiv. 8), and is frequently mentioned in Old Testa- ment history(Num. xiii. 21, 2 Sam. viii. 9, 1 Kings vin. 65, 2 Kings xviii. 34, 2 Chron. viii. 3, Isa. x. 9, Amos vi. 2). The city lies in a narrow valley, the pass south of it being

. . EP, probably the " entering in of Hamath" (1 Kings vin. 65). The Orontes flows winding through it, and 1s spanned by four bridges. On the south-east the houses rise 150 feet above the river, and tliere are four other hills, that of the Kalah or castle being to the north 100 feet high. Twenty- four minarets rise from the various mosques. The houses are principally of mud,

and the town stands amid poplar gardens with a fertile plain to the west. The castle is ruined, the streets are narrow and dirty, but the bazaars are good, and the trade with the Bedawin considerable. The numerous water-wheels (radrah), of enormous dimen- sions, raising water from the Orontes are tlie most remark- able features of the view. The population is stated in XI, — 51

official returns to consist of about 39,000 Moslems and 4000 non-Moslems. The curious Hamath inscriptions first men- tioned by Burckhardt have lately attracted much attention. Four stones exist covered with ideographic designs in a character as yet quite unknown. The latest researches of Mr George Smith, however, indicate that the inscriptions are probably of Hittite origin, and other relics of that once powerful nation resembling the Hamath stones have been

discovered farther east.

In the year 854 B.c. (according to the late George Smith) Hamath was taken by Shalmaneser, king of Assyria, who defeated an army of 1400 chariots and 10,000 footmicn under Irhuleua, king of the district. Again in 743 B.c. Tiglath Pileser II. reduced the city to tribute, and in 740 B.c. he defeated the Hamathites, who were assisted by Azariah, king of Judah. Another rebellion was crushed by Sargon in 720 B.c. After the Macedonian eonquest of Syria Hamath was called Epiphania by the Greeks in honour of Antiochus IV., Epiphanes, and in the early Byzantine period it was known by both its Hebrew and its Greek name. In 639 a.pD. the town sur- rendered to Abu 'Obeideh, one of Omar's generals, and the church was turned into a mosque. In 1108 a.p. Tancred captured the eity and massaered the Ism'aileh defenders. In1115 it was retaken by the Moslems, and in 1178 was occupied by Saladin. Abulfeda, prince of Hamah in the early part of the 14th century, is well known as an authority on Arab geography.

HAMANN, Jowann Georc (1730-1788), a distin- guished writer on philosophical and theological subjects, was born at Kénigsberg in Prussia in 1730. His parents were of humble rank and small means. The education he received was comprehensive but unsystematic, and the waut of

definiteness in this early training doubtless tended to aggravate the peculiar instability of character which troubled Hamann's after life. In 1746 he began theological studies, but speedily deserted them and turned his attention to law. That too was taken up in a desultory fashion and quickly relinquished. Hamann seems at this time to have thought that any strenuous devotion to " bread-and-butter " studies was lowering, and accordingly gave himself entirely to read- ing, criticism, and philological inquiries. Such studies, how- ever, were pursued without any definite aim or systematic arrangement, and consequently were productive of nothing. In 1752, constrained to secure soine position in the world, he accepted a tutorship in a family resident in Livonia, but only retained it a few months. A similar situation in Courland he also resigned after about a year. In both cases apparently the rupture might be traced to the curious and unsatisfactory character of Hamann himself. After leaving his second post he was received into the house of a merchant at Riga named Berens, who contracted a great friendship for him and selected him as his companion for a tour through Dantzic, Berlin, Hamburg, Amsterdani, and London. Hamann, however, was quite unfitted for business, and, when left in London, gave himself up entirely to his fancies, and was quicklyreduced to astate of extreme poverty and want. It was atthis period of his life, when his inner troubles of spirit harmonized with the unhappy external conditions of his lot, that he began an earnest and prolonged study of the Bible; and from this time dates the tone of extreme pietism which is characteristic of his writings, and which undoubtedly alienated many of his friends. Ife returned to Riga, and was well received by the Berens family, in whose house he resided for some time. A quarrel, the precise nature of which is not very clear though the occasion is evident, led to an entire separation from these friends. In 1759 Hamann returned to K6nigsberg,

and lived for several years with his father, filling occasional | posts in Kénigsberg and Mitau. In 1767 he obtained a |

situation as translator in the excise office, and ten years later a post as storekeeper in a mercantile house. During this period of comparative rest Hamann was able to indulge in the long correspondence with learned friends which seems to have been his greatest pleasure. In 1784 the failure of some commercial speculations greatly reduced his means,

and about the same time he was dismissed with a small pension from his situation. The kindness of friends, how- ever, supplied provision for his children, and enabled him to carry out the long-cherished wish of visiting some of his philosophical allies. He spent some time with Jacobi at Pempelfort and with Buchholz at Walbergen. At the latter place he was seized with illness, and died on the 21st June 1788.

Hamann's works resemble his life and character. They are en- tirely unsystematic so far as matter is concerned, chaotic and dis- jointed in style. To a reader not aequainted with the peculiar nature of the man, which led him to regard what commended it- self to him as thevefore objectively true, they must be moreover entirely unintelligible and, from their peculiar pietistic tone and scriptural jargon, probably offensive. A place in the history of philosophy can be yielded to Hamann only because he expresses in uncouth, barbarous faslrion an idea to which other writers have given more effective shape. The fundamental thought is with him the unsatisfactoriness of abstraction or onesidedness. The Aufkld- rung, with its rational theology, was to him the type of abstraction. Even Epicureanism, which might appear concrete, was by him rightly designated abstract. Quite naturally, then, Hainann is led to objeet strongly to much of the Kantian philosophy. The sepa- ration of sense and understanding is for him unjustifiable, and only paralleled by the extraordinary blunder of severing matter and form. Coucreteness, therefore, is the one demand which Hamann expresses, and as representing his own thought he used to refer to Giordano Bruno's conception of the identity of contraries. The demand, however, remains but a deniand. Nothing that Hamann has given can be regarded as in the slightest degree a response to it. His hatred of system, incapacity for abstract thinking, and intense personality rendered it impossible for him to do inore than utter the disjointed, oracular, obscure dicta which gained for him among his friends the name of " Magus of the North." 'Two results only appear throughout his writings,—first, the accentuation of belief, and, secondly, the transference of many philosophical difficulties to language. Belief is, aceording to Hamann, the groundwork of knowledge, and he accepts in all sincerity Hume's analysis of ex- perience as being most helpful in constructing a theological view. In language, whicl: he appears to regard as somehow acquired, he finds a solution for the problems of

reason which Kant had discussed in the Critique. On the application of these thoughts to the Christian theology one need not enter.

None of Hamann's writings are of great bulk ; most are mere pamphlets of some thirty or forty pages. A complete collection has been published by Roth (Schriften, 8vo, 1821-42), and by Gildemeister (Leben wnd Schriften, 6 vols., 1851-73). See also Petri, Hamann's Schriften u. Briefe, 4 vols. , 1872-8 ; Poel, Hamann, der Magus im Norden, sein Leben wu, Mittheilungen aus seinen Schriften, 2 vols., 1874—76. A very comprehensive essay on Hamaun is to be found in Hegel's Vermischte Schriften, ti. (Verke, bd. xvii.).

HAMASAH (more correctly HaMAsEH), the naine of a famous Arabian anthology compiled by Habib ibn Aus et- Tai, surnamed Abii Temmém (corruptly ABu-Temany, g.v.). The collection is so-called from the title of its first book, con- taining poems descriptive of constancy and valour in battle, patient endurance of calamity, steadfastness in seeking vengeance, manfulness under reproach and temptation, all which qualities make up the attribute called by the Arabs haméiseh (briefly paraphrased by Et-Tebrizi as esh-shiddeh jil-amr). It consists of ten books or parts, containing in all 884 poems or fragments of poems, and named respect- ively—(1) Zl-Hamdseh, 261 pieces; (2) El-Mardthi, "Dirges," 169 pieces ; (3) £7-Adab, " Manners," 54 pieces ; (4) Ln-Nesib, "The Beauty and Love of Women," 139 pieces ; (5) Hl-Hijd, "Satires," 80 pieces ; (6) El-Adydf wa-l-Medih, " Hospitality and Panegyric," 143 pieces ; (7) Ls-Sifat, © Miscellaneous Descriptions," 3 pieces ; (8) £s-Seyr wa-n-Nods, "Journeying and Drowsiness," 9 pieces; (9) £l-Mulah, " Pleasantries," 38 pieces; and (10) Medhemmet-en-nisi, " Dispraise of Women," 18 pieces. Of these books the first is by far the longest, both in the number and extent of its poems, and the first two together make up more than half the bulk of the work. The poems are for the most part fragments selected from longer com- positions, though a considerable number are probably entire. They are taken from the works of Arab poets of all periods

down to that of Abi Temmam himself (the latest as- certainable date being 832 a.p.), but chiefly of the poets of the Ante-Islamic time (Jihzliyydn),

those of the early days of El-Islam (Mukhadrimdn), and those who flourished during the reigns of the Umawt caliphs, 660-749 a.p. (islamiyydin). Perhaps the oldest in the collection are those relating to the war of Basis, a famous legendary strife which arose out of the murder of Kuleyb, chief of the com- bined clans of Bekrand Teghlib, and lasted for forty years, ending with the peace of Dhu-l-Mejaz, about 534 a.p. Of the period of the "Abbast caliphs, under whom Abt Temmam himself lived, there are probably not more than sixteen fragments.

Most of the poems belong to the class of extempore or occasion1l utterances, as distinguished from gasétdehs, or elaborately finished odes. While the latter abound with comparisons and long descriptions, in which the skill of

the poet is exhibited with much art and ingenuity, the |

poems of the Hamédseh are short, direct, and for the most part free from comparisons ; the transitions are easy, tlie metaphors simple, and the purpose of the poem clearly indicated. It is due probably to the fact that this style of composition was chiefly sought by Abii Temmam in com- piling his collection that he has chosen hardly anything trom the works of the most famous poets of antiquity. Not a single piece from Imra'el-Qeys occurs in the Handseh, nor are there any from 'Alqameh, Zulieyr, or El-A'sha; En-Nabighah is represented only by two pieces (pp. 408 and 742 of Freytag's edition) of four and three verses respectively, "Antarah by two pieces of four verses each (/d., pp. 206, 209), Tarafeh by one piece of five verses (fd., p. 632), Lebid by one piece of three verses (/d., p. 468), and 'Amr son of Kulthim by one piece of four verses (/d., p. 236). The compilation is thus essentially an anthology of minor poets, and exhibits (so far at least as the more ancient poems are concerned) the general average of poetic utterance at a time when to speak in verse was the daily habit of every warrior of the desert.

To this description, however, there is an important excep- tion in the book entitled Hn-Nestb, containing verses relat- ing towomen andlove. In the classical age of Arab poetry it was the established rule that all gastdehs, or finished odes, must begin with the mention of women and their charms (¢eshbib), in order, as the old critics said, that the hearers

might be softened and inclined to regard kindly the theme which the poet proposed to unfold. The fragments included in this part of the work are thiere- fore generally taken from the opening verses of gasidehs ; where this is not the case, they are chiefly conipositions of the early Islamic period, when the school of exclusively erotic poetry (of which the greatest representative was "Omar son of Abii Rabi'ah) arose.

The compiler was himself a distinguished poet in the style of lis day, and wandered through many provinces of the Muslim empire earning money and fame by his skill in panegyric. About 220 a.m. he betook himself to Khurasan, then ruled by 'Abd-allah son of Tahir, whom he praised and by whom he was rewarded; on his journey home to El-Traq he passed through Hamadan, and was there detained for many months a guest of Abu.l-Wafa son of Selemeh, the road onward being blocked by heavy falls of snow. During his residence at Hamadin Abi Temmam is said to have compiled or composed, from the materials which he found in Abu-l-Wafa's library, five poeti- eal works, of which one was the Zamdseh. This collection remained as a precious heirloom in the family of Abu-l- Wafa until their fortunes decayed, when it fell into the hands of a man of Dinawar named Abu-l'AwAdhil, who earried it to Isfahan and made it known to the learned of that city.

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| The worth of the Hamdseh as a store-house of ancient legend, of faithful detail regarding the usages of the pagan time and early simplicity of the Arab race, can hardly be exaggerated. The high level of excellence which is found in its selections, both as to form and matter, is re- markable, and caused it to be said that Abi Temmam dis- played higher qualities as a poet in his choice of extracts fron the ancients than in his own compositions. What strikes us chiefly in the class of poetry of which the Hamédseh is a specimen, is its exceeding truth and reality, its freedom from artificiality and hearsay, the evident first- hand experience which the singers possessed of all of which they sang. For historical purposes the value of the collec- tion is not small; but most of allthere shines forth from it a complete portraiture of the hardy and manful nature, the strenuous life of passion and battle, the lofty contempt of cowardice, niggardliness, and servility, which

marked the valiant stock who bore El-Islam abroad in a flood of new life over the out-worn civilizations of Persia, Egypt, and Byzantium. It has the true stamp of the heroic time, of its weaknesses and crime as of its strength and beauty.

No less than twenty commentaries on it are enumerated by Hajt Khalifeh. Of these the earliest was by Abfi Riyash (otherwise Er- Riyashi), who died in 257 a.u. ; excerpts from it, chiefly in eluci- dation of the circuinstances in which the poems were composed, are frequently given by Et-Tebrizi. He was followed by the famous grammariau Abu-l-Fath ibn el-Jinut (died 392 a.u.), and later by Shihab ed-Din Ahmed el-Marziqi of Isfahin (died 421 a.u.). Upon El-Marztiqi's commentary is chiefly founded that of Abd Zekeriyé Yahya et-Tebrizt (born 421 A.n., died 502), which has been published by the late Professor G. W. Freytag of Bonn, together with a Latin translation and notes (1828-1851). This monumental work, the labour of a life, is a treasure of information regarding the classical age of Arab literature which has not perhaps its eqnal for cxtent, accuracy, and minuteness of detail, in Europe. No other complete edition of the Hamdsch has been printed in the West ; but in 1856 one appeared at Calcutta under the names of Maulavi Ghulam Rabbani and Kabiru-d-din Ahmad. Though no acknowledgment of the fact is contained in this edition, it isa simple reprint of Professor Freytag's text (without Et-Tebrizi'scommentary), and follows its original even in the misprints (corrected by Freytag at the end of the second volume, whic being in Latin the Calcutta editors do not seem to have consulted). It is thus worthless as a fresh critical authority, and, owing to the absence of a commentary, of little use to the student ; its only merit is that it contains in an appendix of 12 pages a collection of verses (and some entire frag- ments) not found in Et-Tebrizi's recension, but stated to exist in some copies consulted by the editors ; these are, however, very care- lessly edited and printed, and in many places unintelligible.

The Hamdseh has been rendcred with the utmost skill and spirit into German verse by the illustrious Friedrich Riickert (Stuttgart, 1846), who has not ouly given translations of almost all the poems proper to the work, but has added numerous fragments drawn from other sources, especially those occurring in the Scholia of Et-Tebrizi, as well as the Mo'allagahs of Zuheyr and 'Antarah, the Ldiniyyeh of Esh-Shenfera, and the Banet So'ad

of Ka‘b son of Zuheyr. No such faithful interpretation of the ways and thoughts of the ancient Arabs exists to our knowledge in any modern European language ; it is comparable, for fidelity, spirit, and fluency, only to Lane’s translation of the Thousand and One Nights.

When the Hamdsch is spoken of, that of Abii Temmam, as the first and most famous of the name, is meant; but several collec- tions of a similar kind, also called Hamdsch, exist. The best known and earliest of these is the Hamdsch of El-Bohturi (died 284 A.H.), of which some fragmeuts were published by Theo, Néldeke in his Bettrdge zur Kenntniss der Poeste der alten Araber (Hanover, 1864). Four other works of the same name, formed on the model of Abfi Temmam’s compilation, are mentioned by Haji Khalifeh, Besides these, a work entitled Hamdset er-Rah (the Haimaseh of wine), was composed by Abu-l-‘Aliel-Ma‘arri (died 449 A.u.). (C.J. L.)

HAMBATO, a form of the name AmBATO (q.2.).

HAMBURG, a state of the German empire, which con- sists of the city of Hamburg with its incorporated suburbs of St George’s and St Paul’s, the surrounding district with the sixteen suburban hamlets (Vororte), several islands in the Elbe, the five enclaves of Volksdorf, Hansdorf, &c,, in Holstein, the communes of Moorburg in Liineburg and Cuxhaven-Ritzebiittel in the north-west of the duchy of Bremen at the mouth of the Elbe, the island of Neuwerk

about five miles from the coast, and the bailiwick (amé) of Bergedorf, which up to 1867 was held in common by Liibeck and Hamburg. The whole territory has an area of 15718 square miles, exclusive of 99 square miles occupied by the Elbe. Of this area 124 square miles are within the limits of the German customs, but the rest continues to be practically “abroad” in relation to the com- merce of the empire. In 1871 the total population was 338,974; by 1875 it had increased to 388,618 (191,339 males and 197,279 females); by 1877 to 406,014; and by 1878 to 417,239. Administratively the state is divided into the city or metropolitan district, which had 239,107 inhabitants in 1871, the domain of the Geest- land} with 57,216 inhabitants, the domain of the Marscli- land with 22,982, the bailiwick of Bergedorf

with 13,112, and the bailiwick of Ritzebiittel with 6557. Cuxhaven-Ritzebiittel and Bergedorf are the only towns besides the capital, and they had respectively 4102 and 3899 inhabit- ants in 1875. The Geestland comprises the suburban districts of Rotherbaum, Harvestehude, Eimsbiittel, Eppen- dorf, Hohenfelde, Uhlenhorst, Eilbeck, Barmbeck, Winter- hude, Borgfelde, Harum, and Horn, which encircle the city on the north and east; and the Marschland includes various '"'werders,"" such as the Billwerder Ausschlag to the east of the city, the Steinwerder and the Little Grasbrook to the south of the Elbe, the Billwerder, the Ochsenwerder, and the so-called Vierlande or Four Districts (Corslake, Altegamme, Nauegamme, and Kirchwerder) as far east as Geesthacht. While the Geestland has in many places an almost unpro- ductive soil, the Marschland is of extraordinary fertility, and its pastures, corn-fields, and market-gardens furnish Hamburg with large quantities of country produce.

As a state of the empire Hamburg is represented in the federal council by one plenipotentiary and in the diet by three deputies. According to the present constitution, which has been in force since September 28, 1860, the legislative power is in the hands of the senate and the general body of citizens, and the executive is committed to the senate alone. Of the 18 members of the senate no less than 9 must have studied law and finance, and of the remain- ing 9, 7 must be representatives of commerce. The members are chosen by the senate and the burgesses after a complicated process, and the burgess upon whom their choice falls is obliged to accept office for at least six years, on pain of losing his civic rights. The senate by itself has the election of the first and the second burgomaster, each of whom holds office for only a year. There are 196 burgesses, of whom 88 are chosen by ballot by the geueral community, 48 by and from the owners of ground within the town, and 60 by the courts and administrative bodies. They are elected for a period of six years, but as half of each class go out at the end of every three years the elections occur twice as often. Both the senate and the burgesses have the right of introducing new bills. The basis of the civil law is the Jus Hamburgicum, revised in 1603 and supplemented by the Roman law; but in some of the rural districts local customs prevail, and in Bergedorf the Liibeck rights are still partly in force. Hamburg has appeal to the common high court of the Free Cities in Liibeck. There is a special court for commercial disputes. Juries are summoned in the more

important trials; and since 1869 there has been public and responsible prose- cution of criminal cases. The ecclesiastical arrangements

1 Geest is a Platt-Deutsch word signifying " dry," and the Geest- land is consequently the higher and drier district, in contrast to the marsh-land. The surface of the Geestland is composed of sand and erevel, and part of it is occupied by heath.

- *Werder, Warder, or Worth is either equivalent to the old English*

holm," a river-island, or signifies a stretch of flat land between a

river and a piece of standing water, or a portion of a swamp drained and devoted to tillage.

HAMBURG

of Hamburg have undergone great modifications since the general constitution of 1860. From the Reformation to the French occupation in the beginning of this century, Hamburg was a purely Lutheran state ; according to the " Recess" of 1529, re-enacted in 1603, non-Lutherans were subject to legal punishnient and expulsion from the country. Exceptions were gradually made in favour of foreign resi- dents; bunt it was not till 1785 that regular inhabitants were allowed to exercise the religious rites of other denominations, and it was not till after the war of freedom that they were allowed to have buildings in the style of churches. In 1860 full religious liberty was guaranteed, and the identification of church and state abolished. By the new constitution of the Lutheran Church, published at first in 1870 for the city only, but in 1876 extended to the rest of the Hamburg territory, the parishes or communes are divided into three church-districts, and the general affairs of the whole community are entrusted to a synod of 53 members and to an ecclesiastical council] of 9 members which acts as an executive. A central fund for the church was formed in 1870 out of the surplus property of the convent of St Jolin; and in some of the communes there is a church rate. According to the returns of 1871 there were 300,968 Lutherans, 5585 members of other Evangeli- cal Churches, 7771 Roman Catholics, 194 Mennonites, 2696 Christians of other sects, and 13,796 Jews, while 628 described themselves as without religion or*

heathens, and 7071 gave no information as to creed. Since 1871 the ratio of Lutherans to non-Lutherans must have somewhat diminished, The German Reformed Church, the French Reformed, the English Episcopal, the English " Reformed," the Roman Catholic, and the Baptist are all recognized by the state. Civil marriages lave been permissible in Hamburg since 1866, and since the introduc- tion of the imperial law in January 1876 the number of such marriages has greatly increased.

The finances of the state of Hamburg are in a generally satisfac- tory statc ; for, although the public debt has been increasing, this is due mainly to such undertakings as railways, harbour improve- ments, and schools. In 1876 the revenue was estimated at £1,206,161 sterling, in 1877 at £1,264,585, in 1878 at £1,330,550, and in 1879 at £1,384,630 ; and the corresponding expenscs were stated at £1,288,508, £1,358,915, £1,422,175, and £1,507,860. The public debt, which was £6,385,042 in the end of 1874, was reduced by 1878 to £5,325,853. Of the former sum £1,457,775 was the remains of the great conflagration loan of 1842, which originally amounted to £2,550,000.

In 1868 the old civic militia, which then consisted of 7354 men, was dissolved ; all citizens and inhabitants between the ages of 20 and 45 had becn obliged to serve cxcept certain state officials, and school teachers, &c. By convention with Prussia, Hamburg furnishes two battalions to the 2d Hanseatic infantry regiment.

See Statistik des Hamburgischen Staats, 1878; J. Nessmann, Statist. Handbuch

Stir den Hamb. Staat, 1874 and 1876; Gustav Ritter, Zehn Jahre Civilstandsamt tin. Hamburg, 1876.

HAMBURG, one of the most remarkable cities of Germany and indeed of Europe, ranking as it does as the first of all the seats of commerce on the Continent, is situated on the right bank of the northern arm of the Elbe, about 93 miles from the mouth of that river, just where it is joined by the Alster and the Bille. The latitude of the observatory in the western part of the city is 53° 33' 55" N. and the longitude 9° 58' 23:6" E., the latitude of the tower of St Michael's 53° 32' 55-7" N. and the longitude 9° 58' 41:7"

E. Were it not for political and municipal boundaries Hamburg might be considered as forming one town with Altona and Ottensen, the three presenting to the river a continuous frontage of nearly 4 miles ; and Jong lines of suburbs radiate inland in various directions. The city proper lies on both sides of the Alster, which having been dammed up a short distance from its mouth now forms a considerable lake, of which the southern portion within the line of the fortifications bears the name of the Inner Alster (Binnen Alster), and the other and larger portion (2300

metres long and 1200 metres wide at the widest) that of the Outer Alster (Aussex Alster). The fortifications as such were removed in 1815, but they have left their trace in a fine girdle of green round the city, though too many inroads on its completeness have been made by railways and roadways, The oldest portion of the city is that which lies to the east of the Alster; but, though it still retains the name of Altstadt, nearly all trace of its antiquity has disappeared, as it was rebuilt after the great fire of 1842. To the west lies the new town, incorporated in 1678; beyond this and contiguous to Altona is the quondam suburb of St Paul's, incorporated in 1876, and towards the north-east is the quondam suburb of St George, which arose in the 13th century, but was not incorporated till 1868. The old town lies low, and it is traversed by a great number of narrow

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in London nomenclature is used in the Low-German city), which add considerably to the picturesqueness of the meaner quarters, and serve as convenient channels for the transport of goods, They generally form what may be called the back streets, and they are bordered by warehouses,

cellars, and the lower class of dwelling-houses. As they are subject to the ebb and flow of the Elbe, at certain times they run quite dry, and afford a field of operations for the fleetenkieker, who wanders along the oozy channel to pick up any articles of value, and at other times they are filled 15 to 20 feet above their ordinary level. As soon as the telegram at Cuxhaven announces high tide three shots are fired from the Stintfang at the harbour to warn the inhabitants of the " fleets"; and if the progress of the tide up the river gives indication of danger, other three shots add emphasis to the warning. Then the dwellers on the lower levels make a rapid escape

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i 2. ' Plan of Hamburg.

1. Sehiller's Monument. | 4. St James's Chureh. , 8. Johanneum and / 11. Bank. 14. Post-Office. 18. Sailors' Home. 21. Town-House or 2. Adolph von Schaum-| 5. Markt Halle. Town Library. 12. Exehange. 15. Town Theatre, 19. English Episeopal Rathhaus. berg's Monument. | 6. Thalia Theatre. 9. St Catherine's Ch, | 13, Site of Old Town-| 16. Synagogue. Church. 22. Sailors' Poor-

a 3. New Sehool Buildings.| 7. St Peter's Church. [10. St Nieholas Ch. Tall, with their property. At the time of the equinoxes the inundation may be repeated for several days in succession ; but when all is over the people (the Liid von de Water- kant) return like rats to their oozy and dripping abodes. In fine contrast to the dull and dismal fleets is the bright and handsome appearance of the Inner Alster, which is enclosed on three sides by handsome rows of buildings, the Alsterdamm in the south-east, the Old Jungfernstieg in the south-west, and the New Jungfernstieg on the north. west, while it is separated from the Outer Alster by part of the rampart gardens traversed by the railway which unites Hamburg with Altona. These streets and especially the Old Jungfernstieg are fashionable promenades. The largest of the public squares of Hamburg is the Hopfen- markt, which contains the church of St Nicholas, and is the principal market for fish, meat, vegetables, and fruit ;

20. St Michael's Ch. others of importance are the Ginsemarkt or Goose Market, the Zeughausmarkt, and the Great New Market. The churchyards, of which several are pleasantly laid out, are all to be removed to Ohlsdorf, about 4 miles from the town.

Of the churches actually existing in Hamburg (the old cathedral had to be taken down in 1805), St Peter's, St Nicholas, St Catharine's, St James's, and St Michael's are those that give name to the five old city parishes. The church of St Nicholas is remarkable more especially for its tower, which until the spire of the Cologne cathedral reaches its projected elevation of 511 feet, will probably continue to be the second highest building in the world, rising as it

17. Observatory. house.

1 In 1843 pegels or water-gauges were established at Hamburg and Cuxhaven. In 1872 their zeros were lowered respectively 9°80 and 4°31 ft., so that they both stand 9°6 ft. above the zero of Harburg and 10°7 above that.of Kiel. :

does to a height of 473 feet, about 19 feet lower than St Ouen's at Rouen. 'The actual church dates from 1845-1874, the former St Nicholas having perished in the great fire. It was opened for public worship in 1863. The architect, the late Sir G. Gilbert Scott, selected the rich Gothic style of the 13th century ; and both the exterior and interior are elaborately adorned with sculptures. Sandstone from Osterwald near Hildesheim was used for the outside, and for the inner work a softer variety from Postelwitz near Dresden. The roof is wholly constructed of wood. A large part of the cost, which altogether amounted to £204,220, was defrayed by weekly shilling subscriptions. St Michael's has a tower which almost rivals that of St Nicholas, as with its height of 428 feet it ranks ninth in the list of loftiest buildings in the world. It was erected by Ernst G. Sonnin between 1750 and 1762, on the site of the older building of the 17th century destroyed by light- ning; and it not only surpasses all the other churches of Hamburg in size, being 229 feet long and 179 feet broad, but produces a fine effect by the colossal proportions of its four principal pillars. St Peter's church, originally con- secrated in 1352, fell a prey to the great conflagration, but it was rebuilt by Chateauneuf in 1844-1849. The ring on the door of the tower (which dates from 1342) is con- sidered the oldest artistic relic in Hamburg; and the granite columns of the old cathedral, the stained glass windows by Kellner of Nuremberg, and Schubert's Entomb- ment of Christ are worthy of notice. St Catharine's and St James's are the only churches of Hamburg that have been preserved from the Middle Ages, but other- wise neither is of special interest. Of the other churches it is sufficient to mention St George's, built in 1743, St Paul's in the suburb of that name, the lesser St Michael's occupied by the Roman Catholics since 1824, and the English Episcopal church dating from 1838. The new Synagogue was built by Rosengarten between 1857 and 1859, and to the same. architect is due the sepulchral chapel of John Henry Schréder in the churchyard of St Peter's, The beautiful Gertrude's chapel was unfortunately destroyed in 1842,

Though Hamburg has comparatively few secular buildings that are of high architectural interest, its list of publie institutions is one of which any eity might be proud, and several of these are accommodated in spacious structures not unworthy of their destina- tion. The exchange is one of the most important. It was ereeted on the site of the Mary Magdalen convent in 1836-41, and escaped the catastrophe of 1842. At the business hours between 1 and 3 o'clock as many as from 3000 to 5000 merchants and brokers econ- gregate within its walls. The commercial library in the new wing added in 1878 has upwards of 40,000 vols. In the same neigh- bourhood are the Hamburg bank and the site of the old rathhaus, which had to be blown up in the great fire. The town-house, built by Gortz, minister of finance to Charles XII. of Sweden, was purchased by the town in 1722, The academie gymnasium, fonnded on 16th August 1610 as a preparatory school for the uni- versities, has since 1873 surrendered its teaching frnctions, though it still maintains public lectures to which all have access, and is in more or less elose connexion with the botanie gardens, the natural history museum, the observatory, the chemical laboratory, and the museum of Culturgeschichte. The present botanical gardens, which liad been preceded by Veit Scharp's (1547-1782) and Flugge's (1810-1813), were laid out by Dr Lehmann on the glacis of the for- tifications, and contain about 11 acres, The natural history museum was founded in 1848, and in 1875 the sum of 1,200,000 marks from the Hamburg share of the French indemnity was assigned for the purpose of supplying better accommodation for its valnable collec- tions, amongst which may be mentioned that from Heligoland and that of Griesbach from South Africa. The observatory, dating from about 1826-1828, is a noteworthy institution. It possesses a great equatorial telescope made by Repsold & Sons in 1860, the object glass of which has an aperture of 9°6 Paris inches, with a focal dis- tance of only 9°6 feet ; and among its contributions to scienee are Helmert's observations on the constellation of Sobieski's Shield (1874), and the determination of all the stars down to 9°5 magnitude in the zone between 80° and 81° of N. declination. In connexion with the observatory a time-ball on the tower of the Kaiserquai is eaused to fall at 12 o'clock of Greenwich time ; there is a similar

HA MEU RG

ball at Cuxhaven, and another at Bremerhaven. The chemical laboratory was built in 1841. It was not till 1866 that the ethno- graphical collections were put under special curators ; and the name Culturgeschichtliche Muscum ouly dates from 1872. The principal medical institution in the city is the eollege of surgeons, founded in 1771 as a general school for doctors and midwives ; it received its present constitution in 1833, and was furnished with new buildings in 1861. It was not till 1867, however, that the guild of barbers, with its right of surgical practice, was abolished. The medical union established by H. de Chaufepié about 1815-1816 has published several periodical works, aud possesses a library of 12,000 vols. A mathematical society was founded by Heinrich Meissner as early as 1690, the Hamburg-Altona Society for natural science dates from 1837, the Hamburg-Altona branch of the German Anthropological Society from 1870, and the Hamburg branch of the German and Austrian Alpine Club from 1875. A geographical society, which publishes a journal, was founded in 1873; and the firm of Godeffroy, which trades so extensively in the Pacific, has instituted a museum, and sent out scientifie explorers and collectors, — Dr E. Griiffe, Amalie Dietrich, Johann Kubary, Andrew Garrett, Franz Hiibner, &c.,— the results of whose labours are registered in the Journal des Museum Godefroy (1871, &c.). Zoological gardens were fonnded in 1860—1 by a joint-stock company, and an aquarium has since been added under the superintendence of Alfred Lloyd of the Sydenham Crystal Palace, Two of the old monasteries of the town—the St Johanniskloster and the St Maria Magdalenenkloster are still main- tained as foundatious for the danghters and widows of Hamburg citizens, and the former has funds beyond its requirements. The general infinnary (allgemeine Krankenhaus) dates originally from 1606, but the present building was erected in 1825-27, and has since received several additions. The annual number of patients increased between 1825 and 1875 from 2398 to 8206. The subvention from the state rose in the same period from £8400 to £23,182, and the average daily cost of each patient from 9d, to ls. 9d. A lunatic asylum (Friedrichsberg) was founded in 1841 at Barmbeck at a cost of £2540 for the site and £66,086 for the building. Its patients numbered 212 in 1865 and 492 in 1875. Among minor establishments of a similar class are the sailors' infirmary (1863), the St Mary's hospital founded by the Roman Catholic community on the occasion of the Danish war in 1864, but open to patients of every creed, the infirmary of the German Jews built by Solomon Heine in

1840, the infirmary of the freemasons, the children's hospital dating fron: 1846-7, the polyclinicum of the patriotic association for the assistance of women (1872), the deaf and dumb institution (1827), and the blind asylum (1830). The orphanage originated in 1606 by Gillis de Greve and Simon von Petkum, admits about 64 children every year. In the beginning of July the orphans, in their bright blue out-door dress, make a procession through the city and the suburb of St George, and the day, known as the Waisengriin, is considered a popular holiday. In the suburban village of Horn is the famons Rauhe Haus, and at Alsterdorf there is a home founded in 1860 for idiots aud children suffering from ineurable diseases. It had 273 inmates in 1875. The workhouse, which dates from the beginning of the 17th century, has been situated since 1853 in the village of Barmbeck, and since 1869 has had a branch establishment at Fuhlsbiittel. In 1875 it had 1342 inmates, and its revenues were £17,332, besides a state subvention of £20,417. The annual eost per head is £14, 15s. About 200 free dwellingsand a number of pensions are pravided by the Schréder foundation for respectable families and individuals in reduced circumstanees.

Hamburg is well supplied with places of amusements, especially of themore popular kind. Its town theatre, rebuilt in 1874, has room for 1750 spectators ; the Thalia theatre dates from 1841, and eon- tains 1700 to 1800 ; and there are some 7 or 8 minor establish- ments. Theatrical performances were introduced into the city in the 17th century, and 1678 is the date of the first opera, which was played in a house in the Gansemarkt. Under Schroder and Lessing the Hamburg stage rose into importance. Though contributing few names of the highest rank to German literature, the city has been intimately associated with the literary movement. Lappen- berg and Hagedorn were born in Hamburg; and not only Lessing, but Heine and Klopstoeck lived there for some time. In Schréder and Klotze's Lexicon der Hamburg. Schriftsteller there are no fewer than 3536 names up to Schroff; and the library of the society for the encouragement of art and science contains 5000 volumes deal- ing with Hamburg affairs.

The inhabitants of Hamburg used formerly to have no small variety of distinctive costumes ; but it is only the public officials in their robes of state or the peasantry from the villages that preserve the more grotesque peculiarities. ?

1 See Uhde, Das Stadttheater in Hamburg, Stuttgart, 1879.

2 Details and coloured designs will be found in Suhr and Hubbe's Hamburger Ausruf (which gives 1807 styles) and in Buek's A/bum Hamburgischen Costtime (Hamb. 1843-47). Of the local dialect a knowledge may be obtained from Michael Richey's Jdiotikon Hamburgense, oder Wérterbuch zur Erkldrung der eigenen in und um Hamburg gebréuchlichen Nieder-Sdchsischen Mund-Art (1743 and 1755), and Geffeken, Die Hamburgischen Niedersdchsischen Gesangbiicher des 16ten Jahrh. (Hamb. 1857).

Hae BURG

The oldest water-works of Hamburg were those of the Oberdamm, constructed in 1531 ; the first of the modern system with steam power was the Bieber'sehe Elbwasserkunst, opened in 1822. In 1849 the city water-works belonging to the state were set in operation, and they have since incorporated and systematized the older water- works, In 1875 they had 5 steam-engines with 850 horse-power, and raised 876 inillions cubic feet of water at acost of about 8d. per 1000 cubic feet. It was not till after the fire of 1842 that Hamburg began to be properly drained ; but it now possesses an extensive and elaborate system of sewers. In 1853 the upper Old Town, the New Town, and St George's were supplied, and in 1859 the lower Old Town ; and between 1871 and 1875 the system was extended to the aristocratic suburban districts of Uhlenhorst and Eimsbiittel. In 1875 the total length of sewers was 512,226 feet, which had eost £662,850. The largest sewers, of which there were 10,499 feet, have a diameter of nearly 10 feet, and can be traversed by boats; the second elass (8880 feet) have a diameter of 7 feet, and the third class (19,858 feet) of 5% feet. The mouths of the sewers are pro- tected by automatic doors which prevent the flooding of the lower districts by the back-watcer from the river.

The harbour of Hamburg as it now exists is a very modern crea- tion. At first the city was at some distance from the main branch of the Elbe, and the mouth of the Alster served as its port, but partly owing to natural changes in the bed of the great river, and more to the vast engincering enterprises of the inhabitants, —such as the cutting of the channels through the Grandeswerder (1550), the Spadenland marshes (1570), and the Brook,—

the principal eurrent was diverted into its present course. To trace the history of the suecessive labours devoted to the rectification of the stream and the inerease of shipping accommodation would be a long and intricate task. Sufliceit to say that up to the middle of the present century the vessels in the harbour of Hamburg used to anchor in the open space and fasten themselves to piles called "dukes of Alba," and the goods were taken ashore in lighters ; but since the introduction of the railway it has been found necessary to build quays with hydraulie cranes and other modern appliances. For this purpose the greater Grasbrook was first of all selected.

Hamburg is emphatically a commercial city, and though within recent years greatly developed, its manufacturing industries are in comparison unimportant; but only in comparison, for, according to the official return of 1875, no fewer than 4931 persons were engaged in metallurgy, 5926 in the mannfactureof machinery, instrnments, and tools, 940 in chemical works, 1399 in the preparation of heating and lighting materials, 1464 in textile industries, 2687 in the paper and leather manufactures, and 9388 in the wood industries. Ship- building is carried on pretty extensively, the greatest establishment in the departinent, the Reiherstieg or Godeffroy's yards, which was commenced about 1849, employing on an average 700 workmen. There are several enornious distilleries, and two establishnients for the manufacture of artificial manures from the phosphates of guano, each of which yer from 200 to 300 workmen; as well as breweries, sugar-refineries, rice-mills, and factories for the prepara- tion of saltpetre, sulphuric acid, and other chemical products. The curing of beefand pork formis a large trade. Pianofortes and eigars, railway carriages and artificial flowers, sewing-machines and ehocolate are all manufactured in the town, and tile-works and glass- works exist in the neighbourhood.

In the extent of its commeree Hamburg ranks among European ports immediately after London, Liverpool, and Glasgow. Its im- ports and exports are more than those of the whole of Holland, of Belgium, or of Spain. From the year 1836, in which it possessed 146 ships, with a total burthen of 25,722, its marine had increased 770 per cent. by 1877.1 In 1875 it had 443 sea-vessels with 219,567 tons burthen ; in 1876 it had 450 with 219,698 tons, and in 1877 468 with 223,910. Of the last number 264 were copper-plated, 6 were zinc-plated, and 147 were built of iron. The

steam vesscls were 102. The principal line of steamers is that of the Hamburg-American Company, whieh on 1st January 1876 had 2] first-class British- built vessels, with a total burthen of 60,300 tons. Its voyages are mainly made to New York and the West Indics. On an average of the three years 1874, 1875, and 1876 it carried 31,930 passengers and 165,465 cubic yards of goods, The ITamburg and South Amcriean Company at the same time had six vessels, with a burthen of £000 tons, trading with Brazil and the river Plate. The German Steamship Company had 8 vessels with a burthen of 6,850 tons trading with

puveit 1866 it reached the exceptionally high figures, 630 ships of 178,C05 tons urthen,

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China and the Far East; and the Kosmos Company had 7 ships with a burthen of 10,897 tons trading with Chiliand Pern. The Sloman or Mediterranean line of six vessels with a burthen of 5276 tons keeps up monthly communication with ports of Spain and Italy.

From the following table a general view of the movement of the port will be obtained. It is to be observed that the inerease shown is not somuch in the number of the ships as in their average

eapacity. Ships Revister:T Ships eure Entered. Legister-Tons, Cleared. | tegister-Tons. 5186 | 1,223,403 5186 1,216,499

5185 1,327,673 5210 1,332,563

‘ 5055 1,431,082 5071 1,434,563

1868 5297 1,582,665 5287 1,528,844 1869 5192 1,603,812 5201 1,595,946 1870 4144 1,389,789 4101 1,876,179 5439 1,887,505 5457 1,886,784 5913 2,080,913 5872 2,075,472 5270 1,887,057 5363 1,904,050 5225 2,094,102 5238 2,100,193 5260 2,117,822 5209 2,084,748

5483 2,228,162 5481 | 2,247,129

5473 2,233,929 5489 2,243,500

The average eonsequently for the years 1866-1875 was—ships entered 5198, tonnage 1,735,242; ships cleared, 5202, tonnage

1,731,973.

The following table shows the imports (in centners of 110 1b) into Hamburg in 1878, first from non-European, and secondly from European eountries : —

Non-European, European. Non-European. European

Coffee ……..~~…1,015,200 405,280 Betrolenm) ...,... 815,050 86,770 BG ien casisecenreeccces 14,030 388,400 TMG seeceeccess) ls 00 141,643 SUCAM,... Osta 50 41,530 Tobaceo. vee 264,490 130,930 , Cocoa-unt oil…. 5,920 38,420 RICE! s; — 190:700 55,590 Palm-uuts …..... 165,260 57,630 Grain. « 611,820 169,050 COULON evieccceseess 847400 352,310 Rum …... 130 16,990 Cotton wool es 307,980 Ierrings s. __0:250 894,390 Raw and bar iron 2,415,310 Dye woods .. 574,170 40,340 EQUI tsccesessscess 31,400 Saltpetre ……..1,074,510 12,030 Sulphuts……..005 105,900 Copperand silver 52,760 6,050 Code ce cccecceies sss 17,224,530 UAMNO o.0… 6. -0001,697,870 95,550 Miseellaneous …2,609,250 8,895,890 MGtaleescees 10,020,040 31,327,960~~

Hamburg is an important outlet of emigration, no fewer than 870,000 persons having left Germany by its vesscls between 1836 and 1874, or on an average 80,000 every year. In 1874 the number was 42,952 ; in 1875, 31,787 ; in 1876, 28,733; in 1877, 22,148 ; and in 1878, 24,803.

The monetary transactions of Hamburg have long been main- tained on a very extensive seale. As early as 1619 the great Ham- burg giro-bank was founded on the modcl of that of Amsterdain , and, in spite of the blow struck by the French in 1818, it continued to flourish till in 1876 it was replaced by a chief office of the German Imperial Bank, which includes in its domain the province of Schleswig-Holstein-Lauenburg, the three Hanseatic towns,

and the two grand-duchies of Mecklenburg. In 1876 there were, besides, the North German Bank (1856) with a capital of £2,250,000 ; the Union Bank (1856), with £1,500,000 capital; the Commer- cial Bank (1870), with £1,500,000; the International Bank (1870), with £750,000; the Anglo-German Bank (1870), with £1,050,000; the Hypothee Bank (1871), with £375,000; the Exehange (Wechsler) Bank (1872), with £187,500; the Brokers' Bank (1871), with £150,000; the Industrial Bank (1871), with £150,000; the St Paul's Credit Bank, with £150,000; andthe People's Bank (1860). The Imperial Office in 1876 had a total turnover of £336,693,950 ; and in 1875 the North German Bank had 438 millions, the Union Bank 270 millions, and the Commereial 170 millions, There are also 7 savings banks, the total deposits in which rose from £846,070 in 1866 to £1,615,626 in 1874. Few departments are of more extensive development than the marine insurance. In the ten years 1834-43 the average value insured was £17,534,487, at an average premium of 1°50 per cent. ; in the corresponding period 1844-53 it was £24,028,991 at 1°58 per cent. ; and in the next period, 1854-63, it reached £45,571,543.

The following table shows the figures from 1864 to 1877 :—

Per eent. oe Per cent. SGA Tr sess csees £47,112,592 135 TSA... cates ses £84,926,83 0:90 ieee ee. 40/829,647 1-28 1872…..... 102,816,762 0°93 1866 . 50,141,966 1°24 1873 . 90,128,405 101 WIS BNE ccs sccsea'e 50,377,151 1-25 AS ick ec ecseee see 86,184,290 1:05 WIS GSies.svescc ee 56,136,688 1:26 WSUS. ccosccecsce 88,817,942 111 TEC) wqesmeapesoe 59,492,244 1-16 1876 . 91,724,790 111 TSTOneen 63,445,570 1°12 Wit ee 112,083,625 1-06

It is only within recent years that Hamburg has obtained a fair amount of railway communication. The proposal made about 1840 to construct a line from Hamburg to Liibeck was frustrated by the opposition of the king of Denmark, who feared it would injure the trade between his two towns of Altona and Kiel, which soon afterwards (in 1844) he united by rail. The people of Hamburg were forced to content themselves with a line to Bergedorf (1842), but this

was afterwards extended to Schwerin and Berlin, and a branch line was constructed to Liibeck. The Hamburg-Liibeck direct line was opened in 1865, and in the following year a line was constructed between Altona and Hamburg. Direct communication with Paris by

way of Harburg, Bremen, Osnabriick, and Venloo was obtained only |

in 1872. Though as early as 1862 a schemo was set on foot for such a line, the projectors could not come to terms with the Hanoverian Government, which objected to the duchy of Oldenburg obtaining a

share in the advantages of the scheme, and wished to keep to itself |

the whole authority over the bridges on the Elbe while leaving the cost of their construction wholly to Hamburg. In 1866 the Hano- verian Government was swept away by Prussia, and in 1867 the new rulers formed a treaty for the construction of the line. The two main branches of the Elbe, the north and the south, are crossed by two great bridges on the system named after Lohse, which had never before been employed in Germany. As the soil is unstable, the pillars had to be founded on a bed of concrete 17 or 18 fect thick resting on piles. The Hamburg or north bridge has three spans each 334 feet wide, and the Harburg bridge has fourspans. The total weight of iron employed was 84,651 cwts. (36,152 for the one and 48,499 for the other). Forinternal locomotion the city has a system of tramway lines which run out to Wandsbeck and other neighbour- ing villages, and a still more extensive omnibus system. Small steamers plying on the Outer Alster give easy access to the places along its shores.

In 1811 the population of Hamburg (Stadt and Vorstadt) was 106,983; in 1834 it was 145,418; and by 1861 it had reached 198,214. Itssubsequent increase is shown in the following table :—

Increase] Per

1866. 1867, 1871. 1875. 1866-75.| cent. Inner town and harbour | 158,296 | 160,772 | 160,989 | 171,558 13,262 SEG COUMC Si. ..cccessceoceres 30,3871 | 32,423 | 37,097 | 43,911 | 13,540 SEMPSMIIES) coccvereveséccceoeeres 29,185 | 31,775 | 41,021 | 49,206 | 20,071

217,802 | 224,974

239,107 | 264,675

If we include in our survey the suburban hamlets or Vororte, and Altona, Ottensen, and Wandsbeck, we find that there were clustered together 458,585 persons. In 1871 the proportion of males to females in the whole Hamburg territory was 100 to 105, and in 1875 it was 100 to 103. The number of females in pro- portion to the males is much greater among the native than among the immigrant part of the population ; and the proportion of natives to immigrants is a steadily decreasing one,—76 per cent. in 1867, 68 per cent. in 1871, and 65 in 1875. Most of the strangers are from the ncighbouring parts of Germany: 43,523 in 1871 were from Holstein, 30,945 from Hanover, and 15,686 from Mecklenburg- Schwerin. The following table shows the occupations of the people iw 1871 :—

| Females. | Total.

Males. Agriculture Industries Trade and commerce

7,092 65,792 51,589 18.756 11,266 17,913

1,260

14,575 135,670 100,290

38,572

Giving personal service Other CaWings ….....0.ceccccones Without calling

Not returned

21,636 26,652 1,579

The number of marriages, partly in consequence of the changes in the marriage laws, is rapidly increasing (8°29 to every thousand inhabitants in 1861, and 12°26 to every thousand in 1875), and a similar increase is observable in the births.

The death rate varied from 26 to 30 per thousand per annum from |

1872 to 1875. Consumption and acute diseases of the respiratory organs are the most prevalent causes of death. Between 1831 and 1873 there were 14 visitations of cholera, by far the most violent being those of 1832 and 1848, which carried off respectively 1652 and 1765 of the population.

History.—Hamburg, or, as the older documents have it, Hamma- burg, appears to have taken its rise as a frontier block-house or castle on the Slavonic borders of Germany, which in the 9th century lay thus far to the west. The block-house, which may have been preceded by some insignificant hamlet, was founded by Charles the Great in 808 ; and he was just on the point of making the newly erected church the seat of a bishopric when he died in 814. His scheme was ultimately carried out by his son Louis the Pious in 831, and three years later a charter was issued at Aix-la-Chapelle

and confirmed by Gregory IV. raising the bishopric to the rank of ©

an archbishopric, which was to include not only the surrounding dis- trict of Germany, but Iceland, Greenland, and the whole Scandi- navian territory. Ansgarius, the first occupant of the see, founded a

monastery and a school, but in 887 (or 839 according to other |

accounts) his labours were rudely interrupted by the Norman pirates, who laid the little settlement in ashes. Other disasters followed : a large portion of the original territory of the archbishopric fell away from its allegiance ; and in 1847 it was decided at a synod at

HAMBURG

Mainz under the presidency of Hrabanus Maurus that Hamburg

should be attached to the bishopric of Bremen, and the seat of the archbishop be in the latter city. The title of archbishop of Ham- burg remained in use till 1228, though that of archbishop of Bremen appears as early as the 12th century. All through the 10th century Hamburg continucd

to suffer from the inroads of the Danes and the Slavonians, and the latter indeed were in possession from 983 to 987. In spite of all the settlement advanced : Arehbishop Alebrand built a cathedral in 1087, Archbishop Adalbert not long after a castle ; and the havoc wrought by Jarl Kruko of Denmark in 1072 was promptly repaired. In 1110the counts of Schauenburg got possession of Holstein aud Hamburg, an event which bore in many ways fruit for centuries after. In return for a contribution to a crusade, Adolf III. obtained for the town from the emperor Frederick J. in 1189 the right of a separate court and jurisdiction, freedom from toll to the mouth of the Elbe, and right of fishing in the river. Merchants from Flanders now began to visit the place, and its importance as a commercial centre was increased by the destruction of the flourishing town of Bardewijk in 1189 by Henry the Lion. After passing under the lordship of Waldemar of Schleswig (1201) and Albert of Orlamiinde (1216), it was recovered by the Schauenburg counts, who erected a strong castle over against it (1281). The alliance with Liibeck, commenced in 1241, and consuinmated by the treaty of 1255, practically laid the basis of the great Hanseatic League, of which Hamburg continued to be one of the principal members. While its foreign relations were thus improved, its internal organization was also rendered more stable by the new constitution of 1270, and the recognition of the municipal autonomy of the counts of Schauenburg in 1292. The domain of the city was increased in the 14th century by the purchase of Eppendorf, Ritzebitttel, &c. ; in the 15th the Frisian pirates who had harassed the merchants at the mouth of the Elbe were completely defeated. The claims of the Danish crown to the homage of the city were rejected, and the imperial diet of 1510 under Maxi- milian I. declared that it was a city of the empire. Not long after two great changes took place. By the so-called " Long Recess" of 1529 the Reformation was introduced, and disagreements with Liibeck set the city free to follow her own path of progress. Through the troubles of the Thirty Years' War Hamburg escaped almost unscathed ; but it suffered from the effects of its own bigoted Lutheranism, which drove many of its dissentient religionists forth to become the founders of the neighbouring Altona. In 1603 it received a code of exchange, and in 1615 the first imperial post. Its population was not long aftcr increased and its commerce quickened by a number of the Jews who had been expelled from Spain and Portugal. The course of the 17th century was marked by discord and strife between the senate and the lower classes, which ultimately brought about

the interference of the empire and the publication of the "Great Recess" of 1712. Though the courts of the empire had decided in 1618 against the claims of the Danish crown, and had confirmed this decision in 1630 and 1648, Christian V. of Denmark made another attempt to take Hamburg by threat of arms ; but he accepted a ransom of 280,000 rixdollars, and at length in 1768 by the treaty of Gottorp the Danish crown renounced all its claims, and in 1770 the delegates of the city took thcir place in the " Rhenish bench" of the imperial diet. From the Seven Years' War and the war of American independence the commerce of Hamburg drew new life but it suffered terribly during the years of the French ascendency. The town was not only obliged in 1808 to pay 2,125,000 francs to the Hanoverian estates, but in 1806 it had to admit a French garri- son within its walls, and to feel the effects of the British blockade of the Elbe. In 1810 indeed it had the honour of being incorpo-

| rated in the French empire as the chief town of the department of

the '"'Mouths of the Elbe;" but the retreat of the French com- mandant Carra Saint-Cyr on 12th March 1818, and the subsequent

_ entrance of the Russian Tenterborn on the 18th, were welcomed by

the citizens with joy. But their joy was premature, for by the 30th of May the enemy was again in possession. Davoust, the new general, not only demanded a contribution of 48,000,000 francs, but confiscated the 7,506,956 marks banco (of about 1s. 6d.) at that time in the bank, forced the inhabitants to work at the new forti- fications, and drove 20,000 or 30,000 of them out of the city amid the cold of winter. In spite of the attacks of the Russians under Benningsen, Davoust maintained his position till the close of the war. The whole loss of the city from 1806 to 1814 is estimated at £10,500,000 sterling. In 1815 Hamburg became an independent state of the German federation, and formed with Liibeck, Bremen, and Frankfort the curia of the free cities. Its trade rapidly revived, and when in 1842 the great fire destroyed 4219 buildings and rendered nearly 20,000 persons homeless, its credit was suificient to secure a loan of 34 million marks banco. The old oligarchical constitution had been restored after the recovery of independence ; and the internal history of the town from 1840 till 1860 is mainly a protracted contest between the conservative and

innovative parties. The year 1858 was remarkable for a great' commercial crisis, and for the meeting in the town of the commission of the navigation of the Elbe, and of the delegates appointed by the principal German states to consider maritime law. By the new

constitution of 1861 industrial freedom was introduced, possession of land permitted to strangers, the conditions of settlement greatly modified, and various improvements made in the taxation and duties. At the outbreak of the contest between Prussia and Austria in 1866, Hamburg sided with the former, and in May 1867 it voted 136 to 1 for the constitution of the North German Confederation. It was allowed to remain a free port, but has to pay an aversum to tlic Zollverein.

See Zeitschrift fiir Ilamburgische Geschichte, published since 1841 by the local historical society; Lappenberg's JJamburg. Urkundenbuch (vol. i., Hamb , 1842), Hamburg. Chroniken (1861), and Adam Tratziger's Hamburg, Chronik (1862); Tlamburgisches Miinz-und Medaillen-Vergniigen (Hamburg, 1753); Hess, Wam- burg's topogr., polit., und histor. Beschreibung (2d ed., 1810-11); barmann, JZam- burg. Denkwiirdigketten (1817-20), and [amburg's Chrontk (1822); Zimmermann, Neue Chronik von Hamburg (1820); Gallois, Geschichte der Stadt Hamburg (1856-57); Wichmann, Weimathskunde (Hamb. 1863); Buek, Die ITamburgische Oberalten (1857), and Iamburgische Alterthiimer (1859); Iamburgs Neueste Zeit, 1843-60 (anonym., 1866) ; Avé Lallemont, Das Werk- und Armenhaus im Hamburg (1863); Koppmann, Aveine Beitriige zur Geschichte Hamburgs (1867-68); Elers, Chronologie der Geschichte Hamburgs (1868); Mayer, Geschichte des amb. Con- tingents, 1814-67 (Berlin, 1874); Hamburg, die Stadt, die Vororte, &c. (1875) ; Hamburg in Naturhist. und Medic. Beziehung, with excellent maps showing pro- file and relief of site, water and sewer systems, and density of population, for the Gesellschaft der deutschen Naturforscher und Aerzten (Hamb., 1876) ; Dehiio, Geschichte des Erzbisthums Iamburg-Bremen (1877, 2 vols.).

HAMELN, the chief town of a circle in the province of Hanover, Prussia, is situated at the confluence of the Weser and Hamel, and at the junction of four railways, 25 miles 8.W. of Hanover. It is surrounded by old walls, and

possesses a number of old-fashioned houses with quaint richly-adorned gables. The only public buildings of interest are the minster church, restored in 1872, and the town- house. Hameln is the seat of several courts and public offices, and possesses a gymnasium, a higher city school, a higher female school, a trade school, a poorhouse, two hospitals, and a district prison. The principal industries are the manufacture of woollen and cotton goods and machines, distilling, agriculture, and salmon fishing. By the steamboats on the Weser there is communication with Karlshafen and Minden. In order to avoid the dangerous part of the river near the town a channel was cut in 1734, the repairing and deepening of which, begun in 1868, was completed in 1873. The Weser at Hameln is crossed by an iron suspension bridge 830 feet in length, supported by a pier erected on an island in the middle of the river. The population of Hameln in 1875 was 9519.

The older name of Hameln was Hameloa or Hamelowe, and the town owes its origin to an abbey of St Boniface. It existed as a town as early as the 11th century, and in 1259 it was sold by the abbot of Fulda to the bishop of Minden, but this transaction gave offence to the townspeoplc, and after a battle in which many of them lost their lives, they placed themselves under the protection of the house of Brunswick. During the Thirty Years' War Hameln was conquered by the Swedes (1633). In 1757 it capitulated to the French, who, however, vacated it in the following year. Its fortifica- tions were strengthened in 1766 by the erection of Fort George, but they were wholly dismantled in 1807. Hameln is famed as the scene of the myth of the piper of Hamcln. According to the legend, the town in the year 1284 was so infested by rats as almost to com- pel the inhabitants to leave it, when one day there appeared upon the scene a piper clad in a fantastic suit, who offered for a certain sum of money to charm all the vermin into the Weser by his piping. His conditions were agreed to, but after he had fulfilled his promise the inhabitants, on the ground that he was a sorcerer, declined to fulfil their part of the bargain, whereupon on the 26th of June he reappeared in the streets of the town, and putting his pipe to his lips began a soft and curious strain, which drew all the children to come trooping after him while he led them out of the town to the Koppelberg hill, in whose side a door suddenly opened, by which he entered and the children after him, all but one who was lame and could not follow fast enough to reach the door

before it shut again and remained fast. Some trace the origin of the legend to the "Child Crusade," or to an abduction of children. For a considerable time the town dated its public documents from the event. The story is the subject of a poem by Robert Browning, and also of one by Julius Wolff (3d edition, Berlin, 1876).

See S. Baring-Gould, Curious Myths of the Middle Ages, 2d ser., 1868; Grimm,

Deutsche Sagen, Berlin, 1866: and Reitzenstein's edition of Sprenger's Geschichte der Stadt Hameln, Hameln, 1861, : ee

HAMI, the Chinese name of a town in Central Asia, otherwise called Kamit, Komun, or Kamut, situated on the southern slopes of the Tian-Shan mountains, and on the northern verge of the Great Gobi desert, in 42° 48'

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3150 feet. The town is first mentioned in Chinese history in the Ist century, under the name I-wu-lu, and said to be situated 1000 lis north of the fortress Yii-men-kuan, and to be the key to the western countries. 'This evidently referred to its advantageous position, lying as it did in a fertile tract, at the point of convergence of two main routes run- ning north and south of the Tian-Shan and connecting China with the west. It was taken by the Chinese in 73 a.p. from the Hiungnu (the ancient inhabitants cf Mongolia), and made a military station. It next fell into the hands of the Uigurs or Eastern Turks, who made it one of their chief towns and held it for several centuries, and whose descendants are said to live there now. From the 7th to the 11th century I-wu-lu is said to have borne the name of Igu or I-chu, under the former of which names it is spoken of by the Chinese pilgrim Hwen-Thsang, who passed through it in the 7th century. The name Hami is first met in the Chinese Vdian-shi or " History of the Mongol Dynasty," but the name more generally used there is Homi-li or Komi-li. Marco Polo, describing it apparently from hearsay, calls it Camul, and speaks of it as a fruitful place inhabited by a Buddhist people of idolatrous and wanton habits) It was visited in 1341 by John de Marignolli, who baptized a number of both sexes there, and by the envoys of Shah Rukh (1420), who found a magnificent mosque and a convent of dervishes, in

juxta- position with a fine Buddhist temple. Hadji Mahomet (Ramusio's friend) speaks of Kamul as being in his time (cirea 1550) the first Mahometan city met with in travel- ling from China. When Benedict Goes travelled through the country at the beginning of the 17th century, the power of the king Mahomet Khan of Kashgar extended over nearly the whole country at the base of the Tian-Shan to the Chinese frontier, including Kamil. It fell under the sway of the Chinese in 1720, was lost to them in 1865 during the great Mahometan rebellion, and the trade route through it was consequently closed, but was regained in 1873. Owing to its commanding position on the principal route to the west, and its exceptional fertility, it has very frequently changed hands in the wars between China and her western neighbours. As regards the latter quality, it is even now said to yield rice, melons, oranges, and grapes of notable excellence, while, with respect to the former, Baron F. Von Richthofen (probably the highest authority) states that the route from Hsi-ngan-fu past Hami to Kuldja, is by far the best and indeed the only natural line for a railway from China to Europe. The Russian officer Sosnofski, our latest authority respecting Hami, entered it in the autumn of 1875 after eight days' journey across the Gobi steppe lying to the south. He speaks of it as an important mart, whither wool from Turfan and Turkistan goods are brought to be exchanged for the products of Central China. The Mahometan population consists of immigrants from Jitishahr (or Kashgaria), Bokhara, and Samarcand, and of descendants of the Uigurs. HAMILCAR BARCA, the most illustrious of all the Carthaginian generals and statesmen, next to his son, the great Hannibal. The surname Barca is the same as the Hebrew Barak, and signifies "lightning." It was in the eighteenth year of the First Punic War, 247 B.c., that Hamilcar first greatly distinguished himself. He had been known before as a young officer of promise who had made raids on the southern coasts of Italy in the neighbourhood of Locri and Cuma. Suddenly he appeared with a squadron off the north-west of Sicily, and seized a strong position on Mount Ercte, now known as Mount Pellegrino, near Palermo. He had but a small force of mercenaries, which his military genius soon made into a well-disciplined body of troops. For three years he maintained himself

iat. and 93° 28' E. long., at a height above sea-level of | on Mount Ercte, during which time the Romans were in

possession of the whole of Sicily with the exception of the two strongholds of Drepanum and Lilybzeum, and these they were blockading. 'They tried their utmost to drive Hamilcar from his position, but in vain. At last he quitted his stronghold, and in 244 z.c. landed at Mount Eryx, on the western coast, now Mount S. Giuliano, 2 miles from the shore and about 6 from Drepanum. A famous temple of Venus crowned the summit, and half-way up the slope was the city, which itself had the name of Eryx. Hamilcar seized and occupied.

This | His object was to compel —

the Romans to give up the blockade of Drepanum and |

Lilybeeum.

They could not drive him out of the town, |

and for two more years he held his position, keeping open |

his communications by sea with the Carthaginian garrison of Drepanum. MHamilcar's chief difficulty was with his mercenaries, who were little better than savages and with-

seized Spendius and his nine companions, a proceeding –

which the mutineers furiously resented. But they were soon surrounded and cut off to a man, to the number, it is said, of 40,000. The war, which had lasted three years and four months, was now over in the year 238 B.o.

One would have supposed that Hamilcar would be at once recognized as the right man to direct the future policy of the state. But it was not so. Hanno's party, the peace party, was as shortsighted as ever, and actually dared to say that Hamilcar had been the cause of the late war by having

made promises which he was not able to fulfil. But by this folly they injured and weakened themselves. The patriotic party, the ‘ Barcine faction,” as it was called by its opponents, prevailed so far as to raise their leader to a

_ position answering as nearly as possible to a dictatorship

out an idea of loyalty or good faith. Yet he continued to |

hold them well in hand. tonous warfare, so much so that Polybius, here our chief authority, compares it to a boxing match between two

It was a harassing and mono-

skilful pugilists, the blows in which are delivered in such | rapid succession that a spectator could hardly see, much —

less describe them. The Romans, feeling it necessary to

make a supreme effort, in 242 B.c, equipped a fleet, under |

the command of the consul Lutatius Catulus, and des- |

patched it to the western shores of Sicily. The battle off

the Aigates followed, and the Roman victory decided the First Punic War in 241 zc. concluded. The cession of Sicily to the Romans was a matter of course. But though Hamilcar had to surrender the island, he refused to comply with the Roman demand that his army should pass under the yoke. The demand was not persisted in, and Hamilcar and his men were allowed to embark from Lilybaum for Africa.

No sooner had peace been concluded than there broke out the so-called African or Libyan War. It was a most formidable mutiny or insurrection. on their return looked for the pay which he had promised them, but had not been able to furnish while he was cooped in within his lines on Mount Eryx. The stupidity of the home Government soon caused trouble. The peace party

Peace had now to be |

Hamilcar's mercenaries

at Carthage, headed by Hanno, who hated Hamilcar, was _

foolish enough to raise a dispute about the pay of the troops. The result was a furious mutiny, which Hanno, who was sent to quiet them, could not appease. to the number of 20,000 began to march on Carthage itself, and encamped near Tynis. The mutineers were led by Spendius, a fugitive slave from Campania, and by Matho, an African who had served with distinction under Hamilcar in Sicily. These two men incited all the neighbouring tribes to rise against the dominion of Carthage. Carthage

itself was soon cut off from all communication with the |

interior. Hanno was called to take the command, but it was only to meet with defeat and disaster. The rebels surprised and captured his camp. The Government was now thoroughly frightened, and begged Hamilcar to save them from the consequences of their own folly. With a force of only 10,000 men he had to face what must now have grown into a very formidable host, It would seem that his personal influence led many of the rebels to return to his standard, and he was also skilful enough to secure the friendship and aid of the Numidian sheiks. One especially, Naravas, helped him very materially ; and with his assistance he was able to achieve a decisive victory over the mutineers. At last he so effectually hemmed in Spendius within his camp near Tunis that the rebel leader was obliged to throw himself on his mercy. With nine of his brother leaders he sought an interview with Hamilcar. Hamilcar's demand was the surrender of ten of the rebels, whom he was to name himself, This being agreed, he

of reducing Spain to a Carthaginian province. The men

| relations by negotiation.

among the Romans, MHamilcar was made commander-in- chief of the Carthaginian army in Africa, and invested with a power which could be taken from him only by the popular assembly. He was still a young man, under thirty years of age. For a short time he employed himself in overawing the Numidian tribes bordering on Carthaginian territory, but his

main object was to form the nucleus of an efficient army out of his Libyan mercenaries, Mean- while he was maturing a great plan which soon afterwards on his own responsibility he carried into execution, Spain was a country the coasts of which at least were well known to the Carthaginians, Spaniards too had served among Hamilcar's troops. To Spain he decided to go; there, he felt sure, he could find material for an army and abundant means of providing pay. He had now three sons, the "lion's brood," as he called them, Hannibal, Hasdrubal, Mago. Wishing with all his heart that they should be like minded with himself, he made the eldest, Hannibal, then a little boy of nine, swear on the altar of the supreme Carthaginian deity eternal hatred and enmity to Rome. This was just before he left Carthage, probably in the spring of 236 B.c. Suddenly there came tidings to the home Government that their commander-in-chief was, with- out their orders, carrying on war in Spain. He had, how- ever, done his work so thoroughly in Africa that the trouble- some Numidian tribes were now submissive to Carthage, and for the most part paid tribute. He never returned, The last eight years of his life he devoted to the great work He pene- trated into the interior of the country, subduing some of the tribes by force of arms and drawing others into friendly It was not to mere conquest that he aspired ; he did his best to win the good-will of the Spaniards and to attach them to Carthage. Spain was to be a compensation to Carthage for the loss of Sicily and Sardinia. But, above all, its possession was to be subordi- nate to Hamilcar's great design of some day renewing the war with Rome. For this he would have felt himself pre- pared when, in addition to his Numidian cavalry, he had organized a force of Spanish infantry. Had his life been prolonged, he would doubtless, as Livy says (xxi, 2), have invaded Italy at the head of a Carthaginian army, What he accomplished in Spain so much impressed the elder Cato, who less than half a century afterwards saw the traces of his work, that he declared that there was no king like Hamilear Barca. In the prime of his years he fell in battle n 228 B.¢., fighting, it would seem, somewhere between the Tagus and the Douro. Spain was now left in the hands of his son-in-law Hasdrubal. (w. J. B.) HAMILTON, a municipal and parliamentary borough aud market-town of Scotland, county of Lanark, is situated about a mile from the junction of the Avon with the Clyde and 10 miles 8.E. of Glasgow. It occupies a rising ground commanding fine views of a rich and highly picturesque country, and consists of several streets of well-built houses

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somewhat irregularly dispersed, and surrounded by a number of villas belonging chiefly to persons engaged in business in Glasgow. The principal buildings are the town-hall, the county buildings in the Grecian style of architecture,

infantry barracks.

rested on her journey to Langside; the old steeple and pillory built in the reign of Charles I. ; the Moat Hill, the old Runic cross, and the carved gateway in the palace park. In the churchyard there is a monument, with four heads in basso-rilievo, to four covenanters who suffered at Edin-burgh, December 7, 1600, their heads being interred below. Among the industries of the town are weaving and the

tambouring of muslin; and there are also large markct |

gardens, the district being famed especially for its apples ; but the prosperity of the town depends chiefly upon the coal and iron-stone which are extensively worked in the neighbourhood. Hamilton originated in the 15th century under the protecting influence of the lords of Hamilton. It unites with Airdrie, Falkirk, Lanark, and Linlithgow to form the Falkirk district of boroughs, which returns one member to parliament. The population in 1871 was 11,498.

Immediately east of the town is Hamilton palace, the seat of the duke of Hamilton and Brandon, premicr peer of Scotland. The present palace was commenced in 1822. Its front is a specimen of the enriched Corinthian architecture, with a projecting pillared portico after the style of the temple of Jupiter Stator at Rome, 264 feet in length and 60 feet in height. The interior is richly decorated and contains one of the most valuable collections of paintings in Scotland. Within the grounds, which comprise nearly 1500 acres, is the mausoleum erected by the tenth duke, a structure resembling in general design that of the emperor Hadrian at Rome, being a cir- ‘cular building springing from a square basement, and enclosing a

decorated octagonal chapel. About 2 miles south-east of Hamilton, on the suinmit of a precipitous rock 200 feet in height, the foot of which is washed by the Avon, stand the ruins of Cadzow Castle, the original seat of the Hamilton family, conferred on the chief of that family immediately after the battle of Bannockburn, having been previously a royal residence for at least two centuries. The castle has been made the subject of a spirited ballad by Sir Walter Scott. Near it is the noble chase with its ancient oaks, the remains of the Caledonian Forest, where are still preserved some of the old Scotch breed of wild cattle. Opposite Cadzow Castle on the other side of the Avon is Chatelherault, consisting of stables and offices, and imitating in outline the palace of that namein France. A ama double avenue stretches between it and Hamilton

alace, 2 HAMILTON, a city of Canada, the chief town in the county of Wentworth, province of Ontario, is advantage- ously situated on the south side of Burlington Bay, a large and beautiful basin of water connected with Lake Ontario by a short canal, which forms one of the safest and most commodious harbours on the lake. It is also con- nected with the town of Dundas by the Desjardins Canal, about 4 miles in length. Hamilton holds an important posi- tion at the head of the navigation on Lake Ontario, and in the centre of one of the finest agricultural districts of the Dominion. It is the headquarters of the Great Western Railroad, and is connected by other lines of railway with Lake Erie, Lake Huron, and the Georgian Bay. The site on which it is built rises gradually from the bay to the foot of a lofty bluff called "The Mountain," the summit of which commands an extensive and beautiful view. The streets are well laid out, and planted with shade trees, and the houses and public buildings are substantially constructed of stone and brick. The court-house and county buildings, recently completed, are the finest inCanada. Among the other public buildings are the provincial lunatic asylum, the Anglican and Roman Catholic cathedrals, and handsome places of worship of other denominations, the collegiate institute, the Wesleyan female college, the mechanics' institute, the banks, the city hospital, aud other charitable institutions. The city water-works, by means of which a constant supply of pure water is brought from Lake Ontario, have been

_ completed on a scale amply providing for the future growth

of the city, at a cost of about $1,000,000. The industries include iron rolling mills, iron foundries, the manufacture of

| agricultural implements, sewing machines, musical instru- the academy, the St John's grammar school, and the | Among the subjects of antiquarian | interest are Queenzie Neuk, the spot where Queen Mary |

ments, carriages, glass, pottery, &c., tobacco manufacture, and brushmaking. The total value of imports at the port of Hamilton for the fiscal year 1878-9 was $3,992,123; and the duty collected amounted to $839,153. The total tonnage entered at the port was 160,666 tons; but this is exclusive of a much larger amount of goods brought by railway, including foreign importations, on which the duty has already been paid at Quebec or Montreal, and of which therefore no entry is made. Daily lines of steamers run in the summer months between Hamilton, Toronto, Kingston, and Montreal; and an extensive trade is carried on with the maritime provinces. Hamilton was founded in 1813, and incorporated in 1833. The population in 1836 was 2846; in 1851, 10,248 ; in 1861, 19,096 ; in 1871, 26,716; and in 1879 it is estimated at 35,000. It is the seat of the Anglican bishop of Niagara, and of a Roman Catholic bishop. It returns one member to the provincial parlia- ment of Ontario, and two members to the Dominion parlia- ment, or House of Commons.

HAMILTON, a township and post village of Madison county, New York, U.S., is situated on the Chenango canal, and on the Utica branch of the New York and Oswego Mid- land Railway, 30 miles S.W. of Utica. The village is the seat of Madison university, chartered in 1846, in connexion with which there are a theological seminary of the Baptist denomination opened in 1820, and a preparatory academy opened in 1832 under the name of Colgate Academy, and chartered in 1853 as the grammar school of the university. The university has 10 professors, has both a scientific and a classical course, and is attended by upwards of 100 students. The other educational institutions are a female seminary and a union graded school. The village possesses a foundry, a tannery, and manufactories of sashes and blinds, doors, waggons, cigars, and cheese. The popu- lation of the village in 1870 was 1529, and of tlie town- ship 3687.

HAMILTON, a city of the United States, capital of Butler county, Ohio, is situated on both sides of the Great Miami river, on the Miami and Erie canal, and at the junction of several railways, 23 miles N. of Cincinnati. The water-power for manufacturing purposes is obtained by an hydraulic canal which secures a fall of 30 fcet; and the situation of the city in the heart of the Miami valley, a rich agricultural district, is very favourable. to the development of commercial enterprise. It possesses two public parks, twelve churches, two national banks, a com- plete graded system of public schools, an orphans' home, and a free library. Its industries are of a varied kind, and are represented by paper and woollen factories, flour- mills, foundries, breweries, distilleries, bleaching works, machine shops, and manufactories of carriages and wag- gons, reaping machines, ploughs, and other agricultural implements, sashes and blinds, railroad supplies, and machinery. Hamilton received a municipal charter in 1853, at which time the portion on the west side of the river formerly called Rossville was incorporated with it. The population, which in 1860 was 7223, and in 1870 11,081, of whom 3062 were foreigners, was estimated in 137 Oeete):7 000.

HAMILTON, the principal town in the western district of Victoria, Australia, is situated on the Grange Burne Creek, in 37° 45' S. lat. and 142° 1' E. long. It was pro- claimed a borough in 1859, the area of the munieipality being 5280 acres. It has several elegant buildings—a hospital and benevolent asylum, a town-hall, a treasury and land office, anda public library. Its educational

institutions include the Hamilton and western district college, the academy, and the Alexandra college for ladies, besides a state school with accommodation for 500 pupils. It possesses a fine race-course covering 120 acres, and pastoral and agricultural exhibitions are held annually, the surrounding district being chiefly devoted to sheep- farming. The population of the town and suburbs on the 1st January 1879 was estimated at 4400. The railway from Melbourne to Portland passes through the town.

ALEXANDER HAMILTON

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LEXANDER HAMILTON, the ablest American jurist and statesman of the early constitutional era of the United States, was born at the island of Nevis, one of the Antilles under the dominion of England, on January 11, 1757. His father was a Scotch emigrant who had settled at St Christopher, where he engaged in mercantile business. His mother was the daughter of a TIuguenot named Faucette, a prosperous physician of Nevis. She had been the wife of a Mr Irvine, also a physician, and during a brief married life dwelt at St Christopher ; but, owing to faults of his, she appears to have been driven to procure the judicial dissolution of the marriage, after which she returned to her father's home at Nevis, and there married James Hamilton. She bore to him many sons, of whom none but Thomas and Alexander lived to maturity. Alexander, the youngest, was called after his paternal grandfather, who described himself " of Grange," which is said to have been the family seat in Ayrshire, Scotland. The master of Grange married, in 1730, Elizabeth, eldest daughter of Sir Robert Pollock; and young Hamilton, when he had risen to fame and station, said, ' My blood is as good as that of those who plume themselves upon their ancestry." He styled bis suburban residence, near New York, 'the Grange."

His mother died while he was still a child, but not before he was capable of receiving and preserving distinct recollections of her, He derived from her an independent spirit, energy, self-reliance, and a disposition for metaphysical inquiries ; and these qualities were conspicuous from an early age. His father's business misfortunes casting the boy upon the care of some of the mother's relatives, he was taken by them to their home at St Croix, and there at school he first evinced that proficiency which marked him throughout his career. The opportunities for school train- ing were at that time very limited at St Croix, and when, in his thirteenth year, he entered the counting-house of Mr Nicholas Cruger, at that port, he had already received all the benefit such schools were able to impart. This was in the autumn of 1769. In less than a year he was capable of more than clerkly duty, and Mr Cruger, going on a foreign journey, left him in sole charge of the mercantile house. His business correspondence during this time, and the prosperity which attended the affairs, show that Mr Cruger's confidence was not misplaced. This practical acquaintance with mercantile affairs was to be most serviceable to Hamilton. In the methodical and energetic management of matters of state, and in the prudent care of weighty

interests, the influence of the knowledge and experience acquired byhim in the counting-house at St Croix is notable. During these three years he was the same close student that his after years more fully reveal. Te read standard books, which laid open the theories of value and of trade, thinking out to feasible methods how those theories might be advantageously applied to the daily work he had in hand. He read history, poetry, and philosophy. The French language became familiar to him by its general use In society and in the transactions of commerce, and he

always wrote it with accuracy and elegance, and spoke it fluently and with the accent of native speech. The Rev. Hugh Knox, D.D., an Irishman, a divine of the Presby- terian Church, a scholar of distinction honoured as such by the university of Glasgow, was Hamilton's first adequate preceptor, and was the first to discover the rich resources and useful tendencies of his intellectual and moral character. Under his friendly and gratuitous tutor-ship Hamilton supplied many parts in which his education was deficient. But the boy had aims beyond where he was ; and when an incident, trivial in itself, led to an arrangement by which a more liberal education was opened to him, he left the West Indies, in October 1772, and pro- ceeded to New York. There, aided by letters from his friend Dr Knox, he made the acquaintance of some of the leading men in that and the adjoining province of New Jersey. A year at the grammar scliool at Elizabethtown in the latter province proved sufficient to prepare him for the collegiate course, and in the spring of 1774 he entered as a student the King's (now Columbia) College, and, by special privilege, pursued the usual studies according to a plan which he laid out for himself,

When, in 1774, the enforcement of the Boston " Port Bill" aroused even the most moderate in the other colonies to sympathize with the province of Massachusetts Bay, Hamilton studied the political questions relating to the controversy between the colonies and the parliament of England with his habitual research and enlightened reason- ing. He was convinced that his duty as an Englishman required him to take part with the colonists against the assertion of the 'omnipotence of parliament." The famous tract by Lord Somers entitled Zhe Judgment of whole Kingdoms and Nations, &c., which repudiates this as a thing unknown to the law of England, was republished in 1773 at Philadelphia, and widely circulated throughout the provinces, in

aid of the cause of colonial resistance. Its effect upon the mind of Tfamilton is to be observed in his writings of this time. With his usual ardour he now busied himself in publie dis- cussion. Before his eighteenth year ended his reputation as an orator and writer was established. His chief opponent at this period was the distinguished divine Samuel Seabury, who a few years later (1783) was consecrated in Scotland the first bishop of the United States of America. The fame of their debates spread over the whole country, and Hamilton was the acknowledged " oracle" of the party of moderation, with which he acted.

While still a collegian he joined the military of the pro- vince of New York, and began as the captain of its first company of artillery employed in the continental service. To qualify himself for such a position he had, under the immediate instruction of an experienced soldier and officer, not only studied the theoretic art of war but engaged with others in receiving daily for several months practical lessons in the field-drill. He was active with his company of artillerists at the battle on Long Island, at Harlem Plains, at Chatterton's Hill, New Brunswick, Trenton, and Princeton. At Harlem Heights he first attracted the attention of Waslington, and again at New Brunswick excited the commander's admiration by the courage and skill with which he held in check the advance of the British forces, while the American army was retreating toward the Delaware. When the army went, in January 1777, into winter quartersat Morristown, Hamilton, now grown in the friendship and confidence of Washington, resigned his com- mand, became Washington's private secretary, and was raised to the rank of lieutenant-colonel. Hamilton remained on the staff until April 1781, when an unusual and hasty warmth of temper on both sides led to the severance of this par-

ticular connexion, but their mutual friendship remained

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and even increased. He was married in 1780 to Eliza- beth, second daughter of General Philip Schuyler, a distinguished soldier and statesman of the Revolution. For a brief space Hamilton occupied his time in exposing the inherent defects of the existing confederation by a series of excellent papers known as The Continentalist. But the country once more needed his

more active aid ; he returned to the army, led one most brilliant attack, and was present with a command at the surrender of Lord Cornwallis.

The war to maintain the declaration of independence was fought, but it did not make nor leave the United Colonies a nation. A new system of government and "a coercive union " were insisted upon by Hamilton and other foremost men as necessary. But many obstacles stood in the way. Historical prejudice and the selfishness of local interests were against concessions to a union of the States. Tradi- tional dread of centralized government, traditional dread of an hereditary aristocracy, dread that a national legis- lature, if allowed full authority, might assert and act upon the repudiated doctrine of an omnipotence of parliament, dread that a supreme geueral government might absorb, or even usurp, under the plea of care for the public welfare, those local interests which the States were now able to maintain, and which the Confederation was meant to pro- tect—the concurrence of these several causes contributed to bring out opposition whenever a more perfect union was proposed.

The first suggestion towards the establishment of an adequate and permanent government came, as it is now conceded, from Hamilton. It was contained in a letter written by him, September 3, 1780, to James Duane, a delegate from New York to the Congress at Philadelphia. Iie wrote a yet more remarkable letter the following year (April 30) to Robert Morris, the famous financier of the Yevolution, in which not a mere suggestion but a matured and complete scheme of national finance, including a plan for a United States bank, was discussed and laid out. These letters are, indeed, the principia of the American government in its organization and administration. When the convention of delegates met at Annapolis, Maryland, in September 1786, the influence of Hamilton upon the destinies of his country began to be favoured by circum- stances. Although the object of that convention was limited to simply commercial projects, yet, under his and Madison's prudent management, an address was finally issued which brought about the great and conclusive con- vention of 1787 at Philadelphia. The form of government then instituted is, in its groundwork and its principal features, a restoration and perfecting of the ancient consti- tutional liberties of England. While the particular plan proposed by Hamilton was, as were other projects, laid aside, yet it was the spirit of the

system conceived by him which then prevailed and has since been a controlling principle in tlle administration of government. Guizot says of him that "there is not in the constitution of the United States an element of order, of force, of duration, which he did not powerfully contribute to introduce into it and to cause to predominate." It was at this period that Hamilton, in association with John Jay and James Madison, wrote his parts of The Federalist.

At the convention, called by the State of New York, which met at Poughkeepsie, on the Hudson Tiver, June 1788, to ratify the proposed National Constitution, the superb ability of Hamilton for organizing und leading intelligent public opinion displayed itself fully. The utility of candid, earnest, reasonable debate has seldom been more approved by its results. A most disheartening minority of the delegates when the convention first met were in favour of the Constitution. When Hamiltca ceased his

ciforts, not only had he gained to his support a majority, but even ultimately he had the aid and vote of his most eloquent and most powerful antagonist. At length Hamilton arose in the convention, and, stating that Virginia had ratified the Constitution, and that the Union was thereby an acconiplished fact, moved that they cease their conteutions and add New York to the new empire of re- publican states. That day his labours culminated in entire success.

Washington, when forming tlie cabinet for his first presi- dential administration, naturally turned to Robert Morris as the proper person to take the secretaryship of the treasury ; but Morris declined, insisting that Hamilton was " the one man in the United States " fitted by studies and ability to create a public credit aud bring the resources of the country into active efficiency. Washington found his former military secretary more than equal to the task. The fiscal affairs of the country were at once organized, and prosperity quickly came. Hamilton achieved an immediate success which all agree is without parallel. He also was really the organizer of the administration of the new Government, and in its chief department it remains to this day without change. Ilis state papers, written during the two presiden- tial terms of Washington, are regarded as of the highest character

for knowledge of the case, wisdom, and practical method ; and his report on the constitntionality of a national bank, in which he fully develops his favourite policy of the implied powers of the Government, and the other report, nominally upon manufactures, which embraces in its range every pursuit of human industry susceptible of ellcouragement under such a government as he wislied to see that of the United States, are those productions in which the rare qualities of his mind abundantly manifest their force and precision. President Van Buren declared the latter paper to be " Hamilton's masterpiece."

After these labours Hamilton, though offered the position of chief-justice of the United States, remained at the bar of his adopted State. He soon rose to its highest rank, and was esteemed its unrivalled leader. As a citizen, and without the desire of public office, he continued always actively interested in public affairs. His intense and un- compromising moral nature engendered many political antipathies, though personally few were more loved for amiability and respected for their honour. Among those men whom he deemed it a patriotic duty to defeat in a personal ambition was Aaron Burr, the vice-president of the United States. Party lines were marked and party spirit fierce. Burr appreciated what would be the effect of Hamilton's continued opposition to his political designs, and knew that he was a man to be neither conciliated in this respect or outmanceuvred. He eagerly watched for an opportunity to impute offence. A trivial and inadequate occasion soon came. An indiscreet person repeated a remark which he said Hamilton made in a familiar con- versation at the house of a common friend, to the purport that he had a "despicable" opinion of Burr. Upon this gossip Burr acted; and so subtle was the manner with which he managed the correspondence for his determined purpose that he, according to the tone of society at that time, made it, in Hamilton's misconception, an obligation, due to his continued usefulness in public affairs, to accept a challenge. They met early on the morning of July 11, 1804, at a sequestered place beneath the hills of Wee- hawken, on the west bank of the Hudson River, opposite to the city of New York. Hamilton was mortally wounded at the first fire. As he fell, lis own pistol was by accident discharged, and the ball struck the ground near him. He did not himself intend to fire. He died the following day, in the forty-eighth year of his age. His death was considered a national calamity. Eight of his children,

four boys and four girls, were left to his widow's care. She survived him half a ceutury, dying at the age of ninety-seven, and during all tiat time she remained attired in the widow's dress of the early times.

The peculiarity of Hamilton's genius consisted of qualities which eminently distinguish him from the othcr great personages of his time. The epithet precocious was never applicable to him, for whatever he did, even in his boyhood, was accomplished with facility, and resulted in a perfection that the works of latter years did not exceed. He was ever mature. Lis intellect pierced through the most subtle and profound problems, and apparently without the labour of experiment. He " could sec consequents yet dormant in their principles," or, as Talleyrand said of him on more than one occasion, " he divined." " Hamilton avait deviné lEurope," was the reason given by the prince when he comparcd him to Fox and Napoleon. His industry was marvellous, and his learning equal to the creative faculty of his mind. The fecundity, power, vigour, and maturity of his intellectual works as fully im- pressed his contemporaries as they have since impressed posterity.

His political writings seem, in the estimation of judicious!and eminent writers in America, Great Britain, and France, to place him in the first rank of master minds. The most widely known of these writings are those contained in The Federalist. Translations of them were published at Paris (the first as early as 1792), and were studied by the chief public men of that period. It has been asserted that they exhibit an extent and precision of information, a profundity of research, and an accurateness of understanding which would have done honour to the most illustrious statesmen of ancient or modern times, that for comprehensiveness of design, strength, clearness, and simplicity they have no parallel (Blackwood's Maga- zine, January 1825, and The Edinburgh Review, No. 24). Talley- rand called the attention of European statesmcn to the merits of The Federalist as a copious source of correct maxims and profound thought ; and Guizot says that, 'in the application of elementary principles of government to practical administration, it was the greatest work knowu to him." Laboulaye has expressed at great length his deliberate judgment of

Hamilton's geuins and wisdom, and of the consummate ability with which he called into existence a new system of government and organized its administration (Histoire des Etats-Unis, tome iii.). And Hamilton's own country- men have not been less emphatic in grateful acknowledgment, especially Chief-Justice Marshall, the judicial interpreter and ex- pounder of the principles of the American Constitution.

In person Hamilton was below the medium height, slender, almost delicate in frame, instinct with life, erect and quick in gait ; his general address was graceful and nervous, indicating the energy, exactness, and activity of his mind. His complexion was bright and ruddy, his hair light, and the whole countenance decidedly Scottish in form and expression. His political enemies frankly spoke of his manner and conversation, and regretted its irresistible charm. The best portraits of him are by Trumbull, Weimar, Ames, and there is a good bust by Cerrachi.

For full memoirs of Hamilton, sec the elaborate Life, in 7 vols., by John Church Hamilton, one of his sons, New York, 1857; the Life by Dr Renwick, published in Harper's Family Library ; Life by Morse, 2 vols., Boston, 1876; Edouard Laboulaye's Histotre des Etats-Unis, tome iii., Paris, 1870 ; Curtis's History of the Constitu- tion of the United States, 2 vols., New York, 1858; Reithmiiller's Hamilton and his Contemporaries, London, 1864; Bancroft's His- tory of the United States, in the 7th and succeeding vols. ; and Shea's Life and Epoch of Hamilton, 2d ed., New York, 1880. (G. SH.)

HAMILTON, Anrnony or AnToinE (1646-1720), a French classical author, who is especially noteworthy from the fact that, though by birth he was a foreigner, his literary characteristics are more decidedly French than those of many of the most indubitable Frenchmen. His father was George Hamilton, younger brother of James, second earl of Abercorn and head of the family of Ham- ilton in the peerage of Scotland, and sixth duke of Chatellerault in the peerage of France; and his mother was Mary Butler, sister of the duke of Ormonde. He was born in 1646, but the place of his birth has not been ascertained. According to some authorities it was Drogheda, but according to the London edition of his works in 1811 it was Roscrea in Tipperary county. From the age of four till he was fourteen the boy was brought up in France, whither his family had removed after the

execution of Charles I. The fact that, like his father, he was a Roman Catholic, prevented his receiving the political promotion he might otherwise have expected on the Restoration, but he became a distin-

guished member of that brilliant band of courtiers whiose inost fitting portraiture was destined to be the product of his pen. His connexion with France was always main- tained, and the marriage of his sister to the Comte du Grammont rendered it more intimate if possible than before. On the accession of James he found his religious disabilities transfcrmed into advantages. He obtained an infantry regiment in Ireland, and was appointed governor of Limerick. But the battle of the Boyne, at which he was present, brought disaster on all who were attached to the cause of the Stewarts, and before long he was again in France—an exile, but at home. The rest of lis life was spent for the most part in the chateaux of his friends. With the duchess Ludovise of Maine he became an especial favourite, and it was at her seat at Sceaux that he wrote the Mémoires that made him famous. The ill-advised expedition of 1708 was the last political enterprise in which he shared, and he died at St Germain-en-Laye, August 6, 1720.

It is mainly, as has alrcady been indicated, by the Alémoires du Comte de Grammont that Hamilton takes rank with the most classical writers of France. The work was first published anony- mously in 1713 under the rubric of Cologne, but it was really printed in Holland, at that time the great patroness of all ques- tionable authors, An English translation by Boyer appeared in 1714. Upwards of thirty editions have since appeared, the best of the French being Renouard's (1812) and Gustave Bminet's (1859), and the best of the English Edward's (1793), with 78 engravings, and Malleville's (1811), with 64 portraits by Scriven and others. The original edition was reprinted by Pifteau in 1876. In imitation and satiric parody of the romantic tales which Galland's translation of The Thousand and One Nights had brought into favour in France, Hamilton wrote Le Bélin, Fleur d'Epine, Zénéyde, and Les Quatre Facardins, which are characterized by the graceful ease of their style and the successful extravagance of their incidents. The first three tales appeared at Paris in 1730, ten years after the death of the author, and a collection of his @avres Diverses in 1731 con- tained the unfinished " Zénéyde." A collected edition of Hamil- ton's works was published in six volumes in 1749, and was

reprinted in 1762, 1770, 1776, and 1777. A translation of Pope's Essay on Criticism, which procured the author a complimentary acknowledgnient from the poet, is still in MSS., with the excep- tion of a fragment printed in the 1812 edition of the works. In the name of his niece, the countess of Stafford, Hamilton main- tained a witty correspondence with Lady Mary Wortley Montagu. Sec Notices of Hamilton in the 1862 edition of his works, and in Lescure's edition of the Contes, Saintc-Beuve's Causertes du Lundi (tom. i.), and Sayou's Histoire dela littérature francaise & Vétranger,

1853.

HAMILTON, Exizaserny (1758-1816), novelist and miscellaneous writer, was born at Belfast, of Scotch ex- traction, 25th July 1758. Her father's death in 1759 left his wife so embarrassed that Elizabeth was adopted in 1762 by her paternal aunt, Mrs Marshall, who lived in Scot- land, near Stirling. There Elizabeth spent her youth and received a good education,—at first at school, afterwards in private, and latterly for some months under masters at Edinburgh and Glasgow. In her 15th year she made a tour in the Highlands with some friends, and wrote a journal of it for her aunt's perusal, which was inserted, unknown to the authoress, in a provincial magazine. In 1780 Mrs Marshall died, and Miss Hamilton was prevented by house- hold cares from using her pen; but in 1785 she made her first voluntary contribution to the press in the shape of a letter to the Lounger, of which paper it forms the 46th number. On the death of Mr Marshall in 1788, Miss Hamilton lived fora time with her brother, Captain Charles Hamilton, who was engaged on his translation of the Hedaya. Prompted by her brother's associations, she pro- duced her Letters of a Hindoo Rajah in 1796, and soon after, with her sister Mrs Blake, settled at Bath, where she published in 1800 the Memoirs of Modern Philosophers, a kind of satire on the admirers of the French Revolution. In 1801-2 the Letters on Educa- tion appeared, her most valuable though not her most popular work. After travelling though Wales and Scotland

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for nearly two years, the sisters took up their abode in 1803 at Edinburgh. In 1804 Mrs Hamilton, as she then preferred to be called, published her Life of Agrippina, wife of Germanicus; and in the same year she received a pension from Government. About this time she consented to take charge for six months of a widowed Scotch noble- man's family ; and to his eldest daughter were addressed Letters on the Moral and Religious Principle, published in 1806. Her next publication of importance, Zhe Cottagers of Glenburnte, appeared in 1808. This work, to which the authoress owes most of her fame, is an admirable description of the failings of the Scotch peasantry in their home life, and, while graphic and telling, is "saved from caricature and absurdity." Sir Walter Scott describes it as "a picture of the rural habits of Scotland, of striking and impressive fidelity ;" and Lord Jeffrey reviewed it very favourably in the Hdinburgh Review (vol. xii.). Her subsequent works were a supplement to her Letters on Fiducation, under the name of Popular Essays on the Elementary Principles of the Human Mind (1812), and Hints addressed to the Patrons and Directors of Public Schools (1815). She died at Harrogate, July 23, 1816.

Memoirs of Mrs Elizabeth Hamilton, by Miss Benger, were pub. lished in 1818. A notice of her literary life and labours, attributed to Miss Edgeworth, appeared in the Jfonthly Magazine for Sep- tember 1816.

HAMILTON, James (1769-1831), the author of the Hamiltonian system of teaching languages, was born in 1769 and died October 31,1831. The first part of his life was spent in mercantile pursuits. Having settled in Hamburg and become free of the city, he was anxious to become acquainted with German and accepted the tuition of a French emigré, General D'Angelis. In twelve lessons he found himself able to read an easy German book, his master having discarded the use of a grammar and trans- lated to him short stories word for word into French. As a citizen of Hamburg Hamilton started a business in Paris, and during the peace of Amiens maintained a lucrative trade with England; but at the rupture of the treaty he was made a prisoner of war, and though the protection of Hamburg was enough to get the words effacé de la liste des prisonniers de guerre inscribed upon his passport, he was detained in custody till the close of hostilities. His busi- ness being thus ruined, he went in 1814 to Ameriea, intend- ing to become a farmer and manufacturer of potash ; but, changing his plan before he

reached his location," he started as a teacher in New York. Adopting his old tutor's method, he attained remarkable success in New York, Baltimore, Washington, Boston, Montreal, and Quebec. Returning to England in July 1823, he was equally for- tunate in Manchester and elsewhere. His system attracted general attention, and was vigorously attacked and defended. In 1826 Sydney Smith devoted an article to its elucidation in the Hdinburgh Review :—" We are strongly persuaded," he said, " that, the time being given, this system will make better scholars, and, the degree of scholarship being given, a much shorter time will be needed" than in the ordinary system. As text-books for his pupils Hamilton printed interlinear translations of the Gospel of John, of an Epitome historic sacree, of 4Esop's Fables, Eutropius, Aurelius Victor, Pheedrus, &c,, and many books were issued as Hamiltonian with which he had nothing personally to do. The two master principles of his method, which has left its traces on our modern linguistic discipline, are that the language is to be presented to the scholar as a living organism, and that its laws are to be learned from observation and not by rules.

See Hamilton's own account—The Principles, Practicc, and fvsults of the Hamiltonian System Sor the last Twelve Years, Man- chester, 1829; Albertc, Ucher die Hamilton'sche Methode ; O. F. Wurm, Hamilton und Jacotot, 1831,

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HAMILTON, Parrick (1504-1528), son of Sir Patrick Hamilton, well known in Scottish chivalry, and of Catherine Stewart, daughter of Alexander duke of Albany, second son of James II. of Scotland, was born in the diocese of Glasgow, probably at his father's estate of Stonehouse in Lanarkshire. Of his early boyhood and education nothing is known. In 1517 he was appointed titular abbot of Ferne, Ross-shire; and it was probably about the same year that he went to study at Paris, for his name is found in an ancient list of those who graduated there in 1520. It was doubtless during this period that he received the germs of the doctrines he was afterwards so nobly to uphold. From Ales we learn that Hamil- ton subsequently went to Louvain, attracted probably by the fame of Erasmus, who in 1521 had his headquarters there. Returning to Scotland, the young scholar naturally

selected St Andrews, the capital of the church and of learn- ing, as his residence. On the 9th June 1523 he became a member of the university of St Andrews, and on the 3d October 1524 he was admitted to its faculty of arts. There Hamilton attained such influence that he was permitted to coudnet in the cathedral a musical mass of his own composi- tion. But the Reformed doctrines had now obtained a firm hold on the young abbot, and he was eager to communi- cate them to his fellow-countrymen. Larly in 1527 the archbishop Beatoun's attention was directed to the hereti- cal preaching of the young priest, whereupon he ordered that Hamilton should be formally summoned and accused. Hamilton fled to Germany, first visiting Luther at Witten- berg, and afterwards enrolling himself as a student, under Francis Lambert of Avignon, in the new university of Marburg, opened May 30, 1527, by Philip, landgrave of Hesse. Frith and Tyndale were among those whom he met there. Late in the autumn of 1527 Hamilton returned to Scotland, bold in the truth of his principles. He went first to his brother's house at Kincavel, near Linlithgow, in which town he preached frequently, and soon afterwards he married a young lady of noble rank, whose name has not come down to us, Beatoun, avoiding open violence through fear. of Hamilton's high connexions, invited him to a conference at St Andrews. The reformer resolutely accepted the invitation, and for nearly a month was per- mitted to preach freely. At length, however, he was sum- moned before a council of bishops and clergy presided over by the archbishop; and though he clearly and calmly answered all the written charges brought against him, his replies gave ground for new accusations of heresy. The council eagerly convicted him, and handed him over to the secular power. The sentence was carried out on the same day (February 29, 1528) lest he should be rescued by his friends, and he was burned at the stake as a heretic. His courageous bearing attracted more attention than ever to the doctrines for which he suffered, and greatly helped to spread the Reformation in Scotland.

Hamilton left a short treatise showing the antithesis between the law and the gospel. Frith's translation of it, under the name of ' Patrick's Places," is to be found in Foxe's Acts and Monuments. Patrick Hamilton, the first Preacher and Martyr of the Scottish Re- formation, by the Rev. Peter Lorimer, was published at Edinburgh in 1857.*

HAMILTON, Roser (1743-1829), an able writer on political economy and finance, was born at Pilrig, Edin- burgh, on the 11th June 1743. He was of good family, his grandfather, William Hamilton, professor of divinity and afterwards principal of Edinburgh University, having been a cadet of the family of Preston. He received an excellent education, and specially distinguished himself in the classes of mathematics at the university of Edinburgh, then under Professor Matthew Stewart. Although desirous of following a literary life, he was induced to enter the banking-house of Messrs Hogg in order to acquire a prac-

tical knowledge of business. In 1766 he was disappointed in his effort to obtain the mathematical chair at Aberdeen university, but three years later le gave up business pur- suits and accepted the rectorship of Perth academy. In 1779 he was presented to the chair of natural philosophy at Aberdeen university. For many years, however, by private arrangement with his colleague Professor Copland, Hamilton tanght the class of mathematics. In 1817 he was presented to the latter chair. For some years before his death in July 1829 he had retired from the active business of his chair, and quitted his privacy only at rare intervals to take part in important affairs concerning the college.

Hamilton's most important work is the Essay on the National Debt, which appeared in 1813 and was undoubtedly the first to expose the economic fallacies involved in Pitt's policy of a sinking fund. It is still of value. A posthumous volume published in 1830, The Progress of Society, is also of great ability, and is a very effective treatment of economical principles by tracing their natural origin and position in the development of social life. Some minor

works of a practical character (Introduction to Merchandize, 1778 ; Essay on War and Peace, 1790) are now forgotten,

HAMILTON, Tuomas (1789-1842), the author of Cyril Thornton, was tlhe younger brother of Professor Sir William Hamilton, Bart., and was born in 1789. In his early years le acquired a thorough mastery of the classics, and notwithstanding that he entered the artillery and was engaged in active

service throughout the Peninsular and American campaigns, he continued to cultivate his literary tastes. On the conclusion of peace he withdrew, with the rank of captain, froni active professional duties, and amused his leisure hours with the congenial pastime of literature. He was a frequent contributor to Blackwood's Magazine from its commencenient, his papers manifesting great variety and versatility of talent, and embracing both prose and poetry, The most important and popular of his contributions to that periodical was the military novel Cyril Thornton, whose deficiency of plot is sufficiently compensated for by the interest of its details, its vivacity of movement, its truthful and clever delineation of character, and its easy, fresh, and graceful style. His Annals of the Peninsular Campaign, published originally in 1829, and republished in 1849 with additions by Frederick Hardman, though too condensed to leave room for graphic description, is written with great clearness and inipartiality. His only other work, Men and Manners in America, published originally in 1832, is the result of much careful observation, and its criticisms, though frank and outspoken, and somewhat coloured by British prejudice, are always expressed with courtesy and good taste. He died at Pisa, December 7, 1842.

HAMILTON, Sir Wittram, Bart. (1788-1856), one of the most eminent of Scottish metaphysicians, was born in Glasgow, on the 8th March 1788. His father, Dr William Hamilton, had in 1781, on the strong recommendation of the celebrated William Hunter, been appointed to succeed his father, Dr Thomas Hamilton, as professor of anatomy in the university of Glasgow ; and when he died in 1790, in his thirty-second year, he had already gained a reputa- tion that caused his early death to be widely and deeply regretted. William Hamilton and a younger brother (after- wards Captain Thomas Hamilton, noticed above) were thus brought up under the sole care of their mother,—a woman, fortunately, of considerable ability and force of character. William received his early education in Scotland, except during two years which he spent in a private school near London, and went in 1807, as a Snell exhibitioner, to Balliol College, Oxford. There he pursued his studies zealously, though for the most part independently,— devoting himself chiefly to Aristotle, but in other directions

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November 1810 he took the degree of B.A. with first-class honours, after an examination so much above the usual standard in the nuinber and difficulty of the works which it embraced that the memory of it was long preserved at Oxford, He had been intended for the medical profession, but, soon after leaving Oxford, gave up this idea, and in 1813 became a member of the Scottish bar. Henceforward Edinburgh was his place of residence, and, except on occa- sion of two short visits to Germany in 1817 and 1821, he never again quitted Svotland. Neither his ambition nor his success was such as to absorb his time in professional pursuits, His life was mainly that of a student; and the following years, marked by little of outward incident, were "filled by researches of all kinds, through which he daily added to his stores of learning, while at the same time he was gradually forming his philosophic system. The out- ward and visible traces of these researches remain in his common-place books, especially in one which, having been in constant use, is a valuable record of his studies from this time onwards to the close of his life, He did not withdraw himself from society, but his favourite com- panions were the books of his own and of every library within his reach. Among these he lived in a sort of seclusion, from which only now and then, when stirred by some event of the world around, did he come forth, in vigorous pamphlets, to denounce, or protest, or remonstratc, as the case might be.

His own investigations enabled him to make good his claim to represent the ancient family of Hamilton of Preston, and in 1816 he tuok up the baronetcy, which had lain dormant since the death (in 1701) of Sir Robert Hamilton, well known in his day as a Covenanting leader.

In 1820 he was an unsuccessful candidate for the chair of moral philosophy in the university of Edinburgh. Soon afterwards he was appointed professor of civil history, and as such delivered several courses of lectures on the history of modern Europe and the history of literature. In 1829 his career of authorship began with the appearance of the well- known essay on the Philosophy of the Unconditioned,—the first of a series of articles contributed by him to the Ldin- burgh [eview, He was elected in 1836 to the Edinburgh chair of logic and metaphysics, and from this time dates the influence which, during the next twenty years, he exerted over the thought of the younger generation in Scotland. Much about the same time he began

the preparation of an annotated edition of Reid's works, intending to annex to it a number of dissertations. Before, however, this design had beeu carried out, he was struck with paralysis of tle right side, which seriously crippled his bodily powers, though it left his mind wholly unimpaired. The edition of Reid appeared in 1846, but with only seven of the intended dis- sertations,—the last, too, unfinished, It was Sir William's distinct purpose to complete the work, but this purpose re- mained at his death unfulfilled, and all that could be done afterwards was to print such materials for the- remainder, or such notes on the subjects to be discussed, as were found among his MSS. Considerably before this time he had formed his theory of logic, the leading principles of which were indicated in the prospectus of "an essay on a new analytic of logical forms" prefixed to his edition of Reid. But the elaboration of the scheme in its details and appli- cations continued during the next few years to occupy much of his leisure. Out of this arose in 1847 a sharp con- troversy with the late Professor De Morgan of University College, London. The essay did not appear, but the re- sults of the labour gone through are contained in the valnable appendices to his Lectures on Logic. Another occupation of these years was the preparation of extensive

also laying the foundations of that wide and profound | materials for a publication which he designed on the per- scholarship with which his name is associated. In | sonal history, influence, and opinions of Luther. Here he

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advanced so far as to have planned and partly carried out the arrangement of the work; but it did not go farther, and stillremains in MS. In 1852-53 appeared the first and second editions of his Discussions in Philosophy, Literature, and Education, a reprint, with large additions, of his contri- butions to the Edinburgh Review. Soon after, his general health began to fail, Still, however, aided now as ever by his courageous and devoted wife—(he had married in 1829)—he persevered in literary labour; and during 1854-55 he brought out nine volumes of a new edition of Stewart's works. The only remaining volume was to have contained a memoir of Mr Stewart from his pen; but this he did not live to write. He taught his class for the last

time in the winter of 1855-56. Shortly after the elose of the session he was taken ill, and on the 6th May 1856 he died at his house in Edinburgh.

Sir W. Hamilton's philosophy is presented in writings either more or less fragmentary in form and ozcasional in purpose, or else, in whole or in part, prepared for publication by others, not by himself. Hencg, not only do some points receive what seems almost a super- fluity of attention, while others of equal importance are treated with barely enough of detail, but there is no complete statement of the latest results of his thinking in their mutual relations. It may be that this imperfection of the outward form has tended to obscure the real harmony of his system, and in part led to its being pronounced —as it has too often been—an assemblage of contradictory doctrines. How far this is from being the casc, and how closely the various parts are connected, becomes apparent when it is seen how they arc all developed from the central eonception of consciousness. In the following sketch that conception will be used as a point from which briefly to view the system as a whole, and to trace the bearing ou one auother of its leading doctrines.

Consciousness is regarded by Hamilton under three chief aspects : —(1) as it is in itself ; (2) as realized under actual conditions ;

(3) as a source of truth.

_ _ 1. Consciousness in itself is to Hamilton but another name for _inmediate or intuitive knowledge. For such knowledge is a ' relation between a subject (knowing) and an object (known), which, as it is viewed from the side of the one or the other term, is properly called consciousness or knowledge : there are two aspects, but the thing itself is one. Immediate knowledge or consciousness involves the existence of both subject and object,—it is the affirmation by the subject implicitly of its own existence, explicitly of that of the object. In this relation as realized in the primary judgment, that which knows is conceived as the ego or self,—that which is known, either as a mote of the ego or self, or as a mode of the non-ego or not-self. Thus we have, in the terms of the relation, a division of existence into the noumenon self and the contrasted phenomena of mind and of matter; while the relation itself yields a division of knowledge into philosophy, corresponding to its subjective, and science, corresponding to

its objective, phase,—the latter being further subdivided into the sciences of mental and those of material phenomena.!

2. Hamilton adopted the division of mental phenomena (not as states but as elements) into the three groups or classes of cognition, feeling, and conation. Cognitions he classified according to the dif- ferent relations between subject and object, calling these relations, — as subjective, powers or faculties, —as objective, forms or stages, of knowledge. Under these, cognition is either immediate or mediate, z.e., either consciousness itsclf or the datum of consciousness. The first of the faculties, therefore, is of immediate knowledge,—the acquisitive or presentative power, which yields perception (external and internal). The second is of that form of mediate knowledge which is representative of an individual object. Here Hamilton dis- tinguished thee moments or phases, which he termed the retentive, the reproductive, and the representative powers, —distinguished them perhaps too widely, but at the same time indicated their essential unity. The third is of that form of mediate knowledge in which a number of objects reccive a factitious unity from being thought under a common relation. This he named the elaborative or discursive faculty.2 Here, where he had to deal with conscious- ness in the form. of experienee, realized under actual conditions and comprehending every variety of mental life, Hamilton showed, in the first place, how. the mutual action and reaction of the several elements produces the eomplexity which the phenomena present. Reminiscence, imagination, and judgment are all, as acts of which we are conscious, and which imply a prior immediate knowledge, contained in self-perception. But, on the other hand, our know- ledge or perception even of self could not be what it is, did pro-

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1 Reid's Works, pp. 804-810, 878, 929 sq.;

Discussions, 3d ed., 47, 603, 2 Lectures, i, 183-189, ii. 1-17,

Lectures, i. 193, 202-204, ii. 279;

cesses of reminiscence, imagination, and judgment not enter into its composition. Consciousness includes all the particular forms of knowledge ; yet its development into awhole is the effect of the agencies which make up itscontent.3 In the next place, he showed the laws of mental action in the conditions under which conscious- ness is exercised. From the variety and the limitation of con- sciousness, under the relation of time, arises the successive vari- ation of its units,—in other words, the traiu of thought. By the limitation of consciousness is meant the limited number of objects to which it. can at one time be directed, but this issues in a farther limitation, consisting in the disproportion between consciousness and tle whole sum of mental modifications. Sir W. Hamilton held that consciousness is the mental modes or " movements, rising above a certain degree of intensity," and that. "the movements beyond the conscious range are still properties—and effective properties -—of the mental ego." This doctrine he used to explain not only the phenomena of ordinarily latent knowledge and of forgetfulness but also those of the abnormal recovery of apparently lost knowledge and of the formation of habits and dexterities. The units (or rather groups of units) of the train—partly former thoughts again present, partly thoughts for the first time present to the mind-—follow one another according to what Hamilton called the law of integration, 7.¢., "only as they stand together as relative parts of the same common whole." Of this supreme law subor- dinate phases determine more special consecutions of thought. The reappearance of former thoughts (reminiscence voluntary or in- voluntary) is governed by the laws of (1) redintegration and (2) repetitiou. "Thoughts tend to suggest one another which are co- identical (1) in time or (2) in mode." New wholes of thought are framed by successive analyses and syntheses. Under the law of integration these analyses are effected by means of attention and abstraction, ¢.c., by consciousness being continuously and repeatedly concentrated on certain parts or aspects. of objects and withdrawn from others. The syntheses of thought are infinitely diverse in character, yet possess in common an invariable form. This process of forming new wholes, by discrimination and comparisen, out of the materials supplied by perceptiou and recollection, is the one kind of mental activity recognized by Hamilton in the various pro- ducts of thought, from the simplest to the most complex. In other words, le regards. judgment as the. fundamental act of mind, the proposition, or expressed judgment, as its primary product.®*

3.. Hamilton's theory of consciousness in its third aspect, @.¢., asa source.of principles, is embodied in his doctrines of the conditioned and of common sense. The former is so called because it professes to be a demonstration that "the conditionally limited (what we may briefly call the conditioned) is the only possible object of know- ledge and of positive thought." The name of the latter was adopted by Hamilton, not as in itself a good one, but as sanctioned by the usage of philosophers in general and of Scottish philosophers in particular. The doctrine itself is that the primary data of econ- sciousness are, as such, 7.¢., as facts, and solely on the authority of consciousness, to be accepted as true. The.two.doctrines are com- plements of each other, as severally explications of the principle of the relativity of human knowledge, which, common to both, is manifested in the one through that which we cannot know,—in the other through the. inexplicable character of our fundamental cognitions.

The primary data of consciousness Hamilton held to be

'of two orders, otherwise. diverse, but in this the same, that

they are knowu merély as facts. These are—(1) truths of pereep- tiou—the conviction of thereality as modes of self of our own thoughts and feelings, and the allied. conviction that in. seuse-perception we come into contact with a reality external to the mind'; and (2) truths of reason—the fundamental laws of logic, the necessary forms of thought or relations of existence (7.¢., quality, and quantity in its threefold aspect as time,. space, degree), the causal judgment, the principle of substance and phenomenon, &c.® ;

Now. here it was Hamilton's peculiar contribution. to: philosophy that he placed 'the data of perception along with the data of thought, and affirmed that both classes alike are inexplicable, yet as facts clear ; that both rest ou the same authority ; and that, if the one be accepted as truc, so also should be the other. He was a realist, because he held realism to be the dictate of consciousness. LEvi- dently here the ground of the vicw is of even more importance than the view itself, and so to Hamilton the question of realism versus idealism was momentons.chiefly froin its connexion with that of the authority. of eonsciousness. He was fully aware that, since he claimed so high. an. authority for the primary data of consciousness, it was necessary

to supply the means of deciding whether any given cognition is or isnot entitled to be placed among such ; and to this end he laid down certain criteria of alleged primary facts of con- sciousness. 'These criteria are (1) simplicity, (2) universality and (subjective) necessity, (3) comparative evidence and certainty, (4)

3 Reid's Works, 932; Lects., i. 205, ii. 523. 4 Reid's Works, 910, 932, 938; Lects., i. 338-371, ii. 209-218, 5 Reid's Works, 911-913; Lects., i, 225-263, ii. 227-295, iii. 117-140, 275. 6 Reid's Works, pp. xviii., 743. ; XI. — 53

incomprehensibility. datuni of consciousness which is not simple (7.¢c., incapable of being resolved into another), not held by all men as a self-evident and necessary truth, and not in itself inexplicable. Now the doctrine of the immediate knowledge of the non-ego will, Hamilton affirmed, stand all these tests. lt is the simple residuum of truth in the crude and erroneous beliefs of men as to what they perceive through their senses ; it is the spontaneous conviction of all (as to this he cited as witnesses philosophers who regarded the belief as a mistake and a delusion); and it does not admit of being made comprehen- sible! That this is so can hardly be denied. Practically, indeed, all acknowledge that consciousness does intuitively affirm what he alleges it to affirm ; and, the question being one of fact, a practical acknowledgment is quite as good as a theoretical one. ;

Here let it be remarked in passing that Hamilton's doctrine of common sensc is wholly misrepresented when held up as an appeal to the belief of the unthinking multitude versus the judgment of philosophers. Rather it carries the appeal into a sphere where the philosophic and the ied have eeased to be distinguished ; it shows that uot the mind of the philosopher, and not the mind of the vulgar, but the mind of man, is what philosophy has to deal with, and that its office is to resolve current beliefs into their elemeuts, not satisfied till it has reached the final and absolutely pure deliver- ance of consciousness, .

But it may be said, as it often has been said, that consciousness is not competent to aflirm immediate knowledge of the non-ego, because to discriminate the non-ego from the ego is beyond its power. Hamilton's

answer is that, if knowledge be, as he holds, essentially relative, self cannot be known except with and through not-self, and that natural realism is but a corollary of the gencral principle of the relativity of knowledge. On that principle he held that "we think one thing only as we think two things mutually and together," and that, self being inherently a relative notion, we should never interpret by it facts of our experience, if experience

did not come before us under a relation that needs both terms (sclf |

and not-self) for its expression. Hamilton certainly implies, if he docs not expressly say, that, had we no knowledge of a not- self, we could never objectify self so as to know it as such atall. To him a knowledge of the ego alone would be absolute, not relative— such a knowledge, that is, as he held tq be impossible. But, viewing knowledge as a relation between an existing subject and an existing object, he saw no reason why the object should not be what it is known as—sometimes a mode of self, sometimes a mode of not- self, —aud why consciousness of the ego should not include also that which stands in relation with it.?

But that there has been so amazing an amount of misconcep- tion on the point, it might seem hardly needful to say that Hamilton did mot hold that in perception we know the thing-in- itself. His doctrine of relativity included phenomenalism, though it was more than phenomenalism ; and not only his oft-repeated assertions that there can be no such object of knowledge, but the whole tenor of his philosophy, are directly against this interpreta- tion. In passages where he speaks of "the thing" as directly known, the word is obviously used, not for noumenon or the thing in itself, but for the real as opposed to the ideal in phenomena. There can be no doubt that he held the object in sense-perception to be a phenomenon of the non-ego ; and arguments that proceed upon a different supposition are of no effect against his theory.

The relativity of perception on that theory is, indeed, not open to doubt. According to him, we perceive phenomena alone,—such alone as we have faculties to apprehend,—such alone as stand in relation to our organs of sense ; and we perceive only under the contrast of self and not-self. There is thus in every act of perception a twofold relation—(1) between the thing and the organ, manifested in sensation being a condition of perception, and

(2) between self and not-self, manifested in consciousness and perception being different names for the same thing. This of itself should show that he cannot be expected to state definitely what is the object in per- ception, —as it has often been said that he does not do, or dees differ- ently in different places. The object of intuition or perception does not admit of being definitely stated. For individual objects cannot "as such be conceived, still less named, till knowledge has risen above the intuitive or perceptive stage. On this, as on all points relating to perception, Hamilton's mature and carefully expressed view is to be found in his dissertations appended to Reid's works. There he divides the qualities of body into three classes, — primary, secondary, and secundo-primary. He shows that sensation and perception proper, though up to a eertain point inseparable, are not only dis- tinct, but above that point actually in the inverse ratio of one another; that sensations proper (identical with the secondary qualities) are. merely subjective affections of the animated organism, and afford no knowledge of external reality ; that in pereeption proper the material organism, which is to be regarded as an external reality, is presented under those relations which constitute its extension, ¢.e., we know its primary qualities ; and that in sensation

*1 Reid's Works, 742 sq., Lects., ii. 347-3849; Disc., 54, 85-86, 95. * Lect , ti. 587; Dise., 61, 599.*

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In other words, no cognition is an original |] and perception together we know the sccundo-primary qualities,

7.¢., objects external to the body become known, as directly related, through various inodes of resistance, to the organism in motion. The object in perception is, then, according to him, a primary quality of the organism, or the quasi-primary phase of a secundo- primary quality. It is a fundamental point of Hamilton's doctrine that the organism is differently related to the ego in perception proper and in sensation proper.' In his own words—" the organism is the field of apprehension to both, but with this difference, that the former views it as of the ego, the latter as of the non-ego, —that the one draws it within, the other shuts it out from, the sphere of self." On this-distinction is partly founded his doctrine of the twofold

character of space, as at once an a priori conception and an a posteriort perception. He held with Kant that space is a necessary condition of thought, and as sueh not derived froin experience ; but he at the same time held that through sense we have a perception of something extended, 7.¢., of extension. Now the eognition of extension is a cognition of relations,—properly therefore realized by a simple energy of thought; but the facts that sensation is an essential condition of this cognition, and that what is known as extended is the organism, which is as much ex- ternal to the ego as any other part of the material world, seemed to him to justify these relations being regarded not as subjcetive but as objective.

Hamilton's doctrine of the conditioned relates to the second group of primary truths or original data of consciousness. Rela- tivity, as a general condition of the thinkable, he asserts, is brought to bear under three principal and necessary relations :—the first (subjeetive) the contrast of self and not-self, the second (objective) quality, and the third (objective) quantity. Quality is realized under the twofold aspect of substance and phenomenon. Quantity has three phases :—time (protensive), space (extensive), degree (iutensive). Now the doctrine of the conditioned is (1) that under these relations—specially those of quality and time—we must think everything; (2) that the unconditioned as such is either the un-conditionally limited—the absolute, or the unconditionally un- limited—the infinite; (3) that, under the necessary relations of thought, we are unable positively to eonceive either unconditional limitation or unconditional illimitation ; ¢.g., an absolute whole or part of existence in time or in space or in degree is inconceivable, so is infinite increase or division ; absolute quality is inconceivable, quality infinitely undetermined is so equally.4 Thus this doctrine elaims to demonstrate the limited range of positive thought, by showing that the mind is tossed from the one to the other of two eontradictory extremes, unable to conceive either, yet compelled to believe that one or other is actual. The kind of inconceivability of the two extremes is indeed different, and it may be rcegrctted that, in his expositions of this part of his philosophy, Hamilton did not more explicitly recognize that fact. It seems true that to combine the absolute with existence regarded quantitatively, 7.¢., in time orin space or in degree, or the infinite with existence regarded qualitatively, is impossible, not ouly as beyond but as against thought, 7.é., as involving a contradiction ; and therefore that, in

respect of one of the two extremes, the mind is not simply impotent, seeing it rejects it as that to which there can be nothing answering in actual existence. But then it does so only to find itself face to face with an alternative which, while it must be inferred to be actual, can by no effort be realized in thought. So that, even if this objeetion be allowed, the doctrine still remains intact as a demon- stration how limited is the sphere of human thought as compared with that of existence, and how little human powers of conception are to be made the measure of truth.

Its significance becomes still more apparent in the original and ingenious application made of it by Hamilton to the solution of such philosophic problems as the origin of the principles of cause and effect, substance and phenomenou, &c. That the sum of exist- ence of one set of modes has passed into another mode is, aecording to him, what we mean by saying that anevent had causes. Con- sciousness is a knowledge of existence only as conditioned in time, and we are impotent—(it matters not how)—to conceive the forms of existence within our experience as having had an absolute eom- mencement ; therefore we conceive them as having existed in other forms, in other words, as caused. 'Thus it is in order to escape from the necessity of thinking an absolute beginning for existence in time that we view all things as a series of causes and effects. In like manner, it is because wwe can think neither that which exists in and for itself nor that which exists merely in and through some- thing else that we recognize all objects under the double aspect of substance and phenomenon,—knowing nothing but the latter, yet always supposing the former.®

Having showed that the original data of eonseiousness, how- ever different in other respects, are alike inthis, that they are as

8 Reid's Works, Wan, 247n, 809, 816-888; Lects. i. 136-155, ii, 129-132, 822; Dise., 54, 639. s

4 Reid's Works, 743, 934; Lects., ii. 366-374, 525-588; iii. 98-105; Disc., 12-15.

28-30, 596-604,

5 Reid's Works, 985-987 ; Lects., ti. 876-413, 538-541; Disc., 604-617.

facts—Lbut only as facts—clear and certain, and as cognitions rélative, more properly indeed, beliefs than cognitions, —Hamilton claims for all that, on the sole authority of conseiousness, they be accepted as truths. This is the point to which the whole of his philosophy leads up ; hence he offers no arguments in its support. Heonly asks—Ifthe authority of consciousness be dis- allowed, what other warrant of truth remains? Where else will a source of certainty be found? He saw no alternative between ab- solute scepticism and implicit reliance on consciousuess. But his veliance was no absolute and blind belief. He claimed implicit cred- «nce for consciousness only after having investigated and laid down the conditions of its credibility. The inexplicability that is to him a mark of truth must be proved to be that which springs from the fundamental character of the cognition. While the establishmeut ef principles on which belief may be sure, rational, and counsisteut is the ultimate aim of his philosophy, groundless or inconsistent belief he sweeps away wherever he meets with it. Thus he will not

allow the validity of belief in an external reality which, ex |

Aypothesi, is not known. Be it noted too, that it is couscious- ess, t.¢., reason, for which he claims supreme authority.2 His position is best understood through the mutual relation (already referred to) of his doctrines of the conditioned and of common sense. The former extends the bounds of existence as much as it narrows those of thought, and so makes rooin for belief ; While the

intter shows belief to be the condition on which alone even primary |

ind fundamental truths can be apprehended. Thus, for example,

on the ground of both, he held that freedom of will and necessity |

wre alike inconceivable, but that we are not entitled to reject thie testimony of consciousness to the fact that as moral agents we are free, on aceount of the speculative difficulties with which it is sur- vounded. These two doctrines Sir W. Hamilton did not himself apply to theology, and in themselves they have no direct theological bearing, since the one is*

concerned with the infinite and the absolute merely as notions, and the other with simple forms of thought long prior to those of theology. But his references to this subject indi- cate clearly what he considered to be the true relation of theology to philosophy, and show that, in the one as in the other, he held wisdom to lie in such a conviction of human ignorance as disposes the mind to accept harmony with the facts of consciousness as evidence of truth.4 .

Of the three classes into which, as we have seen, Hamilton | divided mental phenomena, the third—the phenomena of conation | —is not treated of in his Lectures, and his other works contain only |

fragmentary discussions of particular ethical points. Several lectures, however, are devoted to the consideration of the pheno-

mena of feeling and the development of a theory of pleasure, founded | chiefly on that of Aristotle, which is in substance that pleasure is |

the reflex in consciousness of the spontaneous and unimpeded exer-

sciousness of overstrained or repressed exertion.®

The logic with which Sir W. Hamilton's name is associated is a purely formal science. Nothing else indeed did he consider properly to be called logic. For it seemed to him an unscientific mixing together of heterogeneous elements to treat as parts of the same

science the formal and the material conditions of knowledge. He | was quite ready to allow that on this view logic cannot, be used |

as a means of discovering or guaranteeing facts, even the most |

general, and expressly asserted that it has to do, not with the object-

ive validity, but only with the mutnal relations, of judgments. He |

further held that induction and deduction are correlative processes of formal logic, each resting on the necessities of thought, and de- riving thence its several laws. In establishing the distinction be- tween logical and scientific induction, he showed that deduction no move than induction is self-sufficient, since it also must havea prior process to start from before it can be applicd to nature. He also

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logic were the result (1) of applying to propositions and syllogisms the two aspects of notions as wholes, —extension, answering to the

| objects denoted, and zntension, answering to the attributes connoted,

—and (2) of assigning quantity to the predicate as well as to the subject in judgments of extension. These judgments receive the form of an equation. Only simple conversion is allowed, but, all propositions being shown to be

capable of simple conversion, the class of immediate inferences is greatly increased. Categorical syllogisms (indnetive and deductive) may be cither unfigured or figured, according as the distinction of subject and predicate and the distinetions included in that are or are not recognized. Unfigured syllogism has but one form ; figured syllogisnis are of three forms, according to the position of the middle term in the premises, Of these the first corresponds to the first and fourth figures of ordinary logic,—the moods of the latter being shown to be merely indirect in- teusive moods of the first. The laws of categorical syllogisin are re- duced to one. Onthe other hand, one of the results of the quantifi- cation of the predicate being to increase the number of propositional forms, a nuniber of new moods are added, and each figure contains twelve. Hypothetical and disjunctive inferences, whether regarded as mediate or as immediatc,—(as to tlhis Hamilton varied in opinion, cf., Lects., iv. 369, 371, 373, 374),—form a separate class of sylogisms,—the conditional, properly subdivided into conjunctive and disjunctive ; for, according to Hamilton, as all inference is hypothetical, this term ought not to be used as the name of one particular group. The quantities allowed by him in logic were but two—the definite, including the nniversal and singular, and the indefinite. The latter also he considercd to be twofold, —partiality as such, from which the universal, both affirmative and negative, is excluded, and partiality which excludes only onc universal extreme, while possibly admitting the other. All these improveinents were embodied in a notation that clearly and compendiously presents to the eye the whole logical scheme. ®

Even from this imperfect outline of Hamilton's system of psychology, metaphysics, and logic it appears how ex- tensive and original were his labours in the various depart- ments of philosophy, how powerful an impetus he gave to speculation, and how much he himself contributed to the elucidation of the ultimate problems of thought. By bis thorough-going analysis of consciousness and of the relation of consciousness to miud he did much to promote the scien- tific study of psychology in his own country and in America, —in particular to give it at once a sound method and a well-defined sphere. He did not himself trace the growth of

t : thie § _ consciousness ; but, by showing that it is both simple and cise of power or energy,—pain being, on the other hand, the con- |

complex, both involving and evolved, he implied that it had grown, and suggested the problem of the conditions of its development. On the other hand, to him there was a wide gulf between mental and material phenomena, and the acceptance of innate ideas was attended with no difficulty ; thus his point of view is so far removed from that of most of the psychologists of the present day that probably his in- fluence now is much less either than it was in his own life- time or than it may be hereafter.

In metaphysics his place is plainly marked. Taking his stand at once on the exclusive authority and on the limited

Sphere of human consciousness, he comes into direct an- _tagonism with all schools of philosophy that find in the

held that no other than formal logic can be distinguished from the |

body of the sciences. Perhaps he may have too much overlooked the fact that the search for causes (a problem common to all the sciences) and the presumable uniformity of nature (a principle capable of guaranteeing general inferences) yield the conditions of a logic entitled to the name of a science of science, and possessing all the im- portance of the knowledge whose organon it ig. Yet it is well to be reminded by a difference of name thata science such as this, eonsist- ing of inferences from the actual order of things, is quite distinet from the body of truths developed from the conditions of thought as such.

The only logical laws recognized by Hamilton were thé three axioms of identity, non-contradiction, and excluded middle, which he regarded as severally phases of one general condition of the possibility of existence and, therefore, of thought. The law of reason and consequent he considered not as different, but merely as expressing metaphysically what these express logically. He added as a postulate—which in his theory was of importance —" that logic be allowed to state explicitly what is thought implicitly."

The changes by which he to a great extent remodelled formal

1 Lects., ii, 138-141; Dise., 91 sq. 2 Reid's Works, 755-770; Disc., 63.

*3 Reid's Works, 599n, 602n, 975-981; Lects., ii. 541-543; Dise., 98, 618-620. * Disc., 620 sq.; Lects., ii. 580-535, 5 Lects., ii. 414-520.*

Unconditioned a field for speculation. At the same time he is divided from scepticism by his assertion that, as the realm of existence transcends that of thought, so belief is wider than knowledge, and from empiricism by his admis- sion of @ priori and inexplicable cognitions. He ranked himself among the Scottish school of philosophers ; yet there he stands by himself, since even those doctrines which he held in common with his predecessors he held after a fashion widely different as to both grounds and results. The doctrine of common sense, in patticular, he set in a new light, rescued from misapprehension, and showed, on the testimony of every school of thought, to be one of the most widely recognized of philosophic tenets. In Reid he found a plulosopher to whom by many ties of intellectual affinity he was bound, and who seemed to him to have so unskilfully used the right clue to a solution of the problems

& See Lectures on Logic, vols. iii. and iv., and Appendices, iv. 229-474; also Discussions, 117-173, 646-706.

with which he dealt as to justify the doubt whether he really had it. Hence he made Reid's writings, as it were, his own, corrected his errors, and gave a solid basis to the theory which he had himself failed even to make plain.

allegiance was Aristotle. His works were the object of his profound and constant study, and supplied in fact the mould in which his whole philosophy was cast. With the com- mentators on the Aristotelian writings, ancient, medizeval, ancl modern, he was also familiar ; and the scliolastic philo- sophy he studied with care and appreciation at a time when it had hardly yet begun to attract attention in his country. His wide reading enabled him to trace many a doctrine to the writings of forgotten thinkers; and nothing gave him greater pleasure than to draw forth sucli from their obscurity, and to give due acknowledgment, even if it chanced to be of the prior possession of a view or argumeut that he had thought out for himself. Of modern German philosophy he was a diligent, if not always a sympathetic, student. How profoundly his thinking was modified by that of

Kant is evident from the tenor of his speculations ; nor was this less the case because, on fundamental points, he came to widely different conclusions. There is a closer likeness as to results between his system and that of Jacobi,—from which, however, his is distinguished by its more scientific character, especially byintuition being more clearly identified with the voice of reasou, and more rigidly required to prove its authority as such.

His labours in logic coincided in time with a general movement by which formal logie was effectually advanced andimproved. But.as to the originality ofhis contributions, especially in regard to the quantification of the predicate, there is no room for doubt. No evidence has ever been adduced that in the smallest degree weakens the force of the abundant evidence brought forward in its support.

Any account of Hamilton would be incomplete which regarded him only asa philosopher, for his knowledge and his interests embraced all subjects related to that of the human mind. Physical and mathematical science had, indeed, no 'attraction for him; but his study of anatomy and physiology was minute and experimental. In literature alike ancient and modern he was widely aud deeply read ; and, from his unusual powers of memory, the stores which he had acquired were always at command, every topic suggesting to him apt quotations or pertinent examples. If there was one period with the literature of which he was more particularly familiar, it was the 16th and 17th cen- turies. Here in every department he was at home. He had gathered a vast amount of its theological lore, had a critical knowledge especially of its Latin poetry, and was minutely acquainted with the history of the actors in its varied scenes, not only as narrated in professed records, but as revealed in the letters, table-talk, and casual effusions of themselves cr their contemporaries. His article on the Epistole Obscurorum Virorum, and his pamphlet on the Disruption of the Church of Scotland in 1843, may be cited in confirmation and illustration of what has now been sail. Among his literary projects were editions of the works of George Buchanan and Julius Cesar Scaliger. His general scholarship found expression in his library, which, though mainly, was far from being exclusively, a philosophical collection. It now forms a distinct portion of the library of the university of Glasgow.

His chief practical interest was in education,—an inter- est which he manifested alike as a teacher and as a writer, and which had led him long before he was either to a study of the subject both theoretical and historical. He thence adopted views as to the ends and methods of education that, when afterwards carried out or advocated by him, met with general recognition ;

| himself a teacher, he was zealous aud successful. The philosopher to whom above all others he professed |

nami? On

one of his articles an unfavourable view of the study of mathematics as a mental gymnastic which excited much opposition, but which he never saw reason to alter. As He did not indeed deem it necessary to give to his lectures the elaboration and precision that he bestowed on his published writings. But he made them sufficient for the end which they had to accomplish, he supplemented them at times by other instruction, and he strove, not only by all academic means, but also by his personal influence, to develop the speculative energy and interest of his pupils. His writings on university organization and reform had, at the time of their appearance, a decisive practical effect, and contain much that is of permanent value.

Many of his moral as well as intellectual characteristics are expressed in his writings,—the intensity and force of his nature, his tendency to be carried away by polemical ardour, his freedom from anything like pettiness, his perfect sincerity and candour. Such a reflex is at best very im- perfect, but here could hardly be bettered by description, which, therefore, is not attempted.

His posthumous works are his Lectures on Metaphysics and Logic, 4 vols., edited by the Rev. H. L. Mansel, Oxford, and Professor Veitch (Metaphysics, 1858 ; Logic, 1860); and Additional Notes to Reid's Works, from Sir W. Hamilton's MSS., under the editorship

of the Rev. H. L. Mansel, D.D., 1862. A Memoir of Sir W. Hamilton, by Professor Veiteh, appeared in 1869. (E. H.)

HAMILTON, Str Wittram (1730-1803), antiquary and patron of the fine arts, was born in 1730 of a noble but needy Scottish family, Of his early life and education we know nothing beyond the fact that he was equerry to Prince George, afterwards George III., whose foster-brother he is said to have been; but in his twenty-fifth year he married a young and beautiful heiress, whose fortune placed him in affluence. In the first parliament of George III. Hamilton sat as member for Midhurst; and in 1764 he was accredited ambassador to Naples, an office which he retained till 1800. On proceeding to his post his attention and interest were at once awakened by the discoveries at Pompeii and Herculaneum, and he took up the study of antiquities with ardour. The Porcinari collection of Greek and Etruscan vases, purchased in 1765, was the nucleus of a valuable collection of his own, now for the most part in the British Museum. Engravings and descriptions of the most valuable pieces are given in the famous Antiquités Etrusques, Grecques, et Romaines, tirées du Cabinet de I. Hamilton, edited by D'Hancarville, and published at Naples in 1766-67. Hamilton also contributed liberally to the museum at Portici, and gave much attention to the MSS. and other valuable articles rescued from the buried cities ; but his efforts were almost nullified by the inertness of the Neapolitan court, which was even suspicious of his zeal. Natural history and science also were not neglected by him. Between 1764 and 1767 Ilamilton paid numerous visits to Vesuvius, Etna, and the Lipari Islands, accompanied by a young artist, Pietro Fabris, who made drawings of the noteworthy objects and appearances under Hamilton's directions. The result of these excursions, first sent as letters to the Royal Society, of which he became a member in 1766, was afterwards expanded into two works, — Observations upon Mount Vesuvius, Mount Etna, and other Volcanoes of the Two Sicilies, published at London in 1772, and Campi Phlegrcet, a collection of plates illustrating the volcanic phenomena, accompanied by concise descriptions – in English and French, published at Naples in 1776-77. A Supplement to the latter described the eruption of Mount Vesuvius in 1779. Hamilton's daughter died in 1775, and his first wife in 1782. In 1772 he was made K.C.B., and in 1791 privy councillor. His continued interest in art and antiquity is manifested by his contributions to the

but he also expressed in | Philosophical Transactions of the Royal Society from 1767

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to 1795, and to the Archceologia in 1777, as well as by his generosity to artists and antiquaries, such as Morghen, Winckelmann, and Piaggi. Recalled in 1800, he died April 6, 1803.

Sir William Hamilton's second wife, Emma Lyon or Harte, whose name is so notoriously associated with that of Nelson, was born of very humble parents at Preston in Lancashire, about April 26, 1764. Her youth was spent in domestic service, and it was first as attendant on a lady of fashion that she learned to develop her talent for sing- ing and mimicry. Having lost this situation she became waitress in a tavern frequented by actors, and soon entered upon a gay and dissolute career. Her beauty attracted among others tle painter Romney, who depicted her in no fewer than twenty-three of his works. Sir William Hamilton married her in 1791 ; and, going with him the same year to Naples, she speedily acquired an ascendency over the mind ef the queen, which at the instigation of Nelson she used for the advantage of the British fleet. On the death of Sir William she lived in a house at Merton Place, provided for her by Nelson, but on his death in 1805 she soon squandered the modest fortune left her by her husband, and after being imprisoned for debt, retired with Nelson's daughter Horatia to Calais, where she died, January 16,1815. Her dfemoirs appeared in the year of her death.

HAMILTON, Wituram (1704-1754), a minor Scottish post, the author of Zhe Braes of Yarrow, was born in 1704, probably at Bangour in Linlithgowshire, the second son of James Hamilton of Bangour, a member of the Scottish bar. It is supposed that he studied at the uni- versity of Edinburgh ; and it is certain that he received an education which enabled him to enjoy the classical writers of Greece and Rome, and to be a congenial associate in after years with such men as Allan Ramsay and Henry Home. As early as 1724 we find him contributing to Ramsay's Tea Table Miscellany. In 1745 Hamilton joined the cause of Prince Charles, and, though it is doubtful whether he actu- ally bore arms, he certainly celebrated the battle of Preston- pans in an ode beginuing—" As over Gladsmuir's blood- stained field." After the disaster of Culloden he lurked

for several months in the Highlands, aud at length escaped to France; but in 1749 the influence of his friends at home

procured him permission to return to Scotland, and in the.

following year he obtained possession of the family estate of Bangour. In 1751 he married for the second time, but the state of his health was such that he soon afterwards went abroad, and he died at Lyons on 25th March 1754.

Hamilton has left behind him a considerable number of what are best deseribed as poetical effusions, many of them pleasing and taste- ful, but none of them except the Braes of Yarrow of striking origin- ality. The first colleetion of his pieces was published without his permission or even knowledge by Foulis (Glasgow, 1748), and intro- dueed by a preface from the pen of Adam Smith. Another edition with corrections by himself was brought out by his friends in 1760, and to this was prefixed a portrait engraved by Sir Robert Strange. Though the poems have been since reprinted in Anderson's British Pocts (vol. ix.), in Sharpe's Collection of the British Poets, and in Chalmers's English Poets (vol. xv.), there was no separate edition between 1760 and 1850, when James Paterson edited The Poems and Songs of Willian. Hamiltot. This volume contains several poems till then unpublished, and presents a bibliographical intro- duetion and life of the author.

See also James Chaliners's ' Notices of Life of William Hamilton" in Transactions of Society of Scottish Antiquaries, vol. iii., 1831 ; and Charles Mackay, The Poetical Works of Allan Ramsay, with Selec- tions from the Scottish Poets before Burns.*

HAMILTON, Str Wittiam Rowan (1805-1865), one of the really great mathematicians of the present century, was bornin Dublin, August 4, 1805. His father, who was a solicitor, and his uncle (curate of Trim), migrated from Scotland in youth. A branch of the Scottish family to which they belonged had settled in the north of Ireland in

the time of James L., and this fact seems to have given rise to the common inipression that Hamilton was an Irishman.

His genius displayed itself, even in his infancy, at first in the form of a wonderful power of acquiring languages. At the age of seven he had already made very considerable progress in Hebrew, and before he was thirteen he had acquired, under the care of his uncle, who was an extra-ordinary linguist, almost as many languages as he had years of age. Among these, besides the classical and the modern European languages, were included Persian, Arabic, Hindu- stani, Sanskrit, and even Malay. But though to the very end of his life he retained much of the singular learning of his childhood and youth, often reading Persian and Arabic in the intervals of steruer pursuits, he had long abandoned them asa study, and employed them merely as a relaxation,

His mathematical studies seem to have been undertaken and carried to their full development without any assistance whatever, and the result is that his writings beloug to no particular " school," unless indeed we consider them to form, as they are well entitled to do, a school by themselves. As an arithmetical calculator he was not only wouderfully expert, but he seems to have occasionally found a positive delight in working out to an enormous number of places of decimals the result of some irksome calculation. At the age of twelve he engaged Colburn, the American " cal- culating boy," who was then being exhibited as a curiosity in Dublin, and he had not always the worst of the encounter. But, two years before, he had accidentally fallen in with a Latin copy of Huclid, which he eagerly devoured ; and at twelve he attacked Newton's Arithmetica Universalis. This was his introduction to modern analysis. He soon commenced to read the Principia, and.at sixteen he had mastered a great part of that work, besides some more modern works on analytical geometry and the differential calculus.

About this period he was also engaged in preparation for entrance at Trinity College, Dublin, and had therefore to devote a portion of his time to classics, In the spmmer of 1822, in his seventeenth year, he began a systematic study of Laplace's Mécanique Céleste. Nothing could be better fitted to call forth such mathematical powers as those of Hamilton ; for Laplace's great work, rich to profusion in analytical processes alike novel

and powerful, demands from the most gifted student careful and often laborious study. It was in the successful effort to open this treasure-house that Hamilton's mind received its final temper. " Dés-lors il commenga 4 marcher seul," to use the words of the bio- grapher of another great mathematician. From that time he appears to have devoted himself almost wholly to original investigation (so far at least as regards mathe- matics), though he ever kept himself well acquainted with the progress of science both in Britain and abroad.

Having detected an important defect in one of Laplace's demonstrations, he was induced by a friend to write out his remarks, that they might be shown to Dr Brinkley, after- wards bisliop of Cloyne, but who was then royal astro- nomer for Ireland, and an accomplished mathematician. Brinkley seems at once to have perceived the vast talents of young Hamilton, and to have encouraged him in the kindest manner. He is said to have remarked in 1823 of this lad of eighteen,-—" This young man, I do not say will be, but zs, the first mathematician of his age."

Hamilton's career at college was perhaps unexampled. Amongst a number of competitors of more than ordinary merit, he was first in every subject, and at every examina- tion. His is said to be the only recent case in which a student obtained the honour of an optzme in more than one subject. This distinction had then become very rare, not being given unless the candidate displayed a thorough | mastery over his subject. Hamilton received it for Greek

and for physics. How many more such honours he miglit have attained it is impossible to say ; but he was expected to win both the gold medals at the degree examination, had his career as a student not been cut short by an unprece- dented event. This was his appointment to the Andrews professorship of astronomy in the university of Dublin, vacated by Dr Brinkley in 1827. The chair was not exactly offered to him, as has been sometimes asserted, but the electors, having met and talked over the subject, authorized one of their number, who was Hamilton's personal friend, to urge him to become a candidate, a step which his modesty had prevented him from taking. Thus, when barely twenty-two, he was

established at the Dublin Observatory. He was not specially fitted for the post, for although he had a profound acquaintance with theoretical astronomy, he had paid but little attention to the regular work of the practical astronomer. And it must be said that his time was better employed in grand original investi- gations than it would have been had he spent it in meridian observations made even with the best of instruments,— infinitely better than if he had spent it on those of the observatory, which, however good originally, were then totally unfit for the delicate requirements of modern astro- nomy. Indeed there can be little doubt that Hamilton was intended by the university authorities who elected him to the professorship of astronomy to spend his time as he best could for the advancement of science, without being tied down to any particular branch. Had he devoted him- self to practical astronomy they would assuredly have furnished him with modern instruments and an adequate staff of assistants.

In 1835, being secretary to the meeting of the British Association which was held that year in Dublin, he was knighted by the lord-lieutenant. But far higher honours rapidly succeeded, among which we may merely mention his election in 1837 to the president's chair in the Royal Irish Academy, and the rare and coveted distinction of being made corresponding member of the academy of St Petersburg. These are the few salient points (other, of course, than the epochs of his more important discoveries and inventions presently to be considered) in the uneventful life of this great man. He retained his wonderful faculties unimpaired to the very last, and steadily continued till within a day or two of his death (September 2, 1865) the task (his Llements of Quaternions) which had occupied the last six years of his life.

The germ of his first great discovery was contained in one of those early papers which in 1823 he communicated to Dr Brinkley, by whom, under the title of Caustics, it was presented in 1824 to the Royal Irish Avademy. It was refcrred as usual to a committee. Their report, while acknowledging the novelty and value of its con- tents, and the great mathematical skill of its author, recommended that, before being published, it should be still further developed and simplified. During the next three years the paper grew to an immense bulk, principally by the additional details which had been inserted at the desire ofthe committee. But it also assumed a much more intelligible

*form, aud the grand features of the new method were now easily to be seen. Hamilton himsclf seems not till this period to have fully understood either the nature or the importance of his discovery, for it is only now that we find him announcing his intention of applying his method to dynamics. The paper was finally entitled " Theory of Systems of Rays,"' and the first part was printed in 1828 in the 7'ransactions of the Royal Irish Academy. The second and third parts have not yet been printed ; but it is understood that their more important contents have appeared in the three voluminous supplements (to the first part) which have been published in the same Transactions, and in the two papers '*Ou a General Method in Dynamics,' which appeared in the Philosophical Transactions in.1834-5. The principle of " Varying Action" is the great feature of these papers; and it is strange, indeed, that the one particular result of this theory which, per- haps more than anything else that Hamilton has done, has rendered his name known beyond the little world of true philo- sophers, should have been easily within the reach of Fresnel and others for many years before, and in no way required Hamilton's new conceptions or methods, although it was by them that he was*

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led to itsdiscovery. This singular result is still known by the namc ' Conical Refraction," which he proposed for it when he first pre- dicted its existence in the third supplement to his Systems of Rays, read in 1882.*

The step from optics to dynamics in the application of the method of " Varying Action" was made in 1827, and communicated to the Royal Society, in whose Philosophical Transactions for 1834 and 1835 there are two papers on the subject. These display, like the "Systems of Rays,"a mastery over symbols and a flow of mathe- matical language almost unequalled. But they contain what is far more valuable still, the greatest addition which dynamical scieneo had received since the grand strides made by Newton and Lagrange. Jacobi and other mathematicians have developed to a great extent, and as a question of pure niathematics only, Hamilton's processes, and have thus made extensive additions to our knowledge of differ- ential equations. But there can be little doubt that we have as yet obtained only a mere glimpse of the vast physical results of which they contain the germ.

And though this is of course by far the more valuable aspect in whieh any such contribution to science can be looked at, the other must not be despised. It is characteristic of most of Hamilton's, as of nearly all great discoveries, that even their indirect consequences are of high value.

The other great contribution made by Hamilton to mathematical science, the invention of QUATERNIONS, is fully treated under that heading. It is not necessary to say here more than this, that quaternions form as great an advance relatively to the Cartesian methods as the latter, when first propounded, formed relatively to Euclidian geometry. The following charaeteristic extract from a letter shows Hamilton's own opinion of his mathematical work, and also gives a hint of the devices' which he employed to render written language as expressive as actual speech. His first great work, Lectures on Quaternions (Dublin, 1852), is almost painful to

-read in consequence of the frequent use of italies and capitals.

"T hope that it may not be considered as unpardonable vanity or presumption on my part, if, as my own taste has always led me to feel a greater interest in mcthods than in results, so it is by METHODS, rather than by any THEOREMS, whieh can be separately quotcd, that I desire and hope to be remembered. Nevertheless it is only human nature, to derive some pleasure from being cited, now and then, even about a 'Theorem ;' especially where. . .. . the quoter can enrieh the subject, by combining it with researches of his own."

The discoveries, papers, and treatises we have mentioned might well have formed the whole work of a long and laborious life. But, not to speak of his enormous collection of MS. books, full to over- flowing with new and original matter, which have been handed over to Trinity College, Dublin, and of whiosc contents it is to be hoped a large portion may yet be published, the works we have already called attention to barely form the greater portion of what he has pub- lished. His extraordinary investigations connected with the solu- tion of algebraic equations of the fifth degree, and his examination of the results arrived at by Abel, Jerrard, and Badano, in their researches on this subject, form another grand contribution to science. There is next his great paper on Fluctuating Functions, a subject which, since the time of Fourier, has been of immense and ever increasing value in

physical applications of mathematics. There is also the extremely ingenious invention of the Hopocrari (q. v.). Of his extensive investigations into the solution (especially by numerical approximation) of certain classcs of differential equations which constantly occur in the treatment of physical questions, only a few items have been published, at intervals, in the Philosophicul Magazine. Besides all this, Hamilton was a voluminous eorre- spondent. Often a single letter of his occupied from fifty to a hundred or more closely written pages, all devoted to the minute consideration of every feature of some particular problem : for it was one of the peculiar characteristics of his mind never to be satisfied with a general understanding of a question ; he pursued it until he knew it in all its details. He was ever courteous and kind in answering applications for assistance in the study of his works, even wlicn his complianec must have cost him much valuable tiine. He was excessively precise and hard to please with reference to the final polish of his own works for publication ; and it was probably for this reason that he published so little compared with the extent of his investigations.

Like most men of great originality, Hamilton generally matured his ideas before putting pen to paper. " He used tocarry on," says his elder son, "long trains of algebraical and arithmetical calcul- ations in his mind, during which he was unconscious of the earthly necessity of eating ; we used to bring in a 'snack' wand leave it in his study, but a brief nod of recognition of the intrusion of the chop or cutlet was often the only result, and his thoughts went ou soaring upwards."

For further details about Hamilton (his poetry and his association with poets, for instanee), the reader is referred to the Dublin University Magazine (Jan. 1842), the Gentleman's Magazine (Jan. 1866), and the Monthly Notices of the Royat Astronomical Society (Feb. 1866); and also to an article by the present writer in the Worth British Review (Sept. 1866), from which much of the above sketeh has been taken. (P. G. T.)

HAM—HAM

HAMIRPUR, or HuMEERPooR, a British district in the lieutenant-governorship of the North-Western Provinces, India, lymg between 25° 5' and 26° 10' N. lat., and between 79° 22 45" and 80° 25' 15" E. long. It

forms the south-western district of the Allahabad division, and is bounded on the N. by the Jumna (Jamuné) ; on the N.W. by the native state of Baoni and Betwa river ; on the W. by the Dhasdn river; on the S by Alfpura, Chhatarpur, and Charkhdri states; and on the E. by the Banda district. It encloses the native states of Sarila, Jigni, and Bihat, besides portions of Charkhari and Garrauli.

Hamirpur forms part of the great plain of Bundelkhand, which stretches between the banks of the Jumna and the central Vindhydn plateau. The district is in shape an irregular parallelogram, with a general slope northward from the low hills on the squthern boundary. The scenery is rendered picturesque by the artificial lakes of Mahoba. These magnificent reservoirs were constructed by the Chandel rajas about 800 years ago, for purposes of irriga- tion and as sheets of ornamental water. Many of them enclose craggy islets or peninsulas, crowned by the ruins of granite temples, exquisitely carved and decorated, From the base of this hill and lake country the general plain of the district spreads northward in an arid and treeless level towards the broken banks of the rivers. Of these the prin- cipal are the Betwa and its tributary the Dhasdn, both of which are unnavigable. There is little waste land, except in the ravines by the river sides. The deep black soil of Bundelkhand, known as mdr, retains the moisture under a dried and rifted surface, and renders the district fertile.

The census of 1872

gives a population of 529,137—276,196 males and 252,941 females.

The Hindus numbered 493,877, and the Mahometans 33,658. The Chandels and Bundelas, the old dominant classes, have now sunk to 548 and 612 respectively ; most of these still cling to the neighbourhood of Mahoba, the seat of their former supremacy. The district contains 6 towns with a population of more than 5000 souls—namely, Rath, Hamirpur, Mahoba, Maudha, Sumerpur, and Jaitpur. The staple produce of the district is grain of various sorts, the most important being! gram. Cotton is also a valuable crop, whose cultiva- tion is on the increase. Out of a total arca of 1,464,641 acres, 762,212 are under cultivation. Irrigation is practised on only 16,000 acres, chiefly in the south, where water can be obtained from the artificial lakes. Agriculturists suffer much from the spread of the kdns grass, a

noxious weed which overruns the fields and is found to be almost ineradicable, wherever it has once obtained a footing. The district is little subject to blight or flood ; but droughts and famine are unhappily common. The scarcity of 1837 and 1868-69 was severely felt in Hamirpur. Commerce is chicfly carried on by means of its great river highway, the Jumna. Cotton and graiu, the main exports, are carried downwards ; while rice, sugar, tobacco, and Manchester goods con- stitute the principal imports upwards. The manufactures consist of coarse cotton cloth and soapstone ornaments. There is only one metalled road, that between Hamirpur and Naugaon, 70 miles in length. The gross revenue in 1870-71 was £184,646; ex- penditure, £116,416. In 1871 the police force numbered 534 men, supplemented by 1953 village watchmen (chaukiddrs), main- tained at a cost of £8058. The district contains only one jail: the average number of prisoners in 1850 was 400 ; 1860, 72; and 1870, 129. In 1870 the number of schools was 112, with 3066 pupils ; the cost, £1354. The district is divided into 8 fiscal divisions (pargands). The climate is dry and hot, owing to the absence of shade and the bareness of soil, except in the neighbourhood of the Mahoba lakes, which cool and moisten the atmosphere. The rain- fall in 1869-70 was 37:1, and in 1870-71 38°1 inches.

History. —From. the 9th to the 14th century this district was the centre of the Chandel kingdom, with its capital at Mahoba. The rajas adorned the town with many splendid edifices, remains of which still exist, besides constructing the noble artificial lakes already described. At the end of the 12th century Mahoba fell into the hands of the Mussulmans, who retained possession of it for 500 years. In 1680 the district was conquered by Chhatar Sal, the hero of the Bundelas, who assigned at his death one-third to his ally the peshwa of the Marhattas. Until Bundelkhand was con- stituted a British district in 1803, there was constant warfare between the Bundela princes and the Marhatta chicftains. land had been impoverished by the

| and devastated by robber chiefs, so that in 1842 it was reported to

be utterly valueless. On the outbreak of the inutiny, Hamirpur was the scene of a fierce rebellion. All the principal towns were | plundered by the

surrounding native chiefs. Since then the con- dition of the district seems to have improved ; but it has not yet recovered from the long anarchy of Marhatté rule.

Hamirpur, the adininistrative headquarters of the above district, in 25° 58' N. lat. aud 80° 11' 50' E long., is situ- ated on a tongue of land at the confluence of the Betwa and the Jumna, on the right bank of the latter river. It was founded, according to tradition, by Hamir Deo, a Karchuli Rajput expelled from Ulwar (Alwar) by the Mahometans. The town possesses little importance ; there are no manufactures, and quite a limited trade in grain. Population in 1872, 7007.

HAMLET, the hero of Shakespeare's drama, is according to some interpreters an historical or quasi-historical person- age, but according to others his story is a mere development or "precipitation" of the great Scandinavian system of mythology. The decision of this point is rendered all the more difficult as the only original authority for the facts (historical or mythological) is the Danish historian Saxo Grammaticus (d. 1204). Though Dr Vigfusson (prolego- mena to the Sturlunga Saga, Oxford, 1878) concludes that the Hamlet legend was contained in the Skjéldunga Saga now lost, it is of course matter of question whether Saxo based this portion of his narrative on previous writ- ings or collected his material from oral tradition.

According to Saxo, whose account is excerpted in Simrock's Quellen des Shakspeare (Bonn, 1870), and summarized in Latham's Dissertations on Hamlet (Lond., 1872, reprinted from Transactions of the Roy. Soc. of Literature, vol. x., new series), Hamlet's history is briefly as follows. In the days of Rérik, king of Denmark, Gervendill was governor of Jutland, and in this office he was succecded by his sons Horvendill and Fengo. The former, returning with glory from a viking expedition in which he had defeated Koller, king of Norway, obtained the hand of Gerutha, Rorik's daughter, who in due course bore him a son Amleth. But Fengo, out of jealousy, murdered Horvendill with his own hand, and then persuaded Gerutha to become his wife, on the plea that he had com- mitted the crime for no other reason than to avenge her of a husband by whom she had been hated. Amleth, afraid of sharing his father's fate, pretends to be imbecile, but the

suspicion of Fengo puts him to various tests, which are related with all the inconsequent simplicity of the ordinary Mdrchen. Despatched to England in company with two attendants, who bear a letter instructing the king of that country to put him to death, he surmises the purport of their instructions, and secretly modifies the inscription ou their "tablets" so that the king is requested to put them to death and to treat him with honour. By his wisdom he makes a deep impression on the king, and obtains the hand of the royal princess ; but instead of settling in England he returns at the end of a year to Denmark, where he is supposed to be dead, just as the people are celebrating his obsequies. During the feast that follows he makes the courtiers all drink freely, and then, when they are heavy with wine and sleep, he pulls down over them the hangings of the hall, fixes these with pegs which he had sharpened and prepared in the early stage of his folly, and then setting fire to the building leaves the revellers to their fate. He next proceeds to the royal chamber to take vengeance on Fengo himself, who falls beneath the stroke of his own sword, for which Hamlet had substituted his own scabbard- fastened weapon. Jeturning to England for his wife, the hero finds that his father-in-law and Fengo had been under pledge to each other that the survivor should avenge the

long war carried on under | Other's death if it resulted from violence; and his father-

Chhatar Sal, overrun and ravaged during the Marhattd aggression, in-law, unwilling to make a direct attack on his life, sends

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him to Scotland as proxy-suitor for the hand of a terrible queen Hermuthruda, who has put all previous wooers to death, But Hermuthruda happens to fall in love with Hamlet, and he returns to England to upbraid his father- in-law with his treachery. As king of Jutland he has to endure the grievous hostility of Vikletus, Rorik's successor, but at last determines, though well aware that he is doomed to death in the attempt, to engage with him in a decisive battle. He perishes, and his widow marries Vikletus. According to Latham, who may be taken as the repre- sentative of the historical theory, there are really two Hamlets,—the Hamlet of Saxo's third book and the Hamlet of his fourth book, who have been confounded

together. The former, who is the Shakespearean hero, he would identify with Olaf Kyrre, the Aulaf Cwiran of the Saxon Chronicle and the Amlaf Cuaran of the Irish Annals, whose name, having passed through England and Ireland, he supposes to have returned to Denmark in a form which is Latinized by Saxo as Amlethus ; the latter he considers as the Hygelac of Beowulf, the Chochilaicus of Gregory of Tours, the Huhleike of the Heimskringla, and even the Havelok of English legend. ‘“‘By a confusion between them as man aud man, the bearers,” he says, “of names

as different as. Olaf and Higelac take a form out of which |

Amlethus is a probable educt.” But this theory, which is expounded with more learning than lucidity, is hardly so much in favour as that of the mythological school.

That, in spite of the links by which Saxo has sought to connect, its different portions with the authentic history of Denmark, the whole story was destitute of historical basis was maintained by P. E. Miiller (Critisk Undersdgelse af Danmarks og Norges Sagahistorie eller om Troverdigheden af Saxos. og Snorros Kilder, Copenhagen, 1823), and his conclusions in regard to the matter have been very generally accepted. Though Hamlet or Amleth himself is not men- tioned in the earlier documents of the Scandinavian mythology—the only allusion to his existence being the phrase Amlotha qvern, or Hamleth’s mill, applied to the sea in the Skaldskaparmal —his father, Horvendill or Orvandil (from dr, the spear, and vandel, skilful), appears in the great Scandinavian mythus in connexion with Thor’s contest with Hrungnir, and is further to be identified with the Orendel of German legend, whose memorial coat was after- wards christened the seamless coat of our Saviour at Treves, and whose name, which occurs also as Ernthielle, may possibly be the source of the more famous name. of Tell. Hamleth’s own name finds its explanation in the Norse amr or ami, toil (still used colloquially in Icelandic, amla, to toil), and lothi, devoted to, and probably has reference to his mythic impersonation of the endless toil and travail of the sea. The various details of the story—not only impro- bable and impossible, but essentially stupid and trivial— lend themselves with remarkable readiness to the theory which explains them as versions of the tale, a thousand times retold, of the

contests between summer and winter, sea and land, light and darkness. An elaborate exposition of the whole will be found in Zinzow's Die Hamletsage an und mit verwandten Sagen erldutert, Halle, 1877. It has been already stated that Saxo's is the only original autho- rity ; but proof of the popularity of the legend is found in the presence in Jutland of such names as Amelhede (Gd, Hamlet's Ileath), near Randers, Fegges Sund, that is, Fengo's Sound, and Feggesklint, that is, Fengo's Cliff, and in the fact that in modern Icelandic the word amlothi is a regular equivalent for an idiotic or stupid man. Nor are literary rifacimentos of the story wanting, The Icelanders have their Amlotha Saga, which is a free translation of Saxo, and their Ambales Saga, in which the matter is treated in a more romantic style. The story of Brian, given in Jon

Arnason's Islenzkur Pjodsigur (Leipsic. 1864, ii.), has the | trade in flax.

same main features; and Dr Vigfusson, by whom it was discovered, is disposed to surmise that the legend may actually be of Celtic origin,—a supposition quite in keep- ing with other well-known facts in Icelandic history. It was taken down from the lips of Lady Hildur Arngrims- dotter, whose father was born in 1568. As Niels of Soro in the 15th century made Hamlet more familiar to the Danes by his Danske Rimkrontke, so the French story-teller Belleforest introduced him to a wider company in his Cent Tlistoires tragiques. That as early as 1587 or 1589 he had been represented on the English stage is shown by the well- known passage from Nash's preface to Greene's Menaphon, "He will afford you whole /Zamlets, I should say, handfulls of tragical speeches."

HAMM, a town of Prussia, capital of a circle in the government district of Arnsberg, province of Westphalia, is situated at. the junction of several railways, on the Lippe at its confluence with the Ahse, 22 miles N.W. of Arnsberg. It is enclosed: by walls, but the ditches which formerly surrounded it have been filled up and converted into promenades. The principal buildings are two Catholie and two Evangelical churches, a gymnasium, a poorhouse, an orphanage, and an infirmary. The town is flourishing and rapidly increasing, and possesses very extensive wire factories (in, connexion with which there are puddling and rolling works),

foundries, machine works, and manufactories of gloves, baskets, wadding, leather, sausages, sago, starch, chemicals, sugar-of-lead, gum, lac, varnish, oil, and beer. The population in 1875 was 18,877.

Iiamm, which became a town about the end of the 11th century, was originally the capital of the countship of Mark, and was fortified in 1226. It became a member of the Hanseatic League. In 1614 it was besieged by the Dutch, and in 1622 it was taken by Tilly, after which during the Thirty Years' War it was alternately in the hands of the imperial and the Hessian forces. In 1666 it came into the possession of Brandenburg. In 1761 and 1762 it was bombarded by the French, and in 1763 its fortifications were dismantled.

HAMMARSKOLD, Lorenzo (1785-1827), Swedish author, was born at Tuna, near Wimmerby, on the 7th of April 1785. He became a student at Upsala in 1801, but failed to take his degree in 1806. He therefore accepted a humble post at the royal library at Stockholm, with which institution he remained connected for many years. In 1804 he published an article on Tieck and Novalis, which attracted much attention, and was the. means of founding the "Phosphoric School," as it was called, of poetry in Sweden. Hammerskild became the friend of Atterbom andantagonist of Wallmark, and in due time, by the bitterness of his tone, brought down on himself the scathing anger of Tegnér. In 1806 he. published Translations and Imitations of Poets, Old and New, in the preface of which he denounced the classic: Swedish writers with much force and wit, commend- ing Goethe and Tieck to the young poets of the day. In 1808 appeared his trenchant Critdque of Schaller, and in 1810 a volume of essays of a polemical kind. In 18138 Hammerskiéld published a collection of his poems, and in 1815 had to endure the ridicule of Tegnér in his brilliant satire of Hammarsyk. In 1818 appeared the first part of Hammarskild's chief contribution to literature, his. famous Svenska Vetterheten, a history of polite letters in Sweden, a book that was revised and republished after his death by Sondén, in 1833. He is chiefly remembered as a critic ;

his lyrics and his juvenile tragedy of Prince Gustaf, 1812,

are of little value.

HAMME, a town of Belgium, in the province of East Flanders and the arrondissement of Termonde or Dender- monde, is situated on the right bank of the Durme, near its junction with the Scheldt, and 18 miles E.N.E. of Ghent. It contains grain and oil-mills, has manufactures of lace,- ribbons, linen, starch, ropes, and cordage, and carries on

Population (1876), 10,778.

HAMMER

HAMMER. This well-known tool stands quite without rival for producing the numberless effects which are due to the remarkable force of "impact." Of all the array of hand tools in use in the industrial arts it ig undoubtedly the one that could least be dispensed with, and so it must have been from the very earliest days of handicraft, A ham- mer of some rude kind must have been as essential to the shaping of an arrow-head out of a flint, as is its modern repre- sentative to the forging of a bayonet out of a bar of steel.

Hammers to be used by hand are made of an endless variety of shapes, and of weights varying from a small fraction of an ounce to 28 or 30 ib. Of the various types now in use the differences are mainly due to the special requirements of the particular trades for which they are intended, but partly also to individual fancy. A few examples are given in fig. 1—a being the ordinary car- penter's haminer with a cross pane, 6 a claw hammer, c an engineer's, and d a shoemaker's hammer, which last has apparently retained its form for many generations. The same may also be said of the two others in the woodcut,

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Fic, 1.—Varieties of Hand Hammer.

which are good examples of the roughness of the instru- ments with which results of almost incredible delicacy can be produced. Of these ¢ is a favourite hammer used in the workshops of a London firm of goldbeaters, with which, together with others not less rude in appearance, gold is hammered out into leaves of such exceeding thinness that 250,000 are required to make up the thickness of an inch. Extraordinarily ill-shaped as f, the file-cutter's hammer, looks, yet with this and a simple chisel the teeth of files are cut by hand with a precision with which no machinery has as yet been able to compete, at least in England.

_ Hand-hammers and sledge-hammers being rigidly limited

as to weight by the trifling power which one man—or at'

most two men—can bring to bear upon them, it long ago became obviously desirable to obtain the force of impact from some more powerful source than human muscles, so that the weight of hammer heads might be largely in- creased and their blows made proportionately more effec- tive. The first step taken in this direction seems to have been the introduction of the " Hercules," a ponderous mass of iron attached to a vertical guide rod, which was lifted originally by a gang of men with ropes, but afterwards by steam power, and allowed to fall by its own weight. This was a fairly efficient tool for forging large anchors and for similar purposes, the strength of the blow and the point at which it was delivered being easily regulated. But as the demand for wrought iron increased, the necessity for more rapid as well as more powerful hammers to aid in its manu-

facture increased also. The lift or helve hammer (fig. 2) and the tilt hammer (fig. 3) thus came into use, and under these forms hammers may be said to have ranked for

Fig. 2.—Lift Hammer.

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the first time as true machine tools. Each of these consists of a heavy head attached to a beam mounted on gudgeons, which is lifted at regular intervals by suitable cams or pins

whine

Fig. 3.—Tilt Hammer, carried by a revolving shaft driven by steam or other power, their chief points of difference being the relative position of the gudgeons and the portion of the beam at which the

STEAM

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Fia. 4.—Steam Hammer.

power is applied, as shown in the diagrams. Heavy blows

are thus obtained with the one, and lighter but much more

rapid blows with the other, both, however, invariable in

their intensity, the lift being always to =< fixed height. ome Fe

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In the steam hammer (fig. 4), which was first patented by Nasmyth in the year 1842, this objection is completely obviated. By the simple device of attaching the hammer head to the lower end of the rod of a piston working in an inverted steam cylinder, he produced a maceliine cap- able of being made to deliver its blows with a force to which no limit has yet been found,

and yet so perfectly under control as to be able to crack a hazel nut without injuring the kemel. To the introduction of this invalu- able tool is due more than to any other single cause the power which we now possess of producing the forgings in iron and steel which are demanded by the arts of modern times; and in one or other of its many forms it is now to be met with in every workshop in which heavy work is carried on. Many modifications of the Nasmyth steam hammer have been introduced. In one of these steam pressure has been applied above the piston to in- tensify the blow, it being only used in the original form for lifting the "tup" and piston and for regulating their descent. In another the piston and piston-rod have been attached to the framing, and the cylinder made movable, its weight being thus added to that of the hammer.

Duplex hammers differ materially from the ordinary steam hammer, inasmuch as no anvil is necessary,—two hammer heads of equal weight (and for some purposes they weigh only a few pounds, for others as much as 30 tons) being made to deliver horizontal blows of equal force simultaneously on opposite sides of the forging, which thus receive perfectly equal treatment. The importance of this may be gathered from the fact that every increase in the weight of the vertical steam hammer necessitates a very much larger increase in the weight and solidity of the anvil which is necessary to afford the requisite inertia for resist- ing the blow. For instance, the anvil of a 40-ton hammer now in use at Woolwich Arsenal weighs upwards of 160 tons, and has nearly 500 tons of iron in its foundation, whereas the anvil of an 80-ton hammer of which a full- sized model was amongst the most striking objects at tle Paris Exhibition of 1878, is of no less than 20 tons weight.

The recent growth of steam hammers to the enormous size just mentioned is due chiefly to the large dimensions, independently of the mere weight, of the forgings which have now to be made for heavy ordnance and for other purposes. As long as the thickness of a forging is moder- ate, the reaction of the anvil acting upon its under side has an effect not greatly inferior to that of the hammer on the upper side. But with every increase in thickness some of this reaction is lost and the effect of the blow is more and more confined to the outer portions of the mass, which thus receive more than their share of treatment at the expense of the central portions. On this account the

difficulty of obtaining thick forgings thoroughly sound throughout their substance is very great, and it seems as if we had now reached the limit beyond which the hammer cannot be advantageously applied for their production. It has been found indeed in the case of large shafts that dispensing altogether with the central portion, thus making them tubular instead of solid, is accompanied by an increase in their strength, owing to the possibility of thus forging the metal uniformly throughout. But a much more widely applicable remedy, and one which will doubtless come into general use for heavy work, is the substitution of hydraulic or other pressure for the force of impact, a system which has lately been employed by Sir Joseph Whitworth with wonderfully good results. The reason of the superiority of its effect seems to be mainly this, that a certain amount of time is essential for completing the "flow" of the metal which it is the object of forging to induce. Under continuous pressure this flow can take place uniformly

throughout the mass, whereas the instantaneous blow of the hammer, though it acts violently on the surface particles, and to a decreasing extent on the adjacent ones, is entirely expended before the action has had time to reach those at the centre, so that unequal density and consequent weakness is the result. For massive forgings therefore the old saying can be no longer accepted that "there is no machine like a hammer." (c. PB. B. 8.)

HAMMERFEST, the most northern town in Europe, is situated in the department of Hammerfest in the province of Finmark, on the western side of the island of Kvalo (i.e. "Whale Island"), which lies off the north-western coast of Norway. Its latitude is 70° 39' 15", and the sun stays for two months above its horizon. Though a small place of about 2100 inhabitants, it is the seat of a considerable trade, in which not only Norwegian and Danish but English, German, and particularly Russian vessels are engaged. About thirty small ships are sent out from Hammerfest every spring to Spitzbergen to take part in the fisheries and walrus hunting. Train oil from the liver of the Scymnus microcephalus and cod-liver oil are manufactured in the town. The exports, among which salted fish occupies the principal place, amounted in 1876 to the value of 1,629,500 crowns (£90,528), and the im- ports, chiefly salt and coal, to 721,700 (£40,094). On the Fuglenaes or Birds' Cape, which protects the harbour on the north,

there stands a column with an inscription jn Norse and Latin, stating that Hammerfest was one of the stations of the expedition for the measurement of the arc of the meridian. Nor is this its only association with science ; for it was one of the spots chosen by Captain Sabine for his series of pendulum experiments. 'The ascent of the Tyven or Diebsberg in the neighbourhood is usually undertaken by travellers. HAMMER-HEAD. See SHARK. HAMMER-PURGSTALL, JoserH von (1774-1856), was born at Gratz in 1774, and after some training in the Oriental academy of Vienna entered the Austrian diplo- matic service. He was the son of Joseph Johann von Hammer, and it was not till 1835, when he had inherited the estates of the countess of Purgstall (in Styria), that he received the title Baron von Hammer-Purgstall, by which he is generally known. His youth and early manhood were passed in the Levant, where he bent all his energies to the task of improving his acquaintance with Oriental literature, in which as early as 1796 he proved his interest by the translation of a Turkish poem. He did not again come forward as an author till 1804, when his Encyclopedia of Oriental Learning appeared, a work whose ambitious character was so diffidently felt by its author that he feared to put his name to it. From that time there was little pause in his literary productiveness. For fifty years he wrote incessantly on the most diverse subjects, and his works were composed in most of the languages of 'Europe. He published numerous texts and translations of Arabic, Persian, and Turkish authors; compiled histories of Persian poetry, Turkish poetry, and Arabic literature ; brought the poems of Hafiz, Mutanebbi, Baki, and Ibn-el- Féridh within the reach of European readers; published travels in Turkey and Austria ; wrote the history of the Tatar races, the Krim Khans, the Golden Horde, the Russians, and the Ottoman Turks; formed a_biogra- phical gallery of Eastern celebrities; put forth theories about every possible subject in the wide range of Oriental learning, discussing the Arabian Nights, Arab music, Mahometan theology, Egyptian papyri, gnostic coffrets, Arabic grammar, Eastern antiquities, the sect of thie Assassins, the sieges of Vienna, the Knights Templars, and Spenser's sonnets, which he translated into German. Von Hammer did for Germany the same work that Sir William

Jones did for England. He showed that Oriental subjects were hot to be studied merely so far as they were connected with biblical theology, but were a worthy object of research for their own sake. For more than fifty years he per- sisted in introducing Eastern authors and Eastern topics to the general reader, and there was a time when no Orientalist was more widely known and admired. As Jules Mohl said—"C'était le doyen de la littérature ori- entale, le premier associé que la Société (Asiatique de Paris) ait tenu & Vhonneur d'inscrire sur sa liste, et le plus zélé, le plus fertile, et le plus célébre des hommies qui se sont vouds, de notres temps, & la culture des lettres orientales,"

It was natural that a scholar who traversed so large a field and wrote so rapidly should lay himself open to the criticism of specialists, and no man was more severely handled by his critics than Von Hammer, to whom Diez, for example (in Unfug und Betrug, 1815), devotes nearly 600 pages of heavy abuse. Von Hammer was undoubtedly inaccurate and superficial at times ; he attempted more than he could possibly achieve with thoroughness, and was in the habit of giving his own whimsical view of matters about which he knew next to nothing ; and he used to offend his critics as much by his Oriental florid style and want of method as by the occasional inaccuracy of his facts and the inconsequence of his deductions. But in spite of his faults he did more for Oriental studies than most of his critics put together.

When he was seventy-six years of age he planned a second edition of his Hncyclopadia of Oriental Learning, and designed a "preliminary " series of twelve volumes which should clear the ground by expounding the history of Arabic literature, and for the last seven years of his life he regularly put forth his annual volume. "Jules Mohl, going to see him, found the old man hard at work, helped by no colleague, and disdaining the aid of an amanuensis. His early travels in the Levant, and then his busy life at Vienna, where he held the post of court-interpreter, saved him from the crushing influence of solitary study ; and to the last he maintained his singular buoyancy of mind. "C'était un homme généreux, franc jusqu'a l'imprudence, hardi, bouillonnant d'esprit, aimable jusqu'a la coquetterie, doué d'une faculté de travail rare, ambitieux dans les grandes ct les petites choses, et d'une vivacité inconcevable—vivacité qui fut la source de sa

bonne et de sa mauvaise fortune." So Mohl pictured him in his address to the Société Asiatique in 1857, when he recorded the death of Von Hammer on Novemker 23, 1856, at the age of eighty-two, a hard worker to the last, like his younger but greater English contemporary Lane, with whom he came into collision in a friendly way on the subject of the origin of The Thousand and One Nights.

Von Hammer's principal works are his Geschichte des osmanischen Retehes, 10 vols., 1827 (2d ed,, 1834-6), translated into French (1835 and 1840) ; Geschichte der osmanischen Dichtkunst, 4 vols., Lnteratur-Geschichte der Araber (unfinished), 7 vols., 1850-6 ; Les Origines Russes, 1827 3 Geschichte der Goldenen Horde, 1840; Geschichte der Ilehane, 1842 3; Geschichte der Chane der Krim, 1856 ; Geschichte der Assassinen, 1818 ; Constantinopolis und der Bosporos, 1822 ; Encyklopidische Uebersicht der Wissenschaften des Orients, 1804. Texts and translations of —Eth- Thadlabi, Arab. and Germ., 1829 ; Ibn Wahshiyah, History of the Mongols, Arab. and Engl., 1806; El-Wasséf, Pers. and Germ., 1856; Esch-Schebistani's Losenflor des Geheimnisses, Pers. and Germ., 1838; Ez-Zam-akhshert, Goldene Halzbinder, Arab. and Germ., 1835; £l- Chazedlt, Hugjet-cl-Islam, Arab. and Germ., 1838; Ll-Hamawi, Das arab. Hohe Lied der Liebe, Arab. and Germ., 1854. Transla- tions of —~E1-Mutancbbi's Poems + Er-Resmi's Account of his Embassy, 1809 ; Contes inédits des 1001 Nuits, 1828. Besides these and smaller works, Von Hammer contributed numerous essays and criti- cisms to the Fundgruben des Orients, which he edited; to the Journal Asiatique ; and to many other learned journals ; above all to the Transactions of the Akademie der Wissenschaften of Vienna, of which he was mainly the founder; and he translated

1836;

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Evliya Effendi's Travels in Europe for the English Oriental Transla- tion Fund. For a fuller list st liabiosom (ant sine nearly 100 volumes, see des Belles Lettres, 1857,

HAMMERSMITH, a town and parish in the Middlesex, situated on the north bank of the Thames, 3% miles S.W. of Hyde Park corner, and now connected with London by continuous lines of streets. The bridge across the Thames at Hammersmith, completed in 1827 at a cost of £80,000, was the earliest suspension bridge erected near London. Formerly Hammersmith was celebrated for its nurseries and market gardens, but these have almost entirely given place to buildings. In the neighbourhood there are a number of fine residences, The principal public buildings are the parish church of St Paul, consecrated in 1631 and restored in 1864, containing a number of interesting monuments; the Latymer schools, founded by Edward Latymer in 1624 ; the Godolphin school, founded in the 16th century, and rebuilt as a grammar school in 1862, with accommodation for 200 boys; the Roman Catholic theological institute, founded originally as a school for. ladies in 1669; the convent of the Good Shepherd, with an asylum for penitent women ; the convent of Little Daughters of Nazareth; the Roman Catholic reformatory, the town-hall, the office of the board of works, and the West London hospital. In the district there are distil- leries, lead-mills, oil-mills, coach factories, boat-building yards, and the works of the West Middlescx Water Com. pany. The population of the parish in 1861 was 24,519, and in 1871 42,691. Hammersmith falls within the limits of the metropolitan district, and forms part of the parliamentary borough of Chelsea.

HAMMOND, Henry (1665-1660), divine of the Church of England, was Surrey, August 18, 1605. He was educated at Eton, whence in his fourteenth year he passed to Magdalen Col- lege, Oxford, becoming demy or scholar in 1619, and fellow in 1625. After graduating in arts he turned his attention to divinity ; in 1629 he entered holy orders, and in 1631 became bachelor of divinity. Two years afterwards, in preaching before the court, he won the approval of the ear] of Leicester, who in the same year presented him to the living of Penshurst in Kent. Hammond received his doctor's degree in 1639, and in 1643 was promoted to the dignity of archdeacon of Chichester. He was a member of the convocation of 1640, and also, but nominally only, of the Westminster Assembly of divines, which began its sittings in 1643, In the latter year Dr Hammond was concerned in the unsuccessful rising at Tunbridge in favour of King Charles I., and was obliged to flee in disguise to Oxford, then the royal headquarters. There he spent much of his time in writing, though he accompanied the king's commissioners to London, and

afterwards to the ineffectual convention at Uxbridge in 1645, where he disputed with the Presbyterian Vines. In his absence he was appointed canon of Christ Church and public orator of the university, These dignities he relinquished for a time in order to attend the king as chaplain during his captivity in the hands of the parliament. When Charles was deprived of all his loyal attendants at Christmas 1647, Hammond returned to Oxford and was made sub- dean of Christ Church, only, however, to be removed from all his offices in 1648 by the parliamentary visitors, who imprisoned him for ten weeks. Afterwards he was per- mitted, though still under quasi-confinement, to retire to the house of Sir Philip Warwick at Clapham in Bedford- shire. In 1650, having regained his full liberty, Hammond betook himself to the friendly mansion of Sir John Pakington, at Westwood, in Worcestershire, where lie died on April 25, 1660, just on the eve of his preferment to the see of Worcester.

(S. L. P.) county of

a learned royalist born at Chertsey in

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Independently of his works, Hammond possessed | qualities entitling him to be remembered long after the former are forgotten. He was an excellent preacher. Charles J. pronounced him the most natural orator he had ever heard. His range of reading was extensive. A dili- | gent scholar and a copious writer, he left no time for idle- ness, which he regarded as the heaviest burden and most dangerous temptation of man.

His writings, published in 4 vols. fol., 1674-84, consist for the most part of controversial sermons and tracts. The best of them are his Practical Catechism, first published in 1644; his Paraphrase and Annotations on the New Testament ; and an incomplete work of a similar nature on the Old Testament. His Life, written by Fell, and prefixed to the collected Works, has been reprinted

iy. of Wordsworth's Ecclesiastical Biography. See also of Henry Hammond, by the Rev.

Hiahgp in vol. Lloyd's Memoires, 1668, and Life G. G. Perry.

HAMON, Jean Louis (1821-1874), one of the best known of French painters under the second empire, was born at Plouha on 5th May 1821. At an early age he was destined to the priesthood, and placed under the care of the brothers Lamennais, but his strong desire to become

a painter finally triumphed over family opposition, and in |

1840 he courageously left Plouha for Paris,—-his sole re- sources being a pension of five hundred franes, granted him for one year only by the municipality of his native town. At Paris Hamon received valuable counsels and encourage- ment from Delaroche and Gleyre, and in 1848 he made his appearance at the Salon with Le tombeau du Christ (Musée de Marseille), and a decorative work, Dessus de Porte. The works which

of Sévres,

1851, he received a medal, and, reinspired by success, left his post to try his chances again at the Salon of 1852. La

Comédie Humaine, which he then exhibited, turned the tide |

of his fortune, and Ma scenr n'y est pas (purchased by the emperor) obtained for its author a third class medal in 1853. At the Paris International Exhibition of 1855, when Hamon re-exhibited the casket of 1851, together with several vases and pictures of which L'Amour et son Troupeau, Ce n'est pas moi, and Une Gardeuse d'Enfants were the chief, he received a medal of the second class, and the ribbon of the legion of honour. In the following year he was absent in the East, but in 1857 he reappeared with Boutique & quatre Sous, Papillon enchainé, Cantharide esclave, Dévideuses, éc., in all ten pictures; L'Amour en visite was contributed to the Salon of 1859, and Vierge de Lesbos, Tutelle, La Voliére, L'Escamoteur, and La Sceur ainée were allseen in 1861. Hamon now spent some time in Italy, chiefly at Capri, whence in 1864 he sent to Paris L'Aurore and Un Jour de Fiangailles. The influence of Italy was also evident in Les Muses & Pompéi, his sole contribution to the Salon of 1866, a work which enjoyed great popularity and was re-exhibited at the International Iixhibition of

1867, together with La Promenade, and six other pictures of previous years. Rivage, appeared at the Salon of 1873. It was painted at St Raphael, where Hamon had finally settled in a little house on the shores of the Mediterranean, close by Alphonse Karr's famous garden. In this house he died on the 29th of May 1874, and the contents of his studio and portfolios were dispersed at an obscure sale—thinly attended—for an almost nominal sum. Hamon had made his own a quiet place amongst those workers who since the days of Vien and David have been trying to bring home to us something of the pictorial aspect of classic time. He had neither the power nor the learning which might have enabled him to

H A M—

he exhibited in 1849—Une Affiche | Romaine, L'Kgalité au Sérail, and Perroquet jasant avec | deux jeunes Filles—obtained no marked success. Hamon | was therefore content to accept a place in the manufactory | but an enamelled casket by his hand having

attracted notice at the London International Exhibition of |

His last work, Le triste |

ie 2

give to that aspect any very real shape, nor was the side of human life with which he was most concerned weighty or important. He especially loved the gestures of children and their little ways,—now comic, now cunning, but always naive, and always full of charms. Dressed in classic fashion they play on the canvas of Hamon, with endless fanciful alterations, the same nursery comedies of which Ma sceur n'y est pas is one of the best examples. The painter's very mannerisms, his pale colour, and the hazy atmosphere which pervades his often rather empty field, enhance the graceful unreality of these little creatures, who are not quite classic loves nor yet altogether human babies.

HAMPDEN, Jonn (1594-1643), the eldest son of William Hampden of Great Hampden in Buckinghamshire, by Elizabeth, second daughter of Sir Henry Cromwell, and aunt of Oliver, the future Protector, was born in 1594. By his

father's death, when he was but a child, he became the owner of a good estate, and a ward of the crown. He was educated at the grammar school at Thame, and in 1609 he became a commoner of Magdalen College at Oxford. In 1613 he was admitted a student of the Inner Temple, and in 1619 he married Elizabeth Symeon. He first sat in parliament for the borough of Grampound in 1621. From that time he was a member of every suc- ceeding parliament till he died.

To the biographer who does not wish to become an historian under the pretence of narrating the incidents of his hero's life, Hampden's career must appear to give little scope for narrative. The letters which he left behind him are few. His speeches are scarcely more numerous and are extremely brief. In the early days of his parliamentary career he was coutent to be overshadowed by Eliot, as in its later days he was content to be overshadowed by Pym, and to be commanded by Essex. Yet it is Hampden, and not Eliot or Pym, who lives in the popular imagination as the central figure of the English revolution in its earlier stages. It is Hampden whose statue rather than that of Eliot or Pym has been selected to take its place in St Stephen's Hall as the noblest type of the parliamentary opposition, as Falkland's has been selected as the noblest type of parliamentary royalism,

Something of Hampden's fame no doubt is owing to the position which he took up as the opponent of ship-rnoney. But it is hardly possible that even resistance to ship-money would have so distinguished him but for the mingled magsiveness and modesty of his character, his dislike of all

_ pretences in himself or others, his brave contempt of danger,

and his charitable readiness to shield others as far as

| possible from the evil consequences of their actions. Nor

was he wanting in that skill which enabled him to influence

men towards the ends at which he aimed, and which was

spoken of as subtlety by those who disliked his ends. During the last two parliaments of James and the first

| three parliaments of Charles, Hampden did not, so far as _we know, open his lips in public debate, but he was

increasingly employed in committee work, for which he seems to have had a specialaptitude. In 1626 he took an actiye part in the preparation of the charges against Buck- ingham. In January 1627 he was bound over to answer at the council board for his refusal to pay the forced loan. Later in the year he was committed to the gate-house, and then sent into confinement in Hampshire, from which he was liberated just before the meeting of the third parliament of the reign, in which he once more rendered useful but un- obtrusive assistance to his leaders.

When the breach came in 1629 Hampden is found in epistolary correspondence with the imprisoned Eliot, discus- sing with him the prospects of the Massachusetts colony, or rendering hospitality and giving counsel to the patriot's

| Sons now that they were deprived of a father's personal care.

HAMPDEN

It was not till 1637, however, that his resistance to the payment of ship-money gained for his name the lustre which it has never since lost. Seven out of the twelve judges sided against him, but the connexion between the rights of property and the parliamentary system was firmly established in the popular mind.

In the Short Parliament of 1640 Hampden stood forth amongst the leaders. During the eventful mouths which followed, when Strafford was striving in vain to force England, in spite of its visible reluctance, to support the king in his Scottish war, rumour has much to tell of Hampden's activity in rousing opposition. It is likely enough that the rumoyr isin the main true, but we are not possessed of any satisfactory evidence on the subject.

In the Long Parliament, though Hampden was by no means a frequent speaker, it is possible to trace his course with sufficient distinctness. Unwearied in attendance upon committees, he was in all things ready to second Pym, whom he plainly regarded as his leader. In the earlier

proceedings of the Commans there was practically unanimity in the House, though a difference afterwards arose as to the form in which the attack upon Strafford should be conducted. All were agreed in desiring that the constitu- tion should rest upon a combination between the king and the two Houses, and that legal questions in which the king was concerned should be decided only by the judges of the ordinary courts.

There was another point on which there was no agree- ment. A large minority wished to retain Episcopacy, aud to keep the Common Prayer Book unaltered, whilst the majority were at least willing to consider the question of abolishing the one and modifying the other. On this sub- ject the parties which ultimately divided the House and the country itself were fully formed as early as February 8, 1641. The details of the contest between Episcopacy and Presbyterianism will be more fitly told in connexion with the life of Pym. It is enough to say that Hampden fully shared in the counsels of the opponents of Episcopacy. It is not that he was a theoretical Presbyterian, but the bishops had been in his days so fully engaged in the imposition of obnoxious ceremonies that it was difficult if not impossible to dissociate them from the cause in which they were embarked. Closely connected with Hampden's distrust of the bishops was his distrust of monarchy as it then existed. The dispute about the church therefore soon attained the form of an attack upon monarchy, and, when the majority of the House of Lords arrayed itself on the side of Episcopacy and the Prayer Book, of an attack upon the House of Lords as well.

No serious importance therefore can be attached to the offers of advancement made from time to time to Hampden and his friends, Charles would gladly have given them office if they had been ready to desert their principles, Every day Hampden's conviction grew stronger that Charles would never abandon the position which he had taken up. He was therefore a warm supporter of the Grand Remon- strance, and was chosen out to be one of the five impeached members whose attempted arrest brought at last the op- posing parties into open collision. In the angry scene which arose on the proposal to print

prevented an actual conflict, and it was after the impeach- ment had been attempted that Hampden laid down the two conditions under which

resistance to the king became the duty of a good subject. Those conditions were an attack upon religion, and an attack upon the fundamental laws. There can be no doubt that Hampden fully believed ee those conditions were fulfilled at the opening of

1642.

When the civil war began Hampden levied a regiment

the Grand Remon- | strance 1t was Hampden's personal intervention which |

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of Buckinghamshire men for the parliamentary cause. In the earlier operations of the war, and in the undecided fight of Edgehill, he bore himself gallantly and well. But it is not on his skill asa regimental officer that Hampden's fame rests. In war as in peace his distinction lay in his power of disentangling the essential part from the non-essential. In the previous constitutional struggle he had seen that the one thing necessary was to establish the Supremacy of the House of Commons. In the military struggle which followed he saw, as Cromwell saw afterwards, that the one thing necessary was to beat the enemy. He protested at once against Essex's hesitations and compromises. In the formation of the confederacy of the six associated counties, which was to supply a basis for Cromwell's operations, he took an active part. His influence was felt alike in parlia- ment and in the field. But he was not in supreme com- mand, and he had none of that impatience which often leads able men to fail in the execution of orders of which they disapprove. His precious life was a sacrifice to his unselfish devotion to the call of discipline and duty. On June 18, 1643, when he was holding out on Chalgrove Field against the superior numbers of Rupert till reinforce- ments arrived, he received two carbine balls in the shoulder. Leaving the field he reached Thame, and after nearly six days he died on the 24th praying for his country and his king. (s, R. G.)

HAMPDEN, Renn Dickson (1798-1868), bishop of Hereford, was born at Barbados, where his father was colonel of the local militia, in 1793, and after receiving a private school education under Dr Rowlandson, vicar of

Warminster, Wiltshire, entered as a commoner at Oriel College, Oxford, in 1810. Having taken his B.A. degree with first-class honours in both the classical and mathe- matical schools in 1813, he in the following year obtained the chancellor's prize for a Latin essay "On the Office of the Ephors at Sparta," and shortly afterwards he was elected to a fellowship in his college, Keble, N ewman, and Amold being among the number of his contemporaries. Having left the university in 1816 he held successively the curacies of Newton, Faringdon, and Hackney, and in 1827 he published An Essay on the Philosophical Evidence of Christianity, followed by a volume of Parochial Sermons elustrative of the importance of the Revelation of God wm Jesus Christ (1828). In 1828 he returned to Oxford as tutor of Oriel, and after having twice acted as public ex- aminer in classics, he was selected to preach the Bampton lectures jn 1832, when he chose for his subject Zhe Schol- astic Philosophy considered in its Relation to Christian Lheology (1833 ; 3ded. 1848). Notwithstanding a charge of Arianism now brought against him by the Tractarian party, he in 1833 obtained the principalship of St Mary's Hall, and in 1834 the chair of political economy ; nor did a university statute of censure against him on the ground of the supposed heterodoxy of the Bampton lectures avail to check his promotion to the regius professorship of divinity in 1836. There resylted a widespread and violent though ephemeral controversy, after the subsidence of which

he published a Lecture on Tradition, which has passed

through several editions, and a volume on The Thirty-nine Articles of the Church of England. His nomination by Lord John Russell to the vacant see of Hereford in December 1847 was again the signal for a violent and organized opposition ; and his consecration in March 1848 took place in spite of a remonstrauce by many of the bishops and the resistance of Dr Merewether, the dean of Hereford, who went so far as to vote against the election when the congé d'élire reached the cathedral. As bishop of Hereford Dr Hampden made no change in his long- formed habits of studious seclusion, and his episcopate was not characterized in a special degree by any form of churchly

Plate VIL.

activity or zeal. Among the more important of his later literary performances were the articles on Aristotle, Plato, and Socrates, contributed to the eighth edition of the Encyclopedia Britannica, and afterwards reprinted with additions under the title of Zhe Fathers of the Greek Philo- sophy (Edinburgh, 1862). In 1866 he had a paralytic seizure which unfitted him for severe mental exertion, and he died at London on the 23d of April 1868. HAMPSHIRE, Hants, or SourHamMPron (most anciently Hamtanscire, in Domesday book Hantesshire, and in the documents of the Middle Ages Sudhamtescire, Sudhamton- sire, and Sudenhamptonsire), a maritime county in the south of England, is situated between 50° 34' and 51° 22' N. lat. and 0° 43' and 1° 54' W. long., and is bounded on the N. by Berkshire, on the E. by the counties of Surrey and Sussex, on the S. by the English Channel, and on tlie W. by Wiltshire and Dorsetshire. It is of an irregular quad- rilateral form, and its greatest breadth from north to south, not including the Isle of Wight, is 46 miles, and its greatest breadth from east to west 41 miles. The total area comprises 1,032,105 imperial acres (mainland por- tion 938,764 acres, Isle of Wight 93,341), or nearly 1613 square miles. Hampshire in its general aspect presents a beautiful variety of gently rising hills and fruitful valleys, adorned with numerous mansions and pleasant villages, and interspersed with extensive woodland, Two ranges of low chalk hills, known as the North and South Downs, enter the county from Surrey and Sussex respectively, and tra- verse it in' a north-westerly direction into Wiltshire and Berkshire, forming in the north-western corner of the county several picturesque eminences, from which some fine viows are obtained. The highest of these summits is Siddown Hill, Highclere, 940 feet. The northern and north-eastern portion of the county, comprising more than 100,000 acres, is in the basin of the Thames; a large portion of the southern district is in the Southampton or Isle of Wight basin ; and a portion to the west is in the basin of Wilts and Dorset. hampton Water is almost wholly occupied by the New Forest. The coast on the whole is low and irregular. The most easterly part forms a large bay containing Hay- ling Island and Portsea Island, which divide it into Chichester harbour, Langston harbour, and Portsmouth harbour. From the south-western extremity of Portsmouth harbour itruns about 18 milesinland in a north-west direc-

nearly 2 miles at high water. From Southampton Water its line is continued irregularly in a south-western direction —for nearly one half of its extent fronting the Isle of Wight, and in its western half forming Christchurch Bay and part of Poole Bay.

Rivers and Canals.—The principal rivers are the Avon, the Boldre, the Exe, the Test with its tributary the Anton, the Itching, and the Hamble, The Avon in the south-west of the county has its source in Wiltshire, and passing Fordingbridge and Ringwood empties itself into Christ Church Bay, where it is joined by the Stour, which rising in Dorset crosses the south-west corner of Hampshire. The Boldre takes its rise in the New Forest, and after collecting the water of several brooks fells into Lymington creek. Tho Exe near the eastern extremity of the New Forest falls into the Solent at Beaulieu. The Test rises near Overton, and after its junction with the Anton at Fullerton passes Stockbridge and Romsey, and forms the head of Southampton Water. The Itching rises near Alresford, and flowing by Kingsworthy, Winchester, and Twyford falls into the Southampton Water to the north of Southampton. The Hamble rises near Bishop's Waltham, and after a course of about 10 miles falls into the South-

The south-western corner from South- '

: ' { for home supplies, and had an acreage of only 5039. tion, and forms Southampton Water, which has a western |

shore about 10 miles in length, and an average breadth of | ees iy | the grass most largely grown, as it is best adapted to land witha

ampton Water. The Wey, the Enbourne, the Loddon, and the Blackwater have their rise in the north part of the county, but soon pass into Berkshire.

There is one canal, Basingstoke, begun in 1778 and completed in 1794 at a cost of £100,000. It is 37 miles in length and terminates in the river Wey, in Surrey, near its junction with the Thames. Andover canal, begun in 1789, was filled up in 1858 and converted into a rail- way, forming a junction with the London and Exeter at Andover.

Geology and Soil.— With the exception of the northern and north-eastern corner occupied by the basin of the Thames, another portion about 8 miles in breadth extend- ing along the easteru side, and the New Forest in the south- west, with a small portion to the north of it, Hampshire is occupied by the Chalk formation which runs from Sussex and Surrey north-east into Wilts and Berks. This middle district has a length from north to south of about 22 miles and a breadth from east to west of between 20 and 30 miles. Its soil is in some places of considerable depth, and produces good crops of all kinds, but a great part of it is so thin as to be unfitted for the plough, and is used as sheep pasture. The basin of the Thames to the north of this district'is principally strong brown and grey loam, with a considerable number of marshes. The eastern portion form- ing the Vale of Petersfield, and comprising only about 50,000 acres, rests on the Wealdean formation, and is a grey sandy loam provincially called "malmy" land, lying on a soft sand rock. Tho southern portion, which includes the ancient Forest of Bere, Waltham Chase, and the New Forest, cousists principally of light sandy and gravelly loams inter- mixed with clay and brick earth, resting chiefly on argil- laceous and calcareous marl.

Agricultwre.—According to the Agricultural Statistics for 1879, the total area of arable land was 706,927 imperial aeres, of which 247,958 were under corn crops, 185,982 under green crop, 112,813 under rotation grasses, 184,141 permanent pasture, and 22,967 fallow. The acreage under woods was 87,229. The principal grain

crop is wheat, for which Hampshire enjoys a great celebrity. Its acreage has been gradually increasing, and in 1879 was 100,090.

| The acreage of barley and oats was 66,228, and 64,957 respectively.

Barley is usually sown after turnips, and is more grown in the uplands than in the lower levels. Beans and pease are only grown to a small extent, the acreage in 1879 being respectively 4633 and 10,092. On account of the number of sheep pastured on the uplands a large breadth of turnips is grown, their acreage in 1879 being 81,472. Potatoes are not cultivated beyond what is necessary Rotation grasses are grown chiefly in the uplands, and their acreage is greater than in any other of the southern counties of England.. Sanfoin is

calcareous subsoil. In the lower levels no sanfoin and scarcely any clover is grown, the hay being supplied from the rich water meadows, which are managed with great ski and attention, and give the best money return of any lands in the county. Where a rapid stream of water can be passed over them during the winter it seldom beeomes frozen, and the grasses grow during the cold weather so as to be fit for pasture before any traces of vegetation appear in the surrounding fields. Hops are extensively grown in the eastern part of the county bordering on Surrey. 'Their acreage in 1879 was 8064, Farming is generally conducted on the best modern principles, but owing to the varieties of soil there is perhaps no county in England in which the rotation observed is more diversified, or the processes and methods more varied. Most of the farms are large, and there is a considerable number of model farms. The waste land has been mostly brought under tillage, but a very large acrcage of the ancient forests is still occupied by wood. New Forest has 60,000 acres under wood, in addition to which there are in the east Woolmer Forest (5949) and Alice Holt (2744), in the south-east the Forest of Bere (11,000) and Waltham Chase (2000), and in the Isle of Wight Parkhurst Forest (3000). The New Forest was originally formed by William the Conqueror in 1079 after the battle of Hastings, and the greater part of it belongs tothe crown. The trees of the forest are principally beech and oak. The oaks, many of which are some hundred years old, do not grow toa great height, but shoot out strong crooked branches which give them a very picturesque appearance. Formerly they were chiefly used for the ships of the royal navy. Herds of small ponies similar to those of Shetland and the Hebrides are still reared in the Forest. It also contains abundance of deer,

and at one time it was famed for its pigs. The honey of the county enjoys a special celebrity.

The number of cattle has increased with the improved facilities for railway transport, and in 1879 was 66,059, or an average of 9°3 to every 100 acres under cultivation, as compared with 16°9 for England and 21:0 for the United Kingdom. Of these the number of cows and heifers in milk or in calf was 35,128. The cattle are of no distinctive breed. The number of horses, to the breeding and rearing of which much attention is paid, was 29,247 in

1879, or an average of 4°1 to every 100 acres under cultivation, as compared with 4°5 for England and 4°1 for the United Kingdom. The number of sheep in 1879 was 552,041, or an average of 782 to every 100 acres under cultivation, as compared with 75°3 for England and 68:0 for the United Kingdom. 'The origmal breed was white-faced with horns, but most of the flocks now are of a Southdown variety which have acquired certain distinct peculiarities, and are known as "'short wools" or " Hampshire downs," The number of pigs in 1879 was 57,122, or an average of 8°0 to every 100 acres, as com- pared with 7:2 for England and 6°7 for the United Kingdom. The breeding and fattening of pigs has long been a most important part of Hampshire industry. The original breed of pigs has been im- proved by crossing with Berkshire, Essex, and Chinese igs. Inthe vicinity of the forests the pigs are fed on acorns an beechmast, and the pork of those so cured is considered the best, although the reputation of the Hampshire bacon depends chiefly on the skilful manner in which it is cured.

According to the Laudowners' Return of 1872-73, the land was divided between 27,472 proprietors, holding land the gross annual value of which was £2,469,124. Of the owners 77 per cent. possessed less than one acre, and the average all over was £2, 10s. 24d. There were no fewer than 35 proprietors holding upwards of 5000 acres, viz :—Earl of Portsmouth, 16,401; Duke of Wellington, 15,847 ; Lord Ashburton, 15,330; Sir Willian: Heathcote, Bart., 14,189; Lord Bolton, 13,808; Melville Portal, 10,566 ; Earl of Carnarvon, 9294; Lord N orthbrook, 9286; Earl of Normanton, 9236; Lord Henry Scott, 8922 ; executors of John B. W. Fleming, 8843; Sir J. B. Simeon, 8724; Thomas Chamberlayne 8535 ; Thomas Thistlethwayte, 8084 ; Thomas Baring, 8058 ; Sir J. C. Jervoise, 7877 ; College of Winchester, 7269 ; Sir H. A. Tichborne, 7270; Sir Henry Mildmay, 6762; Crown Property, 6554; H. P, Delme, 6258 ; Rev. Thomas Best, 6184; F. J. E. Jervoise, 6183 ; W. W. B. Beach, 6099 ; Dean and Chapter of Westminster, 5837 ; W. F. Cowper-Temple, 5780; John Bonham Carter 5621; John Morant, 5596 ; W. H. Kingsmill, 5361; Lord Heytesbury, 5195 ; Edgar A. Drummond, 5155 ;_W. H. 8. Stanley, 5150; William H. lremonger, 5103; Kdward Knight, 5044 ; Lady Jane Mill, 5040.

Manufactures and Trade.—The manufactures are unimportant except those carried on at Portsmouth and Gosport in connexion with the royal navy.

There are large steam docks and an exten- sive shipping trade at Southampton. In many of the towns there are breweries and tanneries, and paper is manufactured at scveral places. Fancy pottery and terra cotta are made at Fareham and Bishop's Waltham ; and Ringwood is celebrated for its knitted gloves. At most of the coast towns fishing is prosecuted, and there are oyster beds at Hayling Island. Cowes in the Isle of Wight is the station of the royal yacht squadron and has building yards for yachts and large steamers. The principal bathing-places, besides those in the Isle of Wight, are Southsea, Southhayling, Bourne- mouth, and Anglesea, a suburb of Gosport. At Portsmouth there is a convict prison, at Parkhurst a prison for convict boys, and at Aldershott a large military camp.

Kailways.—The London and South-Western Railway enters the county at Farnborough, passing by Winchester and from thence to Southampton, a branch diverging from Bishopstoke to Gosport, and again to Portsmouth, Havant, and Emsworth ,viathe South Coast Rail- way, by a branch from Fareham. A branch of the Great Western from Reading joins the South-Western at Basingstoke, about a mile south-west from which a line diverges to Whitchurch, Andover, and Salisbury. The Guildford and Reigate branch of the South Coast Railway communicates with Alton and New Alresford, 6 miles west of which it joms the South-Western. Southampton communicates with Dorchester by the Dorchester Railway which, after branch- ing to Lymington, passes Ringwood, from which there is another branch to Christchurch and Bournemouth. Another line connects Southampton with Salisbury, and from this line a branch 4 miles north of Romsey communicates with Andover.

Administration.—Hampshire, including the Isle of Wight, com- prises 38 "' hundreds," 10 « liberties," 1 city, that of Winchester (16,366), which is also a municipal and parliamentary borough ; 5 other boroughs which are both municipal and parliamentary, viz., Andover (5744), Lymington (5856), Newport (8522), Portsmouth (113, 569), and Southampton (53,741) ; 2 parliamentary boroughs, viz., Christchurch (15,415) and Petersfield (6104) ; and 3 municipal boroughs—Basingstoke (5574), Romsey (2056), and Ryde (11,260).

_For parliamentary purposes I‘ants is formed into three divisions, viz., North Hants, South Hants, and the Isle of Wight. Win- chester which returns 2 members, and Andover and Petersfield

which return 1 member each are in the northern division, which returns in all 6 members ; in the southern division are included the boroughs of Christchurch and Lymington returning 1 member each, and the boroughs of Portsmouth and Southampton returning 2 each, and it returns in all 8 members; the Isle of Wight returns 1 member, and also contains the borough of Newport returning 1 member. The total representation of the county is thus 16 members,

The county has one court of quarter sessions, and is divided into 14 petty sessional divisions. ‘Che city of Winchester, and the boroughs of Andover, Portsmouth, and Southampton (a county of it- self), have commissioners of the peace and separate courts of quarter sessions ; and the boroughs of Basingstoke, Newport, Romsey, and Ryde have commissions of the peace. Inthe borough of Lymington the mayor and ex-mayor are magistrates, and the county justices have concurrent jurisdiction. The county is included in the western circuit, and ecelesiastically is almost entirely in the diocese of Winchester.

Population.—The total population of the county amounted in 1841 to 354,682, in 1851 to 405,370, in 1861 to 481,815, and in 1871 to 544,684 (males, 275,393; females, 269,291). The increase in 30 years from 1841 has been 54 per cent., and since 1801 it has been 97 per cent. The excess of males over females is accounted for by the naval and military establishments situated in the county. In 1871 the mainland portion contained a population of 478,465, and the Isle of Wight 66,219.

History and Antiquitics.—Before the Roman invasion the Welsh Celts of Hampshire had been driven out or subdued by incursions of Gauls, who first took possession of the country round Winchester to the west of the great forest of Andresweald, stretching into Hampshire from Sussex, and gradually occupied the greater part of the southern shires from Surrey and Sussex to Devon. It was probably during this prolonged contest that the

intrenched camps were formed at Beacon Hill, Bury Hill, Danebury, Quarley Mount, and Worldbury Mount. The Gauls whom the Romans found in South Britain were divided into three tribes—the Regni on the coast, the Belge in the middle, and the Atrebates in the north. Their chief town occupied the site of the modern Winchester, and was known as Venta Belgarwm by the Romans, who made it one of their principal stations. From it roads, traces of which may yet be seen, were constructed to Sorbiodunum (Old Sarum), Silchester, and Southampton, and to Porchester (Portsmouth) and Chichester. Next to Venta Belgaruwm the most important Roman station in Hampshire was Calleva (probably Silchester), where there are yet very extensive remains ; traces of a large station (Clausentum) are still to be seen at Southampton ; at Portsmouth portions of an old Roman fort ave incorporated in the castle of Porchester ; at Broughton, near Stockbridge, slight traces of a station are still i and an intrenchment at Egbury Hill, near Whitchurch, is regarded by some as the remains of the ancient Vindomis, although others place the site of that town at Silchester. Eyen before the Roman conquest of Britain the southern shores of England had been frequently attacked by Saxon irates, and afterwards, in 475, the warriors Hengist and Horsa had succeeded ultimately and with great difficulty in establishing themselves in Kent ; but the real conquest of southern Britain was accomplished by a Saxon tribe called Gervissa or Gervisst, who about the year 495, under Cerdic and his son Cynric, landed from five ships on the shores of South- ampton Water, and concluded a stubborn contest by defeating the Britons at Charford in 519, from which period is generally dated the origin of the kingdom of Wessex, which had for its capital Winchester, then known as Wintanceaster or Winteceaster. he establishment of the bishop's see at Winchester, after the conversion of King Kynegils of Wessex about 635, falls more appropriately to be noticed in the article on that city. In 755, according to the Saxon chronicle, Sigebert, king of Wessex, was deprived by the witan of the whole of his kingdom, with the exception of Hamiansetre, the first time that the name occurs. Hampshire played a prominent part in the contest with the Danes or North- men, who about 860 stormed Winchester, but were afterwards worsted, in 871 defeated Ethelbert at Basing, and in 878 compelled King Alfred to retreat to the woods and fastnesses. The devasta- tion of the Isle of Wight by the Danes in the reign of Ethelred I1., and the other historical events connected with that island, will be noticed in the article Wicur, Iste or. Under Edward the Con- fessor

and Harold II. the seat of government had been transferred from Wiuchester to Westminster, but the honour was again restored to Hampshire by William the Conqueror, who made Winchester his principal residence, and for the purposes of sport devastated a large part of the county to form the New Forest. The superstitious fancies of the time traced a necessary connexion between this violent exercise of his prerogatives and the sudden death of his sons and grandson within the boundaries of the scene of his ruth- less devastations: his son Richard was smitten with sudden death in the New Forest while hunting; a second Richard, a natural son of Robert his eldest son, met his death there accidentally ; and William Rufus, his eldest son and his successor, while hunting within it was shot by an arrow in 1100. The loss which the shire

sustained by the final transference of the seat of government to London was partially compensated for by the rise of the ports of Southampton and Portsmouth, which have been an important element in its prosperity down to the present time. The principal other historical events of the shire are connected either with these two towns or with Winchester or the Isle of Wight, the only ex- ception of importance being the siege and capture of Basing House by the troops of Cromwell in 1645. ;

The principal monastic institutions in Hampshire, dissolved by Henry VIII., were the priory of St Swithin, who was bishop of Winchester from 852 to 862; the monastery of Hyde, outside the walls of Winchester, founded by King Alfred; the nunnery of St Mary's, Winchester ; St Elizabeth's College, Winchester; the nunnery of Wherwell, founded by Elfrida ; the Augustinian priory of Southwick, founded by William of Wykeham ; the Premon- stratensian abbey of Tichfield, founded in the time of Henry III. ; the Augustinian priory of Twyneham, Christchurch, founded accord- ing to some authorities by King Athelstan; the Augustinian priory of Breamore, founded by Baldwin de Redvers; the nunnery of Romsey, founded by Edward the Elder about 910 ; the Augustinian priory of Mottisfont, endowed soon after the Conquest, but by whom is uncertain ; the Cistercian abbey of Beaulieu, founded by King John about 1204 ; the Cistercian abbey of Netley, founded in the time of Henry III.; the Augustinian priory of St

Denis, near Southampton, founded by Henry I. ; the abbey of Quarr, Isle of Wight ; and the preceptory of Baddesley. The most important monastic remains are those at Winchester ; the priory church at Christchurch in the Norman and Perpendicular style ; the Norman church at Romsey ; the remains of Netley Abbey, with a church in the Early English style ; the ruins of Beaulicu Abbey, of which a gateway is in good preservation (the abbot's house has been con- verted into a private residence, and the great hall or refectory, in the plain Early English style, is now used as a parish church); the ruins of the priory of St Denis, and the Norman church at Porchester, near Portsmouth. Corhampton church, near Exton, is the only Saxon church in Hampshire which is entire, but Saxon masonry is found in Headbourne Worthy church, which also con- tains au old brass of the 15th century. The principal other old churches not mentioned under Winchester, Southampton, and other towns, nor already referred to in connexion with monastic remains, are—in the Norman style, Chilcombe, Hamble, Kingsclere, and Tichbourne ; in the Norman style, with Early English additions, Alton, Basing, Bishop's Sutton, Brockenhurst, Clatford, Hamble- don, Milford, and Warnford ; in the Early English, Boldre, Cheriton, Grately, Sopley, which is partly Perpendicular, and Thruxton, which contains a brass to Sir John Lisle (died 1407), affording the earliest example of complete plate armour in England ; and in the Perpendicular, Basingstoke, Fordingbridge, which is also partly Decorated, Tichfield, Selborne, and Warblington.

The principal old castles are Calshot Castle, built in the time of Henry VIII., and used by the coast-guard ; Carisbrook Castle (see Wicut, Istz oF); Hurst Castle, near Southampton, where Charles I. was for a short time imprisoned, now transformed into a fortress ; and Porchester Castle (see PorrsmoutH). The modern residences of the gentry are more than usually numerous.

Among the eminent persons connected with Hampshire may be mentioned Young, author of the Night Thoughts ; Warton, author of the History of English Poetry; Dibdin, Bishop Wykeham, Pococke the traveller, Sir William Petty, Jonas Hanway, Brunel, Gilbert White, John Keble, and Charles Dickens.

See the papers regarding the early history of South Britain by Dr Guest in the Archwological Journal, and in the Transactions of the Archeological Institute ; Hampshire, extracted from Domesday Book, by Richard Warner, 1789; Moody, Hampshire in 1086 (1862), and the same author's Antiquarian and Topographical Sketches, 1846, and Notes and Essays relating to the Counties of Hants and Wilts, 1851; R. Mudie, History of Hampshire, 2 vols., 1840; J. Duthie, Sketches of Hampshire, 1840; P. J. Martin, Geology of Hampshire, 1851; Michaclmarsh and its Antiquities, 1867; Woodward's im- portant History of Hampshire, 3 vols., 1869; and White's History and Directory of Hampshire and the Isle of Wight, 1879.

HAMPSTEAD, a suburb of London, is situated in the county of Middlesex, on the slope of Hampstead Hill, 4 miles N.W. of the city. The village is irregu- larly built, and the streets are narrow and tortuous, but it has preserved more than any other London suburb its sylvan appearance, and is still noted for its fine groves and avenues. From the side of the hill there issue chalybeate springs, whose virtue was first dis- covered in the 17th century, and which at the beginning of last century rivalled those of Tunbridge Wells and Epsom in popularity. Their reputation, however, eradually declined after the middle of the century, and now the

supply of mineral water has been greatly diminished by the cutting of deep drains and of railway tunnels. Hamp- stead Heath, an irregular sandy tract occupying the summit and northern slope of the hill, and extending to 240 acres, is much frequented by excursionists aud picnic parties. The hill is the highest in the vicinity of the metropolis, being 443 feet above the level of the Thames, or 36 feet higher than the cross of St Paul's. At one time the village was a favourite resort of poets and other men of letters; and among the more famous of its old taverns was the Flask Inn, now converted into a private residence, the meeting-place of the Kit-Cat elub, of which the more celebrated members were Addison, Steele, Richardson, Marlborough, and Walpole. The parish church of St John, consecrated in 1747 and enlarged in 1844, is a plain brick structure in the Italian style with a picturesque tower. The graveyard contains a number of monuments of eminent persons, including those of Sir James Mackintosh, Joanna Baillie, and Constable the

artist. Near the village a large militia barracks was erected in 1863, and there are a number of charitable institutions, including a soldiers' daughters' home, a sailors' daughters' home, an orphan working school, and the North London Consumptive Hospital. The population of the parish in 1871 was 32,281.

HAMPTON, a village in the county of Middlesex, England, is situated on the north bank of the Thames, 12 miles W.S.W. from Hyde Park Corner. The parish church erected in 1830, with a square tower at its western end, is without architectural merit, but the churchyard contains a number of interesting old monuments. Among the many fine residences in the vicinity is Garrick Villa, formerly, under the name of Hampton House, the residence of Garrick the famous actor. In the neighbourhood there area number of large pumping works for supplying London with water. The free grammar school founded in 1556 was reopened in 1878 as a middle-class school, for which the usual fees are charged. The population of the village in 1871 was 2207.

About a mile from Hampton village and close to the river stands Hampton Court Palace, one of the finest extant specimens of the Tudor style of architecture, and formerly a royal residence. It was originally erected by Cardinal Wolsey, who in 1515 received a lease of the old mansion and grounds for 99 years. As the splendour of the building seemed to awaken the cupidity of Henry VILL, Wolsey in 1526 thought it prudent to make him a present of it. It became Henry's favourite residence, and he made several additions to the building, including the great hall and chapel in the Gothic style. Of the original five quadrangles only two now remain, but a third was erected by Sir Christopher Wren for William ITI. The fine gardens, extending to 44 acres, were laid out at the desire of William III. in the Dutch style, with elevated terraces, long shady walks, and a labyrinth called the "Maze," which is the source of great amusement to visitors. Bushy Park, opposite the palace gardens, is open to the public, and contains a celebrated avenue of chestnut trees. The palace was sold by the parliament in 1641, but afterwards came into the hands of Cromwell ; and it continued to be one of the principal residences of the English sovereigns until the time of George II. It was the birthplace of Edward VI., and the meeting-place of the conference held in the reign of James I. to settle the dispute between the

Presbyterians and the state clergy. It is now partly occupied by persons of rank in reduced circumstances ; but its state apartments, picture gallery, and gardens are open to the public free of charge. The celebrated cartoons of Raphael which it formerly possessed | have lately been removed to the South Kensington

HAM—HAWN

Museum, but it still contains a valuable collection of pictures, including a number of fine specimens of the old masters, and a large collection of portraits of persons famous in English history.

HAMSTER (Cricetus), a genus of rodent mammals belonging to the Juride or mice family, and characterized by the possession of large cheek pouches. The common hamster (Cricetus vulgaris) is somewhat larger and stouter than the Norway rat, but with a much shorter tail. Its fur, which varies somewhat in colour, is generally of a reddish-brown above and black beneath, with several white spots on the sides. IJtis found throughout the dry regions of central Europe and Asia, from the Rhine eastward to the river Obi and southward to Persia and the Caucasus. It is a burrowing animal, its subterranean dwelling consist- ing of several vaults, most of which are used as storehouses for the grain and seeds which the hamster lays up in autumn for consumption during winter and spring. In collecting this store it makes use of its cheek pouches, which are said to be large enough to contain a quarter of an English pint, while the hoard of a single individual will sometimes contain about two bushels of grain. It is thus specially obnoxious to the farmer, who loses no opportunity of destroying the creature and of ransacking its stores. Like many other rodents, the hamster is exceedingly prolific, the female producing several broods in the year, each con- sisting of over a dozen young, and these when not more than three weeks old are turned out of the parental burrow to form underground homes for themselves. The burrow of the young hamster is only about a foot in depth, while that of the adult descends 4 or 5 feet beneath the surface, On the approach of winter the hamster retires to its sub- terranean abode, the various entrances to which it carefully closes, aud there it remains until the advent of milder con- ditions, feeding for a while on its well-garnered store, but becoming torpid during the coldest period of winter. Although feeding chiefly on roots, fruits, and grain, it is also to some extent carnivorous, attacking and feeding upon small quadrupeds, lizards, and birds. It is exceedingly fierce and pugnacious, the males especially fighting with each other for possession of the females. The numbers of those destructive vermin are kept in check by their many natural enemies, the foxes, dogs, cats, and polecats, which feed uponthem. The skin of the hamster is of some value, and its flesh is used as food. Its burrows are sought after in the

countries where it abounds, both for capturing the animal and for rifling its store,

HANAU, a town of Prussia, capital of a circle in the government district of Cassel, province of Hesse-Nassau, is situated at the confluence of the rivers Kinzig and Main, 12 miles E. of Frankfort. It consists of what are called an old and answtown. The streets of the former are narrow and irregular, but the latter, founded at the end of the 16th century by refugee Walloons and Netherlanders, is built in the form of a pentagon with broad streets crossing at right angles, and possesses several fine squares, among which may be mentioned the market-place, adorned with handsome fountains at the four corners. The town is the seat of a circle court, a head tax-office, a chamber of commerce, and a branch of the imperial bank. Among the principal build- ings are the ancient castle, formerly: the residence of the counts of Hanau; the church of St John, dating from the 17th century, with a rather imposing tower ; the old church of St Mary, formerly a collegiate church, and containing the tomb of the counts of Hanau ; the church of the new town, built in the beginning of the 17th century, whose ground plan is in the form of two circles intersecting each other ; the beautiful new Catholic church, the synagogue, the theatre, the barracks, the arsenal, the orphanage, and the infirmary. Its educational establishments include a

gymnasium, a school of design, a real-school, and a higher girls' school. There is a Wetteravian society of natural history and an historical society, both of which possess considerable libraries and collections connected with their respective branches of knowledge. Hanau is the birthplace of the brothers Grimm, and the house in which they were born is now adorned with a medallion. In the neighbour- hood of the town are the electoral palace, with an extensive park and large orangeries, and thie watering-place of Wilhelmsbad. Hanau is the principal commercial and manufacturing town in the province, and stands next to Cassel in point of population. Its staples are ornaments of various kinds, cigars, leather, paper, playing cards, silver and platina wares, chocolate, soap, woollen cloth, hats, silk, gloves, stockings, ropes, and matches. It has also three large foundries and a number of breweries, and in the neighbourhood there

are extensive powder-mills. It carries on a large trade in wood, wine, and corn, in addition to its articles of manufacture. The population of the town in 1875 was 22,269.

From the number of urns, eoins, and other antiquities found near Hanau it would appear that it owes its origin to a Roman settle- ment, It was raised to the rank of a town in 13938, and in 1528 it was fortified by Count Philip, who rebuilt the castle. At the end of the 16th eentury its prosperity received considerable impulse from the aecession of the Walloons and Netherlanders. During the Thirty Years' War it was in 1631 taken by the Swedes, and in 1636 it was besieged by the imperial troops, but was relieved on the 13th June by Landgrave William V. of Cassel, on aceount of which the day is still commemorated by the inhabitants. N apoleon on his retreat from Leipsic defeated the Germans under Marshal Wrede at Hanau, October 30, 1813; and on the following day the allies vacated the town, when it was entered by the French. In 1429 Hanau became the capital of a province of the empire, which on the death of Count Reinhard II. was in 1451 partitioncd betwecn the Hanau-Miinzenberg and Hanau-Lichtenberg lines, but was reunited in 1692 when the elder line beeame extinct. The younger line received prineely rank in 1696, but, as it also became extinct, Hanau-Miinzenberg in 1786 was joined to Hesse-Casscl and Hanau-Lichtenberg to Hesse-Darnistadt. Tn 1785 the whole province was united to Hesse-Cassel, and in 1803 it becaine an independent prin- cipality. In 1813 it again came into the possession of Hesse-Cassel, and in 1866 it was joined to Prussia.

HANCOCK, Jonn (1737-1793), American revolutionary statesman, was born at Quincy, Massachusetts, J anuary 12, 1737. Having taken his degree at Harvard university in 1754, he began a mercantile career, and on the death of an uncle in 1764 succeeded to a large fortune and a pros- perous business. In 1768, two years after his election to the Massachusetts house of representatives by the city of Boston, his sloop " Liberty " was seized for contravention of the commercial laws, and in the riot which followed the royal customs commissioners barely escaped with their lives. After the " massacre " of Boston in 1770, Hancock inveighed with such spirit and bitterness against the troops and their officers, demanding their removal from the town, that he became obnoxious to the Government ; and five

years after- wards the attempt to seize his person led to the first revolu- tionary battle at Concord, Massachusetts. In 1774 Hancock was president of the provincial congress, and from 1775 to 1777 of the general congress at Philadelphia, where he was the first to sign the declaration of independence. Return- ing to Massachusetts he assisted in framing its constitution, and in 1780 was chosen first governor. He was annually elected to this dignity till 1785, and again from 1787 to 1793, sitting as an ordinary member of the legislature in the interval. He received the degree of LL.D. from Harvard university in 1792. He died at Quincy, 8th October 1793.

HANDEL, Grorce Freverick (1685-1759), one of the greatest names in the history of music generally, is abso- lutely paramount in that of English music. His influence on the artistic development of England and his popularity, using that word in the most comprehensive sense, are

perhaps unequalled. He has entered into the private and the political life as well as into the art life of Englishmen ; without him they cannot bury their dead or elect their legislators ; and never has a composer been more essenti- ally national than the German Handel has become in Eugland. It may on the other hand be said that but for his sojourn in that country Handel would never have been what he was. It was under the influence of English poetry, and of English national and religious life, that his artistic conception broadened and gained the dignity and grandeur which we see in his oratorios, and which was wanting, and, seeing the style of art, could not but be wanting, in his Italian operas. The day of Handel's arrival in London, late in the autumn of 1710, was indeed an eventful day in the life of Handel as well as in the annals of English music, aud the facts of his biography preceding that date may be summed up with comparative brevity, George Frederick Handel (in German the name is always Hindel) was born at Halle in Saxony on February 23, 1685, the same year which gave birth to his great fellow composer Johann Sebastian Bach.! He was the son of George Handel, who according to the custom of the time com- bined the occupations of barber and surgeon, and subse- quently rose to be valet-de-

chambre to the elector of Saxony. Tis second wife, Dorothea Taust, was the daughter of a clergyman, and to her the great composer remained attached with all the ties of filial affection. His father was sixty-three years old when Handel was born, and the musical talent shown by the youth at a very early age found little encouragement from the stern old gentleman, who looked upon art with contempt, and destined his son for the law. Many are the anecdotes relating to the sur- reptitious way in which the youth practised the forbidden art on a little spinet smuggled into his attic by the aid of a good-natured aunt, and fortunately of too feeble tone to be audible in the lower part of the house. At the age of eight the boy accompanied his father on a, visit ta Saxe- Weissenfels, and it was there that the proficiency acquired in the manner above described was turned to excellent account ; for, having made acquaintance with the court musicians, and being allowed to practise on the organ, he was on one occasion ayerheard by the duke himself, who immediately recognizing his talent spoke seriously to the father on his behalf. To such a remonstrance coming from such a quarter the valet-de-chambre had of course to submit, and henceforth Handel was allowed to practise his art, and after his return to Halle even received musical instruction from achau, one of the best organists of the town, It was under his somewhat mechanical but thorough tnition that Handel acquired his knowledge of counterpoint ; he also soon became an excellent performer on the organ. His first attempts at composition date from an equally early period, and in his twelfth year he made his début as a virtuoso at the court ef Berlin with such success that the elector of Brandenburg, afterwards King Frederick I. of Prussia, offered to send him to Italy, a proposal declined by Handel's father for unknown reasons. In 1697 the latter died, and the young artist was henceforth thrown on his ownresources. For some years he remained in Ifalle, where in 1702 he obtained a position as organist ; but in the following year we find him at Hamburg, at that time one of the musical centres of Germany. There the only German opera worth the name had been founded by Reinhold Keiser, the author of innumerable operas and operettas, and was flourishing at the time under his direc- tion. Handel entered the orchestra, and soon rose from his place amongst the second violins to the conductor's seat at the clavicembalo, which he occupied during Keiser's

1 The date, 23d February 1684, given on his tombstone in West- minster Abbey is incorrect.

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absence, necessitated by debt. It was at Hamburg that he became acquainted with Mattheson, a fertile composer and writer on musical subjects, whose Vollkommener Kapell- meister (1739) and Khrenpforte (1740) are valuable sources forthe history of music. 'The friendship of the two young men was not without some curious incidents. On one occasion they set out together on a journey to Liibeck, where the place of organist at one of the churches was vacant. Arrived at Liibeck, they discovered that one of the conditions for obtaining the place was the hand of the elderly daughter of the former organist, the celebrated Buxtehude, whereat the two candidates forthwith returned to Hamburg. Another adventure might have had still more serious consequences. At a performance of Matthe- son's opera Cleopatra at Hamburg, Handel refused to give up the conductor's seat to the composer, who was also a singer, and was occupied on the stage during the early part of his work. The dispute led to an improvised duel out- side the theatre, and but for a large button on Handel's coat which intercepted his adversary's sword, there would have been no Messiah or Israel in Egypt. In spite of all this the young men remained friends, and Mattheson's writings are full of the most valuable facts for Handel's biography. He relates in his Lhrenpforte amongst othier things that his friend at that time used to compose " inter- minable cantatas" of no great merit, but of these no trace now remains, unless we assume that a " Passion" according to St John (German words by Postel), the MS. of which is at the Royal Library, Berlin, is amongst the works alluded to. It was composed in 1704, The year after this witnessed Handel's first dramatic attempt—a German opera, Almira, performed at Hamburg on January 8, 1705, with great success, and followed a few wecks later by another work of the same class, Vero by name. In 1706 he left Hamburg for Italy, at that time still the great school of music, to which indeed Handel himself owed his skill and experience in writing for the voice. He remained in Italy for three years, living at various times in Florence, Rome, Naples, and Venice. He is said to have made the acquaintance of Lotti, of Alessandro Scarlatti, and of the latter's son Domenico, the father of modern pianoforte playing, His

compositions during his Italian period were two operas, two oratorios, Resurrezione and Il Trionfo del Tempo e del Disinganno, afterwards developed into the English oratorio The Triumph of Time and Truth, and numerous other choral works. It was during these years that the composer's earlier or Italian style reached its full maturity, and that his name became widely known in the musical world. In the chief cities of Italy 'il Sassone," as Handel, like his countryman Hasse twenty years later, was nicknamed, was received with every mark of favour and esteem. But his own country also began to acknow- ledge his merits. At Venice in 1709 Handel received the offer of the post of capellmeister to the elector of Hanover, transmitted to him by his patron and staunch friend of later years Baron Kielmansegge. The composer at the time con- templated a visit to England, and he accepted the offer only on condition of leave of absence being granted to him for that purpose. To England accordingly Handel journeyed after a short stay at Hanover, arriving in Lon- don towards the close of 1710. Curiously enough he came as a composer of Italian opera, and in that capacity he earned his first success at the Haymarket with the opera Rinaldo, composed it is said in a fortnight, and first per- formed on February 24,1711. The beautiful and still universally popular air "Lascia ch'io pianga" is from this opera. A similar air in the form of a sarabande occurs in Almira, After the close of the season in June of the same year Handel seems to have returned to Germany for a short time; but the temptation of English fame or English gold

proved too powerful, and in January 1712 we find him back in London, evidently little inclined to return to Hanover in spite of his duties at the court there. Two Italian operas, the celebrated Utrecht Ze Deum written by command of Queen Anne, and other works belong to this period. It was in such circumstances somewhat awkward for the composer when his deserted master came to London as George I. of England. MNeither was the king slow in resenting the wrongs of the elector. For a considerable time Handel was not allowed to appear at court, and it was only through the intercession of his patron Baron Kielmansegge that his pardon was at last obtained. Com- missioned by the latter, Handel wrote his celebrated Water- Music, which was performed at a great féte on the Thames, and so pleased the king

that he at once received the com- poser to his good graces. A salary of £200a year granted to Handel was the immediate result of this happy consum- mation. In 1716 he followed the king to Germany, where he wrote a second German "Passion," the words this time being supplied by Brockes, a well-known poet of the day. After his return to England he entered the service of the duke of Chandos as conductor of his private concerts, In this capacity he resided for three years at Cannons, the duke's splendid seat near Edgeware, and pro- duced the two Te Deums and the twelve Anthems surnamed Chandos. The English pastoral Acis and Galatea (not to be mistaken for the Italian cantata of that name written at Naples, with which it has nothing in common), and his first oratorio to English words Esther, were written during his stay at Cannons. It was not till 1720 that he appeared again in a public capacity, viz, in that of impresario of an Italian opera at the Haymarket Theatre, which he managed for the so-called Royal Academy of Music. Senesino, a celebrated singer, to engage whom the 'composer specially journeyed to Dresden, was the mainstay of the enterprise, which opened with a highly successful performance of Handel's opera Radamista. Muzio Scevola, written in conjunction with Buononcini and Ariosti, Tamerlane, Lodelinda, and other operas composed for the same theatre, are now forgotten, only detached songs being heard at concerts, To this time also belongs the celebrated rivalry of Handel and Buononcini, a gifted Italian composer, wlio by his clique was declared to be infinitely superior to the German master. The controversy raised a storm in the aristocratic teapot, and has been perpetuated in the lines generally but erroneously attributed to Swift, and in reality written by John Byrom :—

Some say, compared to Buononcini,

That Mynheer Handel's but a ninny ;

Others aver that he to Handel

Is scarcely fit to hold a candle.

Strange all this difference should be

'Twixt Tweedle-dum and Tweedle-dee,

Although the contempt for music, worthy of Chesterfield himself, shown in these lines may seem absurd, they yet contain a grain of truth. Handel differed from his rival only in degree not in essence. In other words, he was an infinitely greater composer than Buonon- cini, but had he continued to write Italian opera there is no reason to conclude from his existing works of that class that he would have reformed or in any essential point modified the existing genre. The contest was therefore essentially of a personal nature, and in these circumstances it is hardly necessary to add that Handel remained victorious. Buononcini for a reason not sufti- ciently explained left London, and Handel was left with- out a rival. But in spite of this his connexion with Italian opera was not to be a source of pleasure or of wealth to the great composer. For twenty years the indomitable master was engaged in various operatic ventures, in spite of a rival company under the great singer Farinelli. started

by his enemies,—in spite also of his bankruptcy in 1737, and an attack of paralysis caused by anxiety and overwork, Of the numerous operas produced by him during this period it would be needless to speak in detail, Only the name of the final work of the long series, Deidamia, produced in 1741, may be mentioned here. That Handel's non-success was not caused by the inferiority of his works to those of other composers is sufficiently proved by the fact that the rival company also had to be dissolved for want of support. But Handel was in more than one way disqualified for the post of operatic manager, dependent in those days even more than in ours on the patronage of the great. To sub- mit to the whims and the pride of the aristrocracy was not in the nature of the upright German, who even at the con. certs of the princess of Wales would use language not often heard at courts when the talking of the ladies during the performance irritated him. And, what was perhaps still more fatal, he opposed with equal firmness the caprices and inartistic tendencies of those absolute rulers of the Italian stage—the singers, The story is told that lhe took hold of an obstinate prima donna and held her at arm's length out of window, threatening to drop her into the street below unless she would sing a par- ticular passage in the proper way. Such arguments were irresistible at the time, but their final results were equally obvious, in spite of Handel's essentially kindly nature and the ready assistance he gave to those who really wished to learn. No wonder therefore that lis quarrels with virtuosi were numerous, and that

Senesino deserted him at a critical moment for the enemy's camp. It is a question whether Handel's change from opera to oratorio has been altogether in the intcrest of musical art. The opera lost in him a great power, but it may well be doubted whether dramatic music such as it was in those days would have been a proper mould for his genius, Neither is it certain that that genius was, strictly speaking, of a dramatic cast. There are no doubt in his oratorios— for in these alone Handel's power is displayed in its matu- rity—examples of great dramatic force of expression ; but Handel's genius was in want of greater expansion than the economy of the drama will allow of. It was no doubt for this reason that from an inner necessity he created for him- self the form of the oratorio, which in spite of the dialogue in which the plot is developed is in all essentials the musical equivalent of the epic. This breadth and depth of the epic is recognized in those marvellous choral pieces expressive either of pictorial detail (as the gnats and the darkness tangible and impenetrable in Zsrwel in Lgypt) or of the com- bined religious feeling of an entire nation, By the side of these even the finest solo pieces of Handel's scores appear comparatively insignificant, and we cannot sufficiently wonder at the obtuseness of the public which demanded the insertion of miscellaneous operatic arias as a relief from the incessant choruses in [srae in Egypt at the second per- formance of that great work in 1740. Handel is Iess the exponent of individual passion than the interpreter of the sufferings and aspirations of a nation, or in a wider sense of mankind. Take, for instance, the celebrated Dead March in Saul. Yt is full of intense grief, in spite of the key of C major, which ought once for all to dispel the pre- judice that sorrow always speaks in minor keys. Even Chopin himself has not been able to give utterance to the feeling in more impressive strains. And yet the measured and decisive rhythm, and the simple diatonic harmonies, plainlyindicate that here a mighty nation deplores the death of a hero, It is for the same reason that Handel's stay in England was of such great influence on his artistic career. Generally speaking, there is little connexion between politics and art. But it may be said without exaggeration that only amongst a free people, and a people having a national

life such as England alone had in the last century, such national epics as Judas Maccabeus and Israel in Egypt could have been engendered. In the same sense the Messiah became the embodiment of the deep religious feel- ing pervading the English people, and Handel, by leaving Italian opera for the oratorio, was changed from the entertainer of a caste to the artist of the people in the highest and widest sense. The Messiah is indeed the musi- cal equivalent of Milton's Paradise Lost. This leads us to another and equally important aspect of the saine subject — the important influence of English poetry on Handel's works. Not only are some of the greatest names of English literature —Milton (Allegro and Denseroso), Dryden (Alex- ander's Feast), Pope (St Cecilia's Ode)—immediately con- nected with Handel's compositions, but the spirit of these poets, and especially of Milton, pervades his oratorios even when he has to deal with the atrocious doggerel of Morell or Humphreys. In addition to this Handel received many a valuable suggestion from the works of Purcell and other early English musicians with which he was well acquainted. No wonder therefore that Englishmen claim Handel as one of themselves, and have granted him honours both during his lifetime and after his death such as have fallen to the share of few artists. But in spite of all this it is impossible to deny that the chances of a national development of English music were, if not absolutely crushed, at least delayed for centuries by Handel. Under Elizabeth and James England had a school of music which, after the storms of the civil war, was once more revived by such masters as Pelham Humphrey and his great pupil Purcell. The latter, although cut off in his youth, had left sufficient seed for a truly national growth of English music. But Handel soon concentrated the interest of connoisseurs and people on his own work, and native talent had to abandon the larger sphere of the metropolis for the comparative seclusion of the cathedral. The following is a cbronological list of Handel's English oratorios taken from the catalogue of his works appended to Mr J. Marshall's article in Grove's Dictionary of Music and Musicians, vol. i. p. 657. Esther (1720), Deborah (1733), Athalia(1733), Saul (1738), Israel on Egypt (1738), Messiah (1741), Samson (1741), Joseph (1743), Hercules (1744), Belshazzar (1744), Occastonal (1746), Judas Maccabeeus (1746), Alewander Balas (1747), Joshua (1747), Solomon (1748), Susanna (1748), Theodora (1749), Jephtha (1751), Zriumph of Time and Truth (1757). The sequence of these dates will show that the transition from Italian opera to sacred music was very

gradual, and caused by circumstances rather than by premeditated choice. It would lead us too far to enter here into the genesis of each of thess works, but a few remarks must be added with regard to Handel's semmum opus the Messiah. It was written in twenty-four days and first performed April 18, 1742, at Dublin, where Handel was staying on a visit to the duke of Devonsliire, lord-lieutenant of Ireland. Its first performance in London took place on Marchi 23d of the following year. Its introduction into Handel's native country was due to Philip Emanuel Bach, the son of the great Bach, who conducted it at Hamburg. At Berlin it was for the first time given in April 1786, under the leader- ship of Adam Hiller, who also introduced it a few months later at Leipsic against the advice of all the musicians of Saxony. At the Berlin performance Signora Carrara, the celebrated singer, inserted in the first part an aria by Traetta, in which, according to a contemporary account, "she took much trouble to please the public, and the bravura passages of which she delivered with great success. " Two years before this had taken place the great Handel commemoration at Westminster Abbey, when on the third day of the festival, May 29, 1784, the Messiah was splendidly performed by an orchestra and chorus of 525

performers. In the appreciation of Handel England: thus was far in advance of Germany. The remainder of Handel's life may be told in few words. Owing to the machinations of hisenemies he for a second time became a bankrupt in 1745, but nothing, not even his blindness during the last six years of his life, could daunt his energy. He worked till the last, and attended a performance of his Messiah a week before his death, which took place on April 14, 1759. He was buried in Westminster Abbey. His monument is by Roubillias, the same sculptor who modelled the statuo erected during Handel's lifetime in Vauxhall Gardens.

Handel was a man of character and high intelligence, and his interest was not, like that of too many musicians, con- fined to his own art exclusively. He liked the society of politicians and literary men, and he was also a collector of pictures and articles of vertu. His power of work was enormous, and the list of his works would fill many pages. They belong to all branches

of music, from the simple air to the opera and oratorio. His most important works of the two last-named classes have already been mentioned. But his instrumental compositions, especially his concerti for the organ and his suites de pices for the harpsichord, ought not to be forgotten. Amongst the contrapuntists of his time Handel had but one equal—Bach. But he also was a master of the orchestra, and, what is more, possessed the rare gift of genuine melody, unfortunately too often impeded by the rococo embellishments of his arias. The extraordinary rapidity with which he worked has been already referred to. It is true that when his own ideas failed him he helped himself to those of others without the slightest compunction, The system of wholesale plagiarism carried on by him is perhaps unprecedented in the history of music. He pilfered not only single melodies, but fre- quently entire movements from the works of other masters, with few or no alterations and without a word of acknowledg- ment.

A splendid collection of Handel's MSS., six volumes in all, is in the possession of her Majesty at Buckingham Palace. The Fitz- william Museum at Cambridge also possesses seven volumes, mostly sketches and notes for greater works, in the composer's hand- writing. The German and English Handel Societies (the latter founded in 1843 and dissolved iu 1848) have issued critical cditions of his more important works, Three biographers of Handel deserve mention—an Englishman, Mainwaring, Memoirs of the Life of the , late @. F. Handel (1760), a Frenchman, M. Victor Scheelcher, and a German, Herr Chrysander. (F. H.)

HAND TOOLS. Within the limits of the present article it would be impossible to describe even the majority of the instruments which may come under this designation, including as it does (in its popular if not in its technical sense) the whole of the appliances used by the handicrafts- man in the treatment, by means of his muscular energy, of the natural substances used in the arts and manufactures, —-whether in the preliminary operations of setting-out and measuring his materials, in reducing his work to the required form by cutting tools or otherwise, in gauging it and testing its accuracy, or in duly securing it whilst being thus treated. Omitting therefore the large but by no means unimportant class of measuring and gauging instruments, straight edges, templates, &c., we will confine our attention to

examples of those in the use of which an actual expenditure of force is necessary. According to the structure and other proper- ties of the materials to be treated by them, these act almost without exception either by impact, by pressure, or by cutting, the last being effected sometimes with impact and sometimes with pressure. The principal tools acting purely by impact are noticed under Hammmr (q. v.). Those which depend solely on pressure are for themost part of an auxiliary character only, and their consideration will be deferred till we have glanced at a few of the much more numerous and more important class known as cutting or edge tools.

HAND

It should be observed that the term "cutting" is applied to processes which have but little in common, the great differences of structure in the materials operated upon demanding equally great differences in the modes of effect- ing the desired end, which is in almost all cases the forcible separation of their particles in some regular and definite manner. If we regard, for example, the action of a sharp knife upon a piece of chalk as one of true cutting,—i.e., the separation of its particles by the forcible insertion of a wedge-like blade of superior hardness to itself,—we shall find that in by far the larger proportion of instances this simple action is rendered complicated, either through the substance under treatment being insufficiently compact to afford in itself the necessary resistance, or through its want of homogeneity causing a tendency in it to part more readily in some directions than in others. Thus all kinds of wood and the generality of both vegetable and animal substances, being cellular or fibrous in their structure, offer so much less resistance in a direction parallel to their fibres than in one transverse to them that in the former case many of them may be parted by fissure without any true cutting at all. So also with crystalline materials—as is beautifully exemplified by the diamond, which lends itself to cleavage in certain planes in the most perfect manner, though the steel chisel which is employed for the process is very much inferior in hardness to itself. Metals also are frequently not homogeneous ; indeed they are sometimes said to be fibrous in structure, but it is only to a very limited extent, if at all, that they are so, and their great natural tenacity even then prevents the separation of their particles except by a true cutting process. Lastly; some stones and minerals, such as sandstones, are said to be cut,

though they are formed of material consider- ably harder than the tools which are used upon them, the fact being that their hard particles are not cut at all, but are merely separated from one another when the cementing material which holds them together is compelled to give way.

- Cutting or Edge Tools.—These, the term "eutting" being thus qualified, are mainly of two classes—(i.) eutting tools used with impact, and (ii.) eutting tools used mainly with pressure. These again may be subdivided into tools used (1) for wood and soft materials, (2) for metal, and (8) for stone and hard substances.

i, 1.—Wood-tools cutting by impact comprise all the varieties of axes and adzes, such as the ordinary English pattern of carpenter's

Fia. 1.—Axes.

axe (a, fig. 1), the woodman's felling axe (b), the wedge axe © (which was one of the first American improvements in edge tools

introduced into Europe), and the shipwright's adze (d), which last

h J k L TL TL Fie. 2.—Chisels.

is a particularly rapid and efficient tool in skilful hands. All these when used in the direction of the grain of the wood act by eleaving rather than by cutting, except when the thickness of the chip

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removed is so small that its tranverse strength is inferior to the lateral tenacity of the fibres. So also do chisels and gouges when driven by blows from a hammer or mallet. The ordinary mortice ehisel (¢, fig. 2) and the socket ehisel (/) are specially adapted for being used in this way.

2. In the case of metals their hardness in general almost precludes the possibility of employing upon them any tools eorresponding to theabove. If we exceyit a few special tools such as plumbers' knives, &e., chisels will be found to be almost the sole representatives of this elass. A blacksmith's

chisel (g) held in a hazel withe, and used for hot iron, and some common forms of chisel for chipping it cold are shown in fig. 2, these being known as a chipping chisel (h), a cross-cut (7), a diamond point (x), and a round-nose (J).

3. Tools of this class for stone also consist chiefly of chisels, the mason's chisel (7) varying greatly in width of edge according to the variety of stone and the depth of the cut to be taken. Frequently they are brought quite to a point like the mason's pick, when they cease to be cutting tools from our point of view. The jumper (x), employed for rock drilling, with which the hole is produced by means of successive euts radiating in all directions from its centre, which are delivered with the impact due either to its own weight or to the blows of a hammer on its outer end, is also a form of chisel.

ii. Edge tools operating by pressure.—Of this class the ordinary clasp-knife is perhaps the best known example. A sharp knife serves well for showing the different kinds of treatment by eutting or by fissure to which any particular wood or other moderately soft material is eapable of submitting itself. The "thickness" of the cutting edge, or in other words, the angle which the inter- secting planes which include it form with one another, the degree of smoothness or roughness of edge which best effects the clean division or separation of the fibres, and the possibility or other- wise of producing a smooth surface by "scraping," can all to a great extent be judged of with the aid of a knife. And the sub- ject is by no means an unimportant one. Consideration of the action which takes place at the edge of a cutting-tool, and the strain which this action produces on particular portions of it are frequently of service in enabling us successfully to meet the special cases whieh arise in practice, and may sometimes guide us towards remedying the defective action of the hand-tools in use for ordinary work. America has long taken the lead in originating thoughtful improve- ments of this kind, and the result is apparent in the rapid manner in whieh the use of edge tools and applianees of American patterns is now everywhere extending.

1. In fig. 3 are shown a few of the ordinary English wood-tools, They include the firmer chisel (0) used by carpenters, and a carver's chisel (p) and gouge (q). A wood-engraver's scooper (7) and knife (s) are examples of

special tools, being intended only for eutting hard wood in a direction transverse to the grain, eross-cut blocks of box- wood being alone used for the finer kinds of wood-engravings. The spoke-shave (¢) affords a good example of what has just been said as to the result obtainable by a well-directed effort towards the improvement of an old established hand tool. In the form figured (¢), which is the ordinary one in use in England, the blade or " iron" is rather complicated in shape and is not very easy to sharpen;

uw

eS

Fra. 3.—Chisels, planes, and saws.

each successive sharpening moreover impairs the efficiency of the tool by widening the "mouth," the unequal wear of the wooden sole, which very speedily takes place, having also a similar effect. Thus three essential conditions of a good cutting-tool, viz., constant maintenance of its proper action, durability of the parts exposed to wear, and facility in sharpening are all unfulfilled, On the other hand those manufactured in America fulfil them admirably; iron is substituted for wood as the material for the sole and handle, and the blade, which is merely a piece of flat steel, is firmly held in its place by a set serew, half a turn of whieh at once releases it, Planes are to be met with in great variety, the most usual for ordinary earpentry being the jack plane (uw), the trying plane, and the smoothing plane (v). Of these the first is used for tak- ing off the rough, or for reducing the thickness of a board ; the seeond, which resembles it, except in being of much greater length, for correcting inequalities of the surface; and the third, as its name implies, for the final smoothing. Planing being

chiefly performed in the direction of the grain of the wood, a smooth surface can only be obtained when its fibres are cut iustead of being allowed to separate from one another by cleavage, the ten- dency to which, in soft woods more especially, must therefore be carefully resisted. With this object the planes above mentioned, and many others also, are provided with what is called a "double iron," an inverted blade or "iron"' being securely

attached to the upper side of the cutting iron, with its edge at a short distance only from the cutting edge. This causes the shaving to be continually broken transversely, and so prevents the fibres of which it is com- posed from tearing up those in advance of the cut. The width of the " mouth" or space between the cutting edge and the portion of the plane stock in front of it is also kept as small as possible in planes intended for smoothing, so as to iucreasc to the utmost their breaking action by supporting the as yet undisturbed fibres in advanee of the cutting edge. Wear of the mouth is sometimes pre- vented by letting in a metal plate or by forming the stock entirely of iron or stecl. Planes of great length, which are known as jointers, are used for some purposes, coopers' planes of this kind being sometimes over 6 feet long.

The use of moulding planes (w) is indicated by their name. Each is adapted only for producing one particular pattern of mould- ing. Hollows and rounds resemble them, but have the cross section of their soles simply concave and convex respectively. For planing work which is hollowed or rounded in the direction of its length compass planes are employed, each of which, as ordinarily made, cannot deviate much from its own particular curvature. American ingenuity has here again stepped in, and has got over this objection by making the sole of a springy plate of steel, which can be ad- justed to any curve either convex or concave within very wide limits, so that this one tool takes the place of an entire set of ordi- nary compass planes. Ploughs are somewhat complicated planes which are used for forming grooves of various widths, depths, and distances from the edge of the work.

The "pitch" of a plane is the angle at which the blade or iron is inclined to the sole, and the inclination is greater in hard-wood than in soft-wood planes. Some of the former, indeed, have their irons so nearly erect that their action is what would ordinarily be de- scribed as scraping and not cutting—a difference which appears to be undefinable, and to be due to the structure of the materials which can be so treated, and not, as has been suggested, to any peculiarity in the form of the cutting edge. The action of a razor in shaving seems to favour this view, the sections of hair thus obtained being seen under the microscope to be beautifully cleanly sliced, though the blade is applicd at a great angle to the plane of the eut.

The following may be taken as good examples of saws—the hand saw (a), the rip saw and half-rip saw, which differ from it only in size and size of tooth, and the dovetail saw and tenon saw (y), of which the first three all have sufficient stiffness of blade to resist the force exerted in using them, and the last two are thin and unable todo this without the support of the iron or brass " back," which of course limits the depth to which a cut can be made with them. Pit saws and cross cut saws are the largest representatives of saws used by hand, being employed for large work, such as cut- ting timber in the log, and worked generally by two men. Frame saws of all sizes, from those of 8 feet or 10 feet used by pit sawyers down to the fret saws of but a few inches in length and scarcely thicker or wider than a horse hair, and compass saws, for cutting out curves, must also here be mentioned amongst hand-saws, though technically they are not included in the term.

In fig, 4 are some diagrams of saw teeth,—A being the usual form for all the smaller kinds that are nsed single-handed, which is varied however as to size aud also as to the angle at which the "three square"' file used in bringing the teeth to an edge is applied, while B is the gullet-tooth, for pit saws working with the grain of the wood, and C the ordinary cross-cut tooth, for transverse cuts. It is evident that a saw tooth which is well adapted for producing a clean cut in one of these directions would be ill-adapted for doing so in the other, at least in the case of the softer kinds of timber,—for in sawing with the grain the readiness and the uniformity with

A B Cc D Fic. 4.—Varieties of saw teeth.

which the short section of fibres sliced off by cach tooth parts from the fibres by its side (owing to their slight lateral cohesion already alluded to) assists in the operation, aud a fairly clean cut results, But in cross-cutting special provision is required for cleanly divid- Ing the fibres at each side of the cut, after which the removal of the intervening fragments can be accomplished readily by cleavage rather than by cutting. The rationale of the gullet-tooth (B) is thus clear, the keen ehisel-like edges of the teeth being well adapted for slieing the fibres of the wood transversely, and for this it leaves little to be desired. The eross-cut tooth ©, consisting as it does of a series of lancet-like points acting alternately at each side of the

cut, divides the fibres, but has no proper provision for their after removal, and the hand saw tooth (A) is a sort of compromise between the two (at least if we neglect the rounded portion of the gullet-tooth, which does not affect its edge), so that it can be used either with the grain or across it, though not with the best possible results. The cross-cut tooth (D), on the other hand, provides both for the clean separation of the fibres and the removal of their frag- ments.

The "set" of a saw is the slightly increased width given to its toothed edge by alternately bending the teeth towards the opposite sides of the blade; the extent to which thisis done, or the width of the set (as it is called), therefore determines the amount of material which a saw wastes in forming its eut, the more perfect its action the smaller being the amount of set required to make it work freely, and the less the power expended in working it.

Some boring tools for wood are shown in fig. 5. The brad- awl (E) is adapted only for soft wood; the gimlet, either in its plain or its twisted form (F), has little to be said in its favour ; and the shell-auger (G) requires a expenditure of force altogether dis- proportionate to the results produced by it. The screw-auger 1s an improvement upon it, although this, as generally made, still leaves a good deal to be desired as regards consumption of power. But the wood-worker's main stand-by for boring is the stock or brace (H) and set of bits, Those ordinarily supplied for

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Fic. 5.—Boring tools.

boring across the grain consists mainly of centre-bits (I) for the larger and quill bits for the smaller holes,—neither of which are thoroughly efficient tools,—also nose-bits (J), which resemble shell- augers and share their defects, for boring with the grain. The English wood-boring tools indeed offer a considerable field for im- provement. Imported substitutes for the above are already to be met with, amongst others being the twisted centre-

bits, of which the stems resemble the twist drill referred to below, and the ex- panding centre-bits, both of which appear to be an advance in the right direction, though they have not as yet come largely into use. 2. Cutting tools for metal analogous to the foregoing are but few as regards surface work. Their chief characteristic—at least in the case of those used for the harder metals—is the greatly increased thickness of their edges. Files of various cross sections, lengths, and degrees of fineness of tooth, and scrapers (which are merely thick knife- edges, made not unfrequently from worn-out files by sharpening them at the extremity), constitute almost the only edge tools at the disposal of the fitter or mechanic for finishing work that he has roughly surfaced with his chipping chisels. For boring he has drills of various sizes, too often of the antiquated pattern (K), whieh in boring deep holes cannot be kept straight, though the very superior twist drill (L) is now often to be met with. Countersinks, either of the flat (M), rose (N), or snail-horn pattern (O), are generally included with carpenters' sets of bits, for enlarging holes in metal work to receive the heads of screws. They are used with the wooden brace'figured above. The smith's brace resembles it, but is all made of iron, and a heavy pressure is applied to its upper end by means of ascrew.

tap, which bears on its surface the counterpart of the required thread, so that by successive cuts it produces a helical groove of the correct form and depth. Such a tap (S) is represented in the en- graving, together with a diagram of its cross section, showing the three cutting edges by which the screw thread is formed. Three such taps constitute a set for any one size of screw, the first being known asa taper, the second as an intermediate, and the third

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Fig. 6. asa plug-tap, this last being almost parallel throughout. By a reverse process with dies fixed in a stock (T, fig. 6) external screws are cut, the

particular form shown being the improved pattern of Sir J. Whitworth, who has done much to correct the faults of the earlier screwing tools. Screw plates, however, some of which can- not be regarded as cutting tools at all, are still much used for small and fine screw threads.

Cutting pliers and cutting nippers (U) have a pair of knife edges so arranged as to work exactly opposite to one another,—the handles, on being tightly grasped, affording sufficient leverage for these edges to be forced to a short distance into the two opposite sides of a nail or wire, which, if of small diameter or of soft metal, can thus be cut asunder, Tube-cytters are an ingenious device which the extensive use of wrought-iron tubing for gasfitting has rendered necessary. They effect their object by cutting a groove round the tube to a sufficient depth to enable it to be fractured at the desired

oint.

. 3. Stone and hard materials cannot in general be treated by cutting tools simply with hand pressure, though some of the softer kinds of stone are carved with chisels used almost or altogether without im- pact, and are sawn with toothed saws resembling the cross-cut saws used for wood. Glaziers' diamonds were till recently the only tools for producing the peculiar 'cut' requisite for starting the clean fracture by which sheet glass is divided, theirs, however, being a case of fissure rather than of true cutting. But of late years steel glass cutters have been introduced which act —as long as the sharp- ness of their edges js maintained—in a manner precisely similar. In one form of these glass cutters (V) a cast-iron handle carries at its extremity a small freely revolving wheel of carefully hardened steel, round the cireumference of which is the cutting edge, which ean be sharpened on an oilstone when necessary. The so-called cut is produced by simply running this with a light pressure over the sur- face of the glass. Diamonds, however, are used for cutting glass, stone, &c., by actually detaching their particles ; writing diamonds and diamond drills have this kind of action.

Il. Hand-tools without cutting action.—With the exception of hammers and a few tools which are dependent on impact,—such as cleaving wedges amongst wood tools, and embossing and similar punches amongst those for

metal,—tools of this class play in general only a subsidiary part to some cutting or other process.

Amongst those used with pressure which cannot be considered as auxiliary may be instanced—draw-plates, with which wire is made by drawing it through holes of conical form and of successively smaller diameters till the required size or "'gauge" is reached; and burnishers, which reproduce on metals softer than themselves their own highly polished surfaces. Both of these act by inducing a flow of the metal under treatment for which, when it is not effected by impact, great force is required in proportion to the extent of the action. Metal shears and cutting punches of all kinds have been omitted till now, as their mode of operating cannot be regarded as true cutting from our point of view. It may be more correctly described as tearing, more or less completely localized according to circumstances. The ordinary sheet-metal shears (W) merely resemble very powerful scissors, and, their action being quite local, they serve well for dividing the plates or other thin shcets for which alone they are suitable. Block shears (X) act with additional leverage, and can consequently be used for rather thicker metal, the upper bow being replaced by a long straight handle, and the lower one by a stake which can be firmly fixed in a block of wood or otherwise. With these the tearing action begins to be apparent, though its imperfection is of no great importance with the thick- nesses of metal capable of being treated by any hand shears (for some tools of this class, which by hydraulic or other means accumulate the power of one man toa sufficient extent to operate on bars or

plates of comparatively great substance, are machines rather than hand tools, and in their case the mere slowness of the operation produces better results than would otherwise be obtained). The same inay be said of the various punches used in combination with dies or bolsters, as in the punching bear (Z), of which the action exactly resembles that of shears, the punch taking the place of the upper blade, and the bolster that of the lower one.

Of subsidiary tools (figs. 7) the vice is an absolute essential for the generality of metal workers. The ordinary tail-vice (a) used by mechanics

has not yet been largely superseded, though many ingenious arrangements have been devised for remedying its main defect, viz., the want of parallelism in the movement of the jaws. The English parallel vice (8) has not this objection, but its construction is not good mechanically, and it is but little used except for small work. In some patterns of vice, jaws are provided with a horizontal adjustment so as to grip tapering or other irregu- lar forms, and in others the whole body of the vice can be swivelled

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1?) 4 'A Y i Fig. 7.

either vertically or horizontally. Hand-viees are used in the manner implied by their name, without being attached to a bench like the foyegoing. An ingenious form of hand-vice (y) is shown in fig. 7, The screw wrench (8), which is used for turning nuts, &., of various sizes has of late been deservedly the subject of various improvements in which weight is sought to be saved without sacrifice of strength and the shifting spanner, of which the duty is the same, has led to the exercise of much ingenuity without any perfectly satisfactory solution of the problem how it may best be constructed. The merit and simplicity of the ordinary screw- driver, on the other hand, are well known.

Instances of tools which afford a powerful grip by simple means are the blacksmith's tongs (e), the viceechop tan (¢), the pliers (n), and the pincers (3). A very powerful modification of the last-mentioned tool has lately been introduced into use under the name of the nail-puller (1). With this ingenious instrument very largely increased leverage is obtained, and the pull is given in a direction much more advantageous to the attainment of the de- sired object, Tend (C. P, B. 8.)

HANG-CHOW-FOO, a city of China, in the province of Che-Keang, about 2 miles north-west of the Tseen-tang- Keang, at the southern terminus of the Imperial Canal, by which it communicates with Peking. It lies about 100 miles south-west of Shanghai, in 30° 20' 20" N. lat. and 120° 7' 27" E. long. Towards the west is the Si-hu or " Western Lake," a beautiful sheet of water, with its banks and islands studded with villas, monuments, and gardens, and its surface traversed by gaily-painted pleasure boats. To the

Chinese it is a very paradise. Exclusive of extensive and flourishing suburbs, the city has a circuit of 12 miles; its streets are well-paved and clean ; and it possesses a large number of arches, public monuments, temples, hospitals, and colleges. It has long ranked as one of the great centres of Chinese commerce and Chinese

learning. In 1869 the silk manufactures alone were said

to give employment to 60,000 persons within its walls, and -+ has aul extensive production of gold and silver work and tinsel paper. On one of the islands in the lake is the great Wan-Jan-ko or pavilion of literary assemblies, and it is said that at the examinations for the second degree twice every three years from 10,000 to 15,000 candidates come together. In the north-east corner of the city is the Nestorian church which was noted by Marco Polo, the facade being "elaborately carved and the gates covered with elegantly wrought iron." There isa Romau Catholic mission in Hang-chow, and the Church Missionary Society, the American Presbyterians, and the Baptists have likewise stations. The local dialect differs from the Mandarin mainly in pronunciation. The population, which is remark- able for gaiety of clothing, was formerly reckoned at 2,000,000, but is now variously estimated at 300,000, 400,000, or 800,000.

Hang-chow-foo is the Kinsai of Marco Polo, who describes it as the finest and noblest city in the world, and speaks enthusiastically of the number and splendour of its mansions and the wealth and luxuriance of its inhabitants. According to his authority it had a cireuit of 100 miles, and no fewer than 12,000 bridges aud 3000 baths. The name Kinsai, which appears in Wassaf as Khanzai, in Ibn Batuta as Khansa, in Ordericus as Camsay, and elsewhiere as Campsay and Cassay, is really a corruption of the Chinese King-sc, capital, the same word which is still applied to Peking. From the 10th to the 13th century (960-1272) the city, whose rcal name was then Ling-nan, was the capital of Southern China and the scat of the Sung dynasty, which was dethroned by the Mongolians shortly be- fore Marco Polo's visit. Up to 1861, when it was laid inruius by the Taipings, Hangchow continued to maintain its position as onc of the most flourishing cities in the empire, and though for a time it lay comparatively desolate, it

has considerably recovered within recent years. It is the seat of the governor of Che-Keang ; but the governor-general or viceroy for Che-Keang and Fuh-Keen is now Tocated at Fuh-chow. Sée Colonel Yule's cdition of Marco Polo, vol. ii, for a plan of the city and further details.

HANKA, Wencestavs or WAKLAW (1791-1861), a Bohemian philologist, was born at Horeniowes, a hamlet of eastern Bohemia, on June 10,1791. He attended the village school in winter only, being occupied during the summer on his father's farm. While still young he acquired a knowledge of Polish and Servian from some soldiers Dilleted in the neighbourhood, and in 1807 he was sent to school at Kiniggriitz, to escape the conscription. Pro- ceeding then to Prague, he engaged in the study of philosophy, and founded a society for the cultivation of the Ozech language. At Vienna, where he afterwards studied law, he established a Czech periodical ; and in 1813 he made the acquaintance of Dobrowsky, the emi- nent philologist. On September 16, 1817, Hanka made the discovery of some ancient Bohemian manuscript poems of the 12th and 14th century in the church-tower of the village of Kralodwor, or Kéniginhof. These were published in 1818, under the title Kralodworsky Rukopis, with a German translation by Swoboda. Great doubt, however, was felt as to their genuineness ; and Dobrowsky, by pro- nouncing The Judgment of Libussa, another manuscript found by Hanka, an " obvious fraud," confirmed the sus- picion. But some years afterwards Dobrowsky saw fit to modify his decision; and in 1840, after a, careful examin- ation of the manuscripts by two eminent antiquaries, Hanka was ultimately vindicated. A translation into English, The Manuscript of the Queen's Court, was made by Wratis- law in 1852. The originals were presented by the dis- coverer to the Bohemian Museum at Prague, of which he was appointed librarian in 1818, Tn 1848 Hanka took partin the Slavonic congress and other peaceful national demonstrations, being ths founder of the political society Slovanska Lipa. He was elected to the imperial diet at Vienna, but declined to take his seat. In the winter of 1848 he became lecturer and in 1849 professor of Slavonic

languages in the university of Prague, where he died, January 12, 1861 .

His chicf works and editions are the following:—Hankowy Pjsne (1818), a volume of poems; Starobyla Skladanie (1817-1823), in 5 vols.,—a collection of old Bohemian poeins, chiefly from unpublished manuscripts ; 4 Short History of the Slavonie Pcoples (1818); A Bohemian Grammar (1822) and A Polish Grammar (1839), —these grammars were composed ona plan suggested by Dobrowsky; Jgor (1821), an ancient Russian epic, with a translation into Bohemian ; a part of the Gospels from the Rheims manuscript in the Glagolitic character (1846) ; the old Bohemian Chronicles of Dalimil (1848) and Procop Lupac (1848); Evangelium Ostromis (1853).

HANKOW (that is, the "" Mouth of the Han"), the great commercial centre of the middle portion of the Chinese empire, and since 1858 one of the principal places opened to foreign trade. It is situated on the northern side of the Yang-tse-kiang at its junction with the Han river, about 450 miles west of Shanghai in 30° 32' 51" N. lat. and 114° 19' 55" E. long., at an absolute height of 150 feet. By the Chinese it is not considered a separate city, but as a suburb of the now decadent city of Hanyang; and it may almost be said to stand in a similar relation to Wu-chang the capital of the province of Hupeh, which lies immediately opposite on the southern bank of the Yang-tse-kiang. Hankow extends for about a mile along the main river and about two and a half along the Han, It is protected by a wall 18 feet high, which was erected in 1863 at an expense of £250,000, and las a circuit of about 4 miles. In 1861 the port was declared open by James Hope and Sir Harry S. Parkes, C.B., and the site of a British settlement was selected in the east end of the town, with a river frontage of 2400 feet, and a depth of from 1200 to 1500. The building area, divided into 108 lots, was quickly bought up, and houses after the Shanghai style were erected. eases were granted to foreigners as well as to Britislr subjects. A municipal council was formed, and by 1863 a great enbankment and a road- way were completed along the river, which has the awkward fashion of rising as much as 50 feet or more above its ordinary levels, and not unfrequently, as in 1849 and 1866, lays a large part of the town under water. On the former occasion little. was left uncovered but the roofs of the houses. The success of the foreign settlement has not been so great as was anticipated: even in 1866 the number of foreign residents was 125 instead of 150 as in 1863. Chinese merchants have rapidly got even the foreign trade into their hands:

in 1873 they began to run steamers on the river; in 1875 they purchased the property of the Shanghai Steam Navigation Company ; and in 1876 they'had 57 steamers flying the national flag. Besides tea, which is the staple, the exports of Hankow are leat tobacco, of which 6,700,000 ib was sent to Europe in 1876, raw silk mainly obtained from Szechuen, rlubarb, gall-nuts, and musk. Of this last the quantity was as much as 2937 tb at £20 sterling per tb. Tea was first sent direct to London in 1864-65 ; in 1876 this market received from Hankow no less than 34,540,000 Ib out of a total] ex-port of 86,402,271 tb, The Russian merchants, who are fixing their brick-tea factories in the town, obtained 12,844,476 Ib in the same year. They send their goods by water to Tientsin, and thence to Kalgan partly by land and partly by water. A public assay office was cstablished at Hankow in 1864. The Roman Catholics, the London Missionary Society, and the Wesleyans have all missions in the town; and there are two missionary hospitals. Before the Taiping wars, the full brunt of which fell on this part of the country, the sister cities of Hankow, Hanyang, and Wu-chang-fu had a population, it is said, of over 5,000,000, At present Hankow has from 600,000 to 800,000 (Sossnoffsky says only 500,0 00), and the other two from 400,000 to 700,000.

HANLEY, a market-town and municipal borough of Staffordshire, England, is situated in the centre of the pottery district, 2 miles E.N.E. of Stoke-upon-Trent, and 18 miles N. of Stafford. It is indebted for its rise and

prosperity to its pottery manufactures, which include porcelain, encaustic tiles, and earthenware, and give em- ployment to the greater part of the population, women and children being employed almost as largely as men. In the neighbourhood coal and iron are obtained. The streets, which are paved with brick, are wide and regular, and in the suburbs there are a number of fine villas. The prin- cipal public buildings are the six churches (St John's being a handsome structure with a tower 100 feet in height) and the dissenting chapels, the town-hall, the mechanics' insti- tute, the museum, the theatre, and the national and board schools. There is also a flourishing Government school of art. Hanley, which includes the former township of Shel- ton, received a municipal constitution in 1857. It is the

central and most important of the group of towns con- stituting the parliamentary borough of Stoke-upon-Trent. The population of Hanley in 1861 was 31,953, and in

1871 39,976.

HANNAY, James (1827-1873), critic, novelist, and publicist, was born at Dumfries in 1827, and came of the Hannays of Sorbie, an ancient Galloway family. He entered the navy in 1840 and served till 1845, when he adopted literature as his profession. In 1857 Hannay contested the Dumfries burghs in the Conservative interest, but without success, He edited the Hdinburgh Courant from 1860 till 1864, when he removed to London, In July 1868 he was appointed British consul at Barcelona, a post which he occupied till his death on the 8th of January 1873. While at Barcelona he contributed to English periodicals ; and his letters to the Pall Mall Gazette "¥rom an English- man in Spain" were highly appreciated. Hannay's best books are Singleton Fontenoy, Satire and Satirists, Eustace Conyers, and Hssays from the Quarterly Review. Satire not only shows loving appreciation of the great satirists of | the past, but is itself instinct with wit and fine satiric power. The book sparkles with epigrams and apposite classical allusions, and contains admirable critical estimates of Horace (Hannay's favourite author), Juvenal, Erasmus, Sir David Lindsay, George Buchanan, Boileau, Butler, Dryden, Swift, Pope, Churchill, Burns, Byron, and Moore. The Hissays are full of learning and_ historical knowledge, and are lit up with sunny humour and brilliant flashes of wit and poetry. Hannay passionately admired three things—learning, literary genius, and good blood. He showed great interest in the history and fortunes of aris- tocratic families; and his wonderful skill in matters of heraldry and genealogy is recognized by highly competent authorities (see Masson's Life of Milton, vol. i. p. 8). He was a ripe Latin scholar; and his style is marked by grace, vivacity, and poetical feeling. He was intimate with his leading literary contemporaries, and wrote the valuable notes to Thackeray's Hnglish Humorists.

In addition to contributions to Punch and the leading reviews, Hannay issued the following works :—Biscuits and Grog, Claret Cup, aud Hearts are Trumps (1848) ; King Dobbs (1849) ; Sketches im Ultramarine; Singleton Fontenoy (1850); an edition of the Poems of Edgar Allan Poe, to

which he prefixed an exquisite essay on the poet's life and genius (1852); Sands and Shells and Satire and Satirists (1854) ; Eustace Conyers (1855) ; Essays from the Quarterly Review (1861); Characters and Criticisms, consisting mainly of his contributions to the Edinburgh Courant (1865) ; A

Course of English Literature (1866); and a family history eutitled Three Hundred Years of a Norman House (1867).

_HANNIBAL. Hannibal was a very common Cartha- ginian name. Its final syllable bal occurs repeatedly, as a suffix, in Punic names, and is in fact taken from the chief Pheenician deity, Baal. The entire name denotes, according to a probable interpretation, "the favour of Baal."

The famous Hannibal, the hero of the Second Punic War, was the son of Hamilcar Barca, and was born in 247 B.C.

He and his two brothers, Hasdrubal and Mago, were called by the father "the lion's brood." At the age of nine he |

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begged his father, who was leaving Carthage for Spain, to take him with him. The request was granted, but not before he had sworn at that father's bidding on the altar of sacrifice eternal enmity to Rome. That vow determined his life's future. In Spain he was bred up in camps under his father's eye. He was present at the battle in which his father fell in 228 B.c., being then in his nineteenth year. Hamilcar'sson-in-law, Hasdrubal, succeeded to the command. Eight years afterwards, in 221 B.c., he was struck down by an Iberian assassin. Meantime the young Hannibal had proved himself thoroughly able both 'to obey and to com- mand." It was a matter of course that the soldiers witit one voice at once hailed him as their general.

His first object was to complete the work of his father and his father's successor. Spain, he felt, must be more thoroughly overawed, if it was to be a base of operations against Rome. He pushed into the heart of the country, crossed the 'agus, and crushed the resistance of the tribes of the interior. Two campaigns sufficed for the conquest of all Spain to the south of the

Ebro, except Saguntum, a town considerably south of the Ebro and some way to the north of the modern Valencia. It was a Greek colony from Zacynthus (Zante), and had grown into a rich and prosperous place, but, what was now far more important, it was in friendly relations with Rome. To attack it therefore would be like throwing down the gauntlet to the Roman senate and people. But Hannibal was able to tell the home Government at Carthage that the Saguntines were molesting Carthaginian subjects in the neighbourhood. Without awaiting an answer, he began the siege. Roman ambassadors at the solicitation of envoys from Saguntum landed on the coast, but were told by Hannibal that he could not see them. They went on to Carthage, but their remonstrances, though the subject of along debate, were in vain. Hight montlis passed away, and Saguntum, after a gallant defence, was forced to surrender, Hannibal got a rich booty for his army, and went into winter quarters at New Carthage (Cartagena), Again a Roman embassy went to Carthage and insisted ou his being given up. The demand was refused. By the close of the year 219 Bo. the Second Punic War was in fact begun.

Hannibal's resolution was now taken. He prepared at once to invade Italy. He had a numerous and efficient army and a well-filled exchequer. All who shrank from the expedition he dismissed to their homes. In the spring of 218 B.c. he began his great march from New Carthage with an army of 90,000 foot, 12,000 horse, and 37 elephants. The Ebro was easily crossed. In the country beyond he had some fighting with the native tribes, and there he left Hanno, with a force of 10,000 foot and 1000 horse to secure the passes between Spain and Gaul. Again he sent back all in whom he saw signs of hesitation. With a con- siderably diminished army he passed the Pyrenees at Bellegarde and encamped at Iliberris (Elne). Some Gallic tribes, alarmed at his advance, had assembled in the neigh- bourhood, but he soon conciliated their chiefs and persuaded them tliat he meant them no mischief. So he continued his march without molestation to the Rhone.

Meanwhile the Romans had done little or nothing to check their enemy. At last the consul, Publius Cornelius Scipio, arrived at Massilia (Marseilles), and was surprised to find that Hannibal was about to cross the Rhone. But he was too late to oppose the passage, and Hannibal crossed the river probably at some point near the village of Roquemaure. He then followed

its course, marching up its left bank to its junction with the Isére at Valence, and entered what was known as the "Island of the Allobroges." It was from thence that he began his famous passage of the Alps.

The narrative of Polybius, though it raises some difficuls

questions, has conveyed to most modern students and scholars the impression that Hannibal crossed by the pass of the Little St Bernard. If so, he must have cntered Italy by the valley of Aosta. The subject has liad a literature of its own devoted to it. The result is that the Little St Bernard Pass may be almost said to have made good its claims to the honour of Hannibal's memorable march. It was familiar to the ancients, and more than once Gauls had passed through it into the plains of Italy. Such high authorities as Arnold, Niebuhr, and Mommsen regard the question as settled in its favour.

Fifteen days in all were occupicd in the passage. If the view above indicated is correct, Hannibal at first made his way over Mont du Chat through the Chevelu Pass, then continued his march up the valley of the Istre, and mounted the St Bernard. He must have descended the mountain by the valley of the Doria. Part of his route, that by which he climbed to the summit, was a narrow defile, and there he was threatened by the mountain tribes which appeared on the heights. At the "white rock," a roche blanche, as it is still called, he halted his infantry, while the cavalry and beasts of burden were making their way during the night to the top of the pass. Next day, the ninth day, he stood with his whole army on the highest point and spoke, it is said, some checring words to his half-frozen Africans and Spaniards. Tle descent proved trying and dangerous. From the mountain tribes he had little to fear; it was the mountain slope, covered with recent snow, which caused delay and anxiety. The Italian side of the Alps is considerably steeper than the French side, and a road had to be constructed for the passage of the elephants and horses. This was a work of three days. In three more days they arrived in the valley of Aosta, and were welcomed by the Salassi, a friendly tribe of the Insubrian Gauls. The October of the

year 218 B.c. saw the passage of the Alps accomplished and Hannibal with his army encamped in northern Italy.

Thus far he had been successful, but at a tremendous cost. His army was slirunk to a force of 20,000 infantry und 6000 cavalry,—the former being composed of Libyans and Spaniards in about the proportion of three to two, and the latter being chiefly Numidians, and admirably efficient.

It was now five months since he had set out from New Carthage. His men of course sorely needed rest, and this they had for a brief space amid the friendly tribes of Cisalpine Gaul. One tribe indeed, the Taurini, was hostile, but he soon captured their chief city, thus overawing the remaining tribes in the upper valley of the Po. It was now high time for the Romans to exert themselves. Scipio after quitting Marseilles, whence he had sent on his army into Spain, had hurried back to Italy, and on reaching Placentia took command of the Roman army quartered there. He was indeed numerically weaker than Hannibal, and was deficient in cavalry. Still he advanced up the Po to meet him, and on the Ticino, somewhere, it would seem, near Vercelli, was fought the first engagement of the Second Punic War. It was a cavalry action, and the inferiority of the Romans in this arm was decisively proved. They were driven back with heavy loss, and Scipio himself was severely wounded, being rescued, it is said, by his son, a lad of seventeen, who subsequently became as famous as Hannibal himself, and had the good fortune to be his con- queror. He has gone down to posterity as Scipio Africanus. The defeated general fell back to the walls of Placentia. The Trebia, a southern tributary of the Po, was between him and the enemy, and he was soon joined by the other consul, Sempronius. Their united armies numbered not less than 40,000 men. Sempronius was for instantly giving battle ; Scipio was still disabled by his wound.

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Sempronius had his way, and on a bitterly cold December day the Romans plunged into the swollen waters of the Trebia in the face of a sleet storm and a cutting wind. They fought well, but when taken in flank by Hannibal's brother Mago, who was lying in ambush amid brambles and bushes in a watercourse, they broke and fled in utter rout.

This decisive victory gave nearly all northern Italy to Hannibal, He let his troops rest during the winter, and added to them a number of Gauls, Early in the spring of 217 n.c. he decided to cross the Apennines and to pene- trate into the heart of Italy. The route which he took brought him into the marshy lowlands of the Arno near Lucea and Pisa, and here he and his men had to wade through water for four days. Many of them perished miserably, and Hannibal himself lost an eye from oph- thalmia. At last le encamped at Fiesole on high ground. The two consuls Flaminius and Servilius were, with their armies, respectively at Arezzo and Rimini, Flaminius was an impetuous man, and eager to win the glory of settling the war once for all. Hannibal, quitting the valley of the upper Arno, marched past him towards Perugia, ravaging the country and so provoking the Roman general to pursue him. The road from Cortona to Perugia skirts the northern shore of Lake Trasimene, and into this road, which is in fact a mountain defile, the Roman column un- warily entered. They were caught ina trap. Hannibal

had posted his light troops on the hills on either side, while

he himself blocked the outlet near Passignano with the best of his infantry. As soon as the Romans were in the pass they were assailed on all sides, and the battle soon became a mere massacre. The Roman army was in fact destroyed, and Flaminius was among the slain. We might suppose that Hannibal would have now done well to have marched straight on Rome, and this the Romans expected. But he may well have thought that it would be better to wait the chance of insurrection among the Italian com- munities. So he marched through Umbria, and again crossed the Apennines into Picenum. He then marched southwards along the coast into Apulia and encamped at Arpi. Meanwhile the Romans had made the famous Fabius Maximus their dictator. After levying an army of four legions, Fabius marched in pursuit of the enemy having first effected a junction with the army under Servilius at Rimini.

From the first Fabius had decided on the policy which earned for him the name of the Cunctator, the Delayer. He dogged his enemy's steps, but would never risk an engage- ment. The richest districts of southern Italy were laid waste under his very eyes. But he could not be provoked into any rash movement. Once indeed it seemed as if Hannibal was himself entrapped. He

had been ravaging Campania, and was on the point of retreating into Samnium, when Fabius posted a force at the head of the pass which afforded the only available means for his retreat. Hannibal is said to have driven a multitude of oxen with lighted faggots on their horns up the hills overhanging the road, so as to give the impression that he and his army were retreat- ing over the heights. Fabius's detachinent quitted its position to check the supposed movement, and thus gave Hannibal an opportunity of escaping through the pass. The tactics of Fabins disgusted his men, and when he had to Jeave them for a time, he found on his return that his master of the horse, Minucius, on the strength of a small success won in his absence, was eager to bring on a general engagement. Fabius gave him a part of the army, with which Minucius ventured on an attack. He was on the brink of destruction when he was rescued by the dictator's timely interposition. After this Hannibal went into winter quarters at Geronium in the north of Apulia.

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Tn the spring of the next year, 216 3.c., he moved south and pounced on Cann, where Roman supplies were stored up in great abundance. The town is about 6 miles from the mouth of the Aufidus and about 8 from Canosa. The Romans were now again eager to strike a decisive blow. So a vast army was raised by the consuls of the year, Aimilius Paulus aud Terentius Varro, numbering 80,000 infantry and 6000 cavalry. Hannibal's army was probably far inferior numerically. The consuls on arriving in Apulia made Canusium (Canosa) their headquarters. For some few days the armies faced each other on the banks of the Aufidus. There were some preliminary manceuvres and skirmishes, till at last Varro, when it came to his turn to command, determined to fight. Both armies crossed the river, and Hannibal's men were drawn up within a loop which it forms near Canna. On either flank he stationed a strong body of his veteran infantry. His other infantry, ranged in the centre in a crescent form, was soon driven in by the Roman legions, which had advanced to the attack in very decp formation. But meanwhile Hannibal's cavalry had put the Roman horse to rout, and had fallen on their rear. The Roman columns were now attacked also on either flank by the Carthaginian infantry. Pressed into a dense mass they were cut down without the possibility of resistance. The carnage is said to

have been prolonged for eight hours. The Roman army was all but utterly destroyed. The consul A‘milius Paulus, nearly all the officers, and eighty senators, perished in the slaughter. Varro indeed escaped with a few horsemen to Venusia. The remainder were slain or made prisoners. It was at a comparatively small cost to himself that Hannibal won this great victory.

It might well be thought that such a victory would prove decisive, and that it must have been had Hannibal instantly pushed on to Rome. But he had probably good reasons for not doing so. He was, it must be remembered, as much as 200 miles from Rome; he would have had to march through still hostile populations, and yby the time he would have arrived, he must have known that the first

panic would have abated, and that the notion of carrying

the city by a coup de main was simply preposterous. What he counted ou was the dissolution of the Italian confederacy, and a widespread revolt throughout Italy. Nor was he altogether deceived. The disaster of Canne shook the loyalty of the Italian peoples. Rome was deserted by most of Apulia and Samnium, and almost wholly by the Lucanians and Bruttians. She retained indeed some strong fortresses, as Cales, Fregellx, Casinum, Beneventum, Venusia, and these enabled her armies to maintain their ground, But Capua, in Campania, the richest and most powerful city in Italy after Rome itself, was lost to her. Thither Hannibal made his way from Cannz, and there he went into winter quarters, which were perhaps too com- fortable and luxurious. But the story that his men became utterly demoralized is absurd. They proved in the subse- quent years of the war that they could move rapidly and fight bravely. We may indeed well suppose that by this time many of his veteran Spaniards and Africans had been replaced by native Italian soldiers. It is, however, clear that he still had a fine army. It is true indeed that after Cannz his star seems rather to decline, but the explanation of this is that the Romans again reverted to the steady cautious tactics which they had learnt under Fabius. They too were for the most part well officercd. The ablest of their generals was Marcellus. Yet even he never beat his antagonist in anything like a pitched battle. The Romans after Cann made prodigious efforts, They sent three armies into the field, to watch and to check the enemy’s movements. They kept themselves in

strongly entrenched camps near fortresses which Hannibal had not the means

of taking. Some indeed he did capture, as Nuceria, Acerre, and Casilinum in Campania. At Cumz, Neapolis, and Nola he was foiled. The two years after Canna, 215 and 214 B.c., passed without much being achieved on either side. Hannibal was vaguely hoping for reinforcements from Carthage, and for the aid of Philip, king of Macedon.

Next year, 213 Bc, he gained a considerable success. Tarentum surrendered, and so did Metapontum and Thurii. At Tarentum indeed the Roman garrison still clung to the citadel, and Hannibal could not dislodgeit. From Carthage he had received a reinforcement of some elephants and of 4000 Numidian cavalry, but this did not enable him to resume the offensive with much effect. Meanwhile Capua, besieged by two consular armies, seemed doomed to fall again into Roman hands. One of Hannibal's subalterns, Hanno, was defeated in the attempt to revictual the place. Hannibal himself hurried to its aid, but he could not bring the Romans to a battle, though he did temporarily raise the siege. The year 212 B.c. was one of mingled success and disaster for Rome. Syracuse that year had to surrender to Marcellus, and Carthage seemed to have quite lost Sicily. Here was an important gain for Rome. But in Spain the two brother Scipios had been cut off by Hasdrubal, who could now cross into Gaul and advance on Italy. And in Italy there had been some serious reverses, It would appear that there were actually six Roman armies in the field against Hannibal. One of thes? under Fulvius he destroyed in Apulia; another, made up of enfranchised slaves under Gracchus—a proof this of the extremity to which Rome was reduced—he put to rout, Gracchus him- self perishing in an ambuscade.

By the spring of 211 B.c, the Romans were besieging Capua with three armies. It was clear that the city must fall, unless Hannibal could come to its rescue, He made the attempt indeed, but he could not break the- hostile lines, so strongly were they entrenched. Then he conceived the idea of drawing them off by menacing Rome itself. Now for the first time he marched through Latium and made it taste all the horrors of war. At last he encamped 3 miles from Rome on the Anio, But the Romans did not lose their presence of mind, or even relinquish the siege of Capua ; they simply

recalled Fulvius with one of the armies. There were two legions within the city, and Hannibal pro- bably never meditated a serious assault. He ravaged the country up to the walls, but he did nothing more. Through Samnium he again marched into Apulia and thence into Bruttium, where he unsuccessfully attacked Rhegium and the citadel of Tarentum. Capua meanwhile was forced to surrender. This greatly discouraged Hannibal's Ttalian allies. Marcellus too had come back from Sicily after his capture of Syracuse. Altogether the year 211 B.c. was a very unpromising one for Hannibal. Next year, 210 B.0,, however, he partly recovered lost ground by completcly defeating the Roman pretor Cneius Fulvius at Herdonea, the modern Ordona, in Apulia. But he could not follow up this success, and his evident weakness led to the speedy return of Samnium and Lucania to the Roman confederacy. The following year saw Tarentum slip from his grasp. But he soon had his revenge. Next year the two consuls, Crispinus and Marcellus, were both cut off and slain by the Numidian cavalry in the neighbourhood of Venusia. Another disaster soon followed. A Roman army was besieging Locri in the extreme south. It was routed and indeed destroyed by Hannibal. Thus at the close of the year 208 B.c. the struggle was clearly by no means decided.

Rome had been making immense efforts. We hear of her having twenty-three legions under arms, and possibly the total number of her armies may have reached 200,000 men. 'The patriotic spirit of her citizens was still at the highest. But her finances were in a deplorable plight, and

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corn had risen to an almost famine price. The country round must have been woefully wasted, and multitudes reduced to beggary. One thing indeed the Romans had had to console them during these trying years. The Latin communities in Etruria and Latium had stood by them with wonderful fidelity. This had been their salvation. But now in the years 209 and 208 B.c. came signs of discontent and wavering. Of the Latin colonies several declared that they could no longer furnish contingents or contributions. There were rumours too of a disloyal move- ment in Etruria. But, worst of all, there came news in the autumn of 208 3.c. that Hasdrubal had crossed the Pyrenees. By next summer he would have passed the Alps. Should the

two brothers unite their forces, Rome's fate, it could hardly be doubted, would be sealed. She was now in far greater jeopardy than she was even after the disastrous day of Cannz.

The year 207 was thus a very anxious one. Claudius Nero and Marcus Livius were the consuls. The first was to watch Hannibal in Apulia, the other was to encounter Hasdrubal in Cisalpine Gaul. Livius retreated before the new invader, and let him reach Sena in Umbria, to the south of the river Metaurus, without opposition. Thence Hasdrubal sent despatches to his brother, who was at Canusium in Apulia. The plan was that they should join their armies at Narnia on the Flaminian road, between 50 and 60 miles from Rome. Unluckily for the two brothers the despatches fell into the hands of Nero. His resolution was formed in a moment. Leaving the bulk of his army in its camp, he hurried northwards with 7000 of his best troops, and after a rapid march of 200 miles he joined Livius. The two generals forced Hasdrubal to a battle. The Carthaginian was utterly defeated, and he was him- self slain. Nero returned with all speed to his army, and informed Hannibal of the defeat and death of his brother by having the head of Hasdrubal flung into his camp. With that sight all hope must have died in Hannibal's heart, 'The battle of the Metaurus was indeed one of the decisive battles of the world. It decided the Second Punic War. From that time, for four more years, Hannibal could but stand on the defensive in the southernmost corner of the Italian peninsula. But even to the last no Roman general dared to close with him. Never in a single battle, as Polybius says, was he beaten while in Italy. Before quitting the country, he left a memorial of his wonderful achievements. In the temple of Juno on the Lacinian promontory, near Crotona, he inscribed on brazen tablets in Punic and in Greek an account of his expedition and his campaigns. Polybius saw the inscription and doubtless availed himself of it for his history. For fifteen years Hannibal had maintained himself in Italy, ravaging it from end to end, and inflicting on the Romans according to their own calculation a total loss of 300,000 men. Now all was clearly over. After Nero's victory the Romans could afford to wait the course of events. Scipio had been victorious in Spain, and early in 204 B.c. he was allowed to cross into Africa. Soon it was clear that he would threaten Carthage more effectively than Hannibal had ever threatened Rome. He received the order of recall at Crotona, and thence embarked for Africa. He landed at the smaller Leptis,

on the coast of Tunis, late in the year 203 B.c., and lingered during the winter at Hadrametum, the modern Susa. His brothers Hasdrubal and Mago had both fallen, and he was now the last of the "'lion's brood." Fugitive as he was, his presence roused the Carthaginian spirit. The people would not hear of peace. Hannibal indeed attempted to negoti- ate,and had an interview with Scipio, but in vain. When he saw that he must fight, he could not have felt any of his old confidence. He had some good troops, but he was numerically inferior to the enemy. Of his veterans

but few could have remained. The armies at last met at Zama, somewhere near the modern Keff. The battle was obstinately contested, and Hannibal's old soldiers died fighting in their ranks. But he never really had a chance of victory. Many of his men were raw mercenaries, and some of them deserted to the enemy. His army was utterly dis- comfited, and indeed annihilated. The defeat was not dis- creditable to him, but it was decisive. With a handful of men he escaped to Hadrumetum, and in the year 202 B.c. the Second Punic or, more properly, the Hannibalian War was at an end.

He was still only in his forty-sixth year. He soon showed that he could be a statesman as well as a soldier. Peace having been concluded, he was appointed chief magistrate of the state. The office had become rather insignificant, but Hannibal restored its power and authority. The oligarchy, always jealous of him, had even charged him with having betrayed the interests of his country while in Italy, and neglected to take Rome when he might have done so. The dishonesty and incompetence of these men had brought the finances of Carthage into grievous disorder. So effectively did Hannibal reform abuses that the heavy tribute imposed by Rome could be paid by instalments without additional and extraordinary taxation. Carthage grew prosperous, and again the Romans trembled. Seven years after the victory of Zama they demanded Hannibal's surrender. They were still in mortal dread of their old enemy. Hannibal did not wish his countrymen to disgrace themselves, and he therefore at once became an exile. First he went to Tyre, the mother-city of Carthage, and thence to Ephesus, where he was honourably received by Antiochus, king of Syria, who was then preparing for war with Rome. Hannibal soon saw that the

king's army was no match for the Romans. He advised him to equip a flect and throw a body of troops on the south of Italy, adding that he would himself take the command. But he could not make much impression on Antiochus, who was a conceited man, quite ignorant of the strength of Rome. The story was told that, pointing to the great army he had assembled at Ephesus, he asked Hannibal if he did not think that these were enough forthe Romans. Hannibal's reply was, " Yes, enough for the Romans, however greedy they may be." The great army in which Antiochus had trusted was in 190 B.c. routed by Scipio at Magnesia near Smyrna. Again Rome demanded the surrender of Hannibal.

The end was now athand. From the court of Antiochus Hannibal fled to Crete, but he soon went back to Asia, and sought refuge with Prusias, king of Bithynia. Once more the Romans were determined to hunt out the old man, and they sent Flamininus to insist on his surrender. Prusias swas but a poor paltry princeling, and he promptly complied. Hannibal did not choose to fall into his enemies' hands. At Libyssa, on the eastern shore of the Sea of Marmera, he took poison, which, it was said, he had long carried about with him inaring. The precise year of his death was a matter of controversy. If, as Livy seems to imply, it was 183 B.c., he died inthe same year as his great and victorious antagonist, Scipio Africanus.

As to the transcendent military genius of Hannibal there cannot be two opinions. The man who for fifteen years could hold his ground in a hostile country against several powerful armies and a succession of able generals must have been a commander and a tactician of supreme capacity. Wonderful as his achievements were, we must marvel the more when we take into account the grudging support he received from Carthage. As his veterans melted away, he had to organize fresh levies on the spot. We never hear of a mutiny in his army, composed though it was of Africans, Spaniards,and Gauls. He who could throw a spell

over such rough and various natures must indeed have been an extraordinary man. Again, all we know of him comes for the most part from hostile sources, The Romans feared and hated him so much that they could not do him justice. Long after the peril liad passed away, we may well

believe that Horace accurately reflected their sentiment in describ- ing him, as he does more than ounce, as the dirus Hannibal. Livy speaks of his great qualities, but he adds that his vices were equally great, among which he singles out his " more than Punic perfidy " and "an inhuman cruelty." For the first there would seem to be no further justification than that he was consummately skilful in the use of ambuscades. For the latter there is, we believe, no more ground than that at certain crises he acted in the general spirit of ancient warfare. Sometimes he contrasts most favourably with his enemy. No such brutality stains his name as that perpe- trated by Claudius Nero on the vanquished Hasdrubal. Polybius merely says that he was accused of cruelty by the Romans and of avarice by the Carthaginians, He had indeed bitter enemies, and his life was one continuous struggle against destiny. For steadfastness of purpose, for organizing capacity and a mastery of military science, he has perhaps never had an equal.

Considering his fame, we should have expected to find a number of anecdotes about him. There are, however, only afew. One is given by Cicero (De Oratore, ii. 18); and may fairly find a place here. When he was an exile at Ephesus, he was invited to hear a lecture from one Phormio, a philosopher. The lecturer discoursed on things in general and on the duties of a commander-in-chief in particular, and was warmly applauded by his audience. Some of the hearers turned to Hannibal and asked him what he thought of it. "T have seen," said he, ' plenty of old fools in my time, but this man beats them all."

Our chief sources for the life of Hannibal are Polybius and Livy. With Polybius we are generally on safe ground, but unfortunately we have not his guidance throughout. Livy's narrative is too much devoted to his country to be impartial; but he is minute, and his entire history of the Second Punic War has come down to us. There are besides the meagre epitomes of Florns and Orosius, aud the remains of the abridgment of Dion Cassius by Zonaras. We have also Plutarch's lives of Fabius Maximus and Marcellus, in which of course Hannibal figures conspicuously, and a life by Cornelius

Nepos. To these must be added Appian, whose book on the Wars of Hannibal is not without some value. (W. J. B.)

HANNIBAL, a city of the United States, in Marion county, Missouri, is situated on the west bank of the Mississippi river, 150 miles above St Louis. Owing to its position on the river and its extensive railroad connexions, it has become a busy commercial town; and evidence of the prosperity of many of its inhabitants is afforded by the number of fine residences on the surrounding slopes. It possesses a city hall, a Roman Catholic seminary, and a high school. The river is crossed by a splendid iron bridge, which has provision both for ordinary and for railway traffic. The principal shipping trade' is in lumber with other parts of the State, as well as with Kansas and Texas; but tobacco, pork, and flour are also extensively shipped. The manufactories include foundries, car-works, machine- shops, tobacco-works, beef-curing establishments, and flour: mills. In the neighbourhood there are lime-works and coal-pits. The population, which in 1860 was 6505, and in 1870 wag 10,125, of whom 1616 were coloured and 1632 foreigners, is now (1880) estimated at 15,000.

HANNO (a very common Carthaginian name, Greek "Avvwv), according to the title of the Periplus that passes under the name, was a king (basileus) of the Cartha- ginians who undertook an exploring and colonizing ex-pedition along the north-western coasts of Africa beyond the Pillars of Hercules, and on his return inscribed a narra- tive of his voyage in the temple of Saturn. There are no data to fix with. any precision the time at which he flour-

ished, the most definite statement about the matter being Pliny's "Punicis rebus florentissimis." Bougainville and Vivien de Saint Martin are disposed to assign him to circa 570 B.c.; Heeren, Kluge, and others make him contem- porary with a Hauno, father of Hamilear (c. 510 B.c) ; and Miiller thinks he may be possibly identified with Hanno the son of Hamilcar (c. 470 B.c.). According to the Periplus, which is the only detailed notice of the ex-pedition that has come down to us, he sailed with sixty galleys (pentecontoroz) and 30,000 (?) men and women, and in the course of his voyage south founded the city of Thymiaterium and settled colonies at Gytte, Acra, Melitta, Arambys, and in the island of Cerne or Kerne. The terminus of the voyage was an island beyond a gulf called the Noti Cornu, in which they found a number of "hairy women" whom the interpreters named gorillas.

*The identification of the various points mentioned in the narra- tive has given scope to abundant dissertation and conjecture, and the qnestion as to the site of the gorilla island, or southmost limit of the exploration, has been discussed with special interest. Bougainville and Dnreau de Ja Malle maintain that Hanno reached the Bight of Benin ; Miiller and Vivien de Saint Martin find his ultima Thule in the Gulf of Sherboro; Mannert decides in favour of Bissagos, Hecren for the mouth of the Gambia, Malte Brun for the Bay of Cintra, and Quatremére for the neighbourhood of the Senegal, while Gosselin would go no further south than Cape Nun. But while authorities differ so much in the matter of identification, almost all agree that the narrative is one of the most remarkable records of early exploration that have been preserved. '*In its original form," says Vivien de Saint Martin, "it was only a commemorative inscription of barcly a hundred lines, and yet in spite of this extreme conciseuess there is not one of its details, whether of localities or distances, which is not rigorously conformable to the very accurate acquaintance which we now have of these coasts." In the 18th century Dodwell called the authenticity of the Perdplusin question, but it was considered that his arguments had been dis- posed of by Falconcr and others. Recently, however, M. Tauxier has renewed the attack, maintaining that in reality we have nothing before us but 'fa compilation due to an ignorant Greek of the 1st century B.C., brought to its present form-by sonie Christian of the time of Theodosius, probably a student to whom the task was assigned of adapting the old Periplus to the geographical ideas of the day."*

The editio princeps of the Periplus of Hanno issued from the press of Frobenius at Basel in 1533 (Apptavov mepimAous,k.7.A.; Avywyos wepitAous AiBins, x.T.A.). Of more recent editions it is enough to mention that in Hudson's Geo- graphie veterts scriptores Grect minories, vol.i., Oxford, 1698, with Dodwell's dissertations prefixed; Arnold Schmidt, Arrians Indische Merkwiirdigkeiten und Hannons Seereise, Brimswick and Wolfenbiittcl, 1764; Thomas Falconer, he Voyage of Hanno translated … and defended against the objections of Mr Dod- well, London, 1797: Kluge, Hanjonis Navigatio, Leipsic, 1829; and Carl Miiller, Geographi,Greci Minores, Paris, 1855. For further dctails see Miiller's Pro/ego- mena; Bougainville in Acad, des Inscr. et Belles Lettres, tome xxvi.; Vivien de Saint Martin, Le Nord del'Afrique dans l Antiquité, Paris, 1863; Dr Judas in La

*Revue d' Orient; and M, Tauxicr in Za Globe, Geneva, 1867, and Comptes Rendus de U Acad. des Inscr., Paris,1875. **

HANNO, the chief gppgnent of Hamilcar and Hannibal at Carthage. Few details are known of his life; his in- fluence on the history of his country, which for more than forty years was very great, can be appreciated only from a detailed history of the period. During the First Punic War he conducted successfully a campaign against some African nation, and he soon became the most trusted leader of the aristocratic party. When in 240 Bc. Hamilcar's veterans returned from Sicily, clamouring for their promised pay, Hanno was sent to require them to accept partial pay- ment; and on their rebellion he was appointed to the com- mand against them. His unpopularity with the army and his incapacity led to several defeats, and the Government was reluctantly forced to associate Hamilcar with him. After Hamilcar had at length crushed the rebellion, Hanno seems to have remained at Carthage exerting all his in- fluence against the democratic party. During the Second Punic War he advocated peace with Rome; and he even, according to Livy (xxiii. 13), advised that Hannibal should be given up to the Romans. After the battle of Zama (203 B.c.) he was one of the ambassadors sent to Scipio to sue for peace, and after the war he is mentioned among the leaders of the Roman party.

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HANOVER (German, Hannover), formerly an inde- pendent kingdom, but since 1866 a province of Prussia, lies between 51° 18' and 53° 52' N. lat. and 6° 43' and 11° 45' E. long., and is bounded on the N. by the North Sea, N.E. by Holstein, Hamburg, and Mecklenburg, E. and §.E. by Prussian Saxony and tlie duchy of Brunswick, 8.W. by Hesse-Cassel and Westphalia, and W. by Holland. These boundaries include the grand-duchy of Oldenburg, which stretches southward from the North Sea nearly to tlie southern boundary of Hanover.

Physical Features.—The greater part of Hanover is embraced in that extensive plain which, commencing on the shores of the North Sea, terminates on the frontiers of Russia. The most fruitful districts are on the banks of the Elbe and near the North Sea, where, as in Holland, rich meadows are preserved from being immersed in water by broad dykes and

deep ditches, constructed and kept in repair at great expense. It is only the southern portion that is mountainous; the district of Klausthal, containing the Harz, is wholly so, as well as some parts near Got- tingen, and in the district of Hildesheim. The Harz mountains are not a part of any chain, but rise from a plain in an isolated group, the highest points of which are nearly in the centre (see Harz). They are covered with exten- sive forests, On their lower slopes. the trees are of the deciduous kinds, but pines alone are found on the sum- mits.

The whole of Hanover dips towards the north, and the rivers consequently flow in that direction. The Elbe, which forms the boundary on the N.E., receives the fol- lowing tributaries :—the Ohre, which rises in the district of Liineburg; the Aland and the Jetze, which come out of the province of Saxony, and are navigable in their lower course ; the Ilmenau, which becomes navigable at Liine- burg; the Este, navigable to Buxtehude; the Liihe, navigable to Hornburg ; the Schwinge, by which vessels reach Stade ; the Oste, navigable to Kirchosters ; and the Medem, which runs through the Hadeln-laud, and admits large vessels up to Otterndorf. The Weser enters Hanover at Miinden, being there formed by the junction of the Fulda and the Werra. It is navigable for barges from the spot at which its name commences; and it receives the Haniel, the Aller, the Oertze, the Leine, the Bohme, the Eyther, the Wiimme, which in the lower part of its course takes the name of Lesum, the Geeste, and the Hunte,—all of them purely Hanoverian rivers. The Ems rises in the province of Westphalia, and after entering Hanover receives the waters of the Aa, the Haase, the Else, and the Leda; it falls into the Dollart near Emden, which is the principal seaport in the kingdom. It is navigable for flat-bottomed vessels from Rheina downwards, and for sea-going ships from Halte and Weener. The Vecht, a river of short course, rises in the province of Westphalia, and falls into the Zuyder Zee. A navigable canal from the Vecht to Miinster connects that city with the Zuyder Zee. Navigable canals connect tlie various river systems.

The principal lakes are the Steinhuder Meer, about 4 miles long and 2 broad, and 20 fathoins deep, on the borders of Schaumburg-Lippe; the Diimmersee on the borders of Oldenburg, about 12 miles in circuit ; the lake of Bederkesa, and some others in the moorlands of the north; the

Seeburger See near Duderstadt; and the Oderteich, in the Harz, 2100 feet above the level of the sea.

Climate.—The climate in the low-lying districts near the coast 1s moist and foggy, in the plains mild, on the Harz mountains severe and variable. In spring the prevailing

| winds blow from the N.E. and E., in summer from the S.W. The inean annual temperature is about 46° Fahr. ; in the town of Hanover it is higher. The average annual rainfall is about 23°5 inches; but this varies greatly in different districts. In the west the Héhenrauch, a thick fog arising from the burning of the moors, is a plague of frequent occurrence.

Agriculture. —Though agriculture constitutes the most important branch of industry in the province, it is still in a very backward state. The greater part of the soil is of inferior quality, and much that is susceptible of cultivation is still lying waste. Of the entire area of the country 28:2 per cent. is arable, 16°6 in meadow or pasture land, 13 per cent. in forests, 37°2 per cent. in uncultivated moors, heaths, &c.; from 17 to 18 per cent. is in possession of the state. The best agriculture is to be found in the districts of Hildesheim, Calenberg, Gottingen, and Grubenhagen, on the banks of the Weser and Elbe, and in East Friesland. Of the whole area under cultivation in 1878 there was under wheat 1°9 per cent. ; rye, 10°9 ; barley, 0°9; oats, 5°7 ; buckwheat, 1°4 ; pease, 0°4 ; potatoes, 2°8 ; and meadow, 10°4 percent. The extent of tillage was 3,295,752 acres of a total area of 9,464,446 acres. The total yield for the season 1878 was—wheat, 2,298,548 cwt.; rye, 10,843,726 cwt.; barley, 1,350,417 ewt.; oats, 7,054,389 cwt.; buckwheat, 1,150,515 ecwt.; pease, 348,934 cwt.; potatoes, 17,828,490 ewt.; hay, 34,288,480 ewt. Rye is generally grown for bread. Flax, for which much of the soil is admirably adapted, is extensively cultivated, and forms an important article of export, chiefly, however, in the form of yarn. Hemp, turnips, and hops are also among the exports. There were in 1877 805 acres planted with tobacco, the produce of which was 12,207 ewt., valued at £15,150. Of beet there were 27,700 acres, yielding 5,376,480 cwt. of beet-root, from which was manufactured in 27 sugar-niills with 211 engines of 2433 horse-power 581,707 ewt. of raw sugar. Apples, pears, plums, and

cherries are the principal kinds of fruit grown. Red bilberries (Vaccinium Vitis idea) from the Harz and black bilberries (V. Afyrtillus) from the Liineburg Heath form an important article of export.

Live Stock.—By the returns of 1873 there were in Hanover 191,006 horses, 182 mules, 404 asses, 894,158 head of horned cattle, 1,856,962 sheep (including 511,892 heidschnucken, a very coarse breed), 510,550 pigs, 172,902 goats, and 217,045 beehives. Bees are principally kept on the Liineburg Heath. The number of sheep was larger before 1867, but the number of horned cattle has increased. Horses are reared in the marshes of Aurich and Stade, in Hildeshcim and Hanover ; the cattle of Aurich (East Friesland) are famous for their size and quality. The best sheep belong to the country lying between the capital and the Harz. Large flocks of geese arc kept in the moist lowlands; their flesh is salted for domestic consumption during the winter, and their feathers are prepared for sale.

Mining.—Minerals, occur in great variety and abundance. The Harz mountains are rich in silver, lead, iron, and copper; coal is found around Osnabriick, on the Deister, at Osterwald, &c,, lignite in various places; salt-springs of great richness exist at Egestorfshall and Neuhall ncar Hanover, and at Liineburg ; and petroleum may be obtained south of Celle. In the cold regions of the northern lowlands, peat occurs in beds of immense thickness. The mining returus for the year 1878 give thc following quantities and values :— coal, 301,728 tons (£118,765); lignite, 126,714 tons (£33,724); asphalt, 26,000 tons (£28,000); iron ores, 170,969 tons (£16,000); zinc, 5141 tons (£16,944); lead ore, 32,866 tons (£188,785); copper ore, 16,793 tons (£45,286); silver ore, 35 ewt. (£1420); manganese ore, 3070 cwt. (£719); salt from springs, 78,007 tons (£91,498).

Manufactures.—Works for the manufacture of iron, copper, brass, wire, silver, lead, vitriol, and sulphur are carried on to a large extent. About 40,000 persons are employed in these works and in the mines, the yearly revenue from which amounts to £1,200,000. The production of 1878 consisted of—iron, 1,562,231 tons; lead, 8774 tons; copper, 2556 cwt.; silver, 538,982 ib; gold, 171 Ib; sulphuric acid, 573 tons; blue vitriol, 788 tons. The iron works are very important: smelting is carried on in the Harz and near Osnabriick; there are extensive foundries and machine factories at

Hanover, Linden, Osnabriick, Hameln, Geestemiinde, Harburg, Osterode, &c., and manufactories of arms at Herzberg, and of cutlery in the towns of the Harz and in the Sollinger Forest. The textile industries are prosecuted chiefly in the towns. Linen yarn and cloth are largely manufactured, especially in the south about Osnabriick and Hildesheim, and bleaching is engaged in extensively ; woollen cloths are made to a considerable extent in the south about Einbeck, Gidttingen, and Hameln ; cotton- spinning and weaving have their principal seats at Hanover and Lin- den. Glass houses, paper-mills, potteries, tile works, and tobacco- pipe works arenumerous. Wax is bleached to a considerable extent, and there are numerous tobacco factories, tanneries, breweries, vinegar works, and brandy distilleries. Shipbuilding is an important in-

dustry, especially at Papenburg, Emden, Leer, Stade, and Har- burg; and at Miinden river barges are built.

Commerce.—Although the carrying trade of Hanover is to a great extent absorbed by Hamburg and Bremen, the shipping of the province counts 867 sea-going vessels, the larger vessels all belonging to Geestemiinde. Emden is destined to become a very important seaport when the extensive harbour improvements have been completed.

Administration.—The province is divided into six lauddrosteien or counties, and these again have been subdivided, since the annexa- tion by Prussia, into smaller districts. There is a provincial assembly representing 43 towns and 101 bailiwicks. A court of appeal for the whole province sits at Celle, and there are 12 superior courts. To the German parliament (reichstag) Hanover sends 19 members ; to the Prussian house of assembly (abgeordnetenhaus) 36. The debts of the province, contracted before the occupation by Prussia, amount to £226,622.

Population. —The censusof 1871 gave the population as 1,963,618 ; 1,713,664 belonged to the Evangelical Church, 233,633 were Roman Catholics, and 12,790 Jews. The. urban population numbered

. | Extent in Population, Ist Dec. 1875. Counties, English iii Males. Females, Total. Hanover….. 2197°4 | 215,364 214,695 | 430,059 Hildesheim..} 1941:7 204,010 | 209,587 | 413,597 Liineburg …| 4375°6 194,586 | 192,128 | 386,714 Stade …..... 2493°7} 154,694 153,515 | 308,209 Osnabriick…| 2358-6 139,761 | 138,000 277,761 Aurichy.s….| 2180 99,310 | 101,743 | 201,053

14548°0 |1,007,725 |1,009,668 |2,017,393

503,102, and the rural 1,454,587. By the census of 1875 the popu- lation had reached 2,017,393. There are 114 towns, but only 9 have a population exceeding 10,000, viz., Hanover, Osnabriick, Hildesheim, Linden, Harburg, Liineburg, Celle, Gottingen, and Emden.

Education.—Amongst the educational institutions the university of Gottingen stands first, with an average yearly attendance of 900 students. There are besides 18 gymnasiums, a progymnasium, 9 first-class grammar schools, 11 normal and training schools, a polytechnie school at Hanover, a school of mines and forestry at Klausthal, several naval academies and schools of arts, 3 asylums for the deaf and dumb, 2 for the blind, and numerous other charitable institutions.

History.—The word Hanover originally applied only to the city so called. It was gradually, however, extended to the country of which Hanover was the capital ; and it was officially recognized as the name of the state when in 1814 the electorate of Liineburg was made a kingdom.

In ancient times the country formed part of Saxony, which re- mained independent until the time of Charlemagne ; and afterwards it was included in the duchy of Saxony. After the extinction of the Billing family, which ruled Saxony for about two centuries, the duchy was granted to Lothair of Supplinburg, who in 1125 was elected emperor. He gave his daughter in marriage to Henry the Proud, duke of Bavaria, of the ancient house of Guelph, which already had important allodial possessions in Saxony. Henry the Proud became duke of Saxony as well as of Bavaria; and his son Henry the Lion, after a time of bitter dispute, was installed by Frederick Barbarossa in his father's great position. In the latter part of Frederick's reign, in 1180, Henry was deprived of both his duchies, but was allowed to

keep the allodial possessions of his family, viz., Brunswick and Liineburg. In 1235 these lands were yielded by Henry's grandson, Otto Puer, to the emperor Frederick IL, who granted them to him in fief asa duchy. Otto's two sons divided their inheritance into two duchies in 1267 , and thus were formed the old Liineburg and the old Brunswick lines. There was a fresh division in 1428, whereby were formed the so-called middle lines of Brunswick and Liineburg. From 1527 Liineburg was under the sole government of Duke Ernest the Confessor, who was an ardent adherent of Luther, and so persistently laboured to promote the Reformation in his country that it has been essentially Pro- testant ever since. He died in the same year as his friend Luther, 1546 ; and from him descended the younger lines of Brunswick and Liineburg, or of Brunswick-Wolfenbiittel and Brunswick- Liine- burg. For in 1634 Duke Frederick Ulrich of Brunswick-Wolfen- biittel suddenly died childless, and his duchy was inherited by Augustus the younger, the descendant of Ernest's eldest son Henry; and Brunswick has remained in the hands of this dynasty till the present day. Meanwhile Liineburg had been ruled over by William, the younger son of Ernest the Confessor; and when he died in 1592 he left seven sons, of whom four, Ernest, Christian, Augustus the elder, and Frederick, one after the other, became rulers of the land. Frederick, who survived all his brothers, died in 1648, the year in which the Thirty Years' War was brought to a close. The

only one of the seven brothers who married was George, to whom was granted as a separate duchy a part of Liineburg called Calen- berg, of which he made Hanover the capital, Celle being the capital of Liineburg. He arranged that his eldest son should be allowed to select either Calenberg or Liineburg, that the second should take the duchy not chosen by his brother, and that the remaining sons should be content without having territory to govern. The result of this settlement was that his eldest son, Christian Louis, cliose Liineburg, where he ruled till his death in 1665. George William, the second son, ruled over Calenberg till 1665, when he transferred himself to Liineburg, which he governed till 1705. On his going to Liineburg, the third brother, John Frederick, became duke of Calenberg, in which position he was succeeded in 1679 by Ernest Augustus, the fourth

brother, who married Sophia the grand- daughter of James I. of England. Ernest Augustus was an exceedingly ambitious prince, and in order to increase the power of his country introduced in 1682 the law of primogeniture. After- wards, in 1692, in consequence of a vast amount of negotiation and intrigue, he managed to secure for himself and his successors the electoral title. He died in 1698, and was succeeded by his son George Louis, who, having married his cousin Sophia Dorothea, the daughter of George William of Calenberg, finally united the two duchies on the death of the latter prince. In 1714 George Louis, the elector of Luneburg, ascended the throne of Great Britain as George I.

After this time, until the death of William IV., Liineburg or Hanover had the same sovereign as Great Britain; and this per- sonal union of the two countries was not without important results for both. George II., as the ally of Frederick the Great in the Seven Years' War, joined the struggle in the capacity both of elector and of king ; and while George III. was on the throne there was hardly a phase of the foreign policy of England by which Hanover was not affected. In 1803, when the Hanoverian troops capitulated at Sulingen, the country was invested by a French corps, which it had to maintain at a heavy cost. The Prussians received temporary possession of Hanover from Napoleon in 1806; but in 1807 a part of it was annexed to the kingdom of Westphalia, to which the remaining portion was added in 1810. The people never acquiesced in French predominance, and when the final struggle with N ae came they distinguished themselves by the ardour with which they flung themselves into it. At the congress of Vienna in 1815 it was demanded in the name of the elector (King George III.) that the electorate should be recognized as a kingdom; and not only was the demand admitted, but the new kingdom received considerable accessions of territory.

Partly through the influence of the French, partly in consequence of the general progress of ideas, Hanover was now, like many other parts of Germany, penetrated by a desire for freedom; and such had been the sufferings of the people, willingly borne for their sovereign and country, that they felt they had a right to be treated in a con- ciliatory and generous spirit. Their wishes were, however, disre- garded, Count Miinster, who virtually ruled the country from London, drew up a constitution which came

into force in 1819. It was thoroughly reactionary in tendency, and the more resolutely it was enforced the more completely were the people alienated from the ruling class. Not until 1831, when there weve several popular risings of so serious a nature that Count Miinster resigned, was it deemed necessary to make important concessions, and even then the constitution which the states assembly prepared was made con- siderably less liberal by William IV. before he sanctioned it in 1833.

As the law of Hanover prevented a woman from mounting the throue, Ernest Augustus, duke of Cumberland, became king after the death of William IV. in 1837. He proved to be a harsh and narrow-minded despot. In 1837 he arbitrarily abolished the con- stitution of 1833, and when seven professors of the university of Gottingen protested against the act as unlawful, they were deprived of their chairs, and three of the most distinguished—Gervinus, Jacob Grimm, 'and Dahlmann—were banished from the country. The people were profoundly stirred, and it was hoped that the confederate diet might be induced to protect their rights, but it declined to interfere. A pitiful imitation of a constitution was granted in 1840, but this only intensified the public indignation, which became so strong that in 1848 the revolutionary movement that swept over Europe seemed about to overthrow King Emest Augustus and his throne together. By hasty eoncessions he succeeded in preventing this eatastrophe, but no sooner did the agita- tion begin to abate than he showed a disposition to evade the obligations imposed by the constitution which had been wrung from him. The comparatively liberal ministry which had been appointed in the moment of danger was dismissed in 1850, and probably only the death of the king in 1851 prevented him from engaging in as serious a contest as ever with the progressive forces that surrounded him. In 1849, when the Frankfort diet failed to establish the unity of Germany, he joined the kings of Prussia and Saxony in forming what was called "the three kings' alliance" ; but he soon withdrew from this connexion, and associated himself with the thoroughly conservative policy of Austria,

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Emest Augustus was succeeded by his blind son, George V. Personally King George was of an amiable disposition, but he shared his father's

extravagaut conceptions of royal rights, and at once appointed a ministry whose aim was to get rid of the incon- venient constitution of 1848. The second chamber, however, resisted its designs so energetically that in 1852 the more re- actionary ministers had to resign, and in 1853 even the modified cabinet was completely defeated. The king then created a Govern- ment which advised him to appeal to the confederate diet. This was done, and in 1855 the diet proclaimed the constitution of 1848 to be invalid. That a more easy triumph might be secured, the states assembly was dissolved, and a ministry was formed which boldly restored the nominal constitution of 1840. This Govern- ment spared no effort to obtain an overpowering majority, but, as it still encountered some resistance in the new parliament, fresh elec- tions were ordered, and in 1857 it had the satisfaction of meeting as pliant a body of deputies as the king himself could wish. The people, however, were not in sympathy with their nominal repre- sentatives, and gave many proofs of their discontent with the arbitrary rule to which they were subjected. In 1862, when an attempt was made to impose upon the schools the use of a catechism of the 17th century, the popular feeling was so decisively expressed that the king was compelled to dismiss his ministers. The new cabinet, which was rather less extravagant, included Herr Windt- horst, who had for a short time had a seat in the Government that resigned in 1853, and who has since acquired distinction as leader of the Ultramontane party in the imperial parliament of Germany. King George could not long submit even to a slight modification of his absolutist notions, and in 1865 entrusted Herr von Borries, who had done him faithful serviec in previous administrations, with the task of bringing together a cabinet to his liking.

Meanwhile, however, dangers had arisen in Germany, compared with which the internal troubles of Hanover were of small account. Herr von Bismarck, who now controlled Prussian policy, was devising methods for the realization of his vast schemes ; and it became increasingly clear, after the Schleswig-Holstein war, that the minor states of Germany would soon have to accept finally the lead either of Prussia or of Austria. Before the outbreak of that conflict Hanover and Saxony had despatched troops to Holstein for the purpose of executing the will of the bund. Although the federal army was driven back by Prussia, Hanover seemed for a time to be favourable to her rather than to Austria ; but in reality the sympathy of the court was

altogether with the latter power. On the 14th of June 1866, in regard to the decisive question whether the federal army should be mobilized, Hanover voted in the con- federate diet with Austria ; and by doing so she irrevocably declared on which side she would range herself in the approaching struggle. In consequence of this vote Prussia addressed an ultimatum to Hanover on the 15th of June, requiring her to maintain unarmed neutrality and to accept the scheme for the reform of the confedera- tion which the Prussian plenipotentiary had submitted to the diet before retiring from it. As Hanover rejected these demands, Prussian troops at once crossed the frontier ; and on the 17th of June they were in possession of the capital. On the 27th a battle was fought at Langensalza, in which the Hanoverians were victori- ous; but they could make no use of their victory, and were soon compelled to capitulate. At the conclusion of the war, by the treaty of Prague, Hanover, with Hesse, Nassau, and Frankfort, was annexed to Prussia. . King George addressed from Hietzing, near Vienna, a protest to the European cabinets, but it was disregarded ; on the 3d of October 1866, his dominions were formally taken

ossession of, and in the following year the population were sub- ected to the Prussian constitution. In 1878 George V. died at

ietzing, but his son, Ernest Augustus, duke of Cumberland, maintains his right to the crown; and there is still a party in Hanover which expresses itself favourable to his claims. 'The mass of the population, however, whether originally willing to be annexed to Prussia or not, have submitted to the inevitable, and there is evidence that they are gradually becoming loyal subjects of the Prussian king.

Hanover, the capital, is situated in the south of the above province, on a sandy but fertile plain on the river Leine, which here receives the Ihme, and is from this point navigable to the Weser. It is 38 miles W. by N. of Bruns- wick by rail, 157 miles W. of Berlin, 78 S.E. of Bremen, and 107 S.of Hamburg. The Leine flows through the town having the old town on its right bank, and the Calenberger new town between its left bank and the Ihme. The old town is irregularly built, with narrow streets and old- fashioned houses; while the new town has wide streets, handsome buildings, and

beautiful squares. Of the latter the most remarkable are—the square at the railway terminus, with an equestrian statue of King Ernest

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Augustus in bronze ; the triangular theatre square ; George Square, with the statue of Schiller ; Waterloo Square, with a column 99 feet high, surmounted by Victory, and having inscribed on it the names of 800 Hanoverians who fell at Waterloo. In the gardens near the square an open rotunda has been erected enclosing a marble bust of Leibnitz, and near it a monument of General Alten, commander of the Hanoverian troops at Waterloo. The town has numerous churches; in the chapel of the palace are preserved the relics of saints which Henry the Lion brought from Pales- tine. The royal palace—built 1636-1640, rebuilt 1837 —contains a picture gallery and collection of natural curi- osities, and the palace of Ernest Augustus is remarkable for its historic collections, especially the famous Welfen museum. The other principal public buildings are the record office, containing a library of 150,000 volumes ; the town-hall, built in the 15th century; the theatre, the museum, the aquarium, the handsome railway terminus, and the exchange. Hanover has a numberof colleges and schools, and is the seat of several learned societies. During the last ten years the town has become the seat of various new indus- tries and of an increasing trade. It is connected by rail

Plan of Hanover.

1. Cavalry Barracks.| 4. George Square; 6. Markt Kirche. 9. Palace of Ernest 2. Bank. statue of Schiller] 7. Town-Hall. Augustus. 8. Theatre. 5. Royal Palace. 8. Royal Castle. 10, Library.

with Berlin, Harburg, Bremen, Hamelin, Cologne, Alten- beken, and Cassel ; and the annual fairs for cloth, leather, yarns, linen, wool, &c., are frequented by large numbers of buyers. There are several banks and a chamber of com- merce. Almost every industry is at present represented, whilst in former times the inhabitants derived their chief support from the presence of the court and the nobility. The town possesses large cotton- mills, iron- foundries, and machine factories, numerous tobacco manu- factories, breweries, distilleries, &c. Hanover was the first German town

that was lighted with gas. It is the birth- place of Sir William Herschel the astronomer (1822), of the brothers Schlegel, and of the historian Pertz; and the philosopher Leibnitz died there (17 16). The population has increased from 49,909 (including suburbs) in 1852 to 106,677 in 1879 (with the adjoining Linden, 127,576). In the vicinity are the royal palaces of Herrenhausen, the unfinished Welfenschloss (formerly Mont Brilliant), and Marienburg, the private property of Queen Marie, all sur- rounded by gardens.

HAN—HAWN

See Baring, Notitia Seriptorum rerum Brunsvicenstum ac Luneburgensium (Hanover, 1729) ; Leibnitz, Scriptores rerum Brunsvicensium (Han., 1707-11); Biinting, Braunschweig-Liineb. Chronica (Magdeburg, 1586), continued till 1620 by Meibom (ibid. 1620); Hine, Gesch. des Kénigr. Hannover und Herzogth. Braun- schweig (Han., 1825-30); Havemann, Gesch. der Lande Braunschweig und Lineburg (Gottingen, 1853-57); Grotefend, Gesch. der aillg. landstand. Verfassung des Konigrcichs Hannover, 1814-48 (Han., 1857); Schaumann, Handbuch der Gesch. der Lande Hannover und Braunschweig (Han. 1864); Guthe, Die Lande Braunschweig und Hannover (Han., 1867); Oppermann, Zur Gesch. Hannovers, 1832-60 (Berl., 1868); Sichart, Gesch. der Kénigl. hanniverschen Arinec (Berl. 1866-71). (E. J.—J. SI.)

HANSARD, Luxg (1752-1828), English printer, whose name is familiar in connexion with the parliamentary re- ports, was born July 5, 1752, in St Mary's parish, Norwich. Reverses in business compelled his father, a manufacturer there, to apprentice him to Mr Stephen White, printer. Immediately on the expiry of his apprenticeship Hansard started for London with only a guinea in his pocket, and obtained there in 1772 a situation as compositor in the office of Mr Hughs, printer to the House of Commons. There luis ability and energy commended him so well to his master that in two years' time he was made a partner, and under- took almost the entire conduct of the business, which in 1800 was resigned completely into his hands, through the retirement of Mr Hughs. Among those whose acquaintance Hansard made in the exercise of his profession and retained by his amiable private qualities, were Orme, Burke, and Dr Johnson; while

Porson eulogized him as the most accurate printer of Greek, The promptitude and accuracy with which Hansard printed parliamentary papers were often of the greatest service to Government,—notably on one occasion when the proof-sheets of the report of the Secret Committee on the French Revolution were submitted to Pitt twenty-four hours after the draft had left his hands. On the union with Ireland in 1801, the increase of parlia- meutary printing was so great that Hansard was forced to give up all private printing except when parliament was not sitting. He devised numerous expedients for reducing the expense of publishing the reports; and in 1805, when his workmen struck at a time of great pressure, he and his sons did not scruple themselves to work as compositors, and to instruct the new hands they had procured. Shortly after printing the report of the session that rose in J uly 1828, Hansard's health, which had been failing, completely gave way, and he died on October 29th of the same year. See the Gentleman's Magazine for December 1828,

HANSEATIC LEAGUE. The word "hansa," when we find it first in the Gothic Bible of Ulfila, signifies a military assemblage or troop. From this comes the gene- ral sense of union, and especially in the Middle Ages of union for mercantile purposes. A later but less iniportant meaning is that of a tax paid by traders for the right of forming such an union,

The Hansa, the league which ultimately overshadowed all rivals and usurped the name for itself, was no inten- tional creation, and we can fix no exact date for its origin. It arose gradually from two elements, the union of German merchants abroad, and the union of German towns at home.

The first impulse to mercantile union came from the dangers of travelling in the early Middle Ages. In those days mariners had neither chart nor compass to guide their course, and were forced to creep timidly along the shore and to avoid as much as possible the open sea. The inerchant had also to dread more positive dangers than those of storm and wreck. The coasts of northern Germany harboured numbers of rovers and pirates, who regarded the peaceful trader as their natural prey. To increase their powers of resistance, it was usual for merchants to under- take their voyages in more or less numerous companies. The union thus begun on sea was still further cemented

on land. In those days law was personal and not terri- torial. The foreign merchant had no share in the law of the land where he sojourned ; he brought with him his own law, and administered it as best he could. 'The legal customs of northern Germany were substantially alike ; and tlus similarity strengthened the bonds of union among the merchants who found themselves for a time settled in a foreign land. Moreover, the state of trade frequently required a long stay, and sometimes a depositing of goods among strangers. This led in time to the acquisition of common possessions abroad, lodgings, storehouses, de, This common depét, or "factory," became the central point of the union or Hansa formed by the merchants. The union soon received a corporative constitution. At its head stood the elders, whose chief functions were to admiuister justice and to represent the society in its relations to the natives of the country. It was by means of these orderly unions that the German merchants obtained their important privileges, chiefly advantages in trade and taxes, from the people among whom they sojourned.

The most important German mercantile settlements were founded in Wisby, the capital of Gothland, in London, Novgorod, Bergen, and Bruges. Wisby was the central point of the Baltic trade; the other towns represent the four extreme points of North-German commerce. It was not unnatural that the mercantile settlements should exer- cise great influence on the towns from which they sprang. In those towns the municipal government was wholly in the hands of merchants, There was no feudal aristocracy as in the Italian cities, and the artisan was always jealously excluded from political power. It is obvious therefore that the policy of the town-councils would often be influ- enced by the exigencies of foreign commerce. But the influence of the foreign factories was not exercised by all in an equal degree. Wisby differed from the other settle- ments in the fact that the Germans there were not merchants making a temporary visit, but were real settlers living side by side with the native population, N ovgorod was a mere colony of the German settlement in Wisby, and never held an independent position. Bergen was compara- tively unimportant, and the German " counter" in Bruges was not formed until some amount of union had been at- tained at home. But in the German colony in London the majority of the members

were merely passing traders, who remained citizens of their native towns. It was therefore the London Hansa which exercised the greatest influence on the growth of the town league,

In the reign of Edgar we find the "people of the emperor " occupying @ prominent position in London trade, and joined in a lasting league. The members of this league came mostly from Cologne, the first German town which obtained great importance both at home and abroad. Its citizens possessed at an early date a guild-hall of their own, and all Germans who wished to trade with England had to join their guild. This soon included merchants from Dortmund, Soest, and Miinster, in Westphalia ; from Utrecht, Stavern, and Groningen, in the Netherlands ; and from Bremen and Hamburg on the North Sea. But when, at the beginning of the 13th century, the rapidly rising town of Liibeck wished to be admitted into the guild, every effort was made to keep her out. The intervention of the emperor Frederick II. was powerless to overcome the dread felt by Cologne towards a possible rival to its supre- macy. But this obstacle to the extension of the league was soon overcome. In 1260 a charter of Henry III. assured protection to all German merchants. A few years later Hamburg and Ltibeck were allowed to form their own guilds. The Hansa of Cologne, which had long been the only guild, now sinks to the position of a branch Hansa, and has to endure others with equal privileges. Over all the

branch Hansas rises the "' Hansa Alamanniz," first meu- tioned in 1282.

The opposition to the exclusive pretensions of Cologne was chiefly the work of Liibeck, and with the rise of Liibeck we must connect the second element, the internal political element, which contributed to the formation of the Hansa. The old capitals of German trade, Cologne and Wisby, took their stand on the unions of German mer- chants abroad. In opposition to them Liibeck found support in home alliances, in its league with Hamburg and with the Wendish towns. The alliance between Liibeck and Hamburg is generally and with some truth given as the origin of the Hanseatic League. It was well fitted to play this part. These two towns com- manded the

commerce of the North Sea and the Baltic. By taking the land route between them, a merchant could avoid the dangerous passage of the Sound or the Belts, exacted by the Danish kings. The first alliance between the two towns, for which there is no exact date, had for its object the defence of the roads between them. From that came agreements as to mutual legal security, and thence they advanced to common political action in London and in Flanders.

The league between Liibeck and Hamburg was not the only, and possibly not the first, league among the German towns. But it gradually absorbed all the others. Besides the influence of foreign commercial interests there were other motives which compelled the towns to union. The chief of these were the protection of commercial routes both by sea and land, and the vindication of town independence as opposed to the claims of the landed aristocracy. The first to join this league were the Wendish towns to the east, Wismar, Rostock, Stralsund, c&c., which had always been intimately eonnected with Liibeck, and were united by a common system of law known as the " Liibisches Recht." The Saxon and Westphalian towns had long possessed a league among themselves; they also joined themselves to Liibeck. Liitbeck now became the most im- portant town in Germany. It had already surpassed Cologne both in London and Bruges. It soon gained a similar victory over Wisby. Ata great convention in which twenty-four towns from Cologne to Revel took part it was decided that appeals from Novgorod which had hitherto been decided at Wisby should henceforth be brought to Liibeck.

In the 14th century the Hansa changes from a union of merchants abroad to a league of towns at home. In 1380 mention is first made of the Hanse towns, where before it had been the Hanse merchants. In 1343 the league is first designated as the Hansa by a foreign prinee, Magnus of Norway, and thus acquires a diplomatic position as a united state. In 1356 astatute about mercantile privileges at Bruges is made, not by the German merchants, but by the towns themselves, through their representatives assembled at Bruges. Henceforth the town-league subordinates to itself the mercantile unions; the factories and depots of the merchants lose their independence, and became the " gounters," as they are called, of the Hanse towns.

The league thus formed would scarcely have held long together or displayed any real federal unity but for the pressure of external dangers. The true function of the Hansa, and especially of the Baltic towns, was to conduct the commerce between the east and west of northern Europe. But the geographical position of the Scandinavian countries enabled them to interpose a bar to this commerce. Thus from an early period the Hansa stood in a position of watchful hostility towards those countries. It was the careful maintenance of this watch over the Baltic which gave Liibeck its position in the league, and which gave

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and could evade the Sound dues which were often |

LHAGUE

the League its political as contrasted with its mercantile character.

The most dangerous of the Scandinavian countries at thus time was Denmark. Until the 16th century the southern coast of what is now Sweden was in the hands of the Danes, who were thus enabled to command the important channel of the Sound, and to interfere with the herring fisheries, a great source of wealth to the Hanse merchants. The Danish kings were almost always opposed to German interests, and were especially jealous of the supremacy of German traders in the Baltic. Eric Menved (1286-1319) almost succeeded in making himself master of the southern coast of the Baltic. He captured Rostock and the island of Riigen. Even Liibeck submitted to him, and was for a time practi- cally detached from the empire. Stralsund alone success- fully resisted the Danish attack. The league of Wendish towns was for the time wholly broken up, and the growth of the Hansa was arrested; but it was saved from total dissolution by the feuds which distracted Denmark. Eric's successor, Christopher IT., an exile from Denmark, fled to the very towns which his predecessor had humbled. After extorting from him numerous privileges, especially the exclusive right to the fisheries on the coast of Schonen, the Hanse towns restored him to his throne, though to only a fraction of his former power. From 1333 to 1340 Denmark was without a king, and a prey to the wildest anarchy. But as it recovered strength it again became formidable to the Hansa. Waldemar IIL.

(1340-1377) devoted the early part of his reign to the recovery of the lands which Denmark had lost during the recent troubles. To carry out this policy he had to spend large sums of money, and in his straits he determined to enrich himself by the plunder of German commerce. In 1361 he sailed to Gothland, and sur- prised and captured the town of Wisby. The news of this act reached the representatives of the Hansa as they were assembled at Greifswald. They at once resolved on war, and in 1362 their fleet stormed and captured Copenhagen. But while they were besieging the strong fortress of Helsingborg, Waldemar attacked their defenceless fleet and destroyed it. This defeat was followed by a truce, which recognized the Danish possession of Gothland. Waldemar might easily have turned this truce into an advantageous peace, but his success seems to have inspired him with the hope of crushing German ascendency in northern Europe. In 1367 a Hanseatic assembly at Stralsund was informed that Waldemar had laid new duties on the fishing stations, and that he had robbed German merchants in the Sound and the Belts. Another war was inevitable, and this time the result was different. Waldemar did not await the arrival of the hostile fleet, but fled in 1368 to Branden- burg. Denmark fell entirely into the hands of the League. In 1376 Waldemar was compelled, as the price of his return to his kingdom, to sign the treaty of Stralsund. By this treaty the Hansa obtained possession for five years of all fortresses on the coast of Schonen, and as coinpensation for its losses was to receive for fifteen years two-thirds of the Danish revenues. It was also stipulated that hence- forth no king should ascend the throne of Denmark without the consent of the Hanse towns, and that their privileges should be expressly confirmed at each coronation. 'The treaty of Stralsund marks the zenith of the power and pros- perity of the Hansa. The emperor Charles IV., who had always looked coldly on independent combinations among his subjects, seems to have been induced to alter his policy, and in 1375 he distinguished Liibeck by a personal visit.

The war against Waldemar III. seems to have had a great effect in consolidating the Hanseatic League, and in forcing it to adopt a federal constitution. From 1361 we can date the regular meeting of the general assembiies, whose acts (Recesse) have been preserved in the archives

at Liibeck. These assemblies met once a year about mid- |

summer, usually but not exclusively at Liibeck. They were attended by representatives of the various towns, but no one below the rank of councillor could act as representa- tive. The League always endeavoured to maintain its aristocratic character. The assemblies busied themselves with all the details of foreign policy as well as of internal

management. The penalty for non-observance of their |

decrees was expulsion from the League (Verhansung), 'The chief offence which brought this punishment on a town

was the admission of democratic tendencies. The struggle |

between the artisans and the old burgher families, which is so important-a feature of European history in the 13th and 14th centuries, necessarily affected the Hanse towns. It

was for admitting artisans to the council that Brunswick |

was expelled from the League in 1375, and was not re- admitted till 1380, when the old constitution was restored. Besides the central constitution of the Hansa, there are also traces of an internal grouping. At Bruges the German merchants are divided, according as they came from (1) the Wendish and Saxon towns, (2) Westphalia and Prussia, (3) Gothland, Livonia, and Sweden. This division is supposed to refer to a real division of the League, each third being gathered round one of the three chief towns, Liibeck, Cologne, and Wisby. But in later times we find the League divided into four quarters with their respective capitals,—Liibeck, Cologne, Brunswick, and Dantzic, Although, by comparing the documents which have come down to us, we can trace the existence of a fairly definite system of government, yet we must not imagine that this system was carried out with the regularity of a modern constitution. The composition of the League was always fluctuating, and it is impossible to say at any fixed time how many members it contained. The towns lay scattered over a large territory extending from Revel to the Scheldt, and their interests, both territorial and

com- mercial, must have often clashed. It was only in time of danger that the League displayed any real consistency.

When the immediate danger was withdrawn, the want of | union soon made itself again manifest. It is true that the |

towns joined the League of their own accord, but when they had joined, they tried to make their position as independent as possible. They never considered themselves bound to send deputies to the general assemblies. When the depu- ties did appear they usually came late, and after a matter

had been discussed they would insist on referring it to the |

town-council at home, as their own powers were insufficient, The wonder lies, not in the dissensions which sprang up among the towns, but in the fact that for three centuries they did in a manner hold together, and not infrequently sacrificed their individual advantages for the common good.

From the very moment of the treaty of Stralsund, the weakness of a community founded chiefly on commercial interests began to show itself. The eastern Baltic towns, especially those of Prussia, were indignant at the erection of a staple at Liibeck. They desired to trade directly with England and Flanders. To repress this movement Liibeck as the head of the League entered into the closest relations

with the Teutonic order. But the evil of these dissensions |

lay in the fact that they distracted the attention of the Hanse towns from events in Scandinavia. The influence guaranteed to them by the treaty of Stralsund was never

exercised, and their supineness allowed Margaret, Waldemar |

IIL,'s, daughter, to unite the crowns of the three Scandi- navian kingdoms at Calmar in 1397. The erection of a powerful northern state was obviously dangerous to the

ascendency of the Hansa. About tlie same time their allies, the Teutonic knights, were threatened in a similar |

manaer by the accession of the J agellon dynasty in Poland. The battle of Tannenberg (1410) and the peace of Thorn

(1411) were clear signs that the Slavonic race was begin- uing to turn the tables on its German oppressors, At one time it seemed probable that Slavs and Scandinavians would unite in a great anti-German crusade, and that the Hansa and the Teutonic order —the pioneers of German civilization in northern Europe—would fall victims te the alliance. During the 15th century the Hanse towns were frequently compelled to seek safety in arms. Their con- stant policy was to break up the union of Calmar. In 1428 they sent a large fleet against Eric, Margaret's successor, who wished to add Schleswig and Holstein to his possessions. The accession of two German princes, Christopher of Bavaria and Christian I. of Oldenburg, to the Danish crown was due in no slight measure to the exertions of the Hansa. Ou the whole the League held its own in this century, though not without considerable and increasing difficulty.

But with the 16th century the Hansa begins really to decline. The English and Dutch proved formidable rivals for the commercial supremacy in northern Europe. Henry VII. secured in 1489 a treaty from Hans of Denmark, which gave England the right of commerce in the northern seas, and which enabled English merchants to found mer- cantile establishments in the ports. The herrings no longer came in crowds to the Swedish and Norwegian coasts, where the members of the Hansa had so long held a practi- cal monopoly of the fisheries, These fish made at this time one of their periodical changes of course, and went to the coasts of Holland. The Dutch were not slow to grasp at the advantages thus offered to them. Another great blow

_ was dealt to Hanseatic commerce by the grand discoveries

of the age. Most of the German towns were out of the way of the new commercial routes, and could scarcely hope to hold their own with more favourably situated countries.

Besides these causes of decline, the domestic position of the Hanse towns had altered very much for the worse. While in other countries the power of the feudal nobles had fallen before the rapid rise of the monarchy aided by the sympathy of tle commons, in Germany alone the power of the princes had eonstantly increased, at the expense of both king and people. The Reformation and 'the con- sequent secularization of church property in northern Germany only served to strengthen the hands of the lay princes. Such a state of things was fatal to the independ- ence of a town league which had always stood opposed to the lawless independence of the nobles, Gradually most of the towns fell off from the League. Foreign countries triumphed at the fall of their formerly successful rival. In

| Elizabeth's reign the Hause merchants in London lost the

privileges which they had held since the time of Henry III. Religious disturbances and the fearful disasters of the Thirty Years' War completed the work thus begun. The peace of Westphalia restored the form but not the reality of the League. In 1669 the last general assembly was held. Henceforth the name of Hanse towns was kept by Liibeck, Hamburg, and Bremen, but it was to designate their independence, not their union. = – Ree -1430, B. i.-iv., and 1431-1476 Se aa f es eet cag, ede Geschichte des Ur. sprunges der deutschen Hanse (edited by J. M. Lappenberg); Lap- penberg, Urkundliche Gesehichte des hansischen Stahlhofes zu London (Hamburg, 1851) ; Wehrmann, Die Liibeckisehen Zunft- rollen (Lubeck, 1872); Karl von Schlozer, Die Hansa und der deutsche Ritter-Orden in den Ostseelindern the Hansische Gesichts- blaticr; Schafer, Die Hansestdidte und Konig Waldemar von Déne- mark (14878). (R. L.) HANSEN, Peter AnprREAs (1795-1874), astronomer, was born on December 8, 1795, at Tondern, in the duchy of Schleswig. When a youth he served an apprenticeship to aclock and watchmaker at Flensburg, with whom he | remained several years. During this time he exhibited an

intense interest for mathematics and the physical sciences, which was the means of his introduction in 1820 to Schumacher, professor of astronomy at Copenhagen, who, appreciating Hansen's abilitics, engaged him to assist in the measurement of an arc of meridian in Holstein. This led to his appointment as assistant to Schumacher at the observatory of Altona, on its foundation in 1823, Hansen's reputation as an excellent mathematician had by this time become generally known, and in 1825 he was selected to succeed Professor Encke as director of the observatory of Seeberg, near Gotha. There he remained for the rest of his life, devoting his talents to the development of the highest branches of mathematical astronomy, with an originality of conception which was acknowledged by the English Royal Astronomical Society on two occasions, by the award

of their gold medal for his researches in physical astronomy — | Sciences, and the Academies of Berlin and St Petersburg.

and his lunar tables. His Zables de la Lune appeared in 1857, published at the expense of the British Government; they have been adopted for use in the calculations of the Nautical Almanac. In addition to his important volume containing the full details of the formule explanatory of his lunar theory, Hansen was the author of a large number of miscellaneous astronomical papers, principally relating to the orbits of comets and planets or to perturbational astronomy. In one of these he was the first to point out that Encke's value of the horizontal equatorial solar parallax required to be increased to reconcile the lunar theory with modern observations,—an opinion which was subsequently confirmed by Le Verrier from his planetary researches, and by the observations of Mars and the transit of Venus of 1874. Hansen was a foreign member of the Royal Society, and an associate of the Royal Astronomical Society. He died on March 28, 1874, at the age of seveuty-eight. HANSTEEN, CuristopHer (1784-1873), astronomer and physicist, was born at Christiania, Norway, September 26, 1784. From the cathedral school he went to the uni- versity at Copenhagen, where first law and afterwards mathematics formed his main study. In 1806 he taught mathematics in the gymnasium of Frederiksborg, Zeeland, and the following ycar he commenced the inquiries in his favourite branch of science—terrestrial magnetism—which have made his name famous. He took in 1812 the prize of the Danish Royal Academy of Sciences for his

reply to a question on the magnetic axes. Appointed Iccturer in 1814, he was in 1816 raised to the chair of astronomy and applied mathematics in the university of Christiania. In 1819 he published his researches on terrestrial magnetism, a work which attracted the notice of the physicists of Europe and particularly of England, where the search for a formula by which the variation of the needle might be found at any given time and place was being actively pursued. The researclies were translated into German by P, T. Hanson, under the title Untersuchungen tiber den Magnetismus der Erde, with a supplement containing Beobachtungen der Abweichung und Neigung der Magnet- nadel, and an atlas. The rules there framed for the ob- servation of magnetical phenomena have been generally followed. Hansteen hoped by them to accumulate analyses for determining the number and position of the magnetic poles of the earth. In prosecution of his researches he visited London, and also Paris and other Continental cities, and travelled over Finland and the greater part of his own country ; and in 1828-30 he undertook, in company with Ermann and Dne, and with the cooperation of Russia, a Government mission to Western Siberia, the chief aim of which was to find the ideal point of the Asiatic pole of laagnetism—ten observatories being established in Russia to further the project. 'The scientific results—magnetic,

soon appeared (Leise-Hrinnerungen aus Sibirien, 1854 ; | Souvenirs dun voyage en Sibérie, 1857); but the chiet _work was not issued till 1863 (Mesultate magnetescher | Beobachtungen, &c.). Shortly after the return of the mission,

an observatory was erected in the park of Christiania (1833), and Hansteen was appointed director. On_ his representation a magnetic observatory was added in 1839. In 1835-38 his text-books on geometry and mechanics were

| published; and in 1842 he wrote his Dzsgwesitiones de | mutationibus quas patitur momentum acus magnetice, &e.

He also contributed various papers to different scientific journals, especially the Magazin jor Naturvidenskaberne, of which he became joint-editor in1823. He superintended the trigonometrical and topographical

survey of Norway, begun in 1837. He wasa member of the Royal Society of London, the French Institute, the American Academy of Arts and

In 1861 he retired from active work, but still pursued his studies, his Observations de U'inelination magnétique and Sur les variations séculaires du magnétisme appearing in 1865. Hansteen died at Christiania, April 15, 1873.

HANUSCH, Icnaz Jowann (1812-1869), Bohemian savant and philosopher, was born at Prague on the 28th November, 1812. He received his early education in his native city, and taught for a short time in a monastic school there. At the universities of Prague and Vienna, where he afterwards studied, he directed his attention successively to theology and law, and finally, under the influence of Hegcl's writings, to philosophy. After temporarily supply- ing in 1835 the place of Lichtenfels, professor of philosophy at Vienna, he was next year appointed ordinary pro- fessor of philosophy at Lemberg, whence he passed in the same capacity to Olmititz in 1847, and two years later to Prague. There he began a successful course of philosophy in the Czech language, but in 1852 was abruptly suspended from teaching, owing to his leanings towards Slavism. He still, however, retained his full salary; and in 1860 he was nominated director of the imperial university library at Prague, where he died on the 19th May 1869.

His chief writings, mainly on philosophic and Slavonic subjects, are the following :— Wissenschaft des Slavischen Mythus (1842) ; text-books in Logic (1848), Ethics (1866), Mctaphysics (1846), and Empirical Psychology (1849) ; Geschichte der Philosophie von thren Uranfingen bis zur Schliessung der Philosophenschulen unter Justinian (1850); Vorlesungen tiber die Kulturgeschichte der Menschheit (1849) ; Quellenkunde und Bibliographic der bohmisch- slowenischen Litcratur (1868). Besides these and others, Hanusch

wrote some works in Czech, and published the works of the old Slavonic philosopher, Ritter Thomas, in 1852.

HANWAY, Jonas (1712-1786), an English traveller and philanthropist, was born at Portsmouth, but he was still a child when the death of his father, a victualler by trade, caused his mother to remove with her family to London.

At the age of seventeen the boy was apprenticed to a merchant in Lisbon, and he remained there till he entered business for himself. In 1743, after he had been for some time again in London, he became a partner with Mr Dingley, a merchant in St Petersburg, and in this way had his attention turned to the trade between Russia and Persia. Leaving St Petersburg on the 10th of September 1743, and passing south by Moscow, Zuritzin, and Astra- khan, he embarked on the Caspian on November 22d, and arrived at Astrabad on December 18th. Here his difficul- ties began. The town was attacked and captured by a rebel, Mohammed Hassan Beg; his goods were seized, and it was only after great privations that he reached the camp of the Shah Nadir. Obtaining an order for the restoration of his goods he returned to Astrabad, and succeeded in recovering about 85 per cent. of their original value ; but he was obliged to retrace his steps, and after a painful

astronomic, and meteorological—form the bases of many | journey, during which he was attacked by pirates, detained valuable theories. A narrative of the personal adventures | by sickness, and obliged to perform six weeks' quarantine,

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he arrived at St Petersburg July 9, 1750. The autumn of that year he spent travelling in Germany and Holland, and on October 28th he landed in England, where the narrative of his travels published in 1753 soon made him aman of note. The rest of his life was for the most part spent in London, and his leisure was devoted to the advocacy and support of all kinds of useful and benevolent enterprises. In 1762 he was appointed one of the com- missioners for victualling the navy, and on his resignation in 1783 he received the whole of his salary as a pension. He died September 5, 1786. Hanway was naturally a healthy and active man; in Russia he was known as the handsome Englishman ; but the efforts of his travels in Persia rendered him somewhat of a valetudinarian, He is popularly known as the first Englishman to carry an umbrella in his native country ; this he persisted in using in spite of all the efforts of the hackney coachmen to hoot or hustle him into conformity. He succeeded in writing down the custom of giving vails; and in his Journey Jrom Portsmouth to Kingston he attacked

the pernicious habit of tea-drinking, which, however, found an able aud ardent defender in Dr Johnson. In 1757 he took an active part in founding the Marine Society, the object of which was to fit out poor boys and men for the navy; he was one of the originators of the Magdalen Hospital ; it was due to his continued efforts that the Act of George III. was passed for the better treatment of the parish infants ; and in 1785 he took up the lamentable case of those little chimney-sweeps whose dangerous occupation is now a thing of the past. The method of svlitary confinement for prisoners found in him one of its earliest advocates, and in various other ways le sought to improve the chances of the criminal population. "Every man," was his theory, 'is capable of good if properly treated. If doing justice to an offender implies an attempt to reform him by using the proper means, by parity of reasoning the using of im- proper means is doing injustice." Hanway's writings are of little value except for the sake of the causes which they supported ; while effective as pamphlets, they lack both style and method, and are apt to run over into platitudin- ous moralizings. See Pugh, Remarkable Occurrences in the Life of Jonas Hanway, 1787.

HAPARANDA, from Zaaparanta, " Aspen-shore," a small town of Sweden in the district of Tornea, at the northern end of the Gulf of Bothnia, in 65°51' N. lat. It lies about a mile from the mouth of the Tornea-Elf, exactly opposite the town of Torne&, which has belonged to Russia since 1809. Haparanda was founded in 1812, and at first bore the name of Carljohansstad or Charles John's Town. It received its municipal constitution in 1842. The inhabitants, who according to the census of 1875 number 944, carry on a brisk trade and engage in ship-building. Since 1859 the town has been the seat of a meteorological station, which is one of the most valuable in Europe, not ouly because it lies so far north, but also because of its position at the head of the Gulf of Bothnia, and immediately to the south of the line of junction between the permanently open sea and the sea which is frozen during the winter months, or, in other words, in the region where at certain seasons there is an extraordinary crowding together of the isothermal lines.

HAPSBURG, or Hatssura (originally HHabichtsburg, that is, Hawkscastle), an old German family which has given sovereigns to Germany, Spain, and Austria, takes its name from the old Swiss castle of Habsburg, now in ruins,

situated on the river Aar in the canton of Aargau. The first mention of the countship of Habsburg is in a document of 1099, where the name Werner, count of Habsburg, occurs in connexion with the consecration of the monastery of Muri as confirming the grants of the pious foundations

made by his ancestors. This Werner of Habsburg was a nephew of Werner, bishop of Strasburg, who built the castle of Habsburg about the year 1020. The succession of the family cannot be traced between this period and the time of the emperor Frederick Barbarossa, but in a docu- ment whose date is 30th May 1153, Werner IL. and his son Albert the Rich are mentioned as counts of H absburg. This Albert was by Frederick created landgrave of Upper Alsace, and received the countship of the district of Ziirich and the protectorship of the monasteries of Seckingen and Murbach; and on the extinction of the house of Zaibringen he also succeeded to a considerable portion of their terri- tories. Albert died in 1199, and was sneceeded by his son Rudolf the Old, who, as a reward for placing a large sum of money at the disposal of Frederick II., received from him the countship of Aargan. He held an influential position among the Swabian nobility, and so increased his possessions that they included the territories of the bishops of Strasburg, Constance, Basel, Coire, Ghent, and Lausanne, and of the abbot of St Gall, in addition to which he also obtained the countship of Frickgau. Rudolf left behind him two sons, Albert the Wise and Rudolf IL ; who shared the possessions between them, and founded respectively the lines of Hapsburg-Hapsburg and Haps- burg-Laufenburg,—Albert, besides the castle of Hapsburg, holding the lands in Aargau and Alsace, and Rudolf the countships of Klettgau, Rheinfeld, and Laufenburg, and the possessions in Breisgau. The Laufenburg line also divided into two branches, the former of which became extinct in 1408 and the latter in 1415, Laufenburg thereupon fell to Austria, and Klettgau, through the marriage of the female heiress of the line, to the counts Sutz, from whom it passed by marriage in 1687 to the house of Schwarzenberg. Albert the Wise of Hapsburg- Hapsburg was married to the countess of Kyburg, who was descended from the dukes of Zihringen, and related to the emperor Frederick IJ. From this union there was born on the Ist May 1218, Rudolf, the founder of the royal dynasty of Hapsburg. He was elected king of Germany in 1273, and after the defeat

and death of Ottocar, king of Bohemia, in 1278, at Marchfeld on the Danube, he annexed to his possessions Austria, Styria, Carinthia, and Carniola. On the death of Rudolf in 1291 Adolf, count of Nassau, was elected his successor to the German crown, but although on the death of Adolf it again reverted to the Hapsburg line in the person of Albert IL, it passed on his death to Henry, count of Luxembourg, and with the exception of the doubtful period when Frederick, eldest son of Albert, and Lewis, duke of Bavaria, divided the suffrages of the electors and were crowned, the one at Boun and the other at Aix-la-Chapelle, the Hapsburg line remained excluded from its possession till the time of Albert II., who succeeded Sigismund as king of Bohemia and Hungary in 1437, and was chosen emperor of the Romans in 1438, he greater part of the original lands of the house were gradually lost by the victories of the Eidgenossen, who finally in 1474 obtained Aargau, in which the castle of Habsburg was situated. Philip, son of Maximilian I. and of Donna Jnana of Spain, ascended the Spanish throne in May 1506, and on his death in September of the same year, he was succeeded by Charles I., who was chosen emperor in 1519, and was thenceforth known as Charles V. In 1521 Charles granted his Austrian possessions to Ferdinand I., who became the head of the Austrian dynasty. The Spanish brauch became extinct in 1700 with the death of King Charles II., and the male line of the Austrian branch became extinct with the death of the emperor Charles VI. in 1740; but the Austrian house was continued in the female line by Maria Theresa, who by her marriage with Francis of Lotharingia, chosen emperor in 1745, founded

the line of Hapsburg-Lotharingia, from which the present imperial dynasty of Austria is descended.

The main facts of the history of the house of Hapsburg, from the time of Rudolf I., king of Germany, will be found in the articles Austria (vol. iii. p. 124), GERMANY (vol. x. p. 496), and SPAIN. See also Coxe's House of Austria, 2 vols., London, 1807 ; Herrgott's Genealogia diplomatica auguste gentis Habsburgice, Vienna, 1737- 38; Kopp's Vindiciee Actorum Murensium, Leipsie, 1751; Ropell, Die Grafen von Habsburg, Halle, 1832; Lichnowski, Geschichte des Hauses Habsburg, 8 vols., Vienna, 1836-37;

Huber in the Almanac of the Vienna Academy for 1873; Miineh, "Die Miinze zu Laufenburg, nebst einem Abriss der Geschiclite der Grafen von Habsburg-Lanfenburg," in Argovia, vol. vii., 1874; and the same writer's "Regesten der Grafen von Habsburg, laufenburgischer Linie, 1198-1408," in vol. x. of the same publication, 1879.

HAPUR, or Hapoor, an ancient town of India in the Meerut district, North-Western Provinces, 28° 43' 20" N. lat., 77° 49' 45" E. long., lies on the Meerut and Buland- shahr road, 18 miles south of the formercity. During the mutiny, Walid4d Khan of Malagarh threatened Hapur, but was obliged by the loyal Jats of Bhatona to retire. Several fine groves surround the town, but the wall and ditch have fallen out of repair, and ouly the names of the five gates now remain. It contains a tahsili, a police station, school-house, dispensary, 3 sardis, 28 mosques, and 25 temples. Considerable trade is carried on in sugar, grain, cotton, timber, bamboos, and brass utensils. Population (1872), 14,544, comprising 8696 Hindus, 5847 Mahometans, and 1 Christian. Municipal revenue (1875-76), £1208.

HARAN, or Cuarran (Hebrew, 11); LXX., Xappay or Xafpd; Strabo, Kdfpar; Pliny, Carre or Carrhe ; Arabic, HZarrdn) is the name of a fertile district in the north of Mesopotamia (Padan-aram or Aram-naharaim), and also of a town situated some 10 miles south-eastward of Edessa (Orfa), on the banks of the small river Belik about 50 miles to the north of its junction with the Euphrates. It thus lies immediately on the highway between Arrapachitis and Canaan, and at the point where that highway is crossed by the great western road connect- ing Media, Assyria, and Babylonia with the Cilician coast. For the Assyrians accordingly it became a strategic position of first-rate importance, and in this aspect it is mentioned in inscriptions as early as the time of Tiglath Pileser I., about 1100 3.c. (see Schrader, Die Keilinschriften und das alte Testament, p. 45; and compare 2 Kings xix. 12, Isa. xxxvii. 12). It also, for the same reason, ultimately be- came the centre of a considerable commerce (Ezek. xxvii. 23), one of the specialities particularly named being the odoriferous gum derived from tlie strobus (Pliny, ZZ. W., xii. 40). It was here that Crassus in his eastern expedition was attacked and slain by the Parthians (53 B.c.); and here also the emperor Caracalla was murdered at the instigation of Macrinus (217 «.p.). Herodian (iv. 13, 7) mentions the town as possessing in his day a temple of

the moon ; in the Middle Ages it is mentioned as having been the seat of a particular heathen sect, that of the Haranite Sabeans. It retained its importance down to the period of the Arab ascendency ; but by Abulfeda it is mentioned as having before his time fallen into decay. It isnow wholly in ruins. According to the patriarchal history (Gen. xi. 31), Haran was the first resting-place of Terah and his family after their migration from Ur of the Chaldees, and here Terah and Nahor remained when Abraham and Lot passed on to Canaan. According to Dr Beke, indeed, this Haran is not the well-known town on the Belik, but "a place of that name (Harran el-Awamid) between Abana and Pharpar, the two rivers of Aram or Syria" (see Journ. of Loyal Geog. Soc., vol. xxxii.). His arguments, however, have not beel generally accepted as sufficient to set aside the powerful evidence in favour of the Mesopotamian site.

HARAR, Herer, Hurrur, Harrar-Gay, or ARARGE, a city of north-eastern Africa, in the country of the Gallas, at

one time the capital of the province of Iladiyal in the Zayla empire, for a long period a small independent state under an emir of its own, and since 1876 subject to the Egyptian crown. The Somali call it Adari and the Gallas Adaray. According to Burton it stands iu 9° 20' N. lat. and 42° 17° E. long, but the Bulletin de Vétat major général de Varmée égyptienne makes the latitude 9° 26' and the longitude 42° 6'. The height above the sea is according to Burton 5500 feet, and according to the Bulletin 5580. A stone wall, pierced by five gates aud flanked by 24 towers, encloses the city, which occupies an area of 128 acres on the irregular slope of a hill, and comprises 9560 liouses and 346 huts, arranged in narrow streets that run up and down hill. There are five mosques withiu the walls, but only one, the jami (or cathedral, so to speak), is a building of considerable dimensions. The palace of the emir is a mere shed, long, single-storied, and windowless. Among the chapels to Mahometan saints it is enough to mention that of Sheikh Umar Abadir El Bakai, the patron of the city. Harar has long been the seat of a considerable com- merce, though before the Egyptian conquests the merchants had to submit to the exorbitant exactions of their Galla neighbours, who had eommand of all the caravan routes. Slaves, ivory, coffee, tobacco, safflower, cotton eloths, mules, holcus, wheat, glue, honey, and gums are mentioned by Burton among their principal articles of

trade, in return for which they brought back a great variety of wares for local consumption. The Harar coffee especially has a high repute, and the tobacco also is good. The kat or gat (Catha edulis of Forskal), the leaves of which are a favourite stimulant or narcotic in north-eastern Africa, grows abund- antly in the neighbourhood ; and the inhabitants often sit together reading the Koran and enjoying the drug for ten or eleven hours at a time. The rainy season at Harar begins about the 15th of March, and lasts for six months, the heaviest rains occurring about June. In the hot season the thermometer reaches 61° Falr.; in March and April it is not more than 49°. According to Burton the population of the city was only 8000, of whom 2500 were Somali and 3000 Arabs; but the Budletin states the total at 35,000.

The Harari proper are of a distinct stock from the neigh- bouring peoples, and speak a special language. A small glossary in Salt's Abyssinia, and another in the Philological Journal for 1845, were the only materials available for the investigation of the language previous to the publication of Burton's sketch in his 'irst Footsteps in North-Hastern Africa. By him it is maintained that the Hararese is gemi-Semitic or, like the Galla, Dankali, and Somali, "a Semitic graft inserted into an indigenous stock ;" and his opinion is followed by Bleek and Lepsius. The older statement, strongly supported by Burton, that the lan- guage is fundamentally Semitic, and has a special affinity with Amharic, has in its favour no less authorities than Friedrich Miiller (Sitzungsbericht der Wiener Akademie, Dec. 1863) and F. Pretorius ('Ueber die Sprache von Harar," in Zeitschrift der deutschen Morgenldnd. Gesell., 1869). The Harari are Mahometans of the Shafa'i or Persian sect; and they employ the solar year and the Persian calendar. Monogainy prevails, and the women exercise great social influence ; but the moral character of the people is said to be very low. It was in 1521 that Harar became a Mahometan city. Burton, the first European to put foot within its walls, spent ten days there in 1854-55, but it was only under the guise of an Arab that he was able to do so. Mohammed Mokhtar, the Egyptian general, has drawn up a sketch of the history of Harar from the native manuscripts brought with him to Cairo, and in company with Abd' Allah Faouzi he has published a plan of the town in the Bulletin already quoted (Cairo, 1876).

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HARBOURS AND DOCKS

I. HAarRBours.

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a very heavy sea it is often found necessary to make a

Plates LL harbours may be classed either as havens for the | double or compound harbour (fig. 1, 6). In such a case a protection of ships during storms, or as ports suited | the entrance to the inner basin is situated within the shel- : for commercial purposes. Of the first mentioned class, or | tered area formed by the outer works, those which are called harbours of refuge, some are natural 3. Kanted or Curved Piers (fig. 1, c).—Where there is and some artificial. a single pier of this kind vessels lie under the lee of the The designing of harbours constitutes confessedly one | kant or kauts, and the sheltered side of the pier is therefore of the most difficult branches of civil engineering. In | finished as a quay. As the outer end of any such single making such a design the engineer, of course, avails himself pier is surrounded by the open sea, it may be convenient of the information which is derived from past experience, | to call ita "free end" in coutradistinction to the outer end and endeavours, to the best of his power, to institute a! of a close harbour, where the sea room in the fairway is comparison between the given locality and some existing | limited to the breadth of the eutrance which ought, for harbour which he supposes to be similarly situated. sheltering the basin, to be made as narrow as is consistent Perfect identity, however, in the physical peculiarities of | with the safe passage of vessels. Both extremities of all different localities seldom if ever exists, and all that can single insulated breakwaters are of course free ends, as are be done in deriving benefit from past experience is to select | also the seaward ends of all single breakwaters which are the harbour which seems most nearly to resemble the pro- | connected with the land, posed work. 4, Straight Piers

(fig. 1, d).—A straight pier generally In order the better to understand the nature of the projects at right angles to the coast line, with a free end difficulties which beset the marine engineer, let us suppose | at its seaward extremity; and, unless when the wind blows that he is called upon to design works for the accommoda- right in upon the shore, a straight pier will always afford tion of shipping in a given locality. The questions which | some shelter on its lee side. immediately press on his attention are—(1) What is the 5. Quay or Wharf (fig. 1, e).—A quay wall is usually cheapest kind of design that is suitable for the place and | built parallel to the Jine of shore. It affords no shelter of sufficient for the class of shipping which has to be accom- any kind, and the only advantage which it possesses is that modated? and (2) What are the smallest sizes of materials | of enabling vessels to load and unload without their having and thickness of walls that are admissible in its construc- | to "'beach," or, where the shores are steep, even to take tion? as on these the cost of the work will materially depend. | the ground. Before considering how far it is possible to answer such ques- It will be observed that all the kinds of piers or harbours tions, let us éndeavour to define the varieties of design into | just enumerated differ materially from each other in tke which all sorts of harbours may, with propriety, be resolved. | amount of shelter which they afford, and are suitable for In the first place they may be all classified under two | places having very different degrees of exposure. The first nain heads—viz., interior works and exterior works. step to be taken, therefore, is to select from the different The interior works are provided for the accommodation | classes of designs which have been enumerated the ono and repair of vessels, while the exterior works may be con- | which is best adapted to the physical peculiarities of the eniently enough divided into the following five classes. situation. The engineer in order to make this selection Different 1. Harbours of Refuge and Anchorage Breakwaters.— judiciously must keep in view the essential elements of iia These consist of one or more breakwaters, so arranged as to | stability, economy, safety of ingress and egress, and con-

form a safe roadstead, which shall be easily accessible to the largest vessels in all states of the weather and tide. A breakwater forms a barrier either complete or partial to the progress of the waves, and is intended for sheltering the anchorage ground under its lee. It is not used for com-

mercial traffic as are piers .or quays, and therefore a parapet is not necessarily required for preventing the waves from breaking over the top, although this may be useful as a protection against the wind.

venient accommodation for the trade of the port. If the place be much exposed, he must therefore arrange the different parts of the work so as to produce a harbour which may be easily taken and left in stormy weather, without endangering the tranquillity of the internal area; for it is the combination of the qualities of an easy and safe entrance and exit, with a good "loose" and a smooth interior, which alone constitutes a good harbour. Lastly, he must fix the width of the piers and height of the parapets.

2. Deep-water and Tidal Harbours for Commercial Pur- poses (fig. 1, a, b). —A harbour for commercial purposes is any arrangement of piers or breakwaters, or of both, which

The local characteristics which at the outset demand our Local consideration are—(1) the geological and other physical charac- peculiarities of the shore ; (2) the exposure ; (3) the force of te"stics. the waves due to the exposure; (4) the strength, direction, and range of the tides ; (5) the depth of the bay or sea in which the harbour is to be built ; (6) the proximity of deep water to the works, or in other words, the slope of the fore- shore; and (7) the angle at which the heaviest waves impinge on the coast line and on the works.

Before considering some of these questions the reader may refer to figs. 2 and 3, on which are marked the techni- cal names of different parts of harbour works.

Generation of Waves.

Mistakes as to the level of the highest tides are some- Level of times made by drawing too hasty conclusions from the plane of presence of vegetable life. In the Shetland Islands there ction of may often be seen large blocks of rock (and to these refer- ha ence will afterwards be made), which during storms have

Fig. 1.

encloses and so tranquillizes a sheet of water, that vessels may be moored at the quay walls or wharves which form the inner sides of the piers. Where the coast line lies open to

Level of mud a measure of ex- posure.

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been driven over the land at heights much greater than that at which vegetation commences and far above the ordinary run of the surf.

he level below the surface of low water at which mud reposes will be found of very considerable value in judging of the exposure of a coast. It may appear unlikely that the disturbance of the surface of the sea occasioned by storms should be propagated to great depths, but there is no want of evidence on this head. Sir G. B. Airy, the astronomer- royal, has shown, on theoretical grounds, that at a depth equal to the length of the wave the motion is <4, of that at the surface, and mentions that heavy ground swells break ina depth of 100 fathoms, Sir J. Coode found, from under- water examinations made with the diving dress, that the shingle of the Chesil Bank was moved during heavy winter storms at a depth of 8 fathoms ; and Captain E. K. Calver, R.N., has seen waves 6 or 8 feet high change their colour

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Fig. 3. from the abrasion of the bottom after passing into water of

7 or 8 fathoms. Captain Cialdi maintains that waves may excavate the bottom ata depth of 655 feet in the ocean, of 163 feet in the Mediterranean, and of 132 feet. in the English Channel and Adriatic. From these statements it may easily be inferred that in exposed situations mud can- not repose near the surface. Applying such a test to the German Ocean, it is found that in Shetland mud lies in from 80 to 90 fathoms below low water, and its level gradually rises till, on the coast of Holland, it is found at a depth of from 16 to 12 fathoms at the mouth of the Elbe. Now, the violence of the waves upon the shores of the German Ocean certainly corresponds with the rise in the level of the mud, there being a gradual decrease as we come from Shetland and the north of Scotland—where, as will be afterwards shown, wonderful energy is displayed by

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the sea—to the coasts of Holland, where the waves are much modified. Although it is no doubt true that the flat- bottom vessels of the Dutch are built purposely for resist- ‘ing a heavy surf, still the fact of their being able to take the open beacli in nearly all weathers without any protection from harbours proves that the waves are very mucli reduced before they reach the Dutch coast. Mr Hyde Clarke says _“©On the coast of Zealand the Dutch reckoned 84 feet as the greatest height to which any wave would be thrown.”

Tn comparing an existing harbour with a proposed one, perhaps the most obvious element is what may be termed the line of maximum exposure, or, in other words, the line of greatest fetch or reach of open sea, and this can be easily measured from a chart. But though possessed of this information, the engineer still does not know in what ratio the height of the waves increases in relation to any given | increase in tlie line of exposure.

In 1852, in the Edinburgh New Philosoph. Journal, Mr Thomas Stevenson stated as the result of experimental observation that the heights of the waves were most nearly "in the ratio of the square roots of their distances from the windward shore;" or, when h=height of wave in feet, d=distance in miles, and a a coefficient varying with the strength of the wind, then

h=a/d.

The truth of this law has since then been variously tested.1 The accompanying table contains some of the observations made in 1850-52, as well as later observa- tions on the effects of heavy gales which could only be made at long intervals of time :—

Height due to

Height due to Fetch, calculated

Length of Qpseryed | Fetch, caleu-

*Place of Fetch in ; from Formula Observation. Miles = al of * oe h=l5,/d Nautical. a haV50/d. +(2°5— £/d). a ' Vide p. 457. Scalpa Flow…....— 10 4:0 15 30 Firth of Fortl…....0. 13 18 1:8 8°2 GTANtON .iseeecoeeceseee 2°8 40 2°5 3°75 CLAIZNUTE ....seeeeeeeee 35 2°0 29 39 GYANLON .....00ceeeees 6°0 40 a7 4°6 Lough Foyle …... T5 40 41 4:96 Clyde.. ie 9:0 40 4°5 525 Colonsay 9:0 50 4°5 5°25 Dysart… 10:0 4:2 4:9 55 Invergordon 11:0 3°5 50 57 Lough Foyle .. 11°0 50 5'0 57 Glenluce Bay . 135 55 56 61 PmSeTREOE ine sls B&O 65 TS a Lake 0 eneva, ' : 4 : stated by Minard? } i e3 $2 837 Buk id nesstesstieces <<.) B10 70 84 85 % iieeer neue 38°0 70 912 9°2 és 38°0 8:0 9°2 92 ae ey ees 40:0 8-0 9°55 95 Macaull ….cc..2- 44°5 80 10°02 9°9 eh nen waaay, Mae D 100 10°20 100 Douglas, Isle of Man, St George's | 65°10 10°12 12:0 : Channel….0c.c0- Kingstown'....., 1140 15:0 16°0 15:25 Sunderland; dis: tance meaware | 165°0 15° 193 18°15 from Broken Bank ——a – 189°7 153°57 162°68 Some of these earlier results have also been laid down in fig. 4, so as to form a storm curve, but since the dia- gram was made many more observations have been obtained which corroborate the law.*

The formula h=1°5 ,/d is represented by the parabolic curve in the diagram, which indicates pretty nearly the height of waves during heavy gales, at least in seas which do not greatly differ in depth from those where the obser- vations were made. This formula is of course inapplicable where the water is not of sufficient depth to allow the

2 Jt follows from this law that the heights of embankments of reser- voirs above the water surface should, ceteris paribus, be "proportional to the square roots of the lengths of water over which the wind acts.

2 Cours de Construction des Ouvrages Hydrauliques, Liége, 1852, p. 8.

3 Mr Mallet, who made these observations, said that the extreme waves appeared to be about twice this height.

Line of maxi-

mum ex-

posure,

Law of ratio of square roots of the dis- tances

from the

wind- ward shore.

HARBOURS

waves to be fully formed, or where it becomes so shallow as to reduce their height after they are formed.

It must be observed that in short fetches, as in narrow lochs or arms of the sea, waves are raised higher during very violent gales than the formula indicates; though it does not appear that such waves go on progressing in height in the same high ratio for any considerable distance.

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Vertical Scate. Fig, 4.

For short reaches and violent squalls, the formula given in column 5 of the foregoing table will be found more suitable, viz. :—

h=1‘5 / d+(2‘5-#/d)

For all ordinary situations the results in the following

table will be found sufficient as a general guide.

Lable showing approximate Heights of Waves due to lengths of Maximum Fetch by the Formule.

Miles, | lleights. || Miles. | Heights. || Miles. | Heights. || Miles. | Heights, 1 3°0 (gl 39 9°4 130,|| P71 2 3°4 732 40 9:5 140 | 17°7 3 3°8 74 41 9°6 150 | 18°4 4 4°] igs 42 9°7 160 | 19°0 5 4°3 7°6 43 9°8 170 | 19°5 6 4°6 78 44 9:9 180 | 2071 7 4°8 79 45 10:0 190 | 20°7 8 BO jf 27 | 80 46 10°2 200 | 21°2 9 53 28 Srl 47 10°3 210 | 21°7 10 56 29 8°3 48 10°3 220 | 22°2 all 57 30 8°4 49 10°5 230 | 22°7 12 5-9 31 8°5 50 10°6 240 | 23°2 13 6°0 32 8°6 60 11°6 250 | 23°7 14 6°2 33 8°8 70 12°5 260 | 24:2 15 63 34 8°8 80 13°4 270 | 24°6 16 6°5 35 8‘9 90 14°2 280 | 25°1 Wi, 6°7 36 9°0 100 15:0 290 | 25°5 18 6°8 37 9°2 110 ae? 300 | 26°0 a 7°0 38 9°3 120 16°4

Maxi- The Comte de Marsilli, in 1725, observed waves 14 feet mum re- 10 inches in height where the longest possible fetch is 600 corded I At Wick ith height of Miles. ick, with much the same exposure, waves of Graves, sbOut 40° feet have been seen to strike the breakwater. But the highest which are known to have been accurately measured were by Dr Scoresby in the Atlantic, where they attained the height of 43 feet above the hollow. Cialdi gives observations of others which were from 60 to 108 feet high, but he dves not state how the heights were ascertained. Maxi- It does not follow, however, that the line of the maximum Bcc exposure 1s 1n every case the line of maximum effective force’ Erecvare of the waves, for this must depend, not only on the length —ob- Of fetch, but on the angle of incidence

of the waves on the lique _ walls of the harbour. What may be termed the line of

i f maximum effective exposure is that which, after being

“corrected for obliquity of impact, produces the maximum

result, and this can only be ascertained from the chart by successive trials.

Let x= the greatest force that can assail the pier, h= height of

waves which produce (after being corrected for obliquity) the maxi-

20FEET.

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mum effect, and which are due to the line of maximum effective exposure, a = azimuthal angle formed between the directions of pier and the line of exposure ; then, when the force is resolved normal to the line of picr,—

. xech sin %e ; but if the force be again resolved in the direction of the waves themselves, the expression becomes

x«h sin 3a,

It should not, however, be forgotten, in connexion with this subject, that in some cases there are modifying elements to which special attention requires to be given. The waves, for example, when approaching the land obliquely, alter their direction when they get close to the shore, in consequence of the change of depth, and from this cause they approach more nearly at right angles to the general line of the beach, and thus strike with greater force than the line of maximum effective exposure would lead us to expect.

The extraordinary difference between waves which impinge at right angles

and others which have even a very slight amount of

obliquity has been shown in the most unmistakable man-

ner at the Wick breakwater, where all attempts to make | the work stand when exactly at right angles to the waves have hitherto been unsuccessful. It was found by ob- servation that while waves coming from the direction of 8. by E. struck the outer part at normal incidence, they struck the landward end of the same kant at an angle of 81°, giving 9° of obliquity. This small measure of relief was found to make a great difference in the impact upon the wall.

The value of the line of effective exposure varies in certain localities with the geographical configuration of the land, as in Loch Fyne, where the wind seems to alter its direction with the winding of the loch, so that the effective fetch is greater than the width of free water at the place. On the other hand, where the channel expands, the height of the waves is decreased, as at Craignure in Mull, where the highest wave observed during the winter of 1853-4 was very much less than the formula indicates.

In a case such as represented in fig. 5, the waves which enter the entrance channel or harbour mouth B, though generated appa- rently in the fetch AB, are largely due to the fetch CB. For the waves generated in the length CA pass round the point A, and are thereafter subject to the impulse of the wind along the line AB. The waves then which enter the harbour mouth, instead of having their point of genesis at A, really

i Fig. 5. take their origin at OC, and their height is due to the fetch CB, though reduced by a deflexion round the point A. Lateral friction is due to the passage of the end of the Lateral wave along the face of a vertical wall, while lateral erosion friction

and

is due to the end of the wave breaking as it passes along caibes

the face of long talus .walls or sloping beaches.

Force of Waves.

Smeaton, in referring to the propriety of using joggles in the masonry of the Eddystone Lighthouse, says—" When we have to do with and to*

endeavour to control those

XI. — 58

Thomas Steven- gon's marine dyna- mometer.

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powers of nature that are subject to no calculation, I trust it will be deemed prudent not to omit, in such a case, any- thing that can without difficulty be applied, and that would be likely to add to the security." This statement of our greatest marine engineer indicates the propriety of carefully collecting any facts that may help us to a more accurate estimation of those forces which he regarded as being " sub- ject to no calculation."

At the Bishop Rock lighthouse, a bell was broken from its attach- ments at the level of 100 fect above the high water mark during a gale in the winter of 1860, aud at Unst, the most northern of the Shetland Islands, a door was broken open at a height of 195 feet above the sca. 'To these facts it may be added that, as proved by the testimony of an eye-witness, a block of 50 tons was moved by the sea at Barrahead, one of the Hebrides. But still more extra- ordinary effects have been observed at Whalsey in Shetland, where heavy blocks have been quarried, or broken out of their beds in sié2e, on the top of the Bound Skerry at a great elevation above the sea. On the south-cast side, about 370 fect from the low watcr mark, and at a height of 62} feet above its level, there occurs a remarkable beach of angular blocks varying in size from 94 tons downwards, which are huddled together just as one would have expected to find, had they been elevated only a few feet above the high water level. Towards the north-east at the level of 72 feet above the sea, in ad- dition to many smaller blocks which had evidently been recently detached, there was one 54 tons in weight. It presented the appearance of recent detachment, having a fresh unweathered look. Within 20 feet of the spot where it lay, there was a comparatively recently formed void in the rock, which upon exantination and com- parison by measurement was found to suit exactly the detached block. ere then was a phenomenon so remarkable as almost to stagger belief—a mass of 54 tons not only moved but actually quarried from its position in sitw at a level of 72 feet above high water spring tides ; and higher up still there was another

detached rock weighing no less than 184 tons tilted up in a peculiar position, and underneath which numerous angular masses had been wedged, obviously by aqueous action.

But by far the most striking effects as yet recorded were at the harbour works of Wick, which were commenced in 1863, and con- sisted of blocks of from 5 to 10 tons set on edge, first built above high water neap tides with hydraulic lime, then with Roman and latterly with Portland cement. In October 1864, 300 fect of the contractor's staging were carricd away ; and greenheart were afterwards substi- tuted for Memel piles, but these too were broken by the sea. The first portion of the wall was, in conformity with usual practice, founded at 12 feet below low water, but 18 feet was subsequently adopted, and the rubble has since been washed down to 15 feet below that level. In 1872a huge monolithic block of concrete, weighing in all 1350 tons, was removed en masse out of its position and carried to leeward of the breakwater. Extraordinary as this may appear, it was surpassed in 1878, when another conerete mass which had been sub- stituted for the one that was moved, was in like manner carricd away, though it contained 1500 cubie yards of cement rubble, the weight of which was about 2600 tons.

Pee. 6501939 8 @ 8 & 2 8.8 DH TL WBaAnches

Fig. 6.

The marine dynamometer was constructed by Mr T. Stevenson for the purpose of ascertaining the force of the waves against an ob- stacle. DEFD (fig. 6) is a cast-iron cylinder, which is firmly bolted at the projecting flanges G to the rock where the experiments are to be made. This cylinder hasa circular flangeat D. Lisa door which is opened when the observation is to be read off. A is a circular disk on which the waves impinge. Fastened to the dise are four guide rods B, which pass through a circular plate C (which is serewed down

to the flange D), and also through holes in the bottom of the cylinder EF. Within the cylinder there is attached to the plate Ca very strong steel spring, to the other or free end of which is fastened the small circular plate K, which again is secured to the guide rods B. There are also rings of leather

T, which slide on the guide rods, and serve as indices for registering how far the rods have been pushed through the holes in the bottom EF, or, in other ! words, how far the spring has been drawn out by the action of the

waves against the disk A. These disks were from 6 to 9 inches in

diameter.

The greatest result obtained by the dynamometer at Skerryvore Lighthouse, in the Atlantic, was during the heavy westerly gale of 29th March 1845, when there was registered a force equivalent to 6083 Ib, or nearly 8 tons, per square foot, deduced from the area ex- posed. The next highest was 5323 1b. In the German Ocean the greatest result obtained at the Bell Rock was 3013 Ib per square foot. But subsequent and much more exteuded observations at Dunbar, in the county of East Lothian, gave 34 tons ; while at the harbour works of Buckie, on the coast of Banffshire, the highest result of observations, extending over a period of several years, was 3 tons per square foot.

Mr David Stevenson, when referring, in 1835, to the Depth in lakes in North America, pointed out that the general depth front of of water must, in order to allow the waves to be fully ens,

. ur formed, be considerable, and that the sea must be unob- regulates structed by shoals, and also of sufficient area to admit of the the wind acting fully on the water. height

*If in front of a harbour shoal water extends seawards for °! ¥@¥e**

a considerable distance so as to form an extensive flat fore-

shore, the depth of water above it becomes the true limit

of the maximum wave, whatever may be the general depth

of the sea outside. But at Arbroath harbour and at Alne

mouth, the heaviest waves are tripped up by the shoal ; water near the mouths of the harbours, and are not found

su dangerous to the works inside as the smaller waves

which reach the beach in an unbroken state.

Mr Scott Russell states that waves break when they Depth in come into water of the same depth as their height. At Which Wick, however, the height of the waves above the mean} 'y: ; level was about two-thirds of their height. In 1870, at ; Scarborough, it was found that waves of from 5 to 6} feet broke when the depth was 10 feet 3 inches below their troughs, and 6 fect waves broke in water 13 feet 8 inches deep, which would for waves of this class give h=4d, where d is depth below mean level, and A the height from hollow to crest.

The late Dr Macquorn Rankine has shown that, theoreti- cally, the mean water level is not situated half way between the crest and trough of the sea. The following formule furnished by him give the mean level of the sea from the height and length of the wave. These formule are exact s only for water of considerable depth as compared with the length of the wave. For shallower water they are only

approximate :— Let L be the length of a wave, H the height from trough to

nl.

erest; then, diameter of rolling cirle= =e , radius of orbit of particle = 4H, and elevation of middle level of wave above still water = St pe 78540

41, i Consequently—

2

Crest above still water -2 -f 7854 : Trough below still water 2 – 7854 ;

Deep-Water Harbours.

Harbours of refuge are distinguished from tidal harbours maiuly by the superior depth of water which they possess and the larger area which they enclose. The requisites are—shelter during storms, good holding ground,

and easy access for shipping at any time of tide and in all states of the weather

Oblique force in vertical plane.

the sea-level ; and a breakwater has to stop their onward motiou within a given space or else to change the direction of their movement. There are two ways in which this work can be performed. One is by means of a plumb wall to alter the direction of the moving water by causing it to ascend vertically, and then to allow it to descend vertically, by which process the waves are reflected and sent back seawards. Another mode is to arrest the undulations by a sloping wall of length sufficient to allow the mass of elevated water to fall down upon the slope. If, however, the slope is not long enough to enable the waves to destroy themselves, they will, though reduced in height, pursue their original direction and pass over the top of the breakwater. In this case the breakwater does not do its full amount of work, and imperfect shelter is obtained.

The principle asserted in favour of the vertical wall is that oceanic waves in deep water are purely oscillatory, and exert no impact against vertical barriers, which are therefore the most eligible, as they have only to encounter the hydrostatic pressure due to the height of the impinging billows which are reflected without breaking.

From the effect of winds and tide-currents already re- ferred to, and perhaps from other causes, the action of which seems to have been overlooked by the advocates of the upright wall, we have good reason for believing that any form of barrier, in whatever depth of water it may be placed, must occasionally be subjected to heavy impact. The possibility of waves of translation being generated in the deepest water is established by the following facts :— first, that oceanic waves break, partially at least, long before they reach the shore, because (as admitted by the advocates of the purely oscillatory character of oceanic undulations) the depth of water is too small to admit of their being fully pro- pagated ; secondly, that waves in strong tideways break in deep water during calm weather—a phenomenon which is apparent to the eye and familiar to all sailors ;

thirdly, and negatively, that to leeward of those races which produce broken water, and which certainly do not reflect the incom- ing waves, there is comparatively smooth water both at sea and on the adjoining shore until the strength of the tide is exhausted and the race has disappeared, after which violent action is again fully manifested on the shore. Even a vertical wall, if built of ordinary masonry in courses, must during its formation present to the action of the waves at its unfinished end a sloping or at least a stepped face like a talus wall, but which, unfortunately for its stability, possesses none of the advantages of such a finished work. In short, during the most critical period of the history of every built vertical wall, the face work and heart- ing are exposed, at the outer end, to the force of breaking waves. At Dunbar the force against the unfinished end of a nearly vertical wall was found by the marine dynamo- meter to be nearly six times greater than on the face of the finished wall, where the waves were at the time purely oscillatory.

An important advantage of the sloping wall is the small resistance which it offers to the impinging wave, but it should also be borne in mind that the weight resting on the face-stones in a talus wall is decreased in proportion to the sine of the angle of the slope. If we suppose the waves which assail a sloping wall to act in the horizontal plane, the component of their impulsive force at right angles to the surface of the talus will be proportional to the sine of the angle of inclination to the plane, while the effective force estimated in the horizontal plane will be proportional to the square of the sine of the angle of inclination. But if we assume the motion of the impinging particles to be hori- zontal, the number of them which will be intercepted by

the sloping surface will be also reduced in the ratio of the |

sine of the angle of inclination, or of the inclination of the wall to the vertical. Hence the tendency of the waves to produce horizontal displacement, on the assumption that the direction of the impinging particles is horizontal, will be pro- portional to the cube of the sine of the angle of elevation of the wall.

If it further happens that, owing to the relative direction of the pier and of the waves, there is an oblique action in azimuth as well as in altitude, there

will beanother similar reduction in the ratio of the squares or cubes of the angle of incidence, according as the component of the force is reckoned at right angles to the surface of the pier or in the direction of the waves.

Let f=force of the wave on unit of surface of wall for perpen- dicular incidence ; J'=force on unit of surface at vertical incidence g and

azimuthal incidence y ; then, /' &f (sin @ sin y)3.

The amount of shelter which is produced by a breakwater Pro- must be measured by the length of the portion of wave tective which is either destroyed or reflected by it. The amount aoe 2 of work done by it decreases from the maximum, which is chy : at normal incidence, to zero when tlie waves come upon it propor- "end on," in which last case it ceases to act as a breakwater tional to at all, unless to the extent due to lateral friction or erosion there- where there is a wall or a slopé on which the end of the a waves can break. oo

If a breakwater be so situated in relation to the coast line A break- that waves may strike obliquely upon its inner or sheltered water side, an extension of its length in the same direction will ™2Y in- increase the amount of sea intercepted by it. The length- iyo euing of a breakwater may therefore, during certain winds, waves. increase the sea within the harbour instead of reducing it. In such a case the extension should, if possible, be made ina dif- ferent direction, or a separate breakwater may be brought from the shore so as to shelter the inner side. If these works cannot be undertaken, then an addition to the sheltered space within must be provided in which the waves can spread, or additional slopes be provided on which they can break.

The table of the principal proportions of some of the most remarkable breakwaters given on p. 460 may be found useful as a guide in designing works of a similar kind.

The following costs of different breakwaters are from the Cost of minutes of the Institution of Civil Engineers and other break- sources :— —

Depth of

Ni f Cost per | Cost Lin. ‘ pitts, | Warn | Gorbper | Conner 230. | Renna ‘ £ £ Joliette, Marseilles} 5 to 6 te 215 Marseilles (new)...| 5 to 6°6| 109 328 : Convict Borbland’:..... 8 to 10/116 to 120/348 to 360 iat: No rubble, I] Jar, PAIGIOTS eames esse 0s 6 to 9 1122 366 uae blocks. Holyhead .. ..,..... 3to7 |about 163 480 ° PANGETMCY ve .c.:..00-s 3°3 170 510 lymroith …....: 66 to 7°5| 200 600 WOM CTircscs soaesss sich [66 to 8°3} 360 1080

Although some of these prices have given rise to length- ened discussions as to the comparative economic advantages of the various designs, the results have not been of much value, on account of the different degrees of exposure and of depth of water at the various places. The economic values may perhaps be arrived at in a more satisfactory manner, although still but only very approximately, thus:—When «=the price per foot of depth, »=the

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Table of prineipal Proportions of remarkable Breakwaters. Ee

General Slope of Outer Face.

Level of|/Level of

Inner Slopes. ee a lito of | toundar

, | Top Rubbl Wall 4 ena: From Bottom tocar | Near | Upto| Aber | Ata | HANG” | above | netow | “below Low Water. Water. | Water. | Water. Water. | Water. | ee. we aoe Sloping Breakwaters. meee Plymouth Pitched slopes above high 13 tol 4to1} 5tol) 5tol| 2tol | 2tol 0 0 water, looserubble below. : Portrush …....+ Slopes of loose rubble. 1% tol 6 to 1| 8 to 1] 13 tol | 13 to 1 v tol! 16 0 60 Kingstown Pitched slopes of rubble. 12 tol 5tol| 5tol| 5tol 4tol | 4tol) 15 0 0 Holyhead Slopes of loose rubble. 2tol 5 to 112 to 1 we. nenvo IN) < asi ee Composite Breakwaters. ortlandemseeustre Slopes of loose rubble, lj tol 5 to 1/44 to 1) 4tol,) plumb | 1 tol 25 0 with plumb wall above & plumb| wall. high water. wall. Cherbourg Do. do. 2tol 7 to 1} 7 tol i, to u 1ltol| 12% 0 0 & é to Alderney .....-- Do, do. 2 tol 5to1| wall | 4tol,| wall |1ftol| 25 0 12 $tol&plumb.| 4 tol (Cli aameeoondoosase Do. do. 14 to1&6tol {3% tol) wall wall ss toll 125) -::. ww Pulteneytown Do. do.

1ltol&7tol wall | to1] tol | $tol | § to1/6&21 15 18 [This is from bottom | 4 to 1 to 15 feet below low water,] Vertieal Breakwaters. Wowetrnss se Solid masonry. 4 tol ftoljljtol| ftol.] ftol 45 & cavetto Aberdeen …..... Concrete blocks below low i tol ftol) tol] gtol| tol 20

water, and solid above.

price per lineal foot, and d =the depth in feet at high water, then Pp

C= a © The results calculated in this manner are arranged in

towers, but his views are equally applicable to piers and breakwaters :—

"« A primary inquiry in regard the question whether their

strength or their weight, or, their znertia ?

to towers in an exposed situation is stability should depend upon their in other words, on their cohesion or

In preferring weight to strength we more closely follow the course pointed out by the analogy of nature, and this inust not be regarded as a mere notional advantage, for the more close the analogy betwecn nature and our works the less difficulty

order of their costs in the following table, from which the plumb pier at Dover appears to be by far the most costly:—

Depth in we shall experience in passing from nature to art, and the more Name of Harbour. Feet at High < directly will our observations on natural phenomena bear upon the Water. artificial project. If, forexample, we make a series of observations SSeS on the force of the sca as exerted on masses of rock, and endeavour Portland .....e oes to draw from these observations some conclusions as to the amount Jolictte …...cseseeceeessseeeees and direction of that: force as exhibited by the masses of rock which AN giCTS .oei ese eeeeeeterernees resist it successfully, and the form which these masses assume, we Marseilles (new) shall pass naturally to the determination of the mass and form of a BEVIN cae .00c0cveasereuerarsas

building which may be capable of opposing similar forces, as we con Holyhead ….....sseeeerreree os clude with some reason that the mass and form of the natural rock any ecsvassevennveeereennnsse are exponents of the amount and direction of the forces they have over

PO mee eee se eee eereseeseserens

so long continucd to resist. It will readily be perceived that we are in a very different and less advantageous position, when we

Avail- Minard allows for large merchant vessels in harbours of | attempt, from such observations of natural phenomena in which able refuge one cable-length, which would give about four ves- weight is solely concerned, to deduce the strength of an artificial capacity gels per acre. Captain Calver allows three vess is fabric. Another very obvious reason why we should prefer mass anhiar- p . P essels per | and weight to strength as a source of stability is that the effect of pours of acre for a small sheltered harbour of refuge. At Cardiff | mere inertia is constant and unchangeable in its nature, while the refuge Flats there were at one time 224 vessels anchored as close | strength which results even from the most judiciously disposed and and of to each other as they could well be, in an open roadstead well-executed fixtures of a comparatively hight fabric is constantly anchor- A ; £ 5G0 ? ick la wien: 4 subject to be impaired by the loosening of such fixtures, occasioned ages. and occupying @ space O acres, Wich woud g1ve by the almost incessant tremor to which structures of this kind must vessel per acre. | be subject from the beating of the waves. Mass therefore seems

to be a source of stability, the effect of which is at once apprchended

Tidal Iarbours.

We have hitherto been considering outer breakwaters erected in deep water, and which are constantly exposed to

by the mind as more in harmony with the conservative principles of nature, and unquestionably less liable to be detcriorated, than the strength which depends upon the careful proportion and adjustment of parts." 1

the waves; we now turn to piers and sea-walls which are placed within the range of the breaking surf, and which are exposed to its force for a limited period only, being some- times left nearly or altogether dry by the receding tide. In dealing with waves which are admitted by all to exert a true percussive force, the question arises as to how this force may be best resisted—whether by opposing to it dead weight, or a comparatively light structure, the stability of which is dependent on strong fixtures connecting it with the bottom. On this subject the late Mr Alan Stevenson made the following remarks, in relation to lighthouse

It is a remarkable fact that during a summer gale 14 Effect of blocks, each 2 tons in weight, which had been permanently configu- fixed in the Dhu Heartach lighthouse tower by joggles and a ? cement, at the level of 354 feet above the sea, were torn and of out and swept off the rock, while the thin panes of crown bottom glass in the lantern of Winstanley's Eddystone tower, which of the were only about 5 feet higher, resisted the waves for a eae

whole winter. The impact on marine masonry seeMs strue-

tures.

1 Aecount of the Skerryvore Lighthouse, by Alan Stevenson, LL.B., F.R.S.E., Edin., 1848, p. 49.

Forces on out- side of masonry.

Forces within the masonry.

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therefore to depend on the relation subsisting between the height of the waves at the place and the height and con- figuration of the rock itself above and below low water, and perhaps also on the configuration of the bottom of the sea near the rock.1 While the rock at Dhu Heartach from its height above the sea forms a protection against the smaller waves, it operates as a dangerous conductor to the larger waves, enabling them to exert a powerful action at a much higher level than if the rock liad been

lower. It is of great importance that these facts should be kept in view, and that the Eddystone should not be regarded as a safe model for imitation at all rocks which are exposed to a heavy sea.

The impact of the waves against the outside of a sea-wall or pier gives rise to four distinct forces, namely—(1) the direct horizontal force, which tends to shake loose, or drive in, the blocks of which the masonry consists; (2) the vertical force acting upwards on any projecting stone or protuberance, as well as against the lying beds of the stones; (3) the vertical force acting downwards, which results either from the receding wave striking upon the toe of a talus wall, or from its passing over the parapet and falling upon the pitching belind, so as to plough it up; (4) the " backdraught," which tends by reaction from the wall to remove the soft bottom, and in this way to undermine the lower courses or to suck loose stones out of the work.

It may be concluded from the above that the points which require to be most attended to are—the contour and quality of masonry of the wall itself; the parapet, which if not of proper form, or of insufficient height, leads to damage in the pitching behind it; and lastly, the foundation- courses, in the design and construction of which, if similar precautions be not attended to, underwashing of the bottom may take place, so as to leave the lowest courses without protection.

Within the masonry, as well as without, the waves exert force in the following different ways :—(1) by the propaga- tion of vibrations produced by the shock of the waves on the outer or sea-wall, through the body of the pier to the inner or quay-wall; (2) by the direct communication of the impulses through the particles of the fluid occupying the interstices of the hearting, so as to act against the back joints of the face stones of the inner quay; (3) by the sudden condensations and expansions of the air in the hearting, so as to loosen, and at last to blow out, the face stones of the quay; combined with (4) the hydrostatic pressure of the water, which is forced through the sea-wall, and, from want of free exit, is retained and acts as a head at the back of the quay, and which, however small in quantity, will, as in a Bramah press, act with equal force upon all surfaces exposed to its pressure, however large those surfaces may be. The last three causes are probably the most efficient agents in the work of destruction.

From a comparison of different piers in the German Ocean where we have most examples, and from careful consideration of the other data, it appears that vertical piers, fully exposed to the ordinary waves of that sea, should be not less than from 35 to 45 feet broad at the level of high water. Of course this remark does not apply to anomalous cases where waves are exceptionally high, but, as already stated, to works exposed to the ordinary waves.

The positions in which the piers are to be placed depend

on the nature and configuration of the shore and of the -antiy Scee e

1 Mr D. A. Stevenson has lately shown that a funnel-shaped de- pression in the sea-bottom extends from the ocean in the direction of, and nearly as far as, the Dhu Heartach rock, a geological formation which must certainly admit the heaviest class of waves to come nearer to the rock (Min. of Proc. of the Inst. of Civil Engineers, vol. xlvi.)..

bottom. After a correct plan, with soundings, has been Design obtained, the next step is to lay down contour lines of the of different depths which make the limits of the deep and shoal Se water at once obvious to the eye, The lines of the piers may fare, then be sketched so as, without disregarding other con- ditions, to keep the works as much as possible on the shoal ground, while they at the same time enclose the greatest possible area of deep water.

The entrance should be fixed seaward of every part of Entrance. the works; and its direction, unless where the internal area is small and the sea very heavy, should if possible be made to coincide with that of the heaviest waves, so that they may run along with and guide vessels into the harbour.

arbour.

The outer pier should in such a case be extended suf- ficiently far seaward of the end of the inner pier head to give it a free end, as in fig. 7, thus

allowing a ship plenty of sea room to shape an easy course before taking the entrance to the sheltered basin of the harbour.

There should be sufficient distance landward of a harbour mouth to allow a vessel, having full weigh on her, to shorten sail. For this Minard recommends that, where vessels of ordinary size require to alter their course in order to reach the inner basin, no circle with a less radius than 200 yards in smooth water should, if possible, be adopted, and it should not be forgotten that a vessel requires a larger radius in turning where the water is shoal than where it is deep.

If the beach consist of travelling detritus, the entrance must be so devised as not to form a trap for the passing shingle. This danger is most to be dreaded on the coasts where heavy waves strike obliquely uponthe shore. Finally, there must be a good "loose," so that vessels on leaving the harbour shall be able to shape their course free of rocks or a lee-shore; and Minard very properly remarks that the mouths of harbours should be designed rather to suit the entering, which is far more important, than the exit of vessels.

Preference should generally be given to a pier of hori- Piers of zontal convex outline, or a polygonal form, than to one long mn straight pier. The principal objection to a straight pier does — not, however, extend to cases where the heaviest waves strike yature upon it obliquely, and roll landwards along the sea-wall. pre- Especial care, however, must in all cases be taken that a ferable sea-work nowhere presents to the sea a surface of concave aan horizontal outline, or, what is still worse, abrupt faces which am form a re-entrant angle; for the waves will then act with an almost explosive violence, the breaking of a free wave being a very different thing from the breaking of a wave confined by a barrier of masonry. While the first may be compared to the harmless ignition of a loose heap of gun- powder, the other resembles the dangerous explosion pro- duced by the discharge of a cannon.

Vertieal

It may in some cases be found better, in designing a sea- wall for protecting a sinuous coast, to carry the bulwark straight across ledges of rock which extend landwards, than to follow the line of the high water margin. For although with the straight wall we may have to encounter a greater depth of water and a heavier surf, still with the other we may have to oppose the waves with a wall which has at some places a concave horizontal curvature, by which the force is concentrated and rendered more destructive. More- over, the straight wall may be considerably shorter than the curved,

The general gradient of a fragmentary beach depends

profile of upon the size and nature of the particles, and the force of

walls.

Reduc- tion of

waves by

lateral de- flexion.

the sea. The dissimilarity between its slopes near the levels of high and low water arises from a decrease in the force of the waves, caused by their being broken before they reach the high water mark. The great object, there- fore, is to design the profile of the wall so as to alter as little as possible the symmetry of the beach. For the reasons already stated, it is plain that unless near high water mark a vertical wall is in most cases unsnitable for asandy beach. Instead of altering the direction of the wave at a distance from its foundation, the whole change is produced at that very point; and, unless the wall be founded at a considerable depth, its destruction is all but eertain. A curved profile will prevent to a considerable extent the danger of reaction, by causing the alteration in the direction of the wave to take place at that part where the wall is strongest, and which is also at the greatest possible distance from the toe or curb course. But a very serious objection to all forms of curved walls, unless the radius be large, is the weakness which results from the use of wedge-shaped face-stones. The impact of the sea on materials of that form may be compared to a blow

directed upwards against the intrados of a stone arch—the direc- tion of all others in which the voussoirs are most easily dislocated. This action can only be resisted by very careful workmanship in the dressing and setting of the backing. Another objection, applicable to all except tideless seas, such as the Mediterranean, arises from the varying level of the surface of the water; for what may be best at one time of the tide cannot be equally suitable at another.

When a wave encounters an obstacle such as a break- water, the portion which strikes it is either entirely destroyed or reflected seawards; while the portion which is not so intercepted passes onwards, and spreading later- ally under lee of the barrier suffers a reduction of its height. From a very few observations in the sea under lee of the breakwater at Wick, and from some experi- ments made in a brewer's cooling vat by Mr Thomas Stevenson, it appeared that after passing an obstruction the reduction in the height of a wave varies as the square root of the angle of deflexion. When « represents the ratio of the reduced to the unreduced wave and a the angle of deflexion, the formula, which must however, be regarded as only approximate, is

x=1:00 – 067g.

The measurements of the distances of high water mark from the centre of divergence, in sandy bays which are under lee of promontories, seen to show that this formula, or one for a logarithmic spiral, represents the effect of lateral divergence very fairly. Providing the materials of the beach are homogeneous and easily moved, the incursions of the waves into the land will be measures of the forces, all of which become nil at the high water mark. The fol- lowing table shows measurements of the finely curved storm and tide marks traced out on the sandy beach

under the lee of the promontory at North Berwick, and the results of the formula.

Distances from centre Angles of Divergence at end of

of Deflexion. Promontory to High

Water Mark.

Ratios of Results Measurements. of Formula.

0° 3150 1:00

*1000 87 920 73 840 67 735 62 700 60 675 58 600 53 570 0) 555 “46 530 *43*

The tranquillity of close harbours with the same exposure Redue- depends on the relative widths of the entrance and the tion of interior, the depth of water, and the form and direction of 7… the entrance in relation to the line of maximum exposure. passing A formula for the reductive power of harbours has been into given by Mr Thomas Stevenson (Zdin, Phil, Journal for close 1] 8 5 3), hayr- –

Where the piers are high enough to protect the enclosed area from Roum the wind, and the width of entrance not very great in comparison with the breadth of the wave, the quay walls nearly vertical, and the distance from the entrance to place of observation not less than 50 feet, then- t= AG +H |v).

where H=height of wave at entrance,)=breadth of entrance, B=

breadth of harbour at place of observation, D=distance from mouth

of harbour to place of observation, z= height of reduced or residual

wave at place of observation,—all in feet. If H be taken as unity,

‘— be a fraction representing the reductive power of the har- our.

Actual measurements at the harbours of Kingstown, Sunderland, Macduff, Fisherrow, and Buckie gave the mean of observations (whieh at Buekie alone numbered upwards of 2000)=2°64 feet, while that of results calculated by the formula gave 2°62 feet.

The size as well as the ratio of widths of entrance and Size of basin must also bear a proper relation to the height of harbour waves to which the

harbour is exposed. The formula for ae the reductive power assumes that the waves after being nee reduced by lateral expansion shall have time to sink and to mag- be ultimately destroyed. But if instead of this they nitude are again reflected towards the entrance, such recoil will ova destroy the tranquillity of the basin and prevent vessels from answering their helm when taking the entrance. Also where a spending beach which is only partially effective in destroying the waves is formed very near the entrance, it may do little or no good by causing a back wash or recoil wave whicl: will injuriously affect vessels when entering.

As before mentioned, it is essential when the exposure Stilling is great that there be either a considerable internal area, basins or else a separate basin opposite the entrance to the inner basin, for the waves to destroy or spend themselves. Such a basin should, if possible, enclose a portion of the original shore for the waves to break upon, and when circumstances preclude this there should be a flat talus wall of at least 3 or 4 to 1, as recommended by the late Mr Bremner of Wick. Mr Scott Russell has found that talus walls of 1 to 1, or steeper, will not allow the waves to break fully, but will reflect them in such a manner as might in some cases make the entrance difficult or even dangerous of access, and the berthage within unsafe.

The following cases in which traffic has been successfully Places carried on at quays unprotected by covering piers, may be Where found usefulas a guide :— cael

At Scrabster the quay is at right angles to a fetch of 6 miles. At : Invergordon there is a fetch of 5 miles; at Burntisland, 6; Kil- oat

creggan, 4; Londonderry, 14; Greenock, 64; Albert Quay, Greenock, Pd be 7 miles. The last two arc, however, somewhat sheltercd by the ; low-water banks near Greenock.

Five miles is probably not far from the limit that should be ob-

served, which by the ordinary formula, h=1°5/D, gives a wave of

—

Booms.

Capacity of har- bours for eom- merce.

Timber struc- tures,

Destruc- tion by marine insects.

nee BO.U RS

3°8 feet ; but the formula for distances so short as these would give waves about a foot higher, and in heavy storms perhaps waves not much less than 5 feet may exist, but on such occasions vessels could not safely use the quay.

In order to tranquillize harbours of small reductive power, logs of timber called booms, having their ends secured by projecting into grooves cut in the masonry on each side, are placed across the entrance of the inner basin or dock. From 15 to 25 logs are usually dropped into those grooves, or as many more as will insure close contact of the lowest log with a sill-piece placed in the bottom of the harbour. They are also warped down or fixed with an iron hasp at the coping course, without which precaution the swell is found to enter the harbour from underneath. By this contrivance, which forms a temporary wall, the waves are checked, and completely prevented from spread- ing into the interior basin.

Twelve-inch booms of pine timber about 33 feet long have been broken at the small fishing village of Mousehole, near Penzauce, and elm logs have in consequence been substituted. At Hynish in Argyllshire, booms of the same timber and scantling and 20 feet long have been very fre- quently broken. The marine dynamometer at this place gave 14 ton per square foot.

The capacity of commercial harbours for trade varies so much with the exposure and size of vessels, that it is diffi- cult to approximate tothe truth. At Ramsgate, for instance, there were found to be about 6 vessels to an acre in the outer harbour, while there were about 14 in the inner and better protected basin, where too there was perhaps a greater pro- portion of small vessels. In the Scotch fishing harbours the number of boats used to be

reckoned at from 85 to 115 per acre; but of late their size has been much increased, and probably not more than from 80 to 90 could be accommodated. The Cornish boats at New Lynn, according to the Channel pilot, vary from 60 to 80 per acre.

The employment of timber in harbour works is of great antiquity. It seems first to have been used in forming boxes which were filled with stones, and at a more recent period in the formation of open frameworks through which the current could pass freely. Vitruvius mentions moles, consisting of timber filled with stones and cement, as haviug been used by the harbour-builders in his days.! The earliest drawing of timber piers that we have met with is that of the ancient port of Dunkirk in 1699, a cross section of which from Belidor's Architecture Hydraulique is given in Plate VIIL., fig. 4. This kind of structure is still not uncommon on the coasts of the English Channel.

In sheltered bays where a deep-water landing-place is all that is required, and where the bottom is sandy or soft, timber may be employed with great advantage. Even in somewhat exposed situations it can also be used for tidal harbours ; but the fatal evil in places where there is no admixture of fresh water is its rapid destruction by marine insects. In the Atlantic Ocean the Teredo navalis, and at many places in the German Ocean the Limnoria tere- brans, which was first discovered by the late Mr Robert Stevenson at the Bell Rock Lighthouse in 1810, are very destructive of most kinds of timber. Mr Stevenson found that memel was destroyed by the Limnoria at the rate of about 1 inch inwards per annum. He found that green- heart, beefwood, African oak, and bullet tree were scarcely

1 It was probably to some such work that Horace refers in Ode 1, Book iii. : —

" Contracta pisces equora sentiunt, Jactis in altum molibus; hue frequens Czxmenta dimittit redemptor."

A harbour contract dated 1394, in all probability the earliest which has been preserved, appears in the Registrum Nigrum de Aberbrothoc— a collection of ancient documents printed by the Bannatyne Club, and edited by the late Professor Cosmo Innes,

attacked, while teak stood remarkably well and locust tolerably well, though suffering at last. Greenheart timber, though not absolutely impenetrable, as appears from Mr Stevenson's experiments, is the great specific in seas where the worms are destructive. But subsequent experience has proved that on the coasts of Scotland it is, In some cases, readily attacked, and at these places creosoting is of comparatively little use, as the worm manifests no repugnance to timber which has been even very recently impregnated.

In addition to the experiments on timber, twenty-five different kinds and combinations of iron were tried at the Bell Rock, including specimens of galvanized irons. All the ungalvanized irons were found to oxidize with much the same readiness, The galvanized specimens resisted oxidation for three or four years, after which tlie chemical action went on as quickly as in the others, Although the association of zinc with iron protects, so long as it lasts, the metal with which it is in contact, it must be remembered that this immunity is obtained at the expense of the zine, the tendency of which to oxidization is propor- tionally exalted so soon as any part of the iron is exposed.

The important experiments of Mr Mallet on specimens sunk in the sea showed that the amount of corrosion decreased with the thickness of the casting, and that from oth to ;'oth inch in depth, in castings 1 inch thick, and about {5th inch of wrought iron will be destroyed in a century in clear salt water. But there is reason to believe from a cannon ball which was picked up on the shores of the island of Inchkeith that the decay was in that case 3th inch to the century. Cast-iron gratings periodically im- mersed by the tide at the Bell Rock lost at the rate of 1 inch in acentury, Even when the castings were externally sound their strength was reduced one-half in about 50 years.

In judging of the qualities of different quarries for harbour purposes the importance of a high specific gravity ought not to be overlooked, as appears from the table given on page 464.

The superiority of granite to greenstone is proved by the following experiments on the times required to abrade qsth inch of each kind of stone, made with the same weights and grinding agents, and with equal cubes of each material :—30 minutes were required for Queensferry (Carlin Nose) greenstone; 40 minutes for greenstone from Barnton near Edinburgh; 60 minutes for Peterhead granite. Mr Murray of Sunderland also established, many years ago, the superior power of resistance to attrition possessed by granite over greenstone.

Portland cement rubble and concrete, a most valuable material, now very commonly used in Britain as well as on the Continent, may be said to have to a large extent revolutionized harbour building; for it admits of being employed in many different ways, and can, if due care be taken as to the quality of the cement and purity of the sand and gravel, be used with perfect confidence. ,

The following specification has been followed extensively at different places :—

The Portland cement is to be obtained from the best_manufac- turers. It is to be ground extremely fine, and is to weigh not less than 115 Ib per bushel ; and each cargo will, on its arrival at the works, be tested in the following manner. The cement is to be made into small blocks 1 inch square and 8 inches long. After being inade, these blocks are to be immersed in water for 7 days and then tested by being placed on two supports 6 inches apart, when they must stand the transverse strain produced by a weight of 70 Ib placed in the centre. Slabs or cakes are also to be made and placed in water, and after immersion for 24 hours they are not to show any signs of eracking or any softness on the surface.

The cement is to be tested before any of it is used, and if it be found unsatisfactory it must be removed from the works. When a eargo is landed it must be tested from four different bags, and it must also be tested weekly as the works proceed, and the results forwarded to the enginecrs. The cement must be brought direct

Dura- bility of iron.

Materials of eon- struction.

Port- land eement rubble and concrete.

Con- tinuous building.

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AARBOURS

Table of Properties of different kinds of Rocks.

se I = ale | #1. R\z x mis aa Side of a Loss of n a Cube Weight Name of Rocks. a cS weighing |by immersion One Ton in in Sea Sa Air. Water. Weight of = o. of Feet | Side of Cube| Weight of a Specific a Cubic MO aot a Ton correspond- ton Block in Gravity. Foot in an in Sea Water,} ing tolast | Sea Water, Air. Sp. Gr. 1°028. column. | Sp. Gr. 1-028. ib. Cubic feet. | Cubic fect. | Lineal feet. Ton. Fect. Basalt (porphyritic) na censusounmppdaadnondDed: 2°99 186°87 a) 18°26 2°63 658 2‘2838 342 CMeeWSEOMO Geer edcen shows. occcreteesos ces ssnces 2°92 182°50 12°2 19°00 2°66 650 2°302 350 Syemite ….cccccccecceseeesseetsseneeeeenesensees 2sOil 181°9 TEAS} 19°04 2°67 647 2308 3538 Clay-slate ..c.cccceseeeeeeeeeeceeeneeeceeceeseeeess 2°90 181-25 12°3 19°15 2°67 647 2°308 353 VI eRsSEIStircssstectseccsec++sreemernseseeennne 2°89 120°6 124 19°24 2°68 644 Des 356 (ried eid eononononponadabesdouesabronessuesscgna 2°82 176°2 12°7 20°00 Dial 635 2333 365 Amygdaloidal greenstone ….....++15 ree 2°75 171°87 13:0 20°81 2°75 627 2°351 373 Chlorite-schist …....—cessessvceeseeseeeeenes 2°74 Als 13°0 20°93 2 627 2°351 378 Greywacke …... phosespuspecoconcenese Gao0dor 2°73 170°62 eel 21°06 2°76 624 2°357 376 (MM SEOMEN os eecce ceniinceiseoeueneedeeniinenns 2°73 170°62 Wal 21°05 2°76 624 DBO 376 Red gramite ..c..csscsssssssenteseeeece intern es 271 169°37 13‘2 21°30 2°77 621 2°362 “379 Slate (Old Red Sandstone forniation).... Al 169°37 eee 21°30 Diath 621 2°362 379 (COE TR coenanboosonpedodges sodden copooor ele ado 168°75 13°2 21°43 Dai, 621 2°362 379 — a ate Genie) se ey) 168°75 13-2 21:43 2°77 621 2°362 379 ed Primary limestone (marble), with , ; a . , ’ : , crystals of augite embedded …..... ame — 184 21°96 2:80

615 2°375 ane Whlouite: sletesqasssecs.- visser sess sseereseeneinee 2°64 165°00 135 OE} 2°81 612 2°381 388 Granular quartz rock …..sseeeeeee ees 2°63 164‘37 13°6 22°37 2°82 610 2°387 390 Grey granite s…s.see pete s+ sna sna caeeontes 2°61 16312 13°6 22°65 2°83 610 2°387 ‘390 Flinty slate …cscccecseeeeseeeee ner eeeeeeeee ees Debi 160°62 13°9 23°24 2°85 601 2°405 399 Red felspar porphyry. .....— seeeeeeeereees 2°55 159°37 14:0 23°55 2°86 598 2°410 402 Tein He 0009 cnsepHbodnpoo neodbodedosuqponGeSse500c 2°53 158°12 14:1 23°86 2°88 595 2°416 405 Serpentine …...ccesesseeeeceeeeeeeeeeeen ones 2°46 153°75 14:5 25°02 2°92 584 2°438 ‘416 Compact felspar…....-..eseceeeeseeeee cree 2°45 15312 14°6 25°20 2°93 581 2°444 ‘419 (Sim RON® pypmenuboos oeboosavecogbnobocasnenacc 2°41 150°62 14°8 26:00 2°96 575 2°455 “425 Roestone (Oolite).....ceceecsecsecesneeeee ees 2°36 147°50 15°1 26°88 2:99 567 2°472 433 [PAS HG Diyaneagpedseocoougabtices osopapaRdeobRocmoetie: 2°2 137 ‘05 1633 30°6 3:13 532 2°535 “468 Magnesian limestone ….....seeeeeeeeeeneees 2°18 136‘25 16°4 ST 3°14 “529 2°541 ‘471 (OY) it i itsocd onc ce0bce ooo oop naggad copca scoscodaa: 2°05 128°12 17°4 Bia7/ 3:27 501 2°591 ‘499 Parrot coal (American) .....eseeeeeeees 1°54 96°25 233 70°00 4°12 all 2°856 669 Bituminous shale…..... Pe cen m0 365008 1°50 93°75 23°8 75°93 4°23 “S17 2°876 683 (Ciaranallicorll. 6 Soon sspnpp cooonocad cossuoobocxacn: 1:24 77°50 28°9 169°05 5°53 ial 3°069 “829

Nore.—This table is calculated for sea water of the specific gravity of 1‘028 or 642 ib to the cubic foot.

from the manufactory and kept at the works in a dry and well- ventilated storehouse with dry wooden floor and side walls, pro- perly roofed in and completely protected from the weather.

The conerete to be used is to consist of one part of Portland cement, two of sand, and five of gravel, to be thoroughly mixed with a proper quantity of pure water ; after it is deposited, large angular stoncs are to be added, care being taken that all the stones are completely surrounded by concrete for a thickness of not less than 4 inches. All stones to be clean and quite free from sea-weed or other vege- table matter likely to prevent the adhesion of the

concrete. No conerete to be made during frost. The sand and gravel used must be sharp and clean, being perfectly free from clay or earthy matter.

There are different kinds of machines by which the concrete is thoroughly mixed, and a saving of cost cifectced. In that of Mr Messent the number of revolutions to mix the concrete thoroughly is twelve.

The walls of harbours may be constructed of continuous building of concrete and stones, protected by temporary piling and close planking. The best mode of keeping out the water, as adopted by Mr Balmer at the duke of Rich- mond's harbour of Port Gordon, is to make a saw-draft in each plank, and to place a thin plate of iron between the planks. An example of this continuous or monolithic. building is shown in Plate VIIL, fig. 6.

Mr B. B. Stoney has deposited at Dublin the largest blocks that have as yet been attempted to be moved.

Each block is 27 feet high, 21 feet 4 inches wide at base, and 12 feet long in the direction of wall, contains nearly 5000 cubic feet, and weighs 350 tons; and when laid in place 12 lineal feet of the wall is finished at once up to ordinary low water level. No cofferdam, staging, or pumping is required. The superstructure is built in the ordinary method by tide work, and is faced with granite ashlars for the ships to lie against. The blocks are built on land, and after 10 weeks' drying are lifted by floating shears, the barge or pontoon of which is 120 feet long and 48 feet wide, and of this 180

feet 30 form a tank at the aftend ; and, when filled with water, this balances the weight of the block hanging from the shears at the other end, A block can be raised with the flood tide, and is gene-

rally set the following low water.

The late Mr J. M. Rendel introduced the improved and Deposit- very valuable method of depositing the pierres perdues or 128 rubble, which is now generally used in the construction of rode large breakwaters. This method he employed first at Millbay pier, near Plymouth, in 1838, in a depth of 38 feet, and afterwards, on a still larger scale, in the con- struction of the breakwaters at Holyhead and Portland.

The improvement consists in depositing the rough materials from stagings of timber, elevated a considerable height above high water. he stones are brought on the staging in waggons, throu ghthe bottoms of which they are discharged into the sea. The principle on which these stagings are designed is that of offering the smallest possible resistance to the sea, the under structure consisting of nothing more than single upright piles for supporting each roadway. At Wick harbour works, as already stated, it was found that the piles of the staging for depositing the rubble required to be of greenheart timber ; but even these were broken in large numbers. The piles were invariably broken by the waves at about the level of high water.

A depth of from 12 to 15 feet under low water was Level of pointed out by Mr Rendel as the level below which the conser waves did little or no damage to pierres perdues. Sir John es of Rennie indeed considered that there was little or no effect — at a fathom and a half. But at Wick, as already stated, the rubble was moved as low as 15 feet, and at Alderney —

20 feet.

If the beds of the stones in a sea-wall were polished, the Evil of power of resistance would be reduced by about one-fourth, fine — or in other words, roughly dressed materials of three-fourths dra

‘the weight of polished materials will be equally safe.

Tron piers.

Artificial Scouring.

HAR SG There is also good reason to believe that slopes of large | prerres perdues are preferable to slopes of dressed masonry. | The great object to be attained is the maximum amount | and uniform distribution of friction.

Piers of cast and of malleable iron are now frequently employed, Examples of these may be seen at Scarborough, Southport, Portobello, and at many other parts of the English coast, and have been found to answer even where there is a considerable sea.

The pier at Southport, described! by Mr H. Hooper, is of cast iron, and the mode of sinking the piles was peculiar. The piles proper or lowest lengths of the columns are cast in lengths of 8 feet and 10 feet, and are sunk into the sand to the depth of 7 feet and 9 feet respectively. They were provided with circular disks 1 foot 6 inches in diameter, to form a bearing surface ; and, a smalfhole being left in the centre, a wrought-iron tube 2 inches in diameter was passed down the inside of the pile, and forced about four inches into the sand, a connexion being made by means of a flexible hose between the top of the tube and a temporary pipe con- nected with the Water Company's mains, and extended as the sink- ing of the piles proceeded. A pressure of water of about 50 tb per inch was thus obtained, and this was found to be sufficient to force the sand from under the disk. Each disk was provided on the lower side with cutters, which, on an alternating motion being given to the pile, loosened the sand. The piles were gradually lowered, and guided by a small ordinary piling engine. When the pressure of water had been removed about 5 minutes, the piles settled down to so firm a bearing that when tested with a ioe of 12 tons each no signs of settlement could be perceived. The cast-iron columns are 7 inches in external and 53 inches in internal diameter. All the piles, to the number of 237, were sunk in six weeks, being at the rate of between 6 and7 in twenty-four hours.

The Clevedon pier is of malleable iron. Mr J. W. Grover? states that each upright consists of two Barlow rails Weighing 80 Ib to the yard, riveted back to back, and having a total section for each 100 feet span of 64 inches. They are braced together by diagonal tie-rods from 1# to 2} inches in diameter. The lower portions of the piles below low water are of solid wrought iron 5 inches in diameter, shod with cast-iron screws 2 feet in diameter, and were screwed down till a 44-inch rope passed round 6-feet capstan bars parted with the strain. They penetrated the ground to depths varying from 7 to 17 feet, and though made with a thread of 5 inches in pitch seldom descended more than 24 inches or 3 inches in a turn. The solid pile-stems are connected with the Barlow rail piles by cast-iron pees Where rock occurred holes were jumped, and a 4-inch wrought-iron bar was inserted and secured by a jagged key. A shoe to reccive the Barlow rail was fitted and keyed on this, and the remaining space was caulked with iron cement. The length of the longest pilc is 76 feet. The level of roadway is 16

feet above extreme high water, and the height above the ground at the pier-head is about 68 feet,

Deposits and Scouring.

Deposits arise from two essentially opposite causes, viz., commotion and stagnation of the water. They are also of different kinds of material :—(1) those lighter matters, such as mud, silt, and fine sand, which are held for a time in mechanical suspension, and which, as the water approaches stagnation, are gradually dropped in the order of their specific gravity and mass ; and (2) those grosser matters, such as different kinds of sand and gravel, which are rolled along the bottom or driven forward with the water by the action of waves and currents. 'The first-named are deposited on the lee side of piers or groins which obstruct the progress of the waves or currents, while the second accumulate on their weather sides. But the amount and the positions assumed by the deposits of the second kind depend on the direction and force of the waves or currents in relation to the foreshore and to obstructions. The amount of deposits of the first kind are little dependent on the direction of the stroke of the waves outside of the basin or sheltered place in which they are deposited.

The preservation of the depth of harbours at a level lower than that of the original bottom involves both un- certainty and expense. Where the deposit is confined to the space between high and low water-marks, the scouring

1 Min. Inst. Civ. Eng., vol. xx. ® Min. Inst. Civ, Ling., vol. xxxii.

by means of salt or fresh water is comparatively easy ; but where it forms a bar outside of the entrance, the possibility of maintaining permanently a greater depth becomes very doubtful. The efficacy of the scour, so long as it is not impeded by enlargements of the channel, may be kept up for great distances, but it soon comes to an end after it meets the sea. When the volume of water liberated is great compared with the alveus or channel through which it has to pass, the stagnant water which originally occupied the channel does not to the same extent destroy the momentum as where the scouring has to be produced by a sudden finite impulse. In the one case the

scouring power depends, ceteris paribus, simply on the relation subsisting between the quantity liberated in a given space of time and the sectional area of the channel through which it has to pass ; while in the other it depends on the propelling head, and the direction in which the water leaves the sluice. Mr Rendel's scheme for Birkenhead was on the former principle, which it must be recollected is only applicable where the soil is easily stirred up.

The first example of artificial scouring in England seems to be due to Smeaton, who used it effectively at Ramsgate in 1779. At Bute Docks, Cardiff, designed by the late Sir W. Cubitt, the access to the outer basin is kept open most successfully by means of artificial scouring on a large scale,

Minard holds that when a channel has to be maintained by regular and habitual scouring, the whole effect is gene- rally produced in the course of the first quarter of an hour. This was made the subject of particular investigation at Dunkirk, where sections of the channel were made before and during the scour ; and it was found that there was no alteration in the sectional area after the first quarter of an hour.

Causes of Increase of Height of Waves.

The following causes increase the height of waves in a harbour :—(1) the removal of a spending beach either at the entrance channel or within the harbour by building a quay or talus wall across it; (2) deepening the entrance channel or the basin of the harbour itself,—thus the diffi- culty of keeping vessels to their moorings at the quays of a harbour increases during flood tide, just as the tide rises and the depth is thereby increased ; (3) removal of an artificial breakwater or a protecting point of land or spit of gravel outside of the harbour ; (4) filling up side creeks or lateral basins in a harbour or its entrance cliannel ; (5) shortening the distance between the sea and the entrance to an inner basin or dock by projecting the basin or dock farther out from the shore-line so as to bring the gates nearer the sea entrance, or projecting the mouth of a harbour farther seawards ; (6) removal of a jetty or filling up an artificial side chamber or converting talus into plumb walls ; (7) straightening an entrance channel or an outer side breakwater or walls within a harbour; (8) widening

| the entrance or the entrance channel ; (9) reduction of the

area of the basin of the harbour ; (10) making smoother the surface of a natural sloping beach either within or outside of a harbour by pitching its surface ; (11) lower- ing the top of a protecting outside breakwater over which the sea breaks ; (12) converting an open timber quay into a close quay ; (13) lengthening a breakwater so as to intercept a greater portion of tlie waves which come in certain directions.

If. Docks.

Docks are of two kinds, viz., dry or graving docks, and wet or floating docks. The dry or graving dock is a small

| water-tight chamber, fitted with gates of timber or iron,

which are shut against the rising tide after a vessel has XI, — 59

Wet docks.

Locks.

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entered for the purpose of being repaired. The water below low tide level is pumped out generally by steam power.

The wet dock or tide basin is a large water-tight in- closure, usually several acres in extent, which is also fitted with gates which are closed, not, however, during the flowing but the ebbing tide, so that the vessels lying at the quays within the basin may remain constantly afloat and nearly at the same level while being loaded and unloaded.

In order to extend the time during which vessels can enter or leave a wet dock there are two additional works which are often connected with it. ‘These are the entrance- lock and the outer or half-tide basin. The lock is a narrow chamber of just sufficient length and breadth to admit a ship of the greatest length and breadth of beam that is expected to frequent the port. Such a lock can, in absence of the largest class of ships, accommodate

simultaneously three or four vessels of smaller tonnage. Locks are some-time made with double gates, sothat when only one vessel ofsmall size has to enter, she isshut up within a compartment of the lock, by which means some of the water is saved which would have been expended had the whole of the chamber been filled. Shortly after the tide has begun to ebb, and when the gates of the wet dock have been shut, in order to prevent the water from falling too low in the dock, a vessel can still enter or leave by means of the lock. She is first passed into the lock from the sea ; and, the lower or sea gates being closed, the sluices in the upper or dock gates are opened, which raises the water in the lock chamber to the same level as the water in the dock, when the upper gates are opened to let the vessel pass in. Ships leaving the dock after the tide has begun to fall are passed into the lock chamber, when the upper gates are closed and the sluices in the lower gates are opened, until the water

in the lock has fallen to the same level as the tide outside,

Tide basins.

Advan- tages of docks,

when the lower gates are opened and the vessel goes out to sea. This system of locking is continued so long as the level of the dock is not so much depressed as to affect the loading or unloading of vessels lying at the quays, or until the tide has ebbed so far as to prevent vessels reaching the lock from the sea, At the West Dock, Cardiff, where the level is kept up by fresh water from the river Taff, the gates, in order to suit the rise and fall of the tide, are opened one hour before and about two hours after high water.

The tide basin may be described as a lock of very large dimensions capable of receiving at the same time a con- siderable number of vessels, which continue to run into it from the sea after the dock gates have been finally closed for that tide. Such vessels can run in, so long as they have sufficient water over the sill of the sea gates of the basin, or until the basin itself is filled with ships. Thesea gates are then closed, and thesluices in the upper gates are opened till the water in the basin is on a level with the water in the dock. The ships are then passed continuously into the dock, in a string, one after the other. By means of this arrangement the traffic can be carried

on to a far greater extent than is possible with a narrow lock, which has to be filled and emptied for each vessel that enters or leaves the harbour. The late Mr Jesse Hartley of Liverpool was the first to propose half-tide outer basins, as adjuncts to wet docks.

The peculiar advantages of docks are the following. Vessels can be accommodated in the smallest possible space, and are enabled to lie constantly afloat ; whereas in tidal harbours, where they take the ground, they are apt to be strained or to have their floors broken. But there are other sources of mischief than this in open harbours, for often, when the tide is ebbing, vessels, unless watched, fall

against each other. In two instances where the bottom, which was muddy, had a considerable declivity, a ship which had taken the ground on the beach near low water mark was actually run down and damaged by another stranded vessel, the warps of which suddenly snapped and freed her from the moorings at the quay, thus causing a collision between vessels both of which were at the time high and dry. Then there is the chafing of the vessel's sides against the quays in exposed harbours where there is a run of sea, and the breaking of warps during stormy weather, or during land floods, where there is ariver. The late Mr James Walker stated that at Sunderland damage to the extent of £40,000 was occasioned in a single day by large quantities of ice that came down the river Wear. When a vessel is in dock she can be easily and at all times moved from place to place, and the operation of discharging and loading can go regularly on during all times of tide. Her level, too, is never much affected, so that the cargo does not require, when being discharged, to be hoisted so high as would otherwise be necessary. Timber vessels can be unloaded through their ports into the water at all times of tide, while in harbours which are dry at low water the cargo receives injury by falling on the hard bottom. —

From the general description which we have given the following conclusions may be drawn as to the best localities for docks :—

(1) Where the rise of tide is more required than where the rise is small.

considerable, a dock is Best Tn rivers such localities

as the Clyde and the Foyle, for example, where the tide a

rises only from 9 to 10 feet, the inducement to construct docks is not so great as at the Mersey or the Bristol Channel, where the tide rises from 20 to 50 feet.

(2) Where the nature of the trade requires ships of great length, which are therefore very liable to injury from taking the ground, a dock is more needed than at places where the vessels are of smaller size, and therefore less liable to be strained when not water borne.

(3) Where the bottom is soft and muddy, there is less need for a dock than where the bottom is hard and uneven, unless where strong currents are likely to burrow out the soft soil so as to make the bottom irregular by forming deep ruts.

(4) Where the harbour is open to the entrance of sur- face waves of considerable height, or of a ground swell, there is more need for a dock than where there is better protection.

(5) Where there is sufficient fresh water, free from mud or silt, for supplying the basin, a dock will be more suitable than where the supply is from the tide, especially if the sea at the place be much loaded with matter in mechanical suspension.

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In designing a dock the first subject to which the engineer Sea ex- must give his attention is the seaward exposure of his pro- posure.

posed work, Of course no precaution is needed on this

head if the place be a land-locked bay, or a narrow river or

estuary. But if there be a considerable fetch of open sea, the waves generated during gales may be of such height as to endanger the sea gates or to interfere with their being worked in stormy weather. The formula already given at page 457 for short lengths of fetch will be the most suitable for calculating the exposure of docks, where the fetch ought never to be great.

Having calculated by means of this formula the height of waves that may be expected to reach the dock gates, the engineer must then determine whether such waves are too high for the strength of the gates, or for their being properly worked in stormy weather. Now we have unfortunately but few facts on this subject to guide us, and these not very consistent with each other.

Docks.] HARBOURS 467

Height of Waves in which Gates can be Worked.

*Height of Width of Wavesin Name. Entrance | which Gates Authority. in Feet. | are worked in Feet. ENTUTOSGADN , 000 sevcesvsscv'tes 40 2 Mr Moffat, C.E. CANIN, ceies ccs ssiiaeve dense 36 2 Sunderland, North…..... 50 * 3 Mr Meik, C.E. Do. South…..... 60 2 Do. MIG hes eer estas mticorsrasirer 60 2 Mr Boyd, C.E.*

It might at first sight be expected that the strain would increase as the squares of the breadth of the gate, but, owing to the manner in which the forces are distributed, this does not seem to be the case.

Where 6=the width of opening of the entrance in feet, and h=the height of the waves at the place, the formula b= . may perhaps be regarded as safe; or, where /, has not been observed, and D is length of fetch in miles,

60

°“ TE YD+(@5-FD)

Should the calculation by the formula give higher waves than are compatible with safety or convenience, the proper course will be ta provide

an outer harbour or covering break- water, so as to reduce the height of the waves. For this purpose the formula given at page 462 is applicable. In cases where the course now recommended canuot be adopted, from motives of economy or from other causes, recourse may be had ta protecting booms such as are described at page 463. If the traffic be considerable and the interrup- tion caused by the shipping and unshipping of the booms be regarded a formidable objection, the gates may in some cases be protected by fastening together the tops of the initre posts by chains. Another mode of securing gates against the sea was adopted at Ramsgate by Mr Ramsay, and is stated by Sir John Coode to be perfectly satisfactory. It consisted of the following arrangement :—

"One end of a stout beam or stay of greenheart timber was con-

nected, by means of a massive iron movable joint, to the fore part of each gate, near the middle posts on the inner or basin side, and

at about the level of high water of equinoctial spring tides; the |

opposite end of this beam passed into an opening in the masonry of

the side walls of the entranee. The inner end of this beam was |

supported by a small bogie truck running upon a pair of rails laid in a horizontal plane. On the vertieal face of the beam nearest the gate there was a strong toothed rack working into a pinion at the end of a train of gearing, the first motion of which was a screw-and- worm wheel. By means of this gearing the power of the men was communicated to the gate through the beam or stay just described." Docks After the engineer has succeeded in designing a dock which should jig sufficient in so far as the sea is concerned, it may after _ all not prove safe and convenient if it be exposed fully to from the force of the wind, which, acting on the rigging and hulls wind. of the shipping, causes vessels to break their moorings or produces a grinding action of the vessels against the quays. At Sunderland south dock and at the docks in the Tyne, for example, the gales of October 1863 occasioned very considerable damage, from vessels breaking adrift from their moorings and coming into collision with other vessels. Capacity The number of vessels that can be accommodated in each of ee acre of a

harbour may be termed its “available capacity.” hours, Lhis must obviously vary with the sizes of the craft which fortrade. frequent the port and with the ratio of sheltered to un- sheltered acreage; or in other words, with the exposure, depth, and reductive power. It will therefore be highest for a dock with gates, less for a tide-basin into which the waves have access, and least of all for an anchorage break- water or roadstead. But it also depends on the form of the basin and on its depth. The following table contains the greatest number of vessels that can be accommodated at one time per acre for several docks :—

Number of Tonanee ° : beget per Authority.

ee

Mr Moffat, C.E.

Aseetonose 100 to 1000

15

sere 2000 Mr Brunlees, C.E. King’s Lynn …..... 1500 aver. Do. CL 50 to 800 Mr Boyd, C.E,

If » represents the number of vessels per acre, and ¢ their average tonnage, and @ is a coefficient which may be taken at from 3 to 4 according to the tonnage inversely, the formula nn as +a may perhaps be convenient for showing, though necessarily in a very apts sineste way, the relative capacity for mixed shipping of proposed doeks of symmetrical proportions. But the eapacity will very largely depend on whether both large and small vessels fre- quent the port, or only vessels of one size.

The capacity for tonnage per acre is shown in the follow- ing table :— a ea a a | | De pth | Tonnage per Tonnage Name of Acre = pe shipped and

time. unshipped per: Acre per annum.

Authority.

——

Mr Moffat.

Ardrossan….) 184 3400 90,000

Belfast.) 22 8074 40,307 Mr Salmond. King's Lynn 9000 22,650 Mr Brunlees. PAlLOtlie., sas 6000 40,718 Mr Boyd.

and other circumstances admit of it, the width of the basin should, in order to provide for the largest amount of traffic, be greater near the entrance than at a distance from it. The diagram (fig. 8) may perhaps be regarded as an ap- proach to the form of maximum capacity which should be kept in view as a general guide in making a design, But in most situations the form will, as we have said, be mainly if not entirely dependent on the outline of the land and depth of water, on the position of adjoining streets and buildings, and on the geological formation and nature of the subsoil. The serrated outline of the jetties shown in the diagram affords a larger amount of accommodation for

Fig. 8.

shipping than when the quays are continuously straight. Sir John Hawkshaw was, we believe, the first to adopt these indented jetties, which are specially suited for the coal trade ; but the radiating form shown in the diagram has not, so far as we know, been adopted. Not only are numerous cross sections of the ground required for fixing on the best site for a dock, but borings of the subsoil are essential, as, upon a careful comparison of these, the position of the entrance must be determined. It is always of the greatest importance to place the foundations of the lock or entrance gates at a place where the bottom is rock, or, where that is not to be found, on the hardest and most impervious part of the subsoil, or, failing that, on a place where the bottom- though soft, is of uniform consistency.

The general form of a dock willin most cases be depend- Form of ent on local peculiarities, Where the nature of the ground dock.

Amount Mr Ure, in a report on Glasgow harbour, gives the fol- of work lowing table showing the amount of work per yard per per yard annum :— of quay. Tonnage | TOMES aia Pewater,| Yard of | Nmanks Quay 'Glasgow, including steamers. 30 670| 440 Glasgow, excluding steamers. 20,361 293 Fully worked. Southampton Tidal Harbour.| 20,000 | 850 | Could do more. Liverpool Docks…….---| 21,200] 185 | Fully worked. | Hull Docks…….0s0ssee ees 19,000} 143 |During9months. St Catherine's Docks……. 20,500} 142 | Fully worked. Arm- A great increase in the amount of trade, with the same

strong's size of dock and length of quay, may be effected by Sir

oe William Armstrong's patent hydraulic machinery. This

diinwey. principle of applying hydraulic pressure for opening gates, bridges, and sluices, or to the capstans for hauling vessels out and into dock and waggons on and off the coal tips, and for turning them on the turntables, the discharging of ballast and loading of coals, and the shipment and dis- charging of general cargoes, has now been successfully adopted at many harbours, Its use is, however, only warrantable where there is a great amount of traffic, and especially at places where the spring tides remain only a short time at the same level.

At the Victoria Docks, London, the late Mr Bidder mentions that 41 craft and 17 ships, or 11,711 tons, came in at one tide. In one month the number of craft entering the harbour was 1229 ; craft leaving, 1288; ships entering, 250; ships leaving, 258; or an aggregate of 2517 craft and 508 ships during the month, The gates, which are 80 feet span, are opened in less than 14 minutes. At Sunderland the accumulators are equivalent to a head of 600 feet, and the engine is 80 horse-power, A wrought-iron bridge 16 feet wide, and including countcrweights equal to nearly 200 tons, is raised vertically 18 inches, and drawn back in about 24 minutes. At Swansca the accumulators are equivalent to an cffective pressure of 750 tb per square inch, and there are three high-pressure engines of 80, 30, and 12 horse-power respectively. The time employed in cither opening or closing the gates is about 2} minutes, which is the shortest period consistent with safety. The wrouglit- iron swing-bridge can be opened or shut in14 minutes. The ballast cranes, which are distributed round the dock, can each

discharge from 350 to 400 tons in the day. The quantity of coal that can be shipped is about 1000 tons per day, and the effective quantity of water required for the port is 21,050 cubic feet per week. The large new bridge at Leith, designed by Messrs Rendel & Robertson, and worked by the Armstrong apparatus, is 120 feet span,—length of girder 214 feet, weight moved 750 tons,—and is opened in 1} minutes. The saving of time effected by this method is very great, for at Liverpool, according to Mr A. Giles, gates of 70 feet require 20 minutes, and six men on each side to open them.

The proportion of water area to length of quays will obviously depend on the form of the docks. The following water tO table, deduced from information kindly supplied by Mr quays © ; é and land Lyster, C.E., gives examples on this head at Liverpool :— area.

Propor- tion of

Total Water Area and Quay Space at Liverpool and Birkenhead.

Lineal Lineal Yards of Quay Quayage. per Acre.

Acres. Yards. i Yards. 1601 | 17 1472 124°4 4441 1 1088 168°3 1202 | 19 800 127°2 4535 oe” Lig 99°7 2538 9 779 101°0

Water Area.

Liverpool Docks Liverpool Basins Liverpool Docks & Basins} 269

Birkenhead Docks 159 » Docks and Basins| 164

In order to utilize the area of a dock to the best advantage, a certain amount of land space dependent on the kind of trade should be provided around it; for without this space, which is needed for giving room for railway sidings, ware- houses, and the like, the traffic would be cramped. As an illustration of the large extent of railway which is required in a coal-port, we may refer to Cardiff, where Mr M ‘Connochie says, “ The extent of sidings provided and maintained by

OURS

the Bute trustees, in connexion with the docks, amounts to 16 miles in length, the whole of which is at times fully occupied."

[Docks.

The proportion of the area of outer tide basin to that of Propor-

the dock to which it forms the access varies necessarily tion of

with the requirements of the trade, as is shown in the bg 2 following table : — dase

Bute Dock (East)

Bute Dock (West) Penarth Dock Tyne Dock Liverpool generally

The level of the bottom of a dock is always kept lower Depth of

than that of the sill of the entrance gates, in order to dock. admit of a certain amount of deposit taking place without injuriously affecting the depth of water in which the vessels lie, or interfering with the working of the gates. There should never be less than 1 foot of greater depth over the bottom of the dock than over the entrance sill.

The commercial advantage of a great depth of water over Com-

the sill has been well shown by Mr George Robertson in ™erial

his report on the Albert Dock at Leith. By increasing aa

the depth to the extent of 2 feet he found there would be propor- 396 tides in the year giving a depth of 23 feet over the tional to sill, as against only 102 tides in the year when that depth cubes of

could be had if the sill were only 2 feet high. But besides dep the advantage of availing ourselves of a greater number of tides, Mr T. Stevenson found, from an examination of the draughts and tonnage of a large number of sailing vessels, that the commercial advantages in a navigable river, dock, or harbour are proportional to the cubes of the depths.

The relation subsisting between the depth of a dock or channel and the tonnage of sailing vessels which can use it is given by the formula ¢= ‘13d’, or d= ,/7°7 ¢, from which the following table has been calculated :—

In fixing the minimum width that will admit vessels of Width the size which are expected to trade at the harbour, the of en- engineer must take care to preserve a proper relation between the area of the dock and the width of the entrance;

for if this relation be neglected, a current may be gener- ated through the entrance when the tide begins to ebb, which would be incompatible with the safe working of the gates. A very small current is sufficient to act injuriously

i especially if the gates be of great width. Whenever the internal area of the proposed basin is con- siderable, it will be a safe precaution to calculate the velocity of the outgoing current, at different periods of time, after the tide has begun to ebb; and for this pur- pose observations of the fall of the tide must be carefully made and compared with the proposed transverse sectional

area of the passage through the lock chamber. If the velocity thus obtained be thought too great for the safe working of gates of the size required, the only alternative

is to provide an additional lock. Buta double outlet will

at any rate be in all probability needed, or will at least prove a great convenience in all cases where a large internal basin is required.

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Lockage.

Depres- sion of dock- land.

Works of con- struc- tion.

The late Dr Rankine in his Manual of Civil Engineering gives the following table for the expenditure of water due to the passage of vessels through the lock :—

Let L denote alockful of water, that is, the volume contained in the lock chamber between the upper and lower water levels, and Bthe volume displaced by a ship, then the quantities of water discharged from the dock are shown in the table. The sign — prefixed to a quantity of water denotes that it is displaced from the lock into the dock.

- Lock Water Lock

Single Lock. Found. Discharged. Left.

A descending ship ….....+..| Empty. L-B Empty.

Do. CM anobuscenambooseasernod| Jin Ub -B Empty. AT DSCORCINIGMSTU Dy esseresscesseso sce Empty or full. L+B Full.

i . ; Descending Descending 2n ships descending and ascend- nL and ingtalbenmately: ..ici…scecs0see full, ascend- } empty, as:

ing empty. cending full, mpty.

Train of m ships descending….....| E nLu—n

Do do Full a RW ea Train of 2 ships ascending, ...s.e+60- Empty orfull.| 2L+2B Full. Two trains of 2 ships—the lst Full. Qn-DL Full.

descending, the 2d ascending

From these calculations it appears that ships ascending and descend- ing alternately cause less expenditure of water than equal numbers of ships in train.

The level of the surface of the water in a dock will of course sink in proportion to the number of times the lock has to be filled during each tide,

and may also be affected to a small extent by leakage. In order to provide for this depression of level, the old dock of Grimsby, and also the Bute Docks, Cardiff, are supplied by land streams, while at Penarth Sir John Hawkshaw was unable to get a supply of pure water, and the dock at that port is supplied from the tide water of the Bristol Channel, which holds in suspen- sion a large amount of alluvial matter. In the old London docks the level is kept up by pumping.

If the masonry of the walls has been properly constructed, and if the gates and lock are kept in proper repair, and especially if the basin be of large area, the depression of the water level due to leakage, will, as appears from the following table, be comparatively trifling :—

Name of Dock. | Leakage, Authority.

Ardrossan 18 in. per tide. Mr Moffat, C.E.

At first 1 to 2 in., Belfast now 6in. springs, >} | Mr Salmond, C,E.

and 4 in, neaps.

Whitehaven…. 4 |8in. Mr Brunlees, C, E, Avonmouth…. 4 in. in 24 hours. Do.

King's Lynn… If in.

Silloth'. :.<..cive 12 in. per tide. Mr Boyd, C.E.

The principal works required in the construction of docks are—jirst, cofferdams for excluding the tide, and pumps for keeping the basin dry while the works are going on ; second, excavation of the basin and lock pit; thzrd, piling for the foundations of quay walls and lock, where the bottom is soft ; fourth, the building of the quay walls, lock, and outer tide basin; jifth, entrance gates, gangway, and dolphins in the channel outside of the dock for facilitat- ing the entry and departure of vessels.

As to the jirst of these works, namely, the cofferdam and pumping apparatus, reference is made to the articles on these subjects in this work;

and as to the second and third, there is nothing requiring special notice, as no peculiarity attaches to the mode of carrying on excavation or piling for docks more than for any other engineering undertaking where these are needed. _It is only necessary to point out that when the bottom is soft a large amount of piling is required, more especially at the lock pit, where rows of sheeting piles should be driven across the lock, at least at the entrance, and in the lines of the clap or point- ing sills against which the gates shut.

The fourth class of works, namely, quays and Jock,

*ferent rules have been given by engineers for the propor- Propor- tions of quay walls. Mr A. Giles recommends that they tions of should be made strong enough to resist the pressure of a cant head of water equal to their own height; and Minard "** recommends their thickness at bottom to be joths of their height,*

The recent use of Portland cement concrete in the con- Quay struction of harbours has led to its introduction at dock walls of works. In the small dock erected in 1875 at Berwick-on- concrete. Tweed, Messrs Stevenson had the dock walls and gate chamber constructed entirely of Portland cement concrete, excepting a small portion at and above the high water level, against which the vessels might rub; and Mr Rendel at the – new Victoria Docks, London, which are the longest in the world, is making the whole masonry of cement concrete.

Graving docks are basins sometimes 600 feet long and Graving

60 or 70 feet wide, fitted with gates, from which the tide- docks. water which floats the vessel into the dock is pumped out, so as to let the carpenters get access to the ship's bottom. The sides of graving docks consist of a series of steps of masonry, called "altars," against which small timber props, generally of Gulf of Bothnia timber, are placed, for support- ing the vessel's sides as she ceases to be water-borne. Her keel is supported on blocks, generally of hard wood, but of late years they have in some places been made of cast iron. The sides, in order to save pumping, are in some places made of a curved form, so as to suit the shape of the vessel's sides. The advantages are, however, more than counterbalanced by the

undue contraction of the space allotted for the carpenters, who are unable to move about easily on the sloping surface of the masonry.

Of all the different kinds of masonry which enter into the construction of marine works, there is none which requires greater accuracy of workmanship, or more careful circumspection, than the graving dock. Leakage in a wet dock, provided it does not originate at a place where it is liable to increase through time, and is of no greater extent than to depress the surface of the water a few inches, can- not be regarded as a serious evil. But in a graving dock, where the requirements are different, there should be no leakage. A very little water, accumulating on the platform of a dry dock, interferes to a serious extent with the comfort and convenience of the carpenters. Although it may occasion considerable additional expense, there ought to be in all cases, especially where the soil is full of springs, an ample underground storage provided by a system of drains for receiving the leakage, which can then be pumped out periodically, as required, without ever allowing the water to rise above the platform.

Mr. G. B. Rennie's docks are stated to be the first of the MrG.B. kind that have been made of iron. They consist of floating Rennie's caissons for holding the vessel to be repaired. They are sunk fang by allowing them to fill with water, and are raised by pump- ' ing. The caissons are made with water-tight compartments, and they are carried up as high as the vessel's bulwarks, excepting that through which the vessel enters and leaves. Among several advantages that have been claimed for this kind of dock may be mentioned—its independence of the rise and fall of the tide, the power of applying breast shores as in an ordinary graving dock, and the stiffness produced by the side walls. As the upper parts of the side walls or altars are always full of air, this dock may be used in deep water, and is therefore independent of the nature of the bottom.

Mr Edwin Clark's hydraulic lift, at the Victoria Docks, mr 5, London, consists of a pontoon which is filled with water and Clark's sunk between two rows of iron columns. After a vessel] bydrau- has been floated and steadied upon the pontoon, the whole is ae raised by twelve hydraulic force-pumps of 2 feet diameter,

are in all cases most important features in a dock. Dif- | acting on the pontoon by means of chains. After the

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pontoon has been brought about the tide-level, the water is allowed to escape, when there is sufficient floating power to admit of the whole being removed to any place where the repairs can be conveniently made. The pontoons, which can accommodate vessels of a length of 350 feet, are about 320 feet long and 59} feet broad. "The power of the hydraulic lift is 6400 tons. The largest pontoon will carry a dead load of 3200 tons in addition to its own weight." Slips are the contrivance of the late Mr Thomas Morton of Leith, and consist of a carriage or cradle working on an inclined railway, falling generally at the rate of about 1 in 17, and extending above high water to a sufficient distance

for the class of vessels which are expected to use them to

several feet below the level of low water, and a truck or carriage which moves on it. When the carriage is let down under the water, the vessel is floated above the place, and the carriage is drawn up till the vessel catches it forwards. When the ship is placed truly above the line of the carriage, a powerful crab-purchaso at the top of the slip, which is generally worked by steam, is set in motion, and raises the truck and ship out of the water.

The gridiron is a simple framework of timber placed at a level sufficient to admit of vessels being floated above it during the flood-tide, and grounded upon it during the ebb, and when thus left high and dry the vessel's bottom can be examined to ascertain if it be necessary to take her into

The gridirons at Liverpool vary from 25 feet to 36 feet 3 inches in breadth, and from 228 feet 3 inches to 313} feet in length.?

The hydraulic and screw docks chambers into which vessels are floated during the flood-

tide, above a cradle which is drawn up above the high water } the strain is the minimum, is 24° 54', but as the length of the gate – increases with the

secant, the strength will not at this angle be the

level, either by means of Bramah's press worked by a steam- engine, or by a powerful apparatus of screws.

Tho patent slip possesses the following advantages over the graving dock. (1) The cost of its construction is less. (2) When the fall of tide is languid, a vessel can generally be more quickly laid dry. (3) When so laid dry she can be more easily examined, and, from the duration of the day- light being greater than in a deep graving dock, the time in which work can be done is considerably extended during winter. (4) There is more perfect ventilation, by which the vessel's sides are sooner dried, which is of some moment with an iron ship. (5) A vessel can be hauled up long before high water, and the repairs can be begun at once ; whereas with a dock the pumping occasions considerable delay. (6) While the upper part of the slip is occupied, an additional vessel may be taken up for a shorter time than its predeces- sor, without interrupting the workmen.

The advantages afforded by a graving dock, on the other hand, are these. (1) Although its construction is more costly, it is nevertheless, if properly built, unquestionably a more durable structure—the rails, rollers, carriages, and chains connected with the slip being liable to derangement, which entails occasional repair, (2) The management of the graving dock is simple, and involves comparatively little superintendence ; whereas that of a slip is intricate, and requires more than mere nautical skill. (3) The working of a graving dock is equally simple for large or small vessels, while it is undeniable that the raising of a large vessel on a slip is a delicate operation, and should be attempted only under the direction of persons thoroughly versed in such matters, and having ample mechanical resources at command. (4) The graving dock possesses the advantage, which is sometimes important, of affording the means of more easily filling a vessel with water, so as to detect leaks which may not be discoverable by other means. For this purpose a

1 " Historical and Descriptive Sketch of the Mersey Docks and

Harbour," by J. J. Rinckel, in the Artizan for 1864.

HAARBOUES

; of the gate with any head and for a given used in America are |}

[pocks.

nozzle to receive a flexible tube should be fixed into the dock-gates. (5) Where double gates are provided the water contained in the dock affords a certain limited power of scouring the forebay and entrance, an advantage which is of course not possessed by a slip. (6) In any rapid land current, or strong tideway, it is a much easier process to dock a vessel than to land her safely on the cradle of a slip—an operation which, when incautiously gone about, has been in some cases attended with serious consequences even in sheltered situations. (7) The graving dock need not interfere with the set of the currents, whereas a slip which projects a long way seaward of low water may deflect them and produce shoals in the channel. (8) Mr Mallet has remarked that the strains on a ship's timbers are more direct than when she is ona slip, especially when she is leaving the cradle, The late Mr J. M. Balfour suggested, in order to meet this objection, that the cradle for a slip might be made of a wedge shape, so that its npper surface shall be parallel with the horizon, or that the back end should even be tilted slightly, so as to give a bite on the vessel and prevent her from slipping.

The relative advantages of the other contrivances for the repair of ships already described may be judged of by com- paring them with each other in a similar manner.

Mr P. W. Barlow has given the following formule for

| the strength of dock-gates :— the graving dock, and trifling repairs can also be made. |

Formula for Straight Gates.

If p=horizontal angle (or "sally"') between pointing sill and line joining hecl-posts of the two leaves ; W=pressure on the length epth of the gate ; and S=—hole transverse strain at angle } ; then

S=4W sec Pty 008 $. From this Mr Barlow has deduced that the salient anglc, where

greatest with a given section of timber. The '"'sally" or angle which gives the greatest strength, with a given scction of timber, ig stated by him as 19° 25'.

Formula for Curved Gates.

When @ is the salient angle, or camber of the beam, formed by a chord line drawn from the heel to the mitre-post, with the tangent to the curve of the gate—

sin 0

S=4W | 1- sr ap=8

There is great difference of opinion among engineers as to the strain to which dock gates are subjected, and the reader is referred for further information to the 18th and 31st volumes of the Minutes of Proceedings of the Institution of Civil Engineers. In these dis- cussions Mr Brown pointed out an error in Mr P. W. Barlow's paper, which stated that the line of pressure at the mitre-posts would always be a tangent to the curve of the separate gates, whereas that line must always be at right angles to the centre line of the lock, and could only be a tangent to the curve when the two gatcs formed a segment of a circle, or, as Mr Bramwell says, at all events when their junction at the mitre-posts formed at that point part of a continuous curve. Mr Brown gives elaborate formule suited to meet a yielding or deflexion of the structure, which he alleges must always take place. Mr Bramwell states, and we think justly, that, when the gates form when closed a segment of a circle, they cannot be subject to transverse strain, and that the whole of the gates would be subjected simply to compression. Mr R. P. Brereton very properly suggests that when the gates

are of malleable iron the boiler-plate should never be less than 4 inch thick, what, ever the formnla may indicate.

Where J represents the length of one-half of a straight or cambered malleable iron gate, w the distributed pressure over the length of the leaf taken on a given element of the gate, bounded by two horizontal planes 1 foot apart, ¢ the thickness of framework of gate or distance between the two skins, s the transverse strain in middle of gatc, @ half of the mitring anglc —.e., the angle formed by meeting of gates—all the dimensions being in feet, and weight in tons,—then

1 s=sectional area of metal on compressed side in inches; is do. do. on extended side do: sa; 4w tan 6=compressive strain produced by other leaf of gate.

Caissons.

Outer gangway and di- rection of en- trance.

Coal Staiths.

DOCKS. |

Mr Kingsbury adds half of this compressive strain to the strain represeuting the compression due to the transverse pressure, and deducts it from the same amount for the extension ; and these results being divided as before by 4 and 5 respectively, being the allowances per square inch of metal for compression and extension, give the areas for each. He, however, expresses a doubt whether the whole of the compressive strain from the other gate may not perhaps come upon the compressed section. The sections close to the posts he takes as requiring to resist the compression due

: 4w tan 6 to transmitted pressure only, or = ear

For cylindrical gates Mr Kingsbury gives the formula,—when p =pressure per unit of surface, aud r=radius of curvaturc,—

pr : : : “g =Sectional area of metal in square inches.

It must be remembered in designing gates which are exposed to the waves that they should be made stronger than these formulz require. And the gates for graving or dry docks sustain a greater pressure with the same rise of tides than those of wet docks, and should therefore be made correspondingly stronger.

Caissons are sometimes employed instead of gates, and are the invention of the late General Bentham. They are constructed of malleable iron plates and are sometimes made in the form of a ship's hull, and sometimes have vertical sides, The caisson fits into checks made for its reception in the side walls of the entrance to the dock, They require to be very carefully ballasted, and to be most accurately fitted to the masonry on the sides and bottom, and even when they are faced with timber which has been finely dressed and fitted, coal cinders are often needed to make the joints water tight. At high water they are floated into the grooves, and are then scuttled by admitting the water into the interior chamber. When a vessel has to leave the dock, the water is again pumped ont, and the caisson is then floated out of its place and taken into the river or harbour, so as to be out of the way of the vessel which is leaving. General Bentham says caissons are cheaper than gates, occupy less room, are more easily repaired, and the same caisson may be used for different places at different times, while they answer for roadways, and require less labour for opening.

The caisson at Keysham was designed by Mr Scamp, deputy- director of the Admiralty works, and is 80 feet wide and 48 feet deep, with an air-chamber at the bottom. When raised a few inches above the bottom, the caisson is drawn back into a recess or chamber in the side walls. The total weight is 290 tons, and the deflexion was j inch near the bottom, when the pressure of the whole surface was 2000 tons. The time for opening and closing the entrance at Keysham is 10 minutes and 8 minutes respectively. The cost was about £10,000.

Mr M'Connochie says that the iron caisson at Cardiff is 60 feet long, 26 feet greatest width, and 30} feet deep, with a total weight of 152 tons.

The outer gangway at entrance to docks is generally a structure of open timber work, erected in the line which will best suit the entrance of vessels when under the influ- ence of currents. This gangway is sometimes useful

for a vessel discharging her passengers or completing her cargo while the gates are shut. Mr Redman remarks that "the practice in the port of London is to dock a ship upon the flood just before the high water, and to undock her at abet the same period of tide… . The directions as apparently the most desirable are an angle of about 45° pointing up the streams for graving docks, an angle of about 60°in a similar re for wet docks, and a right angle for building slips.'

It is of importance in discharging coal into ships that the fall should be as small as possible.

At Bramley Moor Dock, Liverpool, the Wigan coal is discharged

by railway 18 feet above the quay. At Sunderland Mr Meik finds:

that 20 feet above the quays, as at the south dock, is too small for the shoots, and prefers 36 feet. At Penarth the height is 22, and they are able to lift 180 tons per hour. At Greenock, where steam cranes are used, they load about 500 tons a day. At Middlesboro' they can discharge 150 tons per hour, but 106 tons are

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as much as can be trimmed on board. At Cardiff, where there is no hydraulic machinery, they load 100 tons an hour. The distance between the staiths is 180 feet. At the Tyne Docks, Mr Harrison states that ou onc occasion, when a vessel had very long hatchways admitting of several waggons being simultaneously discharged, 420

tons of coal have been shipped in 55 minutes, a feat which shows the adimirable mechanism employed.

At Swansea, with hydraulic machinery, they can discharge from Ballast and those at Penarth load at the rate of 60 cranes.

350 to 400 tons a day, tons an hour.

The Law of Harbours and Ports.

The power of appointing suitable places to be ports or havens in England is one of the ancient prerogatives of the crown, founded, as Blackstone thinks, partly upon the rights of the king as conservator of the kingdom, partly upon his interest in the marine revenues. "In England it hath always been holden that the sovereign is lord of the whole shore, and particularly is guardian of the ports and havens which are the inlets and gates of the realm, and therefore, so early as the reign of King John, we find ships seized by the king's officers for putting in at a place that was not a legal port." The right of the king to make a harbour, and to grant the dues arising from the use thereof, in any suitable place, although the ownership of the soil may be in another, is subject to any vested rights of harbour already existing; and in the recent case of Foreman v. the Free Fishers of Whitstable, it was said that the right of the public freely to navigate the high seas is a paramount right to which the right of the crown in the soil is necessarily subservient, and therefore, as the right of navigation must include the right of anchorage, the crown or its grantee could not impose a toll on this use of its soil. To justify such a toll some facts must be shown proving that the soil was originally within the precincts of a port or harbour, or that some service or aid to navigation was rendered, in respect of which the alleged right of toll was granted. The crown having once granted a harbour could not afterwards narrow its limits, but by 16 and 17 Vict. c. 107 the crown is enabled to ascertain the limits of all ports, and to assign quays thereon for the enclosure, load- ing, and landing of merchandize, so that frauds on the revenue may be prevented.

The Act 10 and 11 Vict. c. 27 consolidates the clauses usually inserted in private acts authorizing the construc- tion of harbours; 24 and 25 Vict. c. 45 facilitates the for- mation and improvement of piers and harbours in Great Britain and Ireland; and 25 and 26 Vict. c. 69 and 28 and 29 Vict. c, 100 transfer from the Admiralty to the Board of Trade certain powers and duties relative to har- bours. Besides these general Acts, there are many special Acts relating to particular harbours,

Reference may be made to Brit. Assoc. Reports, 1848 (J. S. Russell), and 1850 (Scoresby); Smeaton's Reports; J. S. Russell, ***' Researches on***

Hydrodynamics," Trans. Joy. Soc. Edin., vol. xiv., 1837; Thomas Stevenson, " Account of Experiments on Force of Waves of Atlantic and German Oceanus," Trans. Roy. Soc. Edin., vol. xvi., 1845; T. Stevensou, "On Reduction of Height of Waves after passing into Harbours," Hdin. New Phil. Journ., 1852; J. Bremner, 7rcatise on Planning and Constructing Harbours, Wick, 1845; Sir J. Rennie, Theory, Formation, and Construction of British and Foreign Harbours, Lond., 1854; Belidor's Archi- tecture Hydraulique, Paris; Capt. Washington, Royal Tidal Harbour Com. Reps., Lond., 1845-46; the article on " *Tides and Waves," in the Encyclopedia Metropolitana, by G. B. Airy, Astronomer Royal; Minutes of Proceedings of Institution of Civil Engineers; A. Cialdi's writings on Waves and Harbours; Report of the Committees on Harbours of Refuge, 1857-58; Report of the Royal Commission on Harbours of Refuge, 1858-59 ; C. J. Minard, Cours de construction des ouvrages hydrauliques des ports de mer,*

Liége, 1852; Thomas Stevenson, Design and Construction of Harbours (2d ed.), Edin., 1874; Professor Mitchell's American Reports. a ;

The gates figured in Plate XI. are those at Great Grimsby and Victoria Dock, London; and the caisson, Plate XII., is that in use at Cardiff Docks. (T. ST.)

HARBURG, a seaport town of Hanover, Prussia, at the head of a circle in the district of Liineburg, is situated on the left bank of the southern branch of the Elbe opposite Hamburg, which stands on the right bank of the northern branch of that river. The distance between the two towns is about 44 miles, and there is railway communication be- tween them by means of a bridge over both rivers, com- pleted in1871. The town is also connected with Hanover by railway. Itisthe seat of a local court, a superintendent-general, a head custom house, and a chamber of commerce ; and it possesses an old castle, which from 1524-1642 was the residence of the Hamburg line of the house of Liineburg, a real-school of the first order, a commercial school, and a trade school. The industries include shipbuilding and the manufacture of india rubber and gutta percha wares, oil, soda, starch, alum, cigars, yarn, cast-iron, machines, and leather. 'There are also

horse and cattle markets, and some shipping trade, which, however, has considerably declined since better communication was opened up with Hamburg. In 1878 there entered 469 sea-going vessels with a burthen of 38,110 tons, and 7677 iron vessels with a burthen of 175,643; while the corresponding averages during the previous twelve years (1866-1877) were 633 sea-going vessels and 7669 of iron craft, with burthens respectively of 43,036 and 168,082 tons. Harburg_ be- longed originally to the bishopric of Bremen, and received town rights in 1297. In 1376 it was united to the princi- pality of Liineburg, along with which it fell in 1705 to Hanover, and in 1806 to Prussia. In 1813 and 1814 it suffered considerably from the French, who then held Hamburg, and who built a bridge between the two towns, which remained standing till 1816. The population in 1875 was 17,131.

HARDENBERG, Friepricu von (1772-1801), German poet and philosopher, best known as Novalis, was born on his father's estate in the county of Mansfeld, in Prussian Saxony, May 2, 1772. He was of a shy, retiring, and thoughtful disposition, and was deeply influenced by his parents, who were strict members of the sect of Moravian Brethren. After attending the gymnasium of Eisleben he went as a youth of eighteen to the university of Jena, where he studied philosophy, mathematics, and the natural sciences. There he was treated with great kindness by Schiller, of whom he was a warm admirer. He studied law in Leipsic and Wittenberg, and in 1794 settled for a time in Teunstidt in order to perfect himself in the practi- cil work of the legal profession. During his residence in Tennstidt he formed a passionate attachment to Sophie von Kiihn, a beautiful but delicate girl of thirteen, and with her consent obtained a promise from her parents that when she reached womanhood she should become his wife. In 1795 he was made auditor at the salt-works of Weissen- fels, where his father was director. Two years afterwards his betrothed died, and for some time he seemed to be broken-hearted and to have lost all interest in life. Ina few months, however, he went to the academy of mines at Freiberg, where he studied with a view to a higher appoint- ment in connexion with the salt-works; and in the midst of his studies he became engaged for a second time, and was again able to look forward to a happy and useful career. He returned to Weissenfels in 1799, and was associated as assessor with the directorate of the salt-works. As he was preparing for his marriage in the

autumn of 1800 he was alarmed by the sudden appearance of blood from the lungs. The wedding was postponed, and although he believed to the end that his recovery was certain, the disease made rapid progress, and he died on the 25th of March 1801. He was of a tall, slight, and graceful figure, with light brown hair and hazel eyes, and a face expressive of a calm, gentle, and meditative spirit. After his death his

writings were issued in two volumes by his friends Ludwig Tieck and Friedrich Schlegel, and were rapidly recognized as important contributions to German literature. They are for the most part composed of fragments, of which the chief. is Heinrich von Ofterdingen, an untinished romance. Hardenberg is often spoken of as "the prophet of the Romantic school ;" and the phrase sufficiently marks his leading peculiarities. He took no part in the literary warfare carried on by his friends, but he shared to the full their strongest sympathies. Like them he intensely disliked those "enlightened " writers of the 18th century who had claimed to say the last word about human life through mere logic ; he was penetrated by the conviction that there are elements in the world which cannot be grasped by the understanding, and which must be felt rather than reasoned about. Although he was fond of science and history, he moved most freely in the borderland between religion, philosophy, and poetry ; and his prose writings are full of sayings which, although not easily intelligible, are impres- sive and stimulating. His diction is often simple and unostentatious, but it is rendered difficult both by the abs- truseness of his themes and the remoteness of his allusions. As a poet he lacked definiteness of conception ; his lyrics, however, especially those of a religious nature, have a certain tender beauty which gives them high rank in the serious literature of Germany. They are marked by deep feeling and by sweetness and grace of expression, He himself regarded a series of Hymns to Night as his best achievement, but it is in Heinrich von Ofterdingen that the majority of his admirers find the fullest utterance of his mystic aspirations, his passion for spiritual beauty, and his idealist philosophy.

See his Schriften (5th ed., Berlin, 1837; vol. iii., 1846), and R.

Haym, Die Romantische Schule (1870), and Friedrich von Harden- berg (1878).

HARDENBERG, Kart Aveust (1750-1822), Prussian statesman, was born at Esselroda in Hanover, May 31, 1 750. Having studied at Leipsic and Gottingen, he entered the Hanoverian civil service as chamber councillor (Kammer- rath) in 1770, and afterwards spent some time in Wetzlar, Ratisbon, Vienna, and Berlin, and travelled in France, Holland, and England. He was made privy chamber councillor (Geheim-Kammerrath) and raised to the rank of count in 1778; but a private quarrel with the prince of Wales compelled him four years afterwards to give up his appointments in Hanover and seek a new career. In 1787 he received the office of president of the board of domains (Kammercollegium) in Brunswick ; and he was entrusted with the duty of delivering to Frederick William II. of Prussia the will of Frederick the Great, who had deposited it with the duke of Brunswick. Frederick William IJ. was so impressed by Hardenberg's appearance and character that in 1790 he recommended him as a minister to the margrave of Anspach and Baireuth. These principalities being united to Prussia in 1791, Hardenberg was appointed a Prussian cabinet minister, but continued to perform his duties as chief administrator of the new province. In the war with the French republic he acted as minister of war, and in 1795 signed on behalf of Prussia the treaty of peace con- cluded at Basel. When Frederick William III. mounted the throne in 1797, Hardenberg was transferred from Anspach-Baireuth to Berlin, where he received high offices in the cabinet, being also soon afterwards nominated chief of the departments for Magdeburg and Halberstadt, for Westphalia, and for Neuchatel. At this time the foreign

policy of Prussia was determined by Haugwitz, who was on ~

all occasions subservient to Napoleon. When in 1803 Prussian interests seemed to be threatened by the French occupation of Hanover, Haugwitz fell into disrepute, and in the following year his place at the head of the cabinet was

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taken by Hardenberg. The latter was anxious to maintain peace, but when in 1805 Napoleon's troops marched through Anspach he strongly protested,

and entered into a conven- tion with Russia. The victory of the French at Austerlitz, however, made it difficult for Prussia to proceed to hostili- ties ; and ou the 15th December 1805 Haugwitz signed a convention with Napoleon, whereby in return for Hanover Prussia conceded Anspach, Cleves, and Neuchatel to the French, Hardenberg then retired, and Haugwitz returned to power. The policy of Haugwitz was exceedingly un- popular, and led to the war in which his country was pros- trated at the feet of Napoleon. After the battle of Jena Hardenberg undertook the office of foreign minister; but when the treaty of Tilsit was signed he withdrew and watched from a distance the vigorous and enlightened efforts of Stein to restore new life to the fallen and humili- ated state. Stein being compelled to retire in 1810, Hardenberg was recognized as the only possible successor of the great minister; and he amply justified the con- fidence with which he was honoured. The circumstances of the time did not admit of his pursuing an independ- ent foreign policy ; but he steadily prepared for the in- evitable struggle with France by carrying out Stein's far- reaching schemes of social and political reorganization. The military system was completely reformed, serfdom was abol- ished, municipal institutions were fostered, the civil service was thrown open to all classes, and great attention was devoted to the educational needs of every section of the community. In the war of liberation Hardenberg was one of those who did most to stimulate the patriotic en- thusiasm not only of the Prussians but of all Germans; and so important were his services that on the 3d June 1814, after he had signed the first treaty of Paris, he was raised to the rank of a Fiirst or Prince. He accompanied the allied sovereigns to London, was one of the chief pleni- potentiaries at the congress of Vienna, and took a leading part in the negotiations which led to the second treaty of Paris. After the restoration of peace he retained his place at the head of the Prussian cabinet, but his conduct of affairs was no longer marked by energy and foresight. He was accused of being too submissive to the papacy, and, although a man of liberal sentiments, he had not the courage to resist his royal master's dislike of constitu- tional government. He died at Genoa, November 26,

1822.

Hardenberg wrote memoirs of the time between 1801 and the conclusion of the treaty of Tilsit, and entrusted them before his death to his friend Schéll,

a councillor of state. They were sealed by Frederick William III. and placed in the state archives, with directions that they should not be published until after the lapse of fifty years. At the end of this time they were entrusted by Prince Bismarck to Leopold von Ranke, who issued them accom- panied by a biography of the author (Denkwiirdigheiten des Staats- kanzlers Fiirsten von Hardenberg, 4 vols., 1877). See also Klose, Leben Karl August's, Fiirsten von Hardenberg, 1851; and Seeley, Life and Times of Stein, 1879.

HARDERWIUJK, a town of the N etherlands, in the pro- vince of Guelderland, on the coast of the Zuyder Zee, about 28 miles N.E. of Utrecht. Its principal buildings are the town-house, the Reformed church rebuilt in the 15th cen- tury, the Nassau-Veluwe gymnasium, the colonial dockyard depot, formerly the mint, and the municipal orphanage. Agriculture, fishing, and a few trifling domestic industries form the sole employment of the inhabitants, who in 1872 numbered 5041,

Formerly the town was much more important. Having been surrounded with walls by Count Otto II. in 1229, and gifted with municipal privileges in 1281, Harderwijk rapidly extended its com- merce till it dealt directly not only with Holstcin and Hamburg but with England, Denmark, and Sweden. In 1522 the town was captured by Charles V. ; in 1572 it became subject to the United Netherlands ; and in 1672-73 it was besieged for seventeen months by the bishop of Munster and his French allies,

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HARDICANUTE, Harrnacnut, or Harprxnvur (ce. 1018-1042), the last of the Danish sovereigns of England, son of Canute king of England, and his wife Alfgiva Emma, the sister of Richard duke of Normandy, and widow of King Ethelred,was born most probably in 1018 or 1019. When Canute died in 1035 Hardicanute was ruler of Denmark, and Swend, the elder reputed son of Canute by Alfgiva of Northampton, oue of his concubiues, was ruler of N orway. It is said to have been the wish of his father that Hardj- canute should be ruler of both England and Denmark, but his connexion with Denmark seems to have been prejudi- cial to his English interests ; and though his claims were supported by Godwine and the West Saxons, the witenage- mot which met at Oxford decided that his government should not extend further north than the Thames, and that Harold, Canute's younger

son by Alfgiva of N orthampton, should reigu over the northern provinces, being also in all probability overlord of the whole kingdom. Hardicanute refused, however, to come to England on such conditions, and in 1039 the witan of Wessex deposed him, and chose Harold also for their king. On the death of Harold in 1040, Hardicanute, who was about to invade England, had his hostile intentions disarmed by the message which reached him at Bruges, making him an offer of the crown for which he was preparing to do battle. The witan's choice of him seems to have been spontaneous, and not at all due to the threatening attitude he had assumed; but apparently he had not forgotten the former slight he had received, and his short reign was marked by great oppression and cruelty. He caused the dead body of Harold to be dug up from its place of sepulture at Westminster, and thrown into a marsh or, according to another account, into the Thames; he exacted so heavy a dunegeld for the support of his foreign fleet that: great discontent was created throughout the king- dom, and in Worcestershire a general uprising took place against the earls sent to collect the tax, upon which le burned the city of Worcester to the ground and devastated the surrounding country; in 1041 he permitted Eadwulf, earl of Northumbria, to be treacherously murdered after having granted him his full friendship, It would appear that Hardicanute was greatly given to excess in eating and drinking ; and while carousing at the marriage feast of one of his thegns he was suddenly seized with an epileptic fit, from which he died a few days afterwards, June 8, 1042. He had no children, and though the line of Danish sovereigns might have been continued by Swend, the choice of the kingdom was unanimous for Edward Atheling, son of Ethelred.

See Freeman's Norman Conquest, vol i.: Palgrave's History of the Anglo-Saxons; and Grecn's History of the English People, vol. 1.

HARDING, Jamus Durrratp (1798-1863), a landscape painter, was the son of an artist, and took to the same vocation at an early age, although he had originally been destined for the law. He was in the main a water-colour painter, but he produced various oil-paintings both at the beginning and towards the end of his career. He fre- quently contributed to the exhibitions of the Water-Colour Society, of which he became an associate in 1818, anda full member in 1822. He was also very largely engaged in teaching, and published several books developing his views of art,—amongst others, Zhe

Tourist in [taly, 1831 ; The Tourist in France, 1834; The Park and the Sorest, 1841; The Principles and the Practice of Art, 1845 ; Ele. mentary Art, 1846 ; Scotland Delineated in a Series of Views, 1847 ; Lessons on Art, 1849. He died at Barnes on 4th December 1863. Harding was noted for facility, sureness of hand, nicety of touch, and the various qualities which go to make up an elegant, highly trained, and accomplished sketcher from nature, and composer of picturesque landscape material ; he was particularly skilful a treatment of

foliage, and had for many years a leading position among those landscapists who carry on the miscellaneous work of the art to the satisfaction of their own generation, without establishing an ultimate claim to the higher kind of posthu- mous renown.

HARDING, Jonn. See Harpyne.

HARDINGE, Henry Harprnce, VISCOUNT (1785- 1856), field-marshal and governor-general of India, was born at Wrotham in Kent, March 30, 1785. After passing a short time at Eton college, he entered the army in 1798 as an ensign in the Queen's Rangers, with whom he served in Canada. In the Peninsular War he served for a time on Wellington's staff, and received an appointment as deputy- quartermaster-general in the Portuguese army from Marshal Beresford, whose approval and subsequent influence he had won by his gallantry at Corunna in 1809. Hard- inge was present at nearly all the battles of the campaign ; lhe was wounded at Vimiera and Vittoria. At Albuera he saved the day for the British by taking the responsibility at a critical moment of ordering General Cole's division to advance. When peace was again broken in 1815 by Napoleon's escape from Elba, Hardinge hastened into active service, and was appointed to the important post of com- missioner at the Prussian headquarters. In this capacity he was present at the battle of Ligny, June 16, 1815, where he lost his left hand by a shot, and thus was not present at Waterloo fought two days later. For the loss of his hand he received a pension of £300; and in the same year was made a K.C.B. In 1820 and 1826 Sir Henry Hardinge was returned to parliament as member for Durham; and in 1828 he accepted the office of secretary at war in Wellington's ministry, a post which

he also filled in Peel's cabinet in 1841-43. In 1830 and 1834 he was chief secretary for Ireland. In 1844 he succeeded Lord Ellenborough as governor-general of India, a position which he retained till January 1848. During his term of office the Sikh War broke out; and the governor-general after the battle of Mudki magnanimously offered to serve as second in command under Lord Gough. He mani- fested all his old conrage and skill, and at the peace, for his services in the campaign, he was created Viscount Hardinge of Lahore, and of King's Newton in Derbyshire, with a Government pension of £3000 for three lives ; while the East India Company voted him an annuity of £5000. He returned to England in 1848, and in 1852 succeeded the duke of Wellington as commander-in-chief of the British army. While in this position he had the home management of the Crimean War, which he endeavoured to conduct on Wellington's principles —a system not altogether suited to the changed mode of warfare. In 1855 he was promoted to the rank of field-marshal. Viscount Hardinge resigned his office of commander-in-chief in July 1856 owing to failing health, and died on September 24th of the same year at his liouse near Tunbridge Wells.

HARDOL a British district of Oudh, India, under the jurisdiction of the lieutenant-governor of the North- Western Provinces, lying between 26° 53' and 27° 47' N. lat., and between 79° 44' and 80° 52' E. long, with an area in 1878 of 2285°64 square miles. The district is an irregular parallelogram between the Gumti and Ganges ; its greatest length from north-west to south-east is 78 miles ; and the average breadth is 46 miles, It is bounded on the N. by Shahjahanpur and Kheri; E. by Sitapur, the Gumti forming the boundary-line; 8. by Lucknow and Unao; and W. by Farrukhabad, the Ganges marking the boundary. It isa level district watered by the Ganges, Ramgangé, Garra, Sukheta, Sadi, Baita, and Gumti,—the three rivers first named being navigable by boats of 500 maunds, Or about 17 tons burden. Towards the Ganges, the land is uneven, and often rises into hillocks of sand cultivated at

the base, and their slopes covered with lofty muy grass. The soil of Hardoi is lighter than that of perhaps any other district of Oudh, 27 per cent. being sand, 56 per cent. loam, and 17 per cent. clay. Several large jhils or lakes are scattered throughout the district, the largest being that of Sandi, which is 3 miles long by from 1 to 2 miles broad. These jhils are largely used for

irrigation, 126,000 acres being watered from them. Large tracts of forest jungle still exist. Leopards, black buck, spotted deer, and nilgar are common ; the mallard, teal, grey duck, common goose, and all kinds of waterfowl] abound.

The inhabitants of Hardoi district in 1869 numbered 931,517, of whom 500,994 were males and 430,523 females (Hindus, 845,293; Mahometans, 85,824; Christians, 48; '¢ others," 352). The nine largest towns are,—Shahabad, 18,254 inhabitants ; Sandila, 15,511; Bilgram, 11,534; Mallanwan, 11,670; Sandi, 11,123; Pihant, 7582; Hardoi (the administrative headquarters of the district), 7156; Gopamau, 5949; and Pali, 5122 The principal religious fairs are the following:—At Bilgram, in September, on the occasion of the Ram Lild festival, lasting ten days and attended by about 40,000 persous; at Hattia Haran, during the whole month of Bhadra (August and September), attended by 100,000 persons ; at Barsuya, in April and November, the Pramhanska Samddh festival, lasting for only a single day on cach occasion, and attended by from 15,000 to 20,000 persons. These, together with several other smaller fairs, are held for religious purposes, and have no conunercial importance. Rice, wheat, and other food-grains form the great staples of agri- culture. The area under erops is 844,560 acres or 1319 square miles, being more than one-half the entire area. The Oudh and Rohilkhand Railway from Lucknow to Shéhjahavpur runs through Hardoi for a distance of 62 miles. There are also 329 miles of raised aud bridged roads, and 78 miles of minor roads, intersecting the district. The principal imports are cotton, salt, eountry eloth, and European pieee-goods; the chief exports,—food-grains, sugar, tobaeco, horned eattle, and hides, The value of the imports in 1875 was £102,952 ; of the exports, £62,977. The gross revenue of the district in 1875 amounted to £170,952, the expenditure to £18,478. The regular police (1878) eonsisted of 436 officers and men, eosting £6610. The number of schools in 1875 was 142, with 5877 pupils. The average rainfall for the ten years ending 1872 was 32 inches. Malaria fevers, epidemie cholera, and smallpox prevail.

History.—The first authentic reeords of Hardoi are connected with the Mussulman colonization. Bawan was oeeupied by Sayyid Sélar Masatid in 1028, but the permanent Moslem oceupation did not comnmience till 1217.

Owing to the situation of the distriet, Hardoi formed the scene of many sanguinary battles between the rival Afghan and Mughal empires. Between Bilgram and Sandi was fought the great battle between Humayun and Sher Shah, in which the former was utterly defeated. Hardoi, aleng with the rest of Oudh, beeame British territory under Lord Dalhousie's proclamation of February 1856,

HARDOUIN, Jean, was a classical scholar of the 17th century, at once singularly learned and learnedly singular. He was born at Quimper in Brittany in 1646, and died at Paris in 1727. Having acquired a taste for literature in his father's book-shop, he sought and obtained about his sixteenth year admission into the learned society of the Jesuits. In Paris, where he went to study theology, he ultimately became librarian of the Collége Louis le Grand. The life of laborious authorship inaugurated by his edition of Themistius (Paris, 1684), which included no less than thirteen new orations, was continued with wonderful per- severance and success. At the adyice of Garnier he under- took to edit the Natural History of Pliny for the Delphin series, and five years saw the completion of a task which, in the opinion of Huet, would have taken any ordinary scholar fifty years. His attention having been turned to numismatics as auxiliary to his great editorial labours, he published several learned works in that department, marred, however, as almost everything he did was marred, by a determination to be at all hazards different from other inter- preters. It is sufficient to mention his Nummi antique populorum et urbium illustrat: (Paris, 1684), Antirrheticus de nummis antiquis coloniarum et municipiorum (Paris, 1689), and Chronologia Vet. Test. ad vulgatam versionem exacta et nummis illustrata (Paris, 1696). By the eccles- jastical authorities Hardouin was appointed to supervise

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the Conciliorum collectio regia maxima (Greck and Latin, Paris, 1715, 12 vols.) ; but he was accused of suppressing important documents and foisting in apocryphal matter, and by order of the parliament of Paris the publication of the work was delayed till some of its deficiencies were

remedied. It is, however, as the originator of a variety of |

paradoxical theories that the learned father is now best remembered. The most remarkable, contained in his Chronologie expliquée par les médailles (Paris, 1696), was to the effect that, with the exception of the works of Homer, Herodotus, and Cicero, the Natural History of Pliny, the Georgics of Virgil, and the Satires and Epistles of Horace, all the ancient classics of Greece and Rome were spurious, having been manufactured by monks of thie 13th century,

In 1709 Jean Louis de Lorme published at Amsterdam an edition of Hardouin's Opera Selecta, and though he made many correetions at the author's suggestion, he refused to admit the wholesale can- celling of the passages condemned by the Jesuits, Details in regard to Hardouin's labours, controversies, and whimsies may be found in Bayle and Moreri ; in Lacombe, Diet. des portraits historiques ; Lambert, Hist. litt. du régne de Lowis XI V.; Dupin, Bibliotheque des auteurs ecelesiastiques ; Levot, Biographie bretonne (Vannes, 1852-57); and, more particularly, Augustin and Alois de Backer, Bibliotheque des Eerivains de la Comp. de Jésus (Liége, 1858).

HARDT, Hermann von per (1660-1746), Orien- talist, descended from an old Dutch family, was born at Melle, in Westphalia, on 15th November 1660. His father, who was treasurer of the county of Tecklenburg, appreciating his son's abilities, gave him a good education at Osnabriick, and sent him afterwards to Jena and Leipsic. Young Hardt, gifted with a quick disposition and a power- ful memory, soon gained renown for his fluency in carrying on learned discussions in Latin; but the study of the Ori- ental languages diverted him from all other pursuits, and in no long time he made himself master of Hebrew, Syriac, and Chaldee. The duke of Brunswick, hearing of Hardt's fame, appointed him his librarian shortly after the Ori- entalist had founded at Leipsic a philobiblical society, with the object of determining the sacred text. In 1690 Hardt was called to the chair of Oriental languages at Helmstaidt; and his late master was prevailed upou to pre- sent to that university his valuable library, of which Hardt was again appointed to take charge in 1702. Seven years later he was

named rector of the gymnasium of Marienburg, a post which he held tilt his death on 28th of February 1746.

Among his numerous writings, the following deserve mention:— Autographa Lutheri aliorumque celebrium Virorum, ab anno 1517 ad annuin 1546, Reformationis Aitatem et Historiam egregte tllus- trantia, 1690-91; Magnum eumenicum Constantiense Conetlium, 1697 ; Hebrecee lingue Fundamenta, 1694; Syriace lingue Funda- menta, 1694; Hlementa Chaldaica, 1693; Historia litteraria Re- Sormationis, 1717; Enigmata prisci orbis, 1723. The last is a collection of pieces previously published separately, all of which had been condemned by the church. This republication was ordered to be suppressed. Hardt left a History of the Reformation in manuscript, which is preserved in the Helmstidt Juleum.

HARDWAR, or Hurpwar, an ancient town of India and place of pilgrimage, in Saharanpur district, North-Western Provinces, situated on the right bank of the Ganges at the foot of the Siwélik Hills, in 29° 57’ 30” N. lat. 78° 12’ 52” E. long. Population (1872), 4800. The town is of great antiquity, and has borne many names. It was originally known as Kapila from the sage Kapila. Hwen Thsang, the Chinese Buddhist pilgrim, in the 7th century A.D. visited a city which he calls Mo-yu-lo, the remains of which still exist at Mayapur, a little to the south of the modern town, Among the ruins are a fort and three temples, decorated with broken stone sculptures. The great object of attraction at present is the Hari-ke-charan, or bathing ghdt, with the adjoining temple of Gangadwara. The charan, or foot-mark of Vishnu, is imprinted on a stone let into the upper wall of the gkdt, and forms an object of

| sanctity occurs, known as a Kumbh-mela.

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A great assemblage of people takes every twelfth year a feast of peculiar The ordinary number of pilgrims at the annual fair amounts to 100,000, aud at the Kumbh-mela to 300,000. The Hardwar meeting also possesses considerable mercantile importance, being one of the principal horse-fairs in Upper India. Commodities of all kinds, Indian and European, find a ready sale, and the trade in grain and food-stuffs forms a lucrative traffic.

The Ganges canal draws its supply of water from a branch chanuel close to the town. Hardwar is a police station, with post and telegraph offices,

HARDY, AtexanprE (1560-1631), the most fertile of all dramatic authors, next to Lope de Vega and Calderon, merits a place in dramatic literature on that account alone, He is said to have written upwards of six hundred plays, of which forty-one were printed in his own edition of 1624~28, and may still be read. It cannot be charged upon modern writers that they are slow to see merit in early Freuch authors, but it has been found impossible by any to admire the hasty works of a man who wrote a tragedy in eight days, and did not scruple to borrow situations from any quarter where he could find them. He at first followed a strolling company as its author, and ended by becoming the dramatist of the Théatre du Marais. He knew how to make the most of his situations ; he, evidently by con- stant practice, became a master of stage business and stage effects ; he knew the kind of dialogue—coarse and rough —which would please his audience ; his art, compared with that of Moliére, his successor, is thé art of a carpenter com- pared with that of a sculptor. To the student of the drama Hardy will always be an interesting figure, appearing as he does between the degraded morality and the modern comedy, an imitator alike of Italian pastoral and Spanish tragedy. He had no sympathy with the classical preten- sions of Jodelle ; he gave little heed to arf; he thought entirely of what would succeed for the moment. One piece alone of Hardy's has succeeded in arresting the atten- tion of critics, the tragedy of Mariamne. Hardy lived long enough to witness the first successes of Corneille,

HARDYNG, or Harpine, Joun, an English rhyming chronicler of the 15th century, was born in 1378, Having been admitted at the age of twelve to the household of Henry Hotspur, son of the earl of Notthumberland, he was afterwards present with his patron at the battles of Homildon (1402) and Cokelawe, and saw him fall in the fatal field of Shrewsbury (1402). He next entered the ser- vice of Sir Robert Umfraville, and held for some time the post of constable of the castle of Warkworth. In the begin- ning of the reign of King Henry V. he was commissioned to recover as many as possible of the deeds connected with the homage of the Scottish kings to the English crown ; and we find him some time after presenting the results of his search to Henry at Bois de Vincennes. In recognition of his exertions he was

promised the manor of Gedyngton in Northamptonshire (worth in the money of the time from £32 to £36), but the king dying before he obtained possession he was left, as he tells us, " without reward or lyfelode any wise." Beyond a stray notice in the Lansdowne MS, of his chronicle, to the effect that Hardyng was in 1424 at Rome consulting and transcribing the chronicle of Trogus Pompeius, there is little trace of his proceedings till 1434, when he received a safe conduct from James of Scotland, that he might bring with him "the thynges which we spake to you at Coldingham of, for which we binde us by this letters to pay you a thousand marks of English nobles."

special reverence, place annually, and

tendency ; and in the same year letters patent were issued granting him a pension of £20 per annum for life. The leisure of his old age appears to have been occupied with a revision of his chronicle, which he presented to Edward TV. It could not have been finished before 1465, but it only comes down to the flight of Henry VI. to Scotland. The purpose of the writer being "that Englishe men might haye understanding of all affairs touching their own countree Even to his dayes from all antiquitee," he starts his narrative with Brutus the Trojan, and details the history of all the mythical kings. When he comes down to his own time a considerable part of the material is derived from his own experience. The Scottish portions are ani- mated by strong national hostility: "unto the Scots he could never be friend."

The most important MSS. of Hardyng's Chronicle are the Lans- downe (20) and the Harleian (661) in the British Museum, the Bod- leian (Archiv. Seld., B10), and the Ashmolean. Richard Grafton printed two editions in January 1543, which differ in almost every page from each other. Grafton's abridgment was printed by Tottel in 1562, and again in 1564. Mr Ellisin 1812 edited the work from the Lansdowne MS., and prefixed a life of the author.

HARE, the common name of all the species, excepting the rabbit, of Leporide, a family of rodent mammals, dis- tinguished from the rest of that order by the possession of four incisor teeth in the upper jaw, two infront,

which are well developed and longitudinally grooved, and two exceed- ingly small ones behind. The molars are formed for the mastication of vegetable food, an uneven surface being produced by the presence of transverse enamel plates which are worn down more slowly than the intermediate dentine. The teeth are without permanent roots, and thus the con- stant waste at the surface is compensated for by continuous growth at the opposite extremity. Hares all possess long ears, and in most species the hind legs are. much longer than those in front. They are without exception timid, defenceless animals, although during the breeding season two males have been known to fight together for possession

SS Fig. 1.—Common Hare. *of the female until one was killed ; while all the species are protectively coloured. They form a single genus (Lepus), containing from thirty-five to forty species according as certain forms are regarded as independent species, or merely*

as geographical varieties. They occur in all the great zoo- logical regions of the world, but are especially characteristic of the northern and temperate areas of both hemispheres. The common hare (Lepus témidus, fig. 1) is a typical ex- ample of the family. The ears in this species are longer than the head, and its hind legs are so long in comparison with those in front, that itis only by descending a hill diagonally that it can avoid overbalancing itself. It is found in all parts of Europe except the north of Russia, the Scandinavian peninsula, and Ireland, and is specially abundant in those countries in which it enjoys the protection of game laws. Its fur is usually of a tawny grey colour above and white

beneath, with the upper surface of the short tail and the tips of the ears black. The colour of the fur, however, differs considerably in different latitudes and at different seasons of the year, showing, for example, a tendency to become white during winter in northern countries, while assuming a reddish-yellow hue in the more genial climate of southern Europe. On the strength mainly of such outward differ- ences various species have been described, but these have been found to be so linked together by intermediate forms as to satisfy most naturalists that they are merely climatal varieties of one species. The hare is a night-feeding animal,

remaining during the day on its "form," as the slight depression is called which it makes in the open field, usually among grass. This it leaves at nightfall to seek the fields of young wheat and other cereals whose tender herbage forms its favourite food. It is also fond of gnawing the bark of young trees, and thus often does great damage to plantations. In the morning it returns to its form, where it finds considerable protection in the close approach which the colour of its fur makes to that of its surroundings ; should it thus fail, however, to elude observation it depends for safety on its extraordinary fleetness, On the first alarm of danger it is said to sit erect and to reconnoitre, when it either seeks concealment by clapping close to the ground, or takes to instant flight. In the latter case its great speed, and the cunning endeavours it makes to outwit its canine

Fic. 2.—Mountain Hare.

pursuers, form the chief attractions of coursing. The hare takes readily to the water, where it swims well ; and Yarrell records an instance in which one was observed crossing an arm of the sea about a mile in width. Hares are remark- ably prolific. They pair when scarcely a year old, and the female brings forth several broods in the year, each consist- ing of from two to five leverets (from the French /évre), as the young are called. These have their sight at birth, and after being suckled for a month they are able to look after themselves, In Europe this species has never been known to breed in confinement. The hare was well known to the ancient Greeks and Romans.

In those parts where the common hare does not occur, its place is taken by the varying or mountain hare (Lepus variabilis, fig. 2). It is found throughout the entire northern portion of the great Palearctic region, from Ireland eastward to Japan, while it also occurs on the Pyrenees, the Alps, the highlands of Bavaria and the Caucasus, although altogether absent in the less elevated regions which connect those mountain ranges. Its presence in such isolated situa- tions in company with many truly arctic plants is regarded as one of the many proofs of a former glacial epoch, during which boreal plants and animals were spread all over southern and central Europe. On the advent, however, of milder climatic conditions, this northern flora and fauna retired towards the Arctic Circle, leaving a few species, such

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as the varying hare, behind on the various mountain rauges, where by ascending to a sufficient altitude the necessary boreal conditions could be obtained. The mountain hare differs from the preceding species in its ears being shorter than its head, and in its fur becoming in most cases white in winter,—a change of colour which renders it almost invisible in the snow. Along the southern limit of its range, or in districts where the temperature is from any cause exceptionally mild, this change of colour either does not take place at all, as in Ireland, or is only partial, as in many parts of Scotland. In this respect it resembles the ermine, which it further resembles in having a part of its fur always remaining black ; in the hare, however, it is the tips of the ears,and not the point of the tail, which thus remain unaltered. In Scotland, where it is known as the "blue hare," it occurs plentifully throughout the hilly regions north of the Forth, where it descends to the low grounds in winter; while in Ireland it is the only hare found. Owing to the mildness of the climate, however, in the "' Green Isle," the colour of the fur undergoes little or no alteration in winter, and on this account it was until recently regarded by many as a distinct species (Lepus hibernicus). Throughout the Arctic regions of North America a closely allied species, the polar hare (Lepus glacialis), occurs. Naturalists have hitherto had consider- able difficulty in distinguishing this from the preceding species, the chief difference being in the colour of the fur, which in the Polar hare is white all the year round, with the exception of the tips of the ears. Considerable light has, however, been thrown on this point by the observations of the naturalists attached to the late Arctic Expedition under Sir George Nares, who found this species inhabiting the shores of Grinnell Laud, and obtained evidence in foot- prints on the snow of its existence in latitude 83° 10', about 20 miles north of the nearest land. Unlike all other hares, and resembling in this respect the rabbit, the polar hare would seem to occupy a burrow—"a hole," says Captain Feilden, "4 feet in length, scraped horizontally into a snow drift." "Ihave no doubt," he continues, "the same burrow is regularly occupied, as this one was discoloured by the feet of the animal, and a quantity of hair was sticking to the sides." Another point of importance in establishing the specific distinctness of this species from the former lies in the difference in the number of young composing a brood in each of these species. The number

of young found in gravid females by the naturalists already referred to varied from seven to eight, while in the varying hare of Europe the number does not exceed five. According to Captain Lyon, the polar hare is by no means a shy animal, as during his cruise in the Arctic seas hares were in the habit of coming out on the ice to his ships to feed on the tea leaves which were thrown overboard. This species has thus been found inhabiting the highest northern lands yet visited by man, where it also attains its normal weight of from 8 to 10 b., subsisting on the stoneworts and other hardy plants which form the scanty vegetation of circumpolar valleys. The American varying hare (Lepus americanus) is one of the most widely distributed species of this family, extending, in one or other of its four geographical varieties, from the borders of the Arctic barren grounds southwards to New Mexico. It differs from the mountain hare of Europe iu its smaller size and relatively smaller ears, but resembles it in the change of colour in the fur, especially of the northern varieties, during winter. It is exceedingly abundant on the banks of the Mackenzie River, where it is killed in great numbers by the Hare Indians. A favourite device among the Indians for catching it, according to Darwin, is to walk spirally round and round it, when on its form, especially at midday when the shadow of the hunter is shortest. It has still more implacable enemies, however, in the wolves,

gluttons, and lynxes of those regions, of the last of which it is said to form the principal food. The fur of this species is imported into Great Britain, but it is of little value. Inthe swampy district of the south-eastern portion of the United States, the swamp hare (Lepus aquaticus) and the marsh hare (Zepus palustris) occur. These take readily to the water, and are said to dive for some distance, their legs being less thickly clothed with hair than are those of the less amphibious species. They feed chiefly on aquatic plants. Only one species of hare (Lepus brasili- ensis) occurs in South America. It is found throughout Brazil, and on various parts of the Andes in Bolivia and Peru. Fossil remains of several species of Leporide have been found in the Post-Glacial deposits and the bone-caves of Europe, while the remains of many extinct species have been lately discovered in the Miocene deposits of Dakota and Colorado. (5. GI.)

HARE, Juuits Cuartes (1795-1855), theological writer, was born at Valdagno, near Vicenza, in Italy, on the 13th of September 1795. He came to England with his parents in 1798, but in 1804-5 spent a winter with them at Weimar, where he met Goethe and Schiller, and received a bias to German literature which influenced his style and sentiments throughout his whole career. On the death of his mother in 1806, Julius was sent home to the Char- terhouse in London, where he remained till 1812, when he entered Trinity College, Cambridge. There he became fellow in 1818, and after some time spent abroad he began to read law in London in the following year. In 1822 he was appointed assistant-tutor at Trinity College, which position he retained for ten years. Turning his attention from law to divinity, Hare took priest's orders in 1826 ; and, on the death of his uncle in 1832, he succeeded to the rich family living of Hurstmonceaux in Sussex, where he accumulated a library of some 12,000 volumes, especially rich in German literature. Before taking up residence on his parish he once more went abroad, and made in Rome the acquaintance of the Chevalier Bunsen, who afterwards dedicated to him part of his work, Hippolytus and his Age. In 1840 Hare was appointed archdeacon of Lewes, and in the same year preached a course of sermons at Cambridge (The Victory of Faith), followed in 1846 by a second, Zhe Mission of the Comforter, Neither series when published attained any great popularity. Archdeacon Hare married in 1844, In 1851 he was collated to a prebend in Chichester ; and in 1853 he became one of the queen's chaplains. He died January 23, 1855.

Julius Hare belonged to what has been called the " Broad Church party," though some of his opinions approach very closely to those of the Evangelical Arminian school, while others again seem vague and undecided. He was one of the first of his country- men to recognize and come under the influence of German thought and speculation, and, amidst an exaggerated alarm of Gerinan heresy, did much to vindicate the authority of the sounder German critics. His writings, which are chiefly theological and contro- versial, are largely formed of charges to his clergy, and sermons on different topics; but, though valuable and full of thought, they lose some of their force by the cumbrous German structure of the sentences, and by certain orthographical peculiarities in which the author indulged. In 1827 Guesses at Truth by Two Brothers' appeared. Hare assisted Thirlwall, afterwards bishop of St David's, in the translation of the

1st and 2d volumes of Niebuhr's History of Rome (1828 and 1832), and published a Vindication of Nicbuhr's History in 1829. He wrote many similar works, among which is a Vindication of Luther against his reeent English Assailants, 1854. In 1848 he edited the Remains of John Sterling, who had formerly been his curate. Carlyle's Life of John Sterling was written through dissatisfaction with the " Life" prefixed to Archdeacon Hare's book. Memorials of a Quiet Life, published in 1872, con- tain accounts of the Hare family.

1 Julius Hare's co-worker in this book was his brother Augustus William Hare (1792-1834), who, after a distinguished career at Oxford, was appointed rector of Alton Barnes, Wiltshire. He died prematurely at Rome in 1834. He was the author of Sermons to a Country Congregation, published in 1837.

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HAREBELL, or, asthe name is often written, HAIRBELL, known also as the Blue-bell of Scotland, and Witches' Thimbles, a well-known perennial wild flower, Campanula rotundifolia, L., a member of

the natural order Campanu- @ ry

lacee. The harebell hasavery = NG slender slightly creeping root- firg ; stock, and a wiry, erect stem. Per R The radical leaves, to which the Col ps

specific name refers, have long ' stalks, and are roundish or cord- &) ate, crenate or serrate; the lower stem leaves are ovate or lanceo- late, and the upper ones linear, subsessile, acute and entire, rarely pubescent. 'The flowers are slightly drooping, arranged in a panicle, or in small speci- mens single, having the calyx- tube glabrous, with subulate and erect segments, the corolla campanulate, with slightly re- curvel segments, and the capsule nodding, and opening by pores at the base of the calyx-tube. There are two varieties :—(a) genuina, with slender stem leaves, and (bd) 'montana, in which the lower stem-leaves are elliptical-oblanceolate. The plant is found on heaths and pastures throughout Great Britain and North America, and flowers in late summer and autumn. The harebell has ever been a great

favourite with poets, and on account of its delicate blue colour has been con- sidered as an emblem of purity.

HAREM, or less frequently Haram, the recognized European title for that portion of a polygamist's house which is devoted to the exclusive occupancy of his wives and their attendants, or, by a simple metonymy, for the female portion of his household. The word harem is Arabic for anything forbidden or not to be touched. It is generally applied in Moslem law to such things as games of chance, draughts, chess, witchcraft, and portrait- taking, which are inconsistent with the religious code, and under the form of haram it is well known even to Europeans as designating the sacred enclosure of the prin- cipal mosque at Cairo and at Jerusalem (Haram esch- Scherig). The word seraglio, which is not unfrequently employed as equivalent to harem, is an Italian modification (usually spelled serraglio from assimilation to serrare, to shut in) of the Persian term seraz, which simply means a palace or large building, as in the familiar compound caravanserai. Wherever polygamy is maintained in the midst of a deve- loped social life, the harem appears to be an almost inevitable institution. We consequently find it efter a more or less rigid type among the Jews, the Babylonians, the Siamese, the ancient Persians, the Peruvians, &c. But it is among the modern Mahometan peoples that it has attained its most perfect development; and the harems of the sultan of Turkey and the shah of Persia may be taken as the most elaborate and best-known specimens of the type.

According to the Koran, the Mussulman is required to satisfy himself with four wives, but the sultan may possess as many as seven. Each of these has her own suite of apartmeuts, her own garden and bath-room, and her own body of servants, male and female. They are not called by their names, but distinguished as Kadin (or Lady) Number One, Kadin Number Two, and so on. The title of sultana is bestowed only on the mother, the sister, or the daughter of a sultan; and consequently it isthe kadin who first gives

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NK Harebell (Campanul rotundifolia).

birth to an heir to the empire who alone can have this dis- tinction. She further obtains the title of hasseky or kasseki, but this is lost if the child dies. All the female slaves, or as they are called odalisks (a European corruption of the word odalik, from oda a chamber, and /ik belonging to), are at the absolute disposal of the sultan, and if, in spite of the natural endeavours of the kadins to prevent such a con- tingency, one of them becomes the mother of her lord and master's first-born, she is advanced to the rank of sultana hasseky. It is contrary to etiquette for the sultan to select his own favourites among the odalisks ; he is expected to accept the choice made for him by his mother, who bears the title of validé, and exercises great influence not only in the affairs of the harem but even in political matters. Every odalisk who has been promoted to the royal couch is henceforth considered sacred from all meaner patronage, and receives apartments and attendants of her own; but she has no further claim to the sultan's attention, and may have to console a life-long widowhood with the memory of the honour which was once bestowed on her. The ranks of the odalisks are ever and anon recruited by slaves pre- sented to the sultan by his female relatives or the state officials. The latter, for example, are accustomed to make acknowledgment of their allegiance in this way every year on the evening before the 15th of Ramazan. An old and devoted favourite of the sultan occupies the post of kehaya chatun, or lady-superintendent of the harem. A large body of eunuchs, both black and white, are employed as guards and gate-keepers. The white eunuchs have charge of the outer gates of the seraglio, but they are not allowed to approach the women's apartments, aud obtain no posts of distinction. Their chief, however, the kapou aghassi, or master of the gates, has part control over the ecclesiastical possessions, and even the vizier cannot enter the royal apart- ments without his permission. The black eunuchs bave the right of entering the gardens and chambers of the harem. Their chief, usually called the kizlaer aghasst, or master of the maidens, though his true title is darus scadet aga, or chief of the abode of felicity, is an official of high import- ance. His appointment is for life. If he is deprived of his post he receives his freedom ; and if he resigns of his own accord he is generally sent to Egypt

with a pension of 100 francs a day. His secretary keeps count of the revenues of the mosques built by the sultans. He is usually succeeded by the second eunuch, who bears the title of treasurer or khazuahdar, and has charge of the jewels, &c., of the women. The number of eunuchs is always a large one. The sultana validé and the sultana hasseky have each fifty at their service, and others are assigned to the kadins and the favourite odalisks,

Further details on the Sultan's harem will be found in an anony- mous paper in the Revue d'Orient (London, 1861), in the elaborate article by Hoffmann in Ersch and Gruber's Encyclopédie, and the Serraglio del gransignore descritto (Venice, 1865) by Ottaviano Bon, Venetian ambassador in 1608. An account of a visit to the harem of the Persian prince Melek Kasim Mirza was given by M. Flandin in the Revue des Deux Mondes (1852), and at the time created a great sensation in Persia. Sketches of harem interiors are common in our popular literature from Lady Mary Wortley Montagu's Letters and Lempriere's Tour to Morocco (1793) down to Mrs S. Harvey's Turkish Harems and Circassian Homes (Lond., 1871). The Count de Beauvoir gives a picture of the harems of the sultan of Java and the Siamese mandarins in his Voyage rownd the World (Lond., 1870). Much interesting information on harem life in general is supplied by Dr Hantzsche (who asa physician was mchrem or admis- rr the harem) in Zeitschrift fiir allgemeine Erdkunde (Berlin,

HARFLEUR, the Harflew of our older historians, a maritime town of France in the department of Seine Inférieure and arrondissement of Havre, about 6 miles E. of Havre on the railway between that city and Rouen. Tt lies in the fertile valley of the Lézarde, at the foot of wooded hills not far from the northern bank of the

Seine ; and the steeple of St Martin's, 289 feet high, forms an excellent landmark for the pilots of the river. Its old ramparts are now replaced by bleach-works, chemical fac- tories, and other industrial establishments, and the fosses are transformed into vegetable gardens. St Martiu's is the most remarkable building in the town, and ranks as an "historical monument." It dates from the 15th and 16th centuries, but the great portal is the work of

the 17th, and the whole has undergone the process of modern restoration. Of the old castle there are but insignificant ruins, and the present castle, situated in a fine park to the northward, is a building of the 18th century. The hétel de ville belongs to the 16th. In 1872 the population was only 1966, and though for its size Harfleur is still a busy place with its fishers and traders, it has greatly fallen from its ancient importance.

In the Middle Ages, when its name, Herosfloth, Harofluet, or Hareflot, was still sufficiently uncorrupted to indicate its Norman origin, it was the principal seaport of north-western France. In 1415 it was captured by Henry V. of England, but when in 1435 the people of the district of Caux rose against the English, 104 of the inhabitants opened the gates of the town to the insurgents, and thus got rid of the foreign yoke. The memory of the deed was long perpetuated by the bells of St Martin's tolling 104 strokes. Be- tween 1445 and 1449 the English were again in possession ; but the town was recovered for the French by Dunois. In 1562 the Huguenots put Harfleur to pillage, and its registers and charters perished in the confusion ; but its privileges were restored by Charles IX. in 1568, and it was not till 1710 that it was subjected to the "taille." By common consent Harfleur is now identified with the Caracotinum of the Jéinerary of Antoninus,—M. Fallue's explorations since 1839 having proved conclusively that the neighbourhood is rich in Roman remains.

See De La Motte, Antiquitez de la ville de ITarfleur, Havre de Grice, 1677; Letellier, Recherches historiques sur MTanfleur, 1841; M.Fallue's papers in Archives du Havre, 1840, Mém. de la Soc. des Antiquatres de la Normandie, and Rerue

Archéologique, 1856-57; Abbé de Cochet, La Seine Inférieure, Paris, 1864; E. Dumont and A, Léger, ist. de la ville de Harfleur, 1868.

HARGREAVES, James. See Corroy, vol. vi. p. 490.

HARIANA, or Hurreeanan, a tract of country in the Punjab, India, consisting of a level upland plain, inter- spersed with patches of sandy soil, and largely overgrown with brushwood, The Western Jumna Canal now fertilizcs the grounds of a large number of its villages. Since the 14th century Hissar has been the local capital. During the troublous period

which followed on the decline of the Mug- hal empire, Haritnd formed the battlefield where the Mar- hattds, Bhattis, and Sikhs met to settle their territorial quarrels, The whole surrounding country was devastated by the famine of 1783, Since the conquest of the Punjab, Hariané has been broken up into the districts of Hissar, Rohtak, and Sirsa,

HARING, Wiznetm (1797-1871), German novelist, known as Wilibald Alexis, was born at Breslau, June 23, 1797. He attended the Werder gymnasium in Berlin, and served as a volunteer in the campaign of 1815. On his return he studied law for some time at the universities of Berlin and Breslau, but he soon gave up the legal pro- fession and devoted himself to literature. He made some attempt to add to his income by practical undertakings, but they were rarely successful. He was fond of travel, and happened to be in Italy with his wife during the Revolution of 1848, the progress of which he had an oppor- tunity of watching in Rome, Florence, and Naples. In 1852 he transferred his residence from Berlin to Arnstadt in Thuringia. Here he was laid low by paralysis of the brain, and after many years of suffering died on the 16th September 1871. Haring began his literary career in 1823 with a historical romance, Walladmor, which was given out as the work of Sir Walter Scott.2 It rapidly became popular, and was translated into several languages, includ- ing English. He next published Schloss Avalon, which he eee

1 One of the interlocutors in the jocular " Introduction" to Scott's Betrothed (1825) supposes Walladmor 'to have been the work of Dousterswivel, by the help of the steam-engine,"

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attributed tothe same author. Soon afterwards he issued a number of very successful short stories and several books of travel, and for a time he indicated a preference for the polemical tendencies of the school of Young Germany. In Cabanis, however, which appeared in 1832, he entered the special field of historical romance in which he was destined to achieve his highest fame. From 1840 onwards he pub- lished at short intervals a series of romances, each of which deals with some particular epoch in the history

of Bran- denburg, Among them may be named Der Roland von Berlin (1840), Der falsche Waldemar (1842), Der Wer- wolf (1848), Ruhe ist die erste Biirgerpflicht (1852), Isegrimm (1854), and Dorothe (1856). These tales are not only full of patriotic feeling, but in all of them the interest is well-sustained and the characters are drawn with a bold and firm hand. His Gesammelte Werke have been issued in Berlin in 20 volumes.

HARINGTON, Sir Joun (1561-1612), was the son of Mr John Harington, of Kelston, near Bath, who had been imprisoned in the Tower by Queen Mary for forwarding a letter to Elizabeth. Harington, born in 1561, was Eliza-beth's godson. He studied at Eton and at Christ's College, Cambridge, where he took the degree of M.A., his tutor being Bishop Still, the famous author of Gammer Gurton's Needle. He came up to London abont 1583 and studied law, but Queen Elizabeth scems to have removed him to a place at court. Tradition relates that it was at her command that he undertook the translation of Ariosto's Orlando Furioso, a work that saw the light in 1591 and was reprinted in 1607 and 1634. Soon after this first date Harington retired to the family mansion at Kelston. In 1596 he published in succession The Metamorphosis of Ajax, An Apology, and Ulysses upon Ajax, the three forming collectively a very absurd and indecorous work of a Pan-tagruelistic kind. In 1599 he served in Ireland under Essex, and was knighted on the field, to the annoyance, it is said, of Elizabeth. He married a lady of title, who bore him eight children, and who survived until 1634. In 1608 he wrote a personal satire against the bishops, which he read to James I., but which was first published, by a Presbyterian printer, as late as 1653, under the title of A Brief View of the State of the Church. This is a somewhat scandalous production. In the spring of 1612, Harington was suffering heavily from the dropsy, and in December of that year he died. In 1613 his Epigrams, which had circulated widely in MS., were printed in a collection of the verse of various writers entitled Alcilia, and separately in 1615. They became very popular, and were often reprinted. The miscellaneous writings of Harington existing in MS. in his family were first collected by the Rev. Henry Harington in 1779, in 2 volumes, under the title of Nugw Antique. The Nuge include some very elegant pieces of the poet's father.

The translation of the Orlando Furioso was a very im- portant labour, and it was carried out with skill and per- severance. Harington, however, was neither a very exact scholar nor a very poetical translator, and he cannot be named in the same breath with Fairfax. The Orlando Furioso was a sumptuous book, illustrated in the best taste of the day, and to it were appended a prose critique of the poem, and a life of Ariosto compiled by Harington from various Italian sources. Harington's Rabelaisian pamphlets show that he was almost equally endowed with wit and indelicacy, while of his epigrams little can be said but that they are sometimes smart and always easy.

HARIRI. Abu Mohammed al Kasim ibn 'Alf Ibn Mohammed ibn 'Othman, surnamed EL Hariri, was born at Bussorah 1054-55 a.p. and died in 1121 or 1123, being therefore contemporary with the first crusade. His native city was renowned for its school of grammar, a most im-

portant science amongst a people whose every rule of religion and of life depended upon the accurate interpreta- tion of some word or passage of the Koran, or some saying of the prophet. The rival school of Kufa was the only one

disputes that took place between the two academies Bussorah is generally allowed to have had the advantage. His name Hariri signifies silk-merchant, and was probably derived from his father's occupation, as, in spite of the assertion of his biographers to that effect, he appears not to have ever engaged in trade, but to have devoted himself exclusively to literary pursuits. His great object was to investigate the niceties of the Arabic language, and he composed several treatises on the subject, amongst which the best known 'are Mothat el 'Frab (Beauties of Desinential Syntax) and Durrat el Ghawwds (The Diver's Pearl), in which he criticizes certain common faults of language in vogue amongst the educated. Portions of both these works have been pub- lished by De Sacy in his Chrestomathie, and the Durrat el Ghawwds has been edited by H. Thorhbecke (Leipsic, 1871). But his great work is the Makdémdt, or "' Assemblies," in which a series of anecdotes of a very slight character in the career of an imaginary learned vagabond afford the oppor- tunity for the

display of vast philological and literary learning. The plan was not original, having been already invented and used by Badi‘ az Zaman el Hamadani, who died about 1008, The composition of Hariri’; own Makémdt is attributed to the following circumstance. Being one day in the mosque of the Beni Haram, in the quarter of Bussorah in which he resided, he noticed an old man enter, shabby and worn with travel, who in answer to the questions of the persons present gave his name as Abu Zeid, and said that he came from Sertj, a city near Edessa, which had recently been devastated by the crusaders. The old man related the incidents of the destruction of his native city and his own domestic losses and exile in so eloquent a strain as to excite general admira- tion and compassion. On reaching his home Harirt wrate out the incident in the form of a makémeh or assembly, in the style of El Hamadani’s work, and it now forms the 48th of his book. When subsequently elaborating the idea he modelled the successive chapters on the same theme; a simple-minded Arab gentleman, El Harith ibn el Hammam, on his travels constantly meets with a vagabond old impro- visatore, Abu Zeid, who, under different characters and disguises, always succeeds in eliciting the sympathy and alms of his audience and the approbation of El Harith him- self. Abu Zeid is always poor, ill-dressed, and crafty, but eloquent in the extreme, and his fraudulently-obtained gains are always spent in some forbidden enjoyment; yet there is ever a good side to his character, and he is not without an exhibition of true feeling, especially when he alludes to the circumstances of his expulsion from his home, and the loss of his daughter, who had been made captive by the marauding Franks. The improvised speeches of Abu Zeid are masterpieces of Arabic learning, every sentence being made to introduce some allusion to Arab history, poetry, or tradition, or the discussion and elucidation of some difficult point of rhetoric orgrammar. Itis this that gives the value to the book and makes it with its commentary a complete encyclopedia of classical Arabic literature and philology. It is written in rhymed and rhythmical prose, such as is used in the Koran itself, interspersed with verses of poetry of which the merit is more often in the language than the thought.

The Makdmdt have been edited by Silvestre de Sacy, with a select Arabic commentary (Paris, 1822), and a new edition of this edition, with numerous

French notes, was issued by MM. Reinaud and Derenbourg (Paris, 1853). An English translation of some select

‘ Assemblies” was made by Theodore Preston for the Oriental Translation Fund (London, 1850), and an admirable translation of*

the first twenty-six assemblies by T. Chenery (London, 1867), con- taining an introduction and notes, and a resumé of all the litera- ture of the subject. Of the numerous imitations of the Makdmdt of Hariri, the best known are the Machberoth Ithiel, a Hebrew work

| by Yehudah ben Shelomoh al Kharizi, edited by T. Chenery that approached it in fame or glory, and in all the numerous |

(London, 1872), and the Majma ‘al Bahrain (Confluence of the Two Seas), by Nasyf el Yaziji (Beyrout, 1853), an excellent work in Arabic, displaying an immense acquaintance with the ancient literature of the language. (E. H. P.)

HARLEQUIN. See Pantromrme.

HARLEY. See Oxrorp, Ear or.

HARLINGEN, or HAARtLinGen, in Frisian Harns, an important trading town and seaport in the province of Friesland in the Netheriands, is situated 17 miles W. of Leeuwarden with which it has been connected by rail since 1863. Besides its dilapidated fortifications, and the town-house, which was erected between 1730 and 1733 and is adorned with a statue of the historian Simon Stijl, the only noteworthy buildings are the Great or New church, the West church, which was formerly part of the castle, the Roman Catholic church, and the Jewish synagogue. The school of navigation and school of design may also be mentioned. Harlingen is the seat of the Frisian Navigation Company, and it has regular steam communication, not only with Amsterdam and Nieuwe Diep, but also with London and Hull. Besides an inner harbour protected from the high tides by powerful sluices, it has au outer harbour of modern construction for the

accommodation of large vessels. One of the chief depart- ments of its trade is the export to England of Frisian pro- duce—corn, cattle, butter, cheese, and flax. Wharves, saw-mills, anchor forges, rope-yards, and a canvas factory represent the auxiliary industries of the place. In the middle of the last century, Harlingen had 7000 inhabitants, which increased in the course of the next hundred years to about 8000. In 1860, before the new harbour works, they numbered 9800, and in 1878 they were 10,800.

Originally Harlingen was only a part of the village of Almenum, and lay at some distance inland, but the Zuyder Zee, which had already in 1134 destroyed an intervening town, made another in- road in 1566 and attained its present limits. The Spanisli lieu- tenant Caspar Robles de Belly, whose monument, the " Man of Stone," now stands on the sea-dyke, took care to protect the site of the town by further embankments. In 1579 it was surrounded by walls and fosscs ; a new castle had been built in 1502. During the civil broils of 1787 Harlingen was blockaded by the patriots of

Franeker. In November 1776 and February 1825 it suffered from severe inundations.

HARMODIUS, a beautiful Athenian of the tribe Gephyrei, was the intjmate friend of Aristogiton, a citizen of the middle rank. Hipparchus, younger brother of the tyrant Hippias, was also a lover of Harmodius. He tried to attract Harmodius to himself, and failing in the attempt, revenged himself by putting a public affront on his sister at a solemn festival. Thereupon the two friends conspired with a few others to murder both the tyrants during the armed procession at the Panathenaic festival (514 B.c.). But in a sudden alarm they prematurely at- tacked and slew Hipparchus alone. Harmedius wascut down on the spot by the guards, and Aristogiton was soon captured and tortured to death, When Hippias was expelled (510 B.C.), Harmodius and Aristogiton became the most popular of Athenian heroes ; their statues were set up in the agora, their descendants were exempted from public burdens, and their names were celebrated in popular songs and scolia as the deliverers of fair Athens. Thucydides (vi. 54) alludes to the falseness of the popular belief about them, and gives the story in detail.

HARMONTA, wife of Cadmus. The Theban legends (see Capmus) have been so modified and systematized by poets and logographers that we must look

to Samothrace with its old religious rites for an explanation of the myth. There Harmonia is said to have been the daughter of Zeus and Electra, while her brother Iasion was the founder of

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the mystic rites which were celebrated annually on the island. When Cadmus came to Samothrace, and was initiated, he received Harmonia as his wife. The gods honoured the wedding with their presence, Athene presented the bride with a peplus and necklace, Electra gave the mystic rites of the mother of the gods, According to the scholiast on Euripides (Phen., i.) Cadmus with the aid of Athene carried off Harmonia ; and in the mysteries the lost Harmonia is regularly sought for. We have here an exact parallel to the Eleusinian legends. Electra and Harmonia are mere varieties of Demeter and Core, Cadmus like Pluto carries off the bright daughter of the goddess to the world below to spend tliere the dreary winter. Hence in the Theban tale Cadmus and Harmonia leave Thebes to go away among the Encheleis, the snake people, are themselves changed into serpents, and are finally translated to the Elysian fields. We then under- stand, too, why (according to Pausanias, ix. 16, 5) Cadmus dwelt at Thebes in the temple of Demeter Thesmophoros. The necklace, wrought by Hephestus, which Harmonia received as a marriage gift, may be compared with the cestus of Aphrodite; for it is impossible to draw a fast line between Harmonia or Core and Aphrodite. Then it is seen to be the mythic representative of some pheno- menon like the halo of dawn or the rainbow. Like the works of the German dwarfs, this necklace carried with it ill-luck, and the legends give it a history of woe, With it Polynices bribed Eriphyle to betray her husband Amphi- araus, It brought death at last to her son Alemzon. Dedicated in the temple of Athene Pronoia at Delphi, it was given by the tyrant Phayllus (352 3.c,) to his mistress; her son going mad set fire to the house, and she perished in the conflagration, HARMONICA is the technical name for the " musical glasses" with the learned conversation about which the pseudo-ladies from town astonish the simple-minded vicar of Wakefield, An instrument for producing musical sounds by means of drinking glasses touched with the moistened fingers was, however, known 100 years before Goldsmith's novel. What its exact nature may have been cannot now be ascer- tained, but its mode of playing must have been far from perfect ; for

as late as the middle of the 18th century the musical glasses played by Mr Puckeridge were placed on a table and their pitch was fixed by the quantity of water they contained, naturally a very uncertain mode of deter- mination. It was to this instrument that the great Ben- jamin Franklin applied his improvements described in his letter to Father Beccaria of Turin. Instead of fixing the glasses he made them rotate round a spindle set in motion by the player's foot by means of a treadle. The edge of the glasses by the same means passed through a basin of water, the pitch henceforth being determined by the size of the glasses alone, The player touched the brims of the revolving glasses with his finger, his task being further facilitated by the scale of colour which Franklin adopted in accordance with the musical gamut. Thus C was red, D orange, E yellow, F green, G blue, A indigo, aud B violet. The black keys of the piano were represented by white glasses. The instrument thus improved became very fashionable in England, and a Miss Davis, a relation of Franklin's, became a celebrated harmonica player, who per- formed at numerous concerts with great applause, It is interesting to know that the great composer Gluck was a virtuoso on the musical glasses in their earlier form, which he played, according toa contemporary advertisement, at the Haymarket Theatre, April 23, 1746. He even seems to have claimed the instrument as his own invention, and promises to " perform upon it whatever may be done on a violin or harpsichord." Nowadays the idea of a composer of repute—for such Gluck was at the time —playing on the

musical glasses would appear grotesque. But the notions of artistic dignity were different in the 18th century. Many attempts have been made to increase the power and flexi- bility of the harmonica, and also to avoid the nervous irrita- bility said to be caused by the friction of the vibrating glasses, Thus harmonicas played with the bow or by means of a keyboard, like that of the pianoforte, have been invented. But none of these has met with permanent success, and in all essential points the modern harmonica is such as Franklin left it.

HARMONIC ANALYSIS is the name given by Sir William Thomson and Professor Tait in their treatise on Natural Philosophy to a general method

of investigating physical questions, the earliest applications of which seem to have been suggested by the study of the vibrations of strings aud the aualysis of these vibrations into their funda- mental tone and its harmonics or overtones.

The motion of a uniform stretched string fixed at both ends is a periodic motion; that is to say, after a certain interval of time, called the fundamental period of the motion, the form of the string and the velocity of every part of it are the same as before, provided that the energy of the motion has not been sensibly dissipated during the period.

There are two distinct methods of investigating the motion of a uniform stretched string. One of these may be called the wave method, and the other the harmonic method. The wave method is founded on the theorem that in a stretched string of infinite length a wave of any form may be propagated in either direction with a certain velocity, V, which we may define as the "velocity of pro- pagation." If a wave of any form travelling in the positive direction meets another travelling in the opposite direction, the form of which is such that the lines joining correspond- ing points of the two waves are all bisected in a fixed point in the line of the string, then the point of the string corre- sponding to this point will remain fixed, while the two waves pass it in opposite directions. If we now suppose that the form of the waves travelling in the positive direc- tion is periodic, that is ta say, that after the wave has travelled forward a distance /, the position of every par. ticle of the string is the same as it was at first, then Z is called the wave-length, and the time of travelling a wave- length is called the periodic time, which we shall denote by T, so that

i=VT.

If we now suppose a set of waves similar to these, but reversed in position, to be travelling in the opposite direc- tion, there will be a series of points, distant 4/7 from each other, at which there will be no motion of the string ; it will therefore make no difference to the motion of the string if we suppose the string fastened to fixed supports at any two of these points, and we may then suppose the parts of the string beyond these points to be removed, as it cannot affect the motion of the part which is between them. We have thus arrived at the case of a uniform string stretched between two fixed supports,

and we couclude that the motion of the string may be completely represented as the resultant of two sets of periodic waves travelling in opposite directions, their wave-lengths being either twice the distance between the fixed points or a submultiple of this wave- length, and the form of these waves, subject to this condi- tion, being perfectly arbitrary.

To make the problem a definite one, we may suppose the initial displacement and velocity of every particle of the string given in terms of its distance from one end of the string, and from these data it is easy to calculate the form which is common to all the travelling waves. The form of the string at any subsequent time may then be deduced by calculating the positions of the two sets of waves at that time, and compounding their displacements.

Thus in the wave method the actual motion of the string is considered as the resultant of two wave motions, neither of which is of itself, and without the other, consistent with the condition that the ends of the string are fixed. Each of the wave motions is periodic with a wave-length equal to twice the distance between the fixed points, and the one set of waves is the reverse of the other in respect of displace- ment and velocity and direction of propagation ; but, subject to these conditions, the form of the wave is perfectly arbitrary. The motion of a particle of the string, being determined by the two waves which pass over it in opposite directions, is of an equally arbitrary type.

In the harmonic method, on the other hand, the motion of the string is regarded as compounded of a series of vibra- tory motions which may be infinite in number, but each of which is perfectly definite in type, and is in fact a parti- cular solution of the problem of the motion of a string with its ends fixed.

A simple harmonic motion is thus defined by Thomson and Tait ($ 53) :— When a point Q moves uniformly in a circle, the perpendicular QP, drawn from its position at any instant to a fixed diameter AA' of the circle, inter-

sects the diameter in a point P whose position changes by a simple harmonic motion,

The amplitude of a simple harmonic motion is the range on one side or the other of the middle point of the course.

The period of a simple harmonic motion is the time which elapses from any instant until the moving-point again moves in the same direction through the same position.

The phase of a simple harmonic motion at any instant is the fraction of the whole period which has elapsed since the moving point last passed through its middle position in the positive direction.

In the case of the stretched string, it is only in certain particular cases that the motion of a particle of the string is a simple harmonic motion. In these particular cases the form of the string at any instant is that of a curve of sines having the line joining the fixed points for its axis, and passing through these two points, and therefore having for its wave-length either twice the length of the string or some submultiple of this wave-length. The amplitude of the curve of sines is a simple harmonic function of the time, the period being either the fundamental period or some submultiple of the fundamental period. Every one of these modes of vibration is dynamically possible by itself, and any number of them may coexist independently of each other.

By a proper adjustment of the initial amplitude and phase of each of these modes of vibration, so that their resultant shall represent the initial state of the string, we obtain a new representation of the whole motion of the string, in which it is seen to be the resultant of a series of simple harmonic vibrations whose periods are the funda- mental period and its submultiples, The determination of the amplitudes and phases of the several simple harmonic vibrations so as to satisfy the initial conditions is an example of harmonic analysis,

We have thus two methods of solving the partial differ- ential equation of the motion of a string. The first, which we have called the wave method, exhibits the solution in the form containing an arbitrary function, the nature

of which must be determined from the initial conditions. The second, or harmonic method, leads to a series of terms involving sines aud cosines, the coefficients of which have to be determined. The harmonic method may be defined in a more general manner as a method by which the solu- tion of any actual problem may be obtained as the sum or resultant of a number of terms, each of which is a solution of a particular case of the problem. The nature of these particular cases is defined by the condition that any one of them must be conjugate to any other.

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HARMON ILO – ANALYSIS

The mathematical test of conjugacy is that the energy of the system arising from two of the harmonics existing together is equal to the sum of the energy arising from the two harmonics taken separately. In other words, no part of the energy depends on the product of the amplitudes of two different harmonics. When two modes of motion of the same system aré conjugate to each other, the existence of one of them does not affect the other.

The simplest case of harmonic analysis, that of which the treatment of the vibrating string is an example, is com- pletely investigated in what is known as Fourier's theorem.

Fourier's theorem asserts that any periodic function of a single variable period y, which does not become infinite at any phase, can be expanded in the form of a series consist- ing of a constant term, together with a double series of terms, one set involving cosines and the other sines of multiples of the phase.

Thus if f(€) is a periodic function of the variable é having a period p, then it may be expanded as follows : Qtrk

(8) = Bo + EAs cos T+ BPR, sin (1).

The part of the theorem which is most frequently required, and which also is the easiest to investigate, is the determination of the values of the coefficients Ay, A, By.

These are 1 p Ajy=— p \d, ; 0 J, (t)dé

Pe Qirt 5, . Ae, 20m 8 at ; ae P(é) cos p é B; == ee) sin am dé. This part of the theorem may be verified at once by multi-

plying both sides of (1) by dé, by cos — aE, or by sin

a dé, and in each case integrating from 0 to p.

The series is evidently single-valued for any given value of €. It cannot therefore represent a function of ¢ which has more than one value, or which becomes imaginary for any value of € It is convergent, approaching to the true value of #(€) for all values of ¢ such that if € varies in- finitesimally the function also varies infinitesimally.

Sir W. Thomson, availing himself of the disk, globe, and cylinder integrating machine invented by his brother, Pro- fessor James Thomson, has constructed a machine by which eight of the integrals required for the expression of Fourier's series can be obtained simultaneously from the recorded trace of any periodically variable quantity, such as the height of the tide, the temperature or pressure of the atmos- phere, or the intensity of the different components of terrestrial magnetism. If it were noton account of the waste of time, instead of having a curve drawn by the action of the tide, and the curve afterwards acted on by the machine, the time axis of the machine itself might be driven by a clock, and the tide itself might work the second variable of the machine, but his would involve the constant presence of an expensive machine at every tidal station.

It would not be devoid of interest, had we opportunity for it, to trace the analogy between these mathematical and mechanical methods of harmonic analysis and the dynamical processes which go on when a compound ray of light is analysed into its simple vibrations by a prism, when a particular overtone is selected from a complex tone by a resonator, and when the enormously complicated sound- wave of an orchestra, or even the discordant clamours of a crowd, are interpreted into intelligible music or language by the attentive listener, armed with the harp of three thousand strings, the resonance of which, as it hangs in the gateway of his ear,

discriminates the multifold compon- ents of the waves of the aerial ocean. (3. ©. M.)

HARMONIUM

HARMONIUM. Perhaps no musical instrument ever became in a few years so widely known and used as the harmonium. The reasons for this may at once be found in the facilities it offers for playing easy music, and, when simply constructed, its comparatively low price, which renders the purchase of a tolerable harmonium possible when the cheapest pianoforte fairly playable would be un- attainable, and the real organ, although of chamber size, quite out of the question. Besides being a convenient makeshift for an organ, the harmonium can also be used in domestic concerted music, to play all or any of the wind band parts of the orchestra; it may even be employed as a substitute for the violin, and in such vicarious uses it is past all question one of the handiest of deputies.

It is true the tone of the harmonium is not in itself beautiful ; the prominence in sounds from reeds of eertain overtones is irreconcilable with pleasure to the ear unless by convention of habit, and the necessity of tuning ac- cording to equal temperament all major thirds too sharp leads through this harmonic peculiarity in the chords to an abnormally disagreeable quality, from which those whose nerves are very sensitive or weak are not unfre- quently painfully affected. The American organ, a kind of harmonium of late years much in vogue, owes its popularity to its being less pronounced and reedy in timbre (its softer tone being nearer to that we are familiar with in the church organ), and to its being easier to play for simple domestic use. Yet the real harmonium has more in- dependent character as an instrument, and is capable of higher treatment in performance than the American organ.

Both are known as " free-reed " instruments, the musical tones being produced by tongues of brass, technically "vibrators," set in oblong frames; the sides of these they do not quite touch, but pass, when in movement, freely downwards,—the "beating reeds" used in church organs covering the entire orifice. A reed or vibrator, set in periodic motion by impact of a current of air, produces a corresponding succession of air puffs, the rapidity of which determines the pitch of the musieal note. There is an

essential difference between the harmonium and the American organ in the direction of this current; in the former the wind apparatus forces the current upwards, and in the latter sucks it downwards, whence it becomes desirable to separate in description these varieties of free- reed instruments.

The Harmonium has a keyboard of five octaves compass when complete, from C to C, anda simple action controlling the valves, &e. The necessary pressure of wind is generated by bellows worked by the feet of the performer upon footboards or treadles. The air is thus forced up the wind-trunks into an air-chamber called the wind-chest, the pressure of it being equalized by a reservoir, which receives the excess of wind through an aperture, and permits escape, when above a certain pressure, by a discharge valve or pallet. The aperture admitting air to the reservoir may be closed by a drawstop nanied "expression." The charaeter of the instrument is then entirely changed from a mechanical response to the player's touch to an expressive one, rendering what emotion may be communicated from the player by increase or diminution of sound through the greater or less pressure of wind the reeds may be submitted to. The draw- stops bearing thé names of the different registers in imitation of the organ, admit, when drawn, the wind from the wind-chest to the eorresponding reed compartments, shutting them off when closed. These compartments are of about two octaves and a half each, there being a division in the middle of the keyboard scale dividing the stops into bass and treble. A stop being drawn and a key pressed down wind is admitted by a corresponding valve to a reed or vibrator. Above each reed "in the so-called sound-board or pan is a channel, a small air-chamber or cavity, the shape and capacity of which have greatly to do with the colour of tone of the note it reinforces. The air in this resonator is highly compressed at an even or a varying pressure as the expression-stop may not be or may be drawn. The wind finally escapes by a small pallet-hole opened by pressing down the corresponding key. In Mustel and other good harmoniums, the reed compartments that form the scheme of the instrument are eight in number, four bass and four treble, of three different pitches of octave and double octave dis-

diapason ” of the diapason), 16 feet.

tance. The front bass and treble rows arc the “ piteh known as 8 feet, and the bourdon (double These may be regarded as the foundation stops, and are teehnically the front organ. The back organ has solo and combination stops, the principal of 4 feet (octave higher than diapason), and bassoon (bass) and oboe (treble), 8 feet. These may be mechanieally com- bined by a stop called full organ. M. Mustel, the French maker, whose pre-eminence is universally aeknowledged, has added other registers for much admired effects of tone, viz.,—<« harpe éolienne,” two bass rows of 2 feet piteh, the one tuned a beat too sharp, the other a beat too flat, to produce a waving tremulous tone that hasa certain charm; “musette” and “voix celeste,” 16 feet; and “‘baryton,” a treble stop 32 feet, or two octaves lower than the nor- mal note of the key. The “ back organ” is usually covered by a swell box, containing louvres or shutters similar to a Venetian blind, and divided into fortes corresponding with the bass and treble division of the registers. The fortes are governed by knee pedals which act by pneumatic pressure. Tuning the reeds is effected by scraping them at the point to sharpen them, or near the shoulder or heel to flatten them in pitch. Air pressure affects the pitch but slightly, noticeable only in the larger reeds, and harmoniums long retain their tuning, a decided advantage over the organ and the pianoforte. Mechanical coutrivances in the harmonium, of frequent or occasional employment, besides those already referred to, are the “ percussion,” a small pianoforte action of hammer and escapement which, acting upon the reeds of the diapason rows at the moment air is admitted to them, gives prompter response to the depression of the key, or quicker speech; the ‘double expres- sion,” a pneumatic balance in the wind reservoir of great delicacy exactly maintaining by gradation equal pressure of the wind ; and the “double touch,” by which the back organ registers speak sooner than those of the front that are called upon by deeper pressure of the key, thus allow prominence or accentuation of certain parts by an expert performer. <‘ Prolongement” permits selected notes to be sustained after the fingers have quitted their keys. Dawes’s “melody attachment” is to give prominence to an air or treble part by shutting off in certain registers all notes below it. This notion has been adapted by inversion to a pedal substi- tute ” to strengthen the lowest bass notes. The “tremolo” affects the wind in the vicinity of the reeds by small bellows which in- creases the pulsation in

*rapidity according to pressure; and the *‘sourdine” diminishes the supply of wind by controlling its ad- mission to the reeds,*

The American Organ, as already said, acts by wind exhaustion. A vacuuin is practically created in the air-chamber by the exhaust- ing power of the footboards, and a current of air thus drawn down- wards passes through any reeds that are left open, settmg them in vibration. This instrument has therefore exhaust instead of force bellows. Valves in the board above the ‘air-chamber give com- munication to reeds, made more slender than those of the har- monium and more or less bent, while the frames in which they are fixed are also differently shaped, being hollowed rather in spoon fashion. The channels, the resonators above the reeds, are not varied in size or shape as in the harmonium; they exactly corre- spond with the reeds, and are collectively known as the “ tube- board.” The swell “fortes” are in front of the o enings of these tubes, rails that open or close by the action of the Pee upon what may be called knee pedals. The tone of the American organ is softer than that of the harmonium; this is sometimes aided by the use of extra resonators, as, for instance, in Clough and Warren’s latest instruments (of Detroit, Michigan, U.S.), which they call pipes or qualifying tubes. The blowing being also easier, ladies find it much less fatiguing. To these differences we may attribute its increasing popularity. The expression stop can have little power in the Anierican organ, and is generally absent; the ‘au- tomatic swell” in the instruments of Mason and Hamlin (of Boston, U.S.) is a contrivance that comes the nearest to it, thonglhi far in- ferior. By it a swell shutter or rail is kept in constant movement, proportioned to the force of the air-current. Another very elever improvement introduced by thsse makers, who are the originators of the instrument itself, is the “ vox humana,” a smaller rail or fan, made to revolve rapidly by wind pressure; its rotation, disturbing the air near the reeds, causes interferenees of vibration that pro- duce a tremulous effect, not unlike the beatings heard from com- bined voices, whence the name. This vibrato stop has found general adoption. The arrangement of reed compartments in American organs does not essentially differ from that of harmoniums; but there are often two keyboards, and then the solo and combination stops are found on the upper manual. The diapason treble register is known as “ melodia ’”’— different makers occasionally vary the use of fancy names for other stops. The “ subbass,” however, an octave of 16 feet pitch and always apart from

the other reeds, is used with great advantage for pedal effects on the manual, the compass of American organs being usually down to F (FF, 5 octaves). In large instruments there are sometimes foot pedals as in an organ, with their own reed boxes of 8 and 16 feet, the lowest note being then CC. Blowing for pedal instruments has to be done by hand a

lever being attached tor that purpose. The “ celeste” stop is managed as in the harmonium, by rows of reeds tuned not quite in unison, or by a shade valve that alters the air-current and flattens one row of reeds thereby.

Harmoniums and American organs are the results of many experiments to play upon free reeds by a key- board, initiated by the ‘“orgue expressif” of Grenié, a Frenchman. During nearly the first half of this century various tentative efforts in France and Germany, and subse- quently in England, came to nothing more valuable than the Viennese ‘“physharmonica” of Hickel, the Parisian ‘“‘melophone,” and our own “‘seraphine.” The inventor of the harmonium was indubitably Alexandre Debain, who took out a patent for it in Paris in 1840. He produced varied timbre registers by modifying reed chan- nels, and brought these registers on to one keyboard. Unfortunately he patented too much, for he secured even the name harmonium, obliging contemporary and future experimenters to shelter their improvements under other names, and the venerable name of organ becoming im- pressed into connexion with an inferior instrument, we have now to distinguish between reed and pipe organs. The compromise of reed organ for the harmonium class of instruments must therefore be accepted. Debain’s harmonium was at first quite mechanical; it gained ex- pression by the expression-stop already described. The Alexandres, well-known French makers, by the ingenuity of one of their workmen, Martin, added the percussion and the prolongement. The melody attachment was the invention of an English engineer ; the introduction of the double touch, now used in the harmoniums of Mustel, Bauer, and others—also in American organs—is due to Mr Tamplin, an English professor. Reference has already been made to the improvements of M. Mustel, a maker imbued with true artistic devotion.

The principle of the American organ originated with the Alexandres, whose earliest experiments are said to have been made with the view of constructing an instrument to ex- haust air. The realization of the idea proving to be more in consonance with the genius of the American people, to whom what we may call the devotional tone of the instru- ment appealed, the introduction of it by Messrs Mason and Hamlin in 1861 was followed by remarkable success. They made it generally known in Europe by exhibiting it at Paris in 1867, and from that time instruments have been exported in large numbers by different makers. Har- moniums are not entirely, although chiefly, of French make. Mr Bauer, one of the best English makers, learned the trade in Paris, and employs chiefly French workmen. As keyed instruments, reed organs of either principle cannot be expected to compete musically with the older organ and pianoforte, yet the harmonium, studied for itself with something like the devotion that is given to the other keyed instruments, might be made more important than it is at present. Excepting from a few isolated students who may be told upon the fingers, it has received no true cultivation. Whether it will ever get this is a ques- tion that remains to be answered. Commercially the har- monium and American organ have taken a much more important place, although of course one not equal to that of the pianoforte. For some years the Alexandres were sending annually 7000 harmoniums to England. This afterwards, from various causes, diminished ; the number, however, of their instruments made up to 1879 has reached 110,000. A general estimate of harmoniums made annually in France, Germany, and England is not forthcoming ; but the yearly production of American organs in the United States has been stated at the large total of 40,000. (A.J. H.)

HARMONY. See Acoustics and Music.

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Hake

HARO, said to be the ancient Castrum Bilium, a town of Spain, is situated in the province of Logrofio, and the bishopric of Calahorra, 12 miles S.E. of Miranda, and 58 miles N. of Madrid. It occupies a beautiful site near the Ebro, in a fertile plain, bounded by a range.of mountains, The town contains a fine parish church, a theatre built in 1841, a hospital, and other

public buildings. Various unimportant manufactures are carried on by the inhabitants ; but the chief source of wealth is the red wine produced in great abundance from the vines of the surrounding plain. There are some copper-mines in the neighbourhood. Haro was the birthplace of Diego de Leyva, the celebrated painter, about 1580. The population was estimated for 1870 at 6594.

HAROLD I., surnamed Fairhaired (Harald Haarfager), the founder of the old royal dynasty of Norway, succeeded his father, Halfdan the Black, as jarl about the year 863. His ambition to become king is said to have been awakened by the refusal of Gyda, daughter of Eric of Hadaland, to marry him until he had made himself ruler of all Norway, as Gorm had of Denmark, and Eric of Sweden; and he vowed that he would never clip nor comb his hair until he had fully achieved his task. After he had subdued all the jarls, he sent for Gyda and made her one of his wives, and had his hair cut at a feast in Mére by Jarl Régnwald, who then gave him the name of Haarfager. During the wars of Harold with the jarls many of the Norsemen left their country and settled in Iceland, the Faroe Islands, the Orkney and Shetland Islands, and even in the Hebrides of Scotland, from whence they returned and committed many sea robberies in Norway. Harold therefore fitted out a great expedition, conquered and slew the vikings, and made himself ruler over all tliese Norse settlements. During his absence on another expedition against Jarl Einar of Orkney his sons made war on one another, and also committed many acts of violence against his jarls. Accord- ingly on his return, finding it difficult to keep them in check, Harold resolved to give them separate provinces to govern, and about the year 893 called together a great "thing," at which he conferred on each the title of king, with a seat higher than that of the jarls, he himself retain- ing the sovereignty of the whole country. He also made Eric Bloodyaxe his heir, and took him to live with him; and about his eightieth year, when he found himself no longer able to discharge his kingly duties, he transferred the whole government to Eric and gave him the royal seat. Harold died three years afterwards about the year 933.

HAROLD II. surnamed Greyskin (Harald Graafel), son of Eric Bloodyaxe, succeeded Haco the Good in the government of Norway about the year 960, having bribed his other brothers to be satisfied with reigning as under kings

in the other provinces. It would appear that Harold himself was disposed to govern peacefully and well, but his brothers now resolved to take vengeance on the friends of the late King Haco, and murdered among others Jarl Sigurd. They, however, failed of their purpose on Haco, his son, who after for some time resisting their attacks fled to Denmark, where he obtained the assistance of King Harold Bluetooth, with whose help he defeated and slew Harold Greyskin, upon which, under Harold Bluetooth, he became ruler of Norway with the title of jarl, according to some in the year 965, to others in 969, and to others in 975.

HAROLD IL, surnamed Stérn in Council (Harald Haardraade or Hardrada), son of Jarl Sigurd, half-brother of King Olaf the Holy, and descended by his father from Harold I., was one of the most distinguished warriors among the old Norse kings. About his fifteenth year he made his escape wounded from the battle of Stiklestad (1030), where his half-brother Olaf was killed ; and after staying till he was cured of his wounds with a " bonde" in a

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forest, le made his way to Sweden, whence after the winter was over he went to Russia, where he was kindly received by King Yaroslaf of Novgorod. He remained in Russia for several years, but, being refused the hand of a Russian prin- cess, he betook himself with several companions to Con- stantinople, and became chief commander of the famous Byzantine life- guards known as Varangians, and consisting almost wholly of Norsemen. At the head of these warriors he gained many victories over the Saracens in Sicily and Italy. It is even said that in a crusade against the infidels he penetrated as far as Jerusalem, but most probably if he entered that city it was in the peaceful character of a pilgrim. Returning after his exploits to Constantinople, he was refused the hand of a niece of the empress Zoe, because, according to the legend, the empress herself was enamoured of him; and offended at the refusal he one night made his escape with two galleys, carrying with him all his treasures, and also it is said the princess whose hand had been denied him, whom, however, he put on shore after he had passed the Bosphorus, with a message to the empress that, if he had so willed, her power would have been vain against his strategy aud skill, He

now set sail for Russia, where he was warmly welcomed by King Yaroslaf; and as he was now a man of great fame and wealth Yaroslaf gave him in marriage his daughter Ellisof or Elizabeth, whose hand he had formerly asked in vain. Soon after his marriage he resolved to return home and if possible to win the crown of Norway from his nephew Magnus the Good. With that purpose he about the year 1045 came to an agreement with his relative Swend of Denmark, who had been driven by Magnus into exile in Sweden; but Magnus, having obtained news of the intended joint expedition against him, entered into communication with Harold, and agreed to share with him the government of Norway, each ruling over a separate division. They now turned their united forces against Swend, drove him from Denmark, and com- pletely prostrated his power ; but just when he had resolved finally in despair to give up the contest, Magnus about the year 1047 took suddenly ill and died, bequeathing on his death-bed the whole of Norway to Harold and Denmark to Swend. Such a bequest did not however coincide with the desires of Harold, and between him and Swend a constant warfare raged for several years, until in 1064 they agreed to a peace by which each retained his dominions according to the old established boundaries. The chief motive of Harold in consenting to this arrangement was probably that he might be free to embark on a purpose of wider ambition, namely, to revive in his own person the old Scandinavian sovereignty of England which had ended with the death of Hardicanute. The story goes that he was instigated to the enterprise by a visit from Tostig, the exiled earl of Northumbria ; but whether that be so or not, he in 1066 set sail for Englaud with an immense fleet, which carried his wife Ellisof, his son Olaf, his treasures, and more than half of all his fighting men. After touching at Orkney, where he left his wife, he proceeded southwards to the Tyne, and was there joined by Tostig and by a contingent of troops from Malcolm of Scotland. From the Tyne they sailed southwards along the coast of Yorkshire, stopping at inter- vals to ravage the country for provisions, and after proceed- ing up the Humber cast anchor on the left bank of the Ouse near the village of Riccall. Leaving a detachment under his son Olaf to guard the fleet, Harold along with Tostig marched with a great force towards York, and, defeating the Northumbrians with heavy loss at Fulford on September 20th, received the surrender of the city on September 24th. Meanwhile Harold of England, having heard of the Norse invasion, was

marching northwards from London day and night with an immense army; and passing through York on the day after its surrender, he

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appeared suddenly on the afternoon before the Norsemen encamped at Stamfordbridge. Taken by Surprise, tho Norsemen fought nevertheless with stubborn courage and fierce energy, but though the battle was for some time doubt- ful it ended at nightfall in their total overthrow, with a slaughter so enormous that the great majority of them lay dead upon the field. Tostig was slain and also Harold Hardrada himself, who, towering head and shoulders above all his warriors, was inflicting death on all who dared to meet him, till struck by an arrow in the windpipe he received the wound which laid him low. According to some writers his body ultimately found burial in Norway.

HAROLD IV., king of Norway, surnamed Gille,—said to be the short form of Gylle Kirst, that is, Servant of Christ,—came about the year 1127 to Norway with his mother, an Irishwoman, and claimed to be recognized as the son of King Magnus Barefoot and half-brother of the reigning Sigurd. Sigurd consented to acknowledge the relationship on condition that Harold did not claim any share in the government during his lifetime or that of his son Magnus. This agreement Harold honourably kept during the lifetime of Sigurd, but after his death in 1130 he got himself chosen king of the half of the country, and after several battles took Magnus prisoner, put out his eyes, and confined him ina convent. Harold now reigned as sole king till 1136, when he was murdered in his sleep by Slembi-diakn, another bastard son of Magnus Barefoot.

For the Norwegian Harolds, see the Heimskringla of Snorro Sturleson, translated into English by Samuel Laing, London, 1844; Sturlunga Saga, 2 vols., Oxford, 1878; Carlyle's Early Kings of Norway, London, 1875; and also, for Harold Hardrada, Freeman's Norman Conquest, vols, ii. and iii.

HAROLD I. surnamed Harefoot, king of England, illegitimate son of Canute and Alfgiva of Northampton, was on the death of Canute in 1035 chosen by the witan overlord of England and king of the provinces north of the Thames; and in 1037 he became king of England, when the people of

Wessex offered him their crown on Hardicanute refusing to come to England to accept it. In the beginning of Harold's reign Alfred, son of Ethelred, landed in Wessex, with the purpose it is said of asserting his claims to its sovereignty; but, either without the knowledge of Earl Godwine, or with his connivance, he was seized by the agents of Harold and put to death with cruel tortures. Harold also banished Queen Emma from the kingdom. The only other events of importance in his reign are inroads of the Welsh and Scots, which were, however, without effectual results, and in the case of the Scots who laid siege to Durham ended in defeat with heavy loss. Harold died at Oxford, March 10, 1040. It is affirmed by some that Harold made no pretensions to a Christian belief, but this seems an exaggeration, for, whatever may have been his own private opinions, he appears to have conformed generally to the recognized religious customs, and there is one instance at least in which he redressed a wrong done by others to the church.

HAROLD IL, king of the English, was the second son of Earl Godwine and his Danish wife Gytha, the sister of Earl Ulf. The year of his birth is not accurately fixed, but it must have been about 1022. The choice of his name, like that of some others of his brothers and sisters (see GoDWINE), witnesses to the influence of his Danish mother. Both he and his elder brother Swegen were appointed to earldoms while still very young, seemingly about 1045. Harold's earldom was that of the East-Angles. In 1046 Swegen, having carried off Eadgifu, abbess of Leominster, and not being allowed to marry her, threw up his earldom in disgust, and his possessions were divided between his brother Harold and his cousin Earl Beorn, the nephew of Gytha. In 1049 Swegen came back and sought the recovery of his lands, which was refused by

Harold and Beorn. Harold now appears for the first time in command, holding a ship in the fleet commanded by his father. For some unknown cause his ship was transferred to Beorn, which most likely saved Harold's life ; for Swegen presently came and entrapped and slew Beorn, who was buried by Harold. We next hear of Harold in 1051 as accompanying Godwine when he appeared in arms in Gloucestershire. He shared his

father's outlawry and banishment in that year, but he chose a different place of shelter, going with his brother Leofwine to Ireland, while Godwine went toF landers. In 1052 Harold and Leofwine came back. They were opposed by the men of Somerset and Devonshire, whom they defeated at Porlock, and plundered the country. Then they joined their father, and were with him at the assembly which decreed the restoration of the whole family. Harold was now restored to his earldom of the East-Angles, and, on his father's death in 1053, he succeeded him in the greater earldom of the West-Saxons.

Harold was now the chief man inthe kingdom, and when the older earls Leofric and Siward died, his power increased yet more, and the latter part of Eadward's reign was virtually the reign of Harold. But he was the minister of the king rather than his personal favourite. This last place rather belonged to his younger brother Tostig, who on the death of Siward in 1055 received the earldom of the Northum- brians. Two other of Godwine's younger sons, Gyrth and Leofwine, also received earldoms in 1057. This last date would seem to have been about the time when the prospect of the crown began to open to Harold. The A®theling Eadward, the son of Eadmund Ironside, who had been brought home from Hungary as the intended successor, died that year. So did Eadward's nephew Ralph, who, though not really of the kingly house, might possibly have been looked to for lack of a nearer candidate. There was now no one of the old stock but Eadgar son of Eadward and his sisters. If then the king should die while Eadgar was still a child, there would be no qualified candidate in the royal house. It would seem as if, from this time, men began to look to Earl Harold as a possible successor to the crown. He is spoken of in a way, and his name is joined with that of the king in a way, which is unusual in the case of an ordinary earl.

The chief events in which Harold appears personally during this time are the wars with the Welsh under their king Gruffydd ap Llywelyn. In 1055, in alliance with the banished Earl Atlfgar of Mercia, Gruffydd defeated Earl Ralph and burned Hereford. Harold now drove back the Welsh and restored Hereford, but allowed the restoration of Ailfgar tohisearldom. In 1058 he made the pilgrimage to Rome; in 1060 he completed the building of his church at Waltham, and completed the foundation of the college in 1062. In 1063 came the great Welsh war, in which Harold, with the help of his

brother Tostig, crushed the power of Gruffydd, who was killed by his own people. Harold now gave Wales to two vassal kings, Bleddyn and Rhiwallon. Both of his wars were accompanied by an extension of the English frontier toward Wales. In 1065 the Northumbrians revolted against their earl Tostig, and chose in his place Morkere, the son of Atlfgar. Harold now acted as mediator between the king and the insurgents, and at last, as the Northumbrians were fully prepared not to receive Tostig again, he agreed to their choice of Morkere and to the banishment of his brother.

Besides these there is one very important event in Harold's life the date of which can only be guessed at. At some time or other between William's visit to England in 1051 and Eadward's death at the beginning of 1066, Harold was the guest of Duke William in Normandy, and took some kind of oath to him. 'This oath the Normans

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represented as an act of homage, with a further oath to pro- cure William's succession to the English crown. The tale is told only by the Norman writers, and it is told by them with such contradictions of every kind that no reliance can be placed on any detail. But that there is some truth in the story is proved by the strongest negative evidence. While the contemporary English writers take care, directly or indirectly, to deny all those Norman charges against Harold which were sheer invention, they say not a word as to his alleged oath to William. It seems on the whole most likely that Harold was wrecked on the shore of Ponthieu, imprisoned by its Count Guy, and released by the interference of William. He then helped William in a war with the Bretons, and promised to marry one of his daughters. This was most likely accompanied by an act of homage, such as was often made to any superior or benefactor. Such an oath might, in the ideas of the times, be made to mean a great deal or very little, according to circumstances. The most likely date is 1064. But there is a remarkable statement that Harold took a journey in Gaul with a political object, seemingly that of making alliances with some of the princes of the country, most likely William's enemies in France, Anjou, and Aquitaine. This was in the year of his Roman pilgrimage. And, as there is no direct evidence for the date of the oath, it is open to any one to put the two things together.

At the beginning of 1066 Eadward died. His last act was to recommend Harold for election to the crown. He was accordingly chosen on the day of Eadward's death, January 5th, and crowned the next day by Ealdred, arch-bishop of York. But, though he was crowned by the Northumbrian primate, the men of Northumberland at first refused to acknowledge him. They were won over by the new king, who went to York, accompanied by Saint Wulfstan, bishop of Worcester. To secure Eadwine and Morkere, he married their sister Ealdgyth, the widow of the Welsh king Gruffydd. He thus putit out of his power to comply with that part of his engagement to William which is best attested, namely, to marry one of William's daughters. The rest of Harold's reign was taken up with preparations against the attacks of two enemies at once. William challenged the crown, alleging both a bequest of Eadward in his favour and the personal engagement which Harold had contracted towards him. 'This was of course a mere matter of form, and William began to make ready for the invasion of England. Meanwhile the banished Tostig was trying all means to bring about his own restora- tion. He first, seemingly in concert with William, came in May, and attacked first the Isle of Wight and then Lindesey, but was driven to take shelter in Scotland. From May to September the king kept the coasts with a great force by sea and land; but at last provisions failed, and the land army was dispersed. Harold then went to London, ready to meet whichever enemy came first. By this time Tostig had engaged Harold Hardrada of Norway to invade England. He accordingly sailed up the Humber, defeated Eadwine and Morkere (September 20th), and received the submission of York (September 24th). Harold of England was now on his march northward; on September 25th he came on the Northmen at Stamfordbridge beyond York, and won a complete victory, in which Tostig and Harold Hardrada were slain. But two days later (September 27th) William of Normandy landed at Pevensey and (September 29th) occupied Hastings, and laid waste the land. Harold had then to march southward as fast as possible. He gathered his army in London from all southern and eastern England, but Eadwine and Morkere kept back the forces of the north. The king then marched into Sussex, occupied the hill of Senlac, now Battle, and awaited the Norman attack. After a vain exchange

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of messages, the decisive battle was fought on October | 4th. As the English were wholly infantry, while the Normans were strongest in cavalry and archers, Harold's object was simply to hold the hill against all attack. As_ long as he was obeyed, his tactics were completely successful. | But a part of his troops, disobeying his orders, left the | hill to pursue, and the English array was broken. The | Normans could now get up the hill, and, aftera fight which lasted from morning till evening, they had the victory. The king and his brothers Gyrth and Leofwine were killed. | As Harold was condemned by the pope, William at first | refused him Christian burial, and caused him to be buried | on the rocks at Hastings, But it seems most likely that he afterwards allowed the body to be removed to Harold's own church at Waltham. The tale which represents Harold as escaping from the battle, living a life of penitence, and at last dying at Chester, is a mere romance.

Harold left several children, but there is a good deal of uncertainty as to his marriage or marriages. He had two sons by Ealdgyth, Harold and Wulf; but they must have been twins born after their father's death. He had also three sons, Godwine, Eadmund, and Magnus, and two daughters, Gytha and Gunhild. It will be seen how strong the Scandinavian element is in these names. These five were not children of Ealdgyth, and the sons were grown up, or nearly so, when their father died. They may have been the children of an unrecorded first wife. But the local history of Waltham represented Harold's body as being found after the battle by a former mistress of his, Eadgyth Swanneshals (Swansneck), Some have thought that this Eadgyth is the " Eddeva pulcra" of Domesday, who appears as the former holder of great estates in the east of England. This, though not unlikely, is quite uncertain ; but there seems evidence enough to show that Eadgyth Swanneshals is a real person, and to connect her with Harold's'East-Auglian earldom. It seems most likely that she was the mother of Harold's earlier children, and that the connexion between them was that intermediate state between marriage and concubinage called the Danish marriage, of which we not uncommonly hear in those days.

The character of Harold is blackened with many, but mostly very vague, charges by the Norman writers. The English, on the other hand, paint him as the perfect model of aruler. With regard to his accession to the crown, the common charge of usurpation springs from ignorance of the English law of

the time. Harold was beyond all doubt regularly nominated by Eadward, regularly chosen by the witan, and regularly crowned by Ealdred. This last point is of importance in those days, when the rite of coronation was deemed of such moment. The Normans try to represent the ceremony as invalid, by saying that Harold was crowned by Stigand, archbishop of Canterbury, whose canonical position was doubtful. That Harold crowned himself, instead of receiving the ecclesiastical cousecration, is a mere fable, arising from a misunderstanding of some of the rhetorical invectives of the Norman writers. It should be noticed that those contemporary writers who speak of Harold as an usurper do so wholly on tle ground of the alleged right of William, aud of Harold's oath to William. That Harold's accession was a wrong done to young Eadgar is an idea which we first hear of in the next century, when the doctrine of hereditary right had taken firmer root. In Domesday the reign of Harold is passed by; he is regularly spoken of as earl; the doctrine of the Norman lawyers was that William, though of course not full king till his coronation, had the sole right to the crown from the moment of Eadward's death.

The military skill of Harold is plain, both from the Welsh war, when he overcame the mountaineers by making

/ on to make the settlement.

his English soldiers adopt the Welsh tactics, and from his

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conduct both at Stamfordbridge and at Senlac. He clearly understood the difference between his two enemies, when it was wise to attack and when it was wise to await the attack. At Stamfordbridge his Strategy was perfectly successful; it failed at Senlac only because of the dis- obedience of part of his army. The best witness to his civil government is the general peace and good order of England during that part of the reign of Eadward which was virtually his reign. When the peace is broken, it is always by the act of others, and Harold is always called He appears throughout as singularly mild and conciliating, never pressing hard upon any enemy. 'The later Norman writers indeed have an elaborate tale which represents Harold and Tostig as enemies from their childhood. But this is mere romance, with no ground in any contemporary writer.

The relations of Harold to the church, always an im- portant feature in the character of a prince of that age, suggest several questions. He is charged in Domesday with several encroachments on ecclesiastical property, chiefly in Herefordshire, and the like charge is brought against him in a deed of Leofric, bishop of Exeter. But it must be remembered that this kind of charge is brought against every leading man of the time, and that we very seldom hear more than one side. The most distinct and detailed charge, that which represents Harold as a whole- sale spoiler of the church of Wells, can be refuted, not by hearing the other side, but by going back to the charge as brought by the original complainant, Bishop Gisa. We here find that Harold took nothing from the church, but simply hindered the bishopric from receiving a bequest to which there is some reason for thinking that he may have had a right as earl. On the other hand, Harold appears as the friend and protector of several ecclesiastical bodies, and above all as the founder of Waltham. Here we may remark that, when monks were all the fashion, he preferred the secular clergy. He was the firm friend of the best pre- late of his time, Bishop Wulfstan, and he appeared on good terms with most of the leading churchmen.

The contemporary authorities are the English Chronicles, the Latin biographer of Eadward in Dr Luard's collection (he gives a splendid panegyric on Harold), and Florence of Worcester, on the English side. On the Norman side are the Bayeux Tapestry, William of Poitiers, William of

Jumiéges, Guy of Amiens (Carmen de Bello Hastingensi). In the next ecntury the book De Inventione Sanctee Crucis Walthamensis gives Harold's picture as drawn in his own foundation. The book called Vita Haroldi is a mere romance, but contains one or two scraps of authentic tradition; Ordcric, Eadmer, William of Malmesbury, and the writers of the 12th century generally, often prove particular facts, and especially show how the estimate of the events of the 11th century gradually changed. The French life of Eadward in the 13th is very bitter against Harold. Of the Scandinavian writers, Saxo Grammaticus is violent against him, while the biographer of Olaf Tryggvesson counts him fora saint. All the statements are brought together aud examined in Freeman's History of the Norman Conquest, vols. ii. and iii. The opposite pictures of the earlier writers, Thierry and Palgrave, are also worth comparing. (E. A. F.)

HAROUN AL RASCHID, more properly Hartin er

Rashid, "Aaron the Orthodox," was the fifth of the 'Abbaside caliphs of Bagdad. His full name was Hardin

"'bn Mohammed ibn Abdallah ibn Mohammed ibn Ali 'bn

'Abdallah ibn Abbas. He was born at Ray the last day of Dhi '1 Heggah, 145 a.u. (20th March 763 a.D.) according to some accounts, and according to others 1st Moharrem 149 a.w. (15th Feb. 766 a.p.). Haroun al Raschid was twenty-two years old when he ascended the throne. His biographers unanimously speak of him as "the most accomplished, eloquent, and generous of the caliphs ;" but, though his name is a household word, and few figures stand out more grandly prominent in the history of their times, little is really popularly known about his private life

' and personal history.

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Raschid owed his own succession to the throne entirely to the prudence and sagacity of Yahya 'bn Khalid ibn Barmek, his secretary, whom, on his accession, he appointed his lieutenant and grand vizier. Yahya, upon whom the whole responsibility of the government really devolved, performed his

duties with the most consummate ability and judgment. He fortified the frontiers, and repaired all the deficiencies in the administration of the empire. He filled the treasury, made the provinces flourishing and prosperous by encouraging trade and securing the public safety, and in a word brought the caliphate up to the highest pitch of prosperity and glory. He personally superintended and organized the whole system of govern- ment. Asa minister he was eloquent, wise, accomplished, and prudent, and he was moreover an able adniinistrator, ruling with a firm hand and proving himself able to cope with any emergency that might arise. His generosity was munificent in the extreme and gained for him universal encomiums, With a most affable demeanour and great moderation he combined an imposing dignity that com- manded universal respect.

In 182 a.n. (798 A.D.) Al Raschid proclaimed his son "Abdallah as his heir apparent after E] Amin, his eldest son, whom he had appointed his successor when only five years old, and gave him the post of viceroy of Khorassan. It was on this occasion that he gave "Abdallah the name of El Mamtn and confided him to the care of Jaafer, son of Yahya. The historians speak of this act of Raschid's with natural surprise, for he had seen the results of similar policy on the part of his father and of his grandfather, as well as what his brother Hadi had done in his own case.

Yahya, the prime minister, and Jaafer, his son, enjoyed so fully the confidence of Haroun al Raschid that they rapidly rose to wealth and power. The great popularity and influence of the Barmek or Barmecide family, liowever, at length aroused the caliph's jealousy, and to make matters worse he heard that Jaafer had secretly married his sister. No sooner had he been made acquainted with the facts than he caused his sister to be put to death, ordered Mesrtr, his slave and executioner, to bring him Jaafer's head, and next murdered his two inoffending young nephews.

After the fall of the Barmek family the office of prime minister was exercised by Fadhl ibn Rabi' who had been

1 According to the Mahometan law of succession the eldest brother or male relative of the reigning monarch is the heir apparent to the throne, and almost all Muslim princes have endeayoured to set aside the claims of their relatives in favour of their own children. E] Hadi, Haroun's brother, was no

exception to the rule, and conceived the idea of stripping Harouu of his rights and proclaiming his own son Jaafer as his successor. Yahya was then Haroun's secretary, and expected to exercise the important office of vizier if ever his master should mount the throne. Hadi saw that his first step must be to conciliate Yahya ; he therefore took him apart, and having given him a present of 20,000 dinars began to broach the subject nearest his heart. Yahya, however, brought a very strang argument to bear upon the point: "If yon do so, Prince of the Faithful," said he, ' you will set your subjects an example of breaking an oath and dis- regarding a contract, and other people will be bold enough to do the same. But if you leave your brother Haroyn in possession of his title of heir apparent and appoint your son Jaafer as next in suc- cession to him, it will be much more likely to secure his ultimate accession to the throne." Hadi allowed the matter to rest for some time, but at length paternal affection got the better of him, and he again summoned Yahya into his presence and consulted him, and Yahya urged that if the caliph should die while Jaafer was yet a child the chiefs of the imperial family would never recognize the validity of his succession. Hadi having acknowledged the truth of this, Yahya continued, " Renounce then this project, in order the better to arrive at the consummation of your wishes. Even if your father El Mehdi had not appointed Haroun to succeed you it would be policy on your part to do so, inasmuch as that is the only way to ensure the continuance of the caliphate in the family of the Beni Hashem." Raschid ever afterwards acknowledged this as the greatest obligation which he owed to Yahya.*

chamberlain to Haroun himself, and to his predecessors Menstr, Mehdi, and Hadi. He held the office of vizier until the death of Haroun al Raschid himself, which occurred at Tus, the birthplace of the celebrated Persian epic poet Firdousi. Al Raschid had set out for Khorassan to put down the insurrection of Rafi ibn Leith ibn Nasr ibn Sayyar, who had revolted against his authority, nade him- self master of Samarcand, and killed the governor of that province. The rising had assumed such alarming propor- tions that Al Raschid determined to march in person against the rebels, He had not, however, got further than Tus when he was surprised by death in 193 s.u. (808-9 a.p.).

The reign of Al Raschid was one of the most brilliant in the annals of the caliphate, and the limits of the empire were then more widely extended than at any other period. The greater part of the Eastern world submitted to his laws, and paid tribute into his treasury ; Egypt itself was only a province under his sway, and its ruler an officer appointed by himself. No caliph ever gathered round him so great a number of learned men, poets, jurists, grammarians, cadis, and scribes, to say nothing of the wits and musicians who enjoyed his patronage. Haroun himself was an accomplished scholar and an excellent poet. He was well versed in history, tradition, and poetry, which he could always quote on appropriate occasions, He possessed exquisite taste and unerring discernment, and his dignified demeanour made him an object of profound respect to high and low.

Haroun al Raschid is best known to Western readers as the hero of many of the stories in the Arabian Nights; and in Arabic literature he is the central figure of number- less anecdotes and humorous stories. Of his incognito walks through Baghdad, however, the authentic histories say nothing; and the account of his relations with Charlemagne, of which European historians speak, does not rest on a trustworthy basis, His reign is chiefly remarkable for the fact that a family belonging to the pure Persian aristocracy held for so long the reins of power under a caliph whose boast was that he was the only one who came of unmixed Hashimi blood, that of the family from which the prophet of El Islam sprung.

The principal authorities for the history of this period are—the Arabic 'histories of Ibn El Athir, Ibn Khaldun, and the Tarikh El Khamis; while the best European works to consult on the subject are Gibbon's Decline and Fall of the Roman Empire; Osborn's

Islam under the Caliphs of Bagdad; and Weil's Geschichte der Chalifen. (Et FE, BS)

HARP, a musical instrument of the string kind, approxi- mating to triangular form from the strings diminishing in length as they ascend in pitch. While the instrument is of

| great antiquity, it is yet from northern Europe that the

modern harp andits name are derived. The Greeks and Romans preferred to it the lyre in its different varieties, and a Latin writer, Fortunatus (vii. 8), describes it in the seventh century of our era as an instrument of the barbarians—" Romanusque lyra, plaudat tibi barbarus harpa." This is believed to be the earliest mention of the name, which is clearly Teutonic ——the Old High German "harapha," the Anglo-Saxon "hearpe," the Old Norse "harpa." The modern French "harpe" retains the aspirate ; in the Spanish and Italian "arpa" it is dropped.

For the origin of the instrument we have to look to Egypt, and the earliest delineations of it there give no indication that it had not existed long before. There are, indeed, representations in Egyptian paintings of stringed instruments of a bow-form that support the idea of the invention of the harp from the tense string of the warrior's or hunter's bow. This primitive-looking in- strument was played horizontally, being borne upon the performer's shoulder. Between it and the grand ver- tical harps in the frescos of the time of Rameses IIL,

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more than 3000 years old, paintings discovered by the traveller Bruce (fig. 1), there are varieties that permit us to bind the whole, from the simplest bow-form to the almost triangular harp, into one family (see fig. 2).

The Egyptian harp had no front pillar, and it, being strung with catgut, the tension and pitch must necessarily have been low. The harps above – mentioned depicted in the tomb at –

Thebes, assumed from the players to be more than 6 feet high, have not many strings, the one, according to Wilkinson, hav- ing ten, the other . thirteen. What Na theaccordance was Fig. 1.

of these strings it would be to no satisfaction to follow Burney and others in trying to recover. We must be con- tent with the knowledge that the old Egyptians possessed harps in principle like our own, the largest having

pedestals upon which they bestowed a wealth of decoration, as if to show how much they prized them.

The ancient Assyrians had harps like those of Egypt in being without a front pillar, but differing from them in having the sound-body upperniost, in which we find the early use of soundholes ; while the lower portion was a bar to which the strings were tied and by means of which the tuning was apparently effected. What the Hebrew harp was, whether it followed the Egyptian or the Assyrian, we do not know. That King David played upon the harp as com- monly depicted is rather a modern idea. Medieval art- ists frequently gave King David tho & psaltery, a hori- zontal stringed instrument from which has gradually de- veloped the modern piano. The Hebrew " kinnor" may have been a kind of trigonon, a triangular stringed instru- ment between a small harp and a psaltery, probably sounded by a plectrum, or, as advocated by Dr Stainer in his essay on the music of the Bible, a kind of lyre.

The earliest records that we possess of the Celtic race, whether Gaelic or Cymric, give the harp a prominent place and harpists peculiar veneration and distinction. The names for the harp are, however, quite different from the Teutonic. The Irish '"clairseach," the Highland Scotch "clarsach," the Welsh, Cornish, Breton, "telyn," ' telein," "télen," show no etymological kinship to the other Euro- pean names. The first syllable in clairseach or clarsach is derived from the Gaelic "clar," a board or table (sound- board), while the first syllable of telyn is distinctly Old Welsh, and hasa tensile meaning ; thus resonance supplies the one idea, tension the other.

_ The literature of these Celtic harps may be most directly found in Bunting's Ancient Music of Lreland, Dublin, 1840; Gunn's Historical Enquiry respecting the Performance on the Harp in the Highlands of Scotland, Edinbur h, 1807 ; and E. Jones's Musicai and Poetical Memoirs of the Welsh Bards, London, 1784. The treatises of Walker, Dalyell, and others may also be consulted ; but in all these authorities due care must be taken of the bias of patriot- ism, and the delusive aim to reconstruct much that we must be con- tent to receive as only vagnely indicated in records and old monu-

ments. There is, however, one early Irish monument about which there can be no mistake, the harp upon a cross belonging to the

ancient church of Ullard near Kilkenny, the date of which cannot be later than 830; the sculpture is rude, but the instrument is clearly shown by the drawing in Bunting's work to have no front pillar. This remarkable structural likeness to the old harps of Egypt and Assyria may be accidental, but permits the plausible hypothesis of Eastern descent.. The oldest specimen of the beautiful form the Irish harp is now recognized by, with gracefully curved front pillar and sweep of neck (the latter known as the harmonic curve), is the famous harp in Trinity College, Dublin, the possession of which has been attributed to King Brian Boiroimhe. From this mythic ownership Dr Petrie (see essay in Bunting) has delivered it ; but he can only deduce the age from the a ornamentation and heraldry, which fix its \ date in the 14th century or a little later, BOs There is a cast of it in South Kensington Museum, accurately described in the cata- logue by Mr Carl Engel. The next oldest is in the Highlands of Scotland, the Clarsach Lumanach,or Lamont's Clarschoe, belonging, with another of later date, to the old Perthshire family of Robertson of Lude. Both are described in detail by Gunn. This Lamont harp was taken by a lady of that family from Argyleshire about 1460, on her marriage into the family of Lude. It had about thirty strings tuned singly, but the scale wassometimes doubled . Fic. 3.—

in pairs of unisons like lutesand othercon- Irish (Dalway) Harp. temporary instruments. The Dalway harp in Ireland (fig. 8) in- scribed 'Ego sum Regina Cithararum," and dated 1621, appears to have had pairs of strings in the centre only. These were of brass wire, and played with the pointed finger nails. The Italian contemporary "' Arpa Doppia" was entirely upon the duplex principle, but with gut strings played by the fleshy ends of the fingers. When Bunting met at Belfast in 1792 as many Irish harpers as could be at that late date assembled, he found

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thirty notes which were tuned diatonically in the key of G, under certain circumstances transposable to C and rarely to D, the scales being the major of these keys. The harp first appeared in the coat of arms of Ireland in tho

reign of Henry VIII. ; and some years after in a map of 1567 preserved in a volume of State Papers, we find it truly drawn according to the outlines of the national Irish instrument. References to the Highlands of Scotland are of neccs- sity included with Ireland ; and in both we find another name for the harp, viz., "cruit." Bunting particularly mentions the "cinnard cruit" (harp with a high head) and the "crom eruit" (the curved harp). In the Ossianic MSS. of the Dean of Lismore (1512) the word "erwt" occurs several times, and in Neill M'Alpine's Gaelic Dictionary (1832), which gives the dialect of Islay, closely related to that of Ulster, the word "' cruit" is rendered "harp." In Irish of the 8th and 9th centuries (Zeuss) ' cithara" is always glossed by "crot." True the modern Welsh "crwth" is not a harp; but the expression of Fortunatus,

***Chrotta Britanna canat," has been too readily accepted as meaning the half-fiddle half-lyre*

which also bears the name of "crwth" or "crowd." An old Welsh harp, not triple strung,

exists, which bears a great resemblance to the

Irish harp in neck, soundboard, and soundholes.

The inference is fair that this was the form,

although dimensions may have materially differed,

of the Irish " crom cruit,"' while the triple strung harp with its elevated neck might be the form of the " cinnard cruit." But this does not imply de- rivation of the harp of Wales from that of Ireland or the reverse. There is really no good historical

evidence, and there may have been a common: or distinct origin on which ethnology only can throw light. The Welsh like the Irish harp was often an hereditary instrument to be preserved LIK, with great care and veneration, and used by the Fic. 4.—Welsh bards of the family, who were alike the pocet- Triple Harp.

musicians and historians. A slave was not allowed to touch a harp, and it was exempted by the Welsh laws from seizure for debt. The old Welsh harp appears. to have been at one time strung with horsehair, and by the Eisteddfod laws the pupil spent his noviciate of three years in the practice of a harp with that stringing. The comparatively modern Welsh triple harp (fig. 4) is always strung with gut. It has a rising neck ag before stated, and three rows of strings,—the outer rows tuned diatonic, the centre one chromatic for the sharps and flats. Jones gives it 98 strings and a compass of 5 octaves and one at 2 alee

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C. As in all Celtic harps, the left is the treble hand, and in the triple harps there are 27 strings on that side, the right or bass hand having 37, and the middle or chromatic row 34.

Turning to the modern harp, the first pattern of it is discovered in German and Anglo-Saxon illuminated MSS. as far back as the 9th century. A diatonic instru- ment, it must have been common throughout Europe, as Orcagna, Fra Angelico, and other famous Italian painters depict it over and over again in their masterpieces. No accidental semitones were possible with this instrument, unless the strings were shortened by the player’s finger. This lasted until the 17th century, when a Tyrolese maker adapted hooks (perhaps suggested by the fretted or bonded clavichord) that, screwed into the neck, could be turned downwards to fix the desired semitone at pleasure. At last, somewhere about 1720, Hochbrucker, a Bavarian, invented pedals that, acting through the pedestal of the instrument, governed by mechanism the stopping, and thus left the player’s hands free, an indisputable advantage ; and it became possible at once to play in no less than eight major scales, By a sequence of improvements, in which two Frenchmen named Cousineau took an important part, the various defects inlierent in Hochbrucker’s plan became ameliorated. The pedals were doubled, and, the tuning of the instrument being changed from the key of Eb to Cb, it became possible to play in fifteen keys, thus exceeding the power of the keyboard instruments, over which the harp has

another important advantage in the simplicity of the fingering, which is the same for every key.

It is to Sebastian Erard we owe the perfecting of the pedal harp (fig. 5), a triumph he 'gained in Paris by un- remitting studies begun when he adopted a "fork" mechanism in 1786 and ended in 1810 when he had attained complete success. The mechanical perfection of Erard's apparatus must be seen to be appreciated. The pedals give the extent of movement the disks perform from which the studs project that stop the strings, as it may be required to raise the string in pitch a half tone.or a whole tone. Erard's merit was not confined to this improvement only ; he modified the structure of the comb that conceals the mechanism, and constructed the sound-body of the instrument upon a modern principle more advantageous to the tone.

Notwithstanding these improvements and the great beauty of tone the harp possesses, the domestic use of it has for years past been declining. The great cost of a good harp, and the trouble to many amateurs of tuning, may have led to the supplanting of the harp by the more convenient and useful pianoforte. With this comes natur- ally a diminution in the number of solo-players on the instrument. Were it not for the increasing use of the harp in the orchestra, the colour of its tone having attracted the masters of instrumentation, so that the great scores of Meyerbeer and Gounod, of Berlioz, Liszt, and Wagner are not complete without it, we should perhaps know little more of the harp than of the dulcimer, in spite of the efforts of distinguished virtuosi whose devotion to their instrument maintains its technique on an equality with that of any other, even the most in public favour.

See, in addition to the works already referred to, Engel's Musical Instruments in the South Kensington Museum, 1874 ; and the articles " Harp," in Rees's Cyclopedia, written by Dr Burney, in Stainer and Barrett's Dictionary of Musical Terms, 1876, and in Grove's Dictionary of Music and Musicians, 1879. (A. J. H.)

HARPER'S FERRY, a post village of Jefferson county, West Virginia, United States, is grandly situated at the foot

Fie. 5.—Modern Erard Harp.

of Bolivar heights and at the confluence of the Shenandoah and Potomac rivers, where they intersect the Blue Ridge, 45 miles N.W. of Washington. It is the junction-point of the Baltimore and Ohio and the Winchester and Potomac railways ; and the Ohio and Chesapeake canal passes along the Maryland side of the Potomac river. The village since the civil war has been in a decaying condition. It is the seat of Stover college, for students of colour. Previous to the war Harper's Ferry contained an extensive arsenal and armoury, and during the war it was the scene of several exploits which have given it a name in history. On the 16th October 1859 it was seized by John Brown, the cele- brated abolitionist, and a small handful of followers, but as he was unsupported by a rising of the slaves he was over- powered on the morning of the 18th and taken prisoner. On the 18th April 1861 it was captured by the Confede- rates, who on evacuating it in the following June destroyed the arsenal and armoury and the bridge across the Potomac. The village was afterwards held by a Union garrison of 12,000 men,. who, however, on the 15th September 1862, after a brave resistance of several days, surrendered to a strong Confederate force under Jackson and A. P. Hill. After the battle of Antietam, on the 17th of the same month, it was reoccupied by the army of the Potomac under General M'Clellan,who left a strong garrison in the place. In June 1863 it was again abandoned to the Confederates on their march to Pennsylvania. After their defeat at Gettysburg, the town again fell into the hands of the Federal troops, who held it until the demonstration against Washington in July 1864. After the battle of Monocacy on July 9th it was occupied by the United States forces, and held by them until the end of the war. The most flourishing part of the town was nearly destroyed by a flood in the Shenandoah, October 1878. The population is about 2000. HARPIES, or Harpy1#, a word from the root seen in dpmatw, to snatch, are in Homer merely the embodiment of the rapacious power of violent winds. Whena man has disappeared in a sudden and inexplicable fashion, it is said that the Harpies have carried him off; and the words dprvvat and OveAAau are used indifferently (cf. Od. xiv. 371 with 727, and xx. 66 with 77) to indicate the agent in his sudden disappearance. But Od. xx. 63-5 shows that the winds were conceived as carrying the man away to the banks of Oceanus, in other words, to the sky. So it is said (H. Ven., 208; Schol. 77. xx. 244) that a Oéoms deAAa carried

off Ganymede to heaven. There can be no doubt that the wind was by the primitive Indo-Germanic people considered to be the agent that carried off the souls of the dead to dwell with their fathers in heaven, and that this idea appears in the Odyssey (also Jl. vi. 345) in a more fanciful form. As messengers of Zeus the Harpies are called Ads xkives (Ap. Rh., ii. 289), In some accounts a Harpy is said to have become by Poseidon tlie mother of the horse Arion, and another form of the same union appears in J/. xvi. 148, when the harpy Podarge, grazing in a meadow by the stream of Oceanus, bears to Zephyrus (the fruitful generative wind) the two horses of Achilles. This myth, which orcurs in numberless forms, has been explained in article Gorcons ; from which it is clear that ultimately Harpy is another epithet, like Gorgo and Erinys, of the swift, sudden, violent thunder-storm of a southern country. It is therefore with good ground that the three forms are compared by Aischylus (Hum., 48). The function of snatching away mortals tothe other world leads up to the duty which the Greeks came to assign to the Erinyes of pursuing and punishing certain kinds of offenders (see Furies). In Od. xx. 66 sq, it is related that the orphan daughters of Pandareus grew up under the care of the gods; but when Aphrodite went to Olympus to beg to perfect their life by a marriage, the Harpies carried them off and

delivered them to the Erinyes, In these two daughters, one of whom is the nightingale (Od. xx. 518), and the other probably the swallow (v. Sonne in Kuhn's Zertschrift, x., 121), we recognize the spring growing up in beauty till it issuddenly snatched away from the earth by the storms of autumn. Hesiod (Theog., 267) says that the Harpies, Aello and Ocypete, winged goddesses with beautiful locks, are the daughters of Thaumas and Electra. Other accounts make them children of Poseidon or of Phineus, always the sun in some form; while a third, Celeeno, is often added to their number. As we come down later in literature, a more hateful and repulsive character attaches to the Harpies. This is especially seen in the myth of the blind king Phineus, the sun-god in the dark winter months, tormented by the Harpies, where the transforming fancy of the poets can be traced more and more. Hesiod related (Strabo, vii. 463) that the Harpies carried off Phineus to the land of the Glactophagi, a mythic people, who repre- sent like the

Hyperboreans or the Pheacians the race of the dead, the Pitris or Manes. The myth was incorporated as an episode in the tale of the Argonauts, and is then imitated by Virgil with still more nauseous details (in. iii. 212). On the so-called Harpy monument from Lycia, now in the British Museum, they appear as winged figures, the body like that of a bird with the head and bust of a woman. They are carrying off small figures, probably departed souls,

HARPOORATES, originally.an Egyptian deity, was adopted by the Greeks, and became in later times an object of worship both to Greeks and Romans. In Egypt Har- pa-khruti, Horus the child, was one of the forms of Horus, the sun-god, the child of Osiris (see Eayrt, vol. vii. p. 717). Hence Herodotus (ii. 144) considers him the same as the Greek Apollo. He was said by the Greeks to have been born with his finger on his lips, and is thus represented in statues. As the god of silence he became a favourite deity among the later mystic schools of philosophy. Festivals with certain mysterious rites were celebrated in his honour.

HARPY, a large diurnal bird of prey, so named after the mythological monster of the classical poets,—the

Harpy.

Thrasaetus harpyia of modern ornithologists, —an inhabit- ant of the warmer parts of America from Southern Mexico

to Brazil. Though known for more than two centuries, its habits have come very little under the notice of naturalists, and what is said of them by the older writers must be received with some suspicion. A cursory inspection of the bird, which is not unfrequently brought alive to Europe, its size, and its enormous bill and talons, at once suggest the vast powers of destruction imputed to it, and are enough to account for the stories told of its ravages on mammals, —sloths, fawns, peccaries, and spider-monkeys. It has even been asserted to attack the human race. How much of this is fabulous there seems no means at present of deter- mining, but some of the statements are made by veracious travellers—D'Orbigny and Tschudi. It is not uncommon in the forests of the isthmus of Panama, and Mr Salvin says (Proc. Zool.

Society, 1864, p. 368) that its flight is slow and heavy. Indeed its Owl-like visage, its short wings and soft plumage, do not indicate a bird of very active habits, but the weapons of offence with which, as above stated, it is armed, show that it must be able to cope with vigorous prey. Its appearance is sufficiently striking—the head and lower parts, except a pectoral band, white, the: former adorned with an erectile crest, the upper parts dark grey banded with black, the wings dusky, and the tail barred ; but the huge bill and powerful scutellated legs most of all impress the beholder. The precise affinities of the Harpy cannot be said to have been determined. By some authors it is referred to the Eagles, by others to the Buzzards, and by others again to the Hawks; but possibly the first of these alliances is the most likely to be true. (a. N.)

HARRIER. See Doc.

HARRIER, or Hun-Harrrer, name given to certain birds of prey which were formerly very abundant in parts of the British Islands, from their habit of harrying poultry. The first of these names has now become used in a generic

sense for all the species ranked under the genus Circus of Lacépéde, and the second confined to the particular species which is the Falco cyaneus of Linnzeus and the Circus eyaneus of modern ornithologists. !

On the wing Harriers have much resemblance to Buzzards, using the same flapping stroke of the pinions, and wheeling or sailing aloft as they fly. One European species indeed, C'. eruginosus, though called in books the Marsh-Harrier, is far more commonly known in England and Ireland as the Moor-Buzzard. But Harriers are not, like Buzzards, arboreal in their habits, and always affect open country, generally, though not invariably, preferring marshy or fenny districts, for snakes and frogs form a great part of their ordinary food. On the ground their carriage is utterly unlike that of a Buzzard, and their long wings and legs

render it easy to distinguish the two groups when taken in the hand. All the species also have a more or less well- developed ruff or frill of small

thickset feathers surrounding the lower part of the head, nearly like that seen in Owls, and accordingly many systematists consider that the genus Circus, though undoubtedly belonging to the Falconide, connects that Family with the Striges. No osteological affinity, however, can be established between the Harriers and any section of the Owls, and the superficial resemblance will have to be explained in some other way. Harriers are found almost all over the world,! and fifteen species are recognized by Mr Sharpe (Cat. Birds Brit. Musewm, i. pp. 50-73). In most if not all the Harriers the sexes differ greatly in colour, so much so that for a long while the males and females of one of the commonest and best known, the C. cyaneus above mentioned, were thought to be distinct species, and were or still are called in various European languages by diffcrent names. The error was maintained with the greater persistency since the young males, far more abundant than the adults, wear much the same plumage as their mother, and it was not until after Montagu's observations were published at the beginning of the present century tliat the "MRingtail," as she was called (the Falco pygargus of Linnzus), was generally admitted to be the female of the " Hen-Harrier." But this was not Montagu's only good service as regards this genus. He proved the hitherto unexpected existence of a second species,? subject to the same diversity of plumage. This was called by him the Ash-coloured Falcon, but it now generally bears his name, and is known as Montagu's Harrier, C. cineraceus. In habits it is very similar to the Hen-Harricr, but it has longer wings, and its range is not so northerly, for while the Hen-Harrier extends to Lapland, Montagu's is but very rare in Scotland, though in the south of England it is the most common species. Harriers indeed in the British Islands are rapidly becoming things of the past. Their nests are easily found, and the birds when nesting are easily destroyed. In the south-east of Europe, reaching also to the Cape of Good Hope and to India, there is a fourth species, the C. swainsont of some writers, the C. pallidus of others. In North America C. cyaneus is represented by a kindred form, C. hudsonius, usually regarded as a good species, the adult male of which is always to be recognized by its rufous markings beneath, in which character it rather resembles C. cineraceus, but it has not the long wings of that species. South America has in C. cinereus another representative form, while China, India, and Australia possess more of this type. Thus there is a section in which the males have a strongly contrasted black and grey plumage, and finally there is a group of larger

forms allied to the European C. ceruginosus, Wherein a grey dress is less often attained, of which the South African C. ranivorus and the New Zealand C. gouldi are examples. (A. N. HARRINGTON, James (1611-1677), a distinguished writer on the philosophy of government, was sprung from an old family in Rutlandshire, and was born in January 1611. He received a careful education, and in his eigh- teenth year entered Trinity College, Oxford, as a gentleman commoner. One of his tutors was the famous Chilling- worth. At the close of his university career he set out to travel on the Continent, and proceeded first to Holland, where he spent several years. He served some time in the Dutch army, and enjoyed the friendship both of the prince

1 The distribution of the different species is rather curious, while the range of some is exceedingly wide,—one, C. maillardi, seems to be limited to the island of Réunion (Bourbon).

2 A singular mistake, which has lately been productive of further error, was made by Albin, who drew his figure (Hist. Birds, ii., pl. 5)

es a specimen of one species, and coloured it from a specimen of the other.

of Orange and of the queen of Bohemia. After visiting France and Italy, he returned to England and lived in retirement till 1646, when he was named one of the gruoms of the bed-chamber to Charles IL, who was at that time being conveyed south from Newcastle as prisoner of the parliament. Though republican in his ideas, Harrington secured the confidence and respect of the king, who showed strong personal regard for him. On the removal of Charles to the Isle of Wight, Harrington was prevented from accompanying him, and was for a short time put in confine- ment because he would not swear to refuse assistance to the king should he attempt to escape. His feelings of respect led him also to accompany Charles to the scaffold in the following year.

After Charles's death Harrington once more withdrew into private life and devoted his time to the composition of his work on the theory of the state, afterwards published under the title of Oceana. The nature of his views was

well known, and, as they pleased neither republicans nor royalists, the work was naturally regarded with some suspicion. By order of Cromwell the Oceana was seized when passing through the press. Harrington, however, managed to secure the favour of the Protector's favourite daughter, Mrs Claypole; the work was restored to him, and appeared in 1656, dedicated to Cromwell. The views embodied in Oceana, particularly that bearing on vote by ballot and rotation of magistrates and legislators, Harrington and others who formed a club called the "Rota" endeavoured to push practically, but with no success. In December 1661, by order of Charles II., Harrington was arrested on a charge of conspiracy, and though there seem to have been no sufficient grounds for the accusation, he was thrown into prison. Despite his repeated request no public trial could be obtained, and when at length he endeavoured to protect himself by claiming the right of habeas corpus, he was secretly removed to a small island off Plymouth. There his health completely gave way, and his mind appeared to be affected. By careful treatment he was restored to bodily vigour, but it is supposed that his mind never recovered its tone. After his release he married,—at what date does not seem to be precisely known. He died September 11, hOr7.

Harrington's books consist of the Oceana, and of papers, pamphlets, aphorisms, even treatises, in support and defence of the Oceana. The Oceana is not a philosophical romance ; it is a hard, prolix, and in many respects heavy exposition of a new method for constituting civil society. The details are elaborated with infinite care, even the salaries of officials being computed, but the important or leading ideas in the book are two in number, with two practical precepts following from them. The first is that the determining element of power in a state is property generally, property in land in particular; the second is that the executive power ought not to be vested for any considerable length of time in the hands of the same men or class of men. As practical corollary to his first proposition Harrington recom- mends an agrarian law, limiting the portion of land held to that yielding a revenue of £2000, and consequently insisting on particular modes of distributing landed pro- perty. As a practical maxim following from the second he lays down the rule of rotation by ballot, A third part of the exectitive, senate, or whatever it might be, are voted out by ballot every year (not being capable of being elected again for three years). Harrington explains very carefully how the state and its governing parts are to be

constituted by his scheme, and Oceana undoubtedly contains many valuable ideas. As a book, however, it is irretrievably dull.

His Works were edited by Toland in 1700; Toland's edition, with additions by Birch, appeared in 1747, and again in 1771.

HARRINGTON, Sim Jonny. See Harineton.

BAR—RAR

HARRIOT, or Harriort, Tuomas (1560-1621), an English mathematician and astronomer, was born at Oxford in 1560. After studying at St Mary's Hall, Oxford, where he took his bachelor's degree in 1579, he became tutor to Sir Walter Raleigh, who in 1585 appointed him to the office of geographer to the second expedition to Virginia. Harriot published an account of this expedition in 1588, and the work was afterwards reprinted in Hakluyt's Voyages. On his return to England after an absence of two years, he resumed his mathematical studies with zeal and success ; and having made the acquaintance of Henry Percy, earl of Northumberland, distinguished for his patron- age of men of science, he received from him a yearly pension of £120. He died at London 2d July 1621, after having suffered much from a cancer in the lip, occasioned it is supposed by a habit he had contracted of holding in his mouth instruments of brass often charged with verdigris. A manuscript of Harriot's entitled "' Ephemeris Chrysome- tria" is preserved in Sion College; and his Artis Analy- tecee Praxis ad diquationes Algebraicas resolvendas was published at Londonin 1631. An acconnt of his contribu- tions to the science of algebra will be found in the article ALGEBRA, Vol. i. p. 514; and Wallis's L/istory of Algebra (1685) may also be consulted. From some papers of Harriot's discovered in 1784 it would appear that he had either procured a telescope from Holland, or divined the construction of that instrument, and that he coincided in point of time with Galileo in discovering the spots on the sun's disk.

HARRIS, James (1709-1780), a distinguished English writer on the subject of grammar, was born at Salisbury on the 20th of July 1709, He received his early education at Salisbury, whence he was removed to Oxford at the age of sixteen ; and, having passed the usual number of years as a gentleman

commoner at Wadham College, he was entered at Lincoln's Inn as a student of law, though not intended for the bar. When he had attained his twenty-fourth year his father died ; and this event, having at once freed him from all control, and placed him in the possession of an independent fortune, enabled him to exchange the study of law for other pursuits more congenial to his taste. The decided bent of his mind had always been towards the Greek and Latin classics ; and to the study of these he now applied himself with unremitting assiduity during a period of fourteen or fifteen years. The first fruit of this length- ened course of application was a volume which he published in 1744, containing three treatises—one on art, another on music, painting, and poetry, and a third on happiness. In 1751 appeared the work by which he is best known, Hermes, a philosophical inquiry concerning universal grammar. Although Hermes had considerable reputation in its day as a treatise on grammar, it must now be re- garded as antiquated, and even as erroneous in conception. It is not so much a work on grammar as an attempt to force upon grammatical forms a strictly logical significance, to discover the groundwork of all grammars by analysing the thoughts to be expressed in words, This method, as we now recognize, is incapable of throwing light upon the oral structure and growth of language and grammatical forms. In 1775 Harris published his Philosophical Arrangements, part of a larger work which he had medi- tated, but did not complete, on the peripatetic logic. It is in fact a commentary on Aristotle's categories, and an attempt to discuss problems of more recent philosophy by the Aristotelian notions, The Philological Inquiries is a pleasantly written but slight work on the principles of literary criticism and style. It is the least pedantic of all his works, Harris diedin December 1780. His works were collected and published in 2 vols., 1801, by his son, Lord Malmesbury, who prefixed a bricf biography.

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HARRIS, Joun, D.D. (c. 1667-17 19), an English writer, best known as the editor of the Lexicon Technicum, which ranks as the earliest of the long line of English encyclopedias, and as the compiler of the Collection of Voyages and Travels which passes under his name. He was educated at St John's College, Cambridge, where he took his B.A. degree in 1687, and proceeded M.A. in 1690. Having entered the church, he was soon presented to the

rectory of Winchelsea in Sussex ; and as early as 1698 he was in sufficient repute as a learned divine to be entrusted with the delivery of the seventh series of the Boyle lectures—Atheistical Objections against the Being of God and His Attributes fairly consid- ered and fully refuted. Between 1702 and 1704 we find him lecturing on mathematics on the foundation of Charles Cox, and advertizing himself as a mathematical tutor at Amen Corer. The friendship of Sir William Cowper, afterwards lord chancellor, soon after raised him to a much higher position. Besides receiving the office of private chaplain to Sir William, he was presented in 1708 with a prebend in Rochester Cathedral, and appointed to the rectory of the united parishes of St Mildred, Bread Street, and St Margaret Moses. In this position he showed himself an ardent supporter of the Government, and got into a bitter quarrel with the Rev. Charles Humphreys, who afterwards was chaplain to Dr Sach- everel. Harris was one of the early members of the Royal Society, and for a time acted as vice-president. Besides his contributions to the society's Transactions, and the two important works by which he is still remembered, he published a number of treatises on mathematics and occasional sermons; and at his death on September 7, 1719, he was busy completing an elaborate J/istory of Kent, of which the first volume had just left the press. He is said to have died in poverty brought on by his own bad management of his affairs. There is only one good account of his life, that by Nichols in the Literary Anecdotes, vol. ix., and this even, owing to scarcity of materials, is strangely defective.

HARRIS, Jonn (1802-1856), divine and theologian, was born at Ugborough in Devonshire, March 8, 1802. At the age of fifteen he joined the Independent Church, and began to preach to the rustics of the neighbourhood as a member of the Bristol Itinerant Society. After studying at the Independent college at Hoxton he was in 1827 ordained pastor of a small congregation at Epsom. There in 1836 he wrote his essay, J/ammon, or Covetousness the Sin of the Christian Church, which won a prize of 100 guineas offered by Dr Conquest, and brought its author into notice, thirty thousand copies being sold within a few years. In 1838 he received the degree of doctor of divinity from Brown University, America, and was ap- pointed president and professor of theology in Cheshunt college; and in 1850, when the Independent colleges at Highbury, Homerton, and Coward,

near London, were united, Dr Harris was elected principal of the New College thus formed. He died December 21, 1856.

Besides Mammon, he wrote the Great Teacher (1835); two prize essays, Britannia (1837) and The Great Convmission (1842); and Contributions to Theological Science. The Pre-Adamite Earth (1847), Man Primeval (1849), and Patriarchy (1855), form the

beginning of a series, intended to illustrate the history of man from a theologieal point of view, but interrupted by his death.

HARRIS, Sm Witiiam Syow (1791-1867), a distin- guished electrician, was descended from an old family of Plymouth solicitors, and was born there Ist April 1791. He received his early cducation at the Plymouth grammar-school, and completed a course of medical studies at the university of Edinburgh, after which he established himself as a general medical practitioner in Plymouth. On his marriage in 1824 he resolved to abandon his profession on account of its duties interfering too much with his favourite

study of electricity. As early as 1820 he had invented a new method of arranging the lightning conductors of ships, the peculiarity of which was that the metal was per- manently fixed in the masts and extended tliroughout the hull; but it was only with great difficulty, and not till nearly thirty years afterwards, that his invention was adopted by the Government for the royal navy. In 1826 he read a paper before the Royal Society "On the Relative Powers of various Metallic Substances as Conductors of Electricity," which led to his being elected a member of the society in 1831. Subsequently, in 1834, 1836, and 1839, he read be- fore the society several valuable papers on the elementary laws of electricity, and he also communicated to the Royal Society of Edinburgh various interesting accounts of his experiments and discoveries in the same field of inquiry. In 1835 he received tlie Copley gold medal from the Royal Society for his papers on the " Laws of Electricity by High Tension," and in 1839he was chosen to deliver tle Bakerian lecture. Meanwhile, although a Government commission had recommended the general adoption of his conductors in the

royal navy, and the Government had granted him an annuity of £300 "in consideration of services in the cultivation of science," the naval authorities continued to offer various objections to his invention; to aid in re- moving these he in 1843 published his work on Z'hunder- storms, and also about the same time contributed a number of papers to the Vautical Magazine illustrative of damage by lightning. His system was actually adopted in the Russian navy before he succeeded in removing the pre- judices against it in England, and in 1845 the emperor of Russia in acknowledgment of his services presented him with a valuable ring and a superb vase. At length, every doubt as to the efficiency of his system having been removed, he received in 1847 tle honour of knighthood, and subsequently a grant of £5000. After succeeding in introducing his invention into general use Harris resumed his labours in the field of original research, but as he failed to realize the advances that had been made by the new school of science his application resulted in no discoveries of much value. His manuals of Hlectricity, Galvanism, and Magnetism, contributed to Weale's rudimentary series, were however written with great clearness, and passed through several editions, He died 22d January 1867, while having in preparation a Z'reatise on Frictional Hlectricity, which was published posthumously in the same year, with a memoir of the author by Charles Tomlinson, F.R.S. HARRISBURG, a city of the United States, capital of Dauphin county and of the State of Pennsylvania, is beautifully situated on the east bank of the Susquehanna river, on the Pennsylvania canal, and at the junction of several railways, 126 miles by rail N. of Washington and 105 W. by N. of Philadelphia. The river, which is here a mile in width, is crossed by two bridges, one of which is for the use of the railways. Two other bridges of great beauty and strength span the river in view of the State-house. The State buildings, dating from 1819, occupy an eminence in the centre of the busiest portion of the city, and consist of the State capitol, 180 feet long by 80 feet wide, with a circular portico in front sup- ported by six Tonic columns and surmounted by a dome, and, on two sides of the capitol, smaller buildings uniform in design, containing the executive chamber, the State treasury, and various other offices. The capitol park con- tains a monument to those who died in the Mexican war. Among the other public buildings are the county court- house, the State arsenal, the county prison, and the opera-house. Harrisburg is a bishop's see of the Roman Catholic Church. It is well provided with academies and schools,

and possesses about 30 churches, several of which are costly and ornamental edifices. It is also the seat of

the State library of over 40,000 volumes. Among the benevolent institutions are the city hospital, the home for the friendless, and the State lunatic hospital. An abundant water supply is obtained from the river. Coal and iron are largely wrought in tlie neighbourhood, and the great facilities of communication both by canal and railway have enabled the city to become one of the centres of the iron trade. It possesses large iron-foundries, manu- factories of steel, machines, boilers, engines, carriages, nails, files, galvanized iron, brooms, soap, and shoes, rolling-mills, saw and planing mills, flour-mills, cotton- mills, potteries, tanneries, and breweries. 'The inhabi- tants in 1860 numbered 13,405, and in 1870 23,104. The population of the city proper for 1880 is estimated at 31,700, and that of tlie suburbs at 4900, making a total of 36,600.

Harrisburg received its name from John Harris, an Euglishman who settled on the site of the town in 1726, and whose son estab- lished a ferry over the Susquehanna in 1758. The town was founded in 1785 under the name of Harrisburg, which «vas after- wards changed to Louisbourg; in 1791 it was incorporated under

its present name; in 1812 it became the capital of the State; and in 1860 it was made a city.

HARRISON, Joun (1693-1776), an eminent mechani- cian, was the son of a carpenter, and was born at Faulby, near Pontefract, in Yorkshire, in the year 1693. Thence his father and family removed in 1700 to Barrow, in Lincoln- shire. Young Harrison at first learned his father's trade, and worked at it for several years, at the same time occasionally making a little money by land-measuring and surveying. The strong bent of his mind, however, was towards mechanical pursuits; and this showed itself specially in endeavours to improve the construction of clocks and watches so as to render them more accurate measurers of time. He soon Jearned that, to enable a clock to keep accurate time, the pendulum must be so con- structed as to preserve the distance between the point of suspension and centre of

oscillation invariable, notwith- standing the expansion and contraction of the rod caused by changes of temperature. 'To accomplish this Harrison de- vised, in 1726, his ingenious " gridiron pendulum," which consists in having the bob suspended by a series of parallel rods, alternately of steeland brass, so arranged that the down- ward expansion of the steel rods from change of tempera- ture is exactly compensated for by the upward expansion of the brass rods. This principle of compensation, modi- fied to suit particular cases, is now applied to all good watches and chronometers. Another ingenious improve- ment in clockmaking devised by Harrison was his recoil escapement, which obviated the necessity of keeping the pallets well oiled. He was led to invent this, as he himself tells us, by having on one occasion had to go a long dis- tance to set right a turret clock which had stopped simply from want of oil on the pallets. This escapement, although answering admirably the intended purpose, is rather too delicate to be adopted in ordinary practice. Harrison was also the first to employ the commonly used and effective form of 'going ratchet," which is a spring arrangement for keeping the timepiece going at its usual rate during the interval of being wound up.

In Harrison's time the Government of the country had become fully alive to the necessity of determining more accurately the longitude at sea. For this purpose they passed an Act in 1714 offering rewards of £10,000, £15,000, and £20,000 to any who should construct chronometers that would determine the longitude within 60, 40, and 30 miles respectively. Harrison applied him- self vigorously to the task, and in 1735 went to the Board of Longitude with a watch which he also showed to Halley, Graham, and others. Through their influence he was allowed to proceed in a king's ship to Lisbon to test

it; and the result was so satisfactory that the commissioners gave him £500 to carry out further improvements. Harrison worked at the subject with the utmost persever- ance, and, after making several watches, went up to London in 1761 with one which he considered very perfect. His son William was sent on a voyage to Jamaica to test it; and, on his return to Portsmouth in 1762, the watch was found to have lost only 1 minute 544 seconds. This

was sur- prisingly accurate, as it determined the longitude within 18 niles, and Harrison claimed the full reward of £20,000. After some further trials £10,000 of it was paid to him in 1765, and the remainder in 1767, after he had written such a description of his instrument as would enable other artists to copy it. Harrison died in 1776, at the age of eighty- two. His want of early education was felt by him greatly throughout life. He was unfortunately never able to ex- press his ideas clearly in writing, although in conversation he could give a very precise and exact account of his many intricate mechanical contrivances. He wrote a book en- titled Description concerning such Mechanism as will afford a Nice or True Mensuration of Times.

HARRISON, Wituram Henry (1773-1841), ninth president of the United States, third son of Governor Benjamin Harrison, was born at Berkeley, Charles county, Virginia, February 9, 1773. In 1792 he joined the army with the commission of ensign, and in the following year he became lieutenant and acted as aide-de-camp to Wayne in his expedition against the Western Indians. He was promoted to a captaincy in 1795, but resigned in 1797 on being appointed secretary of the Nortli-\West Territory. In 1799 he was chosen to represent that territory in con- gress, and after its division in 1801 he became governor of the new territory of Indiana and superintendent of negoti- ations with the Indians, over whom, ou the breaking out of hostilities in 1811, he gained the important victory of Tippecanol. In 1813 as major-general and commander of the north-western army he defeated the British forces at the battle of the Thames. In 1814 he concluded a treaty with the North-Western Indians, and in the same year he resigned his commission. He was elected in 1816 member of congress for Cincinnati, in 1819 member of the State senate of Ohio, in 1824 United States senator, and in 1828 minister to Colombia, an office which he held for less than a year, when he retired for a time into private life. By the urgent request of the Whigs he was induced in 1836 to stand for the presidency of the United States, and though unsuccessful, he at the next election in 1840 defeated the same candidate Van Buren by an overwhelm- ing majority, after a canvass memorable for the extra- ordinary enthusiasm it awakened, and historically im- portant for its introduction of new political methods— many of the most characteristic features of Western elec- tions having their origin in this "Harrison campaign." He was

scarcely spared, however, to enter upon the discharge of his duties as president, dying April 4, 1841, about a month after his inauguration. Harrison published at Cincinnati in 1838 a small treatise on the Indians entitled A Discourse on the Aborigines of the Ohio Valley.

HARROGATE, a town and watering-place in the West Riding of Yorkshire, England, is beautifully situated on a fine plateau near the River Nidd, 18 miles W. of York. It is indebted for its rise and importance to its medicinal springs, and is now the principal inland watering-place in the north of England. It consists of two scattered town- ships, Low Harrogate and High Harrogate, which have gradually been connected by a continuous range of hand- some houses and villas. A common of 200 acres, which is secured by act of parliament from ever being built upon, stretches in front of the main line of houses, and on this account Harrogate, notwithstanding its rapid

increase, has retained all its rural charm. As the town is equidistant from the east and west coasts, its air ig supposed to possess certain special qualities, and there is the further advantage of a choice between the more bracing atmosphere of High Harrogate and the sheltered and warm climate of the low town. The waters are chaly- beate, sulphureous, and saline, and some of the springs possess all these qualities to a greater or less extent. The principal chalybeate springs are the Tewitt well, called by Dr Bright, who wrote the first account of it, the "English Spa," discovered by Captain William Slingsby of Bilton Hall about the year 1570; the Royal Chalybeate Spa, more commonly known as John's Well, discovered in 1631 by Dr Stanhope of York, and provided with a neat octagonal building erected in 1842; Muspratt's chalybeate or chloride of iron spring discovered in 1819, but first properly analysed by Dr Sheridan Muspratt in 1865; and the Starbeck springs midway between High Harrogate and Knaresborough. The principal sul- phur springs are the old sulphur well in the centre of Low Harrogate, discovered about the year 1656 3; the Montpellier springs, the principal well of which was dis- covered in 1822, situated in the grounds of the Crown Hotel and surmounted by a handsome building in the Chinese style containing pump-room, baths, and reading- room ; and the Harlow Car springs, situated in a wooded glen about a mile west from Low

Harrogate. Near Har- low Car is Harlow observatory, a square tower 100 feet in height, standing on elevated ground and commanding a very extensive view. A saline spring situated in Low Harro- gate was discovered in 1783. Besides the hotels and churches, the principal public buildings are the High Harrogate college, a boarding-school for young gentlemen; the new Victoria baths, erected in 1871 at a cost of £20,000 ; the Bath hospital for poor patients, founded in 1824; and the Rogers almshouses, founded in 1869, About a mile to the south-east of Harrogate the Crymple valley is spanned bya railway viaduct 1850 feet in length. The population of the town in 1861 was 4737, and in

1871 6843.

HARROW-ON-THE-HILL, a village of Middlesex, England, 10 miles N.W. of London, derives the latter part of its name from its position on a hill which rises from the surrounding plain to the height of about 200 feet. On the summit, and forming a conspicuous landmark, is the church of St Mary, said to have been. founded by Lanfranc, arch- bishop of Canterbury, in the reign of William I., but of the original building very little is now left. Harrow is chiefly celebrated for its school, founded in 1571 by John Lyon, a yeoman of the neighbouring village of Preston who had yearly during his life set aside 20 marks for the education of poor children of Harrow. Though the charter was granted by Queen Elizabeth in 1571, and the statutes drawn up by the founder in 1590, two years before his death, it was not till 1611 that the first building was opened for scholars. Lyon originally settled about two-thirds of his property on the school, leaving the remainder for the maintenance of the highway between London and Harrow, but in the course of time the values of the respective endow- ments have changed, and while the road commissioners receive about £3500, the school's share is only about £1600. In 1660 the headmaster, taking advantage of a concession in Lyon's statutes, began to receive "foreigners," ¢.¢, boys from other parishes, who were to pay for their education. From this time the prosperity of the school may be dated. In 1809 the parishioners of Harrow appealed to the Court of Chancery against the manner in which the school was conducted, but the decision, while it recognized their privileges, confirmed the right of admission to foreigners, At present foundationers receive their education at a slightly

cheaper rate than foreigners ; there are none who are taught | gratis. The government of the school was originally vested in six persons of standing in the parish, who had the power of filling vacancies in their number by election among them- selves; but under the Public Schools Act of 1868 the governing body now consists of the surviving members of the old board, besides six new members elected respectively by the Lord Chancellor, the universities of Oxford, Cam- bridge, and London, the Royal Society, aud the assistant masters of the school. There is a considerable number of fellowships and scholarships in connexion with the school to both the great English universities, some to special colleges, others to colleges in the choice of the holders. The general mode of instruction and discipline is modelled on that of Eton, where most of the former headmasters of Harrow were educated. Originally an exclusively classical school, mathematics became in 1837 a compulsory study at Harrow; modern languages, compulsory on the upper forms only since 1851, were extended to the whole school in 1855; while English history and literature began to be more especially studied about 1869. Science, music, and drawing are now also taught. Among the famous men who have been educated here may be mentioned Bruce, the Abyssinian traveller, Sir William Jones, the Orientalist, Dr Parr, who was born at Harrow, Admiral Rodney, Sheridan, Byron, Peel, Theodore Hook, Lord Palmerston, Lord Herbert of Lea, the earl of Shaftesbury, and Archbishop Trench. Comparatively little change was made in the school buildings till 1819, when the new portion was begun; but since that time improvements and additions have steadily increased. In 1839 a school-chapel was consecrated; but this has been gradually replaced by a handsomer edifice completed in 1857. The Vaughan library was built in 1861-63, and a hospital for the boys in 1865. A new speech room, a gymnasium, and labora- tories have been erected out of the Lyon Tercentenary Fund, subscribed since 1871. The population of the parish in 1871 was 8537, and of the local board district

4997.

HARRY, Burnp, or Heyry tae Minstret, author of a poem in twelve books, entitled Zhe Actis and Deidis of the illuster and vailzeand campioun, Schir

William Wallace, Knicht of Ellerslie. All that is known of Henry's personal history is contained in the following quotation from Major : —' Henry, who was blind from his birth, composed in the time of my youth the whole book of William Wallace, and embodied all the traditions about him in the ordinary measure, in which he was well skilled. By the recitation of these in the presence of the great, he procured, as indeed he deserved, food and clothing." Major was born about 1469, and the only MS. copy of Henry's works is that in the Advocates' Library, Edinburgh, dated 1488. It was first printed at Edinburgh in 1570. In his Lives of Scottish Worthies, P. F. Tytler claims for it a certain historical worth, as "the work of an ignorant man, who was yet in possession of valuable and authentic materials." On account of its glorification of the national hero it has enjoyed a long popularity among the Scottish peasantry, but it possesses no poetical merit except a certain rude fire and energy, and as a literary production its place must be reckoned a very humble one.

HARTE-BEEST (Alcelaphus caama), a species of antelope, occurring in considerable numbers throughout southern and central Africa. It stands nearly 5 feet high at the shoulders, and is somewhat ungainly in form owing to the disproportionate development of its fore and hind quarters—a difference which gives to the posterior limbs when in motion an appearance of weakness. The head is long and narrow, and is crowned in both sexes by a pair of nearly cylindrical horns, ringed throughout their lower half

and smooth above. 'The hair of this species is short, soft, and recumbent, and is of a brownish-yellow colour above and nearly white beueath, the colour, however, being to some extent dependent on age and sex and on the season of the year. The harte-beest is gregarious, living in herds of from five to ten individuals, and frequenting tracts of uninhabited wilderness, or the light brush forest in the neighbourhood of rivers. It is exceedingly wary, and con- sequently difficult of approach, and when suddenly come upon, the entire herd, according to Sir Andrew Smith, scampers off in the train of a leader,—the herd being rarely seen, when in flight, otherwise than in a

string, one treading on the footsteps of another. Of a mild and gentle disposi- tion, the harte-beest seeks safety, whenever it can, in flight ;

-when at bay, however, it does not hesitate to turn upon its

pursuers and to make use of its powerful horns as weapons of offence. During the heat of the day it is said to rest

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Harte-beest.

leaning against the trunks of trees, when the colour of its body so harmonizes with that of the bark as frequently to enable it to elude observation. Dr Schweinfurth, who had frequent opportunity of observing those animals in central Africa, describes a curious and as yet unexplained habit of which he was himself a witness. Having approached nearer to a herd of harte-beests than usual without attract- ing their attention, he observed them running in couples like the horses in a circus, "going round and round a clump of trees, whilst the others stood in groups of three or four intently watching them. After a time these in turn took their places, and, two at a time, ran their own circuit in a similar fashion." He conjectures that the performance had probably some connexion with pairing time. The flesh of this species is considered superior to that of any other South African antelope, the eland alone excepted.

HARTFORD, a city in the United States of North America, in 41° 45' 59" N. lat., 72° 40' 45" W. long., is the eastern portion of the town of the same name, the county seat of Hartford county, and the capital of the State of Connecticut. It is situated on the west bank of the Connecticut river, 60 miles from Long Island Sound, at the head of steamboat and sloop navigation, and 100 miles N.E. of New York and 95 W.S.W. of Boston by rail. An important centre of railway communication, it has also regular lines of steamboats and packets, besides some 200 sailing craft engaged in

the coasting trade. The river is usually closed from the middle of December to the

middle of March, aud at the breaking up of the ice in spring sometinies rises 29 feet. The city is intersected by the sluggish and dirty Park river, which is spanned by 10 bridges. A covered toll bridge, 1000 feet long, across the Connecticut river connects the city with East Hartford. There are about 80 miles of streets, mostly lighted with gas, well drained, and macadamized or paved, and running north-and-south or east-and-west with considerable regu- larity. The city is for the most part compactly built of brick, granite, and freestone,—the public buildings and those of many private corporations being elegant and sub- stantial. The old State-house, a Doric edifice, completed in 1795, has become the city-hall, while the State, since 1879, occupies a capacious new building of white marble in the modern Gothic style, costing over $3,100,000, and standing conspicuously in the midst of the city on a slight elevation at the south side of Bushnell Park (a beautiful area of 46 acres). There are also in the city three other public squares. Of the seven cemeteries the most note- worthy is Cedar Hill, in the south-west part of the town, comprising 268 acres. Wadsworth's tower on Talcott mountain, to the north-west, affords one of the finest views in New England. Hartford is a healthy city, and its mean annual temperature is 50° Fahr. The area of the city is 10 square miles; and the population in 1870 was 37,180, of whom 10,817 were foreigners. A careful esti- mate of the population in 1879 gives nearly 50,000.

The city is divided into 8 wards, and is governed by a mayor and 16 aldermen elected biennially, and 32 councilmen elected annually. The water supply is from four reservoirs in West Hartford, with a capacity of 1,208,450,367 gallons. In 1873 a free public bathing- house was established. Since 1864 the city has had a

paid fire-department, and now has seven steam fire-engines |

and a fire-alarm telegraph with 26 miles of wire. The total real estate and personal property in the city assessed for taxation, October 1, 1878, was $44,001,245.

$2,152,308.

The principal business of the city is insurance. In 1879 there were 9 fire insurance companies, with assets of $19,104,603 ; 8 life insurance companies, with asscts of $101,101,368; and 1 accident insurance company, with assets, $1,170,163. There were 16 banks and trust companies, with au aggregate capital of over $8,000,000, and 4 savings banks, with deposits, October 1, 1878, amounting to $9,528,893. There are also, exclusive of railroads, 73 mechanical and manufacturing corporations, though several of the larger ones have their works in adjacent towns. These have a capital of $17,347,000, and some of them a world-wide reputation, as the Colt Firearms Company, with works occupying grounds of 123 acres reclaimed by an extensive dike along the Connecticut river. They also include carpet, linen, and silk works, and a manufactory of edgetools. The publication of books too is a considerable interest. A very important branch of trade is the sale of leaf tobacco, which is the chief crop of the Connecticut river valley.

In 1879 there were 36 churches and 15 chapels of all denomina- tions, including a fine Jewish synagogue. Here, too, is the seat of the Roman Catholic bishop, and the headquarters, in the United States, of the Chinese educational commission. Beside the 17

public schools and school-houses, which have eost $1,032,000, and |

with their 163 teachers and 7680 pupils cost about $200,000 a year, there were in 1879 43 educational and charitable corporations, several of them of notable importance, especially Trinity College (Episcopal), founded in 1823 as Washington College, which now has beautiful and commodious buildings in the south part of the city; the Theological Institute of Connecticut (Congregational), founded in 1834; the Hartford high and grammar school,

The | debt of the town in 1879 was $1,298,158, and of the city |

‘ ton-on-Tees,

deaf and dumb, retreat for the insane, Hartford hospital and orphan asylum (see Connecticut, vol. vi. p. 287). Thomas Green in 1764 opened the first printing-office in the city, and established the Connecticut Courant, which has ever sinee been regularly published. There were in 1879 three daily newspapers, seven weekly, and four monthly. In 1797 A. Kinsley exhibited the first steain locomotive in Hartford streets; and a portion of the Hartford and New Haven railroad was in operation in 1838. The railroads, however, have not been pecuniarily successful, that to New York being the only one of those meeting at Hartford which is in a prosperous condition.

Hartford was known to the aborigines as Suekiang; it was first permanently settled in 1685 by emigrants from eastern Massachu- setts, and called Newtown. In 1637 it was named Hartford after Hertford in England. The Dutch had built a fort there in 1633, but it passed wholly into English hands in 1654. The first town meeting was held in 1635, and the first place of worship built, and school put in operation, in 1638. In 1639 was written at Hartford the constitution for the colony, the first framed in America, and embodying the characteristic features of all which follow. The first code of laws was drawn up in 1650, redueing the capital offences from 160 under English law to 15. In 1687 Sir E. Andros came to Hartford while the assembly was in session, and demanded the chartcr, but it was concealed in the notorious Charter Oak by Captain Joseph Wadsworth, and remained hidden till 1689. The historic tree survived till 1856. The city was incorporated in 1784, and in 1785 it beeame the sole capital of Connecticut.

HARTIG, Geore Lupwic (1764-1836), a German writer on forestry, was born at Gladenbach near Marburg, 2d September 1764. After obtaining a practical knowledge of forestry from his uncle at Harzburg, he studied from 1781 to 1783 at the university of Giessen. In 1786 he became inspector of forests to the prince of Solms- Braunfels at Hungen in the Wetterau, where he founded a school for the

teaching of forestry. After obtaining in 1797 the appvint-

ment of inspector of forests to the prince of Orange-Nassau, he continued his school of forestry at Dillenburg, where its attendance considerably increased. On the dissolution of the principality by Napoleon I. in 1805 he

lost his situation, but in 1806 he went as chief superintendent of forests to Stuttgart, whence in 1811 he was called to Berlin as principal superintendent of forests under the Prussian Government. There he again opened his institution for instruction in forestry, and succeeded in connecting it with the university of Berlin, where in 1830 he was named honorary professor. He died at Berlin 2d February

1836.

Hartig was the author of a number of valuable works on forestry, new editions of which have been published by his son Theodor. The principal of these works are Lehrbuch fiir Jdger ; Lehrbuch fiir Forster; Kubiktabellen fiir geschnittene, beschlagene, und runde Holzer; and Lexikon fiir Jéiger und Jagdfrewnde.

HARTLEPOOL, and West Harttepoot, respectively a municipal borough and a town of England, county of Durham, and included in the parliamentary borough of the Hartlepools, are situated the one on the north and the other on the south side of Hartlepool Bay, about a mile apart, but having connexion by railway, and practically forming portions of one town. By railway Hartlepool is 10 miles and West Hartlepool 12 miles N.N.E. of Stock- The principal buildings of Hartlepool are the parish church, in the Early English style, dedicated to

| St Hilda; the borough hall, in the Italian style, erected in

founded 1655, the oldest educational institution in the State, and |

occupying one of the finest school edifices in the country; the Watkinson library of reference, with 34,000 volumes ; rooms and library of the Connecticut historical society, with -its valuable collections of relics, books, and MSS.; the young . men's institute, a circulating library of 27,000 volumes (the last three, with a picture gallery, occupy a roomy and accessible building known as the Wadsworth Atheneum); the very complete State law library at the State-house; the American asylum for the

the ;

1866, behind which there is a large market; the Durham militia artillery depédt, erected in 1861; the temperance hall, the mechanics' institute, and the theatre. New schools for boys, girls, and infants have been erected by the school board; and Prissick's schools, founded in 1826, have been constituted elementary schools under the Education Act of 1870. Among the other schools are Crook's endowed school, founded in 1755, and the school in connexion with Henry Smith's charity. The town was originally surrounded by walls, of which considerable re- mains may yet be seen. It is well supplied with water. The principal buildings of West = are the athe- I. — 63

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neum, the town-hall, the exchange, in the Gothic style, erected in 1875 at a cost of £10,000, the mechanics' institute, and the theatre. A Government school of art was established in 1874. The manufactures of the two towns are very much alike: they possess iron-works, puddling furnaces, brass and iron foundries, engine and boiler works, sawmills, cement works, tile works, and breweries. With the addition of the new docks, com- pleted in 1879, the dock area between the towns is 86 acres, besides which there are ponds with an area of about 80 acres. Considerable difficulty has been found in main- taining a sufficient depth of water at the harbour bar of Hartlepool, and although the use of a powerful dredge has been so far effectual, it is probable that the only adequate remedy will be the extension of the breakwater. A large lighthouse for guiding the entrance of vessels was erected in 1846-47 at a cost of nearly £6000. In the shipping returns Hartlepovl and West Hartlepool are classed to- gether as one port; in 1878 the number of vessels that entered the port, including those in ballast, was 4640, with a tonnage of 885,762; the number that cleared 4662, with a tonnage of 992,370. For the five years ending 1878 the average number of vessels that entered was 5371, with a tonnage of 975,039, while 5447 cleared, with a tonnage of 1,005,740. The principal exports are coal, coke, machines, and cotton, linen and woollen goods, aud the principal imports, timber, cattle, corn, provisions, and wool. The fisheries are considerable. The town is much resorted to in summer for sea-bathing. Several caverns, which may be explored for nearly fifty yards, have been excavated by the sea out of the rocks on the shore of the peninsula, The parliamentary

borough of the Hartlepools has an area of 7267 acres, and besides Hartlepool includes Stranton (in which parish West Hartlepool is situated), Seaton Carew, and Throston. Its population in 1861 was 27,475, and in 1871, 38,203. The population of the municipal borough of Hartlepool in 1861 was 12,245, and in 1871, 13,166; and the population of Stranton in 1861 was 13,601, and in 1871, 22,166,

The name Hartlepool means the pool or lake of Hart. The town grew up round a monastery which had St Hilda as its abbess, and the harbour was of some consequence as early as 1171. In the 18th century Hartlepool belonged to the Bruces of Annandale in Scotland, the progenitors of the royal family of that name. The town was erected into a borough about 1200. After Bruce ascended the Scottish throne his English possessions were forfeited, and Hartlepool was granted to the Cliffords. It suffered severely from the Scots in 1312, and again in 1315 after the battle of Ban- nockburu. During the great northern rebellion in the reign of Elizabeth it was seized by the insurgents. In 1644 it was taken by the Scottish army, and it remained in the possession of Scot- land till 1647. West Hartlepool was founded in 1844 by Mr R. W. Jackson, the first M.P. for the borough of the Hartlepools. Its first dock was constructed in 1847, after which it increased with great rapidity.

HARTLEY, Davin (1705-1757), who may justly be called the founder of the English Association school of psychologists, was born on the 30th August 1705. His father, who was vicar of Armley in Yorkshire, wished him to enter the church; and with this view he was sent at the age of fifteen to Jesus College, Cambridge, where he studied under Saunderson the mathematician, and distinguished himself so much that he was elected a fellow of his college. But his university career so far modified his opinions that, feeling himself no longer able conscientiously to sign the Thirty-nine Articles, he abandoned his first intention and devoted himself to the study of medicine. He, however, remained in the communion of the English Church, living on intimate terms with the most distinguished churchmen of his day, among whom may be named Joseph Butler, Warburton, Law, Hoadley, and the poet Young. Indeed he asserted it to be a duty to obey ecclesiastical as well as civil authorities. The doctrine to which he most strongly |

objected was that of eternal punishment. His keen interest in theology is proved by the fact that he devoted a large part of his Observations to that subject, the objective side of which he treated upon orthodox lines. The life of Hartley was the useful life of a benevolent and studious physician. He practised at Newark, Bury St Edmunds, London, and lastly at Bath, where he died on the 28th August 1757, within two days of his fifty-second birthday. It was at the age of twenty-five that he commenced the series of essays that was to make up his Observations on Man: his Frame, his Duty, and his Expectations. The praise of originality cannot be denied him. It is noteworthy, however, that very nearly at the same time with the publication of Hartley's Observations (1749), two works appeared in French expounding theories essentially similar to his—Condillac's Zraité sur l'Origine der Connoissances humaines (1746) and the Zraté Analytique de Ame by Charles Bonnet of Geneva, whose coincidence with Hartley in the most distinctive features of his philosophy is ex- tremely remarkable. But Hartley's own account of the matter is so straightforward as to command immediate assent. His physical theory, he tells us, was drawn from certain speculations as to nervous action which Newton had published in his Prizcipia. His psychological theory was suggested by an Lssay on the Fundamental Principle of Virtue or Morality (written by a clergyman named Gay, and prefixed by Law to his translation of Archbishop King's Latin work on the Origin of Evil), the chief object of which was to show that sympathy and conscience are developments by means of association from the selfish feelings. It is greatly to Hartley's credit that he so frankly owned his obligations to a work so far inferior to his own in completeness and tone of thought.

The outlines of Hartley's theory are as follows. With Locke he asserted that, prior to sensation, the human mind is a blank. By a growth from simple sensations those states of consciousness which appear most remote from sensation come into being. And the one law of growth of which Hartley took account was the law of contiguity, synchronous and successive. By this law he sought to explain, not only the phenomena of memory, which others had

similarly explained before him, but also the phenomena of emotion, of reasoning, and of voluntary and involuntary action.

By his physical theory Hartley gave the first strong impulse to the modern study of the intimate connexion of physiological and psychical facts which has proved so fruitful, though his physical theory in itself is inadequate, and has not been largely adopted. He held that sensation is the result of a vibration of the minute particles of the medullary substance of the nerves, to account for which he postulated, with Newton, a subtle elastic ether, rare in the interstices of solid bodies and in their close neighbourhood, and denser as it recedes from them. Pleasure is the result of moderate vibrations, pain of vibrations so violent as to break the continuity of the nerves. These vibrations leave behind them in the brain a tendency to fainter vibrations or " vibratiuncles" of a similar kind, which correspond to " ideas of sensation." Thus memory is accounted for. The course of reminiscence and of the thoughts gene- rally, when not immediately dependent upon external sensation, is accounted for on the ground that there are always vibrations in the brain on account of its heat and the pulsation of its arteries. What these vibrations shall be is determined by the nature of each man's past experience, and by the influence of tle circumstances of the moment, which causes now one now another tcndency to prc- vail over the rest. Sensations which are often associated together become each associated with the ideas corresponding to the others; and the ideas corresponding to the associated sensations become associated together, sometimes so intimately that they form what appears to be a new simple idea, uot without careful analysis resolvable into its component parts.

*Starting, like the modern Associationists, from a detailed account of the phenomena of the senses, Hartley tries to show how, by the above laws, all the emotions, which he analyses with considerable skill, may be explained. Locke's incomplete phrase " association of ideas * is employed throughout, " idea" being taken as includ- ing every mental state but sensation. He emphatically asserts the existence of pure disinterested sentiment, while declaring it to be a growth from the self-regarding feelings. Voluntary action is explained as the result of a firm connexion between a motion and a sensation or "idea," and, on the physical side, between an '¢ideal" and a motory vibration. Therefore in the Freewill con-*

troversy Hartley took his place as a Detcrminist. It is singular that, as he tells us, it was only with reluctance, and when his speculations were nearly complete, that he came to a conclusion on this subject in accordance with his theory.

Hartley's theory of reasoning is forced into agreement with the rest of his system. He declares that "assent and dissent, what- ever their precise and particular nature may be, must come under the notion of ideas, being only those very complex internal feelings which adhere by association to such clusters of words as are called propositions . . . . And thus a mathematical proposition is nothing more than a group of ideas united by association," this group of ideas including "not only the sum of the ideas belonging to the terms of the proposition, but also those which belong to equality, coincidence, and truth."

The remaining half of the Observations is devoted to discussion of theological questions and to practical ethics, and does not call for detailed notice. While emphatically asserting his faith in supernatural religion, in the psychological part of his work he treats, not only conscience, but also the religious emotions entirely as developments from sensation, in the same sense as the pleasures of imagination.

Clearness, freedom from redundancy, and a severe simplicity and brevity are the best characteristics of his style. 'No book," writes Sir James Mackintosh, " perhaps exists which, with so few of the common allurements, comes at last so much to please by the picture it presents of the writer's character . .. . Whoever bestows a careful perusal on the work must be unfortunate if he does not see, feel, and own that the writer was a great philosopher and a good man." Ci or Wi)

HARTLIB, Samver (c. 1600-1662) was born towards the beginning of the 17th century at Elbing in Prussia, his father being a refugee from Poland. His mother was English. About 1628 Hartlib came to England, where he carried on a mercantile agency, and at the same time found leisure to enter with interest into the public questions of the day. An enthusiastic admirer af Comenius, he published in 1637 his Conatum Comenian- orum Preeludia,

and in 1639 Comenii Pansophice Pro- dromus et Didactica Dissertatio. In 1641 appeared his Relation of that which hath been lately attempted to procure Licclesiastical Peace among Protestants, and A Description of AMacaria, containing his ideas of what a model state should be. During the civil war Hartlib occupied himself with the peaceful study of agriculture, printing at his own expense several treatises by others on the subject. In 1650 he issued the Discourse of Manders Husbandry by Sir Richard Weston; and in 1651 his Legacy, or an Linlargement of the Discourse of Husbandry used in Brabant and Flanders, by Robert Child (see AGRicuLTURE, vol. 1. p. 297). For his various labours Hartlib received from Cromwell a pension of £100, afterwards increased to £300, as he had spent all his fortune on his experiments. He planned a school for the sons of gentlemen, to be con- ducted on new principles, and this probably was the occasion of his friend Milton's Tractate on Education, addressed to him in 1644, and of Sir William Petty's Zwo Letters on the same subject, in 1647 and 1648. His own literary labours were mostly confined to prefaces and short essays. Blythe, a contemporary, says that Ad. Speed, while engaged on his Jmprovements in Husbandry, was lodged and entertained by Samuel Hartlib. At the Restoration Hartlib lost his pension, which had already fallen into arrears; he petitioned parliament for a new grant of it, but what success he met with is unknown, as his latter years and death are wrapped in obscurity. 1662 has been assigned as the probable year of his death, as the latest of his extant letters bears that date.

His other publications are the following :—Considerations tending to England's Reformation in Church and State, 1647; Vindication of Mr John Durie, 1650; Twisse's Doubting Conseience Resolved, 1652; A true and ready way to learn the Latin Tongue, 1654; The Reformed Commonwealth of Bees, and the Reformed Virginan Silkworm, 1655; and The Compleat Husbandman, 1659. See Biographical Memoir of Samuel Hartlib, by H. Dircks, 1865 ; Gentleman's Magazine, January 1802; Warton's Milton ; Harte's

Agricultural Essays; Donaldson's Agricultural Biography; and Masson's Afilton,

HARTMANN, Monrtrz (1821-1872), a German poet and novelist, was born of Jewish parents at Duschnik in Bohemia, October 15, 1821. He studied at Prague and Vienna, and after a tour in Italy, Switzerland, and South Germany became a teacher in Vienna. He left Austria, however, in 1844, in order to publish without danger a volume of patriotic poems entitled Kelch und Schwert, which appeared at Leipsic in 1845, and in which he gave expression to somewhat radical sentiments as regards both church and state, in language full of the fire of youthful passion and tinged with considerable poetic fancy. After residing for some years in Belgium and France, he caine to Leipsic, where in 1847 he published Weuere Gedichte. On his venturing towards the close of this year to return to Austria he suffered a short imprisonment, from which he was freed by the revolution of the following March. In the same year be was chosen to represent the district of Leitmeritz in the Frankfort parliament, where he took his seat on the extreme left. In October he accompanied Blum and Frébel to Vienna, but he made his escape before the execution of Blum, and took part in the deliberations of the "Rump Parliament" at Stuttgart. In 1849 he pub- lished the Reimchronik des Pfaffen Maurizius, a satirical political poem in the style of the old chronicles. After the dissolution of the 'Rump Parliament," he went to Switzor- land, then to England and Treland, and in 1850 to Paris, where, besides other literary engagements, he held that of correspondent to the Kélnisehe Zeitung, On the outbreak of the Russian war he became correspondent of the same paper in the Crimea, where he remained eighteen months. After several years' residence at Paris he settled in 1860 at Ghent, where he delivered courses of lectures on German literature and history in some of the principal academies. In 1863 he removed to Stuttgart to edit the Freya, and in 1868 he undertook the editorship at Vienna of the Weue Freie Presse. We died at Oberdobling near Vienna, May 13, 1872. Hartmann published several volumes of poems in addition to those already mentioned, and besides his spirited accounts of his travels and adventures he is the author of various novels of more than average merit. A series of tales (Vovellen, 3 vols.) appeared in 1863, and a second series (Vach Natur, 3 vols.) in 1866. His eollected works were published at Stuttgart ix 10 vols., 1873-74, and a selection of his poems at the same place in 1874.

*HARTMANN VON AUE, a Middle High German poet, was born about 1170. He was of knightly rank, and held a fief at Aue, which was probably on the upper Neckar. He seems to have been educated in a monastery, and was able to read and write. Among his accomplishments was a knowledge of French, and as he took part in the third crusade he must be considered to have passed under the influences which were in his time most favourable to poetic impulse. Although his lyrics are not without mierit he excels chiefly in narrative poetry ; and the best known of his narrative poems, which was also one of the earliest, is Der arme Heinrich (** Poor Henry"). Some of the inci- dents of this tale are exceedingly repulsive, but others are marked by delicate grace and pathos. Two other tales, FErec and Iwein, the former written before 1197 and the latter before 1204, treat of the Arthurian legend, and are based upon Freneh poems by Chrétien de Troies. The story of each is clearly conceived, and the diction is fresh, harmonious, and animated. Hartmann has neither the exquisite finish and charm of Gottfried of Strasburg nor the soaring imagination of Wolfram von Eschenbach ; but he stands next to these supreme mediseval writers in the power of giving artistic shape to strong feeling. He is mentioned as alive in 1207 by Gottfried of Strasburg, but*

| in 1220 his death is deplored by Heinrich von dem Tiirlein

in the Krone.

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Each of his works has found a special editor; and a complete edition of his writings has been issued by F. Bech in the Deutsche Classiker des Mittelalters. See L. Schmid, Stand, Heimat, und Geschlecht des Minnestingers Hartmann (1874).

HARTSHORN, Srigits of, a name signifying originally the ammoniacal liquor obtained by the distillation of horn shavings, afterwards applied to the partially purified similar products of the action of heat on nitrogenous animal matter generally, and now popularly used to designate solution of ammonia. See AMMONIA, vol. i. p. 741, and CHEMISTRY, vol. v. p, 509.

HARUN ER RASHID. See Haroun at Rascurp.

HARUSPICES (literally entrail-observers, cf. Skt. hild, Gr. xopd7), a class of soothsayers in Rome. Their art consisted especially in deducing from the appearance pre- sented by the entrails of the slain victim the will of the gods. They also interpreted all portents or unusual phenomena of nature, especially thunder and lightning, and prescribed the expiatory ceremonies after such events. To please the god, the victim must be without spot or blemish, and the practice of observing whether the entrails presented any abnormal appearance, and thence deducing the will of heaven, was also very important in Greek religion, as some other modes of ascertaining the will of the gods undoubtedly were, of genuine Aryan growth. It is foreign to the Homeric poems, and must have been in- troduced into Greece after their composition. In like manner, as the Romans themselves believed, the art was not indigenous in Rome, but derived from Etruria. The Etruscans were said to have learned it from a being named Tages, grandson of Jupiter, who had suddenly sprung from the ground near Tarquinii. The art was practised in Rome chiefly by Etruscans, seldom by native- born Romans who had studied in the priestly schools of Etruria. Though it was of great importance under the early republic, it never becaine a part of the state religion. In this respect the haruspices ranked lower than the augurs ; the latter were a more ancient and purely Roman institu- tion, and were a most important element in the political organization of the city. In later times the art fell into disrepute, and the saying of Cato the censor is well known, that he wondered one haruspex could look another in the face without laughing (Cic., De Div., ii. 24). Under the empire, however, we hear of a regular collegium of sixty haruspices; and Claudius is said to have tried to restore the art and put it under the control of the pontifices.

HARVARD COLLEGE, the earliest institution of learn- ing in the United States and on the continent of North America. The record gives its origin thus. The English colonists on Massachusetts Bay, settling at what is now Boston in 1630, began a plantation the next year three miles up Charles River, which they called " New Towne." The colony court of September 1636 " agreed to give £400," which exactly doubled the public tax for the year, " towards a schoole or collidge, whereof £200 to be paid the next yeare, and £200 when the work is finished, and the next court to appoint wheare and what building." In November 1637 "the Colledge is ordered to be at New Towne," the name of which had been changed to Cambridge, and

a committee was appointed " to take order" for it. In March 1638-39 "it is ordered that the colledge agreed upon formerly to bee built at Canrbridge shalbee called Harvard Colledge." The reason was that the Rev. John Harvard, B.A. 1632, and M.A. 1635, of Emmanuel College, Cam- bridge, England, dying in Charlestown, Massachusetts, September 14, 1638, by will left half his estate, about £800, and his library, to the wilderness seminary. The college charter of 1650 declared the object to be "the

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This art, however, appears not to have been, |

| aterm of six years,

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education of the English and Indian youth of this country in knowledge and godlynes." The first brick edifice on the college grounds, having rooms for twenty of the aborigines, was called "the Indian college." In it was printed the apostle Eliot's translation of the Bible into the language of the natives, with primers, grammars, tracts, dc. Several of the natives were members of the college; only one graduated from it. By generous aid received from abroad for this special object, the college was greatly helped in its infancy.

Thus from the beginning private munificence rather than the public treasury fostered and sustained the college, and with steadily increasing preponderance all through its history have its supplies and endowments come from the generosity of individuals. Grants from the colony, province, and State, of small sums for salaries and incidental pur- poses, made annually or at intervals, wholly ceased more than sixty years ago. With scarce an exception all the present invested funds of the college and of its professional schools, amounting to $3,615,538. 87, with the halls, library, and apparatus, are the benefactions of its friends.

The charter constitutes as a corporation a president, treasurer, and five fellows, who initiate all measures con- cerning the college, hold its funds, and have the nomina- tion for filling vacancies in their own body, as also of all the officers for instruction and for the internal government of the

institution in all its départments, subject, however, to the advice and approval and final action of a board of overseers. The State, claiming as founder and patron, till quite recently regarded the college as a State institution, over which it should exercise a direct control through the legislature and the executive, by its authority in the membership and the election of the whole or a part of the board of overseers. Various modifications made from time to time in the composition or method of choice of the members of this board not relieving the controversies and embarrassments incident to legislative action, which proved prejudicial to the best interests of the college, its organic connexion with the State by this tie was severed by statute in 1866. The board of overseers as now constituted is composed of thirty of the alumni, besides the president and the treasurer, elected by the ballots of the alumni on com- mencement day at the college, in sections of five, serving With its complement of professional schools of law, medicine, theology, science, and many special departments of the latter, more than any other institution in America, and with but a few gaps yet to be filled in its completeness of method and equipment to bring it to comparison with foreign institutions of learning, Harvard College may claim to be in the most compre- hensive sense of the term a university, a title which is, indeed, assumed, and generally applied to it. Recent changes in the course of study in the college have allowed a wide range for elective studies to undergraduates, the proportions being, one-fourth obligatory, three-fourths elective. In the professional 'schools most of the studies are obligatory. The number of bound volumes in the library and schools is 232,200. The number of halls owned and occupied for college uses is twenty-nine of brick or stone, including ten for students' chambers. The whole number of professors, instructors, &ec., in all depart- ments, is 135; of librarians, proctors, and other officers in the service of the college, 28. The number of the alumni of the college proper about 9600; the number in all departments about 14,000.

HARVEST-BUG, a name erroneously applied to the hexapod larval condition of a mite, not one of the Insecta, but belonging to the division Acaridea of the class Arach- nida, It is very small, of a brick-red colour, and swarms both among wild vegetation and cultivated plants, especi-

ally near the sea, attaching itself, however, on the first opportunity to the bodies of human beings, hares, dogs, cats, and other mammals, and even insects. On reaching the skin, it rapidly burrows deeply into it, causing a painful itching, followed by a swelling of irritation and size varying with the individuals attacked, and enduring for several days. It is usually at the end of July or in August that these mites make their appearance; and the frequency with which they attach themselves to the lower extremities of people walking in fields at harvest-time has given rise to their trivial name. The effect of their subcutaneous presence varies in different people, as above mentioned ; in some it assumes so intensely painful an aspect as to originate a disease called autumnal erythrema. Such severity of symptoms is generally found in warmer climates than that of Great Britain; the mite however is pleutiful, and causes much annoyance, in Scotland. Extraction with a fine needle, under a magnifying power, is the best way to get rid of the pests ; but the application of a solution of carbolic acid, benzine, sulphur ointment, or any other powerful and easily diffused insecticide agent will usually soon destroy them.

The scientific name of this creature is Acarus (Leptus or Tetrany-

chus) autwmnalis, and in France it has received various common names, that cf "rouget" being the best known. It has been placed in different genera by modern authors, who have hitherto considered it as a fully developed form, of somewhat doubtful affinities. The old naturalist Degeer appears to have suspected its correct status as an imperfect Acarus; but it has been reserved for the French naturalist, M. P. Méguin, to prove from actual obser- vation the fact that it is only the larva of a well-known mite, Lrombidium holosericewm, a silky bright scarlet species often found in spring and early summer in gardens and fields. This distin- guished biologist has in like manner put beyond doubt the identity of various other members of the Acaridea, hitherto dissociated. In April he found both sexes of the perfect mite, but at the end of May and in June only gravid females occurred. These in June and July deposited their eges, from which was hatched the creature heretofore known as Acarus (or Leptus) autwmnalis. As soon as this has implanted its mandibles into the skin of the individual attacked, its abdomen dilates perceptibly, finally becoming about five times as large as on leaving the egg, though the cephalothorax and limbs remain

unchanged. It turns to an octopod nymph, or pupa; and after hibernation, during which the nutritive fluids imbibed in the parasitic stage are assimilated, the adult stage of a purely phytgphagous Zrombidiwm, capable of reproduction, is reached. , _ There seems every reason to believe that the skin irritation caused in Mexicg by a supposed insect, called Thalsahwate or Tlalsa- huate by the Indians, is really produced by this or a closely allied mite. Similar complaints are apparently caused by mites in Brazil, Martinique, Honduras, &.; and the symptoms are naturally aggravated in such tropical localities.

An account, with figures, of all the stages of Zrombidium holo- sericeum and the allied 7. fuliginosum (of which the octopod 7. phalangit, parasitic upon very long-legged spiders, is the nymph or pupa) will be found in the Annales des Sciences Naturelles, 6me série, iii, (1876), article No. 5, by M. Mégnin.

HARVEY, Gasrtst (1545-1630), an English writer of the Elizabethan period, was the eldest son of a rope-maker at Saffron Walden, and received his education at Christ's College and Pembroke Hall, Cambridge, where we find him about 1576-78 lecturing on rhetoric. Immediately afterwards he appears to have been sent abroad by his patron the earl of Leicester, to whom he refers in his Gratu- lationum Waldinensium libri quatuor (Lond., 1578), a col- lection of pieces in honour of the queen's visit to Audley End, near his native town. In 1585 he became doctor of laws. Though Harvey expresses a desire to be " epitaphed the Inventour of the English Hexameter," his name, familiar enough to his more learned contemporaries, would probably have been well nigh forgotten had it not been for his friendship with Spenser and his hostilities with Greene and Nash. To the student of Spenser he is familiar as one of the poet's principal correspondents, and as the Hobbinol who wrote the poem prefixed to the " Faerie Queen." His quarrel with Greene and Nash was begun by Greene allud-

ing in his Quip for an Upstart Courtier (1592) to the fact that Harvey was the son of a rope-maker ; and after Greene's death it raged with ever

increasing violence until the archbishop of Canterbury issued an order for the seizure of all works written by either of the combatants.

Harvey's extant publications, which contain Many minor matters of intcrest to the student of literature, are—Cicerontanus, London, Ii. Binnemann, 1577 ; Rhetor, vel duorwm dierumn Oratio de Natura, Arte, et Exereitatione Rhetorica, 1577; Smithus vel Musarum Lach. ryme, Loud., 1578, in honour of the scholarly Sir Thomas Smith ; Foure Letters and eertaine Sonnets, especially touching Robert Greene and other parties by him abused, 1592 ; Pierce's Supererogation, or a new Prayse of the Old Asse, 1598, reprinted, but inaccurately, by Mr Collier, 4to, 1868; A new Letter of Notable Contents, 1598; The Trimming of Thomas Nash, Gentleman, by the high tituled Don Richardo de Medico Campo, 1597, reprinted in The Old Book Col- lector's Miscellany, Lond., 1871. See Warton's History of English Poetry, Hazlitt's edition, and J. P. Collier's Bibliographical and Critical Account of the Rurest Books in the English Language, Lond., 1865, under " Harvey," " Nash," aud " Greene."

HARVEY, Sir Gzorce (1806-1876), a Scottish painter and president of the Royal Scottish Academy, was the son of a watchmaker, and was born at St Ninians, near Stirling, in February 1806. Soon after his birth his parents removed to Stirling, where George was apprenticed to a bookseller. His love for art having, however, become very decided, he in his eighteenth year entered the Trustees' Academy at Edinburgh. Here he so distinguished himself that in 1826 he was invited by the Scottish artists, who had resolved to found a Scottish academy, to join it as an associate. Indeed it was chiefly to the zeal and judgment of Harvey and of two others that jt owed its early success. Harvey's first picture, A Village School, was exhibited in

1826 at the Edinburgh Institution; and from the time of

the opening of the Academy in the following year he con- tinued annually to enrich its exhibitions by a succession of pictures which, although they never obtained much fame beyond the limits of Scotland, appealed with such effect to Scottish sentiment as to win for him in his native land an unrivalled popularity. His best known pictures are those depicting historical episodes in religious history from a puritan or evangelical point of view, such as Covenanters Preaching, Covenanters' Communion, John Bunyan and his

Blind Daughter, Sabbath Evening, and the Quitting of the Manse. He was, however, equally successful in subjects not directly religious; and The Bowlers, A Highland Funeral, The Curlers, A Schule Skailin', and Children Blowing Bubbles in the Churchyard of Greyfriars, Edin- burgh, manifest the same close observation of character, artistic conception, and conscientious elaboration of details. In The Night Mail and Dawn Revealing the New World to Columbus the aspects of nature are made use of in different ways, but with equal happiness, to lend impressive- ness and solemnity to human concerns. It was chiefly in his later years that he devoted his attention to landscape, the branch of art in which on the whole he was most successful, and there perhaps in suggesting the deep calm and the sweet and varied charm which broods among the hills when nature is at rest. He also devoted some atten- tion to portraiture, among his works in this branch of art being a portrait of Professor Wilson, now at the Philoso- phical Institution, Edinburgh. In 1829 he was elected a fellow of the Royal Scottish Academy, and in 1864 he succeeded Sir J. W. Gordon as president. He received the honour of knighthood in 1867. His death took place at Edinburgh, January 22, 1876.

Sir George Harvey was the author of a paper on the " Colour of the Atmosphere," read before the Edinburgh Royal Society, and afterwards published with illustrations in Good Words; and in 1870 he published a small volume entitled Notes of the Early His- tory of the Royal Scottish Academy. Selections from the Works of Sir George Harvey, P.R.S.A., described by the Rev. A. L. Simp-

son, F.S.A. Seot., and photographed by Thomas Annan, appeared at Edinburgh in 1869.

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HARVEY, Witttam (1578-1657), the discoverer of the circulation of the blood, was the eldest son of Thomas Harvey, a prosperous Kentish yeoman, and was born at Folkestone on Apri] 1, 1578. After passing through the grammar schoo] of Canterbury, on the 31st of May 1593, having just entered his sixteenth year, he became a pensioner of Caius College, Cambridge; at nineteen he took his B.A. degree, and soon after, having chosen the profession of mediciue, he went to study at Padua under

Fabricius and Casserius (see ANAaTomy, vol. i, pp. 809, 810). At the age of twenty-four Harvey became doctor of medicine, April 1602. Returning to England in the first year of James I., he settled in London; and two years later he married the daughter of Dr Lancelot Brown, who had been physician to Queen Elizabeth. In the same year Harvey became a candidate of the Royal College of Phy- sicians, and was duly admitted a fellow (June 1607). In 1609 he obtained the reversion of the post of physician to St Bartholomew's Hospital. His application was supported by the king himself and by Dr Atkins, the president of the college. On the death of Dr Wilkinson in the course of the same year he succeeded to the post. He was thrice censor of the college, and in 1615 was appointed Lumleian lecturer. In the following year—the year of Shakespeare's death—he began his course of lectures, and first brought forward his views upon the movements of the heart and blood.1 Meantime his practice increased, and he had the lord chancellor, Francis Bacon, and the earl of Arundel among his patients. In 1618 he was appointed physician extraordinary to James I., and on the next vacancy physician in ordinary to his successor. In 1628, the year of the publication of the Zxercitatio Anatomica de Motu Cordis et Sanguinis, he was elected treasurer of the College of Physicians, but at the end of the following year he resigned the office, in order, by command of Charles I, to accompany the young duke of Lennox (James Stuart, afterwards duke of Richmond) on his travels. He appears to have visited Italy, and returned in 1632. Tour years later he accompanied the earl of Arundel on his em- bassy to the emperor. He was eager in collecting objects of natural history, sometimes causing the earl anxiety for his safety by his excursions in a country infested by robbers after the Thirty Years' War. Ina letter written on this journey, he says—'"' By the way we could scarce see a dog, crow, kite, raven, or any bird, or anything to anatomize ; only some few miserable people, the reliques of the war and the plague, whom famine had made anatomies before I came." Having returned to his practice in London at the close of the year 1636, he accompanied Charles I. in one of his journeys to Scotland (1639 or 1641). While at Edinburgh he visited the Bass Rock; he minutely describes its abundant population of sea-fowl in his treatise De Gene- ratione, and incidentally speaks of the then credited account of the solan goose growing on trees as a fable. He was in attendance on the king at the battle of Edgehill (October 1642), where he withdrew under a hedge with the prince of Wales and the duke of York (then boys of twelve and ten

years old), “and took out of his pocket a book and read. But he had not read very long before a bullet of a great gun grazed on the ground near him, which made him re- move his station,” as he afterwards told Aubrey. After the indecisive battle, Harvey followed Charles I. to Oxford, “where,” writes the same gossiping narrator, “I first saw him, but was then too young to be acquainted with so great a doctor. I remember he came several times to our college (Trinity) to George Bathurst, B.D., who had a hen

2 A venerable MS. notebook in Harvey’s own crabbed handwriting was discovered only lately in the British Museum, with the title “Prolectiones anatomice,” &c. , this, so far as it has been deciphered, coutains the germs of his great discovery.

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to hatch eggs in his chamber, which they opened daily to see the progress and way of generation.” In Oxford he remained three years, aud there was some chance of his being superseded in his office at St Bartholomew’s Hos- pital, “because lhe hath withdrawn himself from his charge, and is retired to the party in arms against the Parliament.” It was no doubt at this time that his lodgings at Whitehall were searched, and not only the furniture seized but also invaluable manuscripts and ana- tomical preparations.?

While with the king at Oxford he was made warden of Merton College, but a year later, in 1646, that city surrendered to Fairfax, and Harvey returned to London. He was now sixty-eight years old, and, having resigned his appointments and relinquished the cares of practice, lived in learned retirement with one or other of his brothers. It was in his brother Daniel’s house at Combe that Dr (after- wards Sir George) Ent, a faithful friend and disciple (1604- 1689), visited him in 1650. “I found him,” he says, “‘with a cheerful and sprightly countenance investigating, like Democritus, the nature of things. Asking if all were well with him—‘ How can that be,’ he replied, ‘when the state is so agitated with storms and I myself am yet in the open sea? And indeed, were not my mind solaced by my studies and the recollection of the observations I have formerly made, there is nothing which should make me desirous of a longer continuance. But thus employed, this obscure life and vacation from public cares which would disgust other minds is the medicine of mine.’” The work on which he had*

been chiefly engaged at Oxford, and in- deed since the publication of his treatise on the circula- tion in 1628, was an investigation into the recondite but deeply interesting subject of generation. Charles I. had been an enlightened patron of Harvey's studies, had put the royal deer parks at Windsor and Hampton Court at lis disposal, and had watched his demonstration of the growth of the chick with no less interest than the movements of the living heart. Harvey had now collected a large number of observations, though he would probably have delayed their publication, But Ent succeeded in obtaining the manuscripts, with authority to print them or not as he should find them. 'I went from him," he says, "like another Jason in possession of the golden fleece, and when I came home and perused the pieces singly, 1 was amazed that so vast a treasure should have been so long hidden." The result was the publication of the Lxercitationes de Generatione (1651).

This was the last of Harvey's labours, He had now reached his seventy-third year. His theory of the circula- tion had been opposed and defended, and was now generally accepted by the most eminent anatomists both at home and abroad. He was known and honoured throughout Europe, and his own college erected a statue in his honour (1652), "viro monumentis suis immortali." In 1654 he was elected to the highest post in his profession, that of president of the college ; but the following day he met the assembled fellows, and, declining the honour for himself on account of the infirmities of age, recommended the re-election of the late president Dr Prujean. He accepted,

2 "Tonoscant mihi nivese anime, si, summarum injuriarum memor, levem gemitum effudero. Doloris mihi hec causa est: cum, inter nuperos nostros tumultus et bella plusquam civilia, serenissimum regem (idque non solum senatus permissione sed et jussu) sequor, rapaces quedam manus non modo edium mearum supellectilem omnem expilarunt, sed etiam, que mihi causa gravior querimoniz, adversaria mea, multorum annorum laboribus parta, e museo meo summoverunt. Quo factum est ut observationes plurime, presertim de generatione in- sectorum, cum republice literarise (ausim dicere)detrimento, perierint." —De Gen., Ex. lxviii. To this loss Cowley refers—

“O cursed war! who can forgive thee this? Houses and towns may rise again, And ten times easier ’tis To rebuild Paul’s than any work of his.”

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however, the office of consiliarius, which he again held in the two following years. He had already enriched the college with other gifts besides the honour of his name. He had raised for them “a noble building of Roman architecture (rustic work with Corinthian pilasters), com- prising a great parlour or conversation room below and a library above” ; he had furnished the library with books, and filled the museum with “simples and rarities,” as well as with specimens of instruments used in the surgical and obstetric branches of medicine. At last he determined to give to his beloved college his paternal estate at Burmarsh in Kent. His wife had died some years before, his brothers were wealthy men, and he was childless, so that he was defrauding no heir when, in July 1656, he made the transfer of this property, then valued at £56 per annum, with provision for a salary to the college librarian and for the eudowment of an annual oration, which is still given on the anniversary of the day. The orator, so Harvey orders in his deed of gift, is to exhort the fellows of the college “to search out and study the secrets of nature by way of experiment, and also for the honour of the profession to continue mutual love and affection among themselves.”

Harvey, like his contemporary and great successor Syden- ham, was long afflicted with gout, but he preserved his activity of mind to an advanced age. In his eightieth year, on the 3d of June 1657,) he was attacked by paralysis, and though deprived of speech was able to send for his nephews and distribute his watch, ring, and other personal trinkets among them. He died the same evening, “ the palsy giving him an easy passport,” and was buried with great honour in his brother Eliab’s vault at Hempstead in Essex, ‘“‘annorum et famee satur.”

Aubrey, to whom we owe most of the minor particu- lars about Harvey which have been preserved, says— In person he was not tall, but of the lowest stature; round faced, olivaster complexion, little eyes, round, very black, full of spirits ; his hair black as a raven, but quite white twenty years before he died.” The best portrait of him extant is by Cornelius Jansen in the library of the College of Physicians, one of those rescued from the great

fire, which destroyed their original hall in 1666. It has been often engraved, and is prefixed to the fine edition of his works published in 1766.

Harvey's Work on the Circulation.—In estimating the character and value of the discovery announced in the Luercitatio de Motu Cordis et Sanguinis, it is necessary to bear in mind the previous state of knowledge on the subject. Aristotle taught that in man and the higher animals the blood was elaborated from the food in the liver, thence carried to the heart, and sent by it through the veins over the body. His successors of the Alexandrian school of medicine, Erasistratus and Herophilus, further elaborated his system, and taught that, while the veins carried blood from the heart to the members, the arteries carried a subtle kind of air or spirit. For the practical physician only two changes had been made in this theory of the circulation between the Christian era and the 16th century. Galen had discovered that the arteries were not, as their name implies, merely air-pipes, but that they contained blood as well as vital air or spirit. And it had been gradually ascertained that the nerves (vedpa) which arose from the brain and conveyed "animal spirits" to the body were different from the tendons or sinews (vetpa) which attach muscles to bones. First, then, the physicians of the time of Linacre knew that the blood is not stagnant in the body. So did Shakespeare and Homer, and every augur

1 This is the date usually given according to the college annals. Granger's Biographical History of England makes it June 30 ; Hamey, a contemporary, June 153; while Dr Lawrence, following the inscrip- tion on the tomb, gives June 3, 1658.

who inspected the entrails of a victim, and every village barber who breathed a vein. Plato even uses the expres- siON 70 aiva kara wdvTa Te LEAN oodpas wepipepécbar. But no one had a conception of a continuous stream returning to its source (a circulation in the true sense of the word) either in the system or in the lungs. If they used the word crculatio, as did Czxsalpinus,? it was as vaguely as the French policeman cries "Circulez." The movements of the blood were in fact thought to be slow and irregular in direction as well as in speed, like the " circula- tion" of air in a house, or the circulation of a crowd in the streets of a city. Secondly, they supposed

that one kind of blood flowed from the liver to the right ventricle of the heart, and thence to the lungs and the general system by the veins, and that another kind flowed from the left ventricle to the lungs and general system by the arteries. Thirdly, they supposed that the septum of the heart was pervious and allowed blood to pass directly from the right to the left side. Fourthly, they had no conception of the functions of the heart as the motor power of the movement of the blood. They doubted whether its sub- stance was muscular; they supposed its pulsation to be due to expansion of the spirits it contained ; they believed the only dynamic effect which it had on the blood to be sucking it in during its active diastole, and they supposed the chief use of its constant movements to be the due mixture of blood and spirits.

Of the great anatomists of the 16th century, Sylvius (7x Hupp. et Gal. Phys. Partem Anatom. Isagoge) described the » valves of the veins; Vesalius (De Humani Corporis Fabrica, 1542) ascertained that the septum between the right and left ventricles is complete, though he could not bring himself to deny the invisible pores which Galen's system demanded. Servetus, in his Christ'anismi LRestitutio (1553), goes somewhat further than his fellow-student Vesalius, and says—" Paries ille medius non est aptus ad communicationern et elaborationem illam ; licet aliquid resudare possit;" and, from this anatomical fact and the large size of the pulmonary arteries he concludes that there is a communication in the lungs by which blood passes from the pulmonary artery to the pulmonary vein—' Eodem artificio quo in hepato fit transfusio a vena porte ad venam cavam propter sanguinem, fit etiam in pulmone transfusio a vena arteriosa ad arteriam venosam propter spiritum." The natural spirit of the left side and the vital spirit of the right side of the heart were therefore, he concluded, practi- cally the same, and hence two instead of three distinct spiritus should be admitted. It seems doubtful whether even Servetus rightly conceived of the entire mass of the blood passing through the pulmonary artery and the lungs. The transference of the sprritus naturalis to the lungs, and its return to the left ventricle as spiritus vitalis, was the function which he regarded as important. Indeed a true conception of the lesser circulation as a transference of the whole blood of the right side to the left was impossible until the corresponding transference in the greater or systemic circulation was discovered. Servetus, however, was the true predecessor of Harvey in

physiology, and his claims to that honour are perfectly authentic and univer- sally admitted.$

The way then to Harvey's great work had been paved by the discovery of the valves in the veins, and by that

| of the lesser circulation,—the former due to Sylvius and

Fabricius, the latter to Servetus,—but the significance of the

? Indeed the same word, repfodos afuaros, occurs in the Hippocratic writings, and was held by Van der Linden to prove that to the father of medicine himself, and not to Columbus or Cesalpinus, belonged the laurels of Harvey.

3 Realdus Columbus (De Re Anatomica, 1559) formally denies the muscularity of the heart, yet correctly teaches that blood and spirits pass from the right to the left ventricle, not through the septum,

valves was unsuspected, and the fact of even the pulmonary circulation was not generally admitted in its full meaning.

In his treatise Harvey proves (1) that it is the con- traction, not the dilatation, of the heart which coincides with the pulse, and that the ventricles as true muscular sacs squeeze the blood which they contain into the aorta and pulmonary artery ; (2) that the pulse is not produced by the arteries enlarging and so filling, but by the arteries being filled with blood and so enlarging; (3) that there are no pores in the septum of the heart, so that the whole blood in the right ventricle is sent to the lungs and round by the pulmonary veins to the left ventricle, and also that the whole blood in the left ventricle is again sent into the arteries, round by the smaller veins into the venz cave, and by them to the right ventricle again—thus making a complete "cir- culation " ; (4) that the blood in the arteries and that in the veins is the same blood ; (5) that the action of the right and left sides of the heart, auricles, ventricles, and valves, is the same, the mechanism in both being for reception and pro- pulsion of liquid and not of air, since the blood

on the right side, though mixed with air, is still blood; (6) that the blood sent through the arteries to the tissues is not all used, but that most of it rung through into the veins; (7) that there is no to and fro undulation in the veins, but a con- stant stream from the distant parts towards the heart ; (8). that the dynamical starting-point of the blood is the heart and not the liver.

The method by which Harvey arrived at his complete and almost faultless solution of the most fundamental and diffi- cult problem in physiology has been often discussed, and is well worthy of attention. He begins his treatise by point- ing out the many inconsistencies and defects in the Galenical theory, quoting the writings of Galen himself, of Fabricius, Columbus, and others, with great respect, but with unflinching criticism. For, in his own noble language, wise men must learn anatomy, not from the decrees of philosophers, but from the fabric of nature herself, "nec ita in verba jurare antiquitatis magistre, ut veritatem amicam in apertis relinquant, et in conspectu omnium deserant." He had, as we know, not only furnished himself with all the knowledge that books and the instructions of the best

but through the lungs, "quod nemo hactenus aut animadvertit aut scriptum reliquit." 'The fact that Harvey quotes Columbus and not Servetus is explained by the almost entire destruction of the writings of the latter, which are now among the rarest curiosities. The great anatomist Fabricius, Harvey's teacher at Padua, described the valves of the veins more perfectly than had Sylvius. Ruini, in his treatise on the Anatomy and Diseases of the Horse (1590), taught that the left ventricle sends blood and vital spirits to all parts of the body except the lungs—the ordinary Galenical doctrine. Yet on the strength of this phrase Professor Ercolani has actually put up a tablet in the veterinary school at Bologna to Ruini as the discoverer of the circulation of the blood! The claims of Czsalpinus, a more plausible claimant to Harvey's laurels, are scarcely better founded. In his Quastiones Peripateticee (1571) he followed Servetus and Columbus in describing what we now know as the pulmonary " circulation" under that name, and this is the only foundation for the assertion (first made in Bayle's dictionary) that Cxesalpinus knew "the circulation of the blood." He is even behind Servetus, for he only allows part of the blood of the right ventricle to go round by this "circuit"; some, he conceives, passes through the hypothetical pores in the septum, and the rest by the superior cava to the

head and arms, by the inferior to the rest of the body—“ Hanc esse venarum utilitateni ut omnes partes corporis sanguinem pro nutrimento deferant. Ex dextro ventr® cordis vena cava sanguinem crassiorem, in quo calor inteusus est magis, ex altero autem ventr°®, sanguinem tempefatissimum ac sincerissimum habente, egreditur aorta.”” Czsalpinus seems to have had no original views on the subject ; all that he writes is copied from Galen or from Setvetus except some erroneous observations of his own. His greatest ierit was as a botanist; and no claim to the “ discovery of the circulation”’ was made by him or by his contemporaries. When it was made, Haller decided conclusively against it. The fact that an inscription was lately placed on the bust of Casalpinus a Rome, which states that he preceded others in recognizing and demonstrating “ the general circula-

tion of the blood,” is only a proof of the blindness of misplaced national vanity,

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anatomists of Italy could give, but, by a long series of dis- sections, had gained a far more complete knowledge of tlie comparative anatony of the heart and vessels than any contemporary—-we may almost say than any successor, until the times of Hunter and Meckel. Thus equipped, he tells us that he began his investigations into the movements of the lieart and blood by looking at them—~.e., by seeing their action in living animals. After a modest preface, he heads his first chapter “Ex vivorum dissectione, qualis sit cordis motus.” He minutely describes what he saw and handled in dogs, pigs, serpents, frogs, and fishes, and even in slugs, oysters, lobsters, and insects, in the transparent minima squilla, “que Anglice dicitur « shrimp,” and lastly in the chick while still in the shell. In these investigations he used a perspicillwm or simple lens. He particularly describes his observations and experi- ments on the ventricles, the auricles, the arteries, and the veins. He shows how the arrangement of the vessels in the foetus supports his theory. He adduces facts observed in disease as well as in health to prove the rapi- dity of the circulation. He explains how the mechanism of the valves in the veins is adapted, not, as Fabricius believed, to moderate the flow of blood from the heart, but to favour its flow to the heart. He

estimates the capacity of each ventricle, and reckons the rate at which the whole mass of blood passes through it. He elaborately and clearly demonstrates the effect of obstruction of the blood-stream in arteries or in veins, by the forceps in the case of a snake, by a ligature on the arm of a man, and illustrates his argu- ment by figures. He then sums up his conclusion thus :— " Circulari quodam motu, in circuitu, agitari in animalibus sanguinem, et esse in perpetuo motu ; et hanc esse actionem sive functionem cordis quam pulsu peragit; et omniuo motus et pulsus cordis causam unam esse." Lastly, in the 15th, 16th, and 17th chapters, he adds certain coufirmatory evidence, as the effect of position on the circulation, the absorption of animal poisons and of medicines applied externally, the muscular structure of the heart and the necessary working of its valves. The whole treatise, which occupies only 67 pages of large print in the quarto edition of 1766, is a model of accurate observation, patient accumu- lation of facts, ingenious experimentation, bold yet cautious hypothesis, and logical deduction.

In one point only was the demonstration of the circula- tion incomplete. Harvey could not discover the capillary channels by which the blood passes from the arteries to the veins. This gap in the circulation was supplied several years later by the great anatomist Malpighi, who in 1661 saw in the lungs of a frog, by the newly invented micro- scope, how the blood passes from the one set of vessels to the other. Harvey saw all that could be seen by thie unaided eye in his observations on living animals; Malpighi, four years after Harvey's death, by another observation on a living animal, completed the splendid chain of evidence. If this detracts from Harvey's merit it leaves Servetus no merit atall. But in fact the existence of the channels first seen by Malpighi was as clearly pointed to by Harvey's reasoning as the existence of Neptune by the calculations of Le Verrier and of Adams.

Harvey himsclf and all his contemporaries were well aware of the novelty and importance of his theory. He says in the admirable letter to Dr Argent, president of the College of Physicians, which follows the dedication of his treatise to Charles I., that he should not have ventured to publish "a book which alone asserts that the blood pursues its course and flows back again by a new path, contrary to the received doctrine taught so many ages by innumerable lcarncd and illustrious men," if he had not sct forth his theory

for more than nine years in his college lectures, gradually brought it to perfection, and convinced his colleagues by actual demonstrations of the truth of what he advanced. He anticipates opposition, and even obloquy or loss, from the novelty of his views. These anticipations however, the event proved to

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have been groundless. If we are to credit Aubrey indeed, he found that after the publication of the De Motu 'he fell mightily in his practicc ; 'twas believed by the vulgar that he was crackbrained, and all the physicians were against him." But the last assertion is demonstrably untrue; and if apothecaries and patients ever for- sook him, they must soon have returned, for Harvey left a hand- some fortune. By his own profession the book was received as it deserved. So novel a doctrine was not to be accepted without due inquiry, but his colleagues had heard his lectures and seen his demonstrations for years ; they were already convinced of the truth of his theory, urged its publication, continued him in his lecture- ship, and paid him every honourin their power. Abroad the book was widely read and much canvassed. Few accepted the new theory; but no one dreamt of claiming the honour of it for himself, nor for several years did any one pretend that it could be found in the works of previous authors. The first attack on it was a fecble tract by one Primerose, a pupil of Riolanus (Exerc. et Animadv. in Libr. Harvet de Motu Cord. et Sang., 1630). Five years later Parisanus, an Italian physician, published his Lapis Lydius de Motu Cord. et Sang. (Venice, 1635), a still more bulky and futile performance. Primerose's attacks were ' imbellia pleraque" and "sine ictu ;" that of Parisanus "in quamplurimis turpius," accord- ing to the contemporary judgment of Vessling. Their dulness has protected them from further censure. Caspar Hoffmann, professor at Nuremberg, while admitting the truth of the lesser circulation in the full Harveian sense, denied the rest of the new doctrine. To him the English anatomist replied in a short letter, still extant, with great consideration yet with modest dignity, beseeching him to conviuce himself by actual inspection of the truth of the facts in question. He concludes—"I accept your censure in the candid and friendly spirit in which you say you wrote it ; do you also the same to me, now that I have answered you in the same spirit." This letter is dated May 1636, and in that

year Harvey passed through Nuremberg with the earl of Arundel, and visited Hoffmann. But he failed to convince him; "nec tamen valuit Harveius vel coram," writes Schlegel, who, however, afterwards succeeded in persuading the obstinate old Galenist to soften his opposition to the new doctrine, and thinks that his complete conversion might have been effected if he had but lived a little longer—" nec dubito quin concessisset tandem in nostra castra." While in Italy the follow- ing year Harvey visited his old university of Padua, and demon- strated his views to Professor Vessling. A few months later this excellent anatonist wrote him a courteous and sensible letter, with certain objections to the new theory. The answer to this has not been preserved, but it convinced his candid opponent, who admitted the truth of the circulation in a second letter (both were published in 1640), and afterwards told a friend, " Harveium nostrum si audis, agnosces coclestem sanguinis et spiritus ean ex arterlis per venas in dextrum cordis sinum." Mcanwhile a greater convert, Descartes, in his Discours sur la Méthode (1637) had announced his adhesion to the new doctrine, and refers to "the English physician to whom belongs the honour of having first shown that the course of the blood in the body is nothing less than a kind of perpetual movement ina circle." Waleus of Leyden, Regius of Utrecht, and Schlegel of Hamburg successively adopted the new physiology. Of these professors, Regius was mauled by the pertinacious Prime- rose and mauled him in return (Spongia qua eluuntur sordes que Jac. Primirosius, &c., and Antidotum adv. Spongiam venenatam Henr. Hegii). Descartes afterwards repeated Harvey's vivisections; and, more convinced than ever, demolished an unlucky Professor Plempius of Louvain, who had written on the other side. Dr George Ent also published an Apologia pro Circulatione Sanguinis in answer to Parisanus.

At last Riolan ventured to publish his Enehiridium Anatomieum (1648), in which he attacks Harvey's theory, and proposes one of his own. Riolan had accompanied the queen dowager of France (Maria de' Medici) on a visit to her daughter at Whitehall, and had there met Harvey and discussed his theory. He was, in the opinion of the judicious Haller, "vir asper et In nuperos suosque coevos immitis ac nemini parcens, nimis avidus suarum: laudum preeco, et sc ipso fatente anatomicorum princeps."' Harvey replied to the Enchiridiwm with perfectly courteous language and perfectly conclusive arguments, in two letters De Cireulatione Sanguinis, which were

*published at Cambridge in 1649, and arc still well worth reading. He speaks here of the "circuitus sanguinis a me in- ventus." Riolan was unconvinced, but lived to see another pro- fessor of anatomy appointed in his own university who taught Ilarvey's doctrines. Even in Italy, Trullius, professor of anatomy at Rome, expounded the new doctrine in 1651. But the most illustrious converts were Pecquet of Dieppe, the discoverer of the thoracic duct, and of the true course of the lacteal vessels, and Thomas Bartholinus of Copenhagen, in his Anatome ex omnium Veterum Recentiorumgue Observationibus, imprimis Institutionibus beatt met parentis Caspari Bartholini, ad Circulationem Harveianam et vasa lymphatica renovata (Leyden, 1651). At last Plempius also retracted all his objections ; for, as he candidly stated, ** having opened the bodies of a few living dogs, I find that all Harvey's state-*

ments are perfectly true." Hobbes of Malmesbury could thus say in the preface to his Elementa Philosophicethat his friend Harvey, "solus quod sciam, doctrinam novam superata invidia vivens stabilivit."

It has been made a reproach to Harvey that he failed to appreciate the importance of the discoveries of the Jacteal and lymphatic vessels by Aselli, Pecquet, and Bartholinus. In three letters on the subject, one to Dr Morrison of Paris (1652) and two to Dr Horst of Darmstadt (1655), a correspondent of Bartholin's, he discusses these observations, and shows himself unconvinced of their accuracy. He writes, however, with great moderation and reasonableness, and excuses himself from investigating the subject further on the score of the infirmities of age; he was then above seventy-four. The following quotation shows the spirit of these letters : —'Laudo equidem summopere Pecqueti aliorumque in indaganda veritate industriam singularem, nec dubito quin multa adhue in Democriti puteo abscondita sint, a venturi sxculi indefatigabili diligentia expromenda." Bartholin, though reasonably disappointed in not having Harvey's concurrence, speaks of him with the utmost respect, and generously says that the glory of discovering the movements of the heart and of the blood was enough for one man.

Harvey's Work on Generation.—We have seen how Dr Ent persuaded his friend to publish this book in 1651. It is between five and six times as long as the Hyerc. de Motu Cord. et Sang., and is followed by excursus De Partu, De Vteri Membranis, De Conceptione ; but, though the fruit of as patient and extensive observations, its value is far inferior, The subject was far more abstruse, and in fact inaccessible to proper investigation without the aid of the microscope. And the field was almost untrodden since the days of Aris- totle. Fabricius, Harvey's master, in his work De Formatione Ovi et Pulli (1621), had alone preceded him in modern times. Moreover, the seventy-two chapters which form the book lack the coordination so conspicuous in the earlier treatise, and some of them seem almost like detached chapters of a system which was never completed or finally revised.

Aristotle had believed that the male parent furnished the body of the future embryo, while the female only nourished and formed the seed ; this is in fact the theory on which, in the Eumenides of Aischylus, Apollo obtains the acquittal of Orestes. Galen taught almost as erroneously that each parent contributes seeds, the union of which produced the young animal. Harvey,

after speaking with due honour of Aristotle and Fabricius, begins rightly "ab ovo"; for, as he remarks, " eggs cost little and are always and everywhere to be had," and moreover "almost all animals, even those which bring forth their young alive, and man himself, are produced from eggs" ('omnia omnino animalia, etiam vivipara, atque hominem adeo ipsum, ex ovo progigni"). This dictum, usually quoted as "'omne vivum ex ovo," would alone stamp this work as worthy of the discoverer of the circulation of the blood, but it was a pre- vision of genius, and was not proved to be a fact until Von Baer discovered the mammalian ovum in 1827. Harvey procecds with a careful anatomical description of the ovary and ovitluct of the hen, describes the new-laid egg, and then gives an account of the ap- pearance seen on the successive days of incubation, from the 1st to the 6th, the 10th, and the 14th, and lastly describes the process of hatching. He then comments upon and corrects the opinions of Aristotle and Fabricius, declares against spontaneous generation (though in one passage he seems to admit the current doctrine of production of worms by putrefaction as an exception), proves that there is no semen foeminewm, that the chalaze of the hen's egg are not the semen galli, and that both parents contribute to the forma- tion of the egg. He describes accurately the first appearance of the ovarian ova as mere specks, their assumption of yelk, and after- wards of albumen. In chapter xlv. he describes two methods of production of the embryo from the ovum : one is metamorphosis, or the direct transformation of pre-existing material, as a worm from an egg, or a butterfly from an awrelia (chrysalis); the other is epigenesis, or development with addition of parts, the true genera- tion observed in all higher animals. Chapters xlvi.~~l. are devoted to the abstruse question of the efficient cause of generation, which, after much discussion of the opinions of Aristotle and of Sennertius, Harvey refers to the action of both parents as the efficient instru~~ meuts of the first great cause.1 He then goes on to describe the

1 So in Exerc, liv. : "Superior itaque ot divinior opifex, quam est homo, videtur hominem fabricare et conservare, et nobilior artifex, quam gallus, pullum ex ovo producere. Nempe agnoscimus Deum, creatorem summum atque omnipotentem, in cunctorum animalium fabrica ubique preesentem esse, et in operibus suis quasi digito monstrari: cujus in procreationc pulli Instrumenta sint gallus et gallina…. Nec cuiquam sane hxc attributa

conveniunt nisi omnipotenti rerum Principio, quocunque demum nomine idipsum appellare libuerit: sive Mentem divinam cum Aristotele, sive cum Platone Animam Mundi, aut cum aliis Naturam naturantem, vel cum ethnicig Saturnum aut Jovem ; vel potius (it nos decet) Creatorem ac Patrem omnium que in ccelis et terris, a quo animalia eorumque origines dependent, cujusque nutu sive effato flunt et

generantur omnia. XI, — 64

order in which the several parts appear in the chick. He states that the punctum saliens or foetal heart is the first organ to be seen, and explains that the nutrition of the chick is not only effected by yelk conveyed directly into the midgut, as Aristotle taught, but also by absorption from yelk and white by the umbilical (omphalomeseraic) veins; on the fourth day of incubation appear two masses (which he oddly names vermieulus), one of which develops into three vesicles, to form the cerebrum, cerebellum, and eyes, the other into the breastbone and thorax; on the sixth or seventh day come the viscera, and lastly, the feathers and other external parts. Harvey points out how nearly this order of development in the chick agrees with what he had observed in mammalian and particularly in human embryos. He notes the bifid apex of the foetal heart in man and the equal thickness of the ventricles, the soft cartilages which represent the future bones, the large amount of liquor amnii and absence of placenta which characterize the foetus in the third month; in the fourth the position of the testes in the abdomen, and the uterus with its Fallopian tubes resembling the uterus bicornis of the sheep; the large thymus; the cecum, small as in the adult, not forming a second stomach as in the pig, the horse, and the hare ; the lobulated kidneys, like those of the seal (“vitwlo,” se. marino) and porpoise, and the large suprarenal veins, not much smaller than those of the kidneys (li.—-lvi.). He failed, however, to trace the connexion of the urachus with the bladder. In the following chapters (lxiii.— Ixxii.) he describes the process of gencration in the fallow deer or the roe. After again insisting that all animals arise from ova, that a “conception” is an internal egg and an egg an extruded conception, he goes on to describe the uterus of the doe, the process of impregnation, and the subsequent

development of the foctus and its membranes, the pwunctwm saliens, the cotyledons of the placenta, and the 'uterine milk," to which Professor Turner has lately recalled attention. The treatisc concludes with detached notes on the placenta, parturition, and allicd subjects.

Harvey's other Writings and Medical Practice.—The remaining writings of Harvey which are extant are unim- portant. A complete list of them will be found below, together with the titles of those which we know to be lost. Of these the most important were probably that on respiration, and the records of post-mortem examinations. From the following passage (De Partu, p. 550) it seems that he had a notion of respiration being connected rather with the production of animal heat than, as then generally supposed, with the cooling of the blood. "Hee qui diligenter perpenderit, naturamque aeris diligenter intro- spexerit, facile opinor fatebitur eundem nec refrigerationis gratia nec in pabulum animalibus concedi. Heec autem obiter duntaxat de respiratione diximus, proprio loco de eadem forsitan copiosius disceptaturi."

Of Harvey as a practising physician we know very little. Aubrey tell us that "he paid his visits on horse- back with a footcloth, his man following on foot, as the fashion then was." He adds—" Though all of his pro- fession would allow him to be an excellent anatomist, I never heard any that admired his therapeutic way. I knew several practitioners that would not have given threepence for one of his bills" (the apothecaries used to collect physicians' prescriptions and sell or publish them to their own profit), "and that a man could hardly tell by his bill what he did aim at." However this may have been,—and rational therapeutics was impossible when the foundation-stone of physiology had only just been laid,— we know that Harvey was an active practitioner, perform- ing such important surgical operations as the removal of a breast, and he turned his obstetric experience to account in his book on generation. Some good practical precepts as to the conduct of labour are quoted by Willoughby, a contemporary. He also took notes of the anatomy of disease; these unfortunately perished with his other manuscripts. Otherwise we might regard him as a fore- runner of Morgagni; for Harvey saw that pathology is but a branch of physiology, and like it must depend first on accurate anatomy. He speaks strongly to this purpose in his first epistle to Riolanus:

“Sicut enim sanorum et boni habitus corporum dissectio plurimum ad philo- sophiam et rectam physiologiam facit, ita corporum mor- bosorum ct cachecticorum inspectio potissimum ad patho-

logiam philosophicam.” Tho only specimen we have of his observations in morbid anatomy is his account of the post-mortem examination made by order of the king on the body of the famous Thomas Parr, who died in 1635, at the reputed age of 152, Harvey insists on the value of physiological truths for their own sake, independently of their immediate utility; but he himself gives us an interesting example of the practical application of his theory of the circulation in the cure of a large tumour by tying the arteries which supplied it with blood (De Generat., Exerc, xix.).

The following is believed to be a complete list of all the known writings of Harvey, published and unpublished :—

Exercitatio Anatomica de Motu Cordis et Sanguints, 4to, Frank fort- on-the Maine, 1628; Kzxcrcitationes duce Anatomice de Cireulatione Sanguinis, ad Johannem Riolanum, filium, Parisiensem, Cambridge, 1649; Exercitationes de Generatione Animalium, quibus accedunt quedam de Partu, de Membranis we Humoribus Uteri, et de Coneep- tione, 4to, Lond., 1651; Anatomia Thome Parr, first published in the treatise of Dr John Betts, De Ortu et Natura Sanguinis, 8v0, Lond., 1669. Letters:—(1) to Caspar Hoffmann of Nuremberg, May 1636 ; (2) to Schlegel of Hamburg, April 1651; (3) three to Gio- vauni Nardi of Florence, July 1651, Dec. 1653, and Nov. 1655; (4) two to Dr Morrison of Paris, May 1652; (5) two to Dr Horst of Darmstadt, Feb. 1654-5 and July 1655; (6) to Dr Vlackveld of Haarlem, May 1657. His letters to Hoffmann and Schlegel are on the circulation ; those to Morrison, Horst, and Vlackveld refer to the discovery of the lacteals ; the two to Nardi are short letters of friendship. All these letters were published by Sir George Ent in his collected works (Leyden, 1687). Of two MS. Icttcrs, one on official busincss to the secretary Dorchester was printed by Dr Aveling, with a facsimile of the crabbed handwriting (Alemorials of Harvey, 1875), and the other, about a patient, appears in Dr Willis’s Life of Harvey, 1878. Preelectiones anatomie universalis per me Gul. Harveium medicum Londinensem, anat. et chir. professorem, an. dom.

1616, cetat. 37,—-MS. notes of his Lumleian lectures in Latin, —are in the British Museum library; they are almost illegible, but were partly deciphered and a photograph of one of the pages taken by Dr Sieveking ; for an account of them see his Harveian Lecture for 1877. A second MS. has been discovered in the British Museum, entitled Gulielmus Harveius de Museulis, Motw Locali, &c., and an accouut of it was published by Dr George Paget (Wotice of an unpublished MS. of Harvey, Lond., 1850). The following treatises, or notes towards them, were lost cither in the pillaging of Harvey's house, or perhaps in the fire of London, which destroyed the old College of Physicians:—A Treatise on Respiration, pro- mised, and probably at least in part completed (pp. 82, 550, ed. 1766) ; Obscrvationes de usu Lienis ; Observationcs de motu loeali, perhaps identical with the above-mentioned manuscript ; Zractatwm physiologicum ; Anatomia medicalis (apparently notes of morbid anatomy); De Gencratione Insectorum. The fine 4to edition of Harvey's Works, published by the Royal College of Physicians in 1766, was superintended by Dr Mark Akenside; it contains the two treatises, the account of the post-mortem examination of old Parr, aud the six letters enumerated above. A translation of this volume by Dr Willis, with Harvey's will, was published by the Sydenham Socicty, 8vo, Lond., 1849.

The following are the principal biographies of Harvey :—in Aubrey's Letters of Eminent Persons, Xe. (vol. ii,, Lond., 1818), first' published in 1685, the only contemporary account ; in Bayle's Die- tionnaire Historique et Critique, 1698 and 1720 (Eng, ed., 1738); in the Biographia Britannica, and in Aitken's Biographical Me- motrs ; the Latin Life by Dr Lawrence, prefixed to the college edition of Harvey's Works in 1766; memoir in Lives of British Physicians, Lond., 1880; a Life by Dr Robert Willis, founded on that by Lawrence, and prefixed to his English cdition of Harvey in 1847 ; the much enlarged Life by the same author, published in 1878; the biography by Dr Monk in the Roll of the College of Physicians, 2d ed., vol. i., 1879.

The literature which has arisen on the great discovery of Harvey, on his methods and his merits, would fill a library. The most im- portant contemporary writings have been mentioned above. The following list gives some of the most remarkable in modern times :— the article in Bayle's

dictionary quoted above; Anatomical Lec- tures, by Wm. Hunter, M.D., 1784; Sprengell, Geschichte der Arzneikunde, Halle, 1800, vol. iv.; Flourens, Histoire de la Cireu- lation, 1854; Lewes, Physiology of Common Life, 1859, vol. i. pp. 291-345; Ceradini, La Seoperta della Circolazione del Sanguc, Milan, 1876; Tollin, Die Enideckung des Blutkreislaufs durch Michael Servet, Jena, 1876; Kirchner, Die Entdeckung des Blut- kreislaufs, Berlin, 1878 ; Willis, in his Life of Harvey; Wharton Jones, " Lecture on the Circulation of the Blood," Lancet for Oct. 25 and Nov. 1, 1879; and the Harveian Orations, especially those by Dr Sieveking, Dr Guy, and Prof. Rolleston. (GE, Jeg ects)

HAR—HAR

HARWICH, a municipal and parliamentary borough }

and seaport town of Essex, England, is situated on the ex- tremity of a small peninsula projecting into the estuary of the Stour and Orwell, 70 miles N.E. of London by the Great Mastern Railway. It occupies an elevated situation, and a good view is obtained from Beacon Hill at the southern end of the esplanade. The town is somewhat irregularly built, but the streets though narrow arc well paved. It is defended by a redoubt mounted with heavy guns and by three martello towers. The only public building of im- portance is the church of St Nicholas, an edifice of white brick in the Perpendicular style, with stone buttresses and steeple, erected in 1821 at a cost of £20,000. The harbour is one of the best on the east coast of England, and in stormy weather is largely taken advantage of for shelter, Its entrance is, however, encumbered with rocks, and is dangerous without a pilot. The rapid accumulation of shingle threatened some years ago to block up the principal entrance, but this has been prevented by the construction of two breakwaters, having a length respectively of 1350 and 1000 feet. The shipping trade of the port was much injured by the removal, after the introduction of steamships, of the Hamburg and other packets from the station ; but since the construction of the Great Eastern Railway steam packets have plied regularly between Harwich and Antwerp and Rotterdam. In 1878 1198 British ships entered the port with a tonnage of 298,227, and 35 foreign ships with a tonnage of 10,921. The number of British ships that cleared was 1233, with a tonnage of 296,095, and of foreign ships 28, with

a tonnage of 8544. The principal imports are grain, timber, and tobacco, and the principal exports cement and fish. Shipbuilding has declined since the discontinuance of the Government dockyards. The prosperity of the town depends now largely on its shrimp and lobster fisheries, but there are also Roman cement works, breweries, and manufactories for artificial manure and for sails and tackle. It is much frequented for sea- bathing, and its suburb of Dovercourt possesses a chaly- beate spring, the spa-house of which contains a library and museum. Harwich in all probability occupies the site of a Roman station. In 855 a great naval battle took place opposite the town between the Danes and the flect of King Alfred, and in 1666 another took place between the Dutch and the English. Harwich was created a parliamentary borough by King Edward IT, in 1318 with the privilege of returning two members, but since the Reform Act of 1867 it has returned only one. The population of the municipal and parliamentary borough in 1871 was 6079. HARZ MOUNTAINS, Tue (also spelt Hanrrz, the German Marzyebirge, and the ancient Silva Hercynia), the most northerly mountain-system of Germany, situated between the rivers Weser and Elbe, occupy an area of about 786 square miles, of which 457 belong to Prussia, 286 to Brunswick, and 43 to Anhalt. Their greatest length ex- tends in a S.E, and N.W. direction for about 56 miles, and their maximum breadth is about 20 miles. The group is made up of an irregular series of terraced plateaus, rising here and there into rounded summits, and intersected in various directions by narrow, deep valleys. The N.W. and higher part of the mass is called the Ober or Upper Harz ; the S.E. and more extensive part, the Unter or Lower Harz; while the N.W. and S.W. slopes of the Upper Harz form the Vorharz, The Brocken group, which divides the Upper and Lower Harz, is generally regarded as a part of the former. The prevalent upper geological formation of the whole district is greywacke and clay-slate, through which the granite here and there protrudes, as in the case of the Brocken. The highest summits of the Upper Harz

3369 feet), and the Wormberg (3182 feet); the Lower Harz, the Auersberg (1870 feet), and the Victorshidhe (1762 feet). The towns in the district, though not large, are tolerably numcrous. The principal are—in the Upper Harz, Goslar, Klausthal, Zellerfeld, Andreasberg, Altenau, Lautenthal,

Wildemann, Grund, Harzburg, Ilsenburg, and Wernigerode ; and in the Lower Harz, Harzgerode, Elbin- gerode, Riibeland, Quedlinburg, Ballenstedt, Gernrode, Suderode, Blankenburg, Thale, and Stolberg,

The chief industry is mining, which has been carried on since the middle of the 10th century. The Harz is second only to the Erzgebirge among the mountains of Germany in mineral wealth. The most important mineral is a peculiarly rich argentiferous lead, but gold in small quautities, copper, iron, sulphur, alum, and arsenic are also found. Marble, granite, and gypsum are worked ; and large quantities of vitriol are manufactured. 'The vast forests that cover the mountain slopes supply the materials for a very considerable trade in timber. Much wood is exported for building and other purposes, while in the Harz itself no other fuel is used, whether for smelting the ores, which is done at the mines, or for domestic use. Employment is thus given to a large number of charcoal burners. The saw-dust of the numerous wood-factories is collected for use in the manu- facture of paper. Turf-cutting, coarse lace-making, and the breeding of canaries and native song-birds also occupy many of the people. Agriculture is carried on chiefly on the plateaus of the Lower Harz; but there is excellent pasturage both in the north and in the south. In the Lower Harz, asin Switzerland, the cows, which carry bells harmoniously tuned, are driven up into the heights in early summer, returning to the sheltered regions in late autumn.

The Harz being the first obstacle to oppose the moist, cold winds from the North Sea, the northern summits are destitute of trees, but the lower slopes of the Upper Harz are heavily wooded with pines and firs. Between the forests of these stretch numerous peat-mosses, which contain in their spongy reservoirs the sources of many small streams. On the Brocken are found one or two arctic and several alpine plants. In the Lower Harz the forests contain a great variety of timber. The oak, elm, and birch are com-mon, while the beech especially attains an unusual size and beauty. The walnut-tree grows in the eastern districts.

The last bear was killed in the Harz in 1705, and the last lynx in 1817, and since that time the wolf too has become extinct ; but deer, foxes, wild cats, and badgers are still to be found in the forests.

The streams are very numerous, but are allsmall. While they are rendered extensively useful, by various skilful artifices, in working the mines underground, at other parts of their course they present the most picturesque scenery in all the picturesque Harz. Perhaps the finest valley is the rocky Bodethal, with the Ross-Trappe, the Hexentanz- platz, the Baumannshdhle, and the Bielshéhle.

The inhabitants, about 70,000 in number, are descended from various stocks. The Upper and Lower Saxon, the Thuringian, and the Frankish races have all contributed to form the present people, and their respective influenccs are still to be traced in the varieties of dialect. The boundary line between High and Low German passes through the Harz.

The Harz is now one of the most frequented tourist resorts of Germany. It is traversed by excellent roads in all directions, and is completely girt by railways from the principal towns of the empire. The chief point of interest is undoubtedly the Brocken or Blocksberg, famous as the scene of the " Walpurgisnacht" in Goethe's Faust, as well as for the atmospherical phenomena of which the "spectre of the Brocken" (see Hato) is the best known. The Harz

are the Brocken (3743 feet), the Heinrichshéhe (3402 | was the last stronghold of paganism in Germany, and to feet), the Greater and Less Kénigsberg (3376 feet and | that fact are due the weird legends, in which no district is

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richer, and the wild and fanciful names that are given by the people to the peculiar objects and appearances of nature.

Literature.—A very full list of works on the Harz, especially on the Broeken, will be found appended to the pamphlet Zur Gesehichte der Brockenrcisen, 4th cd., Aschersleben and Leip- sic, 1875. See also Holzmann, Hercynisches

Wegweiser im Harz und dessen Umgegend, Berlin, 1857; Nauen- burg, Der Lustwanderer im Harz, Hisleben, 1857; Mrs Burton, Our Summer in the

Harz Forest, Edinburgh, 1865; Groddeck, Abr iss der Geognosie des Harzcs, Klausthal, 1871; Hampe, Flora Hercynia, Halle, 1873; Blackburn, The Harz Mountains, a Tour, London, 1873; Buch (Gesammelte Schriften), " Ueber den Harz," 1877; Rev. J. 8. Hill and J. W. Tanley, in Colliery Guardian, vol. xxx.; Heine, Harzreise. Among the Handbooks may be noted those of Schweizer, Werner, Gottschalk, Meyer, Muller, Prediger, and Grieben.

HARZBURG, or Nevsrapt-Harzpure, the chief town of an office in the Brunswick circle of Wolfenbiittel, Prussia, is situated 727 feet above sea-level on the right bank of the Radau, a tributary of the Ocker, and at the terminus of the Brunswick-Harzburg Railway, 5 miles E.8.E. from Goslar and 18 miles S. from Wolfenbiittel. The opening of the railway has made the Harzburg route a principal one for persons visiting the Harz, and the town is also much frequented as a summer residence. It possesses a salt- water bath and also a hydropathic establishment. A mile and a half south from the town lies the Burgberg, 1500 feet above sea-level, on whose summit, according to tradition, there was at one time an altar to the heathen idol Krodo, still to be seen in the Ulrich chapel at Goslar. There are now on the summit of the hill a hotel, the remains of an old castle, and a monument erected in 1875 to the honour of Prince Bismarck, with an inscription taken from one of his speeches against the Ultramontane claims of Rome— "Nach Canossa gehen wir nicht." The population of Harzburg in 1875, including the villages of Biindheim, Schulenrode, and Schlewecke, was 4271.

The castle was built by the emperor Henry IV. between 1065 and 1069, but was laid in ruins by the Saxons about 1080. By Frederick I. it was granted to Henry the Lion, who eaused it to be rebuilt with great splendour about 1180. It was a frequent resi- dence of Otto IV., who died at it, and by his will granted it to the counts of Woldenberg. After being frequently besieged and taken, it finally, after the battle of Mithlberg in 1546, passed to the house of Brunswick. It ceased to be of importance as a fortress after the Thirty Years' War, and gradually fell into ruins.

See Delius, Untersuchungen tiber die Geschichte der IMarzburg, Walberstadt, 1826; Dommes, Harzburg und seine Umgebung, Goslar, 1862;

Molmstein, Die Harzburg nach Sage und Geschichte, Brunswick, 1878.

HASAN anp HUSEIN, the sons of ‘Ali ibn Abu Talib, cousin and son-in-law of Mahomet, and heroes of the passion play performed annually throughout India and Persia by Shiah Mahometans in the month of Moharram. Their relationship to the prophet is important to the under- standing of their history, and may be seen from the follow- ing table :—

‘Abd ‘ee

| ei ‘Abd el Mottaleb.

| ‘Abd Shems.

‘ Ommaiyeh, progenitor of the Ommaiyide caliphs

(Damascus, 650-750 a.p., ‘ roe

| ¢ ‘ if i Cordova, 755-1031 4.p.). se ene ihe en MAHOMET. Abbaside ealiphs, 750-1258 A.v. Fatima married SANL,]

| lfasan and Husain

HAR—HAS

The office of guardian of the kaabeh or temple of Mecca, and chief of the tribe of Koreish, which was vested in “Abd Mendf, would have descended to ‘Abd Shems, his eldest son, had it not been given to Hashim, the second, in reward for some military successes, and this circumstance caused a bitter enmity between the two families. When Mahomet died, ‘Alf claimed the right to the office of caliph (khalifeh, “vicegerent” or “successor ”), but found formidable rivals in Abu Bekr, the father of ‘Ayesha the prophet’s favourite wife, ‘Omar, another of his fathers-in-law, and “Othman, the only member of the rival house of Ommaiyeh who had joined the Muslim ranks. “Ayesha, whom “Ali had mortally offended by listening to a charge of incontinence which had been made against her, made common cause with the Ommaiyides, and strenuously opposed ‘Ali’s accession. A compromise was effected by the election of Abu Bekr; on his death ‘Omar was made

caliph, and when he in turn died, "Othman was elected, as 'Alf refused to subscribe to the con- ditions imposed upon him that he should govern in accord- ance with the "traditions" as well as the Koran. These "traditions " are the whole body of ceremonial laws and cus- toms by which the imperfect code of the Kordn was sup- plemented ; thef are derived from ancient Arab and even Jewish usage, although to give them a proper sanction and force they have been attributed to Mahomet himself, who is supposed to have enunciated them at different times as separate ahddith (singular, hadith); and the tracing of them through the various authorities to the prophet himself is still a most important branch of Muslim theology.

The "traditions" are spoken of collectively as the Sunneh, whence the name Sunni, given to that sect of Mahometans who follow them, and it was to this that "Ali refused to subscribe. 'Othman on his accession displayed an unblush- ing partisanship for his own, the Ommaiyide, family, and appointed Mo'awiyeh, a bitter enemy of the Hashimi family, governor of Syria. 'Othman was assassinated in 655 ..D., and 'Ali was then unconditionally elected caliph. He immediately recalled Mo'Awiyeh, who refused to obey, and, supported by the influence of the implacable'Ayesha, claimed the caliphate for himself. A severe struggle between the two parties ensued, and 'Ali was at first successful, but was at length compelled by intrigue to submit his claims to arbitration, instead of following up his military advantages. A number of his followers, about 12,000, taking umbrage at this, deserted him, thus originating the sect of Kharejiyeh or " Separatists," who reject the lawful government estab- lished by public consent. A conspiracy of three of these deserters resulted in the murder of 'Ali, who was slain at the door of a mosque in Kufa, and buried at a spot about 5 miles from that town. A magnificent mausoleum was afterwards erected over his tomb, which became later on the site of the town Meshed 'Ali, " Ali's shrine," one of the great places of resort for Shiah pilgrims. On Ali's death his eldest son Hasan was elected caliph, but resigned the office in favour of Modwiyeh on condition that he should resume it at the latter's death. Modwiyeh, however, who wished his own son Yezid to succeed him, caused Hasan to be foully murdered by his own wife eight years later. Yezid succeeded his father, on the latter's death, without opposition or election, and the Ommaiyide dynasty became thus firmly established on the throne. The partisans of "Alf's family were, however, far from content, and Husein,

*‘Alt’s surviving son, was secretly invited to Kufa to place himself at the head of the party, and revolt against Yezid. Prompt measures were taken by the caliph, who had obtained timely warning of the movement. “Obeidallah, a vigorous officer, was appointed governor of Kiifa, seized upon Husein’s envoy, Muslim, and one Hani in whose house he had been concealed, and when the populace assembled and clamoured for their release he caused them to be beheaded and their

heads to be cast down among the crowd. Husein was intercepted on the borders of Babylonia by Harro, with a company of horse, who told him he had orders to bring him alone to Kufa, but allowed him to proceed by what route he chose without losing sight of him. A horseman met them on the road with secret orders from ‘Obeidallah to lead Husein into an open and undefended place, and halt until “Amer, the commander of the Syrian army, arrived with his forces. This happened the next day, and Husein and his small escort were surrounded by 4000 horse, and slaughtered, after a stubborn resistance, on the plain of Kerbeld by the banks of the Euphrates, under peculiarly tragic circumstances, his little son“Abdallah, and his nephew, a beautiful child, both being murdered in his arms. This took place on the 10th of Moharram 61 a.x. (680 ..), and is commemorated during that month by the Shiahs in India and Persia, a long miracle play being performed, the scenes of which are carried on from day to day, and culminate in carrying out the ¢abdé or coffins of the martyrs to an open place, generally the cemetery, or in sea-side places to the sea-shore.

The cause of “Ali and his family was warmly expoused by the Persians, who had been forced to embrace Islam, but who regarded the Sunneh or Semitic law with especial repugnance. ‘The party were known as Shiahs, “Secta- rians ;” and as the quarrel between them and the Sunnis thus perpetuates the old enmity between Jew and Gentile, between the Semitic and Aryan races, it has produced an irreparable breach in Islam.

The passion play of Hasan and Husein has been published in English by Sir Lewis Pelly (London, 1879,2 vols. 8vo) from the dicta- tion of native teachers and performers of the drama. (@) Hs, Bs)

HASBEYA, or Hasperya, a town of the Druses, about 36 miles west of Damascus, is situated at the foot of Mount Hermon in Syria, overlooking a deep amphitheatre, from which a brook flows to the Hasbani. Both sides of the

valley are planted in terraces with olives, vines, and other

fruit trees, The grapes are either dried, or made into a kind of syrup. About four-fifths of the inhabitants are Christians, and in 1846 an American Protestant mission was established in the town. This little community suffered much persecution at first from the Greek Church, and after- wards from the Druses, by whom in 1860 nearly 1000 Christians were massacred, while others escaped to Tyre or Sidon, The castle in Hasbeya was held by the crusaders under Count Oran; but in 1171 the Druse emirs of ths great Shehaab family (see Drusss) recaptured it, In 1205 this family was confirmed in the lordship of the town and district, which they held till the Turkish authorities took possession of the castle in the present century. Near Hasbeya are bitumen pits let by Government; and to the north, at the source of the Hasbani, the ground is volcanic. Some travellers have identified Hasbeya with the Biblical Baal-Gad, or Baal-Hermon,—a supposition rendered the more likely by the ruins of several temples near the town. Population about 5000.

HASDRUBAL. Of the bearers of this very common Carthaginian name the most famous are the following :—

1, One of the leaders of the popular party at the close of the First Punic War. He was conspicuous for his dexterous management in politics and his conciliatory manners, He married the daughter of Hamilcar Barca ; and his skilful and cordial co-operation was of enormous consequence to Hamilcar during his Spanish wars. He went to Spain with his father-in-law, but soon returned to Carthage, where his talents were specially needed to con- duct the party at home. He was, however, in Spain when Hamilear fell (229) ; and was soon formally appointed by the home Government to the command which he had at once assumed. Devoting himself most successfully to the task

of consolidating the Carthaginian power in Spain, he founded New Carthage as the Spanish capital, and married the daughter of a Spanish chief. His kindly and generous manner attached the natives to him, and brought many over to the Carthaginian alliance. In 221 he fell by the hand of an assassin. The account given of him by Polybius

is much more favourable and far more trustworthy than

that of the Roman author Fabius whom he refers to.

2, The second son of the great Hamilcar. He was left by Hannibal as commander in Spain (219 3.0.), where he had to contend with the two Scipios, Cneius and Publius. Three years were spent in desultory warfare, in which the Romans were generally successful. After the battle of Canne, Hasdrubal was ordered to march into Italy, while Himilco was sent from Carthage with a fresh army to supply his place. But a decisive battle on the Ebro, in which he was totally defeated, checked his northward march. It is hardly possible to exaggerate the importance of this battle. Had a fresh Carthaginian army joined Hannibal in Italy for the campaign of 215 or 214, the danger to Rome would have been infinitely increased. Several years now passed, marked by the Roman historians with fresh Roman victories ; and it is certain that the struggle con- tinued doubtful till 212, when both the Scipios were defeated and slain. In spite of this great success, Hasdru- bal was not at the moment able to begin the march on Italy. The Romans were skilfully rallied by Lucius Marcius, and in 21] a fresh army under the preetor Nero landed in Spain. At the same time there seems to have been no co-opera- tion among the Carthaginian generals; and when the younger Scipio landed in Spain (210) he found their armies widely separated. Taking advantage of this, Scipio by a sudden attack (209) captured New Carthage, which con- tained vast military stores, all the Spanish hostages, and 10,000 captives. 'To achieve this brilliant success he had to leave the road northwards undefended; and although he rapidly returned and (according to the Roman accounts) defeated Hasdrubal at Bacula in Andalusia, the Cartha- ginian general was able to make his way with a strong army to the Pyrenees, which he crosscd in safety near the western extremity. The whole course of the Spanish wars, and especially the chronology of these later events, are very obscure. At all events Hasdrubal,

after a very rapid and skilful march across the whole breadth of Gaul, appeared carly in 207 in the north of Italy. When once he had succeeded in getting out of Spain, this brilliant march proved Hasdrubal worthy of his father and his brother; and long as it had taken to carry out his plan, we must remember that after the Romans perceived the necessity of keeping him back from Italy the difficulties in his way were enormous. On hearing of the passage of the Pyrenees, the Romans raised extraordinary levies, but before they had taken any steps to meet him, Hasdrubal was already in Cisalpine Gaul. Hannibal was still in Apulia, perhaps not expecting his brother so soon; Hasdrubal sent to mcet him two Numidian horsemen with four Gauls, who almost at the end of their perilous journey fell into the hands of the consul Nero. In the meantime Hasdrubal had advanced into Umbria, where the plebeian consul Livius was excamped near Sena. Nero, with 7000 men, left his own camp, and by a rapid march, which must be ranked among the most import- ant events of the war, joined his colleague. The united army was much too strong for Hasdrubal. He tried to avoid a battle, but his guides failed him, and he was forced to fight on the south bank of the Metaurus. A long and bloody conflict resulted in the complete defeat of the Carthaginians, and Hasdrubal, after all was lost, fell sword in hand in the midst of the enemy. His head, which was thrown by Nero's soldiers into Hannibal's camp, first revealed to the latter his brother's defeat and the ruin of the Carthaginian cause.

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HASLINGDEN, a market-town of Lancashire, England,

is situated 7 miles 8.E. of Blackburn, in a hilly district on'

the borders of the forest of Rossendale, and is supposed by some to derive its name from the hazel trees which at one time abounded in its neighbourhood. The town formerly stood on the slope of a hill, but the modern part, which is substantially built of stone, has been erected at its base. The parish church dedicated to St James was, with the exception of the tower, which dates from the time of Henry VIIL, rebuilt in 1780, and the whole structure was restored in 1879. Handsome schools are attached, to which there is an endowment for ten poor boys, founded in 1749. The principal other buildings are the mechanics' institute, the town-hall, where

the sessions and county court are held, and the public hall for asseinblies. The woollen manufacture, formerly the staple of the town, lias now been superseded by that of cotton, and there are also silk manufactures, iron-works, and size-works. In the vicinity there are collieries and quarries for stone, flags, and slate. The population of the town in 1861 was 6929, and 7698 in 1871, and that of the township was 10,109 and 12,000.

HASPE, a town of Prussia, province of Westphalia, government district of Arnsberg, and circle of Hagen, is situated in the valley of the Ennepe where the Hasper stream joins that river, and on the railway from Diisseldorf to Dortmund, 25 miles north-east of Diisseldorf. It has iron foundries, rolling mills, puddling furnaces, and manu- factures of iron, steel, and brass wares, and of machines. Haspe was raised to the rank of a town in 1874. The population in 1875 was 7930.

HASSAN, a district of Mysore, India, lying between 12° 30’ and 13° 22’ N. lat. and between 75° 32’ and 76° 58’ E. long. It is bounded on the 8. W. by the Madras dis- trict of South Kanara, and on the §. partly by the state of Coorg. The main portion of the district consists of the river basin of the Hemavati and its tributaries. It natur- ally divides into two portions, the Malnad or hill country, which includes some of the highest ranges of the Western Ghats, and the Maidan or plain country, sloping towards the south. The Hemavati, which flows into the Cauvery in the extreme south, is the great river of the district ; its most important tributary is the Yagachi. The upper slopes of the Western Ghats are abundantly clothed with magnificent forests, and wild animals of all sorts abound. Among the mineral products are kaolin, felspar, and quartz. The soil of the valleys is a rich red alluvial loam.

The area extends to 8291 square miles. The census of 1871 re- turned the inhabitants at 669,961—329,097 males and 340,864 females—the Hindus numbering 650,877, Mahometans 14,460, Jains 1954, Christians 2670. Hassan town and Narsipur each con- tain more than 5000 inhabitants. The staple crops consist of rdgé, rice, tobacco, sugar-cane, the cocoa-nut and arcca-nut palins, plan- tain trees, and chillies. Coffee cultivation has been on the increase of late years. The first plantation was opened in 1843, and now there are 155 coffee estates owned by Europeans and 9500 native

holdings. The statistics of irrigation show a total of 6905 tanks in the district and 215 miles of canals. The exports are large, con- sisting chiefly of food-grains and coffee. The imports are European piece-goods, hardware of all sorts, and spices. The largest weekly fair is held at Alur. A great annual religious gathering and fair, attended by about 10,000 persons, takes place every year at Melukot. The gross revenue amounted in 1873-74 to £126,908, and the police force (1874) numbered 470 men of all ranks, maintained at a cost of £3692. There were 243 schools in 1874 aided by Government, attended by 4379 pupils, and 147 unaided with 1657 pupils. The average mean temperature of the district is 76°, and the average rainfall at Hassan town during seven years was 86 inches. In the Ghats as much as 100 inches sometimes fall in the year. Malarious fever prevails in the Malnad during the early rains.

The real history of Hassan does not begin until the epoch of the Ballala dynasty, which lasted from the 10th till the 14th century. Their capital was at Dwardvati-pura, the ruins of which are still to be seen scattered round the village of Halebid in this district. The earlier kings professed the Jain faith, but the finest temples were

erected to Siva by the later monarchs of the line. While they were at the zenith of their power the whole of southern India acknowledged their sway. After the Mahometan invasion in the 14th century, the district of Hassan ceased to exist as the seat of a metropolis, and became a remote province known as Balam. Since 1832 the district, with the rest of Mysore, has been under direct British administration.

HASSAN. See Assassins, vol. ii. p. 723.

HASSE, Jowann Apotry (1699-1783), a musical com- poser, is a striking instance of the instability of fame. One of the most prolific and most celebrated composers of the 18th century, he is now all but forgotten, and his extant works rest quietly on the shelves of public libraries. He was born at Bergedorf near Hamburg, on March 25, 1699, and received his first musical education from his father. Being possessed of a fine tenor voice, he chose the theatrical career, and joined the operatic troupe conducted by

Reinhard Keiser at Hamburg, the same Keiser in whose orchestra Handel had played the second violin some years before. Hasse's success led to an engagement at the court theatre of Brunswick, and it was there that, in 1723, he made his début as a composer with the opera Antigonus. The success of this first work induced the duke to send Hasse to Italy for the completion of his studies, and in 1724 he went to Naples and placed himself under the tuition of the celebrated Porpora, with whom, however, he seems to have disagreed both as a man and as an artist. On the other hand he gained the friendship of Alessandro Scarlatti, to whom he owed his first commission for a serenade for two voices, sung at a family celebration of a wealthy merchant by two of the greatest singers of Italy, Farinelli and Signora Tesi. This event established Hasse's fame; he soon became very popular by the name of "il caro Sassone," and his opera Sesostrato, written for and pro- duced at the Royal Opera at Naples in 1726, made his name known all over Italy. At Venice, where he went in 1727, he and his works were received with equal favour. It was there that he became acquainted with the celebrated singer Faustina Bordoni, better known as Faustina Hasse, for she became the composer's wife in 1730, The artist- couple soon afterwards went to Dresden, in compliance with a brilliant offer made to them by the splendour-loving elector of Saxony, Augustus II. There Hasse remained for two years, after which he again journeyed to Italy, and also in 1733 to London, in which latter city he was tempted by the aristocratic clique inimical to Handel to become the rival and antagonist of that great master. But this he modestly and wisely declined, remaining in London only long enough to superintend the rehearsals for his opera Artaserse. All this while Faustina had remained at Dresden, the declared favourite of the public and unfortunately also of the elector, her husband, who remained attached to her, being allowed to see her only at long intervals. In 1789, after the death of Augustus II., Hasse settled permanently at Dresden till 1763, when he and his wife retired from court service with considerable pensions. But Hasse was still too young to rest on his laurels. He went with his family to Vienna, and added several operas to the great number of his works already in existence. His last work for the stage was the opera Ruggiero, written for the wedding of Archduke Ferdinand at Milan. On the same occasion a dramatic cantata by Mozart, then (1771) fourteen years old, was performed, and Hasse is said to have pro- phesied Mozart's future greatness much in the same manner as Mozart himself predicted that of

Beethoven. By desire of his wife Hasse settled at her birthplace Venice, and there he died December 23, 1783. His compositions were innumerable, including as many as 120 operas, besides oratorios, cantatas, masses, and almost every variety of instrumental music. It would be needless to criticize or give the titles of these compositions, for most of them are,

as was said before, totally and not unjustly forgotten. Moreover, comparatively few of them have escaped destruc- tion. During the siege of Dresden by the Prussians in 1760, most of his manuscripts, collected for a complete edition to be brought out at the expense of the elector, were burnt. Some of his works, amongst them an opera Alcide al Bivio, have been published, and the libraries of Vienna and Dresden possess the autographs of others. Hasse's instru- mentation is certainly not above the low level attained by the average musicians of his time, and his ensembles do not present any features of interest. In dramatic fire also he was wanting, but he had a fund of gentle and genuine melody, and by this fact his enormous popularity during his life must be accounted for. The two airs which Farinelli had to repeat every day for ten years to the melancholy king of Spain, Philip V., were both from Hasse's works, Of Faustina Hasse, almost as cclebrated as her husband, most that is necessary has been said above. It will be sufficient to add that she was born at Venice in 1700, sang at Vienna, London (under Handel, 1726), and Dresden, and was, according to tle unanimous verdict of the critics (including Dr Burney), one of the greatest singers of a time rich in vocal artists. The year of her death is not exactly known. Most probably it shortly preceded that of her husband.

HASSELQUIST, Freprrick (1722-1752), a Swedish traveller and naturalist, was born near Linkoeping in East Gothland, 3d January 1722. He lost his father at an early age, and his uncle, his sole remaining protector, in his thirteenth year, but succeeded by means of private teaching in supporting himself while continuing his education. In 1741 he entered the university of Upsala, where his taste for the study of nature was fostered and developed by Linneus, and where in 1747 he obtained licence iu medicine, and published a thesis entitled De Viribus Planta- rum. On account of the frequently expressed regrets of Linnzus at the lack of information regarding

the natural history of Palestine, Hasselquist resolved to undertake a journey to that country, and a sufficient subscription having been obtained to defray expenses, he, after making himself acquainted with the languages of the Levant, embarked for Smyrna, where he arrived November 26,1749. He visited parts of Asia Minor, Egypt, Cyprus, and Palestine, and made large natural history collections, but his constitution, naturally weak, give way under the fatigues and anxieties of travel, and he died at Smyrna, February 9, 1752, on his way homewards. His collections reached home in safety, and five years after his death the results of his wanderings were published by Linnzeus under the title Resa till Heliya Landet férdttad fran ar 1749 till 1752. The work is divided into two parts, the first consisting of the traveller's journal and letters, and the second of his remarks on the botany, zoology, and mineralogy of the countries through which he passed, with observations on the prevalent dis- eases and their cure, and the state of industry, commerce, and the arts. It was translated into French and German in 1762, and into English in 1766.

HASSELT, a town of Belgium, capital of the province of Limburg, is situated on the Demer and on the railway from Aix-la-Chapelle to Maestricht, 20 miles north-west of Liége. It possesses two churches, a hospital, a spacious town-hall, an athenzeum, and a public library. Tobacco and madder are cultivated in the neighbourhood. The principal manufactures are linen, lace, brandy, and beer. At Hasselt the Dutch under the prince of Orange gained a victory over the Belgians under General Daine, 6th May 1831. The population in 1876 was 11,361.

HASSENPFLUG, Hans Dantet Lupwic Frrepricu (1793-1862), a minister of state in Hesse-Cassel, cele- brated as a reactionary, was born at Hanau, in the elec-

torate of Ilesse, in 1793. He studied law at Gottingen,

and was appointed by the elector Frederick William I,

(then acting as regent) to a subordinate post in that uni- versity. He rose rapidly, and proved himself a man of great resolution and energy. From the first he adopted that line of policy which made him so disliked throughout his career. He exercised, that is to say, a suspicious censorship over the

press ; he reduced to a shadow the power of the legislative chambers; he introduced new and harsh measures of army discipline, and contended relentlessly with all disciples of freethought. In the matter of education he showed praiseworthy zeal, and promoted as far as he could the national schools of Hesse. But the services he rendered in this way were not sufficient to induce the mass of the people to pardon the reactionary tendency of his general policy, and he was obliged in 1837 to flee from the general hatred he had encountered. He found shelter in Prussia, where the Government entrusted him with the discharge of various judicial offices, and he remained in Prussia till the full tide of reaction had set in after the year 1848, He then (1850) returned to Hesse Cassel, the ministry of the revolution of 1848 having been dismissed. Despite the fact that Hassenpflug had never freed himself froma charge of peculation brought against him in the performance of his judicial duties in Prussia, he was appointed by the elector of Hesse to the head of the new ministry. He acted at once on the old lines, levying taxes without the consent of the chambers, dissolving them when they protested, and finally proclaiming martial law. 'The soldiers rose, the officers being on the side of the people; the Government was in so precarious a condition that it seemed wise to the elector to flee with his court to Wilhelmsbad. Partly by the influence of Hassenpflug the German bundesrath (or council of all the states) espoused the cause of the elector against his subjects, and by the end of the ycar (1850) the astute minister had the satisfaction of seeing the reactionary Government (with himself as minister of finance) reinstated in power. His position was, however, difficult, owing to his great unpopularity among all classes. When in 1852 the brother of the elector assaulted him in a fit of lunacy, Hassenpflug at once sent in his resignation, but it was not accepted till 1855. He then retired to Marburg (in Hesse), where he died October 15, 1862. His friend Dr Vilmar, who pronounced his funeral oration, dwelt chiefly on the piety of the deceased, who he said never travelled without a copy of the New Testament.

_ HASTINAPUR, an ancient city of India, in the Meerut district, North-Western Provinces, lying on the bank of the Buriganga, or former bed of the Ganges, 22 miles N.E. of Meerut. It formed the capital of the great PAndava kingdom, celebrated in the Mahdbhdrata, and probably one of the earliest Aryan settlements outside the Punjab. Few traces of the ancient city now remain, but tradition points to a group of shapeless mounds as the residence

of the children of the moon, the Lunar princes of the house of Bharata whose deeds are commemorated in the great national epic. After the conclusion of the famous war which forms the central episode of that poem, Hastinapur remained for some time the metropolis of the descendants of Parikshit, but the town was finally swept away by a flood of the Ganges, and the capital was transferred to Kausdmbi.

HASTINGS, a municipal and parliamentary borough and market-town of Sussex, England, the principal of the Cinque Ports, is picturesquely situated on the southern coast of England, 74 miles from London by the London, Brighton, aud South Coast Railway, and 62 by the London and South-Eastern Railway. It lies in two gorges, sur- rounded by an amphitheatre of hills and cliffs on every side except the south. At the beginning of the century, when

it first came into reputation as a watering-place, Hastings consisted of two main streets; but since then many new streets and squares have been added, and St Leonards, at that time about a mile distant, is now connected with it by a line of terraces and parades, and forms its more fashion- able district. On the brink of the western cliff there still stand a square and a circular tower of the old castle, pro- bably erected soon after the time of William the Conqueror, and the ruins, opened up by excavation in 1824, of the castle chapel, a transitional Norman structure 110 feet long, with a nave, chancel, and aisles. Besides the chapel, there was also at one time a college, both being under the control of a dean and secular canons. The deanery was at one time held by Thomas a Becket, and one of the canonries by William of Wykeham. The principal public buildings are the old parish churches of All Saints and St Clements, both in the Perpendicular style, the former containing in its register for 1619 the baptism of Titus Oates, whose father was rector of the parish, aud the latter two brasses to Thomas Weekes (d. 1563) and John Bailey (d. 1592); the town-hall, erected in 1823 ; the music hall, erected in 1859; the asscmbly-room, the Roman Catholic college, the Augustinian monastery, and the Albert memorial and drinking fountain, erected in 1864. Among the industries of the town arc fishing, boat-building, and coach-making; but its prosperity depends chiefly upon its

reputation as a watering-place. Its popularity in this respect is owing to its historicai interest, its picturesque situation, the many beautiful walks in the neighbourhood, its fine level sands, and its healthy climate, which, while bracing and vigorous in the higher parts of the town, is in its lower parts speci- ally suited, from its mildness, for sufferers from pulmonary complaints. The town is well supplied with hotels, read- ing rooms, and pleasure gardens, and possesses a line of parades extending along the coast for nearly 3 miles. The Marina, a covered parade 600 feet in length, was built in 1825. There is a fine pier, opened in 1872, 900 feet in length, and possessing a pavilion capable of seating nearly 2000 persons. A public park, 70 acres in extent, is at present being laid out. The sewage of the town is con- veyed a considerable distance out to sea before it is dis- charged. The area of the municipal borough is 1636 acres, and of the parliamentary borough 4617 acres. The population of the municipal borough in 1871 was 29,291, and of the parliamentary borough 33,337.

Hastings is of great antiquity, and was a place of some importance in the time of the Anglo-Saxons. , Some derive its name from Hasten, a Danish pirate who ravaged that coast in the time of Alfred the Great. According to the French biographer of Edward the Confessor, it was so called from the hasty mannerin which William renewed its fortifications. It is mentioned in the chronicles as Hestingas, and is reckoned as distinct from the shire of Sussex. In the Bayeux tapestry it is called Hestinga-ceastra. A mint was established at it by Athelstan in 924, of which there is some notice in the Domesday Book. In 1049, according to the Worcester Chronicle, its seamen distinguished themselves in the pursuit of the pirate Swend after the murder of Beorn, and took two of his ships. Like the other principal seaports on the southern coast, it was gar- risoned by Harold in view of the possible landing of Williain the Conqueror, to whom, however, it surrendered without striking a blow, and who selected it as the site of a permanent camp, and erected a wooden fortress on the cliff on which the castle was afterwards built. From this camp William, on the morning of October 14th, 1066, set out to meet Harold at Senlac Hill ; and after his great victory there he returned to it, and remained encamped five days in the hope of receiving the homage of the English. The site of the original town is supposed to be now in great part covered by the sea. Bya charter of William the Conqueror Hastings, together with Hythe, was added to the three previously

incorporated ports of Sandwich, Dover, and Romney, and invested with certain privileges, the five being subse- quently knownas the “ Cinque Ports.” In the reign of Edward 1. it was rated at 21 ships with 21 seamen in each, for the service of the king for fourteen days at his own charge. In 1877 the town was burned down by the French, but it was soon afterwards rebuilt. The harbour has fallen almost into disuse since the time of Elizabeth, when the wooden pier was destroyed by a storm; it does not now ad-

mit vessels above 100 tons burthen, and this only at full tide. The town received a charter of incorporation from Elizabeth in 1558, which was confirmed and enlarged by Charles II. In the 42d of Edward III. it obtained the privilege of rcturning two members to parliament.

HASTINGS, Warren (1732-1818), the first governor- general of British India, was born on the 6th of December 1732 in the little hamlet of Churchill in Oxfordshire. He came of a family which had been settled for many generations in the adjoining village of Daylesford; but his great-grandfather had sold the ancestral manor-house, and his grandfather had been unable to maintain himself in possession of the family living. His mother died a few days after giving him birth ; his father, Pynaston Hastings, drifted away to perish obscurely in the West Indies. Thus unfortunate in his birth, young Hastings received the ele- ments of education at a charity school in his native village. At the age of eight he was taken in charge by an elder brother of his father, Howard Hastings, who held a post in the customs, After spending two years at a private school at Newington Butts, he was moved to West- minster, where among his contemporaries occur the names of Lord Thurlow and Lord Shelburne, Sir Elijah Impey, and the poets Cowper and Churchill. In 1749, when his headmaster Dr Nichols was already anticipating for him a successful career at the university, his uncle died, leaving him to the care of Mr Chiswick, who was in the direction of the East India Company; and he determined to send his ward to seek his fortune as a “‘ writer ” in Bengal.

When Hastings landed at Calcutta in October 1750, the affairs of the East India Company were at a low ebb. Throughout the entire south of the

peninsula French influ- ence was predominant. The settlement of Fort St George or Madras, captured by force of arms, had only recently been restored in accordance with a clause of the peace of Aix-la-Chapelle. The lurid genius of Dupleix everywhere overshadowed the native imagination, and the star of Clive © had scarcely yet risen above the horizon. The rivalry be- tween the English and the French, which had already convulsed the south, did not penetrate to Bengal. That province was under the able government of Ali Vardi Khan, who peremptorily forbade the foreign settlers at Cal- cutta and Chandarnagar to introduce feuds from Europe. The duties of a young " writer " were then such as are im- plied in the name. At an earlydate Hastings was placed in charge of an awrang or factory in the interior, where his duties would be to superintend the weaving of silk and cotton goods under a system of money advances. In 1755 he was transferred to Kdsimbazar, the river-port of the native capital of Murshid4béd. In 1756 the old nawab died, and was succeeded by his grandson Sirdj- ud-Daulah, a spoilt boy of 19, whose name is indelibly associated with the tragedy of the Black Hole. When that passionate young prince, in revenge for a fancied wrong, resolved to drive the English out of Bengal, his first step was to occupy the fortified factory at Késimbazar, and make prisoners of Hastingsand his companions. Hastings was soon released at the intercession of the Dutch resi- dent, and made use of his position at Murshidabad to open negotiations with the English fugitives at Falta, the site of a Dutch factory near the mouth of the Hooghly. In later days he used to refer with pride to his services on this occasion, wien he was first initiated into the wiles of Oriental diplomacy. After a while, he found it necessary to fly from the Mahometan court, and join the main body of the English at Falta. When the relieving force arrived from Madras under Colonel Clive and Admiral Watson, Hastings enrolled himself as a volunteer, and took part in the action which led to the recovery of Calcutta. Clive showed his appreciation of Hastings's merits, by appointing him in 1758 to the important post of resident at the court of Murshi-

dabad. It was there that he first came into collision with the Bengalf Brahman, Nandkumar, whose subsequent fate throws so deep a shadow upon his own fair fame. During his three years of office as resident he was

able to render not a few valuable services to the Company ; but it is more important to observe that his name nowhere occurs in the official lists of those who derived pecuniary profit from the necessities and weakness of the native chiefs. In 1761 he was promoted to be member of council, under the presi- dency of Mr Vansittart, who had been introduced by Clive from Madras. The period of Vansittart's government has been truly described as "the most revolting page of our Indian history." The entire duties of administration were suffered to remain in the hands of the nawab, while a few irresponsible English traders had drawn to themselves all real power. The members of council, the commanders of the troops, and tle commercial residents plundered on a grand scale. The youngest servant of the Company claimed the right of trading on his own account, free from taxation and from local jurisdiction, not only for himself but also for every native subordinate whom he might permit to use his name. It was this exemption, threatening the very foundations of the Mussulman government, that finally led to a rupture with the nawdb. Macaulay, in his celebrated essay, has said that "of the conduct of Hastings at this time little is known." As a matter of fact, the book which Macaulay was professing to review describes at length the honourable part consistently taken by Hastings in opposition to the great majority of the council. Some- times in conjunction only with Vansittart, sometimes abso- lutely alone, he protested unceasingly against the policy and practices of his colleagues. On one occasion he was stigmatized in a minute by Mr Batson with " having espoused the nawdb's cause, and as a hired solicitor de- fended all his actions, however dishonourable and detri- mental to the Company." An altercation ensued. Batson gave him the lie, and struck him in the council chamber. When war was actually begun, Hastings officially recorded his previous resolution to have resigned, in order to repudi- ate responsibility for measures which he had always opposed. Waiting only for the decisive victory of Buxar over the allied forces of Bengal and Oudh, he resigned his seat and sailed for England in November 1764.

After fourteen years' residence in Bengal Hastings did not return home a rich man, estimated by the oppor- tunities of his position. According to the custom of the time he had augmented his slender salary by private trade. At a later date, he was charged by Burke with having taken up profitable contracts for supplying bullocks for the use of the Company's troops. Itis

admitted that he conducted by means of agents a large business in timber in the Gan- getic sandarbans. When at Falta he had married Mrs Campbell, the widow of an officer. She bore him two children, of whom one died in infancy at Murshidabad, and was shortly followed to the grave by her mother. Their common gravestone is in existence at the present day, bearing date July 11, 1759. The other child, a son, was sent to England, and also died shortly before his father's return. While at home Hastings is said to have attached himself to literary society; and it may be inferred from his own letters that he now made the personal acquaintance of Samuel Johnson and Lord Mansfield. In 1766 he was called upon to give evidence before a com- mittee of the House of Commons upon the affairs of Bengal. The good sense and clearness of the views which he expressed caused attention to be paid to his desire to be again employed in India. His pecuniary affairs were embarrassed, partly from the liberality with which he had endowed his few surviving relatives. The great influence of Lord Clive was also exercised on his behalf. At: last,

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in the winter of 1768, he received the appointment of second in council at Madras. Among his companions on his voyage round the Cape were the Baron Imhoff, a speculative portrait painter, and his wife, a lady of some personal attractions and great social charm, who was des- tined henceforth to be Hastings's life-long companion. Of his two years' work at Madras it is needless to speak in detail. He won the good-will of his employers by devot- ing himself to the improvement of their manufacturing business, and he kept his hands clean from the prevalent taint of pecuniary transactions with the nawab of the Carnatic. One fact of some interest is not generally known. He drew up a scheme for the construction of a pier at Madras, to avoid the dangers of landing through the surf, and instructed his brother-in-law in England to ob- tain estimates from the engineers Brindley and Smeaton. In the beginning of 1772 his ambition was stimulated by the nomination to the second place in council at Bengal with a promise of the reversion of the governorship when Mr Cartier should retire. Since his departure from Bengal in 1764 the situation of affairs in that settlement had scarcely improved. The second governorship of Clive was marked by the transfer of the diwdné or financial ad- ministration from the Mogul emperor to the

Company, and by the enforcement of stringent regulations against the besetting sin of peculation. But Clive was followed by two ineflicient successors ; and in 1770 occurred the most terrible Indian famine on record, which is credibly esti- mated to have swept away one-third of the population. In April 1772 Warren Hastings took his seat as president of the council at Fort William. His first care was to carry out the instructions received from home, and effect a radical reform in the system of government. Clive's plan of governing through the agency of the native court had proved a failure. The directors were determined " to stand forth as déiwdén, and take upon themselves by their own servants the entire management of the revenues." All the officers of administration were transferred from Mur- shidébad to Calcutta, which Hastings boasted at this early date that he would make the first city in Asia. This reform involved the ruin of many native reputations, and for a second time brought Hastings into collision with the wily Brahman, Nandkumar. At the same time a new settlement of the land revenue on leases for five years was begun, and the police and military systems of the country were placed upon a new footing. Hastings was a man of immense industry, with an insatiable appetite for details. The whole of this large series of reforms was conducted under his own personal supervision, and upon no part of his multifarious labours did he dwell in his letters home with greater pride. As an independent measure of economy, the stipend paid to the titular nawdb of Bengal, who was then a minor, was reduced by one-half—to sixteen lakhs a year (say £160,000). Macaulay imputes this re- duction to Hastings as a characteristic act of financial immorality ; but in truth it had been expressly enjoined by the court of directors, in-a despatch dated six months before he took up office. His pecuniary bargains with Sujah Daula, the nawab wazir of Oudh, stand on a differ- ent basis. Hastings himself always regarded them as incidents in the general scheme of his foreign policy. The Mahrattas at this time had got possession of the person of the Mogul emperor, Shah Alam, from whom Clive obtained the' grant of Bengal in1765, and to whom he assigned in return the districts of Allahabad and Kora and a tribute of £300,000. With the emperor in their camp, the Mahrattas were threatening the province of Oudh, and causing a large British force to be cantoned along the fron- tier for its defence. Warren Hastings, as a deliberate measure of policy, withlield the tribute due to the emperor, XI, — 65

and resold Allahabad and Kora to the wazir of Oudh. The Muahrattas retreated, and all danger for the time was dissipated by the death of their principal leader. The wazir now bethought him that he had a good opportunity for satisfying an old quarrcl against the adjoining tribe of Rohillas, who had played fast and loose with him while the Mahratta army was at hand. The Rohillas were a race of Afghan origin, who had established themselves for some generations in a fertile tract west of Oudh, between the Himalayas and the Ganges, which still bears the name of Rohilkhand. They were not so much the occupiers of the soil, as a dominant caste of warriors and freebooters. But in those troubled days their title was as good as any to be found in India. After not alittle hesitation, Hastings con- sented to allow the Company's troops to be used to further the ambitious designs of his Oudh ally, in consideration of a sum of money which relieved the ever-pressing wants of the Bengal treasury. The Rohillas were defeated in fair fight. Some of them fled the country ; and so far as pos- sible Hastings obtained terms for those who remained. The fighting, no doubt, on the part of the wazir was con- ducted with all the savagery of Oriental warfare; but there is no evidence that it was a war of extermination. Meanwhile, the affairs of the East India Company had again come under the consideration of Parliament. The Regulating Act, passed by Lord North's ministry in 1778, effected considerable changes in the constitution of the Bengal Governnient. members with a governor-general, who were to exercise certain indefinite powers of control over the presidencies of Madras and Bombay. Hastings was named in the Act as governor-general for a term of five years. The council con- sisted of General Clavering and the Hon. Colonel Monson, two third-rate politicians of considerable parliamentary influ- ence ; Philip Francis, then only known as an able pernia- nent official ; and Barwell, of the Bengal Civil Service. At the same time a supreme court of judicature was appointed, composed of a chief and three puisne judges, to exercise an indeterminate jurisdiction at Caleutta. The chief- justice was Sir Elijah Impey, already mentioned as a schoolfellow of Hastings at Westminster. The whole tendency of the Regulating Act was to establish for the first time the influence of the crown, or rather of parlia- ment, in Indian affairs. The new members of council dis- embarked at Calcutta on the 19th of October 1774; and on the

following day commenced the long feud which scarcely terminated twenty-one years later with the acquittal of Warren Hastings by the House of Lords. Macaulay states that the members of council were put in ill-humour because their salute of guns was not proportionate to their dignity. In acontemporary letter Francis thus expresses the same petty feeling: "Surely Mr H. might have put on a ruffled shirt." Taking advantage of an ambiguous clause in their commission, the majority of the council (for Barwell uni- formly sided with Hastings) forthwith proceeded to pass in review the recent measures of the governor-general. All that he had done they condemned ; all that they could they reversed. Hastings was reduced to the position of a cipher at their meetings. After a time they lent a ready ear to detailed allegations of corruption brought against him by his old enemy Nandkumar. To charges from such a source, and brought in such a manner, Hastings disdained to reply, and referred his accuser to the supreme court. The majority of the council, in their executive capacity, resolved that the governor-general had been guilty of pecu- lation, and ordered him to refund. A few days later Nandkumar was tlirown into prison on a stale charge of forgery, tried before the supreme court sitting in bar, found guilty by a jury of Englishmen, and sentenced to be hanged. That Hastings set this prosecution in motion, no

The council was reduced to four |

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reasonable person can doubt ; and it is equally clear that Chief-Justice Impey is free from all personal blame. The majority of the council abandoned their supporter, who was executed in due course. He had forwarded a petition for reprieve to the council, which Clavering took care should 'not be presented in time, and which was subsequently burnt by the common hangman on the niotion of Francis. At the time no one dared to impute to Hastings the crime of a judicial murder. But though he had thus silenced the charges brought against him, a combination of circumstances placed him in a position of fresh difficulty. While the strife was at its hottest, he had sent an agent to England, witha general authority to place his resignation in the hands of the Company under certain conditions. The agent thought fit to exercise that authority. The resignation was promptly

accepted, and one of the directors was appointed ‘to the vacancy. But in the meantime Colonel Monson had died, and Hastings was thus restored, by virtue of his casting vote, to the supreme management of affairs. He refused to ratify his resignation; and when Clavering attempted to seize on the governor-generalship, he judici- ously obtained an opinion of the supreme court in his own favour. From that time forth, though he could not always command an absolute majority in council, Hastings was never again subjected to gross insult, and his general policy was able to prevail.

A crisis was now approaching in foreign affairs which demanded all the experience and all the genius of Hastings for its solution. Bengal was prosperous, and free from ex- ternal enemies on every quarter. But the Government of Bombay had hurried on a rupture with the Mahratta con- federacy at a time when Frauce was on the point of de- claring war against England, and when the mother-country found herself unable to subdue her rebellious colonists in America. Hastings did not hesitate to take upon his own shoulders the whole responsibility of military affairs. All the French settlements in India were promptly occupied. On the part of Bombay, the Mahratta war was conducted with procrastination and disgrace. But Hastings amply avenged the capitulation of Wargdon by the complete suc- cess of his own plan of operations. Colonel Goddard with a Bengal army marched across the breadth of the penin- sula, from the valley of the Ganges to the western sea, and achieved almost without a blow the conquest of Guzerat. | Captain Popham, with a small detachment, stormed the rock fortress of Gwalior, then deemed impregnable and the key of Central India; and by this feat held in check Sindia, the most formidable of the Mahratta chiefs. The bhonsla, or Mahratta r4j4 of Nagpur, whose dominions bordered on Bengal, was won over by the diplomacy of an emissary of Hastings. But while these events were taking _place, a new source of embarrassment had arisen at | Calcutta. The supreme court, whether rightly or wrongly, assumed a jurisdiction of first instance over the entire pro- _vinee of Bengal. The English common law, with all the absurdities and rigours of that day, was arbitrarily extended to an alien system of society. Zaminddrs, or government renters, were arrested on mesne process; the sanctity of the zandna, or women’s chamber, as dear to Hindus as to Mahometans, was violated by the shierifl’s officer; the deepest feelings of the people and the entire fabric of revenue administration were

alike disregarded. On this point the entire council acted in harmony. Hastings _and Francis went joint-bail for imprisoned natives of dis- tinction. At last, after the dispute between the judges and the executive threatened to become a trial of armed force, Hastings set it at rest by a characteristic stroke of policy. A new judicial office was created in the name of the Company, to which Sir Elijah Impey was appointed, | though he never consented te draw the additional salary

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offered to him. The understanding between Hastings and Francis, originating in this state of affairs, was for a short period extended to general policy. An agreement was come to by which Francis received patronage for his circle of friends, while Hastings was to be unimpeded in the control of foreign affairs. Buta difference of interpretation arose. Hastings recorded in an official minute that he had found Francis's private and public conduct to be "void of truth and honour." They metas duellists. Francis fell wounded, and soon afterwards returned to England.

The Mahratta war was not yet terminated, but a far more formidable danger now threatened the English in India. The imprudent couduct of the Madras authorities had irritated beyond endurance the two greatest Mussulman powers in the peninsula, the nizim of the Deccan and Hyder Ali, tlie usurper of Mysore, who began to negotiate an alliance with the Mahrattas. A second time the genius of Hastings saved the British empire in the east. On the arrival of the news that Hyder had descended from the highlands of Mysore, cut to pieces the only British army in the field, and swept the Carnatic up to the gates of Madras, he at once adopted a policy of extraordinary bold- ness. He signed a blank treaty of peace with the Mah- rattas, who were still in arms, reversed the action of the Madras Government towards the nizim, and concentrated all the resources of Bengal against Hyder Ali. Sir Eyre Coote, a general of renown in former Carnatic wars, was sent by sea to Madras with all the troops and treasure that could be got together; and astrong body of reinforcements subsequently marched southwards under General Leslie along the coast line of Orissa. The landing of Coote pre- served Madras from destruction, though the war lasted through many campaigns and only terminated with the death of

Hyder. Leslie's detachment was decimated by an epidemic of cholera (perhaps the first mention of this disease by name in Indian history); but the survivors penetrated to Madras, and not only held in check the bhonsla and the nizim, but also corroborated the lesson taught by Goddard—that the Company's sepoys could march anywhere, when boldly led. Hastings's personal task was to provide the ways and means for this exhaust- ing war. A considerable economy was effected by a reform in the establishment for collecting the land tax. The Government monopolies of opium and salt were then for the first time placed upon a remunerative basis. But these reforms were of necessity slow in their beneficial operation, The pressing demands of the military chest had to be satisfied by loans, and in at least one case from the private purse of the governor-general. Ready cash could alone fill up the void ; and it was to the hoards of native princes that Hastings's fertile mind at once turned. Cheyte Sing, r4j4 of Benares, the greatest of the vassal chiefs who had grown rich under the protection of the British rule, lay under the suspicion of disloyalty. The wazir of Oudh had fallen into arrears in the payment due for the maintenance of the Company's garrison posted in his dominions, and his ad- ministration was in great disorder. In his case the ances- tral hoards were under the control of his mother, the begum of Oudh, into whose hands they had been allowed to pass at the time when Hastings was powerless in council. Hastings resolved to make a progress up country in order to arrange the affairs of both provinces, and bring back all the treasure that could be squeezed out of its holders by his personal intervention. When he reached Benares and presented his demands, the r4j& rose in insurrection, and the governor-general barely escaped with his life. But the faithful Popham rapidly rallied a force for his defence. The native soldiery were defeated again and again; Cheyte Sing took to flight, and an augmented permanent tribute was imposed upon his successor. The Oudh business was

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managed with less risk. The wazir consented to every- thing demanded of him. The begum was charged with having abetted Cheyte Sing in his rebellion ; and after the severest pressure applied to herself and her attendant eunuchs, a fine of more than a million sterling was exacted from her, Hastings appears to have been not altogether satisfied with the

incidents of this expedition, and to have anticipated the censure which it received in England. As a measure of precaution, he procured documentary evidence of the rebellious intentions of the rdjé and the beguin, to the validity of which Impey obligingly lent his extra- judicial sanction.

The remainder of Hastings's term of office in India was passed in comparative tranquillity, both from internal oppo- sition and foreign war, The centre of interest now shifts to the India House and to the British Parliament. The long struggle between the Company and the ministers of the crown for the supreme control of Indian affairs and the attendant patronage had reached its climax. The decisive success of Hastings's administration alone postponed the inevitable solution. His original term of five years would have expired in 1778 ; but it was annually prolonged by special Act of Parliament until his voluntary resignation. Though Hastings was thus irremovable, his policy did not escape censure. Ministers were naturally anxious to obtain the reversion to his vacant post, and Indian affairs formed at this time the hinge on which party politics turned. On one occasion Dundas carried a motion in the House of Commons censuring Hastings, and demanding his recall. The directors of the Company were disposed to act upon this resolution ; but in the court of proprietors, with whom the decision ultimately lay, Hastings always possessed a sufficient majority. Fox's India Bill led to the downfall of the Coalition Ministry in 1783. The Act which Pitt successfully carried in the following year introduced a new constitution, in which Hastings felt that he had no place. In February.1785 he finally sailed from Calcutta, after a dignified ceremony of resignation, and amid enthusiastic farewells from all classes.

On his arrival in England, after a second absence of six- teen years, he was not displeased with the reception he met with at court and in the country, A peerage was openly talked of as his due, while his own ambition pointed to some responsible office at home. Pitt had never taken a side against him, while Lord Chancellor Thurlow was his pro- nounced friend. But he was now destined to learn that his enemy Francis, whom he had discomfited in the council chamber at Calcutta, was more than his match in the parlia- mentary arena. Edmund Burke had taken the subject races of India under the protection of his eloquence. Francis, who had been the early friend of Burke, supplied him with the personal animus against Hastings, and with

the knowledge of details, which he might otherwise have lacked. The Whig party on this occasion unanimously followed Burke's lead. Dundas, Pitt's favourite subordinate, had already committed himself by his earlier resolution of censure ; and Pitt was induced by motives which are still obscure to in- cline the ministerial majority to the same side. To meet the oratory of Burke and Sheridan and Fox, Hastings wrote an elaborate minute with which he wearied the ears of the House for two successive nights, and he subsidized a swarm of pamphleteers. The impeachment was decided upon in 1786, but the actual trial did not commence until 1788. For seven long years Hastings was upon his defence on the charge of "high crimes and misdemeanours." During this anxious period he appears to have borne himself with characteristic dignity, such as is consistent with no other hypothesis than the consciousness of innocence. At last, in 1795, the House of Lords gave a verdict of not guilty on all the charges laid against him; and he left the bar at

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which he had so frequently appeared, with his reputation clear, but ruined in fortune. However large the wealth he brought back from India, all was swallowed up in defray- ing the expenses of his trial. Continuing tlie line of con- duct which in most other men would be called hypocrisy, he forwarded a petition to Pitt praying that he might be reimbursed his costs from the public funds. This petition, of course, was rejected. At last, when he was reduced to actual destitution, it was arranged that the East India Com- pany should grant him an annuity of £4000 for a term of years, with £90,000 paid down in advance. This annuity expired before his death; and he was compelled to make more than one fresh appeal to the bounty of the Company, which'was never withheld. Shortly before his acquittal he had been able to satisfy the dream of childhood, by buying back the ancestral manor of Daylesford, where the re- mainder of his life was passed in honourable retirement. In 1813 he was called ou to give evidence upon Indian affairs before the two Houses of Parliament, which received him with exceptional marks of respect. The university of Oxford conferred on him the honorary degree of D.C.L. ; and in the following year he was sworn of the Privy Council, and took a prominent part in the reception given to the duke of Wellington and the allied sovereigns. He died on the 22d of August

1818, in his 86th year, and lies buried behind the chancel of the parish church, which he had recently restored at his own charges.

In physical appearance, Hastings "looked like a great man, and not like a bad man." The body was wholly sub- jugated to the mind. A frame naturally slight had been further attenuated by rigorous habits of temperance, and thus rendered proof against the diseases of the tropics. Agaiust his private character not even calumny has breatlied a reproach. As brother, as husband, and as friend, his affec- tions were as stedfast as they were warm. Ly tlie public he was always regarded as reserved, but within his own inner circle he gave and received perfect confidence. In his dealings with money, he was characterized rather by liberality of expenditure than by carefulness of acquisition. A classical education and the instincts of family pride saved him from both the greed and the vulgar display which marked the typical "nabob," the self-made man of those days. He could support the position of a governor- general and of a country gentleman with equal credit. Concerning his second marriage, it suffices to say that the Baroness Imhoff was about forty years of age, with a family of grown-up children, when the complaisant law of her native land allowed her to become Mrs Hastings. She survived her husband, who seems to lave cherished towards her to the last the sentiments of a lover. Her children he adopted as his own; and it was chiefly for her sake that he desired the peerage which was twice held out to him.

Hastings's public career will probably never cease to be a subject of controversy. It was his misfortune to be the scape-goat upon whose head Parliament laid the accumu- lated sins, real and imaginary, of the East India Company. If the acquisition of our Indian empire can be supported on ethical grounds, Hastings needs no defence. No one who reads his private correspondence will admit that even lis least defensible acts were dictated by dishonourable motives. It is more pleasing to point out certain of his public measures upon which no difference of opinion can arise. He was the first to attempt to open a trade route with Thibet, and to organize a survey of Bengal and of the eastern seas. It was he who persuaded the pandits of Bengal to disclose the treasures of Sanskrit to European scholars. He founded the Madrasa or college for Ma- hometan education at Calcutta,

primarily out of his own funds; and he projected the foundation of an Indian

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Institute im England. The Royal Asiatic Society was estab- lished under his auspices, though he yielded the post of president to Sir W. Jones. No Englishman ever under- stood the native character so well as Hastings; none ever devoted himself more heartily to the promotion of every scheme, great and small, that could advance the prosperity of India. Natives and Anglo-Indiaus alike venerate his nanie, the former as their first beneficent administrator, the latter as the most able and the most enlightened of their own class. If Clive's sword conquered the Indian empire, it was the brain of Hastings that planned the system of civil administration, and his genius that saved the empire in its darkest hour.

The bibliography dealing with Warren Hastings is not large. The histories of Mill and Thornton both adopt a standpoint that is on the whole adverse. The A/emotrs, by Gleig, in 3 vols. (Lond., 1841) are too tedious to be read at the present day. The review of those Afemoirs by Macaulay, despite its exuberance of colour, its Whig partiality, andits proved inaccuracies, will not easily be superseded as the one standard authority. There is a recent Biography by Captain Trotter(1878). Muchinteresting information, in correction or amplification of Macaulay, may be found in the Memoirs of Francis, with Correspondence, &e., by Parkes and H. Merivale (1867), and in the Memoirs of Sir E. Impey by his son (1846), who deposited his private MS. materials in the British Museum. In 1872 the British Museum also obtained by purchase froin a Mrs Kinter 268 vols. of papers relating to Hastings, chiefly letters between 1757 and 1818. These have been partly utilized by Mr Beveridge in a series of articles contributed to the Calcutta Review for October 1877, April 1878, and April 1879. (J. S. CO.)

HASTINGS, Francis Rawpon Hastines, First Marquis or (1754-1826), ranks among those governors- general of India who, completing the work of Clive and Warren Hastings, achieved the creation of the Indian empire of England. Theservices of Lord Hastings in this respect were special and important. He was both governor- general and commander-in-chief in India from 1818 till the end of 1822; during that period he carried two important

wars, the Nepaulese and the Mahratta, to a successful issue ; while adding to the territories of the East India Company, he in several respects altered and improved their policy ; aud by the sagacity and at the same time the generosity of his own administration (in which he exhibited the true qualities of a Christian proconsul) he won reverence from the natives and left a great name in India.

Lord Hastings was in no way connected with Warren Hastings; his family name was Rawdon. His father, Sir John Rawdon of Moira in the county of Down, fourth baronet, was created Baron Rawdon of Moira, and afterwards Earl of Moira, in the Irish peerage. His mother was the Lady Elizabeth Hastings, daughter of the ninth earl of Huntingdon. Both his father and mother appear to have been persons of considerable ability and high culti- vation. Lord Rawdon, as he was then called, having gone at an early age to the university of Oxford, joined the army in his seventeenth year as ensign in the 15th foot. His life henceforth was entirely spent in the service of his country, and may naturally be divided into four periods :— from 1773 to 1782 he was engaged with much distinction in the American war; from 1783 to 1813 he held various high appointmeuts at home, and took an active part in the business of the House of Lords; from 1813 to 1823 was the period of his labours in India; after retiring from which, in the last years of his life (1824-1826), he was governor of Malta.

In America Lord Rawdon served at the battles of Bunker's Hill, Brooklyn, White Plains, Monmouth, and Camden, at the attacks on Forts Washington and Clinton, and at the siege of Charleston. In fact he was engaged in all the chief operations of the war. Perhaps his most noted achievements were the raising of a corps at Phila- delphia, called the Irish Volunteers, who under him became famous for their fighting qualities, and the victory of Hob-

kirk Hill, which, when in command of only a small force, he gained by superior military skill and determination against an American corps d'armée. invalided. The vessel in which he returned to England was captured and carried into Brest. This occasioned the loss of his papers and personal records of the war which would doubtless have been interesting.

He was speedily released, and on his arrival in England was much honoured by George IIL, who created him an English peer (Baron Rawdon) in March 1783.

In 1793 Lord Rawdon succeeded his father as earl of Moira. In 1794 he was sent with 10,000 men from South- ampton to Ostend to reinforce the duke of York and the allies in Flanders. The march by whicli he effected a junction was considered extraordiuary. In 1803 he was appointed commander-in-chief in Scotland, and in 1804 he married Flora Muir Campbell, countess of Loudon in her own right. He and Lady Loudon lived at Duddingston House near Edinburgh, where they were very popular. Tbe opposition coming into power in 1806, Lord Moira, who had always voted with them, received the place of master general of the ordnance. He was now enabled to carry a philanthropic measure, of which from his first entry into the House of Lords he had been a great promoter, namely, the Debtor and Creditor Bill for relief of poor debtors. Treland was another subject to which he had given parti- cular attention: in 1797 there was published a Speech by Lord Moira on the Dreadful and Alarming State of Ireland. Lord Moira's sound judgment on public affairs, combined with his military reputation and the honourable uprightness of his character, won for him a high position among the statesmen of the day, and he gained an additional prestige from his intimate relations with the prince of Wales. On two occasions, in 1809 and again in 1812 after tle assassi- nation of Percival, there were negotiations for placing him at the head of affairs. Asa further mark of the regent's regard Lord Moira received the order of the Garter, and in the same year was appointed governor-general and commander-in-chief of India. He landed at Calcutta, and assumed office in succession to Lord Minto in October 1813. He was now fifty-nine years of age. One of the chief questions which awaited him was that of relations with the Goorkha state of Nepaul. warlike little nation, failing to extend their conquests in the direction of China, had begun to encroach on territories held or protected by the East India Company ; especially they had seized the districts of Bootwul aud Seoraj, in the northern part of Oudh, and when called upon to relinquish these, they deliberately elected (April 1814) to go to war rather than do so, Lord Moira, having travelled tlirough the northern provinces and fully studied the question, declared war against Nepaul (November 1814). The enemy's frontier was 600 miles long, and Lord Moira, who

directed the plan of the campaign, resolved to act offen- sively along the whole line. It was an anxious undertaking, because the native states of India were all watching the issue and waiting for any serious reverse to the English to join against them, At first all seemed to go badly, as the British officers too much despised the enemy, and the Sepoys were unaccustomed to mountain warfare, and thus alternate extremes of rashness and despondency were exhibited. But this rectified itself in time, especially through the achievements of General (afterwards Sir David) Ochterlony, who before the end of 1815 had taken all the Goorkha posts to the west, and early in 1816 was advancing victoriously within 50 miles of Katmandoo, the capital. The Goorkhas now made peace; they abandoned the dis- puted districts, ceded some territory to the English, and agreed to receive a British resident. Ever since they have faithfully kept these terms ; the northern frontier of India

In 1782 he was |

The Goorkhas, a brave and.

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| has been securely fixed, and the Goorkhas have entirely

kept aloof from the machinations of disaffected native states. For his masterly conduct of these affairs Lord Moira was created Marquis of Hastiugs in 1816.

He had now to deal with internal dangers. A treacherous combination of Mahratta powers was constantly threatening the continuance of British rule, under the guise of plausible assurances severally given by the peshwah, Sindia, Holkar, and other princes. . At the same time the existence of the Pindhéree state was not only dangerous to the English, as being a warlike power always ready to turn against them, but it was a scourge to India itself. In 1816, however, the Pindhérees entered British territoryin the Northern Circars, where they destroyed 339 villages. On this, permission was obtained to act for their suppression. Before the end of 1817 the preparations of Lord Hastings were completed, when the peshwah suddenly broke into war, and the British were oppesed at once to the Mahratta and

Pindhdree powers, estimated at 200,000 men and 500 guns. "The whole was utterly shattered in a brief campaign! of four months (1817— 1818). The peshwah's dominion had been annexed, and those of Sindia, Holkar, and the rajah of Berar lay at the mercy of the governor-general, and were saved only by his exceeding and honourable moderation. There was at last, after sixty years from the battle of Plassy, no question of the supremacy of British power in India, now more perfectly established and more effectively dominant than that of Aurungzebe."? The Pindharees had ceased to exist, and peace and security had been substituted for misery and terror.

' It is a proud phrase to use," said Lord Hastings,® ' but it is a true one, that we have bestowed blessings upon millions. Nothing can be more delightful than the reports I receive of the sensibility manifested by the inhabitants to this change in their circumstances. The smallest detachment of our troops cannot pass through that district without meeting everywhere eager and exulting gratula- tions, the tone of which proves them to come from glowing hearts. Multitudes of people have, even in this short interval, come from the hills and fastnesses in which they had sought refuge for years, and have reoccupied their ancicnt deserted villages. The plough-share is again in every quarter turning up a soil which had for many seasous hever been stirred, except by the hoofs of predatory cavalry,"*

While the natives of India appreciated the results of Lord Hastings's achievements, the court of directors grumbled at his having extended the British territory. They also disliked and opposed his measures for introducing education among the natives and his encouraging the freedom of the press. Posterity has, however, vindicated the policy of Lord Hastings in all respects. In 1819 he obtained the cession by purchase of the island of Singapore. In finance his administration was very successful, as not-withstanding the expenses of his wars he showed an aunual surplus of two millions sterling. He laboured much at law reform, and he succeeded in greatly raising the status and character of the civil service of India. Lord and Lady Hastings by their stately and yet genial manners, and by their warm encouragement of literature and science, gave a high tone to the society of Calcutta, And he was the first governor-general to exhibit a personal interest in the exertions of the missionaries. Brilliant and beneficent as his career had been, Lord Hastings did not escape, any more

than Clive, Warren Hastings, or Lord Wellesley, the assaults of unjust detraction. His last years of office were embittered by the discussions on a matter very notorious

1 For the interesting details of this campaign, as well as of the war in Nepaul, see Prinsep's History of the Political and Military Trans- actions in India, during the administration of the Marquis of Hastings.

- *Meadows Taylor's Student's Manual of the History of India, p.*

595.

3 Reply to Address of Inhabitants of Calcutta ; see Asiatic Journal, February 1819.

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at the time, namely, the affairs of the banking-house of W. Palmer and Company. The whole affair was mixed up with insinuations against Lord Hastings, especially charging him with having been actuated by favouritism towards one of the partners in the firm. From imputations which were inconsistent with his whole character he has subsequently been exonerated. But while smarting under them he tendered his resignation in 1821, though he did not leave India till January 1823. He was much exhausted by the arduous and almost incredible labours which for more than nine years he had sustained. Among his charac- teristics it is mentioned that 'his ample fortune absolutely sank under the benevolence of his nature;" and, so far from having enriched himself in the appointment of governor- general, he returned to England in circumstances which obliged him still to seek public employment. In 1824 he received the comparatively small post of governor of Malta, in which island he introduced many reforms and endeared himself to the inhabitants, He died in 1826, leaving a request that his right hand should be cut off and preserved till the death of the marchioness of Hastings, and then interred in her coffin.

*No * Life" of the marquis of Hastings has appeared, but a diary of his first tours in India, written for his children, has been published, and affords interesting indications of his character. For further particulars of his career*

see the Asiatic Journal for Novem- ber 1823, and the Annual Biography and Obituary for 1828; and for details of his Indian administration see Prinsep's work cited above, Wilson's continuation of Mill's History of India, and other Indian histories. (A. GR.)

*HAT, a covering for the head worn by both sexes, and distinguished from the cap or bonnet by the possession of a brim. The modern hat can be traced back to the petasus worn by the ancient Romans when on a journey ; and hats with brims were also used, probably on like occasions, by the earlier Greeks. It was not till after the Norman conquest that the use of hats began in England. A "hatte of biever" about the middle of the 12th century was worn by some one of the '*nobels of the lande, mett at Clarendom ;" and Froissart describes hats and plumes which were worn at Edward's court in 1340, when the Garter order was instituted. In the 13th century the use of the scarlet hat which distinguishes cardinals was sanc- tioned by Pope Innocent IV, The merchant in Chaucer's Canterbury Tales had*

*'*On his head a Flaundrish bever hat ;"*

and from that period onwards there is frequent mention of "felt hattes," "'beever hattes," and other like names. Throughout medizval times the wearing of a hat was regarded as a mark of rank and distinction. The caprices of fashion in hats during the reign of Elizabeth may be understood from an extract from Stubbs's Anatomie of Abuses, published about 1585 : —

'Sometimes they use them sharpe on the crowne pearking up like the spire or shaft of a steeple, standing a quarter of a yard above the crowne of theire heads; some more, some lesse, as please the fantasies of their inconstant mindes. Othersome be flat, and broade on the crowne, like the battlements of a house. Another sorte have rounde crownes, sometimes with one kind of bande, sometimes with another ; now black, now white, now russed, now redde, now grene, now yellow; now this, now that; never content with one colour or fashion two daies to an end."

During the reign of Charles I. the Puritans affected a steeple crown and broad-brimmed hat, while the Cavaliers adopted a lower crown and a broader brim ornamented with feathers. Still greater breadth of brim and a

profusion of feathers were fashionable characteristics of the hats in the time of Charles II., and the gradual expansion of brim led to the device of looping or tying up that portion. Hence arose various fashionable "cocks" in hats, such as the "Monmouth cock," &c. ; and ultimately, by the looping up equally of three sides of the low-crowned hat, the cocked hat which prevailed throughout the 18th century was elaborated.

HAT—HAT

Since the beginning of the present century the cocked hat as an ordinary article of dress has disappeared. The Quaker hat, plain, low in crown, and broad in brim, which originated with the sect in the middle of the 17th century, is also now becoming uncommon. See CosTUME.

Hat Manuracture.—Until recent times hats were prin- cipally made by the process of felting, and as tradition ascribed the discovery of that very ancient operation to St Clement, he was assumed as the patron saint of the craft, and the annual festival of the trade continues to be held on St Clement's day, the 23d November. At the present day the trade is divided into two distinct classes. The first and most ancient is concerned with the manufacture of felt hats, and the second has to do with the recent but now most extensive and important manufacture of silk or dress hats. In addition to these there is the equally important manufacture of straw or plaited hats, which does not fall within the scope of this article ; and hats are occasionally manufactured of materials and by processes not included under any of these heads, but such manufactures do not take a large or permanent position in the industry.

Felt Hats.—As now made, felt hats are of three different kinds, plain soft, plain hard, and "napped" or "ruffed" felts. There isa great range in the quality of felt hats, the finer and more expensive qualities being made entirely of fur; for commoner qualities a mixture of fur and Saxony wool is used ; and for the lowest kinds wool alone is em- ployed. The processes and apparatus necessary for making hats of fur differ also from those required in the case of woollen bodies; and in large manufactories machinery is now generally employed for operations which at no distant date were entirely manual, In the smaller factories, and for special objects, the old hand processes are still in opera- tion, An outline of the operations by which the

old beaver hat was and to some extent yet is made will give an idea of the manual processes in making a fur napped hat, and tle apparatus and mechanical processes employed in making ordinary hard and soft felts will afterwards be noticed.

Hatters' fur consists principally of the hair of rabbits (technically called seth and hares, with some proportion of nutria, musquash, and beavers' hair; and generally any parings and cuttings from furriers are also used. Furs intended for felting are deprived of their long coarse hairs, after which they are treated with a solution of nitrate of mercury, an operation called carroting or secretage, whereby the felting properties of the fur are greatly increased. The fur is then cut by hand or machine from the skin, and in this state it isdeliveredto the hatmaker. Rabbits' fur for hat-making now comes in large quantities from the Australian colonies ; and it is also largely collected in the United Kingdom and in northern Europe. A considerable trade in rabbit fur for hat-making is maintained between Great Britain and the United States.

The old process of making a beaver hat is as follows. The materials of a proper beaver consist, for the body or foundation, of rabbits' fur, and for the nap, of beaver fur, although the beaver is often mixed with or supplanted by a more common fur. Such a hat may be regarded as the highest achievement of the hatter. In preparing the fur plate, the hatter weighs out a sufficient quantity

Rise T. of rabbit fur for a single hat, which is spread out and combined by the operation of bowing. The bow or stang ABC (fig. 1) is about 7 feet long, and it stretches a single cord of catgut D, which the workman vibrates by means of a wooden pin E, furnished witha half knob at each end. Holding the bow in his left hand, and the pin in his right, he causes the vibrating string to come in contact with the heap of tangled fur, which does not cover a space greater than that

of the hand. At each vibration some of the filaments start up to the height of a few inches, and fall away from the mass, a little to the right of the bow,

their excursions being restrained by a concave frame of wicker work called the basket. One half of the material

is first operated on, and by bowing and gathering, or a patting use of

the basket, the stuff is loosely matted into a triangular figure, about 50 by 86 inches, called a bat. In this formation care is taken to work about two-thirds of the fur down towards what is intended for the brim, which being effected, greater density is induced by gentle pressure with the basket. It is then covered with a wettish linen cloth, upon which is laid the hardening skin, a piece of dry half- tanned horse hide. On this the workman presses or bakes until the stuff adheres closely to the damp cloth, in which it is then doubled up, freely pressed with the hand, and laid aside. By this process, called basoning, the bat has become compactly felted and thinned toward the sides and point. The other half of the fur is next sub- jected to precisely the same processes, after which a cone-shaped slip of stiff paper is laid on its surface, and the sides of the bat are folded over its edges toits form and size. It is then laid paper-side downward upon the first bat, which is now replaced on the hurdle, and its edges are transversely doubled over the introverted side-lays of the second bat, thus giving equal thickness to the whole body. In this condition it is reintroduced between folds of damp linen cloth, and again hardened, so as to unite the two halves, the knitting together of which is quickly effected. The paper is now withdrawn; and the body in the form of a large cone is removed to the plank or battery room.

The battery consists of an open iron boiler or kettle A (fig. 2), filled with scalding hot water, with shelves, B, C, partly of mahogany and partly of lead, sloping down to it. Here the body is first dipped in the water, and then withdrawn to the plank to partly cool and drain, when it is unfolded, rolled gently with a pin tapering towards the ends, turned, and worked in every direction, to toughen and shrink it, and at the same time prevent adhesion of its sides. Stopping or thicken- ing the thin spots which now appear, on looking through the body,

is carefully performed by dabbing on additional stuff in successive supplies from the hot liquor with a brush frequently dipped into the kettle, until the body be shrunk sufficiently (about one half) and thoroughly equalized. When quite dried, stiffening is performed with a brush dipped into a thin

varnish of shellac, and rubbed into the body, the surface intended for the inside having much more laid on it than the outer, while the brim is made to absorb many times the quantity applied to any other part.

Ou being again dried, the body is ready to be covered with a nap of beaver hair. For this, in inferior qualities, the hair of the otter, nutria, or other fine fur is sometimes substituted. The requisite quantity of one or other of these is taken and mixed with a propor- tion of cotton, and the whole is bowed up into a thin uniform lap. The cotton merely serves to give sufficient body to the material to enable the workman to handle the lap. The body of the hat being damped, the workman spreads over it a covering of this lap, and by moistening and gentle patting with a brush the cut ends of the hair penetrate and fix themselves in the felt body. The hat is now put into a coarse hair cloth, dipped and rolled in the hot liquor until the fur is quite worked in, the cotton being left on the surface loose and ready for removal. The blocking, dyeing, and finishing processes in the case of beaver hats are similar to those employed for ordinary felts, except that greater care and dexterity are required on the part of the workmen, and further that the coarse hairs or kemps which may be in the fur are cut off by shaving the surface with a razor. The nap also must be laid in one direction, smoothed, and rendered glossy by repeated wettings, ironings, and brushings. A hat so finished is very dnrable, and it is much more light, cool, and easy-fitting to the head than the silk hat which has now so largely superseded it.

Till a comparatively recent date all attempts to apply machinery to the principal processes in felt hat-making resulted in failure. As is the case with many other labour-saving appliances of recent in- troduction, the first efficient machinery for felt hat-making was

devised in America, and from the United States the machine- making processes were introduced into England about the year 1858 ; and now in all large establishments machinery such as that alluded to below is employed. For the forming of hat bodies two kinds of machine are used, according as the material employed is fur or wool. In the case of fur, the essential portion of the apparatus used consists of a cone of copper of the size and form of the body or bat to be made, perforated all over with small

holes. The cone is inade to revolve on its axis slowly over an orifice under which there is a powerful fan, which maintains a strong inward draught of air through the holes in the cone. At the side of the cone, and with an opening towards it, is a trunk or box from which the fur to be made into a hat is thrown out by the rapid revolution of a brush- like cylinder, and as the cloud of separate hairs is expelled froin the trunk, the current of air being sucked through the cone carries the fibres to it and causes them to cling closely to its surface. Thus a coating of loose fibres is accumulated on 'the copper cone, and these are kept in position only by the exhaust at work under it. When sufficient fur a hat body has been deposited, a wet cloth is wrapped round it, over which an outer cone is slipped and the whole is removed for felting, while another copper cone is placed in posi- tion for continuing the work. The felting of fur bodies is princi- pally done by hand-labour, although machinery has recently been iitvoduced by which it is partly done. The bat or body of wool hats is prepared by first carding in a modified form of carding machine. The wool is divided into two separate slivers as delivered from the cards, and these are wound simultaneously on a double conical block of wood mounted and geared to revolve slowly with a reciprocating horizontal motion, so that there is a continual crossing and recrossing of the wool as the sliver is wound around the cone. This diagonal arrangement of the sliver is an essential feature in the apparatus, as thereby the strength of the finished felt is made equal in every direction ; and when strained in the blocking the texture yields in a uniform manner without rupture. The wool wound on the double block forms the material of two hats, which are separated by cutting around the median or base line, and slipping each half off at its own end. Into each cone of wool or bat an "'inlayer" is now placed to prevent the inside from matting, after which they are folded in cloths, and placed over a perforated iron plate through which steam is blown. When well moistened and heated, they are placed between boards, and subjected to a rub- bing action sufficient to harden them for bearing the subsequent strong planking or felting operations. The planking of wool hats is generally done by machine, in some cases a form of fulling mill being used ; but in all forms the agency is heat, moisture, pressure, rubbing, and turning.

When by thorough felting the hat bodies of any kind have been reduced to dense leathery cones about one-half the size of the origina]

| bat, they are dried, and, if hard felts are to be made, the bodies are

at this stage hardened or stiffened with a varnish of shellac. Next follows the operation of blocking, in which the felt for the first time assumes approximatcly the form it is ultimately to possess, For this purpose the conical body is softened in boiling water, and forcibly drawn over a hat-shaped wooden block. A string is passed round where the band is to be, and the brim is then flattened out from the string. Next follows the dyeing of the hat in a bath of suitable dyeing materials, according to the colour desired. In deal- ing with fine hats, each hat is separately dyed while on the block, but with commoner qualities it is the practice to dye before block- ing. The finishing processes include shaping on a block, over which crown and brim receive accurately their ultimate form, and pouncing or pumicing, which consists of smoothing the whole surface with emery or glass paper while the hat is still stretched on the block. The trimmer finally binds the outer brim and inserts the lining, after which the brim may get more or less of a curl or turn over according to prevailing fashion. Machines of American invention for blocking and pouncing have to some extent been introduced. '

Suk Hats.—The silk hat, which has now become co- extensive with civilization, is an article of recent introduc- tion. It was known in Florence about a century ago; but its manufacture was not introduced into France till about 1825, and its development has taken place entirely since that period. A silk hat consists of a light stiff body covered with a plush of silk, the manufacture of which in a brilliant glossy condition is the most important element in the industry; and in that manufacture the French are without equals. Originally the bodies were made of felt and various other materials, but now calico is almost exclu- sively used.

The calico is first stiffened with a varnish of Shellac, and then cut into pieces sufficient for crown, side, and brim. The side-piece is wound round a wooden hat block, and its edges are joined by hot ironing, and the crown-piece is put on and similarly attached to

the side. The brim, consisting of three thicknesses of calico eemented together, is now slipped over and brought to its position, and thereafter a

second side-piece and another crown are cemented on. The whole of the body, thus prepared, now receives a coat of size, and subsequently it is varnished over, and thus it is ready for the operation of covering. In covering this body, the under brim, gencrally of merino, is first attached, then the upper brim, and lastly the crown and side sewn together are drawn over. All these by hot ironing and stretching are drawn smooth and tight, and as the varnish of the body softens with the heat, body and cover adhere all over to each other without wrinkle or pucker. Dressing and polishing by means of damping, brushing, and ironing, eome next, after which the hat is "velured" in a revolving machine by the application of haircloth and velvet velures, which cleans the nap and gives it a smooth and glossy surface. The brim has only then to be bound, the linings inserted, and the brim finally curled, when the hat is ready for use.

In all kinds of hat-making the French excel, and in such centres as Anduze, Lyons, and Paris the trade is very ex- tensive and important. In the United Kingdom the felt hat trade is principally centred at Denton and other localities in the neighbourhood of Manchester, and in America the States of New York and New Jersey enjoy the greater part of the industry. The value of the hats annually exported from the United Kingdom somewhat exceeds £1,000,000 sterling. (5. PA.)

HATFIELD, or BisHor's HATFIELD, a quiet, old- fashioned market-town of England, in the county of Hertford, is prettily situated on the side of a hill, 177 miles N.N.W. of London by railway. The church of St Ethelreda dates its foundation from Norman times, though only a small portion of the original building is now stand- ing. Hatfield is the seat of a poor-law union embracing four parishes. The population of parish in 1871 was 3998. In the vicinity is Hatfield House, on the site of a palace of the bishops of Ely, which was erected about the beginning of the 12th century. In 1538 the manor was resigned to Henry VIII. by Bishop Goodrich, in exchange for certain lands in Cambridge, Essex, and Norfolk; and after that monarch the palace was succes- sively the residence of Edward VI. immediately before his accession, of Queen Elizabeth during the reign of her sister Mary, and of James I. The last-named exchanged it in 1607 for Theobalds, near Cheshunt, in the same county, an estate: of Sir Robert Cecil, afterwards earl of Salisbury, in whose family Hatfield House has since remained. The

west wing of the present mansion, built for Cecil in 1608-11, was destroyed by fire in November 1835, the dowager- marchioness of Salisbury perishing in the flames. The grounds surrounding the house are extensive and beautifully laid out.

HATHRAS, or Harras, a town in the Aligarh district, North-Western Provinces, India, in 27° 35' 31" N. lat., 78° 6 9" KE. long. It is well built, with numerous brick and stone houses, and is a prosperous trading centre. At the end of last century it was held by the Jat Thakur, Daya Ram, whose ruined fort still stands at the east end of the town, and was annexed by the British in 1803. A municipal hall and school-house stand upon the brink of a new tank ; and the town also contains a post-office and Government charitable dispensary. Since it came under British rule, Hathras has rapidly risen to commercial importauce, and now ranks second to Cawnpore among the trading centres of the Dod&b. The exports include coarse sugar, grain of all sorts, oil-seeds, cotton, and ght; and the imports embrace iron, metal vessels, European and native cloth, drugs, spices, and miscellaneous wares. Population (1872), 23,589, com- prising 21,121 Hindus and 2468 Mahometans.

HATTINGEN, a town of Westphalia, Prussia, in the government district of Arnsberg and the circle of Bochum, is situated on the river Ruhr, about 21 miles N.E. of Diisseldorf. It is the seat of a commission of justice, and possesses a good school, The manufactures comprise cloth,

woollen and silk goods, tobacco, iron, and steel. In the town are large iron-works, a brewery, and a brandy distil- lery. There are iron-stone and coal mines in the neigh- bourhood, and the scanty remains of the Isenburg, demo- lished in 1226. Hattingen was one of the Hanse towns of the Middie Ages. Its population in 1875 was 6995.

HATTO I. (c. 850-913), tenth archbishop of Mainz, was born of a Swabian family about the middle of the 9th century. Educated at the monastery of Ellwangen or at Fulda, he attracted the attention of the emperor Arnulf,

who in 888 made him abbot of Reichenau, in 889 abbot of Ellwangen, and in 891 archbishop of Mainz. During his reign Hatto acquired much ecclesiastical as well as political power. He presided over the council at Tribur or Teuver (895), at which the emperor and twenty-six or twenty-seven bishops attended, and was employed as am- bassador to Charles the Simple and the king of Lorraine at their conference at Saint Goar in 899. Twice he accom- panied Arnulf to Italy, in 894 and 896. On the death of Arnulf in 900, Hatto became regent and guardian of Louis, and in the contest with the dukes of Babenberg treaeher- ously betrayed into the emperor's hands Count Adalbert, who was one of their partisans. Under Jouis's successor, Conrad I., Hatto retained his influence, but he died in 913, two years after Conrad's accession. Another but less pro- bable account has it that he was killed at the battle of Heresburg in 912. Hatto was a zealous churchman and a bold and energetic statesman. By his influence the crown and the church combined to check the growing power of the great nobles. In a letter to Pope John IX.,, still extant, he defends the German bishops from certain charges made to the pope. 'There is a tradition, due probably to his ambition and violence, that his corpse was seized by the devil and thrown into the crater of Mount Etna. The tradition of the Mouse Tower on the Rhine at Bingen is connected with another Hatto, also archbishop of Mainz

(968-970).

HATVAN, a market-town in the county of Heves, Hungary, is situated on the left bank of the Zagyva, at the junction of the Pest-Miskolez, Hatvan-Rutka, and Hatvan- Szolnok lines of railway,'about 30 miles E.N.E. of Budapest, 47° 40'N. lat., 19° 41' E. long. Hatvan possesses a hand- some church and an elegant castle. There are two large cloth factories, and a court of assize is held there. Many of the inhabitants of the town and neighbourhood are employed in raising fruit and melons, in improving the breed of sheep and in tending large herds of horses, which eraze wild on the spacious communal pasture-lands. Cattle fairs are frequently held in the town, and the trade in horses is considerable. In 1870 the population amounted to 4018, for the most part Magyars by nationality and Roman Catholics by creed.

As a fortified place Hatvan rose to some importance in the Middle Ages. In July 1525 a diet of Magyar nobles was held there. Subsequent to the catastrophe at Mohacs (1526), Hatvan, along with many other Hungarian towns, fell into the hands of the Turks. After being besieged by the imperialists in 1594 and 1595, it was taken by them on the 3d September 1596. Iu 1678 it was almost completely destroyed by the Ottoman forces. On the 2d

April 1849 the Austrians were defeated by the Hungarians in a sanguinary engagement near the town.

HATZFELD (Hungarian, Zsombolya), a market-town in the county of Torontdl, Hungary, on the Austrian state line of railway, about 22 miles W. of Temesvar, 45° 48' N. lat., 20°44' E. long. The mostimportant buildings are the Roman Catholic church, the chateau of Count Csekonics, a district court-house, and the usual Government offices. The communal lands are large and very productive, more especially in wheat, barley, oats, Indian corn, and rape seed. The rearing of horses is extensively carried on. In 1870 the population amounted to 7981, for the most part Germans by nationality and Roman Catholics by creed.

HAU—HAU

HAUCH, Jowannes Carsten (1790-187 2), Danish poet, was born of Danish parents residing at Frederikshald in Norway, on the 12th of May 1790. In 1802 he lost his mother, and in 1803 returned with his father to Denmark. In 1807 he fought as a volunteer against the English invasion. He entered the university of Copenhagen in 1808, and in 1821 took his doctor's degree. He became the friend and associate of Steffens and Oehlenschlager, warmly adopting the new views about poetry and philo- Sophy. His first dramas, The Journey to Ginistan and The Power of Fancy, appeared in 1816 and 1817, and were followed by Flosaura ; but these works attracted little or no attention. Hauch therefore gave up all hope of fame

as a poet, and resigned himself entirely to the study of

science, to pursue which he went abroad. At Nice he had an accident which obliged him to submit to the amputation of one foot. He returned to

dramatic production, and published The Hamadryad, Bajazet, Tiberius, Gregory VIL., The Death of Charles V. (1831), and The Siege of Maestricht (1832). These plays were violently attacked by the best critical organs, and enjoyed no success. Hauch then turned to novel-writing, and published in succession four romances —Vithelm Zabern, 1834 ; Guldmageren, 1836; A Polish Family, 1829; and The Castle on the Rhine, 1845. In 1842 he collected his shorter Poems. In 1846 he was appointed professor of the Scandinavian languages in Kiel, but returned to Copenhagen when the war broke out in 1848. About this time his dramatic talent was at its height, and he produced one admirable tragedy after another ; among these may be mentioned Svend Grathe, 1841; The Sisters at Kinnekullen, 1849 3 Marsk Stig, 1850 ; Honour Lost and Won, 1851; and Tycho Brahe's Youth, 1852. From 1858 to 1860 Hauch was director of the Danish National Theatre; he produced three more tragedies—The King's Favourite, 1859 ; Henry of Navarre, 1863 ; and Julian the Apostate, 1868. In 1861 he pub- lished another collection of Poems, and in 1862 the histori- cal epic of Valdemar Atterdag. From 1851, when he succeeded Oehlenschliger, to his death, he held the

honorary post of professor of esthetics at the university of

Copenhagen. He died in Rome in 1872. Hauch was one of the most prolific of the Danish poets, and his writings are unequalin value. His lyrics and romances in verse are always fine in form and often strongly imaginative. In all his writings, but especially in his tragedies, he displays a Strong bias in favour of what is mystical and supernatural. Of his dramas JJarsk Stig is perhaps the best, and of his novels Vilhelm Zabern is admired the most.

HAUFF, WitHetm (1802-1827), a popular German novelist, was born at Stuttgart, 29th November 1809, Having lost his father, who was a Government official, at the age of seven, he repaired with his mother to Tiibingen, where he frequented the Schola anatolica. In 1818 he was sent to the Klosterschule at Blaubeuren, and two years later he entered the seminary of Tiibingen. After having com- pleted, in 1824, his philosophical and theological studies and taken his degree, he acted for two years as private tutor, and assumed, in January 1827, the editorship of the Morgenblatt. In the following month he married, and led a happy and quiet

life, which was ended by a fatal illness on 18th November of the same year. Hauff's literary activity is comprised within the short space of about two years. In his Mérchenalmanach for 1826 he published the fairy Tales he used to relate to his pupils during his tutor- ship. They were distinguished by an originality of concep- tion, a playful though somewhat fantastic humour, and an elegance of style, not usually met with in similar produc- tions. Those fanciful tales founded his fame as a narrator, and form, together with his subsequent novels, several of which belong to the same species, the basis of his per-

manent reputation as an author. His next publication, Mittheilungen aus den Memotren des Satans, " Extracts from the Memoirs of Satan" (2 vols, 1826-27), was of a fragmentary kind, but gave additional proof of his talent as a humorist. In 1826 he wrote a novel—Der Mann im Monde, "The Man in the Moon"—with the intention of satirizing and parodying the sentimental Sensualism of Clauren ; but in the course of composition the projected parody became a regular imitation, and, as he issued the novel under the name of that romancer, the latter brought an action against him for the abuse of his name, and gained his lawsuit. Hauff succeeded, however, in morally annihilat- ing that maudlin narrator by his witty Controverspredigt, "' Controversial Sermon" (1826). Animated by the genius of Sir Walter Scott, Hauff wrote a historical romance called Lichtenstein (1826), which illustrated the most interesting period in the history of Wiirtemberg, and, being one of the first historical German novels, acquired, in spite of its weakness as a literary composition, great popularity through- out Germany. His fanciful work, Phantasien im Bremer Rathskeller (1827), is pervaded, especially in the first portion of the book, by an exuberant spirit of conviviality, which exercises a cheering effect on the reader; but his most perfect fiction is the Bettlerin vom Pont-des-Arts. Hauff's works have gone, collectively and separately, through many editions, and some of his shorter poems have become regular " Volkslieder."

HAUG, Jouann Curistory Friepricr (1761-1829), a German epigrammatist, was born March 13, 1761, at Niederstotzingen in Wiirtemberg, and received

his early training from his father, who was. afterwards professor and preacher at Stuttgart. From the gymnasium in this city Haug passed in 1776 to the Prince Charles academy, where he had Schiller as a fellow scholar, and, after finishing the philosophical and philological course, he devoted himself to the study of legal science with so much success that he attracted the attention of the duke. In 1784 he was appointed secretary of the private closet to his patron, in 1791 received the title of curial and palatine count, in 1794 became the duke's private secretary, and in 1817 was made Hofrath or aulic councillor and librarian of the public library at Stuttgart. In 1827 he travelled through northern Germany, and on 30th J anuary 1829 he died. Haug began his career as an author by publishing Sinngedichte von Friedrich Hophthalmos (Frankfort, 1791), the pseud- onym Hophthalmos being a jocular Greek equivalent of his own name (Aug, the eye, equal to Ophthalmos, and there- fore Haug equal to Hophthalmos),

Among his later works, which are as often characterized by a love of fun as by power of wit, it is enough to mention Epigramme und vermischte Gedichte, Berlin, 1805; Hundert Epigramme auf Arete die Keine sind, Zurich, 1806 ; Epigrammatische Spiele, 1807 ; Tasch- enbuch dem Bacchus und Iocus geweth, Stuttgart, n.d.; Magische Laterne,' Briinn, 1820; Panorama der Laune und des Witzes, Tubingen, 1826; and, perhaps more famous than any, Zwethundert Hyperbeln auf Herrn Wahls ungeheure Nase, Stuttgart, 1804, new edition, Briinn, 1822. Along with Weisses, Haug published Epi- grammatische Anthologie, Stuttgart, 1807-1809, 10 vols. A selcc- tion from his poems appeared at Hamburg, 1827, 2 vols.

HAUG, Martin (1827-1876), Orientalist, was born at Ostdorf near Balingen, Wiirtemberg, January 30, 1827. As a self-taught Jad he became a pupil in the gymnasium at Stuttgart at a comparatively late age; and in 1848 he entered the university of Tiibingen, where he devoted him- self to the study of the Oriental languages, and especially of Sanskrit under Roth. He afterwards for some time attended the lectures of Ewald and Benfey in Gottingen, and finally '"habilitated " as a privat-docent at Bonn. In 1856 he removed to Heidelberg as collaborateur in the pre- paration of Bunsen's Bibelwerk; and in 1859 he accepted an invitation to India, where he became Superintendent of Sanskrit studies and professor of Sanskrit in Poona. Thero

his previous acquaintance with the Zend language and literature enabled him to associate with the Parsees on such terms as affordéd the best opportunities for perfecting his knowledge in this department. The result of his researches was the volume of Lssays on the Sacred Language, Writings, and Religion of the Parsees (Bombay, 1862). After a resi- dence of six years in India, he was compelled by domestic circumstances to return to Wiirtemberg in 1865; from Stuttgart he was called to Munich as first professor ordi- narius of Sanskrit and comparative grammar in 1868, He died at Ragatz in Switzerland on the 3d of June 1876.

Besides the Essays on the Parsces, of which a new edition, by West, greatly enriched from the posthumous papers of the author, appeared in 1878, Haug published a number of works of consider- able importance to the student of the literatures of ancient India and Persia. They include Die Pehlewisprache u. der Bundeheseh (1854); Die Schrift wu. Sprache der zweiten Keilschriftgattung (1855); Die fiinf Gathas, edited, translated, and expounded (1858-60); an edition with translation and explanation of The Attareya Brah-

mana of the Rigveda (1863); A Lecture on an original Speceh of

Zoroaster (1865); An old Zend-Pahlavi Glossary (1867); Ueber den Charakter der Pehlewisprache (1869); Das 18t Capitel des Wendidad (1869); Ueber das Ardai-Viraf-nameh (1870); An old Pahlavi-Pazand Glossary (1870); Vedische Riithselfragen u. Rithselspriiche (1875).
HAUGE, Hans Nietsen (1771-1824), founder of a religious sect within the Lutheran Church of Norway and Denmark, was born in the former country, in the parish of Thund, April 3, 1771. With the aid of various religious works which he found in his father's house, he laboured to supplement the scanty education which he had received as a peasant's son. In his twenty-sixth year, believing him. self divinely commissioned, he began to preach in his native parish and afterwards throughout Norway. In 1800 he passed to Denmark, where, as at home, he gained many followers and assistants, chiefly among the lower orders. Proceeding to Christiansand in 1804,

Hauge set up a printing-press to disseminate his views more widely, but was almost immediately arrested for holding illegal religiot meetings, and for insulting the regular clergy in his books, all of which were confiscated. After being in confinement for ten years, he was released in 1814 on pay- ment of a fine, and retiring to an estate at Breddwill, near Christiania, he died there, March 29, 1824. His adherents, called Haugianer or Leser (i.c., Readers), are still to be found in the south of Norway. By his writing and preach- ing he unquestionably did much to revive the spiritual life of the northern Lutheran Church. Though he cannot be said to have rejected any article of the Lutheran creed, the peculiar emphasis which he laid upon the evangelical doctrines of faith ~~*and grace involved considerable anta*~~ *gonism to the rationalistic or sacerdotal views commonly held by the established clergy. Hauge's principal writings are Forsig til Afhandeling om Guds Visdom, 1796; Anwisning til nogle mérkelige Sprog % Bibelen, 1798; Forklaring over Loven og Evangelium, 1803. For an account*

of his life and doctrines, see Chr. Bang's Hans Nielsen Hauge og hans Samtid, Christiania, 1875.

HAUPT, Morrrz or Moriz (1808-1874), one of the principal representatives at once of classical and of verna- cular philology in Germany, was born at Zittau, in Lusatia, July 27, 1808. His early education was mainly conducted by his father, Ernst Friedrich Haupt, burgomaster of Zittau, a man of good scholarly attainment, who used to take pleasure in turning German hymns or Goethe's poems into Latin, and whose memoranda have been employed by Freytag in the 4th volume of his Bilder aus der deutschen Vergangenheit. From the Zittau gymnasium, where he spent the five years 1821-1826, partly under the tuition of Lindemann, Haupt removed to the university of Leipsic with the intention of prosecuting theology; but the natural bent of his mind and the influence of Professor G. Hermann soon turned all his energies in the direction of what were to be his life-studies. On the close of his university course

(1830) he returned to his father's house, and the next seven years were devoted to quiet work not only at Greek, Latin, and German, but at Old French, Provengal, and Bohemian. In 1834 he became acquainted with

Endlicher, Karajan, and F. Wolff at Vienna, and formed with Lacl- mann at Berlin a friendship which had great effect on his intellectual development. In September 1837 he " habili- tated" at Leipsic as privat-docent, and his first lectures, dealing with such diverse subjects as Catullus and the Nibelungenlied, indicated the twofold direction of his labours. A new chair of German language and literature being founded in his behoof, the new teacher received in succession the title of professor extraordinarius (September 1841) and professor ordinarius (November 1843) ; and in 1842 he married Louise Hermann, the daughter of his master and colleague. But the peaceful and prosperous course opening out before him at the university of Leipsic was brought to a sudden close. Having taken part in 1849 with Otto Jahn and Theodor Mommsen in a political agi- tation for the maintenance of the imperial constitution, Haupt was deprived of his professorship by a decree of the 22d April 1851. Two years later, however, he was called to succeed Lachmann at the university of Berlin; and at the same time the Berlin academy, which had made him a corresponding member in 1841, elected him an ordinary member. For one and twenty years he continued to hold a prominent place among the scholars of the Prussian capital, making his presence felt, not only by the prestige of his erudition and the clearness of his intellect, but by the tirelessness of his energy and the ardent fearlessness of. his temperament. His death, which took place'with very little warning, February 5, 1874, was the result of heart disease. Haupt's critical work is distinguished by a happy union of the most painstaking investigation with intrepidity of conjecture, and while in his lectures and addresses he was frequently carried away by the excitement of the moment, and made sharp and questionable attacks on his opponents, in his writings he exhibits great self- control. The results of many of his researches are altogcther lost, because he could not be prevailed upon to publish what fell much short of his own high ideal of excellence. To the progress of classical scholarship he contributed by Qucestiones Catulliane (1837), Observationes Critiec (1841), and editions of Ovid's Halicutiea and the Cynegetiea of Gratius and Nemesianus (1838), of Catullus, Tibullus, and Propertius (3d ed., 1868), of Horace (3d ed., 1871), and of Virgil (2d ed., 1873). As early as 1836 he with Hoffmann von Fallersleben started the Altdeutsehe Blatter, which in 1841 gave place to the Zeitschrift fiir deutsches Alterthum, of which he continued editor till his death. Hartmann von Aue's Erec (1839) and his Lieder, Biichlein, and Der' arme Heinrich

(1842), Rudolf von Ems's Guter Gerhard (1840), and Conrad von Wiirzburg's Engelhard (1844) are the principal German works which he edited. To form a collection of the French songs of the 16th century was one of his favourite schemes, but a little volume published since his death, Franzésische Volkslieder (1877), is the only monument of his labours in that direction. Three volumes of his Opuscula have appeared (Leipsic, 1875-1877). See Kirchhoff, "Gediichtnissrede," in Abhandl. der Kénigl. Akad. der Wissenschaften zu Berlin, 1875 ; and Otto Belger, Moriz Haupt als Lehrer, 1879. HAUPTMANN, Morrrz (1792-1868), although a com- poser of ability, was of infinitely greater importance as a writer on the theory of music. He was born at Dresden, October 13, 1792, and studied music under Scholz, Lanska, Grosse, and Morlacchi, the rival of Weber. Afterwards he completed his education as a violinist and composer under Spohr, and till 1820 held various appoint- ments in private families, varying his musical occupations with mathematical and other studies bearing chiefly on acoustics and kindred subjects. For a time also Haupt- mann was employed as an architect, but all other pursuits gave place to music, and a grand tragic opera, Mathilde, belongs to the period just referred to. In 1822 he entered the orchestra of Cassel, again under Spohr's direction, and it was then that he first taught composition and musical theory to such men as Ferdinand David, Burgmiiller, Kiel, and others. His compositions at this

time chiefly consisted of motets, masses, cantatas, and songs. His opera Mathilde was performed at Cassel with great success. In 1842 Hauptmann obtained the position of cantor at the Thomas-school of Leipsic (long previously occupied by the great Johann Sebastian Bach) together with that of professor at the conservatoire, and it was in this capacity that his unique gift as a teacher developed itself and was acknowledged by a crowd of enthusiastic and more or less distinguished pupils. He died on January 3, 1868, and the universal regret felt at his death at Leipsic is said to have been all but equal to that caused by the loss of his friend Mendelssohn many years before. Hauptinann's compositions are marked by symmetry and perfection of workmanship rather than by spontaneous invention.

Amongst his vocal eompositions—by far the most importent portion of his work—may be mentioned two masses, choral songs for mixed voices (Op. 32, 47), and numerous part songs. The re- sults of his scientific research were embodied in his book Die Natur der Harmonik und Metrik (1853), a standard work of its kind, in which a philosophic explanation of the forms of music is attempted.

HAURAN. See Baswan.

HAUSER, Kaspar, a German youth whose life was remarkable from the circumstances of apparently inexplic- able mystery in which it was involved. He appeared on May 20, 1828, in the streets of N uremberg, dressed in the garb of a peasant, and with such a helpless and bewildered air that he attracted the attention of the passers-by. In his possession was found a letter purporting to be written by a poor labourer, stating that the boy was given into his custody on the 7th October 1812, and that according to agreement he had instructed him in reading, writing, and the Christian religion, but that up to the time fixed for relinquishing his custody he had kept him in close confine- ment, Along with this letter was enclosed another pur- porting to be written by the boy's mother, stating that he was born on the 30th April 1812, that his name was Kaspar, and that his father, formerly a cavalry officer in the 6th regiment at Nuremberg, was dead. The appear- ance, bearing, and professions of the youth corresponded closely with these credentials. He showed a repugnance to all nourishment except bread and water, was seemingly ignorant of outward objects, wrote his name as Kaspar Hauser, and said that he wished to. be a cavalry officer like his- father. For some time he was detained in prison at Nuremberg as a vagrant, but on July 18, 1828, he was delivered over to the care of Professor Daumer, who under- took to be his guardian and to take the charge of his cduca- tion. On October 17, 1829, he was found to have received a wound in the forehead, which according to his own state- ment had been inflicted on him by a man with a blackened face. Having on this account been removed to the house of a@ magistrate and placed under close surveillance, he was visited by Earl Stanhope, who became so interested in his history that he seut him to Ansbach to be educated. After this he became clerk in the office of Feuerbach,

resident of the court. of appeal, and, his strange history was almost forgotten by the public when the interest in it was suddenly revived by his death on the 14th December 1833 from a decp wound on his left breast. He affirmed that the wound was inflicted by a stranger, but many believed it to be the work of his own hand, and that he did not intend it to be fatal, but only so severe as to give a sufficient colouring of truth to his story.

In 1830 a pamphlet was published at Berlin, entitled Kaspar Hauser nicht unwahrseheinlich ein Betriiger; but the truthfulness of his statements was defended by Daumer, who published A/ittheil- ungen tiber Kaspar Hauser (N uremberg, 1832), and Enthiillungen iiber Kaspar Hauser (Frankfort, 1859) ; as well as Kaspar Hauser, sein Wesen, seine Unschuld, &e. (Regensburg, 1873), in answer to

Meyer's Authentische Mittheilungen tiber Kaspar Hauser (Ansbach,

1872).

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the case by his pamphlet Kaspar Hauser, Beispiel eines Verbreehens am Seelentleben (Ansbach, 1832), and Earl Stanhope also took part in the diseussion by publishing Materialien zur Geschichte K. Hausers (Heidelberg, 1836). The theory of Daumer and Feuer- bach was that the youth was the son of the grand-duke Charles of Baden, and that he had been kidnapped by the countess of Hoeh- berg in order to secure the succession to the children of the grand- duke Charles Frederick; but this theory was set aside in 1875 by the publication in the Augsburg Allgemeine Zeitung of the official record of the baptism, post-mortem examination, and burial of the heir supposed to have been kidnapped. See Kaspar Hauser und sein badrsches Prinzenthum (Heidelberg, 1876).

HAUY, Rent Jusr (1743-1822), an eminent French mineralogist, commonly styled the Abbé Haiiy, from being an honorary canon of Notre Dame, was born at St Just, in the department of Oise, February 28,1743. His parents were in a humble rank of life, and were only enabled by the kindness of friends to educato their son. He was sent to Paris to the college of Navarre, and afterwards to that of Lemoine, where he finished his course amid

incredible privations and difficulties. He escaped from these when, in 1764, he was himself appointed one of the teacliers in the first of the above-named colleges. He began to devote his leisure hours to the study of botany ; but an accident directed his attention to another field in natural history. Happening to let fall a beantiful specimen of calcareous spar belonging to a friend, he discovered, by examining the fragments, the geometrical law of crystallization. By experimenting on a hexahedral crystal of this substance, he found that it could be so dissected, by dividing it by planes parallel to certain edges, as to exhibit a rhombo- hedral nucleus, and, by extending his experiments, he farther showed that the same result could be obtained from mechanical division of every crystal of the same species. This led him to the theory that crystals are composed of what he called "integrant molccules," which he held had each the same shape as the respective nuclei got at by mechanical division. To obtain the different crystalline forms these molecules were supposed to be built up in layers round the nucleus, each layer diminishing regularly in the number of rows of molecules, and the rows at the same time diminish- ing in the number of molecules according to the nature of the crystal. A full account of his mathematical theory of this subject is given by Haiiy in his Traité de Minéralogie (see CrysTaLLocRApuy). Daubenton and Laplace immedi- ately recognized the scientific value of the discovery, which, when communicated to the Academy, secured for its author a place in that society. Besides the important service which he rendered to crystallography, Hatiy also greatly increased our knowledge of pyro-electricity. He demon- strated by experiment in the case of tourmaline that the positive and negative charges of electricity at the re- spective ends of the crystal diminish rapidly as we approach the middle point, where they disappear. He showed also that each particle of a broken pyro-electric crystal itself exhibits polarity ; and he was likewise the first to. observe that, in all minerals, the pyro-electric state has an important connexion with the want of symmetry of the erystals. In tourmaline, for instance, he found the vitreous charge always at the summit with six, and the resinous at thesummit with three faces (see ELrcrriciry). When the Revolution broke out, Haiiy was thrown into prison, and his life was even in danger, when he was saved by the intercession of Geoffroy Saint-Hilaire. Under Napoleon he became professor of mineralogy at the museum of natural history. He also obtained other scientific preferment, of which he was deprived by the feeble Government of the Restoration, though

his royalism had been a serious bar to his promotion under the empire. His latter days were consequently clouded by the poverty which had threatened to blight his early career. But the courage and high moral

Feuerbach awakened considerable psychological interest in | qualities which had helped him forward in his youth did

not desert him in his old age; and he lived cheerful and respected till his death, June 3, 1822.

The following are his principal works :—Zssai d'une Théorie sur la Structure des Cristaux, 1784; Exposition raisonnée de la Théorie de PElectricité et du Magnétisme, apres les Prineipes d' Afpinus, 1787; De la Structure econsidérée comme Caractere Distinetif des Minéraux, 1798; Exposition abrégée de la Théorie de la Strueture des Cristaux, 1793; Extrait dun Traité Elémentaire de Minéralogie, 1797; Traité de Minéralogie, 1802, 4 vols., 2d ed.; Traité Elémen- taire de Physique, 1808, 1806, 2 vols.; Tableau Comparatif des Résultats de la Ortstallographie, et de? Analyse Chimique relative- ment & la Classification des Minéraux;, Traité des Pierres Précieuses, 1817; Traité de Cristallographie, 1822, 2 vols, He also contri- buted papers to various scientific journals, particularly the Journal ' Histoire Naturelle, Annales de Chimie, Journal de Physique, Magasin Eneyclopédique, Annales du Muséum d@' Histoire Naturelle, and Journal des Mines.

HAVANA, Havannan, or Habana, more fully San Cristobal de la Havana, the capital of Cuba, and one of the principal seats of commerce in the New World, is situated on the northern coast of the island in 23° 9' 24" N. lat. and 82° 22' 35" W, long, From the sea it presents a picturesque appearance. The background is indeed tame ; but the long lines of fortifications, the church-towers, and the shipping relieve the somewhat tawdry effect of tho gaily coloured houses, 1702, have been almost entirely demolished since 1863, it is still usual to speak of the intramural and the extramural city. The former, lying close to the harbour, has streets of the

narrowest possible description consistent with the existence of wheel traffic. The latter has been laid out on a spacious plan, with wide thoroughfares frequently fringed with trees, Most of the houses are built of solid stone and have flat roofs, after the manner in vogue in southern Spain, and, as the erection of wooden buildings has heen illegal since 1772, it is only in the suburban districts that they are at all common. The lavish use of white marble in the decoration both of shops and dwelling-houses is one of the peculiarities of the popular taste; and it is worthy of remark that, though the native quarries would supply what is wanted, the marble is brought from Genoa. Cafés, restaurants, clubs, and casinos are both exceedingly numerous and largely frequented, forming a good indication of that general absence of domestic life among the white population which surprises the European visitant, Havana is still, as of yore, a city of smells and noises, There is no satisfactory cleaning of the streets or draining of the sub- soil, and the harbour is visibly rendered foul by the impuri- ties of the town, Victorias,;—of which it is the Cuban boast that there are 6000,—volantes, and other vehicles are driven through the thoroughfares with the utmost reckless- ness; and tramways and railways in the American fashion contribute to the confusion.

The principal defences of Havana are the Castillo de la Punta, to the west of the harbour entrance, the Castillo del Morro and San Carlos de la Cabaiia to the east, the Santo Domingo de Atares, which lies at the head of the western arm of the bay and commands both the city and the neigh- bourhood, and the Castillo del Principe, situated on an eminence to the west, and forming the terminus of the great Paseo Militar. El Morro, as it is popularly called, was first erected in 1589, but additions have been frequently made. La Punta, a much smaller fort, is of the same period. The castle of Atares dates from about 1763, when the Conde de Ricla was governor of the island. Cabafia, which alone has accommodation for 4000 men, fronts the bay for a distance of 800 yards, and is defended on the land side by three bastions. To the east there lies a smaller fort, No. 4, or San Diego, on a hill about 100 feet high.

Of the churches in the city, which number more than a score, the most noteworthy is the cathedral erected in 1724 by the Jesuits. Externally it is

plain though symmetrical ; but within it has richly frescoed walls, a floor of variegated

Though the walls, completed in |

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marble, and costly altars. In the wall of the chancel, a second-rate medallion and a sorrier inscription distinguish the tomb of Columbus, whose remains were removed thither in 1796. It is enough to mention the churches of San Juan de Dios, dating from 1573, Santa Catalina (1658), San Agostino (1608), and San Felipe, which possesses a large library. Of monasteries and nunneries there is of coursé no lack; and the same may be said of charitable institutions. The most important of the seven hospitals is the Real Casa de Beneficencia, founded about 1790, and

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Plan of Havana,

1 Prison, 5. University, 9. Military Hospital. 2. Circus. 6. Mathematical University. | 10. Theatres.

3. Cathedral. 7. Marine Post-Office. 11. Lancers' Barracks. 4. Exchange. 8. Public Library, 12. Bencficencia.

church of San Francisco), and the maestranza or lead- quarters of the artillery, Of the theatres, which have still to compete with the bull-ring and the cock-pit, the most im- portant is the Tacon, erected in 1838, and capable of accom- modating about 3000 persons. The promenades, drives, and public gardens form a notable feature of Havana: it is sufficient to mention the Plaza de Armas, with a statue of Ferdinand VII. ; the Prado or Paseo Isabel, a long and handsome boulevard laid out in the 18th century; the Campo del Marte or drill-park; the Parque Isabel, the Paseo Tacon, the

botanical gardens, and the gardens of Los Molinos, the suburban residence of the captain-general. The palm-tree avenues of Los Molinos are unusually fine. Along the borders of the bay there are several fine embank- ments, of which the best is perhaps that called either the Salon O'Donnell or the Alamada de Paula. In the coral rock of the coast sea-baths have been excavated, so that the bathers may run no risk from the sharks; each apart- ment is about 12 feet square and 6 or 8 feet deep, and the water enters by two port-holes. The city is supplied with water from the river Chorrera by an aqueduct (Canal Isabel II.) constructed by Antonelli under Philip II., and

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the number of fountains is considerable. The markets—of which the most noteworthy are the Mercado de Cristina, erected in 1836, and the Mercado de Tacon or Plaza de Vapor—are abundantly stocked with fruits and vegetables. Several of the suburban villages (e.g., Chorrera, Guanaba- conda) aro attractive places of resort.

The bay of Havana makes one of the finest harbours in the world, easy of access, spacious enough to contain about 1000 large vessels, deep enough to allow them to come close up to the wharves, and, except in the case of a hurri- cane, well protected on all sides. The entrance, encum- bered by neither bar nor rock, is 980 feet wide and 4200 feet long. Within, the bay breaks up into three distinct arms, named respectively Marimalefia or Regla Bay, Guasabacoa Bay, and El Fondo or Bay of Atares. The wharves are well built, and a good floating dock is main- tained by a private company. On the left hand of the entrance stands a lofty lighthouse tower.

In 1865 1950 vessels entered with a burthen of 686,644 tons; in 1873 2194 vessels with a burthen of 921,632 tons ; and in the first six months of 1878 741 vessels with a byrthen of 449,785 tons. The average number of vessels annually in the ten years from 1864 to 1873 was 1981 (771,196 tons), and of this average 647 (324,373 tons) were American, 689 (190,231 tons) Spanish, 384 (131,216 tons) British, 55 (45,218 tons) French, 55 (18,200 tons) N orwegian, and 32 (31,693 tons) German.

In spite. of high tariffs and civil wars, and the competition of Matanzas, Cardenas, Cienfuego, and other Cuban ports opened ta foreign trade in modern times, the commerce of Havana continues to inerease. As indicated by the statistics just quoted, the chief foreign customers are Britain and the United States 3 but, while the latter are gradually Talgings a greater proportion of the trade, the British interest is gradually diminishing. The two staple articles of export are sugar and tobacco-wares. While the average export of sugar for the first ten years of the century was only 177,998 boxes (61,199,200 Ib), by 1855 it had reached 965,677 boxes (386,270,800 Ib), and by 1878 145,601 boxes, 102,786 hogsheads, and 91,974 tons, or a grand total of nearly 408 millions of tb. In 1867 there were exported 7,716,802 ib of tobacco and 199,027 millions of cigars, and the corresponding numbers for 1878 were 13,864,800 ib and 174,638 millions. Other exports of importance are rum, wax, ad honey. The nature and quantities of the imports on an average of the ten years 1868 to 1877 are 295,202 quintals (100 ib each) of jerked beef, 134,203 quintals of cod-fish (61,576 from Europe, and 41,019 from United States), 359,925 barrels of flour, 627,786 quintals of rice (mainly from the East Indies), 143,035 quintals of lard (from tho United States), 85,503 pipes of wine, 145,539 tons of coal, 344,095 jars of olive oil, and 92,857 quintals of coal-oil.

The staple manufacturing industry of Havana is that of tobacco. Of the cigar factories, more than a hundred may be reckoned as of the first class. The Royal and Imperial Factory of La Honradez, which occupies a whole square, and is considered one of the great sights of the city, produces daily 2,532,000 cigarettes. Besides the making of boxes and barrels, and other articles necessarily involved in its sugar and tobacco trade, Havana also prosecutes to some extent the building of carriages and ships, and the manufacture of iron and machinery ; but the weight of taxation is too great to allow the development of any business requiring great capital. There were six banks in the city in 1877, the most important being the Spanish Bank, through which all the Government paper is issued.

Havana has steam communication several times a week with New York ; onee a week with Baltimore, Philadelphia, and New Orleans ; and about as frequently with several ports in England, Spain, and France. It is the terminus of a railway system which reaches Cardenas, Cienfuego,

Matanzas, Batabano, &c.; and short lines run out to the Bay of Havana and Marianas. Telegraphs radiate to all parts of the island ; and a submarine eable to Key West forms part of the line of communication between Aspinwall and New York.

The population of Havana and its suburbs was stated at 139,996 in 1817, at 196,994 in 1841, at 203,676 in 1863, and at 169,184 in 1871. Of this last number 108,754 were whites, 27,623 free negroes, mulattos, &e., and 22,807 slaves, By 1873 the total had reached, it is said, 230,000. None of these statistics can be received with much confidenee as to their accuracy. Ameng the white population the proportion of males to females is extraordinarily high : according to the official returns, there die annually 3682 white males to 1204 white females. The average rate of mortality is 27 per thousand annually. Foreigners are subject to yellow fever, especially from June to September.

Havana, originally founded by Diego Velasquez in 1515 on an un- healthy site near the present harbour of Baracon on the south eoast, was removed to its actual position about 1519, and soon began to be

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considered ono of the most important places in the New World. In 1528 the bueeancers laid the settlement in ashes, but it was soon after restored by Da Soto, who built the fortress of La Fuerza. The residence of the eaptain-general was transferred to Havana from Santiago de Cuba in 1551; and in 1589, to protect the city, which had been plundered by the pirate Jacob Sores in 1555 and threatened by Drake in 1585, Philip II. of Spain ordered the erection of the Bateria de la Punta and the castlo of El Morro or Los Tres Reyes. In tho course of the 17th century the port became the great rendez- vous for the gold-ships of Spain, and the commercial centro of tho Spanish possessions in America. The En glish under Admiral Pocock and the duke of Albemarle captured Havana in 1762, but it was restored to the Spaniards on 10th Feb. 1763, in exchange for tho Floridas, The Gaceta de la Habana, the first paper published in Cuba, appeared in 1782. In1771 the port, which had formerly been, liko the rest of Cuba, monopolized by Seville and Cadiz, was declared open to all nations in regard to certain articles of trade ; and this liberty was extendod in 1818 to all goods whatsoever.

During tho despotieo-paternal administration of Tacon many improvements were introduced at Havana: the railway from Havana to Guines was commenced in 1835 ; a ferry between the city and the suburb of Regla was set on foot in 1837 ; and night watehmen, a police-force, and a fire-brigade were established. The first line of steamships from Cadiz to Havana dates from 1850. Like the rest of Cuba the city has frequently suffered severely from hurricanes, the most violent being those of 1768 (St Theresa's), 1810, and 1846.

See the works referred to under Cua,

HAVELBERG, an ancient town of Brandenburg, Prussia, in the government district of Potsdam and the circle of Westpriegnitz, is situated on the Havel, about 63 miles from its junction with the Elbe. The nearest station is Glowen (6} miles), on the Berlin and Hamburg Railway. The town is built partly on an island in the Havel and partly on hills on the right bank of tho river, on one of which stands the fine cathedral. Tho two parts, which are con- nected by a bridge, were incorporated as one town in 1875. Havelberg is the seat of a commission of justice. The in- habitants are chiefly engaged in farming, tobacco and pin manufacturing, sugar-refining, and shipbuilding, and in the timber trade. Population in 1875, 6907,

Otto I. founded a bishopric at Havelberg so early as 946; the bishop, however, generally resided at Plattenburg or Wittstock, a few miles to the north. In 1548 the bishoprie was reduced, and the cathedral passed to the Protestant Church and retained its endowments till the edict of 1810, by which all former ecclesiastical possessions were assumed by the crown. The final secularization was delayed till 1819. Havelberg was formerly a strong fortress, but in the Thirty Years' War it was taken from the Danish by the imperial troops in 1627. Recaptured by the Swedes in 1631, and again in 1635 and 1636, it was in 1637 retaken by the Saxons under Klitzeng, It suffered severely from a conflagration in 1870,

HAVELOCK, Sir Henry (1795-1857), an eminent British soldier, was the second of four brothers (all of whom entered the army), and was born at Ford Hall, Bishop-Wearmouth, Sunderland, on the 5th of April 1795. His parents were William Havelock, a wealthy shipbuilder in Sunderland, and Jane, daughter of John Carter, solicitor at Stockton-on-Tees, When about five years old Henry accompanied his elder brother William to Mr Bradley's school at Swanscombe, whence at the age of ten he removed for seven years to Charterhouse School. In accordance with the desire of his mother, who had died in 1811, he entered the Middle Temple in 1813, studying under Chitty the eminent special pleader. His legal studies having been abridged by a misunderstanding with his father, he in 1815 accepted a second lieutenancy in the Rifle Brigade (95th), procured for him by the interest of his brother William. During the following eight years of service in Britain

he read extensively and acquired a good acquaintance with the theory of war. In 1823, having exchanged into the 21st and thence into the 13th Light Infantry, he followed his brothers William and Charles to India, first qualifying himself in Hindustani under Dr Gilchrist, a celebrated Orientalist. At the close of twenty-three years' service he was still a lieutenant, and it was not until 1838 that, after three years' adjutancy of his regiment, he became captain. Before this, however, he had held Several staff

appointments, notably that of deputy assistant-adjutant- general of the forces in Burmahi till the peace of Yandabo, of whicl: he, with Lumsden and Knox, procured the ratifi- cations at Ava from the "Golden Foot," who bestowed on him the "gold leaf" insignia of Burmese nobility. His first command had been at a stockade capture in the war, and he was present also at the battles of Napadee, Patanago, and Paghan. He had also held during his lieutenancy various interpreterships and the adjutancy of the king's troops at Chinsurah. In 1828 he published at Serampore Campaigns ix Ava, and in 1829 he married Hannah Shepherd, daughter of Dr Marshman, the eminent missionary. About the same time he became a Baptist, being baptized by Mr John Mack at Serampore. During the first Afghan war he was present as aide-de-camp to Sir Willoughby Cotton at the capture of Ghazni, July 29, 1839, and at the occupation of Cabul, After a short absence in Bengal to secure the publication of his Jfemozrs of the Afghan Campaign, he returned to Cabul in charge of recruits, and became interpreter to General Elphinstone. In 1840, being attached to Sir Robert Sale's force, he took part in the Khurd-Cabul fight, in the celebrated passage of the defiles of the Ghilzees (1841), and in the fighting from Tezeen to Jellalabad. Here, after many months' siege, his column in a sortie en masse defeated Akbar Khan, April 7, 1842. He was now made deputy adjutant-general of the infantry division in Cabul, and in September he assisted at Jugdulluk, at Tezeen, and at the release of the British prisoners at Cabul, besides taking a prominent part at Istaliff. Having obtained a regimental majority he next went through the Mahratta campaign as Persian interpreter to Sir Hugh (Viscount) Gough, and distinguished lumself at Maharajptr in 1843, and also in the Sikh campaign at Mudki, Firozeshah, and Sobraon in 1845. For these services he was made deputy

adjutant-general at Bom- bay. He exchanged from the 13th to the 39th, then as second major into the 53d at the beginning of 1849, and soon afterwards left for England, where he spent two years. In 1854 he became quartermaster-general, then full colonel, and lastly adjutant-general of the troops in India. In 1857 he was selected by Sir James Outram for the command of a division in the Persian campaign, during which he was present at the actious of Mohummaral and Ahwaz. Peace with Persia set him free just as the mutiny broke out ; and he was chosen to command a column 'to quell disturbances in Allahabad, to support Lawrence at Lucknow and Wheeler at Cawnpore, to disperse and utterly destroy all mutineers and insurgents." At Futtehpur, July 12th, at Aong and Pandoonudee on the 15th, at Cawnpur on the 16th, at Onao on the 29th, at Buserutgunge on the 29th and again on August 5th, at Boorhiya on August 12th, and at Bithoor on the 16th, he defeated over- whelming forces. Twice he advanced for the relief of Lucknow, but twice. prudence forbade a reckless exposure of troops wasted by battle and disease in the almost impracticable task. Reinforcements arriving at last under Outram, he was enabled by the generosity of his superior officer to crown his successes on the 25th of September 1857 by the capture of Lucknow. There he died, November 24, 1857, of dysentery, brought on by the anxieties and fatigues connected with his victorious march, and with the subsequent blockade of the British troops. He lived long enough to receive the intelligence that he had been created K.C.B. for thie first three battles of the campaign; but of the major-generalship which was shortly afterwards conferred he never knew. On Novem- ber 26, before tidings of his death had reached England, letters-patent were directed to create him a baronet, and a pension of £1000 a year was voted at the assembling of parliament. The baronetcy was afterwards bestowed upon

his eldest son; while to his widow, by royal order, was given the rank to which she would have been entitled had lier husband survived and been created a baronet. 'To both widow and son pensions of £1000 were awarded by parliament. See Marshman's Life of Havelock, 1860.

HAVERCAMP, Sicrprrt (1683-1742), classical editor and numismatist, was born at Utrecht in December 1683. After studying at the university of his native town and at Leyden, he entered the church, and became minister of Stad-aan-t Haringvliet, in the island of Overflakkee. 'There he remained till 1721, when he succeeded Gronovius in the Greek chair at Leyden, becoming shortly afterwards professor of history and rhetoric also, He died at Leyden, April 23, 1742.

His editions of Latin and Greek authors are useful and learned compilations, rather than original critical commentaries, and bear frequent traces of the rapidity with which they were produced. They are the following :—TZertullian, 1718; Lucretius, 1725; Josephus, 1726; Eutropius, 1729; Orosius, 1738; Sallust, 1742; and Censor- inus, 1748. See Dibdin's . Classics under these names. His principal numismatic works are Dissertationes de Alexandri Magni Numismate, 1722; Thesawrus Morellianus, 1734; Universal History, illustrated from Medals (in Dutch), 1736; Nummophy- laciwm regine Christine, 1742. He was also the author of Sylloge

Seriptorum qui de lingue Grace vera et recta Pronwntiatione

commentarios reliquerunt, 1740; Introductio in Historiam Patrice, 1739; and Introductio in Antiquitates Romanas, 1740.

HAVERFORDWEST (in Welsh Hwurrorpp), the chief town of Pembrokeshire, a seaport, market-town, parlia- mentary and municipal borough, and county by itself, is picturesquely situated on a hill overlooking the West Cleddau river, 8 miles N.N.E. of Milford, and 276 miles W.N.W. of London. The town is clean and well built, though somewhat irregular, owing to its position. Its principal buildings are the guildhall and the market-house, both modern, and the church of St Mary, one of the finest churches in South Wales. The old church of St Martin is close to the castle, of which, built on a rocky eminence overhanging the river, only a wall and the keep remain, the latter with considerable additions being till lately used as the county prison. It was built by Gilbert de Clare, first ear! of Pembroke ; and during the insurrection of Owen Glen- dower was defended for Henry IV. against the French allies of the Welsh. In the civil wars of the 17th century it wag held by the royalists. The castle was visited in 1188 by

Giraldus Cambrensis and Archbishop Baldwin. Below the end of the Parade, a public walk overlooking the river, are the ruins of a priory of Black Canons of the order of St Augustine, dedicated to St Mary and St Thomas. Dating from the 12th century it, was endowed though not founded by Robert, de Hwlffordd, whose liberal grants were confirmed by Edward ITI. The old wall and fortifications that formerly surrounded the town have totally disappeared. On the north side of the river is the suburb of Prendergast, containing the remains of an ancient mansion, formerly occupied by a family of that name. Haverfordwest is the seat of an assize court and quarter sessions, and with the contributory boroughs of Fishguard and Narberth returns one member to parliament. The river is navigable as high as the bridge for small craft. Timber, tea, and spirits are imported, and coal, cattle, butter, and grain are exported. In 1105, the Flemings, who had been driven from their own country by inundations, were settled in this locality by Henry I., and the Flemings who had served under Stephen afterwards increased the colony. Their influence is still to be traced in the non-use of the Welsh language among the townspeople, and in the peculiar shape of the cottages in the surrounding country. Population in 1871, 6622; area, 1430 acres.

HAVERHILL, a city in Essex county, Massachusetts, United States, is situated on the north bank of the Merri- mack river, 18 miles from its mouth, and opposite the towns

of Bradford and Groveland, with which it is connected by two fine bridges. It has railway communication with Boston, which is 32 miles south, and with Portland, 78 miles north. The city contains a handsome soldiers' monu- ment of white marble, erected in 1869, several public halls, including the city hall, the Freemasons' and the Oddfellows' halls, and a public library with 30,000 volumes, Haver- hill derives its prosperity from the manufacture of boots and shoes, chiefly of the finer kinds, in which about 150 firms are engaged, employing from 6000 to 8000 hands, and turning out goods to the annual value of about £2,000,000. Besides these there are about forty manu- factories of different articles used in this trade, as_ heels, lasts, shoe-nails, &c. The other manufactures include hats,

paper-boxes, and woollen goods. 'The first settlement at Haverhill was made in 1640, and for 70 years as a frontier town it suffered much from savage attacks. A fine granite and bronze monument has been recently erected to com- memorate the heroism of the early settlers. Haverhill was incorporated in 1645, and received its city charter in 1870. The population in 1870 amounted to 13,092, of whom 2003 were foreigners, In 1879 the number was estimated at 15,000.

HAVRE, Le (originally Havre pe Grice), a town of France, the second to Marseilles in importance as a seaport, capital of an arrondissement in the department of Seine- Inférieure, is situated on the north bank of the estuary of the Seine, 143 miles N.W. of Paris and 55 W. of Rouen by rail. The greater part of the town stands on a level plain, but from the heights on which Ingouville, since 1856 united to Havre, is situated, a charming and varied prospect is obtained. In the lower part of the town the streets run chiefly in straight lines, and they are grouped round the basins or docks, which communicate by lockgates and are

placed so as to form a triangle entered from the Outer Port. |

The old fortifications surrounding the town were demolished in 1856, and it is now defended by forts erected on the heights of Ingouville and Sainte-Adresse. The principal

street is the Rue de Paris, ranning from north to south in.

the centre of the town, and among the principal promenades may be mentioned the Boulevard de Strasbourg, the Place Louis XVI, and the Jetée du Nord, which terminates in a lighthouse. Havre possesses a tribunal of the first instance, a tribunal of commerce, an exchange and chamber of com- merce, a chamber of agriculture, a hydrographic school, and a communal college. The principal buildings are the churches of Notre Dame and St Francis, the new Hotel de Ville, the Musée, containing apartments for a library, and for art, antiquities, and natural history, and with statues in front of Bernardin de St Pierre and Casimir Delavigne, natives of Havre, by David Angers ; the theatre, the clubhouse called the Cercle du Commerce, the new palace of justice, the marine arsenal, the town-house, the custom-house, and the Frascati bath-house. The docks are among the

finest in the world, and consist of eight separate basins, which, with the late enlargement of the outer harbour, afford 150 acres of accommodation for vessels, The new entrance to the harbour has a width of 100 metres or 328 feet. Lines of rails have lately been laid along the docks. As these have absorbed much of the space on the quays, lading is frequently a slow and tedious process, but the completion of the lately projected harbour will afford all the facilities necessary in this respect. The completion of the proposed canal between Havre and the Seine near Tancarville would be a great commercial benefit to the

port whose prosperity has, notwithstanding its advantages | as the port of Paris, and its unsurpassed facilities for dock |

accommodation, been much hampered by the system of centralization, which has both retarded improvements and led to the levying of exorbitant shipping rates. Partly

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on this account, not only has France been unable to main- tain the transit of goods for Belgium, Switzerland, and Germany, but even much of the traffic of its own northern and eastern provinces has been directed to Antwerp. The latter port is served by an abundant network of railroads and canals, while Havre has only one convenient railroad (that to Paris by Rouen), and the river Seine with its dangers and high tariff. The completion of the scheme for a railway over Montivilliers to Dieppe will afford partial remedy for this state of matters. In the extensive ship- building yards of Havre the finest vessels of France are built, and many are also built for other countries. The construc. tion of two new dry-docks has lately been proposed, one of which is to afford accommodation for the largest Atlantic steamers. Havre is now fortified as a fleet station and harbour of war. The port has regular steam communica- tion with London, Liverpool, Southampton, Dublin, Glas- gow, Hull, Swansea, Bristol, Dunkirk, Brest, Cherbourg, Rotterdam, Hamburg, Copenhagen, St Petersburg, Con- stantinople, West Indies, San Francisco, Vancouver Island, and New York. The total number of vessels which entered

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Plan of Havre,

1. Prison. 5. Theatre. 10. Church of Notre 2. liétel de Ville. 6. College. Dame. 3. Exchange. 7. Marine Arsenal. 1l. Musée.

4. Tribunal of Com- 8. Church of St Francis. 12. Custom House. merce. 9. Courthouse. 13. Fiascati Bath House,

the port in 1878 was 6491 with a tonnage of 2,192,778, while 6458 cleared with a tonnage of 2,148,517. For the 5 years ending 1878 the average number of vessels that entered was 6041 with a tonnage of 1,841,265, the number that cleared 6006 with a tonnage of 1,818,189. The average annual value of exports and imports is about 2800 million francs. The trade of Havre with the United States is very large, and it has always retained its superiority in the importation of cotton, one-third of which, however, it imports from other countries than America. It is also the chief port for the exportation of French goods

_ to the United States, and an important point of emigration.

Besides cotton its principal imports are petroleum, coals, wheat, woollen, silk, flax, mohair and jute tissues, spices, sugar, coffee, hides, dyewoods, and building timber. The principal exports are various French manufactured cloths, leather, jewellery, agricultural and dairy produce, wine, brandy, and oil. Fishing is extensively prosecuted. Besides the various industries connected with shipbuilding, Havre possesses sugar-refining works, tobacco manufactories, iron foundries, salt works, breweries, vitriol works, and manu- factures of fatence, lace, silk, and paper, It is also much frequented for sea-bathing. The population in 1872 was 85,538, and in 1876 it was 85,407,

Plate XIII.

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Until 1516 Havre was only a fishing village possessing a chapel dedicated to Notre Dame de Grice, to which it owes its original name Havre (or harbour) de Grace. The building of the harbour was begun by Francis I.

who gave the town the name of Franciscopolis. At the entrance to the harbour he erected a tower which served as a lighthouse for ships until it was demolished in 1862. The town in 1562 was delivered over to the keeping of Qucen Elizabeth by the Prince de Condé, leader of the Huguenots, and the cominand of it was entrusted to Ambrose Dudley, earl of Warwick ; but the English were expelled within a year, after a most obstinate siege, the progress of which was pressed forward by Charles IX. and his mother, Catheriue de' Medici, in person. The defences of the towu were greatly strengthened by Henry II. and Louis XIII., and undcr Louis XIV. it became an important fortress. In the 17th century it was several times vainly besieged by the English, who also bom- barded it in 1759, 1794, and 1795. It was a port of considerable importance as early as 1572, and despatched vessels to the whale and cod fishing at Spitzbergen and Newfoundland. In 1672 it be- came the entrepdt of the French East India Company, and after- wards of the Senegal and Guinca companies. Its devclopment was greatly furthered by Louis XVI., and Napoleon I. raised it to a war harbour of the first rank. Havre is the birthplace of Bernardin de St Pierre, author of Paul and Virginia, Casimir Delavigne, Made- moiselle Scudéry, and the naturalists Ancelot and Lesueur.

See Guilmeth, Histoire de la ville et des environs du Havre, 1842; Mémotres de la fondation et origine de la ville frangotse de Grace, compos:z par maistre Guillawme de Marceitlles, first published by J. Morlent, 1847; Le Havre, son passé, son présent, et son avenir, by Frederick de Coninck, new edition 1862; Nerval, Doewnents relatifs a la fondation de Havre, 1875.

HAWAIIAN or SANDWICH ISLANDS, Tus, a group of eight inhabited and four uninhabited islands in the North Pacific Ocean, lying between 18° 54' and 22° 2' N. lat. and 155° and 161° W. long. The group has a trend of about N. 64° W., which is nearly the trend of all the Pacific groups. From Honolulu, the capital, on Oahu, the distance to San Francisco is 2100 miles; to Auckland, New Zealand, 3810 miles; to Sydney, New South Wales, 4484 miles; to Yokohama, 3440 miles; to Hongkong, 4893 miles; to Tahiti, 2380 miles. The first of the names by which the group is designated above is taken from that of the largest island Hawaii, and is the name adopted by the inhabitants. The other name was given to it by Captain Cook the discoverer,

in honour of the earl of Sandwich, first lord of the Admiralty at the time of the discovery.

Iistory.—These islands, the most important Polynesian group in the North Pacific, were discovered by Captain Cook in 1778.1 He was received by the natives with many demonstrations of astonishment and delight; and offerings and prayers were presented to him by their priest in one of the temples; and though in the following year he was killed by a native when he landed in Kealakeakua bay in Hawaii, his bones were preserved by the priests and continued to receive offerings and homage from the people, until the abolition of idolatry. At the time of Cook's visit each island had its chief. On the death of the chief who ruled Hawaii at that time there succeeded one named Kame- hameha, who appears to have been a man of quick perception and great force of character. When Vancouver visited the islands in 1792, this chief being desirous of possessing a vessel on the European model, the keel of one was laid down for him. Ten or twelve years later Mr Turnbull found him with 20 vessels of from 25 to 50 tons which traded amongst the islands, and he afterwards purchased others from foreigners. Having encouraged a warlike spirit in his people and introduced firearms, Kamehameha attacked and overcame the chiefs of the other islands one after another, until he became undisputed master of the whole group. He encouraged trade with foreigners, and derived from its profits a large increase of revenue as well as the meaus of consolidating his power. He died in 1819, and was succeeded by his son, a mild and well-disposed prince, but destitute of his father's energy. One of the first acts of Kamehameha II. was to abolish tabu and idolatry through-

} According to the Boletin de la Soc. Geogr. de Madrid, 1877, there had been a previous diseovery by the Spaniards.

out the islands. Some disturbances were caused thereby, but the insurgents were defeated and the peace of the islands has been scarcely broken since. In 1820 missionaries arrived from America and commenced their labours at Honolulu. A short time afterwards the British Govern- ment presented a small schooner to the king, and this afforded an opportunity for the Rev William Ellis, the well- known English missionary, to visit Honolulu, along

with a number of Christian natives from the Society Islands. Finding the language of the two groups nearly the same, Mr Ellis, who had spent several years in the southern islands, was able to assist the American missionaries in reducing the Hawaiian language to a written form. In 1824 the king and queen of these islands paid a visit to England, and both died there of measles. Jor many years the Hawaiians have continued to advance steadily in intel- ligence, resources, and civilization, but their progress has been at times interrupted by the conduct of the officers of foreign powers. On one occasion a British officer went so far as to take possession of Oahu and establish a com- mission for its government; and French officers abro- gated the laws, dictated treaties, and by force of arms established the Roman Catholic religion in the country. The act of the British officer was disavowed by his superiors as soon as known; and these outrages led to a repre- sentation on the part of the native sovereign to the Govern- ments of Great Britain, France, and the United States of America, and the independence of the islands was guaran- teed by these powers in 1844. Kalakaua, the reigning monarch (1880), was elected king by ballot on Lunalilo's death without heirs in 1874. The heir to the throne is a sister of the king, Lelia Kamakacha, and is married to an American.

Inhabitants.—By the census taken in December 1878 the population of the whole group amounted to 57,985 persons, instead of 56,897 as in 1873. The number of natives of pure Hawaiian race was 44,088, of half castes 3420, Chinese 5916, Americans (U.S.) 1276, British 883, Portuguese 430, Germans 272, French 81, other foreigners 666, and Hawaiians born of foreign parents 947.

The natives belong to the Malayo-Polynesian race. Their reddish-brown skin has been compared to the hue of tar- nished copper. 'The hair, usually raven black, is straight or at most wavy; the beard is thin, the face broad, the profile not prominent, the nose rather flattened, and the lips thick, The bulk of the population are of moderate stature, but the chiefs and the women of their families are remark- able for height.

"The inhabitants of these islands," says Mr Ellis,? " are, con- sidered physically, amongst the finest races in the Pacific, bearing the strongest resemblance to the New Zealanders in stature, and in their well-developed

muscular limbs. The tattooing on their bodies is less artistic than that of the New Zealanders, and much more limited than among some of the other islanders. They are also more hardy and industrious than those living nearer the equator. This in all probability arises from their salubrious climate, and the comparative sterility of their soil, rendering them dependent upon the cultivation of the ground for the yam, the arum, and the sweet potato, their chief articles of food. Though, like all undisciplined races, the Sandwich Islanders have proved deficient in firm and steady perseverance, they manifest considerable intellectual capa- bility. Their moral character, when first visited by Europeans, was not superior to that of other islanders ; and, excepting when improved and preserved by the influences of Christianity, it has suffered much from the vices of intemperance and licentiousness in- troduced by foreigners. Polygamy prevailed among the chiefs and rulers, and women werc subject to all the humiliations of the tabu system, which subjected them to many privations, and kept them socially in a condition of inferiority to the other scx. Infanticide was practised to some extent, the children destroyed being chiefly females. Though less superstitious than the Tahitians, the idolatry of the Sandwich Islanders was equally barbarous and sanguinary, as, in addition to the chief objects of worship included in the inyth-

2 Mr Ellis was the writer of the artivle PoLynesta, which ineluded an account of the Hawaiian Islands, in the last edition of this work.

ology of the other islands, the supernatural beings supposed to reside in the voleanocs and direct the action of subterranean fires rendered the gods objects of peculiar terror. Human sacrifices were slain on several occasions, and vast offerings presented to the spirits sup- posed to preside over tlie volcanoes, especially during the periods of actual eruptions. The requisitions of their idolatry were severe, and its rites cruel and bloody. Grotesque and repulsive wooden figures, animals, and the bones of chiefs were the objects of wor- ship. Human sacrifices were offered whenever a temple was to be dedicated, or a chief was sick, or a war was to be undertaken ; and these occasions were frequent. 'The apprehensions of the people with regard to a future state were undefined, but fearful. The lower

orders expected to be slowly devoured by evil spirits, or to dwell with the gods in burning mountains, The several trades, such as that of the fisherman, the tiller of the ground, and the builder of canoes and houses, had each their presiding deities. Houschold gods were also kept, which the natives worshipped in their habi- tations. One merciful provision, however, had existed from time immemorial, and that was sacred inclosures, places of refuge into which those who fled in time of war, or from any violent pursuer, might enter and be safe. To violate their sanctity was one of the greatest crimes of which a man could be guilty."

In the former state of society the habits of the people were extremely licentious ; men were living with several wives, and women with several husbands. Female virtue was an unknown thing, and there is no native word for it. This state of things has, however, been greatly altered by the exertions of the missionaries,

As regards cannibalism, it appears that the heart and liver of the human victims offered in the temples were eaten as a religious rite, and that the same parts of any prominent warrior slain in battle were devoured by the victor chiefs in the belief that they would thereby inherit the valour of the dead man. When, on the death of the great warrior Kamehameha I, the chiefs assembled to deliberate what should be done with his body, one suggested that they should eat it, but this did not find favour with the others.

The Hawaiians are a good-tempered, light-hearted, and pleasure-loving race. They have many games and sports, and the women spend much time in making flower gar- lands. Both sexes are passionately fond of riding, almost every one being in possession of a horse. They delight to

be in the water, and swim with remarkable skill and ease,

In the exciting sport of surf swimming, which always astonishes strangers, they balance themselves whilst stand- ing or sitting on a small board which is carried landwards on the curling crest of a great roller.

In spite of moral and material progress—better food, better clothing, improved dwellings, and many other advan- tages of civilization—the race is dying out, and, indeed, is threatened with extinction in the course of a few

years, Captain Cook estimated the number of natives at 400,000 ; in 1823 the American missionaries calculated them to be only 142,000 ; the census of 1832 showed the population to be 130,313; and the census of 1878 proved that the number of natives was no more than 44,088. To account for this it is said that the blood of the race has become poisoned by the introduction of foreign diseases. The women are much less numerous than the men 3 and the married ones have few children at the most 3 two out of three have none. Moreover the mothers appear to have little maternal instinct, and there is consequently a neglect of the offspring. Whilst the Hawaiians are decreasing, the Chinese are com- Ing in large numbers, and threaten in time to take their place. To counteract this, as well as to supply the pressing need for labourers, the Government has considered many schemes for introducing other immigrants. Polynesians from other islands have been brought over, and a consider- able number of Portuguese have come from Madeira.

The language is a branch of the widely-diffused Malayo- Polynesian tongue; and Hawaiians and New-Zealanders, although occupying the most remote regions north and south at which any of their race have been found, can under- stand each other without much difficulty. This language

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is soft and harmonious, being highly vocalic in structure, The only consonants are , U, m, 2, and p, which with the gently aspirated h, the five vowels, and the vocalic w, make up all the letters in use. The letters 7 and ¢ have been suppressed of late years in favour-of J and k, so that, for example, ¢aro, the former name of the Colocasia plant, is now kalo. The language was not reduced to a written form until after the arrival of the missionaries,1

In the days of idolatry the only dress worn by the men was a narrow strip of cloth wound round the loins and passed between the legs. Women wore a short petticoat made of ¢apa (cloth prepared from the inner bark of the paper mulberry), which reached from the waist to the knee. But now the common class of men wear ashirt and trousers, whilst the better class are attired in the European fashion. The women are clad universally in the holoka, a loose white or coloured garment with sleeves reaching from the

neck to the feet. A coloured handkerchief is twisted round the head or a straw hat is worn. Both sexes delight in adorn- ing themselves with garlands (Jets) of flowers and necklaces of coloured seeds.

The natives derive their sustenance chiefly from pork and fish both fresh and dried, and from the kalo (Colocasia escu- lenta), the banana, sweet potato, yam, bread-fruit, and cocoa- nut. The root of the kalo affords the national dish called pot; after having been baked and well beaten on a board with a stone pestle it is made into a paste with water and then allowed to ferment fora few days, when it is fit to eat. There was formerly a particular breed of dog which, after being fed exclusively on pod, was considered a great deli- cacy. The filthy liquor called awa or kawa is still relished by the natives, and though it is only allowed to be made under licence, it is often prepared clandestinely.

The native dwellings are constructed of wood, or more frequently are huts thatched with grass at the sides and top. What little cooking is undertaken is done outside. The oven consists of a hole in the ground in whicli a fire is lighted and stones made hot; and the fire having been removed, the food is wrapped up in leaves and placed in the hole beside the hot stones and covered up until ready.

Leprosy is prevalent amongst the natives, and the Government has established a settlement on the island of Molokai where all persons found to be affected with the disease are kept entirely isolated from the healthy part of the community. The lepers number about 800.

Agriculture and Commerce.—Large capital has been embarked, chiefly by Americans, in the production of sugar, the soil and climate being well suited to the cane in those localities where tha water supply isample. There are between 60 and 70 sugar estates, and more are being planted. The principal difficulty is the want of labour. The average yield of sugar per acre is 24 tons, whilst in some favoured spots as much as 7 tons has been obtained. In 1878 the exports of sugar amounted to 17,187 tons. Rice is also largely cultivated, 2455 tons having been exported in the same year. Coffee is produced only to a small extent. Arrow-root is prepared from the root of the Tacca pinnatifida. The kato plant (Colocasia csculenta) is extensively grown in wet places. It is said that a patch of kalo measuring 40 feet square

yields sufficient food for a native for a whole year ; a square mile of it would therefore support 17,000 persons. "Maize and wheat are raised, and flour is manufactured. Pine apples, oranges, mangoes, custard apples, guavas, and many other fruits have been introduced, and flourish In gardens. A silky fibre called pulu, growing on the crown of tree- fern stems belonging to the genus Cibotium, is exported in large quantities to America, where it is used for stuffing cushions.

The owners of sheep are few, but they have large flocks, and the wool exported in 1878 amouuted to 523,000 ib. Some districts are well suited for cattle raising. The wild cattle on the mountains—aq very inferior breed, descended from some left by Captain Vancouver —are shot or taken with the lasso for the sake of their hides, which are exported in large quantities. In one island 11,000 were killed in a single year. 'The natives used to entrap them by digging pits

1 See Chamisso, Ueber die Hawatische Sprache (Leipsic, 1837) ; and Andrews, Grammar of the Hawaiian Language (Honolulu, 1854), and Dictionary (Honolulu, 1865),

near pools of water, and it was through falling into one of these pits that Douglas, the botanical collector, met his death by being gored by a bull.

Owing to their geographical position the commercial development of the islands has advanced even more rapidly than the material improvement in the circumstances of the people. A treaty of commerce was concluded in 1876 between the United States and the Hawaiian Islands, under which the manufactures of the former and the chief productions of the latter are reciprocally allowed to enter duty free. This treaty has been of great benefit to the islands, more especially by stimulating the cultivation of the sugar cane. The principal exports are sugar, rice, coffee, hides, skins, tallow, and wool. In 1878 the total amouut of exports reached the value of about 3,500,000 dollars, whilst the value of imports amounted to about 3,000,000 dollars. The United States are by far the largest eustomers for the articles

exported, and supply the great bulk of the imported goods. In 1878 there were 54 vessels registered under the Hawaiian flag, of which 11 were engaged in whaling and foreign trades, whilst 43 were coasters, making a total of 8000 tons. In 1878, besides the mail steamers, 216 merchant vessels of various foreign nations entered the Hawaiian ports.

Many good roads have been made, and railways have been pro- jected; a telegraph line was opened in 1878 between Wailuku and Lahaina in Maui (40 miles), and has since been extended; con- siderable capital has been brought in by foreigners; and the price of land is rising. A Governmeut survey of the islands is in progress.

Climate and Meteorology.—The climate in general is warm but very salubrious, The temperature is equable and the sky usually eloudless. The N.E. trades blow for nine months; and the lee- ward coast, being protected by high mountains, is refreshed by regular land and sea breezes. During January, February, and March the wind blows strongly from the 8, W.; and at this season an uupleasant hot damp wind from the equatorial region occasionally makes itself felt. Very much morc rain falls on the windward side of the principal islands than on the leeward. Thus at Hilo, on the east coast of Hawaii, the usual rainfall is said to amount to 80 inches, and in some years to more than twice that quantity, whilst at Honolulu on the south coast of Oahu, out of the reach of the wiudward rains, the mean annual rainfall for the five years ending 1877 varied from 32°80 to 46°40 inches, the average being about 38. The mean annual temperature at the same place for the same period was 75° Fahr. The mean temperature of the coldest month during the five years was 62° Fahr., and that of the hottest month 81° Fahr. Strong gales blow once or twice during the winter, but destructive hurricanes are entirely unknown.

Zoology.—When Cook arrived at the islands he found only hogs, dogs, and rats. There is a day-flying bat; a small lizard is found, but no other reptiles, Cattle, goats, and hogs at the present day run wild upon the mountains in the larger islands, and do much damage to the woods. As to the birds, fifty-three specics have been enume- rated by Mr Sanford Dole in Proceedings of Boston Soe. of Natwral History (cf. Sclater's paper in Jbis, 1871), but it is thought that many more species remain to be discovered in the mountain

districts. In former times the chiefs exacted as a tax from the pcople the gay feathers of certain species (Drepanus and Moho), and employed them to ornament their state robes, only one of which is now in existence, and that is kept with the greatest care for the king's use on state occasions. Mr Dole's list includes of Falconide 2 species, Strigide 1, Promeropide 10, Meliphagide 4, Turdide 2, Ampelide 1, Corvide 1, Fringillide 5, Charadride 2, Scolopacide 3, Ardeide 2, Rallide 5, Anatide 3, Procellaride 2, Laride 5, and Pelicanide 3. One of the Rallide, now nearly extinct, is remarkable for having rudimentary wings, like the moa of New Zealand, hidden in long, loose, hairy feathers. Dr Otto Finsch, who visited Honolulu in 1879, says that the native birds, as well as the native plants, are being ousted by introduced species. The house sparrow froin Europe and the maina (Acridotheres tristis ?) and the turtle-dove (Turtur chinensis) from China are almost the only birds to be seen in and about the town; and in order to obtain specimens of in- digenous species he had to go far inland. (See Proceed. Roy. Geog. Soc., Jan. 1880.)

Botany.—The ravines and mountain slopes on the windward sidc of the larger islands contain much forest growth, whilst the leeward uplands and plains are comparatively bare. Amongst the more remarkable forms are a Pandanus, or screw pine, and the Aleurites, or candle-nut tree, so named from the natives stringing together the kernels, which. are very oily, and so making a candle. Sandal- wood, formerly plentiful, has been exhausted., The eocoa-nut palm grows in abundance on the coast. For the following valuable notes on the flora, we are indebted to Dr William Hillebrand, who for many years studied the subject on the spot with the view of publish- ing a complete work upon it :—

"The flora of these islands, according to my researches, eomprises 829 species of phanerogams and 147 species of vascular cryptogams. These 976 species are distributed amongst 358 genera. There are 144 species of monocotyledons, of which 45 belong to the Cyperaceee and 63 to the Graminew. Only 8 species of orchids have been

Euphorbia 10. is not a single annual ; aud by far the greater number are arbores-

belonging to the genus Pritchardia.

found. Of the 829 species of phanerogamous plants 94 are known to have been introduced since the advent of the white man, whilst

597 species are peculiar to the islands, leaving only 138 species which are found elsewhere. With few exceptions the peculiar genera are

the richest in species, but some of the genera not entirely Hawaiian

are also reniarkable for the number of their species ; for example, Cyrtandra has 29 species, Piperomia 21, Pittosporum 12, and Amongst the peculiar dicotyledonous plants there

cent or frutesceut. There are only two native species of palm, both Of ferns there are 130 species, including 35 of Asplenium, 16 of Aspidiwm, 16 of Polypodiwm, and 8 of Phegopteris. The tree ferns number 5 species, 3 belonging to the genus Cibotium, and 2 to Sadleria. As to the derivation of

the flora a distinction must be made between the lower and middle

regious and the upper mouutainous region. The two former are

manifestly connected with the south-western Polynesian and

Malaysian flora, so far as the latter is represented by the Moluccas and New Guiuca, and connected by Wallace with the Australian con- tinent. Some of the prevailing forest trees of the lower region are identical with the species found in the localities just mentioned, €,g., Aleuritcs moluccana, Jambosa malaccensis, Alphidoxia excelsa, Dodonea viscosa, Thespesia populrea, Cordia subcordata, Artocar-

pus incisa, Paritium tiliaceum, Broussonetia papyrifera, and Cordy-

line terminalis. Most of the forest trees of the middle belt, although peculiar as species, have very near congeners in the same direction, as Metrosideros polymorpha, Acacia Koa (with phyllodia), the Pcleas, Pscudopanax, Gouldia, Sophora, Eleocarpus, Pittosporum, Bobca, Straussia, Caprosma, Maba, Sapota, Myrsinc, Olea, Pisonia, Santa- lum, Charpentiera, &c. But

with regard to the flora of the highest region in the Hawaiian Islands, there are many plants and some entire orders which point to the American continent as the land of their nearest allies, —for instance, the Composite with few exceptions, the Rosacce, Gcraniacece, and most of the Labiate."

Geology and Mineralogy.—Though the islauds are mountainous, none of the eminences reach the limit of perpetual snow. All the islands are of volcanic origin and are entirely composed of the products of eruption. On one of them (Hawaii) the volcanic forces are still in operation; on all the others they have been quiescent for an indefinite period, and the superficial rocks are in a more or less advanecd state of decay, Where volcanic action has long ceased deep ravines have been excavated on the sides of the mountains, and this is especially the case on the windward side of Hawaii, where the rainfall is very large, The headlands frequently terminate in lofty cliffs, sometimes overhanging the sca to a height of 2000 feet; and these afford additional evidence of a prolonged period of repose. The products of the Hawaiian volcanoes are rather scanty. According to Mr Brigham they consist of hydro- chloric, sulphuric, and sulphurons acids, native sulphur, pyrites, common salt, sal ammoniac, hematite, quartz, palagonite, felspar, chrysolite, thomsonite, gypsum, solfatarite, copperas, nitre, arra- gonite, labradorite, and limonite. Evidence of slight upheaval is furnished by those parts of the shore where old coral reefs are found, sometimes as high as 100 feet above the sea.

Government and Laws.—The form of government is a eonstitu- tional monarchy ,with a legislature composed of 20 nobles appointed by the king for life, and 28 representatives elected every two years by the people—the two classes sitting together. An annual income of 75 dollars is the qualification of an elector, The king has a cabinet of ministers and a privy council. The Government is regularly organized, its departments are efficiently managed, and the laws are justly administered. Many of the principal offices are filled by foreigners, chiefly Americans, who have become Hawaiian subjects. It is somewhat of a burlesque of the proceedings of royalty in Enrope that here, where the whole body of subjects is less than the population of a small English county, we find in full display the titles of majesty, royal highness, prince, excellency, &c., as well as knights grand cross and other grades of two royal orders! A governor is

appointed by the king for each of the larger islands, Diplomatic representatives of Great Britain, France, and the United States of America are resident at Honolulu, and also consuls of these and other foreign powers. At London, Paris, New York, and several other foreign eities there are Hawaiian diplomatic and consular agents. An efficient postal system has been established, and there is a standing army of about 70 men. The laws are modelled on those of the United States. There is a supreme court of justice, as well as eircuit judges and district justices, assisted by a police force.

Religion and Education.—The ancient idolatrous religion has been abandoned since 1819, and the whole population has em- braced Christianity. All forms are tolerated, and at Honolulu there are six churches belonging to the Roman Catholic, Pro- testant Episcopal, and Congregational eommunions. The bishop of the Church of England is styled the bishop of Honolulu, and the Roman Catholics have also a bishop. The Congregationalists are most numerous. Originally started by the foreign missionaries, the question of education has been taken up by the Government,

who have established a board to superintend the affairs connected with this subject. Nearly every native can read and write. In 1878 there were 222 schools, attended by 3991 boys and 3000 girls. In the majority of these schools the instruction 'is communicated in Hawaiian ; but in some of a higher grade English is employed, and, as the people themselves desire it, that language is more and more introduced.

Revenue and Currency.—The annual revenue of the Government amounts to about 600,000 dollars derived chiefly from custom duties (284,000 dollars in 1878), taxes on real and personal property, and a poll tax. It does not equal the expenditure, and there is a funded debt of from 400,000 to 500,000 dollars. Accounts are kept in dollars, and the coins in circulation are those of American States.

Lhe Capital.—Honolulu (population 14,114), the capital of the island group, stands on the 8. W. coast of Oahu, in 157° 51' 48" W. long. and 21°

17’ 56” N. lat., at the mouth of the valley of Nuuanu, which runs back between tall cliffs to two peaks about 3000 fect high in the great eastern range of mountains, It is the seat of the central government and the residence of the king. Although con- sisting largely of one-story wooden houses, mingled with grass huts half smothered by foliage, Honolulu is said to present to approaching vessels more of the appearance of a civilized place with its churches and public buildings than any other town in Polynesia. The streets, laid out in the American style, are straight, neat, and tidy. Water-works supply the town from a neighbouring valley. Among the stone crections are the king’s house, a hospital, a large hotel built by the Government, and the Government buildings, in which are a fair library of English books and a museum containing corals, shells, and other natural curiosities, as well as specimens of ancient weapons and other native articles. Amongst the brick buildings are large iron works, a brass foundry, an establishment for working up wood, and rice mills. All the necessaries and most of the luxuries of civilized life can be obtained in Honolulu. There are several hotels for the accommodation of strangers, and numerous agencies of both British and American insurance offices ; American and English medical men and lawyers have settled in the town; two weekly newspapers in English and two in the Hawaiian language are published. Honolulu has a good natural harbour, with wharves, a custom house, and warehouses. It is connected by regular lines of mail steamers with San F rancisco, Sydney, and New Zealand. There are also lines of steamers to Liverpool and Glasgow, New York and Boston, Bremen, China, and Peru. Small steamers ply between the islands. Business is almost entirely carried on by foreigners, and chiefly by Americans, British, Germans, and Chinese, The last are the most numerous; they are acquiring property rapidly, and some of them are wealthy. ‘The foreigners are very sociable, and have established numerous clubs, benevolent societies, &c. American influence and customs are said to be dominant. In the neighbourhood of the town is a college, where for a small sum boys and girls receive a good English education.

Lhe Separate Islands. —The following description of the separate islands begins with the largest and most casterly, giving the others in the order of their position.

Population.

Islands, ia Mile. in thilee. eae — 5 Census 1878.

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4,000,000 57,985

In older English works Hawaii is called Owhyhee and Maui Mowee, The four uninhabited islets are named Nihoa, Kaula, Lehua, and Molokini,

Hawatt has an area nearly double that of all the other islands put together. In shape it is a rude triangle, with sides of 85, 75, and 65 geographical miles in length. surface is occupied by the gentle slopes of four volcanic mountains,

The slopes on the west side are so gentle that the base of the terminal cones may be reached on horseback. Qn the windward side cryptogamic vegetation reaches as high as 12,000 feet, but the forest ceases at 6000 feet.

Mauna Loa is the most interesting mountain of the whole group from its being stillan active yolcano. The circular terminal crater,

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8000 feet in diameter, is quite perfect, with nearly vertical walls from 500 to 600 feet high on the inner side; and the bottom between the numerous cones is usually covered with solid lava, from the fissures of which issue steam and sulphurous vapours; but its features change with every eruption. There is no record of any eruption from Mauna Loa before 1832, when lava flowed from the summit crater on several sides. In 1843 a vast flood of lava was discharged, which formed three streams 5 or 6 miles wide and between 20 and 30 miles long. There were eruptions in 1851, 1852, 1855, and 1859,

but in none of these did the lava reach the sea cxcept on the last occasion, when the eruption continued for two months, and a winding current 50 miles long, from 1 to 5 miles wide, and from 10 to some hundreds of feet thick, arrived at the west coast in eight days. Its surface is now black, shining, brittle,and veryporous. In 1868 occurred another eruption attended by many earthquakes. One of these caused a huge sea wave 40 feet high to break on the shore, oceasioning the loss of many lives and the destruction of much property. The wave crossed the Pacific to the Californian coast. Later in the same year, at a time when earthquakes were taking place on the coast of South America and the town of Iquique in Peru was destroyed, a great wave came across the Pacific, struck the Hawaiian Islands, and made itself felt in New Zealand. The last eruption took place in February 1877, when a stream of lava flowed for six hours,

Sixteen miles to the S.E. of Mauna Loa is a hill called Kilauea, with a crater which is the largest active one in the world. The earliest recorded eruption was in 1789, and there was another in 1832. This volcano was first made known to the civilized world in 1823, when Mr Ellis and a party ef American missionaries visited it. At an elevation of 4400 feet above the sea they found in the midst of a plain an oval crater 9 miles in circumference with vertical sides 1000 feet deep, covered at the bottom with a lake of liquid lava at one end red and boiling. Around the edge or from the midst of this fiery lake, 51 conical craters sent forth jets of lava or smoke and flame. A stony ledge round the inside of the crater, and 300 or 400 feet above the lake, indicated that the lava had risen to that height and had then run off by a subterranean channel to the sea, where some miles of coast had been filled up with liquid lava a few weeks previously. Since that time many travellers have ascended to the craters of both Mauna Loa and Kilauea, and have given vivid descriptions of the very grand and wonderful phenomena they mien In 1840 the commander and officers of the United States Exploring Expedition spent three weeks on the summit of Mauna Loa and made an accurate survey of the crater. In that year there was a great outburst from a crater 8 miles from the sumniit of Kilauea, when a stream of lava half a mile broad and 40 miles long reached the sea.

Over the whole summit of Hualalai, another of the four mountains of Hawaii, are scattered many pit craters from 300 to 500 feet deep and from

700 to 1000 feet in diameter, their solid walls being nearly vertical. On the edge of one of the deepest craters there is a mound about 50 feet high, composed of drops of lava and fragments of all sizes, coloured yellow, orange, red, blue, and black. They scem to have been ejected in a viscid state, for they are slightly agglutin- ated together. In the centre of the mound is a blow-hole 25 feet in diameter and about 1800 feet deep. The inside of this hole is grooved horizontally, but otherwise smooth as if turned. More than 150 cones have been counted on the sides of Hualai. The last eruption took place in 1801, when a copious flow of lava reached the coast, where it filled up a deep bay.

The lavas of Hawaii are distinguishable according to the aspect of their surface into three classes. 1. The pahochoe of the natives, or velvety lava, is folded and twisted in a manner that shows it was once a viscid fluid. This is the common form when the flow has passed over rocks or dry ground on a gentle slope. 2. The clinkers or scoriaceous lava is rough and covered with fragments. This is found wherever the stream has passed through woods or has been impeded by inequalities of the ground, or where its heat has caused the explosion of caverns beneath the floor of older beds. 3. The a-a or spongy lava, which, on account of its extreme rough- ness and hardness, is carefully avoided by all travellers. This form is thought to owe its origin to the fact that, just as the lava was granulating, impediments that stood in its course gave way, when the spongy mass rolled over and built up piles from which the liquid portion drained off. 'The natives are in the habit of making holes in the a-a, and planting in them banana shoots or sweet-potato cuttings, and though the holes are simply filled with stones or fern leaves the plants grow and in due time are productive.

The plain lying between the mountains of Hawaii is many square

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1 Amongst the minor phenomena they speak of the delicate glassy fibres ealled Pele's hair by the Hawaiians, which are spun by the wind from the rising and falling drops of liquid lava, and blown over the edge or into the erevices of the erater. Pele in idolatrous times was the dreaded goddess of the yoleano. It is noteworthy that a substanee resembling Pele's hair is made from the slag of iron furnaees, by driving steam or air against a thin

eurrent of the melted slag. The filamentous material thus made has been termed mineral or slag wool; it ean be woven into sheets whieh are useful for coatin g steam boilers, &c., as the substance is a very bad conductor of heat,

miles in exteut, and is intersected by lava streams which have issued from the three nearest volcanoes. 'Ihe rocks forming the north point of Kealakeakua bay, where Captain Cook was killed, are part of a flow which may be traced up the stcep aseent and over a precipice where it must have fallen like a eascade, the surface being curiously marked with waves and curves asif the molten stone had been solidified in- stantaneously. A sheet of copper with an inseription, attached to the stump of a coeoa-nut palm, formiany years served as the only me- morial of Captain Cook's death ; but in 1874 a monument was erected at the spot by the residents of Honolulu. The east coast of Hawaii from Hilo to Laupahoehoe, a distance of 30 miles, is very remark- able for the streams, 85 in number, running at the bottom of ravines 1800 or 2000 feet in depth which are cut into the side of Mauna Kea, and render travelling along this coast a work of extreme labour. The ridges between the ravines terminate at the sea in preeipices from 100 to 500 feet high, so that the road is obliged to run inland into and across the ravines.

At a point midway between the three southern mountains, and at a height of 5000 feet, are the ruins of the ancient temple of Kaili, 92 feet long, which formerly coutained many idols. ;

Hilo (population 4200), the residence of the governor, is a straggling village half hidden in sugar-eane and other vegetation on the east eoast. It lies in a bay that is little more than an open roadstead, but is partly protected from heavy seas by a sunken coral reef.

Maut, lying 25 miles N. W. of Hawaii, is composed of two moun- tains conneeted by a sandy isthmus 7 or 8 miles long by 6 miles across, and so low that the depression of a few feet would convert Maui into two islands. Haleakala, the mountain to the N.W., has a height of 10,032 feet, and forms a great dome-like mass with a cir- cumferenee at the base of 90 miles, and

with regular slopes of only 8° or 9°, so that travellers may ride to the top on horseback. The extinet crater on its summit, the Iargest in the world, has a length from E. to W. of 74 miles, and a width of 2} miles, with an area of about 16 square miles. The circuit of the walls, which are composed of a hard grey clinkstonc much fissured, is from 18 to 20 miles. The depth, measured from the highest point of the rim, is 2720 feet. At the bottom are 16 cones 500 or 600 feet high, formed long after the top of the great crater had been de- stroyed, perhaps by explosions. On the east and north are two great gaps in the walls from 1 to 3 miles wide, through each of which has poured a copious flood of lava which nearly reached the sea. These streams, though of unknown date are comparatively modern, for they have blocked up several ravincs in their progress. A little impure sulphur is found in the cratcr, but there is not the least sign of igneous activity at present on the island, Keka, the mountain at the south-east of Maui, is 5820 feet high. Voleanic action appears to have ceased here at a much earlier period than on Haleakala, there being no craters on the summit or sides, whilst the slopes have been denuded into deep valleys separated by narrow sharp ridges.

Lahaina (population 3000), on the north-west shore, is the residenee of the governor. It isa decaying place situated in a grove of coeoa- nut and other tropical trees. The roadstead is roomy and sheltered, and there is regular steam communication with Honolulu, about 72 miles distant. A native Hawaiian eollege in the neighbourhood is supported by Governmeut. Foreigners reside at Lahaina, as well as at Wailuku (population 4000), a town on the east shore of the island. They are prineipally employed in the eultivation of sugar.

KAHULAWI is a small island 6 miles west of Maui. Though the vegetation is scanty and there are no streams, it has been leased by the Government for sheep pasture. The highest pointis only about 1130 fect above the sea, and there are no ravines.

LANAT is another small island on the west of Maui, from which itis 9 miles distant. At the south-east end there is a mountain 3000 feet high without a crater. Vegetation is stunted on the exposed slopes, but the ravines contain a rich growth of trees and shrubs. Sheep in large numbers are pastured here.

Lanai and Kahulawi are remark- able for presenting high cliffs to the leeward and gentle slopes to the windward, the reverse being the casc in all the other islands.

Mo oxal is a long narrow island 9 miles distant from the north- west end of Maui. A ridge of hill forms its backbone and throws off lateral spurs enclosing ravines. At the west end are some lofty broken peaks, the highest of which is about 3500 feet above the sea. Deer are wild on the hills, the descendants of tame animals that be- longed to a former king. The leper settlement of Molokai has been already mentioncd.

Oanv, 23 miles N.W. of Molokai and 67 miles S.E. of Kauai, has an irregular quadrangular form. It is traversed from S.E. to N.W. by two parallel ranges of hills separated by a low plain. The highest point in the island is Kaula, 4060 feet, in the western rauge; but the eastern range is much longer than the other, and its ridge is very broken: on the land side there are many ravincs formed by lateral spurs, but for 30 miles on the other side it presents to the sea a nearly vertieal wall without a break. The valleys are remarkable for beautiful seenery,—peaks, cliffs, lateral ravines, cascades, and tropical vegetation combining

to charm the eye. There are few craters on the loftier heights, voleanic activity appearing to have long ceased, but on the coast there are several groups of small cones with craters, some of lava, others of tuff. The greater part of the coast is surrounded by a coral reef, often half a mile wide. In several localities an old reef has been upheaved, sometimes to the height of 100 feet, and now forms part of the land. By sueh an upheaval a bay of the seaa niile wide and two miles long has been converted into a plain some 25 feet above the level of the ocean, and upon this plain stands Honolulu, the capital of the kingdom, noticed above.

Kavat, 67 miles N.W. of Maui and 23 miles from Molokai, has an irregularly cireular form; and at the centre is the basaltic moun- tain Waialeale, 5000 feet high, whieh has a swampy top and sides deeply furrowed by ravines, showing that volcanic action has been long extinet. To the west of the mountain is a tableland with an elevation of 4000 feet and

an area of 40 square miles, terminating at the sea in a preeipice of 2000 feet. The valleys are numerous, deep, and very picturesque with wood and waterfalls. The soil is fertile, the lavas of nearly the whole island being much decomposed. In some places, however, are cones which have preserved their craters. Numerous dykes are exposed in the valleys, and there are large eaverns in several localities whieh are thought to have been great bubbles in the lava, In one place near the shore is a bank of calcareous sand which on being set in motion gives out a curious noise. When the grains were examined with the microscope they were found to contain cavities, and it is supposed that these minute hollows are the cause of the resonance, for when the sand is wet the noise is not heard. A district on the north side of the island is considered to be the best watered and most fertile in the entire group ; it contains several sugar plantations. In this part the rainy season exteuds over ninemonths. The chief town is Waimea (population 1200), which affords the best anehorage in Kauai; it is situated at the mouth of a stream navigable by boats for three quarters of a mile.

NiHAv, the most westerly island of the group, is15 miles west of Kauai. Two-thirds of it consist of a low plain eomposed of an up- lifted coral reef and matter washed down from the mountains. The hilly portion is destitute of cones, craters, peaks, and ridges. The coast on the side towards Kauai is formed of high cliffs, and from the similarity of the strueture of the rocks on the two sides of the strait it is thought that the islands were once united. The soil of Niihau is dry, yet fertile. The island is the property ofa foreigner who pastures about 75,000 sheep upon it. The unin- habited islets of Kaula and Lchua, close to Niihau, have each of them a tufa cone.

See G. Mortimer, Observations during a Voyage to the… Sandwich Islands, &e., Lond., 1791; G. F. Mathison, Warr. of a Visit to the Sandwich Islands, 1825; W. Ellis, Narrative… with Remarks on the Sandwich Islands, 1826; Voy. of H.M.S. Blonde to the Sandwich Islands, 1824-25, Lond., 1826; J. Jarves, Hist. of the Sandwich Islands, Boston, U.S., 1848; H. T. Cheever, Life on the Sandwich Islands, 1851; W. Ellis, Polynesian Researches, 1853; S. 8. Hiil, Travels in the Sand- wich Islands, 1856; Ch. Wilkes, U.S.N., Narrative of Exploring Exped. round the World, 1838-42, New York, 1856; T. Williams, 7re Sandwich Islands, Lond., 1858; Hopkins, Hawaii Past, Present, and Future, Lond., 1866; Jules Remy, Récits @un vieux sauvage,

pour servir & Vhistoire ancienne du Hawati, Chalons sur Marne, 1859; Id., Ka Mooolelo Hawaii, histoire de V'archipel hawatien (text and translation), Paris, 1862; H. Mann, Flora of the Hawatian Islands (Boston, 1868), and his papers in Mem. Boston Soc., 1869, and in Proc. of Amer. Acad., vol. vii., 1868; Brigham, " Notes on Hawaiian Volcanoes," in den. Bost, Soc. Nat. Hist. (Boston, 1868-69), and his paper's in the Globus, 1876, and the Ausland, 1876; Haun, 'Klima der Sandwich Inseln," in Zeitschrift der Oesterr. Ges. fiir Meteor., viii., 1873; W. R, Bliss, Paradise in the Pacific, New York, 1873; Nord- hoff, Northern California, Oregon, and the Sandwich Islands, London, 1874; C. de Varigny, Quatorze ans aux iles Sandwich, Paris, 1874; H. M. Whitney, The Hawatian 'Guidebook, Honolulu, 1875; Thrum, Hawaiian Almanac for 1875. Honolulu, 1875; Ferreiro, " Las islas de Sandwieli descubiertas por los Espafioles," in Boletin de la Soc. Geog. de Madrid, 1877. For further bibliographical details see Hawaiian Club Papers, Boston, 1868, and W. Martin, Cat. douvrages relatifs aux iles Hawai, Paris, 1867. A map of Hawaii is given in Petermann's Mittheil., 1876, and one of the other islands, zbid., 1878. (J. Y. J.)

HAWARDEN, a market-town of Flintshire, North Wales, 8 miles S.W. of Chester, is a clean and tolerably well-built place, situated on an eminence commanding an extensive prospect. It lies in the midst of a coal district, and near it are valuable clay-beds. Coarse earthenware, draining- tiles, and fire-clay bricks form the chief manufactures of the district. The family of Maude derive the title of viscount from the town. Population (1871) of the town- ship, 6782; of the parish (including Saltney), 8683. In the neighbourhood is Hawarden Castle, built in 1752, and added to and altered in the Gothic style in 1814; it stands near the ruins of the old castle of that name which was granted by the Conqueror to his nephew Hugh Lupus, and which after many vicissitudes came into the possession of Serjeant Glynne, lord chief-justice of England under Crom- well. On the death in 1874 of Sir Stephen R. Glynne, the last of a line of baronets, the castle passed to his brother- in-law the eminent statesman Mr W. E. Gladstoue.,

HAWES, Stepney, a minor English poct of the 16th century. Neither the date of his birth nor that of his death has been ascertained, and all the known facts of his life may be stated in a few lines. He was probably a member of a Suffolkshire family, studied at Oxford, with what success we can only conjecture, travelled in England, Scotland, and France, and having acquired the reputation of a man of culture was appointed groom of the chamber to King Henry VII. He was still alive in J anuary 1520-21, as appears by an entry, Item to Mr Hawse Jor his play wy li. aw s. id. Of the play thus mentioned nothing further is known. The writer's chief work was The Historie

of Graunde Amour and la Bell Pucell, called the Pastime of

Pleasure, conteyning the Knowledge of the Seven Sciences and the Course of Man's Life, a long allegorical poem in the style of Lydgate. Its general method may be guessed

from such a heading as How Science Jirst sent him to Gramer

where he was receyved by Dame Congruittie; and, though it

must be confessed that portions of the poem are better

both in matter and in workmanship than might be expected, it is now of interest almost exclusively because, in Warton's words, it is '"'almost the only effort of imagination and in- vention which had appeared in our poetry since Chaucer." Probably written about 1506, and first printed, it is said, by Wynkyn de Worde, it afterwards went through several editions (J. Wayland, 1554; Richard Tottel, 1555; J. Waley, 1559); a reprint of Tottel's was made for the Percy Society in 1842. Among the minor poems attributed to Hawes it is sufficient to mention

Kynge Henry the Eight. duction, was printed by Wynkyn de Worde (1509?) and William Copland (1551). preserved is among Bishop More's books in the public library of the university of Cambridge. for the Abbotsford Club by David Laing (1854). For

further details see Hazlitt's edition of Warton's Mistory of English Poetry (1874), and the Percy and Abbotsford

reprints.

HAWES, Witutam (1785-1846), an English musician of some merit, is remembered chiefly by the fact that through his instrumentality Weber's Der Freischiitz was for the first time performed in England. This event took place July 24, 1824, and led eventually to Weber's removal Hawes was born in London in 17 85, and was for eight years (1793-1801) a chorister of the Chapel

to London.

Royal, where he studied music chiefly under Dr Ayrton. He subsequently held various musical posts, being in 1817 appointed master of the children of the Chapel Royal. He also, in conjunction with Welsh, carried on the business of a music publisher, and was for many years musical director of the Lyceum Theatre, then devoted to English opera. It was in the last-named capacity that he intro- duced Weber's masterpiece, at first slightly curtailed, but soon afterwards in its entirety. Winter's Interrupted Sacrifice, Mozart's Cosi fan Lutte, Marschner's Vampyre, and other important works were also brought out under his auspices. Hawes also wrote or compiled the music for numerous pieces, none of which however has survived or deserves mention. Better were his glees and madrigals, of which he published several collections. He also superin- tended a new edition of the celebrated Triumph of Oriana. Hawes died February 18, 1846,

HAWFINCH, a bird so called from the belief that the fruit of the hawthorn (Crategus Oxyacantha) forms its chief food, the Loxia coccothraustes of Linneeus, and the Cocco- thraustes vulgaris of modern ornithologists, one of the largest of the Finch family (Fringillide), and found over nearly the whole of Europe, in Africa north of the Atlas, and in Asia from Palestine to Japan. It was formerly

his Conversyon of Swerers and his Joyful Medytacyon to all Englonde of The former, a dry didactic pro-

Of the latter the only copy

Both were edited

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thought to be only an autumnal or winter-visitor to Britain, but later experience has proved that, though there may very likely be an immigration in the fall of the year, it breeds in nearly all the English counties to Yorkshire, and abundantly in those nearest to London, There seems also to be good reason for supposing that it is yearly extending its range in the British Islands. In coloration it bears some resemblance to a Chaffinch, but its much larger size and enormous beak make it easily recognizable, while on closer inspection the singular bill-hook form of some of its wing-feathers will be found to be very remarkable. Though not uncommonly frequenting gardens and orchards, in which as well as in woods it builds its nest, it is exceedingly shy in its habits, so as seldom to afford opportunities for observation. As the genus Coccothraustes is now commonly restricted, it includes but this single species, —the Japanese form, at one time regarded as distinct, being considered by the latest authorities to be inseparable. (A. N.) HAWICK, a municipal and parliamentary borough of Roxburghshire in Scotland, 10 miles S. W. of J edburgh, and 53 miles §.8.E. of Edinburgh by rail, is situated on the south bank of the Teviot at its junction with the Slitrig, a wild and irregular stream that flows through the town. A handsome bridge, spanning the Teviot, connects Hawick with the manufacturing village of Wilton, which is practi- cally a suburb. The town is fairly well built, the main street being broad and well paved. The ancient tower of the barons of Drumlanrig is now occupied as an inn; and many of the older houses testify by their massive propor- tions to the former dangers of Hawick's position as a border town. The tower was the only building not burned down in 1570 by the earl of Sussex. The parish church of St Mary has succeeded one mentioned in the Chronicle of Melrose as having been consecrated in 1214,—a fact which speaks for the antiquity of the town. Additional testimony is afforded by the Moathill at one end of the town, an earthen mound of great antiquity, about 30 feet high. The present town-charter, granted in 1537 by a baron of Drum- lanrig, was confirmed in 1545 by Queen Mary during a residence inthe town. Hawick, with Wilton,

was in 1868 erected into a parliamentary burgh, uniting with Galashiels and Selkirk in sending a member to parliament. The municipal government is vested in a town council, con- sisting of a provost, four magistrates, and ten councillors, The exchange, built in 1865, contains a free public library. Hawick possesses a very complete system of underground drainage, in connexion with purification works,—this being the first experiment of the kind on a large scale in Scotland. The manufactures of Hawick are mentioned in the burgh records so far back as 1640, but they must have been flourishing for some time before that, as the weavers already formed an important part of the population. The weavers then worked each for himself, executing his private orders ; and it is not till the middle of the following century that a number of looms under one employer are heard of. "Linen was at first the chief article of manufacture, but woollen plaidings were also made. Wool was also spun and sold to be manufactured elsewhere. A carpet factory was begun in 1752, and the manufacture of linen tapes or inkle started a few years afterwards, but both industries became extinct towards the beginning of the preseut century. The manufacture of tweeds is the most important industry of Hawick. In this branch the annual turn-over is about £800,000; while in the whole woollen trade it is about £2,000,000. The manufacture of hosiery, to which the town owes so much of its prosperity, was introduced in 1771, when four looms, employing six men and five women, produced annually about 2400 pairs of coarse stockings. Hawick has gradually become the chief seat of this trade in Scotland. Some of the yarn spun at Hawick is sent

to England and to other parts of Scotland to be woven ; while the merino yarn used for the finer goods is chiefly obtained from Pleasley and Nottingham. Besides the staples, tweeds and hosiery, Hawick manufactures shawls, plaids, blankets, gloves, and leather. There are also an oil-work, for extracting oil from the soapy refuse of the fulling-mills, an iron-foundry, and a factory-engineering establishment. The population of the burgh in 1871 was 11,356; in 1879 it was estimated at about 15,000. HAWK (Anglo-Saxon, Hafoc), a word of somewhat indefinite meaning, being often used to signify all diurnal Birds-of-prey which are neither Vultures nor Eagles, and again more exclusively for those of the remainder which are not Buzzards,

Falcons, Harriers, or Kites. Even with this restriction it is comprehensive enough, and will include more than a hundred species, which have been arrayed in genera varying in number from a dozen to above a score, according to the fancy of the systematizer. Speaking generally, Hawks may be characterized by possessing com- paratively short wings and long legs, a bill which begins to decurve directly from the cere (or soft bare skin that covers its base), and has the cutting edges of its maxilla (or upper mandible) sinuated but never notched. 'To these may be added as characters, structurally perhaps of less value, but in other respects quite as important, that the sexes differ very greatly in size, that in most species the irides are yellow, deepening with age into orange or even red, and that the immature plumage is almost invariably more

Fs u~ Rs European Sparrow-Hawk (Male and Female). or less striped or mottled with heart-shaped spots beneath, while that of the adults is generally much barred, though the old males have in many instances the breast and belly quite free from markings. Nearly all are of small or moderate size—the largest among them being the Gos- Hawk (vol. x. p. 788) and its immediate allies, and the male of the smallest, Accipiter tinus, is not bigger than a Song-Thrush. They are all birds of great boldness in attacking a quarry, but if foiled in the first attempt they are apt to leave the pursuit. Thoroughly arboreal in their habits, they seek their prey, chiefly consisting of birds (though reptiles and small mammals are also taken), among trees or bushes, patiently waiting for a victim to shew itself, and gliding upon it when it appears to be unwary with a rapid swoop, clutching it in their talons, and bearing it away to eat it in some convenient spot. It is of course impossible here to enter into details of the numerous forms which, notwithstanding the limitation

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1 In one form, Nisoides, which on that account has been generically separated, they are said to be perfectly straight.

above adopted, are to be called Hawks, or to describe the distinguishing characters, so far as any have been given, of the different groups or

sections into which it has pleased systematic ornithologists to break them up, since hardly any two are agreed in the latter respect. There is at the outset a difference of opinion as to the scientific name which the largest and best known of these sections should bear—some authors terming it sus, and others, who seem to have the most justice on their side, Accipiter. In Europe there are two species—first, A. mésus, the common Sparrow-Hawk, which has a wide distribution from Ireland to Japan, ex- tending also to northern India, Egypt, and Algeria, and secondly, A. brevipes (by some placed in the group Micro- nisus and by others called an Astur), which only appears in the south-east, and the adjoining parts of Asia Minor and Persia. In North America the place of the former is taken by two very distinct species, a small one, A. fuscus, usually known in Canada and the United States as the Sharp-shinned Hawk, and Stanley's or Cooper's Hawk, A. coopert (by some placed in another genus, Cooperastur), which is larger and has not so northerly a range. In South America there are four or five more, including A. tinus, before mentioned as the smallest of all, while a species not much larger, A. minallus, together with several others of greater size, inhabits South Africa, Madagascar and its neighbouring islands have three or four species sufficiently distinct, and India has A. badius. A good many more forms are found in South-eastern Asia, in the Indo-Malay Archi- pelago, and in Australia three or four species, of which A. cirrhocephalus most nearly represents the Sparrow-Hawk of Europe and Northern Asia, while A. radiatus and A. approximans shew some affinity to the Gos-Hawks (Astwr) with which they are often classed. The differences be- tween all. the forms above named and the much larger number here unnamed are such as cau be only appreciated by the specialist, and could not possibly be pointed out within the limits of this article. It may be observed in conclusion that the so-called " Sparrow-Hawk" of New Zealand (Hieracidea) does not belong to this group of birds at all, and by many authors has been deemed akin to the Falcons. For Hawking, see Fatconry. (A. N. HAWKE, Evwarp Hawke, Baron (1705-1781), an English admiral, was the son of a barrister and was born in 1705. He entered the navy at an early age, and in 1733 became commander of the " Wolf." In the engagement off Toulon in 1744, he broke from the line of battle in order to engage the "Poder," and although he succeeded in causing her to strike her colours, his breach of discipline was punished by dismissal from the service. He was, however, almost immediately restored by the king's commands, and in 1747 was promoted to

the rank of rear-admiral of the white. In October of the same year he was sent in command of a squadron intended to intercept a fleet of merchant vessels bound for the West Indies under a convoy of nine men-of- war, and coming up with them on the 14th of the month near the isle of Aix, he succeeded after a severe struggle in capturing six of the men-of-war, but darkness coming on before the close of the contest the whole of the merchant vessels escaped. For his victory Hawke was created a knight companion of the Bath. In December of the same year he was chosen member of parliament for Bristol In May 1748 he became vice-admiral of the blue, and in January 1755 admiral of the white. In the following year he succeeded Admiral Byng as commander of the fleet in the Mediterranean, but arrived too late to succour Minorca ; and in none of the commands which he subsequently held did he have an opportunity of distinguishing himself till 1759, when he took charge of a squadron sent to cruise off Brest. On the morning of the 20th November he sighted the French fleet under Admiral Conflans off Belleisle, and

notwithstanding that the French, trusting to their know- ledge of the rocks and shallows, retired towards the shore, he determined to engage them, which he did with such im- petuosity that their tleet was only saved from total destruc- tion by the approach of nightfall. As it was, more than half their vessels were either disabled, captured, or driven on shore. For this brilliant victory, gained in such

circumstances of difficulty and danger, with the loss of only

two vessels, Hawke received the thanks of the House of Commons and a pension of £2000 per annum. In 1765 he was appointed vice-adiniral of Great Britain and first lord of theadmiralty. In 1776 he was raised to the peer- age by the title of Baron Hawke of Towton. He died at Shepperton, Middlesex, 17th October 1781. HAWKESWORTH, Joun (c. 1715-1773), an author

of the last century, was born in London, according to

one account in 1715, but according to another in 1719.

He is said to have been apprenticed first to a clockmaker and afterwards to an attorney, but at any rate he was indebted for the education requisite for the prosecution of

a literary career chiefly to his own perseverance, In 1744

he succeeded Dr Johnson as compiler of the parliamentary debates for the Gentleman's Magazine, Eight years later he started in company with Johnson, Bathurst, and Warton This journal had a

@ periodical called the Adventurer, great success, and ran to 140 numbers, of which 70 were from the pen of Hawkesworth himself.

Canterbury with the degree of LL.D, lished a volume of fairy tales, and an

Poets.

sum of £6000.

severity of their strictures is said to have hastened his death, which took place November 17, 1773.

his memory. Hawkesworth was a close imitator of Johnscn

both in style and thought, but his independent literary

talent is considerable,

HAWKINS, Sir Jonn (c. 1532-1595), was born in

Plymouth about 1532, and was bred a sailor. Learning that negroes from the coast of Guinea were good merchan- dize for traffic in the West Indies, he made trial of this in three voyages, the first in 1562, the second in 1564. The third, made in company with young Drake in 1567, ended in disaster, the story of which is related by Hawkins himself. He was returned M.P. for Plymouth in 1572; and the next year he was made treasurer and comptroller of the navy. In the expedition against the Armada he was appointed vice-admiral, hoisting his flag on board the "Victory," and for his services on that occasion he was afterwards knighted. His last

expedition (1595) was un- dertaken, once more with Drake, mainly with a view to rescue his son Richard, who three years before had fallen into the hands of the Spaniards off the coast of Quito. It was unsuccessful; and, worn out with fatigue and broken- hearted, he died off Puerto Rico on the 12th of November 1595. Hawkins was the first to use chain pumps and fighting nettings for ships. Stow speaks of him as a very wise, vigilant, and true-hearted man. Along with Sir Francis Drake, he founded in 1588 the « Chest at Chatham," the forerunner of Greenwich Hospital, where

On account of what was regarded as its powerful defence of morality and religion, Hawkesworth was rewarded by the archbishop of In 1761 he pub- edition of Swift's works and letters, with a life prefixed which Johnson has referred to in highly laudatory terms in his Lives of the The reputation he obtained by these and other works was such that he was commissioned by Captain Cook to edit his papers relative to his first voyage. The work appeared in 1773 in three volumes, and as a reward of his labours Hawkesworth received from the Government the His descriptions of the manners and customs of the New World were, however, regarded by many critics as hurtful to the interests of morality, and the

He was buried at Bromley in Kent, where a monument has been erected to

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it is now preserved. A portrait of Hawkins once adorned the Armada tapestry in the House of Lords,

HAWKINS, Sir Jonn (1719-1789), will be permanently remembered as the author of an important work on the history of music. He was born March 30, 1719, in London, the son of an architect who destined his son for his own profession. Ultimately, however, Hawkins took to the law, devoting his leisure hours to his favourite study of music. A wealthy marriage in 1753 enabled him to in. dulge his passion for acquiring rare works of music, and he bought, for example, the collection formed by Dr Pepusit, and subsequently presented by Hawkins to the British Museum. It was on such materials that Hawkins founded his celebrated work on the General History of the Science and Practice of Music, in 5 vols. (republished in 2 vols,, 1879). It was brought out in 1776, the same year which witnessed the

appearance of the first volume of Burney's work on the same subject. The relative merits of the two works were eagerly discussed by contemporary critics. Burney no doubt is infinitely superior as a literary man, and his werk accordingly comes much nearer the idea of a systematic treatise on the subject than Hawkins's, which is essentially a collection of rare and valuable pieces of music with a more or less continuous commentary. But by rescuing these from oblivion Hawkins has given a per- manent value to his work. Of Hawkins's literary efforts apart from music it will be sufficient to mention his occa- sional contributions to the Gentleman's Magazine, his edition of the Complete Angler, and his biography of Dr Johnson, with whom he was intimately acquainted. He was one of the original members of the Ivy Lane Club, and ultimately became one of Dr Johnson's exe- cutors. If there were any doubt as to his intimacy with Johnson, it would be settled by the slighting way in which Boswell refers to him, Speaking of the Ivy Lane Club, he mentions amongst the members "Mr John Hawkins, an attorney," and adds the following footnote, which at the same time may serve as a summary of the remaining facts of Hawkins's life :—" He was for several years chairman of the Middlesex justices, and upon presenting an address to the king accepted the usual offer of knighthood Gunga), He is the author of a History of Music in five volumes in quarto. By assiduous attendance upon Johnson in his last illness he obtained the office of one of his executors,—in consequence of which the booksellers of London employed him to publish an edition of Dr Johnson's works and to write his life." Sir John Hawkins died on the 2lst of May 1789, and was buried in the cloisters of Westminster Abbey.

HAWKWOOD, Sir Joun (ob, 1394), an English adventurer who attained great wealth and renown by his services as a condottiere in the Italian wars of the 14th ceutury, According to the accepted if not the authenticated account of his life, he was the son of a tanner of Sible Hedingham in Essex, and was apprenticed to a tailor in London. Pressed into the army, he served with honour in France, obtained the favour of the Black Prince, and received knighthood from King Edward III. On the peace of Bretigny in 1360, he collected a band of men-at- arms, and moved southward to Italy, where we find him assisting the Pisans to defeat the Florentines in 1364. His services were sought in succession by Bernabo Visconti, by the legate of Bologna, and by Pope Gregory XJ. In 1375 the Florentines entered into an

agreement with him, by which they were to pay him and his companion 130,000 gold florins in three months on condition that he undertook no engagement against them ; and in the same year the priors of the arts and the gonfalonier decided to give him a pension of 1200 florins per annum for as long as he should remain in Italy. His subsequent services to Florence as captain-

general of the city were numerous and important. Hawk- wood married Donnana, an illegitimate daughter of Bernabo Visconti, and one of his own daughters became the wife of the count of Porziglia. His latter years were spent in a villa in the neighbourhood of Florence. On his death in 1394 the republic gave him a public funeral of great magnificence and decreed the erection of a marble monu- ment in the cathedral. This, however, was never executed; but Paolo Uccelli painted his portrait in terre-verte on the inner facade of the building, where it still remains, though damaged by removal from the plaster to canvas. Richard IL. of England, probably at the instigation of Hawkwood's sons, who returned to their native country, requested the Florentines to let him remove the good knight's bones, and the Florentine Government signified its consent.

The fullest account of Sir John Hawkwood in English is in ' Nichol's Bibliotheca topographica Britannica, vol. vi. Richard Johnson's Nine Worthics of London (published in Har- leian Misc., 1808), and Fuller includes him in his Worthies of England. An'elaborate life by Manni is given by Tartini in Rerwin Ital. Script.; and Hawkwood is naturally treated of in Ammirato and the other Florentine chronicles. The compact with the Floren- tines is printed in Archivio Storico, 1868.

HAWTHORN (Anglo-Saxon, haga-, heg-, or hege-thorn), Crategus, L., a genus of plants of the natural order Losacee and sub-order Pome. The common hawthorn, termed also whitethorn, quickthorn, quickset, and May tree, May bush, or May (German, Hagedorn and Ohristdorn; French, Aubépine), C. Oxyacantha, L., is a shrub or small tree having a smooth blackish bark ; numerous branches, beset usually with thorns, which represent aborted twigs ; alter- nate, long-stalked, obovate-wedge-shaped, 3- or 5-lobed, in- cised or serrate smooth leaves; flowers sweet-scented,

arranged in corymbs, and having caducous bracts, broad, white, pink, or scarlet petals, and 1 to 3 styles; and fruit or "haw" an oblong or nearly globular mealy pome, commonly dark red, but occasionally yellow, black, or even greenish-orange or dull white, aud of 1 or 2cells. The common hawthorn is a native of Europe as far north as 604° in Sweden, and of North Africa, Western Asia, aud Siberia, and has been naturalized in North America and Australia. It thrives best in dry soils, and in height varies from 4 or 5 to 12, 15, or, in exceptional cases, as much as between 20 and 30 feet. There are several varieties of the plant. It may be propagated from seed or from cuttings. The seeds must be from ripe fruit, and if fresh gathered should be freed from pulp by maceration in water. They germinate only in the second year after sowing; in the course of their first year the seedlings attain a height of 6 to 12 inches. In England the hawthorn has been em- ployed for enclosure of land since the Roman occupation, but for ordinary field-hedges it is believed it was not generally in use till about the end of the 17th century. James I. of Scotland, in his Quair, ii, 14 (early 15th century), mentions the "hawthorn hedges knet" of Windsor Castle. The first hawthorn hedges in Scotland are said to have been planted by soldiers of Cromwell at Inch Buckling Brae in East Lothian, and Finlarig in Perth- shire. On the planting and use of hawthorn fences, see AGRICULTURE, vol. i. pp. 296, 310. The wood of the hawthorn is white in colour, with a yellowish tinge. Fresh cut it weighs 68 ib 12 oz. per cubic foot, and dry 57 ib 3oz. It can seldom be obtained in large portions, and has the disadvantage of being apt to warp; its great hard- ness, however, renders it valuable for.the manufacture of various articles, such as the cogs of mill- wheels, flails and mallets, and handles of hammers. Both green and dry it forms excellent fuel. The bark possesses tanning pro- perties, and in Scotland in past times yielded with ferrous sulphate a black dye for wool. The leaves are eaten by cattle, and have been employed as a substitute for tea.

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Birds and deer feed upon the haws, which are used in the preparation of a fermented and highly intoxicating liquor, and for their astringency are

sometimes resorted to in dysentery. The hawthorn serves as a stock for grafting other trees. As an ornamental feature in landscapes, it is worthy of notice; and the pleasing shelter it affords, and the beauty of its blossoms, have frequently been alluded to by poets. The custom of employing the flower- ing branches for decorative purposes on the first of May is of very early origin; but since the alteration in the calendar (see vol. iv. p. 677) the tree has rarely been in full bloom in England before the second week of that month. In Cornwall, however, in 1846, the flowers, though scarce, were gathered on the 18th April; and in the Scotch Highlands they may be seen as late as the middle of June. The hawthorn has been regarded as the emblem of hope, and its branches are stated to have been carried by the ancient Greeks in wedding processions, and to have been used by them to deck the altar of Hymen. The supposition that the tree was the source of Christ's crown of thorns gave rise doubtless to the tradition cur- rent among the French peasantry that it utters groans and cries on Good Friday, and probably also to the old popular superstition in Great Britain and Ireland that ill- luck attended the uprooting of hawthorns. Branches of the Glastonbury thorn, C. Oayacantha, var. preecox, which flowers both in December and in spring, were formerly highly valued in England, on account of the legend that the tree was originally the staff of Joseph of Arimathea (see GLASTONBURY, vol, x. pp. 674, 675). Sub-species of C. Oxyacantha are C. monogyna, Jacquin, and C. oxya- canthotdes, Thuill. (C. Pyracantha and C. Crus-galli are among the cultivated species of Crategus.

Sce Lauder, Gilpin's For. Scenery, i., 1834; Loudon, Arbore- tum, ii. 834; Selby, Hist. of Brit. For. Trees, 1842; Bentham,

Illustr. Handb. of Brit. Flora, i. 270, 1865; C. A, Johns, The Forest Trees of Britain, p. 83.

NATHANIEL HAWTHORNE

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b kes family name of Nathaniel Hawthorne was spelled

Hathorne until it was changed by him in early man- hood to its present form, The head of the American branch of the family, William Hathorne of

Wilton, Wiltshire, England, emigrated with Winthrop and his company, and arrived at Salem Bay, Mass., June 12, 1630. He had grants of land at Dorchester, where he resided for upwards of six years, when he was persuaded to remove to Salem by the tender of further grants of land there, it being con- sidered a public benefit that he should become an inhabitant of that town. He represented his fellow-townsmen in the legislature, and served them in a military capacity as a captain in the first regular troop organized in Salem, which he led to victory through an Indian campaign in Maine. Originally a determined "Separatist," and opposed to compulsion for conscience, he signalized himself when a magistrate by the active part which he took in the Quaker persecutions of the time (1657-62), going so far on one occasion as to order the whipping of Anne Coleman and four other Friends through Salem, Boston, and Dedham. He died, an old man, in the odour of sanctity, and left a good property to his son Jolin, who inherited his father's capacity and intolerance, and was in turn a legislator, a magistrate, a soldier, and a bitter persecutor of witches. Before the death of Justice Hathorne in 1717, the destiny of the family suffered a sea-change, and they began to be noted as mariners. One of these seafaring Hathornes figured in the Revolution as a privateer, who had the good fortune to escape from a British prison-ship ; and another, Captain Daniel Hathorne, has left his mark on early

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American ballad-lore. He too was a privateer, commander of the brig " Fair American," which, cruising off the coast of Portugal, fell in with a British scow laden with troops for General Howe, which scow the bold Hathorne and his valiant crew at once engaged, and fought for over an hour, until the vanquished enemy was glad to cut the Yankee grapplings and quickly bear away. The last of the Hathornes with whom we are concerned was a son of this sturdy old privateer, Nathaniel Hathorne. He was born in 1776, and about the beginning of the present century married Miss Elizabeth Clarke Manning, a daughter of Richard Manning of Salem, whose ancestors emigrated to America about fifty years after the arrival of William Hathorne. Young Nathaniel took his hereditary place before the mast, passed from the forecastle to the cabin, made voyages to the East and West Indies, Brazil, and Africa, and finally died of fever at Surinam, in the

spring of 1808. He was the father of three children, the second of whom, Nathaniel, was born at Salem, J uly 4, 1804.

After the death of her husband Mrs Hathorne removed to the house of her father with her little family of children. Of the boyhood of Nathaniel no particulars have reached us, except that he was fond of taking long walks alone, and that he used to declare to his mother that he would go to sea some time, and would never return. Among the books that he is known to have read as a child were Shakespeare, Milton, Pope, and Thomson, Zhe Castle of Indolence being an especial favourite, In the autumn of 1818 his mother removed to Raymond, a town in Cumberland county, Maine, where his uncle, Richard Manning, had built a large and ambitious dwelling. Here the lad resumed his solitary walks, exchanging the narrow streets of Salem for the boundless, primeval wilderness, and its sluggish harbour for the fresh, bright waters of Sebago lake. He roamed the woods by day, with his gun and rod, and in the moon- light nights of winter skated upon the lake alone till mid- night. When he found himself away from home, and wearied with his exercise, he took refuge in a log cabin where half a tree would be burning upon the hearth. He had by this time acquired a taste for writing, that showed itself in a little blank-book, in which he jotted down his woodland adventures and feelings, and which was remark- able for minute observation and nice perception of nature.

After a year's residence at Raymond, Nathaniel returned to Salem in order to prepare for college. He amused himself by publishing a manuscript periodical, which he called the Spectator, and which displayed considerable vivacity and talent, He speculated upon the profession that he would follow, with a sort of prophetic insight into his future. "I do not want to be a doctor and. live by men's diseases," he wrote to his mother, "nor a minister to live by their sins, nor a lawyer and live by their quarrels. So I don't see that there is anything left for me but to be an author. How would you like some day to see a whole shelf full of books, written by your son, with ' Hawthorne's Works' printed on their backs?"

Nathaniel entered Bowdoin College, Brunswick, Maine, in the autumn of 1821, where he became acquainted with two students who were destined to distinction—Henry W, Longfellow and Franklin Pierce. He was an excellent

classical scholar, his Latin compositions, even in his fresh- man year, being remarkable for their elegance, while his Greek (which was less) was good. He made graceful translations from the Roman poets, and wrote several English poems which were creditable'to him. After his graduation three years later, he returned to Salem, and to a life of isolation. He devoted his mornings to study, his afternoons to writing, and his evenings to long walks along the rocky coast. He was scarcely known by sight to his townsmen, and he held so little communication with the

members of his own family that his meals were frequently left at his locked door. He wrote largely, but destroyed many of his manuscripts, his taste was so difficult to please. He thought well enough, however, of one of his com posi- tions to print it anonymously in 1828, A crude melo- dramatic story, entitled /anshawe, it was unworthy even of his immature powers, and should never have been rescued from the oblivion which speedily overtook it, The name of Nathaniel Hawthorne finally became known to his country- men as a writer in The Token, a holiday annual which was commenced in 1828 by Mr S. G. Goodrich (better known as "' Peter Parley"), by whom it was conducted for fourteen years. This forgotten publication numbered among its contributors most of the prominent American writers of the time, none of whom appear to have added to their reputation in its pages, except the least popular of all— Hawthorne, who was for years the obscurest man of letters in America, though he gradually made admirers in a quiet way. His first public recognition came from England, where his genius was discovered in 1835 by the late Henry F. Chorley, one of the editors of the Athenceum, in which he copied three of Hawthorne's most characteristic papers from Zhe Token. He had but little encouragement to continue in literature, for Mr Goodrich was so much more a publisher than an author that he paid him wretchedly for his contributions, and still more wretchedly for his work upon an American Magazine of Useful and Entertaining Knowledge, which he persuaded him to edit. This author- publisher consented, however, at a later perjod (1837) to bring out a collection of Hawthorne's writings under the title of Twice-told Tales, A moderate edition was got rid of, but the great body of the reading public ignored the book altogether. It was generously reviewed in the North American Review by his

college friend Longfellow, who said it came from the hand of a man of genius, and praised it for the exceeding beauty of its style, which was as clear as running waters.

The want of pecuniary success which had go far attended his authorship led Hawthorne to accept a situation which was tendered hiin by Mr George Bancroft, the historian, collector of the port of Boston under the Democratic rule of President Van Buren. He was appointed a weigher in the custom-house at a salary of about $1200 a year, and entered upon the duties of his office, which consisted for the most part in measuring coal, salt, and other bulky com- modities on foreign vessels. It was irksome employment, but faithfully performed for two years, when he was super- seded through a change in the national administration. Master of himself once more, he returned to Salem, where he remained until the spring of 1841, when he wrote a collection of children's stories entitled Grandfather's Chair, and joined an industrial association at West Roxbury, Mass. Brook Farm, as it was called, was a social Utopia, composed of a number of advanced thinkers, whose object was so to distribute manual labour as to give its members time for intellectual culture. The scheme worked admir- ably—on paper ; but it was suited neither to the tempera- ment nor the taste of Hawthorne, and after trying it patiently for nearly a year he returned to the everyday life of mankind.

One of Hawthorne's earliest admirers was Miss Sophia Peabody, a lady of Salem, whom he married in the summer of 1842, He made himself a new home in an old manse, at Concord, Mass., situated on historic ground, in sight of an old revolutionary battlefield, and devoted himself diligently to literature. He was known to the few by his Twice-told Tales, and to the many by his papers in the Democratic Review. He published in 1842 a second portion of Grandfather's Chair, and in 1845 a second volume of Twrce-told Tales. He edited, during the latter year the

African Journals of Horatio Bridge, an officer of the navy, who had been at college with him; and in the following year he published in two volumes a

collection of his later writings, under the title of Mosses from an Old Manse.

After a residence of nearly four years at Concord, Hawthorne returned to Salem, having been appointed surveyor of the custom-house of that port by a new Demo- cratic administration. He filled the duties of this position until the incoming of the Whig administration again led to his retirement. He seems to have written little during his official term, but, as he had leisure enough and to spare, he read much, and pondered over subjects for future stories, His next work, Zhe Scarlet Letter, which was begun after his removal from the custom-house, was published in 1850. Tf there had been any doubt of his genius before, it was settled for ever by this powerful romance.

Shortly after the publication of Zhe Scarlet Letter Hawthorne removed from Salem to Lenox, Berkshire, Mass., where he wrote The House of the Seven Gables (1851) and Zhe Wonder-Book (1851). From Lenox he removed to West Newton, near Boston, Mass., where he wrote Zhe Blithedale Romance (1852) and The Snow Image and other Twice-told Tales (1852). In thespring of 1852 he removed back to Concord, where he purchased an old house which he called The Wayside, and where he wrote a Life of Franklin Pierce (1852) and Tanglewood Tales (1853). Mr Pierce was tlie Democratic candidate for the presidency, and it was only at his urgent solicitation that Hawthorne con- sented to become his biographer. He declared that he would accept no office in case he were elected, lest it might compromise him; but his friends gave him such weighty reasons for reconsidering his decision that he accepted the consulate at Liverpool, which was understood to be one of the best gifts at the disposal of the president.

Hawthorne departed for Europe in the summer of 1853, and returned to the United States in the summer of 1860. Of the seven years which he passed in Europe five were spent in attending to the duties of his consulate at Liver- pool, and in little journeys to Scotland, the Lakes, and elsewhere, and the remaining two in France and Italy. They were quiet and uneventful, coloured by observation and reflexion, as his note-books show, but productive of only one elaborate work, Zhe Marble Faun, which he sketched out during his residence in Italy, and rewrote and prepared for the

press at Leamington, England, whence it was despatched to America and published in 1860.

Hawthorne took up his abode at The Wayside, not much richer than when he left it, and sat down at his desk once more with a heavy heart. He was surrounded by the throes of a great civil war, and the political party with which he had always acted was under a cloud. His friend ex-President Pierce was stigmatized as a traitor, and when Hawthorne dedicated his next book to him—a volume of English impressions entitled Our Old Home (1863)—it was at the risk of his own popularity. His pen was soon to be laid aside for ever ; for, with the exception of the unfinished story of Septimius Felton, which was published after his death by his daughter Una (1872), and the fragment of 7'he Dolliver Romance, the beginning of which was published in the Atlantic Monthly in July 1864, he wrote no more. His health gradually declined ; his hair grew white as snow, and the once stalwart figure that in early manhood flashed along the airy cliffs and glittering sands sauntered idly on the little hill behind his house. In the beginning of April 1864 he made a short southern tour with his publisher Mr. William D. Ticknor, and was benefited by the change of scene until he reached Philadelphia, where he was shocked by the sudden death of Mr Ticknor. He returned to The Wayside, and after a short season of rest joined his friend ex-President Pierce. He died at Plymouth, New Hamp-

| shire, on May 19, 1864, and five days later was buried at Sleepy Hollow, a beautiful cemetery at Concord, where he used to walk under the pines when he was living at the Old Manse, and where his ashes mvulder under a simple stone, inscribed with the single word " Hawthorne."

The writings of Hawthorne are marked by subtle imagina- tion, curious power of analysis, and exquisite purity of diction. He studied exceptional developments of character, and was fond of exploring secret crypts of emotion. His shorter stories are remarkable for originality and suggestive- ness, and his larger ones are as absolute creations as Ham- let or Undine. Lacking the accomplishment of verse, he was in the highest sense a poet.

His work is pervaded by a manly personality, and by an almost feminine delicacy and gentleness. He inherited the gravity of his Puritan ancestors without their superstition, and learned in his solitary meditations a knowledge of the night-side of life which would have filled them with suspicion. A profound anatomist of the heart, he was singularly free from morbid- ness, and in his darkest speculations concerning evil was robustly right-minded. He worshipped conscience with his intellectual as well as his moral nature; it is supreme in all he wrote. Besides these mental traits, he possessed the literary quality of style—a grace, a charm, a perfection of language which no other American writer ever possessed in the same degree, and which places him among the great masters of English prose. (&. 148.)

HAXTHAUSEN, Avaust Franz Lupwic Maria von (1792-1867), baron of Haxthausen-Abbenburg, was born on his father's estate near Paderborn in Westphalia, February 3,1792. Educated at first at home, he proceeded in 1811 to the school of mining at Kiausthal in the Harz, and after serving in the Hanoverian army in 1813-15, entered the university of Gottingen. On finishing his course there in 1818, he occupied himself with the management of his estates, and the study of the land laws and the legal rights of the peasantry. he result of his studies appeared in 1829 in Die Agrarverfassung und ihre Conflicte, a work which attracted much attention, and procured for him an official commission to investigate and report upon the land laws of the Prussian provinces with a view to a new code. After nine years spent in laborious collation, he published in 1839 an exhaustive treatise, Die ldndliche Verfassuny in den Provinzen Ost- und West-Preussen. In 1843-44, at the request of the emperor Nicholas, he undertook a similar labour for Russia. The fruits of his investigations in that country are contained in Studien tiber die inneren Zustiinde, das Volksleben, und insbesondere die ldéndlichen Einrichtungen Russlands (3 vols. 1847-52), in Die Kriegs- macht Russlands (1852), and in Dve ldndliche Verfassung Russlands (1866). In 1836 he received the honorary title of privy state-councillor, and afterwards of hereditary chamberlain of the principality of Paderborn. In 1847-48 he sat as a member of the combined diet at Berlin, and afterwards of the first Prussian chamber. After travelling through a large part of Europe, Baron Haxthausen retired to his estate. He died at Hanover, January 1, 1867.

Besides the foregoing works, Haxthausen was the author of The Algerian Slave, a novel; and Transcaucasia, Sketches of the Nations and Races between the Black Sea and the Caspian, in English, 1854, German, 1856; in 1864 he edited Das Constitutionelle Prineip, a collection of political writings by various authors.

HAYDN, Josrru (1732-1809), one of the most cele- brated composers of the 18th century, was born at Rohrau, a village in Lower Austria, March 31, 1732, Schindler relates that when Beethoven, not long before his death, received. a picture of Haydn's birthplace, he exclaimed— '""How wonderful that so great a man should have been born in a peasant's cottage." This cottage, which is still standing, had been built by Haydn's father, a worthy wheelwright, of whose twelve children the composer was

the second. At an early age the child evinced so decided a talent for music that one Johann Mathias Frankh, a distant relation of the family, proposed to undertake his musical and general education, and for that purpose invited him to Hainburg, a neighbouring town where Frankh kept a school. To Hainburg accordingly young Haydn went in 1738, and there he received instruction in the elementary knowledge of his art, including a practical acquaintance with most instruments, at the hands of the musical schoolmaster. Having developed an agreeable soprano voice, young Haydn was by the intercession of the dean of Hainburg promoted to a post amongst the choir boys of St Stephen's cathedral, Vienna, where he remained from 1740-50, doing duty in the church services, and at the same time enlarging his musical knowledge and experience. His artistic education was, however, all but exclusively practical, and it is said that he received only two theoretical lessons from Reuter the chapel-master. As a composer, therefore, Haydu was in every sense self-taught. Of his zeal in acquiring information he was in the habit of talking with pride in later years, and several works of sacred music were the first fruit of his early studies. In 1749 or 1750 his beautiful boyish voice changed, and he lost his position accordingly. Being now thrown on his own resources, he had to undergo varions forms of musical drudgery, such as giving lessons (at the moderate stipend of two

florins per month) and even playing in the orchestra at dances and the like. His condition was somewhat improved by his acquaintance with Metastasio, the celebrated operatic poet, in fact the Scribe of the 18th century, who introduced him to Sefior Martinez, a Spaniard living in Vienna, whose daughter Haydn instructed for several years. It was through Metastasio also that Haydn came into contact with Porpora the composer, best known as the singing-master of the great Farinelli. For a considerable time Haydn remained in constant intercourse with him, acting as his accompanist, and occasionally it is said as his valet. In return he obtained a perfect acquaintance with Porpora's method, besides his knowledge of the Italian language, both invaluable to a composer in those days. The works of Emmanuel Bach, son of the great Sebastian, at the same time became his model for chamber music, Fux's excellent work Gradus ad Parnassum was his guide in his studies of counterpoint. A mass in F, and a farce Der neue krumme Teufel, both written in or about 1752, were Haydn's first important attempts at composition. The former is still in existence, but of the latter the libretto by Kurz only remains. It was produced early in 1752, and seems to have met with considerable success. Haydn's acquaintance with Gluck also dates from this period. An important event in Haydn's life was his acquaintance with Baron Fiirnberg, an accomplished amateur, for whose private concerts he wrote his first string quartet, a form of composition in which he earned some of his greatest and most permanent triumphs. It is in the key of B flat, and was followed in rapid succession by seventeen other works of the same class, written during the years 1755 and 1756. To his new protector Haydn also owed his still more im- portant acquaintance with Count Ferdinand Morzin. Count Morzin in 1759 appointed him conductor of his small but excellent band. The opportunities of hearing his own works performed by competent musicians Haydn did not neglect, and his first symphony in D belongs to the year 1759. Soon afterwards Count Morzin was compelled to dissolve his band, but Haydn's position was by this time sufficiently

established, and very soon afterwards he found employment |

as second chapel-master to Prince Paul Esterhazy, one of the richest Austrian nobles, whose love of art was as great as his wealth. The Esterhazy family have been amongst

the foremost patrons of music in Vienna from the days of

Haydn to those of Beethoven and Schubert. Prince Paul

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died in 1762, and left his title and fortune to his brother Nicholas, surnamed the Magnificent. He immediately enlarged his orchestra, and also increased the salaries of its members, including that of Haydn (from 400 to 600 florins), and on the death of his colleague Werner, a scholarly but dry musician, appointed him first conductor. This position, or at least its title and emoluments, Haydn retained till his death, and his attachment to the Esterhazy family remained unchanged by his subsequent fame and fortunes. The events just referred to determined Haydn's career for the next twenty-eight years. During this period he was in the active service of his protector, residing at Esterhaz, the splendid country seat of the family, described as a second Versailles, or in Vienna, conducting the orchestra of the prince, and writing for his concerts and theatre a number of works, including symphonies, cassationes, quartets, sonatas, aud numerous vocal compositions, in- cluding several operas, none of which, however, had any permanent success. Thus the opera La vera Constanza, written for the court theatre of Vienna in 1776, was with- drawn by the composer owing to intrigues against him, it is said; and we are not told that it met with a much better fate on its revival fourteen years later, Another dramatic work, L'isola disabitata (1779), procured for the composer the membership of the Accademia Filarmonica at Modena, and a gold snuff-box from the king of Spain. But with its companions it has not escaped oblivion. The truth is that Haydn was without the true dramatic spirit, and of this he was himself well aware. According to his own confession his operas were fitted only for the small stage at Esterhaz; in a large theatre, and before a mis- cellaneous audience, they lost their effect. The scores of most ~~of the operas are preserved in the archives of Eisenstadt, another seat of the Esterhazy family. Of his life during this period little need be said. It was eventless and to a certain extent monotonous, but free from care and exclusively devoted toart. HIs own words, quoted by Herr Pohl, sum up all that it is necessary to relate. ""My prince was always satisfied with my work; I not only had the encouragement of constant approval, but as conductor of an orchestra I~~

~~could inake experiments, observe what produced an effect and what weakened it, and was thus in a position to improve, alter, make additions or omissions, and be as bold asI pleased. I was cut off from the world ; there was no one to confuse or torment me, and I was forced to become original." The only person that could have wished to "confuse or torment" the harmless composer was fortunately kept at distance by the strict order of the prince's household, that none of his musicians was to be accompanied by his wife. Haydn at an early age became attached to the daughter of a hairdresser, Keller by name, and after her death was persuaded to marry her sister, three years older than himself. The marriage was an unhappy one, and the pair separated soon after their union, Haydn's inflammable heart snbsequently causing him more or less serious trouble on more than one occasion. In the meantime the composer's fame had begun to spread from an early period of his eareer. As early as 1766 a journal speaks of him as the "favourite of the nation," and foreign countries were not slow in acknowledging his merits, Thus one of his works, The Seven Words of our Saviour on the Cross, a series of orchestral interludes for the church service on Good Friday, was written by special invitation for the cathedral of Cadiz. In Paris his works were per~~ formed with immense success at the Concert Spirituel, and a single English firm bought the copyright of no less than 129 of his works, including 82 symphonies. The apprecia- tion of Haydn's work in England led to important results in his latter years. Several pressing invitations to visit that country had been declined by the composer on account

of his services being required at Esterhdz. But when in 1790 Prince Nicholas died, and his successor dissolved the orchestra, allowing Haydn a considerable pension, the latter was at last at liberty to accept a munificent offer from Salomon, tlie violinist and entrepreneur, in whose company he started for London, where Salomon occupied a leading position in the musical world. They left Vienna in December 1790, and travelled by way of Bonn, where Salomon had been born. There, accordingly, a halt was made, and Haydn was received by the elector with every honour due to his fame. The amusing description of a dinner given during his stay at Bonn may be read in Thayer's biography of Beethoven, who at that time was a member of

the electoral chapel, and not unlikely made on this occasion Haydn's acquaintance. On the latter's return journey the young man submitted a cantata to the celebrated composer, whom he soon afterwards followed to Vienna to become his pupil. Tt is well known that the relations between the great master and his greater pupil were not altogether what might have been desired. Beethoven's genius was of too individual a type to bear the impress of a nature so different as Haydn's, and the latter may not always have taken sufficient trouble to enter into the ways of his wilful pupil. Certain it is that, at one time of his career, Beethoven delighted in speaking slightingly of "Papa Haydn," and, for instance, refused to call himself Haydn's pupil, because, as he bluntly said, he never learnt anything under his tuition. He even went so far as to suspect Haydn of wilfully trying to keep hin back in his studies. It was only in his later years that this animosity gave way to the more genial appreciation of his great predecessor, an expression of which is quoted at the beginning of this notice.

Haydn's visit to London was a succession of triumphs. Dr Burney welcomed him with a laudatory poem; the various musical societies of the metropolis vied for his presence ; and on July 8, 1791, he was created doctor of music by the university of Oxford. At court also he was received with every distinction, and the aristocracy followed the royalexample. Neither were more substantial rewards wanting. Haydn's engagement with Salomon was to write and conduct at the concerts in the Hanover Square Rooms six symphonies, and the success of these may be judged from the fact that at Haydu's benefit concert, for which £200 had been guaranteed to him, the receipts rose to £350, He also appeared at other concerts (one given by himself at Hanover Square Rooms, where amongst other works the Seven Words already referred to was performed), always with equal success. The same events were repeated in the following year, when the Salomon concerts began in February, and concluded with an extra concert in June. The symphonies known as the 'Salomon Set," com- prising some of Haydn's finest instrumental works, are the permanent record of the connexion of the two artists, In 1792 Haydn also went to hear the charity children at St Paul's, whose singing produced on him as deep an impres- sion as it did on Berlioz many years later. 'I was more touched by this innocent and reverent music," he wrote in his diary, " than by any I ever heard in my life." Haydn left London in June 1792, but only to return in January 1794, In addition to

his earlier works six new symphonies were played at the concerts of Salomon, which in the follow- ing year were given at the King's Concert-room and termin- ated on June 1, 1795, when Haydn appeared for the last time in England. In addition to valuable presents from royalty and other persons, he realized £1200 by his second English visit, from which he returned to Vienna in the autumn of 1795, to resume once more his functions in the newly organized chapel of Prince Esterhazy. He was now well stricken in years, and might have rested on his laurels. But so far from this being the case, the two works on

which—apart from his symphonies and sonatas—his immor- tality must maiuly rest, belong to this last epoch of his life. These were the oratorio 7'he Creation, and the cantata Zhe Seasons. They were both written to German translations of English libretti, the former being compiled from Paradise Lost, the latter from Thomson's Seasons. The Creation was first performed in public on March 19, 1799, when its success was as immediate as it has since proved permanent, The Seasons was begun soon after the completion of The Creation, and finished in very little time. No one, delighted by the charm and spontaneity of its melodies, would suspect it to be the work of afeeble old man. Such, however, Haydn had now become. He wrote little after The Seasons, and his public appearances were few and far between. His old age was surrounded by the love of his friends and the esteem of the musical world, but his failing health did not admit of much active enjoyment. He was seen in public for the last time at a performance of 7Z''he Creation in 1808. But his own music made so overpower- ing an impression on him that he had to be carried out of the hall. He died on May 31, 1809, during the occupation of Vienna by Napoleon's army, and many French officers followed his body to the grave.

Haydn's compositions comprize almost every form of vocal and instrumental music. Of his dramatic works the operas are of infinitely less importance than The Creation and Zhe Seasons. In the former there are points of grand and truly epical conception, surpassed by few masters except Handel, and the idyllic charm of the latter is as fresh to-day as it was eiglity years ago. At the same time the great importance of Haydn in the

history of music lies elsewhere. It was as an instrumental composer that he opened a new epoch of musical development. That amongst his 125 orchestral symphonies there are many extremely slight efforts is a matter of course. Even his finest symplionies, such as the celebrated Surprise, or the one in E flat surnamed in Germany "mit dem Pauken- wirbel," on account of the characteristic drum-roll occurring in it, are pigmies if compared with Beethoven's colossal efforts. At the same time it is true that without Haydn's modest substruction Beethoven's mighty edifice would have been impossible. It was Haydn who first fixed the form of the symphony and gave it consistency of development. The lucid and harmonious treatment of his themes and the symmetrical structure of his symphonic movements remain still unsurpassed. And the same may be said in almost the same words of his string quartets, of which he wrote no less than eighty-three. It is by such works as these that Haydn has earned the name of father of instrumental music, generally and justly applied to him. At the same time it cannot be denied that there is in his works a certain want of intensity and depth. He avoids the high places of thought and passion; his path lies mostly in the smiling plains of humour and agreeable sentiment. In the former especially he excels, and it ouglit to be noted that his humour is of that peculiarly Viennese type which is as harmless as it is charming, and to the genial influence of which even such serious composers as Beethoven and Brahins have had to submit. Some of Haydn's minuets especially seem to spring immediately from the consciousness of the people. How much he was at one with his nation is further proved by such a song as his "Gott erhalte Franz den Kaiser," which has become the Austrian national hymn, and is one of the rare instances in which a genuine volkslied can be traced to a celebrated composer,—for generally the songs of the people are produced by the people. To sum up, Haydn's place in the history of his art will remain unassailed by all the changes musical taste has undergone since his time, or may still undergo. His melodies, though simple, are genuinely inspired, and will never lose their

charm; and his workmanship will remain an invaluable model of clearness and symmetry. Haydu's life has been written by many pens and in many languages, Stendhal, the celebrated novelist, being amongst his French

biogra- phers. But all these earlier attempts have been thrown into the shade by the excellent works of Herr C. F. Pohl (Mozart and Haydn in London, 1867 ; Joseph Haydn, vol, 1, 1875; and the article "' Haydn" in Grove's Dictionary of Music and Musicians), which are full of accurate and com- prehensive research. To Herr Pohl all students of Haydn's life must confess themselves deeply indebted.

Two of Haydn's brothers acquired a certain amount of celebrity. Joun MicuanL Haypn, born at Robhrau, September 14, 1737, and like his brother a choir-boy at St Stephen's cathedral, became a prolificand able composer of masses aud all kinds of church music. He lived during the greater part of his life at Salzburg, and his name is fre- quently mentioned in the biography of Mozart. Of his iumerous compositions few have been printed. A mass in D is perhaps his masterpiece. He died August 10, 1806. The youngest brother, Jonann Haypn (born December 23, 1743, died May 20, 1805), had some reputation as a vocalist, and became, most probably by his brother's inter- cession, a singer in Prince Esterhazy's chapel. F. H.)

HAYDON, Bensamin Ropert (1786-1846), historical painter and writer, was born at Plymouth, January 26, 1786. His mother was the daughter of the Rev. Benjamin Cobley, rector of Dodbrook, Devon, whose son, General Sir Thomas Cobley, signalized himself in the Russian service at the siege of Ismail. His father, a prosperous printer, stationer, and publisher, was a man of literary taste, and was well known and esteemed amongst all classes in Ply- mouth. Haydon, an ouly son, at an early date gave evi- dence of his taste for study, which was carefully fostered and promoted by his mother. At the age of six he was placed in Plymouth grammar school, and at twelve in Plympton St Mary school. He completed his education in this institu- tion, where Sir Joshua Reynolds also had acquired all the scholastic training he ever received. On the ceiling of the school-room was a sketch by Reynolds in burnt cork, which it used to be Haydon's delight to sit and contemplate. Whilst at school he had some thought of adopting the medical profession, but he was so shocked at the sight of an operation that he gave up the idea, A perusal of Albinus, however, inspired him with a love for anatomy ; and Reynolds's discourses aroused within him a smoulder- ing taste for painting, which from childhood had been the absorbing idea of his mind. Sanguine of success, full of energy and vigour, he started from the parental

roof, May 14, 1804, for London, and entered his name as a student of the Royal Academy. He began and prosecuted his studies with such unwearied ardour that Fuseli wondered when he ever found time toeat. At the age of twenty-one (1807) Haydon exhibited, for the first time, at the Royal Academy, The Repose in Egypt, which was bought by Mr Thomas Hope the year after. This was a good start for the young artist, who shortly received a commission from Lord Mulgrave and an introduction to Sir George Beaumont. In 1809 he finished his well-known picture of Dentatus, which, though it brought him a great increase of fame, involved him in a life-long quarrel with the Royal Academy, whose committee had hung the picture in a small side-room instead of the great hall. In 1810 his difficulties began through the stoppage of an allowance of £200 a year he had received from his father, His disappointment was embittered by the controversies in which he now became involved with Sir George Beaumont, for whom he had painted his famous picture of Macbeth, and Mr Payne Knight, who had denied the beauties as well as the value of the Elgin Marbles. The Judgment of Solomon, his next

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production, gained him £700, besides £100 voted to him by the directors of the British Institution, and the freedom of the borough of Plymouth. 'To recruit his health and escape for a time from the cares of London life, Haydon joined his intimate friend Wilkie in a trip to Paris; he studied at the Louvre ; and on his return to England pro- duced his Christ's Entry into J erusalem, which afterwards formed the nucleus for the American Gallery of Painting, which was erected by his cousin John Havilland of Phila- delphia. Whilst painting Lazarus his pecuniary difficulties increased, and for the first time he was arrested but not imprisoned, the sheriff-officer taking his word for his ap- pearance. Amidst all these harassing cares he married in October 1821 a beautiful young widow, Mrs Hyman, to whom he was devotedly attached. In 1823 Haydon was lodged in the King's Bench, where he received consoling letters from the first men of the day. Whilst a prisoner he drew up a petition to parliament in favour of the appointment of "'a committee to inquire into the state of encouragement of historical painting," which was pre- sented by Mr Brougham. He also, during a second imprisonment in 1827, produced the picture of the Mock Election,

the idea of which had been suggested by an inci- dent that happened in the prison, The king (George IV.) gave him £500 for this work. Among Haydon's other pictures were—1829, Eucles, and Punch; 1831, Napoleon at St Helena, for Sir Robert Peel; Xenophon, on his Retreat with the "Ten Thousand," first seeing the Sea; and Waiting for the Z'%mes, purchased by the marquis of Stafford; 1832, Falstaff, and Achilles playing the Lyre. In 1834 he completed the Reform Banquet, for Lord Grey— this painting contained 197 portraits; in 1843, Curtius Leaping into the Gulf, and Uriel and Satan. When the competition took place at Westminster Hall, Haydon sent two cartoons, The Curse of Adam, aud Edward the Black Prince, but had not the good fortune to gain a prize for either, He then painted The Banishment of Aristides, which was exhibited with other productions under the same roof where Tom Thumb was then making his début in London. The exhibition was unsuccessful ; and the artist's difficulties increased to such an extent that, whilst employed on his last grand effort, Alfred and the Trial by Jury, overcome by debt, disappointment, and ingratitude, he wrote "Stretch me no longer on this rough world," and put an end to his existence with a pistol-shot, June 22, 1846, in the sixty-first year of his age. He left a widow and three children (various others had died), who, by the generosity of their father's friends, were rescued from their pecuniary difficulties and comfortably provided for; amongst the foremost of these friends were Sir Robert Peel, Count D'Orsay, Mr Justice Talfourd, and Lord Carlisle.

Haydon began his first lecture on painting and design in 1835, and afterwards visited all the principal towns in England and Scotland. His delivery was energetic and imposing, his language powerful, flowing, and apt, and replete with wit and humour; and to look at the lecturer, excited by his subject, one could scarcely fancy him a man overwhelmed with difficulties and anxieties. The height of Haydon's ambition was to behold the first buildings of his country adorned with lustorical repre- sentations of her glory. He lived to see the acknowledg- ment of his principles by Government in the establishment of schools of design, and the embellishment of the new houses of parliament ; but in the competition of artists for

_ the carrying out of this object, the commissioners (amongst

whom was one of his former pupils) cousidered, or affected to consider, that he had failed. Haydon was well versed in all points of his profession ; and his Lectures, which were published shortly after their delivery, showed that he was as bold a writer as painter. It may be mentioned in this

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connexion that he was the author of the long and elaborate article, " Painting," in the 7th edition of the Lncyclopedia Britannia.

To form a correct estimate of Haydon it is necessary to read his autobiography. This is one of the most natural books ever written, full of various and abundant power, and fascinating to the reader. The author seems to have daguerreotyped his feelings and sentiments without restraint as they rose in his mind, and his portrait stands in these volumes limned to the life by his own hand. His love for his art was both a passion and a principle. He found patrons difficult to manage; and, not having the tact to lead them gently, he tried to drive them fiercely. He failed, abused patrons and patronage, and intermingled talk of the noblest independence with acts not always dignified. He was self-willed to perversity, but his perseverance was such as is seldom associated with so much vehemence and passion. With a large fund of genuine self-reliance he combined a considerable measure of vanity. To the last he believed in his own powers and in the ultimate triumph of art. In taste he was deficient, at least as concerned himself. Hence the tone of self-assertion which he assumed in his advertise-ments, catalogues, and other appeals to the public. He proclaimed himself the apostle and martyr of high art, and believed himself to have on that account a claim on the sympathy and support of the nation. It must be confessed that he often tested severely those whom he called his friends. Every reader of his autobiography will be struck at the frequency and fervour of the short prayers inter- spersed throughout the work. Haydon had an overwhelm- ing sense of a personal, overruling, and merciful providence, which influenced his relations with his family, and to some extent with the world. His conduct as a husband and father entitles him to the utmost sympathy. In art his powers and attainments were undoubtedly

very great, although his actual performances mostly fall short of the faculty which was manifestly within him ; his general range and force of mind were also most remarkable, and would have qualified him to shine in almost any path of intellec- tual exertion or of practical work. His eager and combative character was partly his enemy ; but he had other enemies actuated by motives as unworthy as his own were always high-pitched and on abstract grounds laudable. Of his three great works—the Solomon, the Entry into Jerusalem, and the Lazarus—the second has generally been regarded as the finest. The Solomon is also a very admirable pro- duction, showing his executive power at its loftiest, and of itself enough to place Haydon at the head of British histori- cal painting in his own time. The Lazarus, now in the Natioual Gallery, is a more unequal performance, and in various respects open to criticism and censure; yet the head of Lazarus is so majestic and impressive that, if its author had done nothing else, we must still pronounce him a potent pictorial genius.

The chief authorities for the life of Haydon are Life of B. R. Haydon, from his Autobiography and Journals, edited and com- piled by Tom Taylor, 3 vols., 1853; and B. R. Haydon's Corre- spondence and Table Talk, with a memoir by his son, F. W. Haydon, 2 vols., 1876. (W. M. RB.)

HAY FEVER, Hay Astuma, or SUMMER CaATARRH, a term applied. to a catarrhal affection of the respiratory mucous membrane occurring in some individuals during the hay season, and generally believed to be due to the inhalation of the emanations from the spring grass (Antho- xanthum odoratum). Itisan ailment of comparatively rare occurrence. The symptoms are those commonly experienced in the case of a severe cold or influenza, consisting of headache, violent sneezing, and watery discharge from the nostrils and eyes, together with dry hard cough, and occasionally severe asthmatic paroxysms. The attack usually runs a course of from two to six weeks, unless cut

short by appropriate treatment, to which the complaint is in a considerable measure amenable. There is generally an annual recurrence of the disorder in those liable to it if they are exposed to its exciting cause, namely, the presence of hay. Symptoms of a similar character are produced in certain

persons by the aroma of various flowers, by ipecacuan, and by the odour from cats, dogs, and rabbits. All such cases are examples of idiosyncrasy, and the individual is in general permanently susceptible to the influence of the excitant. In not a few instances an hereditary liability is traceable. The most effectual method of treatment in hay fever is to avoid the exciting cause, namely, the neighbour- hood of grass fields, during the particular season. Removal to the seaside often succeeds in putting an end to an attack, and many persons who are liable to the complaint make such a change annually before its expected onset, and thus escape. For those who are unable to accomplish this, and must remain exposed to the noxious emanation, the use of a respirator is recommended. Of medicinal agents for affording relief during an attack, the usual remedies for asthma may be advantageously resorted to (see ASTHMA), while the use of the nasal douche witb a weak solution of quinine and the employment of creosote or carbolic acid inhalations have been suggested.

HAYLEY, Witrtam (1745-1820), the friend and biographer of Cowper, and grandson of William Hayley,

/dean of Chichester, was born in that city on the 9th

November 1745. On account of mismanagement during a fever which he had while in a boarding school at Kingston, he was reduced to such prostration that the pre- servation of his life appeared to present only the promise of hopeless lameness and idiocy, but by careful nursing his health was gradually completely restored, and after some years' private tuition he pursued his studies at Eton and at Trinity College, Cambridge. In 1766 he procured a certificate of admission to the Middle Temple, London, but a short trial of legal studies was sufficient to dissipate the unexperienced preference which he had cherished for the profession of law. After his marriage in 1769 he stayed for some years chiefly in London, but in 1774 he retired to his patrimonial estate of Eartham in Sussex, resolved to spend the remainder of his days in rural quiet, with only such an amount of literary activity as might defy ennui and give a zest to life. Hayley made more than one attempt to succeed as a dramatic author, but first won fame by his poetical Hssays on Painting, History, and Epic Poetry, and by his poem the Zriwmph of Temper. The success of these poems was partly

attributable to the general dearth of poetic talent at the time, but they had also certain external qualities fitted to secure for them at least a temporary popularity ; and his notes to his poetical essays also dis- played very extensive reading, and exerted considerable in- fluence in directing attention in England to the literature of Italy and Spain. On the death of Warton, Hayley was offered the laureateship, but declined it. In 1792 he made the acquaintance of the poet Cowper; and this acquaintance ripened into a friendship which remained unbroken until Cowper's death in 1800. This bereavement was separated by only a week from that caused by the death of Hayley's natural son Thomas Alphonso, who had given great promise of excellence as a sculptor; and, shrinking from the asso- ciations now connected with Eartham, Hayley retired to what he called a 'marine hermitage," which he had built at Feltham, and there resided till his death, November 20, 1820. Besides the Life of Cowper, published in 1803, Hayley was the author of a number of works in prose, which were not, however, so successful as his early poetical productions. Indeed the estimation in which he was held even during his lifetime depended perhaps more on his acquirements and widely-cultivated tastes and his position

in society than on his achievements in literature. The Memoirs of Hayley, 2 vols., for writing which, to be pub- lished posthumously, he received a considerable allowance during the last twelve years of his life, appeared in 1823.

HAYNE, Roserr Youne (1791-1840), American states- man, was born in St Paul's parish, Colleton district, South Carolina, on November 10, 1791. He studied law at Charleston, 8.C., and in his twenty-first year was admitted to the bar there, but in the same year (1812) served for a short time as a soldier in the war with Great Britain, Returning to practise in Charleston, Hayne was elected a member of the State legislature in 1814, and four years later became speaker. Shortly afterwards he accepted the post of attorney-general for his native State, though he declined the same office for the United States. On being elected a senator of the United States, Hayne at once showed himself an active foe to protective legislation, and vigorously combated the tariffs of 1824 and 1828,

HAYTER, Six GzorcE (1789-1871), principal painter in ordinary to the queen, was the son of a popular drawing- master and teacher of perspective who published a well- known introduction to perspective and other works. The son was born in London, and in his early youth went to sea. Heafterwards studied in the Royal Academy, became @ miniature-painter, and was appointed in 1815 miniature- painter to the Princess Charlotte. He passed some years in Italy, more especially in Rome, returned to London towards 1826, resumed portrait-painting, now chiefly in oil-colour, executed many likenesses of the royal family, and attained such a reputation for finish and refinement in his work that he received the appointment of principal painter, and teacher of drawing to the princesses. In 1842 he was knighted. He painted various works on a large scale of a public and semi-historical character, but essen- tially works of portraiture; such as The Trial of Queen Caroline (189 likenesses), The Meeting of the First Re- formed Parliament, now in the National Portrait Gallery, Queen Victoria taking the Coronation-oath (accounted his finest production), The Marriage of the Queen, and the Trial of Lord William Russell. The artistic merits of Hayter's works are not, however, such as to preserve to him with posterity an amount of prestige corresponding to that which court patronage procured him. He is not to be confounded with a contemporary artist, John Hayter, who produced illustrations for the Book of Beauty, &e.

HAYTI Copyright, 1880, by John D. Champlin, jun. HAYTI, Hairr, Sano Dominco, or Hispanroza, the

XIII. Jargest, excepting Cuba, of the West India Islands, is

situated between 17° 37' and 20° 0' N. lat. and 68° 20' and 74° 28' W. long. Its greatest length, from Cape Engafio on the east to Cape Tiburon on the west, is 407 miles ; its greatest breadth, from Cape Beata in the south to the farthest point on the north coast, is 160 miles; and its area is 28,000 square miles, or about the same as that of Ireland. From Cuba on the W.N.W. and from Jamaica

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on the W.S.W. it is separated by the Windward Passage,— being distant from the former about 70 miles and from the latter about 130 miles,—and

from Puerto Rico, which lies about 60 miles to the east, by the Mona Passage. In general form Hayti somewhat resembles a turtle, its eastern projection forming the head and the two western peninsulas the hinder limbs of the animal. The coast-line, which is estimated at about 1250 miles in length, has numerous projections and indentations. Of the peninsulas, the largest, on the south-west, of which Cape Tiburon forms the extremity, is 150 miles long by 20 to 40 wide ; and the next largest, on the north-west, is 50 miles long with an average breadth of about 40 miles. Between these lies the Gulf of Gonaive, a triangular bay, at the apex of which is the city of Port au Prince. The island of Gonaive, about 27 miles from the city, is 36 miles long by 84 miles broad. It divides the entrance to Port au Prince into two channels, both good, and forms within a safe anchorage of about 200 square miles inextent; but coral reefs near the coast oblige vessels of large draught to lie out about 14 miles. Other ports in the Gulf of Gonaive, north of Port au Prince, are St Marks, frequented for trade in coffee, and Gonaives, a large bay 4 miles deep, divided by a small island. At the extremity of the north-west peninsula is St Nicolas Mole, with an outer and an inner harbour, the latter landlocked and with good anchorage. Beyond, on the north coast, are Port de Paix, Acul Bay, Cape Haiti or Guarico, the Bay of Caracol or Port Royal, and Fort Liberté or Port Dauphin. From Fort Liberté to Samana there is no good harbour on the north coast, Port Isabella being little more than an inden- tation in the coast, and the harbour of Puerto Plata being very shallow and beset with coral reefs. The Bay of Samana is formed by the peninsula of Samana, a mountain ridge projecting into the sea at the north-east extremity of the island. It is about 35 miles in length and from 6 to 10 miles in breadth. The bay is 30 miles long east and west, 10 miles broad north and south, and has an area of about 300 square miles. From the south coast a chain of coral reefs stretches across its mouth to within 14 miles of the north shore ; and the entrance is still further narrowed to about ? of a mile by islets at the north extremity of the reef. There is, however, a good passage for ships of the deepest draught, and the bay inside is safe in all weathers, Beyond Samana, on the east and south coasts, there is no port until Santo Domingo is reached, which has about 12 fect of water. West of Santo Domingo are the adjoining bays of Ocoa and Neiba, the former with an inlet called Calderas Bay, which would be a good harbour if the coral reefs were removed ; Jacmel, a nearly round bay, open to the south. east ; the Bay of Baienet, the

ports of Aquin and St Louis, and the roadstead of Aux Cayes. Between Aux Cayes and Port au Prince are Jérémie and the Bay of Baradéres, the latter a good harbour. Besides Gonaive, the principal islands off the coast are La Tortue or Tortuga, to the north, 22 miles long and 5 broad, once the stronghold of the buccaneers ; La Saéne or Adamanay, off the south-east end of the island, 15 miles long by 34 broad ; Ile de Vache, off Aux Cayes, 9 miles long by 2 broad; Great Cayemite, in the Bay of Baradéres, 5 miles long by 3 broad; and La Beata, off the cape of the same name, 5 miles long by 2 broad. There are also many islets. Navasa, in the Wind- ward Passage, is claimed by Hayti, but the title to it is not settled. It has been occupied since 1855 by a guano company from the United States.

Hayti is essentially a mountainous country, but there are many large and fertile plains between the several ranges. There are three distinct mountain formations, —the northern, the central, and the southern,—all of which have a general east and west direction. The northern chain, commonly called the Sierra de Monte Cristi, extends from Cape

Samana on the east to the Sella de Caballo (3900 feet high) on the west, near Point Fragata. The highest peak in this chain is Mount Diego Canipo, near the middle part, which has an elevation of about 4000 feet. The central range begins near Point Macao on the east, extends west to about 70° 20' long., with an average height of about 1000 feet, and then divides into two distinct chains, the northernmost of which pursues a north-westerly course to Cape St Nicolas, while the other turns south-west to Mount Ocoa, and then curves westward to the sea, which it reaches near St Marc, Near the west end of the island these two chains are con- nected by a secondary S-shaped ridge. The northern limb of this central chain is called the Sierra del Cibao, and is the backbone of the island. The name Cibao is properly limited to the middle part, where, though there are occa- sional peaks more than 1000 feet higher, the average height is 7000 feet. At the east end are still higher elevations, Loma Tina and Pico del Yaqui being each more than 9000 feet high. These are the two highest points on the island. The third or southernmost range of mountains begins near the Bay of Neiba, and runs due west to Cape Tiburon, forming the backbone of the south-west

peninsula. This range has no general name, but is called Baburuco at the east end, La Sella in the middle, from the peak of that name (nearly 9000 feet high), and La Hotte towards the west end. The largest and finest of the great plains is La Vega Real (Royal Plain), as it was named by Columbus, which lies between the middle part of the Cibao and the Monte Cristi ranges. It stretches from Samana Bay to Manzanillo Bay, and is about 140 miles long, with an average breadth of 14 miles. This valley is now commonly ealled the valley of Cibao, the name La Vega being confined to the eastern half, while the western is distinguished as the valley of Santiago. It is watered by the North or Gran Yaqui river and the Yuna river and their affluents. The plain of Seybo stretches eastward from the river Ozama about 95 miles, with an average breadth of 16 niles, and is abundantly watered by the Ozama, Soco, Macoris, Quiabon, and Yuna rivers. Most of the large valleys and plains are in a state of nature, part savanna and part wooded, and well adapted for cattle raising. Of the rivers, the Gran Yaqui rises in the Pico del Yaqui, and after a tortuous course in a generally north-westerly direction falls into the Bay of Manzanillo, Its mouth is obstructed by shallows, and it is navigated only by canoes. The South Yaqui, called also the Neiba or Neiva, rises in the Pico del Yaqui and the Entre del Rios, and flows south into the bay of Neiba. The Yuna rises on Loma Tina, and flows east into Samana bay; it is navigable by vessels of light draught as far as its junction with the Camu, and above that as far as Concepcion de la Vega by loaded canoes. The Ozania also is navigable for small vessels for 3 or 4 miles above its mouth. The largest lake is that of Enriquillo or Xaragua, which is 27 miles long by 8 broad. Though about 25 miles from the sea, its water is salt, as indicated in its French name Etang Salé, and has the same specific gravity as the ocean. It swarms with fish and with caymans. Other lakes are Lago de Fondo or Etang Saumatre, 16 miles long by 4 broad, which has brackish water; Icotea de Limon, 5 miles long by 2 broad, which has fresh water and no visible outlet ; and the smaller Rincon and Miragoane.

The coast-line of Hayti forms a portion of a considerable area of elevation. There are no active volcanoes in the island, but earthquakes are not infrequent. Rocks of earlier than Secondary date have not yet been discovered ; the most ancient, consisting of slates, conglomerates, and lime-stones, and forming as it were the core of the island, have been disturbed

and intersected by intrusive masses of a syenitic character. Flanking the slates and other rocks of

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the Sierra there is in the northern and in part of the southern side of Hayti a broad development of Tertiary deposits, which are skirted by more recent limestones and gravels. The Sierra, forming the central mountain mass that runs the length of the eastern republic, and constitut- ing in the main the peninsula of Samana, and also a small outlier near Porto Plata, is throughout composed of much- uptilted and usually strongly-folded metamorphic rocks, which appear to have originally been clay-shales, sandstones, sandstone-conglomerate, and limestone. These are most disturbed in the western two-thirds of the island, where they are broken in places by dykes. The quartz veins occurring in the slates near eruptive masses are auriferous, as also are the sands of streams running through the meta- morphic rocks, if in the neighbourhood of syenite. Thus the waters of the Nigua, Jaina, Nizao, Ocoa, and most of the tributaries of the Yaqui that descend from the northern flank of Cibao carry gold, though rarely in any notable quantity. The lignite found in the Upper Miocene beds is exceedingly impure, and nowhere more than 8 or 4 inches in thickness. The mineral products include gold, platinum, silver, Mercury, copper, iron, tin, manganese, antimony, sulphur, marble, opal, calcedony, Jazulite, rock-salt, and bitumen ; and mineral springs—ferruginous, sulphurous, and of other kinds—abound. The fossil forms of the Miocene strata are allied to those of the west coast of South America, and forcibly suggest the conclusion that during some portion of the Miocene period the Pacific and Atlantic freely intercommunicated, for details concerning the geology of Hayti see Professor Gabb, 7rans. Amer. Phil. Soc., xv, 49, and, on the Miocene fossils, Guppy, Quart. Journ, Geol, Soc. Lond., xxxii,, 1876, p. 516.

The fauna of Hayti is not extensive. The agouti is the largest wild mammal. Birds are few, excepting water-fowl and pigeons. Snakes abound, though few are venomous. Lizards are numerous, and insects swarm in the low parts, with tarantulas, scorpions, and centipedes. Caymans are found in the lakes and rivers, and the waters teem with fish and other sea food, Wild cattle, hogs, and dogs, descendants of those brought from Europe, roam at

large on the plains and in the forests, The wild hogs furnish much sport to the natives, who hunt them with dogs trained for the purpose.

In richness and variety of vegetable products Hayti is not excelled by any other country in the world. All tropical plants and trees grow there in perfection, and nearly all the vegetables and fruits of temperate climates may be successfully cultivated in its highlands. Among its indigenous productions are cotton, rice, maize, tobacco, cocoa, ginger, native indigo (indigo marron or sauvage), arrowroot, manioc or cassava, pimento, banana, plantain, pine-apple, artichoke, yam, and sweet potato. Among its important plants and fruits are sugar-cane, coffee, indigo (called indigo franc, to distinguish it from the native), melons, the legumes, cabbage, lucerne, guinea grass, bamboo, and the breadfruit, mango, caimite, orange, almond, apple, grape, mulberry, and fig. Most of the imported fruits have degenerated from want of care, and the bamboo has been attacked by an insect which prevents its wide diffusion ; but the mango, now spread over nearly the whole island, has become almost a necessary article of food ; the bread- fruit has likewise become common, but is not so much esteemed. Hayti is also rich in woods, especially in cabinet and dye woods ; among the former are mahogany, manchineel, satinwood, rosewood, cinnamon wood, yellow acoma, and gri-gri; aud among the latter are Brazil wood, logwood, fustic, and sassafras. On the mountains are extensive forests of pine and a species of oak; and in various parts occur the locust, ironwood, cypress or Ber- muda cedar, palmetto, and many kinds of palms.

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Hayti possesses a great diversity of climate. In the plains, where it is generally hot and moist, the thermometer often rises to 96° and sometimes to 100°; but in the high- lands the readings are seldom above 76° or below 60°. In the most elevated parts a fire is sometimes agreeable. The seasons are divided into the wet and dry. Rains are heaviest and most frequent in May and June, when the rivers, some of which have but a scanty supply of water in the dry season, flood portions of the plains. Hurricanes are not so frequent as in the Windward Islands, but violent gales often occur. The prevailing winds are from the east.

Agriculture is very backward, and the implements used arerude, The staple productions for which the island was once famous are now imperfectly cultivated or neglected altogether. Mining, once profitably carried on, is generally abandoned from lack of capital, though some gold-washing still continues in the northern streams. Some mahogany and dyewoods are cut in the interior, and hides, wax, and honey are collected for export, but on a comparatively small scale. The business of the country is chiefly in the hands of foreigners, settled in the cities and larger towns.

The population of the island is about 700,000, of which 550,000 are subjects of the Haytian republic in the west, and 150,000 of the Dominican republic in the east. Of the Haytian population nearly 500,000 are of African descent, of the Dominican about 25,000. Of the mixed races about 125,000 are of Spanish, and 50,000 of French descent. There are also a few Germans, Italians, and natives of the United States, settled chiefly in the coast towns. The language of the eastern end of the island is Spanish, that of the western an impure French patois.

The history of Hayti begins with its discovery by Columbus, who landed at St Nicolas Mole, Dec. 6, 1492, having left Cuba the day before. The island was then occu- pied by about 2,000,000 people of a low type of humanity, who are described by the Spanish historians as feeble in intellect, and morally and physically defective. The natives called the island Haiti (mountainous country) and Quisquica (vast country). Columbus named it Espagnola (Little Spain), which was Latinized into Hispaniola, Ad- venturers from Europe, attracted chiefly by the exaggerated stories of gold, flocked thither, and the natives were reduced to slavery, although many made a gallant resistance. After about 30 years of grinding servitude, nearly all the aborigines had disappeared. A few negroes were brought into the colony as early as 1505, and in 1517 a royal edict

authorized the importation from Africa of 4000 negroes a.

year. The blacks, stronger and better able to bear the labour which had been death to their predecessors, multi- pled to such a degree that the island has finally passed into the hands of their descendants, About 1630 a mixed colony of French and English, who had been driven out of St Christophers by the Spaniards, established themselves in the island of

Tortuga, where they soou grew formidable under the name of buccaneers. They at last obtained a footing on the mainland of Hayti, into which they had previously made only predatory excursions ; and by the treaty of Ryswick (1697) the part of the island which they held was ceded to France. The colony, called Saint Domingue, languished for a while under the restrictions imposed on its trade by the mother country, but after 1722, when these were removed, it attained a high degree of pros- perity, and it was in a flourishing state when the French Revolution broke out in 1789. 'The population was then composed of three classes,—whites, free people of colour (mostly mulattos), and slaves. The free people of colour, some of whom were wealthy proprietors, demanded that the principles of the Revolution should be extended to then ; this was opposed by the whites, who had previously engrossed all the public honours, and the two classes were

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already violently inflamed against each other when the national convention (1791) passed a decree giving to the mulattos all the rights of French citizens. The whites adopted at once the most violent measures, and appealed to the mother country for a reversal of the decree. But wheu the mulattos took up arms for their defence at the time of the insurrection of the plantation slaves (August 23, 1791), the whites endeavoured to conciliate them. In the meantime the home Government reversed the de- cree granting them political rights. The mulattos now took part with the blacks, and a most destructive war raged for several years, during which each party seemed to study to outdo the other in acts of cruelty. Commissioners were sent out from France, with full power to settle the quarrel, but could effect nothing. In 1793 the abolition of slavery in the colony was proclaimed. In September of the same year a British force invaded the island "ut, though some partial advantages were gained, the climate made sad havoc among the troops, and prevented any solid success. Toussaint l'Ouverture, the leader of the blacks, came to the aid of the French, the home Government having in the meantime ratified the act of the commissioners in freeing the slaves. He was made commander-in-chief of the French army, and in 1798 forced the British to evacu- ate the island, By the treaty with Spain, made at

Basel in 1795, France had acquired the title to the entire island, which now received the name of Saint Domingue.

In 1801 Toussaint, then master of the whole country, adopted a constitutional form of government, in which he was to be president for life. Bonaparte, then first consul of France, determined to reduce the colony and restore slavery, sent to Hayti 25,000 troops under General Leclerc. The blacks were compelled to retire to the moun- tains, but kept up a desultory war under Toussaint's able leadership. Leclerc, wearied of the war, cajoled the negro chiefs into a suspension of arms, and having invited Toussaint to an interview, seized him and sent him to France, where he died in prison in 1803. The blacks, in- furiated by this act of treachery, renewed the struggle under Dessalines with a barbarity unequalled in the previous con- tests. The French, further embarrassed by the appearance of a British fleet off the coast, now gradually lost ground, and in 1803 agreed to evacuate the island. On the 30th of November of that year, 8000 French troops surrendered to the British squadron. In 1804 independence was de- clared, and the aboriginal name of Hayti was revived. Dessalines was made governor for life, but in October of the same year he proclaimed himself emperor, and was crowned with great pomp. He soon began to display the cruelty of a tyrant, and in 1806 he was assassinated. His position was now contended for by several chiefs, one of whom, Christophe, established himself in the north, while Pétion took possession of the southern part. The Spaniards re-established themselves in the eastern part of the island, retaining the French name, modified to Santo Domingo. Civil war now raged between the adherents of Christophe and Pétion, but in 1810 hostilities were suspended. Christophe declared himself king of Hayti under the title of Henry I.; but his cruelty caused an insurrection, and in 1820 he committed suicide. Pétion had died in 1818, and was succeeded by Gen. Boyer, who, after Christophe's death, made himself master of all the French part of the island. In 1821 the eastern end of the island proclaimed its inde- pendence of Spain, and Boyer, taking advantage of dissen- sions there, invaded it, and in 1822 the dominion of the whole island fell into his hands. Boyer held the presidency of the new government, which was called the republic of Hayti, until 1843, when he was driven from the island by a revolution. In 1844 the people of the eastern end of the island again asserted their independence, and estab-

lished the Dominican Republic, and from that date to the present time the two political divisions have been main- tained ; the Spanish made an effort to re-establish their authority in Santo Domingo by landing troops there in 1861, but withdrew in 1863. In Hayti several presi- dents rapidly succeeded each other, but in 1846 Soulouque, a black who had been a slave, was elected to the chief magistracy. He attempted to reconquer the eastern part of the island, but was defeated. In 1849 he assumed the title of Faustin I., emperor of Hayti, and in the following year was crowned. He was deposed in 1858, and a republic was proclaimed under the presidency of Fabre Geffrard, His administration was unpopular, and in 1867 he was obliged by an insurrection to abdicate and flee to Jamaica. He was succeeded in the presidency by Sylvestre Salnave. An insurrection broke out against him in 1868, and after a struggle of two years he was captured and shot. On May 29, 1870, Nissage-Saget was elected president, and Gen. Boisrond-Canal on July 17, 1876.

Haytian Republic.—The republic of Hayti occupies the western end of the island, and is separated from the Dominican republic by a line drawn from the river Pedernales on the south to tle mouth of the river Massacre on the north. Its area is estimated at about 10,000 square miles. It is governed under a constitution adopted June 14, 1867. The national assembly is composed of two cham- bers, a senate and a house of commons. The president is elected for four years. The revenue is estimated at about £900,000, and the expenditure at £1,400,000 ; but the frequent civil disorders pre- vent any just estimates. There is a large floating debt, arising chiefly from paper money issued by the different Governments. The foreign debt, made up of aloan contracted in Paris in 1825 and other liabilitics to the French Government, ainounts to £1,281,994. No intercst has been paid for years. The army consists nominally of 6828 men, mostly infantry. The commerce of Hayti is chiefly with Great Britain and the United States. The principal exports are coffee, mahogany, and logwood ; the principal imports, cotton and linen goods. The value of the exports from 1875 to 1877 averaged yearly about £1,300,000 ; the value of the imports during the

same period about £1,180,000. In 1877 British cottons were imported of the value of £252,326 ; linens, £54,098. The weights and measures in use, and the gold and silver coins in circulation, are French. The piastre or dollar of the republic is now worth about 4s.

Dominican Republic.—The republic of Santo Domingo or San Domingo (in Freneh Saint Domingue, and officially Republica Dominica) has an area variously estimated at from 18,000 to 20,590 English square miles, and is divided into the five provinces or statcs of Santo Domingo, Santa Cruz del Seibo, Concepcion de la Vega, Santiago de los Caballeros, and Azua de Compostela, and the two maritime districts of Porto Plata and Samandé. According to the constitution of 1844, rcinforced and at the same time modified in 1865, the executive power in the republicis in the hands of a presi- dent elected for six years, and assisted by a ministry of his own appointment ; and the legislature in the hands of a senate of nine members. Each state has also a legislature of its own. The budget of 1876 was estimated at £170,651. In regard to the home debt no precise information is obtainable. 'The loan of £757,700 contracted in London in 1869, of which it has been proved that the Government received only from £38,000 to £50,000, was repudiated in 1872. The republic has no ficet ; and a battalion or two in the capital is the whole of its standing army. Industry and commerce, hitherto kept in abeyance by the political restlessness of the country, are beginning to devclop. In 1875 the imports of the two harbours of Santo Domingo and Porto Plata were £34,930, and the exports £309,361. The chief articles of export'were tobacco (11,618,230 tb), sugar (7,152,015 tb), coffee (264,179 tb), honey (115,680 tb), wax (289,062 Ib), and mahogany (1,375,790 feet); and other articles are lignum vite, logwood, fustic, cocoa, and turtle-shell. Santo Domingo, the capital of the republic, situated at the mouth of the Ozaina river, has a population of about 20,000.

See B. Edwards, Jfist. Survey of the Island of Santo Domingo, Lond., 1801; Justin, Hist. politique et statistique de Visle de Haiti, Par., 1826 J, Franklin, The Present State of Hayti, Lond., 1828; Jordan, Geschichte der Insel Haiti, Leipsie, 1846; Monte y Tejada, Historia de Santo Domingo, Havana, 1853; Joseph Saint-Remy, Pétion et Haiti, Pay., 1853-58, Ardouin, Mist. d'iZaiti, Par., 1853— 61; Saint Amand, ist. des révolutions d'Haiti, Par., 1859;

Linstant Pradine, Recueil général des lois et actes du gouvernement d Haiti, Par., 1851-65; Handel- mann, Geschichte von Ilaiti, Kiel, 1860; Bonneau, Haiti, ses progrés, son avenir, Par., 1862; Contzen, Haiti und seine Rassenkdmpfe, historisch entwickelt, Cologne, 1863; J. de Marles, Hist. descript. et pittor. de Saint Domingue, Par., 1869; Keim, Santo Domingo, Pen Pictures and Leaves of Travel, Philadelphia, 1871; Delorme, Reflexions sur Tfaiti, Par., 1873; Sam. Hazard, Santo Domingo, Past and Present, Lond., 1873; Robert Stuart, H.M. minister, " Haitl or Hispaniola," in Journ. of the Roy. Geogr. Soc., vol. xlviii., 1878; Eldin, Haiti, treize ans de séjour aux Antilles,

Toulouse, 1879. _Hazard gives a good list of books relating to the island. An excellent map will be found in Petermann's Mitthetlungen, 1874. (WJ. D. C.)

HA Y—HAZ

HAYWARD, Sir Joun (c. 1560~1627), one of the earliest writers of English history as distinguished from the old chroniclers, was born about 1560 at or near Felixstow on the coast of Suffolk. According to a statement in his will he "'received the means of his education" out of the parish of Felixstow. It is affirmed by the old authorities that he studied at Cambridge and took the degree of doctor in civil law, but his name does not occur in any of the registers. In 1599 he published The First Part of the Life and Raigne of King Henrie the IILI., extending to the end of the first yeare of his raigne, which, from its dedication to the earl of Essex, and a passage it contained on hereditary rights, led to the author's imprisonment by Elizabeth. The queen also caused Francis Bacon to search the book for "places in it that might be drawn within case of treason," who reported, "For treason surely I find none, but for felony very many,"—explaining that many of his sentences had been stolen from Cornelius Tacitus. Notwithstanding this jocular exculpation Hayward was continued in prison, in all probability until after the death of the queen. On the accession of James I. he courted that monarch's favour by the publication of two political pamphlets—On the Right of Succession (1603), and A Treatise of Union of England and Scotland (1604); and in 1610 he was appointed his- toriographer along with Camden of the college which King James attempted to found at

Chelsea. In 1613 he pub- lished his Lives of the Three Norman Kings of England, which he wrote at the request of Prince Henry. In 1616 he was admitted an advocate of Doctors Commons, and in 1619 he received the honour of knighthood. He died 27th June 1627. Among his manuscripts was found The Life and Raigne of K. Edward V1, first published in 1630, and Certain Yeres of Queen Elizabeth's Raigne, the beginning of which was printed in an edition of the Reign of Hdward VJ., published in 1636, but which was first published in a complete form in 1840, for the Camden Society, under the editorship of John Bruce, who prefixed an introduction on the life and writings of the author. Hayward was con- scientious and diligent in obtaining information, and, although his reasoning on questions of morality is often childish, his descriptions are generally graphic and vigorous. Notwithstanding his imprisonment by Elizabeth, his por- trait of the qualities of her mind and person is flattering rather than detractive.

HAZARA, or Huzara, a British district in the lieu- tenant-governorship of the Punjab, India, lying between 33° 45' and 35° 2' N, lat., and between 72° 35' 30" and 74° 9' EK. long. It forms the north-eastern district of the Peshawar Division, and is bounded on the N. by the Black Mountains, the Sw4thi country, Kohistan, and Childs; on the E, by the native state of Kashmir; on the 8. by Rawal Pindi district ; and on the W. by the river Indus. The area is 2771 square miles.

The district forms a wedge of territory extending far into the heart of the outer Himalayan range, and consisting of a long narrow valley, shut in on both sides by lofty mountains, whose peaks rise toa height of 17,000 feet above sea level. Towards the centre of the district the vale of Khagan is bounded by mountain chains, which sweep southward still maintaining a general parallel direc- tion, and send off spurs on every side which divide the country into numerous minor dales. The district is well watered by the tributaries of the Indus, the Kunhar, which flows through the Khagan Valley into the Jhilam (Jhelum), and many rivulets. Throughout the scenery is picturesque. To the north rise the distant peaks of the snow-clad ranges ; midway, the central mountains stand clothed to their rounded summits with pines and other forest trees, while grass and brushwood spread a green cloak over the nearer hills, and cultivation covers every available slope.

The cnumeration of 1868, which extended over an area of 3000 square miles (including the feudal territory of Tanawal), penis

e 18,563; Sikhs, 973; The gross revenue in 1875-76 was £25,292. In the same year the police force numbered 510 meu, besides 390 and there were 24 schools with 1042 pupils. The principal crops consist of wheat, barley, oil-seeds, maize, Out of a cultivated area of 393,918 acres, 36,380 are artificially irrigated by means of wells Hazara has not suffered from any calamity since the famine of 1783, which The chief imports are English cloth, salt, indigo; and the exports ghi, mustard oil, barley, wheat, rice, and live stock, In 1875-76 there were 676 miles The average rainfall for the The station

population of 367,218 (males, 191,423 ; females, Mahometans numbered 346,112; Hindus, " others," 1570.*

175,795).

village watchmen ;

rice, pulses, millets, and cotton.

and embankments on the rivers and hill torrents.

affected it as well as the rest of Upper India.

of unmetalled roads within the district. eight years ending 1873-74 amounted to 47 inches, of Abbottabad is the headquarters of the Punjab frontier force. History.—The name Hazara Turki family which entered India with Timur in the 14th century, and subsequently settled in this remote region.

number of mixed tribes, which each began to assert its independence,

so that the utmost anarchy prevailed until the time when Hazgra attracted the attention of the rising Sikh monarchy. Ranjit Sinh first obtained a footing in the district in 1818, and, after eight

years of constant aggression, became master of the whole country. During the minority of the young Mahdraja Dhulip Sinh, the Sikh

capital fell into a state of complete disorganization; the people seized

the opportunity for recovering their independence, and rose in 1845 in rebellion. They stormed the Sikh forts, laid siege to Haripur, and drove the governor across the borders, In the following year the greater part of the district was included in the territory ceded to Raja Ghulab Sinh by the British, at the conclusion of the first Sikh war. On the outbreak of the second Sikh war the troops in garrison revolted, but the Mussulman inhabitants supported Lieu- tenant Abbott under the Lahore Government, and the insurrection was soon quelled. Since then Hazdra has passed under direct British rule, and has enjoyed for more than quarter of a century uninterrupted peace.

HAZARAS. See ArcHanisray,

*HAZARD, a game played with dice, The player or " caster" calls a * main" {that is, any number from five to nine inclusive). He then throws with two dice. If he "throws in," or "nicks," be wins the sum played for from the banker or "setter." Five is a nick to five, six and twelve are nicks to six, seven and eleven to seven, eight and twelve to eight, and nine to nine, If the caster "throws out" by throwing aces, or deuce, ace (called crabs), he loses, When the main is five or nine the caster throws out with eleven or twelve; when the main is six or eight he throws out with eleven; when the main is seven he throws out with twelve. If the caster neither nicks nor throws out, the number thrown is his " chance," and he keeps on throwing till either the chance comes up, when he wins, or till the main comes up, when he loses. When a chance is thrown, the "odds" for or against the chance are laid by the setter to the amount of the original stake,*

Suppose, for example, 7 is the main. If the caster throws 7 or 11 he wins; if he throws aces, crabs, or 12 heloses. If he throws any other number, that is his chance. Say 7 is the main and 4 the chance, the odds against the caster are now 2 to 1 (as will appear from the table below). Ifthe stake were £1, the setter would lay £2 to £1 in addition. The easter goes on throw- ing till either 7 or 4 appears, when he loses £2 or wins £8.

In laying the odds, the setter gains no advantage, as can easily be

shown, examining the yarious ways in which two dice can be thrown. Ways,

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in all 36 ways. The table shows that there are six ways in which

7 can be thrown, three ways in which 4 can be thrown. [ence the odds are 6 to 8, or 2 to 1.

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During the pros- perous period of the Mughal dynasty, the population included a

o+7

But there is always an advantage in favour of the setter on the stake first played for. The least disadvantageous main for the caster to call is 7.

Take the case in which 7 is the main and £18 (to avoid fractions) the caster’s stake, and £36 therefore the sum played for. Then (1) if 7 or 11 is thrown the caster wins. There are eight ways out of 36 in his favour; therefore his expectation on nicking is 8ths of £18=£8, (2) If the chance is 6, in order to win he must throw 6 before he throws 7. There are five ways of throwing 6, and six ways of throwing 7, His expectation on 6 is therefore gsths of rrths of £36 =<£2, 5s, 54d. (3) The expectation on a chance of 8 is the same as on 6, viz,, £2, 5s. 54d, (4 and 5) If the chance is 9 or 5 the expectation is ths of 4d of £36=£1, 12s. (twice). (6 and 7) If the chance is 10 or 4 the expectation is ,3;ths of 3d of £36=£1 (twice). The total expectation of the caster is all the separate expectations added together, viz,, £17, 14s. 1ld. If his expectation were equal to the setter’s, it should amount to £18. Therefore the caster’s expectation is 5s. 1d. less than it

would be if the prob- abilities of his winning or losing were equal, This makes his disadvantage when 7 is the main equal to 33d. and half a farthing in the pound.

The calculations applied to the main of 7 can easily be made usc of for any other main, when it will be found that the caster's expectation of loss when 5 or 9 is the main is 34d, and half a farthing in the pound, and when 6 or 8 is the main 54d. and nearly half a farthing in the pound, 5h

HAZARIBAGH, a British district in the lieutenant- governorship of Bengal, India, lying between 23° 25' and 24° 48' N. lat., and between 84° 29' and 86° 38' E. long. It is bounded on the N, by the districts of Gayd and Monghyr, on the E. by the Santél Parganas and Ménbhim districts, on the S. by Lohardaga, and on the W. by Lohardaga and Gaya; it forms the north-east portion of the Chutia N. agpur division, and has an area of 7020 square miles.

The physical formation of Hazdribaégh exhibits three dis- tinct features—(1) a high central plateau occupying the western section, the surface of which is undulating and cultivated ; (2) a lower and more extensive plateau stretch- ing along the north and eastern portions; to the north, the land is well cultivated, while to the east the country is of a more varied character, the elevation is lower, and the character of a plateau is gradually lost ; (3) the cen- tral valley of the Damodar river occupying the entire southern section. Indeed, although the characteristics of the district are rock, hill, and wide-spreading jungle, fine patches of cultivation are met with in all parts, and the scenery is generally pleasing and often picturesque. The district forms a part of the chain of high land which ex- tends across the continent of India, south of the Nerbudda on the west, and south of the Sdn river on the east. The most important river of Hazdribagh is the Damodar, with its many tributaries, which drains an area of 2480 square miles. The only other river of any importance is the Barakhar, The jungle gives shelter to wild animals of all sorts, Game birds are plentiful.

The census of 1872 showed a population of 771,875 (males, 397,045; females, 374,830). Belonging to aboriginal tribes there are 57,120; scmi-Hinduized aborigines, 216,712; Hindus, 421,622; persons of Hindu origin not recognizing caste, 2664 ; Mahometans, 72,338 ; non-Asiatics, 1862;

and mixed races, 57. Three niunici- palities contain more than 5000 inhabitants ;—Hazaribagh, 11,050; Ichak, 8999 ; and Chatrd, 8818, The only place of special interest is Parasnath Hill, a celebrated place of pilgrimage, which is annu- ally visited by large numbers of Jain worshippers. The revenue in 1870 amounted to £32,841, and the expenditure to £31,367. The regular police force (1872) numbered 557 men of all ranks; municipal force, 65 ; and rural police, 3884 men; maintained at a total cost of £15,763. There were, in 1873, 86 schools with 2183 pupils. Rice is the staple crop, and the three principal kinds are grown. Among the other crops are wheat, barley, Indian corn, the usual pulses and green crops of Bengal, jute, flax, aloes, sugar- cane, opium, cotton, &c. The trade is concentrated at Chatra, the great central market. The chief exports are lac, metal cooking utensils, ght, iron, and cattle ; and the imports, rice, salt, cattle, and tobacco. There are 400 miles of road. Six coal-fields aro known to cxist in the district, —the most important being that of Karharbari, which is capable of supplying 20,000 tons a year for 300 years. In 1877 there were three tea plantations containing mature plants, and one on Parasndéth Hill which promises well. The average mean temperature for 1874 was 74° F.; the average

yearly rainfall, 52‘4 inches. The climate is very healthy, but rheumatism, fever,and dysentery are not uncommon; cholera is rare. The history of the district is involved in obscurity until 1755, about which time a certain Mukund Sinh was chief of the country. In a few years he was superseded by a Tej Sinh, who had gained the assistance of the British. In 1780 Hazaribagh, along with the surrounding territory, passed under direct British rule.

Hazsripicu, the chief town and administrative head- quarters of the above district, is picturesquely situated on the high central plateau of the district, at an elevation of 2000 feet above sea-level, and in the midst of a group of conical hills, 23° 59’ 21” N. lat. and 85° 24’ 32” E. long. The town is little more than a cluster of villages, with intervening cultivation, which have sprung up round the military bdzd7. Hazaribagh has been the military head- quarters of the district since 1780, and the seat of civil

administration since 1834, The cantonment lies south- |

east of the town. Population in 1872, 11,050 (6312 males, 4738 females) : —-Hindus, 7240; Mahometans, 3384; Christians, 52; "others," 374.

HAZEBROUCK, a town of France, capital of an arrou- dissement of the same name in the department of Nord, is situated on the Bourre, 32 miles W,N.W. of Lille, in a district formerly covered with marshes. It stands on the Lille and Calais Railway, at the junction ef the branch from Dunkirk. The town is governed by a sub-prefect, and has a court of primary instance with two juges de paix, besides various offices of excise and inland revenue. 'There are numerous religious and charitable societies including the Fréres des Ecoles Chrétiens, Sceurs de Charité, and Dames de la Sainte Union. The convent of Capuchius, built near the town in 1854, is now occupied by a school. Haze- brouck contains some handsome public buildings, as the church of St Nicolas, with a tower 260 feet high, of fine open work, built about 1520, the hétel de ville (1807-

1813), the prison for the department, two theatres, and the The Augustinian convent, built in the |

communal college. 16th century, with a fagade of the 17th century, is now occupied in its several parts by the hospital, a tobacco- warehouse, a market, and college lecture-rooms. A chamber of agriculture meets in the town, where tliere are also a small public library and a secondary school. The prin- cipal manufactures are linen cloth, thread, soap, beer, oil, lime, and salt. There are also tanneries, salt-refineries, corn-mills, and dye-works. Trade in country produce, cattle, timber, and hops is also carried on. Population (1876) of the district 9857, of the town 6363.

HAZEL (Anglo-Saxon, Hesel;! German, Hasel; French, Noisetier, Coudrier), Corylus, Tournef., a genus of shrubs or low trees of the natural order Cupulifere and sub-order Corylee. The common hazel, Corylus Avellana, L., is dis- tributed throughout Europe, in North Africa, and in Central and Russian Asia, except the northernmost parts. It is commonly found in hedges and coppices, and as an under- growth in woods, and reaches a height of some 12 feet ; occasionally, as at Eastwell Park, Kent, it may attain to 30 feet. According to Evelyn (Sylva, p. 35, 1664), hazels

“above all affect cold, barren, dry, and sandy soils ; also mountains, and even rockie ground produce them; but more plentifully if somewhat moist, dankish, and mossie.” In Kent they flourish best in a calcareous soil. The bark of the older stems is of a bright brown, mottled with grey, that of the young twigs is ash-coloured, and glandular and hairy. The leaves are alternate, from 2 to 4 inches in length, downy below, roundish-cordate, pointed, and shortly petiolate ; occasionally they are found with the margins

coherent at the base, or with the disk so depressed as to

’ Derived, it has been supposed, from Ang.~~Sax. hs, a behest, con~~ nected with hatan = Germ. heissen, to give orders: the hazel-wand was the sceptre of authority of the shepherd chieftain (aomhv Aady) of olden times. See Grimm, Gesch. d. deutsch. Sprache, p. 1016, 1848.

HAZ—HAZ

form a pitcher-like structure (Masters), In the variety C. purpurea, the leaves, as also the pellicle of the kernel and the husk of the nut, are purple, and in C. heterophylla they are thickly clothed with hairs. In autumn tlie rich yellow tint acquired by the leaves of the hazel adds greatly to the beauty of landscapes. The flowers are moneecious, and appear in Great Britain in February and March, before the leaves, and sometimes in October (Loudon). The cylindri- cal, drooping, and yellow male catkins (see BoTany, vol. iv. p. 128, fig. 161) are 1 to 2} inches in length, and occur 2 to 4in araceme; when in unusual numbers they may be terminal in position. The female flowers are small, sub- glubose, and sessile, resembling leaf-buds, and have protrud- ing crimson stigmas; the minute inner bracts, by their enlargement, form the palmately lobed and cut involucre or husk of the nut. The ovary is not visible till nearly midsummer, and is not fully developed before autumn. The nuts have a length of from 4 to ? inch, and grow in clusters. Double or treble nuts are the result of the equal development of two or all the three carpels of the original flower, of which ordinarily two become abortive. Fusion of two or more nuts is not uncommon, and Masters gives an instance of the union of as many as five. From the light-brown or brown colour of the nuts the terms hazel and hazelly, z.e., in hue as hazel nuts ” (Shakespeare, Zam- ing of the Shrew, ii.

1), derive their significance. The wood of the hazel is whitish-red, close in texture, and pliant, and has when dry a weight of 49 ib per cub, foot; it has been used in cabinet-making, and for toys and turned articles. Curiously veined veneers are obtained from the roots ; and the root-shoots are largely employed in the making of crates, coal-corves or baskets, hurdles, withs and bands, whip- handles, and other objects. The rods are reputed to be most durable when from the driest ground, and to be especi- ally good where the bottom is chalky. The light charcoal afforded by the hazel serves well for crayons, and is valued by gunpowder manufacturers. An objection to the con- struction of hedges of hazel is the injury not infrequently done to them by the nut-gatherer, who " with active vigour crushes down the tree" (Thomson's Seasons, " Autumn "), and otherwise damages it.

The filbert,? among the numerous varieties of Corylus Avellana, is extensively cultivated, especially in Kent, for the sake of its nuts, which are readily distinguished from cob-nuts by their ample involucre and greater length. It may be propagated by suckers and layers, by grafting, and (see ARBORICULTURE, ii. 322) by sowing. Suckers afford the strongest and earliest-bearing plants. Grafted filberts are less liable than others to be encumbered by suckers at the root. By the Maidstone growers the best plants are considered to be obtained from layers. These become well rooted in about a twelvemonth, and then, after pruning, are bedded out in the nursery for two or three years. The filbert may be economically grown on the borders of planta- tions or orchards, or in open spots in woods. It thrives most in a light loam with a dry subsoil; rich and, in particular, wet soils are unsuitable, conducing to the formation of too much wood. Plantations of filberts are made in autumn, in well-drained ground, and a space of about 10 feet by 8 has to be allowed for each tree. Ground good for hops is good also for filberts, according to Williamson, who recom- mends old woollen rags as the best manure for the latter ("On the Cultivation of the Filbert," Trans. Hort. Soc., iv. 145). In the third year after planting the trees may require root-pruning ; in the fifth or sixth they should bear well. The nuts grow in greatest abundance on the extre- mities of second year's branches, where light and air have

2 On the expression " hazel eyes," see Notes and Queries, 2d ser., xii. 337, and 3d ser., iii. 18, 39.

3 Kor derivations of the word see Latham's Johnson's Dictionary.

ready access. In 1819, a very productive year, Williamson obtained from 57 trees, mostly not above six years old, and growing on 360 square yards of ground, 2 ewt. of nuts.

To obtain a good tree, the practice in Kent is to select a stout upright shoot 3 feet in length; this is cut down to about 18 inches, of which the lower 12 are kept free from outgrowth. The head is pruned to form six or eight strong

ofisets ; and by judicious use of the knife, and by training,

preferably on a hoop placed within them, these are caused to grow outwards and upwards to a height of about 6 feet, so as to forma bowl-like shape. Excessive luxuriance of the laterals may be combated by root-pruning, or by checking them early in the season, and again later, and by cutting back to a female blossom bud, or else spurring nearly down to the main branch in the following spring. In certain conditions of growth the trees may bear almost exclusively male or female flowers, and those produced in the first blossoming are stated (Gent. Mag., 1788, vol. lviii., pt. 1, p. 495) to be female only. The fertilization of the latter may be secured by suspending amongst them a branch with

male bloom,

Filbert nuts required for keeping must be gathered only when quitc ripe; they may then be preserved in dry sand, or, after drying, by packing with a sprinkling of salt in sound casks or new flower. pots. Their different forms include the Cosford, which are thin- shelled and oblong; the Downton, lancinated husk; the white or Wrotham Park filbert ; and the red hazel or filbert, the kernel of which has a red pellicle. The last two, on account of their elongated husk, were by Willdenow distin- guished as a species, under the name Corylus tubulosa. Like these, apparently, were the nuts of Abella, or Avella, in the Campania (cf. Fr. aveline, filbert), said by Pliny to have been originally designated "Pontic," from their introduction into Asia and Greece from Pontus (see Nat. Hist., xv. 24, xxiii. 7 8). Cob-nuts are short

and roundish, and have a thick and strong shell. Hazel-nuts, under the name of Barcelona or Spanish nuts, are largely exported from France and Portugal, and especially Tarragona and other places in Spain. They afford 60 per cent. of a colourless or pale-yellow, sweet- tasting, non-drying oil, which has a specific gravity of 0°92 nearly,

becomes solid at —19° C. (Cloez), and consists approximately of

carbon 77, and hydrogen and oxygen each 11°5 per cent. Hazel nuts formed part of the food of the ancient lake-dwellers of Swit- zerland and other countries of Europe (see Keller, Lake Dwellings, trans. Lee, 2d ed., 1878). By the Romans they were sometimes eaten roasted. Kaltenbach (Pflanzenfcinde, pp. 633-38, 1874) enumerates ninety-eight insects which attack the hazel. Among these the beetle Balaninus nucum, L., the nut-weevil, seen on hazel and oak stems from the end of May till July, is highly destructive to the nuts. The female lays an egg in the unripe nut, on the kernel of which the larva subsists till September, when it bores its way through the shell, and enters the earth, to undergo transformation into a chry- salis in the ensuing spring. The leaves of the hazel are frequently found mined on the upper and under side respectively by the larvie of the moths Lithocolletis corylt, Nic., and L. Nicelii, Sta. The tomtit has been observed to pass over the filbert whilst destroying other nuts (Darwin, Anim. and PI, ii. 231). Parasitic on the roots of the hazel is found the curious leafless Lathrea squanosa, or Toothwort, of the natural order Orobanchacew.

The Hebrew word Juz, translated "hazel" in the authorized version of the English Bible (Gen. xxx. 37), is believed to signify 'falmond " (see Kitto, Cycl. of Bibl. Int., ii. 869, and iii. 811, 1864). A belief in the efficacy of divining-rods of hazel for the discovery of concealed objects is probably of remote origin (ef. Hosea, iv, 12). G, Agricola, in his treatise Vom Bergwerek (pp. Xxix.~~xxxi., Basel, 1557), gives an account, accompanied by a woodcut, of their em~~ ployment in searching for mineral veins. By certain persons, who for different metals used rods of various materials, rods of hazel, he says, were held serviceable simply for silver lodes, and by the skilled miner, who trusted to natural signs of mineral veins, they were regarded as of no avail at all. The virtue- of the hazel wand was supposed to be dependent on

its having two forks; these were to be grasped in the fists, with the fingers uppermost, but with moderate firmness only, lest the free motion of the opposite end downwards towards the looked-for object should be interfered with. According to Cornish tradition, the divining or dowsing rod is guided to lodes by the pixies, the guardians of the treasures of the earth. By Vallemont, who wrote towards the end of the 17th century, the divining-rod of hazel, or " baguette divinatoire," is described as instrumental in the pursuit of eriminals. The Jesuit Vaniére, who flourished in the early part of the 18th century, in the Pradium Rusticum (pp. 12, 18, new ed., Toulouse, 1742) amus- ingly relates the manner in which he exposed the chicanery of one

or large square nut, having a

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who pretended by the aid of a hazel divining-rod to point out hidden water-courses and gold. The burning of hazel nuts for the magical investigation of the future is alluded to by Gay in Thurs- day, or the Spell, and by Burns in Halloween. The hazel is very frequently mentioned by the old French romance writers. The Corylus rostrata and americana of North America have edible fruits like those of C. Avellana. The Witch Hazel is the species Hamamelis virginica (see vol. ii. p. 320), of the natural order Hamamelidee, the astringent bark of which is used in medicine.

See Loudon, Arboretum, iii. 2016 Seq.; Gardeners Chron., 1850, pp. 101 and 552; C. M'Intosh, The Book of the Garden, ii. 563, 1855; Syme, Sowerby's Eng. Bot., viii. 170, 1868; Masters, Vegetable Teratology, Ray Soc., 1869; J. D. Hooker,

Student's Flora, pp. 363-4, 2d ed., 1878. (F. H. B.) HAZEL-HEN. See Grouse. HAZLETON, a post-borough of Luzerne county,

Pennsylvania, U.S., is situated about 80 miles N .N.W. of Philadelphia. Owing to its elevated and healthy situa- tion, its agreeable climate, and the facilities afforded by its railway connexions with other districts, it has become a favourite and fashionable health-resort in summer, The manufactures include both iron and timber; and a part of the rolling-stock

of the Lehigh Valley Railway is made in the town. There are several valuable coal- mines in the vicinity. The population in 1860 was only 1707 ; in 1870 it was 4317, and since then it has con- siderably increased.

HAZLITT, Wrttram (1778-1830), one 'of the most eminent of English critics, was born April 10, 1778, at Maidstone, where his father was minister of the Presby- terian congregation. He was educated privately, and after- wards at the Unitarian College at Hackney, where he first began to speculate upon metaphysical subjects. Feeling disinclined to enter the dissenting ministry, he returned to Wem in Shropshire, where his father had in the meantime settled, and there led an idle and desultory life until, about 1802, he determined upon becoming a painter. Meta- physics and art continued his joint passion throughout his life. It was his singular lot to be animated by an equal enthusiasm for two of the most dissimilar fields of human effort, in neither of which was he capable of achieving eminence, and yet, by a combination of the qualities proper to both, to obtain the most distinguished success in another sphere which he only entered by accident. The secret of his distinction as a critic is the union in him of the meta- physician's acuteness with the painter's eye for colour and substance. Nowhere else is abstract thought so pictur- esquely bodied forth by concrete illustration, He com- menced the practice of painting in London, where his elder brother had already-acquired some reputation as an artist, and soon found his way into literary and artistic circles, be- coming especially intimate with Lamb, Hunt, and Godwin. Previously to this he had (January 17 98) been powerfully influenced by Coleridge, who had come to preach in his father's neighbourhood, and of whose conversation and general demeanour he has left a most vivid picture. His professional painting did not prosper, and little remains of it except a few portraits; but in 1805 he published his Essay on the Principles of Human Action, which had occupied him at intervals for six or seven years. This work, further defined by the author as an argument in favour of the natural disinterestedness of the human nind, was preferred by him to all his other writings, but never attracted any attention from the public. In 1807 appeared a most useful abridgment of Abraham Tucker's Light of Nature Pursued, and a clever but fallacious attempt to invalidate the natural law established in Malthus's Essay on Population. In the following year he married Sarah, sister of Dr Stoddart, well known for his connexion with the journalism of the day, a

woman of literary tastes and great strength of character, but cold, formal, and utterly uncongenial to him. No man indeed could well be less adapted for domestic life than Hazlitt, whose habits, not- withstanding his exemplary sobriety, were most irregular,

whose temper was fitful and moody, and the intensity of whose passions rendered him for the time insensible to the feelings and rightful claims of those who might stand in the way of their gratification. The dissolution of the ill-assorted union was nevertheless deferred for fourteen years, during which much of his best literary work had been produced. After three or four years, during which he almost disappears from observation, he came forward pro- minently as a writer in the Zxaminer and as a lecturer at the Surrey Institution, bringing out in rapid succession his Round Table, a collection of essays on literature, men, and manners, his View of the contemporary English stage, and his lectures on the poets, the English comic writers, and the dramatic literature of the age of Elizabeth. By these works, together with his Characters of Shakespeare's Plays (1817), and his Zable Talk (1821), his reputation as a critic and essayist will mainly be sustained. Next to Coleridge, Hazlitt was perhaps the most powerful exponent of the dawning perception that Shakespeare's art was no less marvellous than his geuius; and Hazlitt's criticism did not, like Coleridge's, remain in the condition of a series of brilliant but fitful glimpses of insight, but was elaborated with steady care. Ilis lectures on the Elizabethan drama- tists performed a similar service for the earlier, sweeter, and simpler among them, such as Dekker, till then unduly eclipsed by later writers like Massiuger, better playwrights but worse poets, 'Treating of the contemporary drama, he successfully vindicated for Edmund Kean (whom, how- ever, he had at first disparaged) the high place which he has retained as an actor; while his criticisms on the English comie writers and men of letters in general are masterpieces of ingenious and felicitous exposition, though rarely, like Coleridge's, penetrating to the inmost core of the subject. As an essayist Hazlitt is even more effective than as a critic, for this style of composition allows more scope to the striking individuality of his character. Being enabled to select his own subjects, he escapes dependence upon others either for his matter or his illustrations, and presents himself by

turns as a metaphysician, a moralist, a humorist, a painter of manners and characteristics, but always, whatever lis ostensible theme, deriving the essence of his commentary from his own bosom. This coinbination of intense subjectivity with strict adherence to his subject is one of Hazlitt's most distinctive and creditable traits. Intellectual truthfulness is a passion with him. He steeps his topic in the hues of his own individuality, but never uses it as a means of self-display. The first reception of these admirable essays was by no means in accordance with their deserts. Hazlitt's political sympathies and antipathies were vehement, and he had taken the unfashion-able side. The Quarterly attacked him with deliberate malignity, stopped the sale of his writings for a time, and blighted his credit with publishers. He had become estranged frum his early friends, the Lake poets, by what he uncharitably but not unnaturally regarded as their political apostasy ; as well as by an escapade of his own, obscurely related, but apparently not creditable, His inequalities of temper separated him for a time even from Leigh Hunt and Charles Lamb, and on the whole the period of his most brilliant literary success was that when he was most soured and broken. Domestic troubles super- vened ; his marriage, long little more than nominal, was dissolved in consequence of the infatuated passion he had conceived for a servant girl, a most ordinary person in the eyes of every one else. It is impossible to regard Hazlitt as a responsible agent while he continued subject to this influence. His own record of the transaction, published by himself under the title of Liber Amoris, or the New Pyg-matron (1823), is a most remarkable psychological curiosity, and one of the most signal examples extant of the power of

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genuine passion, uot merely to palliate what is wrong, but to dignify what is ridiculous. "His idolatry," says Mrs Jameson, "in its intense earnestness and reality assumes something of the sublimity of an act of faith." The business-like dissolution of his marriage under 'the law of Scotland is related with amazing naiveté by the family biographer. Rid of his wife and cured of his mistress, he shortly afterwards astonished his friends by marrying a widow. "All I know," says his grandson, "is that Mrs

Bridgewater became Mrs Hazlitt." They travelled on the Continent for a year, and then parted never to meet again. Hazlitt's study of the Italian masters during this tour, described in a series of letters contributed to the Morning Chronicle, had a deep effect upon him, and perhaps conduced to that intimacy with the cynical old painter Northcote which, shortly after his return, engendered a curious but eminently readable volume of conversations with him. The respective shares of author and artist are not always easy to determine. During the recent agitations of his life he had been writing essays, collected in 1826 under the title of The Plain Speaker; others subsequently written were published after his death. They are in no respect inferior to his earlier performances. The Spirit of the Age (1825), a series of criticisms on the leading intellectual characters of the day, reveals that he was less qualified to assign their true place to contemporaries than to revise the verdicts of the past, but is in point of style perhaps the most splendid and copious of hiscompositions. It is eager and animated to impetuosity, with no trace of carelessness or disorder. He now undertook a work which was to have crowned his literary reputation, but which can hardly be said to have even enhanced it—TZhe Life of Napoleon (1828-30). The undertaking was at best premature, and was inevitably dis- figured by partiality to Napoleon as the representative of the popular cause, excusable and even becoming in a Liberal politician writing in the days of the Holy Alliance, but preposterous now that the true tendencies of French imperialism are recognized. Owing to the failure of his publishers Hazlitt received no recompense for this laborious work. Pecuniary anxieties and disappointments may have contributed to hasten bis death, which took place on September 18, 1830. Charles Lamb was with him to the last.

With many serious defects both on the intellectual and the moral side, Hazlitt's character in both had at least the merit of sincerity and consistency. He was a compound of intellect and passion, and the refinement of his critical analysis is associated with vehement eloquence and glowing imagery. He was essentially a critic, a disseetor, and, as Bulwer justly remarks, a much better judge of men of thought than of men of action, But he also possessed many gifts in no way essential to the critical character, and tran- scending the critic's ordinary sphere. These, while giving him rank as an independent writer, frequently perturbed the natural clearness of his critical judgment, and seduced him into the

paradoxes with which his works abound. These paradoxes, however, never spring from affectation ; they are in general the sallies of a mind so agile and ardent as to overrun its own goal. His style is perfectly natural, and yet admirably calculated for effect. His diction, always rich and masculine, seems to kindle as he proceeds ; and when thoroughly animated by his subject, he advances with a succession of energetic, hard-hitting sentences, each carry- ing his argument a step further, like a champion dealing out blows as he presses upon the enemy. Although, how- ever, his grasp upon his subject is strenuous, his insight into it is rarely profound. He can amply satisfy men of taste and culture; he cannot, like Coleridge or Burke, dissatisfy them witl themselves by showing them how much they would have missed without him, He belongs to the

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class of critics that exhibits the beauties of an author, rather than to the class that reveals them. He was somewhat backward in appreciating contemporary merit; he venerated Coleridge's intellect, but his estimate of his poetry is ridi- culously low; his review of Shelley's posthumous poems,

though rhetorically fine, is critically poor ; and he did little'

to vindicate the fame of Keats, As a moralist and observer of manners his chief merit consists in the extreme felicity of his occasional observations. But all shortcomings are forgotten in the genuineness and fervour of the writer's self- portraiture, and the bold relief in which he stands out from the crowd of mankind, The intensity of his personal con- victions causes all he wrote to appear in a manner auto- biographic. Other men have been said to speak like books, Hazlitt's books speak like men. 'To read his works in connexiou with Leigh Hunt's and Charles Lamb's is to be introduced into one of the most attractive of English literary circles, and this alone will long preserve them from oblivion.

The most copious source of information respecting Hazlitt is the biography by his grandson (1867), a medley rather than a memoir, yet full of interest. A slight but appropriate sketch had previously been prefixed by his son to

the posthumous essays published in 1836, accompanied by elegant but partial estimates of his intellec- tual character by Bulwer and Talfourd. Valuable biographical particulars have been preserved in Barry Cornwall's memoirs of Lamb, and in the reminiscences of Mr P. G. Patmore, Hazlitt's most intimate associatc in his latter years. A full bibliographical list of his writings, with a collection of the most remarkable critical judgments upon them from all quarters, has been tastefully and industriously prepared by Mr Alexander Ireland (1868). (R. G.)

HEAD, Sir Epuunp Waker, Bart., (1805-1868), a popular writer on art, was born in 1805 at Wiarton Place, near Maidstone in Kent. He was educated at Winchester school and Oriel College, Oxford, and taking his degree with first-class honours in classics, he became in 1827 fellow of Merton College, and in 1834 university examiner in classics. Two years later he married; and on his father's death in 1838, he succeeded to the baronetcy as eighth baronet. His services as poor-law commissioner, to which post he was appointed in 1841 after three years as assistant-commissioner, procured for him in 1847 the office of lieutenant-governor of New Brunswick, whence he passed in 1854 to the governor-generalship of Canada, which he retained till 1861. The following year, having returned to England, Head was nominated a civil-service commissioner. In 1857 he was sworn of the Privy Council, and in 1860 was decorated as K.C.B., while in the course of his career he received the degrees of D.C.L. at Oxford and LL.D. at Cambridge. He died in London, January

28, 1868.

Sir Edmund Head wrote the article " Painting," in the Penny Cyclopedia, A Handbook of the Spanish and French Schools of Painting, 1845; Shall and Will, or two chapters on future Auaili- ary Verbs, 1856; aud Ballads and other Poems, original and trans- lated, 1868. Healso edited A Handbook of Painting of the German, Flemish, Dutch, Spanish, and French Sehools, 1854. His transla- tion from the Icelandic of Viga Glwm's Saga appcared in 1865.

HEAD, Sir Francis Bond, Barr. (1793-1875), soldier, traveller, and author, son of James Roper Head of the Hermitage, Kent, was born there January 1, 1793. He served with the Royal Engineers at the battles of Waterloo and

Fleurus, and when he retired from the army he had risen to the rank of major. In 1825 he accepted the charge of an association formed to work the gold and silver mines of Rio de la Plata. In connexion with this enter- prise he made several rapid journeys across the Pampas and among the Andes, his Rough Notes of which, published in 1826, and written in a clear and spirited style, obtained for lum the name of "Galloping Head." In 1835 he was appointed governor of Upper Canada, where he manifested similar energy in dealing with the discontents from which the colony was at that time suffering. He resigned his

office in 1837, and in recognition of his services he was in 1838 created a baronet. 'The narrative of his administra- tion in Upper Canada was published by him in 1839, In 1867 he became a privy councillor. He died at his resi- dence at Croydon, July 20, 1875. Some time previously a pension of £100 per annum was conferred upon him for his "services to literature."

Sir Francis Head was the author of a considerable number of works, chicfly of travel, written in a clever, amusing, and graphic fashion, and displaying both acute observation and genial humour. Besides those already mentioned, his principal works, which have all gone through more than one edition, are Bubbles from the Brunnen of Nassau, 1833; Life of Bruce, 1844; The Einigrant, 1846; Stokers and Pokers, 1850; The Defenceless State of Great Britain, 1850; A Faggot of French Sticks, 1851; A Fortnight in Ireland, 1852; Deseriptive Essays, 1856; The Horse and his Rider, 1860; The Royal Engineer, 1870.

HEAD, Str GeorcE (1782-1855), brother of the pre- ceding, was born in 1782. He was educated at the Char- terhouse. In 1808 he received an appointment in the commissariat of the British army in the Peninsula, where he was a witness of many exciting scenes and important battles, of which he gave an interesting account in "Memoirs of an Assistant Commissary-General " attached to the sccond volume of his Home Tour, published in 1837, In 1814 he was sent to America to take charge of the commissariat in a naval establishment on the Canadian lakes, and he subsequently held appointments at Halifax and Nova Scotia. Some of his Canadian experiences were narrated by him in Forest Scenery and

Incidents in the Wilds of North America, published in 1829. In 1831 he received the honour of knighthood. He published in 1835 A Home Tour through the Manufacturing Districts of England, and in 1837 a sequel to it, entitled A Home Tour through various parts of the United Kingdom. Both works are amusing and in- structive, but his Rome, a Tour of Many Days, published in 1849, is somewhat dull and tedious. He also contributed several articles to the Quarterly Review, and translated Historical Memoirs of Cardinal Pacca, 1850, and the Metamorphoses of Apuleius, 1851. He died in London, May 2, 1855.

HEARNE, Samven (1745-1792), an English explorer, was born at London in 1745. At the age of eleven he entered the Royal Navy as midshipman in the vessel of Lord Hood, but at the conclusion of the war he took service with the Hudson's Bay Company as quartermaster. In 1768 he was appointed to exaniine portions of the coast of Hudson's Bay with a view to the improvement of the cod- fishing, when he executed his task with such ability that it was resolved to employ him in the discovery of the north- west passage, and of certain mines of copper whose existence was asserted by the Indians. His first attempt, upon which he set out on November 6, 1769, was unsuccessful owing to the desertion of the Indians; and his second, entered upon on 23d February 1770, was by the breaking of his quadrant likewise rendercd abortive; but in his third ex- pedition, upon which he started in December 1770, he was completely successful, as he not only discovered the exist- ence of copper on the banks of what is now known as Coppermine river, but traced the course of that river till it joined the Arctic Ocean. After an absence of eighteen months and twenty-three days he arrived at Fort Churchill, of which he was subsequently promoted to be the governor. He returned to England in 1787, and died there in 1792. An account of his journeys from Prince of Wales Fort to the Northern Ocean was published post- humously in 1795.

HEARNE, Tuomas (1678-1735), an English antiquary, was born in 1678 at Littlefield Green, in the parish of White Waltham, Berkshire, where his father, the parish clerk, in payment of the rental of the vicarage house in which he lived, taught ten boys yearly. Thomas, after

receiving the rudiments of education from his father, was | sent by the kindness of a gentleman to the free school of Bray, 'on purpose to learn the Latin tongue." This gentleman in 1695 took him into his house, and his educa- tion was continued at Bray till the Easter of 1696, when he was sent to study at Edmund Hall, Oxford. There his diligence and scholarship attracted the attention of Dr Johu Mill, the editor of the Greek Testament with various read- ings, who employed him to compare several MSS. Hearne took the degree of B.A. in 1699, and on account of the reputation he had acquired for his knowledge of books he was in 1701 appointed assistant-keeper of the Bodleian Library. There at his own option he set himself dili- gently to correct the catalogue, and prepared an appendix which was afterwards incorporated in the new catalogue without acknowledgment. His interest in the antiquarian treasures of the library induced him to refuse many valu- able preferments, and in 1712 he was appointed second keeper, with the stipulation made by himself that he should also be janitor, so as to obtain access to the library at any time he pleased. In 1714 or 1715 he was elected archi- typographus and esquire beadle of civil law in the university, but, an objection being taken to his holding this office along with that of second librarian, he resigned it in the November following. In January 1716 he was compelled, on account of his refusal to take the oaths to the Govern- ment, to resign also his appointment of librarian, but he continued to reside principally at Oxford, where he occupied himself chiefly in preparing for publication the works of old English authors. His injudicious and inappropriate inser- tion of Jacobite sentiments in his prefaces awakened, how- ever, the hostility of the university magnates, and subjected him to several prosecutions. He died 10th June 1730. Though Hearne was somewhat indiscriminate in his anti- quarian taste, and rambling and desultory in his style of composition, his persevering diligence and minute accuracy enabled him to do valuable service in bibliography.

His publications were nearly all printed by subseription at Oxford. he principal of them are—Ductor Historicus; Reliquice Bodleianew; an edition of Livy; Spelman's Life of Alfred the Great; Leland's Jéincrary; Leland's Collectanea; Acta Apostolorum; Titi Livii Foro-Julicnsis Vita Henrict Quinti, Regis Anglia; Aluredi Beverlacensis Annales; Guliclmi Roperi Vita D. Thome Mori Equitis Aurati; Guliclmi Camdeni Annales Rerum

Anglicarum et Hibernicarum regnante Elizabetha ; Gulielmi Neubrigensis His- toria; Thome Sprotti Chronica; A Collection of Curious Discourses written by Eminent Antiquaries upon English Antiquities; Roberti de Avesbury Historia de Mirabilibus Gestis Edwardi III.; Johannis de Fordun Scotichronicon Genuinum; History and Antiquitics of Glastonbury; Robert of Gloucester's Chronicle ; Annals of Dunstable; and Benedict, Abbot of Pcterborough. Most of these have been reprinted. His MSS. were left by him to Dr William Bradford, of whom they were bought by Dr Richard Rawlinson and bequeathed to the Bodleian Library. Bibliotheca Hearniana, Exccrpts from the Catalogue of Thomas Hearne, M.A., appeared in 1848. Lcliquiw Hearniane, the remains of Thomas Hearne, of Edmund Hall, being extracts from his MS. diarics, collected with a few notes by Philip Bliss, was published in two volumes, Oxford, 1857; 2d ed., London, ee Memorials of the Life and Writings of Thomas Hearne, M.A., by several hands, London, 1736; Lives of Leland, Hearne, and Wood, Oxford, 1772; and Nichol's Literary Anecdotes, Letters addressed to T. Hearne, edited by T.

Ouvry, were privately printed at London, 1874. Bliss's copy of The Life of T. Hearne, with copious notes, is in tho library of the British Museum.

HEART, Disnases oF THE, form a large proportion of the most serious disorders that afflict mankind, in youth as well as in advanced life. For the structure and functions of the organ the reader is referred to ANATOMY and PHYSIOLOGY.

In the early ages of medicine, the absence of correct anatomical, physiological, and pathological knowledge pre- vented diseases of the heart from being recognized with any certainty during life, and almost entirely precluded

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them from becoming the objects of medical treatment. But no sooner did Harvey (1628) publish his discovery of the

circulation of the blood, and its dependence on the heart | that a superficial area of half a square

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as its central organ, than derangements of the circulation began to be recognized as signs of disease of that central organ. 'The earliest indications of this important step in the diagnosis of these diseases are to be found in the instruc- tive records contained in the writings of the great patho- logists of the beginning of the 18th century, of whom the chief in this respect are Lancisi, Morgagni, Senac, and Meckel. There is, however, a limit to the information obtainable in this way; and, though its range has been

largely increased in our day by the invention of such

instruments as the sphygmograph and cardiograph, &c., it was very easily reached in those early times, when men had only their unaided senses to depend upon, and but little ex- perience to guide them. We need not wouder, then, that after the first great step was taken there was but little further progress made, and medicine had to wait till the beginning of another century, when Corvisart (1806) first made practical use of Auenbrugger's (1761) invention of percussion to determine the size of the heart, enlargement of that organ bulking largely in those days as a substantive disease. Corvisart was also in the habit of listening to the sounds made by the heart, and he may therefore be regarded as the first practical exponent of our modern methods of physical exploration, though scarcely as their founder. For as Auenbrugger invented percussion, so Laennec (1819) was undoubtedly the first to make a scien- tific application of mediate auscultation to the diagnosis of diseases of the chest, and it is to him we trace all the benefits derived from this method of inquiry, though it is to Bouillaud (1824) that we are chiefly indebted for its extension to the diagnosis of diseases of the heart; while it is to the clinical experience, and above all to the practical experiments, of James Hope (1832) that we owe much of that precision we have now attained in our diagnosis of those diseases from abnormalities in the sounds produced during the cardiac movements ; just as we have learned from M. Forget (1851) the doctrine of retro-dilatation, which rightly interpreted is capable of greatly informing us as to the origin and progress of heart disease, and from William Stokes (1854) some instructive views on defective heart power as a cause of

certain symptoms simulating disease of the brain, which have proved most valuable and suggestive in the diagnosis of diseases of the heart as well as in their treatment.

The half dozen works just alluded to by no means ex- haust the literature of this subject during the past ages, but each of them marks an era, and by their means we may readily trace the progress of cardiac diagnosis during the 130 years intervening between Lancisi and Stokes ; but during the twenty odd years that have since elapsed the literature of this subject has become so unusually copious and exhaustive that it would occupy too much space merely to enumerate the authors' names. Fortunately this further development need not concern us here. ©

As in former so in recent times the progress made in the diagnosis of diseases of the heart has been entirely based on physics and on physiology, and the heart is an organ so situated and so connected as to render it singularly amenable to these methods of investigation. Resting on the diaphragm, and projected against the anterior chest- wall, the heart is partly within reach, and is otherwise so completely surrounded on three sides by resonant organs (the lungs) that any change in its position or in its size is readily made out by palpation and percussion, while by listeriing over the cardiac area—auscultation—we can ascertain whether the valves of the heart remain intact, have an unusual strain thrown upon them, or have been rendered incompetent by disease.

As the four openings of the heart lie so close together inch includes a part

of each, it is only by taking advantage of certain well-known laws regulating the conduction of sound that we are able to differentiate the sounds produced at each of these open- ings respectively, and to assign to each a definite position on the chest-wall, where it is heard at its maximum intensity. Physiology, on the other hand, teaches us that each indi- vidual cardiac pulsation, the time of which is marked for us by that impulse against the chest-wall of which we are all more or less conscious, consists of alternate acts of con- traction and dilatation affecting the four cavities of the heart. Some of these acts precede this impulse, some accompany it, and

others follow it, and the relation of any sound produced within the heart to these physiological acts is termed its rhythm.

The functional perfection of the heart is thus easily determined by ascertaining that it is of a normal size, that its impulse is neither too strong nor too weak, and that its sounds are normal when listened to, each in its own position of maximum intensity. When these conditions are present, any abnormal cardiac phenomena, such as palpitation, irregular action, &c., are to be regarded as entirely due to abnormal innervation, and not to any actual disease of the heart. On the other hand functional imperfection is readily detected by the occurrence of any abnormality in the phenomena already referred to, especially if accompanied by a blowing sound instead of the usual valve sound in any of the normal auscultatory areas. And an intelligent appreciation of these facts, together with a correlation of the physical with the physiological phenomena, that is, a correct determination of the rhythm of the sounds heard, enables us to ascertain with certainty, not only the valve implicated, but also the mode in which the lesion has affected or is likely to affect the heart and through it the circulation. Having found the heart to be functionally imperfect, we have two alternatives presented to us—either the valves are incurably deformed from previous disease, or they are merely functionally imperfect from over-disten- tion of the cardiac cavities, a state of matters which may arise from various causes, and which is always susceptible of great relief and very often of perfect cure.

The great function of the heart is to keep up such a pressure within the arterial section of the vascular canals as will suffice for the maintenance of the circulation and of all the organic functions of the body dependent upon it. The tendency, however, of all the extrinsic forces connected with the circulation is to equalize the blood pressure throughout the vascular system, and so to bring the circula- tion to a stand-still ; and indeed itis in this way that death at last occurs ; whether it happen suddenly or slowly the cause is still the same—cessation of the circulation brought about by equalization of the blood pressure throughout the whole of the vascular system, or, as it may be otherwise put, from decline of the arterial (aortic) blood pressure.

Valvular lesions of the heart, however produced, tend, as may be readily understood, to neutralize the cardiac function and to lower the arterial blood pressure, either by permitting an unnatural escape of the blood backward (regurgitation) or by obstructing its onward flow (obstruc- tion). And this action is further intensified by the inter- ference with the cardiac nutrition which necessarily results, first of all directly, from the heart being flushed with blood at a low pressure, and secondly indirectly, from the imperfect performance of all those functions, such as digestion, &c., upon which the formation of healthy blood depends, arising from the same cause.

Valvular disease thus gives the heart more work to do, while it takes from it the power of doing it, putting the organ in a vicious circle. In this way curable disease if neglected may readily lapse into incurability, while to incurable disease there can be but one ending, though, apart

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from such accidents as embolism or asystole from violent emotion or exertion, that is neither so sudden nor so speedy as is commonly supposed, and indeed usually occurs from gradual asthenia, often accompanied by dropsy, and preceded by a life of more or less active exertion, averaging in many cases not less than twenty years from the primary onset of the disease. During this comparatively long period the disease may have been entirely mute; that is, the valve lesion has progressed so slowly from its trifling commence- ment that the residual accumulation in the cavity primarily affected has gone on guttatim, and has spread itself back- wards over the other sections of the circulation in the same gradualmanner, the resulting dilatation being so immediately followed by compensating hypertrophy that the sufferer has never been aware of any derangement of his functions. A time comes at last, however, when, from a failure of nutri- tion due to physical causes, the increase in the heart's bulk ceases to be muscular, it becomes fibrous; then indeed the disease is no longer mute, serious rupture of the compensa- tion sets in, and all that art can do is to make the inevitable declension as gradual as possible. Up to this period any accidental rupture of the compensation, which readily enough occurs from over-exertion, imperfect nutrition from any cause, or from any feverish

attack, is as a rule perfectly amenable to appropriate treatment, though the restored com- pensation is always less stable than it had been previously.

Ruptured compensation is often attended by very alarm- ing symptoms, such as great general dropsy and extreme irregularity of the heart's action, but the true measure of the patient's danger lies less in these symptoms than in the condition of the cardiac muscle, and in the circumstances which threaten asystole, that is, arrest of the heart's action.

If in early times the diagnosis of diseases of the heart was @ matter of great difficulty, this seemed of less import- ance as their treatment was so hopeless. 'A mésure qu'on pénétre," says Senac, "dans les maladies du cceur, la médicine parait plus stérile ; que peut-on espérer des médi- caments, par exemple, dans les dilatations du cour?" But modern science, which has rendered the heart so. accessible from all sides that there is nowadays probably no organ of the body whose diseases can be so readily detected or so accurately discriminated, has not only pointed out. the true source of danger in these diseases, but has also put into our hands aremedy by which some are cured who were formerly thought incurable, while many incurables have their downward progress so successfully arrested that they feel themselves to be practically cured. And yet Dicrrauis (q.v.) was all but unknown 100 years ago, while so little was known of its real action—ratio medendi—that within the last thirty years a living author wrote that the use of digitalis as a diuretic in heart disease was quite "indefensible," as "the failing heart is absolutely incap- able of sustaining the depressing influence of the drug." Nowadays we know digitalis to be the only drug that can be relied on for increasing the power of the heart's contrac- tions, and it also slows them,—the result being that the blood pressure is increased throughout the whole arterial system, and that, time being given for the heart itself to be flushed by blood at an increased pressure, Its nutrition is improved. The heart not only acts more powerfully under the immediate influenceof the drug, but it becomes more able to act, so that by and by the drug may be left off; though indeed, should the muscular degeneration determinately threaten a rapid progression, tonic doses of the drug may be safely given daily for many years continuously, in spite of all our forefathers' croaking as to the dangers of accumu- lation. But however marvellous the effects of tonic doses of digitalis may be, the virtues of the

drug in larger doses are even more wonderful in appropriate cases, for by means of large doses the skilled physician has it in his power

permanently to contract many dilated hearts, and so to cure what seemed an incurable disease not only to Senac but even to many of his more modern successors.

There are many other drugs employed in the treatment of diseases of the heart, but there is no other deserving of special mention. Other medicines are employed to relieve pain, aid digestion, dispel flatuleuce, unload the bowels, improve the blood, or simply as general tonics, and may be catalogued as morphia, chloroform, belladonna, pepsine, asafoetida, aloes, rhubarb, iron, &c.

ANGINA PECTORIS (¢.v.) is a painful disease of the heart which has been already described. Palpitation is an extremely rapid and sometimes forcible action of the heart. Irregular and Intermittent Action are sufficiently described by their names ; irregular action may be tumultuous or so peculiar as to deserve the name of a veritable delirium cordis; intermission consists in the dropping of a beat every second, third, or fourth time, or seldomer. Some- times the intermission ouly applies to the pulse, the heart acting regularly, and is caused by that particular systole not being forcible enough to propel the blood to the periphery ; occasionally we have two beats of the pulse and then an intermission, constituting what has been termed a pulsus bigeminus, or the rhythm of the intermission may be even more varied. All these forms of perverted action of the heart may accompany valvular lesions, or they may occur in hearts whose valves are sound; the walls of such hearts are, however, almost invariably more or less feeble, imper- fectly nourished, and the blood often poor and watery. They are rarely indicative of any real danger, though sufficiently troublesome and alarming to the sufferer; they arise from abnormal innervation, and are part of the penalties we pay for our present state of organization. We could enjoy nothing if we could not also suffer; and the blush of sensitiveness, the quickened pulse of affection, are paid for by the throb of anxiety, and the

fatal inhibition of the heart's action due to overwhelming emotion. Most of these cases, however, own a much more ignoble origin: a flatulent distention of the stomach, a crapulous dyspepsia, the abuse of alcohol and tobaceo, d&c., are frequent sources of nervous heart trouble, so frequent that in some parts where young men most do congregate the tobacco-heart

| especially is quite a proverbial ailment. Overwork, worry, or excess of any kind is sufficient to bring on heart trouble of this character, as we can readily understand when we reflect that the heart does about one-fifth of the whole mechanical work of the body—a work equivalent to raising its own weight over 13,000 feet an hour; that it takes its rest only in short snatches as it were, its action as a whole being continuous; and that it must necessarily be the earliest sufferer from any improvidence as regards nutrition,—mental emotion being in this respect quite as potential a cause of constitutional bankruptcy as the most violent muscular exertion. Fortunately, to a skilled physi- cian there is no difficulty of determining the true nature of these cases, and they are all more or less amenable to appro- priate treatment. Syncope, or fainting, is an affection somewhat similar to those just described; it essentially consists in an emotional inhibition of the cardiac systole, so that the blood pressure within the brain falls below that necessary for the maintenance of consciousness; as the heart's action fortunately does not in these cases entirely cease, the best plan is to favour the flow of blood to the head by maintaining the sufferer with a lowered and slightly depending head uutil the effects of the momentary inhibition have passed off. The inflammatory affections of the heart, Carditis, Hndocarditis, and Pericarditis are most important and serious affections, but their history and treatment are more suited for a work on practice of physic, in any of which full information regarding them may be found, They are mainly rheumatic and gouty in character, and they are to be regarded as varieties of these diseases ; the mere fact of their affecting the heart is of but hitle consequence as to their immediate result, however important it may by and by become from the valvular lesions to which they so often give rise. There are but few exceptions to this rule, and amongst them are those rare cases

in whicli acute endarteritis blocks the coronary vessels and gives rise to fatal angina. fatty Degeneration of the heart, which bulks so largely in the popular mind as a cause of sudden death, is an almost hypothetical lesion of most infrequent occurrence, probably never found apart from disease of the coronary arteries, impossible of diagnosis, and very rarely | of itself proving suddenly fatal. (G. W. B.)

Bi A

By Sir WILLIAM THOMSON.

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EAT is a property of matter which first became known to us by one of six very distinct senses,

§ 1, Sense of Heat.—The sense of touch, as commonly meant, has two distinct objects—force and heat. Ifa person stretches out his hand till it meets anything solid, or holds it out while something solid is placed upon it, he experi- ences a sensation of forte. He perceives resistance to the previous motion of his hand in one case, in the other case the necessity of resisting to prevent his hand from being forced downwards; the immediate object of this perception in each case is force! But there is another very distinct sensation, that of heat or cold, which he may or may not

1 The sense of smoothness and roughness to which physiologists have sometimes given the special name " tactile sense' is as clearly a sense of force as is what they call the muscular sense. The sense of rough- ness is a sense of force at places of application distributed over the skin of the finger, while in the muscular sense of force the place of application on a larger scale is distinguished by the position of the hand perceiving the force. The internal mechanism of tissue and nerves in one case and that of muscles in the other, through which the perception of places of application of force is obtained, are no doubt different, but the thing perccived is essentially the same—force—the complete discrimination of which involves magnitude of the force, its place of application, and its direction.

Entered according to Act of Parliament of Canada, in the year 1880, by W1LL1am Tomson, Knt., Glasgow, Scotland, in the office of the Minister of Agriculture.

perceive in either of those cases, and which he may also perceive, still by what is commonly called the sense of touch, in other cases even when no sense of force is also experienced. Thus, in the first case, if the solid be a fixed can of warm water, or of iced water, the person perceives a sense of heat or of cold; and, supposing him to have per- formed the operation with his eyes shut, his mind is informed by the double sense of touch that his hand has met with a hot fixed body ora cold fixed body: in the other case he may perceive that a hot heavy solid, or a cold heavy solid, has been laid upon his hand. But if he dips his hand gently into a can of water, or if he holds it towards a fire, or if he exposes it to a gentle current of air, or waves it about through the air, he perceives heat or cold without any accompanying sense of force.

The earliest scientific thoughts respecting these sensations of heat and cold must have led to the true conclusion that: there is some property of external matter on which the sensations depend, and a little advance into the natural philosophy of the subject has suggested and proved that this property is also possessed by the living body, and that | the sensation of heat or cold in the hand, in the instances

referred to above, depends on the change produced in the hand in respect to this property by a change of circum- stances which preceded the sensation. We now call heat the property of matter concerned in these sensations, and temperature a certain variable quality of matter varying according to its temporary condition in respect to heat.

In the strictest modern scientific language (compare § 3 below) the word heat is used to denote something com- municable from one body or piece of matter to another, and temperature a definite variable quality of matter, vary- ing generally in any particular piece of matter when heat is communicated to it or taken from it, varying also as we shall see (§§ 8 and 9 below; also THERMODYNAMICS) in consequence of operations which

can take place within the body itself, or which may be performed upon it from without, but which cannot be described as communication of heat to it or drawing off of heat from it.

§ 2. Latent Heat.—There are exceptional cases in which temperature does not vary in a mass of matter when heat is communicated to it from, or taken from it to, external matter. For instance, when the body is ice at the melting point, heat communicated to it does not raise its tempera- ture; or if the body be water at the freezing point with ever so small a piece of ice in it (see MarrzrR, Pro- PERTIES OF), heat taken from it does not cause its temperature to fall; or if the whole mass considered be ice and water well mixed, heat may be either communi- cated to it or taken from it without altering its tempera- ture; or if the body be water at the boiling point in the open air, heat very slowly communicated to it in however great quantities does not raise its temperature sensibly, but causes it to disappear by evaporation from its surface ; or if the body be steam in a cylinder with a little water in the bottom and with a frictionless piston above it for roof (fig. 1), under atmospheric pressure, heat taken from it very slowly does not cool it until the whole steam has become condensed into water, and heat communi- cated to it very slowly does not warm it until the whole water has become evaporated into steam; or if the body be ice (or frozen water), in place of the liquid water of the last case, and if the pressure on the upper side of the piston, instead of atmospheric pressure of about 1033 grammes per square centimetre (14‘7 Ib per square inch), be any- 7- thing less than ,),th of a gramme per square centimetre, the same statement will still apply with “ice” substituted for water. Black’s celebrated doctrine of latent heat is merely the declaration of a class of phenomena of which the preceding illustrations sufficiently indicate the character. Modern mysticism has been much exercised in respect to the terms sensible heat and latent heat, whether in decrying them, or in continuing to use them, but with aggravating haziness, instead of the clear wrongness of the old doctrine. It has become of late years somewhat the fashion to decry the designation of latent heat, because it had been very often stated in language involving the assumption of the materiality of heat.1 Now that we know heat to be a mode of motion, and not.a

Fig. 1.

1A hundred years ago those deeper philosophers who in their judg- ment anticipated, or tended to anticipate, what we now know to be the true theory of the nature of heat, had indeed good grounds to be jeal- ous of even the phrase latent heat. Maxwell says—"It is worthy of remark that Cavendish, though one of the greatest chemical dis- coverers of his time, would not accept the phrase latent heat. He prefers to speak of the generation of heat when steam is condensed, a phrase inconsistent with the notion that heat is matter, and objects to Black's term as relating 'to an hypothesis depending on the suppo- sition that the heat of bodies is owing to their containing more or less

material substance, the old "impressive, clear, and wrong" statements regarding latent heat, evolution and absorption of heat by compression, specific heats of bodies and quantities of heat possessed by them, are summarily dis- carded. But they have not yet been generally enough followed by equally clear and concise statements of what we now know to be the truth. A combination of impres- sions surviving from the old erroneous notions regarding the nature of heat with imperfectly developed apprehension of the new theory has somewhat liberally perplexed the modern student of thermodynamics with questions unanswerable by theory or experiment, and propositions which escape the merit of being false by having no assignable meaning.

There is no occasion to give up either "sensible heat" or Sensible

"latent heat"; and there is a positive need to retain the ae ei d aten

term latent heat, because if it were given up a term woul

be needed to replace it, and it seems impossible to invent ~~

a better, Heat given to a substance and warming it is said to be sensible in the substance. Heat given to a sub- stance and not warming it is said to become latent. These designations express with perfect clearness the relation of certain material phenomena to our sensory perception of them. Thus when heat given to a quantity of water warms it, the heat becomes sensible to a hand held in thie water. When a basin of warm water and a basin of water and ice are placed side by side, a hand dipped first in one

and then in the other perceives the heat. If now the warm water be poured into the basin of ice and water, and stirred for a few seconds of time (unless there is enough of warm water to melt all the ice), the hand perceives no warmth ; on the contrary, it perceives that the temperature is the same as it was in the basin of ice and water at the begin- ning. Thus the heat which was sensible in the basin of warm water has ceased to be sensible in the water that was in that basin, and has not become sensible in the other. It is therefore well said to have become latent.

CALORIMETRY.

§ 3. Calorimetry by Latent Heat.—The doctrine of latent heat leads us very smoothly to a most important measure- ment inthermal science, the measurement of quantities ofthis wonderful property of matter which we call heat ; and this without our knowing anything of what the nature of heat is, —whether it be a subtle elastic fluid, or a state of motion, or possibly some modification of matter related to action of force. Without, in the first place, admitting into our minds any definite idea as to the nature of heat, we may agree to measure quantities of heat by quantities of ice melted into water without change of temperature. Thus if a kilo- gramme of ice is melted by a large quantity 'of water at a lukewarm temperature, or by a comparatively small quantity of very hot water, the same quantity of heat has certainly gone from the warm water to the ice in each case, supposing that the result in each case is the ice and warm water left all in a state of ice-cold water. The measurement of quantities of heat, whether thus by the melting of ice, or by any other means, received the name of " Calorimetry," when the essence of heat was supposed to be a fluid, and this fluid called caloric. The name calorimetry is still by general consent retained to designate measurement of quantities of heat, as distinguished from thermometry, or eer 9 ee ee of a substance called the matter of heat ; and, as I think Sir Isaac Newton's opinion that heat consists in the internal niotion of the par- ticles of bodies much the most probable, I chose to use the expression heat is generated' (Phil. Trans., 1783, quoted by Forbes). We shall not now be in danger of any error if we use latent heat as an expres- sion meaning neither more nor less than this :—

“ DEFINITION. —Latent heat is the quantity of heat which must be communicated toa body in a given state in order to convert it into another state without changing its temperature.”’—Maxwell’s Theory of Heat, pp. 72, 73. _ 4

Laplace and La- voisier’s ice- calori- meter.

Bunsen’s j2e- calori- meter.

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the measurement of temperature (§ 10-67). As long as the truth or falsity of the materialistic hypothesis seemed an open question, the word caloric was held to imply the materiality of heat. Thus Davy, after discussing some of the fundamental dogmas of the “ Calorists,” as he called them, and describing his own experiments, which proved beyond all doubt the falsity of their fundamental hypothesis that heat is matter, varied the statement of his conclusion by saying, “or caloric does not exist.” While accepting Davy’s conclusion, however, we need not accept this way of stating it ; andas most of our best modern writers still use the word calorimetry, and as French writers have, in com- paratively recent times, introduced the word “calorie” to designate a unit quantity of heat, it is decidedly convenient still to retain the name caloric to denote definitely the measurable essence of heat. This is convenient scienti- fically as tending to give precision to language and ideas respecting the two classes of measurement, calorimetry and thermometry ; and it has the advantage of leaving the more popular word heat available for that somewhat lax general usage, from which we cannot altogether displace it, in which it may sometimes mean high temperature, as when we speak of great heat, or summer heat, or blood heat, sometimes a measurable quantity of heat, as in the term latent heat, and sometimes a branch of study or science dealing with the transference of heat by conduction and radiation, as in the title of Fourier’s great work Z’héorie analytique de la Chaleur, or the whole province of science concerned with heat, including calorimetry and thermometry, and conduc- tion and radiation of heat, and generation of heat, and dynamical relations of heat, as in English titles of separate books such as Dixon’s, Balfour Stewart’s, and Maxwell’s, or of chapters or divisions of larger treatises, such as even the present article,

§ 4. Calorimetry by Melting of Ice.—Calorimetry was first practised by means of the melting of ice as explained above, and the first thermal unit, or unit quantity of heat, or " calorie," although not then called calorie, was the quantity of heat required to melt unit weight of ice. This, for example, is the unit on which Fourier founds his reckoning illustratively when he explains the fundamental principles of his theory of the conduction of heat. Ice seems to have been first used for calorimetry by Wilcke, a Swede. For the systematic application of this method for the measure- ment of quantities of heat in various physical inquiries Laplace and Lavoisier constructed an instrument, the first to which the name of calorimeter was applied, and described it in the memoirs of the French Academy of Sciences for 1780.1. Though in the hands of Laplace and Lavoisier it gave good results, it had a great inconvenience, which with less careful and less scientific experimenters miglit lead to great inaccuracies, on account of the water adbering by capillary attraction to the broken ice, instead of draining away from it completely and showing exactly how much ice had been melted. To avoid this evil Sir John Herschel suggested that, instead of draining away the water from the ice, the water and ice should all be kept together, and the whole bulk measured. The diminution of bulk of the whole thus gives an accurate measurement of the quantity of ice melted, because ice melting into water comes to occupy just 91°675 per cent. of its original volume. This suggestion is admirably carried out by Bunsen? in his ice-calorimeter, an instrument possessing also other novel features of remarkable beauty and scientific interest. It is particularly valuable for the measurement

; The instrument itself is preserved in the Conservatoire des Arts et Métiers in Paris. It is described and explained in Maxwell's Theory of Heat, chap. iii.

- *Pogg. Ann., Sept. 1870, and Phil. May.,*

871; Maxwell's Theory of Heat, p. 61.

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| of small quantities of heat. Its inventor, for example, by means of it succeeded in naking satisfactory determinations of the specific heats of

some of those rarer metals, such as indium, of which only a few grammes have been obtained.

§ 5. Calorimetry by the Evaporation of Water.—By another application of Black's doctrine of latent heat, the evaporation of water may be used for calorimetry with great advantage in many scientific investigations. It is used generally in engineering practice, particularly for testing the heating power of different qualities of coal and the economy of various forms of furnaces. The thermal unit, which presents itself naturally in this system, is the quantity of heat required to evaporate unit weight of water when the pressure of the atmosphere as measured by the baro- meter is of some conventional standard amount, such as that called one atmosphere, or one atmo, being that for which the barometer, with its mercury column at zero centigrade (or the temperature at which ice melts), stands at 76 centimetres in the latitude of Paris, 48° 50',° or at

76 x (1+ 00531 sin 248°50') 1+ °00531 sin 72 in any latitude 7. This thermal unit (see THERMoDyY- NAMICs) is, according to Regnault's observations, equal to 6-8 times the ice-calorimetric unit.

§ 6. Thermometric Calorimetry.—The most prevalent mode of calorimetry in scientific investigation has been hitherto, however, ueither that by the melting of ice, nor that by evaporation of water, nor indeed anything founded on the doctrine of latent heat at all. It has been founded on the elevation of temperature produced in water by the com- niunication to it of the heat to be measured ; and, for the sake of distinction from calorimetry by latent heat or otherwise, it may be called thermometric calorimetry. We can only consider it now in anticipation, as we have not yet reached the foundation of any thermometric scale; but even now we can see that, if in any way we fix upon any two particular determinate temperatures, the quantity of water warmed from the lower to the higher of them by the heat to be measured is a perfectly definite measure for the quantity of this heat. The two temperatures chosen for thermometric calorimetry are those marked 0° and 1° on the centigrade scale. The first of these we can under- stand at present, being the temperature at which ice melts under ordinary atmospheric pressure. The second is fully defined in §§ 35, 37, 51, 67. The quantity of heat required to raise unit mass of water (1 kilogramme, or 1

gramme, or 1 milligramme, or 1 Ib, as the case may be) from zero to 1° C. is called the thermal unit centigrade, and some- times, especially by Frencli writers, the " calorie."

§ 7. Comparison of Calorimetric Units.—Observations by Provostaye and Desains, and by Regnault, on the latent heat of fusion of ice, show it to be 79°25 thermal units centigrade, a result differing but little from Black's original determination, which made it 142 thermal units Fahr.,— this being equal to 78°9 thermal units centigrade. Thus if one kilogramme of ice be put into 79} kilogrammes of water at 1°C., and left till the whole is melted (the pro- cess may be accelerated by not too violent stirring, § 9), the result will be 80} kilogrammes of water at 0° C.

Regnault's experiments on the latent heat of steam show that the quantity of heat required to convert into steam unit

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3 This is chosen because all the most accurate experimental deter- minations depending on a conventional standard for atmospheric pres- sure, such as measurements of thermal expansions and specific heats of gases, of latent heat of melting solids in terms of a calorimetric unit depending on the centigrade thermometric scale, of latent heats of vapours, and thermal expansions of mercury and glass, and comparisons of mercury and air thermometers, are those of Regnault, and were made in Paris and calculated and given to the world according to au arbi- trary standard atmosphere corresponding to 76 centimetres of mercury there.

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mass of water at the boiling temperature, under standard atmospheric pressure (§ 5), is 5364 thermal units centigrade. This number, which is no doubt very accurate, differs but little from Watt's final result, 960 thermal units Falr. (equal to 533°3 thermal units centigrade), obtained by him, in a repetition in 1781 of experiments which he had com- menced in 1765 at the invitation of Black, whose pupil he was.

§ 8. Preliminary regarding the Nature of Heat.—Dyna- mical Calorimetry. —From the dawn of science till the close of last century two rival hypotheses had been entertained regarding the nature of heat, each with more or less of plausibility, but neither on any sure experimental basis :— one that heat consisted of a subtle elastic fluid permeating through the pores or interstices among the particles of matter, like water in a sponge; the other that it was an intestine commotion among the particles or molecules of matter. In the year 1799 Davy, in his first published work entitled An Hssay on Heat, Light, and Combinations of Light, conclusively overthrew the former of these hypotheses, and gave good reason for accepting as true the latter, by his celebrated experiment of converting ice into water by rubbing two pieces of ice together, without com- municating any heat from surrounding matter. A few years earlier Rumford had been led to the same conclusion, and had given very convincing evidence of it in his observ- ation of the great amount of heat produced in the process of boring cannon in the military arsenal at Munich, and the experimental investigation on the excitation of heat by friction? with which he followed up that observation. He had not, however, given a perfect logical demonstration of his conclusion, nor even quite a complete experimental basis on which it could be established with absolute certainty. According to the materialistic doctrine it would have been held that the heat excited by the friction was not gene- rated,? but was produced, squeezed out, or let flow out like honey from a broken honeycomb, from those parts of the solid' which were cut or broken into small fragments, or rubbed to powder in the frictional process. Ifthis were true, the very small fragments or powder would contain much less heat in them than an equal mass of continuous solid of the same substance as theirs. But unhappily the caloristic doctrine, besides its fundamental hypothesis, which we now know to be wrong, had given an absurd and illogical test for quantity of heat in a body, of which a not altogether innoeuous influence still survives in our modern name "specific heat "; and Rumford actually, in trying to disprove the materialistic doctrine, was baffled by this sophism. That is to say, he measured the specific heat or "' capacity for heat" of the powder, and he found that the powder took as much heat to warm it to a certain degree as did an equal mass of the continuous solid, and from this he con- cluded that the powder did not contain less heat than the continuous solid at the same temperature. This conclusion is so obviously unwarranted by the premises

that it is diffi- cult to imagine how Rumford could have for a moment put forward the " capacity for heat" experiment as proving it, or could have rested in the conclusion without a real proof, or at least the suggestion of a real proof. All that Rumford's argument proved was that the fundamental hypothesis of the "calorists" and their other altogether gratuitous doctrine of equality of "specific heat" as a test for equality of whole quantities of heat in matter could not be both true; and any one not inclined to give up the

1 Published in 1799 in Contributions to Physical and Medical Knowledge, principally from the West of England, collected by Thomas Beddves, M.D., and republished in Dr Davy's edition of his brother's collected works, vol. ii., London, 1836.

2 " An Enquiry concerning the Source of Heat which is excited by

Friction" (Phil. Trans., abridged, vol. xviii. p. 286). 3 Compare quotation from Cavendish, footnote, § 2 above.

materialistic hypothesis might have cheerfully abandoned the minor doctrine, and remained unmoved by Rumford's argument. If Rumford had but melted a quantity of the powder (or dissolved it in an acid), and compared the heat which it took with that taken by an equal weight of the continuous solid, he would have had no difficulty in proving that the enormous quantity of heat which he bad found to be excited by the friction had not been squeezed, or rubbed, or pounded, out of the solid matter, but was really brought into existence, and therefore could not be a material sub- stance. He might even, without experiment, have pointed out that, if the materialistic doctrine were true, it would follow that sufficiently long-continued pounding of any solid substance by pestle and mortar, whether by hand or by aid of machinery, would convert it into a marvellous powder possessing one or other of two properties about equally marvellous. Either the smallest quantity of it thrown into anacid would constitute a freezing mixture of unlimited intensity,—the longer it had been pounded, the more intense would be its frigorific effect on being dissolved, —or the powder would be incapable of being warmed by friction, because it had already

parted with all the heat which friction could rub out of it. The real effect of Rumford's argument seems to have been to salve the intellectual consciences of those who were not inclined to give up the materialistic doctrine, and to save them from the trouble of reading through Rumford's paper and thinking for themselves, by which they would have seen that his philosophy was better than his logic, and would inevitably have been forced to agree with him in his conclusion. It is remarkable that Davy's logic, too, was at fault, and on just the same point as Rumford's, but with even more trans- parently logical fallaciousness, because his argument is put in a more definitely logical form.

" Let heat be considered as matter, and let it be granted that the temperature of bodies cannot be increased unless their capacities are diminished from some cause, or heat added to them from some bodies in contact" !!

" Experiment IT.—I procured two parallelepipedons of ice,* of the temperature of 29°, 6 inches long, 2 wide, and % of an inch thick ; they were fastened by wires to two bars of iron. By a peculiar mechanism their surfaces were placed in contact and kept in a continued and violent friction for some minutes. They were almost entircly converted into water, which water was collected and its temperature ascertained to be 35° after remaining in an atmo- sphere of a lower temperature for some minutes. The fusion took place only at the plane of contact of the two pieces of ice, and no bodies were in friction but ice. From this experiment it is evident that ice by friction is converted into water, and, according to the supposition, its capacity is diminished; but it is a well-known fact that the capacity of water for heat is much greater than that of ice, and ice must have an absolute*

quantity of heat added to it before it can be converted into water. Friction consequently does not diminish the capacities of bodies for heat."—Davy's Essay on Heat, Light, and Combinations of Light, pp. 10-12.

[Delete from "'and, according to the supposition," to " greater than that of ice" inclusive ; and delete the lame and impotent conclusion stated in the last eleven words. The residue constitutes an unanswerable demonstration of Davy's negative proposition that heat is not matter. |

$9. Joule's Dynamical Equivalent of He eat.—It is remark- able''that, while Davy's experiment alone sufficed to over- throw tle hypothesis that heat is matter, and Rumford's, with the addition of just a little consideration of its relations to possibilities or probabilities of inevitable alternatives, did the same, fifty years passed before the scientific world be- came converted to their conclusion,—a remarkable instance of the tremendous efficiency of bad logic in confounding public opinion and obstructing true philosophic thought.

4 ¢¢The result of the experiment is the same if wax, tallow, resin, or any substance fusible at a low temperature be used; even iron may be fused by collision, as is evident by the first experiment."

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Joule's great experiments from 1840 to 1849,1 creating new provinces of science in the thermodynamics of electricity, and magnetism, and electro-chemistry, recalled attention to Davy and Rumford's doctrine regarding the nature of heat, and supplied several fresh proofs, each like Davy's absolutely in itself complete and cogent, that heat is not a material sub-stance, and each advancing with exact dynamical measure- ment on the way pointed out by Rumford in his measure- ment of the quantity of heat generated in a certain time by the action of two horses not urged to overwork them- selves, The full conversion of the scientific world to the kinetic theory of heat took place about the middle of this century, and was no doubt an immediate consequence of Joule's work, although Rumford and Davy's demonstrative experiments, and the ingenious and penetrating speculations of Mohr, and Séguin, and Mayer, and the experimental thermodynamic measurements of Colding, all no doubt contributed to the

result. Each of the several subjects of thermodynamic measurement undertaken by Joule gave him a means of estimating the quantity of work required to generate a certain quantity of heat; but after several years of trials he was led to prefer to all others the direct method of simply stirring a quantity of water by a paddle, and measuring the quantity of heat produced by a measured quantity of work ; and this method he has accordingly used in all his experiments for the purpose of determining the " dynamical equivalent of heat" from the year 1845 to the present time. By this he found his final result of 1849, which was 772 Manchester foot-pounds for the quantity of work required to warm by 1° Fahr., at any temperature between 55° and 61° Fabr., 1 tb of water weighed in vacuum. In 1870 he commenced work for a fresh deter- mination of the dynamical equivalent of heat at the request of the British Association, and the result was communicated to the Royal Society? about the end of 1877, with the following preface :— .

" The committee of the British Association on standards of electri- cal resistance having judged it desirable that a fresh determination

of the mechanical cquivalent of heat should be made by observing the thermal effects due to the transmission of electrical currents

1 List of titles of, and references to, papers by Dr James Prescott Joule, F.R.S. :—

"Description of an Electromagnetic Engine," Sturgeon Ann. Electr., fi, 1838, pp. 122-123, "Description of an Electromagnetic Engine," Sturgeon Ann. Electr., 1539, pp. 437-439. 'On the use pf Electromagnets made of lron Wire for the Electromagnetic Engine," Sturgeon Ann. Electi'., iv., 1839-40, pp. 58-62, "Investigations in Magnetism and Electromagnetism," Sturgeon Ann. Electr., iv., 1839-40, pp. 131-137. " Description of an Electromagnetic Engine," Sturgeon Ann. Electr., iv., 1839-40, pp. 203-205, 'On Electromagnetic Forces," Sturgeon Ann. Electr., iv., 1839-40, pp. 474-481; v., 1840, pp. 187-198, 470-472. "On the Production of Heat by Voltaic Electricity," Roy. Soc. Proc., iv.. 1840, pp. 280-282. "On the Heat evolved by Metallic Condnetors of Electricity, and in the Cells of a Battery during Electrolysis," Phil. Mag., xix., 1841, pp. 260-277; Archives de U Electr, ii., 1842, pp. 54-79; Sturgeon Ann. Electr, viii., 1842, pp. 287-301. 'On the Electric Origin of,the lleat of Combustion," Brit, Assoc, Report, 1842 (pt.

2), p. 31; Archives de Y Blectr, ii., 1842, pp. 80-102; Phil. Mag., xx., 1842, pp. 98-113; Sturgeon Ann. Electr., viii., 1842, pp. 302-315. "On the Electrical Origin of Chemical lfeat," Phil. Mag., xxii, 1843, pp. 204-208; Annal. de Chimie, xvi., 1846, pp. 474-480; Wapoli Rendiconto, iii., 1844, pp. 226-233, 'On the Calorific Effects of Magneto-electricity, and on the Mechanical Value of Heat," Phil. Mag., xxiii, 1843, pp. 263-276, 347-355, 435-443; Annal. de Chimie, xxxiy., 1852, pp. 504-508; Brit. Assoc. Report, 1843 (pt. 2), p. 33. " On the Intermittent Char- acter of the Voltaic Current in certain cases of Electrolysis, and on the Intensities of various Voltaic Arrangements," Phil. Mag., xxiv., 1844, pp. 106-115; Archives de tElectr., iv., 1844, pp. 269-275; "On Specific Heat," Phil. Mag., xxv., 1844, pp. 334-337. "On the Changes of Temperature prodnced by the Rarefaction and Condensation of Air," Roy. Soc. Proc., v., 1844, pp. 517-518; Annal. de Chimie, xxxy., 1852, pp. 118-120; Phil. Mag., xxvi., 1845, pp. 369-383. "On the Mechanical Equivalent of Heat," Brit. Assoc. Report, 1845 (pt. 2), p. 31. " On the Existence of an Equivalent Relation between Heat and the ordinary forms of Mechanical Power," Phit. Mag., xxvii., 1845, pp. 205-207. " On the Heat evolved during the Electrolysis of Water (1843), Afanchester Phil. Soc. Mem., vii., 1846, pp. 87-113. 'Onanew Theory of Heat," Manchester Phil. Soc. Mem., vii., 1846, pp. 111-112, "Ona new Method of ascertaining the Specific Heat of Bodies (1845)," Manchester Phil. Soc. Mem., vii., 1846, pp. 559-573. " Expériences sur Videntité entre le calorique ct la force méeanique," Paris Comptes Rendus, xxv., 1847, pp. 809-324, 'On the Theoretical Velocity of Sound,' Phil. Mag.. xxxi., 1847, pp. 114-115. "On the Mechanical Equivalent of Heat as determined by the Friction of Fluids," Phit. Mag., xxxi., 1847, pp. 173-176; Brit. Assoc. Report, 1847 (pt. 2), p. 55; Poggen. Annat., \xxiii., 1848, pp. 479-484. 'On the Mechanical Equivalent of Heat, and on the Constitution of Elastic Fluids," Brit. Assoc. Report, 1848 (pt. 2), pp. 21-22, " On Shooting Stars," Phil. Mag., xxxii., 1848, pp. 849-351. "Sur léquiv- ey mécanique du calorique," Paris Comptes Rendus, xxviii., 1849, pp. 182-135.

Jowle 'On the Mechanical Equivalent of Heat,' Philosophical Transactions of 1850.

3 "¢ New Determination of the Mechanical Equivalent of Heat," by James Prescott Joule, Phil. Trans. for 1878, pp. 865-888.

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through resistances measured by the unit they had issued, I under- took experiments with that view, resulting in a larger figure (782°5, Brit. Assoc. Report, Dundee, 1867, p. 522) than that which I had obtained by the friction of fluids (772°6, Phil. Trans., 1850, p. 82).

"The only way to account for this discrepancy was to admit the existence of error either in my thermal experiments or in the unit of resistance. A committee, consisting of Sir William Thomson, Professor P. G. Tait, Professor Clerk Maxwell, Professor B. Stewart, and myself, were appointed at the meeting of the British Association in 1870; and with the funds thus placed at my disposal I was charged with the present investigation, for the pur- pose of giving greater accuracy to the results of the direct method."

The result of this final investigation of Joule's is 772°43 Manchester foot-pounds for the quantity of heat required to warm from 60° to 61° Fahr. a pound of water weighed in vacuum, which is about ,4,th per cent. greater than the final result of 1849 expressed in the same terms. According to Regnault's measurements of the thermal capacity of water at different temperatures from 0° to 230° C., it must be about '08 per cent. greater at 60° Fahr. than at 32°. According to this, Joule's thermodynamic result would be 771°81 Manchester foot-pounds, for the work required to warm a pound of water from 32° to 33° Fahr., or 1389°26 to warm a pound of water from 0° to 1° C. Reducing 1389-26 feet to metres, we have 423°437 metres. At Paris the force of gravity is about 745 per cent. less than in Manchester. Hence for about the middle of France and the southern latitudes of Germany, Joule's result, according to the ordinary reckoning of French and German engineers, may be stated as 423-5 kilogramme-metres for the amount of work required to warm 1 kilogramme of water from 0° tol° C. The force of gravity at Manchester is 981°34 dynes (centimetres per second per second). Multiplying 493'437 by this, we find accordingly 41,553,000 centi- metre-dynes, or "ergs," for the amount of work in C.G.S. measure required to warm 1 gramme of water from 0° to 1°C.

THERMOMETRY.

$10. Preliminary for Thermometry,—Sense of Heat (resumed from § 1).—The sense of heat and cold is not simply dependent on the temperature of the body touched. If a person takes a piece of iron, or a stone, or a piece of wood, or a ball of worsted, or a quantity of finely carded cotton-wool, or of eider down, in his hand, or touches an iron column, or a stone wall, or a wooden beam, or a mass of wool or of down, he will perceive the iron cold, the stone cold, but less cold than the iron, the wood but slightly cold—much less cold than the stone, the wool or down decidedly warm.

We now know that if all the bodies before being touched were near one another in similar exposure, they must have been at the same temperature, and from the iron and stone being felt cold we know that this mean temperature is lower than the temperature of the hand. Each of the bodies touched must at the first instant have taken some heat from the hand, and therefore, if the perception were quick enough, all at the very instant of being touched would have seemed cold to the sense. The iron by its high thermal conductivity (§§ 76, 78, 80) keeps drawing off heat from the hand and lowering its temperature, till after many seconds of time an approximately per- manent temperature is reached, which may be consider- ably lower than the temperature of the hand before. contact, but somewhat higher than the previous tem-‘ perature of the iron, because of the internal furnace (see THERMODYNAMICS) generating heat in the hand. A similar result, but in less time and with less ultimate lowering of temperature of the hand, takes place when stone is touched. When wood is touched its comparatively small conductivity (§ 76) allows its surface to be warmed again after the first few seconds, sometimes to a higher tem-

+ Relation des Expériences, vol. i. p. 748, Paris, 1847.

perature than that of the hand before contact ; and thus, if the sensation could be perfectly remembered, it would be perceived that the wood was first felt to be cold, and afterwards to be warm. This latter warmth is rendered very perceptible by first holding the hand in contact with a piece of wood, as for instance a mahogany table, for a considerable time, half a minute or more, and then suddenly removing it; a sense of cold is immediately perceived in consequence of the exposure of the hand to the air.

The foot is similarly sensitive. If, after holding a bare foot for some time in the air, it be placed on a varnished wooden floor, the floor is perceived to be cold, and if, after standing

of ice-cold water, and 13-4 parts by weight of boiling water ; An

the required temperature is 13:4 on a perfectly definite arbitrary scale of thermometry in which the temperature of ice-cold °™tt- water is called zero, that of boiling water 100, and other a temperatures are reckoned according to the law of propor- founded tion of mixtures of water in the manner indicated by the on as- example, and defined generally in § 31 below. For tem- S°™i™8 peratures within the range of sensibility of the hand this a, method would give more accurate results than many (g 68). common thermometers sold by instrument makers for of water

ordinary popular purposes. It may be relied upon for t > constant.

some time with it pressed to the floor, the foot be suddenly lifted, the air now seems cold by contrast. If a person walks with bare feet on a wooden floor, a continued sense of cold is experienced ; and if, immediately after doing so, he sits down, and holds his feet in the air, the air seems to be warm by contrast. The same sensations are perceived even on a carpeted floor, but much less markedly than on a plain wooden floor, and much less markedly on a plain wooden floor than on a varnished wooden floor, and much less markedly on a varnished wooden floor than on a stone floor. In the case of touching soft wool, or finely carded cotton-wool, or eider down, the first instantaneous sensation of cold is scarcely if at all perceived, and that which first provokes consciousness is the subsequent heating; and it is very startling to find a body which we know to be ice- cold on a frosty day feeling positively warm to the first consciously perceptible sensation after it is touched. In this case the small thermal conductivity or great thermal resistance of the substance is such that heat is carried off by it from the hand slower than it was carried off by radiation and aerial convection (§§ 70, 71) before contact ; and thus, after the first momentary cooling of the hand by the initial cataract of heat from it to the cold body touched, in a small fraction of a second of time a higher temperature is attained by the hand than it had before contact.

§ 11, Sense of Temperature.—The sense of heat is in reality a somewhat delicate thermal test when properly used. Even an unskilled hand alternately dipped into two basins of water will, as we have found by experiment, detect a differ- ence of temperature of less than a quarter of a degree centigrade ; and there can be no doubt that bath and hospital attendants, and persons occupied with hot liquors in various manufactures, such as dyeing, can detect much smaller dif- ferences of temperature than that, and, what is still more re- markable, can remember permanently sensations of absolute temperature sufficiently to tell within less than a degree centigrade that the temperature of a bath, or a poultice, or dyeing liquor is "'blood heat," or 'fever heat," or some other definite temperature to which they have been accustomed.

§ 12. Thermometry by Sense of Heat—with arbitrary Centigrade Scale deduced from Mixtures of Hot and Cold Water.—Without knowing anything of the nature of heat we might found a complete system of thermometry on the mixing of hot and cold water with no other thermoscope (§ 13) than our sense of heat, if we had but two definite constant temperatures of reference. These in practical thermometry are supplied by the melting-point of ice and the temperature of steam from water boiling in air at a definite pressure (the "atmo" or standard atmosphere, § 5). Thus, suppose perfectly abundant supplies of iced water and of water at the boiling temperature to be available, and suppose it to be desired to measure the temperature of a river, or lake, or sea. Take measured quantities of the boiling and of the ice-cold water, and mix them by trial until, tested by

absolute accuracy within =°ths of a degree centigrade, pro- vided the mixing of hot and cold water is performed with sufficiently large quantities of water, and with all proper precautions to obtain in that part of the process all the accuracy obtainable by the living thermoscope.

We shall see (§ 25) that with the most accurate mercury or air thermometers, made for scientific investigation and carefully tested, absolute determinations can scarcely be depended upon within {5th of a degree centigrade. The method of mixturcs with only the sensory thermoscope is not limited to the range of temperature directly perceptible

with unimpaired sensibility ; but when the temperature to be tested is beyond this range an indirect method must be followed, as thus :—

A large quantity of water too warm for the hand is ta be tested. Mix it with say twice its weight of ice-cold water, this giving a convenient temperature for the hand ; then find by trial what proportions of ice-cold and boiling water give a mixture of the samme temperature as tested by the hand ; suppose these proportions to be 26:2 of boiling water and 73°8 of ice-cold water. The temperature of the mixture is by definition 26°2, and on the same principle the required temperature is three times this, or 78°6.

This system of thermometry is, however, strictly limited to the range between the freezing and boiling points of water, for we do not at present considcr the possibilities (see Liquip; Stram; Matter, Propertius or; THERMODY- NAMICS) of obtaining and using thermometrically quantities of water below the freezing point and above the boiling point. It is described here, not only because it is very instructive in respect to the principles of thermometry, but because it isin point of fact the thermometric method used through a large range of processes not only in the arts but in scientific investigation. In many cases the hand is a more convenient and easy test than a common mercury thermo- meter, and it has just about the same sensibility, the commonest thermometers in popular use being in fact scarcely to be read to a quarter of a degree centigrade. In respect to accuracy a common cheap thermometer, though perhaps a degree or two wrong in its absolute indications, may still be used asan accurate indicator of equality of tem- peratures just as is the hand in the method of mixtures.

In many cases the hand is more convenient than the thermometer, in other cases the thermometer is more con- venient tlian the hand, but in many cases the thermometer is applicable when the hand is not. When the quantities of water tested are abundant, the hand is always the quicker test, but there must be abundance of water to allow it to be satisfactorily and accurately applicable.

THERMOSCOPES DIFFERENTIAL AND INTRINSIC,

Differential Thermoscopes essentially continuous.—Intrinsic Thermoscopes discontinuous and continwous.—Single and Multiple Intrinsic

Thermoscopes (discontinuous).— Continuous Intrinsic Thermoscopes.

§ 13. A thermoscope is an indicator of temperature. Differ- A differential thermoscope is a thermoscope which shows es difference, or tests equality, of simultaneous temperatures a in two places. Its action is essentially continuous, de-

the hand, the mixture is found to have the same temperature as that of the mass of water of which the temperature is to be determined. Suppose, for example, the mixture giving the required temperature to consist of 86-6 parts by weight

Con- tinuous thermo- scopes.

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pending on difference of temperature between the two places, and showing zero continuously when the tempera- tures of the two places are varied, provided they are kept exactly equal. Every kind of differential thermoscope, and of continuous intrinsic thermoscope, must be founded on some property of matter, continuously varying with the temperature, as density of a fluid under constant pressure, pressure of a fluid in constant volume, volume of the liquid part of a whole mass of liquid and solid kept im constant volume,! steam-pressure of a solid or liquid,' shape or density of an elastic solid under constant stress, stress of an elastic solid in a constant state of strain, viscosity of a fluid, electric current in a circuit of two metals with their junctions at unequal temperatures, electric resistance of a conductor, magnetic moment of a steel or loadstone magnet.

Examples :—(1) Leslie's differential air thermometer ; (2) steam- pressure differential thermometers (§§ 39-44 below) ; (3) Joule's hydraulic and pneumatic differential thermoscopes (Memoirs Chem. Soc., vol. iii, p. 201; Proc. Lit. and Phil. Soc. Manchester, vol. iii. p. 78; Ibid., vol. vii. p. 35); (4) viscosity differential thermoscope (Proceedings R.S.H., April 5, 1880) ; (5) thermo-electric differential

thermometer ; (6) Siemens electric resistance differential thermo-

meter ; (7) thermo-magnetic differential thermometer (see Procced- ings R.S.H. for April 5, 1880).

§ 14. Intrinsic Thermoscopes.—An intrinsic thermoscope is an instrument capable of indicating one definite tempera- ture or several definite temperatures, or all temperatures within the range of the instrument, whatever it may be—the temperature or temperatures indicated being intrinsically determined by the constitution of the instrument and indi- cated by some recognizable feature of the instrument which changes discontinuously or continuously, as the case may ibe, and which is always the samewhen the instrument is brought back again and again to the same temperature, whatever changes it may have experienced in the intervals. Discon- tinuous intrinsic thermoscopes show only a limited number of temperatures. A continuous intrinsic thermoscope shows any temperature whatever throughout the range of efficiency of the instrument, ideally any temperature whatever, though in practice every thermoscope is limited, some with both inferior and superior limit, as the mercury thermometer by the freezing of mercury at about – 39° C., and the bursting pressure of mercury-steam a little above + 360° C.; others with only a superior limit, as metallic thermoscopes, whether thermo-elastic, or thermo-electric, or electric-resistance, or thermo-magnetic, by the melting of their substances at very high temperatures, or, in the case of the thermo-magnetic instrument, by the total or partial loss of its magnetism at some temperature much below the melting point of its sub- stance. A continuous intrinsic thermoscope, when applied to a body whose temperature is changing, shows continuously every variation of temperature within its range of efficiency.

§ 15. Discontinuous Intrinsic Thermoscopes.—A single intrinsic thermoscope is a thermoscope which shows whether the temperature of the body to which it is applied is higher or lower than some one definite temperature depending on intrinsic quality of the instrument.

Examples :—(1) a piece of ice, or of wax, or of fusible metal ; (2) an apparatus for boiling water or other liquid under a perfectly constant pressure ; (3) an apparatus for boiling water under the

natural atmospheric pressure, and a barometer to measure exactly what the pressure is at the time.

A multiple intrinsic thermoscope might be made by pre- paring a graduated series of metallic alloys, numbering them in order of their melting points, and arranging them together conveniently for use. The temperature might be reckoned numerically, according to the number of the alloys that melt, when the whole series is exposed to the tempera- ture to be tested. This discontinuous numerical reckoning of temperature is perfectly analogous to the Birmingham

: This is the principle of the ordinary mercury or spirit thermometer. For definition of steam see § 17 below.

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reckoning of wires and sheet metals by numbered gauges. Ideally it may be made infinitely nearly continuous by making a series of alloys with fine enough gradation of com- position, but the method is in its essence discontinuous. It is useful for many special applications in science and in the arts, as for instance in that very fundamental one (§ 12) of giving one of the fixed points in the ordinary thermometric scale, the "freezing point "; also in a form of safety valve for boilers or hot-water pipes, in which a plug fixed by solder is released by the melting of the solder when the temperatare reaches a certain limit; also an exceedingly useful guard against overheating in the flue of a stove, by which a stopper is allowed to fall by the melting of a leaden support, and stop the draught, before the tem- perature reaches the highest limit judged permissible. $16. Continuous Intrinsic Thermoscopes.—Continuity of indication requires, as said above (§ 13), choice of some pro- perty or properties of matter varying continuously with tem- perature, such as those enumerated in §13. A continuous intrinsic thermoscope must have a feature, depending on the chosen property of matter, which shall vary with perfect continuity when the temperature is gradually changed, and shall always be the same when the instrument is brought to the same temperature again and again, whatever varia- tion of temperature it may have experienced in the intervals. The accuracy of an intrinsic thermometer, whether discon- tinuous or continuous, depends upon permanence of quality of the material and of the

mechanical constitution of the instrument, according to which the recognized feature shall always be veryaccurately the same for the same temperature. The sensibility or delicacy of a continuous intrinsic thermo- meter depends upon the recognizability of change in its indicating feature with very small change of temperature. § 17. The property of matter chosen as the foundation of almost all ordinary continuous intrinsic thermoscopes in common use is interdependence of the density, the tempera- ture, and the pressure of a fluid. The only other thermo- scopes which can be said to be in common use at all are 'metallic thermometers " (see THERMOMETER; MATTER, Properties oF); these depend upon the change of shape of a rigid elastic solid under a stated stress, or on the change of shape of a compound solid, composed of two elastic solids of different substances melted or soldered together. For the present we confine our attention to the former and much larger class of instruments. The general type of all those instruments, except the steam-pressure thermometer (§§ 39-46 below), is a glass measure, measur- ing the bulk of a fluid. To give the requisite practical sensibility to the measurement, the glass, except for the case, of the constant-pressure gas thermometer (S$ 64-67 below) and of the steam-pressure thermometer is made of a shape which may be generally described as a bottle with a long narrow neck. The body of the bottle, which may either be spherical or of an elongated form, is called the bulb, and the neck is called the tube or stem (stem we shall most frequently call it, to obviate ambiguities without circumlocutions). The thermometric fluid may be all liquid, as mercury, or oil, or alcohol, or ether, or glycerine and water; or it may be all gas, as common air, or hydrogen, or carbonic acid; or it may be partly

of a fluid substance at one temperature and pressure throughout, and in equilibrium, with two parts of different densities). This last case is different from the two pre- ceding, in respect to the character of the thermometric indication: the whole volume of the thermometric sub- stance may be changed from that of all liquid to that of all steam without changing the temperature or the pressure, | and the pressure cannot be changed without changing the

liquid and partly steam (steam being a name which we Steam,

shall invariably use to designate the less dense portion ee tion of,

Mano- metric thermo- metry.

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temperature, provided the substance is kept in the double condition of part liquid and part steam ; in other words, in this case the pressure depends upon the temperature alone and is independent of the volume. In the steam-pressure thermometer, therefore, there is no delicate measuring of volume of the thermometric substance, and the vessel containing it is not in the shape of bulb and stem; but the instrument consists essentially of a means of measuring the pressure of the thermometric substance, with a test that it is really in the twofold condition of part liquid and part steam, whether by seeing it through a glass containing- vessel, or by a proper hydraulic appliance for ascertaining that the pressure is not altered by rarefaction or conden- sation when the temperature is kept —aATT constant. Realized thermometers of | this species, quite convenient for many practical purposes, with steam of sul- phurous acid, of water, and of mer- cury, to serve for different ranges of temperature, from below — 30° C. to above + 520° C., are described in §§ 39-44 below.

§ 18. In respect to general con- venience for large varieties of uses, whether for scientific investigation, or for tho arts, or for ordinary life, liquid thermometers are generally and with good reason preferred ; but the general preference of either mercury or spirits of wine for the liquid, which is so much the rule, is not (§ 20 below) so clearly reasonable. For ordinary uses in which the thermometer has to be moved about and placed in various positions, gas thermometers are much less convenient, because they require essentially an accurate measurement of pressure, and gene- rally for this purpose a column of liquid. But when the thermometer is to be kept always in one position, as for instance when it is devoted to testing the temperature of the air in- doors or out of doors, Amonton's air or gas thermometer is really as convenient and as easily read as any liquid thermometer can be: but even it, simple as it is, involves a triple division of the hermetically sealed space, with three different conditions of occupation, —one part occupied by the thermometric substance, another by the pressure-measuring vapourless liquid," and the third vacuous: and it is by so much

the less simple than the liquid thermometer that in the liquid thermometer the enclosed space is divided into only two parts, one occupied by the thermometric liquid, and the other by its steam, with

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1 An instrument closely resembling that shown in the drawing (fig. 2), but with common air instead of hydrogen, was made for the writer of this article, by Casella, about fifteen years ago, and has been used for illustrations in the natural philosophy class in Glasgow university ever since. Itis probably an exceedingly accurate air thermometer. When it was set up in the new lecture-room after the migration to its present locality in 1870, the tube above the manometric liquid column was cleared of air. To do this the instrument must be held in such a sloping position, with the closed end of the tube down, as to allow the bubble of air always found in it to rise and burst in the bulb. If now the instrument is placed in its upright position, the liquid refuses to leave the top of the tube, and it would remain filling the tube (probably, for ever ?) if left in that position. No violence of knocking which has becn ventured to try to bring it down has succeeded. To bring it down a bubble of air must be introduced. The bubble must be very small, so that the pressure of the air which fills it may become insensible when this air expands into the space of the tube left above the mano- metric column after it descends to its proper thermoscopic position. Special experiments made for this article in September 1879 showed

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or without some admixture of common air, For accuracy the air or gas thermometer is superior, we might almost say incomparably superior, to the mercury thermometer, and, though in a much less degree, still decidedly

superior to even the most accurate liquid thermometer, on account of the imperfect constancy of the glass containing-vessel.

§ 19. If we were quite sure of the bulk measurement given by the glass bulb and tube, liquid thermometers would be quite as accurate as gas thermometers. For there is no diffi- culty in giving any required degree of sensibility to the instrument by making the bulb large enough ; and the quality of the liquid itself, hermetically sealed in glass, may be regarded as being as constant as anything we know of in the material world. But, alas for thermometry, the glass measure is not constant! In fact, glass is a substance of very imperfect elasticity (ELasticrTy, § 4, vol. vii. p. 797); and itis found that the bulb of a thermometer is not always of the same volume at the same temperature, but that, on the contrary, it experiences uncertain changes exceedingly embarrassing in thermometry. In the course of a few months after a thermometer is filled and sealed, the bulb generally shrinks by some uncertain amount of from zyia0 to zodoo Of its bulk, sometimes even in the course of years to almost zg2g9- This has beon discovered by a gradual rising of the freezing point, in new mercury thermometers, generally as much as from }° to }° C,, sometimes to as much as 1°, which corresponds to a shrinkage of 859) 28 the bulk-expansion of mercury is when its temperature is raised from 0°to 100°C. (Table II. below) 3.z, or '01815, of its bulk at 0°. After a few months or a few years this progressive shrinkage ceases to be sensible ; butif the thermometer at any time is exposed to the temperature of boiling water or any higher tem- perature, an abrupt sub-permanent enlargement of the bulb is produced, and the freezing point, if tested for by placing the thermometer in ice and water, is found to be lowered ; then again for weeks or months or years there is a gradual shrinkage, as shown by a gradual rising of the freezing point when the thermometer is tested again and again by placing it in ice and water. A very delicate mercury thermometer, which has been kept for years at ordinary atmospheric pressures when out of use, and never when in experimental use exposed to any temperature higher than about 30° C., or much lower than the freezing point, becomes very constant, and probably may never show any change of as much as ,'; of a degree C. in its freez- ing point or in its indication at any other absolutely definite temperature, within some such range as from — 20° or — 10° C. to+30° or+ 40° C. But the abrupt and irregular changes, produced by exposing the thermometer to tempera- tures

much above or much below some such limited range as that, constitute a very serious difficulty in the way of accurate thermometry by the mercury-in-glass thermometer,

jie ee a that in the nine years during which the instrument had remained undis- turbed in the lectnre-room a very sensible quantity of air {enough to render the temperature indication about 35° C. too low) had leaked from the bulb through the sulphuric acid into the tube above the liquid column. This air was eliminated, and the instrument reset up for use, an operation completed in a minute at any time if need be. Some care- ful experiments were then made by Mr Macfarlane to ascertain if the pressure of vapour or gas from the sulphuric acid, in the tube, was sensible, with a happily decisive result in the negative. The bulb was kept at a very constant temperature by cold water; the uppermost few centimetres of the liqnid column, and the whole of the tube above it, were heated to about 100° C. bysteam blown through a glass jacket-tube, fitted round it for the purpose. The height of the manometric column remained sensibly unchanged! Further experiments must be made to ascertain whether or not there is enough of variation of absorption of the air by the sulphuric acid with variation of temperature, and enough of the consequent variation of pressure in the bulb, to vitiate sensibly the thermometric use of the instrument. If, as seems improbable, the answer to this question be unhappily, affirmative, a satisfactory negative might be found by substituting hydrogen for common air.

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Although the greatest care has been bestowed by Regnault, Joule, and all other accurate thermometric experimenters to avoid error from this cause, we have still but little definite information as to its natural history in thermo- meters of different qualities of glass, different shapes of bulb, and constructed differently in respect to processes of glass-blowing, boiling the mercury, and sealing the stem. We do not even know whether the excess of the atmospheric pressure outside the bulb over the pressure due to mercury and Torricellian vacuum inside is influential sensibly, or to any considerable degree, in producing the gradual initial shrinkage. If it were

so we might expect that the effect of heating the thermometer up to 100° or more at any time would be rather to produce an accelerated shrinkage for the time than what it is found to be, which is a return towards the original larger volume, followed by gradual shrinkage from day to day and weck to week afterwards, A careful comparison between two thermometers constructed similarly in all respects, except sealing one of them with Torricellian vacuum and the other with air above the mercury, would be an important contribution to knowledge of this subject, interesting, not only in respect to thermometry, but also to that very fundamental question of physical science, the im- perfect elasticity of solids (see Exasticiry, § 4).

§ 20. The error of a thermometer due to irregular shrink- ages and enlargements of the bulb is clearly the less the greater is the expansion of the thermometric fluid with the given change of temperature. By the investigation of § 30 we can calculate exactly how much the error is for any stated amount of abnormal change of bulk in the bulb. But it is enough at present to remark that for different liquids in the same or in similar bulbs the errors are very nearly in the inverse proportions of the expansions of the liquids) Now (Table III. below) in being warmed from 0° to 1° C. alcohol expands 6 times as much as mercury, methyl butyrate 7 times, and sulphuric ether 8} times. Hence if irregular changes of bulk of the bulb leave, as they probably do in practice, an uncertainty of =4,ths of a degree in respect to absolute temperature by the best possible mercury-in-glass thermometers used freely at all temperatures from the lowest up to 100° C., the un- certainty from this cause will be reduced to sth of a degree by using alcohol, or ;;th by using methyl butyrate instead of mercury; it may therefore, in a glass ther- mometer of alcohol or of the butyrate, be considered as practically annulled (§ 19) after a few weeks or months have passed, and the first main shrinkage is over.

§ 21, An alcohol-in-glass thermometer is easily made strong enough to bear a temperature of 100° C., as this gives by the pressure of the vapour an internal bursting pressure of not quite an atmosphere and a quarter in excess of the atmospheric pressure outside. The boiling point of methyl butyrate (Table III below) is 102° C.; a ther- mometer of it may therefore be used for temperatures con- siderably above 100° C., but how much above we cannot tell, as we have not experiments as yet on the pressure of its

vapour at temperatures above its boiling point. The pressure of vapour of sulphuric ether (Table VI. below) is too great to allow a thermometer of this liquid sealed in glass to be used much above 60° or 70° C., but for low temperatures it makes a very valuable thermometer. It was used in 1850 by W. Thomson in finding by experi- ment the lowering of the freezing point of water, predicted theoretically (see THERMODYNaMIcs) by J. Thomson in 1849 (Trans. R. S. #.), and gave a sensibility of 128 divisions to 1° ©. Glass thermometers with ether, or chloroform (whose expansion is about 4 per cent. greater than that of ether), were used by Joule and W. Thomson in experiments! on changes of temperature experienced by 1 Phil. Trans. for 1860, p. 325. ;

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bodies moving through air, in one of which the sensibility was as great as 330 scale divisions to the 1° C. All these liquids and many others in the modern chemist's repertory of oils and ethers and alcohols, besides the superior sensibility which they give by their greater expansions, have a great advantage over mercury for some thermometric purposes in their smaller specific gravity. This allows the bulb to be larger, with less liability to break or to give disturbed read-. ings through distortion by the weight of the contained liquid.

§ 22. Liquids which wet the glass have another great advantage over mercury in their smaller capillary attrac- tion (see Caprnuary AcrTioy, vol. v. p. 56; and Matter, PROPERTIES OF) and in the constancy of their 180° angle of contact with the glass, instead of the much greater absolute intensity of capillary attraction in the mercury, and its very variable angle of contact, averaging about 45° when the mercury is rising, and about as much as 90° when it is falling. On account of these variations the bulb of the mercury thermometer is subjected to abrupt variations of pressure when the mercury is rising or falling. The greatest and least pressures due to this cause are experi- enced when the angle of contact is respectively least and greatest, and differ by the pressure due to a vertical column of mercury equal in height to the difference of depressions of mercury in a capillary tube of the same bore as the thermometer stem when the angle of contact is changing from one to the other of the supposed extreme values. Hence the

mercury in a thermometer rises and falls by jerks very noticeable in a delicate thermometer when looked at with a lens of moderate magnifying power, . or even with the naked eye. Dr Joule informs us that this defect is much greater in some thermometers than in others, and that he believes it is greatly owing to the tube being left unsealed for too long a time after the introduction of the mercury (by which it is to be presumed something of a film of oxide of mercury is left on the glass to reappear on the surface of the mercury when it sinks as it cools after the sealing of the end). In Joule's own thermometers not the smallest indication has ever been detected of what he calls "this untoward phenomenon, which is calculated to drive an observer nad, if he discovers it towards the close of a series of careful experiments." Their admirable quality in this respect is no doubt due to the great care taken by the maker, Mr Dancer, under Joule's own instructions, to have the mercury and the interior of the bulb and tube thoroughly clean, and to guard it from exposure to any '"' matter in its wrong place " until completion of the sealing. But no amount of care could possibly produce a mercury thermometer of moderate dimensions moving otherwise than by jerks of ever so many divisions, if its stem were of fine enough bore to give anything approaching to two or three hundred divisions to the centigrade degree.

§ 23, One chief objection to the use of alcohol or other vola- tile liquid for the thermometric substance in ordinary glass thermometers is the liability to distillation of some of the liquid into the stem and head reservoir, unless the glass above the level of the liquid be kept at least as warm as the liquid. On this account a spirit thermometer is not suitable for being plunged into a space warmer than the surrounding atmosphere with the stem simply left to take the temperature to which it comes in the circumstances. But whether for elaborate experimental use, or for the most ordinary thermometric purposes, there is little difficulty in arranging to keep the part of the stem which is above the liquid surface somewhat warmer than at the liquid surface, and this suffices absolutely to prevent the evil of distillation. The only other objection of any grave validity?

2 There is one other objection which, though often stated as very grave against the thermometric use of any other liquid than mercury, we do not admit to be so. It is that when the temperature is rapidly sink-

against the use of highly expansive liquids instead of mercury is the difficulty of allowing for the expansion of the liquid in the stem, if it is not at the same temperature as the bulb. With the same difference of temperatures in different parts of the instrument, the error on this account

accordance is practically perfect, provided the thermo- metric plan according to which the different samples are used is the same, or as approximately the same as is easily secured in practice. Two plans for the thermometric use of air naturally present themselves :—(I.) augmentation of

is clearly in simple proportion to the expansibility of the liquid ; and therefore, the residual error due to want of perfect accuracy in the data for the allowance will, gene- rally speaking, be greater with the more expansive than with the less expansive liquid. But in every case in which

volume of air kept in constant pressure ; and (II.) augmenta-

tion of pressure of air kept in constant volume. Regnault Reg- tried both plans, but found that he could only arrange his nault's apparatus to give good results by the second, and on it there- normal

aera i air ther- fore he founded what he called his "'normal air thermo- jometer.

the bulb and stem can all conveniently be kept at one temperature, a thermometer having for its thermometric substance some highly expansive oil or alcohol or ether, or other so-called organic liquid of perfectly permanent chemical constitution, cannot but be much more accurate and sensitive than the mercury thermometer, which has hitherto been used almost exclusively in thermometric work of the highest rank. We shall see (S§ 62 and 64-68) that the ultimate standard for thermometry, according to the absolute thermodynamic scale (§ 34), is practically attained by the use of hydrogen or nitrogen gas as the thermometric substance, but that for

ordinary use a gas thermometer can scarcely be made as convenient as one in which the thermometric substance is a liquid. For practical thermometry of the most accurate kind it seems that the best plan will be to use as ordinary working standard thermometers highly sensitive thermometers con- structed of some chosen "organic" liquid, and graduated according to the absolute thermodynamic scale, by aid of the thermodynamically corrected air thermometer (§ 62) used as ultimate standard of reference. The great con- venience of the mercury thermometer in respect to freedom from liability to distillation and smallness of error on

meter." For the sake of perfect definiteness he chose, as the density of theairin hisnormal thermometer, the density which air has when at the temperature of melting ice and under the pressure of one atmo. He adopted the centigrade scale in respect to the marking of the freezing and boiling points by 0° and 100°; and the principle which he assumed for the reckoning of other temperatures was to call equal those differences of temperature for which differences of pressure of the air in his normal thermometer are equal. Thus he was led to a definition of temperature expressed by the following formula :—

7 oases age (1),

Pyoo —

where II denotes the pressure one atmo, and p and p99 the pressures of the air of the normal thermometer at the temperatures denoted by ¢ and by 100 respectively, the latter being the temperature of steam issuing from water boiling under the pressure of one atmo. By the most accurate observations which he could make Regnault found for his "normal air" 15) = 1°3665 x II. Hence his ther- mometric formula becomes

— Dane QF ae t=100,,F 7 272°86(#)

(2).

account of difference of temperature between the bulb and | stem renders it the most convenient for a large variety of scientific and practical purposes

in which the most minute accuracy or the most extreme sensibility is not required.

§ 24, Without any thermodynamic reason for preferring

§ 25. Regnault compared with his normal air thermo- Reg- meter thermometers on the same plan of constant volume, nault's | but with air at other than the normal density of 1 atmo, ComP¢" and with other gases than air; also air and gas ther- ae mometers on the plan of constant apparent volume as meters.

air to mercury as thermometric fluid, Regnault preferred it for two very good reasons. (1) Its expansion is 20 times that of mercury and 160 times the cubical expansion of glass, and therefore with air the error due to irregularity in the expansion of the glass is 20 times smaller than with mercury, and small enough to produce no practical defalca- tion from absolute accuracy in thermometry, as he found by elaborate and varied trials. So far as this is concerned, some highly expansive organic liquids would answer nearly as well as air for thermometric fluid, and would have the advantage of giving a thermometer much more easily used. (2) For an ultimate standard of reference air has the advantage over organic liquids generally, that different samples of it taken at different times, or in different parts of the world, and purified of water and carbonic acid by well-known and easily practised processes, are sufficiently uniform to give thermometric results between which the

ing, before becoming stationary, a little of the liquid lags behind the descending free surface, detained on the glass, and, trickling slowly down to rejoin the main column, must be waited for before the sta- tionary temperature can be correctly read. We believe that if a fairly inviscid (or mobile) liquid such as alcohol or ether or butyrate of oxide of methyl be used, there will be practically no time lost from this cause, and certainly no accuracy lost when proper care is taken by the ob- server. The observer must be on his guard against a possiblyfalse steadi- ness, through the falling of temperature being momentarily balanced in its cffect on the free surface by the trickling down of liquid from the glass above, when the free surface is still above, or, it may be, has gone down to a little below, the true position for the final temperature.

1 Henceforth, to avoid circumlocutions, the unqualified word " air" will be used to denote atmospheric air taken in any part of the world, and deprived of carbonic acid and whatever vapour of watcr it may have contained, by aid of hydrated lime, or caustic potash, or some other suit- able reagent for removing the carbonic acid, and quicklime, or chloride of calcium, or sulphuric acid, or phosphoric acid, for removing the water.

measured in a glass bulb and stem; also a thermometer founded simply on the dilatation of mercury; also thermo- meters of mercury in different kinds of glass, each graduated on the glass stem with divisions corresponding to exactly equal volumes of the bore; also overflowing thermometers (thermométres 4 déversement), in which a bulb with a short piece of fine stem was perfectly filled with mercury at 0° and the quantity of mercury expelled by the high tempera- ture to be measured was weighed, instead of being volu- metrically measured by divisions of a long stem as in the ordinary thermometer.

The whole of this thermometric investigation is full of scientific interest, and abounds with results of great prac- tical value in respect even of the minutest details of Regnault's work. It will be found fully described in the first of his three volumes, entitled Relation des Lapérvences entreprises par ordre de Monsieur le Ministre des Travaux Publics et sur la proposition de la Commission centrale des Machines & Vapeur pour Déterminer les Principales Lous et Données Numériques qui entrent dans le Calcul des Machines & Vapeur, which were published at Paris in 1847, 1862, and 1870. Here we can but state some of the most im- portant of the general conclusions :— '

(1) The air thermometers with pressure ab 0° of from 44 to 149 centimetres of mercury agreed perfectly with the nor- mal air thermometer calculated according to the same for- mula (2), and nearly the same numerical coefficient 272°85. A slightly larger value 272-98 (or 0036632~) gave the best agreement for the 44 c.m. pressure, and the somewhat smaller value 272°7 (or 0036677") for the pressure 149 c.m.

(2) The hydrogen gas thermometer, with pressure one atmo at 0°, and with its indications calculated according to

formula (2) but with a different numerical coefficient,1 agreed perfectly with the normal air thermometer from 0° to 325°.

(3) The carbonic acid gas thermometer with pressure 46 c.m. at 0°, and its indications calculated with the co- efficient 271°59 (:003682-1), agreed perfectly with the normal air thermometer from 0° to 308°.

(4) The carbonic acid gas thermometer with pressure, at 0°, 74 centimetres (or nearly 1 atmo), calculated with the coefficient 270°64 (~~003695~~“) to make it agree with the normal air thermometer at 100°, gave numbers some- what too large for all temperatures from 200° to 323°. The difference seemed to rise to a maximum at about 180°, when it was about 4°, and to diminish so as to be only about ;1,° at the highest temperatures of the comparison. Two sulphurous acid gas thermometers, with pressures 59 c.m. and 75 c.m. at 0°, calculated with coefficients 263°6 (003794-1) and 261°4 (~~003825··”) respectively to make them agree at 100° with the normal air thermometer, each gave numbers too small for the higher temperatures by dif~~ ferences increasing gradually from $° at 140° to 3° at 320°.

(5) Air and gas thermometers calculated according to differences of pressure of the gas kept at the same apparent volume (that is to say, with the bounding mercury column at a constant mark on the glass stem of the thermometer) gave numbers too small at the higher temperatures by differences gradually increasing up to 2}° at 350° in the case of Chotsi le Rot crystal, a hard glass without lead, and to as mnch as 34° in the case of ordinary glass.

In connexion with these observations Regnault. remarks that the greatest cause of uncertainty in his air ther- mometry is the allowance for expansion of the glass. It was only by most carefully made special experiments? on each particular bulb and tube, to determine its expansion throughout the range for which it was to be used, that he succeeded in obtaining the great accuracy which we find in his results, according to which the probable error, whether by his normal air thermometer, or by other air or gas ther- mometers of those stated above to agree with it perfectly, was not more than from ‘] to ‘15 of a degree for any temperature up to 350°.

(6) The mercury-in-glass thermometers which Regnault generally used for comparison with his normal air ther- mometer were overflowing thermometers, because he found that with such he could more easily obtain the very minute accuracy at which he aimed than with the ordinary volu- metric thermometers; but the formula by which he calcu- lated temperature from the overflowing thermometer was adapted to give exactly the same result as would have been obtained by the ordinary thermometer with divisions on the stem corresponding to equal volumes of the bore. It must be remembered, however, that this perfect agreement between the volumetric and overflowing thermometers would not be found unless the expansion of the bulb and tube were uniform and isotropic throughout.

(7) The general results of Regnault's comparisons of mercury thermometers with his normal air thermometer

1 Instead of the '003665 of his normal air thermometer, Regnault states that for his hydrogen thermometer he used °003652 (which would make the coefficient in formula (2) be 273°82 instead of 272°85). But this must surely be a mistake, as he found 0036678 for the " coefficient of dilatation" of hydrogen calculated from its increase of pressure in constant volume, and '0036618 for the coefficient of dilatation observed directly for hydrogen under constant pressures of from 1 to 4 atmos (pp. 78, 80, 91, 115, 116), and he nowhere speaks of having found any smaller value than °003661 for hydrogen.

4 These experiments were made by finding the weight of mercury contained in each bulb and tube at several different temperatures throughout the range through which it was to be used, and thence cal- culating the bulks according to the density of mercury for the different temperatures found by his independent investigation of the absolute dilatation of mercury by the hydrostatic method, this method being independent of the expansion of the containing glass or other solid.

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were given by himself in a diagram of curves from which the accompanying is copied on a reduced scale (fig. 3). It shows that at a temperature of 320° the independent mercury thermometer stands at 329°8°, the thermometer of

mercury in Choisi le Roi crystal at 327°25°, and the thermometer of mercury in ordinary glass at 321°8°; and that the independent mercury thermometer and the mercury in Choisi le Roi crystal 0755 “927" stand 10° higher than the normal ™ air thermometer at the temperatures s9- by it of 323° and 345° respectively. & § 26. The curve for the inde- = pendent mercury thermometer is gq 1\ merely Regnault’s graphic repre- ™ sentation of his experiments on the sm absolute expansion of mercury #17 (Relation des Expériences, vol. i. = p. 328). It shows that the addition f bulk given to the same mass 4 0 given _ of mercury under constant pressure by elevation of temperature is for ‘ the same difference of temperatures as indicated by his normal air o_ thermometer regularly greater and greater the higher the temperature. § 27. It is interesting to see by the diagram that at the high temperatures all the mercury ther- mometers keep nearer to the air thermometer than does the inde- pendent mercury thermometer, and Yoo- s7es ¢s 21 0 that the mercury in ordinary soft Fig. 3. glass keeps much nearer to the air thermometer than does the mercury in the hard Choisi le Roi glass. We infer that, still reckoning temperature by the air thermometer, we have regular augmentation of expansion at thehigh tempera- tures in all the different glasses, each greater than the augmentation of expansion of mercury, and that this augmentation is greater in the soft ordinary glass | ()M} than in the hard Choisi le Roi glass, being in the | })| ordinary glass great enough to overcompensate in po the resulting thermometric indication the augmenting expansion of the mercury from 100° to 245°; while above 245° in the ordinary glass thermometer, and at all temperatures above 100° in the Choisi le Roi thermometer, the compensation is only partial. | Between 0° and 100° the independent. mercury [hij thermometer stands regularly lower than the air Pa thermometer by as great a difference as ‘35° at 50°, [i where it isa maximum. ‘The curves for the mercury- [i] in- glass thermometers are not shown between 0° and Fi* 100°, but it is clear from the diagram that the Choisi }d#%, le Roi thermometer must, like the independent |], mercury thermometer, stand lower than the air ther- [ij] mometer, but by a smaller difference, probably only pits about °2° at 50°; and the ordinary glass thermometer [373 higher than the air thermometer from 0° to 100° by [#/ a difference which may be ‘2° or ‘3° at 50°. This last pA inference from the diagram is confirmed by Regnault’s \iy table of results facing page 227 of his first volume. § 28. In the best modern thermometers the graduations are actually engraved on the glass; but in most popular*

thermometers, and in many for scientific investigation, they are on an attached scale Fig. 4. of wood, or ivory, or brass, or paper. Some of the best popular thermometers are the German bath thermometers, in which the graduation is on a paper scale guarded by being enclosed in a wide glass tube hermetically sealed round the stem and over the bulb of the glass which contains the mercury, in the manner shown in fig. 4.

Abso-

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pansion

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cury thermo- meter.

Ordi- nary scientific thermo- meter of mereury in glass.

_ and the expansion of the liquid.

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The graduation is clearer and more easily read in this kind of thermometer than in any other. The complete protection of the paper scale against damp and damage afforded by its hermetically sealed glass envelope gives a perennially enduring quality to this form of thermometer,! such as is possessed by no others except those graduated on the glass; and the lightness of the paper renders its proper attachment to the inner stem, by gum or otherwise, thoroughly trustworthy, when once well done by the maker of the instrument. For scientific purposes the paper scale was too cheap, and common, and good, to satisfy the ideas of those instrument makers who in Germany and France substituted the heavy gradu- ated slab of opal glass for the paper, while still adhering to the bath thermometer pattern in her- metically enclosing this scale in an outer containing glass tube,—very unnecessarily, as the glass scale, unlike the paper scale, does not require any such protection.

This is now, however, a thing of the past. At the present time all high-class scientific thermometers are graduated on the glass of the stem without any attached scale of other material. Except in respect to ease of reading the indications this simplest form is, both for popular and for scientific purposes, superior even to the German bath thermometer with hermetically sealed paper scale; and this will be the form intended when we speak of a mercury thermometer, or a spirit thermometer, or a liquid thermometer, without any special qualification.

§ 29. Properties of Matter concerned in Liquid Thermometers. —The indications of the liquid ther- mometer depend not only upon the expansion of the liquid with heat ; they are seriously modified by the expansion experienced also by the containing solid. The instrument in fact consists of a glass measure measuring the bulk of a liquid. Ifthe bulk of the hollow space in the glass and the bulk of the liquid expand by the same amount, the apparent bulk of the liquid as thus measured will remain unchanged. Now, supposing the glass to be perfectly homogene- ous and isotropic (see art. Exasricity, § 38, 39, and chap. i. of Mathematical Theory), and the bulb to be free from internal strain, the glass will, when warmed uniformly, expand equally in all directions, and the volume of the hollow space will: be altered in the same ratio as the volume of the glass itself. Hence the indications of the thermometer depend on a difference between the expausion of the glass

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§ 30. To define exactly the indications of a ther- mometer founded on the expansion of a fluid, let the volume of the bore of the stem between two consecu- tive divisions be called for brevity a degree measure. The degree measure is habitually made as nearly ’ ? as possible equal throughout the scale in the best mercury- in-glass thermometers ; and, as we shall see (§ 62), it ought to be so in an air thermometer to give indications agreeing with the absolute thermodynamic scale nearly enough for the most accurate practical thermometry. But in practical spirit-thermometers the divisions are made to correspond as nearly as may be to degrees of a standard mercury or air

1 Provided it is never exposed to “ browning” temperatutes (or temperatures high enongh to produce partially destructive distillation of the paper). Instrument makers ignoring this caution have actually made it with graduation extending to such temperatures for kitchen use. The result is that it gets injured to the extent of partially browning the hermetically sealed paper, and befogging the inner surface of the glass envelope, by applying it to test the temperature of melted fat in cooking. . For this purpose the simple scientific ther- mometer with graduation on the glass stem is proper.

thermometer, and the degree measures are therefore (Table II. below) larger and larger from the lower to the upper end of the scale. For the purpose, however, of comparing the thermometric performances of different liquids, we shall suppose the degree measure to be of equal volume through- out the scale in each case.

Let N be the number of degreé measures contained in the volume of the bulb and stem up to the point marked zero on the scale ; and Ict D; denote the volume, at any temperature ¢, of the degree measure reckoned in absolute units of volume. The volume of the bulb and stem up to zero will be ND;. On the sup- position of perfect isotropy and freedom from strain in the glass, N will be independent of the temperature and D,/D, will be the ratio of the volume of any portion of the glass at temperature ¢ to its volume at the temperature called zero, if D, denote the volume of the degree measure when the glass is at this zero temperature. Jct now L;and L, denote the volumes of the whole liquid in a thermo- meter at the two temperatures ¢ and 0; we have L.=ND.. And if s be the number of scale divisions marking the place of the liquid surface in the thermometer tube, we have L;= (N+s)D, Hence

L/Lo=(1+s/N)D:/D. Hence s=N Gas – 1) . Hence, if E; i o

denote augmentation of bulk of the liquid, and E, augmentation of bulk of each degree-division of the stem, when temperature is raised from 0 to ¢, each reckoned in terms of the bulk at zero tem- perature, we have

eoN(4E-1)_ x BoE

1+E

This is the formula for the ordinary liquid thermometer. It is also applicable to the constant pressure air ther- mometer, in which, with proper instrumental means to keep the pressure constant, air is allowed to expand or contract with elevation or depression of temperature, and its volume is measured in a properly shaped glass measuring vessel. We may arbitrarily determine to take s as the numeric for the temperature which is indicated by any one particular thermometer of this kind, for instance, a methyl butyrate thermometer, or an alcohol thermo- meter, or a mercury or an air thermometer. But if s=t for any one individual thermometer, it cannot be exactly so for any other. In the first advances towards accurate thermometry it was taken so for ¢he mercury-in- glass thermometer, and by general consent it was con- tinued so until it was found (§ 25) that different mercury- in-glass thermometers, each made with absolute accuracy, differ largely in their reckonings of temperature.

§ 31. Numerical Thermometry.—In § 12 above, a perfectly definite and very simple basis for numerical thermometry was described, not as having been adopted in practice, but as an illustration of a very general principle upon which reckoning of temperature may be done in numbers. The principle is this. Two definite temperatures depending on properties of some particular substance or substances are first fixed upon and marked by two arbitrary numbers,— as, for instance, the temperature of melting ice marked zero, and the temperature of steam issuing from boiling water under atmospheric pressure of exactly one atmo, marked 100, Then any intermediate temperature ¢ is obtained by taking ¢ parts of water at zero and (100 — ¢)

arts at 100° and mixing them together. As said in § 12 this method is limited to temperatures at which liquid water can be obtained, and therefore practically it is only applicable between the melting point of ice and the boiling point of water, under ordinary atmospheric pressure.

§ 32. Any other liquid of permanent chemical constitu- tion might be used instead of water as the thermometric substance in thermometry founded on mixtures; so even might a powdered solid. Oil if used instead of water would have the advantage of being available for higher temperatures ; but want of perfect definiteness and con- stancy of chemical constitution is a fatal disqualification for it as the fundamental thermometric substance for ther:

Thermo- meter defined to make constant the spe- cific heat of water.

Thermo

metry

by mix tures.

Different equally permis- sible thermo- metric assump- tions.

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mometry by mixtures. Liquid mercury might be used with the advantage of being available for both higher and lower temperatures than water, through a much wider whole range indeed than either water or oil. For use as thermometric substance for the method of mixtures both water and mercury, in the conditions of approximate purity in which they are easily obtained in abundance, have a paramount advantage over all other liquids, in near enough approxima- tion to perfect definiteness and constancy of constitution to give practically perfect thermometric results.

§ 33. In §§ 12, 24, 25, 30, 31, 32, several distinct definitions of numerical reckoning of temperature have been given. In each of these the differences of tempera- ture which are to be called equal are defined specially, and this is the essence of the thermometric scale in each case (the marking of 0° and 100° for the " freezing" and " boiling " points being common to all as a matter of practical usage and not an essential of the thermometric principle in any case). Thus in S§ 12, 31, and 32 differences of tempera- ture are called equal which are produced by the com- munication of equal quantities of heat to a given quautity of the particular thermometric substance chosen —water, for example, or mercury; in other words (§ 68 below), this thermometric system is chosen so as to make the specific heat of a particular thermometric substance the sime for all temperatures. Again in § 24 differences of temperature are called equal for which the differences of pressure are equal in air of the particular density which air has if its pressure is one atmo when its tempera- ture is "freezing." This is Regnault's "normal thermo- metry." In § 25 (1), (2), (3), (4), other reckonings of temperature differing essentially from this, though, as

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scale of reference for all thermometers of whatever kind (§ 67). It is defined in §§ 35 and 37 after the following preliminary. A piece of matter which we shall call the "thermometric body" or "thermometric substance" must be given, and at each instant it must be throughout at one temperature, whatever operations we perform upon it. For simplicity we shall suppose it to be of one substance throughout. It may be all solid, or it may be partly solid and the remainder gaseous (as the contents of a wholly frozen cryophorus! or any other form of closed vessel full of ice and vapour of

water, but with no air); or it may at one particular temperature in the course of its use be partly solid and partly liquid and partly gaseous (as the contents of a partially frozen cryophorus) ; or it may be partially liquid and partially gaseous (as the contents of an unfrozen cryophorus or of a " philosopher's hammer") ; ? or it may be all liquid; or it may be all gas; or it may be all fluid at a temperature above the Andrews " critical temperature."? If it be all solid it may be under any homogeneous stress (ELasticiry, Mathematical Theory, part i, chap. i.) ; but in any case we suppose for simplicity the stress to be homogeneous throughout, and therefore if the thermometric body be partly solid and partly fluid, the stress in the solid as well as in the fluid must be uniform pressure in all directions. To avoid excluding the case of all solid from our statements, we shall use generally the word stress, which will mean normal pressure reckoned in number of units of force per unit of area in every case in which the whole or any part of the thermometric body is fluid, and will denote this or any other possible stress when the thermometric body is all solid.

Regnault's experiments proved, by but very small differ- ences, are given simply by the substitution of air of other than Regnault's normal density, and of other gases than air, for the air of Regnault's normal thermometer. In § 25 (5) a thermometry founded on a complex coefficieucy of change of pressure and volume of a gas and change of volume of some one particular glass vessel is defined and compared with Regnault's normal thermometry ; and in §

§ 35. (1) Alter the bulk or shape of the thermometric First substance till it becomes warmer to any desired degree, defini- (2) Keeping it now at this higher temperature, alter bulk or eee. shape farther, and generate the heat which the substance oe na takes to keep its temperature constant, by stirring water, tempera- or a portion of the substance itself, if it is partly fluid, tures. and measure the quantity of work spent in this stirring.

(3) Bring it back towards its original bulk and shape till Carnot's 25 (6) and (7) the same is done for the ordinary mereury- | it becomes cooled to its original temperature. (4) Keeping thermo in-glass thermometer, which depends on a coefficiency of | it at this temperature, reduce it to its original bulk and cyisr glass and mercury leading to the reckoning of temperature |

shape, carrying off, by a large quantity of water, the heat oie defined in § 30. Again in § 26 and § 24 (L.) is indi-| which it must part with to prevent it from becoming alized.

ona par- ticular property of a par- ticular sub- stance,

Prelim- inary for thermo- dynamic defini- tion of tempera- ture.

cated a system of thermometry founded on the absolute dilatation of some fluid, such as mercury or alcohol or buty- rate of oxide of methyl or other permanent liquid or air, at some constant pressure, such as one atmo, with equal differences of temperature defined as those which give equal dilatations of the particular substance chosen as the thermo- metric fluid.

§ 34. Each of all these different definitions of tempera- ture is founded on some particular property of a particular substance. A thermometer graduated to fulfil one of the definitions for one particular substance would not agree with another thermometer graduated according to the same definition for another substance, or according to some of the other definitions. A much more satisfactory foundation for thermometry is afforded by thermodynamic science, which (see THERMODYNAMICS) gives us a definition of temperature depending on certain thermodynamic pro- perties of matter in such a manner that if a thermometer is graduated according to it from observation of one class of thermal effects in one particular substance, it will agree with a thermometer graduated according to the same thermodynamic law from the same class of effects in any other substance, or from the same or from some other class of effects in another substance. Thus we have what is called the absolute thermodynamic scale. This scale is now in modern thermal science the ultimate

warmed. Find by a special experiment how much work must be done to give an equal amount of heat to an equal amount of water by stirring. Then the ratio of the first measured quantity of work to the second is the ratio of the higher temperature to the lower on the absolute ther- modynamic scale.

§ 36. The following is equivalent to § 35, and is more convenient for analytical use. It is derived from § 35 by supposing the first and third operations to be so small that the ratio defined as the ratio of the two

temperatures is infinitely nearly unity, and conversely § 35—our first form of definition of absolute temperature—may be derived from the second, which is to be now given, by passing through a finite range of temperature by successive infini- tesimal steps, and applying the second definition to each step.

§ 37. Let the thermometric body be infinitesimally warmed by stirring a portion or the whole of itself if it be partially or wholly fluid, or by stirring a quantity of fluid in space around it if it be all solid; and during the process let the stress upon the body be kept unchanged. The body expanding or contracting or changing its shape with the heat, as the case may be, does work upon tlie surrounding material by which its stress is maintained.

1 See articles Liquip, MATTER (PROPERTIES

OF), and STEAM. 2 Ibid. 3 Ibid.

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Second Find the ratio of the amount of work thus done to the

defini- gmount of work spent in the stirring. For brevity we aed shall call this the work-ratio. Again, let the stress be

tempera- infinitesimally increased, the thermometric body being now ture: — for the time enclosed in an impermeable envelope so that by ratio it may neither gain nor lose caloric. It will rise (or fall)? ofan in temperature in virtue of the augmentation of stress. The ratio of this infinitesimal elevation of temperature to differ. the whole absolute temperature is equal to the work-ratio ence of multiplied into the ratio of the infinitesemal augmentation tempera- of stress to the whole stress.

ely § 38. To show how our definition of absolute temperature

tempera- 18 to be applied in practice take the following examples.

ture | Example 1.—Any case in which the thermometric substance is part in one condition and the remainder in another of different density, as part

solid and part vapour, or part solid and part liquid, or part liquid and part steam. In this last case, as explained above (§ 34), we suppose the stress to be uniform pressure in all directions.

Let p be its amount, and let ¢ be the absolute temperature corre- sponding to this pressure. Let o be the ratio of the density of the rarer to that of the denser portion, p the density of the rarer por- tion, and Jx the quantity of work required to generate the heat taken to convert unit mass of the substance from the lower to the higher condition (« the “ latent heat” of transition from the lower to the higher condition per unit mass of the substance, and J the dynamieal equivalent of the thermal unit in which « is measured). The work done by the substance in passing from the denser to the rarer condition per unit volume of the latter is p(l—o), and the amount of work required to generate the heat taken in doing so is Jpx. Hence the work-ratio of our second definition is feo)

pl-o =. stash pe Tye Let now the pressure be increased by an infinitely small quantity dp, and, the substance being still in the two conditions but of uniform temperature throughout, let dé be the corresponding rise in temperature. We have by the definition (§ 37)

dt_ p(l-o)dp l-o, tip p Spx as 1 dt l-o« Hen ee ee ee ee ¢) 2 — t dp Jp (2)

Hence by integration

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log ay to hn, Jpk te t=te/Po Spx

Water. § 39. Fig, 6 represents a thermometer constructed to ” show absolute temperature on the plan of example 1, § 38, moter. realized for the case of water and vapour of water as ther- mometric substance. The containing vessel consists of a tube with cylindric bulb like an ordinary thermometer ; but, unlike an ordinary thermometer, the tube is bent in the manner shown in the drawing. The tube may be of from 1 to 2 or 3 millims. bore, and the cylindrical part of the bulb of about ten times as much. The length of the cylindrical part of the bulb may be rather more than zoo Of the length of the straight part of the tube. The contents, water and vapour of water, are to

be put in and the glass hermetically sealed to enclose them, with the utmost precautions to obtain pure water as thoroughly freed from air as possible, after better than the best manner of instru- ment makers in making cryophoruses and water hammers. The quantity of water left in at the sealing must be enough to fill the cylindrical part of the bulb and the horizontal branch of the tube. When in use the straight part of the tube must be vertical with its closed end up, and the part of it occupied by the manometric water-column must be kept at a nearly enough definite temperature by a sur-

1 In the ease of fall the elevation of temperature is to be regarded as negative ; and in this ease the " wcrk-ratio" is negative also.

(3).

or

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rounding glass jacket-tube of iced water. This glass jacket-tube is wide enough to allow little lumps of ice to be dropped into it from its upper end, which is open. By aid of an indiarubber tube connected with its lower end, and a little movable cistern, as shown in the drawing, the level of the water in the jacket is kept from a few inches above to a quarter of an inch below that of the interior manometric column. Thus, by dropping in lumps of ice so as always to keep some unmelted ice floating in the water of the jacket, it is easy to keep the temperature of the top of the manometric water. column exactly at the freezing tem- 30

perature. As we shall see presently, the manometric water below its free surface may be at any temperature from freezing to 10° C. above freez- ing without more than 7, per cent. of hydrostatic error. The temperature in the vapour-space above the liquid column may be either freezing or anything higher. It onght not to be lower than freezing, because, if it were so, vapour would condense as hoar frost on the glass, and eva- poration from the top of the liquid column would either cryophoruswise (see Liquip and THERMODYNAMICS) freeze the liquid there, or would cool it below the freezing point.

§ 40. The chief object of keeping the top of the manometric column exactly at the freezing point is to render perfectly definite and con- stant the steam pressure in the space above it.

A second object of considerable importance when the bore of the tube is so small as one millimetre is to give constancy to the capillary ten- sion of the surface of the water. The elevation by capillary attraction of ice-cold water in a tube of one millimetre bore is about 7 millims. The constancy of temperature pro- vided by the surrounding iced water will be more than sufficient to pre- vent any perceptible error due to inequality of this effect. To avoid error from capillary attraction the bore of the tube ought to be very uniform, if it is so small as one milli- {,,‘ metre. If it be three millimetres or — more, @ very rougb approach to uniformity would suffice.

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*BORE OF THERMOMETRIC TUBE 0*2 CM.*

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Fig. 6.

A third object of the iced-water jacket, and one of much more importance than the second, is to give accuracy to the hydrostatic measurement by keeping the density of the water throughout the long vertical branch definite and

constant. But the density of water at the freezing point is only j, per cent. less than the maximum density, and is the same as the density at 8° C.; and therefore when 35 per cent. is an admissible error on our thermometric pressure, the density will be nearly enough constant with any temperature from 0° to 10° C. throughout the column. But on account of the first object mentioned above the very top of the water column must be kept with exceeding exactness at the freezing temperature.

§ 41. In this instrument the " thermometric substance " (§ 34) is the water and vapour of water in the bulb, or more properly speaking the portions of water and vapour

High- pressure steam thermo- meter.

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of water infinitely near their separating interface. The rest of the water is merely a means of measuring hydrosta- tically the fluid pressure at the interface. When the temperature is so high as to make the pressure too great to be conveniently measured by a water column, the hydrostatic measurement may be done, as shown in the annexed drawing (fig. 7), by a mercury column in a glass tube, surrounded by a glass water jacket not shown in the drawing, to keep it very accurately at some definite temperature so that the density of the mercury may be accurately known.

The simple form of steam thermometer repre- sented with figured dimensions in fig. 6 will be || very convenient for practical use for temperatures —_{} from freezing to 60°. Through this range the | pressure of water-steam, reckoned in terms of the || balancing column of waterof maximum density, in- | creases (Table V.) from 6} to 202‘3 centimetres; | and for this therefore a tube of a little more than 2

TORRICELLIAN VACUUM

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0-2 CM. BORE

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metres will suffice. From 60° to 140° the pressure of steam now reckoned in terms of the length of a balancing column of mercury at 0° increases from 14°88 to 271°8 centimetres ; and for this a tube of 280 centimetres may be provided. For higher temperatures a longer column, or several columns, as in the multiple manometer, or an accurate air pressure-gauge, or some other means, such as a very accur- ate instrument constructed on the principle of Bourdon's metallic pressure-gauge, may be employed, so as to allow us still to use water and vapour of water as thermometric substance.

§ 42. At 230° C., the superior limit of Regnault's high- pressure steam experiments, the pressure is 27°53 atmos, but there is no need for limiting our steam thermometer to this temperature and pressure. Suitable means can easily be found for measuring with all needful accuracy much higher pressures than 27 atmos. But at so high a temperature as 140°, vapour of mercury measured by a water column, as shown in the diagram (fig. 8), becomes available for purposes for which one millimetre to the degree is a sufficient sensibility. The mercury-steam- pressure thermometer, with pressure measured by water- column, of dimensions shown in the drawing, serves from 140° to 280°C., and will have very ample sensibility through the upper half of its scale. At 280° its sensibility

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will be about 4? centimetres to the degree! For tempera- turcs above 280° sufficient sensibility for most purposes is obtained by substituting mercury for water in that simplest form of steam thermometer shown in fig. 6, in which the pressure of the steam is measured by a column of the liquid itself kept at a definite tempera- ture. When the liquid is mercury there is no

virtue in the particular temperature 0°C., and a stream of water as nearly as may be of atmospheric temperature will be the easiest as well as the most accu- rate way of keeping the mercury at a definite temperature. As the pressure of mercury steam is at all ordinary atmospheric temperatures quite imper- ceptible to the hydrostatic test when mercury itself is the balancing liquid, that which was the chief reason for fix- ing the temperature at the interface between liquid and vapour at the top of the pressure-measuring column when the balancing liquid was water (§ 40) has no weight in the present case; but, on the other hand, a much more precise

definiteness than the ten degrees latitude allowed in the former case for the temperature of the main length of the manometric column is now necessary. In fact, a change of temperature of 2°2° in mercury at any atmospheric temperature produces about the same propor- tionate change of density as is produced in water by a change of temperature from 0° to 10°, that is to say, about J; per cent.; but there is no difficulty in keeping, by means of a water jacket, the mercury column constant to some definite temperature within a vastly smaller margin of error than 2°2°, especially if we choose for the definite temperature something near the atmospheric temperature at the time, or the temperature of whatever abundant water supply may be available. If the vertical tube for the pres- sure-measuring mercury column be 830 centimetres long, the simple mercury-steam thermometer may be used up to 520° C., the highest temperature reached by Regnault in his experiments (Table V. below) on mercury-steam. By using an iron bulb and tube for the part of the thermometer exposed to the high temperature, and for the lower part of the measuring column to within a few metres of its top, with glass for the upper part to allow the mercury to be geen, a mercury-steam-pressure thermometer can with great ease be made which shall be applicable for temperatures giving pressures up to as many atmospheres as can be measured by the vertical height available. The apparatus may of course be simplified by dispensing with the Tor- ricellian vacuum at the upper end of the tube, and opening the tube to the atmosphere, when the steam-pressure to be measured is so great that a rough and easy barometer observation gives with sufficient accuracy the air-pressure at the top of the measuring column. The easiest, and not necessarily in practice the least

accurate, way of measuring very high pressures of mercury-steam will be by enclosing some air above the cool pressure-measuring column of mercury, and so making it into a compressed-air pressure- gauge, it being understood that the law of compression of the air under the pressures for which it is to be used

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in the gauge is known by accurate independent experiments such as those of Regnault on the compressibility of air and other gases.

§ 43. The water-steam thermometer may be used, but-

somewhat precariously, for temperatures below the freezing point, because water, especially when enclosed and pro- tected as the portion of it in the bulb of our thermo- meter is, may be cooled many degrees below its freezing point without becoming frozen: but, not to speak of the uncertainty or instability of this peculiar eondition of water, the instrument would be unsatisfactory on account of insufficient thermometric sensibility for temperatures more than two or three degrees below the freezing point. Hence, to make a steam thermometer for such temperatures some other substance than water should be taken, and none seems better adapted for the purpose than sulphurous acid, which, in the ap- paratus represented with figured dimen- sions in the accompanying diagram (fig. 9), makes an admirably convenient and sensitive thermometer for temperatures from + 20° to something far below — 30°, as we see from the results of Regnault's measurements (Table VI. below).

§ 44, Tosum up, we have in §§ 39. . 43 a complete series of steam-pressure ther- mometers, of sulphurous acid, of water, and of mercury, adapted to give absolutely definite and highly sensitive thermometric indications throughout the wide range from something much below — 30° to cou- siderably above 520° of the centigrade | seale. The graduation of the scales of these thermometers to show absolute + temperature is to be made by calculation from formula (3) of § 38, when the requi- site experimental data, that is to say, the values of o and px for different values of p throughout the range for which each substance is to be used as thermometric fluid are available. Hitherto these requi- sites have not been given by direct experi- ment for any one of the three substances with sufficient accuracy for our thermo- metrie purpose through any range what- ever. Water, naturally, is the one for which the nearest approach to the requi- site information has been obtained. For it Regnault's experiments have given, no doubt with great accuracy, the values of p (the steam pressure) and of « (the latent heat of steam per unit mass) for all temperatures reckoned by his normal air thermometer, which we now regard merely as an arbitrary scale of temperature, through the range from — 30° to + 230°. If he, or any other experimenter, had given us with similar

aecuracy through the same range the values of p (the density of steam) and o (the ratio of the density of steam to the density of water in contact with it), for temperatures reckoned on the same arbitrary scale, we should have all the data from experiment required for the graduation of our water-steam thermometer to absolute thermodynamic scale. For it is to be remarked that all reckoning of temperature is eliminated from the second member of formula (3), and that in our use of it Regnault's normal thermometer has merely been referred to for the values of px and of 1—«, which correspond to stated values of p, The arbitrary constant of integration, t, is truly arbitrary. It will be convenient to give it such a value that the difference of values of ¢ between the

Fig. 9.

freezing point of water and the temperature for whicli p is equal to one atmo shall be 100, as this makes it agree with the centigrade scale in respect to the difference between the numbers measuring the temperatures which on the centigrade scale are marked 0° and 100°. We shall see (§ 56 below) that indirectly by means of experiments on hydrogen gas this assignation of the arbitrary constant of integration would give 273 for the absolute temperature 0° C., and 373 for that of 100°C. Meantime, as said above, we have not the complete data from direct experi- ments even ou water-steam for graduating the water-steam thermometer ; but on the other hand we have, from experi- ments on air and on hydrogen and other gases, data which allow us to graduate indirectly any continuous intrinsic thermoscope (§ 19 above) according to the absolute scale ; and we shall see that by thus indirectly graduating the water-steam thermometer, we learn the density of steam at different temperatures more accurately than it has hitherto been made known by any direct experiments on water-steam itself.

§ 45. Merely viewed as a continuous intrinsie thermo- scope, the steam thermometer, in one or other of the forms described above to suit different parts of the entire range from the lowest temperatures to temperatures somewhat above 520°, is no doubt superior in the conditions for accuracy specified in § 16 to every other thermoscope of any of the different kinds

hitherto in use; and it may be trusted more surely for accuracy than any other as a thermometric standard when once it has been graduated aceording to the absolute scale, whether by practical experi- ments on steam, or indirectly by experiments on air or other gases. In fact, the use of steam-pressure measured in definite units of pressure, as a thermoscopic effect, in the steam thermometer is simply a continuous extension to every temperature of the principle already practically adopted for fixing the temperature which is called 100° on the centigrade scale; and it stands on precisely the same theoretical footing as an air thermometer, or a mercury-in- glass thermometer, or an alcohol thermometer, or a methyl butyrate thermometer, in respect to the graduation of its scale according to absolute temperature. Any one intrinsic thermoscope may be so graduated ideally by thermodynamic experiments on the substance itself with- out the aid of any other thermometer or any other ther- mometric substance ; but the steam-pressure thermometer has the great practical advantage over all others, except the air thermometer, that these experiments are easily realiz- able with great accuracy instead of being, though ideally possible, hardly to be considered possible as a practical means of attaining to thermodynamic thermometry. In fact, for water-steam it is only the most easily obtained of experimental data, the measurement of the density of the steam at different pressures, that has not already been actually obtained by direct experiment. Whether or not, when this lacuna has been filled up by direct experiments, the data from water-steam alone may yield more accurate thermodynamic thermometry than we have at present from the hydrogen or nitrogen gas thermometer (§§ 64 . . 69 below), we are unable at present to judge. But when once we have the means, directly from itself, or indirectly from comparison with hydrogen or nitrogen or air ther- mometers, of graduating once for all a sulphurous acid steam thermometer, water-steam thermometer, or mercury- steam thermometer, that is to say, when once we have a table of the absolute thermodynamic temperatures cor- responding to the different steam pressures of the sub- stances sulphurous acid, water, and mercury, we have a much more accurate and more easily reproducible standard than either the air or gas thermometer of any form, or the mercury thermometer, or any liquid aes tpl can give.

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In fact, the series of steam thermometers for the whole

range from the lowest temperatures can be reproduced with

Deville's accurate pyro- meter,

the greatest ease in any part of the world by a person com- mencing with no other material than a piece of sulphur and air to burn it in,! some pure water, and some pure mercury, and with no other apparatus than can be made by a moderately skilled glass-blower, and with no other standard of physical measurement of any kind than an accurate linear measure. He may assume the force of gravity to be that calculated for his latitude, with the ordi- nary rough allowance for his elevation above the sea, and his omission to measure with higher accuracy the actual force of gravity in his locality can lead him into no thermo- metric error which is not incomparably less than the inevit- able errors in the reproduction and use of the air thermo- meter, or of mercury or other liquid thermometers. In temperatures above the highest for which mercury-steam pressure is not too great to be practically available, nothing hitherto invented but Deville's air thermometer with hard porcelain bulb suited to resist the high temperature is available for accurate thermometry.

§ 46. We have given the steam thermometer as our first example of thermodynamic thermometry because intelli- gence in thermodynamics has been hitherto much retarded, and the student unnecessarily perplexed, and a mere quick- sand has been given as a foundation for thermometry, by puilding from the beginning on an ideal substance called perfect gas, with none of its properties realized rigorously by any real substance, and with some of them (see MATTER, Liqurp, Steam) unknown, and utterly unassignable, even by guess. But after having been moved by this reason to give the steam-pressure thermometer as our first theoretical example, we have been led into the preceding carefully de- tailed examination of its practical qualities, and we have thus become convinced that though hitherto used in scientific investigations only for fixing the "boiling point," and (through an inevitable natural selection) by practical en- gineers for knowing the temperatures of their boilers by the pressures indicated by the

Bourdon gauge, it is destined to be of great service both in the strictest scientific ther- mometry and as a practical thermometer for a great variety of useful applications.

§ 47, Example 2 (including example 1).—Any case in which the stress is uniform pressure in all directions.

Let p and v denote the eer and volume. The condition of the substance (single, double, or triple, as the case may be) is de- terminate when p and v are given, and it will therefore be spoken of shortly as the condition (p, v). Lete be the energy which must be communicated to the substance to bring it from any con- veniently defined zero condition (, v9) to any condition whatever (p, v). Remark that e is a function of the two independent variables p, v to be found by experiment, and that the finding of it by experiment is a perfectly determinate practical problem, which can be carried out without the aid of any thermoscope, and without any consideration whatever relating to temperature. We shall see in fact that accurate practical solutions of it for many different sub- stances have been obtained by experiment (sce THERMODYNAMICS), The absolute temperature ¢ is also a function of p and v to be also determined by experiment, according to the equivalent definitions of §§ 35 and 37. Let heat be communicated to the substance so as to cause its volume to increase by dv, the pressure being kept coustant. The energy of the body will be augmented by

de dv.

dv At the same time the body in expanding and pressing out the matter around it does work to the extent of Ba CF mie ene et ee Hence the whole work required to generate the heat given to it

amounts to de dv

1 Practically, the best ordinary chemical means of preparing sul- phurous acid, as from sulphuric acid by heating with copper, might be adopted in preference to burning sulphur.

+ p)@ae ee" (5).

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Hence the ratio of (4) to (5), or

an . (6), dv? is the “ work-ratio” of § 37, Hence by the definition OY og BS ee ee Ga we? bP Bip Bap . dv dv

where Dé denotes the change of temperature produced by aug- Opera- menting the pressure by dp, and at the same time preventing the tion substance from either giving heat to or taking heat from the sur- called rounding matter. To express this last condition analytically, let adiabatic dv be the augmentation of volume (negative, of course, if dp be compres- positive) which it implies. The work done on the substance by sion by the pressure from without is —pdv, and the energy of the substance Rankine. is augmented by just this amount, because of the condition to be expressed. Hence P

de

det eS Spgs sd Bn

Fee ay (8);

whence

(9).

But

and so we have

dt de

oP lip (10),

Eliminating Dé/dp from this by (7) we find de\dt de dt t-(0+ Fae te – e+ (11) § 48. This is a linear partial differential equation of the first order for the determination of ¢, supposing, as we do for the present, that eis a known function of p and y, ‘The following graphical illustra- tion of the well-

known analytical process for finding the complete solutions of such equatious shows exactly how much towards deter- mination of temperature can be done with no other data from de de dv dp and what additional information is required to fully determine ¢.

experiment than the values of — and — as functions of p and »,

First remark that (11) is the condition that 1 be a factor Called d d t thermo- . € € . F ‘ i — el lete differential of a function? dynamic rendering (e + 7,)a+ Z i» a complete differential of a functi Pee of two independent variables p and v. Let ¢ be this function,— by that is to say, let @ be such that er a So 8 be oneal dv AG af we)? dp & dp _ o de € é “gees = — 9), Clausius or mA dv _ dp ‘a and sub- dp dp sequent dv dp writers. Then every solution of the differential equation de a ee ae 13 av de ee ( ) dp

renders ¢ constant ; and conversely, every series of values of p and Called

v which renders ¢ constant constitutes a solution of (13). Now this adiabat- differential equation may be solved graphically by taking p and v ics by as rectangular coordinates of a point in a plane, and drawing the Rankine, whole series of curves which satisfy it as follows. Commence with isentrop- any point and caleulate for its values of p and v the value of the ics by second member of (18). Draw through this point an infinitesimal Willard line in the direction of the tangent to the curve given by the value Gibbs.

so found for Z . With the altered values of y and v corresponding ual aie gran of

2 This function is of great importance in practical thermodynamics: adia- multiplied by é, it is equal to the excess of the energy of the sub- batics stance above its motivity. Motivity (defined by Sir Wm. Thomson, drawn. Proceedings R.S.E., 1879) is the amount of work obtainable by letting the substance pass from the state (p, v) in which it is given to

the zero condition (Yo, V9), Without either taking in heat from or

giving out heat to matter at any other temperature than ¢). See THERMODYNAMICS.

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to the other end of this infinitesimal line, calculate a fresh value of

- , and continue the curve in the slightly altered direction thus v

found,.and so on. Take another point anywhere infinitesimally near this curve but not in it, and draw by a similar process the curve through it satisfying the equation. Take a third point infinitcly near this second curve, and draw through it a third curve satisfying (13), and so on till the whole area of values p, v, possible for the sub- stance in question, is filled with a scries of curves one of which passes through, or infinitely nearly through, every point of the area. Assign arbitrarily a particular value of ¢ to each of these

curves; then grapluically find = and e for any or every value of

yandv. Then either of the two second forms of equation (12) gives

us explicitly a value of ¢ for any values whatever of p and v. Comi- § 49. The solution for ¢ thus obtained involves the arbitrary pleted assumption of a particular value of ¢ for each one of the series of solution curves which we have determinately traced. Hence, to render ¢ of differ- wholly determinate, something more must be given than ¢ as a ential function of yand v. Now the only thing that can be given respect- equation ing tempcrature for any particular substance before we have a ther- fur twith mometric scale is the relation subsisting between p and v when the one arbi- temperature is constant.. This relation can, with merely a single- trary temperaturc-thermoscope (§ 15 above), in addition to dynamical function. instruments, be determined for some one particular temperature ; and

this, if e be known for every value of p and v, is the only additional

Arbi- knowledge required for the determination of ¢ for every value of p trary andv. For let p=/(v) be the relation between p and v for some one function particular temperature, é. If by this we climinate p from (12) we ofthe find ”

analy ti- G7) ek de , a. set [Av) e = | Re, 5 esl tion de-

Yermined Where = , When p=/(v), becomes a known function of v alone,

by €X- Hence by integration we find

peri- 1

ment. o-z[FO) + c] Pe ae (15),

0

Com- where F denotes a known function and C an arbitrary constant.

pleted Now trace the curve p=/(v) on our diagram. It must generally

deter- cut every one of the previously drawn determinate series of

mina- curves. Hence equation (15), with two arbitrarily assigned

tion of constants ¢ and C, gives determinately the value of for every

absolute one of the diagram of curves, and thus @ is determined for

tempera- every value of p and v. Either of equations (12) then gives ¢

turefrom determinately as a function of p and v, with only the value ¢ arbi-

results of trary. The information from experiment, regarding the properties

experi: of the thermometric substance, on which this determination is

ment. founded, consists of a knowledge of the relation between p and v for any one temperature, and of the value of ¢ —é, for all values of p, », (ey denoting the unknown value of ¢ for some particular values pyv). Although, theoretically, this information is attainable by purely dynamical operations and measurements, with no other thermal guidance or test than that afforded by a single-temperature-intrinsic- thermoscope (§ 15), the whole of it has not in fact been explicitly ob- tained for any one substance. But less

than the whole of it suffices to make a perfect absolute thermometer of any given substance.

§ 50. For this purpose it is not necessary to find ¢ for all values of p and v: it is enough to know it for all values mutually related in any manner convenient for thermo- metric practice. For example, if we could find ¢ for every value of v with p constant at some one particular chosen value,—this would give a "constant pressure" absolute thermometer. Or again, if we find ¢ for every value of p with v kept constant,—this would give us a "constant volume" absolute thermometer. Let us now examine into the restricted dynamic and thermoscopic investigations upon any particular substance, which will suffice to allow us to make of it a standard absolute thermometer of one or other of these species.

§ 51. Dynamical and thermoscopic investigation required to graduate, according to the absolute scale, a constant-pressure thermometer of any particular fluid.—Let a large quantity of fluid be given, and let proper mechanical means be taken to cause it to flow slowly and uniformly through a pipe, in one short length of which there is a fixed porous plug. If, as is the case with common air, nitrogen, oxygen, carbonic acid, and no doubt many other gases, the fluid leaves the plug cooler than it enters it, let there be a paddle in the stream flowing from the plug, and let this paddle be turned so as to stir the fluid and cause the temperature, when the

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rapids are fairly past and the eddies due to the stirring subsided, to be the same as in the stream flowing towards the plug. When, as in the case of hydrogen and of all ordinary liquids, the fluid flows away from the plug warmer than it entered it, let a uniform stream of water be kept flowing in a separate canal outside the tube round a portion of it in which the internal flow is from the plug, and by this means let the temperature of the internal fluid be brought to equality with that which it had on entering the plug. By a separate thermodynamic experiment find how much work would have to be spent in stirring the external stream of water by a paddle to warm it as much as it is warmed by conduction from the internal fluid across the separating tube. Returning now tothe internal fluid flow- ing towards and from the plug, let p+ dp be the pressure in the steady stream approaching

the disturbed region, and p the'pressure in the steady stream flowing from the dis- turbed region ; and let dw be the quantity of work done by the paddle per unit of mass of the fluid passing by, reckoned positive in the first case, that namely in which the paddle compensates a cooling effect experienced in passing through the porous plug. In the second case — dw (in this case a positive quantity) must denote the work done by the paddle upon the supposed external stream of water in the separate thermodynamic experiment. It is to be reckoned per unit mass of the internal fluid, irrespectively of the rate of flow of the external water. Let ¢ denote the temperature of the fluid according to the thermodynamic scale, and let d¢ denote the infinitely small change of temperature which it must experience to produce an infinitesimal expansion from volume v to volume v+év under constant. pressure. We have

ee an (16). t dv 1 dw bgt = aos v &p

Proof.—Let v+6v, v, and ¢+6e, ¢, be respectively the amounts of the volume and of the energy of the fluid per unit mass, in the tranquil stream before and after passing the disturbed region. The work done by an ideal piston pressing the fluid in towards the dis- turbed region is (p+ 8p)(v + 8v), and the work done by the emergent stream upon an ideal piston moving before it is pv, each reckoned per unit of mass, of the fluid. The whole work done on the fluid per unit mass by these ideal pistons is pdv+ vip ; add to this dw done by the paddle, and we find that, on the whole, an amount of work equal to pSv-+vdp+8w is done on the fluid in passing through the disturbed region. Hence ¢ exceeds ¢+6e by this amount; that is

to say. ' -ic=pdu+viptiw . . . . » (17),

Now the paddle and plug together act so as to render the tempera- tures equal in the tranquil streams at pressures p and p+dp. But if there were change of temperature its analytical expressior would be dt dt =— —6

ot °F du+ dp Pp Hence 8v and 8p are so proportioned as to make this vanish. That is to say, we have

. (18).

dt =e e . ° ace . . 19 : bu dt bp (19) ; dv and we have ‘ . é é =— ay be ai Sut a iP 3 hence (17) divided by 8p becomes dt _at de dp de _ dp bw 20 adv dt dp – Pp dt + v tp . . . (». dv : dv Using this in (11) we find t ow “ae v Top . ° . o> 2 & (21). dv

Dividing (21) by v, and taking the reciprocal of both members, we have the equation (16) which was to be proved.

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§ 52. Now if for any particular fluid at some one given pressure p, with infinitesimal excess 5p above this pressure for the higher pressure in the thermodynamic experiment, we find neither heating nor cooling effect in passing through the porous plug, the paddle has nothing to do; that is, Sw=0. If, with always the same pressure p, but with different values of v, that is to say, with the fluid given at different temperatures, but with pressures infinitely nearly the same, we always find the same result, Sw =0, it follows from (16) that for this particular fluid at the particular pressure of the experiment, and for all the temperatures of the experiment, we have

vy dt _y (22). t dv

Hence by integration t=Cv (23).

Hence we infer that with this fluid for thermometric substance, with the particular pressure of the experiment, and throughout the range of temperatures for which experi- ment has given us 5=0, absolute temperature is shown on a scale graduated and numbered in simple proportion to the whole volume of the fluid.

§ 53. If the thermodynamic test repeated for the same fluid at different pressures gives still the same result, we have, for all pressures and temperatures within the range for which the supposed result dw = 0 has been found by the

experiment, t=f(pyy ss (24);

where /(p) denotes a quantity which depends only on the pressure of the fluid and is independent of its density.

§ 54, Joule and Thomson's experiments on the thermal effects of fluids in motion! showed that for pressures of from one to five or six atmos hydrogen gas, common air, nitrogen, oxygen, and carbonic acid, all somewhat approximately fulfil the condition of passing through the porous plug without change of temperature,—hydrogen much more approximately, carbonic acid much less approxi- mately, than any of the others. Hence we infer that absolute temperature is somewhat approximately propor- tional to the volume of the fluid, if any one of these gases be used as the thermometric fluid in a constant-pressure thermometer. We shall presently see that the requisite correction of this statement for the case of hydrogen is so small as to be almost within the limits of accuracy of the most accurate thermometric usage.

§ 55. In the case of common air, nitrogen, oxygen, and carbonic acid, the experiments showed a slight cooling effect upon the fluid in passing through the porous plug ; in the case of hydrogen, a much smaller heating effect. According to the rigorous dynamical form of our statement of § 51, we have no right to measure these heating and cooling effects on any scale of temperature, as we have not yet formed a thermometric scale. And it is interesting to remark that in point of fact the thermodynamic experiment described in that section involves the use of a differential thermoscope (§ 13) and not of any intrinsic thermo- scope at all; and in respect to this requisite it may be contrasted with the thermodynamic investigation of § 49 previously, which involved the use, not of any continuous thermoscope, but only of a single-temperature intrinsic ther- moscope ($14). Now, instead of reckoning on any thermo- metric scale the cooling effect or the heating effect of passage through the plug, we have to measure the quantity of work (Sw) required to annul it, in the case of the majority of gases; and in the case of hydrogen, instead of reckoning on any thermometric scale the heating effect, we

1 Transactions Royal Society, June 1858, June 1854, June 1860, and June 1862.

have to measure — dw as explained in $51. The experiments as actually made by Joule and Thomson simply gave the cooling effects and heating effects shown by mercury thermo- meters in the tranquil stream towards and from tlie plug ; but the very thermometers that were used had been used by Joule in his original experiments determining the dynamical equivalent of heat, and again in his later experi- ments by which for the first time the specific heat of air at constant pressure was measured with sufficient accuracy for our present purpose. Hence by putting together different experiments which had actually been made with those thermometers of Joule's, the operation of measuring 6w, at all events for the case of air, was virtually completed. Thus according to our present view the mercury thermo- meters are merely used asa step in aid of the measurement of Sw, and their scales may be utterly arbitrary, provided we know the quantity of work required to raise unit mass of any of the fluids concerned through the particular differences of temperature actually shown by the thermo- meters in the Joule and Thomson experiment. The best way of doing this of course is to take advantage of the best measurements, that is to say Regnault's, of the thermal capacity of air at constant pressure, and then to calculate according to Joule's own measurement the dynamical equivalent of the heat required to warm water through one degree of his own thermometers.

§ 56. Let K be the thermal capacity, pressure constant, of the fluid experimented on, J the dynamical equivalent of the thermal

unit, and 3¢ the cooling effect (reckoned negative when the effect is rise of temperature), as measured by Joule's thermometers. We have

Bimee . ww tt tt CB), Hence (16) becomes ' v dt 1 : do" IK TK 8 (26). ae dp

*The experiment showed 85¢ to be simply proportional to dp not mercly for an infinitesimal difference of pressures but for pressures up to 5 or6 atmos. For the case of hydrogen? the heating effect observed amounted, per 100 inches of mercury, to '100 of a degree centigrade at temperaturcs of 4° or 5° centigrade, and to *155 of a degree centigrade at temperatures of from 89° to 93° centigrade. The investigation was not carried out in sufficient dctail to give any law of variation of this effect with temperature, and it was not even absolutely proved to be greater for the highcr than for the lower temperature. In the circumstances we may take the mean of the results for*

the higher and lower temperatures, say "13 per 100 inches of mercury, or 039 per atmo. Hence if 1M denotes the force per unit of area in the pressure called "one atmo," we have

a¢__ 1039 dp II : So : JK ee 1 – '039 To Hence at dv ¢ v- 039JK/N' which gives by integration t=C(v- 039JK/m) . (28).

The arbitrary constant C depends on the unit adopted for tempera- ture. Let this be such that the difference of temperature between freezing and boiling is 100 (whieh will make our arbitrary scale agree with the ordinary centigrade scale in respect to the difference between these two temperatures). Denote now by ¢ the absolute temperature corresponding to 0° C. The absolute tempcrature corresponding to 100° C. will be ¢)+100. Denote also by v and Vo, for the same two temperatures, the bulks of unit mass of hydrogen at any constant pressure within the limits of Joule and Thomson's experiments, say, from one to five or six atmos. Then by dividing the value of each member of (28) for 0° C. by the difference of its values for 0° and 100°, we find

aa (29).

V190— Vo

f= Pod = -0895K/n0) _

2 Joule and "homson, Transactions Royal Society, June 1860.

Hence

(30);

Evalua- tion of ratio of the ab- solute tempera- ture cor- respond- ing to 100° ©, to the absolute tempera- ture cor- respond- ing to 0° Cc

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where E denotes the expansion of hydrogen, pressure constant, from 0° to 100° C. in terms of its volume at 0°, that is to say, po A eee | |

%

Let Vy denote what the volume would be at 0° C. if the pressure were II instead of the actual pressure p. We have bs (2 mp ‘0805K/1V9) en a ii % Regnault finds (Hupériences, vol. ii. p. 122) that the value of K/M1V, for hydrogen agrees within 4 per cent. with its value for common air; and for common air he finds K=‘238. Thus with 423°5 for the value of J in metres (§ 9 above) we find JK=100°79 metres. And Regnault’s observations on the density of air give for TIV, (or the height of the homogeneous atmosphere at 0° C.) 7990 metres. Hence for common air, and therefore also for hydro- gen, JK/MV,)= 0126; and thus (32) becomes

=p (1+ 22) fears: ey <3 Noe

with c= — ‘00049 for hydrogen. For this gas expanding under constant pressure of one atmo Regnault found (Zaupériences, vol. 1.

80) E= “36613, which gives 1? = 27818. Hence (33), with

a an rn 0)

ty=

= Vo, gives

that is to say :—

§ 57. We conclude from Regnault’s observations on the expansion of hydrogen from 0° to 100° C. under a con- stant pressure of one atmo, and from the small heating effect discovered in Joule and Thomson’s experiments on the forcing of hydrogen through a porous plug, that the absolute temperature of melting ice is 273°00°, if the unit or degree of absolute temperature is so chosen as to make the difference one hundred between the temperatures of melting ice and of water with steam at one atmo of pres- sure.

§ 58. An almost identical number for that most import- ant physical constant, the absolute temperature of melting ice, is obtained from

observations on common air, and a not very different number from observations on carbonic acid, the only two gases besides hydrogen for which Regnault (Expériences, vol. i. p. 90) measured the expansion under constant pressure, and for which Joule and Thomson made their experiment on the thermal effect of passage through a porous plug. For each of these two gases the thermal effect observed was a lowering of temperature, and was found to vary at different temperatures very nearly in the inverse proportion of the square of the temperature-C., by mercury thermometer, with 273 added. Hence nearly enough for use in the small term of the denominator of (26) we have, for air and carbonic acid,

at 278 \2p .

eae nie cee a CR where ¢ denotes as before absolute temperature, and A the amount of the cooling effect per atmo of difference of pressures, on the two sides of the plug, at the temperature of melting ice, The values of A found for common air and carbonic acid are ‘275 and 1°388. Regnault (Lxpériences, vol. ii. p. 126) finds JK/IIV, greater for carbonic acid than for common air in the ratio of 1:39 to 1 on the average of temperatures from 0° to 210°. But he found also that the specific heat of carbonic acid varies greatly with the temperature ; and, taking the mean of the values which he finds for it at_0° and 100°, p. 130, as the proper mean for our present purpose, we find for JK/IIV,, a value 1°29 times its value for common air. From these experimental results we find by the mathematical process below (§ 61) still the same approximate formula (33), but with c= + ‘0026 for common air and c= +°0163 for carbonic acid. At constant pressure of one atmo Regnault’s measuréments gave E= ‘36706 for common air, and E=‘3710 for car- bonic acid; and dividing 100 by these decimals we find respectively 272°44 and 269°5. The corrections on these

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numbers by formula (33) to give the absolute temperature of freezing are accordingly +°70 and +44, and the corresponding estimates for the required absolute tempera- ture are 273°14 and 273°9. Bringing together the results in the three cases, we see them conveniently in the following table :—

P we tll | Uncor- mean! cool-~ i: owes rected esti- : i Bazin | netect /“ate ot | Correction | pera of forcing | apsolute | calculated

*oneatmo] through slr ‘oalinr.| #bsolute Name of Gas. pea porous Sod ieners sae or to Res | per atmo | melting |100 3K melting Mit. jaccording to ice. = d ; E. Joule and 100 ELV ine Thomson, = a t M. s Hydrogen….. “36613 | —0°°039 | 273°18 | —0°18 | 278-00 AI? xo nhoniee’aes, *36706 | +0°°208 | 272-44 +0°°70 273°14 Carbonic acid | °87100 | +1°°105 | 269°5 +4°°4 273°‘9*

1 Investigated in § 61 below.

The close agreement of the results from hydrogen and common air is very satisfactory, and it is interesting to see it brought about with so large a correction calculated from the Joule and Thomson effect. It is also interesting to see the sevenfold larger correction of nearly 5° bringing so nearly the same result from the 1 per cent. larger expan- sion of carbonic acid. The 4 per cent. discrepance which remains between the results from carbonic acid and from hydrogen is not satisfactory, and requires explanation, particularly when we remark that, of five measurements by Regnault (Hapériences, vol. i. p. 84) of the expansion of carbonic acid under constant pressure of one atmo, all

lie within per cent. of the mean number °3710 which

he has given, and we have taken, as his result.

Notwithstanding that the Joule and Thomson correction is so much greater for common air than for hydrogen, the result from common air is probably the most trustworthy of the three, because both Regnault’s experiments and Joule and Thomson’s were probably more accurate for air than for either of the other two gases. The true result to one place of decimals may therefore be considered as most probably being 273°1°, but the probability that it is nearer 273°1° than 273°0° is scarcely enough to make it worth while to use in any ordinary thermodynamic calculations any other number than 273°, which is exactly that found from hydrogen.

§ 59. The real meaning of our result 273°1° for the absolute temperature of melting ice, expressed without any choice of degrees or units for temperature, is that the ratio of the temperature at which vapour of water has a pres- sure of one atmo to the temperature at which ice melts is 3731/2731. Still another way of saying the same thing, this time eliminating all numerical reckoning of tempera- ture, is (see THERMODYNAMICS) as follows :—

For EVERY HUNDRED UNITS OF HEAT CONVERTED INTO Determi- WORK BY A PERFECT THERMODYNAMIC ENGINE, 373°‘1 ARE Dation of TAKEN FROM THE SOURCE, AND 273°‘1 REJECTED TO THE — REFRIGERATOR, If THE TEMPERATURE OF THE SOURCE BE etn THAT AT WHICH STEAM OF WATER HAS A PRESSURE OF with ONE ATMO, AND THE TEMPERATURE OF THE REFRIGERATOR Source — THAT AT WHICH ICE MELTS. coma

erator § 60. Integration of differential equation (26), § 56, between volume “ those

and absolute temperature for a gas, derived from the Joule and tempera Thomson experiment.

. i t 4 Returning to § 56 we may wiite equation (26) as follows :— ae dt bt t — -—v= ae ° é ° ° é e a dt i ss (36)

For each of the five gases experimented on, namely, common air, oxygen, nitrogen, carbonic acid, hydrogen, the experiment showed that, for all pressures up to five or six atmos, d¢/8p was sensibly independent of the pressure, but that it varied very considerably with the temperature. Hence, if we put 8¢/ip=6/T, 0, which will

thus denote the cooling effect per atmo of differential pressure, is a |

function of the temperature, and is independent of the whole pres- sure. With this notation (36) becomes

This is a linear equation in z with a second member, if for a moment we put z=log¢. Integrating it, and replacing ¢, we find, as the complete integral,

ft ont | mK fsa) ee ee 0 to

§ 61. Expansions of different gases, pressure constant, calculated from the Joule and Thomson experiment. We have from equation (87)

*7 t ———~=—— , 14+ —— es 5 si LOONs V% to * Te, 1-0 / 2 (38) t 0*

For each of the gases experimented on, except hydrogen, @ was found to vary nearly in the inverse ratio of ¢, Putting then 6=A(t,/t)?, we find

t t, \3 inf oauje—$al 1 – (2)]- a to

Hence, for these gases at pressures from 0 to 5 or 6 atmos, (38)

becomes ‘i ae gaze to (to 7 ieee 3 Tn, 1 o+ ; ere) E

This shows that the “ proper mean cooling effect” (M in the table

of § 58) is és [1 sm0’r5 (roe) 14 =4 1 caaggtragen Ao “756A, which differs so little from a(1 – isan)! 760A ,

the arithmetic mean of the cooling effects at 0° and 100° C., that if we had simply taken the arithmetic mean for each of the other gases, as for want of knowing better we took it for hydrogen, the differenee in the result would have been barely perceptible.

§ 62. Modifying (89) or (88) to suit any two temperatures, ¢, ?’,

we have : v-v t-t JK — (a + iam) 2 = er m denoting the proper mean cooling effect per atmo in the Joule and Thomson experiment (to be reckoned as negative in the case of hydrogen or any other gas, if there is any other, in which the ex- periment shows a heating effect). This “ proper mean” may be taken as the arithmetic mean of the valucs for ¢ and ?¢’, unless t—-t’ considerably exceeds 100.

To reduce (40) to numbers, let Vy be the volume of unit mass of the gas when at the temperature of melting ice, and under one atmo of pressure. Regnault (vol. ii. p. 308) finds that the value of K/V, is within 1 per cent. the same for oxygen, nitrogen, and hydrogen as for common air. He also (vol. ii. pp. 224-226) finds K to be the same for common air at from 1 to 12 atmos; for hydrogen, 1 to 9; for carbonic acid, 1 to 37.

No doubt similar constancy would be found for oxygen and nitrogen. Hence, as above (§ 56), for common air we still have JK/MV,= °0126, and thus (40) becomes

pet Se Vv for eommon air, 5 F(1 +o ‘126m) oxygen, is ay

hydrogen, and nitrogen

If in this formula we take ¢ and ¢’ for the temperatures of 100° C.

and 0° C., (v-v’)/ v’ becomes a or ‘3662; and we therefore find B= ‘3662(1 + Me 0126”) — which agrees with (88) above. ;

§ 63. The values given by Joule and Thomson’s experi- ment for m are — 0‘039° for hydrogen, + 0°208° for air, + 0°253° for oxygen, and + 0‘249° for nitrogen.

From these and from the previous results for carbonic acid (§ 58) we have the following table for calculating the

Name of Gas. Expansion under constant pressure (=E).

Ty diog@ir. si… %oa ‘3662 (1- 0°00049 V,/v))

Common 4ir ….43…... 3662 (14+0°0026 V,/v)

Oxy. os. cccoc ‘3662 (14+0°0032 V,/v) +. + (48). NIGROGEM §oocs.. scree. 3662 (14+.0°0031 Vo/v) | – Carbonic acid ……..... 8662 (1+0°0163 V,/v)

These formule must be exceedingly near the truth for all pressures from 0 to 6 atmos, because within this range the thermal effects in the Joule and

Thomson experiment were very approximately in simple proportion to the differences of pressure on the two sides of the plug. The following table of results calculated from (43) for several pressures of from 0 to 6 atmos is interesting as showing such different expansions for the different cases,

determined by thermodynamic theory from Regnault's ©

measurements of specific heats and Joule and Thomson's of their particular thermal effect, with absolutely no direct measurement of expansion except the one for common air at one atmo, shown as the third entry of column 5 in the table. The other five entries of column 5 show a fair amount of agreement between our theoretical results and the only direct measurements by Regnault. More of direct measurement, to allow a more extensive comparison, is very desirable.

Ratio of Den- Ratio of Bulk j sity at 0°C. at 0° C. to Bulk | to Density

Expansion, pressure eonstant, from

pier ; 0° to 100° C. supposing supposing oe ee peg A ., atmo at the | were 1 atmo naan NGMS. same tempera- | at the same Dag soni ture. temperature. According to experi- Vo Nos theory. | ments by Vo. V Regnault. co 0 3662 Wie

*1 1 *3660 36613*

*Hydrogen. sess: 1/3 3 3657 Sos 1/3°35 3°35 3656 *36616 1/6 6 3651 eon co 0 3662 at*

1 1 3672 36706

Common Air……. 1/3 3 3691 – 1/3°38 3°38 3694 36954 1/6 6 8719 ii (co 0 oa d il il 36 Se I 1/3 3 3697

1/6 6 3732

co 0 3662

; 1 1 3673

Nitrogeniis…..%: 1/3 3° 3696

1/6 6 3780

© 0 3662 aia

1 1 3721 37099

*Carbonic Acid….. 1/8 3 3841 a8 1/3°316 3°316 *3859 88455 1/6 6 “4019 aie*

§ 64. We are now quite prepared to make a practical working thermometer directly adapted to show temperature on the absolute thermodynamic scale through the whole range of temperature, from the lowest attainable by any means to the highest for which glass remains solid. It is to be remarked that our investigation of § 51, and all the deduced formule and relative calculations, are absolutely independent of the approximate fulfilment of Boyle’s law by the gases to which we have applied them, and are equally applicable without any approach to fulfilment of Boyle’s law ; also that the only experimental data on which are founded our special numerical conclusions of §§ 59 to 63 are Regnault’s measurements of specific heats under constant pressures, and Joule and Thomson’s measurements of the thermal effect of forcing through a porous plug. From these experimental data alone we see by formula (38) of § 61 how to graduate a constant-pressure gas thermo- meter so that it shall show temperature on the absolute thermodynamic scale. Hence, notwithstanding the diffi- culty (§ 24 above) which Regnault found in the thermo- metric use of air or other gases on the system of constant pressure, and his practical preference for the constant-volume

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air thermometer, it becomes of the highest importance to construct a practical constant-pressure gas thermometer. This we believe may be done by avoiding the objectionable expedient adopted by Pouillet and Regnault of allowing a portion (when high temperatures are to be measured the

greater portion) of the whole gas to be pressed into a cool volumetric chamber out of the thermometric chamber proper by the expansion of the portion which remains in ; and instead fulfilling the condition, stated, but pronounced practically impossible, by Regnault (Zxpériences, vol. i. pp. 168, 169), that the thermometric gas "shall, like the mercury of a mercury thermometer, be allowed to expand freely at constant pressure in a calibrated reservoir maintained throughout at one temperature," We have accordingly designed a constant-pressure gas thermo- meter to fulfil this condition. It is represented in the accompany- ing drawing (fig. 10), and de- scribed in the following section. § 65. The vessel containing the thermometric fluid, which in this case is to be either hydrogen or nitrogen,' consists in the main ®| of a glass bulb and tube placed vertically with bulb up and mouth down; but there is to be a secondary tube of much finer bore opening into the bulb or into the main tube near its top, as may be found most convenient in any particular case. The main tube which, to distinguish it from the secondary tube, will be called the volumetric tube, is | to be of large bore, not less than 2 or 3 centimetres, and is to be ground internally to a_ truly cylindric form. To allow this to be done it must be made of thick, well-annealed glass like that of the French glass-barrelled air-pumps. The secondary tube, which will be called the mano- AAT metric capillary, is to be of Fic. 10.—Constant-Pressure round bore, not very fine, say Hydrogen Thermometer. from half a millimetre to a millimetre diameter. Its lower end is to be connected with a mercury manometer to show if the pressure of the thermometric air is either greater or less than the definite pressure to which it is to be brought every time a thermometric measurement is made by the instrument. The change of volume required to do this for every change of temperature is made and

aka Melk eid A

' 1Common air is inadmissible because even at ordinary temperatures

its oxygen attacks mercury. The filin of oxide thus formed would be very inconvenient at the surface of the mercury caulking, round the base of the piston, and on the inner surface of the glass tube, to which it would adhere. Besides sooner or later the whole quantity of oxygen in the air must be diminished to a sensible degree by the loss of the part of it which combines

with the mercury. So far as we know, Regnault did not complain of this evil in his use of common air in his normal air thermometer (see §§ 24, 25 above), nor in his experiments on the expansion of air (Hxpériences, vol. i.), though probably it has vitiated his results to some sensible degree. But he found it to pro- duce such great irregularities when, instead of common air, he experi- mented on pure oxygen that from the results he could draw no conclusion as to the expansion of this gas (Hapériences, vol. i. p. 77). Another reason for the avoidance of air or other gas containing free oxygen is to save the oil or other liquid which is interposed between it and the mercury of the manometer from being thickened or otherwise altered by oxidation.

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measured by means of a micrometer screw? lifting or lower- ing along solid glass piston, fitting easily in the glass tube, and caulked air-tight by mercury between its lower end and an iron sole-plate by which the mouth of the volumetric tube is closed. To perform this mercury caulking, when the piston is raised and lowered, mercury is allowed to flow in and out through a hole in the iron sole-plate by an iron pipe, connected with two mercury cisterns at two different levels by branches each provided with a stopcock. When the piston is being raised the stopcock of the branch leading to the lower cistern is closed, and the other is opened enough to allow the mercury to flow up after the piston and press gently on its lower side, without entering more than infinitesimally into the space between it and the surrounding glass tube (the condition of the upper bounding surface of the mercury in this respect being easily seen by the observer looking at it through the glass tube). When the piston is being lowered the stopcock in the branch leading from the upper cistern is closed, and the one in the branch leading to the lower cistern is opened enough to let the mercury go down before the piston, instead of being forced to any sensible distance into the space between it and the surrounding tube, but not enough to allow it to part company with the lower surface of the piston. The manometer is simply a mercury barometer of the form com- monly called a siphon barometer, with its lower end not open to the air but connected to the lower end of the manometric capillary. This connexion is made below the level of the mercury in the following manner. The lower end of the capillary widens into

a small glass bell or stout tube of glass of about 2 centimetres bore and 2 centimetres depth, with its lip ground flat like the receiver of an air- pump. The lip or upper edge of the open cistern of the barometer (that is to say, the cistern which would be open to the atmosphere were it used as an ordinary barometer) is also ground flat, and the two lips are pressed together with a greased leather washer between them to obviate risk of breaking the glass, and to facilitate the making of the joint mercury tight. To keep this joint perennially good, and to make quite sure that no air shall ever leak in, in case of the interior pressure being at any time less than the external barometric pressure or being arranged to be so always, it is preserved and caulked by an external mercury- jacket not shown in the drawing. The mercury in the thus constituted lower reservoir of the manometer is above the level of the leather joint, and the space in the upper part of the reservoir over the surface of the mercury, up to a little distance into the capillary above, is occupied by a fixed oil or some other practically vapourless liquid. This oil or other liquid is introduced for the purpose of guarding against error in the reckoning of the whole bulk of the thermometric gas, on account of slight irregular changes in the capillary depression of the border of the mercury sur- face in the reservoir.

$66. In the most accurate use of the instrument, the glass and mercury and oil of the manometer are all kept at one definite temperature according to some convenient and

2This screw is to be so well fitted in the iron sole-plate as to be sufficiently mercury-tight without the aid of any soft material, under such moderate pressure as the greatest it will experience when the pressure chosen for the thermometric gas is not more than a few centi- metres above the external atmospheric pressure. When the same plan of apparatus is used for investigation of the expansion of gases under high pressures, a greased leather washer may be used on the upper side of the sole in the screw-hole plate, to prevent mercnry from escaping round thescrew. It is to be remarked that in no case will a little oozing out of the mercury round the screw while it is being turned introduce any error at all into the thermometric result ; because the correctness of the measurement of the volume of the gas depends simply on the mer- cury being brought up into contact with the

bottom of the piston, and not more than just perceptibly up between the piston and volumetric tube surrounding it.

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perfectly trustworthy intrinsic thermoscope (S$ 15 and 16 above), by means of thermal appliances not represented in the drawing but easily imagined. This condition being fulfilled, the one desired pressure of the thermometric gas '3 attained with exceedingly minute accuracy by working the micrometer screw up or down until the oil is brought precisely to a mark upon the manometric capillary.

In fact, if the glass and mercury and oil are all kept rigorously at one constant temperature, the only access for error is through irregular variations in the capillary depres- sions in the borders of the mercury surfaces. With so large a diameter as the 2 centimetres chosen in the figured dimensions of the drawing, the error from this cause can hardly amount to z}> per cent. of the whole pressure, supposing this to be one atmo or thereabouts.

For ordinary uses of our constant-pressure gas ther- mometer, where the most minute accuracy is not needed, the rule will still be to bring the oil to a fixed mark on the manometric capillary; and no precaution in respect to temperature will be necessary except to secure that it is approximately uniform throughout the mercury and con- taining glass, from lower to higher level of the mercury. The quantity of oil is so small that, whatever its tempera- ture may be, the bringing of its free surface toa fixed mark on the capillary secures that the mercury surface below the oil in the lower reservoir is very nearly at one constant point relatively to the glass, much more nearly so than it could be made by direct observation of the mercury surface, at all events without optical magnifying power. Now if the mercury surface be at a constant point of the glass, it is easily proved that the difference of pressures between the two mercury surfaces will be constant, notwithstanding considerable variations of the common temperature of the mercury and glass, provided a certain easy condition is fulfilled, through which the effect of the expansion of the glass is compensated by the expansion of the mercury. This condition is that the whole volume of the mercury shall bear to the volume in the cylindric vertical tube from the

upper surface to the level of the lower surface the ratio (\ – 40)/(A-o), where \ denotes the cubic expansion of the mercury, and o the cubic expansion of the solid for the same elevation of temperature, it being supposed for simpli- city of statement that the tube is truly cylindric from the upper surface to the level of the lower surface, and that the sectional area of the tube is the same at the two mercury surfaces. The cubic expansion of mercury is approximately seven times the cubic expansion of glass, Hence

(a—40)/(A- o) = (7 – $)/6=1111.

Hence the whole volume of the mercury is to be about 1°111 times the volume from its upper surface to the level of the lower surface; that is to say, the volume from the lower surface in the bend to the same level in the vertical branch is to be 4 of the volume in the vertical tube above this surface. A special experiment on each tube is easily made to find the quantity of mercury that must be put in to cause the pressure to be absolutely constant when the surface in the lower reservoir is kept at a fixed point rela- tively to the glass, and when the temperature is varied through such moderate differences of temperature as are to be found in the use of the instrument at different times and seasons.

A sheet-iron can containing water or oil or fusible metal, with external thermal appliances of gas or charcoal furnace, or low-pressure or high-pressure steam heater, and with proper internal stirrer or stirrers, is fitted round the bulb and manometric tube to produce uniformly throughout the mass of the thermometric gas the temperature to be measured. This part of the apparatus, which will be called for brevity the heater, must not extend so far down the manometric tube that when raised to its highest tempera-

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ture it can warm the caulking mercury to as high a temperature as 40° C., because at somewhat higher tem- peratures than this the pressure of vapour of mercury begins to be perceptible (sce Table V. below), and would vitiate the thermometric use of the pure hydrogen or nitrogen of ourthermometer. To secure sufficient coolness of the mercury it will probably be advisable to have an open glass jacket of cold water (not shown in the drawing) round

the volumetric tube, 2 or 3 centimetres below the bottom of the heater, and reaching to about half a centi- metre above the highest position of the bottom of the piston.

§ 67. It seems probable that the constant-pressure hydrogen or nitrogen gas thermometer which we have now

described may give even more accurate thermometry than

Regnault's constant-volume air thermometers (§ 24 above), and it seems certain that it will be much more easily uscd in practice.

We have only to remark here further that, if Boyle's law were rigorously fulfilled, thermometry by the two methods would be identical, provided the scale in each casc be graduated or calculated so as to make the numerical reckoning of the temperature agree at two points,—for example, 0° C. and 100°C. The very close agreement which Regnault found among his different gas thermometers and his air thermometers with air of different densities (§ 25 above), and the close approach to rigorous fulfilment of Boyle's law which he and other experimenters have ascer- tained to be presented by air and other gases used in his thermometers, through the ranges of density, pressure, and temperature at which they were used in these thermo- meters, renders it certain that in reality the difference betwcen Regnault's normal air thermometry and thermo- metry by our hydrogen gas constant-pressure thermometer must be exceedingly small. It is therefore satisfactory to know that for all practical purposes absolute tempera- ture is to be obtained with very great accuracy from Regnault's thermometric system by simply adding 273 to his numbers for temperature on the centigrade scale. It is probable that at the temperatures of 250° or 300° C. (or 523 or 573 absolute) the greatest deviation' of tem- perature thus reckoned from correct absolute temperature is not more than half a degree.

§ 68, The thermometric scale being now thoroughly estab- lished in theory and practice (§§ 33-69 and § 18-80), we are prepared to define, without any ambiguity, the expressions thermal capacity and specific heat with reference to matter at any temperature and in any physical condition.

Definition 1.—The thermal capacity of a body (whether it be a portion of matter homogeneous throughout or of homogeneous substance in two different conditions as liquid

Conclu- sion of er- mometry.

“Their capaci- ties” and “specific

aud steam, or solid and vapour of solid, or a piece of neats,”

apparatus consisting of different parts as glass and metals, and containing as the case may be liquids or gases,—subject only to the condition that the whole matter considered is at one temperature) is the quantity of heat required to raise its temperature by one degree on the absolute thermo-dynamic scale.

Definition 2.—The specific heat of a substance is the thermal capacity of a stated quantity of it. This stated quantity is generally understood to be the unit of mass, unless some other definite quantity is explicitly designated, as for instance the quantity of the substance which occu- pies unit of volume at some definite pressure and tem- perature, for instance, one atmo and temperature 273 absolute. It is of no consequence what unit of mass is chosen provided it be the same as that which is used in defining the thermal unit; but, unless the contrary be explicitly stated, we always understand one gramme as the unit of mass and the thermal unit as the quantity of heat

Trans- ference of heat by con- duction.

By ra- diation.

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required to raise one gramme of water from 273 to 274 (compare § 6 above).

§ 69. There is scarcely any subject upon which more skilled labour in scientific laboratories, chemical and phy- sical, has been spent than the measurement of specific heats, whether of solids, liquids, or gases. An

ample and well-arranged table of results is to be found in Clarke's Constants of Nature, a compilation of numerical results of scientific experiments made in all parts of the world by various observers and experimenters, a. most valuable aid to scientific knowledge given to the world as No. 255 of the Smithsonian Miscellaneous Collections. It is most interesting as showing how very differently dif- ferent substances behave in respect to constancy or variation of specific heat with temperature. Thus it shows that, according to the results of all the experimenters, the specific heats of all the substances experimented on, whether simple or compound, are very nearly constant at all events for ranges between — 10° and 200° or 300° C., except the three elementary substances, boron, carbon, silicon. The specific heats of these three have been found by F. Weber to vary greatly with temperature. Thus for diamond he finds the specific heat to be '1 at 0° C. and 27 at 206° C., or nearly threefold of the amount at 0°; at —50° C. the specific heat is 063 ; and at + 985° it is 459 or about seven and a half times the specific heat at — 50° (a curious practical commentary, we may remark in passing, on the doc- trine of the calorists on specific heat referred to in § 8 above). The specific heats of carbon in its other forms of graphite and charcoal through wide ranges of temperature according to the same observer, F. Weber, are particularly interesting and significant. The approximate equality of the product of specific heat into the atomic weight for the simple metals is interesting and important; no less so is the utter want of constancy and uniformity in the corresponding product for other substances, whether simple or compound, If we were to define a metal as a substance for which through the range of temperature from 0° to 250° C. the product of the specific heat into the atomic weight is not less than 5°86 and not greater than 6°93, we should include every substance commonly called a metal, and no substance not commonly called 2 metal, except phosphorus, and solid sulphur lately fused.

Some important results of Regnault's regarding the specific heats of gases under constant pressure have been already quoted in §§ 56, 58, and 62 above. Further infor- mation from experiments aided by thermodynamic theory, regarding specific heats of gases and vapours under constant pressure and of gases in constant volume, will be found under the heading THERMopyNamics. To this also, and to the articles Matter (PROPERTIES OF), Liqurp, and Srsam, the reader is referred for information respecting

latent heats of liquefaction of solids and of evaporation of solids and liquids, also respecting the thermal capacity of a portion of homogeneous substance in two different states, such as the water-liquid and water-steam of an ordinary cryophorus or philosopher's hammer, or of the sulphurous acid liquid and steam of a sulphurous acid steam thermo- meter (§ 43 above).

TRANSFERENCE OF HEAT.

§ 70. When two contiguous portions of matter are at dif- ferent temperatures, heat is transferred from the warmer to the colder. This process is called conduction of heat.

When two bodies at different temperatures are separated by a transparent medium, such as air, or water, or glass, or ice, heat passes from the warmer to the colder irrespectively of tle temperature of the intervening medium, except in so far as its transparency may in some slight degree be affected by the temperature. Thus the colder of the two bodies be-

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O77 comes actually heated above the temperature of theinterven- ing mediuni if the warmer be kept above this temperature, and if heat is not otherwise drawn off from the colder body in greater quantity than the heat entering it from the warmer. This process of transference from one body to another body ata distance through an intervening medium is called radia- tion of heat. The condition of the intervening matter in virtue of which heat is thus transferred is called light; and radiant heat is light if we could but see it with the eye, and not merely discern with the mind, as we do, that it is per- fectly continuous in quality with the species of radiant heat which we see with the material eye through its affecting the retina with the sense of light. Thus a white hot poker in a room perfectly darkened from all other lights is seen as a brilliant white light gradually becoming reddish and less bright, until it absolutely fades from vision in a dull red glow. Long after it has ceased to be visible to the eye, the fact, that heat is being transferred from it to colder bodies all round it, or above it or below it, is proved by our sense of heat in a hand or face held near it on any side or above it or below it. By considering the whole phenomenon of the white hot mass, without

much of experimental investi- gation, we judge that there is perfect continuity through the whole process, in the first part of which the radiant heat is visible and in the second part invisible to the human eye: and thorough experimental investigation confirms this con- clusion. 'Thus radiant heat is brought under the undula- tory theory of light, which in its turn becomes annexed to heat as a magnificent outlying province of the kinetic theory of heat.

§ 71. In this article we confine ourselves to a practical evaluation of rate of gain or loss of heat across the surface of an isolated solid placed in a medium such as air, and enclosed in a solid surface all at one temperature, as is ap- proximately the case with the air and the floor, walls, and ceiling of an ordinary room. A rough approximation to the law of this action, founded on supposing the rate of motion to be in simple proportion to the excess of the tem- perature of the isolated solid above the temperature of the surrounding medium and enclosure was used by Fourier in those of his solutions in which surface emissivity or, as he called it, "'Conductibilité extérieure," is concerned. Without adopting any hypothesis, we define thermal emissivity as the quantity of heat per unit of time, per unit of surface, per degree of excess of temperature, which the isolated body loses in virtue of the combined effect of radiation and convection by currents of air. This defini- tion does not involve the hypothesis of simple proportion- ality; and the surface emissivity is simply to be determined by experiment for any given temperature of the enclosure, and any given temperature of the isolated body. Dulong and Petit made elaborate experiments on this subject, but did not give any results in absolute measure.

So far as we know the first thoroughly trustworthy ex- periments giving emissivities inabsolute measure were made in the laboratory of the natural philosophy class in the university of Glasgow by Mr D. Macfarlane, in a series of experiments on the cooling of a copper ball. The results are given in Table VII. The ball experimented on was 4 centimetres in diameter, and was suspended in the interior of a double-walled tin-plate vessel. The space between the double walls of this vessel was filled with water at the temperature of the air, and the interior surface was coated with lampblack. Two thermo-electric junctions, one at the centre of the ball the other in contact with the exterior surface of the enclosure, in circuit with a sensitive

mirror galvanometer, served to measure the difference of temperatures between the centre of the ball and the exterior surface of the enclosure. By this arrangement the exterior junction was kept very uniformly at a tempera-

identi- cal.

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ture of 14° C., while the other had the varying tempera- | ture of the centre of the ball. Two sets of experiments were made. In one the ball had a bright surface, in the other it was coated with soot from the flame of a lamp, and in both the air was kept moist by a saucer of water placed in the interior of tle tinplate enclosure. The re- sults are given in terms of the number of units of heat lost per second, per square centimetre of surface of the copper, per degree of difference between the temperatures of the two junctions.

§ 72. Returning to the conduction of heat, we have first to say that the theory of it was discovered by Fourier and given to the world through the French Academy in his Théorie Analytique de la Chaleur,! with solutions of pro- | blems naturally arising from it, of which it is difficult to say whether their uniquely original quality, or their transcend- ently intense mathematical interest, or their perenniallyim- portant instructiveness for physical science, is most to be praised. Here we can but give the very slightest sketch of the elementary law of conduction in an isotropic substance, the mathematical expression for it in terms of orthogonal plane or curved coordinates, and a few of the elementary solutions in Fourier's theory.

§ 73. Consider a slab of homogeneous solid bounded by two parallel planes. Let the substance be kept at two dif- ferent temperatures over these parallel planes by suitable sources of heat and cold. For example, let one side be kept cold by a stream of cold water, or by a large quantity of ice and water in contact with it, and the other kept warm by a large quantity of

warm water or by steam blown against it. Whatever particular plans of heater and refri- gerator be adopted, care must be taken that the temperature be kept uniform over the whole, or over a sufficiently large | area of each side of the slab, to render the isothermal surfaces sensibly parallel planes through the whole of the slab intercepted between the two calorimetric areas, and that the temperature at each side is prevented from varying with time. It will be found that heat must con- tinually be applied at one side and removed from the other, to keep the circumstances in the constant condition thus defined. When this constant condition of surface tempera- ture is maintained long enough, the temperature at every point of the slab settles towards a constant limiting value ; and when this limiting value has been sensibly reached by every point of the slab, the temperature throughout remains sensibly constant so long as the surface temperatures are kept constant. In this condition of affairs the temperature varies continuously from one side of the slab to the other ; and it is constant throughout each interior plane parallel to the sides ; in other words, the isothermal surfaces are paral- lel planes. 'Let V and V' be the temperatures in two of these isothermals and a the distance between them. The

quotient is the average rate of variation of tem-

perature per unit of length between these two isothermals. Let Q be the quantity of heat taken in per unit of time at a certain area A on one side, and emitted at the correspond- ing area of the other side of the slab, measured by proper , calorimetrical appliances to these areas, which we shall call the calorimetric areas of the apparatus. It will generally be found that the value of the quotient (V-V')/a is not the same for consecutive isothermal surfaces. For metals it is ascertained by experiment that it increases continuously from the cold side to the hot side of the slab. In other words, as we shall see presently, the thermal conductivity of the substance is not generally the same at different temperatures, and for metals it is smaller the higher the temperature.

_ | A translation into English by Freeman has been recently published, in 1 vol. 8vo, by the Cambridge University Press, 1879.

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§ 74, Circumstances being as described in § 73, the thermal conductivity of the substance between the isother- mals v and v' is the value of

Qa

A(u-v') fh

It must be remembered that the temperatures 2, v' used in this definition are temperatures of the substance itself. Some experimenters have given largely erroneous results through assuming that the temperatures of the two sides of the slab were equal to those of the calorimetric fluids, such as warm water or steam on one side, and iced water or cold

_ water, with its temperature measured by a thermometer, on

tlie other side. 'To obtain correct results, the actual tem- peratures at two points in the conducting body itself must be ascertained by aid of suitable thermometers, or thermo- meters and differential thermoscopes, applied in such a way as not sensibly to disturb the isothermal surfaces. This, so far as we know, has not been done by any experimenter hitherto in attempting to measure thermal conductivity directly by the method indicated in the definition; and therefore if any results obtained by this method hitherto are trustworthy, it is only in a few cases,—cases in which, un- less the substance experimented upon has been of such small conducting power, and the stirring of the calorimetric fluids on its two sides so energetic, that we can feel sure

| that the observed or assumed temperatures of these fluids, | or of the portions of them of which the temperatures have _ been measured by thermometers, have not differed sensibly _ from the temperatures of the slab at its surfaces in contact _ with them.

§75. What utter confusion has permeated scientific literature, from experiments on thermal conductivity vitiated

| through non-fulfilment of this condition, is illustrated by results quoted in Everett's Units and Physical Constants

(London, 1879), among which we find °19 for the conduc- tivity of copper according to Péclet, and 1°1 according to ngstrém (which we now know to be correct). When we look to Péclet's and Angstrém's own papers the confusion becomes aggravated. Péclet, in his Mémoire sur la déter- mination des coefficients de conductibilité des métaua par la chaleur,? quotes old experiments of Clément, and others more recent of Thomas and Laurent, regarding which he gives certain details. Taking his information no doubt from Péclet's paper, Angstrém gives a statement? for the conductivity of copper, according to experimenters who had preceded him, which, with the decimal point shifted two places to the left to reduce to C. G. §., is as follows :—

Clénient®. ane EEL I SR 00231 Thomas and Laurent,..... INR AN cw sa NES 0122 NOC Otis cca ea realeate na a. « Sa NNRN ERs 178

But Angstrém did not notice that Péclet had stated the thickness of the plate experimented on by Clément to be between 2 and 3 millimetres. Péclet himself in his next seutence seems to have forgotten this when he compares the figure -23 which he had calculated from Clément's

results, without taking account of the thickness of the plate,

with 1:22 which he calculates from Thomas and Laurent's experiments on copper, without stating any thickness for the tube of copper on which (instead of a flat plate) they had experimented. Thus we have no data for finding what their results really were in either Péclet's or Angstrém's paper; but Péclet seems to show enough regarding it to let us now feel perfectly sure that it is only a question of

2 Annales de Chimie et de Physique, Paris, 1841.

3 In Angstrém's own statement the unit quantity of heat is that required to raise 1000 grammes of water 1°. The conduction is reckoned per square metre of the copper plate per second of time, and the unit chosen for the rate of variation of temperature across the plate is 1° per millimetre. To reduce his numbers to the C. G. 8. system we must therefore multiply by 10? x 10-4× 10-1=10-%

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whether it is tens or hundreds of times too small, Omit- ting it then from the preceding statement, completing the correction by multiplying the 0023 by 24 (assuming the thickness of the plate to be 24 millimetres, as Péclet says it was between 2 and 3) to give Clément's result, and appending Angstrém's result, which we now know to be correct, we have the following statement for thermal con- ductivity of copper in C. G. S. units :—

0057, according to Clément.

WS. Lae ss Péclet.+

Bay – ngstrom,

§ 76. The comparison of these results is highly instruc- tive. Clément's result is two hundred times too small, and Péclet's five times too small. Clément experimented by exposing one side of a plate of copper of a square metre surface and about two and a half millimetres thick to steam at 100° C., and the other side to water at 28° C. It was assumed that the difference of temperatures between the two sides was 72°. The difference really was about °36 of a degree, as we know from the quantity of heat actually conducted through it in Clément's experiment, indicated by the amount of steam which he found to be condensed into water. In fact, the amount of steam condensed did not differ sensibly from what it would have been if the copper plate had been infinitely thin, or its substance of infinite thermal conductivity. It is important in engineering, and in many of the arts and manufactures involving thermal processes, and particularly in that one of them of greater everyday value to the human race than all the others put together, cookery, to know that for copper or iron boilers, or steampipes, or pots or frying-pans, the transmission of heat from radiant burning coal or charcoal, or red or white hot fireclay or other solids, and from hot air in contact with them, ou one side, to hot water or steam or oil or melted fat on the other side, or hot liquid or steam on one side and cool air on the other side, is for practical purposes sensibly the same as if the thermal conductivity of the metal were infinite, or its resistance to the transmission of heat nothing. The explanation is obvious to us now with the definite and sure knowledge regarding thermal conduc- tivities of different substances

and of matter in different conditions, solid, liquid, and gaseous, gained within the last twenty years. Angstrém, Forbes, F. Neumann, and Tait have given, each one of them with thoroughly sufficient experimental evidence to leave no room to doubt the sub- stantial accuracy of his results, absolute values for the thermal conductivities of copper and iron. Clausius and Maxwell have given us thermal conductivities of air and other gases, from their splendid development of the kinetic ‘ theory, which are undoubtedly trustworthy as somewhat close approximations to the true values, and which it is quite possible are more accurate than we can hope to see ob- tained from direct measurements of the conduction of heat

through gases. J. T. Bottomley has given a trustworthy |

and somewhat closely accurate direct measurement of the thermal conductivity of water. From the results of these

inferred from knowledge of the average temperature of the whole fluid, or from the temperatures of entering and leaving currents of fluid, may differ by scores of degrees from the actual temperature of the solid at the interface. It is remarkable that Péclet, while perceiving that Clément’s result was largely erroneous on this account, and improving the mode of experimenting by introducing a rotating mechanical stirrer to change very rapidly the fluid in contact with the solid, only multiplied Clément’s con- ductivity by 30 instead of by 200, which would have been necessary to annul the error. Notwithstanding his failure to obtain accurate results for metals, we have ventured to include his results for wood, and solids of lower con- ductivity than wood, in our table, because we perceive that he was alive to the necessity for very energetic stirring of the liquid, and the mechanical means which he adopted for it, though utterly insufficient for the case of even the least conductive of the metals, were probably not so for wood and solids of lower conductivity than wood ; and because it is not probable that the complication of heat generated by the stirring (which Angstrom suggests as an objection to Péclet’s method) was in any case sufficient to produce a sensible influence upon the experimental results.

§ 77. The first correct determinations of thermal conduc- tivities were given by Forbes in his paper on the tempera- ture of the earth, in the 7vansactions of the Royal Society of Edinburgh for 1846, as calculated from

his observations of underground temperature at three localities in the neighbourhood of Edinburgh—the trap rock of Calton Hill, the sand of the Experimental Garden, and the sand- stone of Craigleith Quarry—by an imperfect approximate method indicated by Poisson. A more complete analytical treatment of the observational results, analysed harmoni- eally and interpreted by application of Fourier's formula (equation (19) of Math. App.) to each term separately by W. Thomson, gave results (quoted in Table VIII. below) for the conductivities, which differed but little from Forbes's approximate determinations,

§ 78. It has always seemed to us that the best mode of Estimat- experimenting on the conductivity of metals must, without ing and doubt, be by an artificial imitation in a metallic bar, of ("RN the natural periodic variations of underground temperature, eee produced by periodically varied thermal appliances at one periodic end of the bar. 'The effect of loss or gain of heat through varia- the sides (or lateral surface) of the bar (ideally annullable 4o"s of

by a coating of ideal varnish impermeable to heat) may be a

| practically annulled by making the period of the variation the

small enough. tis Let & be the thermal conductivity of the substance and c its Rian

thermal capacity per unit bulk. Let ¢ be the emissivity (§ 71) of jp oters. its surface. Let the bar be circular-cylindric, and 7 the radius of its cross section. At time ¢, let v be the mean temperature in a cross section at distance x from the end, and v' the surface tempera- ture at the circular boundary of this section,—all tempcratures being reckoned as differences from the temperature of the surrounding

| medium, called zero temporarily for brevity. The heat lost from

experimenters' work, reduced to uniform C. G. S. reckon-

ing in our table of thermal conductivities (Table VIIL.), |

we see that the thermal conductivity of iron is 80 times,

and that of copper 500 times that of water. The thermal | conductivity of iron is 3500 times, and that of copper |

is 20,000 times that of air. Hence, although the water or air at the very interface of its contact with the metal is essentially at the same temperature as the metal, there must be great differences of temperature in very thin layers of the fluid close to the interface when there is large flux of heat through the metal, and the temperature of the fluid as measured by any practicable thermometer, or

1 This result was published by Péclet in 1853, ina work entitled Nouveaux documents relatifs au chauffage et a la ventilation.

the circumference of the bar between the cross sections x ~ 4d" and x +4dx in time dt is ev'. 2erdxdt, and the heat conducted lengthwise,

; , ; , dv across the cross section x, in the same time, is La Hence we

readily find (see Math. App. below) as the equation of conduction of heat along the bar, very approximately if v' differs very little from v (that is to say, if the temperature is very nearly uniform throughout each cross section),

dv af,dv\ 2

lial (ee Oe ee ee

"at 5 #5) rp Mh) To estimate v', let v'" be the temperature at the centre of the cross

section a, and let = "denote the rate of decrease of tempera-

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ture from within outwards in the substance of the bar close to its

surface. We have clearly

and, because the emission is supplied by conduction from within,

1p ev =k ae Hence vw vc Oy. < i

The value of ¢ fora blackened globe hung within a hollow, with blackened bounding surface, is about zz according to Macfarlane's experiments (Table VII. below), and considerably less for surfaces with any degree of polish. We may therefore take zy'yp a8 a maximum value for e. The valucs of & for copper and iron at ordinary temperatures are, in C. G. S., approximately '95 and "18. Hence, if r=5 ems. (or the diameter of the bar 10 cms., which is more than it is likely to be in any laboratory experiments), we find

/

" — irr for copper, and :

and if we suppose & to be independent of temperature, (1) becomes dv kd'v_ 2¢

pice gee epee 2 dt c dx® re (2), or

dv_- dv»,

dé "de '

which is Fourier's equation for the conduction of heat along a bar or the circumference of a thinring. Its solution to pe simple harmonic variations of temperature produced in an infinitely long bar by properly varied thermal appliances at one end is

*v= Re-9*cos(nt — fx +e) : (4), n, R, ¢ being arbitrary constants,—the "speed," the semi-range, and the epoch for «=0; and f, g constants given by the formule*

ford 5 | +I ~h | g—J se | onsen | |

For iron and copper the values of c are respectively “95 and ‘845. Hence, with the previously used values of & for these metals, and with 1/4000 for ¢, we find «=1°1 for copper and «= ‘2 for iron; and for either, 2=1/1700r nearly enough.

*Suppose, for example, *=2 cm., this makes h=1/3400; and suppose the period to be 32 m. (the greatest of those chosen by Angstrém), this makes n=27/(60 × 32), or roughly »=1/310 and h/n=1/17. Now when h/7 is small, we have approximately*

h

: (1-3),

h

C (1495)

and therefore with the assumed numbers

ro) 20-3

= : 1

si) and gj= (143)

by which we see that the propagation of the variation of tempera- ture is but little affected by the lateral surface emissivity. Little as this effect is, it is very perfectly eliminated by the relation

vi) Sg=2-

(5).

c=

(6),

which we find from (5).

It is convenient to remark that g is the rate of diminu- tion of the Napierian logarithm of the range, and f the rate of retardation of the epoch (reckoned in radians) per centimetre of the bar. Were there no lateral emissivity these would be equal, and the diffusivity might be calcu- lated from each separately. This was done by William Thomson in his analysis of the Edinburgh underground temperature observations. But in the propagation of periodic variation of temperature along a bar (as of electric potential along the conductor of a submarine cable) lateral emissivity (or imperfect insulation) augments the rate of diminution of the logarithm of the amplitude, and diminishes the rate of retardation of the phase, leaving the product of the two rates unaffected, and allowing the diffusivity to be calculated from it by (6). This was carried out for copper and iron by Angstrém in Sweden, and the results communicated to the Royal Swedish Academy in January 1861. German and English editions

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of his paper have been published in Poggendorff's Annalen for 1863, and the Phil. Mag. for 1863 (first half year). The details of the apparatus aud of the actual experiments, in which Angstrém had the assistance of Thalen, are sufficiently described in this paper,! and in a subsequent paper (Pogg. Annalen for 1863, p. 428), to allow us to feel perfect confidence in the very approximate accuracy of the results. Hence we have included them in our Table.

8 79. The question, Does thermal conductivity vary with temperature? was experimentally investigated by Forbes about thirty years ago ; and in a first provisional statement of results communicated to the British Association at Belfast in 1852 it was stated that the thermal conductivity of iron is less at high temperatures than at low. Forbes's investigation was conducted by an elaborate method of experimenting, in which the static temperature of a long bar of metal is observed after the example of the earlier experiments of Despretz, with a most important additional experiment and measurement by means of which the static result is reduced to give conductivity in absolute measure, and not merely as in Despretz's experiments to give comparisons between the conductivities of different metals. In 1861 and 1865 Forbes published results cal- culated from his experiments, including the first

deter- mination of thermal conductivity of a metal (iron) in absolute measure, and a confirmation of his old result that the conductivity of iron diminishes with rise of tem- perature. Forbes's bars have been inherited and further utilized, and bars of copper, lead, and other metals have been made and experimented upon according to the same method, by his successor in the university of Edinburgh, Professor Tait. The investigation was conducted partly with a view to test whether the electric conductivities and the thermal conductivities of different metals, more or less approximately pure, and of metallic alloys, are in the same order, and, further, if their thermal conductivities are approximately in the same proportion as their electric conductivities. The following results quoted from his paper on "Thermal and Electric Conductivity" (Zvansactions R.S,E., 1878) are valuable as an important instalment, but expressly only an instalment. towards the answering of this interesting question :—

" Taking the inferior copper (' Copper C') as unit both for ther- mal and for electric conductivity, we find the following table of

conductivities at ordinary temperatures, with the rough results as to specific gravity and specific heat referred to in § 15 above :—

Thermal. Electric. Copper, CLOWN .....sessersceereesssesscees eeoese Meal 1:729 BS Eaieoemeates 1:00 1:000 Forbes's iron .0°29 0264 TWeeadieseccssscesseeee .0°12 0149 German silver…... Sasa vasesseueOELe 0-117

1 The first paper is marred unhappily by two or three algebraic and arithmetical errors. One algebraic error is very disturbing to a careful reader, and might even to a hasty judgment seem to throw doubt on the validity of the experimental use which is made of the formule. There is, however, no real foundation for any such doubt. The fol- lowing little correction suffices to put the matter right. For the general term as printed in Angstrém's paper read

eu sin Cy — agr/i+ #'), with the following values for g;, gj :—

*el eae : K2T? * 4K22" 9Ki' lS – K°T? * 4K2j2 2K7'*

instead of these formule without the ¢, as Angstrom gives them.

Here we see that =: and it is the product gg; that Angstrom

KT

uses in his experimental application, not the separate values of either g;, or gj. Hence no error is introduced by his having overlooked that gi is not equal to g, except for 7=1.

HE

"The agreement of these numbers is by no means so close as is generally stated ; but this is no longer remarkable, for it is well nown that the electric conductivity of all pure metals alters very much with the temperature, while we have seen that as regards thermal conductivity there is but slight change with either copper or lead, though there is a large change with iron. This accords with some results of my own on the electric conductivity of iron at high temperatures (Proc. R.S.E., 1872-78, p. 82), and with the results of the repetition of these experiments by a party of my laboratory students."—Proc. R.S.Z., 1875-76, p. 629.

§ 80. The absolute values of Tait's results for the five metals of the preceding list are given in C.G.S. units in our general table. As to change of conductivity with tempera- ture there isa discrepance between the results of Angstrém's and Tait's experiments. Tait finds but little difference in

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solid considered. Though Fourier makes the special sub- ject of his chapter on " Diffusion" the conduction of heat through an infinite solid, we may conveniently regard as coming under the several designations " Diffusion of Heat" every case of thermal conduction in which the heat con- ducted across any part of the solid has the effect of warm- ing contiguous parts on one side of it, or of leaving contigu- ous parts on the other side cooler,—in other words, every case in which the temperature of the body through which the conduction of heat takes place is varying with time, as distinguished

from what Fourier calls “ Uniform Motion of Heat,” or the class of cases in which the temperature at every point of the body is constant.

The experiments of Investi-

Péclet, Despretz, Forbes and Tait, Wiedemann and Franz, gations

were founded on the uniform conduction of heat across

measuring absolutely quantities of heat that were conducted “uni-

the conductivity of copper through the wide range of tem- peratures from 0° to 300° C., and that difference an aug- mentation instead of a diminution at the high temperatures as shown in the following results (where ¢ is measured from

ena ce : 0° C.) poe aieay out of the body tested. On the other hand, it is the Nae te ae es a peel diffusion of heat that is used in the determinations of of peat.” TROM sossccssesssiucaheessateneesssne.eeg0 Olu ——0O0IEME) thermal conductivity in absolute measure by Forbes and

William Thomson from the periodic variations of under- By dif-

On the other hand, Angstrém finds for copper from ex- ground temperature ; in those of Angstrom, from his experi- fusion

periments described in his second paper referred to above,

Diffusion of heat.

at mean temperatures of from 28°°8 to 71°°5 C., results which reduced to C.G.S. are as follows :—

Ci a ere. 982 f ~-001519¢)

MMOWy. .rscesconancessesectasnsstiseneseees 199 (1 ~ 00287 4¢)

From the admirable method of experimenting, and the care with which experiments were carried out by himself and Thalen, it is impossible for us

to doubt the validity and somewhat closely approximate numerical truth of the result. On account of the discrepance from Tait's results it is desirable that Angstrém's method should be carried out for copper through a much wider range of temperatures. This can be done with great ease from the lowest tempera- ture obtainable by freezing mixtures to temperatures up to the melting point of copper, so excellently plastic is Angstrém's method. Our proposed extension of it is to be carried out by proper thermal appliances to the end of the bar which Angstrom left to itself,—appliances by which in one series of experiments it may be kept constant at — 50° or —60° C., in others left to itself to take nearly the atmospheric temperature, in others kept at high tempera- tures limited only by the melting temperature of copper, if the experimenter desires to go so far. We would also suggest that the thermo-electric method first introduced by Wiedemann and Franz in their experiments on the static temperature of bars or wires heated at one end and allowed to lose heat by convection and radiation from their sides, {which was rejected, not, we think, judiciously, by Angstrém), might be used with advantage instead of the mercury thermometers inserted in holes in the bar in Angstrém's apparatus; or that, if thermometers are to be used, air thermometers in which the bulb of the thermometer is it- self a very small hole in the bar experimented on, and the tube a fine-bore glass tube fitted to this hole, would be much preferable to the mercury thermometers hitherto employed in, we believe, all experiments except those of Wiedemann and Franz, on the conduction of heat along metallic bars.

§ 81. Fourier's ninth chapter is entitled " De la Diffusion de la Chaleur." The idea embodied in this title is the spreading of heat in a solid tending to ultimate equalization of temperature throughout it, instead of the transference of heat from one body to another by conduction through the

1 These results are, like those given above in this section, expressed in terms of the foot and minute, but the unit of heat employed is the amount of heat required to raise the temperature of a cubic foot of

the substance by 1°. In other words, these results are " diffusivities " (§ 82) in square feet per minute.

ments on the spreading of periodic variations of tempera- ° b¢t.

ture through bars of iron and copper, and a series of valuable experiments a year or two later by F. Neumann, applying the same general method to bars of brass, zinc, German silver, and iron; in experiments by F. Neumann on substances of lower conductivity (coal, cast sulphur, ice, snow, frozen earth, gritstone) formed into cubes or globes of 5 or 6 inches diameter, and heated uniformly, and then left to cool in an atmosphere of lower tempera- ture, and from time to time during the cooling explored by thermo-electric junctions imbedded in them to show their internal distribution; in similar experiments on the cooling of globes of 14cm. diameter of porphyritic trachyte by Ayrton and Perry in Japan; and in Kirchof and Hansemann's recent experiments," to find the thermal con- ductivity of iron by the not well-chosen method of suddenly cooling one side of a cube of iron of 14 cm., and observing the temperatures by aid of thermo-electric junctions in several points of the line perpendicular to this side through its middle.

§ 82. When the effect of heat conducted across any part of a body in heating the substance on one side or leaving the substance on the other side cooler is to be reckoned, it is convenient to measure the thermal conductivity in terms, not of the ordinary general gramme water-unit of heat, but of a special unit, the quantity required to raise unit bulk of the substance in 1°. In other words, if & be the conductivity in terms of any thermal unit, and ¢ the ther- mal capacity of unit bulk of the substance, it is kc, not merely &, that expresses the quantity of the substance on which the phenomenon chiefly depends. We therefore propose to give to kc the name of thermal diffusivity (or simply diffusivity when heat is understood to be the sub- ject), while still using the word thermal conductivity to denote the conducting power as defined in § 73, without re- striction as to the thermal unit employed. It is interest- ing and important to remark that "diffusivity" is essen- tially to be reckoned in units of area per unit of time, that its "dimensions" are L?D (see Dimxnstons). Its regular C.G.S. reckoning is therefore in square centimetres per second. In the article Dirrusron the relation between diffusion of heat and diffusion of matter is explained. We have added diffusion of electricity through a submarine cable, which has been shown® to follow the same law as the

2 Wiedemann's (late Poggendorff's) Annalen, 1880, No. 1.

3 Proc. Roy. Soc., May 1855, Wm. Thomson " Qn the Theory cf the Electric Telegraph."

Thermal

diffus- ivity.

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"linear" diffusion of heat, as Fourier calls the diffusion of heat when the isothermal surfaces are parallel planes. The curves of the following diagram and Tables A, B, and C show in a practically useful way the result in the course of the times noted, of from fractions of a second to thousands of millions of years, of linear diffusion of two different qualities in an infinite line from an initial con- dition in which there is sudden transition from one quality to the other, in the thoroughly practical cases specified in the accompanying explanations.

No. 2.

Equation of No. 2 is sae Se — a? /4ut 2(arnt)? 4

proved in Math. App. xii. (27). Curve No. 1 is found by quadrature from (2) thus—

y=const. x /vdx.

AS i Re. Weal Td Dis a ek 9 Fria. 11.—Diagram of Diffusion.

Curve No. 1 shows temperature; or quantity of substance in solution ; or potential in the conductor of a submarine cable through which electricity is diffusing. Curve No, 2 shows rate per unit of distance of variation of the temperature, or of the quantity of sub- stance in solution. Vertical ordinates are actual distances through the medium. Horizontal ordinates represent temperature or quan- tity of diffusing substances in No. 1 curve, and rate of variation of temperature or of diffusing substance or of electric potential in No. 2 curve.

Diffusions.— Table A.

Time in Seconds from the commeneement of the

Diffusi i iti Substance. pea heey ines on the Actual Scale (6=2 Centimetres) is reached. Carbonic acid through air ….....066 6°97 seconds. Heat through hydrogen ….....e0s00 ‘89 of a second. ns oie COPPET .is.ceeeeees sees erees 92 By _ 5 WOO biteg. cay dente. deetsaned 5°5 seconds. a ” las nae Gareyerta Ake! gansta oll Gaby > 53 fe – underground strata…... 10:00; ay 53 WOOUN: 555 fakes, ceeet ered 770 5 Common salt through water …..... 4320 »»

Electricity through Suez-Aden cable…{1-087 × 10-18 of a second. Aden-Bombay cable…/0°739 × 10-16 Persian Gulf cable …,0°635 × 10-18 ig Atlantic cable …..... 0‘440 × 10-16 French Atlantic cable. |0°396 × 10-16 Direct U.S. cable…... 0°340 × 10-16

v2 ”

Ld ”? a? 29

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Diffusions (Secular).—Table B.

Time in Years from the commencement of the Diffu- sion until the Condition represented by the Curves on the Scale of b6=20 Kilometres, or 1,000,000 times the Actual Scale, is reached.

Substanee.

Carbonic acid through air’ ..... 2,220,000 years.

Heat through hydrogen ….....068 283,000, aes cate a| 293,000 ,,

te St, clinke: 1,738,000 ,,

eee Fc one Oe ee 1,982,000 ,, 0 ~e underground strata? ... 3,000,000 ,, 53 a5 Woods tc8 Series 244,000,000 ,, Common salt through water® ..... 1,370,000,000__,,

1 Instruetive as to the proportion of earbonic acid in air at different heights, proving its approximate uniformity due to convection, not to diffusion.

2 Instructive as to geological theories respecting terrestrial temperature.

3 Instructive as to theories respecting the saltness of the sea.

Table C.

Time in Seconds from the commencement of the Diffusion until the Condition represented by the Curves on the Scale of b=1000 Nautical Miles, or 92,615,000 times the Actual Scale, is reached.

Name of Cable.

PSSM SIN oe esr ccters wire cicrale roca gales ein era ore ANGGra= TB OWN DAY) paises t0 oes swlielo ons slew aeince Perea OME. ctmiacicoseh aianepunaRaEs gee BN eh Mounts ferarsee steps oe aug. eh irsnasove sete wes ace ae French Atlantic ….. een

0°932 of a second. 0°634 + 0°545 ” O87 45

0339, 0‘292 55

eee eee ee terres resenns

§ 83. The following tables contain useful information regarding various thermal properties of matter. Every known property of a piece of matter, except its gravity and its inertia, varies with variation of temperature. For further information respecting the effect of variation of temperature in causing changes in properties of matter reference is made to the articles Evasticiry, ELECTRICITY, Macnetism, Licut, Marrer (PRoPERTIES oF), &c.

*TABLE I.—Linear Expansions of Solids.**

Mean Expansion | per degree C. through Range stated

Range. ? Authority.

to 100°

100

100° 40° }

40°

Muschenbroek. Kupffer. Matthiessen.

00002120

» 1910 ”

» 1943 ”

8021

6413

8680 1675

2799 2924

Sulphur, Sieily. Fizeau. Selenium, cast…..00 40°

Tellurium, ,, 40°

Matthiessen.

to 100° 40° Fizeau.

1156 to 100° 1190 » 100°

Calvert, Johnson, and Lowe.

Steel, annealed 100° » French cast, tempered.. » French cast, annealed… » English cast, annealed…

1220 –

1322 40°

40°

Muschenbroéek.

1101

1095 40°

Steel, BOLE. 0500-200 103

CASE IFGD), 5. -cceeass cane 112

Cobalt, red by H. compressed

Nickel, red by H. compressed.

1 Apridged from Clarke's Constants of Nature.

2 Where only one number is given for the range in this and the following table, the eorresponding statement is to be understood as applying through a small range on either side of the number stated.

| HEAT 983

Mean Expansion Mean Expansion

Bayeux poreelain….. » 165

{ Deville and Troost.

*per degree. Range. Authority. Name. Per deerbe: Authority. Were wrrccseeesss | OU0OLTS: = Borda. Copper oxide, Cu0O…., —*000000095 JOOS ORICON CAECOBUBE » 1866 0° to 100° Matthiessen. + a 3, 000000 » native a 169 40° 3 6 + °000000136 Superior. 2 7 = » 90597 » commercial…| ,, 1678 40° " – » 01059 Ruthenium, semi- ° | Fizeau, Zine oxide, ZnO PBA. eee } pe % along Bite at Fizeau. Zincite, normal to) | 0539 Rhodium, pico 0850 40° BRIS: ccsscscessscssse # fused)... ceseeres Y*

Quartz, SiO,, along 4 0781 Palladiiwms……..00.0.| 1 1104 es Matthiessen. pio ea x ° a artz, SiO. a » forged… ” 1176 40 Fizeau. aa oe » 1419 0857 0° to 100° Borda. ener e eet esereeee ” . ae 1» 0680 Te I sisteress eae » 0886 ov ;, 100° Matthiessen, Galena, PDS..... » 18594 ’ Pfaff. LUIGI. sccceeesscseess > » 0700 40°) Beryl, longit. axis…. 017214 » Fizeau. » horiz, axis….. —-0000001316 J Osmium, semi-fused.| ,, 0657 40° 5) Calvert, Johnson aati ats “ia Pa ee ° ° ’ rmal to i 2200 So ee | ve eee A air { rizeau, » 2976 0° is 100° Matthiessen. 18 Fizeau. a : Topaz, lesser horiz. a 08395 Chak barren _ 3 902 0° to 100° { a al Topaz, gretier 08362 | A cotoccorcueronss ” 3159 0° a LOOR Matthiessen, ae aes eal distilled… 3069 40° } a 04723 i ” horiz. axis…... i ” Magnesium, cast…... » 2694 40° F Pfaff. Bizedu: Tourmaline, longit. ti 09369 Indium, Cast….~~0e~~| 5) 4170 40° | tourmaline ‘toi iy y 077321 Arsenie, sublimed….| ,, 0559 40° = AXIS...» oo } a ° ° alvert, Johnson, AntiMONY…eseseenee| 99 0980 0° to 100 { ane oe ss Garnet svancssare well yy 108478 Pere |. » 1056 105 to. 100° | Matthiessen. along on i} 1» 1692 40 Glass tube…..... seveess| 1083888 Smeaton a ” hana z » 0882 40° Fizeau. cf) pa acc + ae Delue. ‘ ‘i Eosaoceteccod| | »Mmeanyalue)O| ,, 1152 49 = 3 091827 putongana Petit. Calvert, Joh a ” Tete Bismuth. .....0sseeeee » 133 0° to 100° ar pete pe nson, SDE aspanpeneonn 1, 0890890 2 é : Lowe, ee a3 DELOW ress » 087572 Lavoisier and + on » 1316 0 die 100 igntienen – Be he 1; 089760 Laplace, – along. axis) 3 3) Le2L 0 43 a ep ceed! poe ented » normal to E » 1208 40° Fizeau. ” babe oah French..| ,, ree es O| 4, 1846 40° a soft Thuringian 4 1195 Weinhold. Prvcvees 1460 0° to 100° Musehenbrick, ” a , 138 Of vate: ACRE Taare | | Sores ee | ot mae } Daniell sesseene » 1470 0° 4, 1008 Matthiessen. Bo » 1443 40° |

»» 00000 —38°8 . . » 00562 0° ee ‘ ° Platiniridium, one- ° , ” : peeked ae = tenth pee » 0884 sia Fizeau. , graphite… » 0786 40° en alt gas carbon… 0540 40° Lead and tin, solder ” anthraeite…| ” 92078 40° —2 lead, 1tin…..f| » 2508 0° to 100° | Smeaton. Lead and antimony.. 2033 16°°6 100° A Tin…... seesceseperpeseese| yy 2840 0° to 100° Musehenbrock. oceaie… y 1952 16°°6 z 264° \ Daniell oe 273 0° 100° Calvert, Johnson, 6) opeccosnnoeesonsoCese ” ie and Lowe. F TT ° ° ne an in— ° ° ee ee o° ,, 100 Matthiessen. ay » 2692 oO ,, 200 Aluminium, nee | Calvert, Johnson . 222 0° 160° Copper and tin—8 Smeat MERCIAL. ..000..000 ” ” PP e ; Shee ere and Lowe. oat. t » 1817 0° ,, 100 Fluo Calaaes: e ° r spar, CaF2 »

19504 On uo Pfaff. Speculum metal…...| 4, 1983 @° ,, 100° Silver iodide, Agt, cylinder, preeipi- Bronze, } tin…....| 4, 1844 16°°6 to 100° tated and eom- ~~ owe Ay alia 16”6° 5, Bos Daniell, pressed— i — » 1737 16°°6 ,, 957° Lengthwise Mis » 0168 40° ransyersely ….. 0122 40° 0° 100° Mean value…..... ” 0137 40° Brass, eae ” pak: o 100° \smeaton. ‘ Rectccesseese| 53 Meveumiey 1000 — ee » 1788 0°» 100° | Borda ereurie iodi i » 2387 40° | * 7893 0° i 100° 1 Roy Gortsesser » 1895 ° 3 100° : Lead iodide, PbI,....| ,, 3359 40° | ii ‘a er 2283 oh persue =< be . e Sane |, ae w || > ee ae | ” ” Tee, HS. ..60 002941 eee fleinrieh. Paraffin, Rangoon….. 00027854 40° ; _ Hematite, Fe,0;3, HASEE alowiaeie . On} “00000829 40° ; Soft coal, Charleroi… °00002782 40° Hematite, Fer0s 0836 ‘ Fizeau. . normal eG axis.. ” 40 aaa tens asset cece “8 mm pe to id \ KohIrauseh OS crocs) ‘4 Magnetie oxide of = 7 iron, Fe3Q4…..... a te aoe ue Deal wood…..... —/*
Equal to Glass, ae Roy.

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*TABLE II.’—-Cubical Expansions of Solids and Liquids. | eo = 1 = Expansion . —— “Te Lee se oes Name. per degree. Range. Authority. pansion per Range. Authority. degree C. ANtiIMONY ….eceeceeeeeeeeeereeeee 000033 ox Kopp. Se ——$—$$_____—_ a -00003167 | 0° to 100° Matthiessen. *001016027 -7 0000400 ro , 001038186! 0° Pierre “00004411 | 0° to 100° Matthiessen. 001318677! +63° 00000354 40° Fizeau. Sinduesiasans}| @ SDUD2aD Kz er piece Kopp.*

, upon fusion …..... 1682 Billet. — “000034 2 to 4° Weidner.

+ Fieri catectyeetcss oat eOnBeS Be } -0002500 | 4° ,, 50° 1 atatehiessen SHIVEr. «2. csccaicsecncecessessrsne “00005831 0° to 100° Matthiessen. a 0004496 y eres Cte . Sulphur, nativ 000137 Oo go isn2 Ice -0001585 Be bt YS. Pliicker and Geisler

*re *000223 13°2 ,, 50°3 Sulphur dioxide ….++..++++ 00202 B, ee ne D’ Andreéf. : 000259 | 50°3 ,, 78° Carbon dioxide, liquid, CO2| °00475 = |-10° ,, 5° s 000620 | 78° 4, 96°5|\ Kopp e a 00492 Sy OF 5 003097 |96%5*

*,, 109°9 PP- 4 i -00540 e » 5 05002 In melting “a # 00629 BP 5, . a8 ‘ D’Andreéf, ” 5 { at 115°. | a ~ oo7e9 «| 10°, 15° Lead -000089 a a si “00975 15° 4, 20° Pe -00008399 | 0° to ea Matthiessen. = ‘ a on Hy , i 4 a a r *0000355 Or ts, aD: isu 1, CSagccerse 2 =50° 5, iz , — 0000441 | 0° ,, 300° \ Dulong and Petit. = ae 6 See 00119625 | 0° |) 40° ; Muncke. Be) cagunaadhtiaavaosvéh 000037 “9 Kopp. eta! ag Sant pools e > 70° er “000055 0° to 100° ‘ = a Der ° atts oa 0000767 | 0° 4, 100° \ Playfair and Joule. 4 0013260 | 0° 4, 80° ae*

5 000051 ‘ Kopp. x -0014596 | 0° 4, 120° | .

ae bie 00004998 Ors tee parte h 0° mee (tid Palladium. .....cccceceeeeeeseees 00603312 | 0° ,, 100° Matthiessen. 4 \ ° .

*DEMS Peek dose caktiavasbssesteestos «00002658 | 0° 3, 100° 00001394 40 Fizeau. ZANG .ccccecsssscccssscccesccscacesers 000089 re Kopp. 000040 ius Kopp. se csbaehasesansusowangneancevon -00008928 0° to 100° Matthiessen. ae -00000168 40° Fizeau. “0000940 fa Kopp. |__| Berylesscesessnssssenensenceneasens “00000105 | 0° to 100° 00017905 OO HF PLO eceecer cee eeeeenere neers res *00002137 O° «,, 200° | -00017950 wo |} Botrmaline …..eeceeeerseeesees -00002181 | 0° ,, 100° | } Pfaff. -00018001 20° id | —t*t*~*~t—ti*dSCCY Gtr nett cn seneen ene ece scence eco neee -000025434) 0° ,, 100° | -00018051 80° puns clutviandbassevetaes -000027783} O° ,, 100° -000181L02 40° ttf | LMOCTASE «...cecevereereereneereeeee 00002700 OS) OE inebans -00018152 507 TTL | EIT COT ces eseeeeeceseeees 00002835 OF OO heed -00018203 60° Glass, white _— anise ares ns +3 ee -00018253 70° globule -00005 p , 100° 00018304 80° Regnault. -00002299 | 0° », 100° *00018354 90° 00002132 Oo. 100° “00018405 100? CP s—<“—stsi‘“—s~sY ng SIRE ER DE sess ce 00002363 Dass, 200: | -00018657 150° » globule... 00002426 | 0° ,, 100° | \ poonautt, co -00018909 200° ” hard French tube.....| "00002142 | 0° ,, 100° BRAY -00019161 250° > » ~~ -«Blobule| 00002242 | 0° ,, 100° -00019413 300° ” erystal tube… -00002101 | 0° ,, 100° “00019666 350° globule…..... 00002330 et me A*

i w “0001812 0° to 100° Matthiessen. = | | | 3, Q1ODE…+eerecenenee 00002326 0° ,, 100°

PHOBPHOTUS ..cseseseseeeveeseees -000366 83 ,, 15°8| Kopp. | | | | » common tube…..... 00002579 | 0° r |)

1 Abridged from Clarke's Constants of Nature.

Tape I1].—Eaxpansions of Liquids.

Pierre, having measured the expansions of many different liquids, embodies the results in the empirical formula 3: = at + bt? + ct', where 8 represents the expausion of unit volume from 0° to ¢° eent., and a, 0, c have the values given in the Table for the different liquids specified. The substances and formule in quotation marks are quoted from Dixon's Heat, Dublin, 1849.

Tempera- | Observed

care i – re of Pressur ii Name of Liquid. Siem Cone ee \cmemee| woe. Cool. Coote Point. Point. ' / mms, W | Die OE FE nbn nc sncssecneeness (C,H;),0 35°-5 | 0°7558 | 0001513 | 0-000 00236 | 0-000 000 040 0 2 | Ethylie alcohol …....-:cceeee Fis 78°°3 | 0°7580 0:001 049 | 0-000 001 75 | 0°000 000 001 38 3 Methylic aleohol …..... ees ie eo CH,HO 66°°3 | 0°7590 0:001 186 | 0:000 001 56 } 0°000 000 009 1 : 3. . 0000 890 0-000 000 66 | 0:000 000 011 8! 4 ng alcohol ssaceeet tee ceesanseeence C;H,,HO 1381°°8 0 75138 | 0000 899 0:000 000 69 0:000 000 010 12 5 | Chloride of ethyl…..... ere C,H,Cl 11°-0 | 0°7580 ' 0°001575 | 0°000 002 81 | 0-000 000 015 7 6 Bromide Of BUY. «cows. pinche eset eaua C,H;Br 40°°7 | 0°7571 0:001 338 0:000 001 50 | 0°000 000 016 9 | Mathdera Big o ,ccpeesesdovrennsenoe, CaHI 70°-0 | 0:7517 | 0001142 | 0°000 00196 | 9°000 000 006 2 8 | Bromide of methyl …....:.....006 CH,Br 18°°0 | 0°7590 0:001 415 | 0°000 003 32 | 9000 000 113 8 9 Iodide of methyl …....:cccceeeeeee CH,I 43°°8 | 0°7502 0°001 200 0:000 00216 | 0:000 000 010 1 10 Formiate of ethyl …....~~.seeeeeeeees C,H,CHO, 52°°9 | 0°7520 0°001 325 0:000 002 86 | 0:000 000 006 6 11. | Mesthile~~ SE MEF) 4. .ricwnoronasrtnnnnons C,H,C,H,0,| 74°-1 | 0°7665 | 0001258 | 0-000 002.96 | 0-000 000 001 5 OF . 0°001 203 0000 000 07 | 0:000 000 022 63 19 | Dadgeete OPO... .c8s besser een C,H,C,H,0, | 119-0 | 0°7465 oS Pa eee | ouereetaa 18 | Adstata Of MethYl, ..ncc.ceasrorerro- CH,C,H,0, | 59.5 | 0°7612 | 0°01 296 | 0:000 002 91 | 0-000 000 004 8 14 | Butyrate of methyl …..... .seeeen CH.C,H,O, | 1027-1 | 0°7439 | 0-001 240 | 0-000 000

63 | 0-000 000 013 1 15 | Terchloride of phosphorus …..... PCI, 78°°3 | 0°7515 0-001 ha 0000 000 87 | 0°000 017 923 6 , on ‘ 0°000 8 0-000 000 44 | 0°000 000 002 5° 16 | Terbromide of phosphorus.….....-. PBr, 175°°3 | 0°7602 } 0-000 824 | 0-000 000 91 | 0-000 000 000 08 17. | Terchloride of arsenic.….....~~+ + + + + AsCl, 1338°°8 | 0°7569 0:000 979 | 0:000 00097 | 0°000 000 001 8 18 | Biechloride of tin ….....ccccenseeeeees SnCl, 115°°4 | 0°7531 0°001 133 | 0:000 000 91 | 0:000 000 007 6 LS Tetrachloride of titanium ….....~~. TiCl, 136°°0 | 0°7623 0°000 948 | 0:000 001 85 | 0:000 000 000 9 20 | ‘ Terehloride of silicon” .....- ** SiCl,” 59°°0 | 0°7601 0:001 294 | 0:000 00218 | 0°000 000 0409 21 | ‘Terbromide of silicon” .....- ‘* SiBr,” 153°°4 | 0°7625 0°000 953 | 0°000 00076 | 0:000 000 000 8 22 | Biehloride of ethylene’.....~~+ C,H,Cl, 84°°9 | 0°7619 ae 119 | 07000001 05 | 0°000 00001038 : ; °. : “000 953 0000 001 82 | 0:000 000 001 18 23 | Bibromide of ethylene …..... C,H,Br, 132°°6 | 0°7569 0:001 017 | 0:00000010 | 0:000 000 008 8° aD een eee Br 63°-0 | 0°7600 | 07001038 | 0-000 001 71 | 0-000 000 005 4 25 | Bisulphide of carbon …....++ cs, 47°°9 | 0°7558 0:001 140 | 0:000 00137 | 0:000 0000191*

pc ee

4¥rom 90° to 118°. 5 Frem 0° to 100°. 8 From 20°°09 to 100°-16.

1 From 15° to 80°. 2 From 80° to 131°°8. 3 From 138° to 90°.

¥ Ms Ee ‘ 6 From 100° to 175°3. For this liquid ¢is counted from 20°.09, its point of congelation.

® From 100°16 to 132°°6.

HEAT 985

Water.

Mercury. Sulphur.

Temp. : Density. Pressure. Temp. Pressure. || Temp. Pressure.

= 7 ee 9°20 170° “809 560° 346°53

0 999884 “999443 11:75 || 180 1100 || 570 | 887°71 I 999941 999312 14°88 190 1°48 “999982 999173 18°69 200 1:99 5 1°000008 998667 35-46 230 4°53 6 “999983 998473 43°30 240 588 A 999946 “998272 52°54 250 7°57 8 “999899 997839 63°38 260 9°67 10 “999760 -996879 90°64 280 15°52 At 999668 “996344 107°54 290 19°45 12 999562 995778 126°94 300 24-29 ‘ 14913 310 29°97 TABLE V.—Steam Pressures (in Centimetres of Mercury). ae be ee vice Water. h Mercury. Sulphur. 235°37 340 54°83 Temp. Pressure. Temp. Pressure. Temp. Pressure. He = <8 a bi — 32° 0°03 0° 002 390° 2128 858°12 870 95°46 — 30 0°04 10 003 400 32°90 408°86 380 113°96 —25 0°06 20 004 410 89°52 465°16 890 134°67 — 20 0°09 30 005 420 47°21 527°45 400 158°80 -15 0°14 40 008 430 56°10 596°17 410 186°37 —10 0-21 50 011 440 66°31 671°75 420 217°75 – 5 0°31 60 016 450 77°99 754°64 430 253°30 0 0°46 70 024 460 91°27 845°32 440 293°40 5 0°65 80 035 470 106°32 944°27 450 838°44 10 0°92 | 90 051 480 Ae P77, 1051°96 460 388°81 15 yee | 100 075 490 142°29 200 1168 °90 470 444°94 20 1°74 110 107 500 163°53 205 1295°57 480 507°24 25 23D | 120 153 510 187°'16 210 1432°48 490 57613 30 3°15 130 ‘218 520 F333 215 1580°13 500 652°03 35 4°18 140 306 530 242°20 220 1739°04 510 725°34 40 5°49 150 427 540 273°92 225 1909°70 520 826°50

45 7:14 160 “590 550 308 °65 230 2092°64

TABLE VI.—Steam Pressures.

f isd | sole (ag ls. lee as | € $3\28| 2/3, | ¢ |se | gel ole cclege| 2. |28,| a8 J ate o om Pe.) = vo 9 la Oe fo} o ann 2 ard ee Yo | a 2ecbes oo | eo 23 |2¢ Ged) $e | x [22 | so Baa AS PEs sES Bea) 27 esas ee |BEe) ge v =| aS |] a | — Sz ies = Sim Oy |) caieed, | = og anil S \es”alod Aa a & IPe5R= 8 $0186 | SS/2E|Sa°! 50 | 8S 13a | ES IRS Bt (pee iSe0lhae§ Sg lSadSisso0/ & aS, Si Bg ige°| <°|8 |22|S° |ES 22 | | <° az | Se ao) ae PS SS" ["5°| ge Moroes ae | os o 25} oO 5 1S) mn Q i<3] n a ar dese || < BT] nce | vor | cee face foe [ieee | cee | BBR] 4. | OOM] OBB, 11-09) 98-76) S7E5| S790, SED)... 6, See AI). | ove | oe | ae fone | 1097] wf 404]... | 12°57] 10°34] 14°50) 37°88) 71-61) 71-78) 110-43) 87493) 1300°70 —20) ... 33) 58} «°63} | 98]... | 1 | 2°65) 4°73) 5°92} 6°89) 15-95 14°82} 18°75) 47-95) 88°20) 88°32) 139-21) 443°85) 1514-24 —15} ... 51] 88,93) | we | 185] ww |. | 8958] 616] 7-81] 8-98} 20-07] 20°36] 23°96) 60-79) 107-77) 107 92)

*178°65) 519°65) 1758-25 —10] .. 65, 1-29] 1°35]... |... | 185]... |... | 4°65) 7°94] 1015) 11-47} 25-05) 27°05) 30-21) 76:25| 130-66] 130-96) 214-46) 608-46) 2034-02 — 5| .. “91; 183} 1:92] ... | .. | 248] ... |... | 6°05] 10-13] 13°06) 14-61) 31°03) 35-02 37°67) 94°69) 157-25) 157°87| 26242) 706-60) 2344°13 0} 21] 1-27; 2:58} 2-68) 4:19) 3°80] 3-29) ... | ... | 780] 12-79) 16°56) 18-44] 98-13] 44-41) 46-52) 116°51/ 187-90| 189°10, 318-33) 820-63) 2690°66 + 5] .. | 176] 3-42] 3°69) 5°41) 4°91) 4-32} ... |... | 9°96] 16°00) 20°72) 23-09! 46:50] 55-40] 56-98) 142-11) 222-99| 225°11) 383-03) 949-08! 3075°38 10} +29] 242} 4:52] 5-01) 6-92) 6.29; 5-60] ... | ... | 12:59) 19°85] 25:74) 28-68) 56-29, 68-19) 69°11) 171-95) 262-90) 266-38) 457-40) 1089°63/ 3499‘86 15| .. | 3°30} 5°89| 6*71/ 8°76) 7°98] 7-17] ... | ... | 15:77] 24-41| 81-69] 35-36) 67-66] 83-03) 83°26) 206-49| 307-98| 313-41) 542-34) 124479) 3964-69 20| 44]. 4:45] 7:56| 887| 11-00) 10°05} 9-10} 16-05! 17°96] 19°59) 29°80] 38-70} 43-28] 80-75, 100°19| 99°62| 246-20| 358°60) 366-69) 638-78) 1415°15) 4471°66 25! ... | 5:94| 9°59] 11-60] 18°69] 12°56} 11-43] 20-02) 22-63 24-11) 36-11, 46-91} 52°59) 95-73] 119-98) 118-42) 291-60] 415-10/ 426-74) 747-70) 1601-24) 5020-73 30| 69] 785] 12-02| 15:00) 16-91] 15°56) 14-23] 24-75] 2810) 29-45] 43-46 56-45| 63-48) 112-75) 142-74| 189°90) 343-18] 477-80| 494-05) 87010) 1803°53) 5611-90 35| ... | 10-29| 14-93] 19-20| 20-71| 19-14] 17-55 30-35 34:52| 85-68] 51-97| 67-49| 7612| 181-97| 168:87| 164‘32, 401-48 569°11} 1007-02| 2022-43] 6244-78 40] 1°08] 13°37] 18°36| 24-35] 25°17] 23°38} 21-48] 36-93| 42-01) 42-91) 61-75| 80-19] 90-70) 153°52/ 198-80) 161-96, 467-02 1159-53 2258:25) 6918-44 45| ... | 17-22] 22-41] 30°61] 30°38] 28-35] 26-08| 44-60| 50-75] 51-23] 72-95] 94-73) 107-42! 177-57) 232-98| 223-07| 540°35 1328-78) 2495-43, 7631-4 50| 1:70] 21-99} 27-14} 38+17| 36-40] 34°14) 31-44] 53°50| 60-29] 60-75) 85-71) 111-28) 126-48| 204-22) 271-93] 257-94) 622-00 151583] 2781-48 55| ... | 27-86] 82°64| 47-22) 43°32) 40°85) 37-63] 63-77) 72-59] 71:54] 100-16] 13003] 148-11| 233-62) 316-21) 266-84| 712-50 1721-98, 8069-07 60| 2°65} 35°02] 89°01] 57-99] 51-22| 48°56) 44-74) 75:54] 86-05] 83-72| 116-45] 151-19] 172°50| 265-85| 866-42| 340°05) 812-38 1948°21/ 3374-02 65| ... | 4869) 46°34] 70-73 57°39] 52-87| 88-97] 101-43] 97-37| 134-75] 174-95] 199-89] 301-02} 423+22) 387°85) 922-14 2196°51) 8696°15 70| 4:06] 54-11] 54-74] 85°71 67°42] 62-11] 104-21] 118-94 15521| 201°51| 230-49] 389-21] 487-32] 40°50 2467°55| 4085°32 75| .. | 66°55) 64-82) 103-21 78°76| 72-57) 121-42| 188-76 177-99! 231-07| 264-54; 380°48| 559°46| 498-27 2763-00*

*80| 613} 81-29] 75-19| 123-85 84-33, 140-76| 161-10 203°25| 263-86| 302-28| 424-83 561-41 3084°31 85} .. | 98°64) 87°46) 147-09 97°51) 162-41] 186-18 231-17! 300-06, 343-95] 472-01 630°16 3433-09 90} 9°06 | 118-93] 101-27) 174-17 112-23) 186-52] 214-17 261-91| 33989) 389-83 704-75 8810-02 95| ... | 14251| 116-75} 205-17 128°69| 213-28) 245-28 296°63| 383°55| 440°18 785*39 1 100 | 18-11 | 169-75} 13401] 240°51 146-71| 242-85| 279-73 332°51| 431-23] 495-38 872°28 4660°82 105| ... | 201-04] 153-18] 280°63 166-72) 275°40| 317-70 372°72| 483-12| 555°62 110| 18°6 | 236-76) 174-41| 325:96 188-74) 311-10] 359°40 416-41) 539-40) 621-46 115| ... |277-34| 197-82| 376-98 21291] 350-10] 405-00 463-74] 600°24| 693°33 120) 25°7 | 323-17| 228-54] 434-18 239°37| 892°57| 454-69 514-88] 665°80| 71°92 125| ... | 374-69) 251-71] 498-05 268°24] 438-66) 508-62 569°97| 736-22 130 | 34°9 | 432-30| 282-43) 569-13 299°69| 488-51) 566-97 62916] 811°65 135| ... | 496-42) 315:85| 647-93 333°86| 542-25| 629°87 692-59| 892-19 140 | 46-4 | 567-46] 352°07| 733-71 370°90| 60002) 697-44 760°40| 977-96 145| ... | 64581] 391-21! 830-89 411-00] 661-92 832-69 150| 60°5 | 731-84] 433-37| 936-18 454-31) 728-06 909-59 155| 68°6 | 825-92| 478-65 501-02| 798-53 160| 77°5 527-14 551:31| 873-42 165 568°30 605°38| 952-78 170 63407 663°44*

AL = 74

586 HEA TY

TABLE VII.—Lmissivity for Heat of Polished and Blackened

|

Copper Surfaces Thermal | Thermal Capacity | ,.; . S| | eeaioo ep be yee Substance. Conductivity.| of Unit Bulk. Diffusivity.| Authority. Amount of Heat lost per second per square | ce ib Rie . centimetre of the surface per degree a ; a Difference : ; Traprock Ol})s ae a ae of of difference of tempcratures. Ratio. Calton Hill .. i 0°00415 5283 0°007 86 Temperat aye. ANN NN Sand of Experi- ve tal Gar- 10262 3006 “008 73 Polished Surface. Blackened Surface. = S “ i aii | Sandstone of) Craigleith 0-01068 4623 0°023 11 | ° F – i ; QWarTy ie… sec: J 5 ‘000178 000252 707 Gane Gal _ — 10 000186 000266 “699 Greenwich 0-012 49 1 Units and 15 “000193 ‘000279 692 Observatory | \ Phys. Con- | 2 ~~*000201 “000289 695 13 01)*~~

*~~Reser en esc ‘ | stants, p01 | 25 (00207 000298 694 | Bory, Pha. 30 ‘000212 000306 6938 ce eee t 00590 0°5738 0001 028 Mag., 1878, 35 “000217 000313 693 first half~~ 40 000220 ‘000319 693 i aa 45 000223 ‘000323 690 Material Diffusivities. 30 “000225 ‘000326 “690 Common salt, through Water ….ccccccccorerercssersscerece 0000 011 62) Fick. 55 000226 000328 690 Cane sugar, through water…..... cushou Siagtere sees ssreee| 0°000 008 65} Voit. 60 “000226 “000328 “690 Prof. Mach Caramel, through water at 10° C ….....sscescrsceesees 0000 000 54| | of Praguc, a a a Albumen, through water at 13° C …...cscceeeee seveeeeee! 0°000 000 73) | Imperial Cane sugar, through water at 9° C. .....ssseseeseeeres; 07000 003 6 Academy Water aye — salt, through water at ‘5° C. ....| 0°000 008 85 e Psy — we ie. dents do. 9° C. .,../ 0000 0106 || of Vienna, Taste VIII.—Thermal Conduetivities. Hyanwenionie acid, through water ..s….sscee a 0-000 020 2 4 me ae 13, fide Potassium chloride, 10 ¥ solution through water…| *000 0127 |° 4 Potassium bromide, a ” ...| 1000 013 1 Substances, : Authority. Potassium iodide, * . ...{ “000 013 0 ‘ Potassium nitrate, ob oD …| ‘000 009 26 Potassium carbonate, a 7 …| 7000 006 94 Potassium sulphate, ” ” «| ‘000 008 68 Ammonium chloride, 7 ss …| *000 012 0 Sodium bromide. i “ ...| 000 009 95) | T. Schuh- Sodium iodide, 6 “ ...| ‘000 009 26] | meister, Clausius and Max- Sodium chloride, “A “5 …| 1000 00972) | Wiener Sodium nitrate, of +f …| 000 006 94) } Stizungs-*

0000049 well,according to

berichte, April 3,

1879.

Sodium carbonate, on O19 «| “000 004 63 Sodium sulphate. a x …| ‘000 007 64 Lithium bromide, oF a …| 7000 009 26 Lithium iodide, = % ...{ 7000 009 26)

INTIROEEST saeseononsvonenonanacoc Carbonic oxide Carbonic acid ….....00068-| 0°000038 Do. do,

kinetic theory.

EBVO OG CIic,~~5~~—csecsesssvees 01409 Vienna,10th Q 0. 0. Carbonic acid and carbonic oxide …....csscsssssssesses 0140 6 farch 187 ei Carbonic acid and marsh gas 0°158 6 Se Traprock of Calton Hill. 000415 Do. do. Carbonic acid and cation. es creas ine ee phi Sand of Experimental Garden| 0°00262 Do. do. Sulphurous acid and arene cee er seseeeee| 0°480 0 aie SION, Vol. Vii. WE RTOW. 6 ccs crosmees ssuanesvensenes| COU J. T. Bottomley. nL a Sat ooh oxide… Eee ve eee p. 216, ‘ Péclet, in Everett’s ‘arbonic oxide and hy TOgEN ».--- meee sesteraueasiaas eet Fir, across fibres…....., sesieal| s00026 Units oe a? Electric Diffusivities. cal Constants. —— 00047 Do do se $ gs Sep : Zz le a 4 aon 00029 Do. do. 4 29 BN. ey Bs 8 FE a ‘00048 Do. do. & jgsg jes | pod 4 g2¢ 00059 Do. do. ga |Zag |g2u.| ES e O83 oF otal ot ~ Ae ee af ittusivity,| 225 58 ‘ 0. 0. E 2° lo BS” 12 83| OSes | £8eo8 » old 0-000119 Do. do. Nemororiais. oe oo a9) anc rn i Be Writing paper, white. 0°000119 Do. do. §elSen jexe of BoESS Grey paper, unsized .. 0000094 Do. do. a” |So8 |8h | Boe goa 83 Calico (new), of all densities.., 0°000139 Do. do. & lke e ja™ SEP SS Ree Wool (carded), of all den-}} 9.999399 Die SS Be ap Beech SLGL ES) tnseem a emacernecs rare : ; | Sa Ls ae Finely carded cotton wool….| 0°000111 Do. do. : : : : i: re Ee i . 0. . uez-Aden …... 10°42 | 0000178] 0°3580) 1:93 × 10-21 | 0-920×1018) Bag es Hider down Oeapes » ae ‘Aden-Bombay…| 7-02 | -0000264| 0°3610| 1°95 × 10-21 | 1354×106, A ZEss Persi Guit BUS aS ersian 95 | + “! ‘ -22 . ° ee Cable, 1864 } 6-25 | 0000296 03486] 1:88 × 10-2? | 1575 × 1016 oS ee Mee. : , Atlantic, 1865 …| 4:27 | 0000434) 0-3535/1-908 × 10-1) 2:274× 1016] “5 24 TasLe 1X.—Diffusivities (Thermal, Material, and Electric). French Atlan-) | 3.7¢ | 9090586! 04295 2-232 × 10-211 2-528× 1018) $= <= tic, 1869 … é Seas Direct Uuited . oe 2°88 | 0000643) 0°4095)2-211 × 10-21) 2-909 × 1016 et Sh Thermal Thermal Capacity Pacion States Cable co OS) Substance. | conawativity. | of Umea | |S ety) eeniy 2 As ka Cc: k/e. 1 This result has been accidentally printed ‘00000116 in some impressions of aS ee = —7 vol. vii. p. 217. Copper. -sticeeeee|) Onell 0845 1:077 a Cae : = ues es .— TABLE X.— ge of different Substances mi 5 Nien”) | 0-0000049 0000807 | O16 | Maxwell, bi ae as Perec | 5 Carbonic oxidc.| J t according ~ Approximate times of equal diffusion of different substances, Authority. Carbonic acid…| 0°000038 0:000428 o-osss | | ae ———————— EE ESS Hydrogen Sey 0:00034 0:000307 112 J oe erm N LCM N coos Tat sn. -caMes ens csi bakaecesiececssscdaaee 1 ndderground Chloride of sodium..

anearnqnnocdecauanbancondespuoenocica 2 strata (rougli I 0:005 0°5 0°01 A ad eo RATA tetas soerescsssionne ee ame ane ‘a oe teases (a Sulphate of Magnesia. sulsiisj es sot eaeeteees< TIR ee ect ea cei eset beccssasseccendesccesssatedessssetteassssstiee 98 J

HA AT

Each of the following expressions I… .. XVII. for v satisfies Fourier (9) or its equivalent (6), as the reader will readily verify for hiniself. solutions.

MATHEMATICAL APPENDIX.

Let v be the temperature at any point P specificd by &, n, ¢ accord- ing to any system of tliree sets of plane or curved orthogonal surfaces used for co-ordinates. Let Adé, udn, vd be the lengths of the edges of the infinitesimal rectangular parallelepiped having P for its centre, and its sides parts of the six surfaces ¢-$dt, &+4dE, n-4dn, n+4dn, (-3d¢, (+206.

The rates of variation of temperature per unit of length in the directions corresponding to the variations of f, n, ¢ are respectively

1 dv 1 dv 1 dv Kee nw dn' vy d¢ Hence the fluxes across three infinitesimal rectangles having their edges parallel to the three pairs of sides of the parallelepiped, and each having its centre at P, are respectively

k adv k dv — "— —.pvdnd(, —~— ~-vadgdt, – — —Apdidn. vA de pvdnd¢ , A oy Cae , s aenn Hence the excess of the quantities of heat conducted in to the parallelepiped above those conducted out across the three pairs of

faces is § S(dv ae =) Hated s) dtdnd¢....(1 (Oe i "ts p dn ta¢ vy dy edna. ()- The effect of this gain of heat is to warm the matter of the ig at a rate per unit of time equal to the rate of gain of eat divided by cAuvdtdnd¢, the thermal capacity of the matter.

Hence dv i d [,uv dv\ adf,vadv\ , dfzrAu dv nasa eae) ta saa) tHe ae)

This, for the case of the uniform motion of heat (dv/dt=0), was first given by Lamé, to whom the generalized system of curvilinear coordinates for a point is due (" Mémoire sur les Lois de 1'Equilibre des Fluides Ethéres," Journal del' Ecole Polytechnique, vol, iii., cahier

xxiii.) He deduced it from Fourier's equation [(3) below] in terms

of plane rectangular coordinates by a laborious transformation.

Equation (2) was first given, proved as above, as the direct expression

of Fourier's fundamental law of conduction, by W. Thomson (Cam-

bridge Mathematical Journal, Nov. 1843).

For plane rectangular coordinates we have A=w=vy=1 an if we put 2, y, 2 for &, 7; ¢ in this case, (2) becomes

dv 1(\d/,dv d [,dv d =i ons aaa ta ay) tae tae) | ©

which is Fourier's celebrated fundamental equation. From it we may deduce by transformation the proper forms of the corresponding equation for polar coordinates ; but they are more easily got direct fvom the equation (2) for generalized coordinates. Thus for ordinary polar coordinates r, 0, @ we have, if we take these for ¢, n, ¢ respectively,

k dv

A=1, p=7, v=r sine. Hence (2) becomes

*de_ 1} d (itt) 42, 2(b snot) i 4 (ute) (4 di crt 1a 4) + Sind zd int 5) * aa aa aay) | If & be constant, and we put k/c=x, this becomes dy*

*dv_«(d/adv A, 2 sind) 1 oe 6; dtr EG ee) + np qe eae) * ante dg?) (5);*

eM agli Bieatt) dt (dr? 'sine dé\" dé/" sin? d¢® – (6). wherew=07 . . . . 1°. If again we take for the coordinates 7, ¢, z (polar coordinates in the plane perpendicular to z being denoted by 7, ¢), we have A=1, =r, v=1, and so find

dv 1s ad dv d {k dv d [,dv arc She ee (on)

For the case of k constant we may take it outside the brackets in savy of these equations, as we have already done in (4) ; thus (2) ecomes

(Fe ee ie (8);

dt c\da® dy dz ' or, with « for k/c, the diffusivity (§§ 81, 82),*

dv dy dy dv

dt «(Sart get Gt) (9).

It is this restricted form which, with the further restriction that c be constant, is most generally recognized as Fourier's equation of conduction, and it is for it, with these restrictions, that his brilliant solutions were given. These solutions are available for practical use by limiting the range of temperature within which any one solution is continuously applied to a range of temperature within which the values of & and c arc each nearly enough constant. We may expect 10° or 20° C. on each side of the mean temperature to be practically not too wide a range for any case, judging from copper and iron (§ 80), the only substances for which hitherto we have any infor- mation as to variations of both & and ¢ with tempcrature.

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The special condition corresponding to the peculiar character of the particular solution is specially noted in each case.

I. Instantaneous simple point-source ; a quantity @ of heat sud- denly generated at the point (0, 0, 0) at time ¢=0, and left to diffuse through an infinite homogeneous solid.

EVERY OTHER SOLUTION IS OBTAINABLK FROM THIS BY SUMMATION. Ger 224K

Balik)? (10).

where 7? = 20 + 97? + 22

co] co) o col Verify that ih Dy ye vdadydz = 4r ye vrtdr =Q; and that (oe) — 0) — oO 0

v=0 when t=0; unless also x=0, y=0, z=0. Remark that

2

a0 when i= Guys II. Constant simple point-source, rate q: fo a) —72/4eé € rT | Ko 7] q = | a 12). of af, Sar (Kt)? | 4er (12)

The formula within the brackets shows how this obvious solution is derivable from (11).

III. Continued point-source ; rate per unit of time, at time ¢, an arbitrary function, /(¢):

a) —7r7/4ny

on f dxfit- x) —,—

) 8ri(«x)!

IV. Time-periodie simple point-source, rate per unit of time at time ¢, g sin 2nt;

of = q f "aX sin2n(¢ – x)

(13).

—72/4 eK _ geen) ain tont—cenytry (14). 4rr

ga (xx)! Verify that v satisfies (6); also that — dar? =q sin2nt where r=0.

V. Instantaneous spherical surface source ; a quantity Q suddenly generated over a spherical surface of radius a, and left to diffuse outwards and inwards :

€- (7 -a)2/det _ em (r+a)2/4nt

v= Sartar(«t)? To prove this most casily, verify that it satisfies (6); and farther

verify that ax [ytd = @:

()

and that v=0 when ¢=0, unless also r=a.

Remark that (15) becomes identical with (10) wheu a=0; remark farther that (15) is obtainable from (10) by integration over the spherical surface. :

VI. Constant spherical surface source ; rate per unit of time from the whole surface, q:

*oem (r—a)tet ey ; Vv = Ss L af * Smtar(nt)? ue): |*

= q/4ar , where r>a and = q/4ma , where r=VII. Time-periodic spherical surface source ; rate per unit of time, at time ¢, from whole surface, g sin 27 :

20 e —(r—a)?/4nx _ ¢— (7 +-a)7/4ex v| =9g ax sin2n(t ~)) a | L of oe C-x Srtar(Kx) A*

4

= e7 (”)“T sin [Ont — (xn)‘r +B], where r=a,

(15).

(17),

F

4

*= Cf eer) rsinfant—(1en)br +D]-e”) *sin[2nt + (xn) tr + Dj}*

where r=

lrsa~ Urea 0,

— 4a? (=) ~ (3) =g sin2nt, dr r>a ar } nea

when the two values of 7 exceed @ and fall short of a by infinitely small differences. Verify that v satisfies (6). Also that v is finite when 7=0. ;

VIII. Fourier's " Linear Motion of Heat"; instantaneous plane- source ; quantity per unit surface, o:

—22/4Kt eS See Qn? (xt)?

Verify that this satisfies (9) for the case of v independent of y and

z, and that

and

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foe} we vdk=o.

fee) Remark that (18) is obtainable from (15) by putting Q/4ra=o, and a=; or directly from (10) by integration over the plane. IX. 'Linear Motion of Heat"; time-periodic plane-source ; rate per unit of area, per unit of time, at time ¢, o sin 2nt:*

. in In(t += a /4xx

= sln 2an\t — ae ee

[-af a %? Qal(ex)h oe

ene sin (2nt — nta – 4m) where > 0 f :

~ (2n)!ae = 2 etnte sin(2nt+ntx—-3m) where 2<0 | (2n)t2ar . : dv dv c : Verify that v satisfies af ae which is what (9) becomes x

when v is independent of y and z; also that —2Q9 a = g sin 2nt when x is infinitely small positive,

dv

and + an = o sin 2nt when 2 is infinitely small negative.

X. ‘Linear Motion of Heat”; space-periodic simple harmonic solid source, with plane isothermal surfaces. Initial distribution, v=V sin ax, whent=0. Solution for any value of ¢

20 ; €~ S/Axt

the case of a single infinite row of images, and equating the result to the right-hand member, we see that 2a

i dnt f,

(20).

*a t= Qin? = * ae BR ale 8) Se (ET) Met et an aw (21), i=—-o z being any integer. It is obvious that for a we may substitute ja in the second mem- ber, and in the factor a(z—£) under the integral sign of the first*

member, without altering it elsewhere, j being any integer: thus we have

*Qr 1 = ae —Kpott s. . rey, * de Sos ke — OS =€ ain jax |*

.. (22).

‘— ce TY at f (where S= SE (6+ 77) (se | i=—0 J

XI. ‘Linear Motion of Heat”; space-periodic arbitrary solid source, isothermals plane. Initial distribution, v=/(x), when ¢=0, f denoting an arbitrary periodic function, period 7; so that f(a +71) =/(x), 7 being any integer. Two solutions (A), (B).

(A) derived synthetically from (10) :

Y

1 4

rap dese 28 aeaht an! pos ae where S= > € — (E441) Ant

i=-0

» (23),

. (24).

*(B) derived analytically and synthetically from (20). Find Ay, A;, Ag, ..., By, Ba, &c., by the harmonic analysis, to satisfy the condition fi=Ao+ A, cos6+ A, cos20+ &e. > B, sin@. B, sin2é+ &c. *

Qara where ¢= J

(25).

j=m _, (3) Thenv-=A)y+ > € vd (El XII. Uniform row of simple instantaneous plane sources. solutions (A) and (B). (A), from XI. (A), (28):*

(As cos YE +B, sin Ue | – (26).

Two

Ie 2 a en (xtily /4xt 2(wnt)? i=- oe,

The No. 2 diffusion curve of § 82 is the representation of the first term (=0) of this formula. (B), from XI. (B), (25) and (26) :

Qn \? : (=)t m(i) cos I | The comparison of these two solutions is very interesting physi-

‘ This is Fouricr’s (¢) of Art. 374 for the case of f(x) a periodic function.

V=

(27).

joo

jm © 1149 BOWE” (28). 1 j=l

He AT

cally, and useful arithmetically. To facilitate the comparison, put

i/2(mxt) =q, and x/2(rnt)}=p . (29) ;*

the two solutions become i=0 – i=” 4 a “% j . oy Se ~m(ptig?? 149 > € # cos eta (30).

The equation between the second and third member, virtually due originally to Fourier, is also an interesting formula of Jacobi’s, Fundamenta Nova Theorie Functionum Ellipticarwm, as was long ago pointed out by Cayley.2 Each formula is a series which con- verges for every value of ¢ however small or however great; the first, (27), the more rapidly the less is ¢; the second, (28), the more rapidly the greater ist. For the case of ¢=/?/4x, and «=0 (that is, qg=1and p=0), the two series become identical. For the more com- prehensive case of p=0, but g unrestricted, the comparison gives the following very curious arithmetical theorem—

142(€7 7 4678 +e OE + be.) 1427 pg AM 4 OPI + Be.) When t=?/4«m (or g=1) the first solution (27) converges with so great suddenness that three terms suffice for most practical pur- poses; when ¢=-/?/4xm (or g=1) the second solution (28) converges with so great suddenness that one term (after the constant first term) suffices for most practical purposes. Thus by using the solu- tion (27) for all values of ¢ from zero to something less than /?/4«7, and (28) for all values greater than the greatest for which (27) is used, we have an exceedingly rapid convergence and easy calcula- tion to find v for any values of x and¢. Thesc formule, thus used, have been of great practical value in calculating what is now known as the arrival curve of signals through a submarine cable, and in designing instruments to record it automatically and allow its telegraphic meaning to be read, or without recording it to allow its meaning to be read by watching the motions of a spot of light. It is clear that (27) and (28) express the potential at a point at distance x from one end of a cable of length 4/7, at time ¢ from an instant when a quantity 4oc of electricity has been suddenly communicated to that end of the cable, both ends being always kept insulated after that instant (as is done practically by an exceedingly short contact with one pole of a voltaic battery, the other being kept to earth). The value of v for «=41, and for all values of¢ from 0 to oo, represents the rise of

the potential at the remote end towards the limiting value 2»

lie,» Gaby

towards which the potential rises throughout the conductor.

XIII. (X. inthree dimensions.) Space triple periodic solid source ; in other words v=V sin ax sin By sin yz, when ¢=0. Solution for any value of (—

_ nee? co 70 po F : ‘ 4kt of ev fr ee dédndé sin a(x ~ €) sin B(y ~ 9) siny (z are ar =V sin az sin py sin wee re ee 2):

Remark that, as an analytical expression for the present case of the general theory of triply-multiple images, the triple integral within the brackets may be written

Qe Qe lr vf “yf af Y d€dndZ sina(x—- £) sinB(y ~~11) siny(z~~ of, ‘ 0 0 0 8ar2(Ki) Lar\ 2 jr 7 =o soc =a (¢+=”) +(nt wy + (e457) i);

‘wheros= = GF = 4xt

i=-© J=-0 k=-«

t, j, &, being any positive or negative integers.

XIV. and XV. (X. and XI. in three dimensions.,; The formule may be written down by inspection; from I., with X. and XI. for guides. The analytical theorem thus obtained, corresponding to (80), in three dimensions, is interesting to pure mathematicians.

XVI. Harmonic solutions, Any distribution of heat, whether in an infinite or in a bounded solid, which keeps its type unchanged in subsiding towards uniformity, when left without positive or negative sources, except such, essentially negative, as are required to fulfil a proper boundary condition, is called a harmonic distribu- tion, provided the temperature does not increase to infinity in any direction. The boundary condition, if the solid is bounded, is essentially that the rate of emission from the surface at every point of it varies in simple proportion to the temperature, and at such a rate

per 1° of temperature at each part of the surface as the solution requires. X. and XIII. are cxamples. The general con- dition for a harmonic solution is

v=fOF(e4,2)

2 Quarterly Journal of Mathematics for 1857; Note by Cayley on an article by W. Thomson, entitled "On the Calculation of Transcendcnts of the form

*o * 7 8 yaar."*

. (84);

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and this tried in (9) gives

*GE aF a 1 Oft)_ de dy d®. | |, . (35). fia * ¥ os*

The first member being independent of x, y,z, and the second being independent of ¢, the common value of the two must be independent of x, y, 2, t, that is to say, must be an absolute constant. Let it be

denoted by -,¢; we have FO=Cer ~ & wee oe Je KBR)

F F @F p oe ee eh Ea S| aT, a A he" ra sid or in terms of polar coordinates, by (6),

?U 1 Gf . au 1 GU py

dr" 7 sine aA sind) + sin do « . \ (38)

where Oi F J r

and

Of this we have a spherical harmonic solution,

U=[A¢i®+Byi®]JSi. . . . . (89), where S; denotes a spherical surface-harmonic of order 7, and oir), Yi®, two particular solutions of the equation

eu uUi+1)

m@t|t-“> w=0 … . . (40). Then (36) and (35) give finally

ome See Peele, mes wear

This solution is in its generality applicable to an infinite solid occupying all space except a hollow round the origin. The solid may of course be bounded externally also by a finite closed surface. If there be no hollow, A/B must fulfil the condition that is finite when r=0. If there are two bound- aries, concentric spherical surfaces, with their common centre at the origin of coordinates, the boundary condition obviously requires uniform emissivity over each, but not necessarily equal for the two. Ifthe two emissivities be denoted by hf and h’, and the radii of the surfaces by a (outer) and a’ (inner), the boundary con- ditions are

a —hv, when r=a |

dv yi. h’v, when r=a

. (42).

and

HEATH, the English form of a name given in most Teutonic dialects to the common ling or heather, but now applied to all species of Hrica, an extensive genus of mono- petalous plants, belonging to the order LHricacew. The heaths are evergreen shrubs, with small narrow leaves, in whorls usually set rather thickly on the shoots; the per- sistent flowers have 4 sepals, and a 4-cleft campanulate or tubular corolla, in many species more or less ventricose or inflated; the dry capsule is 4-celled, and opens, in the true Hrice, in 4 segments, to the middle of which the partitions adhere, though in the ling the valves separate at the dissepiments. The plants are mostly of low growth, but several African kinds reach the size of large bushes, and a Spanish variety, /. arborea, occasionally attains almost the aspect and dimensions of a tree.

One of the best known and most interesting of the family is the common heath, heather, or ling, Calluna vulgaris, placed by most botanists in a separate genus on account of the peculiar dehiscence of the fruit, and from the coloured calyx, which extends beyond the corolla, having a whorl of sepal-like bracts beneath. This shrub derives some eco- nomic importance from its forming the chief vegetation on many of those extensive wastes that occupy so large a portion of the more sterile lands of northern and western Europe, the usually desolate appearance of which is enlivened in the latter part of summer by its abundant pink blossoms. When growing erect to the height of a yard or more, as it often does in sheltered places, its purple stems, close-leaved green shoots, and feathery spikes of bell-shaped flowers render it one of the handsomest of the heaths ; but on the bleaker elevations and more arid slopes it frequently rises only a few inches above the ground. In

*From these we may find h and X', so as to let the harmonic char- acter of the solution be fulfilled in the subsidence. Or if A and h' be given, we have in (41) two equations which determine the two unknown quantities A/B and p. Eliminating A/B, we thus find a single transcendental equation for p, which is proved to have no imaginary or negative roots, and an infinite number of real positive roots, each >«i(i+1)/r2. In the case of *=0, or temperature independent of ¢ and @, (40) gives*

u=Acos7n/2+B sin rrJt.

For this case the transcendental equation for determining valucs for p is very simple, and its roots are calculated numerically with great ease. With the further restriction of no central hollow, we must have A=0, so that w/r may be finite when r=0. This case was fully investigated by Fourier, and very beautifully worked out in his fifth chapter. The more general problem of a solid sphere, with any given initial distribution of temperature, without the restriction of temperature independent of @ and ¢, was solved first we believe by Poisson in the 11th chapter of his Théorie Mathe- matique de la Chaleur, in terms of the formule (36), (38), (40) above.

XVII. The equation of the transference of heat in terms of columnar coordinates, (7) above, affords naturally another beautiful case of harmonic solution. Assume

ome ug Sin ig me. 2… .(48)5 we find by (7) @u;, 1 du; (/p ee | ee row met (2-m -5 uso ar sore Ee

The treatment of this equation and its integral (obviously derivable by 7 differentiations from w, which is a Bessel's function) for the full solution of the thermal problem is most interesting, and very instructive and suggestive in respect to pure analysis. It was splendidly worked out for the case of m= 0 and 7=0 by Fourier in his 6th chapter, "The Motion of Heat in a Solid Cylinder," truly a masterpiece of art. When it was printed in 1821, and published after having with the rest of Fourier's work becn buried alive for fourteen years in the archives of the French Academy, and when Bessel found in it so thorough an investigation and so strikingly beautiful an application of the " Besselsche Function," we can imagine the ordinary feeling towards those "qui ante nos nostra dixerunt " reversed into the pleasure of genuine admiration.

all moorland countries the ling is applied to many rural purposes ; the larger stems are made into brooms, the shorter tied up into bundles that serve as brushes, while the long trailing shoots are woven into baskets. Pared up

NS = S= . VLSI, SS

Wh A aS :

Fic. 1.—Zrica cinerea. Fic. 2.—Calluna vulgaris.

with the peat about its roots it forms a good fuel, often the only one obtainable on the drier moors. The shielings of the Scotch Highlanders were formerly constructed of heath stems, cemented together with peat-mud, worked into a

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kind of mortar with dry grass or straw; hovels and sheds for temporary purposes are still sometimes built in a similar way, and roofed in with ling. Laid on the ground, with the flowers above, it forms a soft springy bed, the luxurious couch of the ancient Gael, still gladly resorted to at times by the

hill shepherd or hardy deer-stalker. The young shoots were in former days employed as a substitute for hops in brewing, while their astringency rendered them valuable as a tanning material in Ireland and the Western Isles. They are said also to have been used by the High- landers for dyeing woollen yarn yellow, and other colours are asserted to have been obtained from them, but some writers appear to confuse the dyer's-weed, Genzsta tinctoria, with the heather. 'The young juicy shoots and the seeds, which remain long in the capsules, furnish the red grouse of Scotland with the larger portion of its sustenance ; the ripe seeds are eaten by many birds. The tops of the ling afford a considerable part of the winter fodder of the hill flocks, and are popularly supposed to communicate the fine flavour to Welsh and Highland mutton, but sheep seldom crop heather while the mountain grasses and rushes are sweet and accessible. In recent times ling las been suggested as a material for paper, but the stems are hardly sufficiently fibrous for that purpose. The purple or fine- leaved heath, Z. cinerea, one of the most beautiful of the genus, abounds on the lower moors and commons of Great Britain and western Europe, in such situations being some- times more prevalent than the ling. The flowers of both these species yield much honey, furnishing a plentiful supply to the bees in moorland districts ; from this heath honey the Picts probably brewed the mead said by Boetius to have been made from the flowers themselves.

It was until recently supposed that no species of heath existed in America; but of late years isolated plants of ling have been found in various parts of New England, Nova Scotia, and Cape Breton, while it has been stated to occur in some abundance in several places in Newfoundland ; probably in distant ages it may have had a wider range on the American continent. The whole group, as observed by Bentham, is "'eminently Atlantic" in its present distribu- tion,—of nearly 500 known species by far the greater part being indigenous to the western districts of South Africa, and nearly all the remainder limited to Europe and its adjacent islands.

The Cape heaths have long been favourite objects of horticulture. In the warmer parts of Britain several will bear exposure to the cold of ordinary winters in a sheltered border, but most need the protection of the conservatory. They are sometimes raised from seed, but are chiefly multi- plied by cuttings "struck" in sand, and afterwards trans- ferred to pots

filled with a mixture of black peat and sand ; the peat should be dry and free from sourness. Much attention is requisite in watering heaths, as they seldom recover if once allowed to droop, while they will not bear much water about their roots: the heath-house should be light and well ventilated, the plants requiring sun, and soon perishing in a close or permanently damp atmosphere ; in England little or no heat is needed in ordinary seasons. The European heaths succeed well in English gardens, only requiring a peaty soil and sunny situation to thrive as well as in their native localities: 2. carnea, mediterranea, ciliaris, vagans, and the pretty cross-leaved heath of boggy

moors, Z. tetralix, are among those most worthy of cultiva-:

tion. The beautiful large-flowered St Dabeoc's heath, belonging to the closely allied genus Menziesia, is likewise often seen in gardens. (c. P. J.) HEATHCOAT, Jonn (1783-1861), the author of im- portant inventions for facilitating the manufacture of Buck- ingham or French lace, was born at Duffield near Derby in 1783. During his. apprenticeship to a framesmith near

Loughborough, he made an improvement in the construc- tion of the warp-loom, so as to produce mitts of a lace-like appearance by means of it. He commenced: business on his own account at Nottingham, but finding himself subjected to the intrusion of competing inventors he removed to Hathern. There he diligently prosecuted his experiments, and in 1808 constructed a machine cap- able of producing an exact imitation of real pillow-lace. This was by far the most expensive and complex textile apparatus till then existing; and in describing the pro- cess of his invention, Heathcoat said in 1836, "The single difficulty of getting the diagonal threads to twist in the allotted space was so great that, if now to be done, I should probably not attempt its accomplishment." Some time before perfecting his invention, which he patented in 1809, he removed to Loughborough, where he entered into partnership with Mr Lacy, a Nottingham manufacturer ; but in 1816 their factory was attacked by the Luddites and the lace frames destroyed. The damages were assessed in the King's Bench at £10,000 ; but as Heathcoat declined to expend the money

in the county of Leicester he never received any part of it. Undaunted by his loss, he began at once to construct new and greatly improved machines in an unoccupied factory at Tiverton, Devonshire, pro- pelling them by water-power and afterwards by steam. His claim to the invention of the twisting and traversing lace machine was disputed, and a patent was taken out by a clever workman for a similar machine, which was decided at a trial in 1816 to be an infringement of Heathcoat's patent. He followed his great invention by others of much ability, as, for instance, contrivances for ornamenting net while in course of manufacture and for making ribbons and platted and twisted net upon his machines, improved yarn spinning-frames, and methods for winding raw silk from cocoons. He also patented an im- proved process for extracting and purifying salt. An offer of £10,000 was made to him in 1833 for the use of his processes in dressing and finishing silk nets, but he allowed the highly profitable secret to remain undivulged. In 1832 he patented a steam plough, which stood foremost in public estimation until superseded by those of Fowler and others. Heathcoat was elected member of parliament for Tiverton in 1832. Though he seldom spoke in the House he was constantly engaged on committees, where his thorough knowledge of business and sound judgment were highly valued. He retained his seat until 1859, and after two years of declining health he died in January 1861 at Bolham House, near Tiverton.

HEATING. In temperate latitudes the climate is gene- rally such as to necessitate in dwellings, during a great portion of the year, a temperature warmer than that out of doors, and, similarly, tropical plants growing in temperate climates require artificial heat in the house in which they are preserved. Thus heating is required for health and comfort: the object of the application of science is to obtain these with the greatest degree of economy. In its aspect as to health it may be assumed that no system of heating is advisable which does not provide for a constant renewal of the air in the locality warmed. In climates such as that of the United Kingdom, the temperature of living rooms should be maintained at from 54° to 68° Fahr. in the daytime; the night temperature may be lower, but should not fall below 40°; and the humidity of the air as measured by the wet and dry bulb thermometers should show a difference of not less than 4° nor much exceeding 8° between the two thermometers, although with an ample supply

of air a greater degree of dryness would probably not be found objectionable.

All heating apparatus depends upon the transference of heat from the fire to the various parts of the building which

it is intended to warm, and this transfer may be effected by radiation, by conduction, or by convection. Radiant heat is emitted and absorbed in an accelerating ratio in proportion as the difference of temperature between the radiant and the recipient increases, and, with the same difference of temperature between the recipient and the radiant, the effect of the radiant will be greater according to the increased temperature of the recipient. In other words, the ratio of the emission of heat increases with the temperature. It is thus easier to effect the warming of a given space by means of a highly-heated surface than by a surface emitting a lower temperature.

An open fire acts by radiation; it warms the air ina room by first warming the walls, floor, ceiling, and articles in the room, and these in their turn warm the air. There- fore in a room with an open fire the air of the room is, as a rule, less heated than the walls. In this case the warm- ing of the air depends on the capacity of the surfaces to absorb or emit heat; except that the heat received by the walls may be divided into two parts, one part heating the air in contact with the wall, and the other passing through the wall to the outer surface, where it is finally dissipated and wasted. Fireplaces are sometimes constructed to assist the warming of the air of a room. For instance, in Sylvester's grate iron bars of which one end terminates under the fire are laid so as to form a projecting radiating hearth. The ventilating fireplace warms the fresh air before its admission into the room by means of gills cast on the back of the grate.

In a close stove, heated to a moderate temperature, the heat, as it passes from the fire, warms the surface of the materials which enclose and are in contact with the fire and with the heated gases. The materials next transfer the heat to the outer surface in contact with the air; and the air is warmed by the agency of this outer surface. If heated to high temperatures a stove

gives out radiant heat, which passes through the air to warm the objects on which the rays impinge.

With hot-water pipes, the heat from the water heats the inner surface of the pipe, and this surface transfers its heat to the outer surface through the material of the pipes. The rate at which the heat can pass from the inner to the outer surface, and be thus utilized instead of passing away straight into the chimney, depends on the heat evolved by the fire, on the extent of surfaces exposed to the heat and their capacity to absorb and emit heat, and on the quality of the material between the inner and the outer surface as a good or bad conductor of heat, This passage of heat through a body by conduction varies directly with the quality of material, and with the difference between the temperature of the inner surface exposed to the heat and the outer sur- face exposed to a cooling influence, and inversely as the thickness between the surfaces. Other things being equal, copper is a better material] than iron for conveying the heat from the fire to water or air; and coverings of brickwork, wood, or woollen fabrics are better adapted than iron for re- taining the heat. The property which appears more than any other to make materials good non-conductors of heat is their porosity to air, and the retention of the air in their pores.

The direct warming of the air may be effected by stoves with brick or iron flues, or by hot-water or steam pipes. The sizes of the heat- ing surfaces for this object must be proportioned to the volume of air required to be warmed for ventilation, and the degree of heat to be maintained, the thickness of the material, and its capacity for absorbing and radiating heat and for transferring heat from one surface to the other. When a large volume of air is supplied and removed for ventilation, rapidity in transferring the heat from the fuel to the air is an important consideration. Brick stoves and flues are worse conductors of heat than iron stoves or flues, but the surface of a brick stove parts with the heat which reaches it somewhat more rapidly than do the surfaces of an iron flue. The slow conducting power of the material and the greater thickness of

a brick stove prevent alternations which may take place in the fire from being felt so much as with iron stoves or flues; and therefore the brick stove warms the air more equably, without sudden variations ; the air so warmed

is free from objectionable elements ; and where they can be conveniently applied, it is advis- able to use brick stoves for warming air for ventilating purposes.

With an iron flue pipe from a stove, almost the whole heat which any fuel is capable of developing may be utilized by using a sufficiently long pipe, horizontal for the greater part of its length, to convey the products of combustion to the outer air. The heat given out by a steve pipe varies with the temperature from end to end, being of course greatest at the end next the stove, where the emission of heat is very rapid; and the amount of heat given out per square foot will vary at each point as the distance from the stove increases. The proportions also into which the heat divides itself between radiation and convection vary greatly with the tem- perature. Thus, with a stove pipe heated at the end nearest the stove to a dull red heat of 1230° Fahr., and of sufficient length to allow the heat to be diminished to 150° at the further end, it would be found that at the stove end of the flue pipe 92 per cent. of the total heat emitted by the pipe is given out by radiation to the walls and only 8 per cent. to the air; but at the exit end the heat is nearly equally divided, the walls receiving 55 and the air 45 per cent. Taking the whole length of such a pipe, the walls would receive 74 per cent. and the air 26 per ceut. of the heat emitted. But with a flue pipe heated to lower temperatures, the air might receive half the heat or even more. When therefore the objeet is to heat the walls rather than the air, the temperature of the pipes should be high; and for this purpose stove pipes are more effective than hot-water or low-pressure steam pipes. At high temperatures there will be practically little differenee of effect between horizontal and vertical flue pipes, because the heat given out is principally that due to radiation, which is independent of the form and position of the radiant. An adequate proportion of flue pipes to the form and size of the stove involves a large surface for the flue pipe ; with a careful observance of proportion, as much as 944% per cent. of the heat in the fuel has been utilized.

There are, however, several serious objections to iron stoves, especially for small rooms: a long flue pipe is unsightly, and on that aceount often inadmissible ; iron stoves heat rapidly, and easily become red-hot, and the effect produced therefore is uncqual. Carbonic oxide, too, has been found in

air warmed by iron stoves very highly heated. It is alleged that highly-heated iron may take oxygen from the carbonic acid in the air in contact with its surface, and thus reduce the acid to carbonic oxide. ©

Whenever iron stoves or cockles are used for heating air, care should be taken to prevent the iron from attaining a high tempera- ture, and with this object all iron stoves should have a lining of fire-brick, so as to prevent the fire from coming in direet contact with the iron; such an arrangement preserves greater regularity in the heating of the air. This object may be also attained by giving the stove a large surface in proportion to the fire by means of flanges or gills to carry off the heat as fast as itis generated. Iron coated with a surface of glazed enamel would enable the heat to pass rapidly from the fire to the surface, while the enamel surface would emit the heat more rapidly than the iron surface.

Hot-water pipes for warming air arc free from many of the objections arising from the direct application of heat to iron, because the heat can be regulated with exactness.

A high temperature may be obtained from water without gene- rating steam by heating it under pressure. In Perkins's high- pressure system, a continuous iron tube, about 1 ineh diameter, is filled with water ; about onc-sixth of the length of the tube is coiled and placed in a furnace, and the remainder, forming the heating surface, is heated by the circulation of the water. At the highest level to which the tube is carried it is enlarged so as to allow of a space for expansion of the heated water equal to 5 per cent. of the contents of the small tube.

Pipes may be heated by either hot water or by steam. The higher the temperature, the greater is the comparative effect in warming air; therefore, with a small heating surface, steam pipes are more cfficient than hot-water pipes, and steam at a high pressure more efficient than low-pressure steam. The efficient action of hot-water pipes depends upon the upward flow of the heated and expanded water as it passes from the boiler, the passage being nade as direct as possible, and so protected as to lose little heat between the boiler and the place where the heat is to be utilized. The return pipe, which brings back the water after it has been cooled down by the abstraction of heat in warming the air, should be passed into the bottom of the boiler as

directly and in as uniform a line from the place where the heat has been used as possible. The velocity of flow in the pipes will depend upon the temperature at which the water leaves the boiler, the height to which the heated water has to rise, and the temperature at which it passes down the return pipe back into the boiler. The efficiency of a hot-water apparatus will be regulated by these conditions, by | the size of the pipe, and by such other conditions as affect the flow

of water in pipes. When the boiler or source of heat is very near the level of the pipes for heating the air, the average temperature which can be obtained in the pipes will be lower than when the vertical column is long. The heating surface must be regulated with reference to this difference of level. It may further be assumed that with small pipes, the temperature being constant, the velocity of flow in the pipe necessary to furnish a given amount of heat will vary in the ratio of the length of the pipe. When the water circu- lates through the pipes by virtue of the difference of temperature of the flow and return currents only, it is impossible to count upon a

eater mean temperature of the pipes than from 160° to 180°,

ecause above that temperature the water iu the boiler begins to boil. To obtain a sufficient velocity of circulation for long dis- tances, or with small differences of level, a forced circulation may be resorted to. This has been done by Messrs Easton and Anderson at the county lunatic asylum at Banstead, in the following manner. ‘he whole hot-water service is supplied from boilers placed at one end of the asylum buildings, which extend toa distance of several hundred yards. There are two pipes: one of them, which may be called the flow pipe, is connected directly with the boiler, ter- minating at the point furthest from the boiler ina dead end; the other, which may be termed the return pipe, is parallel to the first, and terminates at one end ina cistern which is placed about 6 feet above, and supplies the boiler. At the other eud furthest from the cistern the second pipe also terminates in a dead end, At each pavilion or place to which hot water is required to be conveyed, there is a connexion between the two pipes, which can be closed or opened at will; when it is opened, the water can pass from the flow to the

return pipe. In the second, or return pipe, near the point where it ascends to the cistern, is placed a rotatory pump, or tan wheel, which is always kept revolving. When the openings are all closed between the two pipes, this pump or fan simply slips through the water ; but as soon as the return pipe obtains a supply of water from any of the openings between it and the flow pipe, a circulation is established.

The following diagram, resulting from Mr Anderson's experi- ments, published in the Journal of the Institution of Civil Engineers for 1877, shows the total units of heat given out by cast-iron and wrought-iron pipes per square foot of surface per hour for various differences of temperature applicable either to hot-water or steam

ipes. Suppose, for example, it is required to know how much

eat will be given out by 4-inch cast-iron or 2-inch wrought-iron as at 190° in a room, the temperature of which is 60°; the

ifference of temperature is 130°, and corresponding to this will be found 232°7 units for 4-inch pipes and 356 units for 2-inch wrought-iron pipes per square foot per hour.

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eo ou i—) Units of Heat per Square Foot per Hour.

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0 10° 20° Bu° 40° BU” 6)° 70° BU 90° 100” 110° 120° 130° 140° 150° 160° 170° 15u”,190° 200° Diagram for ascertaining the heat given out by 4-inch cast-iron and 2-inch wrought-iron pipes at various differences of temperature. The dotted line shows the 4-inch, and the solid line the 2-inch pipes.

The amount of heating surface to be afforded with hot-water pipes depends mainly upon the volume of air to be admitted and removed, and the temperature desired to be maintained, but in any given building there are other circumstances to be taken into account, viz., the position, aspect, subsoil, temperature of locality, thickness of walls, size and form of windows, and other influences affecting the temperature of the incoming air, or causing loss of heat. An empirical rule has been laid down that in a dwelling- house 1 square foot of heating surfacc is required for every 65 cubic feet of space to be warmed, and in a greenhouse 1 square foot to every 24 cubic feet. This empirical rule does not take into account the sanitary considerations as to the renewal of air.

Steam-heated pipes present important advantages in some cases over hot-water pipes for heating purposes, because of the higher temperature to which the pipes can be raised, their consequent smaller size, and the facility of conveying the heat to a distance. Steam heating may be applied directly; and the waste steam from an engine is also applicable for heating.

for boiling, and even for baking.

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The direct application of steam heating on a large scale has been made at Lockport, New York. About 200 houses in the city are

heated from a central supply through about 3 miles of piping,

radiating from a boiler-house, which contains two boilers 16 feet by 5 fect, and one boiler 8 feet by 8 feet. These boilers are fired during the winter to a pressure of 35 Ib to the inch, with a con- sumption of 4 tons of anthracite coal in twenty-four hours. The boiler pressure of 35 Ib in winter and 25 Tb in summer is maintained through a total length of 3 miles of piping up to the several points of consumption, where there is a cut-off under the control of the cousumers. The first 600 feet of mains from the boilers are 4 inches in diameter. There are 1400 feet of 38-inch pipes, 1500 feet of 23- inch pipes, and 2000 feet of 2-inch pipes. The supply pipes from these mains to the houses are 1} inches in diameter, and within each house $-inch pipes are used. In addition to the cut-off tap from the main under the control of the consumer, there is a pres- sure valve regulated to a 5-f pressure under the control o the company ; and beyond this is an ingeniously constructed meter, whiel indicates, not only the total consumption in cubic feet of steam, but also the quantity of steam in each apartment. At each 100 feet of main an expansion valve, like an ordinary piston and socket, is inserted, allowing an expansion in each section of 100 feet of 13 inches for the heat at 35-fb pressure. No condensation occurs in the mains. They are covered with a thin layer of asbestos paper next the iron, then a wrapping of Russian felt, and finally manilla paper, and the whole is encased in tiniber bored out three- quarters of an inch larger than the felt-covered pipes, and laid along the street like gas-pipes. The distribution of heat in the apartments is by means of radiators consisting of inch pipes, 30 inches long, placed vertically either in a circle or as a doeble row, and connected together at top and bottom, with an outlet pipe for the condensed water, which escapes at a temperature a little below boiling, and is sufficient for all the domestic purposes of the house, or it may be used as accessory heating power for horticultural and other purposes. The steam has also been applied at a distance of over half a mile from the boilers for motive power, and two steam engines of 10-horse and 14-horse power are worked from the boilers at a distance of half a mile with but a slightly increased consump- tion of fuel. The laid-on steam is also used for cooking purposes, As in the case of gas supply, the steam supply company lay their pipes up to the houses, the con- sumer paying for all internal pipes, fittings, and radiators. Ina

moderatcly-sized eight-roomed house the expense of these amounted to $150, and in larger houses with costlier fittings to $500.

Boulton's system of heating with exhaust or waste steam is devised to cause the steam froma steam engine to travel long distances without any back pressure on the engine. It is especially applicable to drying rooms in which 150° Fahr. has been obtained by a large heating surface ; for a lower temperature less heating surface is required. The capacity of heating by exhaust steam is nearly in a ratio with the fuel expended in the boiler. There is some cooling in passing through the engine, and in the conveyance along the pipes to the rooms to be heated, but this loss is compara- tively small if the pipes and the cylinder are covered with a good uon-conductor, nee the condensed water is taken back hot into the boiler. Thus, if the steam be taken from the boiler direct to the pipes at five atmospheres, the temperature would be 307°, and if.a comparative capacity of steam were allowed to pass through the engine to create power, and discharged into the pipes at one atmo- sphere, it would decrease in temperature to 213°; but it would increase in bulk according to the expansion ; and thus to obtain nearly the same temperature in the room the heating surface should be increased. .

With an engine of 17-inch cylinder and 25-horse power nominal, the exhaust steam has been made to travel 200 yards in a direct line, as well as to pass into various branches, amounting in the agsregate to about 2386 yards (or 14 miles) of 14-inch pipes. After this it warms the water for the boiler, and the steam is not all used up. The whole efficiency of the system depends upon so arranging the pipes as to prevent back pressure. Mr Boulton assumed that one-horse power if properly applied should warm about 30,000 cubic feet of space, subject to reductions for window space, wall space, the number of cubic feet of air allowed to escape for ventilation, and other considerations, and lays down the follow- ing empirical rule, viz.: —1 square foot of steam pipe is allowed for cach 6 square feet of glass in the window, 1 for every 6 cubic feet of air escaping for ventilation per minute, and 1 for every 120 feet of wall, roof, or ceiling, adding about 15 per cent. for contingencies.

Wrought-iron pipes 14-inch bore are the most economical for steam, as they afford a large heating surface with small area. In heating living rooms by steam, the high temperature of the a affords one of the advantages of an open fire, viz., warmt by radiation, and combines with this the advantage which hot-water pipes possess of directly warming the air. (D.G.)

HEAVEN. See Escuaronoey, vol. viii. p. 537.

HEBBEL, Friepricu (1813-1863), a German poet and | was a slight modification of that of Hera, and he believes

dramatist, was born of peasant parents at Wesselburen, in Schleswig-Holstein, 18th March 1813. In his fourteenth year he obtained a humble clerkship in his native parish, but already his ambition was souring towards higher things. At an early period he began to practise poetical composition, and several of his poems published in the Modezeitung at Hamburg awakened such interest that several gentlemen procured him in his twenty-second year the means of preparing himself in Hamburg for the uni- versity. He afterwards studied philosophy and history at Heidelberg and Munich. In 1841 he returned to Ham- burg, where he published his first tragedy, Judith. Ina journey which he made to Copenhagen in 1842 he formed the acquaintance of Thorwaldsen and Ochlenschliger, and acquired the more substantial advantage of a travelling annuity from the king of Denmark. He accordingly visited Paris, after which he went to Italy, where he re- mained several years, staying principally at Rome, Pisa, and Palermo. Having in the spring of 1846 stopped at Vienna on his way home to Germany, he made the acquaintance of the actress Christine Engehaus, whom he married in May of the same year. His marriage led liim to take up his permanent residence in Vienna, and probably deepened his interest in dramatic composition, which from that time chiefly occupied his attention. He died in 1863. His principal dramas are Genoveva, 1843 ; Maria Magdalena, 1844; Julia, 1851; Agnes Bernauer, 1855; and Die Nibelungen, 1862. They exhibit con- siderable skill in the portraiture of character, great glow of passion, and a true feeling for dramatic situations, but their poetic effect is marred

by frequent extrava- gances which border on the grotesque, and by the intro- duction of incidents the unpleasant character of which is not sufficiently relieved. In many of his smaller poems his undoubted poetic gifts found a truer and more artistic utterance.

His collected works appeared at Hamburg in 12 vols, (1865-68). His biography by Emil Kuh was published at Vienna in 1877.

HEBE, in Greek mythology, is a personification of the blooming freshness and youth of nature. Originally she appears almost identical with the pure Greek Aphrodite (as distinguished from the Oriental goddess). Hebe is the daughter of Zeus and Hera, as Aphrodite of Zeus and Dione; but Dione and Hera are only two names for the same goddess. Like Aphrodite, Hebe is called the most beautiful of the gods (Pind., V., 10, 17). In Sicyon and Phlius Hebe is called Dia, a regular epithet of Aphrodite. In Phlius, where Hebe was worshipped on the citadel in a temple where no image of her was allowed and to which right of asylum was attached, a festival called xicaordmor was celebrated to her every year; and ivy was sacred also to Aphrodite. It is in accordance with the close resem- blance between Aphrodite and Core that Hebe also has many points of analogy with the latter, to whom she is compared by Gerhard and Welcker (Gr. G@tt., i. 369). According to the custom for the unmarried daughters of a family, Hebe acts in the Homeric poems as a sort of

attendant to the gods and especially to her own mother |

Hera. She offers the cup to the gods, just as on earth the women, and especially the youngest daugliter, did to guests and to warriors departing or returning. She bathes Ares (i1., v. 905), as Polycaste does Telemachus. She harnesses the horses for Hera (//., v. 722). She appears very often in connexion with the worship of Hera. A statue of her by Naucydes stood beside the Hera of Polyclitus in the Hereum at Argos. Praxiteles placed statues of her and Athene beside that of Hera in the temple at Mantinea, and Kekulé (Zebe) maintains that the artistic conception of Hebe which prevailed in the finest period ef Greek art

that a bust, now in private possession, is the single remain- ing example of its kind. Welcker's opinion that the so- called Farnese Flora is really a

Hebe has not been generally accepted. In later art she is often represented, like Gany- medes, caressing the eagle; and it is possible that the epithet Ganymeda, by which she was called in Phlius, is not really ancient, but arises from the supposed analogy of her office with that of Ganymedes. The meaning of the word Hebe tended to transform the goddess into a mere personification of the eternal youth that belongs to the gods, and this conception is frequently met with. Then she becomes identical with the Roman Juventas, who is simply au abstraction of an attribute of Jupiter Juventus, the god of increase and blessing and youth. By a most transparent allegory it was said that Juventasand Terminus alone of all the gods refused to give way when the temple of Jupiter Capitolinus was being built. Perhaps the most interesting point about Hebe is her connexion with Heracles. When he was received among the gods and re- conciled to Hera, Hebe was given him in marriage. This legend appears only in a doubtful line of Homer (Od., xi. 603) ; but Hesiod (7'%., 950) and Pindar (V., 10, 17) also know it. They were worshipped together in the Cynosarges at Athens, and represented side by side on the Amycleean throne. The apotheosis of Heracles and his marriage with Hebe became a favourite subject with poets and painters. Many instances occur on vases, thongh several of those enumerated by Kekulé are otherwise explained by other writers on art.

HEBER, Recinarp (1783-1826), a distinguished prelate and hymn-writer, was born at Malpas in Cheshire in 1783. He early showed remarkable promise, and was entered in November 1800 at Brasenose College, Oxford, where he proved a distinguished student, carrying off prizes for a Latin poem entitled Carmen Seculare, an English poem on Palestine, and a prose essay on The Sense of Honour. In November 1804 he was elected a fellow of All Souls College ; and, after finishing his distinguished university career, he made a long tour on the Continent. He was admitted to holy orders in 1807, and was then presented to the family living of Hodnet in Shropshire. In 1809 Heber married Amelia, daughter of Dr Shipley, dean of St Asaph. He was appointed Bampton lecturer for 1815, prebendary of St Asaph in 1817, preacher at Lincoln's Inn in 1822, and bishop of Calcutta in January 1823. Before sailing for India he received the degree of D.D. from the university of Oxford. In India Bishop Heber laboured indefatigably, not only for the good of his own diocese, but for the spread of Christianity throughout the East. Animated by apostolic zeal, he undertook numerous

tours in India, consecrating churches, founding schools, and discharging other Christian duties. Such devotion to his work in a trying climate told severely on his health, At Trichinopoly he was seized with an apoplectic fit when in his bath, and expired on 3d April 1826.

' Heber was a man of profound learning, refined literary taste, and great practical energy. His Christian character manifested all the beauty and simplicity of the days of the early church. As a poet he has attained a high place. His Palestine is generally considered the best prize poem ever written at Oxford. Heber's fame rests mainly on his hymns, which, as literary compositions, rank among the best in the English language. Those beginning as follows may be instanced :—'"' Lord of mercy and of might"; "Brightest and best of the sons of the morning"; "By cool Siloam's shady rill"; 'Lo, He comes in clouds descending"; "The Lord of might from Sinai's brow"; "Jesus Christ is risen to-day"; "Holy, holy, holy, Lord God Almighty"; "From Greenland's icy mountains";

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"Thou art gone to the grave! but we will not deplore thee." Heber's hymns and other poems are distinguished by finish of style, pathos, and soaring aspiration ; but they lack originality, and are rather rhetorical than poetical in the strict sense. —

Heber was a voluminous author, as may be scen from the follow- ing works :—Palestine; a Poem, to whieh ts added the Passage of the Red Sea, 1809; Europe: Lines on the Present War, 1809; The Personality awd Office of the Christian Comforter asserted and ex- plained, being the Bampton Lectures for 1815; The Whole Works of Bishop Jeremy Taylor, with a Life of the Author, and a Critieal Examination of his Writings, 1822; Hymns written and adapted to the Weekly Chueh Service of the Year, prineipally by Bishop Heber, 1827; A Journey through India, 1828; Sermons preached in England, and Sermons preached in India, 1829;. Parish Sermons,

1837.

For further information about Heber sce his Zife, by his widow, 1830, which also contains 2 number of Heber's miscellaneous writings ; The Last Days of Bishop Heber, by Thomas Robinson, A.M., archdeacon of Madras, 1830; and Memorials of a Quiet Life, by Augustus J. C. Hare, 1874.

HEBERDEN, Wiuiam (1710-1801), a practical physician of some celebrity, was born in London in the year 1710. Inthe end of 1724 he was sent to St John's College, Cambridge, where he obtained a fellowship about 1730, became master of arts in 1732, and took his degree in physic in 1739. He remained at Cambridge about ten years longer as a practitioner of physic, and gave an annual course of lectures on materia medica. In 1746 he became a fellow of the Royal College of Physicians in London ; and two years afterwards he left Cambridge to establish himself in London, where he was elected a fellow of the Royal Society in 1769, and was employed in a very extensive medical practice for more than thirty years. Latterly he passed his summers at a house which he had taken at Windsor, but he continued his practice during the winter for some years longer. Iu 1778 he was made an honorary member of the Royal Society of Medicine at Paris. He died 17th May 1801.

Heberden's first publication seems to have been a short essay on the incongruous composition of the mithridate and theriac, entitled Antitheriaca (1745). He also wrote several papers for the Royal Society, which were published in its Transactions ; and he was one of the principal contributors to the first three volumes of the Medical Transactions, published, in a great measure at his sug- gestion, by the College of Physicians. He is, however, best known by his Commentaries on the History and Cure of Diseases, the result of careful notes made in his pocket-book at the bedside of his patients. In accordance with his directions the work was ublished posthumously in 1802 ; prefixed to it is a short notice of his life.

HEBERT, Jacquss Rens (1755-1794),a French revolu- tionist, surnamed from the newspaper he edited " Le Pére Duchesne," was born of obscure parents at Alengon in 1755. He came at an early age to Paris, where he lost more than one situation through malversation, and was in abject poverty when the occurrence of the French Revolution opened up tq him a career in which he obtained consider- able temporary success and permanent

notoriety. Having shown great readiness and proficiency in a style of writing and of oratory which appealed to the worst feelings of the revolutionary mob, he soon acquired great influence in the clubs, and was chosen to oppose the constitutional paper Le Pere Duchesne by editing a revolutionary paper of the same name. 'The scurrilous and extravagant language of the new print exactly coincided with the sentiments of the class to whom it was addressed, and it contributed not a little to several of the worst and most violent manifesta- tions of the revolutionary spirit. It had a very bene- ficial influence on the fortunes of its editor, who after the 10th August 1792 was one of the chief members of the revolutionary commune, and on the 2d September was appointed substitute to the procureur syndic. On the 2th May 1793 an order was sent out for his arrest by the more moderate party of the commune on the ground that he was plotting their assassination, but on account of a formidable outbreak of the mob he was set at liberty,

and when he appeared again at the commune he was pre- sented with a civic crown. member of the commission to examine Marie Antoinette, he with unsurpassed moral baseness foully accused her of a crime too scandalous to be mentioned, several of his colleagues he invented the worship of the goddess " Reason," and subsequently he organized a party

Having been appointed a Along with

of ultra-revolutionists known as the Heébertists or enragés. The faction were, however, arrested by the committee of public safety, and on the 24th March 1794 were led forth to execution. Hébert behaved with great cowardice at his trial, and died amid the jeers and insults of the mob over whose passions he had at one time exercised such sway and to whom he owed his promotion to power.

He was the author of Vitres eassées par le véritable Pere Duchesne, 1791; Vie privée de Vabbé Maury, 1790; Petit caréme de Vabbé Maury, 1791; Nouvelle lanierne magique, 1792.

HEBREW LANGUAGE AND LITERATURE. The name Hebrew (Latin, Hebreus; Greek, éBpatos) is a tran- scription of ‘ebrdyd, the Aramaic equivalent of the original Old Testament word “22Y, ‘2bri, pl. “dbrém, which is the proper Gentile name of the people who also bore the collective name of Israel or Children of Israel (B’né Israel). The name of Israel with its sacred associations in the patriarchal history is that by which the Old Testament writers prefer to designate their nation ; and this circumstance, combined with the fact that the Sacred Text frequently employs the term Hebrews where foreigners are introduced as speaking or spoken to (e.g., Exod. it. 6; 1 Sam. iv. 6, 9; Gen. xl. 15; Ex. iii. 18), has led to the conjecture that the name of Hebrews (men from the other side, scil. of the Euphrates) was originally given to the descendants of Abraham by their Canaanite neighbours, and continued to be the usual designation of the Israelites among foreigners, just as the Magyars are known to other Europeans as Hungarians (foreigners), as we call the High- Dutch Germans (warriors), or as the Greeks gave the name of Phcenicians to the people that called themselves Canaanites.! A closer view of the case does not confirm this conjecture. The name of Israel is often found in the Old Testament in the mouth of foreigners, and the whole usus loquendé is explained by the observation that the Gentile noun corresponding to the collective “Israel” is regularly “Hebrew” and not “ Israelite,” the latter word being rare and apparently of late formation.? Nor has the word Hebrew been hitherto found in the early monuments of other Eastern nations; for the identification proposed by Chabas which finds the Hebrews in the hieroglyphic Apuriu is more than doubtful. On the other hand the name of Israel appears on the stone of Mesha king of Moab, and perhaps has been deciphered on Assyrian monuments. The form ‘tbr? is, in the language of Semitic grammarians, a relative noun, presupposing the word ‘#ber as the name of the tribe, place, or common ancestor, from whom the Hebrews are designated. Accordingly we find Eber as a nation side by side with Assyria in the obscure poetical passage Num. xxiv. 24, and Eber as ancestor of the Hebrews in the genealogical lists of Gen. x., xi. Here we must apparently distinguish two records.° According to*

1 See especially Gesenius, Geschichte der Hebréischen Sprache und Schrift, pp. 9 seg.; most recently Kautzsch in Riehm’s Handworter- buch. 2 In 2 Sam. xvii. 25 Israelite must be corrected to Jshmaelite, as in the

parallel passage 1 Chron. ii. 17. 3 Chabas, ALlélanges Egyptologiques, i. 42; Ebers, Aegypten wnd die Bicher Mosts, i. 316 ; Brugsch-Bey, Geschichte Aegyptens, 582 (Eng. trans., ii. 128-9); Birch, Egypt, p. 128. 4 Schrader, Keilinschriften und Geschichtsforschung (Giessen, 1878), pp. 359, 536, gives the latest arguments for this not undisputed reading.

5 See De Goeije in the Theol. Tijdschrift, 1870, p. 248 ; hausen in Jahrbb. f. D. Theol., 1876, p. 395.

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HEBREW

Gen. xi. (and Gen. x. 24) Eber is the great-grandson of Shem through Arphaxad, and ancestor of Terah through Peleg, Reu, Serug, and Nahor. These are not to be taken as the names of individual men. Several of them are designations of places or districts near the upper waters of the Euphrates and Tigris, and among other circumstances the place at the head of the series assigned to the district of Arrapachitis (Arphaxad), through which a migration from Ararat to the lands occupied by the Semites in bis- torical times would first pass, suggests the probability that the genealogy is not even meant to exhibit a table of ethno- logical affinities, but rather presents a geographical sketch of the early movements of the Hebrews, who are personified under the name of Eber. venture to assert (with some scholars) that the author of the list (the Levitical Elohist) extended the name of Hebrews to all descendants of Terah.! The case is different with another and apparently older record of which a frag- ment seems to be preserved in Gen. x. 21, 25-30. Here there is no intermediate link between Shem and Eber. Sons of Shem and sons of Eber appear to be coextensive ideas, and to the latter are reckoned not only the descend- ants of Peleg (Aramzans, Israelites, Ishmaelite Arabs, &c.), but the South Arabian tribes of Joktan. We possess no information which casts light on this wide conception of the sons of Eber, and in the ordinary language of the Old Testament Hebrew aid Israelite are strictly synonymous.

Compare, however, the interesting conjectures of Sprenger, Alte Geographie Arabiens (Bern, 1875), p. 294, who identifies Peleg with Falag in Central Arabia, and finds in the record a witness to the truth of the view that Arabia

is the original centre of the Semitic dispersion, a view which is shared by other scholars, as Hitzig (Geschichte Israels, pp. 26, 59), and Schrader (Z. D. MM. G., 1873, pp. 897-424), In this connexion it is perhaps worth while to note the Arabic Gentile name 'Obri, belonging to 'Obra, a minor division of the Joktanic tribe of the Azd (Lubb-

When it is recognized that Eber in Genesis is not an actual personage but an ethnological or geographical abstrac- tion, we are thrown back on etymological conjecture as to the origin of the name of Hebrews. 'Eber means the further bank of a river, from a root meaning fo cross. Hence in Gen. xiv. 13 the Septuagint renders Abram the Hebrew by 6 zrepdrns, 'the crosser."? Grammatically more accurate, while resting on the same etymology, is the render- ing of Aquila, 6 zepatrys, 'the man from the other side" of the Euphrates, which is the explanation of Jewish tradi- tion (Bréshit Rabba, and Rashi) and still generally adopted. It is, however, far from satisfactory, and almost of necessity depends on the theory that the name was fixed upon the Hebrew immigrants by the earlier inhabitants of Canaan.® A modified form of the etymology takes 'eber in the Arabic sense of a river bank, and makes the Hebrews " dwellers in a land of rivers" (Steiner in the Bibel-Lea., ii. 613). This goes well with Peleg (watercourse), as in Arabia we have the district Falag, so named because it is furrowed by waters (Sprenger, Geog. Arab., p. 234).4

Lhe name "Lebrew Language." —By the Hebrew language we understand the ancient tongue of the Hebrews in Canaan —the language in which the Old Testament is composed, with the exception of the Aramaic passages (Jer. x. 11; Ezra iv. 8-vi. 18; vii. 12-26; Dan. ii. 4—vii. 28). But ee ee Oe ee

= The Terahites, according to other testimonies, are Arameans (Gen. xxii, 20 seg.; Deut. xxvi. 5), but our Elohist, who can hardly have written before the captivity, makes Aram a separate offshoot of Shem, having nothing to do with Eber (Gen. x. 22, 23).

- *Compare Jerome, Quest. Hebr. on the passage, and Theodoret, Qu. LXI. in Gen.*

3 Compare Ewald, Geseh. Israels (8d ed.), i. 407 seg. (Eng. trans., i, 284), where also other etymologies are noticed.

- *Complete ignorance of Hebrew made it possible for early Christian writers to derive the naine of the Hebrews from Abraham. See Bochart's Phaleg, lib. ii., cap. 14. Other guesses will be found in the Onomastica.*

If this is so we can hardly .

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we do not find that this language was called Hebrew by those who spoke it. It is the lip, i.e, speech of Canaan, Isa. xix. 18, or, as spoken in Southern Palestine, .n»q)7" Jewish (2 Kings xviii. 26 ; Neh. xiii. 24). The later Jews call it the holy tongue in contrast to the profane Aramaic dialect (commonly though improperly enough called Syro- Chaldaic) which long before the time of Christ had super- seded the old language as the vernacular of the Jews. This change had already taken place at the time when the expression "in Hebrew" (éGpaicrt) first occurs (Prologue to Sirach) ; and both in the Apocrypha and in the New Testament the ambiguous term, naming the language after those who used it, often denotes tlie contemporary verna- cular, not the obsolete idiom of the Old Testament. But the other sense was admissible (¢.g., Rev. ix. 11, and so fre- quently in Josephus), and naturally became the prevalent one among Christian writers who had little occasion to speak of anything but the Old Testament Hebrew.® In modern usage it is incorrect to call the Jewish Aramaic Hebrew ; though uneducated Jews apply the name even to the corrupt German and Spanish jargons which they are accustomed to write and print in Hebrew characters.

Character and Philological Relations of Hebrew.— Hebrew isa language of the group which since Eichhorn has generally been known as Semitic, and of which Arabic and Ethiopic (Southern Semitic), the various dialects of Aramaic, and the language of the Assyrian and Babylonian cuneiform inscriptions are the other chief representatives. From its geographical position asthe language of Palestine between the Aramzans of the north and the Arabs of the south, Hebrew has been called Middle Semitic. Or Aramaic Assyrian and Hebrew may be grouped together as Northern Semitic in contrast to Arabic and Ethiopic. The affinities of the Semitic languages are so close that they may fairly be com- pared with a sub-group of the Indo-Germanic family—for example, with the Teutonic languages. The

fundamental unity of the Semitic vocabulary is easily observed from the absence of compounds (except in proper names) and from the fact that almost all words are derived from their roots in definite patterns (measures) as regular as those of gram- matical inflexion. The roots regularly consist of three consonants (seldom four or five), the accompanying vowels having no radical value, but shifting according to gram- matical rules to express various embodiments of the root idea. The triliteral roots are substantially common to the whole Semitic group, subject to certain consonantal per- mutations, of which the most important are strikingly analogous to those laid down by Grimm for the Teutonic languages,

There are four sounds in Arabic unknown to Hebrew and Aramaic, and for which the former regularly has a sibilant, the latter a lingual—in one case a deep guttural. This guttural (}),

and the palatal letters which in the following table are represented by d, s, t, 2, are peculiar Semitic sounds.

Arabic. Hebrew. Aramaic.

te 5 = sh = tn

dh & = ge = at

ze b = s¥ = ty

d 4d =x s 3 = Y [also s]

On the last cquation see Lagarde, Scmitica, i, 22; Néldcke in Z. D. Md. G., xxxii., 405; and on the permutation of consonants in general, Merx, Gram. Syr., § 24; Stade in Morgenl. Forschungen (1875), p. 179 seg. Whether the Arabic or Aramaic forms are the older is disputed. No one maintains that the Hebrew forms arc original.

5 The term “ Hebrew language” seems to have originated with the Greeks or Hellenists. Philo, however, calls the language of the Old Testament Chaldee (De Vita Mosis, ii. 5, 6; ef. Jerome on Dan. i.). On the use of the

expression "' Hebrew language" in the Talmud, see Berliner, Beitrdge zur heb. Gr. (Berlin, 1879), p. 5.

Derivation from the roots aud inflexion proceed partly by the reduplication of root letters and the addition of cer- tain preformatives and afformatives (more rarely by the insertion of formative consonants in the body of tlie root), partly by modifications of the vowels with which the radi- cals are pronounced. Almost every root expresses in its origin something that can be grasped by the senses, and the mechanism by which words are formed from the root is adapted to present sensible notions in a variety of nuances and in all possible embodiments and connexions, so that there are regular forms to express in a single word the in- tensity, the repetition, the production of the root idea—the place, the instrument, the time of its occurrence, and so forth. Thus the expression of intellectual ideas is neces- sarily metaphorical, almost every word being capable of a material sense or at least conveying the distinct suggestion of some sensible notiou. For example, the names of passions depict their physiological expression ; "to confer honour" means also "to make heavy," and so on. The same concrete character, the same inadequacy to convey purely abstract thoughts without a substratum appealing to the senses, appears in the grammatical structure of the Semitic tongues,—for example, in the absence of the neuter gender, in the extreme paucity of particles, in the scanty provision for the subordination of propositions, which de- prives the Semitic style of all involved periods and reduces it to a succession of short sentences linked by the simple copula and. The fundamental element of these languages is the noun, and in the fundamental type of sentence the predicate is a noun set down without any copula and there- fore without distinction of past, present, or future time. The finite verb is developed from nominal forms (participial or infinitive), and is equally without distinction of time. Instead of tenses we find two forms, the perfect and thie imperfect, which are used according as the speaker con- templates the verbal action as a thing complete or as con- ditional, imperfect, or in process. It lies in the nature of this distinction that the imperfect alone has moods. In their later stages the languages seek to supply the lack of tenses by circumlocutions with a substantive verb and par- ticiples. Other notable features common to the

Semitic tongues are the use of appended suffixes to denote the possessive pronouns with a substantive, or the accusative of a personal pronoun with a verb, and the expression of the genitive relation by what is called construction or an- nexation, the governing noun being placed immediately before the genitive, and if possible slightly shortened in pronunciation so that the two words may run together as one idea. A characteristic of the later stages of the lan- guages is the resolution of this relation into a prepositional clause.

These and other peculiarities are sufficient to establish the original unity of the group, and entitle us to postulate an original language from which all the Semitic dialects have sprung, Of the relation of this language to other linguistic stems, especially to the Indo-Germanic on the east and the North-African languages on the west, we cannot yet spcak with certainty; but it appears that the present system of triliteral roots has grown out of an earlier biliteral system which, so far as it can be recon- structed, must form the basis of scientific inquiry into the ultimate affinities of the Semitic group.!

Before the rise of comparative philology it was a familiar opinion that Hebrew is the original speech of mankind. Taken from the Jews, and as already expressed in the Palestinian Targum on Gen. xi. 1, this opinion drew its

1 Renan, Histoire des Langues Sémitiques, sketches the history of research in this direction. Noteworthy are the remarks of Lagarde, Symmicta, p. 121. On survivals from the biliteral stage, see Noldeke, Mandéische Graim., p. 96. –

‘of the Nifal (Arab. vii.), and in other minor points.

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main support from etymologies and other data in the earlier chapters of Genesis, which, however, were as plausibly turned by Syriac writers in favour of their own tongue.” Till quite recently many excellent scholars (including Ewald) have claimed for Hebrew the greatest relative an- tiquity among Semitic tongues. But though Hebrew has by far the oldest literature,

this does not prove that its structure comes nearest to the original Semitic language. And it is now generally recognized that in grammatical structure the Arabic, slut up within its native deserts till the epoch of Islam, preserved much more of the original Semitic forms than either Hebrew or Aramaic. In its richer vocalization, in the possession of distinct case-end- ings, in the use for feminine nouns of the afformative ¢, which in the northern dialect has passed through h (originally audible as in Egyptian Arabic) into a mere vowel, in the more extensive range of passive and modal forms, and in other refinements of inflexion, Arabic repre- sents no later development, but the original wealth and primitive subtlety of Semitic speech, as appears not only from fragmentary survivals in the other dialects but from an examination of the process of decay which has brought the spoken Arabic of the present day into a grammatical condition closely parallel to the Old Testament Hebrew. But while Arabic is in many respects the elder brother, it is not the parent of Hebrew or Aramaic. Each member of the group had an independent development from a stage prior to any existing language, though it would seem that Hebrew did not branch off from Aramaic so soon as from Arabic, while in its later stages it came under direct Aramaic influence.

Among the points in which Hebrew differs both from Arabic and Aramaic may be mentioned the consonantal relations already spoken of, the system of tone long vowcls, the use of Waw consccutive, the 1 of the causative and reflexive stems and of the article, and the compensation for omitting the reduplication of gutturals and r by lengthening a preceding vowel.? Again, Hebrew agrees with Arabic against Aramaic in possessing a prefixed article, in the use But in more notable features Hebrew and Aramaic agree against Arabic, as in the absence of broken plurals, the place of the accent, the aspir- ation of certain letters whenever thcy are preceded by a vowel sound, and the substitution of y for was the first radical of roots. To give furthcr details would carry us too far into comparative grammar. Speaking generally, it may be said that Hebrew is less copious in vocabulary than Arabic (in which tongue, however, the abundance of synonyms is largely due to an artificial combination of several dialects), and less rich in subtle distinctions of gram- matical form and refinements of syntax. On the other hand, Hebrew is much superior to Aramaic in flexibility of structure, in

fulness of vowels, and in all the qualities which adapt a language for poetical expression.

Geographical Sphere and History of Hebrew as a Spoken Language.—The Hebrew spoken by the Israelites in Canaan was separated only by very minor differences (like those of our provincial dialects) from the speech of neigh- bouring tribes. We know this for the Moabite language from the stone of Mesha; and the indications furnished by proper names, as well as the acknowledged affinity of Israel with these tribes, make the same thing probable for Ammonand Edom. More remarkable is the fact that the Pheenicians and Canaanites, with whom the Israelites acknowledged no brotherhood, spoke a language which, at

2 Theodoret (Quest. iw Gen.), xi., Barhebreeus, and others cited by Assemani, Bib. Or., iti. 314. The same opinion appears among the Babylonian Jews (Rab in Synh., 88b). Conversely, Jacob of Sarug concedes the priority of Hebrew (see Z. D. Af. G., xxv., p. 520). The Arabs, whose language is in many points older than either, yield priority to Hebrew (Abulfeda, H. A., p. 18), or to Syriac (Tabari, i., 220; Abu Isa in Abulfeda, p. 148), the language of the race to which they owed their first knowledge of letters.

3 The verbal prefixes ha, hith, appear in Palestinian Aramaic, and the Aramaic dialects also exhibit some cases of a leugthened vowel before 7 (Noldeke, Afand. Gram., p. 17). On the other hand, the – transeription of the LXX. shows that Hebrew once could double r.

least as written, differs but little from Biblical Hebrew. | appear before the Exile.? The fall of the Jewish kingdom

This observation has been nsed in support of the very old idea that the Hebrews originally spoke Aramaic, and changed their language in Canaan. But an exacter study of the Phoenician inscriptions shows differeuces from Hebrew which suffice to constitute a distinct dialect, and combine with

other indications to favour the view that the descend- ants of Abraham brought their Hebrew idiom with them from Haran. And in this connexion it is important to observe that the old Assyrian, which preceded Aramaic in regious with which the book of Genesis counects the origins of Abraham, is in many respects closely akin to Hebrew.! As the origin of Hebrew is lost in the obscurity that hangs over the early movements of the Semitic tribes, so we know very little of the changes which the language underweut in Canaan. The existence of local differences of spsech is proved by Judges xii. 6; but the attempt to make out in the Old Testament records a northern and a Judean dialect, or even besides these a third dialect for the Simeonites of the extreme south,? has led to no certain re- sults. In general it may be said that the Biblical text supplies inadequate data for studying the history of the language. Semitic writing, especially a purely consonantal text such as the Old Testament originally was, gives an imperfect picture of the very grammatical and phonetic details most likely to vary dialectically or in course of time. The later punctuation (including the notation of vowels), and even many things in the present consonantal text, rc- present the formal pronunciation of the Synagogue as it took shape after Hebrew became a dead language—for even the Septuagint has often a more primitive pronunciation of proper names. This modern system being applied to all pirts of the Old Testament alike, many archaisms were obliterated or disguised, and the earlier and later writings present in the received text a grammatical uniformity which is certainly not original. It is true that occasional conso- nantal forms inconsistent with the accompanying vowels have survived—especially in the books least read by the Jews—and appear in the light of comparative grammar as indications of more primitive forms. These sporadic sur- vivals show that the correction of obsolete forms was not carried through with perfect consistency ; but we are never safe to argue as if we possessed the original form of the texts.

'In the Pentateuch, for example, the form Sn stands not only,

for 847 (8d personal pron. masc.) but for Ns] (the feminine). And henee a favourite arguinent was drawn for the superior antiquity of this part of the Old Testament. But the same thing is found else- where (Frensdorff, Afass. Worterb., p. 233), especially in Babylonian eodices of the prophets (Geiger, Ursehrift, p. 236; Z. D. M. G., xxviii, 676). The feminine ean never by any

possibility have been pronounced hu, but the old orthography was probably x1 for hu and hi alike (Noéldeke in Bibel-Lexikon, ut supra, after Levy).

The chief historical changes in the Hebrew language which we can still trace are due to Aramaicinfluence. The Northern Israelites were in immediate contact with Aramean populations and some Aramaic loan-words were used, at least in Northern Israel, from a very early date. At the time of Hezekiah Aramaic seems to have been the usual language of diplomacy spoken by the statesmen of Judah and Assyria alike (2 Kings xviii. 26). After the fall of Samaria the Hebrew population of Northern Israel was partly deported, their place being taken by new colon- ists most of whom probably had Aramaic as their mother- tongue. It is not therefore surprising that even in the language of Judea increasing signs of Aramaic influence

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1 See Stade's essay on the relation of Phoenician and Hebrew, Morgenlandische Forschungen (1875), with Néldeke's criticism, 4, D, M. G., xxix, 325; also the latter's article, 'Sprache, hebriische," in Bibel-Lexikon, v. 362 seq.

2 Buttcher, Lehrb. d. Hebr. Sprache (1866), i. 18 seg.

accelerated the decay of Hebrew as a spoken language. Not indeed that the captives forgot their own tongue in Babylon, as older scholars supposed on the basis of Jewish tradition. The Exilicand post-Exile prophets do not write in a lifeless tongue, and Hebrew was still the language of Jerusalem in the time of Nehemiah (ch. xiii.) in the middle of the 5th century B.c. But after the Exile the petty people of the Jews were in daily intercourse with a surrounding Aramzean population, and the Aramaic tongue, which was the official language of the western provinces of the Persian empire, begau to take rank as the recognized medium of polite intercourse and letters even among tribes of Arabic blood—- the Nabatzeans whose inscriptions in the Hauran are writteu in Aramaic. Thus Hebrew as a spoken language gradually yielded to its more powerful neighbour, and the style of the latest Old Testament writers is not only full of Aramaic words and forms but largely coloured with Aramaic idioms, wlile their Hebrew has lost the force*

and freedom of a living tongue (Ecclesiastes, Esther, some Psalms, Daniel). The Chronicler no longer thoroughly understood the Old Heb- rew sources from which he worked, while for the latest part of his history he used a Jewish Aramaic document, part of which he incorporated in the book of Ezra. Long before the time of Christ Hebrew was the exclusive pro- perty of scholars, and its further history is that of a merely literary language.

The Literary Development of Hebrew.-—The Semitic peoples possessed the art of writing and an alphabetical character from a date so remote as to be lost in the mists of antiquity. This character was formerly known as Pheenician, its invention being ascribed to that people (Tac., Ann., xi. 14). In reality it was the common property of all Semitic nations between Assyria and Egypt—an alphabetic character in contact on the east and on the west with more complicated syllabic or hieroglyphic systems, from one or other of which it may possibly have been derived.

De Rougé's theory that the alphabet was derived by the Pheeni- cians from the Egyptian hieratic writing obtained much currency a few years ago (see ALPHABET), but has rather lost ground since the appearance in 1874 of the long expected Mémoire sur Torigine Egyptienne de Valphabet Phénieven. See the criticisin in Lagarde's Symmicta, p. 113 seg. A newer theory by Deecke (7. D. A. G., xxxi. 102 svg.) derives the alphabet from the cuneiform characters, and makes the Aramzans its authors, for which there is ancient tradition in Pliny, Diodorus, and Cleinens Alexandrinus. Deecke dates the invention from the 9th century u.c., when the Assyrians first established themselvesin Aram. This is certainly wrong, for, apart from other arguments, the stone of Mesha is not a product of the first days of alphabetic writing. Against the derivation of the Semitic alphabet froni any hieroglyphic system, see Levy, Phénizische Studien, i. 49 seg. The best comparative table of Scmitie alphabets is that by Euting in the English translation of Bickell's Outlines of Heb. Gram. (Leipsic, 1877). On the history of Hebrew writing, especially in its bearing on the history of the Biblical text, see Wellhausen in Bleek's Zinleitung, 4th ed. (1878), with Noldcke's remarks, Z. D. MW. G., xxxii. 591 seg.

This ancient alphabet consists of twenty-two consonants, of which one at least (y) stood in Hebrew for two distinct sounds, stillseparated in the

Septuagint pronunciation. The vowels were supplied by the reader—which is not so difh- cult in Semitic languages, where vocalization constitutes no difference of root. In certain cases the weaker consonants served as matres lectionis to indicate cognate vowel sounds and preclude ambiguity of pronunciation ; but in the old

3 Details in Ryssel, De Elohiste Pentateuchi Sermone, (Leipsic, 1878), the most important collection of materials since Gesenius, Geschichte der hebr. Spr. und Schrift (1815).

4 An arenment to the contrary drawn by Jewish interpreters from Neh. viii. 8 rests on false exegesis. :

5 As we possess no books in classical Hebrew except the Old Testa- ment, the reader is referred for several aspects of this topic to the sketch of the Old Testament literature in the article BIBLE.

writing this usage was far less extensive than in our Heb- rew MSS., and hardly applied except to diphthongs and to a,—or less often 1, fiat the end of words.' This old char- acter with its scauty indications of vowels continued to be used by the Hebrews throughout the flourishing period of their literature and for some time after the Exile, till at length they gradually adopted a newer form of letters (the square or, as the Talmud calls it, the Assyrian character) which was developed among the Aramezans and spread with the increase of Aramaic influence. Jewish tradition ascribes the introduction of the square character to Ezra (Synh. 21b 22a; Jerome, Prol. Gal.); but the Samaritaus, who did not receive the Pentateuch from the Jews till about 400 B.c., must have got it in the old letter which they still retain in a corrupted form. The square letter probably did not prevail till a good deal later, the earliest Jewish inscription in which it appears being of the date 176 Bc, (published by De Vogué, Rev. Arch., 1864), while the coins of Judea retain the old character still later. 'The transformation was complete before the time of Christ, for Mat. v. 16 alludes to the new form of Yod (jot).? By this time too the use of matres lectionis uust have become more ample. The later introduction of vowel points and accents belongs to the history of the study of Hebrew as a dead

language. The forms of the old Semitic alphabet are most suitable to be cut on stone, and indicate a special adapta- tion for monumental inscriptions (¢f. the two tables of the Decalogue). Between the beginnings of such inscriptions and the general use of writing for literary purposes a considerable period might intervene. 'The earliest products of Hebrew authorship seem to have been lyrics and laws, which would circulate in the first instance from mouth to mouth without the use of written copies. We have notice of early written collections of lyrics prior to our present historical books—the Book of the Wars of Jehovah (Num. xxi. 14) and the Book of Jashar (Josh. x., 2 Sam. i). We have no clue to the age of the former book, but the lines quoted from it are plainly of great antiquity. 'The Book of Jashar is not earlier than the time of Solomon; for a fragment from it referring to the building of the temple has been recovered from the Septuagint of 1 Kings viii. (Wellhausen in Bleek, wé supra, p. 236). The earliest date of written law books is uncertain. It may fairly be made a question whether Moses left in writing any other laws than the commandments on the tables of stone. Even Ex. xxiv. 4 and xxxiv. 27 may in the original context have referred to the ten words alone. And it is certain that ancient law was handed down by oral tradition and local custom to a much later date. The prophets frequently allude to the oral decisions of the priests as a source of law, and the practice of appealing to the local customs of certain towns is alluded to in 2 Sam. xx. 18 (as restored by Ewald from the LX X.)—" Ask at Abel and at Dan whether the genuine old statutes of Israel have lost their force." In like manner tlie story of the early fortunes of the nation down to the time of David often presents characteristics which point to oral tradition as its original source. Yet written history began comparatively early. A scribe was attached to the royal court from the reign of David downwards; and the older parts of the books of Samuel, which must have been written not long after the time of that king (see

1 The stone of Mesha is the earliest evidence. Lagarde, (riech. UVebers. d. Proverbien (1868), p. 4, observed that the LXX. translated from a Hebrew copy without matres lectionis. This is put rather too barely, but is very near the truth. Compare Wellhausen, ué supra, and Text der BB. Samuelis (1871); Néldeke, 7. f. Wissensch. Theol. (1873), p. 120 ; Chwolson in Travaux de la 3mé section du Congrés international des Orientalistes, pt. ii.

aeAN papytus of the British Museum, showing the square letter as it was written in Egypt a little before the time of Christ, has been fuc- similed by the Palzographical Society (Or. Ser., 1877).

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Davip), are framed in a masterly style, which shows that the art of composition in prose was already thoroughly understood. So too the best written and niost brilliant part of the narrative of the Pentateuch—the 'combined history of the Jehovist and the non-Levitical Elohist— appears to be unquestionably earlier than the rise of pro- phetic literature in the 8th century B.c. In this narrative —itself the product of more than one writer— are included several collections of old laws, so that we have between the time of David and the age of "Amos and Hosea a flourish- ing historical and legal literature, in which and in lyrical collections like the Book of Jashar were embodied many poems, legends, and other remains, transmitted, whether orally or by writing, from a much earlier date. To the same period may be assigned the most interesting and graphic histories in the book of Kings, the splendid episode of Elijah, and other remaius of Ephraitic history; and to these must probably be added the main stock of the Song of Solomon, though this lyric drama has suffered much from interpolation, and presumably was not written down till a comparatively late date and from imperfect recollection, so that its original shape is very much lost. It is mainly from the admirable prose narratives, to which nothing in later books can be compared, that we must judge of the first bloom of Hebrew literature under the ancient kingdoms of Judah and Ephraim, before the convulsions that accom- panied the advance of Assyria and prior to the influence of written prophecy. It is a literature eminently fresh and vivacious, full of exact observation of nature and of men, always drawing directly from life, and working on the reader not by elaborate description but by dramatic pre- sentation of character and actiou. The authors are too in- tent upon the story to interpose their own comments or point a moral, but they tell their tale with sympathy and often with an undercurrent of dry humour. It can hardly be said that the writings of this period have a specifically religious purpose. Reflecting with admirable veracity the actual life of the nation they are full of the relation be- tween Israel and Jehovah, because that relation was con- stantly present to the

people as a very real fact without which the history could not be told. It is to this circum- stance that we owe the preservation of so large a mass of early prose, which was taken over and incorporated in their works by later historians who wrote with a distinctly religious purpose ; while on the other hand the early lyric | collections have disappeared, all but a few fragments, pre- sumably because their tone was prevailingly secular. That the Hebrews once possessed a poetry of high merit drawn from the themes of ordinary life appears, not only from the book of Canticles and such relics as the Song of the Well (Num. xxi. 17, 18), but from the names of popular airs pre- served in the titles of the Psalms. Thus we learn from Isa. lxv. 8 that the title Al-Taschith (Ps. lvii.) is taken froia a vintage song of which the first line was " Destroy it not, for a blessing is in it." These popular songs, then, sur- vived the Exile and long continued to live in the mouths of the people. But they were without interest to the later guardians of Israel's literature, and fell into oblivion when Hebrew ceased to be the vernacular of the nation. A last echo of the festal songs of the Jewish maidens in the Talmud (Mishna Ta'anit, iv. 8, and the corresponding Gemara) shows only the total decay of the popular muse. In this earliest period—the age of popular literature, as we may call it, modelled upon the songs and histories that circulated orally through the country—there is a remark- able preponderance of writings connected with the northern kingdom, and these include the narratives that are fullest of human interest and the poetry richest in colour and imagination, such as the loves of Jacob and Rachel, the history of Joseph, the life of Elijah, the pictures of nature

in the Canticles. The political and social superiority of Ephraim before tlie conflict with Assyria is reflected in the literature. A new epoch begins with the rise of written prophecy in the 8th century. By this time writing and literary knowledge were widely diffused (Isa. viii. 1; xxx. 8; x, 19).1 Amos, himself an excellent stylist, in whose book only perverse ingenuity can trace marks of rusticity ('imperitum sermone," says Jerome), was a simple herds- man in the wilderness of Judah. Yet it appears that thie origin of written prophecy was due less to the spread of education than to the rise of a new school of men whose whole method and aims were iu conflict with the official prophetic societies, the unworthy successors of Samuel and Elijah.

In the terrible struggle with Nineveh, when the kingdom of Ephraim perished and Judea seemed lost beyond hope, the new prophecy, clear of vision when all were blinded, calm in its unshaken faith of ultimate victory, and pursuing with unfaltering steadfastness a great purpose of righteous- ness, established a spiritual and intellectual ascendency which is stamped on the whole literature of the Assyrian and Chaldean periods. In the book of Deuteronomy the ancient ordinances of Israel were rewritten in the prophetic spirit, and the reformation carried out by Josiah on the basis of this book is the decisive proof of the influence of the written word as the organ of prophetic ideas. The same influence can be traced in other directions,—in psalms that express the type of individual faith, and in the histori- cal books as they were finally shaped after the fall of Jerusalem, when the old popular narrative was filled out and continued in a spirit of prophetic pragmatism, and with the direct object of enforcing prophetic teaching. The Exile, which robbed Israel of every other inheritance, gave increased value and authority to the written word, and in the author of Isa. xl.~~lxvi. we find a prophet who no longer appears in person before his audience but does his whole work by the pen. There are other short prophecies of the Babylonian age, as Isa. xiii., xiv., which seem to have been first published as anonymous broadsides—a characteristic change from the method of the former proplhiets, who wrote only what they had first spoken tothe people. The earliest written prophecy is nervous rhetoric of the old pregnant Hebrew style interspersed with bursts of song. Even before the Exile this style had undergone a change ; the prophecies of Jeremiah have lost something of the old force, while they display a subtler habit of reflexion and a pathos which has its origin in the conflict of a sensitive and shrink~~ ing temperament with the overpowering sense of prophetic duty. Jeremiah was much occupied with the dark pro- blems of providence and the meaning of the sufterings of the faithful] in Israel, a topic which goes beyond the sphere of the earlier prophecy, but forms a chief theme of Isa. xl.-Ixvi., and froma different point of view is taken up and discussed in the book of Job. The last-named book is the highest utterance of another characteristic form of Hebrew literature, the Chokma, that is, wisdom or practi- cal philosophy in parabolic, epigrammatic, and poetic form. The earliest distinct trace of literary cultivation of this philosophy, which from its nature must at first have passed unwritten from mouth to mouth, is the collection of ancient proverbs by scholars in the

service of Hezekiah (Prov. xxv. 1). Along with the simple epigrammatic proverbs which continued to be a favourite vehicle of Jewish thought long after Hebrew had given way to Aramaic, the earliest form of Hebrew wisdom seems to have been the fable about plants and trees (Jud. xi, 2 Kings xiv. 9, of. 1 Kings iv. 33), so different from the animal fables of Kalilag and

1 In the 7th century written instruments were used in sales of pro-

perty © er, xxxii. 10), and in divorce cases they are recognized in Deut. xxiv. 1. ;

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Damnag or Sindbin, which the later Semitic literature borrowed from India. The further development of the Chokma ran parallel with the progress of prophecy, and though it is generally maintained that Jeremiah quotes the book of Job, it is perhaps more likely that the contrary is the case, and that the latest and most meditative phase of prophecy was absorbed into the poetry of the Chokma. The brief revival of spoken prophecy after the Exile lacks the old fire, and presents no notable literary feature except the use of somewhat fantastic symbolic imagery, the proto- type of the later apocalyptic literature.

The decadence of prophecy and the synchronous system- atization of the ceremonial law on lines first drawn by Ezekiel, mark the commencement of the third and last period of Hebrew literature. The age of religious produc- tivity was past, and the narrow limits and political nullity of the new Jewish settlement under the Persians presented no favourable conditions for a fresh development of truly national literature. The scribes took the place of the prophets, and the growth of traditionalism imposed increas- ing restrictions on original thought. The freshest and best products of this period are the post-Exile psalms, the hymns of the second temple, which occupy a large part of the Psalter, and, though generally inferior to the older lyrics in the highest poetical qualities, are often full of the charm of genuine feeling and sweet utterance, and sometimes rise to a sublime energy of devotion and faith. With these psalms the graceful prose idyll of Ruth has a natural affinity. The other writings of the last age are on the

whole much inferior. As the language decayed, the graces of the older prose style were lost. The memoirs of Ezra and Nehemiah, the colourless narrative of the Chronicles, and even the book of Esther, are singularly destitute of literary merit.

Yet letters were sedulously cultivated, The Jfid- rash, or sermonizing treatment of the old history which holds so large a place in later Jewish literature, had come in before the time of the Chronicler, who quotes a work of the kind by name—the Midrash of the Book of Kings (2 Chron. xxiv. 27, of. xiii, 22). Along with this came the beginnings of Haggada, the formation of parables and tales attached to historical names, of which the book of Jonah is generally taken as an early example, and which attains much greater dimensions in theapocryphal additions to the Hagiographa. And so at the close of the Old Testament period the author of Ecclesiastes could speak of the weariness of much study and the endless sterility of bookmaking. His judgment was confirmed by posterity, for of these many books scarcely a trace remains.

The Cultivation of Hebrew as a Dead Language.2—We have seen that when the latest books of the Old Testament were written Aramaic had already supplanted Hebrew as the language of common life. But the knowledge of the ancient idiom was kept alive not merely by the study of the sacred books but by the continued use of Hebrew for literary purposes. Several books of the Apocrypha appear to be translated from Hebrew originals—Sirach, Judith, 1 Mac.—the last according to the express testimony of Jerome. Itis even probable that the Old Testament canon contains elements as late as the epoch of national revival under the Maccabees (Daniel, certain Psalms), for Hebrew was the language of religion as well as of scholarship. As for the scholars, they affected not only to write but to speak in Hebrew; but they could not resist the influence of the Aramaic vernacular, and indeed made no attempt to imitate

2 On this topic compare in general Wolfii Bibliotheca Hebrea, 1715-1733; Bartolocii Bibliotheca Magna Rabbinica, 1675-1693 ; Imbonati Bibliotheca Latino-Hebraica, 1694; Diestel, Geschichte des A. T. in der Christlichen Kirche, 1869 ; R. Simon, Histoire Critique du V. T., 1678.

tlie classical models of the Old Testament, whicli neither furnished the necessary terminology for the new ideas with which they operated, nor offered in its forms and construc- tions a suitable vehicle for their favourite processes of legal dialectic. Thus was developed a new scholastic Hebrew, ‘“‘the language of the wise” (D’D9n wd), preserving some genuine old Hebrew words which happen not to be in the Bible, and supplying some new necessities of expression by legitimate developments of germs that lay in the clas- sical idiom, but thoroughly interpenetrated with foreign elements and as little fit for higher literary purposes as the Latin of the medieval schoolmen. The chief monument of this dialect is the body of traditional law called thie Mishna, which is formed of materials of varions dates, but was collected in its present form about the close of the 2d Christian century. The doctors of the subsequent period still retained sone fluency in the use of Hebrew, but tlie mass of their teaching preserved in the Gemara is Aramiaic.! The language of the Mishna las been described by Geiger, Lehr- und Lesebuch zur Sprache der Mischnah (Breslau, 1845); L. Dukes, Die Sprache der Mischna (Esslingen, 1846) and Zur rabbinischen Sprachkunde (Vienna, 1851) ; J. H. Weiss, Mishpat L’shén ham-Mishna (Vienna, 1867).

During the Talmudic period nothing was done for the grammatical study of the old language, but there was a traditional pronunciation for the synagogue, and a tradi- tional interpretation of the sacred text. The earliest monu- ment of Jewish interpretation is the Septuagint, but the final form of traditional exegesis is embodied in the Targums or Aramaic paraphrases, especially in the more literal Targums of Onkelos and Jonathan, which are often cited by the Talmudic doctors. Many things in the language of | the Old Testament were already obscure, and the meaning of words was discussed in the schools, sometimes by tlie aid of legitimate analogies from living dialects,? but more often by fantastic etymological devices such as the Votari- kon, or use of analogies from shorthand.

The real service rendered to Hebrew philology by the Talmudic doctors consists not in what they produced but in the knowledge which they preserved from the time when the idiom of the Old Testament was a living tongue. The exaggerated value which their casuistic exegesis attached to every syllable and every letter of the sacred books re- sulted in a finical preservation, not indeed of the original text, but of the text which had

become authoritative, and which is hardly later than the Ist Christian century. And fortunately for later scholarship the period immediately subsequeut to the close of the Talmud (about 600 a.p.) devised in the vowel points and accents a means for pre- serving not merely the consonants of this text but the exact pronunciation and intonation of the synagogue. The idea of this system of punctuation appears to have been taken from a similar usage adopted in Syriac MSS.; the complete development of the idea as we find it in our present Hebrew Bibles must have been reached by successive steps which we cannot now trace. The current punctuation is the work of the Palestinian schools; another system resting on the same foundations was developed in Babylon, and is known from the MSS. of the Petersburg library collected by Firkowitsch, and also from copies bronght from Yenteu. The difference between the two systems lies more in the notation than in the pronunciation, and neither punctuation ean claim absolute priority.? The work of the punctuators

1 See Bacher, Die Aggada der Babylonischen Amoréer (Strasburg,

fe for many illustrations of the Hebrew scholarship of the Gemar- ISbS.

ait = B. Rosh hash-Shana, 26b ; Dclitzsch on Ps. lv. 23 and Isa. 1vV. .

_° The Babylonian punctuation can be best studied in Strack's fac- simile (St Petersburg, 1876) of the St Petersburg codex of the prophets

of 916 a.p. Notable in this system is the absence of a sign for seghol |

was perliaps completed in the 7th century. After a time the vowel signs came to be thought as old as the text, but a juster view was revived by Elias Levita (1472-1549),4 and, after the great controversy in the 16th century between Cappellus and Buxtorf, finally gained universal recognition. With the work of the punctuators is asso- ciated the collection by the Massorets of a great mass of notes designed to preserve and illustrate by statistics

excep- tional phenomeua of the Old Testament text,6a work which may be viewed as the first step towards scieutific study of Hebrew philology.

With all this the old traditional scholarship continued to decline till the 10th century, when a revival of Hebrew study under the influence of Mahometan learning took place among the Arabic-speaking Jews (Saadia of the Fayyum, Menahem ben Sarug, &c.).' Then, early in the 11th cen- tury, came the ackuowledged fathers of medizeval Jewish philology,—the grammarian Judali surnamed Hayyug, discoverer of the systeni of triliteral roots,® and the lexico- grapher Abulwalid Merwdn ibn Ganfh (Rabbi Jonah), who made excellent use of Arabic analogies as well as of the traditional material.® A succession of able scholars con- tinued their work, of whom the most famous are Abraham ben Meir of Toledo, surnamed Ibn Ezra (1092-1167), a man of great originality and freedom of view ; Solomon Isaaki of Troyes, called Rashi and sometimes by error Jarchi, ze, of Lunel (died 1105), whose writings are a storehouse of traditional lore; and David Kimchi of Narbonne, called Radak (circ. 1200), whose commentaries, grammiar, and lexicon exercised an enormous and lasting influence, and were the chief fountain of knowledge for the Christian Hebraists of the 16th century. Our own authorized version, for example, bears tle stamp of Kimchi on every page.

On the Jewish scholars and their works consult Wolf and Barto- locci, also De Rossi, Dizionario Storico degli Autori Ebrei, Parma, 1802 ; on Ibu Ezra in particular, the Zntroduction to Fricdlander's translation of his Com. on Isaiah (Loudon, 1873), and the same writer's Essays on the Writings of Ibn Ezra (Loudon, 1877) ; on the Freuch Rabbins, Histoire Lit. de la France, vol. xvi., but espe- cially vol. xxvii. (1877) ; on Rashi, Zunz's Gesammelte Sehriften, iii. 100, and a biography by the saime scholar, translated into Ger- man by Bloch (1840). In the later Middle Ages Jewish learning was cramped by a narrow Talmudical orthodoxy; but a succession of sound scholars held their ground till Elias Levita and others of his age transmitted the torch to the Christian universities.

Up to the revival of letters there was no productive Hebrew scholarship among Christians. In the Greek and Latin Church the few fathers whi, like Origen and Jerome, knew something of the language were wholly

dependent ou their Jewish teachers, and have value for us only as depositaries of Hebrew tradition. Nor was it otherwise in the East. The Syriac version of the Old Testameutis permeated

(2), which is replaced by i ora. See also Pinker's Ein. in d. Baby- lonisch-heb. Punctationssystem (Vienna, 1863), and for other litera- ture, Wellhausen-Bleek, p. 614, to which add Derenbourg, Revwe Critique, June 21, 1879.

4 See his Alassoreth ham-Massoreth, re-edited by Dr Ginsburg, 1867.

5 The history of the controversy has been written by G. Schneder- mann, Die Controverse des Ludovieus Cappellus mit den Buxtorfen (Leipsic, 1879).

6 On the Massorah see especially Jacob b. Hayyim's preface to the Venice Rabbinical Bible (reprinted and translated by Dr Ginsburg, London, 1867), Levita's Afassoreth ham-Massoreth, and Buxtorf's Tiberias (Basel, 1620). Besides the Massorah as printed by J. b. Hayyim in the Venice Bible, which is superior to all reprints, we have in print Ochlah w'Ochlah (ed, Frensdorff, Hanover, 1864), and the. first part of the Afassorah Magna (ed. Frensdorff, 1876). A new edition of the Bible with Massorah, from an extensive collation of MSS., is now being printed at Vienna by Dr Ginsburg.

? The connecting link between the Massorets and the grammarians is Rabbi Aaron ben Mosheh ben Asher, whose Dikduke hat-T'amim has been published by Baer and Strack (Leips. 1879).

8 See his Two Treatises, edited by Nutt, London, 1870.

® His Book of Roots, in Arabic, edited by Neubauer, Oxford, 1875.

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by the influence of the synagogue where it is not guided by the Septuagint, and the homilies of Aphraates are a mine of Jewish tradition. In the Middle Ages some knowledge of Hebrew was preserved in the church by converted Jews and even by Christian scholars, of whom the most notable were the

Dominican controversialist Raymundus Martini and the Franciscan Nicolaus de Lyra, through whose popular commentaries the exegesis of Rashi was conveyed to Luther and largely influenced his interpretation of Scrip- ture! But there was no continuous tradition of Hebrew study apart from the Jews, and in the 15th century, when the revival of independent scholarship kindled the desire to add a third learned tongue to Latin and Greek, only the most ardent zeal could conquer the obstacles that lay in the way.. Orthodox Jews refused to teach those who were not of their faith, and on the other hand the bigotry of ignorant churchmen desired nothing better than the entire suppression of Jewish learning. Even books were to be had with the greatest difficulty, at least north of the Alps. In Italy things were somewhat better. Jews expelled from Spain received favour from the popes. Study was facilitated by the use of the Hebrew printing press, which was at work at Reggio as early as 1475, while the whole Hebrew Bible appeared at Soncino in 1488.2 The cause of learning found its champion among the northern humanists in John Reuchlin(1455-1522), whose Rudimenta (Pforzheim, 1506) opened the door to students, while his victorious contest with Pfefferkorn and the Cologne obscu- rantists established the claim of Hebrew studies on scholar. ship and the church.

The new learning spread fast. Sebastian Miinster in Heidelberg, and Paul Biichlein (Fagius) at Isny, Strasburg, aud Cambridge, were worthy pupils of the famous and liberal Jewish scholar Levita. France drew teachers from Italy. Santes Pagninus of Lucca was at Lyons; and the trilingual college of Francis I. at Paris, of which Vatablus and Le Mercier soon became the ornanients, attracted among other foreigners Giustiniani, bishop of Nebbio, the editor of the Genoa Psalter of 1516. In Rome the Jewish con- vert Felix Pratensis taught by invitation of Leo X., whose name and that of the more famous convert J. b. Hayyim live mainly in connexion with the great Rabbinical Bibles that issued from the Bomberg press at Venice. In Spain, the old home of Jewish scholarship, Hebrew learning was promoted by Cardinal Ximenes, the patron of the Com- plutensian Polyglot. Printing presses were multiplied, and the great humanist printers, as Froben at Basel and Etienne at Paris, competed with Italy in the production of Hebrew books. In brief, before the middle of the 16th century the place of Hebrew studies was secure throughout learned Europe, while in Protestant countries opposition to the authority of the Vulgate combined with scholarly

interest to make the study of the original text of Scripture appear indispensable. Thus in Scotland the establishment of a trilingual course in the universities is contemplated in the first Book of Discipline.® For a time the best Christian scholars leaned mainly on

1 See Siegfried's essay in Merx's Archiv, i. 428, ii. 38.

2 De Rossi, Annales Hebrao-Typographici Sec. XV., Parma, 1795. A lively picture of the difficulties that lay in the way of Hebrew study is found in the Autobiography (ed. Riggenbach, 1877) of Conrad Pel- lican, who contributed to Reisch's Margaritha Philosophica the first imperfect Hebrew grammar composed by a Christian (Strasburg, 1504, . reprinted in facsimile by Nestle, Tiibingen, 1877). See also Geiger's Johann Reuchlin (Ueipsic, 1871). Reference may also be made to the same author's Studium der Heb. Spr. in Deutschl. vom Ende des 15fen bis zur Mitte des 16¢en Jahrhunderts (Breslau, 1870), and Jour- dain's De Venseignement de Vhebreu dans Vuniversité de Paris (1863).

3 The first Hebrew grammar published in Scotland is that of John Row, moderator of the school of Perth, and afterwards minister at Aberdeen, (Glasgow, 1644). The preface bears date 1637. With the grammar appeared a XiAids LMebraica.

the Rabbins. But in the larger air of humanism a more independent type of learning soon arose, of which Le Mercier in the 16th and Drusius in the beginning of the 17th century may be taken as representatives. The importance of the ancient versions was recognized, and their study was fostered by the publication of the Polyglots.

In the 17th century the cognate dialects were cultivated with great vigour and success by men like Selden, Castell, and Pococke in England, De Dieu in Holland, Bochart in France, Ludolf and Hottinger in Germany ; and these studies bore fruit both for the Hebrew grammar and for the lexicon. Rabbinic learning was not forgotten, and found its chief ornament inthe elder Buxtorf at Basel, who was also the author of grammars and a handy

*lexicon which long remained favourite manuals in England and on the Continent.**

At the same time a critical spirit arose, which involved Hebrew philology in the meshes of theological controversy. The battle as to the age of the vowel points has already been referred to. It was part of a larger question as to the integrity of the received Hebrew text, and the legitimacy of text criticism, which received dogmatic importance from the prevalence of extreme theories of verbal inspiration in the Protestant Church. Thus the Protestant Cappellus found his main support in the Catbolic Church (Morinus, R. Simon), while the authority of the Massoretic text and punctuation was elevated to a dogma in the Vormula Consensus ITelvetica (1675), not without protest from the wiser Protestantism of France. The critical school had also its extravagances, and an undue depreciation of tradi- tion was one of several false principles that it would be tedious to enumerate, which came into vogue in the latter part of the 17th century, and long continued to impede the progress of scientific Hebrew philology. In the beginning of the 18th century Semitic studies had their chief seat in Holland, where Albert Schultens took up the comparative method with fresh energy, and applied it to Hebrew on a scale which gave a new shape to the study of the language.° Schultens laid emphasis on the limited extent of the Old Testament literature, which makes it an inadequate record of the phenomena of the Hebrew language, and proposed to supply these defects by a large use of the dialects, mainly of the Arabic, in which he had wide and accurate reading. His Institutiones ad fundamenta Lingue Hebrew (1737) mark an advance on previous grammars, and in his com- mentaries is accumulated an enormous mass of material of the highest value for the lexicographer. Schultens founded an influential school, of which Schroeder was the chief ornament; but his method was easily abused, and fell into discredit in the hands of arbitrary expositors like Venema. After Holland, Germany became the chief seat of Hebrew studies, In Halle, where the influence of Francke directed special attention to Biblical learning, there sprang up con- temporaneously with the Dutch school a school of Hebraists, —earnest, laborious, and thorough, but somewhat jejune and deficient in esthetic sympathy,—of which the Michaelis family were the chief representatives. J. D. Michaelis (1717-1791) exercised a sort of sovereignty in Hebrew letters, and the stamp of Halle has left a permanent

impress on the German schools, though a more sympathetic and emotional type of scholarship, beginning with Herder and Eichhorn, became dominant under the influence of Ewald.

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4 To obtain an idea of the way in which Hebrew was taught in the 17th century one may read the Diatriba of Caspar Scioppius, in I. Grotii et aliorum dissertationes de studiis instituendis (Amst., 1645).

5 On Schultens, his method and school, see C. Sepp, Johannes Stinstra en zijn Tijd (Amst., 1865). The Dutch schools of the 16th and 17th centuries are well described by the same author, Met godge- leerd Onderwijs in Nederland gedurende de 164 en 174 Heuw (Leyden,

1873-74). x1 5S a 7

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By the epoch-making labours of Silvestre de Sacy (1758- 1838), which first placed Oriental learning and especially Semitic grammar on a broad and thoroughly scientific footing, a new impulse was given to Hebrew philology, which since that time has moved with the advance of general Semitic studies, and can hardly again fall into devious paths. The great teachers of Hebrew in the present century have been two Germans, Gesenius and Ewald,—the former excelling in method and lucidity of exposition, the latter in range of view and creative fertility of ideas. Among the direct or indirect disciples of these great scholars may be reckoned almost every Hebraist in Europe, and' to them is mainly due the revival in Eng- land of a branch of learning which had almost become extinct through the prevailing dilettantism of last century.

Helps to the Study of Hebrcw.—Grammars.—The principal modern methods are those of Gesenius, Ewald, and Olshausen. Gesenius's larger work, his Lchrgebdude dcr hebriiischen Sprache, (Leipsic, 1817), is still uscful for occasional reference. His smaller grammar has passed through innumerable editions, and in its most recent shape, as recast by Rédiger and finally by Kautzsch (1878), holds its ground as one of the best books for

learners. Davies's version of Rodiger's Gesenius is the best of several English translations (1869- 1876). The mcthod of Gesenius is mainly empirical. Much more philosophic, but less simple and sometimes arbitrary in its refine- ments, is the Ausfithrliches Lehrbuch of Ewald (8th ed., Gottingen, 1870), of which the " Syntax" has been translated into English by Kennedy (1879). The shorter Sprachlehre fiir Anfénger (4th ed., 1874; Eng. trans. by Smith, 1870) is valuable but too difficult for ordinary beginners. Olshausen's Lehrbuch (Brunswick, 1861) is in- complete, the syntax having never appeared; but it is, on the whole, the best and most scientific exposition of the Hebrew gram- matical forms. Twoelementary grammarson Olshausen'ssystem have been translated into English,—Bickell's Grundriss (Leipsic, 1869- 1870; English by Curtiss, 1877) and_Land's Hebrecuwsche Gram- matica (Amsterdam, 1869; English by Poole, 1876). The latter work has some peculiarities which detract from its utility, and neither Bickell nor Land supplies a proper syntax. Miiller's Schulgram- matik (Halle, 1878) is also mainly on Olshausen's method with the addition of an excellent syntax. In English A. B. Davidson's Introductory Hebrew Grammar (8d ed., Edin., 1878) may be com- mended to beginners as a good practical method and easy introduc- tion to the larger scientific grammars. Of other more extensive works may be named Bottcher's Ausfihrliches Lchrbuch, posthum- ously edited by Miihlau (Leipsic, 1866-68), a huge book serving as a sort of grammatical concordance to the Old Testament ; Luzzatto's Italian Grammatica (Padua, 1853-69), which is valuable from the thorough Jewish scholarship of the author, the Latin grammar of Roorda, and in English the works of Kalisch (1862-63) and Green (New York, 1861). Among useful monographs on special points of grammar may be named Philippi, Wesen wnd Ursprung des Status Constructus (Weimar, 1871); S. R. Driver, The Use of the Tenses in Hebrew (Oxford, 1874); Giesebrecht, Die Hebriiische preposition Lamed (Halle, 1876); Davidson, Outlines of Hebrew Accentuation (1861). For comparative purposes, in the absence of a comparative system of the Semitic languages, which is hoped for from Renan, the hints in Wright's Arabic Grammar will be found most valuable.

Lexicons.—Far superior to all other lexicons is the Thesaurus of Gesenius, completed by Rédiger (Leipsic, 1829-1858). Gesenius published also a Handwirterbuch—of which the 8th ed. by Mihlau and Volek (Leipsic, 1877-

78) contains a good deal of new matter not always improvement—and a Lcwicon Manuale in Latin (2d ed. by Hoffmann, 1847), of which there is an English translation. The Handwérterbuch of First (2d ed., 1868; Eng. trans. by S. Davidson, 1871; 3d ed. by Ryssel, 1876) proceeds on very faulty etymological principles and must be used with great caution. On Hebrew synonyms Pappenheim's Y ri'6t Sh'lémoh (1784-1811) is the principal work.

Concordances.—The Concordantie of Buxtorf (1632) were re- printed by Beer (1863). Fiirst's Concordance (1840) contains a good deal of supplementary matter, part of which is of little use. For the particles the (incomplete) concordance of Noldius (1679; ed. Tympius, 1734) is useful.

In addition to modern books the advanced student will sometimes find it useful to recur to older works, especially to the Jewish gram- marians and lexicographers, but these need not be detailed here.

For the later Hebrew of the period of the Mishna, and for the new words and technical terms in the scholastic Hebrew of the Middle Ages, the best lexicon is Buxtorf's Lexicon Chaldaicum Talmudicum ct Rabbinicum (1640). The recent reprint is not so good. A new lexicon by Levy has been in the course of publication since 1875 (Neu-hebréisches und Chaldéisches Worterbuch). The

beginner will find the Lexicon breve Rabbinico-philosophicwm appended to Buxtorf's small Lexicon Hebraicum very useful, and may also consult the treatises in Reland's Analecta Rabbinica (1702). In reading Rabbinical Hebrew it is well to have Selig's Compendia Vocum Hebraico-Rabbinicarwm (1780). The similar work of Buxtorf is less full.

On the whole subject of this article consult Gesenins, G- schichtc dcr hebriiischen Sprache und Schrift (Leipsic, 1817) ; Renan, Histoire générale des langucs Sémitiques (4th ed., Paris, 1864). (W. RB. S.)

HEBREWS, Epistte To tHE. The New Testament writing usually known under this name, or less correctly as the Epistle of Paul the Apostle to the

Hebrews, bears in the oldest MSS. no other title than the words pos ‘Efpatovs, “To the Hebrews.” ‘This brief heading em- braces the whole information as to the origin of the epistle on which Christian tradition is unanimous. Everything else—the authorship, the address, the date—was unknown or disputed in the early church, and continues to form matter of dispute in the present day. But as far back as the latter part of the 2d century the destination of the epistle ‘to the Hebrews” was acknowledged alike in Alexandria, where it was ascribed to Paul, and in Carthage, where it passed by the name of Barnabas, and no indication exists that it ever circulated under another title! At the same time we must not suppose, as has sometimes been done, that the author prefixed these words to his original manuscript. The title says no more than that the readers addressed were Christians of Jewish extraction, and this would be no sufficient address for an epistolary writing (xiii. 22) directed toa definite circle of readers, a local church or group of churches to whose history repeated reference is made, and to which the author had personal relations (xiii. 19, 23). The original address, which according to custom must have stood on the outside of the folded letter, was probably never copied, and the early and universal prevalence of the present title, which tells no more than can be readily gathered from the epistle itself, seems to indicate that when the book first passed from local into general circulation its history had already been forgotten. With this it agrees that the early Roman Church, where the epistle was known about the end of the Ist century, and where indeed the first traces of the use of it occur (Clement, and Shepherd of Hermas), had nothing to contribute to the question of authorship and origin except the negative opinion tliat the book is not by Paul. Caius and the Muratorian fragment reckon but thirteen epistles of Paul; Hippolytus (like his master Irenzeus of Lyons) knew our book and declared that it was not Pauline. These facts can hardly be explained by supposing that at Rome during the 2d century the book had dropped out of notice, and its history had been forgotten. Clement, Hermas, Hippolytus form a tolerably continuous chain, and the central Church of Rome was in constant connexion with provincial churches where, as we shall presently see, the epistle had currency and reputation. Under these circum- stances an original trustworthy tradition could hardly have been lost, and it must appear highly questionable whether the author and address of the book were known at Rome even in the time of Clement. ‘The earliest positive tradi- tions of authorship to which

we cau point belong to Africa and Egypt, where, as we have already seen, divergent views were current by the end of the 2d century. The African tradition preserved by Tertullian (De Pudicitia, c. 20), but certainly not invented by him, ascribes the epistle to Barnabas. Direct apostolic authority is not therefore claimed for it; but it has the weight due to one who "learned from and taught with the apostles," and we are told that it had more currency among the churches than

1 See the full refutation of supposed exceptions to the uniformity of this tradition in Zahn's article " Hebrierbrief"' (Herzog-Plitt, R.£., vol. vy. p. 657).

'that apocryphal shepherd of the adulterers " a Shepherd of Hermas). This tradition of the African Church holds a singularly isolated positiou. Later writers appear to know it only from Tertullian, and it soon became obsolete, to be revived for a moment after the Reformation by the Scottish theologian Cameron, and theu again in our own century by the German critics, among whom at preseut it is the favour- ite view. Very different is the history of the Egyptian tradition, which can be traced back as far as a teacher of the Alexandrian Clement, presumably Panteenus (Euseb., Hist, Eccl., vi. 14). This 'blessed presbyter," as Clement calls him, sought to explain why Paul did not name himself as usual at the head of the epistle, and found the reason in the modesty of the author, who, in addressing the Hebrews, was going beyond his comniission as apostle to the Gentiles. Clemeut himself takes it for granted that an epistle to the Hebrews must have been written in Hebrew, and supposes that Luke translated it for the Greeks. Thus far there is no sign that the Pauline authorship was ever questioned in Alexandria. Origen rests on the same tradition, which he refers to "the ancient men." But he knows that the tradition is not common to allchurches. He feels that the language is un-Pauline, though the admirable thoughts are not second to those of the unquestioned apostolic writings. And thus he is led to the view that the ideas were orally set forth by Paul, but that the language, arrangement, and some features of the exposition are the work of a disciple. According to some this disciple was Clement of Rome; others named Luke ; but the truth, says Origen, is knowu to God alone (Euseb., vi. 25, of. iii. 38).

It is not surpris- ing that these limitations of the tradition had less influence than the broad fact that Origen accepted the book as of Pauline authority. From the time of Origen the opinion that Paul wrote the epistle became more and more prevalent in the East. In the West this view was still far from established in the 4th century. But it gained ground steadily ; even those who, like Jerome and Augustine, knew the variations of tradition were unwilling to press an opposite view ; and in the 5th century the Pauline author- ship was accepted at Rome, and practically throughout Christendom, not to be again disputed till the revival of letters and the rise of a more critical spirit.

That the received view cailed for revision could not indeed be questioned wheu men begau to look at the facts of the case. The vacillation of tradition and the dissimi- larity of the epistle from the style and thoughts of Paul were brought out with great force by Erasmus in his con- cluding annotation on the book, where he ventures the conjecture based on a passage of his favourite Jerome, that Clement of Rome was the real author. Luther (who suggests Apollos) and Calvin (who thinks of Luke or Clement) followed with the decisive argument that Paul, who lays such stress on the fact that his gospel was not taught to him by man but by direct revelation (Gal. i.), could not have written Heb. ii. 3, 4, where the author classes himself among those who received the message of salvation from the personal disciples of the Lord on the evidence of the miracles with which God confirmed their word. The force of tradition seemed already broken, but the wave of reaction which so soon overwhelmed the freer tendencies of the first reformers brought back the old view. Protestant orthodoxy again accepted Paul as the author, and dissentient voices were seldom heard till the revival of free Biblical criticism in last century. As criticism strengthened its arguments, theologians began to learn that the denial of tradition involves no danger to faith, and at the present moment, in spite of the ingenious special pleading of Hofmann (Die Heilige Schrift N. Ts., vol. v., Nérdlingen, 1873), scarcely any sound scholar will be found to accept Paul as the direct author of the epistle, though

such a modified view as was suggested by Origen still claims adherents among the lovers of compromise with tradition.

The arguments against the Alexandrian tradition are in fact conclusive. It is probably unfair to hamper that tradition with Clement's notion that the book is a trans- lation from the: Hebrew, a monstrous hypothesis which has received its reductio ad absurdum in the recent attempt of J. H. R. Biesenthal to reconstruct the Hebrew text (Das Trostschreiben des Apostels Paulus an die Hebrder, kritisch wiederhergestellt, &c., Leipsic, 1878). But just as little can the Greek be from Paul's pen. The un-Fauline character of the style, alike in the words used and in the structure of the sentences, strikes every scholar as it struck Origen and Erasmus. 'The type of thought is quite unique. The theological ideas are cast in a different mould; and the leading conception of the high priesthood of Christ, which is no mere occasional thought but a central point in the author's conception of Christianity, finds its nearest analogy not in the Pauline epistles but in John xvii. 19. The Old Testament is cited after the Alexandrian translation more exactly and exclusively than is the custom of Paul, and that even where the Hebrew original is divergent. Nor is this an accidental cireumstauce. There is every appearance that the author was a Hellenist whose learning did not embrace a knowledge of the Hebrew text, and who derived his metaphysic and allegorical method from the Alexandrian rather than the Palestinian schools.}

The force of these arguments cau be brought out only by the accumulation of a multitude of details too tedious for this place, but the evidence from the few personal indica- tions contained in the epistle is easily grasped and not less powerful. The argument from ii. 3, 4, which appeared decisive to Luther and Calvin, has already been referred to. Again, we read in xiii. 19 that the writer is absent from the church which he addresses, but hopes to be speedily restored to them. 'This expression is not to be understood as im- plying that the epistle was written in prison, for xiii, 23 shows that the author is master of his own movements." The plain sense is that his home is with them, but that he is at present absent, and begs their prayers for a speedy return. But Paul, if he could say that he had a home at all, had it not in acommunity of Jewish Christians. The external authority of the Alexandrian tradition can have no weight against such difficulties. If that

tradition was original and continuous, the long ignorance of the Roman Church and the opposite tradition of Africa are inexplicable. But no tradition was more likely to arise in circles where the epistle was valued and its origin forgotten. In spite of its divergencies from the standard of Pauline authorship, the book has manifest Pauline affinities, and can hardly have originated beyond the Pauline circle, to which it is referred, not only by the author's friendship with Timothy (xiii. 23), but by many unquestionable echoes of the Pauline theology, and even by distinct allusions to passages in Paul's

1 For the Alexandrian elements in the epistle consult the list of passages in Hilgenfeld's Hinleitung (Leipsic, 1875), p. 384, note, Alarge mass of valuable material is collected in J. B. Carpzov s Sacre Exer- citationes in Ep. ad Heb. ex Philone Alexandrino (Helmstadt, 1750).

2 Tn x, 34 the trne reading is not "of me in my bonds," but "on them that were in bonds," rots decplors cvverabjoare. The false reading, which was that of Clement of Alexandria, is probably con- nected with the tradition that Paul is anthor. '

3 An unambiguous proof that our author had read the epistle to the Romans seems to lie in x. 80. This is the one Old Testament citation of the epistle which does not follow the Septuagint (Deut. xxxii. 35); but it is word for word from Rom. xii. 19. Further signs of depend- ence on Romans and Corinthians (which require sifting) have been collected by Holtzmann in Schenkel's Bibel-Lexikon, ii. 620, and Hil- genfeld's Zeitschrift, ix, 4 seq.

immediately after the recognized epistles of that apostle, and which contained nothing in its title to distinguish it from the preceding books with similar headings, "'To the Romans," "To the Corinthians," and the like! A similar history, as Zahn has pointed out, attaches to the so-called second epistle of Clement to the Corinthians.

When we see that the tradition which names Paul as author does not possess an authentic historical basis, we are necessarily carried on to deny historical authority to tle subsidiary conjectures or traditions which speak

of Luke and Clement of Rome. The history of the Alexan- drian tradition shows that these names were brought in merely to lessen the difficulties attaching to the view that Paul wrote the book exactly as we have it. The name of Luke seems to be a conjecture of the Alexandrian Clement, for it has no place in the tradition received from his master. And Origen attaches no importance to either name. Some had mentioned one, and some the other, but God alone knows the truth. We have no reason to think more highly of these suggestions than Origen did. Indeed, no Protes- tint scholar now proposes the name of Clement, whose extant epistle to the Corinthians shows his familiarity with the epistle to the Hebrews, and at the same time excludes the idea that le composed it. The name of Luke has still partisans —most notably Delitzsch, who has carefully collected linguistic parallels between our epistle and the Lucan writings (Commentar zum Llebréerbrief, Leipsic, 1857; English translation, Edinburgh, 1868-70). The arguments of Delitzsch are generally met with the objection that our author must have been a born Jew, which from luis standpoint and culture is in the highest degree probable, though not perhaps absolutely certain. In any case we cannot suppose that Luke wrote the epistle on Paul's com- mission, or that the work is substantially the apostle's ; for such a theory takes no account of the strongly-marked individuality of the book in thought and method as well as expression. And the theory that Luke was the independent author of the epistle (Grotius and others) has no right tu appeal to antiquity, and must stand entirely on the very inadequate grounds of internal probability afforded by language and style.

If Alexandria fails us, can we suppose that Africa pre- served the original tradition? This is a difficult question. The intrinsic objections to authorship by Barnabas are not important. The so-called Epistle to Barnabas was not written by our author, but then it is admittedly not by Barnabis. The superior elegance of the style of our epistle as compired with that of Paul is not inconsistent with Acts xiv. 12; nor is there, as we sliall see presently, any real force in the once favourite objection that the ordinances of the temple are described with lcss accuracy than might be looked for in Barnabas, a Levite and one who had resided in Jerusalem. On the other hand it is hard to believe that the correct account of the authorship of our book was pre- served only in Africa, and in a tradition so isolated that Tertullian seems to be its only independent witness. How could Africa know

this thing and Rome be ignorant? Zahn, who is the latest exponent of the Barnabas hypo thesis, argues that in the West, where the so-called epistle of Barnabas was long unknown, there was nothing to suggest the idea of Barnabas as an author; that the true tradition might perish the more readily in other parts of the church after the name of Barnabas had been falsely attached to another epistle, dealing with the typology of the ceremonial law; and finally, that the false epistle of

; 1 The place of the epistle in MSS, varies. The order of our Bible is that of the Latin Church, the oldest Greek codices placing it before the pastoral epistles. But the Latin order, which expresses the

original uncertainty of the Pauline tradition, was formerly current even in the East.

HEBRE Ws

Bamabas, which was first so named in Alexandria, may there have carried off the true title of the epistle to the Hebrews after the latter was ascribed to Paul. That is not plausible, and it is more likely that an epistle which calls itself Adyos rapakAjoews (Heb. xili. 22) was ascribed to the vids mapaxAjoews (Acts iv. 36) in the same way as Ps. exxvii. was ascribed to Solomon, 'the beloved of the Lord " (2 Sam, xii. 24, 25), from the allusion exxvii. 2, than that this coincidence of expression affords a confirmation of the Barnabas hypothesis. In short, the whole tradition as to the epistle is too uncertain to offer much support to any theory of authorship, and if the name of Barnabas is accepted it must stand mainly on internal evidence.

Being thus thrown back on what the epistle itself can tell us, we must look at the first readers, with whom, as we have already seen, the author stood in very close relations. It is generally agreed that the church addressed was com- posed of Hebrews or Christians of Jewish birth. We are not entitled to take this simply on the authority of the title, which is hardly more than a reflexion of the impression produced on an early copyist. But it is plain that the writer is at one with his readers in approaching all Christian' truth through the Old Testament. He and they alike are accustomed to regard Christianity as a continuous develop- ment of Judaism, in which the benefits of Christ's death belong to the ancient people of God and supply

the short- comings of the old dispensation (iv. 9; ix. 15; xiii, 12). With all the weight that is laid on the superiority of Christianity, the religion of finality, over Mosaism, the dis- pensation which brought nothing to its goal, the sphere of the two dispensations is throughout treated as identical, without any allusion, such as could hardly have been avoided in addressing a Gentile church, to the way in which strangers and foreigners (Hph. ii. 19) had been incorporated with the people of God. Schiirer indeed (Stud. u. Krit., 1876, p. 776) has sought such an allusion in vi. 1, 2, where faith in God and belief in the resurrection and the judgment, points common to Judaism and Christianity, are reckoned to the elementary doctrine of Christ ; and he con- cludes that the readers addressed were Gentile converts of a Judaizing type. But taken with the context these verses imply only that the Hebrews required to be warned against losing hold even of these first principles of revealed truth which lie in the Old Testament (v. 12). From all this we are not perhaps entitled to conclude that the church addressed contained no Gentile members, but it is plain that they were not sufficiently numerous and independent in their way of thought to affect the general type of Christianity in the community. To some writers the emphatic "all" in xiii. 24, the admonitions x. 25, xiii. 17, have suggested the possibility that the Hebrews addressed were but part, and a soniewhat discontented part, of a larger community in which Gentile elements has a consider- able place. But this appears a strained conclusion (Phil. iv. 21; 1-Th. v. 26) distinctly contrary to the general tone of the epistle, which moves altogether outside of the anti- thesis between Jewish and Gentile Christianity. We must think not of a party but of a church, and such a church can be sought only in Palestine or in one of the great centres of the Jewish dispersion. That the epistle was addressed to Palestine, or more specifically to Jerusalem, has been a prevalent opinion from the time of Clement of Alexandria, mainly because it was assumed that the word Hebrews must naturally mean Jews, whose mother-tongue was Aramaic. But the term has this restricted sense only when put in contrast to Hellenists. In itself, according to ordinary usage, it simply denotes Jews by race, and in Christian writings especially Jewish Christians. And there are several things in the epistle that seem to exclude Palestine, and above all Jerusalem. Tlie Hellenistic cul-

ture of the writer and the language in which le writes furnish one argument. Then the most marked proof of Christian love and zeal in the church addressed was that they had ever been assiduous in ministering to the saints (vi. 10). This expression may conceivably have a general sense (1 Cor. xvi. 157%), but it is far more likely that it las the specific meaning which it generally bears in the New Testament, viz., the collection of alms for the church in Jerusalem. At any rate it was clearly understood in the first age of Cliristianity that the Judean Church took alms and did not give them, receiving in temporal things an acknowledgment for the spiritual things they had imparted (Rom, xv. 27). In fact the great weight laid in the epistles of Paul on this—the only manifestation of the cathiolicity of the church then possible (Gal. ii. 10)—alone explains the emphasis with which our author cites this one proof of Christian feeling. Again, the expressions In ii 3 already referred to imply that the readers did not include in their number direct disciples of Jesus, but had been brought to Christ by the words and miracles of apostolic missionaries now dead (xiii. 7). This conversion, as it appears from x. 32, was a thing of precise date immediately followed by persecution (note the aorists wricbévres—dreneivate) ; so that we cannot think of a second generation in the Palestinian Church, but are referred to some part of the Diaspora. Against these difficulties, which have led some of the latest defenders of the Palestinian address, as Grimm (who, in Hilgenfeld's Zectschr. 1870, proposes Jamnia) and Moulton (ew Testament Commentary for English Readers, vol. iii, 1879), to give up Jerusalem altogether, while others, as Riehm, suppose that the Hellenists of Jerusalem (Acts vi. 1) are primarily addressed, it is commonly urged that the readers are exposed to peculiar danger from the persecutions and solicitations of unbelieving Jews, that they are in danger of relapsing into participation in the Jewish sacrifices, or even that they appear to have never ceased to follow the ceremonial observances that had their centre in the temple ritual. The capital argument for this is drawn from xiii. 13, where the exhortation to go forth to Jesus without the camp is taken as an injunction to renounce fellowship with the synagogue and with the ceremonies and ritual of Judaism. But this exegesis rests on a false view of the context, which does not include verse 9, and expresses by a figure that Christians (as the priests of the new covenant) have no temporal advantage to expect by their participation in the sacrifice of Cliist, but must be content to share his reproach, renouncing this earthly country for the heavenly kingdom (cf. xi.

16, 25-27 with xili. 14; Phil. iii. 20). Altogether, this view of the situation of the first readers of the epistle appears distorted or exaggerated. It is obvious that our Hebrews were familiar with the law, and had a high regard for the ordinances of temple worship. In particular it appears that they had not fully understood how the mediatorial functions of the Old Testament were superseded by the mediatorship of Christ. But their ritualism seems to have been rather theoretical than practical. Had they been actually entangled in the daily practice of superseded ordinances, the author, whose insight into the true worth of these ordinances is clear, and whose personal relations to the Pauline circle are obvious, could hardly have been so nearly one of themselves as appears in xiii. 19, and at any rate could not have failed to give an express precept on the subject. But, on the contrary, he is in thorough sympathy with the type of doctrine on which their church was formed (xiii. 7); the easy way in which he touches on the " meats and drinks and divers washings " of Judaism seems to show that on this head he could count on carrying his readers along with him; and xiii. 9 hardly refers to sacrifices or to Levitical laws of clean and unclean, but

rather to some such form of asceticism (cf. ver. 4) as is spoken of in Rom. xiv. Nowhere does our author speak a warning against participation in sacrifices ; nowhere does he touch on the burning questions that divided the Pharisaic Christians of Jerusalem from the converts of Paul. The practical lesson which he draws from his doctrine is that his readers ought to use with diligence the specifically Christian way of access to God (x. 19 seg.) ; and the only positive fault which he mentions in this connexion is a disposition to neglect the privilege of social worship (x. 25). This again is plainly counected, not with an inclination to return to the synagogue, but with a relaxation of the zeal and patience of the first days of their Christian profession (vi. 4 seg.; x. 32 seg.; xii. 1 seg.), associated with a less firm hold than they once had of the essentials of Christian faith, a less clear vision of the heavenly hope of their calling (iii. 12; iv. 11; v. 12). The apostle fears lest they fall away not merely from the higher standpoint of Christianity into Judaizing practices, but from all faith in God and judgment and immortality (iii, 12 ; vi. 1 seg.)

For the solution of the problem of the epistle it is of the highest importance to form an exacter conception of the causes and nature of this unhealthy condition of the church. Their first conversion had been followed by direct persecution, which their faith had triumphantly overcome. But these days were long gone by (x. 32). It does not appear that a like severity of trial had again fallen upon them. But there were persecutions at least in other parts of the church (xiii. 3, 23). The times were troubled, and from day to day there were many trials and many reproaches to sustain. The dull and long-continued strain of conflict with surrounding wickedness was harder to bear than a sharp onslaught of the enemy (ch. xii). They were weary of enduring, weary of hope deferred, and so the bonds of their Christian unity were loosened, their brotherly love weakened (xiii. 1 seg.), and they began to doubt the verity of those heavenly good things which their first faith had so vividly realized. In such circumstances it was natural that the writer should lay stress on the contrast between the eternal and the transitory, the things of faith and the things of sight, the heavenly Zion aud the earthly pilgrimage. But the remarkable feature of the epistle is that this contrast is drawn out in the form of a threefold argument to show the superiority of Christianity over the old dispensation, inasmuch as Christ is superior (1) to the angels, (2) to Moses, (3) and chiefly to the Levitical priest- hood and its mediatorship. In each of these relations, it is argued, the old covenant, which is earthly, temporal, and without finality, contains within itself the evidence of its own imperfection, and points to the time when it shall be superseded by a new covenant in which every reality and every hope is heavenly, eternal, or, as we should say, ideal. It is the form of this argument which mainly gives force to the common impression that the Hebrews addressed were in danger of seeking access to God by the superseded methods of the old dispensation—in short, that the epistle is a warning against an Ebionite tendency to Christian Pharisaism. But to such a tendency, as we have seen, the practical admonitions of the epistle by no means point. To some scholars accordingly, and particularly to Reuss (Histoire de la Théologie Chrétienne, liv. vi. chap. 1; Les Epitres Catholiques, Paris, 1878), the theoretical part of the book has seemed disproportionate to the practical and personal conclusion, and it has been proposed to regard the whole as a theological system with an epistolary appendix. Doubtless this view contains an element of truth, Ina

1 The statement of Renan, L'Antechrist, pp. xiv., 215, 219, that some had already fallen away and that the question of their readinis- sion was being agitated, seems to be part of the ingenious historical romance in which he has enveloped the whole origin of the epistle.

far higher measure than the Pauline epistles, and in a sense which thoroughly well agrees with the position of the author as no apostle but an apostolic convert, tle book presents the marks of theological reflexion on the established data of the faith. Yet it is impossible to ignore the fact that a special and practical motive runs through the whole book. 'he author never loses sight of a definite circle of readers, and the vast scope of his argument, which is at once felt in the dignity of the opening verses, so unlike the commencement of an ordinary letter, appears to be directly suggested by some historical circumstance affecting his readers and himself, but nowhere explicitly set forth in the epistle, which brought the trial of their faith into close connexion with the question of the permanence of the temple and its ritual. Now we have seen reason to believe that these Jewish Christians were not Palestinians of an Ebionite type but men of the Hellenistic dispersion, with a possible tendency to ascetic mysticism, and almost certainly of such a habit of thought as enabled them readily to sympathize with the typological method of our author. Among men of this type there was no great danger of a relapse into practical ceremonialism. They would rather be akin to the school of Judaism characterized by Philo (De Migr. Abr., c. xvi.; ed. Mangey, i. 450), who neglected the observance of the ceremonial laws because they took them as symbols of ideal things. Occupying this position before their couversion, their adoption of the Christian faith would not have forced upon them any close examina- tion of the relation of the new dispensation to the old law. But it appears from Philo that the men who spiritualized away the Sabbath, the great feasts, even circumcision itself, were not prepared to think lightly of the sacred ritual of the temple. The holy hill of God, the meeting-place of heaven and earth, with its stately service and its ancient memories, had too central a place in the religion of the old covenant to seem indifferent to the freest thinker. And so our Hebrews, whose acceptance of Christ had not shaken their sense of the continuity of the people of God and their Old Testament

privileges, might readily retain the feeling that the ritual of the temple was still what it was of old—- a visible and necessary pledge of God's approach to His people and His acceptance of their worship. So long as things ran their old course such a feeling would hardly affect the even tenor of their Christian life. But when the death struggle of Judea against Rome drew the sympathy of every Hebrew heart, when the abomination of desolation stood in the holy place, wlien the holy and beautiful house was burned up with fire, and when, with all this, terror and distress filled the whole Roman empire and still the Lord delayed His coming, it was not strange that something like despair of God's help should assail our Hebrews, and that all the hopes of the people of God should seem threatened in the overthrow of the ancient pledge of Jehovah's near- ness to Israel.

Now it has generally been argued that the epistle to the Hebrews, which describes the temple services in the present tense, must necessarily have been written before they ceased to be performed. But it has been shown in the most con- clusive manner, from the use of similar presents in Rabbi- nical writers as well as in Josephus and elsewhere, that this argument goes for nothing; and the most recent writers, since Holtzmann's discussion of the subject in Schenkel's Bibel-Lexikon, ii. 623 seg., generally admit that the epistle may have been written after the fall of the temple. And if this be so it can hardly be questioned that the most natural view of the apostle's argument, as it comes toa point in such passages as viii. 13, ix. 9, is that the disap- pearance of the obsolete ritual of the old covenant is no blow to Christian faith, because in Christ ascended into glory the church possesses in heavenly verity all that the

old ritual presented in mere earthly symbol. It was the ruin of the Jewish state and worship which compelled Christianity to find what is offered in our epistle—a theory of the disappearance of the old dispensation in the new. Many attempts have been made to determine which of the centres of the Diaspora was the seat of our Hebrews, Hofmann suggests Antioch ; Ewald, Ravenna ;} but Rome and Alexandria are the places for and against which most has been said. One argument for Alexandria on which great stress has been laid must certainly be dismissed. Wieseler (Untersuchung

tiber den IHebréerbrief, iite Halfte, Kiel, 1861), combining the arguments against a Palestinian address with the impression, which we have seen to be without sufficient foundation, that the readers lived in the neighbourhood of a Jewish temple, seeks them among the Egyptian Jews who frequented the schismatical temple of Leontopolis (Tel-el-Yahtidia) in the upper Delta, And he tries to show that in his description of the temple and the functions of the high priests our author diverges from the Judean pattern and follows peculiarities of the Egyptian temple. But this argument rests on a series of improbable assumptions. The supposed peculiarities of Onias's temple are proved by arbitrary exegesis from passages of Philo, who apparently never thought of that temple at all. Nor can it be shown that it had ever such a reputation as to play the part which Wieseler assigns to it, And our authot's supposed ignorance of the Jerusalem ritual is not made out. In the true text of x. 11 the high priest is not mentioned, and in vii. 27 what is asserted of the high priest is, not that he offered daily sacrifice, but that he was in daily need of atonement. It is more difficult to under- stand why in ix. 4 the golden Ovjuarijprov, that is, the censer or incense-altar,—for the usage of the word does not determine which is meant,—is assigned to the Holy of Holies. But a passage from the almost contemporary Apocalypse of Baruch, to which Harnack has directed atten- tion (Stud. w. Krit., 1876, p. 572 seg.), similarly connects the censer with the Holy of Holies, and seems to show that our author here proceeds on a current opinion and has not simply made a slip.2. Apart from Wieseler's arguments, there is still something to be said for Alexandria. The use in ch. xi. of 2 Maccabees, an Egyptian Apocryphon,?® the general sympathy of the argument with Alexandrian thought, the apparent analogy between our Hebrews and the free-thinking Jews of whom Philo speaks, are all in favour of this address, though we do not know enough about the early history of the Egyptian Church to speak with positiveness either for or against this view of the epistle. Among Continental scholars the disposition at present is to favour the Roman address ; upon which view, since that church was a mixed one, we must suppose that the letter was originally directed to a Jewish section of the Roman Christians, This is not quite plausible, especially since we find in the epistle no trace of the division of parties alluded to by Paul in his epistle from Rome to tle Philippians. It is argued, however, that there is an analogy between the way of thinking of our Hebrews and the dis- position of the majority of the Roman Church as it appears in Rom. ix. seg. The

persecution x. 32 is supposed to be that of Nero, in which case Oearpifdpevor may literally mean "exposed as a public spectacle"; and xili. 7 is taken as an allusion to the martyrdom of Peter and Paul. In working

1 Das Sendschreiben an die Hebrier und Jakobos' Rundschreiben, iibersetat und erklart von H. Ewald, Gott., 1870. 5

2 The Syriac word in Baruch is Pirma. To the passages cited by Harnack to establish for this word the sense of censer, not incense altar, may be added Bar Ali ed. Hoffmann, No. 2578; Barhebr., Chron. Eecl., p. 507; Ezek. viii. 11 (Pesh. and Syr Hex.).

3 Professor Plumptre, in the Ezpositor, vol. i., has also traced analogies with the book of Wisdom.

out this view there is great divergence of opinion; thus Renan will have it that the epistle was written from Ephesus in the year 65, while Harnack (Patr. Ap., I. p. lxxxii.) thinks he finds traces of two distinct persecutions (1), and dates the book from the time of Domitian. The early currency of the epistle at Rome is urged in favour of the Roman address, but the ignorance of the Roman Church as to the author's name seems to go rather in the opposite direction. Ch, xiii. 24 gives us no help, for they of Italy (oi dro Tis "Iradias) may in the epistolary style be Italians either at home or abroad. It is most natural to infer from x. 32 seg., compared with xii. 4, that the church spoken of had not yet produced martyrs, but had suffered only by bonds and the loss of goods. This would exclude Rome, but perhaps the inference is not quite stringent.

Returning from this survey we bring little with us that can throw light on the authorship of the epistle. We can only say that the writer was a man of the first intellectual mark and of Alexandrian culture, whose home and work lay mainly among Jewish Christians, but who was at the same time associated with the Pauline circle. Of the names offered to us in other New Testament writings, Barnabas and Apollos seem the most likely, and Barnabas will claim the preference if we are entitled to give any weight to

tradition. Hither name would go well with the Alexan- drian address. Apollos was an Alexandrian Jew. Barna- bas was of Cyprus, always closely counected with Egypt; and the tradition which connects his relative and associate Mark with the Church of Alexandria is as old as the 2d century.

Literature.—A full account of the oldcr literature will be found in Delitzsch's Commentary; and in the great work of Bleck (Der Brief an die Hebréer erléutert durch Hinleitung, Uebersetzung, und fortlauf- enden Commentar: Abth. I., Versuch einer volistandigen Einleitung, Berlin, 1828; Abth. IJ., Uebersetzwng und Commentar, 1836, 1840), which has formed the basis for all subscquent work on the epistle, and is an indispensable storehouse of material for the student. Bleek's ultimate views on the exposition of the book may be ale ered from the briefer posthumous work edited by Windrath (Elberfeld, 1868). To the recent comnientaries cited in the course of the article may be added. those of Ebrard (1850; Eng. Trans., Edinburgh, 1853), Tholuck, (8d ed. 1850 ; Eng. Trans., Edinburgh, 1842), Linemann (3d ed., Gottingen, 1867). For the doctrine of the epistle the most elaborate work is Riehm's very useful Lchrbegriff des Hebraerbriefs, Ludwigsburg, 1858-59; with which, in addition to the general works on New Testameut theology by Weiss, Reuss, and others, the reader may compare Ritschl's Zntstehung der Altkatholischen Kirche, 2d ed., p. 159 seg. (Bonn, 1857), and Pfleiderer's Pauwlinismus, chap. ix. (Leipsic, 1878). Au excellent summary of the present state of the critical questions bearing on the epistle is given by Zahn in the article " Hebrierbrief" in the new edition of Herzog's Encyklopadie. (W. R. S.)

HEBRIDES, Tue, or WESTERN IsLEs oF SCOTLAND, 1s a uame sometimes applied collectively to all the islands on the west coast of Scotland, but seldom including Bute, Arran, and the other islands situated in the Firth of Clyde. The group is usually divided into the Outer Hebrides, or Long Island, and the Inner Hebrides. The former division embraces the Lewis, Harris, North and South Uist, Ben- becula, Barra, and a number of small islands, the whole length of this group from Barra-Head to the Butt of Lewis being about 130 miles. The Inner Hebrides include Islay, Skye, Mull, Jura, Coll, Colonsay, Rum, Eigg, Tiree, Lismore, and Ulva. The number of inhabited islands is over 100, and the population is nearly 100,000. The principal islands are noticed under separate headings. The outer range

consists almost exclusively of gneiss rocks, with poor soil and large proportions of peat and moor. The Inner range 1s composed chiefly of trap and slate. The scenery of the islands may be generally described as par- taking of the wild and sublime. Jarge masses of mountains of all forms tower up in the interior; and the coasts, indented by arms of the sea, are rugged and varied in out- line. Spots of great beauty—green pastoral glens, sheltered

bays and lakes—are interspersed with the wildest scenes. The climate, though mild, is humid and unsuitable for corn crops. Only a very small portion of the surface is arable, the greater part being mountains, and the valleys inter- secting them narrow and frequently covered with peat moss. Much of the land has, however, been converted into sheep walks, and the moors and desolate tracts are often let at high rents tosportsmen. The development of the prosperity of the islands has been greatly aided by the construction of excellent roads, and by the establishment of various lines of steamers in connexion with Glasgow, thus rendering the fine and in some respects unique scenery fully and easily accessible to tourists. One of the principal sources of wealth is that of the fisheries, Stornoway in the island of Lewis being the headquarters of that industry on the

western coast.

The Hebrides are mentioned by Ptolemy under the name of "EBovdat and by Pliny under that of Hebudes, the modern spelling having, it is said, originated in an accidental misprint. By the Norwegians they were called Sudreyjar or Southern Islands. The Latinized form was Sodorenses, prescrved to modern times in the title of the bishop of Sodor and Man. The original inhabitants of the Hebrides seem to have been of the same Celtic race as those settled on the mainland—the Scoto-Irish whom Columba about the middle of the 6th century converted to Christianity. Scandinavian hordes then poured in with their northern idolatry and lust of pluuder, but in time they adopted the language and faith of the islanders. Mention is made of incursions of the vikings on their shores as early as 793, but the principal emigration took place towards the end of the 9th century in the early part of the reign of Harold Haarfager, and consisted of persons driven

thither, as well as to Orkney and Shetland, to escape from his tyrannous rule. Soon afterwards they began to make incursions against their mother-country, and on this account King Harold fitted out an expedition against them, and placed Orkney, Shetland, the Hebrides, and the Isle of Man under Norwegian government. The chief seat of the Norwegian sovereignty was Colonsay. About the year 1095 Godred Crovan, king of Dublin, of Man, and of the Hebrides, died in Islay. His third son, Olaus or Olave, succeeded to the government about 1103, and the daugliter of Olaus was married to Somerled or Sorlet of Argyle, who became the founder of the dynasty known as Lords of the Isles. Many efforts were made by the Scottish monarchs to displace the Norwegians. Alexander II. led a fleet and army to the shores of Argyllshire in 1249, but he died in the island of Kerrera. On the other hand King Haco, at once to restrain the independence of his jarls and to keep in check the ambition of the Scottish kings, set sail in 1263 on a great ex-pedition, whieh, however, ended disastrously. Magnus, son of Haco, concluded in 1266 a peace with the Scots, renouncing all claim to the Hebrides and other islands except Orkney and Shet- land, and King Alexander agreed to give him a sum of 4000 mcrks in four yearly payments. It was also stipulated that Margaret, daughter of Alexander, should be betrothed to Eric, the son of Magnus, a connexion long remembered and lamented in Scottish song and story.

The race of Somerled continued to rule the islands, and from a youuger son of the same potentate sprang the lords of Lorn, who took the patronymic of Macdougall. Jolin Macdonald of Isle of Islay, who died about 1386, was the first to adopt the title of " Lord of the Isles." He was one of the most potent of the island princes, and was married to a daughter of the Earl of Strathern, steward of Scotland. His son, Donald of the Isles, was memorable for his rebellion in support of his claim to the earldom of Ross, in which, however, he was unsuccessful. Alexander, son of Donald, resumed the hereditary warfare against the Scottish crown; and in 1462 a treaty was concluded between Alexander's son and successor John and King Edward IV. of England, by which John, his son Donald Balloch, and his grandson John, became bound to assist King Edward and James, earl of Douglas, in subduing the kingdom of Scotland. The alliance seems to have led to no active operations, and the island king was adjudged to be a traitor to his liege sovereign of Scotland. In the reign of James V. another John of Islay

resumed the title of " Lord of the Isles," but was compelled to surrender the dignity. The glory of the lordship of the isles— the insular sovereignty—had departed. From the time of Bruce the Campbells had been gaining the ascendency in Argyll. The Macleans, Macnaughtons, Maclachlans, Lamonts, and other ancient races had sunk before this favourite family. The lordship of Lorn was wrestcd from the Macdougalls by Bruce, and their extensive possessions, with Dunstaffnage Castle, bestowed on the king's relative, Stewart, aud his descendants, afterwards lords of Lorn. The Macdonalds of Sleat, the direct representatives of Somerled, though driven from Islay and deprived of supreme power by

James V., still kept a sort of insular state in Skye. There were also the Macdonalds of Clanranald and Glengarry (descendants of Somerled), with the powerful houses of Macleod of Dunvegan and Macleod of Harris, M'Neill of Barra aud Maclean of Mull. Fierce sanguinary feuds continued throughout the 16th and 17th centuries among these rival clans and their dependent tribes, and the tur- bulent spirit was not subdued till a comparatively recent period. James VI. made an abortive endeavour to colonize Lewis. William ILI. and Queen Anne attempted to subsidize the chiefs in ordér to preserve tranquillity, but the wars of Montrose and Dundce, and the Jacobite insurrections of 1715 and 1745, showed how futile were all such efforts. It was not till 1748, when a decisive blow was struck at the power of the chicfs by the abolition of heritable jurisdictions, and the appoiutmeut of sheriffs in the different dis- tricts, that the arts of peace and social improvement made way in these remote regions.

The change was great, and at first not unmixcd with evil. A new system of management and high rents were imposed, in con- sequence of which numbers of the tacksmen, or large tenants, emigrated to America. The exodus continued for many years. Sheep-farming on a large scale was next introduced, and the crofters were thrust into villages or barren corners of the land. The con- sequence was that, despite the numbers who entered the army or emigrated to Canada, the standard of civilization sank lower, and the population multiplied in the islands. The people came to subsist almost entirely on potatoes and herrings ; and in 1846, when the potato blight

commenced its ravages, a scene of nearly universal destitution eusued,—embracing, over the islands generally, 70 per cent. of the population. Temporary relief was administercd in the shape of employment on roads and other works; and an emigration fund being raised, from 4000 to 5000 of the people in the most crowded districts were removed to Australia.

The principal books on the Hebrides are Martin's Description of the Western Islands of Scotland, 1703; Pennant's Tour in Scotland and Voyage to the Hebrides, 1774; Sir Joseph Bank's Contributions to Pennants Tour; Boswell's Tour to the Hebrides with Sanuiel Johnson, LL.D.; Macculloch's Geological Accownt of the Hebrides, 1819; Hugh Miller's Cruise of the Betsy ; W. A. Sinith's Lewisiana, or Life in the Outer Hebrides, 1874, Their history under Norwegian rule is given in the Chronica Regum Mannie ct Insulurum, edited, with learned notes, from the MS. in the British Musewn by Professor Pp, A. Miinch of Christiania, 1860.

HEBRON, the most southern of the three cities of refuge west of Jordan (Josh. xx. 7), built "seven years before Zoan (Tanis) in Egypt" (Num. xiii, 22). Tanis, according to Brugsch, was standing at least 2400 years B.c. Hebron was originally called Mamre and Kirjath Arba, after Arba, one of the Anakim (Josh. xiv. 15), It is frequently mentioned in the Old Testameut (Gen. xiii. 18 and xxiii. 19; 2 Sam, iii, 20 and v. 5). The present town encloses the Haram or sanctuary built over the supposed site of Machpelah ; but if this site be (as seems probable) genuinc, the ancient Hebron must have faced the cave, as is re- marked by many ancient writers (Gen. xxiii, 17). The naine Machpelah signifies "' place of division," and the cave was therefore called as early as the 6th century Spelunca Duplex. In the 12th century an iron door (still visible) is mentioned as leading from the Haram wall to the cavern. In 1167 a.p. Hebron became the see of a Latin bishop, and it was taken in 1187 by Saladin. In 1834 it joined the rebellion against Ibrahim Pasha, who took the town and pillaged it. Modern Hebron rises on the east slope of a shallow valley—a long narrow town of stone houses, the flat roofs having small stone domes. The main quarter is about 700 yards long, and two smaller groups of houses _exist north and south of this. The hill behind is terraced, and luxuriant vineyards surround the place, which is well watered on the north by three principal springs, including the Well Sirah, now 'Ain Sdrah (2 Sam. iii. 26). Three conspicuous minarets rise,

two from the Haram the other in the north quarter. The population includes 17,000 Moslems and 600 Jews. The Bedawin bring wool and camel's hair to the market; and glass bracelets, lamps, and leather water-skins are manufactured in the town. The modern name of Hebron is 4? Khalil, " the friend," in allusion to Abraham the friend of God. The most con- spicuous building is the Haram, an enclosure measuring

112 feet east and west by 198 north and south, surrounded with high rampart walls of masonry similar in size and dressing to that of the Jerusalem Haram walls. These ramparts are ascribed by architectural authorities to the Herodian period. 'The interior area is partly occupied by a 12th century Gothic church, and contains six modern cenotaphs of Abraham, Isaac, Jacob, Sarah, Rebecca, and Leah. 'The cave beneath the platform has probably not been entered for at least 600 years. The numerous tradi- tional sites now shown round Hebron are traceable gene- rally to medizval legendary topography, including the tombs of Adam, Esau, Judah, Abner, and Jesse, the Field of Damascus, the Vale of Tears, and the Oak of Mamre ('plain " in A. V.,Gen. xiii. 18), which has at various times been shown in different positions from # mile to 2 miles from the town.

HECATEUS, son of Hegesander, was sprung from an ancient and noble family of Miletus. His life seems to fall between the years 550 and 475 zc. His earlier years were spent in travelling. He lived some time in Egypt (Herod., ii, 143); he was well acquainted with the resources and power of the Persian empire (Herod., v. 34) ; and the extant fragments of his writings seem to imply personal acquain- tance with Libya, Spain, and Italy, as well as with the countries bordering on the A2gean and Euxine seas. After middle life he seems to have settled in Miletus, where he occupied a position of great honour, and to have devoted his time to the composition of geographical and historical works. When Aristagoras held a council of the leading Tonians at Miletus, to organize a revolt against the Persian rule, Hecataus tried to dissuade his countrymen from the undertaking. Being overruled, he then advised them to equip a strong fleet, using for the emergency the treasures of the temple at Branchide, which might be repaid after the war. But both then and at a later period of the war (Herod., v. 124)

his skilful and prudent advice was given in vain, When the remainder of the revolted Ionians sued for terms, he was one of the ambassadors sent to the Persian satrap Artaphernes. He wrote a work on geography en- titled IepémAovs or Iepurynots ris T'js, in which he went over the countries of the known world, told their inhabit- ants, enumerated the towns, and described their situation and history. He improved the map of the world which Anaximander had made. He also wrote a work called TeveaAdoylar or 'Ioropfa, describing systematically the traditions and mythology of the Greeks. According to Arrian, he was the first to employ critical method to dis- tinguish myth from historical fact ; though lie accepts Homer and the other poets as trustworthy authority. Herodotus, though obviously regarding him with respect, often controverts his statements.

HECAT/EUS, of Abdera, sometimes confounded with Hecatzeus of Miletus, was a Greek historian and philosopher of the 4th century 3.c. He was a disciple of Pyrrho and a contemporary of Alexander the Great and Ptolemy Sotor. He accompanied the latter in an expedition to Syria, and during the reign of the same prince sailed up the Nile as far as Thebes. Some fragments of works by him on Egypt and on the Hyperboreans still exist. According to Suidas, he also wrote a treatise on the poetry of Hesiod and Homer. Regarding his authorship of a work on the Jews, of which some fragments remain, there is some disagreement among critics, but in all probability he is not the author of it.

The Hecatei Abderite Fragmenta were collected by P. Zorn, and published at Altona in 1730. See C. Miiller, Histor. Greecor. frag., and Vossius, De Historicis Grecis.

HECATE, a Greek goddess who is never mentioned in Homer, but is of great importance in other parts of the literature as well as in religious observance. The name Hecatos, the masculine corresponding form, is a frequent

epithet of Apollo; and though the word éxdéry is never used exactly as an epithet of Artemis, yet this suggests a close relationship between the two goddesses, which an examination of their functions fully confirms. Their

character and attributes stamp both as moon-goddesses. In fact, though often distinguished from Artemis, yet at other times Hecate is identified with her. The worship of Hecate seems to have flourished especially among the wilder tribes of Greek nationality, in Samothrace, Thessaly, and elsewhere; she has, however, been received into the Pantheon of the more civilized Greek races, probably on account of her close resemblance to Artemis; and this is doubtless the meaning of Hesiod's statement (7Z'heog., 423) that she alone of all the Titanic powers was left undisturbed in her honours by Zeus. The parentage of Hecate is variously given. Hesiod names her father Perses (a word connected with Perseus, Persephone, &c., all of which denote powers of light) and her mother Asteria, the starry sky of night. Zeus and Demeter, Zeus and Hera, &c., are also named as her parents. Her chief prerogatives or functions are the following.

(1) She is the chief goddess who presides over magic arts and spells, for all incantations naturally were performed by the light of the moon. Medea is in this respect closely as- sociated with her worship. See her prayer in Sophocles, Rhizot. fr. In Theocr., Jd. it, where a woman's incantation to bring back her faithless lover is given, Hecate is con- stantly invoked. (2) She is a Chthonian power, and is wor- shipped at the Samothracian mysteries. She is then closely connected with Demeter. Alone of the gods besides Helios, she witnessed the abduction of Persephone, and, torch in hand (a natural symbol for the moon's light), she assisted Demeter in the search for her daughter (//ym. Dem., 45 ff.). She is obviously a by-form of Perse- phone, who as queen of the lower world is also the moon, the bride of the sun, when at setting he has gone to the lower world.. She rules as a terrible power, Kratais, among the shades (Orph., 48, &c.). (3) As 8adodxos, hordépos, troddurrepa, she lights wanderers on their way by night, and is therefore, along with Hermes, wor- shipped as patron of roads under the name évodia. At cross-roads she was the director, hence her name tpuodcris, and probably also rpipopdos, tpiurpécw7os, &e. Pillars called Hecatzea, like the Herma, stood, especially in Athens, at cross-roads and door-ways. (4) She is the god- dess of fertility, and, like Artemis, presides especially over the birth and the youth of wild animals. As the moon measures the months, the moon-goddess in all forms, as Artemis, Helena, &c., presides over birth. (5) It follows easily from the last that she should be the goddess who gives wealth and power. Thus she is celebrated by Hesiod

(Z.c.). On the Acropolis at Athens Hecate Epipyrgidia, as protectress of the citadel, had a shrine beside the temple of Victory. To Hecate dogs were offered, also honey and black she-lambs, as black victims were offered to other Chthonian deities. She was represented generally as a triple form, holding in the six hands torches, with some- times a snake, a key, a whip, or a dagger, often with dogs standing beside her. The three heads support a basket, '"kalathos," such as often adorns the statues of Artemis and Hera. The Hecatza also generally represent her with three heads; occasionally, however, a single-formed Hecate is found, still with torch or key in hand, and sometimes with crescent moon on head.

HECKMONDWYKE, a town of England, in the West Riding of Yorkshire, on the Huddersfield and Bradford Railway, 2 miles N.W. of Dewsbury and 10 miles 8. W. of Leeds. It occupies a gradually sloping site, and is some- what irregularly built, although latterly it has assumed a more town-like appearance. It possesses a church

dedicated to St James erected in 1831, a market-house erected in 1868, a working men's club established in 1868, a mechanics' institute founded in 1873, a chamber of commerce dating from tlie same year, and a literary institute established in 1878. There are three board schools, a national school, and a Roman Catholic school, the whole affording accommodation for 1600 scholars. Much has been done for the improvement of the town by draining, and under the provisions of the Dewsbury and Heckmondwicke Waterworks Act of 1876 an ample supply of water has been obtained for domestic and manufactur- ing purposes. A cemetery with chapels for churchmen and dissenters was formed in 1860. The chief manu- facture is blankets, and there are also carpet factories, machine shops, dye works, and iron foundries. Coal is extensively wrought in the vicinity. The town is under the government of a local board of health established in 1853. The area of the township is about 700 acres. The population of the town, which in 1801 was only 1742, had in 1871 reached 8300, and is now estimated at

10,000.

HECLA. See IcELAND.

HECTOR, son of Priam and Hecuba, the champion of the Trojans and the mainstay of their city. Like Paris and other Trojans, he had an Oriental name, Darius, as well as a Greek one, an interesting fact on which many fanciful theories have been founded. He was married to Andro- mache, daughter of Eetion, king in the Cilician Thebe. By Homer his character is drawn in most favourable colours as a good son, a loving husband and father, and a trusty friend, —religious without superstition, tenderhearted yet courageous. The one blemish apparent in some parts of the Iliad (see Geddes's Homeric Problem) is a tendency to presumptuous aud boastful confidence. He is an especial favourite of Apollo ; and later poets even describe him as son of that god. When Achilles, enraged with Agamemnon, deserted the Greeks, Hector drove them back to their ships, which he almost succeeded in burning. Patroclus, the friend of Achilles, who came to the help of the Greeks, was slain by Hector with the help of Apollo. Then Achilles, to revenge his friend's death, returned to the war, slew Hector, dragged his body behind his chariot to the camp, and afterwards dragged it round the tomb of Patroclus. Priam, guarded by Hermes, went to Achilles and prevailed on him to give back the dead body, which was buried with great honour (//., xxiv.). Hector was worshipped in the Troad by the Beotian tribe Gephiyreei ; and he is, like other heroes, probably an ancient god. It would require an inquiry into the whole Trojan legend to determine the conception involved: it is impossible to do more in this place than refer to Ruckert's essay in this direction.

Scenes from the life of Hector are favourite subjects in vase paintings. A very ancient pinax from Camirus represents his fight with Menelaus over the dead Euphorbus ; and on an amphora, also from Camirus, of not later date than 450 B.c., he is represented starting for battle, standing beside the quadriga into which his charioteer Cebriones has already mounted. Both vases are now in the British Museum. Though many of the subjects in which he was supposed to appear have now been assigned to other heroes,— for example, the frequently occurring Parting of Hector and Andromache is by a more searching criticism generally trans- formed into a scene from the life of Amphiaraus,—yet many undoubted examples remain. We find such scenes as the parting cup given by Hecuba to her son as he departs to the battle, his

battle with Achilles in presence of Apollo and Athene, or the dragging of his corpse round the tomb of Patroclus.

HECUBA (the Latin form of the Greek Hekabe), wife of Priam, is in Homer daughter of the Phrygian king Dymas, who dwelt on the bank of the Sangarius; but according to Euripides, Virgil, &c., her father was named Gisseus. According to Homer she was mother of nineteen of Priam's fifty sons. When Troy was captured and Priam XI. — 77

slain, she was made prisoner by the Greeks. Her fate is told in various ways, most of which connect her with the promontory Cynossema, on the Thracian shore of. the Hellespont. According to Euripides (Hekabe), her youngest son Polydorus was placed during the siege under the care of Polymestor, king of Thrace. When the Greeks came to the Thracian Chersonese on their way home Hecuba discovered that her son Polydorus had been murdered, and in revenge she contrived to put out the eyes of Polymestor and murder his two sons. She was acquitted by Aga- memnon ; but, as Polymestor foretold, she was turned into a dog, and her grave became a mark for ships. Other tales about her may be found in Ovid (Met., xiii. 423 #-) and Dictys. It is obvious from the tales of Hecuba's trans- formation and death that she is a form of some goddess to whom dogs were sacred; and the analogy with Scylla is striking.

HEDA, Witte Craasz, Dutch painter, born at Haarlem it is said in 1594, and still living there in 1668, was one of the earliest Dutchmen who devoted himself exclusively to the painting of still life. He was the contemporary and comrade of Dirk Hals, with whom he had in common pictorial touch and technical execution. But Heda was more careful and finished than Hals, and showed consider- able skill and not a little taste in arranging and colouring chased cups and beakers and tankards of precious and inferior metals. Nothing is so appetizing as his "luncheon," with rare comestibles set out upon rich plate, oysters,— seldom without the cut lemon,—bread, champagne, olives, and pastry. Even the commoner "'refection" is also not without charm, as it comprises a cut ham, bread, walnuts, and beer. One of Heda's early masterpieces, dated 1623, in the Munich Pinakothek is as homely as a later one of 1651 in the Lichtenstein Gallery at Vienna. A more

luxurious repast is a Luncheon in the Augsburg Gallery, dated 1644. Most of Heda's pictures are on the Continent, notably in the galleries of Paris, Parma, Ghent, Darmstadt, Gotha, Munich, and Vienna. He was a man of repute in his native city, and filled all the offices of dignity and trust in the guild of Haarlem. He seems to have had consider- able influence in forming the younger Frans Hals.

HEDGEHOG (Zrinaceus europaeus, Linn.), the Common Urchin of Pennant, Hérisson of the French, Riccio of the Italians, Zgel of the Germans, is the best known, and from an anatomical point of view perhaps the most charac- teristic, of the Jnsectivora. The genus is remarkable for its dentition, its armature of spines, and its short tail, while the ordinary species is characterized by not having the spines longer than the head or the ears more than half that length. The upper jaw is longer than the lower one, and the whole snout, which is long and flexible, has somewhat the appear- ance of that of the hog; the nostrils are narrow; and the claws are long but weak. The animal is about 10 inches long, its eyes are small, and the integument of the ventral surface is covered with hairs of the ordinary character. The brain is remarkable for its low degree of development, the cerebral hemispheres being excessively small, and marked with but one groove, and that a shallow one, on each side, while the more special characters of this region call to mind the organization of the same parts in the very lowest of mammals.

The most remarkable point in its external appearance is the possession of spines, and the power possessed by it of rolling itself up into a ball, from which these spines stand out in every direction. The spines, which are modified hairs, are sharp, hard, and elastic, and form so efficient a defence that there are but few animals that are able, and even they rarely, to effect a successful attack on this curious creature, The moment it is touched, or even hears the sound of so slight a menace as the report of a gun, it rolls

itself up by the action of the powerful muscles which lie just beneath the skin, while this same contraction effects the erection of the spines. The most important muscle is the orbicularis panniculi, which extends over the anterior region of the skull, as far down the body as the ventral or purely

hairy region, and on to the tail; three other muscles are connected with this, and aid in the contraction of the integument, passing as they do from the breast-bone to the face and lower jaw, from the fore-arm to the sides of the ventral region, and from the fore-arm to the dorsal surface. '

Though insectivorous, the hedgehog is reported to have a great liking for mice, while frogs and toads, as well as plants and fruits, all seem to be acceptable ; its ingestion of snakes has been detailed by Buckland and Broderip, and its fondness for eggs has caused it to meet with the enmity of game-preservers. Pennant reports that "it lies under the undeserved reproach of sucking cattle, and hurting their udders, but the smallness of its mouth renders that impos- sible," nor does it seem that any well-authenticated report of such an occurrence has ever been made, It makes a not rare domestic pet. Ina state of nature it does not emerge from its retreat during full daylight, unless urged out by hunger or by the necessities of its young. During the cold of winter it passes into a state of complete hiberna-tion, and its temperature falls very considerably ; having

Hedgehog.

provided itself with a nest of dry leaves, it is well protected from the influences of the rain, and rolling itself up it re- mains undisturbed till distinctly warmer weather returns. In July or August the female brings forth four to eight young, or, according to others (Bell), two to four at a some-what earlier period ; at birth the spines, which in the adult – are black in the middle, are white and soft, but soon harden, though they do not attain their full size until the succeed- ing spring. It is commonly found in woods and gardens, and extends over nearly the whole of Europe; it has been found at 6000 to 8000 feet above the level of the sea. The witch in Macbeth who heard the "hedge-pig" whine thrice and once gave not an incorrect account of the character of its voice, rarely as this is heard. The adult is provided with thirty-six, and the young with twenty-four teeth ; in both cases canines appear to be absent ; the median incisors are very long, and project; there are two more false grinders in the upper than in the lower jaw, while the true molars of the upper jaw are remarkable for the presence of four cusps, of which the anterior inner and the posterior outer are connected by an obliquely-set ridge. This is the same arrangement as is

seen in man. In the lower jaw the corresponding teeth are, as in the lemurs (or half-apes), provided with two transverse ridges.

Sixteen species of the genus have been recognized by some zoologists. The tenrec (Centetes) of Madagascar has very many points in common with it.

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HEDGE-SPARROW. See Sparrow.

NEEM, Jan Davipsz VAN (or JOHANNES DE), was born according to Houbraken and Sandrart in 1604, according to Descamps in 1600, at Utrecht, and died at Antwerp in 1683 or 1684. Thoré has said of Heda, but it is only true of De Heem, that "he glorified insects, butterflies, and all the minute beings that swarm in vegetation, and made the moth drink in cups of chased gold." He was, if not the first, certainly the greatest painter of still life in Holland ; no artist of his class combined more successfully perfect reality of form and colour with brilliancy and harmony of tints. No object of stone or silver, no flower humble or gorgeous, no fruit of Europe or the tropics, no twig or leaf, with which he was not familiar. Sometimes he merely represented a festoon or a nosegay. More frequently he worked with a purpose to point a moral or illustrate a motto. Here the snake lies coiled under the grass, there a skull rests on blooming plants. Gold and silver tankards or cups suggest the vanity of earthly possessions ; salvation is allegorized in a chalice amidst blossoms, death as a crucifix inside a wreath. Sometimes De Heem painted alone, sometimes in company with men of his school, Madonnas or portraits surrounded by festoons of fruit or flowers. At one time he signed with initials, at others with Johannes, at others again with the name of his father joined to his own. At rare intervals he condescended to a date, and when he did the work was certainly of the best. De Heem entered the guild of Antwerp in 1635-6, and became a burgher of that city in 1637, He steadily maintained his residence till 1667, when he moved to Utrecht, where traces of his presence are preserved in records of 1668, 1669, and 1670. It is not known when he finally returned to Antwerp, but his death is recorded in the guild books of that place. A very early picture, dated 1628, in the gallery of Gotha, bearing the signature of Johannes in full, shows that De Heem at that time was familiar with the technical habits of execution peculiar to the youth of Albert Cuyp. In later

years he completely shook off dependence, and appears i all the vigour of his own originality.

Out of 100 pictures or more to be met with in European galleries scarcely eighteen are dated. The earliest after that of Gotha is a chased tankard, with a bottle, a silver cup, and a lemon on a marble table, dated 1640, in the museum of Amsterdam.

CorNELIUS DE Herm, the son of Johannes, was in practice as a flower painter at Utrecht in 1658, and was still active in his profes- sion in 1671 at the Hague. His pictures are not equal to those of his sire, but they are all well authenticated, and most of them in the galleries of the Hague, Dresden, Cassel, Vienna, and Berlin. In the Staedel at Frankfort is a fruit piece, with pot-herbs and a porcelain jug, dated 1658 ; another, dated 1671, is in the museum of Brussels. Davip DE HerEM, another member of the family, entered the guild of Utrecht in 1668 and that of Antwerp in 1693. The best piece assigned to him isa table with a lobster, fruit, and glasses, in the gallery of Amsterdam ; others bear his signature in the museums of Florence, St Petersburg, and Brunswick. Itis well to guard against the fallacy that David de Heem above mentioned is the father of Jan de Heem. We should also be careful not to make two persons of the artist who sometimes signs Johannes, sometimes Jan Davidsz or J. D. Heem.

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HEEMSKERK, Jonan van (1597-1656), Dutch poet, was born at Amsterdam in 1597. He was educated as a child at Bayonne, and entered the university of Leyden in 1617, In 1621 he went abroad on the grand tour, leaving behind him his first volume of poems, Afinnekunst (The Art of Love), which appeared in 1622. He was absent from Holland four years. He was made master of arts at Bourges in 1623, and in 1624 visited Hugo Grotius in Paris. On his return in 1625 he published Afinnepligt (The Duty of Love), and began to practise as an advocate in the Hague. In 1628 he was sent to England in his legal capacity by the Dutch East India Company, to settle the dispute respecting Amboyna. In the same year he published the poem entitled A/cennekunde, or the Science of Love. He proceeded to Amsterdam in 1640, where he married Alida, sister of the eminent statesman Van Beuningen. In 1642 he published The Cid, a tragi- comedy,

and in 1647 his most famous work, the pastoral romance of Batavische Arcadia, which he had written ten years before. During the last twelve years of his life Heemskerk sat in the upper chamber of the states-general. His last poetical work was The Inconstant Hylas. Hedied at Amsterdam on the 27th of February 1656.

The poetry of Heemskirk, which fell into oblivion during the 18th century, is now once more read and valued. He takes a pro- minent place among writers of the second rank in the great age of Dutch literature. But his famous pastoral, the Batavian Arcadia, which was founded on the Asétrée of Honoré d'Urfé, enjoyed a great popularity for more than a century, and passed through twelve editions. It provoked a host of more or less able imitations, of which the inost distinguished were the Doortsche Arcadia (1662) of Lambertus Bos, the Zaanlandsche Arcadia (1658) of Hendrik Zooteboom, and the Rotterdamsche Arcadia (1703) of Willem den Elger. But the original work of Heemskerk, in which a party of nymphs and shepherds yo out from the Hagne to Katwijk, and there indulge in polite and pastoral discourse, surpasses all these in brightness and versatility.

HEEMSKERK, Martin Jacopsz (1498-1574), some- times called Van Veen, was born at Heemskerk in Holland in 1498, and apprenticed by his father, a small farmer, to Coruelisz Willemsz, a painter at Haarlem. Recalled after a time to the paternal homestead and put to the plough or the milking of cows, young Heemskerk took the first opportunity that offered to run away, and demonstrated his wish to leave home for ever by walking in a single day the 50 miles which separate his native hamlet from the town of Delft. There he studied under a local master whom he soon deserted for John Schoreel of Haarlem. At Haarlem he formed what is known as his first manner, which is but a quaint and gauche imitation of the florid style brought from Italy by Mabuse and others. He then started on a wandering tour, during which he visited the whole of northern and central Italy, stopping at Rome, where he had letters for a cardinal. It is evidence of the facility with which he acquired the rapid execution of a scene-painter that he was selected to co-operate with Antonio da San Gallo, Battista Franco, and Francesco Salviati to decorate the triumphal arches erected at Rome in April 1536 in honour of Charles VY. Vasari, who saw the battle-pieces which Heemskerk then produced, says they were well composed and boldly

executed. On his return to the Netherlands he settled at Haarlem, where he soon (1540) became president of his guild, married twice, and secured a large and lucrative practice. In 1572 he left Haarlem for Amsterdam, to avoid the siege which the Spaniards laid to the place, and there he made a will which has been preserved, and shows that he had lived long enough and prosperously enough to make a fortune. At his death, which took place on the Ist of October 1574, he left money and land in trust to the orphanage of Haarlem, with interest to be paid yearly to any couple which should be willing to perform the marriage ceremony on the slab of

his tomb in the cathedral of Haarlem. It was a supersti- tion which still exists in Catholic Holland that a marriage so celebrated would secure the peace of the dead within the tomb.

The works of Heemskerk are still very numerous, but by no means in the same demand as they were in the master's own time. Adam and Eve, and St Luke painting the Likeness of the Virgin and Child, in presence of a poet crowned with ivy leaves, and a parrot in a cage—an altar-piece in the gallery of Haarlem, and the Ecce Homo in the museum of Ghent, are characteristic works of the period preceding Heemskerk's visit to Italy. An altar-piece executed for St Laurence of Alkmaar in 1538-41, and composed of at least a dozen large panels, would, if preserved, have given us a clue to his style after his return from the south. In its absence we have a Crucifixion executed for the Riches Claires at Ghent (now in the Ghent Museum) in 1543, and the altar-piece of the Drapers' Company at Haarlem, now in the gallery of the Hague, and finished in 1546. In these we observe that Heemskerk studied and repeated the forms which he had seen at Rome in the works of Michelangelo and Raphael, and in Lombardy in the frescos of Mantegna and Giulio Romano. But he never forgot the while his Dutch origin or the models first presented to him by Schoreel and Mabuse. As late as 1551 his memory still served him to produce a copy from Raphael's Madonna di Loretto (gallery of Haarlem). A Judgment of Momus, dated 1561, in the Berlin Museum, proves him to have been well acquainted with anatomy, but incapable of selection and insensible of grace, bold of hand and prone to daring though tawdry contrasts of colour, and fond of

florid architecture. Two altar-pieces which he finished for churches at Delft in 1551 and 1559, one complete, the other a fragment, in the museum of Haarlem, a third of 1551 in the Brussels Museum, representing Golgotha, the Crucifixion, the Flight into Egypt, Christ on the Mount, and scenes from the lives of St Bernard and St Benedict, are all fairly representative of his style. Besides these we have the Crucifixion in the Hermitage of St Petersburg, and two Triumphs of Silenus in the gallery of Vienna, in which the same relation to Giulio Romano may be noted as we mark in the can-vases of Rinaldo of Mantua. Other pieces of varying importance are in the galleries of Rotterdam, Munich, Cassel, Brunswick, Carlsruhe, Mainz, and Copenhagen. In England the master is best known by his drawings. A comparatively feeble picture by him is the Last Judgment in the palace of Hampton Court.

HEEREN, Arnorp Hermann Lupwie (1760-1842), an eminent German historian, was born 25th October 1760 at Arbergen near Breinen. He studied philosophy, theology, and history at Gottingen, and thereafter travelled in Italy, France, and the Netherlands. In 1787 he was appointed one of the professors of philosophy at Géottingen, and he afterwards was chosen aulic councillor, privy councillor, &c., received in short those rewards which are the lot of successful German scholars. He died 7th March 1842. Heeren's great merit as an historian was that he regarded the states of antiquity from an altogether fresh point of view. ~~He examined their economic relations, their consti~~ tutions, their financial systems, and thus was enabled to throw quite a new light on the development of the old world. He possessed vast and varied learning, perfect calmness and impartiality, and great power of historical insight. A French critic has thus briefly summed up his merits—" He had all the qualities of the historians of his nation without their defects, and there is not a French historian superior to him in clearness of thouglit and method of cemposition."

Heeren's chief works were—Ideen tiber Politik, den Verkehr, und den Handel der vornehmsten Volker der alten Welt (2 vols., Gott., 1793-1796 ; 4th ed., 5 vols., 1824-26; English trans., Oxford, 1833) ; Geschichte des Studiwms der elassischen Literatur sett dem Wiederaufleben der Wissensehaften (2 vols., Gott., 1797-1802 ; new ed., 1822); Die Geschiehte der staaten des Alterthums (Gott., 5th ed., 1826 ; English trans., Oxford,

1840) ; Gesehiehte des ewropd- tsehen Staatensystems (Gott., 1800; 5th ed., 1830; English trans., 1834); Versuch einer Entwickelung der Folgen der Kreuzziige (Gott., 1808, and, in French, Paris, 1808, a prize essay of the Institute of France). Besides these Hecren wrote brief biographical sketches of Joh. von Miiller (Leipsic, 1810), Spittler (1812), and C. G. Heyne (Gott., 1813), founded with Ukert the famous historical collection Geschichte der europ. Staaten (Gotha, 1819, and follow- ing years), and contributed many papers to learned periodicals. A

ae of Heeren's Historische Werke was published in 15 vols.,

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HEGEL, Gzora WitHetm Frieprica (1770-1831), was born at Stuttgart on the 27th August 1770. His father, an official in the fiscal service of Wiirtemberg, is not otherwise known to fame; and of his mother, who died when her eldest son, the future philosopher, was in his fourteenth year, we only hear that she had scholarship enough to teach him the elements of Latin. He had one sister, Christiana, who died unmarried, and a brother Ludwig, who served in the campaigns of Napoleon.

At the gymnasium or grammar school of Stuttgart, where Hegel was educated between the ages of seven and eighteen, he was not remarkable. His main feat was a diary kept in German and toa less extent in Latin, at intervals during eighteen months (1785-7), to record and comment on incidents of the class-room, the street, and the parlour. His private industry was shown by written trans- lations of the Antigone, the Manual of Epictetus, &c. But the characteristic feature of his studies was the copious extracts which from this time onward he unremittingly made and preserved. Alphabetically arranged under suit- able heads, this strange congeries, forming his intimate library, comprised annotations on classical authors, passages from newspapers, whole treatises on morals and mathe- matics from the standard works of the period. It is the palpable exhibition of the marvellous receptivity by which he saturated himself with the thoughts of others, and absorbed in their integrity the raw materials for elaboration. Yet as evidence that he was not merely receptive we have essays already breathing that admiration of the classical world which he never lost. Even

then too his chief amuse- ment was cards, and even then he began the habit of taking snuff.

In the autumn of 1788 he entered at Tiibingen as a student of theology ; but though an exhibitioner and on the foundation, if we may so call the "Stift," he showed no interest in the theology or philosophy of the place: his sermons were a failure ; and, instead of seeking after acade- mical distinction, he found more congenial reading in the classics, on the advantages of studying which his first essay was written. After two years he took the customary degree of Ph.D., and in the autumn of-1793 received his theological certificate, stating him to be of good abilities, but of middling industry and knowledge, and especially deficient in philosophy.

His university career, unlike that of Schelling, who, five years younger, came to Tiibingen in 1790, was not brilliant. Hegel was quietly making himself at home in the Greek and Roman world, and gathering stores of miscellaneous information. Amongst his comrades he went by the title of "old man," such, it is said, being his withered aspect. He took part, however, in the usual walks and beer-drinking, and even it seems love-making, of the student. But he gained most from intellectual intercourse with his contem- poraries. Several of these are mentioned, but the two best known to fame were Hélderlin and Schelling. The former, who was of the same age as Hegel, left for Jena about the time that Schelling arrived. With him Hegel learned to feel for the old Greeks a love which grew stronger as the semi-Kantianized theology of his teachers more and more failed to interest him. With Schelling like sympathies bound him. They both protested against the political and ecclesiastical inertia of their native state, and adopted with fervour the revolutionary doctrines of freedom and reason. The myth which tells how the two went out one morning to dance round a tree of liberty in a meadow is antedated, as the incident happened after they had left: still it is in keeping with their opinions, if unsuited to their character. Like many a German student, Hegel was glad of a tutorship, in 1793, when his university course ended. For three years he taught the children of a M. Steiger of

Tschugg. Tschugg was the summer residence of the family, near Erlach on the lake of Biel; in winter they lived in Bern. Little happened in these years. Hegel had a few acquaintances in Bern; but, on the whole, intellectually he lived in isolation. He was, however, far from inactive. Local influences may explain a systematic account of the fiscal system of the canton Bern which he made for himself. But the main factor in Hegel's mental growth came from his study of Christianity. Under the impulse given by Lessing and Kant he turned to the original records of Christianity, and attempted to construe for himself the real significance of Christ. He wrote a life of Jesus, in which Jesus was simply the son of Joseph and Mary. He did not stop to criticize as a philologist, and simply ignored the miraculous, He asked for the secret contained in the conduct and sayings of this man which made him the hope of the human race. To Hegel Jesus appeared as revealing the unity with God in which the Greeks in their best days unwittingly rejoiced, and as lifting the eyes of the Jews from a lawgiver who metes out punishment on the trans- gressor, to the destiny which in the Greek conception falls on the just no less than on the unjust.

The interest of these lucubrations is in general twofold. In Jesus Hegel finds the expression for something higher than mere morality: he finds a noble spirit which rises above the contrasts of virtue and vice into the concrete life, seeing the infinite always embracing our finitude, and pro- claiming the divine which is in man and cannot be over- come by error and evil, unless the man close his eyes and ears to the godlike presence within him. In religious life, in short, he finds the principle which reconciles the opposi- tions of the temporal and ordinary mind. But, secondly, the general source of the doctrine that life is higher than all its incidents and codes is of interest. He does not free himself from the current theology either by rational moraliz- ing like Kant, or by bold speculative synthesis like Fichte and Schelling. He finds his pauacea in the concrete life of humanity: he turns to history, and not to abstract specula- tion. But although he goes to the Scriptures, and tastes the mystical spirit of the medieval saints, the Christ of his conception has traits that seem borrowed from Socrates and from the heroes of Attic tragedy, who suffer much and yet smile gently on a destiny to which they were reconciled. Instead of the Hebraic doctrine of a Jesus punished for our sins, we have the Hellenic idea of a man who is calmly tranquil in the consciousness of his unity with God.

During these years of arduous wrestling with the pro- blems of religion, Hegel kept up a slack correspondence with Schelling and Holderlin. Schelling was already on the way to fame. He was trying (to quote his own words) to find the premises to the results of Kant. Meanwhile he kept Hegel abreast with German speculation. Both of them were intent on forcing the theologians from their holes into the daylight, and grudged them any aid they might expect from Kant's postulation of God and immor- tality to crown the edifice of ethics. After lamenting his want of books, Hegel concludes a letter of 1795 with the words, " Let reason and freedom remain our watchword, and our point of union the church invisible." Great is their animus against the pietistic hypocrisy of Wiirtemberg. Meanwhile Hélderlin in Jena had been following Fichte's career with an enthusiasm with which he infected Hegel.

After these vehement struggles of thought, it is pleasing to turn to a short tour which Hegel in company with three other tutors made through the Bemese Oberland in July and August 1796. Of this tour he has left a minute diary. It embraced Lauterbrunnen, Grindelwald, the Grimsel, and the valley of the Reuss to the lake of Lucerne. The popular passion for natural scenery had scarcely begun, and the days of hotels and tourists were distant. Our four

tutors carried little luggage, save a pack of cards to while away the hours of rest. Hegel was particularly delighted with the varied play of the waterfalls, Still no glamour blinds him to the squalor of Swiss peasant life. The glaciers and the rocks call forth no raptures. 'The spectacle of these eternally dead masses gave me nothing but the monotonous and at last tedious idea, 'Es ist so.'" Again, speaking of the upper parts of the Hasli-thal: "TI doubt if the most orthodox theologian would be bold enough in these regions to credit nature with the purpose of being useful to man, who with difficulty must wrest from her the scanty pittance of which he can make use,—who is uncertain whether rocks or avalanches may not crush him to pieces even as he steals a poor handful of grass, and destroy his miserable hut and cow-stall, the wretched work of his hands."

Towards the close of his engagement at Bern, Hegel had received hopes from Schelling of a post at Jena. 'Tired of isolation, he was anxious to get away from Bern. Fortun- ately his friend Hélderlin, who was now tutor in Frank- fort, secured a similar situation there for Hegel in the family of a Herr Gogol, a merchant. Hegel entered upon his new post in January 1797. It was apparently more agreeable, and left more time for study. At the same time he was nearer the centre of public interest. But above all it renewed the much-missed intellectual society, Holderlin was still, as formerly, enamoured of the ideal of ancient Greece. And another friend called Sinclair, a Fichtean, the author of several forgotten philosophical works, helped to animate Hegel's interest in philosophy.

It may have been the political position of Frankfort that made Hegel about this time turn to questions of economics and government. He had studied

Gibbon, Hume, and Montesquieu in Switzerland. We now find him making copious extracts from the English newspapers on the Poor- Law Bill of 1796; criticizing the Prussian land laws, pro- mulgated about the same time; and writing a commentary on Sir James Steuart's Inquiry into the Principles of Polit- cal Economy, as a means of defining his own views on economics. Here, as in contemporaneous criticisms of Kant's ethical writings, Hegel aims at correcting the abstract discussion of a topic by treating it in its systematic interconnexions. Church and state, law and morality, com- merce and art, are reduced to factors in the totality of human life, from which the specialists had isolated them.

But the best evidence of Hegel's attention to contem- porary politics is two unpublished essays—one of them written in 1798, "On the Internal Condition of Wiirtemberg in Recent Times, particularly on the Defects in the Magis- tracy," the other a criticism on the constitution of Germany, written, itis probable, not long after the peace of Lunéville (1801). Both essays show more vigour in pointing out the inadequacies of the present than in suggesting a remedy. Criticism, not construction, is their forte. In the first Hegel showed how the supineness of the committee of estates in Wiirtemberg had favoured the usurpations of the superior officials in whom the court had found compliant servants. And though he perceived the advantages of change in the constitution of the estates, he still doubted if an improved system could work in the actual conditions of his native province. The main feature in the pamphlet is the recogni- tion that a spirit of reform is abroad. If Wiirtemberg suffered from a bureaucracy tempered by despotism, the Fatherland in general suffered no less. "Germany," so begins the second of these unpublished papers, "is no longer a state." Referring the collapse of the empire to the retention of feudal forms and to the action of religious animosities, Hegel looked forward to reorganization by a central power (Austria) wielding the imperial army, and by a representative body elected by the geographical dis-

tricts of the empire. But such an issue, he saw well, could only be the outcome of violence—of "blood and iron." The philosopher did not pose as a practical statesman. He only described the German empire in its nullity

as a con- ception without existence in fact. In sucha state of things it was the business of the philosopher to set forth the out- lines of the coming epoch, as they were already moulding themselves into shape, amidst what the ordinary eye saw only as the disintegration of the old forms of social life.

His old interest in the religious question reappears, but in a more philosophical form. Starting with the contrast between a natural and a positive religion, he regards a positive religion as one imposed upon the mind from with- out, not a natural growth crowning the round of human life. A natural religion, on the other hand, was not, he thought, the one universal religion of every clime and age, but rather the spontaneous development of the national conscience varying in varying circumstances. A people's religion completes and consecrates their whole activity : in it the people rises above its finite life in limited spheres to an infinite life where it feels itself all atone. Even philo- sophy with Hegel at this epoch was subordinate to religion ; for philosophy must never abandon the finite in the search for the infinite. Soon, however, Hegel adopted a view according to which philosophy is a higher mode of appre- hending the infinite than even religion.

At Frankfort, meanwhile, the philosophic ideas of Hegel first assumed the proper philosophic form. 'In my scien- tific training," he says (in a letter to Schelling of November 2, 1800), "which started from more subordinate wants of man, I could not but be forced onwards to science, and at the same time the ideal of youth had to transform itself into the reflective form of a system." In a MS. of 102 quarto sheets, of which the three first and the seventh are wanting, there is preserved the original sketch of the Hegelian system, so far at least as the logic and meta- physics and part of the philosophy of nature are concerned. The third part of the system—the ethical theory—seems to have been composed afterwards; it is contained in its first draught in another MS. of thirty sheets. Even these had been preceded by earlier Pythagorean constructions envisaging the divine life in divine triangles.

Circumstances soon put Hegel in the way to complete these outlines. His father died in January 1799; and the slender sum which Hegel received as

his inheritance, 3154 gulden (about £260), enabled him to think once more of a studious life. At the close of 1800 we find him asking Schelling for letters of introduction to Bamberg, where with cheap living and good beer he hoped to prepare himself for the intellectual excitement of Jena. The upshot was that Hegel arrived at Jena in January 1801. An end had already come to the brilliant epoch at Jena, when the romantic poets, Tieck, Novalis, and the Schlegels made it the headquarters of their fantastic mysticism, and Fichte turned the results of Kant into the banner of revolutionary ideas. Schelling was the main philosophical lion of the time ; and in some quarters Hegel was spoken of as a new champion summoned from Swabia by Schelling to help him in his struggle with the more prosaic continuators of Kant. Hegel's first performance seemed to justify the rumour. It was an essay on the difference between the philosophic systems of Fichte and Schelling, tending in the main to support the latter. Still more striking was the agreement shown in the Critical Journal of Philosophy, which Schelling and Hegel wrote conjointly during the years 1802-3. So latent was the difference between them at this epoch that it, in one or two cases, is not with certainty possible to determine by whom the essay was written. Even at a later period foreign critics like Cousin saw much that was alike in the two doctrines, and did not

hesitate to regard Hegel as a disciple of Schelling. The dis- sertation by which Hegel qualified for the position of privat- docent—an essay, De orbitis planetarum—was probably chosen under the influence of Schelling's philosophy of nature. It was an unfortunate subject. For while Hegel, depending on a numerical proportion suggested by Plato, hinted in a single sentence that it might be a mistake to look for a planet in the interval between Mars and Jupiter, Professor Piazzi had already discovered the first of the asteroids on lst January 1801. Apparently in August, when Hegel qualified, the news of the discovery had not yet reached him, but critics have made this luckless sugges- tion the ground of attack on @ priori philosophy. The theses attached to this dissertation contained some charac- teristic paradoxes, eg., that the syllogism is the principle of idealism, that a square is the law of nature, and a triangle of mind, &c.

Hegel's earliest lectures, in the winter of 1801-2, on logic and metaphysics were attended by about eleven students. Ata later period, in 1804, we find him with a class of about thirty, lecturing on his whole system ; but his average attendance was rather less, Besides philosophy, he once at Icast lectured on mathematics. As he taught, he was led to modify his original system, and notice after notice of his lectures promised a text-book of philosophy— which, however, failed to appear. Meanwhile, after the departure of Schelling from Jena in the middle of 1803, Hegel was left to work out his own views. Besides philo- sophical studies, where he now added Aristotle to Plato, he read Homer and the Greek tragedians, made extracts from books, attended lectures on pliysiology, and dabbled in other sciences. On his own representation at Weimar, he was in February 1805 made a professor extraordinarius, and in July 1806 drew his first and only stipend—100 thalers. At Jena, though some of his hearers became devotedly attached to him, Hegel was not a popular lecturer any more than Krause. The ordinary student found Fries more intelligible.

Of the lectures of that period there still remain consider- able notes. The language often had a theological tinge (never entirely absent), as when the "idea " was spoken of, or "the night of the divine mystery," or the dialectic of the absolute called the "course of the divine life." Still his view was growing clearer, and his difference from Schelling more palpable. Both Schelling and Hegel stand in a rela- tion to art, but while the esthetic model of Schelling was found in the contemporary world, where art was a special sphere and the artist a separate profession in no intimate connexion with the age and nation, the model of Hegel was found rather in those works of national art in which art is not a part of the common life but an aspect of it, and the artist is not a mere individual but a concentration of the passion and power of beauty in the whole community. " Such art," says Hegel, "is the common good and the work of all. Each generation hands it on beautified to the next ; each has done something to give utterance to the universal thought. Those whoare said to have genius have acquired some special aptitude by which they render the general shapes of the nation their own work, one in one point, another in another. What they produce is not their invention, but the invention of the whole nation ; or rather, what they find is that the whole nation has found its true nature. Each, as it were, piles up his stone. So too does the artist. Somehow he has the good fortune to

come last, and when he places his stone the arch stands self-supported." Hegel, as we have already seen, was fully aware of the change that was coming over the world, "A new epoch," he says, "has arisen. It seems as if the world-spirit had now succeeded in freeing itself from all foreign objective existence, and finally apprehending itself as absolute mind."

HEGEL

These words come from lectures on the history of philo- sophy, which laid the foundation for his " Phenomenology of the Mind." The printing of this work (Phénomenologie des Getstes) began in 1806 at Bamberg, and the sheets were distributed, as they appeared, to a class where he treated the phenomenology as an introduction to logic. That course he closed on the 18th September 1806, as follows : —'This, gentlemen, is speculative philosophy, so far as I have worked it out. We stand in a momentous time,— a seething mass, in which the mind has made a sudden bound, left its old shape behind, and is gaining a new. The whole bulk of our old ideas, the very bands of the world, are rent asunder, and collapse like a dream. Mind is preparing a new start. Philosophy, above all things, has to own and welcome such a start. While some in powerless resistance cling to the past, aud the majority help, but unconsciously, to swell the numbers of its cortege, philosophy, recognizing it as the eternal, has to show it due honour."

Less than a month after, on the 14th October 1806, Napoleon was at Jena. But Hegel, like Goethe, felt no patriotic shudder at the victory, and in Prussia he saw only a corrupt and conceited bureaucracy. Writing to his friend Niethammer on the day before tlie battle, he speaks only with admiration of the " world-soul," the emperor, and only with satisfaction of the probable overthrow of the badly- generallel and inefficient Prussians. The scholar's wish was to see the clouds of war pass away, and leave thinkers to their peaceful work. His manuscripts were his main care; and doubtful of the safety of his last despatch to Bamberg, and disturbed by the French soldiers in his lodgings, he hurried off, with the last pages of the Pheno- menology in his pocket, to take refuge in the pro-rector's house. Hegel's fortunes were now at the lowest ebb. Without means, and obliged to borrow from his friend Niethammer, he had no further hopes from the

impoverished university. He had already tried to get away from Jena, In 1805, when several lecturers left in consequence of diminished classes, he had written to Voss suggesting that his philosophy might find more congenial soil in Heidelberg ; but the application bore no fruit. Now, however, it was necessary to do something. And so, when the proprietor of the Bamberger Zeitung was in want of an editor, Hegel, who had been named by Niethammer, at once accepted the offer, which involved a certain partnership in the concern. Farly in 1807 he came to Bamberg, and stayed for about eighteen months. Of his editorial work there is little to tell ; no leading articles appearedin hiscolumns. Patriotic indignation against Napoleon, or interest in the fortunes of Prussia, were not wanted, and probably would not have been allowed. The editor was only expected to give his constituency news, and he did so with proper neutrality and from the best sources available. It was not a lofty or suitable vocation; and when a nomination to the rectorship of the Aegidien-gymnasium in Nuremberg was procured for Hegel, again by the agency of Niethammer, who was now in the education office at Munich, he was glad to go.

From December 1808 to August 1816 Hegel was school. master, Bavaria, at this time under the direction of Montgelas, was modernizing her institutions. The school system was reorganized by new regulations, which, enter alta, prescribed a training in philosophy as part of the gymnasial course. To this regulation (with which Hegel, however, was not agreed) we owe a series of lessons in the outlines of philosophy—ethical, logical, and psychological— which Hegel drew up with great care and many revisions. They were published in 1840 by Rosenkranz from Hegel's papers. Deviating somewhat from the official order, he began with the outlines of moral and religious doctrine ; he then proceeded to psychology and a combined system of

logic and metaphysics, and ended with a general summary of the whole of philosophy.

As a teacher and master Hegel seems to have been fairly successful. He inspired confidence in his pupils, and maintained discipline without pedantic interference in their associations and sports. On the prize-days at

the close of the session, his addresses summing up the history of the school year discussed some topic of general interest. Five of these addresses are preserved. The first is an exposition of the advantages of a classical training, when it is not con- fined to mere points of grammar. "The perfection and grandeur of the master-works of Greek and Roman litera- ture must be the intellectual bath, the secular baptism, which gives the first and unfading tone and tincture of taste and science." The school was mainly classical; yet at least one half of the time was given to arithmetic, history and geography, mathematics, physics, and preliminary philosophy. In another address, speaking of the introduc- tion of military exercises at school, he says :—' These exercises, while not intended to withdraw the students from their more immediate duty, so far as they have any calling to it, still remind them of the possibility that every one, whatever rank in society he may belong to, may one day have to defend his country and his king, or help to that end. This duty, which is natural to all, was formerly recognized by every citizen, though whole ranks in the state have become strangers to the very idea of it."

On the 16th September 1811, in the summer vacation, Hegel married Marie von Tucher, The young lady (twenty- two years younger than her bridegroom) belonged to Nuremberg, and seems to have been all that could be wished for in awife. She brought her husband no fortune, but a cheerful heart. They seem to have had a happy ifa frugal home; and ashort excursion now and then was their chief dissipation. 'The husband kept a careful record of income and expenditure. That income at Nuremberg amounted to 1500 gulden (£130) and a house; at Heidel- berg, as professor, he received about the same sum; but at Berlin his regular stipend was about 3000 thalers (£300). Two sons were born to them; the eldest, Karl, born 7th June 1813, has since become eminent as a historian. The younger was named Immanuel, born on the 24th September 1816. Hegel's letters to his wife, written during his solitary holiday tours to Vienna, the Netherlands, and Paris, breathe of kindly and happy affection. Hegel, the tourist, recalling happy days spent together ; confessing that, were it not because of his sense of duty asa traveller, he would rather be at home, dividing his time between his books and his wife ; commenting on the shop windows at Vienna ; de- scribing the straw hats of the Parisian ladies,—is a contrast to the professor of a profound philosophical system. But it shows that the

enthusiasm which in his days of courtship moved him to verse had blossomed into a later age of domestic bliss.

The year after his marriage appeared the first two volumes of his Wissenschaft der Logik, and the work was completed by a third in 1816. This work, in which his system was for the first time presented in what, if we except a few minor alterations, was its ultimate shape, found some audience in the world, and from here and there came voices of encouragement. Sinclair, who in 1811 brought out three volumes on JZ'ruth and Certainty ; Windischmann, subsequently professor at Bonn; Thaden, a Danish peasant farmer and votary of free thought ; Berger, another Dane and philosopher ; Van Ghert, an old pupil, now a Government official at Amsterdam,—these, as well as Knebel and Niethammer, corresponded with him during this period. Towards the close of his eighth session three professorships were almost simultaneously put within his reach,—at Erlangen, Berlin, and Heidelberg. The Prussian

offer expressed a doubt that his long absence from university teaching might have made him rusty, so he accepted the post at Heidelberg, whence Fries had just gone to Jena. He came to Heidelberg in October 1816. Though charmed with the neighbourhood, and pleased with the people, he was a little disappointed when only four hearers turned up for one of his courses. Others, however, on the encyclopedia of philosophy and the history of philosophy drew classes of twenty to thirty. While he was there, Cousin first made his acquaintance, but a more intimate relation dates from Berlin, Among his pupils was Hinrichs, who, originally a law student, became a philosophical disciple and wrote several works, to one of which, Religion in tts Inward Relation to Science, Hegel wrote a rather important preface in 1822. The strangest of his hearers was an Esthonian baron, Boris d'Yrkull, who after serving in the Russian army came to Heidelberg to hear the wisdom of Hegel. But his books and his lectures were alike obscure to the baron, who betook himself by Hegel's advice to some simpler fare, in the shape of rudimentary knowledge, before he returned to the Hegelian system. The logic of his master, with whom he became intimate, was afterwards his constant companion in his travels.

At. Heidelberg Hegel was also active in a literary way. In 1817 he brought out the Encyclopedia of the Philo- sophical Sciences, in outline, for use at his lectures. In its first form it was a small treatise of about 300 octavo pages ; but in the second of 1827, and the third of 1830, it rapidly grew to twice the original bulk. It is the only exposition of the Hegelian system asa whole which we have direct from Hegel's own hand. Besides this work he wrote two reviews for the Heidelberg Jahrbticher—the first on Jacobi, the other a political pamphlet which called forth violent criticism. It was entitled a Criticism on the Transactions of the Estates of Wiurtemberg in 1815-16. On the 15th March 1815 King Frederick of Wiirtemberg, at a meeting of the estates of his kingdom, laid before them the draft of a new constitution, in accordance with the resolutions of the congress of Vienna. Though an improvement on the old constitution, it was unacceptable to the estates, jealous of their old privileges and suspicious of the king's intentions. A decided majority demanded the restitution of their old laws, though the kingdom now included a large population to which the old rights were strange. Hegel in his essay, which was republished at Stuttgart, strongly supported the royal proposals, and severely animadverted on the back- wardness of the bureaucracy and the landed interests. In the main he was right ; but he forgot too much the provo- cation they had received, the usurpations and selfishness of the governing family, and the unpatriotic character of the king.

After two years at Heidelberg Hegel accepted the re- newed offer of the chair of philosophy at Berlin, which had been kept vacant since the death of Fichte. The hopes which this offer raised of a position less precarious than that of a university teacher of philosophy were in one sense disappointed ; for more than a professor Hegel never became. But his influence upon his pupils, and his solid- arity with the Prussian Government, gave him a position such as few professors have held.

On the 22d October 1818 Hegel began his lectures at Berlin. "Our business and vocation," he said to his young hearers, "is to cherish the philosophical development of the substantial foundation (7.e., the state) which has renewed

its youth and increased its strength." But Prussia had |

already proved false to the spirit of freedom which had armed the peoples against Napoleon. The enthusiasm which in the hands of Stein, Humboldt, and Scharnhorst had reformed the social, intellectual, and military organi-

zation of Prussia still smouldered ; but hot-headed youth- | under his influence.

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ful politicians made it burst into fitful flames. Sober men were disgusted by the absurdities perpetrated at the Wartburg to celebrate the tricentenary of the Reformation. And though professors like Fries and Oken shared the behaviour of the students in this demonstration, and the assassination of Kotzebue in 1819 found admirers—such as the theological professor De Wette, who spoke of it as a "beautiful sign of the time "—Stein spoke of the two professors as a pair of fools, and Niebuhr grew sad over the extravagances of the younger generation. Secret societies were formed or believed to be forming ; and the Govern- ments grew alarmed. In Prussia the reaction triumphed by the withdrawal of Humboldt in the last days of 1819; and the death of Hardenberg in 1822 was followed by a period of bureaucracy and conservatism.

It was in such an atmosphere that Hegel published the "Philosophy of Right" (Grundlinien der Philosophie des Rechts) in 1821. It is a combined system of moral and political philosophy, or a sociology dominated by the idea of the state. It turns away contemptuously and fiercely from the sentimental aspirations of reformers possessed by the democratic doctrine of the rights of the omnipotent nation. Fries is stigmatized as one of the "ringleaders of shallowness" who were bent on substituting a fancied tie of enthusiasm and friendship for the established order of the state. The disciplined philosopher, who had devoted himself to the task of comprehending the organism of the state, had no patience with feebler or more mercurial minds who recklessly laid hands on established ordinances, and set them aside where they contravened humanitarian senti- ments. With the principle that whatever is real is rational, and whatever is rational is real, Hegel faucied that he had stopped the mouths of political critics and constitution- mongers. His theory was not a mere formulation of the Prussian state. Much that he construed as necessary to a state was wanting

in Prussia; and some of the reforms already introduced did not find their place in his system. Yet, on the whole, he had taken his side with the Govern- ment. Altenstein even expressed his satisfaction with the book. In his disgust at the crude conceptions of the enthusiasts, who had hoped that the war of liberation might end in a realm of internal liberty, Hegel had forgotten his own youthful vows recorded in verse to Holderlin, " never, never to live in peace with the ordinance which regulates feeling and opinion." And yet if we look deeper we see that this is no worship of existing powers. It is rather due to an overpowering sense of the value of organization,—a sense that liberty can never be dissevered from order, that a vital interconnexion between all the parts of the body politic is the source of all good, so that while he can find nothing but brute weight in an organized public, he can compare the royal person in his ideal form of constitutional monarchy to the dot upon the letter A keen sense of how much is at stake in any alteration breeds suspicion of every reform.

During his thirteen years at Berlin Hegel's whole soul seems to have been in his lectures. Between 1823 and 1827 his activity reached its maximum. His notes were subjected to perpetual revisions and additions. We can form an idea of them from the shape in which they appear in his published writings. Those on Wsthetics, on the Philosophy of Religion, on the Philosophy of History, and on the History of Philosophy, have been published by his editors, mainly from the notes of his students, under their separate heads ; while those on logic, psychology, and the philosophy of nature are appended in the form of illustra- tive and explanatory notes to the sections of his Hnceyclo- paidie. During these years hundreds of hearers from all parts of Germany, and from beyond the Fatherland, came His fame was carried abroad by eager

or intelligent disciples. At Berlin Henning served to pre- pare the intending disciple for fuller initiation by the master himself. Gans and Hotho carried the method into special spheres of inquiry. At Halle Hinrichs maintained the standard of Hegelianism amid the opposition or indif- ference of his colleagues.

Hegel himself in his class-room was neither imposing nor fascinating. You saw a plain, old-fashioned face, without life or lustre—a figure which had never looked young, and was now bent and prematurely aged; the furrowed face bore witness to concentrated thought, Sitting with his snuff-box before him, and his head bent down, he looked ill at ease, and while still speaking kept turning the folios of his notes, His utterance was interrupted by frequent hemming and coughing; every word and every sentence came out with a struggle; and if, when the right word seemed as if it would never come and no progress appeared to be making, the listener for a moment ceased to listen, he found when attention returned that the lecture had reached a new stage, and the connexion was lost. And the style of thesc utterances was no less irregular. Sometimes in the plainest narrative the lecturer would be specially awkward, while in the abtrusest passages he seemed speci- ally at home, rose into a natural eloquence, and carried away the hearer by the grandeur of his diction.

Three courses of lectures are especially the product of his Berlin period: those on esthetics, the philosophy of religion, and the philosophy of history. In the years preceding the revolution of 1830, public interest, excluded from political life, turned to theatres, concert-rooms, and picture galleries. At these Hegel became a frequent and appreciative visitor. He even made extracts from the art-notes in the newspapers. In his holiday excursions, the interest in the fine arts is prominent, and more than once takes him out of his way to see some old painting. His letters to his wife are full of such topics. A visit to Vienna in 1824 presents him spending every moment at the Italian opera, the ballet, and the picture galleries. In Paris, in 1827, curiously enough, he heard Charles Kemble and an English company play Shakespeare. This familiarity with the actual facts of art, though neither very deep nor very historical, gave an unusual freshness to his lectures on zsthetics, which, as put together from the notes of 1820, 1823, 1826, are in many ways the most successful of his efforts.

The lectures on the philosophy of religion are another application of his method to an important sphere of human interest. Shortly before his death he had prepared for the press a course of lectures on the proofs for the existence of God. In his lectures on religion he dealt with Christianity, as in his philosophy of morals he had regarded the state. On one hand he turned

his weapons against the rationalistic school, who reduced religion to the modicum compatible with an ordinary worldly mind. On the other hand he criticized the school of Schleiermacher, who elevated feeling to a place in religion above systematic theology. His middle way attempts to show that the dogmatic creed is the rational development of what was implicit in religious feeling. Todo s0, of course, philosophy becomes the inter- preter and the superior. To the new school of Hengsten- berg, which regarded Revelation itself as supreme, such interpretation was an abomination.

A Hegelian school began to gather. The flock included intelligent pupils who applied the method in different pro- vinces of speculation, empty-headed imitators who repeated the catchwords of the new dialectic, and romantic natures who turned philosophy into lyric measures. Opposition and criticism, which were not wanting, only served to define more precisely the adherents of the new doctrine. The master himself grew more and more into a belief in his own doctrine as the one truth for the world. The system

had grown gradually with him, and had assimilated intel- lectual nutriment from every hand so as to make all history and all knowledge bear witness to its truth. He was in harmony with the Government, and his followers were ou the winning side. Though he had soon resigned all direct official counexion with the schools of Brandenburg, his real influence in Prussia was considerable, and as usual was largely exaggerated in popular estimate. In the narrower circle of his fricnds his birthdays were the signal for congratulatory verses. In 1826 a formal festival was got up by some of his admirers, one of whom, Herder, spoke of his categories as new gods; and he was presented with much poetry and a silver mug. In 1830 the students struck a medalin his honour, and in 1831 he was decorated by an order from the king. In 1830 he was rector of the university ; and on the tricentenary of the Augsburg Con- fession in that year, he took the opportunity in his speech on the occasion to charge the Catholic Church with regard- ing the virtues of the pagan world as brilliant vices, and giving the crown of perfection to poverty, continence, and obedience.

One of the last literary undertakings in which he took part was to give his support to Gans and Varnhagen von Ense in the establishment of the Berlin

Jahrbiicher fiir Wissenschaftliche Krittk. The aim of this review was to give a critical account, certified by the names of the contri- butors, of the more important literary and philosophical productions of the time, in relation to the general progress of knowledge. The journal was not solely in the Hegelian interest ; and more than once, when Hegel attempted to domineer over the other editors, he was met by vehement and vigorous opposition. It gave him besides a deal of trouble with sanguine authors, who looked forward to a favourable word from him as a passport to fame.

The revolution of 1830 was a great blow to him, as to many other Germans; and the prospect of democratic advances almost made him ill. His last literary work was an essay on the Euglish Reform Bill of 1831, the first part of which appeared in the Preussische Staats-zeitung. It contains primarily a careful consideration of the effects likely to come from the alterations in the electoral franchise, in relation, first, to the character of the new members of parliament, and secondly, to the measures which they may introduce. In the latter connexion he eularges on several points where England had done less than many Continental states for the abolition of monopolies and abuscs. Survey- ing with much intelligence of English circumstances the questions connected with landed property, with the game laws, the poor, the Established Church, especially in Ireland, Hegel throws grave doubt on the legislative capacity of the English parliament as compared with the power of renova- tion and reform manifested in the more advanced states of western Europe. Much of the essay, unfortunately, has not become antiquated as a critique on the social state of Britain.

In 1831 the cholera had first entered Europe. Hegel and his family retired for the summer to a lodging in the suburbs, and there he finished the revision of the first part of his Science of Logic. On the commencement of the winter session, however, he returned to his house in the Kupfergraben. On this occasion an unseemly altercation occurred between him and his friend Gans, who in his notice of lectures on jurisprudence had recommended Hegel's Philosophy of Right. Hegel, indignant at what he deemed patronage, asked Gans in a rough missive to withdraw the note. On Friday 11th November Hegel had lectured as usual, On Sunday he had a violent attack of cholera, and on Monday, the 14th November 1831, he was

dead. He was buried on the spot he had wished for himself, between Fichte and Solger.

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Hegel's Philosophy.

Hegelianism is confesscdly one of the most difficult of all philoso- phies. Every one has heard the legend which makes Hegel say, "'Qne man has understood me, and even he has not." He abruptly hurls us into a world where old habits of thought fail us. In three places indeed he has attempted to exhibit the transition to his own system from other levels of thought ; but in none with much success. In the introductory lectures on the philosophy of religion he gives a rationale of the difference between the modes of consciousness in religion and philosophy (between Vorstellung and Begriff). In the beginning of the Encyelopddie he discusses the defects of dogmatism, empiricism, the philosophies of Kant and Jacobi. In the first case he treats the formal or psychological aspect of the difference ; in the latter he presents his doctrine less in its essential character than in special relations to the prominent systems of his time. The Phenomenology of Spirit, regarded as an introduction, suffers from a different fault. It isnot an introduction —for the philosophy which it was to introduce was not then fully elaborated. Even to the last Hegel had not so externalized his system as to treat it as something to be led up to by gradual steps. His philosophy was not one aspect of his intellectual life, to be con- templated from others ; it was the ripe fruit of concentrated re- flexion, and had become the one all-embracing form and priuciple of his thinking. More than most thinkers he had quietly laid himself open to the influences of his time, and the lessons of history.

The Phenomenology is the picture of the Hegelian philosophy in the making, —at the stage before the scaffolding has been removed from the building. For this reason the book is at onee the most brilliant aud the most difficult of Hegel's works,—the most brilli- ant because it is to some degree an autobiography of Hegel's mind, —not the abstract record of a logical evolution, but the real history of an intellectual growth; the most difficult

because, instead of treating the rise of intelligence (from its first appearance in contrast with the real world to its final recognition of its presence in, and rule over, all things) as a purely subjective process, it exhibits this rise as wrought out in historical epochs, national characteristics, forms of culture and faith, and philosophical systems. The theme is identical with the introduction to the Eneyelopddie ; but it is treated in a very different style. From all periods of the world,— from medieval piety and stoical pride, Kant and Sophocles, science and art, religion and philosophy,—with disdain of mere chronology, Hegel gathers in the vineyards of the human spirit the grapes from which he crushes the wine of thought. The human mind coming through a thousand phases of mistake and disappointment to a sense and realization of its trne position in the universe,—such is the drama which is consciously Hegel's own history, but is represented objectively in the ficld of the world as the process of spiritual his- tory which the philosopher wakes into consciousness and reproduccs in himself. The Phenomenology stands to the Eneyelopidie some- what as the dialogues of Plato stand to the Aristotelian treatises. It contains almost all his philosophy—but irregularly and without due proportion, The personal element gives an undue prominence to recent and contemporary phenomena of the philosophic atmo- sphere. Jt isthe account given by an inventor of his own discovery, not the explanation of an outsider. It therefore to some extent assumes from the first the position which it proposes ultimately to reach, and gives, not a proof of that position, but an account of the experience (Hrfahrung) by which consciousness is forced from one position to another till it finds rest in Absolutes Wissen.

It is impossible in a mere resumé to do justice to this remarkable work, which is neither a mere psychology, nor logic, nor moral philosophy, nor history, but is all of these at once and a great deal more. What the Phenomenology wants is not distillation, but ex- pansion and illustration from contemporary and antecedent thought and literature. It treats of the attitudes of consciousness towards reality under the six heads of consciousness, sclf-consciousness, reason (Vernunft), spirit (Geist), religion, and absolute knowledge. The native attitude of consciousness towards existence is reliance on the evidence of the senscs ; but a little reflexion is sufficient to show that the reality attributed to the external

world is as much due to intellectual conceptions as to the senses, and that these conceptions slip through our fingers when we try to fix them. If consciousness cannot detect a permanent object outside it, so self-consciousness cannot find a permanent subject in itself. It may, like the Stoic, assert freedom by holding aloof from the entanglements of real life, or like the sceptic regard the world as a delusion, or finally, as the

unhappy consciousness" (Ungliickliches Bewusstseyn), may be a recurrent falling short of a perfection which it has placed above it in the heavens. But in this isolation from the world, self-conscious- ness has closed its gates against the stream of life. The perception of this is reason. Reason convinced that the world and the soul are alike rational observes the external world, mental phenomena, and specially the nervous organism, as the meeting ground of body and mind. But reason finds mueh in the world recognizing no kindred with her, and so turning to practical activity seeks in the world the realization of her own aims, Either in a crude way she

pursues her own pleasure, and finds that necessity counteracts her cravings ; or she endeavours to find the world in harmony with the heart, and yet is unwilling to see fine aspirations crystallized by the act of realizing them. Finally, unable to impose upon the world either selfish or humanitarian ends, she folds her arms in_pharisaie virtue, with the hone that some hidden power will give the victory to righteousness. But the world goes on in its life, heedless of the demands of virtue. The principle of nature is to live and let live. Reason abandons her efforts to mould the world, and is content to let the aims of individuals work out their results independently, only stepping in to lay down precepts for the cases where individual actions conflict, and to test these precepts by the rules of formal logic.

So far we have seen consciousness on one hand and the real world on the other. The stage of " Geist" reveals the consciousness no longer as critical and antagonistic but as the indwelling spirit of a community, as no longer isolated from its surroundings but the union of the single and real consciousness with the vital fceling that auimates the conmunity. This is the lowest stage of concrete con- sciousness—life, and not knowledge ; the spirit inspires, but does not reflect. It is the age of unconscious morality,

when the indi- vidual's life is lost in the society of which he is an organic member. But increasing culture presents new ideals, and the wind, absorb- ing the ethical spirit of its environment, gradually emancipates it- self from conventions and superstitions. This " Aufkliérung" pre- pares the way for the rule of conscience, for the moral view of the world as subject ofa moral law. From the moral world the next step is religion; the moral law gives place to God ; but the idea of God- head, too, as it first appears is imperfect, and has to pass through the forms of nature-worship and of art, before it reaches a full utter- ance in Christianity. Religion in this shape is the nearest step to the stage of absolute knowledge ; and this absolute knowledge— "the spirit knowing itself as spirit"—is not something which leaves these other forms behind but the full comprehension of them as the organic constituents of its empire; " they are the memory and the sepulchre of its history, and at the same time the actuality, truth, and certainty of itsthrone." Here, according to Hegel, is the field of philosophy.

The preface to the Phenomenology signalled the separation from Schelling —the adieu to romantic. It declared that a genuine philosophy has no kindred with the mere aspirations of artistic minds, but must earn its bread by the sweat of its brow. It sets its face against the idealism which either thundered against the world for its deficiencies, or sought something finer than reality. Philosophy is to be the science of the actual world—it is the spirit comprehending itself in its own externalizations and manifestations. The philosophy of Hegel is idealism, but it is an idealism in which every idealistic unification has its other face in the multiplicity of existence. It is realism as well as idealism, and in its highest speculations never quits its hold on facts. Compared with Fichte and Schelling, Hegel has a sober, hard, realistic character. At a later date, with the call of Schelling to Berlin in 1841, it became fashionable to speak of Hegelianism as a negative philosophy requir- ing to be complemented by a " positive" philosophy which would give reality and not mere ideas. The cry was the same as that of Krug (more than once alluded to by Hegel) asking the philosophers who expounded the absolute to construe his pen. It was the cry of the Evangelical school for a personal Christ and not a dialectical Logos. Philosophy, as Schelling says, was asked to supply the real God and not the mere conception of Him. Experimental science complained that the real world of matter and force had been supplanted by a fantastic tissue of

logical forms and ethereal proeesses. The claims of the individual, the real, material, and historical fact had bcen sacrificed, it was said, by Hegel, to the universal, the ideal, the spiritual, and the logical.

There was a truth in these criticisms. It was the very aim of Hegelianism to render fluid the fixed phases of reality ,—to show ex- istence not to be an immovable rock limiting the efforts of thought, but to have thought implicit in it, waiting for release from its petrifaction. Nature was no longer, as with Fichte, to bea mere spring-board to evoke the latent powers of the spirit. Nor was it, as in Schelling's earlier system, to be a collateral progeny with mind from the same womb of indifference and identity. Nature and mind in the Hegelian system—the external and the spiritual world—have the same origin, but are not co-equal branches. The natural world proceeds from the "idea," the spiritual from the idea and nature. It is impossible, beginning with the natural world, to explain the mind by any process of distillation or develop- ment, unless consciousness or its potentiality has been there from the first. Reality, independent of the individual consciousness, there must be; reality, independent of all mind, is an impossibility. At the basis of allreality, whether material or mental, there is thought. But the thought thus regarded as the basis of all existence is not con- sciousness with its distinction of ego and non-ego. It is rather the stuff of which both mind and nature are made, neither extended as in the natural world, nor self-centred as in mind. Thought in its primary form is, as it were, thoroughly transparent and absolutely

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fluid, free, and mutually interpenetrable in every part, —the spirit in its seraphiic scieutitic life, before creation had produced a natural world, and thouglit had risen to independent existence in the social organism. Thought in this primary form, when in all its parts completed, is what Hegel calls the "idea."' But the idea, though fundamental, is in another sense final, in the process of the world. It only appears in consciousness as the crowning development of the mind. Ouly with philosophy does thought become fully con- scious of itself in its origin and development. Accordingly the history of philosophy is the presupposition of logic, or the three branches of philosophy form a circle.

The exposition or constitution of the "idea" is the work of the Logic. As the total system falls into three parts, so every part of tle system follows the triadic law. Every truth, every reality, has three aspects or stages; it is the unification of two contradictory elements, of two partial aspects of truth which are not merely con- trary, like black and white, but contradictory, like same and differ- ent. The first step is a preliminary affirmation and unification, the second a negation and differentiation, the third a final synthesis. For example, the seed of the plant is an initial unity of life, which when placed in its proper soil suffers disintegration into its constitu- ents, and yet in virtue of its vital unity keeps these divergent ele- ments together, and reappears as the plant with its members in organic union, Or again, the process of scientific induction is a threefold chain ; the original hypothesis (the first unification of the fact) seems to melt away when confronted with opposite facts, and yet no scientific progress is possible unless the stimulus of the original unification is strong enough to clasp the discordant facts aud establish a reunification. Thesis, autithesis, and synthesis, a ea formula, is generalized by Hegel into the perpetual law of thought.

In what we may call their psychological aspect these three stages are known as the abstract stage, or that of understanding (Verstand), the dialectical stage, or that of negative reason, and the speculative stage, or that of positive reason (Vernunft). The first of these atti- tudes taken alone is dogmatism; the secoud, when similarly isolated, is scepticism ; the third, when unexplained by its elements, is mysticism. Thus Hegelianism reduces dogmatism, scepticism, and mysticism to factors in philosophy. The abstract or dogmatic thinker believes his object to be one, simple, and stationary, and intelligible apart from its surrounding. He speaks, e.g., as if species and genera were fixed and unchangeable ; and fixing his eye on the ideal forms in their purity and self-saineness, he scorns the phenomenal worl:l, whence this identity and persistence are absent. The dialective of negative reason rudely dispels these theories. Appealing to reality it shows that the identity and permanence of formsare contradicted byhistory ; instead of unity it exhibits multi- plicity, instead of identity difference, instead of a whole, only parts. Dialectic is, therefore, a dislocating power; it shakes the solid structures of material thought, and exhibits the instability latent in such conceptions of the world. It is the spirit of progress and change, the enemy of convention and conservatism ; it is absolute and universal unrest.

In the realm of abstract thought these transi- tions take place lightly. In the worlds of nature and mind they arc more palpable and violent. So far as this Hegel seems on the side of revolution. But reason is not negative or dialectic only ; it binds up as well as breaks down, and, while it disintegrates the mass or unconscious unity, builds up a new unity with higher organization. But this third stage is the place of effort, requiring neither the surrender of the original unity nor the ignoring of the diversity afterwards suggested. The stimulus of contradiction is no doubt a strong one ; but the easiest way of escaping it is to shut our eyes to one side of the antithesis. What is required, therefore, is to readjust or reconstitute our original thesis in such a way as to include and give expression to both the elements in the process.

The universe, then, is a process or development, to the eye of philosophy. It is the process of the absolute—in religious lan- guage, the manifestation of God. In the background of all the absolute is eternally present ; the rhythmic movement of thought is the self-unfolding of the absolute. God reveals Himself in the logical idea, in nature, and in mind; but mind is not alike conscious of its absoluteness in every stage of development. Philosophy alone sees God revealing Himself in the ideal organism of thought as it were a possible deity prior to the world and to any relation between God and actuality; in the natural world, as a series of materialized forces and forms of life ; and in the spiritual world as the human soul, the legal and moral order of society, and the creations of art, religion, and philosophy.

This introduction of the absolute became a stumbling-block to Feuerbach and other members of the " Left." They rejected as an illegitimate interpolation the eternal subject of development, and, instead of one continuing God as the subject of all the predicates by which in the logic the absolute is defined, assumed only a series of ideas, products of philosophic activity. They denied the theo- logical value of the logical forms,—the development of these fornis being iu their opinion due to the human thinker, not toa self-reveal- ing absolute. Thus they made man the creator of the absolute. But

with this modification on the system another necessarily followed ; a nmiere logical serics could not create nature. And thus the material universe became the real starting-point. Thought became only the result of organic conditions—subjective and human; and the system of Hegel was no longer an idealization of religion, but a naturalistic theory with a prominent and peculiar logic.

The logic of Hegel is the only rival to the logic of Aristotle. What Aristotle did for the theory of dcmonstrative reasoning, Hegel attempted to do for the whole of human knowledge. His logic is an enumeration of the forms or categories by which our experience exists. It carried out Kant's doctrine of the categories as @ priori synthetic principles, but removed the limitation by which Kant denied them any constitutive value except in alliance with experience. According to Hegel the terms in which thought exhibits itself are a system of their own, with laws and relations which reappear in a less obvious shape in the theories of nature and mind. Nor are they restricted to the small number which Kant obtained by manipulating the current subdivision of judgments. But all forms by which thought holds sensations in unity (the formative or synthetic elements of language) had their place assigned in a system where one leads up to and passes over into another.

The fact which ordinary thought ignores, and of which ordinary logic therefore provides no account, is the presence of gradation and continuity in the world. The general terms of language simplify the universe by reducing its variety of individuals to a few forms, none of which exist simply and perfectly. The method of the uudcrstanding is to divide and then to give a separate reality to what it has thus distinguished. It is part of Hegel's plan to remedy this one-sided character of thought, by laying bare the gradations of ideas. He lays special stress on the point that abstract ideas when held in their abstraction are almost interchangeable with their opposites—that extremes meet, and that in every true and concrete idea there is a coincidence of opposites.

*The beginning of the logic is an illustration of this. The simplest term of thought is being; we cannot think less about anything than when we merely say that itis. Being—the abstract '*is"—is nothing definite, and nothing at*

least 7s. Being and not being are thus declared identical,—a proposition which in this un-

ualified shape was to most people a stumbling-block at the very flow: of the system. Instead of the mere "is" which is as yet nothing, we should rather say " becomes," and as "' becomes"' always implies "something," we have determinate being—"a being" which in the next stage of definiteness becomes "one." And in this way we pass on to the quantitative aspects of being,

It is impossible to give a brief account of the long development of thought, especially as the cogency of the demonstration lies in the details. The logical idea is treated under the three heads of being (Seyn), essence (Wesen), and notion (Begrif'). The terms treated under the first head, in addition to those already mentioned, are the abstract principles of quantity and number, and their appli- cation in measure to detcrmine the limits of being. Under the title of essence are discussed those pairs of correlative terms which are habitually employed in the explanation of tlhe world,— such as law and phenomenon, cause and effect, reason and consequence, substance and attribute. Under the head of notion are considered, firstly, the subjective forms of conception, judgment, and syllogism ; secondly, their realization in objects as mechanically, chemically, or teleologically constituted ; and thirdly, the idea first of life, and next of science, as the complete interpenetration of thought and objectivity. The third part of logic evidently is what contains the topics usually treated in logic-books, though even here the province of logic in the ordinary sense is exceeded. The first two divisions— the 'objective logic' —are what is usually called metaphysics. —

The characteristic of the system, and one impossible to exhibit in a resumé, is the gradual way in which idea is linked to idea so as to make the division into chapters only an arrangement of con- venience. The judgment is completed in the syllogism; the syllogistic form as the perfection of subjective thought passes into objectivity, where it first appears embodied in a mechanical system ; and the teleological object, in which the members are as means and end, leads up to the idea of life, where the end is means and meaus end indissolubly till death. In some cases these transitions may

be unsatisfactory and forced ; it is apparent that the linear develop- ment from "being" to the "idea" is got by transforming into a logical order the sequence that has roughly prevailed in philosophy from the Eleatics ; cases might be quoted where the reasoning seems a play upon words ; and it may often be doubted whether certain ideas do not involve extra-logical considerations. The order of the categories is in the main outlines fixed; but in the minor details much depends upon the philosopher, who has to fill in the gaps between ideas, with little guidance from the data of experience, and to assign to the stages of development names which occasionally deal hardly with language. The merit of Hegel is to have indicated and to a large extent displayed the filiation and mutual limitation of our forms of thought ; to have arranged them in the order of their contparative capacity to give a satisfactory expression to truth

.in the totality of its relations ; and to have broken down the parti- | first work ; only that here the historical background on which the

'tion which in Kant separated the formal logic from the transcen- dental analytic, as well as the general disruption between logic and metaphysic. It must at the saine time be adimitted that much of the work of weaving the terms of thought, the categories, into a system has a hypothetical and tentative character, and that Hegel has rather pointed out the path which logic must follow, viz., a 'eriticism of the terms of scicntific and ordinary thought in their filiation and interdependence, than himself in every case kept to the right way. The day for a fuller investigation of this problem will partly depend upon the progress of the study of language in the direction marked out by W. von Humboldt.

The Philosophy of Nature starts with the result of the logical development, with the full scientific "idea." But the rclations of pure thought, losing their inwardness, appear as relatious of spacc and time ; the abstract development of thought appears as matter and movement. Instead of thought, we have perception ; instead of dialectic, gravitation ; instead of causation, sequence in time. The whole falls under the three heads of

mechanics, physics, and "¢ organic, "»—the content under each varying somewhat in the three editions of the Encyclopddie. The first treats of space, time, inatter, movement ; and in the solar system we have the representation of the idea in its general and abstract matcrial form. Under the head of physics we have the theory of the elements, of sound, heat, and cohesion, and finally of chemical affinity, presenting the phenomena of material change and interchange in a series of spceial forces which generate the variety of the life of nature. Lastly, under the head of " organic," come geology, botany, and animal physiology, —presenting the concrete results of these processes in the three kingdoms of nature.

The charges of superficial analogies, so freely urged against the "' Naturphilosophie " by critics who forget the impulse it gave to physical research by the identification of forces then believed to be radically distinct, do not particularly affect Hegel. But in general it may be said that he looked down upon the mere natural world. The meanest of the fancies of the mind and the most easual of its whims he regarded as a better warrant for the being of God than any single object of nature. Those who supposed astronomy to in- spire religious awe were horrified to hear the stars compared to eruptive spots on the face of the sky. Even in the animal world, the highest stage of nature, he saw a failure to reach an independ- ent and rational system of organization ; and its feelings under the eontinuous violence and menaces of the environment le described as insecure, anxious, and unhappy.

His point of view was essentially opposed to the current views of science. To metamorphosis he only allowed a logical value, as explaining the natural classification ; the only real, existent meta- morphosis he saw in the development of the individual from its embryonic stage. Still more distinctly did he contravene the gene- ral tendency of scientific explanation. "It is held the triumph of science to recognize in the general process of the earth the same categories as are exhibitcd in the processes of isolated bodies. This is, however, an application of categories from a field where the conditions are finite to a sphere in which the circumstances are in- finite." In astronomy he depreciates the merits of Newton and elevates Kepler, accusing Newton particularly, & propos of the dis- tinction of centrifugal and centripetal forces, of leading to a con- fusion between what is mathematically to be distinguished and what is physically separate. The

principles which explain the fall of an apple will not do for the planets. As to eolour, he follows Gocthe, and uses strong language against Newton's theory, for the barbarism of the conception that light is a compound, the incorrectness of his observations, &c. In chemistry, again, he objects to the way in which all the ehemical elements are treated as on the same level.

The third part of the system is the Philosophy of Mind. Its three divisions are the " subjective mind" (psychology), the ' ob- jective mind "' (philosophic jurisprudence, moral and political philo- sophy), and the "absolute mind" (the philosophy of art, religion, and philosophy). The subjects of the second and third divisions have been treated by Hegel with great detail. The " objective mind" is the topic of the Rechts-Philosophie, and of the lectures on the Philosophy of History; while on the 'absolute mind" we have the lectures on Aisthetic, on the Philosophy of Religion, and on the History of Philosophy—in short, more than one-third of his works.

The purely psychological branch of the subject takes up half of the space allotted to "Geist" in the Encyclopddie. It falls under the three heads of anthropology, phenomenology, and psychology proper. Anthropology treats of the mind in union with the body, —of the natural soul,—and discusses the relations of the soul with the planets, the races of mankind, the differences of age, dreams, animal magnetism, insanity, and phrenology. In this obscure region it is rich in suggestions and rapprochements ; but the ingenuity of these speculations attracts curiosity more than it satisfies scientific Inquiry. In the Phenomcnology consciousness, self-consciousness, and reason are dealt with. The title of the section aud the contents recall, though with some important variations, thc earlier half of his

stages in the development of the ego were represented has disappeared. Psychology, in the stricter sense, deals with the various forms of theoretical and practical intellect such as attention, meniory, desire, and will. In this account of the development of an independent, active, and intelligent being from tlie stage where man like the Dryad is a portion of the natural life around him, Hegel has com- bined what may be termed a physiology and pathology of the mind, —a subject far wider than that of ordinary psychologies, and one of vast intriusic importance. It is, of course, easy to set aside these questions as unanswerable, and to find artificiality in the

arrange- ment. Still it remains a great point to have even attempted some system in the dark anomalies which lie under the normal consciousness, and to have traced the genesis of the intellectual faculties from animal sensitivity.

The theory of the mind as objectified in the institutions of law, the family, aud the state is discussed in the " Philosophy of Right." Beginning with the antithesis of a legal systcim and morality, Hegel, carrying out the work of Kant, presents the synthesis of these elements in the ethieal life (SvttJichkcezt) of the family and the state. Treating the family as an instinetive realization of the moral life, and not as the result of contract, he shows how by the means of wider associations due to private interests the state issues as the full home of the moral spirit, where intimacy of interdependence is combined with freedom of independent growth. The state is the consummation of man as finite; it is the necessary starting-point whence the spirit rises to an absolute existence in the spheres of art, religion, and philosophy. In the finite world or temporal state, religion, as the finite organization of a church, is, like other societies, subordinate to the state. Bunton another side, as absolute spirit, religion, like art and philosophy, is not subject to the state, but belongs to a higher region.

The political state is always an individual, and the relations of these states with cach other and the " world-spirit'"' of which they are the manifestations constituté the material of history. The Lectures on the Philosophy of History, edited by Gans and subse- quently by Karl Hegel, is the most popular of Hegel's works. The history of the world isa scene of judgment where one people and one alone holds for awhile the sceptre, as the unconscious in- strument of the universal spirit, till another rises in its place, with a fuller measure of liberty—a larger superiority to the bonds of natural and artificial circumstance. Three main periods—the Oriental, the Classical, and the Germanic—in which respectively the single despot, the dominant order, and the man as man possess freedom—eonstitute the history of the world. Inaccuracy in detail and artifice in the arrangement of isolated peoples are inevitable in such a scheme. A graver mistake, according to some critics, is that Hegel, far from giving a law of progress, seems to suggest that the history of the world is nearing an end, and has merely reduced the past to a logical formula. The answer to this charge is

partly that such a law seems unattainable, and partly that the idealistic content of the present which philosophy extracts is always an advance upon actual fact, and so does throw a lightinto the future. And at any rate the method is greatcr than Hegel's employment of it.

But as with Aristotle so with Hegel—beyond the ethical and political sphere rises the world of absolute spirit in art, religion, and philosophy. The psyehological distinction between the three forms is that sensuous perception (Anschauung) is the organon of the first, presentative conception (Vorstcllung) of the second, and free thought of the third. 'The work of art, the first embodiment of absolute mind, shows a sensuous conformity between the idea and the reality in which it is expressed. The so-called beauty of nature is for Hegel an adventitious beauty. The beauty of art is a beauty born in the spirit of the artist and born again in the spec- tator ; it is not like the beauty of natural things, an incident of their existence, but is "essentially a question, an address to a re- sponding breast, a call to the heart and spirit." The perfection of art depends on the degree of intimacy in which idea and form appear worked into each other. From the different proportion between the idea and the shape in which it isrealized arise three different forms of art. When the idea, itself indefinite, gets no further than a struggle and endeavour for its appropriate expression, we have the symbolic, which is the Oriental, form of art, which sceks to com- pensate its imperfect expression by colossal and enigmatic structures. In the 'second or elassical form of art the idea of humanity finds an adequate sensuous represettation. But this form disappears with the decease of Greek national life, and on its collapse follows the romantic, the third form of art ; where the harmony of form and content again grows defective, because the object of Christian art— the infinite spirit—is a theme too high for art. Corresponding to this division is the classification of the single arts. First comes architecture—in the main, symbolic art; then sculpture, the classical art par cxccllence ; they are found, however, in all three forms. Painting and music are the specially romantic arts. Lastly, asa union of painting and music comes poetry, where the sensuous element is more than ever subordinate to the spirit,

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The lectures on the Philosophy of Art stray largely into the next sphere and dwell with zest on the close connexion of art and religion; 'and the discussion of the decadence and risc of religions, of the esthetic qualitics of Christian legend, of the age of chivalry, &c., make the Zsthetik a book of varied intercst.

The lectures on the Philosophy of Religion, though unequal in their composition and belonging to different dates, serve to exhibit the vital connexion of the system with Christianity. Religion, like art, is inferior to philosophy as an exponeut of the harmony betwecn man and the absolute. In it the absolute exists as the poetry and music of the heart, in the inwardness of feeling. Hegel after ex- pounding the nature of religion passes on to discuss its historical phases, but in the immature state of religious science falls into several mistakes, At the bottom of the scale of nature-worships he places the religion of sorcery. The gradations which follow are apportioned with some uncertainty amongst the religions of the Kast. With the Persian religion of light and the Egyptian of enigmas we pass to thosc faiths where Godhead takes the form of a spiritual individuality, ¢.¢., to the Hebrew religion (of sublimity), the Greek (of beauty), and the Roman (of adaptation), Last comes absolute religion, in which the mystery of the reconciliation be- tween God and man is an open doctrine. This is Christianity, in which God is a Trinity, because He is a spirit. The revelation of this truth is the subject of the Christian Scriptures. For the Son of God, in the immediate aspect, is the finite world of nature and man, which far from being at one with its Father is originally in an attitude of estrangement. The history of Christ is the visible reconciliation between man and the eternal. With the death of Christ this union, ceasing to be a mere fact, becomes a vital idea,—- the Spirit of God which dwells in the Christian community.

The lectures on the History of Philosophy deal disproportionately with the various epochs, and in some parts date from the beginning of Hegel's career. In trying to subject history to the order of logic they sometimes misconceive the filiation of ideas. But they created the history of philosophy as a scientific study. They showed that a Fiulosetihieel thuers is not an accident or whim, but an exponent of its age determined by its antecedents and environments, and handing on its results to the future.

For ten years after Hegel's death his system remained the fore- most intellectual phenomenon of the time. Besides Gans, Hinrichs, Henning, and Hotho, who have been already alluded to, the most prominent of his immediate disciples were Gabler, whose Propddeu- ttk is a good introduction to Hegel; K. L. Michelet, one of the most ardent Hegelians, who is now (1879) on the point of complet- ing a summary of the system ; Daub and Marheineke, two theo- logians ; and Goschel, whosc Aphorismen diber nicht- Wissen und absolutes Wissen elicited an appreciative review from Hegel. In zsthetics, where the school won some distinction, are the names of Schasler, Rosenkranz, and Vischer. Karl Rosenkranz, the literary champion of the system, has just ended a life devoted to its expo- sition ; Erdmann still teaches in its spirit at Halle, as does Kuno Fischer at Jena. The last two have specially distinguished them- selves by their histories of modern philosophy. With Michelet they form the more orthodox and conservative section of the school. The opposition to its doctrines was concentrated in the Zeztsehrift fiir Philosophie, founded in 1837 by the younger Fichte with the help of Weisse ; while Beneke and other followers of Herbart vigorously attacked its metaphysics and psychology. But the most notable outgrowth of Hegelianism was the so-called " Left," the critical and heterodox school of Feuerbach, Bruno Bauer, and Ruge. While Hegel had vindicated God as the subject of metaphysics, maintained the consonance of philosophy and theology, and elevated the state to sovereignty in ethics, the Left eliminated God from the system, exposed its alleged pantheistic or athcistic tendencies, and reasserted the supremacy of the individual in morals. To discuss the evolution of Hegelianism in this direction would almost be to write the history of modern German philosophy up to 1860. Hegelianism has now ceased to exist as an isolated system in Ger- many, though its spirit and method have leavened the whole mass of philosophic thought. Out of Germany, besides occasional ad- mirers and disciples, it has attracted a considerable amount of gene- ral curiosity. In England it has stimulated philosophical thought,

and probably suggested the correction of some national limitations; |

but few if any profess to accept the system in its integrity. Pro- fessor Vera of Naples is perhaps its most enthusiastic advocate on

the Continent, whilst the Journal of Speculative Philosophy upholds its banner in America.

Bibliography.—Shortly after Hegel's death his collected works |

were published by a number of his friends, who combined for the purpose.

edition came out about twelve years later. tain the works published by himself ; the remainder is made up of his lectures on the Philosophy of History, Aisthetic, the Philosophy of Religion, and the History of Philosophy, besides some essays and reviews, with a few of his letters, and the Philosophical Propedeutic.

For his life see Rosenkranz, Leben Hegels, Berlin, 1844; Haym,

They appeared in eighteen volumes in 1832, and a second | Volumes i.—viii. con- |

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Hegel und scine Zeit, Berlin, 1857; Kostlin, Hegel in philosoph- iseher, politischer, und nationaler Beziehung, Tiibingen, 1870; Rosen- kranz, Hegel als Deutsehcr National-philosoph, Berlin, 1870, and his Neue Studien, vol. iv., Berlin, 1878.

*For the philosophy, see Ruge's Aus Fritherer Zeit, vol. iv., Berlin, 1867; Haym (as above). Trendelenburg (in Logische Untersuch- ungen), Kym (Metaphysiche Untersuehungen), and C. Hermann (Heget und die logisehe Frage, and other works) are noticeable as modern critics. Vera has translated the Eneyelopddie into French, with notes ; Bénard, the stheties. In English Dr Stirling's Seeret of Hegel, 2 vols., London, 1865, contains a translation of the beginning of the Wissenschaft der Logik ; the ** Logic" from the Encyclopddie has been translated, with prolegomena, by W. Wallace, Oxford, 1874; and large portions have been translated in the American Journal of Speculative Philosophy—especially by its energetic editor, W. T. Harris. (W. W.)*

HEIBERG, Jonan Lupvic (1791-1860), Danish poet and critic, was the son of the political writer Peter Andreas Heiberg, and of the famous novelist, afterwards the Baroness Gyllembourg-Ehrensvird. He was born at Copenhagen, December 14, 1791. In 1800 his father was exiled, and he was taken by Rahbek and his excellent wife into their house at Bakkehuset. They found him, however, very difficult to manage, and about 1802 sent him back to his own family. His mother's marriage being by a state decree annulled, she married the Swedish baron Gyllem- bourg-Ehrensviird, keeping up, however, friendly corre- spondence with her first husband in Paris. In 1805 she describes, in one of these letters, the brilliant precocity of the young Johan. The latter proceeded to the university of Copenhagen in 1809. It was not needful that he should earn his bread, and accordingly his mother indulged for many years his extraordinary thirst for knowledge. In 1812 he visited Sweden, and made some long stay in Stockholm; he afterwards sent to his mother from Upsala-the first important poem which he composed, //jemkomsten (The Return Home), a piece of remarkable strength and brightness. In 1813 his first publication appeared, a romantic drama for children, entitled Zhe Theatre for Marionettes. This was followed by Christmas Jokes and New Year's Tricks in 1816, The Imitiation of Psyche, 1817, and The Prophecy of Tycho Brahe. These works attracted attention at a time when Baggesen, Oehlenschliiger, and Ingemann possessed the popular ear, and were understood at once to be the opening of a great career. In 1817 Heiberg took his degree, and in 1819 went abroad with a grant from Government. He proceeded to Paris, and spent the next three years there, under his father's roof. In 1822 he published his drama of Vina, and was made professor of the Danish language at the university of Kiel. At this town he delivered a course of lectures, comparing the Scandinavian mythology as found in the Zdda with the poems of Oelilenschliger. These lectures were published in German in 1827. In 1825 Heiberg came back to Copenhagen for the purpose of introducing the vaudeville! on the Danish stage. Mean- while he was producing dramatic work of a more serious kind: in 1828 he brought out the national drama of Elverhii, in 1835 the comedy of Zhe Elves, and in 1838 Fata Morgana. In 1841 Heiberg published a volume of New Poems, containing "A Soul after Death," which is perhaps his masterpiece, "The Newly Wedded Pair," and other pieces. All this time he had been busily engaged in editing the famous journal, Zhe Copenhagen Flying Post, which he founded in 1827 and continued until

1837. In 1831 he married Johanne Louise Petges, the greatest actress that Scandinavia has produced. Heiberg's scathing satires at last began to make him very unpopular; and this antagonism reached its height when, in 1845, he published

1 He composed a great number of vaudevilles, of which the best known are King Solomon and George Hatmaker, 1825; April Fools, 1826 ; A Story in Rosenborg Garden, 1827; Kjige Huskors, 1831; The Danes in Paris, 1833 ; No, 1836; Yes, 1839 ; and Emily's Beating Heart, 1840.

his little malicious drama of The Nut Crackers. Notwith- | standing this he received in 1847 the responsible post of director of the national theatre, for which indeed he was more eminently fitted than any other living person. He filled it for seven years, working with great zeal and con- scientiousness, but was forced by intrigues from without to resign itin 1854. His health was much disturbed by these attacks, aud he retired into private life. Heiberg died at Bonderup, near Ringsted, on the 25th of August 1860.

It has been said that " the average cultivated Dane nowa- days is very much what Heiberg has made him." His in- fluence upon taste and critical opinion was greater than that of any writer of his time, and can only be compared with that of Holberg in the 18th century. Most of the poets of the Romantic movement in Denmark were very grave and serious; Heiberg added the element of humour, elegance, and irony to the dignity of Oehlenschliger, the pathos of Ingemann, and the passion of Hertz. His versification was refined and exact, and his very best pieces are those in which he mingles rich lyrical expression with what is satiri- cal or purely ludicrous. The works of Heiberg were collected, in 11 vols., in 1861-62.

HEIDE, a town of Prussia, chief town of the circle of North Ditmarsh, province of Schleswig-Holstein, is situated on a small plateau which stands between the mirshes and moors bordering the North Sea, 35 miles N.N.W. of Gliickstadt. It is the seat of a provincial office,

a court of justice, and a head tax office, and possesses tobacco and cigar manufactories, a tannery, and a rope work. Heide in 1447 became tlie

capital of the Ditmarsh peasant republic, but on the 13th June 1559 it was the scene of the complete defeat of the peasant forces by the The popula-

Danes and the duke of Schleswig-Holstein. tion in 1875 was 6772.

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HEIDEGGER, Joun Henry (1633-1698), theologian, was born at Birentschweil, in the canton of Zurich, Switzer- land, on July 1, 1633. He began his studies in his native country, and completed them at Marburg and Heidelberg. Becoming doctor of philosophy at the latter university, he soon afterwards was appointed professor extraordinarius of Hebrew, and later of philosophy. From Heidelberg he was in 1659 summoned to Steinfurt to fill the chair of theology and ecclesiastical history, and in the same year he became doctor of theology of Heidelberg. In 1660 he revisited Switzerland ; and, after marrying, he travelled in the following year over Holland. The war at this time having dispersed the students from Steinfurt, Heidegger returned in 1665 to Zurich, where he was immediately elected professor of moral philosophy. Two years later he succeeded Hottinger in the chair of theology, which he occupied till his death, January 15, 1698. Heidegger was the principal author of the Formula Consensus Hel- vetica in 1675, which was designed to unite the Swiss Reformed churches, but had an opposite effect.

His writings are largely controversial, and are in great part levelled against the Roman Catholic Church. The chief are De Historia saera Patriarcharum Exereitationes select, 1667-1671; Dissertatio de Peregrinationibus Religiosis, 1670; De Ratione Studiorum, opuseula aurea, &c., 1670 ; Historia Papatus, 1684 ; Tumulus Coneilii Tridentini, 1690; Exereitationes Biblice, 1700, with a life of the author prefixed; Corpus Theologie Christiane, 1700; and lives of Hottinger, 1667, and Fabricius, 1698. His auto-

biography appeared in 1698, under the title Historia Vite J. HT, Heideggeri.

HEIDELBERG, a German university city in the Baden circle and jurisdiction of the same name, lies in 49° 24’ N. lat. and 8° 41’ 32” E. long., at the foot of the Castlehill, a spur of the Kénigsstuhl on the south

bank of the Neckar, about 12 miles from the junction of that river with the Rhine. The situation of the town is one of romantic beauty.

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Reference 1 Maretall 7 Petensharche 2 Raz 8 Theatre 3 Heiliggersdirche 9 Providens -Hinche 4 Unwersity W Physwlogwal Inst. & Chem! Laboratory 5 Museum Wrede’s Monument 6 Jesuzts Ch. 12 English Church

Plan of Heidelberg.

Placed at the opening of the winding Neckar valley, it has behind it and before it lofty hills covered with vineyards and forests. Between these the Neckar rushes swiftly along. To the left the country opens out into the broad Rhine plain, cultivated like a garden, and bounded by distant and hardly perceptible mountains. The town primarily consists of one long narrow street, the Haupt- strasse, which begins near the station of the Main-Neckar railway on the west, and runs parallel to the river with continuations for a distance of about 2 miles to the Karlsthor (where there is a smaller station) on the east. To the south of this the Anlage, a pleasant promenade flanked with fine houses and gardens, leads directly from the chief station to the centre of the town. A number of smaller streets run up from the river, intersecting the

Hauptstrasse at right angles. On the other side of the Neckar the Heiligenberg, a vine-clad hill wooded towards the summit, crowned with the ruins of an old chapel, rises abruptly from the river bank. About half-way up the hill the Philosophenweg, a famous road, runs from the Hirsch-gasse opposite tle Karlsthor to the suburb of Neuenhein, opposite the railway station. At this point the Neckar valley ceases, and the river flows

slowly onward in the almost level Rhine plain. Of late years the town lias grown very much towards the west end on both sides of the river. The additions have been almost entirely of the better class of houses.

Of the churches the chief are the Peterskirche (founded before 1392), where Jerome of Prague in 1460 ex- pounded the Reformed doctrines; the Heiliggeistkirche,

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erected at the beginning of the 15th century, of which the nave is used for Protestant, the choir for Old Catholic wor- ship; and the Jesuitenkirche, with sumptuously decorated interior, All these are built in the Gothic style. The rath- haus, the museum, and the university (1712) are large but common-place erections. Two handsome bridges cross tlie Neckar. That to the east, opposite the castle (built 1788), is adorned with a gateway, and with statues of Minerva and tlie elector Charles Theodore of the palatinate ; the other (built 1877) unites Heidelberg and Neuenheim, In the west part of the town there is a bronze statue of Field-Marshal Prince Wrede (1767-1838), erected in 1860 by Louis IL, king of Bavaria. The chief building at Heidelberg, and indeed its chief attraction for strangers, is the famous castle which overhangs the west part of the town. It is situated on the Castlehill, more properly called the Jettenbuhel, 330 feet above the Neckar, Though now a

ruin, yet its extent, its magnificence, its beautiful situation, its interesting history, render it by far the most noteworthy, as it certainly is the grandest and largest, of the old castles

E. The Great-Tun Room. F. Frederick's Build-

A. Rupert's Building,

B. Old or Rudolph's Building. ing.

C. The Thick Tower. G. The Octagonal Tower.

D. The English or Eliza- | H, Otto Henry's Build- beth's Building. ing.

of Germany, It was begun about the end of the 13th century. Elector Rupert greatly improved it, and erected the Rupert's building in the early part of the 15th century ; succeeding electors of the palatinate did much for it, especially Frederick V., the unfortunate king of Bohemia. It suffered greatly during the Thirty Years' War, but was restored by Charles Louis (1650-1680). It was dismantled by the French in 1689, and again in 1693. In 1764 it was struck by lightning and its destruction completed. The castle as it at present stands is a square edifice formed of several distinct structures built round a large court-yard ; the entrance is on the south side. The court-yard contains a fountain adorned with four granite pillars brought from Charlemagne's palace at Ingelheim. The chief parts of the castle are Rupert's building (about 1400) on the left ; Otto Henry's building (1556) on the right, "the finest example of Renaissance architecture in Germany," a lofty building of which the front is richly decorated ; Frederick's building (1601), the finest part, forming the northern portion of the whole, and adorned

I. Library Tower.

K. Louis's Tower.

L. The Blown – up Tower.

M. Louis's Tower.

with a large number of imposing statues. Within this is the chapel, and behind it the Altan (1610), or castle balcony, which directly overhangs the town and from which the finest of Heidelberg views is obtained. The castle contains an interesting antiquarian museum! formed by the Count Graimberg, and the celebrated Great Tun, which was built in 1751, but has been only used on one or two occasions. Its capacity is 49,000 gallons.' There is a castle garden, spacious and well laid out.

The university of Heidelberg is the oldest in the German kingdom. It was founded in 1356 by the elector Rupert, but it was not till 1386, when it obtained papal sanction, that its real life begins. It was constructed after

the type of Paris, had four faculties, and possessed numerous privi- leges. Marselius von Inghen wasits first rector. Frederick the Victorious, Philip the Upright, and Louis V. respect- ively cherished it. Otto Henry gave it a new organiza- tion, further endowed it, and founded the library. At the Reformation it became a stronghold of Protestant learning. The famous Heidelberg catechism was drawn up by its theologians. Then the tide turned, Damaged by thee Thirty Years' War, it led a struggling existence for a century and a half. A large portion of its remaining endowments were cut off by the peace of Lunéville (1801). In 1803 however the elector Charles Frederick raised it anew, and reconstituted it under the name of " Ruperto-Carolina." At present (1880) it has 38 ordinary and 26 extraordinary professors. The students number about 500 in winter, and from 800 to 900 in summer. A very large propor- tion are English and Americans. The library was first kept in the choir of the Heiliggeistkirche, and then con- sisted of 3500 MSS. In 162% it was sent to Rome by Tilly, and stored as Bibliotheca Palatina in the Vatican. It was afterwards taken to Paris, and in 1815 was restored to Heidelberg. In 1703 the new library was founded ; it has now nearly 300,000 volumes, besides many valuable MSS. Among tlie other university institutions are the academic hospital, the maternity hospital, the physiologi- cal institution, the chemical laboratory, and the zoological museum.

The other educational foundations are a gymnasium and a burgher and a real school. There isa small theatre (closed during the summer months) and a Kunstverein. The manu- factures of Heidelberg are unimportant. The inhabitants chiefly support themselves by supplying the wants of a large and increasing body of foreign permanent residents, of the considerable body of tourists who during the summer pass through the town, and of the university students. The population of the town and outlying suburbs was 19,988 in 1871, and 22,334 (or including Neuenheim, 23,918) in 1875. About one-third are Catholics. The town is well lighted, and is supplied with excellent water from the Wolfsbrunnen,

Heidelberg at an early period was a fief of the bishop of Worms, but the rulers of the palatinate came more and more to reside there, till Count Otho of Wittelsbach (1228-1253) made it the capital of the palatinate, and this it continued to be for nearly six centuries. As Heidelberg was one of the great

centres of the Reformed faith, it suffered severcly in the Thirty Years' War. In 1622 it was sacked by Tilly, and in 1633 was taken by the Swedes. In 1634 it was beleaguered by the Bavarians. In 1635 it was occupied by the imperial forces under Gallas. At the peace of Westphalia (1648) Charles Louis, son of Frederick V., was restored, and he did much to raise the castle, the university, and the town. In 1688, and again in 1693, it was sacked by the French. On the last occasion, so thorough was the work of destruction that only one house—a quaintly decorated erection in the Marktplatz now used as an inn—escaped. In 1720 Charles Philip removed his court to Mannheim, and in 1803 the town became part of the grand duchy of Baden. On 5th March 1848 was held the famous Heidel- berg assembly, at which steps were taken that led to the German revolution of that year.

1 This museum was acquired by the town in 1879.

Of the numerous topographical works on Heidelberg, those of Fickler (1863) and Oncken (2d ed., 1874) may be mentioned. The Wegweiser durch Heidelberg (1879) supplies a briefer and more popular account. The university annals are told in Hautz's Gesehichte der Universitét Heidelbergs (2 vols., 1868-64), and the very interesting history of the library in Wilken's Geschichte der Bildung, Beraubung, und Vernichtung der alten Heidelberger Biwhersammlung (1817), and in Ruland's Zur Geschichte der alten nach Rom entfiihrten Bibliothek zu Heidelberg, Leip., 1856. The Heidelberger Jahrbiicher (1817-78) contain a mass of interesting and important information as to the history of the town and castle. (F. WA.)

HEIDELOFF, Karr ALEXANDER von (1788-1865), a German architect, was the son of Victor Peter Heideloff, a painter of some reputation, and was born at Stuttgart 2d February 1788. He studied at the art academy of lis native town, and after following the profession of an arclti- tect for some time at Coburg was in 1818 appointed city architect at Nuremberg. In 1822 he became professor at the polytechnic school, and some years later he was chosen conservator of the monuments of art. Heideloff devoted his chief attention to tle Gothic style of architecture, and the buildings restored and erected by him at Nuremberg and in its neighbourhood attest both his

original skill and his purity of taste. He also achieved some success as an historical painter. He died at Hassfurt 28th September

1865.

Among his writings on architecture are Die Lehre von den Stiulenordnungen, 1827; Der Kleine Vignola, 1832; Niirnbergs Baudenkmiler der Vorzeit, 1888-43; and Die Ornamentik des Mittelalters, 1838-42.

HEILBRONN, a town of Wiirtemberg, in the circle of the Neckar, is situated in a pleasant and fruitful valley on the Neckar, and at the junction of several railways, 26 miles N. of Stuttgart. It is the seat of a circle court, a jury court, a superior tribunal, a head tax office, and a chamber of commerce. Inthe older part of the town the streets are narrow, and it contains a number of high turreted houses with quaintly adorned gables. The old fortifications haye now been demolished, and their site is occupied by prame- nades, outside of which are the more modern parts of the town with wide streets and many handsome buildings. The principal public buildings are the church of St Kilian, in the Gothic and Renaissance styles, begun in 1019 and completed in 1529, with an elegant tower 210 feet high, a beautiful choir, and a finely carved altar; the town-house, founded in 1540, and possessing a collection of interesting documents ; the house of the Teutonic knights, now used as barracks; the Catholic church of St Joseph; the tower on the Neckar, in which Gétz yon Berlichingen was confined in 1525; the synagogue, the prison, and the hospital. The educational establisliments include a gym- nasium, a real-school of the second order, an agricultural school, and a female school of industry. The town ina commercial point of view is the most important in Wiirtem- berg, and possesses an immense variety of manufactures, of which the principal are gold, silver, steel, and iron wares, machines, sugar of lead, white lead, vinegar, beer, eau de Cologne, sugar, tobacco, soap, oil, cement, sulphuric acid, tartaric acid, artificial manure, glue, soda, tapestry, thread, and cloth. Grapes, fruit, vegetables, and flowering shrubs are largely grown in the neighbourhood, and there are large quarries for sandstone and gypsum. By means of the Neckar a considerable trade is carried on in wood, bark, leather, agricultural produce, fruit, and cattle. The popu- lation in 1875 was 21,209.

Heilbronn occupies the site of an old Roman settlement. Its name—originally Heiligbronn or holy spring—was bestowed on it by Charlemagne from a spring of water which until 1857 was to be seen issuing from under the high altar of the church of St Kilian. In 1225 Heilbronn became a frec imperial city. It was frequently besieged during the Middle Ages, and it suffered greatly during the

Peasants' War, the Thirty Years' War, and the various wars with France. In 1803 it came into the possession of Wiirtemberg.

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HEI—HII

HEILIGENSTADT, a town of Prussian Saxony, govern- ment district of Erfurt, is situated on the Leine and on the railway from Halle to Cassel, 32 miles E.N.E. of Cassel. It possesses an old castle, formerly belonging to the electors of Mainz, one Evangelical and two Catholic churches, a Catholic gymnasium, a Catholic normal school, two orphanages, and aninfirmary, The principal manufactures are woollen wares, cigars, paper, bone dust, and needles. The population in 1875 was 5193.

Heiligenstadt is said to have been built by Dagobert, and was formerly the capital of the principality of Eichsfeld. In 1022 it was acquired by the archbishop of Mainz, and in 1103 it came into the possession of Henry the Proud, but when Henry 'the Lion was placed under the ban of the empire it again came to Mainz. It was destroyed by fire in 1333, and was captured in 1478 by Count Heury the Young of Schwarzburg, and in 1525 by Duke

Henry of Brunswick. In 1803 it came into the possession of Prussia.

HEILSBERG, a town of Prussia, capital of a circle in the government district of Konigsberg, is situated at the junction of the Simser and Alle, 38 miles 8. of K6nigsberg. It has one Evangelical and two Catholic churches, and an old castle formerly the seat of the prince-bishops of Erm- land, but now used as an infirmary. The principal indus- tries are cloth-weaving, yarn and thread spinning, dyeing, and brewing, and there is considerable trade in grain. The population of the town in 1875 was 5762.

The castle founded at Heilsberg by the German knights in 1240 became afterwards the property of the bishops of Ermland, who in 1306 made it their seat—an honour which it retained for 500 years. On the 10th June 1807 a battle took place at Heilsberg between the French and the Russians under Benningsen, which, although the French who attacked thought it prudent to withdraw before victory declared for either side, resulted on the following day in the retreat of the Russians.

HEILSBRONN, or KiostEr-HEILsBronN, a market- village in the Bavarian government of Middle Franconia, with a station on the railway between Nuremberg and Ansbach. In 187] it had only 998 inhabitants, but in the Middle Ages it was the seat of one of the great monas- teries of Germany. This foundation, which belonged to the Cistercian order, owed its origin to Bishop Otto of Bamberg in 1132, and continued to exist till 1555. Its sepulchral monuments, many of which are figured by Hocker, Heilsbronnischer Antigquititenschatz (Ansbach, 1731-40), were of exceptionally high artistic interest, ten burgraves of Nuremberg (it was their hereditary burial- place), three electoral princes, five margraves of Branden- burg, and many other persons of note having been laid to rest within its walls. The buildings of the monastery have all disappeared, with the exception of the fine church, restored between 1851 and 1866. The "Monk of Heils- bronn" is the ordinary appellation of a didactic poet of the 14th century, whose Seven Degrees, Daughter of Syon, and Life of Saint Alexius were published by Merzdorf at Berlin in 1870.

See " Note Halesbrunnenses" and " Annales Halesbrunnenses," in Pertz, Alon. Germ. Hist., vol. xvi.; Muck, Bettrdge zur Gesch. von Heilsbronn, Ansb., 1859; Rehm, Lin Gang durch und um die Miinster-Kirche zu Kloster-Heilsbronn, Ansb., 1875; and Stillfried,

Rloster-Heitbronn, ein Bettrige zu den Hohenzoll. Forschwngen, Berlin, 1877.

HEIM, Francois Josern (1787~1865), French painter, belongs to that group of painters in whose works we find the special characteristics of the Restoration. Born at Belfort on 16th December 1787, he early distinguished himself at the Ecole Centrale of Strasburg, and in 1803 entered the studio of Vincent at Paris. In 1807 he obtained the first prize, and in 1812 his picture

of The Return of Jacob (Musée de Bordeaux) won for him a gold medal of the first class, which he again obtained in 1817, when he exhibited, together with other works, a St John —bought by Vivant Denon. In 1819 the Resurrection cf Lazarus (Cathédral Autun), the Martyrdom of St Cyr (St

Gervais), and two scenes from the life of Vespasian (ordered by the king) attracted attention. In 1823 the Re-erection of the Royal 'Tombs at St Denis, the Martyrdom of St Laurence (Notre Dame), and several full-length portraits increased the painter's popularity; and in 1824, when

he exhibited his great canvas, the Massacre of the Jews | | perceived that he was bent upon travelling a different path

(Louvre), Heim was rewarded by the legion of honour. In

1827 appeared the King giving away Prizes at the Salon of |

1824 (Louvre—engraved by Jazet)—the picture by which Heim is best known—and Saint Hyacinthe. Heim was now commissioned to decorate the Gallery Charles X. (Louvre), work for which he was thought eminently fit. Like many other painters of this period, Heim retained only enough of the high-pitched ideal of David to make an awkward con- trast with the lively colour and movement by which he tried to give interest to his subjects, and with the emptiness of form and expression which resulted from the hasty execution necessitated by the vast number of his commis- sions. Ridiculed by the romantists, Heim maintained his position, and replaced Regnault at the Institute in 1834, shortly after which he commenced a series of drawings of the celebrities of his day, which are of much interest. His decorations of the Conference room of the Chamber of Deputies were completed in 1844 ; and in 1847 his works at the Salon—Champ de Mai and Reading a Play at the Théatre Frangais—were the signal for attacks renewed with great violence. Yet something like a turn of opinion in his favour took place at the exhibition of 1851; his powers as a draughtsman and the occasional merits of his composition were recognized, and toleration extended even to his colour, Heim was awarded the great gold medal, and in 1855—having sent to the Salon no less than sixteen portraits,

amongst which may be cited those of Cuvier, Geoffroy de St Hilaire, and Madame Hersent— he was made officer of the legion of honour. In 1859 he again exhibited a curious collection of portraits, sixty- four members of the Institute arranged in groups of four ; and six years later, on 29th September 1865, he died, at the age of seventy-eight. Besides the paintings already

mentioned, there is to be seen in Notre Dame de Lorette

(Paris) a work executed on the spot; and the museum of Strasburg contains an excellent example of his easel pictures, the subject of which is a Shepherd Drinking from a Spring.

HEINE, Hernrica (1799-1856), poet and journalist, was born, according to the most trustworthy accounts, on the 13th December 1799, at Diisseldorf, of Jewish parents. His father, after various vicissitudes in busi-

ness, had finally settled in that town, and his mother, |

who seems to have possessed much energy of character, was the daughter of a physician of the same place. Heine

received the rudiments of his education at the gymnasium ©

or lycée (as it was called during the foreign occupation) of his native town, and, although not an especially apt or diligent pupil, he acquired while there a good knowledge

of French and English,—he tells us that Gudlliver's Travels |

in the original was one of the favourite books of his child- | hood,—as well as some tincture of the classics and Hebrew. |

But if the influence upon him of his teachers and their | : : | of a Rhenish newspaper, as well as in completing his

teaching was unimportant, not so that of the public events amid which he grew up. His early years coincided with the most brilliant period of Napoleon's career; and the

boundless veneration which he is never tired of expressing |

for the emperor throughout his writings shows that his true schoolmasters were rather the drummers and troopers of a victorious army than the Jesuit fathers of the lycée ; while, if to the vivid personal impression produced upon him by the pomp and circumstance of the imperial gar- rison in his birthplace there be added the public, and in a

manner national, enthnsiasm for Napoleon which he must |

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often have heard vented by his elder co-religionists—who hailed the conqueror as a temporal Messiah—the weighty bearing of his boyhood upon his subsequent fortunes becomes fully apparent. Upon his quitting school, attempts were made to engage him in commerce, but his father and uncle, the latter a wealthy banker of Hamburg, soon

from that which they had followed. It speaks well for both these men that they should have refrained from coercion upon making this discovery ; and Solomon Heine, the banker, at once gave his nephew an earnest of the gener- ous treatment the latter was subsequently to experience at his hands, for he came forward with money to enable his young kinsinan to go to a university, his sole stipulation beiug that his protégé should study with the view of entering the legal profession. Heine gladly accepted his uncle's terms, and entered the university of Bonn in the spring of 1819. During his stay there he was an eager student ; but the subjects to which he devoted himself had no connexion with the profession which had been chosen for him. He seems to have attended no lectures save those on literature and history—notably A. W. von Schlegel's; and he not long afterwards acknowledged his obligations to Schlegel by dedicating a sonnet to him—a tribute which he re- called in later days by a wanton and outrageous attack upon the veteran critic in Die Romantische Schule. Why Heine left Bonn does not clearly appear, but it is at Gottingen that we find him in the autumn of 1820. His stay here was even shorter than at Bonn. In February 1821 the authorities of the 'Georgia Augusta" rusticated him for some infraction of the duelling laws. Although from these beginnings Heine's academical career promised to pursue no very even course, he nevertheless

determined, after his resi- dence at Gottingen had been cut short, to seek a third uni- versity ; and it was to Berlin that he now repaired, where Hegel was at the zenith of his renown. Whether or not the lectures of this philosopher benefited him in any way —by giving him, for instance, as some have supposed, a certain dialectical precision of style—he has himself con- fessed that he seldom understood them ; and in after years Hegel's ultra-conservatism and orthodoxy made him tle con- stant butt of his former pupil's ridicule and sarcasm. But the interest of Heine's life in Berlin was social and not academic. He enjoyed the privilege of mixing in the best literary circles of the capital. He was on terms of intimacy

| with Varnhagen von Ense and his wife, the celebrated

Jewess, Rahel, and at their house—the rendezvous of Ger- many's geuius and learning—he frequently met such men as the Humboldts, Hegel himself, and Schleiermacher ; while he lived on a still more familiar footing with a number of

| his own co-religionists, who, without having acquired Euro-

pean reputation, were men of varied and approved abilities. In an atmosphere of such geniality as this his gifts were rapidly displayed. He began ere long to contribute poems to the Berliner Gesellschafter, many of which were subse- quently incorporated in the Buch der Lveder, and in 1822 a volume came from the press entitled Gedzchte von Heinrich Heine, his first avowed act of authorship. He was still further employed at this time as the correspondent

tragedies Almansor and William Latcliff, which were pub- lished in 1823 with small success. He was now, indeed, fairly embarked upon his literary course. But he was still largely dependent upon his uncle ; and in order so far to fulfil his engagements towards his benefactor, he returned to Géttingen in 1825, and shortly afterwards took his degree in law, having previously qualified himself for prac- tice by publicly professing Christianity.

This act of "apostasy," as it has been called, calls for something more than a mere passing reference; for it not

only laid Heine open to contumely while alive, but las provoked adverse criticism of special severity since his death. That he was guilty of "apostasy" is no doubt verbally true ; but there are two circumstances in this con- nexion which should always be remembered. The one is that Heine was wholly wanting in the religious sense—that he never was a Jew save nominally and by the accident of birth _—so that he cannot, with any real propriety, be said to have forsaken the creed of his race; the other, that his family, by encouraging him to adopt a profession which could not be entered except by the gateway of "apostasy," tacitly left him free to take that step. In short, Heine's "apostasy" was a purely secular act; and, although there will doubtless be found many to stigmatize him all the more blackly for this very reason, candour appears rather to require that this change of faith, if such it can be called, should be classed as one of his most venial offences, being the plainly outward act of one who throughout life made himself peculiarly ob- noxious to the imputation of malice and bad-heartedness.

Heine seems never to have made any serious attempt to practise law. His life from the year 1826 until his death was devoted entirely to literature, and more especially to journalism, which alone indeed was the main source of his income for many years. At first he lived in Hamburg, and then it was that, besides the Buch der Lieder, the earlier portions of the Reisebilder appeared, both of which, but particularly the latter, at once created an immense sensation throughout Germany, not only among the youthful and enthusiastic, who found their own sentiments expressed by the new writer with the happiest audacity, but amongst such dignified and rangés personages as Metternich and Gentz. In 1827 Baron Cotta, the Bavarian publisher, offered Heine, who had risen at a bound into celebrity, the joint-editorship of the Allgemeine Politische Annalen. The young author accepted the offer, and betook himself to Munich in the winter of that year, after having paid a visit to London, where he found every person and everything detestable save Canning and his policy—and it may be said here in passing that a most violent hatred of England forms a marked feature of

all Heine's writings. He remained for a considerable period in the South-German capital, and it was owing, not to any disagreement with his employer, but to the demands of the court of Prussia, which was not long of taking umbrage at his freedom of opinion, that his editorial function ceased so abruptly as it did. What the secret history of the next two or three years of his life was— whether from the very first he really was an object of especial disfavour at Berlin, or whether, as is quite as likely, taking his vanity and love of publicity into account, he exaggerated his powers of offence beyond the endurance of the Government there, and forced it into what seemed a petty persecution—he presently perceived that he must either quit Germany altogether or prepare for a life-time perhaps of fortress-imprisonment. He did not long hesi- tate between these two alternatives; and on the Ist of May 1831 Heinrich Heine left his native land for Paris, where he lived for the rest of his life, only once recrossing the Rhine, in 1843.

Just as his adoption of Christianity has led to Heine's being pronounced "apostate," so has his self-expatriation caused German writers to denounce him as "renegade." But the one accusation is as groundless as the other. In the first place Heine was a Jew, in spite of his Christian-ization, and cannot therefore rightly be called a "rene- gade" against Germany—least of all when the degraded social and political status of his race in that country at the date of his emigration is recollected. Then again his writings were systematically subjected to the cruellest mutilations, and it is tolerably certain that had he remained in the '"' Fatherland," he would sooner or later have been

deprived of all power of publicspeech. Was it any wonder, seeing that he had adopted the profession of letters, that he should have turned his back upon such a prospect? He at any rate was the best judge ; and it ill becomes Germans to'call him "renegade," when, had he continued to tarry among them, their literature would probably have suffered an irreparable loss. At the same time, and for the same reasons, it is equally inept to assert that he was in the essential qualities of his mind a Frenchman who gravitated towards Paris by a sort of intellectual necessity. The necessity (to use that

word) was physical. Heine would never have left Germany could he have freely expressed his opinions there.

After settling in his new home, where his life for many years must have been as gay and brilliant as latterly it was sad and sombre, and where he speedily became more or less intimate with such writers as Balzac, Dumas the elder, George Sand, Victor Hugo, and Théophile Gautier, Heine devoted himself more exclusively than ever to journalism ; and from 1831 until 1847, he was an active and indefatigable publicist. The two series of papers entitled Franzisische Zustdnde and Lutetia contain a selec- tion from his press-contributions during these years; and even at this date they well repay perusal, not only by the brilliancy of wit and elegance of style which they possess in common with almost all his writings, but also by the remarkable sagacity of their political apergus. Alongside of this main stream of journalism, he also kept up a subsidiary current of literature in its more proper sense—although it may be said that all his writings are of an occasional nature—and to this we owe the Salon (1833-39), which comprises among other pieces a series of articles, " Zur Geschichte der Religion und Philosophie in Deutschland," which had originally appeared in the Kevue des deux Mondes, and in which Heine came forward as the introducer of German thought to the reading world of Paris. The Salon also contains several admirable papers in art-criticism, and a strange, fragmentary medley of sentiment and satire, in its author's most characteristic vein—' Die Florentinische Niachte." To this period, too, belongs Die Romantische Schule, to which reference has already been made, and the substance of which is sufficiently indicated by its name. In 1839 Shakespeare's Madchen und Frauen appeared— Heine acting in this slight work as cicerone through a gallery of Shakespeare's heroines. The year 1840 was signalized by the publication of Heinrich Heine tiber Ludwig Borne, a brochure of the wittiest and most trenchant satire, in which the German refugees in Paris—a fraternity whom Heine: always anxiously avoided—were far more severely handled than was the defunct agitator whose name it bore, and who, it may be noted, was himself a Jew. In 1844 Deutschland, ein Wintermdrchen, came forth—the result of the visit to Germany which has been alluded to as the sole journey of the kind which Heine undertook; and this effu- sion may be ranked, along with a similar performance, Atta Troll (1846), as belonging to his most inferior writings. It

was in 1848 that Heine, in the very hey-day of his activity, and with gigantic projects seething within him for the foundation of a journal, was suddenly prostrated by the disease which finally carried him off, though not before it had confined him for seven years upon the "mattress-grave" of mournful notoriety. His sufferings throughout that time are reported to have been frequently excruciating, and he at length grew so habituated to the use of opium that the very largest doses failed to afford him relief. But when his malady—a softening of the spinal cord—allowed lum a respite, his intellect was as clear and vivacious as ever ; and. it is to these closing years of his life, harassing as they were, that we are indebted for the finest and most finished of all his poems—for the two collections, that is to say,

Romanzero (1851) and Neueste Gedichte (1853-54), as well as for the various pieces posthumously published in H. Heine's Letzte Gedichte und Gedanken. It was from his "mattress-grave " too that the dying man put forth his Gestdndnisse or Confessions, the psychological interest of which is very great, whatever their claim to trustworthiness may be. Heine bore the misery of his protracted death-bed with fortitude, nay, with cheerfulness, assiduously attended by his wife Mathilde, and towards the end by that mysterious lady whom he called " Die Mouche," and who was, it now appears, a Madame Krinitz; and there are many anecdotes on record of his bearing in the midst of his trials—and heavier trials seldom fell to the lot of man—which go far to prove that he possessed a healthy fond gaillard, for which his writings are scarcely likely to gain him credit. He died on the 17th February 1856 in Paris, in the Rue d'Amsterdam, and lies buried in the cemetery of Mont- martre. .

We have callel Heine " poet and journalist" ; but his reputation has, naturally enough, now come to rest almost exclusively upon his poetry, and above all upon his songs —the Buch der Lieder having passed through upwards of twenty-five editions. This great popularity may no doubt (and especially in foreign countries) be attributable, to a certain extent, to the singular good fortune which has wedded to very many of these songs the music of such composers as Schumann and Mendelssohn. But still, when all deductions upon this score are made,—and the true view of the matter

probably is that the poet and his composers are mutually obliged,—the fact remains that Heine is one of the great song-writers of the world, not unworthy of a place beside Burns and Béranger, although far less masculine and passionate than the one, and far less jovial and debonair than theother. The intense individualism which prevented him from ever becoming a literary artist in any other department—his dramas and essays in fiction are worthless—stood him in excellent stead in the lyric field, —was a positive and essential strength indeed, for, after all, a song to appeal to men's hearts must be an utterance of personal experience. And this condition is amply fulfilled in the Buch der Lieder, the greater portion of which was the direct outcome of a sentiment entertained by the poet for one of his cousins—a sentiment, by the way, which has been alluded to by German writers as a mere Coustnen- schwérmerer, while others (not Germans) have affirmed that all Heine's bitterness and cynicism in after life arose from its having remained unrequited. On the whole, Heine as a song-writer is a fit descendant of Walther von der Vogel- weide and those old Minnesdinger who of yore assembled in the halls of princes, and recounted their sorrows and their joys—of those nameless bards, too, who sang the Volkslieder ; and when all his other writings are forgotten, he will be remembered by such imperishable gems as " Die Rose, die Lilie, die Taube, die Sonne;" " Auf Fliigeln des Gesanges ;" and " Du bist wie eine Blume." There is much, too, of great beauty in many of his ballads and narrative pieces ; witness among others, "Spanische Atriden," "' Die Prinzessin Sabbat," "Jehuda-ben-Halevy," "Béses Getriume"—a piece of the most exquisite pathos and simplicity—and " Die Insel Bimini." But too often, no matter how sweet a chord is struck at the beginning, a dissonance creeps in, to end in a crashing discord, and the outraged reader starts like one who should suddenly see Romeo and Juliet fall to grimacing and squeaking like Punch and Judy. Heine's confession that poetry was no more than his " holy plaything" would have been entitled to our unqualified acceptance had he omitted the adjective.

But when we turn to his prose-writings—to his "journal- ism," that is to say, for, as we have remarked, almost all his prose falls under this category, in its widest acceptation

—we see the man Heine indeed, not perhaps, as he was ambitious of being regarded by posterity, in the full panoply of a "soldier of human emancipation," but at any rate as no contemptible assailant of obscurantism and philistinism. Beside such a redoubtable champion of the catholic reason of mankindas Lessing "of the ponderous battle-axe," he looks somewhat small, it is true, and his rapier somewhat gim- crack, But ridicule will often reach whither heavier weapons cannot, and pierce the elephantine hide of pedantry and dulness, after these have been attacked in vain by battering- rams; and Heine was a master of it. The worst is that in unscrupulous hands—and no one was more unscrupulous than he—it may be turned to illegitimate uses, and come to be indulged in finally for its own sake. How easily Heine became the slave of his propensity in this direc- tion may be seen in the two works—which seem his best and most characteristic writings, notwithstanding—Zur Geschichte der Religion und Philosophie in Deutschland and Die Romantische Schule. Both these abound in the most irreverent passages, especially the former, wherein such philosophers as Kant, Fichte, and Schelling scarcely serve a higher purpose than to be used as pegs whereon the writer may hang his jests. And admirable these are. Nothing can be better, for instance, than his account of how Kant (who is parenthetically described as a man whom Nature intended to sell coffee and sugar across a counter) came to postulate a Deity in his practical, after having exploded that idea in his theoretical, system. He did this, says Heine (most adroitly hitting one of the chief opprobdria, scientifi- cally regarded, of the critical philosophy), for the sake of his old man-servant Lampe, who looked so dismally at the conclusions of the Pure Reason that the philosopher was moved to compassion! The Lomantische Schule, being concerned for the most part with its author's contem- poraries, is far more virulent than the treatise just men- tioned, but equally happy; and it aimed a death-blow at a school which rivalled the wildest and most licentious ravings of a Monk Lewis and the most stilted horrors of an Ann Radcliff. And here it may be said, in connexion with the attack upon Schlegel occurring in this essay, that Heine's onslaughts were always open and above-board, unmerciful and sometimes grossly brutal as they were. He was a literary swashbuckler, it may be (though that term is singularly inapplicable to one who wrote in such a style), but he was neither a literary assassin nor a literary ghoul. Even his attack upon Borne was really aiined, as we have said, at men who were alive to resent it; and it was resented,

though from a strange quarter. Borne's widow's husband challenged Heine, and the latter was slightly wounded in the encounter.

Of the Reisebilder, Heine's most voluminous and best- known prose work, and that which originally gave him fame, small space remains to speak. But if we except its first and third books, it has been greatly overrated. It is easy to understand tlie popularity it acquired upon its first appearance, falling as it did like a breath of genuine life upon a land well-nigh asphyxiated by high art and the " Hiibsch-Objectiv "—but nowadays, notwithstanding its undoubted mirth-provoking qualities, it chiefly serves to point out, the gulf which was fixed between its author and him who took the Sentimental Journey. The most that can be said for it is that Sterne might have written it had he been a German Jew.

The best edition of Heine's works is that published by Hoffmann and Campe, Heinrich Heine's Sémmitliche Werke, 20 vols., Ham- burg, 1865. Another edition has appeared in America, Heinrich Heine's Simmtliche Werke, in 7 vols. Heinrich Heine's Leben, by Adolph Strodtmann, Berlin, 1870, is the only Life of Heine entitled to consideration, although the pleasure of reading it is certainly

marred by its length, A biography of the poet has also appeared in England, Life and Opinions of Heinrich Heine, by W. Stigand,

1876. Mr Matthew Arnold has, in his Essays in Criticism, handled Heine with his accustomed grace and felicity. Mention may also be made of Wit, Wisdom, and Pathos of Heinrich Heine, by J. Snodgrass, London, 1879, a collection of extracts from Heine's works in an English dress. A translation, Heine's Poems, Com- plete, by Edgar A. Bowring, ©.B., was issued in Bohn's Standard Library. His prose works have not as yet received adequate renderings, although a version of the Reisebildcr has been put forth in America. (J. W. F.) HEINECCIUS, Jonann GoTTLIEs (1681-1741), a celobrated jurist, was born 11th September 1681 at Eisen- berg. He studied theology at Leipsic and law at Halle ; and at the latter place he was appointed in 1713 professor of philosophy, in 1718 extraordinary, and in 1720 ordinary professor of jurisprudence. He subsequently filled legal

chairs at Franeker in Holland and at Frankfort, but finally returned to Halle in 1733 as professor of philosophy and jurisprudence. He died there, 31st August 1741. Heineccius belonged to the school of philosophical jurists. He endeavoured to treat law as a rational science, and not merely as an empirical art whose rules had no deeper source than expediency. Thus he continually refers to first principles, and he develops his legal doctrines as a system of philosophy. His chief works were

Antiquitatum Romanarum Jurisprudentiam illustrantinm Syn- tagma (1718), Historia Juris Civilis Romani ae Germanict (1733), Elementa Juris Germanici (1735), Elementa Juris Nature et Gen- tiwm (1787, English traus. by Turnbull, London, 2 vols., 1768). Besides these works he wrote on purely philosophical subjects, and edited the works of several of the classical jurists. His Opera Omnia (9 vols., Geneva, 1771, &c.) were edited by his son.Johann Christian Gottlieb Heineccius,

HEINECKEN, Curistian Hernricn (1721-1725), a child remarkable for extraordinary precocity of intellect, was bornon February 6, 1721, at Liibeck, where his father was a painter. Able to speak at the age of ten montlis, by the time he was one year old he knew by heart the principal incidents in the Pentateuch. At two years of age he had mastered all the sacred history; at three he was intimately acquainted with history and geography, ancient and modern, sacred and profane, besides being able to speak French and Latin; and in his fourth year he devoted him- self to the study of religion and church history. This wonderful precocity was no mere feat of memory, for the youthful savant could reason on and discuss the knowledge he had acquired. Crowds of people flocked to Liibeck to see the wonderful child; and in 1724 he was taken to Copenhagen at the desire of the king of Denmark, On luis return to Liibeck he began to learn writing, but his sickly constitution gave way, and he died, June 22 1725.

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The Life, Deeds, Travels, and Death of the Child of Liibeck were published in the following year by his tutor Schéneich. See also Toutsche Bibliothck, vol. xvii., and Mémoires de Trévoux, Jan.

1731.

HEINSE, Jonann Jacos Witnetm (c. 1746-1803), German romance writer, was born at Langenwiesen in the Thuringian Forest, February 16, 1746, or, according to some accounts, February 15, 1749. He was educated at the gymnasium of Schleusingen, and afterwards, through many privations, studied law at Jena and Erfurt, At Erfurt he became known to Wieland, and through Wieland's recom- mendation to the poet Gleim, who, attracted by some of Heinse's early literary attempts, offered him assistance and a home; but at this time he made the acquaintance of an adventurer, Captain von der Goltz, and was induced to accompany him on his travels. Von der Goltz easily succeeded in corrupting the taste and misdirecting the talents of the young author, and the baneful influence of this friendship pervades Heinse's writings. After parting with Von der Goltz Heinse returned for a time to Langen- wiesen, and afterwards obtained, with Gleim's assistance, under the feigned name of Rost, a tutorship in the family of Von Massow at Quedlinburg, which, however, he did not keep very long. In 1774 he went to Diisseldorf to assist J. G. Jacobi in the production of the Jris journal. In

1780 he obtained from Jacobi leave and the necessary funds

to travel in Italy. There he remained three years, living chiefly at Rome, where he was intimate with the painter Miller. In 1789 he obtained the post of reader to the elector of Mainz, who afterwards made him councillor and librarian. He died at Aschaffenburg, June 22, 1803. Heinse's works are—Sinngedichte, Halberstadt, 1771; Begeben- heiten des Enkolp, translated from the Satirieon of Petronius, 2 vols., Schwabach, 1773; Die Kirschen, after Dorat's Cerises ; Laidion, oder die Eleusinischen Geheimuusse, Lemgo, 1784 ; prose translations of Tasso's Jerusalem Delivered, 4 vols., 1781, and Ariosto's Orlando, 4 vols., 1782; Ardinghello und die gliiekscligen Inseln, 2 vols., Lemgo, 1787; Hildegard von Hohenthal, 2 vols., Berlin, 1795; Anastasia und das Schachspicl, 2 vols., Frankfort, 1803. A collection of his entire works was published at Leipsic in 1838 in 10 vols., and another edition in 1857 in 5 vols. HEINSIUS, or Huns, Danzet (1580-1655), one of the most famous scholars of the Dutch Renaissance, was porn at Ghent, June 9, 1580. The troubles of the Spanish war drove his parents to settle first at Veere in Zealand, then in England, next at Ryswick,

and lastly at Flushing, In 1594, being already remarkable for lis attainments, he was sent to the university of Franeker to perfect himself in Greek under Henricus Schotanus. He stayed at Franeker half a year, and then settled at Leyden for the remaining sixty years of his life. There he studied under Joseph Scaliger, and there he found Marnix de St Aldegonde, Janus Douza, Paulns Merula, and others, and was soon taken into the society of these celebrated men as their equal. His proficiency in the classic languages won the praise of all the best scholars of Europe, and offers were made to him, but in vain, to accept honourable positions outside Holland. He soon rose in dignity at the university of Leyden. In 1602 he was made professor of Latin, in 1605 professor of Greek, and at the death of Merula in 1607 he succeeded that illustrious scholar as librarian to the university. The remainder of his life is recorded in a list of his productions. He died at the Hague, February 25, 1655. The Dutch poetry of Heinsius is of the school of Roemer Visscher, but attains no very high excellence. It was, however, greatly admired by Martin Opitz, who was the pupil of Heinsins, and who, in translating the poetry of the latter, introduced the German public to the use of the rhyming alexandrine. He published his original Latin pocms in three volumes—Lambli (1602), Elegie (1608), and Poemata (1605); his Emblemata Ama- toria, poems in Dutch and Latin, were first printed in 1604. In the same year he edited Theocritus, Bion, and Moschus, having edited Hesiod in 1603, In 1609 he printed his Latin Orations. In 1610 he edited Horace, and in 1611 Aristotle and Seneca. In 1613 appeared in Dutch his tragedy of The Massacre of the Inno- cents; and in 1614 his treatise De politica sapientia. In 1616 he collected his original Dutch poems into a volume. He edited Terence in 1618, Livy in 1620, published his oration De contemptu

mortis in 1621, and brought out the Zpistles of Joseph Scaliger in 1627.

HEINSIUS, Nixonazs (1620-1681), Dutch scholar, was the son of Daniel Heinsius, and scarcely less illustrious than his father. While, however, Daniel was the type of the stationary scholar, Nikolaes was by temperament rest- less and peripatetic. He was born at Leyden, July 20, 1620, and early displayed an extraordinary precocity. His boyish Latin poem of Breda Hxpugnata was printed in 1637, and attracted much attention. In 1642 he began his wanderings with a visit to England in search of MSS. of the

classics; it is unhappily recorded that he met with great discourtesy from the English scholars. In 1644 he was sent to Spa to drink the waters; his health restored, he get out once more in search of codices, passing through Louvain, Brussels, Mechlin, Antwerp, and so back to Leyden, everywhere collating MSS. and taking philological and textual notes. Almost immediately he set out again, and arriving in Paris was welcomed with open arms by the French savants. After investigating all the classical texts he could lay hands on, he proceeded southwards, and visited on the same quest Lyons, Marseilles, Pisa, Florence (where

he paused tv issue a new edition of Ovid), and Rome. Next year, 1647, found him in Naples, from which he fled during the reign of Masaniello; he pursued his labours in Leghorn, Bologna, Venice, and. Padua, at which latter city he published in 1648 his volume of original Latin verse entitled Ztalica. He proceeded to Milan, and worked for a considerable time in the Ambrosian library; he was pre- paring to explore Switzerland in the same patient manner, when the news of his father's illness recalled him hurriedly to Leyden. He was soon called away to Stockholm at the invitation of Queen Christina, at whose court he waged war with Salmasius, who accused him of having supplied Milton with facts from the life of that great but irritable scholar. Heinsius paid a flying visit to Leyden in 1650, but immediately returned to Stockholm. In 1651 he once more visited Italy ; the remainder of his life was divided between Upsala and Holland. He collected his Latin poems into a volume in 1653. His latest labours were the editing of Velleius Paterculus in 1678, and of Valerius Flaccus in 1680. He died at the Hague, October 7, 1681. Nikolaes Heinsius was one of the purest and most elegant of modern Latinists, and if his scholarship was not quite so perfect as that of his father, he displayed higher gifts as an original writer.

HEINSIUS, Nrxorass, an illegitimate son of the sub- ject of last article, was born in 1655 at the Hague. At the age of twenty he wrote The Delightful Adventures and Wonderful Life of Mirander, a work of extraordinary humour and genius, the sole original romance produced in Holland during the 17th century. Dr Ten Brink has pointed out that Mirander preceded Gil Blas, which it curi- ously resembles, by at least forty years. The author,

how- ever, added nothing else to literature. He was disowned by his father, driven from the house, and in 1677 had to flee the country on account of a murder which he committed at night in the streets of the Hague. life as an outlaw in Paris, Rome, and elsewhere, and died in obscurity.

HEIR. See INHERITANCE.

HELDER, or Tue Hetper, a township of the Nether- lands at the northern extremity of the province of North Holland, directly opposite the island of Texel. Since 1819 it lias been the terminus of the North Holland Canal, and it is now connected (since 1865) by railway with Alkmaar and Haarlem. Its fortifications and its dykes are both con- structed on an extensive scale, the former comprising four batteries and five forts, and the latter being the most strik- ing on the whole coast. A garrison of 7000 to 9000 men is necessary for the defence of the place, and 30,000 men could be accommodated within the lines. The harbour, called the Nieuwe Diep, is one of the best in Europe. Its area is 6560 feet long by 330 to 490 broad, and it has depth enough for the largest vessels, which are admitted to the North Holland Canal by the Koopvaarders sluice. The Government arseual comprises an extensive wet dock, a dry dock, and auxiliary establishments. Besides eight churches and a synagogue Helder possesses a palace for the board of marine, a royal institute for the education of naval cadets, a marine hospital, an orphan asylum, a town-house erected in 1836, and a meteorological observatory. The industries of the place are those usual in a flourishing seaport. Previous to 1819 the population was not much more than 2000, but since then it has rapidly increased. In 1870 the suburbs of Willemsoord, Nieuwe Diep, Nieuwstad, and the Canal Road being included, the total amounted to 16,205. As a commune it numbered 18,366 in 1870 and 20,104 in 1874. .

Helder was originally an offshoot of the now decayed town of Huisduinen. The first church was built in 1624, and though the harbour became a favourite resort of the whale fishers, it was not

He lived a precarious ©

till the construction of the Nicuwe Diep between 1770 and 1780, and its adoption in 1781 asa war harbour, that the prosperity of the plaee was secured. Under the Batavian republic the fortifications were extended and strengthened, and Napoleon still further im- proved them. In 1799 the English, under Abercromby, assisted by the Russians, drove out the French and secured the capitulation of the Dutch fleet in the Zuyder Zee.

HELENA, daughter of Zeus and of Leda the wife of Tyndareus king of Sparta, was sister of Castor, Pollux, and Clytemnestra, and was married to Menelaus, According to Homer she was obliged by Aphrodite to flee with Paris to Troy; and after the Trojan War she returned with Menelaus and lived with him as queen in Sparta. She had only one child, a daughter named Hermione, who was married to Neoptolemus. In the Homeric poems her character is drawn with marvellous skill; forced by the gods to do what she regrets, she seems to be separated from the wrong that she does, and remains always an object of interest and respect.1 Goethe (/aust, part ii.) introduces Helena apparently to symbolize the Greek spirit acting on the modern mind, Among later poets the tales of Helen are much more complicated. She was carried off by Theseus to Attica in her childhood, but was recovered by her brothers. Her character often suffers much in the tales followed by lyric and tragic poets. Stesichorus and Euri- pides (Z/elena), however, relate that Paris on his homeward voyage was driven by stress of wind to Egypt. Proteus, king of Egypt, learning the facts, detained the real Helen in Egypt, while a shadowy Helen was taken to Troy and fought for. Menelaus on his way home from Troy was also driven to Egypt, and there found his true wife. After the death of Paris she is also said to have been married to his brother Deiphobus.

If we turn to the religious ceremonies and the genuine popular tales, we find traces of a more archaic Helen. At Rhamnus in Attica she was connected with the worship of Nemesis, whose daughter she was considered to be. In Argos she was counted mother of Iphigenia, and was said to have founded a temple of Kileithyia, the goddess of Lirth. At Sparta she was honoured as presiding over the care of children, and festivals were celebrated in her honour by the maidens. A tree appears to have been connected with her worship there (sec Theoer., xviii.); and in Rhodes she was worshipped by maidens with the epithet dSevdpiris, a relic of the very oldest kind of

worship, where a sacred tree was worshipped as the embodiment of the god. In most of these cults connexion with a moon-goddess, the most important of whose functions was the care over child-birth, is apparent; and we are led to regard €Aévn as an cpithet of the moon, which has gradually been severed from it and raised to an independent existence (ef. the account given of Gorgophone under Gorcon). Beauty is a specially common attribute of the moon and of moon-goddesses, such as Hera. This makes it most probable that the word, like ceAjvn, is connected with the root svar, to shine. The tales connecting Helena with Achilles, who is clearly a sun-god originally, which are known already to the writer of the Cypria, are also very instructive. Over the Black Sea coasts Achilles and Helena were worshipped as united in the Elysian fields. With this we must compare the story of Cadmus and Harmonia (see HARMoNIA), and of Hades and Persephone; and we must remember that these colonies of Miletus were closely connected with Attica. We may then look on it as probable that the rape of Helena by Theseus is merely a device of harmonizing skill to connect the Helena of Spartan religion with the Helena worshipped in Attica. Probably a similar reason has contributed to mould the tale which has formed itself round the undoubtedly historical fact of the destruction of Troy by a Greek tribe or army. The worship of Aphrodite, the goddess whose influence in the story of Paris and Helena is so great, was common to Troy and Cythera. Many facts also point to a close connexion between Aphrodite and Helena, The swan from whose egg she is born is the bird of Aphrodite. By the author of the Cypria and in Attic tradition Helen is made the daughter of Nemesis; but Nemesis as a goddess of fate is clearly a dawn-god- dess (see Kuhn, Zt., iti. 449), and therefore may be identified in origin with Aphrodite. We have here another instance of the

intimate relation of the moon and dawn goddesses, and the im-

possibility of dividing them by any broad line (sec HEBE, HERA). It would be at once a most instructive and a most interesting task

1 Most appreciative and sympathetic analyses may be found in Gladstone's Homeric Studies and Mure's History of Greek Literature.

to trace the steps by which the antique pre-Greek goddess was gradually transformed into the charming heroine round whom the action of the liad revolves. The data for reconstructing the history of this figure are more than usually full, and are so clear that writers of the most opposite schools (as Welcker, Gerhard, Mannhardt, Maury, Roscher) have recognized in Helena the ancient goddess.

HELENA, Sarnv, a woman of humble origin, said to have been the daughter of an innkeeper, was the wife of Con- stantius Chlorus. Of her nationality nothing certain is known. She had one son, Constantine the Great. In 292 A.D. Chlorus was raised to the purple by the emperors Dio- cletian and Maximian, and forced to divorce Helena to make room for a more noble wife. After her son became emperor she was treated with great respect and styled Augusta, and cities in Bithynia and Lysia were after her named Heleno- polis. She became a Christian when her son was converted, and during a pilgrimage to Jerusalem she discovered the holy sepulchre and the true cross. Her zealous patronage of their religion made her a favourite with the Christian writers, and finally procured her the honour of canonization ; but pagan historians, such as Zosimus, regard her with dislike, and even question, though without ground, the legality of her marriage. Many coins occur with the name of Helena, but it is difficult or impossible in many cases to determine whether they belong to Saint Helena or to others of the family of Constantine bearing the same name.

HELENSBURGH, a town and favourite watering-place of Dumbartonshire, Scotland, is situated at the mouth of the Gareloch, a branch of the Firth of Clyde, opposite Greenock, which is about 4 miles distant. It is 24 miles N.W. of Glasgow by railway. In 1776 the site of the town was advertised for feuing, and in 1802 Helensburgh, named after Lady Helen, wife of Sir James Colquhoun, the superior of the soil, was erected into a burgh of barony, under a provost and council. The boundaries have since been enlarged. The town is pleasantly situated on a gentle slope, the streets mostly intersecting each other at right angles, while many of the houses are surrounded by gardens,—peculiarities that produce an agreeable regu- larity and openness. A handsome burgli hall was erected in 1879. Near the town is a hospital, and within its boundaries a public park, Convenient as

headquarters for visiting the whole district of the Clyde, and connected with Glasgow by both rail and steamer, Helensburgh is much frequented in summer. The population in 1871 was 6231 ; it is now (1880) estimated at fully 10,000,

HELIAND (2.¢., Hetland) is an Old Saxon poem of the 9th century. According to some critics it isa fragment of a larger work which dealt with the entire historical material of the Old and New Testaments. The part which we now possess sets forth the life of Christ as told by the four evangelists, whose various narratives the author seeks to harmonize. The poem is said to have been composed by a Saxon writer at the request of the emperor Louis the Pious; but who the author was, except that he was a Saxon, we have no means of knowing. The general opinion is that he lived in Westphalia, but even this is uncertain, Like all the most ancient remains of Teutonic poetry, Héliand is written in alliterative verse, of which the writer had a perfect mastery. It is almost the only remnant of the Old Saxon dialect, and has therefore a high philological value, but it is still more interesting from a literary point of view. The poet does not merely repeat his authorities ; while true to the main facts of the original story, he allows his imagination to play upon them in a free and poetic spirit. He realized with intense force the incidents in the career of the Founder of Christianity, and gives vitality and definiteness to the received conception of His character. The diction is simple and popular, but marked by an eleva- tion of sentiment adapted to the theme and to its epic treat- ment ; and by a happy phrase the author often succeeds in

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| imparting to his style colour, variety, and animation. The 9th century is remarkable in the history of Old English and of Old Norse poetry; the Hélzand affords proof that the impulse which revealed itself in these two literatures was also experienced to the full by the higher minds of Germany. ‘The historical aspects of this great work are hardly less important than those which claim the attention of the purely literary student. Of all the German tribes the Saxons were the last to submit to the influence of Christianity. They regarded baptism as the symbol of Frankish supremacy,

and clung as long as they could to the ancient Teutonic faith. Not until Charlemagne, after more than thirty years of warfare, forced upon them Frankish institutions did they generally accept the new creed, and even then, while they talked of Christ and the saints, they thought of Wodan and Thor, and took delight in the heathen poetry which had been handed down from remote periods, Louis the Pious was of a gentle and conciliatory nature, and by treating the Saxons with kindness obliterated to a large extent the recollection of his father's severity. Léliand was one of the works with which he and the clergy endeavoured to replace pagan literature, so that we may regard it as the monument of a struggle between two civilizations. The author is dominated by the ideals and the sympathies of the Catholic Church, but occasional touches remind us of the order of life that was passing away, and these have heen found suggestive by writers on German archeology.

Héliand received its name from A. Schmeller, who edited it (Munich, 1830-40) from the two existing manuscripts, one of which is in the British Museum, the other in Munich (formerly in Bamberg). More recent editions have been issued by Kéne (Miin- ster, 1855, accompanied by a modern rendering), Heyne (2d ed. Paderborn, 1873), and Riickert (4th volume of Deutsche Dichtungen des Mittelalters, Leipsic, 1876). There are renderings into modern German by Kannegiesser (Berlin, 1847), Grein (Rinteln, 1854; im-

roved edition, Cassel, 1869), Rapp (Stuttgart, 1856), and Simrock 2d ed. Elberfeld, 1866). See also Vilmar, Deutsche Alterthiimer im Héliand (2d ed., Marburg, 1862); Windisch, Der Héliand und seine Quellen (Leipsic, 1868); Grein, Die Quellen des Héliands

(Cassel, 1869); and Sievers Der Héliand wnd die angelsdchsische Genesis (Halle, 1875),

HELICON, a mountain, or more strictly a mountain range, of Boeotia in ancient Greece, celebrated in classical literature as the favourite haunt of the muses, is situated between Lake Copais and the Gulf of Corinth. On the fertile eastern slopes stood a temple and grove sacred tu the Muses, and adorned with beautiful statues, which, taken by Constantine the Great to beautify his new city, were consumed there by a fire in 404 a.p. Hard by

sparkled the famous fountains of poetic inspiration, Aganippe and Hippocrene, the latter fabled to have gushed from the earth at the tread of the winged horse Pegasus, whose favourite browsing place was there. At the neighbouring Ascra dwelt the ancient Hesiod, a fact which probably enhanced the poetic fame of the region. Pausanias, who describes Helicon in his ninth book, asserts that it was the most fertile mountain in Greece, and that neither poisonous plant nor serpent was to be found on it, while many of its herbs possessed a miraculous healing virtue. The highest summit, the present Paleovuni (old hill), rises to the height of about 5000 feet. Modern travellers, aided by ancient remains and inscriptions, and guided by the local descriptions of Pausanias, have succeeded in identifying many of the ancient classical spots. For details of modern research see Clarke's Z'ravels in Various Countries (vol. vii., 1818), Dodwell's Classical and Topographical Tour through Greece (1818), and Leake's Z'ravels in Northern Greece (vol. ii.,

1835).

HELIGOLAND (German, Helgoland), Hetligeland, or Hellige Land, as the natives call it, is one of the Frisian Islands, and an English possession, situated in the North

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Sea, 54° 11' 34" N. lat., 7° 51' E. long., 36 miles from Cuxhaven at the mouth of the Elbe, and about 100 from Hamburg. Though the red cliffs of the Rock Island are most familiar to the voyager entering the Elbe, there are in reality two islets, the second being the Dune or Sand Island, now lying a quarter of a mile east of the main one, though at one time connected with it by de waal, a neck of land which the sea broke through and destroyed in 1720. The Rock Island is nearly triangular in shape, surrounded on every side by steep clitis, the only beach being the sandy spit where the landing-place is situated, near the south-east point. On this islet there are some 500 houses, divided into a lower town or Unterland, on the spit, and an upper town or Overland, situated on the cliff above and connected with the lower town by a wooden stair of 190 steps, the only possible mode of communication between the two sections. The portion of the flat-topped rock not occupied by the houses, the church with graveyard,

*the Government resi- dencies, and place for a battery, comprises a little pasture- land, a few cabbage gardens, potato patches, and a powder magazine at the north endof the rock. About 200 sheep, tethered to particular spots, feed on the scanty herbage, eked out by potato-peelings and halms, cabbage blades, or any other vegetable refuse, which is carried out to them every morning. From one end of the island to the other runs a footpath, called by the Heligolanders the ‘ Land- wae” or High Road, but better known to visitors by the name of “ Kartoffel-Allee” (Potato Walk). There is also a lighthouse ; but, though a few guns are placed behind a rude earthwork, there are no fortifications except the inaccessible cliffs of the island, and no garrison of any kind unless a few coast-guardsnien be considered as such. The greatest length of the island, which slopes somewhat from west to east, is 5880 feet, and the greatest breadth 1845 feet, its circumference 13,500 feet, its average height 198 feet, and the highest point 216 feet. The Dune or Sand Island is little more than a sand-bank covered with scanty herbage, and imperfectly bound together by bent, grass, and carices. It is only about 200 feet above the sea at its highest point, but the drifting sands and the constant inroads of the sea make the height rather variable. The sea-bathing establishment is situated here; but, with the exception of the restaurant keeper and waiters, and the attendants who drag the bathing-coaches into the sea, there are no residents. A shelving beach of white sand pre- sents excellent facilities for bathing ; everything is under strict Government surveillance, the boats in which the bathers cross in the morning, the hours of bathing, and the tariff being all regulated by Jaw. Approached from the sea the Rock Island, with its red-tiled houses perched in a little cluster on the red cliff_—‘*Am Falm,” as it is called,—looks very picturesque, and even the narrow brick-paved or sandy lanes of the town are not deficient in a certain degree of quaintness. There are—with the exception of a wheelbarrow and an occasional peram-bulator—no wheeled carriages in the island, and no horses or other beasts of burden. Even the two cows kept in the Unterland for the use of invalid visitors, and whose milk is sold at the apothecary’s shop, are removed at the end of the bathing season to Cuxhaven, the island not supplying food for both man and beast. Mud is ‘unknown on the streets, the rain only serving to wash their sloping surfaces clean as the scoured floor of the housewives’ kitchens. Most of the houses are built— the lower half at least—of brick, but some are of wood. There are a theatre, a “conversation house,” and a*

number of hotels and restaurants, though during the season nearly every house is more or less let out to " baadegaster "— visitors for sea-bathing forming the great source of the islanders' prosperity. In both the lower and the upper

town there are numbers of shops; but the articles for sale seem to be chiefly intended for the summer " bathing guests," the natives getting most of their supplies from Hamburg or Bremen. The dwellings of the fisher-folk are reasonably clean, and the interiors bear evidence of the sea- faring character of the population. Some of the houses have little gardens with flowers, cucumbers, é&c., in front of them; and in places protected from the sea breezes there are a few fruit trees. At the foot of "the stair" are one or two lime trees sheltered by the contiguous houses; they are looked upon by the Heligolanders as objects of national pride.

During the summer from 2000 to 3000 people visit the island for sea-bathing. Most of these are from Hamburg, English or other "guests" being rare. There are no English resideuts, the officials, the governor excepted, being either natives or Germans; and German, when Frisian is not em-ployed, is the official language, though for form's sake on the postage stamps English and German words appear in duplicate. The natives speak a dialect of Frisian, barely intelligible to the other islands of the group. They are perfectly content with the almost perfect autonomy they enjoy under the English Government. There is little emi- gration, and accordingly the population is slowly increasing. In 1879 the number was a little over 2000. There is regular communication with Bremen and Hamburg in the summer and autumn months, but during the winter the island is often isolated for weeks at a time, owing to tempestuous weather, drift ice, and other causes. It is said that insanity and suicide are in consequence not rare. Epidemic diseases occur, though they do not commonly spread ; but scrofula, owing to the poor character of the islanders' food, attacks three-fourths of the population. In ten years there were 309 deaths—about 15 tothe 1000; while during tlie same period—from 1863 to 1872 inclusive—there were no less than 17 suicides. At one time the population did not exceed 300, and it was only when it increased to over 1000 that the inhabitants had to dispense

with the few horses they kept to till their patches of land. This is now done with the spade, and loads are conveyed either in wheel- barrows or in shallow willow baskets,

The temperature of the Oberland is, owing to its exposure, about 1°5° lower than that of the Unterland. 'The following are the means of the months, froin a'series of observations taken for seven consecutive years at the lighthouse built on the highest point of the island :—January, 31°9° Fahr.; February, 33°9°; March, 35:2°; April, 43°1°; May, 48°9°; June, 57°5°; July, 62:2°; August, 61:0°; September, 58°4°; October, 48°2°; November, 40°0°; December, 34°3° —the mean temperature of the whole year being 47'2° Fahr.! The winters are however very stormy, and the air is so laden with salt spray that the rain leaves a delicate deposit of salt after it has evapo- rated. May and the early part of June are very wet and foggy, so that the first visitors do not arrive until the middle of the latter month.

The rocks composing the island are of Triassic age, bunter-sand- stone, keuper, lias, oolite, muschelkalk, and chalk (now denuded), topped by Pliocene—" the brown tock," in which are found the scales and teeth mostly of freshwater fishes, freshwater Mollusca, and fruit and leaves of a Carpinus, a Quercus, an Alnus, a maple, a plant allied to a hoya (Stomatophyllum helgolandicum), &e. The cliffs are worn into caves, and around the Rock Island are many fantastic arches and columns of rock. There is no just ground, however, for believing that the Rock Island was ever much bigger than it is,—the tales of the great size of Heligoland—its numerous churches and villages in early times—being doubtless exaggerated by tradition, while the maps affecting to show its former extension doubtless relate to the Sand Island, which was incontestably much larger in very recent periods, and is now yearly becoming smaller. The natural history presents nothing remarkable. There are no wild animals on it, and the numerous birds which breed in its

cliffs, or light on it during their migrations, all belong to the main- land or to the North Sea.? Hallier has enumerated 220 flowering

1 Zimmermann, Die sanitiéren Zustinde Melgolands, mit specieller Beriicksichtigung des Ozongehaltes der Luft, 1873, pp. 12, 13.

2 Gitke, Edinburgh New Philosophical Journal, n. s., ix., p. 333; Blasius, " Naumannia," 1858, p. 303 (Zbis, 1862, p. 58); Cordeaux, Ibis, 1875, p. 1872.—Mr Gitke, the island secretary, is preparing a special work on Heligoland ornithology.

plants as growing on the island, but none of them are peculiar to it, though there are one or two local varieties. The sandy-bottomed shallow sea supplies abundance of flat fish, and in the deeper water crabs, lobsters, haddock, &c., abound. There arc, howevcr, not many fishing-boats, and these of small size. . Most of the men act as pilots.

The trade of the island is insignificant. The only time when it enjoycd any commercial prosperity was during the Napoleonic wars, when, by the '" Continental system," the European ports were sup- posed to be shut to Mngland. During that period smuggling pros- pered, and the island was cro wded with soldiers and adventurers. In 1878 the revenuc was £7236, the expenditure £7548, and the public debt £2115. The imports are mostly from Bremen and Hamburg, those from Britain being valued at only £72; the exports, consisting chiefly of goods bought by visitors, are ladies' feathers, hats, muffs, fish, &c. The government is vested in a governor appointed by the English crown, aided bya council,—the former mode of government having been more democratic, but less conducive to the islanders' peace than the present. 'The taxes arc few, and consist chiefly of a duty on wine, beer, and spirits, a small house tax, and the " kur- tax," levied on all visitors who reside beyond three days.

*History.—The history of Heligoland, * the holy island," is interesting. "Sunt et alia insulz contra Friesiam et Daniam, sed nulla earum tam memorabilis," writes Adam of Bremen. " Multa regna, multas regiones et insulas perlnstravi, nec unquam similem huic sacre vidi," are the words of Pontanus. Here Hertha? had her great temple, and hither came from the mainland the Angles to worship at her shrine. Here lived King Radbod, a pagan, and on this isle St Willebrod, 1200 years ago, first preached Chris- tianity; and for its ownership, before and after that date, many sca-rovers have fought. Finally it settled down to be a fief of the dukes of Schleswig or Holstein, though often in pawn for loans advanced to these impccunious*

princes by the free eity of Ham- burg. The island thus happened in 1807 to be a Danish posses- sion, when the English scized and held it until it was formally ceded to them in 1814. In these days of swift steamers the value of Heligoland as a military position commanding the Elbe mouth has been doubted. There is not, with the exception of wells, the rain collecting in the "Sapskulen" or hollows, and that caught in casks, any water on the island, while the shelter afforded by the north and south harbours formed by the sand point on which the Unterland is built is but indifferent. It is only vessels of small size that can approach the shore, and passengers by the steamers have to land in open boats at the end of a long jetty (the Laster-Allee, or " Misery Walk"). Under British rule the islanders enjoy the utmost frecdom, and in return for this privilege are subjected to a trifling taxation for local purposes, and escape the compulsory military service to which they would be liable were they to become German or Danish

subjects.

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HELIODORUS, son of Theodosius, was born at Emesa iu Syria, in the second half of the 4th century. He belonged to a family of priests of the Syrian sun-god Elaga- balns, but he was himself a Christian, and became bishop of Tricca in Thessaly. He is famous as the author of the best of the Greek love-romances. It is called "thzopica, as it relates the history of

Chariclea, daughter of Hydaspes, king of Adthiopia, her love for Theagenes, a Thessalian of high rank, and the happy issue after a series of exciting adventures and hairbreadth escapes. The Alexandrian pastoral poets often introduced brief love episodes to give animation to their scenes of pastoral life. When rhetorical prose became the fashionable style of composition, the mere episode was expanded into a complete history of the lovers from their birth to their happy union. Antonius Diogenes, according to Photius, was the first to write a book of the kind ; and Jamblichus, about 100 a.D., also wrote a love

1 The tax is at present—for one person three marks (Hamburg), for a family of two to three persons four marks, and for larger families six marks; after a stay of four weeks the visitors are free of " kur-tax."

2 Fossite, after whom in pre-Christian days the rock was called Fossite-land, was not, as is often asserted, the goddess herself, but only the priestess of Hertha.

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romance. But the Zthiopica is the oldest work of the kind that has come down to us. It is full of the most improb- able scenes and incidents; the hero is a weak and dull character, but the heroine is well drawn and full of interest. The description of customs and manners, especially of religious ceremonies, is minute, and often most interesting in an antiquarian point of view. The work not only became a model for the later Greek romance writers, but has been much imitated by the French and Italian writers of romance. Tasso praises the artful development of the plot ; and the early life of Clorinda (Jerusalem Delivered, c. xii.) is almost identical with that of Chariclea. Racine meditated a drama on the subject of the romance, and Raphael has made scenes from it the subject of two of his pictures. The best edition is that of Cortes (Paris, 1804). The

'pook has been translated frequently, and into almost all

modern European languages.

HELIOGABALUS, a Greecized form of Elagabalus, the name of a Syrian deity, was the name adopted by Varius Avitus Bassianus, the Roman emperor. His pedigree is

given in the accompanying table :— ee

| Julia Domna=Emp. Sept. Severus Julia Mesa=Avitus

Caraealla

ay | Julia Soemias=S. Varius Marcellus Julia Mamméea

Emp. Ieliogabalus Emp. Alex. Severus

On the murder of Caracalla (217 a.p.), Julia Msesa was forbidden the court by the new emperor Macrinus. She retired to her ancestral city Emesa with her daughters and grandsons. Varius Avitus, though still only a boy, was – appointed high priest of the Syrian sun-god Elagabalus, one of the chief seats of whose worship was Emesa. His beauty, and the splendid ceremonials at which he presided, made him a great favourite with the troops stationed in that part of Syria, and Mesa increased his popularity by spreading reports that he was in reality the illegitimate son of Caracalla. Macrinus was very unpopular with the army ; an insurrection was easily raised, and Varius under his adopted name Heliogabalus was proclaimed emperor. The troops sent to quell the revolt joined the new emperor, and Macrinus, advancing in person against him, was defeated and soon afterwards slain (218). Heliogabalus was at once recognized by the senate as emperor. After spending the winter in Nicomedia, he proceeded in 219 to Rome. He made it his business to exalt the honour of the deity whose priest he was. The Syrian god was proclaimed the chief deity in Rome, and all other gods his servants ; splendid ceremonies in his honour were celebrated, at which Helio- gabalus danced in public ; and it was believed that secret rites accompanied by human sacrifice were performed in his honour. The shameless profligacy of the emperor's life was such as to shock even a Roman public. His popularity with the army declined, and Mesa perceiving that the liking of the soldiers inclined to Alexander Severus, persuaded him to raise his cousin to the dignity of Cesar (221). Helioga- balus soon repented of this step. An attempt to murder Alexander was

frustrated by the watchful Mesa. Another such attempt in 222 produced a mutiny among the soldiers, in which Heliogabalus and his mother Sozmias were slain. HELIOGRAPHY is the name applied to the method of communicating between distant points in which visual signals are obtained by reflecting the rays of the sun from a mirror or combination of mirrors in the required direction. This method can of course be only employed to advantage in places where the sky is free from clouds and the atmosphere clear for considerable periods of time, and the fact that an atmospheric change may indefinitely delay the transmission of a message is an insuperable objection to the establish- ment of permanent heliographic stations in most climates.

In favourable localities, however, heliography possesses important advantages for military signalling over other methods, the principal being the portability of the appara- tus, the great distance to which messages can be sent with- out retransmission, and the fact that the signals are visible to those only who are on the direct line of signalling.

The signals are produced by causing the reflected beam to appear and disappear or be obscured alternately at the distant point, the intervals of appearance and obscuration being usually varied in length, so as to produce the com- binations of long and short signals known as the Morse alphabet. This is done in two distinct ways. In the first of these, known as signalling by "appearance," the reflected

beam or " flash" is obscured from the receiving station |

except when a message is being transmitted, the flashes

then giving the signals or "dots" and "dashes"; while in |

the second method, or signalling by "' obscuration," the flash is kept continually on the receiving station, and only obscured for intervals forming signals. The first method is more easily read by learners ; the second is less fatiguing to the eye, and possesses the advantage of enabling the

signaller to correct the adjustment of his instrument at

any time.

Glass mirrors with a plane surface are employed, hence |

the angle of divergence of the extreme rays in the reflected beam is the same as that subtended by the sun's diameter at the point, or about 32 minutes of arc; this small diver- gence rendering the flash visible to great distances.

The distance through which signalling by this method ©

can be carried on depends on the size of the mirror em- ployed and the angle of reflexion of the rays, a large mirror giving a more intense "flash" than a small one, since it reflects more rays, and being therefore visible to a greater distance; also when the angle of reflexion is nearly a right angle the flash will be more intense than when the rays are only diverted through a small angle from the greater extent of surface exposed to the sun's rays. The range, however, depends to so great a degree on the state of the atmosphere that it is impossible to assign any limits to the distance

that the flash might be seen through in exceptionally clear |

weather. From the Himalayas a 5-inch mirror has been found to give very distinct signals over a distance of 60 miles; but when the air was at all misty a very much larger mirror had to be employed,

The more perfect reflexion when the angle between the direct and reflected rays is large is not sufficient to compensate for the loss of intensity caused by the small number of reflected rays. Hence when this angle is greater

than a right angle tivo mirrors are used, the sun's rays | being reflected from one back to the other and thence |

to the distant point. working.

Two forms of instrument are at present used in the British army. In the one known as Beghic's field heliostat

This is called the duplex method of

the mirrors are square, the sun mirror having a side of 5 |

inches, and the signalling mirror 4 inches. The object of this difference is to ensure the latter receiving the flash over its whole extent of surface. The mirrors are screwed on to tripod stands, the stand for the signalling mirror having a sighting bar with a frame of cross wires at the end, by means of which the alignment can be accurately taken by looking through a hole in the centre of the mirror. When this has been found a small white disc is put into a hole in the centre of the cross wire frame, and a black disc in the central hole in the signalling mirror, or, if two mirrors are used, the white dise in the signalling and the black dise in the sun mirror. The flash is then brought on the true line by making the shadow corresponding to the black disc fall on the white one; this is accurately obtained by means of slow-motion screws in a vertical and horizontal

direction, by which meaus also the sun's apparent motion is continually corrected. The obscuration is effected by ' a screen placed on a tripod in the alignment of the flash, pivoted horizontally, and worked by a handle. In the heliograph patented by Mr Mance the mirrors are circular, the obscuration being effected by giving a small angular motion to one of the mirrors, causing the reflected beam to

travel through twice the angle and completely disappear from the distant point. This is more easily manipulated than obscuration by a screen. Its working is made very similar to that of an ordinary Morse key. The sun's motion is corrected by slow-motion screws, and the arrange- ments for directing the flash are very similar to those in the heliostat. Two tripod stands are employed: one is for

_ the signalling mirror; the other in single working carries

a jointed arm, fitted with a small white metal tablet having

a black spot on which is thrown the shadow from an un-

silvered hole in the centre of the signalling mirror, while

in duplex working a piece of paper in the centre of the second mirror answers the same purpose.

In addition to its usefulness as a signalling instrument, the heliograpl: has been found of great service indefining exactly distant points for large surveys, such as the triangulation of India. For this purpose it was coustantly employed by the late astronomer-royal at the Cape, Sir T. Maclear, in his verification of the are of the meridian. (Pp. ©.)

HELIOPOLIS. See Baatsec and Eeyrt, vol. vii. p. 769.

HELIOTROPE, or Turnsote, Heliotropium, L. (Greek, nAvotpémov, 2%¢., a plant which follows the sun with its flowers and leaves, or, according to Theophrastus, st. Plant., vii. 15, which flowers at the summer solstice), a genus of usually more or less hairy herbs or undershrubs of the tribe Heliotropieew of the natural order Boraginea, having alternate, rarely sub-opposite leaves ; small white, lilac, or blue flowers, in terminal or lateral one-sided simple or once or twice forked spikes, with a calyx of five deeply-divided segments, a salver-shaped, hypogynous, 5-lobed corolla, and entire 4-celled ovary; fruit 2- to 4-sulcate or lobed, at length separable into four 1-seeded nuts, or into two hard 2-celled carpels; and seeds generally with a scanty al- _bumen. In some species the cone surmounting the stigma is bearded. The heliotropes are indigenous mostly to tropi- _ cal and subtropical regions, but a few species are natives of Europe, as H. ewropeum, L., which is also a naturalized species in the southern parts of North America. H. indicum, L. (of the section Heliophytum, D.C.), is to be met with in equinoctial Africa, America, and Asia, but apparently not in Australia. Of 23 Australian species. of Heliotropium that have been described, 16 are endemic. The common helio- _ trope of English hothouses, //. la | peruvianum, L., popularly known as " cherry-pie," is on

account of the delicious odour of its flowers a great favourite | with florists. It was introduced into Europe by the younger Jussieu, who sent seed of it from Peru to the royal garden at Paris. About the year 1757 it was grown in England by Mr P. Miller from seed obtained from St Germains. The plant has been known to occur with double flowers | (Masters, Veg. Terat., p.510,

Ray Soc., 1869). H. corym- bosum, Ruiz et Pav., which was grown in Hammersmith XI. — 80

Heliotropium suavolens.

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nurseries as early as 1812, has larger but less fragrant flowers than H. peruvianum. The species commonly grown in Russian gardens is H. swaveolens, which has white, highly-fragrant flowers. Heliotropes may be propagated either from seed, or, as commonly, by means of cuttings of young growths taken an inch or two in length. The plants require in hot weather a plentiful supply of water, and in winter careful protection from frost, which soon kills them. If favoured with a light rich soil and a warm conservatory, in which they may be grown in a border, or against a pillar, wall, or trellis, they bloom all the year round. The formation of flowers is promoted by a sunny situation. Many florists' varieties of heliotrope are now under cultivation,

Pliny (Nat. Hist., xxii. 29) distinguishes two kinds of " helio- tropium," the tricocewm, and a somewhat taller plant, the helio- scopium; the former, it has been supposed, is Croton tinctoriwm, L., and the latter the jAvorpémoy pixpdy of Dioseorides, or Lcliotropium europeum. The helioseopium, according to Pliny, was variously employed in medicine; thus the juice of the leaves with salt served for the removal of warts, whence the term herba verrucaria applied to the plant. What, from the perfume of its flowers, is sometimes ealled winter heliotrope, is the fragrant butterbur, or sweet-seented eoltsfoot, Petasites (Tussilago) fragrans, Presl., a perennial Compo- site plant. (For fig. see Maund, The Botanic Garden, i., pl. iv., fig. 4, 1878; and Gardener's Chron., Feb. 2, 1878, p. 147.)

See Ruiz and Pavon, IJ. Peruv., ii. 2-4, pl. evii—cxi., 1799; P. Miller, Dict., ed. T. Martyn, i. pt. ii., 1807; ZZist. Nat. de Plinie, cd. A. de Grandsagne, xiy. 158 seq., 1832; De Candolle, Prodr., x. 532, 1845; Bentham, Fl. Austral., iv. 392, 1869; Bentham and Hooker, Gen. Plant., ii. 848, 1873-76; Hemsley, Handb. of Hardy Trees and Shrubs, &c., p. 325, 1873; Proc. Americ. Acad, Arts and Sct., x. 49, Bost, 1875; Gardener's Chron., 1878, i.

21; and, for fig, of H, eS aa and H, corymbosum, Curtis's Bot. Mag., No. 141, 1791, and No. 1609,

HELIOTROPE, or Bioopstonz, a cryptocrystalline variety of quartz, dark green in colour, with small spots of red jasper, resembling drops of blood. The name, from the Greek 7#Axos, sun, and tpérw, to turn, is stated by Pliny (Wat, EHist., xxxvii. 60) to be due to its giving, when thrown into water, a red reflexion of the light of the sun. The modern heliotrope, however, is Pliny's prasius (op. ctt., xxxvi. 34); and what he terms heliotrope was apparently a leek-green prase or plasma, abundantly veined with blood- red jasper. Heliotropeis found in the Isle of Rum, and in Mull of Cantyre, Argyllshire, and in several foreign locali- ties. It is of common occurrence in the trap-rocks of the Deccan. Medicinal and other virtues were formerly ascribed to the stone. It is used for signet rings and a variety of ornamental articles.

HELL. See Escuatoxroey, vol. viii. p. 536.

HELLANICUS, the most important of the Greek logo- graphers, was a native of Mytilene. His father was named Andromenes or Aristomenes. His life, which, as Lucian tells, lasted eighty-five years, extends over the 5th century B.c., but the date of his birth is uncertain, and the circum- stances of his careerare unknown. If the quotation in the scholiast on Aristoph., Ran., 706, can be trusted (fr. 80), Hellanicus in one of his works r-ferred to the battle of Arginuse (406 B.c.). In that case (482-397 B.c.) the dates assigned by Miiller (Fragm. Hist. Gr,, i. p. xxxiv.), following the author of the Vita Luripidis, must be approximately correct. On the other hand Thucydides (i, 93), who died in 403 B.c., criticizes the work in which this statement might be expected to occur, which leaves a very narrow interval for the work to appear and acquire reputation enough to be taken notice of by Thucydides; while the style of the reference certainly suggests at first sight that Hella- nicus was dead when Thucydides was writing. If on these grounds we disregard the scholiast, we may on the authority of Pamphila assign 496-411 as the limits of his life. Suidas says that he died at Perperene, a town on the Gulf of Adramyttium, and that he lived for some time at the Macedonian court along with Herodotus. If the latter fact be

true, the time to which Suidas assigns it, viz., during the reign of Amyntas (553-504), is impossible.

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The following list of his works gives the results of Miiller's care- ful discussion of the extant fragments :—

(1.) Persica, probably in two books. This work, which was written before those on Greek history, gave (probably in bk. i.) an account of the Assyrians and the Medes, and (in bk. ii.) a history. of the Persian empire. (2.) Phoronis, Argolie traditions from Phoroneus, "father of mortal mien," the contemporary of Ogyges, down pro- bably to the return of the Heraclide. It consisted chiefly of genealogies, with short notices of events interspersed. It was pro- bably in two books; and the works quoted as Bwotica and Argolica are probably only portions of it. (8.) Deucalionia, tracing Thes- salian traditions in a similar manner from Deuealion, who corre- sponds to Phoroneus as the first man. It was in two books; and the Thessalica is probably only another name for it or the title of a part of it. Asopis was apparently au appendix giving the genealogy of the Macid race from Zeus and Atgina, daughter of Asopus, down to Miltiades. (4.) Atlantis, in two books, briefly enumerating the descendants of Atlas in general, but dwelling at much greater length on the offspring of Electra, aud introducing in this part an account of Trojan history. Hence the work is often eited under the name of Zvoica. The works quoted as ep) 'Apxadlas and wept Avdias are probably merely parts. (5.) Adthis, ealled by Thucydides (i. 97) 7 'Artixnh ovyypaph, giving in four books the history of the country from Ogyges or Ceerops down at least to the beginning of the Peloponnesian War. Thucydides says that he enumerated the events between 480 and 431 B.c. very briefly, and with little regard to chronological sequence. These four works on Greek history (2-5) were probably published in one single work, and were divided by later grammarians into separate sections and books. (6.) Lesbiaca @r Holica, a oivraypa émixéptov in two books at least. (7.) 'Iéperat THs "Hpas, a list of the priestesses of the Argive Hera, ineorporating a synopsis both of what had been seattcred through his other works and of history that had not come within the seope of these works. We may pre- suine that a list of priestesses was preserved in the temple with a

slight account of contemporary events, particularly those relating to festivals and religious matters, and that Hellanicus made this the basis of his work. Reference to this line of priestesses was one of the commonest methods of dating, and is used by Thucydides in important eases (ii. 2; iv. 183), This is probably the same work that is often referred to under the name of Historics. It was in three books ; the first eame down to the apotheosis of Heracles and the voyage of Theseus to Crete, and the second probably to the Persian Wars. (8.) Carnconice, a list of the victors in the Carncan games of Apollo from their foundation, Ol. 26; along with the conquerors in the poetical and musical contests, it probably contained notices of literary events. (9.) BapBapi& vduima, quoted also with the titles mep) é6vav, &e. As the history of the barbarian races was too little known to be arranged as Hellanicus had arranged the Greek history, the plan in this work was to enumerate the towns, and to describe the country, manners of the people, &c., like a geographer. The -gyptiaca and the Jtcr ad Templum Ammonis, which were parts of this work, are counted by Miiller spurious insertions on Orphie theology by an Egyptian writer; while Aids moAvruxla is merely a part of this spurious insertion. Preller (De Hellan. Lesb. Histor.) considers this whole work to be spurious.

As an historian Hellanicus is greatly in advance of preceding logographers. He was not content to repeat the traditions that had gained general acceptation through the poets, but he tried to give the traditions as they were locally eurrent, and he availed himself of the few national or priestly registers that presented something like contemporary registration. Thus, in the first place, he gave in many points accounts quite different from the usual beliefs: ¢.g., he recorded the local belief in the Troad that Troy had not been totally destroyed by the Greeks but had continued to exist to his own time; and in the ~~4éthis, touching on Spartan affairs, he made no reference to Lycurgus, but attributed the Spartan constitution to Eurysthenes and Procles. Now it is cer~~ tain that the Spartan state registers could not have made any mention of Lyeurgus on account of the plan on which they were framed (Miiller, Hist. Dor., i. p. 182). Secondly, Hellanicus laid the foundations of a scientifie chronology, thongh his materials were insufficient and he often had recourse to the usual rough reckoning by generations. On aceount of his deviations from common tradition, Hellanicus is often called an untrustworthy writer by the ancients

themselves; but probably few authors would have been more useful to a scientific student if his works had been preserved. Dionysius (Judie. de Thucyd.) censures him for arrang- ing his history, not according to the natural connexion of events, but according to the locality or the nation he was describing ; and undoubtedly he never, like his contemporary Herodotus, rose to the conception of a single current of events wider than the local distine- tion of race. His style, like that of the older logographers, was dry and bald; and there seems little foundation for the statement of Suidas that he wrote poetry, though perhaps some parts of the Aolica were in verse.

HELLEBORE

HELLEBORE (Greek, éAA€Bopos ; Modern Greek also oxépdy ; German, Nieswurz, Christwurz; French, ellébore, and, in the district of Avranche, herbe enragée), Helleborus, L,, a genus of plants of the natural order Ranunculacee,) natives of Europe, Western Asia, and North America. ~The leaves? are palmate or pedate (Botany, vol. iv. p. 111, fig. 108), are usually solitary, and have five persistent petaloid sepals, within the circle of which are placed the minute gland-like tubular petals, the nectaries of Linnzus, of the form of a horn with an irregular opening, and representing, according to Baillon (Wat. Hist. of Plants, i. 13, 1871), "the lower or outermost stamens trans- formed into staminodes."? The stamens are very numer- ous, and are spirally arranged ; and the carpels are variable in number, sessile or stipitate, and slightly united at the base, and dehisce by ventral suture (vol. iv. 141, 149).

Heileborus niger, L., Black Hellebore, or, as from blooming in mid-winter it is termed, the Christmas Rose (Ger., Schwarze Nics- wure ; Fr., Rose de Noél), is found in southern and central Europe, and with other species was cultivated in the time of Gerard (see Herbali, p. 977, ed. Johnson, 1733) in English gardens. Its knotty bracteated rhizome is blackish-brown externally, and, as with other species, gives origin to numerous straight roots. The leaves are

radical, coriaceous, smooth, distinctly pedate, dark green above,

and lighter below, with 7 to 9 segments, and long petioles. The scapes, which end the branches of the rhizome, have a loose entire

bract at the base, and terminate in a single flower, with two bracts,

Helleborus niger. 1, Vertical section of flowers; 2, nectary, side and front view (nat. size).

from the axis of one of which a second flower may be developed.

The flowers have 5 white or pale-rose, eventually greenish sepals,

15 to 18 lines in breadth; 8 to 13 tubular green petals containing

a sweet liquid secretion ; and 5 to 10 free carpels.

Varieties of Black Hellebore are H. niger minor, or H. angusti- folius, and Giant Hellebore, distinguished as H. niger major, maximus, giganteus, and grandijflorus, or as a distinct species, H. altifolius. H. foevidus, L., Stinking Hellebore, in Westmoreland Felon-grass, known also, from the shape of its leaves, as Bear's-foot (Fr., Pied de Griffon), is a native of England, where, like H. viridis, it is confined chiefly to limestone districts ; it is common in France and the south of Europe. Its leaves have 7- to 11-toothed divisions, and the flowers are in panicles, numerous, cup-shaped, and droop- ing, with many bracts, and green sepals tinged with purple, alter- nating with the five petals.

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1 On the plants known as White Hellebore (Veratrum album) and American White Hellebore, commonly called "Green Hellebore " (V. viride), which are members of the natural order Melanthacee, see -VERATRUM,

? On the development and structural relations of the leaves, see A, Trécul, Ann. Sci. Nat., Bot., ser. lil., tom. xx. 260, 268, pl. 23, figs. 101-3, 1853 ; and Clos, Bull. Soc. Bot. de France, iii. 682, 1856.

- *On the petals of the hellebores, see J. B. Payer, Traité d'Organo- génie comparée de la Fleur, pp. 256-260, 1857. In the opinion of Baillon (op.*

cit., pp. 15-21), the groups Hranthis and Coptis, from the structure of their flowers, as also strictly Zsopyrum and Trollius, should not be generically separated from Helleborus.

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H, viridis, L., or Green Hellebore proper, ranges from England, Where it is probably indigenous in some of the southern and eastern counties, to Spain and Italy, and even it is said to Turkey. It has bright yellowish-green flowers, 2 to 4 on a stem, with large leaf-like bracts. Brunfels and Bock (16th century) regarded the plant as the Black Hellebore of the Greeks,

The radical leaves of H. viridis and its varieties, as also of H.« multifidus, Visian, H. purpurascens, W. & K., H. cyclophyllus, Boiss., and several allied forms, wither in winter. In Z. vesicarius, Auch. (Boissier, #2. Orient.,i. 60), a native of Syria, the flower-stem bears 4 to 5 flowers, and the carpels are much compressed laterally, and, when ripe, united half way up, as in certain Nigelle. H. lividus, Soland (H. argutifolius, Viv., trifolius, Mill., and ilicifolius and triphyllus), Holly-leaved Hellebore, found in the Balearic lslands, and in Corsica and Sardinia, is remarkable for the handsomeness of its foliage. H. antiquorwm, Braun, which has purplish-white flowers, occurs in Bithynian Olympus. ZH. olympicus, Lindl., is perhaps a variety of it. HH. cyclophyllus (Boiss., Fl. Orient., i. 61), a Grecian species, has ovate-orbicular green sepals. H. orientalis, Lam., Ency., ill. 92 (H. ponticus, Braun, see Boiss., op. cit.), indigenous to Macdonia, Thrace, the vicinity of Constantinople, and northern Asia Minor as far east as Trebizond, has leaves pubescent below, and of 7 to 9 segments, and scapes bearing 3 to 5 flowers, with white or rosy sepals. Allied to it are H. odorus, W. & K., of which Koch regards H. atrorubens as a variety, and H. caucasicus, Koch,4 having green and purplish-green sepals respectively.

Hellebores may be grown in any ordinary light garden mould, but thrive best in a soil of about equal parts of turfy loam and well-rotted manure, with half a part each of fibrous peat and coarse sand, and in moist but thoroughly- drained situations, more especially where, as at the margins of shrubberies, the plants cau receive partial shade in summer. For propagation, cuttings of the rhizome may be taken in August, and placed in pans of light soil, with a bottom heat of 60° to 70° Fahr.; hellebores can

also be grown from seed, which must be sown as soon as ripe, since it quickly loses its vitality. The seedlings usually blossom in their third year. The exclusion of frost favours the pro- duction of flowers; but the plants, if forced, must be gradually inured to a warm atmosphere, and a free supply of air must be afforded, without which they are apt to become much affected by greenfly. The flowers on one plant of H. niger major in Mr B. Hooke's garden at Brad- field, Berks, about the end of January 1878, numbered nearly 500 (Gard. Chron., 1878, i. 145). For potting, ZZ. niger and its varieties, and ZZ. ortentalis, atrorubeus, and olympicus have been found well suited. After lifting, pre- ferably in September, the plants should receive plenty of light, with abundance of water, and once a week liquid manure, not over-strong. The flowers are improved in delicacy of hue, and are brought well up among the leaves, by preventing access of light except to the upper part of the plants. Of the numerous species of hellebore now

grown, the deep-purple-flowered ZH. colchicus is one of the

handsomest. ZH. atropurpureus, introduced in 1844, blooms in March or at the end of February, and may be effectively used in flower borders to succeed hepaticas, scillas, and crocuses (Maund, Bot. Gard., vi., pl. ccxviii, fig. 2). Helle- bores having variously coloured spreading or bell-shaped flowers, spotted with crimson, red, or purple, were grown by Sauer, late superintendent of the Berlin University Garden, about the year 1851, as the result of crossing /. guttatus, Braun, and H. purpurascens. Other fine varieties have been obtained by Bouché, his successor, from crosses with H. olympicus, and by Carl Heinemann from H. gut- tatus and ZZ. abchasicus.

The rhizome of H. niger occurs in commerce in irregular and nodular pieces, from about 1 to 3 inches in length,

4 According to Regel, H. orientalis, caucasicus, colchicus, anti- quorum, olympicus, guttatus, and abchasicus should all be reduced to one species. Koch (Gard. Chron., 1874, i. 118) regards the Hungarian H. purpurascens, W. & K., and the Caucasian H. colchicus, Reg. (=H. porphyromelas, Braun), as varieties of the last-named. The " H, abschasicus" of Belgian florists is stated by M. J. L. Le Béle ("Monog. des Helléb.," La Belgique Horticole, vii. 331) to be merely a variety of H. intermedius, Guss.

white, and of a horny texture within. Cut transversely it presents internally a circle of 8 to 12 cuneiform ligneous bundles, surrounded by a thick bark. It emits a faint odour when cut or broken, and has a bitter and slightly acrid taste. The drug is sometimes adulterated with the rhizome of baneberry, Actea spicata, L., which, however, may be recognized by the distinctly cruciate. appearance of the meditullium of the attached roots when cut across, and by its decoction giving the chemical reactions for tannin. 'The rhizome is darker in colour in proportion to its degree of dryness, age, and richness in oil. A specimen dried by Schroff lost in eleven days 65 per cent. of water.

H. niger, orientalis, viridis, fetidus, and several other species of hellebore contain the glucosides helleborin, CygH a2, and helleborein, CygH 4,015, the former yiclding glucose and helleboresin, CyoH3,0,, and the latter glucose and a ae substance helleboretin, ©,,H_903._ Helleborin is most a undant in H. viridis. A third and volatile principle is probably present in H. fetidus. Both helleborin and helleborein act ee on animals, but their decom position-products helleboresin and helleboretin secm to be devoid of any injurious qualities. Helleborein produces excitement and restlessness, followed by paralysis of the lower extremities or whole body, quickened respiration, swelling and injection of the ;nucous membranes, dilatation of the pupil, and, as with helleborein, salivation, vomiting, and diarrhea. Helleborein exercises on thie heart an action similar to that of digitalis, but more powerful, accompanied by at first yuickened and then slow and laboured respiration ; it irritates the conjunctiva, and acts as a sternutatory, but less violently than veratrine.

Of various species of hellebore examined by him, Schroff found IL orientalis to possess most medicinal activity ; less encrgetic in succession were H. viridis, fatidus, purpurascens, ponticus (? Braun, v. sup.), and niger. Pliny states that horses, oxen, and swine are killed by eating " black hellebore ," and Christison (On Poisons, p. 876, 11th ed., 1845) writes: '(1 have known severe griping pro- duced by merely tasting the fresh root in January." Parkinson, who questions the virulence of the drug 1640, fol.), possibly observed its effects in the dry condition. According to Bergius (Mat. Med.,

ii. 496, Stackh., 1778), the rhizome of H. niger, if fresh, is poisonous, rubefacient, and vesi- cant; when recently

gative, but alterative and diuretic. Rayer also has observed that when dried and powdered it is almost devoid of purgative properties. Poisonous doses of hellebore occasion in man singing in the ears, vertigo, stupor, thirst, with a feeling of suffocation, swelling of the

{mally collapse and death from cardiac paralysis. Inspection after Jeath reveals much inflammation of the stomach and intestines, more especially the rectum. The drug has been observed to exercise a cumulative action. lts extract was an ingredient in Bacher's pills, an empirical remedy once in great repute in France. Tn British medicine the rhizome was formerly official (see J. B. Nevins, Transl. New Lond. Pharm., p. 666, 2d ed., 1854), and the tincture, powder, or, more rarely, the decoction is still occasionally used. Parkinson (op. cit.) mentions the employment of the leaves and juice of H. niger "to help the Dropsie, Jaundies, and other evil dispositions of the liver and gall;" and Dr C. D, F. Phillips

(Mat. Med. and Therap., p. 27, 1874) has found the tincture of |

the rhizome of value in dropsical affections, especially in anasarca resulting from scarlet fever. H. fatidus was in past times much

| bore, J. D. Reuss,

| vi. 19, 1840; Stephenson and Churchill, Md. Bot., i., pl. x1. and xxi, | ville, Med. Bot.,

| D. J. Koch, Synop. Fl. Germ. et Helv. p. 21, 2d ed.,

(Theat. Botan., p. 216, | also xi, 20, where,

! si- | of the dispersion, had also many ee Be oa eg ee eam Skane in- 'and were remarkable there for their zeal. < s Et io y o a | ° . .

secti¢idal, and sternutatory: and after long keeping scarcely pur rosence in the capital of Judaism at all may safely be

extolled as an anthelmintic, and is recommended by Bisset (ed. |

Ess., pp. 169 and 195, 1766) as the best vermifuge-for children; J. Cook, however, remarks of it (Oxford Mag., March 1769, p. 99): "Where it killed not the patient, it would certainly kill the worms ; but the worst of it is, it will sometimes kill both." This plant, of old termed by farriers Ox-heel, Setter-wort, and Setter-grass, as well as H. viridis (Fr., Herbe a séton), is employed in vetcrinary surgery, to which also the use of H. niger is now chiefly confined in Britain.

In the early days of medicine two kinds of hellebore were recog- nized, the white, or Veratrum album (vide supra, note), and the black, including the various species of Helleborus. The former, according to Codronchius (Comm… . de Elleb., 1610), Castellus (De Helleb. Epist., 1622), and others, is the drug usually signified in the writings of Hippocrates. Among the hellebores indigenous to Greece and Asia Minor, H. orientalis, Lam. (v. supra), the rhizome of which differs from that of H. niger and of H. viridis in the bark being readily separable from the woody axis, is the species found by Schroff to answer best to the descriptions given by the ancients of black hellcbore, the €AAéBopos pedas of Dioscorides. The rhizome

1 E ¢ For the microscopical characters and for figures of transverse

i of the rhizome, see Lancssan, Mist. des Drogues, i. p. 6,

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of this plant, if identical, as would appear, with that obtained by Tournefort at Prusa in Asia Minor (fel. d'un Voy. du Levant, ii. 189, 1718), must be a remedy of no small toxic properties. Accord- ing to an early tradition, black hellebore administered by the sogthsayer and physician Melampus (whence its name JAelam- podiwnu), was the means of curing the madness of the dauglitcrs of Proetus, king of Argos. The drug was used by the ancients in paralysis, gout, and other diseases, more particularly in insanity, a fact frequently alluded to by classical writers, ¢.g., Horace (Sat., ii. 3, 80-83; Ep. ad Pis., 300). Various superstitions were in olden times connected with the cutting of black hellebore. The best is said by Pliny (Nat. Hist., xxv. 21) to grow on Mt. Helicon. Of the three Anticyras (see vol. li. p. 127), that in

Phocis was the most famed for its hellebore, which, being there used combined with '"sesamoides," was, according to Pliny, taken with more safety than elsewhere.

See Hayne, Arzney.-Gewéichse,

i. pl. 2 and 7-10, 1805; Sibthorp, Flora Greca,

1831; Wood- iii. 473-9, 38d ed., 1832; Spach, Suites a Buffon, Mist, Nat. des Vég., vii. 312-22, 1839; Reiche:.bach, Icon. Fl. Germ., iv., pl. citi-cxii., 1840; W. 1843, and Taschenb. d. Deutsch. u. Schweiz. Fl., p. 228, 2d ed., 1878; Schrotf, Prager Vierteljahressch. f. d. pract. SIeilk., \xii. 49-117, and Ixiii, 95-134, 1859; Berg and Schmidt, Of Gewdchse, iv., pl. xxix. sq., 1663; Syme, Sowerby's Eng, Bot., i. 56-59, pl. xliv., xlv., 1863; Marmé and Husemann, Zeitsch. d. vat. Medic. 3d scr., xxvi. 1-98, 1865, also Dis A. and T. Husemann, Die Pflanzenstoffe, p. 796, 1871; Gard. Chron., 1874, 1.480; 1877, i. 482, 464; The Garden, vii. 463, and xiv. 178, 451; The Florist, 1875, p. 159; Bentley and Trimen, Afed. Pl., pt. 5, No. 2, 1876; Journ. of Hort. and Cott. Gard., Nov. 21, 1877, p. 397; Von Boeck, Ziemssen's Cycl.of the Pract. of Med., xvii. 741, 1878; and for bibliography of early treatises on helle- Repert. Comment., ' Mat Med.," xi, 143, 1816; and E. J. Waring, Bibliotheca Therapeutica, ii, 458, New Cay. Soc., 1879. (F. H. B.)*

HELLENISTS ('EAAnvorai) was the name usually applied by those who called themselves Greeks (Hellenes) to all Graecizing and more especially to all Greek-speaking foreigners,—a class whic, after the conquests of Alexander the Great, formed a large and important element in almost every community throughout the civilized world. More particularly the word is applied in the New Testament (Acts vi. 1; ix. 29; and, according to the textus receptus, however, the best MSS. and critical edi- tions read "EAAnvas) to Greek-speaking or " Grecian" Jews, who, besides being very numerous in the various countries synagogues in Jerusalem, Indeed their

taken to have implied on their part a more than ordinary

"interest in the affairs of the ideal theocratic kingdom ; their

: attitude therefore to Christianity, when that new system tongue and fauces, emesis and catharsis, slowing of the pulse, and | – y

first came to be promulgated, could not fail to be very pro- nounced on the one side or on the other. The early records show that the apostles made many converts among the Hellenists of the city; and it is interesting to note that, if the names can be taken as a safe indication, all the seven deacons mentioned in Acts vi. 5 belonged to the " Hellen- istic" and not to the "Hebrew" party within the. primi- tive church. Saul of Tarsus also was a Hellenist; but whether he belonged to the synagogue of the " Libertines " orto that of "those of Cilicia" is a question which our data do not enable us to decide. In the Vulgate, which translates 'EAAyjvicral by the word " Greeci," the distinction go consistently preserved in our authorized version between '"'Grecians" and " Greeks " is made to disappear.
HELLESPONT, the modern DarpaNeELLes (vol. vi. p. 823), is variously named in classical literature 'Ed ijo- movtos, Hellespontus, 6 "EAAys zévros, Pontus Helles, Hellespontum Pelagus, and Fretum Hellesponticum. It received its name from Helle, in Greek mythology, daughter of Athamas, king of Orchomenus in Beotia, and of the goddess Nephele, whom he had married at the command of Hera (Juno). Athamas, however, secretly loved the mortal Ino, and on his marrying her also the dissensions between his wives became so great that he went to con- sult the Delphic oracle. The priestess there, bribed by Ino, assured him that the sacrifice of Phrixus, the brother of Helle, was necessary to domestic harmony ; but Nephele, in order to save her children, despatched them to Colchis in Asia, on the back of the ram with the golden fleece. Helle, however, had the misfortune, when crossing this strait, to

slip from her seat, and to be carried away by the current: | at Benty Grange in Derbyshire.

hence the name Hellespontus, or "Sea of Helle."

HELLIN (l/unum), ao town of Spain, in the province of Albacete, is situated on the slope of the Sierra de Segura, 35 miles S.S.E. of Albacete. It is a clean and well-built towa, and possesses the remains of an old Roman castle and a beautiful parish church, the masonry and marble pave- ment at the entrance of which are worthy of special notice. The principal manufactures are sulphur obtained from the celebrated mines about 13 miles distant, earthenware, linens, cloth, hats, leather, and oil. Hellin was sacked by the French under Montbrun ; and was the point where Joseph and Soult united with Suchet after Marmont's rout at Salamanca. The population is about 8000.

HELMERS, Jan Freverix (1767-1813), Dutch poet, was born at Amsterdam, March 7, 1767. His early poems Night (1788) and Socrates (1790) were tame and senti- mental, but he woke up after 1805 to the melancholy con- dition of the Fatherland, and determined, in company with his friend Cornelis Loots, to rouse national feeling by a burst of patriotic poetry. His poems, published in 1809 und 1810, but especially his great work Zhe Dutch Nation (1812), created great enthusiasm and enjoyed immense success. Helmers died at Amsterdam, February 26, 1813. He was a fiery, somewhat turgid writer, by no means devoid of force, but owing his success mainly to the integrity of his patriotism and the opportune moment at which he sounded his counterblast to the French oppression. His posthumous poems was collected in 1815.

HELMET, or Het (Anglo-Saxon, Helm ; Italian, Elme, Elmetto; French, Heaume ; Icelandic, Hjalmr), is the term used in a general sense to includg the various forms of head defences which were either made in solid metal or of metal plates. The form of helmet used among the Assyrians, as shown by the monumental sculptures, was a close-fitting skull-cap, round or conical, sometimes surmounted by a crest rising from the summit of the cone and curving forwards in a semicircular form. The Greek helmet was also in its simplest form a skull-cap, covering the head in front above the level of the eyes, but reaching down to the nape of the neck from ear to ear. Another form had this lower part prolonged and carried round so as to cover all above the shoulders with the exception of a slit in front, partly protected by a nose-piece. Occasionally hinged cheek-pieces were added to the skull-cap, and the upper part of the casque was sometimes prolonged

into a conical shape with a crest curving forwards, or surmounted by a ridged prominence on which was fastened a flowing crest of horsehair. The Greek helmets are often represented as highly decorated, and many examples of the different forms and their varieties of decoration occur on the painted vases, the gems, and the coinage. The Etruscan helmet differed but slightly from that of the Greeks. It was more conical in form, and often furnished with horns or wings in place of a crest. The Roman helmet was usually a skull-cap, with or without crest, and often plain and undecorated. The Gaulish helmet, of which a beautiful specimen was obtained from an Iron Age burial at Berru in Marne in 1872, was of hammered iron, conical in shape, terminating m an ornamental apex, and having a richly decorated border round the lower part. Conical helmets of an earlier character found at Theil and Auxonne have been assigned to the Age of Bronze. A silver helmet of the Early Iron Age, consisting of a skull-cap with a mask for the face fastened together by a hinge, which was found in the Thorsbjerg Moss in South Jutland, is the only specimen known of the early Teutonic helmet. An Anglo-Saxon helmet of iron, shaped like a skull-cap, and formed of ribs or flat strips of metal, covered with plates of horn, and sur-

mounted with the figure of a boar, was found in a tumulus |

Such boar-crowned helmets are referred to in the Anglo-Saxon poem of Beo- wulf. The helmets worn by the Normans and Saxons at the time of the Conquest, as shown in the Bayeux tapestry, were conical in shape with a projecting nasal. The earliest known example of a date subsequent to the Norman Conquest is one which was discovered in the church of Faversham, and is now in the Musée d'Artillerie at Paris. It preserves the conical top of the earlier Norman headpiece, but has a barrel-shaped body, covering all the head and face with the exception of a vertical slit partially protected by a projecting nasal, and having transverse apertures on either side for the eyes. This barrel-shape, with flattened instead of conical top, continued in use during the 12th century in England, although the conical cap with the nasal, appears on the great seals of the Scottish kings down to the time of Alexander II. The helm of Edward the Black Prince (died 1370), which still hangs over his tomb in Canterbury Cathedral, has the top shaped like a

truncated cone and the lower part more oval than barrel-shaped, the aperture for sight taking the form of a transverse slit between the upper and lower parts of the helm. In the lower portion the perforations for breathing are arranged in the form of a crown on both sides. The helm of Henry V. (died 1422), which hangs with his saddle and shield above his tomb in Westminster Abbey, is lower in the crown, more rounded to the shape of the head, and thie oculariwm or perforation

| for sight is protected by the projection of the lower part

beyond the line of the upper. The helm of King Henry VI., which was suspended over his tomb in St George's Chapel, Windsor, has the lower part contracted to the form of the neck and rounded to the shape of the shoulders. The oculariwm, which is wide, is protected by a series of curved bars riveted across it. The helm of Edward IV. (died 1483), which was also suspended in St George's Chapel, exhibits a still greater shaping to the form of the neck and shoulders; the top is rounder, and hasa spike for a crest. In the endof the 15th century the great helm was superseded by the smaller headpiece with movable vizor and beaver or chinpiece and neck guard, which is properly styled a helmet. Other varieties of headpiece were the bascinet, of a plain oval form pointed at the top and somewhat compressed on the sides, having holes at the bottom for the attachment of the camail or gorget of chain-mail. The bascinet was sometimes worn alone and sometimes under the helm. It was succeeded in the 15th century by the salade, a lighter skull-cap with the hinder part projecting, aud occasionally a movable vizor. The armet, the burgonet, and the casque are varieties of the lighter form of head- piece, partaking more or less of the skull-cap form, while the morion and the chapelle de fer were distinguished by their flattened brims. '

HELMOND, a town of the Netherlands, in the province of North Brabant, to the left of the river Aa, with a station (since 1866) on the state railway between Venloo and Eind- hoven. The castle of Helmond remains a beautiful speci- men of the architecture of the 15th century, and among the other buildings of note in the town are the spacious church of St Lambert, the Reformed church, and the town-house. Cotton-weaving on a very extensive scale, dyeing, iron- founding, brewing, soap-boiling, and tobacco

dressing are the chief industries of the commune. The popula- tion of the town proper in 1870 was only 5280, but the commune, which includes several suburbs, had about

6500.

Helmond is first mentioned as a town in 1354, but it may pos- sibly be identical with a certain Harlemont or Harlomont which appears in the 12th century. In the middle of the 18th century it was the favourite residence of Mary of Brabant, queen of the

Romans. Fortified shortly after the attack of the people of Guelder- land in 1543, it continued a place of military importance till the

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peace of Miinster. The occupation of the town by the duke of Parma in 1579, its recovery by the states of Holland in 1581, its capture by the count of Hohenlohe in 1588, and the seizure of the castle by Count Frederick of Nassau are the chief events in its military annals. In 1814 the town received the right of parlia- mentary representation, but it afterwards lost the privilege.

HELMONT, Jean Baptiste van (1577-1644), was born at Brussels in 1577. He was educated at Louvain, and began the study of natural science under the Jesuits in that city. Their hard and dry philosophy, however, had few attractions for a nature so ardent and imaginative as his. Turning for relief to other systems, he found no rest except in the mysticism of A Kempis and Tauler. From them he learned that wisdom is the gift of the Supreme Being, that it must be obtained by prayer, and that we must renounce our own will if we wish to participate in the influence of the divine grace. From this time he began a life of exem- plary meekness and humility, made over his property to his sister, and retired from the high society in which he had hitherto walked. He devoted himself to the study of medicine, read carefully all that had been written on the science, and felt dissatisfied with its method and results. He then turned to Paracelsus and the alchemists, and con- ferred a real boon on humanity by rescuing chemical science from the erratic absurdities of the post-Paracelsian alche- mists, and applying to it

more philosophical principles. He graduated as M.D. in 1599, and, after travelling through France and Italy, Switzerland and England, married a rich lady of Brabant, by whom he had several children. He died in Holland in 1644, in the sixty-seventh year of his age. Science is under real obligations to Van Helmont, though the greater part of his speculations present a curious mixture of mystical philosophy and acute chemical research. To him is due the invention, or at least the first application, of the term '"'gas" in the sense in which it is now used. He also discovered that gas was disengaged in abundance by the application of heat to various bodies, and during the solution of various carbonates and metals in acids.

Van Helmont's works were published at Amsterdam in 1648 by his son Mercurius ; a more accurate and complete edition is that of Elzevir, 1652. The fullest account of his speculations is given in Rixner and Sieber, Bettrdge zur Geschichte der Physiologie (1819-26), Hft. vii. See,also Spiess, Helmont's System der Medicin, 1840; Rommelaere, Etudes sur J. B. v. Helmont, 1868. Van Helmont's mystical theosophy and alchemy appeared in even greater confusion in the works of his youngest son, Franz Mercurius, who was born in 1618 and died, after a somewhat adventurous and troubled lite,

at Berlin in 1699. His chief works are Cabbalah Denudata, 1677; Paradoxal Discourses, 1685; and Opuseula Philosophiea, 1690.

HELMSTADT, or Hetmsrepr, a town of Germany in the duchy of Brunswick, is situated on the railway from Magdeburg to Brunswick, 23 miles E. of Brunswick. It is the seat of a circle directorate, and of a circle and a dis- trict court. The principal buildings are the Juleum in the Byzantine style, founded by Duke Julius of Brunswick in 1575 for the university which was abolished in 1809, and now containing an old library of 40,000 volumes; the church of St Stephen's, dating from the 12th century; the Lutheran female institution, with a beautiful church in the Roman style ; and the Catholic church and ruined monas- tery of St Ludger. The educational institutions include a gymnasium, two city schools, an agricultural school, and two female schools of the higher grade. The principal manufactures are yarn, soap, tobacco, sugar, vitriol, earthen- ware, and tobacco pipes. Not far from the town there is an iron mineral spring especially efficacious in

gouty affec- tions. Near it a monument has been erected to those who fell in the Franco-German war of 1870-71; and in the town there is also a monument to those who fell at Waterloo. The population in 1875 was 7783.

Helmstidt originated in connexion with the Ludger monastery, founded by Ludger, the first bishop of Miinster, about the end of

the 8th century. It obtained town rights in 1099, and although destroyed by the archbishop of Magdeburg in 1199 it was soon

rebuilt. In 1457 it joined the Hansa, and in 1490 it came into the possession of Brunswick. See Kunhard, Bettrdge zur Geschichte der Universitit Helmstddts, 1797; Ludewig, Gesehichte und Be- sehreibung der Stadt Helmstddt, 1821; Gesehiehte der ehemaligen Hoehsehule Julia Carolina zu Helinstédt, 1876.

HELOISE. See ABELARD.

HELOTS, in Grecian antiquity, were the serfs or bonds- men of the Spartans. The most probable of the various explanations of their origin seems to be that they were the early aborigines of Laconia, who at the time of the Dorian invasion werc reduced to slavery by the conquerors. The name is perhaps best derived from the root éA, found in éetv, #Awv, and other words. The Helots were the lowest class of the inhabitants of Sparta; but those of them who were emancipated formed the class of Veodamodes, next in political rights to the Spartan citizens themselves. The Mothones or Mathakes were domestic slaves who had been brought up along with the young Spartans, and afterwards liberated. The Helots were the property of the state, which alone had the right of emancipating them, although it made over their services to individuals. They were attached to the soil—adscriptz glebe—and could not be sold away from it. They tilled the land which was allocated to them in the proportion of one lot to several families ; and for each lot they paid to their masters an annual rent of 82 medimni of barley, and a quantity of wine and oil. They were also employed on public works, and performed all domestic service. In time of war the Helots generally served as light-armed troops; but when on special emergencies they fought

as hoplites, they were usually rewarded with their freedom, The first occurrence of this kind was under Brassidas in 424 B.c. In the fleet the great bulk of the sailors were Helots. Although every care was taken to distinguish the serf from his lord, even in the matter of dress, the accounts of the cruel treatment of the Helots by the Spartans only hold true of the later history of Lace- demon. 'The condition of the Helot was better than that of a slave in other Greek states, for, being a serf of the soil, he was not wholly at the mercy of his master, and there was a legal way whereby, after many stages, he could eventually attain freedom and citizenship. After the Messenian war, however, when the multitude of the Helots made them formidable to the diminished numbers of the full citizens, there is no doubt that very cruel measures were adopted against them. The evidence is strong that the Crypteva, instituted ostensibly to inure the Spartan youth to hardship, was really intended to reduce the number of the Helots by assassination ; and we know from Thucydides (iv. 80) that on one occasion 2000 Helots were treacherously massacred by the Spartan citizens. At the close of the second Messenian war (668 B.c.), the conquered Messenians were classed with and treated as the Helots, till Epaminondas restored them to their native country after the battle of Leuctra (371 B.c.).

For further details sec Plutarch's Life of Lycurgus, Thirlwall's History of Greeee, Grote's History of Greece, Miiller's History of the Dorians, and Hermann's Political Antiquities of Grecee.

HELPS, Sir Arruur (1813-1875), fourth and youngest son of Thomas and Ann Frisquett Helps, was born at Balham Hill, in the parish of Streatham and county of Surrey, on the 10th of July 1813. His father was then and for many years afterwards head of a large mercantile house in the city of London, and for the last thirteen years of his life treasurer of St Bartholomew's Hospital. His mother was the only surviving child of John, fourth son of the Rev. Charles Plucknett, M.A., of Wincanton. After the usual preliminary training at Eton, young Helps went to Trinity College, Cambridge, passing as B.A. in 1835, when he came out 31st wrangler in the mathematical tripos, and taking his M.A. degree in 1839. Although he took no high honours at the university,—and indeed he

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had not health sufficiently robust, even if he had possessed the ambition, to achieve them,—he was recognized by the ablest of his contemporaries there as a man of superior gifts, and likely to make his mark in after life. They showed this by electing him as a member of the Conversazione Society, better known as the Apostles, a society which had been established in 1820 for the purposes of discussion on social and literary questions by a few young men attracted to each other by a common taste for literature and specula- tion. A body which in its early days included the names of Charles Buller, Frederick Maurice, Richard Chenevix Trench, Monckton Milnes, Arthur Hallam, and Alfred Tennyson had in it every element to make its gatherings delightful as well as useful. To be elected into its limited circle was a distinction of which Arthur Helps was proud then and to the close of his life; and, familiar as he was with the best and most intellectual society of his time, the social hours passed year by year with the Cambridge Apostles were always counted by him among his happiest, both in anticipation and in remembrance.

In the discussions of these and later days Helps may have found the suggestions for the dialogues of the /'riends in Council, in which his genius appears at his best. But his first literary effort, which appeared under the title of Lhoughts in the Cloister and the Crowd in 1835, the year he took his B.A. degree, assumes a very different but scarcely less ambitious form, that of a series of aphorisms upon life, cliaracter, politics, and manners. Asarule, such things are only valuable when they come as the fruits of wide experience and matured thought. Still in this volume are to be found passages which may take their place beside the sayings of Vauvenargues, Chamfort, and other masters of aphorism of the second rank, and are quite equal in quality to the many pithy quotable sayings scattered through Helps's later works.

Soon after leaving the university, where he had estab- lished many valuable friendships, Arthur Helps became private secretary to Mr Spring Rice (afterwards Lord Monteagle), then chancellor of the exchequer in Lord Melbourne's administration, This appointment he filled till 1840, when he went to Ireland as the private secretary of Lord Morpeth (afterwards earl of Carlisle), then the chief secretary of state for Ireland, where he remained until his principal left Ireland in 1841, on the Government pass- ing from

Lord Melbourne into the hands of Sir Robert Peel. In the meanwhile (28th October 1836) Helps had married Miss Bessy Fuller, a young Irish lady. He was also appointed one of the commissioners for the settlement of certain Danish claims which dated so far back as the siege of Copenhagen ; but with the fall of the Melbourne adminis- tration his official experience closed for a period of nearly twenty years. The character whicli he had established for himself by his tact, sagacity, and business habits was not, however, forgotten by his political friends. And combined as these qualities were with an admirable manner which invited confidence while it repelled intrusion, and with a reticence and discretion on which absolute reliance could be placed, his fitness for official life was unmistakable. When therefore the clerkship of the Privy Council became vacant in 1860, on the resignation of the Hon. W. L. Bathurst, he was recommended for the appointment by his old friend Lord Granville, who knew that for ability, tact, and discretion it could not be in safer hands.

During his early official career Helps cultivated literature with varying success. His Lssays written in the Intervals of Business, published in 1841, and his Claims of Labour, an Lissay on the Duties of the Employers to the Employed, published in 1844, continue to interest, and are likely to keep their place in well-selected libraries. But two plays, King Henry the Second, an Historical Drama, and Catherine

Douglas, a Tragedy, both published in 1843, have no particular merit. Neither in these, nor in his only other dramatic effort, Culita the Serf, published in 1858, a work far superior, however, to his earlier efforts of the same kind, are to be found the sense of dramatic situation and move- ment, the sharp outlines and contrast of character, or the fitness and concise force of diction which alone justify the selection by an author of the dramatic form as the vehicle for his thoughts. Helps possessed, however, just enough dramatic power to give life and individuality to the dialo- gues which he introduced with excellent effect to enliven many of his other books. His first effort in this direction was in Friends in Council, a Series of Readings and Dis- course thereon, published in 1847and1851. The plan of this book seems to have been suggested by a passage in Bacon's essay Of Discourse,

which appears as the motto of it. "It is good in discourse and speech of conversation to vary and intermingle speech of the present occasion with arguments, tales with reasons, asking of questions with telling of opinions, and jest with earnest; for it is a dull thing to tire, and, as we say now, to jade anything too far." The variety and conflict of opinion, the play of character, the flashes of humour, got by submitting the formal essays on social and moral questions which made the staple of these volumes to be criticized and pulled to pieces by the imagi- nary personages, who, under the names of Milverton, Elles- mere, and Dunsford, grew to be almost as real to Helps's readers as they certainly became to himself, gave a special charm to a book which, by its richness of suggestion, its sweetness of tone, and beauty of style, made for its author a high and enduring reputation. The same expedient was resorted to for the discussion of the ideas of social and philanthropic improvement on which Helps's mind was always at work, in a second series of Mriends in Council, published in 1859, and again in Conversations on War and General Culture, published in 1871. The old familiar speakers, with others added, also appeared in his Realmah, and finally in what certainly must always rank as the best of its author's later works, Zalk about Animals and their Masters, published in 1873.

The subject of slavery was one which had a peculiar fascination for Helps. A long essay is devoted to it in the first series of Friends in Council. This was subsequently elaborated into a work in two volumes published in 1848 and 1852, called The Conquerors of the New World and their Bondsmen. Helps's interest in the subject led him into further investigations into the history of the conquest of America by the Spaniards, and he went to Spain in 1847 for the special purpose of examining the numerous MSS. bearing upon the subject at Madrid. The fruits of these researches were embodied in an historical work based upon huis Conquerors of the New World, and called The Spanish Conquest in America, and its Relation to the History of Slavery and the Government of Colonies. This appeared in four volumes during the years 1855, 1857, and 1861. No pains were spared by its author to secure the most scrupulous accuracy as to the facts with which he dealt. He had found, as most inquirers into the sources of history have found, that this accuracy is rarely to be met with in accepted histories. On this point he was determined that he should not be opeu to censure ; and so anxious was he that fact should not be coloured or distorted by imagination that he

deliberately resisted the temptation to use the picturesque method of treatment by which other writers on the same subject have secured popularity. The success of this work with the public was injured by other peculiarities. History, like fiction, will not bear to be written with an obtrusively moral purpose, as this book was written. Its merits in a literary point of view were also diminished by the author's tendency to suspend the onward movement of the narrative,

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whilst he pauses to analyse character, to investigate motives, and to philosophize upon results.

This book, the result of years of research and meditation, was not a success. Butthe excellence of the studies of the» great pioneers of Spanish conquest which it contained was quickly perceived when some years afterwards they were recast and published as separate biographies. Thus Zhe Life of Las Casas, the Apostle of the Indians, appeared in 1868, The Life of Columbus in 1869, The Lofe of Pizarro in the same year, and The Life of Hernando Cortes in | 1871. In this form all that is most important as well as | attractive in the larger historical work has been placed within the reach of a wide circle of readers, to whom the result of Helps's researches otherwise would have been unknown.

From the time of his appointment as Clerk of the Council in 1860 to his death, Helps continued to add to the already considerable list of books, all dealing in one form or another with questions of social, sanitary, or political reform, which he had most earnestly at heart. Noman felt more strongly that, in the words of Lamennais (Livre du Peuple, cap. i.), "things in this world are not as they ought to be." No man was more eager to do what he might towards obviating or curing the folly, stupidity, ignorance, lethargy, and selfishness to which so much of the misery, the ill-health, the suffering, and the sin of the world is due, It was a matter of conscience to do what he could towards "the | relief of man's estate," by putting again and again before the world the results of his observation and thought upon its defective social and sanitary arrangements, and in this the reason is to be found for nearly all his books. Besides | those which have been already mentioned the following may be named to complete the list :—Organization

in Daily Life, an Essay (1862), Realmah (2 vols. 1869), Casimir Maremma (1870), (1871), Thoughts upon Government (1872), Lefe and Labours of Mr Thomas Brassey (1872), Ivan de Biron (1874), Social Pressure (1875).

His appointment as Clerk of the Council broughit him into personal communication with the Queen, and also with the late Prince Consort. They were not slow to find how valu- able a servant they had obtained in him. His powers of mind, his gentle, reserved manners, and his tender almost | chivalrous devotion to the sovereign, not demonstrated yet subtly making itself felt, produced their natural effect in winning the confidence and respect of these high personages. After the Prince's death, the Queen early turned to Helps to prepare such a sketch of the prince's character as might make her people aware how much they as well as herself had lost by his early death, The task was undertaken by Helps, and performed with all the excellence which might have been anticipated from his sympathy with the great aims and objects of the Prince's life, and his practised skill in the analysis and portrayal of character. His intro- duction to the collection, published in 1862, of the Prince Consort's speeches and addresses was the first, and will pro- | bably always be the standard, attempt to sketch in clear and | vivid outlines the varied characteristics of this remarkable — man. Helps some years afterwards edited and wrote an introductory preface to the series of extracts from the | Queen's diary, which were published in 1868 under the title Leaves from a Journal of Our Life in the Highlands. In 1864 he received the honorary degree of D.C.L. from the university of Oxford. He was made a C.B. in LS? lL, and K.C.B. in the following year.

At no time of his life very strong, an obvious decline of | vital strength, accelerated probably by anxiety from embar- | rassments in which his later years were involved by unfor-

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Brevia, Short Essays and Aphorisms |

| has remained in the possession of Sweden.

tunate speculations in the purchase of land, was visible to Sir Arthur Helps's friends for some years before his death. |

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| This came after only a few days' illness on the 7th of

Marchi 1875.

Sir Arthur Helps was of middle height, slender, dark in com- plexion, with a high well-defined forehead, deep-set eyes, and a mouth the habitually grave expression of which was tempered by a pleasant smile, when his fancy was touched by the humorous suggestions of his own mind, or the playfulness or wit of others, to which he was peculiarly seusitive. Something of the delieacy of his frame entered into his mauner and conversation, which were marked by an avoidance of everything approaching vehemence or even emphasis. He loved good talk, and his low vibrant voice and grave playfulness of mind were very pleasant, when among trusted. friends he was tempted into taking an active part in the give and take of easy conversation. But he was in manhood what he was in youth, when we aro told by one who knew him well, " he had not the physical force or the auimal spirits which predispose novices to oral controversy." Asa rule, he was more ready in general soeiety to listen than to talk,—especially when people were present whose

_ character was worth studying, or whose ideas were fresh and based

upon experience or comprehensive study. He was always learning, and a new thought or pregnant suggestion dropped by a friend in conversation was often to be found soon afterwards in his writings carefully developed, and illnstrated from his own fertile stores of reading and rescarch, As might be expected from his books, there was a sympathetic charm in his familiar intercourse which was peculiarly fascinating. His sensitiveness to pain, especially to moral pain, was extreme, and would have unfitted him for much of the rough work and ways of the world. As an orator, a character for which he had many intellectual qualities, he could scarcely have failed to attain a high rank. He was himself not unconscious of lis gifts in this direction; but he was altogether of too fine a fibre for the hard hitting and the fiery struggle of the political arena, in which alore he would have coveted distinction. isely, therefore, he made for himself, as was well said by a friend at the time of his death, " work of another sort, applying his gentle

ever busy mind to such discussion as purifies the thought, informs the pity, and confirms the forbearance of mankind." To the last his mind retained its vigour as well as its delicacy of perception. Nor would he have regarded it as among the least happy circum- stances of his lot on earth that he was taken away before either of these had been touched by the palsy of decay—taken, moreover, swiftly and by no lingering illness to wear out the spirits of him- self and those to whom he was dear. (I. MA.) HELSINGBORG, a town of Sweden, province of Skane and lin of Malmé, is beautifully situated at the narrowest part of the Sound—there only 3 miles wide— opposite Elsinore, and 32 miles N.N.W. of Malmo, | ft is connected with the Swedish railway by a branch line to Hessleholm and Eslif, and it has regular communication with Denmark by steamer. The harbour, completed in 1832, is sufficient for vessels of an ordinary size. The inhabi- tants are chiefly engaged in fishing, commerce, and agri- culture, Corn is the principal export. A short distance north-east of the town there is a mineral spring, and about 2 miles south-east are the more famous wells of Ramlosa. The sea-baths to the north of the town are much frequented

in summer, At Hodganiis, about a mile and a half north,

there are extensive coal-mines and also a pottery. The

population, which in 1800 was only 1761, in 1860 was 5053, and in 1876 had reached 10,066.

Helsingborg is one of the oldest towns of Sweden. The original site is marked by the tower of Karnan (i.e. the ehurn), which was probably the strongest in the old fortress first mentioned in the year 1135. In the 14th century it was several times besieged. From 1370 it, along with the other towns of Skane, was joined for fifteen years to the Hanseatic League, The fortress having been laid waste by fire in 1418, King Eric of Pomerania about 1425 built a new fortress near the sea, and caused the town to be transplanted thither, bestowing upon it at the same time important privileges. Until 1658 it belonged to Denmark, and it was again occupied by the Danes in 1676 and 1677. In 1684 its fortifications were dis- mantled, It was retaken by Frederick 1V. of Denmark in November 1709 ; but his troops, undcr General Rantzau, were scverely defeated near it by General

Stenbock, 10th March 1710, from which time it In 1711 it was again bombarded by the Danes.

HELSINGFORS (Finnish, Helsinki), chief city of the grand-duchy of Finland and the government of Nyland, in the district Helsinge, on the Gulf of Finland, 274 miles by rail west of St Petersburg. The latitude of the observatory is 60° 9’ 4” N., and longitude 24° 57’ 39” E. from Greenwich.

The town is well laid out, with long and wide streets run- ning at right angles. The houses are large and well built, and the principal square contains several fine buildings, as the senate-house, the university, and a magnificent church. Helsingfors has a colossal Russo-Greek cathedral, assembly- rooms, botanical gardens, an observatory well supplied with both astronomical and magnetic instruments, a beautifully decorated theatre, and other handsome public buildings. The university, removed from Abo in 1827, has 4 faculties, 53 professors, and about 900 students, and possesses a museum with extensive natural history and mineralogical collections, an ethnological collection, and a chemical laboratory. There are scientific, literary; and other learned societies, a normal lyceum, polytechnic institute, school for the blind, school of navigation, asylum for the insane, hospitals, and other edu- cational and charitable institutions. Helsingfors is the seat of the governor-general of Finland, the imperial senate, and all the central officers of the grand-duchy. In the hall of the senate-house is a splendid throne for the emperor; in the ritter-house the various branches of the assembly meet, and there also are the remains of the library saved from the fire of Abo, and containing 15,000 volumes. Helsing- fors has several machinery manufactures (one with 850 workpeople), and produces at the rate of £100,000 per annum; it has also porcelain, faience, sugar, and tobacco factories, There are two considerable harbours, with a handsome granite quay extending along the front of the town. In 1870 the population was 32,113, in 1879 about

40,000.

Helsingfors has the largest import trade in Finland, consisting mainly of wool, colonial and manufactured wares, salt, wine, &c., amounting in 1874

to £1,635,744, in 1878 to £3,748,487. The exports consist chiefly of wooden wares, the total amounting to £2,340,327 in 1878. Of the imports £437,100 came from, and of the exports £87,541 went to, England. In 1874 880 vessels of 158,717 registered tons entered the port, and in 1878 713 vessels of 73,297 tons; in 1874 980 of 159,549 tons cleared, and in 1878 825 of 122,170 tons. In 1876 the port possessed 43 vessels (18 of them steamers) of 4129 tons.

Helsingfors was founded by Gustavus Vasa in the 16th century, about 4 miles N.E. of the present site, to which it was removed by Queen Christina of Sweden in 1642. In 1742 it was the scene of the capitulation of the Swedes under Lowenhaupt; but in 1749 the fortress of Sveaborg was erected by the Swedish high admiral, Count Ehrenwerd, who at his own request was afterwards buried within its walls. In 1808 Admiral Cronstedt surrendcred the place to the Russians under General Suchtalen. A combined squadron of the French and English bombarded Sveaborg in 1808.

See Brummer, Historiska Uppgifter om Helsingfor's, 1874.

HELST, BARTHOLOMZUS VAN DER, was born in Holland at the opening of the 17th century, and died at Amsterdam in 1670. The date and place of his birth are uncertain; and it is equally difficult to confirm or to deny the time- honoured statement that he was born in 1613 at Amster- dam. It has been urged indeed by competent authority that Van der Helst was not a native of Amsterdam, because a family of that name lived as early as 1607 at Haarlem, and pictures are shown as works of Van der Helst in the Haarlem Museum which might tend to prove that he was in practice there before he acquired repute at Amsterdam. Unhappily Bartholomew has not been traced amongst the children of Severijn van der Helst, who married at Haarlem in 1607, and there is no proof that the pictures at Haarlem are really his; though if they were so they would show that he learnt his art from Frans Hals and became a skilled master as early as 1631. Scheltema, a very competent judge in matters of Dutch art chronology, supposes that Van der Helst~ was a resident at Amsterdam in 1636. His first great picture, representing a gathering of civic guards at a brewery, is variously assigned to 1639 and 1643, and still adorns the town-hall of Amsterdam. His noble

portraits of the burgomaster Bicker and Andreas Bicker the younger, in the gallery of Amsterdam, of the same date no doubt as Bicker's wife

lately in the Ruhl collection at Cologne, were completed in 1642. From that time till his death there is no difficulty in tracing Van der Helst's career at Amsterdam. He acquired and kept the position of a distinguished portrait-painter, producing indeed little or nothing besides portraits at any time, but founding, in conjunction with Nicolaes de Helt Stokade, the painters' guild at Amsterdam in 1654. At some unknown date he married Constance Reynst, of a good patrician family in the Netherlands, bought himself a house in the Doelenstrasse, and ended by earning a com- petence. His likeness of Paul Potter at the Hague, executed in 1654, and his partnership with Backhuysen, who laid in the backgrounds of some of his pictures in 1668, indicate a constant companionship with the best artists of the time. Waagen has said that his portrait of Admiral Kortenaar, in the gallery of Amsterdam, betrays the teaching of Frans Hals, and the statement need not be gainsaid; yet on the whole Van der Helst's career as a painter was mainly a pro- test against the systems of Hals and Rembrandt. It is needless to dwell on the pictures which preceded that of 1648, called the Peace of Miinster, in the gallery of Amsterdam. The Peace challenges comparison at once with the so-called Night Watch by Rembrandt, and the less important but not less characteristic portraits of Hails and his wife in a neighbouring room. Sir Joshua Reynolds was disappointed by Rembrandt, whilst Van der Helst surpassed his expectation. But Biirger asked whether Reynolds had not already been struck with blindness when he veutured on this criticism. The question is still an open one. But certainly Van der Helst attracts by qualities entirely differing from those of Rembrandt and Frans Hals. Nothing can be more striking than the contrast between the strong concentrated light and the deep gloom of Rem- brandt and the contempt of chiaroscuro peculiar to his rival, except the contrast between the rapid sketchy touch of Hals and the careful finish and rounding of Van der Helst. The Peace is a meeting of guards to celebrate the signature of the treaty of Miinster. The members of the Doele of St George meet to feast and congratulate each other not at a formal banquet but in a spot laid out for good cheer, where De Wit, the captain of his company, can shake hands

with his lieutenant Waveren, yet hold in solemn state the great drinking-horn of St George. The rest of the com- pany sit, stand, or busy themselves around,—some eating, others drinking, others carving or serving—an animated scene on a long canvas, with figures large as life. Well has Biirger said, the heads are full of life and the hands admirable. Tho dresses and subordinate parts are finished to a nicety without sacrifice of detail or loss of breadth in touch or impast. But the eye glides from shape to shape, arrested here by expressive features, there by a bright stretch of colours, nowhere at perfect rest because of the lack of a central thought in light and shade, harmonies, or composition, Great as the qualities of Van der Helst un- doubtedly are, he remains below the line of demarcation which separates the second from the first-rate masters of art.

His pictures are very numerous, and almost uniformly good ; but in his later creations he wants power, and though still amazingly

careful, he becomes grey and woolly in touch. At Amsterdam the four regents in the Werkhuys (1650), four syndics in the gallery (1656), and four syndics in the town-hall (1657) are masterpieces, to which may be added a number of fine single portraits. Rotter- dam, notwithstanding the fire of 1864, still boasts of three of Van der Helst's works. The Hague, as we saw, owns but one. — St Petersburg, on the other hand, possesses ten or eleven, of various shades of excellence. The Louvre has three, Munich four. Other pieces are in the galleries of Berlin, Brunswick, Brussels, Carlsrulie, Cassel, Darmstadt, Dresden, Frankfort, Gotha, Stuttgart, and Vienna.

HELSTON, a municipal and parliamentary borough and market-town of England, county of Cornwall, is situated on the declivity of a hill on the river Cober, 9 miles S.W.

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of Falmouth. It consists of four main streets intersecting each other at right angles; at their junction in the centre stands the market-house. The principal other buildings are the church dedicated to St Michael and built by the earl of Godolphin in 1763, the town-hall, the old coinage hall, the

literary institute, the grammar school, and the union work- house. The prosperity of the town is due to its being the centre of an extensive agricultural and mining district. The principal manufacture is shoes. At Portheven, about 3 miles distant, a considerable export and import trade is carried on. Population of municipal borough (1871), 3797; of parliamentary borough (area 10,992 acres), 8760. Helston is one of the original coinage towns. It obtained a charter from King John, and the privilege was conferred on it by Edward III. of holding a market and fairs. It was made a cor- porate town by Elizabeth. Before the Reform Act of 1832 it returned two members to parliament, but it now returns only one.

HELVETII. See SwITZERLAND.

HELVETIUS, Cravpe Aprren (1715-1771), was descended from a family of physicians, the first of whom, John Frederick Schweitzer (Latinized into Helvetius), migrated from Germany to Hoiland about the year 1649, and became physician to the prince of Orange. His later years were spent in the study of alchemy. His son, John Adrien, also a physician, went to Paris in the hope of estab- lishing a sale for his father's drugs. He failed in this attempt, but was so fortunate as to introduce with the greatest success the use of ipecacuanha, then an unknown drug. The duchess of Chaulnes, whom he had treated successfully, introduced him to Colbert, who recommended the young physician to the dauphin, after which his reputa- tion was firmly established. His son, John Claude Adrien, who embraced the same career with even greater success, was appointed inspector-general of the military hospitals of Flanders and first physician to the Queen Marie Leczinska. He was remarkable for the generosity with which he received and visited poor patients who could pay him nothing. His son, Claude Adrien, the future author of De Esprit, showed as a boy little aptitude for study, but was fond of desultory reading. His father, who destined him for finance, placed him for a few years with his maternal uncle, M. D'Arman- court, "directeur des fermes" at Caen. There he learned all that was necessary for a profession so simple, and having plenty of spare time amused himself with writing verses and cultivating social graces. He was elected a member of the academy of Caen, and when he was only twenty- three years of age he had the singular good fortune to be appointed, at the queen's request, to a place as farmer-general ; in other words, while still a

very young man he was put into a post of great responsibility and dignity which was worth a hundred thousand crowns a year. Thus provided, young Helvetius proceeded to enjoy life to the utmost. He had every advantage except one, that of noble birth; he was the handsomest man of his time; he was possessed of a manner singularly charming; he was able to hold his own among the scholars and philosophers and poets; he was skilled in all those arts cultivated by gentlemen ; he was generous like his father, and his great fortune enabled him to gratify his love of giving; he had an inclination to letters, and was a friend of Fontenelle, Voltaire, and Montesquieu, besides being a patron of such writers as Marivaux, Saurin, and Sabatier. Probably there was no young man in Paris in the years 1740 and 1750 who occu- pied a more enviable position or was more entirely conteuted with his lot than this spoiled child of fortune, on whose name there rested but one blot, an almost morbid desire to excel. So far indeed did he carry this passion for distinc- tion that he once danced on the stage of the opera under the mask and name of the public favourite Javillier.

As he grew older, his social successes and bonnes fortunes naturally ceased ; the splendour of his youth had vanished ;

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he began to dream of other and more lasting distinctions. Maupertuis, he observed, had put mathematics in fashion ; he himself would be a mathematician. trious for poetry; he too would be a poet. had made so brilliant a success with his Hsprit des Lows that he himself would become a philosopher. dream seems to have produced nothing ; his poetical ambi- tions resulted in his poem called Le Bonheur, in which he develops the idea that true happiness is only to be found in making the interest of one that of all; his philosophical studies ended in the production of his famous book De

Voltaire was illus- Montesquieu

The mathematical

Esprit, the composition of which occupied him for more than seven years. In the year 1751 he married, his wife

being a niece of Madame de Graffigny, the author of Lettres une Péruvienne ; and he spent eight months in the year at his newly purchased estate of Voré in Le Perche; the remaining four months were given up to Paris and his duties of mattre ’hétel to the queen.

It was characteristic of the man that as soon as he thought his fortune sufficient for his wants he gave up his post of farmer-general. The

history of his life in the country is full of anecdotes which

illustrate his generous and kindly disposition : he relieved

the poor, sent physicians to the sick, mediated between

those who quarreiled, encouraged agriculture, developed

industries, and found happiness in the patriarchal life of a

French seigneur, being as great a stickler as any for his seigneurial rights. It was in 1758 that his book De ? Esprit, which was to be the rival of L’Hsprit des Lois, appeared. It was so far successful at the very outset as to attract immediate attention and to arouse the most formid-

able opposition, at the head of which was the dauphin, son

of Louis XV. The Sorbonne condemned the book ; the priests persuaded the court that it was full of the most dangerous doctrines, and the author, terrified at the storm he had raised, wrote three separate retractations ; yet, in spite of his protestations of orthodoxy, he had to give up his office at the court, and the book was publicly burned by the hangman. The virulence of the attacks upon the work, as much as its intrinsic merit, caused the whole world to read it; it was translated into almost all the languages of Europe; it was discussed in every literary circle. Yet the Esprit des Lois lives and is still studied with profit, while De /’ Esprit has long since been forgotten. It is indeed difficult to understand that the work could ever have had any serious influence upon the thought of the time. Voltaire said it was full of commonplaces ; Buffon maliciously said that “ Helvétius aurait dé faire un

livre de moins et un bail de plus dans les fermes du roi ;" Rousseau declared that the very benevolence of the author gave the lie to his principles ; Grimm thought that all the ideas in the book were borrowed from Diderot ; Madame du Deffand said that Helvetius had raised such a storm by simply revealing the '"'great secret"; Madame de Graffigny averred that all the good things in the book had been picked up in her own salon.

As for the philosophy of the book, it belongs to the selfish school ; the four discussions of which it consists have been thus summed up :—(1) all man's faculties may be reduced to physical sensation ; memory, comparison, judgment, are only feeling; our only difference from the lower animals lies in our external organization ; (2) our interest, founded on the love of pleasure and the fear of pain, is the only spring of our judgments, our actions, our affections ; we have no liberty of choice between good and evil; there is no such thing as absolute right—ideas of justice and injus- tice change according to customs; (3) the inequalities of intellect do not depend on a more or less perfect organiza- tion, but have their cause in the unequal desire for instruc- tion, and this desire springs from passions of which all men commonly well organized are susceptible to the same degree ;

we can therefore all love glory with the same enthusiasm, and we owe all to education; (4) in this discourse the author treats of the ideas which are attached to such words as genius, imagination, talent, taste, good sense, &e. It is sufficient to add that, although the book was reprinted after the author's death, it ceased to have any influence even during his own life.

In 1764 Helvetius visited England, and the next year, on the invitation of Frederick, he went to Berlin, where the king paid him marked attention. He then returned to his country estate and passed the remainder of his life in perfect tranquillity. He died in 1771 at the age of fifty- six, leaving behind him a widow, who died in 1800, and two daughters.

A sort of supplement to the De l'Esprit, called De Homme, de ses facultés intellectuelles et de son éducation, was found among his manuscripts after his death, and was published, but created little interest. Editions of the work, however, appeared in 1772, 1773, and 1786. The complete works of Helvetius were published in 1774, 1777, 1781, 1794, 1795, and 1818. The best estimate of his work and place among the philosophers of the 18th century is that by Cousin (@wvres, ii.). (W. BE.)

HELVIDIUS PRISCUS lived in the Ist century, during the reigns of Nero, Galba, Otho, Vitellius, and Vespasian. In those evil days he won the respect of all good men by his fearless love of freedom. Among the cringing and obsequious senators of Rome he dared to be sincere and outspoken, Tacitus says of him (//tst,, iv. 5) that in his early youth he devoted his great abilities to the highest pursuits, and made it his object to enter on public life with a spirit thoroughly fortified against all contingencies. It was natural that such a man should be a warm adherent of the Stoic school of philosophy. His father-in-law, Thrasea Peetus, had been the same; he had been driven to suicide in Nero's reign, and his last words to Helvidius were— "Young man, you have been born into times in which it is well to brace the spirit with examples of courage" (Tacitus, Annals, xvi. 35). Although he repeatedly offended the emperor, he held several high offices. During Nero's reign he was questor in the province of Achaia; he was also sent into Armenia in command of a legion, and by his good sense and moderation he succeeded in restoring peace and order in that country. By the provincials he was respected and trusted. His well-known sympathies with such men as Brutus and Cassius occasioned his banishment in 66 a.D., and he lived with his wife Fannia in Macedonia until Nero's death. Having been recalled to Rome by Galba in 68 a.pD., he at once impeached Eprius Marcellus, one of the most villanous of the informers, and the very man who had been the accuser of Thrasea Petus. After an angry debate he dropped the charge, as the condemnation of Marcellus would have involved a host of senators in like ruin. As preetor-elect he had once the courage to oppose Vitellius in the senate, and again as preetor in the following year he ventured to argue against the financial policy of Vespasian. Such matters, he maintained, ought to be left to the discretion of the senate. He proposed that the Capitol, which had been destroyed in the Neronian con- flagration, should be

restored at the public cost. It would seem that he rather perversely went out of his way to insult Vespasian, saluting him by his private name, and not recognizing him as emperor in the edicts he had to publish as preetor. There was very possibly in all this some of the affectation which often characterized the Stoics. The end of it was that he was banished, his wife Fannia, whose constancy and virtue are highly commended by his friend the younger Pliny, going with him into exile. Shortly afterwards he was executed by Vespasian's order. His life was written at his widow's request by Herennius Senecio ; it took the form of a warm panegyric, and proved fatal to its author in the reign of Domitian.

| friend Maximilien Bullot completed the edition.

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HELVOETSLUYS (in Dutch, Hellevoetsluis), a fortified town of the Netherlands, in the province of South Holland, situated in the south of the island of Voorne-and-Putten, on the shore of the Haringvliet. It possesses a good harbour, a dry and a wet dock, extensive wharves, and a naval arsenal, and among its more important public build- ings are the communal chambers, the Reformed church dating from 1661-1684, the Roman Catholic church, the synagogue, and the naval college. The population was only 1208 in 1795; by 1840 it had increased to 2523, and by 1874 it was 4135.

Helvoetsluys was founded in the 17th century. The construction

| of the dock was decreed by the statcs of Holland in 1636, and the

erection of the fortifications in 1688; but it was not till 1696 that the works were completed. The new harbour soon became an im- portant rendezvous for the Dutch fleet, and in 1688 it was the starting-point of William of Orange's expedition to England.

HELYOT, Prerre (1660-1716), monastic historian, was born at Paris in January 1660, of supposed English descent. After spending his youth in study, he entered in his twenty- fourth year the convent of the third order of St Francis, founded at Picpus, near Paris, by his uncle Jéréme Helyot,

canon of St Sepulchre. There he took the name of Pére Hippolyte. Two journeys to Rome on monastic business afforded him the opportunity of travelling over most of Italy ; and after his final return he saw much of France, while acting as secretary to various provincials of his order there. Both in Italy and France he was engaged in collecting materials for his great. work, which occupied him about twenty-five years, L'/Zistoire des Ordres Monastiques, Religieux, et Militaires, et des Congrégations Séculiéres, de

Cun et de Vautre Sexe, qui ont été établies jusqu' & présent, published in 8 volumes in 1714-21.

Helyot died on January 5, 1716, before the fifth volume appeared, but his This work, appearing at first anonymously, has been republished several times, and translated into German. Helyot's only other noteworthy work is Le Chrétien Mourant (1695). HEMANS, Fenicra Dorotuza (1793-1835), was born in Duke Street, Liverpool, September 25, 1793. Her

father, George Browne, of Irish extraction, was at the

time of her birth a merchant in Liverpool, and her mother, whose maiden name was Wagner, wus the daughter of tlie Austrian and Tuscan consul at. Liverpool, and of united German and Italian descent. Felicia, the fifth of seven children, was scarcely seven years old when her father failed in business, and retired with his family to Gwrych, near Abergele; and there the young poetess and her brotliers and sisters grew up in the wildest seclusion, in a romantic old house by the sea-shore, and in the very midst of the mountains and myths of Wales, the monotony of her young life being varied only by two visits to London, which she never revisited in after years. The little Felicia was a lovely, precociouschild. Her education was desultory ; and she may indeed be said to have educated herself, the only subjects in which she ever received regular instruction having been French, English grammar, and the rudiments of Latin. Books of chronicle and romance, and every kind of poetry, she read with avidity ; and she studied Italian, Spanish, Portuguese, and German sufficiently to be able to read them with ease and enjoyment. She was also fond of music, and played on the harp and piano, her preference being for simple national and pathetic melodies, especially those of Wales and Spain. In 1808, when she was only

fourteen, a quarto volume of her Juvenile Poems was pub- lished by subscription. Among the earliest of these were " Congratulatory Lines on her Mother's Birthday," "A Prayer," an " Address to the Deity," and some " Lines to Shakespeare,"——stiff, little, childish productions, which show, however, a good ear for rhythm and a considerable imitative faculty. The verses having been rather harshly

criticized in the Monthly Review, the little poetess was for some days in tears ; but the muse was soon reawakened. One of her brothers was fighting in Spain under Sir John Moore ; and Felicia, fired with military enthusiasm, wrote England and Spain, or Valour and Patriotism, a poem of some length and much elaboration, which was afterwards published and translated into Spanish. Her second volume, entitled Zhe Domestic Affections and other Poems, appeared in 1812, on the eve of her marriage to Captain Hemans, which took place in the summer of that year. She lived for some time at Daventry, where her husband was appointed adjutant of the Northamptonshire militia; but about this time her father went on some commercial enter- prise to Quebec and died there ; and, after the birth of her eldest son, she and her husband took up their abode with her widowed mother at Bronwylfa. Here during the next six years four more children—all boys—were born; but in spite of domestic cares and uncertain health she still read and wrote indefatigably. Her poem entitled The Restora- tion of Works of Art to Italy was published in 1816, her Modern Greece in 1817, and in the following year appeared her volume of Translations from Camoens and other Poets.

In 1818 Captain Hemans went to Rome, leaving his wife, shortly before the birth of their fifth child, with her mother at Bronwylfa. No further explanation than that it was in the first instance for Captain Hemans's health has ever been offered of this step ; there seems to have been then merely a tacit agreement, perhaps on account of their limited means, that they should live for a time apart. Letters were interchanged, and Captain Hemans was often consulted about his children; but the husband and wife remained separate, and indeed never met again. Kind and influ- ential friends among them the bishop of St Asaph and Bishop Heber—clustered

round the poetess and her children, Her health, however, began to fail her, and her beauty, which was of a peculiarly delicate type, is said to have faded rapidly, leaving behind it an habitually worn and har- assed expression. She became subject, too, to paroxysms of beating of the heart. Yet for the next six years her literary industry never flagged. In 1819 she published Z'ales and Historic Scenes in Verse, and in the same year she gained a prize of £50 offered for the best poem on The Meeting of Wallace and Bruce on the Banks of the Carron. The poem was published in Blackwood's Magazine. In 1820 appeared The Sceptic and Stanzas to the Memory of the late King. In June 1821 she won the prize awarded by the Royal Society of Literature for the best poem on the subject of Dartmoor, and during the same year she began her play, Zhe Vespers of Palerm>. She now applied herself to a course of German reading. Korner was her favourite German poet, and her lines on the grave of Kérner were one of the first English tributes to the genius of the young soldier-poet. The Vorce of Spring, one of her best known lyrics, was written in 1825, the same year in which she began to contribute to the Wew Monthly Magazine ; and in the summer of 1823 a volume of her poems was published by Murray, containing 'The Siege of Valencia," "The Last Constantine," and " Belshaz- zar's Feast," which last had appeared previously in a collec- tion edited for a charitable purpose by Joanna Baillie. The Vespers of Palermo was acted at Covent Garden, December 12, 1823, and Mrs Hemans received £200 for the copyright ; but, though the leading parts were taken by Young and Charles Kemble, the play was a failure, and was withdrawn after the first performance. It was acted again in Edin- burgh in the following April with greater success, when an epilogue, written for it by Sir Walter Scott at Joanna Baillie's request, was spoken by Mrs Henry Siddons. An interchange of notes on this subject was the beginning of a cordial friendship between Mrs Hemans and the novelist. In the same year she wrote De Chatillon, or the Crusaders ;

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but the manuscript was mysteriously lost, and the poem was not published till two years after her death, and then from a rough copy. In 1824 she began "The Forest Sanctuary," which appeared a year later with the '"

Lays of Many Lands" and miscellaneous pieces collected from the New Monthly Magazine and other periodicals.

In the spring of 1825 Mrs Hemans, with her mother and children and an unmarried sister, removed from Bronwylfa, which had been purchased by her brother, to Rhyllon, another house belonging to him on an opposite heiglit across the 1iver Clwyd. The contrast between the two houses suggested her Dramatic Scene between Bronwylfa and Rhyllon. The house itself was bare and unpicturesque, but the beauty of its surroundings has been celebrated in 'The Hour of Romance," "To the River Clwyd in North Wales," "Our Lady's Well," and "To a Distant Scene." This time seems to have been the most tranquil in Mrs Hemans's life. Her children were growing up about her ; her own variable health was at its best ; her popularity was spreading, not only in England but in America, where Professor Norton of Harvard university undertook to superintend the publication of a complete edition of her works and to secure to her the profits. But the death of her mother in January 1827 was a second great break- ing-point in'her life. Her own health began to alarm her ; and though the nature of her illness, which afterwards proved heart complaint, was not.at first apparent, she was from this time an acknowledged invalid. In the summer of 1828 the Records of Woman was published by Blackwood, and in the same year the home in Wales was finally broken up by the marriage of Mrs Hemans's sister and the departure of her two elder boys to their father in Rome. Mrs Hemans therefore left Rhyllon, and took a very small house in the village of Wavertree, near Liverpool, where she hoped to obtain good schooling for her children and society for her- self. But, although she had a few intimate friends there, —among them her two subsequent biographers, Henry F. Chorley and Mrs Lawrence of Wavertree Hall,—she was disappointed in her new home. She thought the people of Liverpool stupid and provincial; and they, on the other hand, found her uncommunicative and eccentric. In the following summer she travelled by sea to Scotland with two of her boys, to visit the Hamiltons of Chiefswood. This visit to Scotland was one of the most daring feats, and perhaps the richest episode, in her uneventful life. She was cordially welcomed in Edinburgh, dined with Jeffrey and other celebrities, visited Henry Mackenzie, heard Ali- son preach, and stayed with Sir David and Lady Wedder- burn, and with Sir Robert Liston at Milburn, where she sat for a

bust to Angus Fletcher. Above all, while she was at Chiefswood, she enjoyed "constant, almost daily, intercourse" with Sir Walter Scott, with whom she and her boys afterwards stayed some time at Abbotsford. "There are some whom we meet, and should like ever after to claim as kith and kin; and you are one of those," was Scott's compliment to her at parting. One of the results of her Edinburgh visit was an article, full of praise, judiciously tempered with criticism, by Jeffrey himself for the Bdzn- burgh Review. The poetess returned to Wavertree to com- pose her Songs of the Affections, which were published early in 1830. In the following June, however, she again left home, this time to visit Wordsworth and the Lake country ; and in August she paid a second visit to Scotland. She was resolved to leave Wavertree, and wished to make Edinburgh her home ; but the climate was pronounced too rigorous, and, as a brother and his family were already settled in Ireland, it was arranged that she sliould go to live in Dublin. In her new home kind friends and ad- mirers gathered round the invalid, who now had with her only the youngest of her children. She was obliged

to lie constantly, and the exertion of writing began to be painful to her. Her poetry of this date is chiefly religious. Early in 1834 her Mymns for Childhood, which had appeared some years before in America, were published in Dublin. At the same time appeared her collection of ational Lyrics, and shortly afterwards Scenes and Hymns of Lafe. She was planning also a series of German studies, to consist of translations from German authors, with introductions and explanatory notes, one of which, on Goethe's 7'asso, was completed and published in the Vew Monthly Magazine for January 1834, In intervals of acute suffering she wrote the lyric Despondency and Aspiration, and dictated a series of sonnets called Thoughts during Sickness, the last of which, "' Recovery," was written when she fancied she was getting well. After three months spent at Redesdale, Archbishop Whately's country seat, which had been placed at the disposal of the dying poetess, she was again brought into Dublin, where she lingered till spring. The use of her limbs was entirely gone; but her passion for reading remained to the last, and the table at her bedside was strewn with books, one of which always lay open. Her last poem, the Sabbath Sonnet, was dictated to her brother on Sunday April 26th, and she

died on the evening of Saturday, May 16, 1835, at the age of forty-one. She was buried in a vault under St Anne's church, Dublin. Besides the bust of Mrs Hemans by Angus Fletcher, there were three portraits taken of her in 1827 by the American painter West, one of which has been engraved ; and another portrait, an engraving of which is in Chorley's Memorials, was painted in 1831 by a young Irish artist, Edward Robinson.

Mrs Hemans's poetry is the production of a fine imagina- tive and enthusiastic temperament, but not of a commanding intellect or very complex or subtle nature. It is the out- come of a beautiful but singularly circumscribed life, a life spent in romantic seclusion, without much worldly experi- ence, and warped and saddened by domestic unliappiness and real physical suffering. Perhaps from these circum- stances, aided by a course of self-instruction at best desul- tory and unguided, the emotional in a sensitive and intensely feminine nature was unduly cultivated; and this undue preponderance of the emotional is a prevailing characteristic in Mrs Hemans's poetry, and one to which Scott alluded when he complained that it was " too poetical," that it con- tained "too many flowers" and "too little fruit." Her genius—beautiful and pleasing as it was—was not of a very high order. Like her favourite music, it lay within a small compass, and give little opportunity for intricate harmonies. Tlius her tragedies, and her longer and more complicated poems, such as The Sceptic and Forest Sanctuary, though by no means devoid of striking passages, are the least not- able of her works. It is not, however, as the writer of these more ambitious productions, which in her own time were but doubtful successes and are now rarely read, but as the authoress of many short occasional pieces, and especi- ally as a lyrist, that Felicia Hemans has earned so high a place among our poets. In her lyrics she could concentrate her strength on the perfect expression of simple themes. Her skill in versification, her delicate ear for rhythm, and the few ruling sentiments of her nature here found ample scope. In her lyrics Mrs Hemans is uniformly graceful, tender, delicately refined,—sometimes perhaps, even here, too fervent, too emotional,—but always pure and spiritual in tone; and in these too she occasionally displays those rarer qualities which belong only to the finest lyric genius. Many of her poems, such as "The Treasures of the Deep," "The Better Land," "The Homes of England," " Casa- bianca," " The Palm Tree," "The Graves of a

Household," "The Wreck," " The Dying Improvisatore," and " The Lost Pleiad," have become standard English lyrics, and on the

strength of these, and others such as these, Felicia Hemans is ranked among our chief British lyrical poets.

_ An edition of Mrs Hemans's Poetical Works was published, 2 vols., in 1832; Poetical Remains, with Memoir by Delta, 1836; Jfemorials, &e., by H. F. Chorley, 1836; Recollections of Mrs Hemans, by Mrs Lawrence, 1836; Works of Mrs Hemans, with a Memoir of her Life, by her sister (Mrs Hughes), 7 vols., 1839, and American reprint, 2 vols., 1847; Early Blessings, a Colleetion of Poems written between eight and fifteen years of age, with a Life of the Authoress, 1840; Poems, chronologically arranged, Edin., 1849; Poems, copyright edition, Edin. and London, 1872; Poetieal Works, with critical memoir by W. M. Rossetti, London and Edin., 1873. (F. M.)

HEMEL-HEMPSTEAD, a market-town of England, county of Hertford, is pleasantly situated on the declivity of a hill near the river Gade, 23 miles N.W. of London, 14 miles from the Boxmoor station of the London and North-Western Railway, and on a branch line of the Midland Railway. The town consists almost wholly of one main street about a mile in length. Among the principal build- ings are the parish church, cruciform in shape, and partly Norman in style, surmounted by a lofty octagonal spire, and containing an old brass of the time of Edward IIL; the town-hall, a long narrow building formerly supported on square wooden pillars, but whose open market-place underneath has now been converted into a corn exchange ; the union workhouse, and the West Herts infirmary. The chief industry is straw plaiting, but there are also manu- factories of paper, an iron foundry, breweries, and tanneries, The population of the township in 1871 was 5996, and of the parish 8720.

From its name, meaning high stead or place, the town is appa- rently of Saxon origin. In Domesday it is written Henamsteda and Hamelamestede. It received a charter of incorporation from Henry VIIL., which was renewed

by Cromwell. It still makes annual choice of a bailiff, but he possesses no magisterial authority.

HEMEROBAPTISTS, an ancient Jewish sect, so named. from their observing a practice of daily ablution as an essential part of religion. Epiphanius, who mentions their doctrine as the fourth heresy among the Jews, classes the Hemerobaptists doctrinally with the Pharisees, from whom they differed only in, like the Sadducees, denying the resurrection of the dead. The name has been sometimes given to the Mendeans on account of their frequent ablutions ; and in the Clementine Homilies (ii. 23) St Jolin the Baptist is spoken of as a Hemerobaptist. Mention of the sect is made by Hegesippus (see Euseb., Hist. Eccl., iv. 22) and by Justin Martyr in the Dialogue with Tryphon.

HEMINGFORD, or HemMIncrorD, WALTER, a Latin chironicler of the 14th century, was a canon regular of the Austin Priory of Gisborough, now Guisborough, in York- shire. Leland calls him Hemengoburgus, and in one of the manuscripts of his chronicle his name appears as Heming- burght. In a document of the priory the name is also given as De Hemingburgh ; and in Gisborough Chartulary mention is made of a neighbouring family of that name. Bale seems to have been the first to give him the name by which he is more commonly known. His clironicle em- braces the period of English history from the Conquest (1066) to the nineteenth year of Edward IIl., with the exception of the latter years of Edward II. Jt ends with the title of a chapter in which it was proposed to describe the battle of Crécy (1346); but the chronicler seems to have died before the required information reached him. In compiling the first part, Hemingford apparently used the histories of Eadmor, Hoveden, Henry of Huntingdon, and William of Newbury ; but the reigus of the three Edwards are original, composed from personal observation and infor- mation. 'There are several manuscripts of the history extant,—the best perhaps being that presented to the College of Arms by the earl of Arundel. The work is correct and judicious, and written in a pleasing style. One of its | special features is the preservation in its pages of copies of

the great charters; and Hemingford's versions have more than once supplied deficiencies and cleared up obscurities in copies from other sources.

The first three books were published by Dr Thomas Gale in 1687, in his Historie Anglicane Seriptores Quinque, and the remainder by Hearne in 1731. The first portion was again published in 1848 by the English Historical Society, under the title Chronicon de Gestis Regum Anglie, edited by H. C. Hamilton.

HEMIPTERA (jpu-, half, and zrepév, wing), an order of the Znsecta most commonly known by the name of " bugs," and containing the species so well known to infest houses. In their earlier stages they have what is known amongst naturalists as an incomplete metamorphosis; that is to say, after quitting the egg, and during the two stages of their existence before assuming tlie perfect form, they move freely about, thus unlike the Lepidoptera, &c., whose pupa state, or that preceding the perfection of the insect, is quiescent. When the transformations have been completed, the insect generally possesses four wings. The superior pair, or hemielytra as they are called by authors, are attached to the mesothorax, and are composed of two substances,—the basal portion coriaceous, or resembling leather, aud the apical one membranaceous, or resembling thin, transparent parchment. The lower pair are attached to the metathorax, and are entirely membranous and generally transparent, and capable of being folded when the insect is in repose. This segment of the sternum likewise bears on each side, anteriorly, a more or less reniform-shaped orifice, within which lies a sac containing the fluid or matter from which so many of the Heteropterous portion of the order emit a most disagreeable odour. They also possess in all stages a mouth (rostrum) composed of three or more joints formed for suctorial purposes.

The order is divided into two sub-orders, Hemiptera-~Heteroptera and Hemiptera-Homoptera, and these again are separated into divi- sions and subdivisions, the latter being distributed into familics which contain the various genera and species. Iu the first sub-order (Henviptera-Heteroptera) there are two divisions, viz., Gymnocerata and Cryptocerata, and the families comprised under these heads are 69 in number, the following being

the generally accepted order in which they are arranged, viz.: Paehycoride (in this family the scutellum is so enlarged as to cover the whole of the upper side of the abdomen, both pairs of wings being concealed beneath it when not in flight; in one genus at least the species might be mistaken for some of the Buprestide in Coleoptera, which they resemble in form and brilliancy of colour), EZurygastride, Podopide, Odonto- scelide, Plataspide, Oxynotide, Asopide, Cydnidw, Sciocoride, Phieide (this last contains but one genus, the species of which are most peculiar in appearance, as they resemble small, thin pieces of bark joined together), Halydide, Pentatomide, Urostylide, Edesside, Phyllocephalide, Megymenide, Spartoceride, Mietide, Nematopide, Homeceride, Syronustide, Acanthocoride, Anisoseelide, Alydide, Stenocephalide, Berytide, Coreide, Rhopalide, Lygeide, Dipso- coride,

line in length, 'The first family affects trees and plants, in many, instances distorting the leaves and buds; one of its species, Rhinocola speciosa, has been recorded by Lichtenstein in the annals of the French Entomological Society for 1872 as puncturing poplar leaves which afterwards attain the size and form of a cucumber. The Psyllidw differ from the second family in having the power to leap, their third pair of legs being formed for this purpose. The Aphidide are perhaps best known by the terms " blight," " green fly," &c. These are to be found almost always in large companies on nearly every kind of tree, plant, and shrub. They are said to produce the honey dew found upon maple and other trees, although this has been disputed by Dr Hooker in the Gardener's Chronicle for July 1873. They are furnished with two sctiform pipes or tubes, varying considerably in length in the different species, placed one on each side of the abdomen on the fourth segment from the apex, from which certainly is emitted a sweet fluid which the ants are well known to follow them for and consume. This family also contains the great vine-pest known by the name of Phylloxera vastatriz. The third family, Coccide, has amongst its members the well-known cochineal insect (Coeeus Cacti), from the female of which when gathered and killed is obtained the drug or dye used in giving the red colours, scarlet and crimson. It is also used for making carmine. The last division to be dealt with is called the Anoplura, and contains the most degraded forms of

the whole order, viz., the lice, the fullest information concerning which may be obtained by consulting the works of Nitzch, Burmeister, Leach, aud Denny.

Although the Hemiptera are of very ancient date, remains of some of the fossil forms having been found in the Primary and other formations, the number of these is but few; they are enumerated in a paper on " Fossil Entomology" by Mr H. Goss in vol. xv. of the Lntomologist's Monthly Magazine.

The whole of the group is extremely widely distributed, being found in almost every portion of the globe; and they are very varied both in form and in their modes of life,— man, animals, birds, insects, and plants being subjected to their attacks. On the Continent they have for a long period engaged the attention of naturalists, but in England little was known of the actual number inhabiting these islands until Douglas and Scott in 1865 published their volume of British Hemiptera-Heteroptera. In 1859 Dr A. Dohrn published what may be considered to be the first whole- world catalogue of the order ; and, taking it as a basis, for there is no other approximate list, and adding a reasonable amount of new species collected in each year since that time, their number would amount to nearly 10,500 species, 5300 belonging to the heteropterous section and the remainder to the second sub-order. Out ofthese Europe lays claim to at least 3000, whilst Great Britain is known to possess not fewer than 1000. There is no record of any one of the species being cosmopolitan (except perhaps the house bug, Acanthia lectularia), although some of the species inhabiting England are also to be met with in China and Japan. (5. sc.)

HEMLING. See MEmuine.

HEMLOCK is the Conium maculatum of botanists, a biennial umbelliferous plant, found wild in many parts of Great Britain and Ireland, where it occurs in waste places, on hedge-banks, and by the borders of fields, and which is also widely spread over Europe and temperate Asia, and naturalized in the cultivated districts of North and South America. It is an erect branching plant, growing from 3 to 6 feet high, and emitting a disagreeable smell, like that of mice. The stems are hollow, smooth, somewhat glaucous, green, spotted with dull dark purple, as alluded to in

the specific name, maculatum. The root-leaves have long furrowed footstalks, sheathing the stem at the base, and are large, triangular in outline, and repeatedly divided or compound, the ultimate and very numerous segments being small, ovate, and deeply incised at the edge. These leaves generally perish after the growth of the flowering stem, which takes place in the second year, while the leaves produced on the stem become gradually smaller upwards, The branches are all terminated by compound

many-rayed umbels of small white fiowers, the general in- volucres consisting of several, the partial ones of about three short lanceolate bracts, the latter being usually turned towards the outside of the umbel. The flowers are succeeded by broadly ovate fruits, the mericarps (half-fruits) having five ribs which, when mature, are waved or cre- nated; there are no vitte or oil-cysts; and when cut across the albumen is seen to be deeply furrowed on the inner face, so as to exhibit in section a reuiform outline. The fruits when triturated with a solution of caustic potash evolve a most unpleasant odour,

Hemlock is a virulent poison, but it varies much in potency according to the conditions under which it has grown, and the season or stage of growth at which it is gathered. In the first year the leaves have little power, nor in the second are their properties developed until the flowering period, at which time, or later on when the fruits are fully grown, the plant should be gathered. The wild plant growing in exposed situations is to be preferred to garden-grown samples, and is more potent in dry warm summers than in those which are dull and moist.

The poisonous property of hemlock resides chiefly in the alkaloid conine or conta which is found in both the fruits and the leaves, though in exceedingly small proportions in the latter. Conine resembles nicotine in its deleterious action, but is much less powerful. No chemical antidote for it is known. The plant also yields a second less poisonous crystallizable base called conhydrine, which may be converted into conine by the abstraction of the elements of water.

When collected for medicinal purposes, for which both leaves and fruits are used, the former should be gathered at the time the plant is in full blossom, while the latter are said to possess the greatest degree of energy just before they ripen. The fruits are the chief source whence conine is pre- pared. The principal forms in which hemlock is employed are the extract and juice of hemlock, hemlock poultice, and the tincture of hemlock fruits. Large doses produce vertigo, nausea, and paralysis; but in smaller quantities, administered by skilful hands, it has a sedative action on the nerves. It bas also some reputation as an alterative and resolvent, and as an anodyne.

The acrid narcotic properties of the plant render it of some importance that one should be able to identify it, the more so as some of the ecompound-leaved umbellifers, which have a general similarity of appearance to it, form wholesome food for man and animals. Not only is this knowledge desirable to prevent the poisonous plant being detrimentally used in place of the wholesome one; it is equally important in the opposite case, namely, to prevent the inert being substituted for the remedial agent. The plant with which hemlock is most likely to be confounded is the Anthriscus sylvestris, or cow-parsley, the leaves of which are freely eaten by cattle and rabbits; this plant, like the hemlock, has spotted stems but they are hairy, not hair-less ; it has much-divided leaves of the same general form, but they are downy and aromatic, not smooth and nauseous when bruised; the fruit of the Anthriscus, besides, is linear- oblong and not ovate.

HEMP, Cannabis sativa, an annual herb, having angular rough stems and alternate lobed leaves. The bast fibres of Cannabis are the hemp of commerce, but under the name of hemp fibrous products from many different plants are often included. Sunn hemp is the bast fibre of a papilio-naceous plant, Crotolaria juncea, of India and the Sunda Islands ; Hibiscus cannabinus, an Indian malvaceous plant, yields brown or Bombay hemp; Jute or Paut hemp is pro- duced by Corchorus capsularis and C. olitorius, and to some extent by C. fuscus, C. fascicularis, and C. decem- angulatus. Manila hemp or feather fibre is derived from

the fibro-vascular bundles of certain monocotyledons, namely, several species of Musa, chiefly from MZ. textilis, but to some extent from MW.

sapientum, MM. ensete, M. minda- nensis, and M. Cavendishii, in India, New Guinea, the Philippines, &c. Pita hemp is produced from certain species of Agave; the Aloe stsalina of Central America yields grass-hemp; and Murva or bowstring-hemp is obtained from an aloe-like plant, Sanseviera zeylanica, in Bengal, Ceylon, Java, and southern China.

The hemp plant, like the hop, which is the other member of the same natural order, Cannabinacee, is dicecious, that is, the male and female flowers are borne on separate plants. The male plant is smaller than the female, and ripens and dies earlier in the summer. The foliage of the female plant is darker and more luxuriant than that of the male. 'The leaves of hemp are constituted of 5 to 7 leaflets, the form of which is lanceolate-acuminate, and sharply serrate. The loose panicles of male flowers and the short spikes of female flowers arise from the axils of the upper leaves. The height of the plant varies greatly with season, soil, and manuring ; a variety (C. sativa, var. gigantea) has produced specimens over 17 feet in height, but the average height of the common sort is about 8 to 10 feet. There is but one species of hemp known, Cannabis sativa, the C. indica, Lam., and C'. chinensis, Delile, owing their differences to climate, and losing many of their peculiarities when cultivated in temperate regions. Rumphius (in the 17th century) had noticed these differences between Indian and European hemp.

The original country of the hemp-plant was doubtless in some part of temperate Asia, probably near the Caspian Sea. It spread westward throughout: Europe, and south- ward through the Indian peninsula.+

Wild hemp still grows on the banks of the Lower Ural and the Volga, near the Caspian Sea. It extends to Persia, the Altai range, and northern and western China. It is found in Kashmir, and on the Himalaya, growing vigor- ously as far up as 6000 or even 10,000 feet.

Hemp is grown for three products—(1) the fibre of its stem ; (2) the resinous secretion which is developed in hot countries upon its leaves and flowering heads ; (3) its oily seeds,

Hemp has been employed for its fibre from ancient times. Herodotus (iv. 74) mentions the wild and culti- vated hemp of Scythia, and describes the

hempen garments made by the Thracians as equal to linen in fineness. Hesychius says the Thracian women made sheets of hemp. Moschion (about 200 B.c.) records the use of hempen ropes for rigging the ship "Syracusia" built for Hiero II. The hemp plant has been cultivated in northern India from a considerable antiquity, not only as a drug but for its fibre. The Anglo-Saxons were well acquainted with the mode of preparing hemp. Hempen cloth became common in central and southern Europe in the 13th century.

The medicinal and intoxicating properties of hemp have probably been known in Oriental countries from a very early period. An ancient Chinese herbal, part of which was written about the 5th century B.c., while the remainder is of still earlier date, notices the seed and flower-bearing kinds of hemp. Other early writers refer to hemp as a

1 The names given to the plant and to its products in different countries are of interest in connexion with the utilization of the fibre and resin. In Sanskrit it is called gont, sana, shanapu, banga, and ganjika; in Bengali, ganga ; Persian, bang and canna; Arabic, Zinnub or cannab; Greek, kannabis; Latin, cannabis; Italian, canappa; French, chanvre; Spanish, céiamo; Portuguese, cdénamo; Russian, konépel; Lettish and Lithuanian, kannapes; Slavonic, konopi; Erse, canatb and canad; Anglo-Saxon, henep; Dutch, hennep; German, hanf; English, hemp ; Danish and Norwegian, hamp; Ice- landic, hampr; and in Swedish, hampa. The English word canvas sufficiently reveals its derivation from cannabis.

remedy. The medicinal and dietetic use of hemp spread through India, Persia, and Arabia in the early Middle Ages. The use of hemp (bhang) in India was noticed by Garcia d'Orta in 1563, Berlu in his Treasury of Drugs (1690) describes it as of "an infatuating quality and per- nicious use." Attention was recalled to this drug, in consc- quence of Napoleon's Egyptian expedition, by De Sacy (1809) and Rouger (1810). Its modern medicinal use is chiefly due to trials by Dr O'Shaughnessy in Calcutta (1838-1842). The plant is grown partly and often mainly for the sake of its resin in Persia, northern India, and Arabia, in many parts of Africa, and in Brazil, ;

The hemp plant grown in some parts of the United States yields the active resin so freely that less than 1 grain of the extract is a full dose. But it is as a fibre-producer that the hemp is now being more extensively cultivated in the United States. Hemp seeds were ordered for Plymouth colony as early as 1629, but the greater profit derivable from tobacco has always opposed the development of hemp-grow- ing. The plant is chiefly grown in the States of Kentucky, Missouri, Tennessee, Ohio, Indiana, and New York. The produce of Kentucky in 1877 was 6140 tons. According to the census of 1870 the total production of the United States was 12,746 tons. In the northern part of the State of New York the crop is valued chiefly for the seeds, which may be from 20 to 40 bushels or more per acre. The produce per acre in the United States is from 700 to 1000 tb of fibre, 4 to 6 pecks of seed being usually sown.

Although the hemp-plant is grown in India chiefly for the production of its narcotic or intoxicating resin, yet a good deal of true hemp fibre is produced there. It is imported into England, however, chiefly from Russia, the United States, Italy, Holland, Germany, Hungary, and Turkey. It is grown in Ireland, and in some parts (Suffolk and Lincolnshire) of England, It thrives well in Algeria, It requires a rich deep soil and heavy manuring, and is an exhausting crop. In Great Britain about 6 pecks of seed per acre are drilled, 18 inches apart, in the middle of April. The male plants are pulled from the end of July to the end of August, the female or seed-bearing plants being gathered in September.

The British imports of hemp cannot be ascertained with accuracy, as the official returns include under that name the fibres of many hemp-substitutes. The following statement of hemp imported into the United Kingdom must therefore be taken with all necessary reserve :—

ic ae 1,247,354 cwts. | 1876…....c006 1,174,859 ewts. WORE 0, Be.. er eee 1,254,667 ,, 7 es 550,769 ,, ell S7Biewevsccsseveeey220BeQnen,

The following table gives the sources whence the supplics were chiefly drawn in the year 1877. But it must be again observed that the figures given for the imports from India, the Philippines, and other places to a less degree, include Manila hemp, Sunn hemp, and other spurious hemps.

Imports of Hemp into the United Kingdom in 1877.

Tow or Codilla.

Philippines United States Mexico

There were sent out 11,790 ewts. dressed English-grown hemp, more than half of this going to France. 14,676 cwts. of foreign and colonial dressed hemp were re-exported to British America and a countries, with 133,516 cwts. rough hemp, and 197 cwts. codilla.

Nearly all the hemp imported into the United Kingdom is landed at Liverpool, London, Hull, and Leith. Most of it is employed in the manufacture of cables, ropes, cordage, twine, sacking, tar-

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HEMP

paulins, canvas, and sailcloth. The finest hemp comes irom Italy, but it is almost eqnalled by the higher qualities of the Russian fibre. 2nssian hemp varies much in price, according to quality and market fluctuations; its price in November 1879 was from £28 to £25 per ton, Italian or garden hemp fetching from £38 to £41.

In order to frec the fibre of the hemp plant from the soft and useless pareuchyma and the tissues of the bark, the stems are sub- mitted to nearly the same processes as those described in the article Fiax. They are dried, beaten, or crushed in a hemp mill, and fermented or retted, preferably in soft water, after which they are again beaten with wooden mallets or in a specially constructed machine called a break. After breaking the stems are seutehed, and thus the separation of the fibres furthered by the rubbing and striking to which they are subjected. The fibres are then hackled or combed.

*According to Vétillart, the average length of European hemp fibres is °86 inch, the extremes being ‘2 and 2°1 inches. Dr M‘Nab gives ‘0005 to *0007 inch as the diameter of fibres, the central eavity being ‘0001 in breadth. Under the microscope hemp fibres resemble those of flax, both being bast-*

fibres, and differ widely from those of Manila hemp or New Zealand flax; they are longitudinally striated cylinders, soinetimes free and sometimes associated in small bundles. A hemp cord of 1 square millimetre section will bear, according to Haberlandt, an average weight of 34°5 kilogrammes without breaking—sonietinies as much as 50 kilos.

*The chief constituent of the fibre of hemp is of course cellulose, but small quantities of other substances are always present— the purest sorts, however, being richest in cellulose. A fine sample of Italian hemp gave on analysis the following pereentages— water 8°9, wax 0‘6, ash 0°8, matters soluble in water 3°5, lignose, albuminoids, &c., 8*4, cellulose 77°8. An ordinary sample of Russian hemp contained no less than 10°5 per cent. of moisture, and 1°5 of mincral matter, with but 72 of pure cellulose. By boiling a portion of this sample for four hours with water in a sealed tube at 150° C., a soluble extract amounting to jth of the original hemp was obtained, Manila hemp giving 15°4 per eent., and Phormiuin fibre no less than 19 per cent., when similarly treated. Dilute solutions of iodine and sulphuric acid, successively applied, give to hemp fibres a greenish hue. The ash of hemp is rich in lime,*

Hemp-resin. Hemp as a drug or intoxicant for smoking and chewing occurs in the three forms of bhang, ganja, and charas.

(1) Bhang, the Hindustani siddhi or sabzi, consists of the dried leaves and small stalks of the hemp; a few fruits occur in it. It is of a dark brownish-green colour, and has a faint peculiar odour and but a slight taste. It is smoked with or without tobacco; or it is made into a sweatmeat with honcy, sugar, and aromatic spices ; or it is powdered and infused in cold water, yielding a tur- bid drink, subdschi. HHashish is one of the Arabic names given to the Syrian and Turkish preparations of the resin- ous hemp leaves, One of the commonest of these prepar- ations is made by heating the bhang with water and butter, the butter becoming thus charged with the resinous and active substances of the plant.

(2) Ganja, the guaza of the London brokers, consists of the flowering and fruiting heads of the female plant. It is brownish-green, and otherwise resembles bhang, as in odour and taste. Some of the more esteemed kinds of hashish are prepared from this ganja. Ganja is met, with in the Indian

bazaars in dense bundles of 24 plants or heads apiece, The hashish in such extensive use in Central Asia is often seen in the bazaars of large cities in the form of cakes, 1 to 3 inches thick, 5 to 10 inches broad, and 10 to 15 inches long.

(3) Charas, or churrus, is the resin itself collected, as it exudes naturally from the plant, in different ways. The best sort is gathered by the hand like opium ; sometimes the resinous exudation of the plant is made to stick first of all to cloths, or to the leather garments of men, or even to their skin, and is then removed by scraping, and afterwards con- solidated by kneading, pressing, and rolling. It contains about one-third or one-fourth its weight of the resin. But the churrus prepared by different methods and in different countries differs greatly in appearance and purity. Some- times it takes the form of egg-like masses of greyish-brown colour, having when of high quality a shining resinous

.fracture. Often it occurs in the form of irregular friable lumps, like pieces of impure linseed oil-cake.

Hemp, however consumed, acts in a most strange way upon the nervous system, but its effects differ greatly with races as well as with individuals. Generally the first effect of a small dose is to produce increase of appetite and cheerfulness. Larger doses produce hallucinations, delirium, sleep, and sometimes catalepsy. During the dreamy state induced by an average dose of hashish, the patient becomes the sport of rapidly shifting ideas. Errors of perception as to time and placeare a conspicuous characteristic of its effects on the mind. For the connexion of the name assassin with hashish, see vol. ii. p. 723.

Extract of hemp has been repeatedly tried in modern European medical practice without very consistent or satis- factory results. It has antispasmodic and anodyne char- acters, and has been employed in tetanus, spasmodic cough, hydrophobia, and some forms of mania. It is a quieter of the nervous system, but does not cause constipation, check the appetite, nor diminish the secretions like opium.

Hemp is very largely used in Eastern countries as an intoxicant and narcotic—probably by nearly 300 millions of the human race. The amount consumed cannot be esti- mated. Of dried hemp and churrus there was sent in 1876 not less than £86,000 worth through the Khyber Pass into British India,

There arc three substances in the hemp-drug to which its activity has been attributed. Of these the resin, separated and investigated by Messrs T. & H. Smith, is the most abundant and probably the most important, and yet its chemical nature and propertics are by no means certain. It is soluble in alcohol, and has a warm, bitter, acrid taste with a slight odour. It melts between 70° and 90° C., and has a pale brown colour. It is called cannabin. Cannabene is the volatile oil of Indian hemp obtained by distilling ganja or churrus with water. Its composition is represented by CyH,); it boils between 235° and 240°. Cannabene is accompanied by a crystalline hydrocarbon containing 84 per cent. carbon and 16 per cent. hydrogen. The supposed occurrence of nicotine in Indian hemp has not been confirmed, and would not in any way suffice to explain the properties of the drug. Moreover, tobacco is often added to hemp. That there is a volatile alkaloid in hemp, though in small quantities, is, however, established beyond doubt. The proportion of pure resin in ganja was found by Messrs T. & H. Smith to be 6 or 7 per cent. Gastinell gives 3 per cent. as obtain- able from Egyptian hemp. The volatile oil in fresh hemp pro- bably does not exceed 3 parts in 1000. By treating the comunercial resinous extract of Indian hemp with strong nitric acid, Bolas and Francis obtained (Journ. Chem. Soc., vol. vii., n. s., p. 417) an oxidation product, soluble in alcohol and crystallizing in long flat prisms. The formula C;H,O, las been assigned to this substance, which is known as oxycannabin.

Hemp Seed, Cake, and Oul.—The ripe seeds, really fruits, being nuts or achenes of the hemp plant, contain about 34 per cent. of oil and 16 of albuminoids. When the crushed seeds have been submitted to pressure, the re- sidual cake is found to retain about 7 per cent. of oil. The value of hemp cake as a cattle-food is lessened by its purgative property. The seeds are much used as a food for singing birds. A hundred parts of the seed yield from 70 to 75 of cake and 25 to 30 of oil. This oil has drying properties, though it is in this respect much inferior to linseed oil. Its specific gravity is

‘9307. The seeds are roundish ovate, about 4 inch in length, and of a dark grey colour, with a pale ash-coloured network of surface- markings.

See Bentley and Trimen’s Medicinal Plants, No. 231; Vétillart’s Etudes sur les fibres textiles, pp. 72-87; Dickson’s Fibre Plants of India ; Royle’s Fibrous Plants of India; Cultivation of Hemp in India; Dr O’Shaughnessy’s Preparation of Indian Hemp or Gunjah ; Yates’s Textrinum Antiquorum ; Hugo Miiller’s Pflanzenfaser; the Dispensatory of the United States; Knight’s Dictionary of Mechanics; Dr G. Martius’s Studien uber den Han; and Johnston’s Chemistry of Common Life, 1879. (A. H.C.)

HEMS, Hoos, or Hums, a town of Syria, about 63 miles by road north-east, of Tripoli (Tarabulus), situated 1312

eastern side of the valley of the Nahr el Asy or Orontes, which about 4 miles further down forms the lake of Hems, Atini, or Kabas. The kala’at or castle, a great mound “still crowned with a tiara of torn and ruined towers,” forms a striking landmark well-known to the caravans journeying north from Damascus. It is about 120 feet in- height, and has a breadth of 435 feet and a width of 375. According to Captain Burton, it probably occupies the site of the temple of the sun, which formed the glory of the ancient city: not only does it contain columnar masses of syenite, grey granite, and white marble, but he found, apparently in position, a Doric pilaster. Though the ancient walls of Hems, with a circuit of about a mile and a half, are greatly dilapidated and even in many places practically demolished, the town is entered by regular gates, six in number, which in olden times bore the names of the planets. Within it presents little except narrow and tortuous streets, poorly paved and foul, with houses for the most part of the meanest description ; but none the less it is the seat of a Turkish vice-governor or mutesarif, as well as of a Greek and a Maronite bishop, and its cavalry barracks are capable of containing two regiments. As the market-town of the neighbouring tribes it has some commercial importance : it trades in cotton, sesame, and oil; and among its craftsmen it numbers a body of skilful goldsmiths and about 3000 silk weavers, whose looms produce the finest kind of kaffiehs or head-cloths. The population is estimated at from 20,000 to 40,000, and about 7000 are Christians. Jews are con- spicuous by

their absence, though one of the gates of the town in the quarter which they formerly occupied is still called‘the “ Jews’ Gate.”

Hems is the Emesa, Emissa, or Hemesa of the Romans, and by Ptolemy it is assigned to the district of Apamene. Its inhabitants are mentioned among the early opponents of the Roman arms. Heliogabalus or Bassianus, declared emperor in 218 A.D., was a native of Emesa, and held office as a priest of the sun. It was in the neigh- bourhood of the town that the army of Zenobia was routed by Aurelian. The first Christian bishop is said to have been St Silvanus. About fourteen years after the Hegira Khalid bin Walid, who was to find his grave in one of its suburbs, made himself master of Hems; and from 1098 to 1187 it was in the hands of the crusaders. It was probably Saladin, by whom they were expelled, that turned the temple of the sun, which under Christian rule had been uscd as a cathedral, into the chief fortress of the place. In July 1831 Ibrahim Pasha, having defeated the governor of Aleppo at Hems, caused the fortress to be blown up.

The poet Ka’ab el] Alibar is buried in the town, and the people show another grave which they wrongly believe to be that of Ja’afar el Tayyar. :

See Burton and Tyrwhitt Drake, Uncxplored Syria, 1872.

HEMSTERHUIS, Francois (1720-1790), writer on esthetics and moral philosophy, was born at Franeker in Holland in 1720. He received an excellent education from his father, Tiberius Hemsterhuis, noticed below, and com- pleted his studies at the university of Leyden. There un- doubtedly he was attracted towards the study of the Platonic philosophy, which exercised the greatest influence both on the form and on the matter of his own writings. He did not, however, devote himself to a learned life after complet- ing his university courses, but entered upon practical affairs, and for many years acted as secretary to the state council of the United Provinces. His interests were mainly philo- sophical, and partly by direct social intercourse with a few similarly disposed friends, partly by correspondence with philosophical writers of other countries, mainly with Jacobi, he preserved the continuity of his philosophical work. His writings, none of which can be described as of high speculative worth, are distinguished by elegance of form and by the touch of refined sentiment which is not uncom- mon among the amateur or dilettante philosophers of

the 18th century. Any direct contributions to philosophy made by him are in the department of ssthetics or the

feet, according to Cernik, above the level of the sea, on the | general analysis of feeling, He died in 1790.

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His first work, published in 1769, was a Lettre sur la Seulpture, written, like all the others, in French. It was followed in 1770 by the Lettre sur les désirs, in 1772 by the Lettre sur Vhomme et ses rapports, in 1778 by Sophyle, a dialogue on the relation between soul and body, in 1779 by Aristée, a dialogue on the existence of the Divine Being, in 1787 by Alexis ou U'dge d'or, by Simon, ou des fueultés de Vame, and by the Lettre de Dioelés & Diotime sur Uathéisme. Collected editions of his works have been published in 1792 (2 vols.), and more completely by Meyboom, in 1846-50 (6 vols.). See Grucker, Francois Hemsterhuis, sa Vie et ses Cuvres (Paris, 1866).

HEMSTERHUIS, Treertus (1685-1766), philologist and critic, was born on January 9, 1685, at Groningen in Holland. His father, a learned physician, recognizing the abilities of his son, gave him so good an early education that, when he entered the university of his native town in his fifteenth year, he speedily proved himself to be the best student of mathematics. After a year or two at Groningen, he was attracted to the university of Leyden by the fame of Perizonius; and while there he was entrusted with the flattering duty of arranging the manuscripts in the library. Though he accepted an appointment as professor of mathematics and philosophy at Amsterdam in his twentieth year, he had already directed his attention to the study of the ancient languages. In 1706 he completed the edition of Pollux's Onomasticon begun by Lederlin ; but the praise he received from his countrymen was more than counterbalanced by two letters of criticism from Bentley, which mortified him so keenly that for two months he refused to open a Greek book. In 1717 Hemsterhuis was appointed professor of Greek at Franeker, but he did not enter on his duties there till 1720, In 1738 he became pro- fessor of national history also. Two years afterwards he was

called to teach the same subjects at Leyden, where he died, April 7, 1766. Hemsterhuis deserves special note for reinstating the study of Greek in its honourable place among his fellow-countrymen, while he was also the founder of a laborious and useful Dutch school of criticism, of which Valckenaer, Lennep, and Ruhnken are the most famous disciples.

His chief writings are the following :—Luciani Colloquia et Timon, 1708; Aristophanis Plutus, 1744; Notw, &c., ad Xeno- phontem Ephesium in the Miscellanea Critica of Amsterdam, vols. iii. and iv.; Observationes ad Chrysostomi Homilias; Orationes, 1784; a Latin translation of the Birds of Aristophanes, in Kuster's edition; notes to Bernard's Thomas Magister, to Alberti's Hesy- chius, to Ernesti's Callimachus, and to Bunnann's Propertius. See Elogium T. Hemsterhusit (with Bentley's letters) by Ruhnken, 1789; and Supplementa Annotationis ad Elogium T. Hemsterhusit, &c., Leyden, 1874.

HENAULT, Cuartes Jean Frangors (1685-1770), French historian, was born in Paris 8th February 1685. His father, a farmer-general of taxes, was a man of literary tastes ; and young Hénault obtained a good education at the Jesuit college and the Collége des Quatre-Nations. Captivated by the eloquence of Massillon, he in his fifteenth year entered the oratory with the view of becoming a preacher, but after two years' residence he changed his intention, and, inheriting a, position which secured him access to the most select society of Paris, he at an early period achieved distinction by his gay, witty, and graceful manners, and by his literary talent as manifested in the composition of various light poetical pieces, and of two discourses which respectively gained a prize at the French Academy in 1707, and at the Académie des Jeux Floraux in 1708. In 1706 he became councillor of the parliament of Paris, and in 1710 he was chosen pre- sident of the court of enquétes. He was admitted into the French Academy in 1723, and subsequently into the leading literary societies of Europe. After the death of Bernard de Coubert he became superintendent of the household of Queen Marie Leczinska, whose intimate friendship he had previously enjoyed. On his recovery in his fiftieth year from a dangerous malady, he professed to have undergone religious conversion and retired into private life, devoting

the remainder of his days to study and devotion. His devotion was, however, according to the Marquis d'Argenson "exempt from fanaticism, persecution, bitterness, and intrigue ;" and it did not prevent him from continuing his friendship with Voltaire, to whom it is said he had formerly rendered the service of saving the manuscript of La Henriade, when its author was about to commit it to the flames. The literary work on which Hénault bestowed his chief attention was the Abrégé Chronologique, first published in 1744 without the author's name. It is a model of its kind, and is valuable both for popular use and as a work of reference. In the compass of two volumes he has com- prised the whole history of France from the earliest times to the death of Louis XIV. His information is for the most part drawn from original sources, and for such a work the number of errors committed by Hénault was remark- ably small. The results of deep researches and lengthened disquisitions on public law are summed up in a few words. The moral and political reflexions are always short and generally as fresh and pleasing as they are just. A few masterly strokes reproduce the leading features of each age and the characters of its illustrious men; accurate chrono- logical tables set forth the most interesting events in the history of each sovereign and the names of the great men who flourished during his reign; and interspersed throughout the work are occasional chapters on the social and civil state of the country at the close of each era in its history. Con- tinuations of the work have been made at separate periods by Fantin des Odoards, by Auguis with notes by Walckenaer, and by Michaud. Besides some other historical works of minor importance Hénault wrote several dramatic pieces of no particular merit. He died at Paris, 24th November 1770. His Mémoires, published in 1854, are somewhat fragmentary and disconnected, but contain many interesting anecdotes and details regarding persons of note.

See the Correspondance of Grimm, of Madame du Deffand, and of Voltaire; the notice by Walckenaer in the edition of the Abrégé Chronologique; and Sainte-Beuve, Causertes du lundi, vol. xi.

HENBANE (in French, jusquiaume, from the Greek hyoscyamus, or hog's-bean ; in Italian, giusqyuiamo ; and in German; Schwarzes Bilsenkraut, Hihnertod, Saubohne, and Zigeuner-Korn or "gipsies' corn") is the common name of the Hyoscyamus niger, a Solanaceous plant indigenous to

Britain, found wild in waste places, on rubbish about villages and old castles, and cultivated for medical use at Mitcham aud other places in Surrey, and in Bedfordshire, Cambridgeshire, and Hereford. It occurs also in central and southern Europe and in western Asia, and has long been naturalized in the United States. There are two forms of the plant, an annual and a biennial, which spring indifferently from the same crop of seed,—the one growing on during summer to a height of from 1 to 2 feet, and flowering and perfecting seed; the other producing the first season only a tuft of radical leaves, which disappear in winter, leaving underground a thick fleshy root, from the crown of which arises in spring a branched flowering stem, usually much taller and more vigorous than the flowering stems of the annual plants. The biennial form is that which is con- sidered officinal. The radical leaves of this biennial plant spread out flat on all sides from the crown of the root ; they are ovate-oblong, acute, stalked, and more or less incisely- toothed, of a greyish-green colour, and covered with viscid hairs ; these leaves perish at the approach of winter. The flowering stem pushes up from the root-crown in spring, ultimately reaching from 3 to 4 feet in height, and as it grows becoming branched, and furnished with alternate sessile leaves, which are stem-clasping, oblong, unequally- lobed, clothed with glandular clammy hairs, and of a dull grey-green, the whole plant having a powerful nauseous

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odour. The flowers are shortly-stalked, the lower ones growing in the fork of the branches, the upper ones sessile in one-sided leafy spikes which are rolled back at the top before flowering, the leaves becoming smaller upwards and taking the place of bracts. The flowers have an urceolate calyx which persists around the fruit and is strongly veined, with five stiff, broad, almost prickly lobes; these, when the soft matter is removed by maceration, form very elegant specimens when associated with leaves prepared in a similar way. The corollas are obliquely funnel-shaped, of a dirty yellow or buff, marked with a close reticulation of purple veins. The capsule opens transversely by a convex lid, and contains numerous seeds. Both the leaves and the seeds are employed in pharmacy. The Mahometan doctors of India are accustomed to prescribe the seeds. Henbane yields a poisonous alkaloid, hyoscyamine, which is stated to have properties almost identical

with those of atropine, from which it differs in being more soluble in water. It is usually obtained in an amorphous, scarcely ever in a crystalline state. Its properties have been investigated in Germany by Husemann, Schroff, Hohn, &e. Hohn finds its chemical composition ex- pressed by C,,H,,.N,O3. (Compare Hellmann, Beitrdge zur Kenntniss der physiolog. Wirkung des Hyoscyamins, Xc., Jena, 1874.) In small and repeated doses henbane has been found to have a tranquillizing effect upon persons af- fected by severe nervous irritability. In poisonous doses it causes loss of speech, distortion, and paralysis. In the form of extract or tincture it is a valuable remedy in the hands of a medical man, either as an anodyne, a hypnotic, ora sedative. The extract of henbane is rich in nitrate of potassium and other inorganic salts. The smoking of the seeds and capsules of henbane is noted in books as a sonie- what dangerous remedy adopted by country people for toothache. Accidental poisoning from henbane occasion- ally occurs, owing sometimes to the apparent edibility and wholesomeness of the root.

*HENDERSON, Atexanver (1583-1646), a celebrated Scottish ecclesiastic, was born in 1583. He was educated at the university of St Andrews, where he was appointed professor of rhetoric and philosophy and questor of the faculty of arts in 1610. A year or two after this he was presented to the living of Leuchars by Archbishop Glad- stanes. As Henderson was forced upon his parish by an archbishop, and as he was known to sympathize with Episcopacy, his settlement was at first extremely unpopular; but he subsequently changed his views, and became a Presbyterian in doctrine and church government, and one of the most esteemed ministers in Scotland. He early made his mark as a church leader, and took an active part in petitioning against Episcopal innovations. On the Ist of March 1638 the public signing of the ‘“ National Covenant” began in Greyfriars Church, Edinburgh. Henderson is mainly responsible for this document; and he,seems always to have been applied to when any mani- festo of unusual ability was required. In July of the same year he proceeded to the north, to debate on the ‘“*Covenant” with the famous Aberdeen doctors; but he was not well received by them. ‘The voyd church was made fast, and the keys keeped by the magistrate,” says Baillie. Henderson’s next public appearance was in the famous Assembly which met in Glasgow on the 21st of November 1638. He waschosen moderator by acclamation, being, as Baillie says, “incomparablie the ablest man of us all for all things.” The*

marquis of Hamilton was the king's commissioner ; and, when the Assembly insisted on proceed- ing with the trial of the bishops, he formally dissolved the meeting under pain of treason. Nothing daunted, however, they sat till the 20th of December, deposed all the Scottish bishops, excommunicated a number of them, repealed all acts

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favouring Episcopacy, and reconstituted the Scottish Kirk on thorough Presbyterian principles. During the sitting of this Assembly it was carried by a majority of seventy-five votes that Henderson should be transferred to Edinburgh. He had been at Leuchars for about twenty-three years, and was extremely reluctant to leave it. While Scotland and England were preparing for the 'First Bishops' War," Henderson drew up two papers, entitled respectively—The Remonstrance of the Nobility, and Instructions for De- fenswe Arms. The first of these documents he published hiniself ; the second was published against his wish by Corbet, a deposed minister. The "First Bishops' War" did not last long. At the Pacification of Birks the king had virtually to grant all the demands of the Scots. In the negotiations for peace Henderson was one of the Scottish commissioners, and made a very favourable impres- sion on the king. In 1640 Henderson was elected by the town council rector of Edinburgh university—an office to which he was annually re-elected till his death. The Pacification of Birks had been wrung from the king; and the Scots, seeing that he was preparing for the "Second Bishops' War," took the initiative, and pressed into England so vigorously that Charles had again to yield everything. The maturing of the treaty of peace took a considerable time ; and Henderson was again active in the negotiations, first at Ripon, and afterwards at London. While he was in London he had a personal interview with the king, with the view of obtaining assistance for Edinburgh university from the money formerly applied to the support of the bishops. On Henderson's return to Edinburgh in July 1641, the Assembly was sitting at St Andrews. To suit the convenience of the parliament, however, it removed to Edinburgh ; and Henderson was elected moderator of the Edinburgh meeting. In this Assembly he proposed that 'a confession of faith, a catechism, a directory for all the parts of the public worship, and a platform of government, wherein possibly England and we might agree," should be drawn up. This

was unanimously approved of, and the laborious undertaking was left in Henderson's hands; but the "notable motion" did not lead to any immediate re- sults. During Charles's second state-visit to Scotland, in the autumn of 1641, Henderson acted as his chaplain, and managed to get the funds, formerly belonging to the bishopric of Edinburgh, applied to the metropolitan uni- versity. In 1642 Henderson was engaged in corresponding with England on ecclesiastical topics; and, shortly after- wards, he went to Oxford to mediate between the king and his parliament; but his mission proved a failure. A memorable meeting of the General Assembly was held in August 1643. Henderson was elected moderator for the third time. He presented a draft of the famous "Solemn League and Covenant," which was received with great enthusiasm. Unlike the "National Covenant" of 1638, which applied to Scotland only, this document was common to the two kingdoms. Henderson, Baillie, Rutherford, and others were sent up to London to represent Scotland in the Assembly at Westminster. The 'Solemn League and Covenant," after undergoing some slight alterations, passed the two Houses of Parliament and the Westminster Assembly, and thus became law for the two kingdoms. By means. of it Henderson has had an extra- ordinary influence on the history of Great Britain. As Scottish commissioner to the Westminster Assembly, he was in England from August 1643 till August 1646; and the action of the Scottish commissioners gave a fresh impulse to English Presbyterianism. arly in 1645 Henderson was sent to Uxbridge to aid the commissioners of the two parliaments in negotiating with the king; but nothing came of the conference. In 1646 the king joined the Scottish army; and, after retiring with them to New-

castle, he sent for Henderson, and discussed with him the two systems of church government in a number of papers. Meanwhile Henderson was failing in health. He sailed to Scotland, and eight days after his arrival died on the 19th of August 1646. He was buried in Greyfriars Churchyard, Edinburgh ; and his death was the occasion of national mourning in Scotland. An absurd story was at once invented to the effect that, after rccanting to the king's views, he had died of remorse. A document was forged, purporting to be a "Declaration of Mr Alexander Henderson ;"

and, although this paper was disowned, denounced, and shown to be false in the General Assembly of August 1648, the fiction was used by Clarendon, and still finds a place in professedly historical compilations.

Henderson is one of the greatest men in the history of Scotland, and, next to Knox, is certainly the most famous of Scottish ecclesiastics. He had great political genius ; and his statesmanship was so influential that "he was," as Professor Masson well observes, 'a cabinet minister without office." He has made a deep mark on the history, not only of Scotland, but of England; and the existing Presbyterian Churches in Scotland are largely indebted to him for the forms of their dogmas and their ecclesiastical organization. He is thus justly considered the second founder of the Reformed Church in Scotland.

For further information about Henderson reference may be made to M'Crie's Life of Alexander Henderson, 1846; Aiton's Life and Times of Alexander Henderson, 1836; The Letters and Journals of Robert Baillie, 1841-2 (an exceedingly valuable work, from an historical point of view); Burton's Hestory of Scotland ; Masson's Life of Drummond of Hawthornden; and, above all, Masson's Life of Afilton, (2. G1.)

HENDERSON, Exenzzer, Scottish dissenting minister and theological and miscellaneous writer, was born at the Linn near Dunfermline, November 17, 1784, and died at Mortlake, May 17, 1858. He was the youngest son of an agricultural labourer, and after three years' schooling spent some time at watchmaking and as a shoemaker's apprentice. In 1803 he joined Mr Robert Haldane's theological semi- nary, and in 1805 was selected to accompany the Rev. John (afterwards Dr) Paterson to India; but as the Hast India Company would not allow British vessels to convey mis- sionaries to India, Henderson and his colleague went to Denmark to await the chance of a passage to Serampore. Being unexpectedly delayed, they ultimately decided to settle in Denmark, and in 1806 Henderson was fixed at Elsinore. From this time till about 1817 he was engaged in encouraging the distribution of Bibles in the Scandi- navian countries, and in the course of his labours he visited Sweden and Lapland (1807-8), Iceland (1814-15), and the mainland of Denmark and part of Germany (1816). During most of this time he was an agent of the British and Foreign Bible Society. In 1818,

after a visit to England, he travelled in company with Dr Patcrson through Russia as far south as Tiflis, but, instead of settling as was pro- posed at Astrakhan, he had to retrace his steps, having re- signed his connexion with the Bible Society. In 1822 he was invited by Prince Alexander Galitzin to assist the Russian Bible Society in translating the Scriptures into various languages spoken in the Russian empire. After twenty years of foreign labour Henderson returned to England, and in 1825 was appointed tutor of the Mission College, Gosport. In 1830 he succeeded Dr William Harrison as theological lecturer and professor of Oriental languages in Highbury Congregational College, and though in 1850, on the amalgamation of the colleges of Homerton, Coward, and Highbury, he was excluded from office through age, he was pastor in 1852-53 of a chapel at Mortlake. His last work was a transla- tion of the book of Ezekiel. Henderson was a man

labours he made himself more or less acquainted, not only with the ordinary languages of scholarly accom- plishment and the various members of the Scandinavian group, but also with Hebrew, Syriac, Ethiopic, Russian, Arabic, Tatar, Persic, Turkish, Armenian, Manchoo, Mongolian, and Coptic. He organized the first Bible Society in Denmark (1814), and paved the way for several others. In 1817 he was nominated by the Scandinavian Literary Society a corresponding member; and in 1840 he was made D.D. by the university of Copenhagen. He was honorary secretary for life of the Religious Tract Society, and one of the first promoters of the British Society for the Propagation of the Gospel among the Jews. The records of his travels in Iceland (1818) were valuable con- tributions to our knowledge of that island, His other principal works are Biblical Researches and Travels in Russia (1826), Divine Inspiration (1836), and annotated translations of Isaiah (1840, 1857), the twelve minor prophets (1845), and Jeremiah (1851).

See Memotrs of Ebenezer Henderson, by Thulia 8, Henderson (his daughter), London, 1859.

HENGSTENBERG, Ernst Wituetm (1802-1869), for more than forty years one of the most conspicuous and able champions of the strictest Lutheran orthodoxy, was born at Frondenberg, a Westphalian village near Hamm

and not far from the Ruhr, on October 20, 1802; received his entire school education under the roof of his father, who was a minister of the Reformed Church, and head of the Fréndenberg Frauleinstift ; and entered the university of Bonn in 1819, shortly before the completion of his seventeenth year. There he attended the lectures of Freytag and Gieseler on Old Testament exegesis and church history, but his energies were principally devoted to philosophy and philology, and his earliest publication was an edition of the Moallakah of Amrw l Kais (Amrulkeisi Moallakah cum scholiis Zuzenit edidit, latine vertit, et illustravit E.G. H., 1823), which gained for him the prize at his graduation in the philosophical faculty, and the public commendation of Sylvestre de Sacy. This was followed in 1824 by a German translation of Aristotle's Metaphysica. On quitting Bonn it had been Hengstenberg's wish to complete his theological studies under Neander and Tholuck in Berlin; but finding himself without the means of doing so, he accepted for a year a situation at Basel as tutor in Oriental languages to J. J. Stéhelin. Then it was that, suffering much from ill- health and deeply mourning the loss of his mother, he began to direct his attention, with an ardour formerly unknown to him, to the spiritual truths of the Bible. His studies and experiences at this crisis resulted in a conviction, never afterwards shaken, not only of the divine character of evangelical religion, but also of the unapproachable adequacy of its expression in the Augsburg Confession. Taking as his motto Psalm exviii. 17, he resolved thenceforward to devote himself to the uncompromising defence of that creed, In the autumn of 1824 he joined the philosophical faculty of Berlin as a privat-docent, and in the following year he became a licentiate in theology, his theses even then being remarkable for their evangelical fervour and for their emphatic protest against every form of "rationalism," especially in questions of Old Testament criticism. In 1826 he became professor extraordinarius in theology; and in July 1827 appeared under Hengstenberg's editorship the first number of the Hvangelische Kirchenzettung, a " reac- tionary " journal which in his hands was destined to acquire an almost unique reputation as an organ of religious, theo-logical, and ecclesiastical controversy. It did not, however, attain to great notoriety until in 1830 an anonymous article (by E. L. von Gerlach) appeared, which openly charged Professors Gesenius and Wegscheider with infidelity

of great linguistic attainment: in the course of his | and profanity, andon the ground of these accusations advo-

cated the interposition of the civil power, thus giving rise to the prolonged " Hallische Streit " as it was called, which was at least effectual in giving the public a due impression of the energy and zeal of. the new "evangelical" school. In 1828 the first volume of Hengstenberg's Christologie des Alten Testaments passed through the press ; in the autumn of that year he was promoted to the dignity of professor ordinarius in theology; and in 1829 he married. The remainder of his life, apart from the excitement which its various literary activities imparted to it, was uneventful. He died on the 28th of May 1869.

The following is a list of the principal works of Hengstenberg:— Christologie des Alten Testaments (1829-35; 2d ed., 1854-57; Eng. transl. by R. Keith, 1835-39, also in Clark's " Foreign Theological Library,' by Th. Meyer and J. Martin, 1854-58), a work of much ingenuity and considerable learning, but which will be differently valued according to the hermeneutical principles of the individual critic; Bettrdge zur Einlettung in das Alte Testament (1831-39 ; Engl. transl., " Dissertations on the Genuineness of Daniel and the Integrity of Zechariah," Edin., 1848, and " Dissertations on the Genuineness of the Peutateuch,"' Edin., 1847), in which the tradi- tional view on each question is strougly upheld, and much capital is made of the absence of harmony among the negative critics; Dic Biicher Mosis und Afgypten (1841), spoken of by Diestel as " per- haps Hengstenberg's most meritorious work;" Dic Gesehichte Bileams u. seiner Weissagungen (1842; translated into English along with the Dissertations on Daniel and Zechariah mentioned above); Com- mentar iiber die Psalmen (1842-45 ; 2d ed. 1849-52; Eng. transl. by Fairbairu and Thomson, Edin., 1844-48), which shares the merits and defects of the Christologie; Die Offenbarung Johannis erldutert (1841-51; 2d ed. 1861-62; Eng. transl. by Fairbairn, also in Clark's "Foreign Theological Library," 1851-52); Das Hohe Lied ausgelegt (1858); Der Prediger Salomo ausgelegt (1859); Das Evangelium Johannts erldutert (1861-63; 2d ed. 1867-71; Eng. transl. 1865), and Dic Wetssagungen des Propheten Ezeehicl

erldutert (1867-68). Of minor importance are De rebus Tyriorum com- mentatio academica (1882); Ueber den Tag des Herrn (1852); Das Passa, ein Vortvag (1858); and Die Opfer der heiligen Schrift (1859). Several series of papers also, as, for example, on " The Retention of the Apocrypha," " Freemasonry," " Duelling," and "The Relation between the Jews and the Christian church," which originally appeared in the Kirchenzcitung, were afterwards printed ina separate form. Geschiehte des Reiches Gottes unter dem Alten Bunde (1869-70), Das Buch Hiob erléutert (1870-75), and Vorle- sungen tber die Leidensgeschichte (1875) were published, from Hengstcnberg's papers, posthumously. See Bachmann's rast Withelm Hengstenberg (1876-79) ; also his article in Herzog and Plitt's Encyklopidie (1879).

HENKE, Heyyricn Puinipp Konrap (1752-1809), a learned German theologian of the broad school, best known as a writer on church history, was born at Hehlen, Bruns- wick, on July 3, 1752, was educated at the gymnasium of Brunswick and the university of Helmstiidt, and from 1778 until his death, which occurred on May 2, 1809, held a professorship of theology in that university. His principal work (Kirchengeschichte, in 6 vols., 1788-1804; 2d ed. 1795-1806) is commended by Baur for fulness, accuracy, and artistic composition, as one of the best in that class of literature. His other works are Lineamenta institutionum fidei Christiane historico-criticarum (1783), Opuscula Academica (1802), and two volumes of Predigten. Hisson, Erngt Ludwig Theodor (1804-1872), has also left a name in the literature of theology and ecclesiastical history, having been the author of monographs upon Georg Calizxt u. seine Zeit (1853-60), Papst Pius VII. (1860), Konrad von Marburg (1861), Kaspar Peucer u, Nik. Krell (1865), Jak. Lriedr. Fries (1867), as well as of other works.

HENLEY, Joun (1692-1759), an eccentric clergyman of the last century, commonly known as " Orator Henley," was born August 3, 1692, at Melton-Mowbray, where his father was vicar. After attending the grammar schools of Melton and Oakham, he in his seventeenth year entered St John's College, Cambridge, and while still an under- graduate he addressed in February 1712, under the pseudonym of Peter de Quir, a letter to the Spectator displaying no small wit and humour. After graduating B.A, he became assistant and then head-master of the

*grammar school of his native town, uniting to these duties those also of assistant curate. His superabundant energy was not, however, fully consumed by this plurality of offices, for besides publishing in 1714 a poem entitled Esther, Queen of Persia, containing many vigorous and eloquent passages, he also devoted his attention to the compila- tion of a grammar of ten languages entitled Zhe Complete Lnnguist (2 vols., London, 1719-21). In his school he is said to have introduced many new methods of study, but whether it was that his innovations were not sufficiently appreciated, or that he desired a wider sphere for the exercise of his exceptional abilities, he resolved to place his services at the disposal of the metropolis, where he arrived with thirty recommendatory letters from some of the most influential persons of his native county. He succeeded in obtaining the appointment of assistant preacher in the chapels of Ormond Street and Bloomsbury, and in 1723 was presented to the rectory of Chelmondiston in Suffolk ; but residence being insisted on, he resigned both his appointments, and on July 3, 1726, opened what he called an " oratory" in Newport Market, which he licensed under the Toleration Act. Into his services he introduced many peculiar alterations: he drew up a "Primitive Liturgy," in which he substituted for the Nicene and Athanasian creeds two creeds taken from the apostolical constitutions ; for his " Primitive Eucharist" he made use of unleavened bread and mixed wine; he distributed at the price of one shilling medals of admission to his oratory, with the device of a sun rising to the meridian, with the motto Ad summa, and the words Inveniam vam aut faciam below. But the most original element in the services was Henley himself, who is described by Pope in the Dunciad as " Preacher at once and zany of his age." He possessed some oratorical ability and adopted a very theatrical style of elocution, " tuning his voice and balancing his hands;" and his addresses were a strange medley of solemnity and buffoonery, of clever wit and the wildest absurdity, of able and original disquisition and the worst artifices of the oratorical charlatan, His services were much frequented by the *'freethinkers," and he himself expressed his determination " to diea rational." Besides his sermons on Sunday he delivered on Wednesday lectures chiefly on social and political subjects ; and he also projected a scheme for connecting with the "oratory" a university on quite a novel plan, and intended to be, in a sense too utopian*

to be realized, the foster-mother of the arts and sciences. For some time he edited the Zyp Doctor, a weekly paper estab- lished in opposition to the Craftsman, and for this service he enjoyed a pension of £100 a year from Sir Robert Walpole. At first the orations of Henley drew great crowds, but, although he never discontinued his services, his audience latterly dwindled almost entirely away. He died

13th October 1759. P Henley is the subject of several of Hogarth's prints. His life, professedly written by A. Welstede, but in all probability by him- self, was inserted by him in his Oratorical Transactions. | See Nichol's History of Leicestershire, and Disraeli's Calamities of Authors, : HENLEY-ON-THAMES, a market-town of Oxfordshire,

England, is situated on the left bank of the Thames and at the terminus of a branch of the Great Western Railway. It is 22 miles S. of Oxford and 35 W. from London by rail, and 47 miles from Oxford and 644 from London by the river. It occupies one of the most beautiful situations on the Thames, at the foot of the finely wooded Chiltern Hills. The river is crossed by an elegant stone bridge of five arches, constructed in 1786 at a cost of £10,000. The principal buildings are the parish church, a handsome Gothic struc- ture recently restored at a cost of over £7000, possessing a lofty tower of intermingled flint and stone, which is attributed to Cardinal Wolsey, but which was more pro-

bably erected by Bishop Longland; the grammar school, founded in 1605; the town-hall, a neat building supported by Doric columns; the reading-room and library, and various charitable institutions. Henley is a favourite summer resort, and also possesses some trade in corn, flour, malt, and timber. It is celebrated for the Henley Royal Regatta, the principal gathering of amateur oarsmen in England, which usually takes place in July. The popula- tion of the parish in 1871 was 3736, and of the local board district 4623.

Henley existed at a very early period, and according to some authorities was a Roman station. It obtained a charter of incor- poration from Elizabeth, in which it is named Hanleygang or Hanneburg. In 1643 it was

occupied by the Parliamentary forces, who successfully repelled an attack made upon them by the Royalists.

See History of Henley-on-Thames, by John Southerden Burns, London, 1861, and An Account of the Races at the Annual Henley Regattas from their commeneement June 1889 to the year 1879, Henley, 1879.

HENNA is the Persian name for a small shrub found in the East Indies, Persia, the Levant, and along the African coasts of the Mediterranean, where it is frequently culti- vated. It is the Lawsonia alba of botanists, and from the fact that young trees are spineless, while older ones have the branchlets hardened into spines, it has also received tlie names of Lawsonia inermis and L. spinosa. It forms a slender shrubby plant of from 8 to 10 feet high, furnished with opposite oval-lanceshaped smooth leaves, which are entire at the margins, and bears small white four-petalled sweet-scented flowers disposed in panicles. The four spreading petals are obovate, and furnished with claws; and alternating wit them are eight stamens approximating by pairs. Its Egyptian name is Khenna, its Arabic name Al Khanna, its Indian name Jfendee, while in England it is called Kyyptian privet, and in the West Indies, where it is naturalized, Jamaica mignonette.

Henna or Henné is of ancient repute asa cosmetic. This consists of the leaves of the Zawsonia powdered and made up into a paste; this is employed by the Egyptian women, and also by the Mahometan women in India, to dye their finger nails and other parts of their hands and feet of an orange-red colour, which is considered to add to their beauty. The colour lasts for three or four weeks, when it requires to be renewed. Itis moreover used for dyeing the lair and beard, and even the manes of horses ; and the same material is employed for dyeing skins and morocco- leather a reddish-yellow, but it contains no tannin. The practice of dyeing the nails was common amongst the Egyptians, and not to conform to it would have been con- sidered indecent. It has descended from very remote ages, as is proved by the evidence afforded by Egyptian mummies, the nails of which are most commonly stained of a reddish hue. Henna is also said to have been held in repute amongst the Hebrews, being considered to be the plant referred to as camphire in the Bible (Song of Solomon i. 14; iv. 13). "The custom of dyeing the nails and palms of the hands and soles of the feet of an iron-rust

colour with henna," observes Dr Royle, " exists throughout the East from the Mediterranean to the Ganges, as well as in Northern Africa. In some parts the practice is not con- fined to women and children, but is also followed by men, especially in Persia. In dyeing the beard, the hair is turned to red by this application, which is then changed to black by a preparation of indigo. In dyeing the hair of children, and the tails and manes of horses and asses, the process is allowed to stop at the red colour which the henna pro- duces." Mahomet, it is said, used henna as a dye for his beard, and the fashion was adopted by the caliphs. " The use of henna," remarks Lady Callcott in her Serepture flerbal, "is scarcely to be called a caprice in the East.

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There is a quality in the drug which gently restrains perspiration in the hands and feet, and produces an agree- able coolness equally conducive to health and corafort." She further suggests that if the Jewish women were not in the habit of using this dye before the time of Solomon, it might probably have been introduced amongst them by his wife, the daughter of Pharaoh, and traces to this proba- bility the allusion to "camphire" in the passages in Canticles above referred to.

The preparation of henna consists in reducing the leaves and young twigs toa fine powder, catechu or lucerne leaves in a pulverized state being sometimes mixed with them. When required for use, the powder is made into a pasty mass with hot water, and is then spread upon the part to be dyed, where it is generally allowed to remain for one night.

It has been already noted that the flowers of the Law- sonia are very fragrant, whence they derive in the West Indies the name of Jamaica mignonette. According to Lady Callcott, they are often used by the eastern women to adorn their hair; and Mr Simmonds states that the distilled water from the flowers is usedas a perfume. The plant is further credited with the possession of vulnerary and astringent properties.

HENNEBONT, a town of France, arrondissement of Lorient, and department of Morbihan, is situated on the Blavet, not far from its mouth, and 25 miles W.N.W. of Vannes. It is a picturesque old town, and contains some remains of its former fortifications. The church of Notre Dame de Paradis, a beautiful building of the 16th century, possesses some fine wood carving. The town has an im- portant corn-market, and considerable shipping trade in iron, corn, honey, wax, hemp, cider, and wine. Shipbuild- ing, sawing, and tanning are also carried on. Hennebont is famed for the resistance which it made, under the widow of John de Montfort, when besieged by the armies of Philip of Valois and Charles of Blois. The population in 1876 was 4844.

HENNEQUIN, Patuiprs Aveuste (1763-1833), French painter, was a pupil of David. He was born at Lyons in 1763, distinguished himself early by winning the "grand prix," and left France for Italy. The disturbances at Rome, during the course of the Revolution, obliged him to return to Paris, where he executed the Federation of the 14th of July, and visiting his native town was at work there on a large design conimissioned for the town-hall, when in July 1794 he was accused before the revolutionary tribunal and thrown into prison. Hennequin escaped, only to be anew accused and imprisoned in Paris, and after running great danger of death, seems to have devoted himself thenceforth wholly to his profession. At Paris he finished the picture ordered for the municipality of Lyons, and in 1801 pro- duced his chief work, Orestes pursued by the Furies (Louvre, engraved by Landon, Annales du AMusée, vol. i. p. 105). He was one of the four painters who competed when in 1802 Gros carried off the official prize fora picture of the Battle of Nazareth, and in 1808 Napoleon limself ordered Hennequin to illustrate a series of scenes from his German campaigns, and commanded that his picture of the Death of General Salomon should be engraved. After 1815 Hennequin retired to Liége, and there, aided by subventions from the Government, carried out a large historical picture of the Death of the Three Hundred in defence of Liége—a sketch of which he himself engraved. In 1824 Hennequin settled at Tournay, and became director of the academy ; he exhibited various works at Lille in the following year, and continued to produce actively up to the day of his death, which took place in May 1833. The Orestes of the Louvre is his capital work ; it shows a certain style and

finish of draughtsmanship, but the attitudes are melodramatic, the composition stagy, and the colour false and violent.

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HENNERSDORF, or SEIFHENNERSDOREF, a manufac- turing village of Saxony, in the circle of Bautzen, and 20 miles §.S.E. of the town of that name. The inhabitants are engaged in weaving and bleaching, and in the manu- facture of woollen goods, satin, arnotto, machinery, bricks, and wooden shoes, There is also an iron foundry. Popu- lation (1875), 6366.

HENRIETTA MARIA. (1609-1666), queen of Charles I. of England, born November 25, 1609, was the daughter of Henry IV. of France. When the first overtures for her hand were made on behalf of Charles, prince of Wales, in the spring of 1624, she was little more than fourteen years of age. Her brother, Louis XIII., only consented to the marriage on the condition that the English Roman Catholics were relieved from the operation of the penal laws. When therefore she set out for her new home in June 1625, she had already pledged the husband to whom she had been married by proxy on May 1 to a course of action which was certain to bring unpopularity on him as well as upon herself.

That husband was now king of England. The early years of the married life of Charles I. were most unhappy. He soon found an excuse for breaking his promise to relieve the English Catholics. His young wife was deeply offended by treatment which she naturally regarded as unhandsome. The favourite Buckingham stirred the flames of his master's discontent. Charles in vain strove to reduce her to tame submission. After the assassination of Buckingham in 1628 the barrier between the married pair was broken down, and the bond of affection which from that moment united them was never loosened.

For some years Henrietta Maria's chief interests lay in her young family, and in the amusements of a gay and brilliant court. She loved to be presentat dramatic enter- tainments, and her participation in the private rehearsals of the Shepherd's Pastoral, written by her favourite Walter Montague, probably drew down upon her the savage attack of Prynne. With political matters she hardly meddled as yet. Even her co-eligionists found

little aid from her till the summer of 1637. She had then recently opened a diplomatic communication with the see of Rome. She appointed an agent to reside at Rome, and a papal agent, a Scotchman named Con, accredited to her, was soon engaged in effecting conversions amongst the English gentry and nobility. Henrietta Maria was well pleased to become a patroness of so holy a work, especially as she was not asked to take any personal trouble in the matter. Protestant England took alarm at the proceedings of a queen who associated herself so closely with the doings of " the grim wolf with privy paw."

When the Scottish troubles broke out, she raised money from her fellow Catholics to support the king's army on the borders in 1639. During the session of the Short Parlia- ment in the spring of 1640, the queen urged the king to oppose himself to the House of Commons in defence of the Catholics. When the Long Parliament met, the Catholics were believed to be the authors and agents of every arbi- trary scheme which was supposed to have entered into the plans of Strafford or Laud. Before the Long Parliament had sat for two months, the queen was urging upon the pope the duty of lending money to enable her to restore her husband's authority. She threw herself heart and soul into the schemes for rescuing Strafford and coercing the parlia- ment. The army plot, the scheme for using Scotland against England, and the attempt upon the five members were the fruits of her political activity.

In the next year the queen effected her passage to the Continent. In February 1643 she landed at Burlington Quay, placed herself at the head of a force of loyalists, and marched through England to join the king near Oxford. After little more than a year's residence there, on April

3, 1644, she left her husband to see his face no more. At Exeter she gave birth to her youngest child, who was one day to be duchess of Orleans, and to negotiate the treaty of Dover. Henrietta Maria found a refuge in France. Richelieu was dead, and Anne of Austria was compas- sionate. As long as her husband was alive the queen never ceased to encourage him to resistance.

During her exile in France she had much to suffer. Her husband's execution in 1649 wasa terrible blow. She brought up her youngest child Henrietta in her own faith, but her efforts to induce her youngest son, the duke of Gloucester, to take the same course only produced discom- fort in the exiled family. The story of her marriage with her attached servant Lord Jermyn needs more confirmation than it has yet received to be accepted, but all the informa- . tion which has reached us of her relations with her children points to the estrangement which had grown up between them. When after the Restoration she returned to England, she found that she had no place in the new world. She received from parliament a grant of £30,000 year in com- pensation for the loss of her dower-lands, and the king added a similar sum as a pension for himself. In January 1661 she returned to France to be present at the marriage of her daughter Henrietta to the duke of Orleans. In July 1662 she set out again for England, and took up her residence once more at Somerset House. Her health failed her, and on June 24, 1665, she departed in search of the clearer air of her native country. She died on August 31, 1666, at Colombe, not far from Paris.

HENRY I. (1068-1135), king of England, fourth and Kings of youngest son of William the Conqueror and Matilda of England.

Flanders, was born some time in the autumn of 1068. Local tradition fixes his birthplace at Selby in Yorkshire. Little is known of his earlier life, except that he received an unusually good education, and attained a proficiency rare among the princes of his day. In 1086 he was dubbed knight. Next year his father bequeathed to him on his death-bed a sum of five thousand pounds, and is said to have foretold that he would eventually be king. Condemned, by the division of the Conqueror's territories, to a position of inferiority to his two brothers, he used his legacy to improve that position. Robert, being in need of money, sold him the districts of the Cétentin and the Avranchin, which he held of his brother as a fief. His relations with Robert were not always friendly, but he defended Normandy against Rufus, and aided his liege lord in putting down a revolt in Rouen. Nevertheless, in the treaty between William and Robert made in 1091, he was excluded from the succession, and soon afterwards was deprived of his lands in Normandy.

The treatment he met with from Robert was not likely to make him support the terms of the treaty of 1091. Immediately after the death of Rufus, he rode to Win- chester, and seized the royal hoard in that city, Next day (August 3, 1101) he was elected king by such of the witan as were present, and on Sunday, August 5th, he was crowned at Westminster. In order to conciliate the clergy and the nation, he recalled Anselm, imprisoned Ranulf Flambard, and issued a comprehensive charter of liberties. Before the year was out he married Matilda, daughter of Malcolm and Margaret, and great-granddaughter of Edmund Ironside, a step which greatly strengthened his otherwise insecure title to the crown, 'The alliance thus contracted with the church and the nation was his constant support in the struggle with his brother and his unruly vassals, which began immediately. It resulted in the conquest of Normandy, the temporary suppression of feudalism, and the consolidation of royal power on both sides of the Channel. Robert, as soon as he returned from the Holy Land, attempted with the aid of a conspiracy in

England to wrest the crown from the usurper. at Portsmouth (August 1, 1101), but before a blow was struck the brothers came to terms. Robert recognized Henry as king of England, and returned to Normandy. Henry's vengeance fell upon his brother's partisans, and Robert of Belesme and several others were banished from the country and lost their English estates. Secure in England, Henry carried the war into the enemy's country. His brother's misgovernment gave him both pretext and opportunity. After two or three expeditions, the struggle was brought to a close by the battle of Tenchebrai (Sep- tember 28, 1106), in which Robert was taken prisoner. He remained in captivity till his death in 1134, and Nor- mandy passed into the possession of the English king. This conquest at once brought Henry into collision with France. Louis the Fat was a constant supporter of Henry's rebellious vassals, and of his rival and nephew, William, son of Robert. Henceforward Henry had to spend most of his time in the duchy. A war with France (1111-1113) ended in a peace which brought some advantages to Henry. Louis gave up his claim to the sovereignty of Maine and Brittany, and Henry was able to carry his old opponent, Robert of Belesme, to England, where he was imprisoned for thé rest of his life. Henry had

already, though in vain, attempted to secure the aid of Flanders by two treaties with Count Robert (1103, 1108). He now sought a mightier ally in the emperor Henry V., to whom he mar- ried his daughter Matilda (January 7, 1114). Another war with France, which broke out in 1116, and in which Louis took up the cause of William, son of Robert, against his uncle, was marked by the battle of Noyon (1119). Ata council at Rheims (1119) Louis accused Henry before Pope Calixtus of rebellion and usurpation. _ Henry, however, pleaded his own cause before the pope at Gisors so persuasively that Calixtus brought about a peace between the two kings (1120) on the basis of a mutual restoration of conquests. During the war Henry had suffered a severe loss in the death of his queen Matilda. He now felt it more than ever necessary to take measures for securing the succession to his only son William. The baronage of Normandy and England were made to do homage to the young prince (1119), who shortly afterwards married Matilda, daughter of Fulk of Anjou, an alliance by which Henry hoped to turn a dangerous foe into a firm friend, and to secure at least the chance of a rich inherit- ance. All these hopes were, however, shattered by the death of William (1120). Deprived of an heir to his throne, Henry now married Adeliza, daughter of Godfrey, count of Louvain (1121), but the marriage unfortunately proved childless. Shortly afterwards another rebellion, headed by Count Waleran of Meulan, broke out in Nor- mandy (1123). The rebels were emboldened by the assist- ance of the king of France and the count of Anjou, but were entirely defeated at Bourgtheroulde (1124). The terrible vengeance taken by Henry on this occasion, to- gether with the death of William, son of Robert, in 1128, seems to have finally crushed the opposition in Normandy. The death of Duke Robert in 1134 removed the last object round which the schemes of rebellion or the intrigues of France could centre. Meanwhile Henry had recalled his daughter Matilda, now a widow, from Germany. In de- fault of an heir to the throne, he made the witan swear to accept her as Lady of England and Normandy (Christmas 1126). Next year he gave her in marriage to Geoffrey, son of Fulk, count of Anjou, hoping thereby to secure the objects frustrated by the death of hisson. Fate, however, thwarted the immediate success of these schemes.

The annals of England, after the expulsion of Robert of Belesme, are uneventful. In his ecclesiastical policy

He landed | his father had asserted, was forced to recognize to a certain

extent the advancing claims of Rome. His dispute with Anselm was conducted with good temper on both sides, and was brought to a satisfactory conclusion. Anselm had made no objection to the ecclesiastical supremacy claimed by Rufus, but the decrees of the Lateran Council (1099) obliged him to resist a similar claim when put forward by Henry I. He refused to do homage to his new king, or to consecrate the bishops whom Henry invested, according to ancient custom, with the symbols of ecclesiastical dignity. Neither side would give way. Henry continued to make bishops as before, and Anselm refused to consecrate them. In 1103 he left England. For the next three years the affairs of Normandy hindered the settlement of the ques- tion, but a compromise was effected in 1107. The pope, Paschal II., consented that homage should be done to the king, while Henry gave up his claim to investiture with the ring and staff. The question thus settled was not re- opened till the days of Becket. In other respects Henry acquiesced in the tendency of the time towards ecclesiastical separatism, and countenanced the decrees of the synod of 1102, which forbade the marriage of the clergy and the tenure of temporal offices by ecclesiastics. He showed his care for the church by the establishment of two new sees, those of Ely (1109) and Carlisle (1133), taken respectively from the unwieldy dioceses of Lincoln and York. In the old quarrel between York and Canterbury, Henry supported the claims of the southern metropolitan against Archbishop Thurstan. On Anselm's death, Henry was guilty of leaving the see vacant for five years, but in his other deal- ings with the church he seems to have been actuated by worthy motives. He refused, however, to open her high places to Englishmen, and till near the end of his reign no native attained the dignity of prelate. The same exclusive spirit made itself felt in the appointments to temporal office. But although political liberty and influence were not granted to Englishmen under Henry I., the English nation as a whole acquiesced gladly in his rule. Its chief wants were justice and order, and protection from feudal tyranny ; and these blessings it obtained. The necessities of his position compelled Henry

to rely mainly on his English subjects. As a counterpoise to the local influence of the baronage, he did his best to restore to activity the old popular institu- tions of the hundred and the county-court, of tithings and frankpledge, of watch and ward. His frequent progresses through the country, for judicial and other purposes, form a link between the annual courts held by the Conqueror and the regular circuits of the justices established by Henry TI. In the administration of justice and the toils of government he relied on new men, raised from the ranks and dependent on himself for their position. The older baronage he habitually depressed, and every unsuccessful rebellion thinned the ranks of the feudal nobility, while it tightened the link between the king and the nation.

Thus secure at home, Henry was dreaded by his neigh- bours within the four seas. Over Scotland, Ireland, and Wales a sort of ecclesiastical supremacy was recognized. On the northern frontier there was peace throughout the reign ; on the western there was more disturbance. Henry settled a colony of Flemings in Pembroke (1111), and made two expeditions into Wales (1114, 1121), in one of which he received the submission of several Welsh princes. The profound peace which England enjoyed for a period of thirty-four years is the best testimony to Henry's merits as a king. As aman his character is not admirable, nor yet wholly to be condemned. He was hard, merciless, and unforgiving, but not wantonly cruel. He sometimes dis- played a grim humour which reminds one of his father ; but he never gave way to the vices and brutality of Rufus,

Henry, without giving up the control over the church which | nor to the jovial good-humour which was so winning in his

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OF ENGLAND. |

eldest brother. Regarded as the "Lion of Justice" by his people, and bitterly regretted after he was gone, he was not a popular king. He died, after bequeathing his crown to his daughter Matilda, near Rouen (December 1, 1135). His body was carried to England, and buried in the abbey he had founded at Reading.

The following general authorities may be consulted for this and the next five reigns here noticed :—Statutes of the Realm; Rymer's Federa; the Pipe-Rolls, Rotuli Cartarum, Rotuli Littcrarwn Pat. and Claus, &c. (ed. Hardy); Lappenberg and Pauli, Gesehichic von England; Stubbs, Constitutional History of England; Stubbs, Documents illustrative of English History (for Henry 1., I1., II1.); Lingard, History of England; Green, History of the English People.

For this reign, original authoritics:—Anglo-Saxon Chroniele; Florence of Worcester, Chronicon ex Chronicis, with its continua- tion; Simeon of Durham, De Regibus Anglorum, &c.; Ordericus Vitalis, Historia Ecclesiastica; William of Malmesbury, Gesta,Pon- tificum Anglorum, Gesta Regum Anglorum, and Historia Novella; Eadmer, Vita Anselmi and Historia Novorum; Robert du Mont, Chronica, and continuation of William of Jumiéges; the Magnus Rotulus Scaecarii, 1181 a.p. (ed. Hunter),

Modern authoritics.—Freeman, History of the Norman Conquest, vol. v.; Church, Life of Anselm; Palgrave, History of Normandy and England. (GW 23)

HENRY ITI. (1133-1189), king of England, son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I., was born at Le Mans, March 5, 1133. He was left in France during the first part of his mother's struggle with Stephen, but was sent over to Englandin 1141. There he remained four years, in the charge of his uncle, Robert of Gloucester. In 1147 he took a more active part in the war, but was not successful. He now souglit the aid of David, king of Scotland, and was knighted by him (1149), but nothing came of the alliance with that prince. On hisreturn to Normandy (1151), Louis VII. conferred the duchy upon him, and later in the year he became, by his father's death, count of Anjou, In 1152 he married Eleanor of Aquitaine, and added Poitou and Guienne to his dominions. He again went to England in 1153, and the great position he lad won on the Continent turned the scale in his favour. After a short struggle Stephen consented to negotiate. By the treaty of Winchester (November 7, 1153) it was settled, among other things, that Stephen should reign un- disturbed during the rest of his life, and that Henry should succeed him. A year later Stephen died, and Henry took quiet possession of the throne. He was crowned on

December 19, 1154, and at once issued a charter of liberties, in which he confirmed the charter of Henry I.

His reign falls into three main periods. During the first Henry was occupied in restoring and maintaining order. The second is that of the quarrel with Becket. The third is for the most part a period of rebellion and trouble, the consequences of that quarrel. Henry's first business was to fulfil the promises made in the treaty of Winchester, and to undo the work of his predecessor. Several of Stephen's earldoms were abolished, new sheriffs were appointed, the adulterine castles destroyed, the royal domains recovered. In this task the king met with little serious opposition, and his presence generally sufficed to ensure success. In 1156 Henry was able to go to France, where his brother Geoffrey was causing trouble by his claims on Anjou. He had to subdue him by force of arms, after which he allowed him to be chosen count of Nantes. He then exacted homage from his Continental vassals, and himself did homage to Louis VII. At Easter 1157 he returned to England, to complete the restoration of order there. Those of the great barons who had not yet given up their castles had now to do so, and the king of Scotland surrendered the three northern counties. An unsuccessful expedition to Wales followed. In 1158, on his brother Geoffrey's death, Henry secured his inheritance. At the same time he betrothed his second son Henry (the eldest, William, being dead) to Margaret, daughter of Louis. Next year he made an attack

upon Toulouse, which he claimed in right of his wife, but after some successes retired, owing to the opposition of the French king. In a peace made soon after, he retained Cahors, but gave up his claim to the rest of the county. Hostilities between him and Louis were, however, more or less continuous during this time, in spite of the efforts of Alexander III. In January 1163 Henry returned to England after five years' absence, and his quarrel with Becket immediately began.

Becket had been consecrated archbishop of Canterbury in June 1162. He at once resigned his temporal offices, and demanded the restitution of lands alienated from his see. Ata council at Woodstock he refused to pay the tax of two shillings per hide demanded by the king. A little later the struggle was

removed to still more dangerous ground. Becket refused his consent to the king's proposal for settling the dispute between the temporal and spiritual courts. Upon this Henry asked him and the bishops whether they would abide by the ancient customs of the realm. So vague a question met with an evasive answer. The bishops would only consent " saving their order." However, at the council of Clarendon (January 1164) the disputed customs were drawn up in the form of sixteen constitutions, and after considerable hesitation accepted by Becket. He nevertheless got absolution from the pope, who refused to confirm the constitutions. Henry now attacked Becket with a series of. charges connected with his chancellor- ship, the result of which the latter evaded by leaving England. Henry took possession of the see, and expelled Becket's friends and relations. The greater part of the next five years he spent abroad. During this time he was occupied in maintaining order among his unruly vassals, checking the intrigues of Louis, and negotiating with the pope. He also obtained possession of Brittany for his son Geoffrey, and betrothed Richard to Alice, daughter of Louis. With the object of securing the succession he had his son Henry crowned by the archbishop of York at Westminster (June 1170). The young king's wife was not crowned with him. Louis, taking this as an insult, invaded Normandy, and only made peace with Henry on condition that he would restore Becket to favour. A meeting between the king and the archbishop ended in a compro- mise, and the latter returned to England. His first step was to suspend the archbishop of York and other bishops who had taken part in the coronation of the young king, and Henry, on hearing of this, uttered the angry words that led to Becket's murder. The pope was, however, in too critical a position to quarrel seriously with Henry. Nego- tiations between them ended in a meeting with the legates at Avranches (1172), in which Henry received absolution, and promised to abolish all the bad customs introduced during his reign. He had employed the interval in making an expedition to Ireland, and appropriating the conquests made by Strongbow a few years before.

The ecclesiastical quarrel seemed to have died away, but its consequences were felt in the great rebellion of 1173. A confederacy was organized by the French king, the count of Flanders, the king of Scotland, and Henry's sons, with the object of placing the young Henry on his father's throne. The first campaign was indecisive, but on the whole favour- able to the king. In view

of a general attack which was to be made next year, Henry crossed over to England and did penance at Becket's tomb. Fortunately his justiciar, De Lucy, captured the Scotch king at Alnwick, and the rebellion in England was speedily put down. William the Lion was forced to buy his release by doing homage to Henry; the other confederates made peace; and Henry was left stronger than ever. He at once proceeded to secure his position by further legislative enactments, and hence- forward he had no trouble in ats But -he was

involved in constant difficulties with his sons and with the French king, owing to the mutual jealousies of the former and the intrigues of the latter, to which Henry's partiality for his youngest son John and his refusal to allow the marriage of Richard with Alice gave rise. A war between the brothers in 1183 was brought to an end by the death of the young Henry in the same year. The feud broke out again in 1184, and continued at intervals, in spite of the death of Geoffrey in 1186, to the end of the reign. At length Henry's apparent intention to name John as his successor forced Richard to ally himself with Philip I, and in the war that followed Henry was beaten at all points. He was forced to make a disgraceful peace, the terms of which, together with the discovery that Jolm was among his enemies, broke his heart. He died at Chinon, July 6, 1189, and was buried at Fontevraud.

Henry's legislative activity, which was great and constant, deserves special notice. His aim was the consolidation of royal power by means of a centralized system of justice and administration, The Constitutions of Clarendon were an essential part of this scheme, designed to bring the clergy, as well as other classes of the nation, under the rule of law, and to prevent an ecclesiastical "imperium in imperio." Other enactments, as the Assize of Clarendon (1166), were intended to perfect the judicial system and to supersede the baronial by the royal courts. The system of recognition by jury took the place of trial by battle. The grand jury was organized for the presentment of criminals for trial. The jury system was further employed for the inquiry into the conduct of the sheriffs (1170), and for the assessment of the Saladin tithe (1188). The circuits of the justices itinerant were, after repeated experiments, brought to some- thing like perfection, and a high

court of justice formed out of the Curia Regis, which was the origin of the Court of King's Bench. By the commutation of feudal service for scutage, and by the Assize of Arms (1181), which revived the national militia, Henry made himself independent of the baronage, and formed that alliance between king and people which was the surest basis of his power. Whatever may be said against his private character, the wisdom and steadiness with which he pursued these aims, and the permanence of the mark that he left upon the constitution, secure him the title of a great king.

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HENRY III. (1207-1272), king of England, eldest son of John and Isabella, was born on October 1, 1207, and was just nine years old on his father's death. Ten days after that event he was crowned at Gloucester (October 28, 1216). His long reign falls into four periods,—that of the regency, ending with the fall of De Burg; that of government by favourites, which led to the Mad Parliament ; the period of the Barons' War ; and the short period between the close of the war and Henry's death. At his accession the whole country was in rebellion, and Louis with his Frenchmen held the east and south. In this crisis it was fortunate that the government fell into the hands of such a man as William Marshall, and that the pope gave him all the assist- ance in his power. The acceptance of the charter at once recalled many to their allegiance, and the defeat and retire- ment of Louis broke up the opposition. The charter was confirmed (1217) and order rapidly restored. The legate

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| Gualo aided the earl marshal and Archbishop Langton in

the work. On Marshall's death (1219) Pandulf took Gualo's place, and asserted the papal authority in a way which obliged Langton to make a personal protest at Rome. Pandulf was recalled, and Hubert de Burg, the justiciar, ruled with Langton till the latter's death (1228), and alone afterwards. The influence of Peter des Roches, bishop of Winchester, the head of the foreign party and guardian of the king's person, was successfully resisted. Meanwhile a last outbreak of pure feudalism under Falkes de Breauté was put down, and the charter again issued in its final shape (1227). But the worst plague of the reign, the influence of foreign favourites, had already made itself felt, while another great evil, the financial exactions of Rome, was causing much discontent. An expedition to Poitou, opposed by De Burg, caused the first quarrel between him and the king. Shortly afterwards Peter des Roches re- turned from a temporary banishment, and gained such influence over Henry that he dismissed De Burg with insult and ingratitude (1232). From this point his real reign may be said to have begun.

The bad promise of his youth was amply redeemed in the events of the next twenty-six years. Under the influence of Peter des Roches, foreigners began to flock to the court, and even foreign mercenaries were introduced into England. Richard, earl marshal, who openly rebuked the king for this conduct, was outlawed, but other barons took up his cause, and collisions between them and the king's troops took place. Civil war appeared imminent, when Archbishop Edmund persuaded Henry to dismiss Peter des Roches, and the danger was avoided for the time (1234). But the king's partiality for foreigners was a constant source of dis- content. In 1236 he married Eleanor of Provence. Two uncles of the queen, William, bishop of Valence, and Peter of Savoy, came over with her, and were immediately placed in positions of honour and emolument. In 1238 Henry married his sister Eleanor to Simon de Montfort, an event which nearly produced an outbreak. Resistance already ceutred in the Great Council, which in 1236 had declined "to change the laws of England," and supported the bishop of Chichester in his refusal to give up the great seal at the king'sdemand.

Henry's personal extravagance caused him much embarrassment, and the extortions of the papal see pressed heavily on thechurch. In 1242 the barons refused to give the aid demanded by the king for another expedi- tion to Poitou, and when they met again after his return, they joined with the clergy in a general protest against his misgovernment (1244). In order to remedy this state of things, it was proposed that the king's advisers should be chosen by the parliament, as it now began to be called, but Henry found means of evading the demand. Hitherto his brother Richard, carl of Cornwall, had been the leader of the opposition, but Simon de Montfort, earl of Leicester, was now becoming the centre of constitutional resistance. In 1246 the king's step-father, the count of La Marche, died, and Henry's half-brothers came to England, bringing with them a fresh crowd of hungry followers. The demands made upon the great cities, especially London, upon the Jews, and upon the clergy, to meet the expenses caused by the king's favourites, were constantly on the increase. Owing to the cessation of the office of justiciar since the fall of De Burg, the judicial system was falling into decay, and crime of all kinds wasrampant. At the same time the pope, engaged in his great struggle with Frederick II, regarded England as an "inexhaustible spring of wealth," and redoubled his demands. He won over most of the bishops by supporting them in their claim to inspect the monastic houses in their dioceses, and the church, deprived of its natural head,—for Boniface, an uncle of the queen, was archbishop cf Canterbury, —was disnnited and helpless.

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Grosseteste, bishop of Lincoln, was almost aloue in his efforts to follow in the stepsof Stephen Langton. He and De Montfort were at one in their desire for reform, but the nation was not yet ready. Two mistakes on the part of Henry brought matters to a crisis. He had conferred the government of Gascony on De Montfort in 1248, and the latter had reduced the province to obedience. But accusa- tions made against him found ready audience with the king, who feared and disliked his brother-in-law. The result was a bitter quarrel (1252), which Henry followed up by super- seding De Montfort in his government, and sending his eldest son Edward to take his place. This had the effect of throwing the earl once for all into the arms of the national party. A little later an event occurred which forced that party to take active

measures. The pope persuaded Henry to accept the kingdom of Sicily for his second son Edmund, and to bind himself to pay the expenses of its conquest, together with a large debt already incurred (1255). This important scheme was entered into without the knowledge of the parliament, and the nation suddenly found itself pledged to an undertaking which had purely dynastic or papal objects. The coalition of pope and king produced a corresponding union of the church and the baronage, and the troubles of the year 1257, Scotch and Welsh inroads, together with a failure of the harvest, united the nation against the Government.

A parliament which met at Westminster (April 1258) forced Henry to promise reform, and elected a committee of tweuty-four to act for the king till a complete scheme could be drawn up. On June 11th the assembly, called afterwards the Mad Parliament, met at Oxford. A coun- cil of fifteen, of whom two-thirds were on the baronial side, was appointed, who, together with twelve repre- sentatives of the "community," were to take charge of the government and meet in parliament thrice a year. Hugh Bigod was named justiciar, other offices were filled up, the castles were entrusted to Englishmen, and four knights were summoned from each county to declare grievances. These reforms, together with certain general enactments, went by the name of the Provisions of Oxford. The king's authority was completely superseded, and the rule of a baronial oligarchy established. Next year, owing to the demands of the knighthood, who felt themselves neglected, a further series of Provisions was issued. The Sicilian project was formally repudiated, and a final peace made with France, in which the claim on Normandy and other districts was renounced. But beyond this the baronial Government did uothing. The nation testified its disappointment, and a quarrel took place between the earls of Leicester and Gloucester which divided the baronial party. The king took advantage of this state of affairs, and in 1261 obtained absolution from the Pro- visions at the hands of the pope. Tower, deposed the baronial justiciar, and soon began to rule as before, In this crisis the baronial party made a bid for popular favour by summoning representatives of the counties to a parliament, but the reaction was for the time complete, and Henry had leisure to go to France in order to win over Louis IX. to his side. In 1263 hostilities broke out on the Welsh border, and the barons seized the opportunity to renew their attack on the king. After some months of desultory warfare, it was agreed to submit to the

arbitration of Louis, That king, in the Mise of Amiens, decided in favour of Henry, and annulled the Provisions. Leicester at once appealed to arms. The battle of Lewes (May 14, 1264) was a complete victory for him, aid put the king and his eldest son into his hands. For a time he was master of the country, but the party he headed was not that which had been dominant six years before, and Henry now had many adherents among the

He then fortified the

greater barons. Nevertheless, for more than a year he remained practically a prisoner in the hands of De Montfort. At a parliament which met in June 1264, and at which knights of the shire were certainly present, a constitution was drawn up, which, while preserving to the king a high position as head of the executive, placed supreme power in the hands of the "community." Early next year, in a parliament to which members from the boroughs as well as from the counties were summoned, this constitution was confirmed, and Henry swore to observe it. In accord- ance with the settlement made at Lewes, Edward was now to be released. His father was already supposed to be at liberty, but in reality both he and Edward were kept in restraint. _Edward's escape (May 1265) caused an im- mediate renewal of the war, and at tlie battle of Eveshum (August 4, 1265) De Montfort wus killed and Henry set free. 'Two years later the war was practically concluded by the capture of Kenilworth. Henry had little to do with the conduct of the war, and acquiesced in the arrangements made by his son for the pacification of the country. His triumph was, however, complete, and for the rest cf his reign the kingdom was at peace. He died on November 16, 1272, leaving behind him the memory of one whose virtues were of the priestly kind, and whose worst vices were those of indulgence, ill-temper, and prodigality. As a subject he would have been harmless, aud even perhaps respectable ; as a king he was weak, hasty, imprudent, equally incapable in the position of a ruler, an administrator, or a general. Original Authorities.—Roger of Wendover, Flores Historiarwm ; Matthew Paris,

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HENRY IV. (1366-1413), king of England, only son of John of Gaunt aud Blanche, daughter of Henry, duke of Lancaster, was born in 1366. At the age of fifteen he married Mary Bohun, and in 1385 was made earl of Derby. Two years later he was one of the five lords appellant who impeached the earl of Suffolk and others, and took part in the proceedings of the Merciless Parliament. He acquiesced, however, in Richard's return to power, supported the king in his coup @état of 1397, and became duke of Hereford. His quarrel] with the duke of Norfolk led to his banishment shortly afterwards, and on his father's death Richard denied him the succession to his title and inheritance (1398). Next year he took advantage of Richard's absence in Ireland to reassert his rights. He landed in Yorkshire, took Bristol, and seized Richard (August 19) near Conway Castle. At a parliament which met on September 30th, he claimed the throne on the ground of his descent from Henry IIL, the right of conquest, and the necessity of reform. He was accepted by the parliament ; Richard was forced to abdicate ; and Henry was crowned (October 13, 1399). The last of his three claims gives the explanation of his policy. He had won the favour of the church by pledges in favour of orthodoxy ; the circumstances of his accession and the difficulties of his government forced him to make concessions to the House of Commons, which raised that body to a position if did not again attain for more than two centuries. The first part of his reign was occu- pied with the suppression of the revolts, not only of the defeated party, but also of his own discontented adherents. These troubles were complicated by hostile relations with

France, Scotland, and Wales. Charles VI. was inclined to take up the cause of his daughter Isabella, wife of Richard II., and on the death of the latter (February 1400) demanded her and her dowry back. The duke of Albany in Scotland was hostile to Henry, and Owen Glendower raised a national revolt in Wales. The first attempt at insurrection was made by the earls of Richard's party early in 1400, but their plans were discovered, and their forces crushed piecemeal. Most of the leaders fell victims to popular vengeance. A more serious rebellion was that of the Percies (1403), hitherto Henry's staunchest supporters. Hotspur and his father thought themselves ill requited for their services, and made common cause with Glendower and other malcontents. A junction of the northern army with the Welsh was prevented by the battle of Shrewsbury (July 21, 1403), in which Hotspur was killed. Northumberland submitted and was pardoned. But the danger was not over. The north was still in a state of ferment, the war in Wales went on, and a French fleet ravaged the southern coast with impunity. Henry's vigilance and activity were, however, equal to the task. A plot to carry off the young earl of March (January 1405) was foiled, and a fresh outbreak in the north was crushed. Scrope, archbishop of York, and Mowbray, earl marshal, who led the rebels, were taken and executed. The king had already got into his power the son of the duke of Albany ; he now captured James, the heir-apparent to the Scotch crown, as he was on his way to France; and the murder of the duke of Orleans removed his chief enemy in that country. Thus secured from danger abroad, he put down a final rebellion in the north, drove Glendower back into his mountains, and henceforward had no trouble at home (1408). The late crisis had, however, compelled him to make important concessions to the House of Commons. He promised (1407) to act solely by the advice of a council nominated with their approval, and submitted to the appropriation of his revenue and to other limitations. Throughout his reign he was hampered by want of money, and the regular exercise by parliament of the right to withhold supplies gave that body great control over his actions. He had seized the crown as the champion of orthodoxy. He had therefore to pay for ecclesiastical support by persecuting Lollards against his will, while he did not dare to act upon the suggestion of the Commons that church property should be converted to purposes of state. Thus limited, his foreign policy was not energetic. He had enough to do at

first to defend his coasts, and though he afterwards seized the opportunity afforded by civil war to invade France (1411), his efforts were in general confined to strengthening his dynasty by foreign marriages. In his later years he was a confirmed invalid, and had to entrust much power to his eldest son, with whom he was not always on the best of terms. He died on March 20, 1413, and was buried at Canterbury. A cautious, crafty, resolute man, naturally inclined to fair dealing and clemency, but on occasion unscrupulous and cruel, he was successful in the great enterprise of his life, and has the credit of see- ing that the power he had usurped could only maintain itself by resting on a constitutional basis.

HENRY V. (1387-1422), king of England, eldest son of Henry IV. and Mary Bohun, was born August 19, 1387. Early bred to arms, his first military effort was not successful, for at the age of thirteen he commanded an expedition to Wales which was defeated by Glen- dower. Three years later he was present at the battle of Shrewsbury, and in 1408 he revenged himself on Glendower by driving him back to Snowdon. At the same time his position in the council, at the head of which he appears after 1410, gave him experience in affairs, and proves the confidence already felt in his political ability. The stories of his youthful extravagance

and dissoluteness are unfounded, and, as the above facts show, improbable. Although his father appears to have been jealous of his popularity, he was practically at the head of affairs for some years before the death of Henry IV. Three weeks after that event he was crowned (April 9, 1413), and entered upon his inheritance with the good-will of all classes of the nation, So unanimous was the support he met with in parliament that constitutional affairs cease to have any interest during his reign, In his ecclesiastical policy he followed the lines laid down in 1401, with much greater heartiness than his father had shown. His persecution of heretics caused a conspiracy to sur- prise him and his brothers, which was discovered and put down with some severity (January 1414). Sir John Old- castle, the head of the Lollards, was condemned to be burnt, and though he escaped for the time, he was again taken in 1417, and put to death. MHenry's orthodoxy

brought him into connexion with the emperor Sigismund, then engaged in settling the affairs of the church at the council of Constance, and his assistance was very instrumental in the healing of the great schism. But the great work of his life was the conquest of France, It was with this object that he issued a kind of general amnesty on his accession, and appealed to the nation as a whole to support him. War was resolved on by parliament, and Henry laid claim to the French crown. This demand was afterwards reduced to one for all the districts which the English kings had ever held in France, Such claims as these, of course, precluded all negotiation. The expedition was not delayed by a con- spiracy to carry off the earl of March, which was discovered before it was ripe, and on August 14, 1415, the English army landed at Havre. Harfleur was soon taken, but the English losses were so great that Henry resolved to retreat to Calais. On October 25th the French army that opposed his march was cut to pieces at Agincourt. The next two years were spent in preparations for continuing the war. In 1417 Henry again invaded France, took Rouen (1419), and with the assistance of the Burgundian party forced Charles VI. to grant hisdemands. By the treaty of Troyes (1420) it was arranged that he should marry Catherine, take the government in hand at once, and succeed on Charles's death. This disgraceful treaty had, however, the effect of reviving the national party in France, and during Henry's absence in 1421 the English began to lose ground. He hurried back to France, but before he had had time to recover his position, he died at the castle of Vincennes, August 31, 1422. A great soldier, an able politician, a skilful diplomatist, a generous, pure, and high-minded man, he was one of the noblest and most popular of English kings. But these good qualities should not blind one to the fact that he was a religious persecutor, and that he plunged his country into an unjust and hopeless war. HENRY VI. (1421-1471), king of England, only son of Henry V. and Catherine of France, was born ou December 6, 1421, and was therefore only eight months old at his father's death. He can hardly be said ever to have reigned, for his long minority passed into another kind of tutelage, during which the influence of his wife and favourites pre- pared the way for civil war. Ten years of anarchy culminated in his dethronement, and ten years more of wandering and imprisonment fill the interval between that event and his death. The chief interest of the first thirty years of his life lies in watching the decay of English power in France; that of the last twenty is to be found in the civil wars which resulted from the

misgovernment of the preceding period. Although the English had lost some ground towards the end of Henry V.'s reign, their position, when the duke of Bedford undertook the task of continuing his brother's work, was very favourable. They held the north

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and centre of France, while Burgundy held the eastern dis- tricts. The alliance with Duke Philip was strengthened by a marriage between his sister Anne and the duke of Bedford. The Scotch king, James I., was released from captivity, in order that England might be relieved from danger on that side. Thus strengthened, Bedford was able to apply himself vigorously to the conquest of France, towards which the battle of Verneuil (1424) was animportant step. But the English cause had already received its first great blow in the marriage of the duke of Gloucester with Jacqueline of Hainault, which destroyed the good understanding between Burgundy and England. Bedford for the time managed to stave off the quarrel, and after renewing his union with Burgundy, laid siege to Orleans, the key of southern France. The capture of the town seemed certain, when the appearance of Joan of Arc turned the scale. The relief of Orleans (1429) was followed by other French successes, and by the coronation of Charles VIT. at Rheims, The capture of Joan did little for England, for the spirit she had inspired survived her loss, aud her death (May 1431) only nerved the French to fresh efforts. It was in vain that Bedford had Henry crowned at Paris (December 17, 1431). The young king remained in France nearly two years (April 1430 to February 1432), but his presence did not turn the tide of French success. On the side of England the supply of men and money was falling short, while on that of France a new type of commanders was coming to the front, who were not inclined to repeat the disastrous blunders of Crécy and Agincourt. The death

of Bedford's wife (November 1432) broke the link that

bound Burgundy to England, and negotiations for peacc were set on foot, These culminated in a great congress at Arras (July 1435), but the demands of the two countries were found ineompatible, and the war was renewed. Bedford's death (September 14, 1435) finally destroyed all hope of recovery in France, Burgundy at once made peace with Charles VII., and the English

commanders who succeeded Bedford were constantly defeated. Paris was retaken, Normandy overrun. Repeated efforts on the part of England led only to further exhaustion. Meanwhile negotiations for peace had been continued at intervals, and led in 1444 toa truce, during which Henry was married (April 22, 1445) to Margaret, daughter of René of Anjou. It was hoped that this marriage, together with the cession of Anjou and Maine, would lead to a permanent peace, and save Normandy and Guienne. But though Anjou and Maine were actually surrendered in 1448, the truce was broken next year, and before the end of 1450 the whole of Normandy was lost. In 1451 Guienne was reconquered by the French, and in 1453 Calais alone remained to

England. The war was practically at an end.

Its conelusion coincides with the period when the two parties that divided England were just about to appeal to arms. The civil war was in great measure the result of the defeats abroad, as those defeats themselves were in part the consequence of discord at home. Quarrels between the chief members of the reigning house were the origin of its weakness; financial embarrassment, a divided foreign policy, and a feeble administration brought disgrace on the king and his advisers; family feuds and a long tale of mutual injuries added bitterness to political differences. Eventually an outburst of popular discontent kindled the train so long prepared, and the champion of order and good government began a struggle in which the original objects were soon lost sight of, and which ended only with the death of the king whose innocent imbecility had caused the disorder. To check the rivalry of Henry's uncle, the duke of Gloucester, and his great-uncle, Cardinal Beaufort, was beyond the power of the council. Bedford alone could appease the quarrel, and Bedford's presence in England

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meant disaster in France. The quarrel between them and their adherents was complicated by the existence of the Lollards, and the question of peace or war. In both matters Gloucester, as persecutor of the Lollards and head of the war-party, appears to have taken the more popular side. 'The coronation of the young king at Westminster (November 6, 1429) put a formal end to the regency of Bedford and Gloucester, but not to the

intrigues of the latter. The House of Commons was unable to interfere with any effect ; the Lords were mostly engaged on one side or the other. The death of Bedford removed the only guarantee of peace, and Gloucester attacked Beaufort with more virulence than ever after his brother's death. In the midst of these troubles Henry VI. came of age (1442). Had he been a great statesman, he would have found an almost hopeless task before him. But, unfit as he felt him- self to be, he naturally shrunk from politics, and was mucli more intent on completing his foundations at Eton and Cambridge than on healing the disorders of his country, The work of government was left mainly in the hands of Cardinal Beaufort and the earl of Suffolk, who did their best to secure peace with France. On the other side the dukes of Gloucester and York headed the opposition, and took up the cry of reform, with the object of infusing vigour into the government at home and abroad. Suffolk, however, won a great victory in the truce with France (1444) ; and through the young queen Margaret, whose marriage was chiefly due to his exertions, he obtained com- plete influence over the king. The suspicious death of Gloucester (1447), followed in six weeks by the death of his rival Beaufort, together with the appointment of York to the governorship of Ireland, left Suffolk master of the situation. But such a position could not be long main- tained in the face of the odium which always attaches to a favourite, and the complete failure of his foreign policy brought about his fall (1450). The king in vain attempted to save him, and by so doing shared his unpopularity, while the partial concessions he made to the demands of the rebels under Jack Cade only postponed the inevitable out- break. The duke of York now made himself the mouth- piece of popular discontent. When the final loss of France had exhausted the country's patiencc, and the birth of an heir to the throne had destroyed his hope of the succession, he took advantage of Henry's mental derangement to claim the protectorate (1453). It was granted him early next year, but in 1455 the king recovered his senses, aud York was deprived of power. Unable to endure this he marched on London, and on May 22, 1455, the Wars of the Roses began in the battle of St Albans. The effect of the battle was to bring the queen to the front as the leader of the royalists, and to make the quarrel between her and York ir- reconcilable, During the four years of uneasy quiet which followed the first collision, Henry tried hard to keep the peace. But all his efforts were vain. When the struggle broke out anew, and the Yorkists won the battle of North- ampton, he was forced to consent to an

arrangement by which his son was excluded from the succession and York recognized as heir to the kingdom (1460). The settlement was of short duration. York himself lost his life at Wake- field, but his son seized the crown and was acknowledged king (March 4, 1461). The battle of Towton brought the struggle to an end for ten years, and the capture of Henry in 1465 seemed to secure Edward IV. on the throne. Five years later a sudden revolution hurled him from it, and restored the wretched prisoner for a while to liberty, but tlie battle of Barnet destroyed his hopes again. He had time to know that his son had died at Tewkesbury, that his wife was a prisoner, and that his cause was finally lost, before death released him from captivity on May 21, 1471. Gentle, pure, and generous, full of good intentions, enthu-

siastic in the cause of religion and learning, he was utterly without the qualities which were indispensable to a medizval king, and he paid the penalty of incapacity in a miserable death and in the destruction of his house. But this very incapacity was an element of the utmost import- ance in the history of his time. The weakness of his character made him the puppet of contending factions, and his well-meant but misguided efforts to govern England as a constitutional king led only to anarchy and the temporary downfall of the constitution.

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of Anjou, &c. (both in Camd. Soc.); Chronicles of Hardyng, Otterbourne, Adam of Usk, Fabyan, Hall; the Paston Letters (ed. Gairdner); Original Letters illustrative of Eng. Hist. (ed. Ellis); Rolls of Parliament; Procecd-ings, &c., of the Privy Council (ed. Nicolas).

Modern Authorities, —Besides those already given above, Nicolas's History of the Battle of Agincourt; Gairdner's Preface to the Paston Letters, (GW. ES)

HENRY VIL (1456-1509), king of England, was the founder of the Tudor dynasty. On his mother's side Henry belonged to the illegitimate branch of the house of Lancaster, being descended from John of Gaunt and Catherine Swinford, and it was only in the absence of nearer heirs that he was accepted as the representative of that house. On the father's side he was sprung from the marriage of Owen Tudor, a Welsh gentleman, with Catherine, widow of Henry V., and this family name became the name of the line of kings which he founded. On the complete overthrow of the Lancastrians, especially after Richard had won the throne by putting his nephews out of the way, Henry, under the name of the earl of Richmond, appeared as the centre of the opposition. From his exile in Brittany or France he schemed for the overthrow of Richard, and made an expedition to England to support the unsuccessful rising of Buckingham. The increasing unpopularity of Richard gave him greater success in his second enterprise. He landed at Milford Haven in order to profit by the good-will of his kinsmen the Welsh, and marching into Leicestershire defeated Richard at the battle of Bosworth, thus ending the Wars of the Roses (1485). Soon after he married Elizabeth daughter of Edward IV., and so the White Rose and the Red were united. Henry, however, was not allowed to enjoy the crown in peace. 'Two pretenders, one after another, led a rising against him. Lambert Simnel, personating the earl of Warwick, son of the duke of Clarence, gathered the Yorkists about him in Treland, and landing in Lancashire advanced as far as Stoke in Staffordshire, where he was defeated and made captive (1487). Next arose Perkin Warbeck, a Fleming, who, pretending to be one of the princes murdered by Richard in the Tower, received much countenance abroad and in Scotland, and had many supporters among the discoutented at home. But when he ventured to land in Cornwall, he was captured and finally executed (1499). 'These risings

troubled the reign of Henry, but did not shake his throne. Hoe ruled with a firm hand; he took care to repress the nobles, already almost exterminated in the civil war, in this case continuing the policy of Edward IV.; he put down the practice of maintenance, by which they kept bodies of retainers ready to support them in battle, and in every way sought to concentrate in the person of the king the whole power of the nation. Henry was a parsimonious and

calculating ruler, who avoided war, gained by diplomacy what other sovereigns attempted by force, kept a well-filled treasury, and made two brief expeditions into France the oceasion of amassing additional wealth. His avarice led him even to revive old and forgotten statutes, and to exact heavy fines from those who had transgressed them, in which evil work he was assisted by the two well-known lawyers Empson and Dudley. His reign is marked also by two marriage arrangements which had great influence on subse- quent history. His son Arthur was wedded to Catherine of Aragon. When Arthur died in 1502, a few months after the marriage, Catherine remained in England in order to be united to the younger son Henry, though the nuptials did not take place till after his accession to the throne. The other marriage was that of the young princess Margaret to James IV. of Scotland (1503), which a century after resulted in the union of the crowns. Henry VII. died in 1509, leaving, it is said, a treasuré of two million pounds to his successor. He was by no means an amiable or popular sovereign, but did great service in settling and con- solidating the kingdom after the long troubles.

‘he authorities for Henry VII. are—Memorials of Henry VII. (with which is published Bernardi’s Historia de Vita Henrici VII),

and Letters and Papers illustrative of Henry VII., both edited by Gairdner; and Bacon’s History of Henry VII., edited by Stebbing.

HENRY VIII. (1491-1547), king of England, was born in 1491, being the second son of Henry VII. and of his wife Elizabeth of York. On the death of

his elder brother Arthur in 1502, he became heir apparent to the throne. As younger son Henry had been educated for the church, and it is said that his interest in theology was due to those early studies ; but as he was only eleven when his brothier died, they could not have been either extensive or profound. His training under the severe and methodical Henry VII. must have been a very careful one ; he was deeply interested in the new learning, and was a most accomplished scholar. During his father's lifetime we hear nothing of the young king except as the destined husband of Catherine of Aragon, the widow of his brother Arthur, a lady six years older than himself. It suited the plans of the old monarchs, their parents, that Catherine should be wedded to Henry, and so she remained in England during the seven years of her widowhood. Henry was only eighteen when the death of his father (1509) left the throne of England vacant, as well as set him free to shape his own career. His first important act was to fulfil the contract im- posed upon him by his father to marry Catherine. His ministers, almost without exception, were in favour of the marriage. Henry expressed himself highly delighted with his wife. Catherine was fond of him to excess. The dis- parity of years was not so marked at that early period ; Catherine was amiable, accomplished, of the bluest blood in Europe, closely connected with the most powerful dynasties, a queen of whom England with her then dimin- ished prestige might well be proud. For the time all went well, and no one saw in such a simple event the seeds of a great revolution,

Englishmen were not in the mood to anticipate evil at the accession of Henry. In the young king all the condi- tions requisite for a prosperous reign seemed to be combined in a rare degree. To the dull monotony, varied only by Yorkist rebellions, to the greed, suspicion, and jealousy which made the shady side of the previous reign, succeeded an era of splendour and enjoyment in which every free and generous impulse should have free scope. As Henry united in his own person the lines of the White Rose and the Red, there was no likelihood of a revival of the old broils. Those who grudged to see his Lancastrian father on the throne were well pleased to see it occupied by a son of Elizabeth of York. The hated avarice of Henry VII. had

provided means for the popularity of his successor ; and to Henry VIII. fell the easy and generous réle of squandering the treasure which his father had amassed. Nor was this the only respect in which the young Henry entered on the fruit of other men's labours. In the Wars of the Roses, and by the policy of Edward IV. and Henry VII., the old feudal nobility had been brought very low. When nothing more was to be feared from that quarter, it was Henry VIII.'s easy task to gather round him the broken remnants, to attach them to lis person, and to make them the ready instruments of his will, in short, to convert the representa- tives of a haughty feudal baronage into submissive courtiers. In character the young Henry was a king according to the people's heart; even in his faults he was exceptionally fortunate. He was handsome, frank, extravagant, of vast muscular strength, accomplished in all the manly exercises of the time andin the new learning ; he was vain, thirsting for popularity, eager to retrieve tle old renown of England, the enemy of France, and dreamt always of renewing the conquests of the Henrys and Edwards. It is not surprising that Henry excited the highest expectatious in all classes of his subjects, for his varied character offered an attractive side to all of them. The men of the new learning were charmed by his love of letters. Ecclesiastics saw with pleasure his punctual performance of the duties of religion, All good men were delighted with the excel- lence and purity of his private life. Statesmen were struck by his capacity for business; his gaiety and frankness captivated the courtiers; the prospect of French conquest inspired the warlike and theambitious. From the descrip- tion of Henry by the Venetian ambassador, Giustiniani, in 1519, we can easily perceive what impression he must have made on England at his accession :—" His Majesty is twenty-nine years old, and extremely handsome. Nature could not have done more for him. He is much handsomer than any other sovereign of Christendom,—a good deal handsomer than the king of France,—very fair, and his whole frame admirably proportioned. On hearing that Francis I. wore a red beard, he allowed his own to grow; and as it is reddish, he has now got a beard that looks like gold. He is very accomplished, a good musician, com-poses well, is a most capital horseman, a fine jouster, speaks good French, Latin, and Spanish, is very religious, hears three masses daily when he hunts, and sometimes five on other days. He hears the office every day in the queen's chamber,—that is to say, vesper and compline. He is very fond of hunting, and never takes his diversion without tiring eight or ten horses,

which he causes to be stationed before- hand along the line of country he means to take ; and when one is tired he mounts another, aud before he gets home

they are all exhausted. He is extremely fond of tennis, at which game it is the prettiest thing in the world to see him play, his fair skin glowing through a shirt of the finest texture." When we take all these facts into consideration, when we remember also that erelong he had raised England from a third-rate position to a level with the greatest powers of Europe, and that for twenty years nothing serious occurred to break the harmony of his reign, we caunot be surprised that Henry was a most popular king. The reign of Henry falls naturally into two periods, separated by the question of the divorce. During the first period Henry is the splendid and jovial king at home, abroad a figure of the first magnitude in the wars and international diplomacies of the time. Both in home and

foreign affairs, but particularly the latter, Wolsey was the | right hand man of the king, ready, as occasion served, either to transact the whole business of the government, or to be the humble instrument of the king, when the royal hand did actively interfere. In point of fact Henry always was master, and took a keen interest in business. The events

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of the first period were concerned chiefly with the foreign wars. At home, with the exception of the execution of Empson and Dudley, the instruments of his father's extor- tion, who suffered, however, on a trumped-up charge of treason, nothing important occurred. 'There were Christ- mas revels, May festivals, tilting matches, in which Henry always shone victorious, and in which he squandered the treasures of his father. But the serious endeavours of the time were directed abroad ; Henry joined his relatives Ferdinand and Maximilian in a league against France. Though Henry took a personal share in the campaign in France of 1513, and won the easy Battle of Spurs, and though Surrey, his general, gained the great victory of Flodden, no substantial result was attained by the war. Henry was duped and then abandoned by his allies. When he was undeceived, he made peace (1514) with France, which was cemented by the marriage of his youthful sister Mary to the old and worn-out Louis XIJ. Soon after, when Louis was

succeeded by Francis I. (1515), and Charles V. entered on the government of his hereditary dominions (1516), the three monarchs who figure so conspicuously as the contemporaries of the Reformation, and whose doings constitute so much of the history of the 16th century, found theniselves face to face. With these two and with the suc- cessive popes Henry had to do during the rest of his life. Their relations at first were chivalrous and even friendly. Henry never had any chance of success in his canvass for the imperial crown. When it fell to Charles, it made him beyond a doubt the first monarch of the age; his success placed him in open rivalry to France; but to Henry, fortunate again, it gave the desirable prospect of being courted by the two rivals, and even of acting as arbiter in their disputes. Henry, however, descended from this lofty position to engage in quarrels which had no concern with the true interests of England. The chimera of French conquest again fascinated him and his people, so that when the false chivalry of the Cloth of Gold had degenerated into war, Henry took the side of Charles. In the campaign of 1523 the English forces advanced to within eleven leagues of Paris, but the war led to no durable and satisfactory result as far as Henry was concerned. The people grew sick of the heavy contributions they were called upon to make, and threatened revolt. After the battle of Pavia (1525), where the French were completely overthrown and their king made prisoner by the armies of Charles, the policy of Henry was completely disturbed. Till that event it had heen clear enough. The commercial interests of the cquntry, which were bound up with the Flemish dominions of Charles ; the ambition of Wolsey, who founded his hope of the papal crown on the good-will of the emperor; the hereditary enmities and warlike instincts of the people, as well as the inclination of the king, coincided conveniently in requiring the imperial alliance. But now France was down, and the balance of power, already a working conception in politics, was destroyed, while Charles in his triumph ignored the claims of Henry, and had more than once disappointed the ambition of Wolsey. Under these circumstances English policy was forced out of its old groove, and an alliance was made with France. In a short time, moreover, interests and passions of a far more momentous nature emerged. The dilettante politics of Henry's early career were to be superseded by occupations of a tragically earnest nature. Adventurous enterprises abroad were to give place to real interests at home, and the jovial young king was to be

transformed into the stern, self-willed, and often cruel revolutionary. The serious and important part of Henry's

life therefore is still to come: but before leaving the earlier

period it is well to remark that it lasted twenty years, or more than half of hisreign ; that during these years Henry was popular in the highest degree ; and especially that he

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had gratified the national pride of his subjects by restoring England to a leading positionin Europe. This should not be forgotten during the troubled and more questionable events that were to follow.

The year 1528 may justly be fixed as the turning-point of Henry's life. By that time the divorce had become a national and even a European question, and Henry had decisively committed himself to the course which was to result in the separation from Rome. It is not clear when the plan of a divorce began to take shape in Henry's miud ; it was the slow result of a variety of causes which were not clear to the king himself. We know, lowever, that Anne Boleyn returned to the court of Eugland in 1522; that she made quite a sensation there as soon as she appeared ; and that among other admirers, married and uumarried, Heury soon expressed a decided preference for her. On the other hand, he seems to have been alienated from Catherine loug ere the question of divorce became public; if we may trust a statement of his own, he had abstained from her bed since 1524, and his coldness for her increased with his love for Anne. That his scruples regarding his marriage awoke about the same time was certainly a very convenient coin- cidence. 'The danger, however, of a disputed succession in the absence of male heirs was a real one. The situation probably justified such an extraordinary measure as a divorce, though we must recollect that the raising of a secoud family, rival to Mary the daughter of Catherine, might precipitate the very crisis which men feared. Still we must admit on the whole that the uational interest and the inclination of Henry coincided, and that concern for his kingdom probably had a large part in the mixed motives which urged him to seek a divorce.

When the demand for a divorce was first formally laid before the pope in 1527, no one anticipated that it would encounter so many difficulties. The great opponent of it was Charles V., who loyally supported his aunt, and who, as the event proved, had the pope entirely in his power. But for the emperor, Clement would soon have arranged every- thing to the satisfaction of the English court. As it was, he sought safety in delay. Thus he declined giving any decisive answer himself, and when he delegated the case to Wolsey and Campeggio, he managed still further to defer the question and then to revoke it to Rome (1529). By that time Henry's patience was exhausted. As early as 1528, and as if sure of a speedy decision in their favour, the king and Anne were living familiarly together under the same roof. Their disappointment was natural, and Henry soon began to take more active measures. He appealed from the pope to the universities. Notwithstanding his life-long services Wolsey was discarded, because he was supposed not to have been sufficiently earnest about the divorce. The same year (1529) a parliament was called, which proved to be the ready auxiliary of the king in his new policy. This parliament, which sat at intervals from 1529 to 1536, had little independent or substantive power ; it was made up largely of the nominees and creatures of the court, and seldom moved but at the royal initiative. Still it was well that the old forms should be recognized in the great changes that were coming, and significant that the strong-willed Tudor felt it safe to have the nation at his back. The changes themselves were gradual, and were by no means disagreeable to the advanced and influential part of the nation. Only a very small minority had any sympathy with the Lutheran movement ; but many wished to see the church reformed, to have her power curtailed, and that England should take up a more independent attitude towards the pope. Under these circumstances Henry found it easy to carry the majority, especially the active and pro- gressive part, of the nation with him. In no case was the

templated was not a revolution but only some necessary reform; it, as well as Henry, would have been astonished to hear that they were working on the side of Luther. Yet the parliament soon proceeded to take some very decisive steps. In 1529 the probate duties and mortuaries (or burial fees) exacted by the church were curtailed; the clergy were prohibited from following secular employments ; residence was enforced, and pluralities forbidden. In 1531 the clergy were laid under the charge of preemunire, which they bought off by the payment of £118,000, and the acknowledgment that the king was supreme head of the church. In 1532 the abuses of " Benefit of Clergy" were reformed, annates abolished conditionally, and the inde- pendent legislative power given up by convocation. Soon after the king took a step which precipitated the crisis ; he married Anue Boleyn, an event which was quickly followed by the publication in Flanders of a threat of excommunica- tion from Rome. After this the Act of Appeals was passed, forbidding appeals from the English ecclesiastical courts to Rome, and Cranmer, in a court at Dunstable, declared the marriage with Catherine null and void. In the following year (1534) the papal authority in England was annulled, and by the Act of Supremacy Henry was declared supreme head of the English Church. The next step was asad one ; but it convinced the world that the king was in earnest. Sir Thomas More and Fisher, bishop of Winchester, the noblest champions of the old faith, two of the best and noblest Englishmen of the time, were executed for refusing to accept the Supremacy Act (1535). Such an event pro- duced a deep sensation in Europe, but it was decisive ; when the pope drew up the Bull of Deposition in 1536, which, however, was not published till 1538, the rupture with Rome was complete. In the same year (1536) the first Articles of religion, ten in number, were drawn up; in effect they were a great simplification of the old creed, though they gave little encouragement to Lutheranism. At the same time the Act for the dissolution of the smaller monasteries, which was based upon the report of a com- mission of inquiry, was passed, being the final important measure of the first Reformation parliament. With such events as the abolition of the papal power in England and the dissolution of the

monasteries modern England begins ; they inaugurate a fundamental change in the national policy and in the structure and habits of society. While the purpose, real or ostensible, of Henry had been merely to marry a younger woman and provide for the succession, he had effected the greatest revolution which England has undergone.

Henry had indeed succeeded in the task to which he had applied himself nine years before ; but the enemies he had raised were formidable, and he was destined to many a bitter disappointment. He had excited the hostility of the pope and the emperor; worst of all, he had seriously hurt the feelings and prejudices of a large class of his subjects. The danger of foreign invasion was greatly increased by the discontent both in the north and west of England, where the love of use and wont in the church and in the national habits was strongest. The death of Catherine had indeed greatly relieved him, as it made reconciliation with the emperor practicable, and deprived the English opposition of a common centre. The rising in Ireland was suppressed without much difficulty, but the discontent in the north which broke out in the Pilgrimage of Grace was a formid- able danger (1536). It was averted more by skilful states- manship on Henry's part than by open show of force. The opposition in the west was nipped in the bud by the execu- tion of its leaders, the marquis of Exeter and Lord Montague (1538). These measures of the king and of his minister Cromwell sometimes appeared cruel and unjustifi-

parliament of 1529 conscious of its destiny ; what it con- | able, but they kept the country united; Charles was con-

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vinced of the futility of an invasion; and the thunderbolts of the pope fell harmless to the ground. In all this crisis, when a wrong step or the appearance of vacillation might have occasioned a religious war, in which the conservatism at home would have been seconded by the armies of Spain, the energy and the commanding sagacity of Henry did more than aught else to save the country. To him the praise is chiefly due that this great revolution was comparatively free from blood and havoc.

Henry had defied the emperor and tlie pope, and he had suppressed the conservative Catholic discontent at home with a high hand; but he was never disposed to be a Protestant. Instead of following. the lead of the advanced Reformers he impressed upon the English Church his own moderate and substantially Catholic theology. At thirty he had defended the seven sacraments against Luther; he was thirty-six when he took up the question of divorce, and he was forty ere his relations to the pope had hardened into alienation and hostility. All his life he was orthodox from conviction as well as from traditional assent. Such a man could not. be a revolutionary in theology. He repressed with a firm hand all excess in innovation, showing equal aversion to the iconoclastic mob and to iconoclastic preachers. The bill of the Six Articles, passed in the same year that saw the final dissolution of the monastic system of England, was the most remarkable exemplification of this spirit of Henry. It also proves that innovation in theology was a new thing to the mass of the English nation, and its penalties too clearly illustrate the fact that religion was not considered an individual and private matter, but a national interest, the violation of which was a capital offence. It is to the honour of Henry that the victims of the Bloody Statute wereso few. Five hundred arrests were made by the eager Catholic party in a single fortnight after the passing of the bill; but the king interposed in time, and only twenty-eight suffered under the statute during the whole reign.

In the meantime Henry had been less fortunate in the matrimonial scheme which hid been the occasion of all the changes and dangers we have noted. A few months after the death of Catherine, Anne Boleyn was sent to the scaffold. Anne may have been guilty of the crimes laid to her charge, but Henry himself had taught her to cast aside all feminine reserve and self-respect, and his fickle heart had been capti- vated hy another, long before the disclosures which were the ground of her death. Henry married his new love, Jane Seymour, the day after the execution of Anne (1536). The birth of Edward in the following year gratified the king's desire for a male heir; but the early death of Jane left him again without aqueen. After an interval of more than two years Cromwell undertook to procure a suitable wife at the Protestant courts of Germany; but his ruin was not less complete than that of his patron Wolsey on a similar occasion ten years before. Anne of Cleves found no fayour in the king's eyes; she was divorced and pensioned off,

while the enemies of Cromwell succeeded in sending him to thescaffold. Anne's place was occupied by Oatherine Howard, till she, really guilty, was also executed (1542). For his sixth and last queen Henry married (1543) Catherine Parr, who proved a patient wife and an excellent nurse. During the last few years of Henry's reign home affairs and the question of the religious revolution ceased to be the exclusive subject of interest. England and the neighbouring powers were constrained to acquiesce for the time being in Henry's arrangement of things. Even the emperor cultivated his alliance. His foreign politics ended very much as they began—with a war against Scotland and France. 'The former arose out of certain border quarrels ; the Scots were beaten at Solway Moss, but defeated an English force at Ancrum Moor. After the death of James V.

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Henry's course was to arrange a marriage of the infant queen of Scots with his own son Edward. 'The plan failed through Henry's self-will, and Scotland was ravaged to no purpose. The war with France (1543-46) was equally fruitless. Its chief feature was a threatened invasion by a formidable Freuch fleet, which for some time was master of the Channel.

At home the most important point of interest was the struggle between the two factions, Protestant and Con- servative, which had now for some years confronted each other—Norfolk and Bishop Gardiner of Winchester being the leaders of the latter, while the queen, Cranmer, and the earl of Hertford, uncle of young Edward, were at the head of the former. Cromwell had already fallen under the machinations of the Conservative party. Cranmer and even the queen were not quite safe from its attacks. The heads of that party uow suffered at the close of thereign. Surrey was executed, and Norfolk was saved only by the death of the king. The effect of such measures was to make the prospects of Edward secure by confirming the power of his uncle Hertford.

Henry was anxious to arrange affairs for the accession of his son, as he felt his own life waning away. Though only in his fifty-sixth year he was unwieldy with disease and corpulency, and required to be wheeled from room to room ; an ulcer in the leg had troubled him for many years. In this as in so many other respects the contrast between the beginning and end of

his career is striking: the young athlete is transformed into a helpless invalid; the joviality, the enthusiasm, and the unanimity of his earlier reign gave place to a long period of gloom and contention, repressed only by the savage and imperious hand of the king. He died on the 28th of January 1547,

Tbe character of Henry has long been a stumbling-block to historians, and will always be a puzzle to such as classify mankind under the two heads of good and bad without recognizing the intermediate gradations to which the vast majority belong. To many it is all the more inexplicable, because the contrast between his youth and declining man- hood is so apparently complete. Yet it was a perfectly | consistent, though a mixed character, and the later phases of it are only a natural development of the earlier. He was always strong-willed to excess, capricious, and fickle, with the sensuous part of his nature predominating. In his youth his baser tendencies were controlled by his love of popularity, his regard for his excellent wife, his own sense of duty, and the vigorous animal spirits which found congenial play in physical exercise and in foreign war, In his maturer years he was more self-reliant and therefore less dependent on popularity; after losing his regard for Catherine he fell into baser companionship ; as his health began to fail, his boisterous spirits declined. Worst of all, his constitutional fickleness took the form of disloyalty to his successive wives, and to his friends and ministers. In the time of Henry there was no acuter man than Sir Thomas More. His verdict may be accepted as final on this aspect of the king's character. In the height of his favour with the king, after walking an hour with him in the garden at Chelsea, the king holding his arm about his neck, More confessed that he had "no cause to be proud thereof, for if my head would win him a castle in France it should not fail to go." Such may have been the repulsive side of Henry. Much more important, however, than the consider- ation of his personal character is the question as to the nature and tendency of the historic work in which he took the initiative. Was that the outcome merely of misguided self-will concealing itself under the guise of duty, or was it the true and durable expression of the claims and aspirations of the time? The passions of Henry had certainly too much to do with it; the work he did was, like his character, mixed with baser elements. But the best answer to such

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a question is to be found in the modern history of England. That history in its progressive spirit, in its gradual approxi- mation to a sounder and better state of society, and in its liberal openness to the influence of truth, is only the con- tinuation and development of the work of Henry. In his rupture with the pope, in his abolition of an idle and anti- quated monasticism, and in his endeavour to establish a purified and simplified Catholicism as the permanent creed of England, he was fighting on the side of truth and light and progress. Tho English Reformation was too much alloyed with baser elements to serve as an ideal example of a great historic change; yet it succeeded better than any

other in appropriating the good both of the old and the

new, in avoiding a violent rupture with the past, in keeping

the nation unanimous, and in escaping those fatal religious

wars which desolated Europe for nearly a century and in

Germany delayed the progress of civilization for a century

more. This desirable consummation was due first of all to

Henry, whose sagacity and unfaltering resolution baffled the enemies of reform both at home and abroad, who repressed the hasty movements of either fanatical extreme in England, °

and who, with his real reverence for the teaching of the past, had a hearty contempt for its abuses. He was no hero, no ideal man or king; he shared fully in the coarseness and indelicacy of the age; he was fickle in his personal attachments, and did not shrink from destroying those who crossed his plans ; but he had a real and lofty sense of his duty asa king; he had a

true insight into the men and things he had to deal with, and helped to lead the country into a new era.

Sources for the Life and History during the reign of Henry VIE. (Record Commission); State Papers, with introductions by Brewer, down to 1530 (Rolls series); Giustiniani's Four Years at the Court of Henry VELL, 1515-1519; Erasmus's Letters; Legrand's Histovre du Divoree ; Cavendish's Life of Wolsey ; Roper's Life of More ; Hall's Chronicle.

Important Historical Works treating of Henry VEEF.—Froude's History of England, vols. i.~~iv.; Lingard's History of England ; Hallam's Constitutional History, vol. i.; Burnet's History of the Reformation ; Seevohm's Oxford Reformers, and his Fra of the Pro~~ testant Revolution. (oe: 3)

HENRY I. (876-936), German king, was born in 876 in Saxony, of which his father, Otto, was duke, He dis- tinguished himself in early youth by the courage and energy with which he warred against the Slavonic tribes to the east of his native duchy. Otto, who died in 912, appointed Henry his successor, not only as duke of Saxony but as lord of Thuringia and part of Franconia. Conrad I., stimulated by certain ecclesiastical advisers whom Henry's independent bearing towards the church had deeply offended, resisted the claims of the young duke; but he was ulti- mately left in possession of all the lands his father had ruled. After Conrad's death Henry was chosen king by the Franconian and Saxon nobles, and he had not much difficulty in securing the acquiescence of the rest of Germany. For some years Lotharingia or Lorraine had held an uncertain position between the kingdoms of the East and the West Franks, as Germany and France were then called; but at this time Duke Giselbert, who was an old friend of Henry, quarrelled with Charles the Simple, and transferred his allegiance to the German king. For eight centuries afterwards Lorraine remained a part of Germany. From the time of Louis the Child, Germany had been tormented by the Hungarians, who were still a savage race, and who had the advantage of fighting on horseback while the Germans resisted them on foot. In 922 an Hungarian chief was captured, and his people were compelled to purchase his release by agreeing to a nine years' truce, on condition that Henry should during this time pay an annual tribute. In the

northern districts the Germans had hitherto lived for the most part in small villages or on separate settlements, after

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the fashion described in the Germania of Tacitus. Henry, perceiving that so long as they continued thus exposed to attack they could never be safe, began the building of cities throughout Saxony and Thuringia, and in the other duchies his example was extensively followed. He also trained his vassals to meet the enemy on horseback, thus giving a strong impetus to the movement which resulted in the institutions of chivalry. When his arrangements were complete he tried his new force in a contest with the Danes and with some Slavonic tribes, whom he utterly defeated. In 933 the Hungarians demanded as usual the tribute which had till then been punctually paid, and when it was refused invaded Thuringia with a great army. Henry twice defeated them, and they were so overwhelmed by this misfortune that they did not enter Germany for some years, and were never again seen in the northern duchies. Having thus broken the power of all the chief enemies of his country, Henry took precautions for the future by establishing the marches of Schleswig, of Meissen, and perhaps of Brandenburg. In his home government he acted with great caution and judgment. The dukes had become so powerful that there was some danger of their altogether overshadowing the throne. Instead of directly meeting this peril by forcing them into submission, as was afterwards done by his son Otto, he attached them to his interests by confirming them in many of their rights and by acting as a mediator in their disputes. Towards the close of his life his position was so secnre that he resolved to go to Rome and claim the imperial crown. In the midst of his preparations he died in 936 at Memleben, and was buried in St Peter's church at Quedlinburg, He was one of the wisest and most energetic of the German kings, and through his

encourage- ment of municipal life, and his powerful defence of Germany against her foreign enemies, his reign marks an epoch of the highest importance in early medizval history. By his first wife, Hatburg, he had a son Thankmar, who gave Otto After she was put away he married Matilda, the daughter of a Saxon count; and the gentle and noble character of this lady, who was uni- versally beloved, was of essential service to him in his rule.

See Waitz, Jahrbiicher des Deutschen Reichs unter Heinrich I. (Berlin, 1837; 2d ed., 1863).

HENRY II. (972-1024), Holy Roman emperor, was born in 972, He was the son of Henry the Wrangler, duke of Bavaria, a grandson of King Henry I. In 995 he succeeded to the duchy of Bavaria, and six years afterwards went to Rome with the young emperor Otto III., to whom he rendered important services. When Otto III. died, Henry, as the chief surviving representa- tive of the house of Saxony, took possession of the insignia of the empire, and was crowned German king at Mainz on the 7th of June 1002. Encouraged by disturbances in Germany, a rebellious party of nobles in northern Italy raised Margrave Harduin of Ivrea to the throne of Lombardy ; but Henry advanced against them, and, like his immediate predecessors, made himself master of the iron crown. His most determined enemy during the greater part of his reign was Boleslaus IJ. of Poland. This ambitious and strong-willed prince annexed Bohemia, and during the king's absence in Italy broke into Lusatia and Meissen. Henry hurried back, defeated Boleslaus in 1005, and granted Bohemia in fief to Jaromir, son of the previous duke. Boleslaus, however, continued the war, which was not ended till 1018, when Henry was obliged to conclude peace on terms that were much more favourable to the Poles than he would have voluntarily granted. In the midst of this struggle he had to make war on Adalbero, his wife's brother, who seized the archbishopric of Tréves, and was protected in his claim by another brother of the

empress, the duke of Bavaria. Both were overcome and

of Bamberg. Three other German bishops, one after the

deprived of their dignities, although Bavaria was ultimately | other, were appointed to the same position ; and as all of

restored to the elder of the two brothers. Henry alsv put down rebellions in Flanders and Meissen, and he concluded an important treaty with Rudolf III. of Burgundy, whereby after Rudolf's death the country was to be united to Germany. In 1013 Henry went for the second time to Italy, where Harduin had again raised hiniself to the throne. The usurper was displaced, and in 1014 Henry was crowned emperor at Rome by Benedict VIII., whom he had con- firmed in the papal see in opposition to the antipope Gregory. Atthe request of Benedict the emperor returned to Italy in 1022 in order to drive back the Greeks, who were steadily pressing northwards. In this enterprise he associated himself with the Norinans, who thus became one of the most important factors in the political life of Italy. Henry's health, which was always feeble, rapidly declined after this third visit to his southern dominions, and in 1024 he died. He was canonized by Pope Eugenius IIL, and at a later time his wife, Cunigunde, was also ranked among the saints. It was natural that they should be thus honoured, not only because of their fervent piety, but because the church has rarely had a more splendid bene- factor than Henry IT., whose ruling policy was to balance the power of the great nobles by increasing that of the spiritual princes. He also founded the bishopric of Bam- berg, which was placed under the immediate jurisdiction of the pope, and to which he left by will all his treasures and his magnificent allodial possessions.

See Hirseh, Jahrbiicher des Deutschen Reichs unter Heinrich II. (Berlin, 1862-75).

HENRY III. (1017-1056), Holy Roman emperor, was the son of Conrad IL, the founder of the Franconian dynasty. He was born in 1017, and his father, anxious to make the succession secure and to strengthen the authority of the crown, caused him to be elected German king in 1026, creating him in 1027 duke of Bavaria, and in 1038 duke of Swabia and king of Burgundy. He became the reigning sovereign of Germany in 1039, at the age of twenty-

two. Of an upright and resolute temper, he soon made his power felt both in church and state. The policy he pursued was that which had been followed by Otto I. during the early part of his reign: that is, he granted as many of the duchies as possible either to members of his own family or to vassals on whose loyalty he could rely. Duke Gottfried of Lower Lorraine, who laid claim to Upper Lorraine also, was the only prince who gave him serious trouble, and even this impetuous opponent could not effectually resist the great emperor. Henry was as distinguished in his wars as in his home government. Duke Bretislaus of Bohemia, who gave signs of aspiring

to an independent position, invaded Poland, plundered

its chief cities, and as a mark of his triumph carried away the body of St Adalbert from Gnesen to Prague. Henry proceeded against him in 1041, and forced him to appear in the following year at Ratisbon in penitent's garb, and to accept Bohemia iu fief of the German crown. Having settled this difficulty, he began in 1042 a series of campaigns in Hungary, where for the first time he asserted the supremacy of Germany. In Italy he was equally successful, not only maintaining his right to the Lombard crown, but establishing supremacy over the Normans in Apulia and Calabria. At this time the moral condition of the church was regarded with regret and concern by every serious nature, and Henry, who was of a deeply religious tendency, associated himself heartily with the movement for reform which proceeded from Cluny. At a council of prelates in Sutri in 1046, he caused the rival popes, Benedict IX., Sylvester IL., and Gregory VI., to be deposed, and raised to the papal see, as Clement II., Suitger, bishop

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them were devout men and energetic administrators, they did much to purify the ecclesiastical system of Europe. During their rule the papacy was held in strict subjection to the empire; but the very earnestness with which Henry applied himself to the task of making the church worthy of its mission created grave dangers for the state, since it was improbable that a pope of proud and independent spirit would be content with a subordinate position. The mag- nitude of the peril soon revealed itself when Hildebrand became pope during the reign of Henry IV., Henry IIL.'s son and successor. Henry died in the prime of life in 1056 at Botfeld.

See Steindorff, Jahrbiicher des Deutschen Reichs unter Heinrich III, (Leipsie, 1874).

HENRY IV. (1050-1106), Holy Roman emperor, son of Henry III., was born in 1050, and crowned German king at the age of four during his father's lifetime. After the death of Henry III. in 1056, the government was undertaken by the empress Agnes, the young king's mother. Henry III.'s vigorous rule, while it had secured the prosperity of the nation as a whole, had excited bitter discontent among the great nobles, and immediately after his death they began to make attempts to recover some portion of the independence he had taken from them. Agnes, who was of too refined a temperament to contend with them, sought to win their support by important con- cessions ; and the evil effects of a feeble central authority were soon felt in every part of Germany. At last, in 1062, Anno, archbishop of Cologne, succeeded in gaining possession of the king by enticing him on board a boat on the Rhine. Agnes then resigned her position, and Anno ruled in her stead. He was a harsh, bigoted, and despotic prelate, and excited Henry's bitter hatred by the sternness of his discipline. In Adalbert, archbishop of Bremen, who was of an exactly opposite disposition,—gay, worldly, and good-humoured,—Anno had an influential rival. This prelate was at first entrusted with some share in the training of Henry, but ultimately completely gained his affections and became his sole guardian. In his fifteenth year Henry was declared, in accordance with the Ripuarian Code, to have reached his majority, but the royal authority was really exercised by Adalbert, who aroused the jealousy of the princes both by his splendid style of living and by his opposition to their usurped powers. At a diet held in Tribur he was compelled to yield the first place once more to Anno. 'Trained under these diverse influences Henry became passionate and wilful; but he was endowed with considerable intellectual gifts, and when thoroughly aroused could pursue an object with unquench- able ardour. In order, if possible, to check the excesses of his private life Anno caused him to marry Bertha, the daughter of the margrave of Susa, to whom he had for some time been betrothed. At first he regarded her with strong dislike; but after she had borne him a son in 1071 she succeeded in gaining his affections, and was afterwards his most trusted friend and companion. ;

Henry's reign was one of the most troubled in German history. His chief anxieties began in consequence of Otto of Nordheim, duke of Bavaria, being charged with an intention of murdering him. Otto was declared to have

| forfeited his titles, and his lands were seized and overrun,

Supported by Duke Magnus of Saxony he rebelled, but both princes were quickly subdued. A new rebellion was organized by Otto of Nordheim, who suddenly, at the head of 60,000 men, appeared before the Harzburg, a strong Saxon fortress in which Henry resided. He escaped, but he was looked upon so coldly by the princes that he found it expedient to yield nearly all the demands of his enemies.

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An opportunity of revenge was, however, created for him by the violence of a body of peasants, who destroyed a chapel connected with the Harzburg and violated the graves of the king's brother and infant son. He had then no difficulty in obtaining an imperial army, and after defeating the rebels at Hohenburg in 1075, he imposed on them his own terms, and seemed to be on the point of asserting the ascendency which had been exercised by Henry ITI. Meanwhile Hildebrand had become pope as Gregory VIL., and had already indicated his design of making the papacy supreme over all earthly authorities. Henry appealed to him to degrade those prelates who had associated themselves with the rebels, Instead of responding favourably to the appeal, Gregory called upon the king to answer to certain charges preferred against him by his subjects. Failing to realize how much power the papacy had acquired through the reforms effected by his father, Henry summoned a council of German prelates at Worms in 1076, and declared the pope deposed. The reply was a sentence of excom- munication. Henry's adherents so rapidly fell away that a reconciliation with the pope was soon perceived to be absolutely necessary. Escaping from his enemies he crossed the Alps in the depth of winter, accompanied only by his wife and child and by a few faithful attend- ants. The nobles of Lombardy were not unwilling to take up his cause, but he preferred to hurry forward to the castle of Canossa, where Gregory was residing with his friend the Countess Matilda. There occurred the famous

scene in which Henry, the highest of secular potentates,.

stood for three days in the courtyard of the castle, clad in the sbirt of a penitent, and entreating to be admitted to the pope's presence. No historical incident has more pro- foundly impressed the imagination of the Western world. It marked the highest point reached by papal authority, and presents a vivid picture of the awe inspired during the Middle Ages by the supernatural powers supposed to be wielded by the church.

The ban was removed ; nevertheless the German princes elected Duke Rudolf of Swabia as their king, and they were soon openly supported by the pope, who resented Henry's persistent opposition to his great scheme for the deliverance of the clergy from the system of feudal investi- ture. Henry renewed his sentence of deposition against Gregory, and raised Guibert, archbishop of Ravenna, to the papacy as Clement III. After the death of the anti- king Rudolf in 1080 he went to uphold his rights in Italy, and in 1084 he gained possession of Rome, where Clement III. crowned him empcror. In Germany Count Hermann of Luxembourg had been chosen as successor to Rudolf, and in 1085 he defeated Henry near Wiirzburg; but in 1087 he voluntarily resigned his position, and soon after- wards died. A third anti-king, Margrave Eckbert of Meissen, also died in 1089; and had Henry had no enemies outside his native kingdom there would then have been peace. But Victor III. and Urban IIL, the successors of Gregory VII. (who died in 1085), con- tinued to oppose him, and in 1090 he was obliged to proceed to Italy for the third time to support Clement IIT., his own antipope. Whilst engaged in this struggle he learned that his son Conrad had been induced by the papal party to rebel against him. Stunned by this unexpected blow, the tired emperor withdrew in disgust to a remote fortress, where he remained inactive for several years. In 1096 he recovered his energy, returned to Germany, and by timely concessions managed to overcome the opposition of his leading enemies. A diet at Mainz decided that Conrad had forfeited his right to the throne, and his brother Henry was proclaimed the emperor's successor. Pope Urban II., the antipope Clement III., and Conrad, all died within two years, and Henry had reason to hope that

he would be able to end his life in quiet. But Paschal IL., pursuing the policy of his predecessors, once more excom- municated the emperor, who was driven to despair by the fact of his son Henry putting himself at the head of the pope's supporters. The aged monarch, deceived by false promises, fell into his hands, and was detained as a prisoner. He ultimately fled to Li¢ge, where he might still have been able to bring an army together ; but in 1106 he was relieved from his heavy cares by death. The bishop of Liége buried him with a splendour becoming his position; but his enemies carried the body to Spires, where it was laid in an unconsecrated chapel; and it was not properly interred until, after a delay of five years, he was delivered from the ban of excommunication.

Henry holds an honourable position in history because, notwithstanding many personal faults, he resisted the excessive pretensions both of the papacy and of the ambitious feudal lords of Germany. He was unable, how- ever, to make good hisclaims. Centuries passed before the secular power of the Romish see was seriously weakened, and amid the confused struggles of the time the princes obtained secure possession of rights which they had formerly held by an uncertain tenure.

See Giesebrecht, Geschichte der Deutschen Kaiserzeit (30 ed., vol. jii., part 1, Brunswick, 1869); Floto, Heinrich IV. und sein Zeitalier (2 vols., Stuttgart, 1855); Minckwitz, Die Busse Kaiser Heinrichs

LV. zw Canossa vor dem Papste Gregor VII. (2d ed., Leipsic, 1875) (J. SI.)

HENRY V. (1081-1125), Holy Roman emperor, son of Henry IV., was born in 1081. In 1098, his elder brother Conrad having forfeited his right to the throne by rebellion, he was appointed his father's successor. Six years after- wards he himself rebelled against the emperor, towards whom he played the part of a thorough traitor. The papal party, with which he allied himself, took for granted that when he mounted the throne church and state would be instantly reconciled ; but their hopes were disappointed. The main point for which Henry IV. had contended was the right of investing the bishops with ring and staff. When Henry V. succeeded him in 1106, Pope Paschal II. demanded that this right should be given up, but he replied that he could not resign powers which had been exercised by his prede- cessors, and the loss of which would imply that the eccle- siastical lands of Germany would

be removed from secular control. In 1110 he entered Italy at the head of 30,000 men. Alarmed by this display of force, Paschal withdrew his claims, and a day was appointed for the coronation of Henry as emperor. The opposition of the Roman prelates made it impossible for the pope to proceed with the cere- mony, whereupon he and his cardinals were made prisoners, Paschal then formally recognized the right of investiture, and Henry received the imperial crown. When the Germans had recrossed the Alps Paschal renounced the treaty he had concluded, and the emperor was excommuni- cated. As many of the princes were pleased to find this opportunity of rebelling, Germany again became the scene of confused contests like those which had brought misery upon it during Henry IV.'s long reign. In 1116 the emperor went a second time to Italy and drove Paschal from Rome; and after Paschal's death he caused Gregory VIII. to be appointed pope. The extreme papal party, how- ever, selected Gelasius II., who renewed the sentence of excommunication against Henry. The latter returned to Germany in 1119, and at a diet in Tribur succeeded in allaying the hostility of the more important among his enemies. Pope Calixtus II., who succeeded Gelasius in 1119, now found it necessary to offer a compromise; and the controversy between the empire and the papacy was for the time closed by the concordat of Worms, which was concluded in 1122. By this treaty it was agreed that at every election ofa prelate the emperor should have the right

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of being present, either in person or through a representa- tive, and that the chosen bishop, before being consecrated, should receive his lands and secular authority in fief of the crown. So far the advantage rested with the emperor; but the papacy gained by being recognized as a power which had the right of negotiating with the empire on equal terms, and by the acknowledgment of the claim of the church to nominate its own rulers. Notwithstanding this settlement Germany did not long enjoy peace, for a number of petty wars broke out which Henry was not strong enough to quell. He died at Nimeguen in 1125, and with him was extinguished the Franconian dynasty.

See Giesebrecht, Gesehtehte der Deutschen Kaiserzett (8d ed., vol. iii., pt. 2, Brunswick, 1869); Gervais, Geschichte Deutsehlands unter der Regierung Heinrichs V. und Lothars (Leipsic, 1841-42); Kolbe, Erzbisehof Adalbert I. von Mainz und Heinrich V. (Heidelberg, 1875).

HENRY VI. (1165-1197), Holy Roman emperor, the sou of Frederick I., was born in 1165, and received the German crown in 1169. When his father started for Palestine at the head of the third crusade, Henry was made imperial vicar, and he succeeded to the throne after the news of his father's sudden death reached Germany in 1190. He shared the intellectual culture of his time, and was distinguished for the splendour of his political schemes; but he was of a stern disposition, and in order to attain his ends was some- times guilty of horrible cruelty. Henry the Lion, who had been banished to England by Frederick I., returned to Germany after the departure of the latter for the Holy Land. Henry resisted him, but on becoming the reigning sovereign he concluded peace, and hastened to Rome, where he was crowned emperor in 1191. Through his wife Constantia he had a right to the throne of Sicily; but the Sicilian nobles had made Count Tancred, an illegitimate son of Constantia's brother, king. After receiving the imperial crown Henry advanced against Tancred, and the whole of

'southern Italy except Naples was quickly in his possession.

Before Naples his army was struck by pestilence, and he was forced to return to Germany. There he suppressed various private wars, and compelled Henry the Lion to acknowledge his supremacy. The great ransom which he received from Richard I. of England enabled him to fit out a fine army, and with this he descended upon Italy in 1194, and without much difficulty conquered the Sicilian kingdom. Tancred was dead, but he had left a number of relatives, who were so barbarously treated that the people were seized with terror, and not even a sentence of exccm- munication which the pope pronounced against Henry could induce any one to express dissatisfaction with his rule. On his return to Germany it was easy for him, with the prestige he had now acquired, to enforce submission ; and so great was his authority that, in 1196, he made attempts to secure that the crown should be declared here- ditary in his family. He might have succeeded had

he lived some years longer; but in 1197 he died at Messina. Before his death he was engaged in checking disorder which had arisen during his absence in Sicily ; and he even obliged the Byzantine emperor Alexius to pay him tribute. See Toeche, Jahrbiicher des Deutschen Reichs unter Hetnrieh VI. (Leipsic, 1867); Micke, Kaiser Heinrich VI. (Erfurt, 1876). HENRY VII. (1282-1313), Holy Roman emperor, was born in 1282. He was the son of Henry II, count of Luxembourg, and was elected king in 1308, seven months after the murder of Albert I. He owed his election partly

to the fact that he was comparatively unimportant, which

led the electors to suppose that under him the powers of the princes would be exposed to no great danger. When he came to the throne Bohemia was subject to Henry of Carinthia, whom the people extremely disliked. The king at once displaced him, and enriched his own family by granting Bohemia, at the request of the Bohemians themselves, to his son John, whose claims were rendered

secure by his marriage with Elizabeth, the daughter of Wenceslaus II. For some time no German king had sought the imperial crown; but Henry, who was of an imaginative temperament, could not forget the splendid dignities to which the wearer of the crown of Germany was entitled. He therefore resolved to revive the traditions which had begun to die out, and with a view to this result did what he could to compose the differences of the nobles and to gain their allegiance. At this time there were signs of rapid progress among the cities, and had a strong king devoted himself to their interests, he might have established his throne on 4 solid basis. Unfortunately the easiest way in which Henry could obtain immediate power for his plans in Italy was to ally himself with the princes against the cities; and this was in most instances the course which he adopted. His visit to Italy was looked forward to with eagerness by the Ghibellins, whose hopes were expressed in words of glowing eloquence by Dante. He held aloof at first from both the great parties in the state, and was in consequerice liked by neither. In 1312 he was crowned emperor in Rome, having previously received the iron crown in Milan. But while he was in Rome, Robert of Naples was there also witha strong army, and in order to

obtain adequate support it was necessary for Henry to declare himself on the side of the Ghibellins. He then resolved to conquer Naples, but while advancing on this expedition he died at Buonconvento, on the 24th of August 1313. It was generally believed at the time that he had been poisoned by a Dominican monk, but this is not proved by satisfactory evidence.

See Dénniges, Acta Henrici VFF. (Berlin, 1840-41); and Ge- sehiehte des Deutschen Kaiserreichs im 14ten Jahrhundert (Berlin, 1841); Thomas, Zur Kénigswahl des Grafen Heinrich von Luxen- burg im Jahre 1808 (Strasburg, 1875); Pohlmann, Der Lémerzug Kaiser Heinrichs VII. (Nuremberg, 1875).

HENRY I. (1005-1060), king of France, son of King Kings of Robert and Constance of Aquitaine, and grandson of Hugh France.

Capet, came to the throne in 1031. On his accession his mother, who favoured her youngest son Robert, allied her- self with the chief feudal nobles, and drove Henry to take refuge at the court of Duke Robert II. of Normandy. With the duke's help he soon broke up her league. Con- stance died in 1032, and Henry, by granting him the duchy of Burgundy, secured the goodwill of Robert his brother, who thus became head of the first house of Burgundy. After the death of Robert "the Devil," Henry, who had first supported William the Bastard, in 1053 and 1054, tried to weaken the power of the Nor- mans. lLeaguing himself with the count of Anjou, and calling his brother Eudes into the field, he invaded Nor- mandy from Evreux. When, however, Eudes had been defeated at Mortemer, Henry drew back in haste, and left the Normans to themselves. In 1059 he had his eldest son Philip crowned as joint-king, and died in 1060. He was an active prince, with his sword rarely in the scabbard, being little more than a great feudal chief, who enjoyed the feudal pastime of petty war. Henry's acts and character did little to strengthen the monarchy im its relations with its feudal neighbours. His political horizon was very narrow. The Normans were independent of him, with their frontier barely twenty-five miles west of Paris ; to the south his authority was really bounded by the Loire; in the east the count of Champagne was little more than nominally his subject. Henry's first wife (if indeed she was more than affianced to him) Maud,

daughter (or niece) of Conrad the Salic, died childless ; his second, Anne, daughter of Jaroslav, grand-duke of Russia, bore him two sons,—Philip his successor, and Hugh, count of Vermandois.

See Rodolf Glaber's Chroniele ; Chron. Andegavense ; Historia de Henrico I.; Epist. Deoduini ; Dom Bouquet, Recueil, tom. xi.

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HENRY II, (1519-1559), king of France, the second

son of Francis I. and Claude, succeeded to the throne in 1547. When only seven years old he was sent by his father, with his brother the dauphin Francis, as a hostage to Spain in 1526, whence they returned after the conclusion of the peace of Cambray in 1529. Henry was too young to have carried away any abiding impressions, yet throughout his life his character, dress,.and bearing were far more Spanish than French. In 1533 his father married him to Catherine de' Medici, from which match, as he said, Francis hoped to gain great advantage, even though it might be somewhat of a misalliance. He did not then think that the dauphin would die so soon, and Catherine thereby become queen of France. Italian manners and politics entered with her into France, and long affected the history and fortunes of the country. Henry gathered round him a court which contrasted strongly with that of his father. Francis, with all his grave faults and selfishness, had fostered learning, had treated his people kindly, and had rarely checked even the Reformers. But Henry, under the influence of Diana of Poitiers, headed the strict Catholic movement; the escape of the learned from Paris to Geneva at his accession showed that not merely Huguenot doctrines but Renais- sance studies were in peril. His court underwent an immediate change: the old officers were dismissed, and men whom Francis had disliked or banished returned. Immorality did not take flight, for Diana of Poitiers and Catherine de' Medici were at court, but it ceased to be gay and bright; men must be grave and severe, even in their vices. At first Diana of Poitiers and the grim old soldier Anne of Montmorency swayed the king ; later, the two brothers Francis, duke of Guise, and Charles, cardinal of Lorraine, rose to power, with the marshal St André; everything was done and given through one or other of these men. Catherine de' Medici was as yet completely in the background.

The final union of Brittany with France marks the opening year of the reign. In 1548 Henry won a great diplomatic triumph over the ministers of Edward VI. of England, by getting possession of Mary queen of Scots, then only six years old; he had her educated in France, and eventually married to his son the dauphin Francis. In 1549 he appeared in Paris for the first time, and marked his presence by a great burning of Calvinists ; and soon after he claimed back Boulogne, which had been promised to Francis I. by Henry VIII. After a success- ful campaign, he made the English Government, then extreinely weak, cede Boulogne, and Henry entered the place in May 1550.

Hitherto he had not come into collision with Charles V.; the time was now approaching when he would enter into contest with him, and permanently advance the borders of his kingdom, while he inflicted a great blow on the emperor. 'Though early in his reign he had dealt with the German Protestants, and with the Otto- man power, he had taken no active steps ; now the league of German princes, headed by Maurice of Saxony, offered an opportunity not to be missed ; Henry made a com- pact with the Swiss and Turks, and concluded a secret treaty (September 3, 1550) with the German princes; in 1552, by the league of Chambord, he undertook to seize the three bishoprics,—Metz, Verdun, and Toul. And so while Maurice drove the emperor from Innsbruck, Henry sent Montmorency into Lorraine. 'The bishoprics were won almost without a blow, and Henry was acknow- ledged as "avenger of Germanic liberty"; an attempt on Strasburg failed. After the siege of Metz by Charles V. in the winter of 1552-53, this district, French-speak- ing, though feudally under the empire, remained in

French hands,—Metz tiil 1870, Toul and Verdun to this day.

In 1556 Henry, supporting the anti-Spanish policy of the ' Theatine" pope, Paul IV., again made war with Spain. Francis of Guise was sent early in 1557 into Italy to oppose the duke of Alva. Anne of Montmorency went to the northern frontier; Gaspard of Coligny, who com- manded in Picardy, was ordered to begin hostilities. These led to the disastrous battle of St

Quentin, in which the French were utterly defeated (August 10, 1557); it was followed by the fall of the town, at that time the chief bulwark of France to the north. Francis of Guise, recalled in haste from Italy, redressed the balance at the expense of England by the capture of Calais (January 1558), and the triumph of the house of Guise seemed com- plete when Mary Stewart was married to the dauphin in the same year ; their niece, with her claims on the Scottish and English crowns, would now ascend the throne of France. The defeat of the French at Gravelines, the desire of Montmorency to escape from captivity, the wish of the High Catholics to have leisure to extirpate heresy, the sympathy of Philip with that aim, the accession of Elizabeth of England—all these things made peace neces- sary, and the treaty of Cateau Cambresis (April 1559) closed the war. As a sequel to the peace high feast was held at Paris to celebrate the marriage of Henry's two daughters ; in a tournament he received his death-wound from the captain of his Scottish guards, Montgomery. So ended Henry IL., in his forty-first year. Handsome, brave, and cold, he left little mark on his age ; he is all but forgotten in the stormy days which followed. By Catherine de' Medici he had ten children, three of whom succeeded to the throne,—Francis II., Charles IX.,and Henry III. The legislation of his reigu was slight ; he reduced the number of secretaries of state to four, and arranged their functions – afresh ; he issued an edict in behalf of a better coinage, reserved to himself the exclusive sale of salt, and permitted the foundation of the university of Rheims. In 1555 we find the first French Reformed churches established at Paris ; these were quickly followed by others. The reign saw the close of the struggle between the crowns of Spain and France.

See Afémoires de Montlue; Mémoires de Tavannes; Mémoires de Vieilleville ; Mémoires de Villars ; Art de vérifier les dates, série ii., tom vi.; Brantéme, Vies des Hommes illustres, and Dames illustres Francoises ; Commentaires de Francois de Rabutin ; Thuanus (De Thou), Hist. sui temp. Libri CXXV. (GOW)

HENRY III. (1551-1589), king of France, third son of Henry II. and Catherine de' Medici, succeeded to the throne of France in 1574. In his youth, as duke of Anjou, he was warmly attached to the Huguenot opinions, as we learn from his sister Margaret of Navarre; but his unstable character

soon gave way before his mother's will, and both Henry and Margaret remained as choice orna- ments of the Catholic Church. Henry won two brilliant victories at Jarnac and Moncontour (1569), and thereby attracted the eyes of the Polish nobles, who elected him their king in 1573. He went to Warsaw, but, on the death of his brother Charles IX. in 1574, came back to France and assumed the crown. He returned to a wretched kingdom, torn with civil war. Now began that " reign of favourites" which has made his career a byword. His mother, ever balancing between parties, first favoured the favourites, then went with the Huguenot chiefs. In these days the famous League was organized (see FRANCE, vol. ix. p. 562), and Henry declared himself its head in 1576. He took but a feeble part in the sixth and seventh civil wars, and was little in earnest till, in 1584, the death of his younger brother, Francis, duke of Anjou, made Henry of Navarre next heir to the throne, and excited to the utmost the fierce passions of the Guises and the League. The

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Parisian development of the League under the "sixteen" (1585), with its devotion to Henry, duke of Guise, and its determination to exclude the heretic of Navarre, to depose the wavering Henry III., and to make Cardinal Bourbon king,—this, as well as the menacing attitude of Philip II. of Spain, forced Henry III. to draw towards his distant cousin Henry of Navarre. And so he was driven to desperation by the commanding position assumed by the house of Guise; and in 1588 Henry of Guise and his brother the cardinal were assassinated by his orders. Henry III. now found himself powerless ; early in 1589 he again joined Henry of Navarre, and with him laid siege to Paris. There he was murdered by one Jacques Clement, a priest, With Henry IIL. ended the direct line of the house of Valois. In his young days he had been enthusiastic for learning and the new religious opinions; as he grew older he grew worse ; and the last of the sons of Catherine de' Medici was perhaps the most debauched of the kings who hitherto had sat on the throne of France,

See Mémoires de Tavannes; Mémoires de Vieilleville; Mémoires de Castelnau; Brantéme, Dames illustres Frangoises ; Ménvoires du Due de la

Force; Thuanus (De Thou), Hist. sut temp. Libri CXXV.; Journal de UV'Estoile; Mémoires de la Ligue; Art de vérifier les dates, sér. ii. tom. vi.

HENRY IV. (1553-1610), king of France, was born in the castle of Pau in 1553, being son of Antony of Bourbon, king of Navarre and duke of Vendome, and Jeanne of Albret. By his father he was tenth in descent from Saint Louis, and only a very distant cousin to his predecessor, Henry III. His mother, a grand and noble lady, brought him up as a Calvinist. His education was rough and hard, and fostered that originality of character which so marked his life; his military training was under the great captain, Gaspard of Coligny. In 1571 he was wedded to the daughter of Catherine de' Medici, Margaret of Valois; and on his mother's death in 1572 he became king of Navarre.

The massacre of St Bartholomew found him in Paris; but his life was spared on his making a profession of Catholicism, which lasted till he succeeded in escaping from court in 1575. Thenceforward he became acknow- ledged head of the Huguenots, and by his dashing bravery kept life in their dispirited forces. No man was better fitted for such work ; he had all the qualities of a guerilla leader, though he was not a great general. His success at Coutras (1587) and the joyousness and generosity of his character endeared him to his followers, while it secured the respect even of his opponents. After the death of Henry III. he was recognized as king of France by only a portion of the army then besieging Paris (August 4, 1589) ; the Catholie " Politiques" in the army stood aloof and disbanded ; the Huguenots formed the only sound nucleus of his power. At Arques (1589) and Ivry (1590) he brilliantly defeated the Leaguers, and resumed the siege of Paris; Alexander of Parma, however, prevented him from taking Rouen (1592); much less could he take Paris. Finding affairs hard, and desiring to be a king and not a guerilla-captain, in 1593 Henry allowed himself to be converted to Catholicism, By this step he struck a deadly blow at the League and made powerless the intrigues of Philip II. For between the fanatical Catholics on one side and the Huguenots on the other lay the great bulk of Frenchmen; the "Politique" party had become more and more powerful, until at length it was felt to be the true national party. The only thing which kept it from Henry was the difference of faith ; that barrier removed, all France at once joyfully accepted him as king. The Leaguers

became almost a foreign body; the Huguenots gloomily accepted his triumph, bought, as they held, at cost of principle. After the battle of Fontaine-Frangaise in 1595

the Spanish and Leaguers were driven out of Burgundy, and the recovery of Amiens from the Spaniards in 1596 secured Picardy and the northern frontier. The Satire Ménippée, published in 1593 and 1594, had already con- demned the Leaguers as hirelings of the Spanish king ; and in April 1598 by the edict of Nantes Henry assured their position to his old Huguenot followers, while by the peace of Vervins (May 1598) he ended the Spanish war, and took from the League its last source of strength.

After 1598 the energies of Henry IV. were given to the restoration of his country, which in nearly forty years of civil war had suffered terribly ; the organizing genius of Maximilian of Bethune, duke of Sully, restored the finances; agriculture, manufactures, and commerce made marvellous advances. Henry also upheld the authority of France ; in 1601 he acquired Bresse, Bugey, .and Valromey from Savoy. He supported the Netherlands against Spain, and he was preparing a great army, which, in combination with the Dutch under Maurice of Nassau, was to interfere in the tangled Cleves-Juliers question, when he was assassi- nated by Ravaillac on the 14th of May 1610. For his character see FRANCE, vol. ix. p. 516.

Henry [V. left no children by his first wife Margaret of Valois ; by his second, Marie de' Medici, he had three sons and three daughters,—Louis, who succeeded him as Louis XIII.; a child who died in 1611; Gaston, duke of Orleans, the meanest of the race ; Elizabeth, wife of Philip IV. king of Spain; Christine, wife of Victor Amadeus, duke of Savoy; and lastly Henriette Marie, queen of England, spouse of Charles I. He also left behind him several natural children, of whom the most celebrated was César, duke of Vendéme, son of the famous Gabrielle d'Estrées.

See Pierre l'Estoile, Journal du régne de Henri IV.; Péréfixe, Histoire du rot Henri le Grand ; Xivrey, Recueil des lettres misstves de Henri IV. (1839-

58); Palma Cayet, Chronologie novennatre ; Mémoires de Tavannes; Mémoires de Vieillevilie; Mémotres de Castelnau; Sully, @eonomies royales; Cimber and Danjou, Archives eurteuses ; Art de vérifier les dates, série ii, tom. vi. The reader is also referred to the documents cited by Von Ranke in his Franzisische Geschichte, and to Olivier de Serres's Thédtre d'agri- culture et mesnage des champs. (G. W. K

HENRY I. (1512-1580), king of Portugal, born at Of Por- Lisbon, January 31, 1512, was the third son of Emanuel tugal.

the Fortunate, was destined for the church, and in 1532 was raised to the archiepiscopal see of Braga, In 1542 he received the cardinal's hat, and in 1578 when he was called to succeed his grandnephew Sebastian on the throne, he held the archbishoprics of Lisbon and Coimbra as well as that of Braga, in addition to the wealthy abbacy of Alcobazar. As an ecclesiastic he was pious, pure, simple in his mode of life, charitable, and a learned and liberal patron of letters; but as a sovereign he proved weak, timid, and incapable. On his death in 1580 after a brief reign of seventeen months the male line of the royal family which traced its descent from Henry, first count of Portugal (c. 1100), came to an end; and all attempts to fix the succession during his lifetime having ignomini- ously failed, Portugal became an easy prey to Philip IL. of Spain,

HENRY I. (c. 1207-1217), king of Castile, son of of

King Alphonso " the Noble," by Eleanor, daughter of Castile.

Henry II. of England, succeeded his father in 1214, and was killed by the falling of a tile in 1217, after a reign of only two years and nine months. He was succeeded by Ferdinand III, son of his sister Berenguela.

HENRY II. (1333-1379), king of Castile, surnamed ed Bastardo or de la Merced, was one of the six illegitimate sons of King Alphonso '"'the Avenger," and consequently half-brother to Pedro the Cruel, who legally succeeded to the throne of Castile in 1350. His mother was Leonora

de Guzman. The extraordinary series of cold-blooded murders which earned for Pedro his unenviable surname encouraged Henry, then known as count of Trastamara, to lead repeated rebellions, in which, with the aid of the French under Du Guesclin, and in spite of the opposition of the English under the Black Prince, he was ultimately successful in 1369. He immediately proceeded to direct his arms against the most formidable of his numerous enemies, King Ferdinand of Portugal, and by four campaigns, during the last of which he forced his way to the very gates of Lisbon (March 1373), succeeded in establishing a favourable peace. At the same time he entered into a treaty with the king of Navarre, which sub- sisted, however, for only three years; in 1375 friendly relations with the king of Aragon were formed, which were cemented by the marriage of the daughter of the latter to Don Juan of Castile. The reign of Henry IL., which was devoted rather to defensive than to aggressive warfare, was not marked by any of the usual exploits against the Moors, but it is distinguished in the annals of Castile by some noteworthy improvements in legislation and reforms in the administration of justice, sanctioned in the cortes of Toro in 1369 and 1372; and Spanish historians also mention with special pride the defeat of the English by the Spanish fleet at Rochelle in 1372. Henry died, of poison it is supposed, on May 30, 1379, and was succeeded by his son John (Juan) I.

HENRY III. (1379-1406), king of Castile, surnamed el Doliente (the sickly), succeeded his father John I. in 1390, when only eleven years of age. During his minority, the question of the regency not having been very clearly settled by his father, the kingdom was in a constant state of disturbance, bordering upon civil war ; unable to satisfy the rival claims of Don Fadrique, Don Alonso, and the archbishop of Toledo, Henryat last resolved, minor as he was, to take the reins of government entirely into his own hands (1393). By energetic measures he succeeded within two years in quelling the turbulence of his nobles, in establishing his own popularity with the body of the people, and thus in effecting the pacification of his kingdom. 'The only foreign war during this reign was that with Portugal, which terminated in the peace of 1399; a great expedition against the kingdom of Granada, for which extensive preparations had been made, and for which large grants from the cortes held in Toledo in 1406 had been obtained, was brought to an abrupt termination by the death of Henry at that city on December 25 of

the same year. It was during this reign that the sovereignty of the Canary Islands was assumed by Castile; and an interest- ing indication of at least a widening interest in foreign affairs was afforded by the mission of a solemn embassy to Tamerlane in 1401, Henry III. was succeeded by John IL., his eldest son by Catherine of Lancaster, whom he had married in 1393. See Davila, Historia de la Vida y Hechos del Rey Don Henrique Tercero de Castilla

(1638).

HENRY IV. (1425-1475), king of Castile, surnamed e/ Impotente (the impotent) and sometimes el Liberal (the spendthrift), the eldest son of John II. by his first wife Maria of Aragon, was born at Valladolid on January 6, 1425. As prince of Asturias he took a prominent and geuerally an unfilial part in most of the disturbances of his father's reign; in 1445 a pitched battle between the king and the prince was prevented only at the last moment by the in- tervention of the clergy and some of the nobles ; and peace was not finally secured until 1450 when Pope Nicholas V. issued his bull of excommunication against all those in the peninsula who, by perplexing the affairs of the sovereign, were disastrously helping the cause of the infidels. In 1440 Henry had in accordance with a treaty signed in 1436 been

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united to Blanche of Aragon; but this marriage, which had not been happy and which had given cause to many scandalous reports, he dissolved in 1453 shortly before his accession to the throne on his father's death in July of that year. He began his reign with a great show of energy against the Moors; but the boldness of his intentions con- trasted strangely with the feebleness of his execution ; and the unsatisfactory character of the results attained tended greatly to bring to a head the discontent which his indolent inattention to home affairs, his reckless extravagance, and the disorders of his private life had not failed to create. In 1465 occurred at Avila the extraordinary scene, so often described, of the king's deposition in favour of his brother Alphonso; this was followed in 1468, shortly after Alphouso's death, by the election of his sister Isabella, who, however, declined to accept the proffered crown. In the same year Henry was forced to repudiate

his wife Joanna of Portugal and to disinherit her daughter Juana (la Beltraneja) whom he had unsuccessfully attempted to put forward as also his; and thus the succession became fixed in favour of Isabella, who was married to Ferdinand of Aragon in the following year. Henry died at Madrid on December 12, 1474.

For the events of the reign of Henry IV, the contemporary authorities are Alonso de Palencia and Diego Henriquez del Castillo, each of whom has left a Cronica del Rey Don Enrique Quarto; the best and at the same time the most accessible modern

English account is to be found in Prescott's History of the Reign of Ferdinand and Isabella, part i., chaps. iii. and iv.

HENRY I. (c. 1210-1274), king of Navarre, surnamed Of

le Gros, third count of Chanipagne, was the youngest son of Navarre.

Theobald I. of Navarre by Margaret of Foix, and succeeded his eldest brother Theobald IJ. in December 1270. His proclamation at Pamplona, however, did not occur till March of the following year, and his coronation was delayed until May 1273. After a brief reign, characterized it is said by dignity and talent, hedied in July 1274, suffocated, according to the generally received accounts, with his own fat. In him the male line of the counts of Champagne, kings of Navarre, became extinct. He was succeeded by his only legitimate child Joanna, born in 1270, by whose marriage to Philip le Bel in 1284 the crown of Navarre became for a time united ta that of France.

HENRY II. (1503-1555), or Henri d'Albret, titular king of Navarre, born at Sanguessa in April 1503, was the eldest son of Jean d'Albret by Catherine of Navarre; and on the death of the latter in exile in June 1516 succeeded his parents in all their claims against Ferdinand the Catholic, assuming under the protection of Francis I. of France the title of king of Navarre, After the ineffectual conferences at Noyon (1516) and at Montpellier 1518, an 'active effort was made in 1521 to establish him in the de facto sovereignty; but the French troops which, under André de I'Esparre, had seized the country were ultimately expelled by the Spanish viceroy, the duke

of Najera. Henry, who along with Francis was taken prisoner at the battle of Pavia (1525) but afterwards contrived to escape, married Margaret, the only sister of the latter, in 1526, and by her became the father of Jeanne d'Albret, the mother of Henry IV. of France. He died at Pau on May 25, 1550.

HENRY III. of Navarre. See Henry IV. of France.

HENRY, Prince (1394-1460), of Portugal, surnamed "the Navigator," to whose enlightened foresight and perse- verance the human race is indebted for the maritime dis- covery, within one century, of more than half the globe, was born at Oporto, on the 4th of March 1394. His father was Jo&o I, under whose reign Portugal first began to recover from her subjugation by the Moors, and to assume a prominent position among the nations of Europe; his mother was Philippa, daughter of John of Gaunt. Prince Henry and his elder brothers, Duarte and Pedro, were sent

out in 1415 on an expedition against the important Moor- ish city of Ceuta, which, after much hard fighting, they succeeded in taking in one day. ll the princes distinguished themselves at the siege, but Prince Henry so pre-eminently that, but for his own entreaties, his father would have knighted him in precedence of his brothers. His renown after this became so high that he was invited severally by the pope, the emperor, and the kings of Castile (Juan II.) and England (Henry V.) to take the command of their respective armies. The prince, how- ever, had set his mind on other and larger plans, involving no less than the hope of reaching India by the south point of Africa. To this end he had several encourage- ments: the geographical position of Portugal was in his favour ; the large revenues of the order of Christ, of which he was grand-master, provided him with means; aud he had contrived to gather important information from the Moors with regard to the coast of Guinea and the populous nations of the interior of Africa. Accordingly in 1418-19 he took up his abode on the extreme south-western point of Europe, the promontory of Sagres, in Algarve, of which kingdom he was made governor in perpetuity, with the purpose of devoting himself to the study of astronomy and mathematics, and to the direction and encouragement of the expeditions which he proposed to

send forth. There he erected an observatory, the first set up in Portugal, aud at great expense procured the services of one Mestre Jacome from Majorca, a man very skilful in the art of navigation and in the making of maps and instruments, to instruct the Portuguese officers in those sciences. An account has already been given of his principal explorations in the article GEoGRAPHY, vol, x. p, 180 (g.v.). At first his efforts seemed to be crowned with little success, and his various expeditions called down upon him much obloquy from the nobles, who complained of such an amount of useless expenditure; but on the prince vituperation fell harmless. The king died in 1438, and the troubles which followed occupied Prince Henry until 1440. In the follow- ing year Cape Branco was reached, and in 1443 inter- course was established with negro states in Senegal and Gambia. In 1442-3 Henry VI. of England conferred on the prince the riband of the order of the garter. In 1444-5 were discovered the river Senegal, Cape Verd, Cape St Anne, Cabo dos Mastos, aud the Rio Grande. During the later years of his life Gomez and others made im- portant voyages of discovery in Prince Henry's service (see vol. x. p. 180). He died November 13, 1460, in his town on Cape St Vincent, and was buried in the church of St Mary in Lagos, but a year later his body was removed to the superb convent of Batalha. His great-nephew, King Dom Manuel, had a statue of him placed over the centre column of the side gate of the church of Belem. On July 24, 1840, a monument was erected to him at Sagres at the instance of the Marquis de Sa da Bandeira,

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The glory attaching to the name of Prince Henry does not rest merely on the achievements effected during his own lifetime, but on the stupendous subsequent results in maritime discovery to which his genius and perseverance had lent the primary inspiration. The sovereigns loyally continued what the prince had begun, The marvellous results effected within a ceutury from the rounding of Cape Bojador in 1433 formed one unbroken chain of discovery, which originated in the genius and the efforts of one man, They were the stupendous issue of a great thought and of indomitable perseverance, in spite of twelve years of costly failure and dis- heartening ridicule. As Mr Major, in his Life of Prince Henry, has justly said, "Had that failure and that ridicule produced on Prince Henry the

effect which they ordinarily produce on other men, it is impossible to say what delays would have occurred before these mighty events would have been realized; for it must be borne in mind that the ardour, not only of his own sailors, but of surrounding nations, owed its impulse to this pertinacity of purpose in him.'

HENRY tue Lion (1129-1195), duke of Saxony and Bavaria, son of Henry the Proud, was born in 1129. After the death in 1139 of his father, who had been deprived of his possessions by Conrad III., the bravery and energy of his mother Gertrude and his grandmother Richenza secured to him the duchy of Saxony. Shortly after coming of age he at the diet of Frankfort in 1147 demanded also the restoration of Bavaria, but was refused, upon which, along with his uncle Welf VI., he made an unsuccessful attempt to seize it by force of arms. In 1154 he, however, received from Frederick I. the formal recognition of his claims to its possession, and in 1156 Henry Jasomirgott was compelled to deliver it up to him. Besides distinguishing himself in the wars of Frederick in Italy, Henry now devoted his energies to establishing his power in his own dominions, both by conquest and by encouraging agriculture and trade. He extended the boundaries of Saxony beyond the Elbe by successful battles against the Slavs, founded Munich in Bavaria, colonized Mecklenburg and Holstein, and fostered the growth of Hamburg and Liibeck. His ambitious projects and his arrogant bearing awakened, how- ever, the hostility of several of the secular and ecclesiastical potentates, who in 1166 concluded a league against him at Merseburg, and a stubborn contest of two years' duration eusued, which was fiually ended by Frederick in 1169 deciding at the council of Bamberg in Henry's favour. In February 1168 Henry, having previously divorced Clementia of Zihringen, married Matilda, daughter of Henry II. of England ; and, elated by such an influential alliance and by the increasing resources of his dominions, he shortly after his return from a pilgrimage to the Holy Land in 1172 began to manifest a tendency to treat the emperor with coldness and to revive the traditional rivalry of his race with the Hohenstaufens, He took no part in the Italian expedition of 1174, and in 1176 his sudden desertion of Frederick in the crisis of his struggle with the Lombard cities resulted in the disaster at Legnano. On Frederick's return from Italy in 1177 Henry was summoned to appear before him at the diet of Worms, and declining to do so he was placed under the ban of the empire,

and his lands were divided among other princes. For more than a year he endeavoured to resist the execu- tion of the imperial decree, but he found it necessary at last, in November 1181, to give in his submission to Frederick, who, on condition that he remained three years in England, agreed to reinstate him in the possession of Brunswick and Liineburg. Having in 1189 refused to accompany Frederick on his crusade, he was again compelled to withdraw to England, but shortly after Frederick's de- parture he returned, and, concluding an alliance with the archbishop of Bremen, made a second attempt to recover his territories; but, though at first he gained several im- portant victories, he was ultimately compelled in July 1190 to conclude a peace at Fulda, which secured to him scarcely any advantages from the contest. Emboldened by the hostile alliance formed against the emperor Henry VI. in 1192, he again renewed the struggle ; but after Richard of England fell into the hands of the emperor in the following year, he found it necessary again to give in his submission; and shortly afterwards a pledge of amity between the two houses was given through the marriage of the eldest son of Henry the Lion to Agnes, niece of Frederick I., and cousin of the reigning emperor. Henry died 6th August 1195 at Brunswick, and was buried in the church of St Blaise. Otto, his second son, became emperor under the title of Otto IV. A colossal statue of Henry was unveiled at Brunswick 4th July 1874. Though ambitious, headstrong, and pugnacious, Henry showed that while he possessed no small skill in the art of war he could appreciate the arts of peace, and he gave

a powerful impetus to the development of many important cities, and furthered with judicious sagacity the material prosperity of his kingdom.

See Bottiger, Heinrich der Liwe, Hanover, 1819; Prutz, Heinrich

der Léwe, Leipsic, 1865: Weiland, Das Sachs. Herzogthum unter |

Lothar wnd Heinrich dem Léwen, Greifswald, 1866 ; Philippson, Geschichte Heinrichs des Léwen, Leipsic, 2 vols., 1867-8 ; and the various biographies of Frederick I.

HENRY rue Deacon,—variously called of Cluny, because he was at one time a monk of that rule, of Lausanne, because he is believed to have first appeared as a preacher of repentance there, and of Toulouse, because his later years were passed in that city and neighbourhood, —founder of the anti-sacerdotal sect of Henricians, was of Swiss or Italian extraction (his birthplace is unknown), and was born towards the end of the 11th century. About the year 1115 he abandoned the cloister, where he had entered the diaconate, and, burning with righteous indignation against the dead mechanical ceremonialism of the dominant church and the hideous moral corruption of its clergy, began to go about asan itinerant preacher. The neighbourhood of Lausanne was probably the scene of his earliest appearances, but he soon betook himself to France, where the soil had been prepared for him by Peter of Bruis (leader of the Petrobrusians), and where he at once began to attract adherents. About the beginning of Lent in 1116 he asked and received permission of the bishop Hildebert of Le Mans (Cenomani) to visit that city; the fact that he was not only tolerated but received with some degree of honour at this time shows that he had not as yet fallen under serious suspicion of heretical pravity. Soon the extraordinary fascination of his character began to make itself felt; and the rude but convincing eloquence with which he exposed the immorality of the clergy rapidly alienated the people of the town from their spiritual guides ; remonstrances and inhibitions by the local ecclesiastical authorities were equally vain; and when Hildebert, who had been absent in Rome, returned to his diocese, he found his episcopal blessing treated with contempt, and was bluntly told by his flock that they had found "a father, a priest, an intercessor, more exalted in authority, more honourable in life, more eminent in knowledge." From the confused accounts of Henry's life and labours which have reached us it does not appear that even then he had come forward as the teacher of any new or strange doctrine ; his efforts as a reformer of public and domestic morals are chiefly insisted on, especially the measures he took for the reclamation of fallen women, for the encouragement of early and honourable marriage among the laity, and for the promotion of a higher standard of purity among the nominally celibate clergy. It was not as a heretic but merely as a somewhat incouvenient agitator that he was ordered by Hildebert at last to leave Le Mans. We next read of Henry as conspicuously active in Provence, especially after the burning in 1124 of Peter of Bruis, with whose peculiar views he is alleged,

upon evidence which has not reached us, to have entirely sympathized. In 1134 he was arrested by the bishop of Arles and taken to the council of Pisa ; there he was declared to be a heretic, and condemned to imprisonment, This captivity, however, does not appear to have lastedlong. The scene of the third and concluding chapter of the recorded life of Henry is laid at Toulouse, where after ten years of uninterrupted activity with the result complained of by Saint Bernard (Hp. 241)—‘ the churches are without flocks, the flocks without priests, the priests are nowhere treated with due reverence, the churches ‘are reduced to the level of synagogues, the sacraments are despised, the festivals disregarded ”—it was found necessary by Pope Eugenius III. to take active measures for the defence of the church. With this view the cardinal bishop Alberice of Ostia was sent as a legate to the disaffected

districts, and with him was associated Bernard of Clairvaux. Their efforts were ultimately successful; Henry died an obscure death in prison about the year 1148, and his sect soon afterwards ceased to have any separate existence.

The original authorities upon this subject are the Acta Episco- porum Cenomanensium (“Gesta Hildeberti”), which have been published in Mabillon’s Anal. Vet., and Bernard’s letter (Ep. 241) to Count Ildephonso of St Gilles, written in 1147. From these sources the distinctive tenets of Henry and the Henricians (if dis- tinctive tenets there were) cannot be gathered with any clearness. The probability is that Henry and his disciples had not any definite system of doctrine to oppose to that of the church, but were anti- gacerdotalists pure and simple, “ insurgents, who shook the estab- lished government, but did not attempt to replace it by any new form or system of opinions and discipline.” See Milman, History of Latin Christianity, bk. ix. ¢«. 8; and Hahn, Geschichte der Ketzer tin Mittclalter (1845).

HENRY or Guent. The scholastic writer generally known by this name was born probably about 1217 in the district of Mude, near Ghent, His family name seems to have beeu Goethals, but he is always described as Henry of Mude or of Ghent. Little is known of the details of his life. He studied at Ghent and then at Cologne under Albertus Magnus. After obtaining the

degree of doctor he returned to Ghent, and is said to have been the first to lecture publicly in that city on philosophy and theology. Like most of the great doctors of the age, he was drawn to Paris by the fame of the university there. In 1247 he is known to have taught at Paris; and he was distinguished by the title of doctor solennis, He took an active part in some of the many disputes between the orders and the secular priests, and warmly defended the latter. He died at Tournay, of which place he was archdeacon, in 1293. His most important works, Quodlibeta Theologica and Summa Theologie have been printed, the first in 1518, the second in 1520. Several other writings remain in MS. Henry of Ghent occupies a somewhat remarkable place in the his- tory of scholasticism. A contemporary of the great Aquinas, he opposed several of the dominant theories of the time, and united with the current Aristotelian doctrines a strong infusion of Platonism and mysticisn. Only a few of the salient points of his doctrine can here be given ; the line of thinking by which they are reached is elaborate and com- plex. He distinguishes between knowledge of natural objects and the divine inspiration or intuition by which we cognize the being and existence of God. The first, accord- ing to Henry, throws no light upon the second. Indi- viduals are not constituted by the material element in them, but by the fact of their independent existence, 1.¢., ulti- mately by the fact that they are created as separate objects. Universals must be distinguished according as they have reference to our minds or to the Divine mind. In the divine intelligence exist exemplars or types of the genera and species of natural objects. On this subject, however, Henry is far from clear; but it deserves notice that he defends Plato against the current Aristotelian criticism, and endeavours to show that the two views are in har- mony. In psychology, his view of the intimate union of soul and body is truly remarkable. The body he regards as forming part of the very substance of the soul ; through this union the soul is more perfect and complete.

There is a monograph on Henry by Fr. Huet, Recherehes his- toriques et eritiques sur la vie, les ouwvrages, et la doetrine de Henri de Gand, Paris, 1838. See also Werner, Heinrich von Gent als Représentant des Christlichen Platonismus im 13ten Jahrh., Vienna, 1878; Stoekl, Phil. d. Mittelalters, ii. 788-758; Jourdain, Phil. de St Thonuas d' Aquin, ii. 29-46; Histoire

littéraire de la France, xx. 144 sqq.; also Hauréau, Tenncmann, and the general histories.

HENRY or Huntinepon, an English chronicler of the 12th century, born, it is likely, between 1080 and 1090, was the son of an ecclesiastic named Nicholas, who probably held the office of archdeacon of Huntingdon, to which Henry himself afterwards attained about 1120. The celibacy of

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the clergy not being enforced in England till 1102, this paternity was considered no disgrace, and our author in several passages of his writings refers to his father with much filial respect. Received as a mere child into the

only continued to enjoy the advantages of its culture and affluence till the bishop's death in 1123, but he also secured the patronage and friendship of Alexander of Blois, who next succeeded tothe see. There is reason to believe that he accompanied Alexander to Rome, probably in 1125 and 1144, and it was to him that he dedicated his Mistoriw Anglorum, which was issued four times during the author's life, and in the last form came down to the accession of Henry IT. (1154). The date of the author's death has not been preserved, but it is probable that the close of his life is approximately marked by the close of his history.

Heury of Huntingdon's Historie was first printed by Savile, Rerwm Anglicarum Scriptores post Bedam (London, 1586), and it was republished at Frankfort in 1603. Books i., ii., iv., v., and vi. were edited by Mr Petrie for the Rccord Commission Collection, vol.i., 1848; and the whole work has been prepared for the Rolls Serics by T. Arnold, 1880. An English translation by Thomas Forester forms a volume of Bohn's Standard Library (1853). We have besides froin Henry's pen an Epistle to Henry I. on the succession of the Jewish, Assyrian, Persian, Macedonian, and Roman kings and emperors (written in 1130); an Epistle to Warin (one of his friends) coutain- ing an epitome of the British History of Geoffrey of Monmouth, which he had discovered at Bec in Normandy; and, better known than

either, an Epistle to his friend Waltcr On Contempt of the World or on Bishops and other Illustrious Men of the Age (written in 1135, and edited by Wharton in his Anglia Sacra, 1691). Nor must Heury's poetical picces be forgotten, as they speak well for his culture andtastc. Two MS. copies of his complete works preserved at Lambeth descrve to be specially mentioned ; and the British Museum possesses several important rescripts of the History. See Wright, Biogr. Brit. Litt., Anglo-Norman Period, 1846 ; Forester's Prefacc; James Gairdner, Early Chroniclers of Europe: England (1879); and Arnold's elaborate introductions.

HENRY, Josern (1797-1878), an eminent American physicist, was born in Albany, the capital of the State of New York, on the 17th of December 1797. He received his education at an ordinary school, and afterward at the Albany academy, which enjoyed considerable reputation for the thoroughness of its classical and mathematical courses. On finishing his academic studies he contem- plated adopting the medical profession, and prosecuted his studies in chemistry, anatomy, and physiology with that view. He occasionally contributed papers to the Albany institute, in the years 1824 and 1825, on chemical and mechanical subjects; and in the latter year, having been unexpectedly appointed assistant engineer on the survey of a route for a State road from the Hudson river to Lake Erie, a distance somewhat over 300 miles, he at once em- barked with zeal and success in the new enterprise. This diversion from his original bent gave him an inclination to the career of civil and mechanical engineering; and in the spring of 1826 he was elected by the trustees of the Albany academy to the chair of mathematics and natural philosophy in that institution. In the latter part of 1827 he read before the Albany institute his first important contribution, "On some Modifications of the Electro-Magnetic Apparatus." Struck with the great im- provements then recently introduced into such apparatus by Mr William Sturgeon of Woolwich, he had still further

extended their efficiency, with considerable reduction of |

battery-power, by adopting in all the experimental circuits (where applicable) the principle of Schweigger's " multi- plier," that is, by substituting for single wire circuits, voluminous coils (Trans. Albany Institute, October 10, 1827, vol. i. pp. 22, 23). In June 1828 and in March

1829 he exhibited before the institute small electro- magnets closely and repeatedly wound with silk-covered wire, which had a far greater lifting power than any then known. Henry appears to have been the first to adopt

insulated or silk-covered wire for the magnetic coil; and also the first to employ what may be called the "spool" winding for the limbs of the magnet. He was also the

| first to demonstrate experimentally the difference of action household of Robert of Bloet, bishop of Lincoln, Henry not |

between what he called a "' quantity" magnet excited by a "quantity" battery of a single pair, and an "intensity" magnet with long fine wire coil excited by an 'intensity " battery of many elements, having their resistances suitably proportioned. He pointed out that the latter form alone was applicable to telegraphic purposes. A detailed account of these experiments and exhibitions was not, however, published till January 1, 1831 (Silliman's Am. Jour. Sev., xix. 400-408). Henry's "quantity" magnets acquired considerable celebrity at the time, from their unprecedented attractive power, —one (August 1830) lifting 750 pounds, another (March 1831) 2300, and a third (1834) 3500,

Early in 1831 he arranged a small officc-bell to be tapped by the polarized armature of an "intensity" magnet, whose coil was in coutinnation ofa mile of insulated copper wire, suspendcd about one of the rooms of his academy. This was the first instance of magnetizing iron at a distancc, or of a suitable combination of magnet and battery being so arranged as to be capable of such ac- tion. It was, thercforc, the earliest example of a true " magnetie telegraph, all preceding experiments to this end having been on the galvanonietcr or necdle principle. About the same time he devised and constructed the first electromagnetic engine with automatic polechanger (Silliman's Am. Jour. Sci., July 1831, xx. 340-348 ; and Sturgeon's Annals Electr., 1889, iti. 554). Early in 1832 he discovered the induction of a current on itsclf, in a long helical wire, giving greatly increased intensity of discharge (Silliman's Am. Jour. Sci., July 1832, xxii. 408). In 1832 he was elected to the chair of natural philosophy in the New Jersey college at Princeton. In 1834 he continucd and extended his researches " On the Influ- ence of a Spiral Conductor in increasing the Intensity of Electricit;

from a Galvanic Arrangement of a Single Pair ;" a memoir of which was read before the American Philosophical Society, February 6, 1835 (Trans. Am. Phil. Soc., v. 223-281, n.s.) In 1835 he coin- bined the short circuit of his monster magnet (of 1834) with the small "intensity" magnet of an experimental telegraph wire, thereby establishing the fact that very powerful mechanical effects could be produced at a great distance by the agency of a very feeble magnet used as a circuit maker and breaker, or as a 'trigger ?— the precursor of later forms of relay and receiving magnets. In 1887 he paid his first visit to England and Europe. In 1838 he made important investigations in regard to the conditions and range of induction from electrical currents,—showing that induced currents, although merely momentary, produce still other or tertiary currents, and thus on through successive orders of induction, with alternating signs, and with reversed initial and terminal signs. He also dis- covered similar successive orders of induction in the case of the passage of frictional electricity (Zrans. Am. Phil. Soc., vi. 308-337, n.s.). Among many minor observations, he discovered in 1842 the oscillatory nature of the electrical discharge, magnetizing about a thousand necdles in the course of his experiments (Proc. Am. Phil. Soc., i. 301). He traced the influence of induction to sur- prising distances, magnetizing needles in the lower story of a house through several intervening floors by means of electrical discharges in the upper story, and also by the secondary current in a wire 220 feet distant from the wire of the primary circnit. The five num- bers of his Contributions to Electricity and Magnetism (1835-1842) were separately republished from the Transactions. In 1848 he made soine interesting original observations on ' Phosphorescence (Proc. Am. Phil. Soc., iii. 38-44). In 1844, by experiments on the tenacity of soap-bubbles, he showed that the molecular cohesion of water is equal (if not superior) to that ofice, and hence, generally, that solids and their liquids have practically the same amount of cohesion (Proc. Am. Phil. Soc., iv. 56, 57, and 84, 85). In 1845 he showed, by means of a thermo-galvanometer, that the solar spots radiate less heat than the general solar surface (Proc. Am. Phil. Soc., iv. 178-176). ;*

In Deceniber 1846 Henry was elected secretary and director of the Smithsonian Institution, then just established. While closely occupied with the exacting duties of that office, he still found time to prosecute many original inquiries,—as into the application of acoustics to public buildings,

and. the best construction and arrange- ment of lecture-rooms, into the strength of various building materials, &c. Having early devoted much attention to mcteor- ology, both in observing and in reducing and discussing observa- tions, he (among his first administrative acts) organized a large and widespread corps of observers, and made arrangements for simul- taneous reports by means of the electric tclegraph, which was yet in its infancy (Smithson. Report for 1847, pp. 146, 147). He was the first to apply the telegraph to meteorological research, to have

the atmospheric conditions daily indicated on a large map, and to utilize the generalizations made in weather forecasts, and the first to embrace a continent under a single system,—British America and Mexico being included in the field of observation. In 1852, on the reorganization of the American lighthouse system, he was ap- pointed a member of the new board ; and on the resignation of Admiral Shubrick as its chairman, Henry, in 1871, became the pre- siding officer of the establishment—a position he continued to hold during the rest of his life. His diligent investigations into the efficiency of various illuminants under differing circumstances, and into the best conditions for developing their several maximum powers of brilliancy, while greatly improving the usefulness of the line of beacons along the extensive coast of the United States, effected at the same time a great economy of administration. His equally careful experiments on various acoustic instruments also re- sulted in giving to his country the most serviceable system of fog- signals known to maritime powers. In the course of these varied and prolonged researches from 1865 to 1877, he also made im- portant contributions to the science of acoustics ; and he established by several serics of laborious observations, extending over many years and along a wide coast range, the correctness of Professor Stokes's hypothesis (Report Brit. Assoc., 1857, part ii. 27) that the wind exerts a very marked influence in refracting sound-beams. The complex conditions of such acoustic refraction he found to be exceedingly variable and curious (Report American Lighthouse Board, 1874, 1875, and 1877). From: 1868 Henry continued to be annually chosen as president of the National Academy of Sciences ; and he was also president of the

Philosophical Society of Washing- ton from the date of its organization in 1871.

Henry was by general concession the foremost of American hysicists. He was a man of varied culture, of large breadth and iberality of views, of generous impulses, of great gentleness and

courtesy of manner, combined with equal firmness of purpose and energy of action. He died at Washington, May 13,1878. (8. F. B.) HENRY, Martruew (1662-1714), the author of the well known and justly popular Hxposition of the Old and New Testaments, was born at Broad Oak, a farm-house on the confines of Flintshire and Shropshire, on the 18th of October 1662. He was the son of Philip Henry, one of the 2000 ministers who were ejected from their livings in 1662 for refusing to conform to the Act of Uniformity. Unlike the majority of his fellow-sufferers, Philip Henry, who through his wife was the possessor of private means, was spared all personal privation or hardship as the con- sequence of his nonconformity, and was thus enabled to give a good education to his son. Having received his preliminary education from his father and a tutor named Turner, Henry was next removed to an academy at Islington, whence he proceeded to become a student of law at Gray's Inn. His legal studies, however, had not advanced far when he relinquished them for theology, to which he thenceforth devoted himself. In 1687 he became minister of a Pres- byterian congregation at Chester, whence in 1712 he was translated to Hackney. Two years later (June 22, 1714), he died suddenly of apoplexy at Nantwich while on a journey from Chester to London. Henry's Lxposition, the work by which he is now chiefly remembered, is a commen- tary of a practical and devotional rather than of a critical kind, ranging over the whole of the Old Testament and extending into the New as far as to the end of the Acts, At this point it was broken off by the author's death, but the work was finished by a number of clergymen, whose names are recorded in most editions of the book. Ina critical point of view, it may be said to be quite valueless ; yet its unfailing good sense, its discriminating thought, its high moral tone, its simple piety, and its altogether singular felicity of practical application, combine with the well-sus- tained flow of its racy English style to secure for it, and deservedly, the foremost place among works of its class. Besides the Exposition, Matthew Henry wrote a Life of Mr Philip Henry ; The

Communicant's Companion; Directions for Daily Communion with God; A Method for Prayer; and A Seriptural Catechism, all of which, along with numerous sermons, have been frequently reprinted, both separately and in complete editions of his Miscellaneous Works, His life has been written by W. Tong (London, 1816), by Davis (prefixed to Exposition, ed. 1844), by

Hamilton (Christian Biography, 1853), by C. Chapman (1859), and by J. B. Williams (1828, new ed. 1865). : ne :

HENRY

HENRY, Patrick (1736-1799), an American statesman and orator, was born at Studley, Hanover county, Virginia, May 29, 1736, the second son in a family of nine children. His father, John Henry, an emigrant from Aberdeen, Scotland, was a nephew of Robertson the historian, and had risen to some eminence in the county, filling the offices of surveyor and presiding magistrate. Patrick Henry was educated ata little school near his home ; and, after the age of ten, by his father, who had opened a grammar school at his residence. In early life he showed no marked pro- ficiency in his studies, except perhaps in mathematics, but was noted chiefly for a love of outdoor sports. At fifteen he became clerk in a country store; and at sixteen he entered into partnership as storekeeper with his elder brother, but the business was unsuccessful, and a second attempt at storekeeping ended likewise in failure. Mean- while the indifference to learning which marked his boy- hood was replaced by a love of history, especially that of Greece and Rome; and his habitual indolence was overcome by his admiration for Livy, whose history he thenceforth read through once every year. At twenty-four, by his admission to the bar, Henry entered on the career that eventually brought him fame and fortune, although his income for some years was in keeping with his lack of previous preparation. At twenty-seven he won his first triumph, as counsel for the collector of tlhe county, in what became known as "the parson's cause." His unexpected display of eloquence on the side of the people procured him an extravagant recognition and the title of "the orator of nature." Business poured in upon him, his popularity concealing his deficiencies; and his success was assured. In 1765 he was elected to the House of Burgesses, where he distinguished himself as the author of certain resolutions against the Stamp

Act, the last of which,—providing that "the General Assembly of this colony have the sole right and power to lay taxes and impositions upon the in- habitants of this colony,"'—though passed by a majority of only one, was the key-note of the struggle for independ- ence. In 1769 he was admitted to practice in the general court, where he attained eminence in criminal cases before juries. In 1773 he was a member of the "com- mittee of correspondence for the dissemination of in- telligence between the colonies." In the following year he was chosen delegate to the Virginia convention, which was the first public assembly to recommend an annual " General Congress," and to the "Old Continental Congress"; but his success there as an orator failed to conceal his defects as a practical statesman. In 1775, in the Virginia con- vention, he delivered a remarkable speech in moving that the "colony be immediately put in a state of defence," and at the head of a body of militia he forced the royal officials to pay £330 for powder clandestinely removed by order of Governor Dunmore. He was appointed by the convention colonel of the first regiment and commander of all the forces to be raised in Virginia, but a misunderstanding with the "conimittee of safety" led to his resignation. He was a member of the second Continental Congress of 1775, and of the Virginia convention of 1776, which had been elected 'to take care of the republic," the royal governor having fled. 'They framed a new constitution, and elected Henry the first republican governor, on the first ballot. He was re-elected in 1777 and 1778. In 1780 he became a member of the legislature, where he continued until he was again elected governor in 1784. In 1786 he withdrew through the pressure of debt, having "never been in easy circumstances." In 1787 he was chosen a delegate to the " Federal Constitutional Convention," but did not attend. He had resumed his practice to better his fortunes. In 1788 he was a delegate to the Virginia convention for ratifying the Federal Constitution, which he vehemently

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opposed as dangerous to the liberties of the country. In 1791 he declined re-election to the legislature, continuing, “ through necessity rather than choice, ” the practice of the law, but usually in great and remunerative cases only. Finally, in 1794, having not only paid his debts but secured affluence, he withdrew to private life. In 1795 he declined the position of secretary of state in Washington’s cabinet, in 1796 the nomination for governor of Virginia, and in 1797 the mission to France, offered by President Adams. In 1799, however, he suffered himself to be elected to the State legislature, where lie wished to oppose what he deemed the dangerous doctrine of the Virginia resolutions of 1798 ; but he did not take his seat, his death occurring on the 6th June. Henry’s manners were plain, his temper cheer- ful, and his habits temperate. His eloquence, of which some fragmentary specimens have become household words among his countrymen, was vivid and startling. Almost entirely a gift of nature, it was equal to every occasion, and, with the aid of a clear voice and perfect articulation, it was of marvellous power in bringing his hearers to a quick decision.

HENRY, Ropert (1718-1790), the author of the History of Great Britain written on a new plan, was the son of a farmer, and was born in the parish of St Ninians near Stirling, 18th February 1718. He received his early educa- tion at the school of his native parish, and at the grammar school of Stirling, and after completing a course of study at Edinburgh University became master of the grammar school of Annan. In 1746 he was licensed to preach by the Annan presbytery, shortly after which he was chosen minister of a Presbyterian congregation at Carlisle, where he remained until 1760, when he was removed to a similar charge at Berwick-on-[Tweed. It was during his stay at Berwick that the idea of his Hvstory first occurred to him, but the dearth of books and the difficulty of consulting original authorities compelled him to postpone the execution of his design till his removal to Edinburgh, as minister of New Greyfriars, in 1768. The first volume of his //istory appeared in 1771, and the others followed at irregular intervals until 1785, when the fifth was published, bringing down the narrative to the Tudor dynasty. The work was virulently assailed by Gilbert Stuart, but the attack was overdone, and although it for a time hindered the sale, the injury effected was only temporary. For the volumes pub- lished in his lifetime Henry realized as much as £3300, and through the influence of Lord

Mansfield he was in 1781] rewarded with a pension of £100 a year from George ITI. In 1784 he received the degree of D.D. from the university of Edinburgh. He died in 1790 before his tenth volume was quite ready for the press. Four years after his death it was published under the care of Malcolm Laing, who supplied the entire chapters v. and vii., and added an index. A life of the author by Sir Henry Wellwood Moncreiff was prefixed to the volume. The novel feature in Henry'se//7story was that he combined with the narrative of the great political events of each era an account of the domestic state and social progress of the people within the same period. His researches were conducted with great care, and his work embodies much novel and curious infor- mation ; but the comprehensiveness of his plan, and the limited character of the historical sources then available, greatly militated against the accuracy of his narrative. Notwithstanding also that the work is well arranged, and written with clearness and simplicity, its defects as an authority are not compensated for by any peculiar excel- lences of style, by originality or vigour of reflexion, or by any special skill in the delineation of character.

A Continuation of Henry's History to the Accession of James I., by

J. Petit Andrews, appeared in 1796. An account of the attack of Gilbert Stuart on Henry is given in Disraeli's Calamitics of Authors.

HENRY, Wiuiam (1775-1836), a distinguished chemist, son of Thomas Henry, an apothecary and author of some works on chemistry, was born at Manchester, December 12, 1775, After completing his education at an academy in Manchester, he was for some years private secretary to a physician, and in 1795 he began the study of medicine at the university of Edinburgh. Prudential con- siderations compelled him, however, to interrupt his studies at the conclusion of his first session, and he did not resume them till 1805, two years after which he received the diploma of M.D. For some time he practised as a physician in Manchester, but on account of delicate health, caused by an accident, he was ultimately compelled to retire from his profession. He nevertheless carried on his original re- searches in chemistry, for which he found great facilities in connexion with his father's business, and from 1797 till his death he continued to enrich the 77ansactions of the Royal Society with

contributions on his favourite science, especi- ally in regard to aeriform bodies. His first communication was an attempt, in opposition to Austin, Beddoes, and others, to establish the title of carbon to rank among the elementary bodies, but discovering afterwards a fallacy in his reasoning he corrected it in a subsequent paper. In 1800 he published in the Philosophical 7'ransactions his experi- ments on muriatic acid gas, made with the view of disen- gaging an imaginary unknown element supposed to be asso- ciated with oxygen in the composition of the gas; but after the discovery of the real nature of the acid by Davy he was one of the earliest converts to the new theory. In 1803 he published his elaborate experiments on the quantity of gases absorbed by water at different temperatures and under different pressures, with the result of establishing the law that "water takes up of gas, condensed by one, two, or more additional atmospheres, a quantity which would be equal to twice, thrice, &c., tlhe volume absorbed under the common pressure of the atmosphere." In 1808 he described in the Philosophical Transactions a form of apparatus adapted to the combustion of larger quantities of gases than could be fired in eudiometric tubes. In the same year he was chosen a fellow of the Royal Society; and in 1809, for his valuable contributions to the Z'ransactions of the society, he was awarded the Copley gold medal. For the next fifteen years he continued his experiments on the gases, making known the results of them from time to time to the society. In his last communication, in 1824, he claimed the merit of having conquered the only difficulty that re- mained in a series of experiments on the gaseous substances issuing from the destructive distillation of coal and oil, and proved the exact composition of the fire-damp of mines. But though Henry's experiments had reference chiefly to aeriform bodies, his acquaintance with general chenzistry is proved by his Hlements of Experimental Chemistry, a work which combines great literary elegance with the highest standard of scientific accuracy. He had also collected materials for a history of chemical discovery from the middle of last: century, but did not Jive to carry out the project. It is indeed to be regretted that he did not con- tribute more to the literature of science. His biographical notices of Priestley, Wollaston, and Davy may be regarded as models in that species of composition. At intervals during his lifetime Henry suffered much from neuralgic pains. These became so severe as to render the extirpation of the principal nerves of the hand necessary, but this failed to afford the expected relief ; and ultimately the irritation of the whole

nervous system deprived him of sleep, and caused his death on September 2, 1836.

HENRYSON, Rozert (c. 1425-c, 1506), one of the early Scottish poets, and the author of the first specimen of the pastoral poetry of his country, is usually designated schoolmaster of Dunfermline; and according to tradition

he was the ancestor of the family of Henryson or Henderson of Fordell, in the county of Fife, one of whom, James Henryson, was king's advocate and justice-clerk in 1494. Of the poet's parentage and early history, however, no certain information can be discovered. From various circumstances known about him he must have been born about the year 1425. He seems to have been educated abroad, as his name does not appear in the registers of the university of St Andrews, the only one then existing in Scotland ; and from an allusion in one of his poems, his attention was probably given to the study of law. In 1462 lis name appears in the list of members of the newly-founded university of Glasgow as " Magister Robertus Henrysone in artibus licentiatus et in decretis Bachalarius." Henryson seems, in addition to teaching, to have practised at Dunfermline as a notary public. His decease in or shortly before 1506 is alluded to by Dunbar, who, in his lament for the "makaris" or poets, says of Death— '¢ In Dunfermline he hes done roun Gud Maister Robert Henrisoun."

Of the writings of Henryson that have come down to the present time, his Zestament of Cresseid may be considered the chief. It was composed as a continuation or supplement to Chaucer's Troilus and Cresetde, which was one of the most popular poems in the English language. Henryson resumes the story where Chaucer leaves off, and completes it by inflicting a suitable punishment on the false Creseide. This continuation displays so much skill that it has been included in all the early editions of Chancer, as if it had beer the work of that poet himself. Another poem, Robene and Makyne, though short, is remarkable as the first known specimen of pastoral poetry in the Scottish language, while his Bludy Serk is amongst the oldest examples of ballad poetry. His metrical version of thirteen of the Fables of sop is perhaps the best known of his works. 'To each fable is appended an application or moral. In these he alludes to the oppressions of the people

and the unsettled state of the country during the feeble reign of James III. His classical Tale of Orpheus, though a languid performance, exhibits his familiarity with the scholastic learning of his time. Several of the poems of Henryson have been preserved in the Asloan MS. in the Auchinleck Library, the Bannatyne MS. in the Advocates' Library, Edinburgh, the Maitland MS. in the Pepysian Library, Cambridge, and the Harleian MSS., British Muscum. His Orpheus and Eury- dice was printed at Edinburgh by Chepman & Myllar in 1508. The Testament of Cressetd was printed at Edinburgh by Henry Charteris in 1593. The poem of Robene and Makyne and the Tes- tament of Cresseid were reprinted for the Bannatyne Club in 1824. The Moral Fables were printed at Edinburgh by Lekprevik in 1570, at London by R. Smith in 1577, and again at Edinburgh by Andrew Hart in 1621. This last edition was reprinted for the Maitland Club in 1832. A collected edition of the works of Henryson, leaving nothing to be desired, was printed at Edinburgh in 1865, under the editorial care of Dr David Laing.

HENSLOWE, Paitip, a contemporary of Shakespeare, whose name continues of interest from his intimate associa- tion with the history of the theatre during the great dramatist's career. Originally, it would appear, a dyer and afterwards a starchmaker, and ready to turn to any profit- able speculation, he probably began his connexion with the stage in 1584 by becoming "joint lessee of the Rose theatre on the Bankside, or of the ground on which it stood." From 1591 to his death in 1616 he was in theatrical partnership with the more famous Edward Alleyn, who in 1592 married his step-daughter Joan Woodward. In 1613 he was appointed sergeant of the king's bear-garden, to take charge of a lion and certain other beasts presented by the duke of Savoy. Henslowe's business diary from 1593 to 1609 has happily been preserved in Alleyn's College at Dulwich, and, though evidently the work of an ignorant man, it is of prime importance for its miscellaneous store of items in regard to the first appearance of plays, the sums paid to the authors, the theatre receipts, and so on. It was edited for the Shakespeare Society in 1841 by J. Payne Collier, who, however, found that the MS. had suffered considerable mutilation at the hands of miscreant autograph hunters since the time when it was employed by its original discoverer Malone. See ALLEYN.

HENZADA, a district in Pegu division, British Barmah, lying between 16° 49’ and 18° 30’ N. lat., and between 94° 51’ and 96° 7’ E. long., with an area of 4047 square miles. Tt is bounded on the N. by the Prome district, on the E. by the Pegu Yomas, on the 8. by Rangoon, Thonkhwa, and Bassein districts, and on the W. by the Arakan Yoma range. Henzada district stretches from north to south in one vast plain, forming the valley of the Irawadi, and is divided by that river into two nearly equal portions. This country is protected from inundation by immense embankments, so that almost the whole area is suitable for rice cultivation. The chief mountains are the Arakan and Pegu Yoma ranges. The greatest elevation of the Arakan Yomas in Henzada, attained in the latitude of Myan-oung, is 4003 feet above sea-level. Numerous torrents pour down from the two boundary ranges, and unite in the plains to form large streams, which fall into the chief rivers of the district, viz., the Irawadi, Hlaing, and Bassein. The forests comprise almost every variety of timber found in Burmah.

The inhabitants of Henzada district in 1876 numbered 501,213. The number of immigrants into the district during the ten years ending 1876 was 90,797. The chief occupation of the people is agriculture. Nearly all the large towns are on the right bank of the Irawadi. The ehief towns have populations as follows:— Henzada, 15,307; Kyan-kheng, 8761; Myan-oung, 5859; and Meng-gyi, on the left bank of the Jrawadi, 15,770. The staple crops of the district are rice, sesamum, cotton, and tobacco. The total area under cultivation in 1876 was 363,048 aercs. The other products are cotton, indigo, oil-seeds, pease and pulses, cocoa and betel nuts, pén-vine, &c. The revenue in 1876-77 was £182,733. In 1876 the police force consisted of 409 men.

The district was once a portion of the Talaing kingdom of Pegu, afterwards annexed to the Burmese empire in 1753, and has no history of its own. During the second Burmese war, after Prome had been seized, the Burmese on the right bank of the Ivawadi crossed the river and offered resistance to the British, but were completely routed. Meanwhile, in Tharawadi, or the country east of the Irawadi, and in the south of Henzada, much disorder

was caused by a revolt, the leaders of which were, however, defeated by the British, and their gangs dispersed,

HEPATICA. See LivErwort. .

HEPHASTION, son of Amyntor, a Macedonian of Pella, is celebrated as the friend of Alexander the Great. The two, according to Quintius Curtius (iii. 12), were com-

-panions in childhood, but beyond this old-standing con-

nexion we find no evidence of such qualities in Hepheestion as deserved the passionate attachment of Alexander. The king, however, seems never to have been blind to his real character, and to have made a marked distinction between him, as the friend of his private life and his leisure hours, and such men as Craterus, whom he could entrust with important enterprises. We do not hear again of Hephes- tion till 334 B.c., when he accompanied the king on his visit to Troy. Many tales are told of the close intimacy subsist- ing between them ; for example, Plutarch says that, when a letter of very delicate and private nature from Olympias was handed to Alexander, Hephestion according to his custom was reading it over his shoulder, when Alexander without uttering a word took his ring off his finger and pressed it on his friend's lips. In the later campaigns of Alexander in Bactria and India, we find Hephzstion charged with important commands. He was rewarded with a golden crown and the hand of Drypetis, the daughter of Darius and sister of Alexander's own wife Statira (324 B.c.), In the end of the same year he died very suddenly at Ecbatana. Alexander tried to relieve his grief by paying the most extravagant honours to his friend. A general mourning was ordered over Asia; at Babylon a funeral pile was erected at a cost of 10,000 talents ; and temples were erected to him as a hero.

HEPH ESTION, a grammarian of Alexandria, author of a work on Greek metres called éyyeupiSiov rept pérpwr. This work is most valuable as the only complete work on the subject that has been preserved. The author is pro-

bably the same as the grammarian that acted as tutor to | the emperor Verus about 150 a.p.

HEPHASSTUS, a word of uncertain derivation but certainly pre-Greek in formation (Kuhn, Zeitschr., v. 214), denotes among the Greeks a god who represents the power of fire and its appliance in the operations of daily life, corresponding to the Latin Vulcan. A clear distinction must be drawn between the Hellenic god and the deity worshipped by the Pelasgic races. Though the word Hephestus is used by Homer in the senso of fire, yet in the Hellenic god no elemental idea is at all prominent. The Hellenic religion had raised itself far above such con- ceptions of the divine power, and its gods were moral powers. Zeus, the ruler of the world, whose will, according to the finest Hellenic conception, is fate, is surrounded by a court in which Hephestus appears as the divine artificer, an object rather of laughter than of respect to the other gods. No worship was paid him, for his altar at Olympia seems not to have been an ancientinstitution. The fire of the hearth, as the centre of family and city unity, is now personified under a purely Greek name, Hestia; but here again it is not the elemental but the moral conception that is the predominant idea in the goddess (see Hest1A). The similarity between the divine artificer of the Greeks and the Finnish Ilmarine or the German Wieland, who has degenerated finally into the Wayland Smith of Scott's Kenilworth, has been often pointed out, and the starting- point of them all is the smith who makes the new sun every morning (see Mannhardt, Zectschr. f, Ethnol., 1875, p. 221), The round disk of the sun has in poetic treatment become the shield of Achilles, whose fabrication is the great deed of Hephestus in the Zliad. This artificer is naturally represented as married to the dawn, Aphrodite or Charis (see GRACES), as Wieland marries the Swan-maiden; and the girdle of Aphrodite which Hephzestus made is the halo of rays that heralds the rising sun. All wonderful works came to be attributed to the divine smith ; in particular the house of the gods has been made by Ilmarine and by Hepheestus ; and they also, like Wieland, have made metal figures that move and almost equal living beings. In general the art of working metals by the hammer is under his patronage—a fact which points out this art as one of the very oldest known to the race (Conze, Gétter- und Heroen-Grestalten, s.v.). In local traditions a set of elfish creatures like the Idzan Dactyls or the dwarfs in German legend were often put in place of this

divine smith. The belief which in Lipara and Strongyle was associated with Hephiestus, that any one that put a lump of iron in a certain spot at night found next morning the article he wished ready made, provided he paid the required price, is in some parts of Germany attached to a correspond- ing set of dwarfs. An ill-omened character often attached to the works of Hephestus, as to that of the Telchines or the German dwarfs. Other points in the Hellenic Hephestus can be explained only by a reference to the worship of the older Pelasgic tribes. When Homer G0, 4: 569) says that he was hurled by his father Zeus down to the earth, the reference to the lightning is unmistakable (Welcker, Gr, @ott., i. 661). Again the weak legs always attributed to Hephzstus remind us of the serpent legs of his son Erichthonius ; and serpents occur often as symbols of lightning. Homer {l.c.) says that Hephestus fell on Lemnos, whose inhabitants tended him 3 he evidently considers that the Hellenic deity was identical with the Pelasgic god. Wherever a Pelasgic race is most certain, there the god is found, associated with the Cabiri: he is the Cabirus par excellence (Herod., vi. 138). Among these tribes the power of fire was considered the life-giving and reproductive power of nature, and the deity in whom

it was embodied became the chief object of their worship. |

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Hence on the coins of Imbros an ithyphallic Hephestus appears. As Greek influence prevailed among the kindred Pelasgic tribes, their native worship survived in the form of mysteries, and their proper gods, whose nature was revealed to the initiated, became in popular tradition heroic or demoniac figures who were the founders of the mysteries (v. HARMonIA, and comp. Lenormant in D'Arem- berg's Dict. des Antiquités, art. "Cabeiri"). This Hephes- tus or Cabirus is the lightning that has descended to earth and become there the origin of all life, and according to Pindar (fr. 162) the first man. The original conception, vague and wide like all primitive ideas, is that the heavenly and the subterranean fire are identical with the fire on earth. In both thunderstorm and dawn the fire of the sun is relighted after being for a time extinguished. Tn both the alternation of light and darkness was the prominent fact. In the thunderstorm the sparks emitted from the sun descend as the lightning to earth. This original power of fire has been

developed in various ways ; the higher thought of the Greeks rejected such a naturalistic deity as the Pelasgic found congenial, while in Athens, where the Pelasgic element was very strong, Hepheestus occupied a correspondingly high place, and is in close relationship with Athene. In many ceremonies, as the Lampadephoria, they were associated ; and at the Apaturia honour was paid to Zeus Phratrius, Athene, and Hephestus. In the oldest traditions they were perhaps married, and their son Erichthonius was the parent of the Athenian people. When the Hellenic conception of the maiden-goddess Athene prevailed, this connexion was transformed into an unsuccessful attempt of Hephestus at a union with Athene. But the marvellous birth of Erichthonius is an ancient feature, as it occurs in Vedic tradition (Kuhn, Zeitschr., i, 443).

Small images of Hephestus stood on every hearth at Athens, and the Amphidromia round the hearth-fire was the rite whereby the newly-born child was adopted into the family. In the oldest Greek art Hephestus is a bearded man fully clad, carrying a ham- mer. This hammer, which the Cabirus of Thessalonica carries, is doubtless in its origin, like the hammer of Thor, the thunderbolt or hammer with which was shattered the tower where the sun was hid during the winter darkness. An undignified and comic character is, however, often apparent, when he wears short, workman's clothes, and wants the dignity proper to a god. The ruling type in later art is a bearded man with a certain resemblance to Zeus, wearing a close cap, carrying the traditional hammer, and clad in a short, girt tunic which leaves the left shoulder frec. (W. M. RA.)

HERA, a word of which many different derivations have been proposed, is the name of a Greek goddess, corre- sponding to the Latin Juno, who according to the conventional type is the wife of Zeus and queen among the gods of Olympus. In the literature of the Grecéks Hera fills a very conspicuous place—the strong, haughty, and rebellious character, full of intense hatreds and likings, which was associated with her, made her a pic- turesque and dramatic figure. According to this concep- tion of her, she was daughter of Cronus and Rhea, and at once sister and wife of Zeus. She was always the bitter enemy of all the heroines who were the successive objects of her husband's Jove, and her persecution of them and of their children often forms the theme of poets from the Iliad (xxiii. 119) downwards. This

type, which is the familiar one in all literature, had never any real existence in religion ; but had been gradually elaborated by poets froni the actual deity worshipped in various parts of Greece, and from the legends transmitted to the Greeks from earlier races.

The most characteristic and fundamental point in the worship of Hera is the iepds ydsos, her marriage with Zeus ; and from this any explanation of the conception involved in the goddess must start. Again in Greek legend we learn that a close connexion exists between Hera and the cow, and that probably she was originally thought to have the

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form of acow. These facts at once direct us to the ancient Aryan idea, described in detail by Gubernatis (Zoolog. Mythol., i.), that the divine power as the origin of all life is embodied in a pair of gods male and female, whose fertility leads to the conception of them as a bull and a cow. This pair, the bull and the cow, appear in various fantastic developments in Greek legend. Tor example, Zeus himself in the form of a bull carries off Europa; and we learn from Hesychius that Europia is an epithet of Hera. Look- ing at the matter from this point of view, we find that the question so much disputed among mythologers, whether the naturalistic conception out of which the Greek goddess hag developed be earth or moon, is a mere matter of words, and that there is no real discrepancy between the two views. The free and vague conceptions of primitive men refuse to

be shut into the precise circumscribed terminology of modern

thought. Ideas which to us are very different were once expressed by the same root (see Curtius, Grundz,, iii, 284, No. 415). Thus we have in the Rig Veda, vi. 61,5, % clear trace of the view so common in all mythologies, whether in the theogony of Hesiod or of the New-Zealanders, that Heaven and Earth are the primitive pair of deities, parents of all existence and first of the gods. This view is of peculiar importance in old Roman religion (cf. Schwegler, Rém. Gesch., i. 328, 422, &e.), and also among the older Pelasgic tribes of Greece. But this same divine power the primitive Aryans beheld in all the great operations of nature; in each they saw the prototype of all earthly works, and in seeking here the origin of life, they found it in

the same divine pair, the bull and the cow. In particular, the various alternations of light and darkness appealed to their minds most strongly, and occupy great part of their mythology. In the transitions between light and darkness, and especially in the struggle between night and day, the idea of a pair is not so prominent; and in legends the marriage of moon and sun does not figure very conspicuously. Yet we sometimes find the marriage of the moon and sun described exactly in the way of this tepds ydpos. In Rig Veda, x. 85, it is the type of all earthly marriage (see Weber, Ind. Stud., v. 178), A Slavonic story makes the marriage of moon and sun annual: they part every winter and meet again in the first days of spring ; and a Lettish song makes the marriage of moon and sun in spring (Mannhardt in Zt. f. Ethnol,, 1875, p. 316). The moon too is often symbolized asa cow. The mystic union takes place in the spring when life returns to the earth, and the voice of the cuckoo is heard in the land. Hence in the legend Zeus, enamoured of his sister Hera, is said to have flown to her in the form of a cuckoo dripping wet, and to have been in pity received into her bosom. In various parts of Greece where traces of the ruder tribes are strongest, there remains a coarser conception of this union, and in the popular accounts the marriage customs of the country are reflected (see Welcker, Gi. Gétterl., 1. 364 #). Lectum in the Trojan Ida and Ocha in Eubea, on the summits of which this union is placed by the legends of the countries, received their names from it. As we might expect, this idea is too purely naturalistic to form any part of the moral Olympian religion. Hera appears there as the wife of Zeus, but all deeper meaning has disappeared. The old tale remains in the mythological legends, which always clung as a degrading appendage to this religion, and we find it in Homer (JU., xiv. 294) trans- formed into an incident of the Trojan war. Inthe popular religion, however, Hera, as first the virgin, then the sacred bride, and finally the lawful wife of Zeus and the patron of all marriage, is a very prominent figure. Every year the festival of Hera was celebrated with special reference to this union in Argos, Samos, Elis, Plateea, and many other parts of Greece. The festival took place in a month named

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Tayydtov at Athens, ‘Hpatos in some other parts of Greece. Hence we have such epithets of Hera as Niudy, vup- evowery, TeAeia, yapynd‘a ; and the

bridal veil is one of her most frequent attributes. Hera was married to Zeus in early youth, and knew no other marriage. Hence she is 'the patron goddess of all married women, the protectress of the sanctity of marriage; and she demands the utmost purity from her votaries. In this respect Hera approaches closely to Demeter Thesmophoros, As the winter is a time of barrenness and separation, so we have in Arcadian, Argive, and Samian legend the angry Hera, the widow Hera, separated from her husband.

Other points in Hera again point directly to the moon. Like all other forms of the moon-goddess (see HEcatE), she presided over child-birth, and under the epithet

Eubcea, the very word being an epithet of the goddess, was one of the chief seats of the worship of Hera. So in Beeotia, her temples both at Thespiz and at Platea were famous. In the Zdiad, Argos, Sparta, and Mycenz are the cities which she specially protects and loves. Argos was always one of the chief seats of her worship,and the Heraion there was one of the chief temples of Greece. At Olympia also was a very ancient temple, the Heraion, the ruins of which have been recently brought to view by the German exploring expedition. At the Lacinian promontory Hera was the patroness of the union first of the Achsan cities and afterwards of a wider circle of the Greek colonies. But the Hera of Samos was perhaps the most famous and most characteristic appearance of the goddess. There the Greek goddess was amalgamated with another, who was worshipped by the kindred tribes among whom the Greeks settled, and who is clearly the same as the Artemis of Ephesus or Clazomenzey and so on coins of Samos we find Hera standing with the sun and moon on either side of her head, exactly like Artemis on coins of Ephesus.

We find such rude images of Hera as a plank at Samos, ora branch at Thespie. A very ancient statue by Smilis stood in her temple at Samos; the goddess, veiled, stood erect, clad in a long chiton, holding in cach of her outstretched hands a giddy. In the earlier vase-paintings she is hardly to be distinguished from Artemis. She appears, just like Artemis, carrying torch and bow, and wear- ing the kalathos or the stephanos ; and several figures which others consider to be Artemis, are by Overbeck explained as Hera. In representations of the Judgment of Paris there is often nothing to

distinguish her from Aphrodite, Her characteristic symbols are the veil or sceptre, and she often carries a fruit. Numerous vase- paintings, representing a bridal procession, which Forster (Zeus und Heras Hochzeit) believes to represent the fepds yduos, are by Jahn and Overbeck shown to be an earthly marriage escorted by deities. Overbeck (Hera, p. 174) maintains that only three certain repre- sentations of this scene exist, The colossal statue by Polycletus in the Heraion at Argos showed her enthroned, wearing the orepdvn, holding in one hand a pomegranate and in the other a sceptre, on the top of which was a cuckoo. There is no evidence to determine what was the character of the face, nor what share it had in deter- mining the ideal type of Hera (Overbeck, J.c., p. 51). The Farnese bust at Naples represents a type more antique than the style of Polycletus. Praxiteles made three great statues of Hera, at Megara, Mantinca, and Platea. The last, which represented Hera Teleia standing, is known to us by many imitations in the Vatican and elsewhere. From the works of these two great artists we May sup- pose that the highest type of Hera was elaborated in the Athenian school about the middle of the 4th century, and in the famous bust of the Villa Ludovisi it is probable that we have the actual work in whicao this type was first attained. This bust, which has becn often described, and especially by Goethe, was probably once the head of a colossal seated statue. (W. M. RA.)

HER—HER

HERACLEA, or Henracteta (in French, Héraclée), the name of several ancient cities in various parts of the area of Greek colonization, so called in honour of Heracles or Hercules.

I. Heractea, a city of Magna Grecia, which lay between the rivers Aciris and Siris, not far from the shores of the Gulf of Tarentum, near the site of the modern village of Policoro. It appears to have been a joint colony of the Tarentines and the Thurians, and to have risen after the destruction of the neighbouring city of Siris. That it attained to no small prosperity and became the seat of the great politico-religious assembly of the Italian Greeks is newly all that can be said of its earlier histury. By Alexander of Epirus it was deprived of this privilege in favour of Thurii. Pyrrhus was victorious in its vicinity in the first battle he fought with the Romans, 280

B.c., and two years later the city formed an alliance on advantageous terms with the conquerors. In the time of Cicero it was still comparatively prosperous. The Zabule ITeracleenses, found at Luce near the ruins of the city in 1753, are two bronze tablets, or rather fragments of tablets, containing on one surface a Greek inscription relating to temple domains and on the other surface a copy of the famous Lex Julia Municipalis published by Julius Caesar in 45 B.c. They are preserved in the Museo Nazionale at Naples, and one of them is distinguished as the Zs Britannicum and the other as the @s Meapolitanum, Both inscriptions are given in Mazzocchi, Commentaria in Regu ITerculanensis Musei aeneas tabulas Heracleenses (Naples, 1754-55), and the Latin one will be found in Muratori, Znscriptiones (vol. ii.), and Haubold, Afonumenta legalia. See also Savigny, Zeitschrift fiir geschicht. Rechtswiss. (vol. ix.) and Vermischte Schriften (vol. iii, Berlin, 1850).

If. Heracuza, a city of Sicily, at the mouth of the IHalycus (the modern Platani), not far from the promontory now known as Capo Bianco. It was distinguished from the other Heracleas by the surname of Minoa, which was explained as referring to its foundation by Minos of Crete. Its name frequently occurs in connexion with the Cartha- ginian occupation of Sicily, and it was in the neighbouring sea that the Carthaginian fleet was routed by Regulus and Manlius in 256 B.c. The Romans introduced a colony.

III, Heracuua Pontica, a city on the coast of Phrygia in Asia Minor, easily identified with the modern Bender Eregli or Erekli, at the mouth of the Kilidj-su on the Black Sea. It was founded by a Megarian colony, which soon subjugated the native tribe of the Mariandynians, and extended its power over a considerable territory. The prosperity of the city, rudely shaken by the Galatians and the Bithynians, was utterly destroyed by Aurelius Cotta in the Mithridatic war. It was the birthplace of Heraclides Ponticus. 'The modern town is best known for its coal mines, from which Constantinople receives a good part of its supply. See Polsberw, De Rebus LTeraclece, Branden- burg, 1833; and O. Kimmel, Heracleotica: Beitrdge zur alten Gesch. der griech. Colonisation im nérdl. Klein-Asien (Progr. des Gymn, zu Plauen, 1869),

IV. Heractua SinticA, a town in Thracian Macedonia, to the south of the Strymon, the site of which is marked by the village of Zervékhori, and identified by the frequent discovery of local coins.

VY. HERACLEA, a town on the borders of Caria and Ionia, near the foot of Mount Latmus, whence it is usually dis- tinguished as the Latmian. In its neighbourhood was the burial cave of Endymion. See Rayet and Thomas, vet et le Golfe Latmique, Paris, 1877.

For Heraclea Trachinia see TRacuis, and for Heraclea Perinthus see PERINTHUS.

Heraclea was also the name of one of the Sporades, between Naxos and Ios, which is still called Raklia, and

Zeus Lophites.

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bears traces of a Greek township with temples to Tyche and See Baumeister in Philologus, vol. ix.

HERACLEON, a Gnostic who flourished about 125 A.D., probably in the south of Italy or in Sicily, is gene- rally classed by the early heresiologists with the Valen- tinian school of heresy. In his system he appears to have regarded the divine nature as a vast abyss in whose pleroma were eons of different orders and degrees,—emana- tions from the source of being. Midway between the Supreme God and the material world was Demiurgus, who created the latter, and under whose jurisdiction the lower, animal soul of man proceeded after death, while his higher, celestial soul returned to the pleroma whence at first it issued. Heracleon seems to have received the ordinary Christian Scriptures ; and Origen has preserved fragments of a commentary by him on St John's gospel, while Clement of Alexandria quotes from him what appears to to be a passage from a commentary on St Luke's gospel. These writings are remarkable for their intensely mystical and allegorical interpretations of the text. The portions of the commentary on St John's gospel have been brought together by Grabe in the second volume of his Spicilegium.

HERACLES. See Hercurzs.

HERACLIDES, surnamed Ponticus, a Greek miscel- laneous writer who flourished in the 4th century B.c., was born at Heraclea in Pontus. Removing to Athens, he is said to have been a disciple successively of Speusippus, Plato, and Aristotle. According to Suidas, the second of these philosophers, on departing for Sicily, left his scholars in the charge of Heraclides. The latter part of his life was spent at Heraclea. Of his private history we have few authentic details. He is said to have been vain and fat, and to have maintained such state in Athens that the wits changed his surname into Pompicus, or the Showy. Various idle stories are related about him. On one occasion, for instance, Heraclea was afflicted with famine, and the Pythoness at Delphi, bribed by Heraclides, assured his inquiring townsmen that the dearth would be stayed if they granted a golden crown to that philosopher. This was done ; but just as Heraclides was receiving his honour ina crowded assembly, he was seized with apoplexy, while the dishonest priestess perished at the same moment from the bite of a serpent. Ou his death-bed lhe is said to have requested a friend to hide his body as soon as life was ex- tinct, and, by putting a serpent in its place, induce his townsmen to suppose that he had been carried up to heaven, The trick was discovered, and Heraclides received only ridicule instead of divine honours.

He wrote on a great variety of subjects, but only one fragment, On Statecraft, is now extant. This was published with the Varia Historia of Ailian at Rome in 1545 ; but the best editions are those of Koller (Halle, 1804), Coray (Paris, 1805), and Miiller. See Fr. W. Schmidt, De Heraclide Pontici et Diewarchi Messenit dialogis deperditis, Breslau, 1867.

HERACLITUS of Ephesus, one of the most subtle and profound of the metaphysicians of ancient Greece, has only of late years had his true position assigned to him in the history of philosophy. To this the obscure and epigram- matic character of his style and the fragmentary condition of his works have in the main contributed, together with the fact that not only his immediate disciples but also his critics, including even Plato, have systematically laid stress upon those features of his doctrines which are least indicative of his real point of view. The true position of Heraclitus is that of the founder of an independent metaphysical system, which sought to

get rid of the difficulty, so prominent in the Eleatic philosophy, of overcoming the contradiction between the one and the phenomenal many, by enunciating, as the principle of the universe, “ Becoming,” implying, as it does, that everything is and at the same time, and in the

same relation, is not. XT. — 86

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The descendant of a family of leading importance in

Ephesus, Heraclitus was born about 535 B.c. His cast of |

mind was so intensely aristocratic that, filled with contempt for the couvcils and capacities of his fellow-citizens, he made over the hereditary office of Baowdevs, which had fallen to him in right of his birth, in favour of his younger brother, and betook himself to a life of solitary meditation. The date of his death was probably about 475 B.c.

To appreciate the significance of the doctrines of Heraclitus, it |

must be borne in mind that to Greek philosophy the sharp distinc- tion between subject and object which pervades modern thought was foreign, a consideration which suggests the conclusion that, while it is a great mistake to reckon Heraclitus with the material- istic cosmologists of the Ionic schools, it is, on the other hand, going too far to treat his theory, with Hegel and Lassalle, as one of pure Panlogism. Accordingly, when he denies the reality of Being, and declares Becoming, or eternal flux and change, to be the sole actuality, Heraclitus must be understood to cnunciate not only the unreality of the abstract notion of being, except as the correlative of that of not-being, but also the physieal doctrine that all pheno- ‘mena are in a state of continuous transition from non-existence to existence, and vice versa, without either distinguishing these pro- positions or qualifying them by any reference to the relation of thought to experience. ‘Every thing is and is not;” all things are, and uothing remains. With Heraclitus the principle of con- tinuity is opposed to the principle of discretion taught by the Eleatics, and consequently for him “ Being and Nothing,” as well as “ Union and Separation,” are logically and physically incapable of distinction. This

being so, he naturally enough sclects Fire, accord- ing to him the most complete embodiment of the process of Be- coming, as the principle of empirical existence, out of which all things, including even the soul, grow by way of a quasi conden- sation, and into which all things must in course of time be again resolved. But this primordial fire is in itself that divine rational process, the harmony of which constitutes the law of the universe. Real knowledge consists in comprehending this all-pervading harmony as embodied in the manifold of perception, and the senses are " bad witnesses," because they apprehend phenomena, not as its manifestation, but as "stiffand dead." In like manner real virtuc consists in the subordination of the individual to the laws of this harmony as the universal reason wherein alone true freedom is to be found. " The law of things is a law of Reason Universal, but most men live as though they had a wisdom of their own." Ethics here stands to sociology in a close relation, similar, in many respects, to that which we find in Hegel and in Comte. For TSesclbtias the soul approaches most nearly to perfection when it is most akin to the fiery vapour out of which it was originally created, and as this is most so in death, " while we live our souls are dead in us, but when we die our souls are restored to life." The doctrine of immortality comes prominently forward in his ethics, but whether this must not be reckoned with the figurative accommodation to the popular theology of Greece which pervades his ethical teaching, is very doubtful.

The only extant work, purporting to have been written by Her- aclitus, which can be regarded as genuine, is the treatise Tep} o@baews, Which has come down in a fragmentary condition. It has been edited by Bywater (Heracliti Ephesti Reliquiwe, Clarendon Press, 1877). The Epistles are in all probability spurious.

The school of disciples founded by Heraclitus flourished for long after his death, the chief exponent of his teaching being Cratylus. A good deal of the information in regard to his doctrines has been

enced by it.

By far the most eomplete exposition of his system is that of Lassalle (Die Phi- losophie Herakleitos des Dunkeln von Ephesos, Berlin, 1858), although his inter- pretation is deeidedly too strongly dominated by modern

Hegelian eonceptions. See also Hegel, Gesch. d. Phil.; Zeller, Gesch. d. Phil. d. Griechen; Bernays, Die Heraclitischen Briefe, Berlin, 1869; and Sehuster, Heraklit von Ephesus, Leipsic, 1873.

HERACLIUS (c. 575-641), emperor of the East, was born in Cappadocia about 575. He was brought into notice by his heading a successful revolt against the emperor Phocas in 610, when he usurped the usurper's throne. At that period the eastern provinces of the empire were being ravaged by the triumphant armies of Chosroes (Khosru) II, which in the first twelve years of Heraclius's reign continued their unresisted progress to the Bosphorus and the Nile,

pillaging Asia Minor and Syria, and reducing Constanti-_

nople to the utmost distress by cutting off its Egyptian corn supplies. In 618 the public distributions of grain, which had been carried on since Constantine had instituted them

as a bribe to attract citizens to his new city in 330, were |

| by the almost imperative prayers of his people from quit-

| is not easy to solve.

ting his capital in shame and fear for Carthage. Taking courage, Heraclius appears to have set himself to the task of reorganizing both state and army, a labour which had probably occupied him since his accession. He was menaced on the west by the fierce tribe of the Avars, who were casting longing eyes on the riches of the imperial city ; but in 620 he succeeded in making a treaty with them, and interposed a human barrier against their further encroachments by inviting the Serbs and Croats to settle in the intervening regions, which they have never since left. In 621 Heraclius led an army into camp in Asia Minor, and devoted himself with ardour to the drilling of his inex- perienced troops. Every military manceuvre, every useful exercise and even hardship, was ordered and shared by the emperor. Hekindled the enthusiasm of his soldiers by his stirring words, and excited their adiniration and affection by his deeds. Next year he led his forces against Persia, and within five years, in a series of brilliant campaigns that place him side by side with the greatest generals of the world, he overthrew the pride of that empire, drove its monarch a fugitive from his throne, and enriched his exult- ing troops with untold wealth. Siroes, the son of Chosroes, revolting against his unhappy father, put him to death in 628, and speedily made a peace with Heraclius, according to which the Persian empire retired to its former limits, prisoners were mutually given up, and the true cross, carried from Jerusalem by the Persians, was restored to Christian hands. Heraclius returned in triumph to Constantinople, which had in his absence two years before successfully re- pulsed a combined assault by the Avars and Persians; and in 629 he proceeded to Jerusalem to restore solemnly the holy relic to its ancient place. But he was not long to enjoy the peaceful fruits of victory. A mighty power had been steadily growing up in the hot sands of Arabia, and was now coming to measure its strength with that of the Roman empire. In 632 the Mahometans invaded Syria ; and, over- throwing the armies sent to oppose them, in six years they made themselves masters of the country. Egypt next fell before Islam, and in 640 that fair province of the empire was Mahometan. 'The people of Asia Minor alone success- fully resisted the advancing Saracens. Heraclius seems meanwhile to have sunk into a sort of lethargy, as though his efforts in Persia had completely exhausted him. While his generals and armies were being cut to pieces he was engaged at Constantinople, whither he had retreated in 634, with speculative theological questions. In 638 his Ecthests

appeared, which, tinctured with the heresy of Monothelism, was probably drawn up by the patriarch Sergius. The energy of his earlier life never returned, and in 641 he sank

gathered from the later Greek philosophy, which was deeply influ- _ under a long-continued disease. He had been twice married;

the second time to his niece Martina, an illicit union which he compelled the reluctant Sergius to celebrate. His eldest son, Heraclius, succeeded him, taking the title of Constan- tine ITI.

The character of Heraclius is a curious riddle, which it Personally brave, and possessed of

tried ability as a diplomatist and a general, in his latter

_ conduct.

years he passively allowed his empire to fall to pieces before his eyes,— presenting in the periods of his life a con- trast that would almost seem to argue the possession of not merely contrary but contradictory qualities. But we must not forget that our information regarding the inner details of his latter reign is very imperfect, and that possibly there may be some reason, though hardly an excuse, for his It would have been better for his fame if he had

| died immediately after his Persian campaigns.

See Gibbon's Decline and Fall of the Roman Empire ; Le Beau's Histoire du Bas-Empire ; and the works of George of Pisidia (¢/.

suspended ; and the bankrupt emperor was hardly dissuaded | vol. x. p. 429).

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HERALDRY

| lager though etymologically denoting all the

business of the herald, has long in practice been restricted to one part of it only, and may be defined as the art of blazoning or describing in proper terms armorial bearings. It treats also of their history, of the rules observed in their employment and transmission, of the manner in which by their means families and certain dignities are represented, and of their connexion with genealogies and titular rank.

Particular symbols have in all ages been assumed by the various families of mankind, civilized and uncivilized. Such were the lion of the tribe of Judah, the S. P. Q. R. upon the standards of ancient Rome and the eagle sur-mounting them, tlie tattoo marks of the savages of America and the Pacific, the Danish raven, and the white horse of Saxony, which still remains carved upon the chalk downs of western England.1 Heraldry, however, is a purely feudal institution, coeval with close armour, devised possibly in Germany, adopted and improved in France, Spain, and Italy, and imported into England by the Norman invaders and settlers. Its figures have little or nothing to do with the older symbols, though these have occasionally been incorporated into its charges, and an apparent connexion

thus established between them. These symbols, as has

been well said, were the precursors and not the ancestors of heraldic bearings. The supposed connexion, however, misled the credulous heraldic writers of the 16th and 17th centuries, and caused them to attribute coats of arms to the heroes of sacred and profane history, who were certainly as ignorant of heraldry as ever was Adam of genealogy.

“Arms” or “armories,” so called because originally dis- played upon defensive armour, and “ coats of arms ” because formerly embroidered upon the surcoat or camise worn over the armour, are supposed to have been first used at the great German tournaments, and to have reached England, though to a very moderate extent, in the-time of Henry II. and Coeur de Lion. To “blazon,” now meaning to describe a coat of arms, is the German “ blasen,” to blow as with the horn, because the style and arms of

each knight were so proclaimed on public occasions. The terms employed in heraldry are, however, mostly French or of French origin. Though now matters of form and ceremonial, and subject to the smile which attaches tv such in a utilitarian age, armorial bearings were once of real use and importance, and so continued as long as knights were cased in plate, and their features thus concealed. At that time leaders were recog- nized in the field by their insignia alone, and these—both figures and colours—became identified with their fame, from personal became hereditary, were subject to certain rules of descent, and to the laws of property and the less certain rules of honour.

Froissart mentions a case in which a knight of the Scrope family could with difficulty be restrained from putting to death a prisoner because he wore the same bearings with himself, The last De Clare owed his death on the field of Bannockburn to his having neglected to wear his cotte d'armes ; had he been recognized, his great value as 4 prisoner would have saved him. Also the loss of the battle of Barnet was in part attributed to the similarity between the royal cognizance of.a sun and that of John

1 The subject of ancient and especially of Greek " heraldry " is discussed by Curtius in a learned and interesting paper " Wappenge- brauch und Wappenstyl im Alterthum" in the Abhandlungen der Kénigl. Akad. d. Wissenschaften zu Berlin (1874). See also article Gems, vol. x. p, 136.

de Vere, a star with streamers,—Warwick charging Oxford by mistake for the king, .

The best if not the only absolutely safe evidence for the origin of armorial bearings is that afforded by seals. Seals were in common use both before and after the introduction of armorial bearings, and they are not so likely as rolls of arms or monumental effigies to be the work of a later age. There are said by Courcelles to be extant, appended to charters of 1030 and 1037 a.p., two seals of Adalbert, duke of Lorraine, which bear on a shield an eagle with wings closed. This however wants confirmation; but Anna Comnena, describing the shields of the French knights who visited Constantinople about 1100, gives their surfaces as of metal only, polished but plain; nor have any decided traces of arms been discovered among the early crusaders. «Louis le Jeune, who seems first of the French kings to

have used the fleur-de-lys, caused it to be repre- sented in gold over the azure mantle and chaussures worn by his son at his coronation. Also, in 1180, he seals with a fleur -de-lys, but it is placed in a circle, not upon a shield. Planché cites two seals of Philip, count of Flanders, one plain, in 1157, and another in 1164 charged with a lion, their subsequent bearing. Seton mentions the seal of John de Mundegumbri in 1170 as bearing a fleur-de-lys, which, like that of Louis, has two intermediate flower-stems, as seen on Florentine coins, He also gives the seal of Falconer (1170) as bearing a falcon; and that of Corbet bore two ravens perched upon a fleur-de-lys, while his brother bore them upona tree. This indeed was at a period when fleurs-de-lys, stars, and various animals were commonly represented as mere ornaments on seals, but the peculiarity of the instances named is that the falcon and the raven, like the fleur-de-lys of France, were afterwards the heraldic bear. ings of those families. The seals of the close of the 12th century, though not generally heraldic, certainly betray many of the elements of heraldry. No doubt, when once introduced, armorial bearings were felt to supply a real and serious want, and came rapidly into use, but Wace, the poet of the reign of Henry II., although he tells us that

- *N'i a riche home ne Baron, Ki n'ait lez li son gonfanon, U gonfanon u altre enseigne," can scarcely be seriously held to mention armorial bearings.*

It is uncertain at what period armorial bearings found their way into England. The Conqueror and his successors certainly did not use them ; they do not appear upon their seals, nor are they shown upon the banners of the Bayeux tapestry. The monk of Marmoutier, probably a contem-porary, describes Henry I., upon the marriage of his daughter to Geoffrey of Anjou in 1122, as hanging about the bridegroom's neck a shield adorned with small golden lions, 'leonculos aureos ;" and, making mention of a combat in which Geoffrey was engaged, he describes him as " pictos leones preeferens in clypeo." It is true that the number, attitude, and position of these lions on the shield are not specified, but considering that not long afterwards two lions became the arms of Plantagenet, and so of England, this may fairly be taken as their introduction, Stephen is said to have used a centaur, Sagittarius, as an emblem, because he landed in England when the sun was in that sign, but on his great seal his shield is quite plain, save a

ridge down the centre, evidently a part of its construction. On the seals of the Conqueror, Rufus, and Henry I., only the hollew or under side of the shield is shown ; so there probably was no design upon the front. There is no seal of Duke Robert, but William, earl of Flanders, his son, shows a,

plain shield on his seal. His monumental effigy (1128) bears a large pavesse shield, and upon it an escarbuncle, apparently a highly ornamented clamp. The seal of Henry IL. also shows the hollow of the shield. The first great seal of Richard I. bears a lion rampant, who from his position may be inferred to be fighting with a similar lion upon the sinister and concealed half of the shield, blazoned in a MS. cited by Mr Way as "two lions confrontés."

Up to this time the kings, though represented on horse- back and in full armour, have the face uncovered, and therefore their persons would be known. The seal of Richard I. in 1189 shows a close helmet, and upon the shield two lions passant gardant in pale, " leones lopardés," as they were then or svon after called. On a later seal, after his return from captivity in 1194, Richard added a third lion. John, while earl of Mortaine, sealed with two lions, but his seal as king bears three, and the coat has so remained. That the two lions were more than a mere ornament is evident from their having been adopted by John's natural son, Richard de Warren, who seals with two lions passant regardant. The seals of the great barons show the growth of the practice, Richard, constable of Chester, contemporary with Stephen, bears a shield covered over with small plates, tegulated, like his armour; but Stephen, earl of Richmond, as early as 1137, seals with seven fleurs-de-lys, a very early heraldic seal. Waleran, earl of Meulan (died 1166), also used an heraldic seal. Duchesne gives a seal of Bouchard de Montmorenci (1182), a con- temporary of Louis le Jeune, with a cross between four alerions on his shield, and another in whch the cross is charged with roundels. Mathieu, his son, seals also with

the cross and alerions, which had evidently become, as they In England, William, earl of Essex

remained, hereditary. (died 1190), seals with the escarbuncle of his family. In 1187 Gervase Paganel, a great Anglo-Norman baron, seals with two lions passant, which his family continued to bear.

With the 13th century arms came rapidly into use. The

second seal of Mathieu de Montmorenci in 1209 has them introduced upon his horse furniture, but this practice does not appear upou the seals of the kings of England until the Baldwin de Bethune, earl of

second seal of Edward I. Albemarle (died 1214), sealed with three martlets in chief, and many other early examples of regular heraldic seals occur at this period attached to extant charters. The earliest roll of arms is of the reign of Henry IIL; of a second of the same reigna copy is preserved in the Harleian

collection ; and a third, in the next reign, is the roll of

Caerlavrock, 1300 a.p. So that for the reign of Henry and his son the evidence for armorial bearings is copious and ex- cellent. Other rolls exist carrying the practice through the 14th and 15th centuries, before the middle of which there is no known work on heraldry, nor any trace of heraldic regu- lations save what may be deduced from recorded practice.

Coats of arms were not at first strictly hereditary, nor even always permanent in the same person. Thus William de Ferrars, 6th earl of Derby (died 1246), seems to have borne "argent, 6 fers de cheval, or horse shoes, 3, 2, 1, sable." William, his son, in consequence of a match with Peveril, who bore " vair," changed his bearing to " vair, or and gules, on a border azure 8 horse shoes argent." Robert his son, 8th earl (died 1278), dropped the horse shoes, and bore " vair, or and gules."

"¢ Ferrars his tabard with rich vair yspread."

After the match with Quincy, the Ferrarses laid aside their own coat and bore that of Quincy, "gules, 7 mascles conjoined 3, 3,1, or." Their male heir through a younger branch,—Ferrers of Baddesley-Clinton,—

commemorates these various changes by bearing "quarterly,—(1st) vair, or and gules ; (2d) sable, 6 horse shoes, 3, 2, 1, argent; (3d)

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gules, 7 mascles, 3, 3, 1, or, a canton ermine." Hugh Lupus, earl of Chester (died 1101), is fabled to have borne a wolf's head, and not improbably his surname arose from some suchemblem. Richard, his son, is said to have borne "azure, semée of crosslets or, a wolf's head erased argent," Ranulph Meschines, 3d earl (died 1128), was sister's son to the first earl, and to him is assigned " or, a lion rampant gules." Hugh Cyfelioc, 5th earl (died 1189), certainly bore "azure 6 garbs of wheat, 3, 2, 1, or;" and Ranulph Blondevile, his son, bore "azure, 3 garbs or." With him the line failed, but as the wheat-sheaf is a common Cheshire bearing, it is probable that arms came into general use in tho palatinate in the time of the last two earls.

Sir Nicholas Carru (died 1283) seals with a tricorporate lion, but at Caerlavrock in 1300 is found with a

'¢ Baniere et jaune bien passable,

O trois passans lyons de sable," the arms of the Carews of our day. The fess and label of Saher de Quincy, earl of Winchester, in 1170, were changed by Roger his son for the mascles by which they were best known, and which he repeats upon his housings. The fact is that, at the close of the 13th century, arms, though on the whole hereditary, had not quite acquired that fixed character that belonged to them half a century later. That the changes were the exception rather than the rule is, however, clear from the roll of Henry Il1., and from the arms of the forty great barons which he caused to be painted on the walls of Westminster Abbey, almost all of which, so far as they are on record, are the same with those borne or quartered by their representatives. There exist also in England a few families of Norman origin, the period of whose arrival in England is known, and whose arms are the same with those of the present stock in the parent country. Such are Harcourt of Ankerwyke and D'Aubigny, who therefore bore their arms before the separation from

Normandy under Henry III.

Early bearings were usually very simple, the colours in strong contrast, and their form and outline such as could readily be distinguished even in the dust and confusion of a battle. They are mostly composed of right lined figures known in heraldry as ordinaries. The favourite beast is the lion.

The earliest and most valuable records relating to English armorial bearings are undoubtedly the rolls of arms of the reigns of Henry III. and the first three Edwards, which have been well edited by Sir H. Nicolas, That of Henry III. known as Glover's roll, drawn up between 1243 and 1246, describes or blazons 218 coats of arms, and therefore shows very sufficiently the heraldry of the period. Of these coats nearly one-half are composed solely of the ordinaries and subordinaries, and other simple lines and figures. About two score of them exhibit lions, chiefly rampant, and leopardés, a form of the same animal. The only other beast is the "teste de sanglier" borne by Swinburne. Of birds there are but the eagle and the papagay, several martlets, and single examples of the raven, the cock, the heron, and the horiole. The luce or pike is the only fish. The cinquefoil and sexfoil, the fleur-de-lys, the rose, and the wheat-sheaf, used very sparingly, represent the vegetable world. Forthe rest there are annulets, barnacles, crescents, estoiles, escallops, fers de cheval, mnilets, and water budgets. There is one ray of the sun, and one whirlpool.

The coat of Mortimer " barré, a chef palée,a corner geren- née d'or et d'azur, a ung escucheon d'argent,"—or, in modern terms, "barry, a chief paly, its corners gyronny or and azure, an escutcheon argent " (fig. 63),—is the only one at all of a complex character, and this is composed of ordinaries and subordinaries; and though many of the ordinaries bear the smaller charges, or are placed between them, there are very few examples of an ordinary so charged also

placed between charges, a common usage in later coats. An exception is Chandos, who bears three estviles on a pile, which again is placed between six others; but this stands alone.

The roll of Edward II. blazons 957 coats of the bannerets of England, so that the use of arms had increased consider- ably. The lions have risen to 225, the eagles to 43; and there are 102 crosses of various kinds. Of new beasts, fabu- lous or real, there are the griffin, the wyvern, the stag, wolf, goat, and greyhound; of new birds, the falcon; of fishes, the dolphin. Of other objects the additions are the millrind, buckle, covered cup, chaplet, gauntlet, arrow, trumpet, hammer, battle-axe, palmer's staff, pots, winnowing fans or vans, pens, cushions, and chessrooks. The character of the arms remains very simple, and the blazon employed agrees in the main with that still in use, and is in general perfectly intelligible. These rolls give various examples of changes of coats, either altogether or by the introduction of a difference to distinguish members of the same family; and it is observable that when the figures are altered the colours are usually adhered to, as though it were considered undesirable to change them, Thus Gilbert de Segrave (died 1254) bore "sable, 3 garbs argent." Of his grandsons John and Nicholas, John bore the paternal coat, but Nicholas, at Caerlavrock, had exchanged the garbs for a lion. This afterwards became the family bearing as "sable, a lion rampant argent, crowned or," the colours being retained.

No sooner had the great barons assumed arms for them- selves than they began to grant them to their followers. Arms so granted commonly bore some resemblance to those of the grantor, and hence certain charges prevailed in certain districts. Thus the chevron of De Clare was common in South Wales, in the Honours of Gloucester and Clare, and about Tonbridge. The garb or wheat-sheaf was found in Cheshire ; the cinquefoils of the Bellomonts in Leicester- shire ; the annulets of Vipont in Westmoreland ; the lion all over England, and the tressure in Scotland, both from the royal arms. Some of these grants remain; others can with certainty be inferred. Stephen Curzon, who held under the earls of Derby, bore " vair, with a border of 8 popinjays argent," and Richard, his brother, bore " vair, on a fess 3 horse-shoes." Hubert, earl of Kent, bore "7 lozenges vair ;" and Anselm de Guise, on taking under him lands in Berks and Gloucester, assumed the same coat, with the addition of a canton or, charged with a mullet sable. In 1849 Robert Morle granted to Robert de Corby and his heirs the arms " d'argent, ove un saltier engrailé de sable," which he himself had inherited from Baldwin de Manoirs, In 1856-7 William, baron

of Greystock, who bore " barry of 6 argent and azure, 3 chaplets gules," granted to Adam de Blencowe and his heirs for ever "an escutcheon sable with a bend closetted [or barred] argent and azure, with 3 chaplets gules." In 1391-2 Thomas Grendale granted to William Moxgue his heirs and assigns, "argent, on a cross azure 5 garbs or," which, as cousin and heir, he himself had inherited from John Beaumeys. Finally, in 1442, Humphrey, earl of Stafford, who bore "or, a chevron gules," granted to Robert Whitgreaves "un escue d'azure, & quatre points d'or, quatre chevrons de gules," to him and his heirs of lineage,—in modern terms "azure, a cross quarter-pierced or, on each limb a chevron gules." A coat of arms was not only heritable, subject to certain heraldic customs, but could be willed or granted away, wholly or in part, like chattel property.

The crusades, by bringing together soldiers of different nations, tended to produce a certain assimilation in their heraldries, but their influence upon the arms themselves has been exaggerated. The stories as to bearings adopted to commemorate feats of arms in Palestine are mostly

inventions. The cross no doubt was a crusading bearing, but it was so because it was the emblem of Christianity, and primarily popular as such. The stars, torteaux, water budgets, and other charges attributed to the crusaders, were of earlier date and of independent origin. There is no evidence that the crosses patée of the Berkeleys, or the crosslets of Beauchamp, Clinton, Windsor, and Howard, were added to their simpler bearings in token of services in the Holy Land. The star of De Vere, always attributed to an adventure there, was evidently a mark of cadency, adopted by Robert de Vere, brother of Alberic, 2d earl of Oxford. The fact appears to be tliat most of the additions to or alterations in the earlier coats of arms were made for some genealogical reason, to commemorate a match with some great family or to distinguish between the several branches from the parent tree. After, usually long after, the period of the crusades, arms were invented for " fabled knights in battles feigned," and but few of the Saracens' heads which figure so formidably in many coats of arms are contemporary with any Saracenic war.

The diversion of the tournament did even more than actual war to promote the glories of heraldry. On these occasions the presence of spectators, and especially of ladies, encouraged all sorts of heraldic display. At a tournament at Calais in 1381 Richard Beauchamp, earl of Warwick, one of the most accomplished knights of the reigns of Richard 1I., Henry [V,, and Henry V., suspended on three shields three several coats of arms, as representing three several knights who professed to be ready successively to meet all comers, Three French knights appeared to the challenge. Against the first the earl came forth as the green knight with a black quarter, bearing "silver, a maunch gules," the arms of De Tony, a maternal ancestor, and so overcame his adversary and retired unknown to his pavilion. On the second day he appeared as the green knight, and bearing "silver, two bars gules," the arms of Mauduit of Hanslape, another ancestor, he met a second knight with equal success. On the third day he appeared in his proper person bearing the arms of Guy of Warwick and Beauchamp on his shield, and those of De Tony and Mauduit on his caparisons, and thus with great honour won the third day also.

The shield, as the most obvious piece of the defensive armour, wag that upon which arms were first displayed. The Norman shield was of wood covered with hide, and clamped and stiffened in a fashion which is thought to have given rise to the first simple bearings. It was 3 to 4 feet long, pointed below, and 18 inches broad. This shield is common on early monumental effigies armed in chain mail, and it is unusual to find it with armorial bearings. It was succeeded by the small triangular heater shield, and that, in the reign of Edward III., by a somewhat larger and full bottomed shield, which by degrees ceased to be used in war, and became more and more an architectural ornament. The arms were also displayed upon the breast-plate, and upon the camise or surcoat that covered the armour, and were repeated upon the bousings of horses both before and behind the saddle, When the Comte d'Artois fell at Damietta, the Saracens showed in triumph his " cotte d'armes toute dorée et fleur-de-lisée." The emperor Henry of Luxembourg is described in the Chromecle of Flanders as bearing "an aigle noir, sur un tornicle d'or qui pendoit jusq'? a mi-jambe." Sir Alexander Nevile appeared at Halidon Hill in a surcoat of his own arms, the quarters filled up with the arms of his friends. The fine effigy of William de Valence at Westminster is decorated with small escutcheons of

his arms on various parts of his dress and weapons. An actual remnant of the richly embroidered sureoat of William de Fortibus, earl of Albermarle (died 1261), is still preserved, and has been engraved in the

Archeologia, It was against the embroidery of the surcoat that the severe sumptuary enactments of Richard and Philip Augustus were mainly directed.

The importance attached to armorial bearings is strongly shown in the uses to which they were applied. A sovereign who wished to assert his claim to a kingdom placed its arms upon his shield. In 1479 when Alphonso of Portugal resigned his claim to Castile, he was required to lay aside its armorial ensigns. It appears that when Edward III. assumed the French lilies, he at first did so simply as re- presenting his mother, who was an heiress, and placed her arms in his second quarter ; when, however, he claimed the kingdom of France in her right, he removed the lilies to the first quarter as representing the more important king- dom. A grant of arms at the hand of a sovereign had great value. Among the more solid bribes which Louis XI. bestowed upon the courtiers of Edward LV. occurs a grant of three fleurs-de-lys to a knight of the Croker family. Thus also when Juan de Orbieta captured Francis I. on the Ticino, he was rewarded by a grant of arms from Charles V., though of so complex a character as to do little credit to 'Spanish heraldry. In later times John Gibbon, the heraldic author, having a quarrel with two maiden ladies of his name, obtained a licence to convert the scallops in their common coat into the black balls called ogresses,—a most heraldic revenge.

Armorial bearings were largely painted, enamelled, and embroidered upou personal ornaments, furniture, and weapons. The sword of Edward, prince of Wales (died 1483), is a curious example of this ; it bears on its pommel the words "aves fortes " and five shields :—(1) England, (2) the duchy of Cornwall, (3) England and France with a label, (4) Mortimer quartering Ulster, (5) the earldom of Chester. In the middle is the cross of St George. The citizens of London were bound to provide their banner bearer, Lord Fitz Walter, with 'a saddle with his arms," and the seal of one of that family, about 1300, shows the arms upon the back or rest of his war saddle. The

seal of Sir Hugh le Despenser (1292) also so shows his arms. Various bequests of plate and furniture with arms occur in the 14th century. In 1368 William, Lord Ferrars of Groby, bequeathed his green bed " with his arins thereon, and his furniture bearing the arms of Ferrars and Ufford, impaled." In 1380 Edward Mortimer devised 'a notre tres chier fitiere John Gilbert, evesque de Hereford, une plate de argent pour espices et enamillés ove les armes de Mortimer en la face."

Richard, earl of Arundel, in 1392, bequeathed a canopy of the arms of Arundel and Warren quarterly. In 1399 Eleanor Bohun, duchess of Gloucester, had a psalter with her father's arms upon the clasps, In the Decorated and Per- pendicular styles of architecture shields of arms are common ornaments. Those of benefactors were set up in church windows in glass, and those of a family in their houses. In the Scrope roll is a list of sixty-six churches in which the Scrope arms were set up, and the histories of Dugdale and Burton show us that nearly every church in Warwick- shire and Leicestershire had a multitude of arms on its windows. 'Those still remaining in the east windows of Bristol cathedral are early and good examples of the arms of great barons, Berkeley, Clare, and Warren. They are also seen upon floor tiles of the same period.

As arms became hereditary, and their use ceased to be confined to the battle-field, but was largely extended to seals and ornaments, it was natural that some notice should be taken of the arms of females, and that the wife's coat should be combined in some way with that of the husband, especially when she was the last of, and represented, her family. This seems first to have been managed by giving the wife a separate shield. 'The kings of France so bore

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the arms of Navarre after the marriage with the heiress of that kingdom. Another very early plan was to form a composite coat. Thus the old coat of Willoughby was fretty, but on their marriage with Bec of Eresby they adopted the coat of Bec, and Sir John Willoughby (13th Edward III.) bears the cross moline of Bec, but the wings of his crest are fretty for Willoughby,

and on either side is a buckle taken from the arms of Roscelin, his wife. Rose of Kilravock bore "or, 3 water budgets sable," but on a marriage with the heiress of Chisholm they added "a boar's head couped gules" from her arms. So also Halyburton of Pitcur, who bore 'or, on a bend azure 3 lozenges of the field," after a marriage with another Chisholm heiress, added to their coat "3 boars' heads erased sable." Bohun, who bore "azure, a bend argent, cotised or, between 6 lion- cels rampant of the third," is thought to have added the bend on the occasion of a marriage with Maud, daughter and heir of Milo, earl of Hereford. As this, however, led to complexity and indistinctness in the bearings, and the introduction of a second shield was obviously inconvenient, the method of impalement was devised, by which the sinister half of the shield was appropriated to the lady's arms, at first under the process known as dimidiation. When, however, the lady was an heiress, a different plan was adopted which ultimately led to quartering or the marshal- ling of many coats in one shield, a practice, when pushed to any extent, quite inconsistent with the original use of coat armour. This also led to a corresponding alteration in the shape of the shield, which was expanded to contain the arms of each heiress who had married into the family, together with such other heiresses as her family had previ- ously been allied with, so that when a Percy heiress married a Seymour, she added her heiress ancestors' arms with her own arms to those of her husband, expanded in a similar fashion by the previous matches of his family. Thus the great shield of a family became a compendium of the family pedigree which, to those who could read its language, con- veyed a considerable mass of semi-historical information. The defect of this system was that it only took account of heiresses, and did not provide for the purity of the whole descent, so that under it the children of a man of no birth who married a great heiress, would display all her quarter- ings, and no account would be taken of the absence of any on his side ; and further, if it happened, as was actually the case in the last century with the Rodneys of Rodney-stoke, that a family, though ancient, had never intermarried with an heiress, they could display no quarterings.

In France and Germany and to some extent in Scotland a far more perfect system was pursued. There the genea- logical escutcheon included the arms of every ancestor and ancestress, whether an heiress or not; thus one generation gave two coats, two generations four coats, and so on. "Seize

quartiers" gave evidence of pure blood for four generations, and thirty-two quarters, the qualification for a canon of Strasburg, for five.

As the combinations out of which the early coats were formed were limited, it occasionally happened that two persons of the same nation bore the same arms, and this gave rise to disputes which, as matters connected with military discipline, came under the jurisdiction of the earl marshal. One of the earliest of these disputes is mentioned in the roll of Caerlavrock—

' Le beau Bryan de Fitz Aleyne, De courtesie, et de honneur pleyn, Ivi o baniere barrée,*

De or et la gouls bien parée, Dont le chalenge estoit le pointz, Par entre lui et Hue Poyntz,

Ki portoit cel ni plus ni moins, Dont merveille avoit meinte et meins."

Cases of a similar character were decided between

Harding and St Loo in 1312, Warburton and Gorges in 1321, and Sytsylt and Fakcnham in 1333, when Sir William Fakenham disputed the arms, "le champ de dise barretz argent et azure, supportez de cing escocheons sables, chargés ovesque tant de lyons primers rampant incensés gules." They were adjudged by a commission to Sytsylt. Hugh Maltby and Hamon Beckwith had a similar dispute in 1339. But by far the most celebrated dispute of this nature arose in 1384 between Sir Richard Scrope of Bolton aud Sir Robert Grosvenor, for the right to bear the arms "azure, a bend or." The greatest men in the country, including John of Gaunt, gave testimony on one side or the other, and it was shown that each family,had used the coat beyond the memory of man. It was finally adjudged to Scrope, and Grosvenor was directed to bear "les ditz armes ove une pleyne border d'argent." Grosvenor, however, declined to accept the arms so differenced, and assumed "azure, a garb or," retaining his colours and marking his connexion with the old earls of Chester. It was proved, incidentally, that an ancestor of Grosvenor's had granted his coat, with a difference, to William Coton of Coton. It is remarkable that both disputants are still represented in

the male line, and continue the arms as then settled. Both families had previously had disputes with other parties, and the Scropes long afterwards had a quarrel with the Stanleys for the right to bear the arms of the Isle of Man. The matter was compromised by Edward IV. The Hastings and Grey de Ruthyn case, which rises to the rank of a tragedy, illustrates still more forcibly the value attached to a coat of arms. On the death, childless, in 1389, of John de Hastings, earl of Pembroke, a dispute arose for his heirship between Reginald Grey, his heir-general, and Edward Hastings, the heir male and of the name, but of the half- blood. A court military decided in favour of Grey. Pending the trial Hastings had ceased to difference his arms as a cadet, and assumed them unbroken. He was, however, ordered to bear them with a label, and for con- tumacy was imprisoned for sixteen years. A suit for arms was decided as lately as 1720 in Blount versus Blount, in the earl marshal's court. ;

The same necessity tliat made it important to prevent the use of similar bearings by different families in the same country made it also necessary to distinguish between the bearings of different members of the same family, all of whom had a right to the paternal coat. As this right was strongest in the eldest son he alone bore the paternal arms unaltered (in French heraldry "sans brisure"); and the other sons were obliged to introduce some sufficient change, called in heraldry a "difference." This was at first managed by inverting the colours or substituting one ordinary or one inferior charge for another, as a bend for a fess, martlets for mullets, and the like; and sometimes by the use of a coat compounded of the paternal bearing with that of an heiress. A multitude of these early differences occur in the rolls of Henry III. and Edward II., and in various carly lists of arms. The family of Grey, always numerous, differenced their cadets in at least fourteen different ways, almost all preserving in some tangible form the paternal coat ; and this was also the case with the very numerous family of Basset. Generally no rule is followed, save that on the whole some reference is retained either to the charges upon, or the colours of, the paternal coat. Very frequently, even in the earliest times, the eldest son differenced his father's coat by a label. In the roll of Henry III. the label occurs fifteen times, though not always as a difference. Gradually, however, it came to be used almost entirely for that purpose, and finally a set of marks, called of

cadency, were devised for each of the sons, the label being the mark of the eldest during his father's life.

All these rules and alterations were, however, the growth

of a later age, and came into use as the bold and simple heraldry of the 13th and 14th centuries began to be over- laid with florid fancies. So long as heraldry represented a real want, its expressious were simple and intelligible, but as "villainous saltpetre" came into use and closed helmets were laid aside, and as skill and strategy rather than personal valour became the attribute of a leader, armorial bearings fell into disuse in war, and were no longer worn upon the person, or upon the horse trappings. But though armorial bearings ceased to be of actual use, they con- tinued to be emblems of rank and family, and a mark of gentle blood. They became, however, exceedingly and often absurdly complex, partly because simplicity was no Jonger necessary, and partly because it was scarcely practicable, owing to the enormous increase in the number of the gentry, which produced a demand for new combinations.

The glories of heraldry reached their zenitli in the reign of Richard II., with "youth at the prow and pleasure at the helm" of the vessel of the state, but it was not till the reign of Richard III. that it was thought necessary to place under specific control the whole heraldry of the king- dom; and this, in close imitation of the example of France, was done by the incorporation of the heralds into a college placed under the presideucy of the earl marshal.

The office of the herald as the messenger of war or peace between sovereigns or between contending armies in the field is of far earlier date than the introduction of armorial bearings, but as these caine into use they were gradually placed under his charge, and he took his specific name sometimes from that of the noble or leader who employed him, sometimes from one of his castles or titles of honour, and sometimes from one of his badges or cognizances, which the herald wore embroidered upon his dress and by which he was known. In the pages of Froissart and other chroniclers

frequent mention is made of heralds-at-arms and their attendants the pursuivants, and we read of Somer- set and York, Windsor, Chester, and Lancaster heralds, Clarencieux, Arundel, Fleur-de-Lys, and Leopard ; and of pursuivants, Antelope, Blanch Lion, Falcon, Portcullis, and many more. At an early period the principal heralds, and especially those attached to sovereigns, were called kings-at-arms, and as early as Edward I. an officer, called from his jurisdiction, Norroy, was placed in charge of the heraldries north of the Trent. It is probable that a herald was always attached to each order of chivalry, as Toison d'or to the Fleece, and Garter to the chief English order. Garter, however, was only officially appointed by Henry V., when he seems to have been recognized as the principal king-at- arms—" Principalis rex armorum Anglicanorum." At the institution of the college, or soon afterwards, it was decided that its officers should be Garter, principal king-at-arms ; Norroy and Clarencieux, provincial kings north and south of Trent; six heralds, Windsor, Chester, Lancaster, Richmond, Somerset, and York; and four pursuivants, Rouge Croix, Blue Mantle, Rouge Dragon, and Portcullis ; who constitute the present establishment, though some special officers have since been appointed, as a king-at-arms to the revived order of the Bath, and some others,. not members of the college.

It became the duty of the new incorporation to take note of all existing arms, to allow none without authority, and to collect and combine the rules of blazoning into a system. To effect a supervision of the armorial bearings throughout the kingdom, it was necessary to visit the several counties. Such a commission of visitation seems to have been issued by Henry IV. as early as 1412, but the first regular com- mission acted upon was issued by Henry VIII., 1528-9, and the last early in the reign of James II. The visitations were taken about every thirty years, and for contemporary events are most valuable records. The provincial king, either

personally or by deputy, visited the capital town of each county in his division, and summoned the surrounding gentry to record their pedigrees, and show a title to their armorial bearings. 'The earl marshal's court survived the fall of the house of Stuart, and a few causes relative to a right

to particular arms were decided in the course of the last cen- tury, but its powers fell into disuse, and not long since it was finally abolished, and with it fell any pretence on the part of the college to regulate, by compulsory authority, the heraldry of the kingdom. At present, however, notwith- standing the democratic tendencies of the age, armorial bearings are in greater demand than ever in England, and more or less coveted in the United States, and a good deal of the proper business of heraldry is still transacted within the college of arms, and a good deal more, irregu- larly and improperly, outside it. A considerable number of persons still bear arms derived from an ancestor who bore them before the institution of the college; others bear them under grants and patents from that body ; and others still more numerous, who or whose fathers have risen from obscurity, have assumed arms according to their fancy, or under the uninstructed advice of some silversmith or finder of arms. The Smiths, said a distinguished member of the family, had no arms; they sealed their letters with their thumbs. It is to avoid so inconvenient a signet that the new men have recourse to the demi-lions and demi-griffins now so much in vogue, and possibly because they are not aware that Garter and his colleagues are still willing to grant arms, crest, and motto, on terms within reach of almost every aspirant to chivalry.

There is no college or corporation of heralds in Scotland or Ireland ; but in Scotland heraldry has been to the full as much considered, and at least as well regulated as in England. Lyon-king at-arms," 'Lyon rex armorum," or "Leo fecialis," called from the lion on the royal shield, is the head of the office of arms in Scotland. When first the dignity was constituted is not known, but Lyon was a prominent figure in the coronation of Robert II. in 1371. The office was at first, as in England, attached to the earl marshal, but it has long been conferred by patent under the great seal, and is held direct from the crown. Lyon is also king-at-arms for the national order of the Thistle. He is styled "Lord Lyon," and the office has always been held by men of family, and frequently by a peer. His powers have been declared by statute, and extend to fine and imprisonment. He is supreme in all matters of heraldry in Scotland. Besides the "Lyon depute," there are tlie Scottish heralds, Islay, Rothesay, Marchmount, Albany, Ross, and Snowdown, with precedence according to date of appointment; and six

pursuivants, Kintyre, Dingwall, Carrick, Bute, Ormond, and Unicorn. Heralds and pur- suivants are appointed by Lyon.

In Ireland also there is but one king-at-arms, Ulster. The office was instituted by Edward VI. in 1553. The patent is given by Rymer, and refers to certain emoluments as "praedicto officio… . ab antiquo spectantibus." he allusion is to an Ireland king-at-arms mentioned in the reign of Richard IT. and superseded by Ulster. Ulster holds office by patent, during pleasure ; under him are two heralds, Cork and Dublin ; and four pursuivants, Athlone, and St Patrick Nos. 1,2,and 3. Ulster is king-at-arms to the order of St Patrick. He held visitations in parts of Ireland from 1568 to 1620, and these and other records, including all grants of arms from the institution of the office, are kept in the Birmingham Tower, Dublin, under the charge of the present most courteous and learned Ulster, Sir B. Burke. The precedence of the three chiefs has been the subject of dispute, but is now generally arranged, Garter being followed by Lyon, and he by Ulster.

Heraldry should be studied with reference to the period

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in which it was a useful art, and in the simple examples of the 14th and 15th centuries. Before that period it was in a changing and elementary state ; after it, it became merely ornamental, and its examples are complicated and debased. In a general treatise on the subject notice must of course be taken of the later as well as the earlier conditions of the art, but the greater number of the illustrations in the follow- ing pages are taken from the earlier and best examples.

A curious evidence of the vitality of heraldry, and of the desire of all mankind for ancestral distinctions, is afforded by its extension among the republics of the New World. The United States boast some excellent genealogical societies, and a great and very general desire is shown by individuals to trace their pedigrees to the stocks of the Old World, and to assume the arms proper to their name. The national emblem of the stars and stripes, now so widely and honourably known throughout the world,

has been traced back to the paternal coat of the first and greatest president, George Washington, whose English ancestors bore "argent, 2 bars gules, in chief 3 mullets of the second." In Canada, Australia, and other English colonies, the assumption of arms by individuals aud by the community is not less general; and the re- publics of South America, of Spanish origin, almost all have adopted coats of arms. The Peak of Teneriffe, the Beaver, the Red Indian, contribute to the list of charges, and the clear firmament of Chili is indicated by a star. "Coupé d'azur sur gules, & une étoile d'argent en abime."

Divisions oF ARMS.

Armorial bearings may be conveniently divided into those of dominion, of a community, of office, of concession, family or paternal arms, and arms of alliance. To these may perhaps be added arms of attribution. There is also another division, or rather peculiarity, called canting arms, of which many of the former divisions present examples.

1. Arms of Dominion are those of a kingdom or a feudal lordship. The origin of such arms is often obseure. Those of the Isle of Man are three legs conjoined in triangle at the thigh (fig. 116), probably borrowed from the emblem of Sicily, the ancient Trinacria, found upon Greek vases. The Irish harp is an emblem probably allusive to the instrument of Brian Boroimhe. The origin of the lion of Scotland is also obscure, and of the tressure equally so, though fabled to be

'¢ First by Achaius borne."

Not unfrequently the arms of kingdoms were those of an early sovereign, adopted by succeeding dynasties to the exclusion of their own coat. The lions of England were certainly personal to the Plantagenet kings, if not to Henry L; but they have become national to the exclusion of the arms of the Tudor, Stuart, Brunswick, and Saxon dynasties, just as neither the arms of Baliol, Bruce, nor Stuart ever became the arms of Scotland. The lion rampant azure, crowned gules, so long borne by the head of the German empire, belonged originally to the house of Hapsburg, and was not used by such of the early emperors as were not members of it; and the bend and alerions of Lorraine only became a part of the arms of the empire after the

marriage of Francis of Lorraine with Maria Theresa. It seems indeed to have been the custom of elected sovereigns, as those of the empire and of Poland, to place their paternal arms on a shield of pretence over those of the dominion. Cromwell so placed his arms over those of the commonwealth, and William of Nassau over those of England, but they dis-appeared with the individual who introduced them. On the other hand the arms of kingdoms and lordships are sometimes continued to be used as personal arms by the descendants of their former lords. The great shield of Mary of Burgundy quarters the arms of a number of

duchies and provinces. Simon de Montfort thus used the arms of the Honour of Hinkley. Richard de Monthermer (who married the countess of Gloucester, and was, by courtesy, earl of that name) at Caerlavrock, while he bore on his shield his own arms, "or, an eagle displayed vert," on his banner displayed "or, three chevrons gules" for the earldom. So also Humphrey, duke of Gloucester, (died 1446), used on one of his seals the three fusils of Montacute, because he held lands which belonged to that barony. The Book of St Albans says that, if the king grant a lordship to a yeoman entitling him to bear arms, he may take those of that lordship.

Under this head may be described the armorial shield of Great Britain (fig. 1), The arms, gules 3 lions passant in pale or, are for England, and are so borne by the kings of England till the reign of Edward III., who in 1340 quartered with them, in the first quarter, the arms of France, azure, semée of fleurs-de-lys or. Thus they con- tinued till the latter part of the reign of Henry IV., when the fleurs-de-lys were reduced to three. No alteration occurred in the royal achievement during any of the succeeding reigns till the accession of James VI. of Scot- land to the throne of England, when that sovereign intro- duced the royal arms of Scotland into the second quarter, and the arms of Ireland into the third quarter. The royal arms were thus borne by all the monarchs of the house of Stewart till the reign of Anne, though William III. bore over the quarterings of the royal arms those of his Dutch dominions—the house of Nassau. In the

Fic. 1.—Arms of Great Britain.

reign of Anne a change again took place, occasioned by the union of England and Scotland; and the arms of these kingdoms wefe impaled in the first and fourth quarters (England on the dexter, Scotland on the sinister) ; France was removed to the second; and Ireland retained its former position. On the accession of the house of Bruns- wick in 1714, the fourth quarter in the royal shield gave place to the arms of his Majesty's German dominions, an arrangement which continued till lst January 1801, when, upon the Union of Great Britain and Ireland, the arms of France were excluded, England occupied the first and fourth quarters, Scotland the second quarter, and Ireland its old position in the third quarter; while over all, on an escutcheon of pretence, were placed the arms of Hanover, ensigned with the electoral bonnet, in 1816 exchanged for the Hanoverian crown. On the death of William IV. Hanover passed away, and its arms were withdrawn, and the present arrangement introduced. In Scotland, and in

dukes of Athole quarter Man.

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Scotch official documents, the Scottish coat is placed in the first quarter. It bears " or, a lion rampant, within a double tressure flory-counterflory, gules." There is no positive authority for any early coat of arms being used for Ireland, though the bearing "azure, 3 crowns in pale or" granted by Richard III. to De Vere has been so regarded. From the reign of Henry VII, "azure, a harp or, strings argent," has been regarded as the Irish coat, and as such is inserted into the imperial shield. There is no authority of any standing for a coat of arms for the whole of the principality of Wales, but the coat usually attributed to it is "quarterly azure and gules, 4 lions passant gardant, counterchanged." The ancient princes of Wales would scarcely have adopted the lions of England. Moreover, this coat was never used by any leading chief in either middle or south Wales.

In Scotland arms territorial are much recognized. The The garbs are quartered by the Erskines for the earldom of Bute. When Archibald Douglas was created duke of Touraine, he placed the arms of that duchy, three fleurs-de-lys, on his first quarter, before those of Douglas, Annandale, and

Galloway. The dukes of Richmond bear three buckles for the dukedom of Aubigny. "Paly of 6 argent and sable" are the reputed arms of the earldom of Athole, and "a saltire between 4 roses " those of that of Lennox.

To this head belong arms of pretension, where a sovereign claims de jure a possession which he no longer holds, and sometimes never held, de facto, Thus the kings of England from Edward III. to George IIT. bore the French lilies, and claimed to be kings of France, and the kings of Sardinia and Naples used the arms of Cyprus and Jerusalem. In fact, nearly all the older sovereigns of Europe used arms of this character. The armorial shield of the house of Austria at the dissolution of the empire affords a number of curious examples of arms of pretension. Besides Hungary, Bohemia, Dalmatia, and Slavonia, it contained Aragon and Sicily, Brabant, Swabia, Antwerp, Flanders, Burgundy, Naples, Jerusalem, Lombardy, and Milan,

2. Arms of Communities are borne by corporations, religious houses, colleges, cities and boroughs, the cinque ports, guilds, and inns of court, some of which were allowed arms from an early period. These are very generally adopted in honour of some founder, great benefactor, or early and distinguished member of the body. Thus Birmingham bears the arms of the barons of that name, Manchester of the Byrons, Leicester of the Bellomonts, Cardiff of the De Clares, Of religious houses Atherstone bore the arms of Basset ; Garendon of the earls of Leicester ; Kirby-Bellers of Bellers. Of colleges, Balliol, All Souls, and Pembroke at Oxford, and Clare at Cambridge, so com- memorate Balliol, Chichele, Valence, and De Clare. The Cinque Ports all bear a part of the arms of England. The arms of the guilds and city companies usually contain some allusion to their trade; those of the grocers are 9 cloves ; of the fishmongers, 3 dolphins ; of the blacksmiths, 3 hammers. Of the inns of court, the Inner and Middle Temples bear badges of that order; Lincoln's Inn uses the purple lion of the De Lacys, earls of Lincoln; Furnival's Inn the bend and martlets of the Barons Furnival. A bishop, as a corporation sole, represents his see and bears its arms. 'These usually contain some ecclesiastical emblem, keys, crosses, mitres, martyrs' crowns, or the like. Here- ford bears the arms of Cantilupe, possibly from its can- onized bishop of that family. The arms of Liclifield and Coventry are founded upon those of Jerusalem; London, Winchester, and Bath and Wells assert their temporal power by bearing swords. The

English sees were early provided with arms, but in Scotland they were of very late introduction. Bishops before the 17th century seem

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to have used their personal arms, bishop of Dunkeld,

‘© Who gave fair Scotland Virgil’s page,”

and Alexander Douglas, bishop of Moray in 1606, placed the Douglas arms upon their seals. Sometimes, however, this seems to have been combined with some ecclesiastical emblem, for the archbishops of St Andrews placed the cross of St Andrew on their seals, while below were their paternal arms, and the bishops of Glasgow so bore a figure of St Mungo.

3. Arms of Office are not uncommon.

Thus Gawain Douglas,

office.

electors of Hanover as arch-treasurers. the dukes of Ormond were hereditary butlers of Ireland, and bore three covered cups. The kings-at-arms bear arms of office. gules, ona chief azure a crown or encircled with a garter of

the order buckled and nowed between a lion of England and

a lily of France,” by no means such an example of heraldry as might be expected from the chief herald of England. The knights of St John of Jerusalem augmented their paternal arms with a chief gules, charged with a cross or. Several civic offices in France gave a right to bear arms. Ménage observed of a mayor of Angers who died upon his election, and was buried with his newly acquired arms—

‘¢ 1] étoit de bonne nature, Et ne fut armé qu’en peinture.”

4, Arms of Concession were granted by a sovereign or

some feudal superior, sometimes in memory of some great deed, but more frequently to indicate the connexion between

the lord and his follower, when they are called arms of

patronage. Of the former character was the heart in the arms of Douglas, first used by William I, earl of Douglas, 1356, in memory of James Lord Douglas's mission with Robert Bruce's heart; and to this a crown was added in the time of William IL. earl of Angus, in 1617. Also the families of De]a Warr, Pelham, Vane, and Fane bear arms in allusion to the share of the ancestors of each in the capture of John of France at Poitiers. Sir James Audley, after Poitiers, not only divided the Black Prince's present between his four squires, but allowed them to bear portions of his coat armour, "gules, a fret or," in memory of which the family of Delves still bear "argent, a chevron gules, fretty or, between 3 billets sable" (fig, 82); and that of Dutton, "quarterly, argent and gules, on the 2d and 3d quarters a fret or." It was probably in memory of the same event that John Touchet, Lord Audley, granted to John and Thomas Mackworth, for services performed by their ancestors and themselves to his ancestors and himself, to bear "party dentelle de sable et d' hermines, un chevron de gules fretté d'or,"—arms still used by the Mackworths, with a slight addition, and now blazoned "'per pale indented sable and ermine, on a chevron gules 5 crosses patée or." Among many similar instances may be mentioned Tatton of Cheshire, who bears "quarterly argent and gules," evidently derived from Massy. Harvey of Ickworth bears " oules, on a bend argent 3 trefoils slipped vert," derived from Foliot, who bore "gules, a bend argent." Staunton of Longbridge, who held by the service of repairing a tower of Belvoir Castle, bore "argent, 2 chevrons within a border engrailed sable," derived from Albini of Belvoir, who bore "or, 2 chevrons and a border gules." Lowther and Musgrave derive their annulets from Vipont. Moton of Peckleton, Brailsford, Astley of Hillmorton, Besington, Lore " argent, a cinquefoil azure ;" " or, a cinquefoil sable; " "azure, a cinquefoil ermine ;" and "azure, a cinquefoil or,"

The electors and chief officers of the empire each bore some token of their Tbe crossed swords so well known on Dresden china were borne by the electors of Saxony; the sceptre by those of Brandenburg; the crown of Charlemagne by the The ancestors of

Garter, the principal king, bears "argent, a cross

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all derived from the bearings of the Bellomonts, "gules, a cinquefoil ermine." Hardress, who held under De Clare at Tonbridge, bore " gules, a lion rampant debruised by a chevron or ;" and the lords of Avan, Welsh barons under De Clare, bore the three chevrons. Thus also Flamville and Wharton used the maunch of Hastings. " Ermine and checquy," from the Newburgh earls, were common in Warwickshire, and the 'canton in Westmoreland, derived from the Lancasters, barons of Kendal. In Douglasdale the "stars" of Douglas preponderate, and in Annandale the "saltire" of Johnstone.

Arms also passed from one friend to another by deed or will, even when there was no blood relationship. Henry de Lacy, the last earl of Lincoln, bequeathed to his friend and executor Sir H. Scrope a lion passant purpure, in aug- mentation of his coat, and Sir Henry wore it accordingly, though for life only. Maud Lucy, heiress of her brother Anthony Lord Lucy of Cockermouth, married Henry Percy, earl of Northumberland, 1414. She died childless, but bequeathed her lands to the Percys on condition they bore her arms, " gules 3 luces," quarterly with Percy, which they continued to do, and indeed, though without any right, often styled themselves Barons Lucy. To this class also belong arms of augmentation, sometimes called additions of honour. Thus Richard II. chose to impale with his own the imputed arms of the Confessor, " gules, a cross patonce between 5 martlets or," and he granted to Thomas Holland, duke of Surrey, to impale them within a border argent with his own arms. Thomas Mowbray, duke of Norfolk, was also allowed to impale the entire arms of the Confessor, a fatal gift, as it was one of the charges brought against his ambitious descendant Henry Howard. Richard also allowed De Vere, duke of Ireland, to bear for life "azure, 3 golden crowns within a bordure," which seems then to have been regarded as the arms of Ireland. They are found on tiles marshalled

quarterly with De Vere. After the victory of Flodden, Henry VIII. granted to the earl of Surrey to augment his arms with a "demi-lion gules pierced through the mouth with an arrow, within a double tressure flowered of the same," to be placed on the Howard bend. Henry used both the pile and the flaunch in his augmentations to the families of his English wives. Seymour, bore "quarterly, 1 and 4, or, ona pile gules between 6 fleurs-de-lys azure 3 lions of England; 2 and 3, Seymour." The augmenta- tion to Catherine Howard includes 2 flaunches, that to Catherine Parr a pale. Manners of Belvoir bore "or, 2 bars argent, a chief quarterly azure and gules, in the Ist and 4th quarter 2 fleurs-de-lys, in the 2d and 3d a lion of England, or." The bars were no doubt taken from the Muschamps. The chief and its contents were an augmenta- tion from Henry VIII.

In Scotland an early Lord Seton had a concession from Robert Bruce of a sword supporting a crown, and his descendant in 1601 received as an augmentation "azure, a blazing star of 8 points within a double tressure or."

Most of the earlier grants or concessions seem intended to commemorate some territorial or genealogical concession, those of later date some connexion with royalty, or some deed of arms in the field. Thus Sir Cloudesly Shovel received 2 fleurs-de-lys in chief and a crescent in base in memory of two victories over the French and one over the Turks, and Nelson and other naval commanders received additions rather to be described as sea pieces than as heraldic augmentations.

5, Family and Paternal Arms and arms of succession are such as descend by custom to the male heir. The descendants of females, heiresses, save by special licence, can only quarter their arms.. This rule has indeed been much abused, and on every side are seen good maternal names and arms adopted to the exclusion of those less dis-

tinguished on the paternal side. Paternal arms are of very various dates and origin. There seem, however, always to have existed certain recognized rules which the earl marshal had power toenforce. One of the most important of these was that no two persons in the same kingdom should

bear the same arms, a practice clearly subversive of the main use of such insignia, Many were the disputes and challenges that arose out of this regulation, of which two of the most remarkable have already been, mentioned.

6. Arms of Alliance or heirship were used when those of a great heiress were allowed to supersede the paternal coat. Thus the heiress of Mandeville, earl of Essex, married Say, and their heiress, Beatrice de Say, married Geoffrey Fitz Piers. Geoffrey (died 14 John) became earl of Essex, and their descendants took the name and bore the arms of Mandeville exclusively. William II., earl Warren (died 1148), left a daughter and heiress Isabel, who married Hamelin, natural son of Geoffrey of Anjou and brother to Henry II. He became earl of Surrey, and bore the name and arms and continued the line of Warren. The De la Bisse family, who claimed to descend from the male stock of the De Clares, bore the 3 chevrons differenced with a label of 3 points, though when, in the reign of Richard IL., they intermarried with the Staffords, they laid this aside, and adopted "a chevron between three roses." When Gilbert Talbot (died 1274) married Gwenllian, or Gwendo- line, the heiress of the Welsh prince Rhys ap Griffith, he laid aside his paternal coat, " bendy of 10 pieces, argent and gules," and adopted that of the lady, '" gules, a lion rampant or, within a border engrailed of the field," as still used by the earls of Shrewsbury.

7. Arms of Attribution are altogether fictitious, and such as the heralds of the 15th and 16th centuries indulged in to an absurd extent, providing every hero of antiquity with a coat of arms. The same age that represented the Virgin Mary as versed in the canon law declared that Solomon, as the wisest of men, must have been a good herald, and described the armorial bearings of Achilles and Hector. Perhaps the most extravagant example of this fashion is contained in the work of Dame Juliana Berners, who says: "Of the offspring of the gentielman Japhet, comes Habre- lam, Moyses, Aron, and the profetys, and also the kyng of the right lyne of Mary, of whom the gentilman Jhesus was borne, very God and man; after his manhode King of the londe of Jude, and of Jues, gentilman by is modre Mary, prynce of coat armure ;" and again, " The four doctors of holy chirch, Seynt Jeromy, Ambrose, Augustyn, and Gregori, war gentilmen of blode and of cotarmures." At an earlier period, in the reign of Richard II., it was

believed that many of the bearings in use had been borne ever since the Conquest, as appears from the evidence in the Scrope and Grosvenor controversy. Almost all the older genealo- gists attribute coats of arms to ancestors long before they were in uge, On the tomb of Queen Elizabeth are em- blazoned the arms of William the Conqueror and Matilda of Flanders, and of Henry I. and Matilda of Scotland, all of course pure inventions. It is only of very late years, since a critical spirit has found its way even into heraldry, that these absurdities have been exposed.

8. Canting Arms, the "armes parlantes" of French heraldry, are common to all the preceding classes of arms, and most common in those of the earliest date. Such were the castle and lion for Castile and Leon, the fers de cheval of Ferrers, the lion (léwe) of Louvaine, the luces of Lucy, the sharp-pointed row of fusils of Montacute, the corbeau or raven of Corbet, the herons of Heron, the falcon of Falconer, the greyhounds (levriers) of Mauleverer, the barnacles of Bernak; the castle of Chastil, the swine's head of Swinbourne, the penfeathers of Coupenne, the hirondelles of Arundel, the storm-finches of Tempest, the hammers of

Hamerton, the tyrwhits of Tyrwhitt, the hanks of cotton of Cotton, the fusils of Trefusis, the oxen of Oxenden, the fer de moline of Molyneux, the hazel leaves of Hazlerigge, the Danish axes of Hakluyt, the bozons or bird bolts of Bol- tesham and Bozon, the bend wavy of Wallop, or Well-hope, the whelk-shell of Shelley, and many more, mostly early coats, and borne by considerable persons and families. In fact the practice was introduced whenever the name ad- mitted of it, and sometimes when the allusion is very far- fetched indeed, as in the boar pig "verres," the crest of De Vere, and the cock for Law, alluding to his cry, cock-a-leary- law ! Canting arms were equally common in other countries. In Italy the Colonne, Frangipani, and Ursini families bore a column, a piece of broken bread, and a bear. They were also common in France, Spain, and Germany.

TINCTURES. Tinctures (in French, émawa) include metals, colours, and

furs, The Metals are— Or Yellow Topaz Sol. Argen White Pearl Luna, The Colours— Azure Blue, azur Sapphire Jupiter. Gules Red, gueules Ruby Mars. Purpure Purple, pourpre Amethyst Mereury, Sable Black, sable Diamond Saturn. Vert Green, sinople Emerald Venus. The Furs—

Ermine, Vair, Ermines or Counter-ermine. Erminois, Erminites, Pean, Vair-en-point, Counter-vair, Potent- counter-potent,

Gules is thought to come from the Persian gul, "a rose," but more probably from gula, 'the throat." The other terms are French. To the older colours have been added "sanguine " and " tenné" or tawny, a compound of red and yellow. They are almost unknown in English heraldry, and are symbolized, the one by sardonyx and dragon's tail, and the other by jacinth and dragon's head. The blazoning by precious stones and planets, and even by the virtues, was a foolish fancy of the heraldic writers of the 16th century, and applied to the arms of peers and princes. Gwillim condescends to use it.

A shield is rarely of one tincture only. In the roll of Caerlavrock, however, Sir Eurmenious de la Brette

' La baniére eut toute rougeate."*

The original bearing of the Gournays of Norfolk seems to have been sable. De Barge of Lorraine bore " azure." The Captal de Buch, who figures in Froissart as a Guyenne knight, bore "or," and Boguet, a Norman knight, bore "argent."

The furs (fig. 2) are all supposed to be formed of the skins of small animals fastened together. Ermine and vair were long the only furs acknowledged, and even now the rest are not com- mon. Ermine (a) repre- sents the skin of the animal of that name, and is white mE powdered with black spots.

In vair (0) the skins in shape resemble small es- cutcheons, the wings representing the forelegs and the point the tail. The fur is that of a sort of squirrel, bluish-grey on the back and white on the belly, and thence called "

varus." The skins are arranged alternately argent and azure; and if of other colours they must be specified. There are varieties of vairs, as vair-en-

Fic. 2.—Furs.

point, where the point of one escutcheon is placed opposite to the base of that below ; counter-vair (2), where those of the same colour are placed base to base and point to point. At first the vair was drawn bell shaped (e).

In ermines © the field is sable and the spots white, in erminois (d) the field or and the spots sable ; pean (/) is the reverse, having golden spots on a black field. Erminites resembles ermine, save that the two lateral hairs of each spot arered. This fur, however, is seldom if ever used in English heraldry. Guillim in blazoning a fur prefixed the word ' purfled."

*Potent (2) is a variety of vair, and often blazoned as *' vair-potent." There is also a form of it called " potent- counter-potent" (gy). Manchester, of the county of Stafford, bore " potent-counter-potent, argent and sable, a bend gules." The escutcheons or skins are T-shaped, and re- semble a " potence," that is, a gallows or a crutch head.*

Ermine and vair are used almost to the exclusion of all other furs. Even erminois is very rare.

The dukes of Britanny, earls of Richmond, bore " ermine" (this was the coat of John de Montfort, duke of Britanny, whose widow married Henry IV.); Lattin, ' per pale argent and sable, a saltire engrailed ermines and ermine ;" Beauchamp (old), "vair, a label gules ;" Gresley of Drakelow, " vair, ermine and gules ;" Calvert, "paly of 6 erminois and pean, a bend engrailed counterchanged."

Of the colours, gules, azure, and sable are by far the most common in early bearings. They contrasted strongly with each other and with the metals, To preserve this contrast, arose the very early and general rule not to place metal upon metal, or colour upon colour. Scott takes the licence of a poet to break this rule in Marmion, whose falcon

‘ Soar’d sable on an azure field,”*

and in Jvanhoe, where the black knight bears “a fetter lock and shakle bolt azure, on a field sable.” He pleasantly defended himself by quoting the arms of the kingdom of Jerusalem, “argent, a cross potent between four crosses, all or,” which thus violates this fundamental canon. The French call such coats “ armés 4 engueris.” There are a few other less illustrious but early instances.

Venour, warden of the Fleet, 1480, bore gules on a fess sable, five

escallops or, 2, 2, 1. Leycester of De Tabley: azure, a fess gules between three fleurs-de-

8 or, Sir Richard de Rokesle, temp. Edward IL: “ d’azure, a six lioncels d’argent, a une fesse de gules,”

When an object is given of its natural colour it is blazoned as “proper.” Thus in the insignia of the order of St George and St Michael we have “the archangel encounter- ing Satan, all proper ; ” though the German family of Teufel displays a teufel or devil gules. A very striking contrast of colour is produced by a process called “counterchanging,” where a shield is divided between two colours, and a charge placed over the dividing line is also divided between the same colours transposed.

Chetwode of Chetwode: quarterly, argent and gules, four crosses patée counterchanged.

- *Peyto of Chesterton: barry of six party per pale dancette, argent and gules counterchanged,*

A very convenient practice of representing the tinctures by certain marks and lines arose in the 16th century, and is attributed to Padre Silvestre de Petro Sancto, an Italian. It was devised to allow of the representation of armorial bearings in drawings or engravings where it was incon- venient to colour them, Planché’states the earliest known instance of the use of this method in England to be in an engraving of the seals of the regicides attached to the death warrant of Charles I. Sir E. Bysshe in Upton, 1654,

gives a representation of these marks, Or (fig. 3) is re- presented by hatched points ; silver is plain ; azure is repre- sented by horizontal lines, gules by vertical lines; those for purpure are drawn diagonally from sinister to dexter,

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and those for vert from dexter to sinister. For sable, the lines are vertical and horizontal; for sanguine, diagonal,

Fic. 3.—Representation of Tinctures. a, or; b, argent; ¢, azure; d, gules: é, purpure; f, sable; g, vert; h, sanguine; ¢, tenné, or in saltire, from right to left and left to right, a compound of purpure and vert; and for tenné, diagonal from sinister to dexter, and horizontal, a compound of purpure and azure.

Parts or ARMs.

These are (1) the escutcheon; (2) the ordinaries; (3) partition lines; (4) charges,

The Escutcheon.

The Zscutcheon, écu, or shield, called in blazon the field, upon which all lines are drawn and charges delineated, represents the shield borne in war upon which the arms of the knight were displayed. The figure of the shield varied in heraldry as in war. First came the long-pointed, kite- shaped shield or " pavesse," slightly convex, and used with chain armour. As late as the reign of Richard I. and John such may beseenon ___ ie early effigies, com- }AVN monly but by no means always with- | out armorial bear- ings, which were not then generally in use (fig. 4). Varie- ties of this are the heart-shaped or pear shaped shields (fig. 5), and sometimes a shield representing scab a third part of a cylinder with square top and bottom, much used in siege operations. Early in the 13th cen- tury was introduced the small heater-shaped shield, also triangular but narrow, short, and somewhat lancet-shaped. This was in use in the reign of Henry III., and in

the Early English period of architecture (fig. 6). The three water budgets of Ros appear on a shield of similar form of the date of Edward I. in the Temple Church (fig. 7), As coats

fs

Fic. 5.—From the Bayeux tapestry.

Fig. 6. Fig. 7.

Fig. 8. of arms were tlien simple, this shield was large enough to contain them without crowding, and therefore with suffi-

cient distinctness. When drawn or carved in architec- ture it is suspended by its " guiges" or shield straps, either upright or by the upper sinister angle, when it is said to be "couché." Fig. 8 is from the great seal of Thomas de Beauchamp, earl of Warwick, and shows the form of shield in use during most of the Edwardian period.

As fluted and fancy plate armour came into fashion, the shield also altered its figure and became four-sided, and concave in the top and side edges, with a central point below ; a notch also was cut in the upper dexter corner to

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allow the lance to reach its rest, which projected from the breastplate, as in the shields upon the tower of the chapel of the Babingtons at Dethick, and on their tombhouse at Kingston (fig. 9). Such shields were called " chancrée," or "4 la bouche." They are fre-

quently carved as an ornament in the Perpendicular style of architecture. As the shield ceased to be used in war, and was only known as a repre- sentation upon tombs or in pedigrees, it was altered to suit the fashionable practice of introducing large numbers of quartered coats, frequently twenty or thirty, and some- Fig. 9.

times a hundred, as in an escutcheon of the earls of Hun- tingdon in Burnham church.

In the construction of the shield, while actually used in war, great strength had to be combined with as much light- ness as possible, and this was attained by the use of cuir- bouilli and plates of horn stretched upon a wooden frame. The cramps and cross pieces employed to stiffen the whole are sometimes seen upon early shields, and are supposed, with much reason, to have been painted or gilded as ornaments, and to have given rise to the bars or ordinaries which predominate in the first simple coats. Our acquaintance with the forms and fashions of the earlier shields is chiefly derived from their representations on tombs, but the actual shield of John of Gaunt was long preserved in old St Paul's, and that of the Black Prince still hangs above his tomb at Canterbury, as do those of his father and of Henry V. at Westminster. An unmarried woman did not place her arms upon an escutcheon, but, whether maiden or widow, upon a lozenge, an early practice in allusion probably to a fusil or distaff. When married she shared the shield of her husband,! The lozenge is an ancient usage, being found in the seals of English ladies of the middle of the 14th century, and in Scotland a century later. In modern heraldry the shields of knights of an order are usually oval or circular, called "cartouche" shields, and encircled with a ribbon bearing the motto of the order. When married the knight's arms are blazoned alone within the ribbon, and again repre- sented with those of his wife in a second shield encireled with a plain ribbon, and placed on the sinister side of the other, The dexter side of the escutcheon is that on the proper right of the bearer and therefore on the left of the spectator.

To secure due precision in blazoning, nine points, indi- cated by as many names, are taken on the surface of the shield. These (represented by the letters in fig. 10) are —at the top in a horizontal line three, the middle, dexter, and sinister chief ; at the base three, also horizontal, the middle, dexter, and sinister base ; and in the ceptral or vertical axis also three, of which the upper is the honour point, the lower the nombril point, and the middle the fess point —the central point of the shield. The last three are of course in a line with the chief and base middle points.

Before passing to the ordinaries, it will be convenient here to mention a species of decoration applied to the shield, which, though not strictly heraldic, is often used in early heraldry and called "diaper." A shield "diapered," "'bracteatus," is covered with a ground pattern usually in squares or lozenges with a flower or scroll work in each

1 When an eminent geologist and proprietor of a well-known patent . lozenge left his business for the militia, and after a short time returned to civil life, it was said— "So maidens who to Hymen yield Exehange the lozenge for the shield,

But, when they lose the best of men, Return to lozenges again."

ORDINARIES. |

ABC

D

E

F GHI Fig. 10.

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compartment. The idea is said to be copied and named from the linen cloths of Ypres. An often-quoted example of diaper, and a very good one, is the shield of Robert de Vere upon his tomb at Earls Colne (fig. 4). Also the shield of William de Valence upon his effigy in Westminster Abbey is a very fine example of diaper. There the ground is divided into small squares, and each contains a pattern. The row of shields in the tabernacle work of the old chapel of St Stephen's, Westminster, exhibits some fine specimens of diapered work in squares, lozenges, and circles, The shield of Earl Warren at Castle Acre Priory is a good example of diaper, as is the counterseal of Thomas le Despenser affixed to a Kenfig charter in 1397 (fig. 11).

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| i Fig. 11.—Counterseal of Thomas le Despense.,

Ordinaries and Partition Lines.

The Ordinaries, or, as they are called in most heraldic books, “the honourable ordinaries,” have been supposed to represent the clamps or fastenings of the shield, converted into ornaments by painting or gilding. They may be regarded as nine in number—the chief, the pale, the fess, the chevron, the bend, the cross, the saltire, the pile, and the quarter. When charged they are drawn somewhat broader than when blank, and each has one or more diminutives. All were more or less in use in the earliest times of heraldry, and they were then drawn more boldly and narrower than is now the custom. When such of the ordinaries as admit of it are cut short so as not to reach to the margin of the field, they are said to be humettée or coupée.

Partition Lines, closely allied to the ordinaries named from them, are the lines by which shields may be divided, and which vary both in direction and pattern. It will be convenient to notice these before proceeding to a detailed account of the ordinaries, as the partition lines will be constantly referred to in the examples. When the field is – divided in the direction of an ordinary it is said to be “party per” that ordinary, as party per fess or per bend. Party per chief is rare, party per pile or per quarter un- known ; party per cross is called quarterly ; party per cross and per saltire is gyronny. When the partition line is mentioned without qualification, it is a straight line, but it may be broken in a variety of ways, as indented, dancette, engrailed, invected, undy, nebuly, embattled, dove-tailed, andraguly. These partition lines in some cases, if not in all, have arisen from the outline of a charge or bearing. Thus Charnels of Snareston at first bore eleven

lozenges conjoined in cross, which at a later date became a cross engrailed, and fusils in the same way became converted into dancette. In English heraldry the partition lines are per pale, per fess, per chevron, per bend dexter and sinister, quarterly, per saltire, and gyronny.

The annexed shield (fig. 12) represents these partition lines. It may be blazoned—quarterly of nine coats: 1. Butler: or, a chief indented azure; 2. Fleetwood: party per pale nebuly, azure and or, six martlets counter-changed; 8. Vavasour: or, a fess dancette sable; 4. or, a chevron invected azure; 5. Boyle: party per bend em- battled, argent and gules; 6. Trevor: party per bend sinister, ermine and ermines, a lion rampant or; 7. Lawrence: argent, a cross raguly gules; 8. Bottetourt: or, a saltire en-grailed sable; 9. party per fess dovetailed, or and sable. A good example ofa cross raguly, not an armorial bearing, is found upon a 12th century tomb in the church of Llanfihangel-yn-Gwynfa in Powysland.

Fig. 12.

The French use parti and coupé for per pale and per fess ; they do not part per chevron, but per bend and per bend sinister are tranché and taillé; quarterly is écartelé, and per saltire écartelé en sautoir ; gyronny is gironé. Besides these the French have a number of other divisions, as "tierce," when the shield is divided into three parts, as "tierce en pal, tierce en fasce, &c. Tierce en pal is con- venient when the coats of two wives are to be marshalled on the husband's shield.

Formerly such broken lines as were used were not mere margins, but affected the whole ordinary ; a fess indented was a zigzag and called a daunce or dancette. This practice is still preserved with the lineundy. A bend undy or wavy is not a mere bend with a wavy edge, but the whole bend is in waves, whereas a bend nebuly or raguly has merely a particular kind of edge.

Returning to the ordinaries, it may be remarked that very many both of these and of the subordinaries in heraldry are very frequent constituents in mouldings in the Norman style of architecture. The chevron and the billet are amongst the most common. The roundel forms the hood moulding of a door at Peterborough, and is in- serted in a moulding in the intersecting

arches of St Augustin's, Canterbury. The fret, the billet, and the roundel or pellet are largely used in the oldest parts of Malmesbury, and on Lincoln tower is a good example of undy,—and this before the regular employment of heraldic bearings.

WIYY

Fig. 13. Fig. 14. Fig. 15. Fig. 16.

i. The Chief, chef, caput, is the upper part or head of the shield, covering one-third of it, and parted off by a horizontal line. It is found in the earliest examples of arms. In the roll of Henry III. it occurs fourteen times, in that of Edward II. twenty-one times.

De Vivonne: ermine, a chief gules (fig. 13).

Butler (see fig. 12). . i siideiaadill

Aston: argent, a chief undy (fig. 14).

St John of Melchbourne: argent, on achief gules, two mullets pierced or (fig. 15).

Cromwell of Tattershall: party per chief, gules and argent, a bend azure; which

might also be blazoned as gules, a chief argent, and a bend azure (fig. 16).

Heraldic writers give the fillet as a diminutive of the chief. It

was a narrow strip laid upon the chief, a little above its lower

margin. Guillim mentions, but gives no examples of it.

2. The Pale, pal, palus, is a vertical strip set upright in the

HERALDRY

[PARTITION LINES.

middle line of the shield, and one-third of its breadth. One of its earliest examples, if indeed it be not a mere gilt ornament, is ascribed to Graintmaisnel, baron of Hinkley, who is reported to have borne gules, a pale or; but the banner of the barons of Hinkley carried by Simon de Montfort was per pale indented, gules and or. The "sable pale of Mar" is the well-known bearing of Erskine, argent, a pale sable (fig. 17), but when it was introduced into Scotland isnotclear. Intheroll of Henry III. there occurs no pale, but there are three examples of paly. Party per pale is also there found. In the roll of Edward II, there is also no pale, but paly or party per pale occurs thirteen times. The latter is called simply " party — Pluys, " party d'or et goules."

DOGS

Fig. 17. Fig. 18. Fig. 19. Fig. 20.

The diminutives of the pale are the pallet, one-fourth, and the endorse, onc-eighth, of the breadth of the pale, both unknown anciently. The pallet may be used singly, the endorse only in pairs, onc on each side of the pale.

Waldgrave: per pale or and gules.

Marshall, Earl Marshal and of Pembroke: party per pale or and vert, a lion rampant gules.

Fleetwood (see fig. 12).

When the pale is tepeated, it is blazoned as " paly," and the number of pieces specified. Kingdom of Aragon: paly of ten argent and gules (fig. 18). Gurney: or, two pallets azure. Wykes of Dursley: argent, ona pale endorsed sable three greyhounds' heads erascd or, collared gules (fig. 19). Daniel of Cheshire: argent, a pale fusilly sable. Lightford: azure, a pale rayonéc or (fig. 20).

Oo

Fig. 21. Fig. 22. Fig, 23.

3. The Fess, fesse, fascia, is a strip placed horizontally across the middle of the field. It occurs about twenty-five times in the roll of Henry III., and its diminutives about twenty-three times, or forty- eight times in all, against ninety in the roll of Edward I. Hapsburg: gules, a fess argent (fig. 21).

Charlotte, queen of George III., on her shield of Mecklenburg-Strelitz placed a scutcheon of pretence party per fess, gules and or, for Stargard.

Vavasour (see fig. 12).

Henry de Percy, ancient blazon: azure, a fess engrailed or (fig. 22). This is a way of describing what is better known .as azure, five fusils conjoined in fess or.

The seal of Waltcr son of Alan, steward of Scotland, 1190, gives a fess checquy, probably the earliest trace of the Stewart coat.

Weld of Lulworth: azure, a fess nebuly between three crescents ermine (fig. 23).

De le Plaunch: argent, a fess embattled gules.

Paramour: azure, a fess embattled counter-embattled, between three estoiles or.

The Temple banner ‘’ Beauseant”’ was party per fess sable and argent.

Nicholas de Criol: per fess or and gules.

— grt party per fess gules and argent, three cinquefoils counter- change

Pearston: argent, a fess, quarterly, sable and or (fig. 24).

The diminutives of the fess are the bar, covering one-fifth of the field ; the barruleé, one-half, and the closet, one-quarter of the bar. The closet is used in pairs only, usually called gemelles, and these are sometimes quadrupled, two pairs on each side, and sometimes are used without the bend between them. The bar is rarely used singly, the number must be specified if above

four, when the coat is barry" of the given number. The term fessy is not used.

Harcourt of Ankerwyke: gules, two bars or.

Basset of Tehidy: or, three bars wavy gules.

Blount: barry nebuly of eight pieces, or and sable.

Fitz Alan of Bedale: barry of six, argent and azure.

Dabridgecourt: ermine, three bars humetty gules, fesswise in pale.

Badlesmere: argent, a fess gemelled gules (fig. 25). This is from the roll of Caerlavrock, but the more used blazon is—argent, a fess and two bars gemelles gules, which might be givech—a fess closeted.

Falrfax of Denton: argent, three bars gemelles gules, surmounted by a lion rampant sable, crowned or. :

Huntercombe: ermine, two palr of gemelles gulesi

Edmondson and some other writers describe the gemelles as cotises.

4, The Chevron, cheveron, canterius, from whatever source derived, seems to have been named from its resemblance to the main rafters or principals of a roof, a familiar sight in early buildings. It is common to find orders on the royal foresters for so many pairs of chevrons. Mr Planché points out that in the earliest English examples of this ordinary, in the seal of Gilbert, earl of Pembroke, in the reign of Stephen, the upper edge of the shield is pointed like a ridged roof, and the chevrons are parallel to it, and divide the

shield into thirteen spaces, He regards asa part of the structure of the shicld these chevrons, afterwards reduced to three and used as a regular heraldic bearing by the house of Clare. The chevron occurs six times in the roll of Henry ITI., and the chevronel, its diminutive, nine times. The two occur ninety-two times in the roll of Edward II, In breadth it is one-fifth of the

shicld. Its diminutives are the chevroncl or étage, of half, and the couple-close, of a quarter its breadth. The latter is borne in pairs above and below the chevron. When the chevron is peli up to three they may be chevrons or chevronels. If exceeding that number the bearing is chevronny, unless the num- ber be specified. The chevron is still used to denote the rank ot the non-commissioned officers of the British army, but of late years has been borne by them inverted.

Vag

Fig. 24, Fig 25. Fig. 20.

Stafford: or, a ehevron gules (fig. 26).

Marler : argent, a chevron purpure, in dexter eanton an eseallop sable.

Fettiplace : gules, two chevrons argent.

Clare: or, three chevrons gules (fig. 6).

Wyvili of Constable-Burton, derived from Fitz Hugh: gules, three eheyronels brazed vair, and a chief or (fig. 27). [Brazed is interlaced.]

Kniveton: gules, a ehevron party per chevron nebuly, argent and sabie (fig. 28).

Fitz Walter: or, a fess between two chevrons gules (fig. 29).

Hungerford: per pale indented gules and vert, a chevron or (fig. 30).

Hotot: azure, a chevron eouple-closed or, between three crescents argent (fig. 31).

Newport on Usk eommemorates the Staffords, its aneient lords, by bearing a chevron reversed (fig. 32). :

JJS8

Fig. 28. Fig. 29. Fig. 30. Fig. 31.

5. The Bend, bande, balteum, is a strip extended upon the shield from the dexter chief to sinister base, and in breadth one-fifth of the field. The diminutives are the dcndict, half the bend, and the cotise, or cost, a fourth part, borne in pairs, flanking the bend; and the ribbon, one-eighth of the bend. 'The ribbon is used as a difference, and is sometimes couped or cut short, when it becomes a bdton, and is the French barre. The baton often marks illegitimacy. The term bAton, however, is also applied to the ribbon.

VINES,

Fig 82, Fig. 33. Fig. 34.

pane . Pepe azure, a bend or; a very celebrated example of the bend

(fig. 83).

Culpepper: argent, a bend engrailed gules.

Wallop of Farleigh-Wallop: argent, a bend wavy sable (fig. 84).

Forteseue of Castle-Hill: azure, a bend engrailed argent, cotised or.

Clopton: sable, a bend between two eotises daneette or (fig. 35).

Boyle: party per bend embattled,! argent and gules (see fig. 12).

Byron of Rochdale: argent, three bendlets enhanced gules (fig. 36).

Montford: bendy of ten, or and azure.

Chaueer: per pale argent and gules, a bend eounterchanged (fig. 37).

Fitz Herbert of Norbury: argent, a ehief valr, or and gules, over all a bend sable.

Widdrington: querterly, argent and gules, a ribbon sable (fig. 88).

Sir Hugh Baden: palewise or.

—_- Stoughton: sable, a bend ermine between two cotise3, flory counter-*

ory, or.

SYVY

Fig, 85. Fig. 36. Fig. 87 Fig, 88.

The Bend Sinister is a variety of the bend drawn from the sinister chief to the dexter base. Its diminutives are the scrape or scarp, half the breadth, and the ribbon or baton sinister. A bend sinister

ee”

1 This is ealled also erenellated, and in French bretassé, from the bretasche or wooden gallery attached to the battlements of castle walls. When embattled on both faces the piece is sald to be “embattled eounter-embattled.” The notch In a parapet is an embrazure, the intermediate piece of masonry a merlon. When a second and a smaller merlon is plaeed on the first, the battlement is suid to be stopped. ;

ORDINARIES. |

Fig. 27.

| gives 107 of them, and there are many more.

argent, on a bend double cotised sable three eagles displayed |

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is a rare bearing, and, with its diminutives, is frequently uscd

to express illegitimacy, especially the biton, though sometimes as

a difference only.

Richard de Bury, bishop of Durham: party per bend sinister, or and azure, a bend eounterchanged (fig. 39).

Trevor (see fig. 12).

The dukes of Orleans: azure, three fleurs-de-lys or, a baton argent (fig. 40).

6. The Cross, croix, crux, necds no description save that in heraldry it is usually the Greek cross, or that of equal arms. The breadth is one-third of the shield. It is an early and very common bearing, and whatever its originit speedily became identified with the emblem of Christianity, and was popular throughout Christendom—

“ Crux mihi certa salus, crux est quam semper adoro,

Crux domini mecum, crux mihi refugium.

Per erucis hoe signum fugiat proeul omne mallgnum.” When plain it is blazoned only as “a cross.” Thus the cross of St George is “argent, a cross gules,” and the statutes of the Temple direct cach knight to wear a red cross upon his “ cotte d’armes,”’ on breast and back. Asa plain cross it occurs six times in the roll of Henry III., and in its varieties eleven times, and in the roll of Edward II. these numbers have risen frcm 17 to 102, when it was the most popular of the ordinaries.

De Burgh of Ireland: or, a eross gules (fig. 41). Duckenfield of Duckenfield: argent, a cross pointed wavy sable, voided. Ufford: sable, a cross engrailed or (fig. 42).

Fig 40.

Fig. 39. Fig, 42.

A seal of John de Ufford, probably about 1860, bears on a heater shield what would now be described as eight fusils conjoined in cross, and which is an early form of the Ufford coat. There is also a mullet in dexter canton, possibly to mark a younger branch.

Colley: argent, a eross wavy, voided, sable (fig. 43).

Skirlaw, bishop of Durham: argent, six willow wands interlaced in eross sable,

in allusion to his father, who was a basket-maker (fig. 44). Lawrenee (see fig. 12).

Party per cross or quarterly is an early and popular bearing. Say: quarterly, or and gules (fig. 45). Lacy: quarterly, or and gules, a bend sable. Fitz Warin: quarterly, per fess indented, argent and gules, Atkins of Saperton: argent, a eross sable, bordered with hulf fieurs-de-lys, be- tween four mullets, sable. Loraine of Kirkharle: quarterly, sablo and argent, a eross counter-quartered of

the field. Fig 43. Fig. 44. Fig. 45. Fig. 46,

When the central square of the cross is removed, it is said to be quarter-pierced, a cross quarter-pierced,

The varieties of the cross are almost innumcrable. Edmondson Of these it will be sufficient to notice those comparatively few that are older and in general use ; as the cross botonny, the cross crosslet, the cross flory, moline, patée, patonce, potent, recercelée, and voided. None of these varieties extended to the margin of the field. When a plain cross does not so extend it is blazoned as couped or humetty.

The cross botonny, treflée, or modulata has cach limb capped by a trefoil, or sort of button.

Mei ote of Pynes: argent, three erosses botonny sable, palewlse In bend (fig. 46).

The cross crosslet has its extremities crossed.

as a charge in numbers, but not always.

Wasterley: argent, a cross erosslet sable. ; Beauchamp, earl of Warwick: gules, a fess between six eross erosslets or (fig. 8).

When the lower limb is uncrossed and pointed it is "fitchy." Belgrave: argent, a cross patée fitchy sable (fig. 47).

It is usually borne

Fig. 47.

Fig. 48,

The cross patée was the emblem of the Knights of St John, and is known as the " Croix de Malthe." The cross patonce has ex- panded ends like the cross patée, but each terminates in three points. Patée and patonce were not always distinguished. At

Fig. 49.

Caerlavrock Latimer is described as bearing a cross patée, whereas the regular eoat of the family was gules, a cross patonee or. Wm. de Fortibus, before 1241: gules, a cross patonce vair (fig. 48).

The cross flory or fleurettée is capped ina similar way by fleurs-de-

lys. ; 7 Gulag of Lamplugh: argent, a eross flory sable (fig. 49). Riehard Suwart or Siward at Caerlavrock bore sable, a eross flory argent.

The cross moline is so called from the fer de moline, or millrind, the iron clamp of the upper millstone. When the millrind itself is borne it is pierced, but the cross moline is not neeessarily so. Its extremities are split, curved outwards, and cut off square.. It is an early bearing. When pierced this must be specified.

Bee of Eresby: gules, a cross moline argent. Molynenx of Sefton: azure, a eross moline quarter-picreed or (fig. 50).

The eross potent, potence, or cruteh or gibbet headed, has its extremities T-shaped.

An early example is scen in the arms of Jerusalem, argent, a eross potent between four erosslets or (fig. 51). Originally, however, the arms of the cross ended in knobs like the handles of a pilgrim's staff, thence called "bourdonnée."

The eross recercelée has the ends split and curled outwards, but differs from the cross moline in having them pointed. The two bearings were occasionally confounded, and while the Baron Bec bore a cross moline, Bishop Antony Bec, his brother, is described as bearing a eross recercelée.

The cross voided is the outline only, ealled by the Freneh "un croix faux;" the field is seen through it. The cross recercelée is usually also voided.

The lords of Creveeceur bore "d'or, ung faux erois de goules, recercelée" (fig. 52). Basing, temp. Edward III.: azure, a eross recereelée and voided or.

J & IY

Fig. 50. Fig, 51. Fige 52. Fig. 53.

The cross formée is peculiar among these varieties, inasmuch as its extremities reach the edge of the field. In other respects it resembles the cross patée.

Lawley of Spoonhill: argent, a eross formée checquy, or and sable.

Among the other, later, and but little used varieties of the cross may be mentioned the avellane, ending in filbert husks ; the cross anchored, of which the limbs terminate in anehors; the eross of the crucifixion or of Calvary, mounted on steps. A eross with a narrow border of another colour is "fimbriated"; a cross pointed is where the ends are so cut.

7. The Saltire, saltier, or sautoir, is known as the cross of St Andrew, and is a common constituent in Scottish coats of arms. The origin is said to be a sort of stirrup or crossed loop suspended froin the saddle by the aid of which the knight leaped into his seat. Such a stirrup certainly appears on the steed of Patrick, earl of March, on his seal, and on the seal of an early Despenser, and this is the only suggestion that accounts for the name. 'The saltire is in breadth one-third of the ficld.

The Scottish emblem is azure, a saltire argent; that of St Patrick, argent, a saltire gules. Neville bore ~ "A silver saltire upon martial red," that is, gules, a saltire argent (fig. 53). Bottetourt: or, a saltire engrailed sable (fig.

12). Gage: party per saltire, argent and azure, a saltire gules (fig. 54). Glanville of Catehfreneh: azure, three saltires humetty or (fig. 55). Bruce: or, a saltire and ehief gules.

Fig. 54. Fig. 55.

Fig. 56.

Fig. 57.

Common charges placed upon a horizontal or vertical ordinary, as a fess or chief or cross, are placed upright; if on an inclined ordinary, as a bend or saltire, their position should be specified ; if upright, they are palewise; if inelined, bendwise or saltirewise. On the chevron they are upright unless otherwise specified. Dalrymple: or, on a saltire azure nine lozenges of the first (fig. 56).

Here the charges slope with the limbs of the saltire, that in the eentre being upright. The deanery of Hengham, dedicated to St Andrew, bore on its seal asaltireraguly. The saltire has no regular diminutives, but when several are borne they are couped.

8. The Pile, pieu, pila, isa triangular strip, its base one-third of the breadth of the shield, and usually applied to its upper margin, the point coinciding with the lower point of the shield. It has been

+ 4 :

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[ORDINARIES,

derived from the Roman pilum, a military weapon, and from the pile of the engineer. The origin is obscure, but it isa very carly bearing. It has no diminutive.

Sir John Chandos, as Froissart often tells us, bore “d’argent, a ung peel de goules, e un label d’azure ” (fig. 57), and his ancestor Robert, temp. Henry

III., bore or, ona pile gules three estoiles, between six of the same, counterchanged, an unusually complicated bearing for that age.

Waterhouse: or, a pile engrailed sable,

Frequently more piles than one were used, gencrally three, when

they are to be blazoned as meeting in base.

Holles: ermine, three piles sable meeting in base (fig. 58).

Tulse: argent, three piles sable, one issuant from the chief between two from the base.

When the base of the pile is applied to any other part of the shield

than the chief it must be specified. The pile was used by Henry

VIII. as a vehicle for some of his grants of augmentation.

9. The Quarter or frane-quartier eovers the upper dexter' quarter of the shield. If placed in the sinister quarter, this must be specified. Its diminutive isthe canton, of two-thirds its area. Both are early bearings, but in the roll of Henry III. the quarter appears in several coats which in later rolls are blazoned with the eantou. Both are frequently charged. When either occurs in conjunction with another ordinary or subordinary, they are placed above it, and therefore blazoned after it, as further from the dead. Both are used as early differences, as in the families of Zouch and Basset, and both are always borne with straight edges. A canton is also called a corner, and a cross between 4 crosses is said to be cantoned of them. De Clare (old): or, a quarter gules (fig. 59).

Shirley of Eatington: paly of six or and azure, a quarter ermine, Sutton of Norwood: argent, a canton sable.

— lg the martyrologist: gules, a fleur-de-lys or, a canton ermine g- 60).

Fig. 58.

Fig. 59.

Fig. 60.

Subordinate Ordinaries.—These are the border, the inescutcheon, the orle, the tressure, the fret, the gyron, the flasque, the lozenge, the fusil, the mascle, the rustre, the roundel, guttes or drops, the billet, and checquy.

The Border, bordure, fimbria, or limbus, thongh a very old and independent bearing, was frequently used as a difference, and ocea- sionally as a mark of illegitimacy. It is what its name expresses, and its breadth is one-fifth of the field. When used in an impaled coat the border is not continued round the inner side; in faet it is dimidiated. In old examples this was not always attended to. In a quartered coat the border is borne complete.

Sir Perdicas d'Albret, demp. Edward III.,

" Who guly shield about his neck did fling, Wrought with dent bordure, silver shining,"

bore " gules, a border indented argent."

Rondell: ermine, a border eompony, or and sable (fig. 61).

Hamelin, illegitimate brother of Henry II., seems to have borne around his arms, on a border gules, eight lioncels passant or. This was before quartering came into use. The angmentation granted by Henry VIII. to Courtenay, marquis of Exeter, was a border quarterly of England and France, the fleurs-de-lys and lions enurmy, or in orle (fig. 62).

Fig, 61. The Ineseutcheon, or écusson, is a small shield borne within and

Fig. 62. Fig 63.

upon the greater one. voided becomes an orle.

Mortimer: barry of 6 or and azure, an inesentcheon argent, a ehief of the first paly of the second between two gyrons of the same (fig. 63).

Rokeley: ermine, an ineseuteheon azure.

Allestree of Allestree: argent, a chief aznre, on a bend gules three ineseutch-eons party per ehief, vert and argent (fig. 64). .

The arms of Maxwell, Lord Herries and earl of Nithsdale, afford a good example of this subordinary. They are, argent, an eagle displayed sable, beaked and membered gules, surmounted with an ineseuteheon of the first, eharged with a saltire of the second, surcharged with a hedgehog or, for Herries.

It occurs in the earliest coats, and when

The Orle is the edge or hem, ourlet, of the inescutcheon, voided, and is therefore blazoned by the French as a false escutcheon.

SUBORDINARIES. |

John de Baliol: " De goules, ove ung faux eseochon d'argent," that is, " gules, an orle argent" (fig. 65).

Winnington of Stanford: argeut, an ineseutcheon voided, within an orle of martlets sable (fig. 66).

The Tressure isin faet a narrow orle, almost always borne double, and usually flowered. It is a favourite Seottish bearing, and is set with fleurs-de-lys placed alternately, the upper and tlie lower half on each faee of the tressure, when it is blazoned " flory-counter- flory." This, in the Scottish royal arms, is said to denote the early alliance between that country and Franee. The bearing is, or, a lion rampant within a double tressure, flory-eounterflory, gules (fig. 67). The tressure was a common grant of augmentation from the erown for services or in memory of an alliance. Scott of Thirlstane had it from James V. and bore or, a bend azure, eharged with a mullet piereed, between two ereseents of the first, the whole within a double tressure flory-counterflory of the seeond—

" The tressured fleurs-de-lys he claims To wreath his shield."

The Freé was originally borne fretty, representing a trellis. The single fret is very rare in ancient arms, but many of those families who at first bore fretty afterwards bore a fret. Fretty is usually composed of eight pieces, eae ; sable, fretty or, whleh soon became and continued sable, a fret or

g. 68). When nailed at the joints it is said to be elouée. Trussel: gules, a trellis (fretty) clouée or. Ilarrington: sable, a fret argent, called also a Harrington knot (fig. 69). Vernon of Sudbury: argent, a fret sable. a

The Gyron, also an old bearing, is the lower half of a quarter divided diagonally. It is a Spanish ordinary, and said to come from "giron," a gusset. It is seldom borne singly, and usually is gyronny, when the shield is divided per pale, per fess, per bend dexter, and per bend sinister into eight seetions. If more, thenumber must be specified. In the earliest examples the divisions are twelve.

Bassingbourne: gyronny of twelve, or and azure. Campbell: gyronny, or and sable (fig. 70).

Fig. 68. Fig. 69. Fig. 70. Fig. 71.

The Flasque, or flaunch, is the segment of a eirele taken out of the two sides or flanks of the shield, the margin of whieh forms the ehord. They are always used in pairs, one on each side. This bearing is not of great antiquity.

The Votder, the diminutive of the flasque, has a flatter eurve. The voider in defensive armour was a gusset-picce either of plate or of mail, used to cover a void or unprotected space at the elbow or knee joints.

Frere: gules, two pards' faces between as many flasques or (fig. 71), alluded to in Whistlecraft by Mr Hookham Frere— "Two leopards' faces were the arms he bore."

*When the bearer was asked to give some verses descriptive of his arms to be placed at the head of a history of the family, his answer was — " The flanehes, on our field of gules, * Denote, by known heraldie rules, A race contented and obscure, In medioerity seeure, By sober parsimony thriving,*

For their retired existence striving, By well-judged purehases and matehes, Far from ambition and debauches. Such was the life our fathers led; Their homely lesson, deep inbred In our whole moral composition, Confines us to a like condition." '

The lozenge, the masele, and the rustre are all derived from the = or fretty, and do not appear originally to have been used singly.

The Lozenge is a square, set up diagonally like the diamond in playing ecards. It is seldom used alone, and when the shield is covered with it, it is ealled lozengy.

Fitzwilliam: lozengy, argent and gules (fig. 72). De Burgh: gules, seven lozenges yair conjoined 3,3,1.

The Masele, or rather masculy, for originally it was so used, is said to represent a net.

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Rokele of Suffolk: maseuly, gules and ermine. Poges of Stoke-Poges: maseuly, argent and gules. De Quiney, earl of Winehester: " gueles, six maseles d'or, voydés du champ ;" and afterwards, gules, seven mascles or, conjoined 3,3,1 (fig. 74). The Rustre is of later introduction, and is not a common bearing. It is a lozenge piereed in its centre by a round hole.

Custanee: or, a rustre sable (fig. 73).

Fig. 72. Fig. 73. Fig, 74.

The Fusil is an elongated lozenge, from the Freneh fuseau, a spindle, and is supposed to represent a distaff charged with yarn, A very early example of its use is

Montacute: " d'argent avee ung fess engralé de geules d. trois pitees," whieh speedily became " argent, three fusils eonjoined in fess gules" (fig. 75). William of Waynflete and Wilson-Patten: f usilly, ermine and sable, a canton or

(fig. 76). It has been suggested that the Percys derived their fusils from their lordship of Spindleton.

Trefusis of Trefusis: argent, a chevron between three spindles sable,

Fig. 78. Fig. 76. Fig. 77. Fig. 78.

The Rowndel, if of metal, is a simple disk; if of eolour, it is eonvex, half a globe. It is seldom borne singly, and is named specially from its colour.

If Or, a Bezant.

», Argent, a Plate.

» Azure, a Hurt.

» Gules, a Torteau.

+, Sable, a Pellet, Gunstoue, or Ogress.

The last four are almost unknown in English heraldry. Akin to these is the fowntain, a disk barred wavy, argent and azure, to represent water. Although bezants, plates, hurts, and tor- teaux are given in early rolls of arms, their names do not always earry their colours. They are blazoned as roundels d'or, pelottes d'argent, torteaux de goules. The torteau is sometimes ealled a seruse, The pellet often stands for the roundel, and the bezant is ealled a talent, from a eoin of that name eurrent with the bezant in the East.

Alan La Zouch: Gules, bezanty. This was afterwards reduced to ten bezants, 4,3,2,1, with a quarter and sometimes a eanton of Britanny, that is, " ermine" (fig. 77).

Camoys: or, on a chief gules three plates (fig. 78).

Wellesley: gules, a eross argent between twenty plates, 5,5,5,5.

Baskerville of Old Withrington: argent, a chevron between three hurts (fig 79).

Hurting: argent, ten hurts, 4,3,2,1.

Courtenay: or, three torteaux (fig. 62).

Babington: argent, ten torteaux, 4,3,2,1, a label azure (fig. 9),

Fulkyn: sable, on a eross between twelve billets argent three golpes,

Greville: sable, on a eross engrailed or five pellets.

Bridgeman: argent, ten ogresses, on a chief a lion rampant of the second,

Stourton of Stourhead: sable, a bend or between three fountains (fig. 81).

If Vert, a Pompey.

», Tenny, an Orange. » Sanguine, a Guze. », Purpure, a Golpe.

Fig. 79. Fig. 80. Fig. 81.

In carly lists the annulet is blazoned as a false roundel; thus Vipont is said to bear gules, six false roundels or. ; 2 Guttes or drops are represented pear-shaped with a tail like a Rupert's drop, or the tears on funeral draperies. They are not found in the earliest eoats. They, like roundels, are named from their eolour, thus : or—gutté d'or ; gules—gutté de sang ; argent—gutté d'eau ; sable—gutté de poix ; azure—gutte de larmes ; vert—gutté @huile. Malory: argent, a eross sable, gutté d'or.

Winterbottom: azure, gutté d'eau. , :

Kington: argent, gutté de larmes; on a ehief azure three barons' eoronets or fig. 80).

Fitz 2 iritetora: argent, gutté de sang, a eross of the same,

Chichester eity: argent, gutté de puix, on a ehief indented gules a lion of England.

Marshal: argent, on a fess gules three drops ermine.

The Billet or delve is a small parallelogram usually borne in

numbers and set up on one end. Coudray: gules, billetty or. Delyes: argent, a chevron gules, fretty or, between three delves sable (fig. 82).

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Somewhat akin to these subordinarics is a division of the field known as checquy, where the field is divided into small squares like a chess-board. Their number is not specified, but usually is made up of seven squares in a line, and in depth according to the length of the shield. Hugh, earl of Vermandois, is said to have borne checquy, or and azure, and as his daughter married Warren, it is possible that the earls of Surrey thence derived their well-known coat.

Warren: checquy, or and azure (fig. 83). Tateshal: checquy, or and gules, a chief ermine.

Fig. 82, Fig. 83. Cheequy was not confined to the field, but was also applied to the charges upon it. Stuart: or, a fess checquy, argent and azure.

Where there is but one row of squares, the bearing is called

gobonny or compony, if of two rows, countcr-compony.

Gray: barry of six, argent and azure, a bend compony of the first and gules fi

(fig. 84). Fitz Roy: gules, a border quarterly, ermine and eounter-compony, or and azure.

Common Charges.

Next to the purely heraldic figures connected with the shield and their diminutives and subordinaries, come those imported into heraldry as charges from all quarters, in- cluding an immense variety of objects, natural and artificial, beasts, birds, fishes, reptiles and insects, flowers, and

the fruits of the field, chimeras, astronomical and celestial figures, man and his parts, arms and armour, implements of war and the chase, ships, articles of dress, and a mis- cellaneous budget far too heavy to enumerate.

The rules for the placing of these charges are simple. If single, they stand in the centre of the shield ; if two, in pale, or one over the other; if three, 2 and 1; if the number is longer the order must be specified (see fig. 85). The French carry the unexpressed understanding much further. With them, four pieces are placed 2 and 2 ; five pieces, in saltire ; six are 3,2,1; seven are 3,3,1; eight are in orle; and nine are 3,3,3.

Fig, 85.—Different arrangements of charges upon a shleld :—(1) 2 roses; (2) 2 roses in fess; (8) 3 roses; (4) 3 roses in bend; (5) 4 roses, 2 and 2; (6) 5 roses in cross; (7) 5 roses in saltire; (8) 6 roses, 3,2,1; (9) 6 roses, 2,2,2; (10) 8 roses in orle; (11) 9 roses, 3,3,8; (12) 9 roses, 3,3,2,1; (13) 10 roses, 4,3,2,1; (14) 10 roses, 4,2,4; (15) 12 roses, 4,4,4.

ANIMALS,

The following rules are applicable to the blazoning of animals. Generally, unless otherwise specified, they are shown in profile,

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[cOMMON CHARGES.

looking towards the dexter side; when to the sinister, the word counter is prefixed, "a lion counter-passant."'? Animals back to back are " addorsed" ; face to face, " confrontée" ; facing the spec- tator, " gardant," or "affrontée"; looking back, "regardant"' ; when rising out of the edge of an ordinary, "issuant ;' when out of the middle of it, "naissant." When the claws, horns, tongues, hoofs, or mane are shown of a special colour, the animal is "armed," "corned," "langued" or "lampassé," "ungued," or ' crined." Sometimes he is crowned royally or ducally, sometimes " collared," " gorged," or " accollée." When wounded he is " vulned."

When of its natural colour an animal is " proper," but it may be of any metal, colour, or fur, and divided by any partition lines. When a head or

*member is torn off it is “erased.” When cut off **couped.” When men are clothed, they are “habited” ; when nude, they are “ salvage.”*

QUADRUPEDS.—Of these the Lion is by far the most popular, nor ishis popularity confined to England. He appears not only in the British arms, but in those of Spain, Holland, Denmark, Bohemia, and Saxony, and many lesser states. Of Edward II.’s 918 bannerets, 225 bear lions in some form or other. The favourite attitude is rampant, but he may be passant, saliant, statant, sejant, couchant, or dor- mant. About thirty varieties of attitude are enumerated by writers ; but most are rarcly if ever used, and indeed it is seldom the lion is other than rampant or passant. Sometimes he is borne “demi,” especially as a crest. His paws or jambs are also borne, and his tail. In one or two well-known instances on the Continent he is

‘ déhaché,” that is, his head and paws and the tuft of his tail are cut off. When a member is borne upright, it is “ erected.” Asa set off to this dismemberment, in early rolls the lion is sometimes represented as two-tailed, or “ queue furchée,” and there are examples of bicorporate and tricorporate lions, though not many. When above three lions are shown, they become lioncels or lions’ whelps, unless otherwise specified.*

It has been shown that as early as 1127 Henry I. used the lion as an ornament upon the shield he gaye to his son-in-law, who bore those animals upon his brodekius, as did the early French kings the fleur-de-lys. Mr Planché has investigated this early use of the lion by Henry with great acuteness.

William, earl of Gloucester, Henry’s grandson, sealed with a lion. Richard de Redvers, earl of Devon, who married a granddaughter of Henry, also bore a lion, as did Ranulph, earl of Chester, who married another grandchild. William d’Albini who married Henry’s widow, used the same animal. All this occurred at a period when armorial bearings were by no means an established institution, and when every great noble was taking it up, and quite open to assume a bearing. On the whole, therefore, it seems probable that to Henry I. was due the introduction of the lion into English heral- dry. Ithas been seen that under Richard and John the lions became the settled arms of England, and this will account for the general adoption

of the royal beast in English coats of arms. In heraldry a ‘ i passant gardant or” is always blazoned as “a lion of Eng-

and.

The identity of the lion of England with the leopard has been the subject of much controversy, and when Napoleon talked of driving the leopards into the sea he evidently used the word in disparage- ment of our national bearing. The early heralds, who probably were not zoologists, seemed to have confounded the lion with the leopard, and to have used the names according to the attitude of the animal. When rampant he was a lion, when in any other attitude, as passant, he was leo-pardé or a lion-as-a-leopard, but never drawn spotted like a real leopard. As the lion came more generally into use, and was borne in various attitudes, the allusion to the leopard was gradually dropped, though as late as the reign of Edward ITI. and Richard II. the royal crest was described as a leopard, and Henry V. had a Leopard herald. Among the greater barons of the 13th and 14th century, the lion was borne by the earls of Arundel, Cornwall, Devon, Hereford, Leicester, Lincoln, the Earl Marshal and the earl of Salisbury, as well as by scores of the lesser barons or knights. Sir Tristem, the knight of lionesse, bore a lion when

- *Mordant with his might, With a lance un-light, He smote him in the lion.”*

Fig. 86.

Lewis of Llanishen and Cromwell thelr eadet bore and bear sable, a llon rampant argent, a bearing still used by their cadets, the Lewises of Pennyslvania, who migrated above two centuries ago (fig. 86).

Fig. 87. Fig. 88. Fig. 89.

QUADRUPEDS. |

Mathew of Castell-y-Mynach: argent, a lion rampant regardant sable (fig. 87). Everingham: gules, a lion rampant vair, crowned or. “ Haverlng: argent, a Hon rampant qucue furchée gules, gorged azure (fig. 88). Capel:

gules, a lion rampant between three cross crosslcts, fitchy, or. In allusion to which Lord Capel is described at the siege of Colchester :— "There lion-like undaunted Capel-stood, ' Beset with crosses in a field of blood." Sir Simon de Felbrigge, K.G.: or, a lion saliant gules (fig. 89). Fitz Payne: gulcs, three lions passant in pale argent, debruised by a bendlet azure (tig. 90).

Fig. 90,

Fig. 91. Fig. 92. The lion statant is moro usually seen on a crest, and is that of Perey and

Talbot.

Tynte Pg Mably: gules, a lion couchant between six cross crosslets, argent, 8 and 3,

Ayleworth of Essex: gules, a lion dormant or.

Longspee, earl of Salisbury: azure, six lioncels rampant or, 8,2,1 (fig. 91).

Edmond, earl of Lancaster: a tricorporate lion issuing from three parts of the escutcheon, united at the head, gardant in the fess point, or, armed and langued azure (fig. 92).

A Scottish seal of Chalmers, 1449, bears a demi-lion issuant from a fess, in base a fleur-de-lys.

Markham : azure, on a chief or a demi-lion rampant issuant gules (fig. 93).

Sir Henry Eame, K.G.: or, out of the middle of a fess a lion rampant naissant gules, armed azure (fig. 94).

Wyndham ; argent, a chevron between three lions' heads erased or (fig. 95.

Newdigate: gules, three lions' jambs erased argent (fig. 96).

Pinchbeke : sable, three lions' tails crased erect argent (fig. 97).

i

Fig. 93. Fig. 94. Fig. 96.

The Leopard, that is, the real spotted animal, is seen now and then in coats of arms, but is of much later introduction than the lion, which is often called by thatname. Thus Sir Reginald de Dunstan- ville is blazoned as bearing "gules, two lcopards passant de- bruised of a baton ;" these most certainly were lions. A coat of Astley was however, gules, a leopard rampant argent, in that case areal leopard. He is often called a pard.

Cantelupe : azure, three pards' heads jessant fleurs-de-lys or (fig. 98).

Wentworth: sable, a chevron between three pards' faces or.

Hubard of Ipsley, who held under Cantelupe: sable, three pards' heads jessant fleurs-de-lys argent,

The heraldic Tiger is neither a common nor an early bearing. To the body of the wolf he adds the tail of a lion, and he is studded with tufts of hair.

The supporters of Hastings, earls of Huntingdon, are two man-tigers affrontés. Lone of Ellow bears azure, a tiger passant or.

Hunioke of Wingerworth: azure, a fess between three heraldic tigers' heads erased or.

The Wolf, when saliant, is said to be " ravissant." Lovett of Astwell: gules, three wolves passant sable, in pale. The wolf, the boar, the hart, and the hare were the four heraldic beasts of venery. Dame Juliana Berncrs says—

"Four maner beastys of venery there are: The first of them is the hert, the second the hare, The boar is one of them, the wolf, and not one moe."

Fig. 95.

Fig. 97.

Fig. 98. The Boar is the only beast besides the lion borne in the roll of

Fig. 99, Fig. 100.

Henry IlI., where Adam de Swyneburne bears " de goules, a trois testes de sanglier @argent" (fig. 99), a bearing which, however, the family have long laid aside for 'per fess gules and argent, two cinquefoils counterchanged," a coat derived from Umfraville. The hure or teste de sanglier is a common érest. The "glory of the

tusky boar" is in his tusks, 'dente timetur aper." He is also borne whole.

Gilpin : or, a boar sable. The boar was the cognizance of Richard III., with a thorn bush— "The bristly boar In infant gore Wallows beneath the thorny shade." It is the crest of most of the elan Campbell

The Bear is also a beast of heraldry.

Beresford : argent, a bear rampant sable, muzzled, eollared, and ehained or. Fitz Urse : or, a bear passant sable.

The Fox.

Williams: argent, two foxes saliant counter-saliant in saltire, gules, the dexter surmounting the sinister (fig. 100).

The Cat-a-Mouwntain, musion, or wild cat, was long preserved in Rockingham forest, the country of Catesby, the first of the well- known trio —

"The cat, the rat, and Lovel our dog." Catesby, however, bore argent, two lions passant gardant sable, crowned or. Keate : argent, three mountain cats passant in pale sable.

The musion was the emblem of Burgundy and the arms of an im- meee cat were fabled to have been granted by Childebert to a

night who made prisoner Gundemar of Burgundy.

In the following dialogue from Fere's Glory of Generositie the reader will recognize an amusing passage in Quentin Durward.

'" Paradis, the herald.—Therefore, I pray you, begin and tell your sovercign what coat armour this knight bearcth? '*

" Torquatus, a knight——Methinks he beareth sable, a musion passant gardant or, oppressed with a fret gules of cight parts, nayles argent (fig. 101).

'"" Columel, a ploughman.—Jezu, Zir! call you this arms? now by my vaye, chad thought arms should not have been of such trifling things. Why, this is even the cat in the milk-house window. Full ill will her dayri thrive giffe she put zutche a vermin beast in trust to keep it."

The Dog.—The mastiff or talbot supports the shield of the earls of Shrewsbury. " The talbot ever true and faithful to the crown." In the fine brass of Sir Brian Stapleton at Ingham, 1432, the knight rests his foot upon a dog whose collar is marked " Jakke."

Burton of Falde : aznre, a fess between threc talbots' heads erased or. Maulevercr of Allerton Mauleverer: gules, three greyhounds or levriers eurrant in pale argent,

The alaund or hunting dog was in great request. VIII. bore his arms and badges on their collars. Dacre, used it as a supporter.

*The Stag and Hart were old, though not of the earlicst bearings. The stag appears in the roll of Edward II. When in motion he is trippant ; when lying down he is lodged. His antlers are his '*attires ;" a pair of attires attached toa fragment of the skull bone forms "a massacre." The head is usually borne full-faced, when it is said to be cabossed or cabaged.*

Green of Green's Norton: azure, three bucks trippant or.

Bullstrode of Bullstrode: sable, a stag's head cabossed argent, attired or, and betwcen the attires a eross patée fitchy of the third, transfixed through the nostrils by an arrow of the last, barbed and feathered of the second. This is called a stag of St Hubert (fig. 102).

The kingdom of Wiirtemberg : or, three attires of a stag barwise in pale sable.

Cocks: sable, a chevron between three massacres argent.

Roper: per fess, azure and or, a pale and three roebucks' heads ecounterehanged.

John Trie who, temp. Edward II., was son and heir of Alicia de Hertley, bore " a hart's head cabossed."

Those of Henry Fienes, Lord

Fig. 101.

Fig. 102.

The stag's head was the emblem and armorial bearing of the M'Kenzies, whose chief, the lord of Kintail, was called by the High- landers " Caberfaigh "—

Fig. 103.

"Proud chief of Kintail, Let the stag in thy standard bound wild in the gale. The heraldic Antelope, or agacella, somewhat resembles a tiger, but has horns and hoofs. Brooke, Lord Cobham, had fora dexter supporter an agacclla, horned, tusked, and armed or.

The Elephant.

Elphinston : gules, an elephant passant argent, tusked or. deilicxp of Welford : we chevron, sable and argent, three elephants' heads

erased counterehangced.

The Bull, or buffler, in his wild state was a formidable animal, and is used heraldically, though more frequently as a crest, supporter, or cognizance, than in arms—

“ Mightiest of all the beasts of chase That roamed in woody Caledon.”

Front de Beeuf, a real Norman name, probably bore no arms, though Scott

Skeffington : argent, three bulls’ heads erased sable, armed or (fig. 103).

The Calf.

Le Vele of Tortworth and St Fagans in Glamorganshire: argent, on a bend sable three ealves or. Calverley : argent, on a fess gules three ealves or,

The Horse, the support of the equestrian order, docs not appear

in early coats of arms, although the winged horse was a cognizance

of the order of the Temple. A grey horse is a liard, a bay a bay-

ard. When in the field he is free, when in harness barded and

caparisoned.

Trevelyan of Nettlecombe, whose ancestor is supposed, in Cornwall, to have come out of the sca at the Land’s End ready mounted, ineongruously enougl, upon a land horse, bears gules, a demi land horse issuant from the water, all proper. :

Horsey of Mcleombe-Horsey: azure, three horses’ heads couped, bitted, and reined or.

The Ass, probably the wild ass endued with sublimity in the book of Job, found a place on the shield of the old Cheshire family of Hockenhull, argent, an ass’s head erased sable.

The Ran.—Recently a valuable silver dish was fished up from Whittlesea Mere, having rams' heads at each end, evidently once thie property of the Abbey.

Ramsey Abbey, " Ramscy the rich," bore or, on a bend azure three rams' heads couped argent, armed of the field.

The Sheep is occasionally seen, but the Lamb from its religious association was in general use. 'The Pascal Lamb was one of the cognizances of the Templars, and is adopted with equal propriety by the gentlemen of the long robe. As the " Lamb and Flag " it is known extensively in South Wales. Price of Park and other descendants of Jestyn ap Gwrgant bore it as a crest.

Lambton of Lambton: sable, a fess between three lambs trippant argent.

The fleece of the sheep gave name to the great Burgundian order, and the toison d'or was its jewel. It probably refers to the pas- toral wealth of Burgundy, but is said to have been founded by Philip the Good, in allusion, not to the bad faith of Jason, but to the prowess of Gideon.

The Goat.—William de Capraville bore a goat " exsiliens." , Thorwold of Marston: sable, three goats saliant argent.

The Coney.

Coningsby of Hampton Court: gules, three coneys-argent.

The Otter.—L'outre was used as a supporter by Luttrel of Dunster.

The Squirrel.

Nutshaw : argent, a squirrel sejant nibbling a nut, all proper, from a hatchment in Claybrook Church.

The Hedgehog, herison, ericius.—In the church of Gamelston, Notts, is a fine effigy in chain mail of the end of the 18th century, of ono of the family of Heriz, and on the shield are three hedgehogs. They bore azure, three

hedgehogs or. The hedgehog is also borne by the Maxwells for the lordship of Herries.

The Mole.

Mitford of Mitford: argent, a fess sable between three moles proper.

The Ermine, the fur of which is borne widely, is scareely known in heraldry as an animal. The reader will, however, remember the three ermines in the windows of Waverley House.

Brirps.—The bird of heraldry before all others is the Eagle, the symbol of the fourth evangelist. Its earliest and chief popularity wasin Germany, where it was adopted by the empire and by many of the principal sovereign princes.

It appears but twice in the roll of Henry IJII., but after his brother Richard, earl of Cornwall, became king of the Romans, he adopted the eagle, which on that account was to be seen in all the armorial glass of the midland churches, and was widely copied in private coats of arms. His son Edmund, while bearing " Cornwall" for his arms, suspended his shield from the beak, and placed it on the breast of an eagle in reference to his father's rank. In the roll of Edward II. there are forty-three examples of eagles.

The nobles of the old Holy Roman cmpire place their shields upon the breast ofan eagle, as may be seen in England in the insignia of the duke of Marlborough as a prince, and of the earl of Denbigh and Lord Arundel of Wardour as counts, of that empire.

The imperial eagle is always represented with two heads, the origin of which is obscure. The emperor Frederick II. on his con- temporary shield in Westminster Abbey has a single-headed eagle. The second head is supposed to have been produced by the dimidi- ation of two coats, each an eagle, but this is scarcely probable. The eagle of the house of Brandenburg has hut one head. Some of the North Wales gentry, headed by Sir Watkin Williams Wynn, place their shields upon the breast of an eagle, single-headed, and the practice is not unknown in Scotland. « The seal of the widow of one of

the Warwickshire Harpurs in the time of Edward Il. gives an eagle, and in his two claws shields of her husband's arms and her own.

Besides the eagles of Austria, Brandenburg, Russia, imperial France, and the United States, the bird was the emblem of Este, Bohemia, and Moravia, of many of the German, Italian, and French nobles, and of many very ancient English and Scottish names, as Monthermer, Bedingfield, Biddulph, Glyn, Weston, in England, and Ramsay, Maxwell, and Carnegie, in Scotland. The great financiers Rothschild use an eagle for their arms.

The eagle is always shown "' displayed," that is, upright, with his breast to the front, and his legs, tail, and wings expanded,—what 1s commonly known as a spread eagle.

When the beaks and talons of birds of prey are specified, they

are said to be beaked and armed. In the roll of Henry IIL, Sir.

[COMMON CHARGES.

Dru de Barenton bore sable, three eagles or, and his descendents in the reign of Edward II. had increased the number to six and gave them argent. Piers Gaveston bore six eagles upon his shield and horse furniture.

Peter, earl of Riehmond and Savoy, who built the Savoy Palace in 1250, and was uncle of Eleanor, queen of Henry III., on the shield of his monumental effigy at Aqua Bella bears an eagle for Savoy. The cross, the later arms of that house, appears on the pommel of hissword. Long before this, about 1142, when Mathieu de Montmorenci married Adela of Savoy, he added four alerions or eaglets to his arms, probably in compliment to his wife, who bore an eagle displayed ; and certainly in 1206 the acknowledged arms of the house of Savoy were an cagle.

Parts of birds, especially of eagles, are borne, as the head, wings, legs, and feathers. When feathers are used, and the quill is of a special colour, they are said to be quilled. When a bird is leaving the ground it is "rising," when on the wing it is " au vol," when the wings are down it is " closed," when open " disclosed,"

ae of Oxburgh: ermine, an cagle displayed barry argent and gules

(fig. 104).

Glynne of Hawarden: argent, a two-headed eagle sable (fig. 105).

Culeheth of Culcheth : argent, an eagle disclosed, preyant on a child {n a mantle gules, wattled or. This is the crest of Stanley, well known in Lancashire as the bird and bantiling.

Aubrey of Llantrithyd: azure, a chevron between three cagles' heads erased or.

Seymour: gules, two eagles' wings conjoined in lure or (fig. 106).! .

Bray of Shere: argent, a chevron between three eagles' legs erased & la quise ("euisse," that is, removed at the thigh) sable, armed gules (fig 107).

Fig. 104. Fig, 105. Fig. 106, Fig. 107.

The Falcon, as an accessory to field sports, was much esteemed, and is often borne in heraldry. It is also called a gerfalcon, pere- grine falcon, and tiercelet. The falcon is usually borne with the jesses or leather thongs about its legs, sometimes with a hood and bells. It is then jessed, hooded, and belled. When feeding it is "at prey." The lure was a bunch of feathers towards which the bird was taught to return. On the seal of Alice, countess of Eu (1234-42), she bears on her hand a falcon with its jesses pendant. It was the custom to slip over the claws of the young birds a silver ring, which could not afterwards be removed. Two such rings were found at Castle Hedingham, the seat of the De Veres, engraved '¢Qx-en-forde." One of gold found at Biggleswade bore " Sum regis Anglie," and within the ring " et comitis Herfordie." How- ever well trained, these birds were always liable to prove riflers, that is, not to return to the lure—

"For though thou night and day take of him hede, And strew his eage faire and soft as silk, And give him sugre, hony, bred, and milke, Yet right anon so that his door is up He with his feet will spurren down his eup, And to the wood he will, and wormes," &e.

Falconer of Halkerton bore originally gules, three hawks' lures or. After a marriage with Douglas they bore or, a falcon's head proper, issuant out of a man's heart gules between three stars azure. The English Falconers bore argent, three falcons gules, jessed, belled, and hooded or (fig 108).

Fig. 108. Fig. 109. Fig, 110.

Degge: or, on a bend azure, threc falcons rising argent, fessed and bclled of the field.

Baker: argent, on a fess gules three falcons' heads erased of the field.

Ridley of Blaydon: gules, a chevron between three gos-hawks argent,

Aldrington : sable, three hawks' lures penned, stringed, and ringed argent.

The Swan was the cognizance of the Bohuns. Humphrey, earl of Hereford, in 1819, bequeathed to his son "un lit entier de vert oudré de cynes blanches."" When gorged with a ducal coronet facies a gold chain attached to it, it is called a cygnet royal. The swan was marked or nicked according to the rank of its owner. By a statute of 22 Edward IV. no man having less than five marks

1 Heralds differ about the blazoning of this eoat. The old terms, gules, a pair of wings displayed or, were thought scareely elear. York deseribed it as gules, two wings conjoined in fess or. Ralph Brooke takes refuge in Freneh with "Deux vols de l'aigle en eceur; but "vol," says Camden, "is a complete pair of wings." Guillim gives "a pair of wings inverted and conjoined." Who shall decide amidst so many wearers of the tabard?

per annum could lawfully keep a " game" of swans. The keeper who looked after them was the " gamester."

Pitfield of Dorset: aznre, a bend engrailed between two eygnets royal.

Guest: azure, a chevron or between three swans' heads erased proper.

The Peacock, paon, is more common as a crest than in the shield. He is usually represented with his tail spread, and is then blazoned as a " peacock in his pride," as seen in the crest of Manners,

Pawne: argent, three peacocks in their pride proper,

Yeo of Devon bore argent, a chevron sable between three Turkey Coeks, tails expanded, proper.

The Pelican is also more common as 2 crest thanin arms. When in profile she is usually vulning herself, and when full-faced on her nest feeding her young she is " a pelican in her piety."

Carne of Nash: gules, a peliean in her piety or (fig. 109). Pelham ; azure, three pelicans vulning theinselves proper.

The Ostrich is also better known as a crest as borne by Digby, or as a supporter by the earls of Buchan. The plume of ostrich feathers, the well-known cognizance of the Black Prince, gave rise éo the arms of his natural son, Sir Roger Clarendon, who bore or, on a bend sable three ostriches' feathers argent, passing through as many scrolls of the field.

Jervis of Devon: argent, six ostriches' feathers, 3,2,1, sable.

The Stork.

Starkie of Huntroyde: argent, a bend between six storks sable.

The Heron is ono of the few birds found in early coats of arms,

Heron of Chipchase and Ford oceurs in the roll of Henry III. One of the family was the husband of her of whom " Fame Whispered light tales"

at the eourt of James IV. They bore gules, three herons argent.

The Cormorant, or liver, appears with a double pun in the arms of Liverpool: argent, a liver sable, billed and legged gules, holding in his bill a bunch of laver vert.

The Sheldrake, also a water-fowl, was introduced into heraldry to suit Sheldon, mayor of London in 1676, who bore sable, a fess between three sheldrakes argent.

The Raven, corbeau, has been the bearing of Corbet from the beginning of armorial bearings.

Corbet of Moreton Corbet: or, a raven sable— "A raven sat on Corbet's armed crest." Ravenhill: argent, three mounts vert, on each-a raven sable.

The Rook is occasionally borne, and sometimes conjointly with the piece known as the rook in chess.

Rook of Kent: argent, on a chevron engrailed between three rooks sable, as many chess rooks of the first.

The Owl, the bird of Mincrva, but seldom condescends to figure in a coat of arms. The learned Sir Henry Savile however bore— – Argent, on a bend sable three owls of the field.

Sir Francis Theobald of Barking, Castello's " harum linguarum eallentissimus," bore sable, a fess embattled between three owls argent.

The Cock, more usual as a crest, is sometimes borne in arms. When his beak, comb, wattles or gills, and spurs are given, he is beaked, crested, wattled or jewlapped, and armed.

Coekaigne: azure three coeks argent, armed, erested, and Jewlapped proper,

The Popinjay, papagay, or pye, is one of the earliest heraldic birds.

Curzon: argent, on a bend sable three popinjays or, eollared gules, Thwengo or Fitz Marmaduke: argent, a fess gules between three popinjays vert, beaked, legged, and collared of the seeond.

The Chough is in repute in Cornish heraldry; he is black, with red legs and beak.

Peniston: argent, three Cornish choughs sable, beaked and legged gules. Onslow: argent, a fess between six Cornish ehoughs proper.

The Shoveller, said to be a Cornish bird, is borne by the family of Herle, who came to Cornwall from West Herle in Northumberland, and probably therefore assumed their arms, argent, a fess gules be- tween three shovellers proper, after their migration, The hciress married Hastings.

Tyrwhit: gules, three tyrewhits or.

The Swadllow, or hirondelle, forms the very early coat of the Arun- dells, of whom William le Brito (1170) says—

" Hirundele velocior alite, quee dat Hoe agnomen ei." "More swift than bird hight Arundel, That gives him name and in his shield of arms is blazoned well, Ho rides amid the armed troops, and with hls spear in rest (Tho staff was strong, tho point right sharp) runs full upon the brest Of Sir Guillaume."

Sir Thomas Arundell was by Rudolph IT. (1595) created a count of the empire for military service against the Turks. The Arundells of Wardour bear sable, six swallows argent, 3,2,1.

Fisnzs.—The inhabitants of the water do not play a very im- portant part in heraldry, and are scarcely known among the more ancient coats, although a special and interesting volume has been written by Mr Moule on the heraldry of fishes. When borne horizontally they are "naiant ;" when vertically, ' hauriant,"

though this is not always expressed ; when bent they are "em- bowed "' as the dolphin in the crest of Courtenay.

The Pike, or luce, is the oldest example of a fish in heraldry. Lucy of Charleeote, Shakspeare's " Justiee Shailow": gules, semée of eross

erossiects, three Inees hauriant argent (fig. 110).

The Dolphin, whatever his zoological position may be, is heraldi- cally a fish, as is also the Whale. As the emblem of Dauphiné the dolphin was adopted with the name by the heirs-apparent of the old French monarchy, who quartered with the fleur-de-lys azure a dolphin hauriant or.

Fishacre of Fishaere: gules, a dolphin naiant argent. —< Pelyn: argent, a chevron between three dolphins naiant embowed sudle.

_Dean Swift says that his cousin Thomas Swift gave for his de- vice a swift or dolphin twisted about an anchor with the motto — lente." This, however, was the device of the printer

us.

Whalley of Whalley: argent, three whales' heads erased naiant sable.

The Barbel was also an early bearing, used by the counts of Bar, who bore azure, crusuly fitchy, two barbels erect embowed or, within a border engrailed gules,—a bearing found in the quarterings of many German princes.

The Herring occurs in the roll of Edward II. Heringaud: gules, three herrings hauriant argent.

The manor of Earlton, Norfolk, was held by the service of present- ing annually at the exchequer certain herring pies.

Roach.—Peter de Rupibus or Des Roches, bishop of Winchester, bore three roaches.

Conger.—Chief-Justice Gascoyne bore argent, on a pale sable a conger's head erased or.

Trout. Troutbeck: azure, three trouts fretted in triangle argent.

The Chabot, a sort of gurnet, was uscd as a badge by the family of Rohan-Chabot.

The Seallop, or escallop shell, is an old and popular charge, especially in Spain, as the emblem of St James of Compostella, which led to its being the sign ofa pilgrim. The seal of the fraternity of St James at Wisby (about 1200) represents St James as a pilgrim with a scallop upon his scrip. Sir Walter Raleigh says—

"Give me my seallop shell of quiet, My staff of faith to walk upon." Seales: gules, six escallops argent, 8,2,1 (fig. 111). Shelley: sable, a fess engrailed between three whelks or.

Fig, 111. Fig, 112. Fig. 113. Fig. 114.

REPTILES, INsEcTs, AND Monsters.—Reptiles and Insects are charges rarely seen in early coats.

The Serpent is the bearing of the Visconti, dukes of Milan : ar- gent, a serpent gliding in pale azurc, crowned or, vorant an infant issuant gulcs,

The Snake or bisse, anguis.

Sir Wm. de Malbisse: three testes de bysses., The usual bearing of the name of Vaughan in S. Wales is azure, three boys'

heads eouped at the bust argent, wreathed about the neck with a snake proper, Bottreaux: argent, three toads (botraces) ercet sable.

The Fly, musca.—Muschamp of Wooler bore argent, a chevron vert between three flies. This bearing is seen on a boss of the cloister at Canterbury, but the musce are represented as butterflics,

which loses sight of the allusion. et : The Bee.—Both Sir Robert Pcel and Sir Richard Arkwright

appropriately placed a bee in their arms. 44 ; Chimeras.—A chimera isa modification of some existing animal,

though often much more than " parce detorta" from its type. Of them the most celebrated is the winged lion of St Mark, the proud emblem of ancient Venice. 'Technically the bearing is "azure, a winged lion sejant' gardant,

with a glory, or ; in his fore paws an open book, thereon ‘ Pax tibi, Marce, Evangelista meus,’ over the

dexter page a sword erect,—all proper.” The Dragon, though not very much used in heraldry, is a chimera of ancient date and much employed in early romance. He is thus

described— “ There was a dragon great and grymme,

Full of fire and also of venym; And as a lion then was his fete, His tayle was long and full unmete; Between his head and his tayle Was twenty-two foote withouten fail; His body was like a wine ton, He shone full bright against the sun; His eyes were bright as any glass, His seales were hard as any brass.”

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The dragon was a favourite standard with the Welsh princes, and used also by the Anglo-Norman sovereigns. He is drawn with four legs and wings, a long barbed tail usually knotted, and a body pro- teeted by scales. In English heraldry he is used chiefly as a crest. In Wales, Rhys Ap Tudor Mawr is said to have borne “ argent, a dragon segreant sable.”

The Gryphon is popular both in romanceand heraldry. He is an emblem of vigilanee, and inhabited a mountain in Bactria and guarded much gold there. It was in defence of this that he

“Through the wilderness Pursued the Arimaspian.”

He is drawn with the body and tail of a lion, the head of a cock, a air of wings, and very long sharp claws. When on his hind legs e is segreant.

Morgan of Tredegar: or, a gryphon segreant sable (fig. 112).

Evelyn of Wotton; azure, a gryphon passant and a ehief or,

Cotton of aaa sable, a chevron between three gryphons’ heads erased

argent.

The gryphon was an early cognizance of Redvers, earl of Devon, and was used statant by somo branches of the Montacutes in the time of Henry III.

The Wyvern is a two-legged dragon with the body passing offinto a long tail barbed at the end and usually borne nowed or knotted, Drake: argent, a wyvern statant, taii depressed and nowed, gules (fig. 113).

Cockatrice. Langley ;"argent, a cockatrice sable, eombed gules.

*The Unicorn or licorne abounds in Scottish heraldry, and was made the sinister supporter of the arms of Great Britain by James I. *"Ceste merveillose beste, Qui une corne a en ta teste Senefie nostre seigneur, Thesu Crist nostre sauveur. C'est l'unicorne spirituel, Qui entre la vierge prist ostel."*

Harting: argent, a unicorn sejant sabie, armod and ungued or.

The Mermaid.

Ellis: argent, a mermaid gules, crined or, in her right hand a comb, in her left a mirror, argent. ,

The Martlet, or merlotte, a small bird without legs, and always represented close. Itis one of the oldest and commonest of charges, but seldom if ever borne singly (see Fleetwood, fig. 12).

Furnival of Farnham Royal: argent, a bend between six martlets gules, Roger de Merley, roll of Henry 1IJ.: barry of ten, argent and gules, on a border azure eight martlets or.

FLowers AND Fruits oF THE Earntu.—Of these the palm was an emblem of victory ; the laurel, of triumph; the oak, of strength; the olive, of peace ; the cypress, of woe ; the vine, of fecundity and joy ; the lily, of purity ; the daisy, of humility ; while the holy

"Trefoil, St John's wort, and dili Hinder witches of their will."

Fleur-de-lys.—At the head of heraldic flowers, if flower indeed it be, is the flewr-de-lys (fig. 60), the Flos gladiolt of Upton, said to havo been brought

down by an angel for the arms of France, and which was certainly used by Louis VII. and borne singly and in numbers by Philip Augustus. It may be allied to the lily—

“The lily, lady of the flowery field,

Or fleur-de-luce, her lovely paramour ;” or its original designation may have been “ Fleur de Louis.” It was not at first popular either in Normandy or in England, oc- curring but twice in the roll of Henry III., and only twenty times in that of Edward II., nor was it until its assumption by Edward III. that it came into general use in England. The Cantilupes bore three fleurs-de-lys before they added the pards’ heads (fig. 98). Digby of Coleshill: azure, a fleur-de-lys argent. Portman of Orechard-Portman: or, a fleur-de-lys azure. Beaumont, to show his elaim to descend from the blood-royal of Franee, bears azure, semée of fleurs-de-lys, a lion rampant or.

Hawkins: argent, on asaltire sable a fleur-de-lys or. New College, Oxford: sable, three lilies slipped argent.

The Rose (Flos florwm) is a very popular charge in English heraldry, though in the roll of Henry III. it occurs but once, and in that of Edward II. only twelve times. Usnally the flower is borne alono and full-faced, with five petals, and barbs and_sceds

betweenthem. If astalk is shown, it is usually “ slipped,” that is, cut off obliquely. were Boseawen-Rose: ermine, a rose gules, barbed and seeded proper

Bilson, bishop of Winchester: azure, a rose and pomegranate impaied dimidiated, Sules and or, barbed, seeded, stalked, and slipped counterchanged.

The rose is also used in the chaplet, a favonrite head ornament, of which a good example may be seen upon the conical helmet of Humphrey de Bohun (1267), in Gloucester cathedral. After the gallant defence of Calais in 1348, in which Edward and the Black Prince served under Sir Walter Manny, the king was so pleased with the valour shown by his prisoner Eustace de Ribcaumont that he took a chaplet from his own head and gave it to Sir

Eustace with his liberty, bidding him " wear it for a year for the love of me." Greystoke; barry of six, argent and azure, three ehapicts guies.

HERALDRY

[COMMON CHARGES.

Tho Trefoil, Quatrefoil, Cinguefoil, and Sixfoil are all common charges, usually but not always borne, liko the rose, without a stalk.

Harvey of Iekworth: gules, on a bend argent three trefoils slipped vert.

Vincent of Stoke D'Abernon: azure, three quatrefoils argent (fig. 115).

Robert de Bellomont, ear] of Leicester (1191-1220), sealed with a cinquefoil, bear- ing on each foil an ermine spot; and Robert de Quincy, the son of one of Earl Robert's sisters, bore "de goules ung quintefoil de hermyn."

Umfraviie of Penmark: gules, a sixfoil or.

Fig. 115. Fig. 116. Fig. 117.

The Thistle, which gives name to the Scottish order, is also an heraldic bearing in that country.

Leaves, feuilles, are borne by Leveson and Foulis; hazel leaves by Hazlerigge of Noseley ; strawberry leaves, or fraises, by Fraser of Lovat; walnut leaves by Waller ; oak leaves by Oakes ; by Elmes of Lifford, elm leaves ; rye and barley or orge by Rye and Grandorge. Bigland bears three ears of big.

Wood and Borough bear trees rooted up or eradicated.

Borough of Chetwynd: gules, the stem and trunk of a tree eradicated and couped, sprouting in two branches argent,

When Queen Elizabeth visited Worcester the citizens transplanted a pear tree laden with fruit into the market-place, for which atten- tion she added

pears to the city arms. Warden abbey, Beds, was famous for a pear that bore its name and constituted its arms— azure, three Warden pears or. The kingdom of Granada bore i a pomegranate slipped proper. Serjeaux bore argent, a saltire sable between twelve cherries slipped gules.

The Garb, gerbe, or wheatsheaf, was a common bearing, especially in Cheshire. Sometimes the garb is banded of a different colour. Grosvenor: azure, 4 garb or.

Vernon of Shipbrook : or, on a fess three garbs of the field.

CELESTIAL FicuRES.—The Sun was the cognizance of Louis XIV. , with the overbearing motto, " Nec pluribus impar." In heraldry this was blazoned as " the sun in his splendour."

Jean de la Hay bore argent, the sun in his splendour gules.

Ralph de la Hay, temp. Henry III., differenced this coat by bearing only a ray of the sun, '"' blane, ung rey de soleil de goules."

Sir John Aldam, temp. Edward II.: azure, a ray of the sun or. In both examples the ray issues from the dexter chief, and is borne bendwise. It resembles a pile wavy.

John de Fontibus, bishop of Ely, 1220-25, bore the sun, moon, and seven stars,

2,1,2,1,2,1.

The Jfoon is always borne as a crescent, and usually with the con- cavity upwards. If this be to the dexter it is inevescent, if to the sinister, decrescent. It is an early and general charge, though seldom borne singly.

Chapman: per chevron argent and gules, a crescent counterchanged.

Wel@: azure, a fess nebulé between three crescents ermine.

Baron of co. Lincoln: azure, in chief two moons inereseent and decreseent argent, in base an estoile or.

The seal of Sir Lawrence de Berkerolles, 1392, gives a chevron between three ereseents (fig. 118).

The Star, or estoile, is usually shown with six rays, wavy, and is thus, and by not being pierced, distinguished from the mullet. If there be more rays the number must be given.

Ingilby of Ripley: sable, an estoile argent. :

One of the branches of De la Hay bore ar- gent, an estoile of sixteen rays gules.

Sir Francis Drake, in memory of his voyages, bore sable, a fess wavy be- tween the aretic and antarctic pole stars argent.

MAN AND His Parts.—Tho full human figure is very rarely borne in coats of arms. In Scotland the Dalzells bear sable, a naked man with arms extended, proper; formerly he was borne suspended from a gibbet.

Wood: azure, three salvage men ambutiant in fess, proper; in their dexter hands a shield argent charged with a cross guies, in their sinister a ciub resting on their shoulders, also proper.

Mr Way mentions an MS. at Melton, in which two knights are

represented tilting before a French princess, one of whom bears for

a coat three demoiselles caged in a basket.

Canning of Foxeote: argent, three biackamoors' heads eouped sabie, capped or, fretty gules.

Fig. 118,

COMMON CHARGES. |

Tremaine of Colacombe: gules, three dexter arms conjoined at the shoulder, flexed in triangle, or, fisted argent.

Maynard: argent, three sinister hands eouped at the wrist gules.

Foljambe of Walton bears a man's leg for a erest.

The Isle of Man: gules, three legs armed in mail proper, garnished and spurred or, conjoined at the thighs and flexed in triangle, a bearing eertainly in use as early as the reign of Edward E., and possibly earlier (fig. 116).

A very extraordinary bearing is that granted to Peter Dodge of Stopworth, Cheshire, by Guyenne king-at-arms, 8th April, 834 Edward 1, for services in battle, " Porter a son eseu d'or et sables, barré de six pitees et ung pal gules, avee une mamelle de femme dégoutante." It is said to be the earliest example of a grant of arms by a herald. Happily for heraldry there are not many such.

Newton: sable, two shin bones saltire-wise, the sinister surmounted by the dexter, argent,

Douglas: argent, a man's heart gules, ensigned by a royal erown prorer, on a ehief azure two stars of the first.

The "quingue vulnera" or five wounds of the crucifixion are a comnion ecelesiastical bearing on architectural shields, and several bishoprics bear figures of saints on their shields, but these are scarcely within the limits of proper heraldry. Thus the arms of the see of Chichester are—

Azure, Presbyter John mitred, seated on a tombstone, in his sinister hand a mound, his dexter extended, all or. In his mouth a sword fesswise argent, hilted and pomelled or, the point to the sinister.

MiscELLANEOUsS OzsEcTs,—Helmet.—The helmet completed the knight's equipment. He wore "l'ecu au cou, son heaulme sur la téte, et son glaive au poing," or,

"His helm of latoun bright, His saddel was of revell bone,

His bridle as the sun shone, Tlis spere was of fine eypress."

*Halliday of Hungerford: sable, three helmets argent, garnished or, with a border engrailed of the second. The motto referring to the omitted fourth helmet is exeeedingly happy, ** Quarta salutis."*

Morion, or steel cap.

Brudenel of Deno: argent, a ehevron between three morions sable.

Gauntlet.

Gunter of Tregunter: sable, three dexter gauntlets or.

The Sword is much used in heraldry; it was the oldest weapon and that most thought of. The soldier in all time was the man of the sword. Damascus, Cologne, Bilbao were in turn famous for the manufacture, as was among smiths Andrea di Ferrara, The swords of great soldiers have been celebrated: Bhowanee as the sword of Sivajee, Excalibar of Arthur, Taillefer of Coeur de Lion—

/ ' Sechwafurlama's magie blade

Was by dwarfs at midnight made." There was also the weapon by which Roland, with "huge two- handed sway," cleft the pass of Roncesvalles, " And to the enormous labour left his name."

The sword of Talbot bore "Sum Talboti pro vincere inimicos suos,"—" Bad Latin," says Fuller, "on it, but good steel in it." King John gave his own sword to the town of Lynn Regis with the inscription, " Ensis hic donum fuit regis Joannis, a suo ipsius latere datum." The sword of heraldry is two-handed.

Kilpee of Kilpee: argent, a sword bendwise sable.

The Axe was reckoned a manly weapon—

***King Richard, as I understond, Yet he went out of Englonde, Let make an axe for the nones, Therwith to erush the Saracens bones.*

Thereon were twenty pound of steele." The Danish battle-axe was famous. Walter de Plumpton held Plumpton by the tenure of a Danish axe that hung up in his hall there. Haekluyt: gules, three Danish axes or.

Lance.—The arms granted to Shakespcare's father were, or, on a bend sable a lance of the field.

Spear Head.—This is a common bearing among the Welsh of Glamorgan and Brecknock, and used by Jones of Fonmon : sable, a chevron between three spear heads argent, points embrued gules. It Ae quartered by Lewis of Greenumeadow, a cadet of Vau, and by others.

The Arblast, or cross-bow, was a most unpopular weapon, as ga no strength or manliness for its use. Richard I. is gene- rally said to have met his death from a cross-bow ; but the earls of Aberdeen, who claimed to represent Bertrand de Gourdon, bear as their crest two arms drawing a long bow. The cross-bow was forbidden by Innocent II. and the emperor Conrad at a council in 1139. Guillaume de Déle, who wrote before 1200, says of this weapon—

"Par effort de lanee et d'eseu, Conqueront toy ses ennemies Ja arbalétrices nu fu mis, Por sa guerre li autoritez." Nevertheless as early as 1270 the master of the cross-bows was a great officer of the Freneh crown.

Arblaster: ermine, a eross-bow in pale gules.

The Bow, though formed of Spanish yew, was essentially an English weapon. Tt occurs in heraldry, though scarcely so frequently

as might have been expected, and chiefly in allusion to a name. The belt or baldrick, sheaf of arrows, buckler, and sword com- pleted the equipment of an areher— " Their baudrieks set with studs, athwart their shoulders east,

To which, under their arms, their sheaves were buekled fast;

A short sword at their belt, a buekler searece a span,

Who struek below the knee, not eounted then a man.

All made of Spanish yew, their bows were wondrous strong ;

They not an arrow drew but was a elothyard long.

Of archery they had the very perfeet eraft."

The bow was used by the English in the attack on the isle of Rhé in 1627. Bowes of Streatlam: ermine, three bows palewise strung gules (fig. 117). The Arrow.—Drayton describes " Their arrows finely paired for timber and for feather,

With bireh and Brazil piereed, to fly in any weather;

And shot they with the round, the square, or forked pile,

The loose gave sueh a twang as might be heard a mile." The burgesses of Sheffield seal with a sheaf of arrows,

Birdbolt, or bozon. William de Gresley held a manor " per unum areum .. . ef unam bozonem." Bozon of Barrowby: argent, three birdbolts gules, feathered or.

The Pheon, or broad arrow. Sydney of Penshurst: or, a pheon azure (fig. 119). Floyer of Floyer's-Hayes: sable, a ehevron between three broad arrows argent. In heraldry arrows are usually drawn as clothyard shafts. The pheon is always drawn with the head only.

Besides these, and also more or less connected with war and the chase, are the buckle, barnaele, ealthrop, castle, fireball, hammer, horse-shoe, hunting horn, maul, pick, spur, stirrup, and some hundreds of miscellaneous objects, travelling so far out of the legiti- mate charges of heraldry as to include apples and acorns, beehives, and aturnstyle. A very fewof the most ancient have been selected. Walter Agard held Tutbury under Henry IIL. by a white hunter's horn, and bore

for arms, argent, three hunters' horns sable.

The Chain borne by the kings of Navarre, the puzzle and delight of Freneh heralds, "gules, a trellis of ehains or, in cross and saltire," also blazoned " gules, a carbuncle closed and pomelled or," or by the Spanish heralds—'"' cadenas d'oro atronesados en campo de sangre."

The Annulet, said to be a link of mail.

Musgrave of Edenhall, derived from Vipont: azure, six annulets or, 3,2,1. Lowther also derived his arms, or, six annulets sable, 3,2,1, from the same sourec.

Calthrop—a four-spiked implement, so arranged that when thrown on the ground one spike always stood upright. Calthrops were used to keep off cavalry. Bruce used them at Bannockburn, and among the stores at Dover castle, 16 Edward III., was a barrel containing 2900 calketrappes. Froissart says the English on one occasion supplied their place by sticking their spurs into the ground. Tlorseman: or, three ealthrops gules (fig. 120).

Fig. 119,

Fig. 120. Fig. 121, Fig. 122.

Castle.

Hill: ermine, on a fess sable a eastle triple towered argent.

Comb—a singular bearing of high entiquity borne by Ponsonby of Ponsonby and Tunstall of Thirland.

Cups.

Argentine: argent, three eups gules. Cushions, oreilliers. Earls of Moray: argent, three pillows gules. Maheu de Redman, in the roll of Henry III.: de goules, a trois horeilers d'or, Possibly these are birds.

Tiara.—The Dukes d'Urbino bore a papal tiara.

Crowns (mural, naval, and others) and mitres are not uncom- mon in arms. The Berkeley crest is a mitre. The erancelin or crown of rue was used in 1150 by Saxony. Bernhard of Anhalt bore barry of eight or and sable, a crancelin vert. :

Mullet.—This is usually ealled a spur rowel, but it was in use long before the rowelled spur. Besides being employed as a differ- ence, it is a constituent of numberless coats of arms.

Assheton of Downham: argent, a mullet piereed sable.

But it is generally borne in numbers (see fig. 15).

The Lymphad or galley. The bearing of the Lords of the Isles, denctaredl by the dukes of Argyll for Lorne, is argent, a lymphad, sails furled and oars in action, all sable, flags flying gules (fig. 121).

The Mauneh, or lady's sleeve—

'"A lady's sleeve high-spirited Hastings bore."

The earls of Pembroke bore or, a maunch'gules; those of Hunting- don bear argent, a maunch sable. It was borne also by Flamville, Wharton, Maunsel, Conyers, and many others. Bayard took a lady's

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sleeve and proclaimed it, with a valuable ruby, as a prize to be con-

tended for. Bayard himself won it, and the lady wore it for his sake.

Fig. 123 is from the seal of John de Hastings, 1291.

The Battering-ram is borne by the Berties, earls of Lindsey, sometime dukes of Ancaster, with the allusive motto, '¢ Virtus ariete fortior"' (fig. 122).

The Escarbuncle was a very early bearing of the Mandevilles. It isa cross of eight rays, set with knobs and the arms cnding in fleurs-de-lys. In another form the ends are connected by cross-bars. The escarbuncle / 7% of the

reign of Henry III. resembles the {(/f9 iron work on doors of that period. i at Blount of Bitton: argent, two bars azure, over all

an escarbunele of eight rays gules, fleurettée and

*pomettée or. *

*Among musical instruments the Clarion *X is borne by Granville, and is seen on tiles at Neath abbey. It resembles a pan-pipe. The Trumpet is seen on the fine Trumping- ton brass near Canibridge.*

Williams of Thame: azure, two organ pipes saltier- wise, the dexter over the sinister, between four saltires argent.

The Water Budget or bucket is an early charge identified with the names of Ros and Rose. Ros, however, got it from the Trusbuts of Belvoir, who possibly bore it as lords of Watre in Holderness.

Z

: “om

Fig. 123. Mr Planelié has discovered a

drawing of a pair of water budgets in actual use. They were of leather, and carried in pairs on a stick over the shoulder.

DEBASED HERALDRY.

Of debased heraldry there is no lack of examples, and a few are ancient, Thomas de Insula, bishop of Ely (1345-61), bore gules, three bezants, on each a crowned king, robed sable, doubled ermine, sustaining a covered cup in his right hand and a sword in his left, both or. No doubt, like the arms of the sees of Chichester and Salisbury, this extraordinary coat was meant to be painted on a ban- ner. Camden granted a great number of coats, mostly of a complex character, and since his time heraldic taste has not improved. Tetlow (granted 1760) bore “on a book erect gules, clasped and leaved or, a silver penny argent, thereon written the Lord’s Prayer; at the top of the book adove proper, in his beak a crowquill pen sable.” Other

grants show negroes working in a plantation, Chinese porters carrying cinnamon, &c. The grants to Lord Nelson and his gallant captains, and to the elder Herschel, are utterly unheraldic. It can scarcely be wondered at that Lord Chesterfield, correcting the Garter of his day, re- marked, "You foolish man, you don't understand your own foolish business."

DIFFERENCES AND MARKS OF CADENCY.

The object of an armorial bearing having been to dis- tinguish one iron-sheathed warrior from another, it was necessary to provide bearings for the members of a family, all entitled to take the paternal coat. This was managed by the introduction of a difference (French, briswre), usually some slight but well-marked alteration, sometimes by in- verting the tinctures, sometimes by changing an ordinary or a smaller charge, as a bend for a fess, or a crosslet for a martlet. Where an heiress had been married a part of her coat was often introduced. The object was with a suffi- cient difference to show the connexion with the head of the house. The following examples are from the families of Hastings and Zouch. Females, who wore no armour, did not need distinguishing marks, and bore the coat unbroken. Sir John Hastings bore (see fig. 128) or, a naunch gules, called "'le

de plein armes."' Sir William Hastings bore the same, with a label of Pembroke.

Sir John Hastings bore the same, with a border of Valence. Sir Edmund Hastings bore the same, with a label vert.

HERALDRY

[DIFFERENCES. _

Sir Nicholas Hastings bore the same, with a label azure. Sir Miles Hastings bore or, a fess and a chief, three mullets gules. Sir Philip Hastings bore the same, with a label azure. Sir Robert Hastings bore ermine on a chief azure, three mullets or. The label of Pembroke and border of Valence show the match with the heiress of Valenee, earl of Pembroke. Sir Miles formed a distinct branch, that of Daylesford, probably before armorial bearings were fixed; his descendants, however, returned to the maunch, Sir Alan la Zouch

bore gules, bezanty. Sir William la Zouch bore the same, with a quarter ermine. Sir William la Zouch bore the same, with a label azure. Sir Oliver la Zouch bore the same, with a chevron ermine. Sir Amory la Zouch bore the same, with a bend argent. Sir Thomas la Zouch bore the same, on a quarter argent a mullet sable. The quarter ermine is to show the descent from the dukes of Britanny.

These and many others of an early date are suitable for their purpose; but, as armorial bearings became less actually useful, alterations of a different character crept in. The label, however, retained its place. It closely resembles the strap with pendants which from the saddle crossed the horse's chest. Theearliest example of its use is said to beby Geoffrey, son of Henry II., in 1153, but a more certain case is the seal of Saher de Quincy, though whether there borne as a charge or as a difference is uncertain, At Caerlavrock Maurice de Berkeley bore a blue label "'parceque ces pere vivoit." In Scotland William Fraser, in 1295, uses a label of three points and on each three roses or mullets, probably meant for "fraises" or strawberry leaves. The mullet, crescent, and fleur-de-lys are used as differences about the same time. The label, even then, was most frequently used by the eldest son, but occasionally he used the crescent, and the label was taken by the second son. The royal house generally used the label, but occasionally the border. Edward I., as prince, bore a label of five points azure ; Edmund Crouchback his brother, who married a French princess, charged the label with fleurs-de-lys. His second son, Henry, bore England with a bendlet ermine. Thomas and Edward, second and third sons of Edward I., used labels. Edward IV., as prince, bore on his great seal a label of three, and on his counterseal one of five points. John of Eltham, his brother, bore England with a border of France. The Black Prince, who bore France and England quarterly, added a label argent, and Richard, during his father's life, placed a cross of St George on the middle point. Lionel, third son of Edward IIL., having married the heiress of De Clare and De Burgh, used a label and on each point a canton gules, said to be the original arms of De Clare, and on his seal as earl of Ulster each point bore a cross for De Burgh. The number of points was matter of indifference, though usually confined to three. The label itself was, on the whole, and has continued to be, a mark for all the princes of the royal house.

Setting aside the royal family, a new system of differ- ences came into use, and is touched upon by Upton early in the 15th century, though then but imperfect. He gives the crescent to the eldest son, and to the others the label with three or more points in succession. Dame Berners, in 1486, besides employing the billet, crosslet, and other marks, describes a method of differencing by "'gerratting," that is, powdering the field with billets or other charges, but the good lady's coats are often mere fancies. The first regular appearance of the modern system is on the effigies of seven Beauchamp cadets in St Mary's windows at War- wick. There the label, annulet, crescent, martlet, fleur- de-lys, and mullet indicate the several cadets. The label is placed in chief, the rest on the fess point of each surcoat.

The modern marks now regularly admitted are—(1) the label of three points ; (2) the crescent ; (3) the mullet ; (4) the martlet ; (5) the annulet ; (6) the fleur-de-lys; (7) the

rose; (8) the cross moline; (9) the octofoil (fig. 124). The elder son of the elder son places a label upon a label, the second a crescent, and so on, so that the ninth son of a ninth son would bear an octofoil upon an octofoil, pointing out the relationship of each member to the parent stock. Practically, however, marks of cadency are but seldom

7. 8.

Fie. 124.—Marks of Cadency. used, The earls of Harrington indeed, descending from the second son of a second son, place a crescent upon a crescent. Lords Abergavenny and Braybrooke difference their Neville saltire with a rose, as springing from the seventh son of Ralph, earl of Westmoreland. On the other hand Lord Derby, though a cadet, bears his arms unbroken.

Marks of Illegitimacy are very various, and on the earlier coats not to be distinguished from differences. Probably the earliest English example is afforded by Wm. Longspee, natural son of Henry II., who bore six lioncels, no doubt derived from his father, though usually attributed to his wife Ela,

heiress of the earldom of Salisbury. His counterseal bears the long sword whence he derived his name. 'The sons of Richard, brother of Henry III., bore their father's lion of Poitou, inverting the colours, until Sir Geoffrey Cornwall took prisoner the duke of Britanny, when he changed his field to ermine. In the roll of Ed- ward II., Sir John Lovel le Bastard bore Lovel, usually or and gules, with 'un label d'azur." Sir Roger Clarendon, son of the Black Prince, has already been mentioned (page 701). John Beaufort, son of John of Gaunt, bore per pale argent, and azure on a bend gules three lions of Eng. land, with his father's label. After his semi-legitimization he bore England with a border gobonny argent and azure, the Lancaster colours. Arthur, Viscount Lisle, son of Edward IV., placed a baton over his father's arms, Sometimes the father's coat was altered. Sir John Stanley bore a coat compounded of Stanley and Lathom. Sometimes a baton sinister was added, sometimes a border. Strictly a natural son does not adopt his father's quarter- ings, unless such as are habitually borne conjoined, as the royal arms. The descendants of Charles II. bear the whole arms with a baton sinister or border ; those of William IV. the baton. With the house of Bourbon the baton marked the cadets, the baton sinister the bastards. Sir Gilbert Tal- bot (1569), son of a bastard son of Sir Gilbert: Talbot, was allowed Talbot and the usual five quarterings of the family, with a bendlet sinister over the whole, but this is unusual.

Rutezs oF BLazon.

To blazon a coat of arms is to describe it in the technical language of heraldry; and, although the works of the fathers of heraldic lore contain much irrelevant matter, and some confusion of arrangement, the rules of blazon, by whom- soever devised or perfected, are remarkable for their pre- cision, brevity, and completeness. Great and successful caré has been taken to produce clear and simple order, to avoid repetition, and to preserve a certain uniformity of arrangement through much complexity of detail. The technicalities arise in great measure from the use of terms once well known, and the language, as was to be ex- pected, shows traces of the French and Franco-Norman channels through which the "gentle art" reached England.

First comes the description of the field, its colour, or the arrangement of the colours (if more than one), and the character of the partition lines when parted. Thus the "parma inglorius alba" would be blazoned "he beareth argent." The coat of Waldgrave is per pale argent and gules ; that of D'Ebroicis, earl of Gloucester, was "per pale dancette argent and gules,"

Next follow the charges, and first those of most im- portance and nearest the field, their name, number, and position (if an animal, its attitude), and finally the colour. The principal charge is that which occupies the principal position, Thus Backhouse of Kellet bore party per saltire, azure and or, a saltire ermine ; Bigland of Bigland, azure, two ears of bigg or. Where the principal charge is an ordinary placed between smaller charges, it follows the field: Foliot,—or, a fess between two chevrons gules. The same rule holds where the ordinary is charged, as in Braith- waite of High Wray,—gules, on a chevron argent three cross crosslets fitchy sable; or when the two are combined, as Kerr of Cessford,—vert, upon a chevron between three uni- corns' heads erased argent, horned and crined or, as many mullets sable. Where the ordinary may be charged, but does not admit of being placed between charges, it is blazoned thus: Russell,—argent, a lion rampant gules, on a chief sable three escallops of the field. If the field be semée of figures (¢.¢., besprinkled with them in regular order) they follow it: Pierrepoint,—argent, semée of cinquefoils gules, a lion rampant sable. Had the cinquefoils been on the lion instead of on the field the blazon would have run, argent a lion rampant sable, semée of cinquefoils gules.

The arrangement of common charges has already been explained (page 698, fig. 85) :—if one, central ; if two, per pale ; if three, 2 and 1; if more, as must be specified, as in Babington (fig. 9). Such diminutives as are borne in pairs follow their ordinary: Cludde,—argent, a bend between four cotises sable. To avoid repetition, if a tincture occurs twice reference is made to the first: Scott of Abbotsford, —or, two mullets in chief and a crescent in fess, azure, within an orle of the last; and so if the same number of charges occurs twice, the words "as many" are used: Maling of Scarborough,—ermine, on a chevron vert between three hawks' jesses as many roses argent. Upton, who wrote in Latin, is put to strange shifts to express his mean- ing. He thus blazons the arms of Mortimer (fig. 63) :—

“ Portavit arma barrata, et caput scuti palatum est et angulatum de azorio et auro, cum quodam scuto simplici de argento.” In heraldic French this is, “I1 portoit barrée et ung chef palée cunetée d’asur et d’or, et ung escu simple d’argent.”

The following, from Menestrier, is the full blazon of thie arms of the old kings of France :—

D’asur a trois fleurs-de-lys d’or 2 and1. Escu timbré d’un casque ouvert d’or placé de front, assorty de ses lambrequins d’or et d’asur, couronné de la couronne imperiale Frangoise, entouré des colliers des ordres du St Esprit et St Michel, soutenu par deux anges vetus en Levites ; la dalmatique des émaux de l’escu tenant chacun un baniere de France ; le tout placé sous un grand pavillon d’asur fleur- de-lisé d’or doublé d’ermines ; le comble rayonné d’or et couronné de la couronne imperiale Frangoise. ‘

Le dit pavillon attaché 4 la baniere ou oriflamme du Royeaume. Cri du guerre, “ Montjoye St Denis.” Devise, ‘ Lilia non laborant neque nent,” alluding to the operation of the Salic law.

MARSHALLING ARMS.

Marshalling is the disposing or arranging of such coats of arms as have to be included in one shield. Blazoning deals with the particulars of each coat, marshalling with its posi- tion as regards other coats. Arms may be arranged per pale or impaled, or the shield may be divided into as many squares as may be required, when it is said to be quartered. The first coat, that of the bearer, may or may not be repeated in the last quarter as may be required to make up an even numn- ber of squares, which, though not necessary, is desirable.

For a time armorial bearings were purely personal, and intended to supply a want only felt by the wearer of armour. Hence, at first, females do not seem to have used them, and when a place was found for them on armorial

seals, the coat was regarded as that of their father, and therefore not differenced. Fora time they seem to have had a separate shield. On one of the seals of Margaret of France, queen of Edward IL, his three lions are displayed upon the point of her tunic, and on her right hand is a shield of France, on her left, one with a lion rampant. On the reverse is a shield of England, and around it, outside, a border of France. Margaret Bruce of Skelton married Robert de Ros. Her seal (1280) bears her effigy, somewhat defaced, so that nothing can be distinguished on her dress, but on her right is a shield of Ros, on her left one of Bruce.

A well-known seal, date about 1347, is that of Joan, daughter of Henry count of Bax, by Eleanor daughter of Edward I. by Eleanor of Castile, Joan was widow of Warren, earl of Surrey. Her seal is circular, with nine compartments. In the centre is Warren for her husband ; above and below, England for her grandsire; right and left are two barbels for her father. These four are on lozenges. 'In the four corner compartments are—(1) and (4) a lion for Leon, and (2) and (3) a castle for Castile, for her grandmother. This is a sort of nebulous quartering.

To this succeeded the allotment to the wife of the sinister half of the husband's shield, displayed as though two shields had been divided vertically and united, omitting therefore the adjacent half of each coat. This is called dimidiation, and the shields so joined constitute an im- palement. Another seal of Margaret of France illustrates this practice. Init half of England impales half There is a good example of dimidiation in the tomb of William de Valence at Westmin- | ster, where Valence impales Clermout-Nesle, both dimidiated. An early German seal combines half an eagle with half a lion in this way. The arms of the Cinque Ports are remarkable examples of dimidiation. In each,

Fig. 125. the lions of England are dimidiated with the arms of the

special Port. That of Hastings (fig. 125) is party per pale dimidiated, Dexter, gules, three lions passant gardant or ; Sinister, azure, three demi-hulks of ships argent. Sometimes one of the coats only was dimidiated. Eleanor (Montendre) was widow of Guy Ferre. Her seal (1348) has a shield of Ferre, a cross moline and over it a baton, dimidiated, impaling Montendre, a lion within an orle of trefoils. The lion is whole. The seal of

Elizabeth, wife of Sir Lawrence Berkerolles (fig. 126),—azure, a chevron or, between three crescents argent, impaling a lion rampant,—is a good example of an impalement without dimidiation (date 1392). Usually the lady has the sinister side, but in the seal of Marion, wife of Sir William Dalziel (1392) this is reversed, as it is in the im- paled shield of John of Gaunt, ; where his wife, a daughter of Fig. 126. Peter of Castile and Leon, has the dexter. side. Dimidi- ation is not applicable to all coats. A canton on the sinister coat would be lost, and a chevron be converted into a bend. The tressure, orle, and border were usually, not always, dimidiated; and although this form of im-

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palement has fallen into disuse, these charges are still borne dimidiated, as may be seen with the border and tressure on the tomb of Mary, queen of Scots.

When the Jady was the last of her race, various modes were devised for the conservation of her name and arms. Thus on the death (1193) of Robert de Lacy, last of the line of Pontefract, John, constable of Chester, half-brother to Robert by his mother, took the name and arms of Lacy, and was ancestor of the earls of Lincoln of that name. In the same century Isabel, heiress of Earl Warren, married Hamelin Plantagenet, who took the name, and their chil- dren bore the arms of Warren; and so with the Mandevilles, earls of Essex.

Sometimes a coat was compounded of the two families. Thus Mr Planché is of opinion that the bend was added to the paternal coat of Bohun, on the marriage with the heiress of Milo, earl of Hereford. Scottish seals show many examples of such composition. Eustacea Colvile, widow of Reginald

le Chein, in 1316, bore a cross moline, square pierced, for Colvile, between four cross crosslets fitchy for Chein. About the middle of the 14th century began the practice of placing the arms of females upon a lozenge. As early as 1347 Elizabeth D'Arcy so bears her arms, as in 1356 does Maud Fitz Payne. The seal of Joan Beaufort, widow of James I, affords the earliest Scottish example.

The first step towards a regular method of preserving heraldically the memory of a family extinct in the male line seems to have been taken in Spain by a process now known as quartering. Eleanor of Castile, queen of Edward I. has upon her tomb a shield divided into four quarters, in the first and fourth of which is Castile, and the second and third Leon. The practice, though not finally regulated, was approved, for on the seal of the 'She-wolf of France," queen of Edward II., the shield is quartered (1) Eng- land, (2) France, (3) Navarre, (4) Champagne, mixing up confusedly the arms of husband and wife, as they also are upon the shield of Philippa of Hainault, queen of Ed- ward III., who bore quarterly, (1) and (4) England, (2) and (3) Hainault and Holland. A very early instance of regular quartering occurs in the will of Humphrey Bohun, earl of Hereford, dated 11th August 1319, by which he be- queaths a courte-point quartered with the arms of England and Bohun. This is five years before the accession of Edward III., and makes it probable that the quartered coat of William de Foix at Winchester is original.

Under Edward III. quartering came into general use. The king led the way by quartering France and England, and the earl of Pembroke followed, quartering Hastings and Valence. John Hastings, his son, commemorated on his shield his father's match with Ann daughter of Margaret, duchess of Norfolk, a co-heir of Thomas of Brotherton, and this affords an early instance of the precedence often given in quartering to the royal arms. John Hastings bore quar- terly of four—(1) and (4) Brotherton (Plantagenet), (2) Hastings, (3) Valence ; and, on another example—(1) and (4) Brotherton, (2) and (3) Hastings quartering Valence. This latter arrangement of sub-quartering shows a consider- able advance inthe system. Henry IV. combined quarter- ing with dimidiation in a shield long preserved in the window of Christ Church, Newgate, which bore France and England quarterly, impaling France with a bend gobonny, and Navarre quarterly,

dimidiated, for Joan of Navarre. In this case the Ist and 3d quarters were removed, and the sinister bearings thus reduced to what may be better blazoned as party per fess, (1) Navarre, (2) France, The French sometimes quartered diagonally, called " Kcartéle en sautoir." The old kings of Sicily thus divided their shield : party per saltire, (1) and (4) Aragon, (2) and (3) Swabia. This plan never found favour in England, where

a regular system of quartering sprang up, and has continued in use.

At first the arms of an heiress were impaled by her husband, but latterly they were placed on a central inescutcheon designated an escutcheon of pretence. The

1. Ralph de Monthermer.

children divided the shield into four quarters, and placed

the paternal coat 1 and 4, the maternal 2 and 3. If a

second heiress came in, she was placed in No. 3; if a third,

in No. 4; if more, the shield was divided as required,

The following pedigree will explain the system. In it all

the descents that did not bring in an heiress are omitted. 4, Waleran de Newburgh

5. Wm. Mauduit=4. Alice.

2. John de Montacute=1. Margaret. 6. Wm. Beauchamp=5. Isabel. 7. Hugh le Despenser=8. Alianor de Clare.

38. Richard Neville=2. Alicia.

| 3. Richard ae Anne.

| 6. Richard Beauchamp=7. Isabel.

| 9. Geo. D. of Clarence =3. Isabel.

Monthermer : or, an eagle displayed vert.

Montacute: argent, three fusils conjoined in fess gules.

- Neville: gules, a saltire argent.

. Newburgh : ehecquy or and azure, a chevron ermine.

. Mauduit: argent, two bars gules.

Beauchamp: gules, a fess between six cross crosslets or.

. Le Despenser : quarterly, 1 and 4 argent, 2 and 8 gules, a fret

or, over all a ribbon sable.

De Clare: or, three chevrons be

. Clarence : quarterly France and England, a label of three points argent, each charged with a canton gules,

. Gloueester : quarterly France and England, a label of three

points ermine, on each point a canton argent.

The armorial bearings of each generation will be as fol-

lows :—

1, Monthermer alone. 2. Montacute impaling Monthermer. 3. Neville impaling quarterly, 1 and 4 Montacute, 2 and 3 Monthermer. 4. Newburgh alone. 5. Mauduit impaling Newburgh. 6. Beauchamp impaling quarterly, 1 and 4 Manuduit, 2 and 3 Newburgh. 7. Le Despenser impaling De Clare.

6. R. Beauchamp: quarterly of four—l and 4 Beauchamp, 2 Mauduit, 3 Newburgh; impaling quarterly of four—1 and 4 Le Despenser, 2 and 3 De Clare.

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Fig, 128.—Seal of Richard Beauchamp, earl of Warwick.

They represent the great seals of Richard Beauchamp, earl of Warwiek, who married Isabel le Despenser, and Richard Neville, earl of Warwiek, who married Anne Beauehamp.

Beauchamp quarters the arms of his wife, but makes De Clare impale Le Despenscr, while he himself impales Newburgh. The

| 10. Richard D. of Gloucester (Richard III.) =3. Anne.

3. R. Neville: quarterly of four—1 and 4 Neville, 2 Montacute, 3 Monthermer ; impaling quarterly of six—1 and 6 Beau- champ, 2 Mauduit, 3 Newburgh, 4 Le Despenser, 5 De

are. 9. George, duke of Clarence: France and England quarterly, impaling Isabel Neville quarterly of nine—1 and 9 Neville, 2 Montacute, 3 Monthermer, 4 Beauchamp, 5 Mauduit, 6 Newburgh, 7 Le Despenser, 8 De Clare.

The above, being a well-known and very noble pedigree, has been selected toillustrate the system of quartering, which is explained by the shield (fig. 127), thus emblazoned :—

1, George, duke of Clarence ; 2, Neville, who brings in 3, Monta- cute ; 4, Monthermer ; 5, Beauchamp, who brings in 6, Mauduit ; 7, Newburgh ; 8, Le Despenser ; 9, De Clare.

Unfortunately the several bearers of these arms were fanciful, and some- times gave precedence to one and some- times to another coat, and indeed

never used the whole, which would have crowded their shields and caparisons. The four woodcuts, figs, 128-31, will illustrate this. Fig. 127,

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Fig. 129.—Counterseal of Richard Beauchamp, earl of Warwick.

blazon would thus be quarterly of four grand quarters—I. and IV., Beauehamp impaling Newburgh ; II. and III., De Clare im aling Le Despenser (fig. 128). On the counterseal (fig. 129) the earl bears on his shield Beauchamp and Newburgh quarterly, and on his caparisons

'Beauchamp, Newburgh, De Clare, and Le Despenser also quarterly.

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The other is the seal of the king-maker. As lord of Glamorgan |! he gives precedence to De Clare and Le Despenser, and bears quarterly of four grand quarters—I. and IV. quarterly, De Clare and Le Despenser; II. and III., Montacute and Monthermer ; Neville not appearing at all. The crests are those of Beauchamp and Montacute. muzzled, and below are ragged staves for Beauchamp (fig. 130).

Fa, 130,—Seal of Richard Neville, earl of Warwick.

The rules were also departed from where the royal arms were quartered, as by Devereux, Hastings, and Stafford, when it was usual to place them in the first or second quarter out of their genealogical order. Also in certain cases the quarterings of an heiress are not broken up, but borne combined as a sub-quarter, sometimes called a grand quarter. Thus the royal arms always form a special quar- ter, and probably the arms of Howard, quartering, as they always do, Brotherton, Mowbray, and Warren, would be so treated.

The English mode of quartering is defective, inasmuch as it affords no proof of purity of descent on both sides. A new man whose father married a Talbot or Clinton heiress would combine their ancient quarterings with his

new coat, and few would be the wiser. On the Continent and in Scotland the system is far more perfect, and the quarter- ings include all ancestors and ancestresses of every kind. There a man who can prove the arms of his father and mother has two quarters ; of his grand- father and grandmother, four; and so on. The following scheme, supplied from the family records of Mr C. J. Middleton, registrar of the preroga- tive court, the representative in the male line of a Scottish family, the Middletons of Fettercairn, two. of whom were earls. of Middleton, will explain this. It gives, or nearly gives,

” Fig. 182.

the well-known “seize quartiers,” without which, in former days, scarcely any important office was ever to be obtained :—

HERALDRY

The remaining supporter is the Neville bull, |

[MARSHALLING ARMS.

The counterseal gives on the shield Neville above with a label, and the swan crest on the helmet. The caparisons are quarterly of four grand quarters: I. quarterly—1, effaced ; 2 and 8, Newburgh charged with five pards’ heads, jessant fleurs-de-lys for Cantelupe ; 4, Beauchamp; If. and IIl.—1 and 4, De Clare; 2 and 3, Le Despenser; IV.—1 and 4, Beauchamp; 2 and 38, Newburgh (fig. 131).

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*Fic. 181,—Counterseal of Richard Neville, earl of Warwick. ee ee Pras EF Se ey 2S ee PF ee) Se ee fy bad wm md oy m™ te Mm wm td ZF s & SPREE foe F ae eo 5 gy a PR x as F o > ae nat a ae ec aaa sien ele Blt E74 O7Ta BTa 272 e78 =i oO «2 ES aa 5 we oo] 3 wa = te} els 8/2 81/3 8/2 & ple vile Bla o 5 2 e\6 Ble “|2 8/8 *]| BIE Fie $18 g|F S “PT Fee <4 . 5 ® % s) > wa 3) ° =I 2 © = tar] B a? a Me Fo oop = & nm Q wm icp] Q g & S 5 5 8 e ee a ere 8h Fb tor ia r=) £ . : . oO*

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| John, earl of Middleton. wig

The arms are thus marshalled (fig. 132) :—

Quarterly of 16:—1, Middleton; 2, Gordon; 8, Strachan; 4, Livingston; 5, Ramsay; 6, Wood; 7, Carnegie; 8, Guthrie; 9, Strachan; 10, ; 11, Erskine; 12, Graham; 13, Graham; 14, Erskine; 15, Carnegie; 16, Wemyss.

When John de Foix, count of Candale, was about to marry Joan, daughter of William de la Pole, duke of Suffolk, by Alice Chaucer, the “ probatio nobilitatis ” was sought for, though with little success, in England :—

APPENDAGES, |

‘1, Petitur informatio linee De la Pole, et primo quenam fuerit mater Gl. de la Pole ; 240. Quinam fuerint ejusdem pater et mater; 3tio. Quenam fucrit uxor Thome Chaucer seu mater Aliacie, &c. . . . Placebit arma gentilitia familiarum Pole, Chauceri, et aliarum, qua apponuntur in superioribus loculamentis, indicare, aut pictura cum debitis coloribus, aut scriptura, per armorum figuras et colores.”

This sort of escutcheon at once placed before the eye the heraldic history of the family for four generations.

Bishops, deans, kings-at-arms, and the heads of certain corporations wear their paternal arms impaled by those of their office. No provision is made for the wife.

Single women or widows bear their arms upon a lozenge. Widows and peeresses use their husband’s supporters. Peeresses in their own right use their own. But no lady uses crest or motto.

A commoner who marries a peeress in her own right uses two shields, On the dexter are his own arms with those of his wife on a scutcheon of pretence ensigned with her coronet ; on the sinister the lady's arms alone on a lozenge with supporters and coronet. If the lady be only a dowager peeress, and not an heiress, there are also two shields. On one the husband impales her arms in the ordinary way ; on the other are the lady's arms, é&c., as a widow, impaled by those of her first husband, with his supporters and coronet, but no crest, and the arms in a lozenge.

A baronet of England or Ireland bears a sinister hand couped gules on an inescutcheon se or a canton. It is blazoned "argent, a yy) sinister hand, couped at the wrist and ap- paumée, gules." Those of Nova Scotia bear argent on a shield of pretence, Scotland en- signed with a crown. Fig. 133.

Bacon of Redgrave, the premier baronet, bears gules, on a chief argent two mullets pierced sable (fig. 1338).

A knight of an order surrounds his shield, usually a cartouche, with the ribbon and motto of the order. If married he takes a second and sinister shield, and thereon impales his wife's arms, the whole within a plain ribbon.

A widower marrying a second wife divides his shield tierce per pale, and places his own arms in the centre, his first wife's on the dexter, his second's on the sinister side. For a greater number there is no strictrule. A certain Sir Gervase Clifton who survived seven wives, placed himself in the centre of the shield, and his wives around him. The widow of two husbands may divide her lozenge tierce per pale, and place her first husband on the dexter side, her second in the centre, and herself in the sinister place; or she may divide the dexter half on her lozenge per fess, and place the arms of the first husband above, and those of the second below.

APPENDAGES,

These include whatever is borne outside the shield, as the crest, badge, motto, supporters, helmet, coronet, and some other additions. Strictly speaking, armorial bearings are confined to the contents of the shield; and heralds have never regarded the appendages as of the same importance,

The Crest was the ornament of the headpiece, and afforded protection against a blow. In early rolls of arms it is not noticed. In early seals when it appears it is rarely heraldic. Richard I. wears a sort of fan-shaped ornament, but has a lion passant gardant on the front of his helmet. Edmund Crouchback in 1296 uses distinctly a crest. Of fourteen seals of horsemen in complete armour appended to the barons' letter to the pope in 1301, three only have regular crests, although many have plumes. The three are—Thomas earl of Lancaster and Ralph earl of Gloucester, men of high rank, and Sir John St John, a great military commander. In the 14th century they became general. In 1355 the count of Hainault presented to Edward III. "unam galeam

pretiosam cum apparatu quam idem comes solebat in capite suo gestare." 'This was the crest of the eagle seen on thie count's seal, and which the king regranted at the fords of Annan to Montagu, earl of Salisbury. Edward himself used the lion, which has continued to be the crest of the English sovereigns. Adam de Blencowe (1356-7) had a grant of arms and crest of the Greystoke bearings from William, lord of Greystoke.

Richard Beauchamp, earl of Warwick (died 1439), rests his feet upon the crests of the bear and griffin for Warwick and Montagu. His paternal crest, the swan's head out of a ducal coronet, is placed upon his helmet, beneath his head. The dragon and wyvern were common crests, and the plume of feathers is still used by Scrope and Courtenay. Ralph, Lord Neville of Raby, used the bull's headin 1353; Hastings, a bull's head in 1347. Crests were, like arms, allusive. Grey of Wilton used a "pray" or badger ; Lord Welles, a bucket and chain ; Botreaux, a buttress. The crest was sometimes placed on a ducal coronet, sometimes rises out of a wreath or torse of the colours of the arms. The coronet below the crest is not a mark of rank. In Carlisle cathedral is the crest of Davidson, a bird rising out of an earl's coronet. This, liowever, is rare; the coronet so used is generally ducal. Crests were granted and bequeathed. In Germany it is usual to bear the crests of the "seize quartiers" or some of them. This of course is inconsistent with the actual use of the crest in war. At first crests were con- fined to persons of rank, but they have long been included in every grant of arms. In England two or more can only legitimately be borne when the bearer has from the crown a grant of name and arms in addition to his own, as Chetwynd-Talbot, Fitz-Alan-Howard.

With the crest is usually combined some flowing drapery known as the "panache," "mantling," or lambreguin. This seems to have served to protect the helmet from heat and dust, and was also ornamental. It is represented in great perfection on tombs of the 15th and 16th centuries, commonly of some brilliant colour with a lining and tassels. The tilting helmet which supports the head of the effigy of Humphrey de Bohun (died 1267), at Gloucester, is ac- companied by a grand early specimen of the lambrequin.

The Badge or Cognizance was not worn on the helmet, but displayed upon the persons of the retainers of great barons, and sometimes used to ornament the shield or seal. At the celebrated judicial combat at Coventry before Richard IT. in 1398, Henry of Lancaster appeared with his housings of blue and green embroidered with swans and antelopes, his badges; and Mowbray had housings of crimson velvet, embroidered with silver lions and mulberry trees, his badges. The bear was the Beauchamp badge, derived possibly from Urso D'Abitot. They also used the ragged staff and the combination of the two.

The seal of Richard IIL, 1484, as lord of Glamorgan, exhibits the boar as a supporter, and the counterseal repeats it as a badge (figs. 134, 135). This seal well illustrates various heraldic points. Its blazon is per pale, baron and femme; baron, France modern and England quarterly, over all a label of three points; femme, per fess, Beauchamp, and checquy, on a chevron five pards' heads jessant fleurs-de-lys, for Newburgh combined with Cantilupe. The same arms' are repeated on the shields and caparisons of the counterseal. Richard married Anne Neville, but the Neville saltire does not appear, only the arms of Beauchamp and Newburgh, both of whom were earls of Warwick.

'The rampant bear chained to the ragged staff" was in- herited by the Nevilles and Dudleys, and granted about 1759 to the Grevilles as the owners of Warwick castle. Pelham used a buckle, Percy a crescent, Boucher, Bowen, Dacre, Heneage, Hungerford, Lacy, Stafford, Wake, and

Harrington used the knots that bear their names. Gower designates the great nobles of his day by their badges, as is done in the following satirical lines written about 1449 :—

The rote! is ded, the swan? is goon,

The fiery cressett? hath lost his lyght, Therefore Inglond may mak gret mone, Were not the helpe of God Almight.

The castell is wonne, where care begoun The portecolys® is leyde a doun; — Yclosed we have oure Velvette hatte®, That kepyd us from mony stormys brown. The white lion'? is leyde to slepe, Thorough the envy of the ape clogge®,*

and so on, through interminable further instances.

The Scottish clans wore native plants for their badges: Chisholm, the alder; Menzies, the ash; M'Intosh, the box, &e.

The Motto.—In times when each chief tenant under the crown brought his own tenants into the field, and led them,

Fig. 184.—Seal of Richard III.

was under seal. It was given to his son, who adopted as a motto "Fides servata cineri."

Supporters are now placed on either side of the shield, and are usually animals or human figures. They seem to have arisen from the ornaments introduced by the seal engraver, and became heraldic with the practice of quar- tering. The seal of Edmund Crouchback bears a shield flanked by two wyverns, probably ornaments. That seal (1286) and the seal of Henry of Lancaster in 1300 contain both crest and helm, lambrequin and supporters. Theseal of Catherine, queen of Henry IV., has two antelopes, and her husband as prince used two swans. At Naworth the family supporters, of gigantic size, support the principals of the roof of the hall. Under the house of Tudor many families of knightly rank, as Babington, Stanhope, and Luttrel, used supporters, but at this time supporters are only granted to peers, knights of the garter, grand crosses of the bath, Nova Scotia baronets, and a few private persons who hold them by prescription. In Scotland they are used by heads of clans and by a few lowland families. Fletcher of Saltoun uses two griffins.

Another appendage is the Zagle, upon which some North Wales families place their shields, and the double-headed variety so used by nobles of the Holy Roman empire.

1 Duke of Bedford.

2 Bohun, for duke of Gloucester. 3 Duke of Exeter.

4 Rouen.

5 Beaufort, duke of Somerset. 6 Cardinal Wolsey.

- 7 Duke of Norfolk. 8 Duke of Suffolk.

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LDRY

distinct war-cries were common. The royal cry was "St George for England." The French cried, " Montjoye St Denis ;" the cri de guerre of Bauffrement was their name ; that of Barr, 'Au feu"; Seyton, '"'St Bennet and Set on." The common Highland cry or slogan was " Claymore"; that of the Medici, " Palle, palle," alluding to their arms. The motto succeeded to this (1291); Bruce of Annandale used "Esto fortis in bello"; Courtenay, "Passez bien devant" ; Hastings, "'Honorantes me honorabo ;" Kirkpatrick used the crest of the bloody dirk with the motto "I mak sicker." The Warren motto, alluding to the earls' resist- ance to the "quo warranto," was '"tenebo ;" Vernon, " God save the Vernon," ill exchanged for " Vernon semper viret." The Scottish borderers, who lived by harrying their neigh- bours by moonlight, used stars and crescents for their arins, and such mottos as " Reparabit cornua Phoebe" for Scott of Harden, or " Watch weel" of Halyburton. In modern times Sir Dudley Ryder died while his patent of peerage

[APPENDAGES.

Fia. 135.—Counterseal of Richard III.

The Livery has long lost its early signification, and is used only for the dress of the retainers in their lord's colour. At Richard III.'s coronation 8000 badges of the white boar were wrought upon liveries of fustian. A statute of Henry IV. forbade the use of liveries under heavy penalties, but

they reappeared in the Wars of the Roses. Richard III. used "collars of livery," but these were for persons of rank. One remains upon a Neville effigy at Brancepeth.

Crowns, Coronets, and Symbols of Rank.—The crown is the head attire of a sovereign prince. It is usually closed at the top by four arched bars called diadems, and sur- mounted by a globe and cross. Edward IV. is said to have first closed the English crown. That now in use is a circle of gold, jewelled, edged above with crosses patée and fleurs-de-lys alternate, and closed above with four bars and the cross and globe called in Germany the Reichsapfel (fig. 136). Since the Restoration the crown of the Princes of Wales has been surmounted by two bars, also with the Reichsapfel (fig. 137). They also use the plume of three ostrich feathers, with the words "Ich dien," adopted by the Black Prince (fig. 138). Figs. 139 and 140 give representations of the imperial crown of Austria and the crown of the old kings of France. The Pope places three crowns over his mitre or tiara (fig. 141), said to have been severally assumed in 1295, 1335, and 1411, The crown imperial of Charlemagne may be seen on a scutcheon of pretence on the arms of Hanover, as the

elector's badge of arch-treasurer. The doges of Venice and Genoa bore a peculiar cap or toque, seen in Greek statuary, and upon the figures on the arch of: Constantine.

Fia. 139.—Crown of Austria.

Fie. 136.—Crown Fic. 1387.—Crown of Fig. 138. of England, the Prince of Wales.

The coronet is the head attire of a noble. In England those of princes of the blood are bordered with crosses

Fic. 142.—The Sultan's Tiara. patée and fleurs-de-lys under a regulation of 13 Charles II. (fig. 143). The princesses alternate the same ornaments with strawberry leaves (fig 144). The coronet of a duke is bor- dered with eight strawberry leaves (fig. 145); that of a marquis with $ four alternating with

four pearls === <= placed on low points (fig. 146), Fig. 143. Fig. 144. An earl's coronet has eight strawberry leaves alternating with eight pearls upon tall points (fig. 147). The viscount borders his coronet with an indefinite number of pearls,

Fic, 140.—Crown of Fig 141.—The Pope's France (old). Crown,

Fig. 145. Fig. 146. Fig. 147. Fig. 148, set close upon the rim (fig. 148). The baron's coronet, granted to the order by Charles IL, carries six pearls placed on the rim at equal intervals,—four being seen at once (fig. 149). These coronets are all lined ¢ with ermine, and enriched with jewels. On ,q@@tieane occasions of state, when not worn by the peer, § they are carried before him on a cushion. The eldest sons of peers above the rank of viscount wear the coronet due to their father's second title, The crowns of the kings-at-arms are of gold, bordered with and encircled by the motto " Miserere mei, Domine." The ducal, as an ancient form of coronet, is often used without reference to rank, as the base for a crest. It was so used by Sir Simon de Felbrigge in 1442.

A bishop has neither crest nor coronet, but ensigns his arms with a mitre. The bishops of Durham, while palatines, placed their mitre in a ducal coronet, as—though without authority—do the archbishops (fig. 150). The Berkeley crest is a mitre. The ancient mitre 4 was low, and of linen stiffened with vellum. The central band and the margin, embroidered with fleurs-de-lys or other patterns, were called HA\,| the orphreys. The pendent side ribbons were | the "infule." Prelates of the church of Rome $24 ensign their shields with a hat, the tassels of ™ which indicate their rank. Acardinal has four F's: rows of red tassels, arranged 1, 2, 4, 8, or 15 on each side; an archbishop the same, but green. A bishop has three rows, an abbot two; the abbot's hat is black. Prelates and legates place a patriarchal cross in pale behind their shield.

The Helmet also indicates the rank of the wearer. It

Fig. 149.

is placed above the shield, and beneath the crest. The sovereign and the royal family bear the helmet full-faced or affrontée with six bars, all of gold (fig. 151). Those of dukes and marquises are of gold with five steel bars (fig.

Fig. 151. Fig. 152. Fig. 153. Fig. 154.

152). The lesser nobles have silver lielmets borne in pro- file with gold ornaments and four silver bars, Those of baronets and knights are of steel, full-faced and open (fig. 153). An esquire's helmet is of steel, represented in pro- file, with the vizor closed (fig. 154). These distinctions were probably introduced after the Restoration.

The Mantling is a sort of cloak or mantle of fur extended behind the shield, and sufficiently ample to include the whole achievement. 'Those of sovereigns are of gold doubled with ermine, and are called " pavillons." Peers' mantlings are of crimson velvet, doubled with white fur and barred with ermine spots; a duke has four bars, a marquis three and a half, an earl three, a viscount two and a half, and abarontwo. Commoners use red mantlings lined with white fur. The prior of St John, whose place was on the right of the temporal barons, used a sable mantling doubled with murrey. The pavillon of France was of blue velvet, powdered with gold fleurs-de-lys, and lined with ermine. Such a mantling may be seen behind the arms of Beaumont in Rothley Temple chapel, in right of their descent from the blood-royal of France.

Certain officers of state accompanied their armorialshields with exterior marks of their rank. The Earl Marshal placed two truncheons saltirewise behind his shield, tipped above with the arms of England, and below with his own arms. His deputy places one truncheon in bend dexter.

In Scotland the Lord High Constable, the earl of Errol, places on either side of his shield an arm issuant from a cloud, and grasping a sword. Under the old monarchy the French colonels commandant placed the standards of their regiments saltirewise behind their shields.

The Lords High Admiral have been variously distin- guished. Thomas de Berkeley bears on his brass a collar. of tritons. Thomas, duke of Exeter,

sealed with a ship and his arms on the mainsail. The anchor in some form or other was a common emblem.

Merchants' marks are scarcely heraldic, though they took the place of arms with the trading classes, They were usually monograms of the name or initials. They were protected by law as marks on goods, and are seen on mer- chants' tombs and sometimes in architecture.

FUNERAL EscuTCHEONS.

Some of the most valuable records in the College of Arms are the certificates of funerals conducted under their super- intendence and authority. These gorgeous and expensive ceremonials have happily fallen into disuse, save on very rare occasions, and for royal persons or eminent public characters. The last private funeral conducted with any- thing like the ancient ceremonial was that of Charles, earl of Shrewsbury, in 1828. All that is now usual is the sus- pension of a shield of arms in a large black lozenge-shaped frame called a hatchment or achievement against the wall of the house of the deceased. It is usually placed over the entrance at the level of the second floor, and remains for from six to twelve months, when it is removed to the parish church. Even this custom, scarcely consistent with living in hired houses and burying in cemeteries, is falling into disuse, though still not uncommon.

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If for a bachelor, the hatchment bears upon a shield his arms, crest, and other appendages, the whole on a black ground, If for a single woman her arms are re- > presented upon a lozenge, | bordered with knotted rib- bons, also on a_ black ground. If the hatchment be for a married man (as in fig. 155), his arms upon a shield impale those of his wife; or if she be an heiress they are placed upon a scutcheon of pre- tence, and crest and other appendages are added. The dexter half of the ground is black, the sinister white. For a wife whose husband is alive the same arrange- Fig. 155. ment is used, but the sinister ground only is black. Fora widower the same is used as for a married man, but the whole ground is black ; for a widow the husband's arms are given with her own, but upon a lozenge, with ribbons, without crest or appendages, and the whole ground is black. When there

have been two wives or two husbands the ground is divided into three parts per pale, and the division behind the arms of the survivor is white. Colours and military or naval emblems are sometimes placed be- hind the arms of military or naval officers. It is thus easy to discern from the hatchment the sex, condition, and quality, and possibly the name of the deceased.

In Scottish hatchments it is not unusual to place the arms of the father and mother of the deceased in the two

lateral angles of the lozenge, and sometimes the 4, 8, or 16 genealogical escutcheons are ranged along the margin.

Undertakers are fond of substituting "In ccelo quies" or some such commonplace for the family motto. This is irregular,

The literature of heraldry commences with the treatises of Sasso- ferrato about 1358, De Fosse in the rcigu of Richard JI., and Upton about 1441, all written in Latin and printed by Sir E. Bysshe in 1654. They are followed by the Boke of St Albans, written by Dame Juliana Berners, prioress of Sopwell, and printed in 1486. These, canals those of Upton and Dame Juliana, are valuable. The lady writes in a mixture of early English and Latin, but her de- scriptions are intelligible and copious, These writcrs were followed by a crowd of others, of whom the chief were Gerard Leigh, Ferne, and Morgan, who wrote in the lattcr half of the 16th ceutury. Their great aim was to elevate their subject by tracing back the use of armoiries to the patriarchs and heroes of Jewish and pagan an- tiquity, whom they invested with coats of arms on the type of those used by Norman barons, There are traces of this folly in Dame Juliana, but it reached its height in the writings of her successors, and was not quite extinguished when Guillim wrote his Display of Heraldry in 1610. Guillim, whose work is still a standard, wrote in English, butas late as 1654 and 1688 Spelman, in his Asptlogia, and John Gibbon strove hard to restore the use of a dead language upon a subject to which it was eminently unsuitable. In 1722 and 1780 were published the excellent volumes of Nisbet, chiefly relating to Scotland, and of Edmondson, whose list or ordinary of bearings was long very useful to those who seek to identify the name to which a coat belongs, until

superseded by the very laborious and far more complete work of Papworth. :

Recently the same critical spirit that has pervaded tle works of our historians has been applied with equal diligence to the whole subject of heraldry ; a number of authors, led by Planché, Boutell, Seton, Nichols, and Lower, have sct aside all the fabulous pretensions and baseless assertions of the earlier writers, have sifted the old evidence and adduced much that is new, The whole subject of heraldic and quasi-heraldic seals has been brought under notice by the publication of Laing's fine plates of Scottish seals ; and it may truly be said that the real origin and growth of the use of armorial bearings is placed before the reader in the books of these writers in a truthful and most attractive form, (G. T. C.)

Fig. 156.—Arms of the Dukes of Marlborough.

The above figure represents the armorial achievement of the dukes of Marlborough, princes of the Holy Roman Empire and of Mindelhcim in Swabla. arms are quarterly—1 and 4, Churchill, sable, a lion rampant, and on a canton argent a cross of St George; 2 and 3, Spencer,

The quarterly argent and gules, in the

second and third a fret or, over all on a bend sable 8 escallops of the first; in chicf, as an augmentation, upon an escutcheon of pretence argent a cross of St

George, charged with an inescutcheon azure, 3 fleurs-de-lys or; the whole contained within the garter, of an imperial eagle. Crests—1, Churchill, a lion couchant gardant argent, supporting with his dexter paw a banner gules, of the first, staff or; 2, Spencer, out of a ducal coronet or a griffin's head argent, armed or, gorged with a bar gemclle gules, the second. Between the crests the closed crown of a prince of the empire. Supporters—two wyverns argent, wings expanded.

ensigned with a ducal coronet, and placed upon the breast thereon a dexter hand couped apaumé between two wings expanded of Motto— Fic] pero desdichado."*

HERA T

HERAT is a city of great interest both historically and geographically, and is of even greater interest politically, its importance at the present day being indicated by its popular designation of the "key of India." Its origin is lost. in antiquity. The name first appears in the list of primitive Zoroastrian settlements contained in the Vendidéd Sadé, where, however, like most of the naines in the same list,—such as Sughdu (Sogdia), Mouré (Merv or Mar-gus), Haraquiti (Arachotus or Arghend-ab), Haetumant (Etymander or Helmand), and Ragha (or Argha-stan),—it seems to apply to the river or river-basin, which was the special centre of population. This name of fTaroyu, as it is written in the Vendidéd, or fariwa, as it appears in the inscriptions of Darius, is a cognate form with the Sanskrit Sarayu, which signifies "a river," and its resemblance to the ethnic title of Aryan (Sans. Arya) is purely fortuitous ; though from the circumstance of the city being named "' Aria Metropolis" by the Greeks, and being also recognized as the capital of Ariana, "the country of the Arians," the two forms have been frequently confounded. Of the foundation of Herat (or Heri, as it is still often called) nothing is known. We can only infer from the colossal character of the earth-works which surround the modern town, that, like the similar remains at Bost on the Hel- mand and at Ulin Robat of Arachosia, they belong to that period of Central-Asian history which preceded the rise of Achamenian power, and which in Grecian romance is illustrated by the names of Bacchus, of Hercules, and of Semiramis.

The natural advantages of Herat are mainly due to its river, which, rising in the high uplands 350 miles to the eastward, where the Koh-i-Babd, the prolongation of the Hindu-kush, bifurcates into the two parallel ranges of the Sufid-koh or "white mountains" to the north and the Siy4h-koh or "black mountains" to the south, passes in the upper part of its course through a succession of rolling downs of the finest pasture-land, and lower down traverses a more contracted valley, enlivened, however, throughout with smiling villages and orchards, till it reaches the eastern limit of the alluvial plain of Herat. Here at the present day nine large canals (in former times there were twenty) carry off the waters of the Heri-rid for the irrigation of the circumjacent plain, which on a rough calculation may be said to contain nearly 400 square miles of land available forcultivation. M.

Khanikoff, who visited Herat in 1858, observes that nowhere in the East,—-not even at Samarcand or Bokhara or Ispahdn, where the art of canalization is supposed to be carried to perfection,—had he seen water-courses constructed with so much skill, or maintained with so much care, as in the valley of the Heri-rid ; and he adds that, although at the period of his visit nine-tenths of the villages of the plain, which in ordinary times amount to nearly 500, were partially in ruins and the adjoining fields laid waste, the cereal produce of the remaining lands was still far in excess of the wants of the settled inhabitants. The Heri-rid, passing between 3 and 4 miles to the south of Herat, where it is spanned by a magnificent bridge of twenty-three arches, called the Pril-i-Mdldn, continues its course westward to the extremity of this rich and fertile plain ; it then turns north through an arid country for some 200 miles to Sarakhs, receiving two small streams from the west, the Ab-i-Jém and Ab-i-Meshed, and forming the tertitorial boundary between Persia and Afghanistan. As the Heri- rad is formed of the converging drainage of the Sufid-koh and Siydh-koh ranges, and its volume thus depends on the extent of snow that falls in the mountains, it is impossible to' define with any exactitude the limit of its northern course ; butin ordinary seasons water is rarely found in the river bed beyond Sarakhs, and never does the stream pene- trate to the northward ofa line uniting Abiverd and Merv ;

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and it is of the more importance to note this geographical feature, as in many of our modern maps the line of the Heri-rud, or Tejend, as it is called in its lower course, is prolonged through the desert 200 miles to the north-west ward of Sarakhs,

The city of Herat is in 34° 22' N. lat. and 62° 9' F. long. It is very centrically situated, great lines of commu- nication radiating from it in all directions—southward to Seistan (200 miles), south-eastward to Kandahar (370 miles), eastward to Cabul (550 miles), northward by Mynieneh to Bokhara (600 miles) and by Merv to Khiva (700 miles), while to the westward four routes lead into Persia by Turbat to Meshed (215 miles), and by Birjend to Kerman (400 miles), to Yezd (500 miles), or to Ispahdn (600 miles). The city forms a quadraugle of nearly a mile Square (more

accurately about 1600 yards by 1500 yards) ; on the western, southern, and eastern faces the line of defence is almost straight, the ouly projecting points being the gateways, but on the northern face the contour is broken by a double outwork, consisting of the Ark or citadel, which is built of sun-dried brick on a high artificial mound within the enceinte, and a lower work at its foot, called the Ark- ¢-now, or "new citadel," which extends 100 yards beyond the line of the city wall. That which distinguishes Herat from all other Oriental cities, and at the same time consti- tutes its main defence, is the stupendous character of the earthwork upon which the city wall is built. This earth. work averages 250 feet in width at the base and about 50 feet in height, and as it is crowned by a wall 25 feet high and 14 feet thick at the base, supported by about 150 semi-circular towers, and is further protected by a ditch 45 feet in width and 16 in depth, it presents an appearance of imposing strength. Whether the place is really as strong as it looks has been differently estimated. General Ferrier, who resided for some time in Herat in 1846, states that the city is nothing more than an immense redoubt, and gives it as his opinion that as the line of wall is entirely without flanking defences, the place could not hold out for twenty days against a European army; and M. Khanikoff, who, though not a professional soldier, was a very acute observer, further remarks that the whole interior of the city is dominated from the rising ground at the north-east angle, while the water supply both for the ditch and the city would be at the mercy of an enemy holding the outside country, the wells and reservoirs inside the wall, which would then be alone available, being quite inadequate to the wants of the inhabitants; but on the other hand all experience testifies to the defensibility of the position. Not to speak of the sieges which Herat sustained at the hands of Jenghiz Khan, of Timur, and of Ahmed Shah, we have only to remember that in 1837 the Afghans of Herat beat off the continuous attack for nearly ten months of a Persian army of 35,000 regular troops, supported by 50 pieces of artillery, and in many cases directed and even commanded by Russian officers. The truth seems to be that Herat, though in its present state quite unfit to resist a European army, possesses great capabilities of defence, and might by a skilful adaptation of the resources of modern science be made almost impregnable. A British engineer officer, Major Sanders, calculated in 1840 that at an outlay of sixty or seventy thousand pounds, which would include the expense of deepening the ditch, clearing the glacis and esplanade,

providing flanking defences and repairing the walls, &c., throughout, Herat might be rendered secure against any possible renewal of the attack by Persia; but of course if an attack by a well-appointed European army were anticipated, more extensive preparations for defence would be required, including probably the erection of two independent forts on the high ground at Mosall4 and Thaleh-bengi,

The city possesses five gates, two on the northern face, the Kutab-chak near the north-east angle of the wall, and the Malik at the re-entering angle of the Ark-i-now ; and three others in the centres of the remaining faces, the Irak vate on the west, the Kandahar gate on the south, and the Khushk gate on the east face. Four streets called the Chahar-sik, and running from the centre of each face, meet in the centre of the town in a small domed quadrangle. The principal street runs from the south or Kandahar gate to the market in front of the citadel, and is covered in with a vaulted roof through its entire length, the shops and buildings of this bazaar being much superior to those of the other streets, and the merchants' caravauserais, several of which are spacious and well built, all opening out on this great thoroughfare. Near the central quadrangle of the city is a vast reservoir of water, the dome of which is of bold and excellent proportions. It is stated by General Ferrier to have been constructed by command of Shah Abbas, and to be a chef d'ewvre of its kind, It is supposed to contain above a twelve months' supply of water for the entire city, but, as M. Khanikoff observes, it is within easy mortar range of the high ground at the north-east angle of the city, and might thus be destroyed by a few well-directed shells, in which case the ruins of the dome would fill up the basin and the water supply would be lost. The only other public building of any consequence in Herat is the great mosque or Mesjid-i-Juma, which comprises an area of 800 yards square, and must have been a most magnificent structure. It was erected towards the close of the 15th century, during the reign of Shah Sultan Hussein of the family of Timur, and is said when perfect to have been 465 feet long by 275 feet wide, to have had 408 cupolas, 130 windows, 444 pillars, and 6 entrances, and to have been adorned in the most maguificent

manner with gilding, carv- ing, precious mosaics, and other elaborate and costly em- bellishments. Now, however, it is falling rapidly into ruin, the ever-changing provincial governors who administer Herat having neither the means nor the inclination to undertake the necessary repairs. Neither the palace of the Charbagh within the city wall, which was the residence of the British mission in 1840-41, nor the royal quarters in the citadel deserve any special notice. At the present day, with the exception of the Chahar-sik, where there is always a certain amount of traffic, and where the great diversity of race and costume imparts much liveliness to the scene, Herat presents a very melancholy and desolate appearance. The mud houses in rear of the bazaars are for the most part uninhabited and in ruins, and even the burnt brick build- ings are becoming everywhere dilapidated. The city is besides one of the filthiest in the East, as there are no means of drainage or sewerage, and garbage of every descrip- tion lies in heaps in the open streets.

With regard to the population, it fluctuates so rapidly, according to the circumstances of the period, that it is impossible to give any estimate of its normal strength. When Christie visited the city in 1809 it was in a very prosperous condition, having been undisturbed for fifty years, and was supposed to contain 100,000 inhabitants. 'A. Conolly in 1828 reduced the numbers to 45,000. Before the Persian siege in 1837 the population was estimated at 70,000, but at the close of the war 6000 or 7000 were all that remained. In 1845, at the time of General Ferrier's visit, the numbers had increased again to 22,000, and con- tinued to increase to the time of the capture of the place by Dost Mahomed Khan in 1863, when there were at least 50,000 inhabitants within the walls. Since that time Herat has been a mere provincial city governed from Cabul, and its average population has ranged between 20,000 and

30,000, within which limits must be confined its present estimate,

HERAT

The maximum population of which the enceinte would seem to be capable may be put at Christie's estimate of 100,000, and it is manifest therefore that when Herat contained a population of a million and a half, as is testified by so many contemporary autho- rities, the present city could have

been only the citadel of this vast metropolis, the great mass of buildings lying along the slopes of the northern hills, where for a space of some 4 miles in length by 3 miles in breadth the surface of the plain, strewed over its whole extent with pieces of pottery and crumbling bricks, is also broken here and there by earthen mounds and ruined walls, the debris of palatial structures which at one time were the glory and wonder of the East. Of these structures indeed some have survived to the present day in a sufficiently perfect state to bear witness to the grandeur and beauty of the old architecture of Herat. The mosque of the Mosella, for instance, originally built in the 12th century, but restored or rather rebuilt at the end of the 15th century, and intended for the reception of the body of the Imam Reza which Shah Sultan Hussein wished to remove from Meshed to Herat, is, even in its present state of ruin and decay, one of the most imposing and elegant structures to be seen in Asia. "The mosque," says General Ferrier, 'is completely covered with a mosaic of glazed pricks in varied and beautiful patterns, and the cupola is of amazing dimeusions. Several arcades supported by pillars in brick equal the proportions of the arch of Ctesiphon, and the seven mag- nificent minarets that surround it may be said to be intact, for the upper part of them only is slightly injured." Scarcely inferior in beauty of design and execution, though of more moderate dimen- sions, is the tomb of the saint Abdullah Ansari, in the same neighbourhood. This building, which was erected by Shah Rokh Mirza, the grandson of Timur, nearly 500 years ago, contains some exquisite specimens of sculpture in the best style of Oriental art. Adjoining the tomb also are numerous marble mausoleums, the sepulchres of princes of the house of Timur ; and especially deserv- ing of notice is a royal building tastefully decorated by an Italian artist named Geraldi, who was in the service of Shah Abbas the Great. The locality, which is further enlivened by gardens and running streams, is named Gazir-gdh, and is a favourite resort of the Heratis. It is held indeed in high veneration by all classes, and the famous Dost Mahomed Khan is himself buried at the foot of the tomb of the saint. Two other royal palaces named respect- ively Bagh-i-Shah and Takht-i-Sefer, are situated on the same rising ground somewhat further to the west. The buildings are now in ruins, but the view from the pavilions, shaded by sp endid plane trees on the terraced gardens formed on the slope of the moun- tain, is said to be very beautiful. a –

The population of Herat and the neighbourhood is of a very mixed character. The original inhabitants of Ariana were no doubt of the Aryan family, and immediately cognate with the Persian race, but they were probably intermixed at a very early period with the Sacee and Massagetz, who seem to have held the mountains from Cabul to Herat from the first dawn of history, and to whom must be ascribed—rather than to an infusion of Turco-Tartaric plood introduced by the armies of Jenghiz and Timur—the peculiar broad features and flattish countenance which distinguish the inhabitants of Herat, Seistan, and the castern provinces of Persia from their countrymen farther to the west. Under the government of Herat, however, there are a very large number of tribes, ruled over by separate and semi-independent chiefs, and belonging pro- bably to different nationalities. The principal group of tribes is called the Chahar-Aimdk, or 'four races," the constituent parts of which, however, are variously stated by different authorities both as to strength and nomenclature. Mountstuart Elphinstone, by far the best general authority on Afghan questions, gives the original four tribes as the Taiments, the Hazarehs, the Taimiuris, and Zuris; Khanikoff, on the other hand, whose forte was ethno- graphy, and who made his inquiries on the spot, describes the Chahar-Aimdk as the Kipchaks (100,000 families), the Jamshidis (12,000), the Taimenis (60,000), and the Firoz-kohis (10,000 to 12,000); while Pottinger substitutes the Sooni Hazirechs of Kileh- now for the Kipchaks of Khanikoff, and raises the Firoz-kohi Aimaks to 30,000 families. These tribes all dwell in the mountains to the north-east, the east, and the south-east of Herat, and number in the aggregate perhaps a million souls. Major Taylor, who made special inquiries on the subject in 1856, found that the governor of Herat could raise for fighting purposes from these tribes and the allied Turcomans of Merv 47,000 horse and 28,000 foot, put matters have very much changed since Herat came under the government of Cabul in 1863, the recent policy being to lower the fighting force of the semi-independent chiefs, and to substitute infantry regiments raised and paid by the central authority. At present there are perhaps ten such regiments, which can be supple- mented by about 10,000 horse and 10,000 irregular foot.

The trade of Herat is also subject to great fluctuation. From its central geographical position it must naturally be an emporium of commerce between Persia, Turkestan, Afghanistan, and India, while owing to the

richness of the valley, which can usually fur- nish supplies for 150,000 men over and above the consumption of

the fixed inhabitants, as well as to the mineral wealth of the adjoining mountains and the industrial activity of the city popula- tion, especially in regard to silk and woollen manufactures (the carpets of Herat being famous throughout the East), the eountry rapidly recovers from the effects of war, and its normal condition may be said to be that of prosperity and abundance.

In actual territory Herat extends east and west from near the sources of the Heri-rid about 300 miles to the Persian frontier beyond Ghorian, and north and south from the Merv boundary, in about 36° lat., 200 miles to the northern limit of Seistan, The inhabitants of the city of Herat are for the most part Shiahs, and in regard to language and habits, as well as religion, are Persians rather than Afghans. There are, however, both in the town and in the neighbouring villages a certain number of Afghan colonists, who have been settled there—the greater part by Nadir Shah—during the last 150 years, as well as Hazdrehs, Jamshidis, and Taimenis, with a fair sprinkling of Hindus and some forty familics of Jews. The net revenue of the valley and its immediate dependencies in ordinary times is under £100,000 per annum, but the vizier Yar Mahomed Khan is supposed in the plenitude of his power, and when he had for a time brought a great part of Seistan under his sway, to have realized double that amount from the entire province.

To trace in any detail the fortunes of Herat would be to write the modern history of the East, for there has hardly been a dynastic revolution, or a foreign invasion, or a great civil war in Central Asia since the time of the Prophet, in which Herat has not played acon- spicuous part and suffered accordingly. Under the Tahirides of Khorassan, the Soffarians of Seistan, and the Samanides of Bokhara, it flourished for some centuries in peace and progressive prosperity ; but during the succeeding rule of the Ghaznevide kings its metro- politan character was for a time obscured by the celebrity of the neighbouring capital of Ghazui, until finally in the reign of Sultan Sanjar of Merv about 1157 the city was entircly destroyed by an

irruption of the Ghoz, the predecessors, in race as well as in habitat, of the modern Turcomans. Herat gradually recovered under the enlightened Ghoride kings, who were indeed natives of the province, though they preferred to hold their court amid their ancestral fortresses in the mountains of Ghor, so that at the time of Jenghiz Khan's invasionit cqualled or even exceeded in populousness and wealth its sister capitals of Balkh, Merv, and Nishapoor, the united strength of the four cities being estimated at three millions of inhabitants. But this Moghul visitation was most calamitous; forty persons, indeed, are stated to have alone survived the general mas- sacre of 1232, and as a similar catastrophe overtook the city at the hands of Timur in 1398, when the local dynasty of Kurt which had succeeded the Ghorides in eastern Khorassan was put an end to, it is astonishing to find that early in the 15th century Herat was again flourishing and populous, and the favoured seat of the art and litera- ture of the Kast. Itwas indeed under the princes of the house of Timur that most of the noble buildings were erected, of which the remains still excite our admiration at Herat, while all the great historical works relative to Asia, such as the Rozet-es.Sefd, the. Habtb-es-seir, Hafiz Abri's Tartkh, the Matld a-es-Sa'adin, &c., date from the same place and the same age. Four times was Herat sacked by Turco- mans and Uzbegs during the centuries. which intervened between the Timuride princes and the rise of the Afghan power, and it has never in modern times attained to anything like its old importance. Afghan tribes, who had originally dwelt far to the east, were first settled at Herat by Nadir Shah, and from that time they have mono- polized the government and formed the dominant element in the population. It will be needless to trace the reyolitions and counter-revolutions which, have followed each other in quick succes- sion at Herat smce Alimed Shah Durani founded the Afghan mon- archy about the middle of the last century. Let it suffice to say that Herat has been throughout the seat of an Afghan government, sometimes in subordination to Cabul and sometimes independent. Persia indeed for many years showed a strong disposition to yeassert the supremacy over Herat which was exercised by the Suffavean kings, but Great Britain, disapproving of the advance of Persia towards the Indian frontier, steadily resisted the encroachment; and, indeed, after helping the Heratis to beat off the attack of the Persian army in 1838, the British at length compelled the shah in 1857 at the close of his war with them to sign a treaty recognizing the future independence of the place, and

pledging Persia against any further interference with the Afghans, In 1863 Herat, which for fifty years previously had becn independen¢ of Cabul, was incorporated by Dost Mahomed Khan in the Afghan monarchy, and, such is the present condition. of the principality, the actual Governor Ayub Khan being theuterine brother

and deputy of Yacib Khan, who recentlysigned with the Government of India the famous treaty of Gandamak. (H. €. R.)

HERAULT, a department in the south of France, formed from parts of the old province of Languedoe, is bounded on

the N.E. by Gard, N.W. by Aveyron and Tarn, and S. by Aude and the Gulf of Lyons. It has an area of 2444

square miles, and is situated between 43° 10’ and 44° N. |

lat., 2° 30’ and 4° 10’ E. long. Its greatest length is 84 miles, and its greatest breadth 50. About a third of the department consists of moorland, heath, and common, a

_ fourth of arable land, a sixth of vineyards, and an eighth

of wood. The southern prolongation of the Cevennes mountains forms the north boundary of the department. The highest point is about 4250 feet above the sea-level. The ridge forms the watershed between the waters of the Atlantic and the Mediterranean, and from it there flow the Vidourle, Mosson, Hérault, Livron, and Orb. Of these the Hérault, 80 miles long, is the chief, and gives name to the department. The Vidourle forms the boundary between the department and that of Gard. The high mountains of the north are partly barren, partly wooded. In the extensive plains of the centre the vine and olive flourish, and figs, mulberries, and other fruit-trees are to be met with nearly in all parts. Grain is chiefly produced in the south. The soil of the north is chalky clay, of the centre light gravel, and of the south a strong rich loam. The “ garrigues” are cousiderable portions of waste land, covered with heath and shrubs. St Loup, Couques, and St Thibéry, the first of which is 750 feet high, are extinct volcanic cones, The greater part of the south coast consists of a series of salt marshes,

separated from the sea by a narrow strip of land. The marsh of Thau, the largest, stretches from the mouth of the Hérault, and communicates, through the marsh of Frontignan, with that of Mauguio, on the eastern frontier of the department. The Canal du Midi, after stretching about 30 miles into the department, terminates at Agde. From Cette the navigation is kept up through the marshes by the canals of Agde and Radelle to Aigues Mortes. The coast line of the department is 66 mileslong. In the valleys and at the foot of the mountains the climate is delightfully mild. Fish abound in the salt marshes. The vegetable productions comprise aromatic and dyeing plants ; the ilex oak prevails in the forests. The mineral wealth of the department is considerable. Mines of lignite, coal, iron, eapper, and lead are wrought. It produces magnificent blocks of marble, also alabaster, gypsum, granite, sand- stone, potters' clay, alum ; and the marslies supply France with salt. At Gabian there is a petroleum well, Wine and oil constitute the chief agricultural wealth of the department. The red wines of St Georges, St Drézéry, St Christol, ad the white wines of Frontignan and Lunel, are held in high estimation, Considerable quantities of wheat, oats, and potatoes are grown. There is a large amount of excellent pasturage, and horses and sheep. are extensively reared, Mulberries, pomegranates, figs, raisins and other dried fruits, and olives are prepared for exportation. The chief manufactures are woollen and cotton, cloth, silk, per- fumery, soap, and chemical substances. 'The department has Montpellier for its capital, and is divided into the arrondissements of Montpellier, Béziers, Lodéve, and St Pons, with 36 cantons and 331 communes, The population was 429,878 in 1872, and 445,053 in 1876. HERBARIUM, or Hortus Siccys, a collection of plants so dried and preserved as fully to illustrate their several specific characters. Since the same, plant, owing to pecu- liarities of climate, soil, and situation, degree of exposure to light, and other influences, may vary greatly according to the locality in which it occurs, it is only by gathering together for comparison and study a large series of examples of each species. illustrative of the flora of different regions that the laws of vegetable morphology, and many more points of scientific interest, can be satisfactorily determined. Thus, from the herbarium may be acquired a knowledge of those details concerning the minuter structure of individual plants which are of necessity omitted in works of systematic botany, as also of the relative taxonomic importance of the characters to be met with in large groups of forms.

Commencing with British herbaria, the collection of the Royal Herbarium at Kew, generally acknowledged to be at

once the most extensive and the best preserved and most orderly in the world, comprises some 100,000 species, many of them represented by numerous specimens. It is arranged, for easy reference, in cases situate between the windows of the building containing it, the atmosphere of which is kept dry by means of hot-water pipes. In the intervening spaces are tables for the purpose of study, which is further facilitated by the presence in the same building of a large and valuable botanical library. Next in importance is the herbarium of the British Museum, which comprises assemblages of specimens gathered by numerous eminent botanists. The collection of Dillenius is deposited at Oxford, and that of the late Professor Harvey at Trinity College, Dublin, The original herbarium of Linneus is in the possession of the Linnean Society of London. With the more important British herbaria are to be ranked also those of Cambridge and Edinburgh, The collections of Jussieu and St Hilaire are included in the large herbarium of the Jardin des Plantes at Paris, and in the same city is the extensive private collection of Dr Cosson. At Geneva are three large collections,—De Candolle's, containing the typical specimens of the Pro- dromus, Delessert's fine series, and Boissier's Mediterranean and Oriental plants, The university of Géttingen has had bequeathed to it the largest collection (exceeding 40,000 specimens) ever made by a single individual—that of the late Professor Grisebach. At the herbarium in Brussels are the specimens obtained by the traveller Martius, the majority of which formed the groundwork of his Flora Brasiliensis, Other national herbaria sufficiently extensive to subscrve the requirements of the systematic botanist exist at Berlin, St Petersburg, Vienna, Leyden, Stockholm, Upsala, Copenhagen, and Florence. Of those in the United States of America, the chief, formed by Asa Gray, is the property of Harvard university ; others are to be seen at Yale and Columbia colleges and at New York and Michigan universities, The herbarium at Melbourne, Australia, under Baron Miiller, has attained large propor- tions; and that of the Botanical Garden of Calcutta is noteworthy as the repository of numerous specimens de- scribed by writers on Indian botany.

Specimens of flowering plants and vascular cryptogams are, at' Kew, generally mounted on sheets of stout smooth paper, of uniform quality, and in most cases 17 inches long by 11 inches broad ; the palms and their allies, however, and some ferns, require a size of 22 by 14 inches, The tough but flexible coarse grey paper (German, Wliesspapier), upon which on the Continent specimens are commonly fixed by gummed strips of the same, is less hygroscopic than ordinary cartridge paper, but has the disadvantage of affording harbourage in the inequalities of its surface to a minute insect, Atropos pulsatoria, L., which commits great havoc in damp specimens, and which, even if noticed, cannot be dislodged without difficulty. The majority of plant specimens are most suitably fastened on paper by a mixture of equal parts of gum tragacanth and gum arabic made into a thick paste with water. Rigid leathery leaves are affixed by means of glue, or, if they present too smooth a surface, by stitching at their edges. Where, as in private herbaria, the specimens are not liable to be handled with great frequency, a stitch here and there round the stem, tied at the back of the sheet, or slips of paper passed over the stem through two slits in the sheet and attached with gum to its back, or simply strips of gummed paper laid across the stem, may be resorted to. A new adhesive substance, a kind of fish glue, has lately come into use for this purpose, and is highly spoken of. To preserve from insects, the plants, after mounting, are brushed over with

HERBARIUM

a liquid formed by the solution of 4 ib each of corrosive sublimate and carbolic acid in 1 gallon of methylated spirits, They are then laid out to dry on shelves made of a network of stout galvanized iron wire. After this are written, usually in the right-hand corner of the sheet, or on a label there affixed, the designation of each species, the date and place of gathering, and the name of the collector. Information as to economical or medicinal properties may either be added thereto, or mentioned on the back of the sheet. It is especially important to attach to the name of the plant the initials or abbreviated name of the author by whom it was first described ; «9, the words Ulva lactuca alone, might signify either of two distinct plants, the one described by Linnzeus, the other by Agardh. When the generic name has been altered, but the specific name has been retained, the name of the original describer of the plant is placed in brackets before the name of the

later author. Thus the Hnteromorpha Greville' of Thuret, having been renamed, has become Ulva Grevillet (Thur.), Le Jolis, The value of specimens in private herbaria is greatly enhanced by briefly stating on the lower left-hand corner of the sheet the characters that distinguish it from the plants most nearly resembling it. Other particulars as to habit, local abundance, soil, and claim to be indigenous may be written on the back of the sheet, or on a slip of writing paper attached to its edge. It is convenient to place in a small envelope gummed to an upper corner of the sheet any flowers, seeds, or leaves needed for dissection or microscopical examination, especially where from the fixation of the specimen it is impossible to examine the leaves for oil- receptacles, and where seed is apt to escape from ripe capsules and be lost, The addition of a careful dissection of a flower greatly increases the value of the specimen. To ensure that all shall lie evenly in the herbarium the plants should be made to occupy as far as possible alter- nately the right and left sides of their respective sheets. The species of each genus are then arranged either systematically or alphabetically in separate covers of stout, usually light brown paper, or, if the. gcnus be large, in several covers with the name of the genus clearly indi- cated in the lower left-hand corner of each, and opposite it the names or reference numbers of the species, Unde- termined species are relegated to the end of the genus. Thus prepared, the specimens are placed on shelves or movable trays, at intervals of about 6 inches, in an air-tight cupboard, on the inner side of the door of which, as a special protection against insects, is suspended a muslin bag containing a piece of camphor.

The systematic arrangement varies in different herbaria. The works usually followed are—for dicotyledons, De Candolle's Prodromus, and Endlicher's or Bentham and Hooker's Genera Plantarum; for monocotyledons, Kunth's Enumeratio; for ferns, Hooker and Baker's Synopsis Filicum ; for mosses, Miiller's Synopsis Muscorum Frondo- sorum; for. alge, Kiitzing's Phycologia generalis; for hepaticse, Gottschie, Lindenberg, and Nees ab Esenbeck's Synopsis Hepaticarum; and for other groups of cryptogamic plants the treatises of various authors scattered through numerous scientific publications. In certain herbaria, as in those of Boissier and Delessert at Geneva, the authority of the Prodromus is accepted only in the absence of any more recent treatise, or of a complete monograph on a family. For the

members of large genera, e.g., Piper and Ficus, since the number of cosmopolitan or very widely distributed species is comparatively few, a geographical grouping is found specially convenient by those who are constantly receiving parcels of plants from known foreign sources. The ordinary systematic arrangement possesses

the great advantage, in the case of large genera, of readily

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indicating the affinities of any particular specimen with the forms most nearly allied to it in type. In the United States the species in the genera, and the genera in the orders, are usually arranged alphabetically, and the orders

serially; sometimes, however, the genera are placed alpha-.

betically throughout without reference to the orders. The alphabetical arrangement, provided works on systematic botany are referred to for the identification of particular plants, possesses the advantage of permitting ready reference to any given species, and also of being independent of changes of classification; but in Europe it is rarely adopted, on account of the counterbalancing practical in- conveniences it is considered to present. Instead of keep-

ing a catalogue of the species contained in the herbarium, which, owing to the constant additions, would be almost impossible, such species are usually ticked off with a pencil in the systematic work which is followed in arranging them, so that by reference to this work it is possible to see at a glance whether the specimen sought is in the her- barium, and what species are still wanted. The custom commonly prevalent in Continental, especially German, herbaria of placing the dried specimens loosely between sheets of papers not always of uniform character is liable to lead to the admixture of nearly allied forms in intri- cate genera, such as Lubus, Rosa, Hieracium, Salix, &c., unless a label is attached to each specimen, a precaution not always adopted. In Germany Endlicher's system is much followed for flowering plants, with the exception of palms, for which Martius's arrangement is preferred, At Geneva De Candolle's original herbarium is

arranged in exact accordance with his Prodromus. In the other large herbaria in that city, the mounting and arrangement of the specimens are conducted much as in England, with the exception that smaller-sized sheets of paper are used for cryptogams.

Specimens intended for the herbarium should be eolleeted when posstble in dry weather, earc being taken to select plants or por- tions of plants in sufficient number and of a size adequate to illustrate all the characteristie features of the species. When the root-leaves and roots present any peculiaritics, they should invari- ably be eolleeted, but the roots should be dried separately in an oven at a moderate heat. Roots and fruits too bulky to be placed on the shcets of the herbarium may be conveniently arranged in glass-eovered boxes contained in drawers. The best and most effective mode of drying specimens is learned only by experience, different species requiring special treatment aceording to their several peculiarities. The chief points to be attended to are to have a plentiful supply of botanical drying paper, so as to be able to use about six sheets for each specimen; to change the paper at intervals of six to twelve hours; to avoid eontact of one leaf or flower with another; and to increase the pressure applied only in proportion to the dryness of the specimen. To preserve the colour of flowers pledgets of eotton wool, which prevent bruising, should be introduced between them, as also, if the stamens are thick and sueculent, as in Digitalis, between these and the eorolla, A flower disseeted and gummed on the sheets will often retain the colour which it is impossible to preserve in a erowded inflorescence. Before placing in a serew-press, should that be used, a flat sheet of lead or some other suitable weight should be laid upon the top of the pile of specimens, so ag to kcep up a continuous pressure, Suceulent specimens, as many of the Orchidacew, and sedums and various other Crassulaceous plants, require to be killed by immer- sion in boiling water before being placed in drying paper, or, instead of becoming dry, they will grow between the sheets. When, as with some plants like Verbascum, the thiek hard stems are liable to cause the leaves to wrinkle in drying by removing the pressure from them, small pieces of bibulous paper or cotton wool may be placed upon the leaves near their point of attachment to the stem. When a number of specimens have to be submitted to pressure, ventilation is secured by means of frames eorresponding in size to the drying paper, and eomposed of strips of wood or wires laid aeross each

other so as to form a kind of network. Another mode of drying is to keep the specimens in a box of dry sand in a warm place for ten or twelve hours, and then press them in drying paper. A third method consists in plaeing the speci- men within bibulous paper, and enclosing the whole between two plates of coarsely perforated zine supported in a wooden frame. The zine plates are then drawn elose together by means of straps,

aud suspended before a fire until the drying is effeeted. By the last two methods the colour of the flowers may be well preserved. When the leaves are finely divided, as in Conium, much trouble will be experienced in lifting a half-dried specimen from one paper to another; but the plant may be placed in a sheet of thin blotting paper, and the sheet containing the plant, instead of the plant itself, can then be moved. Thin straw-coloured paper, such as is used for biscuit bags, may be conveniently employed by travellers unable to earry a quantity of bibulous paper. It offers the advan- tage of fitting closely to thiek-stemmed specimens, and of rapidly drying. A light but strong portfolio, to which pressure by means of straps can be applied, and a few quires of this paper, if the paper be changed night and morning, will be usually sufficient to dry all except very succulent plants. When a specimen is too large for one sheet, and it is neecssary, in order to show its habit, &c., to dry the whole of it, it may be divided into two or three portions, and each placed on a cd sheet for drying. Speci- meng may be judged to be dry when they no longer cause a eold sensation when applied to the cheek, or assume a rigidity not evident in the earlier stages of preparation.

Eaeh class of flowerlesy or cryptogamic plants requires special treatment for the herbarium.

Marine alge are usually mounted on tough smooth white cart- ridge paper in the following manner. Growing specimens of good colonr and in fruit are if possible scleeted, and eleansed as much as practicable from adhering foreign particles, either in the sca or a rocky pool. Some species rapidly change colour, and eause the decay of any others with whieh they come in contact. This is especially the ease with the Ectocarpi, Desmarestie, and a few others, which should therefore be brought home in a separate vessel. In mounting, the specimen is floated out in a flat white dish containing sea-

water, so that forcign matter may be detected, and a piece of paper of suitable size is placed under it, supported either by the fingers of the left hand or by a palette. It is then pruned, in order clearly to show the mode of branching, and is spread out as naturally as possible with the right hand. For this purpose 4 bone knitting-needle answers well for the coarse species, aud a eamel's-hair pencil for the more delicate ones. The paper with the specimen is then earefully removed from the water by sliding it over the edge of the dish so as to drain it as much as possible, If during this process part of the fronds run together, the beauty of the specimen may be restored by dipping the edge into water, so as to float out the part and allow it to subside naturally on the paper. The paper, with the specimen upwards, is then laid on bibulous paper for a few minutes to absorb as much as possible of the superfluous moisture. When freed from exeess of water it is laid on a sheet of thick white blotting-paper, and a piece of smooth washed ealico is placed upon it (unwashed calico, on aceount of its sae adheres to the sea-wced), Another shect of blotting-paper is then Jaid over it ; and, a number of similar specimens being formed intg a pile, the whole is submitted to pressure, the paper being changed every hour or two at first. The gee is inereased, and the papers are changed less frequently as he speeimens become dry, which usually takes [pe in thirty-six hours. Some species, especially those of a thick or leathery tex- ture, eontraet so much in drying that without strong pressure the edges of the paper beeome puckered. Other species of a gelatinous nature, like Nemaleon and Dudresnaia, may be allowed to dry on the paper, and need not be submitted to pressure until they no longer present a gelatinous appearance. Large coarse alge, such, for instanee, as the Fucaccew and Laminaria, do not readily adhere tq paper, and require soaking for some time in fresh water before being pressed. The less robust speeies, such as Sphacclaria scoparia, whieh do not adhere well to paper, may be made to do so by brushing them over either with milk earefully skimmed, or with a liquid formed by placing isinglass (4 oz.) and water (14 0z.) in a wide-mouthed bottle, and the bottle in a small glue-pot or saueepan containing cold water, heating until solution is effected, and then adding 1 oz. of rectified spirits of wine; the whole is next stirred together, and when cold is kept in a stoppered bottle. For use, the mixture is warmed to render it fluid, and applied by means of a eamcel's-hair brush to the under side of the speeimen, which is then laid neatly on paper. For the more delicate species, such as the Callithamnia

and Ectocarpt, it is an exeellent plan to place a small fruiting fragment, carefully floated out in water, on a slip of miea of the size of an ordinary mieroscopieal slide, and allow it to dry. The plant ean then be at any time cxamined under the mieroscope without injuring the mounted specimen. Many of the fresh-water algee which form a mere crust, sueh as Palmella cruenta, may be placed in a vessel of water, where after a time they float like a scum, the earthy matter settling down to the bottom, and may then be mounted by slipping a piece of miea under them and allow- ing it to dry. Osctllatorie may be mounted by laying a portion on a silver coin placed on a piece of paper in a plate, and pouring in water until the edge of the eoin is just covered. The alga by its own peculiar movement will soon form a radiatin circle, perfectly free from dirt, around the coin, which may then be removed.

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There is considerable difficulty in removing mounted specimens of alge from paper, and therefore a small portion preserved on mica should accompany each specimen, enclosed for safety in a small envelope fastened at one corner of the sheet of paper. Filamentous diatoms may be mounted like ordiuary seaweeds, and, as well as all parasitic alge, should whenever possible be allowed to remain attached to a portion of the alga on which they grow, some species being almost always found parasitical ou Histivular plants. Ordi- nary diatoms and desmids may be mounted ou mica, as above described, by putting a portion in a vessel of water aud exposing it to sunlight, when they rise to the surface, and may be thus removed comparatively free from dirt or impurity, Owing to their waut of adhesiveness, they are, however, usually mounted on glass as microscopie slides, either in glycerin jelly, Canada balsam, or some other suitable medium.

Lichens are generally mounted on sheets of paper of the ordinary size, several specimens from different localities being laid upon one sheet, each specimen having been first placed on a small square of paper which is gummed on the sheet, aud which has the locality, date, name of collector, &., written upon it. This mode has some disadvantages atteuding it: such sheets are difficult to handle; the crustaceous species are liable to have

their surfaces rubbed ; the foliaccous species become so compressed as to lose their characteristic appearance; and the spaces between the sheets caused by the thickness of the specimen permit the entrance of dust. A plan which has been found to answer well is to arrange them in cardboard boxes, either with glass tops or in sliding covers, in drawers—the name being placed outside each box, and the speci- mens gummed into the boxes, Lichens for the herbarium should, whenever possible, be sought for on a slaty or laminated rock, so as to procure them ou flat thin pieces of the same, suitable for mounting. Specimens on the bark of trees require pressure until the bark is dry, lest they become curled; and those growing on sand or friable soil, such as Coniocybe furfiraeca, should be laid earefully on a layer of gum in the box in which they are intended to be kept. Many lichens, such as the Verrucarie and Collemacee, are fennd in the best condition during the winter months. In mounting collemas it is advisable to let the specimen become dry and hard, and then to separate a portion from adherent mosses, earth, &e., and mount it separately so as to show the branching of the thallus. Pertwsaurie should be represented by both fruiting and sorediate specimens.

The larger species of fungi, such as the Agaricint and Polyporei, &e., are prepared for the herbarium by cutting a slice out of the centre of the plant so as to show the outline of the pileus, the attachment of the gills, and the character of the interior of the stem. The remaining two halves of the pileus are theu lightly pressed, as well as the central slices, between bibulous paper until dry, and the whole is then " poisoned," and gunimed on a sheet of paper in sueh a manner as to show the under surface of the one and the upper surface of the other half of the pilens on the same sheet. As it is impossible to, preserve the natural colours of fungi, the specimens should, whenever possible, be accompanied by a coloured drawing of the plant. Mieroseopic fungi are usually preserved in envelopes, or simply attached to sheets of paper, or mounted as mieroscopie slides. Those fungi which are of a dusty nature, like the Myzomycetes, may, like the licheus, be preserved in smia}l boxes, and arranged in drawers. Fungi under any circumstanees form the least satisfactory portion of an herbarium.

Mosses when, growing in tnfts should be gathered just before the capsules have become brown, divided into small flat portions, and pressed lightly in

drying paper. During this process the capsules ripen, and are thus obtained in a perfect state. They are then preserved in envelopes attached to a sheet of paper of the ordinary size, a single perfect specimen being washed, and spread out near the envelope so as ta show the habit of the plant. For attaching it to the paper a strong mucilage of gum tragacanth, containing an eighth of its weight of spirit of wine, answers best. Ifnot preserved in an envelope the calyptra and operculum are very apt to fall off and become lost. Scale-mosses are mounted in the same way, or may be floated out in water like sea-weeds, and dried in white blotting paper under strong pressure before gumming on paper, but are best mounted as microscopic slides, care being taken to show the stipules. The specimens should be collected when the capsules are just appearing above or in the colesule or calyx; if kept in a damp saucer they soon arrive at maturity, and can then be mounted in better condition, the fruit-stalks being too fragile to bear ear-riage in a botanical tin ease without injury.

Of the Chavacee many are so exceedingly brittle that it is best to float them out like sea-weeds, except the priekly species, which may be carefully laid out on bibulous paper, and when dry fastened on sheets of white paper by means of gummed strips. Care should be taken in collecting char to seeure, in the case of dicecious Species, speeimens of both forms, and also to get when possible the roots of those species on which the small granular starehy bodies or gemmee are found, as in C. fragifera. Portions of the fructification may be preserved in small envelopes attached to the sheets.

| yet to do nothing is forbidden by logic.

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See Bentham, Proce. Linn. Soe. Lond., 1869-70, p. xlvi. ; Johann Nave, Handy Book to the Collection and Preparation of Freshwater and Marine Alge, &e., Lond.; G. Rainann, Das Herbarium, Berlin; and Laségue's Musée botanique de M. Benjamin Delessert, Paris, 1845. E. M. H.)

HERBART, JoHANN FRIEDRICH (1776-1841), was born

of cultured parents at Oldenburg in 1776. He showed his bent towards philosophy while still a child, and after study- ing under Fichte at Jena

gave his first philosophical lectures at Gottingen in 1805, whence he removed in 1809 to occupy the chair formerly held by Kant at Kénigsberg. Here he also established and conducted a seminary of pedagogy till 1833, when he returned once more to Gottingen, and remained there as professor of philosophy till his death in 1841. His works were collected and published in twelve volumes by his disciple Hartenstein

(Leipsic, 1850-52).

Philosophy, according to Herbart, begins with reflexion upon our empirieal conceptions, and consists in the reformation and elaboration of these,—its three primary divisions being determined by as many distinet forms of elaboration. Logie, which stands first, has to render our conceptions and the judgments and reasonings arising from them clear and distinct. But some conceptions are such that the more distinet they are made the more contradictory their elements become; so to change and supplement these as to make them at length thinkable is the problem of the second part of philosophy, or Metaphysies. There is still a class of conceptions © requiring more than a logieal treatment, but differing from the last in not iuvolving latent contradictions, and in being independent of the reality of their objects, the ae viz., that embody our judgments of approval and disapproval ; the philosophic treatment of these conceptions falls to Aisthetie.

In Herbart's writings logie receives comparatively meagre notice ; he insisted strongly on its purely formal character, and expressed himself in the main at one with Kantians such as Fries and Krug.

As a metaphysician he starts from what he terms "the higher scepticism " of the Hume-Kantian sphere of thought, the beginnings of which he discerns in Locke's perplexity about the idea of sub- stance, By this scepticism the real validity of even the forms of experience is called in question on account of the contradictions they are found to involve. Aud yet that these forms are " given" to us, as truly as sensations are, follows beyond doubt when we consider that we are as little able to control the one as the other. To attempt at this stage a psychological inquiry into the origin of these coneep- tions would be doubly a mistake ; for we should have to use these unlegitimated conceptions in the course of it, and the task of clearing up their contradictions would still remain, whether we suc- cecded in our inquiry or

not, But how are we to set about this task? We have given to us a conception A uniting among its con- stituent marks two that prove to be contradictory, say M and N ; and we can neither deny the unity nor reject one of the contra- dictory members, For to do either is forbidden by experience; and We are thus driven to the assumption, that the coneeption is contradictory because incomplete; but how are we to supplement it? What we have must point the way to what we want, or our procedure will be arbitrary. Experi- ence asserts that M is the same (¢.¢., a mark of the same concept) as N, while logic denies it ; and so—it being impossible for one and the same M to sustain these contradictory positions—there is but one way open to us ; we must posit several Ms. But even now we cannot say oue of these Ms is the same as N, another is not ; for every M must

‘ be both thinkable and valid. We may, however, take the Ms not

singly but together; and again, no other course being open to us, this is what we must do; we must assume that N results from a combination of Ms. ‘This is Herbart’s method of relations, the counterpart in his system of the Hegelian dialectie.

In the Ontology this method is employed to determine what in reality corresponds to the empirical conceptions of substance and cause, or rather of inherence and change. But first we must analyse this notion of reality itself, to which our scepticism had already led us, for, though we could doubt whether “the given” is what it appears, we cannot doubt that it is something ; the con- ception of the real thus consists of the two conceptions of being and quality. That which we are compelled to “ posit,” which cannot be sublated, is that which 7s, and in the recognition of this lies the simple conception of being. But when is a thing thus posited ? When it is posited as we are wont to posit the things we sec and taste and handle. If we were without sensations, @.¢., were never bound against our will to endure the persistence of a presentation, we should never know what being is. Keeping fast hold of this idea of absolute position, Herbart leads us next to the quality of the real. (1) This must cxelude everything negative ; for non-A sub- lates instead of positing, and is not absolute, but relative to A. (2) The real must be absolutely simple ; for if it contain two deter-.

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minations, A and B, then either these are reducible to one, which is the trne quality, or they are not, when each is conditioned by the other and their position is no longer absolute. (3) All quantitative conceptions are excluded, for quantity implies parts, and these arc incompatible with simplicity. (4) But there may be a plurality of "reals," albeit the mere conception of being can tell us nothing as to this, The doctrine here developed is the first cardinal point of Herbart's system, and has obtained for it the name of " pluralistic realism."

The contradictions he finds in the common-sense conception of inherence, or of "a thing with several attributes," will now become obvious. Let us take some thing, say A, having » attributes, a, }, c.. .: weare forced to posit each of these because each is pre- sented in intuition. But in conceiving A we make, not 7 positions, still less 7 +1 positions, but one position simply ; for commion sense removes the absolute position from its original source, sensation. So when we ask, What is the one posited? we are told—the possessor of a, b, ¢..., or in other words, their seat or sub- stance. But if so, then A, as a real, being simple, must = a; similarly it nust = b; and so on. Now this would be possible if a, b,c… were but 'contingent aspects" of A, as ¢.g., 2°, 764, 44+3+1 are contingent aspects of 8. Such, of course, is not the casc, and so we have as mauy contradictions as there are attri- butcs ; for we must say A is a, is not a, is J, is not b, &. There must then, according to the method of relations, be several As. For a let us assume A, + A, + A,...; for b, Ag + Ag +Ag . . . 3 and so on for the rest. But now what relation can there be among these several As, which will restore to us the unity of our original A or substance? There is but one ; we must assume that the first A of every series is identical, just as the centre is the sanic point in every radius. By way of concrete illustration Herbart instances "the common observation that the propertics of things exist only under external conditions. Bodies, we say, are coloured, but colour is nothing without light, and nothing without eyes, They sound, but only in a vibrating medium, and for healthy ears. Colour and tone eee the appearance of inherencc, but on look- ing closer we find they are not really immanent in things but rather presuppose a commuuion among several." The result then is briefly thus :— In place of the one absolute position, which in some un- thinkable way the

common understanding substitutes for the absolute positions of the n attributes, we have really a series of two or more positions for each attribute, every series, however, begin- ning with the same (as it were, central) real (hence the unity of substance in a group of attributes), but each being continued by different reals (hence the plurality and difference of attributes in unity of substance), Where there is the appearance of inhereuce, therefore, there is always a plurality of reals; no such correlative to substance as attribute or accident can be admitted at all. Sub- stantiality is impossible without causality, and to this as its true correlative we now turn.

The common-sense conception of change involves at bottom the same contradiction of opposing qualities in one real. The same A that was a, b,c. . . becomes a,6,d… 3; and this, which experi- ence thrusts upon us, proves ou reflexion unthinkable. The meta- ve supplementing is also fundamentally as before. Since ¢

epended on a series of reals A, + Ag + Ag… in connexion with A, and d may be said simitarly to depend on a series Ay + Ay + A,..., then the change from ¢ to d means, not that the central real A or any real has changed, but that A is now in con- nexion with A,, &c., aud no longer in connexion with Ag, &c.

But to think a number of reals "in connexion" (Zusanmenscin) will not suffice as an explanation of phenomena ; something or other must happen when they are in connexion; what is it? The answer to this question is the second hinge-point of Herbart's theoretical philosophy. What "actually happens" as distinct from all that seems to happen, when two reals A and B are together is that, assuming them to differ in quality, they tend to disturb cach other to the extent of that difference, at the same time that each preserves itself intact by resisting, as it were, the other's disturbance. And so by coming into connexion with different reals the " sclf-preserva- tions" of A will vary accordingly, A remaining the same through all; just as, by way of illustration, hydrogen remains the same in water and in ammonia, or as the same line may be now a normal and now a tangent. But to indicate this opposition in the qualities of the reals A+B, we must substitute for these symbols others, which, though only "contingent aspects" of A and B, 7.¢.,

repre- senting their relations, not themselves, yet like similar devices in mathematics enable thought to advance. Thus we may put A= a+B—-y, B=m+n+y¥; ¥ then represents the character of the self- preservations in this case, and a+ B+m+n represents all that could be observed by a spectator who did not know the simple qualities, but was himself involved in the relations of A to B; and such is exactly our position.

Having thus determined what really isand what actually happens, our philosopher proceeds next to explain synthetically the objective semblance (der oljective Schein) that results from these. But if this construction is to be truly objective, 7.¢., valid for all intelli-

genccs, ontology must furnish us with a clue. This we have in the forms of Space, Time, and Motion which are involved whenever we think the reals as being in, or coming into, connexion, and the opposite. These forms then cannot be merely the products of our psychological mechanism, though they may turn out to coincide with these. Meanwhile let us call them " intelligible," as being valid for all who comprehend the real and actual by thought, although no such forms are predicable of the real and actual them- selves. The elementary spatial relation Herbart conccives to be "'the contiguity (Aneinander) of two points," so that every " pure and independent line" is discrete. But an investigation of depeud- ent lines which are often incommensurable forces us to adopt the contradictory fiction of partially overlapping, ¢.¢., divisible points, or in other words, the conception of Continuity.! But the contra- diction here is one we cannot eliminate by the method of relations, because it does not involve anything real ; and in fact as a necessary outcome of an " intelligible" form, the fiction of continuity is valid for the " objective semblance," and no more to be discarded than say /-—1. By its help we are enabled to comprehend what actually happens among reals to produce the appearance of matter. When three or more reals are together, each disturbance and self-preserva- tion will (in general) be imperfect, 7.¢., of less intensity than when only two reals are together. But "objective semblance" corre- sponds with reality ; the spatial or external relations of the reals in this case must, therefore, tally with their inner or actual states. Had the self-prescrvations been perfect, the coincidence in spacc would have been complete, and the group of reals would have been inextended ; or had the several reals been simply

contiguous, 7.¢., without connexion, then, as nothing would actually have happened, nothing would appear. As it is we shall find a continuous molecule manifesting attractive and repulsive forces ; attraction corresponding to the tendency of the self-preservations to become perfect, repulsion to the frustration of this. Motion, even more evidently than space, implicates the coutradictory conception of continuity, and cannot, therefore, be a real predicate, though valid as an intelligible form and necessary to the comprehension of the objective semblance. For we have to think of the reals as absolutely independent and yet as entcring into connexions. This we can only do by conceiving them as originally moving through intelligible space in rectilinear paths and with uniform velocities. For such motion no cause necd be supposed ; niotion, in fact, is no more a state of the moving real than rest is, both alike being but relations, with which, therefore, the real has no concern. The changes in this motion, however, for which we should require a cause, would be the objective semblance of the self-preservations that actually occur when reals meet. Further, by means of such motion these actual occurrences, which are in them- selves timeless, fall for an observer ina definite time—a time which becomes continugus through the partial coincidence of events.

But in all this it has been assumed that we are spectators of the objective semblance ; it remains to make good this assumption, or, in other words, to show the possibility of knowledge ; this is the pro- blem of what Herbart terms Eidolology, and forms the transition from metaphysic to psychology. Here, again, a contradictory con- ception blocks the way, that, viz., of the Ego as the identity of knowing and being, and as such the stronghold of idealism. The contradiction becomes more evident when the ego is defined to be a subject (and so a real) that is its own object. As real and not merely formal, this conception of the ego is amenable to the method of relations. The solution this method furnishes is summarily that there are several objects which mutually modify each other, and so coustitwte that ego we take for the presented real. But to explain this modification is the business of psychology; it is enough now to see that the subject like all reals is necessarily unknown, and that, therefore, the idealist's theory of knowledge is unsound. But though the simple quality of the subject or soul is beyond know- ledge, we know what actually happens when it is in connexion with other's reals, for its self-preservations then are what we call sensa- tions.

And these sensations are the sole material of our knowledge ; but they are not given to us asa cliaos but in definite groups and series, whence we come to know the relations of those reals, which, though themselves unknown, our sensations compel us to posit absolutely. . .

In his Psychology Herbart rejects altogether the doctrine of mental faculties as one refuted by his metaphysics, and tries to show that all psychical phenomena whatever result from the action and interaction of elementary ideas or presentations (Vorstellungen). The soul being one and simple, its scparate acts of self-preservation or primary presentations must be simple too, and its several pre- sentations must become united together. And this they can do at once and completely when, as is the case, for example, with the several attributes of an object, they are not of opposite quality. But otherwise there ensucs a conflict in which the opposed presenta- tions comport themselves like forces and mutually suppress or obseure each other. The act of presentation (Vorstellen) then

1 Hence Herbart gives the name Synechology to this branch of

metaphysics, instead of the usual one, Cosmology.

becomes partly transformed into an effort, and its product, the idea, becomes in the same proportion less and less intense till a position of cquilibrium is reached; and then at length the remainders coalesce. We have thus a statics and a mechanics of mind which investigate respectively the conditions of equilibrium and of move- ment among presentatious. In the statics two magnittides have to be determined :—(1) the amount of the suppression or inhibition (Hemmungssumme), and (2) the ratio in which this is shared among the opposing presentations. The first must obviously be as small as possible : thus for two totally-opposed presentations a and 8, of which @ is the greater, the inhibendum = 6. Foi a given degree of opposition this burden will be shared between the conflicting pre- sentations in the inverse ratio of their strength. When its remainder after inhibition = 0, a presentation is said to be on the threshold of consciousness, for on a small diminution of the inhibition the "effort" will become actual ptesentation in the same proportion. Such total exclusion

from consciousness is, however, manifestly im- possible with only two presentations,' though with three or a greater number the residual value of one may even be negative. The first and simplest law in psychological mechanics relates to the "sinking" of inhibited presentations, As the preseutations yield to the pressure, the pressure itself diminishes, so that the velocity of sinking decreases, t.e., we have the equation, (S ~~— o) dt = do, where Sis the total inhibendwm, and o the intensity actually in~~

hibited after the time ¢. Hence ¢ = log = and g = 8 (1 — e-#). =o

From this law it follows, for example, that equilibrium is never quite obtained for those presentations which continue above the threshold of consciousness, while the rest which cannot so continue are very speedily driveu beyond the threshold. More important is the law according to which a presentation freed from inhibition and rising anew into consciousness tends to raise the other presentations with which it is combined. Suppose two presentations p and + united by the residua 7 and p; then the amount of p's "help" to + is r, the portion of which appropriated by a is given by the ratio

p: 3 and thus the initial help is 7?. wv

But after a time ¢, when a portion of p represented by w has been actually brought into consciousness, the help afforded in the next instant will be found by the equation

"e : en dit=de, from which by integration we have the value of w,

rt w=p (a = <5) . So that if there are sevcral xs connected with p by smaller and smaller parts, there will be a definite " serial " order in which they will be revived by p ; aud on this fact Herbart rests all the pheno- mena of the so-called faculty of memory, the development of spatial and temporal forms, and much besides. Emotions and volitious, he holds, are not directly self-preservations of the soul, as otir presenta- tions are, but variable states of such presentations resulting from their interaction when above the threshold of consciousness. Thus when some presentations tend to force a presentation into conscious- ness, and othcrs at the same time tend to drive it out, that presentation is the seat of painful feeling ; when, on the other

hand, its entrance is favoured by all, pleasure results. Desires are preseutations strug- gling into consciousness against hindrances, and when accompanied by the supposition of success become volitions. Transcendental freedom of will in Kant's sense is an impossibility. Sclf-conscious- ness is the result of an interaction essentially the same in kind as that which takes place when a comparatively simple preseutation finds the ficld of cousciousuess occupied by a long-formed and well- consolidated "mass" of presentations—as, ¢e.g., one's business or garden, the theatre, &c., which promptly inhibit the isolated pre-

sentation if incongruent, and unite it to themselves if not. What we |

call Self is, above all, such a central mass, and Herbart seeks to show with great ingenuity and detail how this position is occupied at first chiefly by the body, then by the seat of ideas and desires, and finally by that first-personal Self which recollects the past and resolves con- cerning the future. But at any stage the actual constitueuts of this "complexion ' are variable; the concrete presentation of Self is never twice the same. And, therefore, finding on reflexion any par- ticular couercte factor coutingent, we abstract the position from that age occupies it, and so reach the speculative notion of the pure

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istheties elaborates the "ideas" involved in the expression of taste called forth by those relations of object which acquire for them the attribution of beauty or the reverse. The beautiful (addy) is

1 Thus, taking the case above supposed, the share of the inhibendum

*falling to the smaller presentation 6 is the fourth term of the propor- } 2 tion @+ b:a::b: moat and so b's remainder is p — L**

which only = 0 when @ = oo.

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to be carefully distinguished from the allied conceptions of the useful and the pleasant, which vary with time, place, and person ; whereas beauty is predicated absolutely and involuntarily by all who have attained the right standpoint. Ethics, which is but onc branch of esthetics, although the cluief, deals with such relations among volitions (WV illensverhdltnisse) as thus unconditionally please or displease. These relations Herbart finds to be reducible to five, which do not admit of further simplification ; and corrc-sponding to them are as many moral ideas (Musterbegriffe), viz. :— (1) Internal Freedom, the underlying relation being that of the individual's will to his judgment of it; (2). Perfection, the relation being that of his several volitions to each other in respect of inteusity, variety, and concentration ; (3) Benevolence, the relation being that between his own will and the thought of another's; (4) Right, in case of actual conflict with another ; and (5) Retribution or Equity, for intended good or evil done. The ideas of a final society, a system of rewards and punishments, a system of adminis-tration, a system of culture, and a "unanimated society," corre- sponding to the idcas of law, equity, benevolence, perfection, and internal frecdom respectively, result when we take account of a number of individuals. Virtue is the perfect conformity of the will with the moral ideas ; of this the single virtues are but spccial expressions. The conception of duty ariscs from the existence of hindrances to the attainment of virtue. A general scheme of prin- ciples of conduct is possible, but the subsumption of special cases under these must remain matter of tact. The application of ethics to things as they are with a view to the realization of the moral, ideas is moral technology (Zugendlchre), of which the chief divisions are Pedagogy and Politics.

In Theology Herbart held the argunent from design to be as valid for divine activity as for human, and to justify the belief in a superseusible real, concerning which, however, exact knowledge is neither attainable nor on practical grounds desirable.

Among the post-Kautian philosophers Herbart doubtless ranks next to Hegel in importance, and this without taking into account his very great contributions to the science of education. His dis- ciples speak of theirs as the " exact philosophy," and the term well expresses their master's chief excellence and the character of the chief influence he has exerted upon

succeeding thinkers of his own and other schools. His criticisms are worth more than his construc- tions ; indeed for exactness and penetration of thought he is quite on a level 'with Hume and Kant. His merits in this respect, how- ever, can only be appraised by the study of his works at first hand. But we are most of all indebted to Herbart for the enormous advance psychology has been enabled to make, thanks to his fruit- ful treatment of it, albeit as yet but few among the many who have appropriated and improved his materials have ventured to adopt his metaphysical and mathematical foundations. (J. W.)*

HERBELOT, Barruttemy v' (1625-1695), Orientalist, was born December 4, 1625, at Paris. As soon as he had completed the ordinary course in classics and philosophy at the university of his native city, he devoted himself to the study of the Oriental languages, and went to Italy to per- fect himself in them by converse with the Orientals who frequented its seaports. There he made the acquaintance of his fellow-savants Lucas Holstenius and Leo Allatius, and attracted the favourable notice of the cardinals Grimaldi and Bamberini. On his return to France after a year and a half, he was received into the house of Fouquet, superintendent of finance, who gave him a pension of 1500 livres. Losing this on the disgrace of Fouquet in 1661, he was appointed secretary and interpreter of Eastern languages to the king. A few years later he again visited Italy, when the grand-duke Ferdinand II. of Tuscany presented him with a large number of valuable Oriental MS&S., and tried to attach him to his eourt. Herbelot, however, was recalled to France by Colbert, and received from the king a pension equal to the one he had lost. In 1692 he succeeded D'Auvergne in the chair of Syriac, in the Collége de France. He died at Paris, December 8, 1695. His great work is the Bibliothéque Orientale, ou dictionnaire universel contenant tout ce gut fait connattre les peuples de ?Orient, which occupied him nearly all his life, and was published in 1697 by Galland. It is based on the immense Arabic dictionary of Hajji Khalfa, of which in- deed it is largely an abridged translation, but it also con- tains the substance of a vast number of other Arabic and Turkish compilations and manuscripts. With all his learn- ing, the author seems to have been deficient in critical

sagacity, and there is consequently a want of minute accuracy in many of its details, and of harmony between its various parts. It is, however, even yet the one avail- able source for much information to others than Oriental scholars, and as such it retains its importance.

The Bibliotheque has been reprinted at Maestricht (fol. 1776), and at the Hague (4 vols. 4to, 1777-99). The latter edition is en- riched with the contributions of Schultens, Reiske, and others. Herbelot's other works, none of which have been published, com- prise an Oriental Anthology, and an Arabic, Persian, Turkish, and Latin Dictionary.

HERBERT, Georce (1593-1633), one of the best of English religious poets, was born near the town of Mont- gomery on the 3d of April 1593. He was a brother of Lord Herbert of Cherbury, noticed below. Educated privately till the age of twelve, he was then sent to West- minster School, and in 1608 he became a student at Trinity College, Cambridge, where he was made B.A. in 1611, M.A. and major fellow of the college in 1615, and orator for the university in 1619. In his capacity as orator he was several times brought into contact with King James, About the same time also he appeared as the champion of Anglicanism against Andrew Melville, the famous Scotch Presbyterian. He numbered among his friends Dr Donne, Sir Henry Wotton, Izaak Walton, Bishop Andrewes, and Francis Bacon, who consulted Herbert about several of his works, and dedicated to him his translation of the Psalms. During his youth he was a courtier, dancing attendance on King James, and "enjoying his genteel humour for clothes" ; and the king rewarded his attentions by the gift of a sinecure worth £120 a year. The death of his patrons the duke of Richmond, the marquis of Hamilton, and King James, approaching ill-health, and the influence of his motlier finally induced him, not without a struggle, to take holy orders. In July 1626 he was appointed prebendary of Layton Ecclesia, in the county of Huntingdon. Shortly before his induction (1630) to the parsonage of Bemerton, near Salisbury, he married Miss Jane Danvers after three days' acquaintance. Mr Danvers had been set on the mar- riage for a long time, and had often spoken of his daughter Jane to Herbert, and "so much commended Mr Herbert to her, that Jane became so much a Platonic as to fall in love with Mr Herbert unseen." The story of the poet's life at Bemerton, as told by Walton, is one of the most exquisite pictures in literary biography. He

devoted much time to explaining the meaning of the various parts of the Prayer- Book, and held services twice every day, at which many of the parishioners attended, and some "let their plough rest when Mr Herbert's saints-bell rung to praise, that they might also offer their devotions to God.with him." Next to Christianity itself he loved the English Church. He was passionately fond of music, and usually went twice a week to attend the cathedral service at Salisbury. Walton illustrates Herbert's kindness to the poor by many touching anecdotes. He had not been three years in Bemerton when he succumbed to ill-health. He died in

1633.

Herbert's works are—The Temple (1631); a few miscellaneous poems ; a collection of proverbs entitled Jaeula Prudentum (1640); and The Country Parson, which did not appear till 1652. The Temple is a collection of religious poems marked by unity of sen- timent and inspiration. The chief faults of the book are obscurity, verbal conceits, and a forced ingenuity which shows itself in grotesque puns, odd metres, and occasional want of taste. In spite of these drawbacks, the quaint beauty of Herbert's style and his genuine poetical feeling give The Temple a high place in literature. The following poems are the gems of the collection :—"The Church Porch," "The Agony," "Sin," "Sunday," " Virtue," " Man," "The British Church," '"The Quip," "The Collar," "The Pulley," 'The Flower," " Aaron," and " The Elixir." The finest of all is his poem on " Man," which is Miltonic in its sublimity of con- ception, and shows how poets, in their loftier moods, often anti- cipate the discoveries of science and the most far-reaching specula- tions of philosophy. Herbert and Keble are the poets of Anglican

theology. No book is fuller of devotion to the Church of England

than Zhe Temple. No poem in our language exhibits more of the

spirit of true Christianity. Every page is marked by transparent

ests, and reflects the beautiful character of 'holy George erbert."

Among recent editions of Herbert's works the following may be mentioned : — Works in Prose and Verse, with life by Izaak Walton, and notes by S. T.

Coleridge, 1846; Gilfillan's edition, in his ' Library of the British Poets," 1853 ; Willmott's edition, 1854; Professor Nichol's edition, 1863; and the Aldine edition by the Rey. Dr A. B. Grosart. For further information consult Walton's Life, and England's Antiphon, by George Macdonald, 1871.*

HERBERT, Henry Wiiiiam (1807-1858), novelist and writer on sports, son of the Hon. and Rev. William Herbert, dean of Manchester, a son of the first earl of Carnarvon, was born in London, April 7, 1807. He was educated at Eton and at Caius College, Cambridge, where he graduated M.A. in 1828. Having become involved in debt he emigrated to America, and from 1831 to 1839 was teacher of Greek in a private school in New York. In 1833 he commenced the American Monthly Magazine, which he edited till 1835. In 1834 he published his first novel, The Brothers, a Tale of the Fronde, which was fol- lowed by a number of others, all of them obtaining a certain degree of popularity. He was also successful in a series of historical studies, such as The Cavaliers of England, The Knights of England, France, and Scotland, The Chevaliers of France, and The Captains of the Old World, and wrote numerous contributions to magazines; but he is best known for his works on sporting, published by him under the pseudonym of Frank Forester. These include The Field Sports of the United States and British Provinces (1849), Frank Forester and his Friends (1849), The Fish and Fishing of the United States (1850), The Young Sports- man's Complete Manual, and The Horse and Horsemanship in the United States and British Provinces of North America (1858). Herbert was a man of varied accomplishments, but of somewhat dissipated habits. He died by his own hand at New York, May 17, 1858,

HERBERT, Sir Tuomas (1606-1682), traveller and author, was born at York in 1606, Several of his ancestors were aldermen and merchants in that city, and they could trace their connexion with the great Herbert family repre- sented by the earl of Pembroke. His grandfather, Alder- man Herbert, who died in 1614, left him real estate of considerable value. He went to Oxford in 1621, and be- came a commoner of Jesus College, but afterwards removed to Cambridge at the invitation of his mother's brother, Dr Ambrose Akroyd. Having gone to London, he was intro- duced to the earl of Pembroke, through whose influence he obtained an appointment in the suite of Sir Dodmore Cotton, who was about to leave as ambassador for Persia

in company with Sir Robert Shirley. Sailing in March 1627, they visited the Cape, Madagascar, Goa, and Surat ; having landed at Gombroon, they travelled inland to Asharoff, and thence to Cazbeen, where both the chiefs of the expedition died. Herbert reached England again in 1629, and in 1630, to his great disappointment, his patron the earl of Pembroke died suddenly. After this he travelled on the Continent for more than a year. From his return in 1631 till about two years after his marriage in 1632 he retained his ambition for court favour, but failing in this he retired, probably to his estate of Tintern in Monmouth- shire, till the outbreak of the civil war, when he sided with the parliament. In 1646 he was appointed to attend the king with his other servants. Becoming a devoted royalist, he continued with his majesty during the last two eventful years of his life, and at the Restoration he was rewarded with the title of baronet (1660). He resided at West- minster till the great plague, when he returned to York and bought Petergate House, where he died on the Ist March 1682.

It was in 1634 that Herbert first published his Description of the Persian Monarchy now beinge : the Orientall Indyes, Iles and other parts of the Greater Asia and Africk. Four years later a new and enlarged edition appeared under the title of Some Yeares Travels into Africa and Asia the Great; a third edition followed in 1664, and a fourth in 1677. The work is evidently the production of a man of considerable scholarship and activity of mind, and altogether ranks as one of the best records of 17th century travel. It is illus- trated with woodcuts, among which the sketch of the dodo, the specimen of the cuneiform inscriptions, and the vicw of Persepolis deserve to be mentioned. Herbert's Threnodia Carolina, or Memoirs of the two last years of the reign of that unparallelld prince of ever blessed memory King Charles I., was in great part printed at the author's request in Wood's Athenew Oxonienses, but it did not appear in its entirety till Dr Charles Goodall published his Collection of Tractsin 1702. A reprint was issued by G. and W. Nicol in 1813. Sir William Dugdale is understood to have received assistance from Herbert in preparing the fourth volume of the Monasticon Angli- eanum ; aud Mr Drake has printed in the appendix to

his Eboracum two papers from Herbert's pen on the church of St John at Beverley and the collegiate church of Ripon. The best account of Sir Thomas Herbert isthat by Robert Davies, F.S.A., York, which appeared in The Yorkshire Archeological and Topographical Journal, part iii., pp. 182~214 (1870). Tt contains a facsimile of the long inscription on Herbert's tomb.

HERBERT, Lorp, or Cuersury (1582-1648). Edward Herbert, Lord Herbert of Cherbury, soldier, diplomatist, historian, and religious philosopher, was born at Eyton in Shropshire in 1582, and was descended from an ancient line of illustrious soldiers, to which the earls of Pembroke belonged, Sent to Oxford in his twelfth year, he married an heiress, his kinswoman, in his fifteenth, and returned to the university to prosecute his "beloved studies." He was knighted soon after the accession of James I., and for a year or two fulfilled the functions of sheriff of his county. In 1608 he went abroad, at Paris gaining the esteem and love of the old Constable de Montmorency, and beginning an acquaintance with scholars like Casaubon, Gassendi, and Grotius. Next year he served as a volunteer in the Low Countries under the prince of Orange, whose intimate friend he became, and also took part in the cam- paigns of 1614 and 1615. Between the latter campaigns he visited Italy, and on his return was arrested in France for recruiting Huguenots for the service of the duke of Savoy. In 1618 he was sent as ambassador extraordinary to the court of France; and, though recalled for a few months through the hostility of the French king's favourite, he soon returned to Paris as ordinary ambassador. In 1625 he came back to England, where, with the exception of one or more short visits to Paris, he spent the rest of his life. Created Lord Herbert of Castle Island in 1625, he was raised by Charles I. to the English peerage in 1631 as Baron Herbert of Cherbury. In the civil war he sided at first with the court, and subsequently declared for the par- liament, but the part he played was not a prominent one. His castle of Montgomery was, however, destroyed during the war, and he received an indemnity for his loss from the parliament, He died 20th August 1648.

"Tt is impossible to draw his picture well who hath several countenances," Herbert says of Henry VIIL,; Horace Walpole made a bold attempt to sketch Herbert's character by declaring that in his case 'the history of Don Quixote was the life of Plato." To his contemporaries Herbert was mainly

known as a high-spirited man of the world, of great knightly and courtier-like accomplishments, who, though stiff and stately, was on the smallest actual provocation ready and able to defend his honour with his sword, He maintained the character of ambassador with dignity, but his diplomacy was not attended by much success. Itis as author that Herbert is chiefly remembered. And though in 1633 the De Veritate received the official imprimatur of the bishop of London's chaplain, on the strength of the same work the writer was soon after held up to abhorrence as an atheist. As a resolute opponent of

empiricism in philosophy, he is unquestionably entitled to rank as one of the heralds of the philosophy of Reid and the Scottish metaphysicians. In the theological sphere he

is justly claimed as the father of English deism, and doubt- _

less exercised a strong influence on the religious thought of England. His views were not so novelas he thought them to be, but he was an original and very independent thinker ; and, as his chief work was published but a few years after the Novum Organum, and many years before any of the works of Descartes or Hobbes, Herbert deserves a marked place in the van of modern speculation.

Herbert's first and most important work is the De Veritate prout distinguitur a Revelatione, aVerisimili, a Possibili, et a Falso (Paris, 1624 ; translated into French, but never into English). It com- bines a theory of knowledge with a partial psychology, a metho- dology for the investigation of truth, and a scheme of natural

religion. The author's method is prolix and often far from clear ; the –

book is no compact system, but it contains the skeleton and much of the soul of a complete philosophy. Giving up all past philoso- phizings as useless, Herbert professedly endeavours to constitute a new and true system. Truth, which he defines as a just conforma- tion of the faculties with one another and with their objects, he dis- tributed into four classes or stages :—(1) truth in the thing or the truth of the object; (2)truth of the appearance ; (8) truth of the appre- hension (conceptus) ; (4) truth of the intcllect. The

faculties of the mind are as numerous as the differences of their objects, and are accordingly innumerable ; but they may be arranged in four groups. The first and fundamental and most certain group is the Natural Instinet, to which belong the xowwal évyorat, the Notitie Communes, which are the "received principles of denionstration," existing in every sane and sound man, against which it is nefas to dispute. The second group, the next in certainty, is the Sensus Internus (under which head Herbert discusses amongst others love, hate, fear, conscience with its communis notitia, and free will); the third is the Sensus Externus ; and the fourth is Disewrsus, reasoning, to which, as being the least certain, we have recourse when the other faculties fail. The ratiocinative faculties proceed by division and analysis, by questioning, and are slow ail. gradual in their move- nient ; they take aid from the other faculties, those of the instinetus naturalis being always the final test. Herbert's categories or ques- tions to be used in investigation are ten in number,—whether (a thing is), what, of what sort, how much, in what relation, how, when, where, whence, wherefore. No faculty, rightly used, can err "even in dreams"; badly exercised, reasoning becomes the source of almost all our errors. The discussion of the notitie com- mumes is the most characteristic part of the book. The exposition of them, though highly dogmatic, is at times strikingly Kantian in substance. "So far are these elements or sacred principles from being derived from experience or observation that without some of them, or at least some one of them, we can neither experience nor even observe." Unless we felt driven by them to explore the nature of things, "it would never occur to us to distinguish one thing from another." It cannot be said that Herbert proves the existence of the common notions ; he does not deduce them or even give any list of them. But each faculty has its common notion ; and they may be distinguished by six marks, their priority, inde- pendence, universality, certainty, necessity (for the well-being of man), and immediacy. Law is based on certain common notions ; so is religion. Though Herbert expressly defines the scope of his book as dealing with the intellect, not faith, it is the common notions of religion he has illustrated most fully; and it is plain that it isin this part of his system that he is chiefly interested. The common notions of religion are the famous five articles, which became the charter of the English deists :—(1) that there is a supreme god ; (2) that he ought to be worshipped; (8) that virtue and piety form the chief part of that worship; (4) that sins should be repented of; (5) that there are rewards and punishments

in another life. To these doctrines, which constitute the faith of the true catholic and orthodox church, it is not easy to add anything that can make men more virtuous or godly. There is little polemic against the received form of Christianity, but Herbert's attitude towards the church's doctrine is distinctly negative, though he admits the possibility, under certain conditions, of specific and super- natural revelation. In the De Religione Gentiliwm (Lond., 1645) he gives what may be called, in Hume's words, "a natural history of religion." By examining the heathen rcligions Herbert finds, to his great delight, that under all their absurditics the five great articles were recognized. The heathen, yearning for the supreme God, saw Him in His works and worshipped Him in the most glorious of His ereatures, the heavenly bodies. It was crafty priests who insisted on the necessity of multifarious rites and ceremonies, and developed full-fledged polytheism. The same vein is maintained in the tracts De Causis Errorum and De Religione Laiei. Herbert's first his- torical work is the Expeditio Buckinghami Ducis (1656), an account

of Buckingham's ill-fated expedition in 1627. The Life and Raigne of King Henry VIII. (1649), in pithy English, is called by Walpole 'a masterpiece of historic biography," but is ill-proportioned and is digested into annals. It abounds in picturesque but prolix ac- counts of sieges and pageants at home and abroad ; the sketch of the – Reformation history is so dispassionate as to suggest a lack of keen sympathy with either party. Henry's character is very leniently judged. The Life of Herbert by Himself (first published by Horace Walpole in 1764) gives a vivacious and interesting account of his early life down to the return from his embassy, dwelling mainly, with something of an old man's garrulity and a famous man's vanity, on the romantic and chivalrous incidents in his career. Herbert's poems, Latin and English, are of small value.

There are sketches of Herbert in Leland's Deistical Writers, Lechler's Geschichte des Englischen Deismus, and elsewhere ; but the only adequate work is M. Charles de Rémusat's Lord Herbert de Cherbury, sa Vie et ses Guvres (Paris, 1874).

HERCULANEUM. The ruins of the buried city of Herculaneum are situated about two-thirds of a mile from the Portici station of the railway from Naples to Pompeii. They are less frequently visited than the ruins of the latter city, not only because they are smaller in extent and of less obvious interest, but also because they are more diffi- cult of access, The history of their discovery and explora- tion, and the artistic and literary relics which they have yielded, are worthy, however, of particular notice. The small part of the city which has been restored to the light of day in the spot called Gli scavi nuovi (the new excava- tions) was discovered in the present century. But the more important works were executed in the last century ; and of the buildings then explored at a great depth, by means of tunnels, none are visible except the theatre, the orchestra of which lies 85 feet below the surface of the soil,

The brief notices of the classical writers inform us that Herculaneum! was a small city of Campania between Nea- polis and Pompeii, that it was situated between two streams at the foot of Vesuvius on a hill overlooking the sea, and that its harbour was at all seasons safe. With regard to its earlier history nothing is known. The account given by Dionysius repeats a tradition which was most natural for a city bearing the name of Hercules. Strabo follows up the topographical data with a few brief historical state- ments—Ooo. eyov kal ravrny kal rHv épeffs Topumniay

. + tra Tuppnvot xat WeAacyol, pera tatra Savvira. But leaving the questions suggested by these names, such as that of the domination of the Etruscans in Campania,? as well as the other questions recently discussed in regard to the origin of Pompeii, which might have an intimate relation with our subject, it is sufficient here to say that the first historical record about Herculaneum has been handed down by Livy (viii. 25), where he relates in what manner the city fell under the power of Rome during the Samnite wars. It remained faithful to Rome for a long time, but it joined the Italian allies in the Social War. Having submitted anew in June of the year 665 (88 z.c.), it appears to have been less severely treated than Pompeii, and to have escaped the imposition of a colony of Sulla's veterans, although Zumpt has suspected the contrary

1 A fragment of L. Sisenna calls it “ Oppidum tumnlo in excelso loco propter mare, parvis menibns, inter duas fluvias, infra Vesuvium collocatum”’ (lib. iv., fragm. 58, Peters). Of one of these rivers this historian again makes mention in the passage where probably he related the capture of Herculaneum by Minatius Magius and T. Didius (Velleius Paterculus, ii. 16). Further topographical details are sup- plied by Strabo, who, after speaking about Naples, continues— exduevov 5€ dpotpidy éoriw ‘Hpardrcioy exxetmevyy els thy OddAarray &xpav exov, katamveduevoy AB) Oavpactas &s0 Syrewhy worciy thy karoilay. Dionysius of Halicarnassus relates that Hercules, in the place where he stopped with his fleet on the return voyage from Iberia, founded a little city (woAixvnv), to which he gave his own nae; and he adds that this city was in his time inhabited by the Romans, and that, situated between Neapolis and Pompeii, it had Aimévas év mavr) kalp@ BeBatous (i. 44).

_ ? Disputed by Niebuhr, Hist. of Rome, vol. i. p. 76, and by Mommsen, Die Unteritalischen Dialekie, 1850, p. 314.

(Comm. Epigr., 1.259). It afterwards became a municipium, and enjoyed great prosperity towards the close of the re- public and in the earlier times of the empire, since many noble families of Rome selected this pleasant spot for the construction of splendid villas, one of which indeed belonged to the imperial house (Seneca, De Jra, iii.). By means of the Via Campana it had easy communication north- westward with Neapolis, Puteoli, and Capua, and thence by the Via Appia with Rome; and southwards with Pompeii and Nuceria, and thence with Lucania and the Bruttii. In the year 63 a.p, it suffered terribly from the earthquake which, according to Seneca, ‘“‘Campaniam nunquam securam hujus mali, indemnem tamen, et toties defunctam metu magna strage vastavit. Nam et Herculanensis oppidi pars ruit dubieque stant etiam que relicta sunt” (Wat. Quest., vi. 1), Hardly had Herculaneum completed the restoration of some of its principal buildings (cf. Mommsen, J. J, n. 2384; Catalogo del Museo Nazionale di Napoli, n. 1151) when it fell beneath the great eruption of the year 79, described by Pliny the younger (Zp. vi. 16, 20), in which Pompeii also was destroyed with other flourishing cities of Campania. According to the commonest

account, on the 23d August of that year Pliny the elder, who had com- mand of the Roman fleet at Misenum, set out to render assistance to the soldiers stationed at Retina, near Her- culaneum, as there was no escape except by sea, but, the little harbour having been on a sudden filled up so as to be inaccessible, he was obliged to abandon to their fate those people of Herculaneum and Retina who had managed to flee from their houses, overwhelmed in a moment by the material poured forth by Vesuvius. But the text of Pliny the younger, where this account is given, lias been subjected to various interpretations ; and from the com- parison of other classical testimonies and the study of the excavations it has been concluded that it is impossible to determine the date of the catastrophe, though there are satisfactory arguments to justify the statement that the event took place in the autumn. The opinion that immedi- ately after the first outbreak of Vesuvius a torrent of lava was ejected over Herculaneum was refuted by the scholars of the last century, and their refutation has been recently confirmed by Beulé (Le Drame du Vésuve, p. 240 sg.) And if the last recensions of the passage quoted from Pliny are to be accepted, Retina is not the name of the harbour described by Beulé (7d., p. 122, 247), but the name of a lady who had implored succour, the wife of Cesius Bassus, or rather Tascius (cf. Pliny, ed. Keil, Leipsic, 1870 ; Aulus Persius, ed. Jahn, Sat. vi.). The shore, moreover, accord- ing to the new and accurate studies of the engineer Michele Ruggiero, director of the excavations, was not altered by the causes adduced by Beulé (p. 125), but by a simpler event. "It is certain," he says (Pompei e la Regione Sotterrata dal Vesuvio Vanno 79, Naples, 1879, p. 21 sq.), "that the districts between the south and west, and those between the south and east, were overwhelmed in two quite different modes. From Torre Annunziata. (which is believed to be the site of the ancient Oplontii) to San Giovanni a Teduccio, for a distance of about 9 miles, there flowed a muddy eruption which in Herculaneum and the neighbouring places, where it was most abundant, raised the level of the country more than 65 feet. The matter transported consisted of soil of various kinds,— sand, ashes, fragments of lava, pozzolana, and whitish pumice, enclosing grains of uncalcined lime, similar in every respect to those of Pompeii. In the part of Hercu- laneum already excavated, the corridors in the upper portions of the theatre are compactly filled, up to the head of the arches, with pozzolana and pumice transformed into tuff (which

proves that the formation of this stone may take place in a comparatively short time). Tuff is also

found in the lowest part of the city towards the sea in front of the few houses that have been discovered ; and in the very high banks that surround them, as also in the lowest part of the theatre, there are plainly to be seen earth, sand, ashes, fragments of lava and pumice, with little distinction of strata, almost always confused and mingled together, and varying from spot to spot in degree of compactness. It is clear that this immense congeries of earth and stones could not flow in a dry state over those 5 miles of country (in the beginning very steep, and at intervals almost level), where certainly it would have been arrested and all accumulated in a mound; but it must have been borne along by a great quantity of water, the effects of which may be distinctly recognized, not only in the filling and choking up even of the most narrow, intricate, and remote parts of the buildings, but also in the formation of the tuff, in which water has so great a share; for it cannot be supposed that enough of it has filtered through so great a depth of earth. 'The torrent ran in a few hours to the sea, and formed that shallow or lagoon called by Pliny Subtwm Vadum, which prevented the ships approaching the shores." Hence it is that, while many made their escape from Pompeii (which was overwhelmed by the fall of the small stones and afterwards by the rain of ashes), comparatively few can have managed to escape from Herculaneum, and these, according to the interpretation given to the inscription preserved in the National Museum (Mommsen, J. W., n. 2455), found shelter in the neighbouring city of Neapolis, where they inhabited a quarter called that of the buried city (Suetonius, Titus, 8). The name of Herculaneum, which for some time remained attached to the site of the disaster, is mentioned in the later itineraries; but in the course of the Middle Ages all recollection of it perished.

In 1709, while Prince Elbeuf of the house of Lorraine, in com- mand of the armies of Charles VI., was seeking crushed marble to make plaster for his new villa near Portici, he learned from the peasants that there were in the vicinity some pits from which they not only quarried excellent marble, but had extracted many statues in the course of years (see Jorio, Notizia degli

scavi d'Ercolano, Naples, 1827). In 1738, while Colonel D. Rocco de Alcubierre was directing the works for the construction of the "Reali Delizie" at Portici, he received orders from Charles III. to begin excavations on the spot where it had been reported to the king that the Elbeuf statues had been found. At first it was believed that a temple was being explored, but afterwards the inscriptions proved that the building was a theatre. This discovery excited the greatest com- motion amoung the scholars of all nations; and many of them hastened to Sapte to see the marvellous statues of the Balbi and the paintings on the walls. But everything was kept private, as the Government wished to reserve to itself the right of illustrating the monuments. First of all Monsignor Bayardi was brought from Rome and commissioned to write about the antiquities which were being collected in the museum: at Portici under the care of Camillo Paderni, and when it was recognized that the prelate had not suffi- cient learning, and by the progress of the excavations other most abundant material was accumulated, about which at once scholars and courtiers were anxious to be informed, Bernardo Tanucci, having become secretary of state in 1755, founded the Accademia Ercolanese, which published the principal works on Herculaneum (Le Pittwre ed 4 Bronat d' Ercolano, 8 vols., 1757, 1792; Disscrta- tionis Isagogice ad Herculanensium voluminum explanationem pars prima, 1797). The criterion which guided the studies of the academicians was far from being worthy of unqualified praise, and consequently their work did not always meet the approval of the best scholars who had the opportunity of seeing the monuments. Among these was Winckelmann, who in his letters gave ample notices of the excavations and the antiquities whicli he was able to visit on several occasions. Other notices were furnished by Gori, Symbole litterarie Florentine, 1748, 1751, by Marcello Venuti, Descrizione delle prime scoperte d' Ercolano, Rome, 1748, and Scipione Maffei, Tre lettere intorno alle scoperte d'Ercolano, Verona, 1748. The excavations, which continued for more than forty years (1738- 1780), were executed at first under the immediate direction of Alcubierre (1738-1741), and then with the assistance of the engineers Rorro and Bardet (1741-1745), Carl Weber (1750-1764), and Francesco La Vega. After the death of Alcubierre (1780), the last-named was appointed director-in-chief of the excavations ; but

| from that time the investigations at Herculaneum were intermittcd, and the researches at Pompeii were vigorously carried on. Resumed in 1827, the excavations at Herculaneum were shortly after sus- pended, nor were the new attempts made in 1866 with the money bestowed by King Victor Emmanuel attended with success, being impeded by the many dangers arising from the houses built over- head. The meagreness of the results obtained by the occasional works executed in the present century, and the fact that the in- vestigators were unfortunate cnough to strike upon places already explored, gave rise to the opinion that the whole area of the city had been crossed by tunnels in the time of Charles III. and in the beginning of the reign of Ferdinand IV. And although it is re- cognized that the works had not been prosecuted with the caution that they required, yet in view of the serious difficulties that would attend the collection of the little that had been left by the first excavators, every proposal for new investigations has been aban- doned. But ina memoir which Professor Barnabei read in the Reale Accademia dei Lincei (Atti della R. Ac., series iii., vol. ii. p. 751), he undertook to prove that the researches made by the Government in the last century did not cover any great area. The antiquities excavated at Herculaneum in the last century form a collection of the highest scientific and artistic value. Thcre are marble statues of astonishing art and perfect preservation, of which it is sufficient to mention the two equestrian statues of the Balbi (Afuseo Borbonico, vol. ii. pl. xxxviii.—ix.) and the so-called statue of Aristocles. With the exception of a few pieces, nearly all the great bronzes of the museum belong to Herculaneum. It is thence that we have ob- tained the reposing Hermes, the drunken Silenus, the sleeping Faunus, the dancing girls, the bust called Plato's, that believed to be Seneca's, the two quoit-throwers or discoboli, and so many master-pieces more, figured by the academicians in their volume on the bronzes. Mural paintings of extraordinary beauty were also discovered, such as those that represent Theseus after the slaughter of the Minotaur (Helbig, Wandgemdldc, Leipsic, 1878, No. 1214) and Chiron teaching Achilles the art of playing on the lyre (cdid., No. 1291). Notwithstanding the recent discoveries of the stupen- dous paintings in the gardens of the Villa Farnesina on the banks of the Tiber, the monochromes of Herculaneum remain among our finest specimens of the exquisite taste and consummate skill dis- played iby the ancient artists. Among the best preserved is Leto and Niobe, which has been the subject of so many studies and so many publications (ibid., No. 1706).

There is also a considerable number of lapidary inscriptions edited in vol. ii. of the epigraphic collection of the Cat. del Mus. Naz. di Napoli.

But all these antiquities do not seem to afford adequate support for the opinion of those who, pointing out that those marvels were found for the most part in two or three buildings, conclude that similar riches would be found in other houses if the excavations were resumed. For their contention is that Herculaneum was not only a much greater city than Pompeii, but had attained a more exquisite Greek culturc, because a large body of the Greek colonists expelled from the cities of Southern Italy had settled there either through their own numerical strength or through the favour of the Samnite confederation, whose conquests had placed it above all alarm at the advance of an already vanquished race. But in support of these assertions, more proof seems to be required than the fact that only two Samnite inscriptions have been found in Herculaneum (¢/- Fabretti, Glossariwm TItalicum, No. 2784, 2784 bis), whilst at Pompeii they have been met with in great numbers ; since, if it is borne in mind that in a later age Herculaneum was a municipium as well as Pompeii, and had the same political life, we must seek another explanation of the circumstance that in Pompeii there are so many inscriptions relative to municipal affairs, while in Hercu- laneum there are none. On the other hand, the classical tradition does not force us to believe that the city was so small as the academi- cians held it to be. The plan published in the Déssertatio Isagogica represents nine insule or blocks, each having the proportions of the sides of the Villa Suburbana or Villa Ercolanese discovered in the place called the wood of St Agostino. It was believed that this place was in the suburb, because it was divided from the rest of the inhabited area by a narrow valley formed by the washing of the rain (Diss. Isag., p. 30). If this was correctly determined, the same cannot be said of the circuit of the city, as the walls have not been discovered. Nor are the investigations sufficient to fix precisely the ancient shore line. The discovery of the Villa Suburbana contributed to magnify the greatness of Hercu- laneum ; within its walls were collected statues of marble and of bronze, and the famous library, of which, counting both entire and fragmentary volumes, 1803 papyri have been preserved. Among the nations which took the greatest interest in the discovery of the Herculaneum library, the most honourable rank belongs to England, which sent Bishop Hayter and other scholars to Naples to solicit the publication of

the volumes. Of the 341 papyri which have been unrolled, 195 have been published (Herculanensium voluminum que supersunt, Naples, 1793-1809; Collectio altera, 1862-1876). They contain works by Epicurus, Demetrius, Polistratus, Colotes, Chrysippus, Carniscus, and Philodemus, The names of the authors

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Plan of Villa Ercolanese, Herculaneum.

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are in themselves suf- ‘ficient to show that the library belonged to a person whose prin- cipal study was the Epicurean philosophy. But of the great mas- ter of this sehool only », a few works have becn p:; found. Of his treatise Pippy? Tlep) dicews, divided ::] into 87 books, it is known that there were three copies in the library (Coll. ait., vi.). Quite recently Profes sor Comparetti, study- ing the first faseiculus of volume xi. of the same new colleetion, reeognized most imn- portant fragments of the Ethics of Epicurus, and these he publish- ed in 1879 in Nos, ix. and xi. of the Rivista di Filologia ed Istru- zione classica, Turin. Even the otherauthors above mentioned are but poorly represented, with the exeeption of Philodemus, of whom 26 different treatises have been reeognized. But all these philo- sophie discussions, be- longing for the most ‘te-enee part to an author less than seeondary among the Epicureans, fall short of the high ex- pectations

excited by the first discovery of the library. Aniong the many volumes unrolled only a few are of historical import- anee,—that edited by Biicheler, which treats of the philosophers of the academy (Acad. phil. index Hercul., Greifswald, 1859), and that edited by Comparetti, which deals with: the historians (“ Papiro ereolanese inedito,” in Rivista di Fil. ed Ist. class. anno ili., fasc. x.-xii.). To appreciate the value of the volumes unrolled but not yet published (for 146 vols. were only eopied and not printed), the student must await the appearance of Comparetti’s

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paper, “ Relazione sui papiri ercolanesi,” read in the Reale Aecad. dei Lincei, which will appear in the “ Proceedings” of the academy for 1879. Contributions of some value have been made to the study of Herculaneum fragments by Spengel (“ Die Hercul. Rollen,” in Philologus, 1863, suppl. vol.), and Gompertz (Hercul. Studien, Leipsic, 1865-66, cf. Zeitschr. f. dsterr. Gymn., 1867-1872). There are in the library some volumes written in Latin, which, aecording to Boot (Notice sur lcs manuserits trouvés & Herculaneum, Amster- dam, 1845), were found tied up in a bundle apart. Of these we know 18, but they are all so damaged that hardly any of them can be deciphered. One with verses relating to the battle of Actium is believed to belong to a poem of Rabirius. The numerical pre- ponderance of the works of Philodemus led some people to believe that this had been the library of that philosopher. But quite recently Professor Comparetti has come to the conclusion that the library was collected by Lucius Piso Cesoninus (see Pompei e la Regione Sotterrata dal Vesuvio, Naples, 1879, p. 159 sq.). A new support to the theory of Professor Comparetti is furnished by the epigraphie fragment edited by De Petra (7b., p. 251 sg.) ; but Dr Mau takes up a counter position,—he is the first to do so,—and shows that the fragment must have another interpretation (Bull. Inst. di Corr. Arch., 1880). Professor De Petra has also published the official notices upon the antiquities nmearthed in the sumptuous villa, giving the plan exeeuted by Weber and recovered by chance by the director of excavations, Miehele Ruggiero. This plan, which is here reproduced from De Petra’s monograph,} is the only satisfactory document for the topography of Herculaneum ; for the plan of the theatre published in the Bullettino archeologico-ttaliano (Naples, 1861, i. p. 53, tab. iii.) was executed in

1747, when the excavations were not eompleted. And even for the history of the. "finds" made in the Villa Suburbana the necessity for further studies makes itself felt, since there is a lack of agreement between the accounts given by Aleubierre and Weber and those eommuni- eated to the Philosophical Transactions (London, vol. x.) by Camillo Paderni, eonservator of the Portici Museum. It is hoped, there- fore, that among the papers recovered by Ruggiero there may be others which will shed light on what remains dark in the topography of the buried city.

Among the older works relating to Hereulaneum, in addition to those already quoted, may be mentioned De Brosses, Lettre sur Vétat actuel de la ville svuterraine d' Heracléa, Paris, 1750 ; Seigneux de Correvon, Lettre sur la découverte de l'ancienne ville a' Herculane, Yverdon, 1770; David, Les antiquités d'Hereulaneum, Paris, 1780 ; D'Ancora Gaetano, Prospetto storico-fisico degli scavi d'Ercolano e di Pompei, Naples, 1803 ; Venuti, Prime Scoverte di Ercolano, Rome, 1748 ; and Romanelli, Viaggio ad Ercolano, Naples, 1811. A full list will be found in vol. i. of Museo Borbonico, Naples, 1824, pp. 1-11. (F. B.)

HERCULES (Old Latin, /ercoles, Hercles) is the Latinized form of the mythical Heracles, the chief national hero of Hellas, who has part in all the most important myths of the generation before that which embraces the Homeric warriors at Troy. The name "HpakAjs is com- pounded of Hera, the goddess, and the stem of xAéos, "glory." The thoroughly national character of Heracles is shown by his being the mythical ancestor of the Dorian dynastic tribe, while revered by Ionian Athens, Lelegian Opus, and Aolo-Phcenician Thebes, and closely associated with the Achzean heroes Peleus and Telamon. The Perseid Alemene, wife of Amphitryon of Tiryns, was Hercules's mother, Zeus his father (see ALCMENE). After his putative father he is often called Amphitryoniades, and Alcides too, after the Perseid Alczus, father of Amphitryon. His mother and her husband lived at Thebes in exile as guests of King Creon. By the craft of Hera, his foe through life, his birth was delayed, and that of Eurystheus, son of Sthenelus of Argos, hastened, Zeus having in effect sworn that the elder of the two should rule the realm of Perseus. Hera sent two serpents to destroy the new-born Hercules, but he strangled them. He was trained in all manly ac- complishments by heroes of the highest renown in each, until he slew Linus,

his instructor in music, with the lyre. Thereupon he was sent to tend Amphitryon's oxen, and at this period slew the lion of Mount Citheron. By the sub- jection of the Minyans of Orchomenus he won Creon's

1 The diagram shows the arrangement and proportions of the Villa Ercolanese, p indicating pictures, 6 bronzes, m marble statues or busts, pa papyri, and f fountains. The dotted lines show the eourse taken by the excavations, which began at the lower part of the plan.

daughter, Megara, to wife. Her children by him he killed ina frenzy induced by Hera. After purification he was sent by the Pythia to serve Eurystheus. The apologue of Prodicus on the Choice of Hercules between pleasure and virtue was founded on his obedience to the oracle. Thus began the cycle of the twelve labours :—

1. Wrestling with the Nemean lion.

2. Destruction of the Lernean hydra.

3. Capture of the Arcadian hind (a stag in art).

4, Capture of the boar of Erymanthus, while chasing which he fought the Centaurs and killed his friends Chiron and Pholus, this homicide leading to Demeter's institution of mysteries.

5. Cleansing of the stables of Augeas.

6. Shooting the Stymphalian birds.

7. Capture of the Cretan bull subsequently slain by Theseus at Marathon.

8. Capture of the man-eating mares of the Thracian Dio- medes.

9. Seizure of the girdle of Hippolyte, queen of the Amazons.

10. Bringing the oxen of Geryones from Erythia in the far west, which errand involved many adventures in the coast lands of the Mediterranean,

and the setting up of the “ Pillars of Hercules” at the Straits of Gibraltar.

11. Bringing the golden apples from the garden of tho Hespe- rides.

12. Carrying Cerberus from Hades to the upper world.

Most of the labours lead to various adventures called mapepya. Their common order and selection, due to Apol- lodorus and Diodorus Siculus, are later than Euripides, who omits 5, 6, and 7, and seems to count the victory over Cycnus in Phthiotis, the bearing of the heavens for Atlas, and the freeing of the seas from dangerous monsters. In Homer we read of unspecified labours for Eurystheus, of the struggle with the sea monster of the Troad, and of wars. Hesiod mentions labours 1, 2, and 10, and the freeing of Promethens. It is a mistake to suppose that legends of Hercules's struggles with monstrous embodi- ments of evil are not of high antiquity, though we cannot say positively which are old and which comparatively late. Some enumerations give only 10 labours. The late lists probably rest partly on astronomical ideas,

On Hercules's return to Thebes he gave his wife Megara to his friend and charioteer [olaus, son of Iphicles, and by beating Eurytus of Cichalia and his sons in a shooting match won a claim to the hand of his daughter Tole, whose family, however, except her brother Iphitus, withheld their consent to the union. Iphitus persuaded Hercules to search for Eurytus's lost oxen, but was killed by him at Tiryns in a frenzy. He consulted the Pythia about a cure for the consequent madness, but she declined to answer him. Whereupon he seized the oracular tripod, and so entered upon a contest with Apollo, which Zeus stopped by sending a flash of lightning between the combatants. The Pythia then sent him to serve the Lydian queen Omphale. He then with Telamon, Peleus, and Theseus took Troy. He next helped the gods in the great battle against the giants. He took part in the Argonautic voyage and the Calydonian boar hunt, made war against Augeas, and against Nestor and the Pylians, and restored Tyndareus to the sovereignty of Lacedemon. He sustained many single combats, one very famous struggle being the wrestling with the Libyan Antzeus, son of Poseidon and Ge (Earth), who had to be held in the air, as he grew stronger every time he touched his mother, Earth. Hercules withstood Ares, Poseidon, and Hera, as well as Apollo, The close of his career Is assigned to Attolia and Trachis. He wrestles with Achelous for Deianeira ("destructive to husband"), daughter of CEneus, king of Calydon, vanquishes the river god, and breaks off one of his horns, which as a horn of plenty is found as an attribute of Hercules in art. Driven from Calydon for homicide, he goes with Deianeira to Trachis.

On the way he slays the centaur Nessus, who persuades Deianeira that his blood is a love-charm. From Trachis

HERCULES

he wages successful war against the Dryopes and Lapithze as ally of Aigimius king of the Dorians, who promised him a third of his realm, aud after his death adopted Hyllus, his son by Deianeira, Finally Hercules attacks Eurytus, takes Cchalia, and carries off Iole. Thereupon Deianeira, prompted by love and jealousy, sends him a tunic dipped in the blood of Nessus, and the unsuspecting hero puts it on just before sacrificing at the headland of Ceneum in Eubcea. Mad with pain, he seizes Lichas, the messenger who had brought the fatal garment, and hurls him on the rocks ; and then he wanders in agony to,Mount Cita, where he mounts a pyre, which, however, no one will kindle. At last Poeas, father of Philoctetes, takes pity on him, and is rewarded with the gift of his bow and arrows. The immortal part of Hercules passes to Olympus, where he is reconciled to Hera and weds her daughter Hebe.

In one aspect Hercules is clearly a sun-god, being identified, especially in Cyprus and in Thasos (as Makar), with the Tyrian Melkarth. He is again a representative of endurance and effort in the cause of Hellenic civilization and enterprise. Sundry of his exploits may be based on actual achievements of tribes and leaders of men, but it is impossible to unravel satisfactorily the tangled strands which make up this highly elaborate myth, though the separate existence of some is clearly discernible. The close connexion of the hero with both Thebes and Argos suggests actual relations between the two states, The Lydian episode shows traces of Eastern influence. The second, fifth, and sixth labours may be solar, but yet they suggest reclamation of marsh land. The third and twelfth are the most obviously solar, the horned hind representing the moon, and the carrying of Cerberus to the upper world an eclipse. It may be admitted as highly probable that the last episode of the hero's tragedy is a complete solar myth developed at Trachis. The winter sun is seen rising over the Cenzan promontory to toil across to Mount Cita and disappear over it in a bank of fiery cloud. The fatality by which Hercules kills so many friends as well as foes recalls the destroying Apollo; while his career frequently illustrates the Delphic views on blood-

guiltiness and ex- piation. As Apollo's champion Hercules is Daphnephoros, and fights Cyenus and Amyntor to keep open the sacred way from Tempe to Delphi. As the Dorian tutelar he aids Tyndareus and Aigimius. As patron of maritime adventure (iryeuovios) he struggles with Nereus and Triton, slays Eryx and Busiris, and perhaps captures the wild horses and oxen, which may stand for pirates. Asa god of athletes he is often a wrestler (radaiuwv), and founds the Olympian games. In comedy and occasionally in myths he is depicted as voracious (Bovddyos). He is also represented as the companion of Dionysus, especially in Asia Minor. The " Resting" (dvaravéuevos) Hercules is, as at Thermopyle and near Himera, the natural tutelar of hot springs in con- junction with his protectress Athena, who is usually depicted attending him on ancient vases. The glorified Hercules was worshipped both as a god and a hero, In the Attic deme Melita he was invoked as dAcgixaxos (" Helper. in- ills"), at Olympia as KxaAXivxos (" Nobly-victorious"), in the rustic worship of the CEteans as xopvoriwv (xdpvores, "Jlocusts"), by the Erythraans of Ionia as imoxrdvos, (" Canker-worm-slayer"). In Italy he was, like Apollo, Musagetes ("Leader of the Muses"). He was owryp ("Saviour "), z.¢., a protector of voyagers, at Thasos and Smyrna, and in Italy, where tithes were vowed to him to be spent in entertainment. Games in his honour were held at Thebes and Marathon. In early poetry, as often in art, he is an archer, afterwards a club-wielder and fully-armed warrior. In early art the adult Hercules is bearded, but not long-haired. Later he is sometimes youthful and beard- less, always with short curly hair and thick neck, the lower

part of the brow prominent. A lion's skin is generally worl or carried. Lysippus worked out the finest type of sculptured Hercules, of which the Farnese by Glycon is a grand specimen. The infantine struggle with serpents was a favourite subject.

Quite distinct was the Idan Hercules, a Cretan Dactyl connected with the cult of Rhea or Cybele. The Greeks recognized Hercules in an Egyptian deity Chom and an Indian Dorsanes, not to mention personages of other mytho- logies. Hercules is supposed to have visited Italy on his return from Erythia, when he slew Cacus, son of Vulcan, the giant of the Aventine mount

in Rome, who had stolen his oxen. To this victory was assigned the founding of the Ava maxima. With respect to the Roman relations of the hero, it is manifest that the native myths of Recar- anus, or Sancus, or Dius Fidius, were transferred to the Hellenic Hercules.

The best account of the Hercules myths and cults is by L. Preller, Griechische Mythologic, 3d ed., Berlin, 1875. See also Hillan, De Herculis Romani fabula et cultu, Miinster, 1850 ; and Bréal, Hercule et Cacus, Paris, 1863. (C. A. M. F.)

HERDER, Jonann Gortrrtep von (1744-1803), one of the most prolific and influential writers that Germany has produced, was born in Mohrungen, a small town near K6nigsberg, in 1744. Like his contemporary Lessing, with whose literary aims his own had so much in common, Herder had throughout his life to struggle against adverse circumstances. His father was poor, having to put together a subsistence by uniting the humble offices of sexton, choir singer, and petty schoolmaster. Gottfried seems to have got some rudimentary instruction from his father, after which he was sent to the grammar school (gymnasium) of his native town. The mode of discipline practised by the pedantic and irritable old man who stood at the head of this institution was not at all to the young student's liking, and the impression made upon him stimulated him later on to work out his projects of school reform. The hard- ships of his early years drove him to introspection and to solitary communion with nature, and thus favoured a more than proportionate development of the sentimental and poetic side of his mind. When quite young he ex- pressed a wish to enter the church, but his aspirations were somewhat rudely discouraged by the local clergyman. In 1762, at the age of eighteen, he went up to K6nigsberg with the intention of studying medicine, but finding himself unequal to the operations of the dissecting-room, he aban- doned this object, and by the help of one or two friends and his own self-supporting labours, followed out his earlier idea of the clerical profession by joining the university, There he came under the influence of Kant, who was just then passing from physical to metaphysical problems, Without becoming a disciple of Kant, the young Herder was deeply stimulated to fresh critical inquiry by that thinker's revolutionary ideas in philosophy. To Kant's lectures and conversations he further owed something of his large interest in cosmological and anthropological

problems, Among the writers whom he most carefully read were Plato, Hume, Shaftesbury, Leibnitz, Diderot, and Rousseau, Another personal influence under which he fell at Konigs- berg, and which was destined to be far more permanent, was that of Hamann, "the northern Mage." 'This writer had already won a name, and in the young Herder he found a mind well fitted to be the receptacle and vehicle of his new ideas on literature. From this vague, incoherent, yet clever writer our author acquired some of his strong feeling for the natural naif element in poetry, and for the earliest developments of national literature. – Even before he went to Kénigsberg he had begun to compose verses, and at the age of twenty he took up the pen as a chief occupa- tion. His first published writings were occasional poems

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and articles contributed to the Kénigsberg Journal. Soon after this he got a double appointment at Riga, as assistant master at the cathedral school, and as curate to the sub- urban churches. In this busy commercial town, in some- what improved pecuniary and social circumstances, he developed the main ideas of his writings. In the year 1767 he published his first considerable work Fragmente tiber die neuere deutsche Literatur, which at once made him widely known and secured for him the favourable interest of Lessing. From this time he continued to pour forth a number of critical writings on literature, art, &c. His bold ideas on these subjects, which were a great advance even on Lessing's doctrines, naturally excited hostile criticism, and in consequence of this opposition, which took the form of aspersions on his religious orthodoxy, he resolved to leave Riga. He was much carried away at this time by the idea of a radical reform of social life in Livonia, which (after the example of Rousseau) he thought to effect by means of a better method of school-training. With this plan in view he began (1769) a tour through France, England, Holland, &c., for the purpose of collecting infor- mation respecting their systems of education. It was during the solitude of his voyage to France, when on deck at night, that he first shaped his idea of the genesis of primitive poetry, and of the gradual evolution of humanity. Having received an offer of an appointment as travelling tutor and chaplain to the young prince of Eutin-Holstein, he aban- doned his somewhat visionary scheme of a social reconstruc- tion of a Russian province. He has, however, left a curious sketch of his projected

school reforms. His new duties led him to Strasburg, where he met the young Goethe, on whose poetical development he exercised so potent an influ- ence. At Darmstadt he made the acquaintance of Caroline Flachsland, to whom he soon became betrothed, and who for the rest of his life supplied him with that abundance of consolatory sympathy which his sensitive and rather querulous nature appeared to require. The engagement as tutor did not prove an agreeable one, and he soon threw it up (1771) in favour of an appointment as court preacher and member of the consistory at Biickeburg. Here he had to encounter bitter opposition from the orthodox clergy and their followers, among whom he was received as a free- thinker. His health continued poor, and a fistula in the eye, from which he had suffered from early childhood, and to cure which he had undergone a number of painful operations, continued to trouble him. Further, pecuniary difficulties, from which he never long managed to keep himself free, by delaying his marriage, added to his depres- sion. The correspondence between Herder and Caroline Flachsland indicates a relationship which offers a curious parallel and contrast to that of Lessing and his future wife under very similar circumstances. Notwithstanding these trying circumstances he resumed literary work, which his travels had interrupted, For some time he had been greatly interested by the poetry of the north, more particularly Percy's Leliques, the poems of 'Ossian " (in the genuineness of which he like many others believed), and the works of Shakespeare. Under the influence of this reading he now finally broke with classicism and became the leader of the new "Sturm und Drang" movement. He co-operated with a band of young writers at Darmstadt and Frankfort, includ- ing Goethe, who in a journal of their own sought to diffuse the new ideas of Herder. His marriage took place in 1773. In 1776 he obtained through Goethe's influence the post of upper court preacher and upper member of the consistory at Weimar, where he passed the rest of his life. There he enjoyed the society of Goethe, Wieland, Jean Paul (who came to Weimar in order to be near Herder), and others, the patronage of the court, with whom as a preacher he was very popular, aud an opportunity of carrying out some of

his pet ideas of school reform. Yet the social atmosphere of the place did not suit him. His personal relations with Goethe again and again became embittered.- He had not the poet-minister's liking for the elegant frivolities of court life, while the efforts of Goethe and Schiller to make Weimar a dramatic centre repelled his austerely moral nature. All this, added to ill-health, served to intensify a naturai irrita- bility of temperament, and the history of his latter Weimar days is a rather dreary page in the chronicles of literary life. He had valued more than anything else a teacher's influence over other minds, and as he began to feel that he was losing it he grew jealous of the success of those who had outgrown this influence. Yet while presenting these unlovely traits, Herder's character was on the whole a worthy and attractive one. This seems to be sufficiently attested by the fact that he was greatly liked and esteemed, not only in the pulpit but in private intercourse, by culti- vated women like the countess of Biickeburg, the duchess of Weimar, and Frau von Stein, and, what perhaps is niore, was exceedingly popular among the gymnasium pupils, in whose education he took so lively an interest. While during the last years of his life he produced much that is of little value, he wrote also some of his best works, among others his collection of popular poetry, Stemmen der Volker ; his most notable original poem, the Cid; his celebrated work on Hebrew poetry, Vom Geist der hebrdischen Poesie ; and his opus magnum, the Ideen zur Philosophie der Ge- schichte. Towards the close of his life he occupied himself like Lessing with speculative questions in philosophy and theology. The boldness of some of his ideas cost him some valuable friendships, as that of Jacobi, Lavater, and even of his early teacher Hamann. He died in the year 1803, full of new literary plans up to the very last.

Herder's writings were for a long time regarded as of temporary value only, and fell into neglect. Recent criticism, however, has tended very much to raise their value by tracing out their wide and far-reaching influence. The number of publications relating to Herder that have appeared during the last few years shows that there is a revival of interest in this writer. His writings are very

voluminous, and to a large extent fragmentary and devoid of artistic finish ; nevertheless they are nearly always worth investigating for the brilliant suggestions in which they abound. His place in German literature has

already been faintly indicated in tracing his mental development. Like Lessing, whose work he immediately continued, he was a pioneer of the golden age of this literature. Lessing had given the first impetus to the formation of a national literature by exposing the folly of the current imitation of French writers. But in doing this he did not so much call his fellow-countrymen to develop freely their own national sentiments and ideas as send them back to classical example and principle. Herder on the contrary fought against all imitation as such, aud bade German writers be true to themselves and their national antecedents. As a sort of theoretic basis for this adhesion to national type in litera- ture, he conceived the idea that literature and art, together with language and national culture as a whole, are evolved by a natural process, and that the intellectual and emotional

life of each people is correlated with peculiarities of physical —

temperament and of material environment. In this way he became the origiuator of that genetic or historical method which has since been applied to all human ideas and insti- tutions. Herder was thus an evolutionist, but an evolu-

tionist still under the influence of Rousseau. That is to say, :

in tracing back the later acquisitions of civilization to im- pulses which are as old as the dawn of primitive culture, he did not, as the modern evolutionist does, lay stress on the

superiority of the later to the earlier stages of human development, but rather became enamoured of the simplicity

and spontaneity of those early impulses which, since they are the oldest, easily come to l6ok like the most real and precious. Yet even in this way he helped to found the historical school in literature and science, for it was only after an excessive and sentimental interest in primitive human culture had been awakened that this subject would receive the amount of attention which was requisite for the genetic explanation of the later acquisitions of

the species. This historical idea was carried by Herder into the regions of poetry, art, religion, language, and finally into human culture as a whole. It colours all his writings, and is inti- mately connected with some of the most characteristic attri- butes of his mind, a quick sympathetic imagination, a fine feeling for local differences, aud a scientific instinct for seizing the sequences of cause and effect.

Herder's works easily arrange themselves in an ascending series, corresponding to the way in which the genetic or historical idea was developed and extended. First come the works on poetic literature, art, language, and religion as special regions of develop- ment. Secondly, we have in the deena general account of the pro- cess of human evolution. Thirdly, there are a number of writings which, though inferiorin interest to the others, may be said to supply the philosophic basis of his leading ideas. (1) In the region of poetry Herder sought to persuade his countrymen, both by example and precept, to return to a natural and spontaneous form of utterance His own poetry is voluminous, and as a whole has but little value. Herder was a skilful verse-maker but hardly a creative poet. His best poetry consists of translations of popular song, in which he shows a rare sympathetic insight into the various feelings and ideas of peoples as unlike as Greenlanders and Spaniards, Indians and Scotch. In the Fragmente he aims at nationalizing German poetry and freeing it from all extraneous influence. He ridicules the ambition of German writers to be classic, as Lessing had ridiculed their eager- ness to be French. " Let us," he says, "be idiotistic writcrs, adapt- ing ourselves to the peculiarities of our people and our language ; whether we are classic posterity may find out." In his sweeping condemnation of contemporary writers, he does not exempt even Klopstock, with whose feeling for nature he has so nuch sympathy, but whose poems appear to him exotic in sentiment and ideas. He looked at poetry as a kind of " proteus among the people, which changes its form according to language, manners, habits, according to temperament and climate, nay, cven according to the accent of different nations." This fact of the idiosyncrasy of national poetry he illustrated with great fulness and richness in the case of Homer, the nature of whose works he was one of the first to elucidate, the Hebrew poets (Geist der hebrdischen Poesie), and the poetry of the north as typified in " Ossian." This same idea of necessary re- lation to national character and circunistance is also applied to dramatic

poetry, aud more especially to Shakespeare. Lessing had done much to make Shakespeare known to Germany, but he had regarded him in contrast to the French dramatistswith whom he also contrasted the Greek dramatic poets, and accordingly did not bring out his essentially modern and Teutonic character. Herder does this, and in doing so shows a far deeper understanding of Shake- speare's genius than his predecessor had shown. His appreciative criticisms of Hamlet, Othello, and other plays are worthy of being read along with those of later German critics. (2) The views on art contained in Herder's Silve, Plastik, &c., are chiefly valuable as a correction of the excesses into which reverence for Greek art had betrayed Winckelmann and Lessing, by help of his fundamental idea of national idiosyncrasy. He argues against the setting up of classic art as an unchanging type, valid for all peoples and all times. He was one of the first to bring to light the characteristic excel- lences of Gothic art. Beyond this, he eloquently pleaded the cause of painting asa distinct art, which Lessing in his desire to mark off the formative arts from poetry and music had confounded with sculp- ture. He regarded this as the art of the eye, while sculpture was rather the art of the organ of touch. Painting being less real than sculpture, because lacking the third dimension of space, and a kind of dreain, admitted of much greater freedom of treatment than this last. Herder had a genuine appreciation for early German painters, and helped to awaken the modern interest in Albrecht Durer. (3) By his work on language Ueber den Ursprung der Sprache, Herder may be said to have laid the first rude foundations of the science of com- parative philology and that deeper science of the ultimate nature and origin of language. It was specially directed against the supposition of a divine communication of language toman. Its main argumentis that speech is a necessary outcome of that special arrangement of mental forces which distinguishes man, and more particularly from his habits of reflexion. "If," Herder says, "it is incomprehensible to others how a human mind could invent language, it is as incom- prehensible to me how a human mind could be what it is without discovering language for itself." The writer does not make that

use of the fact of man's superior organic endowments which one might expect from his general conception of the relation of the physical and the

mental in human development. (4) Herder's ser- vices in laying the foundations of a coniparative science of religion and mythology are even of greater value than his somewhat crude philological speculations. In opposition to the general spirit of the 18th eentury he saw, by means of his historic sensc, the natural- ness of religion, its relation to man's wants and impulses. Thus with respect to early religious beliefs he rejected Hume's notion that religion sprang out of the fears of primitive men, in favour of the theory that it represents the first attempts of our species to explain phenomena. He thus intimately associated religion with mythology and primitive poetry. As to later forms of religion, he appears to have held that they owe their vitality to their embodiment of the deep seated moral feelings of our eommon humanity. His high appreciation of Christianity, which contrasts with the contemptuous estimate of the contemporary rationalists, rested on a firm belicf in its essential humanity, to which fact, and not to conscious decep- tion, he attributes its success. His exposition of this religiou in his sermons aud writings was simply an unfolding of its moral side. In his later life, as we shall presently see, he found his way toa speculative basis for his religious beliefs. (5) Herder's masterpiece, the Ideen, has the ambitious aim of explaining the whole of human development in close connexion with the nature of man's physical environment. Man is viewed as a part of nature, and all his widely differing forms of development as strictly natural processes. It thus stands in sharp contrast to the anthropology of Kant, which opposes hunian development conceived as the gradual manifestation of a growing faculty of rational free will to the operations of physi- cal nature. Herder defines huinan history as "a pure natural his- tory of human powers, actions, and propensities, modified by time and place." The Zdeen shows us, that Herder is an evolutionist after the manner of Leibnitz, and not after that of more modern evolutionists.!_ The lower forms of life prefigure man in unequal degrees of imperfection ; they exist for his sake, but they are not regarded as representing necessary antecedent conditions of human existence. The genetic method is applicd to varietics of man, not to man as a whole. It is worth noting, however, that Herder in his provokingly tentative way of thinking comes now and again very near ideas made familiar to us by Mr Spencer and Mr Darwin. Thus in a passage in book xv. chap. ii., which unmistakably fore- shadows Mr Darwin's idea of a struggle for existence, we read : " Among millions of ereatures whatever could preserve itself abides, and still after the lapse of

thousands of years remains in the great harmonious order. Wild animals and tame, carnivorous and gra- minivorous, insects, birds, fishes, and man are adapted to each other." With thismay be compared a passage in the Ursprung der Sprache, where there is a curious adumbration of Mr Spencer's idea that intelligence, as distinguished from instinct, arises from a growing complexity of action, or, to usc Herder's words, from the substitution of a more for a less contracted sphere.2 Herder is more successful in tracing the early developments of particular peoples than in constructing a scientific theory of evolution. Here hemay be said to have laid the foundations of the science of primitive cul- ture as a whole. His account of the first dawnings of culture, and of the ruder Oriental civilizations, is marked by genuine insight. On the other hand the development of classic eulture is traced with a less skilful hand. Altogether this work is rich in suggestion to the philosophic historian and the anthropologist, though marked by much vagueness of conception and hastiness of generalization. (6) Of Herder's properly metaphysical speculations little needs to be said. He was too much under the sway of feeling and concrete imagination to be capable of great things in abstract thought. It is generally admitted that he had no accurate knowledge either of Spinoza, whose monism he advocated, or of Kant, whose critical philosophy he so fiercely attacked. His sympathy with the one and his antipathy to the other were iutimately connected with the essential character of his mind, which was more synthetic than analytic, regarded things in their concrete surroundings rather than in abstract isolation. It was but onestep more to the man who had learnt to view poetry, art, language, &c., in their counexion with social and physical surroundings, and to conceive of human history in its relation to physical events, to bring together the great aggre- gates of material and spiritual phcnomena under one total concep- tion of a single substance or God. _Herder's Spinozism, which is set forth in his little work, Vom Erkennen und Empfindung der amnenschlichen Seele, is much less logically conceived than Lessing's. It is the religious aspect of it which attracts him, the presentation in God of an object which at once satisfies the feelings and the intellect. With respect to his attacks on the critical philosophy in the Metakritik, it is easy to understand how his concrete mind, ever alive to the unity of things, instinctively rebelled against that analytic separation of the mental processes which Kant attempted. eT

? See article EVOLUTION, vol. viii. pp. 760, 761.

? Herder's relation to modern evolutionists is dealt with in F. von Birenbach's Herder als Vorgdnger Darwins.

However crude and hasty this critical investigation, it helped to direct philosophic reflexion to the unity of mind, and so to develop the post-Kantian line of speculation. Herder was much attracted by Schelling's writings, but appears to have disliked Hegelianism because of the atheisin it seemed to him to involve. In the Calli- gone, a work directed against Kant's Critic of Judgment, Herder argues for the elose counexion of the beautiful and the good. To his mind the content of art, which he conceived as human feeling and human life in its completeness, was much more valuable than the form, and so he was naturally led to emphasize the moral element in art. Thus his theoretic opposition to the Kantian es- thetics is but the reflexion of his practical opposition to the form- idolatry of the Weimar poets.

The most valuable original sources of information on Herder, next to his own works (of which a new cdition, critically revised by B. Suphan, is just appearing), ave the Erinnerungen aus dem Leben J. G. von Herder, by Herder's wife; J. G. von Herder's Lebensbild, by his son Emil; and his letters, edited by Dtintzer and Herder's grandson. The general reader will find a sufficient account of Herder in a number of recent biographical works. Among these the fullest are Ch. Joret's Herder et la Renaissance Littératre en Allemagne (which unfortunately does not deal with the latter part of his life), and R. Haym's Herder nach seinem Leben und seinen Werken, The account of Herder in Hettner's Literaturgeschichte is very full and interesting. (J. 8.)

HEREFORD, an inland English county on the south Plate Welsh border, is bounded on the N. by Salop, S. by XIV.

Monmouthshire and Gloucestershire, E. by Worcestershire, and W. by Radnorshire and Brecknockshire. Its circular shape is indented by spurs of adjacent counties, and its outlying parts have by an Act of William IV. 7 and

8 been incorporated with the counties in which they are situated. Its greatest length from Ludford by Ludlow to the Doward Hills, near Monmouth, is 38 miles; its greatest breadth from Cradley to Clifford, near Hay, 35. Its area according to the census of 1871 is 532,898 statute acres, or 832 square miles. It is divided into 11 hundreds and 221 parishes, and is a bishop's see, of which the cathedral city is the centre of the county.

Its chief riversare the Wye and Lug. The former, rising near the source of the Severn on the summit of Plinlimmon, forms the boundary between Brecon and Radnor ere it enters Herefordshire near Clifford, and, flowing past Hereford, Ross, and Monmouth, falls into the Severn near Chepstow. A striking feature of the Wye is its sinuosity, especially between Hereford and Monmouth. Its never very effectual navigation has been put an end to by railway enterprise, and its salmon fisheries are now so protected by legal enactment that there is no longer a danger of Hereford apprentices being fed on salmon "ad nauseam." The Lug, a first-rate trout stream, rising in Radnorshire, enters Herefordshire near Presteign, and, passing by Aymestry, Kingsland, and Leominster, joins the Wye below Mordiford Bridge, south-east of Hereford. The Arrow also rises in Radnorshire, and flowing past Kington aud Pembridge joins the Lug near Monkland, and the Frome, having its source near Bromyard, joins the same river near Mordiford, while the Ledden runs past Ledbury to join the Severn near Gloucester. All these, as well as the Teme, a boundary line of the north-east of the county, are more or less famous trout streams.

The soil is generally marl and clay, but in various parts contains calcareous earthin mixed proportions. Westward the soil is tenacious and retentive of water; on the east it is a stiff and often reddish clay. In the south is found a light sandy loam. The subsoil is mostly limestone, in some parts the Old Red Sandstone, and a species of red and white veined marble. Where the soil does not rest on lime- stone, it is sometimes a silicious gravel, or contains fuller's earth and yellow ochres. Limestone, quarried at Aymestry and Nash to the north-west of the county, and at Ledbury, Woolhope, and elsewhere, is successfully applied as a manure for arable land and pasture. For the physical history of the county reference must be made to Murchi- son's Stlurea, or Symonds's Records of the Rocks, where the upheaval and

denudation in the Woolhope valley and over the central dome of Haughwood and similar questions are discussed.

XI. — 92

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The climate is variable, owing to the damp and fogs, | Emily Foley, Stoke Edith Park, 5660; Sir Henry Cotterell,

which moisten the earth and account for its great verdure, as well as to its large proportion of timber, not only in parks and. on landed estates, but almost on every hedgerow. In spite, however, of the prevalence of rheumatism, Here- fordshire is reckoned healthy, ranks high in the statistics of longevity, and enjoys a comparative immunity from diseases of the respiratory organs.

The surface of the county is undulated in long ridges, as if by snbterranean ripples. Ash and oak coppices and larch plantations clothe its hill-sides and crests. Its lowlands are studded with pear and apple orchards, of such productiveness that Herefordshire sometimes, as well as Kent, is called the garden of England. The apple crop, generally large, is enormons one year out of four. Twenty hogsheads of cider, which is the county beverage, have been made from an acre of orchard, twelve being the ordinary yield. Hops are another staple of the county, the vines of which are planted in rows on ploughed land. As early as Camden's day a Herefordshire adage coupled Wcobley ale with Leominster bread, indicating the connty's capacity to produce fine wheat and barley, as well as hops. On the Worcestershire border above 10,000 acres are taken up in hop-plantations, and about Ledbury the clay lands are noted for wheat and hops.

Herefordshire is also famons as a breeding county for its cattle of bright red hue, with mottled or white faces and sleek silky coats. The Herefords are stalwart and healthy, and, thongh not good milkers, put on more meat and fat at an early age, in propor- tion to food consumed, than almost any other variety. They produce the finest beef, and are more cheaply fed than Devons

or Durhams, with which they are advantageously crossed. As a dairy county Hereford does not rank high. Its small, white- faced, hornless, symmetrical breed of sheep known as " the Rye- lands,' from the district near Ross, where it was bred in most perfection, made the county long famons both for the flavour of its meat and the merino-like textnre of its wool. Fuller says of this that it was best known as " Lempster ore,"' and the finest in all England. In its original form the breed is extinct, crossing with the Leicester having improved size and stamina at the cost of the fleece, and the chief breeds of sheep on Herefordshire farms at pre- sent are Shropshire Downs, Cotswolds, and Radnors, with their crosses, Agricultural horses of good quality are bred in the north, and saddle and coach horses may be met with at the fairs, especially Orleton, Brampton Bryan, and Huntington. Herefordshire has progressed greatly in farming within the last half century. Tnrni and green-crop husbandry, with improved rotation, is the genera rule, and an average yield of wheat is from 28 to 30 bushels an acre, while about Ross and the "Old Red" districts a yield of 40 bushels is obtained. Breeders' names from the county are famous at the national cattle shows, and the number, size, and quality of the stock are seen in their supply of the metropolitan and other markets. Prize Herefords are constantly exported to the colonies.

The county las no manufactures to speak of. Woollen goods have never been a successful staple of trade at Hereford ; yarns and coarse woollens are made, however, in small quantities at Leominster and Kington. There are iron foundries for agricultural implements at Kington and Ross.

The agricultural returns of Great Britain for 1879 give the follow- ing statistics for Herefordshire :—

Corn crops (two-thirds being wheat and barley)...

103, 252 acres. Green crops (of which two-thirds are turnips and

swedes) .....405 sJaiag Sten} bb0c00 00 eRe Reon aeeen 34,671 ,, GUGRRES TMEEY TOCAGIONis ay. oss .ccnr. aeeclscsicendedce sere 40,092 ,, Pena nent pastures atsss-. soa. coeeeeeeence pers cre os 246,533 ,, PTGS... 1. cutee s -ogteannmeeal ts .oaeene ss eemiiens semen Ces aai ss en Bare, fallow, and uncropped arable land…..... 09S) 4,

Live Stock.

HGR iiies… arena tOOIn . .05 cv Re eee ee eaten ko ees 21,206 CREDO ioiwcwnnecnwamnemayeeaene … BIEED, « 05. 000. setsnncwnseisce sien sida hwes ne rr 340,741 PIGS, «0 sssesvcoslentien sve eaglte ges xovanv crear 24,169

In all but the last item the live stock presents a marked increase on 1878 ; in corn crops there is a decreased acreage, in green crops and permanent pasture a considerable increase, and the area in hops is the same as in the previous year.

_According to the parliamentary return of 1873 the county was divided among 13,731 proprietors, owning a total area of 506,559 acres, with a rental of £924,640. Of the proprietors, 9085 (66 per cent.) held Iess than 1 acre, and 2478 (18 per cent.) between 1 and 10 acres. The owners of the largest holdings are—J. H. Arkwriglit, Hampton Court, Leominster, 10,559 acres; A. R. Boughton Knight, Downton Castle, 10,081; R. D. Harley, Brampton Bryan, 9869; Sir George H. Cornewall, Moccas, 6946; Lord Bateman, Shobdon Court, 6815; Earl Somers, Eastnor Castle, 6668 ; Lord Ashburton, 6583; Major Mcysey Clive, Whitfield, 5799; Lady

Garnons, 5066; Sir Henry E. Scudamore Stanhope, Holm Lacy, 5039 ; Major Peploe, Garnstone, 4928.

In Herefordshire inland navigation was represented in the early part of the century by the Gloucester and Newent and Ledbury canal ; but this has been bonght up for railway purposes, and the canal from Leominster to Woofferton, and thence eastward to Tenbury and Stourport, has also ceased to exist. Hereford is an important railway centre: the Hereford, Ross, and Gloucester line is now amalgamated with the Great Western; the Shrewsbury and Hereford railway traverses the county southward from Woofferton, via Leominster, to Hereford. The Worcester line from Hereford, via Malvern, connects the county town with Oxford and London by an alternative route of the Midland and Great Western; and the west of the county is served by the Midland line from Hereford to Brecon, while the Hereford, Abergavenny, and Newport line accomméuates the south-west.

Branch lines run from Eardisley to Kington and Presteign, from Ross to Monmouth, from Worcester to Bromyard, and from Leominster to Kington.

The latest statistics of public elementary schools show about 135 Church of England national or parochial schools, 6 board schools, 3 British and Foreign and 3 Roman Catholic schools in the county. Its population, which was 115,489 in 1851, had increased in 1871 to 125,370. Herefordshire is represented in parliament by 6 members—3 for the county, 2 for Hereford city, and 1 for the burgh of Leominster. Its towns, besides Hereford, arc Ross, Leominster, Ledbury, Kington, and Bromyard ; of these, Ross and Leominster arc the most considerable, though Kington, from its position on the Welsh border, drives a brisk trade. In Kington, Bromyard, Ledbury, and Ross, and such larger villages as Weobley and Orleton, survive many picturesque timber and plaster houses of the 15th and 16th centuries.

History.—The earliest known inhabitants of the county were the Silures, whose stout resistance to the Romans provoked the emperor Claudius to the war of extermination in which Ostorius Scapula took Caractacus prisoner. Coxwall Knoll, Caer Caradoc, and other heights contest the claim to have been the final stand- point against the Romans. Traces of the Danes are found at Wigmore ; and in 912 they sailed up the Wye, and carried off from Archenfield the bishop of St David's, who had to be redeemed with a large ransom. By the Normans the county was held on the tenure of repelling the Welsh, and for centuries the Marches of Wales were a debatable ground for Welsh and English. In the strnggle between Maud and Stephen there was fighting in and around Herefordshire. When the barons rose against Henry III. their hostilities affected this county, and it was the success of a plot of the earl of Gloucester, Roger Mortimer, and others to effect Prince Edward's escape out of De Montfort's hands that led to his flight to Wigmore, and the subsequent defeat of the barons at Evesham. In the Wars of the Roses a battle was fought on February 2, 1461, at Mortimer's Cross, near Kingsland, between Edward, earl of March (afterwards Edward IV.), and Jasper Tudor and James Butler, earls of Pembroke and Wiltshire, in behalf of Qneen Margaret, which resulted in the victory of the Yorkists. The Marches were incorporated in the reign of Henry VIII. In the war between Charles I. and his parliament Herefordshire suffered severely for its loyalty,

and Hereford, Goodrich, and Ledbury en- dured sieges, all but the last ending in disaster to the king's party.

Antiquities.—The only pre-historic memorial in the county is the cromlech of Arthur's Stone on the hill above Bredwardine. A line of British entrenchments stretches from the Severn and from Malvern, where an earthwork is still known as the " Herefordshire Beacon," to Wapley, Croft Ambrey, and Coxwall Knoll, in the north of the county. A branch of the Watling Street road from Uriconium and South Shropshire crosses Herefordshire from Mar- low to Longtown. Another Roman road came direct from Gloucester (Glevum) to Ariconinm or Weston-under-Penyard, and thence by a short route under Caplar Hill to Magna or Kenchester, but by a longer route to Monmouth, Usk, Abergavenny, and so through Magna to Shrewsbury. Offa's Dyke, the Saxon ruler's line of defence against the Welsh, is still traceable at Moorhampton, near Lyonshall, and beyond Kington. Offa's traditional palace, the scene of his murdcr of Ethelbert, was at Sutton Walls, a little north of Hereford. The ruins of several Norman castles still exist at Wigmore, Clifford, Goodrich, and Brampton Bryan. Among the most interesting churches of that period are one or two remark- able structures of rare Irish Norman architecture, viz., Kilpeck, Moccas, and the arches of old Shobdon church ; besides the Cis- tercian church of Abbey Dore, and the fine old churches of Ledbury and Leominster

HEREFORD, the capital city of the above county, is situ- ated on the left bank of the Wye, which is crossed there by a bridge of six arches. The see of Hereford was de- tached from Lichfield in 673, Putta being its first bishop. The removal of murdered Ethelbert's body from Marden

to Hereford led to the foundation of a superior church, reconstructed by Bishop Athelstan, and burnt by the Welsh in 1055. Recommenced in 1079 by the first Norman bishop, Robert of Lorraine, it was carried on by Bishop Reynelm, and completed in 1148 by Bishop R. de Betun. The lady chapel, clerestory of the choir, and north transept date between 1226 and 1269, while succes- Sive additions and reconstructions have extended over 450 years. In 1786 the great western tower fell and carried with it the west front and the first bay of the nave, since which date there have been two modern

restora- tions, in 1842 and 1863. The total length of the cathedral outside is 342 feet, inside 327 feet 5 inches, the nave being 158 feet 6 inches, the choir from screen to reredos

Cloister

E. Choir Screen. Us

N.E. Transept, : \° : K, S.E. Transept. C. Door to Cloisters, G. Altar. L. Entrance to Crypt.

D. Central Tower. H. Bp,Stanbery's Chantry. | M. Audley Chapel. 75 feet 6 inches, and the lady chapel 93 feet 5 inches, The breadth of the naye (span of roof) is 31 feet 4 inches, the nave and aisles, internally, 73 feet 4 inches, and the central transept 146 feet 2 inches. The height of choir is 62 feet 6 inches, of nave 64 feet, of lantern 96 feet, of tower to top of the leads 140 feet 6 inches, and to the top of the pinnacles 165 feet. The pillars and arches of the nave, the north and south arches of the choir, and the triforium are Norman in their architecture, as is also the font; the lady chapel, the clerestory, and stone vault- ing, Early English. The north transept is of the date of Bishop Aquablanca (1245-68), the south-east transept of Late Decorated. As the late Sir Gilbert Scott pointed out at Hereford to the Archeological Institute, but for the fall of the western tower, the consequent curtailment of the nave, and other solecisms, few cathedrals could offer so complete a field of progressive architectural study from Early Norman to latest Perpendicular. The cathedral can boast some fine monuments, notably St Thomas of Can- tilupe's shrine in the north transept, and Bishop Aqua- blanca's tomb. The "Mappa Mundi," compiled in 1300

A. West Door. B. Font.

or thereabouts by a monk of Lincoln, one of the largest and most curious of all the old maps, is preserved in the south choir aisle. The bishop's palace overlooks the Wye on the south of the cathedral, and to the left of it lies the castle green, the site of the historic castle, which is utterly effaced. One only of the six gates of the old walls is still to be seen, but there are ruins of the

Black Friars' Monastery in Wide- marsh, and a mile out of Hereford on the Brecon Road, the White Cross, erected in 1347 by Bishop Charlton, and restored by Archdeacon Lord Saye and Sele, commemorates the departure of the Black Plague. For its loyalty and sufferings in the civil war Charles I. gave the city its motto " Invictze fidelitatis premium." It was incorporated in 1189 by Richard I., and is governed by a municipal council, consisting of a mayor, 6 aldermen, and 18 coun- cillors. It has no manufactures. Its population at the census of 1871 numbered 18,355, or an increase of more than a third in twenty years; its area was 4969 acres, Its public buildings are the shire hall in St Peter's Street, in the Grecian Doric style, with a statue of Sir George Cornewall Lewis in front of it; the corn-exchange (1858), the Rankin free library and Woolhope Club museum in Broad Street, and the Herefordshire middle-class college. The most noteworthy churches are All Saints and St Peter's,

For the bibliography of the city and county of Hereford, see Duncumb's Collections for a History ; Robinson's Castles, Manors, and Mansions, 2 vols., 1869 and 1873; Webb's History of the Civil War in Herefordshire, 1879; Havergal's Fasti Herefordenses ; Quarterly Review, art. ' Herefordshire," July 1879; and the Woolhope Transactions, (J. DA.)*

HERENCIA, a town of Spain in the province of Ciudad Real, New Castile, is situated in a fertile, hilly region, near the junction of the rivers Gfiiguela and Valdespino, about 80 miles south of Madrid. Soapmaking is the chief industry ; coarse cloth, wax, and chocolate are also manufactured, 'Wheat, barley, vines, and olives are grown in the neighbourhood, where also thereis excellent pasturage. Population about 7300.

HEREROLAND, or Damarazann, a region of South- Western Africa, stretching north from -the Kuisip to the Cunene, so called from the native race known to the Namaqua as Herero and to the Cape colonists as Damara (Damra, or Dama). The north-west portion is also known as Kaokoland,

According to the treaty of Okahandya, by which, in 1876, the country came in some sort under British protec- tion,! the boundary line is fixed as coinciding in the south with the line of latitude passing through Rehoboth or Annis (a mission station in 17°5' E. long. and about 165 miles from the

coast), thence in a straight line to Otyimbinde (Tunobis or Riet Fontein), in 20° 53' E. long. and 22° 5'S. lat., thence northwards to Otyiondarmie, and finally from that place westwards along the Omuramba Ovambo to the Cunene. The territory thus defined has an estimated area of 100,000 square miles; and of this about 35,000 square miles were marked out as a British reservation, bounded by a line drawn from Rehoboth to Otyimbinde, thence north-west to Otyituo, about 19° E. long. and 20°S. lat., thence west to Otyahevita, and south to the neighbourhood of Mount Erongo. According to Palgrave the total population of Hereroland is 121,150, of whom 85,000 are Herero proper, 30,000 Hill Damara, 3000 Bushmen, 1500 Namaqua, 1500 Bastards, and 150 Europeans. In a paper in Petermann's Mittheilungen, 1878, based on information from the Rhenish missionaries, the total is given as 184,000, of whom 110,000 are Herero (80,000 Ova Herero and 30,000 Ova-mbanderu),

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1 See Damara and Namaqua Land: Report of W. Coates Palgrave, Esq., special commissioner to the tribes north of the Orange River, of his mission to Damaraland and Great Namaqualand in 1876, Cape Town, 1877.

20,000 Bushmen, and 300 whites. .

Hereroland has a coast-line of 460 miles, but the only point where it offers shelter and access to ships is Walfish Bay, a safe but comparatively shallow harbour formed by Pelican Point immediately to the south of the mouth of the Kuisip. The country consists of three distinct physical regions—first, a long and narrow coast district backed by a very regular line of hills, of which the highest point appears to be Mount Messum or Dourissa ; secondly, a broad moun- tainous tract, containing in the south such peaks as Omatako, 8800 feet, Ombotozu (Diambotodzu), 7300, Etyo, 4000, and far in the north Etendeka, 4000 ; and thirdly, a steppe region which stretches away into the Kalahari desert. The rivers of Hereroland, of which the most important, passing from south to north, are the Tsoachaub, the Eisib or Omaruru, the Ugab, and the Huab, are mere wadies, which only at intervals succeed in bringing water as far as the sea. Except in the half-dry

river-beds, the coast dis- trict is almost destitute of vegetation, the only edible fruit being the nara, which grows on the sand-downs, and is, according to Anderson, eaten by oxen, mice, men, ostriches, and lions. In the mountainous tract there are places of considerable fertility ; large trees, as sycamores, &c., grow along the river-beds, and euphorbias, tamarisks, and a variety of strong-spined bushes prevail. In a few favoured spots wheat can be cultivated, and from a single grain as many as 150 stalks may be produced. The coast range and many of the mountains, such as Okonyonyo and Amatako, are composed of granite and gneiss, broken by intrusive quartz and porphyry; further east limestone formations, both Carboniferous and Oolitic, are predominant; and these again give place to sandstone strata, which are weathered into table-shaped eminences. 'The granite and gneiss are being disintegrated with great rapidity. Both iron and copper are said to occur in considerable abundance, though the mineral exploitation of the country has had no satisfactory result. About 25 mineral springs, both hot and cold, are known to exist among the mountains.

An interesting sketch of the climate was contributed by Dr A. von Danckelmann to the Zettsehr. der dsterr. Gesellseh. fiir Meteor., 1878. Owing, it would appear, to the cold current in the neigh- bouring sea, the coast region is almost rainless ; though occasion- ally, in the rainy season of the intcrior, storm-clouds with thunder and lightning come from the east, and from September to March south-west winds laden with heavy mist blow almost without inter- ruption. In the intcrior the year is divided into a regular dry and wet season, the former lasting from May to November. From September onwards the air is so clear that the planet Venus can be distinguished at midday, and cvery object looks so distinct that it is almost impossible to calculate distances correctly. Even during the rainy scason the nights are usually cloudless. Not unfre- quently before the beginning of the rains " sand-spouts," or, as they are called by the natives, Kumb'anhara or "rain-beggars," drive across the country. No support is afforded by the observations in Hereroland to the theory of the periodicity of African rain in accordance with the changes of the sun spots; but there would seem to be a gradual decrease of atmospheric precipitation. From September to December the east wind usually blows in the morning, but it passes round to the north-west in the forenoon. From December to April the east is decidedly predominant. Snow is extremely rare, but night frosts

occur several times a year, and ice has been found inch thick. In the dry season the daily range of the thermometer is from 82° or 36° Fahr. to 75° or 79°; in the rainy season from 86° or 95° to 68° or 82°.

The Herero are the dominant race. They are well-formed, of good stature, and of regular features. Their complexion is usually dark but not black ; but there is sufficient variety to lead them to classify themselves into the Ovathorondu or "red folks" and the Ovatherandu or 'dark folks." Their scanty clothing consists mainly of skins and leather thongs, and both their garments and their bodies are thickly smeared with ochre and grease. The women's head-dress is a curi- ous three-eared helmet. Assegais, bows and arrows, and knobsticks or kieries are the native weapons, but guns and even breechloaders are growing not uncommon. The whole race is in the pastoral stage, and some of the chiefs possess very extensive property in cattle. The various clans or '"'uandas" have each its own totem ;

HER~—HER 50,000 Hill Damara, 2500 Namaqua, 2000 Bastards, |

and thus to one man it is a sin to partake of the flesh of a red cow and to another a one-horned sheep is equally sacred. By their language (Otyiherero) the Herero belong to the great Bantu family. For our acquaintance with it we are mainly indebted to the Rhenish missionaries, and more particularly to Dr Hahn, who published Grundziige einer Grammatik der Herero, Berlin, 1857. A spelling book (Cape Town, 1848) appears to be the earliest work printed in the tongue.

The Herero would seem to have come from the north, and they probably first appeared to the south of the Cunene about 150 years ago, to the dismay of the Hill Damara (Houquoin, lhaukoin, Ova- zoratu, or Ghoudaimoup), a peculiar race who now occupy the fast- nesses of the country, and speak the Nama or Hottentot language with a foreign accent, though there is no tradition of their having used any other. The Herero were subjugated by Jonker Afrikaner, and for a time were scattered among the Namaqua tribes, but about 1865 they recovered their independence. They are still unfriendly to the Hill Damara, who steal their cattle, and they are beginning to hunt down the Bushmen. A single tribe of the Namaqua, which sided with them in their war of liberty, is still settled near Mount Erongo.

Besides the works already mentioned, and the travels of Baines, Galton, and

Anderson, see Hahn, " Die Ova-Herero," in Zeitsch. fiir Erdkunde, Berlin, 1868 and 1869, and "Reise im Lande der Herero," in Petermann's Mittheilungen, 1873.

HERESY is the English equivalent of the Greek word atpeo.s, Which has had a somewhat varied ecclesiastical use. The first employment of the word in the New Testament is to denote a sect or school of opinion among the Jews. We read of the heresy of the Sadducees (aipeous tov Yaddoveaiwy, Acts v. 17), the heresy of the Pharisees (aipeors Tov Papicaiwy, Acts xv. 5), and St Paul speaking to Agrippa says, " After the straitest heresy of our religion I lived a Pharisee" (xara ryv axpiBeorarny aipeow THs HueTépas Opnoxeias, &c., Acts xxvi. 5). Christianity itself was in the beginning looked upon as one of those sects or schools of Jewish opinion, and the "heresy" of the Nazarenes (Acts xxiv. 5) is spoken of as well as the heresy of the Pharisees (cf. Acts xxiv. 14, Acts xxviii. 22). This use of the term is plainly borrowed from classical Greek, where aipeois frequently means a school of Roman jurists or a school of philosophy (cf. Cic., Zpis. ad Fam. xv. 16; Diog. Laert., Proem., 13). In the New Testament the word is used in another sense which is purely ecclesiastical. Thusin Titus iii. 10 the apostle says : "A man who is an heretic after the first and second admonition reject"; in 2 Pet. ii. 1 the church is warned against false teachers, '" who privily shall bring in damnable heresies, even denying the Lord that bought them," and these heretics and false teachers are evidently the same as those of whom Paul, in the Epistle to the Galatians, says that they are to be anathematized. They are men who in the name of Christ preach such doctrines as tend to frustrate the grace of Christ, who preach "another gospel" (Gal. i. 8, 9); they are compared to the false prophets of the Old Testament Scriptures ; they cause divisions and schisms in the church (1 Cor. xi. 18, 19); and the heresies they are guilty of are classed along with grave moral offences (Gal. v. 20). It is this second New Testament use of the word which was taken over into ecclesiastical terminology, and it is in this sense that the early Christian writers speak of heresy and heretics. This early ecclesiastical use has continued down to the present, save that in earlier times schism was generally included under heresy, the names and

the things not being separated by definition. It is interesting, however, to notice that the earlier New Testament use of the word seems to have lingered on. Tertullian (Apolog., c. 1) calls the church a sect, which is the Latin equivalent for heresy, and in the same way Constantine called the church (Eusebius, H.2., x. 5, §§ 21-22) 4 atpeois 4 KafoArkn, n dywraryn aipecis.

Heresy means a grave error in matters of faith, but it is much more than a theological or ecclesiastical term. From the days of the emperor Theodosius at the latest, the Christian religion has been intimately connected with law, and heresy is a legal term, with a definite meaning attaching

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to it; a heresy was a crime with punishment annexed, and therefore was capable of legal definition, It was an offence in canon law, and it was also for long an offence according to civillaw. The theological meaning, and the definitions according to canon law and according to civil law respect- ively, are all different, from each other and must be sepa- rately explained.

1. Lhe Theological Sense of the Term.—The early |

Christian writers say a great deal about heresy, but com- monly refrain from telling what it is. They describe heresies, but they only denounce heresy. It is vain to look for a definition of it in Irenzns's Against Heresies, in Hippolytus's Refutation of all Heresics, in Tertullian's Prescription against Heretics. It is possible, indeed, to collect from these one or two leading tests of heresy, but no definition is to be found. The common features of heresy are too well known to call for specific enumeration. We can gather from Irenzeus that heretics are those who reject Scripture, who refuse to accept the " doctrina tradita," who deny the authority of the clergy who have come in

regular succession from the apostles, who keep aloof from the |

Catholic Church, the sole depositary of apostolic doctrine (Against Heresies, iii, 2-4), 'Tertullian, in his usual succinct manner, calls every man

a heretic who does not at once accept the " Regula Fidei," and he refuses to argue

adduce arguments from Scripture. 'A controversy over Scripture with heretics can clearly produce no other effect than to help to upset either the stomach or the brain"

period of the cecumenical councils, Tertullian's test was the touchstone of heresy. The church had her rule of faith expanded into the Nicseo-Constantinopolitan creed, with the various explanations added in the symbols of the remaining cecumenical councils, and a heretic was one who denied this creed in whole or in part. In the Western Church, on the other hand, theologians were accustomed

| congregatio. origin both of heresy and of schism ; for heresy is just a

_and its source is different.

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ideas. Christianity appears in history as a community

whose common work is to confess and to adore God because

of what He has done for His people in salvation. This

twofold work of confession and worship has manifested

_ itself in a double organization,—an organization of thouglit

aud an organization of work,—doctrine and polity. There may be the church without a creed, and the heart-church without the congregatio ; but that is not the way in which Christianity has taken actual historical shape. It is

_ possible to conceive the entrance of a heterogeneous element

into this organization on either side. A heterogeneous element, something really foreign – to it, may become

| organized with the church's doctrine, or may have become

incorporated in the church's polity, and whenever this happens there is a doctrine, apparently Christian, which is

really subversive of Christianity, there is a polity which,

apparently Christian, is really opposed to the real life of the This possibility is the historical root of the

heterogeneous element imbedded in the organized dogmatic of the church, and schism is a foreign element which has found its way into church polity. This description, how- ever, is somewhat misleading, because it may happen that

_an element which seems heterogeneous is not really so, but _is on the contrary a true part of the organization. with such a nian even though the heretic proceeds to

Heresy is not only apparently but really foreign to the system in which it has become incorporated. Its nature is different, Mere apparent incongruity,

| therefore, does not prove heresy. A doctrine must be seen (Prescr, adv. Her. 16). In the Eastern Church, after the

to define heresy in a vague way. Thus Jerome calls heresy |

"'perversum dogma"; a heretic, with him, is one who interprets Scripture in other fashion than according to the witness of the Spirit of God; and Augustine summarily defines heresy to be the invention or retention of new and false opinions. But whatever the definition, the rough and ready test was always nonconformity to the " formula fidei preescripta ab ecclesia Romana." Instead of definition the Eastern Church simply points to the creed and the cecumenical councils, the Western Church to the rule of faith enjoined by Rome.

These meagre definitions, extracted from the writings of early theologians, all of them going back in the last resort to the recognized creed of the

church for the time being, imply, in spite of their vagueness, that there is a certain essential kernel of doctrine in Christianity, which cannot be denied or challenged without involving the destruction of Christianity itself, and they all point the way to a fuller description of what is meant by heresy in the theological sense of the word. Heresy is a doctrine which, with the appearance of Christian doctrine, is really contradictory to the essential nature of Christianity, and, if persisted in, would in the end make Christianity something very different from what it really is. In order, therefore, to say what heresy is, it is necessary to know what the essential nature of Christianity is, and therefore heresy is generally described by reference to the fundamental nature of Christianity, while the real nature of Christian doctrine is commonly brought out by contrasting it with heresy.

When we look at the matter historically we see that Christianity has always taken the shape of a community thinking and acting for the most part together, and that it has always implied a common life, common work, common

_these four fundamental ideas.

to be really contradictory to the fundamental facts of Christianity, and to have come from a different source, before it can be called a heresy. It has frequently hap-

pened, accordingly, that doctrines have been judged heretical which a better acquaintance with the nature

of Christianity would have pronounced orthodox. Christianity, under the many forms which it assumes, has always implied the reconciliation of God and mau through the person and work of Christ. It implies that Jesus Christ the Saviour has so brought it about that He

_has established a new kingdom of God which will last,

in which men have communion with God through His Spirit. Christianity is complete when the kingdom of God is fully established. 'Thy kingdom come" is its aspira- tion. It therefore implies a moral separation between God and man—a separation which is overcome by the work of Christ the

Mediator. The idea of reconciliation is the central thing in Christianity, the essential part in its description. God, man unable to approach God until

reconciliation has been made, Christ the Mediator who

reconciles, and His people brought again into communion with God,—all Christian doctrine rings the changes ou Whatever contradicts or tends to destroy these, or their relations to each other, is incompatible with Christianity. Whenever any of these four ideas—-God, man, Christ, and the kingdom of God ——are so misread as to introduce notions incompatible with the relations in which they stand to each other in Christianity, then heresy enters. Theology therefore (and Protestant theology only carries the idea somewhat further) has usually recognized four kinds of heresy, corresponding to the four fundamental ideas on which Christian doctrine rests. The nature and character of God and of His relation to the universe and to man may be so misread as to make reconciliation an impossible thing, and so also may the nature of Christ, the nature of man, and the nature of the results of Christ's work among men. Hence arise heresies about God, about the person of Christ, about the

_nature of man, and about the results of Christ's work—

_all of them being doctrines which are incompatible with

the idea of reconciliation.

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I. Reconeiliation implies that man has been separated by sin from God, and that God can overcome this separation. All descrip- tions of God, of His nature, character, and works, which contradict this fact may give rise to heresies. Thus God cannot overcome the separation if it be impossible for Him to project Himself beyond Himself for salvation, The nature of the Godhead may he so deseribed as to contradict the idea of reconciliation, as, ¢.g., in the Arian heresy. Again, all descriptions of God's relations to the universe which imply that the universe and all things are not absolutely dependent on Him, which imply that His gracious pur- pose can be thwarted, contradict the idea of reconciliation, and so may give rise to

heresies, ¢.g., the Gnostic doctrine that matter is independent of God. Misstatements about God's relation to Him- self and about His relation to the universe give rise to two different kinds of heresy.

II. Reconciliation implies a real mediator who ean accomplish the reconciliation on both its sides, and so heresies may arise about the nature of Christ. The Saviour may be so deseribed that there is no real mediation, and no real recon¢iliation. These errors may arise in two ways, as one or other side of the mediator is described. The Saviour may be represented so that He has no real relation to God on the one hand or to man on the other. He may be described in such a way that there is no solidarity between Him and God, as ¢.g., in the Ebionite heresy ; or He nay be deseribed in such a way that there is no solidarity between Him and man, as in the Doeetist heresy. Misstatements about the relation of Christ to God and the relatiou of Christ to man give rise to two different kinds of heresy.

ITI. Reconciliation implies that man is so separated from God by sin that there is real need for salvation, and yet not so separated that he cannot be brought into communion with God again ; and the nature of man, and especially the presence of sin in man, may be so deseribed as to set aside these requirements. The fact of sin and its presence in man may be so explained away as to leave little ground for the necessity of reconciliation, ¢.g., in the Pelagian heresy. Again, on the other hand,:the fact and presence of sin may be so deseribed that there is no capacity in man for salvation ; it may be alleged that sin belongs to the essential nature of man and cannot be removed, e.g.,in the Manichean heresy. These two misstatements about the connexion between man and sin give rise to two kinds of heresy.

IV. The results of the reconciliation effected by Christ may also be misrepresented in two ways. The separation between man and God, which is the formal occasion of the reconciliation, was caused by sin; and the distance between God and man isa moral one. It is not such a separation as might arise from the difference between the divine and the human nature, or from the inevitable distance between Creator and ereature. And so reconciliation has for its effect, not niere absorption into God, but the restoration of moral communion between God and His people. The intercourse was broken by sin, and the result of reconciliation must be

moral ; it must take effect in a change of will, in the creation of a life of new obedience. False ideas arise when this is misrepresented, and these misrepresentations can arise in two ways :—when it is said that the action of divine grace impregnates the nature in a magical way, instead of taking effect on the will in a moral fashion, e.g., the magical idea of sacramental efficacy ; or when jt is said that the result of the reconciliation is to raise man above the necessity of living a inoral life and of conforming to the laws of morality, ¢.g., the Antinoniian heresy.

Thus theology finds at least eight separate kinds of heresy, arising from the entrance of foreign elements into the four fundamental ideas of Christianity. All heresies may be reduced to one or other of these eight classes. In point of fact, however, most heresies which have actually arisen cannot be said to belong purely to any one of them. The class only denotes the type; for one error is apt to bring others in its train, and so most heresies are mixed, and do not in all respects conform to their type.

Theologians, however, have not rested content with the mere theoretical or genetic description of heresy and here- tics, and have commonly borrowed distinctions first laid down by jurists in canon law to distinguish more narrowly the characteristic marks of heresy. Thus a false doctrine to be a heresy must be an zztellectual error, it must be held voluntarily, it must contradict'a doctrine already defined by the formula of the church, it must be held pertinaciously, and the heretic must be professedly within the church; but these distinctions belong properly to the legal aspect of heresy, and must be referred to again.

Many theologians, Schleiermacher among others, have

attempted to describe the actual origin of heresies, and a common mode of explanation isas follows. Heresies arise in that province of theology called dogmatic, and commonly appear during the definition of some important part of dogmatic theology. Dogmatic theology is the rationale of the spiritual events and forces which have called Christianity into being. In the attempt made by the church to under- stand these events and forces which have called it into being, its attention has commonly been confined to the

more outstanding portions. The history of dogmatic shows us that from time to time the church has endeavoured to master one doctrine, not the whole round of doctrines ; it has endeavoured to make distinct single points, instead of working at the various relations of all the doctrines to each other. This very natural mode of work has the one dis- advantage that it concentrates attention on isolated portions of doctrine rather than on the whole mass, and between the consecutive portions there are gaps. The mind of man, however, like nature, abhors a vacuum, and summarily fills these vacua up with material usually drawn from the prevailing philosophical or scientific theories of the day. These summary explanations or theories may or may not be in accordance with the spirit of Christianity, and when they are not they become a fruitful source of heresies. One of the best illustrations of this is the introduction into theology of the Aristotelian doctrine of 76 éxovcvov, which gave the church the Pelagian heresy along with some others.

So much for the general theological conception of heresy, of its nature, divisions, and sources ; but before proceeding to describe the use of the term in canon law, it should be observed that the theological does not always correspond with the ecclesiastical meaning of the word. It is generally acknowledged that Holy Scripture is the source of doctrine, and that for the due understanding thereof the enlightening guidance of the Holy Spirit is required ; though, of course, the precise meaning of this statement varies in different systems of theology. Holy Scripture and the witness of the Spirit of God are thus the touchstone of heresy. In the Roman Catholic and Greek Churches, however, it is held that the enlightening guidance of the Holy Spirit in this respect is restrained within the limits of certain ecclesias- tical machinery (the cecumenical council, the pope ex cathedra, &c.), which are the only channels through which the Spirit comes to the church, and hence the creed of the church rather than Scripture is the real touchstone of heresy. Protestant theologians, on the other hand, do not believe either that the guidance of the Spirit is always present within this ecclesiastical machinery or that it is given in this way only, and so they make a distinction between mere ecclesiastical and real theological heresies. Ecclesiastical heresies arise when a fundamental statement made in the creed or confession is contradicted. But it may happen, since creeds and councils may err, that the error is not in the contradiction but in the

creed, and therefore there is always an appeal from the creed to the Scripture. The ecclesiastical idea of heresy has always the theological idea behind it, and may at any time be corrected by it. Roman Catholic and Greek theologians, on the other hand, do not admit any going behind the record; they do not allow any appeal from the creed to Scripture. According to their ideas the creed is the infallible digest of Scripture, and therefore heresy is to be tested by the creed and not by Scripture—that is, the ecclesiastical and theological ideas of heresy are exactly the same.

2. Heresy according to Canon Law.—Canon law was the ecclesiastical law of medisval Europe, and is still the law of the Roman Catholic Church, and its description of heresy and of heretics is almost more important than the theological in the investigation of the matter from the historical side. Canon law regards heresy

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from the practical side of ecclesiastical procedure aud legal enactment. Its view is much narrower thau the theological, but much more precise. Orthodoxy is the doctrine maintained by the infallible Roman Church and assented to by all its faithful members ; heresy is dissent from the articles of faith established by the Roman poutiffs aud by the councils of the Roman Church. Canon law also is mainly concerned with heresy in order to punish it, and therefore is obliged to treat the whole subject with severe legal accuracy of statement. It proceeds from strict definitions. Perhaps the commonest definition is the following :—heresy is "error intellectus voluntarius contra aliquam propositionem catholicam cum pertinacia assertus ab eo qui baptismum accepit." Jurists are accustomed to expand this geueral definition in a variety of qualifying statements. (a) All heresy is error, but every error is not a heresy. It is an error according to canon law to take usury ; it is heresy to say that to take usury is not a sin, but taking usury is no heresy. Heresy is intellectual error. It is intellectual error believed to be truth, and that in spite of predominant opinion. Canonists distinguish between members of the Roman Church who refuse, e.g., to accept the "filioque" clause in the creed, and members of the Greek Church who make the same refusal. The refusal is in both cases an error, but it is a heresy only in the Roman Church, for there only the predominant opinion is

against the error. () An error also only becomes heresy when it is held voluntarily. 'To be a heretic a man must stick to his error, although he knows that it has been condemned by the church. A heretic not only errs, but knows that he errs, aud wishes to err. (c) Nor is every voluntary error a heresy; the heretic must contradict a doctrine which has been clearly stated in the creed and has become part of the defined faith of the church. (d) Nor is an erroneous opinion voluntarily professed in opposition to the creed of the church heresy, unless the heretic persists in it, Pertinacity, all canonists insist, is an essential element in heresy, and unless it is present no process for leresy can legally proceed. (e) And lastly, a heretic must be a member of the church. He must have been baptized. Neither a Jew, a Mahometan, nor a heathen can be a heretic. They may be unbelievers, they may hold erroneous opinions, but their opinions are not heresies.

From the first qualification, that heresy is an intellectual error, canonists deduce the ground of their enactments against the suspicion of heresy and against those suspected. Canon law uniformly proceeds on the idea that heresy is not merely an error but a crime. It is a crime, however, which belongs to the invisible part of man, to his intellect. It is not something done with his hands or his feet which witnesses can see, and they argue that direct proof is there- fore almost impossible, and that the commission of the crime must almost always be proved from suspicions. This suspicion of heresy occupies a very large space in the dis- sertations of canonists, and the weakness of their position has made them bring in a very great number of reasons which they seem to think strengthen it (see especially Dandinus, De suspect. de heresibus), They carefully define the degrees of suspicion with the conduct appropriate to each: where the suspicion is only "light," the suspected are simply to be watched; where it is " vehement," they are to be denounced ; where it is "violent," they are to be treated as heretics. Canonists have carefully analysed and arranged what are reasonable grounds of suspicion. Pope Innocent ILI. declared that to lead a solitary life, to refuse to accommodate one's self to the prevailing manners of society, and to frequent unauthorized religious meetings were abundant grounds of suspicion; while later canonists were accustomed to give lists of deeds which made the doers suspect :—a priest who did not celebrate mass, a lay-

man who was seen in clerical robes, those who favoured heretics, received them as guests, gave them safe conduct, tolerated them, trusted them, defended them, fought under them, or read their books, were all to be suspect. The canonist rules for suspicion became a sort of inquisitor's vade mecum, and when really practised produced a reign of terror.

Since canon law regarded heresy with such horror and detestation, it is not surprising that it gives many direc- tions, which have the force of legal enactments, whereby men may avoid the dangers of heresy. Pope Alexander IV. prohibited laymen from arguing about matters of faith. The council of Toledo (1129), anxious to put down the Albigenses, ordained that every man above fourteen and every woman above twelve years of age should solemnly swear to abjure every heresy and to maintain in its com- pleteness the Catholic faith. Pope Pius IV. ordered the laity to abstain from reading the Scriptures in the vulgar tongue. The promiscuous reading of books was forbidden, and an index of prohibited books believed to be dangerous to faith or morals was formed.

Canon law regards heresy as a crime, and while it recog- nizes that the power of the church is spiritual, and that the church visits offences with spiritual punishments such as excommunication, it proceeds on the idea that the state should assist the church in suppressing heresy, and visit heretics with civil pains and penalties, including torture and capital punishment; but this side of the history of heresy belongs as much to civil as to canon law. 'he church, however, did what it could against heretics. The council of Laodicea (can. 6-9) prohibited them from attend- ing service, though from subsequent acts this could not have been enforced. They were not allowed to give evidence in an ecclesiastical court; a father was prohibited from allowing his son or daughter to marry a heretic; social intercourse with them was prohibited, ce.

3. Heresy according to Civil Law.—Civil law treats heresy in a still simpler fashion. The legal idea seems to have been that, since the state approved of one creed and gave it public recognition, to profess any other creed was in some sense civil disaffection or a kind of treason, and manifested lack of loyalty. This notion, however, was supplemented by another and much deeper one in the public law of the medizeval empire. According to the

ideas of the earlier medizval jurists, civil government and ecclesiastical government were equally and in the same sense ordinances of God ; and this thought found expres- sion in the twin conceptions of world-king and world- priest, emperor and pope, who were God's vicars, and ruled in His name over church and state. God was tlie king of the world; the emperor was His vicar, and treason, therefore, included treason against God, or heresy, as well as treason against the emperor. This idea lingered long, and indeed still lingers, and compli- cates the simpler civil notion of heresy. For all practical purposes, however, the deeper thought may be discarded. In civil law, heresy is pertinacious dissent from the creed approved of for the time being. For example, the Lutheran creed, the Confessio Augustana, was heresy in all parts of Germany up to the peace of Augsburg, when it was recog- nized as a creed which might be professed. It then became orthodox in the civil sense of the term, in the same way that the Roman Catholic creed was orthodox, while the Calvinist creed, still unrecognized, was heresy.

Civil punishment followed religious offences as early as the time of Constantine, who enacted severe penalties against the Donatists, and ordained that all possessing Arian books should burn them on the pain of death. Laws against the reading of heretical books became very frequent during and after the 4th century. Arcadius made the

reading of books written by the Eunomians a capital offence. "Theodosius and Valentinian proscribed Nestorian books, and Valentinian and Marcian the books of Eutyclies and Nestorius. 'The custom became so common that the condemnation of any heresy by the church was followed by the proscription of the writings of members of the sect. The Codex Theodosianus, bk. xvi. tit. 5, "De heereticis," enumerates a great variety of laws against heresy with penalties more or less severe. They had the practical effect of declaring heretics outlaws, who could not hold offices of dignity or value, receive or bequeath money, enforce con- tracts, &c. In some cases death was the punishment for heresy. Justinian made it impossible for any heretic to bear witness in the civil courts of the land. This legislation may all be traced back to the action of Theodosius, who

imposed the Nicene creed upon all his subjects, and made it a law of the land. It continued in force during the Middle Ages, and in consequence heretics who could not accept the Nicene creed were outlaws also. This perhaps explains the curious fact that almost all the medizval heretics were also revolutionists. During the Middle Ages, especially from the time of Innocent III. onwards, civil interference in cases of heresy was much increased. Iu the early church the power of discipline belonged to the presbytery, and was afterwards usurped by the bishops, who continued to exercise it in matters of heresy until Innocent III. appointed the Inquisition to deal with heretics. So – long as the empire was not Christian, the civil law had nothing to do with the punishment of erroneous opinions, but as soon as Christianity hecame the authorized religion of the state, the old pagan idea that the state has power to punish veligiones novas et illicitas was revived. The state, either instructed by the church or, as in the Theodosian code, without instruction, visited with civil pains and penalties all such opinions. This came to a height when the Inquisition was established ; and civil courts and national assemblies one after another decreed that whatever penalties

were imposed by the Inquisition should be imposed by the

state, or else handed over all cases of heresy tu the Inquisi- tion to be dealt with as matters deserving the infliction of civil penalties, fines, imprisonment, torture, and deatl. There is no sadder page in the history of the church than her alliance with the state for the purpose of torturing men out of opinions different from herown. Since the Reforma- tion the persecuting spirit, although tenacious of life, has been gradually dying out.

Principal Heresies.—Early Christian theologians wrote a great many books against heretics in which they enume- rated the various heresies which had sprung up in the church up to their own time. St Augustine tells us (Zp. 222) that Philastrius, bishop of Brescia, had discovered 28 heresies among the Jews before the coming of Christ, and 128 in the Christian Church afterwards ; and many other orthodox writers have given very long lists of these erro- neous opinions. It was natural that the early centuries of the Christian era, especially the first five, should be some- what prolific in heresies, because that was the very period when the church was occupied in

defining the principal doctrines of Christianity. A history of heresies must spend most time upon the early centuries. The first dogmatic work of the church was to define the nature of Christ, who occupied the central place in its thought, and it had to steer its way between two opposite views, both of which interfered with the full dogmatic expression of the nature of the Mediator. On the one hand, many of the Jewish converts never rose to the height of the Christian idea of the person of Christ, and it is evident that these must have been very numerous from the emphasis with which it is insisted that Christians should @eodoyeiv rév vidy. These Jewish converts preferred to regard the Saviour as the last

ancient and medizval heresies.

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of the prophets, one who bore the same relation to God and to man asthe prophets did. They shrank from the idea of the incarnation ; they seemed to feel no need for thie divine Saviour. This theory was of course accompanied by other views about the' nature of Christianity, but the main element was opposition to the Christian doctrine of the real divinity of Christ, God who has become man. This Ebionite heresy has been maintained by men who wish to call themselves Christians since these early days, and has taken a great variety of shapes; but whether it is held by Jew or Unitarian, there is the same ontline of opinion and the same steadfast repugnance to the doctrine of the incarnation. On the other hand, the philosophic doctrine of the repugnance between matter and spirit, the idea, which runs through all Greek philosophy, that matter is the source of evil, induced many of the early Gentile converts to Christianity to think of the incarnation as a metaphor rather than as a fact. Christ, they thought, did not take, but only seemed to take, a human body. These Docetists, as they were called, had a whole series of successors in the early church. When Christian theology advanced step by step in the definition of the doctrine of the person of Christ, it was this old idea of the repugnance between the divine spirit and human nature embodied that lay at the root of the Apollinarian, Eutychian, and Monophysite heresies. Apollinaris denied that the Theanthropos had a " reason- able" soul; he denied the full humanity of the Saviour. Eutyches denied that the Theanthropos had a human nature ; and the Monophysites,

in their various theories, held strongly by the same idea. All these theories, how- ever different in form and expression, denied the full and true humanity of Christ, and so contradicted the church's yearning for a Saviour truly man as well as truly God. These heresies, along with the Nestorian, were all finally condemned at the council of Chalcedon (the fourth cecu- menical).

But long before the church had definitely set forth the doctrine of the person of Christ, its attention was turned to the doctrine of the essential nature of the Godhead. At first this doctrine was scarcely considered apart from Christology. It is impossible to separate the history of the doctrine of the Trinity from the doctrine of the person of Christ ; for long the two separate problems were inex- tricably mixed. At length it became evident to the mind of the church that there were two doctrines, and Christian theology turned aside to discuss, and if possible settle, the doctrine of the essential nature of the Godhead before it proceeded to exhaust the doctrine of the person of Christ. For the real problem in the Arian controversy was not the divinity of the Mediator but the nature of God. Is God to be thought of asa Trinity or asa Unity? what is the relation of the Second Person in the Trinity to the First Person? The real gain to Christian theology which came from the discussions in the Arian controversy was to thrust out the Greek conception of Deity as the Absolute who cannot be described save by negations, and to put in its stead a Christian conception which shows that there are motions within the Deity which, however incomprehensible, enable us to know that God may be in sympathy with men, and that all things may live, move, and have their being in Him.

The philosophical idea that matter is the source of evil, that matter has always some stubborn element in it by which it can defy the ideal, gave rise to a whole series of The Gnostics in all their various sects distinguished between God and the Creator. The good God, they held, could not defile Himself by con- tact with matter, and therefore could not be the God of creation and providence. Christian theology, on the other hand, has always confessed God to be the Almighty Maker

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of heaven and earth, and all things seen and unseen, and the necessity for such a doctrine of creation consists in the fact that the Cliristian consciousness demands the absence of any thing that might come in between God and the furtherance of His plan of salvation. It demands that all things be thought of as dependent on God, in order that He may be able to make all things work together for the good of His people; and so it has strenuously asserted the doctrines of creation and providence in opposition to an independent matter and the reign of fate. The Gnostic ideas were repeated by the Manicheans and by several medieval sects, such as the Paulicians and Messalians, and, in the Eastern Church, by the Bogomili.

The Pelagian and Manichzan heresies principally concern the Christian doctrine of man and of the presence of sin in man, and contradict tlie church's creed, because they do away with the Christian doctrine of reconciliation. Pela- gianism, it was held, denied the need of God's grace by insisting that man was free from indwelling sin at the beginning of his career, and followed good, when he did follow it, by the power of his own will; while Manichxism, by asserting that sin belonged to the essential nature of man, seemed to paralyse the whole divine action in reconciliation. It was held by the orthodox opponents of Pelagius that his opinions really implied that there was no real need for the Saviour and the salvation which Christianity describes, and that semi-Pelagianism, although much nearer orthodox doctrine, very inadequately comprehended that sinfulness in man which rendered reconciliation indispensable ere there could be a restoration of communion with God.

The Antinomian and various kinds of mystical theories about the Christian life all proceed upon a view of the effects of Christ's work which is at variance with funda- mental Christian ideas. Christian doctrine teaches that men reconciled to God will strive to live a life of new obedience to Him, and it holds that this life of new obedience comes under the same moral laws as the ordinary life of man. But many Christian sects have professed theories about this life of new obedience which seem to imply that it is not under the laws of ordinary morality, that Christian freedom means licence to do what ordinary morals forbid. The Epistles to the Corinthians seem to say that such theories were held in the apostolic church, and were denounced by the apostles; many of the Gnostic and Manichzan sects

undoubtedly professed them. The same views occur again and again in medieval heresy, and were held by many of the enthusiastic sectaries in Refor- mation times and later. The Brethren of the Free Spirit in the 13th and 14th century, the Anabaptists during the Reformation period, and some of the followers of Molinos are examples. The mystical theories which so largely eutered into the medieval church, and which have con- tinually clung to the skirts of Christianity, have in many instances proceeded on the principle that the new life is implanted in man in a physical way, and magical ideas of the means of grace have been very destructive to the moral theory of the Christian life.

The history of the mediwval heretical sects is by far too complicated to be entered on here. Many of them did no more than protest against the hierarchical constitution of the church of the Middle Ages. Most of them only sought room to carry out to the full their ideas of a true " Imitatio Christi," but it is also certain that a good many Gnostic and Antinomian tenets were held. The Friends of God, the Fratricelli, the Beghards, were all mystics, but their mysticism was of a very harmless description ; while the Brethren of the Common Life were worthy forerunners of the pietists of the 18th century (see Mystics).

The heretics of the Reformation Church scarcely call for separate remark, The Zwickau prophets and the Ana-

baptists held opinions at variance with the ordinary notions of what is meant by the Christian life, Schwenkfeld, the Quietists, the followers of Madame Bourignon, all revived types of mysticism which had appeared long before; and tho Quakers had their forerunners in medieval times, Many of these sects, thongh called heretical, seem to have arisen simply from the desire to live purer and more spiritual lives than the church organization of their times permitted, and in order to do so were led to lay stress upon the idea of personal guidance by the Spirit of God, and on the necessity of the "house and heart church" in opposition to the external church life of their time, on the need of personal as opposed to official religion.

In this article Christian heresy alone bas been described. Heresy, however, arises wherever there is doctrine, and there are Mahometan and Buddhist

heresies and sects as well as Christian.

The best history of sects and heresies from the sympathetic side is Gottfricd Arnold's Unpartetische Kirchen- und Ketzer-Historic, 1699-1700 (best ed. that of Schaffhausen, 1740). A very good list of writers on heresy, ancient and medieval, is given in Burton's Bampton Lectures on Heresics of the Apostobie Age, 1829. The various Trinitarian and Christological heresies may be studied in Dorner's History of the Doctrine of the Person of Christ, 1845-56, Eng. tr., 1861-62; the Gnostic and Manichean heresies in the works of Manscl, Matter, and Beausobre; the medieval heresies in Hahn's Geschichte der Ketzer inv Mittclalter, 1846-50, and Preger's Geschichte der deutschen Mystik, 1875; Quiectism in Heppe's Geschichte der quictistischen Mystik, 1875; the Pietist sccts in Palmer's Gemeinschaften und Secten Wiirttembergs, 1875; the Reformation and 17th century heresies and sects in the Anabaptis- tiewm et enthusiasticum Pantheon und Geistliches Liiist- Haus, 1702. Bohmer's Jus Ecelesiastiewn Protestantium, 1714-28, and Van Espen's Jus Ecelesiusticwm, 1702, detail at great length the relations of heresy to canon and civil law. On the question of the baptism of heretics see Smith and Cheetham's Dict. of Eccl. Antiquities, 'Baptism of Iteration ;" and on that of the readmission of heretics into the church, compare Martenc, De Zitibus, and Morinus, De Peenitentia. CD Vie alin)

Heresy according to the Law of England.—The highest point reached by the ecclesiastical power in England was in the Act De heeretico comburendo (2 Henry IV. c. 15). Some have supposed that a writ of that name is as old as the common law, but its exccution might be arrested by a pardon from the crown. The Act of Henry IV. enabled the diocesan alone, without the coopera- tion of a synod, to pronounce sentence of heresy, and required the sheriff to execute it by burning the offender, without waiting for the consent of the crown.) A large number of penal statutes were enacted in the following reigns, and the statute 1 Eliz. c. 1 ig regarded by lawyers as limiting for the first time the description of heresy to tenets declared heretical either by the canonical Scripture or by the first four gencral councils, or such as should thereafter be so declared by parliament with the assent of convocation. The writ was abolished by 29 Car. II. c. 9, which reserved to the ceclesiastical courts their jurisdiction over heresy and

similar offences, and their power of awarding punishments not extending to death. Heresy became henceforward a purely ecclesiastical offence, although disabling laws of various kinds continued to be enforced against Jews, Catholics, and othcr dissenters. The tem- poral courts have no knowledge of any offence known as heresy, although incidentally (¢.g., in questions of copyright) they have refused protection to persons promulgating irreligious or blas- phemous opinions. As an ecclesiastical offence it would at this moment be almost impossible to say what opinion, in the case of a layman at lcast, would be dcemed heretical. Apparently, if a proper case could be made out, an ecclesiastical court might still sentence a layman to excommunication for heresy, but by no other means could his opinions be brought under censure. The last case on the subject (Jenkins v. Cook, Law Reports, 1 Probate Division 80) leaves the matter in the same uncertainty. In that case a clergyman refuscd the communion to a parishioncr who denied the personality of the devil. The judicial committee held that the rights of the parishioners are expressly defined in the statute of 1 Edw. VI. c. 1, and, without admitting that the canons of the church, which are not binding on the laity, could specify a lawful canse for rejection, held that no lawful cause within the meaning of either the canons or the rubric had been shown. It was maintained at the bar that the denial of the most fundamental. doctrines of Christianity would not be a lawful cause for such rejection, but the judgment only queries whether a denial of the personality of

a eee he ee 1 Stephen's Commentaries, bk. iv. c. 7.

the devil or eternal punishment is consistent with membership of the ehurch. The right of every layman to the offices of the ehureh is established by statute without reference to opinions, and it is not possible to say what opinions, if any, would operate to dis- qualify him.

The case of elergymen is entirely different. The statute 13 Fliz. c. 12, § 2, enacts that 'if any person ecclesiastical, or which shall have an ecclesiastical living, shall advisedly maintain or affirm any doctrine

directly contrary or repugnant to any of the said artielcs, and by conventicle before the bishop of the diocese, or the ordinary, or before the queen's highness's commissioners in matters ecclesias- tical, shall persist therein or not .tevoke his error, or after such revocation eftsoons affirm such untrue doctrine," he shall be de- prived of his ecclesiastical promotions. The Act it will be observed applies only to clergymen, and the punishment is strietly limited to deprivation of benefice. The judicial committee of the privy council, as the last court of appeal, has on several occasions pro- nounced judgments by which the scope of the Act has been con- fined to its narrowest legal effect. The court will construe the Articles of Religion and formularies according to the legal rules for the interpretation of statutes and written instruments. No rule of doctrine is to be ascribed to the church which is not distinctly and expressly stated or plainly involved in the written law of the Chureh, and where there is no rule, a clergyman may express lis opinion without fear of penal consequences. In the Essays and Leviews cases (Williams v. the Bishop of Salisbury, and Wilson v. Fendall) it was held to be not penal for a clergyman to speak of merit by transfer as a " fiction," or to express a hope of the ultimate pardon of the wicked, or to affirm that any part of the Old or New Testa- ment, however unconnected with religious faith or moral duty, was not written under the inspiration of the Holy Spirit. In the case of Noble v. Voysey in 1871, the eommittce held that it was not bound to affix a meaning to articles of really dubious import, as it would have becn in cases affecting property. At the same time any manifest eontradiction of the Articles, or any obvious evasion of them, would subject the offender to the penaltics of deprivation. In some of the cases the qnestion has been raiscd how far the doctrine of the church could be ascertained by reference to the opinions'generally expressed by divines belonging to its communion, Such opinions, it would seem, might be taken into account as showing the extent of liberty which had been in practice, claimed and exercised on the interpretation of the articles, but would eertainly not be allowed to increase their stringency. It is not the business of the court to pronounce upon the absolute truth or falsehood of any given opinion, but simply to say whether it is formally consistent with the legal doctrines of the Church of England. Whether convocation has any jurisdiction in cases of heresy is a question which has occasioned some difference of opinion among lawyers. Hale, as quoted by Phillimore, says that before the time of Richard IL, that is, before

any Acts of Parliament were made about herctics, it is without question that in a eon- vocation of the clergy or provincial synod "they might and frequently did here in England procecd to the sentencing of heretics." But later writers, while adhcring to the statement that convocation might declare opinions to be heretical, doubted whether it could proceed to punish the offender, even when he was a clerk in orders. Phillimore statcs that there is no longer any doubt, even apart from the effcct of the Clergy Discipline Act, 3 and 4 Vict. e. 86, that eonvocation has no power to eondemn elergymen for heresy. The supposed right of convocation to stainp heretieal opinious with its disapproval was recently exercised on a somewhat memorable occasion. In 1864 the convocation of the province of Canterbury, having taken the opinion of two of the most eminent lawyers of the day (Sir Hugh Cairns and Mr Rolt), passed judgment upon the volume entitled Essays and Reviews, The judgment purported to "synodically condemn the said voluine as containing teaching eontrary to the doctrine received by the United Church of England and Ireland, in common with the whole Catholie Church of Christ." These proceedings were challenged in the House of Lords by Lord Houghton, and the lord ehancellor (Westbury), speaking on behalf of the Government, stated that if there was any 'synodical judgment" it would be a violation of the law, subjecting those eoncerned in it to the penalties of a preemunire, but that the sentence in question was '"simply nothing, literally no sentence at all." It is thus at least doubtful whether convocation has a right even to express an opinion unless specially authorized to do so by the erown, and it is certain that it eannot do anything more. Heresy or no heresy, in the last resort, like all other ecclesiastical questions, is decided by the judicial committee of the council.

The English lawyers, following the Roman law, distinguish be- tween heresy and apostasy. The latter offence is dealt with by an Act which still stands on the statute book, although it has long been virtually obsolete—the 9 and 10 Will. III. ce. 35. If any person who has been edweated in or has professed the Christian religion shall, by writing, printing, teaching, or advised speaking, assert or maintain that there are more Gods than one, or shall deny

any of the persons of the Holy Trinity to be God, or shall deny the Christian religion to be true or the Holy Scriptures of the Old and New Testament to be of divine authority, he shall for the first offence be declared incapable of holding any ecclesiastical, civil, or military office or employment, and for the second incapable of bringing any action, or of being guardian, executor, legatee, or grantee, and shall suffer three years' imprisonment without bail. Unitarians were saved from these atrocious penalties by a later Act (58 Geo. III. c. 160), which permits Christians to deny any of the persons in the Trinity without penal consequences. (E. R.)

HERFORD, a town of Prussia, capital of a circle in the government district of Minden, province of Westphalia, is situated in a beautiful and fruitful district at the conflu- ence of the Werra and Aa, and on the Minden and Cologne railway, 19 miles south-west of Minden. It possesses five evangelical churches, among which may be mentioned the Miinsterkirche, a Romanesque building with a Gothic apse of the 15th century ; the Marienkirche, in the Gothic style ; and the Johanniskirche, with a tower 280 feet high. The other principal buildings are the Catholic church, thie synagogue, the gymnasium founded in 1540, the agricul- tural school, and the theatre. The industries include cotton and flax spinning, and the manufacture of linen cloth, furniture, sugar, tobacco, and leather. The popu- lation of the town in 1875 was 11,967.

Herford owes its origin toa nunnery whieh is said to have been founded in 832, and was confirmed by Louis the Pious in 839. From the emperor Frederick I. the abbcess obtained princely rank and a seat in the imperial diet. The foundation was sccularized in 1803. Herford was a member of the Hansa League. In 1631 it became a free imperial town, but in 1647 it was subjugated

by the elector of Brandenburg. It eame into the possession of Westphalia in 1807, and in 1813 into that of Prussia.

HERIOT. See CopyHotp.

HERIOT, Georcx (1563-1623), the founder of Heriot's Hospital, Edinburgh, was descended from an old family of some consideration in the county of Haddington; and his father, a goldsmith in Edinburgh, for some time

represented the city in the Scottish parliament. George was born in 1563, and after receiving a good education was apprenticed to his father's trade. In 1586 he married the daughter of a deceascd Edinburgh merchant, and with the assistance of her patrimony set up in business on his own account. At first he occupied a small " buith" at the north-east corner of St Giles's Church, and afterwards a more pre- tentious shop at the west end of the building. To the business of a goldsmith he joined that of a money-lender, aud in 1597 he had acquired such a reputation that he was appointed goldsmith to Qucen Anne, consort of James VI. In 1601 he became jeweller to the king, and on the removal of the court to London, he followed his royal master thither, and occupied a shop opposite the Exchange. Heriot was largely indebted for his fortune to the extra- vagance of the queen, and to the imitation of this extra- vagance by the nobility. Latterly he had such an extensive business as a jeweller that on one occasion a Government proclamation was issued calling upon all the magistrates of the kingdom to aid him in securing the workmen he required, He died in London, 10th February 1623. In 1608, having sone time previously lost his first wife, he married Alison Primrose, daughter of James Primrose, grandfather of the first earl of Rosebery, but she died in 1612; by neither marriage had he any issue, The surplus of his estate, after deducting legacies to his nearest relations and some of lis more intimate friends, was bequeathed to found a hospital for the education of freemen's sons of the town of Edin- burgh; and its value afterwards increased so greatly as to supply funds for the erection of several Heriot foundation schools in different parts of the city. For a notice of Heriot's Hospital, see EprnpurcH, vol. vii. p. 666.

Heriot takes a leading part in Scott's novel, The Fortunes of Nigel (see also the Introduction), A History of Heriot's Hospital,

with a Memoir of the Founder, by William Steven, D.D., appeared in 1827, 2d ed. 1859.

HERISAU, the largest town in the Swiss half-canton of Appenzell-ausser-Rhioden, is situated at the confluence of the Glatt and Briithlbach, 7 miles north-west of Appenzell, and about 2550 feet above sea-level. The town is irregularly built, and extends over a large area. The church-tower, in which

the archives are kept, is referred to the 7th century. Herisau has a public library, an arsenal, a new town- house, and a hospital, and is the seat of the cantonal council and of a district court of justice. The manufactures comprise muslin, cotton, and silk. Christianity was intro- duced at Herisau (a name during the Middle Ages Latinized as Augia Domini) about the beginning of the 7th century. The nobles of Herisau were its first superiors, but their power passed in 1390 into the hands of the abbots of St Gall, from whose somewhat oppressive rule the people bought themselves free in 1463. The population in 1870 was 9736. In the neighbourhood beautiful walks lead to the interesting ruins of the castles of Rosenberg and Rosen- burg. The baths and goat's-whey cure of Heinrichsbad are about a mile to the north-east.

HERISTAL. See Hersrat.

HERITABLE JURISDICTIONS, in the lawof Scotland, were grants of jurisdiction made to a man and his heirs. They were a usual accompaniment to feudal tenures, and the power which they conferred on great families, being recognized as a source of danger to the state, led to frequent attempts being made by statute to restrict them, both before and after the Union. They were all abolished by the Act 20 Geo. II. c. 43, which enacts (§ 1) that all heritable jurisdictions of justiciary, and all regalities and heritable baileries, and all heritable constabularies, other than the office of high constable of Scotland, and all stewartries, being parts only of shires and counties, and all sheriffships and deputy-sheriffships of districts, being parts only of shires and counties, belonging to or possessed by any sub- ject or subjects, shall be taken away and totally dissolved and extinguished. At the same time, constabularies and other jurisdictions having been recognized as rights of pro- perty by the Treaty of Union, the Act provides that com- pensation shall be awarded to all persons lawfully possessed of such jurisdictions, and the sum of £150,000 was after- wards voted by parliament to pay the claims for compensa- tion for loss of jurisdiction, as settled by a report of the Court of Session (ses Erskine's Institutes, by Nicholson,

pO): i HERLEN, Frrrz, of Nordlingen, was an artist of the early Swabian school, who tempered the rudeness of his native art with some of the

delicacy of the masters of Bruges. The date and place of his birth are unknown, but his name is on the roll of the tax-gatherers of Ulm in 1449; and in 1467 he was made citizen and town painter at Noérdlingen, "because of his acquaintance with Flemish methods of painting." One of the first of his acknowledged productions is a shrine on one of the altars of the church of Rothenburg on the Tauber, the wings of which were finished in 1466, with seven scenes from the lives of Christ and the Virgin Mary. In the town-hall of Rothenburg is a Madonna and St Catherine of 1467; and in the choir of Nérdlingen cathedral a triptych of 1488, representing the Nativity and Christ amidst the Doctors, at the side of a votive Madonna attended by St J oseph and St Margaret as patrons of a family. In each of these works the painter's name certifies the picture, and the manner is truly that of an artist "acquainted with Flemish methods." We are not told under whom Herlen laboured in the Netherlands, but he probably took the same course as Schongauer and Hans Holbein the elder, who studied in the school of Van der Weyden. His altarpiece at Rothen- burg contains groups and figures, as well as forms of action and drapery, which seem copied from those of Van der

Weyden's or Memling's disciples, and the votive Madonna of 1488, whilst characterized by similar features, only dis- plays such further changes as may be accounted for by the master's constant Jater contact with contemporaries in Swabia. Herlen had none of the genius of Schongauer. He failed to acquire the delicacy even of the second-rate men wlio handed down to Matsys the traditions of the 15th century; but his example was certainly favourable to the development of art in Swabia. By general consent critics have assigned to him a large altarpiece, with scenes from the gospels and figures of St Florian and St Floriana, and a Crucifixion, the principal figure of which is carved in high relief on the surface of a large panel in the church of Dinkelsbiihl. A Crucifixion, with eight scenes from the New Testament, is shown as his in the cathedral, a Christ in Judgment, with Mary and John, and the Resurrection of Souls in the town-hall of Nérdlingen. A small Epiphany, once in the convent of the Minorites of Ulm, is in the Holzschulier collection at Augsburg, a Madonna and Cir- cumcision in the National Museum at Munich. Herlen's epitaph, preserved by Rathgeber, states that he died on the 12th of October 1491, and was buried at Nérdlingen.

HERMANN, the popular modern name in Germany for the ancient German hero Arminius. See GERMANY, vol. x. p. 475.

HERMANN, commonly distinguished as Hermannus Contractus, z.e., Hermann or Heriman the Lame, an old German chronicler and scholar, was born in 1018, a son of the Swabian Count Wolverad (Wolfrat) of Vehreningen (Veringen or Voringen), and died in 1054, at the family residence of Aleshusen near Biberach. Educated at the monastery of Reichenau, and afterwards admitted a mem- ber of the fraternity, he added greatly to that reputation for learning which the establishment had maintained from the time of Abbot Berno. Besides the ordinary studies of the monastic scholar, he devoted himself to mathematics, astronomy, and music, and constructed watches and instru- ments of various kinds.

His chief work is a Chronicon ab urbe condita ad annunv 1054, Which in its earlier portion consists of a compilation from previous chronicles, but between 1044 and 1054 furnishes important aud original material for the history of Henry III. The first edition, from a MS. no longer extant, was printed by Sichard at Basel in 1529, and reissued in 1580; another cdition appeared at St Blaise in 1590 under the supervision of Ussermann; and a third, from a Reichenau MS., forms part of vol. v. of Pertz's Monumenta Germanvice histortea. A German translation of the last is contributed by Robbe to Die Gesehichtsschreiber der deutschen Vorzeit. The separate lives of Conrad II. and Henry III., often ascribed to Hermann, appear to have perished. His treatises De mensura astrolabii and De utilitatibus astrolabii (to be found, on the authority of Salzburg MSS., in Pez, Thesaurus aneedotorum novissinws, iii.) being the first contributions of moment furnished by a European to this subject, Hermann was for a time considered the inventor of the astrolabe. A didactic poem from his pen, De oeto vittis prinei- palibus, is printed in Haupt's Zeitsehrift fiir deutsehes Alterthum (vol. xiii.) ; and he is sometimes credited with the composition of the Latin hymns Vent Sancte Spiritus, Salve Regina, and Alina Redemptoris.

HERMANN, FRrieprich BENEDIcr WILHELM von (1795-1868), one of the most distinguished of modern writers on political economy, was born on 5th December 1795, at Dinkelsbithl in Bavaria. After finishing his primary education he was for some time employed ina draughtsman's office. He then

resumed his studies, partly at the gymnasium in his native town, partly at the univer- sities of Erlangen and Wiirzburg. His attention seems principally to have been given to mathematics and political economy. In 1817 he took up a private school at Nurem- berg, where he remained for four years. After filling an appointment as teacher of mathematics at the gymnasium of Erlangen, he became in 1823 privat-docent at the uni- versity in that town. His inaugural dissertation was on the notions of political economy aniong the Romans (Disserta-

tio exhibens sententias Romanorum ad economia politicam pertinentes, Exlangen, 1823). He probably did not remain long at Erlangen, for a year or two after this date we find him acting as professor of mathematics at the gymnasium aud polytechnic school in Nuremberg, where he continued till 1827. During his stay there he published an elementary treatise on arithmetic and algebra (Lehrbuch der Arith, u. Algeb., 1826), and made a journey to France to inspect the organization and conduct of technical schools in that country. The results of his investigation were published in 1826 and 1828 (Ueber technische Unterrichts-Anstalten). Soon after his return from France he was made professor extraordinarius of political science at the university of Munich, and in 1833 he was advanced to the rank of ordinary professor in the same subject. In 1832 appeared the first edition of his great work on political economy, Staatswirth- schaftliche Untersuchungen (Economical Researches). In 1835 he was made member of the Royal Bavarian Academy of Sciences.

From this time onwards Hermann's life was one of great and varied practical activity. From the year 1836 he acted as inspector of technical instruction in Bavaria, and made frequent journeys to Berlin and Paris in order to study the methods there pursued. In the state service of Bavaria, to which he devoted himself, he rose gradually but rapidly. In 1837 he was placed on the council for superintendence of church and school work; in 1839 he was entrusted with the direction of the bureau of statistics ; in 1845 he was one of the councillors for the interior; in 1848 he sat as member for Munich in the national assembly at Frankfort. In this assembly Hermann, with Heckscher and Sommaruga, was mainly instrumental in organizing the

so-called “ Great German” party, and was selected as one of the representatives of their views at Vienna. Warmly supporting the customs union (Zoll- verein), he acted in 1851 as one of its commissioners at the great industrial exhibition at London, and published an elaborate report on the woollen goods. Three years later he was president of the committee of judges at the similar exhibition at Munich, and the report of its proceedings was drawn up by him. In 1855 he became councillor of state (Staatsrath im ordentlichen Dienst), the highest honour in the service to which he could attain.

It is hardly surprising that in the midst of such varied and weighty practical occupations Hermann did not find time for carrying on systematically his work in the pure science of economics. Yet the long series of reviews, mainly of works on economical subjects, published in the Jltinchener Gelehrte Anzeigen from 1835 to 1847, attest his unabated industry and constant interest in the subject on its theo- retical side, while his more elaborate papers in Rau’s Archiv der politischen Ockonomie and in the Augsburger Allgemeine Zeitung show the wide extent of his practical knowledge. As head of the bureau of statistics he published a series of annual reports (Beitrdge zur Statistik des Konagreichs Bayern, Heft 1-17, 1850-1867) which are of very high value, especially as regards the growth of population. His only complete work in economic science, the Jesearches, had gone out of print a very few years after the book was published, but not until near the close of his life did Hermann find an opportunity of undertaking a revision of

it. Upon this task he was engaged at the time of his death,

23d November 1868, and he had recast, enlarged, and amended nearly two-thirds of the volume. The second edition, prepared from his MS., and including those parts of the first edition which had not been revised or superseded, was published in 1870 by his friends Dr

Helferich and Dr Mayr. There have since been several reprints,

science since the [Vcalth of Nations.

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Although the Staatswirthschaftliche Untersuchungen is not a systematic treatise on political economy, it must nevertheless be re- garded as in many respects the most important contribution to the It cannot, indeed, be said to contain principles which are in themselves novel or original ; Hermann's merits are not so much those of a discoverer as of a most acute and subtle critic. Like Ricardo he excels in abstract analysis, in resolution of complex phenomena into their simpler elements, but he has a more firm hold than Ricardo ever seems to have pos- sessed of the true nature of these elementary facts, and a remarkable power of precisely stating and comprehensively combining them. The peculiar value of the Researches cousists in the strict analysis to which the primary notions of cconomics are subjected, in the general conception of the method and plan of the science which emerges from this analysis, and in the masterly way in which fundamental principles are carried out in the detailed problems of the science. Only in the fashion indicated by Hermann can we hope to render clear the position of a pure theory of economic facts as an indis- pensable and independent branch of social science. The historic method of inquiry, fatal to much that has been regarded as dis- tinctive of the abstract or English school of political economy, harmonizes perfectly with the theory of the elementary facts from which economical development takes its start, as stated by Hermann and those Continental writers who have followed bim.

The Rescarches, in the 2d edition, consists of ten separate essays, of which the first, on the fundamental notions of economies (" Grund- legung," pp. 1-77), the fifth (pp. 148-389, on " Production"), the sixth (pp. 390-459, on "Price"), the eighth (pp. 448-581, on "Profit"), and the ninth (pp. 582-598, on " Revenue") are of the greatest import- ance. In the " Grundlegung," a clear and lucid description is given of the simple phenomena, in family, community, and state, npon which economical inquiries are founded. Human-wants and the satis- faction to be obtained for them by labour exercised on natural agents are recognized as the primitive facts. But in the satisfaction of wants there are two aspects, the technical and the economical. Technically we consider solely the process by which commodities of a quality suited to satisfy want are obtained. Economically we have always to estimate the ratio between the effort expended and the result obtained. An "economy" is a distribution of forces so that the result, satisfaction, may be obtained with least expenditure of effort, with least loss

of utility. The influence of this economical principle, the institutions to which it gives rise, the conditions under which it is possible, and the circumstances which affect, modify, or counteract it, are traced with reference to the individual, the family, the community, and the state or nation. The increasing complexity of the phenoniena does not alter the nature of the principle which lies at the basis of them, and it is the business of economic theory to analyse these phenomena under guidance of the general principle. Economics is therefore defined by Hermann as the " quantitative theory of goods ;" and, though he is sparing in the use of symbols, his method of treatment is throughout mathematical. Deserving of attention is the manner in which he points out the influence of collective feeling and collective wants as giving rise to special institutions (government, defence) in the community. To this first fundamental essay the three succeeding papers (" Wants," "Goods," "Economy," pp. 78-142) are appendices. The treatment of these, the classifications given, the detailed discussion of particular points, e.g., the productivity of labour, and the distinction drawn between economical estimates from the individual or the collective point of view, make up a solid contribution to the science.

The fifth essay is an elaborate treatise on the theory of pro- duction, treating the agents of production—frec goods, labour, and capital—separatcly, then the interests of the several parties en- gaged, and the changes due to variations in the cost of producing. Under " Labour" is given the most complete and systematic discus- sion of separation of employments. Capital is defined so as to in- clude land, but careful reference is made to the distinctive peculiarities of this form of wealth. Especially remarkable is Hermann's treatmeut of what he calls Nutz-capital (i.e., service- capital), with regard to which he accepts almost entirely the view of J. B. Say. Under fixed capital a very elaborate treatment of the nature and economic influence of machines is given, while the handling of changes in the cost of production, both here and in the essay on " Profit," is acute and luminous.

The sixth essay analyses the forces which underlie supply and demand. 'These are stated to be:—(a) on the side of the pur- chaser—(1) his desire for the commodity in question, or its utility to him, (2) his means, (3) the competition of sellers; (2) on the side of the seller—(1) cost of production,

(2) competition of the buyers, (3) the value of the medinm of exchange. The same considerations are shown to hold good in the case of the price of labour, though unfortunately the seventh essay, on " Wages," is incomplete. The eighth essay, on " Profit," discusses very elabo- rately the rate of return on the various species of capital and the circumstances that determine it, distinguishes interest from profit in general, and marks as a special form the profit of the entrepreneur (Unternehinergewinn). This last he regards as distinct from wages of

superintendence, and from insurance for risk. The ninth and tenth essays, ou "' Revenue" and "Consumption," are perhaps specially in- teresting from the clear mode in which the theory, afterwards called that of the wages fund, is rejected, and from the precision with which the al points of view for estimating net revenuc are discrim- inate

This brief analysis is sufficient to show the high value of Herniann's work as a contribution to pure economies. On praetiecal questions, those of economic legislation, his opinions are only to be gathered with difficulty from the papers in the Gelchric Anzcigen, and generally were expressed with such reference to special cireum- stances as to render doubtful their full import. It seems probable, however, that his views on protection were far from elear, and that he was somewhat under the sway of the dangerous principle that the best financial policy is encouragement of national industry. It is difficult, however, to speak definitely on this subject.

Seo Kautz, Gesch. Entwicklung d. National- Ockonomik, pp. 633-388; Roscher, Gesch. d. Nat. Ockon. in Deutschland, pp. 860-79. (R. AD.)

HERMANN, Jouann Gorrrriep Jaxoz (1772-1848), classical editor and philologist, was born at Leipsic on November 28,1772. Entering the university of his native city at the precocious age of fourteen, Hermann at first studied law, but his inclination to classical learning was too strong to be resisted, and accordingly, after a session spent at Jena in 1793-94, he became a lecturer on classical literature in Leipsic. In 1798 he was appointed professor extraordinarius of philosophy at the university there, and after refusing an invitation to proceed to Kiel as rector of a school, he

was in 1803 chosen professor of eloquence. In 1809 he received the chair of poetry in addition. He died, senior of the university, on December 3], 1848.

Hermann devoted his early attention to the classical poetical metres, aud published on that subject De metris Gracorwin ct Ro- manorum poctarum, in 1796; Handbuch der Metrik, in 1798; Ele- menta doctrine metric, in 1816, of which an Epitome appeared in 1818 ; and De dletris Pindari in 1817, attached to Heyne's edition of that author. Of his influential and valuable writings on Greek grammar the chief are De emendenda ratione Grace grammatice, 1801 ; Notes and Excursus to Viger's " De precipuis Greee dictionis tdiotismis," 1802; and De particula & libri IV., 1831. His Lewi- con of Photius appeared in 1808. His editions of the classies com- prise several of the plays of Euripides (see vol. viii. p. 680); the Clouds of Aristophanes, 1799; Trinwmmus of Plautus, 1800; Poctics of Aristotle, 1802; Hymns of Orpheus, 1805; and the Homeric Hymns, 1816. In 1825 Hermann finished the edition of Sophocles begun by Erfurdt. His cditions of Bion and Moschus were published posthumously in 1849, and of all the plays of Aischylus in 1852. The Opuscula, a collection of Hermann's smaller writings in Latin, appeared in seven volumes between 1827 and 1877.

HERMANN, Karr Friepricu (1804-1856), one of the leading representatives of classical investigation in Germany, was born August 4, 1804, at Frankfort-on-the-Main. His early education was received partly at Frankfort and partly at Weilburg, and his university studies were carried on at Heidelberg and Leipsic. On his return from a tour in Italy he habilitated in 1826 as privat-docent in Heidelberg ; in 1832 he was called to Marburg as professor ordinarius of classical literature ; and in 1842 he was transferred to Gottingen to fill the chair left vacant by the death of Ottfried Miller. Both at Marburg and Géttingen he like- wise held the office of director of the philological seminary. He died at Géttingen on the 8th of January 1856. Her- mann's scholarship took in a wide and ever-widening horizon ; but his vision was clear and steady, and he knew well how to portray for other eyes the scenes that shaped themselves with new life before his own. Among his more important publications are the Lehrbuch der grrechischen Antiquitdten, of which the first portion (Heidelberg, 1841) deals with political, the second (1846) with religious, and the third (1852)

with domestic antiquities ; the Geschichte und System der Platonischen Philosophie (Heidelberg, 1839); an edition of the Platonic Dialogues (6 vols., Leipsic, 1851-52) ; and Culturgeschichte der Griechen und fiémer (Gottingen, 1857-58, 2 vols.), published after his death by G. Schmidt. A collection of Abhandlungen und Betrage zur class, Literatur und Alterthumskunde appeared in 1849, but the great mass of his essays and brochures,

which deal with a vast variety of archeological, artistic, critical, and philosophical subjects, are still unarranged., See Lechner, Zur Lrinnerung an K. F. Hermann (Berlin,

1864).

HERMANNSTADT (Hungarian Wagy-Szeben, Latin Cilinium), chief town of an Hungarian county of the same name, is advantageously situated on the Szeben, an affluent of the Aluta, about 72 miles S.E. of Kolozsvar (Klausen-burg), and is the terminus of the Kapus and N agy-Szeben branch line of railway, in 45° 48' N. lat. and 24° 9' FE. long. It is the see of a Greek Orthodox bishop, the meeting place of the Lutheran consistory for the Transylvanian circle, and the headquarters both of the honvéd (or '"defence-militia") and of the regular infantry and artillery of the district ; and it also possesses royal courts of law and assizes, and offices of finance, assay, state survey, and engineering. Hermannstadt has a somewhat medieval appearance, the streets being often narrow, and the houses built in the old German style. Of the squares the most striking is the large quadrangular market-place. The public buildings comprise Roman and Greek Catholic, Greek Orthodox, Calvinist, and Lutheran churches, a royal law academy, both Roman Catholic and Lutheran gymnasia, a Greek Orthodox seminary for priests, a hospital for the insane, foundling and orphan homes, Franciscan and Ursulan retreats, a house of correction, civil and military hospitals, county and town halls, the infantry and large new artillery barracks, the town theatre, the "Transylvania" assurance office, the " Albina" bank, and, above all, the Bruckenthal palace with its fine museum and library. Among the industrial establishments are factories for the preparation of soap, candles, soda, sulphuric acid, bone-dust, paper,

cloth, linen, leather, caps, boots, combs, and building materials. There are also printing houses, tanneries, and rope-walks, several distilleries, and a large brewery. A brisk trade is carried on both at the regular weekly markets and at the special fairs. The civil population in 1870 was 18,998, of whom about two-thirds were of German (Saxon) and the remainder of Roumanian and Magyar extraction.

The German name of the town is traceable to Hermann, a citizen of Nuremberg, who about the middle of the 12th century established a colony on the spot. In the 13th century it bore the name of Villa Herman. Under the last monarchs of the native Magyar dynasty Hermannstadt enjoyed exceptional privileges, and soon became a thriving centre of trade, its commerce with the East rising to considerable importance. In the course of the 15th and 16th centuries it was several times besicged by the Turks. In 1610 it suffered at the hands of the Transylvanian prinee Gabriel Bathori. At the beginning of 1849 it was the scene of several engagements between the Austrians and Hungarians; and later in the year it was several times taken and oie by the Russians and Hungarians, the latter being eventually forced to yield to overwhelming numbers, August 6.

HERMAS. See Apostoric Faruers, vol. ii. p. 197.

HERMENEUTICS, Brsricat, is that branch of theo- logical science which treats of the principles of Scripture interpretation. Variously described as the theory of the dis- covery and communication of the thoughts of Holy Scrip- ture (Lange), the science of attaining clearness both in comprehending and in explaining the sense of the Biblical authors (Ernesti), the methodological preparation for the interpreter and for exegesis (Doedes), the science of the removal of differences between us and the sacred writers (Immer), it has for its task to determine the laws of valid exegetical practice. Schleiermacher and Klausen have limited it to the doctrine of what the interpreter has to observe in order to put himself in possession of the mind of Scripture. The former defines it as a discipline which looks simply to the reader's own apprehension, not to the conveyance of the meaning ascertained to others; which latter is to be regarded, he thinks, as but a particular division of the art of speaking and writing. It has been

generally taken, however, to have respect to the communi- cation as well as the acquisition of the thoughts of the Biblical writers. This larger definition, which is as ancient at least as Augustine's statement of the two things ' quibus nititur omnis tractatio Scripture, modus inveniendi que intelligenda sunt et modus proferendi que intellecta sunt " (De Doctr. Christ., i. 1), has been formally accepted or practically acted on by most modern authorities, It is con- sonant with the curreucy of the terms épuyvetw, épuyveds, épunveutys (connected it may be with Hermes, but not derived from that, such use of a deity's name being prob- ably unexampled).! These in the classics express both expounding (Pindar, O., 2, 153) and interpreting or trans- lating a foreign language to others (Xen., Anab., i. 2, 17 ; Herod., ii. 125) ; while in the New Testament épyyvevew means to' translate (John i, 39, 43) and dtepynvevew to expound, interpret, or trauslate (Luke xxiv. 27, 1 Cor. xii. 30, Acts ix. 36). The definition is in harmony too with the Protestant idea of exegesis as an art which brings tle con- tents of Scripture to the general understanding, and the Protestant conception of the direct approach of God's word to man's heart by Scripture. As the theory of the interpre- tative art hermeneutics is usually taken to be an historical science, forming a subdivision of historical theology. Where, however, a fourfold, instead of a threefold, distribution of theological science is adopted, it is assigned to literary theo- logy. It presupposes such disciplines as textual criticism and Biblical introduction, while it may exercise a reflex influence on some of the discussions with which these are conversant. Although practice precedes theory, and only through the use of the art of interpretation can the principles of interpretation be reached, as it is out of Scripture itself that the laws of Scriptural exposition must be drawn, theoretically this science precedes exegesis and forms an indispensable preparation for Biblical tlieology. Much which it has been the custom to embrace within it belougs really to general hermeneutics. The limits properly assignable to it are comparatively narrow, its immediate object being to decide how the laws of general hermeneutics are related to the particular records known as Scripture. The propriety of a special Biblical hermeneutic is established so far as Scripture is proved to be more than an ordinary literature. The Christian who comes to the Bible with the conviction that it is the record of divine communications, and with the

experience that it is the medium through which God has spoken to him and led him into new relatious to Himself, has to ask whether the principles of ordinary hermeneutics have to be modified or supplemented when applied to these books. Neither the Christian recognition of the spiritual character of Scripture nor the Protestant asscr- tion of the right of private judgment, the perspicuity of Scripture, and the laity's direct interest in the Bible, warrants the extreme position assumed among some sccts, that a scholarly interpretation and, therefore, a scieuce of hermeneutics are superfluous. Being a literary record com- posed in languages which demand the exegetical praxis of translation, and produced under circumstances, by writers, and for readers widely removed in date and character from our present acquaintance, Scripture requires a scientific process for its exposition, and the laws of that process must be verified. The peculiar value which attaches to it as a holy literature makes this the more needful, the exceptional position assigned it rendering its interpretation opener to the invasion of prepossession and private religious ideas. The exclusive authority ascribed to these books by the Protestant, who accepts tliem as the only rule of faith and life, gives him a special interest in hermeneutics. The

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1 See article HeRus, and compare Curtius, Greek Etymology, § 350.

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so largely used in them, the numerous presuppositions on which their statements of religious truth and fact proceed, suggest the necessity of such a discipline. The qualities of Scripture which render its appeal to the common under- standing distinct and immediate are arguments for scientific intelligence in educing from its declarations nothing more and nothing less than their exact intention. The interpre- ter's function being, not to develop some meaning which the words might bear to present students or which the first readers may have seen in them, but simply to ascertain with precision and completeness the ideas which the writers themselves meant to convey, it may be said with Schleier- macher that in a certain sense tlie interpreter has to educe more than the author introduced. The former has to bring out into clearness much that influenced the latter

half- unconsciously in his composition, and to give objective expression to much that underlies his definite statements. Hence the special need for a scientific hermeneutic in the case of a book like the Bible, in which there is so much that is implicit. The vast variety of results reached in crucial passages, and the wide diversities of metlod which have been pursued among individual exegetes and in exegetical schools, make the propriety and utility of such a science the more apparent.

Since Christopher Wolle (Hermeneutica Now Foederis acroanatico-dogmatica certissimis defecatce philosophie prin- ciptis corroborata eximitsque omnium Theologie Christiane partium usibus inserviens, Leipsic, 1736) the hermeneutics of the New Testament, for the sake of convenience or on grounds of scientific distinction, has often been separated from the hermeneutics of the Old Testament. 'The scien- tific union or disjunction of these disciplines depends on the view entertained of the mutual relations of the Hebrew Scriptures and the Christian. Where the Bible is seen to constitute an organic whole, the hermeneutical principles applicable to the two Testaments are treated in connexion. It then becomes one great object of the science to grasp the differences which are discovered within the unity of Scrip- ture, and cxhibit what account has to be taken of these in the art of interpretation. A distinct position, however, naturally belongs to Jewish hermeneutics, which dealt with the Hebrew Scriptures as at once the entire written revela- tion of God, and the repertory of the highest wisdom on all subjects of human inquiry. The results of the scientific study of the Old Testament, which was carried on with vast activity from Ezra's time by numerous scribes and in great schools and colleges (Jerusalem, Tiberias, Sura, Pumbeditha, Nahardea, é&c.), are seen in the Talmudical writings, the Mishna giving authoritative enlargements and explanations of the law, and the Gemara, in its twofold form of Jeru- salem Talmud edited at Tiberias, and Babylonian Zalmud proceeding from Sura, containing further commentaries, fantastic definitions, and explanations of prior explanations (see TatmuD). The most ancient Jewish interpretation of Scripture, the Iftdrash (" study," " investigation"), which assumed a fixed character during the period of the second temple and gradually formed a literature, ran out into two great branches, logical or legal exposition, and practical or homiletical exposition. The former, designated "Halacha" ('rule by which to walk," " binding precept "),

brought the law to bear upon points of religious or general interest on which there was no explicit declaration. It confined itself chietly to the Pentateuch, extracting from it by numerous exegetical expedients a body of "Halachoth" or sopheric precepts (cf. Matt. xv. 2, Mark vii. 3), which were held authoritative. These, after a long period of oral trans- mission, gradually assumed written form, and passed finally through a process of compilation, classification, and redaction which extended perhaps from about two centuries before to two centurics after Christ. The latter,

styled '" Hagada" ("opinion," "free exposition"), was meant for edification, traversed the entire Old Testament, and occupied itself with the application of Scripture to the purposes of practical instruction in all manner of subjects,

ethical, political, metaphysical, theosophic, as well as re- |

ligious. Its expositions were conveyed in forms, symbolical, poetic, parabolic, such as were most likely to arrest atten- tion, and, though of no binding authority, it made itself so attractive to the people that it was often known as " the Midrash " distinctively. The hermeneutical laws followed in these two lines of exposition are sufficiently well known. Eliezer ben Jose, the Galilean, a distinguished rabbi of the 2d century of our era, has embodied the results of a final redaction of the principles of the Hagadic exegesis in a series of thirty-two rules. Some of these are sound, dealing, e.g., with the use of brachylogy, repetition, parable, the reconciliation of two discrepant texts by a third, &e. Many of them are wholly fantastic, prescribing how explana- tions are to be sought by reducing the letters of a word to their numerical value, by the transposition of Ictters, by the substitution of another word of the same numerical value fer one which yields no worthy sense, by studying the introduction of superfluous particles, &e. Such prin- ciples held a much smaller place in the Halachic exegesis, which, as it aimed at something higher than applications of Scripture, could indulge in fewer freedomis in certain directions, so far as it was true to its idea. In the fixing of the Halachic hermeneutics Hillel I. (died 8 or 10 a.p.) occupies a conspicuous place. He reduced the traditional legal erudition of the Jews, with its bewildering multiplicity of laws, from

the 600 or 700 sections over which it is said previously to have spread, to six capital "Sedarim" or orders, forming a manageable basis on which his successors 'Akiba, Simon [II., and Jehudah I. could work on to the final codi- fication of the A/¢tshna. He was also the first to formulate definite rules by which the rabbinical development of the law should proceed. These canons of interpretation were seven in number, afterwards increased by Rabbi Ismael to thirteen by the addition of seven new rules and the omission of the sixth, and looked to the construction of Biblical warrant for precepts which it was wished to prove implicit in the law. These "Middoth" were instructions to reason (1) a minort ad majus, (2) ex analogia, (3) by derivation of a principal proposition from a single passage, (4) by derivation of a principal proposition from two passages, (5) by limitation of the general through the particular, (6) by explanation of one passage through another, (7) by the use of the context. The idea that the Old Testament, pre- eminently the law, held hidden in it the highest wisdom on all subjects, was naturally inimical to the rights of the literal sense. The rabbinical hermeneutics drew inevitable distinctions between the proper or innate sense (vow), which again was described as either verbal (OWS) or figurative (s3p), and the derivative or studied sense (#79, ny), which was to be sought either by inference (#177) or by artificial conjunction (1199). The natural sense, how- ever, though practically robbed of its dues, was not pro- fessedly ignored. This regard for it, which was never wholly disowned, ultimately took shape in the improved rabbinical hermeneutics of the Middle Ages. In the writings of such rabbis as Saadias Gaon, Jarchi, Rashi, Kimchi, Maimonides, Abarbanel (a line of expositors ex- tending from the 10th to the 16th century), we find, along- side the traditional rules and explanations, a scientific recognition of the interpreter's duty to give the literal sense as well as a practical application of the principles of grammatical and historical exegesis to the Old Testament. The hermeneutics developed among the Hellenistic Jews had marked characteristics of its own. These interpreters, departing from the exclusiveness of rabbinical devotion to

tle Old Testament revelation, and from the pure Hebraism of native Jews, brought to the study of the sacred books a range of ideas derived from

Hellenic culture. They had to devise a hermeneutical procedure which would harmonize their new ethnic learning with the traditional estimate of the Jewish Scriptures. To the theosophic Hellenist, and specially to the Alexandrian Jew, acceptance of the plain sense was often an impossibility. A reconciliation was sought by the use of allegorical interpretation. This method was also pursued by the Rabbinical exegetes. It is em- braced in the Halachic hermeneutics, and is seen in the distinctions drawn by Palestinian Jews between the body and the soul of texts. But while the allegorical interpreta- tion of native Jews, in consonance with their purer estimate of the Hebrew revelation, moved in the direction of the typical, that of the Hellenists became rather mystical. The corypheus in this hermeneutical practice was Philo (born perhaps about 20 B.c.), although he had predecessors in Aristobulus (180 3B.c.), Josephus, and others. He devoted himself mainly to the exposition of the Pentateuch, with the view of explaining the realism and anthropomorphism of the Old Testament in a way to suit the philosophy of the time. Wishful to retain the Alexandrian Jew's regard for Moses as the supremely inspired prophet of God and the oracle of all mysteries along with adherence to the current Platonism and theosophy, he supposed that the Mosaic writings contained a twofold mode of teaching, a popular representation of God and divine things and a spiritual. It was the task of wisdom to penetrate tlrough the envelope of the literal history to the secret sense which it shielded. The verbal sense was acknowledged, but held to be for the illiterate. The outstanding facts in the records of the creation, the delnge, the careers of the patriarchs and Moses, were accepted in an historic sense, but the details of all these narratives were spiritualized. Sometimes the figurative meaning was made the only meaning, but in other cases the objective meaning was allowed to be the intended meaning. The hermeueutical rule, however, was to rise by allegory from the superficial anthropomorphic sense (7d yvyixdv) to the higher or spiritual sense (76 avevpaticdv). The simple histories were synibols of abstract truths. To the enlightened they were so many modes of soul (rpd7ou yryjs) Adam the figure of thie sensuous nature, Rebecca of patience, Jeah of despised virtue, Egypt an emblem of the body, and Canaan of piety.

Two later chapters in the history of Jewish herme- neutics deserve notice. On the one hand the rabbinical procedure was decisively departed from by

the Karaites, among whom Japhet ben Heli, of Bussorah, belonging to the close of the 10th century, and Aaron ben Joseph, of the 13th century, are notable. In their case interpretation again sought the via media between bald literalism and arbitrary spiritualizing. It was prosecuted on the principles of renouncing the quest after a variety of senses, abiding by the natural sense, accepting metaphor where the figura- tive was intended, and conserving the religious interest. On the other hand an extraordinary development was given to the rabbinical hermeneutics by the Kabbalists of the Middle Ages, who used the devices of ar tificial interpreta- tion in order to find an Old Testament basis for their mixed Neo-Platonist, Gnostic, and Sabzean culture. The Kabbala (" what has been received," "tradition," see KaBBaLA) had its roots in the ancient doctrine of numbers, for which the Jews were probably indebted to the Chaldeans, The use of the numerical power of letters as a key to mysteries, which the Palestinian Jews had early favoured and which formed a not inconsiderable element in the Hagadic exposi- tion, expanded into a vast system of fantastic Hebrew Guosticism in the 8th century of the Christian era. The written Word was regarded as a depository of secret doctrine

and absolute truth which could be entered only by the initiated. The mysteries hidden in its letters required for their discovery processes of exchange, more or less intricate, between literal and numerical values. By the combinations and permutations of letters, the interchange of words of equal numerical value, and similar artifices, new meanings were extracted where the proper sense seemed poor, and acceptable meanings found where offence was felt. Where the text, e.g., states (Numbers xii. 1) that Moses married an Ethiopian woman, the veiled sense was shown to be that he married a woman of beautiful countenance, and the offence against the law was thus removed. For the letters of NAD added together make the sum 736; the letters in the expression 872 ND', "beautiful of countenance," yield the same sum; and the enlightened are able to read the latter idea in the former appellative. Distinct titles came to be applied to different branches of the art. The process of reaching hidden truths by the numerical eqniva- lence of letters (as when from the circumstance that x occurs six times in the first and last verses of the Old Testament it is inferred that the

world is to last 6000 years) was styled ‘“‘Gematria.” The process of forming new words out of the several letters of some solemn term, or one new word by combining the first letters of several words (as when the answer ‘12”, “‘circuincision,” is discovered in the question in Deut. xxx. 12, “ Who shall go up for us to heaven?” by bringing together the letters with which the several words in the query commence), was called “ Notarikon.” The use of the anagram or permutation (as when by trans- position of “N20 into “$2 it is ascertained that ‘“ mine angel” of Exod. xxiii. 23 was the angel Michael) was known as “Temurah.” The hermeneutical practice of the Kabbalists increased in subtlety as the theosophic system itself grew. Rules were elaborated for exchanging the powers of letters, reading them in a variety of orders, and otherwise conjuring with the literal sense.

The course which Biblical hermeneutics has run outside the purely Jewish pale has been not less cliangeful or remarkable. The New Testament writings show at large how the apostles and first followers of Christ viewed, inter- preted, and quoted the Old Testament. They give little in the shape of formal hermeneutical principles, but allow much to be inferred from usage and example. Conclusions as to authoritative canons of interpretation, so far as these are drawn from New Testament employments of Old Testa- ment Scripture, are weighted with the question whether or how far currency is followed. It is affirmed on the one hand that Paul, eg., in his hermeneutics, was a pure rabbinist, while on the other the equally extreme position is held that his training is in no way reflected in his use of the Hebrew Scriptures. The citation of the Old Testament in the New, which forms a question by itself and one of great intricacy, takes a variety of modes. Passages are reproduced as direct prophecies of the Messiah and His kingdom (Acts ii. 34, Heb. i. 13), as mediate references to the same through partial realizations of their idea (Heb. ii. 6-9, 12, 13), as illustrations or applications of principles common to both economies (Rom. x. 6-8, 1 Tim. v. 18), as apt expressions, without the character of explicit quota- tion, in which New Testament statements naturally embody themselves (1 Pet. i. 24). The proper and immediate sense is adhered to. The application of typology and symbolism (Heb. viii. 5, ix. 9) is at the same time exem- plified, and the existence of secondary or higher meanings in allegorical or other forms (Gal. iv. 24, Eph. v. 32) is to a certain extent recognized. The

typical relation of the Old Testament to the New is everywhere presented. It is exhibited both in the histories and in the insti- tutions, and is developed alike in ethical, didactic, and prophetic significance (1 Cor. x. 6, 11, Rom. vi. 17, v.

HERMENEUTICS

14). The Hebrew revelation is interpreted as a divine preparation for the Christian and as a continuous prophecy bearing onwards towards Christ (Acts. ii. 25). Its official personages and its saints, its ordinances and its events, are real though imperfect exhibitions of Messiah and the Messianic kingdom. Even its minor occurrences and inci- dental utterances are anticipations or expressions of the purposes of Jehovah realized in the Christian dispensation (Matt. ii. 15, Heb, iv. 7, Eph. iv. 8-12). How far Biblical hermeneutics within the Christian Church has gathered its principles from Scripture itself, and what use it has made of the New Testament praxis will appear from its history. It will be enongh here to deal with the capital ideas to which the various conflicting methods seem capable of being reduced. We indicate which of these prevailed on the whole in important schools and periods, without attempting a chronological statement or detailing the exact relations of each great name to this subject. It is not to be supposed, however, that any single mode was exclusively dominant at any one time, or that the interpreters whose names are connected with some particular procedure held by that only. On the contrary, in the long-continued absence of a definite settlement of principles the best writers swayed remarkably from method to method, and men who are largely identified with vicious modes exhibit at the same time admirable examples of the opposite. It may be said that three great hermeneutical tendencies have been followed. These may be conveniently designated the subjective, the dependent, the historical. é

1. The first, which we have distinguished asthe Suljective tendency, embraées all those widely diverse schemes which agree in passing beyond the objective intention of the words

_and seeking veiled or underlying meanings. To this belong

the different forms of the allegorical method, by which is meant the imposition of a sense not designed by the writer. It is the adding of a meaning foreign to the intention, rather than the substitntion of an improper for the proper sense. The first Christian interpreters were under special temptations in this direction. The idea of the need of ex- ceptional principles of exposition in order to reach the deep significance of divine communications had a great hold of the ancient mind, Greek, Roman, Oriental, and Hebrew. The spell of this idea and the powerful influence of the Rabbinical tradition, acting on the Christian conviction that the Bible is a divine message, readily induced the notion that the ordinary laws of interpretation are inade- quate, and that Scripture is honoured when the natnral or "lower" sense is made the stepping-stone to a " higher " sense for which special processes are required. Early Christian literature, although its mysticism may sometimes be otherwise explained, adheres decidedly to this idea. The apostolic fathers and the Apologists, while not entire strangers to sound spiritual interpretation, are addicted to tlie allegorical. The Lpistle of Barnabas confirms faith and perfects yvéous by spiritualizing the details of snch narratives as that of the two goats in Leviticus xvi. The Shepherd of Hermas contains various examples. Clement of Rome gives the figurative application of the scarlet line suspended from Rahab's window, which is adopted by so many of the fathers. In this connexion great interest belongs to Justin Martyr, who exhibits acquaintance with several of the distinct senses which were subsequently formulated. Embracing Christianity as the only certain philosophy, and carrying much of his old Platonism with him into his new faith, he dealt with the Scriptures very much as he dealt with the classics. The histories of the Old Testament (he seldom expounds the New) were a drapery covering broad spiritual truths. Asthe piling of Pelion and Ossa was a Greek version of the building of the tower of Babel, so Jacob's marriage with Leah and Rachel denoted

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Jelovah's revelation in the Jewish Church and the Christian. Every particular in prophetic passages like Gen. xlix. 9-12 had a mystical reference to Christ and His salvation, His passion being signified by the washing of the garments in wine, the Jews by the ass, the Gentiles by the colt.

The allegorical method, which offers itself as a natural expedient for harmonizing difficulties between religious faith and philosophical feeling, and which had been freely applied to Homer by Plato, found a most congenial home in Alexandria, where Philo's influence was strong. It became a recognized principle with the entire catechetical school, firmly rooted in the distinction which there prevailed between wioris and yvdors. Clement of Alexandria, who seems to have been the first to bring the New Testament no less than the Old under its scope, finds a parabolic meaning in all Scripture, and affirms that the literal sense carries us simply to the elementary stage of Christian know- ledge called faith, while it is only through the allegorical or mystical interpretation that we can reach that higher wisdom which implies insight into the essence, reason, aud real relations of faith's objects. He speaks of a "tradition of the church," an " ecclesiastical canon," or "canon of the truth," which gives the key to the true understanding of Scripture, and is identified with the yvaous or spiritual apprehension of divine mysteries as that was first communi- cated by Christ to the apostles in oral form, and by them transmitted to their successors. This canon is described as "the consent and harmony of the law and the prophets with the covenant delivered during the Lord's presence." In accordance with this Clement discovers in the Mosaic law three senses in addition to the natural. The terms in which the precepts are expressed are images of other things, rules for the direction of life, and predictions of the future. The high priest's robe is an emblem of the world of sense; tlic bells upon it are a symbol of the acceptable year of the Lord. The decalogue itself is spiritualized, the fifth com- mandment being taken to refer to the Heavenly Father, and that divine Wisdom which is the mother of the just.

A position of commanding importance must be claimed for Origen, whose genius secured wide and long-continued acceptance for lis greatest

*extravagances. Exact grammati- cal exegesis is by no means alien to his homilies and com- mentaries, and many of his strangest uses of Scripture may be viewed as practical applicatious rather than scholarly expositions, J*anciful modes, however, are so predominant that he has been generally regarded as the chief allegorist of the Christian Church. Yet the disservice thus done by his example cannot cloud the lustre of his merits in Biblical studies, His Platonism, his adhesion to the Alexandrian idea of yvaors, his wish to defend and elucidate the Christian religion by reason and philosophy, his exaggerated notion of inspiration, combined to commend a mystical style of interpretation. In terms of the Platonic division of man into body, soul, and spirit, he held that Scripture had a threefold sense, cwparixés, puyixds, tvevparixds. The first, or obvious, sense was meant for the edification of the simple. The second, which was to be sought for under the letter, and embodied the soul of Scripture, exhibited the bearing of the word upon the practical needs of the moral life, and addressed itself to the more advanced. The third, which lay still deeper, and imparted the spirit of Scripture, disclosed pure unmixed truth, exercised the speculative powers, and was intended only for the perfect, such as are described in 1 Cor. ii. 6, 7. He has been sometimes credited with the promulgation of the fourfold distinction afterwards so current, especially in the Latin Church, and expressed in the couplet (given, eg., by Lyra):—*

1 See especially Strom., vi. p. 676-89; also Baur, Die Christliche Gnosis, and Kaye, Some Account of the Writings and Opinions of Clement of Alexandria.

Litera gesta docet, quid credas allegoria, Moralis quid agas, quo tendas anagogia.

Such terms, however, as tropological, mystical, allegorical, pneumatic, anagogical, are rather interchangeable with him. The literal sense, too, is so far from being dispensed with that he has even been regarded (e.g., by Emesti) as the first who secured for it its primary value, particularly in New Testament exegesis. But, while he maintains that the spirit and the letter are generally to be taken together, and admits that no small portion of the contents of Scripture (e.g., the decalogue, precepts of universal obligation,

even many of the narratives) may not be allegorized, his practice is greatly in the direction of esteeming the literal sense only as the protecting shell of secret treasure. Wherever the letter yields a meaning which seems to him unworthy, or opposed to reason and possibility, a mystical sense is discovered. He stuinbles at the record of creation when it introduces the sun after the third day, at many of the Mosaic ordinances, at the realism of Christ's temptation. He finds mysteries or figures of spiritual things in Eden, Abraham's wives, Rebecca's visit to the well, the waterpots at Cana, and many other narratives. The later type of Alexandrian hermeneutics is seen in Cyril, who, without wholly abandoning the literal sense, carries typical inter- pretation into unqualified allegorical extremes in dogmatic and polemic interests,

The Western Church exhibited the same tendency, not only in the marked artificialities of such teachers as Hippo- lytus, Hilary, and Ambrose, but in the eminent instance of Augustine. Though not the first to attempt a statement of hermeneutical canons (having before him, for instance, the seven rules of Tichonius, which he states and criticizes at length), he constructed more of a system in this line of in- quiry as in some others. Many of the principles which are enunciated in different parts of his writings, and most defi- nitely in his De Doctrina Christiana, are of permanent value. He conceives the object of interpretation to be the discovery of the thoughts of the writer exactly as he meant to express them. He shows that the real sense is often not to be got by insisting merely on expressions as they stand by themselves ; that they must be compared with the immediate context, with similar passages elsewhere, and with the essentials of Christian doctrine; that faith and the aids of the Holy Spirit cannot supersede the use of science ; that a reverent aud sympathetic mind is indispensable. But along with such rules as these he propounds others which served as grounds for his allegorical procedure. He affirms, e.g., that whatever cannot clearly be seen to bear upon honesty of morals or the truth of faith must be taken figuratively. He speaks of several different modes of interpretation, —the historical, the setiological, the analogical, the allegorical. He usually practises the first and the last of these. His profound spiritual experience gave him a truer insight than his canons indicated into many parts of Scripture, and above all into the Pauline epistles. Yet over most even of the New Testament he allows the allegorical fancy to range

freely. His influence perpetuated the reign of the allegorical method for many centuries throughout the Western Church. In Gregory the Great, the Venerable Bede, Hrabanus Maurus, Hugo de 8. Caro, and many others, we see it steadily extending rather than merely

maintaining its sway, until in Bonaventura we find the

current four senses—historical, tropological, allegorical, anagogicai—enlarged to seven by the addition of the symbolical, synecdochical, and hyperbolical.

2. The secoud great hermeneutical tendency, which we call the Dependent, has an equally instructive history. It is easy to understand how extreme allegorizing would lead to a counter movement, and how this would be helped by the exigencies of dealing with heretics who were themselves

advocates of yvaous. The appeal soon came to be made to a rule of faith which may at first have meant nothing more than the harmony of Scripture teaching, but which was speedily identified with something outside Scripture, with the contents of doctrinal summaries, or with the verdict of exegetical tradition, 'The East and the West gave way alike to this bias, but the West first and most positively. In both we find early mention of an ecclesiastical canon or norm of truth. In the Church of the East, indeed, that took originally the form of an authoritative yvoous or private exposition of the esoteric meaning of Scripture handed down by careful tradition from Christ and the apostles, while in the Church of the West it was rather the voice of the church itself, and that soon the voice as formulated, Both churches, however, more or less dis- tinctly recognized an ecclesiastical tradition represented in compends of doctrine which were used for catechetical and other purposes, and an interpretative tradition embodied in the expositions of influential doctors. 'Thus hermeneutical independence was sacrificed. In Irenzus and Tertullian we see how a very natural reaction took this direction. The necessity of meeting errorists who were greater adepts in arbitrary spiritualizing than any whom the church

could present led them to protest against the practice. They saw the propriety of looking to Scripture itself for hermeneutical guidance, and of rescuing it from the despotism of a mystical philosophy which threatened the life of its cardinal doc- trines. They adopted a simpler reading of its message, and so far they deserve the name of pioneers in real historical interpretation, But, as appears in their gross chiliastic expositions, their literalism was carried to excess. It came into conflict with the deeper declarations of Scripture, and this conflict they were tempted to compose by a relapse into fanciful methods, 1t created difficulties in their controversy with Gnostic opponents, and these they thought to remove by a final appeal to an authoritative tradition fixing the sense in which the sacred books which both parties used as witnesses to their doctrine were to be understood. This was to be found in its integrity in those ancient churches which had enjoyed direct apostolic teaching, and, as Irenzeus conceived, in some special way in that of Rome. Gradually the idea of a normative analogy of faith discovered within Scripture was externalized, and the standard of interpreta- tion was looked for in ecclesiastical symbols and the formal decisions of the heads of the churcl. In this process, which issued in the Tridentine definition of the ultimate determination of the interpretation of Scripture as resident in the church, and the more recent declaration of the in- fallibility of the pope as the voice of the church, Vincent of Lerins claims particular notice. In his Commonitorium, for which we are indebted to the Semi-Pelagian controversy, he lays down rules for the attainment of certitude in belief. Faith is to be settled by two things, the authority of Scripture and the tradition of the church. The former isa perfect and adequate foundation. Yet the caprices of inter- pretation require it to be supplemented by the latter. The sense of Scripture is the sense in which the church under- stands it, and this tradition of the Catholic Church, which is to be accepted as the canon of hermeneutics, is defined as "quod ubique, quod semper, quod ab omnibus creditum est." This treatise, still retained in singular honour by large sections of the Christian Church, exhibits the herme- neutics which had been winning acceptance since the times of Irenzeus and Cyprian, and by which the Latin com- munion was led to bind itself. The result of the deference paid to the fathers in both churches, and especially in the West, was the renunciation of independent exegesis and the production of compilations of patristic conmments. These gepat or Catence

epitomized the interpretations of most of the great expositors, particularly Origen, Chrysostom,

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Jerome, and Augustine, and were on the whole more suc- cessfully executed in the Greek Church than in the Latin. They were in use by the end of the 5th or beginning of the 6th century. Andreas of Cesarea, who belongs to the former period, or Olympiodorus, whose date is about the beginning of the 7th century, has sometimes been recog- nized as the earliest epitomizer; but the position is to be assigned rather to Procopius of Gaza, who comes between these two. For many centuries the most emiuent diviues took part in the preparation of Catenw, such as Cassiodorus (also a literalist), Bede (already cited as an allegorist), Alcuin, Hrabanus Maurus (often honoured as the most learned interpreter of the 8th and 9th centuries), Haymo, Remigius, Sedulius, Theophylact, Gicumenius, Paschasius Radbertus, and Aquinas. The Catena aurea of Aquinas on the guspels was of great value. Medactions of the Catence were also made in course of time. These were the Glosse, which were known as marginales or extrinsecce when the comments were given on the margin, and ¢nterlineares or intrinsecee when these were introduced in the text. The most influential glossa of the second class was that of Anselm of Laon, who belongs to the end of the 11th and the begin- ning of the 12th century. Of the former the most im- portant was the Glossa ordinaria of Walafrid Strabo, which was esteemed the chief exegetical manual for some six cen- turies. Throughout the Middle Ages, full as these were of theological activity, dogmatic and polemic, hermeneutics became more and more a tradition. 'The less the Bible was studied in a free spirit, the more it became the subject of strained panegyric. Aquinas, indeed, though his practice was often in conflict with his theory, could still speak of the literal sense as that on which all the senses of Scripture are founded, and of argument as to be drawn only from that one literal sense and not from those senses which are ex- pressed according to allegory (Summa, i. 1, art. 10). But at last independence was so completely resigned that John Gerson, the illustrious chancellor of Paris, was only the ex- ponent of the prevalent opinion, when he declared that those who did not take the literal sense as the church defined it ought to be dealt with not by curious reasonings but by statutory penalties.

3. But alongside these two hermeneutical tendencies there can be traced from the earliest times, however obscurely or fitfully, a third which we term the LHvstorical. Men like Trenzeus, Origen, Augustine, &c., were not wholly incapa- citated for the exercise of a better method by their allegorical or dogmatic bias. There has been a line of interpreters, slender enough as that line has been at times, who have recognized it to be the exegete's object to dis- cover the one sense intended by the writer himself, who have allowed allegory therefore only where the writings themselves indicated their mystical design, and who have laid the first importance on the grammatical sense and on the capacity of transporting oneself into the writer's posi- tion. Even Alexandria presents in the great Athanasius and in Isidore notable instances of interpreters who, though given to occasional spiritualizing, proceed on the principle of the airapxea of Scripture (this specially in the case of Athanasius), and on the necessity of considering the occasion of each writing. But in direct antithesis to the allegorizing school of Alexandria stood the school of Antioch, which was grammatical and historical, with a tendency to an extreme literalism which yielded in not a few cases a jejune and unspiritual exegesis. Theophilus and Julius Africanus may claim a place in this order. But the acknowledged representatives of the Antiochene school are Lucian of Samosata, who is sometimes reckoned its real founder, Diodorus of Tarsus, Theodore of Mopsuestia, and above all John Chrysostom and Theodoret of the Syrian Cyrrhus. The last two, while not less careful of the

objective sense, surpassed the others in spiritual insight. Chrysostom abounds in sound hermeneutical statements which strike a happy mean between Alexandrian arbitrari- ness and the unethical superficiality into which extreme Antiochene interpretation sank. He withstands the imposi- tion of foreign senses as a practice dishonouring to the Word of God, and yet shows how much there is that must be taken otherwise than asitstands. He insists upon the importance of ascertaining the "scope" of a writing in order to a correct judgment of its separate declarations, on the necessity of the revelation of the Spirit, on the respect due to the harmony of Scripture with itself. He lays it down asa general principle that, when allegory is employed, the Bible also gives its interpretation as a check upon the

unbridled desire of those who wish to allegorize (Hom. tn Genes. v.). Theodoret cxhibits a kindred sobriety, and, though occasionally guilty of seeking a secondary sense where the obvious sense seems too bald, ranks deservedly among the very best of ancient exegetes. Principles similar to the Antiochene prevailed for a long period also in the schools of Edessa and Nisibis. The objective tendency found representatives, too, in men like Basil of Czsarea, Gregory of Nazianzus, Gregory of Nyssa (although he was less decidedly historical, and strongly advocated a non-literal reading of Canticles in particular), Pelagius, and the laborious Jerome. This last-named ornament of the Latin Church, although he too often drifted into fanciful and even puerile interpretations, was strongly opposed both to the allegorists and the extreme literalists, Against the former he affirmed that the gram- matical and historical sense must be held the fundamental thing. Against the latter he insisted that the figurative interpretation is not necessarily equivalent to the allegori- cal, and that the gospel is to be sought not in the words but in the sense of Scripture, not in the surface but in the marrow, not in the leaves of discourses but in the root of the idea (Comm. in Iabac. iii. 14; in Lpist. ad Galat. i. 11). In the unproductive centuries which followed, this purer hermeneutical tendency appears occasionally in such instances as those of Druthmar, "the grammarian;" Cicumenius, bishop of the Thessalian Tricca, who belongs to the 10th century ; Theophylact, bishop of Achrida in Bulgaria, 'the last of the fathers"; Rupert of Deutz and Euthymius Zigabenus, who carry us into the 12th century.

A great impetus was given to independent hermeneutics by the Humanists and the precursors of the Reformation. An eminent position is occupied by Nicolaus de Lyra, to whose Postille, or brief commentaries on the whole Bible, Luther and the Reformers owed a debt expressed in the familiar distich, "Si Lyra non lyrasset, Lutherus non saltasset." The current fourfold division of the sense of Scripture still appeared in his writings, but for the most part only as a theoretic division. He allowed occasional spiritualizing, but that mostly in the form of professed practical application of the proper sense. He declared anew the necessity of adhering to the plain objective meaning, likening the mystical interpretation which departs from the solid basis of the literal sense to a building which deviates from its foundation and inclines to its fall. On the side of grammar and philology the reaction

was helped by Laurentius Valla and other Humanists, although the services of Reuchlin in particular, great as they were in the assertion of exegetical freedom and in the restoration of linguistic science, were impaired by cabbalistic predilections (cf. specially his De verbo mirifico). On the religious side, something was achieved by men like Wycliffe, Huss, Wessel, who all perceived the primary importance of the grammatical method, and Faber Stapulensis (Lefévre d'Etaples), who affirmed the sufficiency of the Word, and practised an independent, non-dogmatic exegesis. It is

matter of course that Erasmus should claim special notice in this connexion. In this consummate scholar and versa- tile genius, who continued and vastly excelled all that had been attempted by Valla and others, and whose guidance the Reformers were wise enough to follow, notwithstanding the frequent deficiencies of his exegesis in depth and spiritual insight, we come at length upon a master hand that marks a great epoch. Indecision clings indeed to his utterances on some subjects. He speaks with caution on the infallibility of the church and the church's head, although he lets us see that he rejects it. He admits the existence of occasional inaccuracies in the Scriptures. But he declares that these are so far from being disadvantageous to the gospel that they are turned by the Spirit into a help to faith, He adds at the same time that if the authority of the entire Scripture should be supposed to be impaired by the presence of the smallest error in it, it is more than probable that none of the copies now used by the Catholic Church is so perfect as to be frce from the intrusion of all mistakes, accidental or intentional (cf Annot. in Matt. ii. 6). But his clear enunciation of the interpreter's inde- pendence and the inquirer's obligation to become bound by the authority of no one (Zn Lue. ii. 35), his advocacy of the translation and free circulation of the Scriptures, his repudiation of any other sense than what was meant to be conveyed, his sagacity in dealing with the figurative sections of both Testaments, his recognition of the need of a "pia curiositas" and a "curiosa pietas " in the exposition of the divine word (cf. Pref. to Paraph. in Evang.), his practice of the true exegetical art in his Paraphrases and Annotations, contributed powerfully to the diffusion of better hermeneutical ideas.

The mightiest impetus was given by the Reformers. They were the heirs of what was best in the ancient school of Antioch and in the Humanistic

revival. But they added to the philology, the grammar, the history, and the independ- ence which were illustrated in these the spiritual insight and the personal religious interest which were so often wanting. The process by which they won their own way to a freer faith lifted them above tradition, mysticism, and unspiritual literalism. Their profound religious experiences, intensified by the forces at work in an unexampled mental upheaval, made the Bible a new thing to them. It came to them as God's message, and they received it as the only rule of faith and life. It spoke immediately to their souls, and they saw it was to be interpreted by itself. They found it a message conveyed in historical form, and recognized the need of the appliances of language and history in order to read it. They perceived it to be a spiritual message, and discovered that the full reception of it could come only by spiritual enlightenment. Believing it to be a message meant for all, they held it perspicuous to the general intelligence of the prayerful in all that concerns faith and morals, and affirmed, with Melanchthon, "'unam et certam et simplicem sententiam ubique querendam esse juxta pre- cepta grammaticz, dialectic, et rhetorice." Each of the great Reformers did something to advance this truer her- meneutical movement. Luther, Zwingli, and Calvin were alike imbued with the historic sense, Luther excelling in spiritual genius and a bold originality which carried him at tinies to extremes in the independence of his treatment of Scripture, Zwingli in an incisive perception which inclined strangely at times to subjective interpretations, Calvin in a union of qualities which distinguished him as the foremost exegete of the Reformation. Profoundly reverencing Scrip- ture as God's word, submitting to it as authoritative, yet not binding himself to any theory of its inspiration which would preclude the possibility of circumstantial inaccuracies (of. on Matt. xxvii. 9, Acts vii. 16), the Reformer of Geneva excelled all in freedom from arbitrary exposition, in reading

the Biblical statements in the light of historical occasion and intention, in laying the foundations of a truer typology, and in exhibiting with its Christward testimony the historical basis of Messianic prophecy. The corypheei of Protestant exegesis were aided by Beza, Bucer, Bullinger, CEcolampadius, and others. At length the hermeneutics of the Reformation

found symbolical expression in the Pro- testant definitions of the exclusive sufficiency of Scripture, its perspicuity under the use of the ordinary means and with the teaching of the Holy Spirit, its possession of a sense which is one and not manifold, and its interpretation by itself. In the Clavis Scripture Sacre of M. Flacius Illyricus it was cast for the first time into systematic form, and dealt with theoretically.

With the Reformation objective exegesis may be said to liave been firmly established. The conditions were also laid for further hermeneutical progress. Since then the prin- ciples of true grammatico-historical interpretation have been gradually coming to be better understood aud more success- fully applied. This has not been the case, however, without frequent relapses. In various schools there have been revivals of old errors. There has been a return to the subjective tendency, ¢g., in the " moral interpretation" of Kant, as well as in various forms of ratioualistic and Socinian exegesis. In accordauce with his ideas of the empiric and local order of an historical faith, and his defini- tion of morality as the essence of religion, Kant held that tlle judgments of the pure reason must be the test of religious truth, and that the literal sense, when it seems to convey a meaning adverse to morality, inconsistent with reason, or unworthy of God, must have a new meaning found for it. His lermeneutics, therefore, did not profess to rest with the sense intended by the writer, but reckoned it legitimate to adopt any possible sense which should be con- formable to tlie interests of perfect morality. To the same tendency belong the 'psychological interpretation" of Paulus and Eichhorn, and the mythical interpretation of Weisse and Strauss. Of these the former proposed to hermeneutics the task of distinguishing the realities from the inexact impressions formed of facts by the sacred writers, while the latter sought principles by which the idea might be disentangled from the narrative vesture which it had woven for itself. Pietism, too, although its leaders, Spener and Francke, were of a better spirit, degenerated through its straining after "edifying" interpretation into mystic and chiliastic licence. The dependent tendency, again, formulated in the symbolical definitions on the sub- ject of the Vulgate as the basis of exegesis, the church as the authoritative interpreter, and the pope as the infallible exponent of the church in official declarations on faith and morals, has become so firmly seated in the Rornaan Catholic communion that the interpreter's attitude to

the church is capable of being compared by a Catholic author to that of a diplomatist acting in the spirit and interest of his prince.} It is followed, too, by that section of the English Church which defers to primitive tradition or the consent of the fathers of the first four centuries. Even among those who adhere to the Protestant positions there has been partial reaction in both directions, The subjective tendency has reasserted itself, eg., in the artificial typology of the Cocceian school, although Cocceius himself rather deserves the credit of making Protestant theology, after it had entered its scholastic period, again more Biblical, and of enforcing the importance of a literal, contextual interpretation. The dependent tendency has reappeared where the 'analogy of faith," instead of being kept to the original idea of the general contents of Scripture as gathered from the lucid passages and used for a help to the understanding of the

1 Loehnis, Grundziige der biblischen Hermeneutik und Kritik, p. 151, Giessen, 1839.

obscurer, has been identified with the creeds and employed as au external standard of interpretation.

But with partial retrogression there has been an advance on the whole in Protestant hermeneutics. To this inter- preters of very different schools have contributed. Among these are to be mentioned Sal. Glassius, the author of the Philologia Sacra, Hugo Grotius, Abr. Calov, G. Calixtus, J. J. Rambach, whose Jzstitutiones Hermeneutic Sacree exercised a salutary influence, notwithstanding his inclina- tion to the pietist principle of ' emphasis" in interpreta- tion; J. A. Bengel, in whose Gnomon a happy union was effected between pietism and science; and J. 8. Semler, who did much for the expansion of historical interpretation, not- withstanding the injurious results of his theory of accom- modation. Of still greater importance are J. A. Ernesti, to whose celebrated Jnstitutio Interpretis Novi Testamenti last century was indebted for the scientific presentation of the soundest hermeneutical principles on the philological side; Friedr. Schleiermacher, whose /lermeneutitk abounds in fertile suggestions, and brings ont for the first time the necessity of recognizing a specifically Christian element in the language of the New Testament ; and I. Liicke, who illustrates the just combination of the strictest scientific method with the primary qualification

of spiritual sympathy with the Word in the true interpreter. Extensions of hermeneutical method have been attempted, in the form of defining a special "psychological" (Stiudlin), "theological" (Klausen, Landerer), or dogmatic" (Doedes) interpreta- tion, or in the form of proposing new modes of interpretation, such as the " zesthetical" of Pareau, the " pneumatical" of Beck, the "panharmonic" of Germar. But whatever is valid in these schemes comes within the ordinary gramma- tico-historical method. Properly understood, the historical side of that method covers all that concerns the transporta- tion of the exegete, not only into the times and circum- stances of the composition of the books, but also into the position and personality of the authors. It embraces therefore that subjective quality which, however variously designated as the religious preparation, sympathy with the writers and their message, spiritual tact, or the illumina- tion of the Holy Spirit, has been recognized by the best interpreters to be a primary and essential requisite. The development of these principles has been greatly helped by the grammatical studies of men like Gesenius, Ewald, Ols- hausen, and Bottcher in Hebrew, and Winer and Buttmann in Greek; by the literary, historical, critical, and theologi- cal investigations of Herder, Baur, Rothe, Hofmann, and many others ; and above all by the exegetical practice of scientific expositors such as De Wette, Bleek, Hupfeld, Liicke, Meyer, Godet, Ellicott, Lightfoot, and Delitzsch. Results are thus being gathered which will issue in new enlargements of hermeneutical method. A clearer insight is being gained into the genius of the languages, which has already rescued New Testament Greek from purist and Hebraist extremes, and into the nature of typology, the laws of prophecy, the relation of the two Testaments to each other, the historical delivery and development of their contents, the unity (so distinguishable from uniformity) which animates their different sections. In these directions there is the promise of further progress in hermeneutics. More exact inquiry into the presuppositions which underlie the Biblical doctrines will also tell upon the laws of interpretation. Differences in hermeneutical method, how- ever, run up finally into differences of conception on the origin of the sacred literature, its intention, and the spirit which animates it. Uncertainty of view on the subject of what Scripture is and what its inspiration covers, as seen in the symbols of the churches and in the widely divergent positions affirmed by representative theologians of different schools (cf., e.g., those expounded respectively by Chemnitz,

Beck, Schleiermacher, Martensen, Hodge, Ewald, Rothe, Hofmann), exercises a disturbing influence. More deter- minate conclusions on the definition of Scripture, such as can be the result only of completer historical investigation into the rise and object of the several books, must yet be reached before a thorough adjustment is possible between the religious interest and the scientific in Biblical her-

meneutics.

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Philo und die alexandrinische Theo- sophie, 1831; Keim, Geschichte Jesu von Nazara, vol. i.; Siegfried, Philo von Alexandria als Ausleger des A. T., 1875; Frankel, Ueber den Einfluss der paldstinischen Exegese auf die alexandrinische Hermeneutik, 1851 and Ueber paliistinische wnd alexandrinische Schriftforschung, 1854; the monographs by Kaye on Clement and Thomasius, and Redepenning on Origen; C. R. Hagenbach, Obs. circa Origents methodum interp., 1823; J. J. Bochinger, De Origenis allegorica S.S. interpretatione, 1829. On the Antiochene School :—Hergenréther, Die Antioch. Schule und thre Bedeutung auf exeg. Gebiete, 1866; Kihn, Die Bedeutung der Antioch. Schule auf dem exeget. Gebicte, 1867; Specht, Der exeg. Standpunkt des Theodor von Mopsuestia und Theodoret von Kyros in der Auslegung mess. Weissay., 1871; also the monographs on Chrysostom by Neander, Meyer, Forster, and Stephens. Of the treatises referred to above, the following are of special importance:—M. Flacius, Clavts S. Scripture (by Museus), 1674; Rambaeh, Institutiones Her- meneutice, 1723; Ernesti, Institutio interpr. N. 7. (in English by Terrot, 1843); Schleiermacher, Hermencutik und Kritik mit besond. Bezichung auf das N. T. (by Liicke), 1888; Fr. Liicke, Grandziss der Neutest. Hernwnewtik, 1817. In addition these also deserve notice:—S. F. N. Morus, Super Hermencutica N. T. acroases academ., 1797-1802; Olshausen, Hin Wort iiber tiefern Schriftsinn, 1824; Kuenen, Critices ct Hermeneutices librorum Novi Feadcris lincamenta, 1858; Dipke, Hermencutik der Neutest. Schriftsteller, 1829; Wilke, Die Hermeneutik des N. T. systematisch darge- stellt, 1843-44; Immer, Hermeneutik des N. T., 18738, Eng- lish edition by Newman, Andover, 1877; Cellerier, Afanwel d'Her- meneutique bibligue, 1852; Doedes, Manual of Hermeneutics, 1867; Lange, Grundriss der bibl. Hermenewtik, 1878. On the Hermeneutics of the Roman Catholic Church, in addition to Lochnis, there may be mentioned—J. Jahn, Luchiridion Her- meneutice genreralis tabularum Vet. ct N. 7., 1812; Ranolder, Herm. bibl. gen. principia rationalia, 1839; Kohlgruber, Hern. bibl. gener., 1850; Giintner, Herm. bibl. gener., 1851; Setwin, Herm, bdibl, institutiones, 1872; Reithmayr, Lehrbuch der bibl. Herm., 1874; Friedlieb, Prolegomena zur bibl. Hermen., 1868; Wilke, Bibl. Hermen., 1853. Important discussions of sections of the subject are found in Seyffarth, Ueber Begriff, Anordnung, und Umfang der Herm. des N. T., 1824; J. C. K. von Hofmann, Ver- mischte Aufsdtve, 1878: John Keble, Primitive Tradition recog- nized in Holy Scripture, 1837, and On the Mysticism attributed to the Early Fathers of the

Church, 1868; Merx, Eine Rede von Aus- legen ins besondre des Alten Tests., 1879. (S. D. F. 8.)

HERMES is the name of a Greek god (corresponding to the Roman Mercury) whose origin and real character are perhaps more difficult to define than is the case with any other Greek deity ; here it is possible only to give an out-

line of one definite theory, and refer the reader to the works quoted at the end. He was not a god worshipped by the pure Doric or Ionic races, but is found in most places where /Molian, Achzan, and Telasgic tribes can be traced. Jf we begin with the rudest races, summed up generally under the title of Pelasgic, we find Hermes often connected with the mysterious Cabiri. These deities, in the accounts we have, vary in number and sex, being sometiines two, sometimes three or four. We may conclude that originally they were a pair, male and female, whom we may compare with Uranus and Gama, or with Cronus and Rhea. Often the female is doubled, as mother and daughter, resembling the relation of Demeter and Persephone; while the male also is transformed either into twin brothers, or into a father and his son by one of the female deities. Certainly the male deity seems sometimes to be regarded as Hermes, sometimes as Hephestus (see Hepuastvs), while in other places the two are associated. Hermes and Hephestus are perhaps local varieties of one type, which after having acquired distinct individuality in their separate homes were brought beside each other by subsequent intercourse. Hence we may understand how the epithet dyyeAos and the office of messenger between gods and men, which in the Jig Veda belong to Agni, the fire, are in Greek mythology attached to Hermes. This Pelasgic Hermes is an ithyphallic deity, tle god of fertility and reproductive power, and bestower of riches in flocks and herds. Corresponding to this religious conception we have in mythology such epithets as éprovvios, dxaxynta, Kc. ; and in the hymn to Aphrodite (written perhaps in /&olis in the 9th century B.c.), Hermes and the Sileni (Latin Silvan') are the companions of the monntain nymphs. So in Arcadia, one of the chief seats of his worship, where on Cyllene his birthplace was shown, he was by Penelope the father of Pan. Penelope, the " torch-eyed " (Ahreus

in Philol., 1879, p. 205), is a form of Athiene, Odysseus of Hermes; and Hermes and Athene are asso- ciated as Hepliestus with Athene in Attica. In the very mixed Attic people, it is not surprising to find the wor- ship of Hermes widespread ; it is sometimes said to have been introduced from Samothrace. In Athens Hermes is the god of social life and intercourse in general, of streets and doorways, and of the palestra. He is worshipped as éyopatos and zmporvAaws; and Herme, pillars supporting a bearded head and furnished with a phallus, stood all over the city. In Bceotia also we find Hermes, especially at Tanagra, where Hermes the champion, and Hermes xptoddpos, the averter of diseases, were worshipped. The Doric god Apollo, with tlie titles Agyieus and Paion, corresponds most closely to these last aspects of Hermes. As god of social intercourse lie easily grows into the impersonation of cleverness, and at last into the patron of thieves. If we pass from religion to mytho- logy, where we find all the snecessive ways of expres- sing views of nature preserved to us side by side, we find an immense variety of traditions. The most common subject in these tales is the struggle between darkness and light. When it is said that Hermes stole the oxen of Apollo, and after killing two of them nailed their skins on a rock, we have one of a class of myths described at length by Kuhn (£ntwickelungsstufen der Mythologie). The slain auimal is the sun, who is killed every evening; and the hide, z.e., the sky of night, is either hung up on the tree of heaven (as is the Golden Fleece) or fastened with the star-headed nails. Again, when Io, the moon, is watched by the hundred-eyed Argus (Sanskrit rajas, " darkness"), the star- studded sky, Hermes slays Argus with a stone, the same which Cadmus and Jason use, viz., the rising sun. In both cases Hermes is the sun-god as hidden during the night away among the souls of the dead ; hence the Chthonian character

so frequently attached to him. The rod with which lie lulls men to sleep is the same sceptre that the ruler of tle dead, Yama or Rhadamanthus, Minos or Hades, always bears (Knhn in Z/¢., iv. p. 123); he is also the sender of dreams ; we find him worshipped among the Chthonian deities at Cnidus, and on vases accompanied by the Chthonian dog. We are now able to understand a fact which is perhaps the most interesting point connected with Hermes. Kuhn first pointed out the ideutity of the Greek 'Eppecas with

the Sanskrit Sirameyas, and though the con- nexion has been doubted by various writers, as Mannhardt (Wald- und Feld-Kulte, ii. pref.) and others, yet no valid objection has ever been offered on etymolegical grounds (see Benfey in Abhandl. Gott. Ges., 1877). Amid the diffi- culties which still envelop the translation and the mytho- logy of the Vedas, it is, however, even more difficult to dis- cover the original character of the two Sdrameyau and their mother Sarama, than it is to determine the nature of Hermes. The two Sairameyau are mentioned twice in the Jig Veda (vii. 55; x. 14); they are two dogs, are said both to guard the way to the abode of the dead and refuse a passage to the impious, and also to act as the messengers of Yama, carry- ing away the souls when the time of death has arrived. Sarama also seems to be regarded as the messenger or the dog of Indra; and Hermes appears regularly as the com- pinion and helper of all the light-heroes on their adventures. One epithet of these dogs is Carvara, spotted, which in its Greek form Cerberus (Benfey, Vedica, p. 149) is the name of the dog that guards the gate of the lower world. Now we find in Rome that two dares preestites, children of Mercury and Ligeria, are said to guard dwellings and strects in the form of dogs; and in the German legend the dog who attends the wild huntsman Wuotan, z.c, the sun hidden during the seven winter months, is closely related to the dwarfs or spirits of the dead, and is called by their name (Kuhn, Westf. Sagen, i. p. 69c). So Hermes, whom we have seen as king of the dead, is as Yvxoroprds also the conductor of souls to their future home ; we may there- fore count the dog (or dogs) as ultimately identical in character with the king of the dead. Sonne (on Charis in Kuhn's Zt., x.) has pointed out how these primitive concep- tious commonly pass through the stage of animals before reaching that of gods; and in mythology we have the two stages preserved side by side as distinct beings. The Hindu Kubera, lord of the treasures of the lower world, who may be identified with Pluto or with Hermes, is styled " Lord of the hosts of the Sairamcyas."

In this account there has been no room left for the idea of Hermes as connected with the wind. The sun, after lic has set at night, is the same as the sun hidden during the dreary mouths of winter, who then rides abroad in the tempest. The wind is then easily conceived as his servant and messenger, and is often considered to carry away the souls of the dead (see Harries). From his connexion with the wind, Hermes is represented with

winged shoes. But with Roscher (Zermes der Wind-Gott) to see in Hermes simply the wind is to take a narrow view and to ignore the character of primitive Aryan thought.

In art, besides the Herme already described, Hermes is in the archaic time represented as a man with pointed beard, wearing a chlamys and the broad hat called petasus ; his symbols are the staff (xypvxeov) and the winged shoes (talaria). The ideal type of Hermes was probably modelled after the statue by Praxiteles in the Heraion at Olympia. This statue, which was recently discovered by the Ger- man expedition, represented the god leaning with his left arm on a rock and supporting on it the infant Bacchus. The right arm, which is lost, probably held the caduceus. The form shows a perfect combination of agility and strength.

HER—HER

See the works on mythology or religion by Welcker, Gerhard, Rinck, Stuhr, Schwenck, O. Miiller, Eckermann, H. D. Miiller, Lauer, Schwartz, Max Miiller, Preller, Hartung, Braun, Maury, &c.; also Lehrs, Popularische Aufsdtze ; Schomann, Hesiod. Theog. ; Géttling in Hermes, xxix.; Mehlis, Grundidee des Hermes, Myri- antheus Agoins; Haupt in Zt. f. Alterth., 1842; Oestermaun, Hermes- Odysseus; H.D. Miiller in Philologus, xiv. ; Kuhn in Haupt's Zft. f. d. Alterth., vi.; Von Hahn, Sagwissensch. Studien; Roscher, Hermes. As usual, the fullest list of ancient authorities is to be found in Jacobi, Handworterbuch der Mythologie. (W.M. RA.)

HERMES, Grore (1775-1831), a distinguished Catholic theologian, born on 22d April 1775, at Dreyerwald, in Westphalia, was educated at the gymnasium and university of Miinster. His life presents no facts of importance. After completing his course of study at Miinster, he acted for some time as lecturer at the gymnasium and then as professor at the university. In 1820 he was called, as professor of theology, to the university of Bonn, where he remained till his death on 26th May 1831. Hermes was peculiarly adapted for the life and work of the professoriate. He had great gifts as a lecturer and teacher, and gathered round him at Bonn a devoted band of adherents. His works were Untersuchungen tiber die innere Wahrheit des Christenthums, Miinster, 1805, and Linlectung in die Christ- katholische Theologie, of which the first part, a philoso- phical

introduction, was published in 1819, the second part, on positive theology, in 1829. The Hinleitung was never completed. His Christkatholische Dogmatik was published, from his lectures, after his death by two of his scholars, Achterfeld and Braun, 3 vols. 1831-4.

The Linleitwng is aremarkable work, both in itself and in its effect upon Catholic theology in Germany. Few works of modern times have excited a more keen and bitter controversy. Hermes liimself was very largely under the influence of the Kantian and Fichtean ideas, and though in the philosophical portion of his Linleitung he criticizes both these thinkers severely, rejects their doctrine of the moral law as the sole guarantee for the existence of God, and condemns their restricted view of the possibility and nature of revelation, enough remained of purely speculative material to render his system obnoxious to the Catholic Church. A very few years after his death, the contests between his followers and their opponents grew so embit- tered that reference of the dispute was made to the papal see. The judgment consequent upon a review of Hermes's writings, undertaken in Rome in 1833, was adverse, and on 25th September 1835 a papal bull condemned both parts of the Hinlectung and the first volume of the Dog- matik, Two months later the remaining volumes of the Dogmatik were likewise condemned. The controversy did not cease with this condemnation; but not till 1845 was there any systematic attempt on the part of Catholic theo- logy to examine and refnte the Hermesian doctrines. In that year was published anonymously by F. X. Werner the most complete survey of the principles of the works of Hermes as contrasted with the orthodox catholic faith (Der Hermesianismus, 1845). In 1847 the condemnation of 1835 was confirmed by Pius IX. A sufficient account of Hermes and the dispute raised by him will be found in K. Werner, Geschichte der Katholischen Theologie, 1866, pp. 405 sqq.

HERMES TRISMEGISTUS. The Egyptian Thoth, Tauut, or Tat (see vol. vii. p. 718), who was identified by the Greeks more or less completely with their own Hermes, is described in the hieroglyphics by various epithets, among which occurs that of "the great great" or twice great, with an added hieroglyphic (a kite) also signifying "great." To him as scribe of the gods, "Lord of the divine words," "Seribe of truth," was attributed the authorship of all the strictly sacred books generally called by Greek authors

Hermetic. These, according to Clemens Alexandrinus, our sole ancient authority (Strom., vi. p. 268 sq.), were forty-

two in number, and were subdivided into six divisions, of which the first, containing the ten books " of the prophets," dealt with laws, deities, and the education of priests ; the second, consisting of the ten books of the "stolistes," or official whose duty it was to dress and ornament the statues of the gods, treated of sacrifices and offerings, prayers, hymns, festive processions ; the third, "of the hierogram- matist," also in ten books, was a repertory of hieroglyphical, cosmographical, geographical, and topographical informa- tion ; the four books "of the horoscopus " were devoted to astronomy and astrology ; the two books "of the chanter " contained respectively a collection of songs in honour of the gods and a description of the royal life and its duties ; while the sixth and last division, consisting of the six books '"'of the pastophor," was medical. Of this canon, which according to the generally received opinion of Bunsen must have been closed at latest in the time of the Psammetichi but probably earlier, numerous small fragments are to be found in the works of Stobzeus and other ancient writers. The now well-known Book of the Dead, according to Bunsen, originally had its place among the ten ceremonial books of the "stolistes," but this is denied by Lepsius; an ancient papyrus recently deciphered by Ebers is believed by that author to date from about the year 1500 3.c., and to have formed part of one of the books of the pastophor.

The epithet Trismegistus (6 tpuopéyroros, or " superla- tively " greatest), as applied to Hermes, is of comparatively late origin, and cannot be traced to any author earlier than the 2d Christian century. Most probably it arose out of the earlier forms péyas kal péyas or péyrros, derived by the Greeks from early Egyptian sources ; but various other explanations of the appellation have been offered, such as that of the author of the Chronicon Alexandrinum (47 A.D.), who maintains that it was because Hermes, while maintain- ing the unity of God, had also asserted the existence of three supreme or greatest powers that he was called by the Egyptians Trismegistus.1 This view, which is also adopted by Suidas, seems preferable

at least to that met with in Nicolai's History of Greek Lnterature, according to which an apocryphal author named Hermes was called tpicpe- ylorwos, simply in order to indicate that he had succeeded and outdone a certain Megistias of Smyrna in astrological, physiognomical, and alchemistic theories. The name of Hermes seems during the third and following centuries to have been regarded as a convenient pseudonym to place at the head of the numerous syncretistic writings in which it was sought to combine Neo-Platonic philosophy, Philonic Judaism, and cabbalistic theosophy, and so provide the world with some acceptable substitute for the Christianity which had even at that time begun to give indications of the ascendency it was destined afterwards to attain. Of these pseudepigraphic Hermetic writings some have come down to us in the original Greek ; others survive in Latin or Arabic translations; but the majority appear to have perished. That which is best known and has been most frequently edited is the wousdvdpys sive De Potestate et Sapientia Divina (roinavdpys being the Divine Intelligence toy.nv dvopov), which consists of fifteen chapters treating of such subjects as the nature of God, the origin of the world, the creation and fall of man, and the divine illumina- tion which is the sole means of his deliverance. The Hditio Princeps appeared in Paris in 1554; and there has been a recent edition by Parthey (1854); the work has also been translated into German by Tiedemann (1781). Along with it are usually printed the certainly later dpo. or Definitions of Asclepius, which have sometimes but erroneously been attributed to Apuleius. Other Hermetic writings which

1 'Epis ppace tpets peyloras Suvduers elvar +d Tod appyrov Kal Syusroupyod Geod Bvoya play Ocdryta elev civat. .. Sid Kat exAHOn bmd Tav Aiyumtlov Tpropéeyioros 'Eppijs.

Tol

have been preserved, and which have been for the most part collected by Patricius in the Vouva de Universis Philosophia (1593), are (in Greek) "Iarpopabyparixa mpds "Appova Aiytrrior, Ilept xataxAicews voootyTwv TEPLYVWOTLKG, °EK Ths paOnparuhs émoripns apos "Appova; (in Latin) Aphorismi sive Centiloguium, Cyranides ; (in Arabic, but doubtless from a Greek original) an address to the human soul, which has been

translated by Fleischer (An die menschliche Seele, 1870). The connexion of the name of Hermes with alchemy will explain what is meant by hermetic sealing, and will account for the use of the phrase " hermetic medicine" by Paracelsus, as also for the so-calied " hermetic freemasonry " of tle Middle Ages.

See Ursinus, De Zoroastre, ITermete, &e., Nuremberg, 1661; Leng- let Dufresnoy, L'iistoire de la Philosophie Hermétique, Paris, 1742; Baumgarten-Crusius, De librorwm hermeticorwm origine atque indole, Jena, 1827; Hilger, De Hermetis Trismegisti Poémandro, 1855; Ménard, Hermes Trismégiste: Traduction complete, précédée @une étude sur lV origine des livres hermétiques, 1866 ; Pietsehmann, Hermes Trismegistus, nach Atgyptischen, Gricchischen, und Orient- alischen Ueberlicferungen, 1875.

HERMESIANAX, an elegiac poet of the Alexandrian school, was born at Colophon, and flourished in the time of Philip and Alexander, or a little later. He was a friend and admirer—probably also a pupil—of the gram- marian and poet Philetas, whom he outlived. His chief work was a poem in three books, which he, following the example of his countrymen Mimnermus and Antimachus, inscribed with the name of his mistress Leontium (said by some to be the same as the mistress of Epicurus). Of this poem a fragment of about one hundred lines has been pre- served by Athenzens (xiii. 597) ; and it may serve as a speci- men of the style of the school. Erotic in character, and plaintive in tone, it enumerates instances, mythological and historical, of the irresistible power of love, and redeems the monotony of its ground plan by its picturesque language, and by the alternate force and tenderness of its treatment. Hermesianax was exceedingly popular in his own times, and was highly esteemed even in the Augustan period. Pro- pertius follows his example in dedicating the first book of his Elegies to his mistress Cynthia.

Many scholars have laboured upon the text, but it is still in a very unsatisfactory condition. See Hermann, Opusewla, iv. ; Sehneidewin, Delect. Pocs, Eleg.; Bergk, De Hermesianactis Elegia 5 the editions of Bailey (London, 1839), &c.

HERMOGENES, of Tarsus, Greek rhetorician, flourished in the reign of Marcus Aurelius. His precocious ability secured him a public appointment as teacher of his art while as yet he was only a boy; but at the age of twenty- five his faculties gave way, and he spent the long remainder of his life in a state of intellectual impotency. In the nine or ten years, however, of his activity he composed a whole series of treatises on matters rhetorical, which became popular text-books, and the subject of subsequent com- mentaries. Of his Téyvy fyropixy we still possess Ilept tov ordcewv; Iepi cUPETEWV} Tlept ideav; Iept pcb ddou Sewdryros; and Ipoyupvdcpara.

The last-mentioned was only known from Priseian's Latin trans- lation till the publication by Heeren of the Greck original dis- covered at Turin (Bibl. fiir alte Lit. und Kunst, Gott., 1791). Richard Volkmaun, in Animadversiones critice im nonnitllos veterum de praceaereitationtbus rhetoricts locos (Jauer, 1869), discusses the relation of the original to Priscian's translation, and treats them as sourees of reciprocal cmendation.

HERMON, the highest mountain in Syria (9150 feet above the Mediterranean), an outlier of the Antilebanon. The name }1270, "separate," is perhaps due to its isolated position. The Sidonians called it Sirion, and tle Amorites Shenir (Deut. iii. 9). It is probably the 'high mountain " near Cesarea Philippi where the Transfiguration occurred (Mark ix. 2). The modern name is Jebel esh Sheikh, or " chief mountain." Itis also called Jebel eth Thelj, 'snowy mountain." The ridge of Hermon, rising into a dome-

shaped summit, is 20 miles long, extending north-east and south-west. The formation is a hard dark-grey crystalline limestone belonging to the Neocomian period, and full of fossils. The spurs consist in some cases of white chalk covering the limestone, and on the south there are several basaltic outbreaks. The mountain in spring is covered with snow, but in autumn there is occasionally noue left, even in the ravines. To the height of 500 feet it is clothed with oiks and brush, while luxuriant vineyards abound. Above the snow limit the mountain is bare and covered with fine limestone shingle. The summit is a plateau from which three rocky knolls rise up, that on the west being the lowest, that on the south-east the highest. On the

south slope of the latter are remains of the small temple or sacellum described by St Jerome. A semicircular dwarf wall of good masonry runs round this peak, and a trench excavated in the rock may perhaps indicate the site of an altar. On the plateau is a cave about 25 feet square, with the entrance on the east. A rock column supports the roof, and a building once stood above. The view from Hermon is very extensive, embrac- ing all Lebanon and the plains east of Damascus, with Palestine as far as Carmel and Tabor. On aclear day Jaffa may also be seen. Other small temples are found on the sides of Hermon, of which twelve in all have been explored. They face tle east, and are dated by architects about 200 a.p. The most remarkable are those of Dez el 'Ashaiyir, Hibbartyeh, Hosn Niha, and Tell Thatha. At the ruined town called Rukhleh on the northern slopes are remains of a temple, the stones of which have been built into a church. A large medallion 5 feet in diameter, with a lead supposed to represent the sun-god, is built into the wall. Several Greek inscriptions occur among these ruins. Foxes, wolves, and the Syrian bear are commonly found on Hermon, with various kinds of game. In the 12th century Psalm lxxxix. 12 was supposed to indicate the proximity of Hermon to Tabor. The conical hill imme- diately south of Tabor was thus named Little Hermon, and is still so called by some of the inhabitants of the district.

HERMOSILLO, a town of Mexico, state of Sonora, is situated at the entrance to a valley of remarkable fertility near the river Sonora at its confluence with the Horcasitas, 40 miles south-west of Ures. Some of the principal houses are built of stone, but most of the dwellings are of adobe. The town possesses two churches, a prison, and a mint. Its rise and early prosperity were due to the discovery of gold mines in Sonora, but it now depends wholly on the fertility of the surrounding country, of which the principal products are cotton, wheat, grapes, and a great variety of fruits. The town is the commercial centre of Sonora. It has cotton manufactories, flour mills, and brandy distilleries, and carries on a considerable foreign trade by means of the port of Guaymas, which is 100 miles distant. The popu- lation is about 14,000.

HERMSDORE, generally known as Niederhermsdorf, a town of Prussia, in the government district of Breslau and circle of Waldenburg. There are coal

aud iron mines and lime quarries in the vicinity, and in the town there is a large iron-work. The population in 1875 was 5984.

HERMUPOLIS. Sce Syra.

HERNIA (a Latin term commonly derived from épvos, a sprout, but this origin is doubtful) is the protrusion of any viscus from its normal cavity ; for example, hernia cerebri is the name given to a protrusion of the brain substance, hernia pulmonum a protrusion of a portion of the lung. The word may here be restricted to its most usual meaning, a pro- trusion of part of the contents of the abdomen from their normal position in the abdominal cavity,—in common language a "rupture." A rupture may occur at any weak point in the abdominal wall. The common situations are the groin (inguinal hernia), the upper part of the thigh

(femoral hernia), and the umbilicus or navel (umbilical hernia). The contents of a rupture may be any of the abdominal viscera; the more movable the viscus the more tendency there is to protrusion, and therefore we generally find that the small intestine and the omentum are most frequently displaced. The tumour may contain intestine alone (enterocele), omentum alone (epiplocele), or a com- bination of intestine and omentum (entero-epiplocele). The predisposing cause to rupture is any weakness of the abdo- minal wall due (1) to natural conformity, as in inguinal hernia, which descends along the inguinal canal, a canal in which the cord lies in the male and the round ligament in the female; or in femoral hernia, in which the hernia descends along the femoral canal along with and to the inner side of the femoral vessels; (2) to any cause which weakens the wall locally, as an abscess or wound; (3) to general laxity of the tissues, as in weakly people, or after repeated pregnancies. This third cause only predisposes to hernia in so far as it may weaken an already weak part under the first and second heads. The exciting cause of hernia is generally some strain or over-exertion in any powerful effort, as lifting a heavy weight, jumping off a high wall, straining, as in difficult micturition or in conse- quence of constipation, or excessive coughing, as in chronic bronchitis. The pressure of the diaphragm above and the anterior abdominal wall in front acting on the abdominal viscera tends to cause their protrusion at the weakest point. Rupture is either congenital or

acquired. A child may be born with a hernia in the inguinal or umbilical region, the result of an arrest of development in these parts; or the rupture may be acquired, first appearing perhaps in adult life, the result of one or other of the accidents referred to above. Ruptures are most frequent at the extremes of life. Men suffer more frequently than women, because they are more liable to those accidents, being frequently exposed to intermittent work, such as the lifting of heavy weights. At first the rupture is small, and with more or less rapidity it gradually increases in size; it varies from the size of a small marble to that of a child's head or even larger. The swelling which appears is spoken of as con- sisting of three parts,—the coverings, sac, and contents. (1) The "coverings" are composed of the different struc- tures which form the abdominal wall at the part where the rupture occurs, In femoral hernia the coverings are formed of the structures at the upper part of the thigh. These structures are stretched and may be thinned; in some cases they are condensed and matted together, the result of pressure; in others there is an increase in their thickness, the result of repeated attacks of inflammation. (2) The "sac" is composed of the peritoneum or mem- brane lining the abdominal cavity; in some very rare cases the sac is wanting. The neck of the sac is the term used to designate the narrowed portion where the peri- toneum forming the sac becomes continuous with the general peritoneal cavity. Very frequently the neck of the sac is thickened, indurated, and adherent to surround- ing parts, because here the tendency to local inflammatory action is most marked, the pressure being greatest at this point. (3) The "contents" have already been described. There are three distinct conditions in which we may find the contents of a hernial tumour: it may be either reducible, irreducible, or strangulated. A "reducible" hernia is one in which the contents can be pushed back into the abdomen. In some cases this is done with ease, in others it is a matter of great difficulty. At any moment a reducible hernia may become "irreducible," that is to say, its contents cannot be pushed back into the abdominal cavity. This may suddenly occur in conse- quence of an attack of constipation, or slowly, the irreduci- bility being at first partial and gradually becoming more

and more complete. Generally this is due to an increase in the size of the omentum, accompanied by inflammatory induration.

Reducible Hernia.—The symptoms of reducible hernia show themselves in a soft compressible tumour (elastic when it contains intestine, doughy when it contains omentum, a combination of elasticity and doughiness when both are present), its size increasing in the erect, and diminishing in the horizontal posture, wheuce as arule it gives little trouble during the night, and becomes more troublesome in the daytime, more especially towards evening. There is a morc or less distinct impulse on coughing, and when the intestinal contents are pushed back into the abdomen a gurgling sensation is perceptible by the fingers. Such a tumour may be met with in any part of the abdominal wall, but the chief situa- tions are—(a) the inguinal region, in which the neck of the tumour lies immediately above Poupart's ligament (a cord-like ligamentous structure which can be felt stretching from the anterior superior spinous process of the ilium to the spine of the pubis immediately above the genital organs); (&) the femoral region in the upper part of the thigh, in which the neck of the sac lies immediately below the inner end of Poupart's ligament; (c) the umbilical region, in which the tumour appears at the navel. As the inguinal hernia increases in size it tends to pass into the scrotum in the male, into the labium_in the female; while the femoral hernia, appearing first below Poupart, tends gradually as it increases in size to pass upwards superficial to Poupart's ligament.

The treatment of reducible hernia consists in pushing back the contents of the tumour into the abdomen, and applying a truss or elastic bandage in order to prevent the contents from again escap- ing. The younger the patient the more chance there is of the truss acting as a curative agent, as the natural tendency to contraction of the channel through which the hernia protrudes is greater. The truss is frequently laid aside at night, because in the horizontal | es the tendency of the contents to descend is greatly lessened.

he truss or bandage should, however, be worn day and night. If, after the hernia is once returned, it is never again allowed to come down, there is a probability of a cure taking place; but if it is allowed to come down occasionally, as it may do, even during the night, in consequence of a cough

or from turning suddenly in bed, the parts are stretched, and the contracting process which may lave been going on for weeks is undone.

It is unnecessary to describe the multitudinous varieties of trusses. When a truss is ordered the surgeon has to see that it fits accurately, the necessary amount of pressure being obtained by means of a steel spring, to which a pad is attached. The pad should be so arranged as to press, not into the opening through which the hernia has come, but rather on its sides, so as to facili- tate its contraction aud permanent closure. The main pressure should be in the neighbourhood of the neck of the sac; if the pad presses into the opening, the tendency is to keep the opening patent. The principle of the nipple-shaped pad, frequently ordered for umbilical hernia, is evil; a flat pad properly applied and held in position by an elastic bandage is the proper arrangement for restraining an umbilical hernia. No truss is to be applied until the hernia is completely reduced; it will only do harm by pressing on the contents of the unreduced hernia, In some hernie, gene- rally those of large size, it is found impossible to keep them up by means of a truss; in such cases an elastic bandage will sometimes effect the object, in others various operations have been recom- mended. 'They are spoken of as "the radical cure of hernia," in contradistinction to the so-called 'palliative treatment by mcans ofatruss." An attempt has been made above to show that a truss may radically cure a hernia. The principles involved in the operations described are (1) obliteration of the neck of the sac, (2) obliteration of the channel through which the hernia has de-

scended, (3) obliteration of the sac itself, (4) plugging of the channel by invaginating the loose skin. The first and second are specially important, as in them the surgeon imitates nature's way of attempting to cure the tendency to hernial protrusion.

Irreducible Hernia.—Here the main symptom isa tumour in one or other of the situations already referred to, of long standing and generally of large size, in which the contents of the tumour, in whole or in part, cannot be pushed back into the abdomen. The irreducibility is due either to its large size or to changes which have taken place in the contents, either indurations or adhesions. Such a tumour is a constant source of danger: its

contents are liable, from their exposed situation, to injury from external violence; it has a constant tendency to increase in size; it may at any time become strangulated, or the contents may inflame, and strangula- tion may occur secondarily to the inflammation. It is accompanied by dragging sensations referred to the abdomen, colic, dyspepsia, and coustipation, which may in its turn lead to obstruction, that is to say, a stoppage of the passage of the contents of that portion of the intestinal canal which lies in the hernial tumour. Whenan irreducible hernia becomes painful and tender, a local peritonitis has occurred, which resembles in many of its symptoms a case of strangulation.

The treatment of irreducible hernia may be palliative: a bag truss may be worn to prevent the swelling from getting larger ; the bowels must be kept open, and all irregularities of diet avoided. A person with such a hernia is in constant danger, and more than palliation is called for. An attempt should be made to reduce the hernia—(1) by laying the patient on his back, raising his buttocks, administering purgatives, and starving him (persevering attention to these points may so reduce the size of the contents that the hernia may be re- turned) ; or (2) by means of an elastic bandage carefully applied so as to press continuously on the tumour, and gradually press it back into the abdominal cavity. By this simple means large irreducible hernie, which have withstood all attempts at reduction, have been returned into the abdomen after elastic pressure has been carefully and continuously applied for a few days. (3) The surgeon may cut down on the hernia, under strict antiseptic precautions, open the sac, divide any omental adhesions, ligature and cut away in- durated omentum, return the bowel, and then tie the neck of the sac. Such an operation is unjustifiable unless other means have been fairly tried and failed, and unless the hernia is giving rise to such symptoms that the usefulness of the patient is interfered with.

Strangulated Hernia,—In this the contents are constricted, and the flow of blood into the tumour and from the tumour is stopped. The symptoms are—nausea, vomiting first of bilious matter, after a time of feecal matter, a twisting, burning pain generally referred to the umbilicus, intestinal obstruction, a quick wiry pulse, pain on pressure over the tumour and in the abdomen uear the tumour, the abdomen tense and tympanitic, and no impulse on coughing, because the contents of the tumour are practically cut

off from the general abdominal contents. The patient has an anxious cxpression. Sooner or later, from eight hours to eight days, if the strangulation is unrelieved, the tumour will become livid and em- physematous; mortification has occurred, and gangrene of the bowel at the neck of the sac will take place, followed by extrava- sation of the intestinal contents into the abdominal cavity ; the patient hecomes collapsed, and dies comatose.

The treatment of a strangulated hernia admits of no delay; delay is fatal. Ifthe symptoms are not very acute, and if the case is seen early, attempts may be made by large enemata and by the application of cold to the tumour to reduce the congested condition and relieve the strangulation. But these attempts must not be persevered with for more than two or three hours. If the strangulation continues, then the patient should be told that his case is one which admits of no delay. Chloroform should be administered ; another attempt to return the contents by pressure (termed "the taxis") should be made. If this has already been fairly tried, and if the symptoms indicate urgency, no prolonged attempts at taxis are justifiable, because the condition of the hernial contents may be such that they cannot bear the pressure. The taxis to be successful should be made in a direction opposite to the one in which the hernia has come down. The inguinal hernia should be pressed upwards, out- wards, and backwards, the femoral hernia downwards, backwards, and upwards. The larger the hernia the greater is the chance of success. The slightest gurgle indicates that success is near. If taxis does not succeed then the surgeon must cut down on the tumour, carefully dividing the different coverings until le reaches the sac. The sac is then opened, the constriction divided, care being taken not to injure the bowel. The condition of the bowel is then examined, and if it is glistening, however black it may be, it is returned into the abdomen. If it has lost its glistening aspect, if it is like " wet parchment," then the case is very doubtful. If in doubt, relieve the constriction and leave the bowel in the sac. Never open the bowel, however bad it looks; it may recover; and if it does not burst for some hours afterwards, the chances are that adhesions may form at the neck of the sac and lessen the risk

of extravasation into the abdominal cavity—a fecal fistula will be the result. The omentum, if healthy, may be returned; or if con- gested and indurated, it may be ligatured and cut off. After the bowel is returned the wound is sewn up, and a pad and flannel bandage applied. A dose of opium should be given to prevent movement of the bowels. On the third day a dose of castor oil is administered if the bowels do not opeu naturally. A truss is applied after the wound is healed before the patient is allowed to get out of bed. Many complications which may occur cannot here

be referred to. Any one suffering from hernia should take great

care to obtain an accurately fitting truss, and should remember that, whenever any symptoms resembling in any degree those of strangulation occur, any delay in the treatment is not only danger- ous but may prove fatal. A medical man should at once be com- municated with. He in his turn has to remember that when a patient asks his advice, complaining of symptoms resembling strangulation, he must exainine all the situatious where hernia may occur, because the hernial tumour may be so small that it has escaped the notice of the patient. Any assertion on the patient's part that he does not suffer from hernia must receive no weight. The surgeon must satisfy himself by ocular inspection and manual examination. If au operation is necessary he may with confidence say that the operation is not in itself a dangerous one, while, on the other hand, he can assure the patient that any delay is most certainly excessively dangerous. (J. C.)

HERNOSAND, chief town and seat of the administra- tion of the lin of Wester Norrland on the east coast of Sweden, is built on the island of Herné (connected with the mainland by bridges), about 3 miles south of the mouth of the Angerman river, and 230 miles north of Stockholm. It is the seat of a bishop and possesses a fine church, erected in 1842-46. 'There are engine works, timber-yards, saw-mills, and various manufactories in the town. The harbour is good. In 1878, 33 vessels, chiefly engaged in the timber trade, with a total burthen of 7698 tors, entered and cleared at the port. Tar is also exported, and there is an institution for pisciculture in the town. Hernésand was founded in 1584, and received its first town privileges from John IIT. in 1587. The population in 1876 was 4912.

HERO AND LEANDER. Hero, the beautiful priestess of Venus at Sestos, was there seen by Leander, a youth of Abydos, at the celebration of the festival of Venus and Adonis. He became deeply enamoured of her, and found that day an opportunity of declaring his passion, which she returned; and as her position rendered their marriage impossible, they agreed to carry on a clandestine inter- course. Nightly Hero placed a lamp in the top of the tower where she dwelt by the sea, and Leander, guided by it, swam the dangerous Hellespont. One stormy night the lamp was blown out, and Leander perished. On finding his body next morning on the shore, Hero flung herself into the waves.

Reference is made to this famous tale by Virgil (@eorg., iii. 258) and by Statius (7hebd., vi. 535). Ovid (Her., xviii. and xix.) has composed an epistle from Leander to Hero, and one from Hero to Leander. But the story is best known from the work of Muszus (see Musaus), which has been repeatedly translated into modern European languages. The Hero and Leander of Marlowe and Chap- man is an imitation and expansion of the work of Muszus.

HEROD was the name of a family of Idumzan origin, which displaced the Asmoneans as the rulers of Judea. The founder of the dynasty, and its most notable represen- tative in every way, was Herod the Great, who was king of the Jews for about thirty-seven years, from 40 to 4 Bc. Herod's father was Antipater, who during the troubles which broke out in the family of Alexander Janneus, attached himself to Hyrcanus, the weak-minded son of Alexander. In this way Antipater, though an Idumzan, soon became the most powerful man in Judea, and in the Alexandrian war gave such effectual help to Julius Cesar that the dictator made him procurator of Judea, Hyreanus being high priest (47 B.c.). The same year, at the age of twenty-five, Herod was appointed governor of Galilee by his father. He soon gave proof of the remark- able energy of his character in rooting out the banditti

who infested his province; but his summary measures gave a handle to. the enemies of his house at Jerusalem, and he was summoned before the sanhedrin. 'There he appeared, not in the garb of an accused person, but gorgeously attired, and attended by a guard of soldiers. He found it expedient, however, to withdraw from Jerusalem without awaiting the

sentence. He retired to Syria, where he met with a gracious reception from Sextus Cesar, who appointed him governor of Ceele-Syria. Herod now marched with an army against Jerusalem, but at the persuasion of his father and brotlier was induced to depart without exacting vengeance on his enemies. After the death of Cesar, the fortunes of Herod were affected by all the changes which befell the Roman state. When Cassius took the command in the East, and began to gather his strength for the final struggle which was decided at Philippi, Herod managed to win his favour by the readiness with which he raised his share of the heavy exactions imposed upon the East. About the same time his father was poisoned, and to Herod fell the task of avenging his death, as well as of supporting the interests of his house in Palestine. After Philippi he gained Antony over by large presents of money. He and his brother Phasael were appointed tetrarchs of Judea. In 40 B.c. the Parthians appeared upon the scene, overran the whole of Syria, and placed on the throne of Judea Antigonus, son of Aristobulus, and representative of the rival branch of the Asmonean house. Herod was com- pletely overpowered; and, after placing his relatives in safety, so far as he could, he hastened to Rome to lay his case before Antony and Octavianus. He succeeded beyond his expectation, for, while he meant only to advocate the claims of Hyrcanus the Asmonean, the two heads of the state made him king of Judea. Herod returned home without delay, and set about the task of winning the kingdom allotted to him. Owing chiefly to the slackness of the Roman generals who should have helped him, it was three years before he succeeded in taking Jerusalem (37 B.0:). Before that event he had married the beautiful Mariamne, a princess of the Asmonean house, a granddaughter both of Aristobulus and Hyrcanus. Herod's early measures were cruel; he put to death all the members of the sanhedrin except two, and spared no one that was likely to stand in his way. Aristobulus, the youthful brother of Mariamne, whom he had appointed high priest, he caused to be treacherously drowned because he was too popular with the patriotic party. On this occasion Alexandra, mother of Aristobulus, induced Cleopatra to take her part, and Herod had to appear before Antony to answer the charge of murdering the prince. Again Herod knew how to gain the Roman, and he returned home with confirmed power. During the war of Actium, Herod had the good fortune to be engaged in a war with the king of Arabia on Antony's behalf, and so escaped the risk of fighting against Octa- vianus. Yet he recognized the danger of his position as the friend of Antony,

and faced it with his usual courage and foresight. Hastening to Rhodes (30 3.c.), he appeared in the presence of the conqueror, and avowing his loyalty to his friend Antony, proffered the same faithful service to Octavianus. Octavianus was gracious, and remained the constant friend and patron of Herod to the end, This was the last crisis of Herod's life ; he was henceforward undis- puted king of Judza, and next to Agrippa the most trusted friend of Augustus. But while the friend of the great, and

prosperous in all external relations, Nemesis pursued him in —

his family. When summoned to answer for himself before Antony, and again on his journey to Rhodes, he left the beautiful and beloved Mariamne in charge of one of his friends, but with the cruel injunction that she should be put to death should anything serious befall himself. On both occasions Mariamne discovered the secret, and, instead

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of regarding the commana as a proof of his jealous love, abhorred it as another instance of the cruelty which had not spared so many of her nearest relatives. A horrible tragedy ensued: Mariamne openly expressed her disgust ; and Herod, furious with rage, jealousy, and rejected love, ordered lier death. The violence of his feelings threw him into a dangerous malady, and even drove him to the verge of insanity. His mind never recovered its healthy tone, and in later years the avenger again overtook him. In the meantime his government was marked by the greatest magnificence aud apparent success. His turbulent subjects were kept tolerably quiet in spite of heavy taxes. He managed to gratify his love for Greek and Roman life ; and yet he avoided wounding too deeply the susceptibilities of the Jews. The magnificent buildings which he raised were the most brilliant products of his reign. He rebuilt Samaria, calling it Sebaste, from the Greek name for Augustus. He converted the small town of Strato's Tower into a magnificent seaport with an artificial harbour, under the name of Caesarea. These and other towns which he built were furnished with temples, theatres, aqueducts, and all the other ornamental and useful appliances of Greek and Roman life. In the city of Jerusalem even he built a theatre, and an amphitheatre outside of it. A more patriotic work was the rebuilding of the temple (begun 20 B.c.), which had suffered greatly during the late troubles ;

it was on a very magnificent scale, and lasted nine years and a half, even then being unfinished. Equally necessary and equally significant of his relation to his subjects was the construction of strong fortresses in various parts of the country. The last years of Herod's life were darkened by the return of those family troubles which had previously overcast it. Histwo sons by Mariamne had been educated at Rome, and returned, 17 3.c., to Judea. Their Asmonean descent, their youth, beauty, and accomplishments, and their too interesting history gained them the most enthu- siastic popularity among the Jews. Their father himself was proud of them. But Pheroras and Salome, brother and sister of Herod, did all they could to sow jealousy and suspicion. Herod's mind was too painfully open to dark insinuations, and he recalled his eldest son Antipater to counterbalance the influence of the Asmonean princes. After the arrival of Antipater, who was a most unscrupulous plotter, there was no more peace or security at the court of Herod ; things went from bad to worse, till after many years of the darkest intrigue and the bitterest domestic contention, the two sons of Mariamne were strangled at Sebaste. Soon after the clearest proof was discovered of a conspiracy which Antipater had formed with Pheroras against the life of Herod himself. The order for the death of Antipater was given by Herod from his death-bed. His health had long been failing; after the cruellest torments of both mind and body, he died 4 Bc. The birth of Christ took place in the same year as Herod's death, but this, as is well known, occurred four years before the date fixed as the beginning of the Christian era. The massacre of the little children at Bethlehem is not mentioned by Josephus among the horrors of Herod's last days. He was buried with great magnificence. His will, by which the greater part of his dominions was bequeathed to his sons by Malthace, a Samaritan, was confirmed by Augustus. Herod's name is doubtless one of the most repulsive in history. He was a man of wonderful energy and sagacity. He saw clearly that Rome was the hinge on which everything turned, and that no policy could be success- ful which did not depend upon her leading men. His skill in understanding these men, in conciliating them, and making himself useful to them, was very great. Thus he made the successive masters of the world his willing friends, and out of all the crises of his fate emerged victo-

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tious. But his hands were red with the blood of his own household ; when his position or his interests were touched no scruple could arrest him. All that can be said in his favour is that many of his cruel measures cost him unspeak- able agony of mind, and that he was simply more expert than his rivals at the weapons which were in common use in the political life of the time.

The great source for the life of Herod is Josephus ; but such writers as Strabo or Dion Cassius are of service in further illustra- ting it. Useful modern works are Hausrath, Neutestamentliche Zeitgeschichte ; the work of the same name by Schiirer; Ewald, Geschichte des Volkes Israel, vol. iv.; Keim, Geschichte Jesu von Nazara, vol. i.; and Milman's History of the Jews, vol. ii. (T. K.)

HEROD ANTIPAS, son of Herod the Great by the Sama- ritan Malthace, and full brother of Archelaus, received as his share of his father's dominions the provinces of Galilee and Perea, Like his father, Antipas had a turn for architec: ture: he rebuilt and fortified the town of Sepphoris ; he also fortified Betharamptha, and called it Julias after the wife of the emperor. Above all he founded the important town of Tiberias on the west shore of the Sea of Galilee, with institutions of a distinctly Greek character. Antipas is mentioned more than once in gospel history under the name of Herod. He it was who was called a "fox" by Christ. He is erroneously spoken of as a king in Mark vi. 14. It was to him that Jesus was sent by Pilate to be tried. But it is in connexion with his wife Herodias that he is best known, and it was through her that his misfor- tunes arose. He was married first of all to a daughter of Aretas, the Arabian king ; but, making the acquaintance of Herodias, the wife of his brother Philip (not the tetrarch), during a visit to Rome, he was fascinated by her and arranged to marry her. Meantime his Arabian wife discovered the plan and escaped to her father, who made war on Herod, and completely defeated his army. John the Baptist con- demned his marriage with Herodias, and in consequence was put to death in the way described in the gospels and in Josephus. When Herodias's brother Agrippa was appointed king by Caligula, she was determined to see her husband attain to an equal

emineuce, and persuaded him, though naturally of a quiet and unambitious temperament, to make the journey to Rome to crave a crown from the emperor, Agrippa, however, managed to influence Caligula against him. Antipas was deprived of his dominions, and banished to Lyons, Herodias voluntarily sharing his exile.

HEROD PHILIP, son of Herod the Great by Cleo- patra of Jerusalem, received the tetrarchate of Iturea and other districts to the N.E. of the Jordan. He is a different person from the first husband of Herodias, also called Philip by St Mark (vi. 17), and was married to Salome the daughter of Herodias. Philip is described as an excellent ruler, who loved peace, and was careful to maintain justice, and spent his time in his own territories. He was also a builder of cities, one of which was Cesarea Philippi, and another was Bethsaida, which he called Julias. He died after a reign of thirty-seven years; and his domi- nions were incorporated in the province of Syria.

HERODIANS (‘Hpwé.avoi), a sect or party mentioned in Scripture as having on two occasions—once in Galilee, and again in Jerusalem—manifested an unfriendly disposi- tion towards Jesus (Mark iii. 6; xil. 18; Matt. xxii. 6; cf. also Mark viii. 15). In each of these cases their name is coupled with that of the Pharisees. According to many interpreters the courtiers or soldiers of Herod Antipas (“ Milites Herodis,” Jerome; “Diener Herodis,” Luther) are intended; but more probably the Herodians were a public political party, who distinguished themselves from the two great historical parties of post-exilian Judaism by the fact that they were and had been sincerely friendly to Herod the Great and to his dynasty (cf. such formations as “ Ceesariani,” “ Pompeiani”). For the evidence which goes

to show that neither the Pharisees nor the Sadducees as such could in consistency have been really thus friendly, reference may be made to Hausrath (especially his Meu- Testamentliche Zeitgeschichte, and article “ Herodianer ” in Schenkel’s Bibel-Lewxicon), and to Wellhausen (Pharisder u. Sadducter, 1873). It is possible that, to gain adherents, the Herodian party may have been in the habit of repre- senting that the establishment of

a Herodian dynasty would be favourable to the realization of the theocracy ; and this in turn may suggest some explanation of Tertullian's (De Prescr.) palpably absurd allegation that the Herodians regarded Herod himself as the Messiah.

HERODIANUS, the author of a Greek history of the period extending from 180 to 238 a.p. Of his origin and condition in life very little is known. He was in Rome in 203, and seems to have held some public office. It has been conjectured that he was first "procurator Czesaris" and afterwards "legatus" of the Sicilian provinces, and that, while fulfilling his official duties, he wrote at intervals the history which bears his name. It is entitled "Hpwd:avod Ths wera. Mdpxov BaotAelas toropidv BiBrAta dxrd, and it narrates the events of the fifty-eight years that intervened between the death of Marcus Aurelius and the proclamation of Gordianus III. The narrative is of special value for the reigns of the emperors subsequent to Alexander Severus, with whom the work of Dion Cassius ends. Asan historian Herodianus has prominent merits and defects. His work has the value that attaches to a record written by one chronicling the events of his own times, gifted with respectable powers of observation, indubitable candour, and independence of view. But he prefers the interest of style to the interest of truth, and is thus led into exaggerations and errors. The inner life and thought of Rome, the formidable barbarian pressure on her borders, are alike unheeded, that he may blazon his pages with the dazzling vicissitudes of the purple. Though the somewhat sober declamations which he introduces are apt to become tedious, his story is on the whole clear, graceful, and vivacious. The frequent anti- theses and studied tricks of plirase savour of the rhetorical schools. Imitations of Thucydides and Latinisms are frequent. Yet in the main his style retains an original cast, a genuine unborrowed beauty, and contrasts favourably with the thin, affected Atticism of the period. Extensive use has been made of Herodianus by later chroniclers. His history was first translated into Latin in the end of the 15th century, by the famous Angelo Poliziano.

HERODIANUS, JAitius, a famous grammarian of antiquity, called by Priscian "maximus auctor artis gram- matics." He was the son of the grammarian Apollonius, was born at Alexandria, and resided at Rome. He was patronized by the emperor Marcus Aurelius (161-180 .p.), to whom he

dedicated his great treatise on prosody. This was a work in twenty books, called Kafodrxy I[poowdia, which included also an account of the etymological part of grammar. An epitome of it has been preserved. Abstracts of a treatise on difficult words and peculiar forms, called "Exieptopot, are also extant. Besides these, Herodianus wrote various other treatises ; but of the large number of titles quoted, some are probably merely names for parts of larger works. Only one of them has come down complete—a treatise on monosyllables (aept wovinpous A€fews). Numerous quotations, however, and considerable fragments still exist.

Fabricius (Bibl. Gree. vi. 278 sqqg.) enumerates his works and

the passages where they are quoted. Lenz (Herodiani technici

reliquice, Lips. 1867~70) has collected and thoroughly edited all the remains.

HERODOTUS, according to the best authorities, was born in or about the year 484 B.c. He was a native

of Asia Minor, but which from a date considerably anterior to the birth of Herodotus had been excluded from the confederacy, and was an isolated Greek town, dependent upon the Persians. Herodotus was thus born a Persian subject, and such he continued until he was thirty or five- and-thirty years of age. At the time of his birth, Halicar- nassus was under the rule of a queen called Artemisia, who had been allowed by the Persians to succeed to the sove- reignty of her husband, and was mistress, not only of Halicarnassus, but also of Cos, Nisyrus, and Calydna, The year of her death is unknown; but she left her crown to her son Pisindelis (born about 498 8.c.), who was succeeded upon the throne by his son Lygdamis about the time that Herodotus grew to manhood. The family of Herodotus belonged to the upper rank of the citizens. His father was named Lyxes, and his mother Rhzo, or Dryo. He had a brother Theodore, and an uncle or cousin called Panyasis, who was an epic poet, and a personage of so much importance that the tyrant Lygdamis, suspecting him of treasonable projects, put him to death. It is likely that Herodotus derived from this near

relative that love of letters which led him at an early age to the careful study of the existing Greek literature, and determined him ulti- mately to engage in the composition of his great work. It is probable also that he shared his relative's political opinions, and was either exiled from Halicarnassus, or quitted it voluntarily, at the time of his execution.

Of the education of Herodotus no more can be said than that it was thoroughly Greek, and embraced no doubt the three subjects essential to a Greek liberal education— grammar, gymnastic training, and music. There is no reason to suppose that he went beyond the walls of his native city for instruction in this, the ordinary, curriculum or that he enjoyed any special advantages in respect of these early studies. They would be regarded as completed when he attained the age of eighteen, and took rank among the "ephehi " or "eirenes" of his native city. Under ordinary circumstances a Greek of this age began at once his duties as a citizen, and found in the excitement of political life suffi- cient employment for his growing energies. But whena city was ruled by a despot or tyrant, this outlet was wanting ; no political life worthy of the name existed ; and youths of spirit, more especially those of superior abilities, had to cast about for some other field in which to distinguish them- selves. Herodotus may thus have had his thoughts turned to literature as furnishing a not unsatisfactory career, and may well have been encouraged in his choice by the example of Panyasis, who, whether his cousin or his uncle, was certainly his elder, and had already gained a reputation by his writings when Herodotus was still an infant. At any rate it is clear from the extant work of Herodotus that he must have devoted himself early to the literary life, and commenced that extensive course of reading which renders him one of the most instructive as well as one of the most charming of ancient writers. The poetical literature of Greece was in his time already large; the prose literature was more extensive than is generally supposed; yet Herodotus shows an intimate acquaintance with the whole of it. He has drunk at the Homeric cistern till his entire being is impregnated with the influence thence derived. The Jliad and the Odyssey are as familiar to him as Shakespeare to the most highly educated of modern English- men. He is acquainted with the poems of the epic cycle, the Cypria, the Epigoni, &c. He quotes or otherwise shows familiarity with the writings of Hesiod, Olen, Muszeus, Bacis, Lysistratus, Archilochus of Paros, Alczeus, Sappho, Solon, Aisop, Aristeas of

Proconnesus, Simonides of Ceos, Phrynichus, /4schylus, and Pindar. He quotes and criti-

of Halicarnassus, a city which belonged originally to the | cizes Hecateeus, the best of the prose writers who liad pre- Doric Hexapolis, situated towards the south-western corner | ceded him, and makes numerous allusions to other authors

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of the same class. It may be questioned whether there was

put himself under the protection of Athens. The fact that

any single work of importance in the whole range of extant | Egypt was then largely under Athenian influence may have

Greek literature with the contents of which Herodotus had not made himself acquainted by the time that he undertook the composition of his " History."

It must not, however, be supposed that the great Hali- carnassian was at any time a mere recluse student. 'There can be no reasonable doubt that from a very early age his inquiring disposition led him to engage in travels, both in Greece and in foreign countries, which must have been continued year after year for a considerable period, aud which made him as familiar with men as with books. He traversed Asia Minor and European Greece in all directions, probably more than once; he visited all the most important islands of the Archipelago,—Rhodes, Cyprus, Delos, Paros,

-Thasos, Samothrace, Crete, Samos, Cythera, and Aigina,

He undertook the long and perilous journey from Sardis to the Persian capital Susa, passed some considerable time at Babylon, and went a voyage to Colchis, and another along the western shores of the Black Sea as far as the estuary of the Dnieper; he travelled in Scythia and in Thrace, visited Zante and Magna Greecia, explored the antiquities of Tyre, coasted along the shores of Palestine, saw Gaza, and made a long stay in Egypt. At the most moderate estimate, his travels covered a space of thirty-one degrees of

longitude, or 1700 miles, and twenty-four of latitude, or nearly the same distance. Nor was he content, like the modern tourist, with liasty glimpses of the countries which he visited. At all the more interesting sites he took up his abode for a time ; he examined, he inquired, lle made measurements, he accumulated materials. Having in his mind the scheme of his great work, he gave ample time to the elaboration of all its parts, and took care to obtain by personal observation a full knowledge of all the various countries which were to form the scene of his narrative. The travels of Herodotus seem to have been chiefly accomplished between his twentieth and his thirty-seventh year (464-447 B.c.). It was probably in his early manhood that asa Persian subject he visited Susa and Babylon, taking advantage of the Persian system of posts which he describes in his fifth book. His residence in Egypt must, on the other hand, have been subsequent to 460 B.c., since he saw the skulls of the Persians slain by Inarus in that year. Skulls are rarely visible on a battlefield for more than two or three seasons after the fight, and we may therefore presume that it was during the reign of Inarus (460-454 B.c.), when the Athenians had great authority in Egypt, that he visited the country, making himself known as a learned Greek, and therefore receiving favour and attention on the part of the Egyptians, who were so much beholden to his countrymen. On his return from Egypt, as he proceeded along the Syrian shore, he seems to have landed at Tyre, and from thence to have gone to Thasos, which lay off the coast of Thrace. His Scythian travels are thought to have taken place prior to 450 B.c. It is a question of some interest from what centre or centres these various expeditions were made. Up to the time of the execution of Panyasis, which is placed by chronologists in or about the year 457 B.c., there is every reason to believe that Halicarnassus was the historian's home; and thus we may assume that, for some seven or eight years, that city was the point from which he started and to which he returned. His travels in Asia Minor, in European Greece, and among the islands of the AXgean probably belong to this period, as does also his journey to Susa and Babylon. We are told that when he quitted Halicarnassus on account of the tyranny of Lygdamis, in or about the year 457 B.c., he took up his abode in Samos. That island was an important member of the Athenian con- federacy, and in making it his home Herodotus would have

induced him to proceed, in 457 or 456 B.c., to that country. The complete knowledge that he has of the whole of Egypt indicates a stay there of some years, and it was perhaps not till 454 B.c. that he returned to his Samian home. The stories that he had heard in Egypt of Sesostris may then have stimulated him to make voyages from Samos to Colchis, Scythia, and Thrace. When he had seen these countries, he had made acquaintance with almost all the regions which were to be the scene of his projected history, and could apply himself to the task of its composition with the comfortable feeling that he possessed all the local know- ledge requisite for graphic and telling description.

After Herodotus had resided for some seven or eight years in Samos, events occurred in his native city which induced him to return thither. The tyranny of Lygdamis had gone on from bad to worse, and at last the citizens rose in rebellion against him, and he was expelled. According to Suidas, Herodotus was himself an actor, and indeed the chief actor, in the enterprise ; but no other author confirms this statement, which is intrinsically improbable. It is certain, however, that a revolt broke out, that Lygdamis was dethroned, and that Halicarnassus became a voluntary member of the Athenian confederacy, to which it continued thenceforth attached. Herodotus would now naturally return to his native city, and enter upon the enjoyment of those rights of free citizenship on which every Greek set a high value. He would also, if he had by this time com- posed his history, or any considerable portion of it, begin to make it known by recitation among his friends and acquaintance. 'There is reason to believe that these first attempts to push himself into notice were not received with much favour,—the prophet did not obtain honour in his own country,—his countrymen ridiculed the work which they lad been expected to admire; and the disappointed author, chagrined at his failure, precipitately withdrew from his native town, and sought a refuge in Greece proper (about 447 B.c.).

A writer of late date (125-200 a.p.) and low credit, Lucian of Samosata, in one of his rhetorical pieces, declares that on quitting Halicarnassus Herodotus proceeded straight to Olympia, and finding the quadriennial festival in pro- gress recited his work to the assembled multitudes, who were highly delighted with it, and freely expressed their admiration. The statement, however, is improbable, and is rejected by most critics, who point

out with reason the unsuitability of the work for recitation before an assemblage of persons from all parts of Greece, and call attention to the suspicious circumstance that the story is first told 600 years after the time of its supposed occurrence. From earlier and better writers we learn that Athens was the place to which the disappointed author betook himself, and that he appealed from the verdict of his countrymen to Athenian taste and judgment. By recitations held in that city he made his work known to the best Grecian intellects, and won such approval that in the year 445 B.c., on the proposition of a certain Anytus, he was voted a sum of ten talents (£2400) by decree of the people. At one of the recitations Thucydides was present with his father, Olorus, and was so moved that he burst into tears, whereupon Herodotus remarked to the father—'" Olorus, your son has a natural enthusiasm for letters."

Athens was at this time the centre of intellectual life, and could boast a galaxy of talent such as has rarely been gathered together either before or since. The stately Pericles, his clever rival Thucydides the son of Melesias, the fascinating Aspasia, the eloquent Antiphon, the scientific musician Damon, the divine Phidias, Protagoras the subtle disputant, Zeno the inventor of logic, the jovial yet bitter

Cratinus, the gay Crates, Euripides the master of pathos, Sophocles the most classic even of the ancients, formed a combination of which even Athens might be proud, and which must have charmed the literary aspirant. Accepted into this brilliant society, on familiar terms with all pro- bably, as he certainly was with Olorus, Thucydides, and Sophocles, he cannot but have found his Attic sojourn delightful, and have been tempted, like many another foreigner, to make Athens his permanent home. It is to his credit that he did not yield to this temptation. At Athens he must have been a dilettante, an idler, without political rights or duties, a mere literary man. As such he would have soon ceased to be respected in a society where literature was not recognized as a separate profession, where.a Socrates served in the infantry, and a Sophocles commanded fleets, and a Thucydides was general of an army, and an Antiphon was for a time at the head of the state. Men were not men according to Greek notions unless they were

citizens; and Herodotus, aware of this, probably sharing in the feeling, was anxious, having lost his political status at Halicarnassus, to obtain such status elsewhere. At Athens the franchise, jealously guarded at this period, was not to be attained without great expense and difficulty. Accordingly, in the year 444 3B.c., on the scheme of sending a colony to Thurii in Italy being broached by Pericles, Herodotus was among those who gave in their names ; and in the spring of the following year he sailed from Athens to Italy with the other colonists, and became a citizen of the new town.

From this point of his career, when he had reached tbe age of forty, we lose sight of Herodotus almost wholly. He seems to have made but few journeys, one to Crotona, one to Metapontum, and one to Athens (about 430 B.c.) being all that his work indicates. No doubt he was employed mainly, as Pliny testifies, in retouching and elaborating his general history. He may also have composed at Thurii that special work on the history of Assyria to which he twice refers in his first book, and which is quoted by Aristotle. It has been supposed by many that he lived to a great age, and argued that "the never-to-be-mistaken fundamental tone of his performance is the quiet talkative- ness of a highly cultivated, tolerant, intelligent, old man" (Dahlmann). But the indications derived from the later touches added to his work, which form the sole evidence on the subject, would rather lead to the conclusion that his life was not very prolonged. There is nothing in the nine books which may not have been written as early as 430 B.C.; there is no touch which, even probably, points to a later date than 424 B.c. As the author was evidently engaged in polishing up his work to the last, and even promises touches which he does not give, we may assume that he did not much outlive the date last mentioned, or in other words, that he died at about the age of sixty. The predominant voice of antiquity tells us that he died at Thurii, where his tomb was shown in later ages.

In estimating the great work of Herodotus, and his genius as its author, it is above all things necessary to con- ceive aright what that work was intended to be. It has been called "a universal history," "a history of the wars between the Greeks and the barbarians," and "a history of the struggle between Greece and Persia." But these titles are all of them too comprehensive. Herodotus, who omits wholly the histories of Phcenicia, Carthage, and Etruria, three of the most important among the states

existing in his day, cannot have intended to compose a "universal history," the very idea of which belongs to a later age. He speaks in places as if his object was to record the wars between the Greeks and the barbarians ; but as he omits the Trojan war, in which he fully believes, the expedition of the Teucrians and Mysians against Thrace

and Thessaly, the wars connected with the Ionian coloniza- tion of Asia Minor, and others, it is evident that he does not really aim at embracing in his narrative all the wars between Greeks and barbarians with which he was acquainted. Nor does it even seem to have been his object to give an account of the entire struggle between Greece and Persia. That struggle was not terminated by the battle of Mycale and the capture of Sestos in 479 n.c. It continued for thirty years longer, to the peace of Callias. The fact that Herodotus ends his history where he does shows distinctly that his intention was, not to give an account of the entire long contest between the two countries, but to write the listory of a particular war—the great Persian war of invasion. His aim was as definite as that of Thucydides, or Schiller, or Napier, or any other writer who has made his subject a particular war; only he deter- mined to treat it in a certain way. Every partial history requires an "introduction ;" Herodotus, untrammelled by examples, resolved to give his history a magnificent intro- duction. Thucydides is content with a single introductory book, forming little more than one-eighth of his work ; Herodotus has six such books, forming two-thirds of the entire composition.

By this arrangement he is enabled to treat his subject in the grand way, which is so characteristic of him. Making it his main object in his "introduction" to set before his readers the previous history of the two nations who were the actors in the great war, he is able in tracing their history to bring into his narrative some account of almost all the nations of the known world, and has room to expatiate freely upon their geography, antiquities, manners and customs, and the like, thus giving his work the " uni- versal" character which has been detected in it, and secur- ing for it, without trenching upon unity, that variety, rich- ness, and fulness which are a principal charm of the best histories, and of none more than his. In tracing the growth of Persia from a petty subject kingdom to a vast dominant empire, he has occasion to set out the histories of Lydia, Media,

Assyria, Babylon, Egypt, Scythia, Thrace, and to describe the countries aud the peoples inhabiting them, their natural productions, climate, geographical position, monuments, &c.; while, in noting the contemporaneous changes in Greece, he is led to tell of the various migrations of the Greek race, their colonies, commerce, progress in the arts, revolutions, internal struggles, wars with one another, legislation, religious tenets, and the like. The greatest variety of episodical matter is thus introduced ; but the propriety of the occasion and the mode of introduction are such that no complaint can be made—the episodes never entangle, encumber, or even unpleasantly interrupt the main narrative.

The most important quality of a historian is trustwortlu- ness; fora professed history is of no value unless we can place reliance upon its truth. It has been questioned, both in ancient and in modern times, whether the history of Herodotus possesses this essential requisite. Several ancient writers call his veracity in question, accusing him of the crime of conscious and intentional untruthfulness. Moderns generally acquit him of this charge; but his severer critics still urge that, from the inherent defects of his character, his credulity, his love of effect, and his loose and inaccurate habits of thought, he was unfitted for tlhe historian's office, aud has produced a work of but small his- torical value. It is impossible, within the limits of an article such as the present, to enter fully upon this contro- versy. Perhaps it may be sufficient to remark that the defects in question certainly exist, and detract to some extent from the authority of the work, more especially of those parts of it which deal with remoter periods, and were taken by Herodotus on trust from lis informants, but that

they only slightly affect the portions which treat of later times and form the special subject of his history. In con- firmation of this view, it may be noted that the authority of Herodotus for the circumstances of the great Persian war, and for all local and other details which come under his immediate notice, is accepted by even the most sceptical of modern historians, and forms the basis of their narratives.

Among the merits of Herodotus as an historian, the most prominent are the diligence with which he has collected the materials for his history, the

candour and impartiality with which he has placed his facts before the reader, the political dispassiouateness which he displays in the judg- ments that he passes upon party leaders, the absence of undue national vanity, and the breadth of his conception of the historian's office, which makes his work a storehouse of diversified knowledge for which the student of antiquity can never be sufficiently grateful. On the other hand, he has no claim to rank asa critical historian ; he has no con- ception of the philosophy of history, no insight into the real causes that underlie political changes, no power of penetrat- ing below the surface, or even of grasping the real intercon- nexion of the events which he describes, He belongs dis- tinctly to the romantic school; his forte is vivid and picturesque description, the lively presentation to the reader of scenes and actions, characters and states of society, not the subtle analysis of motives, or tle power of detecting the undercurrents which sway events, or the generalizing faculty which draws lessons from history and makes the past illumine the darkness of the future.

But it is as a writer that the merits of Herodotus are most conspicuous and most unquestioned. "O that I were ina condition," says Lucian, "to resemble Herodotus, if only in some measure! I by no means say in all his gifts, but only in some single point ; as, for instance, the beauty of his language, or its harmony, or the natural and peculiar grace of the Ionic dialect, or his fulness of thought, or by whatever name those thousand beauties are called which to the despair of his imitator are united in him." Cicero calls his style "copious and polished;" Quintilian, "sweet, pure, and flowing ;" Longinus says he was " the most Homeric of historians ;" Dionysius, his countryman, prefers him to Thucydides, and regards him as combining in an extra- ordinary degree the excellencies of sublimity, beauty, and the true historical method of composition. Moderns are almost equally complimentary. '"'The style of Herodotus," says one, "is universally allowed to be remarkable for its harmony and sweetness." " The charm of his style," argues another, 'has so dazzled men as to make them blind to his defects." Various attempts have been made to analyse the nature of the charm which is so universally felt ; but it may be doubted whether any of them are very successful, whether the aroma of the flower does not evaporate in the critic's alembic. All, however, seem to agree that among the qualities for which the style of Herodotus is to be admired are

simplicity, freshness, naturalness, and harmony – of rhythm. Master of a form of language peculiarly sweet and euphonical, and possessed of a delicate ear which instinctively suggested the most musical arrangement possible, he gives his sentences, without art or effort, the most agreeable flow, is never abrupt, never too diffuse, much less prolix or wearisome, and being himself simple, fresh, naif (if we may use the word), honest, and somewhat quaint, he delights us by combining with this melody of sound simple, clear, and fresh thoughts, perspicuously expressed, often accompanied by happy turns of phrase, and always manifestly the spontaneous growth of his own fresh and unsophisticated mind. Reminding us in some respects of the quaint medizval writers, J"roissart and Philippe de Comines, he greatly excels them, at once in the beauty of his language and the art with which he has com-

bined his heterogeneous materials into a single perfect harmonious whole.

As might have been expected from its excellence, the history of Herodotus has been translated by many persons and into many languages. About 1450, at the time of the revival of learning, a Latin version was made and published by Laurentius Valla. This was revised in 1537 by Heusbach, and accompanies the Greck text of Herodotus in many editions. The first complete translation into a modern language was the English one of Littlebury, published in 1737. This was followed in 1786 by the French translation of Larcher, a valuable work, accompanied by copious notes and essays. Beloe, the second English translator, based his work on that of Larcher. His first edition, in 1791, was confessedly very defec- tive ; the second, in 1806, still left much to be desired. A good German translation, but without note or comment, was brought out by Friedrich Lange at Berlin in 1811. Andrea Mustoxidi, a native of Corfu, published an Italian version in 1820. In 1822 Auguste Miot endeavoured to improve on Larcher; and in 1828-32 Dr Adolf Scholl brought out a German translation with copious notcs (new ed., 1855), which has to some extent superseded the work of Lange. About the same time a new English version was made by Mr Isaac Taylor (London, 1829). Finally, in 1858-60, the history of Herodotus was translated by Canon Rawlinson, assisted in the copious notes and

appendices accompanying the work by Sir Gardner Wilkinson and Sir Henry Rawlinson. More recently we have translations in German by Bahr (Stuttgart, 1867) and Stein (Oldenburg, 1875); in French by Giguet (1857) and Talbot (1864) ; and in Italian by Ricci (Turin, 1871-76), Grandi (Asti, 1872), and Bertini (Naples, 1871-2). A Swedish translation by F. Carlstadt was published at Stockholm in 1871.

The best recent editions of the Greek text of Herodotus are the following :— Herodoti Historic, ed. Schwcighauser, 5 vols. 8vo, Strasburg, 1816; Werodoti Halicarnassei Historiarum libri IDE ed. Gaisford, Oxford, 1840; Herodotus, with a Commentary, by J. W. Blakesley, B.D., 2 vols. 8vo, London, 1854; Herodoti Muse, ed. Bihr, 4 vols. 8vo, Leipsic, 1856-61, 2d ed. ; Herodoti Historie, ed. Abicht, 2 vols. 8vo, Leipsic, 1869 ; and Herodoti Historie, ed. H. Stein, 2 vols., 1869-71. Among works of value illustrative of Herodotus may be mentioned Bouhier, Re- cherehcs sur Hérodote, Dijon, 1746; Rennell, Geography of Hero- dotus, London, 1800; Niebuhr, Geography of Herodotus and Seythia, Eng. trans., Oxford, 1880; Dahlmann, Herodot, aus seinem Buche sein Leben, Altona, 1823; Eltz, Quastiones Herodotec, Leipsic, 1841; Kenrick, Egypt of Herodotus, London, 1841; Mure, Litcrature of Grecce, vol. iv., London, 1852; Abicht, Uebersicht tiber den Hero- doteischen Dialect (Leipsic, 1869, 3d ed. 1874), and De codicum Herodoti fide ac auctoritate (Naumlurg, 1869); Melander, De anacoluthis Herodotcis (Lund, 1869); Matzat, " Ueber die Glaub- enswirdigkeit der geograpli. Angaben Herodots iiber Asien," in Hermes, vi. ; Biidinger, Zur cgyptischen Forschung Herodots (Vienna, 1873, reprinted from the Sitzwngsber. of the Vienna Acad.) ; Merzdorf, Qucestiones grammatice de dialecto Herodotca (Leipsic, 1875) ; A. Kirchhoff, Ueber die Entstehungszeit des Hero- dotischen Geschichtswerk (Berlin, 1878) ; and Adolf Bauer, Herodots Biographie (Vienna, 1878). For notices of current literature see Bursian's Jahresbericht. Students of the original may also consult with advantage the lexicons of Amilius Portus (Oxford, 1817) and of Schweighauscr (London, 1824). (G. R.)

HEROLD, Louis Josep Ferpinanp (1791-1833), French musician, was born in Paris, January 28, 1791, the son of Francois Joseph Hérold, an accomplished pianist, who, however, did not at first wish his son to adopt the musical profession. It was indeed not till after his father's death that

Hérold in 1806 entered the Paris conservatoire, where he studied under Catel and Méhul, one of the leading composers of the time, by whose teaching his pupil profited soon and permanently. In 1812 he gained the grand prix de Rome (a travelling scholarship awarded by the French Government to the best pupils of the conservatoire), and accordingly started for Italy, where he remained till 1815, and composed a symphony, a cantata, and several pieces of chamber music. It was also during his stay in Italy that Hérold for the first time ventured on the stage with the opera La Gioventa di Enrico V., first performed at Naples in 1815 with moderate success. Returning to Paris he had the good fortune to be invited by Boieldieu to participate in the com- position of an opera called Charles de France, performed in 1816, and soon followed by Hérold's first French opera, Les Rosiéres (1817), which was received very favourably. Of the numerous dramatic works which Hérold produced for

the next fifteen years in rapid succession it is unnecessary to give a detailed account. Only the names of some of the more important may be mentioned here :—-La Clochette (1817), L'Auteur mort et vivant (1820), Marie (1826), and the ballets Za Fille mal Gardée (1828) and La Belle au bors dormant (1829). Heérold also wrote a vast quantity of piano- forte music of a more or less ephemeral kind, in spite of his time being much occupied by his duties as accompanist at the Italian opera in Paris. In 1831 he produced one of the two works which have given immortality to his name, the romantic opera Zampa, which has met with immense success not only in France but also in Germany, where it has kept the stage till the present day, and is considered Hérold's masterpiece. In France that eminence is justly accorded to the Le Pré aux Cleres (first performance December 15, 1832), in every way a representative work of the French school, in which French esprit and French chivalry find their most perfect embodiment. Grace, liveliness, and true dramatic spirit are Hérold's best qualities, and secure him a promi- nent place amongst the composers of opéra comique, in the more refined sense which has been lost by most composers of modern France. Hérold died January 19, 1833, of the lung disease from which he had suffered for many years, and the effects of which he accelerated by incessant work.

HERON, or Huo, a mathematician and natural philo- sopher of Alexandria, was the pupil of Ctesibius, and flourished probably about a century or a century and a half before Christ. His name has been preserved in the well-known experiment of Hero's fountain, in which, by means of condensed air, water is made to spring from a jet in a continuous stream. Several of Heron's writings are entirely lost, and of those that remain some have never been printed. His most valuable work is that on Pneu- matics, in which are given his experiments on the elasticity of the air and of steam. His Mechanics and Barulcus treat of the subjects which would now be comprised in an elementary book on dynamics. At the end of his Cata-peltica or Belopoietica, which are probably the same, occurs Heron's solution of the ancient and much discussed problem to find two mean proportionals between two given straight lines. Chetrobalistra, Cambestria, Camarica, Automata, are the titles of some of his other physical works. His mathematical works (see Hultsch's Heronis Alexandrini Geometricorum et Stereometricorum Reliquice, Berlin, 1864) are very fragmentary, and it is difficult to determine whether several of them are not to be attributed to later and anonymous writers. Heron seems to have been the first to show how the area of a triangle may be found from its three sides. See two papers by Vincent and Boncom- pagni in Bullettino di bibliogr. e da storia delle screnze matem. ¢ fisiche, iv.

HERON, called the younger, to distinguish him from his namesake of Alexandria, was, like him, a mathematician and natural philosopher. By some he is supposed to have flourished in the first half of the 7th century a.D.; by others, with more probability, to have lived at Constanti- nople in the 10th century. He wrote a treatise on Besieg- ing Engines which still exists, and another on the Construc- tion of Sun-dials, which is now lost. Some mathematical writings assigned to him should perhaps be referred to Heron the elder (see Mémoires Présentés a l Académie des Inscriptions, 1®® série, tome iv., Paris, 1854).

HERON—French, Héron; Italian, Aghirone, Azrone ; Latin, Ardea; Greek, éowSiés; Anglo-Saxon, Hragra ; Ice- landic, Hegre ; Swedish, Hager; Danish, Hewe ; German, Heiger, Rether, Heergans; Dutch, Reiger—a long-necked, long-winged, and long-legged bird, the representative of a very natural group, the Ardede, which through the neglect or ignorance of

ornithologists has been for many years encumbered by a considerable number of alien forms,

belonging truly to the Cranes, Grud (see vol. vi. p. 546), and Storks, Cicenitde, whose structure and characteristics are wholly distinct, however much external resemblance some of them may possess to the Herons. Eliminating these intruders, it is difficult or even impossible to estimate with any accuracy the number of species of Ardeide which exist. Professor Schlegel in 1863 enumerated 61, besides 5 of what he terms " conspecies," as contained in the col- lection at Leyden (Mus. des Pays Bas, Ardez, 64 pp.),— on the other hand, G. R. Gray in 1871 (Hand-list, &c., iii. pp. 26-34) admitted above 90, while Dr Reichenow (Journ. fiir Ornithologie, 1877, pp. 232-275) recognizes 67 as known, besides 15 "subspecies" and 3 varieties, arranging them in 3 genera, Wycticorax, Botawrus, and Ardea, with 17 subgenera. But it is difficult to separate the Family, with any satisfactory result, into genera, if structural characters have to be found for these groups, for in many cases they run almost insensibly into each other— though in common language it is easy to speak of Herons, Egrets, Bitterns, Night-Herons, and Boatbills. With the exception of the last, Professor Schlegel retains all in the

aera ee Fia. 1.—Heron.

genus Ardea, dividing it into eight sections, the names of which may perhaps be Englished—Great Herons, Small Herons, Egrets, Semi-egrets, Rail-like Herons, Little Bitterns, Bitterns, and Night-Herons. It may be expe- dient here to adopt this arrangement, though the present writer would guard himself against being supposed to give it more than partial and provisional assent.

The common Heron of Europe, Ardea cinerea of Linneus, is universally allowed to be the type of the family, and it may also be regarded as that of Professor Schlegel's first section. The species inhabits suitable localities throughout the whole of Europe, Africa, and Asia, reaching Japan, many of the islands of the Indian Archipelago, and even Australia. Though by no means so numerous as formerly in Britain, it is still sufficiently common to render a deserip- tion of it almost unnecessary,! and there must be few

persons who have not seen it rising slowly from some river- side or marshy flat, or passing overhead in_its lofty and

UTTERWOR SHE HEATE

*1 In many parts of England it is generally called a '¢ Hernser "— being a corruption of '¢Heronsewe," which, as Professor Skeat states (Etymol. Dictionary, p. 264), is a perfectly distinct word from " Heronshaw," commonly confounded with it. The further corrup- tion of *' Hernser" into' " handsaw," as in the well-known proverb, was easy in the mouth of men to whom hawking the Heronsewe was unfamiliar.*

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HERON 761

leisurely flight on its way to or from its daily haunts; while they are many who have been entertained by watch- ing it as it sought its food, consisting chiefly of fishes (especially eels and flounders) and amphibians—though young birds and small mammals come not amiss—wading midleg in the shallows, swimming occasionally when out of its depth, or standing motionless to strike its prey with its formidable and sure beak. When sufficiently numerous the Heron breeds in societies, known as Heronries, which of old time were protected both by law and custom in nearly all European countries, on account of the sport their tenants afforded to the falconer. Of late years, partly owing to the withdrawal of the protection they had enjoyed, and still more, it would seem, from agricultural improvement, which, by draining meres, fens, and marshes, has abolished the feeding-places of a great population of Herons, many of the larger Heronries have broken up—the birds composing them dispersing to neighbouring localities and forming smaller settlements, most of which are hardly to be dignified by the name of Heronry, though commonly accounted such. Thus the number of so-called Heronries in the United Kingdom, and especially in England and Wales, has become far greater than formerly, but no one can doubt that the number of Herons has dwindled. Mr Harting, after being at great pains to collect statistics on the subject, gave, in 1872 (Zoologist, ss. pp. 3261-3272 ; with additions and corrections, pp. 3404-3407), a list of those existing in the three kingdoms, more than 200 in number, of which a little

over one-half are in England and Wales, more than 50 in Scotland, and nearly 50 in Ireland. The sites chosen by the Heron for its nest vary greatly. It is generally built in the top of a lofty tree, but not unfrequently (and this seems to have been much more usual in former days) near or on the ground among rough vegetation, on an island in a lake, or again on a rocky cliff of the coast. It commonly consists of a huge mass of sticks, often the accumulation of years, lined with twigs, and in it are laid from four to six sea-green eggs. The young are clothed in soft flax-coloured down, and remain in the nest for a con- siderable time, therein differing remarkably from the "pipers" of the Crane, which are able to run almost as soon as they are hatched. The first feathers assumed by young Herons in a general way resemble those of the adult, but the fine leaden-grey back, the pure white breast, the black throat-streaks, and especially the long pendent plumes, which characterize only the very old birds, and are most beautiful in the cocks, are subsequently acquired. The Heron measures about 3 feet from the bill to the tail, and the expanse of its wings is sometimes not less than 6 feet, yet it weighs only between 3 and 4 ib.

Large as is the common Heron of Europe, it is exceeded in size by the Great Blue Heron of America, Ardea herodias, which generally resembles it in appearance and habits, and both are smaller than the 4. sumatrana or A. typhon of India and the Malay Archipelago, while the A. goliath, of wide distribution in Africa and Asia, is the largest of all. The Purple Heron, A. purpurea, as a well- known European species having a great range over the Old World, also deserves mention here. Of the species included in Professor Schlegel's second section, little need now be said. They inhabit the tropical parts of Africa, Austral- asia, and America. The Egrets, forming his third group, require more notice, distinguished as they are by their pure white plumage, and, when in breeding-dress, by the beautiful dorsal tufts of decomposed feathers that ordinarily droop over the tail, and are so highly esteemed as ornaments by Oriental magnates. The largest species is A. occidentalis, only known apparently from Florida and Cuba; but one not much less, the Great Egret, A. alba, belongs to the Old World, breeding regularly in south-eastern Europe,

and occasionally straying to Britain. A third, A. egretta, represents it in America, while much the same may be said of two smaller species, A.

garzetta, the Little Egret of English authors, and A. candidissima; and a sixth, A. intermedia, is common in India, China, and J apan, besides occurring in Australia. The group of Semi-egrets, con- taining some nine or ten forms, among which the Buff- backed Heron, A. bubuleus, is the only species that is known to have occurred in Europe, is hardly to be distin- guished from the last section except by their plumage being at certain seasons varied in some species with slaty-blue and in others with rufous. The Rail-like Herons form Professor Schlegel's next section, but it can scarcely be satisfactorily differentiated, and the epithet is misleading, for its members have no Rail-like affinities, though the typical species, which inhabits the south of Europe, and occasionally finds its way to England, has long been known as A. ralloides.1 Nearly all these birds are tropical or sub-tropical. Then there is the somewhat better defined group

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Fie. 2.—Bittern. of Little Bitterns, containing about a dozen species—the smallest of the whole family. One of them, A. minuta, though very local in its distribution, is a native of the greater part of Europe, and has bred in England. It has a close counterpart in the A. exilis of North America, and is represented by three or four forms in other parts of the world, the A. pusilla of Australia especially differing very slightly from it. Ranged by Professor Schlegel with these birds, which are all remarkable for their skulking habits, but more resembling the true Herons in their nature, are the common Green Bittern of America, A. virescens, and its very near ally the African A. atricapilla, from which last it is almost impossible to distinguish the A. javanica, of wide range throughout Asia and its islands, while other species, less closely related, occur elsewhere as A. flavicollis, —one form of which, A. gouldi, inhabits Australia.

The true Bitterns, forming the genus Botaurus of most authors, seem to be fairly separable, but more perhaps on account of their wholly nocturnal habits and correspond- ingly adapted plumage than on strictly structural grounds, though some differences of proportion are observable. The

1 It is the " Squacco-Heron'"' of modern British authors—the dis-

tinctive name, given '"'Sguacco" by Willughby and Ray from Aldro-vandus, having been misspelt by Latham. XI. — 96

common Bittern of Europe, B. stellaris, was formerly an abundant bird in many parts of Britain; but, since the reclamation of the bogs and fens it used to inhabit, it is become only au irregular visitant,—though not a winter passes without its appearing in some numbers, when its uncommon aspect, its large size, and beautifully pencilled plumage cause it to be regarded as a great prize by the lucky gun-bearer to whom it falls a victim. Its value as a delicacy for the table, once so highly esteemed, has long vanished. The old fable of this bird inserting its beak into a reed or plunging it into the ground, and so causing the booming sound with which its name will be always associated, is also exploded, and nowadays indeed so few people in Britain have ever heard its loud and awful voice, which seems to be uttered only in the breeding-season, and is therefore unknown in a country where it no longer breeds,! that incredulity as to its booming at all has in some quarters succeeded the old belief in this as in other reputed peculiarities of the species. The Bittern is found from Ireland to Japan, in India, and throughout the whole of

Fie. 3.—Boatbill.

Africa—suitable localities being, of course, understood. Australia and New Zealand have a kindred species, B. peciloptilus, and North America a third, B. mugitans or B. lentiginosus. The former is said to bellow like a bull, but authorities differ as to the vocal powers of the latter,? which has several times wandered to Europe, and is distinguish- able by its smaller size and uniform greyish-brown prima- ries, which want the tawny bars that characterize B. stel- laris. Nine otherspecies of Bitterns from various parts of the world are admitted by Professor Schlegel, but some of them should perhaps be excluded from the genus Botaurus.

Of the Night-Herons the same author recognizes six species, all of which may be reasonably placed in the genus Nycticorax, characterized by a shorter beak and a few other peculiarities, among which the large eyes deserve mention. The first is 1. griseus, a bird widely spread over the Old

World, and not unfrequently visiting England, where it would undoubtedly breed if permitted. Professor Schlegel unites with it the common Night-Heron of America; but

1 The last-recorded instance of the Bittern breeding in England was in 1868, as mentioned by Mr Stevenson (Birds of Norfolk, ii. p. 164). All the true Bitterns, so far as is known, lay eggs of a light olive-brown colour.

2 Richardson, a most accurate observer, positively asserts (Fauna Borealiw Americana, ti. p. 874) that its booming exactly resembles that of its Old-World congener, but American ornithologists seem only to have heard the croaking note it makes when disturbed.

this, though very closely allied, is generally deemed distinct, and is the V. nevius or V. gardens of most writers. A clearly different American species, with a more southern habitat, is the WV. violaceus or NV. cayennensis, while others are found in South America, Australia, some of the Asiatic Islands, and in West Africa. The'Galapagos have a peculiar species, N. pauper, and another, so far as is known, peculiar to Rodriguez, V, megacephalus, existed in that island at the time of its being first colonized, but is now extinct.

The Boatbill, of which only one species is known, seems to be merely a Night-Heron with'an exaggerated bill,—so much widened: as to suggest its English name,—but has always been allowed generic rank. This curious bird, the Cancroma cochlearia of most authors, is a native of tropical America, and what is known of its habits shews that they are essentially those of a Vycticorax.®

Bones of the common Heron and Bittern are not un- common in the peat of the East-Anglian fens. Remains from Sansan and Langy in France have been referred by M. Alphonse Milne-Edwards to Herons under the names of Ardea perplexa and A. formosa; a tibia from the Miocene of Steinheim by Dr Fraas to an A. similis, while Professor Owen recognized a portion of a sternum from the London Clay as most nearly approaching this Family.

It remains to say that the Heronsform part of Professor Huxley's section Pelargomorphe, belonging to his larger group Desmognathe, and to draw

attention to the singular development of the patches of " powder-down" which in the family Ardeide@ attain a magnitude hardly to be found elsewhere. Their use is utterly unknown. (A. N.)

HEROPHILUS. See Anaromy, vol. i. p. 801-2.

HERRERA, Frrnanpo bE (1534-1597), lyrical poet, born at Seville in 1534, Although an ecclesiastic, he addressed his verses to an Andalusian lady, said to have been the countess of Gelves, under different names ; but his love was as Platonic as Petrarch's, and served only to lend additional beauty and tenderness to his poems. Herrera has been celebrated in a sonnet by Cervantes ; and his poems were taken as models by the later poet, Lope de Vega. He died at Sevillein1597. Flourishing at a time when the Castilian language was not yet ripe for the higher lyrical efforts, Herrera endeavoured to remedy the defects of his native tongue by expelling from poetry the more vulgar and trivial words, by introducing words in their place from Greek, Latin, and Italian, and by employing unfamiliar inflexions and inverted constructions so as to approach more nearly the model of the classical tongues. His system, however, was theoretical and artificial, and not inspired by any genuine impulse of taste, so that in many instances where he strives to be elevated and correct, he succeeds only in being affected and formal.

Herrera published his critical views in 1580, in able notes to the works of Garcilaso, whose Italian style he followed in a volume of poems which appeared in 1582. Of these the sonnets are poor, the elegies good, and the sixteen canzones or odes best of all. The finest of these last are perhaps the two on the battle of Lepanto and on the overthrow of Sebastian of Portugal. The Pindaric ode on sleep has been frequently praised. Pacheco, the

ainter, published additional poems of Herrera in 1619; and

ernandez added still more in the fourth and fifth volumes of his Poestas Castellanas, in 1808. The Battle of the Giants, The Rape of Proserpine, The Amadis, and The Loves of Laurino and Corona are among the titles of longer poems of Herrera which are now lost. Of his prose works the chief are the Relacion de la Guerra de Chipre y batalla de Lepanto, 1572 ; and the Vida y muerte de Tomas Moro, 1592, translated from Stapleton's Latin

Lives of the Three Thomases. His History of Spain till the time of Charles V., said by Rioja to have been completed about 1590, has not come down to our time.

3 The very wonderful Shoe-bird (Baleniceps) has been regarded by many authorities as allied to Cancroma, but there can be little doubt that it is more nearly related to the genus Scopus belonging to the Storks. The Sun-Bittern (Zurypyga), by some systematists con- sidered to belong to the Ardeide, would appear to have greater affinity to the Rallide, if it does not form a Family of itself.

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HERRERA, Francisco (1576-1656), surnamed el Viejo (the old), historical and fresco painter, studied under Luis Fernandez in Seville, his native city, where he spent the most of his life. Although so rough and coarse in manners that neither scholar nor child could remain with him, the great talents of Herrera, and the promptitude with which he used them, brought lim abundant commissions. He was also a skilful worker in bronze, an accomplishment that led to his being charged with coining base money. From this accusation, whether true or false, he sought sanctuary in the Jesuit college of San Hermenegildo, which he adorned with a fine picture of its patron saint. Philip IV., on his visit to Seville in 1624, having seen this picture, and learned the position of the artist, pardoned him at once, warning him, however, that such powers as his should not be degraded. In 1650 Herrera removed to Madrid, where he lived in great honour till his death in 1656. Herrera was the first to relinquish the timid manner of the old Spanish school of painting, and to initiate the free, vigorous touch and style which reached such perfection in Velaz- quez, who had been for a short time his pupil. His pictures are marked by an energy of design and freedom of execution quite in keeping with his bold, rough character. He is said to have used very long brushes in his painting ; and it is also said that, when pupils failed, his servant used to dash the colours on the canvas with a broom under his directions, and that he worked them up into his designs before they dried. The drawing in his pictures is correct, and the colouring original and skilfully managed, so that the figures stand out in striking relief. What has been con- sidered his best easel-work, the Last Judgment,

in the church of San Bernardo at Seville, is an original and strik- ing composition, showing in its treatment of the nude how ill-founded the common belief was that Spanish painters, through ignorance of anatomy, understood only the draped figure. Perhaps his best fresco is that on the dome of the church of San Buenaventura; but many of his frescos have perished, some by the effects of the weatlier, and others by the artist's own carelessness in preparing his surfaces. He has, however, preserved several of his own designs in etch- ings. For his easel-works Herrera often chose such humble subjects as fairs, carnivals, ale-houses, and the like.

See Stirling's Annals of the Artists of Spain, 3 vols., 1848.

HERRERA, Francisco (1622-1685), surnamed el Mozo (the young), historical and fresco painter, son of the subject of last notice, was also a native of Seville. Unable to endure his father's cruelty, the younger Herrera, seizing what money he could find, fled to Rome. There, instead of devoting himself to the antiquities and the works of tlie old Italian masters, he gave himself up to the study of architec- ture and perspective, with the view of becoming a fresco- painter. He did not altogether neglect easel-work, but became renowned for his pictures of still-life, flowers, and fruit, and from his skill in painting fish was called by the Italians Zo Spagnuolo degli pesct. In later life he painted portraits with great success. He returned to Seville on hearing of his father's death ; and in 1660 was appointed subdirector of the new academy there under Murillo. His vanity, however, brooked the superiority of no one; and throwing up his appointment he went to Madrid. There he was employed to paint a San Hermenegildo for the barefooted Carmelites, and to decorate in fresco the roof of the choir of San Felipe el Real. The success of this last work procured for him a commission from Philip IV. to paint in fresco the roof of the Atocha church. He chose as his subject for this the Assumption of the Virgin. Soon afterwards he was rewarded with the title of painter to the king, and was appointed superintendent of the royal build- ings. He died at Madrid in 1685, Herrera el Mozo was of a somewhat similar temperament to his father, and

offended many people by his inordinate vanity and suspicious jealousy. His pictures are inferior to the older Herrera's both in design and in execution ;

but in some of them traces of the vigour of his father, who was his first teacher, are visible. He was by no means an unskilful -colourist, and was especially master of the effects of chiaroscuro. As his best picture Sir Edmund Head in his Handbook names his San Francisco, in Seville Cathedral. An elder brother, known as Herrera el Rubio (the ruddy), who died very young, gave great promise as a painter.

See Stirling's Annals of the Artists of Spain, 8 vols., 1848.

HERRERA Y TORDESILLAS, Antonio pg (1549- 1625), Spanish historian, was born in 1549, at Cuellar, in the province of Segovia in Spain. His father, Roderigo de Tordesillas, and his mother, Agnes de Herrera, were both of good family. After studying for some time in his native country, Herrera proceeded to Italy, and there became secretary to Vespasian Gonzago, with whom, on his appoint- ment as viceroy of Navarre, he returned to Spain. Gonzago, sensible of his secretary's abilities, commended him on his death-bed to Philip II. of Spain; and that monarch, no less discerning, appointed Herrera first historiographer of the Indies, and one of the historiographers of Castile. Placed thus in the enjoyment of an ample salary, Herrera devoted the rest of his life to the peaceful pursuit of litera- ture, retaining his offices till the reign of Philip IV., by whom he was appointed secretary of state, very shortly, however, before his death, which took place at Madrid on March 29,1625. Of Herrera's writings, the most valuable is his Historia General de los Hechos de los Castellanos en las Islas y Tierra Firme del Mar Oceano (Madrid, 1601- 15, 4 vols. fol.), a work which relates the history of the Spanish-American colonies from 1492 to 1554. The author's official position gave him access to the state papers and to other authentic sources not attainable by other writers, while he did not scruple to borrow largely from other MSS., especially from that of Las Casas. He used his facilities carefully and judiciously ; and the result is a work on the whole accurate and unprejudiced, and quite indispensable to the student either of the history of the early colonies, or of the institutions and customs of the aboriginal American peoples. Although it is written in the form of annals, mistakes are not wanting, and several glaring anachronisms have been pointed out by Quintana. "If," to quote Dr Robertson, " by attempting to relate the various occurrences in the New World in a strict chronological order, the arrangement of events in his work

had not been rendered so perplexed, disconnected, and obscure that it is an unpleasant task to collect from different parts of his book and piece together the detached shreds of a story, he might justly have been ranked among the most eminent historians of his country."

Herrera's other works are the following :—ZHistoria de lo Sucedido en Escocia é Inglaterra en quarcnta y quatro afios que vivid la reyna Maria Estuarda (Madrid, 1589); Cinco Libros de la Historia de Portugal, y Conquista de las Islas de los Agorcs, 1582 y 15838 (ib., 1591); Historia de lo Sucedido en Francia, 1585-1594 (7b., 1598); Historia Gencral del Mundo del tiempo del Seftior Rey Don Felipe IT., desde 1559 hasta su muerte (ib., 1601-12, 3 vols. fol.); Tratado, Re- lacion, y Discurso historico de los movimientos de Aragon (ib., 1612); Comentarios de los Hechos de los Espafioles, Franceses, y Venecianos en Italia, &c., desde 1281 hasta 1559 (b., 1624, fol.).

HERRICK, Rozsert (1591-1674), English poet, was born in Cheapside, London, and baptized on the 24th of August 1591. He was the seventh child of Nicholas Herrick, goldsmith, of the city of London, who died in 1592, under suspicion of suicide. The children were brought up by their uncle, Sir William Herrick, one of the richest goldsmiths of the day, to whom in 1607 Robert was bound apprentice. In 1613 he proceeded to Cam- bridge ; and it was no doubt between these dates that the young poet was introduced to that circle of wits which he

was afterwards to adorn. He seems to have been present at the first performance of Zhe Alchemist in 1610, and it was probably about this time that Ben Jonson adopted him as his poetical "son." He entered the university as fellow-commoner of St John's College, and he remained there until, in 1616, upon taking his degree, he removed to Trinity Hall; in 1620 he became master of arts. From this date until 1629 we entirely lose sight of him; it has been variously conjectured that he spent these nine years preparing for the ministry at Cambridge, or in much looser pursuits in London. In the latter year his mother died, and, taking orders, he was presented to the rural living of Dean Prior, not far from Totnes in Devonshire. He entered upon this new career on October 2, 1629, being in

his thirty- ninth year. At Dean Prior he resided quietly until 1648, when he was ejected by the Puritans. The solitude there oppressed him at first; the village was dull and remote, and he felt very bitterly that he was cut off from all literary and social associations ; but soon the quiet existence in Devonshire soothed and delighted him. He was pleased with the rural and semi-pagan customs that survived in the village, and in some of his most charming verses he has immortalized the morris-dances, wakes, and quintains, the Christmas mummers and the Twelfth Night revellings, that diversified the quiet of Dean Prior. Herrick never married, but lived at the vicarage surrounded by a happy family of pets, and tended by an excellent old servant named Prudence Baldwin. His first appearance in print was in some verses he contributed to A Description of the King and Queen of Fairies, in 1635. In 1640 a volume of Wit's Recreations contained sixty-two small poems afterwards acknowledged by Herrick in the Hesperides, and one not reprinted until our own day. These partial appearances make it probable that he visited London from time to time. We have few hints of his life as a clergyman. Anthony Wood says that Herrick's sermons were florid and witty, and that he was "beloved by the neighbouring gentry." A very aged woman, one Dorothy King, stated that the poet once threw his sermon at his congregatiou, cursing them for their inattention, The same old woman recollected his favourite pig, which he taught to drink out of a tankard. In 1648 he published his celebrated collection of lyrical poems, entitled Hesperides, or the Works both Human and Divine of Robert Herrick, only a few weeks, it would seem, after his ejection from his living by the Puritans. That he was reduced to great poverty in London has been stated, but Dr Grosart shows this to be veryunlikely. In August 1662 Herrick returned to Dean Prior, supplanting his own supplanter, Dr Jolin Syms. He died in his eighty- fourth year, and was buried at Dean Prior, October 15, 1674. A monument was erected to his memory in the parish church in 1857.

As a pastoral lyrist Herrick stands first among English poets. His genius is limited in scope, and comparatively unambitious, but in its own field it is unrivalled. His tiny poems—and of the thirteen hundred that he has left behind him not one is long—are like jewels of various value, heaped together ina casket. Some are of the purest water, radiant with light and colour, some were originally set in false metal that has tarnished, some

were rude and repul- sive from the first. Out of the unarranged, heterogeneous mass the student has to select what is not worth reading, but, after he has cast aside all the rubbish, he is astonished at the amount of excellent and exquisite work that remains. Herrick has himself summed up, very correctly, the themes of his sylvan muse when he says :—

I sing of brooks, of blossoms, birds and bowers, Of April, May, of June and July flowers,

I sing of May-poles, hock-carts, wassails, wakes, Of bridegrooms, brides, and of their bridal-cakes.

He saw the picturesqueness of English homely life as no one before him had seen it, and he described it in his verse with a certain purple glow of Arcadian romance over it, in tones of immortal vigour and freshness. His love poems are still more beautiful; the best of them have an ardour and tender sweetness which give them a place in the fore- front of modern lyrical poetry, and remind us of what was best in Horace and in the poets of the Greek anthology.

After suffering complete extinction for more than a century, the fame of Herrick was revived by Mr Nichols (Sylvanus Urban), who introduced his poems to the readers of the Gentleman's Magazine of 1796 and 1797. Dr Drake followed in 1798 with considerable enthusiasm. By 1810 interest had so far revived in the forgotten poet that Dr Nott ventured to print a selection from his poems, which attracted the favourable notice of the Quarterly Review. In 1823 the Hesperides and the Noble Numbers were for the first time edited by Mr T. Maitland, afterwards Lord Dundrennan. Other editions followed in 1839, 1844, 1846, 1850, 1852, and 1859. A more complete collection, by Mr W. C. Hazlitt, was brought out in 1869. In 1876 followed Dr Grosart's exhaustive and authori- tative edition in three vols, and in 1877, under the title of Chrysomela, a very elegant selection by Mr F, T. Palgrave, with a prefatory essay. There are therefore few English poets of the 17th century whose writings are now more accessible to every class of readers than those of Herrick.

HERRING (Clupea harengus, Haring in German, Le Hareng in French, Sil in Swedish), a fish belonging to the genus Clupea, of which more than sixty

different species are known in various parts of the globe. The sprat, pilchard or sardine, and shad are species of the same genus. Of all sea-fishes Clupece are the most abundant; for although other genera may comprise a greater variety of species, they are far surpassed by Clupea with regard to the number of individuals. The majority of the species of Clupea are of greater or less utility to man; it is only a few tropical species that acquire, probably from their food, highly poisonous properties, so as to be dangerous to per- sons eating them. But no other species equals the Common Herring in importance as an article of food or commerce. It inhabits in incredible numbers the German Ocean, the northern parts of the Atlantic, and the seas north of Asia. The herring inhabiting the corresponding latitudes of the North Pacific is another species, but most closely allied to that of the eastern hemisphere. Formerly it was the general belief that the herring inhabits the open ocean close to the Arctic Circle, and that it migrates at certain seasons towards the northern coasts of Europe and America. This view has heen proved to be erroneous, and we know now that this fish lives throughout the year in the vicinity of our shores, but at a greater depth, and at a greater distance from the coast, than at the time when it approaches land for the purpose of spawning.

Herrings are readily recognized and distinguished from the other species of Clupea by having an ovate patch of very small teeth on the vomer (that is, the centre of the palate). In the dorsal fin they have from 17 to 20 rays, and in the anal fin from 16 to 18; there are from 53 to 59 scales in the lateral line, and invariably 56 vertebree in the vertebral column. They have a smooth gill-cover, without those radiating ridges of bone which are so conspicuous in the pilchard and other Clupew. The sprat cannot be con-founded with the herring, as it has no teeth on the vomer, and only 47 or 48 scales in the lateral line.

Herrings grow very rapidly ; according to H. A. Meyer's observations, they attain a length of from 17 to 18 mm. during the first month after hatching, 34 to 36 mm. during the second, 45 to 50 mm. during the third, 55 to 61 mm. during the fourth, and 65 to 72 mm. during the fifth. The size which they finally attain and their general condition depend chiefly on the abundance of food (which cousists of crustaceans and other small marine

animals), on the temperature of the water, on the season at which they have been hatched, &c. Their usual size is

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about 12 inches, but in some particularly suitable localities they grow to a length of 15 inches, and instances of speci- mens measuring 17 inches are on record. In the Baltic, where the water is gradually losing its saline constituents, thus becoming less adapted for the development of marine species, the herring continues to exist in large numbers, but as a dwarfed form, not growing either to the size or to the condition of the North-Sea herring. The herring of the American side of the Atlantic is specifically identical with that of Europe. A second species (Clupea leachit) has been supposed to exist on the British coast; but it comprises only individuals of a smaller size, the produce of an early or late spawn. Also the so-called " white-bait " is not a distinct species, but consists chiefly of the fry or the young of herrings, and is obtained "in perfection" at localities where these small fishes find an abundance of food, as in the estuary of the Thames, The important subject of herring-fishing has already been treated in the article FIsHERIES (see vol. ix. pp. 251, 257, &c.).

Several excellent accounts cf the herring have been published, as by Valenciennes in the 20th vol. of the Histoire naturelle des Poissons, and more especially by Mr J. M. Mitchell, The Herring, tts Natural History and National Importance, Edin., 1864. Older treatises are—P. Neucrantz, De Harengo, Liibeck, 1654; J. S. Dodd, Hssay towards a Natural History of the Herring, Lond., 1768; J. Sola, Hssay towards a Natural History of Herrings; Bock, Versuch einer volistindigen Natur- und Handels-Geschichte des Hérings, Kéuigsberg, 1769.

HERRNHUT, a town of Saxony, in the circle and 18 miles south-east of the town of Bautzen, and situated on the Lobau and Zittau Railway, is chiefly known as the principal seat of the Moravian or Bohemian Brotherhood, styled on the Continent Herrnhuter, a colony of whom, fleeing from persecution in their own country, settled at Herrnhut in 1722, on a site presented by Count Zinzendorf. The buildings include houses for the

brethren, the sisters, and the widowed of both sexes. The town is remarkable for its regularity, cleanness, and stillness, Linen, paper (to varieties of which Herrnhut gives its name), tobacco, and various minor articles are manufactured. The Hutberg commands a pleasant view. The population in 1875 was 1128. Berthelsdorf, a village about a mile distant, has been the seat of the directorate of the community since about 1789.

HERSCHEL, Carotine Lucretia (1750-1848), sister of Sir William Herschel, the eighth child and fifth daughter of her parents, was born at Hanover on the 16th March 1750. On account of the prejudices of her mother, who did not desire her to know more than was necessary for

being useful in the family, she received in youth only the

first elements of education. After the death of her father in 1767 she, in order to fit herself to earn her bread, obtained permission to learn millinery and dressmaking, but continued to assist her mother in the management of the household until the autumn of 1772, when she accom- panied to England her brother William, who had established himself as a teacher of musicin Bath. At once she became a valuable co-operator with her brother, both in his profes- sional duties and in the astronomical researches to which he had already begun to devote all his spare time. She was the principal singer at his oratorio concerts, and acquired such a reputation as a vocalist that she was offered an engagement for the Birmingham festival, which, however, she declined. When her brother accepted the office of astronomer-royal, she became his constant assistant in his observations, and also executed the laborious calcula- tions which were connected with them. For these services she in 1787 received from the king a salary of £50 a year. Her chief amusement during her leisure hours was to sweep the heavens with a small Newtonian telescope planted on the lawn. Besides detecting by this means many of the small nebulz included in Sir William Herschel's catalogue,

she succeeded in discovering seven comets, in the discovery of five of which she could lay claim to priority, viz., those of 1786, 1788, 1791, 1793, and 1795. In 1797 she presented to the Royal Society a catalogue of 560 stars taken from Flamsteed's observations, and not included in the British catalogue, together with a collection of errata that should be noticed in the

same volume. Though she returned to Hanover in 1822 she did not abandon her astronomical studies, and in 1828 she completed the reduction, to January 1800, of 2500 nebule discovered by her brother. In 1835 the Astronomical Society, to mark their sense of the benefits conferred on science by such a series of labo- rious exertions, unanimously resolved to present her with their gold medal, and also elected her an honorary member of the society. In 1846 she reseived a gold medal from the king of Prussia. She retained the use of her intellec- tual faculties, and also preserved her interest in science, to the close of a long life. Her death took place on 9th Jan- uary, 1848. Zhe Memoir and Correspondence of Caroline Herschel, by Mrs John Herschel, appeared at London in

1876.

HERSCHEL, Sir Frepertck Wittiam (1738-1822), generally known as Sir William Herschel, one of the most illustrious of astronomers, was born at Hanover, Novem- ber 15,1738. His father was a musician employed as hautboy player in the Hanoverian guards. The family had migrated from Bohemia in the early part of the 17th cen- tury, on account of religious troubles, they themselves being Protestants. Herschel's earlier education was necessarily of a very limited character, chiefly owing to the troubles in which his country at that time was involved ; but, being at all times an indomitable student, he, by his own exertions, more than repaired this deficiency of his youth. He became a very skilful musician, both theoretical and practical ; while his attainments as a self-taught mathematician were fully adequate to the prosecution of those branches of astronomy which, by his labours and his genius, he so eminently advanced and adorned. Whatever he did he did methodically and thoroughly ; and in this methodical thoroughness lay the secret of what Arago very properly terms his astonishing scientific success.

In 1755, at the age of seventeen, he joined the band of the Hanoverian guards, and with his detachment visited England, accompanied by his father and eldest brother ; in the following year he returned to his native country, but two years later, impelled by the troubles that surrounded him, he finally quitted Hanover to seek his fortunes in England. As might have been expected, the earlier part of his career in his adopted country was

attended with formid- able difficulties and much privation. We find him engaged in several towns in the north of England as organist and teacher of music, but these were occupations not attended with any lucrative results. In 1766 the tide of his fortunes began to flow, inasmuch as he obtained the appointment of organist to the Octagon Chapel in Bath, at that time the resort of the wealth and fashion of the city, and of its numerous distinguished visitors.

The next five or six years of his life were spent in estab- lishing his reputation as a musician, and he thereby even- tually became the leading musical authority in the place, and the director of all the chief public musical entertain- ments. His circumstances having thus become easier, he revisited Hanover for the purpose of bringing back with him his sister Caroline, with the view of her rendering him such services as she could in his multifarious undertakings. She arrived in Bath with her brother in August 1772, being at that time in her twenty-third year. She thus describes her brother's life soon after her arrival :—"' He used to retire to bed with a bason of milk or a glass of water, with Smith's Harmonics and Ferguson's

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Astronomy, &c., and so went to sleep buried under his favourite authors; and his first thoughts on waking were how to obtain instruments for viewing those objects himself of which he had been reading." It is not without signi- ficance that we find him thus reading Smith's Harmonics ; to that study loyalty to his profession would impel him ; as a reward for his thoroughness this led him to Smith's Optics ; and this, by a natural sequence, again led him to astromony, for the purposes of which the chief optical instruments were devised. Jt was in this way that he was introduced to the writings of Ferguson and Keill, and subsequently to those of Lalande, whereby he was educating himself for an astronomer and for undying fame. In those days telescopes were very rare, very expensive, and not very efficient, for the Dollonds had not as yet perfected even their beautiful little achromatics of 2? inches aperture. So Herschel was obliged to content himself with hiring a small Gregorian reflector of about 2 inches aperture, which he had seen exposed for loan in a tradesman's shop. Not satisfied with this implement, he procured a small lens of about 18 feet focal length, and set his sister to

work on a pasteboard tube of that length, so as to make him a tele- scope. A tube of this construction naturally bent, and it was useless for all purposes but for the determined eyes of William Herschel. This material was soon displaced for tin, and thus a sorry sort of vision was obtained of Jupiter and Saturn and the moon. He then sought for a reflector of much larger dimensions from artists in London. No such instrument, however, was for sale; and the terms demanded for the construction of a reflecting telescope of 5 or 6 feet focal length he regarded as too exorbitant even for the gratification of such desires as hisown. So he was driven to the only alternative that remained ; he must construct a large telescope for himself. His first step in this direction was to purchase the debris of an amateur's implements for grinding and polishing small mirrors; and thus, by slow degrees, and by indomitable perseverance, he in 1774 had, as he says, the satisfaction of viewing the heavens with a Newtonian telescope of 6 feet focal length constructed by his own hands. But he was not a man to be con- tented with viewing the heavens as a mere star-gazer; on the contrary, he had from the very first conceived the gigantic project and the hope of surveying the entire heavens, and, if possible, of ascertaining the plan of their general structure on a settled and systematic mode of pro- cedure, if only he could but provide himself with adequate instrumental means. With this view he, his brother, and his sister toiled for many years at the grinding and polishing of hundreds of specula, always retaining the best, and re- casting the others, until the best of the previous perfor- mances had been surpassed. 'This was the work of the daylight in those seasons of the year when the fashionable visitors of Bath had quitted the place, and had thus freed the family from professional duties. After 1774 every avail- able hour of the night was devoted to the long-hoped-for scrutiny of the skies. In those days no machinery had been invented for the construction of telescopic mirrors ; the man who had the hardihood to undertake the polishing doomed himself to walk leisurely and uniformly round an upright post for many hours, without removing his hands from the mirror, until his work was done. On these occasions Herschel received his food from the hands of his faithful sister. But his reward was nigh.

In May 1780 his first two papers containing some of the results of his astronomical observations during the last SiX years were communicated to the Royal Society through the influential introduction of Dr Watson.

Herschel had made the acquaintance of this excellent man and skilful physician in a characteristic manner. In order to obtaina sight of the moon the astronomer had taken his telescope

into the street opposite his house; the physician happen- ing to pass at the time, and seeing his eye removed for a moment from the instrument, requested permission to take his place. The mutual courtesies and intelligent con- versation which ensued soon ripened this casual acquaint- ance into a solid and enduring regard.

The subject of this first memoir was the varying lustre of several of the stars, and especially that of Mira in the constellation of Cetus. It had been long known to fade in brightness from nearly that of a star of the first magni- tude down to invisibility in such telescopes as then existed. Herschel had examined it, and many other variable stars, for himself ; it was not, however, a simple or isolated phenomenon that engaged his attention; but, regarding the stars as so many suns, he examined stellar phenomena as possibly leading him to some intelligent conception of what might be occurring in our own sun. The sun, he knew, rotated on its axis, and he knew that dark spots often exist on its photosphere ; the questions that he put to himself were—Are there dark spots also on these variable stars? do the stars also rotate on their axes? or are they sometimes partially eclipsed by the intervention of some opaque and invisible bodies? And then he asked himself— What are these singular spots upon tlie sun? and have they any practical relation to us, the inhabitants of this planet? To these questions he applied his telescopes and his thoughts ; and as light from time to time dawned upon his apprehension, he communicated the results to the Royal Society in no less than six memoirs, occupying very many pages in the Philosophical Transactions, and extending in date from 1780 to 1801. It was in the latter year that these remarkable papers culminated in the inquiry whether any relation could be traced in the recurrence of sun-spots, regarded as evidences of solar activity (allied to volcanic), and the varying seasons of our planet, as exhibited by the varying price of corn? Herschel's solution of the question was scarcely final, and the question has recently cropped up again, with more than a renewal of its former interest.

In the following year (1781) he communicated to the Royal Society the first of a series of papers containing the results of his telescopic inquiries in relation to the rotation of the planets and of their several satellites. The object which he had in view was not so much to ascertain the velocities or times of their rotation, as rather to discover whether those rotations are strictly uniform. From the result he expected to gather, by analogy, the probability of an alteration in the length of ourown day. These inquiries occupy the greater part of seven memoirs extending from 1781 to 1797. In the course of these telescopic observa- tions he lighted on the curious appearance of a white spot near to each of the poles of the planet Mars. On investi- gating the inclination of its axis to the plane of its orbit, and finding that it closely resembled that of our earth, he concluded that its changes of climate also would resemble our own, and that these white patches were probably polar snow. Modern investigations have confirmed his conclusion. He also discovered that, as far as his observations extended, the times of the rotations of the various satellites round their axes are in analogy with our own moon, viz., equal to the times of their revolution round their primaries. Here again we observe that his discoveries arise out of the complete and systematic and comprehensive nature of the investigation in which he is engaged. Nothing with such a man is accidental.

In the same year (1781) Herschel made a discovery which, as we shall see, soon completely altered the character of his professional life. In the course of his systematic examination of the heavens with a view to the discovery of the plan of their construction, he lighted on an object which at first he supposed to be a comet, but which, by its subse-

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quent motions and appearance, turned out to be a new planet, moving outside of the orbit of Saturn. To this planet he in due time assigned the name of Georgium Sidus; but this name has by general consent been laid aside in favour of Uranus. It was discovered with a favourite 7-foot reflector having an aperture of 64 inches ; subsequently, when he had provided himself with a much more powerful telescope, of 20 feet focal length, he discovered what he believed to be no less than six satellites. Modern observations have shorn this gloomy planet of four of these

supposed attendants, but at the same time have added two others apparently not observed by Herschel. No less than seven memoirs on the subject were communicated by him to the Royal Society, extending from the date of the discovery in 1781 to 1815. There isa peculiarity worthy of notice in Herschel's mode of obser- vation which led to the discovery of this planet. He had observed that the spurious diameters of stars are not much affected by increasing the magnifying powers, but that the caseis different with other celestial objects; hence if anything in his telescopic field attracted his notice by peculiarity of appearance, he immediately varied the magnifying power in order to decide the nature of the object. Thus Uranus was discovered ; and had a similar method been applied to Neptune, that planet would have been discovered at Cambridge some months before it was recognized at Berlin.

We now come to the commencement of Herschel's most important series of observations, culminating in what ought probably to be regarded as his most capital discovery. A material part of the task which he had set himself as the work of his astronomical life embraced the determination of the relative distances of the stars from our sun and from each other. Now, in the course of his scrutiny of the heavens, he had observed many stars in apparently very close contiguity, but often greatly differing in their relative brightness. He concluded that, on the average, the brighter star would be the nearer to us, and the smaller enormously more distant. He considered that an astronomer on the earth, in consequence of its immense orbital displacement of some 180 millions of miles every six months, would see such a pair of stars under different perspective aspects; and this variety of perspective aspect observed and measured would, he thought, lead to an approximate determination of their distance. With this view he mapped down the places and aspects of all the double stars that he met with, and communicated in 1782 and 1785 very extensive cata- logues of the results. Indeed, the very last scientific memoir that he ever wrote, sent to the Royal Astronomical Society in the year 1822, at the time when he was its first president and already in the eighty-fourth year of his age, related to these investigations. In the first of these memoirs he throws out the hint that these apparently con- tiguous stars must, if constituted after the material laws of our solar system, circulate round each other through the effects of gravitation ; but he significantly adds that the time had not yet arrived for

settling the question. Thus the philosopher abides his time in patience and confidence, and a dozen years afterwards (1793) he remeasures the relative positions of many of these contiguous pairs, and Wwe may conceive what his feelings must have been at find- ing the verification of his prediction. For he found that some of tliese stars had circulated round each other, after the manner required by the laws of gravitation. Thus Herschel had demonstrated the action of the same mechanical laws among the distant members of the starry firmament which bind together the harmonious motions of our solar system. This sublime discovery would of itself suffice to immortalize his memory in the respectful

homage of all future races of intelligent men. If only '

Herschel had lived long enough to learn the approximate distances of some of these binary combinations, he would at once have been able to calculate their masses when com- pared with that of our own sun; and thus, knowing, as we now do, that these stars in their weights are strictly comparable with the weight of our own sun, he would have found another of his analogical conjectures realized.

In the year 1782, in consequence of his fame, Herschel was invited to Windsor by George III., and then accepted the offer made by the king to become his private astronomer, and henceforth devote himself wholly to a scientific career. The salary offered and accepted was £200 per annum, to which an addition of £50 per annum was subsequently made for the astromonical assistance of his faithful sister. Dr Watson, to whom alone the amount of this salary was mentioned, made the natural remark, " Never before was honour purchased by a monarch at so cheap a rate." In this way the great philosophical astronomer removed from Bath first to Datchet and soon afterwards permanently to Slough, within the easy access of his royal patron at Windsor.

The old pursuits at Bath were soon resumed at Slough, but with renewed vigour and without the old pro- fessional interruptions. The greater part, in fact, of the papers already referred to are dated from Datchet and Slough, for the magnificent astronomical speculations in which he was engaged, though for the most part conceived in the earlier portion of his

philosophical career, required years of patient observation before they could be fully examined and realized.

It was at Slough in 1783 that he wrote his first memor- able paper on the " Motion of the Solar System in Space," —a sublime speculation, yet through his genius realized by considerations of the utmost simplicity. He returned to the same subject with fuller details in 1805. It was also after his removal to Slough that he published his first memoir containing his speculative ideas on the construction of the heavens, which from the first had been the chief aim of his toils both of mind and body. In a long series of remarkable papers, addressed as usual to the Royal Society, and extending from the year 1784 to 1818, when he was eighty years of age, he demonstrated the fact that our sun is a star situated not far from the bifurcation of the Milky Way, and that all the stars visible to us lie more or less in clusters scattered throughout a comparatively thin stratum, but in the other two dimensions stretching immeasurably further into space. At one time he imagined that his powerful instruments had pierced through this stellar stratum of the Milky Way, and that he had approximately determined the form of some of its boundaries. In the last of his memoirs he had convinced himself of his error, and he admitted that to his telescopes our stratum of stars is "fathomless." Over this stratum of stars and their planetary attendants, the whole being in ceaseless motion round some common centre of gravity as the resultant point of the combined gravitation, Herschel discovered on either side a canopy of discrete nebulous masses, from the condensation of at least a part of which the whole stellar universe had been formed,—a magnificent conception, pursued with a force of genius and put to the practical test of observation with an industry almost incredible. It was the work of a single mind, carried to its termination with no assistance beyond that of a loyal sister, almost as remarkable a personage as himself.

Hitherto we have said nothing about that grand reflect- ing telescope, of 40 feet focal length and 4 feet aperture, which is too often regarded as the chief effort of his genius and his perseverance. 'The full description of this cele- brated instrument will be found in the 85th volume of the Transactions of the Royal Society. Gigantic as it really

was, we are disposed to regard it as among the least of his great works. On the day that it was finished (August 28, 1789) Herschel saw at the first view, in a grandeur not witnessed before, the Saturnian system with all its six satellites, five of which had been discovered long before by Huygens or Cassini, while the sixth, latterly named Enceladus, he had, two years before, sighted by glimpses in his exquisite little telescope of 64 inches aperture, but now saw in unmistakable brightness with the towering giant he had just completed. On the 17th of September he discovered a seventh, which proved to be the nearest of all the satellites of Saturn. It has since that time received the name of Mimas. It is somewhat remarkable that, notwithstanding his Jong and repeated scrutinies of this planet, the eighth satellite, Hyperion, and the crape ring should have escaped him.

Herschel married the widow of Mr John Pitt, a wealthy London merchant, on May 8, 1788, by whom he had an only son, John Frederick William. The prince regent conferred a Hanoverian knighthood upon him in 1816. But a far more valued and less tardy distinction was the Copley medal assigned to him by his associates in the Royal Society in 1781.

He died at Slough on August 25, 1822, in the eighty-

fourth year of his age, and was buried under the tower of St Laurence Church, Upton, within a few hundred yards of the old site of the 40-foot telescope. A mural tablet on the wall of the church bears a Latin inscription from the pen of the late Dr Goodall, provost of Eton College. A collected edition of his astronomical memoirs would speak of his genius in unmistakable language; but this has not yet been published. iP.

HERSCHEL, Sir Jonn Freperick Wituiam, Barr. (1792-1871), the illustrious astronomer, the only son of Sir F. William Herschel, was born at Slough, Bucks, in the year 1792. His early home was a singular one, and eminently adapted to nurture into greatness any child born, as he was, with natural gifts capable of wide development. The examples about him were those of silent but ceaseless industry, busied about things which, at the first view, seemed to have no apparent connexion with the world outside the walls of his abode, but which, at a mature period of his life, he, with rare eloquence, taught his countrymen to appreciate as foremost among those in- fluences which satisfy and exalt the nobler instincts of our nature.

His scliolastic education commenced at Eton, but maternal fears or prejudices soon removed him to the house of a private tutor. Thence, at the early age of seventeen, he was sent to St John's College, Cambridge, and the form and method of the mathematical instruction he there received exercised a material influence on the whole com- plexion of his scientific career. In due time the young student acquired the highest academical distinction of his year, graduating as senior wrangler. It was during his undergraduateship that he and two of his fellow-students who subsequently attained to very high eminence in their respective careers of life, Dean Peacuck and Mr Babbage, entered into a sort of moral compact that they would "do their best to leave the world wiser than they found it,"'—a compact loyally and successfully carried out by all three to the end. As a commencement of this laudable attempt we find Herschel associated with these two friends in the production of a work on the differential calculus, and on cognate branches of mathematical science, which changed the whole style and aspect of mathematical learning in England, and brought it up to the level of the Continental methods. Two or three memoirs communicated to the Royal Society on new applications of mathematical analysis at once placed him in the front rank of the cultivators of

this branch of knowledge. Of these his father had the gratification of introducing the first, but the others were presented in his own right as a fellow.

His first intention had been to study for the bar, and with this view he left the university, and placed himself under the guidance of an eminent special pleader of that day. Probably this temporary choice of a profession arose from the extraordinary success which for some time had attended the efforts of so many eminent Cambridge mathe- maticians in legal pursuits. Be that as it may, an early acquaintance with Dr Wollaston in London soon changed the direction of his studies, In 1820, assisted by his father, he completed a mirror of 18 inches diameter and 20 feet focal length, for a reflecting telescope. This, subse- quently improved by his own hands, became the instrument which enabled him to effect the astronomical observations which, more than any other of his great works, form the basis of his fame. In 1821-23 we find him associated with Mr South in the re-examination of his father's double stars, by the aid of am achromatic

telescope and other appliances, the like of which for excellence and power had not hitherto been collected. For this work in 1826 he received the recognition of the Astronomical Society by the award of their gold medal; the French Insti- tute also presented him with the Lalande medal for the same contribution to astronomical science. It ought also to be mentioned that in 1821 the Royal Society had presented him with the Copley medal for his mathematical contributions to their Zransactions. From 1824 to 1827 he held the distinguished and responsible post of secretary to that society. In 1827 he was elected to the chair of the Astronomical Society, which office he also filled on two subsequent occasions. In the course of the discharge of his important offices in the last-named society he ennobled its literature by his memorable presidential addresses and obituary notices of deceased fellows, which, it is not too much to say, are, by their combination of eloquence and wisdom, the chief adornments of their printed memoirs. In 1831 the honour of knighthood was conferred on him by William IV., and two years later he again received the recognition of the Royal Society by the award of one of their medals for his memoir " On the Investigation of the Orbits of Revolving Double Stars." There isa significance in this award ; the father had been the original discoverer of the extension of gravitation to the remotest boundaries of the visible universe, and the son had now put the crown- ing stone to this edifice of discovery by the invention of a graphical method whereby the eye could as it were see the two component stars of the binary system revolving before it, after the regularity of the Newtonian law.

Before the end of the year 1833, being then about forty years of age, Sir John Herschel had re-examined all his father's discoveries of double stars and nebule, and had added many similar bodies to his own list ; this alone con- stituted a gigantic work even for the lifetime of any astro- nomer in that day. For it should be remembered that the astronomer was not as yet provided with those curious and valuable automatic contrivances for observing and for recording observations which at present most materially abridge the labour and increase the accuracy of astronomi- cal work such as that in which Sir John had been engaged. And he had no assistant. Equatorial clocks for turning the telescope, electrical chronographs for recording the times of the phenomena observed, were at that date unknown.

His scientific life now entered another and very char- acteristic phase. The bias of his mind, as he subsequently was wont to declare, was towards chemistry and the pheno- mena of light, rather than towards astronomy. Indeed, very shortly after taking his academical degree at Cam- bridge, he proposed himself as a candidate for the vacant

chair of chemistry in that university ; but, as he said with some humour, the result of the election was that of the votes he had a glorious minority of one. In fact Herschel had become an astronomer from a sense of duty, just as his father liad become one by fascination and fixed resolve ; hence it was by filial loyalty to his father's memory that he was now impelled to undertake the com- pletion of that work which at Slough had been so grandly commenced. William Herschel had explored the northern heavens ; John Herschel determined to explore the heavens of the south, as well as re-explore the north. "TI resolved," he said, "to attempt the completion of a survey of the whole surface of the heavens; and for this purpose to transport into the other hemisphere the same instrument which had been employed in this, so as to give a unity to the results of both portions of the survey, and to render them comparable with each other." In accordance with this resolution, he and his family embarked for the Cape on the 13th November 1833; they arrived in Table Bay on the 15th January 1834 ; and proceedings, he says, " were pushed forward with such effect that on the 22d of Feb- ruary I was enabled to gratify my curiosity by a view of « Crucis, the nebula about 7 Argus, and some other remarkable objects in the 20-foot reflector, and on the night of the 4th of March to commence a regular course of sweeping."

To give an adequate description of the vast mass of labonr com- pleted during the next four busy years of his life at Feldhausen would require the transcription of a considerable portion of the Cape Observations, a volume which probably is not surpassed in varied interest or astronomical importance by any scicntific work in existence ; although it might perhaps be equalled by a judicious sclec- tion from Sir William's " Memoirs," now scattered in some thirty voluines of the Philosophical Transactions. It was

published, at the sole expense of the late duke of Northumberland, but not till

1847, nine years after the author's return to England, for the very cogent reasons assigned by himself:—" The whole of the observa-

paring them for the press, have been executed by myself." There are 164 pages of catalogucs of southern nebule and clusters of stars. There are then careful and elaborate drawings of the southern appearance of the great nebula in Orion, and of the region surround- ing the remarkable star of Argo. The labour and the thought bestowed npon some of these objects are almost incredible ; several months were well spent upon a minute spot in the heavens contain- ing 1216 stars, but which an ordjnary spangle, held at a distance of an arm's length, would eclipse. These catalogucs and charts being completed, he proceeds to, discuss their significance, which in the eyes of scicnce possesses an absorbing interest. He confirms his father's hypothesis that these wonderful masses of glowing vapours are not irregularly scattered, and without apparent law, hither and thither in the visible heavens, but are collected in a sort of canopy, whose vertex is at the pole of that vast stratum of stars in which our solar system finds Its position,—buried in it, as he supposes, at a depth not greatcr than that of the average distance from us of an eleventh magnitude star. Then follows his catalogue of the relative positious and magnitudes of the southern double stars. And he applies to one of them, y Virginis, that beautiful graphical method invented by himself, whereby he determines the orbit of the two components round each other ; and he had the satisfaction of wit- nessing with his own eyes the fulfilment of a prediction he had made some years before, viz., that the two stars would, in the course of their orbital movements, appear to closc up into a single star, in- scparable by any telescopic power. The double stars and their stately revolutions and lustrous colours dismissed, in the next chapter he proceeds to describe the observations which he had made on their varying and relative brightness. It has becn alrcady detailed how his father commenced his scientific carecr by similar observations on the varying magnitudes of many stars, and how his remarks culminated years afterwards in the question whether the variation of the lustre of our sun, by the presence or absence of sun spots, affected our harvests and the price of corn. The son carries his speculations

backwards to a still more philosophical depth. The variation from time to time, he remarks, in the lustre of our sun, to the extcnt of half a magnitude, would account for those strange alternations of a semi-arctic and semi-tropical climate which geo- logical researches have disclosed as having occurred in various regions of our globe.

Herschel returned to his English home in the spring of 1838. As was natural and honourable to all concerned, he was welcomed with an enthusiastic greeting. By the queen

at her coronation he was created a baronet ; and, what to him was better than all such rewards, other men caught the contagion of his example, and laboured in fields similar to his own, with an adequate portion of his success. In particular Mr Lassell transported a telescope as large as the celebrated Herschelian telescope to Malta, where with excellent results he "minded the heavens" for the space of four years. He was rewarded there, and at his own English residence near Liverpool, by the discovery of new satellites of Saturn and of Uranus, constituting what Sir John Herschel, animated by a fraternal sympathy, well called an epoch in astronomy. Mr De La Rue also, at Islington and at Cranford, followed zealously aud successfully in the wake of the same infec- tious enthusiasm.

Herschel was a highly accomplished chemist. His dis- covery of the solvent power of hyposulphite of soda on the otherwise insoluble salts of silver, in 1819, exercised a most iniportant influence on the practical applications of photography twenty years afterwards; and in 1839, the natal era of that valuable art, he, independently of Mr Fox Talbot, had discovered the means of taking and multiplying photographic pictures, and early in the spring of that year exhibited more than twenty photographic pictures to the Royal Society, including one of the old 40-foot telescope. He was the first person to introduce the now well-known terms positive and negative in photographic images, and to deposit upon glass a sensitized film for the reception of the picture. He also paved the way for Professor Stokes's im- portant discovery of the change which luminous waves may suffer in their period of oscillation, by bis addition of the lavender rays to the spectrum,

and by his announcement of "epipolic dispersion," as exhibited by sulphate of quinine. Several other important and successful researches of his,

_ connected with the undulatory theory of light, are scattered tions, as well as the entire work of reducing, arranging, and pre- |

through the pages of his treatise on " Light" published in the Encyclopedia Metropolitana.

To the other varied accomplishments of his gifted mind we must add the graces of a deep poetic feeling. Perhaps no man can become a truly great mathematician or great philosopher, if unendowed with the versatile powers of the imagination. John Herschel possessed this endowment to a large extent ; and he had reserved for himself as a solace and enjoyment in old age the translation of the J/ad into verse. He had at an earlier period of life translated in a similar manner Schiller's Walk. But the main work of his declining years was the collection of all his father's cata- logues, combined with his own observations and those of other astrononiers of nebule and double stars, each into a single volume. He lived to complete the former, and to present it to the Royal Society, who have published it in a separate form in the Philosophical Transactions, The latter work he had not fully completed at his death ; but he bequeathed as much of it as was finished to the Astro- nomical Society. That society has printed a portion of it, which serves as an index to the observations of various astronomers on double stars up to the year 1866,

A complete list of his various contributions to learned societies will be found in the Royal Society's great cata- logue, and from them may be gathered most of the records of his busy scientific life. Sir John Herscliel met with an amount of public recognition which was unusual in the time of his illustrious father. Naturally he was a member of almost every important learned society in both hemi- spheres. For five years he held the office of master of the mint, the same appointment which, more than a century before, had been occupied by Sir Isaac Newton; his friends also offered to propose him as president of the Royal Society and again as a member of parliament for the uni- versity of Cambridge, but neither office was within the scope of his own desires.

In private life Sir John Herschel was a firm and most active friend; he had no jealousies; he avoided all scientific feuds; he gladly accorded a helping hand to those who consulted him in scientific difficulties; he never discouraged, and still less disparaged, men younger than or inferior to himself ; he was pleased when his own work was appre- ciated, but that was never an object of his solicitude: it was said of him by a discriminating critic, and without extravagance, that " his was a life full of the serenity of the sage and the docile innocence of a child."

He died at Collingwood, his residence near Hawkhurst in Kent, May 11, 1871, in the seventy-ninth year of his age, and his remains are interred in Westminster Abbey close to the grave of Sir Isaac Newton.

Sir John Herschel, independently of the labours connected with his Cape Observations, was the author of several books, oue of which at least, On the Study of Natural Philosophy (1830), possesses an interest which no future advances of the subjects on which he wrote can obliterate from the attention of thoughtful men in auy age. In 1849 came the Outlines of Astronomy, of which it is enough to say that, notwithstanding the obvious disadvantage arising from the practice of stereotyping text-books which relate to progressive sciences, there is no more instructive volume extant on the subject of which it treats. His articles, ' Meteorology," " Physical Geography," and " Telescope," contributed to the 8th edition of the Encyclopedia Britannica, were afterwards published separately. There is also another very valuable little book, which originated from a happy peculiarity of Sir John Herschel's dignified simplicity and truthfulness of mind. When he was at the Cape he more than once assisted in the attempts there made to diffuse a love of know- ledge among men not engaged in literary pursuits. In one of his addresses he, with a kindly and far-seeing wisdom, told his audience that the advance of a nation's intelligence or a nation's fame did not depend upon a few successful philosophers toiling in their lonely studies, and gathering great reputations for their learning or their discoveries, but that a nation's progress rather lay in the diffusion of their _eainie among the masses of the population. Acting

ractically on this prineiple, he, on his return to England, pub- ished, in Good Words and elsewhere, a serics of papers on interest- ing points of natural philosophy, which have since been collected in a volume called Familiar Lectures on Scientific Subjects. None but a deep thinking philosopher could have written this book ; none but a clear thinking master of his subjects could have made it what it is, enticingly intelligible. Another volume of his, not so widely known to the public as any of the above works, is his Col- lected Addresses, in which he is seen in his happiest and most in- structive mood, walking, as it were, at liberty among sympathizing associates, in his own fields, and enamoured of their beauties, (C. P.)

HERSENT, Louis (1777-1860), French painter, was one of David's most distinguished pupils, and became one of the most noted painters of the Restoration. He was born at Paris on 10th March 1777, and obtained the Prix de Rome in 1797; in the Salon of 1802 appeared his Metamorphosis of Narcissus, and he continued to exhibit with rare interruptions up to 1831. His most considerable works under the empire were Achilles parting from Briseis, and Atala dying in the arms of Chactas (both engraved in Landon's Annales du Musée); an Incident of the life of Fénelon, painted in 1810, found a place at Malmaison, and Passage of the Bridge at Landshut, which belongs to the same date, is now at Versailles. Hersent's typical works, however, belong to the period of the Restoration ; Louis XVI. relieving the Afflicted (Versailles) and Daphnis and Chloe (engraved by Langier and by Gelée) were both in the Salon of 1817 ; at that of 1819 the Abdication of Gustavus Vasa brought to Hersent a medal of honour, but the picture, purchased by the duke of Orleans, was destroyed at the Palais Royal in 1848, and the engraving by Henriquel-Dupont is now its sole record. Ruth, produced in 1822, became the property of Louis XVIII, who from the moment that Hersent rallied to the Restoration zealously patronized him, made him officer of the legion of honour, and pressed his claims at the Institute, where he replaced Van Spaendonck. He continued in favour under Charles X., for whom was executed Monks of Mount St Gotthard, exhibited in 1824. In 1831 Hersent made his

last appearance at the Salon with portraits of Louis Philippe, Marie-Amélie, and the duke of Montpensier; that of the king, though good, is not equal to the portrait of Spontini (Berlin), which is probably Hersent's chef-@euvre. After this date Hersent ceased to exhibit at the yearly salons. Although in 1846 he sent an excellent likeness of Delphine Gay and one or two other works to the rooms of the Société d'Artistes, he could not be tempted from his usual reserve even by the international contest of 1855. Five years later, on 2d October 1860, he died. His work shows every artistic merit which can be attained by steadily directed intelligence and labour; his skilful arrangement, delicacy of line, and certainty in execution are points which have excited the admiration even of those who find him wanting in feeling, in interest, and in sense of colour. Louis XVI. relieving the Afflicted, the treatment of which indicates the approach of the realistic movement, is less theatrical than Daphnis and Chloe, which combines, in the true spirit of the Restoration, drawing-room graces with a pseudo-classic style; but both show the same dryness and hardness of manner which Hersent had acquired under the influence of the first empire, and from which he never was able to free himself.

HERSFELD, a town of Prussia, capital of a circle in the government district of Cassel, province of Hesse-Nassau, is pleasantly situated at the confluence of the Geisa and Haune with the Fulda, on the railway from Frankfort to Bebra, 10 miles N.N.E. of Fulda. The greater part of its old fortifications remain, but the ramparts and ditches have been laid out as promenades. The principal buildings are the ancient town-house; the parish church, completed in 1320, in the Gothic style, with a fine tower and a large bell; the ruins of the collegiate church in the Byzantine style, erected in the beginning of the 12th century on the site of the cathedral, but burnt down by the French daring the Seven Years' War; and outside the town the ancient monastery with its surrounding grounds. Among the public institu-_ tions are a gymnasium, a higher town school, an orphanage, and a district infirmary. The town has important manu- factures of cloth and leather, as well as dye-works, worsted mills, and soap-boiling works. The population in 1875 was 6929,

Hersfeld owes its origin to a Benedictine abbey which, founded by Lullus, archbishop of Mainz, about 760, was richly endowed by Charlemagne, and

became in the 12th century an ecclesiastical priucipality. In 1870 the town came under the protection of Hesse, and in 1525 it gave in its formal allegiance to it. The abbey was secularized in 1648, but Hersfeld remained the capital of a princi- pality until 1828.

HERSTAL, or in its older form HeErisTat, a market- town of Belgium, on the left bank of the Meuse, 3 or 4 miles north-east of Liége, and skirting the road which leads from that city to Maestricht. Its population, which in 1876 numbered 11,126, is mainly supported by its coal mines and iron industries. Herstal probably derives its name from being a "Heerstelle" or permanent camp of the Franks. It is well known as the birthplace and family seat of Pippin, the major-domo of the Austrasian kingdom, some few traces of whose castle are still pointed out above the town. And though it cannot maintain its claim to be the birthplace also of Charlemagne, it was undoubtedly a frequent place of residence for this greatest of the Carolin- gians ; and in 870 it gave its name to the treaty by which Charles the Bald and Lewis the German decided the parti- tion of Lotharingia. The lordship of Herstal passed to the house of Nassau in 1444; and in 1702, on the death of William III. of England, its possession was disputed between the house of Orange and the king of Prussia. The decision of the courts was given in 1714 in favour of Prussia ; but the new possessors, finding the feelings of the people of Herstal against them, sold the lordship to Liége

Plate XV.

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for 140,000 thalers. Another Herstal, distinguished as. the Saxon, was the place where Charlemagne had his winter quarters in the year 797. It is now the village of Herstelle on the Weser, in the government of Minden.

HERTFORD, County or, HERTFORDSHIRE, or HERTS, an inland county in the south-east of England, is situated between 51° 36' and 52° 5' N. lat. and 0° 13' E, and 0° 45' W. long. It is bounded on the N. by Cambridgeshire, N.W. by Bedfordshire, E. by Essex, 8. by Middlesex, and S.W. by Buckinghamshire. The area comprises 391,141 acres or 611 square miles.

The aspect of the county is pleasant and picturesque, its surface being broken by gentle undulations which in some parts form a quick succession of hills and valleys. The highest summit is Kensworth Hill on the border of Bedfordshire, about 910 feet above sea-level. Fine oak and other trees are grown in the hedges, and from being pruned obliquely they form high walls of living timber shading narrow winding lanes. The arable and pasture lands of the farms are intermingled with the parks and ornamental woods of the country seats which are scattered thickly throughout the county. These features, varied by its winding rivers, impart to it a peculiar beauty, while in luxuriance it is not surpassed by any county in England.

The principal rivers are the Lea, which, rising some miles beyoud Luton in Bedfordshire and entering Hertfordshire at Hidemill, flows south-east to Hatfield and then east by north to Hertford and Ware, whence it bends southward, and passing along the eastern boundary of the county falls into the Thames a little below London, having received in its course the Maram, the Beane, the Rib, and the Stort, which all flow southward in the north-eastern part of the county, the Stort for some distance forming the boundary between it and Essex; the Colne, which, flowing through the south-western part of tlie county, falls into the Thames at Brentford, having received in its course the Ver, the Bulborne, and the Gade; the Ivel, which, rising in the north-west of the county, soon passes into Bedfordshire. The New River, one of the water supplies of London, made by Sir Hugh Myddelton (1607-13), has its source in some springs near Ware, and runs parallel for many miles with the Lea. The Grand Junction Canal from London to Bir- mingham traverses the south-west corner of the county, passing by Watford and Berkhampstead. There are mineral springs in the parishes of Chipping Barnet, Northaw, and Watton.

Geologically the county consists of Cretaceous and Tertiary rocks, the greater part being Lower, Middle, and Upper Chalk, which in the south-eastern part of the county are covered by Tertiary deposits belonging to the London basin. Over a large part of the eastern side of the county there are superficial deposits of glacial origin, and on the western side there are traces of the Lower Tertiary beds having formerly extended over a much wider area, outliers of the beds being of not unfrequent occurrence, and the drift deposits on the chalk hiils being largely composed of their debris. The

vales traversed by the rivers and streams exhibit in the bottoms a rich sandy loam ; the sloping sides are covered by loams of inferior quality ; and the flat surface of the high ground is generally formed of a loam of reddish hue tending towards common clay, with which it is often confounded.

The climate is mild, dry, and remarkably salubrious. On this account the London physicians were accustomed to recommend the county for persons in weak health, and it was so much coveted by the noble and wealthy as a place of residence, that it was a common saying— He who buys a home in Hertfordshire pays two years' pur- chase for the air."

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According to the agricultural returns for 1879, the total area of arable land was 339,187 acres, of which 145,666 acres were under corn crops, 39,443 under green crops, 38,416 under rotation grasses, 97,548 permanent pasture, and 18,111 fallow. 'The area under woods was 20,714 acres. It will thus be seen that the main produce of Hertfordshire iscorn. The principal crop is wheat, which in 1879 occupied 59,363 acres. The varieties mostly grown are white, and they are not surpassed by those of any county in England. Wheathampstead on the river Lea receives its name from the fine quality of the wheat grown in that district. Of barley, which is largely made use of in the county for malting purposes, there were 49,129 acres in 1879, and of oats only 25,779. Little or no rye is grown, and of pease and beans together there were in 1879 only a little over 11,000 acres. Of green crops, turnips and Swedes occupied in 1879 an area of 21,578 acres, while potatoes had only 2576. Vetches are largely grown for the London stables, extending to 8191 acres in 1879. 'The greater part of the permanent grass is made use of for hay. There are some very rich pastures on the banks of the river Stort, extending from Hertford to Hockeril on the borders of the river Lea, and also ncar Rickmansworth, where they are watered by the river Colne. The percentage of cultivated area in 1879 was 86°7 instead of 85°1 in 1870; of area under corn crops 37°2 instead of 88°5; under green crops 10'1 instead of 11°5 ; under rotation grasses 9°8 instead of 10°2; and of permanent pasture 24°9 instead of 22°0. The most common system of rotation is the five-course—turnips or fallow, barley, clover, wheat, oats. In the south-west part of the county large quantities of cherries and apples are

grown for the London market. On the best soils nearest to London culinary vegetables are forced by the aid of rich manure, and more than one crop are sometimes obtained in a year.

Generally speaking, the quantity of stock kept is small. Not much attention is paid to the breeds of cattle, but among cows the Suffolk variety is the most common. The number of cattle in 1879 was only 31,754, or an average of 9°3 to every 100 acres under cultivation, the average for England being 11°9, and for the United Kingdom 21:0. Of these the number of cows in milk or in calf was 11,802. The number of horses in 1879 was 15,022, or an average of 4:4 to every 100 acres, the average for England being 4°5 and for the United Kingdom 4‘1. The horses used for agricultural purposes are chiefly Suffolk punches. The number of sheep in 1879 was 171,133, or an average of 50°4 to every 100 acres under cultivation, the average for England being 75:8, and for the United Kingdom 68°0. The principal kinds are the Southdown and Wiltshire, and a cross between Cotswolds and Leicesters. Pigs in 1879 numbered 30,404, or an average of 8°9 to every 100 acres under cultivation, the average for England being 72, and that for the United Kingdom 6:7.

In Hertfordshire the number of resident proprietors is very large, which circumstance, as well as the proximity to London, has doubtless greatly aided the development of agricultural enterprise. The average extcut of the farms is about 200 acres, and the modern improvements are everywhere adopted.

According to the return of owners of land for 1872-73, the soil was divided among 12,387 proprietors, holding land the gross annual rental of which was £1,163,192. Of the owners 77 per cent. held less than one acre, and the total annual value for the county was £2, 17s. 34d. per acre. There were only eight proprietors who held upwards of 4000 acres, viz., Marquis of Salisbury, Hatfield, 18,389; Abel Smith, Watton, 10,212; Earl Cowper, Panshanger, 10,122; Earl of Verulam, Gorhambury, St Albans, 8625; Earl Brownlow, Ashridge Park, 8551; Lord Dacre, The Hoo, Welwyn, 7100; Charles C. Hale, King’s Walden, 6558; and Earl of Essex, Cashiobury Park, Watford, 6157. W. R. Baker, Bayfordbury, comes next with 3911 acres.

The staple trade of the county is in corn and malt, most of which is sent to the metropolis. There are numerous flour-mills, as well as brewerics, tanneries, tile-works, and coach factories, but the principal manufactures are paper, silk, and straw plait. ;

Hertfordshire is so much intersected by railways that no place in any part of the county is more than 5 miles distant from a station. On the eastern border there is the Great Eastern, with branclies to Hertford and Buntingford. The middle of the county is traversed by the Great Northern, with branches from Hatfield to Hertford, Luton, Dunstable, and St Albans, and from Hitchin to Royston, and thence to Cambridge. The Midland passes through St Albans, with branches to the Great Northern and London and North- Western. The London and North-Western traverses the south-western corner. ao

The county comprises 8 hundreds, and the municipal boroughs of Hertford and St Albans. The principal towns are the municipal and parliamentary borough of Hertford (municipal borough, 7169), the city of St Albans (8298), Hitchin (7630), Watford (7 aN Bishop Stortford (6250), Hemel-Hempstead (5996), Ware (4917), Berkhampstead (4083), Tring (4045), Barnet (3720). For parlia- mentary representation the county is an undivided constituency, and returns three members, while one member is returned for the borough of Hertford. Hertfordshire is in the south-eastern circuit. There were formerly two courts of quarter sessions, one for the

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county aud one for the liberty of St Albans, whieh liberty had also a separate commission of the peace, but the-county and the liberty are now amalgamated, though prisoners are tried both at Hertford and St Albans. The jail for the county is at the latter city. The county is divided into fifteen petty sessional divisions, and for some purposes into two divisions, those of Hertford and the liberty of St Albans. The boroughs of Hertford and St Albans have com- missions of the peace. LEcclesiastically the county is in the diocese of St Albans, and contains 188 civil parishes, townships, or places, as well as parts of other parishes extending into adjoining counties. The total population in 1871 was 192,226, of whom 93,244 were males and

98,982 females. The population in 1861 was 173,280. Since the first census in 1801 it has increased by 94,883, or 97 per cent.

History and Antiquities.—Previous to the Roman invasion the Celtic inhabitants of Hertfordshire, as of the other parts of South Britain, had been subdued by the Belge. In 54B.c. Cassivelaunus, the chief of the Cassii, led an army to oppose Cesar, but he was de- feated, and his eapital Verulam, near the present town of St Albans, taken. At Verulam and Berkhampstead traces of ancient British works may yet be seen; and it has been conjectured that British stations existed at Royston, Braughing, and various other places in the county. Numerous British coins have been found at Verulam. Three principal British roads or trackways crossed the county: Watling Street passed through its south-west corner, iu a north- west direction by St Albans to Dunstable ; Ermine Street entered the south-east corner at Little Hookgate, whence it proceeded by Gough's Oak and Broxbourne Bury to Ware, holding thence much the same course as the present road by Buntingford to Royston ; Ieknield Street, from Dunstable to Royston, crossed the north-west corner. There are numerous barrows at Royston, and along the range of chalk hills at the northern edge of the eounty. Hertfordshire was the scene of an important part of the struggle carried on against the Romans by Caractacus about 44 A.p. ; and during the rebellion of Boadicea the Romans were defeated on the road from Verulam to Colchester, and Verulam itself was taken and devastated by the Britons. The shire was included within the Roman province of Flavia. Among the Roman stations within its limits were the capital Verulamiwm, which the Romans rebuilt and fortified ; Forum Diane, not far from Dunstable; Ad Fines, supposed to have been near Braughing, where there are remains of a vallum with fosse; and pro- bably others at Royston and Bishop Stortford. Watling Street and Ermine Street were causewayed as Roman roads, and other branch roads traversed the county in various directions. Roman antiquities have been found at Verulam, Braughing, Royston, Wilbury Hill (where there are remains of an ancient camp), Cheshunt, Hemel-Hempstead, and Bishop Stortford. After the conquest of England by the Anglo-Saxons, Hertfordshire was included partly in Mercia and partly in Essex. It was the scene of frequent contests between the Saxons and the Danes. In 896 the Danes, having an- chored their vessels in the Lea near the town of Ware, laid siege to Hertford, whereupon Alfred the

Great, by dividiug the stream into three channels, stranded their vessels and compelled them to retreat to the Severn. After the battle of Senlac in 1066, William the Conqueror, in order to force the earls to hurry home from London to their earldoms, crossed the Thames at Wallingford and marched into Hertfordshire, where at Berkhanipstead an attenipt was made by the abbot of St Albans to stop his course by cutting down the trees ; and at a meeting of nobles held at the town hé took an oath to rule according to the ancient laws and customs of the country. The subsequent events of historic importance connected with the couuty are the capture of Hertford castle by the revolted barons under the French dauphin, December 6, 1216; the battle between the royalists and the armies of the White Rose at St Albans, May 22, 1455, in which Henry VI. was wounded and taken prisoner; a second battle near St Albans, 17th February 1461, in which'the earl of Warwick was defeated by Queen Margaret; the defeat near Barnet of the earl of Warwick by Edward IV., 14th April 1471; and the arrest by Cromwell of the high sheriff of the county as he was proceeding to St Albans for the purpose of proclaiming by order of Charles I. that all the Parliamentary commanders were rebels and traitors.

Among the objects of antiquarian interest may be mentioned the cave of Royston, rediscovered in 1742, doubtless at one time used as a hermitage, and containing rude carvings of the crucifixion and other sacred subjects ; Waltham cross, in the Pointed style of architecture, (restored in 1838), erected to mark the spot where rested the body of Eleanor, Queen of Edward I., on its way to Westminster for inter- ment ; and the Great Bed of Ware referred to in Shakespeare's Twelfth Night, for many years shown to visitors at the Crown Inn of that town, and in September 1864 put up to auction at the Saracen's Head for 100 guineas andbought in. The principal monastic buildings are the noble pile of St Albans abbey, founded about 793 in honour of the first Christian martyr of Great Britain ; the remains of Sopwell Benedictine nunnery near St Albans, founded in 1140; the remains of the priory of Ware, dedicated to St Francis, and originally a cell to the monastery of St Ebrulf at Utica in Normandy ;

'and in some monastic charters.

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and the remains of the priory at Hitchin built by Edward II. for the White Carmelites. Among the more interesting churches may be mentioned those of Abbots Langley and Hemel-Hempstead, both of Late Norman architecture ; Baldock, a handsome Gothic build- ing supposed to have been erected by the Knights Templars in the reign of Stephen; Royston, formerly eonnected with the priory of the canons regular ; Hitchin, built in the 15th century on the site of an older structure, with a fine porch in the Perpendicular style and an altarpiece by Rubens; Hatfield, dating from the 13th century; Berkhampstead, chiefly in the Perpendicular style, with a tower of the 16th century. The ruins of secular buildings of importance are the massive remains of Berkhampstead castle, Hertford castle, Hatfield palace, the slight traces at Bishop Stortford, and the earthworks at Anstie. Of the numerous mansions of interest only a few can be mentioned :—the Rye House, erected in the reign of Henry VI., tenanted by Rumbold, one of the principal agents in the plot to assassinate Charles II. ; Moor Park, Rickmansworth, at one time the property of St Albans abbey, granted by Henry VII. to John de Vere, earl of Oxford, for some time in the possession of Cardinal Wolsey and subsequently of the duke of Monmouth, who built the present mansion, which, how- ever, after it was sold by the duchess of Monmouth to Mr Styles, was cased with Portland stone, and received various other additions at a cost of £150,000 ; Knebworth, the seat of the Lyttons, originally a

- Norman fortress, rebuilt in the time of Elizabeth in the Tudor

style, and restored in the present century ; Hatfield House, the nianor of which was granted to the abbey of St Ethelred at Ely by King Edgar, and with the palace was made over to Henry VIII., from whose reign it remained a royal residence until the time of James I., who exchanged it for the palace of Theobalds with Sir Robert Cecil, afterwards earl of Salisbury, by whom the present mansion in the Elizabethan style was erected, being founded in 1611; Panshanger House, now the principal seat of the Cowpers, a splendid mansion in the Gothic style erected at the beginning of the present century ; Cashiobury House, the seat of the earls of Essex, supposed to derive its name from the old British tribe Cassii, and the manor of which was formerly held by the abbot of St Albans, rebuilt in the beginning of the present century from designs by Wyatt, some- what resembling those of

Windsor Castle; Gorhambury House, formerly the scat of the Bacons, and the residence of the great chancellor, but rebuilt by the Grimstons. Among the eminent persons connected with the county were Nicholas Brakespcare (Pope Adrian IV.), Francis Bacon, Sir John Mandeville, William Cowper, Charles Lamb, and Lord Lytton.

The old historics of Hertfordshire by Cox, Salmon, and Chauncey have been superseded by the splendid work of Clutterbuck, 3 vols. folio, 1815-27, and the laborious compilation now in course of publication by John Edwin Cussans,

HERTFORD, a town of England, capital of the above county, is situated in a sheltered valley on the river Lea, and on the Great Northern and Great Eastern Railways, 26 miles north of London by rail. It is somewhat irregularly built, but is neat, clean, and well-paved. The principal buildings are the shire-house or town-hall, erected on the site of the former edifice, and finished in 1771; the corn exchange, erected in 1858; the church of All Saints recently restored, a cruciform structure of the 14th century, with a square tower surmounted by a spire ; the new church of St Andrews, occupying the site of the old one; the brick edifice which occupies the site of the ancient castle, and includes some portions of the old building; and the in- firmary. The county jail has lately been sold under the provisions of the new Prisons Act. There are a large num- ber of educational institutions, including the preparatory school for Christ's Hospital, London; Hale's grammar school for boys, the Cowper Testimonial school for boys, the Abel Smith Memorial school for girls, and the Green Coat school for boys and girls of poor parents who have never received alms. The town depends for its prosperity chiefly on agriculture. The trade is principally in. wheat and wool, and a large quantity of malt is made for the London breweries. There are also breweries, iron foundries, and flour and oil mills. The population of the municipal borough in 1871 was 7169, and of the parliamentary borough 7894. The area of the municipal borough is 864 acres, and of the parliamentary borough 1123 acres.

The name Hertford is identified by Bede with Herudford, meaning red ford, but more probably it is a corruption of Hereford, meaning army ford, and indeed it is spelt in this way by Saxon authorities

In 678 a council was convened at Hertford by Theodore, Archbishop of Canterbury, at which two

Saxon kings attended. The castle was erected about 905 by Edward the Elder, who at the samc time rebuilt the town, which had in all probability been devastated by the Danes. Its custody and the government of the town were given by William the Conqueror to Peter dc Valoignes. Subsequently it was surrendered to the crown. In the reign of John it was captured by the revolted barons headed by the dauphin of France. By Edward III. the castle was made the occasional prison of John II. king of France and David king of Scotland. Hertford is recorded asa borough in Domesday. It received its first charter from Queen Mary in 1554, and this was renewed and modified by Elizabeth, and confirmed and extended by James J. and Charles II. The borough sent two members to parliament from the reign of Edward I. to the 50th of Edward III., when the privilege was suspended until the reign of James I. Since the Reform Act of 1867 it has returned only one member.

HERTZ, Henrik (1798-1870), Danish poet, was born of Jewish parents in Copenhagen, August 25,1798. At that date it was unusual for Jews to enjoy a professional education, but young Hertz showed such marked literary bias that in 1817 he was sent to the university. His father having died in his infancy, and the family property having been destroyed in the bombardment of 1807, the boy was brought up by his relative, M. L. Nathanson, for many years editor of the principal Danish newspaper. Young Hertz was destined for the law, and passed his juridical examination in 1825. But his taste was all for polite literature, and in 1827 he came forward as a dramatic author by the publication of two plays, Mlerr Burchardt and his Family and Love and Policy; the latter enjoyed considerable success on the stage. In 1828 followed the comedy of &lyttedagen, which occupied itself with the humours of moving house on quarter-day. In 1830 he brought out what was a complete novelty in Danish litera- ture, a drama in rhymed verse, Amor's Strokes of Genius. In the same year Hertz published anonymously Gyenganger- brevene, or Letters froin a Ghost, which he pretended were written by Baggesen, who had died in 1826, and which were full of satirical humour and fine critical insight. The success of this book was

overwhelming ; Copenhagen talked of nothing else for a whole season; but Hertz preserved his anonymity, and the secret was not known until many years later. In 1832 he published a didactic poem, Vature and Art, and Four Poetical Epistles. A Day on the Island of Als was his next comedy, followed in 1835 by The Only fault. Hertz passed through Germany and Switzerland into Italy in 1833 ; he spent the winter there, and returned the following autumn through France to Denmark. In 1836 his comedy of The Savings Bank enjoyed a great success. But it was not till 1837 that he developed his most important talent by writing the romantic drama of Svend Dyring's Mouse, a beautiful and original piece, which still holds the stage. His historical tragedy Valdemar Atterdag was not so well received in 1839; but in 1845 lie achieved an immense success with his lyrical drama King Renés Daughter, which has been translated into almost every European language, and successfully acted all over the civilized world. To this succeeded the tragedy of Ninon in 1848, the romantic comedy of Zonzetta in 1849, A Sacrifice in 1853, The Youngest in 1854. His lyrical poems appeared in successive collections, dated 1832, 1840, and 1844. From 1858 to 1859 he edited a very interest- ing literary journal entitled Weekly Leaves. He died in 1870. Hertz is one of the first of Danish lyrical poets. His poems are full of colour and passion, his versification has more witchcraft in it than any other poet's of his age, and his style is grace itself. He has all the sensuous fire of Keats without his proclivity to the antique. As a romantic dramatist lie is scarcely less original. He has bequeathed tothe Danish theatre, in Svend Dyring's House and King Renés Daughter, two pieces which have survived the vicissitudes of forty years, and which are as popular as ever. He is a troubadour by instinct; he has little or

nothing of Scandinavian local colouring, and succeeds best when he is describing the scenery or the emotions of the glowing south.

HERTZEN, Atexanper (1812-1870), was born at Moscow in 1812, a very short time before the occupation of that city by the French. His father, Ivan Yakovlef, after a personal interview with Napoleon, was allowed to leave, when the invaders arrived, as the bearer of a letter from the French to the Russian emperor. His family attended him to the Russian lines. Then the mother of the infant Alexander (a young German Protestant of Jewish extraction from Stuttgart, according to A. von Wurzbach), only seventeen

years old, and quite unable to speak Russian, was forced to seek shelter for some time in a peasant's hut. A year later the family returned to Moscow, where Hertzen passed his youth,—remaining there, after completing his studies at the university, till 1834, when he was arrested and tried on a charge of having assisted, with some other youths, at a festival during which verses by Sokolovsky, of a nature uncomplimentary to the emperor, were sung. The special commission appointed to try the youthful culprits found him guilty, and in 1835 he was banished to Viatka. There he remained till the visit to that city of the hereditary grand-duke (afterwards Alexander II.), accompanied by the poet Joukofsky, led to his being allowed to quit Viatka for Vladimir, where he was appointed editor of the official gazette of that city. In 1840 he obtained a post in the ministry of the interior at St Petersburg; but in conse- quence of having spoken too frankly about a death due to a police officer's violence, he was sent to Novgorod, where he led an official life, with the title of " state councillor," till 1842. In 1846 his father died, leaving him by his will a very large property. Early in 1847 he left Russia, never toreturn. From Italy, on hearing of the revolution of 1848, he hastened to Paris, whence he afterwards went to Switzerland. In 1852 he quitted Geneva for London, where he settled for some years. In 1864 he returned to Geneva, and after some time went to Paris, where lie died, January 21, 1870.

His literary career began in 1842 witb the publication of an essay, in Russian, on Ddlettantism in Science, under the pseudonym of "Iskander," the Turkish form of his Christian name,—convicts, even when pardoned, not being allowed in those days to publish under their own names. His second work, also in Russian, was his Letters on the Study of Nature (1845-6). In 1847 appeared his novel Kio Vinovat ? (Whose Fault'), and about the same time were published in Russian periodicals the stories whicli were afterwards collected and printed in London in 1854, under the title of Prervannuie Razskazui (Interrupted Tales). In 1850 two works appeared, translated from the Russian manuscript, Vom anderen Ufer (From another Shore) and Lettres de France et d'Italie. In French appeared also his essay Du Développement des idées révolutionnarres en Russie, and his memoirs, which, after being printed in Russian, were translated under the title of Le Monde russe et la Révolution (3 vols. 1860-62), and were in part trans- lated into English as M/y Exile to Siberia (2 vols., 1855). From a literary

point of view his most important work is Kto Vinovat ? a story describing how the domestic happi- ness of a young tutor, who marries the unacknowledged daughter of a Russian sensualist of the old type, dull, ignorant, and genial, is troubled by a Russian sensualist of the new school, intelligent, accomplished, and callous, with- out there being any possibility of saying who is most to be blamed for the tragic termination. But it was as a political writer that Hertzen gained the vast reputation which he at one time enjoyed. Having founded in London his " Free Russian Press," of the fortunes of which, during ten years, lie gave an interesting account in a book published (in Rus-

sian) in 1863, he issued from ita great number of Russian works, all levelled against the system of government pre- vailing in Russia. Some of these were essays, such as his Baptized Property, an attack on serfdom; others were periodical publications, the Polyarnaya Zvyezda (or Polar Star), the Kolokol (or Bell), and the Golosa tz Hossi (or Voices from Russia). The Kolokol soon obtained an immense circulation, and exercised an extraordinary influence. For three years, it is true, the founders of the "Free Press" went on printing, "not only without selling a single copy, but scarcely being able to get a single copy introduced into Russia ;" so that when at last a bookseller bought ten shillings' worth of Baptized Property, the half sovereign was set aside by the surprised editors in a special place of honour. But the death of the emperor Nicholas in 1855 produced an entire change. Hertzen's writings, and the journals he edited, were smuggled wholesale into Russia, and their words resounded throughout that country, as well as all over Europe. Their influence became overwhelming. Evil deeds long hidden, evil-doers who had long prospered, were suddenly dragged into light and disgrace. His bold and vigorous language aptly expressed the thoughts which had long been secretly stirring Russian minds, and were now beginning to find a timid utterance at home. For some years his influence in Russia was a living force, the circula- tion of his writings was a vocation zealously pursued. Stories tell how on one occasion a merchant, who had bought several cases of sardines at Nijni-Novgorod, found that they contained forbidden print instead of fish, and at another time a supposititious copy of the Kolokol was printed for the emperor's

special use, in which a telling attack upon a leading statesman, which had appeared in the genuine number, was omitted. At length the sweeping changes introduced by Alexander II. greatly diminished the need for and appreciation of Hertzen's assistance in the work of reform. The freedom he had demanded for the serfs was granted, the law-courts he had so long denounced were remodelled, trial by jury was established, liberty was to a great extent conceded to the press. It became clear that Hertzen's occupation was gone. Whenthe Polish insurrec- tion of 1863 broke out, and he pleaded the insurgents' cause, his reputation in Russia received its death-blow. From that time it was only with the revolutionary party that he was in full accord, and it is by that section of Russian Liberals alone that his opinions are now considered of authority. For the great reforms, however, which fol- lowed the Crimean War, Russia is much indebted to the outspoken utterances of Alexander Hertzen, and will be so in all probability for the constitutional changes which are likely to follow the repressive measures of 1879.

In 1873 a collection of his works in French was commenced in Paris. A volume of posthumous works, in Russian, was published at Geneva in 1870. His Memoirs supply the principal information about his life, a sketch of which appears also in A. von Wurzbach's Zeitgenossen, pt. 7, Vienna, 1871. See also the Revie des Deux Mondes for July 15 and Sept. 1, 1854. Kto Vinovat has been trans- lated into German under the title of Wer ist Sehuld ? in Wolffsohn's

Russlands Novellendichter, vol. iii. The title of Aly Exile in Siberia is misleading ; he was never in that country. (QV. RS. R..)

HERULI, rvui, or Ervti, a nomadic and warlike German tribe who inhabited the northern shores of the Black Sea, but afterwards divided into various sections and wandered into different parts of Europe. They made their first appearance in history in the 3d century, as taking part with the Goths in their incursions against the eastern pro- vinces of the Roman empire. In the 4th century they acknowledged the overlordship of the Gothic king Ermanric, but when Attila, king of the Huns, made his descent upon Gaul, they joined his standard. After the overthrow of the Huns, in which they suffered considerably, they estab-

of the Danube, and under the leadership of Odoacer, assisted in 476 in the overthrow of the Western empire. Under their king Rudolf they in the beginning of the 6th century attempted the subjugation of the Longobardi, but were defeated and dispersed, some of them proceeding to Scandinavia, and others being allowed by the emperor Anastasius to settle on the south bank of the Danube. In the time of Justinian some of them embraced Christianity. A large portion of them afterwards joined the Gepide in their wars against the Eastern empire; but others who remained afforded Justinian important assistance in his wars against the Vandals and East Goths, so that they frequently fonght against one another. About the end of the 6th century

they became submerged and lost in other nations, and dis-

appeared from historical records. The Heruli were bold, hardy, and extremely pugnacious. For a considerable period they retained intact their strong individuality, and presented a firm resistance to the influences of surrounding civilizations. They put to death without mercy the sick and the aged, and are said even to have offered human sacrifices,

HERVEY, James (1714-1758), a popular religious writer of the 18th century, was born at Hardingstone, near Northampton, on February 26, 1714, and was educated at the grammar school of Northampton, whence in 1731 he passed to Lincoln College, Oxford. At the university he came under the influence of John Wesley and others of that school, and for some time manifested an inclination towards their theology ; ultimately, however, while retaining his regard for the men and his sympathy with their religious aims, he adopted a thoroughly Calvinistic creed, and resolved to retain connexion with the Established Church. Having taken holy orders in 1737, he became curate to his father in the family livings of Weston Favell and Colling- tree, to which he himself succeeded in 1752. There, under the disadvantage of very weak health, he laboured with great diligence in the discharge of his parochial duties, and also wrote numerous religious works, which, though of but slight literary or theological value, rapidly became highly popular, and in many English and Scottish houses, especi- ally of the humbler class, took a place on the same shelf with the Prlgrim's Progress and the Whole Duty of Man. His earliest work, Meditations and

Contemplations, contain- ing " Meditations among the Tombs," " Reflexions on a Flower Garden," and a '" Descant on Creation" (1746), and "Contemplation on the Night and Starry Heavens" (1747), said to have been modelled on Boyle's Occasional Reflexions on various Subjects, within fourteen years passed through as many editions. Theron and Aspasio, or a Series of Letters upon the most important and interesting Subjects, which appeared in 1755, and was equally well received, called forth some adverse criticism even from Calvinists, on account of tendencies which were considered to lead to antinomianism, and was strongly objected to by Wesley in his Preservative against unsettled Notions im Religion. Besides carrying into England the theological disputes to which Fisher's Marrow of Modern Divinity had given rise in Scotland, it also led to what is known as the Sandemanian controversy as to the nature of saving faith. Hervey died on December 25, 1758. A "new and complete" edition of his Works, with a memoir, appeared in 1797. See also Collection of the Letters of James Hervey, to which ws prefixed an account of his Life and Death

1760).

HERVEY, Joun Hervey, Lorp (1696-1743), the "Nar- cissus," "Sporus," and "Lord Fanny" of Pope's satire, a nobleman of political and social distinction in the reign of George II., was son of John first earl of Bristol, and was born on October 13, 1696. Educated and trained for public

lished an organized and distinct confederacy on the banks | lifeat Westminster and Clare Hall, Cambridge, he became a

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favourite at the court of the prince and princess (afterwards George II. and Queen Caroline), to which Pope, Gay, Arbuthnot, Chesterfield, and other wits resorted, and which was celebrated for the beauty and accomplishments of its ladies, such as Miss Bellenden (afterwards duchess of Argyle), Miss Howe, Miss Lepell, and Mrs Howard, whose names "will live for ever in the poetry of Pope, Gay, and Swift, and in the lively memoirs and correspondence of that brilliant circle. Hervey was married to Miss Lepell in 1720. Having entered the House of Commons as member for Bury (1725), he in 1730 received the appointment of vice-chamberlain to the king

; in 1733 Sir Robert Walpole called hin up to the House of Lords, where he proved a frequent and effective speaker ; and in 1740 he succeeded Lord Godolphin as lord privy seal, which office he held until the Walpole administration was driven from power in 1742. Notwithstanding miserable health he continued to take an active part in politics until his death, which occurred on August 8, 1743. He was survived by four sons, three of whom became successively earls of Bristol. Destitute of any commanding talents or solid principle, a sceptic in religion and a profligate in morals, Lord Hervey was yet far above the intellectual rank assigned him by his merciless satirist, Pope. He wrote and spoke vigorously on public questions, was studious and laborious, a fair scholar, and a writer of pleas- ing occasional verses. The origin of the hostility which led to the allusion in the Dunciad (iv. 104) in 1728, and afterwards to the attacks in the Prologue and Epilogue to the Satires, remains obscure. 'It would be now idle," as Mr Croker remarks, "to seek for a cause of quarrel which the parties were, a hundred years ago, unable or unwilling to explain; but may it not be sufficiently accounted for by the jealousies almost inevitable between persons of such similar and therefore discordant tastes and tempers, living together in a circle of tittle-tattle, scandal, and pasquinades?" Political differences had probably something to do with it, Lord Hervey and Lady Mary Wortley Montague (who shared with him the poet's enmity) having at the accession of George II. adhered to Walpole, while Pope and his brother wits were chiefly associated with the opposition. Lord Hervey left be- hind him Jfemoirs of the Reign of George the Second, from his Accession to the Death of Queen Caroline, which were not published until 1848, when they appeared in two volumes, edited, with a biographical notice, by Mr Croker. The work throws much light ou the interior of the court— its coarseness, dulness, and immorality ; but itisas degrad- ing to the author as itis to the English monarchy, for Lord Hervey appears rather in the light of a court parasite and malignant gossip than in that of a fair historian or an English gentleman.

HERZEGOVINA, an Illyrian province, ethnographically belonging to the Serbo-Croatian nationality, under the titular dominion of the Turkish sultan, but since 1878 ad- ministered by Austria-Hungary. The Turks included it in the vilayet of Bosuia. Itis bounded N. and FE, by Bosnia, S. by Montenegro, and W. by Dalmatia, only touching the Adriatic by the narrow

enclaves of Klek and Suttorina. The province extends about 117 miles in a south-east direction between 17° 10’ and 20° 15’ E. long. By the treaty of Berlin the Herzegovinian districts of Niksich and Dormitor have been placed under the government of the prince of Montenegro.

Population.—The Austrians have not yet (1879) had time to complete trustworthy statistics as to the population and resources of the province, and those published in the days of Turkish administration must be received with great reserve. The best statistical accounts of Herzegovina are

those collected for the Austrian Government by the staff- |

officers Majors Roskiewicz and Thoemmel, and their dis- crepancy is the best proof of the difficulties which have hitherto prevented an exact calculation.

According to Roskiewicz the population of Herzegovina amounted in 1868 to 230,000 souls. Thoemmel (in 1867) gives it as 207,970, of whom 101,348 were Pravoslavs or adherents of the Orthodox Greek Church, 56,000 Maho- metans, 49,217 Roman Catholics, 1340 Gipsies, and 65 Jews. Dr Blau (late Prussian consul-general at Seraievo) fixes the Herzegovinian population in 1872 approximately at 230,000, viz., 130,000 of the Orthodox Greek Church, 55,000 Mussulmans, 42,000 Roman Catholics, 2500 Gipsies, and 500 Jews. Klaich, however, the most recent Slavonic authority on the province (1878), reduces the total population to 185,421. During the troubles that ensued on the insurrection of 1875, about two-thirds of the Christian population fled beyond the Dalmatian and Montenegrin border, and the fearful mortality among these refugees has largely diminished the Herzegovinian popula- tion during the last three years.

With the exception of the Gipsies, the Jews, and a small sprinkling of Osmanli officials, the whole population is Slavonic, the Mahometans being for the most part renegade descendants of the feudal nobility that had formed itself here before the Turkish conquest. Much of the old Slavonic customs and family life still holds among the Herzegovinian Mussulmans, and here as in Bosnia poly- gamy is unknown, The Herzegovinians are tall,

broad, and darker, and of greater personal bravery than the Bosnians ; they are brachycephalic. In frame as well as character they approach very nearly to the Montenegrin type, and in the mountain districts they are divided, like the Montenegrins and Albanians, into clans or nahias, whose loyalty is reserved for their own waiwodes or mili- tary chiefs. Their temperament is pre-eminently poetic, in so much that the recent insurrection has already given rise to many epic lays, which are recited to the sound of the guzla or Serbian lyre by the national minstrels. The Serbo- Croatian language is spoken in its purest form in Herzego- vina, and the Narenta valley has been called the Serbian Val d'Arno. The Orthodox Greek population is chiefly settled in the district east of the Narenta; to the west of that river the population is mostly Roman Catholic, and the Mahometans inhabit the larger towns. According to the Schematismus of the Franciscan P. Bakula, the popu- lation of the capital Mostar amounted in 1873 to 29,116, of whom 20,306 were Mahometans, 5008 Greeks, and 2821 Roman Catholics. Of the other towns, Ljubuski has, according to Klaich, a population of about 3000 souls, Stolatz 3500, Focha 10,000, Niksich (now under Mon- tenegro) 4000, and Trebinje 3000.

Natural Features.—Herzegovina, which has been de- scribed as the Turkish Switzerland, is divided into a variety of mountain plateaus by the parallel ranges of the Dinaric Alps; and the whole country is bisected by the river Narenta, which cleaves its way through the mountains from the Bosnian frontier towards the Adriatic. The valley of the Narenta and its tributaries forms the main artery of the province. There is situated the capital Mostar; and a fine highroad, the only avenue of communication between Seraievo (Bosna Serai) and the Adriatic, follows the river bank from the Dalma- tian frontier to the Bosnian. The " polyes" or moun- tain plateaus are the most characteristic feature of the country. The smaller towns and villages group themselves on their level and comparatively fertile surface, and the districts or cantons thus formed are walled round by a natural rampart of white limestone mountains. These "'polyes " may be described as oases in what is otherwise a desert expanse of mountains. The surface of some, as

notably the great Mostarsko Blato, is marshy, and in spring forms a lake; others are watered by streams which dis- appear in swallow-holes of the rock, and make their way by underground channels either to the sea or the Narenta. The most conspicuous example of these is the Trebinstica, which disappears in two swallow-holes in Popovopolje, and after making its way by a subterranean passage through a range of mountains, wells up in the mighty source of Ombla near Ragusa, and hurries in undiminished volume to the Adriatic. The climate of Herzegovina is cold in winter and oppressively hot (maximum 100° Fahr. in shade) in sum- mer. Thé sciroccois a prevalent wind, as well as the bora, the fearful north-north-easter of Illyria, which, sweeping down the lateral valleys of the Dinaric Alps, overwhelms everything in itspath. The snow-fall is slight, and, except on a few of the loftier peaks, the snow soon melts. In the valleys, as that of the Narenta, the flora approaches that of Dalmatia and Southern Italy, and olives, mulberries, figs, melous, pomegranates, grapes, rice, and maize flourish. The Dinaric Alps, which stretch across the province from N.W. to S.E., are asa rule barer and loftier than those of Bosnia. To the west of the Narenta, indeed, their flanks are in places covered with a forest growth of beech and pine, but north-east of that river they present for the most part a scene of lunar desolation. They are of the Tertiary formation common to the Mediterranean geological zone, but their limestone has a more dolomitic character than that of the Bosnian ranges. The group of mountains in the north-west bend of the Narenta, the Krabac, Lipeta, and Porim Planivas, attain altitudes varying from 4000 to 5000 feet; the dolomitic peaks of Orobac, Samotica, and Veliki Cap rise, over 6000; Orien on the Dalmatian-Montenegrin frontier 6300 ; and Mount Dormitor, in the tract of Herzegovina now ceded to Montenegro, reaches a height of 8500 feet. The river Narenta is navigable for small steamers as far as Metkovitch, the Dalmatian fron- tier station, and for trabaccoli as far as Chaplina beyond Gabella, but the narrow and rocky bed of the stream beyond this point makes it doubtful whether the navigation can ever be extended as far as Mostar.

Produce and Industries. —In mineral wealth Herzegovina cannot compete with Bosnia. ignite exists in considerable abundance in the Nareuta valley near Mostar, at Konjica, and at Stolac. Mineral springs occur near Ljubuska; asphalt towards Metkovitch and Drazevo on the Dalmatian

frontier. Rice is cultivated in the Trebisat valley and about Ljubuska. Mulberries are cultivated in the Narenta valley for silk- worms, which were introduced here by the famous vizier Ali Pasha, but the culture is at present small. The wine of Konjica and Mostar resembles Dalmatian, and might be excellent, and the Trebinje tobacco is celebrated. Previous, to the insurrection the chief wealth of the inhabitants con- sisted in cattle. Roskiewicz estimates the numbers as 100,000 horned cattle, 1,200,000 sheep and goats, and 100,000 swine; but there has been a terrible decrease during the three years of anarchy. Before the insurrec- tion the annual value of the exports of the province, consisting principally of sheep's wool, hides, wax, wine, and tobacco, amounted to about 18,170,000 piastres (£163,530). The imports, priucipally cloth and woollen goods, were estimated at 17,500,000. piastres (£157,500).

History.—The old Serbian zupa of Chelm or Zachlumje was in- corporated in the banat of Bosnia by the ban Stephen in 1326. Afterwards exchanged for Primorje with the king of Hungary, it was reannexed by the ban Stephen Tvartko, afterwards first king of Bosnia, who granted it as a fief to his distingnished general Vlatko Hranich. Vlatko's grandson, known as Stephen Cosaccia from his birthplace Cosae, took advantage of the weakness of King Tvartko Ill. of Bosnia to transfer the immediate suzerainty of his county to the emperor Frederick IV., who in 1440 created him duke, or, as his Slavonie subject, borrowing the German word, expressed it, Her- zega, of St Sava. This and the further title of keeper of St Sava's

| lords who had apostatized to Islam.

' office at Vieuna.

HERBeGCOVONA

sepulchre he derived from the tomb of the patron saint of Serbia in his monastery of Milesevo. From this time the Slav population of Illyria begins to know the dominions of Cosaccia as the " Herze- govina" or duchy, a general term which embraced, besides the former county of Chelm, the two old Serbian zupas of Tribunja and Primorje, also governed by the " Herzega." The original Herze- govina thus extended from the sea-coast of Dalmatia to the confines of Rascia. The duke was prevailed on at the

parliament of Konjica to recognize the suzerainty of the Bosnian king ; he fixed his residence at Mostar, whieh he greatly enlarged, and whicli has since remained the capital of Herzegovina. The shrewd policy of Stephen Cosaccia, which offered an asylum for the Bogomiles or Puritans of Bosnia, hounded from their homes by the bigotry of a priest-ridden king, was greatly instrumental in warding off for a while from the duchy the blow that overwhelmed Bosnia. The duke managed with Bogomilian help to defend Herzegovina with some success; and though in 1464 the country was overrun and rendered tributary by the sultan's hordes, it was not till 1488, twenty years after the final conquest and extinction of the Bosnian kingdom, that the Turkish Begicrbeg succeeded in dispossessing Stephen Cosaceia's son and successor Duke Vladislav. The whole country was now incorporated in the Sandjakate of Bosnia. At different times the Venetians suc- ceeded in recovering for Christendom parts of Herzegovina, and by the peace of Carlowitz in 1699 and that of Passarowitz in 1718 Primorje or the. Herzegovinian coast-land, Castelnuovo, and Risano were finally merged in Venetian Dalmatia, and have thus descended to the Austrians. The only remaining strips of Herzegovinian sea- eoast, the narrow enclaves of Klek and Suttorina, were left to the Turks by Ragusan dread of Venetian contact, supported by the good offices of England. The history of Herzegovina under the Turks is toa great extent a blank: the viziers of Herzegovina who resided at Mostar imitated by their quasi-independence of their Bosnian superiors the defiant attitude adopted by the duke of St Sava to his Bosnian suzerain. Feudalism under a Mahometan guise continued to survive here. The spahis, begs, or agas were merely medieval They kept their ancestral castles, their banners, their medieval title deeds and patents of nobility, They exacted feudal service from their serfs and retainers. They indulged in the medieval passion for hawking. One of these Mahometan nobles, Ali, aga of Stolac, did such good service for Sultan Mahmoud in his struggle with the Bosnian magnates that he was made vizier of Herzegovina, which was freed for a while from depend- enee on the Bosnian government. The reforms of Sultan Mahmoud did not by any means remove the grievances of the rayah population of Herzegovina. The serfs had now to satisfy the extortion of imperial tax-farmers and excisemen as well as the demands of their feudal lords. The begs aud agas continued to exact their forced labour and a third of the produee ; the central Government levied a tithe which at the date of the outbreak had become au eighth. Three kinds of cattle tax, the tax for

exemption from military service levied on every infant in arms, forced labour on the roads, forced loan of hoyses, a heavy excise on grapes and tobacco, and a variety of lesser taxes combined to burden the Christian peasants ; but what was more galling than the amount, was the manner in which these various taxes were extorted,—the iniquitous assessment: of tax-farmers and excisemen, and the brutal licence of the zaptiehs who were quartered on recalcitrant villagers. Meanwhile the profligate expenditure of the imperial voluptuary at Stamboul and the peculation of his ministers hurried on the crisis. The public bankruptcy of Turkey put the last straw on the rayah's back. Ou July 1, 1875, the villagers of Nevesinje, which gives its name to a mountain plateau east of Mostar, unable to bear the extortion of the tax-farmers, and goaded to maduess by the outrages inflicted on them by the zaptiehs and bashi-bazouks, rose against their oppressors. The insurrection rapidly spread through Herzegovina and thence to Bosnia. The Herzegovinians under their leaders Peko Pavlovich, Socica, Ljubibratich, and others held out for a year against all the forces that Turkey could despatch against them, and in two struggles in the gorge of Muratovizza alone the Turks lost over 2000 men. In July 1876 the principalities joincd in the struggle ; the Russo-Turkish war followed, and by the treaty of Berlin the government of Bosnia and Herzegovina was confided to Austria-Hungary, while Niksich and the country about Mount Dormitor were detached from Herzegovina and annexed to Monte- negro. On July 3], 1878, the Austrian troops crossed the Herze- govinian frontier, and the news roused the Mahometan fanatics toa desperate effort. On August 2d the Mahometans of Mostar, imitat- ing the example of Seraievo, and believing themselves betrayed by the Turkish Government, rose en masse, murdered the Turkish governor and officials, and proclaimed a ulema head of a provisional govern- ment. The Austrians, however, pressed forward, and crushing some ineffectual efforts at resistance entered Mostar on the 5th of August. By the 29th of September the reduction of Herzegovina was com- pleted by the capture of the hillfort of Klobuk. Since the comple- tion of the occupation, the government of the province has been under the military governor at Seraievo, controlled by the foreign The sultan still remains sovereign de jure, nor

have the Austro-Hungarian administrators as yet been able to regulate the agrarian difficulty which lies at the root of all the evils that have, afflicted the province.

Authoritics.—Mauro Orbini, Contado di Chelmo (in his Storia degli Slavi, Pesaro, 1601) ; Spictlegium, &c., de Bosnice Regno, Leyden, 1737 ; Schimek, Politische Geschichte des Kénigreichs Bosnien u. Rama, Vienna, 1787; Farlato, Illyrieum Sacrum, vol. iv. ; Ami Boué, La Turquic d'Europe; Sir G. Wilkinson, Dalmatia and Monicnegro, London, 1848; Kovachevich, Bosna, Belgrade, 1851. Thoemmel, Beschreibung des Vilajet Bosnien, Vienna, 1867 ; Roskie- wicz, Studien tiber Bosnien u. Herzegovina, Vienna, 1868; E. de Sainte-Marie, L'Herzégovinc, Paris, 1875, and ' Itinéraires en Herzégovine" in Bull. de Soc. Géogr. de Paris, 1876; Evans, Through Bosnia and Herzegovina, London, 1876, and Illyrian Letters, London, 1878 ; Stillman, Herzegovina and the late Uprising, London, 1877; Dr Blau, Reisen in Bosnien wu. d. Herzegovina, Berlin, 1877; Klaich, Bosna, Agram, 1878; Haardt, Dic Occupa- tion Bosniens u. d. Herzegovina, Vienna, 1878. Correspondence respecting affairs in Bosnia and Herzegovina, issued by the English Foreign Office, 1876, &c., and Reports of Consuls Holmes and Freeman. (A. J. EB.)

HERZOGENBUSCH, or's Hertocensoscu. See Bors- LE-DUC.

HESEKIEL, Gzorcz Lovis (1818-1874), German author and journalist, was born August 12, 1818, in Halle, where his father, a man of considerable distinc- tion, was a preacher and inspector of schools, Hesekiel studied history and philosophy in Halle, Jena, and Berlin, and devoted himself in early life to journalism and litera- ture. In 1848 he settled in Berlin, where he lived till his death, February 26, 1874, achieving a considerable reputation both as a writer of books and as editor of the WVeue Preussische Zeitung. He attempted many dif- ferent kinds of literary work, the most ambitious being perhaps his patriotic songs, of which he published a volume during the revolutionary excitement of 1848-49. Another collection —Weue Preussenlieder—appeared in 1864 after the Danish war, and there was a third in 1870—Gegen die Franzosen, Preussische Kriegs- und Konigslieder. Among his novels may be mentioned Vier Junker (1864) and Der Schultheiss vom Zeyst (1875). By far the best known of his works is his

life of Prince Bismarck—Das Buch vom Liirsten Bismarck (3d edition, enlarged, 1873). This biography, which has been translated into English by R. R. H. Mackenzie, is written from the point of view of an ardent admirer of the great chancellor. It is of no value as an estimate of his political importance, but it has acquired a certain popularity because of the mass of more or less interesting anecdotes which the author has brought together respecting both the public and the private life of his hero. It has lately, however, been rather thrust into the shade by the more piquant revelations of Herr Busch.

HESIOD, the father of didactic poetry in Greece, is placed by Herodotus before Homer, but not more than 400 years before his own epoch ; and, though the settlement of the question must depend on the internal evidence of the Hesiodic poems, this testimony is corroborated by the Parian marble and the historian Ephorus. He probably flourished about nine centuries before Christ. His father had mi- grated from Cyme in olia to Beeotia, exchanging there a seafaring life for agriculture; and Hesiod and his brother, & scapegrace named Perses, were born at Ascra, near the base of Helicon and under the mountains which encircle Beeotia. Of this locality—whose claim to be his birth- place was disputed by the city Orchomenus on the score of possession of his'relics—Hesiod's description differs from that of modern topographers in pronouncing the climate un- genial, with alternations of excessive heat and cold; but the poet's prejudice may have been influenced by the injustice of Beeotian law-courts, and it was at any rate here, as he fed his father's flocks beside Helicon, that he received his com- mission from the Muses to be their prophet and poet—a commission which he recognized by dedicating to them an eared tripod won by him in a contest of song at funeral

C17 games in Eubcea, and extant at Helicon in the age of Pausanias (Z'heog., 20-34; Pausan., ix. 31, § 3). But to this call were linked, no doubt, literary antecedents in fEolia, as well as local associations of music and poetry in Hellas. His earliest poem, the famous Works and Days, embodies the experiences of his life afield, and, interwoven with episodes of fable, allegory, and personal history, forms a sort of Boeotian shepherd's calendar. The first portion is an ethical enforcement of honest labour and dissuasive of strife and idleness (1-383); the second consists of hints and

rules as to husbandry (384-764); and the third is a religious calendar of the months, with remarks on the days most lucky or the contrary for rural or nautical employ- ments. The connecting link of the whole poem is the author's advice to his brother, who appears to have bribed the corrupt judges to deprive Hesiod of his already scantier inheritance, and to whom, as he wasted his substance lounging in the agora, the poet more than once returned good for evil, though he tells him there will be a limit to this unmerited kindness. In the Works and Days the episodes which rise above an even didactic level are the "Creation and Equipment of Pandora," the "Five Ages of the World," and the much-admired 'Description of Winter" (by some critics judged post-Hesiodic). It is in the Works and Days especially that we glean indications of Hesiod's rank and condition in life, that of a stay-at- home farmer of the lower class, whose sole experience of the sea was a single voyage of 40 yards across the Euripus, and an old-fashioned bachelor whose misogynic views and prejudice against matrimony have been conjecturally traced to his brother Perses having a wife as extravagant as himself.

The other poem attributed to Hesiod or his school which has come down in great part to modern times is Z'he Theo- gony, a work of grander scope, inspired alike by older traditions and abundant local associations. It seems that no more congenial task could have suggested itself to the Ascrean shepherd than to work into system, as none had essayed to do before, the floating legends of the gods and goddesses and their offspring. This task Herodotus attri- butes to him, and he is quoted by Plato in his Symposium (p. 178 B) as the author of the Zheogony. The first to question his claim to this distinction was Pausanias, the geographer (200 4.p.). The Alexandrian grammarians had no doubt on the subject ; and indications of the hand that wrote the Works and Days may be found in the severe strictures on women, in the high esteem for the wealth-giver Plutus, and in coincidences of verbal expression. If, too, as commentators assert, the proper beginning of the Works and Days is at verse 11—

Oik Xpa podvoy éhv "Epldwy yévos, GAA' ert yatay Elgt dvw,

it is hard to avoid the conclusion that the poet there corrects a statement made in his Zheogony (225), where he had described Eris, the daughter of

Night, as one and indivisible. One thing is clear, that, as Mr Grote puts it, it was the aim of Hesiod, or the member of his school who composed the 7heogony, "to cast the, divine functions into a systematic sequence,"——so welding into intelligible co- herence the generations and genealogies of the deities of Hellas, whom Homer had dealt with in passing and scattered notices only. The Zheogony consists of three divisions—(1) a cosmogony, or creation; (2) a theogony proper, recounting the history of the dynasties of Zeus and Cronus; and (3) a brief and abruptly terminated heroogony, or generaticn of heroes by immortal sires from mortal mothers; the starting-point not improbably of the Hesiodic poem, the Lozaz, or 'Catalogues of Women," of which all but a few fragments are lost. Prefaced by an account of the Muses' visit to their bard, the Zheogony XT, — 98

proceeds, from the spontaneous generation of Erebus and Night from Chaos, to detail a cosmogonic order at first corresponding with the Mosaic. The first ruler of creation, Uranus, is disabled and dethroned by Cronus, and Cronus in turn by his sixth son by Rhea, Zeus; but the chronicling of Titans and Cyclopes, of Nereids and Oceanids, divine rivers and water-nymphs, defies even the briefest enumera- tion. The poet has interwoven several episodes of rare merit, such as the contest of Zeus and the Olympian gods with the Titans, or the description of the prison-house in which the vanquished Titans are confined, with the Giants for keepers and Day and Night for janitors (735 seq.). Notable also is the version of the legend of Pandora given in the 7heogony as compared with that in the Works and Days. The Theogony omits the part played in the earlier poem by Epimetheus in accepting Pandora at Jove's hands in spite of the counsel of Prometheus, as well as the mention of the casket of evils from which in the Works and Days Pandora lifts the lid with such woeful results.

The only other approach to a poem of Hesiod is the so-called Shield of Hercules, a piece of patchwork with which interpolators have done their worst. The opening verses are attributed by a nameless grammarian to the fourth book of Zoiai, The theme of the piece is the expedition of Hercules and Iolaus against the robber Cycnus ; but its main object apparently is to describe the shield of Hercules (141-317). C. O. Miiller deems this

description worthy of a place beside Homev's shield of Achilles in JJ. xiii., and recognizes in it the genuine spirit of the Hesiodic school. Titles and fragments of other lost poems of Hesiod have come down to us: didactic, as the Maxims of Chiron; genealogic, as the Mgimius; and mythic, as the Marriage of Ceyx and the Descent of Theseus to Hades.

A strong characteristic of Hesiod's style is his senten- tious and proverbial philosophy (as in Works and Days, 24-5, 40, 218, 345, 371). There is naturally less of this in the Theogony, yet there too not a few sentiments take the form of the saw or adage. With the poet's history, apart from the evidence of his poems, we have little acquaintance. 'There is reason to suppose that in later life he removed from Ascra to Orchomenus, where, according to Pausanias, were his sepulchre and epitaph. Tradition has assigned a tragical ending to a life seemingly placid and unemotional; but the story that he met a violent death near the Locrian Cineon in the territory of Naupactus, by reason of an intrigue with a sister of his host, or a guilty knowledge of such intrigue, is probably valueless except as evidence of the hero-worship of Hesiod in Locris and Beeotia (cf. Friedel, Die Sage vom Tode Hesiods, Leipsic, 1879). The poet will be remem- bered as the first of didactic poets, the accredited syste- matizer of Greek mythology, and the rough but not unpoetical sketcher of the lines on which Virgil wrought out his exquisitely finished Georgics.

Among the older editions of the Hesiodic poems may be mentioned those published at Venice in 1495 and 1537, and those of Heinsins (Leyd. 1622), Schrevelius (Leyd. 1650), Grevius (Amst. 1701), Robinson (Oxf. 1787); and among those of modern date, Paley (Lond. 1861), Lehrs (Leips. 1840, new ed. 1868), Schomann (Berl. 1869), Kéchly and Kinkel (Leip. 1870), Flach (Berl. 1874). The Works and Days has been edited apart by Spolu (Leip. 1819), Vollbehr (Kiel, 1844), Lennep (Amst. 1847); and the T7'heogony by F, A. Wolf (Halle, 1783),: Lennep (Amst. 1843), Schomann (Berl. 1869), and Flach (Berl. 1873). The Fragments were col- lected by Markscheffel (Leip. 1840). The many disputed questions associated with the name of Hesiod have given rise to a vast critical and polemic literature. In regard to the language of the poems the student may consult W. Clemm, "Krit. Beitrage zur Lehre vom Digamma" in Curtius, Studien, ix. ; Dr H. Flach, Das

dialektische Digamma des Hesiodos (Berl. 1876) ; Alois Rzach, Der Dialekt des Hesiodus (Leip. 1876). The composition and system

of the Theogony have been investigated by Kock (Breslau, 1842),

Gerhard (Berl. 1856), Wolcker (Elberf. 1865), Leitschuh (Wurz- burg, 1867), Schomann (Berl. 1868), Flach (Leip. 1874), Fritz Ehlung (Clausthal, 1875); and special studies on the Works aid Days have been contributed by Twesten (Kiel, 1815), Ranke (Gotting. 1838), Steitz (Leip. 1869), Betke (Minster, 1872), and Canna (‘Tur. 1874). Works of more general criticism are Creuzer and Hermann, Briefe tiber Homer und Hesiod (Heidelb. 1817) ; Thiersch, Ueber die Gedichte des Hesiods (Munich, 1813); J. P. Mahaffy, “Studies in Greek Literature” in Hermathena, iv. The MSS. are discussed by Flach, Die beiden dltesten Handschrificn des Hesiod (Leip. 1877); Kinkel, De codic. Hesiodcis nonnullis in Anglia asservatis (Heidelb. 1866) ; Wrobel, “ Uber eine neue Hesiodhand- schrift” in Sitzungsber. of Vienna Academy, 1879. There are English translations of the Hesiodic poems by Cooke (Lond. 1728), Elton (Lond. 1815), and Banks (Lond. 1856) ; German translations by J. H. Voss (Heidelb. 1806) and Uschner (Berl. 1865) ; French translations by Leconte de Lisle (Par. 1869) and Patin (Par. 1872-8) ; and Italian by Chiodi (Cosenza, 1867) and Pozzuolo (Milan, 1873). (J. DA.)

HESPERIDES, maidens whose number is variously given as three, four, or seven, who guarded the golden apples which Earth gave Hera at her marriage to Zeus. They live far away in the west at the borders of Ocean, in other words at that point of heaven where the sun sets. Hence the sun (according to Mimnermus) sails in the golden bowl that Hephestus made from the abode of the Hesperides to the land where he rises again. According to other accounts they dwell among the Hyperboreans, who live in quietness and calm, z.¢., they dwell in heaven among the souls of them that have died on earth. The golden apples grow on a tree which is guarded by an ever-watchful dragon. The sun is often in German and Lithuanian legends described as the apple that hangs on the tree of the nightly heaven, like the fleece of the sun-ram that was sacrificed and skinned, and the dragon, the envious power, keeps the light back from men till some beneficent power takes it from him. Heracles is the hero who brings back

the golden apples to mankind again. Like Perseus, he first applies to the Nymphs, who help him to learn where the gardenis. Arrived there he slays the dragon and carries the apples to Argos; and finally, like Perseus, he gives them to Athene. The Hesperides are, like the Sirens, beautiful singers, Avy¥dwvor. They are said to be the daughters of Atlas; or, according to other accounts, they are the children of Erebus and Night, or Phorcys and Ceto, and are thus sisters of the Graz, who also receive into their care the setting sun. Hesperides are introduced into the Argonautic legend, but it is doubtful if this is really antique, or only a poetic embellishment of the wanderings of the Argonauts.

HESS. Amongst numerous German artists of this name, the following particularly deserve attention.

Hetyrich Maria Hess—Von Hess, after he received a patent of personal nobility—was born at Diisseldorf in 1798, and brought up to the profession of art by his father, the engraver Karl Ernst Christoph Hess, Karl Hess had already acquired a name when in 1806 the elector of Bavaria, having been raised to a kingship by Napoleon, transferred the Diisseldorf academy and gallery to Munich. Karl Hess accompanied the academy to its new home, and there continued the education of his children. In time Heinrich Hess became sufficiently master of his art to attract the attention of King Maximilian. He was sent with a stipend to Rome, where a copy which he made of

monumental design, probably caused him to become a painter of ecclesiastical subjects on a large scale. In 1828 he was made professor of painting and director of all the art collec- tions at Munich. He decorated the Aukirche, the Glypto- thek, and the Allerheiligencapelle at Munich with frescos ; and his cartoons were selected for glass windows in the cathedrals of Cologne and Ratisbon. Then came the great cycle of frescos in the basilica of St Boniface at Munich,

Raphael's Parnassus, and the study of great examples of.

and the monumental picture of the Virgin and Child enthroned between the four doctors, and receiving the homage of the four patrons of the Munich churches (now in the Pinakothek), His last work, the Lord's Supper, was found unfinished in his atelier after his death in 1863. Before testing his strength as a composer Heinrich Hess tried genre, an example of which is the Pilgrims entering Rome, now in the Munich Gallery. He also executed portraits, and twice had sittings from Thorwaldsen (Pina- kotlek and Schack collections). But his fame will rest on the frescos representing scenes from the Old and New Testaments in the Allerheiligencapelle, and the episodes from the life of St Boniface and other German apostles in the basilica of Munich. Here he holds rank second to none but Overbeck in monumental painting, being always true to nature though mindful of the traditions of Christian art, earnest and simple in feeling, yet lifelike and powerful in expression. Through him and his pupils the sentiment of religious art has been preserved and extended in the Munich school, and will not easily die out.

PeteR Hess—afterwards Von Hess—was born at Diisseldorf in 1792, and accompanied his younger brother Heinrich Maria to Munich in 1806. Being of an age to receive vivid impressions, he felt the stirring impulses of the time, and became a painter of skirmishes and battles. In 1813-15 he was allowed to join the staff of General Wrede, who commanded the Bavarians in the military operations which led to the abdication of Napoleon; and there he gained novel experiences of war and a taste for extensive travel. In the course of years he successively visited Austria, Switzerland, and Italy. On Prince Otho's election to the Greek throne King Louis sent Peter Hess to Athens to gather materials for pictures of the war of liberation. The sketches which he then made were placed, forty in number, in the Pinakothek, after being copied in wax on a large scale (and little to the edification of German fceling) by Nilsen, in the northern arcades of the Hofgarten at Munich. King Otho's entrance into Nauplia was the subject of a large and crowded canvas now in the Pinako- thek, which Hess executed in person. From these, and from battlepieces on a scale of great size in the Royal Palace, as well as from military episodes executed for the ezar Nicholas, and the battle of Waterloo now in the Munich Gallery, we gather that Hess was a clever painter of horses. His conception of subject was lifelike, and his drawing in- variably correct, but his style is not so

congenial to modern taste as that of the painters of touch. He finished almost too carefully with thin medium and pointed tools; and on that account he lacked to a certain extent the boldness of Horace Vernet, to whom he was not unaptly compared. He died suddenly, full of honours, at Munich, in April 1871. Several of his genre pictures, horse hunts, and brigand scenes may be found in the gallery of Munich.

Karu Hass, the third son of Karl Christoph Hess, born

at Diisseldorf in 1801, was also taught by his father, who hoped that he would obtain distinction as an engraver. Karl, however, after engraving one plate after Adrian Ostade, turned to painting under the guidance of Wagenbauer of Munich, and then studied under his elder brother Peter. But historical composition proved to be as contrary to his taste as engraving, and he gave himself exclusively at last to illustrations of peasant life in the hill country of Bavaria. He became clever alike in representing the people, the animals, and the landscape of the Alps, and with constant means of reference to nature in the neighbourhood of Reichenhall, where he at last resided, he never produced anything that was not impressed with the true stamp of a kindly realism. Some of his pictures in the museum of Munich will serve as examples of his manner. He died at Reichenhall on the 16th of November 1874.

HESSE, or Hessra (in German Hessen), an old country of Germany, situated on both banks of the Rhine and Main, north and south of Frankfort, has had different boundaries at different times. Its greatest length was about 95 miles, while its breadth has varied considerably. Several detached portions of territory were also included in Hesse.

The earliest recorded inhabitants of the district were the Chatti, whose chief settlement Mattium, probably near Gudensberg, was destroyed by Germanicusin15 a.p. The Chatti, merged in the Franks, migrated westward, and their place in Hesse was taken by the Saxons. Among these, when conquered by the German kings, several ‘ gaus” or earldoms were founded, some of whose possessors after the death of Charlemagne rose to great power. Two families—those of Werner and of Giso, count of Gudens- berg—became latterly the most important. In 1130 the heiress of the Gisos married the landgrave of Thuringia, who thus became the overlord of Hesse. In

1247 the Thuringian male line became extinct, and Hesse, along with the other possessions of the landgrave, was involved in a prolonged war of succession. In 1263 Sophia, duchess of Brabant and niece of the last landgrave, received by treaty tlie landgraviate of Hesse, as it was from that time called, and two years later resigned it in favour of her son, Henry the Child, the ancestor of the present house of Hesse. Till the death of Philip the Magnanimous in 1567, Hesse continued to be regarded as one state, though sometimes shared by two rulers; but at that date Philip's four sons divided the landgraviate into Hesse-Cassel, Hesse- Marburg, Hesse-Rheinfels, and Hesse-Darmstadt. Of these the second and third lapsed by inheritance in 1583 and 1604 to the others, which became the chief lines, The sinall landgraviate of Hesse-Homburg was formed in 1596 of part of Hesse-Darmstadt. Hesse-Darmstadt, since the annexation of the other two to Prussia in 1866, has been the only independent part of Hesse left, and generally receives the common name.

Hesse-Nassau is a province of Prussia, formed in 1866 from parts of Hesse-Cassel and the dukedom of Nassau. Hesse-Philippsthal was a collateral Jine of the house of Hesse-Cassel, founded in 1630, and extinct in 1820. Hess-Barchfeld, Hesse-Butzbach, Hesse-Rothenburg, Hesse- Rumpenheim, and Hesse-Wanfried were collateral lines of little importance.

For further information see Teuthorn, Ausfiihrliche Geschichte des Hessen, 1777-80; Wenck, Hessische Landesgeschichtc, 1783 and 1808; Pfister, Ucher den Chattischen wnd Lessischen Stamm und die dilteste Geschichte des Chattischen Stammes, 1868; Hoffmeister, Historisch-genealogisches Handbuch iber alle Linicn des Regenten- hauses Hessen, 1874; Rommel, Geschichte von Hessen, 1820-58, 10 vols.; Heppe, Hessische Kirchengeschichtc, 1876.

HESSE-CASSEL, in German KurHESssEN, ¢.¢., Electoral Hesse, now forming the government district of Cassel in the Prussian province of Nassau, was till 1866 a land- graviate and electorate of Germany, consisting of several detached masses of territory, to the N.E. of Frankfort-on-the-Main. It contained a superficial area of 3699 square miles, and its population in 1864 was 745,063.

The line of Hesse-Cassel was founded by William IV., surnamed the Wise, eldest son of Philip the Magnanimous. On his father's death in 1567 he received one half of Hesse, with Cassel as his capital ; and this formed the landgraviate of Hesse-Cassel. Additions were made to it by inheritance from his brother's posses- sions, while, as compensation for losses sustained in the Thirty Years' War, a large part of the countship of Schaumburg and other territory was acquired towards the middle of the 17th century. Charles I.,.who ascended the throne in 1670, was the first ruler who adopted the system of hiring his soldiers out to foreign powers as mercenaries, as a means of improving the national finances. Frede- rick I., the next landgrave, had become by marriage king of Sweden, and on his death was succeeded in the landgraviate by his brother William VIII., who fought as an ally of England during the Seyen Years' War. From his successor Frederick II., who had become a Roman Catholic, 22,000 Hessian troops were hired hy

England for about £3,191,000, to assist in the war against the North American colonies. The reign of the next landgrave, William IX., was an important epoch in the history of Hesse- Cassel. Ascending the throne in 1785, he took part in the war against France a few years later, but in 1795 peace was arranged by the treaty of Basel. For the loss in 1801 of his possessions on the left bank of the Rhine he was in 1803 compensated by some of the former French territory round Mainz, and at the same time was raised to the dignity of Kurfiirst or Elector William I. In 1806 he made a treaty of neutrality with Napoleon, but after the battle of Jena the latter, suspecting William's designs, occupied his country, and expelled him. Hesse-Cassel was then added to Jerome Bona- parte's new kingdom of Westphalia ; but after the battle of Leipsic in 1813 thg French were driven out and the clector restored. By the Vienna congress, where he intrigued in vain to be recognized as a king, several changes in the cxtent of his dominion were made. On his return to his sovereignty, William promised to grant his people a new and popular constitution ; but just as the draft was ready to become law by his signature, he drew back, dissolved the diet, and continued to rule without again summoning it. His son, William II., who succeeded in 1821, pursued the same Jine of policy, and carried on the

government without reference to the diet. The discontent which this conduct excited was intensified by the clector's shameless connexion with the countess of Reichenbach. Disturbances took place, and the elector, after attempting to pacify his people, appointed his son as regent in 1831, and withdrew to Frankfort, where he died in 1847. The regent, becoming Elector Frederick William I., startled by the Paris revolution of 1848, made many promises to the people, and carried some of them into effect, but on the reaction of 1850, which spread over all Germany, snatched at the first pretext for returning to the former order of things. He attempted to levy the usual taxes without obtaining the consent of his chambers, but the commotion thus caused was so great that he was forced to retire to Wilhelmsbad, along with his very unpopular minis- ter, Hassenpflug. Heinduced the diet of princes then assembled at Frankfort to support him, and Austrian and Bavarian troops entered Hesse-Cassel to enforce obedience. Prussia, in alarm, immediately occupied the northern part of the country, and a civil war was barely avoided by arrangement. The elector, however, scarcely changed his policy, and the next sixteen years were occupied with disputes between the chambers and the Government. In 1866 Hesse-Cassel joined Austria against Prussia. Prussian troops immediately over- ran the country, and on the treaty with Austria, the electorate was annexed to the Prussian kingdom. The elector was carried a prisoner to Stettin, and was only released on resigning his claims to the throne of Hesse-Cassel. He dicd in 1875.

See Wippermann, Kurhessen seit den Fretheitskriegen, 1850 ; Roth, Geschichte von Hessen-Kassel, 1856 ; Grafe, Der Verfasswngs- kanupf in Kurhessen, 1851 ; and works under HEssE.

HESSE-DARMSTADT, Granp-Ducuy or, the actual Hesse of the present day, isa state of Germany situated on the Rhine and Main, between Prussia on the north and Baden on the south. It consists of two large and several small detached portions of territory. The more northerly of the large portions forms the province of Oberhessen, and is completely surrounded by Prussia. The other, divided by the Rhine into the provinces of Starkenburg and Rhein- hessen, is bounded on the N. by Hesse-Nassau, on the W. by the Rhine Palatinate and Rhenish Prussia, on the S. by Baden, and on the KE. by Baden and Bavaria. The extent of the duchy is about

2965 square miles. Ober- hessen is mountainous, having the Vogelsberg in the east with Taufstein (2579 feet) as the highest summit in the country, and the Hausberg, a branch of the Taunus, in the south-west. In the south-east of Starkenburg is the Odenwald. Rheinhessen is occupied by fertile hills. The chief rivers are the Rhine, Main, Neckar, Lahn, and Fulda, with their tributaries. There are no lakes, but mineral-springs abound in all the provinces. The climate is pleasant and mild in the river valleys and plains, but severe on the heights, especially in Oberhessen. Besides the usual domestic animals, deer of various kinds, wild swine, foxes, martens, and otters are found. Agriculture, including the breeding of horses and cattle, is actively encouraged by Government, and is the principal industry of the people. Forestry and vine-growing are also im- portant, the latter being practised almost exclusively in Rheinhessen. The principal crops are millet, buckwheat, oats, and potatoes ; but rape (for oil), hemp, flax, tobacco,

and fruit are also cultivated. The manufactures embrace leather (enamelled and coloured), tobacco, cigars, shoes, furniture, pocket-books and similar goods, chemicals,

matches, machinery, and various textile fabrics. Mining is carried on chiefly in Oberhessen. Iron, copper, man- ganese, graphite, lignite, salt, marble, and clay are the principal minerals, which are worked for home consump- tion. In 1878 there were produced in Hesse 45,300 tons of lignite, 91,724 tons of iron ore, and 13,200 tons of salt, representing in value about £62,100. Trade is tolerably important in Hesse. The following numbers of persons engaged in the various industries are taken from the industrial census of 1875 :—Horticulturists, 292 ; fishermen, 65; miners, 1556; workers in stone, clay, glass, 4715; in metals, 8266; in macliines, instruments, &e., 7202; in chemical industries, 2153; in lighting materials, soap, resins, &c., 1190; in textile industries, 8274; in paper and leather, 7600; in wood, 11,142; in food and drink, 19,923; in dress and washing, 21,629 ; in building, 1291; in polygraphic industries, 1291 ; in artistic industries, 412; in mercantile business, 17,593 ; in conveyance, 2273; in lodging and boarding, 6016— total, 134,383. The people are well educated; of the recruits in 1878-79 only ‘21 per cent. were unable either to read or

write. There is a university at Giessen, and the schools, ordinary, technical, and theological, throughout the country are very numerous. The Protestant religion predominates, though the Roman Catholic faith is also recognized by the state. Darmstadt is the capital ; Offenbach is the chief manufacturing town; Mainz has perhaps the most active trade. The other chief towns are Alsfeld, Lauterbach, Friedberg, Bingen, Bensheim, and Worms. The population in 1875 was 884,218. The government since 1820 has been a constitutional heredi- tary monarchy, assisted by two chambers, modified in 1856—the one of life members, mostly from among the nobility, the other of popular representatives, elected indirectly. The chambers must meet at least once every three years. The ministry of three is responsible to the nation. Hesse is represented in the imperial federal council by 3 votes, and in the reichstag by 9. The annual revenue for the finance-period 1876-78 was £872,375, and the expenditure £872,481. The estimated annual revenue for the period 1879-82 is £1,011,762, and the estimated expenditure £857,124. The public debt in 1879 was £2,041,397, chiefly incurred for railways. For additional statistics see GERMANY.

George I., youngest son of Philip the Magnanimous, received on his father's death in 1567 the upper countship of Katzenelnbogen, and, selecting Darmstadt as his residence, became the founder of the Hesse-Darmstadt line. Additions to the territory were made both in his reign and in that of his son, Louis V. The landgraviate, as it was at first styled, suffered severely from war and its attendant fainines and plagues. The Thirty Years' War, a war of succession with Hesse-Cassel, and the Seven Years' War dealt heavy blows at its prosperity. Louis X, who succeeded his father in 1790, involved it in further contests. Joining at first the allies against France, he was compelled in 1793 by the latter power to sign a treaty of neu- trality. By the treaty of Lunéville he gave up his possessions on the left bank of the Rhine, receiving as compensation a very much larger district on the right bank. From 1805 till 1813 he was compelled to supply Napoleon with a contingent of troops against the other Germans. In 1806, as member of the Confederation of the Rhine, he assumed the title of grand-duke Louis I. of Hessc. After the battle of Leipsic in 1813, when Napoleon was defeated, Louis again joined the allies. By the decision of the Vienna con- gress in 1815 considerable change in his dominions was made ; but though he was forced to recognize the independence of Hesse- Homburg, which since the

beginning of the century had been incorporated with Hesse-Darmstadt, his title of grand-duke was confirmed. Within his country a growing desire for political liberty had been making itself apparent, and in 1820 the grand-duke pro- mulgated a new constitution, This was rejected by the people, and attempts were made in vain by successive diets to frame a consti- tution pleasing alike to the ruler and the ruled. Louis II.

Succeeded his father in 1830. His policy in no degree lessened the popular discontent. His son Louis II1., who succeeded in 1848, alarmed by the events in Paris of that year, and by commotions in his own country, gave way a little, but under the reaction of 1850 he again restored matters to their old state. Since that time,

although no radical change has been effected, the liberal party in—

the state hag been steadily gaining ground. In 1866 Hesse-

Darmstadt supported Austria against Prussia, with the result that ;

it had to pay a heavy indemnity and cede certain provinces, including the lately acquired Hesse-Homburg, to Prussia. In 1867 it entered the North German Confederation, and in 1870 the German Confcderation. Louis IV. succeeded his uncle in 1877.

A list of works on Hesse is to be found in Walther's Literar- isches Handbueh fiir Gesehichte wad Landeskunde von Hessen, 1841. See also Stciner, Geschtehte des Grossherzogthums Hessen, 5 vols., 1833-4; Tiirckheim, Histoire généalogique de la matson de Hesse, 1819-20 ; Heber, Gesehiehte des Grossherzogthums Hessen, 1837 ; Dieffenbach, Das Grossherzogthun Hessen in Vergangenhett und Gegenwart, 1875; Voltz, Uebersieht der geologisehen Verhilt- nisse des Grossherzogthums Hessen, 1852; and works under HEssE.

HESSE-HOMBURG, a former landgraviate of Germany, consisted of two parts, the province of Homburg-vor-der- Hohe, on the right bank of the Rhine, and the lordship of Meisenheim (added in 1815), on the left bank, to

the north of Frankfort-on-the-Main. It comprehended an area of 106 square miles; and its population in 1864 was 27,374. Homburg now forms part of the Prussian government district of Wiesbaden, and Meisenheim of the government district of Coblentz.

Hesse-Homburg was formed into a separate landgraviate in 1596, by Frederick I., son of George I. of Hesse-Darmstadt. By his two sons it was divided into the parts Hesse-Homburg and Hesse-Hom- burg-Bingenhcim ; but the latter returned by inheritance to the original line in 1681. In the reign of Frederick V. (1751-1820) Hesse-Homburg was in 1806 incorporated with Hesse-Darmstadt, but that state was obliged by the Vienna congress to recognize the independence of Hesse-Homburg, which at the same time was increased by the district of Meisenheim. Frederick V. became a member of the German Confederation in 1817. After his death, his five sons successively filled the throne. The last, Ferdinand Henry Frederick, granted a liberal constitution to his people, but in the reaction of 1850 cancelled it. On his death on March 24, 1866, the landgraviate reverted by inheritance to the grand-duke of Hesse-Darmstadt ; but in September of the same year that ruler

was forced to cede it to Prussia, in consequence of having supported Austria in the Seven Weeks' War.

HESSIAN FLY, a name originally given in the United States in 1776 during the War of Independence to a small fly very destructive to wheat, supposed to have been brought over in straw by the Hessian troops employed on the British side. It is a species of Cecidomyia, described under the name C. destructor by the American entomologist Say, and belonging to the Dipterous family Cecidomyiide, the numerous members of which produce galls, distortions, and other injuries in the plants they attack. It was often thought that this insect occurred in England; but the indigenous English wheat-midge, also very destructive, is an allied species, Diplosis tritici. A species found in Hungary and Germany, where it has committed great damage, has been supposed to be the true Hessian fly, which has also been recorded from Minorca and Naples; Cohn notices its ravages in Silesia, and Kiinstler in Austria; and Kaltenbach (who identifies C'. secalina, Loew, witli it) says it is more or less common in Germany, and that it originally

came from Europe. Nevertheless, many good authorities have considered that the destructive European fly is not identical with the North American insect, though closely allied to it, and of similar habits. In the United States this minute midge has been a dreadful scourge at times, even to the extent of causing local famine. The female lays 20 or 30 eggs in a crease of the leaf of the young plant, and the larvee when hatched work their way between the leaf and the stalk, till they come to a joint, a little below the surface, where they remain, head down, suck- ing the sap, and turn to pupz enclosed in a covering; this is known as the " flax-seed" condition. The injury occasioned is not detected until the plant grows higher. There are

two broods every year, one reaching the fly state in May, the other in August or early in September; as the fly only lives a few weeks, wheat that is sown so late as not to come up until the second brood has disappeared escapes harm. The usual result of the attack is that small aborted ears only are formed, the few grains of which shrivel and will scarcely ripen, the straw also being of inferior quality. The perfect insect is smaller than the common gnat, whick it somewhat resembles, and from which its size and more simple antenne distinguish it. The larve are spindle- shaped and reddish-white, with the intestinal canal show- ing through the skin when full grown; they are about one-seventh of an inch long, and are provided with small hooks near the head ; at this stage they group themselves in regular rings round the stem attacked. A very minute natural parasite, Semiotellus destructor, belonging to the division Pteromalides of the Hymenopterous family Chalei-dide is, luckily for agriculturists, usually so plentiful as to be able to keep down the fly, on the larva and pupz of which its own larvee feed.

Besides the original account by Say (in the Jowrnal of the Academy of Natural Science, Philadelphia, 1817), his countryman, Dr Asa Fitch, has published a history of this insect in the Trans- aetions of the New York State Agrieultwral Society, 1846; and in England the celebrated entomologist Kirby gave an account of it in the Magazine of Natural History, 1829, It is figured in the American Naturalist, vol. ii. p. 163. A map showing its dis-tribution will be found in Hayden's Report of the United States Geological and Geographical Survey for 1875.

HESSUS, Hetivs Eoranus (1488-1540), a distin- guished German humanist of the 16th century, was born January 6, 1488, at Bockendorf near Frankenberg in Hesse. His family name is not known: the baptismal name Eoban he owed to a local saint ; Hessus merely indi- cates the land of his origin ; while the prenomen Helius was assumed by himself partly with reference to the sun-god, patron of poets, and partly also, it is said, with reference to the fact that he had been born on a Sunday. His early education was received in the monastery of Haina, where his father held a menial position, and afterwards at Franken- berg; in 1503 he entered the university of Erfurt, where in 1505 Crotus Rubianus and Ulrich von Hutten became his fellow-students and his firm friends. Though devoting himself enthusiastically to the composition of Latin verse, in which he soon became an acknowledged master, he was far from neglecting the other studies of the place, and shortly after lis graduation he held for a short time the post of rector of the St Severus school. Compelled by disturbances to leave Erfurt in 1510, he for five years led a somewhat wandering life, in the course of which he passed some time in Leipsic as a student of Jaw; in 1515 he returned to his former post at Erfurt, and in 1516 became professor of belles-lettres. He was now pro- minently associated with Reuchlin, Peutinger, Mutianus, as well as with Crotus Rubianus and Hutten; and from the first he fully identified himself with the cause of Luther and the Reformation. In 1526 he went as teacher of rhetoric and poetry to Nuremberg, but in 1534 returned to Erfurt, whence in 1536 he was called to the chair of poetry and history in Marburg. There he died October 5, 1540.

Hessus was generally regarded by his contemporaries both in Germany and elsewhere as the foremost Latin poet of the age ; "if Erasinus was the modern Ciccro, Eoban was Virgil and Ovid." His most popular works were a translation into Latin distichs of the Psalms, which passed through more than forty editions, and Latin hexameter translations of Theocritus and of the Jiiad. He also published Stlve, a collection of idylls, epigrams, and occasional pieces, and a series of Christian Heroidew, in imitation of Ovid. His Epistole were edited by his friend Joachim Camerarius, who also published his Life (1553). See the monographs of Herz (H.£. Hesse, ein Lehrer u. Dichterleben aus der Reformationszeit, 1860), Schwert- zell (H.E. Hessus, cin Lebensbild aus der Reformationszeit, 1874), and Krause (H.#.

Hessus, sein Leben wu. seinc Werke, 1879); also Strauss, Ulrich von Hutten (1858 ; 2ded. 1871; Engl. transl. 1874).

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HESTIA, a Greek goddess, who is probably the latest in origin of the greater deities. She seems to belong to a particular stage in the advance of civilization, and to embody the religious sauction that confirmed the social system then reached. When we compare her worship with that of Agni, the nearest parallel in the Vedic period, we see that the Greeks made this advance after they had separated from the Aryan conquerors of India. Agni is invoked in the Rig Veda as the brother, friend, and helper of men, as dwelling with them and mediating between them and the gods. But beyond this Hestia is the hearth-fire as the centfe of an association, wider or narrower, which meets in common atthe liearth. Sheis not mentioned in Homer ; in the Odyssey sometimes one swears by Zeus, the table and the hearth, i.e, by Zeus as the god of the family both in its external relation of hospitality and its internal unity round its own hearth. Hence we have the Zeus éoruivaé, éxriodxos, éféorios. The former of these two ideas is too delicate and fine ever to become more than a mere aspect of Zeus, but the second gradually formed itself into a distinct worship, in which the already existing worship of the fire was merged. The fact that Hestia is not mentioned in Homer shows that her worship was not so universally acknowledged at the time which these poems reveal to us. Perhaps we may see in the connexion of the Latin Jupiter and Vesta at Lavinium a relic of the original connexion of the two; and the fact that the worship of this same goddess under the same name (they are only two forms of the feminine of the passive participle of the root vas, burn) is found in Latium and Greece affords strong evidence of a specially close connexion between the two races. We find therefore in Hestia relics of the old pre-Greek worship ; she is the altar-fire, presiding over all sacrifices, and sharing in the honours of all the gods. The opening sacrifice was offered to Hestia ; to her at the sacrificial meal the first and the last libations were poured. The fire of Hestia was always kept burning, or if by any mischance it were extinguished, only sacred fire made by friction, or got direct from the sun, might be used to re- kindle it (see Kuhn, Herabkunft). But beyond this she is the goddess of the family union, the personification of the idea of home (see

Welcker, G7. Gétt., ii. 694), the protec- tress along with Zeus of the suppliants who fled for refuge to the hearth. To her therefore is ascribed the art of housebuilding. Hestia and Hermes are often united as the representatives of home and private life on the one hand, and of all business and outdoor life on the other. The city union, moreover, is just the family union on a large scale ; it has its centre in the prytaneum, where the common hearth-fire round which the magistrates meet is always burning, and where the sacred rites that sanctify the con- cord of city life are performed. From this fire, as the representative of the life of the city, was taken the fire wherewith that on the hearth of a new colony was kindled. As patroness of the deliberations held in the prytaneum, Hestia is surnamed BovAaia. Even larger unions than the city had their central fire: in Tegea was the Hestia of the Arcadians; and it is probable that the Achaans had theirs at Aginium. In the later mystic philosophy Hestia became the hearth of the universe, the eternal fire at the centre of the world.

As Hestia had her home in the prytaneum, special temples to her rarely occur. There was one in Hermione, where the only symbol of the goddess was a fire always burning on the hearth. We also hear of her house at Olympia. Her statue stood in the prytaneum at Athens beside that of Peace. Though many statues of the Roman Vesta are preserved, more or less based on the Greek con- ception of Hestia, yet no really Greek representation of the goddess has come down to us.

HES—HES

HESYCHASTS (jovxacrai or novydfovres, also called éupadrdyvxo, Umbilicanimi, and sometimes referred to as Fuchites, Massalians, or Palamites), a quietistic sect which arose among the monks of the Gréek Church, and especially of Mount Athos, during the later period of the Byzantine empire, and owing to various adventitious circumstances came into great prominence politically and ecclesiastically for a few years about the middle of the 14th century. Their opinion and practice will be best represented in the words of one of their early teachers (quoted by Gibbon, Decline and Fall, c. 63) :—" When thou art alone in thy cell shut thy door, and seat thyself in a corner; raise thy miud above all things vain and transitory; recline thy beard and chin on thy breast; turn thine eyes and thy

thought towards the middle of thy belly, the region of the navel; and search the place of the heart, the seat of the soul. At first all will be dark and comfortless ; but if thou persevere day and night, thou wilt feel an ineffable joy ; and no sooner has the soul discovered the place of the heart than it is involved in a mystic and ethereal light." About the year 1337 this Hesychasm, the affinity of which with certain well-known forms of Oriental mysticism is obvious, attracted the attention of the learned and versatile Barlaam, a Calabrian monk, who at that time held the office of abbot in the Basilian monastery of St Saviour's in Con- stantinople, and who had visited the fraternities of Mount Athos on a tour of inspection. Amid much that he dis- approved, what he specially took exception to as heretical and blasphemous was the doctrine entertained as to the nature of this divine light, the fruition of which was the supposed reward of Hesychastic contemplation. It was maintained to be the pure and perfect essence of God Himself, that eternal light which had been manifested to the disciples on Mount Tabor at the transfiguration. This Barlaam held to be polytheistic, inasmuch as it postulated two eternal substances, a visible and an invisible God. On the Hesychastic side the controversy was taken up by Gregory Palamas, afterwards archbishop of Thessalonica, who laboured to establish a distinction between eternal oboia and eternal évépyea. In 1341 the dispute came before a synod held at Constantinople ; the decision, which no doubt was to a large extent determined by the excessive veneration in which the writings of the pseudo-Dionysius were held in the Eastern Church, was adverse to Barlaam, who in consequence returned to Calabria, and afterwards became bishop of Hierace in the Latincommunion, Three other synods in relation to the same subject were subse- quently held ; and at the last of these, held in 1351 under the presidency of the emperor John Cantacuzenus, the uncreated light of Mount Tabor was established as an article of faith for the Greeks, who ever siuce have been ready to recognize it as an additional ground of separation from the Roman Church. The contemporary historians Cantacuzenus and Nicephorus Gregoras have both dealt very copiously with this subject, which is also more or less discussed in all the church histories. See Engelhardt's article on the Arsenians and Hesychasts in Illgen's Zertschr. f. Hist. Theol., viii. 48, and the account of the Hesychasts in Herzog's Encyklopiédie. It may be mentioned that in the time of Justinian the word Hesychast was applied to

monks in general simply as descriptive of the quiet and contem- plative character of their pursuits.

HESYCHIUS was a graminarian of Alexandria, as we learn from a letter prefixed to his great work. From the fact that he was apparently unknown to Hesychius the Milesian and other writers of the time of Justinian, M. Schmidt considers that he must have flourished latcr than 530 a.p. On the other hand he cannot have been later than 642 a.p., when the school of Alexandria was scattered by the Saracen conquest. Many bad Greek words occur-

ring in his book show that he belonged to this late period. Welcker (2h, Alus., ii. 269) places him in the latter part of the 4th century. Belonging to the school of Alexandria, he was probably a pagan; and the explanations of words from Gregory Nazianzen and other Christian writers (glossce sacre) are interpolations of a later time: He has left a Greek dictionary, containing a copious list of peculiar words, forms, and phrases, with an explanation of their meaning, and often with a reference to the author who used them or to the district of Greece where they were current. Hence the book is of great value to the student of the Greek dialects; while in the restoration of the text of the classical authors generally, and particularly of such writers as Aischylus and Theocritus, who used many unusual words, its value can hardly be exaggerated. The explana- tions given of many epithets and phrases reveal to us numberless facts about religion and social life, which are of the highest importance in the study of antiquities. In a prefatory letter addressed to his friend Eudocius (who is probably the Eudocius Scholasticus mentioned in the Ltymologicum Magnum and elsewhere), Hesychius meutions that his work is based on the lexicon of Diogenianus, but that he has also used similar works by Aristarchus, Apion, Heliodorus, &c. (about whom see M. Schmidt's edition, vol. iv.). The text is very corrupt, and the order of the words has often been disturbed. There is no doubt that many interpolations, besides the Christian glosses, have been made.

HETTSTADT, or Herrsrepr, a town of Prussian Saxony, in the circle of Mansfeld, and the government district of Merseburg, is situated on both banks of the Wipper, about 23 miles N.W. of Halle. It is the seat of a

commission of justice, and las manufactures of machinery, pianofortes, and artificial manure. The population in 1875 was 5988. In the neighbourhood are mines of argenti- ferous copper, and the surrounding district and villages are occupied with smelting and similar works. Silver and sulphuric acid are the other chief products; nickel and gold are also found in small quantities. Hettstiidt is mentioned as early as 1046; in 1220 it possessed a castle ; and in 1380 it received the privileges of a town. When the countship of Mansfeld was sequestrated, Hettstidt came into the possession of the Saxons, from whom it passed to the Prussians in 18165. .

HEUGLIN, Turopor von (1824-1876), an eminent African and Arctic traveller, was born 20th March 1824 at Hirschlanden near Leonberg in Wiirtemberg, and died at Stuttgart, 5th November 1876. His father was a Protestant pastor, and he was originally trained to be a mining engineer, but his own early ambition was to coutribute to

scientific progress by his personal explorations, and he pre-

pared himself for his task by careful and multifarious dis- cipline, studying the natural sciences, and more particularly zoology, acquiring the more serviceable of the modern languages, strengthening his physique by gymnastic exer- cises, and learning to use with equal skill his pencil and his gunn. Supplied with funds by his mother's liberality, Heuglin went to Egypt in 1851, and till 1865 the north- eastern regions of Africa were the main scene of his labours. In 1852 he accompanied Dr Reitz, the Austrian consul at Khartum, in his fatal journey to Abyssinia; in 1853, having been appointed Dr Reitz's successor in the cousul- ate, he visited Kordofan and the lower course of the White Nile; and in 1857; on his return after about two years' absence in Europe, he was commissioned by the grand-duke Ferdinand Maximilian of Austria to explore the countries along the west coast of the Red Sea. From the latter part of 1858 to the latter part of 1860 he was again in Europe; but in 1861 he was placed at the head of the Vogel search expedition, which included Munzinger,

Steudner, Kinzelbach, &c., and was expected to make its way to Wadai. Having reached Mai-schecha, however, the explorers broke up into three

parties, Heuglin turning along with Steudner and Schubert in the direction of Adoa, Gon- dar, and the Galla lands. At Khartum they joined Miss Tinne's party, and proceeded to Lake Rey and the Kosanga river, but Steudner died on 10th April 1865, and Heuglin was compelled by sickness to retrace his steps. He returned to Europe in 1865. In 1870 and 1871 he made a valuable series of explorations in Spitzbergen and Novaya Zemlya ; but 1875 found him again in North-East Africa, in the country of the Beni Amer and Habab. An invitation from the khedive took him abroad again in 1876, but receiving no definite appointment he returned to Europe. Later in the same year he was engaged in preparing for an exploration of the island of Socotra, when he was suddenly carried off by inflammation of the lungs. He was buried beside Mauch, the African traveller, and a statue has been ° erected over his grave.

His principal works are Systematische Ucbersicht der Vogel Nordost-Afrika's, 1855 ; Reisen in Nordost- Afrika, 1852-18538 (Gotha, 1857) ; Syst. Uebersicht der Stiugethicre Nordost-Afrika's (Vienna, 1867) ; Teise nach Abessinien, den Galla-Liéndern, &c., 1861-62 (Jena, 1868) ; Itcise in das Gebiet des Weissen Nil, 1862-1864 (Leipsic, 1869) ; Reisen nach dem Nordpolarmeecr, 1870-71 (Brunswick, 1872- 74); Ornithologie von Nordost-Afrika's (Cassel, 1869-75) ; Reise in Nordost-Afrika (Brunswick, 1877, 2 vols.). It is principally by his zoological, and more especially his ornithological, labours that Heuglin has taken rank as an independent authority.

HEUSCH, Wie or GuILLIAM DE, a landscape painter in the 17th century at Utrecht. The dates of this artist's birth and death are unknown. Nothing certain is recorded of him except that he presided over the guild of Utrecht, whilst Cornelis Poelemburg, Jan Both, and Jan Weenix fornied the council of that body, in 1649. According to the majority of historians, Heusch was born in 1638, and was taught by Jan Both. But each of these statements seems open to doubt; and although it is obvious that the style of Heusch is identical with that of Both, it may be that the two masters during their travels in Italy fell under the influence of Claude Lorraine, whose " Arcadian " art they imitated. Heusch certainly painted the same effects of evening in wide expanses of country varied by rock formations and lofty thin-leaved arborescence as Both. There is little to distinguish one master

from the other, except that of tle two Both is perhaps the more delicate colourist. The guild of Utrecht in the middle of the 17th century was composed of artists who clung faithfully to each other. Poelemburg, who painted figures for Jan Both, did the same duty for Heusch. Sometimes Heusch sketched landscapes for the battlepieces of Molenaer. The most important examples of Heusch are in the gal- leries of the Hague and Rotterdam, in the Belvedere at Vienna, the Stadel at Frankfort, and the Louvre. His pictures are signed with the full name, beginning with a monogram combining a G (for Guilliam), D, and H, Heusch's etchings, of which thirteen are known, are also in the character of those of Both. After Guilliam there also flourished at Utrecht his nephew, Jacob de Heusch, who signs like his uncle, substituting an initial J for the initial G. He was born at Utrecht in 1657, learnt draw- ing from his uncle, and travelled early to Rome, where he acquired friends and patrons for whom he executed pictures after his return. He settled fora time at Berlin, but finally retired to Utrecht, where he died in 1701. Jacob was au " Arcadian," like his relative, and an imitator of Both, and he chiefly painted Italian harbour views. But his pictures are now scarce. 'Two of his canvases, the Ponte Rotto at Rome, in the Brunswick Gallery, and a lake harbour with

shipping in the Lichtenstein collection at Vienna, are dated 1696. A harbour with a tower and distant mountains, in the Belvedere at Vienna, was executed in 1699. Other examples may be found in English private galleries, in the Hermitage of St Petersburg, and the museums of Rouen and Montpellier.

HEVELIUS, Hever, Hewer, Hewexke, or HOVELKE, Jouann (1611-1687), astronomer, was born at Dantzic on January 28, 1611, and died there on January 28, 1687 (see Astronomy, vol. ii. p. 754).

HEXHAM, a market-town of England, county of Northuntberland, is situated on the south bank of the river Tyne, crossed there by a handsome stone bridge of nine arches, 20 miles west from Newcastle and 36 east from Carlisle, and on the line of railway connecting those towns. It is somewhat irregularly built, and consists chiefly of several narrow streets diverging from the market-place, a spacious square. Its defects in architecture and

arrangement are, however, compensated for by its pleasant situation and the imposing remains of the old priory church. This church, begun by Wilfrid in 674, and completed by Acca, his successor, remained uninjured till 875, when every part of the monastery but the stone work was destroyed by the Dances. It was built of stones used in an earlier work, and many of them bear Roman inscriptions. Originally in dimensions and splendour it was unsurpassed on this side of the Alps, and doubtless had no small influence on eccle- siastical architecture in various parts of England. The building as renovated in the 12th century consisted of nave and transepts, choir and aisles, and a massive central tower ; but the nave was burned by the Scots in 1296, and has never been rebuilt. The style is Early English with Transi- tion details. The crypt, discovered in 1726, is a fine example of Saxon architecture, of which there appear also to be some traces in the choir. Among the interest- ing old monuments which have been collected in the transept is a sculptured stone slab of Oswulf, king of Northumbria, of the date 788. To the west of the church there are still some remains of the conventual buildings. Near the market-place there are two old castellated towers. A vessel containing about 8000 Saxon coins was discovered in the churchyard in 1832. The "Seal," formerly the park of the monks, is now used as a promenade, and from an eminence within its bounds a fine view is obtained. Hex- ham possesses a new town-hall and corn exchange, erected in 1866 in the Italian style, and a large board school. A hydropathic establishment has recently been opened. Leather gloves are the principal manufacture of the town ; and it has tanneries, wool-staplers' yards, a brewery, and an irou and brass foundry. In the neighbourhood there are extensive market gardens and nurseries. The popula- tion of the township in 1871 was 5331, and of the parish

6437.

Hexham is supposed by some to have been the Axelodunum of the Romans, but although in all probability it was a Roman station, the similarity in the names is too slight to establish the identity. By the Saxons it was called Hextoldesham and Halgulstad from two ot the neighbouring streams, Wilfrid, who founded the monastery and church in 673, received from Queen Etheldreda a grant of the town and a large surrounding tract of country. In 681 the southern portion of Bernicia was formed into the

diocese of Hexham, which comprised the county of Durham and the greater part of North- umberland. In 821 Hexham was united to the dioccse of Lindis- farnc, after which it formed part of Durham, then of York until 1837, when it was restored to Durham. In 875 the town was plundered by the Danes and the monastery destroyed. In 1138 the monastery was plundered by the Scots, and in 1296 they again attacked the town and destroyed the nave of the conventual church. In the reign of Henry VIII. the last prior of Hexham was in 1536 hanged at the gate of the monastery for being concerned in the insurrection called the Pilgrimage of Grace.

See the old History of the Church of Hexham by Prior Richard ; Loman Hexham and Hexham Church in Archeologia Ailiana, new series, vol. v.; Wright's History of Hexham, 1823; The Priory of

Hexham, tts Chroniclers, Endowments, and Annals, cdited for the Surtces Society by James Raine, 1864-65 ; Hewitt, A Handbook to Hexham and its Antiquities, Hexham, 1879.

HEYDEN, Jan VAN DER, was born at Gorcum in 1637, and died at Amsterdam on the 12th of September 1712. He was an architectural landscape painter, a contemporary of Hobbema and Jacob Ruysdael, with the advantage, which they lacked, of a certain professional versatility; for, whilst they painted admirable pictures and starved, he varied the practice of art with the study of mechanics,

improved the fire engine, and died superintendent of.

the lighting and director of the firemen's company at Amsterdam. 'Till 1672 he painted in partnership with Adrian van der Velde. After Adrian's death, and probably because of the loss which that event entailed upon him, he accepted the offices to which allusion has just been made. At no period of artistic activity had the system of division of labour been more fully or more constantly applied to art than it was in Holland towards the close of the 17th cen- tury. Vander Heyden, who was perfect as an architectural draughtsman in so far as he painted the outside of build- ings and thoroughly mastered linear perspective, seldom turned his hand to the delineation of anything but brick houses and churches in streets and squares, or rows along canals, or " moated granges," common in his native

country He was a travelled man, had seen the Hague, Ghent, and Brussels, and had ascended the Rhine past Xanten to Cologne, where he copied over and over again the tower and crane of the great cathedral. But he cared nothing for hill or vale, or stream or wood. He could reproduce the rows of bricks in a square of Dutch houses sparkling in the sun, or stunted trees and lines of dwellings varied by steeples, all in light or thrown into passing shadow by moving cloud. He had the art of painting microscopically without loss of breadth or keeping. But he could draw neither man nor beast, nor ships nor carts; and this was his disadvantage. His good genius under these circumstances was Adrian van der Velde, who enlivened his compositions with spirited figures ; and the joint labour of both is a delicate, minute, transparent work, radiant with glow and atmosphere, and most pleasant to look at. Almost all Van der Heyden's pieces are inscribed with his name alone, as if Van der Velde had been but a sleeping partner in his work. Like Heusch, he formed the first letters of his name into a monogrammatic interlacement. Very few of his pictures are dated. One, a street ina Dutch town, of 1666, is in the Hope collection in London. Two of 1667, a bridge on a canal, lined with houses casting their reflexions into the water, and the town-house at Amsterdam, are in the galleries of the Hague and Florence. Another view of the dam and town-hall at Amsterdam, dated 1668, is in the Louvre. A church and houses in the museum of Dresden is inscribed 1673, In all there are seventy or more of Van der Heyden's works fairly accessible to the public—those which are least so being chiefly in English private collections. Eight capital examples are in the Herntitage at St Petersburg, two of which are views in Cologne. Four are in the London National Gallery, four at Amsterdam and Dresden. Munich and Cassel have two apiece, and two very fine ones are in Buckingham Palace. The rest are in public and private galleries in Vienna, Paris, Frankfort, and Carlsruhce.

HEYDUKE. See Haspux.

HEYLIN, Peter (1599-1662), an historical and polemi- cal writer, born at Burford, Oxfordshire, 29th November 1599, was the second son of Henry Heylin, gentleman, who belonged to an old Montgomeryshire family. Being of a studious turn of mind, Heyliu was entered at Hart Hall, Oxford, in 1613; was of Magdalen College, 1615; B.A., July 1617; M.A., 1620; B.D., 1629; D.D., 1633. In July

1618 he began to read college lectures on cosmography (.¢., geography) with such acceptance that his associates made him fellow of Magdalen. The lectures, under the title of Microcosmos, were published in 1621; and many editions of this useful book, each somewhat enlarged, subsequently appeared, until scarcely any scholar's library was without a copy. In-1625 he published his observations on a journey to France. This book—which was frequently reprinted— Southey termed "one of our liveliest books of travel in its lighter parts, and one of the wisest and most replete with information that was ever written by a young man." After obtaining the patronage of Laud, whose life he wrote, Heylin was made chaplain to Charles I. His legendary and learned JZistory of St George of Cappadocia procured for him the rectory of Hemmingford, Hunts ; his hearty attachment

to the High-Anglican party brought many other prefer-

ments; and his analysis of Prynne's Histriomastix was rewarded by the rectory of Islip. He was also made a prebendary of Westminster (9th November 1631), treasurer to the chapter (1637), and subsequently sub-dean. Here he was the bitter opponent of the rule of Bishop Williams, the commendatory dean. With great ardour Heylin entered into the religious controversies which preceded the war, being equally hostile to the Puritan element within and without the church. He was consequently singled out for punishment by the committees of the Long Parliament, who deprived him of benefices worth £800, and heavily fined him. An amusing anecdote he tells affords proof of his unpopularity in London, and at the same time shows how his Cosmography was appreciated. As he passed along the street a fellow "'shouldered" him with the remark, 'Geography is better than Divinity." For seven years, he says, his name was in almost every libel. He retired to his Hampshire parsonage of Alresford until Waller's army disturbed him. Robbed there of his library, valued at £1000, and his property, he went to Oxford, where from Ist June 1643 he edited Mercurius Aulicus, a vivacious but virulent news-sheet which greatly annoyed the Parliamentarians. His Hxtraneus Vapulans, written against L'Estrange (who wittily retorted that a prelate should be '"'no striker"), refers to his sufferings and hardships. The necessary quiet for his literary pursuits was

ultimately found at Lacy's Court, Abingdon, whence were dated several books and pamphlets against those of his own communion whose opinions were not as unyielding as his, as also against the Presbyterians and others, controversies in which Ussher, Fuller, Baxter, and Harrington were concerned. His works, all more or less marred by political or theological rancour, were upwards of fifty in number; and they comprise histories of Episcopacy, of the Reformation, and of the Presbyterians, with a useful J/elp to English History. Some verses of merit also came from his active pen; and his poetical memorial of Bishop Waynflete was published by the Caxton Society in 1851. Heylin was a diligent writer and investigator, a good ecclesiastical lawyer, and had his learning always at command. His principles, to which he was honestly attached, were defended with ability ; but his efforts to uphold the church passed unre- cognized at the Restoration. His sight began to fail him ; yet he rejoiced that his "' old bad eyes" had seen the king's return. Upon that event he preached a jubilant sermon in Westminster Abbey to a great audience, 29th May 1661. He died on 8th May in the following year, and was buried two days after under his sub-dean's seat.

Lives of Heylin were written by Dr John Barnard, his son-in-law, and by George Vernon. Barnard's work was very carefully reprinted,

with notes, in the History of the Reformation, published, 1849, by the Ecclesiastical History Society.

HEYNE, Curistran Gorrios (1729-1812), one of the most distinguished critics and archeologists of the modern

school of which Ernesti and Gesner were the founders, was born on the 25th of September 1729, in a suburb of the city of Chemnitz in Saxony, where his father, who had been compelled by some religious persecutions to abandon his native country of Silesia, earned a precarious support for his family by exercising the trade of a weaver. It was only by the liberality of his godfathers that Heyne was enabled to obtain his primary instruction in the elementary school of Chemnitz, and afterwards to prosecute his classical studies in the gymnasium of that city. In 1748 he entered the

university of Leipsic, with the professed intention of studying for the legal profession. There he was so scantily supported by those on whose assistance he relied that he was frequently in want even of the common necessaries of life, and was sometimes indebted for food to the generosity of a maid-servant in the house where he lodged. In this situation, without even the hope of future distinction, he continued to struggle on against every difficulty and dis- appointment in the acquisition of knowledge. For six months he is said to have allowed only two nights in the week to sleep, and he was at the same time forced to endure his godfather's reproaches for negligence in the prosecution of his studies. His distress had almost amounted to despair, when he procured the situation of tutor in the family of a French merchant resident in Leipsic, He was thus enabled to continue his studies, though with much interruption,—the enloluments of his appointment being sufficient to support him in what was at least comparative comfort. Under Ernesti he was initiated into the criticism of the classical authors ; from the prelections of the celebrated Bach he acquired a competent knowledge of Roman jurisprudence ; and by Christius, who lectured on archeology, his atten- tion was strongly directed to the works of ancient art. Even after he had finished his studies at the university, he was exposed for many years to all the accumulated distresses of poverty and neglect. The first situation he was able to procure was that of copyist in the library of Count von Brith] in Dresden, with a salary of somewhat less than twenty pounds sterling, which he obtained in the year 1753. From the necessity of adding something to this scanty pittance, he was forced to employ himself in the drudgery of translation; and, besides some French novels, he rendered into German the Greek romance of Chariton. He published his first edition of Z'baullus in 1755, and in 1756 his Lpzctetus. In the latter year the Seven Years' War broke out; Dresden was entered, and the Saxon archives seized; the Briihl ministry fell ; and Heyne was once more in a state of absolute destitution. In 1757 he was offered a tutorship in the household of Frau von Schénberg, and there he first became acquainted with Teresa Weiss, whom he subsequently married. In January 1759 he accompanied his pupil to the university of Wittenberg, at which more than a year was spent in the study of philosoply and German history, but from which he was driven in 1760 by the Prussian cannon. The bombardment of Dresden (to which city he had meanwhile returned) on July 18, 1760, destroyed not only his humble lodging but also all his worldly

possessions, which included amongst other valuable papers an almost finished edition of Lucian based on a valuable codex of the Dresden Library. In the summer of 1761 he married, although still without any fixed means of support ; and for some time he found it necessary wholly to suspend his literary pursuits that he might devote himself to the duties of the office of land- steward, to which he had been charitably appointed in the household of the Baron von Lében in Lusatia. He was enabled, however, to return to Dresden in the end of 1762, where he was commissioned by Lippert to prepare the Latin text of the third volume of his Dactyliotheca. At length, in the commencement of the year 1763, Heyne's XI. — 99

merit met with its reward, and a new and illustrious career was opened to him. On the death of Johann Matthias Gesner at Gottingen in 1761, the appointment to the vacant cbair had been first offered to Ernesti, who, however, declined leaving the university of Leipsic, but proposed Ruhnken of Leyden or Saxe of Utrecht for the appoint- ment. Ruhnken likewise refused it, but having been strongly impressed with the taste and learning displayed by the editor of Tibullus and Epictetus, he advised Miincli- hausen, the Hanoverian minister and principal curator of the university of Géttingen, to bestow the professorship on Heyn$, whose merit, though known to few, he was con- fident would do honour to the choice. The minister had the good sense to acquiesce in thle recommendation of this great scholar, and Heyne, after some delay, became pro- fessor of eloquence in Gottingen. Though his appoint- ments were at first few and his emoluments inconsiderable, these were gradually augmented in proportion as his use- fulness was proved, and his growing celebrity rendered it an object with the other Governments of Germany to secure the services of so distinguished a scholar, He refused the most advantageous and honourable overtures from Cassel, Berlin, and Dresden. As professor, principal librarian, member of the Royal Society, and chief editor of the Gelehrte Anzeigen, and still more by his publications, he greatly contributed to raise the university of Gottingen to the distinguished rank it still holds among the seminaries of Europe. After a long and useful career, graced witli all the distinctions which in Germany are conferred on literary eminence, he died, full of years and honour, on the 14th of July 1812.

Besides Tibullus (1755; 4th ed. by Wundcrlich in 1817) and the Enehiridion of Epictetus (1756; 2d ed. 1776), he edited Virgil (1767-75; new ed. by Wagner, 1830-44), Pindar (1773; 3d cd. 1817), the Bibliotheca Groeea of Apollodorus (1782; 2d cd. 1803), and the Ziad (1802),—all illustrated with copious commentaries. His Opuseula Academiea, in six vols. (1785-1812), contain a serics of more than a hundred academical disscrtations, of which the most valuable are those respecting the colonies of Greece and the antiquities of Etruscan art and history. He Icft also a great number of papers on almost every subject of erudition, more especially on ancicnt mythology, among the Commentationes Socictatis Regi Gottingensis, His Antiquarische Aufsdtze, in two vols., comprise a valuable collection of essays connected with the history of ancient art. His contributions to the Géttinger Gelehrte Anzeigen arc said by Heeren to have been betwecn 7000 and 8000 in number. In the earlier part of his life he translated, or rather wrote anew, a great part of the Universal History. Sce Heeren, Heyne's Biographie (1813), which forms the basis of the interesting essay by Carlyle, originally published in the Foreign Review (1828), and now re-printed in his Aftseellanies, vol. ii.

HEYWOOD, a manufacturing town of Lancashire, is situated on the Roch, and on the Lancashire and Yorksliire Railway, 3 miles east of Bury and the same distance south- west of Rochdale. It possesses several handsome churches and chapels, among which may be mentioned St Luke's church, erected in 1860, with a tall spire and a peal of bells. The other principal buildings are the national school, the mechanics' institute, the new Conservative club-house, and the market-hall. A new park—the Queen's Park— purchased and laid out at the cost of £11,000 with money which devolved to Her Majesty in right of her duchy and county palatine of Lancaster, was publicly opened on the 2d of August 1879. Heywood Hall in the neighbourhood of the town was at one time the residence of Peter Heywood, who contributed to the discovery of the Gunpowder Plot. Heywood owes its rise to the enterprise of the Peels, its first manufactures having been introduced' by the father of the first Sir Robert Peel. It is an important seat of the cotton manufacture, in connexion with which it has upwards of fifty factories, and there are in addition power-loom factories, iron foundries, boiler-works, and railway waggon works. Coal is wrought extensively in the neighbourhood. The population in 1871 was 21,248.

HEYWOOD, Joun (c. 1500-1565), sometimes styled "the Epigrammatist," was born, it is not known in what year, at North Mims near St Albans. He was educated at Oxford, and afterwards made the acquaintance of Sir Thomas More, who introduced him at court. His skill in music and his inexhaustible fund of ready wit made him a special favourite of Henry VIII., and afterwards of his daughter Mary. On thie accession of Elizabeth, Heywood, who was a zealous Catholic, retired to Malines in Belgium, where he died in 1565. A collection of his works was published in 1562.

His longest single composition is the allegorical work, written in the octave stanza, entitled The Spider and the I'ly (1556), in which the flies are the Roman Catholics and the spiders the Protestants, while Queen Mary is represented by the housemaid with her broom (the sword), exccuting the commands of her master (Christ) and her mistress (the church). It has been justly characterized by Warton as dull, tedious, and trifling. Of greater literary interest are the Interludes (4 Play between Johan the Husband, Tyb the Wife, and Sir Johan the Priest; A merry Play between the Pardoner and the Irriar, the Curate and Neighbour Prat; The play ealled the four P's, anew and very merry Interlude of a Palmer, a Pardoner, a Potyeary, and a Pedlar; A Play of Genteelness and Nobility ; A Play of Love; A Play of the Weather) which form a connecting link between the old moralities and the modern drama, and were extremely popular in their day. They generally represent some ludicrous incident of a homely kind in a style of the broadest farce, but in their way dis- play considerable skill and talent. Other works of Heywood are a comic poem in long verse entitled A Dialogue containing im effeet the number of all the Proverbs in the English tongue compact in a matter concerning two marriages; and three collections of Epigrams.

HEYWOOD, Tomas, a voluminous dramatist and miscellaneous author of the 16th and 17th centuries, was born in Lincolnshire and was educated at Cambridge, where he became a fellow of Peterhouse. The dates of his birth

and death are alike unknown, and the few facts of his life –

that are preserved have been gleaned chiefly from his own writings. He is mentioned in the MS. book of Henslowe as having written a book or play for the Lord Admiral's Company in October 1596; and from the same source we learn that in 1598 he was regularly engaged as a player and a

sharer in that company. In the preface to The Hnglish Traveller, written in 1633, he describes himself as having had "an entire hand or at least a main-finger in two hundred and twenty plays." Of this number, which probably afterwards was considerably exceeded (for we find him still writing in 1640, and indeed his last published piece did not appear until 1655), only three and twenty survive ; but they amply attest that had he chosen to concentrate his powers, he might easily have ranked with the Massingers, Fords, and others of his great contemporaries. "Heywood," says Charles Lamb, "is a sort of prose Shakespeare; his scenes are to the full as natural and affecting." His facility and variety are almost without a parallel, his fancy was inexhaustible, and his invention never at a loss; but he delighted to excess in what he called "merry accideuts, intermixed with apt and witty jests," or in other words, in the broadest and coarsest farce. His best pieces, such as A Woman Killed with Kindness, Fortune by Land and Sea, The English Traveller, and The Fair Maid of the West, lie chiefly in the department of what has been called the domestic drama.

Besides his dramatic works, which werc partly reprinted by the " Shakespeare Society," and were published in a complete cdition of six vols. with notes and illustrations in 1874, he was the author of Trota Britannica or Great Britain's Troy (1609), a poem in seventeen cantos "intermixed with many pleasant poetical tales" and "conclud- ing with an universal chronicle froin the creation until the present time ;" An Apology for Actors, containing three brief treatises (1612) ; Tuvaietov or nine books of various history eoneerning women (1624) ; England's Elizabeth, her Life and Troubles during her minority from the Cradle to the Crown (1631); The Hierarchy of the Blessed Angels (1635); Pleasant Dialogues and Dramas seleeted out of Lueian, &c. (1637); and The Life of Merlin surnamed Ambrosius

(1641).

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HEZEKIAH (2M), VPN, MPM? or MUPIN " Jehovah makes strong" ; "E@exias ; Hzechias; the Ha-za-ki-ya-hw or Ha-za-ki-a-hu of the Assyrian

inscriptions), one of thie greatest and best of the kings of Judah, succeeded his father Ahaz when still a young man (at the age of twenty- five according to 2 Kings xvili. 2; and this is probably correct if the LXX. be followed in reading " twenty-five " instead of "twenty " in 2 Chr. xxviii. 1; cf 2 Kings xvi. 2). The year of his accession was most probably 717 B.c.;} and he ruled for twenty-nine years with a vigour and a success that deeply impressed later historians ; " he trusted in the Lord God of Israel ; so that after him was none like him among all the kings of Judah, nor any that were before hin" (2 Kings xviii. 5; cf. Ecclus, xlviii. 17-25). The very outset of his reign was marked by an emphatic reversal, both in foreign and in domestic affairs, of the policy which had been so disastrously followed by his weak and foolish predecessor. While Ahaz had shown distinctly paganizing tendencies in religion, Hezekiah was ardent in his zeal for the exclusive worship of Jehovah, which he sought to simplify, centralize, and refine even at the expense of abolishing many cherished institutions which had the sanction of ancient usage. 'He removed the high places, and brake the pillars, and cut down the Asherah, and brake in pieces the brazen serpent that Moses had made; for unto these days the children of Israel did burn incense to it; and he [or, perhaps, they] called it Nehushtan" (ze. according to the A.V., "brazen" ; but, if this was the popular name, it is probably derived from nakash, serpent; see 2 Kings xviii. 4). How great were the strength of conviction and the courage which were necessary to such reforms as these is incidentally shown by the appeal to conservative feeling which some years afterwards could still be made by a skilful diplomatist with at least some hope of success (2 Kings xviii, 22). The details of the reforming activities of Hezekiah, extending even to the northern kingdom, as given with characteristic fulness and minuteness by the compiler of the book of Chronicles, are not now accepted by the majority of critics as absolutely trustworthy, a pre- valent opinion being that actions have been attributed to Hezekiah which ought really to have been assigned to Josiah, and that some at least of the chronology is imaginary ; but it is obvious that the influence of such prophets as Isaiah and Micah must have been powerful enough to bring about many tliorough-going changes even during the earlier reign. As in the internal religious affairs of the theocratic kingdom so in its relations with foreign powers Hezekiah innovated very conspicuously on the policy of his father, although not here entirely on the lines laid down by the great contemporary prophet. Confirmed in the

conscious- uess of military strength by a successful war against the Philistines (2 Kings xviii. 8), and having no longer any- thing to fear either from Damascus or from Samaria, he began to cherish the hope (at least with Egyptian support and the active co-operation of Egyptian cavalry) of being able to shake off entirely the yoke of Assyria, and with this view he set about extensive fortifications and other eugineering works in and about Jerusalem. "Ile made

1 Hales and Ussher gave respectively 727 and 725 B.c.; and these dates were accepted as close approximations by all subsequent chrono- logists until the decipherment of the Assyrian inscriptions, when it became apparent that the destruction of Samaria by Sargon and the Augypto-Palestinian expedition of Sennacherib were separated by a wider interval than eight years, and therefore that 2 Kings xviii. 10 _ and 2 Kings xviii. 18 cannot both be right. In the present article the chronology of Schrader (art. "Sanherib," in Schenkel's Bibel-Lexicon, i.; comp. Die Ketlinschriften u. das Alte Testament) is that which is substantially followed. A full exposition of the bearings of the cuneiform inscriptions on the chronology of the Bible must be post-

poned to the article on the history of Israel. See also BABYLONIA, vol. ii, p. 187.

the pool and the conduit and brought the water into the city," "stopping the upper outlet of Gihon and bringing it straight by an underground way ;" he also "built up all the wall that was broken, and raised thereupon towers" (2 Kings xx. 20; 2 Chr. xxxii. 5, 305 and of. Tsahaai: 8-11, which also has been referred by the sagacity of Ewald to this period). It is not clear from the sacred historians how far Judah was affected by the successful expedition of Sargon against Ashdod in 711 3.c., which is mentioned in Isa. xx. 1 (and in which possibly Sennacherib may have held the rank of a rabsaki or general); but Ewald's bril- liant conjecture, to the effect that Isa. xxii. 1 sqq. alludes to hardships suffered by the people of Hezekiah at that time, is remarkably confirmed by the cuneiform inscriptions. It was not, however, until after the accession of Sennacherib (705) and the resolution of that monarch to direct one of his great expeditions against Egypt (c. 701), that matters were brought to a sharp and immediate crisis between Nineveh and

Jerusalem. ‘The capture of all his “fenced cities,” Jerusalem excepted, coupled with the inactivity of Egypt, convinced Hezekiah of the uselessness of a struggle with the greatest military power of his century, in a way } that Isaiah, with often repeated admonitions, had failed to do; aud the payment of a large sum of money by way of tribute readily purchased a temporary relief. But when Sennacherib sent from Lachish his “ tartan,” or commander- in-chief, along with the “rab-saris,” or head eunuch, and the “rab-shakeh,” or chief of the staff (the rendering “chief cup-bearer” seems based on a wrong etymology), with a large foree to demand the surrender of Jerusalem itself, it was felt by king and prophet alike that the time for resistance to the utmost had come. Probably the resolution thus formed was in part, at least, due to the fact that the main body of the Assyrian army was already finding it necessary to fall back before Tirhakah, the

‘Ethiopian king of Egypt, from Lachish to Libnah ; it was

*at all events justified, not only by the indecisive battle at Altaku near Ekron, but also by the pestilence (2 Kings xix. 35) which speedily compelled the withdrawal of Sennacherib with the remains of his army from Libnah to Nineveh. The “— relation between the accounts of this retreat given by Sen- nacherib himself, by the sacred historians, and by Herodotus (ii. 141) will be considered in the article SENNACHERIB. The sickness and recovery of Hezekiah, recorded in 2 Kings xx. 1-1] and (with additional details) in ‘Isa, xxxviii, * seem to have preceded the invasion of Sennacherib by © three years at most; they were almost immediately fol- lowed by the arrival of the messengers of Merodach (not Berodach) Baladan, the son of Baladan, who for some six months, until repressed by Sennacherib, usurped the throne of Babylon about the year 703.. The excessive courtesy shown to these ambassadors gave occasion, it is recorded (2 Kings xx. 17, 18), to a prediction by Isaiah of the Babylonian exile, which took place more than a century afterwards. Of the later portion of Hezekiah’s ~ reign no details have been preserved ; but it appears to have been characterized by peace and prosperity. He was succeeded in 688 by Manasseh, his son by Hephzibah, born appareutly about 702. Besides being a patron of literature (Prov. xxv. 1), Hezekiah was himself a poet ; and his sole remaining production (Isa, xxxvili. 10-20), if somewhat deficient in originality, abounds in depth and tenderness of religious and poetic feeling.*

HIBERNATION (frequently, but less correctly, written HyYBERNATION) is the term employed by naturalists to denote the peculiar state of torpor in which many animals which inhabit cold or temperate climates pass the winter. In hot and dry countries, on the contrary, various animals pass into a similar condition during the hottest season of the year; and this state is called "/¢stivation." Several

of the animals which hibernate during the winter are liable to fall into a similar state at intervals during mild weather, and Dr Marshall Hall has applied the term "' Diurnation " to the day-sleep of bats, which he regards as precisely ana- logous to hibernation.

Mammatra.—Although comparatively few mammals hibernate, the phenomena of hibernation and similar con- ditions have been better studied in this class than in any other. Dr Marshall Hall has laid down the principle tliat the amount of respiration is inversely as the degree of irritability of the muscular fibre. Every gradation may be mét with between ordinary sleep, the imperfect or abnormal hibernation of some animals, and the profound hibernation of others, in which all the 'functions of life aré almost suspended. Such a condition is always accom- panied by reduced respiration, and increased irritability of the muscular fibre. If the respiration is reduced without this irritability being increased, death results from torpor and asphyxia, whereas, if the respiration is increased simul- taneously with increased irritability (as when an animal is aroused too suddenly), death likewise results from too great stimulation of the vital powers, The well-known danger of suddenly awakening a patient from a state of somnam- bulism is doubtless due to a similar cause.

Ilibernation, however, is a physiological condition, and not produced simply by cold, though it is favoured by it, because cold induces sleep, which may afterwards pass into hibernation. It is an error to suppose that hibernating animals are capable of resisting any amount of cold, though their capacity of doing so must vary according to their species and to the climate which they inhabit. They always seek secure hiding-places where they may be pro- tected from too great a degree of cold, as well as from interference. During hibernation the temperature of their bodies sinks to a point corresponding

nearly to that of the surrounding atmosphere; but if they are exposed to an unusual amount of cold, they are first awakened by it, and then sink into a fatal torpor like other animals. Many hibernating animals perish in this manner during severe winters,

Respiration being almost suspended during hibernation, the maintenance of vitality depends almost wholly on the action of the heart, which will continue for a long time after an hibernating animal has been decapitated. Animals may also bé placed in carbonic acid or under water for several

hours, without injury, when in this condition, though they .

would die in a very few minutes if they were in their normal state,

Man.—Long-continued suspension of consciousness in man, whether voluntary or otherwise, is rare in temperate climates, but it is more frequent in India, where some religious ascetics are stated on unimpeachable authority to possess the power of throwing themselves into a state closely resembling hibernation for an indefinite period. Many curious cases have been recorded by Mr Braid in his small treatise on Human Hybernation, published in 1850, the most celebrated of which is that of a fakir who was actually buried alive at Lahore, in 1837, in the presence of Runjeet Singh and Sir Claude Wade, and who was dug up and restored to consciousness several months afterwards, after every precaution had been taken to prevent any one from disturbing the grave in the interval.

Bats.—Dr Marshall Hall says that the hibernating bat never wakes at all, except from warmth or excitement, and that the digestive functions are suspended to a far greater degree than in the dormouse or hedgehog. Respiration is also suspended, and when the animal is disturbed it quickly subsides again into total quiescence, after a few feeble respirations. It is to be regretted that Dr Hall has not stated to which species of bat his remarks refer, as the

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habits of the various species differ. ‘Earlier or later in autumn, according to the species, they retire to caves, hollow trees, and similar hiding-places,

where they cluster together, hanging head downwards by their hinder claws, and clinging to each other, as well as to the walls and sides of their retreat, so that a great number can crowd theinselves into an amazingly small space. Although such assemblies frequently consist of more than one species, yet the various species do not all retire to their winter quarters at the same period ; the noctule is rarely seen abroad later than July, whereas the pipistrelle may be seen flying on mild evenings almost every month in the year. It is only natural to suppose that the hibernation of the former species is much more profound than that of the latter, which doubtless feeds in winter as well as summer; for though insects are far less numerous in winter than in summer, yet some species appear only at that season of the year.

Bear and Badger.—These animals retire to winter quarters in northern climates, and pass the greater part of their time in sleep; but the brown bear and badger do not fall into a state of genuine hibernation. When the bear retires for the winter, he is very fat, and it is said that the black bear will not hibernate if this is not the case. Digestion is suspended, and his intestines become stopped up with an indigestible mass chiefly composed of pine leaves, which is ;not discharged till spring. The brown bear of Europe and Siberia is very dangerous if disturbed during the winter; but the black bear of America can scarcely be aroused from his torpor, which there is thus reason to believe is a state of true hibernation, differing from that in which the former species passes the winter.

Hedgehog.—This animal hibernates more completely than almost any other. In the autumn it retires to a hole among rocks or under the roots of a tree, where it remains for the winter, seldom or never awakening till spring, and of course taking no food until then. If a sleeping hedge- hog is disturbed, it merely stirs, and then coils itself up more closely ; but if a hibernating hedgehog is interfered with, it takes a deep sonorous inspiration, followed by a few feeble respirations, and then by total quiescence. The tenrec, an allied animal found in Madagascar, sleeps for three months in its burrow during the hottest period of the year.

Rodentia.—Several animals belonging to this order hibernate more or less completely, among which we may mention the hamster, the porcupine, the

dormouse, the squirrel, and the marmot. Several of these awake at intervals to feed, and therefore lay up a store of provisions before they retire, although they all become very fat before winter. Other species of this order hibernate less perfectly, or only occasionally, like the hare, which will lie beneath deep snow in a small cavity, just large enough to receive her body, for some weeks unharmed. But this is not true hibernation, as respiration is maintained during the whole time, a small air-hole being always kept open by the warm breath of the animal. Ina similar manner sheep (though belonging to a very different order of animals) have some- times been buried in snow-drifts in Scotland for several weeks without sustaining any injury. The dormouse not only hibernates in the strict sense of the term, but will sleep at intervals for several days together during mild weather. When a J/yoxus, an allied animal inhabiting Africa, was brought to Europe, it hibernated as if this were its normal habit. Whether it zstivates in its native country is not known, but its hibernating in Europe shows a greater power of adapting itself to changed conditions of life than we should have been inclined to suspect.

Aves AND Pisces.—It was formerly supposed that various species of swallows hibernated, and it was even asserted that the sand martin was accustomed to bury itself

in the mud at the bottom of the water; but tlua has long been regarded as an exploded error. For the hibernation of fish, compare the article on IcHTHYOLOGY.

AmpuHiIBiA AND Reprinia.—All the animals belonging to these classes hibernate in cold or temperate climates. Land tortoises bury themselves in holes in the ground, and fresh-water tortoises in the banks or at the bottom of lakes and rivers. Lizards and snakes retire to holes in trees, under stones, or among dead leaves, where many species congregate in large numbers, and pass the winter closely entwined, and in a still more torpid condition than that of the hibernating mammals, their digestion and respiration being entirely suspended. Many tortoises, crocodiles, and serpents bury themselves in mud in both South America and Africa, aud estivate in the hard-baked ground during the dry season of the year. When the viper is

disturbed during the winter its bite is harmless ; but this is not the case with the venomous serpents which estivate in tropical countries.

Frogs generally hibernate in masses in the mud at the bottom of the water, and if awakened from hibernation by warmth can remain eight times longer under water without drowning than frogs in the breeding season. We should hardly expect the habits of such an animal as the frog to be greatly affected by domestication, but Professor Bell was acquainted with a gentleman living at Kingston, whose kitchen was built on the banks of the Thames, and whose servants made a pet of a frog which had his hole in the skirting, It was unnecessary for the frog to hibernate, and instead of doing so he came out of his hole every even- ing to bask before the kitchen fire for three successive winters. It is impossible to say how long frogs and toads may continue to retain a dormant life, if the mud in which they bury themselves should become hardened around them during hibernation. Too many circumstantial accounts of the discovery of live toads embedded in solid rock, and even in coal, have been published to allow us to dismiss them all as fabulous, notwithstanding the difficulty and obscurity in which this subject is still involved.

Mo.tiusca.—Many species hibernate. The land-snails bury themselves in the ground, or conceal themselves under the bark of trees, in holes in walls, or even in the stems of large umbelliferous plants. They close the mouth of the shell with a calcareous plate, technically called an epiphragm, which they secrete by means of their mantle, and which is perforated by a small hole to admit the air. In winter they bury themselves with the head upwards, and do not grow at all during the winter; but while growing they bury themselves in summer, with the head downwards, at occasional intervals, for several days together, and then grow very rapidly. Snails are not considered in season at Paris till after the first frost, when they are closed with a white epiphragm. In dry weather, and during the heat of summer, snails also close their shells with an epiphragm, to protect themselves from drought, but this covering is thinner than that which they construct during the winter. In the British Museum is preserved the shell of a specimen of Helix desertorum, from Egypt, which revived after having been gummed to a board for four years' in the Museum, and lived for ~

two years afterwards. @i\ Other instances of the & revival of land-shells

after a still longer period are equally well authen- ticated. .Some species retire to winter quarters earlier than others, and their pulsation, which ranges from 30 to 110 during summer, ceases entirely in winter. Slugs also bury themselves in

Helix Desertorum,

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the ground, and become torpid during frosts or droughts,

but it is doubtful whether their condition is that of genuine

hibernation. The fresh-water mussels (Anodonta) hibernate

before the close of autumn, and bury themselves in the mud

till the beginning of spring. It is believed that many of. the marine Jollusca also hibernate, but very little is known

of their habits at present.

Insecta.—Most of the insects which pass the winter as larvee or perfect insects hibernate during the period that they can obtain no food. Larve which are full grown in autumn frequently lie dormant during the winter, and do not assume the pupa state till spring. In the case of insects which

~~*have more than one brood in the year, the last brood gene*~~

rally hibernates, sometimes retiring to winter quarters quite early in the autumn, while the perfect insects of the pre- vious brood are still flying about, and while the weather is still fine and warm. Insccts which hibernate in the perfect state do not pair till spring, and are probably not fully developed till after hibernation. Hive-bees probably do not hibernate, and it is well known that they require food during the winter. It is asserted that the aphides, on whose swect secretion ants chiefly subsist in inclement weather, become torpid at exactly the same low temperature as the ants tliemselves.

ConcLupinc Remarks.—The seeds of many plants, and the eggs of many of the lower forms of animal life, may remain dormant for years in cold or dry climates, until heat or moisture awakes them to vitality. Many plants die down in winter, the roots remaining in the ground, while many trees then shed tkeir leaves, the sap retiring to the roots. Similar phenomena take place in tropical countries during the hot, dry season, wherever the amount of humidity in the atmosphere is insufficient to maintain a perennial vegetation during the year. These phenomena in the vegetable world are regarded as analogous to those of hibernation in animals, and the term "hibernation of plants " is sometimes applicd to them.

Dr Marshall Hall, in Todd's Cyclopedia of Anatony and Physiology, art. ' Hibernation"; Braid's Observations on Tranees or Human Hybernation; Bell's British Quadrupeds and British Reptiles ; Humboldt's Views of Nature ; Gwyn Jeffrey's British Conchology ; Tate's Land and Fresh-water Mollusca ; Kirby and Spence's Inéro- duction to Entomology, &c. é; (W. F. K.)*

HICKES, Georez (1642-1715), a learned English divine of the nonjuring party, and an eminent Auglo-Saxon scholar, was born at Newsham near Thirsk, Yorkshire, on June 20, 1642. In 1659 he entered St John's College, Oxford, whence after the Restoration he removed first to Magdalen College and subsequently to Magdalen Hall. In 1664 he was chosen fellow of Lincoln College, and in the following year proceeded M.A. On his return from a Con- tinental tour in 1673 he graduated in divinity, and in 1675 he was appointed rector of St Ebbe's, Oxford; in the following year he as

private chaplain accompanied the duke of Lauderdale, the royal commissioner, to Scotland ; and shortly afterwards he received the degree of D.D. from the university of Glasgow. In 1680 he became vicar of All Hallows, Barking, London ; and after having been made chaplain to the king in 1681, he,was in 1683 promoted to the deanery of Worcester. At the revolution of 1688, having declined to take the oath of allegiance to William

‘ and Mary, he was first suspended and afterwards deprived,— | he meanwhile affixing to the cathedral doors a “ protestation

and claim of right” that he was, and still did “continue to be, the only rightful and legal dean of this cathedral church of Worcester.” After remaining some time in con- cealment in London, he was employed by Sancroft and the other nonjurors on a mission to the Continent on matters connected with tlie proposed action of his party relative to the continuance of their episcopal succession; upon his return he was himself consecrated by Lloyd, White, and

Turner suffragan bishop of Thetford in 1694, His later years were largely occupied in controversies the interest of which has now almost wholly passed away ; but to them we owe the two works which constitute his chief claim to an enduring reputation, the learned Jnstitutiones Grammatice Anglo-Saxonice et Maeso-Gothice (1689), and Linguarum veterum Septentrionalium Thesaurus grammatico-criticus et archeologicus (1703-1705). In 1713 he united with Bishops Campbell and Gadderar to consecrate Jeremy Collier, Samuel Hawes, and Nathaniel Spinkes to be bishops in thegnonjuring church. He died December 15, 1715.

Even apart from the two works already mentioned, Hickes was a very voluminous and laborious author. His earliest performances, which were anonymous, were suggested by contemporary events in Scotland that gave him great satisfaction, —the execution of Mitchel on a charge of having becn implicated in the murder of Archbishop Sharp, and that of Kid and King, Presbyterian ministers, “ for high treason and rebellion” (Ravillac Redivivus, 1678; The Spirit of Popery speaking out of the Mouths of Phanatical Protestants, 1680). In his Jovian (an answer to Johnson’s Julian

the Apostate, 1683), he endeavoured to show that the Roman empire was not hereditary, and that the Christians under Julian had recognized the duty of passive obedience. His Zwo Treatises, one "On the Christian Priesthood" and the other "On the Dignity of the Episcopal Order," originally published in 1707, have been more than once reprinted, and form three volumes of the Library of Anglo-Catholie Theology (1847). In 1705 and 1710 were published Collections of Controver- sial Letters, in 1711 a collection of Sermons, and in 1726 a volume of Posthumous Discourses. Other treatises, such as the 4pologetical Vindication of the Church of England, are to be met with in Gibson's Preservative against Popery.

HICKORY. The hickory trees are natives of North America, and belong to the genus Carya of botanists. They are closely allied to the walnuts (Juglans), the chief or at least one very obvious difference being that, whilst in Carya the husk which covers the shell of the nut separates into four valves, in Juglans it consists of but one piece, which bursts irregularly. The hickory trees are of lofty growth, and are held in high estimation, both on account of their durable timber, and from the excellent nuts which some of the species produce. The timber is both strong and heavy, and remarkable for its extreme elasticity, but it is not much used either for shipbuilding or for architectural purposes, as it decays rapidly when exposed to heat and moisture, and is peculiarly subject to the attacks of worms. It is very extensively employed in manufacturing musket stocks, axle-trees, screws, rake teeth, the bows of yokes, the wooden rings used on the rigging of vessels, chair backs, axe- handles, whip-handles, and other purposes requiring great strength and elasticity. Its principal use in America is for hoop-making ; and when it is remembered how large a proportion of the productions of the United States is packed in barrels, some estimate may be formed of the consumption of hoops and of the consequent demand for hickory wood, which is the only American wood found perfectly fit for that purpose. ;

The wood of the hickory is of great value as fuel, on account of the brilliancy with which it burns and the ardent heat which it gives out, the charcoal being heavy, compact, and long-lived. The species which furnish the best wood are Carya alba (shell-bark hickory), C. tomentosa (mocker-nut), C. oliveformis (pecan or pacane nut), and C. porcina (pig-nut), that of

the last-named, on account of its extreme tenacity, being preferred for axle-trees and axe-handles. The wood of C. alba splits very easily and is very elastic, so that itis much used for making whip-handles and baskets ; the whip-handles are greatly esteemed for their suppleness, and considerable numbers of them are aunually imported into England. The wood of this species is also used in the neighbourhood of New York and Philadelphia for making the back bows of Windsor chairs. The timber of C. amara and C. aquatica is considered to be of inferior quality.

Most of the hickories form fine-looking noble trees of from 60 to 90 feet in height, with straight, symmetrical

trunks, well-balanced ample heads, and bold, handsome, pinnated foliage. When confined in the forest they shoot up 50 or 60 feet without branches, but when standing alone they expand into a fine head, and produce a lofty round- headed pyramid of foliage. They have, observes Downing, all the qualities which are necessary to constitute fine graceful park trees, aud are justly entitled to a place in every considerable plantation. The most ornamental of the

Fig. 1.—Shell-bark Hickory (Carya alba) in flower (} nat. size). 1, Femule flower (nat. size); 2, portion of male inflorescence (nat. size), species are C. oliveformis, C. alba, and C. porcina, the last two also producing delicious nuts, and being worthy of cultivation for their fruit alone.

The husk of the hickory nut, as already stated, breaks up into four equal valves or separates into four equal portions in the upper part, while the nut itself is tolerably even on the surface, but has four or more blunt angles in its transverse outline. he hickory nuts of the American markets are the produce of C. alba, which is called the

Fig. 2.—1, Fruit of Carya alba; 2, hickory nut; 3, eross seetion of nut; 4, vertieal section of the seed. All natural size.

shell-bark hickory because of the roughness of its bark, which becomes loosened from the trunk in long scales bending outwards at the extremities and adhering only by the middle. The nuts are much esteemed in all parts of the States, and are exported in considerable quautities to Europe. The

pecan-nuts, which come from the Western States, are from an inch to an inch and a half long, smooth, cylindrical, pointed at the ends, and thin-shelled, with the kernels full, not like those of most of the hickories divided by partitions, and of delicate and agreeable flavour. The thick-shelled fruits of the pig-nut are generally left on the ground for swine, squirrels, &c., to devour. In C. amara the kernel is so bitter that even the squirrels refuse to eat it.

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HICKS, Eras (1748-1830), founder of the Hicksites, one of the two great sections into which the Society of Friends in America has since 1828 been divided (see QUAKERS), was born at Hempstead, Long Island, on March 19, 1748. During the earlier part of his life he followed the business of a carpenter and housebuilder; but this occupation he latterly exchanged for that of farming. Rteared ia a Quaker family, he began, when about twenty-seven years of age, to "have openings leading to the ministry," and to be " deeply engaged for the right admin- istration of discipline and order in the church." In the intervals of business, accordingly, he began to visit the meetings and families of Friends throughout an extensive range of country; and soon he established a very consider- able reputation as an efficient and popular itinerant preacher. His first literary effort seems to lave been made no earlier than 1811, when he published Observations on Slavery ; those doctrinal divergences from the received orthodox creed of the Friends, by which his name was brought into the prominence it now possesses, appear not to have become

visible until 1820, when he wrote a Doctrinal Epistle

(published in 1824), which was followed by much contro- versy, and resulted in 1828 in the formal separation from the Hicksites of their more orthodox Quaker brethren. The points involved were justly considered to affect the funda- mental doctrines of the Christian religion, such as those of the Trinity, the Incarnation, and the supreme authority of Scripture. Hicks died at Jericho, Long Island, on February 27, 1830. See Journal of the Life and Labours of Elias Ticks (Philadelphia, 1828).

HIERAPOLIS. Of the many cities in the Greek world bearing this name the following are the most important.

1. A city of Syria Cyrrhiestica, situated on some hills about 16 miles south-west from the junction of the Euphrates and the Sajur. Besides the natural strength of its position, it was important as lying on the line of intercourse between Northern Syria and Mesopotamia, and was always a great trading city. Its early history is quite unknown. It is not mentioned during the Assyrian wars in this part of Syria (see Sayce, Academy, October 1876). Abul Fardz asserts that Josiah was defeated there by Pharaoh Necho (611 3.c.) on his march towards Car- chemish ; but according to 2 Chron. xxxv. 20 the battle took place at Carchemish, which lay on the Euphrates a little further north on the site of the modern Jerablis, or Jerabis ; and probably Abul Fardz confounded the two cities. The same confusion perhaps has caused the state- ment of Ammianus that Hierapolis was identical with Ninus Vetus on the Euphrates. Jerabltis is clearly a corruption of Hierapolis, by which name therefore Carchemish must at some time have been styled by the Greeks; but it is surprising to find two great cities of the same name so near one another. No proof exists that Hierapolis was an-im-portant city before the time of the Seleucid, and Professor Sayce suggests that it then succeeded to the trade and name of thie older city, which had now decayed. Its original name is given in Greek as Bayfv«n, which points back toa form Bambyg or Mambug, while the Syrian form is given by Pliny as Mabog, ¢.e., Mabbog for Mambog. The romance of trade by which this name has become natural- ized in many European languages deserves a passing notice. As the city lay on the highway to the East, cotton and silk were important branches of its trade. Probably cotton plantations existed there in old time; and after the culti- vation of silk was introduced to western Asia in the time of the Sassanian kings, large groves of mulberry trees sur- rounded the city. The name Mambe was afterwards con- founded with the Persian word pambe, silk; and the Greek form Bay Pvxy also was similarly mixed up with the

word Boufvé,! which originally denoted the fly supposed to spin on trees the cotton or silk (for the two substances were confused by the Greeks and

Romans) which men then gathered off the trees (Virg., Georg., ii. 121). Hence the "Bombycinz vestes" of the Roman writers; while the city itself is called "Bombycina urbs." In Asia cotton seems to have been known as a distinct article, and was named after the city which was the chief seat of its manu- facture, as muslin is from Mosul. By the crusaders the stuff and the name were carried to Europe, and the latter exists in English in the form "bombazine." The Syrian goddess Atargatis, called by the Greeks Derceto, a per- sonification of the nature power worshipped under different names over the whole of western Asia, had one of her most famous temples in the city; and perhaps Mambe may have been a local name of the goddess. Hence in the 3d century B.c., when, under the Seleucid kings, Bambyce became a great Greek city and the most important station between Antioch and Seleucia, it was called Hierapolis or Hieropolis. The latter form is found on coins, the former is used in classical literature. The coinage of Hierapolis begins under the Seleucid. The autonomous coins, pro- bably for commercial reasons, imitate closely the coins of Antioch. The temple was plundered by Crassus on his Parthian expedition (53 3B.c.). Under Diocletian or Constantine, Hierapolis became the capital of the new province of Euphratensis, a name which soon gave place to the older name Commagene. As paganism decayed, Hierapolis ceased to be the sacred city, and recovered its ancient name; at the same time its importance and popu- lation declined. In the time of Julian, who concentrated there the Roman troops for the fatal Parthian campaign, it was still one of the greatest cities of Syria; but under Justinian, who made some attempt to restore it, great part of its area was a desert, and the once strong fortifications were so decayed that the place was not defensible against the Parthian king Chosroes. At the Arab conquest it passed into the hands of the caliphs. Haroun-al-Raschid (786-808) restored it and strengthened its walls, and it is mentioned about 1150 by Edrisi as a strong city. As the empire of the caliphs dwindled, Mambedj became a frontier post in the struggle between Christians and Mahometans, and its possession carried with it the rule in this part of Syria. The emperor Romanus Diogenes captured it in his gallant struggle against the Turks (1068). Recaptured by the Seljuk Turks, it soon afterwards fell into the power of the crusaders, until it was stormed by Saladin (1175). It was for some time the headquarters of the Mongol host under Hulagu Khan; and, as with many other Syrian cities, its desolation dates from this time. The ruins which still exist called Kara Bambuche or

Buyuk Mambedj, have been described by Pococke and others, and most carefully by Chesney (Haphrates Hapedition, i. 420).

Strabo (xvi. p. 748) confuscs this Hicrapolis with Edessa in Mesopotamia.

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2. A city in Phrygia, at the junction of the Lycus and Meander, on the road from Apamea to Sardis. In it there were warm springs which had and still have a remarkable power of forming incrustations. Its name Hierapolis is due to the sanctity conferred on it by these hot springs, and by the Plutonium, a small cave under a projecting rock, from which there constantly emanated a dark vapour deadly to man and beast (Strabo, xiii. 629; Vitruv., viii. 3; Apuleius, De Mundo, p. 65). In reference to this' we find sometimes on its coins Pluto carrying off Proserpine.

- *BéuBvé is borrowed from the Persian word (Benfey, Wurzellex., ii. 113), though the form it has taken in Greek is influenced by the word*

Bou Béw, to buzz. It is used by Aristotle, &e. , to denote a gnat found in Asia Minor, which has certainly nothing to do with silk.

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The water was also much used for dyeing. Nothing is known of the origin of the city ; from the legend apxnyerns on coins, with a radiate head of the sun-god, Eckhel con- cludes that a Greek foundation was made under the guidance of Apollo; but a native city may have already existed there. The native name of the suu-god was AatpByvos, which often occurs on coins; he was probably a Phrygian form of the Greek Zeus. The goddess of healthful drinking, Euposia, is also seen on coins. Cybele also, who is found on the coins, was one of the chief deities of the place. Little is known of the history of thecity. The philosopher Epictetus was born there ; and there St Paul founded a church (Coloss. iv. 13). The very considerable ruins which still exist, called Pambuk Kalessi (" Cotton Castle "), have been described by Pococke, Leake, &c. The ancient theatre and gymnasium are in a state of remarkable preservation.

HIERARCHY. From iepépyys, meaning a steward or guardian of holy things, is derived fepapxia, naturally signifying the office of such a steward or guardian (not a "ruler of priests" or " priestly ruler ": see Boeckh, Corp. Inscr. Gr., No. 1570), but most commonly used in ecclesi- astical language to denote the aggregate of those persons who exercise authority within the Christian Church,—the patriarchate, episcopate, or entire threefold order of the clergy. The word, which does not occur in any classical Greek writer, owes its present extensive currency to the celebrated writings of Dionysius Pseudo-Areopagita, which, originating probably in the age of Justinian, exerted during the 9th and following centuries so remarkable an influence on the current of theological speculation, both in the Eastern and in the Western Church. Of these the most important are the two which treat of the celestial and of the-ecclesi- astical hierarchy respectively. Defining hierarchy as the " function which comprises all sacred things," or, more fully, as "a sacred order and science and activity, assimilated as far as possible to the godlike, and elevated to the imitation of God proportionately to the Divine illuminations conceded to it," the author proceeds to enumerate the nine orders of the heavenly host, which are subdivided again into hierarchies or triads, in descending order, thus :— Seraphim, Cherubim, Thrones ; Dominations, Virtues, Powers ; Prin- cipalities, Archangels, Angels. These all exist for the common object of raising men through ascending stages of purification and illumination to perfection. The ecclesi- astical or earthly hierarchy is the counterpart of the other. In it the first or highest triad is formed by baptism, com- munion, and chrism. The second triad consists of the three orders of the ministry, bishop or hierarch, priest, and minister or deacon (iepdpyns, tepeds, Aevroupyds) ; this is the earliest known instance in which the title hierarch is applied to a bishop. The third or lowest triad is made up of monks, "initiated," and catechumens. To Dionysins may be traced, through Thomas Aquinas and other Catholic writers of the intervening period, the definition of the term usually given by Roman Catholic writers—" coetus seu ordo presidum et sacrorum ministrorum ad regendam ecclesiam gignendamque in hominibus sanctitatem divinitus institutus""!—although it immediately ,rests upon the authority of the sixth canon of the twenty-third session of the council of Trent, in which anathema is pro- nounced upon all who deny the existence within the Catholic Church of a hierarchy instituted by divine appoint- ment, and consisting of bishops, priests, and ministers." This definition,

however, relates only to what is called the "hierarchy of orders," to which hierarchy, it must further

1 Perrone, De Locis Theologicis, pt. i., sec. i., cap. 2.

2 Si quis dixerit in ecclesia catholica non esse hierarchiam divina ordinatione institutam, que constat ex episcopis, presbytcris, et minis- tris; anathema sit.

-over all bishops, even

HIE—HIE

be borne in mind, belong the lesser orders of sub-deacon,

acolyth, exorcist, lector, and doorkeeper (to which that of singer is sometimes added) ; though these are to be re- garded as institutions of ecclesiastical authority only, while fhe other three are of divine right, and therefore pre- eminently "holy." The "hierarchy of jurisdiction," as distinguished from that of " orders," is represented by the Roman pontiff alone, who enjoys supreme authority when these are assembled in general council. This supreme authority he holds by divine right as the successor of Peter, who received immediately from Christ the primacy of honour and of jurisdiction over the universal church.? Between the pope and the bishops occur the metropolitans or archbishops and the patriarchs; but these intermediate grades are not regarded as essential, and, for the present at least, the rank of patriarch may almost be said to be, in the Roman com- munion, purely titular. The Greek Church, like the Roman, recognizes a threefold clerical order, distinct jure deno from. other Christians, of bishops, priests, and deacons. The five patriarchs, of equal dignity, hold the highest rank in the episcopate; and the episcopal body united in a general council represents the church, and infallibly decides, under the guidance of the Holy Ghost, allmatters of faith and ecclesiastical life. The Anglican Church acknowledges the superior and divinely conferred authority of the episcopal order, but, seeking its hierarchical doctrine in the records of a comparatively early period of church history, holds the substantial equality of all bishops, and, while acknowledging the validity, does not maintain the necessary infallibility, of their decisions when met in general council. Thus

in form of government the Roman Church may be said to be a hierarchical monarchy, the Greek in some sense a patriar- chal oligarchy, and the Anglican an episcopal aristocracy. For historical and other details relating to the growth and development of the hierarchical system the reader is referred to the articles ApostLz, ARcHBISHOP, Bistop, CARDINAL, Cuurcu, Ciercy, Covuncir, Droczss, E;PISCOPACY, Exarcu, Parrrarcn, Pops, &e.

Some kind of hierarchy, both of orders and of jurisdic- tion, may, from the nature of the case, be looked for in every religious system that has attained any considerable degree of visibility and external organization. The ancient Jewish and Egyptian hierarchies, for example, find parallels in Parsism and Mahometanism; while in some regions Buddhism has attained a degree of complexity in its ecclesiastical government strikingly suggestive of many features of the present Roman hierarchy.

HIERAX, or Himracas, a learned ascetic who flourished about the end of the 3d century at Leontopolis in Egypt, where he lived to the age of ninety, supporting himself by caligraphy and devoting his leisure to scientific and literary pursuits, especially to the study of the Bible. He was the author of Biblical commentaries both in Greek and Coptic, and is said to have composed many hymns. He ultimately became leader of the so-called sect of the Hieracites, an ascetic society from which persons living in the married state were excluded, and of which one of the leading tenets was that only the celibate could enter the kingdom of heaven. This doctrine was based on a some- what too literal interpretation of the parable of the ten virgins ; on other points, however, Hierax followed Origen in allegorizing Scripture ; thus he thought that the narrative of the fall and the doctrine of the resurrection ought both to be taken ina spiritual sense. It is upon this apparently Manichzean view of matrimony, taken along with his denial of the resurrection and of a visible paradise, and lis asser- tion that infants, as incapable of "striving lawfully," can-

De

3 Perrone, De Locis Theslogicis, pt. i., sec. thy Cnioy Iw, ah

not inherit the kingdom of God, that his reputation as a heretic chiefly depends. HIERO, the name of two rulers of Syracuse.

Hrero [., displacing his infant nephew, succeeded his | famous brother Gelon as tyrant of Syracuse in 478 Bo. |

His rule was more tyrannical than Gelon's had been, and his jealousy of his more popular brother Polyzelus (who was at the head of the army, and had married Gelon's widow Demarete, daughter of Theron of Agrigentum) ended in an open quarrel, in which Theron sided with Polyzelus. Hiero married Theron's sister. extant regarding Hiero, his influence seems to have been very great. Catana to Leontini, and peopled Catana, which he renamed AGtna, with Dorians. He was also an important factor in the history of Agrigentum, of Rhegium, and of Locri; and he saved the Greeks of Campania from the Etruscans, whose naval power he destroyed by his great victory at Cume (474 3.c.). Though despotic in his rule, he was a hearty

The brothers, however, were reconciled, and | From the slight information —

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tained by the Romans after the reduction of Sicily. He kept up a powerful fleet for defensive purposes, and em- ployed his famous kinsman Archimedes in the construction of those engines that, at a later date, played so important a part during the siege of Syracuse by the Romans. His only son, Gelon, predeceased him, and he was succeeded by his grandson Hieronymus.

HIEROCLES, a Roman proconsul, first of Bithynia and afterwards of Alexandria, flourished during the reign of Diocletian (284-305 a.p.), and is said to have been the instigator of the fierce persecution of the Christians under Galerius Cesar in 303. He was a man of considerable

_ intellectual culture, and wrote a work entitled Adyor

He removed the inhabitants of Naxos and —

patron of literature, and numbered among his friends such |

names as Auschylus, Bacchylides, Epicharmus, Simonides, |

and Pindar—the last of whom celebrated his victories in the Grecian games. He died at Catana in 467 B.c. Hiro II., king of Syracuse, was the illegitimate son of a Syracusan noble, Hierocles, who claimed descent from Gelon (see GuLon). His birth must have taken place before the year 306 B.c. On the departure of Pyrrhus from Sicily (in 275 or end of 276 B.c.), the Syracusan army and citizens alike marked their approval of Hiero's military and popular qualities by placing him at the head of the troops, and he materially strengthened his position by marrying the daughter of Leptines, the leading citizen. A body of Campanian mercenaries, who had been employed by King Agathocles of Syracuse, had taken the designation of Mamertines, and occupied Messana. From this stronghold they harassed the Syracusans, Hiero led his army against them, and in the engagement that ensued he abandoned to the enemy his mercenary troops, whose fickle disposition he distrusted, and retreated with the rest of his soldiers to Syracuse. There he raised a native force, with which he drove the Mamertines into the corner of the island, defeated them in a pitched battle, and was prevented from capturing Messana only by Carthaginian interference. His grateful countrymen then chose him king (270 B.c.). In 264 he again returned to the attack, and the Mamertines called in the aid of Rome. Hiero at once joined the Punic leader Hanno, who had newly landed in Sicily; but being defeated by the consul Appius Claudius, he withdrew to Syracuse. Pressed by the Roman forces, he was in 263 compelled to conclude a treaty with Rome, by which he was to rule over the south-east of Sicily and the eastern coast to Tauro- menium. From this time till his death in 216 he remained the fast friend of Rome, rendering frequent and valuable service during the First Punic War by supplying men, material, and provisions. Presents were sent him in acknowledgment of these good offices; but the strong desire of the Romans to occupy Sicily prevented his receiv- ing any accession of territory at the close of the war. When the Second Punic War broke out, he was faithful as ever, joined his fleet to that of Sempronius, and offered supplies of food and clothing. At home, he was a wise and just ruler. He retained the republican senate, and governed as a constitutional monarch. Munificent in his gifts to foreigners—witness his

presents to Olympia, to the Rhodians, to King Ptolemy, and above all to the Romans— and in the erection of public buildings within his own domain, he was exceedingly simple in his personal tastes ; he wore a, citizen's dress, and was not attended by guards. So wise were his financial arrangements that they were re-

pradrnbes mpds Tos Xpicriavovs in two books, in which he endeavoured to persuade the Christians that their sacred books were full of contradictions, and that in moral influence and miraculous power Christ was inferior to Apollonius of Tyana. For our knowledge of the nature of this treatise, which has not come down to our times, we are dependent on Lactantius (Jnstit. Div., v. 2), and still more on Eusebius, who is the author of a refutation entitled avTippytiKds mpds TA 'Tepoxdéovs.

HIEROCLES, a Neo-Platonic writer of the 5th century A.D., was apparently a native of Alexandria. He was born most probably about the beginning of the 5th century, studied under the celebrated Neo-Platonist Plutarch at Athens, and taught for some years in his native town. He seems to have been banished from Alexandria and to have taken up his abode in Constantinople, where he endured some persecution for his religious opinions. His death must be referred to the closing decade of the 5th century, probably about 490. The only complete work of his which has come down to us is the commentary on the great Pytha- gorean Carmen Aureum, but several other writings, specially one on Providence or Foreknowledge, are quoted or referred to by Photius and Stobeus. The commentary contains several remarkable utterances, and is written with much elegance. Philosophy is there regarded in its practi- cal aspect, as a discipline for purifying or elevating the mind by inculcating virtue and leading totruth. The most curious doctrines contained in the work are those bearing on providence and the human soul. The activity of the Divine Being, the supreme God, although eternal and all- reaching, is viewed as extending specially or immediately only to spiritual existences, or rather to the genera of such existences. The individuals are not directly the objects of divine operation, but are left to natural chance or law. In more modern phraseology there is only, according to Hierocles, general, not particular, providence. As against divine foreknowledge, perfect freedom of individual will is maintained. All that is preordained is but the connexion between

volitious and their natural consequents. As re- gards the human soul, the teaching of Hierocles in the main resembles Neo-Pythagoreanism. He states the doctrine of transmigration and pre-existence, holds that there is an ethereal body which is purified by trial along with the soul, and regards the world as the means by which judg- ment upon the past actions of the individual spirit is carried out.

The earliest edition of the commentary is the Latin translation by Aurispa in 1474; the Greek text was first given by Curterius in 1583. The fragments of the works on Providence and Fate were published in 1593 by Morellus. Later editions of all that is pre- served appeared in 1654-5, 1673, and 1709. The commentary alone has been edited by Ashton (1742), by Wolf (1710), by Gaisford in his edition of Stobeus (1850), and finally by Mullach (1852). The jest-book entitled acreta (edited by Schier, 1768, and Eberhard, 1869), though frequently attributed to this author, is certainly the work of a later hand. The most complete information regarding Hierocles is to be found in Mullach's edition, and in the relative portions of his Fragmenta Phil. Greecorum, 1860, i. 408 sq. Cf. Zeller, Phil. d. Gricchen (2d ed.), iii. 2, pp. 681-7.

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HIEROGLYPHICS

INTRODUCTION.

oa term hieroglyphics is used, with others, by Greek and Latin writers to describe the sacred characters of the ancient Egyptian language in its classical phase. It is used by the moderns for various systems of writing in which figures of objects take the place of conventional signs, 'This article is limited to an account of Egyptian hieroglyphics, with some notice of the derived systems called hieratic and demotic.

It is no longer necessary in an article like the present to give a history of the interpretation of hieroglyphics and a sketch of the grammar of ancient

Egyptian. What students need is a statement of the main results as to the Egyptian characters themselves and a systematic bibliography.

*The written language of the ancient Egyptians remained the same from the date of the earliest monu- ments (Third Dynasty) until the age of the Ethiopian kings (B.c. cir. 700), when a vulgar dialect expressing the common speech is first found in written documents. Then, if not earlier, the older phase of the language became the classical Egyptian, sometimes called the sacred dialect, to distinguish it from the vulgar dialect. The classical Egyptian was used almost as late as the fall of paganism generally for all documents but legal and commercial ones, for which the vulgar dialect was used.**

It is necessary to observe that although Egyptian is not proved to i a Semitic language, it contains in its oldest known form undoubted Semitic elements, both in structure and roots. The constant comparison with the Semitic languages which is here necessary is there- fore not merely employed for the sake of the analogies that may be discovered, but on the ground of partial affinity, which, however, must not be strained.

It must also be borne in mind that the grammar of ancient Egyptian is in its infancy. We know many of its principal facts, but we do not know them accurately. For instance, we know the forms of many tenses of the verb, and can perhaps place these tenses in groups, as past, present, and future, but we cannot define the ditlerent senses of the various tenses of each group. Similarly, in Coptic we do not always know the shades of difference within a group of tenses. It may be that in Coptic these shades have disappeared through the decay of the language, but it would be rash to affirm this of the classical Egyptian. Thus this essential part of the grammar will not be understood until the verb has been thoroughly worked downwards from the oldest texts through the classical language, then through the demotic, and then the Coptic, and again in inverted order from the Coptic upwards. The same labour has to be performed for the whole grammar in each of the three phases of the language, before we can speak with any certainty of Egyptian grammar. This is said in no disparagement of the admirable work already done, but as a necessary caution to the student.

_|, As early as the time of the Empire differences of dialect due to difference of speech in Upper and Lower Egypt had crept into cor- respondence (Brugsch, Gram. Hiér., 98). Ultimately vulgar forms and constructions are distinctly traceable in the sacred language (Id. lL c.; cf. Id. Geogr. Inschr., i. 94, 95). There are also natural changes due to development or decay or both, and artificial changes due to fashion. Modifications of grammatical forms and the growth of style are instances of natural changes, and the direct borrowing of Semitic words by the scribes of the Ramessides, and, what is still more remarkable, the actual Semiticization of Egyptian words, are examples of artificial changes (Maspero, Hist., 337, 338).

The following sections are abridged (to p. 806, end of section on 'Secret Writing"), with additions and modifications, which are noted by their being included in parentheses, from M. de Rougé's Chres- tomathie Egyptienne, Abréoé Grammatical.

Tue Systems oF WRITING.

The elements of Egyptian writing are composed of a certain number of actual objects, natural or artificial, imitated by drawing or engraving.

Egyptian writing falls into three systems—(1) hiero- elyplic, (2) hieratic, (3) demotic or enchorial, the hieratic being a simplified form of hieroglyphic, and tlie demotic of hieratic. The complete designing of hiero- glyphics required skill and time. They thus came to be reduced in writing to the simplest forms which retained the leading characteristics. These were called by Champollion linear hieroglyphics. The linear forms not lending themselves with sufficient readiness to very rapid writing, a further abbreviation was made, by which the forms became almost conventional,—the original type usually ceasing to be immediately recog- nizable: this cursive system Champollion called hieratic. The demotic writing is a new abbreviation of the hieratic: it gradually departs so far from the original types as to appear to consist of arbitrary signs.

Hieroglyphics are written either in horizontal lines or vertical columns, and are ordinarily read from the right. The heads of animals and the like shew from what direction to begin reading. Hieratic and demotic are written from

right to left, in horizontal lines. In very early times hieratic is sometimes written in vertical columns. |

(The hieroglyphic is a lapidary system, the hieratic and demotic purely systems for common writing. Con- sequently the hieroglyphic is the most difficult of the three to read, as the engraver or painter paid great attention to the symmetrical appearance of each group of signs, and grammatical forms were hence often omitted. In hieratic and demotic the signs follow each other without interruption of the natural order, and the grammatical forms are usually given, and even more fully.)

CHARACTERS IN RELATION TO THEIR USE IN

WRITING.

Egyptian writing is composed of a mixture of signs of two distinct classes—(1) ideographic, each sign repre- senting an idea; (2) phonetic, representing a sound, either (a) a simple articulation (alphabetic) or (8) a complete sound, #.¢., a complete syllable (syllabic). he two classes were combined according to fixed rules in writing words.

IDEOGRAPHIC SIGNS.

This class may be best divided into (a) representative signs and (8) symbolic (tropical).

The representative signs exactly express the idea of the object of which they present an image, as 4 a star.

The symbolic (tropical) signs represent an idea by the aid of certain analogies which the mind sees betwee1 the symbol and the idea attached to it. A simple symbol presents a single object, as the sun ©, wher used in the symbolic sense "day." A symbol is com: plex when uniting more objects than one to convey t the mind a single idea, thus a star suspended beneatl the celestial vault =j= represented "night." Unde

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complex signs should be placed figures of divinities in which the human form has special headdresses or insignia.

The value of ideographic signs may be discovered in various ways. 'The representative signs ouly need that the thing represented should be determined. The symbolic signs are often (rather, sometimes) explained by classical authors; they may also be explained by careful study of bilingual documents, as the Rosetta Stone (and the Decree of Canopus). 'The sense, and more certainly the reading, can be discovered by an exact knowledge of the words written by phonetic combined with ideo- graphic signs, and above all by the variants allowed in writing the same word with signs of different classes.

(The result may be thus tabulated :

Ideographic Signs. Phonetic Signs. Representative. Alphabetic. Syllabic.

Dr. Brugsch in his Gram, Hiér. (p. 3) gives the following scheme :

Phonetic Signs.

Alphabetic. Syllabic.

Here the ideographic signs are classed, not according to their nature but according to their use, which will be later noticed. M.de Rougé's seems the more logical classification.)

Symbolic.

Ideographic Signs.

Special. General.

PHoneETic Sians.

As the phonetic signs represent either (a) a simple articulation or (8) 2 complete sound, i.e, a complete syllable, the hieroglyphic method comprehends (a) an alphabet and (@) a syllabary.

Champollion held that the alphabet originated from giving to each object the phonetic value of the initial of its name: thus the mouth <> "ro" would become ""y." This probable principle cannot now be tested for a great part of the alphabet, probably in consequence of the loss of many archaic words,

The alphabet of the Greek aud Roman periods pre- sents a great number of homophones for each articula- tion. The more we advance towards antiquity the more the method simplifies, and the alphabet of primitive times admits but a very small number of homophones. Dr. Lepsius (Lettre d Rosellini) first scientifically treated this distinction.

ARTICULATIONS OF THE EaypTiIAN LANGUAGE.

The determination of the exact number of articula- tions which the scribes distinguished in the Egyptian language presents great difficulties. Comparison with the articulations of languages which occur in bilingual texts cannot give sufficiently precise results, for the shades of sound are far from bags the same in the languages thus placed in juxtaposition. The Romans and Greeks had many letters which, though quite distinct in their languages, the Egyptians confounded in their transcriptions. On the other hand, there were some Egyptian articulations preserved in the Coptic language which had no special representative in Greek or Latin ; hence certain letters derived from the demotic were added to the Greek alphabet on its adoption by the Copts. (It must also be remarked that the Greek and Roman rule was an age of literary decay and ruin for classical Egyptian, in the depression of which little effort seenis to have been made to represent accurately foreign sounds. The student must not be misled by the greater accuracy at this time in rendering the vowels, which was merely due to the decay of the system of

writing, by which the Egyptian vowels usually following certain consonant signs came to be disregarded.) Happily those Egyptian articulations which were unknown to the Greeks and Romans have at least analogues in the Semitic languages. Moreover, the many transcriptions of Semitic words (made while the Egyptian was in full vigour), joined to the traditions of the Coptic language (which has ceased 'for a hundred years to be a living

speech), enable us to appreciate sufficiently those articulations unknown to the Greeks and Romans (and this indication may be followed in the cases of the rest of the letters).

The words common to Egyptian and Semitic in the earliest known condition of the Egyptian language must be omitted from comparison ; the more exact tran- scriptions of the scribes of the Ramessides (Dynasties XIX., XX.) must take precedence of the looser ones of the earlier period of the Empire (Dynasty XVIII.). Coptic, having long existed in a languishing state and under the influence of Arabic, whence the colouring of the latest dialect, the Bashmuric (Revillout ap. Rossi, Gram. Copto-Ger., 30, n. 1),and certain peculiarities of the present pronunciation, is not an absolutely safe guide.

It might be thought that the study of the various modes in which words are written would furnish an exact table of homophones, and give us at once the list of distinct articulations; thus we might suppose that variants shewing two characters might enable us to assume their identity, as when in reading Greek we assume that @ is the same as $. But in Egyptian, as in other written languages, there are certain licensed irregu- larities of orthography, and also oscillations between the different atvenas of sound in the same class of letters when used for the same word: a small number of variants between two letters therefore does not prove their perfect homophony. Hence certain differences of opinion among Eeyptologists, according to the weight, greater or less, which they give to this or that series of variants. Thus the number of letters under the 't" group differs with different scholars.

ithout denying that there may have been some shades of sound in the ditferent signs here called homo- hones, as in the sounds represented by the English "th," the chief guide should be the estimate the Copts made of the elements of their language, when they adopted the Greek alphabet, completing it for their purpose by adding six special letters taken from demotic writing.

-The Egyptian Christians in adopting the Greek alphabet, which had vowels with fixed sounds, made their writing undergo a radical change: up to that time they had only vague vowels which were, as in the Semitic alphabets, simple aspirations, susceptible of being coloured by the sounds of different

vowels (but this vague character must be limited by the vowels falling, as in Semitic, into three groups of sounds; the vagueness was therefore not unlimited. 'This characteristic of the old Egyptian influenced the Coptic, which presents in the vowels varieties of orthography of the same word, these varieties, however, usually falling within the three ancient groups. It is only in the Coptic helping vowel that absolute vagueness is found, like that of the primitive "shéva" of Hebrew.)

Following these indications we find 15 leading articu- lations in Egyptian: the shades of sound which may be most certainly distinguished would indicate an alphabet of 2] divisions. They are transcribed by letters taken, one, x, not to be confused with the Coptic x, excepted,

from the Latin alphabet, according to the principles ot the Standard Alphabet. Cf Lepsius, Standard Alphabet.

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The simple letters used by the Egyptians in the earliest times to write these articulations are as follows:

ee. ae — | g

a °@ a : =

ute RW Dd

_S

Variants

£2. # Pi dl tte! By 8 1st Type AB et ey I eee

Variants| | 3 3 Ps | h

Li

1st Type

= A ~ Ef

ram

x

S

Variants | cal ten .

During the Pharaonic periods ten homophone letters were added: one is very ancient; some appear under the Ramessides; others under the Saitic T'wenty-sixth Dynasty. hen g | they were introduced in order to render it easier to fill spaces in sculptured inscriptions.

It must be observed that all simple letters can in writing radical forms be replaced by syllabic signs.

These articulations have now to be examined under natural classes: their interchange has to be noticed, their use in the transcription of Latin, Greek, and Semitic words, and the rules according to which Eyyp- tian words are transformed into Coptic words in the two chief dialects, the Sahidic and Memphitic. (This branch of the subject is of great importance for comparative philology, as our endeavour should be to ascertain as nearly as we can the fundamental sounds of ancient Eeyptian, and then to compare these sounds with those of languages to which it has relation.)

Sorr AsPrraTE, AND Vague VoweELs.

The Egyptian vowels have two distinct uses—(1) as aspirates, or initials in the syllable, and (2) as vague vowels, either final or medial. The Copts have marked no difference of aspiration between the initial vowels of syllables in their language, which correspond to

ancient words beginning with IF , OF want,

When these signs are mapicres as vowels, or " matres lectionis," it does not appear that one of them was used by preference for one sound more than another: they remain vague in the full force of the

term. This vague "a" is unlike the | of prolongation of the Arabs,

which (though otherwise susceptible of being coloured by all the vowels) then becomes a true a. (Notwithstanding this vagueness it is safest to transcribe this group by a, as there were special signs for the semi-vowels 7 and w, and the helping vowel which we write 2 was not written. The a must, however, be considered a symbol, vague to the extent of the Hebrew & when not vowelled.)

The final vague vowels do not vary much between themselves in the ancient texts; the orthography of each word was very stable, and, besides, the choice of the final vowel depended much on the preceding consonant, each sign having a vague vowel which it seems to prefer. (See the Section on " Expletive Vowels and Complements of Simple Letters," and observe the usage of syllabic signs.) They sometimes interchange, and are even replaced "i the vowels wu and 2, which as finals share their vague character. This system lasted to the latest periods of demotic writing. (Coptic shews the same in- stability of @ and the kindred vowels.)

The three signs of the soft aspirate sometimes interchange: l and serve equally as initials in Greek and Roman names, as well as

m Egyptian words. The group of two a's, aa, was ordinarily written Ss aa, and is found as variant of initial.

l is used with a marked preference to transcribe the Semitic &.

SS

HIEROGLYPHICS

On the contrary »—1 seems preferentially used to express long vowels, or such as were emphatically pronounced. In the Semitic transcriptions it corresponds habitually to Y, when that letter is initial. But it was not the same articulation. Under the Nineteenth and Twentieth Dynasties, and particularly in the papyri, a great degree of exactness was sought in the transcription of Semitic words. The scribes often then expressed the yy by

the syllabic -—, which has the value of Ga. It seems that the arm alone did not offer them an approximation which they judged sufficient.

The Hebrews transcribed .» by y in many words. The Wf

the Copts answers oftener to ~—0 than to the other vowels (and this — a convincing proof that the signs of the «w vowel had no stable sound).

There are also some cases of permutation between a and the aspirate h, analogous to the variants between 7 and & (but we must be careful not to confound true variants with a root in Egyptian augmented by a preformative h).

When the vowel a should form a syllable by itself it is often

followed by the sign Sh , which indicates the voice, by the represen-

tation of a man, his hand to his mouth. Transcriptions of proper

names thus beginning, as l 4 344, Apophis, shew that 1st should

a ppr ordinarily be pronounced a.

The final vague vowels could be omitted in writing; numerous variants shew there was no rule in this matter; but the hieratic pre- serves them more habitually. In writing the medial vowel of asyllable of two (or three) consonants, it was very ordinarily placed after the consonants and not between them; this is true of a, a, @, u, 7. Thus

the name of the divinity S

d} xensu, is constantly tran- ° . MAA, scribed by xwvs in proper names.

There is a striking instance of this orthography in the word jaw, \ GE, ani for ain, transcription of the Hebrew }'Y "eye" and " fountain." —List of cities of Syria taken

by Thothmes ITT. U and i could be initial semi-vowels or vague vowels; w initial

answers in many Coptic words to the diphthongs O¥‘WW, OYE, &c.,

without being followed in writing by a second vowel: here it is an initial semi-vowel. U necessarily carried with it its aspiration;

there are some variants with the aspirate , h, which recalls 6. The two signs ». @, interchange readily, and may be considered to

be absolute homophones, but » was much more frequently used in

the earliest times. .

U, considered as a vowel, was vague, and in a larger measure than the Hebrew 4, for we find it transcribed even by 7 and bye. It interchanges with 2 in Egyptian words, and sometimes even with a, In Hebrew we remark frequently the same oscillation between the sounds w and 7 in the kéri kétib of the Biblical text. In Coptic this

vowel has generally produced OY, O, UW, but very often also € and the other vowels or diphthongs; the group \», au, answers to €, ¢, in the Coptic and the Greek transcriptions; it would be thus

equivalent to & in the Masoretic system. Of the two signs for 2, and \, the second is evidently short- hand for the first. J initial should always be considered to be a

semi-vowel with the value ia, iw: in this use we ordinarily find l ’

which better fills the initial space; \ serves oftener for 7 vague final. Thus the verb 7, “to go,” was written with vague a initial for

the aspirate, and 4. or \, as final vowels et QQ Pot

Qh és , the legs determining the idea of movement: it is transcribed ai; in Coptic §, Ef, “to go,” “come.” We also find the variant

iS A, 4, which is regular in consequence of the vagueness of

the vowels. (The two forms are traceable in Coptic.) The signs

l and \ interchange as much as their forms permit, which fit very

differently into the composition of groups. J, semi-vowel, does not vary with any other letter; it is only found in a very small number of Egyptian words, but it is much used in

the Semitic transcriptions; the Coptic derivations are initial J and ef.

J, the vague vowel, interchanges with wu and a, @, au,at. The Greek transcriptions oscillate principally between 2, e, et. The

HL GLY PHTCS

*Semitic transcriptions have a much wider range, which *comprehends nearly all the vowel sounds.*

(The unwritten aspirate or short vowel is not noticed in this place by M. de Rougé. It will be seen, under the Section on "the 'Tran- scription of Vowels Omitted," that he does not admit the transcription of an unwritten vowel except as a makeshift, or in other words, that he does not allow the Egyptians to have had a vowel sound never written. 'The existence of the supposed vowel seems, however, certain on these grounds. Some syllabics never take a vowel except for an unusual form,—the root and the ordinary derivatives uever being vowelled, and a vowel only appearing in what is obviously a derivative formed by lengthening the vowel. Further, the Coptic has such a vowel marked by peculiar forms \ or — above a letter, or in the latter case above a letter or syllable, indicating that the sound,

here generally €, was omitted in writing by the ancient Egyptians ; and still more remarkably the Coptic use is sometimes found where the older writing would lead us to expect it. In ancient Egyptian the use of this helping vowel is implied, as an aspirate in a syllable

written with a consonant alone, as mw 2, m, <=>r; in Coptic

*\ S *

N, 32, Pp, and as a medial vowel in a syllable of two con- sonants, as = IN tm, "not," in Coptic TI. In Coptic, as already mentioned, it is generally read €, &, but had this been its

constant sound it would have been represented by €, and would of course have been needless. It is safest to read the old Egyptian helping vowel & It resembles the Hebrew Shéva, as including its variants Hateph-Pathah, Hateph-Segol, and Hateph-Kames.

M. de Rougé's section on this subject seems wanting in his usual clearness. This is, however, due to the inherent difficulty of the sub- ject. The Egyptian vowels, except when used as semi-vowels, are undoubtedly vague. Thus, in the writing of Semitic words under the Ramessides, while the consonants are most carefully represented, the vowels affected by those consonants are frequently used, and the apparent pronunciation is distorted. Consequently, though we have no difficulty in separating the vowels into the a, 7, and w group, adding the helping vowel, or short &, because the use of the 7 and w vowels as seml-vowels gives them and the third vowel (a) thus limited a certain defiuite character, yet, when we have to treat of vowels pure and simple, the distinction of these classes vanishes. Thus the idea of fixed vowels, with however wide legitimate extension, is constantly rising in the enquiry to be as constantly suppressed by the vagueness of their use. It must, therefore, be held that the transcriptions we adopt do not give the accurate pronunciation, inasmuch as the vowel constantly, but not always, depended upon the consonant preceding, and vowel complements are even added where they were not pronounced. Thisis proved by Greek transcriptions, as will be seen later. On the other hand, the vowelling of Greek and Latin proper names shews that the vagueness of the vowels was not absolute, for the Egyptian scribes in the decay of the old style, no longer bound by the ancient usage of complenients, employed the vowels with such accuracy as their limitation in sounds permitted, subject to the carelessness of the age. Ofcourse these vowels could not accurately represent the Latin five or the Greek seven. Perhaps it may be suggested, in conclusion, that some idea of the Egyptian vowel system may be formed by a comparison with unpointed Hebrew.)

*Lasiats, While approaching ph or f, *~- is distinct, for the Copts who adopted*

also considered the *~ needful, of which their qj is the demotic

sign in a modified form. In some words *~— is employed as a variant of u. On account of this function it has been transcribed by w instead of f. In consequence of this use it was sometimes omitted:

+ = ae \ a , snef, "blood,"

Coptic CN oc. (M. de Rougé calls this letter, so used, a vowel or variant of w, and in the example just cited characterizes it asa short vowel, but it seems more analogous to } after a vowel, when not quiescent, in the present or ordinary Hebrew pronunciation.) In Greek words x— does not render @; the Egyptians used either O, p, or the com- bination O10, ph. But in the transcription of Semitic words we sometimes find *~ for 5. In Coptic, besides Cf, this letter some-

times becomes

Like the Hebrew 2 the tee b comprised the two shades of sound 3 6 and 3 (bh or) », at least in the less ancient periods. The Copts seem also to have known the two sounds, thongh thcir one A

has been generally transcribed by v. The transcriptions of the Greeks do not aid us, for their 8 was probably sounded v. The evidence of the Semitic words is perhaps more precise in the system of transcription

thus , sni, for

oul

of the (hieratic) papyri of the Nineteenth Dynasty. 3, b, is rendered

DK, ws 3 Gh) by J sound of 6 should therefore approach v. In the hieroglyphics they

S&S, b, homophone of J; for 3. (‘Lhe weight of this reasoning partly depends upon the antiquity of the Masoretic punctuation, which is, however, supported by the double rendering of the Egyptians.)

The compound bp, introduced for Semitic words, is found later employed in hieratic for Egyptian words, no doubt to characterize

the pronunciation b, 3, better than by > alone, or the group S& , which serves as its variant in these same words. The signs

either by por by the group | alone: the ordinary

were often content with

and sometimes interchange ; oftener replaces alone; they also exchange, but rarely, with p and f. The ancient b produced regularly the Coptic B, and by affinity OF‘, JT, cb, CJ, and SR.

T he two signs of p, O and be , are complete homophones. The

Memphitic dialect aspirated p, and used

the Sahidic used J¥. Here the Sahidic has been more faithful to

*the ancient pronunciation: in fact @ Greek was sometimes rendered by the group Of, ph, and the Hebrew 5 by *~, f. This ancient Kgyptian letter was then p; it also corresponds exactly to B. It was further used to transcribe approximately 3, as already remarked.*

It produced regularly in Coptic the Sahidic J¥ and the Memphitic

cp. Affinities occasionally introduced Cf or R. The ancient p also presents some instances of varying with b

PALaTALs.

This class of letters lends itself to great varieties of pronunciation which render them difficult to understand; it is in their nature to modify

themselves considerably by the simple change of the vowel which follows them. The Greek and Roman transcriptions would

lead us to consider the four signs 4,

The Semitic transcriptions afford the following results: 1, J and

(Y answering to) é (gh) are almost always rendered by A; 2, 3 cor-

responds to <=, and p to 4; but this second rule is uot so faithfully observed as the first.

In the Coptic language there are here two distinct types: 1, K Sahidic, aspirated as } in the Memphitic; 2, G Sahidic corresponding to XX Memphitic, but sometimes identical.

Taking the Copts as guides we distinguish two palatals, which we

mark as k andk. % did not exist in their writing, but in some

rare cases which do not correspond to a special ancient letter: in a small number of words where it is derived from <—~, &, it is produced

by the presence of the nasal which precedes; thus ANY, I, from

lee, — ¢

In studying more closely the three signs 1, <=, LJ, we are easily convinced of the perfect homophony of LJ with =~. The equality of A1and Lj may seem more doubtful ; variants exist, but they

are not frequent. However, we find the group LJ, whcre the first letter only doubles the second, as we have seen in the group J SS ’ and we are thus authorized to connect intimately 1, LJ, and <=, and transcribe them by k.

To this articulation correspond regularly, in Coptic, K Sahidic and X Memphitic, G and & less frequently, DD and OC, as rare

exceptions.

The rule of derivation is different in what concerns A, and it is there above all that we recognize the distinct type preserved in the Coptic G. The sign J\, which we transcribe &, shows some ancicnt

cases of variants with the preceding signs, and the Greek transcrip- tions do not give us sufficient reasons for making a distinction. The Semitic transcriptions are more decisive; the A\, as already noticed,

é: The Coptic derived forms strengthen this first result ; they quite regularly class themselves under the Sahidic G, answering to the Memphitic

is quite specially set apart to render 3, and Y answering to

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X, or under the G in both dialects. follows, in order of frequency :—1, CG Sahidic, K Memphitic ; 2, K Sahbidic, ; Memphitic; 3, K in both dialects; 4, X Sahidic, CG Memphitic.

The graphic origin of the Coptic G is doubtful. It is incorrect in

our judgment to derive it, as hitherto, from the demotic ©, coming

from 6" , hieratic of <=: the suffix of the second person K has

been rendered as far as the latest periods, almost contemporary with the Coptic, by this demotic sign ; consequently we ought to find it in

Coptic under the form G if this letter came from that sign; on the

contrary, K is used for this pronoun. G may have come from the demotic form of A, through the hieratic.

The exceptions are as

DeENTALS. The exact appreciation of the Egyptian dentals is hard. It seems

certain that the three homophones s=>, ©, }; answer to a é, and that |; | , are represcntcd in Coptic by the special articulation ha

XK. The sign ~== seems to have the character of an intermediate shade of sound. In the Greek and Roman names, 7, 6, and 6 are transcribed by all the signs without distinction (the Roman being tran- scribed through Greek forms). In the Semitic transcriptions N and

Q are rendered by , ©, j|, and more rarely ; 17 is tran- scribed by —=s with a marked preference; t and ¥ answer exclusively to | and its homophones (including a later sign).

The Coptic offers two certain types, "J, becoming Memphitic, and 2%; the trace of a third variety seems also preserved in the syllabic Fe We are thus led to distinguish three consonants ¢, ¢, and ¢'.

The three signs ===, 4, }; t, conduct themselves as perfect

homophones. The Greek and Roman names shew them to be used for 7, 6,5; but the hierogrammats when they sought a more scrupulous

transcription of @ used the group = , th (cf. O10, ph), which shews that originally the Egyptian ¢ did not lend itself to the aspirated sound. The Leyden M8. with Greek transcriptions thus places 6av in correspondence to an Egyptian word, written © IN fd yew Tahan, in which the first a is a "mater lectionis," of no value in

In Semitic words s=>, ©, J], served to transcribe

regularly FM aud 0, sometimes also 3, but more rarely.

We observe no preference for transcriptions of 0; this letter, which is not frequently found, corresponds even to c=», #, in the name of Potiphar. We may conclude that the special sound of the Y had no existence in old Egyptian. The Coptic derived forms have but one

type “S for => and its homophones; the Memphitic aspiration

pronunciation.

changes it to @; following the rules of affinity we find some cases of

derivation with X. We pass at once to the third dental, ¢’, of which the differential characteristics are more marked ; perhaps the intermediate consonant

may be more easily defined afterwards. The two signs, \; \ which we transcribe ¢’, interchange in many Egyptian words; they are

both varied with the very common syllabic & , t’a (which became an

alphabetic sign though retaining its vowel, like our g); they act in exactly the same manner in the transcriptions and in the Coptic derived words. The hierogrammats employed them, but very rarely, to transcribe the Grcek 7 and 6, and the Greeks felt some difficulty in transcribing this articulation; thus we find ¢ rendered by 7 and 6, or by o; thus Sa-n-t’aho is rendered by Sensaos, and Har-ant’-atef by Arontotes and Arendotes. ‘

In the cartouche of Cambyses the Persian articulation z, 7 of

Rawlinson, ~ t’, but not con-

stantly; variants shew a simple ¢, ==, Therefore there was not a pee identity between the Egyptian ¢’ and the Persian z. The ebrews had two sibilants more or less shading off into cerebrals, } and

8; they are constantly transcribed by , t’, and its homophones,

and not by ¢; but we do not remark a preference in favour of this or that sign for either of the two Semitic letters, and this confusion shews that there was but anepproxsimative correspondence.

HBR OGLY PHTCe

The Coptic derived forms from the ancient ¢’ are classed according to two rules :—they are written either (1) with 2X in the two dialects,

or (2) with XX Sahidic, corresponding to GC Memphitic,—the dialect of Upper Egypt shewing a higher exactness. The exceptions shewus— 1, “T Sahidic, Memphitic ; 2, CG Sahidic, 2 Memphitic ; 3, WJ; 4, the palatals; 7.e., all the letters which shewa kind of affinity with

this dental, of which we cannot now fix the pronunciation beyond saying that it approached the sibilants and the cerebrals. The Copts

preserved it in 2%, which comes from the hieroglyphic \ , through iJ

the hieratic | . » becoming in demotic : this was developed

and made regular by the Copts.

information as to the pronunciation of 2%; in the last century, an attempt was made to indicate it by sj. Dr. Brugsch proposes for the ancient letter z, and Dr. Birch 7; it seems to us that the conven- tional ¢’ is more suitable to the Egyptian variants of the articulation, which constantly make it approach c=ns, ¢.

In the eyes of the ancicnt Egyptians the letter ===, ¢, was a near

The Copts cannot now give precise

neighbour of , t’; it could eveu be considered as a homophone if we had only the evidence of the variants; for variants between

and c= are numerous, and found in the earliest texts. The

variants between c= and s=>,, ©, jj, are rare enough, and belong

above all to the late periods. But the Semitic transcriptions indicate the principle of a distinction. Far from using it to render } and ¥, c= is connected with 7 with a very marked preference. From the Nineteenth Dynasty, when the system of these transcriptious appears to have been made regular, on account of the many relations established with the

neighbouring nations by conquests and emigra- tions (into Egypt), this preference became so constant that it led Dr. Brugsch to transcribe == by a d

The exceptions to this rule place the == beside 4 and N, rather than the cerebrals.

In Coptic the derivatives of =, t, do not act like those of ancient words usually written with ¢'. We find the derivatives of c=

regularly under the dentals "T, ©, » sometimes also under X, but in very small number. The verb tu, 'to give," ordinarily written

S11, becomes in Coptic S[—. This sign, which the earlier Copts pronounced di, was considered a simple ligature for "T and §. But

Dr. Brugsch has remarked that Tt resembles the demotic af

responding to A, "to give," too much for the likeness to be due to chance; there was here a recollection of the softened sound

, cor-

; peculiar to <==, and the Copts took the ss from demotic with

their other special lettcrs. . Evidently these two groups of documents may induce us to mark the == as a special letter, but this letter could not be a d. In fact,

the Copts excluded 2A from their native words, and the hiero-

grammats indicated that the <== was not a true d: when they would transcribe more exactly the Latin d, which they found in foreign names, they employed a double letter, nt. We notice this in variants of the cartouche of Darius for the Persian d, and for the

—_h ! Al , nt(a)kik(u)s, for Dacicus,

inserted in the cartouche of Trajan. This wholly artificial ortho- graphy aids us to appreciate a peculiarity of the Egyptian dentals, that after the nasal the pronunciation softened in the direction of d. This explains many Greek transcriptions which shew the 4, as ZGevderns, which represents Nes-bi-n-tet.| The d being out of the question we select ¢ as near the poimt of vicw of the Egyptian

Latin d in the surname Y =

variants where => replaccs =) .

Lrquips. INS ok; and 4—— exactly answer to m; the transcriptions are uniform, always w Greek and jy Semitic.

The Coptic derived forms are almost always &&, some rare excep- tions presenting N, B, TT. One must be very careful in Coptic not to confound a radical && with that which comes from §¥ by assimila- tion | before a labial, as in the Sahidic particle ExT S coming from ON, "in," before the article JT.

1 Cf. the Gnostic word Sabitat, which does not differ from the other but by th absence of the flexion x, and retains the ¢.

The three signs

It is also to be remarked

that one often fiuds in Coptic the & added to an ancient root as a kind of final, which slightly modifies its signification: thus, O¥YWE,, "to add" OYWELLk, "to repeat ;" CWP, "to strew;" CUUPSX, "to wander," &c. (cf. also the Hebrew 0 added to the root). This peculiarity has not yct been noticed in the ancieut

language. N was regularly transcribed v and 9; an undoubted exception

shews the change of 5 into m in the word NGS

Sanahem, “ grasshopper,” pydp, The example justifies ns in searching for 5 under the transcription », which is more easily explained as the ancient Egyptians originally had not any sign to express the articulation J.

The Coptic transcribes the ancient , but in course of time

the liquid 7, ‘\, had gained a footing in the pronunciation; a part of the Coptic words in which it figures derive it from the ancient 2; thus,

[1% nes, “ tongue,” became DAC.

The nasal presents many peculiarities worthy of remark in the Egyptian writing and language. It influenced certain consonants, in the direction of modifying the pronunciation; thus it softened ¢, as in the group né for writing d. The s, preceded by a nasal, seems to have been also analogously modified ; for the Greeks transcribed the particle Th , nes, which begins certain proper names, by z, as we have

seen in ZBevderys. The similar action of on k, which was thus modified cnough for the Sahidic dialect to have sometimes rendered

it by %, has been previously observed. NV, as already remarked,

sometimes became J, the Coptic \; the combination nr must have more frequently given occasion to the pronunciation 7 through the

° . ° MW << MWA, softening of 7; mr is often written ;;, | , Where, | | represents

MWA a sounding x. The group , | |, which has the value ng, is a syllabic: the a is of no force in the pronunciation. In illustration of the modification of nr (where the ” was originally sounding), the Coptic

root, Roda, “outside,” may be cited; it comes from the Egyptian 5| € VW oe re, bunar, of the same sense.

The Egyptian grammarians evidently considered the nasal a simple accident of the vowel, to be indicated or omitted at will in

ale : mows Mn <> writing: thus the same person's name is written =”? bi) d]

kanra, and , kara. In such cases a bar above the vowel may be used to note the omission of the nasal. Thus the

particle l may be transcribed @, when we find it written under wn

the form [|, which it would be difficult to recognize without this note

in transcription. The examples of this curious peculiarity are frequent; it is a grammatical view analogous to the “ anusvara” of the Indians; it is known that the omission of the nasal has also been remarked in the ancient monuments of classical epigraphy.

The Egyptians used very readily the nasalized vowel; they some- times introduced it into Semitic words which they adopted, or even

only transcribed: thus they wrote otal Tey se |, Sasank, the

name of the king called in the Bible PUY Sisaq, a name apparently of Semitic origin. (Here the nasal helps to express the sound of the Hebrew p-)

The Coptic possesses the two letters P and ‘Q\; it is difficult to

ascertain if the ancient dialects of the Egyptian language knew the distinction of these two liquids, but it is certain that the hiero- glyphics admitted but one type, represented by the signs <> and

<=, which serves indifferently to transcribe p and A Greek, and

and 4; only at certain times we rerark a preference given to the lioness for transcribing J, but without regularity, and it is not until the last stage of demotic writing that the letter derived from this sign seems to attach itself sagrebinly to the liquid 7, In Egyptian words ZA is rare; it is sometimes joined to —», as a doubled

letter <> ZS, like the groups O : , eo, It is

frequently employed in the transcription of Semitic words. In the Bible the, Egyptian liquid is rendered by ‘1 in all the words given, never by 5: “thus the ancient articulation was r.

The Coptic derived forms are divided between P and @.—Sce also above for the combination n7.—The Bashmuric dialect is characterized

| above all by the exclusion of P (and use of ‘2\ in its stead, from the

influence of Arabic). This liquid approached the semi-vowels in its nature; hence it was sometimes permissible to omit it in writing, like the nasal:

thus LJ, ka, for L{ <>, kar, 7 “flame.” By a frequent exception final r (and 7 in Bashmuric) is obliterated in Coptic words; thus the particle <>, er, has become €.

WWWAMAAA , nes, for —~ |j|, neser,*

S1piLant.

The two signs for s are homophones. The Greek transcriptions have always o, and the Semitic render s by D or WY; an exception which is common enough makes the Egyptian s equivalent to yy, but probably this is only apparent. We know how easily the pronuncia-

tion varies between s and & in the Semitic languages. The celebrated story of the word shibboleth nba (Judges xii. 6) shews that even

among the Hebrews the pronunciation varied according to the tribes. The pronunciation of Hyhesiva: which doubtless followed that of the different peoples situate north of Palestinc, shews why we find sometimes an Egyptian s in relation to &% Hebrew, particularly in the names of Syrian towns or nations. (‘This should be qualitied, for Ephraim was in middle rather than northern Palestine, and it is possible that & was always anciently sh.) The Coptic derivatives of

the Egyptian s fall under C, but there are many exceptions to this rule, the ancicnt s sometimes becoming WY, and more rarely GC; it seems to have passed into "J in some roots. We also find the

sibilant written in Coptic MSS. by Z; but the instances are so few as to be unauthoritative. It has been already remarked that ¢ was used by the Alexandrian Greeks to transcribe the combination ns.

Husnina Lerrer (Chuintante).

(The term M. de Rougé uses iy important as distinguishing this letter from the sibilant. We can only suggest the English "hushing" as here equivalent.)

The letter ' (ch, French) having no representative in the Greek

alphabet, the Copts preserved the demotic , regularized as UY:

it comes from the hieratic WwW, hieroglyphic [tft]. The Greeks

ordinarily rendered & by ¢, sometimes by x and cx. The exact sound of é is found in Persian and the Semitic languages; it is con- stantly rendered by [j]jJ in the names of Persian kings; we also find cx in the cartouches of Darins and Artaxerxes. For the Hebrew w we find equally TyVsT a little oftener than cx.

The Coptic derivatives are very regular; they use CY; some exceptions shew the ancient § passing into 2, 6, and rarely rash

,

and D. The transcriptions and derivations shew us that from a very ancient time Jt{j] and cx were homophones; but perhaps we cannot

affirm that it was so from the origin of Fgyptian writing. Dr. Hincks conjectured that —3 had the value of cx. This idea resis on—(1) the fact that cm presents a certain number of variants with S$, x; (2) that it seems to double itself with an initial s, without change of value, so that we

sometimes find — instead of 3S alone. On the other hand, there has not yct been noted a variant between Tovey

and &. It is then possible that cx primitively markcd some inter- mediate shade of sound of which the trace was afterwards lost in pronunciation. Perhaps we may attribute to this oscillation the

most ancient orthography of sexa, "to write," Coptic CDA! ,

tt which in the earliest times was written . The sign in

question must, however, be classed as homophonous with 14] i : ASPIRATED GUTTURAL. The aspirated guttural, here rendered by the Greek x, is represented in the alphabet by © and 7 . These letters sometimes interchange,

and are found grouped as a double letter of, a reduplication

analogous to those noted above. s#+— is a third homophone, of a little rarer use but very old. The Greek transcribed this aspirated guttural by x; this was but an approximate value, for the Copta,

who adopted the §¢ for the aspiration of K in the Memphitic dialect, judged it necessary also to take thcir DJ from the demotic

alphabet, in which the & represented H .sicraic of {- It

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was uscd side by side with x and in the same dialect. The Copts noted carefully shades of sound which appear to us very near.

The cartouches of the Persian kings render the Persian kh by if and by ©; these two signs answer to 1 of Hebrew words, but we must here draw a distinction. We know that the fm comprises two

shades of sound which Arabic distinguishes by aa (ak the hiero-

glyphic transcriptions establish the antiquity of this distinction in the pronunciation; for they render the 7 sometimes by © or t , the

Egyptian x, and sometimes by i, h, as will be shewn later.

The Coptic derivatives of the ancient x are of two classes. In the first the Memphitic dialect faithfully observes the ancient orthography, preserving the D ; we find in the same words a Sahidic @.. In a sccond class of words the ancient x is softened, and we find a GY) tn the two dialects. The exceptions, conforming to the laws of

affinity, are the Memphitic 9, the @ , and the K. ASPIRATES.

*The Copts borrowed but one aspirate, @,, from the demotic alphabet. The Semitic transcriptions indicate, however, two shades of sound, at least as marked as those which are found in French in the letter . The Greeks, who had lost the habit of writing the aspiration H of their ancient alphabet, equally omitted (in most cases, but note *Qpos as well as *Qpos for her) to transcribe the Egyptian h, at least when they had not occasion to indicate it by an aspirated letter, as Pits for p-hib, 'the ibis.' As to the hierogrammats, they sometimes used their h, (1, to indicate the breathing at the beginning of Greek words which they transcribed, or in seeking to render*

aspirated letters by the combination ph, » th, Tae for $, 9. The Hebrew 1, as already stated, answered to two shades of

sound; these also existed in Egyptian, so that the Semitic tran- scriptions take the following progressive order: 1,7 = Tl, 3 Zins

c = a Es kr, c' = &, x. It is therefore needful to distin-

uish these two aspirates in the point of view of the transcription of oreign (Semitic) words, for they have a considerable importance for the

determination of these words. The distinction of fy, 4, and hi, h,

the latter being a strengthened aspirate, would be less useful for Coptic, for this distinction had been lost, the Copts having taken from

the demotic the sign of the strong aspirate @,, coming from

hieratic , demotic The Coptic derivatives have almost all preserved faithfully the

©, in the two dialects. The exceptions are rare; they introduce the

Memphitic D>, the QW), and the K; it is also possible for the aspiration to be obliterated and the Coptic to present an initial vowel. The rare variants which may be aeokdl in the Egyptian texts between the aspirates and the other letters are limited to x, or to the initial vowels.

SytiaBic Sians. An ideographic sign could be employed in four

different ways. Of this the sign + the symbol of "life," may be taken as an illustration.

1. It could be used alone, + , to indicate the idea of "life" and the different words conveying this idea (Tike,") "to live," 13 living'').

2. The same sign could be written after the phonetic expression of one of the words signifying life, thus

meet any, Coptic WN, "life." Here the sign takes

-no part in the pronunciation ; it simply determines the idea which we should attach to the word dny preceding it: In this use it is called, following Champollion, a determinative.

3. The same sign could be accompanied by all or by a part of the letters used to write the word dry: the letters thus used have been termed phonetic comple- ments; their choice (as to number) is ordinarily ruled by the necessities of design, in which the squareness of the group was much considered. 'Thus we find or-

HIEBROGLYPIHCS

dinarily {“S”, with the second and third complement; but _ ,2 and _.-%@ would be equally in accord

with rules. A group of this kind is said to be written in the mixed manner.

4, The same sign, once attached to a word such as dnx, could be used in writing for the phonetic value of this word with a complete loss of the primitive sense.

This is exactly a rebus in principle. Thus, + DO:

any, “ear ;” 4. “oath,” Coptic, ANAY. A deter- minative often indicates to the reader, as in the first example, this radical change in the use of the sien. In this case the sign is said to be employed as a syllabic (The Assyro-Babylonian syllabary is remark- able as affording a double system of this kind, arising from the original Akkadian sounds of a sign and the later Assyro-Babylonian ones. The difference is in the extensive polyphony of this syllabary.)

Probably in principle all hieroglyphics were susceptible of use as syllabics; but in fact, it was necessary for this—1, that’a symbol should represent a word composed of a simple syllable, and, 2, that we should find this syllable in different words. The list of the most usual syllabics of known value, in the Pharaonic period, amounts to considerably over three hundred.

It is therefore not enough to have established the fact that a certain syllable corresponds in reading to a symbol, for us to consider the symbol as being properly a syllabic. We must also have found it sometimes more or less turned from its ideographic value and corresponding to a simple sound, to write which it takes thie place of the letters of the alphabet. Thus the essential character of the syllabic is the abstraction made of the ideographic value for its use as a sound pure and simple. Itis only as syllabics and determinatives that the ideographs belong to grammar. Those that do not play these parts have their proper place in the dictionary.

Syllabics, as well as ideographs, can be written alone or with phonetic complements in the mixed manner ; the choice (and arrangement) of the complements depended on the needs of the designer. Thus we find

Ss, sem, grouped thus, i a De ‘yy

(=)

Sh ~ FY, Sh , &e., the legs A, here determining

movement.

The second phonetic complement is found frequently ; the first is more rare, and there are syllabics for which it has not yet been discovered. ‘The writer seems to have had full liberty in this matter. From these facts it is evident that we cannot retain Champollion’s term, “initial signs,” nor adopt Lepsius’s division, in his Lettre & Rosellini, into “initial signs” and signs intended for the middle of a group. Bunsen’s division into syllabic signs and mixed signs is equally untenable.

A sign could wholly lose its ideographic value, although written as a determinative. Thus the word 24}, tar, determined by a shoot(?) of palm, signified “season,” “time ;” but to write the syllable tar, m another word, as htar, “horses,” it was not necessary to drop the

determinative {, and the whole group © l {> tar, could be retained; thus: all iL ap, htar, Coptic

e770, “horse.” This peculiarity may embarrass the interpreter, particularly in texts carelessly written, where the determinative of the idea is often omitted or in- correctly given. (Mr. le Page Renouf distinguishes this use of the determinative by the term deter-

minative of sound from the ordinary use as determinative of sense.)

Syllabics are divided into two classes—1, an articulation and one or more vowels; 2, two articulations (usually with a medial helping- vowel

unexpressed. All are, no doubt, monosyllables, although a syllabic like saa has the appearance of a dissyllable; here, either the first a has no force, or the two indicate a long vowel.)

The first class of syllabics, an articulation and a vague vowel, is scarcely distinguishable from the letters of the alphabet. The distinction is thus determined: 1, the simple letters were used as phonetic complements; 2, the syllabics do not seem to have been used quite indifferently for all kinds of words. We frequently find allusions, relations direct or remote, which have originally induced their choice for the purpose of writing this or that radical. (This is strictly analogous to the principle of the syllabary of Assyro-Baby- lonian in its Akkadian and Semitic developments, though in its pear that principle led to wide polyphony, in consequence of an ideograph taking different sounds according to the cognate scnses in which it was used.)

It is also possible that the syllabics were sometimes employed to give an idea of the sound of the vowels. But if they had this use primitively, they did not retain it, for we cannot establish this property in a constant manner in the hieroglyphic transcriptions of Greek or Semitic words. (It is indeed the converse use of the vowel most affected by a consonant or of the syllabic with its vowel which is our chief embarrassment in the reading of Semitic tran- scriptions.)

There were also some signs corresponding to three articulations which could be used as syllabics. Here the cases of homophony are much more rare; we have to do with different acceptations rather than different radicals, but the ideal bond between these different

.acceptations may escape us now. (These are still monosyllables.)

PoLyPHony.

There are characters which had various pronuncia- tions. There are three kinds of polyphones :—

1. A sign can answer to various words which belong to the same class of ideas; thus, the calf's

ear, yf, answers to the words hil Ad » mest'er, +"s";

dnkh, and | = , at, which seem to have all signified the ear or some special part of this organ. The words @ NW

66 " ? sem, and (l= , setem, "to hear," are two new values,

on the same principle. One might add to this first class the very near values produced by variants of pronuncia- tion or writing for the same word, such as fg, tag, ta, at, aat, aat, aatu for '\o, and the forms more or less developed of a single root, but these are rather ex- tensions of a word than true instances of polyphony.

2. The same sign might have been chosen as symbol of a certain number of ideas without any true bond between them, at least to our view: thus w answers to

the phonetic » (P usex, "'largeness," to a Ju, ab, "offering," and La , hent, " regent" (fem.)

3. A sign may have become syllabic and be used for several purely phonetic values taken from the words in which it figures, on the two principles explained. Thus in

the syllabary, the sign ,_,, which symbolizes the idea " sift," answers to two roots, tu and md; these give in their turn to so the values "S, tu, and

ma, even in words where the idea of gift no longer exists.

Such is the series of facts which has produced Egyptian polyphony. The number of figures suitable to design and with which one could reasonably charge the memory being limited, we should expect to find polyphony more or less developed in every system of writing originally ideographic. The syllabic polyphony of Assyrian seems to have been eee by wholly analogous circumstances, though the change from the original language habitually veils the connection of values.

Polyphony is a source of great difficulty, and science has still much to do to fix the different phonetic values of the polyphones. Often our decision is made on the evidence of phonetic complements, and in hieratic it is seldom that this aid is wholly omitted.

Thus ai is easily recognized as mé& But our

ignorance is not always thus aided, and the choice of the suitable word sometimes can only be indicated by a profound study of analogous texts.

The following list gives an abridgment of De Rougé's lists of syllabics, and contains the most common signs, the important polyphones being indicated by asterisks, and their principal varieties of sound being given in the fourth column. The method is varied from that of the Chrestomathie.

Taste or THE Most Common Syxtuasic Srens.

A i | Ka ks | ba 2 oo ka kés Ni .| 4 ae : : tu Oo VW tép 6* W/) sém, set, set tzb*

4 :

8 () t'er g } ka,kém,kém, ma neh ; aa i ma ma tu 11 5 ma * " ma nth met | ka, bah U men 1 | $\ : j mer mer 3 A; més 4 |S meh 5* | na . 7 nu nen ne fer F 1 , i néb B ' de neb P i nem 2* SY num*

hl. = tes

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HIEROGLYPHICS

TABLE OF THE Most Common Syiuasic Signs.—continued.

SIGN. SOUND. SIGN, SOUND. 3 sén 8 ale nen Q x 9 nL. | nen | na, am, xém|| 1 WS xe 10 nas nas tep 2, cS xu 11 IN neh 3 | a | xe R ret! 4 Sey xen 1 ON rut, rut 2 a ru 5% an xent | fant 8 6| AN | xe 1 sa 7% | xeér | hép | Bt 3| © | s@ 1 ha 4 Y sa 2) a? | ha 5 | Sm | saa 3 ° ha 6 | su 4 | =| hu 5| Oo*

|a 7 stb tau * 6 i hak 8 | LN | s&tép 9 4 stm 7*|_S) | we | pe 8 het, het, 10 sén het: 9 | On | hetep 11 | YF | ser 10*| wy | hem | peh 8 Vv Ta Se ee 11 | & | her 2 lees eee 12) hés*

DETERMINATIVES.

Champollion described as determinatives certain ideo- graphic signs which were placed after words phonetically expressed. The use of each of these signs is more or less extended. The greater part are used for one radical, or at least for one and the same idea. For such determinatives the proper place is the dictionary. But there is a class of determinatives placed after different words, often many in number, and therefore called generic determinatives. 'The determinative is attached to the radical, and has nothing to do with the

grammatical use of a word as noun or verb. (M. de =

Rougé gives a list of above a hundred as necessary for the student of Egyptian grammar, leaving out those of more restricted use.) Science has not yet wholly accomplished its task in this section. (Necessarily the exact definition of the range of a determinative requires a careful induction from its use.)

(The table which follows is but slightly abridged from M. de Rougé's, after comparison with Dr. Brugsch's in his Grammaire Hiéroglyphique, where a somewhat fuller but less logical list is given, apparently founded on that of the French savant. The reason for here giving a larger proportion of determinative than of syllabic signs is that the senses of the determinatives when logically arranged, as by M. de Rougé, present a key to the whole construction of the Egyptian

system of ideographic signs, and afford us a remarkable insight into the genius of the language.)

wo ww

SS ks Yon Ge WS Bd lM Be ee mca Hinte 0 § x oq |

ao co oe] =}

©

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

Taste oF Generic DETERMINATIVE SIGNS.

SIGN.

VARIANTS.

Varied by many at- tributes

y

Varied ac- cording to race of prisoner

(seated)

REPRESENTING

ceiling

ceiling with star

sun star hilly country oval

? country divided

same ?

Waves

flaming censer man (squatting)

man acting

man and wo- man

man with long

beard

personage en- throned hold- ing whip similar, kneeling man squatting, his hand to his mouth man raising

hands

man bound

man stamping and striking himself

man, slain

man, his right hand raised

man,arms raised

man, with staff

DETERMINING IDEAS.

sky, ceiling; to raise, superiority

night, obscurity

sun, light; divisions of time

star,constellations; gods; divisions of time

country, mountains ; na- tions

islands, oases, maritime countries

cities, villages

| nomes, districts, fields

territories and their por- tions, dikes; mud

water, liquid,seas,rivers; to wash; freshness; level

fire, heat; zeal

proper names; pronouns and participles

more general, often used in Saitic period for the more special determi- natives following the next

humanrace,its divisions, classes; participles pl.

gods, august persons, kings

ancestors, princes, kings

similar; defunct persons, manes

actions of the mouth, eating, speech; thought

adoration, invocation,

prayer

enemies, prisoners ; per- verse

impiety, perversity ;

enemies

enemies;to strike; death, massacre

exclamation, invocation

height; grandeur; joy

chief,great distinguished

HIEROGLYPHICS

803

Taste or Generic DeterMInATIVE Sians—continued.

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44 45

AG

47

SIGN.

VARIANTS. } REPRESENTING

same, leaning on

staff tne a. man, holding oar) 8 club (or oar) child, hand to mouth (the same, horizontal) pone

funeral couch, without or with

i’

mummy varied by | woman squat- many ting attributes

head of man in profile

curl , ©,| human eye, iris, pupil

eye weeping

gaa oe @ eo JP wep oh ah

ay nose, calf's head tooth we, hand _ holding small club pee! ~~ | hand, the palm

below; foot of bird lying down

a breast and two arms,arms and

(YO. 0) 6 ? vase, arms () extended arms

phallus

bent leg

same and knife

legs walking the same reversed

lion's hind part

Typhonian ani- mal

DETERMINING IDEAS. old age; 1o end force in general, violence

infancy, youth; to suckle, education ; renewing

embalming; manes;rites; images, types, forms

mummies; death,discase; embalming ; to lie down, rest

woman, goddess; fem. pronouns and_parti- ciples

head; superiority

hair; black, colours in general; grief; turns

to see, to awake, to know; enemy

tears, grief

to breathe, smell; joy, pleasure

eating; speech; hard objects, stones, &c.; regions, directions; everything relating to the earth and fields

all actions implying the use of any force

arms, shoulders, sides; directions; gentle ac- tions, rest, gentleness, accord, songs

to embrace, unite; to squecze,enclose ; event, fortune negation, prohibition; adytum

male, generation ; pollu- tion; to pour out ; parts of generation; in front; veins

leg, foot, knee, &c.; walk; diminution and enlargement; measures

of length to carry off, leap over, surpass, diminish, an- nihilate, violate locomotion return, send back, repel behind, to follow; to re- volt, refuse; force, v10-

lence

revolt,violence, disorder}; tempests, storms

56

57

64

65

66

67

68

69

70

TABLE oF GENERIC DererMINATIVE Sians—continued.

SIGN.

VARIANTS.

oF

(varied)

°

0, 000

fe} (varied ac-

cording to kind of

grain) (varied)

REPRESENTING

calf's face, head

head of ox on support (?) piece of skin

bone with flesh ?

Nile-duck wagtail

wing

ess

crocodile

kind of fish serpent kind of tree dry branch ? palm-shoot ?

bunch of flowers

grains

bushel pouring out grain, vase full of grain

ground-plan of room

rampart

the same, falling

steps

fortified enclo- sure

basin

DETERMINING IDEAS.

nose, nostrils; lungs; to smell, breathe, sleep ; pleasure; to separate, shut up, revolt

throat, gullet,lungs, &c.; to eat; breathe

quadrupeds; objects in leather

members in general

birds; flying insects smallness; vile, wicked

wings, feathers ; y fly, rise

egg ; oviparous animals ; race, descent; feminine

crocodiles of different kinds, divinities con- nected therewith; to conceal oneself, to spy ; destruction

fishes, fishing ; impurity, prohibition

reptiles, worms; sacred serpents ; names of cer- tain genil

trees of all kinds

different kinds of wood; objects made of wood

season, year,time; youth; to renew

plants, flowers; objects composed of plants

cereals of different kinds; to labour, to harvest; measures

cereals of different kinds; harvest; tribute; to measure, bushel

abodes; places in general

walls, fortifications, en- closures

to stagger, crumble, de- stroy

stair, to mount; to ap- proach; foot of a monu- ment

names of fortified cities written within the eterminative)

waters, rivers, seas, canals, basins; to irri- gate, cultivate

DETERMINING IDEAS.

SIGN. VARIANTS. | REPRESENTING

‘followed by one or more determinatives.

*71 | Gee canal, or road | ways, journeys; separa- i tion, to chase; ee periods 72 runt block of stone | stones, bricks, different kinds of rocks; objects in stone; mineral sub- stances 72 | sae boat ships, boats; navigation ; voyages, journeys 74 sail sails; air; to breathe; freshness, _ pleasure ; winds and their geo- graphical directions Wo || eee roll of papyrus | writings, books; designs, paintings; calculations, quantities; to know, thought, &c. 76 tie of a roll to write, books; know- N ledge; to tie, close, finish 77: | LX | (varied) | cover of mum- | mummy-case, embalm- my-case; dif-| ing; abode, divers ferent forms of | places case 78 } post to wander, journey, land; foreign peoples and names; impiety, &e. 79 q graver, or plane? | to lessen, polish; ivory, bone; to clean, em- balm, &c. so| *\ knife, or sword | to cut, prick, &c.; kill, beat ; separate; whet 81} => loaf bread; victuals; _provi- ~~sions of all kinds; riches 82 basket with dia~~ | festivals; joy, pleasure Qe 4 | mond-shaped be | object 83 C7 ‘ basket largeness; victuals and offerings carried in basket 84 | ¥ vase with cover | oil; wax; perfumes; salt provisions 85 Fe, vase, or double |perfumes, fats, ointments; (especially| Vase wine; liquids in general 86 xy pore) vase midst; repose; heart; feelings 87 x | saltier crossing; mixture; mul- tiplication; flexion, reflexion; transitive verbs 88 e knot or packet om dresses; bands, Cis 3 | Gao oval band (or | oval, orbit; name (names seal ?) of royal personages written within deter- minative) 90 Oo ring or circle renewal; atime; totality; circle*

HIEROGLYPHICS

TasLe oF Generic DretTERMINATIVE SiGns—continued.

SIGN. VARIANTS. | REPRESENTING | DETERMINING IDEAS. O ‘91 | 000 | (oftencon-| rings metals; precious solids ; fused with resins, &c.

92)

92 | 000 round grains sand; powder; flour 93 | es packet to envelop, embalm; | develop, count 4/ (OS same, with jet | smells (good and bad)

and odoriferous objects ;

of liquid filth, corruption

THe ReapinG or IpEoGRApPHIC Srens.

The Egyptians used not only simple letters and syllabic signs, but also ideographs, to write words. The reading of these ideographs is obtained in divers ways. It is often furnished by the analysis of proper names of which there are transcriptions, though the result is sometimes approximative. Another method is the study of variants, when a phonetic form of a word replaces the ideographic sign, in the same text. Often also the ideograph is written as a determinative after the phonetic equivalent. (Henee the great importance of publishing collations of known texts, a work to be recommended to new students.)

When a word is written by a single ideograph, and above all when it is a substantive, it is most commonly distinguished by the marks |, a, or their combinations a!,o°, Thus cr is the letter §, 27, Se, the basin.

THE CoMBINATION OF SIGNS OF DIFFERENT KINDS IN WritinGc Worbs.

In texts which shew a certain development, and above all in hieratic manuscripts, where the signs are always more abundant, many words are written phonetically and In such a case, the determinative which is most general is written

—— , hanen, "to become ANA '

weak,feebleness"—Copt. 6ffoyy, Soft, —where thephonetic

letters are followed by the determinatives for (1) repose, feebleness, (2) crossing, bending, (3) evil, unfortunate. A word expressed by an ideograph may be followed by ageneric determinative. (The same is the case when a word is written phonetically with its ideograph as a first determinative, of course special.)

last: thus in

EXPLETIVE SIGNS.

There are a few expletives which were not pronounced, and had a purely graphic use. ‘The most important is the roll —<4, the determinative of writing, knowledge, &c. Itis sometimes used as a sign of separation or as disjunc- tive. The signs a, |, at, oo, are often used as pure expletives, adding nothing to the idea or the sound. | or © is frequently added to a determinative; it is almost the rule, when the s ds it: a == } haem

” pace needs it: as WWA

mennefer, Memphis. In such cases the expletive

ordinarily follows the gender of the substantive, | for masc., for fem. The phonetic value of ¢, ¢, as feminine final, sometimes causes perplexity, but its expletive character is clear in other cases. The sign |, which (like ©) is not always expletive, has similar uses. It is

written after <>, thus =>, even for final r, With ©

ey)

HIEROGLYPHICS

it forms the group @ |, not only for the substantive far, |

ha, “face,” but also for the particle her, “upon,” &c. In hieratic, | is attached to many characters, probably to

distinguish them from very similar ones; thus { 3 for

<=> is clearly distinguished from gg for o. It is thus

used as a diacritical sign, though very variably. At the end of words we find, above all in late times, the ex-

pletive | [-

ExpLeETIVE VOWELS AND CoMPLEMENTS OF SIMPLE LETTERS.

Although the vowels were often omitted, sometimes they are added in a wholly expletive manner, which their vagueness can only aid us to understand. 'This is easily proved from certain words transcribed, such as

Oday, the Egyptian a fo IN In any other system the first a would produce a separation of syllable between ¢ and 4, transcribed here by 6. (It should be remembered, however, that the Greek could not represent a sound like t'han otherwise than by 6. The Egyptian vowel may here represent a disjunctive.) 'The same remark applies in the consideration of the Exyptian transcriptions of divers foreign words, of which the grammatical form is well known. Thus the Hebrew

—_—= nap v is written AN WK Jey , mar- | NO ae

habuta, and the name of the Hebrew harp "33, is

: er | Written. juan l Fa , kenganaur. It

ral, | ole aa has been remarked that each consonant had a kind of

favourite complement, and that this complementary sion should often be treated as an expletive in reading. It has been proposed to admit for these letters inherent

now, tahan.

vowels, but this idea seems exaggerated: the alphabet is |

not a syllabary, for most of the letters unite with the different vowels. The knowledge of the ordinary com- plements of each letter is useful, especially in reference to transcriptions.

Pe 6 Km ~~, f, seems to take \, but Nf: ? Sa; »' Ju;

are common. has as favourite final u, @ or KS indifferently :

we also find J Q, ba; jJ—, bi; J 44, be; bat JK, ba, is rare: ba is expressed ordinarily by Se: we find & Ac or J = ING equally. > thus has \ as favourite complement.

It is the same with p, 0, which has for complement «, @ , %, and we find the syllables O IF &., oO l ; but pa was written Ke \ or OX IN In the spelling of I q, which is often found for the article pi, the variant \, pai, intro- duces the complementary IN a.

For J, k, we find all the combinations 4 IN rt l , Ay yA) >

A but the favourite vowel seems to have been INN a. We observe equally the use of all the vowels after <=%, except, perhaps, .—1, G, which we have not remarked. The complementary vowel secms

to be ING or \, according to the writers. A\, k, shews a decided FAN _

preference for Ww but we also find ,; AS, itl l . With

LJ, &, we observe q, =r. », Q, but

sometimes the expletive | is added, even when | {| is not a substantive.

is more frequent ;

805

==, t, somewhat prefers : it is joined to ING IF ae l |, or\\. ©, ¢, takes , », as complementary vowel; but it is not repugnant to any other combination of vowels. } ordinarily takes \, or l q; much more rarely iN and Ss. es", "8 a

most often followed by A: 5 and i are used; some texts shew \ as expletive of <=>. ane t', seems also to be com-

pleted by \. The syllables oy l, a i | &, are not rare,

but ¢'a is rendered by \ ING the eagle being the favourite comple- ial of |: this sign also forms the groups | > | ! l : We cannot cstablish any special

complement for m; the ordinary

syllabic combinations are Ym IN l, IN », IN I l :

The transcriptions shew that s» is often expletive after ING The

eagle is more readily attached to Lo as 5 iN next

in frequency is ae —— often takes as expletive |, #1.

— “e: =|

For www, 2”, the complementary vowel seems to be

It is also conibincd as

NWO gg NN

l , are more used than “““~“™

l ’ ’ , for this syllable atl was ordinarily written © a—S, as initial. <=, 7, is completed by the expletive |, forming the group

—— a gl =S=. . . 1? hieratic 2. @ is the favourite syllabic of <—>;

—— << P ==> l, l l , but ING extremely ———)

rare. #28 also often takes the expletive |, hieratic (7 and is joined to the final vowels without exception.

as final, and by the syllabics S\—~ ,~

we also note often

| s, is often completed by © expletive; the name of the band

seems to have been set. \ is frequent after \ but | paee |

D4. 149,

homophones were used more readily for this syllable. In other cases

the vowel was suppressed, as | th ms = ING CY

is also completed by a, and follows exactly the same rules as The

is found ; but syllabic

name of the letter —+— was undoubtedly N=, SCS HOt

cw, 3, most readily takes 0, @, l d. An prefers

IN without excluding the others. ©, x, takes \ as expletive,

and we find very often © » S F S , 8 ING are

more rare, the last syllable being almost always written with

, or the group © . The eagle is evidently the

complement of if thus the syllables 14 l. 1» have as ordinary variants TS l l. XMt, | A oe xXaU. Ht is

ordinarily followed by consonants; its vowel is .0; with the

expletives saa: it is the substantive xd.

[], 4, takes IN as complement ; we also find [7] » es 4

in which TX often causes variants, as in the case of if x. illo

806

the harder aspirate,h,

of ale as VW IN or SlaN ha. 8 alone united with sao) ,

l . S ; Ht ; its ordinary expletive is \.) for h is rare:

wasrarely added except with theintroduction

we have only found it followed by consonants or the vowel uw. The syllabic ==, hu, much used for h, has for expletive —<=.

These remarks are of much use when one desires to fill up lacune of small extent in Egyptian texts. They explain usages, on which

one general remark may be added, that the vowel , a, did not

unite itself readily to a certain number of letters; hence the intro- duction of an intermediate letter and the pleonastic forms , &c., for pa, xa, &c. (It must also be re-

membered that, on the one hand, the expletive vowel cannot in all cases have full weight in roots which are always monosyllabic, on the other, that we can scarcely deny itsome force. Was it used to modify the consonant as when a local pronunciation of g in English is written by grammarians g' as g'arden? In transcriptions the expletive vowel appears, but for philological purposes must be disregarded, and the same is sometimes true of the complementary vowel. In English q, our only syllabic, always requires u as its complementary vowel: conse- quently when it is used for its ancestor the Semitic koph, as in goran, an uneducated person would read and even write quoran.

On applying these observations to the orthography of markabuta for M257) and kanaanaur for "\33, it is immediately evident that

the deviations from the Semitic are due to the Egyptian vowel-system. In the word markabuta, the u is the favourite complement of the), and the final ¢ requires a vowel. In kenaanaur the doubled n is resolved into two syllables: it could have been written with the dis- junctive sign between the two "ns and a final vowel.

It has been shewn that the transcriptions of the scribes of the Ramessides from Semitic into Egyptian were very accurate so far as the consonants were concerned. It is equally evident that this was scarcely possible and

practically was not the case with the Semitic vowel sounds. This remark should be borne in mind in all comparisons of Hebrew and Semitic.)

Tuer TRANSCRIPTION OF VOWELS OMITTED.

The vowels, particularly the complementary ones noticed above, were omitted at will in writing, and must often be added in transcription. This is easy when a definite fuller form of a word is known. But there are many words for which the variants give different vowels, and many others for which a vowelled variant has not yet been found. Most Egyptologists here use e for the absent vowel, which must only be regarded asa con- ventional sign for a gap to be filled. (There are, however, cases in which a very common word is never vowelled: here we may safely assume a very short vowel best represented by @, as already noticed.)

ABBREVIATIONS AND EXCEPTIONS.

Abbreviations were rare; ideographs and syllabics rendered them needless. But there are cases in usual

formule ; as |||, nuder a, for , nuter atef, "divine

father," the title of an order of priests. In the formula j , any ut'a send, "life, balance, health," a kind of

[so/) good wish added to king's names and rendered in the Rosetta Stone iyieta, is dny, \ 'a is an abbreviation, sw)

for we find the complete word e{ judg, in the same formula;

4

but the | for

_ There are some words of which the writing is excep- tional, due to causes which may sometimes be traced. Thus

a "v which should according to rule be transcribed senkit, was a variant of seti. The syllabic 4 y set,

is of a more trenchant character.

HIEROGLYPHICS

received as hieratic abbreviation 2 , the last line being exactly like the ~ ~=%, of that time: thus it

resembles the hieratic group for the three letters ~~~, a)

° ° i e . and the scribes took occasion to trace "™ in hiero-

glyphics for set. This is an imitation of the cursive style taken into the monumental, of which there are a certain number of cases. .

SEcRET WRITING.

Intentionally accumulated exceptions in certain texts compose what Champollion has called the Secret Writing. The most ancient traces we have found are of the Eigh- teenth Dynasty. In this system we remark— (1) objects rare or unused in ordinary writing; (2) syllabic signs used as simple letters ; (8) phonetic values obtained oy turning the signs from their ordinary ideographic values; (4) variants between the values of neighbouring sounds. Thus every deviation was made from the usual principles of writing by which it was possible to produce exceptions. This is an enigmatic system intended to be unintelligible to the ordinary reader. The causes of this method are of interest, for from them originated the new values which strangely complicate the hieroglyphic writing of the time of the Greeks and Romans (the secret writing thus passing in a certain degree into the common writing).

Tue Use or HIEROGLYPHICS IN GRAMMAR.

Although, as already stated, an outline of ancient Egyptian grammar is not given in this article, it is necessary to explain how hieroglyphics were used for grammatical purposes.

In expressing roots or derivatives, whether pronominal, verbal, or of particles, both phonetic and ideographic signs could be employed, either

apart or in combination. There is, however, in all but verbal roots a marked preference for phonetic expression, with again a pre- ferential use of alphabetic signs.

The masculine and feminine of nouns are marked, especially when they were ideographically written, by | and @: the former was not pronounced ; it is doubtful whether the latter was, and if so in what cases (De Rougé, Chrestomathie, ii. 7, 8).

The plural of nouns, pronouns, and the pronominal affixes which were also used to indicate the persons of verbs, is indicated by the abstract

symbol, |||, |. In the case of nouns it may be replaced by a phonetic

ending or the trebling of the word when written sdacgraphinally or even phonetically. The principle of expressing the dual, which is proper to nouns, appears to have been the same, though as to this there are difficultics.

The pronouns and cognate words, including the article, are mostly written alphabetically. The affixed personal pronouns, which aro identical in form with a very few exceptions, whether used as pos, sessives, as inflexional verbal suffixes, or as direct complements, or in other words, in their genitive, subjective, and objective uses, afford instructive instances of the different modes of writing. It may be observed that in Egyptian these are the i ly forms of the personal pronouns. 'The following table is taken from M. de Rougé's Chrestomathie, ii. 42, with the omission of some late forms.

AFFIXED Persona Pronouns. Singular.

Bh PE hd | hb Yb oo

HIEROGLYPHICS

3.m. f Xa, @

I depewel

f. s ——, {l se(t ?) | > ,[a a a

Plural. AWWA | I ie ghee Ae yf } af —— aS nee a 2: ten WY ANG ’ i. atl NW AA

1 @ ’ © A Fa Shy cme Se i ith

aS . a sen wn Y Rne TI? @ lll

It will be remarked that all the phonetic forms but one are written with alphabetic signs, that the introduction of ideographs, either as determinatives or independent symbols, gives the common first person singular a feminine in writing but not in sound, and farther confuses this feminine and the true feminine of the second person singular when represented by the same symbol only. ‘The principle of writing an ideograph to determine the use of the pronoun, phonetically expressed or only represented by that symbol, is carried farther in the first person singular than the table shows, there being special signs for a god, &c.

In the case of the articles and the pronouns of more common use alphabetical signs are employed with ideographic signs for the pro- nouns when the necessity occurs. Syllabic signs are used for some of the less common pronouns, and ideographs for substantives employed as pronouns. ‘The fuller forms of pronouns are produced by alphabetic signs; the same is usually the case with the compounds that intro- duce no new element.

The verbal root, identical with that of the noun, is expressed in every mode in which hieroglyphics can be used. It is, however, otherwise with the derivative forms, the inflexions, and the substantive verb, which in its various expressions is really an inflexional word employed in tense-formation. ‘The derivative forms are produced by prefixes which are always alphabetic or by repetition of the radicals (reduplication, sometimes afterwards apocopated). The inflexions are formed by the pronominal affixes for the persons and other prefixes and affixes, these affixes being almost always placed before the pronominal ones,for the moods and tenses; here again the expression isalphabetic with the exceptions afforded by the pronominal affixes as already shewn. ‘The

forms of the substautive verb are phonetic, either alphabetic,

ag? Po terely BASS

= tu; or syllabic CAS 5 wns ’ Be @ AW ;

*0 xeper, =, ari, This mode of writing leads to the *

@, ay a

Q@—<——

identity of some forms of this verb and of other parts of speech : thus pa is the same in form as the definite article, and put with the affixes as the possessive article,and pu as the demonstrative article. These identical forms are here cited as evidence of the result of the use of alphabetic writing.

The radical particles shew the same phenomena. The pre- positions are expressed phonetically, the majority, including nearly all the most common, alphabetically. The simple adverbs, in- cluding the negatives, are written phonetically, with perhaps about an equal use of alphabetic mF i syllabic forms. The few interjections are written alphabetically. In consequence of this mode of writing, particles of different sense are sometimes identical

in form. Thus , &m, is both “in” and “not,” but most

apparent instances of this kind are due to the use of a particle as both preposition and conjunction or adverb.

The bearing of these results on the problems of the formation of the Egyptian hieroglyphic writing, and the growth and origin of the hegreee is significant.

The earliest Egyptian writings, which are hieroglyphic, shew a predominant use of ideographic signs. The phonetic signs gradually grow in importance until the full development of the character aud language. We are thus led to ask whether there was a period in Egyptian writing

when it was wholly ideographic, the supposed first stage of all such systems, when the figure of each object conveyed its name or names and nothing more,

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A stage of pure picture-writing would express a language in the condition which is supposed to have beeu the earliest in the case of all monosyllabic languages, the condition before grammar. It is pre- cisely to such a condition that the linguistic phenomena of Egyptian seem to point. For its simple necessities ideographs alone would be sufficient, and the phonetic signs wanted for granimatical machinery would be introduced when a higher condition was reached,

It may be farther enquired whether the growth of Egyptian was wholly internal, or whether it was influenced from without; in other words, whether there is any reason to assign the roots which serve the purposes of grammar, and even the verbal roots to more than one source. Lhe basis of the inquiry by which this question might be answered lies in the undoubted identity of the personal pronouns in Egyptian and Semitic. 'The inquiry is beyond the scope and limits of this article. It requires an exhaustive comparison of the Egyptian vocabulary, including the structural words, and of the system of grammar, with the Semitic and with the families of language which geographical and ethnological considerations would lead us to include in the category of possible cognates to the Egyptian. The leading results of a limited examination may, however, be stated. In the verbal roots a certain small number occur apparently common to Egyptian and Semitic. Of these roots a good proportion are proper to civiliza- tion, and thus belong to a stage above that of barbarism. In the pronominal roots the personal pronouns are undoubtedly Semitic, whereas the articles seem to be identical in source with a non-Semitic form of the substantive verb, The roots of particles fall into two classes, those which are purely metaphysical, probably including Semitic equivalents, though in the case of 'practically 'aniliteral forms the comparison is hazardous, and such as have become particles by the diversion of substantives to a tropical sense.

It would thus appear that the Egyptian language was originally purely monosyllabic without inflexion and written by idcographic signs, that the first stage towards inflexion was the use of cabeteatives in tropical senses for prepositions and adverbs, the primitive ideographic signs being still sutticient for the purposes of writing, and that the second stage was attained by borrowing from Semitic, so far as was necessary, grammatical forms and particles, with perhaps some verbal roots needed in a civilized condition, and that at this time phonetic signs became absolutely necessary. The importance of the phonetic signs for expressing grammatical forms would tend to their prevalent use for the whole category, except where the radical sense was dominant in the tropical, as in our own use of the word "head" in such prepositional phrases as " at the head of" the table, the army, the administration, &c. This view is put forward as a mere hypothesis, to be sustained or refuted by the study which the subject deserves. 'The importance of the question is great as its solution will mainly tend to determine whether the Egyptian belongs to an early stage of Semitic, as has been conjectured on very insuflicient grounds. In the previous remarks it is assumed that such a view may at present be set aside, otherwise we could not speak of borrow- ing from Semitic, _

THE SupposeD DERIVATION OF THE PHOENICIAN FROM THE EaypTIAN ALPHABET.

M. de Rougé endeavoured to shew that the Pheenician alphabet was derived from the Egyptian in its hieratic form. The hypothesis has been accepted by M. Francois Lenormant in his Essai sur la Propagation de V Alphabet Phénicien, 2d ed., of which the first Plate presents a comparative table of hieratic and archaic Phoenician letters. The method leaves nothing to be desired. The conclusion is, however, scarcely established. It must be remembered that the Egyptian alphabet presents one or more alternative forms of more than half its letters. Most of these correspond to a single Phoenician letter. Thus there is in half the Phoenician alphabet a choice between two or more hieratic forms. 'This diminishes the effect of the comparison. Again the hieratic forms vary, like all cursive forms of writing, with the hand of eich scribe. Consequently the writer who desires to establish their identity with

Phoenician can scarcely avoid straining the evidence. Any one who will compare M. Lenormant's plate with M. de Rougé's hieratic alphabets in the Chrestomathie, Pls. I. seqq., will see that the signs chosen for comparison by M. Lenormant do not agree throughout with any of the three types given without that object by M. de Rougé. It may be remarked in illustration that if we endeavoured to connect the demotic in its latest form

with the Arabic Koofee in its earliest, which is of course absurd, it would be possible, by selecting the demotic variety nearest in form to the typical Koofee of coin- inscriptions, to shew a very good apparent agreement of many letters. Any one may try the experiment with the Koofee alphabet in Soret's MNumismatique Musulmane, Pl. 1. and M. de Rougé's demotic in the Chréstomathie (l.c.), taking care to use only one type where it was repeated by the Arabs for other letters, and in the case of their alphabet to compare only the isolated or final forms. The result would shew the great caution needed in the inquiry.

There are two objections to the proposed derivation of the Pheenician alphabet which must have great weight against any but the strongest evidence of resem- blance. The Egyptian letters represent objects the names of which begin with these letters; similarly the Phoenician letters had names indicating an origin from a hieroglyphic system on the same principle of acrophony. It would be supposed if the Phoenician letters were derived from the Egyptian ones that their names would describe the original signs. This, however, is not the case in a single instance. Aleph signifies an ox and not an eagle, Beth a house and not a bird, Gimel a camel and not a basket, and so, as far as we know, to the end. It is difficult to imagine the complete loss of the original form, and the naming of letters trom a supposed resemblance to another form, which form can scarcely be traced in the most archaic Phoenician. Yet, if the derivation from hieratic be true, we are tied to this archaic form on account of its apparent similarity to the hieratic, and any deviation to explain the Semitic names of the letters would weaken, if not destroy, the foundation of the theory.

Again, itis very noteworthy that the oldest monuments of the Phoenician alphabet are to be found not in Egypt but in Palestine and Assyria. These are the Stele of Mesha, king of Moab, and the inscriptions on the Nemrood bronze lion-weights. These weights take us a step farther in the argument, for they shew us on oficial documents of a palace of Assyrian kings the use of this alphabet, side by side with the Assyrian character, as a kind of demotic or perhaps commercial writing, of necessity well-known in Assyria itself. Of course it is not to be supposed that the languages expressed were the same, but they were so closely allied that their joint use in Assyria was natural, and particu- larly to a nation accustomed to the Turanian Akkadian. This appearance of the Phoenician alphabet in Assyria would suggest that it had its origin rather from Assyrian than Egyptian writing. Is there, however, any evidence that any such alphabet was derived from cuneiform ?

Among the systems of writing which present a sufh- cient similarity to the Phoenician, and its descendant the Greek, to justify our conjecturing their common derivation, though uot necessarily their later connexion, is the Cyprian. This is radically different from the Pheenician in being syllabic, and thus having a much larger list of characters, but the formal resemblances suggest the same source. In the case of the Cyprian, Dr. Deecke has endeavoured to shew the source to be the Assyrian cuneiform in its later form. His arguments are very strong; here it is only necessary to mention the syllabic character of the Cyprian, the agreement in form of many signs, without the readjustment of their elements suggested as theoretically possible by the Median and Armenian variants, and the striking fact that the Cyprian is found in two inscriptions written in cuneiform, each stroke having the Assyrian typical shape (Deecke, Der Ursprung der hyprisehen Sylbensehrift, Strasburg, 1877).

This provable solution of the Cyprian problem sug- gested to Dr. Deecke the comparison of the Phoenician alphabet with Mesopotamian cuneiform. The result, published in the Zeitsehrift der Deutschen Morgeniiindisehen Gesellschaft (xxxi. 102 seqq.), is well worthy the attention of scholars. The inquiry was founded on the comparison of forms and sounds in cuneiform. The forms were much less numerous than the extent of the list of signs would lead us to expect, for the great

majority of these signs are far too complex to have been the prototypes of such simple signs as the Phcenician letters. 'The sounds on the same side present no little difficulty, as the adoption by the Babylonians and Assyrians of the Akkadian system of writing produces a confusion of kindred sounds, and

'excludes some proper to the Semitic alphabets. A

further difficulty arises from the polyphony of the Assyro- Babylonian cuneiform signs, whether ideographic or syllabic, which gives a variety of sounds to the same group and thus greatly diminishes the degree of proba- bility in an agreement. 'These signs are all conventional transcriptions of original iene These hiero- glyphies can sometimes be traced in the rare hieratic orms, and even occasionally in the regular cuneiform types. When we know the original form we can seme- times select the radical sound, but where we find more than one cognate sense with a different sound, the selection becomes difficult, if not impossible. Supposing such a sign to be represented by the English figure 1, standing for "'one " and "first," the discovery of the radical sound would be apparently hopeless. It would be obviously so if the sign also stood for " beginning" and "union." The result seems satisfactory to the extent of about one-third of the Phoenician alphabet, signs like the Phoenician having like sounds. This resultwould have little force did it not seem to be supported by the meaning of some of the signs as compared with the names of the Hebrew letters of which we know the meaning, seventeen in number. But the difficulty in discovering the original radical sound and sense in cuneiform shakes this con- clusion. Consequently the five agreements which might be aceepted were we certain of the original Assyrian sound and sense cease to have much weight. 'There are also some probable agreements which, of course, have still less strength. " Itis, however, to benoted thatthe syllable had, &c., taken as the origin of Heth, and ¢ip, as that of 'eth, have forms in the hieratic cuneiform agreeable to the meaning of the words from which these syllables are sup- posed to be abbreviated, Aattu, a " graver," and dilbu, a " writing-table." This explanation of the signs Heth and eth, consecutive, be it remembered, and without certain renderings, in the Hebrew alphabet, is very remarkable as a confirmation of the theory. For the present it is no more than a theory,

but perhaps it is as probable as the derivation of the Phoenician alphabet fron Egyptian hieroglyphics, through the hieratic types.

It is of course possible that the old Semitic alphabet had an origin independent of Egyptian hieroglyphics or the conventional hieratic forms of Assyro-Babylonian cuneiform. 'The discovery of a new hieroglyphic character in the Hittite inscriptions, containing, in a list of greater extent, certain of the forms indicated by the names of the Hebrew letters, is a new factor in the problem, and must be defined before its true value can beascertained. All that can be said at present is that the Hittite characters wear the aspect of an Egyptian origin. Considering the geographical position of this mode of writing, its prima faere evidence is in favour of M. de Rougé's derivation of the Phoenician ulphabet from Egyptian.

HIE—HIG

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HIERONYMITES, Hieronymiant, or Sancti HrEro- nymt Eremirs, an order of monks, originally hermits, who resolved to adopt the cenobite life under the patronage of St Jerome and the rule of St Augustine. The order first arose in the 14th century in the neighbourhood of Toledo, through the influence of a Franciscan Tertiary named Vasco, and Fernando Pecha, chamberlain of Pedro the Cruel. It soon received papal sanction (from Gregory XI. in 1373), and made considerable progress in Spain and Portugal, where its chief seats were at Guadalupe and Yuste (both in

Caceres, the latter being the scene of the cloister-life of Charles V.), and at the Escorial, the palace-monastery of Philip IL. near Madrid ; afterwards it gained a footing in America also. From about the close of the 16th century it rapidly decayed, and now it is wholly extinct. The dress of the order consisted of a coarse white frock with tan-coloured scapulary and cowl. About 1375 an order of nuns of St Jerome was originated by Maria Garcias de Toledo, and for a time was highly popular. As branches of the Hierony- mite order must be reckoned the Congregation of the Eremites of St Jerome of the Observance, which, originated by Lupus Olivetus, third general of the Hieronymites, was sanctioned by Martin V. in 1426, and still subsists in some parts of Italy as the Congregation of St Jerome of Lombardy, and the Pauperes Eremitsz Sancti Hieronymi, a congregation founded by Peter of Pisa in 1377, which obtained some foothold in Tyrol and Bavaria, as well as in Italy, and subsisted until 1688. See Reinkens, Die Hinsiedler des heiligen Hieronymus, Schaffh., 1864.

HIGDON, or Hiepen, RANvLF, was a Benedictine monk of the monastery of St Werberg in Chester, in which he lived, it is said, for sixty-four years, and died "in a good old age," probably in the year 1363. He was buried, we are told in a note prefixed in the 16th century to the MS. of his work belonging to the library of Christ Church, Oxford, "in St Werberg's Church (now Chester Cathedral), on the south side of the church near the choir, not far from the door which leads into the churchyard; an arch was made for him in the wall, and on the wall is the inscrip- tion, 'Non hic sub muro, sed subter marmore duro.'" This monument, extant in the 16th century, seems now to have

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entirely disappeared. Higdon was the author of a long chronicle, one of several such works based on a plan taken from Scripture, and written for the amusement and instruc- tion of the society to which the compiler belonged. Its chief interest perhaps lies in the fact that it closes the long series of general chronicles, which were soon put com-

| pletely out of date by the invention of printing. It is

commonly styled the Polychronicon, from the longer title Ranulphi Castrensis, cognomine Higdon, Polychronicon (sive Historia Polycratica) ab initio mundi usque ad mortem regis Edwardi ILI. in septem libros dispositum. The work is divided into seven books, in humble imitation of the seven days of Genesis, and, with exception of the last book, is a summary of general history, a compilation made with considerable style and taste. It seems to have enjoyed no little popularity in the fifteenth century. The Christ Church MS. says that Higdon wrote it down to the year 1342; the fine MS. at Christ's College, Cambridge, states that he wrote to the year 1344, after which date, with the omission of two years, John of Malvern, a monk of Wor- cester, carried the history on to 1357, at which date it ends. According, however, to its latest editor, Higdon's part of the work goes no further than 1326 or 1327 at latest, after which time it was carried on by two continuators to the end. Gale in his Quindecim Scriptores published that portion of it, in the original Latin, which comes down to 1066; an English translation of the whole was made by John of Trevisa, and printed by Caxton at his press in Westminster in 1482, with the addition of an eighth book. There is also an anonymous English translation of the work. The whole is being at this time carefully edited by

Professor Lumby, B.D., under the authority of the Master of the Rolls; six volumes have appeared, 1865-1876. HIGHGATE, a suburb of London, county of Middlesex, is situated on an eminence on the great north road, 54 miles N.W. of the London general post-office. From various points on the hill, which reaches a height of 426 feet, striking views are obtained of London and its suburbs, The village is composed chiefly of a good class of houses surrounded by villas and gardens ; and there are a number of mansions of historical interest in the neighbourhood, XI, — 102

among which may be mentioned Arundel House, in which Bacon died iv 1626, and Lauderdale House, once the resi- dence of Lord Lauderdale, one of the "'Cabal" of Charles IL., now used as the convalescent home of St Bartholomew hospital. The principal buildings are the church of St Michael, erected in 1832, in the Perpendicular style, con- taining a monument to Coleridge, who had his residence in Highgate for nineteen years; the new building erected in 1868 for the grammar school founded by Chief-Justice Cholmeley in the time of Elizabeth; the Roman Catholic monastery called St Joseph's Retreat, a splendid and spacious structure in the Italian style, recently erected; the London diocesan penitentiary, the infirmary, the small-pox and vaccination hospital, the Alexandra orphanage, and the Whittington almshouses. Near the foot of the hill is the Whittington stone, erected in 1821 in place of the old one, which was removed in 1795. In 1809 a scheme was projected to avoid the steep ascent at Highgate by means of an arched tunnel, but after the work had pro- ceeded about 130 yards the whole fell in on 13th April 1812. A road was, however, formed in the line of the intended tunnel, passing under an arch over which the ancient road, Hornsey Lane, is continued. The North Loudon cemetery, in the neighbourhood, contains the graves and monuments of a great number of celebrities. Highgate is supposed by some to have received its name from the gate erected by the bishop of London for the purpose of receiving toll from the passengers by the road which at this point entered his park; but it is possible that gate is here used according to its old significa- tion, and that the name simply means high road. The road was constructed in the 14th century, and the toll-house was built on the site of an ancient hermitage. In the time of stage

coaches a custom was introduced of making ignorant persons believe that they required to be sworn and admitted to the freedom of the Highgate before being allowed to pass the gatc, the fine of admission being a bottle of wine, which was discussed at the conclusion of the ceremony. The population of the parish in 1871 was 6437, and of the township 5331.

HIGH PLACE is the rendering invariably given in the authorized English version of the Old Testament Scriptures to a Hebrew word 93 of uncertain derivation bus with much plausibility connected by Gesenius with the Indo- Germanic root which appears in the Persian bam (roof, summit), and in the Greek Boyds (compare Bio, Doric Papa). By the LXX. the word is sometimes left untouched (Baya in 1 Sam. ix. 13 and elsewhere); the prevalent rendering of the plural, when a translation is hazarded at all, is in the Pentateuch orjAat, in the historical books ra bYymAd, 7d VYry, and in the prophetical writings Bwpoi. The Vulgate invariably gives either excelsa or fana. The habit so widely diffused among primitive peoples of selecting the tops of mountains, or at least elevated sites, as suitable from their comparative isolation from the world and their supposed nearness to the sky for the erection of altars and sacred pillars, is so obviously natural as to require no explanation. Along with that of worshipping under trees or groves (see GRove), it was fully participated in by the Israelites from an early period, and continued to assert itself down to a very late date, as is abundantly shown by the frequency with which bamah and other words (har, gub ah, ramah) signifying height occur in connexion with their public and private worship, whether Jehovistic or idolatrous. Thus one of our earliest notices with regard to Abraham after his departure from Haran is that after ois up a sanctuary at Sichem at the oak of Moreh, he

removed unto a mountain on the east of Bethel, and there builded an altar unto the Lord" (Gen. xii. 8). It was on @ mountain (Ebal) that the first altar to Jehovah was raised

by Joshua after the conquest of Canaan had begun (Josh. viii. 30; of Deut. xxvii. 4, 5); and many other "high places," some of them (eg., Beth-Shemesh, or Ir-Heres, and Ashtaroth Karnaim) apparently taken over directly from the Canaanites, speedily obtained recognition as

sanctuaries. A few of these, such as Shiloh, early became important pilgrimage centres, but this was not regarded as inconsistent with the right of each town or village-com- munity to have its own high place, or with the view that Palestine as a whole was the " house" or peculiar territory of God, and that it was therefore lawful on suitable occasions to erect new and extempore altars or high places within its limits. For example, we find in 1 Sam. x., xi.

| repeated references made to the bamah of Samuel's native

village as if it were a thing of course; from 2 Sam. xv. 32 (Hebr.) we gather that even in David's time the top of Mount Olivet was a place " where God was wont to be worshipped ;" while at a later period we read of Elijah repairing the altar on Mount Carmel that had been broken down, and complaining of the violation of God's covenant of which those persons had been guilty who had thrown down the altars and slain the prophets (1 Kings xviii, 30 ; xix. 10, 14). And we read of new altars, generally on high places, being set up by Gideon (Judg. vi. 26, 27), by Manoah (Judg. xiii, 19, 20), and repeatedly by Saul (1 Sam. xiv. 35). The comparatively late author of the books of Kings expressly states, on the one hand, that before the days of Solomon the people 'sacrificed in high places because there was no house built unto the name of the Lord" (1 Kings iii. 2), and, on the other hand, that after that king the high places were removed neither by Asa (1 Kings xiv. 15), nor by Jehoshaphat (xxii. 44), Joash (2 Kings xii. 3), Amaziah (xiv. 4), Uzziah (xv. 4), or Jotham (xv. 35). The still later author of the books of Chronicles, indeed, states of Asa (2 Chr. xiv. 5) and Jehoshaphat (xvii. 6) that they did take away the high

| places " out of all the cities of Judah ;" but this apparent | contradiction can best be explained if we assume that the

chronicler is alluding only to those high places where heathen deities were worshipped or idolatrous practices allowed, while the earlier author had in view the Jehovistic high places which, during many of thie earlier reigns at least, were not discountenanced either in the northern or in the southern kingdom. In reading sucha passage as Amos vil. 9, it would be a mistake to interpret it as meaning that the multiplicity of bamoth was

regarded as wrong in itself; the prophet's zeal is directed not against the placcs but against the cultus and the false value that was attached to it. Hezekiah is the first monarch of whom in the earlier record we read that with some risk to his popularity he removed the high places and altars of Jehovah, and "said to Judah and Jerusalem, ye shall worship before this altar in Jerusalem" (2 Kings xviii. 4 compared with xviii. 22). But it was not until the reign of Josiah that the high places were finally repressed, not on the ground of direct prophetic revelation, but on that of a strict written law. Even then, however, a distinction was made between the " high places" of the southern kingdom, sacred to Jehovah, and those of the northern, dedicated to a mixed worship; the priests of the former were brought to Jerusalem, and, though not allowed to officiate at the altar there, were permitted to share the priests' portion along with their brethren, while those of the latter were put to death (2 Kings xxiii. 8, 20). As for the altars built upon the high places, their construc- tion appears to have been regulated by the law provided for the case in Ex, xx. 24, 25; very often magceboth or pillars were erected beside them (see Ex. xxiv. 4; Josh. xxiv. 26; cf. Isa. xix. 19; Hosea iii. 4); and sometimes they were enclosed in " houses" or "temples" (1 Kings xii. 31, xiii. 32; Amos vii. 13). For the bearing of the facts contained

in this article on the criticism of the Pentateuch and of its | by the board are charged on a district fund to which

legislation, see PENTATEUCH.

the several parishes contribute; but each parish remains

HIGHWAYS. A highway is a public road over which | separately responsible for the expenses of maintaining its

all persons have full right of way—walking, riding, or driving. See Roaps. Such roads in England for the most part either are of immemorial antiquity or have been created under the authority of an Act of

Parliament. But a private owner may create a highway at common law by dedicating the soil to the use of the public for that purpose; and, apart from any special dedication, the using of a road for a number of years, without in- terruption, will support the presumption that the soil has been so dedicated, and the road will be to all intents and purposes a public highway. At common law the parish is required to maintain all highways within its bounds; but by special custom the obligation may attach to a particular township or district, and in certain cases the owner of land is bound by the conditions of his holding to keep a highway in repair. Breach of the obligation is treated as a criminal offence, and is prosecuted by indict- ment. Bridges, on the other hand, and so much of the highway as is immediately connected with them, are asa general rule a charge on the county; and by 22 Henry VIII. c. 5 the obligation of the county is extended to 300 yards of the highway on either side of the bridge. A bridge, like a highway, may be a burden on neighbouring land ratione tenure. Private owners so burdened may sometimes claim a special toll from passengers, called a 'toll traverse."

Extensive changes in the law of highways have been made by the recent Highway Acts, viz, The Highway Act, 1835 (5 and 6 Will. IV. c. 50), and the amending Acts of 1862 and 1864. It is no longer possible for a private owner, by dedicating a highway to the public, to make the charge of maintaining it a burden on the parish in all cases. To create a new highway of this character he must give three months' notice of his intentions to the parish surveyor, and a meeting of vestry must then be called to consider whether the proposed highway is worth the expense of maintenance. Should the vestry decide against it, the charge of maintenance will not fall on the parish, unless the justices of the peace at the next highway sessions decide otherwise.

The leading principle of the Highway Act, 1835, is to place the highways under the direction of parish surveyors, and to provide for the necessary expenses by a rate levied on the occupiers of land. Two or more parishes may unite to form a district under a district surveyor, and large parishes may appoint more than one surveyor. It is the duty of the surveyor to keep the highways in repair; and if a highway is out of repair, the surveyor may be summoned before justices and convicted in a penalty not

exceeding £5, and ordered to complete the repairs within a limited time. The surveyor is likewise specially charged with the removal of nuisances on the highway, or any obstruction or injury rendering it less commodious to the public. A highway nuisance may be abated by any person, and may be made the subject of indictment at common law. The Act con- tains provisions simplifying the process by which a high- way may be widened, enlarged, diverted, or stopped. The amending Acts, while not interfering with the operation of the principal Act, authorize the creation of highway districts on a larger scale. The justices of a county may convert it or any portion of it into a highway district to be governed by a highway board, the powers and responsi- bilities of which will be the same as those of the parish surveyor under the former Act. The board consists of representatives of the various parishes, called 'way war- dens," together with the justices for tle county residing within the district. Salaries and similar expenses incurred

own highways.

The Highway Act of 1835 specifies as offences for which the driver of a carriage on the public highway may be punished by a fine, in addition to any civil action that may be brought against him,—riding upon the cart, or upon any horse drawing it, and not having some other person to guide it, unless there be some person driving it ; negligence causing damage to person or goods being conveyed on the highway ; quitting his cart, or leaving control of the horses, or leaving the cart so as to be an obstruction on the high- way ; not having the owner's name painted up; refusing to give the same ; and not keeping on the left or near side of the road, when meeting any other carriage or horse. This rule does not apply in the case of a carriage meeting a foot- passenger, but a driver is bound to use due care to avoid driving against any person crossing the highway on foot. At the same time a passenger crossing the highway is also bound to use due care in avoiding vehicles, and the mere fact of a driver being on the wrong side of the road would not be evidence of negligence in such a case. When there is a public crossing in a street, the driver is bound to use special care ; and the expression has been used that a cross- ing is the special property of the foot-passengers.

The “rule of the road” given above is peculiar to the United Kingdom. Cooley’s treatise on the American Law of Torts states that “the custom of the country, in some States enacted into statute law, requires that when teams approach and are about to pass on the highway, each shall keep to the right of the centre of the travelled portion of the road.” The same appears to be the general rule on the continent of Europe.

The excessive use of the highway by acts which in moderation are lawful becomes a nuisance if it interferes with the public enjoyment of the roadway. Thus when a carrier, having warehouses on a public street, occupied one side of the street in loading and unloading his waggons several hours at a tine, so that foot-passengers were incom- moded and no carriage could pass on that side, although there was room for two carriages on the opposite side, this was held to bea nuisance; and Lord Ellenborough held it to be a nuisance for stage coaches to stop in the street for three-quarters of an hour taking up and setting down passengers, for the ‘ king’s highway was not to be used as a stable-yard.” In the same way, at common lawa tramway laid along a highway is a public nuisance, although it may be shown to be a common convenience. The construction of tramways is now authorized by 33 and 34 Vict. c. 78.

The Acts 24 and 25 Vict. c. 70, and 28 and 29 Vict. c. 83, regulate the use of locomotives on turnpike and other roads. No engine, so constructed as to be a public or private nuisance, is protected by these Acts. When horses had been frightened by a traction engine, and the jury found that it was likely to frighten horses and that the defendant knew it, he was held liable in damages.

Turnpike Acts—Many of the more important highways are placed under the management of boards of commis- sioners or trustees. The number of local and general turn- pike acts is very great, No fewer than thirty-three general acts are mentioned in the index to the statutes—the first and principal Act being 3 Geo. IV. c. 126. The trustees are required and empowered to maintain, repair, and improve the roads committed to their charge, and the expenses of the trust are met by tolls levied on persons using the road. The various grounds of exemption from toll on turnpike roads are all of a public character, ¢.¢., horses and carriages attending

the sovereign or royal family, or used bysoldiers or volunteers in uniform, are free from toll. In general horses

and carriages used in agricultural work are free from toll. By the Highways and Locomotives Act of 1878 (41 and 42 Vict. c. 77) disturnpiked roads are to become "main roads," and half the expense of maintenance is to be paid out of the county rate. declared to be "main roads," and "main roads" may be reduced to the status of ordinary highways.

In Scotland the highway system will in future be regu- lated by the Roads and Bridges Act, 1878, which comes into operation at the latest on the lst of June 1883, but may be adopted sooner in any county. From and after the commencement of the Act in each county, the manage- ment and maintenance of the highways and bridges shall be vested in the county road trustees, viz., the commissioners of supply, certain elected trustees representing ratepayers in parishes, and others. One of the consequences of the commencement of the Act is the abolition of tolls, statute- labour, causeway mail, and other exactions for the main- tenance of bridges and highways; and all turnpike roads shall become highways, and all highways shall be open to the public free of tolls and other exactions. The county is to be divided into districts under district committees, and county and district officers are to be appointed. The expenses of highway management in each district (or parish), together with a proportion of the general expenses of the Act, shall be levied by the trustees by an assessment on the lands and heritages within the district (or parish).

Highway, in the law of the States of the American Union, generally means a lawful public road, over which all citizens are allowed to pass and repass on foot, on horseback, in carriages, and waggons. Sometimes it is held to be restricted to county roads as opposed to towu-ways. In statutes dealing with offences connected with the highway, such as gaming, negligence of carriers, &c., "highway" in- cludes navigable rivers. But in a statute punishing with death robbery on the highway, railways were held not to be included in the term. In one case it has been

held that any way is a highway which has been used as such for fifty years. (E. R.)

HILARION, St, abbot, the first to introduce the monastic system into Palestine, was born of heathen parents at Tabatha, about 5 miles to the south of Gaza, about the year 288, was sent when very young to Alexandria to be educated, and there became a convert to tlie Christian religion. Attracted by the fame of St Anthony, he went to visit that saint in his solitude, and forthwith became a disciple. Returning to Palestine with some companions while still but a lad of fifteen, he gave away all the property he had inherited by the recent death of his parents, and then withdrew into loneliness in the desert between the sea and the marshes on the Egyptian border. In this solitude he observed the most rigid asceticism, and (to quote the quaint remark of Butler) "thought himself at liberty to practise certain mortifications which the respect we owe to our neighbour makes unseasonable in the world." Twenty years of patient continuance in the way of life he had chosen for himself were rewarded, we are told, with mira- culous gifts and with rapidly growing fame; disciples and imitators multiplied to the number of two or three thousand, and all owned the spiritual oversight of Hilarion. Informed by revelation when sixty-five years old of the death of Anthony, he undertook an extended tour into Egypt, where he visited all the scenes of that saint's labours ; afterwards lic removed in the company of a favourite disciple, Hesychius, into Sicily, where, however, his popularity

rendered impossible the quiet and retirement which were

congenial to his habits; a further migration to Epidaurus thus became necessary ; and ultimately he found a resting- place in Cyprus, the diocese of his old friend Epiphanius, Where in a loncly cell amongst some almost inaccessible

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rocks he died in 371. According to Sozomen his festival was observed in Palestine with great solemnity as early as the 5th century; he is now comniemorated by the Roman Church on October 21st. His earliest biographers were Epiphanius and Jerome.

HILARIUS, or Hitarus (Hizary), bishop of Rome from 461 to 467, who according to some authorities had attained to the archidiaconate as early as the year 417, is known to have been a deacon and to have acted.as legate of Leo the Great at the "robber" synod of Ephesus in 449. There he so vigorously defended the conduct of Flavian in deposing Eutyches that he was thrown into prison, whence he had great difficulty in making his escape to Rome. Chosen to succeed Leo on November 12, 461, he issued a brief de fide catholica, in which he anathematized Eutyches, Nestorius, and Dioscurus, and reaffirmed the decisions of the councils of Nice, Ephesus, and Chalcedon. In 465 he held at Rome a council which put a stop to some prevalent abuses, particularly to that of bishops appointing their own successors. His pontificate was also marked by a successful encroachment of the papal authority on the metropolitan rights of the French and Spanish hierarchy, and by a resistance to the toleration edict of Anthemius, which ultimately caused it to be recalled. Hilarius, who died November 17, 467, was succeeded by Simplicius.

HILARIUS, St, of Arles (c. 403-449), an eminent pre- late and an able if unsuccessful defender of the liberties of the Gallican Church, was born about 403, and in early youth entered the abbey of Lerins, then presided over by his kinsman Honoratus (St Honoré). Having succeeded Honoratus in the bishopric of Arles in 429, he set about the discharge of his episcopal functions with unusual energy and zeal. Following the example of St Augustine, he is said to have organized his cathedral clergy into a " congre- gation," devoting a great part of their time to social exercises of ascetic religion. As bishop of Arles he held the rank of metropolitan of Vienne and Narbonne, and in this capacity he came into collision in 444 with Leo the Great on the question of the deposition of one of his bishops (Cheli- donius) ; this quarrel resulted in his being deprived of his rights as metropolitan to consecrate bishops, call synods, or exercise ecclesiastical oversight in the province, and in the edict of Valentinian III., so important in the history of the Gallican Church, "ut

episcopis Gallicanis omnibusque pro lege esset quidquid apostolic sedis auctoritas sanxis- set." He died in 449, and his name was afterwards intro- duced into the Roman martyrology for commemoration on the 5th of May. Hilarius enjoyed during his lifetime a high reputation for learning and eloquence as well as for piety ; his extant works (Vita S. Honorati Arelatensis Lpiscopi and Metrum in Genesin) compare favourably with any similar literary productions of that period. A poem, De Providentia, usually included among the writings of Prosper, is sometimes also attributed to Hilary of Arles.

HILARIUS, Sr, bishop of Pictavium (Poitiers), an eminent "doctor" of the Western Churcli, sometimes referred to as the "malleus Arianorum" and the " Atha- nasius of the West," was born at Poitiers about the end of the 3d century a.p. His parents, who were pagans of distinction, afforded him every means of acquiring a good education; and to the ordinary accomplishments of an educated gentleman there was added in his case what had even then become somewhat rare in the West, some know- ledge of Greek. After he had attained to manhood his attention was directed to the Old and New Testament writings, with the result that he became convinced of the truth of Christianity, and along with his wife and his daughter received the sacrament of baptism. We have no means of knowing the nature or duration of the services which he rendered the church during the period which im-

mediately followed his admission within its pale; but he appears to have continued to reside in Poitiers, and so great was the respect in which he came to be held by the citizens there that about 353, although still a married man, he was by the unanimous voice elected bishop. At that time Arianism, which under imperial protection had over- spread the Eastern, was now under similar auspices threaten- ing also to overrun the Western Church ; to resist and repel the irruption was the great task which Hilary now set himself to achieve. One of his first steps was to secure the excommunication, by those of the Gallican hierarchy who still remained orthodox, of Saturninus, the Arian bishop of Arles, along with Ursacius and Valens, two of the most prominent of the supporters of that prelate.

About tlie same time he wrote to the emperor Constantius a remon- strance against the persecutions by which the Arians had sought to crush their opponents (Ad Constantium Augustum Liber Primus, of which the most probable date is 355). His labours for the triumph. of orthodoxy were not in the first instance, however, crowned with success; for at the synod of Biterrae (Beziers), summoned in 356 by Constautius with the professed purpose of settling the long-standing dis- putes, Hilary was by an imperial rescript banished along with Rhodanus of Toulouse to Phrygia, in which exile he spent nearly four years. From this hostile region, however, he continued to govern his diocese without undue difficulty, no successor having been nominated to the see; while at the same time he found leisure for the preparation of two of the most important of his contributions to dogmatic and polemical theology, the De Synodis, or De Fide Orientalium, an epistle addressed in 358 to the bishops in Gaul, Germany, and Britain, expounding the true views (sometimes veiled in ambiguous words) of the Oriental bishops on the Trini- tarian controversy, and the De Trinitate Libri XII., com- posed in 359 and 360, in which, for the first time, it was successfully attempted to express in the Latin tongue the theological subtleties and refinements which had been elaborated with the aid of the more flexible language of Greece. The former of these works was not entirely approved by some of the members of his own party, who thought he had shown too great forbearance towards the Arians, and had expressed himself too hopefully as to the possibilities of an ultimate reconciliation of the contending views ; to their criticisms he replied in the Apologetica ad Reprehensores Libri de Synodis Responsa. In 359 Hilary attended the convocation of bishops at Seleucia in Isauria, where, along with the Egyptian Athanasians, he joined tho Homoiousian majority against the Arianizing party headed by Acacius of Czesarea ; thence he betook himself to Con- stantinople, and, in a petition (Ad Constantium Augustum Liber Secundus) personally presented to the emperor in 360, repudiated the personal calumuies of his enemies and sought to vindicate his Trinitarian principles. His urgent and repeated request to be permitted a public discus- sion with his opponents, especially with Ursacius and Valens, proved at last so inconvenient that he was sent back to his diocese, which, accordingly, he appears to have reached about 361, within a very short time of the accession of Julian. Though he was received in his diocese with every demonstration of joy, he

yet found Arianism strong enough there to demand his best energy and skill for the next two or three years; but in 364, extending his efforts once more beyond Gaul, he impeached Auxentius, bishop of Milan, and a man high in the imperial favour, as hetero- dox. Summoned to appear before the emperor (Valen- tinian) at Milan and there maintain his charges in person, Hilary had the mortification of hearing the supposed heretic give answers entirely satisfactory to all the questions which were proposed ; nor did his (doubtless sincere) denunciation of the metropolitan as a hypocrite save himself from an

ignominious expulsion from Milan as a disturber of the peace of the church. In 365 he published the Contra Arianos vel Auxentium Mediolanensem Liber, in connexion with the controversy ; and also (but perhaps at a somewhat earlier date) the Contra Constantium Augustum Liber, in which he pronounced that lately deceased emperor to have been Antichrist, a rebel against God, " a tyrant whose sole object had been to make a gift to the devil of that world for which Christ had suffered." The later years of Hilary's life were spent in comparative quiet and retirement, devoted in part to the preparation of his expositions of the Psalms (Tractatus super Psalmos), for which he was largely indebted to Origen; of his Commentarius in Evangelium Matthar, a work of no exegetical value ; and of his no longer extant treatise on the book of Job. He died 13th January 368. His great energy and zeal, courage and perseverance, rendered him a very influential ecclesiastic during his life ; while, in virtue at once of the depth and acuteness of his intellect and of the wide extent of his knowledge, he holds the very highest rank among the Latin writers of his century. Designated already by Augustine as 'the illustrious doctor of the churches," he by his works exerted an increasing in- fluence in later centuries ; and by Pius IX. he was formally recognized as "universe ecclesiz doctor" at the synod of Bordeaux in 1851. Hilary's day in the Roman calendar is January 14; the English " Hilary Term" begins on the 11th and ends on the 31st.

Of Hilary's works, which include, besides those already mentioned, some minor treatises, there have been several editions, of which the most worthy of mention are that of Erasmus (Basel, 1523, 1526, 1528), the Benedictine by Coutant (Paris, 1693; reprinted by Maffei, Verona, 1730),

and that of Migne in the Patrologiw Cursus Compictus. His biography by Fortunatus probably datcs from about the middle of the 6th century ; other sources for the facts of the life of Hilary are the numerous incidental notices to be met with in his own writings and in those of Jerome, Sulpicius Severus, and Gregory of Tours. See Reinkens, Hilarius v. Poictiers (1864).

HILDA, or Hixp (614-680), usually called St Hilda, a Saxon lady whose name is intimately associated with the history of the early English church and of early English literature. She was a member of the royal family of Northumbria, her father Hereric being a nephew of King Edwin ; and it was along with her royal kinsman that, asa girl of fourteen, she received baptism at the hands of Paulinus. During the pagan reaction which followed Edwin's defeat and death, Hilda was tempted to settle with her widowed sister Hereswith at the monastery of Clielles, 12 miles from Paris; but she was recalled to England by Bishop Aidan, the missionary from Iona, and in 649, two years after her consecration as a nun, she was appointed to succeed Heru the abbess of Heortea or Hartlepool. When, in fulfilment of the vow which he had made before the decisive battle with Penda, Oswy came to dedicate his daughter to God, it was to the care of Hilda that he entrusted her. In 658 the abbess founded the famous monastery on the cliffs at Streoneshalh or Whitby, and for the next twenty-two years she ruled with rare ability and virtue over the double community of monks and nuns which gathered round her. Among those who shed the most abiding lustre on the establishment were St John of Beverley and the Saxon poet Cadmon. Hilda died, full of years, in 680, mourned by her nuns as their common mother. There is a St Hilda's church both at South Shields and at Hartlepool, and the latter preserves her effigy on its ancient seal. At Whitby the tradition long lingered that on a summer forenoon, when the sun shone in the highest windows of the north part of the abbey, a figure of Lady Hilda could be discerned ; and the fossil ammonites of the neighbourhood are popularly known as St Hilda's snakes. See Bede, Eccl. Hist., xxiv.; Dr G. Young, Hist. of Whitby, 1817 ; Sir Cuthbert Sharp, Hist. of fZarilepool, 1816.

HILDBURGHAUSEN (in old records Wiltpershusia and Villa Hilperti), the chief town of a circle in the duchy of Saxe-Meiningen, Germany, is situated in a wide and fruitful valley on the river Werra and on the Werra railway, 19 miles south-east of Meiningen by rail. It is the seat of a circle court, of a court of appeal, and of the jury court for the duchy. The streets are wide and regular, and the principal buildings are the former castle of the duchy, erected 1685-95, now used as barracks, with a park in which there is a monument to Queen Louise of Prussia ; the old town-house, the Government buildings, the gymna- sium erected in 1877, the normal seminary, and the lunatic asylum. A monument has been erected to those of the

citizens who died in the Franco-Prussian War of 1870-71. .

The manufactures are very various, and include linen fabrics, cloth, papier-maché, toys, buttons, optical instru- ments, agricultural machines, knives, mineral waters, con- densed soups, and condensed milk. The population in 1875 was 5162.

Hildburghausen belonged in the 14th century to the counts of Henneberg, from whom it passed into the possession of the dukes of Saxony. In 1683 it became the capital of a principality, which in 1826 was united to Saxe-Meiningen.

HILDEBERT (Hypa.zBert, GILDEBERT, ALDEBERT) of Le Mans and afterwards of Tours, a prominent church- leader, and one of the best Latin writers of his century, was born about 1055 at Lavardin near Vendéme, became a pupil of the famous Berengarius of Tours, and made so great progress in all the learning of the time that he was made head master of the school, arclideacon, and finally, in 1097, bishop of Le Mans. In the beginning of his episco- pate much trouble was caused him by the jealousy of his dean, Godfrey, who had accused him of immorality ; but finally he succeeded in fully vindicating his innocence. He next had to encounter the persecutions of William Rufus, who had captured the city; and these proved so harassing that he ultimately felt it necessary to withdraw to Rome, with the intention of resigning his charge; but Pope Paschalis IL. declined to give him his release, On his return to Le Mans, Hildebert found the diocese in a state of great commotion, which had

been caused by the preaching of Henry the Deacon ; but he speedily succeeded in restor- ing order after he had banished the agitator. About 1125 he was translated, much against his will, to the see of Tours ; and soon afterwards he held the important synod of Nantes, convened for the purpose of correcting the abuses and terminating the disorder which had so long prevailed in Brittany. A dispute with Louis the Fat about the rights of ecclesiastical patronage brought him into much disfavour with that monarch ; but their mutual relations had much improved before the death of Hildebert, which took place on December 18, 1134. From some writers he has received the name of Saint, but his name occurs in no martyrology.

The works of Hildcbert, which include letters, sermons, and pocms, as well as formal contributions to philosophy and dogmatic theology, have been edited by Beaugendre (Paris, 1708), and in part both by Baluze and Muratori. (See also Galland's Bibliotheca Patrum, vol. xiv.) The poems, which are on very various sub- jects, are disfigured by many faults of metre and defects of style, but nevertheless enjoyed great popularity in their time, and were frequently used as classics in'the schools of France and Italy, as also were the letters, of which the literary merit is greater (129 in 3 books), The sermons are often eloquent and instructive, but generally overloaded with imagery and disfigured by an excessive use of the allegorical method of interpretation. The tendency to Mariolatry is strongly developed in them; and the De Cena Domini has an historical interest, as exhibiting the first instance of the use of the word transubstantiation. The Vractatus de querimonia s. conflict carnis et anime is an imitation of Boetius ; and the Moralis Philosophia has its sources in earlier Latin authors, and especially in Cicero and Seneca. The Zractatus theologicus appears to have determined the form of later systems, and thus to be of import- ance tn the history ef dogmatic theology. His method is first to

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lay down the thesis, which is then supported by seripture proofs and by passages from the fathers, especially from Angustine; he finally proceeds

by detailed argument to dispose of difficulties and objections with considerable acuteness, and without that excessive subtlety which characterized later scholastic writers.

HILDEBRAND. See Grecory VII.

HILDEBRANDSLIED. This invaluable example of Old German alliterative poetry is contained in a MS. origi- nally belonging to the library of I"ulda, and now preserved at Cassel. It is written on the first and last pages of a volume of Biblical and theological contents by two con- temporary hands apparently belonging to the beginning of the 9th century. The conclusion of the poem is unfortu- nately wanting, evidently from want of space. From such misreadings as man for inan, and puas for wuas or was (with p for the Runic w sign sometimes used here as in Old English MSS.), it is manifest that our text was not written down from memory,—as has often been assumed,-—but is a transcript from an older original. This conclusion is confirmed by the state of the language of the fragment, which shows a curious mixture of Low and High German forms that can never have existed in any living dialect of Germany, but can only be explained as the result of an attempt made by a Low German scribe to adapt the forms of a High German original to his vernacular idiom.

The fragment is mostly taken up with a dialogue between Hildebrand and his son Hadubrand. When Hildebrand followed his master Theodoric the Great, exiled from Italy by Odoacer, he left his young wife and an infant child behind him. At his return to his old home, after thirty years' absence at the Hunnic court, he is met by a young warrior and challenged to single combat. Before the fight begins, Hildebrand, asking for the name of his opponent, and discovering his own son in him, tries to avert the fight, but in vain. 'Then they let their horses run with their sharp spears, and then they hewed their white shields until they were beaten to pieces with their weapons." With these words the frag- ment stops abruptly, giving no clue as to the issue of the combat. It is certain, however, from allusions to the tale made in the Old Norse Asmundar Saga, that it must have been fatal to Hadubrand.! But in the later traditions both of the Old Norse Thidriks Saga (13th century), and thie so- called Jiingere

Hildebrandslied,—a German popular song preserved in several versions dating from the 15th to the 17th century, but evidently originating at an earlier time,2— Hadubrand is represented as defeated simply, and obliged to recognize his father.

The Hildcbrandsiicd was discovered and published for the first time as a prose story, as early as 1729 ; but it was not till 1812 that its metrical charactcr was recognized by the brothers Grimm.‘ Since that time numerous reprints and critical editions have been published, among which Lachmann’s text ® holds the foremost rank as to critical exactness and sagacity, although some of the metrical rules laid down by Lachmann, and followed in his text, have since been shown not to be applicable to the Old German allitcrative verse in which the Hildcbrandslicd is written.®*

HILDEBRANDT, Epvarp (1817-1868), was born in 1817, and served his term as apprentice to his father, a house-painter at Dantzic. He was not twenty when he came to Berlin, where he was taken in hand by Wilhelm

1 See Miillenhoff and Scherer, Denkmdiler, p. 264.

2 See Grimm’s edition, and Uhland, Alte hoch- und niederdeutsche Volkslieder, i. 330 foll.

3 See J. G. Eckhard, Commentarit de rebus Francie orientalis, Wiirzburg, i. 864 foll.

4 Die beiden dltesten deutschen Gedichte aus dem 8" Jahrh.. . . herausgegeben durch die Briider Grimm, Cassel, 1812.

5 Given in Miillenhoff and Scherer, Denkmédler deutscher Poesie und Prosa, 2d ed., Berlin, 1873, No. ii. A lithographic facsimile of the MS. was published by W. Grimm, Gottingen, 1830, and a photographic by E. Sievers, Halle, 1872.

6 See especially F. Vetter, Zum Muspilli, Vienna, 1872, and M. Rieger, Dic ait- und angelstchsische Verskunst, Halle, 1876 (reprinted from the Zeitschrift fiir deutsche Philologie, vii.).

Krause, a painter of sea-pieces. Like other artists who have earned a name for subtle and rapid execution, he worked at first in a formal, smooth, and timid fashion. Several early pieces exhibited after his death, —a breakwater, dated 1838, ships in a breeze off Swinemiinde (1840), and other canvases of this and the following year,—show Hilde- brandt to have been a careful student of nature, with inborn talents kept down by the conventionalisms of the formal school to which Krause belonged. It is difficult to say what the outcome of his art would have been if Hilde- brandt had not felt other influences than those of his native schools. Accident made him acquainted with masterpieces of French art displayed at the periodical exhibitions of the Berlin Academy, and these awakened his curiosity and envy. He made up his bundle and wandered to Paris, where, about 1842, he entered the atelier of Isabey and became the companion of Lepoittevin. In a short time he sent home pictures which might have been taken for copies from these artists. Gradually he mastered the tricks of touch and the mysterious secrets of effect in which the French at this period were already so perfect. He also acquired the necessary skill in painting figures, and having done this he returned to Germany, unsurpassable in techni- cal execution, and well skilled in the rendering of many kinds of landscape forms. His pictures of French street life, done about 1843, are impressed with the stamp of the Paris school, but they reveal at the same time a spirit eager for novelty, quick at grasping, equally quick at rendering, momentary changes of tone and atmosphere in varying space and medium. After 1843 Hildebrandt, under the influence of Humboldt, extended his travels, and in 1864-65 he actually went round the world, But whilst his experience became enlarged his powers of concentration broke down. He lost the taste for detail in seeking for scenic breadth, and a fatal facility of hand diminished the value of his works for all those who look for composition and harmony of hue as necessary concomitauts of tone and touch. In oil he gradually produced less, in water colours more, than at first, and his fame will probably rest on the sketches which he made in the latter form, many of which are known to the general public by means of chromo-lithography. His course may best be compared to that of a meteor, being breath- lessly rapid, brilliant, and charged with colour. No other had the same art of

combining elements singly unpicturesque into a picturesque and striking whole, and this chiefly by contrasts of tint and observation of natural phenomena. Fantasies in red, yellow, and opal, sunset, sunrise, and moonshine, distances of hundreds of miles like those of the Andes and the Himalaya, narrow streets in the bazaars of Cairo or Suez, panoramas as seen from mastheads, wide cities like Bombay or Pekin, narrow strips of desert with measureless expanses of sky,—all alike display the bravura of a master who had innumerable admirers in his day on account of this facility, and deserved all the admiration he received, subject to the merited reproach that all these fire- works would have been more satisfactory if combined with deeper meditation on the art of composition and more patient study of detail. Hildebrandt died young at Berlin, on the 25th of October 1868. His pictures are scattered in vast numbers throughout Germany. But good selections are accessible in the royal palaces and in the collections of Borsig, Raabe, and Ravené at Berlin.

HILDEBRANDT, TuEopor (born at Stettin 1804, died at Diisseldorf 1874), was a disciple of the painter Schadow, and, on Schadow's appointment to the presidency of a new academy in the Rhenish provinces in 1828, followed that master to Diisseldorf. Bred in the academy of Berlin, and finished under Schadow (1820-24), Hildebrandt began by painting pictures illustrative of Goethe and Shakespeare; but in this form he followed the traditions of the stage

rather than the laws of nature. His artificial modes of thought were not, however, without admirers, and he pro- duced rapidly Faust and Mephistopheles (1824), Faust and Margaret (1825), and Lear and Cordelia (1828). He visited the Netherlands with Schadow in 1829, and wandered alone in 1830 to Italy ; but travel did not alter his style, though it led him to cultivate alternately eclecticism and realism. At Diisseldorf, about the year 1830, he produced Romeo and Juliet, Tancred and Clorinda, and other works of the same kind which deserved to be classed with earlier ones ; but during the same period he exhibited (1829) the Robber and (1832) the Captain and his Infaut Son, examples of an affected but kindly realism which captivated the public of the time, and

marked to a certain extent an epoch in Prussian art. The picture which made Hilde- brandt's fame is the Murder of the Children of King Edward, of which the original, afterwards frequently copied, still belongs to the Spiegel collection at Halberstadt. It challenges comparison with a similar composition by Paul Delaroche, though rather to Hildebrandt's disadvantage. Hildebrandt chose the moment when the children are asleep, and the murderers pause ere they smother their victims with a pillow. Delaroche with subtler sense of artistic propriety represented the princes seated on their bed, unconscious of the near approach of their assassins, whose vicinity is betrayed by a streak of light at the bottom of the door and the watching of a dog. The execution of Delaroche is spirited and delicate, that of Hildebrandt finished and smooth. But the German master, who was below Sohn and Schadow in power, is also naturally far below his French competitor. Comparatively late in life Hildebrandt tried his powers as an historical painter in pictures representing Wolsey and Henry VIIL., but he lapsed again into the romantic in Othello and Desdemona, a fair replica of which, in Schulte's collection at Diisseldorf, gives a good idea of his shiny, ineffective, technical execution. After 1847 Hildebrandt gave himself up to portrait painting, and in that branch succeeded in obtaining a large practice.

HILDEGARD (1098-1179), commonly referred to as St Hildegard, abbess, " prophetess," and a figure of some con- sequence in the history of medixval mysticism, was born of noble parents at Béckheleim in the countship of Sponheim, diocese of Mainz, in 1098 (or 1099), and from her eighth year was educated at the Benedictine cloister of Disibodenberg (Mons Disibodi) in the principality of Zweibriicken, now in Rhenish Bavaria, where Jutta, sister of the count of Sponheim, was at that time abbess. From earliest childhood, we learn from Hildegard herself, she was ac- customed to see visions which increased in frequency and vividness as she approached the age of womanhood ; these, however, she for many years, though with great pain, kept almost wholly secret, nor was it until she had reached her forty-third year (1141) that she felt constrained at last to divulge them. Committed to writing by her in- timate friend the monk Godefridus, they now form the first and most important of her printed works, entitled Scivias (probably an abbreviation for "sciens vias" or "nosce vias Domini") s. Visionum et Revelationum Libri

Z/Z.,and completed in 1151. In 1147 St Bernard of Clair- vaux, having come to Bingen while engaged in preaching the new crusade throughout Germany, chanced to hear of Hildegard's revelations, and on inquiry became so con- vinced of their reality that he not only wrote to her a letter cordially acknowledging her as a prophetess of God, but also successfully advocated her recognition as such by his friend and former pupil Pope Eugenius III. in the synod of Tréves (1148), In the same year Hildegard, who meanwhile had succeeded Jutta as abbess at Disibo- denberg, and had attracted overflowing numbers to that

cloister, migrated along with eighteen of her nuns to 4 new convent at Rupertsberg near Bingen, over which she pre- sided during the remainder of her life. By means of voluminous correspondence, as well as by extensive Journeys, in the course of which she was unwearied in the exercise of her gift of prophecy, ske wielded for many years an increasing influence upon her contemporaries,—an influence doubtless due to the fact that she herself was so fully imbued with the most widely diffused feelings and beliefs, fears and hopes, of her time. Amongst her correspondents were Popes Anastasius IV. and Hadrian IV., the emperors Conrad III. and Frederick I., and also the theologian Guibert of Gembloux, who submitted numerous questions in dogmatic for her determination. It deserves to be specially mentioned to her credit that, though zealously opposed to the Catharists, she stood almost alone in maintaining that the image of God ought to be respected even in them, and that therefore they ought not to be killed, She died in 1179, but has never been canon- ized; her name, however, was received into the Roman martyrology in the 15th century, September 17th being the day fixed for her commemoration. Her biography, which was written by two contemporaries, Godefridus and Theodoricus, was first printed at Cologne in 1566, and has frequently been reproduced in various forms since that date.

The works of Hildegard, in addition to the Setvias already men- tioned, include Divinorum operwm simplicis hominis liber, a hither- to unpublished treatise containing later visions and revelations, many of

them relating to physical and medical questions ; Vite meritorum, also unpublished; Lives of St Rupert and St Disibod ; Expositions of the rule of St Benedict, and of the Athanasian creed; Letters, and Exhortations. While her " visions" on such themes of the Christian religion as God and His kingdom, the church and its mystical union to Christ, must be regarded as crude and extravagant even to insanity, it is impossible to deny all ethical or religious value to her earnest denunciations of the corruptions of the clergy and mendicant orders, or to the intense expressions (however ignorant and imperfect) of the life-long aspirations of a mind so singularly unselfish and unworldly as hers. The Scivias were printed in 1513 and again in 1628. The Epistolarwm Liber (first published in 1566) appears with some other Opuseula in the Maz. Bibl. Vet. Patr., vol. xxiii, and in Martene and Durand's Amplissima Collectio, vol. ii. The Opera Omnia form vol. cxevii. of Migne's Patrologice Cursus Completus. Sec Meiners, De Sanetce Hildegardis vita, seriptis, meritis (1793) ; Dahl, Die heilige Hilde- gard (1832) ; Gorres, Die Christliche Mystik.

HILDEN, a town of Prussia, in the government and circle of Diisseldorf, on the Itterbach. It is a station on the Rhenish railway, and has a considerable manufacture of silks, both pure and mixed, calico, and machinery ; it also possesses a deaconess institute. During the last half century its growth has been rapid. While in 1816 the population numbered only 2056, it amounted in 1875 to 6789. Hilden was constituted a town in 1861.

HILDESHEILM, the chief town of a district in the pro- vince of Hanover, Prussia, is beautifully situated on the right bank of the Innerste, 18 miles south-east of Hanover by railway. It has a very antique and quaiut appearance, and is surrounded by old ramparts which have been con- verted into shady alleys and promenades. 'The streets are for the most part narrow and irregular, and contain many old houses with overhanging upper stories and richly and curiously adorned wooden facades. The town is the seat of a district governorship, a high court of justice, two justice courts, a general superintendency of the Evangeli- cal Church, and a Roman Catholic chapter. The Catholic cathedral, which occupies the site of a building founded by Louis the Pious in 818, dates

from the middle of the 11th century. It is chiefly remarkable for the antiquities and notable works of art connected with it, including the bronze doors executed by Bishop Bernward, with reliefs from the history of Adam and Christ; the so- called Irmensiule, at one time believed to have been

‘number of minor articles of ecclesiastical furniture.

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erected, before it was transferred to its present site, in honour of the Saxon idol Irmin, but now regarded as’ be- longing to an cld Roman aqueduct; the Christ column by Bishop Bernward, adorned with reliefs from the history of the Saviour; a brazen font of the 13th century, two candelabra of the 12th century, the sarcophagus of St Godehard, the tomb of St Epiphanius, and an immense The rose-bush on the wall of the crypt is alleged to be a thousand years old. Among the other churches those of special interest are St Godehard’s church, completed in 1172 and restored in 1863, a remarkably fine specimen of the Romanesque style, with three massive pyramidal towers ; the church of St Michael, an almost equally fine specimen of Romanesque, founded by Bishop Bernward, and restored in 1186 after injury by fire, containing a beauti- ful painted ceiling of the 12th century, and the tomb and monument of Bishop Bernward; St Magdalene’s church, which possesses various works in metal by Bishop Bern- ward; St Martin’s church, now used as a museum and library ; the Lutheran church of St Andrew, with very lofty towers ; and the fine columnar basilica of the abbey church of Moritzburg, a suburb half a mile south-west of the town. The other principal buildings are the town- house, dating from the 15th century, and containing the archives of tle town; the house in the late Gothic style said, but erroneously, to have been built by the Knights Templars ; the Michaelis monastery, now used as a lunatic asylum ; and the old Carthusian monastery. The educa- tional establishments include a Catholic and a Lutheran gymnasium, a Catholic normal school, a weaving school, and an agricultural school. The other principal public institutions are the Georgstift for daughters of state servants, the maternity hospital, two orphanages, and several other hospitals and infirmaries. The town has

iron foundries, manufactures of cloth, damasks, linen fabrics, thread, sail-cloth, wadding, leather, machines, carriages, stoves, glass, tobacco, alcohol, perfumeries, chocolate, and starch. The population in 1875 was 22,581.

Hildcsheim, though previously in existence, owes its risc and prosperity to the transference to it in 822 of the bishopric instituted by Charlemagne at Elze in 812. In the 10th century its import- ance was largely increased under Bishop Bernward, who, if he did not introduce, greatly stimulated by his example and patronage the art of working in metals, for which the town retained a high reputation until the close of the Middle Ages. It also obtained considerable fame by its cathedral school, at which several sons of the emperors received their education. In 1241 it joined the Hanseatic League, and in 1249 received town rights. It was frequently at feud with its bishops, and in the 14th century placed itself more than once under the protection of the house of Brunswick-Liineburg. The bishops in the course of time had acquired considerable terri- tory, but their feuds with the neighbouring princes resulted in 1523 in the annexation of a grcat part of their possessions to Brunswick. A restoration, however, took place in 1643, and in the beginning of the present century the principality amounted to 682 square miles. 'The last bishop of Hildesheim possessed also the bishopric of Paderborn, acquired by his predecessor. Both bishoprics were secularized and ceded to Prussja in 1808. In 1807 they were incor- porated with the kingdom of Westphalia, but in 1813 they were restored to Prussia, which ceded Hildesheim to Hanover, retaining only Paderborn. In 1866 the principality was united, along with Hanover, to Prussia.

On October 9, 1868, a unique collection of ancient plate was dis- covered on the Galgenberg near Hildesheim, about 10 fect bclow the surface. This Hildesheimer Silberfund, as it is usually called, has excited great interest among classical archeologists, compris- ing, as it does, no less than 60 pieces, or a complete service for three persons—plates, dishes, mixing-bowls, &c. The workiman- ship evidently belongs to the Augustan age, and by some authori- ties it is conjectured that we have nothing less than the plate that belonged to Drusus himself. The most noteworthy of the picces are a erater richly ornamented with arabesques and figures of

children, a platter with a representation of Minerva, and others with a boy Hercules, a Cybele, and a Deus Lunus. The whole collection is preserved in the Berlin Museum. For details see Wieseler, Der Hildeshetmer Silberfund, Bonn, 1868.

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HILDRETH, Ricnarp (1807-1865), an American journalist and author, was born at Deerfield, Massachusetts, June 28, 1807. He was educated at Harvard College, where he graduated in 1826; and after studying law at Newburyport, he was called to the Boston bar in 1830, He had, however, already conceived a predilection for literature, and in 1832 he became joint founder and editor of a daily newspaper, Zhe Boston Atlas. gone to the south for the benefit of his health, he was led by what he witnessed of the evils of slavery to write the anti-slavery hovel Archy Afoore, which, chiefly on account of its subject, met with considerable success in America and England. An enlarged edition of it appeared in 1852 under the title of the White Slave. In 1837 he wrote Banks, Banking, and Paper Currency, a work which had some influence in fostering the growth of the free banking system in America. In 1838 he resumed his editorial duties on the Ad/as, but in 1840 he found it. necessary on account of his health to remove to British Guiana, where he was editor of two weekly newspapers in succession at Georgetown. He published in the same year Despotism an America, and he also made the columns of his newspapers the medium for the dissemination of anti- slavery opinions. In 1849 he published the first three volumes of a History of the United States, a work which, if its narrative is rather bald and tame, is characterized by perfect fairness and candour, and displays great industry and care in the representation of facts. Other three volumes, completing the work, appeared in 1855. His Japan as it was and is is a valuable digest of the informa- tion contained in other works on that country. He also wrote Zheory of Morals (1844), and Theory of Politics (1853), as well as Lives of Atroctous Judges, compiled from Lord Campbell's two works. For some time Hildreth was on the editorial staff of the New York Tribune, and he was also a frequent contributor to periodicals. In 1861 he was appointed United States consul at Trieste, but ill health compelled him to resign his office and remove to Florence, where he died July 11, 1865.

HILL, Aaron (1685-1749 or 1750), an English poet and miscellaneous writer, was born in London, 10th February 1685. Though left by his father in necessitous circumstances, he was educated first at Barnstaple and then till his fourteenth year at Westminster School, after which he went out to Constantinople, where Lord Paget, a rela- tive of his mother, was British ambassador. Under the care of a tutor he then travelled through Palestine, Egypt, and a great part of the East, returning to England about 1708. Having subsequently quarrelled with his patron, he again went abroad as travelling companion to a Yorkshire baronet. On returning home he published in 1709 his LFistory of the Ottoman Empire, which, according to his own adniission, had far more success than it deserved. About the same time appeared his poem of Camillus, in hononr of the famous Charles Mordaunt, earl of Peterborough ; and in the same year he was made manager of Drury Lane Theatre, and afterwards of the Haymarket. Both those offices he soon after lost through his indiscretion, and the remainder of his life was spent partly in literary pursuits and partly in commercial speculations, which were all unlucky. One of these schemes called him to the Highlands of Scotland, and while there he wrote Zhe Progress of Wit, being a Caveat for the use of an eminent Writer. The "eminent writer" was Pope, who had introduced Hill into the Dunciad, though in a way that was in fact complimentary. Hill died in 1749 or 1750, and was buried in Westminster Abbey. Two only of his seventeen dramas are now remembered, Zara and Merope, both adaptations from the French of Voltaire. His poetry is stilted and commonplace, and even the

Having in 1834.

Progress of Wit never rises above a flippant smartness. Though a poor and tasteless poet, and afflicted with an overwhelming sense of his own importance, Hill was an honourable man, and his letters to Savage, on whom he con- ferred many benefits, show his character in a very amiable light. The Itscellaneous Works of Hill were published iu 1753 in 4 vols. 8vo, and his Dramatie Works, to which a Life was prefixed, appeared in 1759 in 2 vols. 8vo.

HILL, Marrnew Davenport (1792-1872), was born August 6, 1792, at Birmingham, where his father, T. W. Hill, was at that time assistant in a charity school. He made such rapid progress in his education that in his thirteenth year he rendered his father efficient assistance in conducting a private school in Birmingham, and in his seventeenth year became the principal teacher. Resolving, however, to adopt the legal profession, he in 1814, while still continuing his scholastic duties, became a student of Lincoln's Inn, and in 1816 began to devote his uninter- rupted attention to legal studies. He was called to the bar in 1819, and went upon the Midland circuit, where his ability was soon generally recognized, although for various reasons his acquisition of a profitable practice was not so rapid. In 1832 he was elected one of the Liberal members for Kingston-upon-Hull, but he lost his seat at the next election in 1834. On the incorporation of Birmingham in 1839 he was chosen recorder; and in 1851 he was appointed commissioner in bankruptcy for the Bristol district. Having in the course of his profes- sional duties had his interest excited in questions relating to the treatment of criminal offenders, he in his charges to the grand juries, as well as in special pamphlets, ventilated opinions which have been the means of introducing many important reforms in the methods of dealing with crime. One of his principal coadjutors in these reforms was his brother Frederick Hill, whose Amount, Causes, and Remedies of Crime, the result of his experience as in- spector of prisons for Scotlaud, may be said to mark an era in the methods of prison discipline. Hill was one of the chief promoters of the Society for the Diffusion of Useful Knowledge, and the originator of the Penny Magazine. He died 7th June 1872.

His principal works are Practical Suggestions to the Founders of Reformatory Schools, 1855; Suggestions for the Repression of Crime, 1857, eonsisting of charges addressed to the grand juries of Bir- mingham; JMettray, 1855; Papers on the Penal Servitude Aets, 1864; Journal of a Third Visit to the Convict Gaols, Refuges, and Reformatories of Dublin, 1865; Addresses delivered at the Birming- ham and Midland Institute, 1867. See Memoir of Matthew

Davenport Hill, by his daughters Rosamond and Florence Daven- port Hill, 1878.

HILL, Rowtanp (1744-1833), an eccentric and popular English preacher, sixth son of Sir Rowland Hill of Hawk- stone, was born there 23d August 1744. After receiving his early education at the grammar school of Shrewsbury and at Eton, he in 1764 entered St John's College, Cambridge. While at the university he made the acquaiunt- ance of the Methodist preacher Whitfield, and stimulated by his example he somewhat seandalized the university authorities and his own friends by preaching, before he had obtained holy orders, in the surrounding villages, and con- ducting religious services in the houses of the sick and poor. After graduating with distinction he took orders, and in 1773 was appointed to the parish of Kingston, Somersetshire, where he began to indulge his favourite taste for open air preaching, and soon attracted great crowds to the services which he held nearly every day of the week. Having on the death of his father in 1780 inherited con- siderable property, he built for his own use Surrey Chapel, in the Blackfriars Road, London. The chapel was opened on the 8th June 1783. Though now practically occupying the ecclesiastical position of a dissenter, Hill conducted his

services in accordance with the forms of the Church of England, in whose communion he always remained. From the beginning his success was complete, and his chapel soon came to be filled with an audieuce such as no other preacher in London could boast. During the summer months he made what he called ' gospel-tours" into all parts of the country, sometimes extending them to Scotland and Ireland, and attracted wherever he went audiences as numerous and as interested as those which had crowded to hear Whitfield. After these tours he always returned with increased enthu- siasm to his duties at Surrey Chapel, where he continued to officiate almost to the day of his death, 11th April 1833. The oratory of Rowland Hill, like that of Whitfield, was specially adapted for rude and uncultivated audiences, and it was equally effective although by more varied means. He possessed a voice of great power, and, according to Southey, "his manner" was "that of a performer as great in

his own line as Kean or Kemble." Not unfrequently he violated the laws of good taste in the eccentricities of his wit and humour, but the intensity and purity of the purpose by which he was actuated enabled him always to retain uninjured his moral influence over his audience. Among the various publications of Rowland Hill the best known is his Village Dialogues, which first appeared in 1810, and reached a 34th edition in 1839.

See Life by Rev. Edwin Sidney, 1833; Memoirs by Rev. William Jones, 1834; and Memorials by Rev. James Sherman, 1857.

HILL, Sir Rowzanp (1795-1879), author of the penny postal system, a younger brother of Matthew Davenport Hill, and third son of T. W. Hill, who named him after Rowland Hill, the preacher, was born December 3, 1795, at Kidderminster, to which town his father had lately removed from Birmingham. For some years of his child- hood his health was very feeble, and as, on account of an affection of the spine, he had to maintain a recumbent position, his principal method of relieving the irksomeness of his situation was by repeating figures aloud consecutively until he had reached very high totals. A similar bent of mind was manifested when he entered school in 1802, his aptitude for arithmetic and mathematics being quite excep- tional. But if he owed his subsequent eminence to a peculiar natural talent for figures, he was indebted for the direction of his abilities in no small degree to the guidance of his father, a man of great force of character and of advanced political and social views, which were qualified and balanced by the strong practical tendency of his mind. At the age of twelve Rowland began to assist in teaching arith- metic and mathematics in his father's school at Hilltop, Birmingham, and latterly he had the chief management of the school. On his suggestion. the establishment was removed in 1819 to Hazelwood, a more commodious building in the Hagley Road, in order to have the advantages of a large body of boys, for the purpose of properly carrying out an improved system of education. That system, which was devised principally by Rowland, was expounded in a pamphlet entitled Plans for the Government and Educa- tion of Boys in large numbers, the first edition of which appeared in 1822, and a second with additions in 1827. The principal feature of the system was "to leave as much as possible all power in the hands of the boys

themselves ;" and it was so successful that, in a circular issued six years after the experiment had been in operation, it was announced that "the head master had never once exercised his right of veto on their proceedings." This doubtless was in no small degree due to the powerful personality of Rowland Hill, which made itself felt whether he was present or not. The system, it must be admitted, had several features of too utopian a character for the present constitution of Society ; but on the whole Rowland Hill, as an educa- tlonist, is entitled to a place side by side with Arnold of

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Rugby, and was equally successful with him in making moral influence of the highest kind the predominant power in school discipline. After his marriage in 1827 Hill removed to a new school at Bruce Castle, Tottenham, which he conducted until failing health compelled him to retire in 1833. About this time he became secretary of Gibbon Wakefield's scheme for colonizing South Australia, the objects of which he explained in 1832 in a pamphlet on Home Colonies, afterwards partly reprinted during the Irish famine under the title Lome Colonies for Ireland. It was in 1835 that his zeal as an administrative reformer was first directed to the postal system. The discovery which resulted from these investigations is when stated so easy of comprehension that there is great danger of its originality and thoroughness, and its greatness as an element in human progress, being lost sight of. A fact which also enhances its merit was that he was not a post-office official, and possessed no practical experience of the details of the old system. After a laborious collection of statistics he succeeded in satisfying himself and in demonstrating to the world that the principal expense of letter carriage was in receiving and distributing, and that the cost of conveyance differed so little with the distanee that a uniform rate of postage was in reality the fairest to all parties that could be adopted. Trusting also that the deficiency in the postal rate would be made up by the immense increase of correspondence, and by the saving which would be obtained from prepayment, from improved methods of keeping accounts, and from lessening the expense of distribution, he in his famous pamphlet pub- lished in 1837 recommended that within the United Kingdom the rate for letters not exceeding half an ounce in weight

should be only one penny. The employment of postage stamps is mentioned only as a suggestion, and in the following words :—" Perhaps the difficulties might be obviated by using a bit of paper just large enough to bear the stamp, and covered at the back with a glutinous wash which by applying a little moisture might be attached to the back of the letter." Proposals so striking and novel in regard to a subject in which every one had a special personal interest could not fail to command general attention, and perhaps no pamphlet that ever issued from the press has caused so much and such widespread discussion, or been so speedily effective in promoting reforms in any degree so beneficial to the human race. So great became the pressure of public opinion against the opposition offered to the measure by official prepossessions and prejudices that in 1838 the House of Commons appointed a committee to examine the subject. The committee having reported favourably, a bill to carry out Hill's recommendations was brought in by the Government. The Act received the royal assent in 1839, and after an intermediate rate of fourpence had been in operation from December 5th of that year, the penny rate commenced January 10, 1840. Hill received an appointment in the Treasury in order to superintend the introduction of his reforms, but he was compelled to retire when the Liberal Government resigned office in 1841. In consideration of the loss he thus sustained, and to mark the public appreciation of his services, he was in 1846 presented with the sum of £13,360. On the Liberals returning to office in the same year he was appointed secretary to the postmaster-general, and in 1854 he was made chief secretary. In these positions, his ability as a practical administrator made itself felt in every department of the postal system, and enabled him to supple- ment his original discovery by practical expedients realizing its benefits in a degree commensurate with continually improving facilities of communication, and in a manuer best combining cheapness with efficiency. In 1860 his services were rewarded with the honour of knighthood ;

and when failing health compelled him to resign his office in 1864, he received from parliament a grant of £20,000, and was also allowed to retain his full salary of £2000 a year as retiring pension. In 1864 the

university of Oxford conferred on him the degree of D.C.L., and on the 6th June 1879 he was presented with the freedom of the city of London. The presentation, on account of his infirm health, took place at his residence at Hampstead, and he survived the ceremony only a few weeks, dying on the 27th August following. He was buried in West- minster Abbey.

HILL, Viscount (1772-1842). Rowland Hill, nephew of the Rev. Rowland Hill, was born at Prees, Shropshire, llth August 1772. After receiving his early education at Ightfield and Chester, he was gazetted to the 38th regiment, obtaining permission at the same time to improve himself in the knowledge of his profession in a military academy at Strasburg, where he continued after removing into the 53d regiment with the rank of lieutenant. In the beginning of 1793 he raised an independent company, and was promoted to the rank of captain. The same year he distinguished himself at the siege of Toulon; and after serving for some time on the Continent he in 1797 set out as colonel of the 90th regiment with Sir Ralph Abercromby's expedition to Egypt, where he acquired great distinction, and was wounded at the battle of Alexandria. Having in 1803 been gazetted brigadier-general, he in 1808 accompanied Sir Arthur Wellesley to Spain, and from Vimiera to Vittoria, in advance or retreat, he proved him- self the most indefatigable coadjutor of the great captain. In 1809 he was gazetted lieutenant-general, and in the following year was appointed to the independent command of the second army corps of Wellington in Portugal ; in 1811 he annihilated the French army under Girard at Arroyomolinos (Caceres), in recognition of which he received the order of the Bath; and for his capture of the forts of Almarez, which cut off the communication between the French armies on the north and south sides of the Tagus, he was in 1814 rewarded with the title of Baron Hill of Al- marez. In 1813 he held temporarily the command of the English and Hanoverian troops in Belgium, and two years later crowned the glories of his noble career by his conduct at Waterloo, where he was at the head of the brigade which resisted and repulsed the last effort made in behalf of the French by the imperial guard. When Wellington became premier in 1828 Hill received the appointment of general commanding-in-chief, and on resigning this office in 1842 he was created a viscount. Hediedon the 10th December of the same year. Lord Hill was, next to

Wellington, the most popular and able soldier of his time in the British service, and was so much beloved by the troops, especially those under his immediate command, that he gained from them the honourable title of " the soldier's friend." '" With Hill," they used to say, "both victory and life may be ours." On the other hand, the strategic skill and military capacity he displayed in the Peninsula secured for him the not less honourable title of 'the right arm of the duke of Wellington." rom the first day he entered the army he displayed the germs of those qualities that afterwards secured for him fame, rank, and power—boldness that amounted to daring and was yet always under the control of calm judgment, skill equal to independent commands of the most difficult kind, and a regard for the moral and physical welfare of the army such as liad never before been shown by any commander-in-chief.

The Life of Lord Hill, G.C.B., by Rev. Edwin Sidney, A.M., appeared in 1845.

HILLAH, a town of Asiatic Turkey in the pashalik of Baghdad, from which town it lies 60 miles to the south. It is picturesquely situated, in the midst of a very fertile

district, on both banks of the Euphrates, which are con- nected there by a floating bridge 450 feet in length, The estimated population, which includes a large number of Jews, varies from 6000 to much above 10,000. The bazaars are large and well supplied; and tanning, dyeing, and silk manufacture are carried on to a considerable extent. The horse mart has recently declined in repute. Hillah occupies the site of the ancient Babylon, and is to a large extent built of bricks obtained from the ruins. HILLARD, Georce Stittman (1808-1879), an Ameri- can author, was born at Machias, State of Maine, September 22,1808. After graduating at Harvard College in 1828, he became joint rector of the Round Hill Seminary at Northampton. In 1833 he was called to the Boston bar, where he soon obtained a good practice. He was chosena member of the common council of Boston in 1845, and he was for six months its president. In 1849 he was elected a member of the State legislature. The engrossing char- acter of his professional and other engagements did not,

however, prevent him from devoting a large portion of his time to literature. Besides editing successively the Christian Register (a Unitarian paper), Zhe Jurist, and the Boston Courier, he published an edition of Spenser's works (in 5 vols., 1839), and a selection from the works of Walter Savage Landor (1856), and wrote Six Afonths in Italy (2 vols., 1833), Life and Campaigns of George B. M'Clellan

. (1865), a series of school-books which have met with wide

acceptance, and various articles in periodicals and encyclo- pedias. In addition to this he made frequent successful appearances as a public lecturer. From 1867 to 1878 he was United States district attorney for Massachusetts. He died 27th January 1879.

HILLEL, a famous Jewish rabbi, sometimes called for distinction's sake {?t5, "the elder" or 'the old," flourished about the time of Herod the Great. According to the Talmudists he was born of a poor Davidic family, at Babylon, apparently about the year 75 s.c. In his zeal for the study of the law he went, when already of mature age, to Jerusalem, where Shemaiah and Abtalion were at that time the leading teachers. While supporting himself and his family there by working as a day labourer, he was not always able to earn the fee which the porter of the Beth- Midrash or house of instruction is said to have required ; but such was his ardour for learning that on one occasion on a cold December morning, having failed to obtain admission, he climbed up to the window of the class-room, where some time afterwards he was found quite buried and half frozen to death under a heavy fall of snow. He was now made free of the schools, and so great were the attain- ments with which his diligence was ultimately rewarded that, according to the tradition, he understood all languages, including those of the hills and the valleys, the trees and the flowers, the beasts and the demons, In his later years he succeeded the "sons of Bethyras" in the presidency of the sanhedrin, and iu this high position he became the author of several important rules of interpretation (the so- called seven "'middoth"; see HERMENEUTICS), and also of some authoritative legal decisions. A contemporary, and perhaps a pupil of his, was Shammai, who became the head of a rival and at times bitterly hostile school. Dying about the year 10 a.p., Hillel was succeeded in his

official position by his son Simeon, and afterwards by his grandson Gamaliel I.

There is evidently a good deal of what is incredible in the above Talmudic account; for example, it is now recognized on all hands that the Talmudie statement as to Hillel's presideney over the sanhedrin is absolutely irreconcilable with what we learn from the New Testament writers and froin Josephus, and must be regarded as wholly unhistorieal. But after every reasonable deduction has been duly made, we still have ample traces of a strong personality, characterized by unusual sweetness and light, bent on supporting

the claims of a right-minded and ethical religion against those of mere sacerdotal traditionalism. His "middoth," so far as they go (but they do not go far), are based on sound principles of logic and hermeneutic; the so-called " prosbol," by which he evaded the restrictions laid upon commerce through the law relating to the sabbatic year, showed that he possessed at least some power of adapting old institutions to the changing circumstances and wants of a progressive society; and if most of the questions which are alleged to have divided his school from that of Shammai cannot but strike the modern reader as having been infinitely small, the "golden rule" and some other sayings attributed to him show that he was not incapable oflarge and true vicws on the deepest problems of human life.

A remote descendant of the same name, who flourished abont 350 A.D., is said to have sought to quiet his co-religionists, restive under forcign domination, with the novel doctrine that all the "Messianic" prophecies of the Old Testament had related to Hezekiah, and had becn fulfilled in him.

Our only source of information with regard to Hillel "the old" is the Talmud, unless indeed the Pollion referred to once and again by Josephus be also Hillel] under a Greck name. For the grounds on which this probable identification rests, and for a masterly sketch of Hillel and his place in the history of Israel, the great work of Ewald may be consulted

(Gesch. d, V. Israel, vol. v.). See also Delitzsch, Jesus u. Millel (3d ed., 1879); Derenbourg, Histoire de la Palestine, pp. 176-92; and Schtirer, Veutestamentliche Zeitgeschichte, sce. 25. All the recent works dealing with the life of Christ also touch upon this subject, especially with reference to the question regarding the ‘ originality” of the two teachers. Renan, Keim, and Farrar (vol. ii. appendix) may be specially named.

HILLER, Jonann Apam (1728-1804), musical composer, was born at Wendisch-Ossig near Gérlitz in Silesia, Decem- ber 25, 1728. By the death of his father in 1734 he was left dependent to a large extent on the charity of friends. Entering in 1747 the Kreuzschule in Dresden, the school frequented many years afterwards by Richard Wagner, he afterwards went to the university of Leipsic, where he studied jurisprudence, supporting himself by giving music lessons, and also by performing at concerts both on the flute and as a vocalist. Gradually he adopted musie¢ as his sole profession, and devoted himself more especially to the per- manent establishment of a concert institute at Leipsic, It was indeed he who originated (in 1781) the celebrated Gewandhaus concerts which still flourish at Leipsic. In 1789 he became “cantor” of the Thomas mA a position previously held by the great Johu Sebastian Bach, He died June 16, 1804. Two of his pupils placed a monument to his memory in front of the Thomas school. Hiller’s compositions are numerous, and comprise almost every kind of church music, from the cantata to the simple chorale. But infinitely more important are his operettas, 14 in number, which for a long time retained their place on the boards, and had considerable influence on the development of light dramatic music in Germany, The Jolly Cobbler, Love in the Country, and the Village Barber were amongst the most popular of his works. Hiller also excelled in songs and ballads of the sentimental kind. With great simplicity of structure his music com- bines a considerable amount of genuine melodic invention. Although an admirer and imitator of the Italian school, Hiller fully appreciated the greatness of Handel, for the appreciation of whose music in Germany he did much. It was under his direction that the Afessiah was for the first time given at Berlin, more than forty years after the composition of that great work. Hiller was also a writer on music, and for some years (1766-1770) edited a musical weekly periodical named Wochentliche Nachrichten und Anmerkungen die Musik betreffend.

HILL TIPPERAH, a native state adjoining the British district of Tipperah, Bengal, lying between 22° 59’ and 24° 31’ N. lat., and between 91° 12’ and 92° 24′ E. long., with an area of about 3867 square miles, and population (1878) 75,792. It is bounded on the N. by the Assam district of Sylhet, on the W. by the Bengal districts of Tipperah and ‘ Noakhali, on the S. by Nodkhal{ and Chittagong districts, and on the E, by the Lushai country and the Chittagong Hill Tracts. As its name implies the country is hilly. Five or six ranges of hills run parallel from north to south, at an average distance of about 12 miles from each other.

The hills are covered for the most part with bamboo jungle, while the low ground abounds with trees of various kinds, canebrakes, and swamps. The principal ranges are, begin- ning from the east, the Jampui, Sakkankhang, Langtarai, and Athdramura. The chief rivers are the Gumti, Haord, Khozai, Dulai, Manu, and Pheni. During the heavy rains the people in the plains use boats as almost the sole means of conveyance. The forests give shelter to numbers of wild elephants and other large game. Small game of various kinds are met with.

The history of the state relates to two distinct periods—the tradi- tional pcriod described in the Rdjmdid, or “ Chronicles of the Kings of Tipperah,” and the period since 1407 a.p. The Rdjmdld is a history in Bengali verse, compilcd by the Brahmans of the court of Tripura. In the early history of the state, the rdjas were in a state of chronic feud with all the neighbouring countries. The worship of the All-destroyer was here, as elsewhere in India, associated with the practice of huinan sacrifice, and in no part of India were more victims offered up. It was not until the beginning of the 17th cen- tury that the Mughals obtained any footing in this country. By dint of constant invasions and continual intrigues, the Mahometans gradually established themselves, and Tipperah soon became a mere Mughal province under a Mussulman governor. The raja still remained in possession of the hilly tracts, but subject to the nawab of Murshidabad. When the East India Company obtained the diwdént of Bengal in 1765, so much of Tipperah as had been placed on the rent-roll came under British rule. Since 1808, each succes- sive ruler has received

investiture from the British Government, and has_been required to pay the usual nazar or tribute on accession. The state has a chronological era of its own, adopted by Raja Bir- raj, from whom the present rajd is 92d in descent. The year 1875 corresponded with 1285 of the Tippcrah era.

Both as regards its constitution and its relations to the British Government, the state of Hill Tipperah ditters alike from the independent native states of India and from those which arc tributary and dependent, Besides being the ruler of Hill Tip- perah, the raja holds an estate in the British district of Tipperah, called chakié Roshnabad, which is by far the most valuable of his possessions. The form of government is despotic and patriarchal. The raja's word is law, without appeal. In 1871 an English officer was appointed as political agent to protect British interests and advise with the raja. 'lhe most important hill tribe is that of the Tipperahs, who were estimated in 1874-75 to number 34,727. Thcre arc no towns in Hill Tipperah. Agartala, the capital of the state and residence of the raja, is merely a moderate-sized village sitnated on the north bank of the Haura.

The principal crop and main food staple is rice. The other articles of produce are cotton, chillies, and vegctables. The chief exports are cotton, timber, ¢/, bamboo canes, thatching-grass, and firewood. Occasionally small imports are required from the neighbouring dis- tricts, The total revenue in 1874-75 was £18,693. Besides this, the raja's cstates in Tipperah and Sylhet yield about £50,000 and £1400 respectively, His total annual income, therefore, is about £70,000. 'The-police force (1874-75) consisted of 102 men, and the raj maintains a force of 277 officers and men. The state has only 2 schools, and only 103 boysarc being educated. The climate of Hill Tipperah is generally pleasant; the annual rainfall is 60 inches. The chief endemic diseases are bowcl complaints, remittcnt and inter- mittent fevers, and rheumatism; the principal epidemic is cholera.

HILTON, Wittiam (1786-1839), English painter, was born in Lincoln on 3d June 1786, son of a portrait-painter, who was probably his first instructor. In 1800 he was placed with the engraver J. R. Smith, and about the same time began studying in the Royal Academy School. He

first exhibited in this institution in 1803, sending a group of Banditti; and, though he could not be called a popular artist, he soon established a reputation for choice of subject, and qualities of design and colour superior to the great mass of his contemporaries. He made a tour in Italy along with Thomas Phillips, the portrait-painter. In 1814, having exhibited Miranda and Ferdinand with the Logs of Wood, he was elected an associate of the Academy, and in 1820 a full academician, his diploma-picture represeuting Ganymede. In 1823 he produced Christ crowned with Thorns, a large and important work, which has lately been bought by the Academy out of the Chantrey Fund ; this may be regarded as his masterpiece, displaying all the qualities which go to make up pictorial propriety and efficiency, though it does not entitle Hilton to the praise of

original genius. In 1825 he succeeded Fuseli as keeper of

HILVERSUM, a village and commune in the Nether-

the Academy ; and he died in London on 30th December | lands in the province of North Holland, about equally dis-

1839, a widower without children. pictures remained on his hands at his decease,—such as the Angel releasing Peter from Prison (life-size), painted in

1831, Una with the Lion entering Corceca's Cave (1832), | the Murder of the Innocents, his last exhibited work (1838), |

Comus, and Amphitrite. The National Gallery now con- tains Edith finding the Body of Harold (1834), Cupid Dis- armed, Rebecca and Abraham's Servant (1829), and Sir Calepine rescuing Serena (from the Faerie Queen) (1831). Hilton's excellence as an artist is relative to the state of art in his country at the time. In a great school or period he could certainly not count as more than a respectable sub-

ordinate ; but in the British school of the earlier part of |

this century he had sufficient elevation of aim and width of attainment to stand conspicuous and praiseworthy, and, comparatively speaking, above the leyel of mediocrity.

Some of his best |

tant from Amsterdam, Utrecht, and Amersfoort, with all of which it is connected by railway. The village is well sheltered on the west and north-west by a range of hills, and since 1874 it has been the seat of a hospital, the Trompenberg, for convalescents. The public buildings comprise a town-house and four churches and a synagogue, and there is a very handsome railway station. The weaving of floor-cloths, horse blankets, and Hilversum stripe is the principal industry. In 1423 Hilversum was separated from Laren. In 1505 it suffered at the hands of the people of Guelderland, in 1629 from the Croats, and in 1672 from the French. The population of the village in 1840 was 5160, and in 1870 5611; while that

of the commune in the same years was 5314 and 6615, Of this last number 3463 were Roman Catholics, 2327 belonged to the Dutch Reformed Church, and 236 were Jews.

HIMALAYA

Plate IMALAYA is the name given to the mountains which | from which are thrown off the great rivers of China, Siam, XVI. form the northern boundary of British India, betwecn | and Burmah. On the west, however, it has been com- = the 75th and 95th mcridians east of Greenwich. The word | pletely established that a continuous chain extends beyond signifi is Sanskrit, and literally signifies ‘‘snow-abode,” from Aim, | the Indus along the north of the Oxus, and ends in that cation of Snow, and d/dyd, abode, and is well translated “snowy- quarter about 68° E. long. In like manner it is found that name. range,” though that expression is perhaps more nearly the | no separation can be established, except a purely arbitrary equivalent of Jéimdchdl, another Sanskrit word, derived | one, between the Himalaya as commonly defined and the from him, snow, and dchdl, mountain, which is practically | greatly elevated and rugged table-land of Tibet; nor be- synonymous with Himalaya, and probably as often used in | tween this last and the mountain ranges which form its conversation by natives of northern India. The letter y in | northern border along the low-lying desert regions of Central the last syllable of Himalaya is purely a consonant, and | Asia. the last two syllables should be pronounced /d-yi, the con- It thus appears that the Himalaya, with its prolongation Relation version of the ay into a diphthong being quite erroneous. | west of the Indus, constitutes in reality the broad moun- of Hima- The name, by transformations such as are common to all | tainous slope which descends from the southern border of ah ans times and nations in the use of foreign words, was converted | the great Tibetan table-land to the lower levels of Hindustan sie sit by the ancient Greeks into Hmodos and Jinaos. | and the plains of the Caspian ; and that a somewhat similar other How ap- Although the term Himalaya is applied by the natives | mountain face, descending from the northern edge of the moun- – plied by of India only to the ranges which they sec covered with | table-land, leads to another great plain on the north, extend- t#!“8- aad perpetual snow, it has been long used by European | ing far to the

eastward, to the northern borders of China. graphers. . ; ; : : 2 : geographers to designate the whole mountain region for | Towards its north-west extremity this great system is con- which the Indian has no other name than pdhdr, i.e., "the | nected with other mountains,—on the south, with those of mountains," of which the snowy ranges constitute but a | Afghanistan, of which the Hindu-Kusl: is the crest, occupy- small portion. The first mere cursory examination of these | ing a breadth of about 250 miles between Peshawur and mountains by the older geographers rightly convinced them | Kundtiz; and on the north, with the mountains that flank of the general physical unity of the mountainous region to | the Jaxartes or Sir on the north, and the Thian-shan or the north of India, which in length extends from about 72° | Celestial Mountains, The eastern margin of Tibet descends to 95° E. long., that is, between the rivers Indus and | to western China, and the south-eastern termination of the Brahmaputra, and in breadth includes the ranges between | Himalaya is fused into the ranges which run north and the plains of Hindustan and the upper parts of the main | south between the 95th and 100th meridians, and separate branches of these two great rivers. To these ranges the | the rivers of Burmah, Siam, and western China. designation of Himalaya has by degrees been specially Nor can any of the numerous mountain ranges which Con- attached; and there is a certain convenicnce in still re- | constitute this great elevated region be properly regarded nexion stricting the name to that part of the mountains which is | as having special, definite, or separate existence apart from ;., accessible from British India, for this is the practical sig- | the general mass of which they are the component parts ; nification of it now commonly accepted, and Tibet cannot be rightly described, aa it has been, Though it is to the area thus limited that the present | as lying in the interval between the two so-called chains article is mainly designed to refer, it will be necessary, for | of the Himalaya and the Kouenlun or Kara Koram. It the correct apprehension of some of its main characteristics, | is in truth the summit of a great protuberance above the to understand aright the relation which the Himalaya bears | general level of the earth's surface, of which these alleged to the great mountain region beyond it, and a general | chains are nothing more than the south and north borders, description of that region thus becomes requisite. while the other ranges which traverse it are but corrugations Extent Scientific

investigation has clearly shown that, so far as | of the mass more or less strongly marked and locally de- of geo- the main characteristics of the mountains are concerned, | veloped. graphi- the natural boundaries of the Himalayan system must be The average level of the Tibetan table-land may be taken Extentot forma- carried much farther than had at first been recognized. | at about 15,000 feet above the sea. The loftiest points Tibeto- tion. Considerable obscurity still involves the eastern portion of | known on the earth's surface arc to be found along its ane these mountains, and there is great want of precise know- | southern or Himalayan boundary ; one of them falls very ont ledge as to their connexion with the ranges of westcrn China, | little short of 30,000 feet in clevation, and peaks of 20,000 ,

Drainage of its surface.

Water- shed lines.

Principal rivers and lake area.

822

feet abound along the entire chain. The plains of India which skirt the Himalayan face of the table-land, for a length of rather more than 1500 miles, along the northern border of British India, nowhere rise so much as 1000 feet above the sea, the average being much less. on the north, about Kashgar and Yarkend, have an elevation of from 3000 to 4000 feet, and no part of the Central Asiatic desert seems to fall below 2000 feet, the lake of Lob-nor being somewhat above that level. The greatest dimension of the Tibetan mountain area from east to west may be about 2000 miles, while its average breadth some- what exceeds 500 miles; about 100 miles on either side constitute the sloping faces, the central table-land having a width of about 200 miles on the west and probably 500 miles at its eastern border.

The southern portion of the Tibetan tableland throws off its waters to the north-west and south-east from a cen- tral line almost on 82° E. long., the Indus flowing in the former direction, and the Brahmaputra in the latter. These two rivers maintain their courses for a great distance in opposite

ways, longitudinally, along the summit of the table-land ; they receive as they proceed the drainage of a large portion of its surface ; and their accumulated waters are at length discharged by two openings in the Himalayan slope across the plains of Hindustan into the Indian Ocean. With the one exception of the basin of the Sutlej, the Tibetan area that discharges itself southward at points intermediate between the debouchure of the Indus and that of the Brahmaputra is comparatively insignifi- cant. No important part of the drainage of the table-land, so far as is yet. known, passes in the opposite direction through the northern slope ta join the rivers which flow from tliat slope to the Central-Asiatic plain. The waters of the southern slope, together with the drainago of the exceptional Tibetan area above referred to, traverse the Himalaya more or less directly, and constitute the main tributaries of the Indus, the Ganges, and the Brahmaputra.

Thus the northern border of the table-land, or the sum- mit of its northern slope, so far as it is known, scems to form the real watershed between the rivers that flow to the Indian Ocean and those that lose themselves in the plains of Turkistan and Mongolia. The summit of the Himalayan slope forms a subordinate watershed, separating the rivers that fall into the Indian Ocean into two classes, those that pass directly through the Himalaya to the plains of India, and those that are collected on the summit of the table-land and discharged, also through the Himalaya, but by two concentrated streams at distant points towaids the opposite ends of the chain. It has been proposed to call these dividing lines, respectively, the Turkish and the Indian watershed.

The waters that issue from the Himalaya to the west of the 77th meridian combine to form the Indus. Between the 77th and 88th meridians all the streams fall into the Canges, and eastward of the 88th meridian into the Brahmaputra. Of the continuity of the Brahmapntra, beyond the point up to which it has been explored from Assam, with the Tibetan river called on the maps Sanpoo, Yarou-dzangbo-tchou, and so forth, there is no room for doubt. The correct Tibetan name for the river is Tachok- tsangpo, ze. " Horse-river," or simply "Tsangpo," 2.e., "Great river",—the word "'tsangpo" being applied exactly like the corresponding Indian term " ganga," or the Chinese '"kyang," as a generic affix to the name of any

large river. In the mountains on the border of Assam the river is called " Dihong," but on entering the plain it receives the waters of the sacred stream locally called " Lohit," which is also believed to have a Tibetan source; and this name the united river retains throughout the greater part of its

The low lands |

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' course in Assam, Brahmaputra being a classical Sanskrit /name not commonly used. In its course through Bengal

local names are given to the various branches into which

it there divides ; and this is also the case with the Ganges,

which uuites with the Brahmaputra about 100 miles from the sea. That part of Tibet which lies north of the 30th parallel of latitude and between the 82d and 92d meridians east is believed to have no escape open for its waters, which are consequently collected in lakes occupying de- pressions on its surface. The region east of the 92d meridian, excluding the comparatively small tract which drains into the Brahmaputra, fecds the great rivers of western China, Siam, and Burmah,

At the western extremity of the Tibetan table-land two Oxus transverse watershed lines are established in connexion with 224 it, by mountain ranges nearly at right angles to what may — be regarded as its general direction in this region,—first, ~~ on the south by the mountains which under the name of Hindu-Kush form the north-east angle of the high land of Afghanistan, and from the north-west of which the waters flow into the Oxus (the true Turki name of which is "Amu "), and theuce to the Aral Sea, while those from its south-eastern face join the Indus through the Cabul river ; and second, ou the north by the Terek-tagh, which unites the Tibetan systein with the mountains of northern Turkis-tan, and separates the Jaxartes (in Turki " Sir") from the basin of Yarkend. The Oxus and Jaxartes flow off to the Aral Sea in a north-westerly direction, having between them a range which probably

represents the extremity of either the Tibetan or the Thian-shan mountains, and which falls away into hills of minor importance beyond the 70th meridian.

Some further particulars of the relations of the Article Tibeto-Himalayan region with the contiguous mountain AS/4 re- systems, and of its influence both physical and political fedte. on the Asiatic continent in the heart of which it is situated, are containcd in the article Asta, to which reference may be made. A more detailed account of TiBEr will be given under that heading, and the remainder of this notice will be confined to the description of the restricted Himalayan area, as already defined.

The northern provinces of British India occupy the great Geogra- plain which flanks the Himalaya on the south, along its phical whole extent from the issue of the Brahmaputra on the nrg A east to the ranges that lie along the Indus. The whole youth. tract, excepting Assam, 7.¢., the valley of the Brahmaputra, India. is highly cultivated and populous ; and with the same ex- ception the population tliroughout is of the race known as Aryan, being almost exclusively Hindu in religion on the east, but passing into Mahomctan on the west.

The most eastern portion of the Himalayan mountain Eastern slope, as far as the 92d meridian, is occupied by wild tribes Hima- of which, or of the country they occupy, little is known. "ee ;

: ite 3 5 otan They are in small communities under petty chiefs, and their gin,' languages, which vary considerably in detail, are to some extent allied to Tibetan and monosyllabic. Between the 92d and 89th meridians is the small state of Blotdén, the local name of which is " Lhopato." It approximates in language, customs, and religion to Tibet proper, and its government is carried on by two separate chiefs, temporal and spiritual. Its northern border, where it is met by Tibet, lies along the 28th degree of north latitude. The small British dis- trict of Sikim succeeds, occupying the lower part of the basin of the Tista river, and having Darjeling as its chief settlement. The native state of Sikim, in Tibetan called " Demojong," extends north of British Sikim to Tibet ; it is almost as Tibetan as Bhotdn, and still less important. Its western border falls nearly on the 88th meridian.

From the 88th nearly to the 80th meridian the whole Nepal. southern slope is occupied by the kingdom of Nepal, which

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since the wars with the British in 1814-16 has retained complete independence. The jealousy with which its government has excluded Europeans from most parts of the country leaves us with little precise knowledge of any part of it except its eastern border and the neighbourhood of the capital, Kathmandu. The people pass from the Tibetan and Buddhist type, which prevails on the east, into almost pure Hindus, speaking a Hindi dialect, on the west. The rivers Kosi, Gandak, Rapti, and Karnali are the prin- cipal streams that issue from this part of the mountains. The northern border of Nepal follows the main watershed, and its western angle reaches the 30th parallel of north latitude in the vicinity of the well-known Tibetan lakes Rakas-tal and Manasarowar, where the general direction of the mountains has, from east and west, become nearly south-east and north-west.

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The summit of the table-land from the borders of China: Tibet.

to the 75th meridian, where the Indus suddenly turns off to the south, is comprised in Tibet, or as it is called in the language of its inhabitants " Bod " or " Bodyul," the latter word being equivalent to " Bod-land." Of the eastern half of Tibet very little is known, and that little chiefly relates to the most southern portion which borders on the Himalaya, and the most eastern which abuts on China. The table- land here has its greatest development, and is perhaps as much as 500 miles from north to south. At its north- western end its breadth is reduced to something under 200 miles. The physical features of Tibet, from its great elevation, are so peculiar, and it is so cut off by nature from communication with its neighbours, that it is not surprising to fiud in it a distinct race with a language of their own, and habits widely different from the surrounding nations.

Kumaon, The Kali or Sarda river forms the boundary between | The extreme cold and drought make Tibet essentially poor ; alee Nepal and the British provinces of Kumaon and Garhwél, | and the character of its inhabitants approaches that of the S.

People The population of the whole of the mountain districts west | which prevails eastward, and the table-land there ends in

of of Nepal maintains to a great extent its Hindu type, though | the region known as Pamir, which has all the characteristics

ae the Mahometan religion gradually becomes more prevalent | of the higher parts of Tibet. Beyond this we pass into

laya, 8 we approach the Indus, where it is found to have super- | Turkistan and reach the limits by which the scope of the seded Hinduism. Inthe more remote and elevated valleys | present article is restricted. an infusion of Tibetan race, religion, and language is found, The difficulty of accomplishing with any approach to Physical diminishing as we pass to the west; but otherwise the | success such a task as that of giving a sufficient account features. dialects spoken are everywhere Prakritic, and closely allied | of the chief physical and other characteristics of mountains Bear to Hindi, Asa rule the people are short in stature, muscular, | like the Himalaya is much diminished by the remarkable str. as is common among mountaineers, fairer than the inhabi- | uniformity in many points of structure and other important ture. tants of the plains, and in the western regions, where the | peculiarities, which prevails along the whole length of the Hindu or Aryan stock prevails, women of remarkable | chain. The perception of such general characteristics among beauty are often seen. At the lower altitudes cotton cloth- | mountains so vast is, indeed, too often overshadowed and ing is usual, at the greater elevations hempen and woollen | obscured by the magnitude of their parts, the multitude of materials prevail, but an utter disregard of personal clean- | their details, and the variety of their forms ; yet when the liness is universal. Goitre is frequent in both sexes, and | idea of the subordination of all these elements to common cretinism seems to occur much in the European form. laws has once been duly conceived, it obtains constantly

General The eastern ranges are wetter, the climate generally | growing confirmation from what at first only produced im-

climate. warmer and more equable, and the vegetation more rank | pressions of hopeless confusion. and of a more tropical character ; the mountains are more The great plain of northern India stretches with an almost The copiously covered with forest, and the extent of cultivation | unbroken surface along the foot of the Himalaya from the great is less, and the population probably less also. To the west, | upper Indus to the head of the delta of the Ganges, and rigs with a drier atmosphere and greater variations of tempera- | thence has a narrow prolongation along the Brahmaputra i ture, the climate above 5000 or 6000 feet becomes more | up the valley of Assam. Including its extensions to the like that of southern Europe, and the main features of the | sea, along the Indus on the west, and along the Ganges on scenery become more conspicuously similar to those of | the east, its area is about 500,000 square miles. It no-

Customs. European mountains. On the east the customs of the | where rises to more than 1000 feet above the sea-level, and people differ little from those of the neighbouring Tibetan | to the unassisted eye it appears a perfectly dead flat. That or semi-Tibetan provinces. On the west there is no great | part of the plain which lies along the foot of the mountains, distinction between the people of the hills and of the

the chief town in which is Almora, and which occupy the entire mountain face, from the watershed to the plains, as far as the main stream of the Ganges, for a distance from east to west of about 100 miles. Thence, an equal distance brings us to the Sutlej, the intermediate tract being occupied by many small principalities, independent in their civil government, but entirely under the political control of the British. In this region is situated Simla, the summer capital of the government of British India, on one of the outer ranges overlooking the Sutlej. Other small districts and principalities, partly British, occupy the Himalayan slope as far as the 76th meridian, beyond which we reach the territories of Jamu and Kashmir, which extend to within 50 miles of the Indus, a narrow band bordering on which river is mainly in the possession of Afghan tribes but partly under British rule. From the portion of the mountains

west of the 79th meridian issue the rivers Ganges and Jumna; also the five rivers of the Punjéb,— the Sutlej, the Ravi, the Chenab, the Jhelum, and the Indus, besides the Bydés which unites with the Sutlej. The valley of Kashmir is the upper part of the basin of the Jhelum.

plains in their customs, agriculture, or other occupations.

denizens of the Arctic regions, wholive under somewhat simi- lar physical conditions. The people are broadly built, with a strongly marked Mongolian physiognomy, dark hair, little or no beard, oblique eyes, and prominent cheek bones. In the warmer valleys they are mainly agricultural, and live in houses ; in the higher regions they are shepherds, living in tents, thinly scattered over a large area. They are clothed in woollens or sheep skins. The practice of polyandry prevails, a woman marrying a whole family of brothers. The government at Lhassa is nominally administered by the Tibetans themselves, but in reality is altogether under the control of a Chinese resident. The authority of the Lhassan Government extends to about 78° E. long.; west of this as far as the Indus, the country was conquered some forty years ago by the sovereign of Kashmir and remains under him. In the most western province of

Tibet, called "Balti," the Buddhist religion ceases to

prevail; the population is exclusively Mahometan, and that religion only is known beyond the Indus. To the west of Tibet the mountains are prolonged to the

70th meridian at an elevation not greatly less than that.

and more particularly the central and eastern portion, is well watered, being intersected by the numerous streams

Pamir.

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that flow from the mountains, and under the full influence

“ Siwalik,” and “sub-Himalayan,” rise abruptly, and with- Siwdliks

of the periodical rains, and it comprises the best cultivated, | out any intermediate undulating ground from the apparently or sub- the richest, the most populous, and most civilized districts | level surface of the plain. These hills, which from recent Hima- of India.. geological investigation we learn to be formed of deposits “”™ The The snowy peaks of the Himalaya are, under favourable | of various periods of the Tertiary epoch, attain elevations Tarai. conditions, visible from the plains at a distance of about from a few hundred to 3000 or 4000 feet. The dip of the 200 miles. It is not, however, till the traveller is within | strata composing them is usually at a low angle towards 30 or 40 miles of the foot of the mountains that the | the mass of the mountains, so that they present a steep outlines of the great peaks become well defined and their | face to the plains, while a comparatively easy declivity grandeur appreciable. At about the same distance, too, the | slopes inwards, and frequently, by meeting a corresponding lower ranges begin for the first time to attract attention. | but longer and more gradual talus descending from the At about 20 or 25 miles from the outer hills the cultivation | foot of the internal line of mountains, forms a shallow, of the plain commonly becomes less complete, and the | narrow valley which runs generally parallel to the outer villages more sparse; an open grassy tract is entered, often | range. traversed by shallow, sluggish streams, along wlich are These valleys, which are very characteristic of the outer The formed morasses, or fringes of gigantic reeds and grasses, | border of the mountains, have by some writers been Duns or frequently occupying very large areas. This tract is known | erroneously confounded with the Tarai. They are termed Me as the “Tarai,” or “ TariyAni.” Where most strongly | ‘ Dun” in the western regions; in Nepal they are known developed it has a width of 10 or 15 miles, but its exist- | by the name of “Mari.” Their floors consist of deposits ence is manifestly greatly dependent on the local conditions | of gravel and boulders, having a maximum elevation of of drainage and of rainfall, and to the west of the point | about 2000 or 2500 feet above the sea. Their continuity where the Ganges leaves the mountains the Tarai is not | is broken at intervals by low, transverse, watershed lines, formed. It has been erroneously described as 2 depression | from which the drainage is thrown off along their longitu- along the foot of the mountains, but

there is no foundation | dinal axis, and falls into some of the larger streams which for such a view, and the causes that lead to the formation | cross them from the inner ranges, though less frequently are not far to seek. it finds an independent exit into the plains by a sudden The To explain these it is necessary to take a further step | bend to the south through a rupture in the line of outer hills. Bhdbar. towards the mountains. Just as the Tarai somewhat | At intervals these valleys are entirely wanting, and the outer suddenly appears along a certain definite line, so it as | hills which form them elsewhere are undistinguishable from suddenly ceases, and is replaced by a band of forest of | the general mass of mountain within, except through the about equal breadth, known asthe "Bhabar." This tract is | aid of their geological character. From the considerable almost waterless, and the soil is seen to be chiefly sand or | elevation of the duns above the plains, down to the level shingle, more or less filled with boulders. The streams | of which the streams which drain them descend in a very that issue from the outer hills on entering the Bhabar are | short distance, the unconsolidated strata which form the for the most part rapidly absorbed, and finally disappear in | floors of these valleys are often deeply cut into by the their sandy or shingle beds, the water they pour into the | watercourses, and present a surface worn into terraces soil keing again discharged along the outer and lower | descending in steps of various heights. These conditions border of the tract, and collecting once more in the streams | lead to a peculiarity which characterizes large parts of the which characterize the Tarai. duns, the almost complete impossibility of getting water + How The Bhabar and Tarai slope continuously from the foot | from wells, due no doubt to the thorough desiccation of formed. of the mountains to the cultivated plain. The inclination | the subsoil.

is so uniform as to be hardly perceptible, but becomes gradually less as the distance from the mountains becomes greater. Observation leads us to suppose that the upper part of this talus, lying along the foot of the outer hills, is composed of coarser matter, and the lower part, which comes into view at a greater distance, of a finer and less permeable silt ; and that, the latter having a smaller in- clination and extending further than the former, the water absorbed by the upper beds will naturally be brought to the surface at their termination, where the finer materials forming clayey

strata make their appearance. That the swampy Tarai is not developed in the western part of the range is doubtless due to the smaller rainfall in that region; while its more marked occurrence to the east of the Ganges at irregular intervals arises from the local peculiarities of the surface drainage, which at some places is carried off directly into the larger rivers without check, and in others is forced to follow a line nearly parallel to that of the mountains for considerable distances, through a tract from which there is no free escape for the water; and which, thus becoming water-logged and covered with a rank development of vegetation, acquires its peculiarities, among which has to be reckoned a climate in which fevers of a deadly character are frequently induced, rendering its permanent occupation and cultivation difficult or im- possible,

The transition from the plains to the mountains is sudden and well-defined along a line that is almost continuous. The ranges to which geologists have given the name of

The sub-Himalayan ranges have a well-defined distinct Extent geographical existence along the greater part of the chain, of sub-

and their geological continuity is established where no valley ;,

is formed between them and the inner ranges, and where they cannot be otherwise distinguished from the general mass of mountains. 'To the west of the Sutlej river these ranges and the valleys connected with them have an unusual development, the width over which they extend increasing from 10 or 15 miles to as much as 50 miles, with a series of two or three dtn-like valleys one within another. West of the river Jhelum, again, the aspect of the outer Himalaya is entirely modified by a small table- land, which is formed to the north of the line of elevation known as the Salt range, and extends to the Indus. Its general surface lies at about 1000 feet above the general level of the plain, having a maximum elevation of about 1800 feet, and being remarkable for the extraordinary manner in which it is broken up by ravines, the number, gigantic dimensions, and intricacy of which are alike per- plexing and astonishing—the extremely dry climate leading to an almost total want of vegetation, and the absence of any such concealment exhibiting a picture of confusion and desolation not often seen.

ima- ya.

The ranges which lie immediately within the external Outer band of the Siwdliks, or sub-Himalaya, rise abruptly above ranges of

it to much greater elevations, and constitute the first masses which in such a region we can with propriety dignify with the name of mountains. Their ordinary elevation is about 7000 feet, and the highest summits on them reach 8000

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or 9000 feet above the sea. It is on them that sanitary To give a more precise idea of the character of the snowy Num- stations have been established for the convenience of the | zone, it will be worth while to state somewhat in detail the bers of European residents in the neighbouring provinces of India, | distribution of the great peaks which lie between the 78th cate

as affording the nearest sites to the plains at which a temperate climate can be reached. These ranges cover a breadth of about 60 or 70 miles, within which the magnitude of the mountains does not very greatly vary, their crests rarely going above 10,000 feet or falling below 5000 feet. Beyond this again another great change is observed, and the mountains rise rapidly and attain those surpassing heights which place the snow-clad summits of the Himalaya in the foremost rank of all the mountains of the earth.

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and 81st meridians, in the provinces of Kumaon and Garhwal, which have been far better surveyed that any other part of the range. Ona line of something less than 150 miles in length are found six great snowy groups, with five great rivers passing between them:—(1) on the east is the cluster of Api in Nepal, with a peak of 22,700 feet ; (2) Yirnajang, between the Darma river and the Kali, rising to 21,300 feet; (3) the Panch-chuli

group, between the Darma river and the Gori, with a maximum of 22,700 feet ; (4) the great compound mass which lies between the Gori

Charac- A remarkable deviation from the normal character of | and the Dhaoli rivers, consisting of Nanda-devi, Nanda-kot, ter west this zone of the mountains is observed to the west of Dunagiri, and Trisul, the first reaching 25,700 feet, the eSEnAe)- le Sutlej, where, combined with the exceptional extension | second 22,600 feet, the third 23,200 feet, and the last, of the sub-Himalayan ranges already noticed, is found | having a length of more than 10 miles, no part of which what may perhaps be best described as an outlier of the | is under 20,000 feet, its central point reaching 23,400 feet great central axis of snowy mountains. With a marked | above the sea; (5) the peaks between the Dhaoli and Vishnu-change in respect to elevation, as well as in respect to | ganga rivers, three of which lie between 22,300 and 22,600 its mineral constituents, the range locally known as the | feet; (6) the great group of Badarindth, Keddrmath, and " Dhaola-dhar," or White Mountain, rises directly from | Gangotri, between the Alaknanda and Bhagirathi, the chief the dtn of Kangra, the elevation of which is about | feeders of the Ganges, the first mass rising to 22,400 feet 2500 feet, into the regions of perpetual snow, its highest | and the second to 22,900 feet, while the third has five points reaching an elevation of 16,000 to 17,000 feet. | points varying in height between these. All these masses The same features are prolonged still further to the west | are connected with the main watershed by ridges more or beyond the Ravi, and this line of elevation forms the | less covered with perpetual snow, on which have been great snow-clad range that shuts in the valley of Kashmir | measured two other peaks rising above 25,000 feet, several on the south, there known as the Pir-panjal, the general | others reaching 23,000 feet, and many more between elevation of which is from 14,000 to 15,000 feet, and the | 19,000 and 20,000 feet. There is no reason for thinking passes over it not lower than 10,000 feet. that this gives an exaggerated idea of the vast scale on Snowy With this exception the ranges covered with perpetual | which these mountains are developed. There can be little ranges: snow are first met with on the southern slope of the great | doubt that as precise knowledge is advanced the number of general Tndo-Tibetan table-land, along a line between 80 and 90 peaks between 25,000 and 30,000 feet will be found to be position. niles from the

foot of the outer mountains, and 20 or 30 | very much extended; nor will it be surprising if points are miles south of the Indian watershed, and from this line | eventually discovered exceeding 30,000 feet in altitude. northward snowy peaks abound everywhere over the summit The average elevation of the crest of the Indian water- Eleva- of the table-land. The highest yet measured are near the | shed, between the points where the Indus and Brahma- tion of Indian watershed, but as it is only in this region of the | putra cross it, a distance of some 1500 miles, most —— western Himalaya, and in northern Ladak, that any com- | probably exceeds 18,000 feet. At a comparatively few na. plete survey has been made, it is necessary to be cautious | points only its continuity is broken, and it allows the in making statements as to absolute maximum elevation, | passage of rivers that rise on its northern flank ; but for the known in these mountains still bears far too small a | at all other parts its summit must be crossed to enter Tibet proportion to the unknown to afford sufficient ground for | from the south. The passes over it, in ordinary use for safe speculation on such a subject. men and animals, are frequently more than 18,000 feet Line of On the Himalayan slope the loftiest peaks are usually | above the sea, and except where it is broken through as highest met on the first ranges that enter the limits of perpetual | just mentioned, one point only is believed to exist at which peaks. snow, advanced some 20 or 30 miles south of the Indian | it can be surmounted under 16,400 feet. This pass, which watershed, and not on a continuous ridge, but grouped in | leads directly from Kashmir into the Tibetan district of masses separated from one another by deep depressions, | Drds, is only 11,300 feet, and is quite anomalous; such a through which is discharged the drainage of the tract | depression elsewhere would have been sufficiently deep to lying between them and the watershed. open a passage for the drainage of the table-land, but the Heights | The highest known peak in the Himalaya, and indeed in | great depth of the valley further north, in which the Indus of peaks. the world, is that in Nepal known as Mount Everest, which | flows, here gives the waters a more favourable escape in

rises to 29,002 feet. Kinchinjinga, in Sikim, on the east, reaches 28,156 feet, and another peak more recently measured, in the extreme west, reaches 28,278 feet. Dha- walagiri, in Nepal, is stated to be 26,826 feet,

and Nanda- devi, in Kumaon, to be 25,700 feet above the sea. But many other points have been measured exceeding 25,000 feet in elevation, two of which are to the north of Kumaon ; and the enumeration of all known peaks over 20,000 feet would be wearisome. These statements have reference to the particular zone along the Indian watershed above described, beyond which, as was before said, few measurements have been made (excepting in Ladak), but there is every reason to believe, 'from such scanty facts as are available for forming an opinion, that mountains rising considerably above 20,000 feet are of frequent occurrence throughout Tibet.

that direction.

The valleys which traverse the mountains between the Valleys.

plains and the great watershed are for the most part little more than gigantic ravines, at the bottom of which flows the river each contains, in a very contracted bed which at rare intervals opens out into a narrow alluvial flat capable of cultivation. The level of the river beds is necessarily very various. Valleys only 2000 or 3000 feet above the sea are often opened up into the very heart of the moun- tains, and carry with them the heat and vegetation of the tropics among ranges the summits of which are capped with eternal snow. In tracing up the larger streams it is usually found that on arriving within 10 miles of the line of the great peaks the rivers are flowing at an elevation of little more than 4000 or 5000 feet, but on crossing that line the acclivity suddenly and rapidly increases, and the XI. — 104

Their slope.

Tibetan rivers and. lakes,

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river-beds in a very few miles are found to be at an altitude of 9000 or 10,000 feet, indicating that the sudden increase to the height of the mountains along this line is not con- fined to the peaks alone, but consists of a general elevation of the whole surface. Having once crossed the line

of great peaks, the inclination of the valleys again becomes much less, and they thus continue for some miles, those that are fed from the larger glaciers frequently emerging from the ice at a level no more than 12,000 feet above the sea in the western mountains, 1000 or 2000 feet higher on the east.

The slope of the larger Himalayan rivers may be esti- mated to range from 20 feet per mile near the plains to between 100 and 200 feet per mile where they approach the snowy mountains. In their passage through these the inclination increases to as much as 700 or 800 feet in the mile, but to the north it is again reduced to 150 or 200 feet. Like all Indian rivers, they vary greatly in volume at different seasons of the year, and among the higher mountains are liable to special fluctuations from the more or less rapid melting of the snow from which they are fed. In the summer their waters increase and decrease with the varying temperature of the day or power of the sun, and in the winter they contract to a small fraction of their summer volume as the permanent frosts set in. In the lower parts of their courses the rivers commonly present an alternation of sparkling rapids with long reaches of deep, clear, tranquil water, in which the action of the current is often hardly visible ; as we ascend, the rapids become by

degrees more frequent and more impetuous, till in passing among the snowy mountains we find only the most furious torrents, pouring their turbid glacier waters over boulders of gigantic dimensions among which they are at times almost lost to view, and filling the valleys with their incessant roar.

The valleys of Kashmir and Kathmandu, by their Kashmir exceptionally large extent and comparatively level char-4™4_, acter, offer such remarkable deviations from the normal on: characters of Himalayan valleys as to require some com- ment. But the differences are after all

rather in degree than in kind, and it would not be difficult to find somewhat similar areas, though on a much smaller scale of develop- ment. In Kashmir, too, is found one of the very few lakes which occur in the Himalaya. The almost complete absence of such collections of water is among the circum- stances which serve to give a special character to the scenery of the Himalaya, and to distinguish it from that of European mountains.

On crossing the Indian watershed into Tibet, the Table- general character of the country completely changes. The land of summit of the table-land, though deeply corrugated with Tet. valleys and mountains in detail, is in its general relief laid out horizontally at a mean height little inferior to that of the watershed itself. The valleys of central Tibet are commonly

long, flat,and open, of no great breadth, perhaps 1 to 3 miles,

with a bottom of alluvial soil laid out nearly horizontally, from which the mountains rise abruptly on either side. The plateau of Gugé, immediately to the north of Kumaon,

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*=] * TIMETAN TABLE-LAND * »”*

a Hiatayan Siorr NoriwERN SLOPE R: |

E er cr HUILLMIPLUTATLM EAT aad tim a Wa eT TLELLA ADE a TOATLALLE ELEN ULL ERE EAL LAE LALLLDE ee SLICE LL LULDLLIILELIUSSLPEULLLE wore mee oan meee ce eee – i

Switzerland Italy Bernese Pennine Scale of Miles

30 50 40 + 80

Fie. 1.—Sections of the Alps and of the Himalaya on the same scale.

the average elevation of which is not less than 15,500 feet above the sea, and at the extremity of which lie the two lakes of Rakas-tal and Manasarowar, the waters of which are also nearly at that level, is a remarkable expansion of the ordinary Tibetan valley, and calls for special notice. It varies in breadth from 15 to 60 miles, and its extreme length is 120 miles, lying along the upper course of the Sutlej, which runs through it at the bottom of a stupendous ravine furrowed out of the alluvial matter of which the plateau is formed, to a depth of 2000 or 3000 feet. Into this run, across the western part of the plain, numerous other similar ravines in every gradation of size, often for miles together as even and straight as a railway cutting ; and so extraordinary is their magnitude in some cases that, in his account of a journey across the plateau, Moorcroft, a traveller of great accuracy in general, describes these slopes as those of mountains.

The main valleys are everywhere remarkable for their gentle slope, and in the central parts of the table-land the inclination at length frequently becomes so small as to give rise to the accumulation of the drainage in lakes, invariably salt when there is no efflux, and as invariably fresh when there is. The upper Indus has a slope as little as 3 feet per mile. Further to the west, as it approaches its great bend to the south, the inclination becomes greater, aver- aging about 24 feet per mile, and the width of its valley floor is reduced. It descends to a level of little above 4000 feet before it finally leaves Tibet.

It may aid in conveying a clear conception of the Com- magnitude of these Himalayan masses, to compare them parison with the Swiss Alps, which will be familiar to many English 0 m2

5 aya with readers. The above diagram represents on the same ips, scale sections of the Alps and of the Himalaya, the curved line from which the latter are shown to rise repre- senting the curvature of the earth. The Alps, measured across from the Lake of Thun to the plains of Lombardy, have a width of about 75 miles, the Tibeto-Himalayan mountains on a line drawn through Simla being about 400 miles across. To complete the comparison a few further explanations may be offered. The range that has already been noticed as the Dhaola-dhar, which rises from the Kangra din, if measured in breadth from Kangra to the upper Ravi, and

in length between that river and the Byas in Kulli, is about equal to the whole of the Bernese Alps comprised between Altdorf and Martigny in length, and laterally between lines drawn along the Rhone and Reuss on one side, and through the Lakes of Lucerne and Thun to the Lake of Geneva at Vevay on the other. The area covered in both cases is rather less than 100 miles in length by 20 or 25 in breadth, the highest peaks being in the Alps the Finsteraarhorn, 14,100 feet, and im the Dhaola-dhér a point 17,100 feet above the sea. The prolongation of the Himalayan ridge just spoken of, which bounds Kashmir cn the south, known as the Pir-panjal, would in like manner compare with the Pennine Alps and their continuation as faras St Gothard. Here the peak

Surface drainage of Hima- Jaya: how deter- mined,

Arrange- ment of mouul- tain features.

Geology. Imper- fection of data.

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of Mont Blane, 15,750 feet, slightly exceeds the highest |

point of the Pir-panjal, which is but little over 15,500 feet, though, with this single exception, the Kashmir range certainly much exceeds in general mass that of the por- tion of the Alps compared with it. To obliterate these two ranges from the Himalaya would make no very sensible inroad on it, though they surpass in bulk the whole of the Swiss Alps ; and it is no exaggeration to say that, along the entire range of the Himalaya, valleys are to be found among the higher mountains into which the whole Alps might be cast without producing any result that would be discernible at a distance of ten or fifteen miles. And it is important to bear in mind these relations of magni- tude, for the terms at our disposal in the description of mountains are so limited that it is necessary to employ the words chain, range, ridge, spur, &c., rather with refer- ence to relative than to absolute importance, so that the scale of our nomenclature changes with the extent and altitude of the mountains of which we speak.

An examination of the maps of the Himalaya indicates that throughout their whole extent a constant tendency is discernible for the rivers to flow either parallel to the general direction of the part of the chain through which they run, or perpendicular to it,—-many or perhaps most of them combining both tendencies, and running first in the one direction and then in the other. The conclusion is hence suggested that the system of surface drainage is determined by a series of longitudinal and transverse lines of rupture along and across the mountains. The study of the rivers and mountains themselves confirms this view. In many cases an apparent diagonal direction is found to be really due to a succession of short abrupt bends, though no doubt the rivers at times actually take an oblique course across the mountains. Frequently, too, where a river changes from a longitudinal to a transverse direction, another longitudinal stream meeting' the first flows down from an exactly opposite direction. The same disposition is otherwise often exhibited by the occurrence of both transverse and longitudinal lines of drainage, or valleys, starting in opposite directions from the same point on the main ranges, while a depression occurs in the ridge at the point whence such valleys take their departure.

As the rivers and ridges that separate them must be laid out on the same general plan, it is natural to find in these last the same tendency to follow lines perpendicular, or parallel, to the general direction of the chain. There is no part of the mountains in which these peculiarities may not be traced, tie longitudinal character prevailing on the summit of the table-land, and the transverse being domi- nant on the Himalayan slope. By the combination of these tendencies the rivers flow to the plains along a line generally oblique to the component parts of their actual course ; and the watershed ridges that separate them follow corresponding directions. But such watershed lines rarely have any true structural continuity, however strongly they may be marked on our maps, and great caution must be exercised in inferring physical relations among such features of the mountains without obtaining some know- ledge of their geological structure.

Considering the vast extent of these mountains, and the material and political difficulties in the way of the traveller who visits them, it is not

surprising that the knowledge of their geological structure is still very imper- fect. From causes which are not very obvious, iniportant parts of the deposits of which they consist have till now not yielded any fossil remains by which their age can be determined ; the visits of qualified geologists to the more remote parts of the chain have been very rare; and it is only within the last few months that any connected memoir on the subject has been published. Much that has been

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written on it is of too speculative a nature to find place in such an account as the present, and all that can be attempted is a brief outline of the main conclusions that seem estab- lished.

Of the great Indian plain nothing very definite can be The

said.

It is an alluvial deposit of sandy clay, on the sur- great

face of which nothing in the shape of a pebble can be found P!™-

excepting in the immediate vicinity of the hills that rise from it. In one place alone, in the north-west, on the Jumna river, have fossil remains been found imbedded in it, at some depth below the surface. They belonged to terrestrial mammals, with fish and crocodiles, which seem to be of the post-Tertiary epoch. A few borings have been made to depths of some hundreds of feet, but they throw no great light on the subject of the origin of the plain. There is no direct evidence either for or against its having been laid out by the sea ; on the one side it seems difficult to understand how so even a surface could have been pro- duced otherwise than under the sea, while on the other there is a complete want of marine remains both in the alluvium itself and in the most recent deposits which form the hills that rise from it. It seems to be admitted that some parts of the alluvial plain of the Indus have been submerged, and in any case, if it was produced by river action, it must have been by rivers having a very small inclination, and in a delta, or at a low elevation.

The outermost ranges of the sub-Himalaya are also geolo- The

gically the most recent. They are composed of gre

micaceous sandstones, generally very soft and often quite unconsolidated, with beds of red and blue clays and marls interspersed, and boulder and gravel beds, at times hardly to be distinguished from those formed in the existing rivers, and often cemented by carbonate of lime into conglome- rates. Though these formations are most strongly de- veloped to the west, they have been observed in Nepal and also in Bhotén. It is from the ranges in the vicinity of the Jumna river that the characteristic Siwdlik fossils have chiefly been obtained. They consist of numerous species of mammals and reptiles, with a few fish, birds, and mollusca,—all, however, remains of land or fresh- water animals, with no certain trace of marine creatures. Lignite occurs in thin isolated beds in small quantities. It had been commonly supposed that the Siwahik fauna was of Miocene age. The later views rather point to its being Pliocene. Sixteen genera among the fossil remains have not been found in any beds older than Pliocene, and of the many genera which continue to the present time, some of the forms preserved in these fossils are remarkably similar to existing species, all of which indicates a closer relation to the more recent than to the older Tertiaries.

outer Siwaliks,

In close juxtaposition with this external band, but con- The nected geologically in a manner that has not been very inner

clearly established, is an older series of beds,

the lowest Ima-=

of which is nummulitic and of the oldest Tertiary epoch. jayq,

The fossils found in these beds are as markedly marine as those of the other series are terrestrial. The junction of the newer with this more ancient series is concealed by disturbances, and the former has not been found overlying the latter, but only abutting upon it. This older section of

the Tertiary beds of the sub-Himalaya has only been properly made out to the west of the Jumna, though it is likely that it is also represented in the central and eastern parts of the chain by certain sandstones which occur there at the foot of the higher mountains. It may be surmised also that the nummulitic beds of these ranges are connected on the one side with those which are found to the west of the Indus extending to Sindh, and on the other with the nummulitic rocks of the hills south of Assan.

A complete change of geological character occurs on

The outer parts of main chain,

Probable age and relations.

Lines of granite and other igneous rocks.

The snowy moun- tains.

Great peaks.

Fossil- iferous strata on Tibetan border.

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passing from these outer and lower ranges to those higher | ing Tibet holds good on the east also, and that the general

mountains which extend to the line of snowy peaks. On the west of the chain the first of these ranges consists of argillaceous shales and schists, grits and limestones, inter- sected by several lines of igneous action, and all devoid of fossil remains. True slates also occur. The stratification is everywhere well niarked, the dip being usually towards the interior of the chain at au angle of from 10° to 20°. Portions of the mountains are found in which the dip is quite reversed, or towards the plains, a result no doubt of absolute rupture and partial dislocation. The lines of igneous action follow generally the line of strike, the type of the rock being greenstone, and conglomerates or breccias being often associated with it.

How far these beds extend to the eastward is somewhat in doubt. Suggestions have been made that they are tlie representatives of the Silurian or other fossiliferous beds found to the north of the great snowy mountains, but the evidence for this is hardly conclusive. The occurrence at the foot of the mountains in Sikim and Bhotan of a deposit containing fossil coal-plants, which are apparently identical with those of tlie Bengal coal-field, renders it probable that the rocks there are of the age of that coal, that is to say, of the lower Trias, a conclusion which somewhat serves to corroborate the speculation as to the age of the western beds just referred to.

In certain parts of this outer region of the mountains granite also occurs, accompanied by gneiss and mica-schist, the latter often abounding in garnets, In mineralogical character this granite and its accompanying schists differ greatly from those of the great peaks, which are also formed of granite and schists ; this has suggested a possi- ble difference of age, and it remains uncertain whether any or what connexion exists between them.

As we approach the line of great peaks the rocks pass into highly crystalline gneiss or mica schist, and another more continuous line of granite intrusion ocenrs, divided into several branches, but distributed generally on the line of strike, that is, along the principal direction of the chain itself. It is chiefly in veins, though it expands at times into masses of considerable size, and more rarely into out- bursts large enough to constitute whole mountains. The general dip of the strata continues throughout this area to be directed inwards, its angle being increased to as much as 45°, though seldom to more than that, Beds of highly crystalline limestone, some pure, and some not easily dis- tinguished from the gneiss or mica schist among which they occur, are common along a band following the direc- tion of the strike. The vein granite is usually large-grained ; hornblende at times replaces the mica; the felspar is invariably white, and crystals of schorl and kyanite are frequently seen in it.

The great peaks are, with few exceptions, composed of schistose rock, though granite veins may be seen in the mountain faces to very great

elevations; one of these exceptions is the great peak of Kamet in Kumaon, which rises to about 25,000 feet in what appears to be a mass of grey granite.

Passing to the north of the line of great peaks the meta- morphosed schists are suddenly replaced by slates and lime- stones, which are in many places highly fossiliferous, ex- hibiting what appears to constitute in the aggregate a fairly continuous series from the Lower Silurian to the Cretaceous formations, though the complete sequence has not been observed in any one locality. The western region of the Himalaya alone has been sufficiently explored to admit of any positive statements, but the indications gathered from such imperfect accounts and other data as exist relative to the eastern parts of the mountains leave little doubt that the change observed in the west on approaching and enter-

physical features of the whole tract are much alike, though doubtless with many differences in detail.

The fossiliferous strata of western Tibet are continued, Plateau : though perhaps with some breaks, to the Tertiary period. Tertiary.

In certain localities nummulitic rocks, probably Kocene, have been observed, and from the great alluvial deposit which forms the plain of Gugé, already noticed, the remains of mammals, apparently of Siwdlik age, have also been obtained. Among these were bones of the elephant and the rhinoceros, the existence of which, in the present condition of these regions, would be wholly impossible ; so that there is no room to doubt that these deposits have been raised from a comparatively low level to their existing great elevation of upwards of 15,000 feet, since they were laid out. As in the case of the plain of India, we here, too, have no complete proof of the origin of these great nearly horizontal deposits, but it seems clear, from the materials of which they are formed, that they must have been laid out by water, either by the sea or some great inland lake. They are largely composed of boulder deposits, and large boulders are strewed over the surface imbedded in the ground in a manner that seems only explicable as the result of the action of a considerable body of water.

Several lines of granitic and eruptive rock occur in Eruptive western Tibet, of which all that need here be said is that, rocks in they appear all to be older than the Tertiary alluvium, but Tet

some of them are possibly contemporaneous with the num- mulitic and older formations.

The general conclusion that may be drawn from the facts Epoch of structure thus briefly indicated is that the elevation of of ele- the Himalaya to its present great height is of compara- Yio.

tively recent occurrence. An area of land must have existed where the main line of snowy peaks now stands, which has not been submerged since the Paleozoic period, and which then had its northern boundary somewhere along what has been termed the Indian watershed. Evidence of a similar ancient sea on the south also exists, but in a less definite shape; and whether it was united with the northern sea or not is still a matter of conjecture, though the distinctive character of the fossils rather indicates that there was no direct union. The possible connexion of this ancient Himalayan land area with the pre-Tertiary land of the peninsula of India is also only a matter for speculation.

There is furtler reason to infer that the existence of Ancient the great line of peaks is rather due to some previous line pre-

of elevation on the ancient land, which has continued to retain its relative superiority while the whole area has been raised, rather than to any special line of energy of upheaval of recent date; and that the fundamental features of its former configuration of surface in mountain and valley have been preserved throughout. There is evidence for the con- clusion that the chief rivers of the pre-Tertiary land issued from the mountains where the present main streams are found, and this;embryo Himalaya may have been of such moderate height as to have permitted the passage across it of the Siwdlik mammals, the remains of which appear both on the border of the Indian plain and in Tibet. It is after the middle Tertiary epoch that the principal elevation of these mountains must have taken place, and about the same time also took place the

movements which raised the table-lands of Afghanistan and Persia, and gave southern Asia its existing outlines.

Tertiary land.

The best answer that can be given to an inquiry as to Forces how changes of level could have arisen, such as those to which which are observed in the Himalaya, is that they should "levatio

be regarded as due rather to secondary actions conse-

is due: their

quent on the general contraction of the cooling terrestrial mode of sphere than to direct elevating forces, for which no action.

Meteor- ology. Effect of moun- tains on atmo- sphere.

Baro- metric pressure and vapour.

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'known origin can be assigned. The contraction of the

cooling but now solid-crust of the earth must have set up great horizontal strains, partly of tension and partly of compression, which would necessarily have been followed by rupture or crushing along lines of least resistance, and tle movements on such lines are marked by the great mountain ranges that traverse the surface. A dislocation of the solid crust of the earth once having taken place, it would probably continue to be a line of least resistance ever after, and a succession of movements during past geological periods may thus be reasonably expected along such lines. Somewhat in proportion as the disturbing forces are intense, and the thickness of the crust on which they act is great, will be the tendency for the lines of rupture to be continuous for a considerable distance; and as the disturbed area is extended in its dimensions, the probability will increase of a repetition of a series of similar dislocations on lines approximately parallel to, or at right angles to, one another, and to the

line on which the greatest compression and consequent tension take place. Ina disturbed area, one transverse dimension of which is sensibly greater than the rest, the longitudinal ruptures will predominate in the interior and the transverse towards the borders. Almost all mountains give indica- tions of having been shaped by forces thus related, and to the action of such forces may the main characteristics of the structure of the Himalaya, and the arrangement of its ridges and valleys, be attributed. Whatever may be the power of rivers in general as instruments of erosion, and whatever effect the Himalayan rivers have had in removing the fragments of the rocks over and among which they took their courses, it is hardly possible to doubt that their main directions were determined by the anterior lines of dislocation which opened up hollows down which they could flow, and which must invariably have been accom- panied by a destructive and crushing action on the rocks along them, which has enabled the waters the more readily to sweep away the obstacles in their path. The parallelism of many of the great Tibetan and Himalayan rivers for hundreds of miles together, amid such mountains, seems wholly inexplicable in any other manner.

Although the loftiest mountains when compared to the earth's diameter are insignificant in their dimensions, and the irregularities of the surface would hardly be perceptible on any sphere, however large, that could be made to represent the earth, yet in relation to the depth of the atmosphere even moderate elevations become of great im- portance, and such heights as those reached by the Himalaya introduce modifications of climate in ascending over its slopes that are not surpassed by those observed in moving from the equator to the poles. One half of the total mass of the atmosphere and three-fourths of the water suspended in it in the form of vapour lie below the average elevation of the Himalaya, and of the residue one half of the air and virtually almost all the vapour come within the influence of the highest peaks.

The general changes of pressure of the atmosphere indicated by the barometer extend in a modified but well-marked manner to the greatest elevations to which observation has been carried, and the annual and diurnal oscillations are not less regular in Tibet than in the plains of India, though somewhat reduced in amount. With the increase of

elevation the diminution of the quantity of vapour held in suspension is very marked, and at the greatest heights reached there is found not more than one- sixth or one-seventh part of that observed at the foot of the mountains, and the proportion is sometimes as low as a tenth, or less. As is well known, the maximum quantity of water that can be suspended in the air in a state of vapour depends on the temperature of the air, and observa-

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tion has established that the actual quantity at all eleva- tions is approximately proportionate to this maximum, and is thus determined by the temperature, which in turn is regulated by the elevation. The theoretical view once held that watery vapour was distributed in the atmosphere in accordance with the laws of pressure of elastic fluids is manifestly inconsistent with observed facts, which indicate that the diffusion of vapour is powerfully obstructed by the air particles, and that it by no means behaves as an independent elastic fluid, but rather as though it were merely mixed up with or entangled among the air particles,

The great elevations to which the Himalaya ascends, Temper- and the broad zone which it covers in respect to latitude, ature of

and its varying distance from the sea necessarily lead to correspondingly great variations of climate in its different parts, including the temperature and the degree of humidity in the atmosphere, and the amount of rainfall. The general position of the whole tract between the 25th and 35th degrees of north latitude renders it subject to high summer temperatures. The heat of the great plain of northern India is not surpassed at any other part of the earth, the air temperature rising in the hottest months to more than 110° Fahr. ; the fall of temperature in the winter is considerable, the thermometer reeeding at times to the freezing point, or even a little below it; the mean tem- perature varies from 78° Fahr. in the east or southern portion to 75° in the west or north. On the mountains every altitude has its corresponding temperature, an eleva- tion of 1000 feet producing a fall of about 3%", or 1° Fahr. to 300 feet. The mean winter temperature at 7000 feet is about 44° Fahr., with a mean minimum of 32° Fahr., and the summer mean about 65° Fahr. At 9000 feet the mean temperature of the

coldest month is 32° Fahr., at 12,000 feet the thermometer ceases to fall below freezing point from the end of May to the middle of October, and at 15,000 feet it is seldom above that point at the coldest part of the day in the height of summer. There seems to be less variation of temperature at equal altitudes on the mountains in passing from east to west than might have been expected from the greater winter cold of the western part of the plains. This is pro- bably due to the greater relative humidity and heavier rainfall of the eastern regions, and the denser vegetation which covers them. These influences tend to keep down the day temperature on the eastern mountains, while the clearer skies and more open character of the west operate in the opposite direction. On the more woody and rainy mountains in the outer parts of the chain the mean summer temperature will be 60° at 10,000 or 11,000 feet, but it will still be as much as that up to 12,000 feet, or even to a greater elevation, in the bare and sunny valleys near the Indian watershed.

Hima- laya.

In Tibet the thermometrical conditions vary considerably Of Tibet.

from those of the Himalayan slope. At 12,000 feet the maximum temperature is perhaps 70° Fahr. and the absolute minimum 5° Fahr. The ordinary winter tempera- ture is from 0° Fahr. to 30° Fahr., with a mean of the coldest month of 10°. The mean of the hottest month is about 60°, and of the year 35°. At 15,000 feet the frost is permanent from the end of October to the end of April, and the lakes are usually frozen over for nearly five months in the year. Between 15,000 and 16,000 feet the thermo- meter will fall below the freezing point every night of the year. At heights of 17,000 or 18,000 feet it rises consider- ably above that point in the summer months. From 18,000 to 19,000 feet it thaws only in the afternoons of July and August, and at 20,000 feet there is probably perpetual frost in the shade, though in the sun the air no doubt rises above the freezing point to much greater elevations.

Freezing of rivers.

Diurnal and other ranges of temper- ature.

Com- parison of eastern and western parts of chain.

General relation of tem- perature to alti- tude.

Rainfall: periodi- city, how caused.

General distribu- tion.

Moun- tain Winds: their causes,

All the rivers in Ladak are frozen over every winter | during the night, thereby setting up currents to and from

down to 8000 feet, a phenomenon that has been nowhere seen in the Himalaya, the rivers that are accessible during winter being at too small an elevation to be ever frozen, and the main streams probably everywhere too rapid.

The diurnal range of temperature is directly dependent on the condition of the surface and the state of the sky. On all well-wooded ranges it is very small, particularly in the cloudy and rainy months, when it will not exceed 5° or 6°. In the dry months of April or May, before the summer rains begin, and in the autumn when clear skies again prevail, the variation is greatest. In Tibet it is greatest in summer and least in winter, which is the most cloudy season. The annual variation follows a similar law, 20° being about the minimum mean monthly range on the wooded outer mountains, while in Tibet it amounts to as much as 50°.

The difference of temperature between ranges densely clad with forest and the Indian plains may be twice as much in April and May as in December or January; and the differences between the temperatures of a well-wooded hilltop and an open valley below have been observed to vary as much as from 9° in the coldest to 24° in the hottest hour. Precisely the

converse may be found to hold good in comparing greater altitudes in Tibet with lesser in the Himalaya, where the humidity is greater.

It is generally true here as elsewhere—(1) that the decre- ment of temperature with altitude is most rapid in summer ; (2) that the annual range diminishes with elevation ; and (3) that the diurnal range also diminishes with elevation. But the greater quantity of cloud and the more dense covering of forest between 9000 and 10,500 feet render comparisons between this zone and the more open and less cloudy regions above and below anomalous, for reasons that will be apparent after the above remarks.

The chief rainfall on the Himalaya, like that of India generally, occurs in the summer months between May and October, the remainder of the year being comparatively dry. The physical causes which give rise to the south-west monsoon, under which name is known the season of summer rain as well as the south-westerly winds which accompany it, have been sufficiently explained in the article on AsrA, to which the reader is referred for further details,

The fall of rain over the great plain of northern India gradually diminishes in quantity, and begins later, as we pass from east to west. At the same time the rain is heavier as we approach the Himalaya, and the greatest falls are measured on its outer ranges ; but the quantity is again much diminished as we pass onward across the chain, and on arriving at the border of Tibet, behind the great line of snowy peaks, the rain falls in such small quantities as to be hardly susceptible of measurement.

An important agent in distributing the rain which falls over the Himalaya, if indeed it be not the essential one, is found in the diurnal currents of wind which are established from the plains towards the mountains, and vice versa, blowing up the valleys towards the main watershed from about 8 a.m, to 8 p.M., and in the opposite direction during the corresponding hours of the night. These diurnal winds, which are a very striking phenomenon, and blow in the afternoon with great force along the Himalayan and Turkish watersheds and the neighbouring parts of the plain of Tibet, are common to all mountains, and are no doubt due to the disturbances of the planes of equal atmospheric pressure

in a direction transverse to the mountains, caused by the unequal diurnal expansion and contraction of the columns of air respectively over the plains and mountains, the former being obviously longer than the latter, so that the planes of equal pressure are lifted by expansion higher over the plains during the day, and depressed by contraction

the highest region of the mountains, as these alternating actions take place.

The condensation of vapour from the ascending currents Their

thus set up across tlle Himalaya from the Indian plain, ee in relation

to rain.

and their gradual exhaustion by repeated precipitations as they. cross successive ranges, is manifested to the traveller on the face of the mountains themselves, by the changes observed in the vegetation on passing to leeward of any important range, and more especially the line of great snow peaks, In the rainy mouths in the higher parts of the chain the southern face of each ridge is clothed by the day upwind with a crest of cloud, which hangs upon it, the northern face being often left entirely free, thus showing how large a portion of the vapour is arrested, and showing also that it is only up the deeper gorges that a small supply of moisture finds its way to the Tibetan table-land.

The yearly rainfall, which amounts to between 60 and Quantity 70 inches in the delta of the Ganges, is reduced to about of rain

40 inches where that river issues from the mountains on ™®

the 78th meridian, and is no more than 30 inches near the foot of the mountains at the issne of the Indus. At Darje- ling, at about 7000 feet on the east, on the outer border of the mountains, it amounts to about 120 inches; at Naini- tal, at about the same elevation and similarly situated in 794° E. long., it is about 90 inches ; and further west it is still more reduced in quantity. In passing from the exterior to the interior of the chain the quantity greatly diminishes, In Kumaon, while in three months

49 inches was registered at Naini-tal on the outer range, only 19 inches fell at Almora, at 5600 feet, 30 miles further in. At Joshimath, 50 miles onward and close under great snowy peaks, at 6500 feet, 22 inches were measured in the same period; while at Niti, 11,500 feet behind the snowy peaks, the fall did not exceed 54 inches. In a week of rainy weather, when 1} inches fell at Joshimath, half an inch was measured at Niti; while beyond the Tibetan watershed during the same period the rain fell in a very faint drizzle which could not be measured at all. Similar facts might be quoted from the eastern mountains,

sured.

In the eastern Himalaya the ordinary winter limit of snow Snow- is 6000 feet, and it is rare for even 3 inches to remain ag fall.

many days on the ground on a southern exposure at 7000 feet. In Kumaon, on the west, it is pretty certain that snow will fall every year at about 6500 feet, and at 5000 feet it will not fail one year out of ten; the lowest level to which sporadic snowfalls are known to descend is about 2500 feet, of which two or three instances have occurred in the present century. At Peshawar, at an elevation of a little above 1000 feet, snow occasionally falls, but very rarely. At Lé, in western Tibet, the results of two years' observations indicate that the depth of snow that falls is less than 2 feet, the heaviest continued fall measuring 8 inches and lasting three days, at an elevation of 12,500 feet. Depths of 3 feet have been measured on passes between 17,000 feet and 19,000 feet above the sea. On the Indian watershed the falls are much heavier, and even in September the passes are sometimes quite blocked by the falls which commonly occur after the equinox, and they are not usually open again till the middle of June.

It is now satisfactorily establislied that the snow line, or The the level to which snow recedes in the course of the year, S20W-

ranges from 15,000 to 16,000 feet on the southern ex- posures of the Himalaya that carry perpetual snow, along all that part of the chain that lies between Sikim and the Indus, It is probably not till December that the snow begins to descend for the winter, though after September light falls

occur which cover the higher mountains down' to 12,000 feet, hut these soon disappear. On the Indian

ine,

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watershed the snow line is not lower than 18,500 feet, and on the summit of the table-land it reaches a height of about 20,000 feet. On all the higher passes into Tibet the vegetation reaches to about 17,500 feet, and in August they may all be crossed in ordinary years, even up to 18,400 feet, without finding any snow upon them; and it is as impossible to find snow in the summer on the great plain of Gugé in western Tibet, at 15,500 feet above the sea, as on the plains of India.

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as before remarked, the valleys descend rapidly to lower levels, are fairly comparable with those of Alpine glaciers, though frequently much exceeding them in length—8 or 10 miles not being unusual. In the elevated valleys of northern Tibet, where the destructive action of the summer heat is far less, the development of the glaciers is enormous. At one locality in north-western Lad&k there is a continuous mass of snow and ice extending across a snowy ridge, measuring no less than 64 miles between the extremities

Cause of There was at one time much discussion as to the true | of the two glaciers at its opposite ends. Another single higher cause of the level of the snow line being higher in Tibet | glacier has been surveyed 36 miles long. ae than on the outer ranges of the Himalaya. But the reason In connexion with almost all the Himalayan glaciers of Former

than on 18 obvious, namely, the greater quantity of snow that falls | which precise accounts are forthcoming are found ancient exten-

Hima- on the exterior ranges. The snow line marks the limit | moraines indicating some previous condition in whicli ome a laya. beyond which some snow always remains unmelted, that is, | their extent was much

larger than now. In the east these ain the point where on the average of years the summer heat | moraines are very remarkable, extending 8 or 10 miles. limits. will destroy the winter's snow. The main element in | In the west they seem not to go beyond 2 or 3 miles, and determining such a point will evidently be the quantity | they have been observed on the summit of the table-land of winter snow that falls, the summer heat being not very | as well as on the Himalayan slope. The explanation sug- different over the whole area. That the fall of snow on the | gested to account for the former great extension of glaciers outer ranges is greater than it is nearer the watershed at | in Norway would seem applicable here. Any modification the same elevation is beyond doubt, and the smaller | of the coast-line which should submerge the area now quantity of snow is more easily and earlier melted. occupied by the North-Indian plain, or any considerable Glaciers. It was long affirmed that there were no true glaciers in | part of it, would be accompanied by a much wetter and the Himalaya, and ingenious arguments were adduced to | more equable climate on the Himalaya; more snow would account for their absence. But, in fact, they abound along | fall on the highest ranges, and Jess summer heat would be all the higher ranges precisely in those circumstauces under | brought to bear on the destruction of the glaciers, which which they are found elsewhere, and all the pllenomena | would receive larger supplies and descend lower. Such an observed elsewhere in connexion with them are reproduced | explanation is not inconsistent with what is known of the in these mountains. geological formation of the mountains, and appears to be Eleva- The level to which the Himalayan glaciers descend is | otherwise supported by the evidence of a greater former tions at very various, being greatly dependent on local conditions, | extension of the lakes of Tibet, and of the former existence —- principally the extent and elevation of the snow basins | of rivers flowing from the Himalaya between the Jumna "which feed them, and the slope and position of the | and the Sutlej, the dry beds of which are now to be traced, mountain on which they are formed. A glacier formed on | in which water is never seen. Till now no geological the southern face of the Himalaya may readily be in a | evidence has been adduced to indicate in this region any- position in which it might, with a length of 10 miles, | thing corresponding to the glacial epochs of northern descend from 18,000 feet to 11,500 feet. But in Tibet, or | Europe, to which these former extensions

of the glaciers in the highest valleys, it might as readily happen that in | could be attributed. 10 miles no lower level than 16,000 feet could be reached. Speaking broadly, the general type of the flora of the Botany. With a larger snow basin on the south the greater waste in | lower, hotter, and wetter regions, which extend along the General reaching the lower level might easily be compensated, while | great plain at the foot of the Himalaya, and include the <9 ; no conceivable supply would enable the Tibetan glacier to | valleys of the larger rivers which penetrate far into thie of flora. reach 11,500 feet, to do which it must extend perhaps 100 | mountains, does not differ from that of the contiguous miles. These considerations will sufficiently explain the | Malayan peninsula and islands, though the tropical and fact that the glaciers on the outer slopes of the Himalaya | insular character gradually becomes less marked as we pass descend much lower than is commonly the case in Tibet, | from east to west, where, with a greater elevation and dis- or in the most elevated valleys near the watershed. The | tance from the sea and higher latitude, the rainfall and glaciers of Sikim and the eastern mountains are believed | humidity diminish and the winter cold increases. The not to reach a lower level than 13,500 or 14,000 feet. In | vegetation of the western part of the plain and of the lhiot- Kumaon many of them descend to between 11,500 and | test zone of the western mountains thus becomes closely 12,500 feet, In the higher valleys and Tibet 15,000 and | allied to, or almost identical with, that of the drier parts of 16,000 feet is the ordinary level at which they end, but | the Indian peninsula, more especially of its hilly portions ; there are exceptions which descend far lower. In Europe | and, while a general tropical character is preserved, forms the glaciers descend between 3000 and 5000 feet below | are observed which indicate the addition of an Afghan as the snow line, and in the Himalaya and Tibet about the | well as of an African element, of which last the gay lily same holds good. The summer temperatures of the points | Gloriosa superba is an example, pointing to some previous where the glaciers end on the Himalaya also correspond | connexion with Africa. fairly with those of the corresponding positions in European The European flora, which is diffused from tle Mediter- Relation glaciers, viz., for July a little below 60° Fahr., August 58°, | ranean along the high lands of Asia, extends to the Hima- to neigh- and September 55°. laya; many European species reach the central parts of Pe Their Measurements of the movement of

Himalayan glaciers | the chain, though few reach its eastern end, while genera ‘hg have been made which also give results according closely | common to Europe and the Himalaya are abundant

with those obtained under analogous conditions in the Alps, viz., rates from 94 to 144 inches in twenty-four hours. The motion of one glacier from the middle of May to the middle of October averaged 8 inches in the twenty-four hours. The average yearly motion of the glacier of the Aar is said to be 74 inches in twenty-four hours. The dimensions of the glaciers on the outer Himalaya, where,

throughout and at all elevations. From the opposite quarter an influx of Japanese and Chinese forms, such as the rhododendrons, the tea plant, Aucuba, LHelwingia, Skiummia, Adamia, Goughia, and others, has taken place, these being more numerous in the east and gradually dis- appearing in the west. On the higher and therefore cooler and less rainy ranges of the Himalaya the conditions of

Eastern moun- tains.

The outer ranges,

Inner ranges,

Alpine and Tibetan region.

Flora of central moun- tains.

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temperature requisite for the preservation of the various species are readily found by ascending or descending the mountain slopes, and therefore a greater uniformity of character in the vegetation is maintained along the whole chain. At the greater elevations the species which are identical with those of Europe become more frequent, and in the alpine regions many plants are found identical with species of the Arctic zone. On the Tibetan plateau, with the increased dryness, a Siberian type is established, with many true Siberian species and more

genera; and some of the Siberian forms are further disseminated, even to the plains of Upper India. The total absence of a few of the more common forms of northern Europe and Asia should also be noticed, among which may be named Z%lia, Fagus, Arbutus, Erica, Azalea, and Cistacece.

In the more humid regions of the east the mountains are almost everywhere covered with a dense forest which reaches up to 12,000 or 13,000 feet. Many tropical types bere ascend to 7000 feet or more. To the west the upper limit of forest is somewhat lower, from 11,500 to 12,000 feet, and the tropical forms usually cease at 5000 feet.

In Sikim the mountains are covered with dense forest of tall umbrageous trees, commonly accompanied by a luxuriant growth of under shrubs, and adorned with climb- ing and epiphytal plants in wonderful profusion. In the tropical zone large figs abound, Z'erminalia, Shorea (sal), laurels, many Leguminose, Bombax, Artocarpus, bamboos, and several palms, among which species of Calamus are remarkable, climbing over the largest trees; and this is the western limit of Cycas and Myristica (nutmeg). Plantains ascend to 7000 feet. Pandanus and tree-ferns abound. Other ferns, Scitaminece, orchids, and climbing Aroidee are very numerous, the last-named profusely adorning the forests with their splendid dark-green foliage. Various oaks descend within a few hundred feet of the sea-level, increasing in numbers at greater altitudes, and becoming very frequent at 4000 feet, at which elevation also appear Aucuba, Magnolia, cherries, Pyrus, maple, alder, and birch, with many Araliacee, Hollbillea, Skimmia, Daphne, Myrsine, Symplocos, and Rubus. Rhododendrons begin at about 6000 feet and become abundant at 8000 feet, from 10,000 to 14,000 feet forming in many places the mass of the shrubby vegetation which extends some 2000 feet above the forest. Epiphytal orchids are extremely numerous between 6000 and 8000 feet. Of the Conifer, Podocarpus and Pinus longifolia alone descend to the tropical zone; Abies Brunoniana and Smithiana and the larch (a genus not seen in the western mountains) are found at 8000, and the yew and Picea Webbiana at 10,000 feet. Pinus excelsa, which occurs in Bhotdn, is absent in the wetter climate of Sikim.

On the drier and higher mountains of the interior of the chain, the forests become more open, and are spread less uniformly over the hill-sides, a luxuriant herbaceous vegeta- tion appears, and the number of shrubby Leguminose, such as Desmodium and Indigofera, increases, as well as Ranun- culacew, Rosacee, Umbellifere, Labiate, Graminee, Cype- vacew, and other European genera.

The alpine flora of Sikim closely resembles that of the western Himalaya, and so far as generic forms are concerned, that of the alpine regions of Europe and western Asia. The vegetation of the Tibetan region appears on rising above 14,000 feet, and its last representatives reach even to 18,000 feet.

Passing to the westward, and viewing the flora of Kumaon, which province holds a central position on the chain, on the 80th meridian, we find that the gradual decrease of moisture and increase of high summer heat are accompanied by a marked change of the vegetation. The

| tropical forest is characterized by the trees of the hotter and drier parts of southern India, combined with a few of European type. Among them are Moringa, Bombaz, Butea, Anogeissus, Hrythrina, Acacia, Bauhinia, Nauclea, and Ulmus integrifolia. Pinus longifolia descends almost to the level of the plains. Among the more common shrubs are Zizyphus, Adhatoda, Calotropis, Carissa. Ferns are more rare, and the tree-ferns have disappeared. The species of palm are also reduced to two or three, and bamboos, though abundant, are confined to a few species. The outer ranges of mountains are mainly covered with forests of Pinus longifolia, rhododendron, oak, and Pieris. At Naini-tal cypress is abundant. The shrubby vegetation comprises Jtosa, Rubus, Indigofera, Desmodium, Berberis, Behmeria, Viburnum, Clematis, with an Arundimaria. Of herbaceous plants species of Ranunculus, Potentilla, Geranium, Thalictrum, Primula, Gentiana, and many other European forms are common. In the less exposed locali- ties, on northern slopes and sheltered valleys, the European forms become more numerous, and we find species of alder, birch, ash, elm, maple, holly, hornbeam, Pyrus, &c. At greater elevations in the interior, besides the above are met Corylus, the common

walnut, found wild throughout the range, horse chestnut, yew, also Picea Webbiana, Pinus excelsa, Abies Smithiana, Cedrus Deodara (which tree does not grow spontaneously east of Kumaon), and several junipers. The denser forests are commonly found on the northern faces of the higher ranges, or in the deeper valleys,

between 8000 and 10,500 feet. The woods on the outer ranges from 3000 up to 7000 feet are more open, and consist mainly of evergreen trees.

The herbaceous vegetation does not differ greatly,

The outer ranges : forests,

Her-

generically, from that of the east, and many species of baceous

Primulacee, Ranunculacee, Crucifere, Labiate, and Scrophulartacee occur; balsams abound, also beautiful forms of Campanulacee, Gentiana, Meconopsis, Saxifraga, and many others.

Cultivation hardly extends above 7000 feet, except in the valleys behind the great snowy peaks, where a few fields of buckwheat and Tibetan barley are sown up to 11,000 or 12,000 feet. At the lower elevations rice, maize, and millets are common, wheat and barley at a somewhat higher level, and buckwheat and amaranth usually on the poorer lands, or those recently reclaimed from forest. these, most of the ordinary vegetables of the plains are reared, and potatoes have been introduced in the neigh-bourhood of all the English stations.

As we pass to the west the species of rhododendron, oak, and Magnolia are much reduced in number as compared to the eastern region, and both the Malayan and Japanese forms are much less common. The herbaceous tropical and semi-tropical vegetation likewise by degrees disappears, the Scitaminee, epiphytal and terrestrial Orchidee, Aracee, Cyrtandracee, and Begonie only occur in small numbers in Kumaon, and scarcely extend west of the Sutlej. In like manner several of the western forms suited to drier climates find their eastern limit in Kumaon., In Kashmir the plane

and Lombardy poplar flourish, though hardly seen further east, the cherry is cultivated in orchards, and the vegetation presents an eminently European cast. The alpine flora is slower in changing its character as we pass from east to west, but in Kashmir the vegetation of the higher mountains hardly differs from that of the mountains of Afghanistan, Persia, and Siberia, even in species.

The flora of western Tibet is essentially European in its character. The juniper and poplar are the only trees that are seen, excepting fruit-trees, which include apricot, pear, and grape. The shrubby plants include small forms of willow, elm, Zonzcera, rose, MMyricaria, Ephedra, and

Besides

vegeta- tion.

Cultiva- tion.

Flora of

most western

area,

Of western ibet.

HIMALAYA

Hippophae. The ordinary firewood of the more elevated tracts is supplied by bushes of Caragana, the furze of travellers, and dwarf Lonicera and willow. Species of Astragalus, Urtica, Allium, small Crucifere and saxifrages, Saussurea, and Rheum are common. Artemisie and many salt-plants, with Glaux maritima and T'riglochin, are found, especially on the borders of the salt lakes. Mosses and ferns are very rare. Many European grasses and Carices occur in the pastures. The herbaceous vegetation ascends freely to 16,000 feet, and isolated plants may be found as high as 19,000 feet; but excepting in the close neighbour- hood of small streams the growth is very scanty, and not one-twentieth of the surface is

commonly clothed with vegetation. Barley is cultivated up to 15,000 feet, wheat, millet, and rape, with buckwheat, being common up to 12,000 feet. Apples and apricots grow up to 11,000 and 12,000 feet, and grapes to 9000 feet. Number The total number of flowering plants inhabiting the range ofspecies amounts probably to 5000 or 6000 species, among which ae may be reckoned several hundred common English plants families, Chiefly froni the temperate and alpine regions; and the characteristic of the flora as a whole is that it contains a general and tolcrably complete illustration of almost all the chief natural families of all parts of the world, and has comparatively few distinctive features of its own.

The timber trees of the Himalaya are very numerous, but few of them are known to be of much value, and the difficulties of transport are so great as to render their removal to a distance in many cases impracticable, The "'Sal" is one of the most valuable of the trees; with the "Toon" and ' Sissoo," it grows in the outer ranges most accessible from the plains. The " Deodar" is also much used, but the other pines produce timber that is not durable. Bamboos grow everywhere along the outer ranges, and ratans to the eastward, and are largely exported for use in the plains of India. Other vegetable products of econo- mical value, excluding the ordinary cereals and esculent plants, are not numerous ; and the primitive condition of the people and the difficulties and expense of carriage are so great as to render the trade in such articles very insignificant.

Though one species of coffee is indigenous in the hotter Himalayan forests, the climate does not appear suitable for the growth of the plant which supplies the coffee of commerce. The cultivation of tea, however, is now carried on successfully on a large scale, both in the east and west of the mountains, and has already become an important item of the export trade of India. In the western Himalaya the cultivated variety of the tea plant of China has been introduced, and succeeds well; on the east the indigenous tea of Assam, which is not specifically different, and is perhaps the original parent of the Chinese variety, is now almost everywhere preferred, The produce of the Chinese variety in the hot and wet climate of the eastern Himalaya, Assam, and eastern Bengal is

neither so abundant nor so highly flavoured as that of the indigenous plant, and there- fore not so commercially valuable.

The cultivation of the cinchona, several species of which have been introduced from South America and naturalized in the Sikim Himalaya, is still in its infancy, but promises to yield at a comparatively small cost an ample supply of the precious febrifuge that is extracted from its bark. At present the manufacture is almost wholly in the hands of the Government, and the drug prepared is all disposed of in India. The progress of cinchona cultivation on the Nilgherries is not less promising than on the Himalaya. Zoology. 'The general disti:oution of animal life on these mountains General ig riauuesuy determined by much the same conditions that char- have controlled the vegetation. The connexion with Europe acters. 0 the north-west, with Cliina on the north-east, with Africa

on the south-west, and with the Malayan region on the

Timber trees,

Tea.

Cin-

chona.

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south-east ,is manifest; and the greater or less preval- ence of the European and Eastern forms varies according to more western or eastern position on the chain. So far as is known these remarks will apply to the extinct as well as to the existing fauna. The Paleozoic forms found in the Himalaya are very close to those of Europe, and in some cases identical. The Triassic fossils are still more closely allied, more than a third of the species being identical. Among the Jurassic Mollusca, also, are many species that are common in Europe. The Siwalik fossils contain 84 species of mammals of 45 genera, the whole bearing a marked resemblance to the Miocene fauna of Europe, but containing a larger number of genera still

existing, espe- cially of ruminants, and as before stated now held to be of Pliocene age.

The fauna of the Tibetan Himalaya is essentially Euro- Fauna of

pean, or rather that of the northern half of the old con- Tibetan tinent, which region has by zoologists been termed Palae-°5'°™ arctic. Among the characteristic animals may be named the yak, from which is reared a cross breed with the ordinary horned cattle of India locally called "zobu," many wild sheep, and two antelopes, as well as the musk- deer ; several hares and some burrowing animals, including pikas (Lagomys) and two or three specics of marmot; cer- tain arctic forms of carnivora—fox, wolf, lynx, ounce, marten, and ermine; also wild asses. Among birds are found bustard and species of sand-grouse and partridge ; water-fowl in great variety, which breed on the lakes in summer and migrate to the plains of India in winter ; the raven, hawks, eagles and owls, a magpie, and two kinds of chough ; and many smaller birds of the passerine order, amongst which are several finches, Reptiles, as might be anticipated, are far from numerous, but a few lizards are found, belonging for the most part to types, such as Phrynocephalus, characteristic of the Central-Asiatic area. The fishes from the head waters of the Indus also belong, for the most part, to Central-Asiatic types, with a small admixture of purely Himalayan forms. Amongst the former are several peculiar small-scaled carps, belonging to the genus Schizothorax and its allies.*

*The ranges of the Himalaya, from the border of Tibet of Him- to the plains, form a zoological region which is one of the alaya richest of the world, particularly in respect to birds, to iy which the forest-clad mountains offer almost every range * of temperature.*

Only two or three forms of monkey enter the moun- Mam- tains, the langur, a species of Semnopithecus, ranging up ™4ls. to 8000 or 9000 feet. No lemurs occur, although a species is found in Assam, and another in southern India. Bats are numerous, but the species are for the most part not peculiar to the area; several European forms are found at the higher elevations. Moles, which are unknown in the Indian peninsula, abound in the forest regions of the eastern Himalayas at a moderate altitude, and shrews of several species are found almost everywhere ;

amongst them are two very remarkable forms of water-shrew, one of which, however, WVectogale, recently discovered, is probably Tibetan rather than Himalayan. Bears are common, and so are a marten, several weasels and otters, and cats of various kinds and sizes, from the little spotted Hels bengalensis, smaller than a domestic cat, to animals like the clouded leopard rivalling a leopard in size. Leopards are common, and the tiger wanders to a considerable elevation, but can hardly be considered a permanent inhabitant, except in the lower valleys. Civets, the mungoose (Jchnewmon), and tree-cats (Paradoxurus) are only found at the smaller eleva- tions. Wild dogs (Cuwon) are common, but neither foxes nor wolves occur in the forest area. Besides these carnivora some very peculiar forms are found, the most remarkable of which is d'lurus, sometimes called the cat-bear, a type

peculiar to the Himalaya. Two other genera, Ffelictis, an aberrant badger, and Prionodon, an aberrant civet, are representatives of Malayan types. Amongst the rodents squirrels abound, and the so-called flying squirrels with a membranous expansion or parachute between their fore

and hind legs are represented by several species. Rats and |

mice swarm, both kinds and individuals being numerous, but few present much peculiarity, a bamboo rat (2hizomys) from the base of the eastern Himalaya being perhaps most worthy of notice, Two or three species of vole (Avvicola) have been detected, and porcupines are common. The elephant is found in the outer forests as far as the Jumna, and the rhinoceros as far as the Sarda; the spread of both of these animals as far as the Indus and into the plains of

India, far beyond their present limits, is authenticated by |

historical records ; they have probably retreated before the advance of cultivation and fire-arms. Wild pigs are common in the lower ranges, and one peculiar genus of pigmy-hog (Porculia) of very small size inhabits the forests at the base of the mountains in Nepal and Sikim. Deer of several

kinds are met with, but do not ascend very high on the | hill sides, and belong exclusively to Indian forms. Themusk |

deer keeps to the greater elevations. The chevrotains of India and the Malay countries are unrepresented. The gaur or wild ox is found at the base of the hills. Three very characteristic ruminants, having some affinities with goats, inhabit the Himalaya; these are the "serraw,"

elevations. Lastly, the pangolin or manis is represented by two species in the eastern Himalaya. A dolphin living on the Ganges ascends that river and its affluents to their issue from the mountains.

HEM ALAYS

Of the reptiles found in these mountains many are Reptiles.

peculiar. Some of the snakes of India are to be seen in the hotter regions, including the python and some of the vellomous species, the cobra being found as high up as 8000 or 9000 feet, though not common. Lizards are numerous, and as well as frogs are found at all elevations from the plains to the upper Himalayan valleys, and even extend to Tibet.

The fishes found in the rivers of the Himalaya show the Fishes.

same general connexion with the three neighbouring regions, the Palearctic, the African, and the Malayan. Of the principal families, the Acanthopterygi, which are abundant in the hotter parts of India, hardly enter the mountains, two genera only being found, of which one is the peculiar amphibious genus Ophiocephalus. None of these fishes are found in Tibet. The Stluride or scaleless fishes, and the Cyprinide, or carp and loach, form the bulk of the mountain fish, and the genera and species appear to be organized for a mountain-torrent life, being almost all furnished with suckers to enable them to maintain their positions in the

rapid streams which they inhabit. A few Siluride have been found in Tibet, but the carps constitute the larger part of the species. Many of the Himalayan forms are Indian fish which appear to go up to the higher streams to deposit their ova, and the Tibetan species as a rule are confined to the rivers on the table-land or to thie

_ streams at the greatest elevations, the characteristics of " soral," and " tahr," the last-named ranging to rather high

Almost all the orders of birds are well represented, |

and the marvellous variety of forms found in the

which are Tibetan rather than Himalayan. The Salmonide are entirely absent from the waters of the Himalaya proper, of Tibet, and of Turkistan east of the Terektag. On crossing the watershed that leads from the streams flowing into the Indus to those falling into the Oxus, a trout is reported to have been found, though it is said not to live

in the Jaxartes or its affluents.

eastern Himalaya is only rivalled in Central and South America. Eagles, vultures, and other birds of prey are seen soaring high over the highest of the forest-clad ranges. Owls are numerous, and a small species, Glaucidium, is

No such general or connected account of the Mollusca, Other insects, or other lower forms of life, of these mountains orders of exists as will admit of anything but very vague statements #0'ml

regarding them. It is, however, understood that the _

conspicuous, breaking the stillness of the night by its

of swifts and nightjars are found, and gorgeously-coloured trogons, bee-eaters, rollers, and beautiful kingfishers and barbets are common. highest trees in the forest. The parrots are restricted to parrakeets, of which there

are several species, and a single small lory. The number of woodpeckers is very great, and the variety of plumage remarkable, and the voice of the

the spring as in Europe.

same relations with the neighbouring European, Asiatic, monotonous though musical ery of two notes. Several kinds ©

Several large hornbills inhabit the —

and African regions are found to exist as have been noticed as characterizing the other forms of life.

Of the land Mollusca, one-half appear to belong to the Mol- genera Helix and Bulimus, and about one-third to the lusca.

family of Cyclostomide ; the species appear to be for the most part very local, and of about 120 species in all, only

_ about one-tenth are recorded as being found in Tibet or

_ the highest Himalayan valleys, cuckow, of which there are numerous species, resounds in >

It is impossible to do more than |

indicate some of the chief passerine birds ; their number is |

immense. Amongst them the sun-birds resemble in appearance and almost rival in beauty the humming-birds of the New Continent. Creepers, nuthatches, shrikes, and their allied forms, fiycatchers .and swallows, thrushes,

dippers and babblers (about fifty species), bulbuls and |

orioles, peculiar types of redstart, various sylviads, wrens, tits, crows, jays, and magpies, weaver-birds, avadavats, sparrows, crossbills, and many finches, including the ex- quisitely coloured rose-finches, may also be mentioned. The pigeons are represented by several wood-pigeons, doves,

and green pigeons. The gallinaceous birds include the peacock, which everywhere adorns the forest bordering on the plains, jungle fowl, and several pheasants ; partridges, of

snow-pheasants and partridges, found only at the greatest elevations. Waders and waterfowl are far less abundant, aud those occurring are nearly all migratory forms which visit the peninsula of India,—the only important excep-

tion being two kinds of solitary snipe, and the red-billed curlew,

The Himalayan butterfliesare very numerous and brilliant, Insects.

for the most part belonging to groups that extend both into the Malayan and European regions, while African forms also appear. There are large and gorgeous species of Papilio, Nymphalide, Morphide, and Danaide, and the more favoured localities are described as being only second to South America in the display of this form of beauty and variety in insect life. Moths, also, of strange forms and of great size are common. The cicada's song resounds among the woods in the autumn; flights of locusts frequently appear after the summer, and they are met far within the mountains, carried by the prevailing winds even among the glaciers and eternal snows. Ants, bees, and wasps of many species, and flies and gnats in great variety of form, and possessed of equal variety of powers of annoyance,

| abound, particularly during the summer rainy season, and which the chukor may be named as most abundant; and |

at all elevations. Apart from the connexion which subsists between the

| Himalaya and the earliest developments of the Hindu

religion, there is little in these mountains thiat is of interest as throwing light on the earlier history of our race. The mythical geography of the Hindus represents the peak of Kailas, the snowy mountain north of the Tibetan lake

BAIA LA Y A

Relation of Manasarowar, as the centre of the world, around which a Him- its visionary kingdoms are spread out. The sanctity of = aa the Himalaya, in Hindu mythology, is known to ail, and mytho- thousands of pilgrims from all parts of India still continue logy: to seek salvation in the holy waters of the Ganges, and at mythical its sacred sources in the snowy Himalaya. " He who thinks Eaohy on Himachal," says the Manas-khanda, one of the Puranas

' or holy books of the Hindus, "though he should not behold him, is greater than he who performs all worship at Kashi (Benares). In a hundred ages of the gods I could not tell of the glories of Himachal. As the dew is dried up by the morning sun, so are the sins of mankind by the sight of Himdchal." And to those who have performed such a pilgrimage the wondrous snow-clad peaks of the Himalaya, though seen through the atmosphere of the 19th century, seem still to be surrounded with the same halo of glory as of old.

The Ganges, which issues from the mountains at Hardwar, is fed by two principal tributaries which unite

Gangotri, which lies to the north of a great cluster of snowy peaks, on the south of which is found the temple of Kedarnath, and on the east that of Badarindth. Large glaciers exist near both of these temples, that near

Holy rivers and

|

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of sculpture bearing the impress of the Greek art introduced by the successors of Alexander; and other relics of the Greco-Scythic kings, in the form of numerous coins, have been obtained from the same quarter. The exact point at

_ which Alexander entered India is still a subject of discussion

Kedarnath feeding the Mandakni, and that near Badarinath | feeding the Vishnuganga, which river gives the main supply |

of water to the Alaknanda. Both the valley above

Gangotri and that above Badarinath lead to Tibet, passing |

through a region of snowy peaks of first-class magnitude. To the west of Gangotri and the Bhaghirati lies the hardly less sacred source of the Jumna and the temples of Jamnotri. Badari- The temple at Badarindth, on the Vishnuganga, as the nath and latter name suggests, is dedicated to Vishnu, and is served by a priests of the Vaishnava sect, presided over by a "Rawal" 'or abbot, who is invariably a Brahman from South India. The temple at Kedarnath is dedicated to Shiva, symbolized by the Lingam, and is more especially venerated by the Saiva sect; and the chief priest here, too, is a Brahman from Malabar in the same part of India. The origin of this connexion of the holy places in the Himalaya with southern India is very obscure ; possibly, however, it dates back to the 8th or 9th century, to the time of Sankara Acharaya, a native of Malabar, the chief expositor of the Saiva doctrines, who is said to have died at Kedarnath. That the Himalaya and the sources of the Ganges, how- ever, were regarded as holy, and had become places of pilgrimage for Hindus long befure this event, or before the development of the two sects that have been here specially named, there can be no reasonable doubt ; but how or when the Aryan races of India first developed for them- selves a system of mythology so intimately bound up with these mountains must ever remain a subject of mere speculation.

Remains of Buddhist monasteries and temples on a great scale, the majority of which are believed from inscriptions found on them to date back to about the commencement of the Christian era, are met with along the foot of the western

Buddhist and. Greek remains in western nioun-

pe on the Indus, and similar ruins are seen as far west as ans.

Jellalabad in Afghanistan. Some of the buildings are doubtless of much greater age, and may go back to the earliest days of Buddhism, about six centuries before our era; and the discovery in this locality of what is probably a contemporaneous copy of Asoka's well-known inscription, cut into the face of a great rock, testifies to the develop- ment of a great centre of Buddhism in his days, that is, about 250 B.c. Among these ruins are found fragments

end of the Himalaya, in the Yusafzai country bordering |

among antiquaries, but it probably was on the line following the skirt of the north-west Himalaya along which the road now runs, and which is known to have been the chief line of traffic for centuries. How the influence of Greek archi- tecture was carried forward both in time and place is illustrated by the curious temple of the sun, or "Marttand," in the valley of Kashmir, the date of which is about 400 A.D.

It would be a task, certainly fruitless, and probably Com- impossible, to endeavour to estimate aright the con- parison flicting claims to admiration of the scenery of the ae Himalaya and other great mountain ranges. If some with elements of the picturesque be better found elsewhere, and other if the softer features of hill, valley, and lake be absent, moun- yet nowhere can the Himalaya be surpassed in the mag- tan | : nificence aud variety of its forests, or in the wealth and ne beauty of its alpine flora, which offer to the traveller ever-changing and ever- renewed pictures, combining the charm of former memories with fresh conceptions of the wonderful never-failing profusion of nature; and to the student of natural phenomena of every description surely no grander field will ever be open than that presented by these mountains.

In many circumstances mere magnitude may not be Grandeur effectual in adding to the apparent grandeur or sublimity of the | of mountain scenery, for everywhere the features nearest pone to the eye, though absolutely smaller, may cut off from :

| view those of far greater importance which are further

removed, And this is often conspicuously true in the valleys of the Himalaya. But the extraordinary scale on which every part of the mountains is developed, the actual vast dimensions of the main features, the apparently endless succession of range after range, of ascent and descent, of valley and mountain top, of river, torrent, and brook, of precipitous rock and grassy slope, of forest and cultivated land, cannot fail to produce impressions of wonder, which are not likely to be equalled and certainly will not be exceeded on any other chain. Upon these mountains alone, of all on the earth, can the traveller, as he climbs their slopes, obtain at a glance a range of vision extending 5 miles in vertical height, from 2000 or 3000 feet to 29,000 feet above the sea, and see spread out before him a compendium of the entire vegetation of the globe from the tropics to the poles. Here may the eye as it sweeps along the horizon embrace a line of snow- clad mountains, such as exist in no other part of the world, stretching over one-third of the entire circle, at a distance of 40 or 50 miles, their peaks towering over a sea of intervening ranges piled one behind another, whose extent on either hand is lost in the remote distance, and of which the nearest rises from a gulf far down beneath the spectator's feet, where may be seen the silver line that marks a river's course, or crimson fields of amaranth and the dwellings of man. Sole represen- tative of animal life, some great eagle floats high overhead in the pure dark-blue sky, or, unused to man, fearlessly sweeps down within a few yards to gaze at the stranger who intrudes among these solitudes of nature. As the sun sinks the cold grey shadow of the summit where we stand is thrown forward, slowly stealing over the distant hills, and, veiling their glowing purples as it goes, carries the night up to the feet of the great snowy peaks, which still rise radiant in rosy light above the now darkening worl.

| From east to west in succession the splendour fades away

from one point after another, and the vast shadow of the

earth is rapidly drawn across the whole vault of heaven. One more departing day is added to the countless series which has silently witnessed

the death-like change that passes over the eternal snows as they are left raising their cold pale fronts against tlle now leaden sky ; till slowly

with the deepening night the world of mountains rises again, as it were to a new life, under the changed light of the thousand stars which stud the firmament and shine with a brilliancy unknown except in the clear rarefied air of these sublime heights. (R. 8.)

HIMERA, a city on the north coast of Sicily. It was founded in 648 B.c. by the Chalcidian inhabitants of Zancle, but with them were many Syracusan exiles who gave to the language of the city a Doric character. Early in the 5th century the tyrant Terillus, being expelled by Theron of Agrigentum, invoked the aid of the Carthaginians. They gladly availed themselves of the pretext, but their general Hamilcar was defeated at Himera by the Greeks under Gelon of Syracuse (480 8.c.). Thrasydzeus, son of Theron, brought a large body of Doric immigrants to the city in 476; but was not long after expelled by Hiero. It seems to have enjoyed great prosperity during the rest of the 5th century. In 415 it refused to admit the Athenian fleet, and was a zealous ally of Syracuse. In 408 the Carthaginians sent another great army under Hannibal, grandson of Hamilcar, who razed the city to the ground. A new city called Thermze Himerenses was founded in 407 close to the former site. This name was derived from the famous hot springs, in which Hercules was said to have bathed. The new city was in Carthaginian hands till it was annexed by the Romans in the Second Punic War. It was treated with peculiar favour by them, and was left a free city under its own laws. In the time of Cicero it was a flourishing town, though not very large. Under Augustus it became a "colonia." We hear little of it from that time, though the site was never deserted, and the town still exists under the name of Termini. Ergotetes, an Olympian victor celebrated by Pindar (OJ. xii.), was a citizen of Himera. Stesichorus the poet was a native of the city; and his statue was preserved at Thermz in the time of Cicero, Agathocles also was a native of Therme.

HIMMEL, Frepericoxk Henry (1765-1814), a German composer of: mark, was born November 20, 1765, at Treuenbrietzen in Brandenburg,

Prussia, and originally studied theology at Halle. During a temporary stay at Potsdam he had an opportunity of showing his self-acquired skill as a pianist before King Frederick William II, who thereupon made him a yearly allowance in order to enable him to complete his musical studies. This he did under Naumann, a German composer of the Italian school, and the style of that school Himmel himself adopted in his serious operas. The first of these, a pastoral opera J/ Primo Navigatore, was produced at Venice in 1794 with great success. After his return to Berlin in 1795 Himmel became court chapel master to the king of Prussia, and in that capacity wrote a great deal of official music, such as cantatas, a coronation Te Deum, and the like, now justly forgotten. The same fate is shared by his Italian operas, successively composed for Stockholm, St Petersburg, and Berlin, and all received with great applause in their day. Infinitely more important than these is an operetta to German words called /anchon, the popularity of which has seldom been surpassed. Although antiquated it still re- mains an admirable specimen of the primitive form of the musical drama known in Germany as the " Singspiel." Himmel's gift of writing genuine simple melody, to which

the operetta owed its success, is also observable in his |

songs, amongst which one called "To Alexis" is the best. It may be found in the first volume of the Musical Library. Himmel died at Berlin, June 8, 1814. HINCKLEY, a market-town of England, county of Leicester, is situated 13 miles S, W. of Leicester, on a branch

line between that town and Nuneaton, which connects tlie London and North-Western and the Midland railways. The principal buildings are the church of St Mary, a Gothic structure lately restored, with tower and spire 120 feet high ; the town-hall; the priestshouse and Roman Catholic academy named St Peter's Priory ; and the union poorhouse, erected in 1838, with accommodation for 400 inmates. There are a grammar school, a national school, and board schools. Hinckley is the centre of the stocking- weaving district, aud its speciality is circular hose. It also possesses breweries, brick and tile works, and lime works. There are several mineral springs in the neighbourhood, and at one of these baths have been erected. The popu- lation in 1871 was 6902.

Hinckley was created a barony soon after the Conquest, when it was held by Hugh de Grentismenil, who erected a castle, the ditch of which is still traceable, and also founded a priory of Benedictine monks. Originally the town had the privileges of a borough, but

these were annulled by Edward IV. Mention is made of " Hinckley Fair" in the second part of Henry IV., act v. se. 1.

HINCMAR (c. 806-882), archbishop of Rheims from 845 to 882, a prominent figure in most of the theological and ecclesiastical struggles of his day, and perhaps the most vigorous and influential prelate France has ever pro- duced, belonged to a noble West Frankish family, and was born about the year 806. Other forms of the name are Ingumar, Ingmar, and Igmar. His early education was received at the abbey of St Denis under Hilduin (the author of Areopagitica), whom he followed to Corvey, Westphalia, when banished by Louis the Pious in 830 for having joined the party of Lothair. Returning about two years afterwards along with his superior to St Denis, of which he had become a canon, he resided partly there and partly at court, where he rapidly rose high in the royal favour. He was with Louis at the 'Field of Falsehood" (Campus mendacii) in Alsace, and was one of the few who remained faithful wlien the majority of the prelates and nobles went over to the other side. After the death of Louis (840), he equally gained the confidence of Charles the Bald, through whose influence, after he had successively held the abbacies of St Mary's, of Compiégne, and of St Germer, he was in 845 elected to succeed the deposed Ebbo or Ebo in the archiepiscopal see of Rheims. Having exacted from Charles a full restitution of all the church property which had belonged to the diocese, and a further promise that it should never again be alienated, he at once entered on the duties of his office, and took a leading part in the council of Meaux (C. Meldense), the reforming decrees of which so strongly roused the opposition of the king. Some attempt having been made to revive the claims of Ebo, Hincmar's title to the archbishopric was confirmed by a synod of

| French bishops at Paris, and ultimately settled by Leo IV.'s | transmission of the pallium in 847. _ nary affairs of his diocese, which included the completion

Apart from the ordi-

and adornment of the cathedral begun by his predecessor, he now became deeply involved in the discussions which arose out of the predestinarianism of Gottschalk (see GortrscHaLK), whom Hrabanus Maurus at the synod of Mainz (848) had caused to be relegated to Hincmar as his metropolitan. Ata synod held at Quierzy on the Oise (Carisiacum), in the diocese of Soissons, in 849, Hincmar had united with Wenilo of Sens and other prelates in con- demning the refractory monk to degradation, scourging,

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and imprisonment ; but in a short refutation of the " pre- destinarian heresy," which he himself shortly afterwards wrote and circulated, he so failed to do justice to the orthodox faith as to elicit the censure of Ratramnus of Corvey, who was afterwards supported by Prudentius of Troyes, Lupus of Ferriéres, and a large Augustinian party (850). Hincmar now summoned the dialectic skill of John

Scotus Erigena to his aid, and the controversy became | Another synod held at Quierzy in 853 passed | the four 'Capitula Carisiaca," which in substance taught |

general,

that there is but one divine predestination ; that free will,

lost by the fall, is restored by the preventing and assisting |

grace of Christ; that God wills generally that all men should be saved ; and that the blood of Clirist was shed for all. These were answered by the six canons of the

(Lotharingian) synod of Valence, which elicited from |

Hincmar, two years afterwards, the De Prcdestinatione Dei et Libero Arbitrio Lnbri tres, of which all that is now extant is the prefatory letter to

the king. By the synod of Langres (S. Lingonensis, 859), however, the articles of Valence were confirmed,—a decision which was afterwards supported by the general synod held at Savona or Savon- niéres, otherwise known as the Concilium Tullense (859). Hincmar now published the Posterior de Prcedestinatione Dei et Libero Arbitrio Dissertatio, but without influencing the voice of the church; nor was he more successful in his controversy witli Gottschalk on the Trinity, his Collectvo ex Sanctis Scripturis et Orthodoxorum Dictis against the phrase "Trina Deitas" having been totally disregarded ; he had, however, the satisfaction of preventing the release of Gottschalk, who died in prison in 868. While these speculative controversies were doubtfully raging, Hincmar found scope for his greater practical talent in the events which followed the death of the emperor Lothair in 855, and which chiefly resulted in the strengthening of clerical ascendency. Having saved Charles from the hands of lis own nobles and of the Germans, the great metropolitan was in a position at last to say, "If kings rule after God's will, they are subject to none; if they be great sinners then is their judgment in the hands of the bishops." In 860 began the divorce suit in which the interests of Thietberga, the oppressed queen of Lothair II., were involved ; and here, undoubtedly, the whole weight of Hincmar's influence was thrown into the scale of morality and right. His contribution to the discussion is still extant in the treatise De Divortio Lotarit et Teutberge Regine (860). While this controversy still remained unsettled, Hincmar became involved in a struggle with the pope (Nicholas I.), which is of very considerable historical importance from the part which was played in it by the newly introduced " Isidorian " decretals, and from the effect which it liad in limiting the rights of metropolitans. Rothad, bishop of Soissons, having been deposed for acts of insubordination and violations of duty at a synod of Soissons presided over by Hincmar in 863, had appealed to Rome ; the appeal had been sustained ; and ultimately in 865 orders were given that the judgment of Hincmar should be reversed, and that his suffragan should be restored to his office. The decision, which, though not without murmuring and contentions, was acquiesced in by Hincmar, was an important step in the development of the hierarchical monarchy of Rome. Hincmar was somewhat more successful when he found himself in opposition to the successor of Nicholas, Adrian II. This pope, who highly disapproved of the action of the archbishop in

crowning Charles as the successor of King Lothair of Lorraine in 869, had fulminated threats of excommunication against all who had been concerned in that action ; Hincmar replied that the Roman see had no right to interfere in such a matter, and that the impending ban would have no

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alike the protest of the emperor and the prohibition of the pope, Charles the Bald and Louis the German quietly divided tlie dominions of their nephew. Again, when Hincmar of Laon, his nephew and suffragan, had defied his authority and appealed to the pope, a long controversy resulted in the appellant's being imprisoned, degraded, and sentenced to the loss of his eyes (871). Of the remaining years of Hincmar's life few incidents are recorded ; in 882 he was compelled by Norman invasion to transfer his see to Epernay, where in the same year he died.

The works of Hincmar, which include, besides these already mentioned, a variety of capitula and other occasional pieces, were first edited by Sirmond in 2 vols. fol. (1645). They are reprinted in Migne's Cursus Patr. Comp. The Annales Bertiniani from 861 to 882 are also by Hincmar. See Gess, Merkwiirdigkeiten aus dem Leben und Schriften Hinemars (1806); Prichard, The Life and Times of Hincmar (1849); and Noorden, Hinemar, Erzbischof von Rheims (1863).

HINDLEY, a manufacturing towu of Laucashire, is situated on tlie Lancashire and Yorkshire railway, 3 miles south-east of Wigan. Cotton-spinning and the manufacture of cotton goods are the principal industries, and there are extensive coal-mines in the neighbourhood. Hindley possesses a grammar school, and among its places of worship may be mentioned the old parish church, and St Peter's church, erected in 1864 in the First Pointed style. In the time of the Puritan revolution Hindley church was entered by the Cavaliers, who played at cards in the pews, pulled down the pulpit, and tore the bible in pieces. The population in 1871 was 10,627.

HINDOL, one of the tributary states of Orissa, India, situated between 20° 29' 30" and 20° 49' 30" N. lat., and between 85° 8' 35" and 85° 31'

15” E. long. It is sur- rounded on all sides by native states, being bounded on the N.‘and E. by Dhenkanal, on the S. by Baramba and Narsinhpur, and on the W. by Angul. Area, 312 square miles ; population (1872), 28,025 (Hindus, 23,345 ; Maho- metans, 122; aud “others,” 4558). The Cuttack and Sam- balpur highroad runs through the state. Only five villages coutain upwards of 100 houses. Hindol consisted originally of three or four petty states, completely buried in jungle, and. ruled by separate chiefs, till two Marhattd brothers, belouging to the family of the Kimidi Raja in Madras, drove them out, and formed their territories into one principality. The present chief maintains a military force of 83 men, and a police force 133 strong. His estimated annual revenue is returned at £2082; tribute, £55,

HINDU KUSH is a title applied to the line of alpine watershed stretching W.S.W. from the southern margin of Pamir, the Caucasus of Alexander’s historians, whicli divides Afghanistan in a general sense from Afghan Turkestan, and the basin of the Cabul river from the basin of the Oxus. Looking towards the heart of a map of Asia, the eye is cauglit by that remarkable {point where the great highland seems clenched as it were to a knot, wlience expand in different directions (1) to east and south-east the great Tibetan plateau, (2) to north that of Pamir, and (3) to west that of Khorasan and Persia. Between the diverging masses run up the great basins of the Indus, the Yarkand river, and the Oxus. Some dim memory of these great features perhaps, trans- formed and transplanted further east, appears in the cosmography of the Puranas, in which the mythical Ganges falling on Mount Meru divides into four great rivers flowing to the cardinal points

This is the first impression. But, imperfectly as we yet know the mountain structure, the more we learn the more evanescent becomes this idea of triplicity as typifying the true skeleton. This node is in fact the place of contact or

validity ; and the actual result was that, notwithstanding | intersection of two great elevations :—(1) of the Himalaya,

of which the axial lines approach ina direction from 8.E. to N.W.,; and (2) of the Thian-Shan and allied ranges, of which the axial lines run from E.N.E. to W.S.W. The parallelism of Hindu Kush seems tv attach it to the latter system.

The definition of geographical features must often be in part arbitrary, but that of Hindi Kush fairly coincides with natural limits. On the east we take it as commencing at the Baroghil Pass, leading from the high valley of Little Pamir south into the valley of Kashgdr or Chitral. Just east of this is a cluster of peaks of great altitude, but their alignment attaches them to the great Gilgit range of the Himalaya (Muztagh of some maps, Dapsang of Richthofen). On the west we regard Hindi Kush as including and terminating at the Hajjigak Passes, those most commonly used between Cabul and Turkestan. West of this the range continues asa watershed of considerable altitude, but with a partial change of direction and loss of true alpine character. In maps this prolongation is styled Koh-i-Baba. Properly Koh-i-Baba is the name of a conspicuous three- peaked mountain rising over the Hajjigak Pass, to a height of at least 16,500 feet, which we regard as the terminal proniinence of Hindu Kush, though it is in truth also isolated from the higher summits to the eastward, which especially claim that name, by a considerable interval of tamer mountain, rounded and naked.

The total length of Hindu Kush as thus defined is 365 miles. Towards the eastern extremity the watershed per- haps emerges little from the table-land, for the Barogbil Pass is of singularly easy acclivity on both sides, and no prominent summits adjoin it on the west. But for the rest of its extent the mountain tract of Hindu Kush realizes the popular idea of an alpine chain, ze, of an unpierced mountain barrier whose passes are never far below the line of perpetual snow, and whose highest peaks are never very far from the watershed,

The general altitude of the "cols" or passes rnns from 12,000 to 13,000 feet. We give those that have been calculated (besides which some 20 or 22 are known more

vaguely), beginning from the east :—

Long. Feet,

T, Teemogitl Past . cseccssncsncoveossnsade 73°26" 12,000 2, MAWURENM 550 snncs-scseactentessverved 71°37’ 17,000 3. Dora bl fie eee ot 71°24’ ——- 16,000-16,500 4. Khawak _,, 69°39’ 13,200 De UMN. J) cece ana Means Caokoe uae 68°47’ 12,000 Gr MSvishanmmer,.. scene nese 68°40’ 15,000 7, Irak ae 67°52! 12,900

8. Kali 12,480

The three highest (2, 3, 6) do not rest upon any observa- tions of barometer or boiling point, but on other and looser data. Of the height of the peaks we have nothing definite. Captain Burslem, who ascended Koh-i-Baba with Lieutenant Sturt in 1840, speaks of seeing the lofty peaks to the eastward “ many thousand feet” above, and Burnes uses similar language. The great peak near the Kushan Pass, sometimes specially called Hindu Kush, which is seen at once from Cabul on the south and from Kunduz on the north, is probably not less than 20,000 feet high. Much further east the estimated heights of passes 2 and 3 indicate probable sumnuits of as greataltitude. A great mountain due north of Chitral, called Tirich Mir, and said to be visible from a great part of Kafiristan and from Zebak in Badakhshan, is estimated by Major Biddulph, who alone has seen it, at the enormous height of 27,000 Pe but General Walker reduces this to 23,000 with a (4).

Apart from this exceptional peak we shall form a just conception of the calibre of Hindi Kush among the ranges of the world if we class it with the French and Swiss Alpsin extent and mass, but with greater average altitude. We have only one report of a glacier, viz., on the Nuks4n Pass, No, 2 in the list of heights above.

_ passes mount.

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The idea of a distinct southern range running parallel to Hindu Kush, north of the Cabul river, which Wood calls “the Himalaya,” is founded on misconception. But peaks have been measured on the spurs which run

south on both sides of the Kunar river. They rise to near 19,000 feet on the left bank, east of Chitral, descending to 11,800 near the Afghan boundary. In Kafiristan there are peaks on these spurs of 16,600 and 16,800 feet, and even within 25 miles of the Cabul river are some as high as 14,000 feet.

On the south side of Hindu Kush the earliest sources of the Helmand are in the gorges up which tlie Koh-i-Baba All the rest of the range drains on that

side to the Cabul river, and so to the Indus. On thie

north all the drainage reaches the Oxus.

Both hydrographic features and the limits of our know- ledge conveniently divide the Hindu Kush into three sections.

(1.) Beginning from the east, in the first section, drainage southward is into tlie Chitral valley, and forms the great, perhaps greatest, contributary to the Cabul river, known as the Kunar or Beilam (probably Choaspes and Malamanthus of the ancients). The highest part of this basin is known as Chitral Bdld (upper), and is politically united to Yasin in the Gilgit basin (see GrLGIr). It consists of two or three confluent valleys, some of them thick with villages, whose continuous cultivation, supported by copious springs, extends far up the hill-sides. Mastuj, the chief place, stands 7500 feet high, in 36° 10' N, lat. Twenty miles farther down is the boundary of Lower Chitral or Kashgar. This forms a state of which the chief or king (he is styled " Badshah"') resides at Chitral town (height 5200 feet, 35° 53' N. lat.). The people are Moslem, apparently a converted section of the neighbouring Katfirs, and speaking a kindred dialect of Sanskritic affinity. Fruit is good, including fine grapes, and the wine was once famous. Chitral is the Bolor of Chinese geography, the misplacement of which so long perplexed and vitiated the geography of the Pamir highlands. The name Balaur medievally covered a larger tract, probably the whole of the then pagan country from Khawak Pass to the Indus. Below Chitral the valley narrows, and is shut in by Kafir villages in nominal subjection to the small state of Asmar (35° 4' N. lat.). Afghan territory begins at Maraora, 20 miles farther down. On the north of this

*section most part of the drainage flows directly into the Little Pamir stream of the Oxus, or into the Panja, the union of the streams from Little and Great Pamir. We have accounts of no passcs immediately west of Baroghil, though certainly they exist. From Avi, near the boundary of Paes and Lower Kashgar, a pass crosses (about 72° E. long.) to Ishtragh on the Panja. At tle western limit of the section are the lofty passes of Nuksan, Kharteza, Agram, and Dora, which lead through the Badakhshan canton of Zebak to the Vardoj branch of the Kokcha or river of Badakhshan. On the '*Nuksan" (quasi Via Mala) in descending towards Chitral the traveller is girt with a leathern kilt, and slides down the snow. Ponies, with feet tied, are rolled down. "By these processes," says the native authority, " both men and beasts generally reach the bettom in safety."*

(2.) The next section is that of which we know least. It embraces on the south Kafiristan, never yet penetrated by European traveller. There is a pass south to Kafiristan from Zebak and Sanglich, and one from Kuran, probably several more. The chief streams southward are that of Pech, joining the Kunar river at Chigar Serai (Chaghanserai of Sultan Baber), and the Alingar and Alishang, which unite in Laghman, formerly Lamghan (Lambaga of Ptolemy), and join the Cabul river at Charbagh above Jalalabad. West of Kafiristan are the Afghanized valleys of Tagao and Nijrao, hardly better known, and occupied largely by Pashais, a people seemingly akin to the Kafirs. On the north side the valleys form mir-ships or cantons among the congeries of small states owning allegiance to Badakhshan, and several of them having their peculiar dialect of old Persian affinity. One of these valleys is Kuran, down which flows the Jerm branch of the Kokcha. It is a wild glen near the borders of Kafiristan, coupled in a local rhyme with the jaws of hell, but which in the 8th century was of sufficient substance as a state to send a mission of homage to the Chinese court,such disproportionate pretcnsions being probably due to its containing the mines of lazuli, famous for ages, commemorated by Marco Polo, and visited by Lieutenant Wood in 1838. Adjoining this are Mungan and Anjuman, high valley cantons of which we barely know the names. Their streams chiefly bear north-west, and join the river of Taljkan, which carries them to the river of Kunduz, and so into the Oxus about 68° 18' E. long.

(3.) The last section extends from the borders of Kafiristan to tl.o

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Koh-i-Baba. On the south the drainage is received by two catch- ment channels flowing parallel to the watershed in opposite dircc- tions,—the Panjhir (or Panjshir) from the east, and the Ghorband river from the west, meeting near Charikar and flowing 8.8.H. to meet the river from Cabul. The Panjhir valley is populous and fruitful, with irrigated orchards and mulberry gardens, the chief support of the people, though these, of Pashai kindred, have for ages borne a repute for ruthless turbulence. It contains silver- mines, worked at an early date, and early Mahometan coins bear the mint marks of secluded towns like Panjhir and Andarab,—the latter place north of the mountains, head of a canton subject of Kunduz. From the Panjhir to the Andarab valley lead at least seven passes. The chief of these is Khawak, crossed by Wood from the north in 1838, and nearly 1200 years before (644) by Hwen- Tsang from the south. The Tul Pass, a loop to this, was crossed by the great Timur on his advance to India (1398). From the Ghor- band valley there are also seven or more passes ; two ascend from Parwan, one of which, Sar-aulang, was attempted unsuccessfully by Wood and Lord in November 1837,—since crossed and surveyed by Havildar Hyder Shah (1870). Kushan Pass, under the great peak, was ascended by Leech and Lord in October 1837. Four of the Ghorband passes descend on the lower Andarab valley, two more on the Surkhab river, coming from the valleys about Bamian. The last, the pass of Shibr, ascends from the top of Ghorbaud valley, and descends on that of Bamian near the castle of Zohak. This was crossed by Hwen-Tsang in approaching India (630), and by Timur on his return (1399), and was commonly used by Baber, who calls it Shibrtu. There remain the Koh-i-Baba passes of Irak, Hajjigak, and Pusht-i-Hajjigak. These are all approached from Cabul by the upper valley of the Cabul river and headwaters of the Helmand. The first Brigadier Dennie's force crossed to Bamian in 1840, before fighting Dost Mahommed on that famous site; Burnes (1832), Wood and Lord (1837), Griffith (1840), and others at that time crossed the Hajjigak, the best known of all the passes. North of the mountains the Andarab river and the Surkhab form catchments like Panjhir and Ghorband rivers on the

south. Uniting near Ghori they form the river of Kunduz or Akserai (called by Baber Doghdba) flowing north to the Oxus. Hazaras (see vol. i. p. 235) are the chief occupants of this section in ,its western portion. Further east on the north side the higher valleys are occupied by tribes of old Tajik lineage, mixed more and more with Uzbeks and other Turki people as the Kokcha is approached (see also vol. i. p. 241 sq.).

Geology.—Information is most scanty, and applies only to the western extremities of Hindi Kush. On the Kushdn Pass Lord speaks of the lower parts as consisting of micaceous schist, black slate with occasional bursts of granite, then mica slate and gneiss, and the summits of the pass and range of a granite core shooting up in precipitous peaks. On the Koh-i-Baba, also, Griffith speaks of the lower mass as predominantly of slaty formations ; the summits of coarse quartzose grey granite, and of very compact brown quartzose rock. In the Irak Pass, and at Zohak, are masses of conglomerate. Limestone occurs in the upper part of the valley of Parwan, exhibiting large cavities, in one of which the stream is engulfed for two miles ; also higher up the Ghorband valley, where a magnificent natural cavern occurs. Limestone occurs also on the Hajjigak Pass; and we hear of another great cavern near Doab, north of Bamian. Eruptive deposits occur in Ghorband valley towards Char- deh, and these recur at Bamian. Richthofen has sup- posed, from Chinese analogies, that the multitude of arti- ficial caves and cave dwellings about Bamian indicate a loess deposit; such details as we have seem hardly to corroborate this.

The region is rich in minerals. Iron is abundant and widely diffused. Villages called Ahangirdn (of the "iron- workers") are numerous. There is a rich black ore on the Hajjigak Pass, but fuel is entirely absent. Tron is also made at several places in Badakhshan, and of excellent quality in Bajaur east of the Kunar river. The districts adjoining the Jerm and Vardoj rivers are called Yamghan, which is popularly interpreted as Zamah-Kédn (' All-Mines") from its various mineral wealth. Copper mines (not worked) exist here and also in Chitral. Antimony is found in Ghorband, and accurate Griffith speaks of ore of antimony forming boulders and even "a large mouutain" on the top of Hajjigak. Lead is found in Ghorband and in Yamghan.

‘Chitral, a fact mentioned also by Hwen-T’sang.

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Sulphate of zinc occurs in Ghorband; silver, as above meutioned, at the head of Panjhir ; rock-salt on the borders of Badakhshan and Kunduz (mentioned by Marco Polv) ; sulphur in Yamghain and Sanglich (north of the Dora Pass); sal-ammoniac in Kuran. Orpimentis exported from The lazuli of Kurdn has been spoken of.

Zoology.—Of this we have not space to speak, nor accurate material. Afghanistan lies on the borders of the Oriental and Palearctic regions (vol. vii. p. 269), and par- takes in degree of both; but the Hindu Kush is to a certain extent a boundary between them. Thus it limits the genus Salmo, which is found in no Indian or Persian stream, but immediately on crossing the passes. The late estimable Russian traveller Fedchenko thought he had first discovered trout in Turkestan, but they were frequently caught by English officers at Bamian in 1840, and Marco Polo mentions them in Badakhshan.

Vegetation.—The only basis for a view of this would be Griffith’s collections near Koh-i-Baba and in the Kunar valley, but they have not been analysed in such a sense. These general remarks by Hooker and Thomson are, how- ever, apposite :—“ The collections of Griffith, besides con- taining an immense number of Persian and European plants which find their eastern limits within the British territory, are rici in Himalayan forms which advance no farther west; and, what is of still greater importance, they contain many species common both to Europe and the Himalaya, but which, from mere differences induced by local causes in these two distant countries, might not be imagined to have a common origin, did not the Afghanistan specimens blend their characters or show the transition between them.” —Flora Indica, i. 85, 86.

Historical Noticcs.—We have said that Hindi Kush is the Caucasus of Alexander’s historians. It is also included in the Paropamisus, though the latter term embraces more, Caucasus being apparently used only when the alpine barrier is in question. Whether the name was given in mere vanity to the barrier which Alexander passed (as Arrian and others

repeatedly allege), or was founded also on some verbal confusion, we cannot say. It was no doubt regarded (and perhaps not altogether untruly) as a part of a great alpine zone believed to traverse Asia from west to east, whether called Taurus, Caucasus, or Imaus. Arrian himself applies Caucasus distinctly to the Himalaya also. The applica- tion of the name Tanais to the Sir seems to indicate a real confusion with Colchian Caucasus. Alexander, after building an Alexandria at its foot (probably at Hupian near Charikar), crossed into Bactria, first reaching Drapsaca, or Adrapsa. This has been interpreted as Andarab, in which case he probably crossed the Khawak Pass, but the identity is uncertain. The ancient Zend name is, according to Rawlinson, Parcsina, the essential part of Paropamisus ; this accounts for the great Asiatic Parnassus of Aristotle, and the Pho-lo-sin-a of Hwen Tsang.

The name Hindu Kush does not appear, so far as we can ascer- tain, in any of the earlier Arab geographers. but it is nsed by Ibn Batuta, who crossed (c. 1332) from Andarab, and he gives the explanation of the name which, however doubtful, is still popular, as (Pers.) Hindu-Killer, " because of the number of Indian slaves who perished in passing" its snows. Baber always calls the range Hindu Kush, and the way in which he speaks of it shows clearly that it was a range that was meant, not a solitary pass or peak (according to modern loca] use, as alleged by Elphinstone and Burnes). Probably, however, the title was confined to the section from Khawak to Koh-i-Baba (see Baber, pp. 1386, 139). The name has by some later Oriental writers been modified into Hindi Koh (mountain), but this is factitious, and throws no more light on the origin of the title. Thename seems to have become known to European geographers by the Oriental translations of the two Petis de la Croix, and was taken up by Delisle and D'Anville. Kennell and Elphinstone familiarized it, and Wilford wilfordized about it. Burnes first crossed the range (1832). A British force was stationed at Bamian beyond it in 1840, with an outpost at Saighan.

The Hindu Kish, formidable as it seems, and often as it has been the limit between petty states, has hardly ever been the boundary of a considerable power. Greeks, White Huns, Samanide of Bokhara, Ghaznevides,

Mongols, Timur and Timuride, down to Saddozais and Barakzais, have ruled both sides of this great alpine chain. (H. Y.)

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HINDUR, also called NaLacary, one of the Punjab hill states, under the government of the Punjab, India, lying between 30° 54’ 30” and 31° 14’ 15” N. lat., and between 76° 39’ and 76° 56’ 45” E. long. Area, 256 square miles. The country was overrun by the Ghoorkas for some years prior to 1815, when they were driven out by

the British, and the raj&4 was confirmed in possession of |

the territories. The estimated population in 1875 was 70,000 ; the estimated revenue £9000, and tribute £500. The principal products are opium and the usual grains.

HINDUSTAN. See Inp1a.

HINDUSTANI,! or Urpt, is a dialect of the Hindi, one of the seven languages of Aryan stock spoken at the present day in North India, the others being the Panjabi, Sindhi, Gujarati, Marathi, Bangali, and Oriya. The area over which it is spoken in North India may be said to be co-extensive with that of the Hindi, which is estimated at

about 250,000 square miles, extending from the river | Gandak in the east to the Sutlej in the west, and from the |

Himalaya in the north to the Vindhiya mountains in the south, It is also extensively used, though in a somewhat different phase, in a great part of the Deccan, and is more- over the lingua franca of most parts of India.

As the Hindi language consists of many dialects, it is necessary to state that it is the Braj Bhasha, or the dialect that is spoken in the districts of Agra and Mathura, and in the neighbourhood of Dehli, the ancient capital of the Mahometau empire, which is generally regarded as the parent of Hindistani. The grammatical structure and alsoa vast number of the commonest vocables of the Braj were incorporated in the new

dialect, and to these were added a vast number of Persian, Arabic, and even Turkish words. 'Such words, however, in no wise altered or influenced the language itself, which, as regards its inflex- ional or phonetic elements, remains still a pure Aryan dialect, just as pure in the pages of Wali or Sauda, as it is in those of Tulsi Das or Bihari Lal."? Peculiarities of com- position, such as reversing the positions of the governing and the governed word (e.9., bap mera for mera bap), or of the adjective and the substantive it qualifies, or such as the use of Persian phrases with the preposition ba instead of the Hindi postposition of the ablative case (¢.9., ba-khushi instead of khushi se, or ba-hukm sarkar-ke, instead of sarkar ke hukm se), are no doubt to be met with in many writings, and these, perhaps, combined with the too free indulgence on the part of some authors in the use of high-flown and pedantic Persian and Arabic words in place of common and yet chaste Hindi words, and the general use of the Persian instead of the Nagari character, have induced some to regard Hindustani or Urdi as a language distinct from Hindi. But such a view betrays a radical misunderstand- ing of the whole question.

*1 Hindistani (Jit. 'Of or belonging to Hindistan") is the English name for the language. The natives generally call it Urda or Urda Zaban, "the camp language" (the word Urdi meaning, in Turkish, "'a camp"), and the poets, Rekhta, " mixed; while the phase of the dialect which is peculiar to southern India is termed Dakhini, or *"southern." The term Hindi, on the other hand, is derived from the Persian Hind, " India," and, strictly speaking, is applicable only to the modern language of the Hindiis. The old language, prior to the inroads of the Musalmins, is termed Hindii, and is derived from Hindi. It may be added that the present article has reference only to the so-called High Hindiistini, which differs considerably from the vulgar speech, 'This, in some parts of the area mentioned in the text, bears but little resemblance to the cultivated language, except in the possession of a few Persian or Arabic words. The High Hindiistani is that which is uniformly employed in literature over the whole of the Specified area. It is, moreover, the language in which the proceedings of the various Government courts and offices are carried on, and is spoken in its purity in all the large towns by the educated classes generally, by Hindiis as well as Musalmans.*

; ae Comparative Grammar of the Modern Aryan Languages, Volei. p! 32.

HIN—HIN

As regards the introduction of foreign words into the various dialects of Hindi, it seems highly probable that it had its origin at an early period, perhaps as early as the 8th or 9th century of our era. But there is good ground for the opinion that, although the Hindi area was overrun as early as the 12th century, the Hindustani was not formed till the 16th century. 'For many generations after the victories of Kutbu'd-din Aibak, the first Musalman sovereign of Dehli,the conquerors retained their own Persian, and the conquered their Hindi. The Musalmans had long been accustomed to speak pure Hindi,and it was not they who introduced Persian words into the language, but the Hindis themselves, who at the epoch above mentioned were com- pelled by Todar Mal's new revenue system to learn Persian.' And we learn from Mir Amman of Delli (whose brief account of the origin of Urdi in the preface to his well- known Bdagh-o-Bahdar bears on the face of it every convinc- ing mark of probability, and, scanty as it is, is remarkeble as, perhaps, the only attempt at a critical disquisition in the whole range of Hindistani literature) that at the date of the composition of his work (1802) the Musalman dynas- ties had endured for a thousand years, and that as inter- course increased the languages of the Hindiis and Musal- mans became to a certain extent mixed. By the arrival and stay of the Amir Timiir the camp or bazar of the army was introduced into the city, whence the city bazar was called Urdi, a Tartar wordsignifying""camp.". ..... "When Akbar ascended the throne, various races from all quarters, on hearing the kind patronage and bounty of that incom- parable house, came and assembled in the royal presence, but the speech and dialect of each was different. From their being collected together, and owing to the trade, traffic, and intercourse which they carried on with one another, a single language, that of the Urdi (or Hindistani), was established."

The epoch of Akbar, which first saw a regular revenue system established, with toleration and the free use of their religion granted to the Hindiis, was, there can be little doubt, the period of the formation of the language.

But its final consolidation did not take place till the reign of Shah Jahan. After the date of this monarch the changes are comparatively immaterial until we come to the time when European sources began to mingle with those of the East. Of the contributions from these sources there is little to say, Like the greater part of those from the Arabic and Persian, they are chiefly nouns, and may be regarded rather as excrescences which have sprung up casually and have attached themselves to the original trunk than ingredients duly incorporated in the body. In the case of the Persian and Arabic element, indeed, we do find not a few instances in which nouns have been furnished with a Hindi termina- tion, ¢.g., kharidnd, badalnd, guzarnd, daghna, bakhshna, kaminapan, &c. But the European element cannot be said to have at all woven itself into the grammar of the language. It consists, as has been observed, solely of nouns, principally substantive nouns, which on their admission into the language are spelt phonetically, or according to the corrupt pronun- ciation they receive in the mouths of the natives, and are declined like the indigenous nouns by means of the usual postpositions or case-affixes.4 A few examples will suffice. The Portuguese, the first in order of seniority, contributes afew words, as kamarad or kamra (camera), "a room;" méartol, 'a hammer;" nilém, ' auction" (often corrupted

3 Beames, Jbid., vol. i. p. 30, note.

4 It is supposed, however, that the strange dialect in which the Lascars, or " native seamen," and the Dandis, or "boatmen," hold converse, and in which orders are given to a native crew regarding the working of a ship, is compounded of Portuguese words assimilated to

Hindistani in their terminations and inflexions. Of this there is no positive proof, and until the matter has been properly and satisfactorily

| investigated it would be injudicious to pronounce a decided opinion.

Fignovs PANT

into lam) ; pert, "a turkey," &c. &c. Of French and Dutch influence scarcely a trace exists. English has con- tributed a number of words, some of which have even found a place in the literature of the language ; e.g.,

Kammishanar (commissioner) ; jaj (judge); istant (assistant); daktar (doctor) ; daktari, "the science of medicine," or 'the pro- fession of physicians ;" cnspektar (inspector); sosayatt (society) ; aptl (appeal) ; apil karnd, "to appeal ;" dikri or digrt (decree) ; digrt (degree) ; inch (inch); fut (foot) ; and many more, are words now commonly used. How far the free use of Anglicisms will be adopted as the language progresses is a question upon which it would be hazardous to pronounce an opinion.

The grammatical structure of the Hindistani differs in no essential particular from that of the Hindi from which it is sprung. It is therefore of the rise and formation of this language, and of the stage to which it had attained when the new phase of the Hindistani was developed from it, that we shall now speak.

Of the history and development of the Hindi or Hindii language previous to the 11th century of our era little or nothing is known. It is accepted as a fact by most scholars that Sanskrit ceased to be a vernacular in the 6th century B.C., When the Buddhist religion was founded, which for ten centuries drove Brahmanism into obscurity. From that time the Aryan people of India spoke popular dialects called Prakrits,1 and it is from these that the modern Aryan tongues are mainly derived. These Prakrit dialects are geuerally grouped under five heads, viz., the Maharashtri, Sauraseni, Magadhi, Paisachi, and Apabhransa, Of these the Sauraseni, or dialect of Saurasena, the modern tract of Mathura and the surrounding country, is taken to be the parent of the Hindi, or at any rate of that phase of it with which we have todo. These Prakrits were, like the Sanskrit, synthetical and inflexional in their structure, and certainly continued to be so up to the 1st century of our era, the lowest stage to which in point of development scholars have been able to reach. At what precise period the synthetical structure of the Prakrit began to break up aud to give place to the analytical formations of the modern speech it is impossible to tell. The gap of nine centuries has yet to be filled up. And unless future discoveries of Buddhistic literature should shed light on the subject, it is to be feared that the history of this period will ever remain unknown.

The dawn of modern Hindi may be dated from the 11th century. The earliest known writer in the language was Chand Bardai (c.1200), whose epic is in a dialect rude and half-formed, but as decidedly analytical as the Hindi of the present day.? Much of the old synthetical structure no doubt is still to be found in the work; the particles and the auxiliary verbs are in a very crude and unformed state (as, for example, the use of an obscure ka for the modern genitive affix ka, which ka does not vary with the governed noun, and is frequently left out alto- gether ; the total absence of the ordinary substantive verb hat, &c.); but these crudities and remnants of old Prakrit forms do not affect the general structure. Indeed, they are to be found in writings of a much later period, in works belonging to the 14th and 15th centuries, ¢.g., in the Adi

+ Prakrit is derived from the Sanskrit prakriti, ‘‘nature,” and signifies “natnral,” “not accomplished,” “‘ vulgar.” It is the col- lective name of those dialects which are immediately derived from, or

which stand in an immediate relation to, Sanskrit, or ‘the polished or accomplished language” of the Hindis,

**.It is this striking change from the synthetical structure of the Prakrit to the analytical of the Hindi, coupled with an accidental resemblance in certain of the case-affixes to those of the Dravidian tongues, that has led some Oriental scholars to claim for Hindi a uon- Aryan descent. But this view is ably combated by Mr Beames in his Comparative Grammar of the Aryan Languages of India, and by Professor Rudolf Hocrnle, in his Zssays on the G@aurian Languages.*

Granth, the language of which exhibits, according to Trumpp, “grammatical forms not firmly fixed, but rather in a state of transition.” And although the forms assume greater fixity, and marked progress is observable in the works of later writers in the Braj Bhakha dialect, e.g., in those of Kabir, Sar Das, Nabha Ji, Kesava Das, and Bihari Lal (whose poems are, as a rule, composed in very pure and elegant Hindi), we still find certain crudities and traces of Prakrit forms and organic structure, and these continue even in the language of the present day.

To give a minute account of the grammatical formation, to indicate the various phonetic or glottic laws by the operation of which the vocables and grammatical forms of the Hindi are derived from those of the Prakrit or Sanskrit, is beyond the scope of the present article. We can but notice a few general laws, and exhibit results, so far as they have been ascertained. For closer acquaintance with the subject we must refer the reader to the Prakrit- Prakasa of Vararuchi, edited by Professor E. B. Cowell; the Prakrit Grammar of Hemachandra, edited by Professor Pischel; the Comparative Grammar of the Modern Aryan Languages of India, by John Beames, B.C.S. ; and Hssays on the Gaurian Languages, by Professor Rudolf Hoernle.

Prakrit tolerates no compound consonant in the begin- ning and no dissimilar consonant in the middle of a word. Two dissimilar consonants in a Sanskrit word are changed in Prakrit to two similar consonants, and occasionally one of these is elided and the preceding vowel lengthened. In the modern dialects this elision of one consonant and compensatory lengthening of the preceding vowel is the rule. Prakrit either changes a medial surd mute consonant to the corresponding sonant one, or elides it altogether ; and it generally changes an aspirate mute consonant to the simple aspirate h. In fact the modern Aryan tongues stand to the Prakrit and the Sanskrit in a relation very similar to that existing between the Italian, &c., and the Romance and Latin languages. Hindi "is not the daughter of Sanskrit, as we find it in the Vedas, or in the later literature of the Brahmans, it is a branch of the living speech of India, springing from the same stem from which Sanskrit sprang when it first assumed its literary independence."?

Vocables.—The vocables may be classed under three heads :~~— 1. Words which are pure Sanskrit, as raja, 'a king" ; pita, "father" ; kavt, "a poct" 5. ndagari, ' of or belonging to a city " ; karma, karya, "work"; krodha (vulg. krodh), "anger." Nota few of this class of words have existed in the language for some cen~~ turies ; some are to be found even in the oldest specimens of the literature ; but by far the larger number have passcd into the language during the present century, and the introduction is still progressing. The form in which they appcar is that of the Sanskrit nominative singular,

*2. Words which are derived from the Prakrit, and have been considerably changed in the process, though not so much as to obscure their origin, ¢9., kam, “ work,” Prk. kamma, 8. karma; kan, “ear,” Prk. kanna, 8. karna; ath, “eight,” Prk, attha, S. ashtha; hath, “hand,” Prk, hattha, 8. hasta; dp, “ self,” Prk. appa, 8. atma; bat, “ word,” Prk. vatid, 8. vartta ; a, “ to- day,” Prk. ajja, S. adya ; age, ‘before,’ Prk. agge, 8. agre; ag, ** fire,” Prk. aggi, S. agni ; dudh, “milk,” Prk. duddha, 8. dugdha; phigun, “¥eb.~~March,” Prk. phaggun, 8. phalgun; buddha, “old,” Prk. vuddho, 8. vriddhah; kaha, “said,” (Braj kahyau), Prk. kahido, kahio, 8. kathitah ; rahd, “ remained,” (Braj rahyaw), Prk. rahido, rahio, 8. rahitah ; thé, “ was,” Prk. thio, 8. sthitah. This is by far the largest class of words in the Hindi. And, ag in the case of the first class, they are adopted in the form of the nomi~~ native singular of the Prakrit. They are divisible into two classes, the first comprising such as have in their declension preserved traces of the old organic inflexion of the Prakrit declension, and the second those which have preserved no such traces. As regards these it may be observed that the terminations 4, ¢, 7, 0, %, of the Prak- rit are regularly reduced in the Hindi to their inherent simple vowels, viz., @ to a, e and 7 to 7, and o and & to w ; and these short vowels are, as a rule, made quiescent, so that a word ending in reality in a short vowel virtually terminates in a consonant ; and, not being pronounced, the final short vowel is frequently suppressed in writing also.*

3 Max Miiller, Lectures on the Science of Language, lect. ii.

3. Words which cannot apparently be traced to any Sanskrit original, and are therefore considered by some scholars as words of nou-Aryan origin ; ¢.g., pagrt, “turban” ; gor, Prk. goram, “ leg.” Such words form but a small proportion ; and itis probable that further research and a better acquaintance with the laws of develop- ment of the modern Aryan tongues will ultimately enable scholars to very much diminish their number.

*Gender.—The three genders of the Prakrit and Sanskrit are, in Hindi and Hindistaui, reduced to two, the neuters and masculines of the old tongues generally becoming masculines in the modern language. Instances, however, are not a few in which they are changed to feminines. A striking feature in the modern tongues is the preponderance of masculines cndingtin , with the corresponding feminines in 7 Now in the Sanskrit is a typical feminine end- ing, and 7 is as often a masculine as a feminine termination. Many feminine words ending in 4@ are no doubt to be found in the Hindi, as chhimd, " patience," =S. kshama ; and similarly many masculine words which in the Prakrit and Sanskrit terminate in 7 are also to be met with, as pani, " water,"=S. paniyam ; hathi, " elephant," =S. hastt (hastin). But a is typically a masculine and 7 a femi- nine termination in the Hindi and Hindistani, and this is pro- bably due to the number of sources from which the termination springs ; thus we have—(1) =Prk. 0,=S. as orah, ¢.9., kaisa, "like what," '' what manner," '' how," Prk. kériso, S. kidrisah ; (2) =Prk. ad, =S. akas or akah, ¢.g., ghora, " horse," Prk. ghorad, S. ghotakah ; (3) =Prk. a(k)am, aam,=S. am, ¢.g., keld, *' plan- tain," Prk. kera(k)am, keraém, 8. kadaram. Again, the masculine ending aka of the old languages has a corresponding feminine in ikaé ; andas the Prakrit commonly employs the pleonastic increment k to raise bases to the form aka, so it employs the same affix to form the feminine zka of these masculines ; ika@ becomes cya, and more commonly 7 in the modern tongues. The form tyd is that which is generally used in feminine diminutives ; ¢.g., dibiyd, "a tiny box"; butit is also used like 2 for a simple feminine ; ¢.g., kutta, ' dog," kutiyd, "bitch" ; barha, "old man," burhiya, "old woman." If to the above class of feminines ending in 7 be added the large class which in Prakrit and Sanskrit form the feminine in i (¢.e., the Prakrit masculines in 0,=S. as), the preponderance of nouns ending in 7 seems sufficiently accounted for. It may be added that @ and 7 are so universally regarded as masculine and feminine terminations respectively that the natives employ them freely in forming feminines from masculines and vice versa, ¢.g., badla, badii, from the Arabic badal. There are afew other feminine terminations which are worthy of notice, not so much on account of their origin (which presents no difficulty), as on account of the free use which is made of them ; these are—(1) inz, in, an, ni, =S. ini (fem. of in, 7) ; (2) dni, dni,*

*din, =S. ant. These are not only found in words de- rived from the Prakrit, but arc added to Persian and even Arabic words ; ¢.g., Adthini, hathin, hathni, "female elephant," (=S. hastini) ; sundrin, sundran, '"'a goldsmith's wife," (fem. of sonar, *" goldsmith," =S. swrarnakdara) ; sherni, " tigress," from the Per- sian sher, "tiger" ; nastban, a proper name, from the Arabic nastb ; panditani, *' the wife of a pandit" ; ehaudhrain, " the wife of a chaudhart or head-man" ; méhtrdnt, "the wife of a sweeper, a sweeper-woman," from the Persian méhéar, "a sweeper."*

Declension.—It is here that the most striking contrast between the old and the new languages is found. The synthetical niethod of the Prakrit and the Sanskrit is, as a whole, rejected, only certain half-effaced traces of declension being retained. The number of cases, aS in the Sanskrit, is seven, the nominative, accusative, in- strumental, dative, ablative, genitive, locative, 'and vocative ; but the inflexions of the Prakrit have given place to case-affixes or post- positions. For example, where the Sanskrit has Sivaéyai and Sivasyai, the Hindi has siv-ko, and siv-ka.

The case-affixes or postpositions are as follow :—

UNISGTUIM ONAL oc. erase csnareerenessetesrs terns gMtICs UEOVce IDBGIVC-ACCUSHUIVE .ceneses:2s..~~cessesesecoessetOy) EatOne eto: ADIALIVG: cme (RCMND) magOlnt HOCH Ce a5 aces sseesesnczxecessilacacasi act~~

+ men, par,

The genitive affix, it may be observed, varies its termination so as to agree with tle governing noun. 1n other words, it is adjecti- val, and agrees with the governing noun just as an adjective would ; €.g., sone-ki ghari, 'a gold watch."

The case-affixes or postpositions are all, there can be no doubt, remnants of Prakrit nouns which were probably in use at the period when the modern Aryan languages began to be formed. The majority of these are fairly determined, and it seems probable that the remainder will also be fixed before long. The results of the in- vestigation of scholars, as regards

the postpositions noticed above (which are those commonly employed in the declension of Hindi and Hindistani nouns), we will here attempt to exhibit.

The case-affix ne of the instrumental (or case of the agent) is re- garded by Trumpp and others as derived from ena, the instrumental case-ending of the Sanskrit. This opinion is, however, combated by Beames (Comp. Gram., vol. ii. p. 266 et seg.), who is of opinion that it is an affix of the dative, which was probably transferred to

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the instrumental as late as the time of Shah Jahan, in whose reign, as has been shown above, Urdi or Elindiisténi was consolidated. Beames shows that the postposition is not used in the old Hindi, and is not to be found in most of the dialects, except as a dative ; but he does not, we believe, trace it to any particular original. It is clear, however, that whether this affix is derived from the instru- mental case-ending of the Sanskrit or not, it bears a striking resem- blance to the latter in its use and the construction it requires ; ¢.g., the Sanskrit tena uktam is marvellously like the Hindi us-na kaha, ""by him it was said," or freely " he said."

The dative postposition Xo is derived by Dr Trumpp from the Prakrit kito, kid, =S. kritam. Dr Hoernte,! however, would seem to connect it with the Bangali kachhe " near," and the S. sa-kasa ; and Beames (Comp. Gram., vol. ii. p. 257), accepting this as a right clue, traces the affix to the Prakrit kakkham,=S. kaksham, "' arm- pit," "side," the locative of which, kakshe, he believes to be the source of the Bangali kachhe.

The postposition se of the ablative is traced by Beames (Comp. Gram., vol. ii. p. 274) to the Sanskrit samam, " with," through an old form sov still used in the rustic dialects.

The genitive case-affix ka (fem. ki, oblique ke) is 'derived by Trumpp and others from the Sanskrit affix ka. But Hoernle? shows conclusively (and his derivation is accepted by Beames) that the affixis derived from the

Prakrit karié (=S. kritas), which becomes kero, kera(k)o, and then keraé; kero is then shortened to kara, whence the modern form ka.

Of the locative case-affixes, men, "in," is derived by scholars from the Sanskrit madhye, the locative of madhya, " the middle"; while par (pari, or pat) is obviously traceable to the Sanskrit uparz, ce upon."

*- The declensions are two in number. In the one the nominative or base is inflected before the case-affixes are added ; in the other no change takes place in the nominative form. The first consists solely of masculine nouns ending in d= Prk. o=S, as (¢.g., ghord, " horse," =Prk. ghorad, =S. ghotakas); the second comprises all other nouns, whether they end in vowels or consonants. The base of the first declension is inflected by changing final to e; ¢g., nom. ghora, inflect. base ghore, gen. ghoye-ka, dat. ghore-ko. But in the second declension we find, nom. rad, ''king," gen. raja-kda, ''of a king," &c. Dr Hoernle connects the ¢ of the inflected base with the ya of the oblique form in Marathi, and so traces it to a Prakrit geni- tive in yassa=tassa=tkassa. 'The correetness of this derivation would seem to be established by the analogy of the oblique or in- flected base of the plural of nouns, and especially by the inflected base of the pronouns, both these bases being indisputably traceable to the Prakrit*genitive. Mr Beames, however, is of opinion that '¢it is not correct to derive the oblique form from any special case of the Sanskrit ;" he thinks that "it rather results from a general fusion of all the cases' (Comp. Gram., vol ii. p. 210). This is the more remarkable as he accepts withont demur the fact that the plural oblique base is a corruption of the Prikrit genitive plural.*

The terminations of the nominative plural of nouns (where a plural form is used) are clearly traceable to the Prakrit. Nouns which fall under the first of the declensions noticed above terminate in e in the nom. plu. (¢.g., ghord, "horse," nom. plur. ghore, 'horses,' which is identical in form with the inflected base of the sing.). The termination e=Prk. ce, =S. dh. Feminines ending in a consonant (and also fem. Arabic words ending in @, as bald), form the nom. plur. by adding ev to the sing. nom. This ending, ei,

=Prk. neuter a, din, =S. neut. ani. The plur. termination an of the nom. of feminines ending in 7 (as betz, “ daughter”) is also to be referred to the Prakrit @im=S. ani. The oblique form of the plural of all nouns ends in on (¢.9., ghoron; gen. ghoron-ka ; raja- on, dat. rajad-on-ko). The termination om is derived from the

Prakrit dram (=S. dram), the termination of the genitive plural.

*Pronouns.—The pronouns stand in marked contrast to the nouns in respect of the fidelity with which they have prescrved the Prakrit forms. Those of the first and second persons run parallel to one another, and have four fundamental forms, namely, the nominatives and the obliquesin both numbers. The genitive is a possessive pro- noun, and, as in the noun, is adjectival inform. Main, “I,” is derived by Trumpp from the Prakrit mam, the accusative of aham ; but it seems more probable that it is, as Beames shows, the instru- mental maim of the Prakrit, and =S. maya. In the genitive me- ra, ‘*my,” the affix ra added to the Prk. base me is, there can be little doubt, connected with the affix 4a, used in forming the geni- tive of nouns ; the form kara, by elision of k would naturally yield 7a, which we may observe is the genitive affix of nowns also in the Marwari dialect of Hindi. The oblique form mujh is derived from the Prakrit majjha, one of the forms of the genitive. The dative- acc. mujhe of the modern Hindi is formed by adding e to mujh, this ¢ being the usual sign of the oblique in nouns. Ham, “ we,” = Prk. amhe by transposition of h. This is now commonly used as the oblique form of the plural (¢.9., ham-ko, ham-par) ; but the oblique hamon, =Prk. gen. plur. amhanam, is also to be met with.*

‘ Journal of the Asiatic Society of Bengal, 1872, pt. 1, p. 174 et seg. 2 Ibid, p. 124.

mime vpUs rani

The genitive plural hamdra is probably from Prk. amha +karo, by elision of X.

The pronoun tz, “thou,” = Prk. twmam, tudém,=S. twam. A form tavi, parallel to main, and similarly derived, is also in use. The oblique twjh is

from the Prakrit tayjjha, one of the forms of the genitive. The sourees from and the proeesses by which the remaining forms are obtained are precisely parallel to those employed in the pronoun of the first person.

The pronouns of the third person are identical with the demon- strative pronouns yah or yth, "this," and wah or wuh, "that," of whieh the older forms are i2 and uh. The origin of these forms has not yet beendiseovered. All that ean be gathered respecting them is that they are probably connected with one or other of the Prakrit forms adm, tdém, inam, im, &e. =S. ayam, m.,tyam, f.,idam, n.,&c., and are to be referred to primitive bases ¢ and a or u. The oblique forms of these pronouns, however, point clearly to the Prakrit geni- tive, c.g., is = Prk. assa, S. asya.

The relative pronoun jo, "he who" = Prk. jo, base ja =S. ya. The other form in use, jawn, = Prk. jo-wna (=S. punah). The singular oblique form jis =Prk. jissa (the fem. base jz being used in place of the mase. ja), =S. yasya. The oblique form of the plural, i.¢., jin=Prk. jaénam (by weakening of the vowel), =S. yanam.

The correlative so =Prk. so = S. sah. Its remaining forms may be made on the model of jo by substituting ¢ for j.

The interrogative pronoun has & for its typical letter, just as the relative has j, and is in all respeets as uniform as the relative and correlative. Kaun, "who" =ko+una (=8. punah); the oblique form kis =Prk. gen. kassa (with ehange of base from mase. ka to fem. kt), =S. kasya.

The indefinite pronoun koi, "some oue," = Prk. kobi, =§ kot+api. 'The oblique form kist shows the oblique of the inter- rogative with the 2, whose origin has been forgotten, so that it is regarded as a mere emphatic particle" (see Beames, Comp. Gram.). Kuchh, 'something "=Prk. kimchi=S. kimehit.

The reflexive pronoun ap, "self"=Prk. appa, apd, = S. dima.

Verbs and Tenses.—The verbal stems are, generally speaking, derived from the Prakrit present tense of Sanskrit neuter verbs, or from the Prakrit passive past participle. In the formation of the tenses, as in the

declension of nouns, the synthetieal or inflexional system of the Prakrit and the Sanskrit has given place to the analytical. Still wrecks of the old inflexions remain.

The tenses of the modern verb may be naturally classed under three heads —(1) the simple tenses, which are the exaet modern equivalents of corresponding tenses in the Prakrit verb, and in which traces of the old synthetic method still linger ; (2) tenses formed of a participle, either the imperfect or the perfect participle ; (3) tenses formed of a participle and an auxiliary verb.

The tenses of the first elass are two in"number,—the aorist (which corresponds to the present indieative of the old languages), and the imperative, which is derived from the Prakrit imperative.

The terminations of the aorist are :—

Singular. Plural. 1. an=Prk. Gmt ==S. ami. 1, en=Prk. dma, ama=S. amah. 2.e =Prk.ast =S. ast. 2. o =Prk. aha =S, a-tha. $3. 6 =Prk. adt, at=S. az. 8. en=Prk. anti =S. anti.

The imperative closely resembles the aorist or old present. The second person sing, is the bare verbal stem, and the second person plur. is identical with that of the aorist.

From the aorist the Hindistani and the Hindi form the simple future by the addition of ga (=Prk. gad, gado, =S. gatah, perf. part. of the root gam, "to go"), ¢.g., kahwi-ga, 'I will tell," &e. The termination gd (which is masc.) beeomes gi for the feminine, and ge for the plural, after the analogy of nouns of the first declension.

Of the tenses of the second elass little need be said. The parti- ciples (which like other voeables are derived from the Prakrit) are the imperfect and the perfect, or what are vulgarly termed the present and the past. An example of each will suffice to show the construction: wah boltd, "he says"; main bola, "I said"; wah boli, "she said"; we bole, "they said." Such is the construction in the case of neuter and intransitive verbs. But if the verb be active transitive, the tenses formed of the perfect passive

participle are passively constructed ; the place of the nominative is taken by the instrumental or case of the agent, and the participle inflects so as to agree with the object, if this be expressed, and appear in the form of the nominative ; but if the object is not expressed, or if when expressed it assumes the dative form, the participle is con- structed impersonally and appears in the masc. sing. form; 2g., matn-ne kahd, by me it was said," "I said"; ws-ne chitthi likhi, ""the letter was written by him," "he wrote the letter" ; ra@ja-ne sherni-ko mara, "the king killed the tigress" ; lit. "as regards the tigress, it was killed by the king." This construction, as we have already remarked, is commonly employed in the Sanskrit.

The tenses of the third elass are formed by adding to the par- ticiples already mentioned the various tenses of certain auxiliary verbs, as hond, ""to be"; jana, "togo"; and the fragmentary forms hiv' (with its remaining persons) and thd ; ¢.g., main jata hun, "1

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am going"; wah parhti hai, "she is reading"; wah baitha tha, "'he was seated," 'he was sitting"; we chale honge, "they will have started."

Of these auxiliaries honé (ho-=Prk. ho-, =S. bhi) and jand (ja = Prk. ja, = 8S. yd) need not detain us. Both verbs are in use in all their tenses in the modern languages, and the preceding remarks on the verbal forms and tenses apply equally to thein. Jané is that which is employed to form the passive voice, ¢.g., wah mara jaega, "he will be killed." It is also used for other purposes, sueh as intensifying a root to which it is attaehed, &c.

The auxiliaries han (with its other persons) and thé stand on a different footing. The former is derived from the present indicative of the root as, " to be," in the old languages :—

Singular. Plural,

1, hun=Prk. amhi=S. asi. 1, haiw=Prk. asma=S. smah.

2. hat=—Prk. ast =S. ast. 2. ho =Prk. attha=S. stha.

3. hai=Prk. atthi=S, astt. 3. hain=Prk. santi=S. santt.)

The latter is derived from the Prakrit thio, =Sanskrit sthitah, the perfeet participle of the root stha@, "to stand," Besides being used as auxiliaries, both are employed to express simple existence, as main han, "Tam," "itisl"; wah hat, 'he or it is" ; wah tha, "he was" ; wah thi, "she was." (ds Wh, JB),

HINDUSTANI LITERATURE.—Hindustani litera- ture falls into two great divisions, of which the first is comprehensively styled Hindi, the second Urdii. Both of these forms of speech are, in their application to literary pur- poses, at first intruders upon the ground already occupied by the learned languages, Sanskrit and Persian, At no time during modern Indian history has Sanskrit altogether ceased to be used for composition by the class who regard culture and literature as their special heritage, although during the last two centuries it has much fallen from its former estate ; and Persian has been still less neglected by learned Muhammadans and their Hindu imitators in India. But there is this difference between them that, whereas Hindi has been raised to the dignity of a literary language chiefly by impulses of revolt against the monopoly of the Brahmans, Urdii has been cultivated with good will by authors who have themselves highly valued and dexterously used the polished Persian. Both, however, represent the popular side of the natioual culture, and in the present day they are almost in sole possession of the field. The sub- ject niay be conveniently divided as follows :—

1. Early Hindi, of the period during which the language was being fashioned as a literary medium, represented by the old heroic poems of Rajpitana and the literature of the Bhagats or Vaishnava reformers, and extending from about 1200 to 1570 a.p.

2. Middle Hindi, representing the best age of Hindi poetry, and reaching from about 1570 to 1750 a.p.

3. The rise and development of literary Urdu, beginning about the end of the 16th century and reaching its height during the 18th.

4. The modern period, marked by the growth of a prose literature in both dialects, and dating from the beginning of the present century.

1. Early Hindi literature has as yet been very insuffi- ciently explored. Chand's Prithwirdj Rasau is the only specimen of the heroic ballads of which any portion has been published, other ancient metrical chronicles of the same character being known to us only from the use made of them by such writers as Colonel Tod in his Annals of Rajasthan, and Major Pogson in his History of the Boondelas. Chand was the bard of Prithwiraj, the last Hindu king of Dehli, whose life and death he has related. He was himself a native of Lahore, which had for nearly 200 years (since 1023) been under Musalman domination at the time when the poem may be supposed to have been written. His language exhibits a considerable proportion of Persian words, but little of the distinctive features of what is now Panjabi. His work is probably, with the

1 Beames (Comp. Gram., vol. iii. p. 171, e¢ seg.) thinks it difficult, if not impos- sible, to derive these modern forms from the old ones given above, and would postulate the existence of a present tense of the root as conjugated after the baa type, thus—(sing.) 1. asa@mi; 2. asast; 3. asati: (plur.) 1. asa@mah; 2. asatha; 3. asanti. The objection to this, however, is that no such forms have been found to exist.

exception of a fragment by Jaideo (the author of the Sanskrit Gitd-Govinda), preserved in the Adi-Granth, the oldest specimen of Hindi which we possess: but it is im- possible to suppose that he was the first to attempt poetical composition in that language. The metrical perfection of his verse alone shows that he must have had many prede- cessors ; and rude and rough though his utterance is, it abounds in poetic conventionalisms which must have been the common stock of many

singers of his class. The story is told in sixty-nine books, of which some are interludes and digressions, bnt most are occupied with the exploits of the hero and his warriors. Considering the early date of the poem, and the opportunities of knowing the truth which the author (if he was really Prithwiraj's bard) possessed, it is remarkable how much legend and fiction is mixed up with history in the chronicle. The repeated conflicts between the raja and Sultan Shihabuddin of Ghor, in which the latter always, except in the last great battle, comes off the worst, and is released on payment of a ransom, seem to be entirely unhistoric, our authorities knowing only one encounter (that of Tirauri near Thanesar, fought in 1191) in which the sultan was de- feated, and there even lie escaped uncaptured to Lahore, The Mughals (Book xv.) are brought on the stage more than thirty years before they actually set foot in India (1222), and are related to have been vanquished by the redoubtable Prithwiraj. These and other points make it questionable whether we have here, at least in its entirety, a genuine contemporary work; but we may concede, as indeed we are justified in doing by the language of the poem, that it is one of our earliest documents in Hindi.

It is very difficult for us now to form a just estimate of Chand's poem: the language, essentially transitional in character, abounds in strange forms which have long since died out of the vernacular speech ; few if any Hindus,

~~even the most learned, are able to interpret him; and his meaning must be sought by investigating the pro~~ cesses by which Sanskrit and Prakrit words have been trausfigured in their progress into Hindi. But upon the whole he may be said to exhibit both the merits and defects of ballad-chroniclers in general. There is much that is lively and spirited in his descriptions of fight or council ; and the characters of the Rajpit warriors who surround his hero are not unfrequently sketched in their own words with skill and animation. The sound, however, too often predominates over the sense, and we find abundantly exemplified in his poem the wearisome iteration, uninven- tive sameness of machinery, and tedious unfolding of familiar themes and images which distinguish nearly the whole of Indian narrative poetry. His value, for us at least, is linguistic rather than literary.

The other class of composition which is characteristic of the period of Old Hindi, the literature of the Bhagats, both possesses more intrinsic interest and has exercised a more important influence on subsequent literary endeavour, The heroic chronicles, with perhaps the single exception of a famous saga relating the history of Padmavati, wife of Ratan Sen Raja of Chitor, who in 1303 at the taking of that fortress by Sultan 'Ala- ud-din burnt herself and (so says the tale) 13,000 other women rather than fall into the hands of the conqueror, which has been several times handled by poets outside the pale of Rajpit traditions, and especially in a still highly esteemed work by Jaisi under Sher Shah (1540), had only a local currency, and contributed but little to the further- ance of literature outside the limits of Rajpitana. The Vaishnava reformers, on the other hand, exercised the most powerful influence both upon the national speech and upon the themes chosen for poetic treatment. Nearly the whole of subsequent Hindi literature is impressed with one or

other form of Vaishnava doctrine ; a very large proportion of the poets whose works are still current among the people were Vaishnava saints or bhagats ; and to their initiative is due the almost exclusive use asa poetic dialect of that form of archaic Hindi known as Braj-bhakha. Vaishnavism was essentially a reaction against Brahmanical influence and the chains of caste, a claim for the rights of humanity against the monopoly which the " twice-born" asserted of learning, of worship, of righteousness. As Siva was the peculiar deity of the Brahmans, so was Vishnu of the people; and while the literature of the Saivas and Saktas is almost entirely in Sanskrit, and exercised little or no influence on the popular mind, that of the Vaishnavas is mainly in Hindi, and in itself constitutes the great bulk of what has been written in that language.

The Vaishnava doctrine is commonly carried back to Ramanuja, whose appearance is placed by Wilson about the middle of the 12th century. He was a native of Southern India, and had few immediate followers in the north. In the latter region the new opinions were spread by Ramanand, whom the Bhaktamalé makes the fourth head of the sect, and other authorities the fifth ; both Wilson and Trumpp place him about 1400 of

our era, Nothing in Hindi by Ramanuja has come down to us; of Ramanand we have one short poem in the Granth (Introduction, p. cxxiv.). Between Ramanuja and Ramanand (though not in the line of teachers descending direct from the former) we may place. Jaideo (about 1250) and Namdeo (about 1300), of the first of whom we have a fragment in the Granth, and of the second six pieces have been similarly preserved. Jaideo was a Brahman, and well acquainted with Sanskrit ; but Namdeo (or Nama) was a chhipi or calico-printer, a very despised class, and was perhaps the first to proclaim among the followers of the new doctrine the essential unity of mankind as worshippers of Hari, Kabir comes next, and is incomparably the greatest, in the order of Vaishnava teachers. He was a weaver by caste, and in all probability originally a Musalmain. He is counted among the twelve disciples of Ramanand ; but he seems himself to trace his spiritual paternity rather to Jaideoand Nama.! He dwelt first at Benares and afterwards at Magahar, in the present district of Gorakhpur, during the reign of Sikandar Shah Lodi (1488-1517), and was probably dead before the end of the 15th century. Nanak, the first Guru of the Sikhs, whose Granth is little more than a paraphrase of Kabir's writings, was born in 1469 and died in 1538; and from the relation between the two it seems necessary to suppose that Kabir was several years the senior.

The works attributed to Kabir are very numerous ; they are preserved complete at the headquarters of the sect, the Kabir chauré at Benares, and many portions of them have been separately printed and lithographed in India, The best known are those entitled the Sakhis, Sabds, and Rekhtas, which have a wide popularity even among those who are not professed disciples of the saint, Several of the compositions enumerated under the name of Kabir are, however, not by him, but by his disciples : as the lesser Bijak, by Bhago-Das, the Sukh-Nidhan, by Srut-Gopal, &c. ; it was the custom (as also that of Kabir's religious heirs, the Sikh Gurus) for the successors in the guruship to speak in the name of him whose successors they were. The doctrine of Kabir 2

1 This may be eoneluded from a short poem in the Granth (p. 469), where Kabir says (verses 4, 5):—" Let each one seek this Mind, O brother: when the body falls away, where shall the Mind be absorbed? By the favour of

the Guru Jaideo and Nama through the love of Faith attained to knowledge of Him." (The Mind is the indwelling Rama, divine particula aure.)

? A tolerably full aceount will be found in H. H. Wilson's Essay on the Religious Sects of the Hindis (Works, vol. i. pp. 68 sqq.); Dr Trumpp's Essay on the Religion of the Sikhs (Granth, Introd., pp. xevii. sqg.) may also be consulted.

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was philosophically a form of pantheism, accounting for the existence of phenomena (the reality of which was denied) by the agency of a Mayd, or illusion, emanating from the Supreme. The varied lot of men in life, their differences of faith and aim, their desires, fears, hopes, loves, are all the work of this Maya, to know which, and to recognize beneath all the Supreme, is the only means of emancipation from the chains of illusion. Neither austerities, ritual, nor works of any kind are necessary to obtain the highest end ; this is only to be gained by bhakti, "faith," and perpetual meditation on the Supreme—His names, Hari, Ram, Govind, being ever on the lips and in the heart. The highest end is absorption in the Supreme, reunion with Him from whom all proceeded and who exists in all. Little place is left in this somewhat barren doctrine for a social code, since works are naught ; but negatively, at least, it is inoffensive, commanding respect for all forms of life, and quiet performance of duty without self-seeking or desire for gain.

Of the spiritual followers of Kabir many have left memorials in literature ; one of the most eminent of these was Dadi, founder of a sect very prevalent in Rajputana. A translation of two chapters from the Granth or scripture of this Bhagat will be found in a note to Wilson's Relzgious Sects of the Hindus, pp. 106-113, and will repay perusal. But those whose compositions, if not most excellent from a literary point of view, have at any rate wrought most in history, were the Gurus or spiritual heads of the Sikhs of the Panjab, The Adi Granth, or Book of the first five Gurus (from Nanak, who died in 1538, to Arjun, who died in 1601), is described by its translator as " perhaps the most shallow and empty book that exists, in pro- portion to its size;" and certainly the translation is not attractive

reading. But the doctrines, reiterated with the most 'painful diffuseness, are essentially those of Kabir, much of whose writings has been incorporated in the volume. The language is rather Old Hindi than Old Panjabi, and thus the work falls within the scope of this article ; though Panjabi words and idioms frequently occur, the grammar is Hindi; and the authors evidently aimed at propagating their tenets rather among the Hindi-speaking races of Hindostan proper than (as actually happened) among the Panjabi-speaking tribes of the West and South-West, The Granth consists of six parts: I., the Japji, the only portion as yet published in Europe in the original Hindi ; IL, III., and IV., arrangements for devotional purposes of extracts from Part V., the Rags or body of the Granth ; of these Rdgs there are thirty-one, but only four, Si7 Rag, Majh, Gauri, and Asda, have been rendered by Trumpp ; the remaining twenty-seven are described as "a second gathering or gleaning, as materials offered themselves, no attention being paid to the contents, but only to the bulky size of the Granth;" VI., the Bhog or conclusion, containing verses by various authors, among them Kabir and Shekh Farid of Pakpattan, a famous Indian Suft, and panegyri¢s of the five Gurus by fifteen bhatts or bards. At the end of each Rag is a collection of sayings of the Bhagats, chiefly of Kabir, in confirmation of the doctrines set forth by the Gurus; and it is in these additions that the literary im- portance of the work, as a treasure of specimens of early Hindi, mainly consists.

Another of the following of Ramanand, though consider- ably later in time than Kabir, was Sir-Das. Of his life little is known: as some of his verses are included in the Granth, he must have lived before its redaction (about 1600); if he be the same as a saint of that name mentioned in the Bhaktamdld, as is probable, he was a Brahman, amin or revenue collector of the parganah of Sandila in Oudh during the reign of Akbar, who is related to have appro- priated the collections of his district for the service of the

temple of Madan-Mohan at Brindaban, sending to the treasury instead chests filled with stones, When his delin- quency was discovered, he was pardoned by Akbar, but thenceforth abandoned the world, and, becoming

blind, led a wandering life as a singer of the praises of Vishnu. His stanzas, generally of four lines (padas), are said to number no less than 125,000; they are collected in a huge volume entitled the Sdr-Sdgar, and are extremely popular.

While the sects of which Ramanand may be considered the spiritual father adore the Deity chiefly under the names of Rama, Hart, Govind, and dwell but little on the avatars or human incarnations of the Hindu god whom they have selected as the type of the Supreme, there is another division of the Vaishnavas which is not less important in Hindi authorship, and counts its adherents by millions, whose worship is of a different character. The sects belonging to this division take Krishna as their favourite type of the godhead, and, accepting the whole mass of legends (most of them probably of comparatively late origin) relating to this incarnation, inspire themselves with fervour by the contemplation chiefly of Krishna's childhood and his youth in the society of the herd-maidens of Braj. As the doctrine and object of worship are, so also is the mode of life. The Ramanandis are for the most part men of ascetic and un- worldly life, not indeed given to self-torture or needless rigour, but caring nothing for the wealth of the world, and living quietly and soberly in the possession of what they deem the truth. The worshippers of Krishna and his mistress Radha, or of the infant Bal-Gopal, on the other hand, are no ascetics, but persons of luxurious and often opulent lives; among women especially this form of devo- tion is widespread. The chief sect of this denomination is the Vallabhaéchaéris, or the following of the Gokulastha Gosdiis. Their founder was one Vallabha Swami, a Brahman from the sonth, who settled at Gokul near Mathura, probably about the beginning of the 16th century. The best known works of this sect are the Braj-bilds, a description of Krishna's sports with the maidens of Brin-daban, by Brajbasi-Das, and the Vdrtid, a collection of legends regarding eighty-four teachers of the following, resembling the Bhaktamala, which deals chiefly with the other division of Vaishnavas. The popularity of the Brdj- bildés is immense, and it is to be found in a lithographed form for sale inevery bazaar. Its contents (as indeed many other productions of the worshippers of Krishna) have been condemned by Europeans as indecent; but although con- taining much that seems at least outwardly licentious and prurient, it is a work the study of which is indispensable to one who

would understand the religious temper of the Hindus, The mystic dwelling on the amours of Krishna and the Gopis of Braj has been often compared to the mystical interpretation of the Song of Solomon; and in most religions we shall perhaps find at least one phase in which the sensual is curiously mingled with the spiritual, and faith and love towards the heavenly stimulated by thoughts and phrases drawn from earthly scenes of passion. Of the Vartta we shall speak under the next division of our subject.

2, Middle Hindi reaches from about 1570 to 1750. To this age belong the best poets of Hindi literature, Kesav- Das, Bihari-Lal, and Tulsi-Das, whose writings are no less remarkable for skill and subtlety of language than for perfection of metrical form. The labours of their prede- cessors had wrought the language of western Hindustan into a medium worthy of being put to the highest poetic use ; and we accordingly find in the poets of this period large borrowings from Braj, even where (as with Tulsi-Das) that idiom is not the dialect of their own region. From their day onward Braj-bhakha has been esteemed (in the words of Lalla-Lal) "the standard language of sentiment

(maharasa-mil), and equal to the speech of the gods" (i.e., Sanskrit).

Kesav-Das was a Brahman who lived under Jahangir and Shahjahan. He was the author of a poem on Rama, entitled: the Ramachandrika, written in 1602; the Kavi- priya, written in the same year, a treatise on the poetic art of much celebrity ; the Masik-priya, on rhetoric, written in 1592; the Bhakta-lilamrita, an exposition of the doctrine of Ramanandi Vaishnavism; and several other works. Kesay-Das's compositions are widely popular, and have been frequently lithographed in Northern India.

Bihari-Lal is renowned as the author of the Sat-saz, a collection of 700 distichs, which is perhaps the most cele- brated work of Hindi poetic art, as distinguished from narrative and simpler styles. They are inspired by the Krishna side of Vishnu-worship, and take the form of amorous dialogues between Radha and the other Gopis and their lover. The author was a native of Goaliyar, and lived at Amber during the early part of the

17th century. Editions of this work, one of the most difficult in Hindi and abounding in subtle conceits, are very numerous. It has been commented on by a crowd of scholars, among them, strange to say, more than one Musalman,—a sufficient proof of the value set by natives of India, irrespective of their creed, on its perfection of language. It has even been translated into Sanskrit.

Tulsi-Das, though perhaps inferior in poetic skill to the two last mentioned, is undoubtedly the most popular Hindi poet. His Ramayan (originally named by the author Ram- charit-mdnas, or "the Lake of Rama's deeds") is perhaps better known among Hindus in Upper India than the Bible among the rustic population of England. He was a Kanauji Brahman, and probably (from his language) a native of Oudh. The greater part of his life he spent at Benares; he died in 1624. His Ramayan was commenced at Ayodhya in 1573. Besides this great work, he is the author of six other poems, all bearing more or less on the history and worship of Rama, called the Ram-gitavali, the Dohdvali, the Kabit-sambandh, the Binay-patrika, the Pad- Ramayan, and the Chhanddvalt. Seven other minor works are attributed to him, but their authenticity is doubtful.

Tulsi's Kaémdyan is a rehandling of the great theme of Valmiki, but in no sense a translation of the Sanskrit poem ; real translations are scarcely to be found in original Hindi literature, the vernacular authors permitting themselves great liberty of excision, adaptation, and addition, It consists of seven books, of which the first two, called the Bal-kdnd and Ayodhyd-kind, make up more than half the work, and relates the birth and boyhood of Rama and his brethren, his marriage with Sita, their dwelling together in the forest, her abduction by Ravan, the expedition to Lanka and the overthrow of the ravisher, and the life at Ayodhya after the return of the reunited pair. It is written chiefly in dohds, sorathas, and chaupdis, with here and there a chhand interspersed ; the style is very even and well sustained, and the language, while fundamentally the Old Parbi of eastern Hindustan, borrows largely from Braj. The most admired portion of the work is the second book, Ayodhya, which tells of the mischief wrought by Kaikeyi, one of the queens of Dasarath, Rama's father, who had bound himself by a vow to grant her what boon she should ask, and

whom by this bond she compelled to command Rama and Sita to go into exile in the great forest south of the Jumna, and to give the throne to her own son Bharat. In this trouble Dasarath dies, and his son obediently goes forth with his wife and his brother Lachhman tothe southern wilderness. The sorrow of Dasarath, the sweet filial piety and perfect manhood of the divine Rama, the valour and prompt affection of Lachhman, the sincerity and humility of Bharat, the purity and wifely obedience of Sita, are

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themes which a Hindu reader is never tired of dwelling upon in Tulsi's pages. And unlike though the treatment be to our own standards of taste, overgrown with theological digressions and explanations, and stocked with conventional images and stereotyped phrases as the poem is, even a European may find in it something of literary achievement which appeals to him, however distantly, as the work of a master of the heart. The first two books of the Ramayan have been admirably rendered into English prose by Mr F, 8. Growse (Allahabad, 1877-78).

Tulsi, though essentially a Hindu and a Brahman in religious feeling, yet belongs to the class of Vaishnavas who count among them Ramanand and Kabir. He has little or nothing of the sensual passion of the devotees of Krishna and Radha; and in the commentary on the Bhakiamala it is related that, when in his old age he paid a visit to Brindaban, the centre of the Krishna-cult, he refused to render homage to any other form of the god than Rama. According to the legend, he was beguiled into a temple of Krishna, and bidden there to worship Rama; he answered that he would only bow his head before one who should bear in his hand the bow and arrows of the king of Ayodhya; hearing his speech, the image of the god, standing till then as Krishna with the flute (Bansidhar), suddenly changed to the similitude of Rama with the bow.

The Bhaktamdila, or '" Roll of the Bhagats," is a celebrated work of this period, and is ascribed to Nabhaji, a Vaishnava of the despised caste called Doms or Domrds, who lived during the reign of Jahangir, and was a contemporary of Tulsi-Das. The Bhaktamdala, in the form in which it is commonly met with, consists of a mdi, or original text, ascribed to

Nabhaji, and a kd, or commentary, of which there are two, due respectively to Krishna-Das and Priya- Das, both stated to have been written in 1713, in verse, and many more in prose. The mal is a short stanza (chhappat) for each saint, the first line of which is repeated again at the end, stating, in the briefest and most obscure language, his characteristics. The original work of Nabhaji was amplified and added to by Narayan-Das, who lived during the reign of Shahjahan. Mr Growse justly says of it:—"The style (of the mil) might be described as of unparalleled obscurity, were it not that each separate portion of the text is followed by a ékd, or gloss, in which confusion is still worse confounded by a series of the most disjointed and inexplicit allusions to different legendary events in the saint's life." A considerable portion of the Bhaktamalé was printed in 1817 in Major Price's Hindi and Hindustani Selections, and it has been largely drawn upon by Wilson in his account of the religious sects of the Hindus. The saints treated in it are chiefly of the class of Vaishnavas addicted to the worship of Kama; and the anecdotes of them contained in the work are generally insipid and extravagant in the extreme. "Such as it is, however, it exercises a powerful influence in Upper India on popular belief, and holds a similar place in the supersti- tions of this country to that which was occupied, in the darkest ages of the Roman Catholic faith, by the Golden Legend and Acts of the Saints" (Wilson).

The other side of Vaishnavism, that devoted to the cult of the infant or youthful Krishna, with or without his mistress Radha, is represented by a work similar in character to the Bhaktamdld, called the Vartta, or Chaurast Vartta, already mentioned. Specimens of its contents will be found in Wilson's Religious Sects of the Hindus, p. 132. Its legends are of the most trivial and childish description ; but, with the tenth chapter of the Bhdgavata Purana, rendered into Braj-bhakha by Chaturbhuj Misr, and into modern Hindi in 1804-10 by Lalla Lal, they are neverthe- less the inspirers of the greater part of the popular worship throughout the whole of Northern India. The universality

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of the cult of the infant Krishua may be judged by the enormous number of Hindu proper names which end in Lai, meaning "child," all of which embody some reference to this deity in his youthful form. In Bengal especially the sect is extremely numerous, having there arisen out of the teaching of Chaitanya, who is said to have married a daughter of Vallabhacharya, and is believed by his followers to have been himself au incarnation of Krishna.

Such, in the briefest outline, is the character of Hindi literature during the period when it grew and flourished through its own original forces. Founded by a popular impulse in many respects similar to that which gave rise to Buddhism nearly 2000 years before, and cultivated chiefly (though by no means exclusively) by authors not belonging to the Brahmanical order, it was the legitimate descendant in spirit, as Hindi is the legitimate descendant in speech, of the Prakrit literature which preceded it. Entirely in verse, it adopted and elaborated the Prakrit metrical forms, and carried them to a pitch of perfection which is too often overlooked by those who concern themselves rather with the substance than with the form of the works they study. The language of these compositions strikes us often as rude, abrupt, and ambiguous ; undoubtedly in its earlier speci- meus it is wanting in clearness and definiteness of gram- matical form; but the shackles of metre are frequently the explanation of uncouth forms of speech, and the necessity of filling out a metrical scheme led in too many cases to irregularities and amplifications which had perhaps no representatives in the uncompelled utterances of the verna- cular tongue. Interesting when regarded in the mass, its attractions in detail are few. As in all Oriental literature, repetition and shallowness of idea overcome it, and render an extensive course of reading intolerable to a European. Conventional images, platitudes exhausted to the utmost degree of tenuity, barren philosophical and theological themes which in their wideness entirely overlook the study of detail,—such are, with few exceptions, its leading features ; and one who has read two or three books has in truth made himself master of the whole secret of original Hindi literature.

3. The origines of Urdii as a literary language are extremely obscure. The popular account refers its rise to the time of Timitr (1398). Some authors

even claim for it a higher antiquity, asserting that a diwan, or collection of poems, was composed in Rekhtah by Mas‘tid, son of Sad, in the last half of the 11th and beginning of the 12th century, and that Sa‘di of Shiraz and his friend Amir Khusrau of Dehli likewise made verses in that dialect before the end of the 13th century. This, however, is very questionable; and the better opinion appears to be that these ancient compositions, if they existed at all, were written in Hindi according to the metrical forms of that language, rather than in what is properly called Urdi. That Muhammadans composed in Hindi, and used that language as their vernacular, is certain ; and in many passages of Kabir, which are never- theless pure Hindi compositions, Persian words are used almost as freely as in the modern dialect. Much of the confusion which besets the subject is due to the want of a clear definition of what Urdi, as opposed to Hindi, really is.

Urdi, as a literary language, differs from Hindi rather in its form than in its substance. The really vital point of difference, that in which Hindi and Urdii are incommensur- able, is the prosody. Hardly one of the metres taken over by Urdi poets from Persian agrees with those used in Hindi; in the latter language, it is the rule to give the short a inherent in every consonant or group of consonants its full value in scansion, except occasionally at the metrical pause: in Urdi this is never done, the only somewhat analogous rule providing for the enunciation of a short a

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(the n%m-fathah) after a nexus of consonants which would otherwise be pronounced without it ; the great majority of Hindi metres are counted by the number of syllabic instants or mdtrds (the value in time of a short syllable): in Urdi the metres follow a special order of longs and shorts.

. The question, then, is not—When did Persian first become intermixed with Hindi in the literary speech ’—for this process began with the first entry of Muslim conquerors into India, and continued for centuries before a line of Urdii was coniposed ;—nor, When was the Persian character first employed to write Hindi ?—for the written form is but a subordinate matter. We must ask—When was the first verse composed in Hindi, whether with or without foreign admixture, according to the forms

of Persian prosody and not in those of the indigenous metrical system? Then, and not till then, did Urdii come into being. If, then, it is really the case that poems were so composed as early as the 11th or the 13th century, the origin of Urdi literature must be carried back to that period. But Hindi itself was at that date, and for many decades later (as we see from Chand and our other earliest specimens of the language), in an unsettled and transition stage. Neither in its case- inflexions nor in its verbal forms did it resemble the language which we know as Urdi. It abounded in short vowels and hiatuses, which could not accommodate them- selves either to the Persian character (without the free use of vowel-signs and hamzah, which were seldom employed) or to Persian prosody; and its syntactical order was loose and unsettled. Urdi, as we know it, is the Hindi of the end of the 16th century enriched from Persian, not the Hindi of Chand and the early Bhagats.

The whole of Urdii poetry follows Persian models of composition ; its themes are those which had already been worked (some might say, worked out) by writers in that language ; and neither in form nor substance do we find the faintest flavour of originality from its commencement to the present day.

The paucity of themes and want of originality in Urdii verse has led toa most elaborate development of the system of rhetoric. Where the substance of what a poet has to say is identical with that which has been said by hundreds, nay thousands, of poets before him, it is of the highest importance that the way of saying it shall if possible be peculiar to himself. Rhetoric, accordingly, rather than poetic feeling, is the distinguishing feature of composition in Urdi. Pleasing hyperbole, ingenious comparison, antithesis, alli- teration, carefully arranged gradation of uoun and epithet, are the means employed to obtain variety ; and few of the most eloquent passages of Urdii verse admit of translation into any other language without losing that which in the original makes their whole charm. Even in the masnavis, or narrative poems, the story is usually quite a subordinate matter ; it has in most cases been handled time after time, and is familiar to the reader in its minutest detail. Even when the names chosen for the actors are new, the intrigue is old, and the mode in which it is unfolded is the only thing which distinguishes one

poem from another. Thi descriptions thus, confined within a narrow circle of incident and epithet, repeat each other with a monotony which to a European is inexpressibly fatiguing, but which in the East is deemed rather a merit than a defect. Differences of school, which are made much of by native critics, are to us hardly perceptible; they consist in the use of one or other range of metaphor and comparison, classed, according as they repeat the well-worn poetical stock- in-trade of the Persians or seek a slightly fresher and more Indian field of sentiment, as the old or the new style of composition.

These being the nature and features of Urdi poetry, it will be manifest that such an account of it as can

be given here must be little more than a list of names

and dates.!

The earliest Urdu authors lived and wrote in the Dakkhan, at the courts and under the patronage of the Muhammadan dynasties of Golkonda and Bijapur, shortly before these dynasties were over- thrown by the campaigns of Aurangzeb in the south. Shuja'uddin Nii, a native of Gujarat, a friend of Faizi and contemporary gf Akbar, is mentioned by the native biographers as the most ancient Urdi poet after Amir Khusrau. He was tutor of the son of the wazir of Sultén Abu-l-Hasan Qutb Shah of Golkonda, and several ghazals by him are said to survive. Quli Qutb Shah of Golkonda, who reigned from 1581 to 1586, and his successor 'Abdullah Qutb Shah, who came to the throne in 1611, have both left collections of verse, including ghazals, rubd'is, masnavis and gasidahs. And dur- ing the reign of the latter Ibn Nishati wrote two works which are still famous as models of composition in Dakhni ; they are masnavis entitled the Zati-ndémah, or " Tales of a Parrot," and the Phal-ban. The first, written in 1639, is an adaptation of a Persian work by Nakhshabi, but derives ultimately from a Sanskrit original entitled the Suka-sauptati ; this collection has been frequently rehandled in Urdi, both in verse and prose, and is the original of the Tota- Kahani, one of the first works in Urdi prose, composed in 1801 by Muhammad Haidar-bakhsh Haidari of

the Fort William College. The Phil-ban is a love tale named from its heroine, said to be trans- lated from a Persian work entitled the Basdiin. Anothcr famous work which probably belongs to the same place and time is the Story of Kamrip and Kala by Tahsinuddin, a masnavi which has been published (1836) by M. Garcin de Tassy; what makes this poem remarkable is that, though the work of a Musalman, its personages are Hindu. Kamrip, the hero, is son of the king of Oudh, and the heroine, Kala, daughter of the king of Ceylon; the incidents somewhat resemble those of the tale of es-Sindibad in the Thousand and One Nights ; the hero and heroine dream one of the other, and the former sets forth to find his beloved ; his wanderings take him to many strange countries and through many wonderful adventures, ending in a happy marriage.

The court of Bijapur was no less distinguished in literature. Ibrahim 'Adil Shah (1579-1626) was the author of a work in verse on music entitled the Nau-ras or;" Nine Savours," which, however, appears to have been in [indi rather than Urdii; the three pre- faces (dibajahs) to this poem were rendered into Persian prose by Maula Zuhiri, and, under the name of the Sth nasr-i Zuhtri,_are well-known models of style. A successor of this priuce, 'Ali 'Adil Shah, had as his court poet a Brahman known poetically as Nus- rati, who in 1657 composed a masnavi of some repute entitled the Gulshan-t 'Ishq, or ' Rose-garden of Love," a romance relating the history of Prince Manohar and Madmalati,—like the Kamrap, an Indian theme. The same poet is author of an extremely long mas- navi entitled the' Ali-namah, celebrating the monarch under whom he lived.*

These early authors, however, were but pioneers and feelers of the way ; the first generally accepted standard of form, a standard which has suffered little change in two centuries, was established by Wali of Aurangabad (about 1680-1720) and his contemporary and fellow-townsman Siraj. The former of these is commonly called " the Father of Rekhtah"—Baba-e Rekhtah; and all accounts agrce that the immense development attained by Urdi poetry in Northern India during the 18th century' was due to his example and initiative. Very little is known of Wali's life ; he is believed to have visited Dehli towards the end of the reign of Aurangzeb, and is said to have there received instruction from

Shah Gulshan in the art of clothing in a vernacular dress the ideas of the Persian poets. His Kulliyat or complete works have been published by M. Garcin de Tassy, with notes and a translation of selected passages (Paris, 1834-36), and may be commended to readers desirous of con- sulting in the original a favourable specimen of Urdii poetical com- position.

The first of the Dehli school of poets was Zuhiruddin Hiatim, who was born in 1699 and died in 1792. In the second year of Muhammad Shah (1719), the dtwan of Walireached Dehli, and ex- cited the emulation of scholars there. Hatim was the first to imitate it in the Urdi of the north, and was followed by his friends Naji, Mazmiin, and Abrii. Two diwans by him survive. He became the founder of a school, and one of his pupils was Rafi'us-Sauda, the most distinguished poet of Northern India. Khan Arzi (1689-1756) was another of the fathers of Urdt poetry in the north. This author is chiefly renowned as a Persian scholar, in which language he not only composed much poetry, but one of the best of Persian lexicons, the Sirdju-l-lughat; but his compositions in Urdi are also highly esteemed. He was the master of Mir Taqi, who

1 The late M. Garcin de Tassy's Histoire dela Littérature Hindouie et Hindoustanie, and his annual summaries of the progress made from 1850 to 1877, afford all the materials which can be desired on this subject by one who does not care to refer to the original vernacular works ; the peculiarities of the latter can be learned only from long- continued study and familiarity with Oriental modes of thought.

ranks next to Sauda as the most eminent Urdii poet. Arzii died at Lakhnau (Lucknow), whither he betook himself after the devasta- tion of Dehli by Nadir Shah (1739). Another of the early Dehli pocts who is considered to have surpassed his fellows was In'amullah Khan Yaqin, who died during the reign of Ahmad Shah (1748-54), aged only twenty-five. Another was Mir Dard, pupil of the same Shah Gulshau who is said to have instructed Wali; his diwan is not long, but extremely popular, and especially esteemed for the skill with which it develops the themes of spiritualism. In his old age he became a darwesh of the Nagshbandi following, and died in

1793.

Sanda and Mir Tagi are beyond question the most distinguished Urdt poets. The former was born at Dehli about the beginning of the 18th century, and studied under Hitim. He left Dehli after its devastation, and settled at Lakhnau, where the Nawab Asafud- daulah gave him a jagir of Rs. 6000 a year, and where he died in 1780. His poems are very numerous, and cover all the styles of Urdu poetry ; but it is to his satires that his fame is chiefly due, and in these he is considered to have surpassed all other Indian poets. Mir Tagi was born at Agra, but early removed to Debli, where he studied under Arzi ; he was still living there at the time of Sauda's death, but in 1782 repaired to Lakhnau, where he like- wise received a pension ; he died at a very advanced age in 1810. His works are very voluminous, including no less than six diwans. Mir is counted the superior of Sauda in the ghazal and masnavi, while the latter excelled him in the satire and gasidah. Sayyid Ahmad, an excllent contemporary authority, and himself one of the best of modern authors in Urdi, says of him in his Asdru-s- Sanadid :—" Mir's language is so pure, and the expressions which he employs so suitable and natural, that to this day all are unani- mous in his praise. Although the language of Sauda is also excellent, and he is superior to Mir in the point of his allusions, he is nevertheless inferior to him in style."

The trernendous misfortunes which befell Dchli at the hands of Nadir Shah (1739), Ahmad Shah Durrani (1756), and the Marathis (1759), and the rapid decay of the Mughal empire undertheserpeated shocks, transferred the ecntre of the cultivation of literature from that city to Lakhnau, the capital of the newly founded and _ flourishing state of Oudh. It has been mentioned how Arzii, Sauda, and Mir betook themselves to this refuge and ended their daysthere; they were followed in their new resideuce by a school of poets hardly inferior to those who had made Dehliillustrious in the first half of the century. Here they were joined by Mir Hasan (died 1786), Mir Soz (died 1800), and Qalandar-bakhsh Jur'at (died 1810), also like themselves refugecs from Dehli, and illustrious poets. Mir Hasan was a friend and collaborator of Mir Dard, and first established himself at Faizaibad and subsequently at Lakhnau ; he excelled in the ghazai, ruba it, masnavi, and marsiyah, and is counted

the third, with Sauda and Mir Taqi, among the most eminent of Urdi poets. His fame chiefly rests upon a much admired masnavi entitled the Sihru-I- bayan, or " Magic of Eloquence," a romance relating the loves of Prince Be-nazir and the Princess Badr-i Munir ; his masnavi called the Gulzar-i Tram (" Rose-garden of Iram," the legendary 'Adite paradise in Southern Arabia), in praise of Faizibad, is likewise highly esteemed. Mir Muhammadi Soz was an elegant poet, remarkable for the snecess with which he composed in the dialect of the harem called Rekhti, but somewhat licentious in his verse ; he becanie a darwesh and renounced the world in his later years. Jur'at was also a prolific poet, but, like Soz, his ghazals and masnavis are licentious and full of double meanings. He imitated Sauda in satire with much suceess ; he also cultivated Hindi poetry, and composed dohras and kabitts. Miskin was another Lakhnau poet of the samme period, whose marsiyahs are especially admired ; one of them, that on the death of Muslim and his two sons, is con- sidered a masterpiece of this style of composition. 'The school of Laklnau, so founded and maintained during the early years of the century, continued to flourish till the dethronement of the last king, Wajid 'Ali, in 1856. Atash and Nasikh (who died respectively in 1847 and 1841) are the best among the modern poets of the school in the ghazal ; Mir Anis, a grandson of Mir Hasan, and his contem- porary Dabir, the former of whom died in December 1875 and the latter a few months later, excelled in the marsiyah, Rajab Ali Beg Surtr, who died in 1869, was the author of a much-adniired romance in rhyming prose entitled the Fasdénah-e'Ajaib or "Tale of Mar- vels," besides a diwan. The dethroned prince Wajid 'Ali himself, poetically styled Akhtar, is no mean poet ; he has published three diwans, among them a quantity of pocty in the rustic dialect of. Oudh which is philologically of much interest.

Though Dehli was thus deserted by its brightest lights of litera- ture, it did not altogether cease to cultivate the poetic art. Among the last Mughals several princes were themselves creditable poets. Shah 'Alam 1]. (1761-1806) wrote under the name of Aftab, and was the author of a romance entitled Manzum-i Agqdas, besides a diwan. His son Sulaiman-shikoh, brother of Akbar Shah IL., who had at first, like his brother authors, repaired to Lakhnau, re- turned to Dehli in 1815, and died in 1838 ; he

also has left a diwan. Lastly, his nephew Bahadur Shah II., the last titular emperor of

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Dehli (died 1862), wrote under the name of Zafar, and was a pupil in poetry of Shaikh Ibrahim. Zauq, a distinguished writer ; he has left a voluminous diwan, which has been printed at Dehli. Mashafi (Ghulam-i Hamdani), who died about 1814, was one of the most distinguished of the revived poetic school of Dehli, and was himself one of its founders. Originally of Lakhnau, he left that city for Dehli in 1777, and held conferences of poets, at which several authors who afterwards acquired repute formed their style ; he has left five diwdns, a Tazkirah or biography of Urdi poets, and a Shah-namah or account of the kings of Dehli down to Shah 'Alam. Qaim (Qiyamuddin 'Ali) was onc of his society, and died in 1792 ; he has left several works of merit. Ghalib, otherwise Mirza Asadullah Khan Naushah, laureate of the last Mughal, who died in 1869, is undoubtedly the most eminent of the modern Dehli poets. He wrote chiefly in Persian, of which language, especially in the form cultivated by Firdausi, free from intermixture of Arabic words, he was a master; but his Urdii diwan, though short, is excellent in its way, and his reputation was spread far and wide. To this school, though he lived and died at Agra, may be attached Mir Wali Muhammad Nazir (recently dead in 1832); his masnavis entitled Jogi-némah, Kauri-naémah, Banjare-ndmah, and Burhape- namah, as well as his diwan, have heen frequently reprinted, and are extremely popular. His language is less artificial than that of the generality of Urdii poets, and some of his poems have been printed in Nagari, and are as well known and as much esteemed by Hindus as by Muhammadans.

4, While such, in outline, is the history of the poetic schools of the Dakkhan, Dehli, and Lakhnau, a fourth, that of the Fort William College at Calcutta, was being formed, and was destined to give no less an impulse to the cultiva- tion of Urdii prose than had a hundred years before been given to that of poetry by Wali. At the commencement of the present century Dr John Gilchrist was the head of this institution, and his efforts were directed towards getting together a body of literature suitable

as text-books for the study of the Urdi language by the European officers of the administration. To his exertions we owe the elaboration of the vernacular as an official speech, and the possibility of substituting it for the previously current Persian as the language of the courts and the government. He gathered together at Calcutta the most eminent vernacular scholars of the time, and their works, due to his initiative, are still unsurpassed as specimens of elegant and serviceable prose composition, not only in Urdi, but also in Hindi. The chief authors of this school are Haidari (Sayyid Muhammad Haidar-bakhsh), Husaini (Mir Bahadur 'Ali), Mir Amman Lutf, Hafizuddin Ahmad, Sher "Ali Afsos, Nihal Chand of Lahore, Kazim 'Ali Jawan, Lalli Lal Kavi, Mazhar 'Ali Wila, and Ikram 'Ali.

Haidari died in 1828. He composed the Z'ota-Kahani (1801), a prose redaction of the Tiuti-namah which has been already men- tioned ; a romance named Ardish-t Mahfil ('Ornament of the Assembly"), detailing the adventures of the famous Arab chief Hatim-i Tai; the Gul-i Maghfirat or Dah Majlis, an account of the holy persons of the Muhammadan faith ; the Gulzar-i Danish, a translation of the Bahar-i Danish, a Persian work containing stories descriptive of the craft and faithlessness of women ; and the Tarikh-i Nadiri, a translation of a Persian history of Nadir Shah. Husaini is the author of an imitation in prose of Mir Hasan's Sthru-l-bayan, under the name of Nasr-t Benazir ('the Incom- parable Prose," or "the Prose of Benazir," the latter being the name of tlie hero), and of a work named Akhlagq-i Hindi, or 'Indian Morals," both composed in 1802. The Akhlaq-i Hindi is an adaptation of a Persian work called the Mufarrihu-l-qulab ('the Delighter of Hearts"), itself a version of the HitopadeSa. Mir Amman was a native of Dehli, which he left in the time of Ahmad Shah Durrani for Patna, and in 1801 repaired to Calcutta. To him we owe the Bagh o Bahar (1801-2), an adaptation of Amir Khus- rau's famous Persian romance entitled the Chahar Darwesh, or 'Story of the Four Dervishes." Amman's work is not itself directly modelled on the Persian, but is a rehandling of an almost contemporary rendering by Tahsin of Etawa, called the Naw-tarz-t Murassa. The style of this composition is much admired by natives of India, and editions of it are very numerous. Amman also composed an imitation of Husain Waiz Kashifi's Akhlaq-i Muhsini under the name of the Ganj-i Khubi ("

Treasure of Virtue”), produced in 1802. Hafizuddin Ahmad was a professor at the Fort William College; in 1803 he completed a translation of Abu-l- Fazl’s ‘Jyar-t Danish, under the name of the Khirad-afroz (‘ En- lightener of the Understanding”). The ‘Iyar-i Danish (“ Touch- stone of Wisdom”) is one of the numerous imitations of the

originally Sanskrit collection of apologues known in Persian as the Fables of Bidpai, or Kalilah and Damnah. Afsos was one of the most illustrious of the Fort William school; originally of Dehli, he left that city at the age of eleven, and entered the service of Qasim ‘Ali Khan, Nawab of Bengal; he afterwards repaired to Haidarabad in the Dakhhan, and thence to Lakhnau, where he was the pupil of Mir Hasan, Mir Soz, and Mir Haidar ‘Ali Hairan. He joined the Fort William College in 1800, and died in 1809. He is the author of a much esteemed diwan; but his chief reputation is founded on two prose works of great excellence, the Ardish-t AMahfil (1805), an account of India adapted from the introduction of the Persian Khuldasatu-t-tawarikh of Sujin Rae, and the Bagh-i Urdu (1808), a translation of Sa‘di’s Gulistan. Nihal Chand trans- lated into Urdii a masnavi, entitled the Gul-i Bakawali, under the name of Mazhab-t ‘Ishq (“ Religion of Love’” ;: this work is in prose intermingled with verse, was composed in 1804, and has been frequently reproduced. Jawan, like most of his collaborators, was originally of Dehli and afterwards of Lakhnau; he joined the College in 1800. He is the author of a version in Urdii of the well- known story of Sakuntala, under the name of Sakuntala Natak ; the Urdii was rendered from a previous Braj-bhakha version by Nawaz Kabishwar made in 1716, and was printed in 1802. He also composed a Barah-masé, or poetical description of the twelve months (a very popular and often-handled form of composition), with accounts of the various Hindu and Muhainmadan festivals, entitled the Dastir-i Hind (“ Usages of India”), printed in 1812. {krim ‘Ali translated, under the name of the Jkhwéanu-s-safa, or “Brothers of Purity” (1810), a chapter of a famous Arabian collection of treatises on science and philosophy entitled Rasailu Ikhwani-s-safa, and composed in the 10th century. The complete collection, due to different writers who dwelt at Basrah, has recently been made known to European readers by the translation of Dr F. Dieterici

(1858-1879) ; the chapter selected by Ikram 'Ali is the third, which records an allegorical strife for the mastery between men and animals before the king of the Jinn. The trans- lation is written in excellent Urdti, and is one of the best of the Fort William productions.

Sri Lalli Lal was a Brahman, whose family, originally of Guja- rat, had long been settled in Northern India. What was done by the other Fort William authors for Urdii prose was done by Lallti Lal almost alone for Hindi. His Prem Sagar and Rajniti, the former a version in pure Hindi of the 10th chapter of the Bhagavata Purana, detailing the history of Krishna, and founded on a pre- vious Braj-bhakha version by Chaturbhuj Misr, and the latter an adaptation in Braj-bhakha prose of the Hitoparlesa and part of the Pancha-tantra, are unquestionably the most important works in Hindi prose.. The Prem Sagar was begun in 1804 and ended in 1810; it enjoys immense oe aa in Northern India, has been frequently reproduced in a lithographed form, and has several times been printed. Yhe Laniti was composed in 1809; it is much admired for its sententious brevity and the purity of its language. Besides these two works, Lalli Lal was the author of a collection of a hundred anecdotes in Hindi and Urdi entitled Lafaif-i Hindi, an anthology of Hindi verse called the Sabha-bilds, a Sat-sai in the style of Bihari-Lal called Sapta-Satika, and several other works. He and Jawan worked together at the Singhdsan Battisi (1801), a redaction in mixed Urdu and Hindi (Devanagari character) of a famous collection of legends relating the prowess of King Vikra- maditya; and he also aided the latter author in the production of the Sakuntala Natak. Mazhar 'Ali Wild was his collaborator in the Battal Pachisi, a collection of stories similar in many respects to the Singhasan Battisti, and also in mixed Urdi-Hindi; and he aided Wila in the preparation in Urdi of the Story of Madhinal, a romance originally composed in Braj-bhakha by Moti Ram.

The works of these authors, though compiled and published under the superintendence of Dr Gilchrist, Captain Abraham Lockett, Professor J. W. Taylor, Dr W. Hunter, and other Euro- pean officers of the College, are essentially Indian in taste and style, and owe to this character a popularity and wide reputation which have been gained by no other work (and there have been many) undertaken under British initiative. If not

absolutely the first works in Urdii and Hindi prose, they were at any rate the first literary standards in those languages; and almost the whole of recent prose authorship is due either to their influence or to one of two other impulses, the first of which was almost synchronous with the Fort William productions, and the other not many years pos- terior to them. These were the reform in Islam led by Sayyid Ahmad, and the introduction of lithography and a newspaper press.

Sayyid Ahmad was born in 1782, and received his early educa- tion at Dehli; his instructors were two learncd Muslims, Shah 'Abdu-l-Aziz, author of a celebrated commentary on the Qur'an (the Tafsir-i' Aziziyyah), and his brother 'Abdu-l-Qadir, the writer of the first and best translation of the Holy Volume into Urda. Under their guidance Sayyid Ahmad embraced the doctrines of the Wahhabis, a sect whose preaching appears at this time to have first reached India. He gathered round him a large number of fervent disciples, among others Ismail Haji nephew of 'Abdu-l' Aziz and

'Abdu-l-Qadir, the chief author of the sect. After a course of preaching and apostleship at Dehli, Sayyid Ahmad set out in 1820 for Calcutta, attended by numerous adherents. Thence in 1822 he started on a pilgrimage to Mecca, whence he went to Constanti-

nople, and was there received with distinction and gained many |

disciples. He travelled for nearly six years in Turkey and Arabia, and then returned to Dehli. The religions degradation and cold- ness which he found in his native country strongly impressed him after his sojourn in lands where the life of Islam is stronger, and he and his disciples established a propaganda throughout Northern India, reprobating the superstitions which had crept into the faith from contaet with Hindus, and preaching a jihad or holy war against the Sikhs. In 1828 he started for Peshawar, attended by,

it is said, upwards of 100,000 Indians, and accompanicd by his |

chief followers, Haji Ismail and'Abdu-l-Hayy. He was furnished with means by a general subscription in Northern India, and by several Muhammadan princes who had embraced his doctrines. At the beginning of 1829 he declared war against the Sikhs, and in the course of time made himself master of Peshawar. The Afghans, however, with whom he had allied himself in the contest, were soon disgusted by the rigour of his creed, and deserted him and his cause. He fled across the Indus and took refuge in the mountains of Pakhli and Dhamtor, where in 1831 he encountered a detachment of Sikhs under the command of Sher Singh, and in the combat he and Haji Ismail were slain. His sect is, however, by no means extinct; the Wahhabi doctrines have continued to gain ground in India, and to give rise to much controversial writing, down to our own day.

The translation of the Qur'an by 'Abdu-l-Qadir was finished in 1803, and first published by Sayyid 'Abdullah, a fervent disciple of Sayyid Ahmad, at Highli in 1829. The Vambihu-l-ghajilin, or "¢ Awakener of the Heedless," a work in Persian by Sayyid Ahmad, was rendered into Urdi by 'Abdullah, and published at the same press in 1830. Haji Ismail was the author of a treatise in Urdi entitled Zagqwiyatu-l-Iman (" Confirmation of the Faith"), which had great vogue among the following of the Sayyid. Other works by the disciples of the Zarigah-e Muhammadiyyah (as the new

preaching was called) are the Targhib-i Jihad (" Incitation to Holy |

War"), Hidayatu-l-Maminin (" Guide of the Believers"), Aluzihu- 1-Kabair wa-l-Bid'ah (" Exposition of Mortal Sins and Heresy "), Nasihatu-l-Muslimin ("' Admouition to Muslims"), and the Jf'at Masail, or " Hundred Questions."

Printing was first used for vernacular works by the College Press at Fort William, and all the compositions prepared for Dr Gilchrist and his successors which have been alrcady mentioned were thus made public ; but the expense of this method of reproduction long precluded its extensive use in India, and the ungraceful characters used as types were

not appreciated by the natives. In 1837 the first lithographic press was set up at Dehli, and from that date on- wards the publications, original or editions of older works, issued in this shape annually may be counted by hundreds. The news-

paper press soon followed the introduction of lithography, and |

there are at present about two hundred journals in Urdii and, Hindi printed in India, the majority in the North-Western Provinces, the Panjab, and Oudh, but a few at Madras, Haidarabad, Bangalore, Bombay, and Calcutta. The extension taken by vernacular litera- ture during the last thirty years is enormous, and to describe it adequately would require a volume. 'he reader is referred for the best account of it to M. Garcin de Tassy's Annual Summaries from

1850 to 1877, where he will also find much interesting information | ae é Pie "o: : . _ of India is no less influential in determining the course of

| literary activity. Poetical composition is little practised,

regarding the nature and value of the newspapers now so numerous. Here a few names only can be mentioned which seem the most prominent among the crowd of writers who daily, by the cheap and simple ageney ofa lithographic stone and bazar paper, make their ideas public in Northern India.

Sayyid Ahmad Khan Bahadur, C.S.1. (not to be confounded with the Wahhabi reformer), is perhaps the most eminent and eloquent among conteinporary writers of Urdi. He is the author of humerous works, among others of the Asdru-s-Sanadid (" Vestiges of Princes"), an excellent account of Dehli and its monuments, which has passed through three editions (1847, 1854, 1876). His fame, however, chiefly rests upon his persevering cfforts to raise the standard of civilization and culture among his co-religionists, for which purpose he has since 1870 issued a most valuable journal en- titled the Tahzibu-l-Akhlag, or " Muhammadan Social Reformer" (which, unlike almost all its competitors, is printed with movable types). The articles in this publication, chiefly of a religious or educational character, are of a high order of excellence, and display most

effectively the resources of the Urdti language as a means of expressing modern ideas. Maulavi Nazir Ahmad of Dehli is the author of two excellent stories named Mir'atu-l-'aris (" the Bride's Mirror") and Taubatu-n-Nasth (" the Repentance of Nasith"); and Pandit Kashinath of Agra has written a good treatise on ethics, founded on Persian compilations on the subject, called Akhlagi 'ashi. These three works have received rewards from the Govern- ment of the North-Western Provinees, and enjoy much popularity. Lhe officers of the educational department have been prolific in

schoolbooks of various dcgrecs of excellence. Mr H. S. Reid and his assistants, Qamaruddin Gulab Khan, Chiranji Lal, Pandit Bausidhar, Sri Lal, and Mohan Lal, were at work from 1851 to 1860 in this direction, and several good translations and compila- tions are due to them. Inthe Panjab Zukaullah Khan of Dehli, and Karimuddin and Pandit Ajodhya Parshad of Lahore, have been no less active ; and Northern India is now well supplied with the means of elementary education in the vernacular in literature, history, geography, and mathematics. Science, owing to the diffi- culties of teehnical nomenclature, is less efficiently represented, and the controversy regarding the best method of clothing its voca- bulary in a vernacular dress is hardly yet solved. Owing to the fortunate circumstance that Urdii is able to draw for its vocabulary upon Persian and Arabic as well as upon its native Indian resources, the attempts which have been made in Egypt, Turkey, and other countries where these languages are in use to provide vernacular equivalents for scientific terminology will, it may be hoped, work not only for the benefit of those countries, but also for that of India, and thus in time provide a satisfactory means of raising vernacular education in scicnce to the Jevel of other branches of culture.

In Hindi also there is much activity, though not so much as in Urdi. The pure or " High" Hindi, which rejects all foreign words, and supplies its vocabulary exclusively from Sanskrit, is a recent creation, and cannot even yet be said to represent the language of any large class of the population. A good specimen of this dialect is Nilkanth Shastri Gore's Shad-Darshan Darpan, or " Mirror of the Six (orthodox) Schools (of

Hindu philosophy),” a controversial work by a converted Brahman. ‘The genuine Hindi of the old literature, used now exclusively for poetry, is represented by an excellent publication issued weekly at Benares by Baba Harish- Chandra, entitled Kabi-bachan-Sudhda, or “ Ambrosia of the Words of Poets.” In this will be found much good original work, and a vast quantity of old Hindi poetry now for the first time published. The translations of the Mahabharata and Harivansa, made by Pandit Gokulnath of Benares, and printed at Calcutta in 1829, deserve mention; and one of the most important collections of Hindi poetry, the Rag-Kalpadrum of Krishnanand Vyasadev Rag- Sagar, was printed at the same place in 1842-45 in an immense volume of 1800 pages.

English education has naturally had a vast influence on modern vernacular literature, though not wholly a beneficial one. More than a half of the new works issued within the last thirty years are translations or adaptations from English ; the journals, the great popularizers of new ideas, take their matter chiefly from English newspapers; the courts, where Urdii has since 1832 become the official language, contribute to the spread of the stiff and difficult phraseology of the Acts of the legislature, as different from the natural idiom of the people as can well be imagined. Literature in India has always owed much to the fostering influence of Government. It has been seen how the schools of Dehli and Lakhnau rose and declined with the fortunes of the Mughal empire and the kingdom of Oudh, and how that of Calcutta similarly owed its existence to British initiative. At the present day the patronage of the rulers

both because of the exhaustion of its themes and the little appreciation which it meets with from Europeans. More solid studies, politics, science, philosophy, morals, history, and especially controversial theology, are the topics now in favour; and, though much that is published is of the slightest possible intrinsic value, the resources of the lan- guage are being gradually cultivated and enlarged to meet the needs of the day. ‘There is thus no reason to doubt that Hindostan will in time possess a body of literature worthy of the flexible and expressive speech of its people, and reflecting faithfully the standard of culture which it owes to its Western rulers. (O17 say) HINGANGHAT, a town in the Wardha district, Central

Provinces, India, 21 miles 8.W. of Wardha, in 20° 33’ 30” N. lat., and 78° 52’ 30” E. long., with a population in 1877 of 9415. It isa main seat of the cotton trade, the Hin- ganghat cotton produced in the rich Wardha valley being esteemed one of the best indigenous staples of India. The principal native traders are Marwaris, many of whom have large transactions and export on their own account; but the

greater number merely act as middle-men between the culti- vators and the large merchants. The municipal committee have opened a large gravelled market-place and storage- yard, with raised platforms, and scales for weighing the cotton. . The place consists of Old and New Hinganghat,— the former, a straggling town, liable to be flooded by the river Wand; the latter, in which the better classes reside, laid out in broad streets and avenues.

HINOJOSA DEL DUQUE, a town of Spain, in th province of Cordova, from which city it is distant about 58 miles N. by W. The manufacture.of linens and woollens is carried on to some extent ; the population is estimated at about 8500.

HINTON, James (1822-1875), aural surgeon and author, son of John Howard Hinton, Baptist minister and author of the History and Topography of the United States and other works, was born at Reading in 1822. He was edu- cated at lis grandfather’s school near Oxford, and at the Nonconformist school at Harpenden, and in 1838, on his father’s removal to London, was apprenticed to a woollen- draper in Whitechapel, where he came into contact with a phase of human life in its miserable and degraded forms which influenced powerfully the whole cast of his after thought. After retaining this situation about a year he became clerk in an insurance office. Tho most of his evenings were spent by him in intense study, and this, joined to the ardour, amounting to morbidness, of his interest in moral problems, so affected his health that in his nineteenth year he resolved to seek refuge from his own thoughts by running away to sea. His intention having, however, been discovered, he was sent, on the advice of the physician who was consulted regarding his health, to St Bartholomew’s Hospital to study for the medical profession.

After receiving his diploma in 1847, he was for some time assistant surgeon at Newport, Essex, but the same year he went out to Sierra Leone to take medical charge of the free labourers on their voyage thence to Jamaica, after which his interest in their welfare prompted him to remain a year on the island. After his retnrn to England in 1850, he entered into partnership with a surgeon in London, where he soon had his interest awakened specially in aural surgery, and gave also much of his attention to physiology and to problems bearing on the relation between mind and body. In his practice he became convinced that in the immense majority of cases of ill-health it was the hope of cure rather than the drug that effected the remedy, a fact which explained to him much of the success of homeo- pathy, and induced him to lay the principal stress on moral methods of cure. He made his first appearance as an author in 1856 by contributing a series of papers on physio- logical and ethical subjects to the Christian Spectator ; and the success of his work Afan and his Dwelling Place, which appeared in 1858, determined him, notwithstanding that he had married in 1852, to give up his medical practice in order to devote his whole attention to writing on those practical moral problems which chiefly occupied his thoughts. A series of papers entitled ‘ Physiological Riddles,” which he contributed to the Cornhill Magazine, and afterwards published under the title Life a Nature, as well as another series entitled Thoughts on Health, written for the same periodical and collected and published separately in 1871, gave evidence of great aptitude in popular scientific exposition ; but his interest in speculation was too absorbing to permit him to apply himself with sufficient pertinacity to literary work, and after a year’s trial of it he found it necessary to resume his profession. In 1863 he obtained the appointment of aural surgeon to Guy’s Hospital, after which he speedily acquired a lucrative west-end practice, and the reputation of being the most skilful aural surgeon of his day, a reputation fully borne

out by his works, An Atlas of Diseases of the Membrana Tympani and Questions of Aural Surgery, which are regarded as the chief authorities in this branch of surgery, The skill he had now obtained in his profession seemed to justify him in 1869 in resuming his philosophical studies, but

the mental excitement thus produced, added to his pro- fessional labours, appears to have inflicted permanent injury on his brain; and, although by giving up his practice in 1874 he obtained partial relief, he began to snffer from sleeplessness and depression, and died of acute inflamma- tion of the brain, 16th December 1875.

In addition to the works already mentioned, Hinton was the author of the Mystery of Man, and The Place of the Physician. On account of their fresh and vigorous discussion of many of the im- portant moral and social problems of the time, his writings have had a wide circulation on both sides of the Atlantic. He contri- buted also several papers to the Contemporary Review and other periodicals. His Life and Letters, edited by Ellice Hopkins, with an introduction by Sir W. W. Gull, appeared in 1878.

HIOGO, or Fioco, a seaport town of Japan, in the island of Nipon and province of Setsu, on the western shore of the Idzumi Sea, or Bay of Osaka, about 40 miles S.W. of Kioto, with which it has had railway communi- cation since 1874. It was opeued to foreign commerce in 1860, and since that date it has risen with the maritime suburb of Kobe (the Gato of God) to be a place of 50,000, or according to other authorities, 80,000 or 90,000 inhabi- tants. Its harbour, formerly dangerous, has by the con- struction of a costly breakwater been rendered one of the most serviceable in the kingdom. The best anchorage is found in front of Kobe, which has been chosen as the locale of the foreign settlement. Since the opening of the port great improvements have been effected in the native town, and the value of land and house property has greatly in- creased. The settlement, which consists of 162 lots, has been regularly laid out; its streets are macadamized and lighted with gas ; and it possesses a bank, municipal build- ings, and the largest warehouses yet erected by foreigners on Japanese soil. There is a recreation ground open to both natives and foreigners, with a cricket field and a croquet lawn. The population of the settlement was 169 in 1876 ; that of Kobe in 1874 was upwards of 8500. The trade of Hicgo consists mainly inthe exportation of tea (1,599,199 dollars in 1877), silk, copper, camphor, wax, tobacco, ginseng, isinglass, and dried fish, and the importa- tion of European manufactured goods—woollens, cotton, glass, &c. Most of the tea goes to

New York, very little to London. The total value of the imports in 1874, 1875, 1876, and 1877 was respectively 6,030,239, 5,354,917, 3,748,967, and 4,313,641 dollars (the dollar being worth about 4s.), and the corresponding figures for the exports were 4,956,724, 2,813,102, 3,401,230, and 4,518,570. The industrial establishments comprise a shipbuilding yard, an iron-foundry, and a factory for the manufacture of paper pulp or "half stuff." There is a busy traffic main- tained by ferry steamers between Hiogo and Osaka. The number of foreign ships that entered and cleared from the port in 1875 was 335, with a burden of 453,958 tons.

Hiogo was built in the days of the glory of the Taira family, and its name is equivalent to arscnal. At Minato Gawai near Kobe a small temple marks the spot where Kusunoki Masashige, the mirror of Japanese loyalty, met his death ; and in Kobe itself there is a temple erected on the site of the ancient fanc built by Jingu Kogo on her return from Corea.

HIPPARCHUS, the founder of mathematical astronomy, was born at Nicwa in Bithynia. The years of his birth and death are both unknown, but the period of his activity, according to the evidence of his observations, which have been preserved by Ptolemy, must have been between 160 and 1258.c. Of his writings only one has come down to us, Tév "Aparov kal "Evddgov dawopevey é&yyjoeav BiBrLa y, published by Vittorius at Florence, 1567, and by

Petavius in his Uranologia, Paris, 1630. For a notice of his discoveries see ASTRONOMY, vol. ii. p. 749.

HIPPEL, Turopor GorrTiirn von (1741-1796), a German author, known chiefly as a humorist, was born on the 31st January 1741, at Gerdauen in East Prussia, where his father was rector of a school. In his sixteenth year he went to Koénigsberg to study theology ; but through the influence of the Dutch councillor of justice, Woyt, he was induced to devote himself to jurisprudence. A Russian lieutenant, Yon Keyser, whose acquaintance he made in Konigsberg, took him in 1760 to St Petersburg, where he

might have had a brilliant career had not his love for his country made it impossible for him to live away from it.

Returning to Kénigsberg he became a tutor in a private |

family ;. but, falling in love with a young lady of high position, he, as the readiest means of enabling him to marry her, gave up his tutorship and devoted himself with en- thusiasm to legal studies. He was successful in his pro- fession, passiug from one grade to another, until in 1780 he was appointed burgomaster and director of police in K6nigsberg, and in 1786 privy councillor of war and president of the town; as he rose in the world, how- ever, his inclination for matrimony vanished, and the lady who had stimulated his ambition was forgotten. To write books in his country house near Kénigs- berg was his favourite amusement, and some of them have still a certain popularity. Perhaps the best known is his Ueber die Hhe (Concerning Marriage). He has also works on Zhe Socal Improvement of Woman, and on Female Education. Another curious book of his is Lebensliiufe nach aufsteigender Linie, nebst Beilagen A, B, C' (Careers according to an ascending line, with supple- ments A, B, C). His name is attached to several political writings of a satirical turn, and he was the author of a comedy Der Mann nach der Uhr, which was fortunate enough to win the applause of Lessing. Hippel was a friend of Kant, who admired his ingenuity and resource in forming and executing plans. Before the publication of Kant's Kritck, Hippel was made familiar with its main conclusions, and in his Lebensldéufe he did his utmost to prepare the way for their reception. In nearly all his writings he had a serious purpose, but disliking a cold, systematic style, he communicated his ideas in what he intended to be a light and witty form. Much of his wit is rather crude, but he gave sufficient evidence of a lively fancy to justify his success as an author. His private character presented some curious contrasts. He shared the enthusiasm of his age for passionate friendships, but none of his friends were treated with confidence ; endowed with a clear and penetrating intellect, he had a strong tendency to superstition ; he seemed to have generous sympathies, yet his conduct was often hard and selfish; and although he incessantly praised simplicity of life, nu one could be more fond of pomp and show. He died on the 23d April 1796,

leaving a considerable fortune. In 1827-38 a collected edition of his works in 14 vols. was issued at Berlin.

HIPPO. See Bons.

HIPPOCAMPUS, or Sra-yorsz. The small fishes thus named constitute, together with the Pipe-fishes or Syn- gnathr, a distinct order of the class of fishes, that of Lopho- branchs or fishes with the gills arranged in tufts. The name "Sea-horse" has been given from the singular horselike shape of the head and fore-part of the body. The head 18 compressed, and is prolonged into a flat snout, at the end of which opens the small mouth. The eye occupies the same position as in the horse, and the head is joined at an angle to a narrow and curved neck, which pos- teriorly is dilated into the fishes of this order,

skin or scales, but encased in a mail composed of hard and tongh scutes, which are of a more or less quadrangular shape, and generally armed with tubercles or spines. The tail is long, flexible, and prehensile, without caudal fin. These fishes are very bad swimmers, their locomotion being

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Phyllopteryx eques, attached to sea-weed.

entirely dependent on the long dorsal fin which slowly pro- pels them bya rapidly undulating screw-like motion; placed in the middle of the back of a body which generally ocen- pies a vertical or oblique position in the water, this organ of locomotion has a propelling power far inferior to that of a terminal caudal fin. By means of their prehensile tail the sea-horses attach themselves to the stems of sea-weed or corals, which they resemble so closely in their outward ap- pearance that it is difficult to distinguish them,—a resem- blance which is still more increased in a group of sea-horses (Phyllopteryx) in which many of the spines and tubercles bear long tapering bands like the fronds of sea-weeds. Originally littoral fishes, sea-horses are, nevertheless, fre- quently found in mid-ocean, attached to floating substances on which they are carried away by currents far from

their native shore. In the Sargasso Sea they arecommon. Like the other Lophobranchs, they take care of their progeny till the young have attained sufficient size and strength to shift for themselves. The male receives the eggs immedi- ately after oviposition in a pouch situated on the lower part of his tail, where they are hatched, and where indeed the young remain until hunger compels them to leave their parent in search of food. More. than twenty different species are known from the tropical and the warmer parts of the temperate zones. They are all of small size; that seen in our aquaria is the Zippocampus antiquorum, common on many parts of the French coast and farther south.

HIPPOCRATES, termed the "Father of Medicine," was born, according to Soranus, in Cos, in the first year of the 80th Olympiad, ¢.¢., in 460 B.c. He was a member of the family of the Asclepiadz, and was believed to be either the nineteenth or seventeenth in direct descent from Asculapius. It is also claimed for him that he was descended from Hercules through his mother, Pheenarete. He studied medicine under Heraclides, his father, and Herodicus of Selymbria; in philosophy Gorgias of Leon- tini and Democritus of Abdera were his masters, His earlier studies were prosecuted in the famous Asclepion of Cos, and probably also at Cnidos, He travelled extensively, and taught and practised his profession at Athens, probably also in Thrace, Thessaly, Delos, and his native island. He died at Larissa in Thessaly, his age being variously stated as 85, 90, 104, and 109. The incidents of his life are shrouded by uncertain tradi- tions, which naturally sprang up in the absence of any

broader body. As in all the | authentic record ; the earliest biography was by oue of the the body is not covered with soft | Sorani, probably Soranus the younger of Ephesus, in the.

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2d century ; Suidas, the lexicographer, wrote of him in the 11th, and Tzetzes in the 12th century. In all these biographies there is internal evidence of confusion ; many of the incidents related are elsewhere told of other persons, and certain of them are quite irreconcilable with his char- acter, so far as it can be judged of from his writings and from the opinions expressed of him by his contemporaries ; we may safely reject,

for instance, the legends that he set fire to the library of the temple of health at Cnidos, in order to destroy the evidence of plagiarism, and that he refused to visit Persia at the request of Artaxerxes Longimanus, during a pestilential epidemic, on the ground that he would in so doing be assisting an enemy. He is referred to by Plato (Protag., p. 283; Pheedr., p. 211) as an eminent medical authority, and his opinion is also quoted by Aristotle. The veneration in which he was held by the Athenians serves to dissipate the calumnies which have been thrown on his character by Andreas, and the whole tone of his writings bespeaks a man of the highest integrity and purest morality.

Born of a family of priest-physicians, and inheriting all its traditions and prejudices, Hippocrates was the first to cast super- stition aside, and to base the practice of medicine on the principles of inductive philosophy. It is impossible to trace directly the influence exercised upon him by the great men-of his time, but one cannot fail to connect his emancipation of medicine from super- stition with the widespread power exercised over Greek life and thought by the living work of Socrates, Plato, schylus, Sophocles, Euripides, Herodotus, and Thucydides. It was a period of great intellectual development, and it only needed a powerful mind such as his to bring to bear upon medicine the same influences which were at work in other sciences. It must be remembered that his training was not altogether bad, although superstition entered so largely into it. He had a great master in Democritus, the origin- ator of the doctrine of atoms, and there is every reason to believe that the various '"asclepia" were very carefully conducted hospitals for the sick, possessing a curious system of case-books, in the form of votive tablets, left by the patients, on which were recorded the symptoms, treatment, and result of each case. He had these records at his command; and he had the opportunity of observing the system of training and the treatment of injuries in the gymnasia. One of his great merits is that he was the first to dissociate medicine from priestcraft, and to direct exclusive attention to the natural history of disease. How strongly his mind revolted against the use of charms, amulets, incantations, and such devices appears from his writings; and he has expressly recorded, as underlying all his practice, the conviction that, however diseases may be regarded from the religious point of view, they must all be scientifically treated as subject to natural laws (De dere, 29).

Nor was he anxious to maintain the connexion between philosophy and medi- cine which had for long existed in a confused and confusing fashion. 1 His knowledge of anatomy, physiology, and pathology was neces- sarily defective, the respect in which the dead body was held by the Greeks precluding him from practising dissection ; thus we find him writing of the tissues without distinguishing between the various textures of the body, confusing arteries, veins, and nerves, and speaking vaguely of the muscles as "flesh." But when we come to study his observations on the natural history of disease as presented in the living subject, we recognize at once the presence of a great clinical physician. Hippocrates based his principles and practice on the theory of the existence of a spiritual restoring essence or principle, gvois, the vis medicatrix nature, in the management of which the art of the physician consisted. This art could, he held, be only obtained by the application of experience, not only to disease at large, but to disease in the individual. He strongly deprecated blind empiricism; the aphorism "'7 meipa opareph, 4 Kplois xadenh'" (whether it be his or not), tersely illus- trates his position. Holding firmly to the principle, votcwy piaces intpof, he did not allow himself to remain inactive in the presence of disease; he was not a merely "expectant" physician; as Sydenham puts it, his practice was "the support of enfeebled and the coercion of outrageous nature." He largely employed powerful medicines and blood-letting both ordinary and by cupping. He advises, however, great caution in their application. He placed great dependence on diet and regimen, and here, quaint as many of his directions may now sound, not ouly in themselves, but in the reasons given, there is much which is still adhered to at the present day. His treatise Mep) adpwv, i8drwy, Kal rénwy (Airs,

1 "¥ippocrates Cous, primus quidem ex omnibus memoria dignus, ab studio sapientie disciplinam hance separavit, vir et arte et facundia insignis" (Celsus, De Medicina).*

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Waters, and Places) contains the first enunciation of the principles of public health. Although the treatises Mep) xpicfuwv cannot be accepted

as authentic, we find in the Hpoyvworikdy evidence of the acuteness of observation in the manner in which the occurrence of critical days in disease is enunciated. His method of reporting cases is most interesting and instructive; in them we can read how thoroughly he had separated himself from the priest-physician. Laennec, to whom we are indebted for the practice of auscultation, freely admits that the idea was suggested to him by study of Hippocrates, who, treating of the presence of morbid fluids in the thorax, gives very particular directions, by means of snccussion, for arriving at an opinion regarding their nature. Laennec says, " Hippocrate avait tenté l'auscultation immédiate." Although the treatise Mep) vobcwv is doubtfully from the pen of Hippocrates, it contains strong evidence of having been the work of his grandson, representing the views of the Father of Medicine. Although not accurate in the conclusions reached at the time, the value of the method of diagnosis is shown by the retention in modern medicine of the name and the practice of " Hippocratic succussion." The power of graphic description of phenomena in the Hippocratic writings is illustrated by the retention of the term " facies Hippo- cratica," applied to the appearance of a moribund person, pictured in the Prognosties. In surgery his writings are important and interesting, but they do not bear the same character of caution as the treatises on medicine; for instance, in the essay On Injuries of the Head, he advocates the operation " of trephining" more strongly and in wider classes of cases than would be warranted by the experience of later times.

The Hippoeratie Collection consists of eighty-seven treatises, of which a part only can be accepted as genuine. The collection has been submitted to the closest criticism in aneient and modern times by a large number of commentators. (For full list of the early com- mentators, see Adams's Genuine Works of Hippocrates, Sydenham Society, vol. i. pp. 27, 28.) The treatises have been classified ac- cording to (1) the direct evidence of ancient writers, (2) peculiarities of style and method, and (8) the presence of anachronisms and of opinions opposed to the general Hippocratic teaching,—greatest. weight being attached to the opinions of Erotian and Galen. The general estimate of commentators is thus stated by Adams:— "The peculiar style and method of Hippocrates are held to be conciseness of expression, great condensation of matter, and dis- position to regard all

professional subjects in a practical point of view, to eschew subtle hypotheses and modes of treatment based on vague abstractions." The treatises have been grouped in the four following sections :—(1) genuine; (2) those consisting of notes taken by students and collected after the death of hip.

ocrates; (8) essays by disciples; (4) those utterly . spurious.

*ittré accepts the- following thirteen as absolutely genuine :—(1) On Anetent Medicine (Mep) apxatns inrpixjs); (2) The Prognesties (Ipoyvworikdv); (3) The Aphorisms (Agopiopol); (4) The Epi- demices, i. and ili. (Emdnuidy a' nad y');~~(5) On Regimen in Acute Diseases (Mep) diatrns dtéwv); (6) On Airs, Waters, and Places (Mepl aépwr, bddTwy, kal romwv); (7) On the Articulations (Nep) &pOpwr); (8) On Fractures (Mep) ayuév); (9) The Instruments of Reduction (MoxAuwéds); (10) The Physician's Establishment, or Surgery (Kar intpeiov) ; (11) On Injuries of the Head (Nept rev év kepaarn tpwudrwv); (12) The Oath ("Opkos); (13) The Law (Néuos). Of these Adams accepts as certainly genuine the 2d, 6th, 5th, 8d (7 books), 4th, 7th, 8th, 9th, and 12th, and as "pretty confidently acknowledged as genuine, although the evidence in their favour is not so strong," the 1st, 10th, and 13th, and, in addition, (14) On Ulcers (Mep) érx@v); (15) On Fistule (Mep) ovplyyev) ; (16) On Hemorrhoids (ep) aiuoppotéwv) ; (17) On the Sacred Disease (Mep) fepjs voterov). According to the sceptical and somewhat subjective criticism of Ermerins, the whole collection is to be regarded as spurious except Epidemics, books i. and iii, (with a few interpolations), On Airs, Waters, and Places, On Injuries of the Head ("insigne fragmentum libri Hippocratei"), the former portion of the treatise On Regimen in Acute Diseases, and the "obviously Hippocratic" fragments of the Coan Prog~~ *nosties. Perhaps also the Oath may be accepted as genuine ; its comparative antiquity is not denied. The Aphorisms are certainly later and inferior. In the other non-Hippocratic writings Er merins thinks he can distinguish the hands of no fewer ,than nineteen different authors, most of them anonymous, and some of them very late.*

The earliest Greek edition of the Hippocratic writings is that which was published by Aldus and Asulanus at Venice in 1526 (folio); it was speedily

followed by that of Frobenius, which is much more accurate and complete (fol., Basel, 1538). Of the numerous subsequent editions, probably the best was that of Foesius (Frankfort, 1595, 1621,Geneva, 1657), until the publication of the great works of Littré, Guvres completes d'Hippoerate, traduetion nouvelle avec le texte gree en regard, collationnée sur les manuserits et toutes les éditions, accompagnée d'une introduction, de com- mentaires médicaux, de variantes, et de notes philologiques (10 vols., Paris, 1839-61), and of F. Z. Ermerins, Hippoeratis et aliorum

medicorum veterum reliquic (3 vols., Utrecht, 1859-64). See also Adams (as cited above), and Reinhold's Hippocrates (2 vols., Athens, 1864-67). Daremberg's edition of the Wuvres choisies (2d ed., Paris, 1855) includes the Oath, the Law, the Prorrhetics, book i., the Prognostics, On Atrs, Waters, and Places, Epidemics, books i. and iii., Regimen, aud Aphorisms. Of the separate works attri- buted to Hippocrates the editions and translations are almost in- numerable ; of the Prognostics, for example, seventy editions are known, while of the Aphorisms there are said to exist as many as three hundred. For some notice of the Arabic, Syriac, and Hebrew translations of works professedly by Hippocrates (Ibukrat or Buk- rat), the number of which greatly exceeds that of the extant Greek originals, reference may be made to Fliigel's contribution to the article " Hippokrates" in the Lncyklopddie of Ersch and Gruber. They have been partially catalogued by Fabricius in his Bibliotheca Greea. (ile ts}, UNG) HIPPOLYTUS, an ecclesiastical writer belonging to the first half of the 3d century. Of the details of his life little that is authentic is known. He appears to have been born in the latter half of the 2d century. From the fact that he employs Greek as his mother tongue, it has been supposed that he belonged to the eastern portion of the Roman empire ; but this conclusion is by no means stringent, and there are various indications in his writings that he had passed some at least of his early years in Rome. On the apparently trustworthy authority of Photius (cod. 121), he is believed to have been while still a youth a personal dis- ciple of Irenzeus, perhaps in Rome, but most likely in Lyons. By inference from the vivid minuteness with which he relates details of the personal

history of Callistus in the 9th book of his Refutation he is believed to have been in Rome from the beginning of the episcopate of Victor (189- 199). It is certain that in the early years of the 3d cen- tury he was stationed in that city as a presbyter conspicuous for energy, zeal, eloquence, and learning. He was a pro- minent defender of Victor's view on the much vexed Paschal controversy, but came into collision with Victor's successors, Zephyrinus and Callistus, on several questions of ecclesiastical dogma and discipline. As regarded the rela- tion between the Father and the Son in the Trinity, for example, Hippolytus defended what is known as subordina- tianism against the patripassianism of the bishops, he accus- ing them of Noetianism while they retorted upon him with a charge of ditheism. Again, in the dispute as to whether the lapsed could ever be lawfully restored to the fellowship of the church visible, Hippolytus took the severer and Callistus the milder view. So also on the subject of clerical marriages. From his own language in the 9th book of the Refutatio, combined with his designation of himself in the proem, it appears that Hippolytus ultimately came to occupy in Rome the position of a bishop (cf. Euseb., H. Z., vi. 20), although not in communion with the "Catholic" party ; and the difficulty of reconciling this with the strong evidence we have that Portus (i.e, the Roman harbour opposite Ostia, and not Portus Romanorum or Aden, as Le Moyne and others founding upon a misunderstanding of Eusebius, have conjectured) was the scene of his activity is probably best got over if we assume that as dissenting bishop he undertook the episcopal superintendence of his adherents in both places, but took his title from the smaller. As regards the close of his life our most trustworthy information is derived from the chronographer of 354 (Mommsen, Ueber den Chronographen vom Jahre 354, Leipsic, 1850), according to whom "the presbyter " Hippolytus in the time of Alexander Severus (235) was banished along with the Roman bishop Pontianus to Sardinia, where, it seems to be suggested, he died.

In 1551 a marble statue of Hippolytus 'Portuensis," of uncertain date but not later than the 5th century, was dug up in Rome; it is now to be seen in the Vatican. He is represented as seated upon an episcopal throne, wearing the Greek pallium, over which the Roman toga is thrown. On the sides of the throne is inscribed in Greek the rude Easter Cycle of which

he is known to have been the author ; behind is given an imperfect list of his numerous works. The

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*catalogues given by Eusebius, Jerome, and Nicephorus differ slightly in details; but all bear witness to his diligence as a writer. The extant fragments were first collected by Fabricius (Hippolyti Opera gr. et lat., 2 vols. fol., Hamburg, 1716-18), and were after- wards reprinted by Galland in the second volunic of his Bibliotheca Veterum Patrum (1766). See also Migne, Curs. Patr. Gr., vol. x. They include fragments of commentaries on various books of Scrip- ture, a treatise "On Christ and Antichrist," an " expository " (&mrodeuxtinh) discourse " To the Jews,' a fragment '*To the Greeks" or "On the Universe," tracts " Against Noetus," "Against Beronand Helix,' and "On the Holy Theophany," fragments of homilies (in which kind of composition he particularly excelled), and a few short quotations preserved by the author of the Chronicon Pas- chale. 'The appendix in Fabricius, containing doubtful or spurious pieces, includes " A Discourse on the End of the World, and on Antichrist, and on the Second Coming of our Lord Jesus Christ," also a short account of the twelve apostles, stating where each of them laboured and where each of them died, a list of the seventy apostles, heads of the canons of Abulides or Hippolytus as used by the Athiopian Christians, and the canons of the Church of Alexandria. Of the spuriousness of the last mentioned at least there can be no doubt. A new interest in Hippolytus as an eccle- siastical writer was awakened among scholars about 1851 in connex- ion with his Omniwm Heresium Refutatio, which has an interest- ing history. Asan anonymous MS. of the 14th century it had in 1842 been brought among various other manuscripts from Mount Athos to Paris by Minoides Mynas, a learned Greek who had been commissioned by the French Government to search for such treas- ures, and had been deposited in the great national library where it was registered as a work On all Heresies. It failed for some time to attract any special notice; but the attention of M. Emmanuel Miller, an official of that institution, having been at length excited by some fragments of Pindar and of an unknown lyric poet which*

it contained, he was led to examine it more closely and to adopt the conclusion that it was the continuation of the fragment entitled Philosophumena, printed in the Bencdictine edition of Origen as the work of thatauthor. Under this persuasion he offered it for publi- cation to the university of Oxford, from whose press it appeared in 1851 under his editorship, bearing the title Originis Philosuphumena, sive Omnium Heresium Refutatio. It was at once welcomed by the learned world as a literary treasure of singular value ; but it was alinost immediately perceived that, though Miller had certainly judged rightly in affirming it to bea continuation of the fragmentary Philosophumena, he had as certainly erred in attributing its compo- sition to Origen, whose authorship of the previously known portion had already been disputed by Huet, Heumann, and Gale. By Jacobi aud Duncker in 1851, who were speedily followed by Giese- ler, Bunsen, Wordsworth, and Dollinger, it was with increasing con- fidence claimed for Hippolytus, to whom it is now attributed with almost entire unanimity by critics,—the arguments of Baur (Theol. Jahrbb., 1853) in favour of the presbyter Caius, aud still more those of Armellinus (De prisca refutatione hereseon, Rome, 1863) in favour of Novatian, having been found to be quite unconvincing.

Originally it consisted of ten books, of which, however, only eight survive, namely, the first and the fourth to the tenth inclusive. Book i. gives an account of the different schools of ancient philo- sophy—Greek, Indian, and Druidical ; books ii. and iii. appear to have dealt with the doctrines and mysteries of the Egyptians and Chaldeans respectively ; book iv. (which is slightly defective at the commencement) treats of Chaldean horoscopy and Egyptian theurgy; books v.~~ix. dispose of the various heresies which had asserted themselves within the Christian Church. These are taken up in chronological order and arranged in five main groups, the Ophite, Simonist, Basilidean, Valentinian or Docetic, and Noetian. Whether they be regarded as attempts to Christianize paganism, to conciliate Judaism, or to gnosticize Christianity, their unscriptural character is invariably insisted on. The entire work is summarized in book x. The value of the Refutation as a whole, in its bearing on the history of the apostolic and subapostolic ages, and on the cri~~ tical — arising out of that history, can hardly be overesti- mated.

Since its first publication by Miller (Oxford Clarendon Press, 1851) it has been edited by Lagarde (Hippolyti Romani que ferun- tur omma Greee, Gottingen, 1858), by Duncker and Schneidewin, (Gottingen, 1859), and by Cruice (Paris, 1860). The Refutation as well as the other extant Works and Fragments of Hippolytus are to be met with in an English translation in the " Ante-Nicene Chris- tian Library"' (Edin., 1868-9).

See Bunsen, Hippolytus and his Age (1852; 2d ed., 1854; Germ. cd., 1853); Dillinger, Hippolyius u. Kallistus (1853; Engl. transl., Edin., 1876); Wordsworth, St Hippolytus and the Church of Rome in the Third Century (1858); Cruice, Ktudes sur de nouveaux documents historiques empruntés au livre des Philosophumena et relatifs au commencement du Christianisme (1853); Volkmar, Hippolytus u. die rémische Zetigenossen (1855); Lipsius, Zur Quellenkritik des Epiphanios (1865), and Quellen der dliesten Ketzergeschichte (1875); Harnack, Zur Quellenkritik der Geschichte des Gnosticismus (1873-74). Lipsius and Harnack occupy themselves largely with the question as to the relation between the Refutatio and a shorter treitise which can be shown to have formed the basis of the works of Epiphanius

and Philaster. See also Jacobi, art. " Hippolytus,"' in Herzog-Plitt's ReakEn- cyclopddie (1880).

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HIPPOLYTUS, St, according to the Roman breviary, was one of St Lawrence's converts, who, when summoned before the emperor Valerian on account of the practice of his religion, made a public profession of Christianity. First beaten with rods, he was finally delivered over along with all his family to death, the mode of execution in his case being similar to that by which Hippolytus the son of Theseus perished. The mythical character of this legend, which, however, can in part be traced as far back as to Prudentius (Hym. 11), is recognized by Dollinger (see his Hippolytus u. Kallistus, chap. ii.), This saint, along with Casianus, is commemorated by the Roman Church on August 13. He is the patron of Mexico.

HIPPONAX, of Ephesus, a poet placed third, after Archilochus and Simonides, among the classic iambic poets of Greece. Expelled from Ephesus in 540 B.c. by the tyrants Athenagoras and Comas, he took refuge in Clazomene. There lis deformed figure and malicious disposition exposed him to the caricature'of the Chian sculptors Bupalus and Athenis; and he revenged himself by issuing against them a series of satires. These, though keen and bitter, are in thought and execution much inferior to the similar works of his predecessor Archilochus. His coarseness of thought and feeling, his rude vocabulary, his want of grace and taste, and his numerous allusions to matters of merely local interest prevented his becoming a favourite in Attica. He invented epic parody, and the four opening lines of a parody on the iad have been preserved in Athenzus (xv. 698 B). He was also the inventor of a peculiar metre, used after him by many writers, called the scazon or choliambus, which substitutes a spondee for the final iambus of an iambic senarius. His works, which were annotated by Hermippus of Smyrna, were at an early date mingled and confused with those of Ananius, for whom some even claim the invention of the choliambus.

HIPPOPOTAMUS, a family (Z/ippopotamide) of artio- dactyle ungulate mammals comprising two genera, each containing a single living species. Of these the best known is the hippopotamus (/ippopotamus amphibius), occurring

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pes Hippopvtamus. only in Africa, where it abounds in many of the river courses. It is a huge unwieldy creature, measuring in the largest specimens fully 14 feet from the extremity of the upper lip to the tip of the tail, while it ordinarily attains a length of 12 feet, with a height of 5 feet at the shoulders, and a girth round the thickest part of the body almost equal to its length. Its remarkabiy small ears are exceed- ingly flexible, and are kept in constant motion when the animal is seeking to catch a distant sound. Its eyes are placed high up on the head, and but little below the level of the ears; its gape is wide, and its upper lip thick and

bulging so as to cover over even the largest of its teeth when the mouth is closed. It is provided with a consider- able number of molar teeth adapted for grinding vegetable substances, and a formidable array of long spear-like incisors and curved chisel-edged canines or tusks which, according to Baker, root up the rank grass like an agricul- tural implement. Its legs are short, so that the body is but little elevated above the ground; and its feet, which are small in proportion to the size of the animal, terminate in four short toes each bearing asmall hoof. With the excep- tion of a few tufts of hair on the lips, on the sides of the head and neck, and at the extremity of the short robust tail, the skin of the hippopotamus, some portions of which are 2 inches in thickness, is entirely destitute of covering. It is usually of a dark fleshy red colour, irregularly marked with blackish spots. The hippopotamus is a gregarious animal, living in herds of from 20 to 40 individuals on the banks and in the beds of rivers, in the neighbourhood of which it most readily finds its appropriate food. This con- sists chiefly of grass and of aquatic plants, of which it con- sumes enormous quantities, the stomach of one of those creatures being capable of containing from 5 to 6 bushels. They feed principally by night, remaining in the water during the day, although in districts where they are little disturbed by man they are less exclusively aquatic, In such remote quarters they put their heads boldly out of the water to blow, but when rendered suspicious by man's persecution, .they become exceedingly cautious in this respect, only exposing their nostrils above the water, and even this they prefer doing amid the shelter of water plants. In spite of their enormous size and uncouth form, they are expert swimmers and divers, and can, it is said, remain easily under the water from five to eight minutes. They are also said to walk with considerable rapidity on the bottoms of rivers, beneath at least a foot of water. At night- fall they come on land to feed; and when, as often happens on the banks of the Nile, they reach cultivated ground, they do immense damage to growing crops, destroying by their ponderous tread even more than they devour. To scare away those unwelcome visitors the natives in such districts are in the habit of kindling great fires at night. Although they do not willingly go far from the water on which their very existence depends, occasionally they have been found to travel long distances by night in search of food, and in spite of their clumsy appearance they are able, according to Baker, to climb up steep banks and precipitous ravines with astonishing power and

ease. Of a wounded hippopotamus which that traveller once saw leaving the water and galloping inland, he says, "I never could have imagined that so unwieldy an animal could have exhibited such speed. No man could have had a chance of escape." The hippopotamus does not confine itself to rivers only, but when opportunity occurs of exercising choice it has been known to prefer the waters of the ocean as its home during the day. Of a mild and inoffensive disposition, it seeks to avoid collision with man; when wounded, however, or in defence of its young, it is wont to exhibit the greatest ferocity, and the native canoes are frequently capsized and occasionally demolished by its infuriated attacks, its usual bellowing grunt then becoming loud enough to be heard a mile away. As among elephants, so also among hippopotami there are '" rogues"—old bulls which, having been expelled from the herd, have become soured in solitude; these are at all times dangerous. Assuming the offensive on every occasion, they attack all and sundry without shadow of provocation ; the natives, therefore, are careful to avoid the haunts of those solztatres, which are usually well known.

The rifle of the European has proved the most potent destroyer of the hippopotamus; but to prove effective it

must be aimed at the head, the most vulnerable points in that region being immediately behind the ear and in the eye. Everywhere regarded as a valuable prize, the natives employ.a variety of methods in order to secure it, the most common of these being the use of an iron harpoon attached to a line. Allowing themselves to float down stream on a raft, the hippopotamus hunters no sooner reach the sleep- ing herd than the expertest of them plunges his harpoon deep into the body of the selected victim. The light canoes are then launched from the raft, and with all speed the hunters make for the shore, bearing with them the line attached to the harpoon, which they further secure by giv- ing it a turn round the trunk of a tree. Unable to free itself, the hippopotamus wastes its strength in impotent rage, its persecutors meanwhile assailing it with a shower of javelins under which its life blood gradually ebbs away, until at last it is hauled up dead or dying on the shore. Another native method of

destroying those animals is by means of a trap known as the "downfall," consisting of a heavy wooden beam armed at one end with a poisoned spear-head and suspended by the other to a forked pole or overhanging branch of a tree. The cord by which the beam is suspended descends to the path beneath, across which it lies in such a manner as to be set free the instant it is touched by the foot of the passing hippopotamus ; the beam thus liberated immediately descends, and the poisoned weapon passes into the head or back of the luckless beast, whose death in the adjacent stream takes place soon after. Such "downfalls" are placed over the paths by which the animals are in the habit of reaching their nightly feeding grounds. 'They are also occasionally taken by means of ordinary pitfalls, so dexterously concealed as often to entrap the unwary traveller. Although inferior in sagacity to the elephant, the hippopotamus is very far from being stupid, as is frequently proved by its remarkable adroitness in the discovery and avoidance of traps and pitfalls, as well as in its timely migration from localities which, owing to the prevalence of the rifle, have become no longer tenable. It is said to be possessed of a remarkably tenacious memory, so that, according to Sir Andrew Smith, when once it has been assaulted in its watery dwelling and injured through incautiously exposing itself, it will rarely be guilty of the same indiscretion a second time, even although a very long period should elapse before its haunts are revisited. The female is less in size than the male, and is exceedingly shy, taking to the water with her young, which she usually carries astride on her neck, on the slightest alarm. It is only after long practice that the young become able to remain as long under the water as their parents, and for this reason the females while tending them come much oftener to the surface than their own necessities require. The period of gestation, as observed in females confined in the Zoological Gardens of London and Paris, extends to nearly eight months; the young reach maturity in five years; and the full term of life in the species is believed to extend to thirty years. The male

skulls on which the genus and species were founded.

only a few days old; it had thus nearly attained the age of twenty-nine, while an examination of its dead body dis- closed, says Professor Owen, "‘ no special morbid appearance to suggest that death from old age had: been anticipated " (Annals and Magazine of Nat. Hist., September 1879). The flesh of the hippopotamus is generally considered a delicacy both by natives and colonists, although according to Livingstone there are certain tribes on the Zambesi who have as great an abhorrence of hippopotamus meat as Mahometans have of swine's flesh. The fatty matter lying between the skin and the muscles is one of the purest of animal fats, and was formerly in great request among the Cape colonists when as yet those amphibians abounded in the rivers of that colony. The skin of the hippopotamus is turned to profitable account in the manufacture of elastic whips, which are in great demand throughout the African continent. The skin, according to Schweinfurth, when fresh is cut into long quadrilateral stripes, which when half-dried are trimmed with a knife and afterwards hammered out, like iron on an anvil, into round whips. As several hundreds can be made from a single hide, that part is of considerable commercial value. Still more valu- able are the tusks and incisor teeth, which, from their extreme hardness and the fact that they do not rearlily become yellow, are now largely used in the manufacture of artificial teeth. The hippopotamus formerly abounded in such rivers as the Nile, the Niger, the Senegal, and most of the rivers of South Africa. It is now, however, beconi- ing gradually more restricted in its distribution, having disappeared altogether from the Egyptian Nile,—although still abundant in its Abyssinian tributaries,—as well as from the rivers of Cape colony.

The Liberian hippopotamus (Cheropsis liberiensis), the only other existing member of the family, is exceedingly rare, having been only known until recently from the two It differs from the common species in possessing only one pair of incisors in each jaw instead of two, and in several other minor points. A few years ago a young specimen of this rare species was brought alive to England from the Scarcies river, north of Sierra Leone, but it died soon after landing. The species is found on the west coast of Africa and on certain of the rivers flowing into Lake Chad.

Although there are thus only two living species, both of which are confined to Africa, the hippopotamus family was both larger and more widely distributed in former periods of the earth's history, fossil remains of at least nine species having been found in the Tertiary deposits of Europe and India. In Europe they occur as far north as Belgium and the south of England, but they are found nowhere in such abundance as in the island of Sicily, from which they were formerly exported in shiploads to England and France, where they were used in the manufacture of lamp-black and manure. The occurrence of those animals in a place which they could not possibly have reached had it always been an island, is regarded as one of the many proofs that dry

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PLATE I.

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When insertion throughout the text is desired, the Plates to be placed opposite

the following pages :-— Plate VII. page 430

Plate XII. page 470

Plate I. page 80

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NINTH EDITION

VOLUME XII

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MopERN IlISroRY AND PRESENT DISTRIBUTION OF NortH AMERICAN INDIANS. Copyright, 1880,

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IRING, in law, may be defined as a contract by which one man grants the use of a thing to another in re- turn fora certain price. It corresponds to the locatio-con- ductio of Roman law. That contract was either a letting of a thing (/ocatio-conductio rei) or of labour (locatio operarum). The distinguishing feature of the contract was the price. Thus the contracts of mutwum, commodatum, depositum, and mandatum, which are all gratuitous con- tracts, become, if a price is fixed, cases of locatio-conductio. In modern English law the term can scarcely be said to be used in a strictly technical sense. The contracts which the Roman law grouped together under the head of locatio- conductio—such as those of landlord and tenant, master and servant, &c.—are not in English law treated as cases of hiring but as independent varieties of contract. Neither in law books nor in ordinary discourse could a tenant farmer be said to hire his land. Hiring would generally be applied to contracts in which the services of a man or the use of a thing are engaged for a short time. HIRSCHAU, or Hirsav, a village within the amt of Calw and the circle of Schwarzwald, Wiirtemberg, on the Nagold, is a station on the Pforzheim-Horb Railway, and has paper and other factories. Population 800. It owes its origin and its historical interest to the now ruinous 3enedictine monastery in the neighbourhood, the Monas- terium Hirsaugiense, at one period one of the most famous in Europe. It was founded in 830 or 832 by Count Erlafried of Calw, at the

instigation of his son, Bishop Notting of Vercelli, who enriched it with, among other treasures, the body of St Aurelius. Its first occupants (838) were a colony of fifteen monks from Fulda, disciples of Hrabanus Maurus and Walafridus Strabus, headed by the abbot Liudebert. During about a century and a half, under the fostering care of the counts of Calw, it enjoyed great prosperity, and became an important seat of learning ; but towards the end of the 10th century the ravages of the pestilence combined with the rapacity of its patrons, and the selfishness and immorality of its inmates, to bring it to the lowest ebb. After it had been desolate and in ruins for upwards of sixty years it was rebuilt in 1059, and under Abbot William "der Selige " (1069-1091) more than regained its former splendour. By his Constitutiones Hirsaugienses, a sort of new religious order, Ordo Hirsau-

giensis, was formed, of which the rule was afterwards adopted by many monastic establishments througlont Germany, such as those of Blaubeuren, Erfurt, and Schaff- hausen. The friend and correspondent of Pope Gregory VIL, and of Anselm of Canterbury, he took active part in the politico-ecclesiastical controversies of his time; while a treatise from his pen, De Musica et T'onis, as well as the Philosophicarum et astronomicarum institu-tionwm libri IIT,, bears witness to his interest in science and philosophy. About the end of the 12th century the material and moral welfare of Hirschau was again very perceptibly on the decline ; and it never afterwards again rose into importance. In consequence of the Reformation it was secularized in 1558 ; in 1692 it was laid in ruins by the French. The Chronicon Hirsaugiense, or, as in the later edition it is called, Annales Hirsaugienses of Trithe- mius (Basel, 1559 ; St Gall, 1690), is, although containing much that is merely legendary, an important source of information, not only on the affairs of this monastery, but also on the early history of Germany. The Codex Mirsau- grensis was printed at Stuttgart in 1844. See Christmann, Geschichte des Klosters Hirschau (1782); Steck, Das Kloster Hirschau (1844); Wolff, "Joh. Trithemius u. die Alteste Geschichte des Klosters Hirschau," in the Wirttembergisches Jahrbuch for 1863; and Helmsdérfer, Lorschungen zur Geschichte des Abts Wilhelm von Hirschau (Gottingen, 1874).

HIRSCHBERG, the chief town of a circle in Prussian Silesia, government district of Liegnitz, is beautifully situated at the confluence of the Bober

and Zacken, and on the Silesian mountain railway, 30 miles S.W. of Lauban by rail. It is the seat of a circle court and of a chamber of commerce. A great portion of its old walls still remains, and to the south of the town there are pleasant promenades. It possesses an Evangelical church, one of the six stipulated for in the agreement between Charles of Sweden and the emperor Joseph I. in 1707 ; four Catholic churches, one of which dates from the 14th century ; a synagogue, an Evan- gelical gymnasium, a school of the middle grade, a female school of the higher grade, an orphanage, and an asylum, The town is the principal emporium of commerce in tlie Silesian mountains, and its industries include the carding and spinning of wool, and the manufacture of linen and

cotton fabrics, Brabant lace, veils, artificial flowers, paper, Portland cement, porcelain, sealing-wax, blacking, chemicals, machines, fire-engines, champagne, and cider. There 1s also a lively trade in corn and agricultural produce. The town is celebrated for its romantic surroundings, including the Cavalierberg, from which there is a splendid view, the Hausberg, the Helicon, crowned by a small Doric temple, the Kreuzberg, with walks commanding beautiful views, and the Sattler ravine, over which there isa railway viaduct. The population in 1875 was 12,954.

Hirschberg was in existence in the 11th century, and obtained town rights in 1108 from Boleslaus III. of Poland. It withstood a siege by the Hussites in 1427, and an attack of the imperial troops in 1640. The foundation of its prosperity was laid in the 16th century by the introduction of the manufacture of linen and veils.

HIRTIUS, Avtus, one of Cesar’s chief supporters and most intimate friends. He was with him as legatws in Gaul. After the civil war broke out in 49 B.c., he seems to have been generally stationed in Rome to protect Crxesar’s interests there. He was a personal friend of Cicero, and used his influence with Crsar in behalf of the orator’s brother and nephew. He was nominated along with Pansa by Cesar for the consulship of 43 B.c.; and after the dictator’s assassination in March 44, this honour made him for a

short time one of the leading actors in that troubled time. The consuls supported the senatorial party against Antony, and led their armies into Umbria, where Antony was blockading Dec. Brutus in Mutina. On March 27th a double battle was fought: in the first Antony had the upper hand, and Pansa was mortally wounded; and in the second Hirtius completely defeated the enemy, but was himself killed in the subsequent assault on the enemy's camp. Hirtius was perhaps an author: the eighth book of Ceesar's commentaries on the Gallic war, which was certainly not written by Cesar himself, is commonly at- tributed to him; and the accounts of the Alexandrian, African, and Spanish wars are perliaps also due to his pen.

HISPANIOLA, See Haytt.

HISSAR, a British district belonging to the division of the same namie,! in the lieutenant-governorship of the Punjab, India, lying between 28° 36' and 29° 49' N. lat., and between 75° 16' and 76° 22' E. long. It is bounded on the N. and N.W. by the Patiala state and a small portion of the British district of Sirsa, on the EF, and S. by the territory of Jhind and the British district of Rohtak, and on the W. by the deserts of Bikaner. Area, 3539 square miles ; population (1868), 484,681.

Hissar forms the western border district of the great Bikaner desert, and consists for the most part of sandy plains dotted with shrub and brushwood, and broken by undulations towards the south, which rise into hills of rock like islands out of a sea of sand. The Ghaggar is its only river, whose supply is uncertain, depending much on the fall of rain in the lower Himilayas ; its overflow in times of heavy rain is caught near Fatehdbad and Murakhera by jhils, which dry up in the hot season.

Rice is the staple crop of the district. In favourable seasons, cotton is extensively grown in lands irrigated by the Western Jumna Canal. In 1872-73, 1,431,541 acres were under tillage, out of an assessed area of 2,265,428 acres. Hissdr produces a breed of milk-white oxen, 17 or 18 hands in height, which are in great request for the

2 The division of Hissar is under a commissioner, and comprises the three districts of Hissar, Rohtak, and Sirsa. Area, 8478 square miles. Population (1868), 1,232,435

carriages of natives. The district has always been subject to famine. The first calamity of this kind of which we have authentic record was the famine of 1783; since then there have been several more or less serious failures of the crops.

The principal exports are oil-seeds, gram, grains, copper and brass utensils, hides, and a little cotton ; the imports —salt, sugar, fine rice, cotton goods of English make, spices, and iron. The exports are double the imports in value. The rural manufactures comprise coarse cotton cloth, vessels made of prepared skins, and copper and brass vessels, The annual out-turn of rough saltpetre is esti- mated at 450 maunds. The trade of the district centres in Bhawdni, where nine lines of traffic converge. The main road, about 50 feet wide, unmetalled, traverses the district, passing through Hansi and Hissar towns ; four- teen other roads supply communication. The census of 1868 returned the population at 484,681 (males, 266,847 ; females, 217,834). The Hindus numbered 373,937 ; Mahometans, 102,928; Sikhs, 1812; and “ others,” 6004. There are three municipalities, viz, Bhawani, 32,254 ; Hissdr, 14,133 ; and Hansi, 13,563. The district police numbered 396 men in 1872-73, and the municipal police 174. In the same year there were 50 schools, with 1729 scholars. The climate of Hissar is very dry ; hot westerly winds blow from the middle of March till July. The average rainfall for the six years 1867-68 to 1872-73 was 14°57 inches. The principal diseases are fevers and small- pox. Cholera occasionally breaks out. Skin diseases also are common. Government dispensaries are situated at BhawAni and Hansi.

Prior to the Mahometan conquest, the semi-desert tract of which Hissar district now forms part was the retreat of Chauhan Rajputs. Towards the end of the 18th century, the Bhattis of Bhattiana gained ascendency after bloody struggles. To complete the ruin brought on by these conflicts, nature lent her aid in the great famine of 1783. Hissar passed nominally to the British in 1803, but they could not enforce order till 1810. Early in the mutiny of 1857 Hissar was wholly lost for a time to British rule, and all Europeans were either murdered or compelled to fly. The Bhattis rose under their hereditary chiefs, and the majority of the Mahome- tan population followed their example. Before Delhi had been recovered, the rebels were utterly routed.

Hrsshr, municipal town and administrative head- quarters of the above district, 29° 9’ 51” N, lat., 7 5° 45’ 55” E. long.; population (1868), 14,133 (Hindus 9211, Mahometans 4805, Sikhs 34, Christians 83). The town is situated on the Western Jumna Canal, 102 miles W. of Delhi. It was founded in 1354 by the emperor Firoz Shah, who constructed the canal to supply it with water ; but this fell into decay during the last century, owing to the constant inroads of marauders. Hissar was almost completely depopulated during the famine of 1783, but was afterwards occupied by the adventurer George Thomas, who built a fort and collected inhabitants. It contains a cattle farm, both for commissariat purposes and for improv- ing the breed of the province ; attached is an estate of 43,287 acres for pasturage. There is an import trade in grain, ghi, sugar, oil, cotton, tobacco, and English piece goods. The municipal revenue in 1875-76 was £1229.

HISSAR, a state in Central Asia, lying between the meridians of 66° 30’ and 70° E. and the parallels of 39° 15’ and 37° N., and dependent on the amir of Bokhara. It forms that part of the basin of the Oxus which lies on the north side of the river, opposite the Afghan province of Balkh. The western prolongation of the Tian Shan, which divides the basin of the Zarafshan from that of the upper Oxus, after rising in one peak to a height of 12,300 feet, bifurcates in 67° 45′ E. long. Its two arms include be- tween them the province of Shahr-i-Sabz, with the towns of Shahr Sabz, Kitab, Yakobagh, and Karchi. The main chain and the southern arm of its bifurcation, sometimes

called Koli-i-tan, form the N. and N.W. boundaries of Hissar. On the W. it is wholly bounded by the desert; the Oxus limits it on the S. and S.E.; and the states of Karategin and Darwaz complete the boundary on the E. Until 1875 it was one of the least known tracts of Central Asia, but in that year a Russian expedition from Tashkend traversed and surveyed a great portion of it, and since then successive expeditions have explored various other portions, so that it is now very fairly known. Hissar is traversed from north to south by four important tributaries of the Oxus, viz., the Surkhab or Vakhsh, Kafir- nihan, Surkhan, and Shirabad-Daria, which descend from the snowy mountains to the north and form a series of fertile valleys,

disposed in a fan-shape, within which lie embosomed the principal towns of Hissar. The two chief roads by which Hissar is approached from Bokhara and Russian Turkestan lie through Karchi and Shahr-i-sabz respectively. Both these routes unite at Ak-roba, on the crest of the range between Khuzar and Baisun. There is also a difficult route, running through fine forests from Yakobagh across the mountains to Sarijui. A little way down the other side of the mountain chain between Khuzar and Derbend is situated the famous defile formerly called Kohluga (Mong. “ Barrier”) and the Iron Gate, but now styled Buzghol-khana or Goat’s House. ‘This pass is described by the Russians, who visited it and were vividly impressed with its solemnity, as a huge but narrow chasm in a transverse range, whose frowning rocks overhang and threaten to choke the tortuous and gloomy corridor (in places but 5 paces wide) affording the only exit from the valley. In ancient times it was a vantage point of much importance, and commanded the chief route between Turkestan and India. Hwen-Tsang, who passed through it in the 7th century on his way south- ward, states that there were then two folding doors or gates, cased with iron and hung with bells, placed across the pass. Clavijo, the Spanish ambassador to the court of Timur, lieard of this when he passed through the defile 800 years after, but the gates had then disappeared. Derbend, the first inhabited place met with, is a poor village in the valley of the Shirabad-Daria, along which runs the road to the Oxus and to Afghanistan. Shirabad town itself is a place claiming great antiquity. It has a citadel and three rows of walls, and with its surrounding villages presents the aspect of a flourishing oasis. There are four ferries over the Oxus in the Shirabad chiefship or district, viz., Chush-ka-guzar (boar’s ferry), Patta-kissar, Shur-ab, and Kara- kamir.

Baisun, a picturesque Uzbek town considered to be very healthy, lies on the road from Derbend to Hissar town. Emerging from the somewhat complex mountain mass which fills up this part of Hissar, the valley of the Surkhan is reached. This large river is formed by several affluents froml the snowy rauge to the north, one of which, the Tupalan, formerly gave its name to the whole stream. The valley in its upper part is between 40 and 45 miles wide ; the banks of the river are flat and reed-grown, and are frequented by wild hogs and a few tigers. The Surkhan valley is highly cultivated, especially in its upper portion, where the villages are crowded. It supplies Bokhara with corn and sheep, but its chief products are rice and flax. When Hissar was

independent the valley of the Surkhan was always its political centre, the town of Hissar being simply an outlying fortress. Passing by four fortified towns, Dehinau, Sarijui, Regar, and Karatagh, all in the basin of the Surkhan, Hissar (=fort) claims notice. Its position at the entrance of the Pavi-dul-dul defile com- manded the entrance into the fertile valleys of the Surkhan and Kafirnihan, just as Kubadian at the southern end of the latter stream defended them from the south. The

famous bridge of Pul-i-sanghin (stone bridge, Tash-kepri in Turkish) lies on the road from Hissar and Kafirnihan to Baljuan and Kulab. It spans the Surkhab, which is here hemmed in between lofty and precipitous cliffs barely 30 paces apart. The bridge itself abuts on projecting rocks, and is ten paces wide. The next place of importance is Kulab, in the valley of the Kichi Surkhab, so called from the lakes or inundations near which it stands. The dis- trict is part of that once famous as Khotl. The town (which, strictly speaking, is the capital of Kulab district as distinct from Hissar) contains about 500 houses and a poor citadel, and from it there are roads to Badakhshan and Kurgan-tepe and Kubadian. These two lie in the valleys of the Vaksh (or Surkhab) and Kafirnihan respect- ively. Kulab produces wheat in great profusion, and gold is brought thither from the surrounding districts. Kubadian is a large, silk-producing town, and is surrounded with rice-fields. Formerly the two Jast-named valleys were densely peopled, and a series of settlements extended soutli- ward from Dehinau, from which town an arik or canal pro- vided the city of Termez with water. Termez, or Termedh, was an ancient and important city on the Oxus. After being destroyed by Jenghiz Khan and lying for some time in ruins, it rose again into note in the following century, and wlhien visited by Ibn Batuta, and later by Clavijo, it had grown again into a place of some importance. It is now a mass of ruins.

The population of the districts of Hissar and Kulab consists principally of Uzbeks and Tajiks, the former predominating, and, as inthe valleys of the Sir and Zarafshan, gradually pushing the aboriginal Tajiks into the hills. East of Dushamba the Tajiks are the dominant race. Qn the banks of the Oxus there are some tribes of Baigush Turkmans who work at the ferrics, drive sheep, and accompany caravans. Lyuli (gipsics), Jews, Hindus, and Afghans are also to be found in Hissar. But the Uzbeks are the most

numerous, and their influence is so great that at Bokhara Hissar is known as Uzbekistan. The climate of the valleys of Hissar and Kulab is pleasant, as they are shut in by moun- tains to the north and open towards the Oxus to the south. Baisun (3410 feet) is the most elevated town. Hissar aud Kulab produce in abundance all the cereals and garden plants indigenous to Central Asia. Cotton is grown in considerable quantities in the district of Shirabad, whence it is exported by way of Khuzar to Karshi. The difficulties of transport would prevent its being brought in any quantity from other places. Dehinau, Hissar, and Dushamba export corn and flax to Bokhara. From the vicinity of Khuzar is exportcd rack-salt, and sheep are brought to Bokhara and Karshi from all parts of Hissar district, as well as from Baljuan, Yurchi, and Afghanistan. A spccies of juniper, called archa, is used for timber. Salt is found at Bash-kurd, in the mountains of Hazret-Imam, and at other places. There are numerous brine springs in various quarters, indicating generally an inexhaustible supply of rock-salt. Auriferous sand has been discovered in the Vaksh, and the inhabitants wash the sands after the floods in spring. Merchandize is conveyed by means of camels, mules, and horses from Hissar to Karshi and Bokhara. Not a single waggon is to be found in the district, and the wooden arba is not even known there. Politically, Hissar now consists of seven sub-dis- tricts, governed by begs, Shirabad, Baisun, Dehinau, Yurchi, Hissar, Kurgan-tepe, and Kubadian; and Kulab of two, Baljuan and Kulab. The fact of the chief route between the Russian aud British possessions in Asia lying through Hissar has served of late years to bring it into prominence, and will always invest it with a certain importance.

History.—Our knowledge of the history of Hissar is most frag- mentary. In early written history this country was part of the Persian empire of the Achemenide, and probably afterwards of the Greco-Bactrian kingdom, and then subject to the Eastern swarms who broke this up. In the time of the Sassanian kings of Persia it was under the Haiathalah, the Ephthalites or White Huus of the Greeks, subdued by the Turks in the early part of the 7th century, these soon to be displaced by the Mahometan power. Termedh, Kubadian, and Chagaman are named as places of importance by the Arab geographers of the 10th century ; the last name was also applied territorially to a great part of the Hissar province, but is now obsolete. The country was successively subject to the Mongol Chagatai dynasty and to Timur and his

successors ; it afterwards became a’ cluster of Uzbek states of obscure history. Hissar was annexed by the amir of Bokhara in 1869-70, soon after the Russian occupation of Samarcand. (C, E. D. B.)

HISTOLOGY

I. AnIMAL HiIsToLoey.

NIMAL HISTOLOGY (from iovés, a web or tissue, and Aédyos, discourse) is the study of the minute structure of the tissues of animals. By a tissue is meant any part of an organism which has undergone special changes in structure in adaptation to the performance of special functions. These special changes are expressed by the general term “ differentiation.” In the lowest animal organisms, the whole of whose bodies are composed of the undifferentiated living substance termed ‘‘ protoplasm,” we find all its functions shared by every part of the organism. An amoeba, for example, it is well known, is capable of finding, seizing, devouring, digesting, and assimi- lating food, has a special provision for collecting fluid and pumping it out of its body, respires by its whole surface, moves about apparently where it will, exhibits a sensibility to tactile impressions, and reacts in all probability to smell if not to sound and light,—in short, is capable of perform- ing, although with the lowest possible amount of activity, almost every function which animals vastly higher in the scale of organization exhibit. But even in the amoeba we cannot say certainly that there is no differentiation of its protoplasm. For a condensed portion—the nucleus—is set aside to initiate the reproductive function, and it is by means of the external and firmer layer (ectoplasm) that its movements are effected and its relations with the external world maintained, while the internal more fluid protoplasm (endoplasm) is concerned with the digestion of the food. Still there are simple organisms whose protoplasm is pro- bably absolutely undifferentiated. On the other hand, there are other organisms which are also regarded as composed of simple protoplasm, and are constituted by a single cell, which nevertheless show a marked progress in the dif- ferentiation of portions of their substance apart altogether from the presence of a nucleus. Such differentiation in unicellular organisms generally takes the form of the pro- duction of asheil or “test,” asin the Foraminifera and in Noctiluca, which subserves purely passive functions of sustentation or

defence. It is not certain in such cases whether the structure thus produced is formed by the direct conversion of the protoplasm or by an exudation on the surface which subsequently hardens. But portions of the protoplasm may be set aside for the performance of active functions. We see this in its production in the form of locomotory organs, either temporary (pseudopodia) or permanent (cilia). But in neither of these can any actual change in the minute structure of the protoplasm be observed. A differentiation does, however, occur in one remarkable instance—the flagellum, namely, of the WVoc- tlucide (fig. 1), which exhibits as definite a transverse striation as does the cross-striated or voluntary muscular tissue of the higher animals, in which structural peculiarity it is impossible not to infer a relation to its contractile func- tions ; and similarly, in the Vortzcellide, there is a differen-

tiation of the protoplasm of the rapidly contractile stalk. Whereas in the more highly organized unicellular animals portions of the single cell are thus set aside for the perform- ance of special functions, and modified in structure accord- ingly, in multicellular animals, on the other hand, we find whole cells and sets of cells set apart and differentiated. It is to such modifications in sets of cells in multicellular organisms, rather than in portions of the protoplasm of a unicellular organism, that “histological differentiation ” is commonly restricted; and each such set of cells, destined for the performance of a special function, and modified

accordingly in structure, is denominated a “ tissue.”

The animal tissues may be classed under tlie four heads of Epithelium, Connective Tissue, Muscular Tissue, and Nervous Tissue Of these four classes of tissue the epithelium is the most primitive and least altered. In the development of the Metazoa the numerous embryonic cells which result from the division of the single cell—the ovum —tend in nearly every case to arrange themselves as a single layer surrounding a central cavity (unilaminar condition of the blastoderm), (fig. 2, A).2 Presently a part of the wall of the hollow sphere becomes invaginated, so that, instead of a vesicle enclosed by but a single layer of cells, a cup (Gastrula, Haeckel), is produced (fig. 2, B), the wall of which is formed by two layers derived from the original single layer, and separated from one another by a narrow

interval (which is all that remains of the original cavity of the vesicle) except at the orifice of the cup, where they are continuous (bilaminar condition of the blastoderm), At this part some cells become separated from one or both of

Fig. 1.

Fig, 1.—Flagellum of Woctiluca miliaris (highly magnified).

striated substance ; 6, base of attachment to body of animal.

Fic. 2.—Sections through the unilaminar (A), bilaminar (B), and trilaminar

(C) conditions of the typical blastoderm, ct., ectoderm; £nt., entoderm ; Mes., nesoderm ; ¢, primitive connective tissuc.

Fig. 2.

s, transversely

these two primary layers, and, extending in and occupying the cleft-like space which separates them, become a third layer of cells, which differs from those of the other two in not being arranged into a continuous membrane, and not, therefore, forming an epithelium (trilaminar condition of the blastoderm), (fig. 2, C). Now, of these three layers, the outer one, or ectoderm, and the inner one, or entoderm, give rise to all the epithelial tissues of the body. The nervous tissues are also derived from the ectoderm ; whereas the connective and muscular tissues originate in the meso- derm or middle layer. In most of the Colenterata, how- ever, the mesoderm is not developed at one part only of the embryo as in the higher Metazoa. In the hydroid polyps and Medusc it never becomes completely distinct from the ectoderm and entoderm, although a jelly-like sustentacular substance may be formed to a greater or less extent between the two primary layers, and cells may pass into it from one of them, so that a kind of mesoderm is thus produced, In the Medusc, also, the muscular function is performed by

1 The characters of the several tissues and their varieties are best known as they occur in the Vertebrata, and a description of them will be found in the

article on ANATOMY.

2 A layer of cells which thus forms a membrane by the union of the cells, with an imperceptible amount of intercellular cementing sub- stance, would properly fall under the definition of the term epithelium, which was first applied by Rnysch to the cellular membrane covering the lips, and has ever since been used to designate membranes thus composed of cells alone.

) ANIMAL.]

cells which either still have their place in the general layer .

of the ectoderm or are but imperfectly separated from it ; and here, again, the conimencing separation does not occur at one part only, but over extensive tracts of the surface. Nevertheless these cells are modified in structure precisely in the same way as those which in higher animals are derived from the mesoderm. The nervous functions are also performed by cells and fibres, which, although they show those modifications of structure which in the higher animals are characteristic of nervous tissue, yet remain strictly confined to the ectoderm, and do not, as in the higher animals, penetrate into the mesoderm.

The Epithelial Tissues. —Although, as we have seen (see p. 4, note 2), the layers of cells which are first formed are layers of epithelium, and, therefore, the epithelial tissues are the first to be produced, nevertheless we find that they undergo less modification in structure than any of the other three classes of tissue. As before said, they invariably con- sist merely of cells cemented together by an imperceptible amount of intercellular substance,! and the cells them- selves only show minor degrees of modification in shape and structure, at least as compared with the other tissues constituted mainly of cells, namely, the muscular and nervous.

Modifications in Shape of Epithelial Cells.—The cells of this tissue may be either elongated and set like palisades over the surface which they cover, in which case they are termed “columnar” (fig. 3), or they may be flattened out over the surface, and they then appear as thin “scales”; and every variation in shape is met with between these two extremes. In any case where they form a single layer, since the cells are set closely together, the

mutual apposition of neighbouring cells produces a flattening of the opposed sides, so that, when the epithelium is looked at from the surface, the cells have a polygonal outline, and collectively present the appearance of a mosaic pavement (fig. 4). In

Fig. 4.

Fic. 3.—Columnar epithelium cells, Fic. 4.—Mosaic appearance of epithelium. Fic. 5.—Stratified epithelium.

certain cases, especially where there is liability to abrasion of the surface which they cover, the epithelial cells are dis- posed in two, three, or more superimposed layers (fig. 5), and then the cells of the different layers may vary much in size, shape, and consistence. Such an epithelium is termed “stratified.”

It frequently happens that the layer of epithelium which covers a surface is prolonged into depressions, which may be quite simple or may be ramified either slightly or in the most complex manner. The epithelial cells which line such depressions may resemble those of the surface upon which the depression opens, or they may become more or less modified in size, shape, and other particulars, and con- stitute themselves into a distinct variety of epithelial tissue. Since depressions like those just mentioned are generally for the purpose of forming some special secretion, and are termed glands, and since this secretion is elaborated by the agency of the epithelial cells which line the gland, any such special ee so. 8 0 oe eS

- Exceptions to this general rule are seen in the layer of cells which underlies the chitinous cuticula of annelids (Claparéde), and in the enamel organ of the developing teeth of vertebrates (Kolliker), where the cells, although epithelial, are ramified and united by their branches Into a network; and, in a far less degree, in many of the lower cells of a stratified epithelium, where it can be seen with a high power that the edges and surfaces of the cells are provided with numerous short projections which are applied to those on adjacent cells.

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variety of epithclium is termed a “glandular” or “secreting” epithelium.

Modifications in Structure.—The modifications in struc- ture which the cells of epithelial tissue undergo are com- paratively slight. One of the most common is the conver- sion of the external layer of the protoplasm of the cell into a firm membrane, generally of a horny nature, but this membrane is seldom sharply marked off from the substance of the cell, as is the case with the cellulose membrane of the vegetable cell. It becomes formed, moreover, to a very different extent in different cells, according to the function which the particular epithelium has to perform; where, for example, the epithelium is almost purely a protective cover- ing, as in the stratified scaly epithelia, a considerable part, or even the whole thickness of many of the epithelial cells, is thus transformed ; but where, on the other hand, the cells have to play an active part in yielding a secretion to moisten the surface, or in protruding a portion of their protoplasm in the form of vibratile cilia to produce currents over the surface, or to move the organism through the water, we find little, if any, of such conversion of the superficial cell-substance. What little there may be is con- fined to the attached surfaces of the cell, or if there is any such covering on the free surface, it is penetrated by pores which allow of a communication between the protoplasm of the cell and the external medium.

Another common modification of structure which epi- thelial cells exhibit is the existence of vibratile cilia at the free surface (fig. 6). This, again, is especially frequent with cells of a columnar shape, but it may occur in any. The cilia appear to be protrusions of the more active external protoplasm of the cell, which are in most cases incapable of being again witlidrawn, and are in all probability modified in minute structure, although they are always so small that such modi- fication, if it exists, escapes detection even with the employinent of the highest powers of the microscope. At their base, however, the cilia are certainly con- tinuous with the unaltered proto- plasm of the cell. This may be

Fig. 7. Fig. 8. Fia. 6.—A ciliated epithelium eell. Fig. 7.—A striated epithellum cell. Fig. 8.—A ciliated cell with one large cilium. Fig. 9.—Sense-epithelium cell of Aurelia.

seen even where the cilia are small and spring in a bunch from the free surface of the cell, but much better in those kinds of ciliated epithelium in which but a single large cilium is connected to each columnar cell (fig. 8).

Many epithelial cells, especially those of secreting glands, show a differentiation of their protoplasm in the form of fine strize or rods which pass from the attached border of the cell towards the free end (fig. 7). Cells thus modified are found in the ducts of the salivary glands, in the alveoli of the pancreas, and in the convoluted tubules of the kidney in Vertebrata.

One of the most remarkable modifications which epithe- lium cells exhibit is found in the organs of special sense. This is the presence of a fine filamentous process or processes springing from the free surface of the epithelium cells, and resembling in their appearance long cilia, but not spontane- ously vibratile (fig. 9). Moreover, the cells in question,

Fig. 9.

which are generally of an elongated columnar form, com- monly branch out at their detached end into fine processes which appear to become connected with nerve-fibres. Cells of this character occur even so low in the Mfetazoa as the Meduse, in connexion with the nerve-epithelium to be afterwards mentioned. And, indeed, in many cases where cells of this character enter into the constitution of the sense organs, it is probably most consistent with their true nature to regard them as detached portions of nervous tissue, which also in every case is originally of an epithelial nature.

Modifications in the Cell Contents.—Another chief modification which the cells of an epithelial tissue may undergo consists in the accumulation within the cells of various chemical substances, which may be either taken in bodily as such, or may be formed in the cell from other substances which are sup- plied to it by the blood. The substances that are thus accumu- lated and formed within the cells of an epithelium are of very various nature, as, for example, the constituents of special secre- tions (fig. 10), mucin, pigment, fatty globules, uric acid, &c., &e. These several substances are toler- ably constant in an epithelium of the same kind—thus, mucin is a

very frequent constitucnt of columnar epithe- lium, and in glands which have the same function in different animals, the same substances are found in the epithelium cells of the gland.

Exudation from Epithelium Cells. Formation of Cuti- cular Structures.—In many invertebrates the epithelium which covers the surface of the body, and sometimes also that which lines a part of the alimentary canal, forms an exudation which is generally soft at first, but may after- wards harden into a horny consistency, or may be rendered still harder and at the same time more brittle by impregna- tion with earthy salts. Any such structure is termed a cuticular formation. It raay be composed of a single thin layer, or a number of layers may be superimposed, so that a “shell” of considerable thickness is thus formed. The chitinous or calcareous covering which forms the exoskeleton in many molluscs, arthropods, annelids, and Hydrozoa is of this nature. On the other hand, the firm skeletons of sponges, Actinozoa, and Echinodermata are formed by deposition in the connective tissue.

The Connective Tissues—The connective tissues are characterized by the great development of intercellular substance in comparison with the cells ; indeed in those animals in which connective tissue may first of all be said to appear, there is an entire absence of cellular elements properly belonging to the tissue. This is the case in many of the Celenterata, in which the connective tissue is repre- sented merely by a layer, more or less thick, of hyaline substance, which undoubtedly performs a sustentacular function, in addition to connecting together the epithelial layers of the ectoderm and entoderm.

The intercellular or ground substance almost invariably takes a prominent part in the formation of connective tissue. It is of a semi-fluid nature, and often contains in addition to albumen a certain amount of mucin. In most cases the cells of the connective tissue separate themselves from the primary layers before the formation of this ground substance ; indeed the mesoderm is at first chiefly formed of these cells) The stages of development are as follows. The mesodermic cells, which are at first in apposition, become separated from one another by the accumulation of intercellular substance, but at the same time main- tain a connexion with one another throughout the tissue by

Fig. 10.—Epithelium cells of renal organ of molluse con- taining crystals of uric acid. (Boll.)

their branching cell-processes (see fig. 2, C, c). Presently, in the production of ordinary connective tissue, fibres of two kinds make their appearance in the intercellular sub- stance, and to all appearance independent of the cells. Those of the one kind (fig. 11, A) are highly elastic and refracting, not easily affected by reagents, stain deeply with magenta, run singly, always branch, and become united with neighbouring fibres so as to form a network throughout the tissue ; those of the other kind “ (fig. 11, B) are exces- sively fine and indis- tinct, never run singly Fig. 11.

but always in bundles, and generally with a wavy course, are readily affected by reagents, and, in vertebrates, yield gelatin on boiling. Inthe various kinds of connective tissue the re- lative proportion of these two kinds of fibres to one another and to the cellular elements of the tissue varies. Thus in the so-called elastic tissue of the Vertebrata the elastic fibres greatly preponderate; in tendinous tissue, on the other hand, they are scarcely to be found, and the ground is almost wholly occupied by the white fibres. It may happen that the intercellular substance is so completely occupied by the fibres as to be entirely obscured, but its presence may be always recognized in consequence of the property which it possesses of reducing silver from its salts when exposed to the light. In certain cases the inter- cellular substance becomes hardened by the deposit within it either of a substance termed chondrin, which confers upon it the well-known toughness and elasticity of carti- lage, or by a deposit of earthy salts imparting to it the firmness of bone. These several changes in the inter- ecllular substance are accompanied by special modifications in the form and relations of the cells (by whose agency they are in all probability effected). In comparatively rare cases the intercellular substance which is found occupying the meshes of the network formed by the branched cells of the developing connective tissue may disappear entirely, and the meshes may be occupied either by blood or by the lymph or plasma of the blood (spleen and lymphatic glands of vertebrates).

It frequently happens that the connective tissue presents the consistence of jelly, and this is generally ascribed to the characters of the intercellular substance. It may, how- ever, be due in many cases to the entanglement of fluid in the meshes of the fibres, and not to a gelatinization of the ground substance. This is shown by the fact that the fluid may be drained from out the meshes by means of filter paper. And the possibility of the formation of a jelly in this manner is evidenced in the coagulation of lymph, where the apparently solid gelatinous clot is a tangled meshwork of fine filaments enclosing fluid.

The connective tissues of invertebrates are, on the whole, similar to those of the vertebrate; at the same time it must be admitted that there are not unimportant differ- ences in chemical constitution, such as the absence of a substance yielding gelatin, and the absence for the most part of mucin, both of which are characteristic constituents of vertebrate connective tissue. On the other hand the anatomical characters of the elements, both cells and fibres, are in most cases sufficiently well marked to be recognizable.

In the sponges the bulk of the animal is made up of a jelly which, when examined under the microscope, is found

to consist of large branched cells (fig. 12) connected to- gether by their processes into a network. The meshes of this are occupied by clear intercellular substance within which the calcareous or horny matter which forms the skeleton is deposited.

Fig. 12.—Connective tissue of sponge. (F. E. Schulze.)

When the development of the sponge is traced it is found that the first part of the tissue to be seen is the clear inter- mediate substance, and the skeletal spicules begin to appear in this before the cellular elements. These wander subse- quently into it from one of the primary layers. There can be no doubt that this jelly-like tissue of the sponge repre- sents a primitive form of connective tissue, although, so far as has at present been ascertained, no fibres are developed in it.

In the Celenterata, as in the sponges, the connective tissue makes its first appearance in the form of a clear intermediate substance, which may be so small in amount as to be almost imperceptible, or so large in amount as to form the main bulk of the organism. In the former case, a8 in the developing sponge, there is an entire absence of both fibres and cells, whereas in the latter case both kinds of elements are found. The fibres are the more con- stant, and are of the elastic kind (fig. 13); they have for the most part a direction across the thickness of the tissue stretching from ento- derm to ectoderm, branching and uniting with their neigh- bours to form the character- istic network which, enclosing watery fluid in its meshes, produces the jelly-like con- sistence of the tissue. Fibres of the white variety are also found as low down in the Metazoa as the Celenterata. In some of the acraspedote Meduse they occur in the form of bundles of indistinct wavy fibres situated near the surface of the jelly, and in the Actinie similar fibres are found forming membranes which bear a strong resemblance to some of the forms of membranous connective tissue of the Vertebrata (fig. 14). As before

Fic. 18.—Cells and elastic fibres from connective tissue of Aurelia.

Fie, 14,—Fibres and cells of connective tissue of an Actinia. (Kolliker.)

mentioned, in the lower forms of Cwlenterata cells are en- tirely absent from their jelly-like connective tissue, but in the higher forms scattered cells (fig. 13) of indeterminate shape and position, but generally in the neighbourhood of the entoderm, begin to make their appearance. Some of these cells are amceboid, but others become fixed, and arranged in a network which pervades the jelly.

We see then that the cells, the intercellular substance, the white fibres, and the elastic fibres of the vertebrate connective tissue are represented in these low forms of the Metazoa in a perfectly recognizable manner. It is not

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surprising, therefore, to find in all the higher classes of the Invertebrata that similar elements characterize the connec- tive tissue, although there are undoubtedly certain modifica- tions and exceptions. The most noteworthy

modifications occur in the chemical constitution of the ground substance and of the fibres. Thus, as before mentioned, there is for the most part an absence of the gelatin-yielding substance of the vertebrate connective tissue. On the other hand, the intercellular substance may become infiltrated with chemical principles unknown in vertebrate histology, as in the tunic of the Z'wnzcata, where cellulose is found.! There are modifications also in the appearance of the connective tissue fibres which are often accompanied by modifications in the chemical constitution. For example, in the Arthro-poda the tissue often undergoes extensive chitinization, and the fibres in it present a straight, stiff appearance, very unlike the soft, wavy look which is exhibited by the fibrous tissue of the Vertebrata.

Although the ramified cell may be looked upon as on the whole the most characteristic form of cell met with in connective tissue, and although this is the first modification in shape which the rounded embryonic cells of the develop- ing vertebrate connective tissue take on, nevertheless it gives place in many parts both in invertebrates as well as vertebrates to other forms. One of the commonest of these is the flat cell, and we almost invariably find cells of this description lying on or in connective tissue membranes, and lining cavities which may have become formed in the con- nective tissue. In the latter case the flat cells may be and most commonly are spread over the whole inner surface of the cavity which they line, and assume the appearance of a pavement epithelium. Such cells, which are termed epithelioid (or by some endothelial), are found lining the body cavity and the vascular canals and heart (where these exist) of all invertebrates just as they do the similar cavities and canals in vertebrates, and they are derived like the rest of the cells of the connective tissue from the meso- derm, and therefore only indirectly from the primary blastodermic layers, But in the holothurians, and some other animals, the cells in question are derived directly from the entoderm.

In the Mollusca (fig 15) a peculiar type of connective tissue cell makes its appearance in addition to the rounded, the ramified, and the flattened forms. This takes the

Fic. 15.—Connective tissue of slug. r, ramified cell; /, flattened cell; v, vesicular cell, The fibres in the ground substance are also indicated. shape

of a large clear, vesicular, double-contoured cell-body (v) with a relatively small nucleus. Cells of this character are in some cases only to be found scattered here and there in the tissues, but in others they are closely col- lected masses, and by their aggregation confer an almost cartilaginous consistency upon the tissue. This is

1 This tunic seems, however, from its development to be an epithelial

| structure, although resembling in many respects connective tissue.

not due, however, to the accumulation of chondrin—the chemical principle of the cartilage of vertebrates—in intercellular substance. Buta true cartilage is met with in some of the higher molluscs (Cephalopoda), in which there is a considerable amount of intercellular substance, and the only difference, as compared with ordinary car- tilage of most vertebrates, is that the cells are much ramified (as in some fishes).

Bone, or osseous connective tissue, as the word is under- stood in vertebrate histology, is not met with anywhere amongst the Invertebrata, and this is less to be wondered at since it does not make its appearance even in some of the lowest of the Vertebrata. But hard structures of various kinds serve to supply the place of bone as a sustentacular tissue, and these may be developed either within the con- nective tissue, so as to form an internal hard skeleton, or on the exterior of the body, so as to form an external skeleton or shell. When external the shell is an epithelial structure, or at least is produced by the formative activity of the epithelium which covers the surface of the body. An internal hard skeleton may either coexist with an external, or the one may be found to the exclusion of the other.

In the ccelenterates the internal skeleton when found is generally deposited in the jelly-like intercellular substance in the form of separate spicules, which subsequently are cemented together by a further deposit of calcareous matter into a continuous skeleton. In the sponges the calcareous spicules often project fromthe jelly into theexternalmedium, but it is probable that they are covered by an extension of the superficial flattened

cells which they seem to pierce; the separate calcareous spicules

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are in some cases united by cal- . careous matter, in others by horny substance, or the spicules may be

altogether absent and the horny framework constitute the whole skeleton. There is no evidence ™ mr to show that these calcareous and Mc. 1 et ane Sl oe

é chinus, partly decalcified by horny deposits are formed by the acid. (Leydig) The connective direct agency of the cells of the {iue.bundles are seen on the jelly-like tissue. On the con- on the right they are obscured trary, the fact that the spicules Wi bre and Weury th econ stiges make their appearance in the °f epithelium (@, ¢). jelly-like substance which accumulates between the two primary layers before there is any trace of cells to be seen in it is a fact pointing in the opposite direction.

In the echinids amongst Echinodermata the shell is formed by a dense deposit of calcareous substance (fig. 16) in the fibrous connective tissue of the integument, but is not of the nature of bone, as has been sometimes supposed. In other echinoderms the deposition is more scanty, and in some (Holothuria) it may merely take the form of isolated spicules, which often present curious shapes.

The Muscular Tissues of Animals.—In the Ver- tebrata three kinds of muscular tissue are met with—the plain or involuntary, the cross-striped or voluntary, and the cardiac or heart muscle. Undoubtedly the last-named is to be regarded as a transitional form between the other two, for it combines some of the characters of each. ‘This is especially well seen in the lower vertebrates, in which the muscular fibres of the heart (fig. 17) consist of long, tapering, uninuclear cells, in

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Fie, 17.— Muscular fibre of

form resembling the plain contractile fibre-cells,Pr°#s he

but differing from these and resembling the multinucleated voluntary muscular fibres in exhibiting distinct transverse striations. Although these three kindsof muscular tissuethus

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differ from one another in this respect, they agree in one im- portant character. Whether transversely striated or not, they all exhibit a distinct longitudinal striation of their substance, which is probably indicatory of a polarity which the protoplasm of the cell has assumed at the same time with the faculty of becoming rapidly shortened in the direc- tion of its length and coincidently with the loss of the power of contracting in other directions. Moreover, this longi- tudinal striation is generally associated with the property of double refraction, which is exhibited to a marked degree

| by all kinds of muscular tissue.

The voluntary muscular fibres are those in which the

protoplasm of the original cell has undergone most dif- ferentiation. If we trace their development we find that they originate from mesodermic cells which become elon- gated in one direction, the nucleus undergoing a corre- sponding change in shape, and soon becoming multiplied ; we next find the external layer of the protoplasm becoming altered and converted into muscular substance, which exhibits from the first both a longitudinal aud a transverse striation. The change in ques- tion gradually extends inwards, so as to involve more and more of the protoplasm. Up to this time we can distinguish (fig. 18) in the muscular fibre a medullary part composed of unaltered protoplasm, with nuclei, and a cortical part com- posed of differentiated muscle-substance. Sub- sequently the nuclei leave their central situa- tion, and either become scattered through the muscular substance or come to lie entirely at the surface. There is always a little of the unaltered protoplasm to be found with each nucleus. Jn the plain muscular fibres, and in the cardiac muscular tibres, the nucleus does not

multiply, and it maintains its central situation. The differentiation of the cell-protoplasm into muscle-substance begins at the periphery and extends towards the centre in the cells which constitute the heart- muscle as in the voluntary muscle, and it is probable that the same is the case in the plain muscular cells.

The muscular fibres of the Invertebrata very closely resemble those of vertebrates. In most cases the differentia- tion of the muscular substance is not so complete as in the voluntary muscles of vertebrates and especially of mam- mals, but there is a striking exception in the Arthropoda, and especially in insects, , where in conformity with the greater muscu- lar activity they possess we find far bettermarked structural features. On this account the muscles of insects have been espe- cially carefully studied witha view to the eluci- dation of the structure of muscle generally.

With a sufficiently high power a voluntary muscular fibre of an in- sect (fig. 19) is seen to be composed of an ex- ternal structureless mem- brane,—thesarcolemma, —a central strand of nucleated protoplasm, and a semi-fluid substance—the proper muscular substance—lying between these and form- ing almost the whole of the fibre. This proper muscular substance is composed of a clear doubly-refracting material, in which are embedded a number of minute rod-shaped particles, which are so arranged side by side and end to

Fie. 18.— Part of de- veloping muscular fibre of a mammal.

Fic, 19.—Living muscle of Water-beetle (Dytis- cus marginalis), highly magnified. s, sar- colemma; a, dim stripe; }, bright stripe; c, rows of dots in bright stripe, which are seen to be the knobbed heads of d, muscle rods.

end as to cause the muscular substance to present both a transversely and a longitudinally striated appearance. Sometimes (as in the fibre shown in the figure) the substance of each muscle rod is partly collected into a swelling or knob at either end, and these knobs so act singly and collectively upon the light which passes through the muscular substance as to cause a brighter appearance in their neighbourhood. In this way bright bands seem to cross

the muscular sub- stance alternating with the dimmer intermediate portions, and the appearance of transverse striation is much intensi- fied. This is still more the case when the muscle contracts, for the contraction is accompanied by an accumulation of the substance of the rods towards their ends, and an apparent blending of these into a dark transverse band or rather a series of dark transverse bands, which, reflect-

ing from their surfaces the light which is bad passing through the muscle, cause the whole

of the substance between them to appear

much brighter than they are themselves,

There are other muscular fibres in the insect

which present an entirely different appear- *

ance. In these (fig. 20) the fibres, which 5, 09 Fivre of are very fine, are wholly made up of alter- wing-muscle of nating bands of dark and light substance. *”’™*°* They are far less like the voluntary muscular fibres of mammals than are the others, and there are no rod-like structures to be seen in them.

We find muscular tissue, like the other tissues, appearing already in the lowest of the Metazoa. In sponges the orifices of the water canals are in many cases capable of being closed partially or wholly when the organism is irri- tated. The researches of F. E. Schulze have shown that these orifices are encircled by long fusiform cells which appear to be modifications of some of the ordinary ramified cells of the jelly-like tissue. The substance of these cells seems to be undifferentiated, and it cannot be conclusively affirmed that they are of muscular nature, but at least they seem to subserve the function of muscular tissue. But in the very next division—the Hydromeduse—the muscular cells are already so much differentiated as to exhibit both longitudinal and transverse striation. Thus many of the cells which form the muscular layer of the sub-umbrella of the Meduse are long fusiform cells (fig 21, A) with an elongated nucleus in the centre, and gradually tapering ends, and their substance is striated, as just remarked,

both transversely and longitudinally. Sometimes there is a con- siderable amount of unaltered protoplasm in the middle of the fibre around the nucleus (fig 21, B), and this nucleated protoplasm may then project between the epithelial cells

Fic. 21.—Muscular cells of J. elly-fish. (Hertwig.)

of the ectoderm. In every case the muscular fibres are in close contiguity with the attached ends of the ectodermal epithelium, and are with justice reckoned as a part of the ectoderm. In the higher ccelenterates the muscular tissue tends to lose its connexion with the ectoderm and to become embedded in the jelly-like mesoderm, but the connexion is not wholly lost in any. In Hydra, on the other hand, the muscular tissue is represented only by simple longitudinal fibres, which are either direct prolongations of the tapering ends of some of the ectoderm cells (Kleinenberg) or are embedded in the enlarged attached end of the cells

| number of processes, which may or may

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(K6lliker, Korotneff). In other invertebrates the muscular tissue is nearly always in the form of long cylindrical or flattened, tapering or uniform, uninucleated, longitudinally- striated fibres, which may possess a membrane, and a central strand of undifferentiated protoplasm (fig. 22, B). In some cases a transverse striation may be detected (fig. 22, A), but more commonly the muscular fibres, especially in echinoderms, worms, and molluscs, ex- a hibit a peculiar double oblique striation (fig. 23), so that an appearance of intercrossing lines is thereby produced. The obliquely striated fibres seem to take the place, in many of these comparatively sluggish ani- mals, of the more active, transversely striated tissues. With the exception of the appear- ance mentioned, they resemble the plain muscular fibres in structure, but they are capable of more energetic contraction than the latter.

The Nervous Tissues of Animals.—The nervous tissue of vertebrates is composed firstly of cells—the nerve-cells or ganglion- cells,—and secondly of nerve-fibres. Most of the nerve-fibres possess a sheath formed p of

nucleated cells wrapped around the fibre, “Yo-gtros of mck. and in this sheath a peculiar white fatty uses. so-called medullary substance is accumulated in some fibres, so that they are distinguished from the others as the white or medullated fibres. There is reason to believe that every nerve-fibre is connected with at least one : nerve-cell, and conversely, that every nerve- cell is connected directly or indirectly with one or more nerve-fibres. Nerve-cells are generally comparatively large solid-looking corpuscles, with a relatively large nucleus and nucleolus, and every developed nerve- cell has either one or two or a greater

not be ramified. It is certain that from yee a many nerve-cells one process of the cell anobliquely stri- passes into and becomes a nerve-fibre.! five. “Grom Nerve-cells are always traversed by ex- Schwalbe.)

quisitely fine fibrils,—nerve-fibrils,—and these pass out from the cell into its processes. Apart from any sheath which it may possess, a nerve-fibre is composed of one or more nerve-fibrils, which are em- bedded in a soft interfibrillar sub- stance. The nervous tissue of ver- tebratesis developed from that part of the ectoderm which occupics the middle of the dorsal surface of the embryo. In the bird and mam- : mal the epithelial cells in this 4 B situation become cut off from the general ectoderm by the forma- tion of a groove which subse- quently closes over and forms a canal—the neural canal. The innermost ectoderm cells (fig. 24, B) which form the wall of this canal acquire cilia at the end which is turned towards the cavity, while the other end of each cell is pro- longed into branching processes which collectively form a network amongst the deeper lying cells of the wall. The latter multiply considerably, and moreover groups of them grow out from the sides of the neural canal as the roots of the nerves. The nerve-fibres themselves seem to be formed either by the outgrowth of undivided processes from these cells of the neural canal, or by the junction of one elongated

Fia. 24,— Nerve – epithelium eclls—A, of Medusa; B, from central canal of spinal cord of vertebrate.

1 The term nerve-fibre is here employed to denote the essential part of the nerve, corresponding to the ‘‘axis-cylinder’’ of vertebrate

cell with others. At any rate the fibres are to be looked upon as outgrowths or prolongations of nerve-cells. But some of the outgrowths of the nerve-cells, instead of passing into nerve-fibres, become ramified, and eventually break up into fine twigs, each of which is occupied by a nerve-fibril, and these form by their interlacement a network which joins that of the branched processes of the ciliated epi- thelium.

With the exception of the formation of the medullary substance in the sheath, the nervous tissue of the in- vertebrate Metazoa agrees precisely, so far as the minute structure is concerned, with that of vertebrates. The lowest forms in which nervous structures have been found are the Medusw. In these the tissue exhibits itself under two modifications. The first of these is a so-called nerve epithelium (fig. 24, A), consisting of a portion of the ciliated ectoderm, the cells of whieh are prolonged at their attached ends into fine ramified fibres which interlace with one another and form a network of nerve-fibrils underneath the epithelium. This form seems to correspond with the ciliated epithelium of the vertebrate neural canal. The second modification occurs in certain cells of the ectoderm, which have become sunken singly here and there below the general epithelium of the surface, and between it and the muscular layer of the sub-umbrella. These cells become enlarged, and their nucleus takes on the characteristic-appearance of the nucleus of a nerve-cell. Then generally from.opposite ends of the cell (fig. 25) two processes grow out into long fibres,

Fig 25. Nerve cell and fibre of a Jelly-fish (Aurelia).

which exhibit all the features of the nerve-fibres of higher animals, and may even possess a nucleated sheath. These fibres, which may be branched or unbranched, seem to be applied to the substance of the muscular fibres, and in all probability serve to convey impulses to the muscle. There can be no doubt of the correspondence of these cells and fibres with the nerve-cells and nerve-fibre prolongations of the Vertebrata. In other invertebrates the nervous tissue is not only more localized than in the Celenterata, but the original ectodermal epithelium cells from which it is derived become much

more extensively developed into well-charac- terized nerve-cells and nerve-fibres, and tend moreover te be completely separated from the rest of the ectoderm and embedded in the mesoderm. But they are never originally developed in common with connective-tissue cells, as are the cells which form the muscular tissue. (E. A. 8.)

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By Vegetable Histology is meant the study by means of the microscope of the texture, web, or tissue of which plants are composed. It may be considered as synonymous with the minute anatomy of plants, and embraces the study of all those points of structure and development requiring the use of the microscope for their elucidation, Histology is, therefore, a modern science of observation and experiment, and it dates its origin from the time when magnifying glasses were first applied to the scrutiny of the organs of plants. All advances in histology have been preceded by some important improvement either in the construction of lenses and microscopes, or by the invention of some new method of research and application of new reagents. In order to prosecute the study of vege- table histology, it is necessary to understand thoroughly the construction and use of the microscope, to be able to manipulate well and dexterously employ the various cutting and other instruments required, and, lastly, to be able to use

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the numerous reagents now so important in assisting to unravel the more difficult tissues.

Nature of the Vegetable Cell.—lf a small portion of the Nature of |) contents of the fertilized embryo-sac of the Phaseolus multi- the cell, jflorus (scarlet-runner, or French bean) be examined in a drop of water on a slide, it is seen to consist of protoplasm with a number of small free cells, in different stages of development, floating in it. These cells consist of little rounded masses of protoplasm with a single contour line; they have the protoplasm more or less granular; and each contains a rounded solid body, the nucleus,

usually with a small spot, the nucleolus. Other cells in the preparation have a distinct wall witha double contour line, these being older and more fully developed. In examining the cells it is usually best uot to employ pure water, but to use instead a solution of sugar or gum (1 part to 50 or 100 of water). Strasburger recommends, for examining the contents of the embryo-sac in phanerogams, a 3 per cent. solution of sugar, to which is added on tlie slide one drop of a 1 per cent. solution of osmic acid. Absolute alcohol may also be used for fixing the pre- toplasm in a nearly unaltered state. A longitudinal section of the growing end of the root of Fritillaria imperialis will exhibit the different stages of development of tissue cells. Near the apex the cells are more or less hexagonal in shape, and have a marked wall with a more or less distinct double contour. Inside the cell-wall, and in close contact with it, is the protoplasm, a densely granular soft inelastic mass, consisting of a mixture of albuminoids, and having in the centre a round and relatively very large solid nucleus, with one or two nucleoli. In both Phaseolus and Fritillaria, as the cell enlarges, clear spaces, called vacuoles, but filled with cell-sap, that is, water with substances in solution, appear in the protoplasm of the cell. In some alge con- tractile vacuoles are met with. The ordinary vacuoles rapidly increase in number and enlarge, separating the pro- toplasm into two parts—one in close contact with the wall of the cell, the other forming strings of varying size and thickness separating the vacuoles. Presently the vacuoles all coalesce and forma central cell-sap cavity, the protoplasm forming a completely closed sac inside the cell-wall. The nucleus remains imbedded in the protoplasm, and is pushed to one side, appearing as if in contact with the wall. The vacuoled condition of the protoplasm may be considered as representing the cell at its state of greatest activity : the central cell-sap cavity is usually seen in tissue-cells, as in Fritillaria, and may be taken to indicate a condition of diminished activity. Further changes take place in tissue cells. The protoplasm with its nucleus may disappear and the cell-sap remain, or even the cell-sap itself may disappear sooner or later, and the dry cell-walls, as those of cork, be left. The conditions here described in /’ritiularia may be taken as typical of all young tissue cells.

The protoplasm is the essential part of the cell, and by it Proto- all the other parts are formed, as well as all the substances, plasm. such as chlorophyll and starch, that are contained in cells. When the cell contains protoplasm it

can grow, multiply, and elaborate new chemical compounds; when the proto- plasm disappears it ceases to perform any of these functions, and passively acts as a protection to deeper cells, or permits certain physical processes to take place, as the transport of water through the walls. The substance of the protoplasm seems to consist of a mixture of various albuminoids, and probably of other nitrogenous compounds, It isa more or less granular, soft, inelastic substance, never a true fluid, but varying in consistence in accordance with the quantity of water it contains.

The chemical reactions of protoplasm are those of albumen. It Chemical) contracts when substances are applied to it which remove some of reactions.) the water, as glycerin and alcohol. It contracts when heat is applied, a temperature of between 50° and 60° C. completely altering the texture of protoplasm containing a normal qnantity of

Move- ments.

Cell- wall,

water. Where the protoplasm contains little water and is very dense, as in some seeds, a higher temperature produces little or no change. A violet colour is given to the protoplasm of young cells by the application first of a concentrated solution of copper sulphate, next washing the preparation carefully to remove all free traces of the copper solution and then applying a solution of caustic potash. Iodine gives a brown colour, sugar solution and sulphuric acid a red’; and dilute caustic potash dissolves protoplasm or renders it perfectly transparent. Carmine and other colouring matters do not colour living protoplasm, but impart a brilliant stain to it when dead.

Protoplasm is usually separable into two parts, an inner

portion, endoplasm, more or less granular, and an outer more dense layer, the ectoplasm or primordial utricle, which is quite freefrom granules. A similar layer surrounds the protoplasm of the nucleus. – The living protoplasm exhibits movements either when inside a cell-wall or when the protoplasm is free and in the condition of a wall-less or primordial cell. The

constant changes in protoplasm must be always accompanied by movements, but these are usually too small to be visible, and it is only in a few cases that the amplitude of the movements renders them visible. The movements are of four kinds, and are distinguished as rotation, circulation, ameeboid, and ciliary.

The first is the movement of rotation, as in Vallisneria and Anacharis, where the whole protoplasmic sac rotates in the intcrior of the cell. The second is circulation, where portions only of the

rotoplasm move as indicated by the circulation of the granules Tie. and thither in the mass, as in the cells of the hairs of Trades- cantia and the stinging hairs of the nettle. In the third or ame- boid movement whole masses of protoplasm not enclosed in walls change their form and position like the ame«ba or white blood cor- puscle. These movements have been noticed in the amceboid and plasmodium stage of the Myxomycetes or gelatinous fungi. Lastly, a movement of small masses of protoplasin destitute of walls, and having parts of the ectoplasm prolonged to form one, two, or more vibratile cilia is not unfrequent in the zoospores, swarmspores, and spermatozoids of cryptogamic plants. All these movements are de- pendent on and much influenced by varying external conditions, as light, heat, presence or absence of oxygen, &c.

The cell-wall is a thin, elastic, transparent and colourless membrane, destitute of visible openings (except in some cells of Sphagnum and in bordered pits), but easily per- meated by water and gas. It consists of the carbohydrate cellulose (C;H,)O;), isomeric with starch, and in young cells it is present in an almost pure state. During the growth of the cell the protoplasm furnishes material for the increase of the wall in size and thickness, and usually during growth of the wall various chemical and physical changes occur in it.

The increase in the size of the cell is rarely quite regular or gene- ral, except in free cells as pollen grains and spores ; usually the growth is inore or less limited to definite parts of the wall, and the increase in size is accompanied by a marked change in form. Inter- calar growth at a ring-like zone on the cell-wall is seen in the genus Cdoyonium, while growth at the apex of the

cell is not uncommon in many unicellular alga and in hairs, as well as in the peculiar.cells (the hyphe) of fungi.

Growth at several points on the surface of a cell gives rise to the stellate forms seen in the pith of Jwneus, and a similar but more limited growth is the cause of the "'tyloses," or cellular filling-up of vessels seen in niany stems, vine, &c. The growth of the cell-wall in thickness may be general or local. Usually it is local, and is either internal (centripetal) or external (centrifugal). Local thick- ening gives rise to the production of peculiar markings depending on the different optical effects produced by the thickened and un- thickened parts. Pitted markings are very common, rounded or variously shaped portions of the wall being left unthickened, while the form of the pits, and their special arrangement, either irregularly scattered or spirally placed, give a characteristic appearance to the walls of the cells. Pits are often elongated, and when very much elongated, and extending the whole width of the cell, form'scalari- form markings, as seen in ferns. When pits are very narrow, cylindrical, deep, and branching, they form canals. Bordered pits, in which the pit is surrounded by a border, occur in the pines. In other cells the thickening assumes the appearance of rings, spirals, or reticulations, which sometimes become detached from the walls. In some instances, as in the wood of the lime and yew, two kinds of marking occurin onecell. Peculiar modifications of internal thick- enlng are seen in the root-hairs of Marchantia, in the cells with cys-

tolithes in the lcaf of the india rubber, and in the pith of Ricinus, &c. External thickening is seen on the surface (cuticle of the epi- dermis) of the plant or on free cells, as pollen grains, spores, &c., and produces peculiar and characteristic markings in various plants, By the alternation of more and less watery layers the cell-wall be- comes marked by concentric lines or striz, as if the wall was built up of layers or strata formed one inside the other, which, however, isnot the case. A longitudinal striation assuming a ring-like or spiral direction is also met with on the walls of many wood and bast cells, and is, like the stratification just mentioned, due to alternations of more and less watery layers in the cell-wall. The inner layer in the interior

of the cell and next thetcontents is always a dense layer rich in cellulose and with little watcr, a fact at once negativing the incrustation theory. Stratification can be readily seen in transverse sections of the bast fibres in the leaf of Hoya, or the bast of the stems of many Asclepiadacew ; and the longitudinal striation may be seen in the same fibres when dricd, or in the dry wood cells of many conifers, as in Pinus sylvestris.

The walls of young cells consist almost exclusively of Reactions pure cellulose, which is coloured blue by Schultz's solution! of cellu- or by iodine and sulphuric acid, and is dissolved by strong lose.

sulphuric acid and by ammoniacal solution of cupric oxide. Iodine solution alone gives no reaction, or more generally a brown tint ; rarely the wall gives a blue reaction, as in the asci of some lichens or in the cells of the cotyledons of Tamarindus indica. The cell-walls of most fungi do not give a blue reaction with iodine and sulphuric acid, form- ing the modification generally known as fungus cellulose. During growth changes occur in the nature of the wall, different strata often having different chemical and physical properties.

cork; (2) the ligneous or woody change, the walls being converted into wood ; and (3) the gelatinous change, as seen — in many alge, where the cell-wall swells up enormously by the imbibition of water, and assumes a clear gelatinous appearance. These changes may occur separately, the whole wall being more or less completely changed; or a part remains composed of cellulose; or, in other cases, two or more of these changes may coexist in the same cell-wall.

The following reagents are useful in distinguishing the different changes. Schultz's solution gives a blue with starch and cellulose, and a yellow-brown with wood and cork. If the cork-cells are pre- viously boiled in caustic potash, and the wood cells touched with nitric acid, the blue reaction may be got with sulphuric acid and iodine. Sulphuric acid dissolves wood cells, but does not touch cork cells. Ammoniacal solution of cupric oxide docs not dissolve cork, causes wood to swell up and to become blue, and deeply colours mucilaginous walls. Boiling caustic potash ultimately dissolves cork. Cold caustic potash at first eauses it to swell up and become yellow, and when slowly heated the colour deepens and the texture becomes

granular. Chlorate of potash and nitric acid (Schultz's macerating fluid) ultimately dissolves cork, like caustic potash, but does not affect wood. When cork-cells are slowly warmed in this mixture the walls of the cork-cells become very distinct, the other cells being very transparent, and, if washed and treated with alcohol and then with ether, they become perfectly transparent. Chromic acid renders cork distinct by rendering other tissues tran- sparent. Bichromate of potash dissolves cork. The following re- actions are given by Zacharias for cell-walls which are coloured brown by Schultz's solution in the rhizome of Acorus Calamus.? Sulphate of aniline and hydrochlorate of aniline, even when the cells are pre- viously treated with hydrochloric acid, give no reaction, but colour the walls of vessels of a golden yellow. An aqueous solution of aniline blue gives no reaction, while an alcoholic solution of aniline red colours the walls of vessels and oil-glands. The red colour is

1 Schultz s Solution.—1 ounce of fused chloride of zinc is dissolved in % fluid ounce of water; then add iodine 3 grains, and iodide of potas- sium 6 grains, dissolved together in the smallest possible quantity of water. Or dissolve granulated zinc in hydrochloric acid, and evaporate in contact with metallic zinc until a thick syrup is formed. Add iodide of potassium to saturation, then a little iodine, and if necessary dilute with water.

For this and other reactions see Héhnel, Ueber den Kork und ver- korkte Gewebe iiberhaupt, p. 16.,

3 "Ueber Secret-Behilter mit verkorkten Membranen," Bot. Zeitung, 1879, p. 619.

The three most important changes in the cell- Changes wall are (1) the suberous or corky change, the cell-wall in cell- wholly or partially becoming cuticularized or converted into W#!l.

Mineral matters in cell- walls.

Molecu- lar struec- ture of cell-wall.

Chloro- phyll.

best seen when thin slices of the rhizome are placed for a few daysin the solution, and then dried and observed under water. The addition of caustic potash causes the colour to disappear, but it reappears on washing away the potash. The walls of vessels become coloured blue- violet by addition of hydrochlorate of phenole, and also when use is made of alcoholic solution of cherry-wood and concentrated hydrochloric acid (Héhnel's xylophilin reaction).

Mineral matters are often deposited in cell-walls. Calcium carbonate occurs rarely, calcium oxalate frequently, and silica is the commonest of all. Calcium carbonate forms the cystolithes of /icws and of the Acanthacew, crystals or masses of crystals imbedded in the cell-wall but projecting into the cavity although surrounded by the substance of the wall. In corallines and many algz, as also in the Charas, carbonate of lime is abundant in the cell-walls. Calcium oxalate crystals occur in the cell-walls of many plants, in other cases forming small granules. The crystals of calcium carbonate are soluble in acetic acid, while those of oxalate are not, although soluble in dilute nitric and hydrochloric acids. Silica is abundant in the Diatomacee aud also in the cells of many of the higher plants (Zquwi- setum, grasses, beech, &c.).

Products of desorganization or degradation of the cell-wall occur in the form of gum, gum-resins, or resins, examples of which may be seen in the cherry, gum-arabic, gum- tragacanth, myrrh, «we. Gum-arabic consists of arabin, gum-tragacanth of bassorin, and cherry-gum is a mixture of thetwo. These substances, when formed, are apparently of no further use to the plant, and are produced by the destruction or desorganization of the cell-walls, as portions of tho cell-wall can be distinctly traced when gum-tragacanth is examined microscopically.

Cell-walls, as those of the wood of Conifers, bast-cells, and cells of ivory nut, and starch granules, are found when examined by polarized light to be doubly refracting. By an elaborate series of researches Niigeli concluded that these structures were made up of crystalline doubly refract- ing particles or micella, each consisting of numerous atoms and impermeable by water, although each of the micellze is surrounded by a thinner or thicker

layer of water. The water may increase or diminish within certain limits with- out destroying the structure ; or under certain conditions as by the application of certain reagents (strong acids and alkalies, ammoniacal solution of cupric oxide), the texture can be destroyed by the swelling up of the part. The water between the micelles may be removed by drying, when the micelle themselves come into contact, as the presence of air would destroy the transparency of the membrane. ‘This peculiar molecular composition of the wall at once explains the striation and stratification observed in it, and also enables us to understand growth and nutrition by the intussusception of new particles in the water space between the micellz.1

Certain substances are formed by the protoplasm and separate from it in the form of granules or crystal-like bodies. ‘The most important of these substances are chlorophyll and starch, the less important are aleurone grains and erystalloids.

Chlorophyll or leaf-green is the green colouring matter of plants, and is met with most frequently in the leaves and young stems. The colouring matter is always united with the protoplasm, usually to definite rounded asses, the chlorophyll granules or corpuscles, readily distinguishable from the general protoplasmic mass of the cell in whieh they are imbedded. Chlorophyll granules never occur separate from the protoplasm of the cell. In a few instances the whole of the protoplasmie mass, with the exception of the eetoplasm, is uniformly coloured green as in Plewrococcus and other low algee ; while in other plants the protoplasmic base for the colouring matter is star-like (Zygnema), in plates or lamelle (Closterium and Jleso- earpus), or spiral, as in Spirogyra. The chlorophyll grains of the yast majority of plants are rounded corpuscles of varying size with

1 See Nageli and Schwendener, Das Mékroskop (2d ed.), p. 299 sq.; and Dippel, Das Aftkroskop, vol. i. p. 409 sg.

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rare cases, as in the cotyledons of pines and in ferns, that the colour- ing matter is formed independently of light.

benzole, chloroform, and other solvents, the protoplasmic mass remaining behind unchanged in size and appearance, except in so far that it is now colourless. dark green colour by transmitted light, and blood-red by reflected light. Its spectrum shows seven absorption bands, being between the lines B and c of the solar spectrum. modifications of chlorophyll exist in plants, and it also undergoes changes in colour during the ripening of fruits or in the corollas of certain flowers. parts of plants ; xanthophyll, yellow granules in leaves in autumn ing matter of red sea-weeds ; phycoerythrin, the red colouring matter of red sea-weeds; the phycochrome of nostoe, &c.; and the brown colour of diatoms and fucoids.

the growth of the granule it is always in relation to the protoplasm

in the milk-sap of certain exotic Huphorbias respectively. Each

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a slightly denser external layer, and frequently containing vacuoles or sinall starch granules. They grow in size and divide, the grain elongating and being cut into two by the formation of a gradually deepening circular groove. These changes may be seen in the pro- thallus of a fern or the leaf of amoss. The granules are produced by the aggregation of protoplasmic particles, so as to form a sharply- defined spherical mass. At first these are colourless or of a yellow tinge, and become green by the formation of the colouring matter, the chlorophyll, when exposed to the light, as it is only in a few

The colouring matter can be removed by means of alcohol, ether,

The solution thus obtained is of a

the strongest Many

The chief modifications are—etiolin, in blanched anthoxanthin, in yellow granules of many flowers ; ; the green colour-

Starch occurs in granules of varying size and form, and during Starch,

of the cell.

The granules are oval, lenticular, polyhedral, or bone- shaped, as may be seen in the potato, wheat, and maize,

and

grain usually exhibits a central or lateral spot, the hilum, and a series of concentric striz, caused like the striation and stratifica- tion of the cell-wall by the alternation of more and less watery layers. Sometimes the starch granule has two or more hila, the compound grains, which often separate into their several parts.

Starch has the same chemical composition as cellulose, CgH 0s, and differs from cellulose in being coloured blue directly by a dilute solution of iodine. Schacht's solution contains 1 grain of iodine and 3 grains of iodide of potassium dissolved in 1 ounce of distilled water; but an aqueous solution of iodine answers quite well. 'Two substances are generally recognized in the starch grain —(1) granulose, coloured blue by iodine and forming by far the greater part of the granule, and (2) starch cellulose, not coloured blue and only forming a sort of skeleton to the grain. Starch is one of the most widely distributed substances in plants, being absent from comparatively few except the fungi.

Oil globules occur not unfrequently in the protoplasm of plants ; and in a few instances they occur in chlorophyll granules, Oil is easily distinguished by its reactions with ether, and by its optical properties.

Occasionally portions of the protoplasm assume a erystal-like ap- Crystal- pearance, resembling cubes, octohedra, tetrahedra, &c. These por- loids, . tions are known as crystalloids or protein crystals. They give the globoids, ordinary reactions of protoplasm, and differ from crystals in their and power of swelling up and changing their angles in certain solutions, aleurone as in caustic potash. Crystalloids occur frequently in the cells of grains. the tuber of the potato, in fatty seeds, in red alge, in petals of many flowers (Viola tricolor), and in some fruits. Usually the crystalloids occur in fatty seeds, as in the castor oil and brazil nut, in the interior of rounded grains of albuminoids, the aleurone or protein grains, along with little rounded bodies

called globoids consisting of a combination of magnesia and lime with phosphoric acid. In other instances aleurone grains without crystalloids are met with, as in Cynoglossum. The aleurone grains are usually soluble in water, and are, therefore, best examined microscopically in strong glycerin, in iodine dissolved in glycerin, or in a solution of corrosive sublimate in alcohol. Aleurone grains form when the seed is nearly ripe, the crystalloids and globoids appearing earlier.

The cell-sap consists of water with different substances in Cell-sap. solution, the substances varying in different cells, and also changing in the same cell from time to time during growth. Tt saturates the whole wall and protoplasm, and collects in the vacuoles and cell-sap cavity.

The most important substances in the cell-sap are inulin, sugar, tannin, and colouring matters, while the calcium oxalate usually crystallizes out, and forms visible crystals in the cell, or in the wall as already described. Inulin can be separated, in the form of spherocrystals, by the action of alcohol or glycerin, from the tissues of many of the Composite, dahlia, sunflower, &c. By keeping the tissue long in absolute aleohol the crystals grow to a large size, and occupy more than one cell. Sugar in solution in the cell-sap may be grape or cane sugar, and can be rendered visible by the copper test, or by the action of glycerin. Glycerin forms drop-like spheres with sugar and inulin; these are very highly refracting and easily

i Cell for- ; ‘ ‘ mation. only accompanied by an increase in the size of the individual

‘|Rejuven- Jescence. goes contraction and rounding; water is eliminated, and an entire

Free-cell

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distinguished in the cell, When these spheres are of syrup they guiekly disappear, no trace remaining in a few minutes, while, as Kraus (Bot. Zeitung, 1877, p. 329) has shown, if the substanee be inulin the formation of sphzrocrystals rapidly oceurs. Hesperidin may be obtained from the unripe fruit of orange, &c., in the form of spheroerystals when treated with aleohol.

Tannin is present in the eells of many plants, and may be seen, when water is applied to the section, in the bark of the oak or bireh in the form of fine granules which soon dissolve. A bluish blaek or greenish colonr or precipitate is produced by the aetion of salt of iron, and a dark red-brown with biehromate of potash. Colouring matter (anthocyan) gives red and blue eolours to flowers and a red colour to stems and leaves, and is dissolved in the cell-sap. Lastly, caleiuim oxalate, which is formed in plants by the metastasis of nutrient matters during growth, is got rid of in many parts of plants, or rendered harmless in others, by crystallizing out, either as large erystals, prismatie or oetohedral, or in masses of small erystals, or in the form of long needle-like erystals or raphides belonging to the trimetric system. The two forms differ only in the quantity of water of crystallization present: the raphides have two equivalents, the prisms six of water.

Cytogenesis.—The enlargement of organs of plants is not

cells, but new cells are also formed in the part, these new cells, which are at first small, soon enlarging to their full dimensions. Usually the formation of a new cell takes place by the division of the protoplasm of a pre-existing cell, the mother-cell, into two portions of equal or unequal size, the daughter-cells. These daughter-cells in turn enlarge, and may each become the mother-cells of new daughter-cells. In this way by cell-division the vegetative cells of plants are increased in number. The process of reproduction in plants is invariably associated with the formation of a new cell or cells, and in general the process is very different from that of division, there being often a diminution in the number of cells, instead of an increase.

Four types of Cytogenesis may be distinguished :—(1) Rejuven- escence ; (2) Conjugation ; (3) Free-cell formation; and (4) Division. In rejuvenescenee, the whole protoplasm of the mother-cell under-

rearrangement of the molecules of the protoplasm may be notieed by changes in the eontents. Asa result of these changcs one new daughter-eell is formed from the entire protoplasm of the mother- eell. Rejuvenescenee is observed in the formation of the swarm- spores, non-sexnal reproduetive organs, of some alge, such as Gidogonium and Vaucheria, as also in the formation of single spermatozoids. The egg-eell of many alge and fungi, as well as of the vaseular cryptogams, is formed by rejuvenescenee, the only difference being that here the daughter-cell remains inside the wall of the mother-eell until fertilization, when it forms a wall and begins to divide.

Conjugation consists in the union of two, rarely more, masses of protoplasm, nearly or quite similar in size and appearanee, to form a single new daughter-eell, which then becomes surrounded by a wall and forms a zygospore. The union of the two masses is always accompanied by rounding and contraction of the masses and a complete molecular rearrangement of the protoplasm. Con- Jugation is seen in the group of the Conjugate among the alge, and also in the Zygomycctes and Myxomyectes among the fungi. In all cases conjugation is a reproductive process. The conjugation in the Myxomyectes is very peculiar, the numerous small masses of protoplasm (the myxoamcebe) fusing into a naked mass of proto- plasm (the plasmodium).

Free-cell formation consists of the formation of several (rarely one) cells from and in the protoplasm of the mother-cell, the whole of the protoplasm not goivg to form daughter-eells, Free-cell for- mation may be typically observed in the formation of the aseospores of the Ascomycetes. The nueleus of the large mother-cell or ascus disappears, and two new ones form, which again and again divide, thus forming eight, each nucleus forming the centre of a new mass of protoplasm, whieh at length beeomes surrounded by a wall. In other eases many new masses of protoplasm form after the disappearance of the nucleus of the mother-eell ; and these new masses develop a wall and a nucleus, or very rarely no nucleus forms. The endosperm in the embryo-sae of Phaseolus and other phanerogams is formed by free-eell formation, the cells after attaining a eertain size fusing together and forming a tissue, the individual cells of which divide. In some fungi, Peronospora, Cystopius, &e., only one daughter-eell is formed in the protoplasm of the mother-cell.

The last variety is cell-division, the whole of the protoplasm of the mother-cell going to form two, rarely more, daughter-cells. The ess may be observed in the eells of Spirogyra, in the eells of

he hairs of Tradescantia, or in the cells near the growing points of

the roots or stems of plants. Spirogyra and Tradescantia may be observed in a hanging drop of fluid,—water in the case of Spirogyra, a dilute sugar solution (1 per eent.) in the other. In Spirogyra a ring-like groove forms round the protoplasm in the centre of the cell, gradually deepening until the nucleus divides, and the two portions of protoplasm become sepatate. As the separation of the protoplasm goes on, the wall forms a ring-like projeetion of cellulose, whieh gradually extends inwards until only a small central hole is left; this soon fills up, and the mother-cell is separated into the two daughter-cells.

Cell-division can be seen in the hairs of the young stamen of Tradeseantia virginiea. A small unopened bud about one-fifth of an ineh long is reeommended by Strasburger.!_ The entire stamens are removed, and one, with the small hairs attached, is to be placed in the 1 per cent. sugar solution in a hanging drop. The cover glass on the under side of whieh the hairs are arranged must be very thin, to permit of observation with an immersion objeet-glass magnifying about 600 diameters. The eell-division in the last three eclls of the hair ean be readily observed, as well as the peeuliar be-haviour of the nucleus, its solution, and the formation of the barrel- like body ‘‘Kerntonne.” These and other changes, which had been fully deseribed by Strasburger (Ueber Zelibildung und Zellthetlaung) in Spirogyra and other eells from specimens hardened and fixed in absohite aleohol, can be seen in the living cell of Tradescantia.

In the pollen of monocotyledons and the tissue cells of many dieotyledons, as in the pith and epidermis, the division of the cell differs slightly from that seen in Spirogyra. ‘The nueleus of the mother-eell divides into two sister nuelei, and the protoplasm separates into two portions, the wall forming at

once as a plate stretehing right across the mother-cell and cutting it into two daughter-cells, The process of division can rarely be observed in living cells; hence it is necessary to make use of specimens killed during the process of division by immersion in absolute alcohol, or in a1 per cent. solution of osmic acid.

Special modifieations of the process of cell-division may be observed in yeast (Saccharomyces), in the formation of styloconidia as in Penicillium, and of the basidiospores of the Basidiomyeetes, as also in Hdogonitwm, in the sporangia of Saprolegnia, and in the spores of the higher cryptogams. In yeast a portion of the cell-wall enlarges in a sac-like manner, and into it a portion of the protoplasm of the mother-cell passes, thus forming two daughter-cells of very different sizes ; when the smaller eel] is full-grown a wall separates the two, and they beeome detached. In Penieilliwm, and in the formation of basidiospores, a very similar process is seen. In Gdogoniwm division of the eells is preeeded by the formation of the eurious cap-like struetures at the apex of the cell due to loeal intercalar growth of the wall.? In Saprolegnia the protoplasm of the mother-cell divides into a large number of daughter-cells, which are liberated as eiliated swarm-spores, and afterwards form a cell-wall. Lastly, in the spores of the higher cryptogams the division of the mother-cell into four daughter-cells is observed.

Union of Cells to form Tissues.—Cells are usually united Tissues together to form an aggregate governed by some common true and.

law of growth. Such an aggregate of cells is called a tissue. Tissues are formed in different ways, and in accordance with their mode of formation are distinguished as true and false. A true tissue is formed by cell-division. In the young growing part of the plant the young active cells are all capable of dividing, a transverse wall cutting the mother- cell into two daughter-cells, the process being repeated for some tine. In this way the tissues of the higher plant are formed, either originally from a single cell (apical cell) at the apex of the part, or from several cells (initial cells) situated at the growing point. In some of the lower plants false tissues are formed, rarely in some of the higher ones. The first mode of formation of a false tissue is noticed in some of the algz, as in Pediastrum and in [Hydrodictyon, as well

as in the formation of the endosperm in the embryo- sac of many plants, as in Phaseolus, Gnetum, &c. Here the cells are at first separate and distinct, but these loose cells become aggregated together, often, as in Pediastrum and /ydrodictyon, to form a beautiful and regular figure. In such instances the wall separating two cavities is a double structure formed by the union of two distinct walls. In the endosperm of the higher plants, when the false

1“ Ueber ein zu Demonstration geeignetes Zelltheilungs-Object,” Sttzungsberiechte der Jenaischen Gesellschaft fir Medicin wnd Natur-wissenschaft, July 18, 1879.

- Fully described by Strasburger, Ucber Zellbildung und Zellthetlung (2d ed.), p. 73.

Mode of union of cells.

Prosen— ehymat- ous and parenchy- matous cells.

tissue is formed, the cells divide in the ordinary way, and at length give rise to a true tissue, as different modes of cytogenesis may occur in the same plant, either in different parts or at different times. The second mode of formation of a false tissue is seen in the fungi and lichens, in the peculiar hyphz tissue so characteristic of these plants. The cells form long narrow rows or filaments, which branch and interlace, producing a network of interlacing fibres, but without the walls becoming fused firmly together as in Pediastrum. In some cases the hyphe cells swell up and come into such close contact by mutual pressure that they form a tissue so like ordinary cell-tissue that it has been denominated pseudo-parenchyma. ‘This variety of tissue occurs commonly in the higher fungi, as in the mushroom.

Cells are united in various ways, the modes of union being often very characteristic of certain of the lower groups of plants, although the same modes of union repeat themselves in the higher plants. The following are the chief varieties. (1) Cell-rows have the cells united by their ends to form a long filament, formed by the repeated division of the cells. Examples of cell-rows are secn in Spirogyra, Conferva, Edogoniwm, the hyphe of fungi,

the monili- form hairs in Z’’radescaniia, and in many others ; not unfrequently these cells branch in various ways. Ccll-fusions or vessels are cell- rows occurring in the higher plants, but having the transverse walls separating the original cells either partially or completely absorbed. They occur in the fibro-vascular bundles of plants, both in the wood andin the bast. Laticiferous vessels are examples of branching and anastomosing cell-rows. (2) Cell-surfaces have the cells united to form a single layer, and are thus in contact by the ends and sides, having an upper and under (rarely only one) free surface. Examples are afforded by some of the sea-weeds, as Ulva, and by the leaves of liverworts. In the higher plants cell-surfaces occur not unfrequently, as in the epidermis, a layer of distinct cells, free on one surface, but in coutact with other cells below. Many flat, scale-like hairs are also cell-surfaces, as well as the thin plates of cells separating the remarkable air spaces in the petioles of Nuphar and Afusa. (3) Cell- bundles are bands or bundles of similar cells either occurring separately or running through the other tissues of plants, and when doing so easily recognized in a transverse section of the part, as the bast-bundles in the stem of flax. Other examples occur among the red sea-weeds, and in the bundles of sclerenchyma in the stems of ferns. (4) Cell-groups are small masses of similar cells, either forming the families or colonies (ccenobia) of many thallophytes, as Chroococcus, Gleocapsa, Pandorina, &c., or forming the curious groups of sclerenchyma producing the gritty particles in the pulp of the pear or the hard massesin cork. (5) Cell-masses are formed when the cells are united in all directions of space, the whole not having necessarily any definite external shape. Examples are numerous, but we may cite the tissues of large fungi, the ground tissue of the higher plants, and the pulp and hard endocarps of fleshy fruits. (6) Lastly, separate cells occur, either distinguished from the cells in the neighbourhood by their peculiar form and development (idioblasts), or the originally united cells separate themselves, as in pollen-grains and spores, and form eremoblasts.

By the form and connexionsof the cells aggregationsof cells may be described as parenchymatous tissue and prosenchy- matous tissue, both these forms occurring very commonly in plants, and usually shortly designated by botanists parenchyma and prosenchyma. Parenchymatous cells are usually thin-walled, and have a correspondingly large cavity ; their length is generally not very much greater than their breadth, the form

frequently being rounded or polyhedral ; the walls are broad and flat, the cells, if elongated, not having pointed and overlappingends. At the places where neighbouring cell-walls meet triangular or quadrangular intercellular spaces are formed, by splitting of the wall during rapid growth. Sometimes these spaces are very minute, in other cases they are largely developed, and if irregular growth of the wall occurs a very loose form of parenchyma may be produced, as in the pith of Juncus. In other cases tolerably large intercellular spaces occur, as iu the spongy parenchyma of the mesophyll of leaves. In prosenchyma the individual cells are greatly elongated and fibre-like, the walls are very thick, and the cavity small or even nearly obliterated ; the ends of the cells are elongated, pointed, and overlapping those above and below; and lastly, no intercellular spaces are developed. ‘Wood-fibres and

bast-fibres are examples of prosenchyma; the young cells of stem or root, and the tissues of pitli, leaves, flowers, and many fruits, of parenchyma. _

By the power possessed by the cells in a tissue of divid- ing and forming new cells such a tissue is distinguished as meristem or the formative tissue of plants, all the other tissues being permanent tissues, or incapable of further enlargement by the formation of new cells. Meristem is observed forming the whole of the tissue of the young embryo plant, as also the whole tissue at the apex of a stem and root. All the other tissues of the plant are formed by the gradual differentiation of the originally similar cells of the meristem. Generally meristem tissue differentiates into special layers, each capable of forming cells which will ultimately form some definite portion of permanent tissue, not necessarily of the same value, however, in differeut groups of plants. The meristem of the embryo and of young stems and roots is distinguished as primary meristem, because occasionally a zone of cells forms in the permanent tissue having the characters of meristem, and secondary meristem, which either originates from the permanent tissue or is partly connected with the primary meristem. The cork-cambium or phellogen in the cortical tissues of dicoty- ledons is a layer of secondary meristem, while the cambium layer between the wood and bast portion of

the bundle is partly (the fascicular cambium) derived from the primary meristem (the procambium) of the fibro-vascular bundle.

Walls of Tissue-Cells.—The cell-wall separating the con- tiguous cavities of two young cells appears as a simple homogeneous plate or lamella of pure cellulose, giving the usual reaction with Schultz's solution and iodine and sulphuric acid. As the tissue grows older and the wall thickens, it apparently separates into distinct layers having different chemical and physical properties, so that in some cases it appears as if each cavity had its own special wall separated from the neighbouring wall by a thin or thick layer of material, to which the older botanists gave the name of intercellular substance. The thickening layers usually exhibit a well-marked stratification, the strata often differ- ing in chemical composition, as in pine-wood, in the bast of laburnum, or in the epidermis of Viscum, Ephedra, Nervum Oleander, &c. The application of Schultz's solution usually brings out the differences very well. Ina few instances the middle lamella becomes gelatinous, and swells up enormously in water. Examples are afforded by the stems of many algze, and by the endosperm of Ceratonia, where the so-called intercellular substance separates the cell-cavities widely one from the other. 'The middle lamella or inter- cellular substance and the thickening layers in the stratified cell-wall vary much in composition, but generally it is found that the incrustiug layers are soluble in sulphuric acid, while the middle lamella is dissolved by nitric acid and chlorate of potash. These two substances, just mentioned under the name of Schultz's maceration process, are con- stantly employed to separate cells from their connexions, as the markings in the thickening layers are not injured by the solution of the middle lamella in the chlorate of potash and nitric acid.

Classification of Tisswes.—In classifying vegetable tissues it is necessary first to distinguish the different kinds of tissue depending on the characters of the individual elements composing it, and, secondly, to consider the various group- ing of these kinds or species into systems more or less homogeneous and obeying certain common laws of growth. It is necessary to distinguish the kinds of tissue, because different kinds may occur in the same system, and it is further necessary to distinguish the systems, because the same form of cell may be repeated in different systems or in different

parts of the same system and yet be of very different morphological and physiological value. In classi-

Merister:

and per. manent

Walls 0 tissue- cells,

VEGETABLE. |

fying the different kinds of tissue we shall follow De Bary (Vergleichende Anatomie der Vegetationsorgane der Phanero- gamen und Farne), and in the systems we shall adopt the threefold divisions of Sachs (Lehrbuch der Botanik), now generally used.

I. Kinps or Tissue. (A.) Meristem Tissue. 1, Primary. 2. Secondary. (B.) Permanent Tissue. 1. Cell Tissue. a. Epidermis, c. Parenchyma proper. . Sclerenchyma. . Gland Cells, Tracheal Tissue. Sieve Tubes. . Laticiferous Tubes,

b. Cork.

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the stem shows a series of cells, the initial group from which the periblem and dermatogen (or the external layer representing it) arise. Further down the initial cells of the plerome are developed from the side of the periblem. In the root of lycopods the arrangement of the layers is exactly the same as in Hydrocharis and Pistia. In the Ligulatw and the remaining Pteridophyta there is a single cell at the apex of root and stem which divides into two. The one daughter-cell forms the new apical cell, the other is the segment cell, The segment cell divides still further, and forms a meristem from which at a later stage zones corresponding more or less accurately to dermatogen, periblem, and plerome are produced. In the roots a segment is cut off in front of the apical cell, which is the first cell of the calyptra, and from which, by repeated divisions, that structure arises.

MI SU G9 bo

Secondary meristem is intimately eonnected with the Second- secondary circumferential growth of stems and roots in ary” gymnosperms and

dicotyledons. One of the zones of meristem.

. Intercellular Spaces, If. Sysrems or Tissvusgs,

imary

sristem.

(A.) Epidermal or Limitary System, (B.) Fibro-vascular System, (C.) Ground System,

(A.) Meristem Tissue.—Primary meristem can be observed in the embryo in its young stages, and at the apex of tlic stem androot. In the embryo at an early stage, as described by Hanstein (Botanische Abhandlungen, i.), the meristem be- comes separable into three zones, differing in the appearance and arrangement of the cells and in the mode of dividing. These zones were called by Hanstein (1) dermatogen, or primary epidermis ; (2) the plerome or central series of more elongated cells with marked longitudinal division of the cells; and (3) aseries between the plerome and derma- togen, dividing more or less irregularly or transversely, the periblem. These three zones remain distinctly marked at the apex of the stem, and in Zippuris the three can be easily seen, while as the stem elongates new cells continually form, the initial cells or cell, as there may be one or more for eacli zone. Usually the dermatogen layer is the most constant in angiospermous plants, the separation into periblem and plerome being sometimes a little obscure. In the root a fourth zone of meristem has to be distinguished, called by Janczewski the calyptrogen layer, from which the calyptra, pileorhiza, or root-cap is formed. Various modi- fications of the arrangement of the different layers in the meristem of roots have been described. Very rarely, as in Hydrocharis and in Pistia, four distinct layers are formed —the plerome, periblem, dermatogen, and calyptrogen. In

secondary meristem arising from permanent cells is the cork-cambium or phellogen layer, which is described under the epidermal system of tissues. The other example of secondary meristem is the cambium layer separating the wood and bast in the stems and roots of gymnosperms and dicotyledons.

When the fibro-vascular bundles first appear, either in Procam- the periblem or plercme, the cells become distinguishable by bium.

their form and arrangement, and as the cells are still in the condition of meristem, the term procambium has been given to the whole. The cells of the procambium are gradually converted into permanent tissue, generally chang- ing their appearance completely, although in some cases the change is but slight, the cells being cambiform and hardly differentiated into the two parts of the fibro-vascular bundle, the wood and bast, to be described under the fibro-vascular tissues. In some plants all the procambium is converted into permanent tissue, while in others a small zone between the wood and bast remains in the condition of meristem. If the bundles are separate, secondary meristem forms in the ground tissue between the bundles, bridging over the

space between the bundles, but uniting so as to form the Cambium- cambium-ring, which consists of fascicular cambium in ring.

the bundle, derived from the procambium, and interfasci- cular cambium, a secondary meristem formed in the ground tissue. It is by the growth of this cambium ring that the secondary circumferential growth, so marked in our ordinary forest trees, takes place.

Cucurbita, Pisum, and a few others there is a common mass of meristem at the apex, from which the others are all differentiated. In Zea Mays and most monocotyledons ‘ two distinct zones are seen, the plerome and the calyptrogen, while between them a short distance from the apex the initial layer forms, which separates into the periblem and

(B.) Permanent Tisswe.—It will be sufficient to give only Per- a general sketch of the seven kinds of tissue described by manent De Bary, and to refer for full details to his Vergleichende *8¥° Anatomie above mentioned.

1. Cell-tissue is permanent tissuc, the cells of which are little if Cell- at all altered in form and appearance from their meristem stage. In tissue.

dermatogen. In Fayopyrum and most dicotyledons the plerome and periblem are sharply separated, but the peri- blem above the apex of the

plerome passes into a common layer with the initial cells of the dermatogen and calyptra, the dermocalyptrogen. In gymnosperms the root possesses a Sharply-defined plerome with a periblem mantle, in Thuja formed by from 12 to 14 regular concentric layers ; there 18 no trace either of a calyptrogen or dermatogen layer, the outer cells of the periblem serving as a calyptra. In the stems of gymnosperms the condition of the layers is some- what intermediate between those formed iu the angiosperms and lycopods. In Araucaria and Dammara the dermatogen, periblem, and plerome are separate and distinct, but in Abietinee and in Cycas they run into a common initial group, and it is only at some distance from the apex that in the Abietinec the separation becomes very marked, and In Cycas only slightly marked. In lycopods the end of

some cases the cells are short, in others elongated. The wall may be thin, and enclose the protoplasm and othercontents, the chlorophyll, starch, sugar, inulin, &c. In others the wall is thick and changed in composition. As varieties of cell-tissue De Bary includes (1)

epidermis and its appendages, equivalent to the epidermal system

of Sachs, and to be considered below; (2) cork, parenchymatous cells chemically altered, and forming usually a part of the secondary

epidermal system ; and (3) parenchyma proper, all the cell-tissue

inside the epidermis and cork cells, a division almost but not quite

equivalent to the ground tissue of Saclis. 2. Sclerenchyma.—De Bary includes under the name of scleren- Scleren- chyma all the hard thickened cells of plants, whether long or short, chyma.

which have become greatly thickened, and whose cavity is nearly if not quite obliterated,—the cell-contents also, as a consequence, having entirely disappeared, or left only slight traces. In this state these cells act in conveying water through their walls, and also serve to give rigidity to the plant, forming the mechanical system of Schwendener. Two forms are distinguished: (1) the short scleren- chymatous cells, and (2) long sclerenchymatous fibres. Of the former, examples are met with in the flesh

of the pear, in the root-tubers of Dahlia, in the rhizome of Dentaria, the pith of Hoya carnosa, and

Glands.

Vessels and vessel- like cells,

Sieve- tubes.

Milk- bearing tubes.

many others. Such cells are rare in monocotyledons, and the typical form (like the cells in the pear) docs not oecur in cryptogams. A variety of the short cells is described under the uame of stegmata. The long sclerenchymatous fibres are pointed, with overlapping ends, and occur commonly in dicotyledons. They are either simple or branched. The best examples are the bast fibres of the fibro-vascu- lar bundles, and the libriform fibres of the secondary wood. The wall of the sclerenchym fibre often exhibits peculiar split-like pitted markings (Ptcris aqutlina). Not unfrequently the sclerenchym fibres have numerous small crystals of calcic oxalate imbedded in the wall, a very beautiful example of which is afforded by Welwitschia mirabilis. Sometimes the cavity in the interior of the fibre is divided by transverse partitions forming chambered fibres, as seen in the bast of the vine, Platanus, Tamarix, &c.

3. Gland Cclls. —Gum, resin, ethereal oils, balsam, and gum-resins are usually met with in peculiar elongated cells, which develop from special meristem-cells. Sometimes they arc isolated, in other cases they occur in rows; they are considered by De Bary asa special kind of tissue, the cells being at once distinguished from the others in the neighbourhood by their contents. In many ways these gland-cells exhibit intermediate transition forms to laticiferous tubes on the onc hand, and to intercellular spaces containing special secretions onthe other. De Bary distinguishes four varietics. (a.) Cells with the cavity nearly filled with raphides or with single crystals or groups of erystals, ¢.g., Aloc, Scilla, and many monocotyledons, as also many dicotyledons. Groups of crystals occur in petiole of aroids,

pith of Ricinus, and others, large crystals in leaves of Citrus, and in the bast of Accr, Robinia, Ulmus, Berbcris, &c. (b.) Cells with the cavity filled with mucilaginous and gummy substances, root of Symphy- tum, Orchis tubers, aud in the parenchyma of Malvacce, Tiliacce, Ulmacce, &e. (¢.) Cells containing resin or gum-resin. Two modifi- cations occur, the cetls being either short or long, and frequently, as Zacharias (Bot. Zcit., 1879, p. 167) has pointed out, the walls are eorky. Short cells occur in Acorns, Canclla, Zingiberacece, &c., while long ones occur with milk-like juice, the laticiferous cells of some authors. As examples De Bary gives Allium, aroids, Musacece, Convolvulacce, Sapotacce, Sambucus, Acer, and doubtfully Sanguinaria, Glaucium, &e. (d.) Cells containing tannin, occurring in rhizocarps, ferns, monocotyledons, and dicotyledons.

4. Tracheal Tissuc.—Uuder this head De Bary distinguishes all those cells which become more or less lignified, and in which the thickening of the wall assumes the form of spirals, rings, reticula- tions, or pits, and which as soon as these markings are formed either lose their contents completely and become filled with air, or con- tain clear watery fluid. Usually these form long cell-fusions, thie vessels of plants, or else they form elongated or. shorter cells not united into a vessel. The former are the vessels, the lattcr the tracheides. The markings in the two forms correspond, and there are intermediate varieties. The markingsare spiral,annular, reticu- lated, pitted, and trabeculate (juniper and lycopod), with the varic- ties of bordered pits and scalariform markings. Short tracheides form the velamen or outer modification of the epidermis of the aerial orchid roots, also the outer tissue of the stem of Sphagnum. In Nelumbriwm speciosum the tracheides are 12 centimetres long. Many of the structures usually called vessels are tracheides. Large vessels frequently exhibit tyloses or cells filling up the cavity of the vessel. They have been observed in many monocotyledons and dicotyledons, both in stems and roots, and in herbaceous as well as in woody plants.

5, Sieve-tubcs.—These resemble vessels in being elongated cylin- drical or prismatic cells joined in long rows, the individual cellsalways remaining distinctly marked. The transverse wall separating the two cavities becomes perforated at the unthickened parts, forming the sieve-plate perforated by the sieve-pores. The contents of the sieve- tubes are colourless and

transparent, and the wall is coated with a thin layer of protoplasm-like substance, not unfrequently with small starch granules. Sieve-tubes form a special part of the bast of plants, and are met with in pteridophytes, gymnosperms, and angiosperms, exhibiting occasionally in different groups slight structural differ- ences.

6. Laticiferous Tubes are tubes containing the peculiar milky sap or latex occurring in special groups of plants. These run through the plant usually for very long distances, and when a portion is injured the milk-sap flows out at the opening. The walls are always soft, of pure cellulose, and readily giving the characteristic reaction with iodine and sulphuric acid. The tubes contain no protoplasm and nucleus ; but aquantity of a rarely watery, usually milky juice, occasionally, however, orange or yellow, and sometimes containing peculiar starch granules. The tubesare either simple or segmented. Segmented tubes oecur in Cichoracce, Campanulaccee, Lobcliacce, Papayaccee, many Papaveracce, as Papaver, Argemone, and Cheli- doninm, but not in Glaucinm or Sanguinaria, many aroids, and Musacee. Simple tubes are met with in Huphorbiaccw, Urticacce, Apocynaccer, and Asclepiadacee. These latter do not exhibit the net-like anastomoses of the segmented forms, and usually have the branches terminating in blind extremities.

7. Intercellular spaces are the cavities betwecn the elements of full-grown tissues, the cells in the meristem stage being in unin-

terrupted continuity. Some of the intercellular spaces are produced Cavities —

by the splitting of the cell-wall between three or more cells, others in are formed by the destruction of the walls of a cell or group of cells tissues,

during the formation, by desorganization, of some secretion. Lastly, large cavities appear in plants as the result of mechanical rupturing and tearing of the inner tissues during rapid growth of the part. De Bary distinguishes all

these by separate names, viz., schizo- genous when formed by splitting of the common wall between cells, lysigenous when formed by the destruction of certain cells and cell- groups, and rhexigenous when produced by mechanical disruption. From the nature of the contents, the intercellular spaces can be divided into two groups, the one containing substances or mixtures similar to those contained in glaud-cells, the other containing air, or rarely water. Of the intercellular glands, spaces, or canals the following varieties may be distinguished :—(a.) mucilage or guin canals, of which examples may be seen in Marattiacee, Lycopodiacce, Cycadacee, Canna, Opuntia, andsome Araliacce: ; (b.) resin, ethereal oil, or gum-resin canals, either in long canals, as in Conifcre, Alismacce, aroids, Composite (Tubuliflore), Umbcllifcre, Araliacee, &e., or short spaces as in Kutacee, Hypericum, Oxalis, Myrtacce, Lysimachia, &. Of the intercellular air or water spaces there are several modifications. First there are the minute spaces between the walls of parenchymatous cells, the interstitial air spaces ; and when the spaces are larger and accompanied with irregular growth of the wall, lacune are produced, as in the root of Sagittaria sagittifolia, or in the pith of Juncus or petioles of Musa, &c. Large schizogenous air-spaces with smooth walls are met with in Isoctes, Potamogcton, Hippuris, Trapa, Nympheacce, and many others. Lysigenous spaces having the remains of the destroyed cells more or less marked on the walls are seen in Equisctum, Cyperacew, Gramince, Typha, Iris; while the large hollow stems of Umbellifere, Composite, grasses, and the leaves of Alliwm, &c., are rhexigenous. Occasionally flat cell-surfaces or diaphragms interrupt the continuity of long air-spaces, and not unfrequently internal hairs or peculiar hair-like idioblasts are formed, projecting into the intercellular spaces asin Nuphar and Monstera. It is only in the neighbourhood of water stomata that the spaces contain water for a short time.

Systems of Tisswes.—Sachs describes three systems of tissues, complex aggregations consisting of different kinds of tissue, but all so combined as to form readily recogniz- able parts of the root, stem, or leaf of a plant. Externally there is the epidermal or Jimitary system equivalent to De Bary’s first division, excluding his parenchyma. This system is taken to include the epidermis of plants, with its cuticle, stomata, and hairs, and also to include the secondary modi- fications produced by the development of cork and bark. In the interior of most parts of the higher plants, and follow- ing in the

direction of the long axis of growth, separate or united strings or bundles are seen running and usually branching or anastomosing. Generally these bundles are harder than the surrounding tissues and readily separable from them. Consisting as they do of many kinds of tissue of vessels, cells, and sclerenchyma, these structures are known as fibro-vascular bundles. Lastly, there exists a quantity of parenchyma or a mixture of parenchyma with other forms, packing up all the space between the fibro- vascular bundles on the one hand and the epidermal system on the other. This forms the ground tissue, and includes the parenchyma proper of De Bary.

1. The Epidermal or Limitary System.

The epidermal system takes its name from the chief member of Epi It is dermal | _ the superficial layer, and is variously developed in the higher and tissues. |

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the group, namely, the epidermis or outer skin of the plant.

lower plants. In the lower forms, alg, fungi, lichens, the external cells are usually smaller than those below, or the walls are thicker and coloured ; while in many mosses and liverworts a true separable epidermis is only slightly indicated. In others, as in Marchantia, capsules of most mosses, and in Sphagnum, a specially differentiated epidermis appears, resembling that in the higher plants. The nature of the epidermis varies in accordance with the eonditions to which it is exposed, as to air and light, or in water, or in the soil, and in darkness. The nature of the limitary tissue also varies with the stage of growth in such parts as are of perennial duration.

Usually the epidermis is a single layer of cells producing stomata and hairs. In many plants the epidermis is strengthened by the formation of acorky outer layer, the cuticle, which develops wax ; or in other eases a new formation takes place below the epidermis, usually in the ground tissue, and by the formation of layers of cork a secondary epidermal or limitary tissue is produced. Other parts of the ground tissue assist in forming the outer covering of plants, and

may be considered physiologivally to belong to the epidermal system. These will be described as hypoderma and collenchyma under the ground tissue.

Epidermis.—The cells of the single layer forming the epidermis vary in shape, but usually the form is determined by the shape of the part on which they are developed, being elongated on long leaves, broad with straight or wavy margins on broad leaves. Usually the cells of the epidermis, although parenchymatous, have no intercellular spaces, except in Osmunda and Todca, and a few other rare instances. The only openings are thosein the stomata, schizogenous intercellular spaces, between the special cells (guard cells) of the stoma. In many plants, as monocotyledons and needle-leaved conifers, the epidermal cells contain no chlorophyll ; but in ferns and in many dicotyledons, as has been shown by Stoéhr (Bot. Zeit., 1879, p. 581), chlorophyll is present. Not unfrequently anthocyan fills the epidermal cells, and completely obscures the green colour of the chlorophyll-bearing eells below. ‘The outer wall of the epidermal cell is usually greatly thickened and corky, forming the cuticle, which generally forms a continuous sheet separable by the action of caustic potash from the rest of the wall below. In applying Schultz’s solution to a thin section of an epidermal cell, the outer layers become brown, while the inner give the reaction of cellulose. The outer laycrs are soluble in boiling caustic potash and in nitric acid and cliorate of potash, but insoluble in sulphuric acid and in ammoniacal solution of cupric oxide. Many of the cells have a marked deposit of mineral mattcr, more particularly silica (Hgwisetwm), in their walls. See Nageli and Schwendener, Das Mikroskop (2d ed.), p. 489.

Wax is frequently produced: either it is on the surface of the cuticle forming a variously constructed coating, or minute particles are embedded in its texture. The chief modifications are described by De Bary (Vergleichende Anatomie, p. 86):—(1) a layer or crust, either thin, homogeneous, and transparent, or thick and striated, the former seen in Sempervivum, the latter in the waxpalm (Klopstockia) ; (2) a coating of rod-like particles placed perpendicularly to the sur- face, either closely placed or somewhat

loose andirregular (Saccharum, Musa, and Scitamince) ; (3) a layer of granular particles, close or widely separated, and not placed one over the other (Allium, Acer, Vitis), &c. ; aud (4) irregular granules piled up one over the other in several layers, as in Eucalyptus, Ricinus, Abics pectinata, &e.

Stomata (De Bary, Vergleich. Anat., p. 36 sq.) are the openings in the epidermis which permit the entrance and escape of gases. They are formed by two semilunar cells, the guard cells, with the pore or intercellular space between them, the pore opening into a large air-space in the tissue below, and in communication, by means of the small intercellular spaces of the parenchyma, with most of the tissues of the plant. The stomata are found on those parts above ground exposed to air and light, hence chicfly on the leaves and tender green stems of plants. On leaves they are most abundant on the under side, and are generally absent from the upper surface. In many leaves, however, especially of monocotylcdons, they are equally distributed on both sides, and in water-plants with floating leaves they are abundant on the upper side but absent from thelowcr. They rarely occur on submerged water-plants and never on roots, Asarule the stomata are irregularly scattered, but in some plants, asin Hguisetum, they occur in tolerably regular longitudinal rows on the stem. Usually the stomata consist of only two cells, the

In Anemia and some other ferns a ccll is formed inside the epidermal cell, cutting a cylindrical piece out of it. This.divides and forms the guard-cells of the stoma.

Two kinds of stomata cxist in many plants. The one kind, already Water fully described, are the air-stomata, to distinguish them from the stomata.

second kind, the water-stomata. The latter occur in many plants on the leaves, immediately over the ends of the fibro-vascular bundles, near the margin on the upper surface, and often on the serrations of the margin itself. They give off water, during a portion of the life of the leaf, which appears

on the surface in the form of drops, under the action of root-pressure. They are at once distinguished by their large size, and by their not opening and closing like air-stomata.

Hairs (De Bary, Vergleich. Anat., p. 58) are usually out-growths Hairs.

of single epidermal cells ; but occasionally some of the cells below the epidermis assist in the construction of large massive hairs or emergences, as they are called by Sachs. Hairs vary very much in construction, size, and appearance, and not unfrequently different kinds of hairs occur mixed together on the same part of the plant, although in many instances only a single characteristic variety of hair may be developed on the epidermis. De Bary distinguishes several typical varietics of hairs :—(1) hairs proper; (2) papule, short rounded sac-like structures; (3) scales; (4) villi; and (5) warts or prickles. The simplest hairs are outgrowths of single epidermal cells, having the cavity either continuous with that of the epidermal cell, or cut off by a wall. Long cylindrical unicellular hairs occur in cotton; and on most roots root-hairs, with thin or sometimes with peculiarly and irregularly thickened walls (Viola tricolor). The cells may divide and form a moniliform hair, as in Tradescantia, or much more complex branched (Verbasewm thapsus) or club-shaped and glandular hairs may be produced. Flat, dry scales, either unicellular or multicellular, are seen in Deuizia, Eloagnus, and in many ferns. Papule are mentioned by De Bary as occurring on Rochea, Begonia, Piper, Ampelopsis, and_ others. The villi or colleteres occur on bud-scales and buds, while spiny hairs or warts occur frequently as the prickles of the rose and bramble, and in Dipsacus, Smilax, &c. The walls of hairs are often thin, and composed of nearly pure cellulose, or thickened and stratified in various ways, with an outer cuticular layer. The thickening is either general or local, and may assume the form of pores or spiral striation (hairs on stamen of Bulbine aloides), or may form peculiar warts or nodules. Silicious hairs (Dewlzia), or hairs containing lime, sometimes occur. In some cascs the hairs (nettle) are supported on cellular elevations of the cpidermis. These may be distinguished as the accessory cells of the hair. Glandular hairs are of frequent occurrence, the end cell or cells secreting some ethercal oil or resin; the secretion collects below the cuticle, aud either it remains there, causing the absorption of the secreting cells, or the cuticle ruptures. The

villi or colleteres are peculiar many-celled glandular hairs on young leaves, stipules, or bud-seales (Ribes, Viola, Polygonum, sculus), and secreting a gum orresin, Frequently the secretion of these colleteres is sup- plemented by the formation of a resin from below the cuticle of the epidermis, forming the gelatinous secretion covering buds, termed blastocolla (horsc-chestnut). In some plants, as Populus, the blastocolla is formed by the epidermal cells alone, in others both by the colleteres and epidermis.

Beneath the epidermis the cclls are often peculiarly modified to Second- form the hypoderma and collenchyma; but as these belong to the ary Tn some plants two or more additional cclls, the accessory cells, are | ground system of tissues they are described below. The secondary epidermal formed. These accessory cells differ from those of the epidermis | epidermal tissues, or the covering that replaces the epidermis on tlie tissue. on the one hand, and from the guard cells on the other. The posi- | perennial parts, consists largely of cork, either in the form ofa thin Periderm tion of the stoma varies. It is somctimes at the end of the long one or in repeated layers developing dceper and deeper in the tissues and epidermal cells, as in the hyacinth, or at the side, ina few cases free | of the stem or root and forming the massive bark or rhytidome. Cork rhyti-

guard cells, or of two pairs of guard cclls (Equisctunz) one over the other, or there are many, as in the peculiar stomata of Marchantia.

in the centre of the epidermal cells (Anemia, &c.). The guard cells may be on a level with the epidermis ; rarely they project slightly ; but frequently they are depressed below the surface. The guard cells often contain chlorophyll and starch, the outer wall is often thick- ened, and occasionally even wax forms on their surface ; but as a gene- ral rule no wax forms, and thus, when a thick coat of wax is developed, narrow canals through it indicate the position of the stomata. Development of Stomata.—In long epidermal cells (hyacinth) a portion is cut off at one end by cell-division, and forms the mother- cell of the stoma. It then divides into two daughter- cells, each form- ing one of the guard cells. The lamella between the two splits, either from without inwards or within outwards, and forms a schizogenous intercellular space. When the epidermal cells are not elongated (@nothera, Silene, &c.), a portion of the epidermal cell is cut off

at one part by a bent wall. This is the mother-cell of the stoma, and either forms the daughter-cells immediatcly, or may divide by segments cut off at one side and then at the other side, either one, two, or more times before the central cell divides to form the daughter-cells which form the guard-cells of the stoma. The other cells cut off on each side are the accessory cells. In other cases the accessory cells have a different crigin, being cut off from the neighbouring epidermal cells after the guard-cells are formed. In- stances of the former may be seen in Crasswlacew, Cructfere, and

Papitionaccee ; of the latter in Juncaccee, Cyperacce, and Gramince.

cells arise usually from the cortical cells, z.c., those of the ground dome.

tissue placed a short distance below the epidermis (Populus, Sambucus). In other cases the cork forms still deeper, among the green chlorophyll-bearing cells of the cortex, as in Rubus Jdous, Ribes, &c. Rarely the cork-cclls arise from the epidermis itself (Salix). In all cases cork is formed by the division of the cells of the cortex or epidermis by a tangential wall, separating the mother- cell into two daughtcr-cells. The outer cell becomes corky, rapidly losing its contents and becoming filled with air; while the inner one retains its protoplasm and forms new cork-cells by division. The formation of cork does not uecessarily begin at all parts of the circumference simultaneously, but sooner or later a complete layer of cork is formed. When the layer has become a few cells thick, it is known as the periderm ; while the active cells from which it arises are distinguished as the cork cambium or phellogen. Inside the cork cambium new cells are often formed, which contain chloro- phyll, and are known as the phelloderma (Magus, Salix), such cells being also formed by division of the cork cambium. After the forma- tion of the periderm, as is easily seen in the stem of the black currant, the whole of the epidermis and of the ground tissue immediately below becomes withered, and is thrown off. In the formation of bark, the layers of cork form repeatedly in the cortical tissue of the stem, and even in the bast portion of the fibro-vascular bundles. The layers of cells between the plates of cork, being cut off from a

Il. — 3

Lenticels. bundles and secondary epidermal tissues.

supply of nourishment, soon wither ; and thus occasionally the dead parts scale off, asin the Platanus, cherry, &c. The bark or rhytidome is thus a very complex structure, consisting of the secondary epidermal tissues either formed in the primary cortex alone or deep in the other tissues, and popularly it includes all the tissues outside the cambium layer, that is, the bast part of the fibro-vascular Lenticels are special structures connected with the epidermal tissues, and are common on dicotyledons (Sambucus, Populus, Juglans, &c.), and on some mono- cotyledons, being formed on stems, branches, petioles, and roots. Below a stoma or group of stomata a few cclls enlarge and divide, and form numerous colourless thin walled cells, which arise from the bent layer of lenticel cambium below. The epidermis becomes ruptured and the cells appear on the surface, forming a brownish wart-like marking. These lenticels are probably to be considered functionally as secondary stomata, as the cells have large inter- cellular spaces and readily permit the passage of air into the interior. Lenticels have the marked peeuliarity of being sometimes closed in autumn by the formation of cork cells, but open again in spring.

2. The Fibro-vaseular System. String-like bundles, the fibro-vascular bundles, are common in

vascular vascular cryptogams, gymnosperms, and angiosperms, and are bundles. familiar in the leaves of plants as the veins.

They run in the ground tissue either separately or united, as in many dicotyledons, and in most roots, &c., to form a central or hollow cylindrical vascular mass. When the bundles are separate they often branch and anastomose as in leaves, or they may only anastomose at the nodes of stems. The bundles are easily separable by maceration, except in water plants, and a few others, in which the bundles are very soft ; or they may be examined in transverse and longitudinal sections of the part, more particularly in the latter case when the tissues have been rendered transparent by boiling in dilute caustic potash, or by being previously boiled in strong nitrie acid. (Sce Nageli and Schwendencr, Das Mikroskop, p. 632.)

reaction, and the cavity contains abundant protoplasmic contents with excessively minute starch granules; (2) bast prosenchyma or bast vessels, elongated prosenchymatous eells, with pointed and overlapping ends, the walls so thick as almost to obliterate the cavity; the walls arc soft and flexible, often marked with fine pits; like the libriform fibres of the wood, they have occasionally the cavity chambered with thin transverse walls, and not unfrequently they branch ; (3) bast parenchyma, repcating the wood parenchyma ; but occasionally the cells are long and narrow, exactly like those of only slightly modified procambium, which they really are; in this state they are often called cambiform cells. The sieve-tubes and bast parenchyma or cambiform cells form the soft bast. ‘These different elements of the wood and bast are not always present, and the secondary wood and bast developed from cambium are often very different from the primary portions developed from procambium. Thus in Cucurbita there are no bast fibres, while in most coniferous woods the tracheides alone are present in the xylem. At the ends of the fibro-vascular bundles in the leaves the different elements gradually disappear until one or two spiral vessels and a few cam- biform cells alone remain. In most roots the fibro-vascular bundles form a central mass with the phloem and xylem in separate groups and arranged alternately; the xylem masses generally project into the centre, and the oldest vessels are nearest the centre. The whole mass, which is either a single bundle or a group of bundles, is usually surrounded externally by a peculiar layer, the pericambium, in contact with the endodermis or sheath, the inner layer of the ground tissue, which in roots forms the massive cortical portion.

8. Ground System of Tissues.

The ground tissue comprises all that remains after the formation Ground of the epidermal and fibro-vascular systems, and is usually composed tissue.

ofparenchymatouscells, not inany way distinguishable except by their position from parenchymatous cells in the other systems. In other cases the

ground tissue contains prosenehyma, or the cells in certain regions are more or less thickened. When the part contains closed

Wood Kach bundle in its perfeet state consists of two groups of cells,

: fibro-vascular bundles, as in monocotyledonous stems and in leaves (xylem) the wood or xylem portion, and the bast or phloem. Bundles are — ‘ 7

the ground tissue forms the chief bulk of the part ; but in other cases,

(phloem). meristem, from which the permanent tissueo

Structure or crystals of calcinm oxalate.

and bast either closed or open. In the former the procambium cells, the F the bundlc originates, entirely passes over into permanent tissue; while in the latter the cainbium remains between the xylem and phloem, and is capable of forming new cells for an indefinite period. Closed bundles thus rapidly assume a permanent form, while open bundles go on growing. Fibro-vascular bundles are divided by De Bary into four groups by the mode of arrangement of the xylem and phloem. The first and commonest form is the ‘‘collateral” bundle, where the xylem and phloem are placed side by side with or without cambium between thein, the xylem being always towards the pith or the central part of the stem, the phloem external. In Cucurbita, Solanwm, and others the bundles are ‘“‘bicollateral,” there being an additional phloem portion inside the xylem. ‘‘Concentric” bundles occur in many vascular cryptogams, the central xylem being completely sur- rounded by the phloem. The last form is the ‘‘ radial,” where the bundles of phloem and xylem are arranged alternately in the central fibro-vascular axis, as in most roots. Irregular bundles also occur, and numerous intermediate forms connect the different types. In each of the portions of the bundle different kinds of tissue occur ;

Structure hut there is a marked similarity in the construction of the phloem of xylem. and xylem, at least in separate bundles and before circumferential

growth takes place. In the wood, distinguished by the lignified hard brittle walls of the cells, there are four elements usually present :— (1) the wood vessels or cell fusions filled with air, having the trans- verse walls more or less completely absorbed, and having thickened walls marked with rings, spirals, reticulations, or pits of different kinds ; the ends of the cells sometimes are more or less pointed and overlapping, with pitted markings, having, however, a free commu- nication from cell to ccll through the absorbed thin part of the pits; (2) tracheides, or vessel-like wood prosenchymatous cells, having walls marked like the vessels, and with the cavity containing air, but never showing any absorption of the end walls and fusion into vessels ; (3) wood prosenchyma or libriform fibres, elongated, pointed, and overlapping cells, exactly resembling bast fibres, often with greatly thickened walls, these walls never having spiral or annular markings, but only small simple or occasionally exceed- ingly minute bordered pits ; they are very common in the wood of dicotyledons, and may either be simple or have fine transverse parti- tions forming ehambers in the long cell; (4) wood parenchyma, wood cells with thin walls, and simple pits ; these in winter con- tain starch, and other reserve materials, along with the cells of the medullary rays, and at other times may contain tannin, chlorophyll, In the bast or phloem portion of the bundle there are three elements only, as there are no cells equivalent to the tracheides. These are— (1) the sieve tubes or bast- vessels, cell-fusions like the wood vessels, but having the trans- verse portion forming the remarkable sieve plate perforated by the sieve pores, while occasionally such plates or similar markings occur ou the side walls: the walls are soft and delicate, giving a cellulose

as, forinstance, in the stems of conifers and dicotyledons, with eircum- ferential growth, the ground tissue is very feebly developed. In such stems the ground tissue forms the pith and cortex, with the

rimary medullary rays joining the two. In roots with a central fibro-vascular mass, the cortex is the only part of the ground tissue represented. The ground tissue immediately below the epidermis may be simply parenchymatous, or it may exhibit certain modifica- tions.

cellular spaces, and having special masses of thickening matter de- veloped on the walls where neighbouring cells meet. ‘These masses readily swell up in water, and probably act as a sort of erectile tissue.

In other cases a greater or less development of hypodermais observed Hypo- in leaves and stems, the cells being elongated and greatly thickened derma,

and sclerenchymatous, resembling in most points the bast-fibres of the fibro-vascular bundles. Insome plants, as in ferns, separate, often dark-coloured, bundles of sclerenchyma occur in the ground tissue. These different elements form part of what has been distinguished asthe ‘‘mechanical” system of tissues, hardened cells giving rigidity to the different parts of the plant, and although such cells occur in very different parts of plants, as in fibro-vascular bundles and in the ground tissue, still they have a marked external resemblance, and are closely related physiologically. Thick, short, sclerenchymatous cells occur in the ground tissue, as in the pulp of the pear; in other cases the parenchyma is unthickened, and contains either colourless contents or develops chlorophyll. The part of the ground tissue

next the fibro-vascular bundles forms the sheath or endodermis, Endo- a layer of cells often thiekened or cuticularized, and surrounding dermis.

either single bundles or the whole vascular mass or series of fibro- vascular bundles. In some cryptogams the endodermis is strength- ened by numerous sclerenchymatous cells surreunding it cither partially or completely. The ground tissue of tree Liliacew, and even in some abnormal dicotyledons, forms a layer of secondary meristem cells capable of developing both new ground tissue and new fibro-vascular bundles ; and it is in this way that the secondary circumferential growth in the stems and roots of Dracena, and pro- bably of the fossil vascular cryptogams, took place. The secondary circumferential growth of gymnosperms and dicotyledons is the result of the activity of the cambium ring formed by the fascicular cambium and the interfascicular cambium in the ground tissue, as already described. The changes produced by secondary circum- ferential growth are very numerous, and are fully described by De Bary (Vergleichcnde Anatomie, chaps. xiv. and Xv.).

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Either the cells form collenchyma, as in many stems and Collen- petioles, a tissue consisting of mere elongated cells without inter- chyma,

HIST OR Y

HISTORY, in the most correct use of the word, means the prose narrative of past events, as probably true as the fallibility of human testimony will allow. This definition takes no account of chronicles in verse which were not uncommon in the Middle Ages. With this exception the definition is fairly exact, both in what it comprehends and what it excludes. Obviously prose narrative is not history when it deals with fictitious events, as in the case of the novel; and verse narrative, even when it deals with true events (as in the account of the battle of Salamis in the Perse of A®schylus, or Guillaume le Breton's metrical chronicle of the reign of Philip Augustus), is either more or less than history, and in any case a sub-species by itself.

In practice, the line between history and mythus is often not easy to draw; but the theoretical distinction is plain. History reposes, however remotely, on contemporary witness to the fact related. Written records are not absolutely indispensable, as tradition may supply their place and re- present authentic contemporary testimony. But tradition is very insecure and apt to be equally inventive and oblivious. It is in the half light of tradition that mythus is born of the creative fancy of man, and the difficulty of separating fact from fiction in this border-land of mingled fable and reality very often amounts to impossibility.

But even authentic facts alone are not sufficient to con- stitute history. Many facts and dates are recorded with reference to China, Egypt, and

Assyria in olden times, which in all probability are true ; but these facts and dates are not enough to give those countries a history. The bare fact that a certain king reigned in a certain year, and conquered or was defeated in battle with a neighbour, is perhaps chronologically valuable, but it is not history. History only attains its full stature when it not only records but describes in considerable fulness social events and evolution, when it marks change and growth, the movement of society from one phase to another.

The field of history is in consequence very limited, both in time and space, in proportion to the length of human existence and the area of the earth's surface occupied by man. Primitive and savage man has no history, because the struggle for existence consumes all his energies, and he has neither time nor faculty to think of himself as a social being, much less to make record of social events. But even when partially civilized, mankind is often incapable, not only of writing history, but of furnishing the materials of it. Under a system of caste, or conservative theocracy, or oppressive tradition, as in India, Egypt, and China respectively, the social evolution is so slow that it hardly seems to move at all. The grandson lives among conditions hardly differing from those of the grandfather. In such a state of things the very subject-matter of history is wanting. Nothing attracts less notice than immobility, and large populations have often lived under conditions which for whole generations did not seem to vary. The vast and vacant annals of the East show that the arts of peace and war may attain considerable development without history or its materials being produced in consequence.

Tf these views be correct we can only allow a period of about 4000 years as the limit of genuine history in point of time. The beginning would be with the historical books of the Old Testament. Before the Jewish records fail us the Greek have begun. The Romans follow in immediate succession, and the historical thread has never been broken since, though thicker and stronger in some epochs than in others. Ag regards area, history long dwelt exclusively on the shores of that inland sea which, if not the birthplace of the human race, have at least been the chief training-ground of its early youth and vigorous manhood. Civilization subsequently spread from the Mediterranean to remote

islands and continents unknown to the ancients, and history has followed it. No doubt in time both will be coextensive with the globe; but that time has not yet come. It is still useful to remember that the materials of history now rapidly accumulating in the far West, the far South, and even the far East, owe their origin to that antiquity of which we are the heirs, to the civilization which took its rise ‘in those ever memorable centres named Rome, Athens, and Jerusalem.

Early history is never critical and painstaking in the investigation of facts. Neither the historian nor his readers or hearers have reached a stage of culture in which accuracy is highly valued. Early history is essentially artistic, its object is much more to charm the fancy and warm the emotions than to instruct the understanding. A good story, pathetic or humorous, is appreciated for its own sake independently of its truth. Striking pictures, dramatic situations, often told in dialogue, scenes in which virtue and vice are depicted on a colossal scale— these are the chief objects of the early historical writer, who mingles fact and fiction with the same naiveté as his brethren, the writers of the early epos and drama. Indeed, their subjects are often the same,—the heroes whose prowess saved or achieved the national existence, the odious foreign foe who was beaten back ; in either case characters appealing strongly to the imagination and the feelings, which would resent cold criticism, but gladly welcome elo- quence and passion. History written under these circum- stauces has much of the character of the prose poem,— carmen solutum, as Quintilian called it. The artistic or imaginative element predominates in it rather to excess. Such is history as written by Herodotus and Froissart. The growth of accurate knowledge in other departments, the increased practice of affairs, the substitution of the political for the heroic and chivalrous sentiment, lead to a more sober and scrutinizing style of history without sacrifice of artistic form. Such is history as written by Thucydides and Tacitus.

Even a most hasty survey of so vast a subject as the historical literature of the world will be helped by its division.

History is of two kinds,—the old or artistic type of history, and the new or sociological type. The artistic type, invented by the Greeks, remained the

ideal of history till comparatively recent times. Its aim was perfection of literary form, weight and dignity of language, depth of moral and sagacity of political reflexion. It was habitually careless and indifferent as regards research. But its chief distinction from the new history was a negative one; it had no conception of society as an organism, no suspicion of the depth and variety of the social forces which underlie and originate the visible events which it describes, often with admirable power. The new history is to a great extent characterized by opposite qualities. Its preoccupa- tion about literary form is secondary, moral reflexion it rather avoids, but it is laborious beyond precedent in research, and above all it is pregnant with the notion that society is a great aggregate of forces moving according to laws special to it, and similar to those producing evo- lution and growth analogous to what we see in other forms of life. The remainder of this article could not perhaps be better employed than by a short examination of these two types of history, including some reference to the causes which brought about a transition from one to the other.

The Greeks were the inventors, and remain the unsur- passed masters, of the artistic form of history. That extra- ordinary insight into the true conditions of harmony, pro- portion, and grace which guided them in other departments of literature and art did not forsake them in this, As in

the drama a few tentative and experimental essays soon led to the master works of A®schylus, Sophocles, and Aristo- phanes, so a few precursors were sufficient to direct Herodotus to the main outlines of historical composition. By one of those mysterious accidents, not to be accounted for, which produce genius, Herodotus was closely followed by the greatest mind that ever applied itself to history. Thucydides remains the unsurpassed ideal of artistic history. As the famous statue of Polycletus, called the Doryphorus, represented the proportions of the human body in such complete beauty ‘‘that it was regarded by the ancient artists as a canon of the rules on this point,” so the history of the Peloponnesian War may serve, as its author seemed to know it would, as a model which all may copy but none may equal. Art, differing from science, allows of something like final perfection. Scientific work, however admirable, is always speedily

superseded. Great artistic works remain perfect in their kind, and such was the work of Thucydides. History never deviated from the lines laid down by the Greeks till the advent of the modern school towards the end of the last and the beginning of this century. Between Thucydides and Gibbon there is no change of the ideal plan on which history should be written, thongh of course there is every degree of success and failure in striving after its realization.

A history of history is a desideratum in literature. The merit of such a work, if properly done, would consist, not only in the criticism of particular authors, but in a compari- son of their epochs and social surroundings, and a pointing out how these influenced the character and quality of their historical writing. It is, for instance, worthy of notice that history is far more sensitive and dependent on public freedom than either poetry, science, philosophy, or juris- prudence. All these have flourished under governments more or less despotic, but history never. Tacitus seems to have felt this in the depth of his heart when he said that he was able to write as he did because of the "'rara temporum felicitas ubi sentire qua velis et que sentias dicere licet." Again, certain epochs are favourable to great historians, as periods of war are favourable to great soldiers. Rating the genius of the Greek historians as high as we please, and it is difficult to rate it too high, it is still manifest that they enjoyed exceptional advantages. The political condition of the Greek world in the 4th and 5th centuries B.c, was: beyond measure stimulating to men of genuine historical power. That extraordinary collection of small states, full of the most active political life, full of wars, alliances, and brusque revolutions, was a scene of interest, of which no subsequent historian has ever seen the like. In this respect the Greek historians had a privi- lege similar to that enjoyed by the Greek sculptors. As the gymnasia displayed the finest type of manly beauty and strength ever seen, so the fervent energy and activity of the Greek states presented in unparalleled variety and fulness the features of political life most capable of inter- esting an historical mind. And it is perhaps hardly too much to say that what the palastra was to Phidias, that the Peloponnesian War was to Thucydides.

Continuing this vein of reflexion, we might remark that it is a noteworthy fact that in history alone the Romans came nearest to their Greek models.

Copyists in every- thing else, and inferior copyists, in history they equalled if they did not excel their masters. It is a moot point with many whether Tacitus should not be placed above Thucydides. In any case that steep inferiority which marked Roman imitation of Greek models in every other department was excepted in the case of history. Why was this so? Obviously because the Romans possessed a robust national life in many respects more lofty and inspir-

ing even than that of the Greeks. The genius of individual men was kindled by the propitious miliew. And a dis- astrous milieu, injurious to all productions of the mind, is peculiarly fatal to history. The decay of historical writing in the later period of the declining Roman empire is a sufficient proof. Nothing so debased as the Augustan History can be found in any other province of Latin litera- ture, and when a man of real power like Ammianus Marcellinus appears, if we compare him with Claudian in another department, we perceive that the muse of history is more austere than her sisters. The Middle Ages would offer the historian of history ample scope for connecting the quality of historical writing with the social surroundings of the authors. The great monastic houses, such as Malmes- bury, St Albans, Eu, and many more, would be shown to have been such schools of history as they were, for very efficient reasons. The appearance of the modern Herodotus, Froissart, would seem meant expressly to show the union of opportunity and genius needed to produce great historical work. It was no accident which gave us the immortal chronicles. The first instalment of the Hundred Years' War between France and England, the grand but abortive outburst of Parisian democracy under Etienne Marcel, the energetic action of the first serious States- General of France—these were subjects to arrest a real historical eye, such as Froissart had, in spite of his many shortcomings. The dramatic struggle between feudalism and monarchy in the 15th century found a competent if somewhat rustic Tacitus in Comines, more friendly but on the whole not less severe to his bourgeois Tiberius, Louis XI. In the stirring times of the 16th century historians abound—Italians, Frenchmen, Dutchmen—too numerous to mention and too distinguished to be passed over with perfunctory notice here. But how much would an historian of history have to say of Fra Paolo, Davila, De

Thou, Grotius, to name only the chief? And then occurs a really surprising phenomenon. History disappears from the con- tinent of Europe for a century anda half. Between the Thirty Years' War and the Seven Years' War the Continent produced no historians whom the world cares to remember, for Mézeray is remembered, though hardly read, on account of his quaint and occasionally graphic style. Yet this was the great age of Louis XIV., the classic age of French literature and philosophy, and the commencement of French science. But history withered under the blight of the Catholic and monarchical reaction. History was indeed being written in France, the most witty, profound, and graphic since the days of Tacitus ; but it was history which the author kept for himself and a remote posterity ; not for a hundred years was the world to be permitted to gaze with wonder and admiration on the incomparable memoirs of St Simon. But Rebellious and Revolutionary England gives us Clarendon and Burnett—cause and effect as usual. review of the 18th century and its performances in history would conclude this interesting retrospect. But it is time to return from this digression to our more immediate subject.

The old type of history, one might say, was a species of portrait-painting which had often every merit except that of close likeness to the original. Whether it is quite just to say this will be presently considered. But it cannot be denied that the old writers generally thought more of the brilliancy of their colours and the effectiveness of their pictures than of their exact truth. ' My siege is finished," said Vertot, when offered new documents which stultified his narrative. The old masters of history resembled, it is to be feared (if so honourable a comparison can be considered derogatory), the old masters of painting. Both thought little of what we call "local colour, " of close conformity to the scene or object delineated, provided they produced

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striking compositions with grand outline and rich tints which were attractive and beautiful for their own sake. When to this conception of their art we add their general apathy in research, the measure of their sins appears to be filled up in the eyes of a generation like ours, which has brought historical evidence under conditions nearly as stringent as those

which regulate the depositions of a court of justice. Still it may occur to some persons that there ig another side to this matter, and that the great men of old are not wholly without defence.. They were indolent in research no doubt, or rather they did not attach the value that we do to it (if they had, they were not men to have spared their pains), but they were large, sympathetic, and humane. They wrote for a public composed of men of the world and not of specialists. Their manner is somewhat off-hand, but they are neither prigs nor pedants. After all, the most important facts of history, as Auguste Comte has weightily remarked, are the best known and the least dependent on minute rectification for their true appreciation. History has an ethical and psychological side as well as a documentary side supported by elaborate citation of chapter and verse for every statement. Chapter and verse, import- ant as they are, are sometimes a little oppressive and over-bearing. The most exhaustive knowledge of authorities will not give a dull man insight into character, or enable him to realize and paint a great historic scene, or teach him to use with skill the mass of erudition under which he staggers. It may be said generally, exceptions of course excepted, that the old historians were strong where their successors are weak, and the converse. Aiming cltiefly at portraiture, they succeeded in it, as was only natural. Amid a crowd of errors on smaller matters, they often catch the true expres- sion of a physiognomy, and hit off the salient points of a character with an insight and success which subsequent inquiry is often unable to modify. Bacon’s portrait of Henry VII. remains substantially correct, though he wrote his book in four months, remote from the means of knowledge accessible even in his day, which did not represent a tithe of the knowledge accessible now. Even down to the practice of introduciug fictitious speeches into their histories, the old writers are not without defence. Nothing more than these speeches has moved the contempt and indignation of modern critics. Macaulay says the practic was absurd, and that if an English writer were to.attempt it now he would be laughed to scorn. Yet men of the calibre of Macchiavelli, Grotius, and Bacon resorted to it. It is more a question of form and less of substance than at first glance appears. It amounts to this—How are we torender our impression of a past epoch? We may give it in broad statement, in carefully reasoned argu- ment, supported by apt quotation and appropriate footnotes. This is the modern plan, and, to speak frankly, unquestion- ably the best. But it is well to listen without impatience to what can be said for the old plan by the other side. Mr Spedding,

referring to the speeches which Bacon intro- duced into his history of Henry VIL., says :—‘‘ My own opinion is that the reader is less liable to be deceived by history written on this principle than upon the modern plan, though the modern be apparently the more scrupulous. The records of the past are not complete enough to enable the most diligent historian to give a connected narrative in which there shall not be many parts resting on guesses Or inferences or unauthenticated rumours. He may guess for himself, or he may report other people’s guesses ; but guesses there must be. The advantage of the old practice 1s that the invention appears in the undisguised form of Invention; whereas the modern practice, by scrupulously eschewing everything like avowed and deliberate invention, leaves it to be supposed that what remains is all fact, whereas in most cases of the kind the writer is but report-

ing his own or another man’s conjecture, just as much as if he had sat down deliberately to compose a soliloquy or a speech in the first person” (Spedding’s Bacon, vol. vi. p. 76). Every one must be glad to see even plausible reasons suggested for not regarding the funeral oration of Pericles or the speech of Galgacus as “absurdities.” Per- haps the truest view of this introduction of speeches into their histories by the ancients and their modern imitators is that it was their mode of offering generalizations. They adopted the concrete and dramatic form when we should use the abstract and impersonal, and perhaps, as Mr Spedding remarks, this practice was not necessarily exposed to more error than ours.

We have now to advert to the causes which led to the transformation of history from the old to the new type.

The inferior quality of history in the 17th century and the first half of the 18th is the more remarkable from the contrast presented by the brilliaucy of contemporary litera- ture in other departments. The age of Louis XIV. in France, as already remarked, and the age of Anne in England produced no histories of superior merit. Bossuet’s famous discourse on universal history is no exception, being much more an eloquent sermon than a history in the true sense of the word. Written by inferior men from a low point of view, or po point of view at all, history at last sank to such a degree in the public

esteem as to be spoken of in a tone of contempt. Dr Johnson openly despised it, and D'Alembert did nearly the same. And yet the time produced great antiquaries—Madox and Rymer in England, D'Achery and Mabillon in France, Maratori in Italy, Leibnitz in Germany. But history had no stamina or muscle. It was also from our point of view blind and utterly stupid: it could not see the plainest facts, and it perverted the facts it did see. Not only the inferior men whose names are barely remembered and whose works are entirely forgotten, the Daniels, the Vellys, the Creviers, the Hooks, the Eckards, but men of such magnitude as Hume and Robertson, Gibbon and Voltaire, often show such an unintelligence as to the past that this unintelligence itself becomes an interesting historical phenomenon, casting no slur on the great writers who displayed it, but deserving consideration for its own sake.

When 18th century writers are arraigned for their defec- tive appreciation of the Middle Ages (the great stumbling- block) and remote periods generally, their critics forget the historical positions of the men they criticize. To write history in the 18th century was something very different from what it lad been before, and this in several ways. First of all, the mere lengthening of the historic retrospect had enormously increased the field of historical survey. – A writer of the 18th century looked back on nearly as muchi as we do; he had behind him the recent modern period, the long Middle Age, the barbarian epoch, those of Greece and Rome. And it was honourable tothe men of the 18th century that they did not shrink from the task of writing on this immense expanse of history, imperfectly as they were prepared for it. It seems to be sometimes forgotten that most of the historical writing of the ancients, and a good part of that of the moderns up to the 18th century, had been the writing of contemporary history, or history of a quite recent past. This is true of Herodotus (when he is not merely a traveller telling travellers' stories), of Thucydides, of Polybius, of Sallust, of Tacitus, of Guic- ciardini, of Fra Paolo, of Davila, of Grotius, of Clarendon, Contemporaneous history may bring out some of the highest qualities of an historian—perspicacity, weightiness of judg- ment and language, skill in narrative, and so forth. But one quality it does not need and cannot display, insight into a remote age differing in culture, politics, and religion from those amid which the historian lives. Yet it waa

precisely the history of remote ages which the writers of the 18th century boldly undertook to treat. That they often failed is not surprising. It would have been a miracle if they had succeeded.

We are now so imbued with the notions of growth and development in all forms that we find no difficulty in apply- ing them to society a3 wellas other phenomena. But these notions were all but entirely wanting in the 18th century; indeed, they did not fully emerge till the 19th had run a good portion of its course. It was difficult for all true sons of the 18th century to conceive of men or of societies dif- ferent from the men and the societies they saw around them. Or if they were forced to admit that men could exist under conditions widely differing from those in which they themselves lived, they unhesitatingly pronounced them barbarians, unpolished, hardly worthy of attention. They consequently speak of past ages habitually in a tone of supercilious contempt which is to us highly amusing. Men who differed in every other opinion agreed in this. ‘The Athenians of the age of Demosthenes were a people of brutes, a barbarous people,” said Dr Johnson ; and Voltaire was quite of his way of thinking on this point (Dict. Philosophique, art. ‘ Anciens et Modernes”), With such views or rather feelings it was impossible to understand the past ; they did not even wish to do so. They mostly re- garded their own age as the only one worthy of respect and admiration, the ouly one in which “polite manners ” had existed. The past to them was mainly a record of crime, ignorance, folly, and fanaticism (notice the way in which the sober Robertson speaks of the crusades); and they did not even wish to see it as it really was. It is ob- vious that such men could not write history as we under- stand it. The moral prejudices of the age shut out a true view of past times. Indeed they preferred a distorted view, if it represented better their notions of the seemly and the noble. They had always a tendency to dress up the past in the garb of the present. The French writers surpassed the English in this foible. For them the only ideal of a king is Louis XIV., and all kings must be made to resemble him more or less, though of course they were not so great. This disposition reaches its acme of absurdity in Scipion Dupleix, historiographer of France, who died in 1661. Describing the baptism of Clovis, he represents the bar- barian Frank as approaching St Remi, ‘with

lofty port and grave demeanour, richly dressed, scented, and powdered, with long wig carefully curled and perfumed according to the custom of the ancient French kings.” More serious is the profound misapprehension of every great character and great period which differed from the current pattern. The unworthy interpretation of all political and religious phenomena with which the writers were unfamiliar, by sagacious references to state and priestcraft, is also apt at times to appear to us wilfully perverse, and even disin- genuous. We may be sure it was nothing of the kind, and only resulted from the inadequate degree of culture then attained.

But the historians in question were hindered not only by prejudice which they could not avoid from understanding the past; they were also hindered by a want of knowledge which it was impossible for them to have. To say nothing of the larger conceptions of society which we have only recently acquired, they were unfurnished with those preparatory means of accurately observing the past which were soon to be discovered. The science of economics, as we shall presently see, was about to throw a broad and vivid light on many hitherto obscure problems of history. But the writers in question did not yet enjoy the benefit of it, and surely the fault was none of theirs. When we see a man of the genius and erudition of Montesquieu (Grandeur et Décadence des Romains, c, 17) gravely ascribing the decline

of old Rome to the fact that all the gold and silver after the division of the empire were carried to Constantinople, we realize the value of true conceptions relative.to the wealth of nations. But in Montesquieu’s time the precious metals were regarded as the sole or chief sources of wealth, and he applied without hesitation to history a principle which he saw statesmen apply without hesitation to politics. Again, Gibbon, writing on the same subject, the decline and fall of Rome, considers the real cause to have been the reluctance of the soldiers to wear defensive armour. It seems hardly credible, but here are his words :—“‘ They (the soldiers) complained of the weight of their armour, which they seldom wore; and they successively obtained permission to lay aside both their cuirasses and their helmets. The heavy weapons of their ancestors dropped from their feeble hands, and their pusillanimous indolence may be considered the immediate canse of the

downfall of the empire” (chap. 27). Montesquieu and Gibbon were men of an historical genius second to none. Yet they could descend to such trivialities, and the reason was that the true sources of national wealth and military strength had not been laid open in their day. It would be easy to multiply examples of a similar kind, taken from the ablest writers, in which the most superficial explanation of wide- reaching events is hastily caught at, as if one were to explain an earthquake by a scratching of the earth’s surface. In fact the old writers might be likened to surveyors as contrasted with geologists. They have little or no concep- tion of the forces at work under the surface they see.

But a change was near—a change in feeling and a change in knowledge. That singular modulation of key in the moral life of Europe, often called, for want of a better term, the Romantic movement, which arrested and surprised the attention of the latter half of the 18th century, was felt in relation to history as well as to philosophy, politics, and religion. Whether represented by the fierce rebellion of Rousseau in France, or a milder literary reform in England and Germany, it essentially consisted in a weariness of and disenchantment with the present and tlie recent past, in a vague feeling after ideas and emotions outside the conven- tional circle in which men had been contented to live for several generations. The tastes and the tempers of men changed with a strange rapidity. The 18th century philo- sophy, as it is called, lately so high and apparently secure, was cast out with contumely. The recent idols—Locke, Hume, Voltaire, Diderot—were smitten down, and others needless to name were put in their place. The whole movement is now seen to have been retrograde, and finally abortive, though temporarily successful. But it had its raison Wétre and even its uses, as all social phenomena have. Among its uses was the service it rendered to history. As it was a first principle with the Romantics to burn what their predecessors had worshipped and the con- verse, the past which had been recently an object of con- tempt was put in the place of honour. Especially the Middle Age, so unjustly despised, seemed to rise out of its grave as a lovely vision full of knights and chivalry, troubadour song, and Gothic architecture, the latter just beginning to be appreciated. Where men had only recently seen barbarism, superstition, and ignorance, they and their sons saw an enchanted land of beauty, piety, and grace. Then came Sir Walter Scott, who turned a current already flowing fast into a headlong

torrent. The Middle Age was studied eagerly, sympathetically, perhaps a little too much so; zeal never is according to knowledge. But the bringing of the Middle Age into the circle of serious historic study had an influence beyond its immediate object. When men had brought themselves to study and understand 11th century popes and emperors, monasticism, feudalism, scholasticism, they became bold and capable of further

adventures in historical enterprise. After the heroic ages of Christendom, the heroic ages of Greece were opened to explorers. And soon all exclusiveness disappeared. The whole past history of man was felt to be worthy of man's study,—a wide field into which many labourers entered. So much for the change in feeling.

No less a change had taken place in the condition of knowledge. Speculation had for a long time been feeling its way to a closer contact with the problems suggested by the growing wealth and industry of the modern world. Adam Smith in his memorable work resumed, co-ordinated, and enlarged the labours of his numerous predecessors, and placed the study of economics on a new and positive basis. But the suggestive stimulus of his researches spread beyond the limits of the science with which he was immediately concerned. The indirect services rendered by political economy to history have not perhaps been adequately recog- nized. The elucidation of the sources of wealth in the present became a means of explaining the prosperity and decay of states in the past, which soon led to valuable results, the more striking as they were unexpected. Hitherto wealth had been thought a source rather of degeneracy than of improvement. The great danger was always under- stood to be "luxury." Poverty was the parent of virtue. Primitive times were virtuous because they were poor. Pagan philosophers and Christian saints had agreed in condemning riches as the source of all evil, and denying the rich man a high place in their ideal republic or the city of God. Political economy cleared up the confusion of thought here implied. The wealth of states has nothing to do with the excessive opulence of a small class. Never has the mass of the people in any country or in any age suffered from an overabundance of wealth. The excessive wealth of the few generally means the poverty of the many. In

short, the evil lies in the great inequality of the dis- tribution of wealth. These common-places of economics would have been paradoxes in the early part of the 18th century, and the historians of that age show a profound ignorance of their bearing, as was only natural. So, when they have to explain the decay of a state they seek to show that it had lost its gold and silver, or that luxury had made fearful inroads, or that martial valour had somehow strangely declined. The notion that poverty in the mass of the people was very often the chief and sometimes the only cause did not oceur to them. When therefore Adam Smith devoted the third book of the Wealth of Nations to “the different Progress of Opulence in different Nations,” it seemed as if a lamp had suddenly been lit in a dark place. That book wasin truth a lofty historical review of the facts of the past, guided by the principles of economic science, The question which has already come before us, and which exercised so much, as well it might, the thinkers of that age, the decline of Rome, was approached in a much more promising manner when one element of it, the decay of agriculture in Italy, was spoken of thus :—* Tillage in that part of ancient Italy which lay in the neighbourhood of Rome must have been very much discouraged by the distributions of corn which were frequently made to the people, either gratuitously or at a very low price. This corn was brought from the conquered provinces, of which several, instead of taxes, were obliged to furnish a tenth part of their produce at a stated price. The low price at which this corn was distributed to the people must necessarily have sunk the price of what could be brought to the Roman market from Latium or the ancient territory of Rome, and must have discouraged its cultivation in that country.” This was catching a glimpse of a vera causa of the effect to be explained, and the vein of thought thus opened proved to be richer the further it was explored.

Both the moral and the intellectual tendencies at work

to produce a new temper with regard to history received an incalculable impetus from the French Revolution. That cataclysm revealed the deeper forces of society which had lain silent and unsuspected under the deceitful calm of the ancien régime in its latter days. It was very certainly a revelation, though light came from the flames of Tophet, in Mr Carlyle’s phrase. Men saw the depth of the abyss over which they had lived in quiet

ignorance, and their notions on man, society, and history underwent a great change. Passions undreamed of were let loose, and the passions of the present threw light on those of the past. History was read with new eyes. ‘“ Whenever,” says a man who lived through the tempest and profited as much as any one by it,—“ Whenever,” says Niebuhr, “an historian is reviving past times, lis interest in them and sympathy with them will be the deeper the greater the events he has witnessed with a bleeding or rejoicing heart” (Preface to List. of Rome). Few generations have seen events which alternately made men’s hearts bleed and rejoice more passionately than Niebuhr’s own, and none have ever stimulated history so much. With the peace of 1815 historical studies acquired an activity and scope they never had before. All history, it was perceived, needed rewriting from new points of view, with more knowledge, deeper insight, keener sympathy. The French led the van of the new movement with their usual brilliancy and mastery of literary form. But it was their position as the nearest witnesses and the greatest sufferers and gainers by the Revolution which did most to open their eyes. A truly illustrious band of scholars and writers under the Restoration, the Monarchy of July, raised history into a position of honour it had never enjoyed before. Michaud, the two Thierrys, Sismondi, Guizot, De Barante, Michelet, and many more rendered services to history which must not be forgotten because on many points their labours have been superseded, It is indeed a capital proof of the merit of their labours that they fur- nished the means and the incentive to their supersession, a proof that their studies were vital and progressive. The Germans, with their solid erudition, were not slow in fol- lowing the French. Between the two, the Middle Ages, Greek and Roman antiquity, and the history of the Christian Church were studied with a minuteness and breadth never known before. History had entered on its modern phase.

This is not the place to dwell in detail on the achieve- raents of the modern school of historians. The whole field of history has been explored afresh with such superior in- sight, knowledge, and just conception of the task in hand that all historical writings anterior in date to the end of the 18th century are entirely superseded, with the single ex- ception perhaps of Gibbon, who alone, as Mr Freeman says, has not been set aside by subsequent research. Ancient history, chiefly in consequence of the extraordinary zeal and diligence of the Germans in what they call the

science of antiquity (Alterthumswissenschaft), has become a reality, vivid in interest, and fruitful in knowledge, instead of the nebulous unreality it had been before. The rejection of the fabulous elements in the histories of Greece and Rome was the first step, but a long one, which it required many years and much effort to make. The next was to obtain a firm grasp of the idea that the Greeks and Romans were living men, and not statues like the Elgin Marbles, and to look at their politics, institutions, and religions with the discriminating eye of common sense, and a real wish to see them as they were. The true natureof Athenian democracy, of the Spartan oligarchy, of the commons and patricians of Rome, of the party struggles which caused and justified the transition from the republic to the empire, has been put in a clear light, which can hardly be appreciated by those who are not aware of the darkness which it replaced. Points of

view and lines of inquiry concerning the religion, govern- ment, institutions, taxation, and law of the ancient states have been opened up, of which the possibility in the old days was not suspected. The sociological knowledge of the present has illumined the past, an interesting example of which is afforded by the rapprochement between the English dominion in India and the Roman provincial administration.

The history of the Middle Age shows even greater results, and greater innovation, to which allusion has been already made. The great difficulty was the papacy. Between the Catholics, who regarded it as of divine institution, and the Protestants, who regarded it as a manifestation of Antichrist, and the sceptics, who despised both and regarded it as mere superstition, this great centre around which the life of the Middle Ages revolved had been unknown or misknown to a degree of absurdity. Gradually, as the 19th century arose wiser and sadder out of the chaos of the French Revolution, the immense part played by the church was at first dimly suspected, and at last with increasing clearness perceived. This must on every account be regarded as the greatest achievement of the modern school ; it implied the unlearn- ing of so many old errors, the acquiring of so many new truths, above all, the repression of so many deeply-rooted prejudices. It restored the continuity of history, in which the Middle Ages

had hitherto appeared as an unexplained gap,—an unwelcome wedge of barbarism thrust between the ancient and modern civilizations.

After the Middle Ages, the period which has been most illumined by the new lamp of history is that of the early church and the whole subject of religious dogma and institu- tions. In spite of the fierce controversies which have raged over this region, a large residuum of undisputed fact has been rescued from ignorance and prejudice, and church history is no longer a legend, but one of the most interesting chapters in the annals of the human mind.

As regards modern history, we are oppressed and nearly overwhelmed with the mass of new materials and new dis- coveries which have been launched upon us. ‘The diligent publication of state papers and documents, which all civilized states have taken in hand, has exceeded in the last half century all that had been done before in that direction. The result is that there are few periods of modern history which are not far better known to us than they were to the contemporaries who lived in them. But history in this field cannot boast of such laurels as she has won in the field of antiquity and the Middle Ages. There has been no great reversal of old points of view, no great triumph of historical perspicacity piercing through traditional error down to latent truth. Modern history has won its victories more by weight of metal than by the skill of its commanders, not that the generals have lacked skill, but they have had less occasion to display it.

The history of institutions has received much attention in recent times, and promises to be one of the most fruitful veins of inquiry yet opened, and this in reference both to primitive institutions, which are rather prehistorical than historical, and the constitutions of states which have reached adult political life. The old Aryan tenure of land and village communities, and ancient law, whether in old Rome or modern Bengal, have been the subjectsof elaborate investi- gation, embodied in works which mark a new departure in knowledge. The institutional history of political states is at the present moment perhaps the subject which attracts the most lively attention of scholars. It is not confined to the constitutional history of England, though England, as the mother of parliaments, has a fair claim to priority of

interest. But the subject is narrowed and degraded by contemplating it from the point of view of modern politics,

and chiefly in reference to the popular freedom or national |

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wellbeing produced. The earnest historical inquirer is as impartial as the pathologist who studies disease equally with health. The institutions of despotism have their raison @étre and normal evolution as well as those of free governments, and the scientific historian will neglect the one as little as the other. In any case the history of the institutions of Europe from the times of the Frankish empire to the end of the French monarchy offers the widest field for courageous historical research. It has absorbed and transcended all those inquiries which used to be included under the somewhat jejune title of the history of civilization. Institutionsin the secular order, and religions in the spiritual order, are now seen to be the most massive and permanent factors in human life, capable indeed of evolution and change, but little susceptible to the immediate action of man's intelligence and will, and yielding only to the new modifications brought about by time and the gradual transformation of ideas and moral conceptions, the result of increased knowledge.

It is hardly necessary to add that a broad distinction must be made between history and what has been called the philosophy of history, a term now replaced by the far better one ‘‘ sociology," invented by A. Comte. Sociology has the purely scientific aim of investigating the nature and constitution of societies, to discover the laws which regulate their growth and decay, to do in short for them what biology has already done for the animal and vegetable kingdoms. History, while it can never again dispense with the assistance of sociology, remains occupied with the description of the social organism (at a given period) in its ensemble, and the term ‘descriptive sociology" has been suggested as an improvement on the old one, history. We may question whether the innovation will be accepted or is needed. The human interest attaching to the story of man's past fortunes will always provoke the means of its own satisfaction, and there is little doubt that history, the name and the thing, as the highest form of prose

literature, will continue to instruct and console mankind to the remotest generations. (3. ©, MO.)

HIT, the ancient 7s (see Eupurares, vol. vii. p. 670), a town of Asiatic Turkey, vilayet of Baghdad, is situated on the west bank of the Euphrates, 70 miles W.N.W. of Baghdad. Its streets are narrow and frequently steep, rising one above another along the side of a hill, and the houses, which are flat-roofed, and one or two stories in height, are built chiefly of clay. It contains a graceful minaret and some richly decorated tomb-towers. The pros- perity of the town depends upon its fountain of bitumen, which has flowed from time immemorial, and, according to Herodotus, supplied that material for the building of Babylon. The inhabitants make use of the bitumen for lime burning, and also for covering boats. From water which bubbles up in the centre of the spring salt is manufactured. The population is about 3000. |

HITCHCOCK, Epwarp (1793-1864), an American geologist, was born of poor parents at Deerfield, Massa- chusetts, May 24, 1793. He owed his education chiefly to his own exertions, and was preparing himself to enter Harvard College when he was compelled to interrupt his studies from a weakness in his eyesight. In 1815 he became principal of the academy of his native town ; but he resigned this office in 1818 in order to study for the ministry. Having been ordained in 1821 pastor of the Congregational church of Conway, Massachusetts, he employed his hours of leisure in making a scientific survey of the western counties of the State. In 1825 he resigned his charge in order to become professor of chemistry and natural history in the newly-founded Amherst College, an institution which owed its early success, if not its continued existence, to his energetic efforts, both in rescuing it from

financial difficulties, and in increasing its literary and scien- tific efficiency. More especially did he render to it invalu- able service during the period when he was president, from 1844 to 1854. In 1830 he was appointed State geologist of Massachusetts, and in 1836 to the same office in con- nexion with the first district of the State of New York, On resigning the presidentship of Amherst College, he was induced to retain his

professorship. In 1836 he received the degree of LL.D. from Harvard, and in 1846 that of D.D. from Middlebury College. Besides his constant labours in geology, zoology, and botany, Hitchcock took an active interest in agriculture, and in 1850 he was sent by the Massachusetts legislature to examine into the methods of the agricultural schools of Europe. In geology his most important achievement was the examination and exposition of the fossil footprints of the Connecticut valley. The collection which he accumulated in connexion with his investigations is contained in the Hitchcock Ichnological Museum of Amherst College, and a description of it was published in 1858 in his report to the Massachusetts legis- lature on the ichnology of New England. As a writer on geological science, Hitchcock was mainly concerned in determining the connexion between it and religion, and employing its results to explain and support what he regarded as the truths of revelation. He died at Amherst, February 27, 1864.

The following are his principal works :—Geology of the Connecticut Valley, 1823; Catalogue of Plants within twenty miles of Amherst, 1829; Dyspepsia Forestalled and Resisted, 1830; Reports on the Geology of Massachusetts, 1832, 1835, 1838, and 1841; 4 Wreath for the Tomb, 1839; Fossil Footsteps in the United States, 1848; Outlines of Geology, 1855; Illustrations of Surface Geology, 1856 ; Ichnology of New England, 1858; Religious Leetwres on the Peculiar Phenomena of the Four Seasons, 1850; History of a Zoological Tem- perance Convention in Central Africa, 1850; The Religion of Geology and its Connected Sciences, 1851; Religious Truths illustrated from Science, 1857 ; Reminiscences of Amherst College, 1863; and various papers in the Biblical Repository, the Bibliotheca Saera, the American Journal of Seience, and other periodicals.

HITCHIN, a market-town of Hertfordshire, England, is situated on the small river Hiz, 34 miles from London, on the Great Northern Railway. It is for the most part neatly built of brick, and the streets are generally spacious. The principal buildings are the parish church in the later style of English architecture, with a fine porch, an Adoration of the Magi by Rubens, a small crypt said to have been used by Cromwell as a prison for the Royalists, and many inter- esting monuments; Hitchin Priory, the residence of the Radcliffe family; various chapels, schools, and banks; the infirmary, the workhouse, the town-hall, and the corn ex- change. Malting and straw-

plaiting are extensively carried on. There are also breweries and manufactories of agri- cultural implements. The population of the local board district in 1871 was 7630, and of the parish 8850.

Hitchin occurs in Domesday Book under the name of Hiz, a modification of the Saxon Hicce or Hitche, which appears more pro- minently in the present form of the name. During the Saxon heptarchy it formed part of the royal demesne of the king of Mercia. It was bestowed by Edward the Confessor upon Harold, and after the battle of Hastings it was retained by William the Conqueror. By William Rufus it was granted to Bernard de Baliol, and on the accession of John Baliol to the throne of Scotland it reverted to the crown of England, after which it was bestowed by Edward III. on his fifth son, Edmund de Langley.

HITTITES, a warlike and powerful nation, whose centre lay in the far north of Syria, between the Orontes and the Euphrates, but whose outposts about 1200 B.c. extended as far to the west as the /Mgean sea. In the Egyptian inscriptions they are called the Khita or Kheta ; in the Assyrian, the Khatti ; in the Hebrew Scriptures, the Khittim. Some confusion has been caused in the treat- ment of the history of the Hittites by the uncritical use of the Old Testament. It is true that the Khittim or Hittites are repeatedly mentioned among the tribes which in-

habited Canaan before the Israelites (Gen. xv. 20; Ex. ili. S) 17 aii: 5) seem. 20, 28, xn. 2) xxxiv. 11; Num. xin, 20 Deutavi, Ween 7 ; Jes, 1.10, ix 1, xi. 3, xii. 8, xxiv. 11; Judg. iii. 5; 1 Kings ix. 20; 2 Chr. viii. 7; Ezra ix. 1; Neh. ix. 8), but the lists of these pre-Israelitish populations cannot be taken as strictly historical documents. Not to dwell on the cases of the Perizzites (properly speak- ing, an appellative and not an ethnic name), and the Kenites and other Arab races, sometimes included, but evidently by an anachronism (see vol. iv. p. 763), it is obvious that narratives written, or (as all will agree) edited, so long after the events referred to cannot be taken as of equal authority with Egyptian and Assyrian inscriptions. How meagre the tradition respecting the Hittites was in the time of the great Elohistic narrator is shown by the picture of Hittite life in Gen. xxiii. As Ewald remarks, ‘‘ Abraham’s allies in war are Amorites ; but when he desires to

obtain a possession peaceably he turns to the Hittites.” Yet the undoubtedly authentic inscriptions of Egypt and Assyria reveal the Hittites in far different guise, as pre-eminently a warlike, conquering race. Not less unfavourable to the accuracy of the Old Testament references to the Hittites is the evidence deducible from proper names. As we shall see presently, the Hittite names preserved in Egyptian and Assyrian records are on the whole strikingly un-Semitic. The three Hittite names given in the Old Testament (Ephron, Gen. xxiii. 8, 10; Ahimelech, 1 Sam, xxvi. 6 ; Uriah, 2 Sam. xi. 3, xxiii. 39) are, however, of undeniably Semitic origin. Is it unnatural to infer that these three names are no less fictitious than the Semitic names ascribed in the Old Testament to the non-Semitic Philis- tines? It is not surprising that at least two eminent Egyptologists (Chabas, Ebers) should absolutely deny the identity of the Khita and the Khittim. This, however, seems to be going too far. The Old Testament writers clearly meant by the latter name the same people as the Egyptian inscriptions by the former, but in their time the memory of the Khita had grown so dim that they could include it among othershadowy names of conquered Canaan- itish peoples. No impartial scholar, indeed, will deny that a branch of the Khita may once have existed in Palestine. Unfortunately there is no historical evidence that it did. so. In fact, the most trustworthy notices in the Old Testament itself point to the Hittites as a nation beyond the borders of the land of Israel. In-2 Kings vii. 6 we find “the kings of the Hittites” mentioned side by side with ‘“‘the kings of the Egyptians;” in 1 Kings x. 29 the same phrase occurs parallel with ‘the kings of Aram”; and in 2 Sam. xxiv. 6 we should probably read, “‘ and they came to Gilead, and to the land of the Hittites unto Kadesh.” The position of Heth in the table of nations (Gen. x. 15) may also be regarded as a vestige of an accurate geographi- cal tradition.

If then we continue to employ the familiar name Hittites instead of the Egyptian Khita and the Assyrian Khatti, let it be understood that by this term we do not indicate one of the Canaanitish peoples conquered by the Israelites, but an extra-Palestinian race capable of holding its own even against Egypt and Assyria. Its centre lay, as we have seen already, and as is admitted on all hands, between the Euphrates and the Orontes. This was in fact the region which—one fears to say for how many centuries— was designated in the Assyrian inscriptions mat Khatti or Khatti-land. Under the name of Khatti we already meet with the Hittites in the astronomical work

in seventy tablets drawn up by Sargina, king of Agane, in the 16th century B.c. It appears from this venerable document that hostilities were constantly arising between Babylonia on the one hand and the Hittite country on the other (Sayce's translation of the tablets, Zransactions of Soc. of

Biblical Archeology, iii. 245), Among the Assyrian kings it is Tiglath Pileser I. who makes the first mention of the Khatti ; in his time they are already the lords paramount of the region between the Euphrates aud Lebanon. Sargon, the most enterprising of the Assyrian monarchs, was impatient of such an obstacle to his victorious arms, By the conquest of Carchemish and Kummuch, Khatti-land lost its two great bulwarks on the east, and was open henceforth to the Assyrian hosts. The last reference to the Khatti is in the time of Esar-haddon, who speaks of " tweuty-two kings of the land of Khatti, which is by the sea and in the midst of the sea." But it has been shown by Schrader that from the time of Sennacherib onwards the name Khatti was trausferred to the western maritime lands in general, viz., Canaan and Philistia, including Edom, Moab, and Ammon (Keilinschriften und Geschichtsforschung, pp. 234-5).

Turning now to the hieroglyphic monuments, we find the Khita playing a still more important part in the history of Egypt,—first of all, under Thothmes III. One of his generals has left us an account of his personal experiences in the campaign against the Khita (Brugsch, History of Egypt, i. 354), and in the Statistical Tablet of Karnak we have a record of the tribute brought from "the great land of the [Khita]" (ibid., p. 334, comp. Records of the Past, ii. 25). At this period, however, the Khita were but one among a number of peoples; in the wars of Seti I. and (especially) Ramses IL., they occupy the first rank among the adversaries of Egypt. The account of the battle of Kadesh (the island city on the Orontes), given by the Theban poet Pentaur, presents a vivid picture of the iili- tary prowess of this rising power (comp. Brugsch's trans- lation with that of Lushington in Records of the Past, ii. 65-78). Ramses was indeed victorious, but he owed his life and consequently his victory to his personal bravery, and, as Pentaur represents

it, to his childlike faith in his god. On an outer wall of the temple of Karnak the treaty of peace between Egypt and Khita-land may still be read

comp. Brugsch's translation with that of Goodwin in_ Records of the Past, iv. 25-32), and the same fruitful source |

of primitive history has furnished inscriptions of Ramses, with the names of conquered towns of the Khita, corre- sponding with those already recorded by Thothmes III. Thus the long feud between Egypt and Khita was closed, and the happy result was celebrated by the marriage of the Pharaoh to a daughter of the king of his chivalrous antagonists. The name of the Khita almost disappears henceforth from Egyptian history, M. Lenormant indeed (Ancient History of the East, i. 268) mentions them as assailing Ramses III., but Dr Birch (Egypt, p. 139) and Brugsch Bey more accurately describe the war referred to as one between Ramses and the conquerors of the Khita, viz., the confederated "Carian-Colchian nations" (see Brugsch Bey, History of Egypt, ii. 147).

We have spoken of the Hittites as we know them from the monuments, as a people of Syria. But the extra- monumeutal history of the Hittites, which is only beginning to be divined from scattered indications, shows that their power was not limited to the area between the Euphrates and the Orontes. Not only had they their confederates or vassals in their near or more distant neighbourhood, but they also (as it seems) despatched conquering hosts into the far-off regions of Asia Minor. Even the Egyptian records have been thought to indicate this fact. At that great battle of Kadesh on the Orontes to which we have already referred, there were present, besides the princes of Khita, the kings of Arathu, Khilibu, Naharain, Qazanadana, Malunna, Pidasa, Leka, the Dardani or Dandani, the Masu, Kerkesh or Keshkesh, Kairkamasha (so Lushington ; Brugsch, somewhat arbitrarily perhaps, Quirqimosh), Aherith, Anangas, Mushanath,—a mighty host "gathered"

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(as the poet Pentaur tells us) "from the margin of the sea to the land of Khita." The late M. de Rougé, a coryphzeus in Egyptology, actually supposed that this list included the Dardani of Asia Minor, the Mysians, Ilion, and perhaps the Lycians ; Brugsch Bey, however, who is now a

greater authority, is satisfied to identify the Dardani with those of Kurdistan (comp. Herod., i. 189), the Leka with the Ligyes (comp. Herod., vii. 72), and the Masu with the peopleof Mount Masius. But putting M. de Rougé's opinion aside, it seems to be evident from other sources that the influence of the Khita extended even into Asia Minor. Prof. E. Curtius has already pointed out "that one of the paths by which the art and civilization of Babylonia and Assyria made its way to Greece was along the great high road which runs across Asia Minor," and Professor Tiele has been struck by the presence in the religions of Asia Minor of an un- explained element which with all reserve he conjectures may be Hittite. Professor Sayce has added an important contribution to the question by showing that the Hittite capital Carchemish (rightly identified by Mr George Smith with the modern Jerabliis) was the source from which that modified type of Assyrian art was derived, which specially characterizes the early monuments of Asia Minor. " The sculpture accompanied by inscriptions in Hittite (or Ham- athite) characters which Mr Davis discovered at Ibreez in Lycaonia (Z'ransactions of Soc. of Bibl. Archeology, iv. 2) proves that the Hittites had penetrated through the eastern barrier of Asia Minor formed by the Taurus range ; and the two or three characters that still remain in the rock-cut inscription engraved in his Life in Asiatic Turkey (p. 222), and found near Bulgar Maden, make it clear that Hittite power had once extended at least as far as the central plateau of Asia Minor." Evidence has now been supplied of the extension of Hittite power to the very shores of the A.gean in the occurrence of Hittite hieroglyphics (the same which occur at Jerablis or Carchemish) on the pseudo- Sesostris (a fellow to which has, however, been pointed out) at Ninfi, the ancient Nymphezum, on the road from Smyrna to Sardes (Letter of Professor Sayce, in Academy, Aug. 16, 1879). Ina subsequent letter, Professor Sayce remarks that there were two roads open to the Hittites, and both, to judge by the scattered monuments already found, appear to have been travelled by their armies. The one was that taken by Croesus on his march against Cyrus ; its course was through Pessinus, Ancyra, and Pterium. The other was that traversed by Xenophon and the Ten Thousand ; this road passed through the Cilician Gates by Iconium. Both roads met in Sardes.

Was this enterprising race a member of the Semitic family ? Let us consider —

(1.) The evidence supplied by the pictorial representations on the ancient monuments,—*‘ If it is allowable to form a judgment on the origin of this cultivated and powerful people from its outward bearing and appearance, it seems to us, under the guidance of the monuments, to be at least very doubtful whether we should reckon this chivalrous

race among the Canaanites” (who, see art. CANAANITES, were prob-

ably in the main Semitic). ‘‘Beardless, armed in a different manner, fighting three men on each chariot of war [the Egyptian chariots only carry two], arranged in their order of battle according to a well con- sidered plan previously laid down, the Khita present a striking contrast to their Canaanite allies.” Such is the verdict of Brugsch and of all who have seen the wonderful wall-sculptures in the great temple of Abusimbel. No modern artist is more careful to repre- sent distinctive racial features than this primitive sculptor. Even at such a distance from this national centre as Ninfi (see above), Professor Sayce maintains that no one who has once seen a Hittite figure can mistake the rescmblance. The peaked tiara and the turned-up shoes are the peculiar marks of the Hittite, and of the Hittite alone.

(2.) The evidenee from language.—Our knowledge of the Hittite language is confined to the proper names mentioned in the Egyptian and Assyrian inscriptions—those which occur in the Hebrew Bible being, as we have seen, of insufficient authority. Opinions differ as to the character of the names derived from hieroglyphic sources. M. de Rougé was strongly convinced of their Semitic origin, but his cx-

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planations are for the most part adventurous, and Brugsch Bey’s ver-dictsecms philologically much more sound, ‘‘that these names do not bear a Semitic, or at any rate not a pure Semitic stamp.” The names of persons are the following, as represented by M. de Rougé:—Kheta- sar, Maursar, Kauisar, Taurteribu, Aktasib, Net’era, Tot’as, Raba- sunana, Tarakaunasa, Mait’arima, Kamaiut’a, Taatur, Sapalel, Sama- risa, Paiusa, Akama, Tuher, Kirabsar. To these may be added the following from the list of nations of Thothmes III. :—Pirkheta, Ai, Amau, Thuka, Thel-manna, Legaba, Tunipa, Ni, Ar, Zizal, Zakal, Arzakana (Brugsch, History of Hgypt, ii. 5). No less

un-Semitic for the most part arc the names of Hittite persons and places which occur on the Assyrian monument. The following is a list of the kings of Khatti-land given by Shalmaneser IJ. on the monolith inscription : ‘‘ Sangar of Carchemish, Kundaspi of Kummuch, Arami, son of Gusi, Lalli of Lallid, Chayan, son of Gabar, Girparud of Patin, Gir- parud of Gamgum” (lines 82, 83), to which should be added “‘Sapalulmi of Patin” (lines 42, 43), which so strongly reminds one of the name of the king of Khita, Sapalili, mentioned in the treaty between Ramses II. and the Khita. The un-Semitic char- acter of this group of names is the more remarkable, because (as Professor Sayce remarks) Assyrian, being itself a Semitic language, could not help representing foreign Semitic names in a form recog- nizable as Semitic. How obviously Semitic, for instance, are the names of the kings of Hamath and Damascus, handed down to us in the Assyrian inscriptions! True, one of the above names of Hittite places, Carchemish (‘‘ fortress of Chemosh ”), has a Semitic air, and the same may be said of Kadesh, the scene of the victory of Ramses II. But (1) it is not quite certain that Carchemish is Semitic (the Assyrians generally reproduce it under the form Gargamis, though sometimes Kargamis), and (2) even if it is Semitic, this may arise from the towns having been occupied by Semites prior to the Hittites. As for Kadesh (in the Egyptian inscriptions, Ketesh), though under the jurisdiction of the Khita, it was reckoned as a Canaanitish or more strictly an Amoritish town (Birch, Hgypt, p. 116), while Orontes (in Egyptian, Arunata) has not even a Semitic appearance. It is true, again, that several of the Hittite proper names are compounded with sar—e.g., Khita-sar (the king who warred against Ramses II.), and that sar is evidently the Assyrian for ‘“‘king” (also Hebrew for ‘‘ prince”). But sar is also found in Egyptian inscriptions ; it isin fact of Accadian (non-Semitic) origin, and was therefore borrowed by the Assyrians, before the Hittites and the Egyptians adopted it from them. The form of names like Khcta-sar (see list above) favours the view that the Hittite language was agglutinative, and consequently non-Semitic.

But this and all other aspects of Hittite culture will appear in a new light when the explorations have made further progress. At present we can only say that the probability is that the Hittites are not Semitic ; in fact, they display an originality of genius which is not strikingly characteristic of pure Semitic races. The hypo- thesis which regards them as the early civilizers of

Asia Minor seems confirmed by the position of Carchemish, so favourable to the radi- ation of civilizing influences. The importance of the Hittite capi- tal in a commereial respect is known to all. The maneh or mina of Carchemish is constantly mentioned on the cuneiform tablets ; pro- bably it was of lighter weight than the silver mina in use in Pheenicia (see Mr Barclay V. Head's letter in Academy, Nov. 22, 1879). Of the religious life of the Hittites we are hardly in a posi- tion to speak. We know indecd that, like the Hyksos, they ee Sutekh (who was localized, like Baal, as the patron of particular cities on the treaty of Ramses II.), and, like the Canaan- ites, Astarata or Ashtoreth. The worship of Astarata will account for the name Hierapolis given afterwards, as it seems, to Carchem- ish, as well as to other Syrian cities (Jerabltis being a corruption of Hierapolis). But beyond this all is dark. Did the Hittites borrow in religious matters from the Assyrians? Had they legends relative to the origin of the world, and in what relation do these stand to the Hebrew narratives? Passing to philology in the narrower sense of the word, we wait longingly for a confirmation of Professor Sayce's view that the Hittites were the authors of the Hamathite hieroglyphics. No Semitic nation ever invented a syllabic system of writing ; the Hittites are in all probability non-Semitic, and from their enterprising character are precisely the people likely to have invented such characters. Professor Sayce has followed up this con- jecture by another of no less importance, viz., that the enigmatical Cypriote syllabary is really derived from the hieroglyphics of Hamath. If this be proved (and the propounder of it claims to have the evidence rcady), and if the Hittites be really the inventors of the Hamathite hieroglyphies, this wonderful nation steps into a position hardly surpassed by that of any of the nations of the distant East.

Authorities—Documents in Brugsch's History of Egypt, compared with the parallel passages in Records of the Past, vols. ii., iv.; ' Monolith Inscription of Shalmaneser," Records of the Past, iii. 25-36; Schrader, Keilinschriften und Geschichtsforschung, pp. 225-236; Brugsch, History of Egypt, ii. 2-8; Chabas, Voyage Pun Egyptien, pp. 318-332; Vicomte de Rougé, Mélanges d'archéologie Assyrienne et Eguptienne, 1875, p. 264, &c. (posthumous); Ictters of Professor Sayce in Academy, Aug. 16 and Nov. 1,1879. On the site of Carchemish, see Schrader, Keilinschriften, &c., pp. 221-225; Maspero, Journal des Savans,

Oct. 1873; and Pococke's Account of the Ruins of Jerabus (Jerablis); A Descrip- tion of the East, &c., 1748-45, ii. 165, (T. K. ©.)

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HITTORFF, Jacques Ienace (1793-1867), French architect, was born at Cologne, August 20, 1793. After serving an apprenticeship to a mason in his native town, he went in 1810 to Paris, and studied for some years at the Academy of the Fine Arts, where he was a favourite pupil of the Government architect Bélauger, who in 1814 appointed him his principal inspector. Succeeding Bélanger as Government architect in 1818, he designed many important public and private buildings in Paris and also in the south of France. After making architectural tours in Germany, England, Italy, and Sicily, he published the result of his observations in the latter country in the work Architecture antique de la Sicile (3 vols. 1826-30; new edition, 1866— 67), and also in Architecture moderne dela Sicile (1826-35). One of his important discoveries was that colour had been made use of in ancient Greek architecture, a subject which he especially discussed in Architecture polychrome chez les Grecs (1830), and in Restitution du temple d'Empédocle a& Sélinunte (1851); and in accordance with the doctrines enunciated in these works he was in the habit of making colour an important feature in most of his architectural designs. His principal building is the church of St Vincent de Paul in the basilica style. He also designed many of the embellishments of the Place de la Concorde, the Champs-Hlysées—where he constructed the Circus of the Empress, which has been the model of many simi- lar buildings in various parts of Europe—the Bois de Boulogne, and other places. In 1833 he was elected a member of the Academy of Fine Arts, He died at Paris, March 25, 1867.

HITZIG, Ferpinanp (1807-1875), exegete and Biblical critic, was born at Hauingen, Baden, where his father was an evangelical pastor, on June 23, 1807, received his early education at the pidagogium of Lorrach and at the lyceum of Carlsruhe, and entered the university of Heidel- berg as a student of theology in the autumn of 1824. There he remained for a year, attending the lectures in exegesis and church history of Paulus the famous " rationalist "; but in 1825 he removed to Halle where Gesenius first decided him to devote himself to Old Testament subjects. His next step was to

Gottingen in 1828, where he had Ewald for his master, and where in 1829 he graduated, the subject of his thesis being De Cadyti Urbe Herodotea. Returning to Heidelberg shortly afterwards, he “‘ qualified ” as “ privatdocent” in theology the same year, and in 1831 published his Begriff der Kritik am Alten Testamente praktisch erértert, a treatise in which the critical principles of the grammatico-historical school were stated with great fulness, clearness, and cogency ; also Des Propheten Jonas Orakel tiber Moab, an exposition of the 15th and 16th chapters of the book of Isaiah attributed by him, as by many subsequent critics, to the prophet Jonah mentioned in 2 Kings xiv. 25. His next literary performance was a commentary on Isaiah (Uebersetzung u. Auslegung des Propheten Jesajas), the publication of which in 1833 was soon followed by a call to an ordinary professorship of theo- logy in the university of Zurich. There he laboured for a period of twenty-eight years, during which, besides commen- taries on Zhe Psalms (1835-36; 2d ed., 1863-65), The Minor Prophets (1838; 3d ed., 1863), Jeremiah (1841; 2d ed., 1866), Ezekiel (1847), Daniel (1850), Ecclesiastes (1847), Canticles (1855), and Proverbs (1858), he published a monograph, Ueber Johannes Markus u. seine Schriften (1843), in which he maintained the chronological priority of the second gospel, and sought to prove that the Apocalypse was written by the same author, and various treatises of archzological interest, of which the most im- portant are Die Erfindung des Alphabets (1840), Urgeschichte u. Mythologie der Phalistier (1845), and Die Grabschrift des Eschmunezar (1855). In 1861 he was called to succeed

Umbreit in the chair of theology at Heidelberg ; there he wrote his Geschichte des Volkes Israel (1869-70), in two parts, extending respectively to the end of the Persian domination and to the fall of Masada, 72 A.D., as well as Zur Kritik Paulinischer Briefe (1870), Die Inschrift des Mescha (1870), Sprache u. Sprachen Assyriens (1871), besides revising Hirzel’s commentary on Job (1874). He was also a frequent contributor to the Monatsschrift des wissenschaftlichen Vereins in Ziirich, the Zeitschrift der Deutschen Morgenlindischen Gesellschaft, the Theologische Studien u. Kritiken, Zeller’s Theologische Jahrbiicher, and Hilgenfeld’s Zeitschrift fir wissenschaftliche Theologie. Hitzig died at Heidelberg on January 22,

1875. As a Hebrew philologist he holds very high rank ; and as a constructive critic he is remarkable for the acuteness and sagacity shown in his combinations. His theories, however, are often carried out with a vigour and rigour quite unwarranted by the amount of evidence upon which they rest; and his deficiency as a commentator in ideality and religious sympathy sometimes almost approaches the ludicrous. His lectures on Biblical theology (Vorlesungen diber biblische Theologie u. Messianische Weissagungen) have been recently published (1880), along with a portrait and biographical sketch by Kneucker. See also Kamp- hausen's article in Herzog and Plitt's Realencyklopddve, vol. vi.

HOACTZIN, or Hoarzrn, a bird of tropical South America, thought by Buffon to be that indicated by Hernandez or Fernandez under these names, the Opzsthoco- mus hoazin or O. cristatus of modern ornithologists—a very curious and remarkable form, which has long exercised the ingenuity of classifiers. Placed by Buffon among his " Hoccos" (Curassows), and then by P. L. 8. Miiller and Gmelin in the Linnean genus P'hasianus, some of its many peculiarities were recognized by Illiger in 1811 as sufficient to establish it as a distinct genus, Opisthocomus ; but various positions were assigned to it by subsequent syste-

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matic authors, whose views, not being based on any infor- mation respecting its internal structure, do not here require particular attention. . L'Herminier was the first to give any account of its anatomy (Comptes Rendus, 1837, v. p. 433), and from his time our knowledge of it has been successively increased by Johannes Miller (Ber. Akad. Wussensch. Berlin, 1841, p. 177), Deville (Rev. et Mag. de Zoologre, 1852, p. 217), Gervais (Castelnau, Hxpéd. Amérique du Sud, Zoologie, Anatomie, p. 66), Prof. Huxley (Proc. Zool. Society, 1868, p. 304), Mr Perrin (Zrans. Zool. Society, ix. p. 353), and Garrod (Proc. Zool. Society, 1879, p. 109). After

a minute description of the skeleton of Opzsthocomus, with the especial object of determining its affinities, Prof. Huxley declared that it ‘resembles the ordinary Gallina- ceous birds and Pigeons more than it does any others, and that when it diverges from them it is either sui generis or approaches the Musophagide.” He accordingly regarded it as the type and sole member of a group, named by him Heteromorphe, which sprang from the great Carinate stem later than the Zinamomorphe, Turnicomorphe, or Chara- driomorphe, but before the Peristeromorphe, Pteroclo- morpho, or Alectoromorphe. This conclusion is substan- tially the same as that at which Garrod subsequently arrived after closely examining and dissecting specimens preserved in spirit ; but the latter has gone further and endeavoured to trace more particularly the descent of this peculiar form and some others, remarking that the ancestor of Opistho- comus must have left the parent stem very shortly before the true Galline first appeared, and at about the same timo as the independent pedigree of the Cuculide and Muso- phagide commenced—these two groups being, he believed, very closely related, and Opisthocomus serving to fill the gap between them.

It would be impossible here to state at length the facts on which these views are grounded, and equally impossible to give more than a very few details of the anatomy of this singular form. The first thing that strikes the spectator of its skeleton is the extraordinary structure of the sternal apparatus, which is wholly unlike that of any other bird known. The keel is only developed on the posterior part of the sternum—the fore part being, as it were, cut away, while the short furcula at its symphysis meets the manubrium, with which it is firmly consolidated by means of a prolonged and straight hypocleidium, and anteriorly ossifies with the coracoids. This unique arrange- ment seems to be correlated with the enormously capacious crop, which rests upon the furcula and fore part of the sternum, and is also received in a cavity formed on the surface of each of the great pectoral muscles. Furthermore this crop is extremely muscular, so as more to resemble a gizzard, and consists of two portions divided by a partial constriction, after a fashion of which no other example is known among birds.

The Hoactzin appears to be about the size of a small Pheasant, but is really a much smaller bird. The beak is strong, curiously denticulated along the

margin of the maxilla near the base, and is beset by diverging bristles, The eyes, placed in the middle of a patch of bare skin, are furnished with bristly lashes, resembling those of Horn- bills and some few other birds. The head bears a long pendent crest of loose yellowish feathers. The body is olive-coloured, varied with white above, and beneath is of adull bay. The wings are short and rounded. The tail is long, and tipped with yellow. The legs are long, the feet stout, the tarsi reticulated, and the toes scutellated ; the claws long and slightly curved. According to all who have observed the habits of this bird, it lives in bands on the lower trees and bushes bordering the streams and lagoons, feeding on leaves and various wild fruits, especially, says Mr Bates (Naturalist on the River Amazons, i. p. 120), on those of a species of Psidiwm, and it is also credited with eating those of an arum (Caladium arborescens), which grows plentifully in its haunts. “Its voice is a harsh, grating hiss,” continues the same traveller, and “ it makes the noise when alarmed, all the individuals sibilating as they fly heavily away from tree to tree, when disturbed by passing canoes.” It exhales a very strong odour—where- fore it is known in British Guiana as the ‘“ Stink-bird ”—compared by Mr Bates to ‘‘ musk combined with wet hides,” and by Deville to that of a cow-house. The species is said to be polygamous; the nest is built on trees, of sticks

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placed above one another, and softer materials atop. Therein the hen lays her eggs to the number of three or four, of a dull yellowish-white, somewhat profusely marked with reddish blotches and spots, so as to resemble those of some of the Rallide (Proc. Zool. Society, 1867, pl. xv. fig. 7. p. 164). In the valley of the Amazon it is called the “ Qigano” or Gipsy, and in no part of the country where it occurs does it seem to be regarded with much favour. Only one species of the genus is known to have existed, for Mr Wallace’s statement (Geogr. Distrib. Animals, i. p. 164) that remains of a second have been found in Brazilian caves seems to have originated in a mistake. (A. N.) HOADLY, Bengamin (1676-1761), the originator of the Bangorian controversy, was the second son of the Rev. Samuel Hoadly, and was born at Westerham, Kent, Novem- ber 14, 1676. After receiving his early education under the direction of his father, he entered Catherine Hall, Cam- bridge, where he graduated M.A. and was for two years tutor, after

which he held for ten years the lectureship of St Mildred in the Poultry, and along with it for the last eight years the rectory of St Peter-le-Poer, London. His first appearance as a controversialist was against Mr Calamy in reference to conformity, and immediately after this he engaged in a more important dispute with Bishop Atterbury against the Anglican doctrine of nonresistance. His prin- cipal treatises on this subject were the Ifeasures of Sub- mission to the Civil Magistrate and The Origin and Institution of Civil Government discussed ; and his part in the discussion was so much appreciated by the Commons that in 1709 they presented an address to the queen pray- ing her to “bestow some dignity in the church on Mr Hoadly for his eminent services both to church and state.” The queen returned a favourable answer, but the dignity was not conferred. In 1710 he was presented by a private patron to the rectory of Streatham in Surrey. In 1715 he was appointed chaplain to the king, and the same year he obtained the bishopric of Bangor. In 1716 he published a Preservative against the Principles and Practices of Nonjurors in Church and State, and in the following year preached before the king his famous sermon on the Kingdom of Christ, which was immediately published by royal com- mand. ‘These works were attacks on the divine authority of kings and of the clergy, but as the sermon dealt more specifically and distinctly with the power of the church, its publication caused an ecclesiastical ferment which in certain aspects has no parallel in religious history. It was at once resolved to proceed against him in convocation, but this was prevented by the king proroguing the assembly, a step which had consequences of vital bearing on the history of the church, since from that period the great Anglican council ceased to transact business of a more than formal nature, The restrained sentiments of the coun- cil in regard to Hoadly found expression in a war of pamph- lets known as the Bangorian controversy, which, partly from a want of clearness in the statements of Hoadly, due perhaps both to his intellectual defects and to a cautious regard to ulterior consequences, partly from the disin- genuousness of his opponents and the confusion resulting from exasperated feelings, developed into an intricate and bewildering maze of side discussions in which the main Issues of the dispute were coucealed almost beyond the Possibility of discovery, But however vague and uncertain might be the meaning of Hoadly in regard to several of the important bearings of the questions around which he aroused discussion, he was explicit in denying the power of the church over the conscience, and its

right to determine the condition of men in relation to the favour of God. To such an extent was the mind of the religious world exercised on the matters in dispute that in July 1717 as Many as seventy-four pamphlets made their appearance ;

and at one period the crisis became so serious that the business of London was for some days virtually at a stand- still. Hoadly was translated in 1721 to the see of Here- ford, in 1723 to Salisbury, and in 1734 to Winchester. He died at his palace at Chelsea, April 17,1761. Though his writings possess no charm of style, and are not only devoid of originality, but characterized by great prolixity and dulness, they in their own day did important service to the cause of civil and religious liberty, and accidentally he was the occasion of a change in the practical authority of the church which had an influence of prime importance on its after history. He was an intimate friend of Dr Samuel Clarke, of whom he wrote a life.

The works of Hoadly were collected and published by his son in 3vols.,1773. To the first volume was prefixed the article ‘“‘Hoadly,” from the supplement to the Biographia Britannica.

HOARE, Str Ricuarp Coss (1758-1838), Bart., English antiquary, eldest son of Sir Richard Hoare, the first baronet, an eminent banker, was born 9th December 1758. Having been accustomed in his youth to apply himself to business, the diligent habits which he then acquired induced him afterwards to relieve the tedium of his life by the study of topography and antiquities. In 1783 he married the eldest daughter of Lord Lyttelton, and on her death in 1785 he made a tour on the Continent, visiting France, Italy, and Switzerland. He succeeded to the baronetcy on the death of his father in 1787, and in the following year he left England on a second Continental tour. The record of his travels was originally published by him in four volumes, and these were afterwards condensed into two, which appeared in 1810 under the title A Classical Tour through Italy and Sicily. Travelling on the Continent having been rendered insecure on account of the war with France, he next resolved to make a tour in Wales, taking Giraldus Cambrensis (de Barri) as his guide, and in 1808 he pub- lished a translation of Giraldus, with notes, illustrations, and a life of the author, in two

splendid quarto volumes. In 1807 he visited Ireland ; and he also published an ac- count of this excursion. His most important contribution to antiquarian science was, however, his history of his native county, Wiltshire. In 1821 he completed in two volumes folio the History of Ancient Wiltshire, after which he com- menced the History of Modern Wiltshire, and confining his attention to South Wiltshire was able with the help of several coadjutors almost to finish the work before his death. The first part—the history of the hundred of Mere—ap- peared in 1822, and the last part in 1843. Hoare died at Stourhead, May 19, 1838. For a notice of him and a list of his works, many of which were printed privately, see the Gentleman's Magazine for July 1838.

HOBART TOWN, sometimes wrongly HoBartown or HoBarron, the capital of Tasmania (named by its founder, Colonel Collins, on the 19th February 1804, in honour of Lord Hobart, then secretary of state for the colonies), is situated in the south of the island in 42° 53' 22" S. lat. and 147° 21' 20″ E. long. It occupies a succession of hills along a sheltered bight on the western bank of the Derwent river, known as Sullivan's Cove, about 17 miles from the ocean, and not far from the base of Mount Wellington, an eminence whose summit, 4166 feet above the level of the sea, is covered with snow during many months of the year. The city proper, forming nearly a square, and laid out in wide streets intersecting at right angles, has an area of 1270 acres, and contains about 5000 houses, with a popula- tion estimated on the 1st of January 1879 at 23,000. Of the public squares the most extensive is the Queen's Domain, and the most central the Franklin Square, with the bronze statue of the eminent Arctic explorer, who governed Tasmania from 5th January 1837 to 21st August 1843. Most of the public buildings (the houses of parliament, the

town-hall, the supreme court, and the museum) are con- veniently adjacent to each other in Magdalen Street. The town-hall, erected about 1872 at a cost of £12,000, contains a large reading-room anda suite of rooms for the free public library, which has upwards of 8000 volumes. The museum comprises a scientific library and apartments for the Royal Society of Tasmania. Besides the Anglican cathedral of St David's, founded in 1873,

and the Roman Catholic cathedral of St Mary's, the churches comprise a Congrega- tional memorial church, a Wesleyan "Centenary" chapel, and others belonging to Baptists, Independents, and Quakers. There is also a synagogue, but the Jewish com- munity consists of only a few families. The charitable institutions of the town are maintained at the expense of the state. Among the remaining buildings may be men- tioned five banks, a theatre, the freemasons' hall and the oddfellows' hall. In the neighbourhood of the city is the official residence of the governor of Tasmania, an ornate castellated mansion ; the grounds of this adjoin the botanic gardens, which occupy an area of 21 acres.

Hobart Town has becn under municipal government since 1853, and was incorporated as a city in 1857. There are nine aldermen elected by the ratepayers, and one of them is appointed mayor. The annual value of rateable property exceeds £100,000. Anabun- dant supply of pure water is brought from the springs of Mount Wellington, and stored in a reservoir about a mile from the city, capable of holding 50,000,000 gallons. Among the industrial establishments are six breweries, a candle factory, a foundry, ten hat and cap factories, seven steam flour-mills, a pottery, twelve saw-mills, aud a tin-smelting work. The commerce of the town is steadily increasing. The securely sheltered harbour is capable of accommodating ships of the largest tonnage, and is provided with three patent slips of considerable size; not only is the port the head- quarters of the Tasmanian Steam Navigation Company, which trades with Melbourne, Sydney, and New Zealand, but a line of colonial vessels communicates regularly with London. During the year 1877 the total burthen of shipping inwards was 79,480 tons, of the shies outwards 82,827 tons. The declared value of the imports at the Custom House was £664,439 (£255,344 from the United Kingdom), and that of the exports £720,136 (£801,477 to the United Kingdom), £715,304 worth being produce of the colony. The customs collected during the year 1878 amounted to £118,306, being an increase of about £4000 on the previous year. According to the returns for 1877 the principal exports were tin ore (valuc £61,765), tin (£20,886), bark (2086 tons, £13,410), fruit (188,585 bushels, £44,001), jam (3,742,341 tb, £100,069), hops (696,048 tb, £36,457), sperm-oil (450 tons, £33,410), rabbit skins (58,781 dozen, £5072), timber, shingles, railings, &c. (£351,851), and_ wool (£299,514). The principal imports are sugar, tea, oil,

tobacco, live stock, machinery, spirits and wine, boots and shoes, wearing apparel, ironmongery and cutlery, glass and china-ware, books and stationery, saddlery, manure, drugs, &c. The first newspaper was published in Hobart Town in 1810. There are now (1880) two dailies, one weekly, and four monthlies. During the summer season the city is a favourite resort of Australian tourists attracted by the comparative coolness of the climate. The mean temperature for 35 years was 55°41° Fahr.; and in the same period the barometer at a temperature of 32° has registered an average of 29°82 inches.

HOBBEMA, Meynpert (c. 1638-1709), the greatest landscape painter of the Dutch school after Ruysdael, lived at Amsterdam in the second half of the 17th cen- tury. His merit has been but recently recognized, whence the obscurity in which his life remains. Nothing is more disappointing than to find that in Hobbema's case chronology and signed pictures substantially contradict each other. According to the latter his practice lasted from 1650 to 1689; according to the former his birth occurred in 1638, his death as late as1709. That no attempt has yet been made to reconcile these con- tradictions is strange. It is perfectly clear that if the masterpiece of the late Bredel collection, called A Wooded Stream, honestly bears the date of 1650, or The Cottages under Trees of the Ford collection the date of 1652, the painter of these canvases cannot be Hobbema, whose birth took place in 1638, unless indeed we admit that Hobbema painted some of his finest works at the age of twelve or fourteen. No doubt, as regards signa-

tures, there is much in Hobbema's creations to excite suspicion. For a considerable period it was profitable to pass Hobbemas as Ruysdaels, and the name of the lesser master was probably erased from several of his productions. When Hobbema's talent was recognized, the contrary pro- cess was followed, and in this way the name, and perhaps fictitious dates, reappeared by fraud. It is difficult to account for the discrepancies of pictures and chronology by any other cause. Yet this leaves unexplained why dates as well as names should have been forged. An experienced eye will note the differences which occur in Hobbema's signatures in such well known examples as adorn the galleries of London and Rotterdam, or the

Grosvenor and Van der Hoop collections. The dates can only be tested by chemical means. Meanwhile, we must be content to know that, if the question of dates could be brought into accordance with records aud chronology, the facts of Hobbema's life would be as follows. Meyndert Hobbema was married at the age of thirty to Eeltije Vinck of Gorcum, in the Oudekerk or old church at Amsterdam, on the 2d of November 1668. Witnesses to the marriage were the bride's brother Cornelius Vinck and Jacob Ruysdael. We might suppose from this that Hobbema and Ruysdael, the two great masters of landscape, were united at this time by ties of friendship, and accept the belief that the former was the pupil of the latter. Yet even this is denied to us, since records tell us that there were two Jacob Ruysdaels, cousins and contemporaries, at Amsterdam in the middle of the 17th century—one a frame- maker, the son of Solomon, the other a painter, the son of Tsaac Ruysdael. Of Hobbema's marriage there came between 1668 and 1673 four children. In 1704 Eeltije died, and was buried in the pauper section of the Leyden cemetery at Amsterdam. Hobbema himself survived till December 1709, receiving burial on the 14th of that month in the pauper section of the Westerkerk cemetery at Amsterdam. Husband and wife had lived during their lifetime in the Rozengracht, at no great distance from Rembrandt, who also dwelt there in his later and impov- erished days. Rembrandt, Hals, Jacob Ruysdael, and Hobbema were in one respect alike. They all died in misery, insufficiently rewarded perhaps for their toil, im- prudent perhaps in the use of the means derived from their labours. Posterity has recognized that Hobbema and Ruysdael together represent the final development of land- scape art in Holland. Their style is so related that we cannot suppose the first to have been unconnected with the second. Still their works differ in certain ways, and their character is generally so marked that we shall find little difficulty, in distinguishing them, nor indeed shall we hesitate in separating those of Hobbema from the feebler productions of his imitators and predecessors—Isaac Ruysdael, Rontbouts, De Vries, Dekker, Looten, Verboom, Du Bois, Van Kessel, Van der Hagen, even Philip de Koningk. In the exercise of his craft Hobbema was patient beyond all conception. It is doubtful whether any one ever so completely mastered as he did the still life of woods and hedges, or mills and pools. Nor can we believe that he obtained this mastery otherwise than by constantly dwelling in the same neighbourhood, say in Guelders or on the Dutch Westphalian border, where day after day he might study the branching and foliage of

trees and under- wood embowering cottages and mills, under every variety of light, in every shade of transparency, in all changes pro- duced by the seasons. Though his landscapes are severely and moderately toued, generally in an olive key, and often attuned to a puritanical grey or russet, they surprise us, not only by the variety of their leafage, but by the finish of their detail as well as the boldness of their touch. With astonishing subtlety light is shown penetrating cloud, aud

illuminating, sometimes transiently, sometimes steadily, different portions of the ground, shining through leaves upon other leaves, and multiplying in an endless way the transparency of the picture. If the chance be given him he mirrors all these things in the still pool near a cottage, the reaches of a sluggish river, or the swirl of the stream that feeds a busy mill. The same spot will furnish him with several pictures. One mill gives him repeated oppor- tunities of charming our eye; and this wonderful artist, who is only second to Ruysdael because he had not Ruysdael's versatility and did not extend his study equally to downs and rocky eminences, or torrents and estuaries— this is the man who lived penuriously, died poor, and left no trace in the artistic annals of his country! It has been said that Hobbema did not paint his own figures, but transferred that duty to Adrian van de Velde, Lingelbach, Barendt Gael, and Abraham Storck. As to this much is conjecture. The best of Hobbema's datcd pictures are those of the years 1663 to 1667. Of the former, scveral in the galleries of Brussels and St Petersburg, and one in the Holford collection, are celebrated. Another was shown as the property of Lord Hatherton at Man- chester. Of 1665 fine specimens are in the Grosvenor gallery and the collection of Sir R. Wallace. Ofseven pieces in the National Gallery, including the Avenue at Middelharnis, which some assign to 1689, two are dated 1667. A sample of the last of these years is also in the Fitzwilliam museum at Cambridge. The value of Hob- bema's pictures may be gathered from this that the Watermill bought from the Schneider collection in 1876 for the Antwerp museum cost 100,000 francs (£4000), whilst a smaller landscape in the Hodshen sale at Amstcrdam was knocked down to Sir R. Wallace for 49,500 florins, or £4800. The Brussels gallery also bought a Hobbema in 1874 for 60,000 francs. Amongst the master- pieces in private hands in England may be

noticed two land- scapes in Buckingham palace, one belonging to Lord Overstone, two to the Earl of Ellesmere, and one to Mr Walter of Bearwood. On the Continent we register a Wood in the Berlin gallery, a Forest belonging to the duchess of Sagan in Paris, and a Glade in the Louvre. There are other fine Hobbemas in the Arcnberg gallery at Brussels and the Belvedere at Vienna. (J. A. C.) HOBBES, Tuomas (1588-]679), was born at Westport, adjoining (now forming part of) Malmesbury, in North Wilts, on Good Friday, the 5th of April 1588,—brought prematurely into the world through his mother's fright at the rumours of the coming Spanish Armada. His father was vicar of Charlton and Westport, an illiterate and choleric man, who is said to have got into trouble later on by quarrelling with a rival at the church door, and been forced to decamp, leaving his three children (of whom Thomas was second) to the charitable care of an elder brother, a flourishing glover in Malmesbury. Hobbes was put to school at Westport church at the age of four, passed to the Malmesbury school at eight, and was taught again in Westport later, at a private school kept by a young man named Robert Latimer, fresh from Oxford and ''a good Grecian." He had begun Latin and Greek early, and under Latimer made such progress as to be able to translate the Medea of Euripides into Latin iambic verse before he was fourteen, About the age of fifteen he was sent to Oxford by his uncle and entered at Magdalen Hall, which had just been put on an independent footing, after being first a grammar school in connexion with the great founda- tion of Magdalen College and then governed as a hall by one of the college fellows. While Hobbes was there as a student the first principal of Magdalen Hall, Dr John Hussee, gave way to a second, Dr John Wilkinson, who is noted as having ruled strongly in the interest of the Calvinistic party in the university ; and this fact, with other circunistances in the Oxford life of the time, makes it hot improbable that the destined foe of the Puritan Revolu- tion was thus early led to mark the aggressive Puritan spirit. For the rest, Oxford did no more to train Hobbes's mind for his future philosophical work than the decayed Scholastic regimen of the universities in that age was able

to do for any other of the active spirits that then began in different countries to open the modern era of thouglit and inquiry. We have from himself a

lively record of his experience and pursuits as a student (Vet. carm. exp, p. lxxxv.),! which, though penned in extreme old age, may be taken as sufficiently trustworthy. In this he tells how he was set to learn ‘‘ Barbara, Celarent,” but, when he had slowly taken in the doctrine of figures and moods, he put it aside and would prove things only in his own way ; how he then heard about bodies as consisting of matter and form, as throwing off species of themselves for perception, and as moved by sympathies and antipathies, with much else of a like sort, all beyond his comprehension ; and how he therefore turned to things more congenial, took up his old books again, fed his mind on maps and charts of earth and sky, traced the sun in his path, followed Drake and Cavendish girdling the main, and gazed with delight upon pictured haunts of men and wonders of unknown lands. Very characteristic in this account is the interest in men and things, and the disposition to cut through questions in the schools after a trenchant fashion of hisown. We may also believe that he was little attracted by the scholastic learning, and only should err if we took his words as evidence of a precocious insight into its weakness. The truth probably is that, finding himself left at Oxford very much to his own devices, he took no particular interest in studies which there was no risk in neglecting, and thought as little of rejecting as of accepting the traditional doctrines. He adds that he took his degree at the proper time; but in fact, upon any computation and from whatever cause, he re- mained at Magdalen Hall five, instead of the required four, years, not being admitted as bachelor till February 5, 1608.

In the same year, shortly after leaving the univer- sity, Hobbes was recommended by Wilkinson as tutor to the son of William Cavendish, baron of Hardwick, and thus began a connexion with a great and powerful family that ended only with his life. Twice it was loosened— once, for a short time, after twenty years, and again, for a longer period, during the Civil War —but it never was broken, and during more than fifty years, to the credit alike of him and his patrons, it was of the closest character. William Cavendish, second son of the famous “ Bess of Hardwick ” by the second of her four marriages, had just by the favour of King James obtained his barony, before being advanced, a few years later, to the earldom of Devonshire. His son, the heir to a name thus rising as well as to a great fortune, was hardly younger than Hobbes, and was indeed already married, a few months before, at the instance of the king, who made up the match, to

the only daughter of the Scottish Lord Bruce of Kinloss, though by reason of the bride's age, which was only twelve years, the pair had no establishment for some time to come. In the circumstances Hobbes was companion rather than tutor (before becoming secretary) to young Cavendish ; and, growing soon greatly attached to each other, they were sent abroad together on the grand tour in 1610. How long they were gone upon this journey, which lay through France, Germany, and Italy, is not known: but it was long enough to give

1 There are three accounts of Hobbes's life, first published together in 1681, two years after his death, by R. B. (Richard Blackburme, a friend of Hobbes's admirer, John Aubrey), and reprinted, with com- plimentary verses by Cowley and others, at the beginning of Sir W. Molesworth's collection of the Latin Works:—(1) T. H. Malmesb. Vita (pp. xiii.-xxi.), written by Hobbes himself, or (as also reported) by T. Rymer, at his dictation ; (2) Vite Hobbiane Avuctariwm (pp. xxii.-Ixxx.), turned into Latin from Aubrey's English; (8) T. H. Malmesb. Vita carmine expressa (pp. \xxxi.-xcix.), written by Hobbes at the age of eighty-four (first published by itself in 1680). The Life of Mr T. H. of Malmesburie, printed among the Lives of Eminent Men, in 1813, from Aubrey's papers in the Bodleian, &c. (vol. ii. pt. ii. pp. 593-637), contains some interesting particulars not found in the Auctariwn.

Hobbes the opportunity of acquiring a moderate knowledge of French and Italian; and he did not return without having received a distinct mental impulse that had a lasting effect on his life. The real intellectual activity of that time (still more than five and twenty years before the definite inauguration of modern philosophy by Descartes's Discourse on Method in 1637) was in the newly enlarged if not newly opened domain of physical science ; and Hobbes was little prepared by his juvenile training to understand the achievements of Galileo and Kepler, if he heard any- thing of them. But he had had a little modicum of scholastic philosophy retailed to him at Oxford ; and now, wherever he went, he could hear nothing but words of scorn poured upon all such learning. How it had come to pass that the scholastic way of thinking, once so dominant, was thus discredited at

the hands alike of revolutionary thinkers such as Bruno, of scientific workers like Galileo, and of men of the world like Montaigne, he could not know. Accordingly, it seems that at first he was more dismayed to find that the only knowledge to which he could pretend was laughed at by people whom he did not understand, than pleased to be furnished with such an excuse for his own youthful indifference to its value. It was not long, however, before he yielded to the stream. He was not yet able to strike out a new line of thought, and so (like Descartes) rise above the misconceptions mingled with the general aversion from scholasticism, ‘amounting to a neglect of all philosophy. He had but sufficient force of mind to wish to be seen, like others, at work upon something else. The line he should take could hardly be doubtful; he had nothing to fall back upon except his Latin and Greek. He was no longer so familiar with them, but it was still open to him to become a scholar ; nor in the age of Scaliger and Casaubon was there any lack of ambition in making classical study the occupation of a life. The resolution was made when he returned home, if not earlier, and made in a determined spirit ; but when after many years’ labour he had made himself a scholar, his true work was still to lie all before him,

Hobbes’s period of scholarly acquirement lasted till 1628, and had as its immediate outcome a translation of Thucydides. In Derbyshire or in London, with his young master, he had abundant leisure and easy access to books, and he went carefully through the classical poets and his- torians, reading critically with the help of commentators, and at the same time bent on acquiring (as if for future use) a good Latin style, clear and easy to read, because fitting words to thoughts. Among all the ancient writers Thucydides attracted him most, and he seems to have set himself early to the work of translation, wishing others to share in the pleasure and instruction he derived from his favourite’s pages. But when he had finished his work he kept it lying by him for years, being no longer so sure of finding appreciative readers ; and when he did send it forth at last, in 1628, he was fain to be content with “the few and better sort.”! That he was finally determined to pub-

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1 The translation, under the title Light Books of the Peloponnesian War, written by Thucydides the son of Olorus, interpreted with faith and diligence immediately out of the Greek by Thomas Hobbes, secre- tary to the late Earl of Devonshire, appeared in 1628 (given also as 1629), after the death of the earl, to whom touching reference is made in the dedication. It reappeared in 1634, with the date of the dedi- cation altered, as if then newly written. ‘Though Hobbes claims to have performed his work ‘ with much more diligence than elegance,” his version is remarkable as a piece of English writing, but is by no means accurate. It fills vols. viii. and ix. in Molesworth’s collection (11 vols., including index vol.) of Hobbes’s Anglish Works (London, Bohn, 1839-45). The volumes of this collection will here be cited as E. W. Molesworth’s collection of the Latin Opera Philosophica (5 vols., 1839-45) will be cited as Z. W. The five hundred and odd Latin hexameters under the title De Mirabilibus Pecci (L. W., Vv. 823-40), giving an account of a short excursion from Chatsworth to

lication by the political troubles of the year 1628 may be regarded as certain, not only from his own express declara- tion at a later time (Vit. carm. exp.), but also from unmis- takable hints in the account of the life and work of his author prefixed to the translation on itsappearance. 1628 was the year of the Petition of Right, extorted by the popular leaders from a reluctant king in the third parlia- ment he had tried within three years of his accession ; and, in view of Hobbes’s later activity, it is very significant that just then he should come forward, at the mature age of forty, with his version of the impressive story of the Athenian democracy as the first production of his pen. Nothing else is known of his doings before 1628, except that through his connexion with young Cavendish, who from about the year 1619 became an important social and political figure, he had relations with literary men of note like Ben Jonson, and also with the two philosophical thinkers who before himself rendered the English name illustrious in the 17th century—Bacon and Lord Herbert of Cherbury. If he never had any sympathy ‘with Herbert’s intuitionalist principles in philosophy, he was no less eager, as he afterwards showed, than Herbert to rationalize in matters of religious doctrine, so that he may with the same reason be called the second of the English deists as Herbert has been called

the first. With Bacon there is evidence of his having been so intimate (Aubrey's Lives, pp. 222, 602) that it is not surprising that some writers have been betrayed into describing him as the disciple and follower of the great Instaurator. The facts as recorded, however,—that he used sometimes to walk with Bacon at Gorhambury, and would jot down with exceptional intelligence the eager thinker's sudden "notions," also that he was employed to make the Latin version of some of the Hssays,—prove nothing of the sort, when weighed against his own disregard of all Bacon's most characteristic principles, and the other evidence that the impulse to independent philosophical thinking came to him not from Bacon, and not till some time after Bacon's death in 1626.?

So far as we have any positive evidence, it was not before the year 1629 that Hobbes first entered on the path of philosophical inquiry ; and meanwhile a great change had been wrought in his outer life. His friend and master, after only about two years' tenure of the earldom, fell a sudden victim to the plague in June 1628; and the affairs of the Devonshire family having become greatly disordered by lavish expenditure, the widowed countess was left with the task of righting them in the boyhood of the third earl. Hobbes went on for a time living in the household ; but his services were no longer in demand as before, and, remaining inconsolable under his personal bereavement, he sought distraction, in 1629, in another engagement which took him abroad as tutor to the son of Sir Gervase Clifton, of an old Notts family. This, his second, sojourn abroad appears to have been spent chiefly in Paris, and the one important fact recorded of it is that he then first began to look into Euclid. Sojourn and engagement came to an end together in 1631, when he was recalled to train the young earl of Devonshire, now thirteen years old, as he never had had an opportunity of training the boy's father, In the course of the next

view the seven wonders of the Derbyshire Peak, were written before 1628 (in 1626 or 1627), though not published till 1636. A later edition, in 1678, included an English version by another hand.

2 Hobbes, in minor works dealing with physical questions (Z. W., iv. p. 316; #. W., vii. p. 112), makes two incidental references to Bacon's writings, but never mentions Bacon as he mentions Galileo, Kepler, Harvey, and others

(De Corpore, ep. ded.), among the lights of the century. The word '" Induction," which occurs in only three or four passages throughout all his works (and these again minor ones), is never used by him with the faintest reminiscence of the import assigned to it by Bacon; and, as will be seen, he had nothing but scorn for experimental work in physics.

seven years Hobbes took his young pupil over rhetoric,' logic, astronomy, and the principles of law, with other sub- jects. Most probably their life for the first three years was in Derbyshire, till they went abroad in the middle of 1634. They remained away till the spring of 1637, and Hobbes went over much the same ground as in his first journey, but now in a very different frame of mind. His head was now full of the thought of motion in nature, and whenever he could meet with the philosophical speculators or scientific workers who were then with a new-born ardour seeking for a clue to the secret of the physical world, none so forward to consort with them as he. He was still in time to pay his respects to the aged Galileo, for whom he conceived and ever retained the warmest admiration ; and on the way homewards he spent no less than eight months in daily converse with the members of a busy scientific circle in Paris, held together by the genial influence of the Pére Mersenne. From that time (the winter of 1636-7) he too, as he tells us, was numbered among philosophers.

It is not impossible to trace a little more exactly the steps by which Hobbes reached this consummation when he was just touch- ing his fifticth year. There can be no doubt, it seems, that his introduction to Euclid took place in 1629, and according to Aubrey, who tells the story with a quaint dramatic vigour (Lives, p. 604), the introduction was quite accidental. Euclid's mauner of proof was as a revelation to him, and it became the model for his own way of thinking upon all subjects ever after ; nor was he content till he too could be seen at work solving it of geometry with as much confidence as if he had been, like Descartes, an accom- plished mathematician from his boyhood. It is less easy to deter- mine when he awoke to an interest in the physical doctrine of motion. The story told by himself (Vit., p. xx.) is that, being struck one day in a company of learned men by the question, What is sense ? which some one asked and nobody could answer, he fell to thinking

often on the subject, till it suddenly occurred to him that if bodies and their internal parts were at rest, or were always in the same state of motion, there could be no distinction of anything, and consequently no scnse ; the cause of all things must, therefore, he presumed, be sought in diversity of movements, and starting from this principle he was driven to geometry for insight into the ground and modes of motion. Unfortunately no date or place is given; but if it may be supposed that he must already have known something of geometry to understand its Lage on the study of motion, the scene or at least the conclusion to which it led should be referred to some time after his casua} introduction to Euclid. It is even suggested in one or two of the biographical narratives that the new mental advance was not made till the time of the third journey. Nothing is said, however, which should exclude another account, that on the third journey he began to study the doctrine of motion more seriously, being interested in it before ; and as he claims more than once (LZ. W., v. p. 803; £. W., vii. p. 468) to have explained light and sound by a mechanical hypothesis as far back as 1630, the company-scenc (which is more likely to have occurred abroad than in England) and the sudden inspiration may perhaps more safely be assigned to the time of the second journey. But it was not till the third journey that the new interest became ‘an overpowering passion, and the ‘‘ philosopher” was on his way home before he had advanced so far as to conceive the scheme of a system of thought to the elaboration of which his life should hence- forth be devoted.

Hobbes was able to carry out his plan in some twenty years or more from the time of its conception, but the execution was so broken in upon by the dire political events that happened from the year 1687, and became so complicated with other labours, that its stages can hardly be followed without some previous understand- ing of the relations of the parts of the scheme, as there is reason to believe they were sketched out from the beginning. Aud there is the more need for some preliminary statement because at least one of the parts—the doctrine of Man—is far more effectivel wrought out in other works than in the treatise De Homine, whic professes to contain the formal exposition of it. Hobbes’s notion was that the whole body of philosophical truth should be disposed in three sectious, dealing progressively with Body, Man, and State or Society. An anxious

political observer before he became a philosopher, he was supremely interested in the problem of con-

1 The free English abstract of Aristotle's Rhetorte, published in 1681, after Hobbes's death, as The Whole Art of Rhetoric (LE. W., vi. pp. 423-510), corresponds with a Latin version dictated to his young pupil. Among Hobbes's papers preserved at Hardwick, where he died, there remains the boy's dictation-book, intcrspersed with head- ings, examples, &c., in Hobbes's hand.

title Human Nature, in 1650.

duct; but the philosopher could not be satisfied till the foundations of scttled social life were based deep in the constitution of human nature ; and his new philosophical insight revealed to him the need and the possibility of interpreting the facts of human nature by what es begun to be known of physical nature generally. He would therefore first work out, in a separate treatise De Corpore, a systematic doctrine of Body, showing how physical phenomena were universally explicable in terms of motion, as motion or mechanical action was now (through Galileo and others) understood, —the theory of motion being applied in the light of mathematical science, after quantity, the subject-matter of mathematics, had been duly considered in its place among the fundamental conceptions of philosophy, and a clear indication had been given, at first starting, of the logical ground and method of all philosophical inquiry. He would then single out Man from the realm of nature, and, in a treatise De Homine, show what specific bodily motions were in- volved in the production of the peculiar phenomena of sensation and knowledge, as also of the affections and passions thence resulting, whereby man came into relation with man. Finally he would con- sider, in a crowning treatise De Cive, how men, being naturally rivals or foes, were moved to enter into the better relation of Society, and demonstrate how this grand and bencficent product of human wit must be regulated if men were not to fall back into brutishness and misery. Such, in briefest summary, was the scheme conceived, at a time of new intellectual expansion, with reference to a threatening movement of social upheaval. We are now to see how it fared in the execution.

Hobbes came home, in 1637, to a country seething with discontent. The reign of “ Thorough” was collapsing, and the forces pent up since 1629 were soon to rend the fabric of the English state to pieces. In February Hampden’s case began to be tried; in July broke out the Edinburgh riot over Laud’s prayer-book ; next year was formed the Solemn League and Covenant ; the year after the rebel Scots had the king at their mercy in the open field ; and finally, in the spring of 1640, with a new prospect of war, Charles had no resource left but once more, after eleven years of personal rule, to call a parliament. Such a rush of events was but too likely to overpower Hobbes’s resolu- tion to work up to social problems from abstract questions of body and space and motion, and there is clear evidence that he was soon distracted from the orderly execution of his philosophic plan. The Short Parliament, as he tells us himself at a later time (£. W., iv. p. 414), was not dis- solved, in three weeks from the time of its meeting, before he had ready “a little treatise in English,” in which he sought to prove that the points of the royal prerogative which the members were determined to dispute before granting supplies, “‘ were inseparably annexed to the sove- reignty which they did not then deny to be in the king.” Now it can be proved that at this time he had written not only his Human Nature but also his De Corpore Polt- tico, the two treatises, though published separately ten years later, having been composed as parts of one work ;? and there cannot be the least question that together they make “the little treatise” just mentioned. We are therefore to understand, first, that he wrote the earliest draft of his political theory some years before the outbreak of the Civil War, and, secondly, that this earliest draft was not written till, in accordance with his philosophical conception, he had established the grounds of polity in human nature. The first point is to be noted, because it has often been supposed that Hobbes’s political doctrine took its peculiar complexion from his revulsion against the state of anarchy before his eyes, as he wrote during the progress of the Civil War. The second point must be maintained against his own implied, if not express, statement some years later, when publishing his De Cive (LZ. W., ii. p. 151), that he wrote this third part of his system before he had

2 Among the Hardwick papers there is preserved a MS. copy of the work, under the title Hlementes of Law Naturall and Politique, with the dedication to the earl of Newcastle, written in Hobbes’s own hand, and dated May 9,

1640. This dedication was prefixed to the first thirteen chapters of the work when printed by themselves, under the

been able to set down any finished representation of the fundamental doctrines which it presupposed. If his philo- sophical plans were disordered and the doctrine of Body was still in the air, he had, in the beginning of 1640, written out his doctrine of Man at least, with almost as much elaboration as it ever received from him,

When, in six months more, the Long Parliament suc- ceeded to the Short, and set to work at once by sending Laud and Strafford to the Towcr, Hobbes, who had become, or thought he had become, a marked man by the circula- tion of his treatise (of which, " though not printed, many gentlemen had copies"), instantly took fright and hasted away to Paris. He was now for the fourth and last time abroad, and did not see England again for eleven years. Apparently he remained the greater part of the time in or about Paris, though he can be traced to Rouen in 1646. In Paris he was welcomed back into the old scientific coterie about Mersenne, and forthwith had the task assigned him of criticizing the Meditations of Descartes, which had been sent from Holland, before publication, to Mersenne with the author's request for criticism from the most different points of view. Hobbes was soon ready with the remarks that were printed as "Third" among the six (later seven) sets of "Objections" appended, with "Replies" from Descartes, to the Jfeditations, when published shortly afterwards in 1641 (reprinted in Z. W., v. pp. 249-74). About the same time also Mersenne sent to Descartes, as 1f they came from a friend in England, another set of objec- tions which Hobbes had to offer on various points in the scientific treatises, especially the Dioptrics, appended by Descartes to his Discourse on Method in 1637 ; to which Descartes replied without suspecting the common author- ship of the two sets, The result in both cases was to keep the two thinkers apart rather than bring them together. Hobbes was more eager to bring forward his own philoso- phical and physical ideas, over which he had now been brooding for ten years, than careful to enter into the full meaning of another's thought; and Descartes was by nature too jealous, and had become

too confident in his hard-won conclusions, to be able to bear with this kind of criticism. He was very curt in his replies to Hobbes's philo- sophical objections, and after a little impatiently broke off all correspondence on the physical questions, writing privately to Merseune (who had continued to act as inter- niediary) that he had grave doubts of the Englishman's good faith in drawing him into controversy (Z. W., v. pp.

277-307).

Meanwhile Hobbes, however eager he might be to keep himself abreast of the general philosophical movement of the time, had his thoughts too full of the political theory which the rush of events in the last years had ripened within him, to be able to settle, even in Paris, to the orderly composition of his systematic works. Though connected in his own mind with his view of human nature and of nature generally, the political theory, as he always declared, could stand by itself. Also, while he may have hoped at this time to be able toadd much (though he never did add much) to the first popular sketch of his doctrine of Man contained in the unpublished " little treatise," he might extend, but could hardly otherwise modify, the sketch he had there given of his carefully articulated theory of Body Politic. Possibly, indeed, before that sketch was written early in 1640, he may, under pressure of the politi- cal excitement, have advanced no small way in the actual composition of the treatise De Cive, the third section of his projected system, In any case, it was upon this section, before the others, that he set to work as soon as he was fixed in Paris; and before the end of 1641 the book, as we know from the date of the dedication (November 1), was finished, He determined, however, though it was

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forthwith printed in the course of the year 1642, not to commit himself to formal publication, but was content to circulate a limited number of copies privately ;! and when he found his work received with great applause by his friends (it was praised even by Descartes), he seems to have taken this recognition of his philosophical achievement as but a reason the more for deferring publication till the earlier works of the system were completed. Accordingly, for the next three or four years, he remained steadily at work, and nothing appeared from him in public except a short treatise on optics

(Zractatus Opticus, L. W., v. pp. 217-248) included in the collection of scientific tracts pub- lished by Mersenne under the title Cogitata Physvco-Mathematica in 1644, and a highly compressed statement of his psychological application of the doctrine of motion (L. W., v. pp. 309-318), incorporated with Mersenne's Ballistica, published in the same year. Thus or otherwise he had become sufficiently known by 1645 to be chosen, with Descartes, Roberval, and others, a referee in a once famous controversy between Pell, an English mathematician in Amsterdam, and the Dane Longomontanus, over that problem of the quadrature of the circle which was seen later on to have such a fatal charm for himself. But though about this time he had got ready all or most of the materials for his fundamental work on Body, not even now was he able to make way with its composition. New distractions came to tear him away from the orderly exe- cution of the fundamental part of his scheme, and when he returned to it after a number of years, he returned a different man.

The Civil War had broken out in the middle of 1642, and, after a period of varying fortunes on either side, the royalist cause began to decline from the time of the defeat of the marquis of Newcastle at Marston Moor, in the middle of 1644. Then commenced an exodus of the king's friends. Newcastle himself, a cousin of Hobbes's dead master and the patron to whom he dedicated the "little treatise" of 1640, found his way to Paris, and was followed, especially after the decisive defeat at Naseby in June 1645, by an ever increasing stream of fugitives, many of whom were known to Hobbes from former days. The sight of these exiles, from whom he learned all the details of the fierce work that had been going on in England while he was quietly busy with his studies in Paris, made the political interest once more predominant in Hobbes, and before long the revived feeling issued in the formation of a new and important design. It first showed itself in the publication of the De Cive, of which the fame, but only the fame, had extended beyond the inner circle of friends and critics who had copies of the original impression. Hobbes now entrusted it, early in 1646, to his admirer, the Frenchman Sorbiére, by whom it was seen through the Elzevir press at Amsterdam in 1647,—having previously inserted a number of notes in reply to objections, and also a striking preface, in the course of which he explained its relation to the other parts of the system not yet forthcoming, and the (political) occasion of its having been composed and being now

published before them.” So hopeless, meanwhile, was he growing of being able to return home that, later on in the year, he was on the point of leaving Paris to take

1The book, of which the copies are rare (one in Dr Williams’s library in London), was printed in quarto size (Paris, 1642), with a pictorial title-page (not afterwards reproduced) of scenes and figures illustrating its three divisions, ‘‘ Libertas,” ‘‘Tmperium,” ‘‘Religio.” The title Elementorum Philosophie Sectio Tertia, De Cive, expresses its relation to the unwritten sections, which also comes out in one or two back-references in the text.

27, W., ii. pp. 188-134. In this first public edition (12mo), the title was changed to Elementa Philosophica de Cive, the references in the text to the previous sections being omitted. The date of the dedi- cation to the young earl of Devonshire was altered from 1641 to 1646.

up his abode in the south with a French friend,! when he was induced to remain as mathematical instructor to the . young prince of Wales, who had come over from J ersey about the month of July. Thus thrown more than ever into the company of the exiled royalists, it was then, if not earlier, that he conceived his new design of bringing all his powers of thought and expression to bear upon the production of an English book that should set forth his whole theory of civil government in relation to the stupen- dous political crisis resulting from the war. The De Cive, presently to be published, was written in Latin for the learned, and gave the political theory without its foundation in human nature. The unpublished treatise of 1640 con- tained all or nearly all that he had to tell concerning human nature, but was written before the terrible events of the last years had disclosed how men might still be urged by their anti-social passions back into the abyss of anarchy. There was need of an exposition at once comprehensive, in- cisive, and popular. The State, it now seemed to Hobbes, might be regarded as a great artificial man or monster (Leviathan), composed of men, with a life that might be traced from its generation through human reason under pres- sure of human needs to its dissolution through civil strife proceeding from human passions. This, we may suppose, was the presiding conception from the first, but the design may have been variously modified in the three or

four years of its execution. Before the end, in 1650-1, it is plain that he wrote in direct reference to the greatly changed aspect of affairs in England. The king being no more, and the royalist cause appearing to be hopelessly lost, he did not scruple, in closing the work with a general “ Review and Conclusion,” to raise the question of the subject’s right to change allegiance when a former sovereign’s power to protect was irrecoverably gone. Also he took advantage of the lax rule of the Commonwealth to indulge much more freely than he might have otherwise dared in rationalistic criticism of religious doctrines ; while, amid the turmoil of sects, he could the more forcibly urge that the preservation of social order, when again firmly restored, must depend on the assumption by the civil power of the right to wield all sanctions, supernatural as well as natural, against the pretensions of any clergy, Catholic, Anglican, or Presby- terian, to the exercise of an imperium in imperio. We know the Leviathan only as it finally emerged from Hobbes’s pen. During the years of its composition he re- mained in or near Paris, at first in attendance on his royal pupil, with whom he became a great favourite. The engage- ment must in any case have come to an end in the year 1648, when the prince removed to Holland, but it was pro- bably broken off earlier by an illness that overtook Hobbes in 1647 and disabled him for six months. On recovering from this illness, which nearly proved fatal, he resumed his literary task, and carried it steadily forward to completion by the year 1650, having also within the same time trans- lated into English, with characteristic force of expression, his Latin treatise. Otherwise the only thing known (from one or two letters) of his life in those years is that from the year 1648 he had begun to think of returning home ; he was then sixty, and might well be weary of exile. When 1650 came, as if to prepare the way for the reception of his magnum opus, he allowed the publication of his earliest treatise, divided into two separate small volumes (Human Nature, or the Fundamental Elements of Policy, E. W., iv. pp. 1-76, and De Corpore Politico, or the Elements of Law, | 5

1 Described as “‘ nobilis Languedocianus” in Vié.; doubtless the same with the “ Dominus Verdusius, nobilis Aquitanus,” to whom was dedicated the Exam. et Hmend. Math. Hod. (Z. W., iv.) in 1660. Du Verdus was one of Hobbes’s profoundest admirers and most fre- quent correspondents in later years; there are many of his letters among Hobbes’s papers at Hardwick.

Moral and Politic, pp. 77-228).2 In 1651 he published his translation of the De Cive under the title of Philosophical Rudiments concerning Government and Society (E. W., ii.). Meanwhile the printing of the greater work was proceeding, aud finally it appeared about the middle of the same year, 1651, under the title of Lewathan, or the Matter, Porm, and Power of a Commonwealth, Ecclesiastical and Civil (, W., iii.), with a quaint frontispiece in which, from behind hills overlooking a fair landscape of town and country, there towered the body (above the waist) of a crowned giant, made up of tiny figures of human beings and bearing sword and crozier in the two hands, It appeared, and soon its author was more lauded and decried than any other thinker of his time; but the first effect of its publication was to sever his connexion with the exiled royalist party, and to throw him for protection on the revolutionary Government. No sooner did copies of the book reach Paris than he found himself shunned by his former associates, and though he was himself so little conscious of disloyalty that he was forward to present a manuscript copy " engrossed in vellum in a marvellous fair hand"* to the young king of the Scots (who, after the defeat at Worcester, escaped to Paris about the end of October), he was denied the royal presence when he sought it shortly afterwards. Straightway, then, he saw himself exposed to a double peril. The exiles had among them desperadoes who could slay; and, besides exciting the enmity of the Anglican clergy about the king, who bitterly resented the secularist spirit of his book, he had compromised himself with the French authorities by his elaborate attack on the papal system. In the cir- cumstances, no resource was left him but secret flight. Travelling with what speed he could in the depths of a severe winter and under the effects of a recent (second) illness, he managed to reach London, where, sending in his submission to the council of state, he was allowed without trouble to subside into private life.

Though Hobbes came back, after his eleven years' absence, without having as yet publicly proved his title to rank with the natural philosophers of the age, he was suffi- ciently conscious of what he had been able to achieve in Leviathan ; and it was in no humble mood that he now, at the age of sixty-four, turned to complete the fundamental treatise of his philosophical system. Neither were those whom his masterpiece soon roused to

enthusiasm, or those whom it moved to indignation, likely to be indifferent to anything he should now write, whether it Jay near to or far from the region of practice. Taking up his abode in London on his return, and continuing to reside there for the sake of intellectual society, even after renewing his old ties with the earl of Devonshire, who lived in the country till the Restoration,® he worked so steadily upon the

2 The Human Nature corresponds with ec. i-xiii of the first part of the original treatise. The remaining six chapters of the part stand now as Part I. of the De Corpore Politico. Part II. of the D. C. P. corresponds with the original second part of the whole work.

3 At the beginning of this year he wrote and published in Paris a letter on the nature and conditions of poetry, chiefly epic, in answer to an appeal to his judgment made in the preface to Sir W. Davenant's heroie poem, Gondibert (EL. W., iv. pp. 441-58). The letter is dated Jan. 10, 1650 (1652).

4 This presentation copy, so described by Clarendon (Survey of the Leviathan, 1676, p. 8), is doubtless the beautifully written and finely bound MS. now to be found in the British Museum (Egerton MSS. 1910).

> During all the time he was abroad he had continued to receive from his patron a yearly pension of £80, and they remained in steady correspondence. The earl, having sided with the king in 1642, was declared unfit to sit in the House of Peers, and though, by submission to Parliament, he reeovered his estates when they were sequestered later on, he did not sit again till 1660. Among Hobbes's friends at this time are specially mentioned Selden and Harvey, who each left him a legacy of £10 on dying, Selden in 1654 and Harvey in 1657. Harvey (not Bacon) is the only Englishman he mentions in the dedi-

eatory epistle prefixed to the De Corpore, among the founders, before himself, of the new natural philosophy.

materials he had long had by him as to be printing the De Corpore in the year 1654. Circumstances (of which more presently), however, kept the

book back till the following year, and meanwhile the readers of Lewathan had a different excitement. In 1654a small treatise, Of Liberty and Necessity (E. W.,iv. pp. 229-278), issued from the press,

claiming to be an answer to a discourse on the same subject by Bishop Bramhall of Londonderry, addressed by Hobbes to the marquis of Newcastle.1 It was really such, and had grown out of an oral discussion between Hobbes and Bram-

hall in the marquis's presence at Paris in 1646,—Bramhall,

a strong Arminian, having afterwards written down his

views and sent them to Newcastle to be answered in this form by Hobbes, and Hobbes having duly replied, but not for publication, because he thought the subject a delicate one. Unpublished, accordingly, the piece remained ; but it happened that Hobbes, in the interval between writing his own reply and receiving from the bishop in 1647 a re- joinder which he left unanswered, allowed a French acquaint- ance to have a private translation of his reply made by a young Englishman, who secretly took also a copy of the original for himself ; and now it was this unnamed purloiner who, in 1654, when Hobbes had become famous and feared, gave it to the world of his own motion, with an extrava- gantly laudatory epistle to the reader in its front. Upon Hobbes himself the publication came as a surprise, but, after his plain speaking in Leviathan, there was nothing in the piece that he need scruple to have made known, and he seems to have readily enough condoned the offender's act. On the other hand, Bramhall, supposing Hobbes privy to the publication, might well resent the manner of it, especi- ally as no mention was made of his rejoinder. Accordingly, in 1655, he printed everything that had passed between them (under the title of A Defence of the True Liberty of Human Actions from Antecedent or Extrinsic Necessity), with loud complaint against the treatment he had received, and the promise added that, in default of others, he himself would stand forward to expose the deadly principles of Leviathan. About this time Hobbes had begun to be hard pressed by other foes, and, being never more sure of him- self than upon the question of the will, he appears to have welcomed the opportunity thus given him of showing his strength. By 1656 he was ready with his Questions con- cerning Liberty, Necessity, and

Chance (Z. W., v.), in which he replied with astonishing force to the bishop's rejoinder point by point, besides explaining the occasion and circum- stances of the whole debate, and reproducing (as Bramhall had done) all the pieces from the beginuing. As perhaps the first clear exposition and defence of the psychological doctrine of determinism, Hobbes's own two pieces must ever retain a classical importance in the history of the free- will controversy ; while Bramhall's are still worth study as specimens of scholastic fence. The bishop, it should be added, returned to the charge in 1658 with ponderous Castigations of LHobbes's Animadversions, and also made good his previous threat in a bulky appendix entitled The Catching of Leviathan the Great Whale. Hobbes never took any notice of the Castigations, but ten years later replied to the charges of atheism, &c., made in the non- political part of the appendix, of which he says he then heard for the first time (Z. W., iv. pp. 279-384. This Answer was first published after Hobbes's death. Bram- hall had died, as archbishop of Armagh, in 1663).?

1 'Phe treatise bore the date, 'Rouen, Aug. 20, 1652," but it should have ye 1646, as afterwards explained by Hobbes himself (Z. W., v. p. 25).

2 A little tract by Bishop Laney of Ely, directed against the con- cluding summary in Hobbes's original statement to Newcastle, was published in 1676, and called forth a printed reply from Hobbes, again addressed to Newcastle (who had meanwhile become duke). This letter is not reprinted by Molesworth,

We may now follow out the more troublesome conflict, or rather series of conflicts, in which Hobbes became entangled from the time of publishing his De Corpore in 1655, and which checkered all his remaining years. In Leviathan he had vehemently assailed the system of the universities, as originally founded for the support of the papal against the civil authority, and as still working social mischief by adherence to the old learning. The attack was duly noted at Oxford, where under the Commonwealth a new spirit of scientific activity had begun to stir; and in 1654 Seth Ward, the Savilian professor of astronomy, replying in his Vindicice Academi- arum to some other assaults (then very common) on the academic system,

retorted upon Hobbes that, so far from the universities being now what he had known them in his youth, he would find his geometrical pieces, when they appeared, better understood there than he should like. This was said in reference to the boasts in which Hobbes secms to have been freely indulging of having squared the circle and accomplished other such feats ; and, when a year later the De Corpore (L. W., i.) finally appeared, it was seen how the thrust had gone home. In the chapter (xx.) of that work where Hobbes dealt with the famous problem whose solution he fondly thought he had found, there were left some self-compla- eent expressions vented against Vindex (Ward) at a time when the solutions still seemed to him good ; but the solutions themselves, as printed, were allowed to be all in different ways halting, as he naively confessed he had discovered only when he had been driven by the insults of malevolent men to examine them more closely with the help of his fricnds. A strange conclusion this, and reached by a path not less strange, as was now to be disclosed by a relentless hand. Ward's colleague, the more famous John Wallis, Savilian professor of geometry, had been privy to the challenge thrown out in 1654, and it was arranged that they should critically dispose of the De Corpore between them. Ward was to occupy himself with the philosophical and physical sections, which he did in leisurely fashion, bringing out his criticism in the course of next year (In Th. Hobbit Philosophiam Exercitatio Epistolica). Wallis was to confine himself to the mathematical chapters, and set to work at once with characteristic energy. Obtaining an unbound copy of the De Corpore, he saw by the mutilated appearance of the sheets that Hobbes had repeatedly altered his demonstrations before he issued them at last in their actual form, grotesque as it was, rather than delay the book longer. Obtaining also a copy of the work as it had been printed before Hobbes had any doubt of the validity of his solutions, Wallis was able to track his whole course from the time of Ward's provocation—his passage from exultation to doubt, from doubt to confessed impotence, yet still without abandoning the old assumption of confident strength ; and all his turnings and windings were now laid bare in one of the most trenchant pieces of controversial writing ever penned. Wallis's Elenchus Geometric Hobbiane, published in 1655 about three months after the De Corpore, contained also an elaborate criticism of Hobbes's whole attempt to relay the foundations of mathematical science in its place within the general body of reasoned knowledge—a criticism which, if it failed to allow for the merit of

the conception, exposed only too effectually the utter inadequacy of the result. Taking up mathematics when not only his mind was alrcady formed but his thoughts were crystallizing into a philosophical system, Hobbes had, in fact, never put hini- self to school and sought to work up gradually to the best know- ledge of the time, but had been more anxious from the first to become himself an innovator with whatever insufficient means. ‘The consequence was that, when not spending himself in vain attempts to solve the impossible problems that have always way- laid the fancy of self-sufficient beginners, he took an interest ouly in the elements of geometry, and never had any notion of the full scope of mathematical science, undergoing as it then was (and not least at the hands of Wallis) the extraordinary development which made it before the end of the century the potent instrument of physical discovery which it became in the hands of Newton. He was even unable, in dealing with the elementary conceptions of geometry, to work out with any consistency the few original thoughts he had, and thus became the easy sport of Wallis. At his advanced age, however, and with the sense he had of his powers, he was not likely to be brought to a better mind by so insulting an opponent. He did indeed, before allowing an English translation of the De Corpore (EZ. I., i.) to appear in 1656, take care to remove some of the worst mistakes exposed by Wallis, and, while leaving out all the references to Vindex, now profess to make, in altered form, a series of mere “‘attempts ” at quadrature ; but he was far from yielding the ground to the encmy. With the

to)

translation,? in the spring of 1656, he had ready Six Lessons to the

3 This translation, Concerning Body, though not made by Hobbes,

was revised by him; but it is far from accurate, and not seldom, at critical places (¢g., ¢. Vi. citations from the De Corpore should always be made in the original Latin. 1655, but from the modified cdition of 1668—modificd, in the mathe-

§ 2), quite misleading. Philosophical

Molesworth reprints the Latin, not from the first edition of

Professors of Mathematics, one of Geometry, the other of Astronomy, in the University of Oxford (EH. W., vii. pp. 181-356), in which, after reasserting his view of the principles of gcometry in opposi- tion to Euclid's, he proceeded to repel Wallis's objections with no lack of dialectical skill, and with an unreserve equal to Wallis's own. He did not scruple, in the ardour of conflict, even to main- tain positions that he had resigned in the translation, and he was not afraid to assume the offensive by a counter criticism of three of Wallis's works then published. When he had thus disposed of the ‘‘ Paralogisms ” of his more formidable antagonist in the first five lessons, he ended with a lesson on ‘‘ Manners” to the two

rofessors together, and set himself gravely at the close to show that he too could be abusive. In this particular part of his task, jt must be allowed, he succeeded very well; his criticism of Wallis's works, especially the great treatise Arithmetica Infinito- rum (1655), only showed how little able he was to enter into the meaning of the modern analysis. Wallis, on his side, was not less ready to keep up the game in English than he had been to begin it in Latin. Swift as before to strike, in three months' time he had deftly turned his own word against the would-be master by admin- istering Due Correction for Mr Hobbes, or School Discipline for not saying his Lessons right, in a piece that differed from the Elenchus only in being more biting and unrestrained. Having an easy task in defending himself against Hobbes's trivial criticism, he seized the opportunity given him by the English translation of the De Corpore to track Hobbes again step by step over the whole course, and now to confront him with his incredible inconsistencies multi- plied by every new utterance. But it was no longer a fight over mathematical questions only. Wallis having been betrayed origin- ally by his fatal cleverness into the pettiest carping at words, Hobbes had retorted in kind, and then it became a high duty in the other to defend his Latin with great parade of learning and give fresh provocation. One of Wallis's rough sallies in this kind suggested to Hobbes the title of the next rejoinder with which, in 1657, he sought to close the unseemly wrangle. Arguing in the Lessons that a mathematical point must have quantity, though this were not reckoned, he had explained the Greek word orlyyy, used for a point, to mean a visible mark made with a hot iron; where- upon

he was charged by Wallis with gross ignorance for confound- ing orvyph and orlyua. Hence the title of his new piece :—3rryual *Avewmuerptas, Aypoitas, “Avriwodtrelas, “Auadelas, or Marks of the Absurd Geometry, Rural Language, Scottish Church Politics, and Barbarisms of John Wallis, Professor of Geometry and Doctor of Divinity (EL. W., vii. pp. 357-400). He now attacked more in detail but not more fleppily than before Wallis’s great work, while hardly attempting any further defence of his own positions ; also he repelled with some force and dignity the insults that had been heaped upon him, and fought the verbal points, but could not leave the field without making political insinuations against his adversary, quite irrelevant in themselves and only noteworthy as evidence of his own resignation to Cromwell’s rule. The thrusts were easily and nimbly parried by Wallis in a reply (Hobbiani Puneti Dispunetio, 1657) occupied mainly with the verbal ques- tions. Irritating as it was, it did not avail to shake Hobbes’s determination to remain silent ; and thus at last there was peace for a time.

Before the strife flamed up again, Hobbes had published, in 1658, the outstanding section of his philosophical system, and thus com- pleted, after a fashion, the scheme he had planned more than twenty years before. So far as the treatise De Homine (L. W,, ii. pp. 1-182) was concerned, the completion was more in name than in fact. It consisted for the most part of an elaborate theory of vision which, though very creditable to Hobbes’s scientific insight, was out of place, or at least out of proportion, in a philosophical consideration of human nature generally. The remainder of the treatise, dealing cursorily with some of the topics more fully treated in the Human Nature and the Leviathan, has all the ap- a of having been tagged in haste to the optical chapters

composed years before)! as a makeshift for the proper transition required in the system from questions of Body Natural to questions of Body Politic. Hobbes had in fact spent himself in his earlier constructive efforts, aud at the age of seventy, having nothing to _add to his doctrine of Man as it was already in one form or another before the world, was content with anything that might stand for the fulfilment of his philosophical purpose. But he had still in him more than twenty years of vigorous vitality, and, not conscious

nr matical chapters, in general (not exact) keeping with the English edition of 1656. The Vindex episode, referred to in the Six Lessons, becomes intelligible only by going beyond Molesworth to the original Latin edition of 1655.

‘They were composed originally, in a somewhat different and rather more extended form, as the second part of an English treatise on Optics, completed by the year 1646. Of this treatise, preserved in Harleian MSS. 3360, Molesworth otherwise prints the dedication to

the marquis of Newcastle, and the concluding paragraphs (2. W., vii. pp. 467-471). j G-paragraphs { ;

Oo”

to himself of any shortcoming, looked forward, now his hands were free, to doing battle for his doctrines. Rathcr than remain quiet, on finding no notice taken of his latest production, he would him- self force on a new conflict with the enemy. Wallis having mcan- while published other works and especially a comprehensive trcatiso on the general principles of calculus (Mathesis Universalis, 1657), he might take this occasion of exposing afresh the new-fangled mcthods of mathematical analysis and reasserting lis own earlicr positions. Accordingly, by the spring of 1660, he had managed to put his criticism and assertions into five dialogues under the title Hxaminatio et Emendatio Mathematice Hodicrne qualis explicatur in Libris Johannis Wallisti, with a sixth dialogue so called, con- sisting almost entirely of seventy or more propositions on the circle and cycloid.? Wallis, however, would not take the bait. Hobbes then tried another tack. Next year, having solved, as he thought, another ancient crux, the duplication of the cube, he had his solu- tion brought out anonymously at Paris in French, so as to put Wallis and other critics off the scent and extort a judgment that might be withheld from a work of his. The artifice was successful, and no sooner had Wallis publicly refuted the solution than Hobbes claimed tho eredit of it, and went more wonderfully than cver astray in its defence. He presently republished it (in modified form), with his remarks, at the end of a new Latin dialogue which he had meanwhile written in defence of another part of his philo- sophical doctrine. This was the Dialogus Physicus, sive De Natura Aeris (L. W., iv. pp. 283-296), fulminated in 1661 against Boylo

and other friends of Wallis who, as he fancied, under the influence of that malevolent spirit, were now in London, after the Restora- tion, forming themselves into a society (incorporated as the Royal Society in 1662) for experimental research, to the exclusion of him- self personally, and in direct contravention of the method of physical inquiry enjoined in the De Corpore.' All the laborious manipulation recorded in Boyle's New Huxperiments touching the Spring of the Air (1660), which Hobbes chose, without the least warrant, to take as the manifesto of the new '' academicians,"' seemed to him only to confirm the conclusions he had reasoned out years before from speculative principles, and he warned them that if they were not content to begin where le had left off their work would come to nought. To as much of this diatribe as concerned himself Boyle quickly replied with force and dignity, but it was from Hobbes's old enemy that retribution came, in the scathing satire Hobbius Heauwton-timorwmenos (1662). Wallis, who had deftly steered his course amid all the political changes of the pre- vious years, managing ever to be on the side of the ruling power, was now apparently stung to fury by a wanton allusion in Hobbes's latest dialogne to a passage of his former life (his deciphcring for the Parliament the king's papers taken at Naseby), whereof he had once boasted but after the Restoration could not speak or hear too little. The revenge he took was crushing. Professing to be roused by the attack on his friend Boyle, when he had scorned to lift a finger in defence of himself against the carlicr dialogues, he tore them all to shreds with an art of which no general description can give an idea, | He got, however, upon more dangerous ground when, passing wholly by the political insinuation against himself, he roundly charged Hobbes with having written Leviathan in sup- port of Oliver's title, and deserted his royal master in distress. Hobbes seems to have been fairly bewildered by the rush and whirl of sarcasm with which Wallis drove him anew from every mathe- matical position he had cver taken up, and did not venture forth into the field of scientific controversy again for some years, when he had once followed up the physical dialogue of 1661 by seven shorter ones, with the inevitable appendix, entitled Problemata Physica, una cum Magnitudine Circuli (L. W., iv. pp. 297-384), in 1662.4 But all the more eagerly did he take advantage of Wallis's loose calumny to strike' where he felt himself safe. His answer to the personal charges took the form of a letter about him-

2 L.W., iv. pp. 1-232. The propositions on the circle, forty-six in number (shattered by Wallis in 1662), were omitted by Hobbes when he republished the Dialogues in 1668, in the collected edition of his Latin works from which Molesworth reprints. In the part omitted, at p. 154 of the original edition, Hobbes refers to his first introduction to Euclid, in a way that confirms the story in Aubrey quotcd in an earlier paragraph.

3 Remaining at Oxford, Wallis, in fact, took no active part in the constitution of the new society, but he had been, from 1645, one of the originators of an earlier association in London, thus continued or re- vived. This earlier society had been continued also at Oxford after the year 1649, when Wallis and others of its members received appoint- ments there.

4 The Problemata Physica was at the same time put into English (with some changes and omission of part of the mathematical appen- dix), and presented to the king, to whom the work was dedicated in a remarkable letter apologizing for Leviathan. In its English form, as Seven Philosophical Problems and Two Propositions of Geometry (HZ. W., vil. pp. 1-68), the work was first published in 1682, after Hobbes's death.

self in the third person addressed to Wallis in 1662, under the title of Considerations wpon the Reputation, Loyalty, Manners, and Religion of Thomas Hobbes (Z. W., iv. pp. 409-440). In this piece, which is of great biographical value, he told his own and Wallis's "little stories during the time of the late rebellion " with such effect that Wallis, like a wise man, attempted no further reply. Thus ended the second bout.

'After a time Hobbes took heart again and began a third period of controversial activity, which did not end, on his side, till his nineticth year. Little need be added to the simple catalogue of the untiring old man's labonrs in this last stage of his life. The first piece, published in 1666, De Prineipiis et Ratioeinatione Geomet- rarum (L. W., iv. pp. 885-484), was designed, as the sub-title declared, to lower the pride of gcometrical professors by showing that there was no less uncertainty and error in their works than in those of physical or ethical writers. Wallis replied shortly in the Philosophical Transactions (August, 1666). Three years later he brought

his three great achievements together in compendious form, Quadratura Cireuli, Cubatio Sphere, Duplieatio Cubi, and as soon as they were once more refuted by Wallis, reprinted them with an answer to the objections, in compliment to the grand-duke of Tus- cany, who paid him attentions on a visit to England in 1669 (Z.W., iv. pp. 485-522). Wallis, who had promised to leave him alone henceforward, refuted him again before the year was out. In 1671 he worked up his propositions over again in Rosetum Geometriewm (L.W., v. pp. 1-50), as a fragrant offering to the geometrical reader, appending a criticism (Censura brevis, pp. 50-88) on the first part of Wallis's treatise De Mfotu, published in 1669 ; also he sent Three Papers to the Royal Society on selected points treated very briefly, and when Wallis, still not weary of confuting, shortly replied, published them separately with triumphant Considerations on Dr Wallis's Answer to them (E. W., vii. pp. 429-448). Next year, 1672, having now, as he believed, established himself with the Royal Society, he proceeded to complete the discomfiture of Wallis by a public address to the Society on all the points at issue between them from the beginning, Lux Mathematiea exeussa col- listonibus Johannis Wallisti et Thomee Hobbesii (L. W., v. pp. 89-150), the light, as the author R. R. (Roseti Repertor) added, being here "increased by many very brilliant rays." Wallis replied in the Yransaetions, and then finally held his hand. Hobbes's energy was not yet exhausted. In 1674, at the age of eighty-six, he published his Principia et Problemata aliquot Geo- metrica, ante desperata nune breviter explicata et demonstrata (L. W., v. pp. 150-214), containing in the chapters dealing with questions of principle not a few striking observations, which ought not to be overlooked in the study of his philosophy. His last picce of all, Decameron Physiologicum (E. W., vii. pp. 69-180), in 1678, was a new set of dialogues on physical questions, most of which he had treated in a similar fashion before; but now, in dealing with

gravitation, he was able to fire a parting shot at Wallis ; and one,

more demonstration of the equality of a straight line to the arc of a circle, thrown in at the end, appropriately closed the strangest warfare in which perverse thinker ever engaged.?

We must now turn back to trace the fortunes of Hobbes and his other doings in the last twenty years of his life. All these controversial writings on

mathematics and physics represent but one half of his activity after the age of seventy ; though, as regards the other half, it is not pos- sible, for a reason that will be seen, to say as definitely in what order the works belonging to the period were pro- duced. From the time of the Restoration he acquired a new prominence in the public eye. No year had passed since the appearance of Leviathan without some indignant protest against the influence which its trenchant doctrine was calculated to produce upon minds longing above every- thing for civil repose; but it was not until the old political order was set up again that " Hobbism" became a fashion- able creed, which it was the duty of every lover of true morality and religion todenounce. Friends and foes alike were impressed by the king's behaviour to the aged philo- sopher. Two or three days after Charles's arrival in London, Hobbes, who had come up to town from spending the previous winter in Derbyshire, drew in the street the notice of his former pupil, and was at once received into favour. The young king, if he had ever himself resented the apparent disloyalty of the "Conclusion " of Lewathan, had not retained the feeling long, and could well enough

1 Wallis's pieces were excluded from the collected edition of his works (1693-97), and have become extremely rare.

appreciate the principles of the great book when the appli- cation of them happened, as now, to be turned in his own favour. He had, besides, from of old a relish for Hobbes's lively wit, and did not like the old man the less because his presence at court scandalized the bishops or the prim virtue of Chancellor Hyde. He even went the length of bestowing on Hobbes (but not always paying) a yearly pension of £100, and had his portrait hung up in the royal closet. These marks of favour, naturally, did not lessen Hobbes's self-esteem, and perhaps they explain, in his later writings, a certain slavishness of feeling toward the regal authority, which is wholly absent from his rational demon- stration of absolutism in the earlier works. At all events Hobbes remained very well satisfied with the rule of a king who had the sense to appreciate the author of Lewathan, and to protect him, when after a time protection in a very real sense became necessary. His eagerness to defend himself against Wallis's imputation of disloyalty, and his apologetic

dedication of the Problemata Physica to the king, are evidence of the hostility with which he was being pressed as early as 1662; but it was not till 1666 that he felt himself seriously in danger. In that year the Great Fire of London, following in ominous succession on the Great Plague of the year before, roused the superstitious fears and intolerant passions of the people, and the House of Commons embodied the general feeling in a bill against atheism and profaneness. On the 17th October it was ordered that the committee to which the bill was referred 'should be empowered to receive information touching such books as tend to atheism, blasphemy, and profaneness, or against the essence and attributes of God, and in parti- cular the book published in the name of one White," and the book of Mr Hobbes called the Leviathan, and to report the matter with their opinion to the House." What steps were taken before the 3lst of January following, when the bill was read a third time and passed, does not appear ; but Hobbes, then verging upon eighty, was greatly terrified at the prospect of being treated as a heretic, and proceeded to burn such of his papers as he thought might compromise him. At the same time he set himself, with a very char- acteristic determination, to inquire into the actual state of the law of heresy. 'The results of his investigation were first announced in three short Dialogues added (in place of the old " Review and Conclusion," for which the day had passed) as an Appendix to his Latin translation of Lewathan (ZL. W., iii.), included with the general collection of his works published at Amsterdam in 1668. In this appendix, as also in the posthumous tract, published in 1680, An Historical Narration concerning Heresy and the Punishment thereof (E. W., iv. pp. 385-408), he aimed at showing that, since the High Court of Commission had been put down, there remained in England no court of heresy at all to which he was amenable, and that even when it stood nothing was to be declared heresy but what was at variance with the Nicene Creed, as he maintained the doctrine of Levathan was not.

The only consequence that came of the parliamentary scare was that Hobbes could never afterwards get permis- sion to print anything on subjects relating to human con- duct. The collected edition of his Latin works (in two quarto volumes) appeared at Amsterdam in 1668, because he could not obtain the censor's licence for its publication at London, Oxford, or Cambridge. Other writings which he had finished, or on which he must have been engaged about this time, were not made public till after his death

—the king apparently having miade it the price of his pro- tection that no fresh provocation should be offered to the

®The De Medio Animarum Statu of Thomas White, a heterodox Catholic priest, who contested the natural immortality of the soul. White (who died 1676) and Hobbes were friends.

popular sentiment. The most important of the works com- posed towards 1670, and thus kept back, is the extremely spirited dialogue to which he gave the title Behemoth : the History of the Causes of the Civil Wars of England and of the Counsels and Artifices by which they were carried on from the year 1640 to the year 1660. To the same period pro- bably belongs the unfinished Dialogue between a Philosopher and a Student of the Common Laws of England (E. W., vi. pp. 1-160), a trenchant criticism of the constitutional theory of English government as upheld by Coke. Aubrey takes credit for having tried to induce Hobbes to write upon the subject in 1664 by presenting him with a copy of Bacon's Elements of the Laws of England, and though the attempt was then unsuccessful, Hobbes later on took to studying the statute-book, with Coke upon Littleton. One other posthumous production (besides the tract on Heresy before mentioned) may also be referred to this, if not, as Aubrey suggests, an earlier time—the two thousand and odd elegiac verses into which he amused himself by throwing his view of ecclesiastical encroachment on the civil power; the quaint verses, disposed in his now favourite dialogue-form, were first published, nine years after his death, under the title Wistoria Kcclesiastica (ZL. W., v. pp. 341-408), with a preface by Thomas Rymer.

For some time Hobbes was not even allowed to utter a word of protest, whatever might be the occasion that his enemies took to triumph over him. In 1669 he had silently to bear the spectacle of an unworthy follower—~ Daniel Scargil by name, a fellow of Corpus Christi at Cambridge—made to act an edifying part in a public recantation of his principles, after having brought them into discredit by offensively supportiug them in the public schools. A few years later, in 1674, he had another ex- perience of academic disfavour when Dr John Fell, the dean of Christ Church, who bore the charges of the Latin trans- lation of Anthony Wood's Mistory and

Antiquities of the University of Oxford (1670), struck out all the complimen- tary epithets in the account of his life, and substituted very different ones ; but this time the king did suffer him to defend himself by publishing a dignified letter (Viz. Auct., pp. xlviii.~l.), to which Fell replied by adding to the translation when it appeared a note full of the grossest in- sults. And, amid all his troubles, Hobbes was not without his consolations. No Englishman of that day stood in the same repute abroad, and foreigners, noble or learned, who came to England, never forgot to pay their respects to the old man, whose vigour and freshness of intellect no pro- gress of the years seemed able to quench.

His pastimes in the latest years were as singular as his labours. The autobiography in Latin verse, with its playful humour, occasional pathos, and sublime self-complacency, was thrown off at the age of eighty-four. At eighty-five, in the year 1673, he sent forth a translation of four books of the Odyssey (ix.—xii.) in rugged but not seldom happily turned English rhymes ; and, when he found this Voyage of Ulysses eagerly received, he had ready by 1675 a complete transla- tion of both Iziad and Odyssey (EL. W., x.), prefaced by a lively dissertation “Concerning the virtues of an heroic poem,” showing his unabated interest in questions of literary style. In that year (1675) he ceased coming to London, and thenceforth passed his time at his patron’s Seats in Derbyshire, always occupied to the last with some intellectual work in the early morning and in the afternoon hours, which it had long been his habit to devote to thinking and to writing. With such tenacity did he cling to his pursuits (always systematically keeping up exercise for the sake of health) that even as late as August

1H. W., vi. pp. 161-418, Though Behemoth was kept back at the

king’s express desire it saw the light, without Hobbes’s leave, in 1679, before his death.

1679 he was promising his publisher ‘ somewhat to print in English.” The end came very soon afterwards. A suppression of urine in October, in spite of which he in- sisted upon being conveyed with the family from Chats- worth to Hardwick Hall towards the end of November, was followed by a

paralytic stroke, under which he sank on the 4th of December, in his ninety-second year. He lies buried in the neighbouring parish church of Hault Hucknall.

In the foregoing sketch the aim has been to give a defi- nite idea of the circumstances in which Hobbes, after slowly developing in the first forty years of his life, displayed a mental activity of such extraordinary variety in his last fifty years. The task of expounding and criticizing either his better-known or his less-known doctrines will not be attempted in this place ; but a few remarks may be added as to his position in the general movement of English philo- sophy. As already suggested, it cannot be allowed that he falls into any regular succession from Bacon ; neither can it be said that he handed on the torch to Locke. He was the one English thinker of the first rank in the long period of two generations separating Locke from Bacon, but, save in the chronological sense, there is no true relation of succes- sion among the three. It would be difficult even to prove any ground of affinity among them beyond a disposition to take sense as a prime factor in the account of subjective experi- ence : their common interest in physical science was shared equally by rationalist thinkers of the Cartesian school, and was indeed begotten of the time. Backwards, Hobbes's relations are rather with Galileo and the other inquirers who, from the beginning of the 17th century, occupied them- selves with the physical world in the manner that has come later to be distinguished by the name of science in opposi- tion to philosophy. But it happened that, even more than in external nature, Hobbes was interested in the phenomena of social life, presenting themselves so impressively in an age of political revolution. So it came to pass that, while he was unable, by reason of imperfect training and too tardy development, with all his pains, to make any contri- bution to physical science or to mathematics as instrumental in physical research, he attempted a task which no other adherent of the new " mechanical philosophy " conceived — nothing less than such a universal construction of human knowledge as would bring Society and Man (at once the matter and maker of Society) within the same principles of scientific explanation as were found applicable to the world of Nature. The construction was, of course, utterly prema- ture, even supposing it were inherently possible; but it is Hobbes's distinction, in his century, to have conceived it, and he is thereby lifted from among the scientific workers with whom he associated to the

rank of those philosophical thinkers who have sought to order the whole domain of human knowledge. Such as it was, the effects of his philo- sophical endeavour may be traced on a variety of lines. Upon every subject that came within the sweep of his system, except mathematics and physics, his thoughts have been productive of thought. When the first storm of opposition from smaller men, roused as much by his para- doxical expressions as by his doctrines, had begun to die down, thinkers of real weight, beginning with Cumberland and Cudworth, were moved by his analysis of the moral nature of man to probe anew the question of the natural springs and the rational grounds of human action; and thus it may be said that Hobbes gave the first impulse to the whole of that movement of ethical speculation that, in modern times, has been carried on with such remarkable continuity in England. In politics, the revulsion from his particular conclusions did not prevent the more clear- sighted of his opponents from recognizing the force of his supreme demonstration of the practical irresponsibility of

the sovereign power, wherever seated, in the state ; and, when in a later age the foundations of a positive theory of legislation were laid in England, it was extreme liberals of the school of Bentham—James Mill, Grote, Molesworth— that brought again into general notice the writings of the great publicist of the 17th century, who, however he might, by the force of temperament, himself prefer the rule of one, based his whole political system upon a rational regard to the common weal. Finally, the psychology of Hobbes, though too undeveloped to guide the thoughts or even perhaps arrest the attention of Locke, when essaying the scientific analysis of knowledge, came in course of time (chiefly through James Mill) to be connected with the theory of associationism developed from within the school of Locke, in different ways, by Hartley and Hume; nor is it surprising that the later associationists, finding their principle more distinctly formulated in the earlier thinker, should sometimes have been betrayed into affiliating them- selves to Hobbes rather than to Locke.

Sufficient information is given in the Vite Hobbianw Auctarium

(L. W., i. pp. Ixv. gf.) concerning the frequent early editions of

Hobbes’s separate works, and also concerning the works of those who wrote against him, to the end of the 17th century. In the 18th century, after Clarke’s Boyle Lectures of 1704-5, the opposi- tion was less express. were collected, with life, &c., by Dr Campbell, in a folio edition, including in order, Human Nature, De Corpore Politico, Leviathan, Answer to Bramhall’s Catching of the Leviathan, Narration concern- ing Heresy, Of Liberty and Necessity, Behemoth, Dialogue of the Common Laws, the Introduction to the Thucydides, Letter to Dave- nant and two others, the Preface to the Homer, De Mirabilibus Pecci

(with English translation), Considerations on the Reputation, &c., of

T. H, In 1812 the Human Nature and the Liberty and Neccssity (with supplementary extracts from the Questions of 1656) were reprinted in a small edition of 250 copies, with a meritorious memoir (based on Campbell) and. dedication to Horne Tooke, by Philip Mallet. Molesworth’s edition (1839-45), dedicated to Grote, has been referred to in a former note. Of translations may be mentioned Les Elémens philosophiques dw Citoyen (1649) and Le Corps politique (1652), both by Sorbitre, conjoined with Le Traité de ia Nature humaine, by D’Holbach, in title Les Cfuvres philosophiques ct politiques de Thomas Hobbes; a translation of the first section, ‘‘ Computatio sive Logica,” of the De Corpore, included by Destutt de Tracy with his Elémens d’ Idéo-

logie (1804); a translation of Leviathan into Dutch in 1678, and

another (anonymous) into German—Des Englinders Thomas Hobbes Leviathan oder der kirchliche wnd bitrgerliche Staat (Halle, 1794, 2 vols.) ; a translation of the De Cive by J. H. v. Kirchmann— T. Hobbes: Abhandlung tiber den Birger, &c. (Leipsic, 1873). No comprehensive monograph on Hobbes’s whole philosophical performance has yet been produced. Molesworth had begun to make preparations for writing one when his energies were diverted into practical politics. (G. C. BR.)

HOBOKEN, a city and port of entry of the United States, in Hudson county, New Jersey, is situated on the Hudson river, contiguous to Jersey city, which stretches immedi- ately to the south. It lies opposite New York city, ¢ of a mile distant, and occupies a picturesque site at the foot of a steep hill,

with a considerable river frontage. The principal public buildings are the Stevens institute of technology, the bequest of the late Commodore Stevens, whose mansion in the Gothic style of architecture is a note- worthy feature of the place ; St Mary's Catholic hospital; and the Franklin lyceum association library. The manu- factories include iron-foundries and a lead pencil work ; and the trade in coal is important. Castle Point and the adjoining " Elysian Fields" afford delightful views of the river, and, before the recent building operations, used to be a favourite resort of the New-Yorkers. The city, which was originally settled by the Dutch, who named it after a village on the Scheldt, was incorporated in 1855. Popu- lation in 1870, 20,000; in 1880, 35,000.

HOCHE, Lazare (1768-1797), a French general of the time of the Revolution, was born of poor parents at Montreuil near Versailles, June 25, 1768, At the age of sixteen he enlisted as a private soldier with the intention

In 1750 The Moral and Political Works

1787, under the general

of proceeding to the East Indies, but was sent instead to a depot of the Gardes Frangaises. Having risen to the rank of sergeant, he, at the outbreak of the Revolution, made an important stand with a mere handful of troops against a large body of insurgents ; and it was he also who, at a later period, defended the entrance to the chamber of the queen when her apartments were invaded by a revolutionary mob. He distinguished himself at the siege of Thionville in 1792, and at the battle of Neerwinden, 13th March 1793. Shortly afterwards he received the brevet of general of brigade, and was appointed to the command of Dunkirk, for his brilliant defence of which against the duke of York he received the chief command of the army of the Moselle. The purpose which he originally proposed to himself in this campaign was to cut the communication between the Austrians and Prussians, and, though foiled in this attempt by the superior forces of the duke of Brunswick, he suc- ceeded by a masterly manceuvre in effecting a junction of a portion of his troops with the army of the Rhine, and thus causing the Austrians to evacuate Alsace. Shortly afterwards he was

assigned the chief command by the representatives of the people with the two armies, but, this promotion awakening the morbid suspicion of Robespierre, he was recalled and thrown into prison, and it was only the timely fall of Robespierre that saved him from the guillotine. On being released by the convention, he was so successful in pacifying La Vendée and Brittany that he was appointed to the command of the three united armies, numbering in all 100,000 men, in order to apply similar measures for the disarmament of the other depart- ments, After accomplishing this task with an admirable combination of firmness and moderation, he was appointed to the command of an army organized for the conquest of Ireland. The expedition set sail from Brest, 16th December 1796, but was dispersed by a storm, scarcely one half of the vessels escaping shipwreck or capture. In the following year Hoche was sent to the eastern frontier to act against Austria, and by a series of masterly manoeuvres he succeeded in surrounding the army of General Kray, and but for a declaration of peace would have taken him and all his troops prisoners of war. Not long after his return he was appointed to the command of the united army in Germany, but eight days afterwards he died suddenly at Wetzlar, 18th September 1797. The belief was widely spread that he had been poisoned, but the suspicion seems to have been without foundation. ‘Though Hoche at his death had not attained the age of thirty, he had already displayed powers, both as politician and as strategist, which, had he lived, would have rendered him a formidable rival of Napoleon, and might have effectually frustrated the latter’s unscrupulous ambition.

See Notes historiques sur la vie morale politique et militaire du général Hoche, Strasburg, 1798; Rousselin, Vie de Lazare Hoche, général des armeées de la république Francaise, Paris, 1798; Dubroca, Eloge funebre du général Hoche, Paris, 1800; Vie et pensécs du général Hoche, Bern; Champrobert, Notice historique sur Lazare ‘Hoche, le pacificateur de la Vendée, Paris, 1840 ; Dourille, Histoire de Lazare Hoche, Paris, 1844; Desprez, Lazare Hoche @aprés sa correspondance, Paris, 1858.

HODGE, Cuartes (1797-1878), theologian, was born in Philadelphia, December 28,1797. He was educated at the college of New Jersey in Princeton, where he graduated in 1815, and afterwards at the theological seminary of the Presbyterian Church in the same place, where he continued a student until 1819; in 1820 he became assistant teacher}; and in 1822 he was chosen by the general assembly to be professor of Oriental and Biblical literature there. He spent two years on the Continent, from 1826 to 1828, studying under De Sacy in Paris, under Gesenius and Tholuck in Halle, and under Hengstenberg, Neander, and Humboldt sn Berlin. In 1840 he was transferred to the chair of

didactic and exegetical theology, to which subjects that of | royal medal, and was also elected a fellow. His formule

polemic theology was added in 1852, and this office he held to the day of his death. In 1825 he established a quarterly publication entitled the Biblical Repertory, designed to furnish translations and reprints of the best contemporaneous foreign essays on theological and religious subjects. On his return from Europe in 1828 he clianged it into a vehicle for publishing original theological essays and reviews, and added the words Princeton Review to its title. He secured for it the position of theological organ of the old school division of the Presbyterian Church, and continued its principal editor and contributor until 1868, He contributed over 130 articles on subjects ranging through every department of theology and ecclesiology, and all the great practical, ecclesiastical, moral, and national questions of

the day. From 1835 to 1868 he wrote yearly an article reviewing the action of each general assembly, which series has exerted a powerful influence over the current opinion and history of the church to which he belonged. The most important of these have been repub- lished in Great Britain and in America, in volumes, under the titles of Modge's Hssays, Princeton Theological Essays, and Hodge's Church Polity. He was made doctor of divinity by Rutgers College, N.J., in 1834, moderator of the general assembly (O.8.) in 1846, member of the com- mittee to revise the Book of Discipline of the Presbyterian Church in 1858, and LL.D. by Washington College, Pa, in 1864. April 24, 1872, the fiftieth anniversary of his election to his professorship, was observed in Princeton as his jubilee by between 400 and 500 representatives of his 3000 pupils, when he received congratulatory addresses and letters from all the Presbyterian theological faculties of Scotland and Ireland, aud from a majority of those belonging to the various Evangelical churches of America. He continued to instruct his classes uninterruptedly up to the time of his death in Princeton, June 19, 1878. The main characteristics of Hodge were strength and persistence of conviction and of purpose, logical clearness and sym- metry of thought and style, energy and effective vigour in the defence of his convictions and in assaults upon what he considered error, sunny cheerfulness of disposition, and humility, tenderness, and gentleness of heart and manner,

Besides his articles in the Princeton Review, he published a Com- mentary on the Epistle to the Romans, Phila., 1835, abridged 1836, rewritten and enlarged 1866; Constitutional History of the Presby- terian Church in the United States, 2 vols., 1840-41; The Way of Life, 1842; Commentaries on Lphesians, 1856, 1 Corinthians, 1857, 2 Corinthians, 1860; Systematic Theology, probably the best of all modern expositions of Calvinistic dogmatic, 3 vols., 2200 pp., 1871- 73; What is Darwinism? 1874; and there have been published

aD his death Hodge's Church Polity, 1878, and Conference Papers,

1879.

HODGKINSON, Earon (1789-1861), a distinguished engineer, was the sou of a farmer, and was born at Anderton near Northwich, Cheshire, 26th February 1789. He re- ceived his first stimulus to the study of mathematics

at the grammar school of Northwich, and this interest was further quickened by the instructions of Dr Dalton at Manchester, whither he had removed in 1811, aud where, instead of following his original purpose to study for the church, he was assisting his widowed mother to establish a business. For several years he carried on mechanical researches and experiments, but his first discovery of importance was that of a new form of iron girder, by which a gain of two-fifths in strength was obtained over that formerly in use. After this he carried on investigations of a similar character in conjunction with Sir William Fairbairn, who greatly pro- fited by his suggestions and assistance in some of his more important inventions. In 1840 Hodgkinson com- municated a paper to the Royal Society on Lxperimental Hesearches on the Strength of Pillars of Cast-tron and other Materials in recognition of which he in 1841 received the

for solid and hollow pillars soon obtained general adop- tion in all engineering class-books, Subsequently he was employed by Stephenson to verify the experiments of Fairbairn on wrought-iron tubes, with a view to the con- struction of the Britannia Bridge ; and for his co-operation in this work he received a silver medal at the Paris Exhibi- tion of 1855. In 1847 he was appointed professor of the mechanical principles of engineering in University College, London. In 1848 he was chosen president of the Manchester Philosophical Society, of which he had been a member since 1826, and to which, both previously and subsequently, he contributed many of the more important results of his discoveries. For several years he took an active part in the discussions of the Institution of Civil Engineers, of which he was elected an honorary member in 1851. He died at Eaglesfield House, near Manchester, 18th June 1861. The name of Hodgkinson will always be associated with those of Fairbairn and Stephenson, and without his assistance it may safely be affirmed that the most brilliant achievements of both would have been im- possible. 7

HODMEZO-VASARHELY, a corporate town in the county of Csongrdd, Hungary, is situated on the lake Hdd, and on the Alfdld Railway, about 90 miles S.E. of Budapest, 46° 27’ N. lat, 20° 22’ E. long. The town is large and rapidly improving, and has many public buildings. Of these the most noteworthy are the town- hall, the Roman Catholic, Greek, and Protestant (one Lutheran and two Calvinist) churches, the Jews’ syna- gogue, the

Protestant gymnasium, and the royal law courts. Hé6dmezo-Vasdrhely possesses also many elegant private residences, two hospitals, two banks, and several literary institutions, and has a flourishing trade. The svil of the surrounding country is exceedingly fertile, the chief pro- ducts being wheat, mangcorn, barley, oats, millet, maize, and various descriptions of fruit, especially melons. Exten- sive vineyards, yielding large quantities of both white and red grapes, skirt the town, which has also a fine public garden. The horned cattle and horses of Hédmezé- Vasirhely are considered the best in the Alféld; sheep and pigs are also extensively reared. The commune is protected from inundations of the Theiss by an enormous dike, but the town, nevertheless, sometimes suffers considerable damage during the spring floods. In 1870 the population was 49,153, chiefly Magyars.

HODOGRAPH is the name given to a geometrical con- struction which greatly facilitates the study of kinematical questions. It was invented by Sir William Rowan Hamilton about 1845, and the first account of it, writ- ten by him, is to be found in the Proc. &. I. A. for

1846.

The hodograph may be thus defined :—-If a point be in motion in any orbit) and with any velocity, and if, at each instant, a line be drawn from a fixed point parallel and equal to the velocity of the mov- Te ing point at that instant, the extremities of these Fig. 1. lines will lie on a curve called the hodograph. Let Ere, be the path of the moving point, and let OT, Of, OT, be drawn from the fixed point O parallel and equal to the velocities at P, P,, P, respectively, then the locus of T is the hodograph of the orbit described by P (fig. 1).

From this definition we have the following important fundamental property which belongs to all hodographs, viz., that at any point the tangent to the hodograph is parallel to the direction, and the velocity in the hodograph equal to the magnitude of the resultant acceleration at the corre- sponding point of the orbit. This will be evident if we consider that, since radii

vectores of the hodograph represent velocities in the orbit, the elementary arc between two con- secutive radii vectores of the hodograph represents the velocity which must be compounded with the velocity of the moving point at the beginning of any short interval of time to get the velocity at the end of that interval, that is to say, represents the change of velocity for that interval. Hence the elementary arc divided by the element of time is the rate of change of velocity of the moving-point, or in other words, the velocity in the hodograph is the accelera- tion in the orbit.

Analytically thus (Thomson and Tait, Nat. Phil.):—Let x, y, 2 be the coordinates of P in the orbit, &, », ¢ those of the corre- sponding point T in the hodograph, then

‘ dae dy dz t= eg» (=a 5 therefore

Pan dy da d@ di di? Also, if s be the are of the hodograph,

ds [dé \? dn\? d¢ 3

ai >= (Gi) + (Gt) + (a) > / dx \2 d?y) diz\2 9 – (Gz) + ( ) + ( )

Equation (1) shows that the tangent to the hodograph is parallel to the line of resultant acceleration, and (2) that the velocity in the hodograph is equal to the acceleration.

Every orbit must clearly have a hodograph, and, con- versely, every hodograph a corresponding orbit; and, theoretically speaking, it is possible to deduce the one from the other, having given the other circumstances of the motion. We give a few examples :—

1. For uniform motion in a straight line the hodograph is easily

seen to be a point. 2. For uniform or variable acceleration in a straight line the hodograph is the line described by a point moving with uniform or variable velocity. 8. For uniform circular mo- tion the hodograph is also a circle. In this case it may be useful to show how the con- ception of the hodograph leads easily to the ordinary expres- sion for the so-called centri-
5 fugal force.

Let P (fig. 2) describe the circumference PP,P, with uni- form velocity v, and from the centre O draw OT, OT,, OT,, &ec., equal to each other and parallel to the tangents: at ‘ ‘ P, P,, P, respectively, then Fig. 2. TT,T, is the hodograph circle. Also let a equal the acceleration of P, which also equals the velocity of T; then, since T describes the hodograph uniformly in the same time that P describes the orbit, we have

ve OF – >) *, g i 4 oro ‘

It is evident that the tangent at T is parallel to PO the direction of acceleration at P.

4. For simple harmonic motion the hodograph is also simple harmonic motion, and similarly for elliptic harmonic motion,

For the former we have

s=a cos (nt+e); . v=s= —na sin (nt+e)=na cos (nt+e+4n);

which indicates siniple harmonic motion with changed amplitude

and phase. 5. For parabolic motion the hodograph is a straight line.

HODOGRAPH

#—0, ii =—/f (/ being the vertical acceleration) ;

as n=e—ft, which indicates a vertical straight line described with uniform velocity f.

F

Fig. 3.

Fig. 4. 6. For central forces the hodograph will vary with the law of

acceleration towards the centre. Hamilton showed that, for the Newtonian law of the inverse square of the distance, the hodograph is always a circle, and for that reason he designated that law the law of the circular hodograph.

Assuming the centre of force as origin for the hodograph, we see that, from definition, the tangent and radius vector at any point P of the orbit are respectively parallel to the radius vector and tan- gent at the corresponding point T of the hodograph (fig. 4). These four lines thus enclose a parallelogram PT, whose shape is constautly changing, although its areais constant, being equal to the constant rectangle YT coutained by the velocity and the perpendicular on the tangent. As usual, let TY=vp=h. Also the angle between two consecutive tangents to the hodograph is equal to the angle between the corresponding radii vectores of the orbit, and hence, if @ be the angle between OP and some initial line, and s the are of the hodograph, the ordinary formula for curvature gives

ee

p @ 8 i but h=r‘6, and =velocity in hodograph =acceleration in orbit=P (say) ;

1 25

a Pr? = a ° ° ° . . ° . (3) 5

a most useful expression for the radius of curvature of the hodo- graph to any central orbit.

If the acceleration vary inversely as the square of the distance, , F . ’ P= v? where M is the mass at the centre acting upon unit mass

in the orbit. Substituting in (3), we get

p= – = constant.

Hence, for this law of force, and evidently for it only, the hodo- graph is a circle.

Assuming that the hodograph is a circle, we can show that the orbit for this law of force must be a conie section. Let CTB (fig. 5) be the hodograph circle, O the origin, and H the centre; and let the

ratio te =e. Draw OP parallel to the tangent at T and, there-

fore, perpendicular to TG. Take OP such that the parallelogram contained by OP and OT=a constant=h. Draw OA perpendi- cular to CB; and let POA=8@; then,

OP.TG=h; “4… -, OP. (TH+HG)=A; but TH=p=7, and HG = HO cos @=ep cos g=st cos 0; M M : or(5 + F088) =h q

2

A ae oe :

M’1+ecos 0°

HOD—HOF

Hence the locus of P is a conic section whose semi-parameter is = If e<1, O is within the circle and the orbit is an ellipse;

if e=1, O is on the circumference and the orbit is a parabola ;

if e>1, O is without the eircle C

and the orbit is an hyperbola. Two values of the potential,

V, can readily be found from

the above :—

M hh. » hears ‘ but r=AG ; – Yor. TG=TH. TG.

Also, since OGH is a right angle, V=TH.TG=the square of the tangent from T to the circle de- scribed on HO as diameter.

A beautiful result con- nected with the hodograph, Fig. 5. and one which has attracted the attention of several of the ablest mathematicians, was communicated by Sir William Hamilton to the Royal Irish Academy in March 1847. It is called the theorem of hodographic isochronism, and is thus stated:—If two circular hodographs, having a common chord, which passes through, or tends towards, a common centre of force, be cut

perpendicularly by a third circle, the times of hodographically describing the intercepted arcs will be equal. A purely quaternion proof is given of this theorem by Hamilton in his Elements, and, following the hints given by that method, he has also indicated the follow- ing geometrical proof.

Let TM1’M’, WMW’M’ (fig. 6), be the two hodographic circles with centres H and Land common chord MM’. Let P, P’, on the common chord produced, be the centres of two eircles WI’W’T’ and BAB’A’, near each other, which cut the hodographs orthogonally. Let O be the centre of force, OZ perpendicular to the tangent at T, and TR, ‘I’R’ perpendicular to SX. Also let AT’ mean the

are AT, and similarly for the other small arcs. Draw PY perpen- dicular to PT.

Fig. 6. From similar triangles THA and TPY we have SS ig, Sy i Br’ also from similar triangles THR and PP’Y oe, FY’, AT PP a i TR PT’ ~ &p. Te . . AT ba — . Similarly, Al’ ss PP’ : TR’

Pr

If. and ¢’ be the times of hodographically describing the arcs AT and A’T’ respectively,

Pi AU . – ia = on (if V be the potential at T).

43

But V= HT. OZ= OP. TR from similar triangles OPZ and THR; M. AT M.PP.TR M >Pr’

“+ = Ops PRs = OP2, PRI PT ~ OP. PT, TR’ aud | gimilarly, ae ee a OFF, TR*, PT ~ OP? Pr. PR’ er ee = aerator | OP? PT. (TR ” TR’ OP?. PT (QTR. TR’

ow 22K. TR’ = the harmonic mean between TR and T’R’=QL ;

TR+ TR’ : * tees re

From this expression we see that the time of describing the two small arcs TA and T'A' is independent of the radius of the hodo- graph and the distance of its centre from L. Hence it is equal to the time of describing the two ares BW and B/W'. By continuing the process of drawing orthogonals we arrive at the conclusion that the time of describing the whole are ATT'A' is equal to the time of describing the are BWW'B'. A very simple analytical proof is given in Tait and Steele's Dynamics of a Particle. " Others not so simple by Cayley and Droop are to be found iu the Quarterly Journal of Mathematics, We can only mention that the theorem of Lambert can be deduced from the above theorem of hodographic isochronism without using any property of conic sections,

Sir William Hamilton has observed that we have a good instance of a hodograph in the curve of aberration of a star, which is merely the hodograph of the earth's annual motion. The fact that this curve isa circle in a plane parallel to the earth's orbit, abstracted, however, from the general idea of the hodograph, was known long before the date of the hodograph. It will be found clearly stated and proved in Woodhouse's Astronomy, of date 1821, and from allusions there it appears to have been known even earlier. As an application of the hodograph, Thomson and Tait point out that the heat and light received by a planet from the sun in any time are proportional to the corresponding arc of the hodograph.

See Proc. Roy. Irish Acad., 1846; Hamilton's Elements of Quaternions ; Tait, Proc. R. S. E. , 1867-8; Tait's Quaternions ; Thomson and Tait, Nat. Phil. . (J. BL.)

HODY, Humpurey (1659-1706), an English divine, was born at Odcombe in Somersetshire in 1659. In 1676 he entered Wadham College, Oxford, of which, having proceeded M.A. in 1682, he became fellow in 1684, Previously he had published in 1680 Dissertatio contra Historiam Aristee de LXX. Interpretibus, in which he showed that the so-called letter of Aristeas, containing an account of the production of the Septuagint, was the late forgery of a Hellenist Jew originally circulated to lend authority to that version. The dissertation was generally regarded as conclusive, although Vossius pub- lished an angry and scurrilous reply to it in the appendix to his edition of Pomponius Mela. In 1689 Hody wrote the "Prolegomena" to the

chronicle of John Malala, published at Oxford in 1691. The following year he became chaplain to Stillingfleet, bishop of Worcester, and, on account of his supporting the ruling party in a contro- versy with Dodwell regarding the nonconforming bishops, he was appointed chaplain to Archbishop Tillotson, an office which he continued to hold under Tenison. In 1698 he was appointed regius professor of Greek in the university of Oxford, and in 1704 he was promoted to the archdeanery of Oxford. In 1701 he published History of English Councils and Convocations, and in 1704 in four volumes De Bibliorum textis originalibus, in which he included his original work on the Septuagint, and published a reply to the attack of Vossius. He died 20th January 1706. A work, De Grecis Illustribus, which he left in manuscript, was published in 1742 by Dr Jebb, who prefixed to it a Latin dissertation.

HOF, originally Reenrrznor, a town of Bavaria, circle of Upper Franconia, is beautifully situated on the Saale, on the north-eastern spurs of the Fichtelgebirge, and at the

junction of several railways, 30 miles N.N.E. of Baireuth. It is the seat of district, town, country, and conimercial courts, a chamber of commerce, and a head tax office. It ig surrounded by walls, and has one Catholic and three Protestant churches, a town-house of 1563 in the Gothic style, a gymnasium with an extensive library, a trade and commercial school, a female school of the higher grade, a people’s school, an orphanage, a richly endowed hospital founded in 1262,and an infirmary. Its industries are chiefly connected with wool and cotton, and include woollen, cotton, and jute spinning, jute weaving, and the manufac- ture of cotton and half-woollen fabrics. It has also dye- works, flour-mills, saw-mills, breweries, iron-works, and manufactures for machinery, iron and tin wares, chemicals, and sugar. In the neighbourhood there are large marble quarries aud extensive iron mines. The population in 1875 was 18,122.

Hof was built about 1080, on the site of an old robber castle. Originally it belonged to the empire, but afterwards it was held by the dukes of Meran, and then by the counts of Orlamiinde, until it was sold in 1373 to the eounts of Nuremberg. The eloth manu- faeture introduced into it in the 15th eentury, and the manufacture of veils, begun in the 16th eentury, greatly

promoted its prosperity, but it suffered severely in the Albertine and Hussite wars, as well as in the Thirty Years' War; and in 1828 the greater part of it was destroyed by fire. In 1792 it came into the possession of Prussia; in 1806 it fell to France; and in 1810 it was ineor- porated with Bavaria. See Widmann, Chronik der Stadt Hof, 1844; Ernst, Geschichte und Beschreibung des Bexirks und der Stadt Hof, 1866.

HOFER, Anpreas (1767-1810), a Tyrolese patriot, was born October 2, 1767, at St Leonhard, in the Passeyr valley. There his father kept a tavern called the Sandhof, which Hofer inherited, and on that account he was popularly known as the '"Sandwirth." In addition to this he carried on a trade iu wine and horses with the north of Italy, acquiring a high reputation for intelligence and honesty. On the outbreak of the war in 1796, he commanded a company of riflemen against the French at Lake Garda, aud after the peace of Lunéville he took an active part in organizing the Tyrolese militia, After the treaty of Presburg (1805), by which Tyrol was transferred from Austria to Bavaria, Hofer was chosen a member of the secret Tyrolese deputation which went to Vienna to confer with the emperor on the condition of their country ; and when, on the advice of Austria, the whole of Tyrol in April 1809 rose in arms, Hofer was chosen to the command of a large division of the insurgents, and inflicted an overwhelming defeat on the Bavarians at Sterzing. Reinforcements sent by Napoleon defeated the Austrians at Woergl and the Tyrolese at Feuersinger, but Hofer coming to the rescue of his country repulsed the Bavarians with great loss at Innsbruck. N otwithstanding also that Austria after Napoleon's victory at Wagram agreed to evacuate Tyrol, Hofer resolved to maintain the struggle, and ou the 13th August, at Berg Isel, routed with great slaughter a combined French and Bavarian force, and com- pletely freed his country from foreign dominion. For some time the internal affairs of Tyrol were administered by an independent Government of which Hofer was the head, Dut after the peace of Vienna the Bavarians again endea- voured to assert their supremacy, and after a heroic resist- ance Hofer was compelled to flee for safety to the mountains. A price was set upon his head, and ou account of thie treachery of one of his most trusted foliowers, he was captured, January 27, 1810, in a chalet in the Passeyr valley. He was sent to Mantua for trial, and on the 20th February, by the orders of Napoleon, was executed twenty- four hours after his condemnation. In 1823 his remains were

removed from the place of sepulture at Mantua to Innsbruck, where they were interred in the Franciscan churcli, and in 1834 a marble statue was erected over his tomb. In 1819 the patent of nobility decreed for him by

Austria in 1809 was conferred upon his family by the title of Von Passeyr.

See Leben und Thaten des chemaligen Tyroler Insurgenten-Chefs Andr. Hofer, Berlin, 1810; Andr. Hofer und die Tyroler Insur- rection 1m Jahre 1809, Munich, 1811; Hormayr, Gesehichte Andr. Hofer's Sandwirths auf Passeyr, Leipsic, 1845 ; B. Weber, Das Thal Passeyr und seine Bewohner mit besonderer Riicksicht auf Andreas Hofer und das Jahr 1809, Innsbruck, 1851; Rapp, Tirol im Jahr 1809, Innsbruck, 1852; Heigel, Andreas Hofer, Munieh, 1874. His history has supplied the materials for tragedies to B. Auerbach and Immermann.

HOFFMANN, Avaust Hernertcy (1798-1874), known as Hoffmann von Fallersleben, German poet, philologist, and historian of literature, was born at Fallersleben, in Liineburg, April 2,1798. He was educated at Helmstadt and Brunswick, and afterwards at the universities of Géttingen and Bonn. His original intention was to study theology, but he soon devoted himself entirely to literature. In 1823 he was appointed librarian to the university of Breslau, a post which he held till 1838. He was made extraordinary professor of the German language and litera- ture at the university in 1830, and full professor in 1835; but he was deprived of his chair in 1842 in consequence of his Unpolitische Lieder, which gave much offence to the ruling classes of Prussia. He then travelled for some time in Germany, Switzerland, and Italy, and lived for two or three years in Mecklenburg, of which he became a natural- ized citizen. The revolution of 1848 brought lim back to Prussia, where he was restored to his rights, and received as a pension the " Wartegeld," that is, the salary attached to a promised office which is uot yet vacant. He married in 1849, and during the next ten years lived first in Bingerbriick, afterwards in N euwied, and then in Weimar, where he was one of the editors. of the Weimarische Jahrbuch. In 1860 he became librarian to the duke of Ratibor, and he retained this appointment till his death on the 20th of January 1874. Fallersleben was one of the best popular poets of modern Germany. In politics he ardently sympathized with

the progressive tendencies of his time, and he was among the earliest and most effec- tive of the political poets who prepared the way for the outbreak of 1848. Asa poet, however, he acquired distine- tion chiefly by the ease, simplicity, and grace with which he gave expression to the passions and aspirations of ordinary life. Although he had not been scientifically trained in music, he composed melodies for many of his songs, and a considerable number of them are sung by all classes in every part of Germany.

The best known of his poetical writings is his G@ediehte (8th edition, Berlin, 1874) ; but there is great merit also in his 4leman- nische Lieder (5th edition, Mannheim, 1843), Soldatenlieder (Mainz, 1851), Soldatenleben (Berlin, 1852), Rheinleben (Neuwied, 1865), and in his Finfzig Kinderlieder, Finfeig Neue Kinderlieder, and Alte und Neue Kinderlieder. His Unpolitisehe Lieder, Deutsehe Lieder aus der Schweiz, and Streiflichter are not without poetieal value, but they are mainly interesting in relation to the praetiecal movements of the age in which they were written. Asa student of ancient Teutonic literature Fallersleben ranks among the niost persevering and cultivated of German scholars, some of the chief results of his labours being embodied in his Hore Belgice, Fund- gruben fiir Geschiehte deutscher Sprache und Literatur, Alidewtsche Blatter, Spenden zur deutschen Literaturgesehichte, and Findlinge. Among his cditions of particular works may be named Letncke Vos, Monwmenta Elnonensia, and Theophilus. Die Deutsche Philo- logie im Grundriss (1836) was at the time of its publication a valuable contribution to philologieal research, and historians of German literature still attach importance to his Geschichte des deutsehen Kirchenliedes bis auf Luther (1832; 8ded., 1861), Unsere volksthiimlichen Lieder (8d ed., 1869), and Dive deutschen Gesell- schaftslieder des 16 und 17 Jahrh. (2d ed., 1860). In 1868-70 Fallersleben published in 6 vols. an autobiography, Mein Leben: Aufreichnungen und Erinnerungen. See also Briefe von Hoffmann von Fallersleben und Moritz Haupt an Ferdinand Wolf (Vienna, 1874); Wagner, Hoffmann von Fallersleben, 1818-68 (Vienna, ae and Gottschall, Portréts wad Studien (vol. v., Leipsie,

1876).

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HOFFMANN, Ernst THeopor WILHELM (1776-1822), German romance writer (for whose name Wilhelm his own substitute, in homage to Mozart, was Amadeus), was born at Konigsberg, January 24,1776. His parents, who lived unhappily together, separating a year or two after his birth, he was brought up in his grandmother's house, under the care of a bachelor uncle. His relations seem to have been fairly puzzled at the waywardness, cunning, and precocity of the boy, who neglected his school lessons and hated routine, but applied himself with passionate zest to the study of music and painting, extemporized marvellously oa the harpsichord, and with his pencil cari- catured friend and foe alike with terrible facility. Incited by his friend Hippel, Hoffmann on leaving school turned to the hereditary profession of the law; but, as no im- mediate post offered itself, he gave lessons in music and painting, and wrote two novels, for which he could not find a publisher. A discreditable love episode with one of his pupils drove him at this time from Kénigsberg, and he went to act as assistant to another lawyer uncle at Gross-Glogau in Silesia. In 1798 he became referendary in the supreme court at Berlin, and in 1800 passed his final examination and was appointed assessor to the court of Posen. Here he seems to have led a dissipated life, and to have contracted the habit of excessive drinking which marred his whole career. He subsequently made enemies in Poseu by sending a series of scandalous caricatures for distribution at a masquerade ball, and his appointment was on this account changed to acouncillorship at Plozk, where, having married ere this time, he spent two years in retire- ment, studying in his leisure hours the theory of music, translating Italian poetry, and sketching plans for future literary work; but in 1804, again in favour at headquarters, he was transferred as councillor to Warsaw. There he found a true friend in Hitzig, his colleague, and made the acquaintance of Werner, at whose request he set music to some parts of the Aveuz an der Ostsee. He soon became the centre of musical society in Warsaw, helped to insti- tute a concert-house or " Ressource," found leisure not only to paint its saloons but to compose music for its orchestra, and was actually conducting this orchestra before enthusiastic audiences when Warsaw was taken by the French in 1806. For some time he lingered in Warsaw ; but in the spring of 1807, having recovered from a fever to find himself almost penniless, he returned to Berlin to seek some means of livelihood. His only child died in Posen while he was in Berlin; and, though he succeeded in obtaining the post of music-director to the Bamberg theatre, the theatre soon after became

bankrupt, and Hoffmann was once more destitute. He now found oc- casional employment as a composer of operatic music, and, as a last resource, attempted authorship. The editor of the Allgemeine Musikalische Zeitung enlisted his ser- Vices, and in that paper appeared a series, afterwards pub- lished, with a preface by Jean Paul Richter, as Mantasie- stiichke in Callots Manier (1814; 4th ed., 1864). He composed at this time, among other things, a Miserere by order of the grand-duke of Wiirzburg, and, for the pro- prietors of the Bamberg theatre, music to Kotzebue's opera Das Gespenst; and he also gave lessons in music and draw- ing, decorated saloons, and painted portraits to order. The misery of his condition was enhanced by his wife's illness and his own light-hearted recklessness. The money which he inherited at the death of his uncle did not suffice to pay his debts; and he had been reduced to selling lis last coat for food when his friends obtained for him the post of music-director to another theatrical company, performing altemmately at Dresden and Leipsic. Hoffmann was writing Tomances in a garret in Dresden, or, bedridden by gout, was drawing caricatures of the "verwiinschte Franzosen"

while Napoleon and the allied armies were struggling round its walls In 1814 appeared his Vision auf der Schlachtfelde von Dresden; and in the same year, on the fall of Napoleon, he returned to Berlin, and was reinstated in the legal profession. Two years later he was appointed councillor in the supreme court, and from that time en- joyed a good income, a dignified position, and the society of his best friends. He was already, in virtue of his Fantasiestiicke, regarded as one of the most notable romance writers of his day, but most of his works were yet to come. These followed cach other in quick succession. Die Elixire des Teufels appeared in 1816; Nachtstiicke in 1817; Seltsame Leiden eines Theaterdirektors in 1818; Die Serapionsbriider, a collection of tales, in 1819-24; Klein Zaches, genannt Zinnober, in 1819; Prinzessin Brambilla in 1821; Meister Floh in 1822; and Lebensansichten des Katers Murr in 1821-22. He also composed the opera Undine, the libretto of which was prepared by Fouqué himself. It was performed with success in Berlin; but the music was lost in the subsequent destruction of the opera-house by fire. Hoffmann's prospects in Berlin were ruined by the old habit of intemperance, which had grown upon him during

the years of his poverty. We are told that his legal duties were scrupulously performed, and that the remainder of his day was spent in literary work, but that, when this was over, he avoided refined society, and his nights became a series of wild pothouse revels. His health soon gave way; and, after intense suffering from spinal paralysis, he died at Berlin, July 24, 1822. Der Feind, his last work, remained unfinished.

Versatility is the chief characteristic of Hoffmann's genius, and it is also its greatest weakness. He is admitted to have been an excellent jurist. His paintings were clever, though fantastic. He was a popular composer and a brilliant romance-writer. But this very versatility pre: vented his rising to eminence in any one vocation ; and, even as a romance-writer, in which capacity he will be longest remembered, he was deficient in some of the highest attributes. His imagination was unbounded, his wit light and acrid, his dialogue stirring. His descriptive passages, in their minute vividness, have been compared to those of Sir Walter Scott, and his romances abound in the supersti- tious and mythical, that demonic element which is so peculiarly German, and which in Hoffmann amounted almost to a frenzy. But, with all this, a perusal of his writings leaves a disagreeable impression on the mind, a feeling of dissatisfaction and unrest. They are the produc- tion of a misdeveloped nature, of a man full of feverish impulses, oddities, and weakness, not devoid of tender- ness, but whose temper was unforgiving and malicious, whose prevailing mood was the sarcastic, and whose only religious creed was a blind, headlong fatalism. There is also a strong element in his writings which Carlyle in his biography of Hoffmann has called " playerlike," a glitter which is of tinsel, a something "false, brawling, and tawdry." His writings, like his character, are a curious mixture of what is really beautiful and rare with much tbat is petty and sordid. Their clever- ness is irresistible; but the dignity of true greatness is not there.

Die Elixire der Teufels, his longest completed work, contains in a narrative form some of his own wildest and most revolting delusions ; and the derisive Kater Murr, of which the third volume is wanting, is not less character- istic. Some of his smaller pieces have justly been thought the most pleasing and perfect of his works. Among tliese are Der goldene Topf, Das Fraulein von Scudery, Doge und Dogaresse, and Meister Martin und

seine Gesellen. The delicacy and finish of the last, slight though it is, have stamped it as Hoffmann's masterpiece.

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A life of Hoffmann has been written by Hitzig, his colleague first in Warsaw and afterwards in Berlin, under the title of Hofimann's Leben und Nachlass. A selection of his writings was published in Berlin, 1827-28, and five more volumes (including Hitzig's life) were added by his widow in 1839. A selection of his writings by Kurz appeared in 1870, and an edition of his collected works, in 12 vols., in 1871-73, Most of his romances are to be obtained separately in the Universal-Bibliothek, a cheap edition of standard authors pub- lished at Leipsic. Die Elizire des Teufels has been translated into English (Edin., 1824), and Carlyle has given us a biography of Hoffmann, together with a translation of one of the Fantasiesticeke, ''Der Goldene Topf," in his German Romance. (F. M.)

HOFFMANN, Friepricu (1660-1742), the most famous physician in a family that had been connected with medicine for 200 years before him, was born at Halle, l'ebruary 10, 1660. He received his school education at the gymnasium of his native town, where he acquired that taste for and skill in mathematics to which he attributed much of his after success. At the age of eighteen he went to study medicine at Jena, whence in 1680 he passed to Erfurt, in order to attend Kasper Cramer's lectures on chemistry. Next year, returning to Jena, he received his doctor's diploma, and, after publishing a thesis, was permitted to teach. Constant study then began to tell on his health, and in 1682, leaving his already numerous pupils, he pro- ceeded to Minden in Westphalia to recruit himself, at the request of a relative who held a high position in that town. After practising his profession at Minden for two years, Hoffmann made a journey to Holland and England, where he formed the acquaintauce of many illustrious chemists and physicians. 'Towards the end of 1684 he returned to Minden, and during the next three years he received many flattering appointments. In 1688 he removed to the more promising sphere of Halberstadt, with the title of physician to the principality of Halberstadt ; and on the founding of Halle university in 1693, his reputation, which had been steadily increasing, procured for him the primarius chair of medicine, while at the same time he was charged with

the responsible duty of framing the statutes for the new medical faculty. He filled also the chair of natural philo- sophy. With the exception of four years (1708-12), which he passed at Berlin in the capacity of royal physician, without however giving up his professorship, Hoffmann spent the rest of his life at Halle in instruction, practice, and study, interrupted now and again by visits to different courts of Germany, where his services procured him honours and rewards. His fame became European. He was en- rolled a member of many learned societies in different foreign countries, while in his own he became privy councillor. He died at Halle, on November 12, 1742.

Hoffmann's writings, the result both of compilation and original research, have still a considerable suggestive value. His theories, though sometimes vague and even idle, contributed in some degree to introduce a revolution in medical science; while his doctrine of atony and spasm in the living solid as the sole cause of internal disorders turned the attention of physicians more directly to the primary moving powers of the system. He pursued with ardour the study of practical chemistry, and pharmacy owes to him several preparations which are still in general use. It was through Hoffmann also that many of the mineral springs of Germany first came into repute as health resorts.

Of his numerous writings a catalogue is to be found in Haller's Bibliotheca Medicine Practice. The chief is Medicina Rationalis Systematiea, undertaken at the age of sixty, and published in 1730. It was translated into French in 1739, under the title of Medecine Raisonnée @ Hoffmann. A complete edition of Hoffmann's works, with a life of the author, was published at Geneva in 1740, to which supplements were added in 1753 and 1760. Editions appeared also at Venice in 1745, and at Naples in 1753 and 1793.

HOFFMANN, Jouann Josuru (1805-1878), an emi- nent Chinese and Japanese scholar, was born at Wiirzburg

on the 16th of February 1805. After studying in the philosophical department of the Wiirzburg university, the young man took to the stage in

1825; and it was only by an accidental meeting with the German traveller, Dr Siebold, in July 1830, that his interest was diverted to Oriental philology. From Siebold himself he acqnired the rudiments of Japanese ; and in order to take advantage of the instructions of Ko-ching-chang, a Chinese teacher whom Siebold had brought home with him, he made himself acquainted with Malay, the only language except Chinese which the Chinaman could understand. Such rapid advance did Hoffmann make that in afew years he was able to supply the translations for Siebold's Nippon ; and the high character of his work soon attracted the attention of older scholars. Stanislas Julien invited him to Paris; and he would probably have accepted the invitation, as a dis- agreement had broken out between him and Siebold, had not M. Baud, the Dutch colonial minister, appointed lim Japanese translator with a salary of 1800 florins or £150. The Dutch authorities were slow in giving him further re- cognition ; and he was too modest a man successfully to urge his claims. It was not till after he had received the offer of the professorship of Chinese in King's College, London, that the authorities made him professor at Leyden, and the king allowed him a yearly pension. In 1875 he was decorated with the order of the Netherlands Lion, and in 1877 he was elected corresponding member of the Berlin Academy. But these honours came almost too late ; for a disease of the lungs from which he had long suffered ter- minated fatally on the 19th of January 1878.

Hoffmann's chief work is his Japanese Dictionary. Though begun in 1839 it is still unfinished, for the difficulties against which he had to contend were immense. Unable at first to procure the necessary type, he set himself to the vg of punches ; and even when the proper founts were obtained he had to act as his own compositor as far as Chinese and Japanese were concerned. His Japanese grammar isa standard work ; it was published in Dutch and English in 1867, and in English and German in 1876. Of his miscellaneous productions it is enough to mention "J apan's Beziige mit der Koraischen Halbinsel und mit Schina " in Nippon, vii.; Yo-San-fi-Rok, L'art d'élever les vers « sote au Japan, par Ouck- aki Mourikouni, Paris, 1848; 'Die Heilkunde in Japan" in Mittheil. d. deutseh. Gesellseh. fiir Natur- und Volkerk. Ost-Asiens, 1873-1874 ; and Japanische Studien, 1877, dealing with Japanese poetry. The Dictionary is being continued by L. Serrurier.

For further details see Kern in Koninklijke Akademie van Wet- enschappen ; W. Vissering in Het Vaderland, 23d Jan. 1878 ; and Leiden Studenten-almanak, 1879.

HOFMANN, Jowann Curistian Konrap von (1810- 1877), Lutheran theologian, was born December 21, 13 at Nuremberg, whence, after passing through the usual gymnasium course, he in 1827 proceeded to the university of Erlangen as a student of theology and history. In 1829 he became the pupil of Schleiermacher, Hengstenherg, Neander, and Ranke, at Berlin; in 1832 he passed his ex- amination as a candidate in theology at Erlangen ; and in the following year he received an appointment to teach Hebrew and history in the gymnasium there. In 1835 and 1838 respectively he ‘“habilitated” in the philosophical and in the theological faculty at Erlangen, where in 1841 he was appointed professor extraordinarius in theology. In 1842 he accepted a call to an ordinary theological chair at Rostock, but in 1845 he returned once more to Erlangen, where he had been nominated as successor of Harless. Apart from his professorial and literary activities, his life was a singularly uneventful one; he was, however, an enthusiastic adherent of the political party of progress, and as such sat as member for Erlangen and Fiirth in the Bavarian second chamber from 1863 to 1868. His death occurred on December 20, 1877.

He wrote Die sicbzig Jahre des Jeremias wu. die stebzig Jahrwochen

des Daniel, 1836 ; Geschichte des Aufruhrs in den Cevennen, 1837 5 Lehrbuch der Weltgeschiehte, 1839, which became a text-book in

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the Protestant gymnasia of Bavaria ; Weissagung wu. Erfiillung am alten u. newen Lestwmente, 1841-44, 2d ed., 1857-60; Der Schriftbeweis, 1852-56, 2d ed., 1857-60; Die Heilige Schrift Newen Testaments zusammenhdngend untersucht, 1862-75; and Theologisehe Ethik, 1878, He also edited, in conjunction with Hofling and Thomasius, the Zeitschrift fur Protestantismus u. Kirehe from 1846 onwards. His most important works are the four last named. In Weissagung wu, Exfillung he not only carries out the idea, originated by Herder, that the entire Old Testament as an organic whole is one great connected prophecy, pointing towards Christ, but

elaborates the thought that the New Testa- ment also is organically prophetic of the last things. In the Sehriftbeweis, on the fundamental axiom that the history of redemp- tion as recorded in Scripture is the history of a development he at great length sets forth the methods according to which dogmatic theology must seck for and use the Scripture proofs on which it is or ought to be based. His work upon the New Testament discusses the credibility of the several books, and seeks to ascertain the place occupied by each in the organic whole. The Theologische Ethik unfolds the scheme of Christian duty as arising out of the new relations of the believer to God through Christ. In theology as in ecclesiastical polity Hoffmann was a Lutheran of a very extreme type, although the strongly marked individuality of some of his opinions laid him open to repeated accusations of heterodoxy.

HOGARTH, Wiutram (1697-1764). Apart from the story of his works, the life of the greatest English pictorial satirist, when divested of doubtful tradition, is singularly devoid of incident. It is mainly to be found in the auto- biographical Memoranda published by John Ireland in 1798, and the successive Anecdotes of the antiquary, John Nichols, Hogarth was born in London on the 10th day of November 1697, and baptized on the 28th in the church of St Bartholomew the Great, His father was a school- master and literary hack, who had come to the metropolis to seek that fortune which had been denied to him in his native Westmoreland. His son seems to have been early distinguished rather by a talent for drawing and an active perceptive faculty than by any close attention to the learn- ing which he was soon shrewd enough to see had not made his parent prosper. ‘Shows of all sorts gave nie un- common pleasure when an infant,” he says, “and mimicry,

common to all children, was remarkable in me… . My

exercises when at school were more remarkable for tle ornaments which adorned them than for the exercise itself.” This being the case, it is no wonder that, by his own desire, he was apprenticed to a silver-plate engraver, Mr Ellis Gamble, at the sign of the “Golden Angel” in Cranbourne Street or Alley, Leicester Fields. For this master he engraved a shop-card which is still extant. When his ‘pprenticeship began is not

recorded; but it must have been concluded before the beginning of 1720, for in April of that year he appears to have set up as engraver on his own account. His desires, however, were not limited to silver-plate engraving. “ Engraving on copper was, at twenty years of age, my utmost ambition.” For this he lacked the needful skill as a draughtsman ; and his account of the means which he took to supply this want, without too much interfering with his pleasure, is thoroughly characteristic, though it can scarcely be recommended as an example. ‘Laying it down,” he says, “first as an axiom, that he who could by any means acquire and retain in his memory perfect ideas of the subjects he meant to draw would have as clear a knowledge of the figure as a man who can write freely hath of the twenty-four letters of the alphabet and their infinite combinations (each of these being composed of lines), and would consequently be an accurate designer, . . . I therefore endeavoured to habituate myself to the exercise of a sort of technical memory, and by repeating in my own mind the parts of which objects were composed I could by degrees combine and put them down with my pencil.” This account, it is possible, has something of the complacency of the old age in which it was written ; but there is little doubt that his marvellous power of Seizing expression owed less to patient academical study

than to his unexampled eye-memory and tenacity of minor detail. But he was not entirely without technical training, as, by his own showing, he occasionally ‘took the life ” to correct his memories, and is known to have studied at Sir James Thornhill’s then recently opened art school.

“His first employment” (¢.e., after he set up for himself) “seems,” says Nichols, “to have been the engraving of arms and shop bills.” After this he was employed in design- ing “plates for booksellers.” Of these early and mostly insignificant works we may pass over The Lottery, an Em- blematic Print on the South Sea, and some book illustra- tions, to pause at Masquerades and Operas, 1724, the first plate he published on his own account. This is a clever little satire on contemporary follies, such as the masque- rades of the Swiss adventurer Heidegger, the popular Italian opera singers, Rich’s pantomimes at Lincoln’s Inn Fields, and last, but by no means least, the exaggerated popularity of Lord Burlington’s protégé, the

architect painter William Kent, who is here represented on the summit cf Burlington Gate, with Raphael and Michelangelo for sup- porters. This worthy Hogarth had doubtless not learned to despise less in the school of his rival Sir James Thorn- hill. Indeed almost the next of Hogarth's important prints was aimed at Kent alone, being that memorable burlesque of the unfortunate altarpiece designed by the latter for St Clement's Danes, and which, in deference to the ridicule of the parishioners, Bishop Gibson took down in 1725. Hogarth's squib, which appeared subsequently, exhibits it as a very masterpiece of confusion and bad drawing. In 1726 he prepared twelve large engravings for Butler's Hudibras. These he himself valued highly, and they are the best of his book illustrations. But he was far too individual to be the patient interpreter of other men's thoughts, and it is not in this direction that his successes are to be sought.

To 1727-28 belongs one of those rare occurrences which have survived as contributions to his biography. He was engaged by a certain Morris, a tapestry worker, to prepare a design for the Element of Earth. Morris, however, having heard that he was ''an engraver and no painter," declined the work when completed, and Hogarth accordingly sued him for the money in the Westminster Court, where, on the 28th of May 1728, the case was decided in his (Hogarth's) favour. It may have been the aspersion thus early cast on his skill as a painter (coupled perhaps with the unsatisfactory state of print-selling, owing to the uncon- trolled circulation of piratical copies) that induced him about this time to turn his attention to the production of "small conversation pieces " (¢.¢., groups in oil of full-length portraits from 12 to 15 inches high), many of which are still preserved in different collections. "This," he says, "having novelty, succeeded for a few years." Among his other efforts in oil between 1728 and 1732 were The Wan- stead Assembly, The House of Commons examining Bam- bridge, an infamous warden of the Fleet, and numerous pictures of the chief actors in Gay's popular Beggar's Opera.

On the 23d of March 1729 he was married at old Padding- ton church to Jane Thornhill, the only daughter of Kent's rival above-mentioned. The match was a clandestine one, although Lady Thornhill appears to have favoured it. We next hear of him in "lodgings at South Lambeth," where he rendered some assistance to the then well-known Jonathan Tyers, who

opened Vauxhall in 1732 with an entertainment styled a ridotto al fresco. For these gardens Hogarth painted a poor picture of Henry VIII. and Anna Bullen, and for them he also made some designs of the Four Times of the Day, which he afterwards elaborated into a finished series. The only engravings between 1726 and 1732 which need be referred to are the Large Masquerade Ticket (1727), another satire on masquerades, and the

print of Burlington Gate, 1731, evoked by Pope's Epistle to Lord Burlington, and defending Lord Chandos, who is therein satirized. This print gave great offence, and was, it is said, suppressed, To 1732 belongs that genial journey from London to Sheerness, of which the original record still survives at the British Museum in an oblong MS. volume, entitled An Account of what seem'd most Remarkable in the Five Days' Peregrination of the Five Following Persons, Viat., Messiewrs Tothall. Scott, Hogarth, Thornhill and Forrest. Begun on Saturday May 27th 1732 and Finish'd On the 31st of the Same Month. Abi tu et fac similiter.—Inscription on Dulwich Colledge Porch. The journal, which is written by Forrest, the father of Garrick's friend Theodosius Forrest, gives a good idea of what a " frisk "—as Johnson called it—was in those days, while the illustrations were by Hogarth and Samuel Scott the landscape painter. John Thornhill, Sir James's son, made the map. This version (in prose) was subsequently run into rhyme by one of Hogarth's friends, the Rev. Mr Gostling of Canterbury, and after the artist's death both versions were published. In the absence of other biographical detail, they are of considerable interest to the student of Hogarth.

In 1733 Hogarth moved into the "Golden Head" in Leicester Fields, which, with occasional absences at Chiswick, he continued to occupy until his death. By this date he must have completed the earliest of those great series of moral paintings which first gave him his position as a great and original genius. This was A Harlot's Progress, the paintings for which, if we may trust the date in the last of the pictures, were finished in 1731. The engravings, by the artist himself, were published in 1734. We have no record of the particular train of thought which prompted these story-pictures ; but it may perhaps be fairly assumed that the necessity for creating some

link of interest between the personages of the little “conversation pieces ” above referred to led to the further idea of connect- ing several groups or scenes so as to form a sequent narra- tive. ‘I wished,” says Hogarth, “to compose pictures on canvas, similar to representations on the stage.” “I have endeavoured,” he says again, “to treat my subject as a dramatic writer; my picture is my stage, and men and women iny players, who by means of certain actions and gestures are to exhibit a dumb show.” There was never a more eloquent dumb show than this of the Harlot’s Progress. In six scenes the miserable career of a woman of the town is traced out remorselessly from its first facile beginning to its shameful and degraded end. Nothing of the detail is softened or abated ; the whole is acted out coram populo, with the hard, uncompassionate morality of the age the painter lived in, while the introduction here and there of one or two well-known characters like Colonel Charteris and Justice Gonson give a vivid reality to the satire. It had an im- mediate success. To say nothing of the fact that the talent of the paintings completely reconciled Sir James Thornhill to the son-in-law he had hitherto refused to acknowledge, more than twelve hundred names of subscribers to the en- gravings were entered in the artist’s book. On the appear- ance of plate iii, the lords of the treasury trooped to Leicester Fields for Sir Jolm Gonson’s portrait which it contained. Theophilus Cibber made the story into a panto- mime, and some one else into a ballad opera; and it gave rise to numerous pamphlets and poems. It was painted on fan-mounts and. transferred to cups and saucers. Lastly, it was freely pirated. There could be no surer testimony to its popularity.

The favourable reception given to A Harlot’s Progress prompted A Rake’s Progress, which speedily followed, although it had not a like success. It was in eight plates in lieu of six. The story is unequal; but there is nothing

finer than the figure of the desperate rake in the Covent Garden gaming-house, or the admirable scenes in the Fleet prison and Bedlam, where at last his headlong career comes to its tragic termination. The plates abound with allusive suggestion and covert humour; but it is impossible to attempt any detailed description of them here.

A Rake’s Progress was dated June 25, 1735, and the engravings bear the words “according to Act of Parlia- ment.” This was an Act (8 Geo. II. cap. 13) which Hogarth had been instrumental in obtaining from the legislature, being stirred thereto by the shameless piracies of rival printsellers. Although loosely drawn, it served its purpose ; and the painter commemorated his success by a long inscription on the plate entitled Crowns, Mitres, &e., afterwards used as a subscription ticket to the Election series. These subscription tickets to his engravings, let us add, are among the brightest and most vivacious of the artist’s productions. That to the Harlot’s Progress was entitled Boys peeping at Nature, while the Rake’s Progress was heralded by the delighful etching known as A Pleased Audience at a Play, or The Laughing Audience.

We must pass more briefly over the prints which followed the two Progresses, noting first A Midnight Modern Con- versation, an admirable drinking scene which comes between them in 1734, and the bright little plate of Southwark Fair, which, though dated 1733, was published with A Rake’s Progress in 1735. Between these and Marriage a la Mode, upon the pictures of which the painter must have been not long after at work, come the small prints of the

‘Consultation of Physicians, Scholars at a Lecture, and

Sleeping Congregation, 1736 ; the Four Times of the Day, 1738, a series of pictures of everyday 18th century life, the earlier designs for which have been already referred to; the Strolling Actresses dressing ina Barn, 1738, which Walpole held to be, “for wit and imagination, without any other end, the best of all the painter’s works ;” and finally the admirable plates of the Distrest Poet, painfully composing a poem on “Riches” in a garret, and the Enraged Musician fulminating from his parlour window upon a discordant orchestra of knife-grinders, milk-girls, ballad-singers, and the rest upon the pavement outside. These are dated respectively 1736 and 1741. To this period also (.¢., the period preceding the production of the plates of Marriage @ la Mode) belong two of those history pictures to which, in emulation of the Haymans and Thornhills, the artist was continually attracted. The Pool of Bethesda and the Good Samaritan, “with figures seven feet high,” were painted circa 1736, and presented by the artist to St

Bartholomew’s Hospital, where they remain. They were not masterpieces ; and it is pleasanter to think of his con- nexion with Captain Coram’s recently established Foundling Hospital (1739), which he aided with his money, his graver, and his brush, and for which he painted that admirable portrait of the good old philanthropist which is still, and deservedly, one of its chief ornaments.

In A Harlot’s Progress Hogarth had not strayed much beyond the lower walks of society, and although, in A Rake’s Progress, his hero was taken from the middle classes, he can scarcely be said to have quitted those fields of observa- tion which are common to every spectator. It is therefore more remarkable, looking to his education and antecedents, that his masterpiece, Marriage @ Ja Afode, should success- fully depict, as the advertisement has it, “a variety of modern occurrences in high life.” Yet, as an accurate delineation of the surroundings of upper class 18th century society, his Marriage & /a Mode has never, we believe, been seriously assailed. The countess’s bedroom, the earl’s apart- ment with its lavish coronets and old masters, the grand saloon with its marble pillars and grotesque ornaments, are fully as true to nature as the frowsy chamber in the “ Turk’s

Head Bagnio,” the quack-doctor’s museum in St Martin’s Lane, or the mean opulence of the merchant’s house in the city. And what story could be more vividly, more per- spicuously, more powerfully told than this godless alliance of sacs et parchemins—this miserable tragedy of an ill- assorted marriage? There is no defect of invention, no superfluity of detail, no purposeless stroke. It has the merit of a work by a great master of fiction, with the addi- tional advantages which result from the pictorial fashion of the narrative; and it is matter for congratulation that it is still to be seen by all the world in the National Gallery, where it can tell its own tale better than pages of com- mentary.

The engravings of Marriage /a Mode were dated April 1745. Although the painter by this time found a ready market for his engravings, he does not appear to have been equally successful in selling his pictures. The people bought his prints; but the more opulent and not numerous connoisseurs who purchased

pictures were wholly in the hands of the importers and manufacturers of ‘ old masters.” In February 1745 the original oil paintings of the two Progresses, the Four Times of the Day, and the Strolling Actresses were still unsold. On the last day of that month Hogarth disposed of them by an ill-devised kind of auction, the details of which may be read in Nichols’s Anecdotes, for the paltry sum of £427, 7s. No better fate attended Marriage la Mode, which five years later became the property of Mr Lane of Hillingdon for 120 guineas, being then in Carlo Maratti frames which had cost the artist four guineas a piece. Something of this was no doubt due to Hogarth’s impracticable arrangements, but the fact shows conclusively how completely blind his contemporaries were to his merits as a painter, and how hopelessly in bondage to the all-powerful picture-dealers. Of these latter the painter himself gave a graphic picture in a letter addressed by him under the pseudonym of “ Britophil” to the St James’s Evening Post, in 1737.

But, if Hogarth was not successful with his dramas on canvas, he occasionally shared with his contemporaries in the popularity of portrait painting. For a picture, executed in 1746, of Garrick as Richard IIT. he was paid £200, “which was more,” says he, “than any English artist ever received for a single portrait.” In the same year a sketch of Simon Fraser, Lord Lovat, afterwards beheaded on Tower Hill, had an exceptional success. Our limits do not, however, enable us to refer to his remaining works in detail, and we must content ourselves with a brief enumera- tion of the most important. These are The Stage Coach or Country Inn Yard, 1747; the series of twelve plates entitled Industry and Idleness, 1747, depicting the career of two London apprentices; the Gate of Calais, 1749, which had its origin in a rather unfortunate visit paid to France by the painter after the peace of Aix-la-Chapelle ; the March to Finchley, 1750; Beer Street, Gin Lane, and the Four Stages of Cruelty, 1751; the admirable representa- tions of election humours in the days of Sir Robert Walpole, entitled Four Prints of an Election, 1755-8 ; and the plate of Credulity, Superstition, and Fanaticism, a Medley, 1762, adapted from an earlier unpublished design called Enthusi- asm Delineated. Besides these must be chronicled three more essays in the “great style of history painting,” viz., Paul before Felix, Moses brought to Pharaoh’s Daughter, and the Altarpiece for St Mary

Redcliff at Bristol. The first two were engraved in 1751-2, the last in 1794. A subscription ticket to the earlier pictures, entitled Paul before Felix Burlesqued, had a popularity far greater than that of the prints themselves.

In 1745 Hogarth painted that admirable portrait of himself with his pug-dog Trump, which is now in the National Gallery. Ina corner of this he had drawn on a

palette a serpentine line with the words “The Line of Beauty and Grace.” Much inquiry ensued as to “the meaning of this hieroglyphic ;” and in an unpropitious hour the painter resolved to explain his meaning in writing. The result was the well-known Analysis of Beauty, 1753, a treatise “to fix the fluctuating ideas of Taste,” otherwise a desultory essay having for pretext the precept attributed to Michelangelo that a figure should be always ‘‘ Pyramidall, Serpent-like, and multiplied by one two and three.” The fate of the book was what might have been expected. By the painter’s adherents it was praised as a final deliverance upon esthetics; by his enemies and professional rivals, its obscurities, and the minor errors which, notwithstanding the benevolent efforts of literary friends, the work had not escaped, were made the subject of endless ridicule and cari- cature. It added little to its author’s fame, and it is perhaps to be regretted that he ever undertook it. Moreover, there were further humiliations in store for him. In 1759 the success of a little picture called The Lady’s Last Stake, painted for Lord Charlemont, procured him a commission from Sir Richard Grosvenor to paint another picture “ upon the same terms.” Unhappily on this occasion he deserted his own field of genre and social satire, to select the story from Boccaccio (or rather Dryden) of Sigismonda weeping over the heart of her murdered lover Guiscardo, being the subject of a picture by Furiniin Sir Luke Schaub’s collection which had recently been sold for £400. The picture, over which he spent much time and patience, was not regarded as a success ; and Sir Richard rather meanly shuffled out of his bargain upon the plea that “tlie con- stantly having it before one’s eyes would be too often occasioning melancholy thoughts to arise in one’s mind.” Sigismonda, therefore, much to the artist’s mortification, and the delight of the malicious, remained upon his hands. As, by her husband’s desire, his widow

valued it at £500, it found no purchaser until after her death, when the Boydells bought it for 56 guineas. It was exhibited, with others of Hogarth's pictures, at the Spring Gardens exhibi- tion of 1761, for the catalogue of which Hogarth engraved a Head-piece and a Tail-piece which are still the delight of collectors ; and finally, by the bequest of the late Mr J. H. Anderdon, it passed in 1879 to the National Gallery, where, in spite of theatrical treatment and a repulsive theme, it still commands admiration for its colour, drawing, and expression.

In 1761 he was sixty-five years of age, and he had but three years more to live. These three years were embittered by that unhappy quarrel with Wilkes and Churchill, over. which most of his biographers are contented to pass rapidly, Having succeeded John Thornhill in 1757 as serjeant painter (to which post he was reappointed at the accession of George III.), an evil genius prompted him in 1762 to do some "timed" thing in the ministerial interest, and he accordingly published the indifferent satire of The Times, plate i. This at once brought him into collision with his quondam friends, John Wilkes and Churchill the poet , and the immediate result was a violent attack upon him, both as a man and an artist in the opposition Worth Briton, No. 17. The alleged decay of his powers, the miscarriage of Sigismonda, tlie cobbled composition of the Analysis, were all discussed with scurrilous malignity by those who had known his domestic life and learned his weaknesses, The old artist was deeply wounded, and his health was failing. Early in the next year, however, he replied by that squinting portrait of Wilkes which will for ever carry his features to posterity. Churchill retaliated in July by a savage Lpistle to William Hogarth, to which the artist rejoined by a print of Churchill asa bear, in torn bands and ruffles, not the most successful of his works. 'The pleasure, and pecuniary advantage," writes Hogarth,

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" which I derived from these two engravings" (of Wilkes and Churchill), " together with occasionally riding on horseback, restored me to as much

health as can be expected at my time of life.” He produced but one more print, that of Finis, or The Bathos, March 1764, a strange jumble of “fag ends,” intended as a tail-piece to his collected prints ; and on the 26th October of the same year he died of an aneurism at his house in Leicester Square. His wife, to whom he left his plates as a chief source of income, sur- vived him until 1789. He was buried in Chiswick church- yard, where a tomb was erected to him by his friends in 1771, with a well-known epitaph by Garrick. Not far off, on the road to Chiswick Gardens, is the now tumble-down house in which, for many years of his life, he spent the summer seasons.

From such records of him as survive, Hogarth appears to have been much what from his portrait one might suppose him to have been—a blue-eyed, honest, combative, little man, thoroughly national in his prejudices and anti- pathies, fond of flattery, sensitive like most satirists, a good friend, an intractable enemy, ambitious, as he somewhere says, in all things to be singular, and not always accurately estimating the extent of his powers. With the art connois- seurship of his day he was wholly at war, because, as he believed, it favoured foreign mediocrity at the expense of native talent ; and in the heat of argument be would pro- bably, as he admits, often come “to utter blasphemous expressions agaiust the divinity even of Raphael Urbino, Correggio, and Michelangelo.” But it was rather against the third-rate copies of third-rate artists—the ‘‘ship-loads of manufactured Dead Christs, Holy Families, and Madonnas ”—that his indignation was directed; and in speaking of his attitude with regard to the great masters of art, it is well to remember his words to Mrs Piozzi :—‘ The connoisseurs and I are at war you know; and because I hate them, they think I hate 7%tian—and let them !”

But no doubt it was in a measure owing to this hostile attitude of his towards the all-powerful picture-brokers that his contemporaries failed to adequately recognize his merits as a painter, and persisted in regarding him as an ingenious humorist alone. Time has reversed that unjust sentence. He is now held to have been an excellent painter, pure and harmonious in his eolouring, wonderfully dexterous and direct in his handling, and in his composition leaving little or nothing to be desired. As an engraver his work is more conspicuous for its vigour, spirit, and intelligibility than for finish

and beauty of line. He desired that it should tell its own tale plainly, and bear the distinct im- press of his individuality, and in this he thoroughly suc- ceeded. As a draughtsman his skill has sometimes been debated, and his work at times undoubtedly bears marks of haste, and even carelessness. If, however, he is judged by his best instead of his worst, his work will not be found to be wanting in this respect. But it is not after all as a draughtsman, an engraver, or a painter that he claims his pre-eminence among English artists—it is as a wit, a humor- ist, a satirist upon canvas. Regarded in this light he has never been equalled, whether for his vigour of realism and dramatic power, his fancy and invention in the decoration of his story, or his merciless anatomy and exposure of folly and wickedness. If we regard him—as he loved to regard himself—as "author" rather than "artist," his place is with the great masters of literature,—with the Thaekerays and Fieldings, the Cervantes and Molicres.

Additions to Hogarth literature have not been numerous of late years. In 1860 Mr G. A. Sala contributed some picturesque pages to the Cornhill Magazine, which were afterwards republished in book form. Much minute information has also been collected in Mr F. G. Stephens's Catalogue of the Satirical Prints and Drawings in

the British Museum, now in course of issue. Pictures by Hogarth from private collections are constantly to be found at the annual

exhibitions of the Old Masters in the Royal Academy ; but most of the best known works have permanent homes in public galleries. Marriage a la Mode, Sigismonda, and his own portrait are in the National Gallery; the Rake's Progress and the Election Series in the Sloane Museum ; and the March to Finchley and Captain Coram at the Foundling Hospital. There are also notable pictures in the Fitzwilliam Museum at Cambridge, and the National Portrait Gallery at South Kensington. The Lady's Last Stake, to which reference has been made, is at present (1880) in the possession of Mr Louis Huth. (A. D.)

HOGG, James (1770-1835), a Scottish poet, best known by his title of the "Ettrick Shepherd," was born on the banks of the Ettrick in Selkirkshire in 1770. His ancestors had been shepherds for centuries. He received hardly any school training, and seems to have had difficulty in getting books to

read. After spending his early years under different masters, first as cow-herd and afterwards as shepherd, he was engaged in the latter capacity by Mr Laidlaw, tenant of Blackhouse, in the parish of Yarrow, from 1790 till 1799. He was treated with great kindness, and had access to a large collection of books, which he soon exhausted, and then subscribed to a circulating library in Peebles. While attending to his flock, he spent a great deal of time in reading. His first printed piece was ‘“‘The Mistakes of a Night,” which appeared in the Scots Magazine for October 1794, and was succeeded by Scots Pastorals in 1801. A year or two after this publication Hogg became acquainted with Sir Walter Scott—a connexion which had a powerful influence for good on the peasant poet. He again appeared before the public in 1807 as the author of the Mountain Bard, to which Scott wrote an introductory notice. By this work, and by a Treatise on the Diseases of Sheep, Hogg realized about £300. With this money he unfortunately embarked in farming in Dumfriesshire, and in three years was utterly ruined, and had to abandon all his effects to his creditors. He returned to Ettrick, and there found only cold and estranged looks. He could not even obtain employment as a shepherd ; so he set off in February 1810 to push his fortune in Edinburgh as a literary adventurer. In the

| same year he published a collection of songs, which, being

dedicated to the countess of Dalkeith, and recommended to her notice by Scott, was rewarded with a present of 100 guineas. He then commenced a weekly periodical, The Spy, which he continued from September 1810 till August 1811. The appearance of the Queen’s Wake in 1813 established Hogg’s reputation as a poet; it was followed by Mador of the Moor, The Pilgrims of the Sun, and The Poetic Mirror. The duchess of Buccleuch, on her death-bed in 1814, had asked the duke to do something for the Ettrick bard; and the duke gave him a lease for life of the farm of Altrive in Yarrow, con- sisting of about 70 acres of moorland, on which the poet built a house and spent the last years of his life. He took possession of it in 1817; but his literary exertions were never relaxed. Before 1820 he had written Zhe Brownie of Bodsbeck, and two volumes of Winter Evening Tales, besides collecting, editing, and writing part of two volumes of Jacobite Relics, and contributing largely to Blackwood’s Magazine. In 1820 he married Miss Margaret Phillips, a lady of a good Annandale family, and

found himself possessed of about £1000, a good house, and a well-stocked farm. Hogg's connexion with Blackwood's Magazine kept him continually before the public. The wit and mischief of some of his literary friends made free with his name, and represented him in ludicrous and grotesque aspects ; but the effect of the whole was favour- able to his popularity. He visited London in 1831, and was feasted by the nobility, literati, and public men of the metropolis. On his return a public dinner was given to him in Peebles,—Professor Wilson in the chair,—and he acknowledged that he had at last "found fame." His

health, however, was seriously impaired. With his pen in his hand to the last, Hogg in 1834 published a volume of Lay Sermons, and in 1835 two volumes of Montrose Tales. His illness ultimately assumed the form of dropsy, and after a short confinement he died November 21, 1835, having nearly completed his sixty-fifth year. He was buried in the churchyard of his native parish Ettrick. His fame had seemed to fill the whole district, and was brightest at its close ; his presence was associated with all the Border sports and festivities ; and as a man James Hogg was ever frank, joyous, and charitable.

His Shepherd's Calendar is the best of Hoge's prose works ; but it is mainly as a great peasant poet that he lives in literature. Nothing can be more exquisite than some of his lyrics and minor poems—his '" Skylark,"

'"' When the Kye comes Hame," his verses on the '"' Comet "' and " Evening Star," and his " Address to Lady Ann Scott." The Queen's Wake unites his characteristic excellences—his command of the old romantic ballad style, his graceful fairy mythology, and his aerial flights of imagination. The story of Kilmeny stands at the head of all our fairy tales, and is inimitable for its scenes of visionary splendour, purity, and bliss, linked to the fairest objects of earthly interest and affection, In such compositions Hogg seems completely transformed ; he is absorbed in the ideal and supernatural, and might have claimed over all his contemporaries the Delphic laurel for direct and immediate inspiration.

See a memoir by Professor Wilson, prefixcd to an edition of Hogg's works published by Blackie & Co. in 1850; Wilson's Noetes Ambro- siane ; Gilfillan's First Gallery of Literary Portraits; Cunningham's Biog. and Crit. Hist. of Lit.; and the general index to Blackwood's Magazine. A collected edition of Hogg's Tales appeared in 1838 in 6 vols., anda second in 1851; his collected Poems were published in 1850 andin 1852. For an admirable account of the social enter-

tainments Hogg used to give in Edinburgh, see Memoir of Robert Chambers, by Dr William Chambers, pp. 268-270.

HOHENELBE (Bohemian, Vrchlabz), the chief town of 'a government district in Bohemia, is beautifully situated on both banks of the Elbe, crossed there by five bridges, on the southern spurs of the Riesengebirge, and on the north-west Austrian railway, 16 miles north-east.of Gitschin. The houses with lofty gables aud arcades supported by wooden columns have a picturesque appearance; and among the principal buildings are the decanal church, the castle surrounded by a fine park, the Augustine monastery, the citizen school, and the trade school. Linen and cotton are the staple manufactures, and there are also bleach- works, dye-works, and a paper-mill.

HOHENLOHE, a German princely family, who took their name from the territory of Hohenlohe in Franconia, which, originally a countship and afterwards a principality, lost its independence in 1806, and is now included partly in Wiirtemberg and partly in Bavaria. They are first men- tioned as possessing in the 12th century the castle of Holloch near Uffenheim. Atan early period they extended their influence into several of the Franconian valleys, includ- Ing those of the Kocher, the Jagst, the Tauber, and the Gotlach. The first count of the name was Gottfried, who was on terms of intimacy with the emperor Henry VI., and whose sons founded the lines of Hohenlohe-Bruneck and Hohenlohe-Holloch. The former became extinct in the fourth generation, and the latter in 1340 divided into the lines of Hohenlohe-Hohenlohe and Hohenlohe- Speckfeld. Of these the former became extinct in Lae, after the most of the possessions had been alienated through the marriage of the female heir; and the latter in 1551 divided into

the present lines of Hohenlohe-Neuenstein and Hohenlobe-Waldenburg, which were elevated, the former in

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1764 and the latter in 1744, to principalities of the em- pire. Hohenlohe-Neuenstein, which adopted Protestantism, became divided into the lines Hohenlohe-Neuenstein- Oehringen and Hohenlohe-Neuenstein-Langenburg, the former of which separated into the branches of Hohenlohe-Weickersheim and Hohenlohe-Oehringen, the one becoming extinct in 1756 and the other in 1805, after which their possessions were inherited by the Hohenlohe-Neuenstein- Langenburg line, which latter became divided into three branches—the MHohenlohe-Langenburg, the Hohenlohe-Langenburg-Oehringen, and the Hohenlohe-Langenburg- Kirchberg, the last becoming extinct in 1861. The line of Hohenlohe-Waldenburg, which remained Catholic, and in which was established in 1754 the order of the Pheenix, divided itself into two branches, the Hohenlohe-Waldenburg-Bartenstein and the Hohenlohe-Waldenburg-Schillingsfiirst, the former subdividing into the branches of Hohenlohe- Bartenstein and Hohenlohe-Jagstberg. Of the Hohenlohe family the following members are noted as having attained individual eminence.

J. Frieprich Lupwice (1746-1818), prince of Hohenlohe- Ingelfingen, a Prussian general, was born 3lst January 1746. Entering the Prussian service at an early age he became colonel in 1788, and in the campaigns of 1792 and 1793, where he was commander of a division, he distin- guished himself in several engagements. In 1794 he gained a brilliant victory at Kaiserslautern, and in 1796 he was promoted lieutenant-general and appointed to the command of the army of the Ems. In the same year he succeeded to the principality of his father. Having been appointed general of infantry in 1800, he in 1805 commanded a Prussian corps between the Saale and the Thuringian Forest. He was severely defeated at Jena in 1806, and after the duke of Brunswick was mortally wounded at Auerstiidt, he succeeded to the chief command, and led to the Oder the frag- ments of the Prussian army which capitulated at Prenzlau on the 28th October. On account of the blame to which this disaster exposed him, he had to retire from the army. He died at Slawentzitz, Silesia, 15th February 1818.

IT, Lupwie Atoystus (1765-1829), prince of Hohenlohe- Waldenburg-Bartenstein, marshal and peer of France, was born 18th August 1765. In 1784 he entered the service of the palatinate, which he quitted in 1792 in order to take tlie command of a regiment raised by his father for the service of the emigrant princes of France. He greatly distinguished himself under Prince Condé in the campaigns of 1792-1793, especially at the storming of the lines of Weissenburg. Subsequently he entered the service of Holland, and, when almost surrounded by the army of General Pichegru, conducted a masterly retreat from the island of Bommnel. From 1794 to 1799 he served as colonel in the Austrian campaigns; in 1799 he was named major-general by the archduke Charles; and after obtaining the rank of lieutenant-general he wasappointed by the emperor of Austria governor of the two Galicias. Napoleon offered to restore to him his principality on condition that he adhered to the confederation of the Rhine, but as he refused, it was united to Wiirtemberg. After Napoleon's fall in 1814 he entered the French service, and in 1815 he held the command of a regiment raised by himself, with which he took part in the Spanish campaign of 1823. In 1827 he was created marshal and peer of France. He died at Lunéville, May 30, 1829.

JII. AnExanper LeoroLp Franz Emmericy (1794~ 1849), prince of Hohenlohe-Waldenburg-Schillingsfiirst, priest and reputed miracle-worker, was born at Kupferzell near Waldenburg, 17th August 1794. By his mother, the daughter of an Hungarian nobleman, he was from infancy destined for the church; and she entrusted the care of his early education to the ex-Jesuit Riel, In 1804 he entered

the "Theresianum" at Vienna,in 1808 the academy at Bern, in 1810 the archiepiscopal seminary at Vienna, and after- wards he studied at Tyrnau and Ellwangen. He was ordained priest in 1815, and in the following year he went to Rome, where he entered the society of the " Fathers of the Sacred Heart." Subsequently, at Munich and Bamberg, he was blamed for Jesuit and obscurantist tendencies, but obtained considerable reputation asa preacher. His first so-called miraculous cure was effected, in conjunction with a peasant Martin Michel, on a princess of Schwarzenberg who had been for some years paralytic. Immediately he acquired such fame as a performer of miraculous cures that multitudes from various countries flocked to partake of the beneficial influence of his supposed supernatural

gifts. Ultimately, on account of the interference of the authorities with his operations, he went in 1821 to Vienna and then to Hungary, where he became canon at Grosswardein, and in 1844 titular bishop of Sardica. He died at Véslau near Vienna, 14th November 1849. He was the author of a number of ascetic and controversial writings, which were collected and published in one edition by Brunner at Ratisbou in 1851,

See Paulus, Qwintessenz aus Anfang, Mitte, wnd Ende der Wun- derewrversuche, welehe zu Wireburg und Bamberg dureh Mart. Michel und den Prinzen von Hohenlohe-Sehillingsfirst unternommen worden sind, Leipsic, 1822,

HOHENMAUTH, the chief town of a government dis- trict in Bohemia, Austria, is situated on the Lautchna, and on the Austrian States Railway 16 miles E. of Chrudim. It possesses a beautiful old decanal church, and has cloth manufactures, a brewery, a tannery, a sugar work, and flour and sago mills. It depends for its prosperity largely on the agriculture of the neighbourhood. The population in 1869 was 6018.

HOHENSTEIN, a town of Saxony, circle of Zwickau, stands on the slopes ofthe Erzgebirge, and on the Saxon States Railway, 12 miles N.E. of Zwickan. Since 1875 Ernstthal has been included within its limits. Hohenstein proper possesses a beautiful parish church, a town-house re- stored in 1876, and a monument to those who fell in the Prussian war of 1870-71; and Ernstthal has also a fine parish church. The principal industry is the spinning and weaving of cotton, the manufacture of waxcloth, stockings, and woollen and silk fabrics, cotton printing, and dyeing. Many of the inhabitants are also employed in the neigh- bouring arsenic mines. Not far from Hohenstein there is a mineral spring, connected with which there are various kinds of baths. Hohenstein is the birthplace of the physicist G. H. von Schubert, and of Schréter, one of the inventors of the pianoforte. The building of Ernstthal was occasioned in 1680 by the presence of the plague at Hohenstein, and it received its name from Count Christian Ernst of Schénburg, who was the principal instigator of its erection. The population of Hohenstein in 1875, including Ernstthal with a population of 4118, was 9844.

HOHENZOLLERN, an old German princely house, from which the present dynasty of Prussia is descended, takes its name from the old castle of Zollern, or Hohen- zollern, on the mountain of Zollern, about 14 miles south from Hechingen. There is a vague tradition connecting the house with the Colonna family of Rome, or the Colalto family of Lombardy, and a more definite one which men- tions a Swabian count, Thassilo of Burchardinger, as having built the castle of Zollern about the beginning of the 9th century. The first counts of Zollern of whom there is historical mention are Burchard and Wezel, apparently brothers, whoin 1061 fell in one of the party feuds during the minority of the emperor Henry IV. Count Frederick II]. of Zolre, who died in 1200, one of the trusted councillors of the emperors Frederick I. and Henry VL,

became count of Nuremberg in 119], through having

married the heiress of Count Conrad II. of Nuremberg.

His sons, Conrad III. and Frederick IV., succeeded to the

joint possession of his titles and estates, and founded respec-

tively the Frankish and the Swabian lines. The Frankish

house steadily and uninterruptedly increased its possessions

and its influence ; in 1363 it was raised to princely rank

in the person of Frederick V. ; in 1415 it obtained through

Frederick VI. the electorate of Brandenburg from the

emperor Sigismund ; and in 1701 its head, the elector

Frederick III., became the first king of Prussia. The

influence of the Swabian line was greatly weakened by parti-

tions, but in the beginning of the 16th century it rose te

some eminence through Count Hitel Frederick II., privy

councillor of the emperor Maximilian I., who received from

the emperor the district of Hargerloch in exchange for

Rhiziins, in the Grisons, which had come into his family

by marriage. His grandson, Charles I, received in

1529 from the emperor Charles V. the countships of

Sigmaringen and Vohringen. Litel Frederick III. and

Charles IJ. divided their states, the former taking Hohen- zollern with the title Hohenzollern-Hechingen, the latter Sigmaringen and Vohringen with the title Hohenzollern- Sigmaringen. Count John George of MHohenzollern- Hechingen, son of Eitel Frederick III., was raised to

princely rank by the emperor Ferdinand II. in 1623, and John of Hohenzollern-Sigmaringen received the same honour in 1638. In 1695 the two Swabian branches entered conjointly into an agreement with the Brandenburg line that, in case of the extinction of the male line of either of the Swabian branches, the states should be inherited by the other branch, and that if both branches became extinct the states should be inherited by the Brandenburg line.

In consequence of the political troubles of 1848, Prince Frederick William of Hohenzollern-Hechingen, and Charles Anton of Hohenzollern-Sigmaringen resigned their princi-. palities, which consequently fell to the crown of Prussia, by whom they were taken possession of, March 12, 1850. By royal decree of 20th May of the same year the title of highness was conferred on the two princes, with the prero- gatives of younger sons of the royal.house. The proposal to raise Prince Leopold of Hohenzollern-Sigmaringen to the throne of Spain in 1870 was the immediate occasion of

the war between France and Germany. In 1852 the lands of Hohenzollern were formed into an administrative division of Prussia. It is composed of a long narrow strip of land bounded on the N.E. and W. by Wiirtemberg and

on the W. and §. by Baden, with an area of 440 square

miles, and a population in 1875 of 66,614.

See Stillfried, Zohenzollernsehe Forschungen, Berlin, 1847; Stillfried and Miarcker, Monwmenta Zollerana, 1852-66; Riedel, Die Ahnherren des preussischen Kénigshauses, 1854; Riedel, Ge- sehichte des preussisehen Kénigshauses bis 1440, 1861; Naehriehten

tiber die Stammburg Hohenzollern, 1868; Carlyle's Frederick the Great.

HOLBACH, Paut Hernricn Dierricu, Baron D' (1723-1789), philosophe of the Parisian school of the 18th century, was born at Heidelsheim in the palatinate in 1723. Of his family little is known ; according to J. J. Rousseau, his father was a rich parvenu, who brought his son at an early age to Paris, where the latter spent most of his life. Much of Holbach's fame is due to his intimate connexion with the brilliant coterie of bold thinkers and polished wits whose creed, the new philosophy, is concentrated in the famous Encyclopédie. Possessed of easy means and being of hospitable disposition, he kept open house for such men as Helvetius, D'Alembert, Diderot, Condillac, Turgot, Buffon, Grimm, Hume, Garrick, Wilkes, Sterne, and for a time Rousseau, who, while enjoying the intellectual pleasure of their host's conversation, were not insensible to the material charms of his excellent cuisine and costly wines.

Although an athcist, or at least a materialist of the most material school, Holbach seems to have been endowed with a more than average share of virtue, and, whether by his courtesy, gentleness, or benevolence, inspired a warm affec- tion in all he met. Even his failings, of which his simple credulity was perhaps the most prominent, were amiable. He was one of the best informed men of his day, and his excellent memory placed at his immediate disposal all the learning he had amassed. He visited England on

one occasion, but the solemn stiffness of the British, even while amusing themselves, and the peculiar relations of society, disgusted as much as they surprised him. For the Encyclopédie Holbach compiled and translated a large number of articles on chemistry and mineralogy, chiefly from German sources. He attracted more attention, how- ever, in the department of philosophy. In 1767 Christian. isme Dévoilé appeared, in which he attacked Christianity and religion as the source of all human evils. Regarding religion as a blind superstitious bondage, maintained on men's minds by the self-interest of the priests, he tried to prove it not only unnecessary but absolutely prejudicial to human morality. This was followed up in 1770 by a still more open attack in his most famous book, Le Systéme de la Nature, in which it is probable he was assisted by Diderot. Denying the existence of a deity, and refusing to admit as evidence all a priort arguments, Holbach saw in the universe nothing save matter in spontaneous move- ment. What men call their souls become extinct when the body dies. Happiness is the end of mankind, 'It would be useless and almost unjust to insist upon a man's being virtuous if he cannot be so without being unhappy. So long as vice renders him happy, he should love vice." Not less direct and trenchant are his attacks on political government, which, interpreted by the light of after events, sound like the first distant mutterings of the tempest that shortly after his death broke over the capital of France. The Systéme de la Nature struck horror into the minds of even the most "enlightened" of the Parisian philosophers. Charmed by the novelty of their own opinions, and dazzled by the glittering wit and argument with which they had supported them, they had never realized into what extremi- ties they had hurried till this lurid torch revealed the hideous abyss from which they were so little removed. Voltaire hastily seized his pen to refute the philosophy of the Systéme, in the article "Dieu" in his Dictionnaire Philosophique, while Frederick the Great also drew up an answer to it. Though vigorous in thought and in some passages clear and eloquent, the style of the book is diffuse and declamatory, and asserts rather than proves its state- ments. Its principles are summed up in a more popular form in Bon Sens, ou Idées 'naturelles oppostes aux idées surnaturelles, published at Amsterdam in 1772. In the Systéme Social (1773), the Politique Naturelle (1773-74), and the Morale Universelle (1776), Holbach attempts to rear a system of morality in place of the one he had so fiercely attacked, but these later writings had not a tithe of the popularity and influence of his earlier and

more pernicious work. He published his books either anony- mously or under a borrowed name, and was forced to have them printed out of France. He died in 1789. On the death of his first wife he obtained a papal dispensation to marry her sister, who survived him till 1814.

Holbach is also the author of the following and other works:— Esprit du Clergé, 1767; De 0 Imposture sacerdotale, 1767 ; Prétres Démasqués, 1768 ; Examen Critique de la vie et des ouvrages de St Paul, 1770 ; Histoire Critique de Jesus Christ, 1770 ; and Etho- cratie, 1776. For further particulars as to his life and doctrines see Grimm's Correspondance Litteraire, &c., 1813; Rousseau's Con- Sessions ; Morellet's Mémoires, 1821 ; Madame de Genlis, Les Diners

du Baron Holbach, Madamed'h pinay's Mémoires ; Avezac-Lavigne,

Diderot et la Société du Baron d'Holbach, 1875; and Morley's Diderot, 1878.

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HOLBEIN, Hans, the elder, belonged to a celebrated family of painters in practice at Augsburg and Basel from the close of the 15th to the middle of the 16th century. Though closely connected with Venice by her commercial relations, and geographically nearer to Italy than to Flanders, Augsburg at the time of Maximilian cultivated art after the fashion of the Flemings, and felt the influence of the schools of Bruges and Brussels, which had branches at Cologne and in many cities about the headwaters of the Rhine. It was not till after the opening of the 16th century, and between that and the era of the Reformation, that Italian example mitigated to some extent the asperity of South German painting. But this is not the place to give even an outline of this development. It must be sufficient to note that Flemish and German art was first tempered with Italian elements at Augsburg by Hans Holbein the elder. Hans first appears at Augsburg as partner to his brother Sigmund, who survived him and died in 1540 at Berne. Sigmund is described as a painter, but his works have not come down to us. Hans had the lead of the partnership at Augsburg, and signed all the pictures which it produced. In common with Herlen, Schongauer, and other masters of South Germany, he first cultivated a style akin to that of Memling and other followers of the

schools of Brussels and Bruges, but he probably modified the systems of those schools by studying the works of the masters of Cologne. As these early im- pressions waned, they were replaced by others less favour- able to the expansion of the master's fame; and as his custom increased between 1499 and 1506, we find him relying less upon the teaching of the schools than upon a mere observation and reproduction of the quaintnesses of local passion plays. Most of his early works indeed are taken from the Passion, and in these he obviously marshalled his figures with the shallow stage effect of the plays, copy- ing their artificial system of grouping, careless to some extent of proportion in the human shape, heedless of any but the coarser forms of expression, and technically satisfied with the simplest methods of execution. If inany branch of his art he can be said to have had a conscience at this period, we should say that he showed it in his portrait drawings. It is seldom that we find a painted likeness worthy of the name. The drawings of which numbers are still preserved in the galleries of Basel, Berlin, and Copen- hagen show extraordinary quickness and delicacy of hand, and a wonderful facility for seizing character; and this happily is one of the features which Holbein bequeathed to his son, It is between 1512 and 1522 that Holbein tempered the German quality of his style with some North Italian elements. A purer taste and more pleasing realism mark his work, which in drapery, dress, and tone is as much more agreeable to the eye as in respect of modelling and finish it is smoother and more carefully rounded, Costume, architecture, ornament, and colour are applied with some knowledge of the higher canons of art. Here too advantage accrued to Hans the younger, whose inde. pendent career about this time began.

The date of the elder Holbein's birth is unknown. But his name appears in the books of the tax-gatherers of Augsburg in 1494, superseding that of Michael Holbein, who is supposed to have been his father. Previous to that date, and as early as 1493, he was a painter of name, and he executed in that year, it is said, for the abbey at Weingarten, the wings of an altarpiece representing Joachim's Offering, the Nativity of the Virgin, Mary's Presentation in the Temple, and the Presentation of Christ, which now hang in separate panels in the cathedral of Augsburg. In these pieces and others of the same period, for instance in two Madonnas in the Moritz chapel and castle of Nuremberg, we mark the clear impress of the schools of Van der Weyden

and Memling; whilst in later works, such as the Basilica of St Paul (1504) in the gallery of Augsburg, the wane of Flemish influence is apparent. But this altarpiece, with its quaint illustrations of St Paul's life and martyrdom is not alone of interest because its execution is characteristic of old Holbein. It is equally so because it contains portraits of the master himself, accompanied by his two sons, the painters Ambrose and Hans Holbein. Later pictures, such as the Passion series in the Fiirstenberg gallery at Donaueschingen, or the Martyrdom of St Sebastian in the Munich Pinakothek, contain similar portraits, the original drawings of which are found in old Holbein's sketch-book at Berlin, or in stray leaves like those possessed by the duke of Aumale in Paris. Not one of these fails to give us an insight into the character, or a reflex of the features, of the members of this celebrated family. Old Holbein seems to ape Leonardo, allowing his hair and beard wildly to grow, except on the upper lip. Haus the younger is a plain-looking boy. But his father points to him with his finger, and hints that though but a child he is clearly a prodigy.

After 1516 Hans Holbein the elder appears as a defaulter in the registers of the tax-gatherers at Augsburg; but he willingly accepts commissions abroad. At Issenheim in Alsace, where Griinewald was employed in 1516, old Holbein also finds patrons, and contracts to complete an altarpiece. But misfortune or a bailiff pursues him, and he leaves Issenheim, abandoning his work and _ tools. According to Sandrart, he wanders to Basel and takes the freedom of its guild. His brother Sigmund and others are found suing him for debt before the courts of Augsburg. Where he lived when he executed the altarpiece, of which two wings with the date of 1522 are in the gallery of Carlsruhe, is uncertain; where he died two years later is unknown. He slinks from ken at the close of a long life, and disappears at last heeded by none but his own son, who claims his brushes and paints from the monks of Issenheim without much chance of obtaining them. His name is struck off the books of the Augsburg guild in 1524,

The elder Holbein was a prolific artist, who left many pictures behind him. Earlier than the Basilica of St Paul, already men- tioned, is the Basilica of St Mary Maggiore, and a Passion in eleven pieces, in the Augsburg gallery,

both executed in 1499. Another Passion, with the root of Jesse and a tree of the Dominicans, is that preserved in the Staedel, Saalhof, and church of St Leonard at Frankfort. It was executed in 1501. The Passion of Donau-eschingen was finished after 1502, in which year was completed the Passion of Kaisheim, a conglomerate of twenty-seven panels, now divided amongst the galleries of Munich, Nuremberg, Augs- burg, and Schleissheim. An altarpiece of the same class, com- missioned for the monastery of St Moritz at Augsburg in 1504-8, has been dispersed and lost. 1512 is the date of a Conception in the Augsburg gallery, long assigned, in consequence of a forged inscription, to Hans Holbein the younger. A diptych, with a Virgin and Child, and a portrait of an old man, dated 1513, is in separate parts in the collections of Mr Posonyi and Count Lanckoronski at Vienna. The sketch-books of Berlin, Copen- hagen, and Augsburg give a lively picture of the forms and dress of Augsburg residents at the beginning of the 16th century. – They comprise portraits of the emperor Maximilian, the future Charles V., Kunz von der Rosen the fool of Maximilian, the Fuggers, friars, merchants, and at rare intervals ladies,

HOLBEIN, Hans, the younger (1497-1543), favourite son of Hans Holbein the elder, was probably born at Augsburg about the year 1497. Though Sandrart and Van Mander declare that they do not know who gave him the first lessons, he doubtless received an artist's education from his father. About 1515 he left Augsburg with Ambrose his elder brother to seek employment as an illus- trator of books at Basel. His first patron is said to have been Erasmus, for whom, shortly after his arrival, he illus- trated with pen-and-ink sketches an edition of the Encomium Moric, now in the museum of Basel. But his chief occupation was that of drawing titlepage-blocks and

initials for new editions of the Bible and classics issued from the presses of Froben and other publishers. His leisure hours, it is supposed, were devoted to the production of rough painter's work, a schoolmaster's sign in the Basel collection, a table with pictures of St Nobody in the library of the university at Zurich. In contrast with these coarse productions, the portraits of Jacob Meyer and his wife in the Basel museum, one of which purports to

have been finished in 1516, are miracles of workmanship. It has always seemed difficult indeed to ascribe such excellent creations to Holbein's nineteenth year; and it is hardly credible that he should have been asked to do things of this kind so early, especially when it is remembered that neither he nor his brother Ambrose were then allowed to matriculate in the guild of Basel. Not till 1517 did Ambrose, whose life otherwise remains obscure, join that corporation; Hans, not overburdened with practice, wan- dered into Switzerland, where (1517) he was employed to paint in the house of Jacob Hertenstein at Lucerne. In 1519 Holbein reappeared at Basel, where he matriculated, and, there is every reason to think, married. Whether, previous to this time, he took advantage of his vicinity to the Italian border to cross the Alps is uncertain. Van Mander says that he never was in Italy ; yet.the large wall- paintings which he executed after 1519 at Basel, and the series of his sketches and pictures which is still extant, might lead to the belief that Van Mander was misinformed. The spirit of Holbein's compositions for the Basel town-hall, the scenery and architecture of his numerous drawings, and the cast of form insome of his imaginative portraits, make it more likely that he should have felt the direct influence of North Italian painting than that he should have taken Italian elements from imported works or prints. The Swiss at this period wandered in thousands to swell the ranks of the French or imperial armies fighting on Italian soil, and the road they took may have been followed by Hans on a more peaceful mission. He shows himself at all events familiar with Italian examples at various periods of his career; and if we accept as early works the Flagellation, aud the Last Supper at Basel, coarse as they are, they show some acquaintance. with: Lombard methods of painting, whilst in other pieces, such as the series of the Passion in oil in the same collection, the modes of Hans Holbein the elder are agreeably commingled with a more modern, it may bé said Italian, polish. Again, looking at.the Virgin and Man of Sorrows in the Basel museum, we shall be struck by a searching metallic style akin to that of the Ferrarese ; and the Lais or the Venus and Amor of the same collection reminds us of the Leonardesques of the school of Milan. When Holbein settled down to an extensive practice at Basel in 1519, he decorated the walls of the house "Zum Tanz" with simulated architectural features of a florid character after the fashion of the Veronese ; and his wall paintings in the town-hall, if we can truly judge of them by copies, reveal an artist not unfamiliar with North Italian composition, distribution, action, gesture, and ex- pression. In his

drawings too, particularly in a set repre- senting the Passion at Basel, the arrangement, and also the perspective, form, and decorative ornament, are in the spirit of the school of Mantegna. Contemporary with these, however, and almost inexplicably in contrast with them as regards handling, are portrait-drawings such as the likenesses of Jacob Meyer and his wife, which are finished with German delicacy, and with a power and subtlety of hand seldom rivalled in any school. Curiously enough, the same contrast maybe observed between painted compositions and painted portraits. The Bonifacius Amerbach of 1519 at Basel is acknowledged to be one of the most complete examples of smooth and transparent handling that Holbein ever executed. His versatility at this period is shown by

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a dead Christ (1521), a corpse in profile on a dissecting table, and a set of figures in couples; the Madonna and St Pantalus, and Kaiser Henry with the empress Kunigunde (1522), originally composed for the organ loft of the Basel cathedral, now in the Basel museum. Equally remarkable, but more attractive, though injured, is the Virgin and Child between St Ursus and St Nicholas (not St Martin) giving alms to a beggar, in the gallery of Solothurn. This re- markable picture is dated 1522, and seems to have been ordered for an altar in the minster of St Ursus of Solotliurn by Nicholas Conrad, a captain and statesman of the 16th century, whose family allowed the precious heirloom to fall into decay in a chapel of the neighbouring village of Grenchen. Numerous drawings in the spirit of this picture, and probably of the same period in his career, might have led Holbein’s contemporaries to believe that he would make his mark in the annals of Basel as a model for painters of altarpieces as well as a model for pictorial composition and portrait. The promise which he gave at this time was immense. He was gaining a freedom in draughtsmanship that gave him facility to deal with any subject. Though a realist, he was sensible of the dignity and severity of religious painting. His colour had almost all the richness and sweetness of the Venetians. But he had fallen on evil times, as the next few years undoubtedly showed. Amongst the portraits which he executed in these years are those of Froben, the publisher, known only by copies at Basel and Hampton Court, and Erasmus, who sat in 1523, as he like- wise did in 1530, in various positions, showing his face three- quarters

as at Longford, Basel, Turin, Parma, the Hague, and Vienna, and in profile as in the Louvre or at Hampton Court. Besides these, Holbein made designs for glass windows and prints, including subjects of every sort, from the Virgin and Child with saints of the old time to the Dance of Death, from gospel incidents extracted from Luther's Bible to satirical pieces illustrating the sale of indulgences and other abuses denounced by Reformers. Holbein, in this way, was carried irresistibly with the stream of the Reformation; in which, it must now be admitted, the old traditions of religious painting were wrecked, leaving nothing behind but unpictorial elements which Cranach and his school vainly used for pictorial purposes.

Once only, after 1526, and after he had produced the Lais and Venus and Amor, did Holbein with impartial spirit give his services and pencil to the Roman Catholic cause. The burgomaster Meyer, whose patronage he had already enjoyed, now asked him to represent himself and his wives and children in prayer before the Virgin; and Holbein produced the celebrated altarpiece now in the palace of Prince William of Hesse at Darmstadt, the shape and com- position of which are known to all the world by its copy in the Dresden museum. 'The drawings for this masterpiece are amongst the most precious relics in the museum of Basel. The time now came when art began to suffer from unavoidable depression in all countries north of the Alps. Holbein, at Basel, was reduced to accept the smallest com- missions —even for scutcheons. Then he saw that his chances were dwindling to nothing, and taking a bold resolution, armed with letters of introduction from Erasmus to More, he crossed the Channel to England, where in the one-sided branch of portrait painting he found an endless circle of clients. Eighty-seven drawings by Holbein in Windsor Castle, containing an equal number of portraits, of persons chiefly of high quality, testify to his industry in the years which divide 1528 from 1543. They are all originals of pictures that are still extant, or sketches for Pictures that were lost or never carried out. Sir Thomas More, with whom he seems to have had a very friendly connexion, sat to him for likenesses of various kinds. The drawing of his head is at Windsor. The picture from that

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drawing belonged, and perhaps still belongs, to Mr Huth in London. A pen-and-ink sketch, in which we see More surrounded by all the members of his family, is now in the gallery of Basel, and numerous copies of a picture from it prove how popular the lost original must once have been. At the same period were executed the portraits of Warham (Lambeth and Louvre), Wyatt (Louvre), Sir Henry Guild- ford and his wife (Windsor and Mr Frewen), all finished in 1527, the astronomer Kratzer (Louvre), Godsalve (Dresden), and Bryan Tuke (Munich) in 1528. In this year, 1528, Holbein returned to Basel, taking to Erasmus the sketch of More's family. With money which he brought from London he purchased a house at Basel wherein to lodge his wife and children, whose portraits he now painted with all the care of a husband and father (1528). He then witnessed the flight of Erasmus and the fury of the iconoclasts, who destroyed in one day almost all the religious pictures at Basel. The municipality, unwilling that he should suffer again from the depression caused by evil times, asked him to finish the frescos of the town-hall, and the sketches from these lost pictures are still before us to show that he had not lost the spirit of his earlier days, and was still capable as a composer. His Rehoboam receiving the Israelite Envoys, and Saul at the Head of his Array meeting Samuel, testify to Holbein's power and his will, also proved at a later period by the Triumphs of Riches and Poverty, executed for the Steelyard in London, to prefer the fame of a painter of history to that of a painter of portraits. But the reforming times still remained unfavourable to art. With the exception of a portrait of Melanchthon (Hanover) which he now completed, Holbein found little to do at Basel. The year 1530, therefore, saw him again on the move, and he landed in England for the second time with the prospect of bettering his fortunes. Here indeed political changes had robbed him of his earlier patrons. The circle of More and Warham was gone. But that of the merchants of the Steelyard took its place, for whom Holbein executed the long and important series of portraits that lie scattered throughout the galleries and collections of England and the Continent, and bear date after 1532. Then came again the chance of practice in more fashionable circles. In 1533 the Triumphs of Wealth and Poverty were executed, then the portraits of Leland and Wyatt (Longford), and (1534) the portrait of Thomas Crom- well. Through Cromwell Holbein probably became attached to the court, in the pay of which he appears permanently after 1537. From that time onwards he was connected with all that was highest in the society

of London. Henry VITI. invited him to make a family picture of himself, his father, and family, which obtained a post of honour at Whitehall. The beautiful cartoon of a part of this fine piece at Hardwicke Hall enables us to gauge its beauty before the fire which destroyed it in the 17th century. Then Holbein painted Jane Seymour in state (Vienna), employing some English hand perhaps to make the replicas at the Hague, Sion House, and Woburn; he finished the Southwell of the Uffizi (copy at the Louvre), the jeweller Morett at Dresden, and last, not least, Christine of Denmark (Arundel and Windsor castles), who gave sittings at Brussels in 1538. During the journey which this work involved Holbein took the opportunity of revisiting Basel, where he made' his appearance in silk and satin, and pro forma only accepted the office of town painter. He had been living long and continuously away from home, not indeed observing due fidelity to his wife, who still resided at Basel, but fairly performing the duties of keeping her in comfort, His return to London in autumn enabled him tu do homage to the king in the way familiar to artists. He presented to Henry at Christmas a portrait of Prince Edward. Again abroad in the summer of 1539, he painted

with great fidelity the princess Anne of Cleves, at Diiren near Cologne, whose form we still see depicted in the great picture of the Louvre. That he could render the features of his sitter without flattery is plain from this one example. Indeed, habitual flattery was contrary to his habits. His portraits up to this time all display that uncommon facility for seizing character which his father enjoyed before him, and which he had inherited in an expanded form. No amount of labour, no laboriousness of finish—and of both he was ever prodigal—betrayed him into loss of re- semblance or expression. No painter was ever quicker at noting peculiarities of physiognomy, and it may be observed that in none of his faces, as indeed in none of the faces one sees in nature, are the two sides alike. Yet he was not 2 child of the 16th century, as the Venetians were, in substituting touch for line. We must not look in his works for modulations of surface or subtle contrasts of colour in juxtaposition. His method was to the very last delicate, finished, and smooth, as became a painter of the old school. Amongst the more important creations of Holbein's later time we should

note his Duke of Norfolk at Windsor, the hands of which are so perfectly preserved as to compensate for the shrivel that now disfigures the head. Two other portraits of 1541 (Berlin and Vienna), the Falconer at the Hague, and John Chambers at Vienna (1542), are noble specimens of portrait art ; most interesting and of the same year are the likenesses of Holbein himself, of which several examples are extant—one particularly good at Fahna, the seat of the Stackelberg family near Riga, and another at the Uffizi in Florence. Here Holbein appears to us as a man of regular features, with hair just turning grey, but healthy in colour and shape, and evidently well to do in the world. Yet a few months only separated him then from his death-bed. He was busy painting a picture of Henry the VIII. confirming the Privileges of the Barber Surgeons (Lincoln's Inn Fields), when he sickened of the plague and died after making a will about November 1543. His loss must have been seriously felt in England. Had he lived his last years in Germany, he would not have changed the current which decided the fate of painting in that country ; he would but have shared the fate af Diirer and others who merely prolonged the agony of art amidst the troubles of the Reformation.

J.7Ae Cs HOLBERG, Lupvic Horzerc, Baron (1684-1754), the greatest of Scandinavian writers, was born at Bergen, in Norway, on the 3d of December 1684. Both Holberg's parents died in his childhood, his father first, leaving a con- siderable property ; and in his tenth year he lost his mother also. Before the latter event, however, the family had been seriously impoverished by a great fire, which destroyed several valuable buildings, but notwithstanding this, the mother left to each of her six children some little fortune. In 1694 the boy Holberg was taken into the house of his uncle, who sent him to the Latin school, and prepared him for the profession of a soldier; but soon after this he was adopted by his cousin Otto Munthe, and went to him up inthe mountains. His great desire for instruction, however, at last induced his family to send him back to Bergen, to his uncle, and there he remained, eagerly studying, until the destruction of that city by fire in 1702, when he was sent to the university of Copenhagen. But he soon exhausted his resources, and, having nothing to live upon, was glad to hurry back to Norway, where he accepted the position of tutor in the house of a rural dean at Voss. He soon returned to Copenhagen, where in 1704 he took his degree, and worked hard at French, English, and Italian. But he had to gain his living, and accordingly he accepted the post of tutor once more,

this time in the house of Dr Smidt, vice-bishop of Bergen. The good doctor had travelled much, and the reading of his itineraries and note-books

awakened such a longing for travel in the young Holberg that at last, in 1706, having scraped together 60 dollars, he went on board a ship bound for Holland. He proceeded as far as Aix-la-Chapelle, where he fell sick of a fever, and suffered so much from weakness and poverty, that he made his way to Amsterdam, and came back to Norway. Ashamed to be seen so soon in Bergen, he stopped at Christianssand, where he lived through the winter, support- ing himself by giving lessons in French. In the spring he travelled, in company with a student named Brix, through London to Oxford, where he studied for two years, gaining his livelihood by giving lessons on the violin and the flute, He mentions, with gratitude, the valuable libraries of Oxford, and it is pleasant to record that it was while he was there that it first occurred to him, as he says, “how splendid and glorious a thing it would be to take a place among the authors.” reached Copenhagen a third time, and began to lecture at the university ; his lectures were attended, but he got no money. He was asked in 1709 to conduct a rich young gentleman to Dresden, and on his return journey he lectured at Leipsic, Halle, and Hamburg. Once more in Copen- hagen, he undertook to teach the children of Admiral Gedde. Weary with this work, he took a post at Borch College in 1710, where he wrote, but did not print, his first work, 4 Universal History, and was permitted to present to King Frederick IV. two manuscript essays on Christian IV. and Frederick III. The king soon after presented him with the Rosenkrantz grant of 100 dollars for four years, the holder of which was expected to travel. accordingly started in 1715, and visited, chiefly on foot, a great portion of Europe.

Through London and Elsinore he

From Amsterdam he walked through Rotterdam to Antwerp, took a boat to Brussels, and on foot again reached Paris. Walking and skating, he pro- ceeded in thc depth of winter to Marseilles, and on by sea toGenoa. On the Jast-mentioned voyage he caught a fever, and nearly died in that city. On his

recovery he pushed on to Civita Vecchia and Rome. When the spring had come, being still very poor and in feeble health, he started homewards on foot by Florence, across the Apennines, through Bologna, Parma, Piacenza, Turin, over the Alps, through Savoy and Dauphiné to Lyons, and finally to Paris, where he arrived in excellent health. After spending a month in Paris, he walked on to Amsterdam, took sail to Hamburg, and so went back to Denmark in 1716. He spent the next two years in extreme poverty, and published his Introduction to Natural and Popular Law. But at last, in 1718, his talents were recognized by his appointment as professor of metaphysics at the university of Copenhagen ; and in 1720 he was promoted to the lucrative chair of public eloquence, which gave him a seat in the consistory. His pecuniary troubles were now at an end. Hitherto he had written only on law, history, and philology, although in a Latin controversy with the jurist Andreas Hover of Flensborg his satirical genius had flashed out. But now, and until 1728, he created an entirely new class of humorous literature under the pseudonym of Hans Mik- kelsen. The serio-comic epic of Peder Paars, one of the great classics of the Danish language, appeared in 1719. This poem was a brilliant satire on contemporary manners, and enjoyed an extraordinary success. But the author had offended in it several powerful persons who threatened his life, and if Count Danneskjold had not personally interested the king in him, Holberg's career might have had an un timely close. During the next two years he published five shorter satires, all of which were well received by the public. The great event of 1721 was the erection of the first Danish theatre in Grénnegade, Copenhagen ; Holberg took the direction of this house, in which was played, m September 1722, a Danish translation of L'Avare, Until

this time no plays had been acted in Denmark except in French and German, but Holberg now determined to use his talent in the construction of Danish comedy. The first of his original pieces performed was Den politiske Kand- stober (The Pewterer turned Politician); he wrote other comedies with miraculous rapidity, and before 1722 was closed, there had been performed in succession, and with immense success, Den Veegelsindede (The Waverer), Jean de France, Jeppe paa Byerget, and Gert the Westphalian. Of these five plays, four at least are masterpieces ; and

they were almost immediately followed by others. Holberg took no rest, and before the end of 1723 the comedies of Barselstwen (The Lying-in Room), Zhe Eleventh of July, Jakob von Thyboe, Den Bundeslise (The Fidget), Zrasmus Montanus, Don Ranudo, Ulysses of Ithaca, Without Head or Tail, Witchcraft, and Melampe had all beeu written, and some of them acted. In 1724 the most famous comedy that Holberg produced was Henrik and Pernille. But in spite of this unprecedented blaze of dramatic genius the theatre fell into pecuniary difficulties, and had to be closed, Holberg composing for the last night's perform- ance a Muneral of Danish Comedy. All this excessive labour for the stage had undermined the great poet's health, and in 1725 he determined to take the baths at Aix-la- Chapelle ; but instead of going thither he wandered through Belgium to Paris, and spent the winter there. In the spring he returned to Copenhagen with recovered health and spirits, and worked quietly at his protean literary labours until the great fire of 1728. In the period of national poverty and depression that followed this event, a puritanical spirit came into vogue which was little in sympathy with Holberg's dramatic or satiric genius. He therefore closed his career as a dramatic poet by publishing in 1731 his acted comedies, with the addition of five which he had no opportunity of putting on the stage. With characteristic versatility, he adopted the serious tone of the new age, and busied liimself for the next twenty years with historical, philosophical, and statistical writings. During this period he published his Description of Denmark and Norway (1729), History of Denmark, Universal Church History, Biographies of Famous Men, Moral Reflections, Description of Bergen (1737), A History of the Jews, and other learned and laborious compilations. The only poem he published at this time was the famous Nicolai Klimii Iter Subterraneum, 1741, afterwards translated into Danish by Baggesen. When Christian VI. died in 1748, the theatre was reopened and Holberg was appointed director, but he soon resigned this arduous post. His last published work was his Zpistles, in 5 vols. In 1747 he was made Baron af Holberg. In August 1753 he took to his bed, and he died at Copenhagen on the 28th of J anuary 1754, in the seventieth year of his age. He was buried at Soro, in Zealand. He had never married, and he bequeathed all his property, which was considerable, to Sord College. Holberg was not only the founder of Danish literature and the greatest of Danish authors, but he was, with the exception of Voltaire, the first writer in Europe during his own generation. Neither Pope nor Swift, who perhaps

excelled him in particular branches of literary production, approached him in range of genius, or in encyclopedic versatility. Holberg found Denmark provided with no books, and he wrote a library for her. When he arrived In the country, the Danish language was never heard in a gentleman's house. Polite Danes were wont to say that a man wrote Latin to his friends, talked French to the ladies, called his dogs in German, and only used Danish to swear athisservants. The single genius of Holberg revolutionized this system. He wrote poems of all kinds in a language hitherto employed only for ballads and hymns; he instituted a theatre, and composed a rich collection of comedies for it $

he filled the shelves of the citizens with works in their own tongue on history, law, politics, science, philology, and philosopby, all written in a true and mauly style, and representing the extreme attainment of European culture at the moment. Perhaps no author who ever lived has had so vast an influence over his countrymen, an influence that is still at work after 200 years.

The editions of Holberg's works are legion. During the last twenty-five years five complete editions of the Comedies have appeared, of which the best is that brought out in 3 vols. by F. L. Lichtenberg, in 1870. Of Peder Paars there exist at least twenty- three editions, besides translations in Dutch, German, and Swedish. The Iter Subterranewm has been three several times translated into Danish, ten times into German, thrice into Swedish, thrice into Dutch, thrice into English, twice into French, twice into Russian, and once into Hungarian. The life of Holberg was written by Welhaven in 1858. Among works on his genius by foreigners may be mentioned an exhaustive study by Robert Prutz, 1857, and Holberg considéré comme imitateur de Moliére, by A. Legrelle, Paris, 1864. (E. W. G.)

HOLCROFT, Tomas (1745-1809), dramatist and miscellaneous writer, was born 10th December 1745 (old style) in Orange Court, Leicester Fields, London. His father, besides having a shoemaker's shop, kept riding horses for hire; but he fell into difficulties some six years later, and was reduced ultimately to the necessity of hawking pedlery from village to village. The

son accompanied his parents in their tramps, and besides the hardships incident to such a life had often to endure the consequences of his father's passionate outbreaks of temper, which were, however, succeeded by equally violent trans- ports of affection. In such circumstances he was disposed to regard it as an extraordinary piece of good fortune when he succeeded in procuring the situation of stable boy at Newmarket, an employment in which he manifested great coolness and courage, and acquired high proficiency. Previous to this he had received a pretty good education, and at Newmarket he spent his evenings chiefly in miscel- laneous reading and the study of music. Gradually he also succeeded in obtaining a competent knowledge of French, German, and Italian. On the expiry of his term of engagement as stable boy he returned to assist bis father, who had again resumed his trade of shoemaker in London; but after marrying in 1765, he procured the office of teacher in a small school in Liverpool. His subsequent career, like his earlier life, was hard and chequered, but it must suffice to state that, after failing in an attempt to set up a private school, he followed for several years the profession of an actor, often at a very meagre salary, and that he was more successful as a dramatist and novelist, but suffered much and frequent anxiety from pecuniary em- barrassments and repeated disappointmients. He died 23d March 1809 from enlargement of the heart, brought on, it is supposed, by the failure of several of his dramatic pieces. He was a member of the Society for Constitutional Reform, and on that account was, in 1794, indicted of high treason, but acquitted. The best known dramas of Holcroft are Duplicity, The School for Arrogance, The Road to Ruin, and The Deserted Daughter. Among his novels may be mentioned Alwyn and Hugh Trevor. He was also the author of Travels from Hamburg through Westphalia, Holland, and the Netherlands to Paris, and of some volumes of verse, and translated several works from the French and German with considerable elegance. The interest which still attaches to his career is, however, less on account of the intrinsic merit of his literary performances than his peculiarly chequered life and his persevering struggle to elevate himself above the ignorant and sordid condition of his early years. His Memoirs written by himself and continued down to the time of his Death, from his Diary, Notes, and other Papers, by William Hazlitt, appeared in 1815, and has gone into several editions.

HOLDERLIN, Jonayn Curistran Frrepricu (1770- 1843), German poet, was born March 29, 1770, at Lauffen on the Neckar. His mother removing, after a second marriage, to Niirtingen, he began his education at the classica] school there, where Schelling was his schoolfellow and playmate. He was destined by his relations for the church, and with this view was later admitted to the free schools of Denkendorf and Maulbronn. At the age of eighteen, already an excellent classical scholar, he was sent to the university of Tiibingen, where, however, he showed no inclination to the study of theology. He was already the writer of occasional verses, and had begun to sketch his first version of /Zyperton, when he was introduced in 1793 to Schiller, and obtained through him the post of tutor to the young son of Frau von Kalb. A year later he left this situation to attend Fichte's lectures, and to become a disciple of Schiller in Jena. Schiller recognized in the young poet something of his own style of genius,

and encouraged his early literary attempts by sending |

some of them to Goethe, and by superintending the publication of others in the Thalia and Horen. In 1796 Hélderlin obtained the post of tutor to the three young children of a banker named Gontard in Frank- fort. Gontard's beautiful and gifted wife is the Diotima of Holderlin's LZyperion. For this lady he conceived a foolish and hopeless passion ; and she became at once his inspiration and his ruin. At the end of two years, during which time the first volume of //yperion was published (1797), some kind of crisis appears to have occurred in their friendship, for the unhappy young poet suddenly left Frankfort and the Gontard family; but whether he was dismissed by the indignant husband of Diotima, or was impelled by his own better resolutions, has not been explained, In spite of ill health, he now completed Ilyperion, the second volume of which appeared in 1799, and he began a tragedy, Der Zod des Empedokles, which is published in an unfinished condition among his works. Some of his verses appeared in the Zaschenbuch fiir Frauen- zimmer in 1799 and 1800; and he contemplated starting a new literary journal, of which he was to be the editor, but the scheme was a failure. His friends now became alarmed at the alternate depression and nervous irritability from which he suffered, and he was

induced to go to Switzerland, as tutor in a family at Hauptwill. There his health improved ; and several of his poems, among which are “Der blinde Sanger,” “An Die Hoffnung,” and “ Dichter- muth,” were written at this time. In 1801 he returned home to arrange for the publication of a volume of his poems; but, on the failure of this enterprise, he was obliged

to accept another tutorship in the family of the Hamburg }

consul in Bordeaux. Diotima died a year later, in June 1802, and the news is supposed to have reached Holderlin shortly afterwards, for in the following month he suddenly left Bordeaux, and travelled homewards on foot through France, arriving at Niirtingen destitute and insane. Kind , treatment gradually alleviated his condition, and in lucid intervals he occupied himself by writing verses and transla- ting Greek plays. Two of these translations—the Antigone and G@dipus Rex of Sophocles—appeared in 1804, and several of his short poems were published by Seckendorf in his Musenalmanach, 1807 and 1808. In 1804 Hélderlin obtained the post of librarian to the landgrave of Homburg, and went to live in Homburg under the supervision of friends ; but the post was abandoned two years later, and he was taken to Tiibingen, where he remained, irremediably but harmlessly insane, till his death, June 7, 1843. Hilderlin’s writings are the production of a beautiful and sensitive mind, a mind of high ideals and noble impulses ; but they are intensely, almost morbidly, subjective, and they lack real human strength. Perhaps his strongest

trade in honey, wax, hides, and wool.

HO L—H OL

characteristic was his passion for Greek subjects, and the

natural result of this was that he almost entirely discarded rhyme in favour of the ancient verse measures. are all short pieces; of his tragedy only a fragment was written. Hyperion, oder der Eremit in G’riechenland, is thus his one important work; and even to this a sequel is wanting. It may be called a prose poem, and is written in the form of letters. its tone, the sad philosophical vein which permeates it, together with its autobiographic character, claim for it a unique position among German classics.

His poems

Its exquisite language, the purity of

An edition of Hélderlin’s complete works, with his letters and

biography, appeared in 1846 ; and there is a cheap edition of his selected works, with a biography by Christoph Theodor Schwab, published in 1874.

HOLESCHAU, Hottescuav, or Horzsov, chief town

of a government district in Moravia, Austria, circle of Hradisch, is situated on the Russawa, 20 miles N.N.E. of Hradisch. It has a large castle in the Italian style (with a fine garden), a beautiful decanal church, and a synagogue.

Linen and cloth-weaving are carried on, and there is some

The population in

1869 was 5282, more than a third being Jews. HOLIBUT, or Hauisut (lippoglossus vulgaris), is the

largest of all Flat-fishes, specimens of 5 feet in length and of 100 ib in weight being frequently exposed for sale in the markets. Indeed, specimens under 2 feet in length are very rarely caught, and singularly enough, no instance is known of

avery youlg specimen having been obtained. The holibut

is much more frequent in the higher latitudes of the temperate zone than in its southern portion; it is a

circumpolar species, being found on the northern coasts of America, Europe, and Asia, extending in the Pacific south- wards to California. On the British coasts it keeps at some distance from the shore, and is generally caught in from 50 to 150 fathoms. Its flesh is considered coarse, though white and firm.

HOLINSHED, or Hotiinsuep, Rapa, author of Chronicles of England, Scotland, and Ireland, flourished in the 16th century. He belonged to a family settled at Bosley, in Cheshire, and according to Anthony Wood he was educated at one of the universities and took orders in the church. In the compilation of the Chronicles called by his name he bore a leading part, but he received exten- sive and important aid from Stow the antiquary, Harrison, chaplain to Lord Cobham, Hooker (alas Vowell), an uncle of the divine of that name, and Francis Boteville (alias Thin), a learned antiquary. olinshed's share in the work comprised the history of England down to the year 1577, the date of the first edition. His will—printed in Iearne's preface to Camden's Annales—shows that in the latter part of his life he was in the service of Thomas Bendet of Bromcote, in Warwickshire. He died between 1580 and 1584. The notice of Elizabeth's reign contained matter so offensive to her and her court that in the second edition, which appeared in 1587, some of the sheets were cancelled altogether. The castrations were published separately by Dr Drake in 1728, and in subsequent reprints have been restored. The history of Scotland, in- corporated by Holinshed in his Chronicles, is for the most part a translation from the Latin of Hector Boece, and is in- teresting as having furnished Shakespeare with the ground- work of his tragedy of Macbeth. The Chronicles, being the work of so many different hands, present great varieties of literary quality ; but the learning and research they show have made them an invaluable aid in the illustration of the early annals of England. An edition in accordance with the original text was published in 1808, 6 vols.

HOLKAR, the title of the maharajé of Inpore (9.2), whose territories are often designated Holkar's Dominions.

HOLLAND

PART IL—GEOGRAPHY AND STATISTICS.

: OLLAND is the most usual English name of the country which is nationally designated the Kingdom of the Netherlands (Koningrijk der Nederlanden). The word, which is popularly explained as if it were Hollow- land, and referred to the same physical fact which has given rise to the

terms Netherlands and the Low Countries, appears in an older form as Holtland, and is thus evidently equivalent to Wood-land. In French the usual expression is Pays-Bas, and in German Niederlande.

There is no country in Europe in which the character of the territory has exercised so great an influence on the inhabitants as in the Netherlands; and, on the other hand, no people has so extensively modified the condition of its territory as the Dutch. In a description of Holland, con- sequently, the greatest importance must be attached to the physical conformation of the country as it was and is; and most of the peculiarities of the political and social condition of the people must be considered in connexion with this con- formation.

The size of Holland, being subject to perpetual diminu- tion and increase, cannot be indicated by a definite figure except as at some definite period; on the one hand, there is loss of area still going on in consequence of the erosion of the coasts, and, on the other hand, this is more than counterbalanced by a continual acquisition of new ground due more especially to “‘ impoldering ” and draining operations. In 1833 the surface of the Netherlands was only 2,270,959 hectares (5,611,860 acres, 8768 square miles) ; on the 20th Oct. 1877, at the time of the conclusion of the cadastral survey, it was 3,297,268 hectares (8,148,020 acres, 12,731 square miles).

The kingdom extends from 53° 32’ 21” (Groningen Cape on Rottum Island) to 50° 45′ 49” N. lat. (Mesch in the province of Limburg), and from 3° 23’ 27” (Sluis in the province of Zealand) to 7° 12’ 20” E. long. (Langak- kerschans in the province of Groningen). The greatest length from north to south, viz., that from Rottum Island to Eysden near Maestricht is estimated at 164 miles, and the greatest breadth from south-west to north-east, or from Zwin near Sluis to Losser in Overyssel at 144 miles. If the Zuyder Zee, the parts of Prussia which encroach on the eastern side, and the projecting portions of Limburg and Zealand are disregarded, the general form is almost an ob- long. With the exception of Greece and Great Britain, no country of Europe has so many inlets of the sea as Holland.

The Netherlands are bounded on the E. by the Prussian provinces of Hanover, Westphalia, and the province of the Rhine, and on the S. by the

Belgian provinces of Liége, Limburg, Antwerp, and East and West Flanders. A purely geographical boundary is formed to the W. and the N. by the North Sea, at the N.E. corner by the Dollart, and from Stevensweert southward to the extreme corner of Limburg (near Eysden) by the Maas or Meuse.! Natural ethno- graphic frontiers, such as occur where two neighbouring Peoples of different origin, race, character, customs, and language are sharply marked off from each other, do not exist in the case of the Netherlands. The Low German element, indeed, of which the Netherlands form as it were the kernel, spreads beyond Dutch limits both north-east

along the coast of the German Ocean and south-west into Belgium.

i: At Maestricht, however, a portion lies on the left bank of the ‘ver, measured, according to the treaty with Belgium, 19th April 1839, art. 4, by an average radius of 1200 Dutch fathoms (7874 feet) from the outer glacis of the fortress.

As regards the seaward boundary—the coasts, river- Coast- mouths, and islands—it is necessary, for a just comprehen- lize.

sion of its character and of its influence on the formation of the soil, to bear in mind that the coasts of the Nether- lands shared in the general vicissitudes of the southern shores of the German Ocean at the time when the English Channel was still closed. Three periods may be distin- guished in the history of these changes. During the first a row of dunes was formed on tlie sandy tongue of land which, beginning at Ostend, cut off and formed iuto an inland lake a portion of the German Ocean, at that time washing the diluvial strata; these are still indicated along the Dutch and the German coasts by a series of dune-formations, sandbanks, and islands. In the second period the separation between ocean and lake was still maintained, the river-water gained the upper hand over the sea-water in the lake, the matter brought down by the river began to settle, and the morasses and beds of marsh-plants, reeds, and rushes (derrie) were formed which are now found above the old sand beds and below the present clay beds. When in the third period the coasts subsided, the dunes were here and there carried away by the rise of the waters, portions of the land were submerged, and, mud being extensively piled up by the sea, the fertile clay (zeeklev) of the maritime

provinces was formed, and at the same time the mouths of the rivers were changed in position. And all this took place on a still greater scale when the limestone rocks which united Calais and Dover at last gave way and the great ocean with its heavier incidence of billows and tides drove into the smaller sea. According to Dr Hartogh Heys van Zouteveen,? 150,000 hectares (370,670 acres) of land were lost on the coast of the German Ocean, 385,000 hectares (951,390 acres) on the Zuyder Zee and the Wadden, 8432 hectares (20,836 acres) in the Dollart, 10,000 hectares (24,711 acres) in the Biesbosch, and about 27,000 hectares (66,720 acres) more in other parts. According to Dr Staring, the province of Groningen, even during the 18th and 19th centuries, has been harassed with inundations once in every 155 years, Utrecht and North Holland south of the Y once in 83 years, South Holland once in 55 years, Friesland, Overyssel, North Holland north of the Y, and the coast of North Brabant every 40 years; while the Netherlands in general have been visited by such disasters in 1702, 1715, 1717, 1741, 1755, 1756, 1791, 1808, 1809, and 1825, or on an average once in every eleven years. In this last period, however, of the history of the land the lordship of man ultimately began to make itself felt. The formation of the first dykes to prevent inundations was quickly followed by the construction of a connected system of earthen ram- parts, behind which the country lies secure, while at the same time hundreds of thousands of acres of fertile land have been recovered from the sea. The area gained from 1833 to 1877 has been already stated. The follow- ing table shows the amount reclaimed by endyking down to the dates given :— Im North Holland) to W864 ….....0060. 72,288 acres.

», South Holland Islands, to 1850…..... 168,302 ,, », Friesland, ” +e eG OF Om oe

,, Groningen, ee ees. 86,838 ,, », North Brabant, COmIS2 See eeeee Joho Olay, », Zealand, fOMSSOR ems 220,411

To return to the present condition of the seaboard of the Netherlands,—it follows from what has been said

2 Algemeene Statistiek van Nederland, p. 61.

Sea- dykes.

that it consists (1) of coasts still protected by dunes or fringed with saudbanks and islands indicating the direc- tion of ancient lines of dunes; (2) of low coasts of sea- clay provided with dykes which in more than one quarter have been repeatedly extended so as to enclose land con- quered from the sea (the sea-polders); and finally (3) of gome high diluvial strata which rise far enough above the level of the sea to make dykes unnecessary. The dunes fol- low the west and north-west coast almost without a break, except in a few quarters where they have been removed and their place supplied by dykes or rubble, as in North Holland between Huisduinen and Nieuwe Diep and be- tween Kamp and Petten, in South Holland on Voorne, and in Zealand on Schouwen and Walcheren, where the famous Westkappel dyke unites the village of Westkappel with the waterinug-place of Domburg. The breadth of the line of dunes naturally varies greatly—from 600 to 7000 feet; and there is a similar variety in the height of the individual dunes proper, called dune-hills (duenheuvels) as compared with the dune-pans (duinpannen) or depres- sions. ‘Fhe elevation of the High Blinkert near Haarlem (196 feet) is an extreme exception, for the average is not more than 50 or 60 feet even in the case of the high dunes which lie nearest the shore and are known as ‘“‘sea-runners” (zeelooper) or the “shore-ridge” (strandreeks). The dunes show a tendency, except where the Dutch prevent it by planting wood or sand-oats, to wear away on the side towards the sea, and to “‘overstuiven” or drift off on the landward side. ‘There is, indeed, a general degradation of the coast, and a recession towards the east, corresponding to the subsidence which may be observed along the German seaboard, and probably traceable also, in part at least, to the Channel current, which at mean tide has a velocity of 14 or 15 inches per second, and especially during strong west or north-west winds carries off large quantities of material. This alteration of coast-line appears at Loosduinen, where the moor or fenland formerly developed behind the dunes now crops out on the shore amid the sand, being pressed to the compactness of lignite by the weight of the sand drifted over it. Again, the remains of the Roman camp at Brittenburg or Huis te Britten, which originally lay within the dunes and, after being covered by them,

emerged again in 1520, were, in 1694, 1600 paces out to | sea, opposite Katwijk; while, besides Katwijk itself,

several other villages of the west coast, as Domburg, Scheveningen, Egmond, have continually to be removed further inland. Two things special to Holland are worthy of particular notice, the artificial formation of dunes, as at Koegras, Callantsoog, Petten, Katwijk, Scheveningen, and Zandvoort, and the carrying away of the sand (afzan- dertj, ‘‘ offsanding”) by ship or rail, as in the “Westland,” for example, to the south of the Hague, to serve elsewhere for engineering operations and the improving of the soil. Mingled with marsh-earth the sand forms a soil suited to the culture of flower-bulbs; with clay it produces that excellent soil for vegetable gardens for which the Westland is so famous, It must be further remarked that both the “‘dune-pans,” which are naturally marshy through thieir defective drainage, and the “ geest” grounds—that is, the grounds along the foot of the downs—have been in various places either planted with wood or turned into arable and pasture land; while the numerous springs at the base of the dunes rise at such a height above the ordinary level of the country that the water is conveyed by canals to the great cities, and an improvement is thus effected at once in the agricultural condition of the coast-land and in the sanitary condition of the cities.

The sea-dykes are found along the northern coasts, the coasts of the provinces which border on the Zuyder Zee,

and the coasts of the islands of Zealand and South Holland

so far as they are not protected by dunes. Only in a few places, it will be seen, are the sea-dykes unnecessary ; as for example, in Friesland between Stavoren and Olde Mirdum (the bold aud steep Roode and Mirduin cliffs) and near Doornspijk, 3 miles south of Elburg, where there are high grounds which stretch 6 miles to the south-west of Harderwijk. The earthen dykes are protected by stoue- slopes aud by piles, and at the more dangerous points also by “‘zinkstukken” (sinking pieces), artificial structures of bulrushes, reeds, and branches, laden with stones, and measuring some 400 yards in circuit, by means of which the current is to some extent turned aside. The West- kappel dyke already mentioned is 12,468 ft. long and 20 high, has a seaward slope of 300 ft., and is protected by rows of piles and

basalt blocks. On its ridge, 39 ft. broad, there is not only a roadway but a service railway. When it is remembered that the woodwork is infested by the pile worm (Zeredo navalis), the ravages of which were discovered in 1731, the enormous expense incurred in the construction and maintenance of the 1550 miles of sea-dykes now exist- ing may be imagined. The cost of construction is not over- estimated at 150,000,000 guilders or £12,500,000.

The Dutch islands may be divided into two main classes Islands, —(1) those surrounded on all sides by the German Ocean or its inlets, and (2) those surrounded entirely or in great part by river arms, and separated by these from the main- land or from each other. The first division again comprises two groups—(a) the islands Texel, Vlieland, Terschelling, Ameland, Schiermonnikoog, and Rottum, which stretch in a long arc from the north point of North Holland to the mouth of the Ems, and indicate the old coast-line, so that they belong to the same physico-geographical group with the islands along the German coast; and (6) the islands Wieringen, Marken, Urk, and Schokland, which are the relics of the stretch of couutry formerly comprising the present bed of the Zuyder Zee. In the second class are to be reckoned the delta of the river Yssel (Camper Island) and the islands belonging to the contiguous deltas of the Rhine, the Meuse, and the Scheldt, including the island of Betuwe between the Rhine and the Waal and the archipelago of South Holland and Zealand.

As the river mouths of Holland must also be regarded as River gulfs or inlets of the sea, they may be noticed here. The moulls average breadth of the Haringvliet at Helvoetsluys is 8860 ft. and at Goedereede 18,045; that of the West Scheldt at Ter Neuzen 15,420 ft., and at Flushing (Vlissingen) 13,780; that of the East Scheldt at the harbour of Goes 13,780, and at the harbour of Zierikzee 13,450; and that of the Roompot 21,650 to 29,530 ft.

The varying characteristics of the coasts in different places Influ- give rise to correspondingly different industries. As re- a | gards trade and navigation, the west coasts with their shal- cas 4 lows and sandbanks can be approaclied only by small vessels indus- of light draught (visscherspinken) unless where access 1s try. afforded by the inlets of the sea, especially the mouth of the West Scheldt at Flushing, that of the East Scheldt at Zierikzee, the Brouwershaven inlet between the islands of Schouwen and Goeree, the

Goeree inlet at Helvoetsluys, the Marsdiep at the Helder, and the mouth of the Ems at Delfzijl, or where a way has been opened up by engineering works as at Rotterdain and Amsterdam (by the new water- way to the sea and the canal to Ymuiden). As we proceed from south-west to north-east the places along the coast become less and less important; in the provinces of Groningen and Friesland the approach to the mainland is obstructed by the Wadden or Shallows ; and on the coast of the Zuyder Zee are those harbours, for the most part rendered useless by alluvial accretions, which have been so well described by Havard in his Villes Mortes du Zuyderzee. Along the greater part of these coasts the

population is engaged ‘in the fisheries rather than in trade, especially when the neighbourhood of a great town (as Alkmaar for Egmond, Haarlem for Zandvoort, Leyden for Katwijk, the Hague for Scheveningen) secures a good market or a ready means of exportation. Many fishing villages on the west coast, ¢.g., Scheveningen, Domburg, and Zandvoort, have in recent years acquired repute as watering-places with both natives and foreigners.

The availability of the flat coasts for trade and naviga- tion is to a large extent dependent on the range of the rise and fall of the tides. As shown in the following table, this steadily decreases from south-west to north-east. In the Zuyder Zee it is naturally very small.

Range of Range of

Places. 5 os om 4

Feet. COO te 51 SS ee Kijkduin 4-1 Westkapelle……..... Nieuwediep .. 37 Brouwershaven…..... Terschelling 5°2 Goedereede …..,..... Ameland …...,.....| 6°4 Helvoetsluys…..... ROGHWIM picecer swvsaeal J °6 BV ear cis islssts See sone Amsterdam!.,...,.,,.... 1‘2 Coast of Delfland…., awanen burg’ aerator 11 Katwijk…..... Rea Spaarndam 1:2

The Shallows (Wadden) of the German Ocean between Groningen and Friesland and the islands Rottum, Schier-

monnikoog, and Ameland are usually left in great measure dry at ebb-tide.

The elevation of the surface of the country ranges from Relief.

about 650 ft. above to 16 or 20 ft. below the Amsterdam zero, Which marks the mean high-water level in the Y in front of the city. The circumstance that so much of it is below the sea-level necessarily exercises a very important influence on the drainage, the climate, and the sanitary condition of the country, as well as on its defence by means of inundation. From the history of the formation of the soil already given, and from the course of the rivers, it may be gathered that the low grounds are in the west, and the higher in the south and east. According to the relief map published by the minister of war (scale 1: 600,000), the provinces of North and South Holland, the western portion of Utrecht as far as the Vaart Rhine, Zealand, except the southern re of Zealand-Flanders, and also the north-west corner of

orth Brabant, all lie, with the exception of the dunes, below the Amsterdam zero; while the eastern portion of the country, except a small strip along the Zuyder Zee in the provinces of Guelderland, Overyssel, and Friesland, as well as the lands in the neighbourhood of the Dollart, is situated above it. The regular slope of the ground from south-east to north-west, and the position of the highest and the lowest points, are indicated by the same authority. At Vaals, in the extreme south-east, the altitude is 656 ft., at Valkenberg 525, at St Pietersberg near Maestricht

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HICH FEN LIMBURG CLAY

- Relief and Geological Charts of Holland. The positions of the chief towns are indicated by the initials of their names. In the left-hand chart the undivided horizontal lines show the tracts that lie below the Amsterdam zero, the broken horizontal lines those under 1 metre, &c.

403, at the Imbosch near Dieren and the Hettenheuvel | in the Veluwe 118 and 98, at Groenlo 78, in the “high

near Heerenberg respectively 360 and 345, at Meerwijk | fens”

near Nimeguen 318, at Apeldoorn 233, at Zeist 164, at Oldenzaal 154, at Wageningschenberg and Grebschenberg respectively 151 and 131, at Hoenderloo and Kootwijk nh ae

1 Before the construction of the canal to Ymuiden.

of Drenthe near Barge 85, at Lochen and Almelo 39, at Coevorden 31, at Steenwijk and Boertange 19, at Groningen 18, at Heerenveen 0°65. Below the Amsterdam zero lie naturally many impoldered districts, especially the marshes and meres which have been drained dry, as for example the Schermer and Purmer polders and the

Geology and soil.

Fens.

Clays.

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Tlaarlem lake, which are respectively — 10°66, — 12°46, 13°61, the Schieveen polder near Schiedam — 16:27, the polders at Woubrugge, the Bergschenhoek, and the Zuidplas —- 16°86, — 17°58, and — 18°49.

Of equal importance with the relief of the country is the geological composition of the soil. It is evident from the history of the origin of the land that Quaternary forma- tions—alluvium and diluvium—must be well represented. In fact they constitute no less than 99°9 per cent. of the surface of the Netherlands, only ‘1 per cent. thus remaining for all the older formations—the Tertiary and the Secondary, including the extremely limited Jurassic.

To the alluvial strata belong, in tho first placc, the fen (veen) strata, which are subdivided into low fens, high fens, marsh fens, and the ‘‘dalgronden” or ‘‘reclaimed high fens.” The low fens, which are found in Groningen, Friesland, Overyssel, North and South Holland, and North Brabant (about the Langstraat), have been formed of aquatic plants, and, in the upper layers, of moss; their elevation is that of the mean sea-level ; from them the ‘‘short turf,” the best quality of peat, is obtained by dredging, and, when the standing water which collects after the peat has been dug out has been drained off, they may be turned into very productive arable land. The subsoil, on which the fertility then depends, consists usually of clays and alluvial sand or dune strata, rarely of diluvial sand strata. ‘I’hese low fens extend to no less than 904,597 acres, or about 11 per cent. of the surface. The high fens, of which the greater part have been ‘‘disfenned” or stripped of peat, are found in Groningen, Friesland, Drenthe, Overyssel, and the ‘ Peel” or Marsh of North Brabant, in the more elevated plains or valleys. They have been formed of trees, heath-plants, and moss, and fur- nish the softer, inferior kind of peat, the ‘‘long turf.” As the removal of the peat has been followed by the construction of canals to carry off the standing water, the high fens are of course free from marshes, but, resting as they do almost

everywhere on diluvial gravel and sand, they do not furnish so fertile a soil as the low fens. They comprise 226,107 acres, or only about 2°8 per cent. of the surface of the country. The marsh fens are composed almost exclusively of a few species of sedge or carex, and. constitute, not only in their method of formation, but also in their character and situation, the transition between the high and the low fens. They are widely scattered, especially along small streams which carry off water mingled with fenny materials, and are nowhere more numerously represented than in Drenthe, where all the drainage is of this character. The marsh fens occupy 168,551 acres, consider- ably less than the high fens. ‘he ‘‘dalgronden” are formed where regular peat-fields are laid out along specially constructed canals, and the denuded surface is usually grubbed up for arable or pasture land, or on rare occasions planted with wood. They comprise about 207,576 acres, and naturally increase in proportion to the decrease of the high fens. We shall return to these “‘dalgronden” in con- nexion with the canals, Besides the fens, the clay lands and cer- tain of the sand-strata belong to the alluvium. The clays—which furnish the richest arable soils, the most luxuriant meadowland, and in some places the material for bricks and earthenware—may be divided into the sea-clay, the river-clay, the stream-clay or green earth, and the old sea-clay of the districts recovered from the water. The exceptionally fertile sea-clay in the provinees of Groningen, Friesland, North and South Holland, and Zealand occupies no less than 1,676,860, or about 20 per cent. of the sur- face, while the river-clay, naturally situated along the banks of the larger rivers, takes up 854,284 acres, or about 10 per cent. The boundary between the sea-clay and the river-clay is formed in the case of these rivers by the maximum high-water line. The stream- clay or green earth, which is found, as the former name implies, on the banks of the smaller rivers or streams, is formed of course on a much smaller scale, and consists of a stratum on an average from 3 to 5 feet thick, resting almost exclusively on the sand diluvium, from which it is occasionally separated by a fenny stratum. It occurs in the east of Drenthe, Overyssel, and Guelderland, along the small tributaries of the Vecht, along the Vecht, Regge, and Schipbeek in Overyssel, and in like manner in North Brabant along the Dommel, Aa, Mark, and other unimportant streams. The green earth not unfrequently contains iron ore; from this the metal is extracted in Overyssel and Guelderland, and it is asserted that in thirty years the natural processes replace the excavated mineral. The stream deposits occupy about

2 per cent. of the surface—157,187 aeres. Finally the old sca-clay of the reclaimed districts covers 127,518 acres, or 14 per cent. of the surface. As already stated, the subsoil of the low fens is not everywhere clay. It is so in the main in the provinecs of North and South Holland, where the drainage operations were consequently much more remunerative than in Friesland, and in the cast of Utrecht, where the fens rested upon sand. Estimating the total area of the recovered districts at 197,690 acres, about five-eighths of this con-

sists of old sea-clay; and these portions, such as the Haarlem lake grounds, the Beemster and Purmer polders in North Holland, and the Nieuwkoop and Zuidplas polders in South Holland, are reckoned among the richest and most fertile. How these low-lying areas have been endyked and drained, surrounded by canals and kept dry by gigantic steam-pumps, has been explained under the heading HAARLEM LAKE.

The alluvial sand-strata (to be distinguished from the diluvial Alluyis sand) may be divided into (1) sand-drifts, (2) river-sand, river- sand,

downs, and ‘‘heibanen,” and (3) old sea-sand and the sca-dunes with the geest-grounds. ‘I’he last of these classes has already been considered in dealing with the sea-coast. The rivers bring down their sand as well as their gravel, not so much from the more elevated districts as from the diluvial valleys in which they have excavated their channels. The beds of the rivers themselves consist likewise of sand, mingled here and there with gravel or rolled and polished pebbles, and, where the current is not too strong, covered with a layer of clay. If sand has been accumulated on the shore, the wind soon transforms it after the retreat of the river into hillocks or river-dunes. When these contain a propor- tion of clay they are more fertile than the sea-dunes. They occur on both sides of the Guelderland Yssel (between Zalk and Oéest), and on the Waal below Hulhuizen and opposite Rossum; and various cminences in other parts of the country, such as Agnietenberg near Zwolle, and the heights near Deventer, near Grafthorst opposite Kampen, and along the Meuse between Venlo and Mook, must be

considered as of similar origin, ‘‘Heibanen,” 7.c., heath-tracks, so called on account of their sterility, are beds of river gravel easily distinguished from the diluvial gravel by the smooth, worn, and uniform appearance produced ages ago by the action of the current. They are found, for example, in the Betuwe, about Avezaat, and between Lienden and Waddenoijen. Sand-drifts are dune forma- tions originated by the action of the wind on the diluvial sand, where in one way or other it has been stripped of the heath-crust. They extend to 179,220 acres, or about 2} per cent. of the surface. The fen strata occupy in all 1,508,300 acres, or 184 per cent, ; the clay strata 2,815,850 acres, or about 85 per cent. ; the alluvial sand strata 475,477 acres, or about 6 per cent, ; and the whole alluvium 4,799,627 acres, or 59 per cent.

he diluvial or sand and gravel strata of the Netherlands are Diluvi far from being of such economic importance as the alluvial strata. strata,

The agricultural products—mainly buckwheat and rye—are neither so abundant nor so valuable as the wheat and rape-seed of the elay soils; and neither stock-breeder nor dairy-farmer obtains so satis- factory results, The boundary of the diluvial strata may be roughly indicated by a line running through Winschoten, Groningen, Dok- kum, Leeuwarden, Heerenveen, Steenwijk, Zwolle, Elburg, the coast of the Zuyder Zee, Naarden, Utrecht, Rhenen, Bois-le-Due, Breda, Bergen-op-Zoom, and Antwerp. South and east of this line lies the diluvium, for the most part on the surface, except in the places already mentioned where the fens, the river-clay, the stream deposits, and the sand-drifts are situated, or in the extreme south and east where the older strata make their appearance. To the north and west of the line the only diluvial strata are those of the Zuyder Zee islands: in Texel, Wieringen, and Urk the soil is of diluvial origin; and this probably holds true also in whole or in part in Vlieland, Ameland, and Terschelling.

The diluvial formations are subdivided into gravel-strata and sand-strata. ‘To the former belong (1) the Scandinavian diluvium, in which occur granites and chalk flints derived from Scandinavia, situated to the north of the Overyssel Vecht (that is, in Groningen, Drenthe, the south-west of Friesland, and the islands); (2) the mixed diluvium, which besides the Scandinavian gravel contains stone-grit from Munster, the Teutoburger

Wald, and the districts along the Rhine (it is situated between the Vecht and the Rhine, in Overyssel, Utrecht, the Gooiland,! and Guelderland); (3) the Rhine diluvium, destitute of granite, but with many fragments of white quartz, basalt, and other kinds of stone from the mountains along the river between Bonn and Coblentz (it lies between the Waal and the Meuse) ; (4) the Meuse diluvium, containing materials brought from the mountains Sects up the stream; and finally (5) the Limburg flint diluvium, like the preceding variety desti- tute of any plutonic or volcanic rocks, but nevertheless consist- ing almost exclusively of flints occurring in the neighbouring chalk formation. :

The sand-diluvium, which is of later date than the gravel, is found in great level stretches at the foot of the hills of diluvial gravel, and contains no pebbles or coarse gravel. It also occurs In the maritime provinces under all the marine and fluvial formations. According to some authorities it owes its origin to the influence of rain, or frost, or wind; according to others it has been formed by the sea like the Kempen sand and that of the dunes, and then transported by the south-westerly currents.

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1 A district formerly ealled Naardingerland, on the southern shores of the Zuyder Zee, including Naarden, Bussum, Huizen, Blaricum, Laren, Hilversum, and Muiderberg.

In the diluviuin must also be included the loess, which occupies a large proportion of the province of Limburg. The whole diluvium comprises 3,308,330 acres, or about 404 per cent. of the country, distributed thus:— Scandinavian 43 per cent., mixed diluvium 44, Rhine and Meuse diluviuni and Limburg flint diluvium 1, loess 14, and lastly the sand diluvium, which includes the diluvial river- banks, 2,876,770 acres, or about 29 per cent.

The older formations, which occupy a very limited area, occur in the east of Guelderland and Overyssel, in the south of Limburg, and in Zealand-Flanders. That they also form the substratum elsewhere, ¢.g., in Zealand

and Brabant, is not improbable. The area of the Tertiary strata is 3425, and of the Secondary 3746

acres.

As regards the capabilities of the soil, Holland does not hold an exceptionally favourable position,—34 per cent. of the country consisting of good and about 2 per cent. of inferior clay land, while more than 45 per cent. is poor and partially reclaimed sand, and fully 18:5 per cent. is covered with fens. The following figures show the account to which the soil is actually turned :—64‘3 per cent. consists of arable and pasture land, gardens, hay-fields, and orchards; 6 per cent. is occupied by water and roads; 7 per cent. is woodland ; 0°7 is covered with buildings ; and the reat, or 22 per cent., must consequently be assigned to the waste lands, shores, and dunes, the reed-beds, heaths, and fens. The extent of this uncultivated area is of course being gradually diminished by the more general employment of improved methods of drainage, by prevention of the progress of the sand-drifts, by reclamation of the fens, by the extension of facilities for the carriage of manures, and by the parcelling out of the mark-lands or commons which are now used only as public pastures or for the digging of turf (plaggen). The distribution of the cultivated lands in the several provinces is considered below in connexion with the density of the population.

The Netherlands are watered by three main rivers—the Rhine, the Meuse or Maas, and the Scheldt or Schelde, besides a great number of smaller streams. How the Rhine breaks up into Rhine and Waal, Rhine and Yssel, Crooked Rhine and Lek, Old Rhine and Vecht, and finally reaches the sea at Katwijk, may be seen from the map ; and also how the Meuse at Gorcum forms a junction with the Waal, flowing on to Dort under the name of the Merwede, and

thence continuing to the sea between the South Holland .

Islands and South Holland, under the names of the North, the Old, and the New Meuse. There too may be traced the course of the Scheldt, with its broad mouths bounding the Zealand Islands and separating them from the mainland of Flanders, or that of the Yssel by Deventer, Zutphen, and

Kampen to the Zuyder Zee. These great rivers render very important service as water-ways, as the following statistics may show :—

Depth Slope of the Surface per (Minimum), 1000 ft.

At At

At Mean Level.

Mean jlowest Level! Level 1875. | 1874.

Hiegimebe cu. ft.) Ft. | Ft. 2483 | 1260 [88,250 | 5-081) 1:96) 941 161,775 | 7°44 | 3°70 410 {17,650 | 686 | 2:23 203} 8,825) 6:13 | 0°98

Second at Mean Level.

At Flood.

Discharge per

Maximum. Minimum.

0°10! to 0°1310°10! to 0°15! 0°10 to 0°15 [0°12 to 0°15

0°10 t0 0°13 10°1 to 0°14 Maestricht to Roermond…0°40 Roermond to

4 622:1:772

Venloto Grave 0:06 Grave to Creve- COUL.....6…0°05

0°88

541] 4,412 0-09

0-11 0:07

The depths are those of the fairway. The mean velocity seldom exceeds 4:9 feet, but rises to 6:4 feet when the river 18 high. Inthe lower reaches of the

streams the velocity and slope are of course affected by the tides. In the Waal

) These figures have reference to the Lower not to the Upper Rhine. Below Grave.

HOLE AWN D

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ordinary high water is perceptible as far up as Bommel; in the Lek the maximum limits of ordinary and spring tides are at Vianen and at Kuilenburg respectively, in the Yssel above the Katerveer and past Wijhe, and in the Meuse near Heusden and at Well. The following table shows the fall at ebb and flood tide respectively in the

rivers named :~— ; Ft. Tt. Lower Rhine and Lek, from Pannerden to

Mn… cr tcauinis iene catia esac 38°827 and 32°688 Waaland Merwede, from Pannerden to Hard-

sca oda aha wine woe RAMONES el easter 33°479 ,, 81°585 Guelderland Yssel, fron1 Westervoort to Mond

I ces valde eaeatic iiaiekeeie« «ntiovees 81:06 ,, 31:00 Meuse, from Grave to Woudrichem…..... se L3nO 9, 12956

The fall in the Meuse from Maestricht to Venlo is 107°05 feet.

The total length of the navigable channels is 1185 miles, but in certain places sand-banks and shallows not unfrequently impede the shipping traffic at low water during the summer. As a draw- back to the services rendered by the rivers must be mentioned the damage inflicted by their inundations and ice-drifts, for protection against which river-dykes were constructed as carly as the days of the Romans, and, in the lower reaches, more especially in the course of the 11th, 12th, and 13th centuries. It is ouly in a few places—for example, on the right-hand side of the Rhine—that elevated banks are found. Elsewhere betwecn the dykes and the stream lie “

fore- lands” or “ outwerders,” which are usually submerged in winter. That the rivers cannot at all times, any morc than the sea, be kept under control by the dykes is shown by the floods of 1775, 1776, 1784, 1799, 1809, 1820, 1861, &c.

The simaller streams are often of great importance. Except where they rise in the fens, they call into life a strip of fruitful verdure in the midst of the barren sand, and thus lead to the existence of many villages. The low-lying spaces at the confluences, being readily laid under water, lave been not unfrequently chosen as sites for fortresses. As a matter of course, the streams are also turned to account in connexion with the eanal system,—the Holland Yssel, the Gouwe, the Rotte, the Schie, the Spaarne, the Zaan, the Amstel, the Dieze, the Amer, the Mark, the Vecht, the Zwarte Water (Black-water), the Kuinder, and the numerous Aas in Drenthe and Groningen being the most important in this respect. have formed for themselves a network of canals, small and great, the united length of which amounts to 1522 miles. The canals differ greatly in character in the different provinces. In North Brabant and Limburg the Zuid Willemsvaart (South William’s canal) unites Maestricht via Weert aud Helmond with Bois le Due (’s Hertogenbosch), communicates by a side branch with Eindhoven, and has a connexion with the canal from Maestricht to Li¢ge. In Zealand the canals give the towns of the interior cominunication with the sea or the river mouths ; for example, canals lead respect- ively from Terncuzen to Sas van Gent and to Ghent, from Middle- burg to Vcere and from Middleburg to Flushing, from Goes to the Eastern Scheldt, and from Zierikzee also to the Eastern Schcldt. The canal from Hausweert to Wemeldinge has been cut to allow ships to pass between the East and the West Scheldt. In South Holland many canals serve the like purpose; thus the Voorn canal unites the Haringvlet with the New Meuse, which does not allow the passage of large vessels above Briel ; and similarly on account of the many banks and shallows in front of Helvoctsluys a new water- way has been opened up to Rotterdam by widening the channel of the Scheur north of Rozenburg, and cutting across the Hoek van Holland, The Goeree inlet unites that place with the Haringvlict. Of a different character is the Zederik canal, which unites the prin- cipal river of central Holland—the Lek—(at Vianen) by means of the Linge with the Merwede (at Gorcum). As Rotterdam has its uew water-way, so in North Holland Amstcrdam is connected with Nieuwe Diep by the

canal via Purmerend and Alkmaar; and, this canal being too shallow for the largest class of vessels in cargo, the canal to Ymuiden has been constructed across Holland-op-zyn- smalst (7.e., Holland at its narrowest). Amsterdam is further con- nected with the Vecht by the Keulsehec Vaart, and with the Lek and the Zederik canal via Utrecht by the Vaart Rhine. In the province of Guelderland Nijkerk inlet unites that town with the sea, and Apeldoorn communicates with Hattem north-east through the Grift canal and south-east with the Yssel through the Dieren canal. A totally different character belongs to the canals in the east and north-east of the country, where, in the absence of great rivers, they form the only watcr-ways which render possible the drainage of the fens and the export of peat, and unite the lesser streams with each other. Thus in Overyssel the Willemsvaart connects Zwolle and the Zwarte Water with the Ysscl, the Dedems- vaart counects the Vecht with the Zwarte Water near Hasselt, and a canal connects Almelo with Zwolle. In Drenthe the Smildervaart

Largely by means of these natural water-ways the Dutch Canals,

Lakes.

Climate.

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or Drenther Hoofdvaart unites Assen with Meppel, and receives on the eastern side the drainage cauals of the Drenthe fens (the Orange canal, the Beilerstroom, and the Hoogeveen Vaart), while the North Willemsvaart unites Assen with Groningen. In the pro- vince of Groningen the chief town communicates with Delfzij] and the Dollart both by the Damsterdiep and by the new ship canal, while the canal to Winschoten brings it into connexion with the flourishing fen colonies, such as Wildervank and Veendam, which have sprung up in the east of the province and in Drenthe. In Friesland, finally, there are three ship canals :—that from Harlingen to the Lauwer Zee via Franeker, Leeuwarden, and Dokkum ; that from Leeuwarden to the Lemmer, whence there is a busy traffic with Amsterdam ; and that from Stroobos in the east of the pro- vince (in connexion with Groningen) to Stavoren in the south- west. It would be superfluous to enumerate the barge canals by which almost all the large towns communicate with each other;

and it is equally unnecessary to mention all the lakes, which exist in great numbers, especially in Friesland and Groningen, and are conuected with rivers or streamlets. Those of Friesland are of note for the abundance of their fish and their beauty of situation, on which last account the Uddelermeer in Guelderland is also cele- brated. The Rockanje Lake near Briel is remarkable for the strong chalky solution which covers even the growing reeds with a hard crust. Many of the lakes are nothing more than deep pits or marshes from which the peat has been extracted.

The climate of Holland? is such as might be conjectured from its geographical position and its generally low level. Situated in the temperate zone between 50° and 53° N. lat., it shows a difference in the lengths of day and night extending in the north to nine hours, and there is a corre- spondingly wide range of temperature; it also belongs to the region of variable winds. The following table, from the observations of Professor C. D. Buys Ballot, the well-known director of the Meteorological Institute at Utrecht, shows the average temperatures and the barometric heights re- corded there during 1849-1878 :~

Month. Deck | Barometer. | Month, Ebene | Barometer. Cc. |Fahr.| Mil. Fess ©. |¥Fahr.| Mill. | Inches, atte anon 1°94 | 35°49 | 759°88 | 29-916 | July ….| 18°52 | 65°33 | 760°58 , 29°948 Feb. ....| 2°99 | 37°38 | 76120 | 29°968 || August | 17°96 | 62°32 | 760-11 | 29°925 March..| 4°96 | 40°92 | 758 95 | 29-879 || Sept. ...| 14°99 | 58°98 ; 760°70 | 29:948 April…) 9°39 | 48°90 | 759°71 | 29909 || Oct. .....] 10°39 | 50-70 | 758 88 | 29‘870 May…..| 18°10 | 55°58 | 759:90 | 29°917 || Nov. ....) 4°98 | 40°96 | 758‘97 | 29-880 June …| 16°99 | 62°58 | 760°90 | 29-956 || Dec. ... | 2°65 36-77 | 760°05 | 29°923

The mean annual temperature was 9°91° C.,, 49°83° Fahr.

How largely the westerly winds predominate is shown by the following statistics. On an average of ten years 5 per cent. of the winds were N., 5 N.N.W., 7 N.W., 6 W.N.W., 7 W., 10 W.S.W., 12 S.W., 7 8.8. W. (total 59 per cent.) and7 S&S, 585E, 55.E, 2ESE, 3 E., 6 E.N.E., 8 N.E., 5 N.N.E. (total 41 per cent.). The west winds of course increase the moisture, and moderate both the winter cold and the summer heat, while the east winds blowing over the Continent have an opposite influence. The following

table, derived from observations taken at Utrecht, shows that, as might be expected, the rainfall is large :—

or

Buildings and

HOLLAND

[CLIMATE,

Average Evaporation

(1855-64),

Rainy Days

(1848-78)

Average Rainfall] (1848-78).

Months.

Millim. 50°3 46°2 43°9 40°5 49°7 50°6 74°4 85°9 69°1 68°7 58°3 58°8

Inches, 1°98 1°81

172

1°59

1:95 1:99

2°93 3°38 Ne?) PAD)

“2:29

2°31

Millim. Inches. 8 0°51

0:91

1°99 38°43 4°89 5°28

4:94

4°62 aes 1°50 0°60 0°47

401 380 375 319 338 306

January February

Yearly average…| 810°2 31°88 695°4 27°37

Tt cannot be said that the climate is particularly good; indeed to strangers it is rather the reverse of pleasant. Fevers, colds, and, when proper precautions are not taken, chest disease and consumption, are results of the change- ableness of the weather, which may alter completely within a single day. The heavy atmosphere likewise, and the neces- sity of living within doors or in confined localities, cannot but exercise an influence on the character and temperament of the inhabitants. Only of certain districts, however, can it be said that they are positively unhealthy ; to this cate gory belong some parts of Holland, Zealand, and Friesland, where the inhabitants are exposed to the exhalations from the marshy ground, and the atmosphere is burdened with the sea-fogs. To what extent the healthiness of the different pro- vinces varies may be seen from the following table of the an- nual death-rate for the twenty-five years from 1840 to 1865 :—

Provinces. Males. Females. Both Sexes,

1 in 42°95 42°69 42°68 42°54 42°07 41°24 39°75

34:90

82°35 80°84 30°60

Lin 42°10 | 1 in 44°00 41°69 43°03 42°82 42°61 41°98 43°62 40°84 43°67 40°00 42°94 39°01 40°54 33°68 36°14 30°33 34°32 29°51 32°24 29°04 32°81

Groningen Overyssel Utrecht

North Holland

For the whole kingdom the annual death-rate was 1 in 36°73—that for the males being 1 in 35-49, and for the females 1 in 38:14.

That the density of the population must, apart from Densitt | other causes, increase through the acquisition and cultiva- of por

tion of new land, and that it visibly differs very greatly! according to the difference of the soil in the different provinces, may be seen from the following table, wherein the increase of the percentage of cultivable land and of the population is indicated :—

Orchards and

cn. Waste Lands. DiGn sera Caen Arable Land. Under Grass. Nursentes. Population.

1833. 1876. 1833 1876 1833, 1876. 1833. 1876. 1829. 1878.

Groningen 16 09 0°9 49°3 51°4 24°9 26°7 Ae ses 157,504 | 249,124
Friesland 11°2 0°8 07 15°6 16 59°2 59°3 0:3 0‘3 204,909 | 328,872 67°5 : 0°3 0°3 8:7 12°3 20°5 24°5 eas 0:2 63,868 | 117,026

Overyssel 44°5 : 0‘5 0°8 5°6 17°‘5 380°4 o22 0:08 071 178,595 | 273,770
Guelderland 32°4 4: 0-7 0°8 2°6 25°2 26°9 OnE El 1 0°9 309,793 | 463,840
11°9 9° 1°5 1°8 11 20°7 46°0 46°5 1‘5 16 182,359 | 191,370

15°7 0° 1‘5 15 4:4 13°1 56°3 56:0 0°4 0:4 413,988 | 667,946

6 4° 1°5 16 37 23°4 47°3 53°2 1 0‘8 479,737 | 796,109

9°5 6° 1) 1:2 4 58 21°8 Pale, 11 0°9 187,762 | 189,666

385°3 35″ 07 0°6 26°71 26°2 261 21°0 On2 02 348,891 468, 667

Oley O22 0°5 0°6 38‘6 41 9°6 10°9 2°9 a1 186,281 240,479

27°9 | 23°3 0‘8 O39 | 95-7 (68095 |) er 06 0°7 2,618, 487 |3,981,877

‘ See Dr F. W. C. Krecke, et Klimaat van Nederland, Haarlem, 1863-64, and the Jaarboek of the Kon. Ned. Meteor. Inst.

ation,

GOVERNMENT. |

The greater density of population in the Holland provinces as compared with Drenthe cannot be explained, however, merely by the character of the soil; the variety of in- dustries and the great number of large towns contribute to the inequality. All the towns with 100,000 inhabitants and upwards (Amsterdam, Rotterdam, and the Hague) are situated in the provinces of Holland; of the 36 comniunes with more than 10,000, 9arein Holland, none in Drenthe ; of the 85 communes between 10,000 and 4000, 9 are in Holland aud 2 in Drenthe. The reason why in the west, and especially in the district between Amsterdam and Rotterdam, there is such a clustering of large towns, only surpassed in a few parts of England and Belgium, is to be found in the facilities there afforded for earning a subsistence. Holland is emphatically a country of large towns. According to the census of 1869 there were forty-four which had a population of upwards of 5000. The greatest of all was Amsterdam, with 256,154 in- habitants; and next in order came Rotterdam, with 113,734. Two others had upwards of 50,000, the Hague and Utrecht, respectively 81,881 and 57,085. Arnheim, Leyden, Haarlem, Groningen, and Maestricht were all above 25,000; and Bois-le-duc, Delft, Dort, and Leeu- warden above 20,000. The five towns of Nimeguen, Gouda, Helder, Deventer, and Zwolle had each between 15,000 and 20,000; and Breda, Zutphen, Zaandam, Amers- foort, and Kempen were all above 10,000, though less than 15,900. Since that date many of these have considerably increased in size. In 1879 Amsterdam had about 300,000 inhabitants, Rotterdam 140,000, the Hague 100,000, and Utrecht 70,000.

As the density of the population varies within the nar- row limits of the Netherlands, so varies likewise the origin of the people. Although ethnographically the whole popu- lation belongs to the Indo-Germanic family, or more defi- nitely to the Teutonic branch of it, the descendants of

the Frisians may be clearly distinguished in the north-west. The mouths of the Meuse separate these from the descend- ants of the Franks, who pushed castward across the Meuse but never settled beyond the Waal, while the territory of the Saxons, who came later from the east, extends no further than to the Utrecht Vecht. The descendants of the Saxons consequently lie between those of the two first- named peoples, although naturally much commingling has taken place between Frisians and Saxons, and Saxons and Franks, especially in the towns and on the newly-acquired

or German Jews), though their influence is not unimportant,

with a literature of its own. It has not been at all satis- factorily determined in what parts of the Netherlands the reinains of a pre-German population are to be found, nor to what extent they are to be distinguished from the Ger- mans by the form of the skull; but investigations are being carried on in this department of inquiry, and a map is being prepared to indicate the boundaries of the various dialects.

_ The governinent of the Netherlands is regulated by the constitu- Govern- tion of 1815, revised in 1848, under which the king's person is in- ment.

violable and the ministers are responsible. The crown is hereditary in both the male and the female line according to primogeniture ; but it is only on the complete extinction of the male linc that females can come to the throne. The crown prince or heir apparent is the first subject of the king, and bears the title of the Prince of Orange. The king alone has executive authority. To him belong the ultimate direction of foreign affairs, the power to declare war aud peace and to make treaties and alliances, the supreme command of the army and navy, the supreme administration of the finances and of the colonies and other possessions of the kingdom, and the prerogative of mercy. By the provisions of the same constitution he establishes the ministerial departments, and shares the legisla- tive power with the first and second chambers. The heads of the departments to whom the especial executive functions are entrusted are eight in number,—

ministers respectively of the interior, of public works (the ‘‘waterstaat,” including trade and industry, railways, post-office, &c.), of justice, of finance, of war, of marine, of the colonies, and of foreign affairs. They are appointed and dismissed at the pleasure of the king, usually determined, however, as in all constitutional statcs, by the will of the nation as indi- cated by its representatives. The members of the first chamber are chosen by the provincial states from among those who bear the greatest burden of direct taxation in each province, the propor- tion of persons thus eligible being 1 to evcry 3000 of the popu- lation. North Brabant scnds 5, Gueldcrland 5, South Holland 7, North Holland 6, Zealand 2, Utrecht 2, Fricsland 8, Overyssel 8, Groningen 2, Drenthe 1, Limburg 8—or altogether 39. The duration of parliament is nine years, a third of the members retiring every three years. The retiring members are eligible for re-election. The members of the second chamber arc chosen in the electoral districts by all citizens of full age who pay direct taxcs varying according to local circumstances from 20 to 160

guilders. One member is clected for every 45,000 of the popula- tion, At present (1880) there are eighty-six; they must be at least

thirty years old, and they cease to be members if they take a salaried Government appvintment. They discuss all laws, and have the right of proposing amendments. Their term is fonr years, but they are re-eligible. All communications from the king to the statcs-gencral and from the states to the king, as well as all general measures relating to internal administration or to forcign possessions, are first submitted to the consideration of the coun- cil of state, which also has the right of making suggestions to the king in regard to subjects of legislation and administration, The king appoints the vice-president of the council, which con- sists of fourteen members; he is himsclf the president, aud can name councillors, to the number of not more than fifteen, for special service.

| lands. The representatives of the Semitic stock (Portuguese

The provincial administration is entrusted to the provincial Provin- states, which are returned by direct election by the same electors cial ad- as vote for the second chamber. The term is for six years, but ministra- part of the members retire every three years. The president of the tion.

nuinber only 50,000 or 60,000, of whom about 40,000 re- side at Amsterdam. The descendants of the three Teutonic peoples above named are very slightly distinguished from

each other by their physical, intellectual, and moral char- acteristics, and all the less so because the Dutch type is not itself strongly marked and bears the traces of foreign commixture ; for many Flemings and Brabanters settled in the country at the time of the revolt against Spain, many Germans, Englishmen, and Scandinavians during the pros- perity of the republic, and many Frenchmen after the revocation of the edict of Nantes. The differences most clearly discernible are in the old local laws, in the pecu- liar customs, and above all in the dialects. Among these last must be distinguished the Holland dialect (Hollandsch) Spoken in the provinces of Holland aud part of Utrecht ; the Zealand dialect (Zeeuwsch, in Staats Flanders inclin- Ing towards Flemish); the Brabantine (modified), also spoken in a part of,Limburg and the south of Guelder- land; the Lower“Rhenish, which is again subdivided into the Guelderland, the Overyssel, and the Drenthe dialects ; and, finally, the Groningen dialect. The peasant or country Frisian forms a completely separate language

assembly is the royal commissioner for the province. As the pro- vincial states only meet a few times in the year, they name a com- mittee of deputy-states to which the management of cnrrent general business is entrusted, and which at the same time administers the affairs of the communes. At the head of every commune stands a communal council, whose members are chosen by the inhabitants for a definite number of years. The president of the communal eouncil, the burgomaster, is named by the king in every instance for six years, and along with the magistrate to be chosen by and from the niembers of the council is charged with the ordinary administration. The provinces, as already stated, are eleven in number (the grand- duchy of Luxenibourg, over which the king has control, is not incorporated with the kingdom); the number of communes at 31st December 1878 was 1128.

The administration of justice is entrusted (1) to the high council, Justice.

the supreme court of the whole kingdom, which holds its sessions at the Hague, and is the tribunal for all high Government officials and for the

members of the states-general ; (2) to the five courts of justice for criminal cascs, and for appeal in more important police and civil cases; (3) to courts established in each arrondissement ; (4) to cantonal judges appointed over a group of communes, whose jurisdiction is restricted to claims of small amount (nnder 200 guilders), and to breaches of police regulations, and who at the same time look after the interests of minors.

XIL. — g

Finance.

Army.

Navy.

Fortifi- cations,

middle of 1878, and of the expenditure for 1877, is taken from the Staats Courant for 1879, No. 6 :—

Revenue, Expenditure. Direet taxation cccarcaasereee £2,000,748 | Royal Household ….....s.seerrrveeee £72,916 Export and import duties … 381,942 | Superior authorities of the state 49,112 FXCISC cceceeeccenceenscarcsereeee 248,293 | Department of foreign affairs… 50,311 Gold and silver wares ….-+ 30,440 oA Justice… 49,201 Indireet taxation …....-. 1,703,364 as interior fe : State COMAINS ...ccsecererrcerres 131,281 fe marine POSt-OFFICE aceesecreceeserenees 302,583 | National debt……..... Government telegraphs ….. 69,290 | Department of finanee State lotteries …c.cswcrererrs 36,146 0 WAT vocceeeceeseee ek 895,068 Game and fisheries . 12,534 ” waterstaat ….....2,043,588 Pilot AUCS ..evererceerveveeeeeaes 76,746 ” eolonies……..... 124,724 Unanticipated expenses…..... 3,163 Totall..ccos £7,992,480 Total…..,. £9,871,792

The following table shows the revenue and expenditure for the and the contributions received from the

provinces and communes, Dutch Indies :—

f1.95,669,434

$7,972,457

£1.96,131,448 £8,010,954

96,257,333 8,021,444 94,424,869 7,952,080

94,144,872 7,953,739 99,107,750) 8,242,312

Revenue

Expenditure «0.00.0 7,373,383 The amount expended on the war and marine departments is given above. ‘The standing army consists of infantry, cavalry, artillery, enginecrs, and endarmerie, forming together a force of 60,000 men, with 3000 horses. Less than half, however, is kept in arms the whole year. The soldiers are raised partly by voluntary enlist- ment, and partly by conscription. In 1876, 1877, and 1878 the conscripts amounted to 10,808, 10,878, and 10,772 respectively. They are selected from the males who have entered their twentieth year and are not exempted for special reasons. The term of service in time of peace is five years, but may be extended in time of war; the conscript recruits, however, so far as the number of volunteers permits, are kept under arms for a few months only. A portion of the aunual contingent is appropriated to the marine service. In the communes there are ‘‘schutterijen,” militia “ trainbands,”’ which in time of war serve for the defence of the country, and at all times for the maintenance of order. Their actual term of ser- vice lasts only five years, but every male inhabitant from his twenty-fifth to his thirty-fourth year is liable to be called out. On the Ist of January 1879 there were of these on duty, in 88 com- munes, 212 companies, or 41,714 men, including 578 officers.

The strength of the navy in 1879 was—home service, 17 ships with 3162 men; Indian military marine, 23 ships with 1793 hands; auxiliary squadron, 4 ships with 900 hands; in the West Indies, 2 ships with 206 men. ‘The fleet for the protection of the ‘‘sea- gates,” or estuaries, coasts, roadsteads, and

rivers on the Ist August 1878 amounted to 61 ships, of which 28 were armour-plated; 21 ships for general service, of which 2 were armour-plated; besides 7 guardships and tenders and 7 training vessels. ‘The strength of the marine corps was in July 1878 returned at 2055, and the number of guns carried by the navy at about 500.

In accordance with the law of April 18, 1874, the military and naval defences are supported by a system of fortification which em- braces the following lines :—the Nieuwe Hollandsche water-line from the Zuyder Zee by Utrecht, the Lek, and the Merwede, through the district of Altena to the New Merwede; the line of the Guelders valley and the Lower Betuwe; the lines of the Hollandsche Diep and the Volkerak, of the mouth of the Meuse and the Haringvliet, and of the Helder; the works for the protection of the river-crossings and the reception of troops on the Yssel, the Waal, and the Meuse;

Groningen.) Friesland.| Drenthe, | Overyssel. sa Protestants ……. 90°5 90 93°5 66°5 61 Roman Catholics 9 4:0 32°0 38 aspoadoagaoodddd B25) ieee Hf

From this it appears that in the north-east the Protestant creed greatly preponderates, and that the majority of the Roman Catholics are found in the south, while both are fairly represented in the central provinces. That in the last fifty years there has been over the whole population a steady increase in the proportion of Protest- ants and Jews, and a corresponding decrease of Roman Catholics, is evident from the following table :—

Protestants, |Roman Catholics. Jews. Unknown.

Number. Perct.) Number. Peret.) Number. Peret.| Numb. Per ct, 1,544,887 59°11 |1,019,109 38-99 46,408 178 J 012 1,704,275 59°58 | 1,100,616 38-48 §2,245 1°83 3,814 ‘011 1,824,860 59°69 | 1,171,924 3834 58,626 192 al “469 005 2,007,026 60°65 | 1,234,486 37-30 63,790 1:93 3,826 -012 2,193,281 61:27 | 1,313,052 3668 68,003 1:90 5,193 015

HOLLAND

The following statement of the revenue for the year ending the |

94,001,483 | 108,932,184

7,833,456

_ 94,460,038

[RELIGION,

Contri-

Communal. butions of

Provineial.

Years Duteh Revenue. |Expenditure.| Revenue. |Expenditure. Indies. 1867 L2719/09C £264,646

1868 273,464 244,325 1369 261,205 242,998 1870 322,909 315,477

1871 314,760 290,127 iis tats 1872 278,983 261,537 | £3,502,640 £3,169,554

1873 312,193 297,250 3,758,827 3,479,869 1874 322,256 322,256 3,547,573 3,277,634

1875 390,647 385,963 | 5,180,414 | 38,565,700 | 1,925,973

We append the total receipts of the ten years 1868-77, including the ordinary revenue, the Indian contributions, balances from pre- vious budgets, proceeds of sale of domains, &c., and the total ex- penditure for the same years, including, besides the ordinary budget, the outlays in payment of annuities, in funding and dis- charging debt, in railway extension, &c. :—

1872.

109,507,189 9,125,599 108,033,523 9,002,793

105,263,637 8,772,469 99,352,356 8,279,363

119,887,578 | 105,783,172 | 102,238,081

8,811,097 8,519,756

112,635,219 | 118,461,511

9,386,268 9,871,709

9,077,673 108,932,183 9,077,673

118,911,278 9,909,278

the Amsterdam line from the German Ocean, near Ymuiden, to the Zuyder Zee and the Nieuwe Hollandsche water-line; the southern water-line from the Meuse above St Andries to the Amer below Geertruidenberg; and the works on the Western Scheldt. As already mentioned, in many cases the fortifications can be supple- mentcd by extensive inundations.

The inhabitants of Holland enjoy full religious as well as political Relig J : \e 8

liberty. Not only is the free profession of his religious opinions guaranteed to every one by the constitution ; the same proteetion is accorded to all the various ecclesiastical bodies; all the adherents of the different creeds have equal civil and political rights, and equal claims to publie offices, dignities, and appointments; and all de- nominations possess perfect freedom of administration in everything relating to their religion and its exercise.

At the census of 1869 the population was classified thus as regards religion :—

Congregations.

Low-Dutch Reformed ..,.....:06+ 1,956,852 with 1,848 ANVENIGISINS) pptogodaecds caancsentiuonosoauent 10,258 ,, Wy Remomeunambe men enseice (aden rie 5,486 ,, 20 Christian Reformed…..... ..... 107,128 ,, 390 Baemies oss .cusascorssrerseseetesetmer csr 44,297 ,, 126 Evangelical Lutherans .,....., 57,545 ,, 50 Old Wuibheramsee oi…) tiertjesce ties eee LORS 2550, 8 IM [onANTIEIT eg soe ceonsonoenoopaconboo02d00NC

BLil op 2 English Episcopalians ….....+. 456 ,, 2 onixole, (C)oyusi@) \ipennconononokosedaonoescusna Sa a: 1 English Presbyterians….....++5 att COW 4

Total Protestants…....0..+« 2,198,284 with 19638 RomanO@atMolics … qerecccccsessseseeenrs 1,307,765 ;, 982 OMGNCatWOlIGS! Gaasceseseseiesicsrerstis a bees 55 16 (GmcekaOlrumel ya. .-vee nsec ricteiects 32) 2 ThowaDutchv Jews… scunenssenvewenetees 64,748 _,, 167 Portuguese Jews …..:sceees ceseeseneee ByO25 5, 2

(Wins Oyitte seer: eMart sale eGe es

Altogether there are about 2800 churches and chapels. The fol- lowing table shows the percentage of Protestants, Catholics, and Jews in the several provinces :—

North Holland.

South Holland.

Utreeht, Zealand. eo Limburg. || Holland.

——

62 67°5 73°5 735 DTS 2°5 59 37 Pall 24°5 26 ‘0 880 OeO 39 1 50 20) 0°5 0°5 0‘5 | 2

‘The government of each of the Protestant bodies (with the excep- tion of the Baptists, who have no central authority) is in the hands of an assembly or ‘‘synod” of deputies from the provincial judi- catures. Inthe case of the Reformed Church the affairs of the community are entrusted to the provincial synods. The provinces are subdivided into “classes,” and the classes again into “ eircles” (ringen), each circle comprising from 5 to 25 congregations, and each congregation being governed by a ‘‘church council” or session. The provincial synods are composed of ministers and elders deputed by the classes ; and these are composed of the ministers belonging to the particular class and an equal number of elders appointed by the local sessions. The meetings of the circles have no administra- tive

character, but are mere brotherly conferences. The financial management in each congregation is entrusted to a special court (kerk-voogdij) composed of “ notables” and church wardens. In every province there is besides, in the case of the Reformed

ns,

ientific id art of the sciences and the fine arts, the following are strictly national ‘stita- —the royal academy of sciences (1855), the royal Netherlands

EDUCATION. |

Church, a provincial committec of supervision for the ecclesiastical administration. For the whole kingdom this supervision is entrusted toa common ‘‘collegium” or committee of supervision, which meets at the Hague, and consists of 11 members named by the provincial committee and 3 named by the synod. Some congregations have within recent years withdrawn from provincial supervision, and have thus free control of their own financial affairs. As a Roman Catholic province Holland is divided into 5 dioceses—the arch- bishopric of Utrecht, and the suffragan bishoprics of Haarlem, Bois le Duc, Breda, and Roermund, which are severally divided into deaneries (dekanaten).

The various denominations are subsidized by the state. total thus expended in 1877 was £65,654.

Primary education is being more widely diffused year after year, and at the same time receiving increased support from the state.

While in 1868 there were 3675 schools, attended by 437,311 pupils, and conducted by 10,375 teachers, the corresponding figures for 1877 were respectively 3813, 522,861, and 12,292; and while in 1858 the state, the provinces, aud the communes expended only 1,278,894 guilders (=1s. 8d. sterling) on the schools, the expenditure for cda- cation in 1877 was 7,271,484 guilders. In 1875, 1876, and 1877 there were 841, 848, and 847 in every thousand boys between six and eight years of age at school, and 786, 796, and 803 out of every thousand girls; and from nine to eleven

years of age 881, 890, and 910 out of every thousand boys, and 812, 815, and 827 out of every thousand girls. There is thus a steady decrease of non-attendance. The improvement of primary education is shown by the growing decrease in the proportion of conscripts who could neither read nor write: from 1846 to 1858 this was 22°82 per cent.; 1859-62, 19°79; 1863-67, 17°74; 1868-71, 15°46; 1872-76, 13°13; and in 1876 only 11°99 per cent. There are no bilingual schools in Holland, and teachers discourage the use of the dialects, !

For secondary education there were in 1877 39 ‘‘burgher schools” (partly day schools, partly night schools), with 372 teachers and 4319 pupils; 43 industrial art and technical schools, with 203 teachers and 4145 pupils; 53 higher class ‘‘burgher schools,” having courses of 5 or 6, of 4, and of 3 years, with 620 teachers and 4000 pupils; the polytechnic school, with 12 professors and 13 teachers, and attended by 319 pupils; and the national school of agriculture at Wageningen, with 100 pupils. Schools of navigation were maintained at Rotterdam, Amsterdam, Helder, Terschelling, Vlieland, Harlingen, Schiermonnikoog, Groningen, Delfzijl, and Veendam, with a total of 536 pupils and 26 instructors. The secondary school for girls (with courses of 5 and of 4 or 8 years) were 12 in number, and had about 900 pupils and a teaching staff of 140. For secondary education in 1876 the state expended 933,721 guilders, the provinces 24,329, and the communes 906,618, making a total of 1,864,668, or £155,389 sterling.

The higher education. is provided for in the four universities of Leyden (founded in 1575), Utrecht (1686), Groningen (1614), and Amsterdam (1877), with 45, 34, 31, and 41 professors, and 627, 401, 189, and 389 students respectively. Instruction is also given by about 100 teachers to 1400 pupils in varions seminaries and theo- logical schools; the number of Latin or grammar schools and gym- uasia in 1877-78 was 51, with 240 teachers and 1503 pupils. The total cost of the higher education amounted to 1,057,694 guilders.

A national institution at Leyden for the study of the languages, geography, and ethnology of the Dutch Indies has given place to communal institutions of the same nature at Delft and at Leyden, founded in 1864 and 1877. Military and naval instruction are pro- vided for by corps schools, by a

training battalion at Kampen, an artillery training company at Schoonhoven, and scientific courses for the several corps, by the royal military academy (founded 1828), the ‘‘schoo] of war” for officers, the royal navy institute at Wil- lemsoord (1856), and by training ships at Amsterdam, Rotterdam, and Helvoetsluys for apprentice boatswains, sailors, cabin-boys, pilots, and engineers. For the education of medical practitioners, civil and military, the more important institutions are the national obstetrical college at Amsterdam, the national veterinary school at Utrecht, the national college for military physicians at Amsterdam, and the establishment at Utrecht for the training of military apothecaries for the East and West Indies.

Of the numerous institutions in Holland for the encouragement

The

meteorological institute (1854), the national academy of the plastic arts, the royal school of music, the national archives, the royal picture gallery at the Hague, and the national gallery of modern Masters in the Pavilion at Haarlem, the national museum of an- tiquities, the national museum of ethnography at Leyden, the toyal collection of curiosities at the Hague, &c. Provincial scien-

1 See Geschiedkundig overzigt van het lager onderwijs in Nederland, Leyden, 1849 ; De wed op het lager onderwys, met aanteekeningen door 8. Blaupot ten Cate en A. Moens, Gron., 1879; and Dr J. Stein Parve, Organisation de Pinstruction primaire, secondaire, et supérieure dans le roy. des Pays-Bas, Leyden, 1878,

tific socicties exist at Middelburg, Utrecht, Bois le Duc, and Leeuwarden, and there are private and municipal associations, institutions, and collections in a large number of the smaller towns, Among others of general utility are the society for the service of the community (Maatschappij tot nut van’t algemeen, 1784), and the geographical society at Amsterdam (1873), Teyler’s Stichting or foundation, and the society of industry at

Haarlem, the royal institute of languages, geography, and ethnology of the Dutch Indies (1851) and the Indian society at the Hague, the royal institute of engineers at Delft (184), the association for the encouragement of music at Amsterdam, &c.

The agricultural methods vary according as the soils are sandy or Agricul- In the first the ‘‘three-crop ” system (two crops of rye and one ture.

clay. of buckwheat) differs widely from the careful Flemish method of eul- tivation, in which even the pastures aremanured. On the clay there is still greater variety both in the modes of treatment and in the amount of care bestowed on weeding and draining. The produce of the land is thus very different in the various provinces for the same soil. The general valne of the crops is gradually rising, as may be seen from the following statistics, in which the higher figures cannot be altogether ascribed to the greater extent of land brought under cultivation: improved education and the inflnence of local associations for the advancement of the interests of agriculture have contributed to the result. In 1851-60 there was under cultivation in grain and other marketable crops 1,637,512 acres, in 1861-70 1,770,890 acres, and in 1871-75 1,860,850 acres. The total value of the crops was £8,311,666 in 1851, £13,445,672 in 1862, £15,870,586 in 1871, and £19,001,598 in 1875. Of the total acreage just men- tioned about 25°9 per cent. was devoted to rye, 17°3 to potatoes, 13°5 to oats, 8°6 to buckwheat, 7 to beans and pease, 7‘1 to barley, 5 to rape seed, 3 to flax and hemp, 0°8 to madder, 0°6 to garden seeds, 0°2 to tobacco; while the rest is set apart for the special cul- tivation of chicory, hops, beetroot, mangold wurzel, market-garden produce, flowers, pharmaceutical plants, grapes, &c. The woods or rather the plantations, covering 6 per cent., consist—of (1) the so-called forest timber (opgaandhout; French, arbres de haute futaie),—including the beech, oak, elm, poplar, birch, ash, willow, and coniferous trees ; and (2) the copse wood (akkermaal or hak- hout),—embracing the alder, willow, beech, oak, &c. This forms no unimportant branch of the national wealth. Stock-breeding varies in the different provinces.

both quality and numbers; sheep are best in Texel and North Holland, and most numerous in Drenthe, where their preponderance is due to the number of commons which still remain unbroken up. Pigs, for which the low lands

are peculiarly favourable, are reared in all the provinces. Goats, mainly kept for their milk, are most numerous in Guelderland and North Brabant. Guelderland, Fries- land, Zealand, and Groningen possess the greatest number of horses, Poultry, especially fowls, are generally kept. Bee culture is mainly carried on in buckwheat and heath districts (Guelderland, Overyssel, Drenthe, the Gooiland, and Utrecht). A bee market is held at Veenendaal in Utrecht. Stock-breeding is mainly carried on along with dairy-farming and hay-making on the alluvial soils ; and there the cereal crops give way to fodder plants. The permanent pasture in recent years extends to some 24 millions of acres, and clover, artificial meadows, &c., occupy about 400,000. ‘The production of milk, butter, and cheese amonnts to the value of 90 millions of guilders (1s. 8d. cach); butcher mcat produces 35 millions, and wool, hides, fowls, and game 10 millions; while horse-breeding also yields a total of 10 millions. In 1870 the number of horses was 252,200; cattle, 1,410,800; sheep, 900,200; goats, 156,900 ; and pigs, 329,100; whereas in 1876 the horses numbered 268,000 g cattle, 1,439,257; sheep, 891,090; goats, 150,000; and pigs, 352,000. The value of this live stock in 1870 was £22,087,375, and in 1876 £29,799, 905.

In the densely peopled Netherlands, with no cxtensive forests, Game.

hunting forms rather an amusement than a means of subsistence, the only exception being the pursuit of wild-fowl (ducks, geese, and snipes). Hares, partridges, wood-snipes, finches, and thrushes are the only form of game; a few roebucks and deer are found in Overyssel and Guelderland ; rabbits are numerons in the dunes, and sea-gulls’ eggs are gathered in the north of Texel, which conse- quently bears the name of Eijerland (7.e., Eggland).

Much more important as a means of subsistence are the fisheries, Fisheries,

which, however, are not at present in a flourishing state. They are divided into the ‘‘ deep-sea fishery” (buitengaatsch) in the Ger- man Ocean, and the ‘‘inner” fisheries (binnengaatsch) in the Zuyder Zee, the rivers of Zealand, and the inland waters. The deep-sea fishery may be further divided into the great (the so-called ‘salt- herring”) fishery, mainly carried on from Vlaardingen and Maassluis, and the ‘‘fresh-herring” fishery, chiefly pursued at Scheveningen, Katwijk, and Noordwijk. The deep-sea fisheries also yield cod and flat fish. In the Zuyder Zee flat fish, herrings, anchovies, and

shrimps are caught off the islands of Urk and Marken and the coast towns of Vollenhove, Kampen, Harderwijk, Huizen, and Vollendam; and there are oyster banks near Texel. In tlic Zealand rivers oysters

For cattle, Live Friesland and North and South Holland take the lead as regards stock.

Trade.

68

and mussels are obtained at Bruinisse, Philippine, and Graauw, and anchovies at Bergen-op-Zoom , while salmon, perch, and pike are caught in the Meuse, the Lek, and the Merwede, and eels in the Frisian lakes. The fisheries not only supply the great loeal demand, but allow exports to the value of £250,000.

The numbers of men and vessels employed are as follows :—

Vessels Men. Great “salt herring” fishery o…...scererseserceeceerees 114 1678 German Occan fishery …..ccccrressererseecrceerseraec nes 410 2965 Duy der Zee fishery…crssccsrsrercrrerseesenrenaeeres 1282 3269 Groningen and Fricsland fishery ….~~/del>..~~.:seersrsrerees 183 524 Zealand fishery …coeceeeeeeice eee cere oe 472 ‘1026 MOtaleveyseeseeseevercerss=swen 2461 9462 Iu 1877 the produce (in ewts.) amounted to— Home . . Consumption. Exported Herrings, cured and salte 10,648 274,670 Red herrings ……-..eeerees 291 97,757 Various fresh sea-fish . 72,941 83,546 Salt COD ....ccccceessoeceees 2,020 19,957 GHIMPS..0.-cseersecoessrsssererosestetsereecesconsetsseecereceree tee 15,174 Other smoked, salted, or dried fish……..sseseeeres 1,231 102,522 Oysters, lobsters, ANd CLADS.....eereeeeeeseees 405 13,694 MUSSEIS ....+-ccesccecscessseresceessseeesenorescscoucaeseracereneres 2,015 161,813 Stock-fish ….cscccecscresse senses cessnee cance: eeesanee seneseeeees 56,160 31,790 TRAVEVSHISED o.0ccc0.0 coves: seoesoeeucsne #0) vecsnrose sonnercirereess 2,518 29,471 TAGE BNE CS opopetee avenpebietne ceenoendos eopeemonce cngasoccnce ie: 21,253

148,613 851,557

‘To obtain a correct idea of the trade of the Netherlands greater attention than would be requisite in the case of other countries must be paid to the inland traffic. this in definite figures, but an estimate may be formed of its extent from the number of ships which it émploys in the rivers and canals, and from the quantity of produce brought to the public markets or daily transported by thousands of carts and delivered by the peasant direct to the salesman. Of the market traffic, even in places of secondary rank, the following facts may give some idea. here are yearly brought to market at Gorcum and Hoorn from 10,000 to 13,000 head of cattle ; at Barneveld, more than 20,000 sheep ; at ‘Alkmaar about 10 million and at Hoorn 54 million tb cheese ; at Delft 14 million 1b butter and 2 million 1b cheese ; at Meppel 3 million 1b butter; at Leeuwarden 9 to 11 million Ib butter, 2 million tb cheese, and 74 million tb of grain and seeds; at the Overyssel markets Zwolle, Deventcr, and Kampen, and at Steenwijk and Almelo, 74 million tb butter; at Utrecht 770,000 and at Groningen 330,000 bushels of grain and seeds. The turn-over at the cattle market at Leyden in 1877 was £639,278. In 1877 there

were 700 steamboats afloat on the rivers and canals in the service of

the inland traffic.

The foreign tradc, although less than it was formerly, still con- tinues to be considerable in proportion to the size of the country. In 1878 the merchant marine consisted of 1277 vessels of 958,652 cubic metres (the register ton is equal to 2°83 cubic metres); of which 79 were steamships of about 200,000 cubic metres. In 1877 there entered 8166 vessels with 3,000,000 tons, and cleared 4936 vessels with 1,800,000 tons; to which must be added 20,500 vessels with 2,400,000 tons, which came down the rivers in cargo from foreign countries, and 11,850 vessels, with 1,500,000 tons, which passed the frontier upward bound.

The extent of the trade and its increase or dcerease from year to year is shown approximately in the following table :1—

Total Imports for

Total Transit Years. Imports. | Home Use. } Exports. Trade. ao £ £ £ £
1846-1850 17,183,000 500 18,660,000 GO 1851-1855 27,458,000 |
18,418,000 23,500,000 9,083,000

1856-1860 34,918,000 25,208,000 29,292,000 9,583,000 1861-1865
40,542,000 80,000,000 33,833,000 8,750,000 1866-1870 48,183,000
38,375,000 40,125,000 9,500,000

1871 65,418,000 | 48,918,000 | 54083,000 | 15,750,000 Tons £ Tons. Tons,

1872 51,500,000 1,467,000 439,000 1873 56,813,000 1,742,000 592,000
1874 55,918,000 1,572,000 627,000 1875 59,918,000 1,614,000 569,000
1876 3,780,000 59,418,000 1,717,000 705,000

1877 3,949,000 | 62,583,000 1,712,000 594,000

The six ports which take the largest share in the foreign trade are Amsterdam, Rotterdam, Helder, Dort, Schiedam, and Harlin- gen; at a considerable distance follow Groningen, Middelburg, Vilaardingen, Purimerend, Zaandam, Edam, Zwolle, Kampen, and Delfzijl. The returns of recent years show best in the case of the South Holland towns ; but it must be kept in view that the direct imports, the so-called ‘proper trade,” are most important at Amster- dam, while a great part of the commercial business at Rotterdam

1 The value of the total imports, ex ; f , exports, and transit trade cannot be given after 1871 in conscquence of a royal decrce of 1872, providing for the siegplinedtion

of the formalitics of fiscal registratio ir i +3 aan eertain cases given only in Lalewelae virtue of which the quantities are in

HOLLAND

It is impossible to state the value of

[INDUSTRY AND TRADE.

belongs to the commission and transit trade. For exports Rotter- dam is by far the most important, sending out neatly thriee as much as Amsterdam.

‘An examination of its lists of exports and imports will show that Holland receives from its colonies its spiceries, coffee, sugar, tobaeco, indigo, cinnamon ; from England, Prussia, and Belgium its manu- factured goods and coals ; grain from the Baltic provinces, Archangel, and the ports of the Black Sea; pease and beans from Prussia, timber from Norway and the basin of the Rhine, yarn from England, wine from France, hops from Bavaria and Alsace ; while in its turn it sends its colonial wares to Germany, its agricultural produee to the London market, its fish to Belgium and Germany, and its cheese to France, Belgium, and Hamburg, as well as England. The briskest trade is carried on with Germany and England ; then follow Java, France, Russia, the United States, &c.

The mineral resources of Holland give no encouragement to in- Indus.

dustrial activity, with the exception of the coal mining in Limburg, tries, the smelting of iron ore in four furnaces in Overyssel and Guelder- land, the use of stone and gravel in the making of dykes and roads and of clayin brick works and potteries, the quarrying of stone at St Pietersberg, &c. Still the industry of the country has de- veloped itself in a remarkable manner sinee the separation of Belgium, and that in spite of the lack of iron and coal, and the rivalry of other productive forms of lahour, The greatest activity is shown in the cotton industry, which especially flourishes in Twenthe (in Overyssel) and also at Haarlem and Veenendaal. In the manufacture of woollen goods Tilburg ranks first, followed by Leyden, Utrecht, and Eindhoven ; that of half woollens is best de- veloped at Roermond and Helmond. The cotton and woollen manu- factures together furnish employment to 20,000 hands. The linen manufacture is carried on especially in Meierij van den Boseh, Helmond, Boxtel, Woensel, &c. Fiven iron works and machine factories have greatly increased since the free importation of the raw matcrial was permitted—for example, at Ainsterdam and at Fijenoord opposite Rotterdam ; and in this department more than 6000 workers are employed throughout the country. It need hardly be said that shipbuilding is of no small importance in the Nether- lands, not only in the greater but also in the smaller towns along the rivers and canals; and it

is naturally associated with rope- spinning and other auxiliary crafts. Among the less noteworthy branches of industry are the making of cigars and snuff, especially at Eindhoven, Amstcrdam, Utrecht, and Kampen ; diamond-cutting at Amsterdam ; beetroot-sugar refining at Amsterdam ; paper- making in the Veluwe, on the Zaan, and in Limburg , shoemaking and leather-tanning in Brabant (Langstraat); mat-plaiting and broom-making at Genemuiden and Blokzijl ; the manufacture of glass, crystal, and earthenware at Maestricht ; carpet-weaving at Deventer ; working in gold and silver in North and South Holland and on a smaller scale at Schoonhoven ; and the distillation of brandy, gin, and liqueurs at Schiedam, Rotterdam, and Amsterdam. The number of hands occupied in the manufactories throughout the whole of the Netherlands is estimated at about 100,000, of whom three-fourths are settled in North and South Holland, North Brabant, and Overyssel. The following table shows how great has been the industrial development of the last thirty years :—

Workshops with Steam aoa han

Engines.

Horse- Power.

Steam

Engines Boilers.

364

983 1,815 2,873 5,140

6,537 ihe ” ae 15,824 A. ae a 20,918 a

76,271 707 87,338 622

4,691 5,396

617 822

2,393 2‘612

As the development of trade and industry and agriculture was Commit | promoted by the improvement of education and the abolition of ication” transit and export dues and the lessening of import dues, so also has it been advanced by the improvement of the means of communi- cation, and of the postal and telegraph systems. The waterways of the country have been already considered. The roads are divided into national or royal roads, placed directly under the control of the “‘waterstaat” and supported by the state; provincial roads, under the direct control of the states of the provinces, and almost all supported by the provincial treasuries ; communal and polder roads, maintained by the communal authorities and the polder boards; and finally, private roads. The system of national roads, mainly constructed between 1821 and 1827, but still in proeess of extension, brings into connexion nearly all the towns. The con- struction of railways was long deferred and slowly accomplished : the “ Holland Railway ” was laid down in 1839-47, the Rhine Rail- way in 1843-56, the ‘Aix-Maestricht-Ianden line in 1853-56, and the Dutch-Belgian in 1853-54. All the other lines, ¢.9., that from Maestricht to Liége, the Central Railway, the Nimeguen line, the Almelo-Salzberg line, the State Railway system, &c., have been con- structed since 1861, a large number of them having been opened about 1863 and 1864. A great improvement has in consequence been cffected in the communication. The town of Utrecht, which

is the centre both of the country. and of the railway system, may be approached by six different lines. From Amersfoort, Zutphen, Zwolle, Hengelo, Boxtel, Rosendaal, Venlo, and Maestricht lines stretch out in four directions, while Groningen, Leeuwarden, Meppel, Enschede, Hilversum, Amsterdam, Haarlem, Uitgeest, the Hague, Rotterdam, Moerdijk, Breda, Tilburg, and Eindhoven are each the meeting place of three lines. With foreign countries the Netherlands communicate from Groningen by the Winschoten and Nieuwe Schans line ; from Overyssel by the Almelo-Salzberg line ; from Guelderland by the Arnhem-Emmerik and Nimeguen-Cleves lines, from Limburg by the Gennep-Goch, Venlo-Gladbach, and Maestricht-Aix-la-Chapelle lines ; and in the south with Belgium by the Terneuzen-Ghent, Hulst-St-Nikolaas, Rosendaal-Autwerp, Tilburg-Turnhout, Kindhoven- Hasselt, Maestricht-Liége, &c. Among the lines at

present projected or in construction may be mentioned the works at Amsterdam by which the Holland Railway along the Y is to be brought into conuexion with the Eastern Rail- way and the Rhine Railway; the line between Zaandam and Enkhuizen via Purmerend and Hoorn; the Groningen-Delfzijl line ; and those from Zwolle to Almelo, and from Rotterdam or Schiedam by Viaardingen to Maassluis and the mouth of the New Waterway.

The extent of the mail service routes was 26,898 miles in 1873, ‘ce and 29,773 miles in 1877; and in the same years the post-office od tele- staff numbered 3026 and 3525 respectively. The number of letters “aphs. (exclusive of newspapers, printed matter, and official letters), which : in 1850 was only 7,000,000, had increased by 1877 to 50,000,000. The number of inland post-cards rose from 4,000,000 in 1871 to about 10,000,000 in 1877; the number of inland newspapers was in 1860 about 5,000,000, and in 1877 abont 27,000,000. The follow- ing are the statistics for 1853 and 1877 of the national telegraph system, originated in 1852 :—

Messages.

Receipts, | Expenditure,

Miles Line.| Miles Wire.

346 80,050

£11,775

104,775

45,700

£4,825

2,985,000

65,900

The Dutch colonies, originally mere trading communities, have so much increased in importance, through the eultivation of their various vegetable products, the reclaiming of their waste lands, and the working of their mines, that they eannot be left altogether out of view in considering the trade and finances of the mother country. The Dutch eolonies in the East Indies, situated between 30° N. lat. and 6° S. lat., aud between 95° and 141° E. long., eomprise an area of 600,000 square miles, with a population of about 23,000,000, among which are 35,000 Europeans, 319,000 Chinese, 15,000 Arabs, and 10,000 other immigrant Asiatics. For eonvenience of super- vision they are divided into the Great Sunda (Soenda) Islands, the Smaller Sunda Islands, and the Moluccas—a division which is based neither on political nor on ethnological considerations, nor on the phenomena of aninial or vegetable distribution. The Great Sunda Islands are Java, Sumatra, Celebes, and Borneo, all with subsidiary islands ; the Smaller Sunda Islands comprise Bali, Lombok, Soem- bawa, Flores, Sandalwood Island, and Timor; the Moluccas include Halmaheira, Ceram, Buru (Boeroe), Amboyna, Banda, and the south-eastern groups, besides Western New Guinea. The West Indian ci of Holland include Dutch Guiana or the govern- ment of Surinam, and the Dutch Antilles or the government of Curagoa and its dependencies (St Eustatius, Saba, the southern half of St Martin, Curagoa, Bonaire, and Aruba), a total area of 60,000 square miles, with 90,000 inhabitants, of whom a small portion are Europeans, and the rest negroes and other people of colour, Chinese,

onies,

The oldest inhabitants of Holland of whom anything is known were of Celtic origin; so much may be gathered from scanty remains found in cairns, from a few proper names, such as Nimeguen (Nimwegen) and Walcheren, and from the Druid altars found in that island. In Ceesar’s day the whole district between the Rhine and the Scheldt was occupied by Belgz, the bravest of Celts, while the Betaw, the “good meadow,” the Insula Batavorum, was peopled by a portion of the Germanic tribe of the Chatti, and pro- vided first the stoutest foes and then the most serviceable allies of the Roman empire. But if the Batavi were the most distinguished of the Germanic tribes in the country, the “free Frisians” (see Fristans), who filled the whole northern portion of it, were by far the most important; In addition

to them, and mostly on the borderland, were others, Usipetes, Bructeri, Sicambri, Chamavi, Eburones, and the like, of whom we know little but the names.

and otheremigrants. The East Indian possessions yield an annual average contribution, as already stated, of over £800,000; the West Indian, on the other hand, require aid to the amount of £500,000 or £600,000 yearly.

The character of the Dutch people may be largely explained National

by their history, the conformation of the country, their means of charac- subsistence, their strife with the sea, and their struggles to maintain ter. their independence against Spain and against hostile neighbours. The love of freedom and independence is the leading element in their character ; the peculiarity of their soil has constrained them

to be industrious and economical; their contest against the sea, their wars, and their distant expeditions, have trained them to bravery and self- possession ; and their liberality has been stimulated

by the disasters which, falling upon one to-day, might be the lot of any other to-morrow. Of course the virtues of the Dutch are apt

to be distorted to vices: their eomposure not seldom becomes in- difference ; their tendency to reflexion makes them laggard in action and deficient in enterprise ; their love of liberty degenerates into an extravagant sense of independence that is more concerned about rights than about duties. Sociability is by no means a dominant characteristic of the Dutch; they speak little and laugh less. But their appearance and expression give a poor indication of their ster- ling qualities, Their general sincerity and uprightness are evident to every one whose own respectability gains him admission, on terms

of familiar intercourse, to the respectable circles of Dutch society.

Bibliography.—The first place {n a bibliography of Holland is due to the Alge- meene Statistiek van Nederland (Leyden, 1st part, 1870, 2d part,1873), a work of much vaster compass than ts indicated by its title,—consisting, as it does, of separate articles on every scientific aspect of the country, contributed by specialists of high authority. The geodetic portion, for example, is furnished by J. H. A. Kuijper; Dr H. Hartogh Heys van Zouteveen treats of the soil, rivers, islands, &c., the geology, and the fauna; the flora is described by Professor Hugo de Vries, Dr C. M. van der Sande Lacosta, and Professor W. F, R. Suringar; the meteoro- logy is by Professor C. H. D. Buys Ballot, the account of the provinces and communes by Professor S. Vissering, and the vital statistics by M. von Baum- hauer, As supplements to this, their greatest work, the Government Society for Statistics also publish Byjdragen en Mededeelingen. voor die Stat. van het Kon, der Nederlanden; Staatkundig en Staathuishoudkundig Jaarboekje; and Stat. Jaar- boek voor het Kon. der Nederlanden. The following are convenient manuals :— Dr A. A. van Heusden, Handboek der Aardrikskunde. &c., van het Kon. der Nederlanden, Haarlem, 1866; J. Kuijper, Nederland, zijne Provincien en Kolonien, Leeuwarden, 1878; Rifkens, Aardriykskunde van Nedeviand, Groningen, 1879; M. H. J. Plantenga, Militaire Aardrikskunde van Nederland, new ed., 1880; J. Craandijk and P. A. Schipperus, Schetsen met pen en potlood, Haarlem, 1874, The exeellent works of W. C. A. Staring—De Bodem van Nederland, Haar- lem, 1856-60; Natuurkunde en Volksvlit van Nederland, Amsterdam, 1870; and Voormaals en thans, Haarlem, 1877—are of a more descriptive cast. For the fauna and flora of the country the reader may consult Professor Schlegel, De dieren van Nederland, llaariem, 1862; C. A.J. A.Oudemaus, De Flora van Neder- land, Haarlem, 1871-74; Van Halls, Neerlands Plantenschat, Grou., 1855. Among the more recent of foreign publications in regard to Holland the following rank high:—Alph. Esquiros, La Neerlande et la vie Hollandaise, Paris, 1859 (English translation, Dutch at Home, London, 1863); J. G. Kohl, Reisen in den Niedevlanden, Leipsic, 1850; Dr A. Wild, Die Niederlande: thre Vergangenheit und Gegenwart, Leipsic, 1862; Henry Havard, La /follande Pittoresque: Voyage aux villes mortes du Zuiderzee, Paris, 1874; Les Frontiéres Menacees, Paris, 1876; and Au ceur du Pays, Paris, 1878; and Edmondo de Amicis, Olanda (Dutch translation by D. Lodcesen, Nederland en zijne bewoner’s, Leyden, 1876). The most important maps and atlases are the topographic maps of the

kingdom of the Netherlands, issued by the War Department, the Hagne, 62 sheets, lithogr. scale 1:50,000; the Waterstaats Kaart van Nederland (1:50,000). issued by the Ministry of the Interior under the supervision of P. Caland and H. Rodi de Loo; W. C. H. Staring's Geologische Kaart, executed by the topographical office of the War Department (1:200,000); Aaaré voor de Natuurkunde en Volksvlit, and Landbouwkaart van het Kon. der Nederlanden (1:200,000); J.

~ Kuijper, Gemeente Atlas van Nederland, naar offcieele bronnen ontworpen (1205

communal maps and one large general map); and Natuur en Staathuishoudkundige Atlas van Nederland. There arethree good gazetteers: —A. J. van der Aa, Aardrijksk. Woordenboek, Gouda, 1855; §. Gille Heringa, Handwoordenboek van Nederland, 3d ed., Utrecht, 1874; and P, H. Witkamp Aardrijksk. Woorden- boek van Nederland, Thiel, 1871-76. (C. M. K.)

PART JI.—HISTORY.

From 28 to 47 a.p. a struggle went on between the Their

Romans and the Frisians, which ended in the latter year in struggles

f with

the complete reduction of the tribe by the vigour of 2

Domitius Corbulo ; the Batavi and Frisians were probably, in the earlier days of their connexion with Rome, admitted, if not to the more honourable position of "socii," at least to the lower grade of "auxilia," their relation to the empire doubtless varying from time to time. This friendly state of things did not last long; for in 70 a.p. Rome had dis- missed her Batavian cohorts, and had turned Claudius Civilis, the ‘‘ Mithridates of the West," into a bitter foe. This remarkable patriot had served for many years in the armies of Rome, and had learnt the secrets of the imperial strength and weakness. Taking advantage of the wrongs of Germans and Gauls, and skilfully using

the divisions within the empire, he displayed high statesmanlike ability, while his energy and success in war placed him in the

rank of great captains. He declared for Vespasian against Vitellius, and grouped together Celt and Teuton in an effort to sweep the tyrant Roman out of Gaul. At first all went well with them, and the Romans were driven out of all modern Holland, Belgium, and from the left bank of the Rhine as far as Alsace. Then the Roman power began to assert itself once more. An able general, Cere- alis, was sent into the north-west, and after a chequered and exhausting struggle, in which both suffered greatly,

These districts were again subdivided into marks or villages, each with its headman, who acted as judge in lesser and local cases. These gaus were Frisian in the north, Saxon in the middle (about Drenthe, &c.), and Frankish in the

In the great partition of Verdun (843), Lothar, eldest Changes gon of Louis the Pious, became lord of North Brabant (as lor ~ it is now called), Guelderland, Limburg, and all modern rr ae Belgium; Charles the Bald got Flanders and part of centu

the Batavian hero gave way. Peace was made on easy terms; Civilis laid down arms, and the Batavians sub- mitted and resumed their old position towards Rome, The Batavian island was lined with forts, and became for the Romans the frontier between Gaul and Gernian; much as in far later days the Spanish Netherlands were the barrier between the Dutch aud the French.

For a time all was quiet on this north-western fron- tier, till late in the 3d century the Franks appeared (see Franks). In the course of the 5th century the Salian Franks had occupied a great part of the Netherlands, and when Hlodowig (Clovis) was lifted (481) on his warriors’ shields, they were possessors of South Holland, the Veluwe, Utrecht, Brabant, Antwerp, Limburg, Liége, Hainault, Namur, and Luxembourg. After his death (511)

these districts for the most part belonged to the Austrasian kingdom, Behind the Salians came the Saxons, who had made themselves felt in the Batavian island by the middle of the 4th century; in the course of the 5th and 6th centuries they had settled firmly in Overyssel and Drenthe, lying between the Frisians to the north and the Franks to the south. There they shared, in alliance with the Frisians, the varying fortunes of that struggle against the Frankish power which lasted 400 years, and was ended only by the genius and persistency of Charles the Great. Spreadot The first Christian church in the Netherlands was founded Christi- in the time of Dagobert I., who had reduced the Frisians anity. and Saxons at the town of Wiltenberg, afterwards Utrecht,

between 622 and 632. But the true apostle of the Nether- lands was Willibrord the Northumbrian, first bishop of that see (695). He made Utrecht the centre from which Christian light spread across a wide circle of heathendom; and under the protection of Pippin of Heristal, the new faith was so firmly planted in those parts, that when Willibrord died Limburg, North Brabant, Utrecht, and other districts had accepted the faith of the Franks. After Willibrord, Christianity had in that part of Europe another stout champion, Wolfram of Seus, who had nearly persuaded the Frisian king, Radbod, to be a Christian ; and lastly in 755, St Boniface, ‘“‘the apostle of the Germans,” was martyred at Dokkum in Friesland while preaching among the heathen. Towards the end of the century the stern methods of Charles the Great completed the conversion of the Netherlands. Govern- As an integral part of the Frankish empire, the land ment and under Charles and his immediate successors was divided

The Franks.

ae into “landschafts” and “ gaus,” ruled over by dukes and country, Counts, by the side of whom the church also asserted her

territorial rights. Hence sprang the dukedom of Brabant, the countships of Flanders, Holland, Guelderland, and the bishopric of Utrecht; and these, under the later Carolings, were independent in all but the name. Lcclesiastically the northern portion of the Netherlands, with South Holland and part of Zealand, was under the bishop of Utrecht ; while the eastern districts were under the Saxon bishops of Miinster and Osnabriick, and the

southern parts under the Frankish bishops of Cologne, Liége, and Doornick. The original dukedoms were subdivided politically into countships, and geographically into gaus; each gau had a chief town, girt with a wall, wherein count and judges administered justice; such towns were also market-places.

Zealand, while Louis the German had whatever lay on the right bank of the Rhine: this district (called Lotharingia in the days of his son Lothar II.) thus became a border- land between Gaul and Germany. When Lothar II. died without heirs in 869, his uncle Charles the Bald got all the northern Netherlands, with Friesland; but the Mersen agreement (870) redistributed these lands,—to Louis the German the districts south of the present Zuyder Zee, including Utrecht and the Veluwe ; to Charles the Bald, Holland, Zealand, and modern Belgium. Eventually in 879 Louis, son of Louis the German, got these districts also. In 912 they accepted Charles the Simple of France as overlord; in 924 Henry I. brought them again under German lordship; afterwards Otto the Great granted them as a fief to his brother Bruno, archbishop of Cologne, who, dividing the land into Upper and Lower Lotharingia, set Gottfried, count of Verdun, over the latter as duke, and himself took the title of archduke. Thus, during this period, the Netherlands from 843 to 869 were a part of Lotharingia (as it came to be called); from 869 to 870 they were under French lordship, from 870 to 879 partly French partly German, from 879 to 912 altogether Ger- man, from 912 to 924 French again, and finally after 924 German.

Throughout this time the country was swamp below and The woodland above; and though much forest was cleared North from time to time, it was still a difficult tangle, with little™™ communication except down the rivers and by the old Roman roads. Yet, backward as they were, the Nether- lands were rich enough to attract the Northmen, who ravaged the shores and river sides, and carried with them southward many a willing Saxon and Frisian warrior. Under Louis the Pious they got firm footing on the coast, and received the district from Walcheren up to the Weser as a group of fiefs under the emperors ; they even took and sacked Utrecht. In 873 Rolf, founder of Normandy, seized Walcheren; in 880 the Northmen took Nimeguen, and spread up the left bank of the Rhine as far as Cologne; in the chapel of the Great Charles at Aix they stabled horses and held heathen

revel, till bribed to withdraw by Charles the Fat. Their great leader Siegfried had the emperor's daughter to wife, with lands in Friesland ; he was willing to become a Christian, though this put no stop to his demands; 'as the lands granted him hitherto produced no wine," he demanded also Rhine towns and districts for the sake of their vintages. His father-in-law, however, sent instead men to murder him, and, this being done, the lord- ship of the Northmen in the Netherlands came to an end.

The effect of these viking incursions on Frankish feudal- ism was great. "Eighty years of plunder and murder," says Gerlache (Zssaz sur les grandes Epoques, p. 94), 'had turned the fields into a wilderness; the towns rose like oases in the desert; the wealth of the monasteries perished ; the people were either slain with the sword or had taken to the sword as robbers; all the elements of political life, kingship, nobility, clergy, were confounded together, and every tie of civil society relaxed." The im- poverished natives took refuge under the nobles, whose power made great advance. Now arose, too, a new title of nobility, that of margrave,—each margrave being bound to defend a piece of frontier, receiving in return an almost

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dill VI,

COUNTS OF HOLLAND.]

complete independence : such was the marquis of Antwerp, who guarded the mouth of the Scheldt. The towns also became as sanctuaries against the ravager; the serf who took refuge there presently became free; the burghers began to trade, and found encouragement in their traffic even from the Northmen themselves. Thus the whole district came to be covered with pros- perous towns ; it was also divided into independent lord- ' ships, among whicli the countship of Holland, as it soon after- wards was called,

was the most prominent and important. The title “count of Holland” does not appear in history till the 11th century. In the latter part of the 9th cen- . tury there was a certain Count Dirk, to whom, early in the 10th, Charles the Simple granted the abbey of Egmond near Alkmaar. Of his history almost nothing is known; he was dead before 942, as there exists still a document I. of that year signed by Dirk II. Dirk II. was a man of weight ; he got for his younger son the archbishopric of Treves, and Arnulf his elder son married a kinswoman of the emperor Otto II. . He himself received in 983 a broad district, that now covered by the Zuyder Zee, from Texel to the north, and the mainland southward down to Nimeguen. He died in 988; and Arnulf was count till 993. His son, Dirk III., a boy, on his accession found things in great confusion; the fiefs held under Frauce were gone, and much besides. But the young count was full of vigour, and grew at last so strong that in 1018 the emperor ordered the duke of Nether Lotharingia to crush him. Dirk, however, completely defeated his assailant, and not only retained the disputed lands and powers, but added

thereto Bodegrave, the Merwede, and Swammerdam, as | It is here that the true |

fiefs of the church at Utrecht. history of Holland begins; for Dirk III. now firmly settled himself in this district, and became lord of the rich wood-land (“ Holt-land,” ¢.¢., Holland) on the Rhine and Meuse.

Having also subdued the Frisians and set his brother over |

them, he next went on pilgrimage to Jerusalem, and after his return in 1034 ruled in peace till his death in 1039. . His son, Dirk IV., was also a man of vigour ; he began the long strife with the counts of Flanders as to the lordship over Walcheren and the other islands of Zealand; the quarrel was important, as dealing with the borderland between French and German overlordship. This strife, which lasted 400 years, did not at first break out into actual warfare, because both Dirk and Baldwin V. of Flanders had a common danger in the emperor Henry IIL., who in 1046 occupied the lands in dispute; but while other opponents gave in, Dirk, after the manner of his house, stood out, and in the winter of 1047 with his

army, and dictated his own terms. In 1049, in a fresh contest with the bishop of Utrecht and his allies, Dirk met with his death at Dort. His brother, Floris I., suc- ceeded, and carried on the quarrel; in 1061 he was slain on the battlefield, after having won a decisive victory – over the bishop, His son, Dirk V., was a child, and the neighbouring princes thought the end of the house of Holland at hand; and though the boy had stout friends, especially Robert “the Frisian,” who had married his Widowed mother, his prospects were at first very gloomy, The battle of Cassel, however, in 1072, in which Robert the Frisian defeated Philip of France and Richilda of Flanders, secured his possessions for Dirk, who henceforth saw better days, and ruled in peace till his death in 1091. I. His son, Floris IL, the Fat, had also peace, and at his death in 1122 left Holland in great prosperity. His widow, Petronilla of Saxony, governed for her young son Dirk VL, and continued the joint resistance of Holland and Saxony to the Franconian emperors. But when, on the death of Henry V., Lothair of Saxony became emperor, this quarrel

came to an end, and the fortunes of the house of Holland rose greatly ; the Frisian Ostergow and Westergow were transferred from the bishop of Utrecht to Count Dirk in 1125. The Hohenstaufen, on the contrary, favoured the bishop, and gave back the two “gows”; and thus, with gain and loss, Dirk VI. ruled till he died in 1157. It was in his time that Holland sent out her first colonists ; invited by Adolf of Holstein and Albert the Bear of Bran- denburg, Hollanders settled on the Elbe and the Havel, and by their skill in reclaiming marshlands, and their thrift and vigour, created a flourishing district out of a waste of wood and water.

Floris IIL., the next count, allied himself with Frederick Barbarossa, thus reversing the traditional policy of his house. He was less fortunate than his fathers; the count of Flanders carried off a slice of his territory ; he scarcely held his own against West Friesland and Groningen; his reign was marked by the great flood of 1170, which swept over Holland, Friesland, and Utrecht, and helped to form the Zuyder Zee. Later in life Floris followed the emperor on crusade, and soon after the death of the latter, perished in 1190 of pestilence at Antioch. His son, Dirk VIL, had a stormy time, losing rather than gaining in the long- run. He died in 1203, leaving an only daughter, Ada, with whom came up the question as to female succession to a male fief. Zealand mainly declared for William, the late count's brother, while Holland went with Ada; by 1206, however, William had beaten down all opposition, and was undisputed count. He sided with the emperor Otto IV, and was present at Bouvines (1214), where Philip Augustus crushed the allied forces of Otto, John of England, landers, Holland, and Brabant, Soon after this William changed sides, and, attaching himself to Philip Augustus, accompanied Louis to England. After King John's death he joined the fourth crusade, in which his men distinguished themselves greatly at the siege of Damietta in 1219. Returning thence he reigned in peace till his death in 1224, His reign is notable by reason of the civic charters he granted,—one to Geertruidenberg in 1213, another celebrated one to Middelburg in Zealand in 1217. These charters were the models on which later ones were framed ; they secured the existing liberties of towns, gave the burghers the right of being ruled by law, and estab- lished equal justice within the walls.

Floris Ill.

Dirk VII.

William

William was succecded by Floris IV., murdered at Corbie Floris

in 1235; his son, William II., was a man of mark. Pope Innocent IV. having deposed Frederick IJ., and wanting a prince to set up against the Hohenstaufen, thought that the

| young count of Holland might serve, and accordingly had light boats took the imperial fleet, ruined the imperial |

him eleeted king of the Romans by an assembly composed chiefly of German ecclesiastics. He took Aix-la-Chapelle, and was there crowned king in 1248 ; and after Frederick's death in 1250 he had a considerable party in Germany. His foreign ambitions were, however, crossed by troubles at home, and before he received the imperial crown he perished in West Friesland, going down, horse and armonr, through the ice. It was he who fixed the seat of govern- ment at the Hague. His successor was Floris V., a babe. The father had been a young man of unusual promise, ruined by German politics; the son was destined to play a considerable part in Netherland history. Hitherto Holland had dealt only with smaller neighbours, Flanders, Fries- land, Utrecht, or Guelderland ; henceforward she takes part in European questions, interfering in the great strife be- tween Edward I. of England and France. For when he came of age Floris allied himself closely with the English king, and secured great trading advantages for his people ; the staple of wool was placed at Dort, and the Hollanders and Zealanders got fishing rights on the English coast. To balance the power of the nobles, which more and more

IV. William II,

Floris V.

John f.

The in- depend- ence of Holland.

Constitu- tion of hercities.

took the form of oppression, he also granted charters to towns (notably to Amsterdam), and forwarded their growth. In 1296, finding that Edward of England was dealing with his rival of Flanders, Floris joined Philip the Fair of France; but this act and his scverities towards the nobles led to a conspiracy, to which he fell a victim ; the burghers and people, who knew

him to be their best friend, took such vengeance on his slayers as permanently reduced the power of the nobles.

John L, his son, was in England when his father was murdered; he was a feeble boy in body and mind, married tothe daughter of Edward I His reign was a struggle between Zealand, led by Wolfart van Borselen, and Holland, guided by John of Avennes, the young count's guardian and next heir. In 1299 Van Borselen was killed by the Hollanders, and soon after Count John died. John of Avennes was at once recognized as count by the Hollanders, and with John I. ended the first line of counts, after a rule of nearly 400 years. Europe has perhaps never seen an abler series of princes ; excepting the last, there is not one weak mau among them; they were ready fighters, brave crusaders, handsome well-built persons, with high chival- rous gifts tainted with corresponding chivalrous vices ; they were all ready to advance the commerce of the country ; they were the friends of the people, the supporters of the growing towns. 'They made their marsh lands fertile, and raised Holland to be a companion of kings.

During this time Holland became independent of the imperial authority. The fragments of Nether Lorraine, Holland, Guelderland, Utrecht, Brabant, and Flanders paid little heed to their nominal lord; Holland especially, so far from the centre of the empire, so nearly forgotten in the greater troubles of Italy or Switzerland, was left to herself. She made her own laws, imposed river-dues (a recognized imperial right), named her own officers, held high court of justice, coined money, made peace or war at will. Even the de jure authority of the empire over Holland is a matter of doubt, much debated by publicists and historians, The independent development of the country took, as we have said, a municipal form ; and as the constitutions of her cities have throughout affected her history, they demand some consideration. Before the 14th century there were in Holland no estates, nor any general political life; the count was all powerful. Over the country districts he set his '' baljews " or bailiffs, and in towns aud villages his "schouts" or local judges, In the 138th cen- tury, when any greater matter had to be discussed in a city, all citizens were summoned by ring of the great bell to the public square, and there decided the question by democratic vote. Justice was administered "' by a man's peers," according to the Saxon code in the east, the Frisian in the north, and the Frankish or Salian in the south,— each

district having also its several uses orcustoms. ‘Taxa- tion for the count’s benefit was styled his “beden” or prayer for supplies, and fell chiefly on the towns. And as the towns paid most, and were generally built on the count’s lands, they claimed his protection, receiving charters and liberties from him in return for their dues and levies of men. In time the vague civie democracy gave place to an oligarchical government. While the Flemish towns were opposed to their feudal lord, in the north it was the other way ; the counts of Holland were with the cities against the other classes of society. Consequently, though the Dutch towns began later, they in the end enjoyed far more steady prosperity than their southern neighbours. Thus under William IJ. and Floris V., Dort and Delft, Haarlem, Alkmaar, Middelburg, Leyden, Schiedam, and others began their prosperous career. Each of these cities was at first ruled by the count’s “‘schepenen” or judges, supported by councillors, one from each quarter of the town, from whom

sprang the title of burgomaster, by which they became known in later days. The “sclepenen” administered jus- tice, while the councillors or burgomasters attended to civil affairs, and by degrees threw the judges into the back- ground. Peace and defence were entrusted to a local militia, armed with the cross-bow. Dort was the earliest of these prosperous towns ; it enjoyed a very strict staple- right; the commerce of the northern districts was com- pelled to pass through its market. Two centuries later came the prosperity of Amsterdam, and with it the European fame of Dutch butter and cheese; then the wealth arising from the herring-fishery, of which the centre was Enkhuysen. In the 14th century the chief towns had joined the Hansa, and though that exclusive body in the 15th century ejected them, they far more than recovered the loss of their trade through the newly opened worlds of India aud America.

When Jolin of Avennes succeeded in 1299 as first count John of the house of Hainault, the Hollanders were willing to Avam | receive him, the Zealanders not; and a long struggle be- tween the provinces ensued. In 1301 he coerced Utrecht juto alliance, and got the bishopric for his brother Guy. In 1304 the Flemings were driven out of Holland, and John II. was for a few

months real lord of the county. He died that year, and was succeeded by his son William Willa| IIL, “the Good” (1304-1337), who made peace with Ml. Flanders in 1323, settled the outstanding quarrel between Holland and Zealand, united the Amstelland and its city Amsterdam to his territories, encouraged civic life, and developed the resources of his country. He also entered into close relations with the states of Europe, having married Johanua of Valois, niece of the French king; m 1323 the emperor Louis the Bavarian wedded his daughter Margaret, and in 1328 his third daughter, Philippa of Hainault, was given to Edward III. of England. William III. was in all respects a great priuce, and an acute states- man. In 1337 he died, and was succeeded by his son William IV., who was killed fighting against the Frisians Willa in 1345. He left no children, and the question as to the!V. succession now brought on Holland a time of violent civil commotions. The county was claimed by Margaret, William’s eldest sister, as well as by Philippa of Hainault, or, in other words, by Edward III. of England. Margaret Marga eventually succeeded, siding with the older nobles, and being, therefore, not. well received by the towns. These are the days in which came up the famous parties of “ Kabbeljaus” and ‘ Hoeks,” the ‘Cods” and_ the “Hooks,” the fat burgher fish and the sharp steel-pointed nobles who wanted to catch and devour them. After much buffeting and many changes of fortune, Margaret resigned her lordship in 1349 in favour of her second son William, Willi put again resumed it in 1350. Then the struggle between V- nobles and cities broke into open war. Edward III. came to Margarct’s aid, winning a sea fight off Veere in 1351; a few weeks later the Hooks and the English were defeated by William and the Cods at Vlaardingen—an overthrow which ruined Margaret’s cause. She made peace with her son in 1354, and died two years later. He, however, shortly after fell mad; so that in 1358 the Hooks had to call in his younger brother, Albert of Bavaria, to be stadt- Albett holder or “ruwaard” in his stead; he ruled well, and re- Baval stored some order to the land. In the latter part of his life he went over to the Cods, a step which led to another outbreak of civil war which lasted until 1395. In 1404 he died, and was succeeded by his son William VI. who Williaa upheld the Hooks with all his power, and secured their 4 ascendency. He died in 1417, leaving only a daughter, Jacoba (or Jacqueline), wife of John of France, who died Jaco™ that same year. Again was Holland rent with civil strife ; the Hooks, as before, readily accepting a female sovereign,

while the Cods declared for John of Liége. Jacoba was granddaughter of Philip of Burgundy, who behaved very ill towards her; her romantic and sad life has rendered her the most picturesque figure in all the history of Holland ; she struggled long against her powerful kinsfolk, nor did she know happiness till near the end of her life, when she abandoned the unequal strife, and found repose with Francis of Borselen, ruwaard of Holland, her fourth husband. Him Philip the Good of Burgundy craftily seized, and thereby in 1433 Jacoba was compelled to cede her rights over the counties of Holland, Zealand, Friesland, and Hainault. Consequently, at her death lip ofin 1486, as she left no children, Philip seized on all her lands. He already held much of the Nether- is4y- lands; he had inherited Flanders and Artois, had bought Namur, had seized Brabant, with Limburg, Antwerp, and Mechlin; lie now got Holland, Zealand, and Hainault, with a titular lordship over Friesland ; a few years later he be- came lord also of Luxembourg. By this incorporation with the possessions of the house of Burgundy, the commercial and artistic life of Holland was quickened, but political liberties suffered ; for the rule of the ‘‘good duke” was far from being good. It was a time of luxury and show, of pageants and display, of the new and brilliant Order of the Golden Fleece (1430), and of the later days of feudalism, with all its brilliancy, corruption, and decline in the presence of the new monarchical spirit of Europe. Duke Philip on his accession declared that the privileges and constitutions of Holland, to which he had taken oath as ruwaard for Jacoba, should be null, unless he chose to confirm them as count. From that moment till the latter part of the next century the liberties of the Netherlands were treated with contempt. Holland, however, at first rial contented herself with growing material prosperity : her , herring fishery, rendered more valuable than ever by the “curing process discovered or introduced by Beukelzoon, brought her fresh wealth; and her fishermen were un- consciously laying the foundations of her maritime great- ness. It was in the days of Duke Philip that Lorenz Koster of Haarlem contributed his share to the discovery of printing ; the arts and learning of the Renaissance began to flourish greatly. The Burgundian dukes rivalled their contemporaries the Medici; under then grew up the Flemish school of painters, headed by the Van Eycks and Memling ; architecture advanced as stately churches and town-houses were

built ; the dukes collected priceless manu- scripts, founded libraries, and encouraged authors. But this speedy growth in art and letters belonged more to Flanders and Brabant than to Holland or Zealand.

In short, throughout the Burgundian time Holland plays but an insignificant part; and it may merely be remarked that the friendship of the dukes for the nobility did that class more harm than their hostility to civic liberties hurt the towns; for the lavish waste of Philip's court impoverished the nobles, and the wars of Charles destroyed them. After their days the Netherlands nobility were never again powerful. The church also suffered: it was enriched and corrupted by Philip, and was consequently very loyal to him ; but his favour instead of strengthening it made the Reformation necessary. The cities, though oppressed and heavily taxed, grew stronger ; and, when Duke Charles perished at Nancy, they at once stood out for their rights,

of and obliged his sole heir the duchess Mary, not unwillingly, to grant them the "Great Privilege " of March 1477, which aflirmed the power of the cities and provinces to hold diets, and reserved to the estates a voice in the declaration of war, and authority to approve of the choice she might make of a husband. It was declared that natives alone might hold high office; no new taxes should be laid without the approval of the estates; one high court of justice was

established for Holland, Zealand, and Friesland ; the Dutch language was made official. Thus came to an end the centralizing despotism of the Burgundian dukes. This period is also remarkable for a reconstruction of the civic government, and for the appearance of the States The General, first summoned 'by Philip the Good. In the States

states of Holland many nobles sat in person, though they Se")

had but one collective vote. At first all towns, larger and smaller, also sent representatives, but after a time the smaller ceased to appear, and only such larger cities as Dort, Haarlem, Leyden, Amsterdam, Gouda, were repre-

sented, each having one vote. The president was the “advocatus,” or “ vogt,” of the country, afterwards styled “the pensionary,” an officer regarded as the champion of the estates against the counts. In Zealand and elsewhere, clergy, nobles, and cities sat separately, each order having a single vote. The estates, under the Burgundians, had little power ; they could not even control the taxation. Duke Philip in 1464 summoned them to meet him at Bruges, and, though some of the more distant held aloof, the majority obeyed. These States General, however, expressed no national feeling or union of the provinces : that was a far later state of things.

After Mary of Burgundy had granted the Great Privi lege, the provinces warmly supported her against Louis XI.; they approved her union with Maximilian of Austria in Maxi-

August 1477, though it brought them no rest; for the old milian of parties still survived, and Hooks and Cods fought savagely 4¥S*2.

in almost every town. Maximilian had allied himself with the Cods, and the Hooks were defeated at Leyden and Dort, and finally in their last stronghold, Utrecht, of which city the archduke was made temporal protector in 1483. Before that time (March 1482) Mary of Burgundy had died, and Maximilian, acting for his son Philip, became governor of the Netherlands. After fresh Hook and Cod troubles at Haarlem, he finally made peace with France in December 1482, and after the death of Louis XI. brought the Flemings to complete obedience by the peace of Frank- fort in 1489. The provinces were still very uneasy, partly through the turbulence of the Hooks, partly because of the autocratic character of his rule, and partly through the so- called ‘‘ Bread and Cheese” war, caused by famine in the northern provinces. War with France also complicated matters, and the government over the Netherlands was entrusted to Albert of Saxony. In 1494 Maximilian, having been elected emperor, laid down his office as guar- dian, and had Philip the Handsome declared of age. He was at once accepted by Brabant, and the estates of Hol- land even let him sweep away the Great Privilege. He ruled over them quietly, and got back their English trade. In 1496 he married Joanna of Aragon, daughter of Fer- dinand and Isabella, and afterwards heiress to the new monarchy of Spain. On Philip’s death in 1506, leaving two sons, Charles and Ferdinand, and four daughters,

Maximilian again became guardian for his grandson Charles, then but six years old; he named Margaret of Savoy, his daughter, governess of the Netherlands in 1507.

In 1515 Charles was declared of age, and received the Count

homage of Holland and Zealand, Brabant and Flanders, Charles

as Count Charles II. In consequence of his friendly rela- —” comrade and trusted follower, was wedded to Claude, sister V.). of Philibert, prince of Orange, and from this union springs the great house of Orange-Nassau. On his accession to the Spanish and imperial thrones successively, Charles continued his aunt Margaret of Savoy as governor of the Netherlands, with a privy council to assist her.

He brought all the provinces under one hand, having in 1524 become lord of Friesland by purchase, and in 1528 acquired the temporalities of Utrecht. He now ruled

XIT. — 10

. . ° . emperor tions with Francis I. of France, Henry of Nassau, his ae

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over seventeen provinces: that is, over four duchies— Brabant, Guelderland, Limburg, and Luxembourg ; seven counties—Flanders, Artois, Hainault, Holland, Zealand, Namur, and Zutphen ; the margraviate of Antwerp; and

five lordships—Friesland, Mechlin, Utrecht, Overyssel, and Groningen, with the Ommeland.

After the death in 1530 of Margaret, who had con-

tinued to act for him with her accustomed wisdom and prudence, Charles V. at first treated the provinces with studied moderation: he redressed some of their griefs, re-

formed the administration and the coinage, issued sump-

tuary edicts, regulated their commerce, while he also re-enacted the severe laws against heresy, and gave full powers to the supreme court of Holland —a body completely

Mary of under his control. He then appointed his sister Mary, Hungary gueen of Hungary, regent of the Netherlands. She had at regent. first no easy task; for the provinces had on hand a war with Denmark, and Anabaptist troubles at home ; before

long also she had to ask for increased supplies ; and while

the Hollanders granted a large annual subsidy, they refused

her a hearth-tax which she demanded. Similar monetary questions in 1539 produced that famous struggle between

the court and Ghent which was only ended by the personal intervention of the emperor; after punishing severely the rebellious burghers, he passed on into Holland,

and in 1540, in defiance of the acknowledged rights of the provinces, established a foreigner, René of Chalons, prince

House of of Orange, as stadtholder of Holland, Zealand, and Utrecht. Orange- He thus forced on them that great family which has Nassau. both shed lustre on the history of Holland, and defended there and elsewhere the liberties of Europe. René himself

ruled but a short time ; he perished in France in 1544, leaving his territories toa little cousin, William of Nassau.

In 1545-46 the estates gave the emperor men and

money for his war against the Protestant princes of Germany ; after Miihlberg, the Netherlanders hoped that

they might now be freed from the foreign troops Charles

had quartered among them. He, however, had other plans

on hand, and determined fo place permanently in the pro-

vinces 4000 horse, entirely at his own orders ; he also laid

before the estates in 1548 a scheme of incorporation, which

aimed at making the Netherlands an integral portion of the

empire, under the name of the circle of Burgundy, and which

he abandoned only after the refusal of the seven electors to

Philip of make Philip king of the Romans. In 1549 he revisited the Spain. provinces and called Philip thither also, that they might see their future master; the young prince swore to main- tain their rights and customs ; and so began between the Netherlands and him the formal relation which under cir- cumstances elsewhere related (vol. v. 416, 417) became so real on October 25, 1555. After appointing Margaret of Parma, a natural daughter of Charles V., to be regent in the Netherlands, in 1559 Philip set sail for Spain, leaving, in spite of the remon- strances of the estates, 4000 foreign troops, nominally to protect the frontiers, really to check the independ- ence of the people, and to support the policy of religious persecution which had been resolved on. The real direc- tion of all affairs was in the hands of the Burgundian churchman Antony Perrenot, bishop of Arras (afterwards so well known as Cardinal Granvella), who was chief of the “consulta” or secret council of three. A sharp attack on the Reformers now began, The first step, the proposal (which had originated with Charles) to reorganize the bishoprics of the Netherlands, was announced at once. Hitherto ecclesiastical affairs had been in the charge of four bishops,—Arras, Cambray, Tournay, Utrecht,—the last under the archbishop of Cologne, the others under Rheims. It was proposed now to establish a new and national hierarchy, independent of Germany and France,

Gran- vella.

HOLLAND)

with three archbishops and fifteen bishops :—Mechlin, The ney the chief archbishopric, having under it Antwerp, Herzo- bishop. genbusch, Roermond, Ghent, Bruges, and Ypres; Cam-“* bray, with Tournay, Arras, St Omer, and Namur ; Utrecht,

bendaries to help him in his diocese; of the nine two

[HISTORY.

with Haarlem, Middelburg, Leeuwarden, Groningen, and Deventer. Each bishop was to appoint nine new pre-

should be inquisitors, specially told off to sniff out and hunt down heresy. Nor was this all; it was believed that not merely would these new bishoprics strengthen the old episcopal inquisition, but that a more stringent form of inquisition was to be introduced, organized after the Spanish system, which had been long known for its efficient severity. The Netherlanders regarded the change, in fact, as part of a general plan for the subjection of the provinces from abroad, by means of foreign troops and ecclesiastics, with contempt of their feelings, rights, and liberties. All classes—nobles, clergy, burghers, peasants—disliked the new ecclesiastical system, and regarded Granvella, who became first archbishop of Mechlin, with detestation. Though the Spanish troops were withdrawn in 1560, the ferment was not quieted; the nobles were uneasy, and, finding their position uncertain between the court and the populace, began to form confederacies and to head the resistance. Even such leading men as William of Orange, who tried to mediate between Government and the pro- vinces, were driven into opposition ; in 1561 Granvella’s overbearing acts alienated them still more, and Orange and Horn withdrew from the council. Even Margaret felt she

and then it was that, in 1566, the Netherland nobles, led by Count Brederode, signed the famous “Compromise,” The with which the open rebellion of the provinces begins, “Com | Orange, Egmont, and Horn stood aloof. When, in their PS first interview with the regent, the nobles appeared on foot, in sedulously plain guise and without arms, Berlay- mont standing by her side begged her not to be alarmed, “for they were but a pack of beggars ;” and the phrase being overheard, at Brederode’s banquet that night it was gaily adopted by the young nobles as a party name, “ les

gueux,” and it became the fashion for patriots to wear beggar’s garb, and a medal round the neck, bearing Philip’s image on one side and a wallet on the other, with two hands crossed, and the legend “ Fidéles au roy jusqu’ 4 la besace.” Orange, Egmont, and Horn, who dropped in on the revelry at Brederode’s house, joined the merry scene and drank the beggars’ health.

To deprecate Philip’s anger at the council of state sent the marquis of Bergen and brother, the lord of Montigny, Knights of the Golden Fleece and men of high repute, to Spain, where Philip received them kindly, but took good care that they should never again see their homes. Meanwhile he gathered forces with which to suppress the disturbances, which had become very serious. Open air preachings, guarded by armed men, were taking place throughout the provinces, and raised the excitement to such a height that it at last found vent im iconoclastic tumults, similar to those of France. This gave the court party only too good an excuse ; it could now interpose with authority on behalf of public order. Matters threatened war. Margaret played with the dis- contented nobles, having orders from Spain to decoy

‘“¢Compromise,” the Deputo- ”

Horn’s tion 0 Philip.

eduke Alva.

STRUGGLE WITH SPAIN. |

and capture the chief men, and so to break up the con- federacy. Hereon Orange withdrew into Holland; Horn, in moody opposition, conscious of his integrity, retired to his country house ; while Egmont still hovered, a bright flutterer, round the fatal taper of the court. The con- federacy was in fact broken up; and Margaret saw with satisfaction a considerable body of German mercenaries enter the provinces to inflict punishment, in all its ghastliest and most brutal forms, on the iconoclasts. In 1567 itcame to blows: the undisciplined rabble of Calvinists, who tried to raise the siege of Valenciennes, were cut to pieces by the troops of Egmont and other loyal nobles. William of Orange withdrew to Nassau, after vainly warning Egmont of the imminent peril which he ran.

In spite of Margaret, who assured Philip that the heretics were completely put down, and their worship abolished, and that consequently there was no need of an army, and that on the contrary the time for mercy had come, the

HOLLAND

(6)

penny, had at this moment driven the Netherlanders to desperation. He was engaged in a struggle with Brussels and Utrecht, in which city, to punish the inhabitants, he had collected his Spanish soldiery from all the neighbouring towns. The news of the capture of Briel woke him from his security. Flushing also fell into the hands of the “Water-Beggars,” who surprised under its walls a rich convoy from Spain. About the same time, Louis of Nassau, who had been at La Rochelle with the Huguenots, and had received help and encouragement from Charles IX. of France, suddenly seized Mons in Hainault, thus giving the French sympathizers with the revolt the means of entering safely into the Walloon provinces. Alva, now seriously alarmed, withdrew from Zealand the whole of the forces with which he had intended to check the movement of the “ Water-Beggars,” in order that he might repair the great breach this made in his southern system of defence, and so left the province free to develop its resistance.

plan for the utter subjugation of the provinces was adhered to, and the duke of Alva, already famous for his harshness and bigotry, was named commander of the forces, with

Holland followed quickly, Enkhuizen setting the example; Revolt of so that, within three months of the capture of Briel, the pro- Amsterdam was the only town in Holland in the hands “!2°¢*-

- struggle began from that moment to change.

almost unlimited powers. He set forth in May 1567, and all hopes of peace or mercy fled before him. There was a great and desperate exodus of the inhabitants ; thousands took refuge in England, Germany, and Denmark, carrying with them, it was thought, the last relics of their faith and party. The nobles’ confederacy had already been broken up ; now the popular

movement was dispersed, despair and helplessness alone remained to greet the cold Spaniard and his train of orthodox executioners. He entered the Netherlands with about 20,000 men, all tried troops, ready for any cruelties. Their weakness lay in the fact that they were after all mere mercenaries,—Spaniards, Italians, Germans,—and as such ever ready for a mutiny, if pay fell short, or if there were none to plunder.

Egmont and Horn were arrested at once ; the Council of Troubles—the " Blood-tribunal "—was established ; Mar- garet, thrust aside by the imperious general, resigned her weary office, and carried away with her the last hopes of the wretched people. Alva was now appointed governor-general, and the executions of his council filled the land with blood. Orange was outlawed on his non-appearance ;

/nge it was about this time that he declared his conversion to

'Calvinism, and so fitted himself in every respect to lead the people when the time came. The hostilities of 1568 led to the execution of Egmont and Horn. Though the Gueux under Louis of Nassau won a considerable victory over the Spaniards at Heiligerlee, the arrival of Alva com- pelled him to raise the siege of Groningen, and to withdraw towards the Ems. At Jemmingen Louis was at last utterly defeated, and though the prince of Orange did his utmost to raise the country, and skilfully avoided a fatal battle, the campaign ended in his being obliged to withdraw out of the country. Alva was now at the highest point of his Success ; his statue, cast from cannon taken at Jemmingen, was set up at Antwerp; the exodus of the inhabitants continued incessantly, especially to England. The advice of Admiral Coligny, that the provinces should wage war from the sea, was hardly listened to at the first. In 1570, however, Orange turned his attention that way, and his little navy under William de la Marck annoyed Spanish commerce and took rich prizes. In 1572, being unable to find refuge in any ports,—for neither England, nor Den- mark, nor Sweden, would allow them harbourage, and they were treated not merely as rebels but as pirates,—William de la Marck, with his " Water-Beggars," suddenly seized on Briel, at the mouth of the Meuse, and the face of the

Alva, partly

from the general requirements of his position, partly from

lack of funds and desire of his recently-imposed tenth

of the Spaniards. In Friesland also the revolt spread far and wide. The states of Holland met, and, acting under advice of Philip of Marnix, lord of St Aldegonde, the prince's deputy, declared that William of Orange was, by

Philip's nomination, stadtholder of Holland, Zealand, and William Friesland ; they also declared their intention to raise money of Orange

for the costs of war and the relief of Mons, and affirmed again the liberties of the provinces ; finally they named the rough and ready William de la Marck captain-general— a man whose prompt and practical daring would supply the qualities which the caution and apparent irresolution and timidity of William of Orange seemed unlikely to provide for the emergency.

Meanwhile Alva pressed the siege of Mons; French help Alva's failed utterly to relieve Louis of Nassau, nor could William successes.

of Orange either force his way through the Spanish: lines or induce Alva to fight. At this moment came tidings of the massacre of St Bartholomew, and the prince, seeing that all hope of aid from France was utterly at an end, bade his brother make the best terms he could, and withdrew beyond the Rhine and thence into Holland. Mons at once capitu- lated, and Alva, passing on to Mechlin, pitilessly sacked that wealthy city. Thence he pressed forward to the north ; Zutphen was taken, the towns of Guelderland and Friesland submitted, and for a while nothing seemed to stay his career of conquest and revenge. The prince of Orange was power- less; but the despair caused by the cruel destruction of Naarden roused a spirit which even Alva could not tame, and the famous siege of Haarlem, lasting through the winter of 1572 till July 1573, cost 12,000 Spanish troops, and gave the insurgent provinces time to breathe. A great mutiny among Alva's troops still more hindered the work of subjugation. The repulse of Don Frederick of Toledo, Alva's son, from Alkmaar, the capture of Geertruidenberg by the Dutch, and Admiral Dirkson's great victory over Alva's fleet, entirely changed the aspect of affairs, and

saved the towns of North Holland. Alva, who had come | ; recalled,

as far as Amsterdam, returned to Brussels, and thence, obtaining his recall, bade farewell to his government. During the six years it had lasted, his executioners had put to death 18,000 persons, to say nothing of the victims in cities captured by his troops; the Spaniards plundered where they could, and considered the whole wealth of the Netherlands their lawful prey, forfeited by rebellion. But his pitiless severity only served to raise up a stubbornness of civic resistance, against which the tried discipline of the Spanish soldiery, and the consummate skill of their com- mander, reckoned to be the first general in Europe, were powerless.

William pro- claimed governor.

76

Don Louis of Requesens, grand-commander of Castile, was appointed Alva's successor, and after a brief and deceptive lull the war went on. In January 1574, by the fall of Middelburg, the Spaniards lost their last hold on Wralcheren and on Zealand, while by the splendid defence of Leyden, unparalleled in the history of heroic endurance, their efforts in another direction were effectually frustrated. After fruitless negotiations with Philip, the estates of Holland, in November 1574, formally offered to William "the Silent," prince of Orange, full authority by land and sea, with the title of governor or regent. Conferences were also held, with a view to peace, at Breda; and on their failure, in summer 1575, Holland and Zealand drew up articles of union, and an ordinanco for their joint govern- ment under the prince of Orange. By it he received supreme command in war and absolute authority in all matters of defence, the control of all money voted by the estates, the maintenance of the laws as count, in the king's name, the ultimate appointment (after nomination by the estates) of all judicial officers. He undertook to protect Calvinism, and to suppress "all religion at variance with the gospel," while he forbade all inquisition into private opinions. These terms accepted, William became, in spite of their nominal recognition of Philip, the true prince of the two provinces. Still this union, brought about by the prince's personal character and ability, and by the popular faith in him, was distasteful to the larger cities. Already we may note the beginnings of that party division which was afterwards so

prominent, and divided Holland between the land-party, popular, quasi-monarchical, Calvinistic, headed by the Orange-Nassau family, and the sea-party, the town-party, headed by the burghers of Amsterdam, Arminian, civic, and aristocratic.

Meanwhile the grand-commander made a successful attempt on the Zealand coast. His troops took Duiveland, and laid siege to Zierikzee, chief town of Schouwen, and key of the whole coast. The two provinces, unable to relieve the place, were driven to consider their position. So Jong as they paid any allegiance to Philip of Spain, against whom they were struggling for life, they could never get much help from any other prince, nor were they strong enough to assert their own sovereignty. Three powers lay near them :—-the empire, already connected with them by old relations, and by the family connexion of the house of Orange; France, with her restless Valois dukes, ready for any venture, whether in Poland, England, or Holland ; and, lastly, England, whose queen knew well that Philip was her foe, and that the Low Countries might effectually hinder his efforts against her. The provinces, though William had suggested it, refused to deal with the emperor, and turned to Elizabeth; she brought them little real help, and they seemed to be on the very brink of ruin when fever carried Requesens off in March 1576.

The breathing space thus gained enabled them to strengthen their union under William; but before the question respecting the position of the duke of Anjou could be settled, the siege of Zierikzee drew to an end. Boisot perished in a too gallant attempt to break the leaguer, and the town yielded. Things looked ill for the patriots, and Zealand would have been at the mercy of the conqueror, had not another great mutiny neutralized the success of the victors; the Spanish and Walloon troops left Zealand and, headed, as usual, by their “ eletto,” marched into the richer plains of Brabant, seizing Alost, whence they threatened both Brussels and Antwerp. One of the results of the panic they caused in Brabant was the capture of Ghent by William. Brussels was only saved from being pillaged by them by the vigour of the inhabitants, who armed in their own defence. Suffering under a powerless administrative, and smarting from the curse of the foreign

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soldiery, the southerners now began to wish for freedom and union with the other provinces. of Orange, moderating the Calvinism of the people, enabled the two groups to draw together. congress of the States General of the province Ghent; the council of state at Brussels was forcibly dis- solved ; the frightful “ Spanish Fury” at Antwerp struck such terror into all hearts that a treaty was concluded in November 1576 under the title of the “ Pacification

The broad liberality

of Ghent.” It was received with great enthusiasm ; in it the provinces agreed first to eject the foreigner, then to meet in States General and regulate all matters of religion and defence ; it was stipulated that nothing should be done against the Catholic religion ; the Spanish king’s name was still used; the prince of Orange was recognized only as stadtholder of Holland and Zealand. All the seventeen provinces accepted the Pacification ; and for a brief space the “ United Provinces” really did exist.

In October 1576 a Pacifics,

es met at tion of Ghent,

Early in January 1577 the “Union of Brussels” was Union d

in ejecting the foreign troops, in carrying out the Pacifica- tion, in maintaining the Catholic faith, in recognizing Philip’s sovereignty, in defending the liberties and con- stitutions of the provinces, It was eagerly adopted ; and even Holland and Zealand made no demur. When the paper, crowded with signatures, was laid before Don John of Austria, who meanwhile had arrived as regent, he also accepted it; and on the 17th February 1577 was signed the “Perpetual Edict,” Ghent. received as governor-general. a few weeks later.

Yet, after all, unity did not ensue from it. The natural divergency between north and south at once appeared ; in character, in interests, above all, in religion, they had little in common; and when William of Orange refused to

pub- lish the edict in Holland and Zealand he was warmly sup- ported by these provinces. This is perhaps the real point at which Dutch independence begins. Don John entered Brussels in triumph, and, by conciliation and winning manners, had already broken up the union; the whole of the southern provinces withdrew from it at once, and that well-marked difference in political life, which, after so many changes, still distinguishes Belgian from Dutchman, was from that moment made clear. Yet, though Don John had achieved so much, the result, after all, disappointed him; he was surrounded by difficulties, suspicions, and. plots; he saw the failure of his larger schemes, and only the partial success of his effort to reduce the N etherlands ; he recognized the dangers which the abilities and rivalry of William of Orange were preparing for him. This was

patriots, and in the destruction of the hated fortifications, ° so long the sign and efficient cause of their subjection. Other castles, such as that of Ghent, were razed to the ground as soon as the fall of Antwerp citadel was known. Still less was Don John pleased by the election of his rival as ruwaard of Brabant, and by his enthusiastic reception at Brussels. The States General (7th December 1577) declared strongly against Don John's authority.

Tt was clear war must begin again; and the patriots raised an army nearly 20,000 strong, which was utterly defeated by Don John and Alexander Farnese, at Gembloux near Namur. But their campaign was wasted on isolated movements and town-taking, while William of Orange fell back unmolested to Antwerp. A sudden illness, so sudden as to arouse the common suspicion of poison, carried off the conqueror of Lepanto (1st October 1578), and Alexander of Parma succeeded him in the government. The struggle had now entirely passed into the southern

put forth. The document engaged all who joined to help Brusse.

which ratified the Pacification of Per- | Not till the troops were gone should Don John be petwal | Philip IJ. ratified the Edict ®"*

soon shown in the seizure of Antwerp citadel by the i. ne

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THE UNITED PROVINCES. | HOLGh AW D | a7

provinces ; Holland and Zealand were left to gatlier strength ; the recovery of Amsterdam (1578) removed the one hindrance to their prosperity. While the south trusted to foreign help, some John Casimir, or duke of Anjou, the north quietly consolidated itself. In January 1579 was

n of proclaimed the famous “Union of Utrecht.” The docu-

ment professed to make no changes ; it would but carry out the Pacification of Ghent by a closer junction of Holland and Zealand with Friesland, Guelderland with Zutphen, Utrecht, Overyssel, Groningen; united as one, these pro- vinces should still retain their local uses and privileges So long as the archduke Matthias, who had been appointed governor-general in 1577, remained, his authority would be respected ; on his withdrawal in 1580 the States General named as stadtholder William of Orange, who had already exercised the real authority over the provinces. ~~A con~~ siderable number of southern cities, Ghent, Antwerp, Bruges, and others, as well as some of the nobles, also joined this union. Thus did the United Provinces at last come definitely into being.

During the next five years Spain devoted her efforts to the southern provinces alone ; the union was unmolested. The Walloon provinces were reconciled to Spain; the others, with exception of Holland and Zealand, had accepted the duke of Anjou as their sovereign; Holland and Zealand had pro- claimed William of Orange as their chief, though he did not finally

accept sovereign power and the title of count till August 1582; by a sort of cross division, the seven northern provinces, meeting at the Hague, had (26th July 1581) made

. an “ Act of Abjuration,” and had issued their “ Declaration

of Independence,” the five naming Anjou, the two William,

“as their sovereign in Philip’s stead. Then Holland and

Zealand framed an independent constitution, conservative of their ancient liberties, as expressed in tlie ‘‘ Great Privilege of the Lady Mary ;” they declared themselves a free country, severed alike from Spain and from the empire.

But Spain was not yet ready to take up this challenge ; aud meanwhile she resorted to other weapons. A scandalous proclamation, offering rewards and honours to any ruffian who would serve church and king by murdering William of Orange, was now issued; and, roused by the double inducement, after many unsuccessful attempts, a paltry wretch (10th July 1584) succeeded in assassinating the greatest man of his age, the worthy “ Father William” of the Dutch, and the only ruler in the world’s history who may fairly be compared with Washington.

Fortunately for the Provinces, and for the world’s liberties, the spirit of William of Orange survived in his second son Maurice, who now, though he was only seventeen and a student at Leyden, and though he had an older brother living in Spain, was at once, chiefly through the influence of that great statesman John Olden Barneveldt, named governor of the United Provinces, with a council of state, and with Count Holenlohe, his brother-in-law, as lieutenant-general. He was also, soon after, made stadtholder of Holland and Zealand, while Utrecht was placed under the lord of Villars as stadtholder, Guelderland and Overyssel under the count of Meurs, and Friesland under William of Nassau. Never was any one better fitted for his life’s task than was this boy, thus early called to rule in troubled times. For Maurice of Nassau had all the coldness and calculation of his family, all its ambition, all its firmness and tenacity of grasp, while he added thereto a quality wanting in the others, a genius for war, and those gifts which go to

make what is commonly called a lucky commander—gifts which may be best described by saying that the lucky captain is he who in war leaves least to luck. For over forty years Maurice was the champion of the Provinces ; and, if we except his treatment of Barncveldt, we may say that he

comes next after his father as a founder of the Dutch republic.

At the outset lis antagonist was that formidable captain, Alex- Alexander Farnese, who had by this time nearly subdued 2der all the southern provinces, and whose arms proved success- F#™*s* ful at Ghent (1584) and at Antwerp (1585). The northern provinces, thinking it necessary to call in foreign aid, appealed to Henry III. of France, but the outburst of the “War of the three Henries,” caused by the anxiety of ths Guises lest Henry should draw too much towards the heretics, put a stop to all hope of help from that side. Olden Barneveldt, therefore, next crossed over to England with offers to Queen Elizabeth, who, though declining for herself the proffered sovereignty over the Provinces, under- took to appoint a governor-general, and to send over and pay 5000 foot and 1000 horse; in return for which she was to be put in possession of certain cautionary towns. Accordingly, Sir John Norris was at once sent over with the English forces ; Sir Philip Sidney was appointed governor of Flushing, and the earl of Leicester was named governor- Farl of general by the queen. At first Leicester was welcomed Leicester. with all the joy that his Calvinistic opinions, and his posi- tion as favourite and representative of Elizabeth, could elicit in the breasts of men who had now long been strug- gling for existence, and who, bereft of their great prince, were yearning for some strong hand to guide them. But it did not last; his high pretensions, and his mistress’s haughty tone, joined with his foolish interference with Dutch commerce and with the religious difficulties now beginning to show themselves, soon offended the States General, and neutralized whatever good the active help of England might have promised them, In 1586 Sir Philip Sidney invaded Flanders, and the young stadtholder of Holland gladly served under him. In the same autumn Leicester himself took the field, and marched to meet Parma, who was threatening the provinces from the east. Under the walls of Zutphen Sir Philip Sidney fell; and Leicester, finding his efforts useless, soon raised the siege of that town, and withdrew to the Hague. The rest of his time was spent in bitter quarrels with the estates; Olden – Barneveldt

and Maurice were united for a time by his marked ill-will towards them both; and so strong did the feeling against him grow, that in 1587 Queen Elizabeth was fain to order his recall. For a while there was great sorcness between the countries ; the general interest, how- ever, was far stronger than any partial pique, and in the crisis of the Spanish Armada in 1588 the Dutch did very great service to England by resolutely blockading in their ports the transports and army with which Parma had meant to invade the English shores. In the same ycar Maurice had the satisfaction of seeing the English and Dutch repulse the famous duke from the walls of Bergen- op-Zoom. In 1589, on the other hand, the English garri- son of Geertruidenberg betrayed that important place, the doorway out of Brabant into Holland, into Parma's hands, and laid the United Provinces open to attack. In other places also the English forces, not yet withdrawn, were an anxiety and danger to the states. Still, from this moment the fortunes of the Dutch began to rise. No contrast Spanish could be more striking than that between the Spanish Nether- Netherlands and the United Provinces. In the fertile aoe districts of Hainault and Brabant, where climate and soil p,,.. are good and transit easy, utter ruin alone was seen : vinces wolves and wild dogs swarmed ; the land was overrun with con- weeds and briars; and even the wealthy cities of the past tasted. were almost deserted. In the United Provinces, on the contrary, the wellbeing of the country was steadily increas- ing: every year its hardy seamen brought back fresh wealth; and thousands of ingenious workers, turning in despair from the hopelessness of their condition in the

War against Spain.

Arch- duke Albert.

Battle of Nieuport.

Siege of Ostend.

Spanish Netherlands, brought their skill and industry into the north, which soon became as famous for its manu- facturing excellence as for its energy in commerce. It was at this period that, just when the southern cities were languishing and losing ground, the northern burgher life made vigorous

growth, and prepared the way for that supremacy of town aristocracy which characterized the history of Holland in the following century.

The year 1590 opened well for the United Provinces : Utrecht joined its fortunes with those of Holland and Zealand; Guelderland and Overyssel made William Louis of Nassau their stadtholder, so strengthening the power of tlic family; and Breda was recovered by a daring stratagem. The duke of Parma also, with failing health, was called away to oppose the victorious progress of Henry IV. in northern France. In 1591 Prince Maurice still further strengthened himself by taking Zutphen, Deventer, Hulst, and eventually Nimeguen, which secured for him the com- plete submission of Guelderland. Parma was unable to oppose him effectually, for his troops were again mutinous ; he was also once more called off into France. The reputa- tion of Prince Maurice rose now to its highest point: the greatest captain in Europe seemed unable to cope with him, and the vigorous help of Barneveldt still secured him firm support at home. In 1593 he took Geertruidenberg ; and in 1594 Groningen, the only stronghold left to the Spaniards in all the Seven Provinces, was reduced.

The appointment of the cardinal archduke Albert as governor of the Spanish Netherlands did not much change the current of affairs; the Dutch now tried to open up a trade with the East Indies, and made some vigorous explorations in Arctic seas. In 1596 the archduke re- covered Hulst, which commanded the northernmost parts of Flanders ; the Dutch on the other hand, with the Eng- lish, sacked Cadiz and destroyed the Spanish fleet ; and in the next year Maurice inflicted a defeat on the Spaniards at Turnhout, transferred his sphere of action to the Rhine country, and took town after town, making the provinces secure on the side of Zutphen, Overyssel, and Friesland. The year 1598 gave a new aspect to affairs by the con- clusion of the Franco-Spanish war in the treaty of Vervins, and by the death of Philip Il. The Dutch, assisted only by the English, and that chiefly by volunteers, were now to bear the whole brunt of the efforts of Spain. In the autumn of 1599 Prince Maurice endeavoured to transfer the war into Germany ; and after taking Emmerich in the Cleves country, delivered Bommel from the siege which Mendoza, the Spanish general, was laying to it. But dis- satisfaction at home, and the unreadiness of his German allies, forced Maurice to turn his eyes towards Flanders, which he invaded in the summer

of 1600. Surprised by the Spaniards in the neighbourhood of Nieuport, Maurice was attacked by the archduke Albert in a most critical position, but, after a long and well-balanced battle, inflicted on him (July 2) a disastrous defeat. Maurice could not, however, take the town, and winter put a stop to the campaign without any great change in the relative position of the belligerents. In 1601 the archduke began the famous siege of Ostend, which lasted three years and two months; the losses on both sides, more especially among the Spanish, were immense. While it continued, the cool- ness between the States General and Maurice steadily increased ; for they thought his cold ambitious nature capable of anything, and saw with fear the paramount influence he had over the army. Their instincts led them to rest on the ships, to prefer peace to war, and commerce to glory. It was during the siege of Ostend that they established the Dutch East India Company in 1602, though

its basis had been laid down by a group of Amsterdam traders in 1595.

In 1604 Maurice took Sluis, and Ostend at last fell to Spinola. Thenceforward the main lines of the struggle by land were simple enough: the Spaniards tried to transfer the seat of war into the United Provinces, and were steadily foiled by Maurice. All the while the States General aimed at peace, though the naval war became vigorous as that on land languished. The sea fight off Gibraltar in 1607 utterly ruined the Spanish fleet, and left her com- merce powerless. At last, after long negotiations, which served to emphasize the variance between the patriot party, headed by Barneveldt and Grotius, and the war party, which included the official classes, the army, navy, Kast India Company, the clergy, and the populace in the towns, a truce for twelve years was signed, on the wit possedetis ground, between Spain and Holland. In the war the Dut: Dutch had added Overyssel and Groningen to the union ; gains they held Sluis, Hulst, and other ports on the Flemish ®¢¥ side, in what is called “ Dutch Flanders”; they had Bergen-op-Zoom, Breda, and Herzogenbusch on the Brabant frontier, and the forts which commanded the Scheldt and strangled Antwerp for the sake of Amsterdam; lastly, they were become lords of the sea, and the chief traders of the world. .

After a brief interference in the affairs of Germany, Theos where the intricate question of the Cleves-Juliers succession sical was already preparing the way for the Thirty Years' War, °mq Holland settled down into that hot and absorbing theologi- | cal struggle, which was closely mixed up with political questions, and which stained with a deplorable triumph the last years of the career of Maurice of Nassau. In 1603 Jacob van Hermansen, or, in Latin form, Arminius (seo Arintus), had been appointed one of the two professors of theology at Leyden, Francis Gomar being the other, The two men took opposite sides with zeal, Arminius assailing and Gomarus defending the current popular theology. The views of Arminius spread fast among the upper classes, especially in the larger towns, and became the theology of the civic aristocracy; the established opinions were tenaciously supported by the bulk of the clergy, the peasantry, the town populace, the army, and the navy. At their head stood Maurice, ready to use the strength of Calvinistic feeling to secure his own authority, however little he might care for the tenets of his side; at the head of the other party, more philo- sophical, less in earnest perhaps, was Barneveldt, with the town traders. King James of England as yet supported the Calvinists, and with Archbishop Abbot influenced greatly the proceedings of the famous synod of Dort (1618) in favour of Prince Maurice and the anti-Remon- strants. The results of the synod enabled the prince for his own political purposes to crush the aristocratic party. Barneveldt and Grotius (another leading Remonstrant) were seized, and in spite of all his great services to his country, his venerable age, and his past support of Maurice, the pensionary was brought to an infamous trial and executed at the Hague in 1619, Grotius afterwards escaped from prison and took refuge in France. The silenced Remonstrants, finding that there was no hope of toleration for them, left the country in great numbers, and formed a prosperous settlement in Holstein in 1621, where they founded the town of Frederickstadt on the Hider.

In 1621 the truce with Spain came to an end, and the Thi Dutch were at once involved in the vortex of the Tlurty * } Years' War, which had now been going on for a couple of "a years. Spinola, after taking Juliers, attempted Bergen-op- Zoom, hoping thereby to open a passage into Zealand ; he was, however, foiled by Maurice. About this time a great coolness

sprang up between Holland and Englaud, the | beginning of the deadly rivalry which lasted so long

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nge,

- land, Utrecht, and Overyssel.

THIRTY YEARS’ WAR. |

King James was eager to gain his objects without fighting, and to be on friendly terms with Spain; he and Laud were opposed to the Calvinism of the Dutch, and disliked

_their form of church government; and commercial jealousy

was already beginning to arise. Successes and losses were evenly balanced in the war: the Dutch recaptured Juliers and took Cleves, while Spinola, after great losses caused by the gallant defence of the English, in 1625 took Breda. A few days before the town fell Maurice died, leaving the Spaniards in the heart of his territories, and the Dutch vexed with religious and domestic factions.

His brother, I’rederick Henry of Orange-Nassau, suc- ceeded him as stadtholder of Holland, Zealand, Guelder- The war by land became utterly spiritless, though by sea the Dutch still asserted their maritime supremacy. By land the chief operations were the siege and capture by Frederick Henry of Herzogenbusch, Maestricht, and Wesel in 1628; by sea the Dutch interfered, much against the popular feeling, to assist the French court against the Huguenots at La Rochelle. They blockaded Duukirk, whence Spanish privateers had been wont to harass their commerce ; under Piet Heyn of Delftshaven, boldest of their sea-captains, they vexed the Spanish coasts, captured Spanish war ships, carried off their “silver fleet,” and

finally in 1631 won near Tholen a brilliant victory over a great Spanish fleet commanded by Count John of Nassau, who was endeavour- ing to make a descent on the Zealand coast.

In this year the States, feeling that the moderation of the stadtholder was honest and salutary, that his influence alone seemed able to quiet the rage of religious faction, and that his military operations had secured the confidence of the provinces, took the important, and, as it turned out, the unwise step of securing to his infant son the reversion of all his great offices of stadtholder, captain, and admiral- general. The Calvinists were willing to grant so much to the head of their party, and made no objection to the introduction of the principle of hereditary succession ; while the Remonstrants, discerning that Frederick Henry, like his brother before him, was personally more favourable to their tenets than to those of their adversaries, accepted the measure in the hope that when permanently established as their prince he would carry out those tolerant views which he was known to hold.

In 1632 he justified their confidence by his masterly siege and capture of Maestricht, in defiance of all the efforts of the Spanish and imperial generals; Namur, Luxembourg, and eastern Brabant were laid under contribution in con- Sequence, and the States defended from danger of attack towards the east. As the war dragged on after the death of Gustavus Adolphus of Sweden, France and Holland drew more together, and in 1635 an alliance and partition treaty

‘ Was made between them, in which it was proposed that the

Spaniards should be driven out of the Netherlands, which should be made an independent state, guaranteed by the allies ; that France should receive, as her share, the sea- coast up to Blankenberg, together with Thionville and Namur ; and that a corresponding portion should be given to Holland ; if this scheme of an independent state proved a failure, then France and Holland should divide the whole district between them, The joint operations consequent on this agreement proved a failure: Frederick Henry had always been opposed to the alliance, and probably did not Wish its success; the divergence between him and the States General at this time gave Cardinal Richelieu the oppor- tunity of restoring the Remonstrant party in Holland,

and making it French in sympathy, in opposition to the House of Orange—a combination of which Louis XIV. afterwards made greatuse. In 1637 the stadtholder recovered Breda, though the gain was balanced by the loss of Roermond and

other places; and in 1638 the war was favourable to the Spaniards. In 1639, however, a series of great naval triumphs under Tromp and De Witt turned the scale in favour of the Dutch.

In 1640, on the death of Count Henry of Nassau, stadt- holder of Friesland and Groningen, the latter province chose Frederick Henry as its stadtholder, and he thus became chief of six out of the seven United Provinces ; in the next year he was able to arrange the marriage of his son William with Mary, eldest daughter of Charles I. of England, a match devised by tle queen-mother of France, while a refugee in Holland, in order to increase the ill-will between Richelieu and the stadtholder. Thus began the dynastic relation between the Stewarts and the house of Orange, which led to such great results before the end of the century. The States General were not too well pleased with this alliance, and looked shyly at Henrietta Maria when she came over to Holland to get help for Charles I. in 1642. They were becoming alarmed at the great power and growing ambition of France under Richelieu, while they sympathized to a great extent with the English Puritans,

All parties, except the French, being now utteriy weary of the war, negotiations fur peace, long talked of, long prepared for, began in earnest at Miinster and Osnabriick. Before their close Frederick Henry died in 1647, and was succeeded in his dignities and offices by his young son William II., and almost immediately afterwards (January 1648), in spite of the opposition of France and the young prince of Orange, the deputies of the Provinces (with ex- ception of Zealand and Utrecht) signed a separate treaty of peace with Spain, which was confirmed and sworn to in May at Miinster. It was a complete surrender of every- thing for which Spain so long had fought. The United Provinces were recognized as free and independent, and

Spain dropped all her claims; the ati possidetis basis was adopted in the matter of all conquests; the two contract- ing parties agreed to respect and keep clear of each other's trading-grounds ; each should pay, in the ports of the other, only such tolls as natives of the other paid; the Scheldt was entirely closed by the States, so that Amsterdam miglit strangle Antwerp—the chief harbour of the free Provinces thus ruining the chief harbour of those still subject to Spain. And so ended the so-called Eighty Years' War.

No sooner was the peace concluded than bitter disputes arose between Holland, on the one hand, and the prince of Orange, supported by the army and navy and the smaller provinces, on the other. He was tempted into foolish acts : he arrested six of the deputies of Holland ; he eveu tried to surprise and occupy Amsterdam ; he favoured the English royalists, now plentiful in the Provinces, while Amsterdam aud Holland inclined towards the Commonwealth. Things went so far that William II. had almost destroyed the liberties of the Provinces, and was intent on two schemes, —the resumption of war against Spain, with a partition with France of the Spanish Netherlands, and interference on behalf of Charles II. in England, —when his opportune death by small-pox occurred. A few days afterwards his widow, Mary of England, gave birth to a son, who was destined to be the most distinguished man of his race, William III. of Holland and England.

Con- nexion with England.

William II,

Peace with Spain.

Holland

and

William a

variance.

For a time the death of William II. restored the burgher- Amster- party to power, and made Amsterdam the head of the United dam now

Provinces. of Orange, friend of the Stewarts, seemed to suffer eclipso with them ; and though the royalist mob even at the Hague, set on by a princely rough of the palatine house, made it impossible for the envoys of the English Commonwealth to come to terms with the republic, still the popular monarchi- cal party was in fact powerless in the Provinces for more

Holland triumphed over Zealand ; the house ™es-

Consti- tution of the United Pro- vinces.

The town-

govern-

ments.

Com-

than twenty years. It was with a view to the security of this aristocratic government that a great assembly of the Pro- vinces was held in 1651, and established that form of rule which Sir William Temple has so well described in his Observations upon the United Provinces of the Netherlands.

“There were four chief elements in that federation :—the terms of the Union of Utrecht (1579); the claims and position of the house of Orange; the sovereignty, within tts own borders, of each province ; and lastly, the liberties

and power of the cities. In the last two the

lead was

taken by Holland: Holland was the chief province, and

Amsterdam, its capital, the chief city of the uni

on. And

these two parts of the federation were at one also in their

resistance to the house of Orange, of which

the chief

strength layin Zealand. The union was governed, in theory at least, by the States General of the provinces, which met at the Hague, and consisted of a fluctuating number of de- puties (sometimes as many as 800), and was supplemented

by a permanent council of state, a kind of cabinet

composed

of twelve deputies from the provinces, and a chamber of accounts. Besides this body each province had its own estates, and each great city its own senate. Thus Amster-

dam was ruled by a senate of thirty-six burghers, order, administered justice, raised local taxes. of senator was for life, originally by election of

who kept The office the whole

body of freemen, but from the 16th century by cooptation,

so that the government of the city became a close

oligarchy.

‘he chief towns followed Amsterdam in this direction. The

senate elected the deputies of the city to the Holland. The commercial prosperity of the Provinces

mercial advancing throughout the 17th century ; each anti its own work. Flushing received the West India trade ;

- Middelburg was entrepét for French wines ; Terveer was the Scottish and Dort the English staple; Leyden manu-

pro-

The

and. States Genera

factured ; Haarlem made linen and mixed stuffs,

states of

went on town had

and grew

tulips for profit and pastime ; Delft was known for beer and hardware; Zaandam built ships; Enkhuizen caught and cured herrings; Friesland had the Greenland trade ; and lastly Amsterdam, recognized chief of Dutch cities, had the East India trade, with that of Spain and the Mediterranean: their whole carrying business reached from the Gulf of Bothnia to the farthest Indies. Their sea-

faring enterprise received an early scientific imp

ulse from

the labours of Coignet and G. Mercator. All questions as to the nature and development of wealth were still in their infancy: it was believed that all depended on balances of actual bullion; and the Spaniards were envied because their ships brought over masses of gold and silver.

The “balance of trade,” the establishment of

banks at

home and colonies abroad, especially mining colonies, a huge carrying trade, the making of goods to be sold for

cash only, the discouragement of all imports,

and the

support of all monopolies—these things, chief elements of what is called the “isolation theory of trade,” guided the politics of the 17th century, gave Holland vast temporary wealth, discouraged her power of production, and eventually

have left her impotent among the nations.

At first William the Silent had been governor of the governor Provinces, nominally at least under the king of Spain ; and in the reconstruction he secured his own rights, while

1, the sovereign power was transferred t

o the States General.

They took the right of making peace and war, of conclud-

ing.alliances, of taxing and coining. The governor had all

military commands, had power to pardon, and

the civil appointments ; he represented the dignity of the state, with a court, and guards, and envoys from other

lands. Each province had its own stadtholder,

in name at least derived from the Spanish times; each

town had its own pensionary or chief minister.

controlled

an office

But after

the death of William IL, the office of stadtholder of Holland was for a time suspended ; there was no captain-general or admiral; and the grand pensionary of Holland, first minister of the state, became virtual president of the republic, as we see in the cases of John De Witt and Heinsius. –

When the English envoys returned to tell their masters, the Commonwealth, of their failure at the Hague, parlia- ment at once replied by passing the memorable Navigation Act of 1651, which aimed at destroying the carrying-trade

of the Provinces. The struggle for the lordship of the seas War with Englan

which ensued, and with which the names of Tromp and Ruyter, Blake, and Monk are so splendidly associated, was waged with equal bravery and nearly equal success on both sides, until 1654, when peace was made by the Amsterdam burgher-party. By the terms of the treaty with Cromwell the Orange-Nassau family was altogether to be excluded from the stadtholderate of Holland, the other Provinces reserving their independence, and the Dutch populace also much disliking the peace. England preserved the honour of her flag, while Holland was seen to be a worthy and equal rival for the command of the sea.

Hostilities between the Dutch and Portuguese respecting War

their rights in Brazil followed, in which, after each side Ms orty,

had done much damage to the other, peace was also made ; and Holland in 1658 interfered to save the Danes from Charles Gustavus of Sweden. In 1659 a treaty of peace was made between France, England, and the United Provinces, with a view to the settlement of the Dano-Swedish question, which ended in securing a northern peace in 1660, and in keeping the Baltic waters open for Dutch trade. Since the abolition of the stadtholderate after William’s death in 1650, the centre of authority had lain in the hands of John de Witt, the sagacious leader of the anti-Orange or Amsterdam

purgher-party ; and he guided the foreign affairs of the provinces in such a way as to secure the fair development of their commerce on every side.

The momentous year 1660 was almost as critical for War with Engla

Holland as for any state of Europe. Charles, in England, having re-enacted the Navigation Act, war again broke out in 1665, and the duke of York took the command of the English fleet. At the beginning of June he met the Dutch admiral Opdam, and, after a close-fought battle off Lowestoft, the English were completely victorious. But so bad was the condition of the home Goverument in Eng- land that in the following year the Dutch had by far the stronger fleet at sea, and fora time held their own in the Channel. The four-days' battle (June 1-4) between Prince Rupert and Monk on the one side and Ruyter on the other ended in an uncertain victory for the Dutch ; but on July 25th they were decidedly defeated off the North Foreland, and driven back to their own shores with immense loss. The English were now masters of the sea ; but both parties needed peace, and negotiations began at Breda. In the course of these Ruyter suddenly sailed up the Thames nearly to Gravesend, and struck terror into the very heart of London, which thus became all the more eager for a settlement. In July 1667 a treaty between England and Holland was signed at Breda; and in the following year Sir William Temple accomplished the triple alliance of England, Holland, and Sweden, against the aggressive views of Louis XIV., a hollow affair, and pernicious in its results to those who made it. It made Louis XIV. determine to take vengeance on the United Provinces and on the De Witts ; it led at once to the humiliation of England by the treaty of Dover (1670). to the overthrow of the Amsterdam party, and to the miserable end of the De Witts; and it eventually raised the prince of Orange to supreme authority in the United Provinces.

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HOUSE OF ORANGE. |

From 1668 to 1672 Louis XIV. made ready to destroy the Dutch ; and so well had his diplomacy served him that they were left without a friend in Europe. In 1672 the ‘storm broke: the English, without a declaration of war, tried unsuccessfully to intercept the Dutch Mediterranean fleet ; and France at once set forth to conquer the hated tradesmen of the north. The States were ill-prepared on land, though their fleet was strong and ready; party spirit was exceedingly bitter, and the ruling party, well aware that the prince of Orange was very popular with the land forces, had utterly neglected their army. On May 28, 1672, Ruyter fought a great naval battle in Southwold Bay (Solebay) against the duke of York and Marshal D’Estrées: the French held aloof, pleased to see the Dutch and English destroy each other ; the English suffered most, but, as the Dutch withdrew to their own ports, the others claimed the victory. Meanwhile Louis XIV. crossed the Rhine and threatened Amsterdam (see FRANCE). The young prince of Orange alone seemed to rise to the occasion; while others were panic-stricken, sending em- bassies of submission to the haughty monarch, making pre- parations for a great flight by sea, William with his miser- able army did his best, and aroused so strongly the feelings of the people that Amsterdam, passing from dejection to despair and thence to reckless enthusiasm, rose against the De Witts and foully murdered both in the streets. They had just before proclaimed William stadtholder of Holland with powers unlimited. And thus Louis XIV. destroyed the proud republic, though in so doing he had raised up the most formidable enemy he was destined to encounter. His invasion did not prosper; other nations began to take up the Dutch cause; Germans and Spaniards threatened the embarrassed French army in the Provinces ; so that in 1674 France was on the defensive on every side. William of Orange in that year was defeated at Senef, and had to abandon his plan of penetrating into

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81

irritation in Holland and Zealand. His power seemed almost autocratic, and the States impotent. Henceforward their part in history ,becomes quite secondary compared with that of England, and we may refer for details of the great wars to the articles ENGLAND and FRANCE.

Tn 1690 Waldeck, commanding the Dutch, was defeated Holland by Luxembourg at Fleurus; and the Anglo-Dutch fleet + war

was also severely handled off Beachy Head by the French, who inflicted terrible losses on Dutch commerce. In 1691 the French took Mons; in 1692 the allied ships ruined Tourville's fleet off La Hogue, and recovered the command of the sea. On land the allies fared ill: Louis took Namur, and after a hard-fought battle Wil- liam was defeated at Steenkirk; in 1693 the Dutch shared in the defeat of Neerwinden, and were not fortunate even on the sea. In 1695 the tide of affairs had turned, and William retook Namur, his greatest triumph after the battle of the Boyne. Negotiations for peace, first attempted

in 1694, led to the peace of Ryswick in 1697, in which Peace of William was recognized by France as king of England, the 8yswick.

Dutch obtaining a favourable commercial treaty, and the right to garrison the Netherland barrier-towns. Holland was still an important factor in the balancing system rendered necessary by the ambition of France. Louis XIV., however, held himself little bound by the peace. In 1701 heelbowed the Dutch troops out of the barrier- towns; he defied England by recognizing James III. on the death of his father; and it was clear to all that another war was imminent, when William III. died in 1702. He had been made hereditary stadtholder in five of the Provinces in 1672; but as he left no children as heirs, the old opposition of Holland to his house again sprang up, and, led by the grand pensionary Heinsius, Amsterdam successfully asserted her independence, and ruled through- out the coming struggle against France with energy and credit.

France, and in 1675 the death of Marshal Turenne, and the retirement of the great Condé, turned the tide of war in favour of the Dutch, except on the sea, where the French

When war was declared in 1702, Marlborough was named The tri-commander-in-chief of English and Dutch troops, and wvirate

thenceforward became the chief man in the famous “ trium- ao

fleet defeated and destroyed in the Mediterranean (in 1676) the united navies of Holland and Spain. In 1677 negotia- ions for peace went on, and were hastened by the marriage, at the close of the year, of William of Orange with the Princess Mary, daughter of the duke of York. At last, in 1678, came the great peace of Nimeguen, which secured the independence of the Dutch.

The aggressive policy of Louis AIV., in the years which followed the peace of Nimeguen, enabled William to lay the basis of the famous confederacy which changed the whole front of European politics. Brandenburg, Denmark, and England sided with the French king; while the ~ league of Augsburg (1686), following directly after the revocation of the edict of Nantes, placed William at the head of the resistance to French domination. The league was joined by the emperor, Spain, the United Provinces, Sweden, Bavaria, and other German princes. The acces- sion of James II. to the throne of England made it easy for the stadtholder to keep up close relations with the malcontents in church and state, who regarded him and the Princess Mary as the natural successors to the English throne. On the birth of the prince of Wales the anti- Catholic feeling in England at last grew so strong that William was able to interfere with success; while the diversion of the attention of Louis XIV. from Holland to the Rhine relieved the timid rulers of Amsterdam from all anxiety. The Revolution of 1688 ensued, and England ~ became, under William’s strong rule, the chief member of the great coalition against France. In the grand alliance of 1689-90 he clearly sacrificed Dutch to English in- terests, and carried through his policy in spite of great

virate” of Marlborough, Heinsius, and Prince Eugene. In 1703 the Dutch invaded Flanders, and fought the drawn battle of Eckeren; in 1704 they and the English took Gibraltar ; in the same year they took part in the great battle of Blenheim. In 1705 Marlborough led them into the Netherlands; but, hampered by the deputies of the States, he achieved little. In 1706 he won the battle of Ramillies, and swept the French out of the Netherlands ;

in 1708 came Oudenarde, and after it an unsuccessful attempt of Louis XIV. to detach the Dutch from the alliance ; in 1709 the terrible battle of Malplaquet and the capture of Mons. After this great changes followed in England, and Marlborough's power came to an end. Negotiations for peace, often tried before, drew towards

success in 1712, and in 1713 the peace of Utrecht was Peace of

signed. While France received Aire, St Venant, Bethune, and Douay, the Spanish Netherlands were formally handed over to the United Provinces, which in their turn passed them on, after conclusion of a barrier treaty, to Austria; henceforth they are known as the Austrian Netherlands. A favourable commercial treaty was also made between the Dutch and France. The peace of Utrecht made the re- public almost as powerful on shore as she had been by sea ; at the same time it taught her that the great powers around her would use her resources for war, and abandon her when they wanted peace: she therefore determined hence- forth to stand clear of all foreign complications, With 1713 the importance of Holland in European politics comes almost to an end.

The ruling party in the States took an active part in securing George I. on the throne of England; and on

X7!. — If

War with France.

William IV.

Peace of Aix-la- Chapelle.

William Vv.

the death of Louis XIV. in 1715, the old ill-will between France and the provinces died entirely out, so that they were secure in a position of tranquillity ; they also brought to a fair conclusion their difficulties with

Austria on the subject of the Netherlands barrier. These, however, began again when in 1723 the emperor set on foot the Ostend East India Company, which was at once regarded as an offensive val by the Amsterdam merchants. For the sake of crushing this competition the States in 1731 consented to guarantee the Pragmatic Sanction of Charles VL In 1743 they joined England in supporting the claims of Maria Theresa, queen of Hungary, and fell consequently into complications with France, which invaded the barrier country. In 1744 they granted a subsidy in money and put 20,000 men in the field, and became a member of the Quadruple Alliance with Austria, England, and Saxony. In 1745 the Provinces took their part in the rout of Fontenoy, after which Marshal Saxe overran the Austrian Netherlands, while England and Holland were alike para- lysed by the Jacobite rising in Scotland. The States lost every barrier-town, and lay defenceless before the French, who in 1747 entered Dutch Flanders, and made an easy conquest. And now the Orange party, supported by English aid, began to lift its head. The Provinces had fallen so low that all men began to wish for a dictator. Accordingly Prince William Charles Henry Friso was pro- claimed stadtholder, captain, and admiral-general of Zealand at Terveer, under the title of William IV. The movement thus begun spread like wildfire ; all Zealand accepted him with enthusiasm, and Holland was not far behind ; even at Amsterdam and the Hague the popular feeling was too strong to be resisted, and the Government had to give way. William IV. became captain and admiral-general of the whole union, and stadtholder of the Seven Provinces; a little later these offices were declared hereditary in both male and female lines.

The peace of Aix-la-Chapelle, in 1748, though it nomi- nally restored things to their old estate, could not efface the mischief and humiliation which the war had caused to Holland. Nor were affairs mended by the death of the stadtholder William IV. in 1751, who, though dull and quiet, did his best to develop the commercial and manu- facturing prosperity of the States. His widow, Anne of England, daughter of George IL, carried on the govern- ment for her son William V. She showed but little aptitude for the post of regent, and the Provinces had great difficulty in standing clear of the European compli- cations of the Seven Years' War. They did so, however, and after her death in 1759 were on better terms with England, which had urged them to take up the cause of Frederick the Great. In 1766 William V.

was declared to be of age; irresolute and weak, he was entirely under the command of his old preceptor Louis of Brunswick, and his wife Frederica Wilhelmina, niece of Frederick the Great. His rule is only distinguished for the springing up of several learned societies, and for the stimulus, derived partly from England partly from France, given to scientific inquiries. In other respects the influ- ences of England and France were not propitious to the Provinces. In the American War of Independence William sympathized with the English court against the French aud the revolted colonies, while the Dutch people warmly embraced the other side. ‘Hence arose again old maritime disputes. The Provinces quarrelled at home over the relative importance of army and navy, and strengthened neither. the famous “ Armed Neutrality,” with which the Conti- nental states replied to the demands of England on the seas, drew the Provinces once more into the arena of European politics. ‘After a division of the States, in

which four were on one side and three on the other, the

United Provinces decided to adopt the Neutrality, and threw

in their lot with France and Russia against England. But War though war broke out at once, nothing could cure the vio- with lence of party spirit—the stadtholder and the court party Englani | going with the English, and neutralizing all the warlike efforts of the “patriot” party. In 1781 Dutch commerce wasutterly paralysed; the other powers set on the Provinces, and took each its part. seized, and it seemed as if they could do nothing in their own defence. action with Admiral Parker at the Dogger Bank roused the national spirit, and the Orange party lost ground every-

of the United States of America; with generous sympathy the aged commonwealth saluted the rising republic of the West, which was destined to take its share also in the ruin of Dutch trade. peace with England, in which the English got right of free traffic with the Dutch East India colonies.

of Orange seemed imminent, and the king of Prussia had to

So things went on from 1776 to 1780, when-

[HISTORY,

Their West India Islands were

At last, however, an indecisive but not inglorious

where. In 1782 the Provinces recognized the independence

In 1783 the States made an inglorious

The patriot party was so much excited by this long series Trout) of blunders and’ humiliations that the fall of the house mith

interfere on behalf of his kinsfolk. In 1784 the States he were in trouble with a new antagonist; the emperor Joseph IL. sought to compel them to acquiesce in the reopening of the mouths of the Scheldt, so as to restore some of its ancient prosperity to Antwerp. But as neither party was able to fight, a peace was patched up in 1785, though its terms, as usual, were very humiliating to the States. The resistance against the princess of Orange continued to increase in violence, until in 1787 the Prussians again interfered, occupying Amsterdam, reinstating the stadt- holder, who had been driven out, and compelling the states to ally themselves, much against their will, with England and Prussia,

Under their swaythe Dutch passivelyremained, and when the French Revolution came they stood neutral as long as they could between it and the kings; it was not till Dumouriez had overrun all the Austrian Netherlands in 1792, and had determined to secure justice to Antwerp by forcing open the passage of the Scheldt, that they were drawn into the strife. On the death of Louis XVI. in War 1793 the national convention at once declared war against with both England and the Provinces. Their first campaign a against the Dutch under Dumouriez failed: the invaders were arrested before Willemstadt, and ultimately were compelled to retreat. But in the autumn of 1793 Jourdan restored the credit of the French arms in the Austrian Netherlands. In 1794 Pichegru brilliantly completed the conquest of Belgium, and before the end of the year invaded the Provinces. The very

severe frost of that winter gave his army easy passage over all the rivers and low-lying lands, which still formed the chief defence of the states; he occupied Amsterdam, and with his hussars crossed the ice and took the Dutch fleet as it lay at the Texel; the stadtholder fled (1795) to Eng- land; and the shattered remains of the duke of York's army having reached Bremen returned home in disgrace. The republican party in the Provinces now reorganized the government so as to bring it into close harmony with that of Paris. A new constitution was framed; the The ancient system of representative government, the stadt- Batat holderate, and the offices of captain and admiral-general 4 were all swept away; a fair and open representation was established ; and the Batavian republic came into being in close alliance with France. The French with one hand delivered the Provinces from a worn-out system of govern- ment, and with the other seized on a substantial return for their assistance. The new constitution, so excellent

" joined together under one prince.

in appearance, soon proved a delusion. One change of government succeeded another: after the States General came a national convention; then in 1798 a constituent assembly with an executive directory; then chambers of representatives; then a return to the earlier system under the names of the eight provincial and one central com- missions (1801). .

The peace of Amiens gave the country a little rest, and the Dutch got back the Cape of Good Hope and their South American colonies: it was, however, but the brief and deceptive lull between two storms; when war began again England once more swept away all she had restored. In 1805 Bonaparte, with his usual high hand, imposed on them a new constitution, and set Schimmelpenninck over "them with the ancient title of grand pensionary. In the next year Napoleon added Holland to the ring of great fiefs with which he surrounded his imperial system, and forced an unwilling brother, Louis, to be king of an unwilling people. Worthy of a better fate, the excellent king of Holland did all in his power to protect his new subjects from the crushing friendship of his brother ; but "his efforts were in vain, and he withdrew to Vienna. In 1810 Napoleon annexed all Holland to the

empire, de- claring that it was “in the nature of things nothing but a portion of France.” In 1813 the change in the

ive, affairs of Europe encouraged the Dutch to join the

- general revolt, when they established a limited monarchy. The prince of Orange was recalled from England, and entered Amsterdam amidst the utmost enthusiasm. An assembly of notables met and declared him king with the title of William I. king of the Netherlands, in 1814. By the treaty of Paris Belgium was united to Holland, and the seventeen provinces were again forcibly It was settled that the

races, with instincts and feelings not merely diverse but opposed. ‘The Belgie provinces spoke French or Walloon, the Batavians, Dutch. The Belgians were strict Catholics, while the Dutch were Protestants. The Dutch were chiefly a commercial and seafaring people, with interests in distant lands and colonial possessions; the Belgians were agriculturists, except where their abundance of minerals madethem manufacturers. The Dutch connected themselves with Germany and (though often only by way of rivalry) with England ; the Belgians drew their chief inspirations from France, and connected themselves with the French in traditions, religion, and commercial interests. Such a diversity could not possibly stand the brunt of any great politicalmovement ; especially as the Dutch were oppressive towards their Belgian partners in the kingdom. Accord- ingly we find that in 1830 the revolution at Paris at once aroused the strongest sympathy at Brussels. The dull obstinacy of William I. had emphasized the divergence, and his narrow and antiquated policy rendered an outburst inevitable.

The revolt at Brussels, which began on the 25th The re- August 1830, spread instantly throughout the whole of volt at Belgium. After a short struggle in November, a confer- Brussels.

ence of France, England, Prussia, Austria, and Russia, sitting in London at the request of William I., pro- posed an armistice, to which both parties agreed. In the following January the conference attempted to settle the terms of a separation, and proposed that Holland should have Luxembourg and part of the left bank of the Scheldt; this the Dutch accepted, while the provisional Govern- ment at Brussels protested against it. The assembly at Brussels constructed a new and liberal constitution, with a broad representative government, liberty of teaching, of the press, of public meeting ; and in April 1831 the crown

house of Orange should have the hereditary sovereignty, with a fairly liberal constitution. To make up to the new king for the loss of his territories in Germany, the grand

was offered to Leopold of Saxe-Coburg, who, after ascer- Leopold taining that he would be recognized by England and king

France, did not hesitate to accept it (see Becium). This of the Belgians.

duchy of Luxembourg, with the exception of the town and fortress of Luxembourg, was handed over to him as his private possession, not as a part of the kingdom; the bishopric of Liége and the duchy of Bouillon also went with it. The episode of the “Hundred Days,” though it delayed the conclusion of the very complicated arrangements involved in these transfers, gave the new kingdom an oppor- tunity of distinguishing itself: it was the first point of attack, and met the crisis with vigour. The Dutch troops under William, eldest son of the new king, took consider- able part in the short and striking campaign which was closed on June 18, 1815, by the final victory of Waterloo.

The allied powers now founded in Holland and Belgium what they hoped would be a solid and permanent kingdom as a barrier against France. It was felt that Napoleon had shown Europe the importance of this district in connexion with his scheme for European domination. The new kingdom under the house of Orange was there- fore the subject of great and anxious consideration at Vienna. The king, an hereditary sovereign, received full executive powers, and the initiative in proposing laws. He had also the

power of appointing his own couneil of State. As a legislative body there were the States-General,

appointment caused the utmost irritation at the Hague, and the Dutch suddenly invaded Belgium ; the opportune appearance of a French army checked the Dutch advance, and gave diplomacy time to interfere. The citadel of Antwerp, however, was still in Dutch hands, and the allied powers used in vain all their influence to persuade William I. to give it up to the Belgians. War was hereon declared, and France and England blockaded the Dutch ports, while a French army attacked the citadel, and, after a sharp struggle, compelled it to capitulate.

on one side, and those of England and France on the other, a convention in which William I. engaged not to recom- mence hostilities against Belgium, and to leave the Scheldt navigation open, till the relation between the two countries should be definitely settled by treaty. The final settlement of outstanding questions, however, was not reached till six years later, when Limburg and the eastern part of Luxem- bourg were secured to Holland, and heavy tolls were imposed on the navigation of the Scheldt ; then the two kingdoms finally parted company on the 19th of April 1839.

The forts of Lillo and Liefkenshoek were Conven- left in the hands of the Dutch ; on May 21, 1833, there tion of was signed at London by the plenipotentiaries of Holland London.

divided into two chambers ; each province had also its own local states. Freedom of worship and political equality were secured for all.

A highly artificial arrangement like this, however, could not stand long, if Europe came to throw off the trammels of the monarchical reaction, and to give freer course to those liberal tendencies which had survived the drama of the

. French Revolution. In religious belief, in laws and usages, In language, in interests, the Belgic and Batavian provinces had little in common. Their inhabitants were different

In the following year William I. resigned his crown to William his son William II., who reigned in peace till his death in Il. 1849, when he was succeeded by his eldest son William William III., who still reigns. The wave of revolution which Hl. passed over Europe in 1848 had in Holland com- paratively little effect: the constitution of 1814 was revised, and the tranquillity of the country secured. In 18538, after the establishment by the papacy of Catholic bishoprics in England and Holland, a considerable excite- ment arose, which resulted in the accession to power of

Biblio- graphy.

a moderate, liberal, and entirely Protestant cabinet, and ‘n the main the Protestant-liberal party has guided the country for the last quarter of a century. The Dutch took but a secondary part in the disputes between France and Germany as to Dutch Luxembourg, which by the treaty of London (1867) was declared neutral, and guaranteed to Holland. Recently they have been engaged in a very vexatious and wasteful war with the sultan of Acheen, their neighbour on the island of Sumatra.

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PART III.—LANGUAGE.

Of the Low German tribes the Old Saxons, the Anglo- Saxons, the Franks, and the Frisians played a specially important part both in north-western Europe in general and in the Low Countries in particular ; and accordingly it is with these tribes that we have in the first place to do when investigating the origin and development of the Dutch lan- guage. A great many dialects formerly existed side by side on Dutch ground, and many of them still live on the lips of the people ; but they all belonged to one or other of three well-defined groups—Frisian, Saxon, and Frankish.

In the earliest times about which records have come down to us, the Frisian dialect, in various shades of differ- ence indeed, occupied a very extensive area. It was the language universally spoken in the provinces of Groningen, Friesland, and North Holland. But in Groningen the Frisian has been superseded by the Saxon, and in North Holland by the Low Frankish dialect; and the three leading dialects of the Dutch are now distributed in Holland nearly, as follows :—(1) Saxon in Groningen, Drenthe, Overyssel, and the county of Zutphen ; (2) Frisian (more or less cor- rupt in the towns) in Friesland; and (3) Low Frankish in Guelderland (excepting the county of Zutphen), Utrecht, North and South Holland, Zealand, North Brabant, and Limburg.

In Groningen and North Holland the Frisian dialect has left more or less marked traces of its former pre- dominance in the pronunciation, vocabulary, and phraseo- logy of the present spoken language. During a considerable period laws, ordinances, contracts, and similar documents were drawn up in the various provinces in the peculiar dialect of each, aud many of these documents, especially in Frisian, have come down to our time. The inhabitants of the northern provinces, however, had neither superiority of culture nor political preponderance enough to secure the assimilation of the adjoining populations. The occupants of the tract in which Low Frankish was spoken were much more favourably situated ; and that dialect has in the end ousted the two others, and become the speech, both oral and written, of cultured Dutchmen.

From the documents collected by Miillenhoff and Scherer, and from many others, it is evident that between the 8th and the.12th century the different

German dialects served as vehicles of literary composition, and this, it appears, must also have been the case in the Netherlands. It may therefore be safely taken for granted that, among the libri Teuthonice script referred to in the act given in the year 1202 by the papal legate Guido for the organization of the bishopric of Liége, there were some written in the vernacular, ze, in Low Frankish, which after the sub- jugation of the Frisians and Saxons by the Franks was the idiom of the victors. Whatever pains Charlemagne took to raise the dignity of the German language, the practice, prevailing at the time and long afterwards, of using Latin in official documents emanating from the authorities, pre- vented the predominant form of speech from encroaching to any considerable extent on the other dialects. Still it is in this period that we must seek the first indications of the future victory of the Frankish dialect over the two others. And in course of time the Franks strengthened their political pre-eminence by a superiority of a different character, which, added to the first, went far to secure to the Frankish dialect the prerogative of being the universal vehicle of cultured thought, written and spoken, throughout the Netherlands. The barbarous victors could not resist the humanizing influence of the higher culture resulting from a lengthened intercourse with the Romans. And when, – after a considerable lapse of time, the new idiom, thus born from Latin, began to be employed in the composition of literary productions, the influence of these writings soon made itself sensibly felt in the southern Nether lands. The inhabitants of ancient Belgium had always continued in close intercourse with their brethren in France ; and the literary productions put forth in France, especially after the crusades, soon began to engage the attention of the opulent citizens of the thriving towns of Flanders and other parts of the southern Netherlands, and were diligently translated by them into their own tongue. Holland, Zealand, and Utrecht in their turn were connected with the southern Netherlands by many close ties. The

language spoken in the southern and in the northern Netherlands was the same for all practical purposes ; and soit happened that the French literary works and their Flemish reproductions attracted no small share of attention also in the northern Netherlands. The “ Dietsch” dialect, in which the oldest

and most popular works, such as Reynard the Fox and the works of Jacob van Maerlant, dating from the close of the 13th century, were composed, became the model speech for every one who wanted to address a larger public than that of his immediate vicinity. It was in this Dietsch dialect that Melis Stoke, an inmate of the monastery of Egmond, composed his Rhymed Chronicle (c. 1305).

From Holland and Utrecht the Dietsch dialect readily found its way farther north. What the Franks had tried to achieve in times long past was now undertaken by the counts of Holland and the bishops of Utrecht, viz., the total subjection of the northern provinces to their rule. These efforts on the part of the princes just named again made Frankish the dialect of the dominant, Frisian and Saxon the idiom of the conquered race. In this way Dietsch, ¢.e., Low Frankish, became the predominant dialect all over the Netherlands.

At a time when laws, mutual contracts, and other official documents issued in Friesland between the Vlie and the Lauwers are still drawn up in pure Old Frisian, the treaty by which the citizens of Stavoren recognize Count Floris for their sovereign lord in 1292 is written in Dutch. ‘The contracts drawn up by Frisians on both sides are nearly always in Frisian, even down to the close of the 15th century, though occasionally Dutch was used. In deeds of sale, contracts, &c., drawn up between 1490 and 1500, we meet with all possible shades and varieties of the Dutch dialect, which is seen to be rapidly gaining ground, Still, this substitution of Dutch for Frisian in documents of this nature by no means proves that Frisian was falling into desuetude among the country population. A good deal of course depended on the persons who were employed to compose the documents above referred to. The historian of Friesland, Gabbema, writing about 1650, bitterly laments the decay of the Frisian tongue; and even foreign writers, such as Conrad Gesner, refer to the fact ina similar way. But in spite of his lamentations Gabbema submits to the pressure of the times and writes his history not in Frisian but in Dutch. Nay, his friend Gysbert Japix, the cultivator par excellence of Frisian, the national poet of Friesland, wrote the introduction to his Friesche ijmelerije (“ Frisian Rhymes ”), and many a manly poem besides, in the same language. They were by no means averse to seeing cultured non-Frisians take cognizance of their literary labours; and

to satisfy this ambition, there was no other course open than to enlploy the language which such eminent men as Marnix, Coornhert, Roemer, Visser, Spiegel, Hooft, Huygens, and Vondel had permanently made the approved vehicle of thought and poetical utterance throughout the Netherlands, more especially after the fall of Antwerp, in 1585, had induced the most highly cultured minds of the southern Netherlands to migrate to Holland. This had been achieved partly by direct endeavours tending to the improvement of the language and the excision of all “foreign dross,” partly by the creation of beautiful works of literary art, and solid contributions to history and erudition. For the language and intellectual culture of Holland had now each attained a stage of advancement where neither imperiously demanded new capabilities in the other. What thus happened in Friesland also took place. elsewhere, the same or nearly the same causes bringing about the same results throughout the country.

The language of the Dutch has travelled to their trans- marine possessions, without engendering a new dialect

either in the East or West Indies. But a very different result might be expected if at any time their East Indian possessions should enter upon an independent career. A kind of mongrel dialect would arise, which may be seen foreshadowed’ in official papers and letters composed by so-called sizjos, or “half-breeds,” in the island of Java. We may even now point to one such dialect, the speech of the Dutch settlers in the Transvaal and the Orange Territory in South Africa, who have actually begun to raise their clipped Dutch to the dignity of a written language, iu which they are now composing works of general litera- ture, and even poems, diligently editing class-books and theological treatises, and printing such newspapers as Den opregten A frikaander.

Flemish or South Dutch, 7.e¢, Belgian Dutch, though very nearly allied to North Dutch or the Dutch of Holland, essentially differs from the latter in many important points of detail. In its vocabulary, its phraseology, and the structure of its sentences, it clearly betrays the influence of the French-

speaking part of the nation. In a novel by a very popular Flemish author, A. C. van der Cruyssen, printed in bold type in small octavo, and numbering less than 200 pages, the present writer noted far more than 200 cases in which a North-Dutchman would have chosen quite another turn of expression. The South Dutch dialect, which after the fall of Antwerp had remained almost stationary, but which in our days has become a cultured written language through the diligent efforts of various writers of great talent, bears the evident marks of this recent emergence from a stateof utter neglect on the partof cultured men, and to a North-Dutchman has an air of simple-minded artlessness and innocent naiveté.

_ The complexity of origin of the Dutch language is most

noticeable in the case of the vowels. In the consonants the Saxon and the Frankish did not differ greatly, and the Frisian has had a much smaller influence. To the Saxon must be ascribed the dropping of the nasal before 8, f, th, as wellas before b and 2, in vyf (five), sedert (sinthe, since), muiden (mouth), in proper names, &c. At the same time there are several words in which the x is pre- served,—most of these being borrowed from the Frankish, as ander, kunde, Yselmonde in Holland (alongside of Yselmuiden in Overyssel), aud gans (for which we have goeze in the Overyssel dialect). The s in the nom. plur. of the vowel stems is only partially retained: side by side there exist in Middle Dutch plural forms like honde, dorpers, kinder, kinde, kyne, which have almost all in later Dutch assumed either s simply, s after the plural form 7, or en (originally the plural form of m stems), the s and n being erroneously regarded as a sign of the plural (see infra). On the whole the Frankish influence has been the most potent,—that of the other two tongues being only observable here and there in the terminations, or in a comparatively limited number of words and expressions. The history of the development of the language may be divided into two great periods. In the first, the Middle Dutch, the fuller forms and long vowels of inflexional and derivational suffixes and the final elements of compound words, which are preserved in Gothic and High German, have already become short and unaccented, while at the same time, through the loss of the accent, the final elements have partly lost their significance, and occasionally a notable abbreviation has been effected both in their pronunciation and their orthography. From the Middle Dutch the modern language is distinguished

by a greater neglect and confusion of inflexional forms, by the presence of a large nuniber of foreign words intro- duced about the end of the 15th century, as well as of a multitude of dialect and modern terms, and by the disuse or modified significations of many of the older words.

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Of the Middle Dutch we have no remains earlier than the beginning of the 13th century, though Saxon and Frankish linguistic monuments go back to the 8th or 9th.

Middle Dutch extends from the 12th century to 1450; then follows a transition period, reaching to 1550, from which date Modern Dutch has prevailed to the present time. In the period last named a subdivision may be made at 1865, the date of the introduction of the new spelling.?

In Modern Dutch there is a considerable difference between the latest and the earliest forms. The older language still preserves many words that have now become obsolete, and the style is modelled more closely on that of the classical writers. Towards the end of the 18th century the influence of Van Effen, Stijl, Bilderdijk, and others effected great changes ; and while the deflexion largely increased, the Hollandsch dialect began to make itself predominant, especially in regard to the vowels w and y or yj (2). Indeed the main difference between Middle and Modern Dutch is due to the fact that the former is under the influence of Dietsch (the Flemish-Zealand dialect), while in the latter Hollandsch has the supremacy.

In the transition period the language was adulterated by a great number of bastard words and bastard forms derived from French, which obtained currency throughout Holland, Zealand, Utrecht, and the southern provinces, from the influ- ence of the court and government of the dukes of Burgundy.

The study of the dialects and grammar of Middle Dutch has not been prosecuted far enough to allow of very detailed statements regarding them. Our principal authorities for the interpretation of the literary remains are the works of De Vries, Verwijs, Verdam, Moltzer, and others. Most of these remains are in Dietsch, as the romances of chivalry, the works of Maerlant, the chronicles and songs ; others, as the St Servaas of Van Veldeke, are in

the language of the south-east (Limburgsch). Of the medieval language, as it was spoken in Utrecht or in the Saxon provinces? (the countship of Zutphen, Overyssel, and Drenthe), the only remains are in charters and similar documents. Since the Saxon, as is indicated by the conjugation of the verb, has exercised no dominant influence, and the Hollandsch on the other hand is closely connected with the Dietsch, we will only quote as an example of the language a single strophe from Maerlant's Wapene Martyn, with a metrical translation (hitherto unpublished) from the pen of Nicolas Bects (1880).

God, diet al bi redene doct, Gaf dit wandel aertsce goct Der menscheit gemene, Dattere mede ware gevoet, Ende gecleet, ende gescoet, Ende leven soude rene. Nu es gicricheit so verwoet, Dat ele scttet sinen'moet Om al te hebbene allene. Hieromme stortmen menscenbloet, Hieromme stichtmen metter spoet Borge ende hoge stene Menegen te wene.3

God, die het al met wijsheid doet,

Gaf dit verganklijk aardsche goed Den menschen in't gemeen,

Op dat zij zouden zijn gevoed,

Het lijf gekleed, geschoeid de voet | En leven rein van zeen,

Maar zie nu hoe de hebzucht wocdt

Dat iederecn in arren mocd *t Al hebben wil alleen!

Hierom vergiet meu menschenbloed,

En bouwt met roekeloozen spoed Burchtsloten, zwaar van stecn, Tot smart van menigeen,

The Consonants.—As regards the consonants, Dutch in the main does not differ from the other Low German languages. The explo- sive g and the ¢# are wanting. Instead of the former there is a g with ''fricative" pronunciation, and as in High German the th has passed over into d.

Nearly all the final consonants in Middle Dutch are sharpened, and the sharp sounds are graphically represented; in Modern Dutch, on the other hand, the historical development of the language being more distinctly kept in view, and the agreement observed with the inflexional forms, the soft consonant is written more frequently than it is sounded ; thus we have Middle Dutch dach, Modern Dutch dag, in analogy with the plural dagen.

_ The gutturals are g, k, ch, andh. The aspirate sound of the g is of very early date; even in the Old Dutch psalms g intcrchanges with h (weh side by side with weg, just as in Gothic faheds and faginon, Anglo-Saxon borh and borges, Old Saxon manah and manag). The gh, which in Middle Dutch frequently appears before ¢ and 4, served to distinguish the fricative g from the French g3; in later Middle Dutch we find this object lost sight of, and the gh also written before a, 0, or wu. In Maerlant ghans and ghene both occur. In the 15thcentury the gh was also employed instead of ch, when people began to observe the etymological agreement of

1 For information regarding the results furnished by an investigation of the a names, see Professor H. Kern in Taal- en Letterbode, part iii. p. 275. Sec Sloet, Oorkondenboek van Gelre en Zutphen: Taalkundige Bijdragen, i.

3 Van Jacob ende van Martine, ed, E. ij ibli i Teed. ’ Verwijs (Bibliotheek van Middelnederl.

HOLLAD®,

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tk lach and si laghen, and in this way arose the spelling 7k lagh, This indicated no change in pronunciation. That in Midille Dutch, however, an explosive pronunciation existed (in some words, more especially after 1), as well as the aspirated pronunciation, is evident from words like dinc, ginc; this sound did not hold its ground but passed into the nasalized guttural now written ding, ging. ‘The explosive force, however, was preserved where the dimi- nutive suffix je followed immediately after ng, as well as before lijk and some other affixes, and it is now expressed by k (Koninkye, jonkman). In combination with s, g became & (speeksel, fluks from vlug). So also in intensive verbs like bukken, knikken, where the k arose from an explosive g

before j of the suffix, and was doubled after the short vowels. In non-intensives, as liggen, zeggen, where the g was aspirated, that letter was doubled in the same way from gj. The Dutch g is besides sometimes derived from the common German g (gans, dag); sometimes it is the Old German h at the end of a word, between vowcls, or after liquids (hoog, zuig). Some: times it is a survival of the compound gw, and exists along withia form in w, as spugen, spuwen. G arose out of j in kruisigen and other verbs in -igen, just as in Anglo-Saxon. In the beginning of some words in Middle Dutch g passed into j, as jonst for gonst, while Modern Dutch again has gunst.. The passage of g into j, and 7 after a or e, and before a vowel, is found both in Middle Dutch and Modern Dutch: segel becomes zeil, gezegd gezeid. In some words the explosive g has passed into %; in others, and indeed the majority, the %, both in the body of the word and as an initial and a final letter, is the common Low German #. After short vowels the & of the compound #j was doubled, and the j dropped off after producing ‘““umlaut” (dekken, wekken). An original & remained as an initial letter before n or r in kring, knijpen, &c., alongside of which we have ring, nijpen, &c., in which the & passed into h and then disappeared. The % also remains undisplaced in the diminutive ken (Taal- cn Letterbode, ii. 105). Before t, & became ch in 2ucht (ziek), wacht (waken).

In Middle Dutch c and & are interchanged without distinction of sound. Cisused before vowels except ¢ and 7, and before 7, n, and rv, and at the end of a word (cop, elcen, cranc). After » sometimes ck is also employed (ganc and ganck). In later Middle Dutch the ck is more frequent; in other cases k is common (kint, kerke), Frequently we find & as well as c,—never, however, c before e or i, except in French words, where c had the sound of s (citroen). Sometimes ch (as in cheins, chessen) occurs as well as c (ceins, cessen), where ch represents the palatal sound of the s, which in the more modern language is rather represented by sf (korsjet and corset, sjokken and sokken, &c.). The doubling of the & was indicated by ck (decken), while gu was the ordinary for kw (bequame, quedelen, quene), in Modern Dutch dekken, bekwaam.

In the beginning of words / has lost its original aspirate sound and become a mere breathing, and consequently it has often dropped off both before other consonants and between vowels: thus hring becomes ring (as early as in the

Old Frankish psalms), slahan becomes slaan, viiehen in Middle Dutch viien. In some of these words ad has been afterwards inserted out of a supposed analogy with weak verbs, as ¢.g., with belien, belide ; where Modern Dutch has viieden, geschieden, Middle Dutch had vlien, gescien ; even in Middle Dutch, indeed, geschiede (Modern Dutch geschiedde) was an alternative form with geschach. In the dialects h is frequently prefixed improperly (harm for arm, &c.). At the end of words the h occasionally kept its fricative sound (hooch, geschach, tooch), as the ch shows. In the verbs tiegen (tiuhan) and tijgen (tihan), which sounded ¢ien and tijen in Middle Dutch, the g has been afterwards introduced into the present stem, probably through the similarity of the sound of the h (ch) in tooch with the ch sound which g acquires as a final consonant, and through the g of the plural preterite éogen. .Ch did not remain in the preterite of all verbs in Middle Dutch: vlien has vice as well as vlooch; alongside of this, however, there is an infinitive wZeghen, also with a preterite vlooch. From the compound hw the f soon dropped off in the Middle Dutch (walvisch, wie, waar), not, however, where the w was vocalized (compare hut with wet, hoe.with woe in the Saxon; in this last case woe passes further into boc). Before ¢, h retains its aspirate sound, as in vlueht (eh pronounced as the German ch without 7); and g also before ¢ takes the sharp sound of ch, although this is not represented by the spelling in substantives in -te, as gebergte, adjectives in ~~lik, as genoeglijk, and in the conjugation hij ligt. The ch in sch (pro~~ nounced as s: vleesch, pron. viecs), derived from the Middle Dutch sc (sk), is a mere orthographical convention ; as an initial consonant sch is now pronounced sg (schip), but in the Saxon dialects and in Frisian the old sound is preserved: skip, skool (schola). Seulan has already in Middle Dutch changed the sc into s, and in Modern Dutch it appears as z (zudlen). Ch before t, except where it stands for 9g, 18 derived from an f (compare gchucht, kocht, sticht, alongside of which we have words in which the f has been retained, as stift and bruzloft, Middle Dutch brulochte). Before-s the guttural is assimilated or syncopated: examples are bus (High German biichse), vos (fox), 22S; deesem (deegsem).

There is in Dutch a d which corresponds to the English th and

the High German d ; it is formed by the tongue and the upper row of teeth ; the , on the other hand, which is like the English d and the High German ¢ is formed by the tongue and the roof of the mouth (or the gums above the tceth).'_ In the Old Frankish psalms dtferde and tiferthi still exist side by side, but even then the distinction was probably not a great one; in Middle Dutch ¢h has become d, or the th is retained as a mere orthographical convention. While in the psalms a distinction is still preserved between th and das a final letter, inasmuch as d passes into ¢, but th, or d derived from th, remains, d at the end of words always changes in Middle Dutch into ¢ or into dt. Where, however, the d had remained before vowels in the conjugations of the verbs or the inflexions of the nouns, the was in several words afterwards restored, although the sharp sound was preserved. In other instances the sharp sound of the nominative affccted the oblique cases, and all forms acquired the sharp sound which then remained in Modern Dutch (gezant, gezanten; rit, ritten; verwant, verwanten); and the same change took place especially in indeclinable words, as want, met.

In Middle Dutch a éenuzs or spirant before d changes it into ¢; but whether it be owing to difference of dialect or to inaccuracies of orthography, many instances may be pointed out where this does not occur; thus we find nochtan, ontaen (for onttaen), but along with these also nochdanne, ontdaen. In Modern} Dutch this is not the case, but a number of forms are due to the same principle, especially in compounds of prepositions with the article (metten, metter), while in the conjugation of weak verbs also the suffix de turns into ¢e after sharp consonants (legde, lachte, Middle Dutch Joech). On account of the sharpening of the das a final letter, no @ is ever found before the suffix -nis, and ¢ even occurs before an afterwards inserted ¢, as in beeltenis (the same is the case with f, 0, v, as vergiffents for vergifnis).

After 0, oe, or wi the d passes into J, though in Middle Dutch in- stances seldom occur (Middle Dutch ruden, Modern Dutch ruien; Middle Dutch roden, Modern Dutch witrocien); sometimes it drops out (kwede, kwee). The spoken language goes much farther than the written in this use of 7 for d; thus dooje, goeje are written doode, goede. In like manner the spoken

language has changed d into w after aw or ow derived from a or ol; thus we find the pronunciation ouwe, gouwen, koww, with the spelling oude, gouden, koude. In the adjectives ouwelijk and kouweltjk the w has become established. Except after vowels in verbs where A has dropped out, whenever there is no preceding consonant, and an r follows either immediately or after ane, d is inserted after 1, n, r (kelder, zxwaarder, helder, diender, donder), an insertion which is less common in Middle Dutch (helre, solre, donre; also, however, dondre). At the end also of words we often have a paragogic d after m where the Middle Dutch kept the n as the final letter (thus zemand, arend ; Middle Dutch teman, wren) ; after sharp consonants ¢ is added, as gedrocht, bureht, borst (High German bursche), and also in mijnent, &c.

D is frequently syncopated as a penultimate consonant before s: thans for thands, volgens for volgends. Asem, wasem, perhaps, have not dropped the d (th) before s, but have changed th into s. While the final ¢ has partly grown out of d, it is partly also the common Low German and English ¢ (tal, laten, haat). Between s and rin words derived from the Romance tongues a¢ is inserted owing to the common German dislike to sr (stroop from sirop) ; after n, and also before the suffix ~~lijk, the introduction of ¢, which was frequent in the 16th century, is less and less heard, and on this point the written speech is far before the spoken (wezenlijk, eigenlijk are frequently pronounced wezentlijk, eigentlijk ; ordéntelijk alongside of ordelijz at an early date has acquired the ¢, and after~~ Wards an inserted ¢, at the same time modifying its signification), In the dialects (Limburg, Brabant, Utrecht) the final ¢ after con- Sonants and vowels is frequently dropped: hij heef (heeft), nie (niet). The compound és serves in words borrowed from the French to represent the Dutch pronunciation of the French sound ¢ (fatsoen, Fr. fagon), While the present language, both in orthography and Pronunciation, makes a distinction betwecn s (as in the English sound) and z (asin the English hazel), the Middle Dutch had only s (though in the later MSS. z begins to appear), and Frisian is still in the same position. Before a vowel or w, s has for the Most part passed into z, except in those words in which it is followed cither by a long or short vowel succeeded by s, or by a short vowel before s or k ; or z was sharpened into s bya ¢ from the preposition te: noel, ewak, vitten; sissen, suizen, sokken, samen (from tsamen for te zamen). In foreign words the s usually remains

(salwut, soldij). Contrary to the pronunciation, z is written in zestig and zeventig

(pronounced sestig, seventig, and in dialects ésestig, tseventig).2 The #In the middle of a word, after a syllable which originally had HO accent, has passed into r: generen, bevrooren; at the same time we have the forms genezen (to heal), bevrozen, and in the Middle

utch woos along with vroor, and kozen with koren. In many cases the meaning has been modified.

Compare on this point Kern in the Zaalkundige BYydragen, 1. 175. 7 This dialect ¢ has probably come from the Old Saxon ant- (hund), which stood efore zeventig, tachtig, negentig (dialect tnegentig). From these words the sharpening of the initial consonant has Spread to the other numerals: veertig and *uftig are pronounced feertig and jiftig.

HOE AND

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Prothesis of s occurs in smoel for moel. Such forms as slink and link, snebbe and nebbe, zwenken and wanken, go back to older forms, and are thus probably doublets of much older date than the break- ing off of the German languages from each other.

As in English so in Dutch 6 is the undisplaced German medial. At the beginning and in the body of a word it has the same sound; at the end it is pronounced as p (see p. 86). In Middle Dutch for the most part 6 was followed by a vowel (Middle Dutch webde, Modern Dutch wed); this vowel fell away in Modern Dutch, but the 6 remaincd in the written language. Wherever the d represents bj it is doubled, just as after a short vowel (krab, krabben). So, too, frequentatives have bb (krabbelen, kibbelen, with which compare Modern Dutch kijven, Middle Lower German kibben; stribdelen side by side with streven; compare also hebben and heeft, Old Frankish libban, Dutch leven). After & or 6+, b fell away both as a middle letter and as a final consonant; but this is not as yet general in Middle Dutch; alongside of erom, omme, we find cromp, ombe, while in Modern Dutch

we always have lam, krom, dom, om. In substantives ending in m with a preceding long vowel, wherever the diminutive particle ye is appended, a p is inserted (kruim, kruimpje; bloem, bloempje); but this does not take place after an imperfect vowel where an ¢ is inserted (kam, kammetje). As in English the p has not been displaced, and it has the same sound (paard, post, pink, lap).

For the English / as an initial letter (¢f. Sweet, Hist. of English Sounds, p. 78), Modern Dutch as well as Middle Dutch has / and v. In the body of a word the / passes into v (=v in English lover), or is doubled after short vowels (Jee, leven ; plof, ploffen). At the end and also before consonants after vowels, v becomes f (hoofd, Middle Dutch hoved; af, Middle Dutch ave and af). Verbs in -elen have f before ¢ (schuitfelen from sehwiven).

¥ (v) is the common German /, and accordingly interchanges With ¢h, as in ofte (Got. withthaw)= English or; but of (Got. iba)= English 7; veel (filu). Before vowels and J, f is sometimes pre- served in pure German words, while in others of the same sort v appears (frisch, verseh; flink, vlak; fel, vechten); so also in the Old Dutch psalms we find vader along with fader, while in Middle Dutch likewise a similar variation prevails. Usually the precedence of a sharp consonant in Middle Dutch causes the v to become f (mesfal, ontfaen; ef. val and vaen; but also mesval, &c.).

The combination /¢ has in Dutch passed into cht, but it appears in the dialects, and was more frequent in Middle Dutch (verkocht, hecht, sticht, achter ; verkoft, heft, stift, after). On the other hand in the psalms and the Glosse Lipsiane, and also in dialectic charters, we find occasionally ft for ht: druften (drwhtin), sufte (stem sdk), eendraftig (for eendrachtig).

The liquids are unchanged, except m and m in inflexional ter- minations. In certain other cases 7 interchanges with m: for example, slak, High German schnecke; Schevelingen (17th century), Scheveningen, &e. By the 7 sound a preceding a or ¢ is turned into 0, as overtollig (tal); insome instances o/ changes into ow, ¢.g., goud, oud, zout; if the o before ¢ passes into w (see under 0), then the solu- tion does not take place (gulden; Middle Dutch hulten, Modern Dutch houten; menigvuldig). In Middle Dutch we have wi, ol, and ouside byside. Jfremains with stem vowels, in the suffix -ma (even where it becomes in High German), as bloem, bezem (High German besen),

and in hem, dat. sing. 3d pers. pron. In other cases it passes into m in inflexional terminations ; den (High German dem), geven (1st pers. plu. pres.); mb becomes mm, and consequently m. In maar, m represents nw (nware for ne ware). In drempel, m is inserted.

The 7 is of very various character. In the first place we have the dental 7, agreeing with the Italian r in ragazzo—for exaniple, raad, rust, hart ; and secondly we have the guttural r, only heard in words which had hr in Old German (ring, ros, rewzel). As the former is a difficult sound for many Dutchmen, especially for those of the Saxon district, the guttural r is used instead; of it. In the Saxon districts we find, besides, a very strong consonant called by Sievers the ‘‘ cerebral” 7 (¢.g., hard, worst, marsch). Although it is not distinctly audible, a practised observer can hear it, just as in the English etter, hard. The r derived from z belongs to the first class. Through the influence of the r, short vowels are lengthened in Middle Dutch (aereh, aerbeid, for arg, arbeid). Transposition of the 7, both before and after the vowel, is frequent in Middle Dutch and in Modern Dutch: godsvrucht, nooddruft, dertig, barnen, kersten (krist). Before r, n was elided in Middle Dutch (mire for minre, &c.); before m it was assimilated (onmate,’ ommate), and before b it passed into m (omberaden) ; but in Modern Dutch this change does not take place.

In some words beginning with a vowel, » has been prefixed through the influence of the declined article, the possessive pronoun, or the preposition in: thus naarstig, Middle Dutch naernst, grew out of in ernst; navonds from avond ; noom (17th century) out of min oom(Modern Dutch, however, hasoom). As regards thepreteritcs dacht and braeht along with denken and brengen, which appear in Middle Dutch, no certainty has been attained. The in this case

3 Kern, Taalk, Bidr., i. 21

may have dropped out, as in the other German languages, while before ch the @ was shortened to a, which like a in other cases before ch passed into o (hence, in the spoken language, brochd, docht exist side by side with bracht, dacht), or the suffix may be appended to the non-nasalized stem.

That each Germanic language may in these cases have gone its own way is evident from the Anglo- Saxon, where such a form as gipohta indicates an older form gipanhta.

Vowels. —As early as the Middle Dutch period, the final vowels of the inflexions, 7 and w as well as ¢, had for the most part lost their sound. The 7 which gave rise to the umlaut was in great measure elided in some words before the umlaut period, in others later. The number of words in which no umlaut occurs is increased ; in some words it is absent, even while 7 is retained or has passed into e; this depends on the greater or less sensitiveness of the dialect for the umlaut:—Jaat, comparat. later; beter; Middle Dutch hoved, Modern Dutch hoofd; teugel; Middle Dutch hoge, Modern Dutch verheugd, heug; bleul[de], bloode ; edel, adel. Analogy has also played a great part in the modification of formations (vast, vaster, along with vesting, vesten; macht, machtig, along with amechtig; hand, handen, handig, along with behendig).

A has in open syllables the sound of English in father, in closed syllables that of the English a in as; when there is a perfect sound in closed syllables the spelling is aa (jaar), in open syllables a (maken); in bad, nat,a=d. An original short a and a long in open syllables are even in Middle Dutch pronounced alike, and may be rhymed with each other (dagen, lagen, a rhyme which was not permitted in Middle High German). In the Saxon dialects was expressed by ao (some words came in this way into Dutch with oo for ao, as moot, a slice of fish), and or in the Frisio-Saxon districts passes into é before 7, as jer (jaar). Middle Dutch preserved a in several words where in Modern Dutch it passes into ¢ before r (arg, erg; sarc, zerk; warf, werf); in others, as aarde, staart, zwaard, the Middle Dutch had e¢ and a (erde, stert, swert, swart, start; Modern Dutch zwaard, staart). In foreign words, likewise, e¢ before 7 has become a; paars, perse; lantaarn, lanterne (in the dialects ¢ is still frequently retained). In Middle Dutch a before 7 sometimes, but not usually, becomes 0 (overtallich side by side with drievoldich) ; the passage of a into 0 before ch also occurs (amboeht, brocht, &c.).

In the preterite singular of the first conjugation of strong verbs the a is always retained in Middle Dutch, and has not passed, as in Modern Dutch, into 0 through the influence of the plural (Middle Dutch zc vant, bant, wi vonden, bonden, Modern Dutch tk vont, bond, &e.). It is also retained before 7 and 7, ¢g., barg, starf (though side by side with these we have berg, sterf), where Modern Dutch has borg, stierf, hielp, &. In te sel, hi scl, the ¢ came from the plural wi selen, whereas the present form is again 7k zal. A similar influence of analogy is observable in the o for a in the verbs scheren, zweren, and wegen, which now have schoor, schoren, zwoor, and woog; Middle Dutch scar, scdren, wach, &c., in which the a has been displaced by the o of the preterite par- ticiple. In the conjugation of the verbs Middle Dutch has e where Modern Dutch has @ (geslegen, dregen, Modern Dutch dragen). In geheven alone ¢ has been kept. In the 3d pers. sing. forms like ontfeet, geet, steet, occur in Middle Dutch, along with ont- fact, gact, staet (Modern Dutch ontvangt, gaat, staat). In participles of verbs in the Germanic ~~jan, Middle Dutch has in some cases the original form without the umlaut, where Modern Dutch, through the analogy with the present, has the umlaut: Middle Dutch becant, genant, gesant; Modern Dutch bekend, gezonden. This last arose through confusion with the participle of the verb sinden, which had become obsolete, gezant continuing to exist as a sub~~ stantive.

In substantives and adjectives we find ¢ (derived from @ through z) along with the unchanged a (gretig, graag, from gradig; hekel, akelig ; edel, adel).

The sound of the ¢ derived from a does not differ from that of an original ¢, or of an ¢ derived from 7, as they appear in open syllables (vele, steden, pronounced as a in English name). If the e derived from @ or? 01 the original ¢ occurs in closed syllables, it has a short sound, as in English men, end, Modern Dutch stem ; while before 7 it is pronounced almost as the ein the High German Herr. Thee in closed syllables with a full sound (as English a; Sweet, ez) is spelled ce: veel, week (e from 7%), beek. The sharp, clear ee which comes from a7 before r and w, followed or not by 7 or j, is indicated by the same letters in both open and closed syllables: cer, snecww, zee. Before other consonants followed by 7% or 7 we always find e¢: verbreiden, heil, leiden, -heid, Middle Dutch -hede, (hence in Modern Dutch plural ~~heden). If nod orj followed, then ai became ce (leed, breed).~~

~~While in the Saxon dialect of Guelder~~ land and Overyssel ai is always ec except when 7 orj follows, an et often occurs in the western dialects, which has not arisen through the umlaut ; in some ee it is even pronounced as a? where the written form has ee: Yselstein (proper name), gemein, &c.; Modern Dutch steen, gemeen.

Sometimes the e¢ has come from ag or eg through vocalization of the g to j (meid, maged ; zeil, segel); sometimes it is from the

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French at, et, é, ée (fontein, hakkenei, balein, &c.). In individual cases e¢ stands where the Middle Dutch has e before 1: deinzen, Middle Dutch denzen; peinzen, Middle Dutch penzen and peizen; sometimes it is the result of an 7 following: heinde (hende, hand).

Since the umlaut has not been equally effective in all dialects, heing even wanting where 7 has passed into e or dropped out, we find words with ce side by side with words with c?7. Thus, Middle Dutch has reene, Kleene, where Modern Dutch, through the influence of another dialect, has rein, klein. In Modern Dutch ce frequently exists side by side with ez (verbreeden, verbreiden ; heelen, hetl) ; in this case there is usually a differentiation of meaning. The dialect of North Holland turns ce into de (biest, stien, bien, for the Dutch beest, steen, been); and this explains some words with 7e in the spoken language: for example, tientje (twig), driegen (dreigen)— 17th century.

The letter o represents three sounds :—(1) the short sharp 0 and (2) the short soft 0, the former like the o in English not and French soldat (Dutch bod, belofte, tocht, kolf), the latter like the French o in ballon (Dutch vod, ploffen, ochtend, vol; Middle Dutch has frequently w, as wehtend); and (3) the full o as in French noter (Dutch kolen, sloten, verloren), The sharp clear oo has almost the same sound as the full 0; in some dialects (among others the Saxon) it is pronounced as double 00, in others (Flemish and Hollandsch) somewhat like au. In Middle Dutch, the lengthening of the vowels was frequently indicated by e (before r sometimes by 7, as in oir);

hence ae for 4, oc for 6. Where oe occurs in the modern language, it has the sound of «(pronounced like the wu in High German, and answering to the Gothic 6, Old High German uo from wa), which in Middle Dutch was frequently re- presented by ow (aw; Sweet, p. 6), still so pronounced in West Flemish and the Groningen dialects,! though before labials and gutturals it was expressed by we and oe (bowc, souken, and also guet, vuerin, but usually goct, soeken, boec). The Saxon dialects stil] preserve in these cases an 6 sound which agrees with the Middle Dutch oe (b6k, méder); in two words—romer (roemer, however, is also used) and spook—o has passed from these dialects into Dutch. As the u (Old German @), which in the modern tongues has passed into wi except before 7 aud w, retains the w sound in the Saxon districts, some words have come into Dutch from these dialects, being written with oc from the similar sound of oc (from 6) and wa (snoet, boer, soczen, alongside of which are Frankish words, snwit, swizen, &c.). Except in the Saxon dialects, which are more sen- sitive to the umlaut, the modification of oe by 7 seldom occurs (Modern Dutch groen, zoct, zoeken, but Saxon gryn, zyt, zyken,—o¢f. Sweet, History of English Sounds, p. 6). IntheGroningen dialect, 6 in zdiken is umlaut of ow (oee=o0u; mouder, Modern Dutch, moeder), Forms in Modern Dutch as rewkeloos, beuk, geneugte alongside of roekeloos, bock, genoegen, show the oe changed before ¢ in ew, when oe was still prononneed 6; they have thus not umlaut of oe but of 4.

In French words which are completely naturalized long o becomes oe (facon= fatsoen).

In Middle Dutch, 0 in some cases oceurs instead of oe (w) in open syllables (gode, moder). This o for oe rhymes with o ; rhymes Fie gode (goede) and gode (Goth. Gups), stocct (stookt) and soect (zoekt), are repeatedly introduced. Thus, too, oc=6from aw and oc=Goth, 6 and @ rhyme with each other.

The Modern Dutch 00 from aw is represented by 00 both in open and in closed syllables. The full clear 0 from the German o or w is expressed in closed syllables by 00, in open syllables by 0: hodl, kolen (English coal), stroom, stroomen. The umlaut of the soft ’ and sharp o (ew=é in High German schén) is rare in Middle Dutch: Modern Dutch vlewgel, Middle

Dutch vlogel; keuken, kokene; verheugen, hogen. Side by side with some cases where the umlaut occurs the form without the umlaut is also retained in Modern Dutch (leugen, logen), somctimes with a difference in the meaning (spreuk, sprook; heusch, hoofsch). In the dialects the area of the umlaut is wider.

Oe before m and oe and oo before eh, especially in monosyllables, have changed into 8: bloem, blom; zocken, xocht; rogpen, rocht (whence berucht and gerueht); koopen, kocht. As in rocht, gerucht, the short soft o from the Middle Dutch has in many words passed into w (Middle Dutch connen, gonnen, joffer (joncvere) ; Modern Dutch kunnen, gunnen, juffer); sometimes both forms have con- tinucd in use: snorken, snurken; plonderen, plunderen; veelvoudig (vcelvoldig), menigvuldig. In like manncr, the forms wu and 0 from ui exist side by side (droppel, druppel; gort, grut), as also u from @ before Z (spud, spel).

The had still the Old German pronunciation in the Old Frankish psalms, and this was probably the case also in the oldest Middle Dutch. In Maerlant's style, however, it had already acquired the sound of the French win nature: thus, Maerlant rhymes nature, eure; gure, pure; sure, ereature. In the dialects we still hear the old sound and not y (Sweet, p. 6), ¢.g., Guelders dialect zur, Dutch zyr. Under the influence of the Hollandsch in the 16th and 17th centuries, the @ has passed over through 6 into w 0 ee eee

1 See De Bo, Westviaamsch Idioticon, 1804,

(pronounced nearly as the High German ew, English oy), except before r and w, where the kceps the sound di. Middle Dutch oi also passed into wt (slover, sluier), just as wi after consonants: hut (hwet), dat (thwett). From the common German thus arose the Middle Dutch w in duve, dusent, mues, and in the verbs sugen, supen, luken, corresponding to the Modern Dutch wi in duzzend, duif, muis, zuigen, zuipen, lwiken (in which the High German has au, Old High German) . 'The words in which the Saxon has the umlaut have in Middle

Dutch likewise wu, but in Modern Dutch ui: Middle Dutch budel, suver, lusteren; Modern Dutch bwidel, guiver, luisteren; Saxon bdiidel, ziiver, listeren, &c. In Modern Dutch moel, snoet, knoest, &c., have oe along with forms in wi (muil, snwit, knwist). In the Saxon dialect, oc (wu) and occur in some cases in the oblique cases (knocst, pl. kniiste). |The same thing takes place in the strong verbs, which in Anglo-Saxon have %@, in Qld High German vo (Modern Dutch bwigen, Anglo-Saxon bigan, Old High German biogan); the Saxon dialects have here some- times a (diigen, sliiten), sometimes oe (krocpen, schocven). Old German 7 passes before the suffix a into eo, io, and finally in Middle Dutch and Modern Dutch into ve (dier, bicden, kiezen). Before r Middle Dutch has the @ frequently along with ze (onghiere, ongehure); Modern Dutch dwwr along with dicrbaar (Belgian duurbaar), vuur (from viwar) along with vier. Sometimes 7¢e changes into e: deemoedig, (diemocdig, dienen), dre as well as drie, heden and Modern Dutch huiden (Cosijn, Noord en Zuid, i. 219). In some cases ui comes from the degradation of ai or 7, especially in words borrowed from the French (/ruiten, Fr. frite, Lat. frictare ; fornwis, Fr. fornaise, Middle Dutch fornays).

If an original ev is followed by j, 7, or w, then eu becomes iu, Middle Dutch uw, Modern Dutch wz: beduden, dutsch, luden, Modern Dutch beduiden, duitsch, lwiden, aloug with which, however, exist the forms dtetsch (derived from diet), lieden, bedieden, which must be ascribed to the influeuce of the Flemish and Zealand dialects. To this influence must also be assigned the ze before r and Jin strong verbs of the first class which originally had a (stierf, hielp, &c.), while the reduplicative verbs in the preterite have ze, just as in Middle German and Modern German it is produced through contrac- tion, according to analogy, and passes before double consonants into ¢ (slvep, ving).

Je further indicates a lengthened 7 and ¢ in syllables on which the chief accent falls (fabrick, fabrieken), while z is used for short vand in unaccented syllables, or, it may be, for short 7 in closed syllables (fabrikant, sikkel, midden, binden). The long 7 is indi- cated by ze, where 7% (which was originally the sign of 1, and in Middle Dutch and the dialects is still so pronounced) passes over into ai and e7 through dialect influence, but retains the written form 1: sijsje(Eng. siskin), parti}, pijn, ijs, &c. In some words in

which the original 7 sound has been preserved, ¢ is also expressed hy te (gerief, wierook, kiem, &c.).

The sounds in Dutch which are the most difficult for foreigners to pronounce are the aspirated g, the ch after vowels, the sch before vowels, and v. This last letter is pronounced by the Germans either as w or asf, and they also usually confound and p as initial consonants. Of the vowels, the most difficult is the wi, which is almost never pronounced with perfect accuracy by a foreigner. The ¢j and ei are generally sounded too closely like az.

into two ea classes :—(1) a combination of the various vowel stems, which have more or less lost their individual characters, though here and there, in particular expressions and dialects, the difference of the stems makes itself apparent ; and (2) aconsonantal declension, that of the n stems—the other consonantal stems having been assimilated partly to the n stems and partly to the vowel stems.

Gradually, however, the two classes begin to be confused with each |

other; thus in the vowel stems s completely ousts the ¢ as a sign of the nominative plural, and consequently acquires a plural signifi- cance as well as en, so that (with some exceptions, like graaf, hertog, &c., and adjectives employed as substantives) s and en are in Modern Dutch used indifferently as plural terminations, the selec- tion mainly depending on the nature of the foregoing consonant. In the words already mentioned—graaf, heer, vorst, &c., and in compounds like gravenkroon, hanenkam, the genitive termination en 1s preserved. The s of the genitive is employed in feminines whenever the qualified word stands after it, as moederskind; with this exception, the s, especiallyin the spoken speech, is almost entirely superseded by the periphrasis van den; des heeren becomes van den heer, the two forms having the same meaning, which is not the case in High German.

Neuters have in the plural the same inflexion as masculines ; but they more frequently than these have the plural termination -c7,— corrupted, however, to -ers or -eren (kind, kinders or kinderen), no plural termination in ~~er alone being now recognized. Some words, which in the singular had a parallel~~

~~form with another termination, have the plural according only to one form: stad and stede, for ex~~

ample, have the plural stcden. In some cases (as schip, plur. sehepen ; |

smd, plur. smeden)the plural form has not yet been explained. In the dialects, especially in the Saxon, the older forms, more particu-

| (Fr. i] se trouve la).

larly of the plural, are still in force ; and there is still a certain dif- ference between the several stems : boom, pl. bewme (dime); gast, geste,

The old genitive and dative forms are only retained in individual expressions, as den lande, des huizes, &c. ; in all other cases the genitive and dative are expressed by the prepositions van or aan. The accusative is like the nominative, while in the neuter the dative also without aan is like the accusative. From the similarity of the dative and accusative masculine and neuter of the article great similarity has arisen in the government of the prepositions ; it is only in a few expressions (metterdaad, van goeden huize) that the original cases have been maintained; in all other instances voor, van, door, met, &c., govern the accusative. In Middle Dutch this coufusion had not advanced so far. The dropping of the n at the end after vowels—a special peculiarity of Hollandsch—has given rise to great neglect of the genders in the spoken language ; and this confusion has even made itself felt in the literary style, though it is kept in check by the Saxon dialects, which are strongly conser- vative in this respect.

The singular of the second personal pronoun du (still used in Middle Dutch) has been displaced by the plural gi, which was originally used out of politeness; and Uderived from Uwe Edelheid is now employed as the honorific. As dative and accusative of gti, jou is familiar in the spoken language (Eng. you, Goth. jus). The third person has, as in English, for the masculine hij (ht), thus diverging from the High German ; the neuter is het.

The form in use for the neuter article also sounds het ; this het is due to the fact that the abbreviation ’t for the pronoun het and for the article dat was the same,—a coincidence which led to an erroncous identifica- tion. In Middle Dutch the reflexive pronoun was hem; Modern Dutch (agreeing in this with the Old Frankish psalms) has zich.

Though the strong verbs and the various classes of weak verbs are always kept separate, many verbs have become through association of ideas almost unrecognizable. Strong verbs have become wholly or partially weak: bannen, bande, gebannen ; spannen, spande, gespan- nen; helen, heelde, verholen and verhecld , beseffen, besefte, beseft (Middle Dutch besief, beseven) ; weak verbs have become strong : jagen (Middle Dutch jaagde), joeg and jaagde, yejaagd ; schenden, schond, geschonden; zenden(see above); prijzenand wijzen passthrough the 7 (the weak) into the strong 4 class (Middle Dutch, prisde, wisde ; Modern Dutch, precs, wees, geprezen, gewezen. In belijden, belwidde, Middle Dutch belién, belide, the d of the preterite found its way into the present also and into the infinitive ; and the deléden, Modern Dutch belijden, thus formed passed into the ¢ class of strong verbs. The a of ward, the preterite of werden, has passed into werd, and the plural has through analogy become werden, the present being tk word and the infinitive worden. The first class of strong verbs has before m + a consonant z in the stem of the present (binden) or else ¢ (helpen), this e remaining throughout the conjugation of the present (hij helpt, not, asin High German, hil/ft). In the preterite the a has changed into o through the influence of the plural, as has already been mentioned undero. The conjunctive or optative is frequently neglected even in Middle Dutch; in the living language it is some- times used after certain’verbs and conjunctions (op dat and ten cinde), but in expressing a wish it is sometimes periphrased by mogen or laten, and it is very frequently displaced by the indicative. The High

; German construction of the verb with zich to express a passive idea Grammar.—In Middle Dutch the different noun-stems are divided |

is contrary to the genius of Dutch, which employs the periphrastic passive form het wordt daar gevonden instead of es findet sich da The formation of the future likewise differs from that of the High German, the auxiliary being

not werden but zullen (Eng. shall): tk zal het doen=both I shall do it and J will do tt.

Much of the vocabulary of Middle Dutch has now become obsolete. Some words have altogether disappeared:—dorper, dorperlike (Modern Dutch, gemeen), graen (knevel), grein (kern, excellent person), ontstaen (afwachten), ors (paard), oorbaer (nut). Others have changed their meaning :—couse, ‘‘breeches,” now ‘‘hose”; clene, ‘‘few,” now ‘‘small”; onnoozel, ‘‘innocent,” now ‘‘half- witted”; slecht, ‘‘simple,” now ‘‘wicked”; beproeven, ‘to prove,” now ‘‘to attempt”; eranec, ‘‘ weak,” now ‘‘sick.”

Many new native words have grown up in connexion with trade, industry, art, and science; many foreign words have also been in- troduced, such as those taken from the French with the suffixes eeren, tek, tef; and many words from the dialects have received rights of citizenship.

For a fuller survey of the history of Duteh, the reader is referred to W. Dwight Whitney’s Language and its Study, and the excellent translation of it by J. B. Vinckers, Taal en Taalstudie, volgens de 3de uitgave voor Nederlanders bewerkt, The grammar of the current speech may be studied in the Spraakkunsten of Kern, P J. Cosijn, Van Helten. For the explanation of Middie Dutch words and forms, see the papers of De Vries, Verwijs,and Verdam in the Zaalgids, the Taal- en Letterbode, and the Taalkundige Bijdragen; De. Vries, Middelnederlandsche Taal- zuivering; the editions of the Spieghel Listoriael by Maerlant, of De Rose, William van Hillegaerdsberg, Seghelyn; and the Bibliotheek van Middelnederlandsche Letterkunde, by H. E. Moltzer. For explanation and history of words of the current language see the Woordenboek der Ned. Taal, by De Vries, Te Winkel, &. The old Saxon and Frankish forins are treated by Kern in Zaal- en Letterbode, Cosijn in the Oud Frank. Psalmen, Gallée in Altsdchsische Laut- und Flexionslehre (ist part). A good survey of the orthography is given in De Vries and Te Winkel’s Grondbeginselen der Nederlandsche Spelling and Wourdenlijst voor de Spelling der Nederlandsche Taal. (J. B. V.—J. H. G.)

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Willem the Minstrel.

and other cities contrived to win such privileges as amounted almost to political independence, and with this liberty there arose a new sort of literary expression. The founder and creator of this original Dutch literature was Jakob van Maer. — Maerlant, born near Bruges between 1225 and 1250. His lant. youth was spent in Holland, and probably in connexion with the court, but in 1261 he returned to Flanders, where he died about thirty years later. Maerlant commenced, as his predecessors had done, by translating the courtly romances of the French, but when he returned to Flanders lie began to take his true position as an original didactic poet. His Flowers of Nature, written about 1263, forms an epoch in Dutch literature ; it is a collection of moral and satirical addresses to all classes of society. With his Rijmbijbel (Rhyming Bible) he nearly brought down on his too secular head, in 1270, the chastisement of the bishop of Utrecht, and thus early in Dutch history foreshadowed the courage and free-thought of the Reformation. It was not until 1284 that he commenced his masterpiece, De Spieghel Historiael (The Mirror of History), at the comniand of Count Floris V. After writing a great many important works, lyrical and didactic, Maerlant died at Damme, about 1291. Of his disciples, the most considerable in South Holland was Jan van Boendale (1280-1365). He Bosndal was a politician of considerable influence, and his works are historical and moral in character. In him the last trace of the old chivalric and romantic element has disappeared. He completed his famous rhyme chronicle, the Brabantsche Yeesten, in 1315 ; it contains the history of Brabant down to the times of the author himself. For English readers it is disappointing that Boendale's other great historical work, an account of Edward III. and his expedition to Flanders in 1338, has survived only in some fragments. The remainder of Boendale's works are didactic poems, — pursuing still further the moral thread first taken up by @ Maerlant, and founded on medizval scholastic literature. in Ypres the school of Maerlant was represented by Jan de Weett. Weert, a surgeon, who died in 1362, and who was the author of two remarkable works of moral satire and exhorta-)

tion. In North Holland a greater talent than that of Weert or of Boendale was exhibited by Melis Stoke, a Stoke monk of Egmond, who wrote the history of the state of | Holland to the year 1305 ; this work, the Rijmkromk, was printed in 1591, and for its exactitude and minute detail has proved of inestimable service to later historians.

With the middle of the 14th century the chivalric spirit came once more into fashion. A certain revival of the ’ forms of feudal life made its appearance under William IIL. and his successors. Kniglitly romances came once more into vogue, but the new-born didactic poetry contended vigorously against tle supremacy of what was lyrical and epical. It will be seen that from the very first the literary spirit in Holland began to assert itself in a homely and utilitarian spirit. Jan van Heelu, a Brabanter, was the Heelu. author of an epic poem on the battle of Woeronc (1288), and to him has been attributed the still finer romance of the War of Grimbergen. Still more thoroughly aristocratic in feeling was Hein van Aken, a priest of Louvain, who Aken. lived about 1255-1330, and who combined to a very curious extent the romantic and didactic elements. As early a8 1280 he had completed his translation of the /oman de la Rose, which he must have commenced in the lifetime of Jean de Meung. More remarkable than any of his trans-

As has been shown above, the language now known as Dutch or Flemish did not begin to take distinct shape till about the end of the 1lthceutury. From a few existing frag- ments—two incantations from the 8th century, a version of the Psalms from the 9th century, and several charters—a supposed Old Dutch language has been recognized; but Dutch literature actually commences in the 13th century, as Middle Dutch, the creation of the first national movement in Brabant, Flanders, Holland, and Zealand, From the wreck of Frankish anarchy no genuine folk-tales of Dutch antiquity have come down to us, and scarcely any echoes of German myth. On the other hand, the sagas of Charlemagne and Arthur appear immediately in Middle Dutch forms. These were evidently introduced by wandering minstrels and jongleurs, and translated to gratify the curiosity of the noble women. It is rarely that the name of such a translator has reached us, but we happen to know that the fragments we possess of the French romance of William of Orange were written in Dutch by a certain Klaas van Haarlem, between 1191 and 1217. ‘The Chanson de Roland was translated

about the same time, and considerably later Parthenopeus de Blois. The Flemish minstrel Diederic van Assenede completed his version of Floris et Blanchefleur about 1250, The Arthurian legends appear to have been brought to Flanders by some Flemish colonists in Wales, on their return to their mother-country. About 1250 a Brabantine minstrel translated Walter Map's Lancelot du Lac at the command of his liege, Lodewijk van Velthem. The Gauvain was translated by Pennine and Vostaert before 1260, while the first original Dutch writer, the fanious Jakob van Maerlant, occupied himself about 1260 with several romances dealing with Merlin and the Holy Grail. The earliest existing fragments of the epic of Reynard the Fox were written in Latin by Flemish priests, and about 1250 a very important version in Dutch was made by Willem the Minstrel, of whom it is unfortunate that we know no more, save that he was the translator of a lost romance, Madoc. In his existing work the author follows Pierre de Saint-Cloud, but notslavishly ; and he is the first really admirable writer that we meet with in Dutch litera- ture. It is not necessary to dwell at any length on the monkish legends and the hymns to the Virgin Mary which were abundantly produced during the 18th century, and which, though destitute of all literary merit, were of use as exercises in the infancy of the language. The first lyrical writer of Holland was John 1, duke of Brabant, who practised the minnelied with success, but whose songs are only known to us through a Swabian version of a few of them. In 1544 the earliest collection of Dutch folk-songs saw the light, and in this volume one or two romances of the 14th century are preserved, of which Het Daghet in den Oosten is the best known. Almost the earliest frag- ment of Dutch popular poetry, but of later time, is an historical ballad describing the murder of Count Floris V. in 1296. A very curious collection of mystical medizval hymns by Sister Hadewych, a nun of Brabant, was first printed in 1877.

Hitherto, as we have seen, the Middle Dutch langnage had placed itself at the service of the aristocratic and monastic orders, flattering the traditions of chivalry and of religion, but scarcely finding anything to say to the bulk of the population. With the close of the 13th century a change came over the face of Dutch literature. The Flemish towns began to prosper and to assert their com- | lated works, however, is his original romance Heinric en mercial supremacy over the North Sea. Under such mild | Margriete, upon

which he was at work for thirty-seven rulers as William II. and Floris V., Dort, Amsterdam, | years. During the Bavarian period (1849-1433) very

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little original writing of much value was produced in Holland. Buodewijn van der Loren wrote one excellent piece on the Maid of Ghent, in 1389. Augustijnken van Dordt was a peripatetic minstrel of North Holland, who composed for the sheriff Aelbrecht and for the count of Blois from 1350 to 1370. Such of his verses as have been handed down to us are allegorical and moral. Willem van Hildegaersberch (1350-1408) was another northern poet, of a more strictly political cast. Many of his writings exist still unpublished, and are very rough in style and wanting inform. Towards the end of the 15th century an erotic poet of considerable power arose in the person of the lord of Waddinxsveen and Hubrechtsambacht, Dirk Potter. During a stay of three years in Rome, from 1409 to 1412, this eminent diplomatist made himself acquainted with the writings of Boccaccio, and commenced a vast poem on the course of love, Der AMinnen Loep, which is a wonderful mixture of classical and Biblical instances of amorous adventure, set in a framework of didactic philosophy. In Dirk Potter the last traces of the chivalric element died out of Dutch literature, and left poetry entirely in the hands of the school of Maerlant.

It is now time to consider the growth of prose literature in the Low Countries. The oldest pieces of Dutch prose now in existence are charters of the towns of Flanders and Zealand, dated 1249, 1251, and 1254. A prose translation of the Old Testament was made about 1300, and there exists a Life of Jesus of about the same date. Of the mystical preachers whose religious writings have reached us, the Brussels friar, Jan van Ruysbroec (1294-1381), is the most important. But the most interesting relics of medieval Dutch prose, as far as the formation of the language is concerned,

are the popular romances in which the romantic stories of the ¢rowvéres and minstrels were

translated for the benefit of the unlettered public into

simple language. As in most European natious, the re- prominent place in every survey of

medivval literature in Holland. Unfortunately the text

of all the earliest mysteries, the language of which would.

have an extraordinary interest for us, has been lost. We possess records of dramas having been played at various places—Our Lord's Resurrection, at the Hague, in 1400 ;. Ow Lady the Virgin, at Arnheim, in 1452 ; and The Three Kings, at Delft, in 1498. The earliest existing fragment,

_ however, is part of a Limburg-Maestricht Passover Play of

about 1360, The latest Dutch miracle play was the ILystery of the Holy Sacrament, composed by a certain Smeken, at Breda, and performed on St John's Day, 1500. This play was printed in 1867. With these purely theological dramas there were acted mundane farces, performed outside the churches, by semi-religious companies ; these curious Moralities were known as " Abelespelen" and " Sotternieén." Tn these pieces we discover the first traces of that genius for low comedy which was afterwards to take perfect form in the dramas of Brederéo and the paintings of Teniers. The theatrical companies just alluded to, "Gesellen van den Spele," formed the germ out of which developed the

famous " Chambers of Rhetoric " which united within them-:

selves all the literary movements that occupied the Low Countries during the 15th and 16th centuries, The poets of Holland had already discovered in late medieval times the value of guilds in promoting the arts and industrial handi- crafts, The term "colléges de rhétorique" is supposed to have been introduced about 1440 by the courtiers of the Burgun- dian dynasty, but the institutions themselves existed at least from 1400. These literary guilds

lasted for two centuries, and during the greater part of that time preserved a com- pletely medizeval character, even when the influences of the Renaissance and the Reformation obliged them to modify mM some degree their outward forms. They were in almost

all cases absolutely middle-class in tone, and opposed to aristocratic ideas and tendencies in thought. Of these remarkable bodies the earliest were almost entirely engaged in preparing mysteries and miracle-plays for the populace. Each chamber, and in process of time every town in the Low Countries, possessed one, and took as its title some fanciful or heraldic sign. The earliest of all, “The Alpha and Omega,” at Ypres, was founded about 1398 ; that of the “ Violet,” at Antwerp, followed in 1400; the * Book,” at Brussels, in 1401 ; the “ Berberry,” at Courtrai, in 1427 ; the “Holy Ghost,” at Bruges, in 1428; the “Floweret Jesse,” at Middelburg, in 1430; the “Oak Tree,” at Vlaardingen, in 1433; and the “ Marigold,” at Gouda, in 1437. The most celebrated of all the chambers, that of the “Eglantine” at Amsterdam, with its motto Jn Inefde Gloeyende (Blossoming in Love), was not instituted until 1496. Among the most influential chambers not above mentioned should be included the “Fountain” at Dort, the “Corn Flower” at the Hague, the “ White Columbine ” at Leyden, the “ Blue Columbine ” at Rotterdam, the “Red Rose” at Schiedam, the “Thistle” at Zierikzee, “Jesus with the Balsam” at Ghent, and the “Garland of Mary” at Brussels. And not in these important places only, but in almost every little town, the rhetoricians exerted their influence, mainly in what we may call a social direction. Their wealth was in most cases considerable, and it very soon became evident that no festival or procession could take place in a town unless the “Kamer” patronized it. Towards the end of the 15th century the Ghent chamber of “Jesus with the Balsam” began to exercise a sovereign power over the other Flemish chambers, which was emu- lated later on in Holland by the “ Eglantine” at Amsterdam. But this official recognition proved of no consequence in literature, and it was not in Ghent, but in Antwerp, that intellectual life first began tostir. In Holland the burghers only formed the chambers, while in Flanders the representa- tives of the

noble families were honorary members, and assisted with their money at the arrangement of ecclesias- tical or political pageants. Their pompous A.ndjwweelen, or tournaments of rhetoric, at which rich prizes were contended for, were the great occasions upon which thie members of the chambers distinguished themselves. Between 1426 and 1620 at least 66 of these festivals were held. There was a specially splendid landjuweel at Antwerp in 1496, in which 28 chambers took part, but the gayest of all was that celebrated at Antwerp on the 3d of August 1561. To this the "Book" at Brussels sent 340 members, all on horseback, and clad in crimson mantles. The town of Antwerp gave a ton of gold to be given in prizes, which were shared among 1893 rhetoricians. This was the zenith of the splendour of the "Kamers van Rhetorica," and after this time they soon fell into disfavour. We can trace the progress of literary composition under the chambers, although none of their official productions have descended to us. Their dramatic pieces were certainly of a didactic cast, with a strong farcical flavour, and continued the tradition of Maerlant and hisschool. They very rarely dealt with historical or even Biblical personages, but entirely with allegorical and moral absiractions, until the age of humanism introduced upon the stage the names without much of the spirit of mythology. Of the pure farces of the rhetorical chambers we can speak witli still more confidence, for some of them have coine down to us, and among the authors famed for their skill in this sort of writing are named Cornelis Everaert of Bruges and Laurens Janssen of Haarlem. The material of these farces is extremely raw, consisting of rough jests at the expense of priests and foolish husbands, silly old men and their light wives. Laurens Janssen is also deserving of remembrance for a satire against the clergy, written in 1583, The chambers also

for the first time such classical snatches of Dutch song as the Ballad of Heiligerlee, the Ballad of Egmond and Horn, and the song of the Sterm of Leyden. The political ballads, with their ridicule of the Spanish leaders, form a section of the Boecrken which has proved of inestimable value to historians. All these lyrics, however, whether of victory or of martyrdom, are still very rough in form and language.

The first writer who used the Dutch tongue with grace Ama and precision of style was a woman and a professed Bijns,

92 [LITERATURE. encouraged the composition of songs, but with very little success ; they prodnced no lyrical genius more considerable than Matthijs de Casteleyn (1488-1550), the founder of the Flemish chamber of “Pax Vobiscum” at Oudenarde, a personage whose influence as a fashioner of language would have been more healthy if his astounding metrical feats and harlequin tours-de-force had not been performed ina dialect debased with all the worst bastard phrases of the Burgundian period.

In the middle of the 16th century a group of rhetoricians

Hou- Jean Baptista Houwaert (1533-1599), a personage of con- | the one poet of real genius. The language, oscillating waert. siderable political influence in his generation. He con- before her time between French and German, formless, sidered himself a devout disciple of Matthijs de Casteleyn, | corrupt, and invertebrate, took shape and comeliness, which | but his great characteristic was his unbounded love of | none of the male pedants could give it, from the impas- | classical and mythological fancy. His didactic poems are sioned hands of a woman. Anna Bijns, who is believed to | composed in a wonderfully rococo style, and swarm with | have been born at Antwerp in 1494, was a schoolmistress misplaced Latinities. In his bastard Burgundian tongue | at that city in her middle life, and in old age she still he boasted of having “ poételijck geinventeert ende rheto- | “ instructed youth in the Catholic religion.” Hendrik rijckelijck ghecomponeert” for the Brussels chamber such | Peppinck, a Franciscan, who edited her third volume of dramas as neas and Dido, Mars and Venus, Narcissus | poems when she was an old woman in 1567, speaks of her and Echo, or Leander and Hero. But of all his writings | as “a maiden small of descent, but great of understanding, Pegasides Pleyn, or the Palace of Maidens, is the most | and godly of life.” Her first known volume bears the date remarkable; this is a didactic poem in sixteen books, | 1528, and displays her as already deeply versed in the dedicated to a discussion of the variety of earthly love. | mysteries of religion. We gather from all this that she Houwaert’s contemporaries nicknamed him “the Homer | was a lay nun, and she certainly occupied a position of of Brabant ;” later criticism has

preferred to see in him an | great honour and influence at-Antwerp. She was named important link in that chain of homely didactic Dutch which | “the Sappko of Brabant” and the “Princess of all Rhetori- ends in Cats. His writings are composed in a Burgundian | cians.” She bent the powerful weapon of her verse against so base that they hardly belong to Flemish literature at all. the faith and character of Luther. Inher volume of 1528 Into the same miserable dialect Cornelis van Ghistele of | the Lutherans are scarcely mentioned ; in that of 1540 Antwerp translated, between 1555 and 1583, parts of | every page is occupied with invectives against them ; while Terence, Virgil, Horace, and Ovid, while the painter Karel | the third volume of 1567 is the voice of one from whom van Mander (1547-1609) puta French version of the Ziad her age has passed. All the poems of Anna Bijns which and of the Hclogues of Virgil into an equally ill-fitting | we possess are called refereinen or refrains. Her mastery Flemish dress. In no country of Europe did the humanism | over verse-form was extremely remarkable, and_ these of the 16th century at first affect the national literature so refrains are really modified chants-royal. The writings of slightly or to so little purpose. Anna Bijns offer many points of interest to the philologist, Psalms The stir and revival of intellectual life that arrived with | In her the period of Middle Dutch closes, and the modern and the Reformation found its first expression in the composi- | Dutch begins. In a few grammatical peculiarities—such hymns. tion of Psalms. ‘The earliest printed collection appeared at | as the formation of the genitive by some verbs which now Antwerp in 1540, under the title of Souwter-Liedekens, and | govern the accusative, and the use of ghe before the infinitive was dedicated toa Dutch nobleman, Willem van Zuylen | —her language still belongs to Middle Dutch; but these van Nieuvelt, by whose name it is usually known. ‘This exceptions are rare, and she really initiated that modern collection, however, was made before the Reformation in | speech which Filips van Marnix adopted and made classical Holland really set in. For the Protestant congregations | in the next generation. Jan Utenhove printed a volume of Psalms in London in In Filips van Marnix, lord of St Aldegonde (1538- Manis 1566; Lucas de Heere, and immediately after him, with 1598), a much greater personage came forward in the much greater success, Petrus Datheen (1531-1590), trans- ranks of liberty and reform. He began life as a disciple of lated the hymns of Clément Marot. For printing this last | Calvin and Beza in the schools of Geneva. It was as a volume, in

1567, Herman Schinkel of Delft was burned to defender of the Dutch iconoclasts that he first appeared death in 1568. Datheen was not a rbetorician, but a | in print, with his tract on The Images thrown down ™ person of humble origin, who wrote in the vulgar tongue, | Holland in August 1566. He soon became one of the and his hymns spread far and wide among the people. leading spirits in the war of Dutch independence, the inti- Until 1773 they were in constant use in the state church | mate friend of the prince of Orange, and the author of the of Holland. But the great events of the period of reforma- glorious Welhelmuslied. It was in the autumn of 1568 tion are not marked by psalms only in Dutch literature. | that Marnix composed this, the national hymn of Dutch Two collections of hymns and lyrical pieces, printed in 1562 | liberty and Protestantism. In 1569 be completed a no and 1569, perpetuate the fervour and despair of the | less important and celebrated prose work, the Bienconf or martyrs of the Mennonite Church. Similar utterances of | Beehive of the Romish Church. In this satire he was the persecuted Protestants were published at Haarlem and inspired in a great measure by Rabelais, of whom he was Leeuwarden, at Ghent and at Bruges. Very different in | an intelligent disciple. It is written in prose that may be Battle- tone were the battle-songs of liberty and triumph sung a | said to mark an epoch in the language and literature of songs. generation later by the victorious Reformers or “ Geuzen.” | Holland. Overwhelmed with the press of public business,

in Brabant and Flanders attempted to put a little new life into the stereotyped forms of the preceding age by intro- ducing in original composition the new-found branches of Latin and Greek poetry. The leader of these men was

The famous song-book of 1588, the Geusen Lneden Boecaxken, was full of ardent and heroic sentiment, expressed often in marvellously brilliant phrases. In this collection appeared

opponent of Lutheranism and reformed thought. Modern Dutch literature practically begins with Anna Bijns. Against the crowd of rbetoricians and psalm-makers of the early part of the 16th century she stands out in relief as

Marnix wrote little more until in 1580 he published his Psalms of David newly translated out of the Lebrew Tongue. He occupied the last years of

his life in preparing a Dutch

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version of the Bible, translated direct from the original. At his death only Genesis was found completely revised ; but in 1619 the synod of Dort placed the unfinished work in the hands of four divines, who completed it. 1. In Dirck Volckertsen Coornhert (1522-1590) Holland for the first time produced a writer at once eager to compose in his native tongue and to employ the weapons of human- ism. Coornhert was a typical burgher of North Holland, equally interested in the progress of national emancipation and in the development of national literature. He was a native of Amsterdam, but he did not take part in the labours of the old chamber of the Eglantine, but quite early in life proceeded to Haarlem, of which place he remained a citizen until his death. He practised the art of etching, and spent all his spare time in the pursuit of classical learning. He was nearly forty years of age before he made any practical use of his attainments. In 1561 he printed his translation of the De Offcizs of Cicero, and in 1562 of the De Beneficiis of Seneca. In these volumes he opposed with no less zeal than Marnix had done the bastard forms still employed in prose by the rhetoricians of Flanders and Brabant. During the next decade he occupied himself chiefly with plays and poems, conceived and expressed with far less freedom than his prose, and more in the approved conventional fashion of the rhetoricians ; he collected his poems in 1575. The next ten years he occupied in polemi- eal writing, from the evangelical point of view, against the Calvinists. In 1585 he translated Boetius, and then gave his full attention to his original masterpiece, the Zedekunst, or Art of Ethics, a philosophical treatise in prose, in which | he studied to adapt the Dutch tongue to the grace and simplicity of Montaigne’s French. His humanism unites the Bible, Plutarch, and Marcus Aurelius in one grand system of ethics, and is expressed in a style remarkable for bright- ness and purity. He died in 1590; his works, in three enormous folio volumes, were first collected in 1630. ter- Towards the end of the period of transition, Amsterdam lt the became the centre of all literary enterprise in Holland. In os £1585 two of the most important chambers of rhetoric in ’ Flanders, the “‘ White Lavender” and the “ Fig-Tree,” took flight from the south, and settled themselves in Amsterdam | by the side of the ‘‘Eglantine.” ‘The last-

named institution | had already observed the new tendency of the age, and | Was prepared to encourage intellectual reform of every kind, | and its influence spread through Holland and Zealand. In Flanders, meanwhile, crushed under the yoke of Parma, literature and native thought absolutely expired. From this time forward, and until the emancipation of the southern provinces, the domain of our inquiry is confined to the district north of the Scheldt. ‘In the chamber of the Eglantine at Amsterdam two men took a very prominent place, more by their intelligence and . . modern spirit than by their original genius. Hendrick

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S\ighel. Laurenssen Spieghel (1549-1612) was a humanist of a | type more advanced and less polemical than Coornhert. | He wrote a charming poem in praise of dancing; but his chief contributions to literature were his Z’wespraeck van de Nederduytsche Letterkunst, a philological exhortation. in the manuer of Joachim du Bellay’s famous tract, urging the Dutch nation to purify and enrich its tongue at the fountains of antiquity, and a didactic epic, entitled Hertspieghel, which has been greatly praised, but which is now much more antiquated in style and more difficult to enjoy than Coornhert’s prose of a similar tendency. That

cising as much public influence as he exercised privately among his younger friends. The same may be said of the _ man who, in 1614, first collected Spieghel’s writings, and

ee published them in a volume with his own verses. Roemer et. Pieterssen Visscher (1545-1620) proceeded a step further

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Spieghel was a Catholic prevented him perhaps from exer-:

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than Spieghel in the cultivation of polite letters. He was deeply tinged with a spirit of classical learning that was much more genuine and nearer to the true antique than any that had previously been known in Holland. His own

disciples called him the Dutch Martial, but he was at best little more than an amateur in poetry, although an amateur whose function it was to perceive and encourage the genius of professional writers. Roemer Visscher stands at the threshold of the new Renaissance literature, himself practis- ing the faded arts of the rhetoricians, but pointing by his counsel and his conversation to the naturalism of the great period.

It was in the salon at Amsterdam which the beautiful The Re-

daughters of Roemer Visscher formed around their father naissance.

and themselves that the new school began to take form. The republic of the United Provinces, with Amsterdam at its head, had suddenly risen to the first rank among the natious of Europe, aud it was under the influence of so much new emotion and brilliant ambition that the country no less suddenly asserted itself in a great school of painting and poetry. ‘The intellect uf the whole Low Countries was concentrated in Holland and Zealand, while the six great universities, Leyden, Groningen, Utrecht, Amster- dam, Harderwijk, and Franeker, were enriched by a flock of learned exiles from Flanders and Brabant. It had occurred, however, to Roemer Visscher only that the path of literary honour lay, not along the utilitarian road cut out by Maerlant and Boendale, but in the study of beauty and antiquity. In this he was curiously aided by the school of ripe and enthusiastic scholars who began to flourish at Leyden, such as Drusius, Vossius, and Hugo Grotius, who themselves wrote little in Dutch, but who chastened the style of the rising generation by insisting on a pure and liberal Latinity. Out of that generation arose the greatest names in the literature of Holland,—Vondel, Hooft, Cats, Huygens,—in whose hands the language, so long left barbarous and neglected, took at once its highest finish and nelody. By the side of this serious and zsthetic growth there is to be noticed a quickening of the broad and farcical humour which had been characteristic of the Dutch nation from its commencement. For fifty years, and these the most glorious in the annals of Holland, these two streams of influence, one towards beauty and melody, the other towards lively comedy, ran side by side, often in the same channel, and producing a rich harvest of great works, It was in the house of the daughters of Roemer Visscher that the tragedies of Vondel

and the comedies of Brederéo, the farces of Coster and the odes of Huygens, alike found their first admirers and their best critics.

Of the famous daughters of Roemer, two cultivated Roemer literature with marked success. Anna (1584-1651) was Vis- | the author of a descriptive and didactic poem, De Roemster pee van den Aemstel (The Glory of the Aemstel), and of various i ‘ miscellaneous writings; Tesselschade (1594-1649) wrote some lyrics which still place her at the head of the female poets of Holland, and she translated the great poem of Tasso. They were women of universal accomplishment, graceful manners, and singular beauty; and their company attracted to the house of Roemer Visscher all the most gifted youths of the time, several of whom were suitors, but in vain, for the hand of Anna or of Tesselschade.

Of this Amsterdam school, the first to emerge into public Hooft. notice was Pieter Cornelissen Hooft (1581-1647). He belonged to a patrician family, and became a member at a very early age of the chamber of the Eglantine. When he was only eighteen he produced, before this body, his tragedy of Achilles and Polyxena (1598), which displayed a pre- cocious ease in the use of rhetorical artifices of style. His intellectual character, however, was formed by a journey into Italy which he took in 1598, where he steeped himself

Brederéo.

Coster.

Vondel.

for three years in the best Italian literature, both prose and verse. Hereturned to Holland in 1601, with his head full of schemes for the creation of a Dutch school of belles lettres. In 1605 he produced his pastoral dramaof Granida, in which he proved himself a pupil of Guarini. During the remainder of his life he dedicated himself chiefly to history and tragedy. In the latter field he produced Baeto and Geraad van Velsen; in history he published in 1626 his Life of Henry the Great, while from 1628 to 1642 he

was engaged upon his master-work, the //istory of Holland. Hooft desired to be a severe purist in style, and to a great extent he succeeded, but, like most of the writers of his age, he permitted himself too many Latinisms. In his poetry, especially in the lyrical and pastoral verse of his youth, he is full of Italian reminiscences both of style and matter ; in his noble prose work he has set himself to be a disciple of Tacitus. Mr Motley has spoken of Hooft as one of the greatest historians, not merely of Holland, but of Europe. His influence in purifying the language of his country, and in enlarging its sphere of experience, can hardly be overrated.

Very different from the long and prosperous career of Hooft was the brief, painful life of the greatest comic dramatist that Holland has produced. Gerbrand Adriaanssen Brederoo (1585-1618) was the son of an Amsterdam shoe- maker. He knew no Latin; he had no taste for humanism ; he was a simple growth of the rich humour of the people. His life was embittered by a hopeless love for Tesselschade, to whom he dedicated his dramas, and whose beauty he celebrated in a whole cycle of love songs. His ideas on the subject of drama were at first a mere development of the medieval " Abelespelen." He commenced by dramatiz- ing the romance of Roderick and Alphonsus, in 1611, and Griane in 1612, but in the latter year he struck out a new and more characteristic path in his Farce of the Cow. From this time until his death he continued to pour out comedies, farces, and romantic dramas, in all of which he displayed a coarse, rough genius not unlike that of Ben Jonson, whose immediate contemporary he was. His last and best piece was Jerolimo, the Spanish Brabanter, a satire upon the exiles from the south who filled the halls of the Amsterdam chambers of rhetoric with their pompous speeches and pre- posterous Burgundian phraseology. Brederéo was closely allied in genius to the dramatists of the Shakespearian age, but he founded no school, and stands almost as a solitary figure in the literature of Holland.

The only individual at all clearly connected with Brederéo in talent was Dr Samuel Coster, whose dates of birth and death areunknown. He is chiefly remembered for having been the first to take advantage of the growing dissension in the body of the old chamber of the Eglantine to form a new institution. In 1617 Coster founded what he called the "First Dutch Academy." This was in fact a theatre, where, for the first time, dramas

could be publicly acted under the patronage of no chamber of rhetoric. Coster himself had come before the world in 1612 with his farce of Teuwis the Boor, and he continued this order of composi- tion in direct emulation of Brederéo, but with less talent. In 1615 he began a series of “ blood-and-thunder” tragedies with his horrible Ztys, and he continued this coarse style of tragic writing for several years. He survived at least until after 1648 as a supreme authority in Amsterdam upon all dramatic matters.

The greatest of all Dutch writers, Joost van der Vondel (1587-1679), was born at Cologne on the 17th of November 1587. In 1612 he brought out his first work, [fet Pascha, a tragedy or tragi-comedy on the exodus of the children of Israel, written, like all his succeeding dramas, on the recog- nized Dutch plan, in alexandrines, in five acts, and with choral interludes between the acts. There is comparatively

little promise in ZZet Pascha. It was much inferior drama- tically to the plays just being produced by Brederdéo, and metrically to the clear and eloquent tragedies and pastorals of Hooft ; but it secured the young poet a position inferior only to theirs, Yet for a number of years he made no attempt to emphasize the impression he had produced on the public, but contented himself during the years that are the most fertile in a poet’s life with translating and imitat- ing portions of Du Bartas’s popular epic. The short and brilliant life of Brederdo, his immediate contemporary and greatest rival, burned itself out in a succession of dramatic victories, and it was not until two years after the death of that great poet that Vondel appeared before the public with a secoud tragedy, the Jerusalem laid Desolate. Five years later, in 1625, he published what seemed an innocent study from the antique, his tragedy of Palamedes, or Murdered Innocence. All Amsterdam discovered, with smothered delight, that under the name of the hero was thinly con- cealed the figure of Barneveldt, whose execution in 1618 had been a triumph of the hated Calvinists. Thus, at the ago of forty-one, the obscure Vondel became in a week the most famous writerin Holland. For the next twelve years, and till the accession of Prince Frederick Hendrick, Vondel bad to maintain a hand-to-hand combat with

the “ Saints of Dort.” This was the period of his most resolute and stinging satires ; Cats took up the cudgels on behalf of the counter-Remonstrants, and there raged a war of pamphlets in verse. A purely fortuitous circumstance led to the next great triumph in Vondel’s slowly developing career. The Dutch Academy, founded in 1617 almost wholly as a dramatic guild, had become so inadequately provided with stage accommodation that in 1638, having coalesced with the two chambers of the “ Eglantine” and the “ White Lavender,” it ventured on the erection of a large public theatre, the first in Amsterdam. Vondel, as the greatest poet of the day, was invited to write a piece for the first night ; on the 3d of January 1638 the theatre was opened with the performance of a new tragedy out of early Dutch history, the famous Gysbreght van Aemstel. The next ten years were rich in dramatic work from Vondel’s hand ; he supplied the theatre with heroic Scriptural pieces, of which the general reader will obtain the best idea if we point to the Athalie of Racine. In 1654, having already attained an age at which poetical production is usually discontinued by the most energetic of poets, he brought out the most exalted and sublime of all his works, the tragedy of Lucifer. Very late in life, through no fault of his own, financial ruin fell on the aged poet, and from 1658 to 1668—that is, from his seventieth to his eightieth year—this venerable and illustrious person, the main literary glory of Holland through her whole history, was forced to earn his bread as a common clerk in a bank, miserably paid, and accused of – wasting his masters’ time by the writing of verses. The city released him at last from this wretched bondage by @ pension, and the wonderful old man went on writing odes and tragedics almost to his ninetieth year. He died at last in 1679, of no disease, having outlived all his contempo- raries and almost all his friends, but calm, sane, and good- humoured to the last, serenely conscious of the legacy he left to a not too grateful country. Vondel is the typical example of Dutch intelligence and imagination at their highest development. Not merely is he to Holland all that Camoens is to Portugal and Michiewicz to Poland, but he stands on a level with these men in the positive value of his writings.

Lyrical art was represented on its more spontaneous side Statle

by the songs and ballads of Jan Janssen Starter (b. 1594), an Englishman by birth, who was brought to Amsterdam in his thirteenth year. Very early in

life he was made a member of the “Eglantine,” and he worked beside

Brederdo for two years; but in 1614 he wandered away to Leeuwarden, in Friesland, where he founded a literary

iid, and brought out, in 1618, his tragi-comedies of Timbrede Cardone and Daraida. But his great contri- bution to literature was his exquisite collection of lyrics, entitled the Friesche Lusthof, or Frisian Pleasance. He returned to Amsterdam, but after 1625 we hear no more of him, and he is believed to have died as a soldier in Germany. The songs of Starter are in close relation to the lyrics of the English Elizabethans, and have the same exquisite simplicity and audacity of style.

While the genius of Holland clustered around the circle of Amsterdam, a school of scarcely less brilliance arose in Middelburg, the capital of Zealand. The ruling spirit of this school was the famous Jakob Cats (1577-1660). In this voluminous writer, to whom modern criticism almost denies the name of poet, the genuine Dutch habit of thought, the utilitarian and didactic spirit which we have already observed in Houwaert and in Boendale, reached its zenith of fluency and popularity. Cats was aman of large property and high position in the state, and his ideas never rose above the horizon of wealth and easy domestic satis- faction. Between 1609 and 1621, that is, during early middle life, he produced the most important of his writings, his pastoral of Galuthea, and his didactic poems, the Maechdenplicht and the Stnne- en Minne-Beelden. In 1624 he removed from Middelburg to Dort, where he soon after published his tedious ethical work called J/ouwelick, or Marriage ; and this was followed from time to time by one after another of his monotonous moral pieces. Cats is an exceedingly dull and prosaic writer, whose alexandrines roll smoothly on without any power of riveting the attention

middle classes in Holland has always been immense, and his influence extremely hurtful to the growth of all branches of literary art. Among the disciples’ of Cats, Jakob Westerbaen (1599-1670) was the most successful. The Jesuit Adriaen Poirters (1606-1675) closely followed Cats in his remarkable Masquer of the World. A poet of Amsterdam, Jan Hermansz

Krul, preferred to follow the southern fashion, and wrote didactic pieces in the Catsian manner.

A poet of dignified imagination and versatile form was Sir Constantijn Huygens (1596-1687), the diplomatist. Though born and educated at the Hague, he threw in his lot with the great school of Amsterdam, and became the intimate friend and companion of Vondel, Hooft, and the daughters of Roemer Visscher. His famous poem in praise of the Hague, Batava Tempe, appeared in 1621, and was, from a technical point of view, the most accomplished and elegant poem till that time produced in Holland. His collected poems, Otiorum Libri Sex, were printed in 1625. Oogentroost, or Eye Consolation, was the fantastic title of aremarkable poem dedicated in 1647 to his blind friend, Lucretia van Trello. He printed in 1654 a topographical piece describing his own mansion, //ofwijck. Huygens represents the direction in which it would have been desir- able that Dutch literature, ‘now completely founded by Hooft and Vondel, should forthwith proceed, while Cats

represents the tame and mundane spirit which was actually | Huygeus had little of the sweet- | ness of Hooft or of the sublimity of Vondel, but his genius |

adopted by the nation.

was eminently bright and vivacious, and he was a con- summate artist in metrical form. The Dutch language has never proved so light and supple in any hands as in his, and he attempted no class of writing, whether in prose or

verse, that he did not adorn by his delicate taste and sound |

judgment. A blind admiration for our own John Donne, Whose poems he translated, was the greatest fault of Huygens, who, in spite of his conceits, remains one of the

, of St Paul.

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most pleasing of Dutch writers. In addition to all this he comes down to us with the personal recommendation of having been “‘one of the most lovable men that ever lived.”

Three Dutchmen of the 17th century distinguished themselves very prominently in the movement of learning and philosophic thought, but the illustrious names of Hugo Grotius (1583-1645) and of Baruch Spinoza (1632-1677)

can scarcely be said to belong to Dutch literature. Balthasar Bekker.

Bekker (1634-1698), on the contrary, a Reformed preacher of Amsterdam, was a disciple of Descartes, who deserves to be remembered as the greatest philosophical writer who has used the Dutch language. His masterpiece, Betoverde Wereld, or the World Bewitched, appeared in 1691-1693. Bekker is popularly remembered most honourably by his detcrmined attacks upon the system of a penal code for witchcraft.

From 1600 to 1650 was the blossoming time in Dutch literature. During this period the names of greatest genius were first’ made known to the public, and the vigour and grace of literary expression reached their highest develop- ment. It happened, however, that three men of particularly commanding talent survived to an extreme old age, and under the shadow of Vondel, Cats, and Huygens there Sprang up a new generation which sustained the great tradition until about 1680, when the final decline set in.

Jan Vos (d. 1667) gained: one illustrious success with his Vos,

tragedy of Aaron and Titus in 1641, and lost still more in the same year by his obscene farce of Oene. His second tragedy of Jfedea, in 1665, and his collected poems in 1662, supported his position as the foremost pupil of Vondel.

biographer, whose lives of Vondel and of De Ruyter are among the masterpieces of Dutch prose. van der Goes (1647-1684) followed Vos as a skilful imitator of Vondel's tragical manner. His Chinese trage- dies, Trazil (1665) and Zungchin (1666), scarcely gave promise of the brilliant force and fancy of his Zjstroom, a poem in praise of Amsterdam, 1671. He died suddenly, in early life, leaving unfinished an epic poem on tlie life

of taste and vigour ; his once famous descriptive epic, The Plague at Naples, is singularly tame and rococo in style.

Joachim Oudaen (1628-1692) wrote in his youth two Oudaen.

promising tragedies, Johanna Gray (1648) and Konradyn (1649). The Amsterdam section of the school of Cats produced Jeremias de Decker (1609-1646) and Joannes Vollenhove (1631-1708), voluminous writers of didactic verse, in 1671 a very remarkable volume of poems. In lyrical poetry Starter had a single disciple, Daniel Jonctijs (1600- 1652), who published a volume of love songs in 1639 under the affected and untranslatable title of Rooselijns oochjens ontleed. None of these poets, except in some slight degree Luiken, set before themselves any more ambitious task than to repeat with skill the effects of their predecessors. Meanwhile the romantic and voluminous romances of the French school of Scudéry and Honoré d'Urfé had invaded Holland and become fashionable.

reproduce this product in native form, and published in 1637 his Bataman Arcadia, the first original Dutch romance, in which a party of romantic youths journey from the Hague to Katwijk, and undergo all sorts of romantic adventures. This book was excessively popular, and was imitated by Hendrik Zoeteboom in his Zaanlandsche Arcadia (1658), and by Lambertus Bos in his Dordtsche Arcadia (1662). A far more spirited and original romance

is the Afirandor of Nikolaes Heinsius, the younger (b. Heinsius.

1655), a book which resembles Gil Blas, and precedes it

Geeraerdt Brandt (1626-1685) deserves remem- Brandt, | brance less as a tragic dramatist than as a consummate or delighting the fancy. Yet his

popularity with the | Johan Antonides Goes.

Reyer Anslo (1626-1669) marks the decline Anslo,

The engraver Jan Luiken (1649-1708) published Luiken.

Johan van Heemskerk Heems- (1597-1656), a councillor of the Hague, set himself to kerk.

Gallican dra- matists.

Decline of poetry.

Van Effen.

by forty years. It was written when the author was only twenty years of age, and gave promise of very great talent in the future; but unfortunately Heinsius committed a murder only two years afterwards, and, escaping to Paris, was never heard of again.

The drama fell into Gallicized hands at the death of Vondel and his immediate disciples. Lodewijck Meijer translated Corneille, and brought out his plays on the stage at Amsterdam, where he was manager of the national theatre or Schouwburg after Jan Vos. In connexion with Andries Pels, author of the tragedy of Dzdo's Death, Meijer constructed a dramatic club, eutitled 'Nil Volentibus Arduum," the great object of which was to inflict the French taste upon the public. Pels furthermore came forward as the censor of letters and satirist of barbarism in Jorace's Art of Poetry expounded, in 1677, and in his Use and Misuse of the Stage, in 1681. Willem van Focquenbroch (1640-1679) was the most voluminous comic writer of this period. The close of the century saw the rise of two thoroughly Gallican dramatists, Johan van Paffenrode and Pieter Bernagie, who may not unfairly be compared respec- tively to our own Farquhar and Shadwell. 'Thomas Asselijn (1630-1695) was a writer of more considerable talent and more homely instincts. He attempted to resist the dictatorship of Pels, and to follow the national tradition of Brederéo. He is the creator of

the characteristic Dutch type, the comic lover, Jan Klaaszen, whom he presented on the stage in a series of ridiculous situations. Abraham Alewijn, author of Jan Los (1721), possessed a coarse vein of dramatic humour ; he lived in Java, and his plays were produced in Batavia. Finally Pieter Langendijk claims notice among the dramatists of this period, although he lived from 1683 to 1756, and properly belongs to the next century. With him the tradition of native comedy expired.

The Augustan period of poetry in Holland was even

more blank and dull than in the other countries of Northern Europe. ture there are but very few that call for repetition here.

Arnold Hoogvliet (1687-1763) wrote a passable poem in

honour of the town of Vlaardingen, and a terrible Biblical epic, in the manner of Blackmore, on the history of Abraham. Hubert Cornelissen Poot (1689-1733) showed an unusual love of nature and freshness of observation in his descriptive pieces. Sybrand Feitama (1694-1758), who translated Voltaire's J7Zenriade, and wrote much dreary verse of the same class himself, is less worthy of notice than Dirk Smits (1702-1752), the mild and elegiac singer of Rotterdam. Tragic drama was more or less capably represented by Lucretia Wilhelmina van Merken (1722-1789), wife of the very dreary dramatist Nicholaas Simon van Winter

(1718-1795).

In the midst of this complete dissolution of poetical style, a writer arose who revived an interest in literature, and gave to Dutch prose the classical grace of the 18th century. Justus van Effen (1684-1735) was born at Utrecht, fell into poverty early in life, and was thrown very much among the company of French émigrés, in connexion with whom he began literary life in 1713 by editing a French journal. Coming to London just wheu the Tatler and Spectator were in their first vogue, Van Effen studied Addison deeply, translated Swift and Defoe into French, and finally deter- mined to transfer the beauties of English prose into his native language. It was not, however, until 1731, after having wasted the greater part of his life in writing French, that he began to publish his Wollandsche Spectator, which

his death in 1735 soon brought to a close. Still, what he composed during the last four years of his life, in all its freshness, manliness, and versatility, constitutes the most valuable legacy to Dutch literature that the middle of the 18th century left behind it.

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Of the names preserved in the history of litera-

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The supremacy of the poetical clubs in every town pro- duced a very weakening and Della-Cruscan effect upon literature, from which the first revolt was made by the famous brothers Van Haren, so honourably known as diplo- The matists in the history of the Netherlands. Willem van broth Haren (1710-1768) wrote verses from his earliest youth, Van while Onno Zwier van Haren (1713-1779), strangely “”™ enough, did not begin to do so until he had passed middle life. They were friends of Voltaire, and they were both ambitious of success in epic writing, as understood in France at.that period. Willem published in 1741 his Gevallen van Friso, an historical epos, and a long series of odes and solenin lyrical pieces. Onno, in a somewhat lighter strain, wrote Piet and Agnietje, or Pandora’s Box, and a long series of tragedies in the manner of Voltaire. The Baroness Bay Juliana Cornelia de Lannoy (1738-1782) was a writer of de considerable talent, also of the school of Voltaire; her Lann poems were highly esteemed by Bilderdijk, and she has a neatness of touch and clearness of penetration that give vivacity to her studies of social life. Jakobus Bellamy Bells (1757-1786) was the son of a Swiss baker at Flushing; his pompous odes struck the final note of the false taste and Gallic pedantry that had deformed Dutch literature now for a century, and were for a short time excessively admired.

The year 1777 has been mentioned as the turning-point The in the history of letters in the Netherlands. It was in that ladies year that Betjen Wolff (1738-1804), a widow lady in Amsterdam, persuaded her friend Aagjen Deken (1741-pay 1804), a poor but extremely intelligent governess, to throw up her situation and live with her. For nearly thirty years these women continued together, writing in combination, and when the elder friend died on the 5th of November 1804, her companion survived her only ninedays,

Madame Wolff had appeared as a poetess so early as 1762, and again in 1769 and 1772, but her talent in verse was by no means very remarkable. But when the friends, in the third year of their association, published their Letters on Duwers Subjects, it was plainly seen that in prose their talent was very remarkable indeed. Since the appearance of Heinsius's Mirandor more than a century had passed without any fresh start in novel-writing being made in Holland. In 1782 the ladies Wolff and Deken, inspired partly by contemporary English writers, and partly by Goethe, published their first novel, Sara Burgerhart. In spite of the close and obvious following of Richardson, this was a masterly production, and it was enthusiastically received. Another novel, Wellem Leevend, followed in 1785, and Cornelia Wildschut in 1792. The ladies were residing in France at the breaking-out of the Revolution, and they escaped the guillotine with difii- culty. After this they wrote no more, having secured for themselves by their three unrivalled romances a place among the foremost writers of their country.

The last years of the 18th century were marked in Holland by a general revival of intellectual force. The romantic movement in Germany made itself deeply felt in all branches of Dutch literature, and German lyricism took the place hitherto held by French classicism. Pieter Nieuwland (1764-1794) was a feeble forerunner of the Niew revival, but his short life and indifferent powers gave him no chance of directing the transition that he saw to be inevitable. The real precursor and creator of a new epoch in letters was the famous Willem Bilderdijk (1756-1831). Bil This remarkable man, whose force of character was even greater than his genius, impressed his personality on his generation so indelibly that to think of a Dutchman of the beginning of the present century is to think of Bilderdijk. He was born at Amsterdam on the 7th of September 1756, and through an accident in early childhood was obliged to rest almost constantly, thus attaining habits of long and

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concentrated study. His parents were zealous in the cause of the house of Orange, and the youth grew up violently monarchical and Calvinistic, as Da Custa says, “anti- revolutionary, anti-Barneveldtian, anti-Loevesteinish, auti- liberal.” In poetry his taste was strictly national and didactic ; he began as a disciple of Cats, nor could he to the end of his life tolerate what he called “the puerilities of Shakespeare.” His early love-songs, collected in 1781 and 1785, gave little promise of talent, but in his epic of Elias in 1786, he showed himself superior to all the Dutch poets since Huyghens in mastery of form. For twenty years he lived a busy, eventful life, writing great quantities of verse, and then commenced his most productive period with his didactic poem of The Disease of the Learned, in 1807; in 1808 he imitated Pope’s Hssay on Man, and published (Moris V., and in 1809 commenced the work which he designed to be his master-piece, the epic of De Ondergang der eerste Wereld (The Destruction of the First World), which he never finished, and which appeared as a fragment in 1820, His long and fretful life ceased on the 18th of December 1831. To the foreign student Bilderdijk isasingularly uninviting and unpleasing figure. He unites in himself all the unlovely and provincial features which deform the worst of his countrymen. He was violent, ignorant, and dull; his view of art was confined to its de- clamatory aud least beautiful side, and perhaps no writer of equal talent has shown so complete an absence of taste and tact. Ten Brink has summed up thie character of Bilderdijk’s writings in an excellent passage :—“ As an artist,” he says, ‘“‘he can perhaps be best described in short as the cleverest versemaker of the 18th century. His admirable erudition, his power over language, more extended and more colossal than that of any of his predecessors, enabled him to write pithy and thoroughly original verses, although the general tone of his thought and expression never rose above the ceremonious, stagy, and theatrical character of the 18th century.” But in spite of his out- rageous faults, and partly because these faults were the exaggeration of a marked national failing, Bilderdijk has enjoyed almost to the present day an unbroken and un- bounded popularity in Holland. Fortunately, however, within the last few years a sounder spirit has arisen in criti- cism, and the prestige of Bilderdijk is no longer preserved so religiously.

Bilderdijk’s scorn for the dramas of Shakespeare was almost rivalled by that he felt for the new German poetry. Notwithstanding his opposition,

however, the romantic fervour found its way into Holland, and first of all in the persons of Hieronymus van Alphen (1746-1803) and Pieter Leonard van de Kastiele (1748-1810), who amused themselves by composing funeral poems of the school of Gessner and Blair. Van Alphen at one time was extolled as a writer of verses for children, but neither in this nor in the elegiac line did le possess nearly so much talent as Rhijnvis Feith (1753-1824), burgomaster of Zwolle, the very type of a prosperous and sentimental Dutchman. In his Julia (1783), a prose romance, Feith proved himself as completely the disciple of Goethe in Werther as Wolff and Deken had been of Richardson in their Sara Burgerhart. In Johannes Kinker (17 64-1845) a comic poet arose who, at the instigation of Bilderdijk, dedicated himself to the Tidicule of Feith's sentimentalities. The same office was performed with more dignity and less vivacity by Baron W. E. van Perponcher (1741-1819), but Feith continued to hold the popular ear, and achieved an immeuse success with his poem The Grave, in 1792. He then produced tragedies for a while, and in 1803 published Antiquity, a didactic epic. But his popularity waned before his death, and he was troubled by the mirth of such witty scoffers as Arend Fokke Simons (1755-1812), the disciple of Klop-

stock, and as P. de Wacker van Zon (1758-1818), who, in a series of very readable novels issued under the pseudonym of Bruno Daalberg, sharply ridiculed the sentimental and funereal school.

Under the Batavian republic an historian of great genius Van der arose in the person of Johannes Henricus van der PaJm Palm.

(1763-1840), whose brilliant and patriotic Gedenkschrift van Nederlands Herstelling (1816) has somewhat obscured his great fame asa politician and an Orientalist. The work commenced by Van der Palm in prose was continued in

verse by Cornelis Loots (1765-1834) and Jan Frederik Loots,

Helmers (1767-1813). Loots, in his Batavians of the Time of Cesar (1805), read his countrymen a lesson in patriotism,

which Helmers far exceeded in originality and force by his Helmers,

Dutch Nation in 1812. Neither of these poets, however, had sufficient art to render their pieces classical, or, indeed, enough to protect them during their lifetime from the sneers of Bilderdijk. Other political writers, whose lyrical energies were stimulated by the struggle with France, were Maurits Cornelis van Hall (1768-1858), Samuel Iperuszoon Wiselius (1769-1845), and Jan ten Brink (1771-1839), the second of whom immortalized himself and won the favour of Bilderdijk by ridiculing the pretensions of such frivolous tragedians as Shakespeare and Schiller.

The healthy and national spirit in which the ladies Wolff and Deken lad written was adopted with great spirit by a

novelist in the next generation, Adriaan Loosjes (1761— Loosjes,

1818), a bookseller at Haarlem. His romantic stories of medieval life, especially his Charlotte van Bourbon, are curiously like shadows cast forward by the Waverley Novels, but he has little of Sir Walter Scott's historical truth of vision. His production was incessant and his popularity great for many years, but he was conscious all through that he was at best but a disciple of the authoresses of Sara Burgerhart. Another disciple whose name should not be passed over is Maria Jacoba de Neufville (1775- 1856), author of Little Duties, an excellent story somewhat in the manner of Mrs Opie.

A remarkable poet wliose romantic genius strove to com- Tolleus.

bine the power of Bilderdijk with the sweetness of Feith is Hendrik Tollens (1780-1856), whose verses have shown more vitality than those of most of his contemporaries. He struck out the admirable notion of celebrating the great deeds of Dutch history ina series of lyrical romances, many of which possess a lasting charm. Besides his folk-songs and popular ballads, he succeeded in a long descriptive poem, A Winter in Nova Zembla, 1819. He lacks the full accomplishment of a literary artist, but his inspiration was

natural and abundant, and he thoroughly deserved the popularity with which his patriotic ballads were rewarded.

Willem Messchert (1790-1844), a friend and follower of Mes- Tollens, pushed the domestic and familiar tone of the latter schert.

to a still further point, especially in his genre poem of the Golden Wedding, 1825. Both these writers were natives and residents of Rotterdam, which also claims the honour

of being the birthplace of Adrianus Bogaers (1795-1870), Bogaers,

the most considerable poetical figure of the time. Without the force and profusion of Bilderdijk, Bogaers has more truth to nature, more sweetness of imagination, and a more genuine gift of poetry than that clamorous writer, and is slowly taking a higher position in Dutch literature as Bilderdijk comes to take a lower one. Bogaers printed his famous poein Jochebed in 1835, but it had then been in existence more than thirteen years, so that it belongs to the second period of imaginative revival in Europe, and con- nects the name of its author with those of Byron and Heine. Still more beautiful was his Voyage of Heemskerk: to Grbraltar (1836), in which he rose to the highest level of lus genius. In 1846 he privately printed his Romances and Ballads. Bogaers had a great objection to publicity, XII. — 13

Staring.

Recent writers.

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and his reputation was long delayed by the secrecy with which he circulated his writings among a few intimate friends. A poet of considerable talent, whose powers were awakened by personal intercourse with Bogaers and Tollens, was Antoni Christiaan Winand Staring (1767-1840), who first at the age of fifty-three came before the world with a volume of Poems, but who continued to write till past his seventieth year. His amorous and

humorous lyrics recall the best period of Dutch song, and are worthy to be named beside those of Starter and Vondel.

Since 1830 Holland has taken a more prominent position in European thought than she could claim since the end of the 17th century. In scientific and religious literature her men of letters have shown themselves cognizant of the newest shades of opinion, and have freely ventilated their ideas. The language has resisted the pressure of German from the outside, and from within has broken through its long stagnation and enriched itself, as a medium for literary expression, with a multitude of fresh and colloquial forms. At the same time, no very great genius has arisen in Holland in any branch of literature, and all that a foreign critic can do in such space as is here at his command is to chronicle the names of a few of the most prominent writers of the past and present generations. The vast labours of Jakobus van Lennep (1802-68) consist of innumerable translations, hiatorical novels, and national romances, which have gained for him the title of the leader of the Dutch romantic school. Reinier Cornelis Bakhuizen van den Brink (1810-65) was the chief critic of the romantic movement, and Everhard Johannes Potgieter (1808-75) its mystical philosopher and esoteric lyrical poet. The genius and influence of Potgieter were very considerable,

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but they were exceeded by the gifts of Nicolaes Beets, author of the famous Camera Obscura (1836), a master- piece of humour and character. Johannes Pieter Hasebroek, who has been called the Dutch Charles Lamb, wrote in 1840 an admirable collection of essays entitled Z'ruth and Dreams. A poet of unusual power and promise was lost in the early death of Pieter Augustus de Genestet (1830- 1861). Criticism has been represented by W. J. A. Jonck- bloet, C. Busken Huet, and Jan ten Brink. With Isaac de Costa (1798-1860), W. J. van Zeggelen, and J. J. L. Ten Kate, the domestic tendency of Cats and Bilderdijk has overpowered the influence of romanticism. An independent writer of great power and charm both in prose and verse is C. Vosmaer, author of a life of Rembrandt, and of a translation of the Jizad into Dutch hexameters. E. Douwes Dekker, in his novel of Max Havelaar, and Marcellus Emants, in his poem of Lilith, have displayed

talents of a very modern and cosmopolitan order, but it yet) remains to be seen whether they have sufficient power to sustain their promise,

Flemish literature has again come into being since the Reyiya)

independence of Belgium, and has produced two writers of of very remarkable talent, the popular poet Karel Ledeganck Flemish |

(1805-47), and the still more popular novelist Hendrik | Conscience. But the general use of the French language, although Flemish exercises are encouraged by the Govern- ment, has prevented any considerable cultivation of Flemish by modern writers of ambition.

Authorities. —Dr W. J. A. Jonekbloet, Geschiedenis der Neder- landsche Letterkunde, 24 ed., 1873; Dr J. ten Brink, Kleine Gesehicdenis der Nederlandschen Letteren, Haarlem, 1877; DrJ. yan Vloten, Schets van de Geschiedenis der Nederlandschen Letteren, 1879. (EB. W. G.)

HOLLAND, or HoLLAND AND WEST FRIESLAND, Was the second province of the republic of the United Netherlands, and consisted of the old countship of Holland, with the addition of the lordship of Voorne. In 1801, after the erection of the Batavian republic, very nearly the same area was included in the “department” of Holland; but when in June 1806 Holland became the name of the new king- dom, it ceased to be applied to any of the administrative divisions. On the establishment of the kingdom of the Netherlands in 1814 the province of Holland was restored, with its ancient limits only slightly modified. A few further alterations were made in 1815, 1819, and 1820. Tt was the only province that had two governors, one for the north and another for the south, and the provincial states met alternately at the Hague and at Haarlem. In 1840 this bipartite arrangement was carried to its logical conclusion by the erection of two distinet provinces called respectively North and South Holland.

1. Norts Hotuanp (Noordholland), the fourth province of the kingdom of the Netherlands, lies between the German Ocean and the Zuyder Zee, and on the land side is bounded by the provinces of South Holland and Utrecht. The area—which in 1855 was increased by the commune of Haarlemmermeer, and in 1864 was diminished by the larger part of

Leimuiden—is estimated at 744,554 acres, ex- clusive of the newly won lands of the Y. The amount of available ground has been augmented by the draining not only of the Haarlemmermeer but also of more than a score of lesser lakes. In 1840 the population was returned at 443,334, in 1850 at 477,079, in 1860 at 521,125, and in 1875 at 620,890. In 1870, when the total was 577,436, there were 382,607 Protestants, 157,971 Roman Catholics, 2723 Old Catholics, and 32,953 Jews. Amsterdam is the largest city, with a population in 1876 of 296,200 ; and next in order as communes follow Haarlem, 34.797; Helder,

22,030; Haarlemmermeer, 13,171; Zaandam, 12,772; Alk- maar, 12,245; Nieuweramstel, 11,502; Hoorn, 9763; Hilversum, 7805; Texel, 6383; Enkhuizen, 5560; and Edam, 5361. There are besides 36 conimunes with more than 2000 inhabitants.

9, SoutH Hortanp (Zutdholland) is the third province of the kingdom of the Netherlands. On the W. it is bounded by the German Ocean, on the N. by North Holland, on the E. by ‘Wtrecht and Guelderland, on the S.E. by North Brabant, ®ud on the S. by Zealand. The area is estimated at 823,851 acres. In 1850 the popula- tion was returned at 564,000, in 1860 at 617,699, and in 1876 at 748,162. In 1870, when the total was 688,254, there were 508,132 Protestants, 166,219 Roman Catholics, and 12,152 Jews. The largest city is Rotterdam, with a population in 1876 of 136,230; and next in order as com- munes follow the Hague, 104,095 ; Leyden, 41,298; Dort, 26,576 ; Delft, 24,511; Schiedam, 21,880; Gouda, 17,070; Kralingen, 10,313 ; Delfshaven, 10,042 ; and Gorinchem, 9301. There are besides 74 communes with more than 2000 inhabitants.

HOLLAND, Sim Henry (1788-1873), physician and author, was born at Knutsford, Cheshire, on the 27th October 1788. He could elaim relationship to three persons who have attained eminence in careers entirely different both from one another and from his own: his maternal grandmother was the sister of Josiah Wedgwood, whose grandson was Charles Darwin; and his paternal aunt was the mother of Mrs Gaskell. After spending some years at a private school at Knutsford, he was sent to a school at Newcastle-on-Tyne, whence after four years he was trans ferred to Dr Estlin’s school near Bristol. There heat once took the position of head boy, in succession to J

ohn Cam Hobhouse, afterwards Lord Broughton, an honour which required to be maintained by physical prowess. On leaving

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HOLLAND

school he became articled clerk to a mercantile firm in Liverpool, but, as the privilege was reserved to him of pass- ing two sessions at Glasgow university, he at the close of his second session sought relief from his articles, and in

1806 began the study of medicine in the university of |

Edinburgh, where he graduated in 1811. After several years spent in foreign travel, he began practice in 1816 as a physician in London,—according to his own statement, “with a fair augury of success speedily and completely fulfilled.” This ‘‘ success,” he adds, ‘‘ was materially aided

by visits for four successive years to Spa, at the close of |

that which is called the London season.” It must also, however, be in a great degree attributed to his happy tem- perament and his gifts as a conversationalist—qualities the influence of which, in the majority of cases belonging to his class of practice, is often of more importance than direct medical treatment. In 1816 he was elected a fellow

| Seven sons.

of the Royal Society, and in 1828 a fellow of the Royal |

College of Physicians. to Prince Albert in 1840, and was appointed iu 1852 physician in ordinary to the Queen. In April 1853 he was created a baronet. He was also a D.C.L. of Oxford and a member of the principal learned societies of Europe. He was twice married, his second wife being a daughter of Sydney Smith, a lady of considerable literary talent, who published a biography of her father. Sir Henry Holland at an early period of

his practice resolved to devote to his professional duties no more of his time than was necessary to secure an income of £5000 a-year, and also to spend two months of every year solely in foreign travel. By the former resolution he secured leisure for a wide

acquaintance with general literature, and for a more than — superficial cultivation of several branches of science; and |

the latter enabled him, besides visiting, ‘‘and most of them repeatedly, every country of Europe,” to make extensive tours in the other three continents, journeying often to places little frequented by European travellers.

He became physician in ordinary —

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held office only for eleven months. His latter days -were oppressed by poverty, partly relieved by the generosity of the common council of Coventry, which in 1632 assigned

_him £3, 6s. 8d. for three years, “if he should live so long.”

He died February 9, 1636, survived by only one of his The fame of Philemon Holland is due solely to his activity as a translator; Livy, Pliny’s Natural His- tory, Plutarch’s Morals, Suetonius, Ammianus Marcellinus, and Xenophon’s Cyropedia successively employed him ;

_and he also published an English version of Camden’s

Britannia. known— ‘De Lyra there his dreadfal front extends, And here the groaning shelves Philemon bends.” Henry Holland, his surviving son, became a London bookseller, and is known to bibliographers for his Baziliw-

Pope’s allusion to his voluminousness is well

| logia; a Booke of Kings, beeing the true and liuely Effigies of

all our English Kings from the Conquest (London, 1618), and his Herwologia Angliea, hoc est elariss, et doctiss, aliquot

_Anglorum vine Effigies, Vite et Elogia (1620).

See Colvile's Worthies of Warwickshire (Warwick, 1869), and Lowndes's Bibliographical Manual.

HOLLAND, Henry Ricuarp Vassaty Fox, THIRD

Baron (1773-1840), nephew of Charles James Fox and

only son of Stephen Fox, second Lord Holland, was born at Winterslow House, Wiltshire, 21st November 1773.

Of his aneestry an account is given in the article Fox

As, more- |

over, he procured an introduction to nearly all the eminent personages in his line of travel, and knew many of them in

his capacity of physician, his acquaintance with 'men and cities" was of a species without a parallel. The London

Medical Record, in noticing his death, which took place on |

his eighty-fifth birthday, October 27, 1873, remarked that it "had occurred under circumstances highly charasteristic of his remarkable career." On his return from a journey

in Russia he was present, on Friday, October 24th, at

the trial of Marshal Bazaine in Paris, dining with some of the judges iu the evening. He reached London on the Saturday, took ill the following day, and died quietly on the Monday afternoon.

Sir Henry Holland was the author of General View of the Agri- culture of Cheshire, 1807; Travels in the Ionian Isles, Albania, Thessaly, and Grecee,

1812-13, 2d ed., 1819; Medical Notes and Reflections, 1839; Chapters on Mental Physiology, 1852; Essays on Scientific and other Subjects contributed to the Edinburgh and Quar- trly Reviews, 1862; and Recollections of Past Life, 1872, which is less interesting than it might have been, owing to the reticence of the author in regard to personal details and characteristics.

HOLLAND, Puitemon (1551-1636), usually styled, in the words of Thomas Fuller, “the translator-general of his age,” was born in 1551 at Chelmsford, in Essex, the son of

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| (CHARLES JAMES).

Not long after his birth he was with difficulty saved from the flames which destroyed the splendid family mansion in which he was born, When little more than a year old he succeeded, through the death of his father, to the peerage. On the death of his mother in his fifth year, the care of his early education nominally devolved upon her brother, the earl of Upper Ossory, but the character of his early training and studies was deter- mined chiefly by his uncle Charles James Fox, of whom he wrote—“ He seemed to take pleasure in awakening my ambition, and directing it both by conversation and corre- spondence, and yet more by talking to me of my studies and inspiring me with a love of poetry both ancient and modern.” After spending eight or nine years at Eton, where he had as contemporaries J. Hookham Frere, Mr Canning, and Frederick Howard, fifth earl of Carlisle, he in 1790 entered Christ Church College, Oxford. Though the years of his early manhood were occupied more in amusement than in study, he acquired at school and the university a taste for classical hterature which he more fully cultivated in after life. Before taking his seat in the

_ House of Lords, he made two tours on the Continent,—in | 1791, while still a student at Oxford, visiting Paris about

the time when Louis XVI. accepted the revolutionary con- stitution; and in 1793 making a prolonged stay in Spain, where he began the study of its language and literature.

| Thence he went in 1795 to Italy; and at Florence he _ formed the acquaintance of Lady Webster, wife of Sir

Godfrey Webster, whom after her divorce from her husband —who received £6000 damages in the action against Lord Holland—he married in 1797. After the marriage lie

‘ assumed his wife’s family name of Vassall, but its use was

a clergyman, John Holland, who had been obliged to take | regarded rather as a misfortune than an advantage, for it _debarred him from a career in tlie House of Commons M.A. at Oxford in 1587, he further took the degree of | | Charles Fox, and raised him to an assembly, not only more

refuge abroad during the Marian persecution. Having be- come a fellow of Trinity College, Cambridge, and passed

M.D. at Cambridge in 1591. In 1612 he was sworn free- man of the city of Coventry, andin 1617, dressed in a suit which cost £11, 1s, 1ld., he had the honour of reading,

as the recorder’s deputy, an oration to King James I. In. 1628 he was appointed head master of the free school of |

Coventry, but, owing probably to advancing old age, he |

discontinued by his son, the fourth and last Lord Holland. Lord Holland’s early inheritance of a peerage must be

which might have proved as brilliant as that of his uncle

listless and much less numerous, but where at the time he entered it the Whig party, of whose principles the influence of his uncle had induced him to become a strenuous supporter, could muster only a minority of six or seven in a house of eighty or ninety. He began his political career

by a motion against the Assessed Tax Bill, and though lus speech had, as was to be expected, no influence on the division, it proved that he had inherited the oratorical abilities of his family, and pointed him out as the leader of his uncle's supporters in the Upper House. As his dis- approval of most of the proceedings of the House of Lords was recorded by protests, his copiousness in this species of composition has perhaps never been equalled. 'These protests were afterwards collected and published by D. C. Moylan under the title Zhe Opinions of Lord Holland as recorded in the Journals of the House of Lords, from 1797 to 1841 (London, 1841), and, besides constituting, as they necessarily do, a full though condensed account of his poli- tical views and opinions, form one of the most authentic and original records of the course of Whig policy during the years to which they refer. After the peace of Amiens in 1802 Lord Holland proceeded to Paris, whence hc went to Spain, staying in that country until the declaration of war in January 1805, when he returned to England. Of this second visit to Spain he doubtless took advantage for the purpose of acquiring a more complete mastery of the Spanish language and literature, and the fruit of this was seen by the publication in 1807 of The Life and Writings of Lope Feliz de Vega Carpio, and in 1808 of Three Comedies from the Spanish. When the ministry of " All the Talents" came into office in 1806, Lord Holland was made a privy councillor, and was appointed along with Lord Auckland to negotiate with the American plenipoten- tiaries that treaty the refusal of whose ratification by Mr Jefferson resulted in the subsequent war with America. On the death of Mr Fox, 15th October following, Lord Holland received the privy seal, holding office till the dis- missal of the ministry in 1807. When the Spaniards rebelled against the French yoke in 1808, Lord Holland's interest in the country induced him to pay it a third visit. He landed at Corunna almost simultaneously with thie division of the British army under Sir David Baird, and did not return to England till the close of 1809. During the long period when the Whigs were excluded from power Lord Holland continued to afford them his strenuous and steady support. He did not join the Canning ministry of 1827, but when the Whigs werc recalled in 1830 he became chancellor of the duchy of Lancaster, an office which, with the exception of two short intervals when his party were temporarily excluded from power, he continued to hold till his death at Holland House, 22d October 1840.

Although Lord Holland for the greater period of his life had to lead the forlorn hope of his party in the House of Lords, his influence on the politics of his country was of an importance far beyond what was manifest at the time, and without his persistent support in parliament and his aid in maintaining his party's courage and discipline, the triumph of many of the measures he advocated would in all probability not have been sospeedyand complete. Few have been more closely identified with all the great political changes of the first half of the present century, more especi- ally the extension of the suffrage, the abrogation of Catholic disabilities, the abolition of the Test and Corporation Acts, the repeal of the corn laws, and the repression of the slave trade. A sympathizer with the French Revolution, he differed from his party in his admiration and esteem for Napoleon, against whose imprisonment he protested as an outrageous violation both of good faith and of what was due to fallen greatness. The character of Lord Holland's oratory very closely resembled that of his uncle Charles Fox, and was inferior to it only perhaps because his natural indolence was not counteracted by the stimulus of a popular assembly encouraging him to a more careful study of the art of eloquence, and affording him more adequate oppor- tunities for its display. He excelled principally in close

reasoning rendered clear and easy of apprehension by copious illustration, and—as was to be expected from the fact that he trusted little to previous preparation—was more happy in reply than in original statement. The effect of the best passages of his speeches was often marred by a more aggravated form of that tendency to hesitation which was one of the principal oratorical defects of Fox, the rush of ideas seeming to be too rapid to permit him to select with ease from his copious vocabulary the word most appropriate for his purpose. According to Lord Brougham—‘ The same delicate sense of humour which distinguished Mr Fox he also showed, and much of the exquisite Attic wit which formed so large and so effective a portion of that great erator’s argumentation, never use- lessly introduced, always adapted nicely to the occasion, always aiding andas it were directing the reasoning.” The language both of his spoken and written style was graceful, pure, flowing, and vigorous, and entirely devoid of extra- vagance, singularity, or affectation. In addition to his poetical translations, he was the author of fugitive verses of some elegance. Two of his works were published post-humously by his son Henry Edward, fourth Lord Holland —Foreign Reminiscences (1850), and Memoirs of the Whig Party during my Time (2 vols. 1852-54).

It is, however, as the restorer of Holland House, and as the host of the brilliant company which he there assembled, that Lord Holland in all probability will be chiefly remem- bered by posterity. Though his temper was quick and excitable, his amiable disposition rendered his manners in private uniformly cordial and engaging. His conversation, easy, unconstrained, and of great variety both as to manner and matter, was enlivened by a peculiarly genial wit, and a never-failing supply of racy anecdote to which his powers of mimicry gave additional point and zest. The width of his sympathies and his manifold acquirements enabled him to enjoy the society of persons of every species of intellec- tual eminence. Holland House, which owes its name to Henry Rich, first earl of Holland,—who was no relation of the Fox family,—and which had been afterwards the home of Addison and of other tenants of various kinds of distinction, was restored by Lord Holland in a manner worthy of the company of European

statesmen, artists, and men of letters, of which it became the common meeting- place. Much of the attraction of these brilliant gatherings was due to the management and personal influence of Lady Holland, who had the pecnliar gift of making herself both feared and fascinating at the same timc. Of her the Princess Liechtenstein writes—“ Beautiful, clever, and well-informed, she exercised a natural authority over those around her. But a habit of contradiction—which, it is fair to add, she did not mind being reciprocated upon her- self—occasionally lent animation, not to say animosity, to the arguments in which she engaged. It is easy for some natures to say a disagreeable thing, but it is not always easy to carry a disagreeable thing off cleverly. This Lady Holland could do.”

Seo Macaulay’s Essays; Brougham’s Statesmen of the Time of George III. and IV.; Hayward’s Essays; Sir Henry Holland’s Recollections; and Holland House, by Princess Marie Liechten- stein, 2 vols., 1874.

HOLLAR, Wenzen or Wencestaus (1607-1 677), a celebrated etcher, was born at Prague on July 13, 1607, and died in Westminster, being buried at St Margaret’s church on March 28, 1677. His family was ruined by the capture of Prague in the Thirty Years’ War, and young Hollar, who had been destined for the law, determined to become an artist. The earliest of his works that have come down to us are dated 1625 and 1626 ; they are small plates, and one of them is a copy of a Virgin and Child by Diirer, whose influence upon Hollar’s work was always

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great. In 1627 he was at Frankfort, working under Matthew Merian, an etclier and engraver; thence he passed to Strasburg and thence, in 1633, to Cologne. It was there that he attracted the notice of the famous amateur Thomas, earl of Arundel, then on an embassy to the imperial court ; and with him Hollar travelled to Vienna and Prague, and finally came in 1637 to England, destined to be his home for many years. Though he lived in the household of Lord Arundel, he seems to have worked not exclusively for him, but to have begun that slavery to the publishers which was afterwards the normal condition of his life. In his first ycar in England he made for

Stent, the printseller, the magnificent View of Greenwich, nearly a yard long, and received thirty shillings for the plate,— perhaps a twentieth part of what would now be paid for a single good impression. Afterwards we hear of his fixing the price of his work at fourpence an hour, and measuring his time bya sandglass. The civil war had its effect on his fortunes, but none on his industry. Lord Arundel left England in 1642, and Hollar passed into the service of the duke of York, taking with him a wife and two children. With other royalist artists, notably Inigo Jones and Faithorne, he stood the long and eventful siege of Basing House ; and as we have some hundred plates from his hand dated during the years 1643 and 1644 he must have turned his enforced leisure to good purpose. Taken prisoner, he escaped or was released, and joined Lord Arundel at Antwerp, and there he remained eight years, the prime of his working life, when he produced his finest plates of every kind, his noblest views, his miraculous “mufis” and “ shells,” and the superb portrait of the duke of York. In 1652 he returned to London, and lived for a time with Faithorne the engraver near Temple Bar. During the following ycars were published many books which he illustrated:—Ogilby’s Virgil and Ilomer, Stapylton’s Juvenal, and Dugdale’s Warwickshire, St Paul’s, and Mon- asticon (part i). The booksellers continued to impose on the simple-minded foreigner, pretending to decline his work that he might still further reduce the wretched price he charged them. Nor did the Restoration improve his position. The court did nothing for him, and in the great plague he lost his young son, who, we are told, might have rivalled his father as an artist. After the great fire he produced some of his famous “ Views of London”; and it may have been the success of these plates which induced the king to send him, in 1668, to Tangier, to draw the town and forts. During his return to England occurred the desperate and successful engagement fought by his ship the “Mary Rose,” under Captain Kempthorne, against seven Algerine men-of-war,—a brilliant affair which Hollar etched for Ogilby’s Africa. He lived eight years after his return, still working for the booksellers, and retaining to the end his wonderful powers ; witness the large plate of Edinburgh (dated 1670), one of the greatest of his works. He died in extreme poverty, his last recorded words being a request to the bailiffs that they would not carry away the bed on which he was dying.

Hollar has been called by a recent critic “the most accurate delineator and the most ingenious illustrator of his time, and as to technic the most able etcher.” His variety was boundless ; his plates number some 2740, and include views, portraits, ships, religious subjects, heraldic subjects, landscapes, and still life in a hundred. different forms. No one that ever lived has been able to represent fur, or shells, or a butterfly’s wing, as he has done. His architectural drawings, such as those of Antwerp and Stras-

urg cathedrals, and his views of towns, are mathematically exact, but they are pictures as well. He could reproduce the decorative works of other artists quite faultlessly, as

in the famous chalice after Mantegna’s drawing. His

Theatrum Mulierum and similar collections reproduce for us with literal truth the outward aspects of the people of his day; and his portraits, a branch of art in which he has been unfairly disparaged, are of extraordinary refinement and power. His genius is wholly unlike that of his great contemporary Rembrandt; it aims rather at the delicate rendering of details than at the truth of character and the mystery of light and shade. But in his own way Hollar is as perfect as Rembrandt.

Almost complete collections of Hollar’s works exist in the British Museum and in the library at Windsor Castle. Two admirable catalogues of his plates have been made, one in 1745 (2d ed., 1759), by George Vertue, and one in 1853 by Parthey. The latter, pub- lished at Berlin, is a model of German thoroughness and accuracy, and leaves very little to be added by future research.

HOLLY, Jlex, L., a genus of trees and shrubs of the natural order J/icinewe or Aquifoliacee, containing some one hundred and fifty species, of which several occur in the temperate northern hemisphere, North-West America ex- cepted, by far the larger number in tropical Asia and America, and very few in Africa and Australia. In Europe, where J. Aguifoliwm is the sole surviving species, the genus was richly represented during the Miocene period by forms at first South American and Asiatic, and later North Ameri-

can in type (Schimper, Paléont. Véyét., iii. 204, 1874). The leaves are generally coriaceous and evergreen, and are alternate and stalked ; the flowers are commonly dicecious, are in axillary cymes, fascicles, or umbellules, and have a persistent four- to five-lobed or parted calyx, a white, rotate four- or rarely five- or six-cleft corolla, with the four or five stamens adherent to its base in the male, sometimes hypo- gynous in the female flowers, and a two- to twelve-celled ovary ; and the fruit is a globose, very seldom ovoid, and usually red drupe, containing two to sixteen one-seeded stones,

The Common Holly, or Hulver (apparently the «jAacrpos of Theophrastus ;} Ang.-Sax., holen or holegr; Mid. Eug., holyn or holin, whence holm and holintree ;2 Welsh, celyn; Germ., Stechpalme, Iiilse, Hulst ; Old Fr., houa ; and Fr., houlx),? 2. Aquifolium, L., is an evergreen shrub or low tree, having smooth, ash-coloured bark, and wavy, pointed, smooth, and glossy leaves, 2 to 3 inches long, with a spinous margin, raised and cartilaginous below, or, as commonly on the upper branches of the older trees, entire —a peculiarity alluded to by Southey in his poem The Holly Tree. The flowers, which appear in May, are ordinarily dicecious, as in all the best of the cultivated varieties in nurseries (Gard. Chron., 1877, i. 149). Darwin (Dif. Forms of Flow., p. 297, 1877) says of the holly: “During several years I have examined many plants, but have never found one that was really herma- phrodite.” Shirley Hibberd, however (Gard. Chron., 1877, i, 777), mentions the occurrence of “flowers bearing globose anthers well furnished with pollen, and also per- fect ovaries.” In his opinion, 7. Aquifoliwm changes its sex from male to female with age. In the female flowers the stamens are destitute of pollen, though but slightly or not at all shorter than in the male flowers ; the latter are

1 Hist. Plant.,i. 9. 3, iii. 3. 1,and 4. 6, et yassim. On the aquifolium or aquifolia of Latin authors, commonly regarded as the holly, see A. de Grandsagne, Hist. Nat. de Pline, bk. xvi., “ Notes,” pp. 199,

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2 The term ‘‘holm,” as indicative of a prevalence of holly, is stated to have entered into the names of several places in Britain. From its superficial

resemblance to the holly, the tree Quercus Ilex, L., the evergreen oak, received the appellation of ‘‘ holm-oak.”

3 Skeat (Htymolog. Dict., 1879) with reference to the word holly remarks: ‘‘The form of the base Kun (=Teutonic Hut) is probably connected with Lat. culmen, a peak, culmus, a stalk; perhaps because the leaves are ‘pointed.’”” Grimm (Deut. Worterb., Bd. iv.) suggests that the term ZZulst, as the O.H.G. Hulis, applied to the butcher’s broom, or knee-holly, in the earliest times used for hedges, may have reference to the holly as a protecting (Aiéllender) plant.

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more numerous than the female, and have a smaller ovary, and a larger corolla, to which the filaments adhere for a greater length. The corolla in male plants falls off entire, whereas in fruit-bearers it is broken into separate segments by the swelling of the young ovary (M‘Nab). The holly occurs in Britain, north-east Scotland excepted, and in western and southern Europe, from as high as 62° N. lat. in Norway to Turkey and the Caucasus, and in western Asia. It is found generally in forest glades or in hedges, and does not flourish under the shade of other trees. In Eng- land it is usually small, probably on account of its destruc- tion for timber, but it may attain to 60 or 70 feet in height, and Loudon mentions one tree at Claremont, in Surrey, of 80 feet. Some of the trees on Bleak Hill, Shropshire, are asserted to be 14 feet in girth at some dis- tance from the ground (WV. and Q., 5th ser., xii. 508). The holly is abundant in France, especially in Britanny. Tt will grow in almost any soil not absolutely wet, but flourishes best in rather dry than moist sandy loam. Beckmann (Z/ist. of Invent., i. 193, 1846) says that the plant which first induced J. di Castro to searcli for alum in Italy was the holly, which is there still considered to indicate that its habitat is aluminiferous. The holly is propagated by means of the seeds, which do not normally germinate until their second year (see ARBORICULTURE, vol. ii, p. 322), by whip-grafting and budding, and by cuttings of the matured summer shoots, which, placed in sandy soil and kept under cover of a hand-glass in sheltered situations, generally strike root in spring. Transplantation should be performed in damp weather in September and October, or,

according to some writers, in spring or on mild days in winter, and care should be taken that the roots are not dried by exposure to the air. It is rarely injured by frosts in Britain, where its foliage and bright red berries in winter render it a valuable ornamental tree. The yield of berries has been noticed to be less when a warm spring, following on a wet winter season, has promoted excess of growth. There are numerous varieties of the holly. Some trees have yellow, and others white or even black fruit. In the fruitless variety laurifolia, ‘‘the most {loriferous of all hollies” (Hibberd), the flowers are highly fragrant; the form known as femina is, on the other hand, remarkable for the number of its berries. The leaves in the unarmed varieties awreo-marginata and albo- marginata are of great beauty, and in ferox they are studded with sharp prickles. The holly is of importance as a hedge-plant (see ARBORICULTURE, Vol. ii. p. 319), and is patient of clipping, which is best performed by the knife. Evelyn’s holly hedge at Say’s Court, Deptford, was 400 feet long, 9 feet high, and 5 feet in breadth. To form fences, for which Evelyn recommends the employ- ment of seedlings from woods, the plants should be 9 to 12 inches in height, with plenty of small fibrous roots, and require to be set 1 to 14 feet apart, in well-manured and weeded ground, and thoroughly watered.

The wood of the holly is even-grained and hard, espe- cially when from the heartwood of large trees, and almost as white as ivory, except near the centre of old trunks, where it is brownish. It is employed in inlaying and turn- ing, and, since it stains well, in the place of ebony, as for tea- pot handles. For engraving it is inferior to box. When dry it weighs about 474 ib per cubic foot. From the bark of the holly bird-lime is manufactured. From the leaves are obtainable a colouring matter named ilixanthin, tlicic acid, and a bitter principle, d/icin, which las been variously described by different analytical chemists. The leaves liave been used in rheumatism, and were at one time, on account of their taste, supposed to be of value in inter- mittent fever. A. Lonicerus (Kreuterd., Th. 1, p. xxxviil., Frankf., 1582, fol.) speaks of their decoction as a remedy

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for pain in the side. ‘They are eaten by sheep and deer, and in parts of France serve as a winter fodder for cattle, The berries provoke in man violent emesis and catharsis, but are eaten with immunity by thrushes and other birds, The larve of the moths Sphinx ligustri, L., and Phoxopteryx nevana, Hb., have been met with on holly. The leaves are mined by the larva of a fly, Phytomyza dicts, and both on them and the tops of the young twigs occurs the plant-louse Aphis ilicis, Kalt. (Kaltenbach, Planzenfeinde, p. 427, 1874), The custom of employing holly and other plants for decorative purposes at Christmas is one of con- siderable antiquity, and has been regarded as a survival of the usages of the Roman Saturnalia, or of an old Teutonic practice of hanging the interior of dwellings with ever- greens as a refuge for sylvan spirits from the inclemency of winter. A Border proverb defines an habitual story-teller as one that “lees never but when the hollen is green.” Several popular superstitions exist with respect to holly. In the county of Rutland it is deemed unlucky to intro duce it into a house before Christmas Eve. In some English rural districts the prickly and non-prickly kinds are distinguished as “he” and “she” holly; and in Derbyshire the tradition obtains that according as the holly prought at Christmas into a house is smooth or rough, the wife or the husband will be master. Holly that has adorned churches at that season are in Worcestershire and Herefordshire much esteemed and cherished, the possession of a small branch with berries being supposed to bring a lucky year; and Lonicerus (op. cit.) mentions a notion in his time vulgarly prevalent in Germany that consecrated twigs of the plant hung over a door are a protection against thunder.

Among the North American species of ica are I. opaca, Ait., which resembles the European tree, and the Inkberry, 1. (Prinos) glabra, L., and the American Black Alder, or Winterberry, I. (Prinos) verticillata, L._ Hooker (Fl. of Brit. India, i. 598,606) enumerates twenty-four Indian species of Hex. The Japanese 1. crenata, Thb., and J. latifolia, Thb., a remarkably hardy plant, and the North American J. Dahoon, Walt., are among the species cultivated in Britain. The leaves of several species of /7ea arc used by dyers. The member of the genus most important economically is I. paraguayensis, St.~~Hil., the prepared leaves of which con~~ stitute Paraguay tea, or Math (g.v.). Knee Holly is the species Ruscus aculcatus, L.; Sea Holly, Eryngium maritimum, L.; and the Mountain Holly of America, Nemopanthes canadensis, Dae

See, besides the above mentioned works, T. Forster, The Perennial Calendar, p 726, 1824; Loudon, Arboretum, ii. 506, 1844; De Candolle, Géog. Botan. i. 1855; Lindley, Med. and Gconom. Bot., p. 190, 2d ed., 1856; N. Paterson, The Manse Garden, pp. 17 seq., 1860; Syme, Sowerby's Eng. Bot., ii 219, 1864; Darwin, Origin of Species, p. 107, 5th ed., 1869, and Anim, and Pl., i, 384, ti. 19, 280; Stillé and Maisch, The National Dispensatory, p. 754, 2d ed., 1879; J. Britten and R. Holland, Dict. of Eng. Plant Names, pt. ii. pp. 253, 263-4, Eng. Dialect Soc., 1880; Notes and Queries, 2d ser., i. 335, 398, 443, 502, iii. 344, 4th ser, viii, 506, x. 486, 492, xii. 467, 5th ser., xi. 206, ix. 67; and The Garden, xiii, xiv., 1878, (F. If. B.)

HOLLYHOCK (from M.E. hols—doubtless because brought from the Holy Land, where it is indigenous (Wedg.) —and A.-8. hoc, a mallow), Althea rosea, L., a perennial plant of the natural order Malvacee and tribe Malvew, a native of the East, has been cultivated in Great Britain for about three centuries. The ordinary hollyhock is single-blos- somed, but the florists' varieties have all double flowers, of white, yellow, rose, purple, violet, and other tints, some being almost black. The plant is in its prime about August, but by careful management examples may be obtained in blossom from July to as late as November. Hollyhocks are propagated from seed, or by division of the root, or by planting out in rich sandy soil, in a close frame, with a gentle bottom heat, single eyes from wood- shoots, or cuttings from outgrowths of the old stock or of the lateral offsets of the spike. The seed may be sown in October under cover, the plants obtained being potted in November, and kept under glass till the following April, or, if it be late-gathered, in May or June, in the open ground, whence, if required, tle plants are best removed in October or April. Seedlings may also be raise

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in February or March, by the aid of a gentle heat, in a light and rich moist soil; they should not be watered till they have made their second leaves, and when large enough for handling should be pricked off in a cold frame; they are subsequently transferred to the flower-bed. Hollyhocks thrive best in a well-trenched and manured sandy loam. The spikes as they grow must be

staked; and water and, for the finest blossoms, liquid manure should be liberally sup- plied to the roots. Plants for exhibition require pruning of side growths; and it is recommended, when the flowering is over, and the stalks have been cut off 4 to 6 inches above the soil, to earth up the crowns with sand. Some of the finest double-flowered kinds of hollyhock will not bloom well in Scotland. The plant is susceptible of great modi- fication under cultivation. The forms now grown are due to the careful selection and crossing of varieties, first by Mr Charles Baron, a shoemaker at Saffron-Walden, and afterwards by Mr Paul of Cheshunt, Messrs R. B. Bircham, W. Chater, Downie & Laird, John Laing, Anthony Parsons, aud other well-known floriculturists. It is found that the

most diverse varieties may te raised with certainty from |

plants growing near together. Darwin from the seed of 11 out of 18 varieties procured-62 plants, all perfectly true to their kind, and from the seed of the remaining 7 varieties 49 plants, half true and half false. Mr Masters of Canterbury, he relates, saved seed from a great bed of 24 named varieties planted in closely adjoining rows, each of which faithfully reproduced itself, with only sometimes a shade of difference in tint. Since the abundant pollen of the hollyhock becomes ripe, and is for the most part shed, before the stigma of the flower affording it is ready for its reception, the preservation of the individuality of different varieties flourishing side by side, in spite of the frequent visits of bees (unless, as suggested by Mr Turner of Slough, those insects be debarred access to the pollen and stigmas by the doubleness of the flowers), would appear to be due to the prepotency of the pollen of each variety on its own stigma over that of all other plants. The hollyhock is very liable to the attacks of slugs, and to a disease occa- sioned by a fungus, Puccinia malvacearum, which, originally from South America, attained notoriety in the Australian colonies, and finally, reaching Europe, threatened the exter- mination of the hollyhock, the soft parts of the leaves of which it destroys, leaving the venation only remaining. It has been found especially hurtful to the plant in dry seasons. Wild mallows, upon which also it is parasitic, do not appear to be very injuriously affected by it. As means of getting rid of this pest the following expedients have been resorted to :—the application of a weak aqueous solu- tion of Condy’s fluid, which in killing it turns its natural light grey colour to a rusty black, or of a

strong solution of soft soap with sulphur (“ Gishurst compound”); the de-
struction of the plants, and their replacement by healthy stocks; and, as
practised by Mr Chater, cultivation in highly-manured trenches, with all
possible exposure to the open air, and mulching during summer.

See Darwin, Var. of Anim. and Plants under Domest., ii. 107, 310; Treas. of
Bot., 2d cd., 1874; M. C. Cooke and M. J. Berkeley, Fungi: their Nature,
Influence, and Uses, p. 2380, 1875; Florist,

1875; Floral World, 1877 and 1879; Gardener’s Chron., NET 75 a6 114,
and 1878, i. 766, and ii, 478; and, for fig. of pollen of holly-

hock, Borany, vol. iv. p. 129.

HOLMAN, Jamus (c. 1787-1857), tle “Blind Traveller,” was born about
1787. He entered the British navy in 1798 as first-class volunteer, and was
appointed lieutenant in April 1807. In 1810 he was invalided by an illness
which resulted in the total and hopeless deprivation of sight. In
consideration of his helpless circumstances he was in 1812 appointed one of
the royal knights of Windsor, but the

ulness and seclusion of such a life harmonized so ill with Is active habits
and his keen interest in the outside world

that he requested leave of absence that he miglit go abroad. This being
granted, he in 1819, 1820, and 1821 journeyed through France, Italy,
Switzerland, the parts of Germany bordering on the Rhine, Belgium, and
the Netherlands. In 1822 he published a narrative of his journey. His
enjoyment in his travels was derived from the love of locomotion and the
attendant exercise, the varieties of company and of topics of conversation,
and the informa- tion and descriptions he obtained from eye-witnesses,
which constantly supplied him with new materials on which to exercise his
imagination. He again set out in 1822 with the design of making the circuit
of the world, but after travelling through Russia into Siberia, he was
arrested when he had managed to penetrate 1000 miles beyond Smolensk,
and after being conducted to the frontiers of Poland, returned home by

Austria, Saxony, Prussia, and Hanover. The pretext for arresting him was the suspicion of his being a spy, but the probability is that the authori- ties wished to prevent him from persevering in what they must have regarded as, to one in his helpless condition, a foolish and hazardous adventure. An account of his journey was published in 1825. Shortly afterwards he again set out to accomplish by a somewhat different method the design which had been frustrated by the Russian authori- ties; and an account of his remarkable achievement was published in four volumes in 1834-35, under the title of A Voyage round the World, including Travels in Africa, Asia, Australasia, America, &c., from 1827 to 1832. His last journeys were through Spain, Portugal, Wallachia, Moldavia, Montenegro, Syria, and Turkey ; and he was engaged in preparing his journals of this tour for the press when he died at London, 29th July 1857. The works of Holman, besides the interest attaching to them from his incidental references to the peculiarities of his circumstances arising from his physical defect, and to his methods of triumphing over lis difficulties, occupy a unique place in literature as products of very extraordinary energy and perseverance, while, on account of the variety of their in- formation and their frequently graphic descriptions, they are of considerable value as books of travel.

HOLSTEIN. See Scuteswra-Housrein.

HOLT, Sir Joun (1642-1710), lord chief-justice of the Court of King's Bench in the reigns of William IIL. and Anne, was born at Thame, Oxfordshire, December 30, 1642. His father, Sir Thomas Holt, possessed a small patrimonial estate, but in order to supplement his income had adopted the profession of law, in which he was not very successful, although he became sergeant in 1677, and afterwards for his political services to the "Tories" was rewarded witli knighthood. After attending for some years the free school of the town of Abingdon, of which his father was recorder, young Holt in his sixteenth year entered Oriel College, Oxford. He is said to have spent a very dissipated youth, and even to have been in the habit of taking purses on the highway, but after entering Gray's Inn about 1660 he completely renounced his old habits and applied himself with exemplary diligence to the study of law. He was called to the bar in 1663, and, although his youth hindered his immediate success, wlien once he had an opportunity of manifesting his talent he speedily acquired a lucrative

practice. An ardent supporter of civil and religious liberty, he distinguished himself in the state trials which were then so common by the able and courageous manner in which he supported the pleas of the defendants. In February 1666 he was appointed recorder of London, and on the 22d of April he was made king'ssergeant and received the honour of knighthood. His giving a decision adverse to the pretensions of the king to exercise martial law in time of peace led to his dismissal from the office of recorder, but he was continued in the office of king's sergeant in order

to prevent him from becoming counsel for accused persons. Having been one of the judges who acted as assessors to the peers in the Convention parliament, he took a leading part in arranging the constitutional change by which William TIL, was called to the throne, and after his accession he was appointed lord chief-justice of the king's bench. His merits as a judge are the more apparent and the nore remarkable when contrasted with the qualities displayed by his unworthy predecessors in office. In judicial fairness, legal knowledge and ability, clearness of statement, and unbending integrity lie has had few if any superiors on the English bench. Over the civil rights of his countrymen he exercised a jealous watchfulness, more especially when presiding at the trial of state prosecutions, and he was especially careful that all accused persons should be treated with fairness and respect. He is, however, best known for the firmness with which he upheld his own prerogatives in opposition to the authority of the Houses of Parliament. On several occasious his physical as well as his moral courage was tried by extreme tests. Having been requested to supply a number of police to help the soldiery in quelling a riot, he assured the messenger that if any of the people were shot lie would have the soldiers hanged, and proceeding himself to the scene of riot he was successful in preventing blood- shed. A still more signal proof of his courage is said to have been given in the Aylesbury case. He declared in favour of the Aylesbury burgesses, who had been committed to Newgate for complaining about the non-registry of their votes. On this account his commitment was moved by the Tories, but the result of the motion is uncertain. There is a tradition, however, which whether true or not is equally a tribute to his integrity, that the House of Conimous summoned him to appear before them, and that

when, on his disregarding the summons, the speaker him- self made his appearance, Holt told him that unless he returned to his chair within five minutes he would have him sentto Newgate. While steadfast in his sympathieswith the Whig party, Holt maintained on the bench entire political impartiality, and always held himself aloof from political intrigue. On the retirement of Somers from the chan- cellorship in 1700 he was offered the great seal, but declined it, His death took place 3d March 1710, and he was buried in the chancel of Redgrave church, where a fine monument in white marble was erected by his brother to his memory.

Reports of Cases deternrined by Sir John Holt, 1681-1710, appeared at London in 1738; and The Judgments delivered in the case of Ashby v. White and others, and in the ease of John Paty and others, printed from original ALSS., at London, 1837. See Burnet's Own Times; Tatler, No. xiv.; a Life, published in 1764; Welsby, Lives of Eminent English Judges of the 17th and 18th Centuries, 1846; and Campbell's Lives of the Lord Chief Justices.

HOLTY, Lupwic Heryricu Caristopx (1748-1776), German poet, and one of the founders of the '* Hainbund," was born at Mariensee in Hanover, December 21, 1748. His father, who was a pastor, was three times married, and Holty was the eldest of his ten children. His second wife, Hilty's mother, died in 1758, and her children were tenderly brought up by the third wife, together with her own large family. In his ninth year, Holty, till then a beautiful and lively child, was smitten with smallpox, and was for some time nearly blind. On his recovery, his features and dis- position were altered, and he was throught life plain, silent, and awkward. From an early age he was an inveterate lover of solitude and books. He was taught at home by his father, besides the ordinary school branches, Latin, French, and Hebrew, and at the age of sixteen was sent to the public school of Celle. On leaving Celle three years later, he went as a theological student to Géttingen, where, however, he devoted his leisure hours to the study of the English and Italian poets, and began his own literary

career. The appearance of some of his verses in a Gottingen weekly paper, especially those on the death of Miinchhausen, brought his name before the

public, and he was shortly afterwards admitted as a member of the ‘‘German Society,” He now made the acquaintance of Biirger, Miller, Voss, Boie, the brothers Stolberg, and other poets, in conjunction with whom he formed in 1772 the famous poetical brother- hood known as the ‘“‘Hainbund.” The next two years were spent by Hélty in this brilliant and enthusiastic company ; and, with the assistance of a scholarship and a post in the philological seminary in Géttingen, he suc- ceeded in making a scanty livelihood by teaching English and Greek and by making translations. In 1774, having abandoned the intention of entering the church, he accom- panied his friend Miller to Leipsic, where he remained for a year in the hopes of obtaining a private tutorship. The penniless young poet had for some time been silently attached to a lady, who about this time married some more eligible suitor. His health now began to cause him anxiety, and symptoms of consumption, inherited from his mother, made their appearance. His prospects were further altered by the death of his father in 1775; and Holty found him- self not only thrown entirely on his own resources, but obliged in some measure to assist his family. Towards the end of 1775 he settled in Hanover, to be near his physician Zimmermann and his friend Boie, and there he died in his twenty-eighth year, September 1, 1776. Holty was a writer of ballads, idylls, elegies, and odes. His conceptions, if not lofty, are always graceful, lus style finished, his language and rhythm faultless, He was from the first one of the shining lights of the “ Hainbund,” and during his short career became one of the most popt- lar of German lyric poets. Many of his songs have become folk-songs, and his ballads have been ranked with those of Biirger.

Hélty was engaged when he died in eolleeting and revising his poems for the press; and after his death his friends Boie and Voss undertook the eharge of their publication. In 1782, however, an ineorreet edition of his works appeared edited by Geissler, which eoutained many poems not by Holty. The eorreet edition was first published by Voss and Stolberg in 1783, and again, revised, in 1804. ‘An edition of his Gedichte, with a biographieal introduction and

notes by Karl Hahn, was published by Brockhaus in the Bibliothek der Deutschen Nationalliteratur (1870).

HOLYHEAD (Welsh, Caer-Gybi, the fort of Gybi), a market-town and parliamentary borough of Anglesey, North Wales, is situated on a small island on the western extremity of the county and at the terminus of the Chester and Holyhead Railway, 24 miles from Bangor. It is con- nected with the mainland by an embankment tliree-quarters of a mile long, over which pass both the railway and the coach road. Underneath the bridge in the centre the tide rushes with great velocity. The town, formerly a small fishing village, has since the reign of William ITI. acquired importance as the station of the mail packets for Dublin, and it now possesses a magnificent harbour of refuge begun in 1847, and formally opened in September 1873. Tie original plan included the erection of a north breakwater 5360 feet in length from the coast-line, and also of an east breakwater 2000 feet in length, but the scheme of the east breakwater, of which the chief object was to cover the Platter's and Skinner's Rocks, was subsequently abandoned, and their positions were marked instead by buoys. On account of the number of vessels which began to take ad- vantage of tlie shelter that was being provided for them it was also resolved to lengthen the northern breakwater ma

- north-easterly direction by 2000 feet, and subsequently by

500 feet more, making its total length 7860 feet. By these additions a sheltered roadstead of 400 acres in extent was obtained, besides the enclosed area of 267 acres. The breakwater consists of a rubble mound, upon which iserectet

a solid central wall of massive masonry rising to a height of 38 feet 9 inches above low water. On the wall there is a promenade sheltered on the sea side by a parapet. The breakwater is terminated by a head 150 feet long and 50 feet wide, on which is erected a lighthouse. The whole cost of the works was £1,479,538. In 1873 works were commenced by the railway company for extending the old harbour and increasing the length of the quay to 4000 feet. 'They were opened by the prince of Wales in June 1880. The cost has been nearly half a million sterling, Upon the pier of the old harbour there is an arch of Mona marble, commemorative of the visit of George IV. in 1821 on his way to Ireland. The church, an old embattled building, is said to

occupy the site of an ancient monastery founded by St Gybi about 610; and in the south porch there is a rude figure of the patron saint

under a canopy. ‘The churchyard is surrounded by a wall |

6 feet thick, supposed by some to be of Roman construction.

Holyhead Harbour.

The town possesses assembly-rooms and baths. On the rock south of the harbour is an obelisk erected in memory of Captain Skinner, commander of the steam packet, who in 1833 lost his life by being washed overboard. About 2 miles from the town, Pen-Caer-Gybi, or the hill of Holyhead, rises perpendicularly from the sea to the height of 700 feet, affording a fine view of the town and harbour, and the irregularities of the rock-bound coast. On the sides of the hill there are traces of an exten- sive British fortification, and on the summit are remains of a circular building, which in all probability was a Roman watchtower. The inhabitants are chiefly engaged in the coasting trade and in shipbuilding. Holyhead unites with Beaumaris in returning a member to parliament. The population of the parliamentary borough in 1871 was 8131.

_ HOLY ISLAND, or LINDISFARNE, an irregularly shaped island in the North Sea, 10 miles S.S.E. of Berwick, and 2 miles from the coast of Northumberland, in which county It is included. It is joined to the mainland at low water by flat sands, over which a track, marked by wooden posts

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and practicable for vehicles, leads to the island. The parish of Holy Island includes Fenham and Goswick townships on the mainland, and had in 1871 a population of 876. The area of the island is about 1000 acres, of which about 400 are under cultivation, producing abundant crops of barley, oats, turnips, carrots, and potatoes. ‘The northern part consists chiefly of barren sand-hills on which rabbits and eider-ducks breed. There are several fresh springs on the island, and in the north-east isa lake of 6 acres. Lime,

quarried and burned on the island, is exported chiefly to Dundee. Four vessels are engaged in the trade. Rabbits, fish, cattle, corn, and potatoes are also exported. At the south-west angle is the little fishing village, formerly much larger, which is now a favourite summer watering-place. Salmon, cod, haddocks, crabs, lobsters, and herrings are the principal fish taken. There are two churches and a national school on the island. The population of the island proper in 1871 was 553.

Holy Island derives its name from a monastery founded on it in 635 by Oswald, king of Northumbria, whieh, after being plundered and destroyed by the Danes in the three preceding eeuturies, was restored by the Normans in 1082 as a cell of the Benedietine monastery at Durham. Its ruins, still extensive and now earefully preserved, justify Seott's deseription of it as a ‘‘ solemn, huge, and dark-red pile.” Holy Island was also an episcopal see (finally transferred to Durham), of whieh St Cuthbert was eonseerated bishop in 685. The eastle, situated to the east of the village, on a basaltie roek about 90 feet high, dates from a very early period. In 1646 it was garrisoned by parliament, and in 1715 an abortive attempt was made by two Jaeobites to hold it for the Pretender.

HOLYOKE, a city of Hamden county, Massachusetts, is situated on the west bank of the Connecticut river, crossed there by a bridge, and on the Connecticut River railroad and the Holyoke and Westfield branch of the New Haven and Northampton line, 8 miles north of Springfield. It is well supplied with schools and churches, and has three hotels and a publie library. It was a small village until 1849, when the construction of a dam across the river supplied it with water-power for its manufactories, which now include paper-mills, cotton-mills both for spinning and weaving, woollen-mills, planing-mills, a flour-mill, a wire- mill, and machine works. Originally the village was a part of Springfield, and in 1786 it was incorporated with West Springfield under the name of Ireland parish. It was incorporated into a town in 1850, and in 1873 it was made a city. The population in 1870 was 10,733, of whom 5490 were foreigners.

HOLY WATER (aqua benedicta, lustralis, exorcizata, aspersoria Or aspersionis, dywacpds, towp eddAoyias), in Roman Catholic ritual, is a specially exorcized and conse- crated mixture of salt and water, believed to

possess, when duly sprinkled, peculiar potency as a remedy for sickness, mental or bodily, and asa protection to property. Accord- ing to present usage prescribed in the Missal, it is prepared in the sacristy on Sunday by the priest who is to cele- brate high mass (or by some other on whom the duty is devolved): robed in alb and superpelliceum and wearing his stole, he first exorcizes the salt and the water separately ; next he mixes the two in the name of Father, Son, and Holy Ghost ; and finally he pronounces the prayer of con- secration over the mixture. Thereupon he assumes his pluvial, goes to the altar, and takes from the deacon the aspergillum, with which he sprinkles the altar, himself, his assistants, and the congregation, meanwhile repeating the words of Ps. li. 7. The faithful who desire it are after- wards permitted to carry a supply home with them for application to the sick and for similar purposes. Holy water is solemnly used, not only in the consecration of sacred objects, such as churches, churchyards, bells, images, vest- ments, and the like, but also on various domestic occasions such as marriages and funerals. A holy-water stoup is placed at every church door and the faithful are expected

to make use of it both on entering and on leaving the building.

The present Occidental usage with regard to holy water admits of being traced substantially, without a break, back to the Carolin- gian period. In the pseudo-Isidorian decretals, Alexander, bishop of Rome (c. 109 A.D.), commenting on Heb. ix. 18, is represented as applying that text to prove the purifying power of consecrated salt and water ;! and in a genuine charge to his clergy Leo IV. (847 A.D.) says, ‘* Every Lord’s day before mass bless water where- with the people may be sprinkled, and for this have a proper vessel.” Hincmar of Rheims to a similar injunetion adds perinis- sion to all who may wish to carry some of the water home in their own clean vessels, and sprinkle it ‘‘ over their dwellings and fields and vineyards, over their cattle also and their provender, and like- wise over their own meat and drink.’’ In Gratian the decree runs —‘*We bless water sprinkled with salt, that all being therewith besprinkled may be sanctified and purified. Which also we recom- mend to be done by all priests.” But from the Ordo

Romanus (i, 42) we learn that, in Rome, if not elsewhere in the West, a peculiar sacredness and magical cflicacy were attributed, to bap- tismal water at least, two centuries before the publication of the forged decretals. After the usual consecration of the font on Easter eve, ‘‘ the whole people, whoever wished, took a blessing in their vessels of the water itself, before the children were baptized in it, to sprinkle about their houses and vineyards and fields and fruits.” We learn from Chrysostom (De Bapt. Chr.) that in the Fast a similar custom prevailed even in his time, while the Apos- tolical Constitutions (viii. 29) show that at a somewhat later period (probably in the 5th century) it had become usual also to bless water and oil without any reference to baptismal uses. An indica- tion of later Oriental practice is gathered from Theodore Balsamon (c. 1200), according to whom, by immemorial custom, holy water was in his day consecrated in Greek churches at the beginning of every lunar month. The use of holy water at the church door can be traced back to pre-Christian practice, both Jewish and pagan. The laver in front. of the altar (Exod. xxx. 18-21) in the old ritual of Israel had its analogue in the vessels with consecrated water (repippavrhpia or amoppayrfpia) at the entrance of the peribolos of the Greek temple; from these the entrants used to sprinkle themselves, or to be sprinkled by the priests, to symbolize the purity required of those who sought to enter the sanctuary of God. There is cvidence that, as early as Tertullian (De Orat., 11) at least, it was customary to place outside Christian places of worship in the atrium (af@piov) a fountain or cistern of water (kphyn, piadn, dpéap, euBdrns, KoAvpBetov, Neovrdptov, nympheum, cantharus) in which persons about to enter were expected to wash their hands and (perhaps) also the face. The vessel was not taken into the church and placed near the entrance of the nave until after the 8th century. It is not evident at what date it became customary within the Christian Church to mix salt with the water employed for sacramental or quasi-sacramental purposes ; this practice also, however, must be traced to pre-Christian usage (see J/iad i, 314; Aristoph., Plut., 656; and ¢f. Tzetzes, Schol. in Lycoph., 185—rd &arindy kad Gardootoy SSwp KabaptixdTepoy pice: TAY yAUKEwr).

HOLY WEEK (éBSopas peydAy, ayia or tov dyiwv, Enpodayias, drpaxtos, also juépar rabypaTwv, Heepar oTavp- dboysat; hebdomas [or septimana] major, sancta, authentica [i.e., canonizata, Du Cangel, altima, peenosa,

luctuosa, nigra, inofficiosa, muta, cructs, lamentationum, indulgentic), in the ecclesiastical year the week immediately preceding that

f Easter. ‘The earliest allusion to the custom of marking this week as a whole with special observances is to be found in the Apostolical Constitutions (v. 18, 19), dating from the latter half of the 3d century A.D. Abstinence from wine and flesh is there commanded for all the days, while for the Friday and Saturday an absolute fast is enjoined. Dionysius Alexandrinus also, in his canonical epistle (260 A.D.), refers to the six fasting days (é€ tov vyoreiav Hpepar) in a mauner which implies that the observance of them had already become an established usage in his time. There is some doubt about the genuineness of an ordinance attri- buted to Constantine, in which abstinence from public business was enforced for the seven days immediately pre- ceding Easter Sunday, and also for the seven which followed

it; the Codex Theodosianus, however, is explicit in ordering

1 Nam si cinis vitule adspersus sanguine populum sanetifieabat atque mundabat, multo magis aqua sale adspersa divinisque precibus sacrata populum sanctificat atqne mundat.

2 Gratian, De Cons., d. iii. e. 20; Labbe, Conc., viii. 37; comp. Baluze, Append. ad. lib. Reginonis de Eccl. Discipl., pp. 503-9.

that all actions at law sliould cease, and the doors of all courts of law be closed during those fifteen days (1. ii. tit viii.). Of the particular days of the “great week” the earliest to emerge into special prominence was naturally that which commemorated the supreme crisis of the passion; next came the Sabbatum Magnum (Holy Saturday or Easter Eve) with its vigil, which in the early church was associated with an expectation that the second advent would occur on an Easter Sunday. The Dominica Palmarum or in Palmis (éopry Tv Batwy) was, as we learn from Chryso- stom, known and observed under that name in his day ; for the fact of its observance in the Western Church, however, probably our earliest authority is the Venerable Bede, Maundy Thursday (7 peyéAy weurrn, feria quinta pasche) is referred

to both by Chrysostom and by Augustine as having been in their time marked by a general and solemn celebration of the sacrament of the supper ; the latter writer also (Ep. 118, Ad Januarium) alludes to a partial obsery- ance of the pedilavium or footwashing which in later cen- turies became the most conspicuous feature in the church services of the day. For details of the elaborate ceremonial observed in the Roman Catholic Church during this week, reference must be made to the Missal and Breviary. In the Eastern Church the week is marked by similar practices, but with less elaboration and differentiation of rite. See also Easter and Goop FRipay.

HOLYWELL (Welsh, 7'refynnon, the town of the well), a parliamentary borough and market-town of Flintshire, North Wales, is beautifully situated on an eminence near the left bank of the estuary of the Dee, and about 2 miles from the station on the Chester and Holyhead line, 17 miles from Chester. The streets are irregular, but spacious and well-paved, while many of the buildings are substantial and elegant, and give the town an air of prosperity and opulence. The parish church, dedicated to St Winifred, and erected in 1769, but retaining some columns of a more ancient structure, is a plain edifice with a strong embattled tower. Near the railway station are the re- mains of Basingwerk abbey, partly Saxon and_ partly Early Pointed. Of the old fort called Basingwerk castle scarcely any traces now remain. Until the commencement of the present century the size of Holywell was incon- siderable, but since then its prosperity has been uninter ruptedly increasing, owing to the lead quarries and the lead, copper, and zinc mines of the vicinity. The town possesses lead smelting works, a shot manufactory, and copper, brass, and zinc works. The population of the parliamentary borough in 1871 was 7961.

The well of St Winifred, from which the town takes its name, long considered onc of the wonders of Walcs, is a spring of water which rushes up at the rate of 21 tonsa minute, Its temperature is higher than that of ordinary spring water, and varies very little with the different seasons. The stones at the bottom of the well have a slightly reddish colouring due to vegetable substances, @ fact which doubtless suggested the legend according to which the spring gushed up on the spot where rested the head of the virgin Winifred, who had been decapitated by a lover offended at her constancy to her monastic vows. The well is covered by a fine Gothic

building said to have been erected by Margaret, countess of Richmond, mother of Henry VII., but having some portions which are of earlier date. The exquisite chapel above has been restored,

and is used for public service. Many Roman Catholics still visit the well, and swimming-baths have been erected for general use.

HOLZMINDEN, the chief town of a circle in the duchy of Brunswick, Germany, is situated on the right bank of the Weser, at the foot of the Sollinger mountains, and on the railway from Kreiensen to Altenbeken, 56 miles south- west of Brunswick. Itis the seat of a circle administration, of a circle and common court, and of a general superin- tendent. The educational establishments include a gym- nasium and an architectural school, the latter attended by upwards of 1000 scholars. The prosperity of the town

depends chiefly on agriculture and the manufacture of iron aud steel-wares, but weaving and the making of pottery are also carried on, and there are baryta mills and polishing-mills for sandstone. By means of the Weser it carries on a lively trade. Holzminden obtained town rights from Count Otto of Eberstein in 1245. In 1410 it came into the possession of Brunswick. The population in 1875 was 6887.

HOMAGE (from homo, through the Low Latin homina- ticum, which occurs in a document of 1035) was one of the ceremonies used in the granting of a fief, and indicated the submission of a vassal to hislord. It could be received only by the suzerain in person. With head uncovered the vassal humbly requested to be allowed to enter into the feudal relation ; he then laid aside his sword and spurs, ungirt his belt, and kneeling before his lord uttered words to this effect :—-“‘I become your man from this day forth, of life and limb, and will hold faith to you for the lands I claim to hold of you.” The oath of fealty, which could be received by proxy, followed the act of homage; then came the ceremony of investiture, either directly on the ground or by the delivery of a turf, a handful of earth, a stone, or some other symbolical object. Homage was done not only by the vassal to whom feudal lands were first granted but by every one in turn by whom they were in- herited, since they were not granted absolutely but only

on condition of military and other service. An infant might do homage, but he did not thus enter into full possession of his lands. The ceremony was of a preliminary nature, securing that the fief would not be alienated; but the vassal had to take the oath of fealty, and to be formally invested, when he reached his majority. The obligations involved in the act of homage were more general than those associated with the oath of fealty, but they provided a strong moral sanction for more specific engagements. They

essentially resembled the obligations undertaken towards |

a Teutonic chief by the members of his “comitatus ” or “‘ gefolge,” one of the institutions from which feudalism directly sprang. Besides homagium ligeum, there was a kind of homage which imposed no feudal duty ; this was homagium per paragium, such as the dukes of Normandy rendered to the kings of France, and as-the dukes of Normandy received from the dukes of Britanny. The act of liege homage to a particular lord did not interfere with the vassal’s allegiance as a subject to his sovereign, or with a to any other suzerain of whom he might hold ands.

HOMBERG, Wine (1652-1715), an eminent natural philosopher, born at Batavia, January 8, 1652, was educated in Holland, studied law at Jena and Leipsic, and became an advocate at Magdeburg in 1674. In that town he interested himself in botany and astronomy, and made the acquaintance of Otto von Guericke, under whose influence, renouncing his profession, he finally devoted himself exclu- sively to the natural sciences. Having travelled in Italy, France, and England, and profited by the instructions of the anatomist Graaf in Holland, he took the degree of doctor of medicine at Wittemberg; and, after visiting Germany, Hungary, Bohemia, and Sweden, he in 1685 settled in Rome, where he practised physic with great success. At Paris, whither he repaired in 1691, he was elected a member of the Academy of Sciences, and became (1702) teacher of physics and (1705) private physician to the duke of Orleans. He died at Paris, September 24, 1715. In 1702 Homberg discovered boracic acid, termed at first the sal sedativum Hombergi, the true nature of Which was ascertained by Bergman in 1775. What is

nown as “ Homberg’s phosphorus ” is a mixture of calcium chloride and lime, which, after heating in a sealed tube

Numerous treatises by Homberg, chiefly chemical, were published in the Recueil de ? Académie des Sciences, 1692, swe a Chauffepié, Dictionnaire, and CHEMISTRY, vol. v. p. ‘

HOMBURG-vor-pEr-Hoéng, chief town of the circle of Obertaunus in the Wiesbaden government district of the Prussian province of Hesse-Nassau, is prettily situated on a small stream at the foot of a spur of the Taunus mountains, about 11 miles north of Frankfort-on-the-Main, with which it 1s connected by rail. Homburg consists of an old and a new town, the latter, founded by the landgrave Frederick IL., being regular and well-built. Besides the palatial edifices erected in connexion with the mineral water-cure, the most important buildings are the theatre, the synagogue, and the various churches, schools, and benevolent institutions. Ona neighbouring hill stands the castle of the former landgraves, built in 1680, and subsequently enlarged and improved. The White Tower, 183 feet in height, is said to date from Roman times, and certainly existed under the lords of Eppstein, who held the district in the 12th century. The castle is surrounded by extensive grounds, laid out in the manner of an English park. The woollen and linen manu- factures of Homburg are unimportant, the prosperity of the town being almost entirely due to the annual influx

Plan of Homburg.

6. Hesse Hotel. . Rathhaus Platz. 7. Hotel de France.

1 11. Four Seasons Hotel. pi

8. Post-Office. 8. Europe Hotel.

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12. English Church. 13. Kaiser Spring. 14. Park Bath House.

. Synagogue.

. Reformed Church. 9. Theatre. . Roman Catholic Church. : 10. Victoria Hotel.

of visitors, which in the season lasting from May to Octo- ber inclusive averages 9000 or 10,000. The five mineral springs which form the chief attraction to strangers are very saline, and contain a considerable proportion of car- bonate of lime. Their use is beneficial for diseases of the stomach and intestines, and externally for diseases of the skin and rheumatism. The population of the town in 1875, including the garrison, was 8294,

Homburg first came into repute as a watering-place in 1834, and owing to its gambling-tables, which were set up soon after, it rapidly became one of the favourite and most fashionable health- resorts of the Continent. In 1849 the town was occupied by Austrian troops for the purpose of enforcing the imperial decree against gambling establishments, but immediately on their with- drawal the bank was again opened, and play continued unchecked till 1872, when the Prussian Government refused to renew the lease for gambling purposes which then expired. As the capital of the former landgraviate of Hesse-Homburg the town shared the vicissi- tudes of that state.

See Schudt's Homburg und scine Umgebungen, 11th ed., 1875.

HOME, Henry. See Kamezs, Lorp.

HOME, Joun (1722-1808), a Scottish dramatic poet, was born on 20th September 1722 at Leith, where his father, Alexander Home, filled the office of town-clerk. He was educated at the grammar school of his native town, and at the university of Edinburgh, where he graduated as M.A. in 1742, Though in his youth he was distinguished for

and exposure to sunlight, phosphoresces in the dark. | vivacity, and showed a fondness for the profession of arms,

he ultimately studied divinity, and was licensed by the presbytery of Edinburgh in 1745. In the same year he joined as a volunteer against the

Pretendcr, and was taken prisoner at the battle of Falkirk. Along with many others he was carried to the castle of Doune, from which, however, he soon effected his escape. In July 1746 Home was pre- sented to the parish of Athelstaneford in Haddingtonshire, vacant by the death of Robert Blair, the author of Zhe Grave. There he devoted himself to dramatic literature, and his first production, Zhe Tragedy of Agis, was finished in 1749, He took it to London and submitted it to Garrick for representation at Drury Lane, but it was rejected as unsuitable for the stage. Being but little disappointed, he projected a new work, and having heard a lady sing the ballad of Gil Morice, he formed the idea of The T'ragedy of Douglas, which after five years' labour he completed, and took to London for Garrick's opinion. It also was rejected, but on his return to Edinburgh his friends resolved that it should be brought out in that city, where it met with over- whelming success, in spite of the opposition of the clergy, who suspended one member of the presbytery for a month for having attended its representation. As the author of the tragedy might count on being dealt with yet more severely, Home resigned his charge in 1757, and shortly afterwards he was appointed lecturer in a Presbyterian chapel in Silver Street, London, In 1758 he became private secretary to Lord Bute, then secretary of state ; and three years later his patron's influence procured him a pension of £300 per annum, A Letter from a Blacksmith to the Ministers and Elders of the Church of Scotland, in which the manner of public worship in that church is con- sidered, published in 1759, has been attributed to his pen. In 1760 Home brought out another tragedy, The Stege of Aquileia, which was put on the stage, Garrick taking the part of Almilius. In 1763 he was appointed to the sinecure office of conservator of Scots privileges at Campvere. In 1769 Home's tragedy of The Fatal Discovery had a run of nine nights; Alonzo also (1773) had fair success in the representation ; but his last tragedy, Alfred (1778), was so coolly received that he gave up writing for the stage. From 1767 he resided either at Edinburgh or at a villa which he built at Kilduff near his former parish. It was at this time that he wrote his [istory of the Rebellion of 1745, which appeared in 1802. Home died at Mer- chiston Bank, near Edinburgh, in 1808, in his eighty-sixth year. He was a man of great amiability of character, and numbered among his friends most of the Scottish literati of the last century. His writings, while they dis- play fervid feeling, and have less artificiality than the works of the poets of

his time, are now, with the exception of Douglas, comparatively little known.

The works of Home were collected and published by Henry Mackenzie in 1822 (3 vols. 8vo), but several of his smaller poems seem to have escaped the editor's observation. These are—‘‘ The Fate of Casar,” ‘‘ Verses upon Inveraray,” ‘‘ Epistle to the Earl of Eglintoun,” “Prologue on the Birthday of the Prince of Wales, 1759,” and several ‘‘ Epigrams,” which are printed in vol. ii. of Original Poems by Scottish Gentlemen, 1762,

HOMEL, or Gomet, a town of Russia in Europe, in the government of Mohileff, 132 miles S. of Mohile#f, on the highway to Tchernigoff, and on the right bank of the Sosh, which joins the Dnieper about 45 miles further down. It is a place of considcrable importance, possessing (according to the St Petersburg Calendar for 1878) a population of 13,030, the suburb of Bielitsa being included. Most of the houses are of wood, but there are a good number of churches, several hospitals, and public schools. Three of the Orthodox churches were built by Rumantzeff, who lies buricd in St Peter's. The sugar-refineries are the most im- portant of the industrial establishments. A good trade is carried on in the agricultural produce of the surrounding

third day after.

district, partly with Warsaw and partly with Riga. In 1860, when the population amounted to 13,659, there were 3637 Raskolniks (separatists) and 6518 Jews.

Homel, which appears in the older documents as Gomie or Gomi and Gom, is mentioned for the first time in 1142, when it belonged to the Tchernigoff principality. The first inhabitants were Rodi- nitchians. In the 12th century we find Izyaslaff Daviditch taking refuge at Homel on his expulsion from Kieff. Along with Tchernigoff the town passed under the power of Lithuania ; but in the 15th century Simeon, son of John of Mozhaisk, to whom it had been entrusted by King Alexander, entered the service of John III. of Moscow, and it was not till 1537 that it was recovered for Sigis-

mund Augustus by Prince Radzivill and a body of Crim Tatars. The bailiwick was granted to the Polish grandees; and by the last of these—Prince Tcharovizhski—a strong oaken castle was erected. In 1648 the town suffered from the invasion of Bogudan Khmel- nitzki, who put to death 1500 Roman Catholics and Jews. Tn 1655 it passed voluntarily to the side of the insurgent Cossacks, but at the peace of Andrusoff it remained with Poland. It was not incor- porated with White Russia till the reign of Catherine II., who assigned it to Field-Marshal Rumantzeff Zadunaiski. In 1834 it was purchased by Prince Paskevitch, and in 1852 it was made the chief town of a district.

HOMER (‘Opmpos) was by the general consent of anti- quity the first and greatest of poets) Many of the works once attributed to him are lost ; those which remain are the two great epics, the Jcad and the Odyssey, about thirty Hymns, a mock epic (the Battle of the Frogs and Mice), and some pieces of a few lines each (the so-called Epigrams).

Ancient Accounts of Homer.—Of the date of Homer pro- bably no record, real or pretended, ever existed. Herodotus (ii. 55) maintains that Hesiod and Homer lived not more than 400 years before his own time, consequently not much before 850 z.c. From the controversial tone in which he expresses himself it is evident that others had made Homer more ancient; and accordingly the dates given by later authorities, though very various, generally fall within the 10th and 11th centuries z.c, It is needless to go into the questions raiscd by these statements, none of which has any claim to the character of external evidence.!

The extant lives of Homer (edited in Westermann’s Vitarum Scriptores Graci minores) are eight in number, including the piece called the Contest of Hesiod and Homer. The longest is written in the Ionic dialect, and bears the name of Herodotus, but is certainly spurious. According to Joh, Schmidt (in the Dissertationes philologice Halenses, vol. ii, pp. 97-219), it belongs to the time which was fruit ful beyond all others in literary forgeries, viz., the 2d cen- tury of our era. ‘The other lives are probably not more ancient. They contain a strange medley, ranging from the simplest outgrowth of popular fancy to the frigid inventions of the age which would not confess itself ignorant of the name of Hecuba’s mother. Thns the story that Homer

was the son of the Meles (the river on which Smyrnais situated) and the nymph Critheis is evidently a local legend. Another story of a primitive cast describes the manner of Homer's death in the island of Ios. Seeing some young fishermen on the beach with their nets, he asked them—

'Fishermen sprung of Arcadia, have we aught ?"

To which they answered in a riddle—

'"< What we caught we left behind, What we caught not we bear with us.'

Homer could not explain this, and then he remembered an oracle which had told him to beware of the young men's riddle, He wrote an epitaph for himsclf, and died on the This story comes from a lost work of Aristotle. On the other hand, when we are told in the Herodotean life that Critheis was a daughter of Melanopus, one of the colonists who came to Cyme from Magnesia, that being found to be with child she was sent with the fresh

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1 See Lauer, Gesch. der Homer. Poesie, pp. 115-80; Sengebusch, Homerica dissertatio posterior, p. 77.

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colony that founded Smyrna, that she there brought forth Homer on the banks of the Meles, whence he was called Melesigenes,—in this form of the story it is easy to recog- nize the hand of the critic. There is an evident desire to get rid of the primitive supernatural element, and also to reconcile the claims of two cities, Cyme and Smyrna, to the envied distinction of giving birth to Homer. There are other incidents in the Herodotean life which seem de- vised merely to fit certain of the minor characters in the Homeric poems. Phemius, we are told, was a schoolmaster of Smyrna, who was kind to the young Melesigenes, and was accordingly immortalized as the singer in the Odyssey ; the original of Mentor was a man of Ithaca, who entertained Homer and tended him in illness; and so on.

The chief value of these ‘‘ Lives,” and especially of the Herodotean life, lies in the curious short poems which they have preserved. These poems are the Zpzgrams which used to be printed at the end of Homer, but are banished by the somewhat inconvenient purism of modern editors, One of them (Zpzgr. iv.) is put in the mouth of a native of “ Aolian Smyrna,” whose poetical aid has been spurned by the people of Cyme, and who is accordingly departing to some other city. pigr. vi. is a prayer to Poseidon for safe arrival at Erythre ; Hpigr. vii. describes the rocky soil of that place. There is also an Epigram addressed to the people of Neonteichos (Zpzgr. i.), and another which brings in the pine woods of Monnt Ida and the iron-mines of that district (Hpigr. x.). Besides these pieces, the interest of which is topographical, there is an interesting little poem addressed to potters, beginning—

“Tf you give me hire I will sing, O potters,”

and another called Eipeousvy, which, according to the author of the life, was sung by the children in Samos when they went round begging at the festival of Apollo; also certain verses addressed to sailors (viii, ix.), to a goat-herd (xi.), &c. All these short poems have a common character. They are ‘“‘rhymes” such as every country possesses in greatcr or less number, treasured by the people as a kind of proverbs. Some of them may be fragments of longer poems, but they are certainly not the work of any one poet. The circumstance that they are ascribed to Homer merely shows that his name had gained such a hold on the imagination of the Ionian and A‘olian Greeks as to draw to itself all ancient and popular verse.

Such being the true character of the Zpigrams, it follows that, so far from being “ occasional verses,” suggested by moments in Homer’s life, they are really the original docu- ments, to which the narrative was afterwards adjusted. Even the leading incident of the Herodotean life—the birth of Homer at Smyrna—may have been originally derived from Hpigr. iv. The epithet “ Kolian” indicates high antiquity ; for Smyrna (according to Herodotus) was lost by the Alolians about 688 B.¢, Similarly, the claim of Cyme was doubtless supported (not quite so logically) by the mention of that place in Lpigr. iv. and i.

he same line of argument may be extended to the Hymns, and even to some of the lost works of the “ Cyclic” poets ; with the result of making it probable that most of the traditions about Homer rest ultimately on poems com- monly ascribed to him. Thus—

I, The hynn to the Delian Apollo ends with an address of the poet to his audience. When any stranger comes and asks Who is the sweetest singer, they are to answer with one voice, the “blind man that dwells in rocky Chios ; his Songs deserve the prize for all time to come.” Thucydides, who quotes this passage to show the ancient character of the Delian festival, seems to have no doubt of the Homeric authorship of the hymn. Hence we may most naturally account for the belief that Homer was a Chian. That it was a general belief is shown by a passage (interesting as

the earliest express quotation from Homer) in which Simonides calls him simply the “man of Chios” (fr. 85) :— “Ev 5€ 7d KadAALoTov Xios ferwev avip, Oty wep PiaAdrwy yeven, toln Se kal avdpav. It was also supported by the Chian family or gens of Homeridz, of whom more will be said hereafter.

2. The Margites—a humorous poem which kept its ground as the reputed work of Homer down to the time of Aristotle—began with the words, “There came to Colophon an old man, a divine singer, servant of the Muses and Apollo.” Hence doubtless the claim of Coloplion to be the native city of Homer—a claim supported in the early times of Homeric learning by the Colophonian poet and grammarian Antimachus.

3. The poem called the Cypria was said to have been given by Homer to Stasinus of Cyprus as a daugliter’s dowry. The connexion with Cyprus appears further in the predominance given in the poem to Aphrodite. From the argument preserved by Proclus it is evident that Aphrodite held the same place in the Cypria which Athene has in the Odyssey.

4, The Little Iad and the Phocais, according to the Herodotean life, were composed by Homer when he lived at Phocza with a certain Thestorides,

who carried them off to Clos and there gained fame by reciting them as his own, The name Thestorides occurs in Zpigr. v.

These indications make it probable that the stories con- necting Homer with different cities and islands do not rest upon any better foundation than supposed allusions in poems, none of which, to all appearance, can make good the claim to Homeric authorship. And this result is con- firmed by the want of positive authority in favour of any one version. The uumber of opinions is proverbial, and most of them are supported by relatively ancient testimony.

It is plain that the contention for Homer began at a time when his real history had been lost. Aud since the inevitable legend found no clue in the Zd/ad and Odyssey, it was driven to seek for one in poems of sccondary value.

A singular exception is formed by Miletus, one of the greatest of Jonian cities, for which no legend claims even a visit from Homer. Yet Arctinus of Miletus is said to have been a “disciple of Homer,” and his Zthiopis was a continuation of the Ztiad. Another equally exceptional fact is that no poem of Arctinus is ever ascribed to Homer. Are we to suppose that the authorship of the poems of Arctinus never fell into doubt? If so, it is a confirmation, from the negative side, of the theory advanced above, viz., that the stories of Homer’s connexion with different places are suggested for the most part by the poems which came to be assigned to him in popular belief.

Recitation of the Poems.—The recitation of epic poetry was called in historical times ‘“‘rhapsody ” (faywoia). The word fapwdds is post-Homeric, but occurs in Pindar, who gives two different explanations of it —‘“‘singer of stitched verse” (parréy éxéwv dovdot), and “singer with the wand” (faBdes). Of these the first is etymologically correct (except that it should rather be “stitcher of verse”); the second agrees with the fact, for which there is early evi- dence, that the recitcr was accustomed to hold a wand in lus hand—perhaps, like the sceptre in the Homeric assembly, as a symbol of the right to a hearing.!

The first notice of rhapsody meets us at Sicyon, in the reign of Clisthenes (600-560 B.c.), who, as Herodotus tells us (v. 67), “put down the rhapsodists on account of the poems of Homer, because they are all about Argos and the Argives.” This description applies very well to the Zddad, in which Argos and Argives occur on almost every page. It may have suited the Thebazd still better, but there is no

1 Compare the branch of myrtle at an Athenian feast (Aristoph., Nub., 1364).

need to understand it only of that poem, as Mr Grote does (Part i. c. 21). In any case the incident shows that the poems of the Ionic Homer liad gained in the 6th century B.c., and in the Doric parts of the Peloponnesus, the ascend-

ency, the national importance, and the almost canonical.

character which they ever afterwards retained.?

At Athens there was a law that the Homeric poems should be recited (jawSetcGar) on every occasion of the Panathenza. This law is appealed to as an especial glory of Athens by the orator Lycurgus (Zeocr., 102). Perhaps therefore the custom of public recitation was exceptional, and unfortunately we do not know when or by whom it was introduced. The Platonic dialogue Hipparchus attri- butes it to Hipparchus, son of Pisistratus, This, however, is part of the historical myth, in the Platonic style, of which the dialogue mainly consists. ‘The choice of a member of the tyrant family as the type of an enlightened despot was evidently made, not on grounds of evidence, but merely asa sign of reaction against popular sentiment. Moreover, the author of the dialogue makes (perhaps wilfully) all the historical mistakes which Thucydides notices in a well- known passage (vi. 54-59). testimony is valuable. He tells us that the law required the rhapsodists to recite “taking each other up in order (e€ Srodijews epeéijs), as they still do.” This recurs in a different form in the statement of Diogenes Laertius (i. 2, 57) that Solon made a law that the poems should be recited “with prompting” (so we must understand eg broBodjs). The question as between Solon and

Hipparchus cannot be settled ; but it is at least clear that a due order of recita- tion was secured by the presence of a person charged to give the rhapsodists their cue (érofddAcw). It was neces- sary, of course, to divide the poem to be recited into parts, and to compel each contending rhapsodist to take the part assigned to him. Otherwise they would choose favourite or show passages.

The practice of poets or rhapsodists (we cannot always tell which) contending for the prize at the great religious festivals is of considerable antiquity, though apparently post-Homeric. It is brought vividly before us in the Hymn to Apollo (see the passage mentioned above), and in two Hymns to Aphrodite (v. and ix.). The latter of these may evidently be taken to belong to Salamis in Cyprus and the festival of the Cyprian Aphrodite, in the same way that the hymn to Apollo belongs to Delos and the Delian gathering. The germ of such contests may, however, be found in the story of Thamyris, the Thracian singer, who boasted that he could conquer even the Muses in song (Il. ii. 594 ff).

Much has been made in this part of the subject of a family or clan (yévas) of Homeride in the island of Chios. On the one hand, it seemed to follow from the existence of such a family that Homer is a mere ‘‘eponymus,” or mythi- cal ancestor; on the other hand, it became easy to imagine the Homeric poems handed down orally in a family whose hereditary occupation it was to recite them, possibly to add new episodes from time to time, or to combine their materials in new ways,as their poetical gifts permitted. But, although there is no reason to doubt the existence of a family of “ Homeride,” it is far from certain that they had anything to do with Homeric poetry. . The word occurs first in Pindar (Vem. 2, 2), who applies it to the rhapso- dists (Opnpidac famrav émévwy dodoi). On this a scholiast says that “‘ Homerids ” denoted originally the descendants of Homer, who sang his poems in succession, but afterwards the rhapsodists who did not claim descent from him. He

1 We may compare the exclamation of the Spartan envoys to Hiero, Hh Ke wey oiudterey 6 TeAomldns “Ayauéuvwy, &c.,—showing that the glories of the carly Achzan empire, with Homer for its vates sacer, were adopted without reserve by the Dorian conquerors.

In one point, however, his |

adds. that there was a famous rhapsodist, Cynzethus of | Chios, who was said to be the author of the Hymn to Apollo, and to have first recited Homer at Syracuse about the 69th Olympiad. Nothing here connects the Homeride with Chios. Our knowledge of Chian Homeridx comes chiefly from the lexicon of Harpocration, where we are told that Acusilaus and Hellanicus said that they were so called from the poet, but that Seleucus pronounced this to be au error. Strabo, also, says that the Chians put forward the Tlomeride as an argument in support of their claim to Homer. These Homeride, then, belonged to Chios, but there is no indication of their being rhapsodists. On the contrary, Plato uses the word to include interpreters and admirers—in short, the whole “spiritual kindred ”—of Homer (Zep., 599 E; Pheedr., 252 B; Lon, 530 D). And although we hear of “descendants of Creophylus” as in possession of the Homeric poems, there is no similar story about descendants of Homer himself. Such is the evi- dence on which so many inferences are based.

The result of the notices now collected is to show that the early history of epic recitation consists of (1) passages in the Homeric hymns showing that poets con- tended for the prize at the great festivals, (2) the passing mention in Herodotus of rhapsodists at Sicyon, and (3) a law at Athens, of unknown date,? regulating the recitation at the Panathenzea. Let us now compare these data with the account given in the Homeric poems. The word “rhapsode” does not yet exist; we hear only of the “singer” (do.Sdés), who does not carry a wand or laurel- branch, but the lyre (fdppey€), with which he accompanies his “song.” In the J/iad even the epic “singer” is not met with, but Achilles himself sings the stories of heroes (kdéa dvSp3v) in his tent, and Patroclus is waiting appar- ently to take up the song in his turn (Z/. ix. 191). Again we do not hear of poetical contests (except in the story of Thamyris already mentioned) or of recitation of epic poetry at festivals. The Odyssey gives us pictures of two great houses, in Ithaca and in Phzacia ; and each has its singer. The song is ona subject taken from the Trojan war, at some point chosen by the singer himself, or by his hearers. Thus Phemius pleases the suitors by singing of the cala- mitous return of the Greeks ;

Demodocus sings of a quarrel between Ulysses and Achilles, and then, on being asked to change the theme, of the wooden horse and the capture of Troy.

It may be granted that the author of the Odyssey can hardly have been just such a singer as he himself describes. The songs of Phemius and Demodocus are too short, and have too much the character of improvisations. Nor is it necessary to suppose that epic poetry, at the time to which the picture in the Odyssey belongs, was confined to the one type represented. Yet in several respects the conditions under which the singer finds himself in the house of a chief like Odysseus or Alcinous are more in harmony with the character of Homeric poetry than those of the later rhapsodic contests. The subdivision of a poem like the Iliad or Odyssey among different and necessarily unequal performers must have been injurious to the effect. The highly theatrical manner of recitation which was fostered by the spirit of competition, and by the example of the stage, cannot have done justice to the even move ment of the epic style. It is not certain indeed that the practice of reciting a long poem by the agency of several competitors was ancient, or that it prevailed elsewhere than at Athens; but as rhapsodists were numerous, and popular favour throughout Greece became more and more confined to one or two great works, it must have become alinost 4

2 For the assertions of the Platonic Hipparchus and of Diogenes Laertius are contradictory. The orators Lycurgus and Isocrates give no date. The question is complicated by the stories about Pisistratus.

necessity. ‘That it was the mode of recitation contemplated by the author of the Jicad or Odyssey it is impossible to believe.

The difference made by substituting the wand or branch of laurel for the lyre of the Homeric singer is a slighter one, though not without significance. ‘The recitation of the Hesiodic poems was from the first unaccompanied by the lyre,} z.¢., they were confessedly sad, not sung ; and it was natural that the example should be extended to Homer. For it is difficuit to believe that the Homeric poems were ever “‘sung” in the strict

sense of the word. We can only suppose that the lyre in the hands of the epic poet or reciter was in reality a piece of convention, a “survival” from the stage in which narrative poetry had a lyrical character. Probably the poets of the Homeric school—that which deait with war and adventure—were the genuine descendants of minstrels whose “lays” or “ballads ” were the amusement of the feasts in an earlier heroic age; whereas the Hesiodic compositions were non- lyrical from the first, and were only in verse because that was the universal form of literature.

It seems, then, that if we imagine Homer as a singer in

a royal house of the Homeric age, but with more freedom’

regarding the limits of his subject, and a more tranquil audience than is allowed him in the rapid movement of the Odyssey, we shall probably not be far from the truth.

Time and Place of Homer.—The oldest direct references to the Zévad and Odyssey are in Herodotus, who quotes from both poems (ii. 53). The quotation from the Jiiad is of interest because it is made in order to show that Homer supported the story of the travels of Paris to Egypt and Sidon (whereas the Cyclic poem called the Cypria ignored them), and also because the part of the Ziad from which it comes is cited as the “Aristeia of Diomede.” This was therefore a recognized part of the poem.?

The earliest mention of the name of Homer is found in a fragment of the philosopher Xenophanes (of the 6th cen- tury B.c., or possibly ‘earlier), who complains of the false notions implanted through the teaching of Homer (é dpxis Kal “Ounpov eet pepabjxacr wévres). The passage shows, not merely that Homer was well known at Colophon in the time of Xenophanes, but also that the great advance in moral and religious ideas which forced Plato to banish Homer from his republic had made itself felt in the days of the early Ionic philosophers.

Failing external testimony, the time and place of the Homeric poems can only be determined (if at all) by in- ternal evidence. This is of two main kinds :—(1) evidence of history, consisting in a comparison of the political and social condition, the geography, the institutions, the manners, arts, and

ideas of Homer with those of other times; (2) evidence of language, consisting in a com- parison with later dialects, in respect of grammar and vocabulary. To these may be added, as occasionally of value, (3) evidence of the direct influence of Homer upon the subsequent course of literature and art.

(1) The political condition of Greece in the earliest times known to history is separated from the Greece of Homer by an interval which can hardly be overestimated. The great national names are different : instead of Achzans, Argives,

- So Pausanias (ix, 30, 2), who supports his opinion from Hesiod, Theog., 30-82. And so Aristophanes (Nub., 1355-64) distinguishes

etwWeen singing an ode from Simonides and saying (A€tar) a piece of ee In the second case the myrtle branch is taken instead of

he lyre, ,, Lhe difficulty which has been made because the title AtouhSous Apwrreta is given in the MSS. to the tifth book, whereas the quotation M question comes from the sixth, is due to an oversight. Putting aside the modern division into books, and looking to the narrative, we See that the Aristeia of Diomede extends from the beginning of Book v. to ver, 811 in Book vi. See the Journal of Philology, vol. ii. p. 214.

Danai, we find Hellenes, Dorians, Ionians, olians—names either unknown to Homer, or mentioned in terms more significant than silence. Mycenz is no longer the centre of empire; new: empires, polities, and civilizations have grown up,—Sparta with its military discipline, Delphi with its religious supremacy, Miletus with its commerce and numberless colonies, Avolis and Ionia, Sicily and Magna Greecia. .

While the political centre of Homeric Greece is Mycene, the real centre is evidently Beeotia. The Catalogue of the Ships begins with Beeotia; the list of Boeotian towns is much the longest ; and they sail, not frony the bay of Argos, but from the Beeotian harbour of Aulis. This position is not due to its chiefs, who are all of inferior rank. The importance of Boeotia for

civilization is further shown by the ancient worship of the Muses on Mount Helicon, and the fact that the oldest poet whose birthplace is known was the Beeotian Hesiod. Next to Beeotia and the neigh- bouring countries, Phocis, Locris, Athens, it appears that tlie Peloponnesus, Crete, and Thessaly are the most im- portant seats of Greek population.

In the Peloponnesus the face of things was completely altered by the Dorian conquest, no trace of which is found in Homer. The only Dorians known in Homer are those that the Odyssey (xix. 177) places in Crete. It seems difficult to connect them with the Dorians of history.

The eastern shores of the A®gean, which the earliest historical records represent to us as the seat of a brilliant civilization, giving way before the advance of the great military empires (Lydia and afterwards Persia), are almost a blank in Homer's map. The line of settlements can be traced in the Catalogue from Crete to Rhodes, and embraces the neighbouring islands of Cos and Calymnos. The colonization of Rhodes by Tlepolemus is related (JJ, ii. 661 f-), and seems to mark the furthest point reached in the Homeric age. Between Rhodes and the Troad the only name is Miletus, and that is still in the hands of " barbar- ous speaking" Carians. Even the Cyclades—Naxos, Paros, Melos—are unknown to the Homeric world. The disposi- tion of the Greeks to look to the west for the centres of religious feeling appears in the mention of Dodona and the Dodonzan Zeus, put in the mouth of the Thessalian Achilles.

To the north we find the Thracians, known from the stories of Thamyris the singer (JZ/. ii. 595), and Lycurgus, the enemy of the young god Dionysus (Zi. vi. 130). Here the Trojan empire begins. It does not appear, however, tliat the Trojans are thought of as people of a different language. As this is expressly said of the Carians, and of the Trojan allies who were "summoned from afar," the contrary rather is implied regarding Troy itself.

The mixed type of government described by Homer— cousisting of a king guided by a council of elders, and bringing all important resolutions before the assembly of the fighting men—does not seem to have been universal in Indo-European communities, but to have grown up in many different parts of the world under the stress of similar con- ditions. The king is the commander in war, and the office probably owed its existence to military

necessities. It is not surrounded with any special sacredness. There were ruling families, laying claim to divine descent, from whom the king was naturally chosen, but his own fitness is the essence of his title. The aged Laertes is set aside; the young Telemachus does not succeed as a matter of course. Nor are any very definite rights attached to the office. Each tribe in the army before Troy was commanded by its own king (or kings); but Agamemnon was supreme, because he was ‘‘more a king” (@aouAevrepos) than any other. Theassembly is summoned on all critical occasions, and its approval is the ultimate sanction, A king there-

fore stands in almost as much need of oratory as of warlike skill and prowess. Even the division of the spoil is not made in the Jliad by Agamemnon, but by “the Achzans” (Zi. i. 162, 368). The taking of Briseis from Achilles was an arbitrary act, and against all rule and custom. The council is more difficult to understand. The “elders” (yépovres) of the Ziad are the same as the subordinate ‘‘kings”; they are summoned by Agamemuon to his tent, and form a small council of nine or ten persons. In Troy we hear of elders of the people (8npoyépovres) who are with Priam, and are men past the military age. So in Ithaca there are elders who have uot gone to Troy with the army. It would seem therefore that the meeting in Agamemnon’s tent was only a copy or adaptation of the true constitu- tional “council of elders,” which indeed was essentially unfitted for the purposes of military service.

Priestliood in Homer is found in the case of particular temples, where an officer is naturally wanted to take charge of the sacred inclosure and the sacrifices offered within it. It is perhaps an accident that we do not hear of priests in Ithaca. Agamemnon performs sacrifice himself, not be- cause a priestly character was attached to the kingly office, but simply because he was “master in his own house.”

The conception of “Jaw” is foreign to Homer. The later words for it (véuos, fyrpa) are unknown, and the terms which he uses (Sé«y and O¢yis) mean merely “ custom.” Judicial functions are in the hands of the elders, who “have to do with suits” (SucaowdAo), and “ uphold judg- ments” (Oéu.0Tas cipvarot). On such matters as the com- pensation in cases of homicide, it is

evident that there were no rules, but merely a feeling, created by use and wont, that the relatives of the slain man should be willing to accept payment. The sense of anger which follows a viola- tion of custom has the name of ‘“ Nemesis ”—righteous displeasure.

As there is no law in Homer, so there is no morality. That is to say, there are no general principles of action, and no words which indicate that acts have been classified as good or bad, right or wrong. Moral feeling, indeed, existed, and was denoted by “ Aidos”; but the numerous meanings of this word—shame, veneration, pity—show how rudimentary the idea was. And when we look to practice we find that cruel and even treacherous deeds are spoken of without the least sense that they deserve censure. he heroes of Homer are hardly more moral agents than the giants and enchanters of a fairy tale.

The religious ideas of Homer differ in some important puints from those of later Greece. The Apollo of the Zdzad lias the character of a local deity—“ ruler of Chryse and goodly Cilla and Tenedos.” He may be compared with the Clarian and the Lycian god, but he is unlike the Apollo of Dorian times, the “deliverer” and giver of oracles. Again, the worship of Dionysus, and of Demeter and Persephone, is mainly or wholly post-Homeric. The greatest difference, however, lies in the absence of hero-worship from the Homeric order of things. Castor and Polydeuces, for instance, are simply brothers of Helen who died before the expedition to Troy (Z7. iii. 243).

The military tactics of Homer belong to the age when the chariot was the principal engine of warfare. Cavalry is unknown, and the battles are mainly decided by the prowess of the chiefs. The use of the trumpet is also later. It has been supposed indeed that the art of riding was known in Homer’s own time, because it occurs in compari- sons. But the riding which he describes (J/. xv. 679) isa mere exhibition of skill, such as we may see in a modern circus. And though he mentions the trumpet (J/. xviii. 219),

1 “The ineidents which, as we read them in Homer, touch us as we are touched by a fairy tale” (Conington’s Virgil, ii. p. 11). This subject is well treated by Mr Mahaffy in his Social Life of Grecce, ch. ii.

there is nothing to show that it was used, as in historical times, to give the signal for the charge. The chief in- dustries of Homeric times are those of the carpenter (réxrwv), the worker in leather (cxvrordpos), the smith or worker in metal (xaAxevs),—whose implements are the hammer and pincers,—and the potter (kepapeds); also spinning and weaving, which were carried on by the women, The fine arts are represented by sculpture in relief, carving in wood and ivory, embroidery. Statuary is later ; it appears to have come into existence in the 7th century, about the time when casting in metal was invented by Rhcecus of Samos. In general, as has been well shown by Mr A. S. Murray,? Homeric art does not rise above the stage of decoration, applied to objects in common use; while in point of style it is characterized by a richness and variety of ornament which is in the strongest contrast to the simplicity of the best periods. It is the work, in short, not of artists but of skilled workmen; the idcal artist is “Dedalus,” a name which implies mechanical skill and _ intricate workmanship, not beauty of design. Mr Murray further shows (following Professor Brunn of Munich) that the Greek art of the Homeric period is identical in origin with contemporary Assyrian work. The sculptures on the shield of Achilles, in particular, are quite Assyrian in type; and the same may be said of the work which has the best claim to equal antiquity with the Homeric poems—the lions sculptured in flat relief over the gate of Mycene.

One art of the highest importance remains. The ques- tion whether writing was known in the time of Homer was raised in antiquity, and has been debated with especial eagerness ever since the appearance of Wolf’s Prolegomena. In this case we have to consider not merely the indications of the poems, but also the external evidence which we possess regarding the use of writing in Greece. This latter kind of evidence is much more considerable now than it was in Wolf’s time. It will be found ina very convenient form in A. Kirchoft’s Studien zur Geschichte des griechischen Alphabets (Berlin, 1877).

The oldest known stage of the Greek alphabet appears to be represented by inscriptions of the islands of Thera, Melos, and Crete, which are referred to the 40th Olympiad (620 z.c.). The oldest specimen of a distinctively Ionian alphabet is the famous inscription of the mercenaries of Psammetichus, in Upper Egypt, as to which the only doubt is whether the Psammetichus in

question is the first or the second, and consequently whether the inscription is to be dated Ol. 40 or Ol. 47. Considering that the divergence of two alphabets (like the difference of two dialects) requires both time and familiar use, we may gather from these facts that writing was well known in Greece early in the 7th century B.C.°

The rise of prose composition in the 6th century B.C. has been thought to mark the time when memory was Prat tically superseded by writing as a means of preserving literature,—the earlier use of letters being confined to short documents, such as lists of names, treaties, laws, &c. This conclusion, however, is by no means necessary. Tt may be that down to comparatively late times poetry was not com- monly read, but was recited from memory. But the ques tion is—From what time are we to suppose that the preser- vation of long poems was generally secured by the existence of written copies? Now, without counting the Homeri¢

2 Contemporary Review, vol. xxiii. p. PAS) fie

3 The fact that the Pheenician Vau (F) was retained in the Greek alphabets, and the vowel v added, shows that when the alphabet was introduced the sound denoted by F was still in full vigour. Other- wise F would have been used for the vowel v, just as the Phoenician consonant Yod became the vowel. But in the Ionic dialect the sound of F died out soon after Homer’s time, if indeed it was still pronounce then. It seems probable therefore that the introduction of the alphabet is not later than the composition of the Homerie poems,

poems—which doubtless had exceptional advantages in their fame and popularity—we find a body of literature dating from the 8th century B.c. to which the theory of oral transmission is wholly inapplicable. In the Trojan cycle alone we know of the two epics of Arctinus, the Little Iliad of Lesches, the Cypria, the Vostor.. The Theban cycle is represented by the Zebatd (which Callinus, who was of the 7th century, ascribed to Homer) and the Zpigoni. Other ancient epics—ancient enough to have passed under the name of Homer—are the Zaking of Gchalia, and the Phocais. Again, there are the numerous works attributed to Hesiod and other poets of the

didactic and the quasi- historical schools;—Eumelus of Corinth, Cinethon of Sparta, Agias of Troezen, and many more. The preserva- tion of this vast mass is not explained by any of the various considerations which have been brought to bear on the Homeric poems—national interest, families of rhapsodists, public recitation, &c. It can only be attributed to writing, which must therefore have been in use for two centuries or more before there was any considerable prose literature. Nor is this in itself improbable. On the contrary, when we see how gradual and tentative progress is, and how great is the influence of an established literary form, we must feel it to be probable that the art of writing had been applied to the existing kinds of literature long before it led to the creation of a new type.

The further question, whether the Ziad and Odyssey were originally written, is much more difficult. External evidence does not reach back so far, and the internal evidence is curiously indecisive. The only passage which can be interpreted as a reference to writing occurs in the story of Bellerophon, ‘told by Glaucus in the sixth book of the Iliad. Proetus, king of Corinth, sent Bellerophon to his father-in-law the king of Lycia, and gave him “ baneful tokens, scratching on a folded tablet many spirit-destroying things, and bade him show this to his father-in-law, that he might perish.” The king of Lycia asked duly (on the tenth day from the guest’s coming) for a token (yree o7jpa idéo8a1), and then knew what Proetus wished to be done.} In this account there is nothing to show exactly how the message of Proetus was expressed. The use of writing for the purpose of the token between “ guest-friends ” (tessera hospitals) is certainly very ancient. Mommsen (Rom. Horsch., i. p. 338 ff.) aptly compares the use in treaties, which are the oldest species of public documents. But we may suppose that tokens of some kind—like the marks which the Greek chiefs make on the lots (Zl. vii. 175 f.)— were in use before writing was known. In any system of signs there were doubtless. means of recommending a friend, or giving warning of the presence of an enemy. There is no difficulty, therefore, in understanding the message of Proetus without alphabetical writing. But, on the other hand, there is no reason for so understanding it.

If the language of Homer is so ambiguous where the use of writing would naturally be mentioned, we cannot expect to find more decisive references elsewhere. Argu- ments have been founded upon the descriptions of the

blind singers in the Odyssey, with their songs inspired directly by the Muse; upon the appeals of the poet to the Muses, especially in such a place as the opening of the Catalogue ; upon the Catalogue itself, which is a kind of historical document put into verse to help the memory; upon the shipowner in the Odyssey, who has “a good memory for his cargo,” &. It may be answered, however, in the first Place, that much of this is traditional, handed down from

the time when all poetry was unwritten, and in the second Os

‘ The word oha means the whole message or document. Hence onuara Avypd are not ‘‘baneful marks” or ‘‘ charaeters,” but “‘a token which ” (instead of being one of friendly reeommendation, as it Purported to be) ‘‘ was a message of death.”

‘of Attic.

place that the form of poetry is determined by the manner in which it is used,—the recitation or performance, if we may give a wide meaning to that term,—not by the manner in which it is composed or preserved. And the “ perfor- mance ” of epic poetry still depended upon the power of memory long after written copies were in existence. In short, it is one thing to recognize that a literature is essen- tially oral in its form, characteristic of an age which was one of hearing rather than of reading, and quite another to hold that the same literature was preserved entirely by oral transmission, And finally, if writing was used in Homeric times, the absence of all mention of it may be connected with the peculiar silence—imposed doubtless by the tradition of his art—which the poet observes regarding himself and his circumstances.

The result of these various considerations seems to be that the age which we may call the Homeric—the age which is brought before us in vivid outlines in the Iliad and Odyssey—lies beyond the earliest point to which history enables us to penetrate. And so far as we can draw any conclusion as to the author (or authors) of the two poems, it is that the whole debate between the cities of AZolis and Ionia was wide of the mark. The author of the Jliad, at

least, was evidently a European Greek who lived before the colonization of Asia Minor; and the claims of the Asiatic cities mean no more than that in the days of their prosperity these were the chief seats of the fame of Homer.”

This is perhaps the place to consider whether the poems are to be regarded as possessing in any degree the character of historical record. The question is one whieh in the absence of satisfactory criteria will generally be deeided by taste and predilection. A few suggestions, however, may be made.

1. The events of the J/iad take place in a real locality, the general features of which are kept steadily in view. There is no doubt about Sigeum and Rheeteum, or the rivers Scamander and Simois, or the islands Imbros, Lemnos, and Tenedos. It is at least remark- able that a legend of the national interest of the ‘tale of Troy” should be so definitely localized, and that in a district which was never famous as a seat of Greek population.

_ 2, The discoveries of Schliemann prove that the Homeric Troy (whieh can hardly be other than Hissarlik, see Troy) was an ancient seat of pre-Hellenie population. This circumstance perhaps adds something to the probability that the legend was’ founded on faet.

3. The story of the J/iad is singularly free from the exaggerated and marvellous charaeter which belongs to most legends. The apple of diseord, the arrows of Philoetetes, the invulnerability of Achilles, and similar fancies, are the additions of later poets. This sobriety, however, belongs not to the whole Jliad, but to the events and characters of the war. Such figures as Bellerophon, Niobe, the Amazons, which are thought of as traditions from an carlier genera- tion, show the marvellous element at work.

4. Certain persons and events in the story have a distinctly mythical stamp. Helen is a figure of this kind. There was another story aeeording to whieli she was carried off by Theseus, and recovered by her brothers the Dioscuri. There are even traces of a third version, in which the Messenian twins, Idas and Lynceus, appear.

4 “The analogy of the French epic, the Chanson de Roland, favours the belief that there was some nueleus of fact. The defeat of Roncevaux was

really suffered by a part of Charlemagne’s army. But the Saracen army is purely mythieal, the true enemy having been the Gascons. Thus the element of fact is found in the place where the battle was fought, and the name of the great emperor. If similarly we leave, as historieal, the plain of Troy, and the name Agamemnon, we shall perhaps not be far wrong.

(2) The dialect of Homer is properly to be called Old Ionic: that is to say, itis the dialect of which the New Ionic of Herodotus and the Attic are varieties, but it is in a much earlier stage of development. The proof of this proposition is to be obtained chiefly by comparing the grammatical formation and the syntax of Homer with those The comparison of the vocabulary is in the nature of things less conclusive on the question of date. It would be impossible to give the evidence in full without writing a Homeric grammar, but a few specimens may be of interest.

2 On this point, see Mr Gladstone’s Homeric Synchronism, ch. iii.

1. The first aorist in Greek being a ‘‘ weak” tense, i.¢., formed by a suffix (-c%), whereas the second aorist is a ‘‘strong’’ tense, distinguished by the form of the root-syllable, we expect to find a constant tendency to diminish the number of second aorists in use. No new second aorists, we may be sure, were formed any more than new “strong” tenscs, such as came or sang, can be formed in English. Now in Homer there are upwards of 80 second aorists (not reckoning aorists of ‘* Verbs in pi,” such as éorny, €Bny), whereas in all Attic prose not more than 30 are found. In this

oint therefore the Homeric language is manifestly older. In Attic poets, it is true, the number of such aorists is much larger than in

rose. But here again we find that they bear witness to Homer. bf the poetical aorists in Attic the larger part are also Homeric. Others are not really Attic at all, but borrowed from earlier Holic and Doric poetry. It is plain, in short, that the later poetical vocabulary was separated from that of prose mainly by the forms which the influence of Homer had saved from being forgotten.

2. While the whole class of ‘‘ strong” aorists diminished, ccrtain smaller groups in the class disappeared altogether. Thus we find in Homer—

(a.) The second aorist middle without the ‘‘ thematic” e or 0: as ZBAn-ro, was struck; €pOi-ro, perished ; ddA-ro, leaped.

(b.) The aorist formed by reduplication: as dédaev, taught ; AcAaBéoGat, to seize. These constitute a distinct formation, generally with a ‘* causative” meaning ; the solitary Attic specimen is #yayov.

3. Another ‘‘ exception,” which is really a survival from a former rule, is secn in the short syllable of the plural of ofda (touey, in Homer %8-pev, tore, &c.). Other examples occur in Homer, both in the indicative and in the participle, as dpnpds, fem. apapvia; so mepaxvia, iSvia, &c.). But this variation of the stem in different

arts of a single tense is exactly one of the complexities from which anguage is ever striving to free itself; and accordingly in Attic it has all but disappeared.

4, It had long been known that the subjunctive in Homer often takes a short Vowel (¢.g., in the plural, -ouev, -ere instead of -wyev, -nre, and in the Mid. -oua, &c., instead of -wpa, &c.). This was generally said to be done by ‘‘ poetic licence,” or metri gratia. In fact, however, the Homeric subjunctive is almost quite ‘“ regular,” though the rule which it obeys is a different one from the Attic. It may be summed up by saying that the subjunctive takes w or 7 when the indicative has o or e, and not otherwise. Thus Homer has {-wev, we go, t-o-wev, let us go. The later t-w-yev was at first a solecism, an attempt to conjugate a ‘“‘verb in yc” like the ‘‘ verbs in w.” It will be evident that under this rule the perfect and first aorist subjunctive should always take a short vowel; and this accordingly is the case, with very few exceptions.

5. The article (6, 4, 76) in Homer is chiefly used as an independent pronoun (he, she, it), a use which in Attic appears only in a few com- binations (such as épéy…. 63é, the one…. theother). This differ- ence is parallel to the relation between the Latin zJ/e and the article of the Romance languages.

6. The prepositions offer several points of comparison. What the grammarians called. ‘‘tmesis,” the separation of the preposition from the verb with which it is compounded, is peculiar to Homer. The true account of the matter is that in Homer the place of the preposition is not rigidly fixed, as it was afterwards. Again ‘‘ wit u is in Homer ody (with the dative), in Attic prose werd with the genitive. Here Attic poetry is intermediate; the use of ody is retained as a piece of poetical tradition.

7. In addition to the particle &v, Homer has another, «ev, hardly distinguishable in meaning. The Homeric uses of &y and xev are different in several respects from the Attic, the general result being that the Homeric syntax is more elastic. Thus &y and xev‘are used in Homer with the future, and with the subjunctive in simple sentences (odk &v Tot xpatoun, shall not avail thee). Again in clauses intro- duced by the relative, or by ei, if, the subjunctive is found both with and without & or kev ; whereas in Attic (except in a few poetical instances) &y is ulways found (8s &y, édv). And yet the Homeric syntax is perfectly definite and precise. Homer uses no construc- tions loosely or without corresponding differences of meaning. His rules are equally strict with those of the later language, but they are not the samerules. And they differ chiefly in this, that the less common combinations of the earlier period were disused altogether in the later.

8. In the vocabulary the most striking difference is that many words appear from the metre to have contained a sound which they afterwards lost, viz., that which is written in some Greek alphabets by the ‘“‘digamma” f. Thus the words &vat, %orv, Epyov, Eros, and many others must have been written at one time Favat, Fdoru, Fépyov, Féros. This letter, however, died out earlier in Ionic than

in most dialects, and there is no proof that the Homeric poems were ever written with it.

The points that have been mentioned, to which many others might be added, make it clear that the Homeric and Attic dialects are separated by differences which affect the whole structure of the language, and require a considerable

founded upon the differences between Homer and later poets. : be observed, however, that, while agreement between poets widely separated by time calls for notice and explanation, difference is only what we expect.

time for their development. At the same time there is hardly one of these differences which cannot be accounted for by the natural growth of the language. It has been thought indeed that the Homeric dialect was a mixed one, containing Holic and even Doric forms, but the proof of this is scanty and doubtful. There are doubtless many Homeric fornis which were unknown to the later Ionic and Attic, and which are found in /Kolic or other dialects. In general, however, these are older forms, which must have existed in Ionic at one time, and may very well have be- longed to the Ionic of Homer's time. So too the digamma is called " Holic" by grammarians, and is found on folic and Doric inscriptions. But the letter was one of the original alphabet, and was retained universally as a numeral. It can only have fallen into disuse by degrees, as the sound which it denoted ceased to be pronounced. The fact that there are so many traces of it in Homer is a strong proof of the antiquity of the poems, but no proof of admixture with Aolic.

There is one sense, however, in which an admixture of dialects may be recognized. It is clear that the variety of forms in Homer is too great for any actual spoken dialect. To take a single instance : it is impossible that the genitives in -ovo and in -ov should both have been in everyday use together. The form in -ovo must have been poetical or literary, like our-eth of the third person singular, or like ge for you, whoso for whoever, and the like. The origin of such double forms is not far to seek. The effect of dialect on style was always recognized in Greece, and the dialect which had once been adopted by a particular kind of poetry was ever afterwards adhered to. The Epic of Homer was doubtless formed originally from a spoken variety of Ionic, but became literary and conventional with time. It is Homer's own testimony that all the Greeks spoke one language (JI. iv. 437),—that is to say, that they understood one another, in spite of the inevitable local differences. In these circumstances experience shows that some one dialect gains a literary supremacy to which the whole nation yields. So Tuscan

became the type of Italian, and Anglian of English. Butas soon as the dialect is adopted, it begins to diverge from the colloquial form. Just as modern poetical Italian uses many older grammatical forms peculiar to itself, so the language of poetry, even in Homeric times, had formed a deposit (so to speak) of archaic grammar. ‘There were doubtless poets before Homer, as well as brave men before Agamemnon ; and indeed the formation of a conventional dialect such as the Homeric must have been the work of several generations.

The use of Ionic (instead of olic) by the Beeotian poet Hesiod, in a kind of poetry which was not of the Homeric type, tends to confirm the conclusion that the literary ascendency of Ionic was anterior to the Iliad and Odyssey. It follows that the choice of Ionic as the language of the Homeric poems is no argument for the Ionian birth of their author (or authors).

The argument for the antiquity of Homer founded upon the traces of Homeric influence in later poetry cannot be profitably discussed without going into details which would be out of place here. When a phrase or idea is found in Homer, and again in a later author, we have to inquire whether it may not belong to the common stock from which the poet of the Jléad or Odyssey himself drew, and then whether it proves anything as to the antiquity of the poems in their present form. Hence it is seldom that such considerations yield a satisfactory proof. The case

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1 This is not the place to notice the argument which a been may

somewhat different with the arguments derived from the early epic poems called “cyclic.” The fragments of these poems, indeed, are so scanty that we cannot compare them with Homer in respect of style or language, but enough is known of their subjects to indicate that they presuppose an Iliad and Odyssey of something like their present form and extent. The Mthiopis of Arctinus (who was of the 8th century) took up the story of the Trojan war at the point where the Z/vad leaves it, and similarly the Telegoneia of Eugammon (fi. 568 B.c.) is a mere continuation of the Odyssey.

Study of Homer.—The Homeric Question.—The critical study of Homer began in Greece almost with the beginning of prose writing. The first name is that of Theagenes of Rhegium, contemporary of Cambyses (525 B.c.), who is said to have founded the ‘‘new grammar” (the older ‘‘grammar” being the art of reading and writing), and to have been the inventor of the allegorical interpreta- tions by which it was sought to reconcile the Homeric mythology with the morality and speculative ideas of the 6th century B.c. The same attitude in the “‘ ancient quarrel of poetry and philosophy” was soon afterwards taken by Anaxagoras ; and after him by his pupil Metrodorus of Lampsacus, who explained away all the gods, and even the heroes, as elementary substances and forces (Agamem- non as the upper air, &c.).

The next writers on Homer of the ‘‘ grammatical” type were Stesimbrotus of Thasos (contemporary with Cimon) and Antimachus of Colophon, himself an epic poet of mark. The Thebaid of Antimachus, however, was not popular, and seems to have been a

reat storehouse of mythological learning rather than a poem of the Fomtiic school.

Other names of the pre-Socratic and Socratic times are mentioned by Xenophon, Plato, and Aristotle. These were the “ancient Homerics” (of 4pxaior’Ounpixol), who busied themselves much with the hidden meanings of Homer; of whom Aristotle says, with his profound insight, that they see the small likenesses and overlook the great ones (Metaph., xii.).

The text of Homer must have attracted some attention when Antimachus came to be known as the ‘‘ correcter” (StopOwrhs) of a distinct edition (Zcdoc1s). Aristotle is said himself to have made a recension for the use of Alexander the Great, His remarks on Homer (in the Poetics and elsewhere) show that he had made a careful study of the structure and leading idcas of the poems, but do not throw much light on the text.

The real work of criticism hecame possible only when great collec- tions of manuscripts began to be made by the princes of the genera- tion after Alexander, and when men of learning were employed to sift and arrange these treasures. In this way the great Alexandrian school of Homeric

criticism began with Zenodotus, the first chief of the Museum, and was continued by Aristophanes and Aristarchus. In Aristarchus ancient philology culminated, as philosophy had done in Socrates. All earlier learning either passed into his writings, or was lost; all subsequent research turned upon his critical and grammatical work.

The means of forming a judgment of the criticism of Aristarchus are scanty. The literary form which preserved the works of the great, historians was unfortunately wanting, or was not sufficiently valued, in the case of the grammarians, Abridgments and newer treatises soon drove out the writings of Aristarchus and other founders of the science. Moreover, a recension could not be repro- duced Without new errors soon creeping in. Thus we find that Didymus, writing in the time of Cicero, does not quote the readings of Aristarchus as we should quote a textus receptus. Indeed, the object of his work seems to have been to determine what those readings were, Enough, however, remains to show that Aristarclius had a clear notion of the chief problems of philology (except per- haps those concerning etymology). He saw, forexample, that it was not enough to find a meaning for the archaic words (the yAdaoat, as they were called), but that common words (sueh as advos, $dBos) hai their Homeric uses, whieh were to be gathered by due induc- tion. In the same spirit he looked upon the ideas and beliefs of Homer as a consistent whole, which might be determined from the evidence of the poems. He noticed especially the difference between the stories known to Homer and those given by later poets, and made many comparisons betwecn Homeric and later manners, arts, and Institutions. Again, he was sensible of the paramount value of manuscript authority, and appears to have introduced no readings from mere conjecture. The frequent mention in the Scholia of

better” and “inferior” texts may indicate a classification made

yhim, His use of the “obelus” to distinguish spurious verscs, Which made so large a part of his fame in antiquity, has rather told against him with modern scholars,! It is chiefly interesting as a Proof of the confusion in which the text must have been before the

? See the chapter in Cobet’s Miscellanea Critica, pp. 225-239.

Alexandrian times ; for it is impossible to understand the readiness of Aristarchus to suspect the genuineness of verses unless the state of the copies had pointed to the existence of numerous interpolations. On this matter, however, we are left to mcre conjecture. The quota- tions from Homer in pre-Alexandrian authors are so inaccurate as to throw little or no light on the text which they used. It is at least clear that our manuscripts are much more trustworthy than the recollection of these ancient writers, ?

Our knowledge of Alexandrian criticism is derived almost wholly from a single document, the famous Iliad of the library of St Mark in Venice (Codex Venetus, or Ven. A), first published by the French scholar Villoison in 1788 (Scholia antiquissima ad Homeri Lliadem). This manuscript, written in the 10th century, contains (1) the best text of the Zdiad, (2) the critical marks of Aristarchus, and (3) Scholia, consisting mainly of extracts from four grammatical works, viz., Didymus (eontemporary of Cicero) on the recension of Aristarchus, Aristonicus (fl. 24 B.c.) on the critical marks of Aris- tarchus, Herodian (fl. 16 A.p.) on the accentuation, and Nicanor (fl, 127 A.D.) on the punctuation, of the iad.

These extracts present themselves in two distinct forms. One series of scholia is written in the usual way, on a margin rescryed for the purpose. The other consists of brief scholia, written in very small characters (but of the same period) on the narrow space left vacant round the text. Occasionally a scholium of this kind gives the substance of one of the longer extracts; but as a rule they are distinct. It would seem, therefore, that after the manuscript was finished the ‘‘marginal scholia” were discovered to be ex- tremely defective, and a new series of extracts was added in a form which interfered as little as possible with the appearance of the book.

The mention of the Venetian Scholia leads us at once to the, Homeric controversy ; for the immortal Prolegomena of Wolf4 appeared a few years after Villoison’s publication, and was founded in great measure upon the fresh and abundant materials which it furnished, Not that the ‘‘ Wolfian theory” of the Homeric poelns is directly supported by anything in the Scholia ; the immediate object of the Prolegomena was not to put forward that theory, but to elucidate the new and remarkable conditions under which

the text of Homer had to be settled, viz., the discovery of an apparatus eritieus of the 2d century B.c. The questions regarding the original structure and early history of the poems were raised (foreed upon him, it may be said) by the critical problem ; but they were really originated by facts and ideas of a wholly different order.

The 18th century, in which the spirit of classical correctness had the most absolute dominion, did not come to an end before a powerfit] reaction set in, which affected not only literature but also speculation and politics. In this movement the leading ideas were concentrated in the word Nature. The natural condition of society, natural law, natural religion, the morality of feeling, the poetry of nature, gained a singular hold, first on the English philosophers from Hume onwards, and then (through Roussean chiefly) on the general drift of thought and action in Europe. In literature the effect of these ideas was to set up a false opposition between nature and art. As political writers imagined a patriarchal innocence prior to codes of law, so men of letters sought in popular unwritten poetry the freshness and simplicity which were wanting in the prevailing styles. The blind minstrel was the counterpart of the noble savage, The supposed discovery of the poems of Ossian fell in with this train of sentiment, and createcd an enthusiasm for the study of carly At poetry. Homer was soon drawn into the circle of inquiry.

lackwell (Professor of Greek at Aberdeen) had insisted, in a book published in 1735, on the ‘‘naturalness” of Homer; and Wood (Essay on the Original Genius of Homer, London, 1769) was the first who maintained that Homer composed without the help of writing, ea

2 For example, Aischines says that the words phun 8 és orpardy HAGe oeeur repeatedly in the Zliad, whereas they never occur there. Had sehines lived two centuries earlier, how decisive this would have seemed against the antiquity of ‘our Homer!” As it is, it only proves the weakness of all such arguments. On the Homeric quotations in Aristotle, see Cope’s edition of Aristotle’s Rhetoric, vol. lii. p. 48.

2 The existenee of two groups of the Venetian Scholia was first notieed by Professor La Roche, and they were first distinguished in the edition of W. Dindorf (Oxford, 1875). There is also a group of Scholia, ehiefly exegetieal,

a ecolleetion of which was published by Villoison from a seeond Venetian MS. in his edition of 1788, and has been again edited by W. Dindorf (Oxford, 1877). The most im- portant colleetion of this group is eontained in the Codex Townleianus of the British Museum, whieh is still unedited, though a MS, pro- bably eopied from it, the Codex Vietorianus at Munich, was used by Bekker for his edition of the Scholia (Berlin, 1825). The vast eom- mentary of Eustathius (of the 12th century) marks a third stage in the progress of aneient Homeric learning.

4 Prolegomena ad Homerum, sive de operum Homericorum prisea et genuina forma varitsque mutationibus et probabili ratione emendandt, scripsit Frid. Aug. Wolfius. Volumen i.

and supported his thesis by ancient authority, and also by the parallel of Ossian. Both these books were translated into German, and their ideas passed into the popular philosophy of the day. Everything in short was ripe for the reception of a book that brought together, with masterly ease and vigour, the old and the new Homeric learning, and drew from it the historical proof that Homer was no single poet, writing according to art and rule, but a naine which stood for a golden age of the true spontaneous poetry of genius and nature.

The part of the Prolegomena which deals with the original form of the Homeric poems occupies pp. xl.—clx. (in the first edition). Wolf shows how the question of the date of writing meets us on the threshold of the textual criticism of Homer, and accordingly enters into a full discussion, first of the external evidence, then of the indications furnished by the poems. writing was unknown to Homer, he is led to consider the real mode of transmission, and finds this in the Rhapsodists, of whom the Homeride were an hereditary school. And then comes the eonclu- sion to which all this has been tending: ‘‘the die is cast’’—the Iliad and Odyssey cannot have been comiposed in the form in which we know them without the aid of writing. They must therefore have been, as Bentley had said, ‘‘a sequel of songs and rhapsodies,” “loose songs not collected together in the form of an epic poem till about 500 years after.” This conclusion he then supports by the eharacter attributed to the ‘‘Cyclic” poems (whose want of unity showed

that the structure of the Iliad and Odyssey must be the work of a later time), by one or two indications of imperfect con- nexion, and by the doubts of ancient critics as to the genuinencss of certain parts. These, however, are matters of conjecture. ‘‘ His- toria loquitur.” The voice of antiquity is unanimous in declar- ing that ‘Pisistratus first committed the poems of Homer to pk and reduced them to the order in which we now read them.

The appeal of Wolf to the ‘voice of all antiquity” is by no means borne out by the different statements on the subject. Ac- eording to Heraclides Ponticus (pupil of Plato), the poetry of Homer was first brought to the Peloponnesus by Lycurgus, who obtained it from the descendants of Creophylus (Polit., fr. 2). Plutarch in his Life of Lycurgus (c. 4) repeats this story, with the addition that there was already a faint report of the poems in Greece, and that eertain detached fragments were in the possession of a few persons (éxéxtnvto 58 ov modAol mépy Twa oro. ddnv THS morhoews ws EtvXE Siapepouévns). Again, the Platonic dialogue Hipparchus (which though not genuine is probably earlier than the Alexandrian times) asserts that Hipparchus, son of Pisistratus, first brought the poems to Athens, and obliged the rhapsodists at the Panathenza to follow the order of the text, ‘“ as they still do,” instead of reciting portions chosen at will. The earliest authority for attributing any work of the kind to Pisistratus ig the well known passage of Cicero (De Orat., 3, 84: ‘Quis doctier eisdem temporibus illis, aut cujus eloquentia litteris instructior fuisse traditur quam Pisistrati? qui

rimus Homeri libros, confusos antea, sic disposuisse dicitur ut nunc febem. To the same effect Pausanias (vii. p, 594) says that the change of the name Dongessa to Gonoessa (in Jl. ii. 573) was thoucht to have been made by “’ Pisistratus or one of his compan- ions,” when he collected the poems, which were then in a fragmen- tary condition (S:ecmacneva te kal &Ada dAAaXOD pynmovevdueva HOpor¢e). Finally, Diogenes Laertius (i. 57) says that Solon made a law that the poems should be recited with the help of a prompter (e& éwoBoajs), so that each rhapsodist should begin where the last left off ; and he argues from this that Solon did more than Pisis- tratus to make Homer known. The argument is directed against a certain Dieuchidas of Megara, who appears to have maintained that the verses about Athens in the Catalogue (JJ. ii. 546-556) were interpolated by

Pisistratus. The passage is unfortunately eorrupt, but it is at least clear that in the time of Solon, accord- ing to Diogenes, there were complete copies of the poems, such as could be used to control the recitations. Hence the account of Diogenes is quite irreconcilable with the notices on which Wolf relied.

It is needless to examine the attempts which have been made to harmonize these accounts. Such attempts usually start with the tacit assumption that each of the persons concerned—Lycurgus, Solon, Pisistratus, Hipparchus—must have done something for the text of Homer, or for the regulation of the rhapsodists. But we have first to consider whether any of the accgunts come to us on such evidence that we are bound to consider them as containjng a nucleus of truth.

In the first place, the statement that Lycurgus obtained the poems from descendants of Crcophylus must be admitted to be purely mythical. But ifwe reject it, have we any bettcrreason for believing the parallel assertion in the Platonic Hipparchus? It is true that Hipparchus is undoubtedly a real person. On the other hand it is evident that the Pisistratide soon became the subject of many fables. Thucydides notices as a popular mistake the belief that Hipparchus was the eldest son of Pisistratus, and that eonsequently he was the reigning ‘tyrant ” when he was killed by Aristogiton. The

Having satisfied himself that _

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Platonic Hipparchus follows this erroneous version, and may there- fore be regarded as representing (at best) merc local tradition. We may reasonably go further, and see in this part of the dialogue a piece of historical romance, designed to put the ‘‘ tyrant” family in a favourable light, as patrons of literature and learning.

Again, the account of the Hipparchusis contradicted by Diogenes Laertius, who says that Solon provided for the due recitation of the Homeric poems. The only good authorities as to this point are the orators Lycurgus and Isocrates, who mention the law prescribing the recitation, but do not say

when or by whom it was enacted. The inference seems a fair one, that the author of the law was really unknown.

With regard to the statements which attribute some work in con- nexion with Homer to Pisistratus, it was noticed by Wolf that Cicero, Pausanias, and the others who mention the mattcr do so nearly zm the same words, and therefore appear to have drawn from a common source. This source was in all probability au epigram quoted in two of the short lives of Homer, and there said to have been inscribed on the statue of Pisistratus at Athens, In it Pisistratus is made to say of himself that he ‘‘collected Homer, who was formerly sung in fragments (6s rv “Opnpoy HOpoca omopadyy 7d mply detddmevor), for the golden poet was a citizen of ours, since we Athenians founded Smyrna.” Thc other statements repeat these words with various minor additions, eliefly intended to explain how the poems had been reduced to this fragmentary condition, and how Pisistratus set to work to restore them. Thus all the authority for the work of Pisistratus ‘‘ reduces itself to the testimony of a single anonymous inscription” (Nutzhorn, p. 40). Now, what is the value of that testimony? It is impossible of course to believe that a statuc of Pisistratus was set up at Athcus in the time of the free republic. The epigram is almost certainly a mere literary exercise. And what exactly does it say? Only that Homer was recited in fragments by the rhapsodists, and that these partial recitations were made into a continuous whole by Pisistratus ; which docs not necegsarily mean more than that Pisistratus did what other authorities ascribe to Solon and Hipparchus, viz., regulated the recitation.

Against the theory which sees in Pisistratus the author of the first complete text of Homer we have to set the absolute silence of Herodotus, Thucydides, the orators, and the Alexandrian gram- marians. And it can hardly be thought that their silence is acci- dental. Herodotus and Thucydides seem to tell us all that they know of Pisistratus. The orators Lycurgus and Isocrates make a great deal of the recitation of Homer at the Panathenza, but know nothing of the poems having been collected and arranged at Athens, a fact which would have redounded still more to the honour of the city. Finally, the Scholia of the Ven. A contain no reference or allusion to the story of Pisistratus. As these Scholia are derived in substance from the writings of Aristarchus, it seems impossible to belicve that the

story was known to him. The circumstance that it is referred to in the later Scholia Victoriana, and in Eustathius, gives additional weight to this argument,

The result of these considerations seems to be that nothing rests on good evidence beyond the fact that Homer was recited by i at the Panathenaie festival. Thc rest of the story is probably the result of gradual expansion and accretion. It was inevitable that later writers should speculate about the authorship of such a law, and that it should be attributed with more or less confidence to Solon or Pisistratus or Hipparchus. The choice would be deter- mined in great measure by political feeling. It is probably not an accident that Dieuchidas, who attributed so much to Pisistratus, was a Megarian. The author of the Hipparchus is evidently influeneed by the anti-democratical tendencies in which he only followed Plato. In the times to which the story of Pisistratus can be traced, the 1st eentury B.c., the substitution of the "* tyrant" for the legislator was extremely natural. It was equally natural that the importance of his work as regards the text of Homer should be exaggerated. The splendid patronage of letters by the successors of Alexander, and especially the great institutions which had been founded at Alexandria and Pergamus, had made an impression on the imagination of learned men which was reflected in the current notions of the ancient despots. It may even be suspected. that anecdotes in praise of Pisistratus and Hipparchus were a delicate form of flattery addressed to the reigning Ptolemy. Under these influences the older stories of Lycurgus bringing Homer to the Peloponnesus, and Solon providing for the recitation at Athens, were thrown into the shade.

In the later Byzantine times it was believed that Pisistratus was aided by seventy grammarians, of whom Zenodotus and Aristarchus were the elief. The great Alcxandrian grammarians had become figures in a new mythology. It is true that Tzetzes, one of the writers from whom we have this story, gives a better version, according to which Pisistratus employed four men, viz., Onoma- critus, Zopyrus of Heraclea, Orpheus of Croton, and one whose name is corrupt (written éucdéyevdos). Many scholars (among them Ritschl) accept this account as probable. Yet it rests upon 00 better evidence than the other.

The effect of the Prolegomena was so overwhelming that, althougli

a few protests were made at the time, the true Homeric controversy did not begin till after the death of Wolf (1824). His speculations were thoroughly in harmony with the ideas and sentiment of the time, and his historical arguments, especially his long array of testimonies to the work of Pisistratus, were hardly challenged.

The first considerable antagonist of the Wolfian school was G. W. Nitzsch, whose writings cover the space 1828-1862, and deal with every side of the controversy. In the earlier part of his Meletemata (1830) he took up the question of written or unwritten literature, on which Wolf's whole argument turned, and showed that the art of writing must be anterior to Pisistratus. In the later part of the same series of discussions (1837), and in his chief work (Die Sagenpoesie der Griechen, 1852), he investigated the structure of the Homeric poems, and their relation to the other epics of the Trojan cycle. These epics had meanwhile been made the subject of a work which for exhaustive learning and delicacy of artistic perception has few rivals in the history of philology, the Zpie Cycle of F. G. Welcker. The confusion which previous scholars had made between the ancient post-Homeric poets (Arctinus, Lesches, &c.) and the learned mythological writers (such as the '«scriptor cyclicus" of Horace) was first cleared up by Welcker. Wolf had argued that if the cyclic writers had known the Iliad and Odyssey which we possess, they would have imitated the unity of structure which distinguishes these two pocms, The result of Welcker's labours was to show that the Homeric poems had in- fluenced both the form and the substance of epic poetry.

In this way there arosc a conservative school who admitted more or less freely the absorption of pre-existing lays in the formation of the Idiad and Odyssey, and also the existence of considerable inter- polations, but assigned the main work of formation to prehistoric times, and to the genius of a great poct. Whether the two epics were by the same author remained an open question ; the tendeney of this svoup of scholars was decidedly towards separation. Re- garding the use of writing too they were not unanimous. K. O, Miller, for instance, maintained the view of Wolf on this

point, while he strenuously combated the inference which Wolf drew from it.

The Prolegomena bore on the title page the words ‘‘ Volumen I.”; but no second voluine ever appeared, nor was any attempt made by Wolf himself to carry his theory further. he first important steps in that direction were taken hy Gottfried Hermann, chiefly in two dissertations, De interpolationibus Homeri (Leips., 1832), and De iteratis Homer? (Leips. , 1840), called forth by the writings of Nitzsch. As the word “interpolation” implies, Hermann did not maintain the hypothesis of a congeries of independent “lays.” Fceling the difficulty of supposing that all the ancient minstrels sang of the “wrath of Achilles” or the ‘‘return of Ulysses” (leaving out even the capture of Troy itself), he was led to assume that two poems of no great compass dealing with these two themes became so famous at an early period as to throw other parts of the Trojan into the back- ground, and were then enlarged by successive generations of rhapso- dists. Some parts of the Ziiad, moreover, seemed to him to be older than the poem on the wrath of Achilles ; and thus in addition to the ‘‘ Homeric” and ‘‘ post-Homeric” matter he distinguished a ‘‘pre-Homeric” element.

The conjectures of Hermann, in which the Wolfian theory found a modified and tentative application, were presently thrown into the shade by the more trenchant method of Lachmann, who (in two papers read to the Berlin Academy in 1837 and 1841) sought to show that the J7iad was made up of sixteen independent lays,” with various enlargements and interpolations, all finally reduced to order by Pisistratus. The first book, for instance, consists of 3 lay on the anger of Achilles (1-847), and two continuations, the return of Chryseis (480-492) and the scenes in Olympus (348-429, 493-611). The second book forms a second lay, but several passages, among them the speech of Ulysses (278-882), are interpolated. In the third book the scenes in which Helen and Priam take part (including the making of the truce) are pronounced to be interpolations ; and so on. Regarding the evidence on which these sweeping results are founded, opinions will vary. The degree of smoothness or consistency which is to be expected on the hypo- thesis of a single author will be determined by taste rather than argument. The dissection of the first book, for instance, turns partly on a chronological inaccuracy which might well escape the poet as well as his hearers. In

examining such points we are apt to forget that the contradictions by which a story is shown to be untrue are quite different from those b y which a confesscdly untrue story would be shown to be the work of different authors.

Structure of the Iliad.—The subject of the Ziad, as the first line proclaims, is the “ anger of Achilles.” The Manner in which this subject is worked out will appear from the following summary, in which we distinguish (1) the plot, z.¢., the story of the quarrel, (2) the main course

of the war, which forms a sort of underplot, and (3) subor- dinate episodes.

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I. Quarrel of Achilles with Agamemnon and the Greek army — Agamemnon, having been compelled to give up his prize Chryseis, takes Briseis from Achilles—Thereupon Achilles appeals to his mother Thetis, who obtains from Zeus a promise that he will give victory to the Trojans until the Greeks pay due honour to her son—Meanwhile Achilles takes no part in the war.

Agamemnon is persuaded by a dream sent from

Zeus to take the field with all his forces.

His attempt to test the temper of the army nearly leads to their return. Catalogue of the army.

Trojan muster—Trojan catalogue.

Meeting of the armies—Paris challenges Menelaus—

Truce made.

“* Teichoscopy,” Helen the Greek leaders.

The duel—-Paris is saved by Aphrodite.

Truce broken by Pandarus.

Advance of the armies—Battle.

Aristeia of Diomede—his combat with Aphrodite —Meeting with Glaucus —Visit of Hector to the city, and offering of a peplus te Athene. Visit of Hector to Paris—to Andromache.

Return of Hector and Paris to the field.

Duel of Ajax and Hector,

Truee for burial of dead.

The Greeks build a wall round their camp.

Battle—The Trojans encamp on the field,

Agamemnon sends an embassy by night, oflering Achilles

restitution and full amends—Achilles refuses.

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pointing out to Priam

des Doloneia—Night expedition of Odysseus and Diomede. ale Aristeia of Agamemnon—he is wounded—Wound-

ing of Diomede and Odysseus. Achilles sends Antilochus to inquire about Machaon.

poll. Storming of the wall—the Trojans reach the ships. X1ll Zeus ceases to watch the field—Poseidon secretly comes to the aid of the Greeks. Lys Sleep of Zeus, by the contrivance of Here. XV. Zeus awakened—Restores the advantage to the Tro- jans—Ajax alone defends the ships. XVI. Achilles is persuaded to allow Patroclus to take the field.

Patroclus drives back the Trojans—kills Sarpedon— is himself killed by Hector. Battle forthe body of Patroclus—Aristciaof Menelaus. . News of the death of Patroclus is brought to Achilles— Thetis comes with the Nereids—promises to obtain new armour for him from Hephestus. The shield of Achilles described. . Reconeiliation of Achilles—His grief and desire to avenge Patroclus.

XX. The gods come down to the plain—Combat of Achilles with Aineas and Hector, who escape. XX. The Scamander is choked with slain—rises against Achilles, who is saved by Hephestus. XXIL Hector alone stands against Achilles—his flight round the walls—he is slain. XXIIL Burial of Patroclus—Funeral games. AXIY, Priam ransoms the body of Hector—his burial.

Such is the “action ” (mpaés) which in Aristotle’s opinion showed the superiority of Homer to all later epic poets. But the proof that his scheme was the work of a great poet does not depend merely upon the artistic unity which excited the wonder of Aristotle. A number of separate “lays” might conceivably be arranged and connected by a man of poetical taste in a manner that would satisfy all requirements. In such a case, however, the connecting passages would be slight and weak. Now, in the Jiiad these passages are the finest and most characteristic. The element of connexion and unity is the story of the “ wrath of Achilles”; and we have only tv look at the books which give the story of the wrath ta see how essential they are. Even if the ninth book is rejected (as Grote proposed), there remain the speeches of the first, sixteenth, and nine- teenth books. These speeches form the cardinal points in the action of the Zicad—the framework into which every- thing else is set ; and they have also the best title to the name of Homer.

The further question, however, remains,— What shorter narrative piece fulfilling the conditions of an independent

poem has Lachmann succeeded in disengaging from the existing Iliad? It must be admitted that when tried by this test his “lays” generally fail. The “quarrel of the chiefs,” the ‘‘ muster of the army,” the “duel of Paris and

Menelaus,” &c., are excellent beginnings, but have no satis- fying conclusion. And the reason is not far toseek. The Tliad is not a history, nor is it a series of incidents in the history, of the siege. It turns entirely upon a single incident, occupying a few days only. The several episodes of the poem are not so many distinct stories, each with an ‘uterest of its own. They are only parts of a single main event. Consequently the type of epic poem which would be produced by an aggregation of shorter lays is not the type which we have in the lad. Rather the Zliad is itself a single lay which has grown with the growth of poetical art to the dimensions of an epic.

But the original nucleus and parts of the incidents may be the work of a single great poet, and yet other episodes may be of different authorship, wrought into the structure of the poem in later times, Various theories have been based on this supposition. Grote in particular held that the original poem, which he called the Achilleis, did not include books ii.—vii., ix., x., xxiii, xxiv. Sucha view may be defended somewhat as follows.

Of the books which relate the events during the absence of Achilles from the Greek ranks (ii—xv.), the last five are directly related to the main action. They describe the successive steps by which the Greeks are driven back, first from the plain to the rampart, then to their ships. More- over three of the chief heroes, Agamemnon, Diomede, and Ulysses are wounded, and this circumstance, as Lachmann himself admitted, is steadily kept in mind throughout. It is otherwise with the earlier books (especially ii—vii.). The chief incidents in that part of the poem—the panic rush to the ships, the duels of Paris and Menelaus, and of Hector and Ajax, the Aristeia of Diomede—stand in no relation to the mainspring of the poem, the promise made by Zeus to Thetis. It is true that in the thirteenth and fourteenth books the purpose of Zeus is thwarted for a time by other gods ; but in books ii.—vii. it is not so much thwarted as ignored. Further, the events follow without sufficient connexion. The truce of the third book is broken by Pandarus, and Agamemnon passes along the Greek ranks with words of encouragement, but without a hint of the treachery just committed. The Aristeia of Diomede ends in the middle of the sixth book; he is uppermost in all thoughts down to ver. 311, but from this point, in the meet- ings of Hector with Helen and Andromache, and again in the seventh book when Hector challenges the Greek chiefs, his prowess is forgotten. Once more, some of the incidents

seem to belong properly to the beginning of the war. The joy of Menelaus on seeing Paris, Priam's ignorance of the Greek leaders, the speeches of Agamemnon in his review of the ranks (in book iv.), the building of the wall—all these are in place after the Greek landing, but hardly in the ninth year of the siege.

On the other hand, it may be said, the second book opens with a direct reference to the events of the first, and the mention of Achilles in the speech of Thersites (ii. 239 #7) is sufficient to keep the main course of events in view. The Catalogue is connected with its place in the poem by the lines about Achilles (686-694). When Diomede is at the height of his Aristeia Helenus says (Zl. vil 200), "We did not so fear even Achilles." And when in the third book Priam asks Helen about the Greek captains, or when in the seventh book nine champions come forward to contend with Hector, the want of the greatest hero of all is sufficiently felt. If these passages do not belong to the period of the wrath of Achilles, how are we to account for his conspicuous absence ?

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Further, the want of smoothness and unity which is visible in this part of the JZiad may be due to other causes than difference of date or authorship. A national poet stich as the author of the Zliad cannot always choose or arrange his matter at his own will. He is bound by the traditions of his art, and by the feelings and expectations of his hearers. 'The poet who brouglit the exploits of Diomede into the /déad doubtless had his reasons for doing so, which were equally strong whether he was the poet of the Achilleis or a later Homerid or rhapsodist. And if some of the incidents (those of the third book in particular) seem to belong to the beginning of the war, it must be considered that poetically, and to the hearers of the Ziad, the war opens in the third book, and the incidents are of the kind that is required insucha place. The truce makes a pause which heightens the interest of the impending battle ; the duel and the scene on the walls are effective in bringing some of the leading characters on the stage, and in making us acquainted with the previous history. The story of Paris and Helen especially, and the general position of affairs in Troy, is put before us in a singularly vivid manner. The book in short forms so good a prologue to the

action of the war that we can hardly be wrong in attributing it to the genius which devised the rest of the Thad.

The case against the remaining books is of a different kind. The niuth and tenth seem like two independent pictures of the night before the great battle of xi.—xviL Either is enough to fill the space in Homer’s canvas ; and the suspicion arises (as when two Platonic dialogues bear the same name) that if either had been genuine, the other would not have come into existence. If one of the two is to be rejected it must be the tenth, which is certainly the less Homeric. It relates a picturesque adventure, conceived in a vein more approaching that of comedy than any other part of the Zliad. Moreover, the language in several places oxhibits traces of post-Homeric date. The ninth book, on the other hand, was rejected by Grote, chiefly on the grounds that the embassy to Achilles ought to have put an end to the quarrel, and that it is ignored in later passages, especially in the speeches of Achilles (xi.609 ; xvi. 72, 85). His argument, however, rests on an assuniption which we are apt to bring with us to the reading of the liad, but which is not borne out by its language, viz., that there was some definite atonement demanded by Achilles, or due to him according to the custom and sentiment of the time. But in the Zdiad the whole stress is laid on the anger of Achilles, which can only be satisfied by the defeat and extreme peril of the Greeks.! He is influenced by his own feeling, and by nothing else. Accordingly, in the ninth book, when they are still protected by the rampart (see 348 7), he rejects gifts and fair words alike; in the six- teenth he is moved by the tears and entreaties of Patroclus, and the sight of the Greek ships on fire; in the nineteenth his anger is quenched in grief. But he makes no condi- tions, either in rejecting the offers of the embassy or in returning to the Greek army. And this conduct is the-re- sult, not only of his fierce and inexorable character, but also (as the silence of Homer shows) of the want of any gene- ral rules or principles, any code of morality or of honour, which would have required him to act in a different way.

Finally, Grote objected to the two last books that they prolong the action of the Iliad beyond the exigencies of a coherent scheme. Of the two, the twenty-third could more easily be spared. In language, and perhaps in style and manner, it is akin to the tenth; while the twenty-fourth 1s in the pathetic

vein of the ninth, and like it serves to bring out new aspects of the character of Achilles.

relic ein i) – RR T 1 On this point see a paper by Professor Packard in the Trans. of the American Philological Association, 1876.

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A recent writer (Dr KE. Kammer) has given some strong reasons for doubting the genuineness of the passage in book xx. describing the duel between Achilles and Aineas (79-852). The incident is certainly very much out of keeping with the vehement action of

that part of the poem, and especially with the moment when

Achilles returns to the field, eager to meet Hector and avenge the death of his friend. The interpolation (if it is one) is probably due to local interests. It contains the well-known prophecy that the descendants of Aineas are to rule over the Trojans,—pointing to the existence of an Ancad dynasty in the Troad. So, too, the legend of Anchises in the Hymn to Aphrodite is evidently local ; and Aineas becomes more prominent in the later epics, especially the Cypria and the ’IAlou mépors of Arctinus.

Structure of the Odyssey.—In the Odyssey, as in the liad, the events related fall within a short space of time. The difficulty of adapting the long wanderings of Ulysses to a plan of this type is got over by the device—first met with in the Odyssey—of making the hero tell the story of his own adventures. In this way the action is made to begin almost immediately before the actual return of Ulysses. Up to the time when he reaches Ithaca it moves on three distinct scenes: we follow the fortunes of Ulysses, of Telemachus on his voyage in the Peloponnesus, and of Penelope with the suitors. The art with which these threads are woven together was recognized by Wolf himself, who admitted the difficulty of applying his theory to the “admirabilis summa et compages” of the poem. Of the comparatively few attempts which have been made to dis- sect the Odyssey, the most moderate and attractive is that of Professor A. Kirchoff of Berlin.}

According to Kirchoff, the Odyssey as we have it is the result of additions made to an original nucleus. There was first of all a ‘Return of Odysseus,” relating chiefly the adventures with the Cyclops, Calypso, and the Pheacians; then a continuation, the scene of which lay in Ithaca, embracing the bulk of books xiii. ~~xxiii, The poem so formed was enlarged at some time between Ol. 30 and Ol. 50 by the stories of books x.—xii. (Circe, the~~

~~Sirens, Scylla, &c.), and the adventures of Telemachus. Lastly, a few passages were in~~ terpolated in the time of Pisistratus.

The proof that the scenes in Ithaca are by a later hand than the ancient ‘‘ Return” is found chiefly in a contradiction discussed by Kirchoff in his sixth dissertation (pp. 185 7., ed. 1869). Sometimes Ulysses is represented as aged and worn by toil, so that Penelope, for instance, cannot recognize him ; sometimes he is really in the prime of heroic vigour, and his appearing as a beggarly old man is the work of Athene’s wand. The first of these representations is evidently natural, considering the twenty eventful years that have passed ; but the second, Kirchoff holds, is the Ulysses of Calypso’s island and the Pheacian court. He concludes that the aged Ulysses belongs to the ‘‘continuation” (the change wrought by Athene’s wand being a device to reconcile the two views), and henee that the continuation is the work of a different author.

Ingenious as this is, there is really very slender ground for Kirchoff’s thesis. The passages in the second half of the Odyssey which describe the appearance of Ulysses do not give two well- marked representations of him. Sometimes Athene disguises him asa decrepit beggar, sometimes she bestows on him supernatural beauty and vigour. It must be admitted that we are not told exactly how long in each case the effect of these changes lasted, But neither answers to his natural appearance, or to the appearance which he is imagined to present in the earlier books. In the palace of ‘Aleinous, for instance, it is noticed that he is vigorous but

marred by many ills” (xakotox ovveppnktat morceat, Od. viii. 187) ; a this agrees with the scenes of recognition in the latter part of

€ poem,

The arguments by which Kirchoff seeks to prove that the stories of books x. —xii. are much later than those of book ix. are not more vonvincing. He points out some resemblances between these three books and the Argonautic fables, among them the circumstance that 4 fountain Artacia occurs in both. In the Argonautic story this fountain is placed in the neighbourhood of Cyzicus, and answers to an actual fountain known in historical times. Kirchoff argucs that the Artacia of the Argonautic story

must have been taken from the rea] Artacia, and the Artacia of the Odyssey again from that of the Argonautic story. And as Cyzicus was settled from Miletus, he infers that both seis of stories must be comparatively late. It is more probable, surely, that the name Artacia occurred independ- ently (as most Seographical names are found to occur) in more than

1 n; oe Die Composition der Odyssee, Berlin, 1869. A full discussion of

this book is give by D ; ee , Leipsic, 1873," n by Dr E, Kammer, Die Hinheit der Odyssee,

one place. Or it may be that the Artacia of the Odyssey suggested the name to the colonists of Cyzicus, whence it was adopted into the later versions of the Argonautic story. The further argument that the Wostoi recognized a son of Calypso by Ulysses but no son of Circe, consequently that Circe was unknown to the poet of the Nosto?, rests (in the first place) upon a conjectural alteration of a passage in Eustathius, and moreover has all the weakness of an argument from silence, in addition to the uncertainty arising from our very slight knowledge of the author whose silence is in question. Finally, when Kirchoff finds traces in books x.—xii. of their having been originally told by the poet himself instead of being put in the mouth of his hero, we feel that inaccuracies of this kind are apt to creep in whenever a fictitious story is thrown into the form of an autobiography.

Inquiries conducted with the refinement which characterizes those of Kirchoff are always instructive, and his book contains very many just observations ; but it is impossible to admit his main conclusions. And perhaps we may infer that no similar attempt can be more successful. It does not indeed follow that the Odyssey is free from interpolations. The Nexvia of book xi. may be later (as Lauer maintained), or it may eontain additions, which could easily be inserted in a description of the kind. And the last book is pro- bably by a different hand, as the ancient critics believed. But the unity of the Odyssey as a whole is apparently beyond the reach of the existing weapons of criticism.

Chorizontes.—When we are satisfied that each of tlie great Homeric poems is either wholly or mainly the work of a single poet, a question remains which has been matter of controversy in ancient as well as modern times—Are they the work of the same poet? Two ancient grammarians, Xeno and Hellanicus, were known as the separators (oi xwptlovres) ; and Aristarchus appears to have written a treatise against their heresy. In modern times some of the greatest names have been on the side of the " Chori- zontes."

If, as has been maintained in the preceding pages, the external evidence regarding Homer is of no value, the pro- blem now before us may be stated in this form :—Given two poems of which nothing is known except that they are of the same school of poetry, what is the probability that they are by the same author? We may find a fair parallel by imagining two plays drawn at hazard from the works of the great tragic writers. It is evident that the burden of proof would rest with those who held them to be by the same hand.

The arguments used in this discussion have been of very various calibre. The ancient Chorizontes observed that the messenger of Zeus is Iris in the Z/iad, but Hermes in the Odyssey ; that the wife of Hepheestus is one of the Charites in the /dad, but Aphrodite in the Odyssey ; that the heroes in the liad do not eat fish; that Crete has a hundred cities according to the J/iad, and only ninety according to the Odyssey; that rpomdpoue is used in the Jliad of place, in the Odyssey of time, &c. Modern scholars have added to the list, especially by making careful comparisons of the two poems in respect of vocabulary and grammatical forms. Nothing is more difficult than to assign the degree of weight to be given to such facts. The difference of sub- ject between the two poems is so great that it leads to the most striking differences of detail, especially in the voca- bulary. For instance, the word ¢é8os, which in Homer means "flight in battle" (not " fear"), occurs thirty-nine times in the J/iad, and only once in the Odyssey ; but then there are no battles in the Odyssey. Again, the verb pyyvupn, "to break," occurs forty-eight times in the dad, and once in the Odyssey,—the reason being that it is constantly used of breaking the armour of an enemy, the gate of a city, the hostile ranks, &e. Once more, the word oxéros, "darkness," occurs fourteen times in the J/iad, once in the Odyssey. But in every one of the fourteen places it is used of "darkness" coming over the sight of a fallen

warrior. On the other side, if words such as dodpwOos, “a bath,” xépvul, “a basin for the hands,” A¢o-xy, “a place to meet and talk,” &c., are peculiar to the Odyssey, we have only to remember that the scene in the J/iad is hardly ever laid

within any walls except those of a tent. These examples will show that mere statistics of the occurrence of words prove little, and that we must begin by looking to the sub-

ject and character of each poem. When we do s0, we at |

once find ourselves in the presence of differences of the

and character. The scene of the poem is a real place, and the poet sings (as Ulysses says of Demodocus) as though he had been present himself, or had heard from one who had been. The supernatural element is confined to an interference of the gods, which to the common eye hardly disturbs the natural current of affairs. The Odyssey, on the

translator of Homer,” he says, “should above all be pene- trated by a sense of four qualities of his author—that he is eminently rapid; that he is eminently plain and direct, both in the evolution of his thought and in the expression

of it, that is, both in his syntax and in his words; that broadest kind. The Z/éad is much more historical in tone |

contrary, is full of the magical and romantic—* speciosa |

miracula,” as Horace called them. Moreover, these marvels —which in their original form are doubtless as old as any- thing in the Ziad, since in fact they are part of the vast stock of popular tales (Mdrchen) diffused all over the world—are mixed up in the Odyssey with the heroes of the Trojan war. This has been especially noticed in the case of the story of Polyphemus, one that is found in many countries, and in versions which cannot all be derived from Homer. W. Grimm has pointed out that the behaviour of Ulysses in

that stury is senseless and foolhardy, utterly beneath the wise and much-enduring Ulysses of the Trojan war. The reason is simple; he is not the same Ulysses, but a being of the same world as Polyphemus himself—the world of giants and ogres. The question then is—How long must the name of Ulysses have been familiar in the legend (Sage) of Troy before it made its way into the tales of giants and ogres (MJdrchen), where the poet of the Odyssey found it

Again, the Trojan legend has itself received some exten- sion between the time of the Z//ad and that of the Odyssey. The story of the Wooden Horse is not only unknown to the

Iliad, but is of a kind which we cau hardly imagine the |

poet of the Ziiad admitting. The part taken by Neopto- lemus seems also to be a later addition. The tendency to amplify and complete the story shows itself still more in the Cyclic poets. Between the Jiiad and these poets the Odyssey often occupies an intermediate position.

This great and significant change in the treatment of the heroic legends is accompanied by numerous minor differ-

ences (such as the ancients remarked) in belief, in manners |

and institutions, and in language. These differences bear out the inference that the Odyssey is of a later age. The progress of reflexion is especially shown in the higher ideas entertained regarding the gods. The turbulent Olympian

he is eminently plain aud direct in the substance of his thought, that is, in his matter and ideas; and finally, that he is eminently noble" (On Translating Homer, p. 9).

The peculiar rapidity of Homer is due in great measure to his use of the hexameter verse. It is characteristic of early literature that the evolution of the thought— that is, the grammatical form of the sentence—is guided by the structure of the verse ; and the correspondence which con- sequently obtains between the rhythm and the grammar— the thought being given out

in lengths, as it were, and these again divided by tolerably uniform pauses —produces a swift flowing movement, such as is rarely found when the periods have been constructed without direct reference to the metre. That Homer possesses this rapidity without falling into the corresponding faults —that is, without becoming either “jerky” or monotonous—is perhaps the best proof of his unequalled poetical skill. The plainness and directness, both of thought and of expression, which characterize Homer were doubtless qualities of his age; but the author of the Ziad (like Voltaire, to whom Mr Arnold happily compares him) must have possessed the national gift in a surpassing degree. The Odyssey is in this respect perceptibly below the level of the F/xad.

Rapidity or ease of movement, plainness of expression, and plainness of thought, these are not the distinguishing qualities of the great epic poets— Virgil, Dante, Milton. On the contrary, they belong rather to the humbler epico- lyrical school for which Homer has been so often claimed. The proof that Homer does not belong to that school—

that his poetry is not in any true sense “ ballad-poetry ”—

is furnished by the higher artistic structure of his poems (already discussed), and as regards style by the fourth of the qualities distinguished by Mr Arnold—the quality of nobleness. It is his noble and powerful style, sustained through every change of idea and subject, that finally

| separates Homer from all forms of “ballad-poetry” and

court has almost disappeared. Zeus has acquired the

character of a supreme moral ruler; and although Athene and Poseidon are adverse influences in the poem, the notion of a direct contest between them is scrupulously avoided. The advance of morality is shown in the more frequent use of terms such as “just” (Sixotos), “piety” (Sai), “inso- lence” (#Gprs), “ god-fearing” (Beovdys), “pure” (dyvos) ; and also in the plot of the story, which is distinctly a con- test between right and wrong. In matters bearing upon the arts of life it is unsafe to press the silence of the Z/zad. We may note, however, the difference between the house of Priam, surrounded by distinct dwellings for his many sons and daughters, and the houses of

Ulysses and Alcinous, with many chambers under a single roof. The singer, too, who is so prominent a figure in the Odyssey can hardly be thought to be absent from the J/cad merely because the scene is laid in a camp.

Style of Homer.—A few words remain to be said on the style and general character of the Homeric poems, and on the comparisons which may be made between Homer and analogous poetry in other countries.

The cardinal qualities of the style of Homer have been pointed out once for all by Mr Matthew Arnold. ‘The

‘popular epic.” }

But while we are on our guard against 1 once common error, we may recognize the historical connexion between the Iliad and Odyssey and the “ ballad” literature which undoubtedly preceded them in Greece. It may even be admitted that the swift-flowing movement, and the simpli- city of thought and style, which we admire in the Iliad are an inheritance from the earlier “ lays ””—the xAéo. dvdpav such as Achilles and Patroclus sang to the lyre in their tent. Even the metre—the hexameter verse—may be assigned to them. But between these lays and Homer we must place the cultivation of epic poetry as an art.2. The pre-Homeric lays doubtless furnished the elements of such a poetry—

| the alphabet, so to speak, of the art; but they must have been refined and transmuted before they formed poems

like the Zliad and Odyssey.

A single example will illustrate this. In the scene on the walls of Troy, in the third book of the Zliad, after Helen has pointed out Agamemnon, Ulysses, and Ajax answer to Priam’s questions, she goes on unasked to name Idomeneus. Lachmann, whose mind is full of the ballad manner, fastens upon this as an irregularity. ‘The unskil-

1 ** As a poet Homer must be acknowledged to excel Shakespeare in the truth, the harmony, the sustained grandeur, the satisfying com- pleteness of his images” (Shelley, Essays, &c., vol. i. p. 51, ed. 1852).

ful transition from Ajax to. [domeneus, about whom no ques- tion had been asked," he cannot attribute to the original poet of the lay (Betrachtungen, p. 15, ed. 1865). But, as has lately been pointed out,' this is exactly the variation which a poet would introduce to relieve the primitive ballad- like sameness of question and answer ; end moreover it forms the transition to the lines about the Dioscuri by which the scene is so touchingly brought to a close.

Analogies.—The development of epic poetry (properly so called) out of the oral songs or ballads of a country isa pro- cess which in the nature of things can seldom be observed. It seems clear, however, that the hypothesis of epics such as the Jdad and Odyssey having been formed by putting together or even by working up shorter poems finds no support from analogy. ; ; ;

Narrative poetry of great interest is found in several countries (such as Spain and Servia), in which it has never attained to the epic stage. In Scandinavia, in Lithuania, in Russia, according to M. Gaston Paris (Histoire poétique de Charlemagne, p. 9), the national songs have been arrested jn a form which may be called intermediate between con- temporary poetry and the epic. The true epics are those of India, Persia, Greece, Germany, Britain, and France. Most of these, however, fail to afford any useful points of comparison, either from their utter unlikeness to Homer, or because there is no evidence of the existence of anterior popular songs. The most instructive, perhaps the only instructive, parallel is to be found in the French " chansons de geste," of which the Chanson de Roland is the earliest and best example. These poems are traced back with much probability to the 10th century. They are epic in character, and were recited by professional jongleurs (who may be compared to the dodof of Homer). But as early as the 7th century we come upon traces of short lays (the so-called cantilénes) which were in the mouths of all, and were sung in chorus. It has been held that the chansons de geste were formed by joining together " bunches" of these earlier cantilenes, and this was the view taken by M. Léon Gautier in te first edition of his great work, Les E'popées francaise sublished in 1865. In the second edition, of which t. . first volume appeared

in 1878, he has aban- doned this theory. He still believes that the epics were generally composed under the influence of earlier songs. “Our first epic poets,” he now says, “did not actually and materially patch together pre-existent cantilénes. They were only inspired by these popular songs; they only borrowed from them the traditional and legendary elements. In short, they took nothing from them but the ideas, the spirit, the life; they ‘found’ (ils ont trouvé) all the rest” (p. 80). But he admits that “some of the old poems may have been borrowed from tradition, without any interme- diary” (b¢d.); and when it is considered that the traces of the “cantilénes” are slight, and that the degree in which they inspired the later poetry must be a matter of impres- sion rather than of proof, it does not surprise us to find other scholars (notably M. Paul Meyer) attaching less im- portance to them, or even doubting their existence.?

; By A, Romer, Die Exegetischen Scholien der Ilias, p. vii. ’ On comprend que des chants populaires nés d’un événement éclatant, Victoire ou défaite, puissent contribuer & former la tradition, a en arréter les traits ; ils peuvent aussi devenir le centre de légendes qu se forment pour les expliquer ; et de la sorte leur substance au Moms arrive au poéte épique qui V’introduit dans sa composition. Voila ce quia pu se produire pour de chants trés-courts, dont il est ailleurs aussi difficile d’affirmer que de nier l’existence. Mais on peut expliquer la formation des chansons de geste par une autre hypothese” (Meyer, Recherches sur UEpopée francaise, p. 65). Ce qui a fait naitre la théorie des chants ‘lyrico-épiques’ ou des cantilénes, c’est le systéme de Wolf sur les poémes homeériques, et de Fmt sur les Vibelungen. Mais, au moins en ce qui concerne cc ernier poéme, le systéme est détruit. . . . On tire encore argument STomances cspagnoles, qui, dit-on, sont des ‘cantilénes’ non encore

When M. Léon Gautier shows how history passes into legend, and legend again into romance, we are reminded of the difference noticed above between the J/iad and the Odyssey, and between Homer and the early Cyclic poems. And as has been recently pointed out, the peculiar degrada- tion of Homeric characters which appears in some poets (especially Euripides) finds a parallel in the later chansons de geste.8

The comparison of Homer with the great literary epics calls for more discursive treatment than would be in place here. Some external differences have been already indicated. Like the French epics, Homeric poetry is indigenous, and is distinguished by this fact, and by the ease of movement and the simplicity which result from it, from poets such as Virgil, Dante, and Milton. It is also distin- guished from them by the comparative absence of under- lying motive or sentiment. In Virgil's poetry a sense of the greatness of Rome and Italy isthe leading motive of a passionate rhetoric, partly veiled by the " chosen delicacy " of his language. Dante and Milton are still more faithful exponents of the religion and politics of their time. Even the French epics are pervaded by the sentiment of fear and hatred of the Saracens. But in Homer the interest is purely dramatic. There is no strong antipathy of race or religion ; the war turns on no political event ; the capture of Troy lies outside the range of the Jiiad. Even the lieroes are not the chief national heroes of Greece. The interest lies wholly (so far as we can see) in the picture of human action and feeling,

Bibliography.—A complete bibliography of Homer would fill volumes. The following list is intended to include those books only which are of first-rate importance, or which would be found of use to a student at the present time.

The editio princeps of Homer, published at Florence in 1488, by Demetrius Chalcondylas, and the Aldine editions of 1504 and 1517, have still some value beyond that of curiosity. The chief modern critical editions are those of Wolf (Halle, 1794-95; Lcipsic, 1804-7), Spitzner (Gotha, 1832-36), Bekker (Berlin, 1843; Bonn, 1858), and La Roche (Odyssey, 1867-68 ; Iliad, 1873-76, both at Leipsic). The commentaries of Barnes, Clarke, and Ernesti are practically superseded; but Heyne's Jliad (Leipsic, 1802), and Nitzsch's commentary on the Odysscy (books i.-xii., Hanover, 1826-40) are still useful. Nagelbach's Anmerkungen zur Ilias (A,B 1-483, L) is of great value, especially the third edition (by Autenrieth, Nurem- berg, 1864). The school editions of Faesi, Ameis, and La Roche should be added to the corresponding English books. The unique Scholia Vencta on the Iliad were first made known by Villoison (Homeri Ilias ad veteris codicis Vencti fidem recensita, Scholia in cam antiquissima ex eodem codice aliisque nunc primum edidit, cum Asteriscis, Obeliscis, aliisque signis criticis, Joh. Baptista Caspar @ Ansse de Villoison, Venice, 1788); reprinted, with many

additions from other MSS., by Bekker (Scholia in Homcri Iliadem, Berlin, 1825-26). A new edition is being published by the Oxford Press (Scholia Groeca in Homert Iliadem, ed. Gul. Dindorfius); four volumes have appeared (1875-77). The vast commentary of Eustathius was first printed at Rome in 1542; the last edition is that of Stallbaum (Leipsic, 1827). The Scholia on the Odysscy were published by Buttmann (Berlin, 1821), and with greater approach to completeness by W. Dindorf (Oxford, 1855). Although Wolf at once perceived the value of the Venetian Scholia on the Iliad, the first scholar who thoroughly explored them was K. Lehrs (De Aristarchi studiis Homericis, Kénigsberg, 1833; 2d ed. Leipsic, 1865). Of the studies in the same field which have appeared since, the most important are:—Aug. Nauck,

The literature of the ‘‘ Homeric Question” begins practically with Wolf’s Prolegomena (Halle, 1795). Of the earlier books

arrivées 2 V’épopée. . . . Et c’est le malheur de cette théorie: faute de preuves directes, elle cherche des analogics au dehors ; en Espagne, elle trouve des ‘cantilenes,’ mais pas d’épopée ; en Allemagne, une épopée, mais pas de cantilénes !” (Jdid., p. 66). 3 A, Lang, Contemporary Review, vol. xvii., n.s., p. 588. Mil 16

Wood’s Essay on the Original Genius and Writings of Homer is the most interesting. Wolf’s views were skilfully popularized in W. Miiller’s Homerische Vorschule (2d. ed., Leipsic, 1836). G. Hermann’s dissertations De interpolationibus Homert (1832) and De iteratis apud Homerwm (1840) are reprinted in his Opuscula. Lachmann’s two papers (Betrachtungen uber Homer’s Ilias) were edited together by M. Haupt (2d ed., Berlin, 1865). Besides the somewhat voluminous writings of Nitzsch, and the discussions con- tained in the histories of Greek literature by K. O. Muller, Bern- hardy, Ulrici, and Th. Bergk, and in Grote’s History of Greece, the chief books are :—Welcker, Der epische Cyclus oder die homerischen Dichter (Bonn, 1835-49); Lauer, Geschichte der homerischen Poesie (Berlin, 1851); Sengebusch, two dissertations prefixed to the two volumes of W. Dindorf’s Homer in the Teubner series (1855-56); Friedlander, Die Homerische Kritik von Wolf bis Grote (Berlin, 1853); Nutzhorn, Die Entstehungsweise der Homerischen

Gedichte, mit Vorwort von J. N. Madvig (Leipsic, 1869); E. Kammer, Zur homerischen Frage (Koénigsberg, 1870); A. Kirchoff, Die Com- position der Odyssee (Berlin, 1869); Volkmann, Geschichte wnd Kritik der Wolf'schen Prolegonena (Leipsic, 1874). The interest taken in the question by English students is sufficiently shown in the writings of Mr Gladstone, Professor Blackie, Mr Paley, Dr Hayman (in the Introduction to his Odysscy), and Professor Geddes.

The Homeric dialect must be studicd in the books (such as those of G. Curtius) that deal with Greek on the comparative method. The best special work is the Griechische Formenlehre of H. L. Ahrens (Gottingen, 1852). On Homeric syntax the chief book is B. Delbriick's Syntactische Forschungen (Halle, 1871-79), especially vols. i. and iv.; on metre, &c., Hartel's Homerisehe Studien (i.-1ii., Vienna), and Knés, De digammo Homerico qucstiones (Upsala, 1872-73-78). The papers reprinted in Bekker's Homerische Blatter (Bonn, 1863-72) and Cobet's Afiscellanea Critica (Leyden, 1876) are of the highest value. Hoffmann's Quastiones Homerice (Claus- thal, 1842) is a useful collection of facts. Buttmann's Lexilogus, as an example of method, is still worth study.

The antiquities of Homer—using the word in a wide sense—may be studied in the following books:—Volcker, Ueber Homerische Geographie und Weltkunde (Hanover, 1830); Nagelsbach's Homer- ische Theologie (2d ed., Nuremberg, 1861); H. Brunn, Die Kunst bet Homer (Munich, 1868); the Shield of Achilles (London, 1854); Buchholz, Realien (Leipsic, 1871-73).

Die homerisehen

Among other aids should be mentioncd the Index Homericus of

Seber (Oxford, 1780); Mr Prendergast's Concordance to the Lliad (London, 1875); Autenrieth's Homeric Dictionary (London, 1877); and the Lexicon Homericum, edited by H. Ebeling (in the course of

publication). (D. B. M.) HOMESTEAD

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HE laws of the United States give to every citizen who

is the head of a family, or who has arrived at the age of twenty-one years, the right to a homestead of 160 acres, to be selected at will from any of the surveyed and otherwise unappropriated public lands, without cost, ex- cept entry fees. The tract thus taken as a homestead must be located in a compact body, upon land which is agricultural in character, and must conform to the legal subdivisions established by the official survey. It is set apart from the general estate of the householder as a sacred provision for the family, and is protected from alienation by the householder, and from execution for his general debts. The administration of the homestead and other land laws is committed to the general land office, a bureau of the interior department of the National Government at Washington, presided over by a commis- sioner, the secretary of the interior having appellate jurisdiction. For the convenience of applicants, the States and Territories where the public lands are still to be found are divided into districts, in each of which there is estab- lished a local land office, in charge of a registrar and a receiver, whose duty it is to attend to the disposal of the public lands.

To obtain a homestead the applicant must make an affidavit before the registrar or receiver that he is over the age of twenty-one years, or the head of a family; that he is a citizen of the United States, or has declared his intention to become such ; and that the entry is made for

legal applicant.

but one homestead privilege. person making a homestead entry should know that no one else has located upon the land and begun improvements as the foundation of a claim under the pre-emption laws, for such a claim would antedate his own. upon and cultivated his claim for five years, the settler is allowed two years more, but no longer, in which to make his “ final proof.” the settler and that of two disinterested witnesses, showing that the claimant is a citizen of the United States, that he has made actual settlement upon and cultivated the land

W. W. Lloyd, On the Homeric Design of

his exclusive use and benefit, and for actual settlement and cultivation. settler an inceptive right only. land which no one can dispute so long as he complies with

A homestead entry thus made vests in the He has a “claim” to the

the law requiring him to live upon and cultivate it for five years; but he has no title which he can convey. If

he abandons the land, or remains absent from it for a period of more than six months, his entry may be contested

and cancelled ; and then the tract will be open to the first In such a case the original claimant will not be permitted to make another entry, as the law allows It is essential that the

Having resided

Final proof consists in the affidavit of

in good faith for the time required, and that he has never

perfected or abandoned an entry made under the home: stead laws. ‘This proof is then transmitted to the commis- sioner of the general land office at Washington, and if the

entry is found to be in all respects lawful, a patent is

forwarded to the settler, who thus acquires a permanent

and absolute title to his homestead.

The public lands are held by the Government at the minimum price of $1.25 per acre; but where alternate sections have been granted to railroads or other works of internal improvement, the reserved sections are held at 89.50. Of this $2.50 or “double minimum” land, formerly only soldiers and sailors of the War of the Rebellion were allowed to enter as homestead claimants of 160 acres, other citizens being restricted to 80 acres. By the acts of March 3d and July lst 1879, the privilege of entering 160 acres was

extended to all citizens and made general; but there are still some portions of Alabama, Mississippi, and other States where no more than 80 acres of $2.50 land can be taken.

Where homestead entries are made by soldiers and

sailors who served ninety days or more in the United States army or navy during the War of the Rebellion, the period of their service, or, if they were discharged on account of wounds or disability incurred in the line of duty, the entire term of enlistment, not to exceed four years, is deducted from the five years' residence required by law. But no one cau receive a title to his homestead under any circumstances without having lived upon it at least one year.} For homestead entries on lands in Michigan, Wisconsin, Iowa, Missouri, Minnesota, Kansas, Nebraska, Dakota, Alabama, Mississippi, Louisiana, Arkansas, and Florida, commissions and fees are to be paid according to the fol lowing table:—

—

1 A settler who under former laws was restricted in his entry to less than 160 acres is now permitted, except in a few localities, to enter other lands adjoining his original homestead, as an 'additional entry, to an amount swfficient to make with his first entry 160 acres; and in this case the time of his residence on the tract originally entered. will be deducted from the five years, so that in making his final proof he need show occupancy and cultivation of his additional homestead for one year only. Entries of this class are made without payment of fees and commissions. Instead of making such an additional entry the settler may surrender his existing entry to the Government, and make another of 160 acres. Soldiers and sailors of the War of the Rebellion, who prior to June 22, 1874, had made homestead entries of less than 160 acres, have the further privilege of selecting thelr additional entries from any unoccupied lands, whether adjoining their original homesteads or not.

HOMESTEAD

Commissions. Fee.

Total of Fee and Commis-

Price per Payable when final Proof is

Payable when Entry is made.

Payable when Entry is made.

On lands in California, Nevada, Oregon, Colorado, and in the Territories of Arizona, Idaho, Montana, New Mexico, Utah, Washington, and Wyoming, the commissions are 50 per cent. greater, but the fees are as given above.

If the settler docs not wish to remain five years upon his land, the law permits him to pay for it with cash, military bounty land warrants, or agricultural college, private claim, or certain other scrip, upon making proof of resideuce and cultivation for a period of not less than six months from date of entry. Scrip is a paper issued by the Government, either asa gratuity, or in lieu of a claim for lands, and made receivable by the land bureau in payment for other lands. When the land is paid for in this way the homestead becomes virtu- ally a ‘‘pre-emption.” Every person qualified to make a homestead entry is also a qualified pre-emptor, provided he is already the owner of 820 acres of land in the United States, and does not abandon a residence on his own land, in the same State or Territory, to go upon the land he wishes to pre-empt ; but only one pre-emption can be made by any citizen. Land to the extent of 160 acres may be obtained by actual settlers under the pre-emption laws, by purchase (sections 2257 to 2288, U. S. Revised Statutes). A residence of at least six months, with cultivation and improvement of the land, is required. Pre-emption claims may be initiated upon unsurveyed lands, although in such a case title cannot be obtained until after the official survey has been made. The first step in securing a pre- emption right is to go upon the land and commence “improvements.” When this has been done, if the land is “offered” —that is, if at some time it has been offered at public sale by proclamation of the president, or otherwise—the applicant, within thirty days from date of his settlement, must file with the district land office a declaratory statement setting forth his claim ; and within one year from date of settlement he must appear before the registrar and receiver, and make proof of actual residence on and cultivation of the tract. He will then be permitted to obtain title to

the land, by locating upon it land warrants or scrip, or by paying for it with cash at the rate of $1.25 per aere, or, if within the limits of a public improvement grant, at the rate of $2.50 per acre. In case the Jand has not been offered at public sale, the applicant has three months aftcr settle- ment within which to file his declaratory statement with the local land offieers, and thirty-three months from settlement within which to make final proof and payment for the land. If the land is un- surveyed when the settlement is made, the claimant must file his declaratory statement within three months from the date of the receipt at the district land office of the approved plat of survey of the township embracing the tract. Where compliance with the requirements of the homestead or pre-emption laws is rendered diffi- cult or impossible in consequence of the destruction of crops by grasshoppers, an absence of one year is allowed, during which time no adverse right can accrue. Public notice by advertisement must be given, under direction of the registrar, before final proof can be made in homestead and pre-emption entries.

Under the homestead laws the land is virtually a gift to the settler by the Government, in consideration of settlement and cultivation, the fees charged being about sufficient to cover the cost of entry and conveyance. Under the pre-emption laws the right of purehase is conceded to the actual settler only. With regard to the value of improvements which must be put upon the land in order to entitle the claimant to make final proof and obtain a patent, nothing is definitely stated in the laws themselves, and no absolute rule has been laid down by the general land office ; it can only be said generally that homestead and pre-emption improvements niust be sufficient to satisfy the land officers that settlement has been made in good faith. “A habitable house, which must be used as the home of the settler, with his family, if he is the head of a family, 1s always required, and a part of the claim must be brought under cultivation,

It will be noted that under the homestead laws none but citizens of the United States, native or naturalized, can make final proof and receive a patent, while a pre-emption entry may be made and consummated by a settler who has declared his intention to become @ citizen, whether or not he has taken out his final citizenship Papers. After a settler has exercised his right of pre-emption, and obtained title to his claim, there is nothing in the

laws or in the regulations of the department to prevent him from proceeding to settle upon another tract under the homestead law; and he may

also, during the time he is residing upon his pre-emption or home- stead claim, make entry of 160 acres under the “timber culture act.” tis possible for a settler in this way to acquire title to an aggregate quantity of 480 acres; and this is frequently done. The privileges of the land laws of the United States are extended equally to male and female citizens. Lands entered under the homestead and pre-emption laws are exempt from taxation during the term of residence necessary to acquire title ; and in a majority of the States such lands are not taxable until a patent has been issued. Upon the death of a claimant under the homestead, pre-emption, or tim- ie culture laws, any rights he may have aequired aecrue to his eirs.

Large portions of the unoceupicd public lands of the United States are devoid of timber. “To encourage the growth of timber on the western prairies ” the following privileges are granted by the Act of March 8, 1878, and subsequent amendments. Any person who is the head of a family or over twenty-one years of age, and who is a citizen of the United States, or has declared his intention to become such, may enter as a ‘‘timber culture” claim one-quarter section (160 acres) of prairie land, upon making affi- davit to the fact that he desires for his own benefit to plant and cultivate timber upon the tract. The section of land in which such an entry is made must be naturally devoid of timber, and only one- quarter of any one section can be entered. A person making an entry of 160 acres is required to break or plough 5 acres during the first year and 5 acres in addition during the sccond year. The 5 acres broken or ploughed during the first year he is required to cultivate during the second year, and to plant in timber, seeds, or cuttings during the third year. The 5 acres broken or ploughed during the second year he is required to cultivate during the third year, and to plant in timber, seeds, or cuttings during the fourth year, Land embraced in entries of a less qnantity than one-quarter section must be cultivated and planted during the same periods and in the same proportion, viz., to the amount of one-sixteenth of the area elaimed. The trees must be such as are suitable for timber, the culti- vation of fruit trees and shrubbery not being sufficient.

Provision is made under the act for au extension of time in case the trees, seeds, or cuttings planted should be destroyed by grasshoppers or by extreme and unusual drought. If, at the expiration of eight years from the date of entry, or at any time within five years thereafter, the claim- ant shall prove by two credible witnesses that he has successfully cultivated the required amount of timber for not less than eight years, according to the provisions of the act of June 14, 1878, he Will be entitled toa patent for the land embraccd in the entry. At any time after one year from the date of entry, if the applicant fails to comply with any of the requirements of the act, his claim becomes liable to contest, and, upon due proof of such failure, the entry will be cancelled and the land become again subject to entry under the homestead laws, or by some other person, under the Act of June 14, 1878, The fces for timber culture entries are $10 if the tract applicd for is more than 80 acres, and $5 if it is 80 acres or less. 'I'he commissions on all entries are $4 at the date of entry, and $4 at the date of final proof.

The foregoing statements refer to public lands which are agri- cultural in character, There are special laws for the disposal of desert lands, mineral lands, town sites on the public domain, and lands which are unfit for cultivation, and valuable chiefly for timber or stone.

By desert lands is meant a class of lands which will not, without irrigation, '' produce any agricultural crop." Title to such lands in any of the following States and Territories may be acquired under Act of Congress of March 8, 1877:—the States of California, Oregon, and Nevada, and the Territories of Washington, Idaho, Montana, Utah, Wyoming, Arizona, New Mexico, and Dakota. Any person desiring to avail himself thereof must file with the registrar and receiver of the proper land office a declaration, under oath, setting forth that the applicantis a citizen of the United States or that he has declared his intention to become such, that he has made no other declaration for desert lands, and that he intends to reclaim the tract applied for, not cxceeding one section, by conducting water thereon within three years from the date of his declaration ; and he must show by the testimony of at least two disinterested and credible witnesses that the tract applied for is desert land. After this proof has been made to the satisfaction of the district officers, 25 cents per acre will be received from the applicant as a prelimi- nary payment for the land. At any time within three years after the date of

the filing of his declaration the claimant may offer proof that he has conducted water upon the land, which proof must consist of the testimony of at least two disinterested and credible witnesses. When such proof is satisfactory to the district officers, the final payment of $1 per acre may be made, and the papers will be forwarded to the general land offiee at Washington, as the basis for a patent.

The laws extending the homestead, pre-emption, timber culture, and desert land entry privileges make bona jide settlement or im- provement of the land a condition precedent to obtaining title. The United States Government does not offer at public sale any of

its lands in the western or north-western States or Territories ; but in the States of Florida, Arkansas, Alabama, Mississippi, and Louisiana there are still large tracts of land which may be bought at the minimum price of $1.25, or at the double minimum price of $2.50 per acre. ; :

The laws providing for the reservation and sale of town sites on the public lands are found in title 32, chapter 8, of the revised statutes of the United States. Persons who desire to found a city or town may acquire title by purchase to the extent of the tract occupied for town purposes, depending upon the number of occu- pants, viz., 100 to 200 inhabitants, 320 acres ; 200 to 1000 inhabit- ants, 640 acres ; 1000 inhabitants, 1280 acres; and 320 acres for each additional 1000 inhabitants, not exceeding 5000 in all. if the town be incorporated, the entry must be made by its mayor or legal representative—if unincorporated, by the county court acting as trustee—tfor the use and bencfit of the several occupants. The patent is issued to the mayor or judge in trust for the purchaser, and the State or Territorial legislature must provide the mode of distribution of the lots.

Mineral lands are subject to exploration, occupation, and purchase by citizens or those who have made declaration of intention to be- come citizens of the United States. Indefinite occupation, without purchase, is secured under some circumstances by certain annual expenditures upon a mining claim. There is no restriction by United States laws of the number of locations one man may make or own by purchase from other locators.

The present area of vacant surveyed Government lands in the United States is about 134,600,000 acres, the area unsurveyed being 1,080, 000,000 acres.

The public lands referred to in this article are found only in the States of Alabama, Arkansas, California, Colorado, Florida, lowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, Oregon, Wisconsin, and the Territorics of Ariz- ona, Dakota, Idaho, Montana, New Mexico, Utah, Washington, and Wyoming. Throughout these States and Territories the laud laws are uniform. When Texas was admitted into the Union the disposal of its peer lands was reserved to the State, and it has therefore a land system of its own, which, although rather com- plicated, does not differ essentially from the land poner of the United States as indicated above. Under the laws of Texas, every person who is the head of a family and without a homestead may acquire title to 160 acres of land, by living upon it and cultivating it for three years ; and every single man over the age of eightecn years may so acquire title to 80 acres. ‘‘ Every person over the age of eighteen years, who is a citizen of the State of Texas, and who shall hereafter in good faith settle upon and occupy any part of the unappropriated public domain, not exceeding 160 acres, shall have the right to purchase the same at the sum of $1 per acre.” But this right of pre-emption is not conceded to any one who is the owner of 160 acres of land in Texas, or who abandons a residence on his own land in that State to take up a residence on the public lands. The extensive school lands of Tcxas are purchasable by actual settlers in tracts of 80 to 160 acres at their actual value, to be determined by appraisement, ‘‘ but in no case for a less price than $1.50 per acre.” (By 2) He)

HOMEYER, Kart Gustav (1795-1874), was born August 13, 1795, at Wolgast, a small town in Pomerania, which at that time was still Swedish territory. After a four years’ stay in Sweden, whither his father, a merchant, had taken him in 1806, and where he may have laid the foundation of that knowledge of the languages and laws of the North which is so conspicuous in his later works, he was in 1810 received into the house of his uncle Riihs, the learned historian, who had just been called to the professor- ship of history at the newly-founded university of Berlin. He subsequently went through the course of law study at the universities of Berlin, Gottingen, and Heidelberg (1813- 1817). It was in Berlin especially that he was introduced

to the principles of the so-called historical school of the science of law by Savigny and Eichhorn, who were his principal teachers. In 1821 he settled as a privat-docent at the university of Berlin, where he was promoted to an extraordinary professorship in 1824, and to the ordinary German law chair in 1827. His principal works are his edition of the Sachsenspiegel (in 3 vols., containing also some other important sources of Saxon or Low German law), which is still unsurpassed in accuracy and sagacity of research, and his book on Die Haus- und Hofmarken (1870), in which he has given a history of the use of trade- marks among all the Teutonic nations of Europe, and

with the axe to cut down the tree,

which is full of important elucidations of the history of law and also contains valuable contributions to the history of art and civilization. In 1850 Homeyer was elected a member of the Berlin Academy of Sciences, in the Trans. actions of which he published various papers exhibiting profound learning (“ Ueber die Heimath,” 1852; “Gene. alogie der Handschriften des Sachsenspiegels,” 1859; ‘ Die Stadtbiicher des Mittelalters,” 1860; ‘‘ Der Dreissigste,” 1864, &c.). He died October 20, 1874.

HOMICIDE, in law, is the act of killing a human being, whether such act be criminal or not. Blackstone distin- guishes three kinds of homicide—(1) justifiable, (2) excus. able, and (3) felonious.

The most important case of justifiable homicide is the execution of a criminal in due course of public justice. This condition is most stringently interpreted. ‘To kill the greatest of malefactors deliberately, uncompelled, and extra- judicially is murder… . And further, if judgment of death be given by a judge not authorized by lawful com- mission, and execution is done accordingly, the judge is guilty of murder” (Stephen’s Commentaries, book vi. C. vam The execution niust be carried out by the proper officer or his deputy: any person executing the sentence without such authority, were it the judge himself, would be guilty of murder. And the sentence must be strictly pursued: to execute a criminal by a kind of death other than that to which he has been judicially condemned is murder.

Homicide committed by an officer of justice in the course of carrying out his duty, as such, is also justifiable; eg,, where a person resists a legal arrest and is killed in the struggle ; where officers in dispersing a riotous assemblage kill any of the mob, &. In these cases the homicide must be shown to have been absolutely necessary. Again, homicide committed for the prevention of forcible and heinous crime, such as violent robbery, or murder, or house- breaking during the night, is justifiable.

Excusable homicide is homicide committed either by misadventure or in self-defence. In the former case, where a man in the course of doing some lawful work, accidentally and without intention kills another, the homicide is excused; e.g., Shooting at a mark and undesignedly hitting and kill- ing aman. The act must be strictly lawful, aud death by misadventure in unlawful sports is not a case of excusable homicide. Homicide in self-defence is excusable when the slayer is himself in immediate danger of death, and has done all he could to avoid the assault. Accordingly, if he strikes and kills his assailant after the assault is over, this is not excusable homicide. And if the assault has been premeditated, as in the case of a duel, the death of either antagonist is murder, and not excusable homicide. The excuse of se defendendo covers the case in which a person in defence of others whom it is his duty to protect—children, wife, master, &c.—kills an assailant. It has been con- sidered doubtful whether the plea of self-defence is avail- able to one who has himself provoked a fray, in the course of which he is so pressed by his antagonist that his only resource is to kill him.

The distinction between excusable and justifiable homr cides refers back to a period in the history of the law when the former were considered to carry with them some taint of guilt, and to require some kind of punishment or expia- tion. In early law homicide, however innocent, subjects the slayer to the lawful vengeance of the kindred. of the dead man. Welhave a good example of this feeling in the J ewish institution of cities of refuge, to which innocent manslayers might flee from the avenger of blood. The case mentioned in Deut. xix. 5 is a typical instance of what we should call excusable homicide :—“A man goeth into the wood with his neighbour to hew wood, and his hand fetcheth a stroke and the head slippeth

from the helve, and lighteth upon his neighbour, that he die.” In English law, the same feeling long remained. Excusable homicide involved at least forfeiture of goods, which, however, might be recovered as a matter of course by the innocent criminal obtaining a pardon and writ of restitution. Afterwards judges appear to have been in the habit of directing an acquittal in such cases. It is only by a statute so recent as 9 Geo. IV. c. 31 that the innocence of excusable homicide is expressly declared.

Felonious homicide includes SuicipE, MANSLAUGHTER, and MurperR —the law rclating to which is discussed under the different headings. These distinctions of the English law correspond generally to those of other systems. The chief difficulty is the definition of murder—the distinction between the highest and second degree of criminal homi- cide. In English law the element of malice aforethought chiefly distinguishes murder from manslaughter. In Scot- land the term culpable homicide is the equivalent of the manslaughter of English law.

HOMILY, HOMILIARIUM, BOOKS OF HOMILIES. The word 6uAta from dptrety (duod, ciAw), meaning com- munion, intercourse, and especially interchange of thought and feeling by means of words (conversation), was early employed in classical Greek to denote the instruction which a philosopher gave to his pupils in familiar talk (Xen., Mfem., I, ii. 6,15). This usage of the word was long preserved (Allian, V. Z., iii. 19); and the éuerroas of Acts xx. 11 may safely be taken to assign not only a free and informal but also a didactic character to the apostle Paul’s discourse in the upper chamber at Troas, when “‘he talked a long while, even till break of day.” That the “talk” on that occasion partook of the nature of the “ exposition” (“Y)4) of Scrip- ture, which, undertaken by a priest, elder, or other compe- tent person, had become a regular part of the service of the Jewish synagogue,! may also with much probability be assumed. ‘The custom of delivering expositions or com- ments more or less extemporaneous on the lessons of the day at all events passed over soon and readily into the Christian Church, as may be gathered from the first Apology (c. 67) of Justin Martyr, where we read that, in connexion with the practice of reading portions from the collected writings of the prophets and from the memoirs of the apostles, it had by that time become usual for the presiding minister to deliver a discourse in which “he admonishes the

people, stirring them up to an imitation of the good works which have been brought before their notice.” This discourse, from its explanatory character, and from the easy conversational manner of its delivery, was for a long time called émAia rather than Adyos; it was regarded as part of the regular duty of the bishop, but he could devolve it, if he though fit, ou a presbyter, or deacon, or even on a lay- man, An early and well-known instance of such delegation is that mentioned by Eusebius (Z. Z., vi. 19) in the case of Origen (216 a.v.).2 In course of time the exposition of the lesson for the day came more frequently to assume a more elaborate character, and to pass into the category of a Adyos or even rocodia or dirooddypa ; but when it did so the fact was as far as possible denoted by a change of name, the word éyAia being reserved for the expository or exegetical lecture as distinguished from the pulpit oration or sermon. While the church of the 3d and 4th centuries

1 : : a efi 630). Quod omnis probus liber, sec. 12 (ed. Mangey, ii. 458; th aaa (ZZ. HZ. vii. 19) mentions that in Alexandria in his day 7 € bishop alone was in the custom of preaching; but this, he implies, a. very exceptional state of matters, dating only from the time of 3m, : a To the more strictly exegetical lectures the names étnyheers, a peo efnyntikd, exOécess, were sometimes applied. But as no oe ar discourse delivered from the pulpit could ever be exclusively Pository and as on the other hand every sermon professing to be

could point to a brilliant succession of great preachers, whose discourses were wont to be taken down in short hand and circulated among the Christian public as edifying read- ing, it does not appear that the supply of ordinary homile- tical talent kept pace with the rapidity of her extension throughout the Roman empire. In the smaller and remoter communities it not uncommonly happened that the minister was totally unqualified to undertake the work of preaching ; and though, as is curiously shown by the case of Rome (Sozom., H, #., vii. 19), the regular exposition of the appointed lessons was by no means regarded as part of the necessary business of a church, it was generally felt to be advisable that some provision should be made for the public instruction of congregations. Even in Jerome’s time (De Vir. Iil., c. 115), accordingly, it had become usual to

read, in the regular meetings of the churches which were not so fortunate as to possess a competent preaclier, the written discourses of celebrated fathers ; and at a consider- ably later period we have on record the canon of at least one provincial council (that of Vaux, probably the third, held in 529 a.p.), positively enjoining that if the presbyter through any infirmity is unable himself to preach, “ homilies of the holy fathers ” (homiliz sanctorum patrum) are to be read by the deacons. Thus the finally fixed meaning of the word homily as an ecclesiastical term came to be a written discourse (generally possessing the sanction of some great name) read in church by or for the officiating clergy- man when from any cause he was unable to deliver a sermon of his own. As the standard of clerical education sank during the dark ages, the habit of using the sermons of others became almost universal. Among the authors whose works were found specially serviceable in this way may be mentioned the Venerable Bede, who is credited with no fewer than 140 homilies in the Basel and Cologne editions of his works, and who certainly was the author of many Homilie de Tempore which were much in vogue during the 8th and following centuries. Prior to Charlemagne it is probable that several other collections of homilies had obtained considerable popularity, but in the time of that emperor these had suffered so many mutilations and corrup- tions that an authoritative revision was felt to be impera- tively necessary. The result was the well-known Homilia- rium, prepared by Paul Warnefrid, otherwise known as Paulus Diaconus.* It consists of 176 homilies arranged in order for all the Sundays and festivals of the ecclesiastical year; and probably was completed before the year 780. Though written in Latin, its discourses were doubtless intended to be delivered in the vulgar tongue ; the clergy, however, were often too indolent or too ignorant for this, although by more than one provincial council they were enjoined to exert themselves so that they might be able to do so.5 Hence an important form of literary activity came to be the translation of the homilies approved by the church into the vernacular. Thus we find Alfred the Great trans- lating the homilies of Bede ; and in a similar manner arose based on Scripture required to be more or less ‘‘ exegetical” and ‘

4 It was first printed at Spires in 1482. In the Cologne edition of 1530 the title runs—Homilie seu mavis sermones sive conciones ad populum, preestantissimorum ecclesice doctorum Hieronymi, Augustini, Ambrosii,

Gregorii, Origenis, Chrysostomi, Bede, &c., in hunc ordi- nem digestee per Alchuinum levitam, idque injungente ei Carolo M. Rom. Imp. cui a secretis fut. Though thus attributed here to Alcuin, who is known to have revised the Lectionary or Comes Hieronymi, the compilation of the Homiliariwm is in the emperor's own commission entrusted to Paul, to whom it is assigned in the earlier printed

editions also. 5 Neander, Church History, v. 174 (Eng. transl. of 1851).

Elfric's AngloSaxon Homilies aud the German Homilia- rium of Ottfried of Weissenburg. Such Homiliaria as were in use in England down to the end of the 15th century were at the time of the Reformation eagerly sought for and destroyed, so that they are now extremely rare, and the few copies which have been preserved are generally in a mutilated or imperfect form.?

The Books of Homilies referred to in the 35th Article of the Church of England originated at a convocation in 1542, at which it was agreed "to make certain homilies for stay of such errors as were then by ignorant preachers sparkled among the people." Certain homilies accordingly, composed by dignitaries of the lower house, were in the following year produced by the prolocutor ; and after some delay a volume was published in 1547 entitled Certain sermons or homilies appointed by the King's Majesty to be declared and read by all parsons, vicars, or curates every Sunday in their churches where they have cure. In 1563 a second Book of Homilies was submitted along with the 39 Articles to convocation ; it was issued the same year under the title Zhe second Tome of Homilies of such matters as were promised and instituted in the former part of Homilies, set out by the authority of the Queen's Majesty, and to be read in every Parish Church agreeably. Of the twelve homilies contained in the first book, four (the Ist, 2d, 3d, and 4th) are probably to be attributed to Cranmer, and one (the 12th) possibly to Latimer ; one (the 6th) is by Bonner ; another (tle 2d) is by Harpsfield, archdeacon of London, and a third (the 11th) by Becon, one of Cranmer's chap- lains. The authorship of the 8th and 10th is quite un- known; and Becon and Ridley have been only doubtfully conjectured as the authors of the 7th and 9th respectively. The second book consists of twenty-two homilies, of which the Ist, 2d, 3d, 7th, 8th, 9th, 16th, and 17th

have been assigned to Jewel, the 4th to Grindal, the 5th and 6th to Pilkington, and the 18th to Parker. See the critical edition by Griffiths, Oxford, 1869. For The Clementine Homilies see Aposrotic Faturs, vol. ii. p. 196.

HOMEOPATHY (from épnovord Gea, a similarity of feel- ing or condition) as a distinctive system of medicine owes its origin to Hahnemann, a German physician (see HAHNE- MANN). It is customary to regard homceopathy as a mere system of therapeutics, having reference only to the ques- tion how and on what principle is disease to be treated. But a careful student of Hahnemann or of his Organon will soon discover that the system with which his name is fundamentally associated is one not merely of therapeutics but of pathology, and that any complete exposition of it must embrace an account of Hahnemann's views of the ultimate nature and cause of disease, as well as of the remedies by which it is to be combated, and the principles or principle on which these are to be selected.

Hahnemann taught that disease is to be regarded as consisting essentially of the symptoms of it as experienced and expressed by the patient, or as detected by the physi- cian; in other words, that the chief symptoms, or the "totality of the symptoms," constitute the disease, and that disease is in no case caused by any material substance, but is only and always a peculiar, virtual, dynamic derange- ment of the health. ‘‘ Diseases" (Introduction to the Organon, p. 17) "will not cease to be spiritual dynamic derangements of our spiritual vital principle." He says on page 3 of the Organon, ‘‘ For as far the greatest number of diseases are of dynamic (spiritual) origin and dynamic (spiritual) nature, their cause is therefore not perceptible

1 An ancient English metrical homiliarium exists in the library of

the university of Cambridge, of which earlier versions have existed, and a portion of perhaps the earliest copy, dating from about the middle of the 13th century, was published in 1862 by Mr J. Small, librarian to the university of Edinburgh.

to the senses;” and at page 18, referring “‘ to small-pox, a disease accompanied by almost general suppuration,” he asks, “is it possible to entertain the idea of a material morbific matter being introduced into the blood?” He held that the psoric miasm, of which the itch is the out- ward and visible and comparatively harmless sign, was at the root of nearly all chronic disease, viz., of all chronic disease that was not due to syphilis or sycosis. us in a note to the 80th section of the Organon that he spent twelve years in the investigations which led to the discovery of that great source of chronic disease and of its remedies (antipsoric remedies). It was a very essential part of Hahnemann’s teaching that nature is a bad physician, and not to be much trusted ; that drugs are the real cura- tive agents provided bythe beneficence of the Almighty ; that drugs given to healthy persons have a power of producing symptoms of disease. produced by drugs in healthy persons is called technically

He tells

The ascertainment of the symptoms

“proving,” and the record of such provings constitutes a

large part of the literature of homceopathy. This power of drugs he perpetuallyrefers to as their “ pathogenetic power.”

His great therapeutical doctrine, for formulating which his

followers call him, with doubtful taste, “the Messiah of

Medicine,” was to this effect, that there is a correspondence

between the symptoms produced by any given drug ad-

ministered to a healthy person and its power of curing any given disease, and that the remedy for any given disease, that is, for any set of symptoms ‘‘in their totality,” is that

drug which, given to any healthy person, will produce the

most perfect imitation of the said set of symptoms; in other words, Similia similibus curantur. Further, the dose of medicine is to be so attenuated as to cure the disease without hurting the patient. This attenuation of medicines constitutes, not only the most popular note of the system of Hahnemann, but that feature of it which is most characteristic of his own views and practice, and which in well-known words he declared to be established beyond the reach of cavil from future experience either of allopaths or of practitioners of the " new mongrel system made up of a mixture of allopathic and homeopathic pro- cesses." He gives minute directions as to the processes by which this attenuation is to be achieved, the principal of which are trituration, succussion, and dilution. These processes developed what he called the " spiritual power which lies hid in the inner nature of medicines" (20th section of the Organon). Hahnemann held that medicines became, for curative purposes, more powerful as they became more attenuated; in his last edition of the Organon (1833), and in its last pages, he gave the most expressive evidence of his belief in the virtue of attenua- tion by saying that he could scarcely name one disease which in the last year he and his assistants had not treated with the most happy results, solely by means of "olfaction"; and he added that a patient even destitute of the sense of smell may expect an equally perfect action and cure from the medicine by olfaction. He condemned strongly the administration simultaneously of a number of medicines, and insisted that only one should be given at a time, Finally, it would be unjust to him not to bear in mind that he claimed to base his views and practice on exper ence and sound experiment. Some points of his system were borrowed by Hahnemann from previous writers—as, indeed, he himself, though imperfectly, admits. Not to mention others, he was anticipated by Hippocrates, and especially by Paracelsus (1495-1541), in his doctrine of Similia similibus curantur, if not in its exclusive applica tion. 'These identical words occur in the Geneva edition (1658) of the works of Paracelsus, as a marginal heading ue one of the paragraphs; and in the 'Fragmenta Medica, Op. Omnia, vol. i. 168, 169, occurs the following passage+—

mom ad OP ArT @ Y

Simile sinvilis cura; non contrarium.

*‘ Quisquis enim cum laude agere Medicum volet, is has nugas longe valere jubeat. Nec enim ullus unquam morbus calidus per frigida sanatus fuit, nec frigidus per calida. Simile autem suum simile frequenter curavit, scilicet Mercurius sulphur, et sulphur Mercurium ; et sal illa, velut et illa sal. Interdum quidem cum proprietate junctum frigidum sanavit calidum; sed id non factuin egt ratione frigidi, verum ratione nature alterius, quam a primo illo omnino diversam facimus.”

It is very remarkable that in Hahnemanu’s enumeration of authors who anticipated him in regard to the doctrine of Similia, he makes no mention of the views of Para- celsus, thongh the very words seem to be taken from the works of that physician. The other point in Hahnemann’s doctrine—that medicines should be tried first on healthy persons—he admits to have been enunciated by Haller. Roughly it has been acted on by physicians in all ages, but certainly more systematically since Hahnemann’s time, though the result is often not such as to support his theory in regard to the action of medicine on the diseased as com- pared with the healthy body.

In the most characteristic feature of Hahnemann’s practice—“ the potentizing,” ‘‘dynamizing,” of medicinal substances—he appears to have been origina]. It has been generally affirmed that he was led to adopt his doctrine of “attenuation” by the fact that the medicines he adminis- tered produced similar effects to those uf the disease, and that in any gross quantity, as he admitted, they would aggravate matters. But another and a chief reason is to be found in his views of the “spiritual,” “ immaterial,” “dynamic” origin of disease, and his resentment against the old modes of practice of medicine.

The followers of Hahnemann are true to him in making light comparatively of pathological facts, and giving their main attention to therapeutics. They are still concerned mainly with medicines, and one very large American encyclopedia is devoted exclusively to a record of ‘‘ Prov- ings”; it is edited by Dr Timothy Allen, professor of materia medica and therapeutics in the New York Homeopathic Medical College. For some years Halnemann’s disciples continued pretty faithful to the doctrine of Simélia similibus curantur, but they were not long in making some changes in it. We can only notice a few of the leading deviations. Dr Sharp, of Rugby, who has striven

hard to overcome objectors, while admitting the doctrine of Similia, requires that it have regard, not to mere symptoms, but to the seat and pathology of the case; that the drug used be one which shall affect the organ at fault. Homeopathy cannot become a science till it is founded on what he calls Organopathy, or a much more careful consideration of the seat of disease than is involved in Hahnemann's views, who, he complains, passionately rejected pathology and morbid anatomy. Re- cently a leading homeeopathist has published a book, the very title of which contradicts the doctrine of his master. Hahnemann maintains that cures never were effected in any other manner than by means of medicines of homeeopathic power (Organon, p. 100), and that, whenever cures were wrought by those who did not understand homeopathy, it was in virtue of the homeeopathic law, "the only law con- sonant to nature." But in 1878 Dr Kidd, the leading con- sultant among homeopathic practitioners in London, pub- lished a book on the Laws of Therapeutics. It is true that he does not carry the pluralizing far: he only substitutes two for Hahnemann's one law ; but it is not the less a very remarkable departure. He is still faithful to the idea of a relationship between the action of medicines on the healthy and their curative value in sickness; but the law of Similia is sadly compromised. "In most cases that relationship is either of similarity or of contraricty."

Looking," says he, "to the observation of facts apart from theoretic speculations, two primary laws of therapeutics

unfold themselves. Those two laws of therapeutics may well be called Galen's law, founded upon the rule of con- trarva contrariis, and Hahnemann's or the homeopathic law, founded upon the relationship of similars." This is certainly a comprehensive if a rather unphilosophical generalization. The practice of Hahnemann as to the use of highly at- tenuated doses of medicine is evidently not more closely adhered to than his doctrine of Stmilia, This fact is the subject of complaint in homeeopathic journals. The Med? cal Investigator, in 1876, says reprovingly: "How many claiming to be homeopaths are daily entirely disregarding the law of Similia. It is getting to be quite a rare thing to hear of a homceopathic practitioner conducting a serious case from beginning to end without using

as such cathar- tics, sudorifics, diuretics, &c., in direct Opposition to our law ; not only are these drugs used in this way, but there are some also go so far as to say that they cannot be dis- pensed with." Dr Wyld, the vice-president of the British Homeopathic Society, in a letter to Dr W. B. Richardson, published in the Lancet of June 2, 1877, arguing for an abolition of the schism of the profession on this question, thus sums up the admissions which he as a somewhat repre- sentative man was prepared to make:—" First, that the views expressed by Hahnemann are often extravagant and incorrect ; Secondly, that Hippocrates was right when he said some diseases are best treated by similars and some by contraries, and therefore it is unwise and incorrect to assume the title of homeopathist ; Thirdly, that although many believe that the action of the infinitesimal in nature can be demonstrated, its use in medicine is practically by a large number in this country all but abandoned." It must not, however, be supposed that there are not many true believers in Hahnemann's doctrines both of Similia, &c., and of infinitesimal doses, extending even to olfactions. In fact, one recent writer goes beyond Hahnemann. In the Homeopathic Observer, after many years of anxious experi- menting, he claims to have discovered decided results from olfaction, or the smelling of medicines, but more especially by means of medicines contained in closed vessels held in the hand. Mons. Granier, of Nimes, carries the dynamic theory of Hahnemann farther than its author. '" Medi- cines," he says, "'are fluidic powers, they are beings (étres) that man may create at his will. I wish I could say they are occult powers, forming the chain of fluidic connection between the world and the tomb; but I am convinced in my own mind that, placed on the limits of fluidic dynamism, our observation might cast its scrutinizing glance into the unseen world."

Homeopathy has a considerable number of adherents in Great Britain, in the United States, and on the continent of Europe. In order to ascertain the esteem accorded to it in the land of its origin, inquiries have been made of neutral and unbiassed authorities, and the general result is that it has no scientific recognition, but that many of the public believe in it, and consult practitioners who profess to practise it. The system has no place in any of the universities of Germany, nor does it seem to have a single school of its own in the entire German empire. It is universally condemned in Germany by men who have anything to do with biological science, and even in the

lectures on therapeutics it is not mentioned at all. In Great Britain the Medical Act of 1858 gives power to the Privy Council severely to prohibit attempts by any examin- ing body to impose restrictions as to any theory of medi- cine or surgery on candidates for examination. There is a homeeopathic hospital with 100 beds in London, to which is attached a homeopathic school (see Dr Wyld in Lancet, June 2, 1877). Homeopathy is not strong in England. There are said to be 105 homeopathic practitioners in London. In Great Britain and Ireland, with a population

of thirty-five millions, there are but 275 homceopathic physicians. Liverpool and Glasgow, each with about half

a million of population, have respectively fifteen and five homeeopathic doctors. The somewhat weak and failing condition of homceopathy in Britain is thus contrasted by a writer in the monthly Homeopathic Review for January 1880 with its condition in America: in four chief Ameri- can cities there are 462 homeopathic doctors, in four English towns 139; in New York city the homceopathic physicians are to the allopathic as 1 to 6, in London the proportion is 1 to 20. The writer attributes the lower condition of homeopathy in England to the fact “ that it has ceased to be a novelty, that it has revolutionized orthodox medicine, and that many of our own men (homeeopathic practitioners) abjure the minute doses which served so well in the hands of Hahnemann and many of his earlier disciples.” But all these facts or factors must obtain equally in America. It is probable that the dif- ferent system of medical education and qualification in the two countries has something to do with the difference. In the United States homeopathy has naturally had freer scope than in Europe. Some have estimated the propor- tion of homceopathic practitioners in the States as being one-eighth of the whole number of legally qualified prac- titioners. Every State determines for itself the conditions of qualification in medicine; and there is thus a vast number of separate medical schools giving both education and diplomas. Consequently there is a serious inequality in the severity of medical education and examination. In some States, as in that of Michigan, the legislature has engrafted on the university a department for teaching its youth the principles and therapeutics of homceopathy ; and very lately the

same legislature has provided a hospital for the homceopathic treatment of disease.

In all countries the doctrine of homeopathy is still with- out broad scientific recognition ; and certainly in England its chief representatives are anxious to cease their existence as a distinctive school, and have, by their avowed departure from Hahnemann's law of Similia, and his mode of attenu- ating and administering medicines, brought themselves under the severest condemnation of their master's few faithful followers, amongst whom are still included men of high character. We need not discuss in detail the indi- vidual doctrines of Hahnemann, especially those just referred to, as they are scarcely fought for by those who now represent what remains of the homeceopathic school. Hahnemann's fundamental views of disease deserve more attention. He despised any deep study of disease, and theorized about it instead. Had he carefully inquired into the nature and natural history of disease as Hippocrates did, or as he himself inquired into the sensations of those who took infinitesimal doses, he would have done more for the world and his own reputation. Hahnemann was easily captivated by theories, and not very sound in his reasoning. But underlying all his system, as we have seen, was the idea that the causes of disease were impalpable, immaterial, spiritual, dynamic. And this great foundation was rotten. Modern medicine is doing some of its best work in show- ing the material and the visible character of the causes of many of the commonest diseases, and suggests this in many cases where it has not as yet been demonstrated. The cause of many diseases is shown to be a living germ or particle which can be discerned under the microscope, can be carried on a lancet or in a tube, and inserted under the skin so as to produce its peculiar disease. This is true of small-pox, Hahnemann notwithstanding. Thegerm can be preserved or it can be killed, and thus disease can be propagated or prevented. The close air of workshops, which generates consumption in such amount, can be shown to be full of impurities, chemical or organic. The

causes of other diseases are often, not merely visible under a microscope, but coarsely visible. We have been lately told on high authority that to produce certain forms of blood-poisoning one or two ounces at least of

septic fluid are necessary. So with other forms of common disease, Alcohol does not destroy a liver or kidney in any dynamic or immaterial form, but in coarse quantities diligently repeated. The lead which paralyses the painter's wrist is not a "spiritual " thing. It is an accumulation of matter in the wrong place, and enters his body in palpable quanti. ties, and, what is more, can be recovered in similar quanti- ties from his body. So with the uric acid or its salts in the blood of a person who has inherited his father's gout, and perhaps his port wine. It is not a " spiritual " affair at all, but can be demonstrated chemically and under the microscope. The itch, to whose mysterious workings Hahnemann attributed two-thirds of the internal diseases of the body, including mania, cancer, gout, &c., is easily demonstrated to be dependent on an ugly crab-like insect, which can be destroyed in a few hours with sulphur, when there is an end both of it and of the itch. We are aware of the euphemistic form which is given to Hahnemann's views of the psoric or itch disease ; and we are partly dis. posed to admit, with the late Professor Henderson, the ablest and wisest of Hahnemann's supporters in England, that Hahnemann was unfortunate in the exposition of his own views of this subject. But Hahnemann's fine but fundamental theories about the spiritual and dynamic origin of disease are all exploded by the revelations of modern pathology, and their demolition only completes that of his therapeutical theories which rested on them.

Still it does not follow that homceopathy has been of no use. Hahnemann deserves the credit of being the first to break decidedly with the old school of medical practice, in which, forgetful of the teachings of Hippocrates, nature was either overlooked or rudely opposed by wrong and ungentle methods. He was so dissatisfied with this system that he gave up practice. We can scarcely now estimate the force of character and of courage which was implied, eighty years back, in abandoning the common lines of medicine. More than this, he and his followers showed results in the treat- ment of disease which compared very favourably with the results of orthodox practice. But they entirely missed the right conclusion from their experience. Let us take, for example, the statistics of the treatment of inflammation of the lung (pneumonia), adduced, not by Hahnemann,—for it is one of his very weak points that he did not record cases, —but, after his death, by Dr Fleischmann of Vienna. Dr Henderson quotes these and other homeopathic statistics with great satisfaction, and undoubtedly and properly

they produced a great effect, showing a mortality of 1 in 21 cases only, which was a much higher percentage of success than under the ordinary treatment, But these statistics have since been entirely eclipsed by the minute and historical record of cases treated in the Edinburgh Infirmary, where the late Dr Hughes Bennett treated 105 cases of acute pneumonia, extending over sixteen years, without one death. Still we must admit that Fleischmann's results were greatly better than the old ones, and that but for the homeopathic practice, which most practitioners regarded as a negation, tantamount to leaving the disease to nature, the emancipation from traditional methods of treatment would have been much slower than it was.

Besides this, homceopathy may be credited with two other services. Ithas given prominence to the therapeutical side of medicine, and has done much to stimulate the study of the physiological action of drugs. No doubt Hahnemand completely erred in despising nature, and in magnifying medicines in the cure of disease. But his very methods showed, unintentionally on his part, what nature could do ;

and his devotion and that of his school to therapeutics has acted as a somewhat deserved rebuke to those physicians who get so absorbed in the study of disease as to forget that the great interest of mankind in it is to have it cured with as little delay as possible. It may be admitted that homeopathy has done some service in directing more special attention to various powerful drugs, such as aconite, nux vomica, belladonna, and to the advantage of giving them in simpler forms than were common before the days of Hahnemann.

Hahnemann's errors were great. His doctrine of specifics was highly retrograde and unscientific, and his disparage- ment of the principle of tulle causam and of those who aimed at discovering the causes of disease (Organon, p. 3) was unphilosophical. He was fanciful and theoretical to a very high degree. He led his followers far out of the track of sound views of disease and the methods by which it can best be prevented and cured. But, with all his defects, it must be admitted that he had the great merit of disturbing and discrediting indefensible modes of practice. (J. G. G.)

HONDA, or San Barrotommeo vE Honpa, a town of the republic of Colombia, in the state of Cundinamarca, on the left bank of the river Magdalena, about 575 miles from the sea, in 5° 11’ 42” N. lat. and 74° 41’ 6” W. long. It is regular and well-built, but none of its public edifices—churches, convents, or hospitals—call for special remark. Situated at the spot where the upward navigation of the Magdalena is stopped by a series of rapids, Honda was formerly the seat of a very considerable trade, and it still retains a certain amount of commercial importance. Goods and passengers for Bogota, the capital of Colombia, are now disembarked at Caracoli about 2 miles further down. The population of Honda is stated at 4000 or 5000. See CotomstA, vol. vi. p. 153.

HONDECOETER, Metcuror pv’ (c. 1636-1695), painter, was born at Utrecht, it is said, about 1636, and died at Amsterdam, April 3, 1695. Old historians say that, being the grandson of Gillis and son of Gisbert d’Hondecoeter, as well as nephew of J. B. Weenix, he was brought up by the last two to the profession of painting. Of Weenix we know that he married one Josina d’Hondecoeter in 1638. Melchior was, therefore, related to Weenix, who certainly influenced his style. As to Gillisand Gisbert some points still remain obscure, and it is difficult to accept the statement that they stood towards each other in the relation of father and son, since both were registered as painters at Utrecht in 1637. Both it appears had practised art before coming to Utrecht, but where they resided or what they painted ig uncertain. Unhappily pictures scarcely help us to clear up the mystery. In the Fiirstenberg collection at Donaueschingen there is a Concert of Birds dated 1620, and signed with the mono- gram G. D, H.; and we may presume that G. D. H. is the man whose Hen and Chickens in a Landscape in the gallery of Rotterdam is inscribed “G. D. Hondecoeter, 1652 ;” but we ask, Is the first letter of the monogram to stand for Gillis or Gisbert? In the museums of Dresden and Cassel landscapes with sportsmen are catalogued under the name of Gabriel de Heusch (2), one of them dated 1529, and certified with the monogram G. D. H., challenging attention by resemblance to a canvas of the same class inscribed c: D. Hond. in the Berlin Museum. The question here is also whether G. means Gillis or Gisbert. Obviously there are two artists to consider, one of whom paints birds, the other landscapes and sportsmen. Perhaps the first is Gisbert, whose son Melchior also chose birds as his peculiar subject. Weenix too would naturally teach

his nephew to study the feathered tribe. Melchior, however, began his career with a different specialty from that by which he is usually known. Mr de Stuers affirms that he produced

sea-pieces. One of his earliest works is a Tub with Fish, dated 1655, in the gallery of Brunswick. But Melchior soon abandoned fish for fowl. He acquired celebrity as a painter of birds only, which he represented not exclusively, like Fyt, as the gamekeeper's perquisite after a day's shoot- ing, or stock of a poulterer's shop, but as living beings with passions, joys, fears, and quarrels, to which naturalists will tell us that birds are subject. Without the brilliant tone and high finish of Fyt, his Dutch rival's birds are full of action ; and, as Biirger truly says, Hondecoeter displays the maternity of the hen with as much tenderness and feeling as Raphael the maternity of Madonnas. But F yt was at home in depicting the coat of deer and dogs as well as plumage. Hondecoeter cultivates a narrower field, and seldom goes beyond a cock-fight or a display of mere bird life. Very few of his pictures are dated, though more are signed. Amongst the former we should note the Jackdaw deprived of his Borrowed Plumes (1671), at the Hague, of which Earl Cadogan has a variety ; or Game and Poultry and a Spaniel hunting a Partridge (1672), in the gallery of Brussels ; or a Park with Poultry (1686) at the Hermi- tage of St Petersburg. Hondecoeter, in great favour with the magnates of the Netherlands, became a member of the painters' academy at the Hague in 1659. William ITI. employed him to paint his menagerie at Loo, and the picture, now at the Hague museum, shows that he could at a pinch overcome the difficulty of representing India's cattle, elephants, and gazelles. But he is better in homelier works, with which he adorned the royal chateaus of Bens- berg and Oranienstein at different periods of his life (Hague and Amsterdam). In 1488 Hondecoeter took the freedom of the city of Amsterdam, where he resided till his death. His earliest works are more conscientious, lighter, and more transparent than his later ones. At all times he is bold of touch and sure of eye, giving the motion of birds with great spirit and accuracy. His masterpieces are at the Hague and at Amsterdam. But there are fine examples in private col- lections in England, and in the public galleries of Berlin, Caen, Carlsruhe, Cassel, Cologne, Copenhagen, Dresden, Dublin, Florence, Glasgow, Hanover, London, Lyons

Montpellier, Munich, Paris, Rotterdam, Rouen, St Peters- burg, Stuttgardt, and Vienna.

HONDURAS

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| 7 poner a republic of Central America, formerly SeePlate

a province of the kingdom of Guatemala, deriving III. its name from the Spanish honduras, depths, in allusion, V°! it is said, to the difficulty experienced by its original ex- plorers in finding anchorage off its coast. It is bounded on the N. and E. by the Bay of Honduras and the Carib- bean Sea, extending from the mouth of the Rio Tinto, 15° 45′ N. lat. and 88° 30’ W. long., to the mouth of the Rio Wanks or Segovia, in 14° 59’ N. lat. and 83° 11’ W. long., having a coast-line of about 400 miles. On the S. it is bounded by Nicaragua, the line of division following the Rio Wanks for about two-thirds of its length, thence deflect- ing to the sources of the Rio Negro, which flows into the Gulf of Fonseca ; it has on this gulf a coast-line of about 60 miles, embracing also the islands of Tigre, Sacate Grande, and Gueguensi. Upon the W. and 8.W. it is bounded by San Salvador and Guatemala ; the line of separation there is irregular, commencing on the Gulf of Fonseca, at the mouth of the Rio Goascoran, and ending at the mouth of the Rio Tinto, on the Bay of Honduras. The republic is therefore entirely between 83° 20’ and 89° 30’ W. long. and 13° 10’ and 16° N. lat., and comprises about 40,000 square miles. The large island of Roatan, with Guanaja or Bonacca, Utila, Helena, Barbaretta, and Morat are naturally dependent on Honduras.

Mountains.—The general aspect of the country is mountainous; it is traversed by ranges of mountains and hills radiating from the common base of the Cordilleras. That chain does not, in this republic, approach within 50 or 60 miles of the Pacific; nor does it throughout maintain its general character of an unbroken range, but sometimes turns back on itself, forming

interior basins or valleys, within which are collected the headwaters of the streams that traverse the country in the direction of the Atlantic Ocean. Nevertheless, viewed from the Pacific, it presents the appearance of a great natural wall, with a lower range of mountains, bristling with volcanic peaks, intervening between it and the western sea. It would almost seem that at one time the Pacific broke at the foot of the great mountain barrier, and that the subordinate coast range was subsequently thrust up by volcanic forces. The northern and eastern coasts of the republic present several bold groups of mountains, which are the ends of the ranges radiating north and east from the Cordilleras, and which, striking the coast diagonally, and overlapping each other, seem to form an unbroken range, and are somctimes repre- sented as such on the maps. The Cordilleras proper traverse the state in the general direction of north-west and south-east, but it is throughout serpentine, and at one point is interrupted by a great transverse valley or plain, known as the plain of Comayagua, having an extreme length of about 40 miles, with a width of from 5 to 15 miles, from which, extending due north to the Atlantic, is the valley of the river Humuya, and due south, to the Pacific, the valley of the river Goascoran, collectively constituting a great transverse valley reaching from sea to sea, which was pointed out soon after the conquest as an appropriate course for inter-oceanic communication. Topographically the country has great diversity of surface and elevation ; broad. alluvions, fertile valleys, wide and elevated plains, and mountains terraced to their summits, collectively afford- ing almost every variety of climate, soil, and production, from oranges and pine apples in the valleys to peaches and pears on the table-lands.

Hydrography.—tThe rivers of Honduras are numerous, and some of them of large size and navigable. The largest is the Ulua, which drains a wide expanse of territory, com- prehending nearly one-third of the entire state, and pro- bably discharges a greater amount of water into the sea than any other river of Central America, the Wanks or Segovia, perhaps, excepted. It may be navigated by steamers of light draught for the greater part of its course. The soil on its banks is of extreme fertility. The Rio Aguan or Roman is a large stream falling into the sea near Truxillo, with a total length of about 120 miles. Its largest tributary is the Rio Mangualil, celebrated for its gold washings, and it may be ascended by boats of light draft for 80 miles. Rio Tinto, Negro, or Black River, called also Poyer or Poyas, is a

considerable stream, said to have a length of 120 miles; it is navigable by small vessels for from 40 to 60 miles. Some English settlements were made on its banks during the last century. The Poyas Indians have a number of establishments on its upper tributaries. The Rio Wanks or Segovia is the longest, if not the largest, river in Central America, rising within 50 miles of the Bay of Fonseca, and flowing into the Carib- bean Sea at Cape Gracias 4 Dios, constituting for the greater part of its length the boundary between Honduras and Nicaragua, and having a length of 350 miles. For 251 miles above its mouth it flows through an almost unbroken wilderness, among high mountains and over a very broken and rocky bed. It is nevertheless occasionally navigated by canoes to within a few leagues of the town of Ocotal or Nueva Segovia in Nicaragua. Three consider- able rivers flow into the Pacific.—the Goascoran, Nacaome,

times called Amapala, is one of the finest ports, or of ports," on the entire Pacific, and on it Honduras has a larger frontage than Nicaragua or San Salvador. in entrance

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and Choluteca, the last-named having a length of about 150 miles. the Humuya, in the plain of Comayagua, has a length of about 80 miles. lake of note in Honduras, and is about 25 miles in length, by from 6 to 8 in breadth. the sea. Jaitique and Sacapa, which unite about 15 miles from the lake; and it is drained on the north by the Rio Blanco, a narrow, deep stream falling into the Ulua. feeder on the north, in the form of a subterranean stream of beautiful clear water, which here comes to the surface.

The Goascoran, which almost interlocks with The Lake of Yojoa or Taulébe is the only

Its surface is 2059 feet above It has two outlets on the south, the rivers

It has also a

Harbours and Islands. —The Bay of Fonseca or Conchagua, some- '* constellation

It is upwards of 50 miles greatest length by about 30 miles in average width, with an

from the sea about 18 miles wide, between the great volcanoes of Conchagua, 3800 feet high, and Coseguina, 3000 feet

high, the lofty islands of Conchaguita and Mianguiri lying between

them, with a collection of rocks called "' Los Farcllones," dividin the entrance into four distinct channels, each of sufficient depth for the largest vesscls. A channel called ''El Estero Real' extends from the extreme southern point of the bay into Nicaragua for about 50 miles, reaching within 20 or 25miles of Lake Managua. The rincipal islands in the bay are Sacate Grande, Tigre, Gueguensi, and sposescion belonging to Honduras, and Martin Perez, Punta Sacate, Conchaguita, and Mianguiri belonging to San Salvador. Of these Sacate Grande is the largest, being about 7 miles long by 4 broad. The island of Tigre from its position is the most important in the bay, being about 20 miles in circumference, and rising in the form of a cone to the height of 2500 feet. The slope from the water for some distance inland is gentle, admitting of cultivation, Upon the southern and eastern shores the lava forms black rocky barriers to the waves, varying in height from 10 to 80 feet ; but on the northward and eastward are a number of playas or coves, with smooth, sandy beaches. Facing one of the most considerable of these is the port of Amapala, with deep water in front, where ships of ordinary size may lie within a cable's length of the shore, This island was a favourite resort of the pirates, and it was here that Drake had his depét during his opcrations in the South Sea. It exports hides, indigo, tobacco, bullion, silver and copper ores, and Brazil wood. The bay abounds in fish, oysters, crabs, and cray fish, and water-fowl swarm along its shores. The whole region around it is eminently productive, and adapted to the production of every tropical commodity. The savannas back from the shores are fitted for grazing, while wheat, potatoes, and other products of the temperate zone may be cultivated on the plateaus and slopes of the mountains in the interior, where oaks and pincs are abundant. The silver and gold mining districts of Tabanco, Aramacina, San Martyn, and Corpus all lie within from 10 to 40 miles of this bay. Limestone is also found near by, with a fine rose-coloured sandstone. Extensive beds of coal exist in the

valley of the river Lempa. Puerto Caballos, on the northern coast, in 15° 49’ N. lat. and 87° 57’ W. long., was selected by Cortes during his expedition into Honduras for the settlement which he founded, with the purpose of making it the entrepdt of New Spain ; he called it Natividad. For more than two centurics it was the principal establishment on the coast ; but, during the time of the buccaneers, the settlement was removed to Omoa, a few miles to the east, because of the large size of the bay, which could only be adequately defended by the construction of several forts, while a single work, still extantand formidable, was sufficient for Omoa. The port or rather bay is about 9 miles in circumference, with a depth throughout the greater part of its area of from 4 to 12 fathoms, with secure holding ground. Towards the northern shore the depth of water is greatest ; there suitable docks have been constructed, and the largest ocean steamers may enter and tie up, the rise and fall of the tide being scarcely perceptible. The prevailing winds are from the north-east, north, and north by west, from all which points the port is perfectly protected. The port of Omoa, in 15° 47’ N, lat. and 88° 3’ W. long., is small but secure, and is defended by a strong work, ‘*B] Castillo de San Fernando.” The anchorage is good, in from 2 to 6 fathoms. The population .in 1876 was about 600, most of the inhabitants having removed to San Pedro, 37 miles inland, where the business of the port is transacted. The exports of these ports consist of bullion, tobacco, indigo, sarsaparilla, hides, &c. large number of cattle are shipped annually to supply the markets of Cuba and the mahogany establishments of Belize. There 18 all abundant supply of fish, turtle, and wild fowl from the quays and waters in its vicinity. Puerto Sal is a small harbour a few miles to the eastward of Puerto Caballos. Truxillo is an ancient port, 10 15° 55! N. lat. and 86° W. long., situated on the western shore of a noble bay, formed by the projecting land of Punta Castilla. Its

trade is chiefly with Olancho, of which department it may be con- sidered the port. There are some mines of gold in its vicinity. Triunfo de la Cruz is a large bay, commencing at Puerto Sal, bend- ing thence inward and terminating at Cabo Triunfo, with a coast- line of upwards of 20 miles. To the northward of Honduras, in the bay of the same name, distant from 30 to 50 miles, is a cluster of islands, sometimes called the Bay Islands,

consisting of Roatan, Guanaja or Bonacca, Utila, Barbaretta, Helena, and Morat. They have a good soil, fine climate, and an advantageous position. Roatan, the largest, is about 30 miles long by 9 miles broad, with mountains rising to the height of 900 feet, covered with valuable woods, and abounding with deer and wild hogs. Its trade is chiefly with New Orleans in plantains, cocoa-nuts, pine apples, &c. Guanaja, discovered by Columbus, ts 9 miles long by 5 miles broad; it lies 15 miles north-east of Roatan, has interior highlands thickly wooded, with beds of limestone, and, it is said, ores of zinc. Wild hogs are numerous. The other islands are comparatively small, and may be regarded as detached parts of Roatan, with which they are connected by reefs.

Minerals.—In respect to mineral resources, Honduras

’ yanks first among the states of Central America 3 the work-

ing of the mines, however, has been conducted on a very small scale, and ina very rude manner, and as a conse- quence most of them have been abandoned and have filled with water, and have thus or otherwise been allowed to go toruin. Silver ores are most abundant and valuable. They are chiefly found on the Pacific ranges or groups of moun- tains, while the gold washings, if not the gold mines proper, are most numerous on the Atlantic slope. The silver is found in various combinations with iron, lead, and copper, and in a few instances with antimony. Chlorides of silver are not uncommon, and rank among the richest ores in the country. The principal supply of gold is from the washings of Olancho, which are exceedingly productive. There are also rich mines of copper, the ores, in all cases, containing a considerable proportion of silver. Tron ores are common, most of them magnetic, and some so rich that they can be worked without smelting. Antimony, zinc, and tin also exist. ignite has been discovered in various localities, and large beds exist in the department of Gracias, in which opals are also abundant,

Animals.—The domestic animals of the country are much the same as those of England and the United States, Cattle are everywhere abundant, and form one of the great sources of wealth in the country. Of late great numbers have been taken to Cuba, wliere there is a large and Increasing demand for them. The forests are frequented by the ocelot or American tiger, and the

peccary and deer ; the tapir is found near the sea, and the manatee in the northern creeks. Monkeys are numerous and of many varieties ; the raccoon, squirrel, Opossum, ant-eater, and armadillo abound. ‘The alligator is found in all the rivers and lagoons on both coasts, Of lizards there are numberless varieties, including the iguana. Serpents are very rare, and of but two or three varieties, of which one only is venomous, Tortoise and turtle are everywhere humerous, and of several kinds, Oysters of two varieties are plentiful, namely, the bank and mangrove oyster. Vast beds of the first are found in the Bay of Fonseca. Crusta- ceans of various kinds and sizes, from the largest lobster to the smallest crab, are abundant. The lagoons and creeks of the coast abound in endless varieties of fish, as do also the waters of the interior. Several varieties of honey bees also are found. Mosquitoes are almost unknown in the interior, and are found at but few points onthe coast. The Woodtick and flea are common everywhere, The insect most dreaded is the “langosta” or “chapulin,” which at intervals afflicts the entire country, vast columns passing from one end to the other, darkening the air, and destroying every green thing in theircourse. The parrot, macaw, and toucan are found everywhere. Hawks, vultures, owls, and sea eagles are among the birds of prey. The crow, black- bird, Mexican Jay, ricebird, swallow, rainbird, and humming-

bird are common. There is a very great variety of water birds. The wild turkey, quail, and pigeon are numerous in the interior.

Inhabitants.—The inhabitants of Honduras are princi- pally of the Indian or aboriginal type. In the eastern portion of the state, between the Rio Roman and Cape Gracias 4 Dios and Segovia river, the country is almost exclusively occupied by native Indian tribes, known under the general names of Xicaques and Poyas. Portions of all of these tribes have accepted the Catholic religion, and live in peaceful neighbourhood and good understanding with the white inhabitants. There are, however, consider- able numbers who live among the mountains, and still con- form closely to the aboriginal modes of life. They all cultivate the soil, and are good and industrious labourers. A small portion of the coast, above Cape Gracias, is occu- pied by-the Sambos, a mixed race of Indians and negroes, which,

however, is fast disappearing. Spreading along the entire north coast are the Caribs, a vigorous race, descendants of the Caribs of St Vincent, one of tlie Windward Islands, who were deported in 1796, by the English, to the number of 5000, and landed on the island of Roatan. They still retain their native language, and are active, industrious, and provident, forming the chief reliance of the mahogany cutters on the coast, A portion of them, who have a mixture of negro blood, are called the Black Caribs. They profess the Catholic religion, but retain many of their native rites and superstitions, In the departments of Gracias, Comayagua, and Choluteca are many purely Indian towns, with industrious, peaceable inhabitants, retaining many of their primitive habits and their ancient language. The aggregate population, in the absence of trustworthy data, can only be estimated approxi- mately. Attempts were made under the crown and subse- quently under the republic to effect a complete census, but with very unsatisfactory results, since it has always been found that the ignorant masses of the people, and especially the Indians, avoid a census as in some way connected with military conscription or taxation. The bulk of the Spanish population exists on the Pacific slope of the continent, while on the Atlantic declivity the country is uninhabited or but sparsely occupied by Indian tribes, of which the number is wholly unknown. Nevertheless, from the im- perfect data which are accessible, the population of Honduras may fairly be estimated at about 400,000, 6000 to 7000 being whites, and the balance Indians and the mixed races.

Departments.—Honduras is divided politically into seven depart- ments, viz., Comayagua, Gracias, Choluteca, Tegucigalpa, Olancho, Yoro, and Santa Barbara.

That of Comayagua lies in the very centre of the state. It con- tains the capital of the same name (see Comayacua). The trade of the town is small, but the plain around it is very fertile, and capable of sustaining, as formerly, a large and flourishing population. Numerous monuments of antiquity are scattered over the plain, consisting of large, pyramidal, terraced structures, conical mounds of earth, and walls of stone.! Pine and oak are abundant on the hills, and mahogany, cedar, and lignum vite, as well as other useful

woods, are found in the valleys, The nopal, cultivated in Guate- mala and Mexico as the food of the cochineal insect, is indigenous.

1 The most remarkable of these are the ruins of Tenampua, situated on a high hill, 20 miles to the south-east of Comayagua. The hill is of the prevailing soft sandstone, about 1600 feet high. At the acces- sible points are heavy stone walls, terraced on the inner side for con- venience in defence. At various points are traces of towers, and remains of water reservoirs. Most of the mounds occur in groups, arranged with obvious design in respect to each other, from 20 to 30 feet square, and of several stages. The principal enclosure is in the very midst of the ruins, at a point conspicuous from every portion of the hill, and is 300 feet long by 80 feet broad, but now elevated only a few feet above the ground, on which are indications of buildings. Great quantities of fragments of pottery are found here, painted and ornamented. Altogether there are the remains of between 300 and 400 truncated, terraced pyramids of various sizes. The whole scrved probably for defensive and religious purposes,

Coffec and the other staples of semi-tropical regions also flourish here.

The department of Gracias lies in the north-western portion of the state, touching on Guatemala and Salvador, and its territory is in many respects the most interesting in Central America, of which it may be regarded as an epitome. On the north are many beau- tiful valleys, among them that of Copan, celebrated for its ancient monuments. Among its mountains is found the quetzal, the royal and sacred bird of the aborigines. Peaches, apples, and plums flourish here, and the blackberry is indigenous among the hills. The vegetable products, actual and possible, exhaust the list of pro- ductions of the tropics and the temperate zones. Wheat, barley, rye, and the potato grow on the mountains, while sugar cane, indigo, cotton, coffee, cocoa, oranges, and plantains flourish in the valleys. Pine covers the hills, and there is much mahogany, cedar, and granadillo, also Brazil wood, &c., for dyeing and manufacture. Copal balsam and liquidambar are among the common gums, while the tobacco has a wide and deserved celebrity. Gold and silver mines are numerous and rich, although but little worked. Bituminous coal, in beds of from 8 to 10 feet in thickness, is found in the plain of Sensenti, and

asbestos, cinnabar, and platinum in various loca- lities. Opals are frequent, principally in the vicinty of Erandique, where as many as sixteen mines have becn “ denounced ” in a single year. Amethysts arc reported to have been found near Campuca.

Choluteca is the extreme southern department of the state, lying along the Bay of Fonseca. It is extremely diversified in surfacc. Its alluvions, fronting the bay, are remarkably fertile, and are capable of producing all the staples of the tropics. As the country rises, Phish it docs by a series of terraces, the savannas become broad and numerous, affording vast pastures for herds of cattle, which at present constitute the chie wealth of the department. Apart from its agricultural wealth, it is rich in minerals, chiefly in mines of silver.

Tegucigalpa, to the north of Choluteca, is the smallest but rela- tively the most populous department. It is a vast interior basin or plateau, with an average elevation of not less than 3000 feet above the sea. Its soil is not so productive as that of some of the other departinents, and is essentially a mining district, rich in gold and silver. Tegucigalpa is the largest and finest city of the state, and is at present the capital, alternating with Comayagua as the seat of government.

The department of Olancho joins Tegucigalpa on the east, and has an area of about 11,300 square miles. Its people are indus- trious, and the department is comparatively the richest in the state. Its exports are bullion, cattlc, hides and deer skins, sarsaparilla, and tobacco. Next to its herds of cattle, its principal sources of wealth are its gold washings. Nearly all of its streams carry gold of a fine quality in their sands.

The department of Yoro comprehends all the northern part of Honduras, with an area of 15,000 square miles, being the largest in size and the smallest in population. The valleys of all the streams abound in precious woods, and comprise the great mahogany dis- trict of Central America. The inhabitants are chiefly mahogany cutters by occupation. The mountains of Pija and Sulaco are said to ae great mineral wealth, but they have never been adequately explored.

The department of Santa Barbara lies between Gracias and Comayagua and the Bay of Honduras. It is traversed by several large streams. The great

plain of Sula is the distinguishing feature of this department, which has a frontage of between 60 and 70 miles on the Bay of Honduras, and reaches inland upwards of 50 miles, comprising an area of not less than 1500 square miles. Its products are cotton, rice, sugar, cocoa, and all the great staples of the tropics.

Administratvon.—The government is republican in form, based on a constitution promulgated in November 1865. The chief executive consists of a president elected every four years, assisted by a council of state, consisting of two ministers appointed by the president, a senator elected by congress, and a judge of the supreme court. The legislature consists of a senate an chamber of deputies.

Public Debt.—The public debt of the republic in 1876 was $29,950,540, held in London and Paris, having been issued in three different loans in those cities, at high rates of interest and at a low valuation to make them attractive to capitalists. Since that time the accumulated interest, which has never been paid, has considerably swollen the amount. This debt, which is of a very questionable origin, was contracted for the alleged purpose of building the ‘‘ Honduras Interoceanic Rail- way” between Port Caballos on the Bay of Honduras and the Gulf of Fonseca on the Pacific, a distance of 148 geographical miles. The road was first proposed by Mr E. G. Squier of New York, in 1854, who made the preliminary survey of the line, finding it per- fectly feasible, and had it been built then it no doubt would have proved a financial success, and a great benefit to the commerce of the world. But the breaking out of the American war put a stop to the enterprise for the time, and the completion of the Union Pacific Railway in the United States has done away with the neces-

sity for such a road as a highway for the nations. be a great benefit to the interior country should it at any time be completed. Pedro, 37 miles from Port Cortez.

To United States…....cccscecsceecseceecesseeeeereceeceaeoees $230,508 To other COUNLTICS.....-.cce cee cec eer ecereeeteectereraeeeseeees 114,337 ene erreeerrrnerecrt -codceaceean 344,840 From the port of

Amapala, of which $208,646 was gold ANU SILVEL. ...0.000.-0ceceresecescvoevesesacecccaseecsearnssccye 250,000 Grand total……...:sseee reer bec eee $594,840

Imports into the Bay Islands, Truxillo, and Puerto Cabaltos for 1876.

From the United States. .....cccsesesceecererseseeeesseeseane $230,184 From. other Countries ……cscceccceeseeeeceerscneeerenecesennces 109,959 MG balls. oa cdecedPevet cosa asncacnanaeassnsseanmmawracaninasdesiya 340,143 Into the port of Amapala, estimated value ……---ceee 300,000 Total imports for 1876…....s:s:-seseesesesserenrteetereeees 640,148 Total foreign commerce for 1876 …....sssereeerereresser ees $1 , 234,988

demand both in New Orleans and New York, and the inhabitants

Still it would It is graded, and has a narrow guage track laid to San

Trade.—The total trade of the country for 1876 is given below :—

Exports from the Bay Islands, Truxillo, Omoa, and Puerto Caballos during the year 1876.

A number of small sailing vessels engaged in the fruit trade ply between the Bay Islands and New Orleans. Cocoa-nuts are in

of the mainland, as well as those of the islands, have planted the fruit extensively, so that the entire north coast will soon be bordered by coeoa-nut plantations.

History.—It was in Honduras that Columbus first planted his feet on the continent of America. In 1502, while on his fourth voyage, he discovered the island of Guanaja or Bonacca, whence he saw the high mountains of the mainland ; and on the 14th of August he landed on the continent at a point which he called Punta de Cassinas, now Cabo de Honduras, and took possession of the country on behalf of the crown of Spain. He subsequently coasted to the eastward, and after many delays and dangers reached a point where the coast abruptly trends to the southward, forming a cape, to which,

in qeaintanle for his safety, he gave the name of Cabo Gracias & Dios, Cape Thanks to God. Less than twenty years afterwards, Hernando Cortes, inspired by accounts of great and

opulous empires to the southward of the then prostrate empire of the

Lontezumas, undertookan expedition into Honduras, which forlength and difficulties encountered and overcome stands unprecedented in the history of martial adventure. He entered the vast and unbroken wilderness, and after two years of struggle and endurance reached the point where Columbus first landed. Without giving the history of Spanish power in Honduras, suffice it to say that as early as 1540, sixty years before Jamestown in Virginia was founded, and nearly a hundred years before Hudson entered the Bay of New York, Honduras had its large and flourishing cities. After throwin off the Spanish yoke, Honduras in 1823 joined the union of Centra America, In 1839 that union was dissolved, but the liberal party in the now independent state made repeated attempts to restore @ federative union with the neighbouring republics of Nicaragua an San Salvador. These efforts even led to unsuccessful hostilities with Guatemala, but President Cabafios in 1855 being defeated and exiled, his successor General Guardiola (1856) concluded with Guatemala a treaty of peace. Six years of quiet ensued, when an insurrection broke out in 1862 among the soldiers, which cost Guardiola his life. After passing through some vicissitudes, the republic in November 1865 adopted a new constitution, under which the president is elected every four years.

See Notes on Central America, by EK. G. Squier, New York, 1855, and Honduras, by same author, London, 1870. (E. G. 8.)

BRITISH HONDURAS

Copyright, 1880, by Charles Scribner’s Sons. ies HONDURAS is the name given to the Eng: se?i

lish establishment or colony of Belize, on the eastern Hl. “} shore of the peninsula of Yucatan, fronting the Bay of Hon-* duras. It probably derives its name of Belize or Balize from the French balise, a beacon, as no doubt some signal or light was raised here to guide the freebooters, who at one

time infested the bay, to some common rendezvous. Its boundaries, as defined by the convention between Great Britain and Carrera, president of Guatemala, in 1859, were fixed as “commencing at the mouth of the river Sarstoon, in the bay of Honduras, ascending that river to the rapids of Gracias 4 Dios, thence turning to the right in a straight

line to Garbutt’s Rapids in the river Belize, and thence due north to the Mexican frontier.” These limits give a terri- tory about 160 miles long by 60 niiles wide at its broadest part, with an area of 7562 square miles.

The approach to the coast is through cays and coral reefs, and is both difficult and dangerous. For some miles inland the ground is low and swampy, thickly covered with mangroves and tropical jungle. Next succeeds a narrow belt of rich alluvial land, not exceeding a mile in width,

beyond which, and parallel to the rivers, are vast tracts of |

sandy, arid land, called “pine ridges,” from the red pine with which they are covered, and which are favourite resorts of wild animals. Further inland these give place to what are called “ cahoon ridges,” with a deep, rich soil covered with myriads of palm trees. Next comie broad savannas, studded with clumps of trees, through which the streams descending from the mountains wind in every direction. The mountains themselves rise in a succession of ridges parallel to the coast. The first are the Manatee Hills, from 800 to 1000 feet high; and beyond these are the Cockscomb Mountains, which are about 4000 feet high.

No less than sixteen streams, large enough to be called rivers, descend from these mountains and crests to the sea, between the Hondo and Sarstoon. Behind the Cockscomb range there is a succession of valleys and hills, with a varied elevation of from 1200 to 3300 feet above the level of the sea, Thus tract, of which but little is known, consists of open, grassy lands, with interesting park-like scenery, and could no doubt support a large number of cattle, as all the conditions of climate, &c., are most favourable.

Many aboriginal remains are found, such as fortified hills, crumbling walls, and buildings subsiding into ruins. The ruins of extensive cities, with monoliths, statues, and

yet unexplored forests. They are all, however, more or less similar to the remains found in the neighbouring states of Honduras and Yucatan, and doubtless are the work of the same race or races. The mineral resources of the colony have been but little developed. There are, however, among the hills many indications of gold, silver, and coal. _ The climate generally is hot and damp, but favourably influenced by the trade winds. The mean temperature for 1878 was 79°75° Fahr. ; the rainfall for the same year was 105°49 inches, which, however, was remarkably high. The country is not troubled by hurricanes, nor has it suffered from earthquakes. It has never been afflicted by epidemics, except cholera. Yellow fever occurs, but only sporadically. The climate is superior to that of Jamaica and the other West Indian Islands, and the high grounds of the interior are unquestionably healthy.

The population is mainly negro, introduced originally as slaves, whence has sprung a hybrid race from inter- mixture with Europeans and Indians. These are engaged in cutting mahogany and dyewoods, and in fishing. As Woodmen they are most efficient, and no class or race of men has been able to excel them. A few only cultivate the soil. There are no aboriginal tribes within the limits of Belize, and of the pure Indians there are but few, belonging principally to the tribes of Yucatan. There are some Carib settlements. The scanty white population is engaged in commerce, and on the sugar plantations. The total population in 1871 was 24,710, of which 12,603 were males and 12,107 females, against a total of 25,635 in 1861, showing a decrease of 925, which can be accounted for from the fact that while the political troubles in the adjacent states caused many of their citizens to take refuge ie these, on the troubles being settled, returned to their

es,

The government is in the hands of a lieutenant-governor,

| alligators are found in the lagoons and rivers. carved stones of fine finish are said to be hidden among the |

with an executive and legislative council; and there are the usual judicial establishment, a lands title registry office, a public hospital, a lunatic asylum, and an alms-house. There is also an agricultural board for distributing infor- mation relative to the cultivation of suitable products, &c. The town of Belize, at the mouth of the river of the same name, has ordinarily about 6000 inhabitants ; but the num- ber is more than doubled during the Christmas holidays, when the mahogany cutters come in. The dwellings of the wealthy inhabitants are large and commodious. Besides the Government houses, court-house, barracks, and jail, there are several churches, Episcopal, Methodist, Baptist, and Presbyterian. There are also some large and costly fireproof warehouses. The place was formerly important from being the commercial entrepot and depdt of the neigh- bouring Spanish states of Yucatan, Guatemala, and Hon. duras ; but this source of prosperity has been mainly dried up, from the opening of direct communication between several of these states and the United States and Europe, and from the diversion of trade on the Pacific to Panama. The principal product of the country is mahogany, of which the export for many years was 20,000 tons annually, but the demand for it is said to be diminishing. Its logwood ranks high, and from 14,000 to 15,000 tons are exported annually. Besides these, it produces rosewood, sapodilla, Santa Maria, and numerous other woods of value. The cahoon or coyol palm is abundant, producing clusters of nuts, from which is extracted a valuable oil. Several varieties of cotton are produced, some of which are of superior quality. Sarsaparilla and vanilla are found in the interior. The animals of the country comprise many fur- bearing species, as ounces, panthers, &c., and the forests abound with various species of monkeys. Manatees and Among the birds are turkeys, ducks, macaws, parrots, pelicans, and humming-birds. There is also a small black bottle- fly, whose bite is most venomous, and which, with the wood-tick, is a source of great annoyance in the forest. There are also several species of venomous snakes and scorpions. Fishes of many varieties are plentiful, as are also turtles, lobsters, and other shell-fish. Cattle and horses are kept in sufficient numbers for all needful pur- poses.

Present statistical information indicates, instead of improvement in the colony, a considerable falling off during the past ten or fifteen years. Its sugar plantations are, however, in a flourishing condition, having increased in their yearly product from 4035 cwt. in 1860 to 38,667 ewt. in 1877. The rate of duty on the principal articles of import is an average of about 10 per cent., principally ad valorem. Machinery, coal, and books are imported free. The gross amount of revenue for 1877 was £41,588, against £27,398 in 1863. The public expenditure for the same year was £39,939, and the public debt £5041, the latter showing a decrease of £34,000 in nine years. The total tonnage of all kinds entered and cleared in 1877, exclusive of that employed in the coasting trade, was 73,974 tons, of which 46,168 tons were British. The value of imports, including bullion and specie, for the ten years ending 1877 was £1,781,175, and for that year £165,756, of which £84,540 came from Great Britain. The exports for 1877 amounted to £124,503, of which £94,548 worth of domestic produce went to Great Britain.

History.—“ Her Majesty’s Settlement in the Bay of Honduras,” as the territory was formerly styled in official documents, owes its origin to logwood-cutters who frequented the coast of Yucatan and Central America, after the decline of piracy in the sea of the Antilles. Most of these had been free companions, and were well acquainted with the coast. The district was rich in dyewoods, and became a principal resort of the English cutters. Although thus industriously occupied, they so far retained their old habits as to make frequent descents on the logwood establishmeuts of the

Spaniards, whose attempts to expel them were generally successfully resisted. The most formidable of these was made by the Spaniards in April 1754, when, in consequence of the difficulty of approaching the position from the sea, an expedition, consisting of 1500 men, was organized inland at the town of Peten. As it neared the coast, it was met by 250 English, and completely routed. The logwood- cutters were not again disturbed for a number of years, and their position had become so well established that, in the treaty of 1763, between England and Spain, the former power, while agreeing to demolish ‘‘all fortifications which English subjects had erected in the Bay of Honduras,” nevertheless insisted on a clause in favour of the

cutters of logwoad, that, ‘‘ they or their workmen were not to be disturbed or molested, under any pretext whatever, in their said places of cutting and leading logwood ; and for this purpose they may build without hindrance and occupy without interruption the houses and magazines necessary for their families and effects.” They had also assured tq them the full enjayment of these advantages and powers in the Spanish coasts and territories. To insure the observance of this treaty, the British Government sent out Sir William Burnaby, who not only settled the limits within which the English were to confine their wood-cutting, but also drew up for their government a code of regulations or laws known as the ‘Burnaby Code.” Successful in their contests with the Spaniards, and now strengthened by the recognition of the crown, the British settlers assumed a correspanding high tone, and, it is alleged, made fresh encroachments on the Spanish territory. The Spaniards, alarmed and indignant, and asserting that the settlers not ouly abused the privileges conceded to them by the treaty, but were engaged in smuggling and other illicit practices, organized a large force, and on September 15, 1779, suddenly attacked and destroyed the establishment, taking the inhabitants prisoners to Merida, and afterwards to Havana, where most of them died. The survivors were liberated in 1782, and allowed ta goto Jamaica. For two or three years the establishment seems to have been abandoned, but in 1788 a part of the original settlers, with a considerable body of new adventurers, revisited the place, and were soon actively engaged in cutting woods. On September 3d of that year anew treaty was signed between Great Britain and Spain, in which it was expressly agreed that his Britannic Majesty’s subjects should have ‘‘the right of cutting, loading, and carrying away logwood in the district lying between the river Wallis or Belize and Rio Hondo, taking the course of these two rivers for unalterable boundaries.” These can- cessions ‘‘ were not to be considered as derogating from the rights of sovereignty of the king of Spain” over the district in question, and all the English dispersed in the Spanisli territories were to concentrate themselves within the district thus defined within eighteen months. Affairs, notwithstanding the explicit stipulations of the treaty, do not seem to have procceded favqurably ; for, three years after, a new treaty was made, in which the king of Spain makes an additional grant of territory, embracing the area between the rivers Sibun or Jabon and Belize, so that collectively the grants embraced the entire coast between the river Sibun in lat. 17° 20’ on the south and the Rio Hondo in lat. 18° 30’ on

the north, a coast-line of about 90 miles, with the adjacent islands and bays. But these extended limits were coupled with still more rigid restrictions. It is not to be sup- posed that a population composed of so wayward and lawless a set of men at a distance from England was remarkably exact in its observance af the letter or spirit of the treaty af 1786. They seem to have given great annoyance ta their Spanish neighbours, who eagerly availed themselves of the breaking out of war between the two countries in 1796 to concert a formidable attack on Belize, with a view to the complete annihilation of the establishment. They con- centrated a force of 2000 men at Campeachy, which, under the com- mand of General O'Neill, set sai] in thirteen vessels for Belize, and arrived off that place July 10,1798. The settlers, in anticipation of their approach, and aided by the English sloop of war '' Merlin," had strongly fortified a small island in the harbour, called St Gearge's Cay, whence they maintained a determined and effectual resistance against the Spanish forces, which, after a contest of two days' dura- tion, were obliged to abandon their object and retire to Campeachy. This was the last attempt to dislodge the English. The defeat of the Spanish attempt of 1798 has been adduced as an act of con- quest, thereby permanently establishing British sovereignty. But those who take this view overlook the important fact that, in 1814, by a new treaty with Spain, the provisions of that of 1786 were revived. They forget also that until possibly within a few years the British Government never laid claim to any rights aequired in virtue of the successful defence ; for so late as 1817-19 the Acts of Parliament relating to Belize always refer to it as ''a settlement, tor certain purposes, under the pretection of his Majesty." After the independence of the Spanish American provinces, Great Britain sought to secure her rights by incorporating the provisions of the treaty of 1786 in all her treaties with the new states. It was, in fact, incorporated in her treaty with Mexico in 1826, in the project of a treaty which she submitted to Seftor Zebadua, the representative of the republic of Central America in London in 1831, and also in the project of a treaty with New Grenada in 1825. Great Britain

was, therefore, without any rights in Belize beyond those conveyed by the treaties already quoted, which define with the greatest pre- cision the area

within which these rights might be exercised. But it appears from a despatch of Sir George Grey, colonial secretary, dated in 1836, that claims had then been set up to an additional wide extent of territory, including the entire coast as far south ag the river Sarstoon, and as far inland as the meridian of Garbutt's Falls on the river Belize. This anomalous state of things has no doubt had a prejudicial influence on the prosperity of Belize; but while Great Britain's right of sovereignty might be questioned, it cannot be doubted that the enterprise of her subjects has reseued a desolate coast from the savage dominion of nature, and carried in- dustry and civilization where none existed before, and where, if left to the control of the Spanish race, none would have existed to this day. It was perhaps this consideration that induced Mr Clayton, the American secretary of state, to consent to the cxclusion of Belize from the operation of the convention of 1850 between Great Britain aud the United States, whereby both powers bound themselves not to occupy, fortify, or colonize any part of Central America.

See Balize or British Honduras, by Chief-Justice Temple, read before the Society of Arts, London, January 14, 1847 ; Notes on Central America, by E. G. Squier, New York, 1855; 4 Narrative of a Journey across the Unexplored Portion of British Honduras, by Henry Fowler, Colonial Secretary, Belize, 1879. (E. G. S.)

HONE. Under the name of hones, whetstones, or sharpening stones, a variety of finely siliceous stones are employed for whetting or sharpening edge tools, and for abrading steel and other hard surfaces. They generally are prepared in the form of flat slabs or small pencils or rods of the material, but some are made with the outline of the special instrument they are designed to sharpen. Their abrading action is due to the quartz or silica which is always present in predominating proportion, some kinds consisting of almost pure quartz, while in others the siliceous element is very intimately mixed with aluminous or calcareous matter, forming a uniform compact stone, the extremely fine siliceous particles of which impart a remark- ably keen edge to the instruments for the sharpening of which they are applied. Hones are used either dry, with water, or with oil, and generally the object to be sharpened is drawn with hand pressure backward and forward over the surface of the hone ; but sometimes the stone is moved over the cutting edge. The coarsest type of stone which canbe included

among hones is the bat or scythe stone, a porous fine-grained sandstone used for sharpening scythes and cutters of mowing machines, and for other like purposes, Next come the ragstones, which consist of quartzose mica-schist, and give a finer edge than any sandstone. Under the head of oilstones or hones proper the most famous and best-known qualities are the German razor hone, the Turkey oilstone, and the Arkansas stone. The German razor hone, used, as its name implies, chiefly for razors, is obtained from the slate mountains near Ratisbon, where it formsa yellow vein of from 1 to 18 inches in the blue slate. It is sawn into thin slabs, and these are cemented to slabs of slate which serve as a support. Turkey oilstone is a close- grained bluish stone containing from 70 to 75 per cent. of silica in a state of very fine division, intimately blended with about 20 to 25 per cent. of calcite. It is obtained only in small pieces, frequently flawed and not tough, s0 that the slabs must have a backing of slate or wood. It is one of the most valuable of all whetstones, abrading the hardest steel, and possessing sufficient compactness to resist the pressure required for sharpening gravers. The stone comes from the interior of Asia Minor, whence it is carried to Smyma. Of Arkansas stones there are two varieties both found in the same district, Garland county, Arkansas, United States. The finer kind, known as Arkansas hone, 18 obtained in small pieces at the hot springs, and the second quality, distinguished as Washita stone, comes from Washita or Ouachita river. ‘The hones yield on analysis 98 per cent. of silica, with small proportions of alumina, potash, and soda, and mere traces of iron, lime, magnesia, a0 hydrofluoric acid. They are white in colour, extremely

dent of the Board of Trade.

hard and keen in grit, and not easily worn down or broken.

Geologically the materials belong to the millstone grit series, and are supposed to be metamorphosed sandstone resulting from the permeation through the mass of heated alkaline The finer kind is employed for fine cutting instruments, and also for polishing steel pivots of watch-wheels and similar minute work, the second Both varieties are largely exported from the United States to all quarters in the form of blocks, slips, pencils, rods, and During the Centennial Exhibition of 1876 the comparative value of

hones per Ib was thus quoted— Arkansas $1:50, Washita ‘35, Turkey 1:00. Among hones of less importance in general use may be noted Charnley Forest stone, a good substitute for Turkey oilstone; Water of Ayr stone, Scotch stone, or snake stone, used for tools and for polishing marble and copperplates; Idwal or Welsh oilstone, used for small articles ; and cutlers’ greenstone from Snowdon, very hard and close in texture, used for

siliceous waters.

and coarser quality being used for common tools.

wheels,

giving the last edge to lancets, HONE, Witt1am (1780-1842), a political satirist and a writer on antiquarian and miscellaneous subjects, was

born at Bath, June 3, 1780. His father, a man of deep

spiritual experience in that time of religious revival, brought up his children in strictness and reverence, but not without

the sectarian narrowness that so frequently produces reac-

tion, The parodist of the litany and of the Athanasian creed was taught to read from the Bible only. Hone received no systematic educatiou. His father having removed to London in 1783, he was in 1790 placed in an attorney’s office. Becoming connected with the London Correspond- ing Society, which was given to freethought and to political agitation, he was removed by his father to the office of a solicitor at Chatham, but after two years anda half he returned to London and became clerk to a solicitor in Gray’s Inn, Having no liking for the study of the law, and apparently no hope of succeeding in it, Hone, being then married, started in 1800 a book and print shop and a circu- lating library in Lambeth Walk, and he soon after removed to St Martin’s Churchyard, where he brought out his first

_ publication, Shaw’s Gardener, and suffered much loss from

a fire. It was at this time that Hone matured and with a

_ friend endeavoured to realize a plan for the establishment _ of popular savings banks, and even had an interview on

the subject with the Right Hon. George Rose, then presi- This scheme, however, fell through from lack of support. His partner in the savings bank became next his partner in a bookseller's business ; but Hone's habits were not those of a tradesman, and bankruptey was the result. After several removals, having compiled an index to Lord Berner's translation of Froissart, he was in 1811 chosen by the booksellers as auctioneer to the trade, and had an office in Ivy Lane,

| Independent investigations carried on by him into the con-

dition of lunatic asylums led again to difficulties and failure, but, Struggling bravely under his burdens, he took a small lodging in the Old Bailey, and kept himself and his now arge family by contributions to Magazines and reviews. He hired a small shop (or rather box) in Fleet Street, but this was on two separate nights broken into, and valuable books lent for show were stolen. In 1815 he started the

raveller newspaper, and endeavoured vainly to exculpate Eliza F enning, a poor girl, apparently quite guiltless, executed on a charge of poisoning. From February 1 to October 25, 1817, he published the Reformist's Register, Writing in it as the serious critic of the state abuses, to which he soon after applied the lash of satire in those political squibs and parodies that made his name known throughout the land, and that first gave notoriety to George Cruikshank, who was his artistic collaborator. In April

1817 three ex officio informations were filed against him by the attorney-general, Sir William Garrow, and he was seized while reading in the street and hurried to the lock-up. Three separate trials took place in the Guildhall before special juries on the 18th, 19th, and 20th of December 1817. The first, for publishing Wilkes's Catechism of a Ministerial Member, was before Mr Justice Abbot (after- wards Lord Tenterden); the second, for parodying the litany and libelling the prince regent, and the third, for pub-lishing the Stnecurist's Creed, a parody on the Athanasian creed, were

before Lord Ellenborough. The prosecuting officials, among whom we must include the judges, took the ground that the prints were calculated to injure public morals, and to bring the prayer-book and even religion itself into contempt. But there can be no doubt that the real motives of the prosecution were political ; Hone had ridiculed the habits and exposed the corruption of the prince regent and of other persons in power. He went to the root of the matter when he wished the jury “to understand that, had he been a publisher of ministerial parodies, he would not then have been defending himself on the floor of that court.” In spite of illness and exhaustion Hone displayed great courage, ability, dignity, and presence of mind. On each of the three days he spoke on an average seven hours. Notwithstanding the powerful prosecution and the bias of the judges, he was acquitted on each count, and the result on each occasion was received with enthusiastic cheers by immense crowds within and without the court. Soon after the trials a public meet- ing, in which Alderman Waithman, Sir F. Burdett, and Lord Cochrane took part, was held, and a subscription was begun, by which a large sum was soon collected to enable Hone to get over the difficulties caused by his prosecution.

Hone’s most successful political satires were published within a few years after his trial. Among them we may mention The Political House that Jack burlt, The Queen’s Matrimonial Ladder (in favour of Queen Caroline), Zhe Man in the Moon, The Political Showman, all illustrated by Cruikshank. Many of his squibs are directed against a certain “Dr Slop,” a nickname given by him to Dr (afterwards Sir John) Stoddart, a writer in the Times. In researches for his defence he had come upon some curious and at that time little trodden literary ground, and the results were shown by his publication in 1820 of his Apocryphal New Testament, and in 1823 of his Ancient Mysteries Explained. He proposed in 1820 to write a Mistory of Parody, but this never appeared. In 1826 he published the Zvery-day Book, in 1897-8 the T’able-Book, and in 1829 the Year-Book; all three were collections of curious information on manners, antiquities, and various other subjects! These are the works by which Hone is best remembered. In preparing them he had the warm approval of Southey and the assistance of Charles Lamb, but pecuniarily they were not successful, and Hone was lodged in King’s Bench prison for debt. Friends, how- ever, again came to his assistance, and he was established in a coffee-house in Gracechurch Street; but this again,

like most of his enterprises, ended in failure. Hone's attitude of mind had gradually changed to that of ex- treme devoutness, and during the latter years of his life he frequently preached in Weigh House Chapel, Eastcheap. In 1830 he edited Strutt's Sports and Pastimes, and, on the starting in 1832 of the Penny Magazine, he contributed to the first number. He was also for some years sub-editor of the Patriot. He died at Tottenham, 8th November

1842.

' According to a recent writer in Notes and Queries (6th 8. i. 171), Hone remarked in conversation that he took the idea of the Every- day Book in 1814 from Defoe's Time's Telescope.

HONEY (Chin., mé; Sansk., madhu, mead, honey,—<¢/. A.S., medo, medu, mead ; Greek, péAt, in which 6 or 6 is changed into A; Lat., mel; Fr., miel; A.S., hunig; Germ., Honig),! a sweet viscid liquid, obtained by bees chiefly from the nectaries of flowers, z.e., those parts of flowers specially constructed for the elaboration of honey (see BoTany, vol. iv. p. 134), and after transportation to the hive in the proven- triculus or crop of the insects, discharged by them into the cells prepared for its reception. Whether the nectar under- goes any alteration within the crop of the bee is a point on which authors have differed. Some wasps, ¢.g., Jyrapetra scutellaris? and the genus Wectarina, collect honey. A honey-like fluid, which consists of a nearly pure solution of uncrystallizable sugar having the formula C,H,,0, after drying in vacuo, and which is used by the Mexicans in the preparation of a beverage, is yielded by certain inactive individuals of Myrmecocystus mexicanus, Wesmael, the honey-ants or pouched ants (hormigas mieleras or moche- leras) of Mexico.8 The abdomen in these insects, owing to the distensibility of the membrane connecting its segments, becomes converted into a globular thin-walled sac by the accumulation within it of the nectar supplied to them by their working comrades (Wesmael, Bull. de Acad. Roy. de Brua., v. 766, 1838). By the Rev. H. C. M'Cook, who discovered the insect in the Garden of the Gods, Colorado, the honey-bearers were found hanging by their feet, in groups of about thirty, to the roofs of special chambers in their underground nests, their large globular abdomens causing them to resemble " bunches of small Delaware grapes" (Proc. Acad. Nat.

Sci. Philad., 1879, p. 197). A bladder-like formation on the metathorax of another ant, Crematogaster inflatus (F. Smith, Cat. of Hymenoptera, pt. vi. pp. 186 and 200, ml ax. fig. 1), which has a small circular orifice at each posterior lateral angle, appears to possess a function similar to that of the abdomen in the honey-ant.

It is a popular saying that where is the best honey there also is the best wool ; and a pastoral district, since it affords a greater profusion of flowers, is superior for the production of honey to one under tillage. Dry warm weather is that most favourable to the secretion of nectar by flowers. This they protect from rain by various internal structures, such as papilla, cushions of hairs, and spurs, or by virtue of their position (in the raspberry, drooping), or the arrangement of their constituent parts. Dr A. W. Bennett (How Flowers are Fertilized, p. 31, 1873) has remarked that the perfume of flowers is generally derived from their nectar ; the blossoms of some plants, however, as ivy and holly, though almost scentless, are highly nectariferous. The exudation of a honey- like or saccharine fluid, as has frequently been attested, is not a function exclusively of the flowers in all plants. A sweet material, the manna of pharmacy, ¢.9., is produced by the leaves and stems of a species of ash, Fraxinus Ornus ; and honey-secreting glands are to be met with on the leaves, petioles, phyllodes, stipules (as in Vicia sativa), or bractez (as in the Maregraviacee) of a considerable number of dif- ferent vegetable forms. The origin of the honey-yielding properties manifested specially by flowers among the several parts of plants has been carefully considered by Darwin, who regards the saccharine matter in nectar as a waste product

of chemical changes in the sap, which, when it happened to

4 The term honey in its various forms is peculiar to the Teutonic group of languages, and in the Gothic New Testament is wanting, the Greek word being there translated melith.

2 See A. White, in Ann. and Mag. Nat. Hist., vii. 815, pl. 4.

3 Wetherill (Chem. Gaz., xi. 72, 1858) calculates that the average weight of the honey is 8°2 times that of the body of the ant, or 0°3942 grammes.

4 Compare Isa. vii. 15, 22, where curdled milk (A.V., “ butter”) and honey as exclusive articles of diet are indicative of foreign in- vasion, which turns rich agricultural districts into pasture lands or uncultivated wastes.

be excreted within the envelopes of flowers, was utilized for the important object of cross-fertilization, and sub- sequently was much increased in quantity, and stored in

various ways (see Cross and Self Fertilization of Plants, p. 402 sg., 1876). It has been noted with respect to the

nectar of the fuchsia that it is most abundant when the

anthers are about to dehisce, and absent in the unexpanded flower. Pettigrew is of opinion that few bees go more than two miles from

home in search of honey. The number of blossoms visited in order

to meet the requirements of a single hive of bees must be very great; for it has been found by A. S. Wilson (“ On the Nectar of Flowers,”

Brit. Assoc. Rep., 1878, p. 567) that 125 heads of common red clover,

which is a plant comparatively abundant in nectar, yield but one gramme (15°432 grains) of sugar ; and as each head contains about 60 florets, 7,500,000 distinct flower-tubes must on this estimate be exhausted for each kilogramme (2°204 1b) of sugar collected. Among the richer sources of honey are reckoned the apple, asparagus, asters, barberry, basswood (Tilia americana), and the European lime or linden (7’. ewropea), beans, bonesets (Eupatorium), borage, broom, buckwheat, catnip, or catmint (Vepeta Cataria), cherry, cleome, clover, cotton, crocus, currant, dandelion, cucalyptus, figwort (Scrophularia), furze, golden-rod (Solidago), gooseberry, hawthorn, heather, hepatica, horehound, hyacinth, lucerne, maple, mignonette, mint, motherwort (Zeonwrus), mustard, onion, peach, pear, poplar, quince, rape, raspberry, sage, silver maple, snapdragon, sour-wood (Oxydendron arboreum, D.C.), strawberry, sycamore, teasel, thyme,

tulip-tree (more especially rich in pollen), tumip, violet, and willows, and the ‘‘honey-dew” of the leaves of the whitethorn (Bonner), oak, linden, beech, and some other trees.

Honey contains dextroglucose and levoglucose (the for- mer practically insoluble, the latter soluble in } pt. of cold strong alcohol), cane-sugar (according to some), mucilage, water, wax, essential oil, colouring bodies, a minute quantity of mineral matter, and pollen. By a species of fermenta- tion, the cane-sugar is said to be gradually transformed into inverted sugar (levoglucose with dextroglucose). The pollen, as a source of nitrogen, is of importance to the bees feeding on the honey. It may be obtained for examination as a sediment from a mixture of honey and water. Other substances which have been discovered in honey are mannite (Guibourt), a free acid which precipitates the salts of silver and of lead, and is soluble in water and alcohol (Callous), and an uncrystallizable sugar, nearly related to inverted sugar (Soubeiran, Compt. Lend., xxviii. 774-75, 1849). Brittany honey contains cowvai, a ferment which deter- mines its active decomposition (Wurtz, Dict. de Chem., th 430). In the honey of Polybia apicipennis, a wasp of tropical America, cane-sugar occurs in crystals of large size (Karsten, Pogy. Ann., C. 550). Dr J. Campbell Brown (‘On the Composition of Honey,” Analyst, iii. 267, 1878) is doubtful as to the presence of cane-sugar in any one of nine samples, from various sources, examined by him. The following average percentage numbers are afforded by his analyses :—levulose, 36:45; dextrose, 36°57} mineral matter, ‘15 ; water expelled at 100°C., 18°, and at a much higher temperature, with loss, 7°81: the wax, pollen, and insoluble matter vary from a trace to 2°] per cent. The specific gravity of honey is about 1-41. The rotation of a polarized ray by a solution of 16:26 grammes of crude honey in 100 c.c. of water is generally from — 3°2° to —5° at 60° F.; in the case of Greek honey it is nearly —5-5°. Almost all pure honey, when exposed for some time to light and cold, becomes more or less granular in consis- tency. Any liquid portion can be readily separated by straining through linen. Honey sold out of the comb 18 commonly clarified by heating and skimming ; but accord- ing to Bonner it is always best in its natural state The mel depuratum of British pharmacy is prepared by heating honey in a water-bath, and straining through flannel pre viously moistened with warm water.
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The term “ virgin-honey ” (A.-S., hunigtear) is applied to the honey of young bees which have never swarmed, or to that which flows spontaneously from honeycomb with or

without the application of heat. The honey obtained from old hives, considered inferior to it in quality, is ordinarily darker, thicker, and less pleasant in taste and odour. The yield of honey is less in proportion to weight in old than in young or virgin combs. The far-famed honey of Narbonne is white, very granular, and highly aromatic; and still finer honey is that procured from the Corbiéres moun- tains, 6 to 9 miles to the south-west. The honey of Gatinais is usually white, and is less odorous, and granulates less readily than that of Narbonne. Honey from white clover has a greenish-white, and that from heather a rich golden- yellow hue. What is made from honey-dew is dark in colour, and disagreeable to the palate, and does not candy like good honey. ‘‘ We have seen aphide honey from sycamores,” says F’. Cheshire (Pract. Bee-Keeping, p. 74), “as deep in tone as walnut liquor, and where much of it is stored the value of the whole crop is practically nz.” The honey of the stingless bees (Melipona and Zrigona) of Brazil varies greatly in quality according to the species of flowers from which it is collected, some kinds being black and sour, and others excellent (F. Smith, Zrans. Ent. Soc., 3d ser., i pt. vi, 1863). That of Apis Peronii, of India and Timor, is yellow, and of very agreeable flavour, and is more liquid than the British sorts. A. wnzcolor, a bee indigenous to Madagascar, and naturalized in Mauritius and the island of Réunion, furnishes a thick and syrupy, peculiarly scented green honey, highly esteemed in Western India. A rose-coloured honey is stated (Gard. Chron., 1870, p. 1698) to have been procured by artificial feeding. The fine aroma of Maltese honey is due to its collection from orange blossoms. Narbonne honey being harvested chiefly from Labiate plants, as rosemary, an imitation of it is sometimes prepared by flavouring ordinary honey with infusion of rosemary flowers.

Adulterations of honey are starch, detectable by the microscope, and by its blue reaction with iodine, also wheatcn flour, gelatin, chalk, gypsum, pipe-clay, added water, cane-sugar, and common syrup, and the different varieties of manufactured glucose. Honey sophisticated with glucose

containing copperas as an impurity is turned of an inky colour by liquids containing tannin, as tea. Elm leaves have been uscd in America for the flavouring of imitation honey. Stone jars should be employedin preference to common earthenware for the storage of honey, which acts upon the lead glaze of the latter.

Honey is mildly laxative in properties. Some few kinds are poisonous, as frequently the reddish honey stored by the Brazilian wasp Mectarina (Polistes, Latr.1) Lecheguana, Shuck., the effects of which have beeu vividly described by Aug, de Saint-Hilaire,? the spring honey of the wild bees of East Nepaul, said to be rendered noxious by collection from rhododendron flowers (Hooker, Himalayan Journals, i 190, ed. 1855), and the honey of Trebizond, which from its source, the blossoms, it is stated, of Azalea pontica and Rhododendron ponticum (perhaps to be identified with Pliny's 4golethron), acquires the qualities of an irritant and intoxicant narcotic, as described by Xenophon (Anab., lv, 8). Pliny (Wat. Hist., xxi. 45) describes as noxious a livid-coloured honey found iu Persia and Geetulia. Honey obtained from Kalmia latifolia, L., the calico bush, mountain laurel, or spoon-wood of the northern United States, and allied species, is reputed deleterious ; also that of the sour-wood is by some good authorities considered to possess undeniable griping properties; and G. Bidie (Madras Quart. Journ. Med, Sci., Oct. 1861, p. 399) mentions urtication, headache, extreme prostration and uausca, and intense thirst among the symptoms produced by a small quantity only of a honey from Coorg jungle. A South African Species of Huphorbia, as was experienced by the missionary Moffat (Miss. Lab., p. 32, 1846), yields a poisonous honey.

? Mémoires du Muséum, xi. 313, 1824.

abs xii, 293, pl. xii. fig. B, 1825, The honey, according to Lassaigne (id., ix. 319), is almost entirely soluble in alcohol.

The nectar of certain flowers is asserted to cause even in bees a fatal kind of vertigo. Asa demulcent and flavour- ing agent, honey is employed in the oxymel, oxymel scille, melt boracts, confectio piperis, conf. scammoni, and

conf. terebinthine of the British Pharmacopeia. To the ancients honey was of very great importance as an article of diet, being almost their only available source of sugar. It was valued by them also for its medicinal virtues; and in recipes of the Saxon and later periods it is a common ingredient. Of the eight kinds of honey mentioned by the great Indian surgical writer Susruta, four are not described by recent authors, viz, argha, or wild honey, collected by a sort of yellow bee; chhatra, made by tawny or yellow wasps ; auddlaka, a bitter and acrid honey-like substance found in the nest of white ants; and déla, or unprepared honey occurring on flowers. According to Hindu medical writers, honey when new is laxative, and when more thau a year old astringent (U. C. Dutt, Mat. Med. of the Hindus, p. 277, 1877). Ceromel, formed by mixing at a gentle heat one part by weight of yellow wax with four of clarified honey, and straining, is used in India and other tropical countries as a mild stimulant for ulcers in the place of animal fats, which there rapidly become rancid and unfit for medicinal purposes. The Koran, in the chapter entitled ‘“‘ The Bee,” remarks with reference to bees and their honey: ‘There proceedeth from their bellies a liquor of various colour, wherein is a medicine for men” (Sale’s Koran, chap. xvi.). Pills prepared with honey as an excipient are said to remain un-indurated, however long they may be kept (Med. Times, 1857, i. 269). Mead, of yore a favourite beverage in Eng- land (vol. iv. p. 264), is made by fermentation of the liquor obtained by boiling in water combs from which the honey has been drained. In the preparation of sack-mead, an ounce of hops is added to each gallon of the liquor, and after the fermentation a small quantity of brandy. Metheglin, or hydromel, is manufactured by fermenting with yeast a solution of honey flavoured with boiled hops (see Cooley, Cyclop.). A kind of mead is largely consumed in Abyssinia (vol. i. p. 64), where it is carried on journeys in large horns (Stern, Wanderings, p. 317, 1862). In Russia a drink termed lipetz is made from the delicious honey of the linden. The mulswm of the ancient Romans consisted of honey, wine, and water boiled together. The clarre, or piment, of Chaucer’s time was wine mixed with honey and spices, and strained till clear; a similar drink was bracket, made with wort of ale instead of wine. L. Maurial (Z’Insectologie Agricole for 1868, p. 206) reports unfavourably as to the use of honey for the pro- duction of alcohol ; he recommends it, however, as superior to sugar for the thickening of liqueurs, and also as a means of sweetening imperfectly ripened vintages. It is occasion- ally employed for

giving strength and flavour to ale. In ancient Egypt it was valued as an embalming material ; and in the East, for the preservation of fruit, and the making of cakes, sweatmeats, and other articles of food, it is largely consumed. Grafts, seeds, and birds' eggs, for transmission to great distances, are sometimes packed in honey. In India a mixture of honey and milk, or of equal parts of curds, honey, and clarified butter (Sansk., madhu-parka), is a respectful offering to a guest, or to a bridegroom on his arrival at the door of the bride's father ; and one of the purificatory ceremonies of the Hindus (Sansk., madhu-prasana) is the placing of a little honey in the mouth of a new-born male infant. Honey is fre- quently alluded to by the writers of antiquity as food for children ; it is not to this, however, as already mentioned,

3Foralist of fifteen treatisesconcerning honey, dating from 1625 to 1868, see Waring, Bibl. Therap., ii. 559, New Syd. Soc., 1879. On sundry ancient uses for honey, see Beckmann, Wist. of Invent., i. 287, 1846.

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that Isa. vii. 15 refers. Cream or fresh butter together with honey, and with or without bread, is a favourite dish with the Arabs.

Among the observances at the Fandroana, or New Year's Festival, in Madagascar, is the eating of mingled rice and honey by the queen and her guests; in the same country honey is placed in the sacred water of sprinkling used at the blessing of the children previous to circumcision (Sibree, The Great African Is., pp. 219, 314, 1880), Honey was frequently employed in the ancient religious ceremonies of the heathen, but was forbidden as a sacrifice in the Jewish ritual (Lev. ii. 11). With milk or water it was presented by the Greeks as a libation to the dead (Odyss., ei27 ; Eurip., Orest., 115). A honey-cake was the monthly food

carried on. The hives are sun-burnt tubes of mud, about 4 feet in length and 8 inehes in diameter, and, with the exception of a small central aperture for the passage of the bees, closed at each end with mud. These are laid together in long rows, or piled pyramid. ally, and are protected from the sun by a covering of mud and of boughs. The honey is extracted, when the ends have been removed by means of an iron hook. (See Tristram, Nat. Hist. of the Bible, pp. 322 sg., 2d ed., 1868). Apiculture in Turkey is in a very rude condition. The Bali-dagh, or ‘‘ Honey Mount,” in the plain of Troy, is so called on account of the numerous wild bees tenanting the caves in its precipitous rocks to the south. In various regions of Africa, as on the west, near the Gambia, bees abound. Cameron was informed by his guides that the large quantities of honey atthe cliffs by the river Makanyazi were under the protection of an evil spirit, and not one of his men could be persuaded to gather any (Across Africa, i. 266), On the precipitous slopes of the Teesta valley, in India, the procuring of honey from the pendulous bees’- nests, which are sometimes large enough to be conspicuous features

of the fabled serpent-guardian of the Acropolis (Herod., viii. 41). By the aborigines of Peru honey was offered to the sun.

The Hebrew word translated ‘‘ honey” in the authorized version of the English Bible is debash, practically synonymous with which are jaar or jaarith had-debash (1 Sam. xix. 25-27; of. Cant. v. 1) and nopheth (Ps. xix. 10, &.), rendered “‘ honey-comb.” Debash denotes bee-honey (as in Deut. xxxii. 18, and Jud. xiv. 8); the manna of trees, by some writers considered to have been the “wild honey ” eaten by John the Baptist (Matt. ili. 4); the syrup of dates or the fruits themselves; and probably in some passages (as Gen. xliii. 11 and Ez. xxvii. 17) the syrupy boiled juice of the grape, resembling thin molasses, in use in Palestine, especially at Hebron, under the name of dibs (see Kitto, Cyclop., and E. Rob- inson, Bibl. Res., ii. 81). Josephus (B. J., iv. 8, 3) speaks highly of a honey produced at Jericho, consisting of the expressed juice of the fruit of palm trees; and Herodotus (iv. 194) mentions a similar preparation made by the Gyzantians in North Africa, where it is still in use. The honey most esteemed by the ancients was that of Mount Hybla in Sicily, and of Mount Hymettus in Attica (vol. iii. p. 59). Mahaffy (Rambles in Greece, p. 148, 2d ed., 1878) describes the

honey of Hymettus as by no means so good as the produce of other parts of Greece—not to say of the heather hills of Scotland and Ireland. That of Thebes, and more especially that of Corinth, which is made in the thymy hills towards Cleone, he found mueh better (cf. vol. xi. p. 88). Honey and wax, still largely obtained in Corsica (vol. vi. p. 440), were in olden times the chief produc- tions of the island. In England, in the 18th and 14th centuries, honey sold at from about 7d. to 1s. 2d. a gallon, and occasionally was disposed of by the swarm or hive, or ruscha (Rogers, Hist. of Agric. and Priccs in Eng., i. 418), At Wrexham, Denbigh, Wales, two honey fairs are annually held, the one on the Thursday next after the ist September, and the other, the more recently instituted and by far the larger, on the Thursday following the first Wednes- day in October. In Hungary the amounts of honey and of wax are in favourable years respectively about 190,000 and 12,000 ewt., and in unfavourable years, as, ¢.g., 1874, about 12,000 and 8000 ewt. The hives there in 1870 numbered 617,407 (or 40 per 1000 of the population, against 45 in Austria). Of these 365,711 were in Hungary Proper, and 91,348 (87 per 1000 persons) in the Military Frontier (Keleti, Uebersicht der Bevilk. Ungarns, 1871, Schwicker, Statistik d. K. Ungarn, 1877). In Poland the system of bee-keeping introduced by Dolinowski has been found to afford an average of 40 Ib of honey and wax and two new swarms per hive, the common peasant's hive yielding, with two swarms, only 3 ib of honey and wax. In forests and places remote from villages in Podolia and parts of Volhynia, as many as 1000 hives may be seen in one apiary. In the district of Ostrolenka, in the government of Plock, and in the woody region of Polesia, in Lithuania, a method is practised of rearing bces in excavated trunks of trees (Stanton, '¢On the Treatment of Bees in Poland," Technologist, vi. 45, 1866). When, in August, in the loftier valleys of Bormio, Italy, flowering ceases, the bees in their wooden hives are by means of spring-carts transported at night to lower regions, where they obtain from the buckwheat crops the inferior honey which serves them for winter consumption (/b., p. 38).

In Palestine, '' the land flowing with milk and honey'? (Ex. iii. 17; Numb. xiii. 27), wild bees are very numerous, especially in the wilderness of Judea, and the selling of their produce, obtained from crevices in rocks, hollows in trees, and elsewhere, is with many of the inhabitants a means of subsistence. Commenting on 1 Sam. xiv. 26, J. Roberts (Oriental Illust.)

remarks that in the East ‘‘ the forests literally flow with honey; large combs may be seen hanging on the trees, as you pass along, full of honey.” In Galilee, and at Bethlehem and other places in Palestine, bee-keeping is extensively

1 In Sanskrit, madhu-kulyd, a stream of honey, is sometimes used to express an overflowing abundance of good things (Monier Williams, Sansk.-Eng. Dict., p. 736, 1872).

at a mile’s distance, is the only mcans by which the idle poor raise their annual rent (Hooker, Him. Journ., ii. 41).

natives of Timor, by whom both the honey and young bees are esteemed delicacies, ascend the trunks of lofty forest trees by the usc of a loop of creeper. sects by a small torch only, they detach the combs from the under surface of the branches, and lower them by slender cords to the ground (Wallace, Journ. Linn. Soc., Zool., vol. xi.). For additional facts concerning honey, and a sketch of the processes of apiculture usually adopted in the Old World, sce the article BEE, vol. iii. pp.

484-508.

To reach the large combs of Apis dorsata and A. testacea, the

Protected from the myriads of angry in-

On honey, and bees and bee-keeping in gencral, see, besides the above-men- tioned works, J. Bonner, .1 New Plan for speedily increasing the number of Bee. hives in Scotland, 1795, containing the substance of The Bee-Master’s Companion,

1789, by the same author; V. Rendu, Traité pratique sur les Abeilles, 1838;

Munn’s Honey Bee, ed. by E. Bevan; J. Samuelson, Humble Creatures, pt. ii, 1860; H. Taylor, Zhe Bee-Keeper’s Manual, 6th ed., 1860; F. Cowan, Curtous Facts in the History of Insects, pp. 174-215, 1865; A. Neighbour, The Apiary, 2d ed., 1866; W. E. Shuckard, British Bees, 1866; A. Pettigrew, The Handy Book of Bees, 1870; G. de Layens, Elevage des Abetlies pan les

Procédés Modernes, 1874; J.de Hidalgo Tablada, Zratado de las Abejas, Madr., 1875; A. J. Danyell, The italian System of Bee-Keeping, 1876; and A. H, Hassall, Food and its Adul- terations, p. 266, 1876. (F. H. B.)

Honey-FARMING In AMERICA.—So rapid of late years has been the development of bee-keeping in the United States, that the taking of steps to secure the fullest and most accurate details with respect to that industry has been deemed necessary by the commis- sioners of agriculture. It has been estimated by several intelligent bee-keepers that there are in the United States 700,000 hives of bees, owned by 35,000 people, of whom at least 30,000 are farmers

ossessing on an average not more than 3 hives each, the remain- ing 5000 being professional apiarians. Mr G. M. Doolittle, of Borodino, NY, on the Auburn branch of the New York Central Railway, obtained in 1877 an average of 100 tb of honey apiece from his hives, and from one of them the exceptionally large yield of 709 tb. It is not unreasonable to say that the hives in the United States afford each a net supply of about 50 Ib of surplus honey, which, selling at 20 cents (10d.) per Ib, returns a good profit to the owners. All American honey is classed by the api- culturist according to the plants from which it is derived. It 1s only in rare cases that pasturage is specially cultivated for the bees. In the States east of the Rocky Mountains there are three chief sources of honey. Those which yield the most delicately flavoured and whitest and therefore most valuable commodity (see above) are, first, the immense forests of basswood, the honey from which has perhaps a slight minty flavour, and, secondly, white clover grass, cultivated throughout the States for hay and stock pasture, which furnishes a honey pronounced by competent judges superior to that of the world-renowned Hymettus. Bees having access to both basswood and white clover frequently store the honey from each in the samecells. The third and often richest source of supply is buckwheat, which blossoms after the basswood and white clover have ceased to yield. The pungent honey obtained therefrom, though by its dark colour rendered unsuitable for the table, 1s greatly valucd for manufacturing purposes, more especially in the brewing of fine beer, since it forms a perfectly clear solution, ferments well, and is richer in saccharine matter than the glucose commonly employed by brewers, which moreover is apt to be con- taminated with the acids

employed in its preparation. Buckwheat honey is also accounted a good remedy in bronchial affections, and is therefore in request for the making of cough mixtures. e day is probably not far distant when the refining of the large quantities of dark honey which are harvested will be undertaken on an extensive scale. bs

For the successful prosecution of bee-keeping energy and perse- verance, as well as experience and considerable capital, are requisite. There are not more than four bce-keepers in the United States who own so many as 2500 or 3000 hives. The largest aplaries are the property of Mr J. S. Harbison of California. They are six 1 number, and situated within easy patrol distance from one another

H O N—

in the extreme south-west corner of the United States, in a narrow strip of country known as the ‘‘bee-belt” of California, which enjoys the soft and equable climate of the Pacific coast. Timber in this region is confined to the bottoms near running streams, and to the cafions, the valleys and hill-sides being covercd with stunted brushwood and an abundant growth of white sage,—an herb similar to the garden sage, and not to be confounded with the sagebrush of Nevada and Utah, which is a species of wormwood, —sumach, and other flowering plants. These bloom nine months in the year, but are most luxuriant in May and June. The white sage affords a honey comparable to that obtaincd from the bass- wood of the eastern States. The Californian honey, owing to the innocuous nature of the flowers from which it is procured, is devoid of the colic-producing properties ascribed to some other varieties of honey. Mr Harbison employs fifteen men in his apiaries, and is reaping rich profits from very many thousands of acres useless for ordinary purposes. Active operations begin in February, and in March or April the bees swarm. The taking of the honey commences usually about May 20th. From the early part of August till as late as October the flowers provide no more honey than is just sufficient for the subsistence of the bees. When October has begun, though the air is still mild, the bees cease to work, becoming semi-dormant, except for an hour or two every eight or ten days, when they fly near their hives in the sunshine. The fact that honey until the middle of the 16th century was the only sweet in general use, and

that the aggregate annual consumption of sugar is now from 2 to 24 millions of tons, points to the conclusion that apiculture, if skilfully and extensively conducted, might cre long become pro- ductive of results of very high importance to commerce. For further information regarding American honey-farming sce The American Bee Journal, The Bee-Keepers' Exchange, Gleanings in Bee Culture, and The Bee-Keepers' Magazine.

HONEY-EATER, or HonEy-suckEr, names applied by many writers in a very loose way to a large number of birds, some of which, perhaps, have no intimate affinity ; but here to be used, as before in this work (Brrps, vol. iii. p. 739), in a more restricted sense for what, in the opinion of a good many recent authorities,! should really be deemed the Family Meliphagide— excluding therefrom the Necta- rimude or SUN-BIRDS (which see) as well as the genera Promerops and Zosterops with whatever allies they may possess. Even with this restriction, the extent of the Family must be regarded as very indefinite, owing to the absence of materials sufficient for arriving at a satisfactory conclusion, though the existence of such a Family is pro- bably indisputable. Making allowance then for the imper- fect light in which they must at present be viewed, what are here called Meliphagide include some of the most char-

acteristic forms of the ornithology of the great Australian

said to occur outside its limits,

Region—members of the Family inhabiting almost every part of it, and a single species only, Ptilotis limbata, being They all possess, or are supposed to possess, a long protrusible tongue with a brush-

_ like tip, differing, it is believed, in structure from that

found in any other bird,—Promerops perhaps excepted,— and capable of being formed into a suctorial tube, by means of which honey is absorbed from the nectary of flowers, though it would seem that insects attracted by the honey furnish the chief nourishment of many species, while others undoubtedly feed toa greater or less extent on fruits. The Meliphagide, as now considered, are for the most part small birds, never exceeding the size of a Mistletoe-Thrush 3 and they have been divided into more than 20

genera, con- taining above 200 species, of which only a few can here be particularized. Most of these species have a very con- fined range, being found perhaps only on a single island or gtoup of islands in the Region, but there are a few which are more widely distributed—-such as Glycyphila rufifrons, the White-throated? Honey-eater, found over the greater Part of Australia and Tasmania, In plumage they vary much, Most of the species of Ptdlot¢s are characterized by a tuft of white, or in others of yellow, feathers springing from behind the ear, In the greater number of the genus

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Z Among them especially Mr Wallace, Geogr. Distr. Animals, ii. p.275.

yee be remarked that the young of this species has the throat

Myzomela® the males are recognizable by a gorgeous display of crimson or scarlet, which has caused one species, J/. sanguinolenta, to be known as the Soldier-bird to Australian colonists ; but in others no brilliant colour appears, and those of several genera have no special ornamentation, while some have a particularly plain appearance. One of the most curious forms is Prosthemadera—the Tui or Parson-bird of New Zealand, so called from the two tufts of white feathers which hang beneath its chin in great contrast to its dark silky plumage, and suggest a likeness to the bands worn by ministers of several religious denomi- nations when officiating. The Bell-bird of the same island, Anthornis melanura—whose melody excited the admiration of Cook the morning after he had anchored in Queen Charlotte's Sound—is another member of this Family, and unfortunately seems to be fast becoming extinct. But it would beimpossible here to enter much further into detail, though the Wattle-birds, Anthochera, of Australia have at least to be named. Mention, however, must be made of the Friar-birds, Z'ropidorhynchus, of which nearly a score of species, five of them belonging to Australia, have been described. With their stout bills, mostly surmounted by an excrescence, they seem to be the most abnormal forms of the Family, and most of them are besides remarkable for the baldness of some part at least of their head. They assemble in troops, sitting on dead trees, with a loud call, and are very pugnacious, frequently driving away

Hawks and Crows. Mr Wallace (Malay Archipelago, ii. pp. 150- 153) discovered the curious fact that two species of this genus,—P. bourensis and P. subcornutus,—respectively in- habiting the islands of Bouru and Ceram, were the object of natural " mimicry" on the part of two species of Oriole of the genus Mimeta, M. bourouensis and M. forsteni, inhabiting the same islands, so as to be on a superficial examination identical in appearance,—the Honey-eater and the Oriole of each island presenting exactly the same tints, —the black patch of bare skin round the eyes of the former, for instance, being copied in the latter by a patch of black feathers and even the protuberance on the beak of the Tropidorhynchus being imitated by a similar enlargement of the beak of the Ifimeta. The very reasonable explana- tion which Mr Wallace offers is that the pugnacity of the former has led the smaller Birds-of-prey to respect it, and it is therefore an advantage for the latter, being weaker and less courageous, to be mistaken for it. (A. N.) HONEY-GUIDE, a bird so called from its habit or supposed habit of pointing out to man and to the Ratel (Mellivora capensis) the nests of bees. Stories to this effect have been often told, and may be found in the narratives of many African travellers, from Bruce to Livingstone. Yet Mr Layard says (B. South Africa, p. 242) that the birds will not unfrequently lead any one to a leopard or a snake, and will follow a dog with vociferations,® so that at present judgment may perhaps be suspended on the matter, though its noisy cry and antics unquestionably have in

3 Mr W. A. Forbes has published a careful monograph of this genus inthe Proceedings of the Zoological Society for 1879, pp. 256-279,

4 This bird, according to Mr Buller (Birds of New Zealand, p. 88), while uttering its wild notes, indulges in much gesticulation, which adds to the suggested resemblance. It has great power of mimicry, and is a favourite cage-bird both with the natives and colonists, On one occasion, says this gentleman, he had addressed a large meeting of Maories on a matter of considerable political importance, when ‘‘immediately on the conclusion of my speech, and before the old chief to whom my arguinents were chiefly addressed had time to reply, a Tui, whose nctted cage hung to a rafter overhead, responded in a clear emphatic way, ‘Tito!’ (false). The circumstance naturally caused much merriment among nly audience, and quite upset the gravity of the venerable old chief Nepia Taratoa. ‘Friend,’

said he, laughing, ‘your arguments are very good; but my mokai is a very wise bird, and he is not yet convinced !’”

> This is also a well-known habit with some Corvide—the J. ays and Pies for example,

many cases the effect signified by its English name. If not ‘ts first discoverer, Sparrman, in 1777, was the first who described and figured this bird, which he met with in the Cape Colony (Phal. Transactions, \xvii. pp. 42-47, pl. 1), giving it the name of Cuculus indicator, its zygodactylous feet with the toes placed in pairs—two before and two pehind—inducing the belief that it must be referred to that genus. Vieillot in 1816 elevated it to the rank of a genus, Indicator ; but it was still considered to belong to the Family Cuculide (its asserted parasitical habits lending force to that belief) by all systematisis except Blyth and Jerdon, until it was shewn by Mr Blanford (Obs. Geol. and Zool, Abyssinia, pp. 308, 309) and Mr Sclater (Ibis, 1870, pp. 176-180) that it was more allied to the Barbets, Capitonide, and, in consequence, was then made the type of a distinct Family, Indicatoridee. In the mean- while other species had been discovered, some of them differing sufficiently to warrant Sundevall’s foundation of a second genus, Prodotiscus, of the group. The Honey- Ciuides are small birds, the largest hardly exceeding a Lark in size, and of plain plumage, with what appears to be a very Sparrow-like bill. Mr Sharpe, in a revision of the Family published in 1876 (Orn. Miscellany, i, pp. 192- 209), recognizes ten species of the genus Indicator, to which another has since been added by Dr Reichenow (Journ. fiir Ornithologie, 1877, p. 110), and two of Prodotiscus. Four species of the former, including #, sparrmani, which was the first made known, are found in South Africa, and one of the latter. The rest inhabit other parts of the same continent, except I. archipelagicus, which seems to be peculiar to Borneo, and J. aanthonotus, which occurs on the Himalayas from the borders of Afghanistan to Bhotan. The interrupted geographical distribution of this genus is a very curious fact, no species having been found in the Indian or Malayan peninsula to connect the outlying forms with those of Africa, which must be regarded as their metropolis. (A. N.)
HONEYSUCKLE (M.E., honysocle, 1.¢., any plant from which honey may

be sucked,—¢/. Ang.-Sax., huni-suge, privet; Germ., Geissblatt; Fr., Chévrefeuille), Lonicerus, L., a genus of climbing, erect, or prostrate shrubs, of the natural order Caprifo- liacece, so named after the German botanist Adam = Lonicer. The British 7 species aro L. Pericly- “yy ac menum, the woodbine, L. Kj Caprifolium, and L. Xy- losteum. Some of thie garden varieties of the woodbine are very beauti- ful, and are held in high esteem for their delici- ous fragrance; even the wild plant, with its pale flowers, compensating for its sickly looks “ with never ~~cloying odours.” The North American sub~~ evergreen L, semper- A a) virens, with its fine heads gee of blossoms, commonly called the trumpet honey- suckle, is a distinct and beautiful species pro- ducing both scarlet and yellow flowered varieties, and the Japanese L. brachypoda aureo-reticulata is esteemed for its charmingly variegated leaves. The fly honeysuckle, L. Xylosteum, a hardy shrub of dwarfish erect habit, and LZ.

tatarica, of similar habit, both European, are amongst the oldest English garden shrubs, and bear axillary flowers of various colours, occurring two on a peduncle. There are numerous other species, many of them introduced to our gardens, and well worth cultivating in shrubberies or as climbers on walls and bowers, either for their beauty or the fragrance of their blossoms.

In the western counties of England, and generally by agri- culturists, the name honeysuckle is applied to the meadow clover, Trifolium pratense. Another plant of the same leguminous family, Hedysarum coronarium, a very hand- some hardy biennial often seen in old-fashioned collections of garden plants, is commonly called the French honey- suckle. ‘The nameis moreover applied with various affixes to several other totally different plants. Thus white honeysuckle and false honeysuckle are names for the North American Azalea viscosa ; Australian or heath honey- suckle is the Australian Banksia serrata, Jamaica honey- suckle the Passiflora laurifolia, dwarf honeysuckle the widely spread Cornus suecica, Virgin Mary’s honeysuckle the European Pulmonaria officinalis, while West Indian honeysuckle is the Z’ecoma capensis, and is also a name applied to Desmodium.

The wood of the fly honeysuckle is extremely hard, and the clear portions between the joints of the stems, when their pith has been removed, are

stated by Linnzus to be utilized in Sweden for making tobacco-pipes. The wood is also employed to make teeth for rakes; and, like that of L. tatarica, it is a favourite material for walking- sticks.

HONFLEUR, a town of France, at the head of a canton in the arrondissement of Pont l'Evéque in the department of Calvados, is situated on the south side of the estuary of the Seine directly opposite Havre, and about 10 miles to the north of Pont 'Evéque and 37 miles to the north-east of Caen. With the general railway system of northern France it is connected by a line running by Pont l'Evéque to Lisieux; and a concession was granted in 1879 for another line to Pont-Audemer. Asatown Honfleur has the typical aspect of a small] old-fashioned seaport, equally heedless of symmetry in its plan and cleanliness in its economy. The most noteworthy of its buildings is the church of St Catherine, constructed entirely of timber work and plaster, and consisting of two parallel naves, of which the more ancient is supposed to date from the end of the 15th century. A process of restoration is at present (1880) going on under Government supervision. Within the church are several antique statues and a painting by Jordaens—Jesus in the Garden of Gethsemane, The church tower stands on the other side of a street, St Leonard's dates from the 17th century, with the exception of its fine ogival portal and rose-window belonging to the 16th, and its octagonal tower erected in the 18th. The ruins of a 16th century castle, and several houses of the same period, are the only buildings of antiquarian interest. The town-house, which contains the exchange and the commercial court, isof modern erection. On the rising ground above the town is the chapel of Notre Dame de Grice, a shrine much resorted to by pilgrim sailors, which was founded in 1034 by Robert the Magnificent of Normandy, and rebuilt in 1606. Honfleur is the seat of a commercial college, a school of hydrography, a chamber of commerce, a custom-house, and various other Government offices, 23 well as of several consular establishments. The harbour, which consists of three basins, has been greatly improved between 1860 and 1875 by the extension of the pier and the formation of a new channel, which has a depth of 21 feet at neap tides and of 24 to 27 at spring-tides; and & fourth basin, decreed by the Government in 1879, will be

completed by 1881. A reservoir of 120 acres in extent

Honeysuckle,

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affords the means of sluicing the channel. In 1878 the gross returns of the shipping showed 894 vessels, of which 586 were British, 118 Norwegian, and 62 French, the total burthen amounting to 200,939 tons; and there were besides 840 French coasting vessels, with 48,000 tons. The export trade consists almost exclusively of eggs (from 10 to 12 million dozens yearly), poultry, table-fruits, nuts, butter (9 to 12 million 1b), and similar produce for the London market; and the principal imports are coals, iron, wheat and oats, cement, wool, and marble, also deals from Norway, Sweden, and Russia, and oak timber from Germany. In 1879 the wheat imported from the United States amounted to 64,000 tons. Shipbuilding was formerly an extensive industry in Honfleur, most of the vessels of from 400 to 1200 tons belonging to the Havre shipowners issuing from its yards ; but the number now laid on the stocks is very small. Saw-mills, oil-factories, soap-works, paper-mills, and marble-works are the main industrial establishments. The population of Honfleur, estimated at 8800 shortly before the great Revolution, was 9946 in 1872. In 1876 the census showed 9037 inhabitants in the town and 9425 in the commune.

Honfleur, Latinized as Honflorium, dates from the 11th century, and is thus four or five hundred years older than its greater rival Havre. During the English wars it was frequently taken and retaken, the longest English occupation being from 1430 to 1440. In 1562 the Protestant forces got possession of it only after a ee siege of the faubourg St Léonard ; and though Henry IV. effected its capture in 1590 he had again to invest it in 1594 after all the rest of Normandy had submitted to his arms. In the earlier years of the 17th century Honfleur colonists founded Quebec, and Honfleur traders under Binot Paulmier established factories in Java and Sumatra. The German troops occupied the town in February 1871. Among the local celebrities are the admirals Doublet, Boitard,

and Hamelin.

See A. Labutte, Hssai historique sur Honfleus et T’arrondissement de Pont-UEvéque, 1840; P. P. V. Thomas, Hist. de la ville de Honfleur, 1840; Hist.

de Honfleur par un enfant de Honfleur, 1867; Abbé Sauvage, Etudes hist. normandes: Honfleur au XIVe siecle, 1875.

HONG-KONG, properly H1anc-Kiane (the place of “sweet streams”), an important British island-possession, situated off the south-east coast of China, opposite the pro- vince of Kwang-tung, on the east side of the estuary of the Chu-Kiang or Canton river, 38 miles east of Macao and 75 south-east of Canton, between 22° 9’ and 22° 1’ N. lat. and 114° 5’ and 114° 18’ E. long. It is one of a small cluster named by the Portuguese ‘‘Ladrones” or Thieves, on account of the notorious habits of their old inhabitants. Extremely irregular in outline, it has an area of 29 square miles, measuring 104 miles in extreme length from north- east to south-west, and varying in breadth from 2 to 5 miles. From the mainland it is separated by a narrow channel, which at Hong-Kong roads, between Victoria, the island capital, and Kau-lung Point, is about one mile broad, and which narrows at Ly-ce-moon Pass tolittle over a quarter of a mile. The southern coast in particular is deeply indented ; and there two bold peninsulas, extending for several miles into the sea, form two capacious natural harbours, namely, Deep Water Bay, with the village of Stanley to the east, and Tytam Bay, which has a safe, well-protected entrance showing a depth of 10 to 16 fathoms. An in-shore island on the west coast, called Aberdeen or Taplichan, affords protec- tion to the Shekpywan or Aberdeen harbour, an inlet pro- vided with a granite graving dock, the caisson gate of which is 60 feet wide, and the Hope dock, opened in 1867, with a length of 425 feet and a depth of 24 feet. Opposite the same part of the coast, but nearly 2 miles distant, rises the largest of the surrounding islands, the Lamma, whose Conspicuous peak, Mount Stenhouse, attains a height of 1140 feet, and is a landmark for local navigation. On the northern shore of Hong-Kong there is a patent slip at East or Matheson Point, which is serviceable during the north-east monsoon, when sailing vessels frequently approach Victoria through the Ly-ce-moon Pass. The ordinary course for such

vessels is from the westward, on which side they are sheltered by Green Island and Kellett Bank. There is good anchorage throughout the entire channel separating the island from the mainland, except in the Ly-ce-moon

Pass, where the water is deep; the best anchorage is in Hong- Kong roads, in front of Victoria, where, over good holding ground, the depth is 5 to 9 fathoms. The inner anchorage of Victoria Bay, about half a mile off shore and out of the strength of the tide, is 6 to 7 fathoms. Victoria, the seat alike of government and of trade, is the chief centre of popu- lation, but in recent years a tract of 4 square miles on the mainland has been covered with public buildings and villa residences. Practically an outlying suburb of Victoria, Kau-lung (Nine Dragons), or as it is commonly called Kowloon, is free from the extreme heat of the capital, being exposed to the south-west monsoon. Numerous villas have also been erected along the beautiful western coast of the island, while Stanley, in the south, has lately been attract- ing attention by its excellent qualifications as a watering- place.

The island is mountainous throughout, the low granite ridges, parted by bleak, tortuous valleys, leaving in some

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Hong-Kong, with adjacent Coast and Islands.

places a narrow stripe of level coast-Jand, and in others overhanging the sea in lofty precipices. rom the sea, and especially from the magnificent harbour which faces the capital, the general aspect of Hong-Kong is one of singular beauty. With something of the rugged grandeur of the western Scottish isles, and a suggestion of Italian softness and grace, it is distinguished by unmistakable traces of a purely tropical character. Inland

the prospect is wild, dreary, and monotonous. The hills have a painfully bare appearance from the want of trees. The streams, which are plentiful, are traced through the uplands and glens by a line of straggling brushwood and rank herbage. No- where is the eye relieved by the grateful evidences of culti- vation or fertility. The mountains, which are mainly com- posed of granite, serpentine, and syenite, rise in irregular masses to considerable heights, the loftiest point, Victoria Peak, reaching an altitude of 1825 feet. The Peak lies immediately to the south-west of the capital, in the extreme north-west corner of the island, and is used as a station for signalling the approach of vessels. Patches of land, chiefly around the coast, have been laid under rice, sweet potatoes, and yams, but the island is hardly able to raise a home-

supply of vegetables. The mango, lichen, pear, and orange are indigenous, and to these the English have added several fruits and esculents. One of the chief products is building- stone, which is quarried by the Chinese. ‘The animals are few, comprising a land tortoise, the armadillo, a species of boa, several poisonous snakes, and some woodcock. The public works suffer from the ravages of white ants. Water everywhere abounds, and is supplied to the shipping by means of tanks. Hong-Kong acquired the name of an ex- tremely unhealthy place at the time of settlement, but it has been found that the mortality is only high in certain seasons. Itisnot free from a certain malaria which, accord- ing to Montgomery Martin, is thrown off by the decomposed. rocks that have been baked by a strong sun during the day. The change from the heat and rain of summer (May to October) to the refreshing temperature of the cool season tends to produce disease of the kidneys, &c. During the years 1871-75 the mean temperature was 73° Fahr. in the shade, and the range from 56° to 84°, taking the mean read- ings for the months. Occasionally the thermometer regis- ters below 40°, and on 26th February 1876, when extreme cold was experienced, water was frozen to the thickness of

of an inch. The annual rainfall was 99°24 inches in 1871 and 83°43 in 1875. The population, which in 1841 was only 5000, had increased to 21,514 in 1848, to 37,058 in 1852, to 123,511 in 1862, and to 139,144 in 1876.

According to the census of 1872, there were of Europeans and Americans 5931, of Chinese 115,444, and of natives of India, Goa, Manila, &c., 2623. Victoria was the residence of almost all the Europeans, and of the Chinese 83,487 (14,269 women) resided there, including a boat population of 12,309, while 10,507 resided in Kau-lung and other villages, and 11,400 were scattered along the coast in boats.

Formerly an integral part of China, the island was first ceded to Great Britain in 1841, and the cession was confirmed by the treaty of Nanking in 1842, the charter bearing date 5th April 1843, Kau-lung, temporarily occupied for several years as a military sanatarium, was ceded by a treaty contracted by Lord Elgin in 1861. The colony is under a governor, and an executive council comprising the colonial secretary, the commander of the troops, the attorney-general, and the auditor-general. The legislative council, presided over by the governor, is composed of all these officials (except the commander), with the addition of four unofficial members, nominated by the crown on the recommendation of the governor. The occupation of Hong-Kong was effected at a con- siderable outlay, but the parliamentary vote on its behalf was reduced from £50,000 in 1845 to £9200 in 1853, and since 1855 the colony has paid its local establishments. In 1868 it extinguished its debt, which had dwindled to £15,625, and it now pays £20,000 a year as military contribution to the imperial exchequer.

The capital, situated at the north-west extremity of the island, is laid out in fine wide streets and terraces. The buildings, mostly of stone and brick, are greatly superior to those of a Chinese city. The merchants' houses are elegant and spacious, with broad veran- dahs and tasteful gardens. Including the Chinese town, Victoria extends for 3 miles along the bay, towards which it slopes from the base of the hills, It is lighted with gas, and supplied with water from the Pokovfulun reservoir, which impounds 74 million gallons. The main thoroughfare is protected by a massive sea- wall, and the appearance of the town has been greatly improved by the construction of public gardens. Besides several handsome Government buildings, Victoria has a large exchange, a cathedral and bishop's palace, several good hospitals, extensive barracks, and a few higher class schools. A city hall with library and museum was opened in 1876, and the public works complcted in that year (the extension of public gardens, construction

of many miles of mountain path, and improvement of drainage) involving an outlay of £30,867. The educational provision of the Government in 1876 comprised 54 schools, with an attendance of 3111 pupils, and of these 16 with 1816 pupils were native schools, in which the language is Chinese. At the central school (556 pupils in 1876) there is a Chinese class for Europeans, as there is also in several of the missionary and ‘‘grant-in-aid” schools. Hong-Kong publishes, in addition to 5 English newspapers (2 daily), 1 in Chinese every second day and a Portuguese weekly. The streets are guarded by a strong force of Indian sepoys, and the natives are not allowed to go abroad after 8 o’clock at night without a pass ; but the general character of the town is orderly, as is attested by the police returns,

from which it appears that only 68 persons were convicted before the superior courts in 1875. ance is by chairs, which are carried by coolies, while the passage across to Kau-lung is usually effected in sampans or pull-away boats. refining, rum-distilling, and ice-making. In 1877 the introduction

The common mode of strect convey-

Victoria has a few slight industrics, including sugar-

of a steam laundry broke the monopoly of the dhoby. There are

upwards of 500 Chinese hongs of a superior class belonging to shi

compradores and to dealers in fancy goods, china ware, articles in old and silver, opium and other drugs, rice, piece goods, tea, &c,

Although formerly the central point of the great European Chinese trade and still a thriving seat of commerce, Hong-Kong owes its present importance chiefly to its financial prominence as the head. quarters of the banking interest, and to its magnificent harbour, which makes it both the station of the British fleet and an entrepdt for the custom trade of all nations. In 1877 it was the residence of 14 foreign consuls, and had 10 large banking-houses. It still imports opium more largely than any other port, and

among other articles of which it is the centre of trade are sugar, flour, salt, china ware, nut-oil, amber, cotton, sandalwood, ivory, betel, live stock, granite, and ship supplies. The principal transactions in tea and silk are controlled by firms residing in Hong-Kong. As it is a free port there are no exact returns of trade, but in 1877 the im. ports from Great Britain alone amounted to £3,645,068 and the exports thither to £1,895,310. Chief of thesc exports was tea, the value of which in 1876 was £839,568. In the same year the opium imported amounted to 96,985 piculs, as compared with 69,851 piculs received at all the other treaty ports. Of 3424 chests of Bengal opium imported in February 1876, 1500 passed into the hands of local consumers and 1924 were exported; at the same date there were 4800 chests in stock as compared with 1374 at Shanghai. There is an enormous passenger traffic: between the years 1871 and 1876 there have passed through the port no fewer than 15,000 Chinese coolies, of whom the majority have gone to the United States. In the year 1876 Queensland drafted hence as many as 8325 emigrants. Large steamers go and come almost daily, the ports in regular com- munication with Hong-Kong including Bombay, Calcutta, Singa- pore, Canton, San Francisco, Yokohama, and (since 1875) Sydney. The aggregate shipping that entered the port in 1878 amounted to 3,900,891 tons. Of this 45°2 per cent. were junks, 43‘7 steamers, and 11°1 European and American built sailing vessels. Exclusive of native craft there entered and cleared (1876) 4,359,616 tons, of which 3,150,952 were in British and 1,208,664 in foreign vessels. The revenue in 1878, derived from land rents, fines, licences to sell opium, and spirits, &., amounted to £197,424, the expenditure to £189,695; there is usually asurplusofrevenue. At the 31st January 1877 the bank-notes in circulation were stated at $3,536,380, and the specie in reserve at $1,295,000. Hong-Kong has a dollar of its own coining (4s. 2d.), but its mint, which entailed a cost of £9,000 a year, has ceased to operate. Other coins in circulation are the Mexican dollar, Chinese taels and cash, the American trade dollar, and Japanese silver yen. A movement is at present on foot to have the last two coins placed on an equality with the Mexican dollar. The standard of value is 1000 Mexican dollars to 717 taels by weight. In spite of the great increase in recent years of the direct trade with the various treaty ports, the progress of Hong- Kong has been steady, and there is every probability of its main- taining its peculiar position of influence in the Chinese trade. In 1871 it was placed in telegraphic

communication with England, and in its recent legislative action it has shown vitality and enterprise. The gambling practices which prevailed here, as they still do in many Chinese towns, have been vigorously suppressed, and the difficulties arising from the sudden development of the coolie emigration have been overcome. The presence of Chinese revenue cruisers in Hong-Kong waters has led (February 1880) to a storm of opposition on the part of resident British merchants, who declare that this amounts to a blockade of the island; but British officials uphold the action of China as a necessary check upon the opium and salt smuggling.

Besides the Government papers and The Zlong-Kong Almanac and Directory, see A Letter from Hong-Kong, descriptive of that Colony, by a Resident, 2d ed., Lond., 1845; Bentham, Flora Hongkongensis, Lond., 1861; Beach, Visit of H.RH. the Duke of Edinburgh to Hong-Kong in 1869, Hong-Kong, 1869; J. Legge, “The Colony of Hong-Kong,” in Zhe China Review (edited by Dennys), 1872. (A. M’D)

HONITON, a municipal borough and market-town of England, county of Devon, is pleasantly situated on a rising ground on the left bank of the Otter and on the London and South-Western Railway, 16 miles E.N.E. of Exeter. It consists of one wide street about a mile in length, crossed by a smaller one at right angles. Along the main street there runs a small stream of water. The only buildings of importance are the old parish church, on an eminence about half a mile from the town, built by Courtenay, bishop of Exeter, about 1482, and possessing a_ curiously carved screen; the church of St Paul’s (now the parish church)

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in the centre of the town, in the N orman style; the dis- pensary ; the St Margaret’s charity, originally erected as a hospital for lepers, but now used as almshouses j the union workhouse, erected in 1836, with accommodation for 250 inmates; the grammar school, the national schools, and the British school opened in 1878. The town is famed for its lace manufacture ; and there are also breweries, malting establishments, flour mills, tanneries, brick and tile works, and an iron foundry. The population of the municipal borough in 1871 was 3464.

Honiton is supposed to have originated in a Roman settlement at Hembury fort, about 3 miles from the town, where there are still traces of an extensive camp conjectured to be the Moridunum of Antoninus. The town first sent members to parliament in the reign of Edward J., but after the reign of Edward II. the privilege was suspended until 1640. In 1867 its representation was limited to one member, and in 1868 it was disfranchised. It was incor- porated as a municipal borough in 1846.

HONOLULU. See Hawairan Istanps, vol. xi. p. 531.

HONORIUS, Fravius Avcustus, was emperor of the West from 397 to 425 a.p. His reign of twenty-eight years was one of the most eventful in the Roman annals ; the weakness and timidity of the emperor co-operated with the attacks of the Goths and Vandals in promoting the rapid disintegration of the empire. But his influence on the current of events was purely negative, and his reign will be noticed under Roman Hisrory.

HONORIUS I., pope from 625 to 638, succeeded Boniface V. The festival of the Elevation of the Cross is said to have been instituted during his pontificate, which was marked also by considerable missionary enterprise. Honorius in his lifetime had favoured the formula proposed by the emperor Heraclius with the design of bringing about a reconciliation between the Monophysites and the Catholics, which bore that Christ had accomplished His work of redemption by one manifestation of His will as the God-man, For this he was, more than forty years after his death, anathematized by name along with the other Monothelite heretics by the council of Constantinople (First Trullan) in 680; and this condemnation was sub-

_ sequently confirmed by more than one pope, particularly by

_ Leo IL, as has been abundantly proved by unimpeachable

_ evidence against the contentions of Baronius and Bellar-

mine (see Hefele, Die Irrlehre des Honorius u. das vatt-

canische Lehre der Unfehlbarkeit, 1871, who, however, has

_ modified his view in Conciliengeschichte, 1877). Honorius

_ Somewhat slow to

I. was succeeded by Severinus.

HONORIUS II.! (Lambert of Ostia), pope from 1124 to 1130, succeeded Calixtus II. As papal legate he had been one of the framers of the concordat of Worms (1122). During his pontificate the Praemonstratensian order, and also that of the Knights Templars, received papal sanction. His successor was Innocent II.

HONORIUS IIL, pope from 1216 to 1227, was the successor of Innocent ITJ., whose uncompromising policy in the struggle between the papacy and the empire he had not firmness and vigour to continue. He consented to crown Frederick II. as Holy Roman emperor in 1220, although the engagements made with his predecessor had not been ful- filled ; the promises which he himself had exacted he was urge, and if was left to his successor Gregory IX. to insist upon their accomplishment. He gave papal sanction to the Dominican order in 1216, and to the Franciscan in 1223 ; and during his pontificate also many of the tertiary orders first came into existence.

HONORIUS IV. succeeded Martin IV., and was pope for two years (1285-1287). After an uneventful pontifi- cate he was succeeded by Nicholas IV,

- This tame had been assumed in the previous century (1061-64)

na Peter Cadalus ; but he never was recognized as a legitimate a

and sincerity dedicated to Pope

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HONTHEIM, Jouann Nixoravs von (1701-1790), a zealous opponent of Ultramontanism, was born at Treves, January 27,1701. After receiving his early education at the Jesuit college of his native town, he studied juris- prudence both there and at Louvain and Leyden. On obtaining the degree of

doctor of laws at Treves in 1724 he took the ecclesiastical habit, and went to Rome in order to make himself acquainted with the forms of the curia. Returning to Treves in 1728, he was appointed ecclesiastical councillor of the consistory, in 1732 professor of law, in 1741 privy councillor of the archbishop, and in 1748 suffragan of the see. In 1750 he published at Treves Historia Trevirensis diplomatica, and in 17 63, under the pseudonym of Justinus Febronius, De Statu ecclesia et legitima potestate Romani Pontiicis liber singularis, in which he maintained the Gallican theory that the supreme authority of the church was vested not in the pope but in the geueral council. This work he in perfect simplicity Clement XIII., who, however, condemned it and caused it to be burned at Rome. When Hontheim was discovered to be the author he was induced to make a retractation, but in his Pebronius abbreviatus et emendatus (Vienna, 1771) and Febronti com- mentarius (Vienna, 1781) he nevertheless gave further currency to his old views. He died at Montquintin, Luxembourg, September 2, 1790.

HONTHORST, Gerarp van (born at Utrecht 1590, died at Utrecht 1656), was brought up as a painter at the school of Bloemart, who exchanged the style of the Franck- ens for that of the pseudo-Italians at the beginning of the 16th century. Infected thus early with a mania which came to be very general in Holland, Honthorst went to Italy, where he copied the naturalism and eccentricities of Michelangelo da Caravaggio. Home again about 1614, after acquiring a considerable practice in Tome, he set up a school at Utrecht which flourished exceedingly ; and he soon became so fashionable that Sir Dudley Carleton, then English envoy at the Hague, recommended his works to the earl of Arundel and Lord Dorchester. At the same time the queen of Bohemia, sister of Charles I. and electress palatine, being an exile in Holland, gave him her counten- ance and asked him to teach her children drawing ; and Honthorst, thus approved and courted, became known to Charles I., who invited him to England. There he painted several portraits, and a vast allegory, now at Hampton Court, of Charles and his queen as Diana and Apollo in the clouds receiving the duke of Buckingham as Mercury and guardian of the king of Bohemia’s children. Charles L., whose taste was flattered alike by the energy of Rubens and the elegance of Van Dyck, was thus first captivated by the fanciful mediocrity of Honthorst, who though a poor executant had luckily for himself caught, as Lord

Arundel said, “ much of the manner of Caravaggio’s colouring, then so much esteemed at Rome.” It was his habit to transmute every subject into a night scene, from the Nativity, for which there was warrant in the example of Correggio, to the penitence of the Magdalen, for which there was no warrant at all. But unhappily this caprice, though “sublime in Allegri and Rembrandt,” was but a phantasm in the hands of Honthorst, whose prosaic pencil was not capable of more than vulgar utterances, and art gained little from the repetition of these quaint vagaries. Sandrart gave the measure of Honthorst’s popularity at this period when he says that he had as many as twenty apprentices at one time, each of whom paid him a fee of 100 florins a year. In 1623 he was president of his guild at Utrecht. After that he went to England as above stated, returning to settle anew at Utrecht, where he married. His position amongst artists was acknowledged to be important, and in 1626 he received a visit from Rubens, whom he painted as the

honest man sought for and found by Diogenes Honthorst. In his home at Utrecht Honthorst succeeded in preserving the support of the English monarch, for whom he finished in 1631 a large picture of the king and queen of Bohemia ‘and all their children.” For Lord Dorchester about the same period he completed some illustrations of the Odyssey, one of which survives in the Weld-Blundell collection at Ince; for the king of Denmark he composed incidents of Danish history, of which one example remains in the gallery of Copenhagen. In the course of a large practice he had painted many likenesses—Charles I. and his queen, the duke of Buckingham, and the king and queen of Bohemia. He now became court painter to the princess of Orange, settled (1637) at the Hague, and painted in succession at the Castle of Ryswick and the House in the Wood. The time not consumed in producing pictures was devoted to portraits. Even now his works are very numerous, and amply represented in English and Continental galleries. His most attractive pieces are those in which he cultivates the style of Caravaggio, those, namely which represent taverns, with players, singers, and eaters. He shows great skill in reproducing scenes illuminated by a single candle. But he seems to have studied too much in dark rooms, where the subtleties of flesh colour are lost in the dusky smoothness and uniform redness of tints procurable from farthing dips. Of

great interest still, though rather sharp in outline and hard in modelling, are his portraits of the Duke of Buckingham and Family (Hampton Court), the King and Queen of Bohemia (Hanover and Combe Abbey), Mary de Medici (Amsterdam town-hall, 1628), the Stadt- holders and their Wives (Amsterdam and Hague), Charles Louis and Rupert, Charles I.'s nephews (Louvre, St Peters- burg, Combe Abbey, and Willin), and Lord Craven (National Portrait Gallery). His early form may be judged by a Lute-player (1614) at the Louvre, the Martyrdom of S+ John in S. M. della Scala at Rome, or the Liberation of Peter in the Berlin Museum; his latest style is that of the House in the Wood (1648), where he appears to dis- advantage by the side of Jordaens and others. Honthorst was succeeded by his brother William, born at Utrecht in 1604, who died it is said in 1666. He lived chiefly in his native place, temporarily at Berlin. But he has left little behind except a portrait at Amsterdam, and likenesses in the Berlin Museum of William and Mary of England. HOOCH, Pieter vs, a Dutch painter of note, was born it is thought about 1632, and died it is supposed in 1681 at Haarlem. Public records testify that he was a native of Rotterdam, and wandered early to Delft, where he married in 1654 and practised till 1657. From that time onward his life is obscure; and the only proofs of his existence to which we can point are the dates on his pictures, which range from 1658 to 1670. The registry of "Pieter de Hooge's" death at Haarlem on the 28th of February 1681 is believed to refer to our artist. Though neglected by his contempo- raries, De Hooch is one of the kindliest and most charming painters of homely subjects that Holland has produced. He seems to have been born at the same time and taught in the same school as Van der Meer and Maes, but his works are more harmoniously coloured than those of Maes, and more boldly touched than those of Meer, In one respect all three are alike, being disciples of the school of Rembrandt. De Hooch only once painted a canvas of any size, and that unfortunately perished in a fire at Rotterdam in 1864, But his small pieces display perfect finish and great dexterity of hand, combined with that power of discrimina- tion which accomplishes detail whilst avoiding rapidity aud smoothness. Though he sometimes paints open-air scenes, these are not his favourite subjects. Heis most at home in interiors, and his delight is to contrast in one picture the

different atmospheres of rooms illuminated by different lights with the radiance of day as seen through doors and windows,

He thus brings together the most delicate varieties of tone and produces chords that vibrate with harmony. The themes which he illustrates are thoroughly suited to his pur. pose. Sometimes he chooses the drawing-room where dames and cavaliers dance, or dine, or sing ; sometimes—mostly

indeed—he likes cottages or courtyards, where housewives

tend their children or superintend the labours of the cook, Satin and gold are as familiar to him as camlet and fur, but the latter are his favourites ; and there is no article of furni- ture in a Dutch house of the middle class that he does not paint with pleasure. What distinguishes him most besides subtle suggestiveness is the serenity of his pictures, whether in the open or in confined spaces. One of his most charm- ing arrangements is a canvas in the Ashburton collection, where an old lady with a dish of apples walks with a child along a street bounded by a high wall, above which gables and a church steeple are seen. The dame is busied with the child, whilst a gentleman in a hat and cloak shows his back in the distance. The sun radiates and glitters joyfully over the whole, Fine in another way is the Mug of Beer in the Amsterdam museum, an interior where a woman is seen coming out of a pantry and giving a measure of beer to a little girl. The light flows in here from a small closed window. But through the door to the right we look into a drawing-room, and through the open sash of that room we see the open air. The three lights are managed with supreme cunning. In such masterpieces as these we discern the models familiar to later artists such as Boursse and Koedijk, and a delicate gradation of tints which Maes and Meer might have envied. Beautiful for its lighting again is the Mother peeling Apples, whilst her child looks on supported in leading strings by a nurse, the sun shining through the casement to the left, a gem in the Speck collection at Liitschena near Leipsic. More subtly suggestive, in the museum of Berlin, is the Mother seated near a Cradle, whilst a child totters away into a lobby on the right. The mother looks into the depths of the cradle with a smile, thus betraying to us the presence of the baby which we cannot see. A Card Party, dated 1658, at Buckingham Palace is a good example of De Hooch’s drawing-room scenes, counterpart as to date and

value of a Woman and Child in the National Gallery, and a Smoking Party belonging to Lord Enfield. Other pictures later onward in the master's career are—the Lady and Child in a Courtyard, of 1665, in the National Gallery, and the Lady receiving a Letter, of 1670, in the Van der Hoop collection at Amsterdam. It is possible to bring together between fifty and sixty examples of De Hooch, but not more. There are eight at St Petersburg alone, three in Buckingham Palace, three in the National Gallery, five, or at least four of undoubted genuineness, in the Hoop col- lection at Amsterdam, some in the Louvre, at Munich, and Darmstadt; the rest are chiefly in private galleries In England, For England was the first to recognize the merit of De Hooch, who only began to be valued m Holland in the middle of last century. A celebrated picture at Amsterdam, sold for 450 florins in 1765, fetched 4000 in 1817, and now even that pmice i thought a bagatelle, since the Berlin museum gave £6000 for a De Hooch at the Schneider sale in 1876. HOO-CHOW-FOO, a city of China, in the province of Che-Keang, lies a little to the south of Lake Tai-hoo, the midst of the central silk district. According to Chinese authorities, it is 6 miles in circumference, and contains about 100,000 families; but Fortune thinks it is not more than 3 or 4 miles round. A broad stream or canal crosse$ the city from south to north, and forms the principa highway for boat traffic. The main trade of the place 1s

in raw silk, but some silk fabrics, such as flowered crape (tchoisha), are also manufactured. Silk is largely worn even by the lowest classes of the inhabitants.

HOOD, Rosin. See Rozin Hoop.

HOOD, Tuomas (1789-1845), humorist and poet, born 23d May 1789, was the son of Mr Hood, bookseller, of the firm of Vernor & Hood, a man of intelligence, and the author of two novels. '“ Next to being a citizen of the world,” writes Thomas Hood in his Literary Reminiscences, “it must be the best thing to be born a citizen of the world's greatest city.” The best incident of his boyhood was his instruction by a schoolmaster who appreciated his talents, and, as he says, ‘‘made him feel it impossible not to take an interest in learning while he seemed so interested in teaching.” Under the care of

this ‘decayed dominie,” whom he has so affectionately recorded, he earned a few guineas—his first literary fee—by revising for the press a new edition of Paul and Virginia. Admitted soon after into the counting-house of a friend of his family, he “ turned his stool into a Pegasus on three legs, every foot, of course, being a dactyl or a spondee ;” but the uncongenial profession affected his health, which was never strong, and he was transferred to the care of a relation at Dundee. He has graphically described his unconditional rejection by this inhospitable personage, and the circumstances under which he found himself in a strange town without an acquain- tance, with the most sympathetic nature, anxious for intel- lectual and moral culture, but without guidance, instruction, or control. originality of his cliaracter : he became a large and indis- criminate reader, and before long contributed humorous and poetical articles to the provincial newspapers and magazines, As a proof of the seriousness with which he regarded the literary vocation, it may be mentioned that he used to write out his poems in printed characters, believing that that pro- cess best enabled him to understand his own peculiarities and faults, and probably unconscious that Coleridge had recommended some such method of criticism when he said he thought “print settles it.”

His modest judgment of his own abilities, however, deterred him from literature as a profession, aud on his return to London he applied himself assiduously to the art of engraving, in which he acquired a skill that in after years became a most valuable assistant to his literary labours, and enabled him to illustrate his various humours and fancies by a profusion of quaint devices, which not only repeated to the eye the impressions of the text, but, by suggesting amusing analogies and contrasts, added con- siderably to the sense and effect of the work.

In 1821 Mr John Scott, the editor of the London Magazine, was killed in a duel, and that periodical passed Into the hands of some friends of Hood, who proposed to him to take a part in its publication. His installation into this congenial post at once introduced him to the best literary society of the time; and in becoming the associate of such men as Charles Lamb, Cary, De Quincey, Allan Cunningham, Proctor, Talfourd, Hartley Coleridge, the peasant-poet Clare, and other contributors to that remark- able miscellany, he gradually developed his own intellectual powers, and enjoyed that happy

intercourse with superior minds for which his cordial and genial character was so well adapted, and which he has described in his best manner in several chapters of Hood's Own. Odes and Addresses—his first work—were written about this time, 1 conjunction with his brother-in-law Mr J. H. Reynolds, the friend of Keats ; and it is agreeable to find Sir Walter Scott acknowledging the gift of the work with no formal expressions of gratification, but "wishing the unknown author good health, good fortune, and whatever other good things can best support and encourage his lively vein of

This self-dependence, however, suited the |:

inoffensive and humorous satire." Whims and Oddities, National Tales, Tylney Hall, a novel, and The Plea of the Midsummer Fairies followed. In these works the humorous faculty not only predominated, but expressed itself with a freshness, originality, and power which the poetical element could not claim. There was much true poetry in the verse, and much sound sense and keen observation in the prose of these works ; but the poetical feeling and lyrical facility of the one, and the more solid qualities of the other, seemed best employed when they were subservient to his rapid wit, and to the ingenious coruscations of his fancy. This im- pression was confirmed by the series of the Comic Annual, a kind of publication at that time popular, which Hood undertook and continued, almost unassisted, for several years. Under that somewhat frivolous title he treated all the leading events of the day in a fine spirit of caricature, entirely free from grossness and vulgarity, without a trait of personal malice, and with an under-current of true sympathy and honest purpose that will preserve these papers, like the sketches of Hogarth, long after the events and manners they illustrate have passed from the minds of men. But just as the agreeable jester rose into the earnest satirist, one of the most striking peculiarities of his style became a more manifest defect. The attention of the reader was distracted, and his good taste annoyed, by the incessant play upon words, of which Hood had written in his own vindication— '* However critics may take offence, A double meaning has double sense." Now it is true that the critic must be unconscious of some of the subtlest charms and nicest delicacies of

language who would exclude from humorous writing all those im- pressions and surprises which depend on the use of the diverse sense of words. The history, indeed, of many a word lies hid in its equivocal uses; and it in no way dero- gates from the dignity of the highest poetry to gain strength and variety from the ingenious application of the same sounds to different senses, any more than from the contriv- ances of rhythm or the accompaniment of imitative sounds. But when this habit becomes the characteristic of any wit, it is impossible to prevent it from degenerating into occa- sional buffoonery, and from supplying a cheap and ready resource, whenever the true vein of humour becomes thin orrare, Artists have been known to have used the left hand in the hope of checking the fatal facility which practice had conferred on the right; and if Hood had been able to place under some restraint the curious and complex machinery of words and syllables which his fancy was incessantly producing, his style would have been a great gainer, and much real earnestness of object, which now lies confused by the brilliant kaleidoscope of language, would have remained definite and clear. He was probably not unconscious of this danger ; for,as he gained experience as a writer, his diction became more simple, and his ludicrous illustrations less frequent. In another annual called the Gem appeared the poem on the story of ‘‘ Eugene Aram,” which first manifested the full extent of that poetical vigour which seemed to advance just in proportion as his physical health declined. He started a magazine in his own name, for which he secured the assistance of many literary men of reputation and authority, but which was mainly sustained by his own intellectual activity. From a sick-bed, from which he never rose, he conducted this work with surprising energy, and there composed those poems, too few in number, but immortal in the English language, such as the “Song of the Shirt,” the “ Bridge of Sighs,” and the ‘Song of the Labourer,” which seized the deep human interests of the time, and transported them from the ground of social philo- sophy into the loftier domain of the imagination. They are no clamorous expressions of anger at the discrepancies XITL — 19

and contrasts of humanity, but plain, solemn pictures of conditions of life, which neither the politician nor the moralist can deny to exist, and which

they are imperatively called upon to remedy. Woman, in her wasted life, in her hurried death, here stands appealing to the society that degrades her, with a combination of eloquence and poetry, of forms of art at once instantaneous and permanent, and with a metrical energy and variety of which perhaps our language alone is capable. Prolonged illness brought on straitened circumstances; and application was made to Sir Robert Peel to place Hood's name on the pension list with which the British state so moderately rewards the national services of literary men. 'This was done readily and without delay, and the pension was continued to his wife and family after his death, which occurred on the 3d of May 1845. Nine years after, a monument, raised by public subscription, in the cemetery of Kensal Green, was inaugurated by Mr Monckton Milnes (Lord Houghton) with a concourse of spectators that showed how well the memory of the poet stood the test of time. Artisans came from a great distance to view and honour the image of the popular writer whose best efforts had been dedicated to the cause and the sufferings of the workers of the world ; and literary men of all opinions gathered round the grave of one of their brethren whose writings were at once the delight of every boy and the instruction of every man who read them. Happy the humorist whose works and life are an illustration of the great moral truth that the sense of humour is the just balance of all the faculties of man, the best security against the pride of knowledge and the con- ceits of the imagination, the strongest inducement to submit with a wise and pious patience to the vicissitudes of human existence. This was the lesson that Thomas Hood left behind him, and which his countrymen will not easily forget. (H.)

HOOD, Tom (1835-1874), son of Thomas Hood, and the inheritor of similar though less brilliant literary talents, was born at Lake House, Wanstead, January 19, 1835. After attending University College School and Louth Grammar School he entered Pembroke College, Oxford, where he passed all the examinations for the degree of B.A., but did not graduate, At Oxford he also wrote his first work, Pen and Pencil Pictures, which appeared in 1854-55. This was followed in 1861 by Zhe Daughters of King Daker, and other Poems, after which he published a number of amusing books for children. His serious novels were not so successful, and are now almost wholly forgotten. He also wielded the pencil with considerable facility, among his illustrations being those of several of his father's comic

verses. Having become editor of the comic paper Mun in 1865, he succeeded in acquiring for it a wide popularity, principally as a depictor of the humours and eccentricities of middle-class life. Privately his lightsomeness, geniality, and sincere friendliness secured him the affection and esteem of his wide circle of acquaintance. He died 20th Nov- ember 1874.

HOOD, Samvuen Hoop, First Viscount (1724-181 6), English admiral, was born in 1724 at Butleigh in Somer- setshire, where his father was rector. Entering the navy at sixteen years of age, he quickly obtained promotion, becom- ing lieutenant in 1746 and commander in 1754. In 1757 he captured a French ship of equal size with his own, and in 1759 herepeated the achievement. After holding succes- sively the appointments of chief commander of the Boston naval station and commissioner of the dockyards at Ports- mouth, he was in 1780 promoted to the rank of rear- admiral, and sent to co-operate with Sir George Rodney in the West Indies, where he fought some indecisive actions with the Comte de Grasse. In July of the following year he succeeded Rodney in the supreme command, shortly

surrender of Toulon from the French royalists. evacuating it to Napoleon on December 18th, Hood burned the arsenal, and destroyed fifteen sail of the line besides

after which the fleet set sail for America. January 1782 Hood failed to hold the island of St Chris.

Although in

topher’s against the superior forces of the French, he succeeded in very difficult circumstances in preserving his

fleet intact until the arrival of Rodney, when he so dis-

tinguished himself in the action of the 9th April and the more important one of the 12th, that for his services he

was created a peer of Ireland with the title of Baron Hood of Catherington. On Redney's return home he was again promoted to the chief command, which he held till peace was proclaimed in 1783. successfully opposed Charles Fox as parliamentary candi-

In 1784 Lord Hood

date for Westminster, and, though he lost his seat on being made a lord of the admiralty in 1788, he regained it in 1790. On the outbreak of war with France, after the Revolution, in 1793, he was appointed to the command of the fleet in the Mediterranean, where he received the Before

carrying off eight. In the following year he succeeded, after a stubborn resistance, in expelling the French from Corsica; and after his return home he was in 1796

appointed governor of Greenwich Hospital and raised to the

English peerage with the title of Viscount Hood of Whitley. In 1799 he was promoted to the rank of admiral, and in 1804

he received the grand cross of the bath. He died at Bath

27th June 1816. The achievenients of Lord Hood, though

not of so brilliant a character as those of a Blake or a

Nelson, were the result of thorough seamanship, and of a rare union of courage and decision with coolness and caution.

HOOFT, Prerer Corneuissen (1581-1647), Dutch poet and historian, was born at Amsterdam on the 16th of March 1581, His father was one of the leading citizens of Holland, both in politics and in the patronage of letters, and for some time burgomaster of Amsterdam. As early as 1598 the young man was made a member of the chamber of rhetoric of the Eglantine, and produced before that body his tragedy of Achilles and Polyaena, not printed until 1614. In June 1598 he left Holland and proceeded to Paris, where on the 10th of April 1599 he saw the body of Gabrielle d'Estrées lying in state.

He went a few months later to Venice, Florence, and Rome. In 1600 he proceeded to Naples, and during all this Italian sojourn he madea deep and fruitful study of the best literature of Italy. In July 1600 he sent home to the Eglantine a very fine letter in verse, which is considered to mark an epoch in the development of Dutch poetry. He returned through Germany, and after an absence of three years and a half found himself in Amsterdam again on the 8th of May 1601. He soon after brought out his second tragedy, the Ariadne, in 1602. In 1605 he completed his beautiful pastoral drama Granida, not published until 1615, He studied law at Leyden from 1606 to 1609, and in June of the latter year received from the prince of Orange the appointment of steward of Minden, bailiff of Gooiland, and lord of Weesp, a joint office of great emolument. He occupied himself with repairing and adorning the decayed castle of Minden, which was his residence during the remainder of his life. In August 1610 he married the famous botanist, Christina van Erp. In 1612 Hooft pro- duced, and in 1613 printed, his national tragedy of Geeraerdt van Velsen, a story of the reign of Count Floris V. In 1614 was performed at Coster's academy Hooft's comedy of Ware-nar, an adaptation of the Aulularia of Plautus, first printed in 1617. In 1616 he wrote another tragedy, Baeto, or the Origin of the Dutch, not printed until 1626. Tt was in 1618 that he abandoned poetry for history, and in 1626 he published the first of his great prose works, the

History of Henry the Great (Henry IV. of France). His next production was his Miseries of the Princes of the Louse of Medici, printed in 1638. In 1642 he published the masterpiece of his life, his Dutch History, a magnificent performance, to the perfecting of which he had given fifteen years of labour. Hooft died on a visit to Prince Frederick Henry at the Hague on the 21st of May 1647, and was buried in the New Church at Amsterdam.

Hooft is one of the most brilliant figures that adorn Dutch literature at its best period. He was the first writer to introduce a modern and European tone into belles lettres, and the first to refresh the sources of native thougbt from the springs of antique and Renaissance poetry. His lyrics and his pastoral of Granida are strongly marked by the influence of Tasso and Sannazaro ; his later tragedies belong more exactly to the familiar tone of

his native country. But high as Hooft stands among the Dutch poets, he stands higher, he holds perhaps the highest place, among writers of Dutch prose. His historical style has won the warmest eulogy from so temperate a critic as Motley, and his letters are the most charming ever published in the Dutch language. After Vondel, he may on the whole be considered the most considerable author that Holland has produeed.

Hooft's poetical and dramatic works were collected in two volumes, 1871, 1875, by P. Leendertz. Many editions exist of his prose works.

HOOGEVEEN (i.e, High Fen or Moor), a village and commune of the Netherlands in the province of Drenthe, about 12 miles north-east of Meppel on the railway opened in 1870 between that town and Groningen. The village contains a Reformed church, erected in 1652 and restored in 1766 and 1801, a small but handsome synagogue, a poorhouse dating from 1810, and a library belonging to the local branch of the society Zot nut van 't Algemeen; and among the industrial establishments of the commune are timber yards, sail factories, block factories, tanneries, brick-works, gin distilleries, and breweries. Hoogeveen was founded in' 1625 by Baron van Eichten, and in the following year it was erected into a lordship which lasted till 1795. The population of the commune, which was 7339 in 1840, had risen to 10,763 in 1874.

HOOGHLY, or Heri. The Hooghly river is the most westerly and commercially the most important channel by which the Ganges enters the Bay of Bengal. It takes its distinctive name near the town of Séntipur, about 120 miles from the sea, The stream now known as the Hooghly re- presents three western deltaic distributaries of the Ganges —viz., (1) the Bhdgiratht, (2) the J alangi, and (3) part of the Matabhingd. 'The Bhagiratht and Jalangi unite at Nadiyd, above the point of their junction with the lower waters of the Matabhanga, which has taken the name of the Churni before the point of junction and thrown out new distributaries of its own. These three western distributaries are known as "The N adiyé Rivers," and are important, not only as great highways for internal traffic, but also as the headwaters of the Hooghly. Like other deltaic distribu- taties, they are subject to sudden changes in their channels, and to constant silting up. The supervising and keeping open of the Nadiyé rivers has, therefore, formed one of the great

tasks of fluvial engineering in Bengal. Proceeding south from SAntipur, with a twist to the east, the Hooghly tiver divides Murshidébad from Hooghly district, until it touches the district of the Twenty-Four Parganas in 22° 57’ 30″ N. lat. and 88° 27’ 15” E long. It then proceeds almost due south to Calcutta, next twists to the south-west, . and finally turns south, entering the Bay of Bengal in 21°

_ AUN, Jat. and 88° E. long,

such

In the 40 miles of its course that are above Calcutta, € channels of the Hooghly are under no supervision, and the result is that they have silted up and shifted to an extent as to be no longer navigable for sea-going

ships. Yet it was upon this upper section that all the famous ports of Bengal lay in olden times. From Calcutta to the sea (about 80 miles) the river is a record of engineer- ing improvement and success. A minute supervision, with steady dredging and constant readjustment of buoys, now renders ita safe waterway to Calcutta for ships of the largest tonnage. Much attention has also been paid to the port of Calcutta. or its trade, shipping, and adminis- tration, see CALCUTTA.

The tide runs rapidly on the Hooghly, and produces a remarkable example of the fluvial phenomenon known as a “bore.” This con- sists of the headwave of the advancing tide, hemmed in where the estuary narrows suddenly into the river, and often exceeds 7 feet in height. It is felt as high up as Calcutta, and frequently sinks small boats or dashes them to pieces on the bank. The difference from the lowest point of low-water in the dry season to the highest point of high-water in the rains is reported at 20 fect 10 inches. The greatest mean rise of tide, about 16 feet, takes place in March, April, or May,—with a declining range during the rainy season to a mean of 10 feet, and a minimum during freshets of 3 feet 6 inches. The scenery on the banks of the Hooghly varies greatly. The sca approach presents nothing to view but sandbanks, succeeded by mean-looking mnd formations covered with coarse grass. Asthe river narrows, however, the

country improves. Trees and rice fields and villages are common, and at length a section is reached where the banks are high, and lined with hamlets buried under evergreen groves. Then come long ticrs of shipping, with the stately painted mansions of Garden Reach on the margin in the foreground, the fort rising from the great plain on the bank higher up, and the domes, steeples, and noble public buildings of Calcutta beyond,— all gradually unfolding their beauties in a long panorama.

HOOGHLY, aBritish district in the lieutenant-governor- ship of Bengal, lying between 22° 13’ 45” and 23° 13’ 15” N. lat., and between 87° 47’ and 88° 33’ E. long. The area, including the magistracy of Howrah, amounted in 1878 to 1467 square miles. It forms the south-eastern portion of the Bardwan division, and is bounded N, by the district of Bardwan, E. by the Hooghly river, separating it from the districts of Nadiyé and the Twenty-Four Parganas; 8. by the Rupnardyan, separating it from Midnapur; and W. by the same river, separating it from Midnapur, and by Bardwan district.

The district is flat, with a gradual ascent to the north and north-west. The scenery along the high-lying bank of the Hooghly has a quiet beauty of its own, presenting the appearance of a connected series of orchards and gardens, interspersed with factories, villages, and temples, The principal rivers are the Hooghly, the Damodar, and the Rupnarayan. ‘The Damodar is the only large river which intersects the district. As in other deltaic districts, the highest land lies nearest the rivers, and the lowest levels are found midway between two streams. There are in con- sequence considerable marshes both between the Hooghly and the Damodar and between the latter river and the Rupnardyan.

The first regular census of the district (1872) showed a population of 1,488,556 persons, of whom 722,856 were males and 765,700 females. Of these 818 were Non-Asiatics, the great majority of them Europeans, and 557 were of mixed races (Hurasians). The Hindus numbered 1,186,485; Mahometans, 299,025; and the Christian community, 25838. Seven municipalities contain a popu- lation of over 5000 each, viz., Howrah, 97,784 ; Hooghly and Chinsurah given as one town, 34,761; Serampur, 24,448 ; Baidyabati, 18,332; Bansbarid, 7861; Bhadreswar, 7417; and Kotrang, 6811. Howran (q.v.) is the largest and most important town in the

district. Amongst other places of interest are— Tribeni, a place of great sanctity, and the scene of many religious gatherings; Panduah, now a small village, but in ancient times the fortified seat of a Hindurdja ; Tarakeswar, a village containing a large and richly endowed shrine of great holiness, visited at all times of the year by crowds of pilgrims. The total revenue in 1870-71 was £239,452, and the expenditure £84,989. In 1870 there were 16 magisterial and 35 civil and revenne courts, with 8 covenanted English officers. The regular police force of Hooghly and Howrah consisted (1871) of 1140 men, maintained at a cost of £20,726. There was also in 1870 a municipal force (exclusive of Howrah) of 583 men, costing £4475, and a rural police of 7068 men, costing £17,856. The number of Government-aided schools in

1877-78 was 625, attended by 22,666 pupils. The principal educa- tional institution in the district is the Hooghly College, attended in 1872 by 3142 students, on which the expenditure was £5143.

Rice forms the staple crop of the distriet, occupying about thirteen-sixteenths of the cultivated area; the other cereals are barley, wheat, and Indian corn. The other crops consist of pease, pulses, oil-seeds, vegetables, jute, hemp, cotton, sugar-cane, indigo, mulberry, tobacco, and pd. Blights occasionally visit Hooghly and Howrah, but they have not affected any crop throughout the entire district. An exceptional case was that of the "' Bombay sugar-cane," which was totally destroyed by blight in 1860. Droughts caused by deficiency of rainfall sometimes occur, but not to any serious extent. Floods are rare. ' The trade of the district is chiefly carried on by means of permanent markets. The prin- cipal exports are—fine rice, silk, indigo, jute, cotton cloth, and vegetables; the chief imports are common rice, English piece goods, lime, timber, ke. he chief manufactures are silk and cotton. In 1870 there were 400 miles of road in Hooghly district, maintained at a cost of £4000. The East Indian Railway has its principal terminus at Howrah, and runs through the district for about 45 miles; there are 10 stations in the district. There are six canals in Hooghly district used for water-carriage, of a total length of 33 miles.

The climate docs not differ from that of Lower Bengal generally. The average maximum temperature is 92° F., the minimum 68° F., and the average annual rainfall about 70 inches. The diseases of the district are fever, cholera, dysentery, &c. An epidemic malarious fever has raged at intervals, and is said to have carried off more than half the population and to have almost depopulated certain villages. There are 7 hospitals and dispensaries.

From an historical point of view the district possesses as much interest as any in Bengal, or indeed in India. In the early period of the Mahometan rule Satgdon was the seat of the governors of Lower Bengal and a mint town. It was also a place of great com- mercial importance. In consequence of the silting up of the Saraswati, the river on which Satgdon was situated, the town be- came inaccessible to large ships, and the Portuguese moved to Hooghly. In 1632 the latter place, having been taken from the Portuguese by the Mahometaus, was madc the royal port of Bengal ; and all the public offices and records were withdrawn from Satgaon, which rapidly fell into decay. In 1640 the East India Company established a factory at Hooghly. This was the first English settle- ment in Lowcr Bengal. In 1685, a dispute having taken place between the English factors and the nawab of Bengal, the town

was bombarded and burned to the ground. This was not the first time that Hooghly had been the scene of a struggle deciding the

fate of a European power in India. In 1629, when held by the Portuguese, it was besieged for three months and a half by a large Mahometan force sent by the emperor Shah Jahan. The place was carried by storm; more than 1000 Portuguese were killed, upwards

of 4000 prisoners taken, and of 300 vessels only 8 escaped. But

Hooghly district possesses historical intcrest for other European nations besides England and Portugal.

poy when it was ceded to Great Britain in exchange for the island of Java. till 1825, when all Danish possessions in India were transferred to the East India Company. Chandarnagar became a French settle- ment in 1683. The

English captured this town twice, but since 1816 it has remained in the possession of the French.

Hoocuty, the administrative headquarters of the above district, is a town situated on the right or west bank of the Hooghly, 22° 54’ 44” N. lat. and 88° 26’ 28” E. long. Hooghly and Chinsurah form one municipality, and the two towns were treated as one in the enumeration of 1872. Population, 34,761, viz., 17,114 males and 17,647 females:—Hindus, 27,429; Mahometans, 6952; Christians, 328; “others,” 52. Hooghly is a station on the East Indian Railway, 25 miles from Calcutta. The principal building is a handsome “imdmbaré,” constructed out of funds which had accumulated from an endowment origin- ally left for the purpose by a wealthy Shia gentleman, Muhammad Mohsin. The town is said to have been founded by the Portuguese in 1537, on the decay of SAtgdon, the royal port of Bengal. Upon establishing themselves they built a fort at a place called Gholghat (close to the present jail), vestiges of which are still visible in the bed of the river. This fort gradually grew into the town and port of Hooghly. (w. W. H.)

HOOGSTRATEN, Samven Dirksz VAN, was born, it is said, in 1627 at the Hague, and died at Dort, October 19;

H O O—

1678. This artist, who was first a pupil of his father, lived at the Hague and at Dort till about 1640, when on the death of Dirk Hoogstraten he changed his residence to Amsterdam and entered the school of Rembrandt. A short time afterwards he started as a master and painter of portraits, (1651) to to Dort, where he married in 1656, and held an appoint- ment as “ provost of the mint.” Hoogstraten’s works are scarce ; but a sufficient number of them has been preserved to show that he strove to imitate different styles at different times. In a portrait dated 1645 in the Lichtenstein collection at Vienna he imitates Rembrandt ; and he con- tinues in this vein as late as 1653, when he produced that wonderful figure of a Jew looking out of a casement, which is one of the most characteristic examples of his manner in the Belvedere at Vienna. dated 1652, in the same gallery displays his skill as a painter of architecture, whilst in a piece at the Hague re- presenting a Lady Reading a Letter as she crosses a Court- yard, or a Lady Consulting a

Doctor, in the Van der Hoop Museum at Amsterdam, he imitates De Hooch. One of his latest works is a portrait of Mathys van den Brouck, dated

Besides directing a mint, he devoted some time to literary labours, wrote a book on the theory of painting, and composed sonnets and a tragedy. him for some of

The Dntch established themselves at Chinsurah in the 17th century, and held the place till

The Danes settled at Serampur, whcre they remained

Ho ©

set out on a round of travels which took him Vienna, Rome, and London, and finally retired

A view of the Vienna Hofburg,

1670, in the gallery Hoogstraten's pictures

of Amsterdam. 'The scarcity of is probably due to his versatility.

We are indebted to the familiar sayings of Rembrandt. He was an etcher too, and some of his plates are still pre- served. His portrait engraved by himself at the age of fifty still exists.

HOOK, THeopore Epwarp (1788-1841), novelist, dramatist, and improvisatore, was born in London 22d September 1788. At Harrow he received but a scant education, and although he subsequently matriculated at Oxford he never actually resided at the university. Indeed he seems to have abandoned all thought of serious study about 1802, on the death of his mother, née Madden, a lady of singular beauty and ability. The father, James Hook, a composer of some distinction, took great delight in exhibiting the extraordinary musical and metrical gifts of the stripling, and before many months the precocious Theodore had become "the little pet lion of the green room." At the age of sixteen he scored a dramatic success with The Soldiers Return, a comic opera, and this be rapidly followed up

with a series of over a dozen sparkling ventures, the instant popularity of which was hardly dependent on the inimitable acting of Liston and Mathews. But an overweening love of society withheld Hook from a lucrative career as a dramatic author, and for some ten of the best years of his life he gave himself up to the pleasures of the town, winning a foremost place in the world of fashion by his matchless powers of improvisation and mimicry, and startling the public by the audacity of his practical jokes. His unique gift of impromptu minstrelsy “mystified” Sheridan, astonished Coleridge, and eventually charmed the Prince Regent into a declaration that “some- thing must be done for Hook.” ‘The prince was as good as his word, and the victim of social success was appointed accountant-general and treasurer of the Mauritius with a salary of £2000 a year. For five delightful years Hook was the life and soul of the island, but in 1817, a serious deficiency having been discovered in the treasury accounts, he was arrested and brought to England on a crimina charge. It transpired that a sum of about £12,000 had been abstracted by a deputy official, and for this amount Hook was held responsible.

During the tardy scrutiny of the audit board he lived obscurely and maintained himself by writing for magazines

and newspapers. In 1820 he launched the John Bull, the champion of high Toryism and the virulent detractor of Queen Caroline. Witty, incisive criticism and pitiless invective secured a large circulation for the newspaper, and from this source alone Hook derived, for the first year at least, an income of £2000. In the midst of his labours, however, he was arrested for the second time on account of his debt to the state, which he made no effort to defray. Confined for eight months in a sponging-house, he issued thence the first series of his lively Sayings and Doings (3d series, 1828). Onhis liberation he continued to work with his pen indefatigably, pouring forth in the remaining twenty-three years of his life no fewer than thirty-eight volumes, besides numberless articles, squibs, and sketches. His novels are not works of enduring interest, but they are saved from mediocrity by frequent passages of racy narra- tive and vivid portraiture. The best are Afazxwell (1830), Love and Pride (1833), the autobiographic

Gilbert Gurney (1835), Jack Brag (1837), Gurney Married (1839), and Peregrine Bunce (1841). Incessant work had already begun to tell on his health, when Hook returned to his old social habits, and a prolonged attempt to combine industry and dissipation resulted in the sad confession that he was “done up in purse, in mind, and in body too at last.” He died 24th August 1841. His writings in great part are of a purely ephemeral character; the less transient, touched though they be with a sparkling fancy, have long since passed out of favour; while the greatest triumphs of the improvisatore may be said to have been writ in wine. Putting aside, however, his claim to literary greatness, Hook will be remembered as one of the most brilliant, genial, and original figures of Georgian times.

See Lockhart’s Biographic Sketch (1852), and the Rev. R. H. D. Barham’s Life and Remains (3d ed., 1877).

HOOK, Watrzr Farqunar (1798-1875), son of the Rev. Dr James Hook, dean of Worcester, and nephew of the witty Theodore, was born in London, 13th March 1798. Educated at Tiverton and Winchester, he graduated at Oxford (Christ Church) in 1821, and after holding an incumbency in Coventry, 1829-37, and in Leeds, 1837-59, was nominated dean of Chichester by Lord Derby. He had received the degree of D.D. in 1837. His friendship towards the Tractarians exposed him to considerable per- secution, but his simple manly character and zealous devotion to parochial work gained him the support of widely divergent classes. Throughout life he held steadily by sober high-church principles, and the earnest, elevated tone of his mind is exemplified in such sermons as “ Hear the Church!” which was preached before the court in 1837, and subsequently passed through many large edi- tions. The vigorous practical turn of his Christianity is attested by the erection in the parish of Leeds, during his Incumbency, of 21 new churches, 32 parsonages, and over 60 schools, in addition to the rebuilding of the parish church ata cost of £28,000. His literary works, which are humerous, attain the limit of their design in advancing some incidental plea or in contributing to the student’s re- sources. he principal are An Mcclesiastical Biography, contarming the Lives of Ancient Fathers and Modern Divines (S rah 1845-52), A Church Dictionary (8th ed., 1859), F> ¢ Means of Rendering more Effectual the Education of the Pd (10th ed., 1851), The Cross of Christ (1873), Zhe i. a

vts Ordinances (sermons, 4 vols., 187 6), and a BA the Archbishops of Canterbury (12 vols., 1860-76).

€ died 20th October 1875. A memorial church has been on in his honour at Leeds; it is a 13th century oe, designed by Sir G. G. Scott (cost

1900), and was consecrated 29th J anuary 1880.

See Life and Letters of Dean Hi i i n Hook by his son-in-law, W. BR. W. Stephens (2 vols., 1878), and Parish Sermons (1879). ”

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HOOKE, Roserr (1635-1703), an original and ingeni- ous experimental philosopher, was born at Freshwater, in the Isle of Wight, July 18, 1635. His father, who was minister of the parish, destined him for the church; but his constitutional ill-health precluded study, and threw him instead on the resources afforded by his precocious mechani- cal genius. From the workshop of Sir Peter Lely, where he was placed after his father’s death in 1648, he was transferred to the house of Dr Busby, master of West- minster School; and there his education progressed with surprising rapidity both in its classical and mathematical branches. In 1653 he entered Christ Church, Oxford, as servitor ; and ten years later he took his M.A. degree by special recommendation of Lord Clarendon, then chancellor of the university. After 1655 he was employed and patronized by the Hon. Robert Boyle, who turned his skill to account in the construction of his celebrated air-pump. Hooke’s inventive faculty exercised itself, between 1657 and 1659, in devising thirty different methods of flying, and more profitably in regulating the movement of watches by the application of the balance spring. In 1675 a lively controversy arose between him and Huygens respecting their rival claims to this ingenious invention. The truth seems to be that the original idea belonged to Hooke, but that the coiled form of the spring, on which its practical utility depends, was due to Huygens. On the 12th of November 1662 Hooke was appointed curator of experi- ments to the Royal Society, and filled the office with extra- ordinary diligence and skill during the remainder of his life. In 1664 Sir John Cutler instituted for his benefit a mechanical lectureship of £50 a year, and in the following year he was nominated professor of geometry in Gresham College, where he

subsequently resided. After the great fire of 1666 he constructed a model for the rebuilding of the city, which was highly approved, although the design of Wren was preferred. During the progress of the works, however, Hooke acted as surveyor, and accumulated in that lucrative employment a sum of several thousand pounds, discovered after his death in an old iron chest, which had evidently lain unopened for above thirty years. He fulfilled the duties of secretary to the Royal Society during five years after the death of Oldenburg in 1677, publishing in 1681-82 the papers read before that body under the title of Philosophical Collections. A protracted controversy with Hevelius, in which Hooke urged the advantages of tele- scopic over plain sights, brought him little but discredit. His reasons were good ; but his offensive style of argument rendered them unpalatable and himself unpopular. Many circumstances concurred to embitter the latter years of his life. The death, in 1687, of his niece, Mrs Grace Hooke, who had lived with him for many years, caused him deep affliction ; a law suit with Sir John Cutler about his salary (decided, however, in his favour in 1696) occasioned him prolonged anxiety; and the repeated anticipation of his discoveries inspired him with a morbid jealousy. Marks of public respect were not indeed wanting to him. A degree of M.D. was conferred on him at Doctors' Commons, December 7, 1691, and the Royal Society made him, in 1696, a grant to enable him to complete his philosophical inventions. While engaged on this task he died, worn out with disease and toil, March 3, 1703, and was buried in St Helen's Church, Bishopsgate Street.

In personal appearance Hooke made but a sorry show. His figure was crooked, his limbs shrunken ; his hair hung in dishevelled locks over his haggard countenance. His temper was irritable, his habits penurious and solitary. He was, however, blameless in morals, and reverent in religion. His scientific performauces would probably have been more striking if they had been less varied. He origin- ated much, but perfected little. His optical investiga-

tions led him to adopt in an imperfect form the undulatory theory of light, to anticipate the doctrine of interference, and to observe, independently of though subsequently to Grimaldi, the phenomenon of diffraction. He was

the first to state clearly that the motions of the heavenly bodies must be regarded as a mechanical problem, and he approached in a remarkable manner the discovery of universal gravita- tion. Hesuggesteda method of meteorological forecasting and a system of telescopic signalling, anticipated Chladni's experiment of strewing a vibrating bell with flour, investi- gated the nature of sounds and the function of the air in respiration and combustion, and originated the idea of using the pendulum as a measure of gravity.

His principal writings are Mierographia, 1664 ; Lectiones Cutleri- ane, 1674-79 ; and Posthumous Works, containing a sketch of his 'Philosophical Algebra," published by Waller in 1705.

HOOKER, Josepn (1814-1879), American general, was born in Old Hadley, Massachusetts, November 13, 1814. He was educated at the Military Academy at West Point, 1833-37, and immediately commissioned second lieutenant in the 1st Artillery. In the war with Mexico (1846-48) le served as aide-de-camp and assistant adjutant-general, and was breveted captain, major, and lieutenant-colonel, and commissioned captain, for meritorious services in the engagements at Monterey, National Bridge, and Chapultepec. He was transferred with his regiment to California in 1849. In 1853 he resigned his commission and bought a large farm near Sonoma, which he managed successfully till 1858, when he was made superintendent of military roads in Oregon. Upon the opening of hostilities in the civil war of 1861-65, he sacrificed his fine estate and offered his sword to the Federal Government. He was commissioned brigadier-general of volunteers, May 17, 1861, and major-general May 5, 1862. At Williamsburg, May 5th, he attacked a strong Confederate position, and for nine hours maintained the fight, inflicting and sustaining heavy loss, and winning the title of " Fighting Joe." He was engaged at Fair Oaks, June Ist, and at Malvern Hill, July 1st, and did signal service at Charles City Cross Roads, June 29th, when his division aided in holding a vital position on the flank of the Union Army, in its noted "change of base." In the campaign of Northern Virginia, under General Pope, August 27 to September 1, 1862, he led his division in the actions at Bristoe Station, Manassas, and Chantilly. In the Maryland campaign, September 6-17 (under General M'Clellan), le commanded the first corps, and gallantly carried the north pass of South Mount, opening the

way for the advance of the army. He opened the battle of Antietam on the 14th, and on the following morning was pitted against “Stonewall” Jackson, at the noted “ corn- field,” where he used his artillery with terrible effect, but received a painful wound, and was borne from the field. He was commissioned brigadier-general in the United States army September 20, 1862, and in the disastrous battle of Fredericksburg, under Burnside, he commanded the centre grand division (3d and 5th corps). He commanded the army of the Potomac January 26th to June 28th, 1863, and, having by a fine strategic movement thrown his army across a turbulent stream in face of the foe, fought a severe battle at Chancellorsville, where he was seriously injured ; and, his army being thrown into an unfavourable position by the unexpected giving way of his right wing, he decided to retire. He was relieved at his own request, on the 28th of June, with the thanks of Congress “for skill, energy, and endurance” in the beginning of the Gettysburg cam- paign. He commanded the 20th corps (11th and 12th corps consolidated) in the Atlanta campaign, winning special distinction in the night battle of Wauhatchie, and at Lookout Mountain, “the battle above the clouds.” For a

hundred days, and until the capture of Atlanta, the noise of battle scarcely ceased, his corps doing signal service at Mill Creek, Resaca, New Hope Church, Pine Mount, Peach Tree Creek, and the siege of Atlanta. He was com- missioned brevet-major-general in the United States army, March 13, 1865, and retired from active service at his own request, October 15, 1868. The last years of his life were passed in the neighbourhood of New York. He died at Garden City, Long Island, October 31, 1879. HOOKER, Ricuarp (1553-1600), author of the Laws of Ecclesiastical Polity, was born at Heavitree, near the city of Exeter, about the end of 1553 or beginning of 1554, At school, not only his facility in mastering his tasks, but his intellectual inquisitiveness and his fine moral qualities, attracted the special notice of his teacher, who strongly recommended his parents to educate him for the church, Though well connected, they were, however, somewhat straitened in their worldly circumstances, and Hooker was indebted for admission to the university to his uncle, John Hooker, chamberlain of Exeter, and in his day a man of some literary repute, who, besides giving

him an annual pension, induced Bishop Jewel to become his patron and to bestow on him a clerk's place in Corpus College, Oxford. To this Hooker was admitted in 1567. Bishop Jewel died in September 1571, but Dr Cole, presi- dent of the college, from the strong interest he felt in the young man, on account at once of his character and his abilities, spontaneously offered to take the bishop's place as his patron; and shortly afterwards Hooker, by his own labours as a tutor, became independent of gratuitous aid. Two of his pupils, and these his favourite ones, were Edwin Sandys, afterwards author of Zwrope Speculum, and George Cranmer, grand-nephew of the archbishop. Hooker's reputation as a tutor soon became very high, for he had employed his five years at the university to such good purpose as not only to have aequired great proficiency in the learned languages, but to have joined to this a wide and varied culture which had delivered him from the bondage of learned pedantry ; in addition to which he is said to have possessed a remarkable talent for communicat- ing knowledge ina clear and interesting manner, and to have exercised a special influence over his pupils' intellec- tual and moral tendencies. In December 1573 he was elected to a foundation in his college ; in July 1577 he proceeded M.A., and in September of the same yeur he was admitted a fellow. In 1579 he was appointed by the chancellor of the university to read the public Hebrew lecture, a duty which he continued to discharge till he left Oxford. Not long after his admission into holy orders, about 1581, he was appointed to preach at St Paul's Cross; and, according to Walton, he was so kindly entertained by Mrs Church- man, who kept the Shunamite's house where the preachers were boarded, that he permitted her to choose him a wife, "promising upon a fair summons to return to London and accept of her choice." The lady selected by her was "her daughter Joan," who, says the same authority, "found him neither beauty nor portion; and for her conditions they were too like that wife's which is by Solomon compared to a dripping house." It is probable that Walton has exag- gerated the simplicity and passiveness of Hooker in the matter, but though, as Keble observes with justice, his writings betray uncommon shrewdness and quickness of observation, as well as a vein of keenest humour, 1b would appear that either gratitude or some other impulse had on this occasion led his judgment astray. After his marriage he was about the end of 1584 presented to the living of Drayton Beauchamp in Buckinghamshire. In the follow- ing year he received a visit

from his two pupils Edwin Sandys and George Cranmer, who found him with the Odes of Horace in his hand, tending the sheep while the

servant was at dinner, after which, when they on the return of the servant accompanied him to his house, “ Richard was called to rock the cradle.” Finding him so engrossed by worldly and domestic cares, ‘they stayed but till the next morning,” and, greatly grieved at his narrow circum- stances and unhappy domestic condition, ‘left him to the company of his wife Joan.”

The visit had, however, results of the highest moment, not only in regard to the career of Hooker, but in regard to English literature and English philosophical thought. Sandys prevailed on his father, the archbishop of York, to recommend Hooker for presentation to the mastership of the Temple, and Hooker, though his “ wish was rather to gain a better country living,” having agreed after some hesitation to become a candidate, the patent conferring upon him the mastership was granted 17th March 1585. The rival candidate was Walter Travers, a Presbyterian and evening lecturer in the same church. Being continued in the lectureship after the appointment of Hooker, Travers was in the habit of attempting a refutation in the evening of what Hooker had spoken in the morning, Hooker again replying on the following Sunday ; so it was said “the forenoon sermon spake Canterbury, the afternoon Geneva.” On account of the keen feeling displayed by the partisans of both, Archbishop Whitgift deemed it prudent to prohibit the preaching of Travers, whereupon he pre- sented a petition to the council to have the prohibition recalled, Hooker published an Answer to the Petition of Mr Travers, and also printed several sermons bearing on special points of the controversy ; but, feeling strongly the unsatis- factory nature of such an isolated and fragmentary discus- sion of separate points, he resolved to compose an elaborate and exhaustive treatise, exhibiting the fundamental prin- ciples by which the question in dispute must be decided. It is probable that the work was begun in the latter half of 1586, and he had made considerable progress with it before, with a view to its completion, he petitioned Whitgift to be removed to a country parsonage, in order that, as

he said, “I may keep myself in peace and privacy, and behold God’s blessing spring out of my mother earth, and eat my own bread without oppositions.” His desire was granted in 1591 by a presentation to the rectory of Boscombe near Salisbury. There he completed the volume containing the first four of the proposed Lnght Books of the Laws of Frelesiastical Polity. It was entered at Stationers’ Hall, 9th March 1592, but was not published till 1593 or 1594. Tn July 1595 he was promoted by the crown to the rectory of Bishopsbourne near Canterbury, where he lived to see the completion of the fifth book in 1597. Inthe passage from London to Gravesend some time in 1600 he caught a severe cold from which he never recovered, but, notwithstanding great weakness and constant suffering, he ‘“ was soliciteus in his study,” his one desire being “to live to finish the three remaining books of Polity.” His death took place about November of the same year. A volume professing to con- tain the sixth and eighth books of the Polity was published at London in 1648, but the bulk of the sixth book, as has been shown by Keble, is an entire deviation from the sub- ject on which Hooker proposed to treat, and doubtless the genuine copy, known to have been completed, has been lost. The seventh book, which was published in a new edition of the work by Gauden in 1662, and the eighth

ook, may be regarded as in substance the composition of mes but, as, in addition to wanting his final revision, : ey have been very unskilfully edited, if they have not .-on Mhanipulated for theological purposes, their statements in Tegard to doubtful matters must be received with due reserve, and no reliance can be placed on their testimony

Where their meaning contradicts that of other portions of the Polity,

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The conception of Hooker in his later years which we form from the various accessible sources is that of a person of low stature and not immediately impressive appearance, much bent by the influence of sedentary and meditative habits, of quiet and retiring manners, and discoloured in complexion and worn and marked in feature from the hard mental toil which he had expended on his great work. There seems, however, exaggeration in Walton’s statement as to the meanness of his dress; and Walton certainly misreads his character when he portrays him as a kind of

ascetic mystic. Though he was unworldly and simple in his desires, and engrossed in the purpose to which he had devoted_his life,—the "completion of the Polity,"—his writings indicate that he possessed a cheerful and healthy disposition, and that he was capable of discovering enjoy- ment in everyday pleasures, and of appreciating human life and character in a wide variety of aspects. He seems to have had a special delight in outward nature—as he expressed it, he loved "to see God's blessing spring out of his mother earth ;" and he spent much of his spare time in visiting his parishioners, his deference towards them, if excessive, being yet mingled with a grave dignity which ren- dered unwarrantable liberties impossible. As a preacher, though singularly devoid of the qualities which win the applause of the multitude, he always excited the interest of the more intelligent, the breadth and finely balanced wisdom of his thoughts and the fascination of his composi- tion greatly modifying the impression produced by his weak voice and ineffective manner, Partly, doubtless, on account of his dimsightedness, he never removed his eye from his manuscript, and, according to Fuller, "he may be said to have made good music with his fiddle and stick alone, having neither pronunciation nor gesture to grace his matter."

To aceede without explanation to the claim put forth for the Ecclesiastical Polity of Hooker, that it marks an epoch in English prose literature and English thought, would both be to do some injustiee to writers previous to him, and, if not to overestimate his influenee, to misinterpret its character. By no means can his ex- eursions in English prose be regarded as chiefly those of a pioneer ; and not only is his intellectual position inferior to that of Shake- speare, Spenser, and Bacon,! who alone can be roperly reckoned as the master spirits of the age, but in reality what effect he may have had upon the thought of his contemporaries was soon dis- regarded and swept out of sight in the hand-to-hand struggle with Puritanism, and 'his influence, so far from being immediate and confined to one particular era, has since the reaction against Puri- tanism been slowly and impereeptibly permeating and colouring English thought down to the present time. His work is, however, the earliest in English prose with cnough of the reserving salt of excellenee to adapt it to the mental palate of modern readers. Attempts more elaborate than those of the old chroniclers had been made two centuries previously to employ English prose both for narrative and for

diseussion ; aud, a few years before him, Roger Ascham, Sir Thomas More, Latimer, Sir Philip Sidney, the com- pilers of the pave book, and various translators of the Bible had in widely different departments of literature brought to light many samples of the rieh wealth of expression that was latent in the language; but Hooker's is the first independent work in English prose of notable power and genius, and the vigour and grasp of its thought are not more remarkable than the felicity of its literary style. Its more usual and obvious excellences are clearness of expression, notwithstanding occasionally complicated methods ; great aptness and coneiseness in the formation of individual clauses, and sueh a fine sense of proportion and rhythm in their arrange- ment as almost conccals the difficulties of syntax by which he was hampered ; finished simplicity, notwithstanding a stateliness too uniform and unbroken ; a nice discrimination in the choice of words and phrases, so as both to portray the exact shade of his meaning, and to express each of his thoughts with that degree of emphasis appropriate to its place in his composition. In regard to qualities more relating to the matter than the manner we may note the subtle and partly hidden humour; the strong enthusiasm under- lying that seemingly calm and passionless exposition of principles —_— S$ eee

1 If Bacon was the author of The Christian Paradoxes, his philosv- phical standpoint in reference to religion was not only less advanced than that of Hooker, but in a sense directly opposed to it.

ginning hath set Himself to do all things by ;" this law is to be dis. covered by reason; and the perfection which reason teaches us to strive after is stated, with characteristic breadth of conception and regard to the facts of humau nature, to be ‘‘ atriple perfection : first a sensual, consisting in those things which very life itself requireth, either as necessary supplements, or as beauties or ornaments there- of ; then an intellectual, consisting in those things which none underneath man is either capable of or acquainted with ; lastly, a spiritual or divine, consisting in those things whereunto we tend by supernatural means here, but cannot here attain unto them." Ap. plying his principles to man as a member of a community, he assigns practically the same origin and sanctions to ecclesiastical as to civil government. His

theory of government forms the basis of the Zreatisc on Civil Government by Locke, although Locke de- veloped the theory in a way that Hooker would not have sanctioned, The force and justification of government Hooker derives from public approbation, either given directly by the parties immediately concerned, or indirectly through inheritance from their ancestors, ‘* Sith men,” he says, ‘‘ naturally have no full and perfect power to command whole politic multitudes of men, therefore utterly with- out our consent we could in such sort be at no man’s commandment living. And to be commanded we do consent, when that society whereof we are part hath at any time before consented, without revoking the same after, by the like universal agreement.” His theory as he stated it is in various of its aspects and applications liable to objection; but taken asa whole it is the first philosophical statement of the principles which, though disregarded in the succeeding age, have since regulated political progress in England, and gradually modified its constitution into its present form. One of the corollaries of his principles, his theory of the relation of church and state, according to which, with the qualifications im- plied in his theory of government, he asserts the royal supremacy in matters of religion, and identifies the church and commonwealth as but different aspects of the same government, has not met with such general approval, but practically it is the theory of the ablest defenders of state churches at the present time.

A life of Hooker by Dr Gauden was published in his edition of Hooker’s works, London, 1662. To correet the errors in this life Walton wrote another, which was published in the 2d edition of Hooker’s works in 1666. The standard modern edition of Hooker’s works is that by Keble, which first appeared in 1836, and has since been several times reprinted. ‘The first book of the Laws of Ecclesiastical Polity has been edited for the ‘“* Clarendon Press Series,” by R. W. Church, M.A. (1868). (T. F. H)

HOOKER, Sir Witttam Jackson (1785-1865), a dis- tinguished English botanist, was born at Norwich, July 6, 1785. His father, J oseph Hooker of Exeter, a mem- ber of the same family as the celebrated Richard Hooker, devoted much of his time to the study of German litera- ture and the cultivation of curious plants. The son was educated at the high school of Norwich, on leaving which his independent means enabled him to travel and to take up as a recreation the study of natural history, especially

ornithology and entomology. He subsequently confined his attention to botany, on the recommendation of Sir James E. Smith, whom he had consulted _respect- ing a rare moss picked up in a ramble. His first botanical expedition was made in Iceland, in the summer of 1809, at the suggestion of Sir Joseph Banks; but the natural history specimens which he collected, with his notes and drawings, were lost on the homeward voyage through the burning of the ship, and the young botanist himself had @ narrow escape with his life. A good memory, how- ever, aided him to publish an account of the island, and of its inhabitants and flora (Zour in Iceland, 1809), privately circulated in 1811, and reprinted in 1813. In 1810-11 he made extensive preparations, and sacrifices which proved financially serious, with a view to accompany Sir R. Brown- rigg to Ceylon to explore that teeming though then almost unknown island; but the disturbances created by the king of Candy led to the abandonment of the projected expedi- tion. Hooker immediately fixed his attention, however, on the formation of an herbarium which was destined to become the finest in Europe; and in 1814 he spent nine months in botanizing excursions in France, Switzerland, and Northern Italy, during which he became acquainted with many of the leading Continental botanists. The following year he married the eldest daughter of Mr Dawson Turner, F.R.S., a lady who, during forty years, shared in the labours of his study. Settling at Holes-

which continually led him away from the minutie of temporary disputes, and has earned. for him the somewhat misleading epithet of ‘‘judicious” ; the solidity of learning, not ostentatiously dis- played, but indicated in the character and variety of his illustra- tions and his comprehensive mastery of all that relates to his subject ; the breadth of his conceptions, and the sweep and ease of his movements in the highest regions of thought ; the fine poctical descriptions occasionally introduced, in which his eloquence attains a grave, rich, and massive harmony that compares not unfavour- ably with the finest prose of Milton. His manner is, of course, defective in the flexibility and variety characteristic of the best models of English prose literature after the language had been enriched and perfected by long use, and his sentences, constructed too much according to Latin usages, are often tautological and too protracted into long concatenations of clauses; but if, when regarded superficially, his style presents in some respects a stiff

and antiquated aspect, it yet possesses an original and innate charm that has retained its freshness after the lapse of nearly three centurics.

The direct interest in the Ecclesiastical Polity is now philosophi- cal and political rather than theological, for what theological im- portance it possessed was rather in regard to the spirit and method in which theology should be discussed than in regard to the decision of strictly theological points. Hooker bases his reasoning on prin- ciples which he discovered in Augustine and Thomas Aquinas, but the intellectual atmosphere of his age was different from that which surrounded them ; he was acted upon by new and more various im- pulses enabling him to imbibe more thoroughly the spirit of Greek thought which was the source of their inspiration, and thus to reach a higher and freer region than scholasticism, and in a sense to inaugurate modern philosophy in England. It may be admitted that his principles are only partially and in some degree capriciously wrought out,—that if he is not under the dominion of intellectual tendencies leading to opposite results there are occasional blanks and gaps in his argument where he seems sometimes to be groping after. a mcaning which he cannot fully grasp; but he is often charged with obscurity simply because readers of various theological schools, beholding in his principles what seem the outline and justi- fication of their own ideas, are disappointed when they find that these outlines instead of acquiring as they narrowly examine them. the full and definite form of their anticipations, widen out into a region beyond their notions and sympathies, and therefore from their point of view enveloped in mist and shade. It is the exposition of philosophical principles in the first and second books of the Polity, and not the application of these principles in the remaining books that gives the work its standard place in English literature. It was intended to be an answer to the attacks of the Presbyterians on the Episcopalian polity and customs, but no attempt is made directly to oust Presbyterianism from the place it then held in the Church of England. The work must rather be regarded as a remonstrance against the narrow ground chosen by the Presbytcrians for their basis of attack, Hooker’s exact position being that ‘‘a necessity of polity and regiment may be held in all churches without holding any form to be necessary.” The general purpose of his reasoning is to vindicate Episcopacy from objections that had been urged against it, but he attains a result which has other and wider consequcnces than this. The fundamental principle on

which he _ bases his reasoning is the unity and all-embracing charactcr of law—law <‘whose seat,” he beautifully says, ‘‘is the bosom of God, whose voice the harmony of the world.” Law—as operative in nature, as regulating each man’s individual character and actions, as scen in the formations of societies and governments—is equally a manifes- tation and development of the divine order according to which God Himself acts, is the expression in various forms of the divine reason. He makes a distinction between natural and positive laws, the one being eternal and immutable, the other varying according to ex- ternal necessity and expediency; and he includes all the forms of government under laws that are positive and therefore alterable ac- cording to circumstances. Their application is to be determined by reason, reason enlightened and strengthened by every variety of know- ledge, discipline, and experience. The leading feature in his system is the high place assigned to reason, for, though affirming that certain truths necessary to salvation could be made known only by special divine revelation, he yet elevates reason into the criterion by which these truths are to be judged, and the standard to determine what in revelation is temporal and what eternal. ‘‘ It isnot the word of God itself,” he says, ‘‘which doth or possibly can assure us that we do well to think it His word.” At the same time he saves him- self from the dangers of abstract and rash theorizing by a deep and absolute regard for facts, the diligent and accurate study of which he makes of the first importance to the proper use of reason, ‘‘ The general and perpetual voice of men is,” he says, ‘‘as the sentence of God Himself. For that which all men have at all timcs learned, nature herself must needs have taught ; and, God being the author of nature, her voice is but His instrument.” Applying his principles to man individually, the foundation of morality is, according to Hooker, immutable, and rests ‘‘ on that law which God from the be-

worth, Suffolk, he continued to increase his herbarium, which became the resort and admiration of British and Continental botanists. In 1816 appeared the British Jungermannie, his first scientific work, which is even now a model of microscopic dissection and of accurate description and figuring. This was succeeded by a new edition of Curtis’s Mora Londinensis, for which he wrote the descriptions (1817-28); by a description of the Plante

Cryptogamice of A. de Humboldt and A. Bonpland; by the Muscologia Britannica, a very complete account of the mosses of Great Britain and Ireland, prepared in conjunction with Dr T. Taylor (1818); and by his Mused Exotici, 2 vols. (1818-20), devoted to new foreign mosses and other cryptogamic plants. In 1820 he accepted the regius professorship of botany in Glasgow university, and entered upon a new career of activity, in which he soon became popular as a lecturer, his style being both clear and ready. The following year he brought out the Flora Scotica, in which the natural method of arrangement of British plants was given with the artificial. During the twenty years he remained at Glasgow he prepared and took part in many works, the more important being the following :—

The Botanical Illustrations ; Exotie Flora, indicating such of the specimens as are deserving cultivation, 3 vols. 1822-27 ; Accownt of Sabine's Arctic Plants, 1824 ; Cataloguc of Plants in the Glasgow Botanic Garden, 1825; the Botany of Parry's Third Voyage, 1826; The Botanical Magazine, 1827-65, 388 vols.; cones Filicum, in concert with Dr R. K. Greville, 1829-31, 2 vols. ; British Flora, of which several editions appeared, undertaken with DrG. A. W. Arnott, 1830, &c.; British Flora Cryptogamia (Fungi), 1833 ; Characters of Genera from the British Flora, 1830 ; Flora Boreali-Americana, 1840, 2 vols., being the botany of British North America collected in Sir J. Franklin's voyage ; The Journal of Botany, 1830-42, 4 vols. ; Companion to the Botanical Magazine, 1835-36, 2 vols.; Ieoncs Plantarwm, 1887-54, 10 vols.; the Botany of Becchey's Voyage to the Pacifieand Behring's Straits (with Dr Arnott, 1841); the Genera Filiewm, 1842, from the original coloured drawings of F. Bauer, with additions and descriptive letterpress; The London Journal of Botany, 1842-48, 7 vols. ; Noteson the Botany of the Antarctic Voyage of the Erebus and Terror, 1843; Species Filicwm, 1846-64, 5 vols, the standard

work on this subject; 4 Century of Orchidew, 1846; Journal |

of Botany and Kew Garden Miscellany, 1849-57, 9 vols. In 1849 he edited the Viger Flora of Vogel, and the Rhododendrons of Sikkim, Victoria Regia, 1851; Muscum of Economic Botany at Kew, 1855; Filices Exotiei, 1857-59; The British Ferns, 1861-62; A Century of Ferns, 1854; A Second Century of Ferns, 1860-61. The estimation in which he held his patron the

duke of Bedford is shown in the Letter on his grace's death printed in 1840, calling attention to the services rendered by him to botany and horticulture.

It was mainly by Hooker's exertions that botanists were appointed to the Government expeditions. While his works Were in progress his herbarium received large and valuable additions from all parts of the globe, and his position as a botanist was thus vastly improved. He received the honour of knighthood from William IV. in 1836 in consideration of his meritorious researches in scientific botany ; and a few years later, in 1841, he was appointed director of the Royal Botanical Gardens of Kew, on the resignation of Mr Aiton. The attainment of this post had long been the object of his life. The gardens flourished under his administration ; the Government had confidence in him ; and his numerous friends and correspondents took pride in contributing to the scientific needs of hisherbarium. From small beginnings the gardens expanded under his direction to 75 acres, with an arboretum of 270 acres; and three museums, enriched with many thousand examples of vege- table products, have been added, forming together, with the magnificent palm-house and conservatories, the most delightful and beautiful resort that the inhabitants of

ondon possess ; while his extensive library of reference and admirably arranged herbarium, the greater part of

Which was presented by Sir William to the country, form »

2 constant attraction to the botanist. He was engaged on

the Synopsis Filicum with J. G. Baker when an epidemic at Kew brought his valuable life to a close. He died August 12, 1865, in the eighty-first year of his age.

HOOLE, Joun (1727-1803), translator and dramatist, was born at Moorfields, London, in December 1727. At the age of seventeen he became a clerk in the accountants' department of the East India House. His leisure hours he devoted to the study of Latin and especially Italian, after obtaining

a mastery of which he commenced writing trans- lations of the chief works of the Italian poets. He pub- lished the Jerusalem Delivered of Tasso in 1763, the Orlando Furioso of Ariosto in 1773-1783, the Dramas of Metastasio in 1767, and Rinaldo, an early work of Tasso, in 1792. He also wrote the following dramas—Cyrus (1768), Timanthes (1770), and Cleonta (1775), none of which achieved success. ‘The verses of Hoole have been praised by Johnson, with whom he was on terms of intimacy, but, though correct, smooth, and flowing, they cannot be commended for any other merit; and the noble poetry of Italy, transmuted through the crucible of his trans- lations, becomes spiritless and commonplace. In 1773 ho was promoted to be auditor of Indian accounts, which office he resigned in 1783, and in 1786 he retired to Abinger near Dorking, Surrey, where he died 2d April 1803.

See Ancedotes of the Life of John Hoole, by the Rev. Samuel Hoole, London, 1803,

HOOPER, Joun (c, 1495-1555), bishop and martyr, was a native of Somersetshire, and was born about 1495. He was educated at Merton College, Oxford, and after taking his degree of bachelor of arts in 1518 joined the order of Cistercian monks at Gloucester. Subsequently, “while living too much of a court life in the palace of the king,” his attention was directed to the writings of Zwingli, and the result of his perusing them was that after a diligent study of the Scriptures he became a zealous advocate of the principles of the Reformation. Fora short time he was chaplain to Sir Thomas Arundel, but, being warned of the danger to which his opinions exposed him, he in 1539 made his escape to France. Returning to England shortly after- wards, he found that plots were again being laid for his life, and escaped to Ireland disguised as a sailor. From Ireland he again went to France, passing theuce to Germany, where he married, probably in 1546. After his marriage he settled in Zurich till March 1549, when he set out for England. Immediately on arriving in London he began to apply himself to the work of instructing the masses, and so successful were his labours that the churches in which he lectured were crowded by eager audiences, and that the king specially requested him to remain in London to further the progress of the Reformation. In 1550 he was pre- sented to the bishopric of Gloucester ; but, refusing it on account of objections to the oath and

vestments, he was sum- moned before the council, and ultimately was imprisoned for some time in the Fleet, till he intimated that his scruples had been removed. The duties of his episcopate he dis- charged with a diligence, zeal, and self-sacrifice that have been rarely equalled. He preached three or four times a day in the towns and villages of his diocese, and so regard- less was he of fatigue that his wife wrote Bullinger to “recommend Master Hooper to be more moderate in his labour,” lest his ‘“‘overabundant exertions should cause a premature decay;” he made minute inquiry into the know- ledge, doctrine, conduct, and worldly condition of his clergy, whose impoverished livings he petitioned the council to be allowed to augment out of his own income; and he sup- plied a free dinner in his hall to the poor of the city daily, sitting down and sharing it with them. In 1552 he was created bishop of Worcester ix commendam. On the acces. sion of Mary in the following year he was immediately arrested and sent to the Fleet, aud after suffering eighteen

blood bursts from the nose, mouth, and ears, or is extrava- sated into the conjunctiva of the eyes. A single fit rarely lasts beyond from half to three-quarters of a minute, but after the “whoop” another recurs, and of these a number may come and go for several minutes. The paroxysm ends by the coughing or vomiting up of a viscid tenacious secretion, and usually after this the patient seems compara- tively well, or, it may be, somewhat wearied and fretful. The frequency of the paroxysms varies according to the severity of the case, being in some instances only to the extent of one or two in the whole day, while in others there may be several in the course ofasingle hour. Slight causes serve to bring on the fits of coughing, such as the acts of swallowing, talking, laughing, crying, &c., or they may occur without any apparent exciting cause. In general children come to recognize an impending attack by a feelin of tickling in the throat, aud they cling with dread to their mothers or nurses, or take hold of some object near them for support during the paroxysm ; but although exhausted by the severe fit of coughing they soon resume their play, apparently little the worse. The attacks are on the whole most severe at night. This stage cf the disease

usually continues for thirty to fifty days, but it may be shorter or longer. It is during this time that complications are apt to arise which may become a source of danger greater even than the malady itself. The chief of these are inflammatory affections of the bronchi and lungs, and convulsions, any of which may prove fatal. When, however, the disease progresses favourably, as it usually does, the therd or terminal stage is announced by the less frequent paroxysms of the cough, which generally loses in great measure its “whooping” character. The patient’s condition altogether undergoes amendment, and the symptoms disappear in from one to three weeks. It is to be observed, however, that for a long period afterwards in any simple catarrh from which the patient suffers the cough often assumes a spasmodic character, which may suggest the erroneous notion that a relapse of the hooping-cough has occurred. In severe cases it occasionally happens that the disease leaves behind it such structural changes in the lungs (emphysema, é&c.), as entail permanent shortness of breath- ing or a liability to attacks of asthma. Further, hooping- cough is well known to be one of those diseases of early life which are apt to give rise toa weakened and vulnerable state of the general health, or to call into activity any 1D- herited morbid tendency, such as that towards consumption. As regards the treatment of hooping-cough in mild cases, little is necessary beyond keeping the patient warm and carefully attending to the general health. The remedies applicable in the case of catarrh or the milder forms of prouchitis are of service here, while gentle counter-irritation to the chest by stimulating liniments may be employed all through the attack. In mild weather the patient may be in the open air. In the more severe forms efforts have to be employed to modify the severity of the paroxysmis. Numerous remedies are recommended, the chief of which are the bromides of ammonium or potassium, hydrocyani¢ acid, chloral, chloric ether, &c. These can only be safely administered under medical advice, and with due. regard to the symptoms in individual cases. During convalescence, where the cough still continues to be troublesome, a change of air will often effect its removal. (3. 0. A.) HOOPOE (French Huppe, Latin Upupa, Greek eropy — all names bestowed apparently from its cry), bird long celebrated in literature, and conspicuous by its variegated plumage and its large erectile crest,! the Upupa epops © naturalists, which is the type of the very peculiar F amily Upupide, placed by Prof. Huxleyin his group Coccygomorphr, 1 Hence the secondary meaning

of the French word huppe– crest or tuft (¢f. Littré, Dict. Francaise, i. 2067).

months' imprisoument he was on January 29, 1555, tried for heresy and condemned to death. The sentence was carried out on February 9th, the martyr enduring the agonies of the stake, which on account of the accidental use of green wood were unusually protracted, with great fortitude. Hooper's opinions were more decidedly auti- Romish than those of Cranmer or Ridley, and very nearly identical with those afterwards promulgated by the Puritans. He was the author of various sermons and coutroversial treatises.

His Early Writings, edited for the Parker Society by the Rev. Samuel Carr, appeared in 1848, and his Later Writings, edited for

the same society by the Rev. Charles Nevinson, M.A., in 1852. A new edition of his works was published at Oxford in 1855.

HOOPING-COUGH, or Wxoorine-Coven (syn. Pertus- sis, Chin-Cough), an infectious disease of the respiratory mucous membrane, manifesting itself by frequently re- curring paroxysms of convulsive coughing accompanied with peculiar sonorous inspirations. Tt occurs for the most part among children, and only once in a lifetime.

The specific cause of hooping-cough is unknown, but the view which ascribes it to some atmospheric condition ap- pears to derive support from the frequency of this disease ng an epidemic ; whether, however, that be the presence of a peculiar form of germ, as is held by some, remains as yet undetermined. Although specially a disease of childhood, hooping-cough is by no means limited to that period, but may occur at any time of life, even to old age, should there have been no previous attack. Itis most common between the ages of one and four, and is rare after ten. Dr Edward Gmith's statistics showed that it was the most fatal of all diseases of children under one year, that 68 per cent. of the deaths from hooping-cough occurred under the age of two, and that only 6 per cent. of the deaths were recorded after five years. It has been occasionally observed in newly-born infants, It is more common in female than in male children. Hooping-cough is highly contagious during auy stage of its progress, but apparently more so in its commencement. It is not only communicated by the breath, but may, as has

been clearly proved, be conveyed by the medium of clothing and by persons who have been +n contact with those affected. It is said to be favoured by cold and damp weather, and to prevail mostly in spring and autumn, doubtless owing to these seasons increasing the predisposition to affections of the respiratory passages. Epidemics of hooping-cough have often been noticed to succeed or even to accompany those of measles or scarlet fever, although no causal connexion between these diseases can be admitted.

With respect to the symptoms of hooping-cough, three stages of the disease are recognized, viz., (1) the catarrhal stage, (2) the spasmodic stage, (3) the stage of decline.

The first stage is characterized by the ordinary phenomena of a catarrh, with sneezing, watering of the eyes, irritation of the throat, feverishness and cough, but in general there is nothing in the symptoms to indicate that they are to develop into hooping-cough. The catarrhal stage usually lasts from ten to fourteen days. The second stageis marked by the abatement of the catarrhal symptoms, but at the same time by increase in the cough, which now occurs in irregular paroxysms both by day and by night. Each paroxysm consists in a series of violent and rapid expiratory coughs, succeeded by a loud sonorous or crowing inspiration—the “whoop.” During the coughing efforts the air is driven with great force out of the lungs, and as none can enter the chest the symptoms of impending asphyxia appear. The patient grows deep-red or livid in the face, the eyes appear as if they would burst from their sockets, and suffocation seems imminent till relief is brought by the “ whoop ”— the louder and more vigorous the better. Occasionally

_ tion of the why and the wherefore can be offered.

_ anatomy, however, forbids its being taken to signify any _ ‘Teal affinity between these groups, and the resemblance on

but considered by Dr Murie (Zbis, 1873, p. 208) to deserve separate rank as Zpopomorphe. ‘This species has an exceed- ingly wide range in the Old World, being a regular summer- visitant to the whole of Europe, in some

parts of which it is abundant, as well as to Siberia, mostly retiring south- | wards in autumn to winter in equatorial Africa and India, though it would seem to be resident throughout the year in North-Eastern Africa and in China. Its power of wing ordinarily seems to be feeble; but it is capable of very extended flight, as is testified by its wandering habits (for it occasionally makes its appearance in places very fur re- moved from its usual haunts), and also by the fact that when pursued by a Falcon it will rapidly mount to an ex- treme height and frequently effect its escape from the enemy. About the size of a Thrush, with a long, pointed, and slightly arched bill, its head and neck are of a golden- buffi—the former adorned by the crest already mentioned, which begins to rise from the forehead and consists of broad feathers, gradually increasing in length, tipped with black, and having a subterminal bar of yellowish-white. The upper part of the back is of a vinous-grey, and the scapulars

their feces are not removed by their parents, as is the case with most birds, but are discharged in the immediate neighbourhood of the nest, the unsanitary condition of which can readily be imagined. Worms, grubs, and insects generally, form the Hoopoes' food, and upon it they get so fat in autumn that they are esteemed a delicate morsel in some of the countries of Southern Europe, and especially by the Christian population of Constantinople.?

Not a year passes but the Hoopoe makes its appearance in some part or other of the British Islands, most often in spring, and if unmolested would doubtless stop to breed in them, and a few instances are known in which it has dono so. But its remarkable plumage always attracts attention, and it is generally shot down so soon as it is seen, and before it has time to begin a nest, which there is reason tu think would not in a temperate climate become so offensive a nuisance as it is in more southern latitudes. Hight or uine so-called species of the genus have been described, but of them the existence of five only has been recognized by the writers who have most lately investigated them— Messrs Sharpe and Dresser (Birds of Europe, pt. vii.). Besides the Upupa epops above treated, these are U. indica, resident in India and Ceylon; JU. longtrostris, which seems to be the form of the Indo-Chinese countries; U. marginata, peculiar to Madagascar; and U. africana or U. minor of some writers, which inhabits South Africa to the Zambesi on

the east and Benguela on the west coast. In habits and appearance they all resemble the best-known and most widely-spread species, and their particular differences cannot, for want of space, be here pointed out. (a, N.)

HOORN, a town of Holland, at the head of an arron- dissement in the province of North Holland, 20 miles N.N.E. of Amsterdam and 10 miles S.W. of Enkhuizen, with which it is connected by the road called De Streek, or The Stroke. The Hoornerhop, a bay of the Zuyder Zee, forms a good outer harbour, and the inner harbour is shut in by a sluice which can be opened only when the water within and | without has nearly the same level. Of the massive walls by which Hoorn was formerly surrounded few indications are left except in the shape of promenades and gardens ; but two of the old gateways, the East Gate and the Cow Gate, and a few towers still remain. The West Gate is gone, with its monument to the filial piety of Lambert Meliszoon, a young man who by heroic exertions managed to bring his aged mother to refuge within the town when the country around was overrun by the Spaniards in 1579. Most of the ordinary houses are old-fashioned, and interesting from the sculptures or carvings with which they are decorated ; but the public buildings have little to boast of in the way of architectural excellence or peculiarity. It is enough to mention the town-house (formerly the state college), the weigh-house, the old admiralty-house or princes' court, the house of correction (formerly the admiralty magazine), the old mint, occupied as barracks, the new infirmary, the orphanage, and the old women's hospital. Of the eight churches the principal is the Groote Kerk, occupying the site of the famous 14th century edifice of the same name, which perished by fire in 1838. A communal high school, a Latin school, a medical and chemical society, and a branch of the society Zot nut van 't Algemeen are the main

Hoopoe.

and flight-feathers are black, broadly barred with white tinged in the former with buff. he tail is black with a white chevron, marking off about the distal third part of its length, The legs and feet are as well adapted for run- ning or walking as for perching, and the scutellations are continued round the whole of the tarsi. Chiefly on account of this character, which is also

possessed by the Larks, Sundevall (entamen, pp. 53-55) united the Upupide and Alaudide in the same “cohors” H. olasprdece. Comparative

this point, which is by no means so striking as that dis- played by the form of the bill and the coloration in certain Larks (of the genus Certhilauda, for instance), must be ascribed to analogy merely, though at present no explana-

Pleasing as is the appearance of the Hoopoe as it fear- lessly parades its showy plumage, its habits are much the morse. All observers agree in stating that it delights to find its food among filth of the most abominable description,

1 This indeed is denied by Naumann, but by him alone; and the statement in the text is confirmed by many eye-witnesses. * Under the name of Dukipath, in the authorized version of the

lg ; :

ties, and making use of its head in all their charms (cf, Tristram, Vat. Hist. of the Bible, pp. 208, 209).

3 The genera Rhinopomastus and Irrisor are generally placed in the Family Upupide, but Dr Murie (/.c.), after an exhaustive examination of their osteology, regards them as forming a group of equal value,

‘8 hot only partly composed of the foulest material, but its condition becomes worse as incubation proceeds, for the len scarcely ever leaves her eggs, being assiduously fed by the cock as she sits 3 and when the young are hatched,

educational institutions. The extensive foreign commerce which Hoorn enjoyed in the 16th and 17th centuries has almost entirely vanished; but there is still a good trade with other parts of the Netherlands, especially in cheese and cattle. ‘The annual export of cheese is about 23,000 tons. Saw-mills and boat-building yards are the chief ‘ndustrial establishments. The

population was 8780 in 1870, and 9763 in 1876. Of the 9391 inhabitants in the commune in 1870, 5112 belonged to the Dutch Reformed Church, 2954 were Roman Catholics, and 386 were Jews. Hoorn, Latinized as Horna or Hornum, has existed at least from the first part of the 14th century, as it is mentioned in a document of the year 1311, five years earlier than the date usually assigned for its foundation. It was at Hoorn in 1416 that the first great net was

made for the herring fishery, an industry which long proved an abundant source of wealth to the town. During the 15th century

Hoorn shared in the troubles occasioned by the different factions; in 1518 it was molested by Groote Pier, and in 1566 and 1567 by Henry

of Brederode. The Spanish forces entered the town in 1569 ; but in

vol. iv. p. 91, fig. 48) called lupulin or lupulinic glands (see vol. 1. p. 381). These glands (fig. 2, c) are stated by Stoddart to be from 53, to 74g inch in diameter, like flat- tened subovate little saucers in shape, and attached toa short pedicel ; by the expansion of the central portion during growth their apex ultimately becomes convex instead of concave. ‘The upper or hemispherical portion consists of a delicate continuous membrane, and the lower part of tabular polyhedric cells. The stalk is not perceptible in the gland as found in commerce. When fresh the gland

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1572 it cast in its lot with the States of the Netherlands, and four Ae S| ic JN a Sy Wis years later it assisted in defeating the duke of Alva’s admiral, Count Anise 7 wa Ks LEM WGK We > de Bossu,who remained for some time a prisoner within its walls. (we Give > bn A

TS _—sS

The riot against the burgomaster Langewagen in 1672 was a matter of purely local interest. A company of commerce and navigation was formed at Hoorn in 1720; but on the other hand, in 1795, the admiralty offices and storehouses were removed to Medemblik. The English under Abercromby took possession of the town in 1799, and in 1811 it suffered severely from the French. Among the celebrities of Hoorn are William Schouten, who discovered in 1616 the passage round Cape Horn or Hoorn, as he called it in honour of his birth- place; Abel Jauszoon Tasman, whose fame is associated with Tasmania ; and Jan Pieters Koen, the founder of Batavia.

HOP (German, Hopfen; French, houblon), Humulus Lupulus, L., the sole representative of its genus, an her- baceous twining plant, belonging to the natural order Can- nabinacee, which is by some botanists included in-the larger group called Urticacewe by Endlicher. It is of com- mon occurrence in hedges and thickets in the southern counties of England, but is believed not to be native in Scotland. On the Continent it is distributed from Greece to Scandinavia, and extends through the Caucasus and Central Asia to the Altai Mountains. It is common, but doubtfully indigenous, in the northern and western States of North America, and has been introduced into Brazil, Australia, and the Himalayas.

It is a dicecious perennial plant, producing annually several long twining roughish striated stems, which twist from left to right, are often 15 to 20 feet long, and climb freely over hedges and bushes. The leaves are stalked, opposite, 3-5 lobed, and coarsely serrate, and beara general resemblance to those of the vine, but are, as well as the whole plant, rough to the touch ; the upper leaves are sometimes scarcely divided, or quite entire. The stipules are interpetiolar, each consisting of two lateral ones united, or rarely with the tips free. The male inflorescence (fig. 1, A) forms a panicle; the flowers consist of a small greenish five-parted perianth (a) enclosing five stamens, whose anthers (6) open by terminal slits. The female inflorescence (fig. 1, B) is less conspicuous in the young state. The catkin or strobile consists of a number of small acute bracts, with two sessile ovaries at their base, each subtended bya rounded bractlet ©. Both the bracts and bractlets enlarge greatly during the development of the ovary, and form, when fully grown, the membranous scales of the strobile (fig. 2, a). The bracts can then only be distinguished from the bract- lets by being rather more acute and more

strongly veined. The perianth (fig. 1, d) is short, cup-shaped, undivided, and closely applied to the ovary, which it ultimately encloses. In the. young strobile the two purple hairy styles (e) of each ovary project beyond the bracts. The ovary contains a single exalbuminous seed, containing a spirally-coiled embryo (fig. 2, 2).

_ The ovary and the base of the bracts are covered with a yellowish powder, consisting of minute sessile grains (see

tip

Sa ‘DBar ry der WE SS Vey —S Cc Fic. 1.—Male (A) and Female (B) Inflorescence of the Hop.

is seen to be filled with a yellowish or dark brown liquid ; this on drying contracts in bulk and forms a central mass. The contents of these glands, according to Lermer, are chiefly wax (myricylic palmitate) and resins, one of which is crystalline and unites with bases ; with these the bitter acid of hops is present in small proportion. It is to these lupulinic glands that the medicinal properties of the hop are chiefly due. By careful sifting, about 1 oz. may be ob- tained from 1 tb of hops, but the East Kent variety 18 said to yield more than the Sussex hops.

In hop gardens a few male plants, usually three or fourto an acre, are sometimes planted, that number being deemed sufficient to fertilize the female flowers. It is stated, how- ever, that the female plant produces sufficient male flowers for self-fertilization (Royle). The blossoms are produced in August, and the strobiles are fit for gathering from the beginning of September to the middle of October, accord- ing to the weather.

The cultivation of hops for use in the manufacture of beer dates from an early period. In the 8th and 9th cen turies hop gardens, called ‘“humularia” or “humuleta, existed in France and Germany. In the herbarium 0 Apuleius (1050 .p.), the hop (“hymele ”) is said to have been put in the usual drinks of England on account of its good qualities. Until the 16th century, however, hops appear to have been grown in a very fitful manner, and to a limited extent, generally only for private consumption ; but after the

commencement of the 17th century the culti- vation increased rapidly. At the present time England

produces a larger quantity than any other country in Europe. Formerly several plants were used as well as hops to season ale, hence the name “alehoof”.for Mepeta Glechoma, and “alecost” for Balsamita vulgaris. The sweet gale, Myrica Gale, and the sage, Salvia officinalis, were also similarly em- ployed. Various hop substitutes, in the form of powder, have been offered in commerce of late years, most of which appear to have quassia as a chief ingredient.

The young tender tops of the hop are in Belgium cut off in spring and eaten like asparagus, and are forced from December to February. They are not only considered a delicacy, but valuable as a diet for anemic, scrofulous, and rachitic persons.

Fic. 2.—Fruit of Hop.

Hops are extensively cultivated in parts of New England, New York, and Michigan, and most of the hops consumed in the United States are supplied by those districts. Al- though the hop was introduced into America nearly 250 years ago, and its cultivation encouraged by legislative enactments in 1657, it is only about seventy-five years since its culture was commenced on an extensive scale; but from that time the progress has been rapid, and hops have been grown in nearly every State in the Union. The amount produced in the United States was estimated in 1840 at 6196 bales, in 1850 at 17,485, in 1860 at 54,960, and in i at 127,283. As in England, the hop is subject to ipl and blight, and in consequence the crop is variable ; thus, in 1869, 69,463 bales were exported from New York and none imported, and in 1873 only 315 bales were exported and 20,885 imported. The English cluster and al hops seem to be most generally cultivated in New

ork and Wisconsin. Hops are also grown largely in Bel- eg Prussia, France, Wiirtemberg, and central Germany. in 1879 only 7153 ewts. of hops were exported from *ngland chiefly to Australia and other British possessions,

| action of sulphurous acid gas.

while 262,765 cwts. were imported, of which 108,306 cwts. were derived from the United States, 63,485 cwts. from Belgium, 50,567 from Germany, 26,796 from Hol- land, and smaller quantities from France and British North America. The first packages of hops collected in England often fetch an extravagant price, and are some- times disposed of with remarkable celerity. The first pocket of hops gathered in 1879 is said to have been picked, dried, sent to London, sold by auction, subjected to hydraulic pressure, packed and banded with iron, covered with three coats of paint, and despatched to an Indian mail steamer—all within twenty-four hours. The better qualities are usually packed in fine and the inferior in coarse sacking. In Germany two varieties of the hop are distinguished, the August and the autumn hop, the former being preferred.

The stem of the hop abounds in fibre similar to that of hemp and flax, and has been used in Sweden in the pro- duction of astrong durable white cloth. Hitherto it has becn usual to steep the stem in water during the whole winter in order to separate the fibre easily. A much quicker process has, however, been patented, by which the fibre can be speedily extracted. This process consists in boiling the stems first for three quarters of an hour in alkaline lye, and then, after rinsing in water, for the same time in acetic acid ; the fibre is thus obtained in a state fit for bleaching. The leaves, stem, and root possess also an astringent property, and their use for tanning purposc was hence at one time patented in England. The leaves have also been recommended as fodder in the fresh state, mixed with other materials, and are said to increase the quantity and improve the quality of milk yielded by cows. The stems or "' bine" are usually burned in the hop garden. The spent hops from breweries form excellent manure

| for light soils, and together with the leaves should be re-

turned to the hop-gardens, the materials absorbed from the ground by the hop plant being thus in some measure restored to it.

By distillation with water, hops yield 0-9 per cent. of a volatile oil, of a greenish colour if from fresh, but reddish- brown if from old hops. Exposed to the air it resinifies. This oil, according to Personne, contains valerol, C,H,,0, which soon passes into valerianic acid, 0°1 to 0°17 of this acid having been found by Méhu in the lupulinic glands. The unpleasant odour of old hops is due to this change, which may be prevented or retarded by exposure to the For medicinal use fresh hops which have neither undergone this change nor been treated with sulphurous acid should be used. For brewing purposes, according to Liebig, the use of sulphured hops is not objectionable. The bitter acid principle, C,,H;,0,, to which hops probably owe their tonic properties, although noticed by Payen, was first obtained in the pure state by Lermer in 1863. It crystallizes in large rhombic prisms, and is soluble in ether. It has been variously called lupulin, lupuline, lupulite, and humulin. Griessmayer (1874) has shown that hops contain also in small proportion a liquid volatile alkaloid, not yet analysed, which has the odour of conia ; to this alkaloid its narcotic property is perhaps duc. The same chemist found trimethylamine in hops. Etti (1876-78) has found in the scales of the hop strobiles an astringent principle, humulotannic acid, Cy >H4gOQog, which is incapable of precipitating gelatin, but which, when boiled in alcohol or water or heated to 130° C., changes to a red substance, phlobaphen, C9H,,0;, whose solution in aleohol possesses that property. Etti likewise obtained a crys- talline white and an amorphous brown resin, also malate,

1 Issleib (Archiv der Pharmacie, May 1880) has further elucidated the chemical relationship of the constituents of the resin, essential oil, and bitter principle,

citratenitrate, phosphate, and sulphate of potassium, and pectic acid.

The use of hops in medicine dates from a very early period. Coles, in his //istory of Plants (1657), says— They are good to cleanse the kidneys of gravel and provoke urine ; they likewise open obstructions of the liver and spleen, and cleanse the blood and loosen the belly ; and as they cleanse the blood, so consequently they help to cure eruptions of the skin.” Brooke’s Dispensatory (1753) recom- mends them also as an alterative, and as a

remedy for hypo- chondriasis. Hops are, however, but little used in medicine at the present day, although official in the British and United States Pharmacopeeias. According to Bartholow hops in- crease the action of the heart, excite the cutaneous circula- tion, and cause diaphoresis. A slight cerebral excitement is first produced, soon followed by a disposition to sleep. Hops also possess someanaphrodisiac properties. The preparations used are the tincture, infusion, and extract, the oleoresin, and the lupulinic glands. The drug is generally employed either as a stomachic in dyspepsia, or to allay uervous irritability or cerebral excitement in delirium tremens, where the use of opium is inadmissible. A combination of the tinctures of lupulin and capsicum is said to be one of the best substitutes for alcoholic stimulants when their habitual use is to be discontinued. A pillow stuffed with hops forms a well-known domestic remedy for sleeplessness, and a bag of hops dipped in hot water is often used as an ex- ternal application to relieve pain or inflammation, especially of the abdominal organs.

See Fliickiger and Hanbury, Pharmacographia, 2d ed., p. 551 ; Bentley and Trimen, Aled. Plants, No. 280 ; Griessmayer, Amer. Journ. Pharm., Aug. 1876, p. 860; Etti, in Dingler's Polyt. Journ. cexxvil, p. 491; ccxxviil, pp. 354, 357 ; Bartholow, Mat. Aed., p. 362; Watson, Rural Eneyclopedia, ii. pp. 686-699; Darwin, Climb- ing Plants, p. 2; Scot, Perfite Platforme of a Hoppe Garden, 1576; Freake, Humulus Lupulus in Gout, 1806 ; La Belgique Horticole, 1851, t. i. 311; Perin, Culture dw Houblon, Strasburg, 1874 ; and for details as to the cultivation and varieties and the picking and preparation of hops, and their employment in the inating of

beer, see AGRICULTURE, vol. i. p. 381, and BREWING, vol. iv. pp. 272-278. (BE, M. H.)

HOPE, Tuomas (c. 1770-1831), the author of Anastasius, born at London about 1770, was descended from a bratich of an old Scotch family who for several generations were extensive merchants in London and Amsterdam. About the age of eighteen he started on a tour through various parts of Europe, Asia, and Africa, where he interested himself especially in architecture and sculpture, making a large collection of the principal objects which attracted his attention. On his return to London he purchased a house in Duchess Street, which he fitted up in a very ornamental and elaborate

style, from draw- ings made by himself. In 1805 he published sketches of his furniture, accompanied by letterpress, in a folio volume, entitled Household Furniture and Decoration, which had considerable influence in effecting a change in the upholstery and interior decoration of houses. In 1809 he published the Costwmes of the Ancients, and in 1812 Designs of Modern Costumes, works which display a large amount of special antiquarian research. He was also a munificent patron of the highest forms of art, and both at his London house and his country seat at Deepdene near Dorking he formed large collections of paintings, sculpture, and antiques. ‘Thorwaldsen, the Danish sculptor, was indebted to him for the early recognition of his talents, and he also gave frequent employment to Chantrey and Flaxman. In 1819 he published anonymously his novel Anastasius, or Memoirs of a Modern Greek, written at the close of the 18th century, a work which, chiefly on account of the novel character of its subject, caused a great sensation. It was generally attributed to Lord Byron, but, though remarkable for the acquaintance it displays with Eastern life, and dis-

tinguished by considerable imaginative vigour aud much graphic and picturesque description, its paradoxes are not so striking as those in which Lord Byron indulged ; and, notwithstanding some eloquent and forcible passages, the only reason which warranted its ascription to him was the general type of character to which its hero belonged. Hope died February 3, 1831. published posthumously,—the Origin and Prospects of Man, 1831, in which he indulged in speculations diverging

He was the author of two works

widely from the usual orthodox opinions, and an Historccal

Essay on Architecture, 1835, an elaborate description of the architecture of the Middle Ages, illustrated by drawings inade by himself in Italy and Germany.

HOPITAL. See L’Hé6pitat. HOPKINS, Ezexien (1633-1690), bishop of London-

derry, and a Calvinistic divine of some repute, was born at Stanford, Devon (where his father was curate), in 1633, was educated at Magdalen College, Oxford, where he identified himself with the Presbyterian party, and about 1660 became assistant to Dr W. Spurstow of Hackney, the W.S. [UU.S.] of "Smectymnuus." He was subsequently presented to the living of St Mary Woolnoth, London, which at the out- break of the plague he exchanged for that of St Mary's, Exeter. Having married a daughter of Lord Robartes,

who in 1669 became lord-lieutenant of Ireland, he was soon afterwards promoted to the deanery of Raphoe, and in 1671 he was raised to the bishopric of that diocese. Trans- lated to the see of Londonderry in 1681, he continued to discharge his episcopal functions until the period of the famous siege, when, after having vainly sought to inculcate the doctrine of passive resistance, he withdrew to London, where in 1689 he accepted the living of St Mary Alderman- bury. He died in June 1690.

His works, consisting chiefly of discourses, but including A prac. tieal Exposition of the Lord's Prayer and An Exposition of the Ten Commandments, were first published in a complete and uniform edition in 1701; they were reprinted in 4 vols. in 1809, with a Life prefixed, by Pratt, and again, in 2 vols., in 1841-44. Though marked by ''strength of thought, originality of illustration, and felicity of style," they are now but seldom read.

HOPKINS, Samuen (1721-1803), the theologian from whom the Hopkinsians or Hopkinsian Calvinists take their name, was born at Waterbury, Connecticut, on September 17, 1721. About his fifteenth year he entered Yale College, where he graduated in 1741 ; he afterwards studied divinity at Northampton with Jonathan Edwards ; and in 1743 he was ordained pastor of the church at Housatonnue (now Great Barrington), Massachusetts. There in the midst of a small settlement of only thirty families he laboured for six and twenty years, preaching, studying, and writing, until in 1769 he was dismissed from his office on the alleged ground of want of funds for his support. He next began to preach in Newport, Rhode Island, where, in 1770, he was settled as pastor of a small congregation, and where, with an interval from 1776 to 1780, caused by the occupation of the British, he continued to labour until about the close of the

century. In 1799 he had an attack of paralysis, from which he never wholly recovered; but he continued to preach occasionally, and with unimpaired mental vigour, al- most until his death, which occurred on December 20, 1803.

While in vigour of intellect and in strength and purity of mo tone hardly inferior to Jonathan Edwards, Hopkins considerably excelled his master in force and energy of character. To him belongs the honour of having becn one of the first to stir up and organize political action against slavery ; and to his persistent though bitterly opposed efforts are chiefly to be attributed the law of 1774, which forbade the importation of negroes into New England, as also that of 1784, which declared that all children of slaves born after the following March should be free. He was the author of numerous pamphlets, addresses, and sermons; and he also published lives of Jonathan Edwards, Susannah Anthony, and Mrs Osborn. But his distinctive theological tenets are chiefly to be sought in his important work, the System of Theology, which, published in 1791, has had an influence hardly inferior to that exercised by the writ-

ings of Edwards himself. They may be sumined up as follows :— 1) God is the efficient cause of all the volitions of the human heart, whether these be good or evil; (2) the guilt of Adam’s first sin lies upon Adam alone ; moral corruption consists exclusively in the opposition offered by the human heart to the doing of that which it is really and fully capable of doing; (8) all virtue or true holiness consists in disiuterested benevolence; (4) all sin consists in selfish- ness; (5) reconciliation and redemption are fundamentally dis- tinct ; the former opens the gate of mercy, the latter applies to individuals Christ’s saving benefits; (6) effectual calling consists in a willingness to allow himself to be saved, produced in the heart of the sinner by God ; (7) although the righteousness of Christ is the sole ground of the sinner’s justification, yet is that righteousness not imputed; (8) repentance is prior in poiut of time to the exercise of faith in Christ.

The works of Hopkins, first published in two volumes at Boston in 1791, ap- peared in a 2d edition in 1811. The latest and best edition is that of 1852, in

three volumes, also published at Boston; to it there is prefixed a biographical sketch by Professor Park of Andover.

HOPKINSON, Francis (1737-1791), an American author, and one of the signers of the Declaration of Inde- pendence, was born at Philadelphia in 1737. He studied at the college of Philadelphia, and after graduating in 1763, r2solved to prepare himself for the legal profession. After being admitted to the bar in 1765, he spent two years in England, and on his return in 1768 he obtained a lucrative public appointment in New Jersey. In 1776-77 he repre- sented that State in Congress. In 1779 he was appointed judge of admiralty for Pennsylvania, and in 1790 district judge for the same state. He died at Philadelphia 9th May 1791. Hopkinson was the author of several songs to which he wrote popular airs, and of various political poems, pamphlets, and jeux d'esprit, which from their humorous satire had a wide circulation, and powerfully assisted in arousing and fostering the spirit of political independence that issued in the American Revolution.

His principal writings are The Pretty Story, 1774 ; The Prophecy,. 1776; The Political Catechism, 1777. Among his songs may be mentioned The T'reaty, The Battle of the Keys, and The New Roof, a Song for Federal Mechanics ; and the best known of his satirical pieces are Typographical Method of conducting a Quarrel, Essay on White Washing, and Modern Learning. His Miscclllancous Essays oe Writings were published at Philadelphia in 8 vols.,

HOPPNER, Jowy (1758-1810), English portrait-painter, was born, it is said, on April 4, 1758, at Whitechapel. His father was of German extraction, and his mother was one of the German attendants at the royal palace. Hoppner was consequently brought early under the notice and re- ceived the patronage of George III., whose regard for him gave rise to unfounded scandal. Asa boy he was a chorister at the royal chapel, but showing strong inclination for art, he in 1775 entered as a student at the Royal Academy. In 1778 he took a silver medal for drawing from the life, and in 1782 the Academy's highest award, the gold medal for historical painting, his subject being King Lear. He first exhibited at the Royal Academy in 1780. His earliest love was for landscape, but necessity obliged him to turn to the more lucrative business of portrait- painting. At once successful, he had,

throughout life, the most fashionable and wealthy sitters, and was the greatest rival of the growing attraction of Lawrence. Ideal subjects Were very rarely attempted by Hoppner, though a Sleeping Venus, Belisarius, Jupiter and Io, a Bacchante, and Cupid and Psyche are mentioned among his works. The prince of Wales especially patronized him, and many of his finest portraits are in the state apartments at St James's Palace, the best perhaps being those of the prince, of the duke and duchess of York, of Lord Rodney, and of Lord Nelson. Among his other sitters we may mention Sir Walter Scott,

Vellington, Frere, and Sir George Beaumont. Competent

judges have deemed his most successful works to be his

Portraits of women and children. Ladies was published by him in translations of Eastern tales into

A Series of Portraits of 1803, and a volume of English verse in 1805,

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The verse is of but mediocre quality. In his later years Hoppner suffered from a chronic disease of the liver; he died January 23, 1810. He was confessedly an imitator of Reynolds. When first painted, his works were much admired for the brilliancy and harmony of their colouring, but they have been much injured by lapse of time. His drawing is faulty, but his touch has qualities of breadth and. freedom that give to his paintings a faint reflexion of the charm of Reynolds. Hoppner was a man of great social power, and had the knowledge and accomplishments of a man of the world.
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HOR, Mounr (139 1, "Op 76 pos), a lofty and con- spicuous double-topped mountain in Arabia Petrea, form- ing part of the great Jurassic chain of Shera or Seir. It stands on the eastern edge of the great valley of the Arabah, which extends from the head of the Gulf of Akabah to the valley of the Jordan, and it is referred to in Scripture as "fon the border" or "at the edge" of the land of Edom (Numb. xx. 23, xxxiii, 37). According to the most recent measurements, its height is 4800 feet above the level of the sea.

Mount Hor was the first halting-place of the Israelites after they had turned from Kadesh on their way southwards towards Zalmonah and the Red Sea, in. order to encompass the land of Edom; and it was while the host was encamped at Kadesh that Aaron ascended this moun- tain to die. This last event is commemorated in the modern name of the mountain, Djebel Nebi Harin, “the hill of the prophet Aaron,” whose “tomb,” a small square Saracenic structure, now occupies one of the summits, Another Mount Hor (7d dpos 76 dpos, LXX.) is mentioned in Scripture in the passage which (Numb. xxxiv. 7, 8) defines the northern boundary of the prospective con- quests of the Israelites. It is probably to be identified with Lebanon.

HORACE (65-8 3.c.). No ancient writer has been at once so familiarly known and so generally appreciated in modern times as Quintus Horatius Flaccus. We seem to know his tastes and habits, and almost to catch the tones of his conversation, from his own works, as we know the character and manner of Dr Johnson from the pages of Boswell. His twofold function of a satiric moralist and a lyric poet give a peculiar value both to his self- por- traiture and to the impressions which he has left of his age. From his Satires, which deal chiefly with the manners and outward lives of men, we know him in his relations to society and his ordinary moods; from his Zpistles, which deal more with the inner life, we best understand his deepest convictions and the practical side of his philo- sophy ; while his Odes have perpetuated the finest pleasure which he derived from art, nature, and the intercourse of life, have idealized some of the graver as well as the lighter aspects of his reflexion, and given an elevated ex- pression to his sympathy with the national ideas and movement of his time.

His own writings afford much the fullest and most trust- worthy materials for his biography and for the estimate of his character. But a few facts, in addition to those recorded by the poet himself, are known from the short life originally contained in the work of Suetonius, De Viris Lllustribus.

Horace was born on the 8th of December 65 B.c., in the consulship of L. Manlius Torquatus and L. Aurelius Cotta (Ode iii. 21, 1; Hpode 13, 6). His birthplace was the town of Venusia on the borders of Lucania and Apulia, whence he describes himself as “ Lucanus an Apulus anceps” (Sat. ii. 1,

34). In his “ Journey to Brundusium ”(Sat. 1. 5) he marks his recognition of the familiar shapes of the Apulian hills—

- Incipit ex illo montes Apulia notos Ostentare mihi ;”

and in one of his finest odes he speaks of Mount Vulturnus as the scene of an adventure of his childhood, which marked him out as a special object of divine protection and as appointed to a poetic destiny. The descriptive touches in that passage, such as “ celse nidum Acherontiz,” show that the scenery by which he was surrounded in lis early years had imprinted itself vividly on his mind. As he connects his native mountains with the dawn of his poetic inspiration, so he associates the name of the “ far-sounding Aufidus,” the river familiar to his early recollection, in more than one passage of his Odes (iii. 30, 10; iv. 9, 2) with his hopes of poetic immortality. He dwells fondly on the virtues of the people belonging to his native district, as in that picture of family happiness and innocence which he paints in the second Lpode— * Quod si pudica mulier in partem juvet Domum atque dulces liberos,

Sabina qualis, aut perusta solibus Pernicis uxor Apuli ;”

and elsewhere he recalls with pride the old martial glory of the race amongst whom his first years were passed (Ode i, 22,14; iii. 5,9). Like Virgil he regards the Sabellian stock as that branch of the Italian people which had con- tributed most to the virtue of Rome as well as to her greatness in war. In the Ofella of tle Satires we meet with a still surviving type of that primitive virtue. The Servius Oppidius, whose dying directions to his sons are recorded in Sat. ii. 3, 168, &c., seems to have been another representative of “the wisdom unborrowed from the schools,” who must have been known to Horace through the tie of neighbourhood. We note also, as a trace of the influence of early impressions on his later tastes, that the name of the “Bandusian fountain,” which he has made as immortal as the names of Castalia or Aganippe, seems to have been transferred by him from a spring in his native district to one on his Sabine farm, which charmed and inspired him in the meridian of his poetical power. We may thus trace some of the germs of his poetical inspira- tion, as well as of his moral sympathies,

to the early years which he spent on the farm near Venusia. But the most important moral influence of his youth was the training and example of his father, of whose worth, affectionate solicitude, and homely wisdom Horace has given a most pleasing and life-like picture (Sat. i, 6, 70, &c.). He was a freedman by position; and it is supposed that he had been originally a slave of the town of Venusia, and on his emancipation had received the gentile name of Horatius from the Horatian tribe in which the inhabitants of Venusia were enrolled. After his emancipation he acquired by the occupation of " coactor" (a collector of the payments made at public auctions, or, according to another interpretation, a collector of taxes) sufficient meaus to enable him to buy a small farm ("macro pauper agello," Sat. i. 6, 71), to make sufficient provision for the future of his son (Sat. i. 4, 108), and to take him to Rome to give him the advantage of the best education there. To his care Horace attributes, not only the intellectual training which enabled him in later life to take his place among the best men of Rome, but also his immunity from the baser forms of moral evil (Sat, 196, 68, &c.). To his practical teaching he attributes also his tendency to moralize and to observe character (Sat. i. 4, 105, &c.)—the tendency which enabled him to become the most truthful painter of social life and manners which the ancient world produced. If Horace drew some of his poetical sensi- bility from the influences of his native district, we may believe that he derived his moral health and practical sagacity from a father who combined with the intelligence and prudence which raised him above his original position the serious spirit and respect for the morality handed down from their forefathers—

ACH

(" mi satis est si Traditum ab antiquis morem servare," &¢.)—

which formed the basis of the old Italian character. In one of his latest writings (Hpist. ii. 2, 42, &.) Horace gives a further account of his education ; but we hear no more of his father, nor is there any allusion in his writings tothe existence of any other member of his family or any other relative. After the ordinary grainmatical and literary training at Rome, he went to Athens, the most famous school of philosopliy, as Rhodes was of oratory ; and he describes himsclf while there as “searching after truth among the groves of the Academy ” as well as advane- ing in literary accomplishment. His pleasant residence there was interrupted by the breaking out of the civil war. Following the example of his young associates, he attached himself to the cause of Brutus, whom he seems to have accompanied to Asia, probably asa member of his staff ; and he served at the battle of Philippi in the post of military tribune. He shared in the rout which followed the battle, and in an ode addressed to his old comrade Pompeius Grosphus he alludes, in imitation of a similar confession of Alceus, to the inglorious casting away of his shield. In interpreting such passages in the works of Horace, we have always to bear in mind the irony habitual to him, and the reserve imposed on him by his subsequent relations to the chiefs of the victorious party. The enthusiasm which he had felt for the republican cause, though necessarily re- pressed, still betrays itself in some expressions of that ode, and in that addressed to Asinius Pollio (ii. 1, 21, &e);

and though he describes himself as “ Imbellis et firmus param,” and as more fitted to treat of the light warfare of love than of the themes of actual war, yet both the martial and the patriotic feeling expressed in many of his later Odes enables us to understand the motives which induced him to quit the placid haunts of art and literature for the harsher experience of the campaign and battlefield. He returned to Rome shortly after the battle, stripped of his property, which formed part of the land confiscated for the benefit of the soldiers of Octavianus and Antony. It may have been at this time that he encountered the dauger of shipwreck, which he mentions among the perils from which his life had been protected by supernatural aid (Ode iii. 4, 28). He procured in some way the post of a clerkship in the quzstor’s office, and about three years after the battle of Philippi, he was introduced by Virgil and Varius to Mecenas. This was the turning-point of

his fortunes. He owed his friendship with the createst of literary patrons to his personal merits rather than to his poetic fame ; for, though some of his shorter and less im- portant pieces may have been known to a small circle of friends before the date of this introduction, his first pub- lished work (book i. of the Satires) shows that the relations of intimacy and mutual confidence which were never after- wards disturbed had been established between the statesman and poet some time before this book was given to the world, He tells us in one of his Sadires (i. 10, 31) that his earliest ambition was to write Greek verses. In giving this direc: tion to his ambition, he was probably influenced by his admiration of the old iambic and lyrical poets whom he has made the models of his own Hpodes and Odes. A parallel to this may be found in the early Latin verse of Milton and Gray, in whom, as in Horace, the gift of expression has been brought to the highest perfection. His common sense as well as his national feeling fortunately saved him from becoming a second-rate Greek versifier in an age when

1 Of, the line of Ennius, which Cicero compares to the voice of an

oracle— – 2 | _ “Moribus antiquis stat res Romana virisque.

_ them are,

living language of Rome was a more fitting vehicle for the new feelings and interests of men than the echoes of the old Ionian or AZolian melodies. His earliest Latin com- positions were, as he tell us, written under the instigation of poverty ; and they alone betray any trace of the bitter- ness of spirit which the defeat of his hopes and the hard- ships which he had to encounter on his first return to Rome may have temporarily produced on him. Some of the Epodes, of the nature of personal and licentious lampoons, and the second Satzre of book 1., in which there is some trace of an angry republican feeling, belong to these early compositions. But by the time the first book of Satires was completed and published (35 3.c.) his temper had re- covered its natural serenity, and, though he had not yet attained to the height of his fortunes, his personal position was one of

comfort and security, and his intimate relation with the leading men in literature and social rank was firmly established.

About a year after the publication of this first book of Sateres Maecenas presented him with a farm among the Sabine hills, in the valley crowned by Mount Lucretilis and watered by the stream Digentia, which joins the main valley of the Anio near the modern Vico Varo (the “ Varia ” mentioned in the Zpzstles), and about 8 miles above the modern Tivoli. No kind of gift could have added more to the poet’s happiness or exercised a more salutary influence on his genius. It made him independent in point of fortune ; it satisfied the love of nature which had been im- planted in him during the early years spent on the Venusian farm ; and it afforded him a welcome escape from the dis- tractions of city life and the dangers of a Roman autumn. The lines (Hpist, i. 16, 15, &c.)—

“ He latebree dulces, etiam, si credis, amen,

Incolumem tibi me prestant Septembribus horis’— express with simple and sincere feeling the charm of peace and outward beauty as well as the restorative influence which this retreat in the Sabine highlands afforded him. Many passages in the Satires, Odes, and Epistles, which recur to the memory of every reader of his poems, express the happiness and pride with which the thought of his own valley filled him, and the interest which he took in the simple and homely ways of his country neighbours. The inspiration of the Satires came from the heart of Rome § the feeling of many of the Odes comes direct from the Sabine hills ; and even the meditative spirit of the later Epistles tells of the leisure and peace of quiet days spent among books, or in the open air, at a distance from “the smoke, wealth, and tumult” of the great metropolis,

The second book of Satires was published in 29 3, c.; the Epodes apparently about a year earlier, though many of as regards the date of their composition, to be ranked among the earliest extant writings of Horace.

_ Horace speaks of them under the name of “ iambi.” In one

«of his Epistles (i.

1, 19, 25) he rests his first claim to origin- ality on his having introduced into Latium the metres and spirit of Archilochus—

__ ‘* Parios ego primus iambos Ostendi Latio, numeros animosque secutus

Archilochi.”’ Yet, whatever technical claim he may have to have naturalized some special combination of metre employed by the poet of Paros, Catullus, Calvus, and Bibaculus had in the Preceding generation employed the iambic metre in the spirit of Archilochus more effectively than Horace. His personal lampoons are the least successful of his works ; and those of the Fpodes which treat of other subjects in a

Poetical spirit are inferior in metrical effect, and in truth

ee freshness of feeling, both to the lighter lyrics of Oe and to his own later and more carefully meditated €s. The Lpodes are chiefly interesting as a record of

the personal feelings of Horace during the years which im- mediately followed his return to Rome, and as a prelude to the higher art and inspiration of the first three books of the Odes, which were published together about the end of 24 or the beginning of 23 z.c.1 The composition of these Odes extended over several years, but all the most important among them belong to the years between the battle of Actium and 24 B.c, at which time the poet was between the age of thirty-five and forty, His lyrical poetry is thus, not, like that of Catullus, the ardent utterance of his youth, but the mature and finished workmanship of his manhood. The state of public affairs was more favourable than it had been since the outbreak of the civil war between Coesar and Pompey for the appearance of lyrical poetry. Peace, order, and national unity had been secured by the triumph of Augustus, and the enthusiasm in favour of the new govern- ment had not yet been chilled by experience of its repress- ing influence. The poet’s circumstances were, at the same time, most favourable for the exercise of his lyrical gift during these years. He lived partly at Rome, partly at his Sabine farm, varying his residence occasionally by visits to Tibur, Preeneste, or Baie. His intimacy with Mecenas was Strengthened. He was

no longer one among a favoured band of poets, but he had become the familiar friend of the great minister. He was treated with distinction by Augustus, and by the foremost men in Roman society. He complains occasionally that the pleasures of his youth are passing from him, but he does so in the spirit of a temperate Epicurean, who found new enjoyments in life as the zest for the old enjoyments decayed, and who cousidered the wisdom and meditative spirit,—“ the philosophic mind that years had brought,”—an ample compensation for the extinct fires of his youth. The soberiug influence of time is acknowledged by him in such lines as “ Lenit albescens animos capillus ;”’ or in the still finer expression of the Hpistles (ii. 2, 211), ‘‘Lenior et melior fis accedente senecta?”

About four years after the publication of the three books of Odes, the first book of the Hpistles appeared, introduced, as his Hpodes, Satires, and Odes had been, by a special address to Macenas. From these Lpistles, as compared with the Satires, we gather that he had gradually adopted a more retired and meditative life, and had become fonder of the country and of study, and that, while owing allegiance to no school or sect of philosophy, he was framing for him- self a scheme of life, was endeavouring to conform to it, and was bent ou inculcating it on others. He maintained his old friendships, and continued to form new intimacies, especi- ally with younger men engaged in public affairs or ani- mated by literary ambition. After the death of Virgil he was recognized as pre-eminently the greatest living poet, and was accordingly called upon by Augustus to compose the sacred hymn for the celebration of the secular games in 17 Bc. About four years later he published the fourth book of Odes, having been called upon to do so by the emperor, in order that the victories of his stepsons Drusus and Tiberius over the Rliweti and Vindelici might be worthily celebrated. He lived about five years longer, and during these years published the second book of Hpistles, and the Hpvstle to the Pisos, more generally known as the “ Ars Poetica.” These later Hpistles are mainly devoted to literary criticism, with the especial object of vindicating the poetic claims of his own age over those of the age of Ennius and the other early poets of Rome. He might have been expected, as a great critic and lawgiver on literature, to have exercised a beneficial influence on the future poetry

1 The date is determined by the poem on the death of Quintilius Varus (who died 24 B.c.), and by the reference in Ode i. 12 to the

young Marcellus (died in autumn 28 B.c.) asstill alive. Cf, Wickham's Introduction to the Odes. XT. — ar

of his country, and to have applied as much wisdom to the theory of his own art as to that of a right life. But his critical Epistles ace chiefly devoted to a controversial attack on the older writers and to the exposition of the laws of dramatic poetry, on which his own powers had never been exercised, and for which either the genius or circumstances of the Romans were unsuited. The same subordination of imagination and enthusiasm to good sense and sober judg- ment characterizes his opinions ou poetry as on morals.

He died somewhat suddenly in the November of the year 8 B.c., within a few weeks of the death of Meecenas, thus strangely confirming the declaration made by him in one of his Odes (ii. 17). Though not an old man, he had reached the full maturity of his faculties, and fully accom- plished the work he was fitted to do in the world. He lived longer than any of the illustrious poets immediately contemporary with him or belonging to the preceding generation ; and his works show a mature character and a mellow wisdom in striking contrast to the tone of the only other great lyrical poet of Rome, "the young Catullus."

Horace is one of the few writers, ancient or modern, who lave written a great deal about themselves without laying themselves open to the charge of weakness or egotism. His chief claim to literary originality is not that on which he himself rested his hopes of immortality,—that of being the first to adapt certain lyrical metres to the Latin tongue, but rather that of being the first of those whose works have reached us who establishes a personal relation with his reader, speaks to him as a familiar friend, gives him good advice, tells him the story of his life, and shares with him his private tastes and pleasures,—and all this without any loss of self-respect, any want of modesty or breach of good manners, and in a style so lively and natural that each new generation of readers might fancy that he was addressing them

personally and speaking to them on sub- jects of everyday modern interest. In his self-portraiture, so far from wishing to make himself out better or greater than he was, he seems to write under the influence of an ironical restraint which checks him in the utterance of his highest moral teaching and of his poetical enthusiasm. He affords us some indications of his personal appearance, as where he speaks of the “nigros angusta fronte capillos ” of his youth, and describes himself after he had completed his forty-fourth December as of small stature, prematurely grey, and fond of basking in the sun (Zpist. i, 20, 24).

In his later years his health became weaker or more un- certain, and this caused a considerable change in his habits, tastes, and placcs of residence. It inclined him more to a life of retirement and simplicity, and also it stimulated his tendency to self-introspection and self-culture. In his more vigorous years, when he lived much in Roman society, he claims to have acted inall his relations to others in accord- ance with the standard recognized among men of honour in every age, to have been charitably indulgent to the weakness of his friends, and to have been exempt from petty jealousies and the spirit of detraction. If ever he deviates from his or- dinary vein of irony and quiet sense into earnest indignation, it is in denouning conduct involving treachery or malice in the relations of friends —as in the lines (Sat. i. 4, 81, dsc.) —

“ Absentem qui rodit amicum, Qui non defendit alio culpante, solutos Qui captat risus hominum famamque dicacis,

Fingere qui non visa potest, commissa tacere Qui nequit, hic niger est, hune tu, Romane, caveto.””

1 “* He who maligns an absent friend’s fair fame, Who says no word for him when others blame, Who courts a reckless laugh by random hits, Just for the sake of ranking among wits, Who feigns what he ne’er saw, a secret blabs, Beware him, Roman! that man steals or stabs.” —Conington.

hORATH

He claims to be and evidently aims at being independent of fortune, superior to luxury, exempt both from the sordid cares of avarice and the

coarser forms of profligacy. At the same time he makes a frank confession of indolence and of occasional failure in the pursuit of his ideal self-mastery, He admits his irascibility, his love of pleasure, his sensitive. ness to opinion, and some touch of vanity or at least of gratified ambition arising out of the favour which through all his life he had enjoyed from those much above him in social station, “ Me primis urbis belli placuisse domique” (Hpist. i. 20, 23). Yet there appears no trace of any un- worthy deference in Horace’s feelings to the great. Even towards Augustus he maintained his attitude of independ- ence, by declining the office of private secretary which the emperor wished to force upon him ; and he did so with such tact as neither to give offence nor to forfeit the regard of his superior. His feeling towards Mzecenas is more like that which Pope entertained to Bolingbroke than that which a client in ancient or modern times entertains towards his patron. He felt pride in his protection and in the intel- lectual sympathy which united him with one whose personal qualities had enabled him to play so prominent and beneficent a part in public affairs. Their friendship was slowly formed, but when once established continued unshaken through their lives. Many passages in the Odes and the Zpistles show how perfect the confidence was between them, how completely Horace remained his own master, how certainly the bond that united them was one of mutual affection and esteem, not of vanity and interest.

There is indeed nothing more remarkable in Horace than the independence, or rather the self-dependence, of his character. ‘This saved him from the danger to which his genial qualities exposed him of becoming, like Moore or Burns, the slave of society or the slave of passion. The enjoyment which he drew from his Sabine farm consisted partly in the refreshment to his spirit from the familiar beauty of the place, partly in the “ otia liberrima” from the claims of business and society which it afforded him. His love poems, when compared with those of Catullus, Tibullus, and Propertius, show that he never, in his mature years at least, allowed his peace of mind to be at the mercy of any one. They are the expressions of a fine and subtle and often a humorous observation rather than of ardent feeling, There is perhaps a touch of pathos in his reference in the Odes to the early death of Cinara, but the epithet he applies to her in the Lpistles,

‘¢ Quem scis immunem Cinare placuisse rapaci,” shows that the pain of thinking of her could not have been very heart-felt. Even when the Odes addressed to real or imaginary beauties are most genuine in feeling, they are more the artistic rekindling of extinct fires than the utter ance of recent passion. In his friendships he had not the self-forgetful devotion which is the most attractive side of the character of Catullus ; but he studied how to gain and keep the regard of those whose society he valued, and he repaid this regard by a fine courtesy and by a delicate appreciation of their higher gifts and qualities, whether proved in literature, or war, or affairs of state, or the ordi- nary dealings of men. He made life more pleasant to himself and others by restraining the propensities which give pain to others, as well as by active good offices and the expression of kindly feelings. He enjoyed the great world, and it treated him well ; but he resolutely main- tained his personal independence and the equipoise of his feelings and judgment. The mention of Virgil and Meecenas elicits from him warmer expressions of affection and appreciation than that of any of the other famous men of the time; but there is no strain of exaggeration Il the language which he applies even to them. Tf it is thought that in attributing a divine function to Augustus he has gone

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QWORACE

beyond the bounds of a sincere and temperate admiration, a comparison of the Odes in which this occurs with the first Epistle of the second book shows that he certainly recog- nized in the emperor a great and successful administrator on whom depended the peace, order, and prosperity of the world, and that the language which at first sight offends our moderu sensibilities is to be regarded rather as the artistic expression of the prevailing national sentiment than as the tribute of an insincere adulation.

The aim of Horace’s philosophy was to “be master of

oneself ”— ‘ ** Tle potens sui Letusque deget,” &c.;

to retain the “ mens zequa” in all circuimstances— ** Quod petis hic est, Est Ulubris, animus si te non deficit equus ;”? to use the gifts of fortune

while they remained, and to be prepared to part with them with equanimity ; to make the most of life, and to contemplate its inevitable end without anxiety. Self-reliance and resignation are the lessons which he constantly inculcates. His philosophy is thus a mode of practical Epicureanism combined with other elements which have more affinity with Stoicism. In his early life he professed his adherence to the former system, and several expressions in his first published work show the influences of the study of Lucretius. At the time when the first book of the Hpistles was published he professes to assume the position of an eclectic rather than that of an adhcrent of either school (Zpist. i. 1, 13-19). We note in the passage here referred to, as in other passages, that he mentions Aristippus, the chief of the Cyrenaic school which antici- pated the doctrines of Epicurus, rather than Epicurus him- self, as the master under whose influence he from time to time insensibly lapsed. Yet the dominant tone of his teaching is that of a refined Epicureanism, not so elevated or purely contemplative as that preached by Lucretius, but yet more within the reach of a society which, though luxurious and pleasure-loving, had not yet become thoroughly frivo- lous and enervated. His advice is to make the most of the present which alone is within our power— ** Quod adest memento Componere equus ; ” to enjoy the pleasures of youth in their season, but to choose some more serious object as life goes on—

“ Nec lusisse pudet, scd non incidere ludum a

_ tosubdue all violent emotion of fear or desire ; to estimate

all things calmly—‘ nil admirari;” to choose the mean

_ between a high and low estate ; and to find one’s happiness

In plain living rather than in luxurious indulgence. His

| social and friendly qualities, his enjoyment of refined and _ Simple pleasures, the attitude which he assumed of a critical _ Spectator rather than of an active participator in the various modes of human activity, _ Practice and the teaching of Epicurus.

were all in harmony with the Still there was in Horace a robuster fibre, inherited from the old Italian race, which moved him to value the dignity and nobleness of life more highly than its ease and enjoyment. This is perhaps the secret cause of that weariness and dissatisfaction with the comfortable routine of existence which occasionally betrays itself in some of his later writings. But in some of the stronger utterances of his Odes, where he expresses ‘sympathy with the manlier qualities of character, whether

‘manifested in the persons of the ancient national heroes or

In the civic dress of his own day, we recognize the resistent

attitude of Stoicism rather than the passive acquiescence of

Picureanism, The concluding stanzas of the address to ue (Ode lv. 9) exhibit the Epicurean and Stoical view a te SO combined as to be more worthy of humau dignity

an the genial worldly wisdom of the former school, more

in harmony with human experience than the formal precepts of the latter :- — ‘* Non possidentem multa vocaveris Recte beatum ; rectius occupat Nomen beati, qui deorum Muneribus sapienter uti Duramque callet pauperiem pati, Pejusque leto flagitium timet ; Non ille pro caris amicis Aut patria timidus perire.”

{t is interesting to trace the growth of Horace in eleva- tion of sentiment and serious conviction from his first ridi- cule of the paradoxes of Stoicism in the two books of the Satires to the appeal which he makes in some of the Odes of the third book to the strongest Roman instincts of forti- tude and self-sacrifice. A similar modification of his re- ligious and political attitude may be noticed between his early declaration of Epicurean unbelief —

“ Namque deos didici securum agere evam’’—

and the sympathy which he shows with the religious reac- tion fostered by Augustus; and again between the Epicurean indifference to national affairs expressed in the words ** Quid Tiridatem terreat unice Sccurus ”

and the strong support which he gives to the national policy of the emperor in the first six Odes of the third book, and in the fifth and fifteenth of the fourth book. In his whole religious attitude he seems to stand midway between the consistent denial of Lucretius and Virgil’s pious endeavour to reconcile ancient faith with the conclusions of philosophy. His introduction into some of his Odes of the gods of mythology must be regarded as merely artistic or symboli- cal, Yet in such lines as

“* Di me tuentur, dis pletas mea

Et musa cordi est,”

“ Dis te minorem quod geris, imperas,”

‘“ Immuuis aram si tetigit manus,” SGan we recognize the expression of a natural piety, thankful for the blessing bestowed on purity and simplicity of life, and acknowledging a higher and more majestic law, governing nations through their voluntary obedience. On the other hand, his allusions to a future life, as in the ‘domus exilis Plutonia,” and the “ furvee regna Proserpine,” are shadowy and artificial. The image of death is constantly obtruded in his poems to enhance the sense of present enjoyment. In the true spirit of paganism he associates all thoughts of love and wine, of the meeting of friends, or of the changes of the seasons with the recollection of the transitoriness of our pleasures—

*“ Nos, ubi decidimus Quo pius Aineas, quo dives Tullus et Ancus, Pulvis et umbra sumus,”’

Horace is so much of a moralist in all his writings that, in order to enter into the spirit both of his familiar and of his lyrical poetry, it is essential that we should realize to ourselves what were his views of life and the influences under which they were formed. Heis, though in a different sense from Lucretius, eminently a philosophical and reflec- tive poet. He is also, like all the other poets of the Augustan age, a poet in whose composition culture

and criticism were as conspicuous elements as spontaneous inspiration. In the judgment he passes on the older poetry of Rome and on that of his contemporaries, he seems to attach more importance to the critical and artistic than to the creative and inventive functions of genius. It is on the labour and judgment with which he has cultivated his

ift— “* Spiritum Graie tenuem Camene ”— that he rests his hopes of fame. The whole poetry of the Augustan age was based on the works of older poets, Roman

as well as Greek. Its aim was to perfect the more imma- ture workmanship of the former, and to adapt the forms, manners, and metres of the latter to subjects of immediate and national interest. As Virgil performed for his genera- tion the same kind of office which Ennius performed for an older generation, so Horace in his Satives, and to a more limited extent in his Epistles, brought to perfection for the amusement and instruction of his contemporaries the rude but vigorous designs of Lucilius. Notwithstanding great differences in their intellectual tastes and culture, and the great differences between a time of republican freedom and one of imperial restraint, in which their respective lots were cast, there was a real affinity of temper and disposition between the first and the second in the line of the great Roman satirists. Horace seems to have made Lucilius to some extent his model, in his manner of life as well as in the form and substance of his satire. We find in the fragments of Lucilius expressions of a love of freedom and independ- ence, of indifference to wealth or public employment, of joy at escaping from the storms of life into a quiet haven, of contentment with his own lot, of the superiority of plain living to luxury, identical in spirit and often similar in manner to those that are almost the common-places of Horace.

It was the example of Lucilius to commit all his private thoughts, feelings, and experience “to his books as to trusty companions,” and also to com- ment freely on the characters and lives of other men. Many of the subjects of particular satires of Horace were immediately suggested by those treated by Lucilius. Thus the “Journey to Brundusium ” reproduced the outlines of Lucilius’s “ Journey to the Sicilian Straits.” The discourse of Ofella on

luxury was founded on a similar discourse of Lelius on gluttony, and the “ Banquet of Nasidienus” may have been suggested by the description by the older poet of a rustic entertainment. The same kinds of excess are satirized by both, especially the restless passion of money- making and the sordid anxieties of money-saving, and the opposite extreme of profuse and ostentatious expenditure. There was more of moral censure and personal aggressive- ness in the satire of the older poet. The ironical temper of Horace induced him to treat the follies of society in the spirit of a humorist and man of the world, rather than to assail vice with the severity of a censor; and the greater urbanity of his age or of his disposition restrained in him the direct personality of satire. The names introduced by him to mark types of character, such as Nomentanus, Menius, Pantolabus, éc., are reproduced from the writings of the older poet. Horace also followed Lucilius in the variety of forms which his satire assumes, and especially in the frequent adoption of the form of dialogue, derived from the “dramatic medley” which was the original character of the Roman Satura. This form suited the spirit in which Horace regarded the world, and also the dramatic quality of his genius, just as the direct denunciation and elaborate painting of character suited the “seva indignatio” and the oratorical genius of Juvenal.

Horace’s satire is accordingly to a great extent @ repro- duction in form, manner, substance, and tone of the satire of Lucilius; or rather it is a casting in the mould of Lucilius of his own observation and experience. There is little trace of the influence of his Greek studies either in the matter or the manner of this thoroughly Roman work; though he mentions in one passage that, as aids to composition, he had carried with him to the country the works of Archi- lochus, and of the comic poets Eupolis, Plato, and Menander. But a comparison of the fragments of Lucilius with the finished compositions of Horace brings out in the strongest light the artistic originality and skill of the latter poet in his management of metre and style. Nothing can be

HORM

rougher and harsher than the

had shown the vivacity with which that light and graceful

describing some trivial situation dramatically. But no one before Horace had succeeded in applying the metre of heroic verse to the uses of common life. But he had one great native model in the niastery of a terse, refined, ironical, and natural conversational style, Terence ; and the Satires show, not only in but in many happy turns of expression very frequent traces

Menander.

which induced Horace

hexameters of Lucilius, or eruder than his expression. In his management of the nore natural trochaic metre, he has shown much greater ease and simplicity. It is one great triumph of Horace's genius that he was the first and indeed the only Latin writer who could bend the stately hexameter to the uses of natural and easy, and, at the sane time, terse and happy conversational style. Catullus, in his hendecasyllabics,

metre could be employed in telling some short story or

allusions to incidents and personages, of Horace's familiarity with the works of the Roman

The Hpistles are more original in form, more philosophic in spirit, more finished in style than the Satires. The form of composition may have been suggested by that of some of the satires of Lucilius, which were composed as letters to his personal friends. But letter-writing in prose, and occasionally also in verse, had been common among the Romans from the time of the siege of Corinth; and a practice originating in the wants and convenience of friends temporarily separated from one another by the public service was ultimately cultivated as a literary accomplish- ment. It was a happy idea of Horace to adopt this form for his didactic writings on life and literature. It suited him as an eclectic and not a systematic thinker, and as a friendly counsellor rather than a formal teacher of his age. It suited his circumstances in the latter years of his life, when his tastes inclined him more to retirement and study, while he yet wished to retain his hold on society and to extend his relations with younger men who were rising into eminence. It suited the class who cared for literature,—a limited circle of educated men, intimate with one another, and sharing the same tastes and

pursuits. While giving expression to lessons applicable to all men, he in this way seems to address each reader individually, “ admissus circum precordia ludit,” with a subtle power of sympathy and. of inspiring sympathy, which respects both himself and bis reader. In spirit the Hpzstles are more ethical and medi- tative than the Satires. Like the Odes they exhibit the twofold aspects of his philosophy, that of temperate Epicu- reanism and that of more serious and elevated conviction. In the actual maxims which lie lays down, in his apparent belief in the efficacy of addressing philosophical texts to the mind, he exemplifies the triteness and limitation of all Roman thought. But the spirit and sentiment of his practical philosophy is quite genuine and original. The © individuality of the great Roman moralists, such 2s Lucretius and Horace, appears not in any difference 12 _ the results at which they have arrived, but in the difference of spirit with which they regard the spectacle of human life. In reading Lucretius we are impressed by his earnest- — ness, his pathos, his elevation of feeling; in Horace we are charmed by the serenity of his temper and the flavour of a delicate and subtle wisdom. We note also in the | Epistles the presence of a more philosophic spirit, not only in the expression of his personal convictions and aims, but also in his comments on society. In the Satires he paints | the outward effects of the passions of the age. He shows | us prominent types of character—the miser, the parasite, the legacy-hunter, the parvenu, &c., but he does not ty to | trace these different manifestations of life to their source © In the Zpistles he finds the secret spring of the social vices | of the age in the desire, as marked in. other times as 1

those of Horace, to become rich too fast, and in the tendency to value men according to their wealth, and to sacrifice the ends of life to a superfluous care for the means of living. In the Satzres he dwells on the discontent of men with their actual condition as he noticed the outward manifes- tation of this spirit in the various callings of life ; in his Epistles he lays his finger on the real evil from which society was suffering. The cause of all this aimless restlessness and unreasonable desire is summed up in the words “Strenua nos exercet inertia.” In point of style the Epistles occupy a middle position between the “sermo pedestris” of the Satvres, and the studied grace or the grave majesty of the Odes, It is the perfection of that kind of style which

conceals much thought, insight, and character under a quiet and unpretending exterior. It combines two great excellences of manner both in writing and in conduct, self-restraint with sincerity and simplicity.

In his Saties and Epistles Horace shows himself a genuine moralist, a subtle observer and true painter of life, and an admirable writer. But for both of these works he himself disclaims the title of poetry. He rests his claims asa poet on his Odes, They reveal an entirely different aspect of his genius, his spirit, and his culture. He is one among the few great writers of the world who have attained high excellence in two widely separated provinces of literature. If this division of his powers has been un- favourable to the intensity and spontaneity of his lyrical poetry, it has made him more interesting as a man, aud more complete as a representative of his age. Through all his life he was probably conscious of the “ingeni benigna vena,” which in his youth made him the sympathetic student and imitator of the older lyrical poetry of Greece, and directed his latest efforts to poetic criticism. But it was in the years that intervened between the publication of his Satires and Epistles that his lyrical genius asserted itself as his predominant faculty. At that time he had outlived the coarser pleasures and risen above the harassing cares of his earlier career ; a fresh source of happiness and inspira- tion had been opened up to him in lis beautiful Sabine retreat; he had become not only reconciled to the rule of Augustus, but a thoroughly convinced and, so far as his temperament admitted of enthusiasm, an enthusiastic believer in its beneficence. But it was only after much labour that his original vein of genius obtained a free and abundant outlet. He lays no claim to the “ profuse strains of unpremeditated art,” with which other great lyrical poets of ancient and modern times have charmed the world. He recognizes with modest and truthful self-appreciation the source of his power in the lines in which he contrasts his genius with that of Pindar :—

‘* Ego, apis Matinee More modoque, Grata carpentis thyma per laborem Plurimum, cirea nemus uvidique Tiburis ripas, operosa parvus Carmina fingo.”

His first efforts were apparently imitative, and were directed to the attainment of perfect mastery over form, Metre, and rhythm. The first nine

Odes of the first book are experiments in different kinds of metre. They

4nd all the other metres employed by him are based on those employed by the older poets of Greece,—Alczeus,

Sappho, Archilochus, Aleman, &c. He has built the Structure of his lighter Odes also on their model, while in Some of those in which the matter is more weighty, as in

that in which he calls on Calliope “to dictate a long _ continuous strain,” he has endeavoured to reproduce some-

t Ing of the intricate movement, the abrupt transitions, the interpenetration of narrative and reflexion, which char- acterize the art of Pindar. He frequently reproduces the

language and some of the thoughts of his masters, but he gives to them new application, or stamps them with the impress of his own experience. He brought the metres which he has employed to such perfection that the art perished with him. A great proof of his mastery over rhythm is the skill with which he has varied his metres according to the sentiment which he wishes to express. He has impressed the stamp of his own individuality or of his race upon all of them. Thus his great metre, the Alcaic, has a character of stateliness and majesty in addition to the energy and impetus originally imparted to it by Alczeus. The Sapphic metre he employs with a peculiar lightness and vivacity which harmonize admirably with his gayer moods. In his combinations of the Asclepiadean we note the grave and thoughtful temperance of tone which pervades those in which the three Asclepiadean line are combined with one Glyconic as in the “Quis desiderio, &c.,” “Inclusam Danaen,” &c., the “Divis orte bonis,” &c., and the peculiar simplicity and grace, of a graver character than that of the Sapphic, in those Odes in which two Asclepiadean lines are combined with one Pherecratean and one Glyconic, as in the

- Quis multa gracilis te puer in rosa,” or the **O fons Bandusiz, splendidior vitro.”

Again in regard to his diction, if Horace has learned his subtlety and moderation from his Greek masters, he has tempered those qualities with the masculine characteristics of his race. No writer is more Roman in the stateliness and dignity, the terseness, occasionally even in the sobriety and bare literalness, of his diction. The individuality of the man is equally marked in his vivid and graphic con- densation of phrase, whether employed in description of outward scenery or in moral portraiture, in the latent fervour or ironical reserve employed in the indication of personal feeling, and in the generalizing maxims which transmute the experience of some special occasion into a universal experience.

While it is mainly owing to the extreme care which Horace gave to form, rhythm, and diction that his own prophecy

- Usque ego postera Crescam laude recens”” has been so amply fulfilled, yet no greater injustice could be done to him than to rank him either as poet or critic with those who consider form everything in literature. Had he been a writer of that stamp he would probably have attached himself to the school of Alexandrian imitators ; and such excellence as lie might have obtained would have been appreciated only by limited coteries, whose opinion and tastes do not long influence either the educated or uneducated world. With Horace the mastery over the

| vehicle of expression was merely an essential preliminary

to making a worthy and serious use of that vehicle. He may have erred, in theory at least, rather in the other extreme of exaggerating the didactic office of poetry. If an explanation is to be sought for his disparaging reference to the lyrical art of his predecessor, Catullus, it is not necessary to find that explanation in jealousy, nor in any insensibility to a power of expression of which he has shown the sincerest admiration by attempting to imitate it. It is more likely that he was repelled by the purely personal and, as he may have thought, trivial subjects, whether of love or hate, to which the art of his predecessor was almost exclusively limited. The poet, from Horace’s point of view, was intended not merely to give refined pleasure to a few, but, above all things, to be “utilis urbi.” Yet he is saved, in his

practice, from the abuse of this theory by his admir- able sense, his ironical humour, his intolerance of pretension

and pedantry. Opinions will differ as to whether he or Catullus is to be regarded as the greater lyrical poet. Those who assign the palm to Horace will do so, certainly not because they recognize in hini richer or equally rich gifts of feeling, conception, and expression, but because the subjects to which his art has been devoted have a fuller, more varied, more mature, and permanent interest for the world.

For the most complete and exact account of the MSS, and the various editions of Horace, readers are referred to the Introduction to the admirable edition of Mr E. C. Wickham, of which only the first volume, containing the Odes and Epodes, has appeared. For English readers the translation of the Odes and Satires by Sir Theo- dore Martin, and of the Odes, Satires, and Epistles by the late Pro- fessor Conington, and the Life of Horace by the late Das Milman, may be especially recommended. (W. Y. 8.)

HORATII, three brothers born at one birth, who were the champions of Rome in the war against Alba Longa. Three Alban brothers, named the Curiatii, likewise born at one birth, were opposed to them. The mothers were also twin sisters, who had been married at the same time, and had given birth to their sons on one day. When the Alban army under their king Cluilius lay encamped some miles from Rome, Tullus Hostilius the Roman king agreed with them that the issue should depend on the combat between the two families. Two of the Horatii were soon slain; the third brother feigned flight, and when the Curiatii who were all wounded pursued him without concert he turned and slew them one by one. Now the sister of the Horatii was engaged to one of the Curiatii, and had made for him a beautiful mantle. When the victor, adorned with this trophy, was entering Rome in triumph, his sister came to greet him by the Porta Capena ; but when the fatal mantle, which he wore as a trophy, showed her that her lover had fallen by her brother’s hand, she invoked curse on him. Enraged at her reproaches, he slew her on the spot; and the body of her that preferred her lover to her country lay unburied till passers by covered it with stones. Horatius was condemned by

duwmviri, spacially appointed as his judges, to be scourged to death ; but his father justified his action, and on appeal the psople spared his life, condemning him in penalty to walk with veiled head below the sororiwm tigillum. Woratius was afterwards sent to destroy Alba Longa and transport all the inhabitants to Rome. Monu- ments of the tragic tale were shown by the Romans in the time of Livy :—the pila Horatia in the forum, where the victor hung his spoils; the beam under which the brother passed, and which stood across narrow street near the site of the later Flavian Amphitheatre ; the sister's grave outside the gate; the grave of the two Horatii, and those of the three Curiatii where each had fallen; the fossa Cluilia dug by the Albans to defend their camp.

The mythical character of many of these details is evi- dent ; and indeed it was even doubtful which of the two gets of brothers belonged to Rome and which to Alba. Under the tale lie historical facts known on other evidence _the close relationship and the final, internecine strife between the two cities. Alba, the ancient city on the Alban mount, was the mother of all the Latin cities, and of Rome itself; but the ancient city on the Alban hill had gradually given way to the younger cities in the plain, and was finally destroyed by them, while the inhabitants were transported to Rome and various other Latin cities. With the tale that formed round this fact were connected various monuments on the road that led from the Roman forum to Alba Longa. According to Schwegler, the fossa Cluilia (clueo, to purify) was probably an attempt to drain the country ; and the sororium tigillum was perhaps the memo- rial of the substitution of judicial trial for the older patri- archal jurisdiction in case of murder. Rome, maintains the historical character of the tale.

gare, about a branches, are coated with a white or hoary felt—whence

woolly below, and pale green

are sessile, in dense whorls

Dyer, Kings of

HOR—-HOR

HORDE, a manufacturing town of Westphalia, Prussia, circle of Dortmund, government district of Arnsberg, is situated on the railway from Dortmund to Soest, 2 miles south-east from Dortmund. It has one Roman Catholic and two Evangelical churches. Its industry is almost wholly connected with iron, and it possesses a large smelting- work, foundries, puddling-works, rolling-mills, and manu- factures of iron and plated wares. In the neighbourhood there are large iron and coal-pits. The population in 1875 was 12,837.

HORERB. See Sina.

HOREHOUND (Ang.~~Sax., harhune ; Germ., Andorn ; Fr., Marrube), Marrubium, L., a genus of perennial, usually cottony or woolly herbs, of the natural order Labiate, and tribe Stachydew. Common or white horehound, JM, vul~~ L,, has a short and stout rootstock, and thick stems, foot in height, which, as well as their numerous

the popular name of the plant. The leaves have long

petioles, and are roundish, or rhombic-ovate, crenate-serrate,

much wrinkled, white and and downy above; the flowers

or clusters, small, and dull- Vg) white, with calyx 10-toothed, @W and the upper lobe of the \{/ corolla long and bifid. The plant occurs in Europe, North Africa, and North Asia to North-West India, and has G& been naturalized in parts of America. In Britain, where it is found generally on sandy or dry chalky ground, it is far from common. White hore- hound contains a volatile oil, resin, a crystallizable bitter principle termed marrubun,

Horehound. and other substances, and has a not unpleasant aromatic

odour, and a persistent bitter taste. It possesses ex pectorant, tonic, and carminative properties, and in large doses is diuretic and laxative. Formerly it was officialin British pharmacopceias ; and the infusion, syrup, or confec- tion of horehound has long been in repute for the treat- ment of coughs and asthma, and has been recommended also in phthisis, chronic rheumatism,

hepatic and uterine disorders, hysteria, and chlorosis. or medicinal purposes the plant should be gathered when in flower, and is pre- ferable in the fresh condition. Black horehound, Ballota nigra, L., is a hairy perennial labiate plant, of foetid odour; is 2 to 3 feet in height; has petiolate, roundish-ovate, serrate leaves, and numerous flowers, in dense axillary clusters, with a green or purplish calyx, and a pale red- purple corolla; and occurs in Europe, North Africa, and Russian Asia, and in Britain, except in northern Scotland, and has been introduced into North America. Water hore- hound is the Lycopus ewropeus of Linnaeus.

See Bentham, Handb. Brit. Fi., ii., 1865; Syme, Sowerby's Eng. Bot., vii. 50, 51, 1867 ; J. D. Hooker, Student's H., ad. ed., 1878;

Bentley and Trimen, Med. Pl., pt. 14, fig. 210; and Stillé and Maisch, The National Dispensatory, p. 901, 1879.

HORGEN, a village in the Swiss canton of Zurich, capital of the district of Horgen, is situated on the left bank of the Zurich Lake, 1500 feet above sea-level, and 9 miles south of Zurich. It is surrounded by meadows and vineyards, and possesses many handsome houses, and a beautiful church with frescos by Barzaghi. The town is one © the centres of the Zurich silk industry and vine culture, and the meeting-place of the boats which ply on the north

and south banks of the lake. The population in 1870 was 5199, of whom 4744 were Protestants.

HORITZ (Bohemian Morice), a town of Bohemia, Austria, overnment district of Koniggratz, is situated on the right bank of the Bistritz, 10 -miles N.E. from Bidschow. Among the principal buildings are the district court of justice, the castle, the synagogue, the town-house, the poor- house, and the infirmary. It possesses woollen and linen manufactories, a brewery, flour-mills, and saw-mills. Flax and fruit are grown in the vicinity. The population in 1869 was 5659.

HORMAYR, JosEru, Baron von, German statesman and historian, was born at Innsbruck, January 20th 1781, and died at Munich, November Sth, 1848. After studying law for several years (1794-1797) in his native town, and attaining the rank of major in the Tyrol landwehr, the young man, who had the advantage of being the grandson of Joseph von Hormayr (1705~ 1781), chancellor of Tyrol, obtained a post in the foreign office at Vienna (1801), from which he rose in 1803 to be court secretary and director of the secret archives of the kingdom and court. During the insurrection by which in 1809 the Tyrolese sought to throw off the Bavarian supremacy confirmed by the treaty of Pressburg, Hormayr was the mainstay of the Austrian party, and assumed the administration of everything save the military arrangements; but, returning home without the prestige and protection of success, he fell into disfavour both with the emperor Francis I, and the prime minister Metternich, and at length in 1813 he was arrested andimprisoned. In 1816 some amends were made to him by his appointment as historiographer royal ; but so little was he satisfied with the general policy and conduct of the Austrian court that in 1828 he accepted an invitation to the Bavarian capital, where he became ministerial councillor in the department of foreign affairs. In 1832 he was appointed Bavarian minister at Hanover, and from 1839 to 1846 he held tha same position at Bremen. ‘The last two years of his life were spent at Munich as superintendent of the national archives. Hormayr’s literary activity was closely condi- tioned by the circumstances of his political career : while the access which he enjoyed to original documents gave value to his treatment of the past, his record or criticism of contemporary events received authority and interest from the character of his personal experience. In his later a he is a keen opponent of the policy of the court of

ienna,

The following are among Hormayr’s more important works :— Kritiseh-diplomatische Leitrige zur Geschichte Tirols im Mittelalter, Innsb., 1802-8; Gesch. der gefitrst. Grafschaft Tirol, Tiib., 1806-8; Ocsterreichischer Plutareh, 20 vols., Vienna, 1807-20 3 Archiv fiir

Geseh, Stat. Lit. und Kunst, 20 vols., 1809-28; Wien, scine Gesch. — unl Denkwiirdigheiten, Vienna, 1823-25; Lcbensbilder aus dem _

Befretungskriege, J ena, 1841-44; Die goldene Chronik von Hohen-schwangau, Munich, 1842; Anemonen aus dem Tagebuch eines

alten Pilgermanns, Jena, 1845-47. Along with Mednyanski

(1784-1844) he founded Taschenbuch Sir die Vaterlind. Gesch., Vienna, 1811-48.

HORMISDAS, pope from 514-523, in succession to Symmachus, was a uative of Campania, Although on his election overtures were at once made by Anastasius I., emperor of the East, for the reunion of the Eastern and Western Churches, which had been separated since the excomunication of Acacius in 484, the zeal or intolerance of the pope delayed it till he was able to procure it on his own terms, in 519, from the orthodox emperor Justin. Hormisdas paid much attention to the instruction of his

- Clergy in psalmody. He was succeeded in 523 by John I. ighty of his letters are preserved in Labbe's Sacrosancta Coneilia, vol. v. (1728), and are also to be found in vol.

Lui. of Migne's Patrologie Cursus Completus (Latin series),

HORN. The weapons which project from the heads of various species of animals, constituting what are known as horns, embrace substances which are, in their anatomical structure and chemical composition, quite distinct from each other; and although in commerce also they are known indiscriminately as horn, their uses are altogether dissimilar. These differences in structure and properties are thus indicated by Professor Owen :—' The weapons to which the term horn is properly or technically applied con- sist of very different substances, and belong to two organic systems, as distinct from each other as both are from the teeth. Thus the horns of deer consist of bone, and are processes of the frontal bone; those of the giraffe are inde- pendent bones or 'epiphyses' covered by hairy skin ; those of oxen, sheep, and antelopes are 'apophyses' of the frontal bone, covered by the corium and bya sheath of true horny material ; those of the proug-horned antelope consist at their basis of bony processes covered by hairy

skin, and are covered by horny sheaths in the rest of their extent, They thus combine the character of those of the giraffe and ordi- nary antelope, together with the expanded and branched form of the antlers of deers. Only the horns of the rhino- ceros are composed wholly of horny matter, and this is dis- posed in longitudinal fibres, so that the horns seem rather to consist of coarse bristles compactly matted together in the form of a more or less elongated sub-compressed cone." True horny matter is really a modified form of epidermic tissue, and consists of an albuminoid principle termed "keratin." It forms, not only the horns of the ox tribe, but also the hoofs, claws, or nails of animals generally, the carapace of the tortoises aud the armadilloes, the scales of the pangolin, porcupine quills, and birds' feathers, &c. The principal application of horns is for the manufacture of combs, and under the heading Comp, vol. vi. pp. 177-78, that industry is described. The other uses to which horn is now devoted, among which may be noted the pressing of buttons, the making of handles for walking-sticks, umbrel- las, and kuives, the manufacture of drinking-cups, spoons of various kinds, and snuff-boxes, do not here require ex- tended notice. The parings and refuse of horn are valuable for the mannfacture of prussiate of potash and as manure; and the ash of the cores of horn makes excellent cupels for the assay of precious metals. In former times horn was applied to several uses for which it is no longer required, although such applications have left their traces in our language. Thus the musical instruments and fog signals known as horns indicate their descent from earlier and simpler forms of apparatus made from horn. In the same way powder-horns were spoken of long after they ceased to be made of that substance ; to a small extent lanterns still continue to be "glazed" with thin transparent plates of horn, a practice which a century ago was universal. Horn- books consisted of spelling-books with their leaves protected by thin plates of horn, and it was in former times customary to protect the titles of valuable MSS. in the same way. ODeer-horn is almost exclusively used for handles by cutlers and walking-stick and umbrella makers. The largest supply is obtained from the East Indies, and consists principally of the antlers of the axis, Axis maculata, and the Rusa deer, Rusa Aristotelis.

HORN, or Frencu Horn, a wind instrument made at various times of various materials such as wood, ivory, and several metals, but belonging in its modern significance to the class of brass instruments. In how far the instru-

ments of similar type or character used by the Jews and other Eastern nations, by the Romans, and by medizval knights may have been related to the modern horn it is needless to investigate here. The instrument as we know it dates at least from the 16th century, for a picture of the circular horn is found in Virdung's Musica (1511). But

ruder representations of similarly-shaped instruments occur 'n armorial bearings of a much remoter period. The horn in its earlier form served exclusively the various purposes of the hunt, whence its name in the different languages : Ttalian, corno di caccia; French, cor de chasse ; German, Waldhorn. Originally there seems to have been only a single ring, but a second semicircle occurs at an early date. The capabilities of the primitive instrument were as limited as its purpose, the latter being chiefly that of announcing by signals the various stages and. incidents of the hunt, such as the Meveille, the Hallali, and the Mort. Simple tunes, however, were within its range, for Mersenne mentions a "concert 4 quatre" for horns as early as 1637. 'The demands on the horn were naturally much enlarged when it was introduced into the orchestra as an exponent of artistic and complicated music. As to the date of this event opinions differ considerably. It has been asserted that Gossec was the first to make use of the horn in an important orchestral part in 1759. But this is true, if true at all, of France only. In Germany and England the instrument was in common use at a much earlier period. From 1712-1740 two hornists were members of the imperial chapel in Vienna at the not incon- siderable salary of 360 florins. Moreover, both Handel (in his Water Music, 1715, and elsewhere) and Bach assign important parts to the horn. The notes natural to the horn and produced by the action of the lips alone are the so-called harmonics or partial tones of the bottom note be- tween the extreme limits of the C below the staff in the bass clef to the Einalt. Some of these notes are, however, not used in practice. In order to supply the notes not in the scale of natural harmonics various methods have been used. The simplest is the insertion of the hand in the bell of the instrument, accidentally discovered by a German hornplayer towards the end of the last century. The effect is to lower the note by a semitone or a whole tone, according to the extent that the orifice is closed. The drawback attaching to this system is that the "closed " or "

stopped” (étouffé) notes differ in character from the open ones, and are in part dull It is true that a good composer may produce certain effects by this means. In the modern horn a mechanical contrivance generally takes the place of the hand. ‘This is the valve or ventil, an apparatus for lower- ing the note by means of the pressure of the fingers. There are three valves attached to the ventil-horn, lowering the note by one, two, and three semitones respectively. Most modern composers write for the ventil-horn exclusively ; others use it in combination with natural or hand horns. Another important appliance of the horn is the crook, which may best be described as a transposing machine. The crooks can be removed at will, their effect (by altering the length of the tube) being to transpose the notes produced by the lips into anything that is required. The player there- fore plays as it were in one and the same key, and the difficulty of transposing his part mentally is saved to him. In consequence the born part in a score is always written in the key of C, which may be changed into E flat or F or E by merely inserting the crook intended for thatkey. In this way not only the diatonic scale, but all kinds of chromatic progressions can be produced on the horn. Of these opportunities modern composers have largely availed themselves, frequently tasking the capabilities of the players to the utmost degree. The passage for three horns in the great scena of Fidelio in Beethoven’s opera of that name is celebrated for its effectiveness as well as for its difficulty. With Wagner also the horns are favourite instruments. In the economy of the orchestra the horns form the transi- tion from the wood-winds to the trumpets, trombones, and other loud brass instruments ; they share the softness of tle former with the power of the latter, and may be used

with equal effect both in filling up the harmony and in emphasizing the melody. In works of a romantic character such as Mendelssohn’s overture to A Midsummer Nights Dream, or Weber’s Der Freischiitz, they are invaluable for the purpose of local colouring. There are also many solo pieces written for the horn, amongst which Mozart’s three concerti for horn and orchestra, Schumann’s concerto for 4 horns and orchestra (op. 86), Beethoven’s horn sonata (op,

trees of the natural order Cupulifere and sub-order Corylec, The Latin name Carpinus has been thought to be derived from the Celtic car, wood, and pin or pen, head, the wood of hornbeams having been used for yokes of cattle (see Loudon, Ency. of Pl., p. 792, new ed., 1855, and Littré, Dict. ii. 556), The’ common hornbeam, or yoke-elm,

baum and Hornbuche; Fr., charme), is indigenous in the temperate parts of western Asia and of Asia Minor, aud in Europe, where it ranges as high as 55° and 56° N. lat. It ig common in woods and hedges in parts of Wales and of the south of England. ‘The trunk is usually flattened, and twisted as though composed of several stems united; the bark is smooth, and light grey; and the leaves are sub-

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17), and Brahms’s trio for pianoforte, violin, and horn (op, 40) may be cited. HORNBEAM, Carpinus, Tournef., a small genus of

Carpinus Betulus, L. (Gr., probably fvyia ; Germ., Horn-

distichous, 2 to 3 inches long, elliptic-ovate, doubly serrate, pointed, numerously ribbed, hairy below, and opaque, and not glossy as in the beech, have large stipules and short petioles, and when young are plaited. The flowers appear with the leaves in April and May. The male catkins are about 14 inches long, and have pale yellow anthers, bearing tufts of hairs at the apex ; the female attain a length of 2 to 4 inches, with bracts 1 to 14 inches long. The green and angular fruit or “nut ” ripens in October; it is about 4 inch in length, is in shape like a small chestnut, and is enclosed in leafy, 3-lobed bracts. The liornbeam thrives well on stiff, clayey, moist soils, into which its roots penetrate deeply ; on chalk or gravel it does not flourish. Raised from seed it may become a tree 40 to as much as 70 feet in height, greatly resembling the beech, except in its rounder and closer head. It is, however, rarely grown as a timber-tree, its chief employment being for hedges. “In the single row,” says Evelyn (Sylva, p. 29, 1664), “ it makes the noblest and the stateliest hedges for long Walks in Gardens or Parks, of any Tree whatsoever whose leaves are deciduous.” As it bears clipping well, it was formerly much used in geometric gardening. The branches should not be lopped in spring, on account of their tendency to bleed at that season.

The wood of the hornbeam is white and close-grained, and polishes ill, is of considerable tenacity and little flexi- bility, and is extremely tough and hard to work—whence, according to Gerard, the name of the tree. Tt has been found to lose about 8 per cent. of its weight by drying. Asa fuel it is excellent; and its charcoal is much esteemed for making gunpowder. ‘The bark of the hornbeam has tonle properties, and the inner part is stated by Linnaeus to afford a yellow dye. In France the leaves serve as fodder. The tree is a favourite with hares and rabbits, and the seed: lings are apt to be destroyed by mice. Pliny (Nat. Hist., xxvi. 26), who describes its wood as red and easily split, classes the hornbeam with maples. The America hornbeam, blue or water beech, or iron-wood, is Carpinus americana, Mich. ; the common hop-hornbeam, a native the south of Europe, is Ostrya vulgaris, Willd., and the American, 0. virginica, Willd.

See Gilpin, For. Scenery, i., ed. Lauder, 1834; Loudon, Arboretum, iii, 2004, 1838; Selby, Forest Trees, p. 337, 1842; Bentham, Handb. of Brit. Flora, ii. 758, 1865 ; Syme, Sowerby’s Eng. Bol.y vii, 176, 1868 ; J. D. Hooker, Student’s Flora, p. 365, 24 ed., 1878; and ARBORICULTURE, vol. ii. p. 317.

HORNBILL, the English name for a long while generally given to all the birds of the Family Bucerotide of modern ornithologists, from the extraordinary horn-like excrescence (epithema) developed on the bill of most of the species,

| though to which of them it was first applied seems doubt-

ful. Among classical authors Pliny had heard of such animals, and mentions them (//ist. Nat., lib. x. cap. Ixx.) under the name of Zragopan ; but he deemed their existence fabulous, comparing them with Pegasi and Gryphones—in the words of Holland, his translator (vol. i. p. 296)—“TI thinke the same of the Tragopanades, which many men afirme to bee greater than the A%gle; having crooked hornes like a Ram on either side of the head, of the colour of yron, and the head onely red.” Yet this is but an exag- gerated description of some of the species with which doubtless his informants had an imperfect acquaintance. Medieval writers found Pliny’s

bird to be no fable, for specimens of the beak of one species or another seem occasionally to have been brought to Europe, where they were preserved in the cabinets of the curious, and thus Aldrovandus was able to describe pretty fairly and to figure (Ormithologva, lib. xii, cap. xx. tab. x. fig. 7) one of them under the name of " Rhinoceros Avis," though the rest of the bird was wholly unknown to him. When the exploration of the East Indies had extended further, more examples reached Europe, and the "Corvus Indicus cornutus" of Bontius became fully recognized by Willughby and Ray, under the title of the "Horned Indian Raven or Zopaw called the Rhinocerot Bird." Since the time of those excellent or-nithologistsonr knowledge of the Hornbills has been steadily increasing, but it must be confessed that in regard to many points there is still great lack of precise information, and accordingly the completion of Mr Elliot's "Afonograph of the Bucerotidee" (now in course of publication) is most earnestly to be desired, for therein it is to be hoped that all questions respecting their history and classification may be fully treated. At present great diversity of opinion prevails as to how many real genera the Family comprises, or how many species. The group, though no doubt ought to be enter- tained as to its limits,! has not attracted sufficient notice from ornithologists, and therefore, apart from the merest superficial characters, the difference of the several sections which it includes has never been properly explained, nor have their distinctions been placed on a firm basis. Some authors appear to have despaired of dividing it satisfactorily, and have left all the described species in the Linnean genus Buceros, as for example, Professor Schlegel (Cat. du Mus. des Pays Bas, Buceros) ; others have split that genus into more than a score—a number which seems to be quite unnecessary. Sundevall (Zentamen, pp. 96, 97), with his

usual caution, has restrained himself to the recognition of

three genera, but it is unquestionable that more should

reasonably be admitted, though the present writer is not prepared to state how many are required.

The first genus admitted by Sundevall is RAcnoplax, which' seems Properly to contain but one species, the Buccros vigil, B. scutatus, or B. galeatus of authors, commonly known as the Helmet-Hornbill, 4 native of

Sumatra and Borneo. This is easily distingnished by pe the front of its nearly vertical and slightly eonvex cpithema

omposed of a solid mass of horn? instead of a thin coating of the ee 1 Instead of a thin coating of the

vie genera as Huryceros, Scythrops, and some others, together andl & whole Family Momotide, which had been at various times a Y various systematists placed among the Bucerotidce, have evi- ay no real affinity to them. of th Ely correlated with this structure is the curious thickening that Prosencephalic median septum” of the cranium as also of cheat ich divides the “‘ prosencephalic ” from the ‘mesencephalic Sa a noticed by Professor Owen (Cat. Osteol. Ser. Mus. Roy. Coll. ae th ngland, i. p. 287); while the solid horny mass is further ine ie ey by a backing of bony props, directed forwards and meet- nob nereeneoe Tight angles. This last singular arrangement, which is

Perceptible in the skull of any other species examined by the pre-

sen t writer, does not seem to have been described.

light and cellular structure found in the others. So dense and hard is this portion of the ‘‘lhelmet” that Chinese and Malay artists carve figures on its surface, or cut it transversely into plates, which from their agreeable colouring, bright yellow witli a scarlet rim, are worn as brooches or other ornaments. his bird, which is larger than a Raven, is also remarkable for its long graduated tail, having the two middle feathers nearly twice the length of the rest. Nothing is known of its habits. Its head was figured by Edwards more than a century ago, but little else had been seen of it until 1801, when Latham described the plumage from a specimen in the British Museum, and the first figure of the whole bird from an example in the Muscum at Calcutta was published by Hardwicke in 1823 (Trans. Linn. Socicty, xiv. pl. 23). Yet more than twenty years elapsed before French naturalists became acquainted with it. Under Rhinoplax Sundevall places the Buceros cornutus of Raffles; but this would seem to be a wrong position for that species, the type of Bonaparte’s genus Berenicornis, since it does not appear to possess a froutlet of solid horn.

Sundevall divides the genus Buccros into three sections, of which one, Buccros proper, contains the species having the cpithema developed to its greatest extent, such as B. rhinoccros, B. hydro- corax, B. bicornis, and others, while the remaining sections have little or no epithema, and one of them has the throat feathered. This last includes the African forms which seem to belong to the genus T'occus of Lesson, while the other comprises the Oriental species cxemplified by Mr Hodgson's genus Accros; but the arrangement cannot be deemed wholly satisfactory, and must be regarded only as au approach to a better. The presence or absence of the epithema may indeed be considered in distinguishing genera ; but among those that possess it, seeing that its development is to a great degree dependent upon age and perhaps sex (this last being uncertain), its size and shape hardly afford good generic characters, and, though the group assigned by Sundevall to Buccros proper doubtless requires further separation, some less superficial distinc- tions must be pointed out than those which have been taken as sufficient to establish many of the "genera" of this family sug- gested by several ornithologists. Again, in the grouping of those forms which possess little or no epithema sound characters are equally wanting for the divisions as yet set forth, and until further investigations have been made the limits of even the genera Accros and Yoccus cannot be laid down. Tickell in his manuscript Birds of India (in the library of the Zoological Society of London) divides the Hornbills of that country into two genera only, Buceros and Aceros, remarking that the birds of the former fly by alternately flapping their wings and sailing, while those of the latter fly by regular flapping only.? Several differences of structure are pre- sented by the sternal apparatus of the various Puccrotide, and it is quite possible that these differences may be correlated with Tickell's observations so as to furnish, when more is known about these birds, a better inode of classing them, and the same may be said of those of the African group containing the genus Zoccus and its allies.

Lastly, we have the genus Bucorvus, or Bucorax as some call it, confined to Africa, and containing at least two and perhaps more species, distinguishable by their longer legs and shorter toes, the Ground-Hornbills of English writers, in contrast to all the preced- ing, which are chiefly arboreal in their habits, and when not flying move by short leaps or hops, while the members of this group walk and run with facility. From the days

of Bruce at least there are few African travellers who have not met with and in their narra- tives more or less fully described one or other of these birds, whose large size and fearless habits render them conspicuous objects.

As a whole the Hornbills, of which more than 50 species have been described, form a very natural and in some re- spects an isolated group, placed by Professor Huxley among his Coccygomorphe. It has been suggested that they have some affinity with the Hoopoes (Upupide), but even if that view be good the affinity cannot be very near. Their supposed alliance to the Toucans (Ahamphastide) rests only on the apparent similarity presented by the enormous beak, and is contradicted by important structural characters. In many of their habits, so far as these are known, all Hornbills seem to be much alike, and though the modifica- tion in the form of the beak, and the presence or absence of the extraordinary excrescence,* whence their name is

3 The noise made by the wings of some of the large species in their flight is compared by Mr Wallace, in an admirable article on the Family (Intellectual Observer, 1868, pp. 310 et segg.), to the puffing of a loco- motive steam-engine when starting with a train, and can be heard a mile off.

4 Buffon, as was his manner, enlarges on the cruel injustice done to these birds by Nature in encumbering them with this deformity, which

derived, causes great diversity of aspect among them, the possession of proniinent eyelashes (not a common feature in Birds) produces a uniformity of expression which makes it impossible to mistake any member of the family. Horn- bills are social birds, keeping in companies, not to say flocks, and living chiefly on fruits and seeds ; but the bigger species also capture and devour a large number of snakes, while the smaller are great destroyers of insects. The older writers say that they eat carrion, but further evidence to that effect is required before the statement can be believed. Almost every morsel of food that is picked up is tossed into the air, and then caught in the bill before it is swal- lowed. They breed in holes of trees, laying large white

Great Indian Hornbill (B. dicornis). After Tickell's drawing in the Zoological Society's library. eggs, and when the hen begins to sit the cock plasters up the entrance with mud or clay, leaving only a small window through which she receives the food he brings her during her incarceration.

This remarkable habit, almost simultaneously noticed by Dr Mason in Burma, Tickell in India, and Livingstone in Africa, and since confirmed by other observers, especially Mr Wallace! in the Malay Archipelago, has been connected by Mr Bartlett (Proc. Zool. Socuety, 1869, p. 142) with a peculiarity as remarkable, which he was the first to notice. This is the fact that Hornbills at intervals of time, whether periodical or irregular is not yet known, cast the epithelial layer of their gizzard, that layer being formed by asecretion derived from the glands of the proventriculus or some other upper part of the alimentary canal. The epithelium is ejected in the form of a sack or bag, the mouth of which is

oe oe ee EEE EEE ee he declares must hinder them from getting their food with ease. The only corroboration his perverted view receives is afforded by the ob- served fact that Hornbills, in captivity at any rate, never have any fat about them. The part played by the wonderful epithema in the birds' economy is altogether unknown.

1 In his interesting work (i. p. 213), this gentleman describes a nest- ling Hornbill (B. bicornis) which he obtained as ''a most curious object, as large as a pigeon, but without a particle of plumage on any part of it. It was exceedingly plump and soft, and with a semi-trans- parent skin, so that it looked more like a bag of jelly, with head and feet stuck on, than like a real bird."

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closely folded, and is filled with the fruit that the bird has been eating. The announcement of a circumstance so ex- traordinary naturally caused some hesitation in its accept- ance, but the essential truth of Mr Bartlett's observations has been abundantly confirmed by Professor Flower (tom, cit., p. 150), and especially by Dr Murie (op. cit., 1874, p, 420), and what seems

now to be most wanted is to know whether these castings are really intended to form the hen bird's food during her confinement. (A. N.)

HORN-BOOK, a name sometimes given to an elementary treatise on any subject. It was originally applied to a sheet containing the letters of the alphabet, which formed a primer for the use of children. It was mounted on wood and protected with transparent horn. Sometimes the leaf was simply pasted against the slice of horn. The wooden frame had a handle, and it was usually hung at the child's girdle, The sheet, which in ancient times was of vellum and latterly of paper, contained first a large cross—the criss-crosse — from which the horn-book was called the Christ Cross Row, or criss-cross-row. The alphabet in large and small letters followed. 'The vowels then formed a line, and their com- binations with the consonants were given in a tabular form, The usual exorcism—" in the name of the Father and of the Sonne and of the Holy Ghost, Amen "—followed, then the Lord's Prayer, the whole concluding with the Roman numerals. The horn-book is mentioned in Shakespeare's Love's Labour's Lost, v. 1, where the ba, the a, ¢, 4, 0, %, and the horn, are alluded to by Moth. It is also described by Ben Jonson—

'¢ The letters may be read, through the horn, That make the story perfect."

Horn-books are now of great rarity, A representation of a good specimen will be found prefixed to Halliwell's Wotices of Fugitive Tracts, in the twenty-ninth volume of the works printed for the Percy Society.

HORNCASTLE, a market-town giving its name to a soke in Lincolnshire, England, is situated at the foot of a line of low hills called the Wolds, on an angle formed by the confluence of the Bain and Waring, and at the terminus of a branch line of the Great Northern Railway, 21 miles east of Lincoln. The principal buildings are the parish church of St Mary's (supposed to have been originally erected in the time of Henry VII., possessing a square embattled tower, many fine old monuments, and an old brass), Queeu Elizabeth's grammar school founded in 1562, the dispensary opened in 1789, the corn exchange opened in 1856, with a room for public meetings, and accommodation for the mechanics' institute, a library, and a news-room. There are also national and Wesleyan schools, and an infant school for poor children. Among the charities is one for apprenticing orphan boys

belonging to the parish. A few fragments still remain of the ancient fortification from which the town takes

its name, and many Roman urns and coins have been dis- covered in the vicinity.

Near the confiuence of the rivers there at one time existed an ancient labyrinth called the Julian bower. To the south-east of the town there ls 8 spot called Hangman’s Corner, where criminals were

formerly

executed. The prosperity of the town is chiefly dependent on agriculture and its horse-fairs,—that held in August being the largest of its class in England. Brewing, malting, and currying are carried on, and there 1s some trade in coal and iron. The population of the parish 10 1871 was 4947, and of the soke 10,469.

Horncastle is believed to be the Roman Bannovallum. The fort is said to have been originally constructed by the Romans, “4 fortified and strengthened by Horsa, the brother of Hengest, bu shortly afterwards demolished by Vortimer, king of the Britons. The manor at the time of the Norman survey belonged to the king, and after being for an unknown period in private hands, was 8° i in the reign of Henry III. to the bishop of Carlisle, who rie from Henry a charter authorizing him to try felons and holda cour leet, and granting free warren and an annual fair.

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HORNE, Georce (1730-1792), bishop of Norwich, was born on November 1, 1730, at Otham near Maidstone, where his father was a clergyman, and received his early education at the Maidstone school, whence he proceeded to University College, Oxford. In 1749 he became a fellow of Magdalen College, of which in 1768 he was appointed president. As a preacher he early attained great popu- larity; and his reputation was further helped by several clever if somewhat wrong-headed publications, including a satirical

pamphlet entitled Zhe Theology and Philosophy of Cicero's Somniwm Scipionis (1751), a defence of the Hutchinsonians in 4 Pair, Candid, and Impartial State of the Case between Stir Isaac Newton and Mr Hutchinson (1753), and critiques upon Dr Shuckford (1754) and Dr Kennicott (1760). In 1776 he published his well-known Commentary on the Book of Psalms, and in the same year he was chosen vice-chancellor of his university; in 1781 he was made dean of Canterbury, and in 1790 he was raised to the see of Norwich, which, however, he held for less than two years. He died at Bath January 17, 1792.

His collected Works were first published, with a Memoir by one of his chaplains (Jones), in 1795. There have been several subsequent editions, the latest being that of 1830. The most popular and also the best of his writings, the Commentary on the Psalms, has been still more frequently reprinted, occasionally along with an essay by James Montgomery, or with a much more remarkable discourse by Edward Irving.

HORNE, Tuomas Hartwett (1780-1862), a well- known writer on Biblical introduction, was born in London on October 20, 1780, and from 1789-95 was educated at Christ's Hospital, where Coleridge was an elder contemporary. On leaving school, his circumstances not permitting him to proceed to the university, he became clerk to a barrister, but early manifested an unconquerable passion for literary pursuits. When barely twenty years of age he published (1800) A Brief View of the Necessity and Truth of the Christian Revelation, which reached a second edition in 1802. In the years immediately following he became the author of several minor works, and in 1814, having heen appointed librarian of the Surrey Institution, he issued his Introduction to the Study of Bibliography. This was followed in 1818 by the work to which he had devoted the best part of many years, the Introduction to the Critical Study of the Holy Scriptures, which rapidly

_ attained a rare popularity, and secured for its author a high

and secure place among contemporary scholars. In 1819 he received ordination from the bishop of London, although unpossessed of the customary university degree, and some time afterwards he was appointed to the cure of the united parishes of St Edmund the King and St Nicolas Acons in London, On the breaking up of the Surrey Institution

_ in 1823, he was appointed (1824) to superintend the classi-

fication and publication of the British Museum Catalogue.

_ After the project of making a classed catalogue had been

abandoned, he continued to take part in the preparation of the alphabetical catalogue, and his connexion with the museum continued to subsist until 1861, when his infirmi- ties caused him to resign. He died in London on J anuary

26, 1862.

Besides the works already mentioned Horne wrote numerous

_ others of secondary importance, which, as catalogued in Allibone's

Dictionary by himself, exceed forty in number. The Introduction, edited by Ayre and Tregelles, reached a 12th edition in 1869 (4 vols. 8vo) ; but, owing to the recent rapid advances of critical science, it 1S now somewhat out of date.

HORNELLSVILLE, a

township and post village of Steuben county,

. New York, is situated on the Canisteo river and on the Erie Railway, 90 miles south-east of Buffalo, It is well supplied with schools and churches, and possesses planing-mills, tanneries, and factories for

Sashes and blinds, furniture, cars, mowing-machines, and

Lil boots and shoes. The population of the village in 1870 was 4552, and of the township 5839.

HORNER, Francts (1778-1817), political economist, was born at Edinburgh, August 12th, 1778, After passing through the usual courses at the high school and university of his native city, he devoted five years, the first two in England, to comprehensive but desultory study, and in 1800 was

called to the Scotch bar. Desirous, however, of a wider sphere, Horner removed to London in 1802, and occupied the interval that elapsed before his admission to the English bar in 1807 with researches in law, philosophy, and political economy, and latterly with parliamentary duties. In February 1806 he became one of the commis- sioners for adjusting the claims against the nawab of Arcot, and in November entered parliament as member for St Ives. Next year he sat for Wendover, and in 1812 for St Mawes, in the patronage of the marquis of Buckingham. In 1811, when Lord Grenville was organizing a prospective ministry, Horner had the offer, which he refused, of a treasury secretaryship. He had resolved not to accept office till he could afford to live out of office ; and his pro- fessional income, on which he depended, was at no time proportionate to his abilities. His labours at last began to tell upon a constitution never robust, and in October 1816 his physicians ordered him to Italy, where, however, he sank under his malady. He died at Pisa, February 8, 1817. He was buried at Leghorn, and a marble statue by Chantrey was erected to his memory in Westminster Abbey.

Without the advantages of rank, or wealth, or even of genius, Francis Horner rose to a high position of public influence and private esteem. The speeches in the House of Commons on the occasion of moving for a uew writ for St Mawes combine with the letters of private friends in testifying to the respect and honour commanded by his integrity and wide and cultured intellect, and to the affection won by his sweet and noble disposition, as well as to the general regret for the untimely death of one who gave promise of such abilities as a statesman. The early friend of Brougham and Jeffrey in Edinburgh, and wel- comed in London by Romilly, Mackintosh, Abercromby, and Lord Holland, Horner was by sincere conviction a Whig. His special field was political economy. Master of that subject, and exercising a sort of moral as well as intellectual influence over the House of Commons, he, by his nervous and earnest rather than eloquent style of speaking, could fix its attention for hours on such dry topics as finance, and coinage, and currency. As chair- man of the parliamentary committee for investigating the depreciation of bank notes, for which he moved in 1810, he extended and confirmed his fame as a political economist by his share in the famous Bullion Report. It was chiefly through his efforts that the paper-issue of the English banks was checked, and gold and silver reinstated in

their true position as circulating media; and his views on free trade and commerce have been generally accepted at their really high value. Horner was one of the promoters of the Edinburgh Review in 1802. His articles in the early numbers of that publication, chiefly on political economy, form his only literary legacy.

Memoirs and Correspondence of Francis Horner, M.P., was pub- lished by his brother in 1848. See also the Edinburgh and Quar- terly Reviews for the same year ; and Blackwood's Magazine, vol. i.

HORNET. See Wasp.

HORNPIPE was originally the name of an instrument no longer in existence, and is now used for an English national dance. The sailor's hornpipe, although the most com- mon, is by no means the only form of the dance, for there is a pretty tune known as the "College Hornpipe," and other specimens of a similar kind might be cited. The

composition of lornpipes flourished chiefly in the last century, and even Handel did not disdain to use the char- acteristic rhythm. The hornpipe may be written in 3 or in common time, and is always of a lively nature.

HORROCKS, Jeremian (1619-1641), an astronomer of extraordinary promise blighted by a premature death, was born in 1619 at Toxteth Park, near Liverpool. Of the circumstances of his family little is known, further than that they were poor; but the register of Emmanuel College, Cambridge, testifies to his entry as sizar, May 18, 1632. Isolated in his scientific tastes, and painfully straitened in means, he pursued amid innumerable difficul- ties his purpose of self-education. His university career lasted three years, and on his return to Lancashire he devoted to astronomical observations the bricf intervals of leisure snatched from the harassing occupations of a laborious life. In 1636 he met with a congenial spirit in William Crabtree, a draper of Broughton, near Manchester ; and encouraged by his advice he exchanged the guidance of Lansberg, a pretentious but inaccurate Belgian astronomer, for that of Kepler. He now set himself to the revision of the Rudolphine Tables (published by Kepler in 1627), and in the progress of his

task became convinced that a transit of Venus overlooked by Kepler would nevertheless occur on the 24th of November (O.S.) 1639. He was at this time curate of Hoole, near Preston, having recently taken orders in the Church of England, although, according to the received accounts, he had not attained the canonical age. The 24th of November falling on a Sunday, his clerical duties threatened fatally to clash with his astronomical observations; he was, however, released just in time to witness the punctual verification of his forecast, and care- fully noted the progress of the phenomenon during half an hour before sunset (3.15 to 3.45). This transit of Venus is remarkable as the first ever observed, that of 1631 predicted by Kepler having been invisible in Europe. Notwithstanding the rude character of the apparatus at his disposal, Horrocks was enabled by his observation of it to introduce some important corrections into the elements of the planet's orbit, and to reduce to its exact value the received estimate of its apparent diameter.

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PART IL—ZOOLOGY AND ANATOMY.

ZOooLoGy.

HE horse and its near allies, the several species of asses © and zebras, constitute the genus Zquus of Linnzus, a small group of animals of the class Mammalia, so dis- tinct in their organization from all other existing members of the class that in many of the older zoological systems they were placed in an order apart, under the name of Solidungula or Monodactyla.

Investigations in comparative anatomy have, however, demonstrated that their structure, at first sight so singular and exceptional, is really but a modification of the same general plan upon which the tapirs and rhinoceroses are formed, and the discovery and restoration of the characters of extinct specics, inaugurated by Cuvier during his fruitful researches into the fauna of the Paris basin, continued in various European localities by Kaup, Riitimeyer, Gervais, Gaudry, Huxley, and others, and recently conducted on a more ample scale in the prolific fossiliferous strata of North America by Leidy, Marsh, and Cope, have revealed numerous intermediate

stages through which the existing horses appear to have passed in their modification from a very different ancestral form.

We shall best understand what a horse really is if we first

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After a year spent at Hoole, he returned to Toxteth, and there, on the eve of a long-promised visit to his friend Crabtree, unexpectedly expired, January 3, 1641, in the twenty-second year of his age. It is difficult to over. estimate the services which, had his life been prolonged, this singularly gifted youth might have rendered to astrono- mical science. To the inventive activity of the discoverer he already united the patient skill of the observer and the practical sagacity of the experimentalist. Before he was twenty he had afforded a specimen of his powers by au important contribution to the lunar theory. He first brought the revolutions of our satellite within the domain of Kepler's laws, pointing out that her apparent irregu- larities could be completely accounted for by supposing her to move in an ellipse with a variable eccentricity and directly rotatory major axis, of which the earth occupied one focus. These precise conditions were afterwards demon- strated by Newton to follow necessarily from the law of gravitation.

In his speculations as to the physical cause of the celestial motious, his mind, though not as yet wholly emancipated from the tyranny of gratuitous assumptions, was working steadily towards the light. He clearly per- ceived the significant analogy between terrestrial gravity and the force exerted in the solar system, and used an ingenious experiment to illustrate the composite character of the planetary movements. He also reduced the solar parallax to 14" (less than a quarter of Kepler's estimate), corrected the sun's semi-diameter to 15' 45", recommended decimal notation, and was the first to make tidal observations,

Only a remnant of the papers left by Horrocks was preserved by the eare of William Crabtree. After his death (which oceurred soon after that of his friend), these were purchased by Dr Worthington, of Cambridge ; and from his hands the treatise Venus in sole visa passed into those of Hevelius, and

was published by him in 1662 svith his own observations on a transit of Mercury. ‘The remaining fragments were, under the directions of the Royal Society, reduced by Dr Wallis to a compact form, with the heading Astronomia Kep- leriana defensa et promota, and published with numerous extracts from the letters of Horrocks to Crabtree, in a volume entitled Jeremie Horroeeti Opera Posthuma, London, 1672. A memoir of his life by the Rev. Arundell Blount Whatton, prefixed to a trans- lation of the Venus i sole visa, appeared at London in 1859.

consider its origin and lineage; and this we are in a better position to do than with almost any other animal, as it is one of the few whose history (if the evidence afforded by paleontology can be relied upon) can be traced back through an almost unbroken chain of links as far as the earliest Tertiary age.

We have as yet no cognizance of the history of any mammals of the group to which the horse belongs before the dawn of the Eocene period. Of where they lived and what they were like, from what earlier forms and by what stages of modifications descended, our actual knowledge is an absolute blank. Conjecture helps us but little, and why none of their remains have not ere this been discovered is a paleontological mystcry. We have, however, certain knowledge that when the land which formed the bottom of the great cretaceous ocean which flowed over a considerable part of the present continents of Europe and North America was lifted above the level of the water and became fitted for the habitation of terrestrial animals, it was very S00n the abode of vast numbers of herbivorous mammals belonging to the group now called Ungulata or “hoofed animals. Wherever they came from, they had existed sufficiently long to have become already completely differentiated into two

principal forms, separated from each other by many distinct points in their organization, among which one of the most externally conspicuous was the structure of their feet. From this character the one form has received the name of Artiodactyla or “even-toed,” the other Perissodactyla or “odd-toed.” It is only of the latter that we shall have to speak in this article.

Perhaps the best notion of a perissodactyle ungulate of the Eocene age can be derived from the tapir of the present day, an animal which has changed less from the primitive and generalized type of the group of that time than any other

| h existing member of the order. These early forms had all the ~ complete number of teeth found in so many of the mammals

_ of that period of various orders, arranged according to the

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well-known formula—incisors 3, canines +, premolars 4,

molars 3=11 on each side, or 44 in all. The molar teeth had very short square crowns, with transverse or oblique | ridges on the grinding surface. In the fore limbs the radius and ulna, and in the hind limbs the tibia and fibula, were distinct and well-developed bones. Whatever the number of toes on each foot, the one corresponding tothe middle or third digit of the generalized pentadactyle limb was the longest ; its ungual phalanx was symmetrical in itself, and it formed the centreof the foot, on each sideof which theother toes were arranged in complete or partial symmetry according to the stage of development. In the hind fvot in all known cases the symmetry was complete, only one toe on each side of the middle digit being present (fig. 3, c); but in the fore foot the primitive symmetry, formed by the presence of two toes on each side of the middle toe, liad been lost in nearly all, by the disappearance of one of the outer toes (the first), the condition still retained by the tapirs (fig. 3, a); or it had been replaced by the second stage of symmetry, in which both outer toes are absent, and only three remain, as in the modern rhinoceros (fig. 3,c). By no animal of this period _ had the third, or most highly specialized stage of symmetry, _ that which, as we shall see, characterizes the modern horses _ (fig. 3, e), been attained. ___ By various and gradually progressing deviations from _ the common original type, these animals began at a very _ early period to break up into several groups, some of which (as Macrauchenia), after undergoing a considerable degree of specialization, have become extinct without leaving Successors; but three of these modified types, already dis- tinct at the close of the Eocene period, have continued up to the present day,

gradually, as time advanced, becoming more and more divergent from each other. These are now represented by the three families of the rhinoceroses, the ~~tapirs, and the horses. Great as may be the differences between these animals as we see them now, we can trace their history step by step, as revealed by the fragments preserved from former ages, further and further back in time, their differences continually becoming less marked, and ultimately blending together, if not into one common ancestor, at all events into forms so closely alike in all essentials that no reasonable doubt can be lield as to their common origin. Leaving out of further consideration the two collateral branches, it will be our purpose now to follow the history _ of the special subject of this article. he remains of the earliest known animals to which it is possible to trace back the modern horse by a series of Successive modifications are found in the lowest strata of the great lacustrine formations assigned to the Eocene Period, spread over considerable portions of the present territories of New Mexico, Wyoming, and Utah in North america. That similar animals may have existed in other Parts of the world is extremely probable. Negative evi~~ ke a in such cases is of little value, as may be judged by ‘the fact that it is only within a very few years that the

existence of these deposits teeming with fossil remains of previously unsuspected forms has been brought to light, and their systematic exploration has scarcely yet commenced. A little animal, not larger than a fox, Hohippus of Marsh, presented the most generalized form of the perissodactyle type as yet discovered, as besides the four well-developed toes of the fore foot, found in so many others, it had at least a rudiment of a fifth. All analogy leads to the sup- position that this must in its turn have been represented at a still earlier period by another form with all five toes complete, but direct evidence of this is at present wanting.

The transition from this horse-like animal of the early period to the horses of modern times has been accompanied by a gradual increase in size. The diminutive Eocene Lohippus and Orohippus were succeeded in the Miocene period by other forms to which the names of Anchitherium and Aiohippus

have been given, of the size of sheep; these again in Pliocene times by Hipparion and Pliohippus, as large as the modern donkeys; and it is only in the Pleisto- cene period that Hquide appeared which approached in size the existing horse. Important structural modifications have also taken place, with corresponding changes in the mode of life of the animal. The neck has become elongated, the skull altered in form, the teeth greatly modified, and the limbs have undergone remarkable changes. The last two require to be described more in detail.

The teeth in the Eocene forms had, as mentioned above, the characteristic number of forty-four. This number has been retained throughout the series, at least theoretically ; but one tooth on each side of each jaw, the anterior pre- molar, which in all the Eocene and Miocene species was a well-developed tooth, persisting through the life time of the animal, is in all modern horses rudimentary, functionless, and generally lost at an early period of life, evidently passing through a stage which must soon lead to its com- plete disappearance. The canines have also greatly dimin- ished in size, and are rarely present in the female sex, so that practically a very large number of adult horses of the present day have eight teeth less than the number possessed by their predecessors. The diastema or interval between the incisor and premolar teeth, of essential importance in the domesticated horse to his master, as without it there could be no room for inserting the special instrument of subjugation to his commands, the bit, already existed in the earliest known forms, but has gradually increased in length. The incisors have undergone in comparatively recent times that curious change producing the structure which will be more fully described hereafter, and which distinguishes the horse’s incisors from those of all other known animals. Lastly, the molars have undergone a remarkable series of modifications, much resembling in principle those that have taken place in several other groups of herbivorous animals. Distinctions in form which existed between the premolars, at least the anterior members of the series, and the true molars have gradually disappeared, the teeth becoming all very uniform in the shape and structure of their grinding surface. The crowns of all these teeth in the early forms were very short(see fig. 2, 2); there was a dis- tinct constriction, the neck, between the crown and roots; and when the tooth was developing, as soon as the neck once rose fairly above the alveolar margin, the tooth remained per- manently in this position. The term

“ brachyodont” ex- presses this condition of teeth, the mode of growth of which may be illustrated by those of man. The free surface had two nearly transverse curved ridges, with valleys between (fig. 2,a); but the valleys. were shallow and had no deposit of cementum filling them, the whole exposed surface of the un- worn tooth being formed of enamel. When the ridges be- came worndown the dentineof the interior was exposed, form- ing islands surrounded by enamel. With the progress of time

the crowns of the teeth gradually become longer, the valleys deeper, and the ridges not only more elevated but more curved and complex in arrangement. To give support to

these high ridges aud save them from breaking in use, the valleys or cavities between them became filled up to the top with cementum, and as the crown wore down an admirable grinding surface consisting of patches and islands of the two b

Fic. 1.—a, Grinding swface of unworn molar tooth of Anchitherium; b, cor- responding surface of unworn molar of young horse; c, the same tooth after it has been some time in use. The uncolourcd portions are the dentine or jvory, the shaded parts the cementum filling the cavities and surrounding the exterior. The black line separating these two structures is the enamel or hardest constitucnt of the tooth

softer substances, dentine and cement, separated by variously reduplicated and contorted lines of intensely hard cnamel, resulted (fig. 2,¢). The crown continued lengthening until in the modern horses it has assumed the form called “hyp- sidont” (fig. 2, 5). Instead of contracting into a neck, and forming roots, its sides continue parallel for a considerable depth in the socket, and as the surface wears away, the whole tooth slowly pushes rm b up,and maintains the grind- aad) ing edge constantly at the same level above the alve- olus, much as in the per- petually growing rodent’s tecth. But in existing horses there is still a limit to the growth of the molar. After a length is attained which in normal conditions supplies sufficient grinding surface for the lifetime of the animal, a neck and roots are formed, and the tooth is reduced to the condition of Fic. 2—a, Side view of second upper

that of the brachyodont an- font torm): ‘2, corresponding ‘tooth of cestor. It is perfectly clear horse (hypsidont form). that this lengthening of the crown adds greatly to the power of the teeth as organs of mastication, and enables the ani- mals in which it has taken place to find their sustenance among the comparatively dry and harsh herbage of the open plains, instead of being limited to the more succulent vegetable productions of the marshes and forests in which their predecessors mainly dwelt.

The modifications of the limbs which took place pare passu with those of the teeth must have been associated with increased speed, especially over firm and unyielding ground. Short, stout legs, and broad feet, with numerous toes, spreading apart from each other when the weight of the creature is borne on them, are sufficiently well adapted for plodding deliberately over marshy and yielding surfaces, and the tapirs and the rhinoceroses, which in the structure of the limbs have altered but little from the primitive Eocene forms, still haunt the borders of streams and lakes and the shady depths of the forests, as was probably the habit of their ancient representatives, while the horses are all inhabitants of the open plains, for life upon which their whole organization is in the most eminent degree adapted. The length and mobility of the neck, position of the eye and ear, and great development of the organ of smell, give them ample means of becoming aware of the approach of enemies, while the length of their limbs, the angles the

different segments form with each other, and especially the combination of firmness, stability, and lightness in the reduction of all the toes to a single one, upon which the whole weight of the body and all the muscular power are concentrated, give them speed and endurance surpassing that of almost any other animal. When surprised, however, they are by no means helpless, both fore and hind feet becom- ing at nced powerful weapons of defence.

Tf we were not so habituated to the sight of the horse as hardly ever to consider its structure, we should greatly marvel at being told of a mammal so strangely constructed that it had but a single toe on each extremity, on

the end of the nail of which it walked or galloped. Such a forma- tion is without a parallel in the vertebrate series, and is one of the most remarkable instances of specialization, or deviation from the usual type, in accordance with special conditions of life. It can be demonstrated, both by the structure of the foot itself, and also by an examination of the intermediate forms, that this toe corresponds to the middle or third of the complete typical or pentadactyle foot, the “ring finger” of man; and there is very strong evi- dence to show that by a gradual concentration of all the power of the limb upon this toe, and the concurrent dwindling away and final disappearance of all the others, the present condition of the horse’s foot has been produced.

The small horse-like animals of the Eocene period with four, or rudiments at least of five, toes on the fore foot have been already mentioned. In the early Miocene period the animal most like an existing horse was the Anchitherium, the remains of which are found in a fossil state both in Europe and in America. In this genus there were three well-developed toes reaching the ground on each foot, and

a b c d

Fic. 3.—Successive stages of modification of the feet of extinct forms of horse-like animals (chiefly from Marsh), showing gradual reduction of the outer and en- largement of the middle toe Qir). a, Orohippus (Eocene); b, Mesohippus

(Early Miocene); c, Méohippus and Anchitherium (Late Miocene); @ Hippa-

rion and Pliohippus (Pliocene) ; e, Zquus (Pleistocene). the radius and ulna, and the tibia and fibula of the hind leg, were complete and distinct, This was succeeded on the European and Asiatic continent by Hipparion and in America by Pliohippus, perhaps more directly in the line of descent, as Hipparion has some special characters of its own in tle tecth and skull, which make it probable that tt is a collateral branch which became extinct without leaving descendants. In these and other forms which flourished at this period, the lateral toes, though containing the full number of bones, were much reduced in size, and did not reach the ground, but were

suspended to the outside of and rather behind the large middle one, like the rudimentary outer toes of the deer, or the short first digit («dew-claw”) of the dog. Horses, or rather horse-like creatures, with this structure of feet were no longer met with in the Pleistocene period, but then for the first time appeared the true horse In its development exactly or very nearly as we know 1 now. The outer toes were reduced to rndiments of the metacarpals or metatarsals only, the so-called “splint bones” entirely Ds cealed beneath the skin (fig. 3, e, 1. and rv.), the middle

toe (111.) greatly elongated, and with its ungual phalanx and hoof expanded, and the stability of the forearm and leg in- creased by the complete subordination of the ulna and fibula to the larger bones, the radius and tibia, which alone are concerned in the formation of the wrist and ankle joint.

Fossil remains of true horses, differing but very slightly from the smaller and inferior breeds of those now existing, are found abundantly in deposits of the most recent geo- logical age, in almost every part of America, from Escholz Bay in the north to Patagonia in the south. In that con- tinent, however, they became quite extinct, and no horses, either wild or domesticated, existed there at the time of the Spanish conquest, which is the more remarkable as, when introduced fromm Europe, the horses that ran wild proved by their rapid multiplication in the plains of South America and Texas that the climate, food, and other circumstances were highly favourable for their existence. The former great abundance of Hquidew in America, their complete extinction, and their perfect acclimatization when reintro- duced by man, form curious but as yet unsolved problems in geographical distribution.

The existing species of the genus Hguus are the follow- ing :-—

(1) The Horse, Lguus caballus, Linn., is distinguished from the others by the long hairs of the tail being more abundant and growing quite from the base as well as the end and sides, and also by possessing a small bare callosity on the inner side of the hind leg, just below the “hock ” or heel joint, in addition to the one on the inner side of the forearm above the

carpus, common to all the genus. The mane is also longer and more flowing, and the ears shorter, the limbs longer, and the head smaller,

Though the existing horses are usually not marked in any definite manner, or only irregularly dappled, or spotted with light surrounded by a darker ring, many examples are met with showing a dark median dorsal streak like that found in all the other members of the genus, and even with dark stripes on the shoulders and legs indicating “the pro- bability of the descent of all the existing races from a single dun-coloured, more or less striped, primitive stock, to which our horses still occasionally revert.” !

In Europe wild horses were extremely abundant in the Neolithic or polished-stone period. Judging from the quan- tity of their remains found associated with those of the men of that time, the chase of these animals must have been among his chief occupations, and they must have furnished him with one of his most important food supplies. The characters of the bones preserved, and certain rude but graphic representations carved on bones or reindeers’ antlers, enable us to know that they were rather small in size, and heavy in build, with large heads and rough shaggy manes and tails, much like, in fact, the present wild horses of the steppes of the south of Russia. These horses were domesticated by the inhabitants of Europe before the dawn of history, but it is doubtful whether the majority of the animals now existing on the Continent are derived directly from them, as it is more probable that they are descendants from horses imported though Greece and Italy from Asia, derived from a, still earlier domestication, followed by gradual improvement through long-continued attention bestowed on their breeding and training. Horses are now diffused by the agency of man throughout almost the Whole of the inhabited parts of the globe, and the great Modifications they have undergone in consequence of domestication and selective breeding are well exemplified by comparing such extreme forms as the Shetland pony, dwarfed by uncongenial climate, the thoroughbred racer, and the London dray-horse. In Australia, as in America,

i Darwin, Variation of Animals and Plants under Domestication, 68, vol. i., chap. ii,

horses imported by the European settlers have escaped into the unreclaimed lands, and multiplied to a prodigious extent, roaming in vast herds over the plains where no hoofed animal ever trod before.

(2.) Lquus asinus, Linn.—The Domestic Ass is nearly as widely diffused and useful to man as the horse. It was known in Egypt loug before the horse, and is probably of African origin, indeed its close resemblance to the existing wild ass of Abyssinia, H. teniopus, Heuglin, leaves little doubt as to its identity with that species.

(3.) The Asiatic Wild Asses, which roam in small herds in the open plains of Syria, of many parts of Persia, of the north-west of India, and the highlands of Tartary and Tibet from tlie shores of the Caspian to the frontiers of China, differ from the last in being of a more rufous or isabelline colour, instead of pure grey, in wanting the dark streak across the shoulder, and having smaller ears. They have all a dark-coloured median dorsal stripe. Though it is considered probable by many zoologists that they form but a single species (1. hemionus, Pallas), they present such marked variations in size and form that they have commonly been divided into three —the Syrian Wild Ass (Z. hemippus, Geoff.), the Onager (Z. onager, Pall.) from Persia, the Punjab, Scinde and the desert of Cutch, and the Kiang or Dzeggetai (H. hemionus, Pallas) of the high table-lands of Tibet, where it is usually met with at an elevation of 15,000 feet and upwards above the sea-level. The last is considerably larger than either of the others, and differs from them in external appearance, having more the aspect of the horse. They are all remarkably swift, having been known to outstrip the fleetest horse in speed.

Lastly, there are three striped species, all inhabitants of South Africa. These constitute the genus Hippotigris of Hamilton Smith, but they are not separable except by their coloration from the true asses, and one of them (4), the Quagga (Z. quagga, Gmel.), may be considered as inter- mediate. This animal has the dark stripes limited to the head, neck, and shoulders, upon a brown ground. In (5) the Dauw or Burchell’s Zebra (Z. burchellii, Gray), the ground colour is white, and the stripes cover the body and upper part of the limbs. This is the commonest species in the great plains of South

Africa, where it roams in large herds, often in company with the quagga and numerous species of antelope. It ranges from the Orange River to the confines of Abyssinia. In (6) the Mountain Zebra (Z. zebra, Linn.) the contrast between the clear white of the ground and the black of the stripes is most marked, and the latter extend quite down to the hoofs. This is, consequently, the most beautiful species of the group as regards colour, if the horse may bear the palm in elegance of form. It frequents mountainous districts rather than the open plains which are the dwelling-places of the otier two species, and as it appears to be limited to the southern portion of the continent, within the confines of the Cape Colony, its numbers are rapidly diminisliing under the encroachments of European civilization.

There are thus at least six modifications of the horse type at present existing, sufficiently distinct to be reckoned as species by all zoologists, and easily recognized by their external characters. They are, however, all so closely allied that each will, at least in a state of domestication or captivity, breed with perfect freedom with any of the others, Cases of fertile union are recorded between the horse and the quagga, the horse and the dauw or Burchell's zebra, the horse and the hemionus or Asiatic wild ass, the common ass and the zebra, the common ass and the dauw, the common ass and the hemionus, the hemjonus and the zebra, and the hemionus and the dauw. The two species which are perhaps the farthest removed in general structure, the horse and the ass, produce, as is well known, hybrids or

mules, which in some qualities useful to man excel both their progenitors, and in some countries and for certain kinds of work are in greater requisition than either. Although occasional instances have been recorded of female mules breeding with the males of one or other of the pure species, it is doubtful if any case has occurred of their breeding inter se, although the opportunities of doing so must have been great, as mules have been reared in im- mense numbers for at least several thousands of years. We may therefore consider it settled that the different species of the group are now in that degree of physiological differentiation which enables them to produce offspring with each other, but does not permit of the progeny

continuing the race, at all events unless reinforced by the aid of one of the pure forms.

The several members of the group show mental differ- ences quite as striking as those exhibited by their external form, and more than perhaps might be expected from the similarity of their cerebral organization. The patience of the ass, the high spirit of the horse, the obstinacy of the mule, have long been proverbial. It is very remarkable that, out of so many species, two only should have shown any aptitude for domestication, and that these two should have been from time immemorial the universal and most useful companions and servants of man, while all the others remain in their native freedom to this day. It is, however, still a question whether this really arises from a different mental constitution causing a natural capacity for entering into relations with man, or whether it may not be owing to their having been brought gradually into this condition by long continued and persevering efforts when the need of their services was keenly felt. Itis quite possible that one reason why most of the attempts to add new species to the list of our domestic animals in modern times have ended in failure is that it does not answer to do so in cases in which existing species supply all the principal purposes to which the new ones might be put. It can hardly be expected that zebras and quaggas fresh from their native mountains and plains can be brought into competition as beasts of burden and draught with horses and asses, whose naturally useful qualities have been augmented by the training of thousands of generations of progenitors.

Not unfrequently instances occur of domestic horses being produced with a small additional toe with complete hoof, usually on the inside of the principal toe, and, though far more rarely, three or more toes may be present. These malformations are often cited as instances of reversion to the condition of some of the earlier forms of equine animals previously mentioned. Such explanations, however plausible they appear at first sight, are nevertheless very doubtful. All the feet of polydactyle horses which we have examined bear little resemblance to those of the extinct Hipparion or Anchitherium, but look rather as if due to that tendency to reduplication of parts which occurs so frequently as a teratological condition, especially among domestic animals, and which, whatever its origin, certainly cannot in

many instances, as the cases of entire limbs super- added, or of six digits in man, be attributed to reversion.

ANATOMY.

The anatomical structure of the horse has been described in great detail in several works devoted to the subject, which will be mentioned in the bibliography, though these have generally been written from the point of view of the veterinarian rather than of the comparative anatomist. The limits of the present article will only admit of the most salient points being indicated, particularly those in which the horse differs from the other Ungulata. Unless other- wise specified, it must be understood that all that is stated

here, although mostly derived from observation upon the horse, applies equally well to the other existing members of the group.

| ANATOMY.

Skeleton.—The skull as a whole is greatly elongated chiefly in consequence of the immense size of the face as com. pared with the hinder or true cranial portion. The basal line of the cranium from the lower border of the foramen magnum to the incisor border of the palate is very nearly straight. The orbit, of nearly circular form, though small in proportion to the size of the whole skull, is distinctly marked, being completely surrounded by a strong ring of bone with prominent edges. Behind it, and freely communi- cating with it beneath the osseous bridge (the post-orbital process of the frontal) forming the boundary between them, is the small temporal fossa occupying the whole of the side of the cranium proper, and in front is the great flattened expanse of the “cheek,” formed chiefly by the superior maxilla, giving support to the long row of molar teeth, and having a prominent ridge running forward from below the orbit for the attachment of the masseter muscle. The lacrymal occupies a considerable space on the flat surface of the cheek in front of the orbit, and below it the malar does the same. ‘he latter sends a horizontal or slightly ascending process backwards below the orbit to join the

Fic. 4.— Side view of skull of horse, with the boneremoved so as to expose the whole of theteeth. Pz, premaxilla; Mx, maxilla; Na,nasal bone; Ma, malar bone ; L,lacrymalbone; £7, frontal bone; Sq, squamosal bone ; Pa, parietal bones 0¢, occipital condyle; pp, paroccipital process ; a1, i2, and 23, the three incisor teeth; ¢, the canine tooth ; pm, the situation of the rudimentary first premolar, which lias been lost in the lower, but is present in the upper jew s pm, pm, and pms, the three fully-developed premolar tecth; m1, m?, and m*, the three true molar teeth.

under surface of the zygomatic process of the squamosal,

which is remarkably large, and instead of ending as usual behind the orbit, runs forwards to join the greatly developed post-orbital process of the frontal, and even forms part of the posterior and inferior boundary of the orbit, an arrangement not met with in other mammals. The closure of the orbit behind distinguishes the skull of the horse from that of its | allies the rhinoceros and tapir, and also from all of the perissodactyles of the Eocene period. In front of the cerebral cavity, the great tubular nasal cavities are provide

with well-developed turbinal bones, and are roofed over by ©

very large nasals, broad behind, and ending im front by 9

narrow decurved point. The opening of the anterior nares

is prolonged backwards on each side of the face between the nasals and the elongated slender premaxille. The latter _ expand in front, and are curved downwards to form the semicircular alveolar border which supports the large mncisor teeth. The palate is narrow in the interval between the © incisor and molar teeth, in which are situated the large anterior palatine foramina. Between the molar teeth it 8 _

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broader, and it ends posteriorly in a rounded excavated border opposite the hinder border of the penultimate molar tooth. It is mainly formed by the maxillx, as the palatines are very narrow. The pterygoids are delicate slender slips of bone attached to the hinder border of the palatines, and supported externally by, and generally ankylosed to, the rough pterygoid plates of the alisphenoid, with no pterygoid fossa between. They slope very obliquely forwards, and end in curved, compressed, hamular processes. There is a distinct alisphenoid canal for the passage of the internal maxillary artery. The base of the cranium is long and narrow; the alisphenoid is very obliquely perforated by the foramen rotundum, but the foramen ovale is confluent with the large foramen lacerum medium behind. The glenoid surface for the articulation of the mandible is greatly ex- tended transversely, concave from side to side, convex from before backwards in front, and hollow behind, and is bounded posteriorly at its inner part by a prominent post- glenoid process. The squamosal euters considerably into the formation of the temporal fossa, and, besides sending the zygomatic process forwards, it sends down behind the meatus auditorius a post-tympanic process which aids to hold in place the otherwise loose tympano-periotic bone. Behind this the exoccipital gives off a very long paroccipital process. The periotic and tympanic are ankylosed together, but not with the squamosal. The former has a wide but shallow floccular fossa on its inner side, and sends backwards a con- siderable “pars mastoidea,” which appears on the outer surface of the skull between the post-tympanic process of the squamosal and the exoccipital. The tympanic forms a tubular meatus auditorius externus directed outwards and slightly backwards. It is not dilated into a distinct bulla, but ends in front in a pointed styliform process. It com- pletely embraces the truncated cylindrical tympanohyal, which is of great size, corresponding with the large develop- ment of the whole anterior arch of the hyoid. This con- sists mainly of a long and compressed stylohyal, expanded at tle upper end, where it sends off a triangular posterior process. The basi-hyal is remarkable for the long, median, pointed, compressed ‘“glossohyal” process, which it sends forward from its anterior border into the base of the tongue. A similar but less developed process is found in the rhinoceros and tapir. The mandible is largely developed, especially the region of the angle, which is ex- panded and flattened, giving great surface for the attach- ment of the masseter muscle. The condyle is greatly elevated above the alveolar border; its

articular surface is very wide transversely, and narrow and convex from before backwards, The coronoid process is slender, straight, and inclined backwards. The horizontal ramus, long, straight, and compressed, gradually narrows towards the sympliysis, where it expands laterally to form with the ankylosed opposite ramus the wide, semicircular, shallow alveolar border for the incisor teeth.

The vertebral column consists of seven cervical, eighteen dorsal, six lumbar, five sacral, and fifteen to eighteen caudal vertebrae, There may be nineteen rib- bearing vertebra, in which case five only will be reckoned as belonging to the lumbar series. The odontoid process of the atlas is wide, flat, and hollowed above, as in the ruminants. The bodies of the cervical vertebrxx are elongated, strongly keeled, and markedly opisthoccelous, or concave behind and convex in front. The neural laminz are very broad, the spines almost obsolete, except in the seventh, and the transverse processes not largely developed. In the trunk vertebre the opistho- ceelous character of the centrum gradually diminishes. The spinous processes of the anterior thoracic region are high and compressed. To these is attached the powerful elastic ligament, ligamentum nuche, or ‘‘paxwax,” which passing forwards in the middle line of the neck above the

neural arches of the cervical vertebree, to which it is also connected, is attached to the occiput and supports the weight of thehead. The transverse processes of the lumbar vertebra are long, flattened, and project horizontally out- wards or slightly forward from the arch. The metapo- physes are moderately developed, and there are no anapo- physes. The caudal vertebrz, except those quite at the base, are slender and cylindrical, without processes and without chevron bones beneath. ‘The ribs are eighteen or nineteen in number on each side, flattened, and united to the sternum by short, stout, tolerably well ossified sternal ribs. The sternum consists of six pieces ; the anterior or presternum is extremely compressed, and projects forwards like the prow of a boat. The segments which follow gradually widen, and the hinder part of the sternum is broad and flat.

As in all other ungulates, there are no clavicles, The scapula is long and slender; the supra-scapular border is rounded, and slowly and imperfectly ossified. The spine is very slightly developed ; rather above the niiddle its edge is thickened and somewhat turned backwards, but it gradually subsides at the lower extremity without forming any acromial process. The coracoid is a prominent rounded nodule, The humerus is stout and rather short. The ulna is quite rudimentary, being only represented by little more than the olecranon. The shaft gradually tapers below and is firmly ankylosed to the radius. The latter bone is of nearly equal width throughout. The three bones of the first row of the carpus (tle scaphoid, lunar, and cuneiform) are subequal in size. The second row consists of a very broad and flat magnum, supporting the great third metacarpal, having to its radial side the trapezoid, and to its ulnar side the unciform, which are both small, and articulate distally with the rudimentary second and fourth metacarpals. The pisiform is large and prominent, flattened, and curved ; it articulates partly with the cuneiform and partly with the lower end of the radius. The large metacarpal is called in veterinary anatomy “cannon bone”; the small lateral metacarpals, which gradually taper towards their lower extremities, and lie in close contact with the large one, are called “splint bones.” The single digit consists of a moderate-sized proximal (0s sufraginis, or large pastern), avery short middle (os corone, or small pastern), and a wide, semi-lunar, ungual phalanx (0s pedis, or coffin bone). There is a pair of large nodular sesamoids behind the metacarpo-phalangeal articulation, and a single large transversely-extended sesamoid behind the joint between the second and third phalanx, called the “ navicular bone.”

The carpal joint, corresponding to the wrist of man, is commonly called the “knee” of the horse, the joint between the metacarpal and the first phalanx the “fetlock,” that between the first and second phalanges the “ pastern,” and that between the second and third phalanges the “ coffin joint.”

In the hinder limb the femur is marked, as in all other known perissodactyles, by the presence of a “third trochanter,” a flattened process, curving forwards, arising from the outer side of the bone, about one-third of the distance from the upper end. The fibula is reduced to a mere styliform rudiment of the upper end. The lower part is absent or completely fused with the tibia. The os calcis has a long andcompressed calcaneal process.

The astragalus has a large flat articular surface in front for the navicular, and a very small one for the cuboid. The navicular and the external cuneiform bones are very broad and flat. The cuboid is small, and the internal and middle cunei- form bones are small and united together. The metapodals and phalanges resemble very closely those of the fore limb, but the principal metatarsal is more laterally compressed at its upper end than is the corresponding metacarpal,

The joint between the femur and tibia, corresponding to the knee of man, is called the “ stifle joint”; that between the tibia and tarsus, corresponding to the ankle of man, is called the “hock.” The bones and joints of the foot have the same names asin the forelimb. The horse is eminently “ digitigrade,” standing on the extremity of the single digit of each foot, which is kept habitually in a position approaching to vertical.

The muscles of the limbs are modified from those of the ordinary mammalian type in accordance with the reduced condition of the bones and the simple requirements of flexion and extension of the joints, no such actions as pro- nation and supination, or opposition of digits, being possible or needed. ‘The muscles therefore which perform these functions in other quadrupeds are absent or rudimentary.

Below the carpal and tarsal joints, the fore and hind limbs correspond almost exactly in structure as well as function. On the anterior or extensor surface of the limb a powerful tendon (7 in fig. 5), that of the anterior extensor

Fig. 5.—Section of foot of horse. ginis); 3, seeond phalanx (08 eoffin bone); 5, one of the upper sesamoid bones; 6, lower sesamoid or navi- euwlar bone; 7, tendon of anterior extensor of the phalanges; 8, tendon of superficial flexor (jl. perforatus), 9, tendon of deep flexor (fl. perforans) ; 10, suspensory ligament of fetlock ; 11, inferior or short sesamoid ligament; 12, derma or skin of the foot, covered with hair, and continued into 13, the coronary cushion, 14, the podophyllous or laminar membrane, and 15, the

keratogenous membrane of the sole; 16, plantar cushion; 17, hoof; 18, fatty eushion of fetlock.

of the phalanges (corresponding to the extensor communis digitorum of the arm and extensor longus digitorum of the foot of man) passes down over the metacarpal bone and phalanges, to be inserted mainly into the upper edge of the anterior surface of the last phalanx or pedal bone. There is also a much smaller second extensor on the outer side of this in each limb, the lateral extensor of the phalanges, In the fore leg the tendon of this muscle (which corresponds with the extensor minimi digitt of man) receives a slip from that of the principal extensor, and is inserted into the first phalanx. In the hind leg (where it is the homologue apparently of the peroneus brevis of man) the tendon becomes blended with that of the large extensor.

A very strong ligamentous band behind the metapodium, arising from near the upper extremity of its posterior surface, divides into two at its lower end, and each division, being first connected with one of the paired upper sesamoid bones, passes by the side of the first phalanx to join the extensor tendon of the phalanges. This is called in veterinary anatomy the “suspensory ligament of the sesamoids,” or of the “fetlock ” (10 in fig. 5); but its attach- ments and relations, as well as the occasional presence of muscular fibres in its substance, show that it is the homologue of the interosseous muscles of other mammals, curiously modified both in structure and function, to suit

1, metacarpal bone ; 2, first phalanx (0s suffra- corone); 4, third or ungual phalanx (0s pedis, or

the requirements of the horse’s foot. Behind or superficial to this are placed the two strong tendons of the flexor muscles, the most superficial, or flexor perforatus (8) dividing to allow the other to pass through, and then inserted into the middle phalanx. The flexor perforans (9) is as usual inserted into the terminal phalanx. In the fore leg these muscles correspond with those similarly named in man. In the hind leg, the perforated tendon is a

continuation of that of the plantaris, passing pulley-wise over the tuberosity of the os calcis. The perforating tendon is derived from the muscle corresponding with the long flexor of man, and the smaller tendon of the oblique flexor (tibialts porticus of man) is united with it. The hoof of the horse corresponds to the nail or claw of other mammals, but is so constructed as to form a com- plete and very solid case to the expanded termination of the toe, giving a firm basis of support formed of a non-gensitive substance, which is continually renewed by the addition of material from within, as its surface wears away by friction against the ground. The terminal phalanx of the toe is greatly enlarged and modified in form to support this hoof, and the size of the internal framework of the foot is further increased by a pair of lateral fibro-cartilaginous masses attached on each side to the hinder edges of the bone, and by a fibro-cellular and adipose plantar cushion in the median part. These structures are all enclosed in the keratogenous membrane or ‘“‘subcorneous integument,” a continuation of the ordinary derma of the limb, but extremely vascular, and having its superficial extent greatly increased by being developed into papilla orlamine. From this the horny material which constitutes the hoof is exuded. A thickened ring encircling the upper part, called coronary cushion (13), and the sole (15), are covered with numerous thickly-set papillae or villi, and take the greatest share in the formation of the hoof; the intermediate part con- stituting the front and side of the foot (14), corresponding with the wall of the hoof, is covered with parallel, fine — longitudinal lamin, which fit into corresponding depres: sions in the inner side of the horny hoof. | The horny hoof is divided into a wall or crust consisting — of the front and sides, the flattened or concave sole, and the frog, a triangular median prominence, notched posteriorly, with the apex turned forwards, situated in the hinder part of the sole. It is formed of pavement cpithelial cells, which are mainly grouped in a concentric manner around the vascular papille of the keratogenous membrane, 80 that a section near the base of the hoof, cut transversely to the long axis of these papillz, shows a number of small circular or oval orifices, with cells arranged concentrically round them. ‘The nearer the surface of the hoof, or further re- moved from the seat of growth, the more indistinct the | structure becomes. Small round or oval plates of horny epithelium called “chestnuts,” growing like the hoof from enlarged papille of the skin, are found on the inner face of the fore arm, above the carpal joint in all species of Zqusda,

and in the | horse (£. caballus) similar formations occur near the upper extremity of the inner face of the metatarsus. Their use is unknown. | Dentition.—The dentition of the horse, when all the teeth are in place, is, as stated before, expressed by the formula — i, 3,c4,p.4, m. $=44, The incisors of each jaw are placed in close contact, forming a semicircle. The crowns — are broad, somewhat awl-shaped, and of nearly equal size. They have all the great peculiarity, not found in the teeth of any other mammal, and only in the Zyuide of com- paratively recent geological periods, of an involution of | the external surface of the tooth (see fig. 6), by which © what should properly be the apex is carried deeply into the interior of the crown, forming a fossa or pit, the bottom

of which becomes partially filled up with crusta petrosa or cementum. ~~As the tooth wears, the surface, besides the external enamel layer as in an ordinary simple tooth, shows in addition a second inner ring of the same hard substance surrounding the pit, which of course adds greatly to the efficiency of the tooth as an organ for biting tough, fibrous substances. This pit, generally filled in the living animal with particles of food, is conspicuous from its dark colour, and constitutes the "mark" by which the age of the horse is judged, as in consequence of its only extending to a certain depth in the crown it becomes obliterated as the crown wears away, and then the tooth assumes the charac~~ ter of that of an ordinary incisor, consisting only of a core of dentine, surrounded by the external enamel layer. It is not quite so deep in the lower as in the upper teeth.

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Fig. 6.—Longitudinal and transverse section of upper incisor of horse. P, pulp cavity; d, dentine or ivory; e, enamel; c, outer layer of cementum or crusta petrosa; ¢’, inner layer of cementum, lining a, the pit or cavity of the crown of the tooth,

The canines are either quite rudimentary or entirely absent

in the female. In the male they are compressed, pointed,

and smaller than the incisors, from which they are separated by a slight interval. The teeth of the molar series are all in contact with each other, but separated from the canines by a considerable toothless space. The anterior premolars are quite rudimentary, sometimes not developed at all, and generally fall by the time the animal attains maturity, so that there are but six functional grinding teeth,—three that have predecessors in the milk dentition, and hence are considered as premolars, and three true molars, but other- wise, except the first and last of the series, not distinguish- able in form or structure. These teeth in both upper and lower Jaws are extremely long-crowned or hypsidont, suc- cessive portions being pushed out as the surface wears away, @ process which continues until the animal becomes

advanced in age. The enamelled surface is infolded in a

complex manner (a modification of that found in other

Perissodactyles), the folds extending quite to the base of the

‘frown; and the interstices being filled and the surface

covered with a considerable mass of cement, which binds

together and strengthens the whole tooth. As the tecth wear, the folded enamel, being harder than the other con- stituents, the dentine and cement, forms projecting ridges on the surface arranged in a definite pattern, which give

fF othe efliciency as a grinding instrument (see fig. 1,

b: ne ¢). The free surfaces of the upper teeth are quad-

‘Fate, except the first and last, which are nearly triangular.

ower teeth are much narrower than the upper.

ae milk dentition consists of 7. 3, ¢. 2, m. = 24,—the

adel and first or rudimentary premolars having appar-

oY 0 predecessors. In form and structure they much

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resemble the permanent teeth, having the same characteris. tic enamel foldings. Their eruption commences a few days after birth, and is complete before the end of the first year, the upper teeth usually appearing somewhat

earlier than those of the lower jaw. The first teeth which appear are the first and second milk molars (about five days), then the central incisor (from seven to ten days); this is followed by the second incisor (at one month), then the third molar, and finally the third incisor. Of the permanent teeth the first true molar appears a little after the end of the first year, followed by the second molar before the end of the second year. At about two and a half years the first premolar replaces its predecessor. Between two anda half and three years the first incisor appears. At three years the second and third premolars, and the third true molar have appeared, at from three and a half to four years the second incisor, at four to four and a half years the canine, and, finally, at five years, the third incisor, completing the permanent dentition. Up to this period the age of the horse is clearly shown by the condition of dentition, and for some time longer indications can be obtained from the wear of the incisor teeth, though this depends to a certain extent upon the hardness of the food or other accidental circumstances. As a general rule, the depression caused by the infolding of the surface of the incisor (the “ mark”) is obliterated in the first or central incisor at six years, in the second at seven years, and in the third at eight years. In the upper teeth, as the depressions are deeper, this obliteration does not take place until about two years later. After this period no certain indications can be obtained of the age of the horse from the teeth,

Digestive Organs.—The lips are flexible and prehensile. The membrane that lines them and the cheeks is quite smooth, The palate is long and narrow; its mucous surface has seventeen pairs of not very sharply defined oblique ridges, extending as far back as the last molar tooth, beyond which the velum palati extends for about 3 inches, having a soft corrugated surface, and ending posteriorly in an arched border without uvula. This embraces the base of the epiglottis, and, except while swallowing food, shuts off all communication between the cavity of the mouth and the pharynx, respiration being, under ordinary circum- stances, exclusively through the nostrils. Between the mucous membrane and the bone of the hard palate isa dense vascular and nervous plexus. The membrane lining the fauces is soft and corrugated. An elongated raised glandular mass, 3 inches long and 1 inch from above down- wards, extending backwards from the root of the tongue along the side of the fauces, with openings on the surface leading into crypts with glandular walls, represents the tonsil. The tongue,

corresponding to the general form of the mouth, is long and narrow. It consists of a compressed intermolar portion with a flat upper surface, broad behind and becoming narrower in front, and of a depressed anterior part rather shorter than the former, and which is narrow behind aud widens towards the evenly rounded apex. The dorsal surface generally is very soft and smooth. There are two large circumvallate papille near the base, rather irregular in form, about a quarter of an inch in diameter and half an inch apart. The conical papille are very small and close set, though longer and more filament- ous on the intermolar portion. There are no fungiform papilla on the dorsum, but a few not very conspicuous ones scattered along the sides of the organ.

Of the salivary glands the parotid is by far the largest, and elongated in the vertical direction, and narrower in the middle than at either upper or lower extremity. Its upper extremity embraces the lower surface of the cartilaginous ear-conch ; its lower end reaches the level of the inferior margin of the mandible, along the posterior margin of which

it is placed. Its duct leaves the inferior anterior angle, at first descends a little, and runs forward under cover of the rounded inferior border of the mandibular ramus, then curves up along the anterior margin of the masseter muscle, becoming superficial, pierces the buccinator, and enters the mouth by a simple aperture opposite the middle of the crown of the third premolar tooth. It is not quite so thick as a goosequill when distended, and nearly a foot in length.

The submaxillary gland is of very similar texture to the last, but much smaller; it is placed deeper, and lies with its main axis horizontal. It is elongated and slender, and flattened from within outwards. Its posterior end rests against the anterior surface of the transverse process of the atlas, from which it extends forwards and downwards, slightly curved, to beneath the ramus of the jaw. The duct which runs along its upper and internal border passes forwards in the usual course, lying in the inner side of the sublingual gland, to open on the outer surface of a distinct papilla, situated on the floor of the mouth, half an inch from the middle line, and midway between the lower sncisor teeth and the attachment of the frenum lingue. The sublingual

is represented by a mass of glands lying just beneath the mucous membrane of the floor of the mouth on the side of the tongue, causing a distinct ridge, ‘extending from the frenum backwards, the numerous ducts opening separately along the summit of the ridge. The buccal glands are arranged in two rows parallel with the molar teeth. The upper ones are the largest, and are continuous anteriorly with the labial glands, the ducts of which open on the mucous membrane of the upper

The stomach of the horse is simple in its external form, with a largely developed right cul de sac, and is a good deal curved on itself, so that the cardiac and pyloric orifices are brought near together. The antrum pyloricum is small and not very distinctly marked off. The interior is divided by the character of the lining membrane into two very distinct portions, right and left. Over the latter the dense white smooth epithelial lining of the cesophagus is con- tinued, terminating abruptly by a raised crenellated border. ~ Over the right part (rather the larger portion) the mucous membrane has a greyish-red colour and a velvety appearance, and contains very numerous peptic glands, which are want- ing in the cardiac portion. The esophageal orifice is very small, aud is guarded by a strong crescentic or rather horseshoe-like band of muscular fibres, which is supposed to be the cause of the difficulty of vomiting in the horse. The small intestine is of great length (80 to 90 feet), its mucous membrane being covered with numerous fine villi. The czecum is of conical form, about 2 feet long and nearly a foot in diameter ; its walls are sacculated, especially near the base, having four longitudinal muscular bands ; and its capacity is about twice that of the stomach. It lies with its base near the lower part of the abdomen, and its apex directed towards the thorax. The colon is about one-third the length of the small intestine, and very capacious in the greater part of its course. As usual it may be divided into an ascending, transverse, and descending portion ; but the middle or transverse portion is folded into a great loop, which descends as low as the pubis; so that the colon forms altogether four folds, generally parallel to the long axis of the body. ‘The descending colon is much narrower than the rest, and not sacculated, and, being considerably longer fa the distance it has to traverse, is thrown into numerous Folds. :

The liver is tolerably symmetrical in its general arrange- ment, being divided nearly equally into segments by a well- marked umbilical fissure. Each segment is again divided by lateral fissures, which do not extend quite to the pos- terior border of the organ; of the central lobes thus cut off,

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the right is rather the larger, and has two fissures in its free border subdividing it into lobules. The extent of these varies, however, in different individuals. The two lateral lobes are subtriangular in form. The Spigelian lobe is represented by a flat surface between the postal fissure and the posterior border, not distinctly marked off from the left lateral by a fissure of the ductus venosus, as this vessel is buried deep in the hepatic substance, but the caudate lobeis distinct and tongue-shaped, its free apex reaching nearly to the border of the right lateral lobe. In most works on the anatomy of the horse this has been confounded with the Spigelian lobe of man. There is no gall-bladder, and the biliary duct enters the duodenum about 6 inches from the pylorus. The pancreas has two lobes or branches, a long one passing to the left and reaching the spleen, and a shorter right lobe. The principal duct enters the duodenum with the bile-duct, and there is often a second small duct which opens separately near to this. Circulatory and Respiratory Organs.—The heart has the form of arather elongated and pointed cone. There is one anterior vena cava, formed by the union of the two jugular and two axillary veins. The aorta gives off a large branch (the anterior aorta) very near its origin, from which arise ~~—first, the left axillary, and afterwards the right axillary and the two carotid arteries. Under ordinary circumstances the horse breathes entirely by the nasal passages, the communication between the larynx and the mouth being closed by the velum palati, The nostrils are placed laterally, near the termination of the muzzle, and are large and very dilatable, being bordered by cartilages upon which several muscles act. Immediately within the opening of the nostril, the respiratory canal sends off on its upper and outer side a diverticulum or blind pouch (called “ false nostril”) of a conical form, and curved, 2 to 3 inches in depth, lying in the notch formed between the nasal and premaxillary bones. It is lined by mucous membrane continuous with that~~

~~of the nasal passage, and its use is not apparent. It is longer in the ass than inthe horse. Here may be mentioned the guttural pouches, large air sacs, diverticula from the Eustachian tubes, and lying behind the upper part of the pharynx, the function of which is also not clearly understood. The larynx has the lateral sacculi well developed, though entirely concealed within the ale of the thyroid cartilage. The trachea divides into two bronchi, one for each lung. Nervous System.—The brain differs little, except in details of arrangement of convolutions, from that of other ungulates. The cerebral hemispheres are rather elongated and subcylindrical, the olfactory lobes are large and project freely in front of the hemispheres, and the greater part of the cerebellum is uncovered. The eye is provided with a nictitating membrane or third eyelid, at the base of which the ducts of the Harderian gland open. ; Reproductive System.—The testes are situated in a dis tinct sessile or slightly pedunculated scrotum, into which they descend from the sixth to the tenth month after birth. The accessory generative glands are the two vesiculz seminales, with the median third vesicle, or uterus mascl~~ linus, lying between them, the single bilobed prostate, and a pair of globular Cowper's glands. The penis 1s very large, cylindrical, with a truncated, expanded, flattens termination. When in a state of repose it is retracted, by a muscle arising from the sacrum, within the prepuce, cutaneous fold attached below the symphysis pubis. The uterus is bicornuate. The vagina is often partially divided by a membraneous septum or hymen. The mamme& are two, inguinally placed. The surface of the chorion 18 covered evenly with minute villi, constituting a diffuse nolr deciduate placenta. The period of gestation 18 eleven months.

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PART II.—HISTORY, MANAGEMENT, AND BREEDING.

From the evidence of philology it is plain that the horse was already known to the Aryans before the period of their dispersion.?

The first mention of the British horse occurs in the well-known passages in Cresar (B. G., iv. 24, 33; v. 15, 16; cf. Pomp. Mela, il, 6), in which he mentions the uative “essedarii” and the skill with which they handled their war chariots. We are left quite in the dark as to the character of the animal thus employed; but there would appear to be much probability in the surmise of Youatt, who conjectures the liorse to have been, ‘‘ then as ever, the creature of the country in which he lived. With short fare, and exposed to the rigour of the seasons, he was pro- bably the little hardy thing we yet see him; but in the marshes of the Nen and the Witham, and on the borders of the Tees and the Clyde, there would be as much pro- portionate development of frame and strength as we find at the present day." After the occupation of the country by the Romans, it appears that the horses of their cavalry were crossed with the native mares, and thus there was infused into the breed new blood, consisting probably of strains from every quarter from which Roman remounts were procured, As to the effect of this cross we are not, however, in a position to judge. We are also quite un- certain as to the

extent to which the Jutes and Saxons may in their turn have again introduced a new breed of horses into England; and even to the close of the Anglo- Saxon period of English history allusions to the horse are still very unfrequent. The horsthegr we know, how- ever, was from an early period a high court official; and from such a law as that of Athelstan prohibiting the ex- portation of horses except as presents, it may be inferred that the English breed was not only much valued at home but also in great request abroad.2

The period of the Norman Conquest marks an important

- Compare Sanser., agva; Zendish and Old Persian, acpa; Lithu-

— anian, aszva (mare); Prussian, asvinan (mare's milk); Old High

German, ehw; Anglo-Saxon, coh; Icel., 267; Gothic, athos, athous (?);

_ Old Irish, ech ; Old Cambrian and Gaelic, ep (asin Lpona, the horse | goddess); Lat. equus; Gr., Yrmos or txxos. The word seems, how- | ever, to have disappeared from the Slavonie lauguages, The root is

probably ak, with the idea of sharpness or swiftness (&pos, ads, "cus, ocior). See Pott, Etym. Forseh., ii. 256, and Hehn, Kultur- Phanzen u. Hausthiere in ihrem Uebergang aus Asien nach Griechen- land u. Italien sowie in das iibrige Europa (3d ed., 1877), p. 38. The last-named author, who points out the absence of the horse from the Egyptian monuments prior to the beginning of the 18th century B.¢., and the fact that the earliest references to this animal in Hebrew literature (Judg. v. 22, 28; ¢f. Josh. xi. 4) do not carry us any further back, is of opinion that the Semitie peoples as a whole were ae for the horse to the lands of Iran. He also shows that iterature affords no trace of the horse as indigenous to Arabia prior to about the beginning of the 5th century A.D., although references abound in the pre-Islamitic poetry. Horses were nut numerous even i Mahomet's time (Sprenger, Leb, Moh., iti. 189, 140). Compare Hee Mo Guidi's paper "Della sede primitiva dei popoli Semitici" in " Pransactions of the Accademia dei Lincei (1878-79).

ome fragments of legislation relating to the horse about this ey may be gleaned from Ancient Laws and Institutes of England (fol., London, 1840), and Aneient Laws and Institutes of Wales (fol.,

London, 1841),

stage in the history of the British horse. William the Conqueror's own horse was of the Spanish breed, and others of the same kind were introduced by the barons on their estates. But the Norman horses included many varieties, and there is no doubt that to the Conquest the inhabitants of Britain were indebted for a decided improve- ment in the native horse, as well as for the introduction of several varieties previously unknown. According to Giraldus Cambrensis, Roger de Bellesme, a follower of William I., afterwards created earl of Shrewsbury, im- ported some stallions from Spain into England; their produce was celebrated by Drayton the poet. It is curious to notice that agriculture seems to be the last use to which the horse has been put. The earliest suggestion that horses were used in agriculture is derived from a piece of the Bayeux tapestry, where a horse is represented as drawing a harrow. This, however, must have been an ex- ceptional case, for we know that oxen were used until a comparatively late time, and that in Wales a law existed forbidding horses to be used for ploughing.

In 1121 two Eastern horses are said to have been imported,—one of them remaining in England, and the other being sent as a present by King Alexander T. to the church of St Andrews, in Scotland. It has been alleged that these horses were Barbs from Morocco, but a stil] more likely theory is that they existed only in name, and never reached either England or Scotland. The crusades were probably the means of introducing fresh strains of blood into England, and of giving opportunity for fresh crossings. The Spanish jennet was brought over about 1182. King John gave great encouragement to horse- breeding: one of his earliest efforts was to import a hundred Flemish stallions, and, having thus paved the way for improving the breed of agricultural horses, he set about acquiring a valuable stud for his own use.

Edward IIT. was likewise an admirer of the horse; he procured fifty Spanish horses, probably jennets. At this time there was evidently a tendency to breed a somewhat lighter and speedier horse; but, while the introduction of

a more active animal would soon have led to the dis- placement of the ponderous but powerful cavalry horse then in use, the substituted variety would have been unable to carry the weight of armour with which horse and rider were alike protected ; and so in the end the old breed was kept up fora time. With the object of pre- serving to England whatever advantages might accrue from her care and skill in breeding an improved stamp of horses, Edward III. forbade their exportation ; they con- sequently improved so rapidly in value that Richard II. compelled dealers to limit their prices to a fixed maximum. In the ninth year of his reign, Edward received from the king of Navarre a present of two running horses, supposed to have been valuable. The wars of 1346 checked the improvement of horses, and undid much of what had been previously accomplished, for we read that the cavalry taken into France by Edward III. were but

indifferently mounted, and that in consequence he had to purchase large numbers of foreign horses from Hainault and elsewhere for remounts. The reign of Richard III. does not seem to have been remarkable for the further- ance of horse-breeding ; but it was then that post-horses and stages were introduced.

Our information on the whole subject is but scanty down tothe reign of Henry VIL, who continued the enactment against the exportation of stallions, but relaxed. it in the case of mares above two years old. His object was to retain the best horses in the country, and to keep the price of them down by limiting the demand and encouraging the supply. In his reign gelding is believed to have had its origin, on ‘account of numerous herds of horses belonging to different proprietors grazing together, especially in time of harvest. Henry VIII. was particu- larly careful that horse-breeding should be conducted on right principles, and his enactments, if somewhat arbitrary, were singularly to the point. In the thirty-second year of this reign, the “bill for the breed of horses” was passed, the preamble of which runs thus —“ ~~Forasmuch as the generation and breed of good and strong horses within this realm extendeth not only to a great help and defence of the same, but also is a great commodity and profit to the inhabitants thereof, which is now much decayed and diminished, by reason that, in forests, chases, moors, and~~

~~waste grounds within this realm, little stoned horses, and nags of small stature and of little value, be not only suffered to pasture thereupon, but also to cover mares feeding there, whereof cometh in manner no profit or commodity." See~~ tion 2 of the Act provides that no entire horse being above the age of two years, and not being of the height of 15 ‘“‘handfulls,” shall be put to graze on any common or waste land in certain counties; any one was to be at liberty to seize a horse of unlawful height, and those whose duty it was to measure horses, but who refused to do so, were to be fined 40s. By section 6 all forests, chases, commons, &e., were to be “driven” within fifteen days of Michaelmas day, and all horses, mares, and colts not giving promise of growing into serviceable animals, or of producing them, were to be killed. The aim of the Act was to prevent breeding from animals not calculated to produce the class of horse suited to the needs of the country. By another Act (27 Henry VIII. chapter 6), after stating that the “breed of good strong horses” was likely to diminish, it was ordered that the owners of all parks and enclosed grounds of the extent of one mile should keep two mares 13 hands high for breeding purposes, or, if the extent of the ground was four miles, four mares. The statute was not to extend to the counties of Westmoreland, Cum- berland, Northumberland, or the bishopric of Durham. Henry took great pains to improve the royal stud : accord- ing to Sir Thomas Chaloner—a writer in the reign of ee! imported horses from Turkey, Naples, and

pain.

Queen Elizabeth is reputed to have been an accomplished horsewoman, and to have indulged in riding late in life. In the first year of her reign she revived an Act passed by Henry VIII. making it felony “to sell, exchange, or deliver within Scotland, or to the use of any Scottishman, any horse ;” this, however, was very naturally repealed by James I. Carriages were soon after introduced, and the use of them speedily became so fashionable that a bill was brought in “to restrain the excessive and superfluous use of coaches.” Prior to the introduction of carriages, horse- back was the means of locomotion, and Queen Elizabeth rode in state to St Paul’s on a pillion; but even after carriages were used, horseback was held to be more dignified, for James I. and his judges rode on horseback to Westminstes Hall. One advantage of the introduction

of carriages was that it created a demand for a lighter and quicker sort of horse, instead of the ponderous animal which, despite all attempts to banish him, was still the horse of England—the age of chivalry having been the first epoch of the British horse.

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Gunpowder, too, was invented ; and now that the weight

of the cavalry soldier was diminished by the substitution of lighter armour, a quicker and better bred horse was thought desirable for military service. The introduction of carriages and the invention of gunpowder thus opened out a new industry in breeding ; and a decided change was gradually creeping on by the time that James I. came to the throne (1603), which commences the second epoch, James was a thorough sportsman, and. his taste for racing, in which he freely indulged, caused him to think but little of the speed of even the best English horses. With the laudable motive therefore of effecting improvement in horses, he gave the then large sum of 500 guineas for an Arab stallion which had been procured from Constantinople by a Mr Markham, since known as the ‘‘ Markham Arabian.” This is the first authentic account we have of the importa- tion of Arab blood, and the Stud-Book says he was the first of that breed ever seen in England. The people having to do with horses at that time were as conservative in

their notions as most of the grooms are now, and the “Markham Arabian” was not at all approved of. The

duke of Newcastle, in his treatise on horsemanship, said that he had scen the above Arabian, and described him as a small bay horse and not of very excellent shape. In this instance, however, prejudice (and it is difficult to believe

that it was anything else) was right, for King James’s first

venture does not appear to have been a success either as a

race-horse or as a sire, and thus Arabian blood was brought into disrepute. The king, however, resolved to give Eastern blood another trial, and bought a horse known as Place's White Turk from a Mr Place, who subsequently held some office in connexion with the stable under Cromwell. Charles I. followed in the footsteps of James, and lent such patronage to the breeding of a better kind of horse that a memorial was presented to him, asking that some measures might be taken to prevent the old stamp of horse "ft for the defence of the country" from dying out.

We now come to a very important period in the history of the British horse, for Charles II. warmly espoused the introduction of Eastern blood into England. He sent his master of the horse abroad to purchase a number of foreign horses and mares for breeding, and the mares brought over by him (as also many of their produce) were called "royal mares"; they form a conspicuous feature in the annals of breeding. The Stud-Book shows of what breed the royal mares really were: one of them, the dam of Dodsworth (who, though foaled in England, was @ natural Barb), was a Barb mare ; she was sold by the stud- master, after Charles II.'s death, for forty guineas, at twenty years old, when in foal by the Helmsley Turk.

James II. was a good horseman, and had circumstances been more propitious he might have left his mark in the sporting annals of the country. In his reign, according to the Stud-Book, the Stradling or. Lister Turk was brought into England by the duke of Berwick from the siege of Buda. f

The reign of William III. is noteworthy as the era 10 which, among other importations, there appeared the first of three Eastern horses to which the modern thoroughbred race-horse traces back as the founders of his lineage. This was the Byerly Turk, of whom nothing more is known than that—-to use the words of the first volume of the Stud-Book—he was Captain Byerly's charger in Treland 10 King William's wars. The second of the three horses above alluded to was the Darley Arabian, who was 4

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~ Connsellor's pedigree

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genuine Arab, and was imported from Aleppo by a brother of Mr Darley of Aldby Park, Yorkshire, about the end of the reign of William ITI. or the beginning of that of Anne. The third horse of the famous trio, the Godolphin Arabian or Barb, brought to England about five and twenty years after the Darley Arabian, will be more particularly referred to further on. All the horses now on the turf or at the stud trace their ancestry in the direct male line to one or other of these three,—the Byerly Turk, the Darley Arabian, and the Godolphin Arabian or Barb. In the female line their pedigrees can be traced to other sources, but for all practical purposes it suffices to regard one or other of these three animals as the wltima Thule of racing pedigree. Of course there is a large interfusion of the blood of each of the trio through the dams of horses of the present day ; indeed, it is impossible to find an English race-horse which does not combine the blood of all three.

The Thoroughbred.—The third and last epoch of the British horse, viz., that of the thoroughbred racer, may be taken to date from the beginning of the 18th century. By thoroughbred is meant a horse or mare whose pedigree is registered in the Stwd-Book kept by Messrs Weatherby, the official agents of the Jockey Club—originally termed the keepers of the match-book-——as well as publishers of the Racing Calendar. The first attempt to evolve order out of the chaos which had long reigned supreme was made in 1791, for we find in the preface of the first volume of the Stud-Book, published in 1808, that “with a view to correct the then increasing evil of false and inaccurate pedigrees, the author was in the year 1791 prevailed upon to publish an Introduction to a General Stud-Book, consisting of a small collection of pedigrees which he had extracted from racing calendars and sale papers and arranged on a new plan.” It will be seen that the compiler of the volume on which so much depends had to go back fully a century, with little else to guide him but odds and ends in the way of publications and tradition, Mistakes under such circumstances are pardonable. The Stud-Book then (vol. i.), which is the oldest authority we have, contains the names and in most cases the pedigrees, obscure though they may be, of a very large number of horses aud mares of note from the earliest accounts, but with two exceptions no dates prior to the 18th century are specified in it. These exceptions are the Byerly Turk, who was “ Captain Byerly’s charger in Ireland in King William’s Wars (1689, é&c.),” and a horse called

Counsellor, bred by Mr Egerton in 1694, by Lord D'Arcy's Counsellor by Lord Lonsdale's Counsellor by the Shaftes- bury Turk out of sister to Spanker—all the dams in } tracing back to Eastern mares. There is not the least doubt that many of the animals named in the Stud-Book were foaled much earlier than the above dates, but we have no particulars as to time; and after all it is not of much consequence.

The Stud-Book goes on to say of the Byerly Turk that he did not cover many bred mares, but was the sire of the Duke of Devonshire's Basto, Halloway's Jigg, and others. Jigs, or Jig, is a very important factor, as will be seen hereafter. The Stud-Book, although silent as to the date of his birth, says he was a common country stallion in Lincolnshire until Partner was six years old— and We know from the same authority that Partner was foaled in 1718; we may therefore conclude that Jigg Was a later foal than Basto, who, according to Whyte's History of the Turf, was a brown horse foaled in 1703.

_ the reign of Queen Anne, however (1702 to 1714), 1s that which will ever be inseparably connected with the {foroughbred tace-horse ou account of the fame during that period of the Darley Arabian, a bay stallion, from

_ Wom our very best horses are descended. According to

the Stud-Book, " Darley's Arabian was brought over by a brother of Mr Darley of Yorkshire, who, being an agent in merchandise abroad, became member of a hunting club, by which means he acquired interest to procure this horse." The Stud-Book is silent, and other authorities differ, as to the date of the importation of this celebrated Arab, some saying he came over in the year 1700, others that he arrived somewhat later; but we know from the Stud-Book that Manica (foaled in 1707), Aleppo (1711), Almanzor (1713), and Flying Childers (1715) were got by him, as also was Bartlett's Childers, a younger brother of Flying Childers. It is generally believed that he was imported in Anne's reign, but the exact date is immaterial, for, assuming that he was brought over as early as 1700 from Aleppo, he could

scarcely have had a foal living before 1701, the first year of the 18th century. The Darley Arabian did much to remove the prejudice against Eastern blood which had been instilled into the public mind by the duke of Newcastle's denunciation of the Markham Arabian. Prince George of Denmark, consort of Queen Anne, was himself a large horse-owner; and it was in a great measure owing to his intervention that so many valuable stallions were imported during her reign,

At this period we find, among a mass of horses and mares in the Stud-Book without any dates against their names, many animals of note with the earliest chronology extant, from Grey Ramsden (1704) and Bay Bolton (1705) down to a mare who exercised a most important influence on the English blood-horse. This was Roxana (1718) by the Bald Galloway, her dam sister to Chanter by the Akaster Turk, from a daughter of Leedes's Arabian and a mare by Spanker. Roxana threw in 1732 the bay colt Lath by the Godolphin Arabian, the sorrel colt Roundhead by Childers in 1733, and the bay colt Cade by the Godolphin Arabian in 1734, in which year she died within a fortnight after foaling, the produce—Cade—being reared on cow's milk. The Godolphin Barb or Arabian, as he was commonly called, was a brown bay about 15 hands in stature, with an un- naturally high crest, and with some white on his off hind heel. He is said to have been imported into England from France by Mr Coke, where, as the editor of the Stud-Book was informed by a French geutleman, he was so little thought of that he had actually drawn a cart in the streets of Paris. Mr Coke gave him to a Mr Williams, who in his turn presented him to the earl of Godolphin. Although called an Arabian, there is little doubt he was a Barb pure and simple. In 1731, being then the property of Mr Coke, he was teazer to Hobgoblin, and on the latter refusing his services to Roxana, the mare was put to the Godolphin, and the produce was Lath (1732), the first of his get, and the most celebrated race-horse of his day after Flying Childers. He was also the sire of Cade, own brother to Lath, and of Regulus the maternal grandsire of Eclipse. He died at Gogmagog in Cambridgeshire, in the possession of Lord Godolphin, in 1753, being then, as is supposed, in his twenty-ninth year. He is believed to have been foaled in Barbary about 1724, and to have been imported during the reign of George II.

In regard to the mares generally, we have a record of the royal mares already alluded to, and likewise of three Turk mares brought over from the siege of Vienna in 1684, as well as of other importations ; but it is unquestionable that there was a very large number of native mares in England, improved probably from time to time by racing, however niuch they may have been crossed at various periods with foreign horses, and that from this original stock were to some extent derived the size and stride which characterized the English race-horse, while his powers of endurance and elegant shape were no doubt inherited from the Eastern horses, most of which were of a low stature,

14 hands or thereabouts. It is only necessary to trace carefully back the pedigree of most of the famous horses of early times to discover faults on the side of the dam— that is to say, the expression “ dam’s pedigree unknown,” which evidently means of original or native blood. What- ever therefore may be owing to Eastern blood, of which from the middle of the 17th to the beginning of the 18th century a complete wave swept over the British Isles, some credit is unquestionably due to the native mares (which Blaine says were mostly Cleveland bays) upon which the Arabian, Barb, or Turk blood was grafted, and which laid the foundation of the modern thoroughbred, Other nations may have furnished the blood, but England has made the race-horse.

Without prosecuting this subject further, it may be enough here to follow out the lines of the Darley Arabian, the Byerly Turk, and the Godolphin Arabian or Barb, the main ancestors of the British thoroughbred of the 18th and 19th centuries, through several famous race-horses, each and all brilliant winners,—Flying Childers, Eclipse, Herod, and Matchem,—to whom it is considered sufficient to look as the great progenitors of the race-horse of to-day.

1. The Darley Arabian’s line is represented in a twofold degree— first, through his son Flying Childers, his grandsons Blaze and Snip, and his great-grandson Snap, and, secondly, through his other son Bartlett’s Childers and his great-great-grandson Eclipse. Flying or Devonshire Childers, so called to distinguish him from other horses of the same name,

was a bay horse of entirely Mastern blood, with a blaze in his face and four white feet, foaled in 1715. He was bred by Mr Leonard Childers of Carr House near Doncaster, and was purchased when young by the duke of Devonshire. He was got by the Darley Arabian from Betty Leedes, by Careless from sister to Leedes, by Leedes's Arabian from a mare by Spanker ont of a Barb mare, who was Spanker's own mother. was by D'Arcy's Yellow Turk from a daughter of the Morocco Barb and Old Bald Peg, by an Arab horse from a Barb mare. Careless was by Spanker from a Barb mare, so that Childers's dam was closely in-bred to Spanker. Flying Childers—the wonder of his time— was never beaten, and died in the duke of Devonshire's stud in 1741, aged twenty-six years. He was the sire of, among other horses, Blaze (1738) and Snip (1736). Snip too had a celebrated son called Snap (1750), aud it is chiefly in the female line through the mares by these horses, of which there are fully thirty in the Stud- Book, that the blood of Flying Childers is handed down to us.

The other representative line of the Darley Arabian is throngh Bartlett's Childers, also bred by Mr Leonard Childers, and sold to Mr Bartlett of Masham, in Yorkshire. He was for several years called Young Childers,—it being generally supposed that he was a younger brother of his Flying namesake, but his date of birth is not on record,—and subsequently Bartlett's Childers. This horse, who was never trained, was the sire of Squirt (1732), whose son Marske (1750) begat Eclipse and Young Marske (1762), sire of Shuttle (1793), This at least is the generally accepted theory, although Kclipse's dam is said to have been covered by Shakespeare as well as by Marske. Shakespeare was the son of Hobgoblin by Aleppo, andconse- quently the male line of the Darley Arabian would come through these horses instead of throngh Bartlett's Childers, Squirt, and Marske ; the Stud-Book, however, says that Marske was the sire of Eclipse. This last-named celebrated horse—perhaps the most celebrated in the annals of the turf—was foaled on the 1st of April 1764, the day on which a reimarkable eclipse of the sun occurred, and he was named after it. He was bred by the duke of Cumberland, after whose decease he was purchased by a Mr Wildman, and subse- quently sold to Mr D. O'Kelly, with whom he will ever be identified. Hisdam Spiletta was by Regulus, son of the Godol- phin Barb, from Mother Western, by a son of Snake from a mare by Old Montague out of a mare by Hautboy, froma daughter of Brimmer and a mare whose pedigrce was

unknown, In Liclipse’s pedigree there are upwards of a dozen marcs whose pedigrees are not known, but who are supposed to be of native blood. Eclipse was a chestnut horse with a white blaze down his face; his off hind leg was white from the hock downwards, and he had black spots upon his ramp—this peculiarity coming down to the present day in direct male descent. His racing career commenced at five years of age, viz., on the 3d May 1769, at Epsom, and terminated on the 4th October 1770, at Newmarket. He ran or walked over for eighteen races, and was never beaten. It was in his first race that Mr O’Kelly took the odds to a large amount before the start for the seeond heat, that he would place the horses. When called upon to declare, he uttered the exclamation, which the cvent justified,

‘* Welipse first, and the rest nowhere.”

HO ase

Spanker himself

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Eclipse commenced his stud career in 1771, and had an enormous

number of foals, of which four only in the direct male line haye come down to us, viz., Potooo00000, or, as he is commonly called Pot-8-os (1773), his most celebrated son, King Fergus (1775) Jee Andrews (1778), and Mercury (1778), though several others are represented in the female line. (1790) out of Maria (1777) by Herod out of Lisette (1772) by Snap. Waxy, who has been not inaptly termed the ace of trumps in the Stud-Book, begat Whalebone (1807), Web (1808), Woful (1809) Wire (1811), Whisker (1812), and Waxy Pope (1806), all but the last being out of Prunella (1788) by Highflyer out of Promise by Snap, while Waxy Pope was out of Prunella, dam of Parasol (1800) by Pot-8-os Trumpator was a son of Conductor, who was by Matchem out of a mare by Snap.

Pot-8-os was the sire of Wax: Penelope (1798) by Trumpator (1782) from

Whalebone’s best sons were Camel (1822) and Sir Hercules (1826). Camel was the sire of Defence (1824) and Touchstone (1831), while Sir Hercules was the sire of Birdcatcher (1833) and Faugh-a-Ballagh (1841), own brothers, and of Gemma di Vergy (1854). Touchstone was the sire of Newminstcr (1848), who begat Lord Clifden Adventurer, and the Hermit, as well as of Orlando (1841) sire of Teddington (1848). Whalebone’s blood also descends through Waverley (1817) and his son the Saddler (1828), while Whisker is represented by the Colonel (1825) and by Economist (1825) and his son Harkaway (1834), sire of King Tom (1851). Birdcatcher begat, besides Saunterer (1854), the Baron (1842), sire of Stockwell (1849) and of Rataplan (1850). Stockwell, who was a chestnut with black spots, was the sire of Blair Athol (1861), a chestnut, and also of Doncaster (1870), another chestnut, but with the characteristic black spots of his grandsire ; and Doncaster was the sire of the chestnut Bend Or (1877).

To turn to Eclipse’s other sons. King Fergus (1775) was the sire of Beningbrough (1791), whose sou was Orville (1799), whence comes some of the stoutest blood on the turf, including Emulius (1820) and his son Priam (1827), Plenipotentiary (1831), Muley (1810), Chesterfield (1834), and the Hero (1843). Joe Andrews (1778) was the sire of Dick Andrews (1797), and from him descend Tramp (1810), Lottery (1820), Liverpool (1828), Sheet Anchor (1832), Lanercost (1835), Weatherbit (1842), Beadsman (1855), and Blue Gown (1865). Mercury was sire of Gohanna (1720), who was foaled in the same year as Waxy, and the two, who were both grandsons of Eclipse and both out of Herod mares, had several contests, Waxy generally getting the better of his cousin. Gohanna’s descendants come down through Golumpus 1802), Catton (1809), Mulatto (1828), Royal Oak (1828), and ee

2. The Byerly Turk’s line is represented by Herod, the Turk being the sire of Jigg, who was the sire of Partner (1718), whose son Tartar (1743) begat King Herod, or Herod as he was commonly called, foaled in 1758. ‘Herod’s dam was Cypron (1750) by Blaze (1733), son of Flying Childers. Cypron’s dam was Selima by Bethel’s ‘Arabian from a mare by Graham’s Champion from a daughter of the Darley Arabian and a mare who claims Merlin for her sire, but whose mother’s pedigrce is unknown, In Herod’s pedigree there are fully a dozen dams whose pedigree is unknown. Herod was a bay

horse about 15 hands 3 inches high, possessed both of sub- stance and length,—those grand requisites in a race-horse, —com- bined with uncommon power and stamina or lasting qualities. He was bred by William, duke of Cumberland, uncle of King George III. He commenced his racing career in October 1763, when he was five years old, and ended it on the 16th of May 1767. He ran ten timos, winning six and losing four races, He died in 1780, and among other progeny left two famous sons, Woodpecker (1773), whose dam was Miss Ramsden (1760) by Cade, son of the Godol- phin Barb, but descended also on the dam's side from the Darley 'Arabian and the Byerly Turk, and Highflyer (1774), whose dam was Rachel (1763) by Blank, son of the Godolphin Barb from @ daughter of Regulus, also son of the Godolphin. These two horses have transmitted Herod's qualities down to the present day in the direct male line, although in the female line he is represented through some of his other sons and his daughters as well. Wood- pecker was the sire of Buzzard (1787), who in his turn became the father of three celebrated sons, Castrel (1801), Selim (1802), and Rubens (1803), all three chestnuts, and all out of an Alexander mare (1790), who thereby became famous. This mare was by Eclipse's son Alexander (1782) out of a mare by Highflyer (son ot Herod) out of a daughter of Alfred, by Matchem out of a danghter of Snap. Bustard (1818), whose dam was a daughter of Shuttle, and his son Heron (1833), Sultan (1816) and his sons Glencoe (1831) and Bay Middleton (1833) and Middleton's sons Cowl (1842) and the Flying Dutchman (1846), Pantaloon (1824) and his xe Windhound (1847), Langar (1817) and his son Epirus (1884) a grandson Pyrrhus the First (1843), are representatives of Castre and Selim. Sin Highflyer is represented through his greatly esteemed son Sil Peter Teazlc, commonly called Sir Peter (1784), whose dam was Papillon by Snap. Sir Peter had five sons at the stud, W ae (1790), Stamford (1794), and Sir Panl (1802) being the chiel.

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"THE RACE-HORSE. |

itz (1813), Cain (1822), Ion (1835), Wild Dayrell (1852), oo Te coer (1857) bring down Sir Paul's blood ; whilst

| Walton is represented through Phantom (1806), Partisan (1811) _ and his sons Glaucus (1829) and Venison (1833) and Gladiator (1838), | Venison's sons Alarm (1842) and Kingston (1849), Gladiator's son

Sweetmeat (1842), Sweetmeat's sons Macaroni (1860) and Parmesan

_ (1857), and Parmesan's sons Favonius (1868) and Cremorne (1869).

It may be added that in the first volume of the Stud-Book there

are nearly a hundred Herod and Highflyer mares registered.

3. The Godolphin Barb is represented by Matchem, as the former

' was the sire of Cade (1734), and Cade begat Matchem, who was

foaled in 1748. He was thus ten years the senior of Herod, repre- senting the Byerly Turk, and sixteen years before Eclipse, though long subsequent to Flying Childers, who represent the Darley Arabian. Matchem was a brown bay horse with some white on his off hind heel, about 15 hands high, bred by Sir John Holme of Carlisle, and sold to Mr W. Fenwick of Bywell, Northumberland. His dam was sister to Miss Partner (1735) by Partner out of Brown Farewell by Makeless (son of the Oglethorpe Arabian) from a daughter of Brimmer out of Trumpet's dam, by Place's White Turk from a daughter of the Barb Dodsworth and a Layton Barb marc ; while Brimmer was by D'Arcy's Yellow Turk from a royal mare. Matchem commenced his racing career on the 2d of August 1753, and terminated it on 1st September 1758. Out of thirteen engage- ments he won eleven and lost two. He dicd in 1781, aged thirty- three years. His best son was Conductor (1767) out of a mare by Snap ; Conductor was the sire of Trumpator (1782), whose two sons, Sorcerer (1790) and Paynator (1791), transmit the blood of the Godolphin down to modern times. Sorcerer was the sire of Sooth- sayer (1808), Comus (1809), and Smolensko (1810). Comus was the sire of Humphrey Clinker (1822), whose son was Melbourne (1834), sire of West Australian (1850) and of many valuable mares, including Canezou (1845) and Blink Bonny (1854), dam of Blair Athol. Paynator was the sire of Dr Syntax (1811), who had a celebrated daughter called Beeswing-(1833), dam of Newminster by Touchstone.

The gems of the three lines may be briefly enumerated thus:

(1) of the Darley Arab's line—Snap, Shuttle, Waxy, and

Orville—the stoutest blood on the turf; (2) of the Byerly Turk's line—Buzzard and Sir Peter—speedy blood, the latter the stouter of the two; (8) of the Godolphin Barb's line—Sorcerer—often pro- ducing large-sized animals, but showing a tendency to die out, and becoming rare.

On the principle that as a rule like begets like, it has been

_ the practice to select as sires the best public performers on _ the turf, and of two horses of like blood it is sound sense

to choose the better as against the inferior public performer. But there can be little doubt that the mating of mares with horses has been often pursued on a haphazard plan, or on no system at all; to this the Stud-Book testifies too plainly. Recently more attention seems to be paid to the 'Successful blending of certain strains of blood, though it cannot be said that more than two or three really first class horses are produced each year. The following is a list of the principal sires whose progeny find a place among the Winners of the three great races, the Derby (D), Oaks (0), and St Leger (L) : — mee Young Eclipse (D), Saltram (D), Sergeant (D), Annette

" i' Bridget (0), Faith (0), Maid of the Oaks (0), Phenomenon

Matehem: Teetotuin (0), Hollandaise (L). Monge a : Herod): Diomed (D), Eager (D), Tartar (L), Ninety- ree (L). Highflyer : Noble (D), Sir Peter Teazle (D), Violante (0), Omphale (L), Cowslip (L), Flora (L),

Pot-8-08: Waxy (D), Champion (D, L), Tyrant (D), Nightshade (0).

Skyscraper (D), Spadille (L), Young

Sir Peter (D): Sir Harry (D), Archduke (D), Ditto (D), Paris (D), Hermione (O), Parasite (0), Ambrosio (L), Fyldener (L), Paulina (L), Petronius (L).

Waxy (D): Pope (D), Whalebone (D), Blucher (D),

a Music (0), Minuet (0), Corinne (0).

i valebone (D): Moses (D), Lapdog (D), Spaniel (D), Caroline (O).

vie Augusta (0), Zine (O), Theodore (L). isker (DY : Memnon (L), The Colonel (L).

Ae Cedric (D), Middleton (D), Cobweb (O).

He (L): Octavius (D), Emilius (D), Ebor (L).

jae. © St Giles (D), Dangerous (D), Barefoot (L).

| ie (D): Priam (D), Plenipotentiary (D), Oxygen (0), Mango

Priam (D) : Miss Seltz (0), Industr i Pr : y (O), Crucifix (0). Sir Hercules: Coronation (D), Faugh-a-Ballagh (L), Birdcatcher (L).

Whisker (D),

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Touchstone (Li): Cotherstone (D), Orlando (D), Surplice (D, L), Mendicant (0), Blue Bonnet (L), Newminster (L).

Birdeateher (LL): Daniel O’Rourke (D), Songstress (0), Knight of St George (L), Warlock (L), The Baron (L). ° .

Lhe Baron (LL): Stockwell (L).

Melbourne: West Australian (D, L), Sykes (L).

Newminster (L) : Musjid (D), Hermit (D), Lord Clifden (L).

Sweetmeat : Macaroni (D), Mincemeat (9), Mincepie (0).

Stockwell (L): Blair Athol(D, L), Lord Lyon (D, L), Doncaster (D),

Regalia (O), St Albans (L), Caller Ou (L), The Marquis (L), Achievement (L).

2 Gee Kingeraft (D), Tormentor (0), Hippia (0), Hannah , L).

Rataplan (son of the Baron): Kettledrum (D).

Monarque: Gladiateur (D, L).

Parmesan (son of Sweetmeat): Favonius (D), Cremorne (D). Buccaneer : Kisber (D), Formosa (0, L), Brigantine (0).

Lord Clifden (L): Jannette (O, L), Hawthornden (L), Wenlock (L), Petrarch (L).

Adventurer : Pretender (D), Apology (0, L), Wheel of Fortune (O). Blair Athol (D, L) : Silvio (D, L), Craig Millar (L).

The successes of the St Leger winners, the Baron and his son Stockwell and his grandson Blair Athol, as well as of Touchstone and his son Newminster and his grandsons Lord Clifden and Adventurer, as stud horses, are more marked than perhaps those of any others in the annals of the turf, except Waxy and his descendants, of whom Whalebone is perhaps the best. Indeed the most successful cross of modern times is the double cross of Whalebone, the “ ready money” cross as it is called, which is arrived at by inter- mixing the descendants of Whalebone through Sir Hercules, Birdcatcher, the Baron, Stockwell, Rataplan, Camel, Touch- stone, Newminster, and Adventurer. Isonomy, by Sterling, son of Oxford by Birdcatcher, is a case in point ; he is one of the best and best bred horses of the century. He has no less than five strains of Whalebone and seven of Waxy in his pedigree, as well as one of Shuttle, the scarcest blood of all.

In regard to mares it has very frequently turned out that animals which were brilliant public performers have been far less successful as dams than others which were comparatively valueless as runners. Beeswing, a brilliant public performer, gave birth to a good horse in Newminster : the same may be said of Alice Hawthorn, dam of Thormanby, of Canezou, dam of Fazzoletto, of Crucifix, dam of Surplice, and of Blink Bonny, dam of Blair Athol ; but

many of the greatest winners have dropped nothing worth training. On the other hand, there are mares of little or no value as racers who have become the mothers of some of the most celebrated horses on the turf; among them we may cite Queen Mary, Pocahontas, and Paradigm. Queen Mary, who was by Gladiator out of a daughter of Plenipotentiary and Myrrha by Whalebone, when mated with Melbourne produced Blink Bonny (winner of the Derby and Oaks) ; when mated with Mango and Lanercost she produced Haricot, dam of Caller Ou (winner of the St Leger). Pocahontas, perhaps the most remarkable mare in the Stud- Book, never won a race on the turf, but threw Stockwell and Rataplan to the Baron, son of Birdcatcher, King Tom to Harkaway, Knight of St Patrick to Knight of St George, and Knight of Kars to Nutwith—all these horses being 16 hands high and upwards, while Pocahontas was a long, low mare of about 15 hands or a trifle more. She also gave birth to Ayacanora by Birdcatcher, and to Araucaria by Ambrose, both very valuable brood mares, Araucaria being the dam of Chamant by Mortemer, and of Rayon d'Or by Flageolet, son of Plutus by Touchstone. Paradigm again produced, among several winners of more or less celebrity, Lord Lyon (winner of the Two Thousand Guineas, Derby, and St Leger) and Achievement (winner of the St Leger), both being by Stockwell. Another mare that has become famous was Manganese (1853) by Birdcatcher from Moon- beam by Tomboy from Lunatic by the Prime Minister from Maniac by Shuttle. Manganese when mated with Rataplan

gora, dam of Apology, winner of the Oaks | Derby and St Leger in 1864, who, when subsequentl cer white sire a ig nh eel, son of New- | sold by auction, fetched the unprecedented sum of 12,000 minster. She also threw Mineral, who, when mated with guineas, as it contains, not only Stockwell (the emperor of Lord Clifden, produced Wenlock, winner of the St Leger, stallions, as he has been termed), but Blink Bonny and and after being sold to go to Hungary, was there mated | Eleanor—in which latter animal are combined the blood of with Buccaneer, the produce being Kisber, winner of the | Eclipse, Herod, Matchem, and Snap,—the only two mares Derby. It is

usual to select sound, roomy mares, giving | that have ever won the Derby, in 1801 and 1857 re preference to those that are comparatively speaking low spectively, as well as those queens of the stud, Eleanor’s and long, and whose temper and disposition are good, great-granddaughter Pocahontas and Blink Bonny’s dam of course paying strict attention to their blood, more | Queen Mary. Both Eleanor and Blink Bonny won the especially if breeding from such large horses as the sons | Oaks as well as the Derby, and it may be observed that of Pocahontas. they are the only winners of the former race that appear in

We append the pedigree of Blair Athol, winner of the | the pedigree. Waxy* (1790)

Sir Hereules Veta (1807) | penevone (1798)

1826 F ‘ Wanderer (1790) en Peri (1822) Thalestris (1809)

Birdeatchert (1833 : +e cata cane $2 POON CRD — Heine aD Guiecioli (182° ec Fat (1802) ae – Wanye C180)” (1842) Sioa Whisker* (1812) i rerclans 178) Economist (1825) Octavian (1807) Floranthe (1818) Caprice (1797) Echidna (1888) Whitelock (1803) Blacklock (1814) Coriander mare (1799 Miss Pratt (1825) (Orvillet (1709) Stockwellt Gadabout (1812) (Minstrel (1808) B ad (1787 (1849) ts Selim (1802) ones ee (1790) Sultan (1816) Williamson’s Ditto (1800 Bacchante (1809) Sister to Calomel (1791) Gleneoe (1831) Dick Andrews (1797) ov Nne(189 Tramp (1810) Gohanna mare ampoline(§22) 9 5 (1808) Waxy* (1780) Pocahontas aan Ee Cb 1837 = eningbroug. ( ) mi — Orvillet (1799) Evelina (1791) uley (1810) ™ Whiskey (1789) Eleanor*t (1798) Young Giantess (1790) Marpessa (1830) Whiskey (1789) Clare (1824 Marmion (1806) Young Noisette (1789) ae Ce) Harpaliec (1814) pee Blair Athol* mae (1861 t Trumpator (1782) c 1809 Soreerer (1796) Young Giantess (1790 are) Houghton Lass (1801) { a ae Humphrey Clinker exina (1788) (1802) Sir Peter* (1784) (Clinker (1805) Hyale (1797) Clinkerina (1812) 2d Tandem (1778) Melbourne Bong ie) Termagant, | Ce) Geieantien HG Don Quixote (1784) { Eee anaes (1770) ervantes (1806) Highflyer (1774) . Evelina (1791) Termagant Daughter of (1825) Gohanna (1790) Daughter of = (1802) Catherine (1795) 181 Paynator (1791 Blink Bonny*t Daughter of (1810) 1 Sister to Doding (1854) Walton (1799) { pas cre) Partisan (1811) Pot-8-os

(1778) ames Parasol (1800) Prunella (1788) adiator (1833) ‘ Whalebone* by Waxy* (1807) ; Moses* (1819) Gohanna mare : Pauline (1826) $e Selim (1802) Queen Mary Quadrille (1815) { Conan (1806) (1843) ” rvillet (1799) ; Plenipotentiary* iar ee 1 Emily (1810) | ee Harriett (1819) { imines ele) Daughter of (1840) { Waxy* (1790) Whalebone* 1807) Penelope (1798) Myrrha (1830) Gift (1818 Pi Gohanna (1810) ift (1818) Sister to Grazier by Sir Peter* (1803) * Winner of the Derby. ¢ Winncr of the Oaks. ¢ Winner of the St Leger.

Pointsof The shape of a race-horse is of considerable importance, | head should be light and lean, and well set on; the the race- although it is said with some degree of truth that they | ears small and pricked, but not too short; the eyes full; horse. win in all shapes. There are the neat and_ elegant the forehead broad and flat; the nostrils large and animals, like the descendants of Saunterer and Sweet- | dilating; the muzzle fine ; the neck moderate in length, meat; the large-framed, plain-looking, and heavy-headed | wide, muscular, and yet light; the throat clean; the Melbournes, often with lop ears; the descendants of Bird- windpipe spacious and loosely attached to the neck; the catcher, full of quality, and of more than average stature, | crest thin, not coarse and arched. The withers may be though sometimes disfigured with curby hocks; and the | moderately high and thin; the chest well developed, but medium-sized but withal speedy descendants of Touch- | not too wide or deep; the shoulder should lie well on the stone, though in some cases characterized by somewhat chest, and be oblique and well covered with muscle, so a8 loaded shoulders. In height it will be found that the | to reduce concussion in galloping ; the upper and lower most successful racers average from 15 to 164 hands, the | arms should be long and muscular ; the knees broad and former being considered somewhat small, while the latter | strong; legs short, flat, and broad ; fetlock joints large; is unquestionably very large ; the mean may be taken as | pasterns strong and of moderate length ; the feet should between 154 and 16 hands (the hand=4 inches), The | be moderately large, with the heels open and frogs sound

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—witlh no signs of contraction. The body or barrel should be moderately deep, long, and straight, the length being really in the shoulders and in the quarters; the back should be strong and muscular, with the shoulders and loins running well in at each end; the loins them- selves should have great breadth and substance, this being a vital necessity for weight-carrying and propelling power uphill. The hips should be long and wide, with the stifle and thigh strong, long, and proportionately devel- oped, and the hind quarters well let down. The hock should have plenty of bone, and be strongly affixed to the leg, and show no signs of curb; the bones below the hock should be flat, and free from adhesions; the liga- ments and tendons well developed, and standing out from the bone; the joints well formed and wide, yet without undue enlargement; the pasterns and feet similar to those of the forehand. The tail should be high set on, the croup being continued in a straight line to the tail, and not falling away and drooping to a low set tail. Fine action is the best criterion of everything fitting properly, and all.a horse's points ought to harmonize or be in pro- portion to one another, no one point being more promi- nent than another, such as good shoulders, fine loins, or excellent quarters. If the observer is struck with the remarkable prominence of any one feature, it is probable that the remaining parts are deficient. A well-made horse wants dissecting in detail, and then if a good judge can discover no fault with any part, but finds each of good proportions, and the whole to harmonize without defect, deformity, or deficiency, he has before him a well-shaped horse; and of two equally well-made and equitably pro- portioned horses the best bred one will be the best. As regards hue, the favourite colour of the ancients, accord- ing to Xenophon, was bay, and for a long time it was the fashionable colour in England; but for some time chest- nut thoroughbreds have been the most conspicuous figure on English race-courses, so far as the more important events are concerned. Eclipse was a chestnut; Castrel, Selim, and Rubens were chestnuts; so also were Glencoe and Pantaloon, of whom the latter had black spots on his hind quarters like Eclipse, and more recently Stockwell and Doncaster. SBirdcatcher was a chestuut, so also were Stockwell and his brother Rataplan, Manganese, Mandra- gora, Thormanby, Kettledrum, St Albans, Blair Athol, Regalia, Formosa, Hermit, Marie Stuart, Doncaster, George Frederick, Apology, Craig Millar, Prince Charlie, Rayon d'Or, and Bend Or. The dark browns or black browns, such as the Sweetmeat tribe, are not so common as the bays, and black or grey horses are almost as

unusual as roans. The skin and hair of the thoroughbred are finer, and the veins which underlie the skin are larger and more prominent than in other horses. The mane and tail should be silky and devoid of curl, which is a sign of impurity.

Whether the race-horse of to-day is as good as the Stock to which he traces back has often been disputed, chiefly no doubt because he is brought to more early maturity, commencing to win races at two years instead of at five years of age, as in the days of Childers and Eclipse; but the highest authorities, and none more emphatically than the late Admiral Rous, aver that he can not only stay quite as long as his ancestors, but also go a good deal faster. In size and shape the modern race-horse iS unquestionably superior, being on an average fully a hand higher than the Eastern horses from which he is descended ; and in elegance of shape and beauty of outline he hag certainly never been surpassed. That experiments, founded on the study of his nature and properties, which have from time to time heen made to improve the breed, and bring the different varieties to the perfection in which |

we now find them, have succeeded, is best confirmed by the high estimation in which the horses of Great Britain are held in all parts of the civilized world; and it is not — too much to assert that, although the cold, humid, and variable nature of their climate is by no means favourable to the production of these animals in their very best form, Englishmen have by great care, and by sedulous attention to breeding, high feeding, and good grooming, with con- sequent development of muscle, brought them to the highest state of perfection of which their nature is cap- able. See the section on Horse-Racing, p. 199.

The Hunter.—A good specimen of an English hunter The He may hunter.

may be described as a horse for universal use. be a coach-horse, for in many of the animals running in the coaches called into existence during the summer months by the coaching revival may be recognized a hunter of

known character ; he may be a good roadster, for, so far as conformation is concerned, there is nothing in a hunter to unfit him from being a first-class hack; nor is hunting incompatible with military duties, for, by the regulations of the service, officers are permitted to hunt their second chargers. For harness work he is perfectly adapted, pro- vided only the vehicle to be drawn is in proportion to his size; while most people will recall instances of hunters having for some reason or other to be so far humbled as to have to take a turn at the plough or harrow, or, in their

older days, even in a chaff-cutter. A hunter may be either Tho- In the grass countries, such as rough- Leicestershire or Northamptonshire, riders to hounds endea- »*¢¢

thoroughbred or halfbred.

vour to get their hunters as nearly clean bred as _ possible ; but, in spite of this ambition, it may be doubted whether one in twenty, even in the most fashionable countries, is thoroughbred, thereby proving that a thoroughbred hunter, although undoubtedly a luxury, is not a virtual necessity. When it can be acquired, a thoroughbred hunter that knows his business is a most desirable possession, save perhaps in a rough country, where his fine skin shrinks from contact with the objects therein encountered. The comparative scarceness of these animals is, however, easily accounted for. From 12 to 14 stone is by no means an uncommon weight for a man to ride hunting, saddle included, but few thoroughbreds are up to it; one that is commands a large price, from £250 upwards, according to “manners.” It is often said that thoroughbreds do not make pleasant hunters, but the complaint, if there is any ground for it at all, is really against the result of the treatment to which nineteen out of twenty thoroughbreds have to submit, and not against pure blood itself. A large proportion of thoroughbred stock come to the starting-post at two years old; and this means that they have been in the trainer’s hands since they were yearlings at least. Now a training stable is just the place for colts to pick up sundry un- desirable tricks, which may at some future time cause the unprofessional rider a little trouble; they get to lean on the hand, often turn out fidgety and fractious, and are not unfrequently inveterate pullers. When fit to go, the young one will have been tried, and if he fails to gallop half a mile at best pace he is probably turned out of train-

ing, although perhaps it was not till the last dozen yards were reached that there was any sign of failing power. Now, although the colt may be unable to stand the test applied to him by the trainer, there is no reason at all why he should not be able to go all day at hunting pace, because the powers of speed are not taxed tothe same degree. The young thoroughbred is then perhaps educated for hunting ; and hence it is that nearly all hunters—thoroughbred ones, that is to say—begin life in a training stable. Instances are comparatively rare of persons breeding thoroughbred stock and then keeping them for hunting purposes. The ranks of hurdle-racers and stceple-chasers too are filled

Half- bred hunters.

Breed- ing.

by thoroughbred) come under the care of the hunting groom.

The halfbred hunter, as he is technically called, may be, and is, a very good substitute for the thoroughbred ; he may have nineteen-twentieths of pure blood in his veins, and still be only “ halfbred.” Perhaps seven-eighths of pure blood is about the average for high-class horses ; but, taking English hunters all round, the majority are halfbred ‘na more literal sense, being for the most part by a horse nearly, if not quite, thoroughbred, out of a common mare. It is much to be regretted that the breeding of halfbred huntérs is too often neglected altogether, or at least con- ducted on haphazard principles. Many men take it into their heads to breed a colt simply because they have a mare which, owing to age or accident, is no longer fitted for active work; and then, be the mare good, bad, or indif- ferent, there is little or uo judgment exercised in the choice of asire. Nearly all country places are periodically visited by travelling stallions, many of which are utterly worthless, but nevertheless, the services of one of them are probably secured by the intending breeder simply because of the saving of trouble. He forgets that there is but little dif- ference between the charge for a good and that for a bad horse, and finds, when the offspring is ready for sale, that the result of his happy-go-lucky system remains on his hands for lack of a buyer, and costs as much to keep as a valuable animal. Very often, too, a

man who has expected to breed a hunter will find himself the owner of a fairly promising colt for a brougham, but having hoped for a hunter he is unwilling to believe it anything else.

Compare this method of setting to work with that adopted by breeders of thoroughbred stock, and indeed by all judicious breeders. To begin witli, the choice of a dam is a matter of moment; and it is difficult to see why anything should be thought good enough fora hunter, even by the inexperienced. ‘The first requisite for a brood-mare is that she should be free from all constitutional infirmities, such as roaring, bad sight, &e.; and the breeder should be on his guard when breeding from mares whose legs have given way. ‘True, it may be the result of an accident, but care should be taken to ascertain that it arose from that cause, and that a predisposition to inflammation had nothing to do withit. For the same reason persons should be chary of breeding from mares that have splints, spavins, &c., and should certainly reject one whose dam or sire had them as well. Mares that have done much hard work are not the best dams that can be selected, as they are apt to slip their foals, or to throw undersized ones. The selection of a stallion is the more important the more defects there are in the mare. Should she be the least delicate, the stallion should be remarkable for a hardy constitution, for considering that a hunter has to be out of his stable for as much as twelve hours sometimes, and rarely less than seven or eight, and has to carry a heavy weight and gallop and jump, it is plain that a horse with no stamina would be nearly worthless as a hunter, no matter what other good qualities he might possess. So, too, as to shape: should the mare be too long on the leg or in the back, or too low in front, the stallion should be singularly free from the defect in question.

While the mare is in foal she should be kept on the best food, for the nourishment given to her is given indirectly to thefoal. The keep of the foal in its early days is not less important than the choice of dam and sire. Thorough- bred colts eat corn from the time they are a month or five weeks old; and the same generous diet should be allowed to halfbred horses, as it is only by this, accompanied of course by proper exercise, that the frames of young horses expand to their full extent, or that a foundation is laid for a good constitution. This system is, of course, more

HOh te

horses, which but for these interventions

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expensive than keeping a colt on hay and grass during the first three years of his life, but it will repay itself in the long run, for very often under its influence a colt will develop into a weight-carrying hunter or valuable carriage horse, where, under more parsimonious treatment, he would never have grown into anything strong enough to carry over 11 or 12 stone.

The breaking and training of hunters is all-important,

because, in spite of the care that may have been expended ! upon the choice of sire and dam and the keep of the colt, ‘

many young ones are ruined beyond all hope of recovery during this process. The colt should be handled from the day of its birth, so that it may grow thoroughly accustomed to man, without ever having experienced the feeling of fear. The person selected to attend on mares and foals, as well as he that undertakes the training part, should be naturally fond of animals; he should be cool, and of an almost imperturbable temper, or he will be unfitted to deal with the waywardness of some of his pupils, which during their early career may at times expose him to personal danger, especially if they be well bred; he should there- fore be well endowed with courage and firmness, for an irresolute man is sure to spoil every horse he has to do with,

When about six months old the colt should receive his first lesson in jumping. Where practicable, there is no better plan than to feed him in one spot, the approach to which is guarded by a stout rail, which should in the first instance lie on the ground, and over which he must step in order to reach his corn. In the course of about a month the rail may be raised 6 inches, and so on from time to time, but the process should be gradual in the extreme; 2 or 3 inches a month is sufficient until it is a couple of feet high, where it should remain for a time, but at three years the colt should jump it at 3 feet, Before he reaches this age the saddle should have been put on and

left there for half an hour at a time, the groom letting the girths and stirrups flap about. At three years the pupil should be backed by a light weight; if the rider be the usual attendant, so much the better, for then it is improb- able that much resistance will be shown. The riding exercise should be varied by the young horse being led by a rather long rein over roughish ground, such as a common or a ploughed field, when it is not too hard, and over little ditches and very low fences, but they must be small, as it is very undesirable to have a horse refuse at first, or to have him fall down in attempting a jump. He should be subsequently ridden over small places, but should always have a lead given to him by an old horse ; and the two should stand in adjoining boxes, so that the colt may be accustomed to his pilot. At four years old he may be ridden to the meet, and suffered to see a fox found, but should on no account be ridden up to the hounds, nor should he be used as a regular hunter till he is six,—if not till seven it will be all the better for him.

In the hunting field there are three kinds which many refusals and falls take place. timber, the second water or wide open ditches, and the third a hedge with a ditch on the taking off side. As to timber jumping, the course we have just recommended 18 the best possible preparation ; in jumping the rail, the colt begins early to exercise, and therefore to strengthen, the very muscles he will want by and by in jumping a gate,— if his owner ever rides him atone. A further course of in- struction in this most useful art may be given ina “circus,” that is, a double row of posts and rails in a circle about the size of a circus ring. Between the two sets a couple of strong timber jumps should be put up, one of about 3 feet and the other of about 3 feet 6 inches in height; the horse is then put into the space between the two rails, one

of jumps at The first 1

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person standing in the centre holding a lunge rein, while an assistant is present with a whip, which should, however, be used but sparingly. Really good water jumpers are so scarce that it would well repay the owner of a

promising young one to teach him, or have him taught, this most important part of a hunter’s business. Ifa small water- course can be found handy, it will do for a commencement ; the colt should, in his early days, be led over this; and, if possible, the place should be widened gradually, and the water dammed up, the colt being always lunged over it before being ridden, and when ridden led over by an old horse. The same course should be pursued in the case of dry ditches, and hedges with a ditch on the taking off side, both of which must be jumped boldly, if the rider wish to keep his place with hounds. This gradual teaching, and the trouble it undoubtedly entails, may sound too theoretical to some who are desirous of turning out a finished hunter in the space of six weeks; but it is to this hurrying, and the substitution of coercive measures for time and gentleness, that we are to attribute the number of indifferent hunters we find. Every hunting man knows the enormous prices realized by really clever hunters; and these animals are simply ordinary horses on whose education much trouble has been expended.

Qualifications for a Hunter.—Of horses equally good jumpers, and equally fast, that will be most valuable which can gallop and jump with the greatest weight on his back. Very good horses for 10 or 11 stone can be obtained at any time, and at a moderate price, but a horse up to weight will always fetch a large sum. Whatever weight has to be carried, mere size must not be con- founded with power; a horse 164 hands high is not necessarily a weight carrier. A compact well-knit frame is of primary import- ance ; and although it is a task of great difficulty to explain the points of a horse on paper, the intending buyer may with advantage have his attention drawn to some of the more important requisites. To cross a country well, the hunter must have nen and oblique shoulders ; and, in the case of a weight carrier, they should be rather thick. Should the reader have any difficulty in deciding what oblique shoulders are, he may get some assistance from putting a saddle on a horse, setting it of course in the right place, and then looking at the horse from a side view. Should the horse have good shoulders, the stirrup leather will hang down at some distance behind the forelegs ; but if, on the other hand, the shoulders be upright, the stirrups will be comparatively close to the forelegs, and, on mounting, the rider will find himself sitting over the legs instead of behind them. Care should be taken, however, that the shoulder is well clothed with muscle. The chest should be

broad ; narrow horses are supposed to be faster, but under weight they knock their legs about. The arm must be long, and of course muscular, the knee wide, the "'cannon bono" (i.¢., the bone between the knee and the fetlock) short, and the legs flat, with strong back sinews. The foot should be moderately widc, and have good strong heels, or they will not stand the battering about that falls to the lot of even the most carefully ridden hunter.

The chest must be deep (otherwise the horse will in all likelihood bea short-winded one), and as a consequence the girth will be great ; a weight carrier should measure 6 feet 3 inches in condition round the barrel, Just where the girth comes. A horse with a well- developed frame, and of large girth, is generally a short-legged horse, as it is called, not that the legs are really shorter—very short legs are a deformity—but the body is not too small in pro- portion to the height of the leg.

It is commonly said that the back of a weight carrier must be short ; but this does not mean that the horse should be short from the chest to the tail, for he should have much of his length in his shoulders and quarters, For very heavy men, the back proper should not be long ; but, as-a matter of fact, few horses are found the length of whose back would be adjudged perfection. A mode- i length of back is essential to pace, and on this question the ate Major Whyte Melville writes as follows :—'* It may not be out of place here to observe, as an illustration of the well-known maxim

orses can go in all shapes,' that of the three heavicst men I can call to mind who rode perfectly straight to hounds, the best hunter owned by each was too long in the back." The loins should be strong, and the hips wide ; if ragged they will be none the worse. ee hind legs are most important, not only because the seat, of € propelling power is there, but also because they affect the carnage of the animal, and the way in which he yields to his rider's

ne The thigh should be long and muscular, the hock well ork we bending inwards, when the horsc is called ''cow-

or outwards, like a bandy-legged man. The shank bone

should be well guarded by strong sinews, and the pasterns mode- rately long, aud by no means straight. Horses with straight, short pasterns are rough to ride, and ill adapted to stand hard work.

So far, then, as the body is concerned, strong legs, wide hips, depth of girth, and a short back, or, more properly, a back not too long, are all important ; but it must be remembered that, beyond a certain point, the development of any extraordinary strength is accompanied by a loss of speed, therefore very heavy men must be content to be carried by an animal not unlike an active cart-horse, for a well-bred horse capable of galloping and jumping under 18 stone is rarely seen, and the few that do exist cannot be acquired except at an enormous outlay.

When a man gets on a horse to try him, the formation and the carriage of the head and neck have a great deal to do with the subsequent purchaso or rejection of him. If appearance be a sine gua non, the head should be sinall, but, except for the look of the thing, the size is immaterial, provided it be well set on to a properly shaped neck, the characteristics of which will be presently explained. The jaws should be wide, as also should the head between the ears. The nostrils, through which alone a horse breathes, should be moderately large, otherwise free respiration will be interfered with. The eye should be bright and full, but not unduly prominent ; small pig-like eyes are nearly certain indications of bad temper. The neck should rise out of the shoulders in an easy curve, and be neither very long nor very short ; muscular it must be, and the principal muscle is the one running along the top of the neck; a muscular development here is usually accompanied by muscular proportions generally. The strength of the neck is important, because upon this the position of the head depends, and if the head be wrongly placed, the horse will never go pleasantly to the hand; indeed, of such moment is the position of the head that a horse is often unmanageable when his head is in an improper position, although he is easy of control when it is in the right place. A short-necked horse is sure to make the rider carry its head, because, from the lower part being thick, as it must be where it springs from the shoulder, the head cannot be set on ata proper angle. It has been said that a long neck is productive of the same inconvenience, but

the better opinions are hostile to this theory, and experience does not tend to convince one that a long- necked horse is necessarily heavy in the hand.

A hunter should have a good mouth, and should not pull,—both which matters depend a good deal upon the rider,—and should not be given to shying. He should, however, be naturally bold, or he may refuse any fence of an uninviting appearance. Good temper is an absolute necessity. A strong and resolute rider ne put up with a puller, in consideration of many good points, but a bad-tempered horse is of no use in the field, as he is sure to lose his rider his place inarun ; moreover, a horse that will be wanted all day cannot afford to lose his temper and take what is equal to half an hour's work out of himsclf at every turn or check, or at every gate-post that may be encountered during the day.

Whatever number of good points a hunter may possess, they will all be utterly valueless unless he be sound into the bargain. There are two kinds of soundness, practical and legal. A horse is not legally sound, that is to say, he is legally unsound, if there is any structural alteration, however slight, in any part of his body, though it may not unfit him in any degree for the immediate performance of his duties. To be legally sound, a horse must be in the same

erfect state as when foaled ; and each reader must determine for inehs how often this can be found in a field of say onc hundred horses, To be practically sound, a horse must have nothing the matter with him that is likely to interfere with his duties as a hunter, and he can be in this condition without being legally sound. For instance, suppose aman, after buying a horse warranted sound, take off the shoes and find the smallest possible corn, which would never be felt, nor diminish the value by one penny, that horse is not legally sound, because the corn, small as it is, is held to be a structural alteration; so, too, a pimple on the body where the saddle would cover it is an unsoundness in a hunter whilc it lasts, if it prevents the saddle from being put on. A temporary cough is also an unsoundness; so is lameness caused by being pricked during shoeing ; yet for some of these no man in the world would reject a good hunter. It need hardly be added that any enlarged joints, or other tokens of work, prevent a horse from being legally sound. On the other hand a horse, if not actually lame, is legally

sound although its legs are so badly formed that the merest tyro could predict lameness as the inevitable result of half an hour's journey.

As to the wind and eyes, however, a hunter should be legally and absolutely sound. Tho usual method of testing the wind by punching the horse or pinching the windpipe is not quite satisfac- tory; the horse should be galloped. The amateur will do well to get the best veterinary surgeon within reach to examine the eycs of any horse he contemplates buying. Cataract, inits incipient stage, is so difficult to discover that it escapes the notice of any but the most practised person. With regard to the fect and legs, the buyer will have to rest satisfied with au assurance that his horse is

practically sound ; for of really sound horses there are not two in a hundred.

The Purchase of a Hunter.—The nature of the country in which the horse is to be used should be the intending purchaser's first consideration, beeause upon it will depend the stamp of animal required, and it is advisable, if possible, to get a horse that has

been used to the prevalent style of fences. Where the fields are large and strongly enclosed with what are called flying fences, nothing is better than a horse which is nearly or quite thorough-

bred ; but if the enclosures are small, and separated from each

other by banks, with or without hedges on the top, and with a

ditch on one or both sides, a rather more compact horse will not

only be more suitable, but cheaper into the bargain. A horse

intended for Leicestershire, or any other grass country, must be

nearly thoroughbred, and not under 15°3, or he would be blown hefore he had crossed half a dozen of the big fields there ; while a

little horse would take too much out of himself at each fence. But

for Devonshire, Surrey, Essex, or Sussex, where the fields are small and the fencing for the most part what is called cramped, a horse with less blood and of smaller stature will answer every purpose, and, what is a great consideration, can be bought for about one-third of the price of a Leicestershire horse. So too a horse

unaccustomed to water would be useless in Lord Fitzhardinge's

country, nor would a bad timber jumper show to advantage with the Blackmoor Vale hounds. Whatever stamp of horse is used, however, the points we have insisted on must exist: good shoulders, back, loins, legs, hocks, and feet are needed in every hunting country in the United Kingdom.

The horse may be purchased either at auction, from a private person, or from a dealer. The first method is not to be recom- mended unless the buyer or his agent be a good judge of a horse, or unless one or the other happen to know something of the antecedents

of any lot intended to be purchased. Few real bargains are picked up Horses of known character, especially if comprised in a stud, always fetch their full value; and to buy a horse of

at the hammer.

which nothing is known is simply to take part in a lottery. Buying from a private person is not alwaysa satisfactory proceeding, even when the performances of the horse arc known. People enter- tain different ideas as to what constitutes unsoundness ; and in

many cases the groom is the only person who knows that there is

a screw loose somewhere, aud what that screw is. Purchasing from a dealer requires some little knowledge. Some men trade only in the highest class of horses, and must perforce ask long prices to afford a fair margin of profit to cover the original outlay, coupled with the expense of schooling and a Othcrs again make a specialty of "useful" animals at a moderate price.

success in either case will, to a great extent, depend upon how he goes to work. The best course is to select a dealer who has a name to lose, and to tcll him at once the kind of horse that is wanted, and about the price the purchaser is willing to pay. The dealer will then offer whatever horses he can sell at the price, aud the buyer can take or reject them as he pleases.

Formerly a warranty of soundness by the seller was a necessary factor in every horse sale ; but now warranties are going out of fashion, many of the leading dealers refusing altogether to give one. Nor is this surprising when the effect of a warranty is looked at ; no lapse of time puts an end to a warranty. The seller of a yearling may have an action brought against him in four years' time, and, if the jury can be got to believe that the unsoundness complained of existed at the time of sale, the buyer will win. In giving a warranty, the seller of a horse insures, as it were, the care and skill of the buyer, aud may have to suffer for selling a sound horse which ignorance and carelessness reduced to the level of a screw in six months.

There is also a limited warranty; that is, the dealer may be willing to warrant the horse for one month, or fourteen days, or for any other fixed period. In this case, the dealer only warrants against such defects as may be discovered within the stipulated time. This kind of warranty should be looked at with some amount of suspicion. It is very often given with a horse that might not pass the veterinary surgeon, and that has some defect of which the dealer knows, which renders it problematical whether he will keep sound for any lengthened period. With a limited warranty the horse often escapes the veterinary surgeon's inspection ; he lasts sound for a short time, and then goes lame, the time of the limited warranty having meanwhile expired.

The most satisfactory and at present perhaps the most usual course of business is for a horse to be sold subject to a veterinary examination anda trial. A skilful man should discover all symp- toms of what may be called external unsoundness, while as to diseasc of the liver, or any internal complaint, if the veterinary surgeon cannot discover it there is no reason why the dealer should have been able to find it out. The trial the buyer will probably make himself, and, if with hounds, it will be well to ascertain what condition the horse isin, An animal just out of a dealer's show stable would

have neither his muscles nor his wind in a state that would enable him to live with hounds ten minutes, even at a

HORS E

The buyer’s

[THE HACK,

moderate pace. Early symptoms of distress therefore, under such circumstances, should not of themselves prompt the rejection of a horse, if he is satisfactory at starting, and if his physical strue- ture is that of a hunter. The age of the horse is determined by the appearance of the teeth till he is seven years old, but the legs are as good a test as anything. Many a horse at five ycars old is often worth less as a hunter than one of ten or twelve years old, owing either to a natural want of stamina or to premature over- work. If the legs show much signs of work, and if the joints are round and big, the money paid should as a rule differ materially from a ‘sound price.” Not that perfectly fresh legs can be expected in aged horses, particularly if good performers ; but there is a point below which ‘‘ honourable scars’’ should be looked upon as an objection, unless the buyer intend to have a ‘‘ screw.” |

The Hack.—Under the term “hack” may be ranked The | cover hack, park hack, cob, pony, and, in short, saddle hack . horses of all kinds save hunters and racers.

The park hack, as its name implies, is for use in fashion- Park | frequented places, and must therefore be worth looking hack, at. Fashion has prescribed that the genuine thing shall be about 14:3, with a small and well set-on head, good sloping shoulders, and well formed hind legs ; he must also be very well bred. So much for his points. A wonderfully good temper is absolutely essential. Street vehicles give but little place to the equestrian, and a series of hurried retreats out of harm’s way might ruffle a horse of uncertain temper and not hard worked into the bargain. Tricks of all sorts must be unknown; a whole week’s idleness should not produce any uncalled-for gambols. The park hack’s breeding and shape will probably have endowed him with a fair turn of speed; this is not a necessity, providing his walk and trot be perfection. He should be able to walk 5 miles

in an hour, or he will be perpetually breaking into an uncomfortable jog when required to keep pace with a quick walking companion. In trotting he should have good but not extravagant action, and, if he is equally easy whether going 5} or 9 miles per hour, he is one of twenty. He should be bitted to a nicety, and should have been thoroughly well trained. Especial care should be exercised in the selection of the lady's horse; and the perfection which is so often theoretical in the case of a gentleman's hack should approach a reality when a horse is intended to carry a lady. With regard to the size, it had better not be under 15:1 at the least, and should have very good shoulders and by no means a short neck, or else the rider will experience that unm- comfortable sensation of having nothing in front of the saddle.

The cob is a nondescript animal, but withal a very Cob valuable one when good. An underbred thickset animal, termed a "stocky ' horse in some parts of England, is not the fashionable cob, which should have a good deal of breeding and the strength of a dray horse. Although a cob should not exceed 14°1,he should be master of 15 stone, being generally ridden by elderly heavy persons. To be worth a large sum he must unite to a symmetrical shape an even temper, perfect manners, and easiness in his paces. "If any one," says a writer in the Field, "pos- sesses a cob up to 16 stone, who can walk 4 miles an hour and trot 12, with a good mouth and amiable disposition, who fears nothing, and never stumbles, let him, if a rich man, keep him, he will not get another such in a hurry; if a poor one, let him, in offering him for sale, fear not to 'open his mouth' boldly, and demand for him a price which shall make a difference in his (the owner's) year's income; for people must, and usually are ready to, pay for their fancies, and a good cob, as already remarked, 18, of all the equine race, essentially a fancy article, and one too for which the demand is always brisk." {

A Galloway, although strictly speaking a distinct breed, Gall! is commonly understood to be a horse not over 14 hands. Prior to the introduction of railways, or even before the f fast coaches were put upon the road, Galloways were a

favourite means of locomotion by persons of moderate weight and stature. ; F

A pony must be less than 52 inches (13 hands) from the ground to the top of the withers; else he.is a Galloway. Ponies, as a rule, will do far more work than a full-sized horse; they improve wonderfully in a well organized stable; they are, it is said, never lame in the feet, and seldom become roarers; but, as a set off against these good points, they are often very tricky, and sometimes troublesome in the stable. In proof of the powers of endurance possessed by ponies, it is related that a well known one, 12 hands high, called Sir Teddy, raced the mail from London to Exeter, beating it by 59 minutes, and doing the 172 miles in 23 hours and 28 minutes. The extraordinary little animal was led between two other horses all the way, aud carried no weight.

The chief use of the cover hack is to take the rider to the meet, usually at the unnecessarily hasty pace of 10 to 12 miles an hour, at which rate the hack should. be able to go with tolerable ease to himself and great ease to) his rider. He should be from 14 to 15 hands in size, and should, in fact, be a somewhat undersized light-weight hunter. Although the cover hack will generally be asked | to canter or gallop, he may be required to trot, and this

must be done at 9 or 10 miles per hour. To accomplish this he must have good hind action, but in front he should waste no time by picking up his feet after the showy manner of his park brother ; in fact, appearance is not of much importance so long as the necessary working qualifications exist. A good temper is desirable, and, although the cover hack need not have such a perfect mouth as the London horse, he should be by no means a . puller.

exist. The bulk of the troop-horses are bought when rising four years, having of course been passed by the veterinary surgeon ; and, being nourished on the best food, these often develop into well-grown animals by the time they take their place in the ranks, Before that time comes, however, there is a good deal to be done in the way of training, for no matter how quiet the four year old may be to ride, or how well he may have been

broken from a civilian’s point of view, he is no more fitted for cavalry purposes, until he has passed through the rough rider’s hands, than if he had never been handled at all.

The young horse’s presence at barracks shows that both the colonel and the regimental veterinary surgeon are satis- fied with him. Lunging constitutes the first part of his education, after which he is ridden. Now comes the forma- tion of the paces, instruction in passaging, <.¢., walking sideways on a pressure by the rider’s leg on the side opposite to that towards which the horse is required to move, and in reining back. All these things are done with the snaffle only ; and, when something like familiarity with these exercises has been acquired, the bit is used. The troop-horse goes more on his haunches than a civilian’s horse, and, while he is taught to walk at a fairly quick pace, the canter is practised as slowly as possible. Then comes jumping practice over the bar; and finally sword, carbine, or lance exercise is performed by his rider, and he is ridden first at drill practice, then at ordinary drills, and last of all on a field day.

As the cavalry soldier has to use his weapons with one hand, he has only one for the reins; and this renders it im- portant first that the horse should be so broken that the rider can effect with his leg or heel what civilians do with the second hand, and next that the horse should be well

CAVALRY Horses. |

jxed- The breeding of hacks, like breeding for any particular | under the control of a single hand. As before remarked,

1 i stamp of horse, is all chance work, especially in the case | the position of the head makes a great difference in the “Sof halfbreds. A rather small thoroughbred horse and a| ease with which the horse can be governed, and as

| hackney mare may produce a thing like a pony, or a | troopers have all to do the same things in the saddle, it

) bigger animal that is quite useless for saddle work. Even | follows that they should as far as possible all ride the same

__ in breeding for hunters, two or perhaps three out of five sort of horses; accordingly all troop-horses are trained to

| colts will grow up more fitted for the shafts than for a carry their heads as nearly as possible in one position, that

| bridle. Perhaps the generality of hacks are either thorough- | being chosen in which the angle formed by the head and

___ breds which have been turned out of training, or horses | neck gives most power to the rider.

| that have grown up too small for hunting purposes. Harness Horses.—Just as a hunter is metamorphosed Harness iger_ Lhe Charger and Troop-Horse. —These are bracketed | into a hack by using a sharper bit and riding him on the horses. © together because their training and duty are nearly identical | road, so the mere fact of driving a horse in harness makes

se, (the charger of a field officer of an infantry regiment need | hima harness horse, whether he really be hack, hunter,

_ only be a decent saddle horse that will stand fire), the chief _ difference between the two being that the latter being paid for by the country is ordinarily a cheaper article than the former, which the officer buys for himself.

_A charger, fit for the mounted arm of the service, is a difficult article to meet with, at least a perfect one is, because so many good qualities must be found combined. A hunter is capital raw material out of which to make a charger ; but appearance, which is not a sine gua non in a hunter, is indispensable in a charger, which must also have high action, though the paces must be easy In conse- quence of much riding having to be done without stirrups. The best size for a charger or a trooper is about 15:2 or 153; moderate-sized horses can be made more handy than larger ones, and experience seems to show that they are more hardy and better doers than horses of greater stature. When a horse has been found that for shape and size will do for a charger, he must be of the right colour for the regiment, if

it be de rigueur to have any particular colour, and he must be passed as sound by the regimental veterinary surgeon.

The troop-horse must be as much like the charger as possible, but, as the trooper’s price is limited to about £40, a difference, and that a very striking one, must always

or charger. Carriages are now made of endless patterns and of all sizes, so that there is not a saddle horse to be found that could not be accommodated with something adapted to his appearance and powers. Perhaps the only class of harness horses except cart horses that are not fitted for saddle work are the regular heavy carriage horses—great upstanding animals 164 or 17 hands high. These are generally bay, aud are bred in Yorkshire or abroad. They are purchased at three years old by the few dealers who trade in them, and are brought to town, where they are care- fully driven about by an experienced breaksman until they are well used to the sights and sounds of London, and have action and strength enough to go to regular work. One well-known firm of dealers never sells these horses, but jobs them, the charge for a year varying from £80 to £120 for a pair, according to the value, the hirer of course keep- ing them, but having the right to call upon the dealers to send a fresh horse to replace one that may fall sick or become lame or fail to give satisfaction to the hirer. During the London season many of these pairs may be seen in the carriages of the titled and the wealthy. They are imposing-looking animals owing to their great size and to the massiveness of the harness, but when closely examined they exhibit many faults. Their heads are often large,

Cart- horse.

shoulders straight, and hind legs defective in power. They are hot a very profitable stamp of horse to have much to do with; they must have a certain amount of action, and this on the London stones soon knocks to pieces legs that are not particularly calculated to withstand wear and tear in the first instance ; and it very often happens that during breaking a horse’s legs show signs of failing, and he has to be thrown up for a while. Carriage horses are

of course not always bay; but greys, chestnuts, and browns are not of any distinct breed.

A really well-matched pair, with good action, are worth a long price; and it is most unreasonable for persons, after selecting their horses no less with an eye to their natural good appearance than for other qualities, to persist in making them carry themselves in a highly unnatural position, by the grossly unnatural use of the bearing rein, which is buckled up cruelly short. If a carriage horse carried his head naturally in the position into which it is forced by the abuse of this contrivance, he would be rejected at once; tight reining up is the cause of many horses becoming roarers.

With regard to harness horses of a smaller size, their ranks may be recruited from the class that supplies hunters and hacks ; but straight and loaded shoulders and straight hind legs, unpardonable defects in a saddle horse, are not quite so objectionable behind the collar. Phaeton horses should have moderately high action, and be compactly built, and should not exceed 15:1, unless the vehicle be very high on the wheel. Stage coaching, as a trade, no longer exists in England, but, during the summer months, many well-appointed coaches are put on different roads to places within a day's journey, not only from London, but elsewhere. For this work the leaders are generally about 15:2, and the wheelers an inch higher; they should all have good sound legs and feet, and free but not high action; the wheelers should have plenty of strength for the exertion required of them in going down hill.

The Cart-Horse.—At the present time it is difficult to classify cart-horses, and to point to any distinct breeds. The true Cleveland horse is practically extinct, and the animal now called a Cleveland bay bears but a slight resemblance to his ancestors. The old Cleveland horses were noted for their strength; they are said to have carried a weight of 760 ib, or more than 54 stone, a distance of 60 miles in 24 hours. The old Suffolk Punch, originally descended from Norman stallions and Suffolk cart mares, is also extinct, the modern representative of that breed being the result of different crossings ; he is found of two different kinds, light and heavy. The Clydes- dale horse is well adapted for use ina hilly country, It derives its name from a district on the Clyde in Scotland, whither it was introduced by one of the dukes of Hamilton, who crossed the Lanark mares with imported Flemish stallions.

The native English cart-horse is a huge animal, usually of a black colour, and stands about 17 hands high and more. ‘These horses are bred chiefly but not solely in Lincolnshire. At two years old they are generally sold by the breeder, who thus is enabled to secure a fair profit at an early period. They are at once put to gentle work by the first purchaser, and so earn something towards their keep. During this period they are well fed, and when they have attained their fourth year they are made up for the market, by being fed with oilcake, grains, and other fattening food, besides oats. When their preparation is finished, they find purchasers at a sum sometimes exceeding £100.

The use of these very heavy horses is now chiefly con- fined to brewers’ drays, to contractors’ trollies for conveying blocks of stone, and for drawing carts containing building

materials, and heavy iron work, such as boilers, parts of bridges, &c. From their great size they require a large amount of food; and, although occasionally useful for drawing heavy weights, they are being gradually displaced by a lighter and more active horse.

STABLE MANAGEMENT,

In treating of this part of the subject, it is assumed that the stable is in a healthy situation, for in an unhealthy one trouble or expense will be simply thrown away. Horses dislike bad smells; the drainage of the stable should there- fore be well looked to, and the traps should be as far from the stable as circumstances will permit. The pit for the reception of the manure and foul litter, which should be constantly removed, should also be some distance from the stable.

Stalls should not be less than 6 feet wide; if 3 inches Stalls, || more can be had so much the better. The partitions should be long enough to prevent horses kicking each other, and high enough, towards the head, to prevent them biting one another. Some authorities recommend that the partitions be

so arranged that horses cannot see each other; it makes them restless they say. The soundness of this advice is open to question: itmay perhaps hold good with regard to race-horses ; but the horse is fond of company, and certainly horses that are driven together, or ridden in company, seem to like the society of their fellows in the stable, while, as already stated, a stable companion is useful to lead young horses over fences in their early attempts at leaping.

In dealers' stables the floor of the stalls often slopes con- siderably from front to back. This makes a horse look bigger than he really is, but it throws all the strain of supporting the body on to the back tendons, and should not be permitted in private stables. A fall of 2} inches is more than enough for the purposes of draining.

As regards the internal arrangements, especial care should Light | be paid to light, ventilation, and temperature. A sufficient amount of light is indispensable for the health of the horse, Horses, like men, are greatly influenced by surroundings, and, considering the number of hours in the week spent indoors, a horse can no more thrive in a dark stable than a man in a dark room. Moreover, a horse brought out of a dark stable is much more likely to shy than one whose eyes had not been dazzled by the sudden change from dark tolight. Dark stables were once thought to be conducive to good feeding, and to making a horse lie down, but the idea is now exploded. The horse owner may here be warned against seeking to make up for a deficiency of natural light by having the whole of the interior of the stable whitewashed. To the height of 7 feet from the ground the walls should be coloured with some neutral tint, that the horse's eyes may not be injured by the glare inseparable from whited walls. Dark stables encourage carlessness in the groom, the result being an accumulation of dirt ; and, evenif the stableman be an honest worker, he cannot see to clean the floors and corners properly unless light be freely admitted to the building.

In the ventilation of stables many theories have been Venti propounded, and many appliances suggested, but most of Ho the latter have failed from letting in cold currents toa greater extent than they let out the foul air. In nineteen cases out of twenty, the ventilation of private stables consists of holes in the brickwork. In using these it will be found advis- able to have

thin pieces of zinc, with felt edging to prevent noise, and with easy working hinges, nailed outside the wall, to act as valves; then should the wind set from the quarter in which the ventilators are situated, the zine coverings will be blown against the apertures, and the en-

trance of cold currents to any great extent thereby hindered. When the stable is empty, doors and windows should be thrown open if the weather allow it to be done without reduc- ing the temperaturetoo much. These remarks on ventilation apply chiefly to smaller stables built in the vicinity of a dwelling house ; in the case of stables built in open spaces, for the reception of a large stud, recourse will generally be had to the advice of a civil engineer on the question of ventilation, but even then experience has shown that the difficulty will not be wholly overcome. The apertures in the walls for the escape of foul air, which, being lighter than fresh, ascends, should in no case be less than 7 feet from the ground. If the ventilators are lower than this there will be a current of cold air blowing on the horse’s body, which would be injurious at all times, but especially when the horse comes in warm from work.

Temperature is of course an important matter, but chiefly so during the colder portions of the year. In summer it is all but impossible to keep stables cool when the ther- mometer is standing at 80° Fahr. in the shade ; still if the situation is favourable to coolness, and the temperature can be kept below 70°, so much the better. During the hunting season, stables may be too warm by accident or from design: they may be overheated owing to in- sufficient ventilation, or because the groom connects a glossy coat with a stable bordering on tropical heat. About 55° Fahr. is a good mean temperature, but this cannot of course be maintained when the outside air is some 10 or 15 degrees higher ; the most that can be done is to keep the temperature up to that poiut in cold weather. A moderate temperature and moderate clothing are better than too low a temperature with excessive covering, or too high a temperature with but little clothing.

Having mentioned clothing incidentally, it may here be said that the best shape is the ordinary sheet, cut out at the neck, and buckled across the chest; the sheet should be long enough to reach the root of the tail, and

should be large enough to buckle easily round the chest; if it be tight the hair will be rubbed. Some people prefer a straight rug that does not buckle, the front being formed of a separate breast cloth. Hoods are only needed when at exercise in bad weather, or when the horse is travelling by railway. Particular care should be taken that the roller does not touch the back bone; the pads should be so placed that there isa clear space of 4 inches between them, so as to leave a clear channel over the back bone. The neglect of this precaution will inevitably produce a sore back, and, while first of all making the horse shy of ee touched, may subsequently make him vicious in the stable,

Regularity is absolutely indispensable to successful stable

“Management ; without it, the horse may be subjected to a

dozen different kinds of treatment in as many days, a course obviously detrimental to his health.

The engagement of a good groom is the first step. Where there is a stud of ten or more horses, a stud groom will probably be kept, and, as he will not do much work himself, —indeed it is better that he should not,—he should know

how things ought to be done, and see that they aredone. In

small establishments, however, there will be but one or two men; but the head one should be a thorough stableman, The More ignorant he is of the veterinary art the better; indeed, every horse owner should, in the strictest terms, forbid his servants to administer any drug or medicine whatever without permission ; and the owner himself may € advised never to sanction the giving of any physic,

but always to seek good professional advice if any signs of

sickness are visible.

Stable work should commence early, as soon after 6 4.M. as possible. The first duty is to examine each animal care-

fully, to discover whether any injury has been received during the night from kicking, getting cast, or any other cause. Horses are then fed and watered, the litter is turned up, that which has been in use during the night not being allowed to remain in the stable during the day, and the stable is put in order ; exercise succeeds, after which the animals are thoroughly dressed, but the dressing should never be performed out of doors. Feeding takes place again at 12 noon, 4 p.m., and 8 p.m., when the horses are done up for the night.

Of the feeding of race-horses nothing need be said here, Feeding. as their care is a business of itself, with which the private person has nothing to do.

Oats and hay form the diet upon which horses are kept, to which beans are added for hunters and horses in hard work ; while bran, linseed, and carrots are used for special purposes, in addition to, or sometimes in substitution for, the regular food. Hacks and horses in light work will do well on a daily allowance of 8 to 10 ib of oats and 10 or 12 tb of hay. Beans, which contain about 30 per cent. of nutri- ment, are heating, and should be given only now and then in small quantities. The oats are best divided into four feeds, and beans when used should be given at the midday and last feeds. A handful or two of chaff is useful with each feed, as it compels a horse to masticate, but in many stables there is a prejudice against it, and the hay is put into the rack four times a day, not more than 3 ib being given at one time. Oats should be bruised ; but, as they soon turn sour, it will be best to bruise every morning only as much as will suffice for the day’s consumption.

Bran is indigestible, but it is a laxative, and, so far as hunters are concerned, it is only given in the form of a mash after a day’s hunting, and on Saturday nights. To make a bran mash, put half a pint of linseed ina pan, pour a quart of boiling water upon it, and Ict it soak for four hours; then take about 2}ib of bran and mix with it enough hot water to saturate it; stir the linseed composi- tion into this, and it is fit for use. Should the mash be put in the manger, the latter should be scoured out with hot watcr afterwards, or the sourness of the remains of the mash will make many horses refuse their corn.

A few carrots, which must be carefully washed and scraped, given every now and then, are useful as tending to keep the blood in good order, and

checking any symp- toms of fever induced by the dry food upon which horscs live,

Maize or Indian corn contains so small a proportion of nutritious matter that it is not fit for hunters or for horses from which fast work is required. The London General Omnibus Company feed their large stud almost entirely on this diet, and it is found to answer (see Mr Church's evidence before Lord Rosebery's Horse Com- mittee, 1873). It is given in the same quantity as oats.

Of late years corn merchants have introduced the system of foraging gentlemen's horses at the fixed price of one shilling per hand per week. Thus a horse of 15-2 would be foraged for 16s., and one between 14 and 15 hands for 15s.

A correct system of watering horses is no less important Watcr- than proper feeding with dry food. Many grooms, in their ing. horror at giving too much, fall into the opposite extreme, and stint the horses under their care to an extent that is positively cruel. The result of such a system is fever in various shapes, and a general loss of condition. There has of late years been a growing tendency to favour the plan of letting horses have access to water at all hours of the day and night, and experience has shown that the effect is beneficial. A separate tank in the stall or loose box is fed by a tap, and a constant supply should be kept up. Ifa horse watered on this plan be watched, it will be seen that

he never takes more than a very few small mouthfuls at a time, nothing like the quantity allowed by the most stingy groom ; and, if the amount consumed be measured, it will be found that, after the first day or two, the horse actually drinks less than when watered at stated intervals. Where the ad libitum plan is not adopted, horses should be watered four times a day. Nothing can be more unwise than the undue stinting hunters of their water

on hunting days ; no one could expect a satisfactory day's work from an animal suffering from excessive thirst. Where horses can have water when they like, it will scarcely be necessary to do more than to put the cover on the water tank at about 9°30 on hunting mornings, assuming the meet to be at 11. It need hardly be said that the quality of water supplied to stables should be carefully attended to. Horses are easily made sick by impurities, and are very dainty in their choice of water. When on a journey, horses should never be allowed to drink at public troughs, as disease is very likely to be contracted by such a proceeding.

Exercise is a great preservative of health, but, like food and medicine, it should be given at proper times and in proper quantities. Exercise must not be confounded with work; the severe work horses are sometimes called upon to perform takes much out of them, and exercise is one of

the means adopted to counteract any ill effects of hard

Treat- ment of hunters.

work. In order that the muscles of a horse may not become prematurely tired, it is not sufficient that they should be violently taxed some three days a fortnight as with hunters ; they must be used every day, and the exer- cise by which this is effected causes all the tissues of the body to receive their support by reason of the tone given to the circulation of the blood. Hacks, harness horses, and particularly ladies' horses, should be sufficiently well exer-

cised to guard against an excessive exuberance of spirits ; for nothing is more annoying than to have an animal, quiet enough in an ordinary way, perpetually jumping about at the approach of vehicles or other horses, merely because he is too fresh. Hunters should have two hours walking exercise daily ; sometimes a slow trot of 3 or 4 miles may be indulged in, but, when the hunting season fairly sets in, and horses are hunted regularly, cantering should be forbidden at exercise unless either master or man happens to be a very good judge of what kind of exercise a horse requires.

Hacks and harness horses are but rarely called upon to perform duties so exhausting as those of the hunter. In the case of the former aninials, a

suitable stable, good food and water, ventilation, and exercise, coupled of course with careful supervision, should, save under exceptional circumstances, suffice to keep them in good health. All the previous remarks apply in the case of hunters, but with them something more is needed. First there is the getting the animal into condition, and then comes the proper mode of treatment after work, when the system is exhausted, and the horse suffering perhaps from the effeets of a blow or a fall. The art of getting hunters into condition has made great strides during the last fifty years. Nowadays one seldom hears of horses dying in the field through sheer exhaustion; and it cannot be said that their work is lighter now than it was then.

To begin at the beginning, a hunter should be fit for use by the end of October, and the question then arises, How long before this time should he have been in what may be called training ?—using the word, of course, in a different sense from what is understood by training ina racing stable. The answer to this question depends very much upon how, at the termination of the last hunting season, the owner solved the difficulty of ‘‘ what to do with the horses.” Assuming horses are to be kept through the summer, it will probably be nearly a month after the last hunting day before the summering treatmeut is adopted. A dose of physic will have been administered, and, if wise, the owner will have ealled iu a veterinary surgeon to see what damages have been sustained; but he shonld be one nsed to hunters and their peculiar infirmities.

Many persons with the best intentions, and following very ancient traditions, turn their horses out to grass, saying that a

summer’s run” will put new life into them, but not explaining why a horse that up to Monday night is kept clothed in a warm stable aud fed on hard food, should be greatly benefited by being

Hf OR Seb

turned into a field on Tuesday without his clothing, and left to subsist entirely on grass.

Although

letters to the Old Sporting Magazine, more enlightened system,

[TREATMENT OF HUNTERS,

This sudden change of living, which used to be so universal in the*case of horses, is condemned in the human subject; and that is not the least powerful argument that can be urged against it. Moreover, most veterinary surgeons agree that more hunters have been made roarers or contracted discase of some kind from being turned' out to grass than from almost any other cause. In the days when summering in the fields was the

usual method pursued, a hunter was never really fit until the

season was far advanced, and the turning out to grass in May was simply undoing all that had been done since the previous August. here and there a few individuals adopted a more common sense way of summering their hunters, the full evils of the grazing system were not impressed upon the publie until ‘‘ Nimrod,” in advocated the adoption of a and showed the weak points in the old

one. The advantages claimed for the plan of turning ont to grass

were that the horse's system and his feet benefited, and that it was cheaper. beneficial, and, as regards the feet, Mr Goodwin, veterinary sur-

But violent changes in the manner of living cannot be

geon to George IV., said: '¢T have invariably observed, where horses are turned ont to grass during the dry and hot summer months, that, on briuging them up to be put into stable condition, their fect are in a much worse state than when they went ont, dried up, and so hard and brittle that, on the application of a tool to bring them into a form to receive a shoe, the horn breaks like a iece of glass, and all the naturally tough and elastic property is ost, so that it requires some months to remove its bad effects. MINS are Horses at grass are much inclined to thrush.” As to the expense, the objection is too trifling to be taken as a set off against any real advantages the system advocated by ‘‘ Nimrod,” and now generally adopted, may be found to possess.

But in whatever way a horse is summered, it is clear that there must be a great change from a state of hard work to oue of absolute rest and quiet, and this change should not be the work of a moment. Unless an owner be particularly lucky, some one or more of lis hunters will gencrally show signs of wear and tear before the end of the season has arrived, and these should be the first thrown up. They sliould be exercised daily, but their corn should be diminished, and their dressing iu the stable need not be of the same thorough kind as when they were in full work, After about a fortnight of this treatment summering may begin in its full sense. The state of the horse's legs, and the judgment of the owner, will determiue whether the horse shall be exercised during the sunimer, or left to exercise himself. In the former case he must remain shod, and have his feet sicppee two nights a week with damp tow, or, if there be much tendency to fever, with tow

dippae in the best Stockholm tar. Exercise shonld take place in the coo

of the day, in the morning for choice, on soft ground, for about an hour and a half. Where the horse is left to exercise himself, he should be housed in a good-sized shed or box opening into a straw- yard or small paddock, which should be shaded by trees or build- ings, so that the maximum of air can be breathed with the minimum of exposure to the sun. A horse thus kept should have his shoes removed, and, as his feet cannot then be stopped, he should stand once or twice a week, for an hour at a time, on wet clay.

The constitution of each particular horse should be taken into account in deciding how he shall be fed during the summer months. The aim to be kept in view is to maintain the strength, but not to engender fever,—to let the system down as it were, but not to undo all that has been done during the hunting season to a greater extent than may be found necessary. Asa general rule, three feeds of oats a day (the feeds being rather smaller than those given during work) will be sufficient; beans should be eschewed, but 8 or 9 ib of hay may be given. Green food should be given with caution, say twice or thrice a week, to assist in maintaining a healthy action of the bowels.

The getting the horse into condition again for the ensuing season should be accomplished. gradually, and all violent exertion should be avoided. About the beginning of August the shoes should be put on the unshod horse, and he should have an hour's walking exercise daily for about a week, when the

time may be extended by degrees. The horse that has been exercised all the summer Wl need no special attention until the beginning of September, about which time all the horses should have slow trotting exercise twice a week on soft, but not deep, ground. During October cantering may be indulged in twice a week, but plenty of walking exercise should form part of every day’s work. The quantity of oats given should of course be inereased as the work gets stronger, until, before the commencement of the hunting season, the full quantity is reverted to. =

It is of course the groomn’s duty to get a hunter into condition, and to apply the proper treatment on his return to the stable, when tired by the day’s work; but during the day the horse will be under the care of the rider, and carelessness or want of judgment on his part may occasion injuries not to be overcome by any known system of stable management. As soon as the hounds leave off, the rider,

if more than a mile or two from home, or if the day has been at all severe, should get his horse some gruel at the nearest inn or cot- tage, or, failing gruel, a little tepid water, with or without a handful or two of flour stirred into it. A horse’s stomach is small in proportion to the size of his body; he should not therefore be kept without sustenance of some sort longer than is necessary.

on the leg, which may be either on the skin or on the sinew. If on the skin, the leg should be bathed with hot vinegar and water, in equal proportions, three or four times a day. A blow on the bone often causes a bony enlargement, but beyond constituting a blemish is of no importance. A blow on the sinew is generally the cause of a long period of lameness, and firing may be needed. If the blow

Should the animal show signs of great distress, he should be got into the first stable that is reached, or if there is not one handy into a shed, and the more airy it is the better. The head and legs should be well rubbed; clothing should be put on the body, and a cordial of some sort administered as quickly as possible,—sherry, spirits, or beer will do; and a veterinary surgeon should be sent for at once.

When the hunter returus to his own stable, he should first have his pail of warm gruel and linseed made according to the receipt given above; and after he is dressed, it will only be necessary to see whether he feeds as

usual. If he does not, water with the chill off may be given to him. Should he be merely fatigued, a night's rest in an airy box will soon restore him; and here it may be observed that all stables should include at least one loose box for the recep- tion of a horse returning from hunting; rest cannot be so satisfac- torily taken in a stall. ;

The treatment of horses' legs is a most important part of stable management, and one which is but too often imperfectly understood by men who, though nothing but strappers, call themselves grooms. In many stables it is the custom to wash the feet and legs of horses returning from work, but the practice is calculated to pro- duce cracked heels, a state of things which often results also from a too frequent use of wet linen bandages. The better plan is to forbid the use of water above the hoof; and, as soon as the hunter comes in, some rough serge bandages (kept for the purpose) should be put loosely on his legs. These may be removed after the rest of his body has been dressed, when the legs will be found quite dry, and the mud will crumble off like sand, while half the labour that would have been needed to dry the washed legs will suffice to brush every particle of grit from the hair and skin. The legs should then be well hand-rubbed, and the ordinary bandages may be put on for about four hours; on their removal more hand-rubbing should take place. A constant use of bandages is to be deprecated, unless it is ordered for some particular purpose by the veterinary surgeon.

The reader has been already warned against being his own vete- rinary surgeon; but there are certain minor casualties to which every horse is liable, and which an average groom should know how to treat, A very common cause of a hunter being laid up is a blow

be only a slight one, bathing in cold water is the best thing that can be done,

Cutting is sometimes the result of malformation of the legs, and Cutting.

sometimes the result of fatigue, for some horses will now and then brush themselves after a long and tiring day, who never do so in going to cover. A boot and change of shoeing inust be resorted to.

Corns are to be laid at the door of the shoeing smith. They Corns.

arise from the shoe being too tight, or fron its being nailed too near the heel. A careful groom should superintend the shoeing, and should instruct the smith to pare the sole at the seat of the corn, and to take care that the new shoes do not press upon the sole. The sole must be kept well pared and dressed with tar. Should the corns be so bad as to suppurate, hot linseed meal poultices should be applied, and work dispensed with.

Thrush is a diseased state of the frog, caused, in most instances, Thrush.

by the feet being neglected in the stable. The diseased parts should be cut away, and the openings in the hoof stopped with tow dipped in tar.

Cracked heels generally owe their existence to the legs having Cracked In the early stages cut the hair from heels,

been left wet after washing. the sore part, wash with warm water, dry, and apply glyceiin lotion, If riding or driving a horse with cracked hecls, never allow the sores to be rubbed with grease before starting, as the dust or dirt will cling to this, and by getting into the sore make it worse than ever.

An over-reach is a not uncommon occurrence in the hunting Over- field. An old piece of linen, folded three or four times, should be reach,

soaked in water and fastencd on the place, and 2 piece of oiled silk should be kept on over the linen to prevent evaporation.

Sore backs are very troublesome to get rid of, and would not Sore happen so often as they do were more attention paid to the back.

fitting of the saddle and the way it is stuffed. Most saddlers put too little stuffing in a saddle, and so after it is used a few times the inside becomes hard. When the skin is found to be rubbed, use the wet linen and oiled silk as for an over-reach, and afterwards chloride of zinc lotion.

Fever in the feet is generally the result of too much knocking Fever in Directly lameness appears, take off the shoe feet.

about on hard roads. and place the foot in cold water, putting on a poultice at night.

PART III.—HORSEMANSHIP.

Horses being ridden for several distinct purposes, viz., in the cavalry service, for hunting, racing, steeple-chasing, on the road, and in the school, there are separate styles of horsemanship adapted to each purpose, and a rider excelling in one is not of necessity a proficient in the others ; in fact few persons, if any, are equally good, for instance, at military or manége riding and at steeple-chasing.

The first step in horsemanship is to mount a horse ; but for the performance of this apparently simple feat no fixed rule can be laid down for the guidance of the civilian. Having taken up the reins, the rider should stand at his horse's near shoulder facing towards the tail, and in that position hold the stirrup with his right hand for the reception of his left foot. By standing at the shoulder the rider is out of harm's way in the event of the horse kicking while he mounts. It is perfectly easy to carry out these directions when the man and horse are both of middle height; but it is simply impossible for a short man to mount a horse of 16 hands high in such a manner, he must risk the kick and stand where he can reach the stirrup—behind it. Having gained the saddle, the Necessity arises for seat and hands. The fact that the Seat of a civilian rider must vary to some extent according to the size and shape of the animal upon which he finds himself, does not preclude certain principles from applying In the formation of it, and it is towards the proper under- standing of these principles, and the adoption of the right Position of the legs and body, that good instruction is desirable at the outset.

The great desideratum in a seat on horseback is that it

should be firm, and thisfor two reasons. In the first place, a rider with an insecure seat is apt to be thrown by any unexpected movement the horse may make, such as a slight stumble, or shying ; and secondly, without a firm seat, the acquirement of good hands is well nigh hopeless, because, when the balance is once disturbed, the rider will have to depend on something else for the maintenance of his seat, and this other means of

support will generally take the shape of “riding the bridle,” a practice as much opposed to good horsemanship as it is injurious to the horse’s mouth.

Having gained the saddle, the rider should seat himself in the middle of it, and should never allow any part of his person to overlap the cantle, as is but too often seen. Many rules are given for adjusting the stirrups to the proper length before mounting, but in practice they are not to be depended upon,—first, because all men are not made in quite the same proportions; secondly, where two men are of equal height, the man with the thicker and rounder legs will require a shorter stirrup than the one with lean and flat legs; and thirdly, men of any build will need a shorter stirrup on a wide horse than on a narrow one, besides which, if a horse pulls at all, another hole or two will give the rider additional power over his animal. The proper length of stirrup, then, cannot be satisfactorily ascertained till the rider is mounted. Sitting well in the middle of the saddle, the thighs being turned in, and the heels drawn somewhat back, the stirrup leathers may be let out or taken up until the tread of the stirrup is on a level with the inner ankle bone, and at this length, when the rider stands up, his fork will clear the pommel of the

saddle by about 3 inches. For maintaining his seat the horseman should depend upon his thighs and knees, and not upon the kuee and calf only ; at times, of course, when on a restive horse, every available muscle may have to be brought into play, but the proper rule is as stated. Some people say they ride by balance only, and others that they vide by grip; a proper seat should be an admixture of the two: a ian riding by balance only is sure to be kicked off, while to grip with all one’s might during an hour’s ride is to undertake as much exertion as should last for a whole day. The position of the foot exercises some influence on the security of the seat; at one time it was thought proper to turn the toes in and depress the heel, a posture that tended to diminish the grip of the thighs, but now the toe should be turned a little outward, and but very little upward,

Beginners are often advised to learn to ride without stirrups; if they do, they should have no saddle either, for riding in a saddle without stirrups is likely

to produce rupture, The soundness of this advice, however, may be questioned, because, although riding without stirrups will undoubtedly tend to a firm seat, it will not be one of the same sort as when stirrups are used; there must therefore be a process of learning and unlearning. The better plan is to practice both ways concurrently. Thus let the pupil be properly placed in a saddle with stirrups, and when he has ridden half an hour let a cloth be substituted for the saddle for about ten minutes, care being taken to observe the rules already laid down for the position of the legs ; in this way the proper seat will be strengthened, instead of a new one being formed.

The proper adjustment of the reins is the next thing to be attended to, and as the management of these depends so much upon the seat being firm and independent of the bridle, the acquisition of a firm seat is certainly half way towards the acquirement of good hands. Assuming a single rein snaffle to be the bridle used, the second, third, and fourth fingers of the left hand should be inserted be- tween the reins, which should be drawn up gently with the right hand until the rider feels that he has got an equal hold of his horse’s mouth on both sides, and with just so much pressure that the slightest movement of the left or right rein would cause him to turn to the left or right respectively ; the fore and middle fingers of the right hand should then take hold of the right rein, which may be drawn out from the left hand so as to enable the hands to be held about 4 or 5 inches apart. The arms from the shoulder to the. elbow should hang naturally close to the sides, and the arms from elbow to wrist should be about parallel to the ground, the wrist being kept loose, so as to yicld gently with every motion of the horse. The rider sitting in the position described, square to the front, with his shoulders well back, will be riding with fairly long reins, one of the secrets of good hands ; if he stoop forward and carry his bridle hand at some distance in front of his body, so as to take a short hold of his horse’s head, seat and hands will both be bad.

When a double reined bridle is used, the third finger of the left hand should be first inserted between the snaffle reins, and then the little, third, and second fingers should

be between the curb reins, the two outside reins will then be the curb, and the two inside oncs the snafile. In this manner of holding the reins the snaffle is not so likely to slip, while the curb can be easily slackened or drawn tighter. As military riders invariably use the curb only, the position of snaffle and curb as just explained is reversed in the cavalry service.

When the horse is in motion, the hands should not be kept in one spot, so as to act like the peg on the pad of a harness horse to which the bearing rein is fastened, as the mouth would thereby become dead, and the horse would

lean unpleasantly on the bit; but the rider should give and

take, so that while the pressure is not stronger at one moment than at another (unless there be a reason for it), yet, on the other hand, the hold should never be entirely relaxed.

In order to encourage the horse to walk, the head must way, not be confined, but the light feeling on the horse’s mouth ing,

must be kept up. Should the horse break into that uncom- fortable pace, a jog trot, which, by the way, a well-broken hack should not do, never snatch at his mouth, but

restrain him gently. ‘To trot press the legs to the saddle, Trottis

raise the bridle hand a little, and urge him if necessary with the voice. The rising to the trot should be performed easily ; the legs must not swing backwards and forwards, nor should the hands be jerked up and down, while the action of the ridcr should be in perfect time with the motion of the horse, or a passer by may remark that the horseman is riding faster than his horse. the curb rein a little and turn the horse’s head slightly to the right, at the same time pressing the left leg behind the saddle, the horse will then lead with the off fore leg, which is generally preferred under ordinary circumstances ; but a well-broken hack should be taught to lead with either, and if he be cantered in a circle to the left he must lead with the near leg, as otherwise an ugly fall is likely to result

from the leg being crossed. Gialloping is a pace not gene- Galle rally indulged in by hack riders; when it is, the hands ing

should be kept low, the body thrown back, and an extra grip taken, as nearly all horses pull more or less when extended.

Hitherto, only road or park riding has been considered, and, with wise people, hacking (except hacking to cover, or in the performance of a journey against time) means progressing at a strictly moderate pace—for the sake of their horse, if for no other reason.

Beginners of all ages are strongly advised to undergo Ridin The lesson

proper instruction when commencing to learn to ride. few directions already given may serve to remind a person what to avoid, but an hour's teaching is worth volumes of theory. The instructor should, however, be a practical and well-taught horseman himself; to be this it matters not whether he be a. professional riding-master or not. When once the proper place for the legs and hands is pointed out, and the proper way of handling a horse and sitting in the walk, trot, and canter,—when, in short, a person has been put in the way of becoming a fair road rider, he has made some progress towards being a hunting man. But if, on the other hand, first principles are disregarded, and a rider believes in the system of "it doesn't matter how you ride so long as you only stick on," it will be a long while before he reaches his own standard, except with the comparatively few men who seem to have been intended by nature for horsemen. Few self-taught riders attain to anything like excellence; they may ride quiet horses with fair success, and even in hunting, if possessed of plenty of courage, and mounted on a bold and not too tender-mouthed horse, they may keep a good place, but horsemen in the proper sense of the word they never will be.

To start in the canter take up ante: |

Fires,

HORSEMANSHIP. |

Now, assuming the begiuner to have acquired some pro- ficiency in riding, and to have had a little practice over the leaping bar, he may be desirous of making his first appearance with hounds, and the question then arises how is the hacking-seat to be exchanged for the hunting one, of which he will probably have heard a great deal, and have geen some very extraordinary specimens.

For practical purposes the chief difference between a park seat and a hunting one consists in the substitution of boots and breeches for trousers, and the shortening of the stirrups some two or three holes. Next to that of a jockey, the seat of the hunting man is the most important of any connected with amusement ; he must sit firm, so as not to be thrown off when his horse leaps, or makes aslight mistake, technically called “pecking,” on landing after jumping a fence, and so as to be able to handle his horse delicately under all circumstances, and to make as much of him as possible. As with road riding, so with hunting, the actual length of the stirrups will depend a good deal upon the form and action of the horse, but the uature of the animal and the peculiarities of the country ridden over will also have something to do with their adjustment. A puller will compel the rider to pull up his leathers one or perhaps two extra holes—a course that may also be rendered necessary in a hilly country, for, in going down hill, the stirrups, if kept at the ordinary length, will generally feel a great deal toolong. The rider’s body must be kept close to the saddle in leaping, for if he were jerked up, the weight of say only a 10-stone man coming down on the horse a couple of seconds after he has negotiated a Jarge fence is sufficient to throw him down. Nothing but actual practice with hounds can teach a man the kind of horsemanship required for hunting where land of all kinds has to be ridden over, and obstacles of various sorts, natural and artificial, have to be encoun- tered.

Considerable progress may, as already stated, be made in seat and hands within the four walls of a good riding school, but as the art of warfare must be learned on active service, and not on the parade ground, so nothing but actual practice in the hunting field will teach a man that kind of horsemanship adapted to the ever-varying conditions and different situations to be met with in a single day’s hunting. Yor example, the ground gone over is not always the level springy turf of the race-course ; it is up

hill and down dale, across ridge and furrow, over ground studded with ant-hills (which, unlike mole-hills, are often very hard), over ploughed lands, and in boggy countries. Now each of these varieties requires a different method of riding over, and nearly every horse will require different handling under similar circum- Stances ; some can go well through the dirt, while others can only go on the top of the ground; some will require rousing at their fences, while others will want quieting. Tt will therefore be seen that much depends on the rider having good hands. This qualification, though generally understood, is very difficult to define. A rider with good hands never depends upon his reins for retaining his seat ; nor does he pull at the horse's mouth so as to make him afraid to go up to his bit; nor again does he ever use any more force than is necessary for the accomplishment of what he desires to perform. But besides all this, there is an unaccountable something about the man with good hands that cannot be described. Pullers appear to renounce Pulling, refusers take to jumping, and clumsy horses appear nearly as handy as a trick horse in a circus. Though

hands " can to a great extent be acquired by care and Practice, yet in the highest form it is a gift like the "hand for crust" which is denied to many cooks and cannot be learned.

There are different kinds of "fences," as all obstacles are genenically called. First, thereistimber, such as gates, stiles,

and rails; the first two are, nine times out of ten, awkward jumps, as the take off is either poached by cattle, or else is on the ascent or descent. Hedges vary according to the custom of the country in which they are found: they either grow in the soil of the field, and are protected by a ditch on one side, or are planted on a bank with a ditch on one side or sometimes on both. The rider may here be reminded that if a bank is high and the ditch before it but small, there is pretty certain to be another ditch on the far side, for the bank is made by throwing up the earth taken from the ditches. Then again there are the large banks found in Wales, Devon, and Cornwall. Lastly come water Jumps, which are met with in two forms: tle water is either

within an inch or two of the top of the bank, so as to be about on a level with the field through which it flows, or there may bea space of some 6 or 7 feet from the bank to the water. For the successful negotiation of brooks a bold horse is required, ridden by a bold man. No fence that is ever encountered stops such a large proportion of the field as water; even a clear 6 feet of it will prove a hindrance to some, while anything over 10 or 12 feet will in general be crossed only by a very few. Some horses, good performers over any other description of fence, will not jump water under any circumstances; while the chance of a ducking deters many from riding at it; and, however bold the horse may be, he will soon refuse water if his rider be perpetually in two minds when approaching a brook, .

The pace at which a hunter should be ridden at his fences depends upon the nature of the fence itself, and the peculiarities of each individual horse. With some very good jumpers—they can hardly be called good hunters— to steady them is to bid fora fall, while with some very clever hunters. to hurry them is to bring them to grief. With ordinary horses, however, it is a good general rule to ride at fences of all descriptions as slowly as the nature of the obstacle admits. In grass countries, where “ flying fences” are found, the rate of speed must of necessity be quicker than when about to take a Devoushire bank of some 7 feet high, but even at a flying fence the rider should steady his horse so as to contract the length of his stride, in order that he may measure the distance for taking off with greater accuracy. Flying fences consist of a hedge with or without a post and rail, and with or without a ditch on one or both sides ; consequently a horse has to jump both high and wide to clear them. But in jumping a gate, or a flight of rails, as ordinarily situated, there is no width to be covered, and to make a horse go through the exertion of jumping both high and wide when he need only do one is to waste his power, added to which to ride fast at timber, unless very low with a ditch on the landing side, is highly dangerous.

All hedges on banks, banks, and doubles must be ridden at slowly ; they are usually of such a size as to make flying them impossible, or at least undesirable. Horses jump them on and off, and in taking them at a moderate pace there is a chance of stopping on the top and choosing a better place to jump from, or, if needs be, of returning and taking the fence at another place. Cramped places will have to be jumped from a walk or even at a

stand; for instance, a tree may be in a line with and close to the only practicable place in a fence; it then becomes necessary to go round the tree before a run at the place can be managed. So, too, with places that have to be crawled over between trees, or with dykes to be crawled down.

In jumping an ordinary hedge or ditch at moderate speed, there is of course a moment of time during which the horse is on his hind legs, and in theory the rider should then lean forward, but, in practice, this position is so momentary, and the lash out of the hind legs in the spring is so powerful,

that it is best not to lean forward at all, because of the difficulty, if not impossibility, of getting back in time for the reverse movement, when the rider should be pre- paring to render the horse some assistance with the bridle as his feet touch the ground.

Water, as was said before, stops a field more than any other kind of fence, because, so far as the rider is concerned, a strain to the horse’s back or a bad over-reach is likely to result, and the contemplation of a ducking is not pleasant on acold day. Then as to the horse, if he ever got into a brook when young, and found any difficulty in getting out again, it is ten to one against his ever taking kindly to water afterwards. When a line of willows indicates the whereabouts of a brook, the horse should be well collected, a clear place selected, so far as circumstances allow, and the pace increased, though in short strides, up to the very brink. Ifthe hounds jump at the brook, even though they fail to clear it, the rider may take it for granted that at that place the leap is within the capacity of any ordinary hunter in his stride; hence if, when going at three parts speed, a horse’s feet come just right to take off, the mere momentum of his body would take him over a place 15 feet wide.

Now jumping a fence is one thing, and riding to hounds is another ; a man may be a very good horseman, and yet be a very bad man to hounds. ‘The leading hounds should be watched, and when they turn right or left the rider should turn too. Then the choice of ground is important ; ridge aud furrow should be taken diagonally, or, if the field be entered towards either end, time will ultimately be saved in going round by the firmer ground at the sides. Ploughed land requires the rider’s special attention ; an injudicious hurry over a couple of deep fields has settled many a good hunter for the remainder of the run. In jumping into a ploughed field the fence should be taken slowly, and the rider should lean well back in the saddle, because, lacking the elasticity of turf, a ploughed field, especially after rain or a frost, will let a horse’s legs sink in deep on landing, and if he has been ridden at the fence quickly, the sudden resistance offered by the soft ground will inevitably cause a fall. When the ground is deep, therefore, the rider’s judgment will be shown in avoiding, where possible, large flying fences into a ploughed field, and in choosing places that can be jumped quietly.

Pace is a relative term; when the thoroughbred is but cantering, the underbred will be doing his utmost; the horseman must therefore always have an eye to his horse, aud must be careful not to press him beyond a certain pace, unless of course he means to be satisfied with a short life and a merry one.

The experience of a single day’s hunting will teach the novice that gates are far oftener opened than jumped ; it is therefore necessary that a hunter should be handy at opening them. Many accidents have arisen from horses rushing through a gateway directly the latch is released, or from their jumping a gate at which they have been pulled up to enable the rider to open it. The horse should be taught to obey the leg as well as the hand, and, by a slight pressure of the leg, should throw his haunches round to the left or right as occasion may require.

Most writers on hunting aver that there is an art in fall- ing, and the young sportsman is duly told to get clear of his horse as soon as possible. It is not to be denied that the number of accidents in the hunting field are but few considering the number of falls that take place during the hunting season, but the rarity of accidents can hardly be ascribed in all seriousness to a

proficiency in the artof falling. In the first place, ditches cause many falls, by the horse dropping his hind legs into them ; that 1s to say, his progress is arrested while the rider continues

in the course his horse would have taken had the ditch not been there.

When the hind legs are dropped the rider clutches instinctively with his hands and legs, and the violence of his fall is thereby broken, while in ninety-nine cases ont of every hundred the ditch prevents the horse from rolling over the recumbent sportsman. Then again

as to falls at flying fences taken at a somewhat quick rate,

it is lucky for hunting men that under such circumstances the rider is in the majority of instances thrown clear of his horse independently of any skill or effort of his own, It is only in what may be termed “slow falls” that the rider can gave himself by presence of mind and activity. When a horse slips intoa ditch, or drops quietly on to his knees preparatory to rolling on his side, a practised rider has time to get clear ; but in falls over timber, or over

fences ridden at quickly, the freedom from accident must

in sober truth be ascribed to luck rather than to good

judgment.

Saddles and bridles form no unimportant feature in the equestrian art, as well as in the establishment of a sports- man. A well-made saddle and bridle make a horse look worth an extra £20, while nothing contributes more to the safety and comfort of a rider than a well-made roomy saddle. The hunting man will be well advised if he patronizes only such establishments as make hunting saddles their peculiar study. Each horse should have its own saddle, and the closer it fits, provided it does not press upon the withers or touch the spine, the better ; but, as even the best

saddlers are addicted to putting too little stuffing into them, the purchaser should, when ordering, stipulate for a liberal quantity. The stirrup irons should be moderately heavy, and, if they are for full grown men, of the largest size made, for the foot will be all the less likely to be caught in the event of a fall.

The selection of a bridle will depend upon the horse's mouth and upon the rider's hands. For hacking purposes a double bridle is almost invariably used, the curb enabling the rider to make the horse appear to the best advantage ; and, as a geueral rule, a double bridle with an easy curb bit (the curb chain being protected by a leather strap) is best for hunting purposes, as with it the horse can be collected at his fences, and held together in deep ground better than with the snaffle only. Some persons use nothing but snaffles on principle, and will submit to a vast amount of discomfort rather than call in the aid of a curb; but there are not five perfect snaffle-bridle hunters out of a hundred, and riding a horse in a snaffle is quite another thing from riding a snaffle-bridle horse. The curb, however, should be of no greater severity than is absolutely necessary; pulling is far more often caused by the pain of a sharp bit than by anything else. Whatever bit be used, it is useless to keep up one continued drag at the horse's mouth, as it thereby becomes callous and ceases to be sensitive to any gentle indications. With a puller the bit should be kept moving in the mouth, and a change of bits is often bene- ficial, each pattern acting in a different way, and taking a horse, so to speak, by surprise.

The less whips and spurs are used the better ; unfinished riders will do well to leave the latter at home, for although they are very useful on the heels of a skilful person, an unintentional application of them is often attended with disastrous consequences.

The qualities possessed by a good jockey, either on the flat or over a country, fully bear out what has been said before concerning the value of early instruction 10 riding, and the impossibility of the existence of any regular system of civilian horsemanship. After having been some time in a training stable, a lad is put on @ quiet horse at exercise ; his stirrups are adjusted, and the reins knotted for him at a proper length. He subsequently

rides other horses, each with some peculiarity perhaps, and, to keep his place in the string, a slug must be kept going, and an impetuous one restrained ; they cannot both be ridden alike, but they must both be ridden as a jockey should ride them. In this way the lad learns the principle of holding a puller, getting pace out of a lazy one, and leaving well alone with a nice free but temperate mover ; he learns to do everything in a horsemanlike manner, and when he has raised himself to the pitch of a “fashionable” jockey, he will frequently be called upon to ride three or four horses a day at race meetings. A jockey must therefore, mere than any other civilian rider, have a hand for all sorts

of horses, and in the case of two and three year olds a very good hand it must be. The same ability to adapt himself to circumstances must be possessed by the steeple-chase jockey, who should possess fine hands to enable him to handle his horse while going at his fences at three-quarter speed. In most details the nearer a hunting man approaches to a steeple-chase jockey the better; but in the matter of the seat it must be remembered that a jockey’s exertions last but a few minutes, while none can tell when the hunt- ing man may finish his day’s work ; the jockey can there- fore ride with more absolute grip during his race than the rider to hounds.

PART IV.—HORSE-RACING.

Probably the earliest instance of horse-racing recorded in literature occurs in J/, xxiii, 212-650, where the various incidents of the chariot race at the funeral games held in honour of Patroclus are detailed with much vivid-

ness. How far such competitions, which bear in Homer a semi-religious character, may have arisen out of the not unnatural practice an instance of which occurs earlier in the same connexion (//. xxiii. 13, 14) can only be con- jectured ; it is certain, however, that they very soon came to be of national importance. According to the ancient authorities the four-horse chariot race was introduced into the Olympic games as early as the 23d Olympiad; to this the race with mounted horses was added in the 33d; while other variations (such as two-horse chariot races, mule races, loose-horse races, special races for under-aged horses) were admitted at a still later period. Of the training and management of the Olympic race-horse we are left in ignorance ; but it is known that the equestrian candidates were required to enter their namics and send their horses to Elis at least thirty days before the cele- bration of the games commenced, and that the charioteers and riders, whether owners or proxies, went through a pre- scribed course of exercise during the intervening mouth. At all the other national games of Greece (Pythian, Isthmian, Nemean), as well as at many of the local festivals (the Athenian Olympia and Panathenza), similar contests had a prominent place. Some indication of the extent to which the passion for horse-racing was indulged in at Athens, for example, about the time of Aristophanes may be obtained from the scene with which The Clouds opens; while it is a significant fact that the Boeotians termed one of the months of their year, corresponding to the Athenian Hecatombzeon, Hippodromius (‘‘ Horse-race month”; see Plutarch, Cam. 15). Details as to the chariot-races and horse-races of the Greeks, and also of their imitators the Romans, will be found under the headings Circus and Games.

There is no direct historical evidence to show that the ancient Britons addicted themselves to any form of this amusement ; but there are indications that among some at least of the Germanic tribes, from a very early period, horse-racing was an accompaniment of their religious cultus. There can be no doubt that the Romans en- couraged the pursuit in Britain, if they did not introduce lb; traces of race-courses belonging to the period of their occupation have been frequently discovered. The influ- ence of the Christian Church was everywhere at first strongly against the practice. The opinion of Augustine and other fathers of the church with regard to attendance at the spectacles, whether of theatre or of circus, is well known ; those who performed in them were rigidly ex- eluded from church

fellowship, and sometimes even those who merely frequented them. Thus the first council of Arles. in its fourth canon, declared that those members

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of the church who drove chariots at the public games should, so long as they continued in that employment, be denied communion. (Compare the rule in the Ap. Const., vill. 32; ap. Bingham, Ant. Chr. Church, xvi. 4,10.) In many cases, however, the weight of ecclesiastical authority proved insufficient to cope with the force of old custom, or with the fascination of a sport the unchristian cliar- acter of which was not very easily demonstrable; and ultimately in Germany and elsewhere the old local races appear to have been admitted to a recognized place among the ceremonies peculiar to certain Christian festivals.

The first distinct indication which contemporary history affords of horse-racing as a sport occurs in the “ Descrip- tion of the City of London” of William Fitzstephen (c. 1174). He says that in a certain “ plane field without one of the gates (quidam planus campus re et nomine— Smithfield, quasi Smoothfield) every Friday, unless it be one of the more solemn festivals, is a noted show of well- bred (nobilium) horses exposed for sale. The earls, barons, and knights who are resident in the city, as well asa multitude of citizens, flock thither either to look on or buy.” After describing the different varieties of horses brought into the market, especially the more valuable chargers (dextrarios preciosos), he says: ‘‘ When a race is to be run by such horses as these, and perhaps by others which, in like manner, according to their breed are strong for carriage and vigorous for the course, the people raise a shout and order the common horses to be withdrawn to another part of the field. The jockeys, who are boys expert in the management of horses, which they regulate by means of curb bridles, sometimes by threes and some- times by twos, as the match is made, prepare themselves for the contest. Their chief aim is to prevent a com- petitor from getting before them. The horses too, after their manner, are eager for the race; their limbs tremble, and impatient of delay they cannot stand still; upon the signal being given they stretch out their limbs, hurry on the course, and are borne along with unremitting speed. The riders, inspired with the love of praise and the hope of victory, clap spurs to their flying

horses, lashing them with whips, and inciting them by their shouts” (see Stow’s Translation).

In the reign of Richard J. knights rode at Whitsuntide on steeds and palfreys over a three-mile course for “ forty pounds of ready gold,” according to the old romance of Sir Bevys of Hampton. The feats of the tilt-yard, however, seem to have surpassed horse-racing in popular estimation at the period of the crusades. That the sport was to some extent indulged in by King John is quite possible, as running horses are frequently mentioned in the register of royal expenditure ; and we know that Edward III. had a number of running horses, but it is probable they were chiefly used for field sports.

An evidence of the growing favour in which horse-

racing was held as a popular amusement is furnished by the fact that public races were established at Chester + 1512. Randle Holme of that city tells us that to- wards the latter part of Henry VIII’s reign, on Shrove Tuesday, the company of saddlers of Chester presented to “the drapers a wooden ball embellished with flowers, and placed upon the point of a lance. This ceremony was per- formed in the presence of the mayor at the cross of the Roody or Roodee, an open place near the city; but this year (1540) the ball was changed into a silver bell, valued at three shillings and sixpence or more, to be given to him who shall run best and furthest on horseback before them on the same day, Shrove Tuesday; these bells were denomi- nated St George’s bells.” In the reign of Elizabeth there ig evidence from the poems of Bishop Hall (1597) that racing was in vogue, though apparently not patronized by the queen, or it would no doubt have formed part of the pastimes at Kenilworth ; indeed, it seems then to have gone much out of fashion.

The accession of the Stuarts opened up an era of pro- sperity for the sport, for James I., who, according to Youatt, had encouraged if not established horse-racing in Scotland, greatly patronized it in England when he came to the throne. Not only did he run races at Croydon and Enfield, but he endeavoured to improve the brecd of horses by the purchase for a high

figure of Markham's Arabian, which little horse, however, was beaten in every race he ran.

In 1607, according to Camden's Britannia, races were run near York, the prize being a little golden bell. Camden also mentions as the prize for running horses in Gatherley Forest a little golden ball, which was apparently anterior to the bell. In 1609 Mr Robert Ambrye, sometime sheriff of the city of Chester, caused three silver bells to be made of good value, which bells he appointed to be run for with horses on St George's day upon the Roodee, the first horse to have the best bell and the money put in by the horses that ran—in other words, a swecpstake—the bells to be returned that day twelvemonth as challenge cups are now; towards the expenses he had an allowance from the city. In 1613 subscription purses are first mentioned. N icholls, in his Progress of James I., makes mention of racing in the years 1617 and 1619. Challenge bells appear to have continued to be the prizes at Chester, according to Randle Holme the younger, and Ormerod's History of Chester, until 1623 or 1624, when Mr John Brereton, mayor of Chester, altered the course and caused the horses to run five times round the Roodee, the bell to be of good value, £8 or £10, and to be a free bell to be held for ever,—in other words, 'a presentation and not a challenge prize.

During James's reign public race mectings were estab- lished at Gatherley or Garterley, near Richmond in York- shire, at Croydon in Surrey, and at Enficld Chase, the last two being patronized by the king, wlio not only had races at Epsom during his residence at Nonsuch, but also built a house at Newmarket for the purpose of enjoying hunting, and no doubt racing too, as we find a note of there having been horse-races at this place as early as 1605. Races are also recorded as having taken place at Linton near Cambridge, but they were probably merely casual meetings. The prizes were for the most part silver or gold bells, whence the phrase "bearing away the bell." The turf indeed appears to have attracted a great deal of notice, and the systematic preparation of running horses was studied, attention being paid to their feeding and training, to the instruction of jockeys,—although private matches between gentlemen who rode their own horses were very common, —and to the adjustment of weights, which were usually

about 10 stone. The sport also scems to have taken firm hold of the people, and to have become very popular.

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[HORSE-RACING,

The reign of Charles I., which commenced in 1625, saw still more marked strides made, for the king not only patronized the racing at Newmarket, which we know was current in 1640, but thoroughly established it there, and built a stand house in 1667, since which year the raees have been annual. Mention is likewise made in the comedy of the Merry Beggars, played in 1641, of races, both horse and foot, in Hyde Park, which were patronized by Charles I., who gave a silver cup, value 100 guineas, to be run for instead of bells. Butcher, in his survey of the town of Stamford (1646), also says that a race was annually run in that town for a silver and gilt cup and cover, of the value of £7 or £8, provided by the care of the aldermen for the time being out of the interest of a stock formerly made by the nobility and gentry of the neighbourhood.

In 1648 Clarendon tells us that a meeting of Royalists was held at Banstead Downs, as Epsom Downs were then called, “under the pretence of a horse-race,” so that horse- racing at Epsom was not unknown early in the 17th century ; Pepys, too, in his Diary of 1663, mentions his having intended to go to Banstead Downs to see a famous horse-race. Cromwell is said to have kept running horses in the year 1653, but in 1654 he appears to have gone so far as to forbid racing for six and eight months re- spectively. After the Restoration in 1660, a new impetus was given to horse-racing, which had languished during the civil wars, and the races at Newmarket, which had been suspended, were restored and attended by the king ; and as an additional spur to emulation, according to Youatt, royal plates were given at each of the prineipal

courses, and royal mares, as they were called, were im-

ported from abroad. Charles II. rebuilt the house origin- ally erected at Newmarket by James I, which had fallen into decay. The Round course was made in 1666, and racing at the headquarters of the turf was regulated in the

most systematic way, as to the course, weights, and other conditions. Charles II. was the first monarch who entered and ran horses in his own name; and, besides being a frequent visitor at the races on Newmarket Heath, and on Burford Downs, near Stockbridge, where the Bibury Club meeting was held, he established races at Datchet. In the reign of James II. nothing specially noteworthy

occurred, but William III. continued former crown dona-

tions and even added to them.

Anne was much devoted to horse-racing, and not only gave royal plates to be competed for, but ran horses for them in her own name. In 1703 Doncaster races were established, when 4 guineas a year were voted by the corporation towards a plate, and in 1716 the Town Plate was established by the same authority, to be run on Don- caster Moor. Nearly a century, however, elapsed before the St Leger was instituted. Matches at Newmarket had become common, for we find that Basto, one of the earliest race-horses of whom we have any authentic account, won several matches there in 1708 and 1709. In the latter year, according to Camden, York races were established, the course at first being on Clifton Ings, but it was subse-

quently removed to Knavesmire, on which the races are

now run, In 1710 the first gold cup said to have been given by the Queen, of 60 guineas value, was run for by six year old horses carrying 12 stone each, the best of three 4-mile heats, and was won by Bay Bolton. In Wal it was increased to 100 guineas. In 1712 Queen Anne’s gelding Pepper ran for the Royal Cup of £100 at York, and her Mustard, a nutmeg grey horse, ran for the same prize in 1713, Again in 1714 her Majesty’s bay horse Star won a sweepstake of 10 guincas added to a plate of £40 at the same place, in four heats, carrying 11 stone. In 1716 the Ladies’ Plate at York for five year olds was wot by Aleppo, son of the Darley Arabian. Racing and match

making continued to be a regular sport at Newmarket, and at York and Hambleton, and we also find a record of a race at Lincoln in August 1717

for a silver tea-board, won by Brocklesby Betty, as was the Queen's Plate at Black Hambleton in the year before.

Between 1714 and 1720 there were races at Pontefract in Yorkshire for plates or money. 'The best of two out of three heats was to be the winner, provided the said horse was not distanced in the third heat—the distance post being 1 furlong from the winning post ; and this appears to. have been a usual condition. In or about the year 1721 Flying Childers is said to have run a trial against Almanzor and Brown Betty over the Round course at New- market (3 m. 4f. 93 y.) in 6 m. 40s,, and another trial over the Beacon course (4 m. 1 f. 138 y.) in 7 m, 30 s.— which is fast even for a six year old; but it is just possible that in those days the art of time-taking was anything but perfect. In 1721 George I. gave 100 guineas in specie in lieu of the gold cup at York presented by Anne, and the king's or queen's plates have been given in cash ever since. In 1725 a ladies' plate was run for on September 14 by female riders on Ripon Heath in Yorkshire. In 1727 Mr John Cheney established the Racing Calendar— an historical list of all the horse matches run, and of all plates and prizes run for in England and Wales of the value of £10 or upwards in 1727, &c. No systematic records had till then been preserved of the running of the race-horses of the day, and it is only through the per- formances of certain celebrated horses and mares that we have any information of what actually took place, and even that is more or less of a fragmentary kind. At this time racing was thoroughly established as a national and popular sport, for there were upwards of a hundred meetings in England and Wales ; but the plates or sweep- stakes run for were for the most part of small value, as £10, £20, £30, £40, and sometimes £50. In 1727, according to Whyte, there were only a dozen royal plates run for in England :—one at Newmarket in April for six year old horses at 12 stone each, in heats over the Round course—first called the King's Plate course; one for five year old mares at 10 stone each, in one heat, and another in October for six year old horses at 12 stone, in heats over the same course ; one at York (which commenced in 1711) for six year old horses, 12 stone each, 4-mile heats ; one at Black Hambleton, Yorkshire (of which no regular account was kept until 1715), for five year old mares, 10 stone, 4 miles; one at each of the following places, Nottingham, Lincoln, Guildford, Winchester, Salisbury, and Lewes, for six year old horses, 12 stone each, 4-mile heats; and one at Ipswich for five year old horses, 10 stone each, A

royal plate was also run for at Edinburgh a i or 1729, and one at the Curragh of Kildare in

In 1739 an Act was passed to prevent racing by ponies and weak horses, 13 Geo. IT. cap, 10, which also prohibited prizes or plates of less value than £50, At this period the best horses seldom ran more than five or six times, and Some not so often, there being scarcely any plates of note except royal ones, and very few sweepstakes or matches of value except at Newmarket until after 1750 ; moreover, as the races were run in heats, best three out of four, over a course of several miles in length, the task set the horses before winning a plate was very severe, and by no means commensurate with the value of the prize. In 1751 the great subscription races commenced at York, the city also giving £50 added money to each day's racing. At

ewmarket there were only two meetings, one in April and the other in October, but in 1753 a second spring meeting was established, and in that year the Jockey Club, Which was founded in 1750, purchased the present racing

gruund. In 1762 a second October meeting was added, in 1765 the July meeting, in 1770 the Houghton meeting, and in 1771 the Craven meeting, In 1766 Tattersall's was established at Hyde Park Corner by Richard Tattersall for the sale of horses; it remained the great emporium of horses, and the rendezvous for betting on horse races, until 1865, when, the lease of the premises at the Corner having run out, it was removed to its present site at Knightsbridge.

We now come to a very important period—that at which the great three year old races were instituted.

The St Leger was established in 1776 by Colonel St Leger, who resided at Parkhill, near Doncaster. On the 24th September, during the Doncaster races, which took place annually in the autumn, at his suggestion a sweep-stake of 25 guineas each for three year old colts and fillies was run over a 2-

mile course; there were six com- petitors, the property of as many subscribers,—a very small beginning, it must be owned. The race was won by a filly by Sampson, belonging to Lord Rockingham, which was afterwards named Allabaculia. In the following year the same stake had twelve subscribers and ten starters, and was won by Mr Sotheron's Bourbon. It was not, however, until the succeeding year, 1778, that it was named thie St Leger, in complement to the founder, at the suggestion of the marquis of Rockingham, on which occasion it was won by Mr T. Gascoigne's Hollandaise, another filly ; thus at the beginning, as well as a century later, the fillies, from Allabaculia and Hollandaise to Apology and Jannette, owing to the cool scason of the year at which it is run, were found capable of taking their own part against the colts in the race. The stakes were increased in 1832 to 50 sovs. each, and the weights have been raised from time to time to keep pace with modern requirements. The Don- caster Cup, a weight for age race for three year olds and upwards, was established in 1801. The course is nearly flat, of an oval or kite shape, about 12 miles round the town-moor. It hasbeen runin 3m. 14s. by three year old horses, carrying 8 st. 10 tb, and fillies 8 st. 5 tb,

The Derby and Oaks were established in 1779 and 1780, the Oaks in the former and the Derby in the latter year. It is true that in 1730 Epsom races became annual, but the prizes were nothing more than the usual plates run for in heats, the money required being raised, by voluntary subscriptions, as well by the owners of booths on the downs as by the parties more immediately interested, whence arose the custom of charges being made by the lord of the manor for permission to erect booths, &c., during the race-meetings. On the 14th May 1779 the twelfth earl of Derby originated the Oaks stakes (named after his seat or hunting box "The Oaks" at Wood-mansterne), a sweepstake for three year old fillies run on a course 14 miles long. The race on its inception was won by Lord Derby's bay filly Bridget, bred by himself— her sire being Herod and her dam Jemima. In the fol-lowing year the earl established a sweepstake of 50 sovs, each, half forfeit, for three year old colts. The distance was then one mile, but it has since been altered to a mile and a half, and is now run on a new course starting on a higher level than before, and joining the old course on the top of the hill. Being a very hilly or up and down course, Epsom is excessively trying to horses not perfectly sound. On the first occasion of the Derby being run it

was won by Sir C. Bunbury’s chestnut colt Diomed by Florizel, son of Herod, who beat eight opponents, including the duke of Bolton’s Bay Bolton and Lord Grosvenor’s Diadem. These two races have since been run for regularly every year, the Derby, which before 1839 was run on the Thurs- day, now taking place on the Wednesday, and the Oaks on the Friday in the same week at the end of May. Two

XII. — 26

The St Leger,

The Derby an Oaks,

Ascot races.

Good- wood.

Two Thou- sand, &c.

Handi- caps.

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fillies only have won both races, viz., Sir C. Bunbury’s Eleanor in 1801 and Mr W. T’Anson’s Blink Bonny in 1857, but Deception ran second for the Derby in 1839, and subsequently won the Oaks. The course has been run in 2m. 43s. by colts and in 2 m. 448. by fillies.

Ascot races, which are held on Ascot Heath, on the con- fines of Windsor Park, close to the kennels of the royal buckhounds, were established by the duke of Cumberland, uncle of George IIL, aud are patronized by royalty in state or semi-state. ‘They are mentioned in the first Racing Calendar, published in 1727, but the races were for the most part plates and other prizes of small importance, though a royal plate for hunters appears to have been given in. 1785. The Gold Cup was first given in 1807, and has been regularly competed for ever since, though from 1845 to 1853 inclusive it went by the designation of the Emperor’s Plate, the prize being offered by the emperor of Russia. In 1854, during the Crimean war, the cup was again

called the Ascot Gold Cup, and was given from the race fund. The Queen's Vase was first given in 1838, and the Royal Hunt Cup in 1843, while in 1865 a new long-distance race for four year olds and upwards was established, and named the Alexandra Plate, after the Princess of Wales.

Goodwood races were established by the duke of Richmond on the downs at the northern edge of Goodwood Park in 1802, upon the earl of Egremont discontinuing races in his park at Petworth. The course is situated in most lovely scenery, about 5 miles from Chichester, with downs and woodlands to the north, and the sea and thie Isle of Wight to the south. The races take place at the end of July, on the close of the London season. The Goodwood Cup, the chief prize of the meeting, was first given in 1812; but from 1815 to 1824 inclusive there was no race for it, with the single exception of 1816. Since 1824 it has been competed for annually.

During the latter half of the 18th century horse-racing declined very much in England, aud numbers of meetings were discontinued, the wars which took place necessarily causing the change. From the beginning of the 19th century, and especially after the conclusion of the French war in 1815, racing rapidly revived, and many new meet- ings were either founded or renewed after a period of suspension, aud new races were from time to time estab- lished. Among others the Two Thousand Guineas at Newmarket for three year old colts and fillies, and the One Thousand Guineas for fillies, were established in 1809 and 1814 respectively, the Goodwood Stakes in 1823, the Chester Cup and Brighton Stakes in 1824, the Liverpool Summer Cup in 1828, the Northumberland Plate in 1833, the Manchester Cup in 1834, the Ascot Stakes and the Cesarewitch and Cambridgeshire Handicaps at Newmarket in 1839, the Stewards' and Chesterfield Cups at Goodwood in 1840, the Great Ebor Handicap at York in 1848, and, to omit others, the City and Suburban Handicap at Epsom in 1851, and the Lincoln Handicap in 1853. With the exception of the Two Thousand and One Thousand Guineas run for in the spring at Newmarket, which are as it were junior Derby and Oaks, or at any rate public trials for those events, all these races are handicaps, which came into fashion for the following reasons :—

In the early days of racing the plates or stakes were given for competition by horses of not less than five and generally of six years of age, all carrying

the same weights, so that if a four year old, as sometimes happened, entered, it took no allowance from its older and more mature opponents, but had to compete with them on even terms, or at a material disadvantage considering the difference in age. We then find that weight for age races were intro- duced, a specified difference in weight for each year, where all were not of the same age, being conceded by the older

horses. As time went on, however, it was found that when well-known winners entered for a race, other com- petitors withdrew, and sport was spoiled. A remedy was devised in handicapping, that is, in apportioning a table of weights to the competitors, placing the heaviest impost oa the best public performers, and lighter weights in a descend- ing scale upon those of lower calibre, in proportion to their known or assumed demerits. The object of course was in theory to place all, both good and bad, on an equal footing, —in other words, so to burden them that on paper they should all be equal and run a dead heat. In practice it is often far otherwise, for the real merits of a horse are frequently kept secret, and he is sent to run in public half trained, with the view of deceiving the handicapper, who then puts on him a lighter weight than he is capable of carrying, and the race and a large stake of money in bets are frequently so won. It is unnecessary to say that handicaps are thus responsible for much of the malpractice which prevails on the turf, and for keeping in training inferior horses otherwise valueless.

No horses of less than three years of age are allowed to run in handicaps, and at present the lowest weight is 5 st, 7 tb, although some years back it was as low as 4 stone, a weight carried to victory in the Chester Cup by Red Deer in 1844. It would be astep in the right direction to raise the minimum to 7 stone, which would not only tend to the improvement of the horses running, but permit abler and stronger jockeys than the present feather-weiglits to ride.

Two year old racing was established very shortly after the great three year old races, and on a similar footing, that is to say, the competitors carried the same weights, with the exception of a slight allowance for sex,—the J uly

Stakes at the Newmarket midsummer meeting having been foundedas early as 1786. The Woodcote Stakes at Epsom succeeded in 1807, the Champagne Stakes at Doncaster in 1823, the Criterion Stakes at the Houghton meeting in 1829, the Chesterfield Stakes at the Newmarket July meeting in 1834, the New Stakes at Ascot in 18438, the Middle Park Plate (or two year old Derby, as it is sometimes called) at the Newmarket second October meeting in 1866, the Dewhurst plate at the Houghton meeting in 1875, and the Rich. mond Stakes at Goodwood in 1877.

No race is now run over a shorter course than 5 furlongs.

The number of races in Great Britain in the year 1879, Stat according to the Macing Calendar, was 1626, of which Hs fifty-nine only were of 2 miles and upwards, ten of 3 miles ms and above, and two of 4 miles. The number of horses prit competing was 844 two year olds, 633 three year olds, 314 four year olds, and 322 of five years and upwards— in all 2113; and the value of the stakes run for amounted to £380,699. During the same period there were foaled 955 thoroughbred colts and 900 fillies, while 716 mares were barren, 98 slipped their foals, 152 were covered by halfbred horses or not covered at all, and 174 either died or were sent abroad before foaling— the total number of mares on the register being nearly 3000. The horses at the stud who sired the above foals amounted in round numbers to 390. ;

The following table will show the value of the principal two and three year old races for the last six years‘—

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18974. | 1875. | 1876. | 1877. | 1878. 1879. 2 |e | 2 |2.2 Two Thousand }1 4900 | 4550 | 4100 | 6200 | 4650 | 6250 UINCAS ....00000 oa _ Thousand } | 3959 | 2360 | 3100 | 4750 | 4500 | 4200 UINEAS .....00- jn eer: 5350 | 4950 | 5575 | 6050 | 5825 | 7050 CORI fopas eases 4375 | 2925 | 4300 | 4150 | 5000 | 4426 BiTeeer uu 4625 | 4150 | 4825 | 5025 | 5750 | 6650 3340 | 8430 | 3860 | 3610 | 3790 | 3470

Middle Park Plate

HORSE 203

Few handicaps ever reach £2000 in value; but to the Manchester Cup of 1880 the sum of £2000 added money was advertised, being the largest amount ever given to a single race, of course irrespective of the stakes of the

HORSE-RACING. |

Horst-RACING AND TROTTING IN THR UNITED STATES.

Horse-racing was indulged in to a limited extent in Maryland and Amert- Virginia as early as the middle of the 17th century, particularly ean rae- in the latter colony. Most of the inhabitants of both were either ing.

individual entries.

In regard to the sums won by individual horses we may instance £18,681 won by Gladiateur as a thee year old, and £18,025 by Lord Lyon, both of whom won Guineas, Derby, and St Leger ; £17,850 by Formosa, who divided the Two Thousand Guineas, and won the One Thousand, Oaks, and St Leger; £11,755 by Achievement, who took the One Thousand and St Leger, after having won £10,387 as a two year old; and £12,074 by Wheel of Fortune, including the One Thousand and the Oaks, after having taken £7665 as a two year old.

The treatment or training of racers is esseutially a trade of itself, for horses intended to run for stakes are either sont, if few in number, to a public training stable, such as those at Newmarket and other places, or else, when numerous, are prepared for their engagements by a private trainer, tle treatment in both cases being the same. The usual charge per horse in a public stable is from 2 to 2} guineas a week, which includes feeding and grooming.

Racing has made cousiderable progress in other countries besides Great Britain, notably in France, Germany, and Austria-Hungary, whither some of

the very best bred Iinglish horses and mares have from time to time been exported to increase the numbers of thoroughbreds reared on the Continent. Thence have been sent to compete in England such horses as Jouvence, Baroncino, Monarque, Dollar, and Flageolet, winners of the Goodwood Cup in 1853, 1855, 1857, 1864, and 1873 respectively ; Gladiateur, winner of the Two Thousand Guineas, Derby, and St Leger in 1865; Fille de l'Air, Reine, and Enguerrande, winners of the Oaks in 1864, 1872, and 1876 ; Mortemer, Henry, Boiard, and Verneuil, winners of the Ascot Cup in 1871, 1872, 1874, and 1878; Chamant, winner of the Two Thousand Guineds in 1877; Sornette and Dutch Skater, winners of the Doncaster Cup in 1870 and 1872; and Rayon d'Or, wiuner of the St Leger in 1879. From Austria-Hungary have come Kisber, winner of the Derby in 1876, and the unbeaten filly Kincsem, winner of the Govdwood Cup in 1878. In France especially, enormous strides have been made in racing, and, when the superiority of its climate over that of England is considered, it is not surprising that French horses have achieved a fair measure of success in the leading races of the English turf.

American horses have sometimes been sent over to com- pete in England, but on the whole they have not been very successful, as they have found the English horses too good for them. 'Their chief successes have been those of Prioress in the Cesarewitch in 1857, of Starke in the Goodwood Cup of 1861, and of Parole in the Newmarket Handicap and the City and Surburban and Metropolitan Stakes at Epsom in 1879.

Steeple-chasing and hurdle-racing take place during the

3 winter months, partly in amalgamated meetings of flat aud . ross-country races, and partly in meetings purely across

country and overfences. The chief event is the Liverpool Grand National, run at Aintree towards the close of the hunting season, It dates from 1839, and, though formerly won by well-bred hunters, now commonly falls to thorough- breds cast off from racing stables as too slow for the flat, as do nearly all the steeple-chases and hurdle-races. Its value averages from £1500 to £1700. There are many Meetings in the provinces and in the London district at which steeple-chases and hurdle races are run, but the more important of them are at Croydon, Sandown Park near Esher, Lincoln,

Rugby, Warwick, Bristol, &c. The prizes are nearly always won by thoroughbreds. (E. D. B.)

from the British Isles or were descended from parents who had immigrated from them, and they inherited a taste for the sport. The animals used for this purpose, however, were not highly prized at the time, and the pedigree of not even one of them has been pre- served, A horse called Bully Rock by the Darley Arabian out of a mare by the Byerly Turk, granddam by the Lister Turk, great-granddam a royal mare, foaled 1718, is the first recorded importation of a thoroughbred horse into America. He was imported into Virginia in 1730. In 1723 the duke of Bolton bred amare named Bonny Lass by his celcbrated horse Bay Bolton out of a daughter of the Darley Arabian. She became celebrated in Eugland as a brood mare, and was the first thorouglibred mare, according to the records, that was carried to America. This is supposed to have been in or after 1740, as the Stud-Book shows she produced in England after 1739 a filly by Lord Lonsdale's Arabian, and subsequently became familiar to the public as the granddam of Zamora. The importations inereased very rapidly from this period, and many valuable shipments were made before the war which resulted in a separation of the colonies from the mother country. This acquisition of thoroughbred stock increased the number and value of racing prizes, and extended the area of operations into the Carolinas in the South, and New Jersey and New York in the North. The first race run in South Carolina was in February 1734, for £20. It took place over " tlic Green," on Charleston Neck. This shows that the earlier races in America were actually on the turf, as they have always been in England. The next year a Jockey Club was organized at Charleston (1735), and a course was prepared, such as thosc which have since come into general use throughout the States, from which the turf is re- moved and the ground is made as nearly level as may be. They are generally oval in shape, and a mile in length, with posts a fur- long apart. A race of greater distance tlian one mile is aceom- plished by traversing the track the necessary number of times to complete the distance prescribed by the conditions of the race.

After the establishinent of the government of the. United States (1776), the importation of thoroughbred horses from England became quite common, and selections were made from the best stocks in the United Kingdom. This

continued and even inereased as the eountry became devcloped, down to 1840. The following Derby winners, were among those carried into the States :—Diomed, who won the first Derby in 1780 ; Saltram, winncr in 1783 ; John Bull, winner in 1792; Spread Eagle, winner in 1795 ; Sir Harry, winner in 1798 ; Archduke, winner in 1799 ; and Priam, who won in 1880. The most important and valuable importations, however, proved to be Jolly Roger, Fearnought, Medley, Traveller, and Dionied in the last century, and Glencoe, Leviathan, Tranby, Lexington, Margrave, Yorkshire Buzzard, Albion, and Leamington of the present century. The best results have been obtained from Diomed and Glencoe. Diomed sired one horse, Sir Archy, who founded a family to which nearly all the blood horses of America trace back. He was foaled in 1805, in Virginia, and became celebrated as a sire, The superi- ority of his progeny was so generally conceded, that they were greatly souglit after. From this period, too, the number and value of races increased ; still they were comparatively few in number, and eould not compare in value with those of Great Britain. Up to 1860 the value of racing prizes was quite inadcquate to develop large breeding establishments, or to sustain extensive training stables, Durimg that year the number of races run was about 250, of the estimated value of $100,000 (£20,000), The institution, however, was in a healthy condition, and gained rapidly in public favour, when the civil war between the North and the South broke ont, which raged for four years. Brecding establishments were broken up during that time; the horses were taken by the armies for cavalry purposes, for which service they were highly prized; and racing was completely paralysed for that period. It took some time to regain its strength ; but an era of prosperity sct in, about 1870, and it has since continued to grow and extend the area of its operations, until it has become the chief sport and amuscment of the more populous cities of the States.

In 1874 there were 958 races run of the value of $496,772 ; in 1875, 866 races, of the value of $490,649; in 1876, 782 races, valued at $485,509 ; in 1877, 907 races, valued at $441,652; in 1878, 1058 races, valued at $461,395; and in 1879, 1221 races were run, of the value of $545,624. In 1877 as many as 1093 horses started ; in 1878 there were 1382, and last year 1524. This incrcase in the value of racing events, and the consequent demand for horses of this class, have stimulated the breeding interests of tle couutry. There are only four prominent breeding establishments whieh

breed and sell the foals produced as yearlings to the public annually. There are, however, a large number of private breeding establishments, some of them nearly or quite as extensive as the public studs. The number of brood mares in the country is about 2100 ; the stallions

number over 300, and the annual number of foals is estimated at about 1400. There are no official records of the produce.

One of the peculiar features of racing in America is that all events are officially timed, and the time is recorded by the clerks of the jockey clubs upon the books of the elub. By it the value of differ- ent performances by the same or different horscs is generally esti- mated. Of course other elements are considered, such as the weight carried, the age of the horses, the weather, the condition of the track, &c. Ifa horse of the same age and weight, and over courses of similar conditions, can run a mile a second quicker than another horse, he is regarded as faster at the distance than his rival. The artificial tracks of the country make time a reasonably accurate test when weighed in connexion with other circumstances. Each club has its official timer, who gives the time taken to the clerk as soon as the race is over. The following is the fastest time made at all distances in the United States, down to July 1, 1880:—

older horses have no record at this distance. three year olds, 1m. 153 8.;

Half mile.—Two year olds, 47% s.;

Three quarters of a mile.—Two year olds, 1m, 15s. ; four year olds and upwards, 1 m. 15s.

One mile.—Two year olds, 1m, 4338.; three year olds, 1 m, 413 s.; four years and upwards, 1m. 39 s.

One mile and a furlong.—Three year olds, 1 m. 54 8.; four years and upwards,

lm. 5538,

One mile and a quarter.—Three year olds, 2m. 8hs.; four years and upwards, 2m. 838.

One mile and a half.—Three year olds, 2 m. 37 8.; four year olds and upwards, 2m, 343 8.

One mile and five furlongs—Three year olds, 2 m. 493 s.; four years and up- wards, 2m. 53 s.

One mile and three quarters.—Three year olds, 3m. 538.; four years and up-wards, 3m. 48.

Two miles,—Three year olds, 3 m. 30} s.; four years and upwards, 3 m. 27} s.

‘Two miles and a furlong.—Three year olds, 3 m. 50 8.; four years and upwards,

3m, 45} 8.

Two miles and a quarter.—Three year olds, 4 m. 2s. ; four years and upwards, 3 m. 56} 8.

Two miles and a half.—Three year olds, 4 m. 31} 8.; four years and upwards, 4m. 273 8.

Two miles and three quarters.—Four year olds and upwards, 4 m. 58} s.

Three miles.—Three year olds, 5 m. 28 s.; four years and upwards, 5 m. 263 s.

Four miles.—Three year olds, 7 m. 313 s.: four years and upwards, 7 m. 153 s. (J. R, H.)

Trotting.—The development of speed in the trotting-horse through systematic breeding and training is one of the great industries of the United States of America and the Dominion of Canada, and in no other portion of

the world is it pursued to any great extent, except in Russia. This interest, which has attained vast proportions, is entirely the growth of acentury, dating back to the importation to Philadelphia from England, in 1788, of the thorough- bred horse Messenger. This was a grey stallion, by Mambrino, 1st dam by Turf, 2d dam by Regulus, 3d dam by Starling, 4th dam by Fox, 5th dam Gipsey, by Bay Bolton, 6th dam by duke of Newcastle's Turk, 7th dam by Byerly Turk, 8th dam by Taffolet Barb, 9th dam by Place's White Turk. He was eight ycars old when imported to the United States. He was at the stud for twenty years, in the vicinity of Philadelphia and New York, serving a number of thoroughbred mares, but a far greater number of cold-blooded mares, and in the progeny of the latter the trotting in- stinct was almost invariably developed, while his thoroughbred sons, who became scattered over the country, were also noted for transmit- ting the trotting instinct. That Messenger was the fountain-head of American trotting is shown by the fact that almost every trotter of merit in that country, whose pedigree is reasonably well established, traces to him in one or more lines, and the more Messenger strains there are in a pedigree the greater is its esteemed value. It was years after the death of Messenger, however, before these facts be- came apparent ; tne taste of the country in racing matters was con- fined to running contests, and systematic trotting breeding is of much later growth. The first public trotting race of which there is any account in the United States was in 1818, when the grey gelding Boston Blue was matched to trot a mile in 3 minutes, a feat deemed. impossible, but he won, though the time of his performance has not been preserved. From about that date, interest in this gait began to increase ; breeders of trotters, in a small way, sprang up, and horses were trained for trotting contests. The problem of breeding trotters has been necessarily found to be a much more complex one than that of breeding the thoroughbred, as in the latter case pure blood lines of long recognized value could be relied upon, while in the former the best results were constantly being obtained from most unexpected sources. At the present day, the leading families are the Hambletonian, of which the modern head was Rysdyk's Hambletonian, a bay horse foaled in 1849, got by Abdallah (traced to imp. Messenger on the side of both sire and dam) out of the Charles Kent mare, by imp. (¢.e., imported) Bellfounder, with two crosses to imp. Messenger on her dam's side ; the Mambrinos, whose modern head was Mambrino Chief, foaled 1844, by Mambrino Paymaster, a grandson of imp. Messenger ; the Bashaws, founded by Young Bashaw,

foaled 1822, by Grand Bashaw, an Arabian horse, dam Pearl, by First Consul; the Clays, springing from Henry Clay, a grandson of Young Bashaw through Andrew Jackson, and pro- perly a branch of the Bashaw Family, but arbitrary usage, of which there is much in American trotting lineage, makes them distinct ;

the Stars, springing from Stockholm's American Star, by Duroc son of imp. Diomed ; the Morgans, whose founder was Justin Mor: gan, foaled 1798, by a horse called True Briton, or Beautiful Bay who was probably thoroughbred ; the Black Hawks, a branch of the Morgan family; the Blue Bulls, descended from Doyle's Blue Bull, foaled 1855, a pacer, sired by a pacer of the same name, dam by Blacknose, son of Medoc ; the Canadians, whose best represen. tatives were St Lawrence and pacing Pilot, horses of unknown pedi- gree ; the Gold Dusts, another branch of the Morgan family ; and the Royal Georges, springing from Tippoo, a horse who was pro- bably by Ogden's Messenger, son of imp. Messenger. 'There are many subordinate branches of these leading families not named here, and in some cases trotters of great speed have been produced which do not trace to any of the sources mentioned. Jt tolloyy that the breeder has an extensive field before him, and the questions of in-breeding or out-crossing, of the value of thoroughbred crosses, pacing crosses, &c., have to be considered, and are abundantly dis. cussed. There are many large and successful establishments /¢ breeding trotters at the present day. All of them are extensive in acreage, while on several a hundred or more brood mares are kept, besides a number of stallions. Asa rule, the stallions do service outside the farms of their owner, but in some cases they are re- served strictly for home use. Very large prices are frequently paid for youngsters, solely on the strength of their breeding. In 1876 $13,000 was paid for two two year old fillies, and $41,200 for a lot of thirteen, nearly all young. Steinway,a three year old colt, wassold in 1879 to go to California, for $18,000; and in 1878 $21,000 was paid for the four year old filly Maud §&., after she had trotted a mile in public in 2 m.17$s. Much larger sums have been paid, however, for matured trotters, such as $40,000 for the stallion Smuggler, $88,000 for Pocahontas,

$35,000 for Dexter, $36,000 for Rarus, and long prices for many others ; StJ ulien, the trotter wit! the fastest record at the close of 1879, was held at $50,000, whil Rysdyk's Hambletonian, Messenger, Duroc, and Volunteer were valued, in their prime, at $100,000 each.

Since the carly days of American trotting, the advance has beer rapid and the changes marked. After the performance of Boston Blue, mentioned above, more attention was paid to the gait, bat for a long time the races were generally under saddle, and at long distances, 3 miles being rather the favourite. The best of the old time trotters were Edwin Forrest, who trotted a mile in 2 m. 81}. in 1834; Dutchinan, whose 3 miles under saddle, in 7 m. 32k s., isstill the best on record; Ripton ; Lady Suffolk, who trotted a mile in 2m. 264s. in 1848, and headed the list of performers; Mac, Tacony, &e, Since 1850, however, the taste of the people has settled upon the style of race called ‘‘ mile heats, best three out of five, in harness,” as the favourite, and nine out of ten contests are of this character. By ‘in harness ” is meant that the horse draws a sulky, a light two-wlieeled vehicle in which the driver sits close to the horse, with his legs on each side of his flanks. These sulkies often weigh less than 40 tb. The driver is required to weigh, with the blanket on which he sits, 150 tb, while for saddle races the regulation weight is 145 tb, or 10 st. 5 tb. Each heat of a mile is a separate race ; 20 minutes is allowed between heats; and the horse that first places three heats to his credit wins the race. There are various penalties imposed upon a horse that breaks into a run in a trotting race. The driver is required to pull him to a trot as quickly as possible ; if the horse gains by running, the judges set him back at the finish twice the distance he has gained, in their estima tion, by running; and for repeated ‘ breaks” they can declare him distanced. ‘The first-class tracks are of oval shape, with long stretches and easy curves, measuring 1 mile at 3 feet distance from the ‘‘ pole,” as the inner railing of the track is called. The time in which the leading horse trots each heat is accurately kept, placed on a blackboard in front of the judges' stand for the information of the publie, and also placed in the book of the course. The fastest time that any trotter has is thus entered as his “record.” This isone of the distinctive features of trotting in America. The purses that are given by the association owning tracks are generally divided into classes, such as for horses that have never beaten 3 minutes, that have never beaten 2m. 40s., 2m.20s., &c. Hence itis an object, as arule, for the record

of a trotter to be kept as slow as possible, that he may be eligible to compete in slow classes, and as the purses are divided into three or four monies, and the second money is usually half as large as the first, drivers frequently ‘‘ pull” a superior animal, an content themselves with an inferior portion of the purse for the sake of avoiding a record, which attaches only to the winner of a heat, and from this cause springs a great deal of dishonest racing. It isin the power of the judges, when they think that a horse is not being driven to win, to substitute another driver, and this is often done.

Prior to 1866 purses for trotters were small; match races were more in vogue, and the trotting turf was in bad odour. In that year an association was formed at Buffalo, N.Y., which undertook to remedy the evil, and inaugurated its efforts by offering the then unprecedented sum of $10,500 for a trotting meeting of four days duration. The experiment was successful; other cities followed the example of Buffalo; larger and larger purses were given; and at Bul-

falo in 1872 the prizes amounted to $70,000. Twice at this point $20,000 has been given for a single race, a sum nearly equal to an average Derby winning. Other cities are also in the habit of giving large purses, and the amount offered in the United States and Canada, during a single year, has reached nearly $1,500,000. In- dividual trotters, in the course of a long turf career, earn enormous ajaounts. The most remarkable instance of this was the mare Goldsmith Maid, by Alexander’s Abdallah (a son of Rysdyk’s Hembletonian), out of an Abdallah mare. She began trotting in 1866, and left the turf in 1878, when twenty-one years old, and her winnings amounted to over $200,000.

In 1869 the organization now known as the National Trotting Association was formed, and it embraces in its membership all the principal tracks of the continent. All members of this association respect the penalties imposed by any other member, and exclusion from the privileges of one is exclusion from the privileges of all. This has had a great tendency to reform abuses on the trotting turf, enabling severe penalties to be inflicted for infractions of

the rules, a very elaborate code of which has been published by the National Trotting Association, and is revised triennially.

In trotting races, it will be noted, the time test is supreme, differ- ing from running races, in which time is of comparatively little con- sequence. The animal which has the fastest record for 1 mile in harness is, until deposed, the king or queen of the trotting turf. Lady Suffolk, with her record of 2 m. 264 s., in 1848, held this honour until 1853, when Tacony trotted in 2m. 254s. under saddle ; Flora Temple wrested it from him in 1856 by trotting in 2 m, 244s. in harness. ‘This latter mare, in 1859, trotted a mile in 2m. 193 s., a feat which the best horsemen thought would never be repeated, but since that time forty-two trotters have beaten 2m. 20s. Dexter’s record was 2m. 174 s. in 1867, and Goldsmith Maid’s in 1871 was 2m. 17s., which she reduced, by successive efforts, to 2 m. 162 s., 2m.16s.,2m.15s., 2m. 143s., and finally, in 1874, to2m. 14s, In 1878 Rarus trotted a mile in 2 m. 13} s., and in October 1879 the bay gelding St Julien, by Volunteer, son of Rysdyk’s Ham- bletonian, dain by Henry Clay, trotted a mile in California in 2 m. 123s, There is a great diversity of opinion among the best informed horsemen as to the limit of trotting speed, but none fix it slower than 2m. 10s., while the more sanguine believe that a mile will yet be made by a trotter in 2 minutes. The pacing gait, in which the front and hind legs on the same side are inoved in the saine direction simultaneously, is admitted to be faster than the trotting, in which the near fore leg and the off hind leg move together, but as pacing is not fashionable, and small purses are given for contests between pacers, a great deal of skill has been expended, of late years, in con- verting pacers to trotters. This is done by means of toe-weights ou the forward feet, which are knobs of brass or iron screwed into the hoof or fastened to the shoe, by means of which a competent trainer can not only change a pacing into a trotting horse, but can correct any errors of gait in a natural trotter. With inveterate pacers very heavy weights have to be used, but these can gradually be lessened as the horse becomes accustomed to the trot. So effec- tive are these weights fovnd that there are very few fast trotters upon whom they are not used to some extent, unless the same object is effected by wearing a very heavy forward shoe.

_ The market for American trotters is by no means confined to those intending to use them for track purposes. While there are probably ten

thousand in training, at least an equal number are used by gentlemen for road purposes; and there is great rivalry among millionaires with a taste for driving to secure the best stable, and especially the fastest double team. In September 1877 Mr W. H. Vanderbilt drove his team, composed of Small Hopes and Lady Mac, a full mile over Fleetwood Park track, near New York city, in 21n. 238,, which is 34 seconds faster than the best record for a mile bya double team, the 2 m. 23 s. performance not being a technical record.

As an indication of the rapid advance that has been made in the general speed of the American trotter, a table recently published in the United States, giving the names of all horses that had trotted

HORSE-CHESTN UT, disculus, L. (Germ., Rosska- stame; Fr., marronnier d' Inde), a genus of trees or shrubs indigenous to North America and mountainous regions in Mexico, New Granada, Persia, North India, and the Malayan peninsula, of the natural order Sapin- dacece and suborder Sapindew, having exstipulate, opposite, digitate, 5- to 9-lobed leaves, an irregular campanulate or tubular 5-lobed calyx, 4 to 5 petals, 5 to 8 stamens, one style, a 3-celled ovary, with 6 ovules, of which 3 or more abort, exalbuminous seeds, and a smooth or echinate forlaceous capsule. The Common Horse-chestnut, Z. Hip- Pocastanum, L., has been stated to be a native of Thibet,

1 mile in harness in 2 m. 25 s., or better, up to the close of 1879, includes 317 performers, and all these, except 25, were living when the table was published. This showsthat a 2 mi. 25 s. record was a very unusual occurrence only a horse generation since, while now an animal who cannot show that rate of speed is not cousidered a promising competitor in turf contests.

Every year a book is published containing summaries of all the trotting and pacing events of the preceding year. The record for 1875 showed 3304 events, amount of purses and stakes, $1,418,971; for 1876, 3484 races, $1,078,449; for 1877, 2802, $951,137 ; for 1878, 2737, $817,629 ; and for 1879, 2246 raccs, amount of purses and stakes, $750,000.

We give, in conclusion, a table of the fastest trotting and pacing

records, at all distances, ages, and ways of going, complete up to July 1880 :—

Trotting in Iarness.

One mile—St Julien, Oakland Park, Cal., Oct. 25, 1879, 2 m. 123 s., ina first heat. One mile (second heat)—Rarus, Hartford, Conn., Angust 23, 1878, 2m. 13} s. One mile (third heat)—Rarus, Buffalo, N.Y., August 3, 1878, 2m. 133s.

One mile (fourth heat)—Lula, Rochester, N.Y., August 14, 1875, 2m. 17 8,

One mile (fifth heat)—Smnggler, Cleveland, 0., July 27, 1876, 2m. 174s.

One mile (sixth heat) —Goldsmith Maid, Nartford, Conn., Ang. 31, 1876, 2 m.193 8.

One mile—Smugeler, Hartford, Conn., August 31, 1876, 2 m. 153 s., the fastest heat by a stallion.

Half-mile, by a yearling—Memento, Lexington, Ky., October 10, 1877, 1 m. 301 s.

One mile, by a two year old—So-So, Lexington, Ky., October 12, 1877, 2 1n. 31s.

One mile, three year old—Jewett, Lexington, Ky., Oct. 15, 1879, 2 m. 23} s.

One mile, four year old—Trinket, Louisville, Ky., July 10, 1879, 2 m. 193s.

One mile, five year old—Santa Claus, Sacramento, Cal., Sept. 11, 1879, 2m. 18 s.

One mile, over half-mile traek—Rarus, Toledo, O., July 20, 1878, 2m. 16s.

One mile, fastest two eonseeutive heats—Rarus, Iartford, Conn., August 23, 1878, 2m. 134 s., 2m. 13} 8.

One mile, fastest three conseeutive heats—Rarns, Iartford, Conn., August 23, 1878, 2m. 15s., 2 m. 134 8., 2 m. 133 s.

One mile, fastest four consecutive heats—Gloster, Rochester, N.Y., August 14, 1874, 2m. 18 s.,, 2 m. 173 8, 2m.17 s.,2 m.198.,; and Goldsmith Maid, Hartford, Conn., August 31, 1876, 2 m. 163s. 2 m.174s,,2m.185s. 2m. 193s. The aggregate times of these two performances are equal.

Two miles— Flora Temple, Eclipse Course, L. I., August 16, 1859, 4m. 50} s,

Three miles—Huntress, Prospect Park, Brooklyn, N.Y., Sept 23, 1872, 7 m. 2148.

Four miles—Trustee, Union Course, L. I., June 13, 1849, 11 m. 6 s,

Five miles—Lady Mack, San Francisco, Cal.. April 2, 1874, 13 m.

Ten miles—Controller. San Franeisco, Cal., November 23, 1878, 27 m. 283.8.

Fifteen miles—Girda, San Franciseo, Cal., August 6, 1874, 47 m. 20s.

Twenty miles—Capt. M‘Gowan, Boston, Mass , 1865, 58 m, 25 s.

Fifty miles—Ariel, Albany, N.Y., 1846, 3h. 55 m. 404 s,

One hundred miles—Conqueror, Long Island, November 12, 1853, 8 h. 55 m. 53 8.

Trotting to Waggon.

One mile—Hopeful, Chicago, Ill., October 12, 1878, 2 m. 163 s., in a first heat, One mile (second heat)—Hopeful, Chicago, Ill., October 12, 1878, 2 m. 17s. One mile (third heat)—Hopeful, Chieago, Ill., October 12, 1878, 2m. 17 s. One mile, drawing 2000 Ib—Mountain Maid, Long Island, 1865,

3 m. 244 s, Two miles—Gen. Butler, Long Island, 1863, first heat, 4 m. 564.s.; Dexter, Long

Island, October 27, 1865, second heat, 4 m. 56} s. Three miles—Kemble, Jackson, June 1, 1853, 8m. 38. Four miles—Longfellow, California, December 31, 1869, 10 m. 34} s. Five miles—Little Mack, Fashion Course, L.I., October 29, 1863, 13 m, 433 s. Twenty miles—Controller, San Franeisco, Cal., April 20, 1878, 58 m. 57s. Fifty miles—Spangle, October 15, 1855, 3 h. 49 m. 4s.

Trotting, Double Teams,

One mile—Gen. Cobb and Lulu May, San Francisco, Cal., 1877, 2 m. 26} s., in a third heat.

One mile, with running mate—Ethan Allen and mate, Fashion Course, L.I., June 21, 1867, 2m. 15 s., in a first heat.

One hundred miles—Master Burke and Robin, 10 h. 17 m. 22s.

Trotting under Saddle,

One mile—Great Eastern, Fleetwood Park, N.Y., September 22, 1877, 2 m. 152 s. Two miles—~Dexter, Long Island, 1865, 5 m. 03s.

Three miles—Dutchman, Beacon Park, N.J., August 1, 1839, 7 m. 32} s.

Four miles—Duteliman, 1836, 10 m. 31s.

Pacing. One mile, in harness—Sleepy Tom, Chieago, IIl., July 25, 1879, 2m. 12} s. One mile, under saddle—Billy Boyce, Buffalo, N.Y., August 1, 1868, 2 m. 14} s. One mile, to waggon—Pocahontas, June 21, 1855, 2 m. 17} s. Two miles, under saddle—Bowery Boy, Long Island, 1839, 5 m. 43 8. Two miles, in harness—Hero, May 17, 1853, 4 m. 56} s. Three miles, under saddle—Oncica Chief, Beacon Park, N.J., 1843, 7 m. 44 s. Three miles, in harness—Harry White, San Franciseo, Cal., August 8, 1874, 7 m. 57} 8. (W. T. C.)

and to have been brought thence to England in 1550; it is now, however, thought to be indigenous in the moun- tains of northern Greece, where it occurs wild at 3000 to 4000 feet above sea-level (Gard. Chron., 1880, 1. 488). Matthiolus, who attributes the origin of the name of the tree to the use of the nuts by the inhabitants of Constantinople for the relief of short-windedness and cough in horses,! remarks that no ancient writer appears

1 Opera que extant omnia, ‘‘Comment.,” lib. i. eap. exxii. p. 184, Frankfort, 1598, fol.; ¢f Gerard, Herball, p. 1443, 2d ed., 1633. For other derivations see Notes and Quertes, 3d scr., x. 452, 523, and Gard. Chron., 1878, ii. 53.

to have made mention of the horse-chestnut. Clusius (Rariorum plantarum hist., lib. i. p. 8, 1601) describes it as a vegetable curiosity, of which in 1588 he had left in Vienna a living specimen, but of which he had not yet geen either the flowers or recent fruit. The dry fruit, he says, had frequently been brought from Constantinople into Europe. The tree grows rapidly ; it flourishes best in a sandy, somewhat moist loam, and attains a height of 50 to 60 or more feet, assuming a pyramidal outline. Its boughs are strong and spreading. The buds, conspicuous for their size, are protected by a coat of a glutinous sub- stance, which is impervious to water ; in spring this melts, and the bud-scales are then cast off. The leaves are com- posed of 7 obovate-cuneate radiating leaflets (see vol. iv. p. 112, fig. 115); when young they are downy and droop- ing. From the early date of its leafing year by year, a horse-chestnut in the Tuileries is known as the “ Marronnier du 20 Mars.” The flowers of the horse-chestnut, which are white dashed with red and yellow, appear in May, and sometimes, but quite exceptionally, again in autumn (Gard. Chron., 1868, p. 1116); they are very numerous on each rachis, and form a thyrse. Comparatively few of them afford mature fruit. The fruit is ripe in or shortly before the first week in October, when it falls to the ground, and the three-valved thorny capsule divides, dis- closing the brown and at first beautifully glossy seeds or nuts, having a resemblance to sweet chestnuts, and com- monly three or else two in number. For propagation of the tree, the nuts may be sown either when fresh, or, if preserved in sand or earth, in spring. Drying by ex- posure to the air for a month has been found to prevent their germination. The cotyledons do not

rise to the surface of the soil. Rooks are wont to remove the nuts from the tree just before they fall, and to disperse them in various directions (R. Ellison, Berwickshire Ncturalist, quoted in J. of Forestry, Apr. 1889, pp. 877, 878).

The bark of the horse-chestnut contains a greenish oil, resin, a yellow body, a tannin, CygH240j0, existing likewise in the seeds and various parts of the tree, and decomposable into phloroglucin and asciglyoxalic acid, C7H,0;, also esculetin hydrate, and the crystalline fluorescent compound esculin, of the formula C,,H._,0j3 (Rochleder and Schwarz), with which occurs a similar substance fraxin, the paviin of Stokes (Q. J. Chem. Soc., xi. 17, 1859; xi. 126, 1860), who suggests that its presence may perhaps account for the cee in the analyses of esculin given by different authors. From the seeds have been obtained starch (about 14 per cent.), gum, mucilage, a non-drying oil, phosphorie acid, salts of calcium, saponin, by boiling which with dilute hydrochloric or sulphuric acid wsculic acid is obtained, quercitrin, present also in the fully developed leaves, wscigenin, CigH, 02, and cesculetin, C,H,0,, which is procurable also, but in small quantity only, from the bark. Rochleder has described as constitucnt principles of the cotyledons aphrodwscin, CygH 03, a bitter glucoside, argyrascin, CopHysOi2, wescinic acid, CysH yoo, and querescitrin, C4;H 4.05, found also in the leaves. ‘lo prepare pure starch from the seeds, Flandin (Compt. Rend., xxvii. 391, 1848 ; xxviii, 188, 1849) recommends kneading them, when peeled and bruised, in an aque- ous solution of x45 to ¢y of their weight of sodium carbonate. E. Staffel (Ann. d. Chem. u. Pharm., \xxvi., 1850, p. 379) after dry-

ing found, in spring and autumn respectively, 10°9 and 3°38 per cent. of ash in the wood, 8°68 and 6°57 in the bark, and 7°68 and 7°52 in the leaves of the horse-chestnut. The ash of the unripe fruit contains 58°77, that of the ripe kernel 61°74, and that of the green shell 75°91 per cent. of-potash (E. Wolff).

The wood of the horse-chestnut is soft, and serves only for the making of water-pipes, for turner’s work and com- mon carpentry, as a source of charcoal for gunpowder, and as fuel. Newly cut it weighs 60 Ib, and dry 35 ib per cubic foot approximately. The bark has been employed for dycing

yellow and for tanning, and was formerly in popular repute as a febrifuge and tonic. The powder of the dried nuts was at one time prescribed as a sternutatory in the Edinburgh Pharmacopora. It is stated to form with alum-water a size or cement highly offensive to vermin, and with two parts of wheaten flour the material for a

7, 737 ; 1878, i. 768, 828, Asa Gray, Man. of Bot., p- 117, 5th ed., 1872; Brewer and Watson,

strong bookbinder’s paste. found to expel worms from soil, and soon to kill them if they are left in it (The Garden, xiii, 198, 1878). nuts furthermore have been applied to the manufacture of an oil for burning, cosmetic preparations, and starch (», sup.), and in Switzerland, France, and Ireland, when rasped or ground, to the bleaching of flax, hemp, silk, and wool. In Geneva horse-chestnuts are largely consumed by graz- ing stock, a single sheep receiving 2 fb crushed morning and evening. Given to cows in moderate quantity, they have been found to enhance both the yield and flavour of milk. Deer readily eat them, and, after a preliminary steeping in lime-water, pigs also. be used boiled, and mixed with other nourishment. The fallen leaves are relished by sheep and deer, and afford a good litter for flocks and herds.

Infusion of horse-chestnuts is-

The

For poultry they should

One variety of the horse-chestnut has variegated leaves, and another double flowers. Darwin has observed that

ZL, Pavia, L., the Red Buckeye of North America, exhibits a special tendency, under unfavourable conditions, to be double-blossomed (Anim. and Pl., ii, 168). The seeds of this species are used to stupefy fish, The Scarlet-flowered Horse-chestnut, 4. rubicunda, is a handsome tree, less in height, and having a rounder head than the common form,

Another species, possessing flowers with the lower petals white with a red tinge, and the upper yellow and red with a

white border, and fruit unarmed, is . indica. Among the North American species are the i 4, glabra, Willd., and 42. flava, Ait., the Sweet Buckeye. ZB, californica, Nutt., when full-grown and in flower, is a beautiful tree, but its leaves often fall before midsummer,

Feetid or Ohio Buckeye,

i. 147, 462; Gard. Chron., 1843, pp. and ii. 58; Technologist, 1865, p. 33

See Loudon, Arboretum,

Geol. Surv. Calif., '* Bot." i. 106; ARBORICULTURE, Vol. ii. p. 319; and, for the chemistry, Rochleder and Schwarz, Ann. d. Chem. Us Pharm., 1xxxvii., 1858, p. 186, and Ixxxviii. 356 ; C. Zwenger, Jd., x¢., 1854, p. 63; and Rochleder, I" ten. Akad. Siteungsber., xl., 1860, xlv., 1862, xlviii., 1863, liv.-Ivii., 1866-68. (F. H. B.)

HORSE-MACKEREL is the name applied to a genus of fishes (Carana) found in abundance in almost all tem- perate and especially in tropical seas. The designation "cavalli," given to them by the early Portuguese navi- gators, and often met with in the accounts of the adven- tures of the buccaneers, is still in frequent use among the sailors of all nations. Some ninety different kinds are known,—the majority being wholesome food, and some of the species attaining a length of 3 feet and more. The fish to which the name horse-mackerel is applicd in Great Britain is Caranx trachurus, distinguished by having the lateral line in its whole length armed with large but narrow bony plates. Horse-mackerel are found singly on the coast all the year round, but sometimes they congregate in shoals of many thousands. Although well-flavoured, they are much more frequently used for bait than for food. This species has a most extraordinary range, being found almost everywhere within the temperate and tropical zones of the northern and southern hemispheres.

HORSEMANSHIP. See Horss, p. 195.

HORSENS, a seaport town of Denmark, in the province of Aarhuus and amt of Skanderborg, is situated at the head of the Horsens-fiord on the east coast of Jutland, and on the railway from Fridericia to Langaa, 25 miles sonth- west of Aarhuus. It isa well-built town, and contains a Latin school and two market-places. In the neighbour- hood there isa large prison. The town possesses 0 large foundry, machine shops, shipbuilding yards, lime-works, and manufactures of cloth and of woodwares ; it has also a good harbour. It is the birthplace of the navigator Vitus Bering or Behring, the discoverer of Behring Straits. The population in 1870 was 10,501.

7 | HO R—H OR

HORSE-POWER is the name given to the unit in terms of which engineers measure the power of steam- engines, water-wheels, and other prime movers. It is defined to be the rate at which an engine works when it does 33,000 foot-pounds of work per minute, a foot-pound being the amount of work necessary to raise a pound weight a foot high. We must go back to the early history of the steam-engine to discover the reason why this number was adopted. ‘The first steam-engines were employed to drive mills, pumps, and other machinery which had previously been driven by horses ; and it seemed natural to express their working-power in terms of the number of horses whose work they were got to accomplish. This led to experiments being made in order to get an estimate of the average working-power of a horse. Several such estimates have been given, all differing considerably from each other; but the one adopted whereby to express horse-power is that obtained by Boulton and Watt from observations on the strong dray horses employed at the London breweries work- ing eight hours a day. ‘They found that a horse was able to go at the rate of 24 miles per hour and at the same time raise a weight of 150 tb by means of a rope led over a pulley. This is easily seen to be equivalent to 33,000 Ib raised one foot per minute, and hence the number given above. In connexion with this subject it is necessary to dis- tinguish clearly between “‘horse-power indicated ” and “horse- power nominal” as applied to steam-engines. The horse- power indicated is got from an examination of the indicator diagram (see Diagrams, vol vii. p. 152). The area of the closed curve traced on the diagram, or “card” as it is technically called, gives the work done by the steam on the piston during each complete stroke. This divided by the

difference between the extreme abscisse gives the average pressure (p) on the piston. If we multiply this by the area of the piston (A) and by the length of stroke (a), we get the number of foot-pounds of work done during each stroke, and this multiplied by the number () of strokes per minute and divided by 33,000 gives the indicated horse- power. Thus—

Indicated H.P. = ain :

Nominal horse-power is a purely conventional term adopted by makers of steam-engines, and has no fixed relation to indicated horse-power. The method of calculat- ing it dates from the time of Boulton and Watt. In their engines they suposed the average pressure on the piston to be 7 ib on the square inch, and the velocity of the piston in feet per minute to be 128 times the cube root of the length of stroke in feet. Computing from these supposed data, we get the nominal horse-power. Thus—

7xAx128xWVx-

33,000.

The British Admiralty rule for nominal horse-power differs from this in using the actual velocity of the piston Instead of the above supposed velocity. These rules only apply to low-pressure engines ; for high-pressure engines It is usual, after Bourne, to assume 21 fb as the average pressure on the piston, the other data remaining as before. See Rankine's Steam-Engine.

HORSE-RACING. See Horse, p. 199.

HORSERADISH (Ger., Jf eerrettig; Fr., ratfort = racine Sorte, cran de Bretagne ; Swed., Peppar-rot ; Russ., chren), Cochlearia Armoracia, L., a perennial plant of the natural order Cruciferce and tribe Alyssinee, having radical leaves on long stalks, ovate or oval-oblong, 4 to 6 inches broad, about a foot in length, subcoriaceous, crenate or serrate, and coarsely veined; stem-leaves short-stalked or sessile, elongate, and tapering to their attachment, the lower ones often deeply toothed ; flowers, which appear in May and

Nominal H.P. =

June, 23-inch in width, in flat-topped panicles, with sepals purplish, and petals white ; and fruit a small silicula, which in the climate of England seldom bears seed. The horse- radish is indigenous to eastern Europe. Into western Europe and Great Britain, where it is to be met with on waste ground, it was probably introduced from Russia (De Candolle, Géogr. Botan., ii. 654, 1855). It was wild in various parts of England in Gerard's time. The root, the armoracie radix of pharmacy, is 4to 2 inches or more in diamete7, and commonly a foot, sometimes 3 feet in length ; the upper part is enlarged into a crown, which is annulated with the scars of fallen leaves; and from the numerous irregular lateral branches are produced vertical stolons, and also adventitious buds, which latter render the plant very difficult of extirpation. From the root of AconITE(g.»., vol. i. p. 98), which has occasionally been mistaken for it, horse- radish root differs in being more or less cylindrical from a little below the crown, and in its pale yellowish (or brownish) white hue externally, acrid and penetrating odour when scraped or bruised, and pungent and either sweetish or bitter taste (see Bentley, Pharm. Journ., 1st ser., xv. 449, 1856), The fresh root yields on distillation with water about '05 per cent. of a volatile oil identical with that of black mustard, resulting from the mutual reaction of sinigrin (potassium myronate) and myrosin in the presence of the water. After drying, the root has been found to afford 11°15 per cent. of ash. Horseradish root is an ingredient

in the spiritus armoracie compositus of the British Pharma-

copeeia. It possesses stomachic, diaphoretic, and diuretic properties, and hence is administered in atonic dyspepsia, chronic rheumatism, and dropsies. As a masticatory, or in the form of syrup or infusion, it is used for hoarseness. Gerard speaks of it as anthelmintic and emetic. Externally applied it acts as a rubefacient ; and the juice with vinegar is a popular remedy for freckles. In common with other species of Cochlearia, the horseradish was formerly in high repute as an antiscorbutic. The root was, as well as the leaves, taken with food by the Germans in the Middle Ages, whence the old French name for it, mowtarde des Allemands; and Coles, writing in 1657, mentions its use with meat in England, where it is now

chiefly employed as a condiment with beef. For the successful cultiva- tion of the horseradish, a light and friable damp soil is the most suitable ; this having been trenched 3 feet deep inautumn, and the surface turned down with a liberal supply of farm-yard manure, a second dressing of decom- posed manure should in the ensuing spring be dug in 2 feet deep, and pieces of the root 6 inches in length may then be planted a foot apart in narrow trenches, During summer the ground requires to be kept free of weeds; and the application of liquid manure twice or thrice in sufficient quantity to reach the lowest roots isan advantage. When dug the root may be long preserved in good condition by placing it in sand. The horseradish tree is the Moringa pterygosperma of Gartner.

See Gerard, Herball, p. 240, ed. Johnson, 1636; Syme, Sowerby's Eng. Bot., i. 183, pl. exxix., 1863; Florist, 1875, p. 191; Floral World, 1879, p. 149; Flickiger and Hanbury, Pharmacogra- phia, p. 71, 2d ed., 1879; Bentley and Trimen, Afed, Pl., i. 21,

1880.

HORSETAIL, Zqwisetum, the sole genus of the natural order Eguisetacee, consists of a group of vascular crypto- gamous plants remarkable for its resemblance in general appearance to the phanerogamic genera Casuarina and Ephedra. The stem is jointed, consisting of numerous easily separable tubular sheaths toothed at the apex, and is generally furnished with whorls of similar but more slender branches. The fructification is borne at the apex of the stem in the form of a dense oval, oblong, or cylindrical spike, consisting of a number of shortly-stalked peltate

scales, each of which has attached to its under surface a circle of spore cases. These open by a longitudinal slit on their inner side. The spores differ from those of ferns in their outer coat being split up into four club-shaped hygroscopic threads or elaters, which are curled when moist, but become straightened when dry. The apparent roots consist of underground stems, any portion of which broken off is capable of producing a new plant ; hence the difficulty of eradicating them when once established. There are 25 known species of the horsetail, and the genus is universally distributed.

The Corn Horsetail, Z. arvense, L., one of the commonest species, is a troublesome weed in clayey cornfields. The fructification appears in March and April, terminating in short unbranched stems. Itis said to produce diarrhoea in such cattle as eat it. The Bog Horsetail, H. palustre, is said to possess similar properties. It grows in marshes, ditches, pools, and drains in meadows, and sometimes obstructs the flow of water with its dense matted roots. The fructification in this species is cylindrical, and in that of E. limosum, L., which grows in similar situations, it is ovate in outline, The largest British species, Z. maximum, L., grows in wet sandy declivities by railway embankments or streams, &c., and is remarkable for its beauty, due to the abundance of its elegant branches and the alternately green and white appearance of the stem. In this species the fructification is conical or lanceolate, and is found in the month of April, on short stout unbranched stems, which have large loose sheaths. Horses appear to be fond of this species, and in Sweden it is stored for use as winter fodder. EH. hyemale, L., commonly known as the Dutch rush, is much more abundant in Holland than in Britain ; it is used for polishing purposes, and also in medicine by homeopathic practitioners. £. variegatum, Sch. grows on wet sandy ground, and serves by means of its fibrous roots to bind the sand together. The horsetails are remarkable for the large quantity of silica they contain, which often amounts to half the weight of the ash yielded by burning them, and the roots contain a quantity of starch.

HORSHAM, a parliamentary borough and market-town of Sussex, England, is pleasantly situated in the midst of a fertile country near the source of the Arun and on the Mid- Sussex Railway, 374 miles south of London. It consists chiefly of two streets crossing each other at right angles, and a picturesque causeway leading to the church, adorned with rows of trees. Within recent years the town has under- gone great improvements, and it now possesses well-paved streets and some handsome buildings. In the vicinity there are several fine mansions. Works were erected in 1865 for supplying the town with water from a well in the neighbourhood. The principal buildings are the parish church, often repaired, and in 1865 entensively restored, a very ancient structure in the Early English style, with the remains of Norman work, having a lofty tower surmounted by a spire, and containing several fine monuments and tombs, and two brasses ; the grammar school, founded in 1540 and rebuilt in 1840, recommended to be

used as a iniddle class school by the Endowed Schools Commission ; the corn exchange, erected in 1766 in the Italian style, with a room for assemblies and public meetings ; the Roman Catholic chapel of St John in the Early English style, erected in 1866 at the cost of the duchess of Norfolk. A school board was formed in 1873, which, besides having the management of most of the schools previously existing, has erected new buildings in the east end of the town, at a cost of above £4000. ‘here are a number of small charities, and almshouses were founded in 1842 by the Rev. Jarvis Kenrick. The town possesses a tannery, a foundry, a carriage factory, and several flour-mills, The area of the

For years though some of them must have been given to the study of

parish and parliamentary borough is 10,741 acres, and th population in 1871 was 7831. |

There is a tradition which derives the name of Horsham from —

Horsa the brother of Hengist, who is said to have been slain in the vicinity; others derive it from horsham, the horses’ meadow: but the most ; (village) in the tion, and returned two members to parliament from the 28d year of the reign of Edward I. to the 2d of William IV., when it was deprived of one of its members. It has never been incorporated, and it is now governed by a local board.

robable derivation is Hurst-Ham or the Ham urst (forest). The town is a borough by prescrip-

HORSLEY Joun (c. 1685-1732), a distinguished anti-

quary of the last century, the date and place of whose birth as well as his parentage are uncertain. John Hodgson, the historian of Northumberland, in a short memoir of him published in 1831, countenances the belief that he was born in 1685, at Pinkie, in the parish of Inveresk and county of Midlothian. with Horsley’s subsequent history, by supposing that his father was a Northumberland Nonconformist, who had migrated to Scotland

during the reign of Charles II. or James IL., but returned to England soon after the Revolution of 1688. on the life of Horsley, printed in the Archwologia Aliana for February 1865, leans to the opinion that he was a native of Newcastle-on-Tyne, and the son of Charles Horsley, a member of the Tailors' Company of that town, an opinion to which colour is given by some expressions of Horsley's own in the Britanima Romana.

The late Rey,

This statement he reconciles

On the other hand, Mr J. H. Hinde, in " Notes"

Horsley undoubtedly received his early education at

the grammar school of Newcastle, and completed. it at the university of Edinburgh, where he was admitted to

the degree of master of arts on the 29th of April 1701. afterwards nothing seems to be known of him,

theology in connexion with the body of dissenters to which he belonged. There is some evidence tending to show that Horsley " was settled in Morpeth as a Presbyterian minister as early as 1709." Mr Hodgson, however, thinks that up to 1721, at which time he was residing at Widdrington, "he had not received ordination, but preached as a licentiate." Even if he was ordained then his stay at the latter place was probably prolonged beyond that date; for he communicated to the Philosophical Transactions notes on the rainfall there in the years 1722 and 1723. Mr Hinde also shows that during these years, in addition to his other duties, whatever their nature, "he certainly followed a secular employment as agent to the York Buildings Company, who had contracted to purchase and were then in possession of the Widdrington estates." Soon after settling at Morpeth, Horsley began to supplement his professional income, probably slender, by opening a private school. 'The enterprise was successful. Respect for his character and abilities attracted pupils irrespective of religious connexion, one of them becoming afterwards Dean of Westminster. He likewise found time to give courses of lectures on

mechanics and hydrostatics in Morpeth, Alnwick, and Newcastle ; and it was doubtless in recog- nition of his scientific tastes and attainments that he was elected onthe 23d April 1730 a Fellow of the Royal Society.

It is, however, in connexion with his archeological researches that John Horsley is now 80 well and 80 honourably known, though strangely enough no place appears to have been hitherto found for his name in such works as the present. Among those who have investigated the traces left by the Romans of their presence in Britain he stands, and must ever stand, as in many respects the fore- most. His great work, Britannia Romana, or the Roman Antiquities of Britain (London, 1732), one of the scarcest and most valuable of its class, contains the result of an amount of patient labour in this extensive field that in the

case of a man in his position is truly marvellous. Nor was the acuteness of his intellectual powers less remarkable ; for so accurately were his researches conducted and so solid was the judgment he brought to bear upon them that a century and a half of subsequent inquiry has invalidated only a few of the conclusions he came to.

Horsley died suddenly, of apoplexy, on the 12th of Jan- uary 1732, his constitution having been in all likelihood pre- maturely worn out by the toil he had undergone in the composition of the Britannea Romana, then on the eve of publication. The following extract from the burial register of the parish of Morpeth gives the date of his interment : “1734, Jan. 15, Mr John Horsley ;” but the site of his

rave is unknown. Besides the Britannia Romana, Horsley published two sermons and a hand-book to his lectures on mechanics, &c. He also projected a history of Northum- berland and Durham, collections for which were found among his papers. By his wife, a daughter of the Rev. William Hamilton, D.D., minister of Cramond, afterwards professor of divinity in the university of Edinburgh, he had one son and two daughters.

HORSLEY, Samuen (1733-1806), a learned Anglican prelate, was born in London in 1733. Entering Trinity College, Cambridge, he became LL.B. in

1758 without graduating in arts, and in the following year succeeded his father in the living of Newington Butts in Surrey. Horsley was elected a Fellow of the Royal Society in 1767 ; but, in consequence of a difference with the president, he withdrew from it in 1784. He had been secretary since 1773. In 1768 he attended the eldest son of the earl of Aylesford to Oxford as private tutor ; and, after receiving through the earl and Bishop Lowth various minor prefer- ments, which by dispensations he combined with his first living, he was installed in 1781 as archdeacon of St Albans. In 1774 the university of Oxford conferred on him the degree of LL.D. Whilst archdeacon, Horsley entered upon his famous controversy with the Socinian, Dr Priestley, who denied that the early Christians held the doctrine of the Trinity. In this controversy, conducted on both sides in the fiercest polemical spirit, Horsley showed the superior learning and ability. His aim was to lessen the influence which the prestige of Priestley's name gave to his views, by proving from his writings the latter's incom- petence through ignorance to form an authoritative judg- ment on the disputed points. For the energy displayed in the contest Horsley was rewarded by Lord Chancellor Thurlow with a prebendal stall at Gloucester ; and in 1788 the same patron procured his promotion to the episcopal see of St David's. As a bishop, Horsley was energetic both in his diocese and in parliament. The efficient support which he afforded the Government in the latter place was acknowledged by his successive translations to Rochester in 1793, and to St Asaph in 1802. With the bishopric of Rochester he held the deanery of Westminster. He died at Brighton on October 4, 1806.

Besides the controversial Tracts, which appeared in 1783-84-86, and were republished in 1789 and 1812, Horsley's more import- ant works are :—Apollonti Pergei Inclinationum Libri duo, 1770; Kemarks on the Observations . . . Jor determining the acceleration of the Pendulum in Lat. 70° 51', 1774; Isaact Newtoni Opera quce —_ Omnia, with a commentary, 5 vols. 4to, 1779-84; On the

operties of the Greck and Latin Languages, 1796; Disquisitions ae xvii, 1796; Hosea, translated from the Hebrew, with Bam ie: Elementary Treatises on . . . . Mathematics, 1801; ti ementorum Libri priores XTT., 1802; Huclidis Datorum {aber, 1803; Virgil's Two Seasons of Honey, &c., 1805; and papers ian po epbical Transactions from 1767 to 1776. Since his 1813: oe ee fermone, 1810-12; Speeches in Parliament, oe | nee eetied with Notes, 1815; ee Criti- Nichols Léteron — ecological Works, 6 vols. 8vo, 1845. See

y Anecdotes, vol. iv.

HORSLEY, Wiii1am (1774-1858), an English musician

of considerable reputation, was born November 15, 1774,

and became in 1790 the pupil of Theodore Smith, an in- different musician of the time, who, however, taught him sufficient to obtain the position of organist at Ely Chapel, Holborn. This post he resigned in 1798, to become organist at the Asylum for Female Orphans, as assistant to Dr Callcott, with whom he had long been on terms of personal and artistic intimacy, and whose eldest daughter he married. In 1802 'he became his friend's successor upon the latter's resignation. Besides holding this appoint- ment he became in 1812 organist of Belgrave Chapel, Halkin Street, and in 1837 of the Charter House. He died June 12, 1858. MHorsley's compositions are numerous, and include amongst other instrumental pieces three symphonies for full orchestra. Infinitely more important are his glees, of which he published five books, besides con- tributing many detached glees and part songs to various collections. Mr Barrett, in his lecture on "English glee and madrigal writers," calls Horsley "one of the princes amongst glee writers," and attributes to him "a fine and powerful dramatic aim and an elegant taste." Horsley's compositions are moreover distinguished by a remarkable purity of style, which sometimes verges on pedantry. His glees, " By Celia's arbour," "'O nightingale," " Now the storm begins to lower," and others, are amongst the finest specimens of this peculiarly English class of com- positions. Horsley's son (Charles Edward), born in 1822, enjoyed a certain

reputation as a musician. He studied in Germany under Hauptmann and Mendelssohn, and on his return to England composed several oratorios and other pieces, none of which had permanent success. In 1868 he emigrated to Australia. He died March 2, 1876, at New York.

HORTEN (KarLJoHANSWZRN), a seaport town of Norway, in the amt of Jarlsberg-Laurvig, is beautifully situated on the west bank of the Christiania fjord, opposite Moss, and 32 miles south of Christiania. It is defended by strong fortifications, is the headquarters of the Norwegian fleet, and possesses an arsenal and shipbuilding yards, as well as a real school, a national school of the higher grade, an observatory, a nautical museum, and an infirmary. It also carries on a considerable shipping trade. The population, which in 1836 did not exceed 200, was 5457 in 1875.

HORTENSE (1783-1837), queen of Holland, is famili- arly known as La Reine Hortense. Her proper name was Eugénie Hortense de Beauharnais, and she was the only daughter of Alexandre de Beauharnais and Josephine Tascher de la Pagerie. She was born on the 10th of April 17883. When four years old she accompanied her mother to Marti- nique, and returned with her three years later to be subjected to all the dangers of the Revolution. For a time she was sent with her brother to England, but soon returned. The marriage of her mother to Napoleon Bonaparte naturally altered her prospects altogether, and, as she grew to woman's estate, several marriages of more or less importance were proposed for her. It suited the first consul, however, that she should marry his brother Louis, and despite her tears and entreaties the marriage was concluded. In one of his moments of brutal frankness Napoleon confessed that his brother as a husband was "'insupportable," though he characteristically proceeded to charge Hortense with having been the cause of his own misfortunes in not agreeing with her husband. Louis it appears was sincerely anxious to please his young wife. But his health was bad and his temper gloomy, while Hortense was exceptionally lively and fond of gaiety. The natural consequence was an infinity of scandal, some of it of a very grave character. The recent publication of Madame de Rémusat's memoirs has, however, gone far toexonerate Hortense. The writer, equally outspoken and well informed, gives instances of

the most fantastic and disgusting exercise of conjugal tyranny on Louis's part, and denies that his wife in any way misconducted herself, the malignant jealousy of the Bonaparte sisters being credited with the accusation. Within seven years of her marriage Hortense had three children, whose nomenclature, unless carefully studied, is somewhat puzzling. The eldest, Napoleon-Louis-Charles, was born in 1802 and died in 1807. The next, Napoleon- Louis, was born in 1804 and died in 1831. The third, Charles-Louis-Napoleon, was born in 1807, and lived to be the late emperor NapoleonIII. When Napoleon distributed crowns to his relations Hortense was very anxious that her husband should receive that of Italy. Holland, however, fell to his share, and the ill-matched pair retired thither. The death of her eldest son made Holland intolerable to Hortense, and before long she returned to Paris and estab- lished herself in the Rue Cerutti. Nor did she from that time forward ever live in any regular fashion with her husband, whose forced abdication of his crown soon followed. In Paris she was more popular than respected, and her leisure time was filled up with many quasi-literary and artisticemployments, It was there that she signalized herself by composing among other airs the famous melody of Partant pour la Syrie. The ineffable silliness of the words of this song is not due to her, but to a certain M. de Laborde; and it is only fair to say that it took French- men twenty years to find out that the air was ugly, and that it was possibly stolen. Hortense continued even after her mother's divorce to exercise a certain influence over her stepfather. At the first Restoration she was confirmed in her title and possessions as Duchesse de Saint-Leu. But she ardently welcomed the returning emperor, and thence- forward France was hardly a residence for her, while her private life was disturbed by constant and indecent bicker- ings with her husband about the custody of her children. She bouglit a house at Arenenberg on the Lake of Constance and another at Augsburg, for the sake of educating her sons, and from time to time she undertook various journeys in the hope of furthering their interests. The Revolution of July gave her some chance of returning to France, but immediately afterwards grave misfortunes overtook her. Her sons took part in the Italian risings, and the elder died of measles. Scarcely had she

recovered from this when the Strasburg attempt was made against her advice. She lived long enough to see the future emperor return from America, and died at Arenenberg on the 3d October 1837. Generally speaking, Hortense appears to have been an amiable woman, whose life was spoilt by the tyrannical egotism of her stepfather. She seems, however, to have been unduly given to intrigue; and she herself admitted that she might have lived on better terms with her husband, upon whom she was forced almost as much as he was forced on her.

HORTENSIUS, Quintus, was one of the first and most famous orators at the Roman bar in the latter days of the republic, when the orator's art was particularly flourishing and was diligently cultivated. His father had been governor of Sicily, and had left behind him a good name for justice and uprightness. He was himself born in 114 B.c., and he lived to the year 50 B.c., so that his life and career ran parallel to that of Cicero, whose senior he was by only eight years. He had the best possible introductions into public life, and at the age of nineteen he made his first speech at the bar, and shortly afterwards successfully conducted the defence of a petty king of Bithynia, one of Rome's many dependants in the East. From that time his reputation as an eloquent advocate was decisively established. As the son-in-law of Catulus he was attached to the aristocratical party of which Sulla was the head, and among his clients he numbered several of its most eminent members. During

Sulla's ascendency the courts of law were tinder the contro] of the senate, the judges being theniselves senators. To this circumstance perhaps as well as to his own merits Hortensius may have been indebted for much of his success, Many of his clients were the governors of provinces which they were accused of having plundered, and such men were generally sure to find themselves brought before a somewhat lenient or even friendly tribunal, one, too, which was shamefully accessible to corruption. according to Cicero, was not ashamed to avail himself of this disgraceful weakness, and a good deal of the plunder which his clients had got from the provincials went into the pockets of the judges. open court, and we are thus driven to assume that it must have had some foundation.

Hortensius himself,

Cicero made this statement in

Hortensius, like other eminent Roman citizens, passed

through the regular succession of public offices, rising from the questorship in 81 to the consulship in 69 Bc. In the year before his consulship he came into collision with the now rapidly rising eloquence of Cicero in the memorable case of Verres, and from that time his supremacy at the bar was shakeu. position. up by all the influence of Sulla's party was a splendid triumph, and it must have been a heavy blow to Hortensius. Shortly afterwards he was again pitted against Cicero, and again failed.

In fact his younger rival stepped into his Cicero's success against a man who was backed

In 67 a proposal was made to supersede Lucullus in his command in the East against Mithradates in

favour of Pompeius. This was supported by Cicero, and was

successfully carried in face of the opposition of Hortensius, From the year 63 B.c., the famous year of Cicero's con- sulship and of the Catiline conspiracy, we find the two great rivals often associated together as counsel in the same case. The fact was that Cicero was now himself drawn towards the aristocratical party,—the party of Hortensius. Consequently, in the many cases which had more or less of a political complexion as arising out of the disorder and turbulence incident to party quarrels, it was natural that the two men should have the same sympathies and be engaged onthe same side. So it happened, for example, in the case of Licinius Murena, whom Cicero defended along with Hortensius against a charge of bribery in canvassing for the consulship. And so strongly declared was his sympathy with Milo against Cicero's bitter enemy Clodius that he was nearly murdered by some of Clodius's gang. After Pompeius's return from the East in 61 3.c., and the political revolution which for a time united him with Caesar, Hortensius withdrew from public life and devoted himself exclusively to his profession. For nine more years he was in continual employment as an

advocate, and won a number of verdicts. In50.c., the last year of his life, hedefended successfully one Appius Claudius against Dolabella, Cicero's son-in-law, who prosecuted the man on a serious charge of bribery.

None of Hortensius's speeches have come down to Us; and it was, it seems, only on special occasions that he wrote them. Almost all our knowledge of him is derived from Cicero. He was undoubtedly a highly-gifted and accom- plished man, and though of course he owed his very early success to his great connexions, yet he was perfectly well able to stand on his own conspicuous merits. His eloquence perhaps was not quite of the highest order ;—it was not for the most part what Cicero called "gravis," weighty, dignified, impressive ; there was, it may be presumed, an absence of those appeals to great moral principles which give such grandeur to the best speeches of Cicero and Demosthenes, and of ourown Burke. His oratory, according to his great rival, was of the Asiatic style, by which appears to be meant a florid rhetoric, better to hear than to read. He had the gift of a marvellously tenacious memory, a"

ae

could retain every single point in his opponent's argument. His action: was highly artificial, and even his manner of folding his toga was noted by eminent tragic actors of the day, and is left on record by Macrobius. He had, too, a fine musical voice, which he could skilfully command. Cicero sometimes speaks of Hortensius very favourably, and even almost affectionately, though it would appear from some passages in his letters that he never quite trusted him. He could not have thought hima high-principled man, as he openly charged him with bribery, and as he actually

'mentions a case in which he claimed property under a will

which he knew to be a forgery (De Ofjciis, iii. 18). Hortensius, in fact, seems to have been a lax, easygoing, clever man, with very little noble ambition and very little real moral worth. " An amiable Epicurean " is a phrase which describes him not unfairly. The anecdotes we have

HORTIC

ORTICULTURE embraces both the art and the

science of the cultivation of garden plants, whether

for utilitarian or for decorative purposes. The subject

naturally divides itself into two sections, which we here

propose to treat separately, commencing with the science,

and passing on to the practice of the cultivation of flowers, fruits, and vegetables as applicable to the home garden.

Part I.—- PRincIPLES on SoreNcE or HorricuLture.

Horticulture, apart from the mechanical details connected with the maintenance of a garden and its appurtenances, may be considered as the application of the principles of vegetable physiology to the cultivation of plants. The lessons derived from the abstract principles enunciated by the physiologist, the chemist, and the physicist require, however, to be modified to suit the special circumstances of plants under cultivation. The necessity for this modifica- tion arises from the fact that such plants are subjected to conditions more or less unnatural to them, and that they are grown for special purposes which are at variance, in degree at any rate, with their natural requirements.

The life of the plant makes itself manifest in the pro- cesses of growth, development, and reproduction. By growth is here meant mere increase in bulk, and by development the series of gradual modifications by which a plant originally simple in its structure and conforma-

_ tion becomes eventually complicated, and endowed with

distinct parts or organs. The reproduction of the higher plants takes place either asexually by the formation of buds or organs answering thereto, or sexually by the pro-

duction of an embryo plant within the seed. The con- ditions requisite for the growth, developnient, and reproduc-

tion of plants are, in general terms, exposure, at the proper time, to suitable amounts of light, heat, and moisture, and a due supply of appropriate food. The various amounts of these needed in different cases have to be adjusted by the gardener, according to the nature of the plant, its “ habit ” or general mode of growth in its native country, and the in- fluence to which it is there subjected, as also in accordance with the purposes for which it is to be cultivated, &c, It is but rarely that direct information on all these points can be obtained ; but inference from previous experience, especially

With regard to allied vegetable forms, will go far to supply — Such deficiencies, Moreover, it must be remembered that

the conditions most favourable to plants are not always

those to which they are subjected in nature, for, owing

poe © Competition of other vegetable forms in the struggle > existence, liability to injury from insects, and other adverse circumstances, plants may actually be excluded

about him all point to a man of luxurious tastes and a great capacity for enjoyment, The vast wealth he had accumu- lated during forty-four years of successful practice he spent after the fashion of rich Roman nobles, in splendid villas, in parks, in fish ponds, and costly entertainments. He left his heir an unusually well-stocked cellar of wine, and his park at Laurentum abounded in every variety of game, He was also a great buyer of pictures and works of art. With true consistency he opposed Pompeius and Crassus when they proposed their sumptuary law. He is said to have spoken wittily on the occasion; he was at any rate successful.

There is a good account of Hortensius in Dunlop’s Roman Litera- ture (ii, 222), and in Smith’s Dictionary of Greek and Roman Bio- graphy his life and career are traced as thoroughly as the materials at our disposal allow. (W. J. B.)

from the localities best suited for their development. The gardener therefore may, by modifying, improve upon the conditions under which a plant naturally exists. Thus it frequently happens that in our gardens flowers have a beauty and a fragrance, and fruits a size and savour denied to them in their native haunts. It behoves the judicious gardener, then, not to be slavish in his attempts to imitate natural conditions, and to bear in mind that such attempts must sometimes necessarily be failures. The most successful gardening is that which turns to the best account the plastic organization of the plant, and enables it to develop and multiply as perfectly as possible. Experience, coupled with observation and reflexion, as well as the more in-

| direct teachings of tradition, are therefore of primary im-

portance to the practical gardener.

We propose here to notice briefly the several parts of a flowering plant, and to point out the rationale of the cultural procedures connected with them.

The Loot.—The root, though not precluded from access of air, is not directly dependent for its growth on the agency of light. The efficiency of drainage, digging, hoeing, and like operations is accounted for by the manner in which they promote aeration of the soil, raise its temperature, and remove its stagnant or superfluous moisture, Owing to their growth in length at, or rather in the immediate vicinity of, their tips, roots are enabled to traverse long distances by surmounting some obstacles, penetrating others, and insinuating themselves into narrow crevices. As they have no power of absorbing solid materials, their food must be of a liquid or gaseous character. It is taken up from the interstices between the particles of soil exclusively by the finest subdivisions of the fibrils, and in many cases hy the extremely delicate thread-like cells which project from them, and which are known as root-hairs. The number and density of these latter are in direct pro- portion to the abundance and suitability of the food of the plant. The importance of the root-fibres, or ‘“feed- ing roots,” justifies the care which is taken by every good gardener to secure their fullest development, and to prevent as far as possible any injury to them in digging, potting, and

transplanting, such operations being therefore least prejudicial at seasons when the plant is in a state of comparative rest.

Root-Pruning and Lofting.—In apparent disregard of the general rule just enunciated is the practice of root-pruning fruit trees, when, from the formation of wood being more active than that of fruit, they bear badly. The contrariety is more apparent than real, as the operation consists in the removal of the coarser roots, a process which results in the development of a leash of fine feeding roots. Moreover,

there is a generally recognized quasi-antagonism between the vegetative and reproductive processes, 80 that, other things being equal, anything that checks the one helps forward the other. —

Watering.—So far as practical gardening 18 concerned, feeding by the roots after they have been placed in suitable soil is confined principally to the administration of water and, under certain circumstances, of liquid manure; and no operations demand more judicious management. The amount of water required, and the times when it should be applied, vary greatly according to the kind of plant and the object for which it is grown, the season, the supply of heat and light, and numerous other conditions, the influence of which is to be learnt by experience only. The same may be said with respect to the appli- cation of manures. The watering of pot-plants requires especial care. Water should as a rule be used at a temperature not lower than that of the surrounding atmosphere, and preferably after exposure for some time to the air.

Bottom-Heat.—The “optimum” temperature, or that best suited to promote the general activity of roots, and, indeed, of all vegetable organs, necessarily varies very much with the nature of the plant, and the circumstances in which it is placed, and is ascertained by practical experience. Artificial heat applied to the roots, called by gardeners ‘‘bottom-heat,” is supplied by fermenting materials, dung, tan, flues, or hot-water pipes. In some cases solar heat is as it were entrapped by placing beneath the roots substances such as bricks, the heat previously absorbed by which is slowly radiated. In winter the temperature of the soil, out of doors,

beyond a certain depth is usually higher than that of the atmosphere, so that the roots are in a warmer and more uniform medium than are the upper parts of the plant. Often the escape of heat from the soil is prevented by “ mulching,” ¢.¢., by depositing on it a thick layer of litter, straw, dead leaves, and the like.

The Stem and its subdivisions or branches lengthen, not only near the tip, but also lower down, by intercalary growth. They upraise to the light and air the leaves and flowers, and serve as channels for the passage to them of fluids from the roots, and they act as reservoirs for nutritive substances. Their functions in annual plants cease after the ripening of the seed, whilst in plants of longer duration layer after layer of strong woody tissue is formed, which enables them to bear the strains which the weight of foliage and the exposure to wind, &e., entail. The gardener aims usually at producing stout, robust, short-jointed stems, instead of long lanky growths defective in woody tissue. To secure these conditions free exposure to light and air is requisite, but in the case of coppice woods, or where long straight spars are needed by the forester, plants are allowed to grow thickly so as to ensure development in an upward rather than in a lateral direction. This and like matters will, however, be more fitly considered in dealing hereafter with the buds and their treatment.

Leaves.—The work of the leaves may briefly be stated to consist in the processes of nutrition and of respiration. Nutrition by the leaves includes the inhalation of air, and the combination, under the influence of light and in the presence of chlorophyll, of carbon from the carbonic acid gas in the air with hydrogen from the watery vapour it contains, oxygen being exhaled. ‘There is also a process of true respiration, in which atmospheric oxygen unites with a portion of the carbon in the plant, and is evolved as carbonic acid gas.

Syringing, &c.—In certain circumstances water is ab- sorbed by the surface of leaves, especially when the supply of moisture at the root is defective, and when by too long

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exposure to drought the watery constituents of the plant have evaporated. A certain amount of evaporation of superfluous watery fluid or vapour is a necessary accom- paniment of nutrition, but this may easily become excessive, especially where the plant cannot readily recoup itself. In these circumstances such operations as “ syringing” and ‘damping down” are of special value. Evaporating basins or tanks in houses for orchid and other plants are beneficial for like reasons, Following Boussingault and Henslow, by whom the absorption of water by leaves has been proved, we may sum up the advantages of syringing as follows :—it washes off dust and insects from the leaves, and by moistening the cuticle promotes res- piration and the absorption of water; it checks loss by transpiration, and so enables terminal shoots and young leaves to receive a sufficiency of sap from the stem; it keeps the air cool by evaporation ; and lastly, as moisture is actually imbibed by the green parts of plants, it helps to compensate for any loss from within, and thus supplements root absorption.

In accordance with the facts just cited it is found that the preservation of cut flowers is promoted by inserting some of their leaves as well as their stalks in water. By cutting an herbaceous stem under water, so that the severed end is never exposed to the air, withering can to a large extent be prevented; and a bouquet may be kept fresh for a long time either by immersing the whole in water, or by simply covering the vase of water in which it is placed with a bell-glass. In the case of “ cuttings” exces- sive transpiration is obviated by means of bell-glasses and by shading, and sometimes by burying a portion of the cutting with a leaf attached.

Carnivorous Plants.—Before leaving the subject of nutrition by leaves, reference may be made to the so-called carnivorous plants, ¢.g., Drosera, Substances, particularly such as contain nitrogen, as insects or fragments of meat, when brought into contact with the surface of the leaves, or with certain glands on the leaves, become dissolved by the agency of a digestive ferment secreted therein, are then absorbed and serve as nutriment. See INsECTIVOROUS PLANTS.

Respiration, already alluded to, is not directly connected with exposure to light, since it goes on by night as freely as by day. It is a process requisite for the health of the plant, and contributes to maintain its heat, to perfect its

structure, to eliminate some of its secretions, and to destroy effete or impure matters. Chlorophyll, according to Prings- heim, acts as a regulator of the respiration of plants by absorbing some of the luminous rays, and thereby favour- ing the function of assimilation.

‘As a result of the processes carried on in the leaves under the influence of light, many of the secretions, as starch, sugar, oils, and colouring and odoriferous matters are formed. ‘These either at once subserve the nutrition of the plant or are stored in its tissues, as in the case of tubers and many seeds. Usually before it can be rendered available as nourishment the stored matter has to undergo a change from a more or less insoluble to a soluble form. The changes which they undergo within the plant requite very careful study, and indeed constitute a department of physiology still very greatly in need of elucidation. Pringsheim’s recent researches on the action of light on chlorophyll, prosecuted with the aid of a small lens and observed under the microscope, bid fair, if confirmed, materially to change the views of chemists as to the pro- cesses which go on in leaves as a consequence of exposure to light; but, although they may change or even reverse our notions as to the mode of action of chlorophyll, they

“will not detract from its importance.

Buds.—The recognition of the various forms of buds,

and their modes of disposition in different plants, on which see BoTANY, vol. iv. pp. 95-99, 118, 119, is a matter of the first consequence in the operations of pruning and training. Flower-buds may be produced on the old wood, i.e, the shoots of the past year’s growth, or on a shoot of the present year. The pear and rhododendron develop flower- buds for the next season speedily after blossoming, and these may be stimulated into premature growth. The peculiar short stunted branches or ‘‘spurs” which bear the flower- buds of the pear, apple, and their allies, and of the laburnum, deserve special attention. In the rose, in which the flower- buds are developed at the ends of the young shoot of the year, we have an example of a plant destitute of flower- buds during the winter.

Propagation by Buds.—The detached leaf-buds (gemme or bulbils) of some plants are capable under favourable con- ditions of forming new plants. The edges of the leaves of Bryophyllum calycinum (see vol. iv. p. 98, fig. 67) and of Cardamine pratensis, and the axils of the leaves of Leliwm bulbiferum (iv. 99, fig. 71), produce buds of this character. It is a matter of familiar observation that the ends of the shoots of brambles take root when bent down to the ground. In rare instances buds form on the roots, and may be used for purposes of propagation, as in the Japan quince. Of the tendency in buds to assume an independent existence gardeners avail themselves in the operations of striking “cuttings,” and making layers and “ pipings,” as also in budding and grafting. In taking a slip or cutting the gardener removes from the parent plant one

or more buds or “ eyes,” in the case of the vine one only, |

attached or not to a short shoot, and places them in a moist and sufficiently warm situation, where, as previously mentioned, undue evaporation from the surface of the leaf or leaves is prevented. For some cuttings pots filled with light soil, with the protection of the propagating house and of bell-glasses, are requisite; but for many, such as willows, no such precautions are necessary, and the thrusting of the end of a shoot into moist ground suffices to ensure its growth. In the case of the more delicate plants, the formation of roots is preceded by the production from the cambium of the cuttings of a succulent mass of tissue, the callus, It is important in some cases to retain on the cutting some of its leaves, so as to supply the requisite food for storage in the callus. In other cases, where the buds themselves contain a sufficiency of nutritive matter for the young growths, the retention of leaves is not necessary. In the tissues of willow-stakes just referred to there exists an abundance of material available for the supply of the young roots. The most successful mode of forming roots is to place the cuttings ina mild bottom-heat, which expedites their growth, even in the case of many hardy plants whose cuttings strike roots in the open soil. With some hard- wooded trees, as the common white-thorn, roots cannot be obtained without bottom-heat. It isa general rule through- out plant culture that the activity of the roots shall be in advance of that of the leaves. Cuttings of deciduous trees and shrubs succeed best if planted early in autumn while the soil still retains the solar heat absorbed during summer. For evergreens

April or May and August or September, and for greenhouse and stove-plants the spring and summer months, are the times most suitable for propagation by cuttings. The great object to be attained is to Secure the formation of active roots before the approach of winter.

Layering consists simply in bending down a branch and keeping it 1n contact with or buried to a small depth in the soil until roots are formed 3 the connexion with the parent Plant may then be severed. Many plants can be far more easily propagated thus than by cuttings.

rafting or “working” consists in the transfer of a

brauch, the “ graft” or ‘scion,” from one plant to another, which latter is termed the “stock.” The operation must be so performed that the growing tissues, or cambium-layer of the scion, may fit accurately to the corresponding layer of the stock. In budding, as with roses and peaches, a single bud only is implanted. Jnarching is essentially the promotion of the union of one shoot to another of a different plant. The outer bark of each being removed, the two shoots are kept in contact by ligature until union is established, when the scion is completely severed from its original attachments. This operation is varied in detail according to the kind of plant to be propagated, but it is essential in all cases that the affinity between the two plants be near, that the union be neatly effected, and that the ratio as well as the season of growth of stock and scion be similar,

The selection of suitable stocks is a matter still requir- ing much scientific experiment. The object of grafting is to expedite and increase the formation of flowers and fruit. Strong-growing pears, for instance, are grafted on the quince stock in order to restrict their tendency to form “‘ gross” shoots, and a superabundance of wood in place of flowers and fruit. Apples, for the same reason, are “worked” on the “paradise” or ‘“‘doucin” stocks, which from their influence on the scion are known as dwarfing stocks. Scions from a tree which is weakly, or liable to injury by frosts, are strengthened by engrafting on robust stocks. Lindley has pointed out that, while in Persia,

its native country, the peach is probably best grafted on the peach, or on its wild type the almond, in England, the suminer tem- perature of whose soil is much lower than that of Persia, it might be expected, as experience has proved, to be most successful on stocks of the native plum.

The soil on which the stock grows is a point demand- ing attention. From a careful series of experiments made in the Horticultural Society's Garden at Chiswick, it was found that where the soil is loamy, or light and slightly enriched with decayed vegetable matter, the apple suc- ceeds best on the doucin stock, and the pear on the quince ; and wliere it is chalky it is preferable to graft the apple on the crab, and the pear on the wild pear. For the plum on loamy soils the plum, and on chalky and light soils the almond, are the most desirable stocks, and for the cherry on loamy or light rich soils the wild cherry, and on chalk the " mahaleb" stock.

The form and especially the quality of fruit is more or less affected by the stock upon which it is grown. The Stanwick nectarine, so apt to crack and not to ripen when worked in the ordinary way, is said to be cured of these propensities by being first budded close to the ground, ou a very strong-growing Magnum Bonum plum, worked on a Brussels stock, and by then budding the nectarine on the Magnum Bonum about a foot from the ground. The fruit of the pear is of a higher colour and smaller on the quince stock than on the wild pear; still more so on the medlar. On the mountain ash the pear becomes earlier.

The effects produced by stock on scion, and more parti- cularly by scion on stock, are as a rule with difficulty appreciable. Nevertheless, in exceptional cases modified growths, termed "graft-hybrids," have been obtained which have been attributed to the commingling of the character- istics of stock and scion. Of these tle most remarkable example is Cytisus Adami, a tree which year after year produces some shoots, foliage, and flowers like those of the common laburnum, others like those of the very diffcrent looking dwarf shrub C. purpureus, and others again intermediate between these. We may hence infer that C. purpureus was grafted or budded on the common Jaburnum, and that the intermediate forms are the result of graft-

hybridization. Numerous similar facts have been re- corded. Among gardeners the general opinion is against the possibility of graft-hybridization. The wonder, however, secms to be that it does not occur more frequently, seeing that fluids must pass from stock to scion, and matter elaborated in the leaves of the scion must certainly to some extent enter the stock. It is clear, nevertheless, from examination that as a rule the wood of the stock and the wood of the scion retain their external characters year by year without change. Still, as in the laburnum just mentioned, in the variegated jasmine and in Abutilon Darwinit, in the copper beech and in the horse-chestnut, the influence of a variegated scion has occasionally shown itself in the production from the stock of variegated shoots. At a meeting of the Scottish Horticultural Association (see Gard. Chron., Jan. 10, 1880, fig. 12-14) specimens of a small roundish pear, the “Aston Town,” and of the elongated kind known as “Beurré Clairgeau,” were ex- hibited. Two more dissimilar pears hardly exist. The result of working the Beurré Clairgeau upon the Aston ‘Town was the production of fruits precisely intermediate in size, form, colour, speckling of rind, and other charac- teristics. Similar, though less marked, intermediate char- acters were obvious in the foliage and flowers.

Double grafting (French, greffe sur greffe) is sufficiently explained by itsname. By means of it a variety may often be propagated, or its fruit improved in a way not found practicable underordinary circumstances. For its successful prosecution prolonged experiments in different localities and in gardens devoted to the purpose are requisite.

Planting. —By removal from one place to another the growth of every plant receives a check. How this check can be obviated or reduced, with regard to the season, the state of atmosphere, and the condition and circumstances of the plant generally, is a matter to be considered by the practical gardener.

As to season, it is now admitted with respect to deciduous trees and shrubs that the earlier in autumn planting is performed the better; although some extend it from the period when the leaves fall to the first part of spring, before the sap begins to move. If feasible, the operation should be completed by the end of November, whilst the soil is still warm with the heat absorbed during summer. Atten- tion to this rule is specially important

in the case of rare and delicate plants. Early autumn planting enables wounded parts of roots to be healed over, and to form fibrils, which will be ready in spring, when if is most required, to collect food for the plant. Planting late in spring should, as far as possible, be avoided, for the buds then begin to awaken into active life, and the draught upon the roots becomes great. It has been supposed that because the surface of the young leaves is small transpiration is correspondingly feeble; but it must be remembered, not only that their newly-formed tissue is unable without an abundant supply of sap from the roots to resist the excessive drying action of the atmosphere, but that, in spring, the lowness of the temperature at that season in Great Britain prevents the free circulation of the sap. The comparative dryness of the atmosphere in spring also causes a greater amount of transpiration then than in autumn and winter. Another fact in favour of autumnal planting is the production of roots in winter.

The best way of performing transplantation depends greatly on the size of the trees, the soil in which they grow, and the mechanical appliances made use of in lifting and transporting them. The smaller the tree the more success- fully can it be removed. The more argillaceous and the less siliceous the soil the more readily can balls of earth be retained about the roots. All planters lay great stress on the preservation of the fibrils; all indeed admit them

to be indispensable for the absorption of nutriment. The point principally disputed is to what extent they can with safety be allowed to be cut off in transplantation. Trees and shrubs in thick plantations, or in sheltered warm places, are ill fitted for planting in bleak and cold situa- tions. During their removal it is important that the roots be covered, if only to prevent desiccation by -the air, Damp days are therefore the best for the operation ; the dryest months are the most unfavourable. Though success in transplanting depends much on the humidity of the atmosphere, the most important requisite is warmth in the soil; humidity can be supplied artificially, but heat cannot,

Pruning, or the removal of superfluous growths, is prac- tised in order to equalize the development of the different parts of trees, or to promote it in particular directions so as to secure a certain form, and, by checking undue luxuriance, to promote enhanced fertility. Inthe rose-bush, for instance, in which, as we have seen, the flower-buds are formed on the new wood of the year, pruning causes the old wood to “break,” z.e.. to put forth a number of new buds, some of which will produce flowers at their extremities. The manner and the time in which pruning should be accom- plished, and its extent, vary with the plant, the objects of the operation, z.e., whether for the production of timber or fruit, the season, and various other circumstances. So much judgment and experience does the operation call for that it is a truism to say that bad pruning is worse than none, The removal of weakly, sickly, overcrowded, and gross in- fertile shoots is usually, however, a matter about which there can be few mistakes when once the habit of growth and the form and arrangement of the buds are known. Winter pruning is effected when the tree is comparatively at rest, and is therefore lcss liable to “ bleeding” or cutpouring of sap. Summer pruning or pinching off the tips of such of the younger shoots as are not required for the extension of the tree, when not carried to too great an extent, is prefer- able to the coarser more reckless style of pruning. The injury inflicted is less and not so concentrated; the wounds are smaller, and have time to heal before winter sets in. The effects of badly-executed pruning, or rather hacking, are most noticeable in the case of forest trees, the mutila- tion of which often results in rotting, canker, and other diseases. Judicious and timely thinning so as to allow the trees room to grow, and to give them sufficiency of light and air, will generally obviate the need of the pruning- saw, except to a relatively small extent.

Training is a procedure adopted when it is required to grow plants in a limited area, or in a particular shape, as in the case of many plants of trailing habit. Judicious training also may be of importance as encouraging the forma- tion of flowers and fruit. Growth in length is mainly in a vertical direction, or at least at the ends of the shoots; and this should be encouraged, in the case of a timber tree, or of a climbing plant which it is desired should cover a wall quickly; but where flowers or fruit are specially desired, then, when the wood required is formed, the lateral shoots may often be trained more or less downward to induce fertility. The refinements

of training, as of prun- ing, may, however, be carried too far ; and not unfrequently the symmetrically trained trees of the French excite admira- tion in every respect save fertility.

Sports or Bud Variations.—Here we may conveniently mention certain variations from the normal condition 1 the size, form, or disposition of buds or shoots on a given plant. An inferior variety of pear, for instance, may suddenly produce a shoot bearing fruit of superior quality ; a beech tree, without obvious cause, a shoot with finely divided foliage ; or a camellia an unwontedly fine flower. When removed from the plant and treated as cuttings OF grafts, such sports may be perpetuated, Many garden

varieties of flowers and fruits have thus originated. The cause of their production is very obscure. In certain instances where plants have been “crossed” or hybridized, perhaps for generations, the phenomenon may be explained on the supposition of a dissociation of previously mixed elements, or of a reversion to some-ancestral conditions. Formation of Flowers.—Flowers, whether for their own sake or as the necessary precursors of the fruit and seed, are objects of the greatest concern to the gardener. As a rule they are not formed until the plant has arrived at a certain degree of vigour, or until a sufficient supply of nourishment has been stored in the tissues of the plant. The reproductive process of which the formation of the flower is the first stage being an exhaustive one, it is necessary that the plant, as gardeners say, should get “established ” before it flowers. Moreover, although the green portions of the flower do indeed perform the same office as the leaves, the

more highly coloured and more specialized portions, which |

are further removed from the typical leaf-form, do not carry on those processes for which the presence of chlorophyll is essential; and the floral organs may, therefore, in a rough sense, be said to be parasitic upon the green parts. A check or arrest of growth in the vegetative organs seems to bea necessary preliminary to the development of the flower. The flower itself is always the modified extremity of a shoot or stalk, which only

exceptionally lengthens beyond the flower, as, for example, in “ proliferous” roses. See Borany, vol. iv. p. 119, fig. 145.

A diminished supply of water at the root is requisite, so as to check energy of growth, or rather to divert it from leaf-making. Partial starvation will sometimes effect this; hence the grafting of free-growing fruit trees upon dwarfing stocks, as before alluded to, and also the “ringing” or girdling of fruit trees, z.¢., the removal from the branch of a ring of bark, or the application of a tight cincture, in consequence of which the growth of the fruits above the wound or the obstruction is enhanced. On the same principle the use of small pots to confine the roots, root- pruning and lifting the roots, and exposing thom to the sun, a8 is done in the case of the vine in somie countries, are resorted to, A higher temperature, especially with deficiency of moisture, will tend to throw a plant into a flowering condition. This is exemplified by the fact that the temperature of the climate of Great Britain is too low for the flowering, though sufficiently high for the growth of many plants. ‘Thus the Jerusalem artichoke, though able to produce stems and tubers abundantly, ouly flowers In exceptionally hot seasons.

Foreing.—The operation of forcing is based upon the facts just mentioned. By subjecting a plant toa gradually Imereasing temperature, and supplying water in proportion, its growth may be accelerated ; its season of development may be, as it were, anticipated; it is roused from a dormant to an active state, Forcing therefore demands the most careful adjustment of temperature and supplies of moisture and light,

Deficiency of light is less injurious than might at first be expected, because the plant to be forced has stored up In its tissues, and available for use, a reserve stock of material formed through the agency of light in former

_ ‘Seasons. The intensity of the colour of flowers and the

richness of flavour of fruit are, however, deficient where there 18 feebleness of light. Recent experiments of Dr Siemens have shown that the gardener may avail him- self of the electric light, which is proved to exercise on chlorophyll the same kind of influence as do the solar rays, and that he may thus supply the deficiencies of natural illu- mination, Theemployment of

thatlight for forcing purposes would seem to be at present a question of expense. The

great advantage hitherto obtained from its use has consisted

in the rapidity with which flowers have been formed and fruits ripened under its influence, circumstances which go towards compensating for the extra cost of production,

Double Flowers.—The taste of the day demands that “double flowers” should be largely grown. Though in some instances, as in hyacinths, they are decidedly less beautiful than single ones, they always present the advantage of being less evanescent. Under the vague term “double” many very different morphological changes are included. The flower of a double dahlia, e¢.g., offers a totally different condition of structure from that of a rose ora hyacinth. The double poinsettia, again, owes its so- called double condition merely to the increased number of its scarlet involucral leaves, which are not parts of the flower at all. It is reasonable, therefore, to infer that the causes leading to the production of double flowers are varied. A good deal of difference of opinion exists as to whether they are the result of arrested growth or of exuberant development, and accordingly whether restricted food or abundant supplies of nourishment are the more necessary for their production. It must suffice here to say that double flowers are most comnionly the result of the substi- tution of brightly-coloured petals for stamens or pistils or both, and that a perfectly double flower where all the stamens and pistils are thus metamorphosed is necessarily barren. Such a plant must needs be propagated by cuttings. It rarely happens, however, that the change is quite com- plete throughout the flower, and so a few seeds may be formed, some of which may be expected to reproduce the double-blossomed plants. By continuous selection of seed from the best varieties, and “ roguing ” or eliminating plants of the ordinary type, a “strain” or race of double flowers is gradually produced.

Lormation of Seed—Fertilization.—In fertilization— the influence in flowering plants of the sperm-cell, or its contents upon the germ-cell (see Borany, vol. iv. 147, and Biotocy, vol. iii, 695)—there are many circumstances of importance horticulturally, to which therefore brief reference must be made. Flowers, generally speaking, are either self-

fertilized, cross-fertilized, or hybridized. Self-fertilization occurs when the pollen of a given flower affects the germ-cell of the same individual flower. Such a flower is hermaphrodite functionally as well as structurally, In self-fertilizing flowers the structure is such that the pollen inevitably comes in contact with the stigma; but fertilization is also dependent on the simultaneous maturity of pollen and stigma. Cross-fertilization varies both in manner and degree. In the simplest instances the pollen of one flower fertilizes the ovules of another on the same plant, owing to the stamens arriving at maturity in any one flower earlier or later than the pistils. Such flowers though structurally hermaphrodite are, at any given time, function-ally unisexual. In many plants a polymorphic condition occurs: thus, in the same species of primrose some flowers have the stamens short, and within the tube of the corolla, with the style projecting beyond the mouth, giving the appearance termed ‘pin-eyed,” while others, known as “thrum-eyed,” present exactly reverse conditions of stamens and style. In the common loose-strife, Zythrwm Salicaria, the stamens are of three lengths, and the styles differ corre- spondingly. In such di- or tri-morphic flowers, as Mr Dar- win’s experiments have shown, the most complete fertility occurs when a cross is effected between a flower having short stamens and one with short styles. It is asserted that, not ouly is such a union more fertile than when pollen from a short stamen is placed on a long style, or vice versa, but the seedling plants are as a rule more vigorous.

Cross-fertilization must of necessity occur when the flowers are structurally unisexual, as in the hazel, in which the male and female flowers are monecious, or

separate on the same plant, and in the willow, in which they are dicecious, or on different plants. A conspicuous example of a dicecious plant is the common aucuba, of which for years only the female plant was known in Britain. ‘When, through the introduction of the male plant from Japan, its fertilization was rendered possible, ripe berries, before unknown, became common ornaments of the shrub.

The conveyance of pollen from one flower to another in cross-fertilization is effected naturally by the wind, or by the agency of insects and other

creatures. Flowers that require the aid of insects usually offer some attraction to their visitors in the shape of bright colour, fragrance, or sweet juices. The colour and markings of a flower often serve to guide the insects to the honey, in the obtaining of which they are compelled either to remove or to deposit pollen, The reciprocal adaptations of insects and flowers demand attentive observation on the part of the gardener concerned with the growing of grapes, cucumbers, melons, and strawberries, or with the raising of new and improved varieties of plants. Scarcely Jess remarkable, though not so important in the present connexion, are the means by which the visits of such insects as are useless for the purpose of fertilization, or even injurious to the plant, as preying without advantage to it on its secretions, are prevented or rendered ineffective. In wind-fertilized plants the flowers are comparatively inconspicuous and devoid of much attractions for insects; and their pollen- cells are smoother and smaller, and better adapted for transport by the wind, than those of insect-fertilized plants, the roughness of which adapt them for attachment to the bodies of insects.

Although the general facts with respect to fertilization are as above stated, it must be remembered that probably self-fertilization is not constant in any plant under all circumstances, and that it certainly does sometimes take place in flowers which are usually cross-fertilized. It may be that, while continued self-fertilization ensures the perpetuation of certain qualities, cross-fertilization induces beneficial variation. Some botanists doubt the injurious effects attributed to self-fertilization, and, so long as a plant is healthy, it can be attended with but little dis- advantage ; but after a time in any case a cross is probably useful, and sometimes fertility is found to be much greater, and, in rare instances, only possible, when impregnation is effected by pollen not produced by a flower’s own stamens.

It is very probable that the same flower at certain times and seasons is self-fertilizing, and at others not so. The defects which cause gardeners to speak of certain vines as “shy setters,” and of certain strawberries as “blind,” may be due either to unsuitable conditions of external temperature, or to the non-accomplishment, from some cause or other, of cross-fertilization. In a vinery or a peach- house it is often good practice at the time of flowering to tap the branches smartly with a stick so as to ensure the dispersal of the pollen. Sometimes more delicate and direct manipulation is required, and

the gardener has himself to convey the pollen from one flower to another, for which purpose a small camel’s-hair pencil is generally suitable. The degree of fertility varies greatly according to external conditions, the structural and functional arrangements just alluded to, and other causes which may roughly be called constitutional. Thus, it often happens that an apparently very slight change in climate alters the degree of fertility. Certain plants which seem almost sterile with their own pollen become fertile if grafted on some others. In a particular country or at certain seasons one flower will be self-sterile or nearly so, and another just the opposite. The influence of conditions on the formation of “races,” and the consequent importance to the horticulturist seeking to obtain new and improved strains of crossing-plants grown

in different localities, have been specially insisted on by Darwin. those accruing from what gardeners call “ change of seed,” i.e., the sowing of seed or the planting of tubers, say of potatoes, in localities and on soils other than those in which they themselves were produced.

hibiting improvements in hardihood, vigour,

| GENERAL,

The advantages of this practice are analogous to

Hybridization.—Some of the most interesting results and

many of the gardener’s greatest triumphs have been obtained by hybridization, z.¢, the crossing two individuals, not of the same but of two distinct species of plants, as, for instance, two species of rhododendron or two species of orchid. degree than in kind from cross-fertilization. The occurrence of hybrids in nature explains the difficulty experienced by botanists in deciding on what is a species, and the widely different limitations of the term adopted by different observers in the case of willows, roses, brambles, &c. The artificial process 1s practically the same in hybridization as in cross-fertilization, but usually requires more care. To prevent self-fertilization, or the access of insects, it 1s advis- able to remove

the stamens and even the corolla from the flower to be impregnated, as its own pollen or that of a flower of the same species is often found to be “ prepotent.” There are, however, cases, ¢.g., Some passion-flowers and rho- dodendrons, in which a flower is more or less sterile with its own, but fertile with foreign pollen, even when this is from a distinct species. procal crosses are not always or even often possible; thus, one rhododendron may afford pollen perfectly potent on the stigma of another kind, by the pollen of which latter its own stigma is unaffected. With respect to the relations

Tt is obvious that hybridization differs more in

Tt is a singular circumstance that reci-

of the hybrid offspring, which partakes sometimes more of

the characteristics of the male or pollen parent, sometimes

more of those of the female or seed-parent, the opinions of practical experimenters are So diverse that at present no general rule can be established. A valuable essay on the subject is the presidential address read by Mr Anderson- Henry at the annual meeting of the Botanical Society of

Edinburgh in 1867. A general résumé of the facts will be found in Darwin’s Origin of Species, his Variations of Am- mals and Plants under Domestication, and his works on the

fertilization of flowers. See also HyBRIDISM.

The object of the hybridizer is to obtain varieties ex- size, shape, colour, fruitfulness, or other attributes. His success depends not alone on skill and judgment, for some seasons, or days even, are found more propitious than others. Although promiscuous and hap-hazard procedures no doubt meet with a measure of success, the best results are those which are attained by systematic work with a definite aim. To secure early and free-flowering varieties, Mr Henry advises “violent” crosses, #.¢., crosses between varieties or species as distantly related as is practicable. Careful experiments are still greatly needed for the elucidation of the mysteries and the development of the resources 0 hybridization. It is difficult to

understand why some very closely-related species, ¢.g., the apple and pear, the currant and gooseberry, refuse to intercross, while much more remote species, or even members of different genera, Cab be made to do so, as in the case of the hybrid Philageria (see Gardeners' Chronicle, 1872, p. 358), which is te result of a cross between the climbing plant Lapagera rose and the dwarf bush Philesia buxtfolia. ;

Hybrids are usually less fertile than pure-bred species, and are occasionally quite sterile. Some hybrids, however, are as fertile as pure-bred plants. Hybrid plants may be again crossed, or even re-hybridized, so as to pee progeny of very mixed parentage. This is the case wit many of our roses, dahlias, begonias, pelargonlums, an other long or widely cultivated garden plants.

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PRINCIPLES. |

Reversion.—In modified forms of plants there is fre- quently a tendency to "sport" or revert to parental or ancestral characteristics. So markedly is this the case with hybrids that in a few generations all traces of a hybrid origin may disappear. The dissociation of the hybrid element in a plant must be obviated by careful selection.

Germination.—The length of the period during which seeds remain dormant after their formation is very variable. The conditions for germination are much the same as for growth in general. Access to light is not required, because the seed contains a sufficiency of stored-up food. The temperature necessary varies according to the nature and source of the seed. Some seeds require prolonged immersion in water to soften their shells; others are of so delicate a texture that they would dry up and perish if not kept constantly ina moist atmosphere. Seeds buried too deeply receive a

deficient supply of air. Asa rule, seeds require to be sown more deeply in proportion to their size and the lightness of the soil.

The time required for germination in the most favourable circumstances varies very greatly, even in the same species, aud in seeds taken from one pod. Thus the seeds of Primula japonica, though sown under precisely similar conditions, yet come up at very irregular intervals of time. Germination is often slower where there is a store of avail- able food in the perisperm or albumen, or in the embryo itself, than where this is scanty or wanting. In the latter case the seedling has early to shift for itself, and to form roots and leaves for the supply of its needs.

Selection. —Supposing seedlings to have been developed, it is found that a large number of them present considerable

_ variations, some being especially robust, others peculiar in

size or form. Those most suitable for the purpose of

the gardener are carefully selected for propagation,

while others not so desirable are destroyed; and thus after a few generations a fixed variety, race, or strain superior to the original form is obtained. Many garden plants have originated solely by selection; and it is certain that, quite independently of cross-breeding, much could still be done to improve our breeds of vegetables, _ flowers, and fruit by more systematic selection. The re- _ markable results obtained in the case of Major Hallett's _ pedigree wheat and Mr Bennett's hybrid tea-roses are in- – stances in point. Two robust-growing varieties of potato, the "Magnum Bonum" and the '" Champion," have been _ found to resist better than others the attacks of fungus to _ which the plant is liable. Whatever may be the cause, _ whether the possession by the tuber of a more than ordi- narily thick skin, or other peculiarity, it is obvious that selection with a view to the development of this quality _ might be productive of the most important results, Darwin recommends, as a means of improving health and fertility by intercrossing without loss of purity of race, to sow in alternate rows seeds grown under as different conditions as possible. Large and well-formed seeds are to be preferred for

harvesting, The seeds should be kept in sacks or bags in

a dry place, and if from plants which are rare, or liable to lose their vitality, they are advantageously packed for transmission to a distance in bottles or jars filled with earth or sphagnum moss, without the addition of moisture. Cuttings and entire plants may be transported in wide- mouthed bottles,

It will have been gathered from what has been said that seeds cannot always be depended on to reproduce exactly the characteristics of the plant which yielded them; for

| Instance, seeds of the greengage plum or of the Ribston

_ pippin will produce a plum or an apple, but not these parti- | cular varieties, to

perpetuate which grafts or buds must be

employed, (M. T. M.)

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Part I],.—Tue Practice or Horticulture.

The details of horticultural practice naturally range

under the three heads of flowers, fruits, and vegetables. There are, however, certain general aspects of the subject which will be more conveniently noticed apart, since they apply alike to each department. We shall therefore first treat of these under four headings :—formation and pre- paration of the garden, garden structures and edifices, garden materials and appliances, and garden operations.

I. Formation and Preparation of the Garden.

1. Site.—The site chosen for the mansion will more or

less determine that of the garden, the pleasure grounds and

flower garden being placed so as to surround or lie con- tiguous to it, while the fruit and vegetable gardens, cither together or separate, should be placed on one side or in the rear, according to fitness as regards the nature of the soil and subsoil, the slope of the surface, or the general features of the park scenery. In the case of villa gardens there is usually little choice: the land to be occupied is cut up into plots, usually rectangular, and of greater or less breadth, and in laying out these plots there is generally a smaller space left in the front of the villa residence and a larger one behind, the front plot being usually devoted to approaches, shrubbery, and plantations, flower beds being added if space permits, while the back or more private plot has a piece of lawn grass with flower beds next the house, anda space for vegetables and fruit trees at the far end, this latter being shut off from the lawn by an intervening screen of ever- greens, Between these two classes of gardens there are many gradations, but our remarks will chicfly apply to those of larger extent.

The almost universal practice is to have the fruit and vegetable gardens combined; and the flower garden may sometimes be conveniently placed in juxtaposition with then. When the fruit and vegetable gardens are combined, the smaller and choicer fruit trees only should be admitted, such larger-growing hardy fruits as apples, pears, plums, cherries, &c., being relegated to the orchard.

Ground possessing a gentle inclination toward the south is desirable fora garden. On such a slope effectual drain- ing is easily accomplished, and the greatest possible benefit is derived from the sun’s rays. It is well also to have an open exposure towards the east and west, so that the garden may enjoy the full benefit of the morning and evening sun, especially the latter ; but shelter is desirable on the north and north-east, or in any direction in which the particular locality may happen to be exposed.

Site.

2. Soil and Subsoil.—A hazel-coloured loam, moderately Soil.

light in texture, is well-adapted for most garden crops, whether of fruits or culinary vegetables, especially a good warm deep loam resting upon chalk; and if such a soil occurs naturally in the selected site, but little will be required in the way of preparation. If the soil is not moderately good and of fair depth, the situation is not an eligible one for gardening purposes. Wherever the soil is not quite suitable, but is capable of being made so, it is best to remedy the defect at the outset ; and as it will be found easier to render a light soil sufficiently retentive than to make a tenacious clay sufficiently porous, a light soil is to be preferred to one which is excessively stiff and heavy. It is advantageous to possess a variety of soils; and if the garden be on a slope, it will often be practicable to render the upper part light and dry, while the lower remains of a heavier and damper nature.

Natural soils consist of substances derived from the decomposition of various kinds of rocks, the bulk consisting of clay, silica, and lime, in various proportions. As regards preparation, draining is of course of the utmost importance.

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Subsoil.

Size.

Plan.

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The ground should also be trenched, to the depth of 3 feet at least, but the deeper the better, provided the good soil be not buried under a mass of inferior quality. In this opera- tion all stones larger than a man’s fist must be taken out, and all roots of trees and of perennial weeds carefully cleared away. When the whole ground has been thus treated, a moderate liming will, in general, be useful. After this, supposing the work to have occupied most of the summer, the whole may be laid up in ridges, to expose as great a surface as possible to the action of the winter’s frost.

Argillaceous or clay soils are those which contain a large per- centage (45-50) of clay, and a small percentage (5 or less) of lime. These are unfitted for garden purposes until improved by draining, liming, trenching, and the addition of porous materials, such as ashes, burnt ballast, or sand, but when thoroughly improved they are very fertile and less liable to become exhausted than most other soils. Loamy soils contain a considerable quantity (30-45 per cent.) of clay, and smaller quantities (5 or less) of lime and humus. Such soils properly drained and prepared are very suitable for orchards, and when the proportion of clay is smaller (20-80 per cent.) they form excellent garden soils, in which the better sort of fruit trees luxuriate. Marly soils are those which contain a considerable per- centage (10-20) of lime, and are called clay marls, loamy marls, and sandy marls, according as these several ingredients preponderate. The clay marls are, like clay soils, too stiff for garden purposes until ameliorated ; but loamy marls are fertile and well suited to fruit trees, and sandy marls are adapted for producing early crops. Cal- careous soils, which may also be heavy, intermediate, or Baht, are those which contain more than 20 per cent. of lime, their fertility depending on the proportions of clay and sand which enter into their composition ; they are generally cold and wet. Vegetable soils or moulds, or humus soils, contain a considerable percentage (more than 5) of humus, and embrace both the rich productive garden moulds and those known as peaty soils.

The nature of the subsoil is of scarcely less importance than that of the surface soil. If an unsuitable subsoil has to be dealt with, it must be removed or ameliorated. An uneven subsoil, especially if retentive, is most undesirable, as water is apt to collect in the hollows, and thus affect the upper soil, The remedy is to make the plane of its surface agree with that of the ground. When there isa hard pan this should be broken up, and if of bad quality the material should be removed altogether. an injurious preponderance of metallic oxides or other

deleterious substances, the roots of trees would be affected

by them, and they must therefore be removed. When the subsoil is too compact to be pervious to water, effectual drainage must be resorted to; when it is very

loose, so that it drains away the fertile ingredients of the |

soil as well as those which are artificially supplied, the compactness of the stratum must be increased. The best of all subsoils is a dry bed of clay overlying sandstone.

3. Size and Form.—The general size of a garden adjoining a mansion is from 4 to 6 acres; but in many places the extent varies from 12 to 20 or even 30 acres. A garden of 2 to 3 acres, enclosed by walls and surrounded by slips, will, however, suffice for the supply of a moderate establishment.

In laying out the garden, the plan should be prepared in minute detail before commencing operations. The form of the kitchen and fruit garden should be square or oblong, rather than curvilinear, since the working and cropping of the ground can thus be more easily carried out. The whole should be compactly arranged, so as to facilitate working, and to afford convenient access for the carting of the heavy materials. This access is especially desirable as regards the store-yards and framing ground, where fermenting manures and tree leaves for making up hot beds, coals or wood for fuel, and ingredients for composts, together with flower pots and the many necessaries of garden culture, have to be accommodated. In the case of villas or picturesque residences, gardens of irregular form may be permitted ; when adapted to the conditions of the locality, they associate better with surrounding objects, but in such gardens wall space is usually limited.

HORTICULTURE

When there is |

[PLAN OF GARDEN,

The distribution of the garden area in walks, borders, and compartments must be partly regulated. by the out. line of the ground. In general, a gravel walk, 6 or 8 feet broad, is led quite round the garden, both within and without the walls. structed in the centre of the garden in the direction of the glazed houses, and this is sometimes crossed by another at right angles, which is far preferable to having the walks led diagonally from the corners, since this throws the enclosed plots out of the square, the walk that skirts it

is called the wall-border, and is commonly from 15 to 20 feet broad. On the interior of the walk there is usually another border 5 or 6 feet broad, which is generally occupied by fruit trees, trained either as espaliers, as dwarfs, or as pyramids. The middle part of the garden is divided into rectangular compartments for raising the various culinary crops. It is advantageous to have several small beds, in which to cultivate the less bulky subjects, such as basil, sage, tarragon, &c., which, in large spaces, are apt to be overlooked or neglected.

A considerable portion of the north wall is usually covered in front with the glazed structures called forcing. houses, and to these the houses for ornamental plants are sometimes attached; but a more appropriate site for the latter is the flower garden, when that forms a separate department. It is well, however, that everything connected with the forcing of fruits or flowers should be concentrated in one place. The frame ground, including melon and pine pits, should occupy some well-sheltered spot in the slips, or on one side of the garden, and adjoining to this may be found a suitable site for the compost ground, in which the various kinds of soils are kept in store, and in which also composts may be prepared.

As the walls afford valuable space for the growth of the choicer kinds of hardy fruits, the direction in which they are built is of considerable importance. In the warmer parts of the country the wall on the north side of the garden should be so placed as to face the sun at about an hour before noon, or a little to the east of south; in less favoured locali- ties it should be made to face direct south, and in still

more unfavourable (peut) a districts it should (772 ——

face the sun an hour Fic. 1.—Plan of Garden an acre in area.

after noon, or a little west of south. The east and west walls should run parallel to each other, and at right angles to that on the north side, in all the most favoured localities; but in colder or later ones, though parallel, they should be so far removed from a right angle as to get the sun by eleven o’clock. On the whole, the form of a parallelogram with its longest sides in the propor- tion of about five to three of the shorter, and running east and west, may be considered the best form, since it affords a greater extent of

south wall than any other. Mr Thompson, in the Gardener’s Assistant, gives a figure which is nearly in this proportion (fig. 1), representing a small garden 272} feet by 160, and therefore containing exactly an acre. This figure admits of nearly double the number of trees on the south aspect as compared with the east and west ; it allows a greater number of espalier or pyramid trees to face the south ; and it admits of being divided into equal principal compartments, each of which forms nearly a square. The size of course can be increased to any requisite extent. That of the royal gardens at Frogmore,

A walk of similar dimensions is often con-.

The space between the wall and

r of the blast is absolutely necessary.

PORMATION OF GARDEN. |

760 feet from east to west, and 440 feet from north to south, is nearly of the same proportions.

The spaces between the walls and the outer fence are called slips. A considerable extent is sometimes thus enclosed, and utilized for the growth of such vegetables as potatoes, winter greens, and sea-kale, for the small bush fruits, and for strawberries. The slips are also convenient as affording a variety of aspects, and thus helping to pro- long the season of particular vegetable crops.

4, Shelter.—A screen of some kind to temper the fury If the situation is not naturally well sheltered, the defect may be remedied by masses of forest trees disposed at a considerable distance so as not to shade the walls or fruit trees. They should not be nearer than say 50 yards, and may vary from that to 100 or 150 yards distance according to circumstances, regard being had especially to peculiarities occasioned by the configuration of the country, as for instance to aerial currents from adjacent eminences. Care should be taken, however, not to hem in the garden by crowded plantations,

_ shelter from the prevailing strong winds being all that

is required, while the more open it is in other directions the better. The trees employed for screens should include both those of deciduous and of evergreen habit, and should suit the peculiarities of local soil and climate. Of deciduous trees the sycamore, wych-elm, horse-chestnut, beech, lime, plane, and poplar may be used,—the Populus canadensis nova being one of the most rapid-growing of all trees, and, like other poplars, well-suited for nursing other choicer subjects; while of evergreens, the holm oak, holly, laurel (both common and Portugal), and such conifers as the Scotch, Weymouth, and Austrian pines, with spruce and silver firs and yews, are suitable. The conifers make the most effective screens.

Extensive gardens in exposed situations are often divided into compartments by hedges, so disposed as to break the foree of high winds. Where these are required to be narrow as well as lofty, holly, yew, or beech is to be preferred ; but, if there is sufficient space, the beautiful laurel and the bay may be employed where they will thrive. Smaller hedges may be formed of evergreen privet, or of tree-box, These subordinate divisions furnish, not only shelter, but also shade, which, at certain seasons, is

peculiarly valuable.

_ Belts of shrubbery may be placed round the slips out- side the walls ; and these may in many cases, or in certain parts, be of sufficient breadth to furnish pleasant retired

| promenades, at the same time that they serve to mask the _ formality of the walled gardens, and are made to harmonize

_ with the picturesque scenery of the pleasure ground.

t 9, Water Supply. —Although water is one of the most _ Important elements in vegetable life, we do not find one garden in twenty where even ordinary precautions have been taken to secure a competent supply. Rain-water is the best, next to that river or pond water, and last of all that from springs; but a chemical analysis should be made of the last. before introducing it, as some spring waters Contain mineral ingredients injurious to vegetation. Iron pipes are the best conductors; they should lead to a

- ©apacious open reservoir placed outside the garden, and

at the highest convenient level, in order to secure suf- ficient pressure for effective distribution, and so that the wall trees also may be effectually washed. Stand pipes Should be placed at intervals beside the walks and in other convenient places from which water may at all times be drawn ; and short flexible tubes should be made to fit on to them, to which a garden hose can be attached, so as to | permit of the whole garden being readily and when neces- _ Stty profusely watered. The maius should be placed under _ the walks for safety, and also that they may be easily

ren! Il @U L PY Slave

reached when repairs are required. Pipes should also be laid having a connexion with all the various greenhouses and forcing-houses, each of which should be provided with a cistern for aerating the daily supplies. In fact, every part of the garden, including the working sheds and offices, should have water supplied without stint. At the same time it is not expedient to admit of large basins or ponds, and far less of a running stream in a garden.

6. Approach and Fence.—The entrance to the garden En- from without is a matter requiring the exercise of some trances.

taste and of sound judgment. If possible, it should be from the south and front, so that the pleasing effect of the range of glazed houses may be realized by the visitor on entering. Sometimes a lateral entrance, leading from the flower- garden through an intermediate shrubbery, and coming upon the hot-houses in flank, may be necessary. The worst of all entrances is from the back or north, everything being then viewed in reverse.

All gardens of large extent should be encircled by an outer boundary, which is often formed by a sunk wall or ha-ha surrounded by an invisible wire fence to exclude ground game, or consists of a hedge with low wire fence on its inner side. Occasionally this sunk wall is placed on the exterior of the screen plantations, and walks lead through the trees, so that views are

obtained of the adjacent country. Although the interior garden receives its form from the walls, the ring fence and plantations may be adapted to the shape and surface of the ground. In smaller country gardens the enclosure or outer fence is often a hedge, and there is possibly no space enclosed by walls, but some divisional wall having a suitable aspect is utilized for the growth of peaches, apricots, d&c., and the hedge merely separates the garden froma paddock used for grazing. The still smaller gardens of villas are generally bounded by a wall or wood fence, the inner side of which is appropriated to fruit trees. For the latter, walls are much more convenient and suitable than a boarded fence, but in general these are too low to be of much value as aids to cultivation, and they are best covered with bush fruits or with ornamental plants of limited growth.

7. Walks and Edgings.—The best material for the con- struction of garden walks is good binding gravel. The ground should be excavated to the depth of a foot or more, — the bottom being made firm and slightly concave, so that it may slope to the centre, where a drain should be intro- duced ; or the bottom may be made convex aud the water allowed to drain away at the sides. The bottom 9 inches should be filled in compactly with hard coarse materials, such as stones, brickbats, clinkers, burned clay, &c., on which should be laid two or three inches of coarse gravel, and then an inch or two of firm binding gravel on the surface. The surface of the walks should be kept well rolled, for nothing contributes more to their elegance and durability.

All the principal lines of walk should be broad enough to allow at least three persons to walk abreast ; the others may be narrower, but a multitude of narrow walks has a

puny effect. Much of the neatness of walks depends upon

the material of which they are made. Gravel from an inland pit is to be preferred ; though occasionally very ex- cellent varieties are found upon the sea-coast. The gravels of Kensington and Blackheath have attained considerable celebrity, and have been frequently employed in remote parts of the kingdom, the expense being lessened by their being conveyed to different sea-ports as ballast for ships. Gravel walks must be kept free from weeds, either by hand weeding, by occasionally salting the surface, or by

watering with boiling salt water. In some parts of the country the available material does not bind to form a close even surface, and such walks are kept clean by hoeing.

Grass walks were common in English gardens during the

En- closure.

Walks.

Edgings.

Gar- dener’s house.

Walls.

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prevalence of the Dutch taste, but, owing to the frequent humidity of the climate, they have in a great measure been discarded. ‘Their disuse is perhaps to be regretted, as in some situations, particularly behind lengthened screens of trees, they form very agreeable promenades in dry, hot weather. Grass walks were made in the same way as grass lawns. When the space to be thus occupied had been prepared, a thin layer of sand or poor earth was laid upon the surface, and over this a similar layer of good soil. This arrangement was adopted in order to prevent excessive luxuriance in the grass.

Edgings.—Walks are separated from the adjoining beds and borders in a variety of ways. If a living edging 18 adopted, by far the best is afforded by the dwarf Dutch box planted closely in line. It is of extremely neat growth, and, when annually clipped, will remain in good order for many years. Very good edgings, but of a less durable character, are formed by thrift (Statice Armeria), double daisy (Bellis perennis), gentianella (Gentiana acaulis), and London pride (Saxifraga umbrosa) ; or by some of the finer grasses very carefully selected, such as the sheep’s fescue (Festuca ovina) or its glaucous-leaved variety. Indeed, any low-growing herbaceous plant, susceptible of minute division, is suitable foranedging. Edgings may also be

formed of narrow slips of sandstone flag, slate, fire-clay tiles, bricks, glass, or cast- iron, Anexcellent form of edging tile is that invented by Mr Stevens of Trent- ham Gardens (fig. 2), which is made of a very durable kind of clay, and is remarkably neat in appearance. It is 18 inches long, 5 inches deep, and 5 inches broad, and, resting on the broad base, is held firmly by the gravel used for filling up the walk. One advantage of using edgings of this kind, especially in kitchen gardens, is that they do not harbour slugs and similar vermin, which all live edgings do, and often to a serious extent, if they are left to grow large. In shrubberies and large flower-plots, verges of grass-turf, from 1 to 3 feet in breadth, according to the size of the border and width of the walk, make a very handsome edging, but they should not be allowed to rise more than an inch anda half above the gravel, the grass being kept short by repeated mowings, and the edges kept trim and well-defined by frequently clipping with shears, and cutting once a year with an edging iron.

Fig. 2.—Stevens's Edging Tile.

Il. Garden Structures.

8, Gardener's Residence.—The gardener's residence and the apartments for the workmen should be within con- venient distance of each other and of the forcing-houses. The gardener's house may stand in the centre of the range of hot-houses, or it may be placed in one corner of the walled garden. In either case it should communicate on the one side with the best part of the garden, and on the other with the yard in which the garden offices are placed.

9. Walls.—The position to be given to the garden walls has been already referred to under par. 3. The shelter afforded by a wall, and the increased temperature secured by its presence, are indispensable in the climate of Great Britain, for the production of all the finer kinds of outdoor fruits ; and hence, the inner side of a north wall, having a southern aspect, is appropriated to the more tender kinds. It is, indeed, estimated that such positions enjoy an in- creased temperature equal to 7° of latitude; that is to say, the mean temperature within a few inches of the wall is

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equal to the mean temperature of the open plain 7° farther south. The eastern and western aspects are set apart for fruits of a somewhat hardier character.

Where the inclination of the ground is considerable, and the presence of high walls would be objectionable, the latter may be replaced by sunk walls. These should not rise more than 3 feet above the level of the ground behind them. As dryness is favourable to an increase of heat, such walls should be either built hollow, or packed behind to the thickness of 3 or 4 feet with rubble stones, flints, brickbats, or similar material, thoroughly drained at bottom, For mere purposes of shelter a height of 6 or 7 feet will generally be sufficient for the walls of a garden, but for the training of fruit trees it is found that an average height of 12 feet is most suitable. In gardens of large size the northern or principal wall may be 14 feet, and the side walls 12 fect in height ; while smaller areas of an acre or so should have the principal walls 12 and the side walls 10 feet in height. As brick is more easily built hollow than stone, it is to be preferred for garden walls) A 14-inch hollow wall will take in its construction 12,800 bricks, while a solid 9-inch one, with piers, will take 11,000; but

_the hollow wall, while thus only a little more costly, will be

greatly superior, being drier and warmer, as well as more substantial. Bricks cannot be too well burnt for garden walls; the harder they are the less moisture will they absorb. The darker colour they acquire when the process of burning is prolonged is also more in harmony with the surrounding objects. At one time brick walls were preferred on account of the facility they afforded for training trees, but now cast-iron studs (fig. 3) or some-times nails are placed in the wall during its erection, being pushed into the joints before the mortar becomes set, and ranged in straight lines, both vertically and hori- zontally; for peaches, &c., they are placed 9 inches apart, and for pears, &c., 15 inches. The trees are fastened to them by soft liga- tures of twine or matting, which should F1¢. 3.—Cast-[ron’ be twisted after being tied to the stud or Wall Sa nail, so as to prevent contact between the branch and the metal. Many excellent walls are built of stone. The best is dark-coloured whinstone, because it absorbs very little moisture, or in

Scotland Caithness pavement 4 inches thick. The stones can be cut (in the quarries) to any required length, and built in regular courses. Stone walls should always be built with thin courses for convenience of train- ing over their surface. Concrete walls, properly coped and provided witb a trellis, may in some places be cheapest, and they are very durable. Common rubble walls are the wors of all.

The coping of garden walls is important, both for the preservation of the walls and for throwing the rain-water off their surfaces. It should not project less than from 2 to 2h inches,.but in wet districts may be extended to 6 inches. Stoue copings are best, but they are costly, and Portland cement is sometimes substituted. Temporary copings of wood, which may be fixed by means of per- manent iron brackets just below the stone coping, are extremely useful in spring for the protection of the blos- soms of fruit trees. ‘They should be 9 inches or a foot wide, and should be put on during spring before the blossom buds begin to expand; they should have attached to them scrim cloth (a sort of thin canvas), which admits light pretty freely, yet is sufficient to ward off ordinary frosts; this canvas is to be let down towards evening, 40 drawn up again in the morning. These copings should be removed when they are of no further utility as protectors, so that the foliage may have the full benefit of rain and

dew. Any contrivance that serves to interrupt radiation, though it may not keep the temperature much above freez- ing, will be found sufficient. Standard fruit trees must be left to take their chance ; and, indeed from the lateness of their flowering, they are generally more injured by blight, and by drenching rains, which wash away the pollen of the flowers, than by the direct effects of cold.

Hot walls, whether constructed to be warmed by flues or hot-water pipes, are nearly or quite obsolete. Their chief use is to assist in ripening the young wood and the crops of the later varieties of tender fruits by the aid of artificial heat, but the expenditure would be more usefully directed to the construction of a glazed house for that purpose.

Espalier Rails.—Subsidiary to walls as a means of training fruit trees, espalier rails were formerly much em- ployed, and are still used in many gardens. In their simplest form, they are merely a row of slender stakes of larch or other wood driven into the ground, and connected by a slight rod or fillet at top. The use of iron rails has now been almost wholly discontinued on account of metal- lic substances acting as powerful conductors of both heat and cold in equal extremes. Trees trained to espalier rails have some advantages, as they are easily got at for all cultural operations, space is saved, and the fruit, while freely exposed to sun and air, is tolerably secure against wind. They form, moreover, neat enclosures for the vegetable quarters, and, provided excess of growth from the centre is successfully grappled with, they are pro- ductive in soils and situations which are suitable.

10. Plant Houses.—These include all those ‘structures * which are more intimately associated with the growth of ornamental plants and flowers, and comprise conservatory, plant stove, greenhouse, and the subsidiary pits and frames. They should be so erected as to present the smallest extent of opaque surface consistent with stability. With this object in view, the early improvers of hot-house archi- tecture substituted metal for wood in the construction of the roofs, and for the most part dispensed with back walls; but the conducting power of the metal caused a great irregularity of temperature, which it was found difficult to control; and, notwithstanding the elegance of metallic houses, this circumstance, together with their greater cost, and some doubt as to their durability, has induced most recent authorities to give the preference to wood. The combination of the two, however, as in the Crystal Palace at Sydenham, shows clearly that, without much’ variation of heat or loss of light, any extent of space may be covered, and houses of any altitude constructed.

The earliest notice we have of such structures is given in the Latin writers of the 1st century (Mart., Zpigr., viii. 14 and 68); the ’AddvSos xjrou, to which allusion is made by various Greek authors, have no claim to be mentioned mn this connexion. Columella (xi. 3, 51, 52) and Pliny (H.N., xix. 23) both refer to their use in Italy for the cultivation of the rarer and more delicate sorts of plants and trees. Seneca has given us a description of the applica- tion of hot water for securing the necessary temperature. The

botanist J ungermann had plant houses at Altdorf in Switzerland ; those of Loader, a London merchant, and the conservatory in the Apothecaries' Botanic Garden at Chelsea, were the first structures of the kind erected in British gardens. These were, however, ill adapted for the growth of plants, as they consisted of little else than a luge chamber of masonry, having large windows in front, With the roof invariably opaque. The next step was taken when it became fashionable to have conservatories attached to mansions, instead of having them in the pleasure grounds. This arrangement brought them within the province of architects, and for nearly a century utility and fitness for the cultivation of plants were sacrificed, as still

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is often the case, to the unity of architectural expression between the conservatory and the mansion.

Plant houses must be as far as possible impervious to wet and cold air from the exterior, provision at the same time being made for ventilation, while the escape of warm air from the interior must also be under control, The most important part of the enclosing material is necessarily glass. But as the rays of light, even in passing through transparent glass, lose much of their energy, which is further weakened in proportion to the distance it has to travel, the nearer the plant can be placed to the glass the more per- fectly will its functions be performed; hence the import- ance of constructing the roofs at such an angle as will admit the most light, especially sunlight, at the time it is most required. Plants in glass houses require for their fullest development more solar light probably than even our best hot-houses transmit,—certainly much more than is transmitted through the roofs of houses as generally con- structed.

Plant houses should be constructed of the best Baltic pine timber, as being the most durable, but the whole of the parts should be kept as light as possible. In many houses, especially those where ornament is of no conse- quence, the rafters are now omitted, or only used at wide intervals, somewhat stouter sash-bars being adopted, and

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Fic. 4.—Lean-to Plant House.

stout panes of glass, 8 to 12 inches wide, made use of. Such houses are very light; being also very close, they require careful ventilation. The glass roof is commonly designed so as to form a uniform plane or slope from back to front in lean-to houses (fig. 4), and from centre to sides in span-roofed houses. In some cases, however, the roof sashes are fitted up on the ridge-and-furrow principle invented by Sir Joseph Paxton, shown in fig. 5, which represents the original ridge-and-furrow house erected by him at Chatsworth. To secure the greatest possible influx of light, some scientific horticulturists recommend

curvilinear roofs; but the superiority of these is largely

1 Mr Knight, an unquestionable authority, proposed a general pitch or elevation of 34° for the latitude of London, the angle at which the rays of the mid-day sun are perpendicular to the surface on the 20th of May and 2ist of July. This would afford four months, from the 20th of April to the 21st of August, during which the angle of incidence at mid-day would not at any time amount to 9°, while the deviation at the winter solstice would be 48°, and the loss of light from reflexion would be little more than sy. The angle of 45° has becn recom- mended as a pitch extremely suitable for early vineries and pine stoves, in which case the midsummer deviation would be 19°, and the loss #,, and the winter deviation 30°, the loss being nearly the same. Greater exactness, however, has been sought in this matter than is at all neces- sary. The reduction of the opacity of the roof arising from the breadth and depth of rafters and astragals is of much more consequence. The massive rafters, framed sashes, and inferior glass inserted in small fragments, with numerous overlaps liable to be choked with dirt, intercept a large proportion of the solar light and heat in ordinary glass houses,

Glaziug.

Conser- vatory.

Green- house.

due to the absence of rafters, which may also be dispensed with in plain roofs. Span and ridge-and-furrow roofs, the forms now mostly preferred, are exceedingly well adapted for the admission of light, especially when they are glazed to within a few inches of the ground. They can be made, too, to cover in any extent of area without sustain- _ ing walls. In- Sg deed, it has been proposed to sup- port such roofs |/jif} to a great extent AAA upon suspension == principles, the internal columns of support being utilized for con- ducting the rain-water off the roof to underground drains or reservoirs. The lean-to is the least desirable form, since it scarcely admits of elegance of design, but it is necessarily adopted in some cases.

In glazing, the greater the surface of glass, and the less space occupied by rafters and astragals as well as overlaps, the greater the admission of light. Some prefer that the sash-bars should be grooved instead of rebated, and this plan exposes less putty to the action of the weather. The simple bedding of the glass, without the use of over putty, seems to be widely approved ; but the glass may be fixed in a variety of other ways, some of which are patented. In Beard’s method (a very good one) the glass is fixed between strips of felt, the covering bar being held in position by white metal nuts tightly screwed. Good results have also been obtained from the system introduced and improved by Rendle, which covers all the framework of the roof, so that the timber is not exposed to the vicissi- tudes of weather.

The Conservatory is often built in connexion with the mansion, so as to be entered from the drawing-room or boudoir. But when so situated it is apt to suffer from the shade of the building, and is objectionable on account of admitting damp to the drawing- room, Where circumstances will admit, it is better to place it at some distance from the house, and to form a connexion by means of a glass corridor. In order that the conservatory may be kept gay with flowers, there should be a subsidiary structure to receive the plants as they go out of bloom. The conservatory may also with great propriety be placed in the flower garden, where it may occupy an elevated terrace, and form the termination of one of the more important walks.

Great variety of design is admissible in the conservatory, but it ought always to be adapted to the style of the mansion of which it is a prominent

appendage. Some very pleasing examples are to be met with which have the form of a parallelogram with a lightly rounded roof ; others of appropriate character are square or nearly so, with a ridge-and-furrow roof. Whatever the form, there must be light in abundance ; and the shade both of buildings and of trces must be avoided. A southern aspect, or one varying to south-east or south-west, is preferable ; if these aspects cannot be secured, the plants selected must be adapted to the position. The central part of the house may be devoted to permanent plants ; the side tables and open spaces in the permanent beds should be reserved for the temporary plants.

The kind of plants adapted for planting out in conservatories are palms, cycads, dracenas, aralias, luculias, camellias, &c., with fuchsias, habrothamuus, plumbago, strong-growing scarlet pelar- goniums, &c., on the pillars, and tacsonias, passifloras, lapagerias, &c., on the roof.

The Greenhouse is a structure designed for the growth of such exotic plants as require to be kept during winter in a temperature considerably above the freezing-point. The best form is the span- roofed, a single span being bettcr even than a series of spans such as form the ridge-and-furrow roof. For plant culture, houses at a comparatively low pitch are better than higher ones where the plants have to stand at a greater distance from the glass, and

therefore in greater gloom. Fig. 6 represents a form of house

adopted by a most successful cultivator, Mr B. 8.. Williams, of Holloway. It is 20 feet wide and 12 feet high, the length in this case being 50 feet, but of course any other convenient length could be adopted. The side walls are surmounted by short upright sashes which open out- wards by ma- chinery

a, and the roof is pro- vided with slid- ing upper sashes for top ventila- tion. In the centre is a two- tier stage for plants, 6 fect wide, with a pathway on each side 8 feet wide, and a side table 4 feet wide, the side tables be- ing flat, and the centre stage having the middle portion one-third of the width elevated 1 foot above the rest, so as to lift up the middle row of plants nearer the light. Span-roofed houses of this character should run north and south so as to secure an equalization of light, and should be warmed by two 4-inch hot-water Pip s carried under the side tables along each side and across each end. Where it is desired to cultivate a large number of plants, it is much better to increase the number of such houses than to provide larger structures. The smaller houses are far better for cultural purposes, while the plants can be classified, and the little details of management more conveniently attended to. Pelargoniums, cinerarias, calceolarias, cyclamens, camellias, heaths, Australian plants, roses, and other specialities might thus have to themsclves either a whole house or part of a house, the conditions of which could then be more accurately fitted to the wants of the inmates.

The lean-to house is in most respects inferior to the span-roofed; one of the latter could be converted into two of the former of oppo- site aspects by a divisional wall along the centre. Except where space does not permit a span-roofed building to be introduced, a jean-to is not to be recommended; but a house of this class may often be greatly improved by adopting a half-span or hipped roof (as in fig. 9), that is, one with a short slope behind and a longer in front.

Where the cultivation of large specimens of heaths, Australian pant Indian azaleas, &c., has to be carried on, a span-roofed

ouse of greater height and larger dimensions may sometimes prove useful; but space for this class of plants may generally be secured in a house of the smaller elevation, simply by rave or removing altogether the staging crected for smaller plants, and allowing the larger ones to stand on or nearer the floor.

The Plant Stove differs in no respect from the greenhouse except Plant in having a greater extent of hot-water pipes for the purpose of stove securing a greater degree of heat, although, as the plants in stove houses often attain a larger size, and many of them require a tan bed to supply them with

bottom heat, a somewhat greater elevation may perhaps be occasionally required. in some of the houses. For the smaller plants, and for all choicer subjects, the smaller size of house already recommended for greenhouses, name- ly, 20 feet wide and 12 fect high, with a side table of 4 feet on each side, a path- way of 3 feet, and a central stage ontwo Jy levels of 6 feet TX wide, will be prefer- able, because more easily managed as to the supply of heat and moisture. Mr Williams's _ plant stove (fig. 7), which is a very good model, is of the foregoing dimensions. It has, how- ever, a different arrangement from the greenhouse as to ventilation. It will be seen that along the ridge of the roof a raised portion oF lantern light 6, 0 is introduced, which permits of the fixing of ae continuous ventilators, one along each side, for the egress of es and foul air, openings a, a being also provided in the side walls opposite the hot-water pipes for the admission of pure cold al

Fic. 6.—Section of Greenhouse.

Fic. 7.—Section of Plant Stove.

FRUIT HOUSES. |

Three or four rows of pipes will be required on each side, aecording to the heat proposed to be maintained. ,

In their interior fittings plant stoves require more care than greenhouses, which are mueh drier, and in whieh consequently the staging does not so soon decay. In stoves the tables should always be of slate or stone, and the supports of iron; slate is now most eommonly used. This should be covered with a layer of 2 or 3 inehes of some coarse gritty material, sueh as pounded spar, or the shell sand obtained on the sea-coast, on whieh the pots are to stand; its use is to absorb moisture and gradually give it out for the benefit of the plants. The pathways should be paved, or made of eonerete and cement, and the surface should be gently rounded so that the water required for evaporation may drain to the sides while the centre is suffieiently dry to walk upon; they should also have briek or stone edgings to prevent the water so applied soak- ing away at the sides and thus being wasted. '

The greenhouses, if large and ornamental, should be eontiguous to the flower garden or pleasure ground; but if of the simple eharacter employed

only for growing deeorative plants, it is better to associate them with similar houses set apart for other purposes, in an enclosed portion of the grounds contiguous to the potting sheds, where fuel and other materials required can be conveniently stored, and where all the untidiness of the workshops may be masked. For this reason it is a very convenient plan to plaee side by side a series of small span-roofed houses for growing plants, where they ean be connected by a glazed passage-way at the back. The glazed way may be utilized for the cultivation of plants re- quiring less light than others, such as ferns, camellias, &c. ; it held eommunicate with the workmen's offices, which are eom- monly plaeed on the north side of the garden wall, so that potting and other cultural operations may be carried on without creating a bloek or confusion in the several houses. Wherever placed, it is imperative that all plant houses should have a free and abundant admission of light.

11. Fruit Houses.—The principal of these are the vinery, pinery, peach house, cucumber and melon house, and orchard house. These or a portion of them, especially the vineries and peacheries, are frequently brought together into a range along the principal interior or south wall of the garden, where they are well exposed to sun and light, an ornamental plant house being sometimes introduced into the centre of the range in order to give effect to the outline of the buildings. When thus associated, the houses are usually of the lean-to class, which have the advantage of being more easily warmed and kept warm than buildings having glass on both sides, a matter of great importance for forcing purposes.

The Vinery is a house devoted to the culture of the grape-vine, whieh is by far the most important exotic fruit cultivated in English gardens. When forming part of a range a vinery would in most eases be a lean-to structure, with a sharp pitch (45°-50°) if intended for early forcing, and a flatter roof (40°) with longer rafters if designed for the main or late crops. Mr A. F, Barron, a reeognized authority on grape growing, recommends in the Florist and Pomologist (1879, p. 87) three classes of

Fig. 8.—Lean-to Vinery.

vineries, namely, early for the production of early or forced grapes, general-crop for all unheated grape houses, and late for producing and *eping grapes till late in the season, each requiring its own special

_ aiTangements, The following are the three forms of houses re-
commended by him. (1) The lean-to (fig. 8) is the simplest form, often erected against some existing wall, and the best for early bec being warmer on aeeount of the shelter afforded by the

ack wall. In this house the prineipal part of the roof is a fixture,

ventilation being provided for by small lifting sashes against the baek wall, and by the upright front sashes being hung on a pivot so as to swing outwards on the lower side. The neeessary heat is provided by four 4-inch hot-water pipes, which would perhaps be best placed if all laid side by side, while the vines are planted in front, and trained up- wards under the roof. A second set of vines may be planted against the back wall, and will thrive there until the shade of the roof becomes too dense. (2) The hipped-roofed or three-quarter span (fig. 9) is a combination of

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as in the lean-to, only Fig. 9.—Hipped-Roofed Vinery.

the top sashes which open are on the back slope, and therefore do not interfere so mueh with the vines on the front slope. In both this and the lean-to the aspect should be as nearly due south as possible. Houses of this form are excellent for gene- ral purposes, and they are well adapted both for museats, which require a high temperature, and for late-keeping grapes. (8) The span-roofed (fig. 10), the most elegant and ornamental

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Fic. 10,—Span-Roofed Vinery.

form, is especially adapted for isolated positions ; indeed, no other form affords so mueh roof space for the development of the vines. The amount of light admitted being very great, these houses answer well for general purposes and for the main erop. The large amount of glass or cooling gurface, however, makes it more difficult to keep up a high and regular temperature in them, and from this cause they are not so well adapted for very early or very late crops. They are best, nevertheless, when grapes and ornamental plants are grown in the same house, exeept, indeed, in very wet and eold distriets, where, in consequence of its greater warmth, the lean-to is to be preferred.

The Pinery is a house devoted to the cultivation of the pine- Pinery.

apple. The pineries or pine stoves of former times were generally large lofty struetures of the lean-to vinery fashion, and heated by smoke flues; but these were superseded by build- ings of more eompaet form, sueh as that of Baldwin, a noted pine grower of his day, in whieh the low roof was hipped, the short or northern slope being of slate, and the glazed sashes being fixtures. These were again improved by the sub- stitution of glass for slate in the back slope, and of hot- water pipes for smoke flues as the heating medium, openings being provided at back and front, as at a, @ (fig. 11), for ventilation, Such houses as these are low, and therefore are more economi- eally kept at the high temperature necessary for pine growing. The best form of pinery is a low structure of this kind, but some- what wider, so as to permit of the utilization of the front and back

Fic. 11.—Section of Pinery,

Peach house.

spaces for general forcing purposes (fig 12). Such a house might be 14 fect wide, consisting of a plunging bed for bottom heat 8 feet wide, a back path of 2 feet provided with a shelf for strawberries

near the glass, a front path of 2 feet, and between that and the.

which might be used for forcing French beans, and which should be on the same level as the front curb of the centre pit, and about 23 feet from the glass. The height of the back wall should be 15 feet. The house should be heated by three or four hot-water pipes placed beneath the front stage, and two placed close to tle wall in the back path; and the

front wall a stage for pots,

Fia, 12,—Modern Pinery.

necessary bottom heat should be provided by fermenting tan or leaves, or by hot-water pipes or a hot-water tank placed beneath the plunging bed. Ventilators should be fixed at short intervals in the front wall beneath the stage and opposite the heating pipes ; and the alternate upper sashes should be made to open, or cor- nee ventilators close to the top of the back wall should be rovided. i If the stock of pine plants is not extensive, certain and abund- ant crops of fruit cannot be expected ; and it is therefore necessary to have not only fruiting pineries but pineries for succession plants, These are generally called pine pits, and differ little from the pits used for accommodating other tender plants. Two or three succes- sion pits are required to provide a stock of plants to keep the fruiting-house filled. Low-roofed pits are to be preferred, not only on account of their appearance, but because the pine can only be cultivated in its highest state of perfection when grown in pits just sufficient for the full development of the foliage and crown of the fruit. These pits, if span-roofed, should be provided with a central path under the ridge, just high enough for a work- man to stand upright, and a plunging-pit on each side ; but any ea well-constructed pit will answer the purpose if sufficiently eated.

The Peach House is a structure in which the ripening of the fruit is accelerated by the judicious employment of artificial heat. For early forcing, as in vineries, the lean-to form is to be preferred, and the house may have a tolerably shar pitch. A width of 7 or 8 feet, with the glass slope continued down to within a foot or two of the ground, and without any upright front sashes, will be suitable for such a house, which may also be conveniently divided into compartments of from 30 to 50 feet in length according to the extent of the building, small houses being preferable to larger ones. As avery high temperature is not required, two or three pipes running the whole ‘ength of the house will suffice. The front wall should be built on piers and arches to allow the roots to pass out: wards into a prepared border, the trees being planted just within the house. Abundant means of ventilation should be provided.

For more general purposes the house represented in fig. 13 will be found more useful. One set of trees is planted near the front, and trained to an arched trellis b. Another set is planted at the back, and trained on a trellis ¢, which is nearly upright, and leans against the back wall ; training. There are no upright front sashes, but to facilitate ventilation there are ventilators d in the front wall, and the upper roof sashes are made to move up and down for the same object. Two or three hot-water pipes are placed near the front wall. The back wall is usually planted with dwarf and standard trees alter- nately, the latter being temporary, and intended to furnish the upper part of the trellis, while the permanent dwarfs are gradually filling up the trellis from below. In any case the front trellis should stop conveniently short of the top of the sashes if there are trees against the back wall, in order to admit light to them. They would also be better carried np nearly parallel to the roof, and at about 1 foot distant from it, supposing there were no trees at the back.

A span-roofed house, being lighter than a lean-to, would be so

or the back wall itself may be used for |.

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much the better for peach culture, especially for the crop grown just in anticipation of those from the open walls, since a high temperature is not

required. A low span, with dwarf side walls and a lantern ventilator along the ridge, the height in the centre being 9 feet, would be very well adapted for the purpose. The trees should be planted inside and trained up towards the ridge on a trellis about a foot from the glass, the walls being arched to per- mit the egress of the roots. A trellis path should run along the centre, and mov- able pieces of trellis should _

[FRUIT HOUSES,

Fig. 13.—Peach House.

be provided to prevent trampling on the soil while dressing and tying in the young wood.

The Cucumber and Melon House.—Wherever a continuous supply Cucum of cucumbers and a considerable number of melons are required, 1 ber ané is found most convenient to grow them in houses, the attention melon required and the risk of failures being much less than when hot- house,' beds and pits heated by fermenting materials are employed. The best form of house is a narrow span (fig. 14), on account of the much greater amount of light which it admits. The width should be 12 fect, the height about 10 feet, and the length divided into short portions so as to be worked in succession; a 60-fect houso divided into three 20-feet portions would be found very useful, as

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Fic. 14.—Span-Roofed Cucumber House.

one or more could be taken for either crop according to the demand. The inside arrangements should include a pathway @ of 3 feet the centre, two beds 0, } provided with hot-water pipes ¢, ¢ OF hot- water tank for bottom heat, two pipes d, d on each side for warm- ing the atmosphere, a lantern ventilator ¢ at the ridge, and open- ings in the wall f beneath the beds to admit fresh air, and a trellis g for training the plants, fixed at 12 or 18 inches from the roof. :

Where the house is built against a wall, the hipped form 0 roof is to be preferred, as it will admit more light, and also allows more space for the cucumber or melon vines. Fig. 15, from Moore's 7'reatise on the Cucumber, shows such a structure, in which 6 is the pathway, ¢ front ventilator, d back ventilator, e hot-water pipes, and f tank for bottom heat. The cold air admitted at c enters a chamber g; thence it passes into the spaee

h over the water in the tank, and is admitted through a tube m, | and glass. Two rows, 14 feet apart, of oak posts a, a, 5 by 3 which passes up through the bed of soil, into the house near the { inches and 9 feet long, or of deal posts set in cast-iron sockets, front; similar tubes 7, inserted at intervals along the front of the | are firmly fixed 8 fect in the ground and 5 feet apart. On each bed, are intended for supplying water amongst the rubble, te keep | of these should be firmly nailed the plate 0, 4 inches by 3, to the soil about the roots constantly receive the ends of the rafters c, c, which should be 8 feet long moistened. : and 3 inches by 14. The ridge board d should be 3 inches by 1,

Pits and frames of various kinds to which the upper ends of the rafters, after being sloped, should are also frequently used for the be nailed. At the lower end a drip board, 5 inches by 1, placed

cultivation of cucumbers and melons, sloping to receive the lower ends of the glass, must be fixed as well as hot beds covered by d on the plate the

ordinary garden frames. In these full length of the cases the first supply of heat is house ; and on the derived from the hot bed made up ridge board a small within the pit (fig. ledge must be 17, a), which is all nailed for the the better for having upper ends of the a layer or two of glass panes to rest f faggot-wood worked upon. On _ the into it to facilitate upper edge of the the distribution of the ridge board a cap, heat from the linings 3 inches by 1, pi later on. When the shaped thus A, heat of the original ¢ should be nailed, 4] bed subsides, linings to ae off the ay of fermenting dung xs water and prevent §jj bb must sy nile, Z \ its entrance at the < and these must be \(e : \ | ridge. The sides kept active by oc- \ \ SSMQV_ | dare boarded, and = _!o easional turnings and '1.2 4? | the roofis of 2102. pyg, 18.—Rivers's Span-

Roofed Orchard House. the addition of fresh Wid, 15. Mogee’s Capaniber House glass, the rafters

material as often as Pe iF F (stout sash-bars) being 20 inches apart, and the panes 15 inches required. Figs. 16 and 17 show different forms of pits of | long, set cnd to end in glazing. Under the glass g on each side this character. It is, however, a vast improvement upon the old | is a ventilating shutter h, # inch broad and 1 foot wide, hinged and system to effect both top and bot- opening downwards. The roof isstayed by irons screwed to every tom heating by hot-water pipes fourth rafter. The angular space over the door forms a ventilator, (fig. 16, a, a), in which case the A house of this form should have a central path ¢, the two beds width of the pits may be increased or spaces on each side /,f accommodating the fruit trees either by at least 2 feet. Where there planted out or grown in pots. These beds may be raised above the is much forcing carried on, the path if used for dwarf trees,

judicious arrangement of the seve- As a larger house, one of 24 feet width (fig. 19) might be ral structures, permitting of their recommended. The oak posts or deal posts in sockets, 6 inclies by being worked from one boiler, 4, must be sct in two rows a, a, 24 feet asunder, 6 feet apart in the should be carefully seen to, ANY rows, and the plates, rafters, ridge board, and drip board should be as vchard Orchard Houses are the inven- ig 6 ae gs described above. The apex of the ridge d should be 12 fect from the uses. tion of the late Mr Rivers of Fra. 16.—Cueumber Pit heated surface. The roof itself ¢ is supported and steadied by two rows of

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Sawbridgeworth. In all the more by Hot Wat iron pillars & connected by tie rods, and glazed with 21 oz. glass, genial portions of England and ce Rags d

Scotland they may be used without fire-heat, and chiefly for JAS

potted fruit trees ; and if the trees are well managed, a very large Pe ig t

mai and variety of fruit can be produced, of excellent if not ee.

tst-rate quality. These houses will be found useful adjuncts to | ~ An

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N \ Io _ id 3 10 0 5 10 1S Fic. 17.—Cucumber Pit heated by Fermenting Dung. Fia. 19.—Orehard House with Raised Beds,

other structures oven in large garden while th the rafters being 20 inches apart. The sides and ends are boarded, value to amateurs, who Pa np oa ft the de bs Me ie and provided with hinged ventilators as in the smaller house. The

crops. They are, moreover. ex ; : floor may be level with the ground, and with a central path or turned to Lei ety of uses, he oO Geunbic.fie the ees two side paths ¢, ¢. For dwarfer and more bushy plants, and for of half-hardy flowers as for our less hardy fruits. For fruit trees | 8°neral purposes, the beds may be slightly raised, as f, f, f in fig. the orchard houses are of most value in spring, not to exeite but | 19: When the trees are planted out the raised beds would be to ct the blossom buds, and in autumn to assibe ia ripenin objectionable as diminishing the available height, but for potted both fruit and wood. While peaches, nectarines, and apricots fe plants they are an advantage, raising the trees nearer to the light. the permanent occupants of the house except “tr late atte In the north of England, and in all moist and cold districts of when they may be set out of Bh sre plums pears, and apples ma | Scotland or Ireland, Mr Rivers recommends the introduction of a all by this means be Raiied 40 produce go Sal crops During hot-water pipe or two into houses in which peaches, nectarines, and Winter and spring (when they nit he kept cool) the reea may apricots are to be grown, not te force them, but to ensure the be stored as closely as possible, and in this state they may remain | “Pemng of both wood and fruit. bis after blooming is over and the fruits are set, when the hardier 12. Pits and Frames,—These are used both for the Pits. inds should be gradually drawn out and hardened in sheltered | summer growth and winter protection of various kinds of

Spots, and eventually plunged in the o i i J d eventy pen garden to swell their | ornamental plants, for th – tults, this thinning out affording room for fie tenderer kinds. Mec oA A

; The orchard house may be of the lean-to form or a span ; but bers, melons, and strawberries, and fo r the forcing of eee: ee latter is much to be preferred, Fig. 18 is a sketch of Mr | tables. When heat is required, it is sometimes supplied vers’s small span-roofed orchard house, which is built of wood by means of fermenting dung, or dung and leaves, or

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prevented the sashes from being opened.

For all useful purposes these two forms of pits will suffice, but Frame there will always be found occupation for some of the common hot- bed frames (fig. 22). They should be made of the best red deal, 14 inch thick. A convenient size is 6 feet wide, 24 inches high at the back and 15 in front; and they are usually 12 feet long, which makes three lights and sashes, though they can be made with two lights or one light for particular purposes. Indeed, a one-light frame (fig. 23) is often found very convenient for many purposes. The lights should be 2 inches thick, and glazed with 21 oz. sheet glass, in broad panes four or five to the breadth of a light, and of a length which will work in conveniently and economi- cally, very long panes being un- desirable from the havoc caused

tanner’s bark, but it is much more economically provided, on the score of labour at least, by hot-water pipes. Fits of many different forms have been designed, but it may be sufficient here to describe one or two which can be recommended for general purposes.

Fig. 20 represents a simple and useful form of pit designed for the Chiswick garden by Mr Sibthorpe, and published by Mr R. Thompson (Gardener’s Assistant, 499). Itis 7 feet wide, the front wall 2 feet high, the back wall 35 feet, The walls are one brick thick, or 44 inches, with a 4-inch pier a at every third rafter, the

Fia. 23.—One-Light Fraine.

by accidents, and very short ones being objectionable as multiply- ing the chances of drip ; panes of from 6 or 8 to 12 inches long are of convenient size for garden lights of this character. In all gardens the frames and lights should be of one size so as to be interchange- able, and a good supply of extra lights (sashes) may always be turned to good account for various purposes.

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Frg. 20.—Sibthorpe’s Plant Pit.

foundations being respectively 9 and 14 inches. The wall plates both at front and back project so as to allow the drip to fall clear of the walls; and fillets of wood fixed to their under surfaces and close up to the wall on each side serve to maintain both the wall plate and top of the wall steadily in their positions, Such a pit nsed for cucumbers or melons might be excavated slightly below the ground level to admit of bottom heat being supplied by a bed of fermenting dung, over which the soil should be placed in the usual way, bringing the plants up near to the glass; or the bottom heat might be supplied by the tank system of heating or by hot- water pipes. For small store plants of any kind the interior might be filled up with any porous materials, finishing off with a surface of fine coal-ashes at a suitable height, or larger plants might be accommodated by using it as shown, without any filling up. Heat can easily be supplied by one or two 4-inch pipes, front and back, according to the temperature required ; but if fermenting material be used for this purpose, the lower ortion of the walls, as far up as will be carnal. by the interior filling, should be pigeou-holed. An excellent pit for wintering bedding-out plants or young greenhouse stock is shown at fig. 21. It is built upon the pigcon- hole principle as . high astheground level a, a, and above that in 9- inch brickwork. At a distance of 9 inches retaining walls b, Dare built up to the ground level, mae he . – a7 spacesbetweenthe \ y no are covered by vA

thick boarding, GGGQG{{4 \ \ Xu

Fia. 24.-—Span-Roof Frame.

Boulton and Paul’s span-roof garden frame (fig. 24) may under some circumstances be useful as a substitute for the three-light frame. It is adapted for storing plants in winter, for nursing small plants in summer, and for the culture of inelons and other crops requiring glass shelter. These frames are made 11 inches high in front, 22 at the back, and 32 at the ridge, with ends of 1}-inch red deal; the sashes, which are 2 inches thick, open by gearing, the front and back separately. The lights are hinged so that they can be turned completely back when necessary. This more direct and ready access to the plants within is one of the principal recommendations of this form of pit.

13. Mushroom House.—Mushrooms may be grown in Must: sheds and cellars, or even in protected ridges in the open)” ground, but a special structure g is usually devoted tothem. A lean-to against the north side of the garden wall will be found suitable for the purpose, though a span-roofed form may also be adopt-

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which is to be 0 5 10 apart _ shut down as : r : _ Y shown at ¢ in Fig. 21.—Ventilated Plant Pit. The internal ar- L

rangement of a lean- to mushroom house is shown in fig. 25. The length may vary from 80 feet to 60 feet; a convenient width is 10 fect, which admits of a 34 feet central path, and

beds 3 feet wide | | A

on each side. The \ SS NS S slate a, a, supported : SN

cold weather to exclude frost, and opened as shown at d in mild weather to promote a free circulation of air through the pit. The height of the pit might be reduced according to the size of the plants ; and, to secure the interior against frost, a flow and return

hot-water pipe ¢ should pass along bencath the staging, which

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Fic. 22.—Hot-Bed Three-Light Frame.

should be a strong wooden trellis supported by projections in the brickwork. The water which dirs fon ha pinks or is spilt in watering would fall on the bottom, which should be made porous to carry it away. For many plants this under current of ventila- tion would be exceedingly beneficial, especially when cold winds

Hy Y shelves should be of \ XY by iron uprights), b, SSN SSS . SN each half having a _ oo a Fira. 25.—Lean-to Mushroom House.

e, c. The slabs of slate forming the shelves should not be too closely fitted, as a small interval will prevent the accumulation of moisture at the bottom of the bed. They may be supported

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FRUIT ROOM. | Ha RT I C SLT UR 227

by iron standards or brick piers, back and front, bearing up a flat | is double, which also conduces to the same end. There is a swing par of iron on which the slates may rest ; the use of the bar will | window 4, opened a little occasionally, but always covered with a

ive wider intervals between the supports, which will be found | roller blind so as to shut out light, and there is a small stove c, convenient for filling and emptying the beds. The roof may be | but seldom used, and never for the sake of warming the air, unless tiled or slated ; but, to prevent the injurious

influence of hot sun, | the temperature is below freezing ; if damp is observed a little there should be an inner roof or ceiling d, the space between which | fire is lighted on a dry day, and this with ventilation soon dissi- and the outer roof e should be packed with sawdust. A hot-water pipe f should run along both sides of the pathway, close to the front ledge of the lowest beds. The different shelves can be planted in succession ; and the lower ones, especially those on the floor level, as being most convenient, can be utilized for forcing sea-kale and rhubarb.

Another style of house which answers remarkably well may be formed by an arch of brickwork, making a kind of tunnel, or by a semi-arch projected against a brick wall or against the side of a bank (fig. 26). In either case the arch d should be covered with

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Fic. 28.—Moorman’s Fruit Room (section).

pates it. The fruit shelves d, d are made with battens 14 inch wide and 14 inch apart, with a layer of clean straw placed across them, and on this the fruit is laid out singly. The shelves are : enclosed by a partition of open work ¢, ¢, which is made of battens \N SC | similar to the shelves themselves.

YY The fruit room in the Royal Horticultural Garden at Chiswick \« WK ASN \ is a very good example of one on a larger scale. The floor of this s = io is sunk about 18 inches below the ground level, and is concreted to keep out rats and mice. It is built against a north wall, and has Fic. 26.—Semi-Arch Mushroom House. é wh are pee of slate. cae z four ranges of shelves are

’ ’ ; xed all round against the walls, and there is a table occupyin a thick bank of earth ¢, and planted with spreading shrubs to keep | the centre for the disetay of samples of the different kinds pio it cool and shaded. The size of the beds and the fitting up may be | Such an apartment would form a convenient fruit room in a private exactly the same as in fig. 25 already described, except that on one garden establishment. The walls should be hollow; and a ven- side the available height will be necessarily less. tilator

made to open and shut, and communicating obliquely with 14. Frat Room. —In many gardens a portion of the | the external air, should be inserted in the ceiling near each end,

shed accommodation behind the ranges of glass-houses is the interval between ceiling and roof being packed with dry saw-

é . ies : dust to assist in keeping up a uniform temperature. The shelves made to do service as a fruit room, but it is sometimes should be made of narrow battens of wood laid somewhat apart, as

difficult to secure in this way the conditions favourable in Mr Moorman’s house, and the central table should be fitted for the conservation of fruit. The main requisites are | with shallow drawers in which to store the very choicest fruits, such coolness and a steady uniform temperature, combined with | *S the finer dessert pears, which should be individually wrapped in

‘ tissue paper and laid in a single tier. The better kinds of fruits darkness and moderate but not excessive dryness. A dry on the open shelves should. be laid out singly. It is a wise

cool cellar makes an excellent fruit room. economy not to stint space in such a structure, as many things

One of the most successful examples of a fruit room is that of | can be accommodated for a time in a room of this sort; for Mr Moorman of Clapham, described by Mr Robert Thompson in | example, the floor space beneath the shelves forms a good place for the Journal of the Horticultural Society (vi. 110), of which figs. 27 | storing seed potatoes, ba cow those for the early crops. A and 28 represent a plan and section, The building in this case | Window is necessary, as

ight will be occasionally required to ie” ; : examine and to select the fruits, but it should be tight-fitting, and \ AX YY \ on all other occasions closed by shutters so as to keep the interior ss —» \ dark. The door should also be closely fitted, to exclude the external air; indeed it is better if the fruit room itself can be entered from an adjoining apartment, from which light need not be excluded, and which may serve as a seed room and store room for

many of the smaller garden requisites. If a hot-water pipe can be run round these apartments from some neighbouring apparatus, so much the better, but in the fruit room proper it should only be used occasionally to dispel damp, or, in the case of very severe weather, to keep out frost. ,

15. Heating Apparatus.—Plant houses are heated in a Heating. variety of ways, but practically smoke flues and hot-water pipes are principally made use of. The cost of erection is a little more for hot-water pipes than for flues, but the —” former are the cheaper in the end. Steam is not now <<\\ | used as a heating medium, except where the waste steam of a manufactory is turned to account in some adjoining

Fig. 27.—Moorman’s Fruit Room (plan). garden. The use of fermenting vegetable substances in : 2 Fa the production of heat is rapidly disappearing from our Was not specially erected for a fruit room, having been originally aa, : a loft over a coach-house. The walls have an fui lining of board best gardens before the application of hot water, which

enclosing a cavity, which is probably one cause of the efficiency of | 1s far more economical and certain in its effects. € apartment, since the wood lining and the cavity containing air The Smoke Flue, that is, the continuous cavity commencing at Smoke oth act as slow conductors of heat. The ceiling on the north side | the back of the furnace and ending at the chimney, when used as flue,

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Hot water.

The furnace.

a source of heat, should be carried along the front of the house, returning near the back; by the time it has run thus far most of the heat taken up from the fuel will be in course of transmission to the enclosed atmosphere of the house to be heated. There should be a gradual rise for some distance after leaving the furnace, which should be from 1 to 2 feet below the level of the front flue ; and there should be no sharp angles or turnings. Earthenware pipes may be substituted when appearance is not a consideration. Smoke fiues should be cleaned out at least once a year. When properly constructed, they answer their purpose sufficiently well ; but this mode of heating is now virtually superseded in all gardens of note by the hot-water system.

Hot Water.—The diffusion of heat in plant houses by causing hot water to circulate in iron pipes or vessels was brought into notice in 1827, and has gradually superseded all other modes. The apparatus is more durable than flues, occupies less space, can be placed in situations where flues cannot, is more elegant in appear- ance, gives out a more steady and uniform heat, and can seldom be overheated. The true cause of the circulation of the water in the pipes may be explained by fig. 29. When the water in the boiler

dl Ce —

a is heated up, it expands and so becomes lighter than that in the cistern 6; the pressure at z in the horizontal pipe d is thus less than at y, so that the water flows through d from 0 to a, and 6 is kept supplied from the pipe ¢. In this arrangement, which represents the common tank boiler, with a cistern at the extremity of the pipes, the process of heating was slow, and many changes have consequently been made.

The Furnace,—The most perfect furnace is that in which the combustion is most complete. On this account the fire should be surrounded by slow conductors of heat, such as Welsh lumps or other kinds of fire-brick ; and the sides of the furnace should not be formed by any part of the boiler, nor should the furnace bars be tubular and connected with the boiler, though this latter plan is sometimes adopted to prevent the burning out of the bars. All the air necessary for maintaining combustion should enter from below, that is, through the ash-pit, and not through the door or sides of the furnace ;

but to produce this effect the furnace should be fitted with double doors and ash-pit registers, for thus only can

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Fie. 30.—Sliding Furnace Doors.

the stoker have control over his furnace. By shutting the ash- pit and furnace door closely combustion is lessened, and the fire may be kept almost in a state of quiescence for many hours together ; while, on opening either the door or ash-pit register, air is admitted and combustion goes on. Sylvester's furnace doors or doors of similar sliding form (fig. 80) are preferable to the ordinary hinged doors, because they can be opened to any extent, and are less liable to get out of order. These doors are faced with fire- brick, and run on rollers on an iron rod, or slide by means of a ledge. Myr Taplin recommended, in the Florist and Pomologist (1868, p.

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32), that, to prevent the burning away of the furnace bars and the formation of clinkers, the ash-pit should be kept filled with water, and states that the bars will then last three times as long as with the ordinary dry ash-pit. The ash-pit may be built in cement for this purpose, or fitted with a cast-iron pan for the water. Hot-Water Boilers. —Only a few of the principal types of the Boiler: very diverse kinds of boilers can be noticed here. The simpler the form and the less complicated the whole apparatus is the better, It is essential that a large area of the boiler surface should be — brought within the direct action of the fire. Rogers's Conical Boiler (fig. 81), which has long been in use, is Coni very suitable for heating pits and small houses, since it is econo- boiler |

(HEATING,

Fra. 31.—Rogers's Conical Boiler.

mical of fuel, and gives out a steady heat for a long time—15 to 20 hours. It is formed of two truncated concentrie cones, with a space of 2 or 3 inches between them for the water, the fumace being in the inner cone, and the fuel sup lied from the top. It was originally surrounded with brickwork, but several improve- ments have been introduced. In fig. 31 the boiler is placed ina cast-iron stand, with ground circular furnace, and register ash-pit doors, —a being the furnace, 6 the boiler, ¢ flow and return pipes, d the furnace door, e smoke-pipe to the vent, f ash-pit, g grating, h hole for cleaning the furnace. The best kinds of fuel are eoke, gas cinders, and anthracite; but common coal which does not eake very much is also suitable, as it is soon formed into coke, Saddle Boilers.—The saddle boiler is a very efficient form, and sure in its working. In its improved forms it is, perhaps, the boile best for general purposes. It should be set over a furnace, the sides and end of which should be of fire-brick. It may be quite plain, or with the inner surface ribbed or corrugated (fig. 82), @ modification adopted by Mr Gray of Chelsea. In all saddle boilers,

steady Saddl\,

Fra, 32.—Gray’s Saddle Boiler.

which should be deep from front to back, and set well back from the doors of the furnace, the full force of the fire strikes the dome of the boiler directly, and so long as the fire continues this 1s the part most directly influenced by its heat. The flow pipe is shown at a, and the return pipe at , while c represents an opening (one on each side) for the passage of the smoke into the flues, the end being a water-way, and forming part of the boiler. The boiler is emptied by a small tap affixed to the pipe shown in the front. — There are many forms of what are called Flucd Saddle Boilers, all of them good and thoroughly efficient if properly set. One of

these, with a terminal water-way, is shown in elevation at fig. 33, and in section, showing the mode of setting, at fig. 34. The fire is made under the principal arch a; the flame and smoke return through the flue 6, and then turn back over the top of the boiler

Fic. 338.—Flued Saddle Boiler.

to the outlet ¢, which can be placed at whatever point is in each ease most convenient. The other parts referred to are—d flow pipe, ¢ return pipes, f soot-door for cleaning flues, g furnace door, hash-pit door.

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Fia. 34.—Flued Saddle Boiler (section).

The Gold Medal Boiler (figs. 85-88) is perhaps one of the best of these modified saddles, and like the others has a dome or arch a, and back water-way b; the heated products of combustion striking against this back are sent up the central flue c, and then diverted Into the side flues d, d, before passing into the chimney shaft e.

1g. 386 shows a transverse section, and fig. 87 a longitudinal Section set in brickwork, which is shown in elevation in fig. 38.

Fie. 85.—Gold Medal Boiler.

The ash-pit is shown at J, the furnace door at A, the centre and ri flues at ¢ and d, the water-way end at 06, the soot-door at ¢, ne sludge-plugs for cleaning out the interior at g, the flow pipe . m, the return at n, while Z shows a hollow space around the oiler for utilizing the heat given off by its exterior surface. This oller is named from its having won the gold medal ina boiler Foal at Birmingham in 1872. The Witley Court boiler and ¢ Glasgow boiler are both excellent forms of the flued saddle type.

Stevens's Trentham Boiler (fig. 39) is a very powerful and Trent- economical one, for large establishments especially. It is a modifi- ham cation of the well-known Cornish boiler, and consists of two boiler. wrought-iron cylinders substantially rivetted together, and having

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a water space of about 2 inches between them. The frame for the furnace doors d is attached to the front. It is supported by two cast-iron chairs a, a, the front chair forming the frame for the lower flue doors 8, which fasten by a simple catch, and can readily

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Fig. 87.—Gold Medal Boiler (longitudinal section).

be lifted off for cleaning the flues. The plug¢, opened by unscrew- ing it, is for the purpose of clearing out all interior accumulations of dirt, which should be done thoroughly at short intervals. The flow pipe is at ¢, the return at f In setting, the chairs are placed

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Fia. 38.—Gold Medal Boiler (brickwork setting). ' level on a solid foundation, and two 9-inch walls are built up so as just to clear the boiler, and about level with the centre of the

cylinder ; on these a course of fire-brick lumps is laid, and brought close up to the side of the cylinder, and resting on the lumps an

areh is turned leaving a space the depth of the top flue doors }, to serve as an upper flue, while the spaee below forms a lower flue. The grate bars are inside the eylinder towards the lower part, the space above them forming the furnace, and that below them the

Fig. 39.—Stevens's Trentham Boiler. ash-pit. 'The heat thus passes through the eentre of the eylinder, then returns by the upper flue over its top, and is condueted to the ehimney by the lower flue, which arrangement is found to work better than when the heated air is made to pass through the lower flue first.

Tubular Boilers. —While the action of tubular boilers is rapid, and they are undoubtedly very powerful, they are said to be prodigal in their eonsumption of fuel, and liable to craek. In many cases, how- ever, they have done good work for many years, and they are conse- quently employed to a considerable extent. The original tubular boilers were horizontal, but the upright form has nearly superseded this, aud the Upright Oval Tubular of Mr Gray, and the Duplex Upright Tubular of Messrs Weeks & Co., both of Chelsea,—the latter marked by improvements introdueed specially to meet the foregoing objeetions,—are the best forms at present in use. The

Duplex (fig. 40) is made in two equal parts, each being capable of —_—~
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Fig. 40.—Weeks's Duplex Tubular Boiler. being worked alone. right tubes forming the boiler proper, fitted with the diaphragm a, by whieh more perfeet eombustion of the fuel is seeured, a series of horizontal pipes forming the furnaee f, a flow pipe 6 and a return

pipe c, and an outlet d for removing sedimentary deposits from the interior.

Each seetion consists of a semieirele of up-

HORTICULTURE

Ladds's Boiler (fig. 41) is a horizontal tubular, whieh is found to be extremely powerful as well as eeonomieal. It is a reetangular box 6 feet long, made of 2-ineh iron pipes, fixed into hollow water spaces whieh form the ends; these pipes aet as fire bars, and form the sides of the furnace. Above the fire there are three series of

horizontal pipes, each eovered by a layer of tiles so placed as to eonvert the two intervening spaees into flues, along whieh the flames and smoke travel for 18 feet, the smoke pk at the far

tier of pipes

end by an opening in the upper layer of tiles. Hae

in its turn therefore gets its share of heat from the burning fuel, and the eonsequence is that the apparatus is very quiek in its action. The tubes are fitted in with Portland cement and hempen eord packing—tar ropes being found to destroy the eement. These boilers each heat 3000 feet or more of 4-ineh piping. On the top of the upper layer of tiles are placed about 9 inehes of ashes, then ordinary ineh boards which rest on 4}-inch retaining walls, and on these 8 or 10 inches more of ashes, which very efficiently prevents any loss of heat.

Stoves, dc.—In the ease of very small houses petroleum stoves or Stoves lamps are sufficient to keep out all ordinary frosts, but they are attended with a disagreeable smell. A small eonical or eylindrical boiler attached to a system of piping is by far the safest and best in such eases. 'The furnace heating may also be effected either with or, better still, as requiring no attendance, with gas. The furnace should be accessible from the outside only, so that none of the produets of combustion may enter the house. A small

used. Flat pipes, and fluted or semi-circular pipes have sometimes been used, but the eylindrical form is much to be preferred. The number of pipes must be regulated by the extent to be heated, and the degree of temperature required; it is often well to have three or even four flow pipes and only one

return pipe. p Pipes of 4-ineh bore are almost universally employed, but 3-inch pipes may often be used in small houses. It is a mistake to stint the quantity of piping, since it is far more eeonomical and better for the plants to have a larger surface heated moderately than smaller surface heated to the highest possible degree. The pipes should, moreover, be placed near the front or lowest part of the house, and, to prevent loss of heat by eonduetion, should be sup- ported elear of the ground, not less than 6 inehes, upon east-iron chairs. se Mr Cannell of Swanley has adopted the plan of fixing two or Pipes) three distinet lines of small piping elose under the roof glass, so under) as to prevent the air near the glass from getting eold. _ This roof | contrivance is particularly useful in repelling damp during winter ; g!48s.| and it may also be adopted for warming pits intended for the growth of half-hardy plants. , Hot water may be beneficially applied to garden walls, not, Heat} however, for the purpose of forcing the blossoms, but to assist in of Wa) maturing late fruit and the young wood in unpropitious seasons.

some years since by Mr W. E. Rendle.

VENTILATION. |

To this end the walls must be built hollow, and the pipes placed near the bottom of the cavity, and supported on cast-iron chairs placed on the top of the foundation course of material. This method was first exemplified by Mr Atkinson in the gardens of the duke of Bedford at Woburn Abbey in 1828.

The Tank System of heating garden structures was introduced It consists in circulating hot water in broad shallow tanks instead of closed pipes. It will be obvious that as the water is to flow along these open (or only loosely covered) conduits, they must themselves be level, and the boiler must be either at the same level or below it, the connexion between the two being made in either case by hot-water pipes of suitable length. The tanks are formed of wood, brick, stone, or cast-iron. When of wood, they require to be made of good sound plank, not less than 2inches thick, and properly jointed, and they are usually covered with slates. Stone or brick tanks require to be lined with a thick coating of Roman cement, while stone, slate, or brick pavement may be employed for covers. ‘The cast-iron tanks have covers of the same material.

‘When one tank only is employed, as for example in supplying bottom heat to the front bed of a propagating pit, it should be constructed with a division along the centre, running to within about a foot of the end, which should be left open to allow of the water passing to the other side; the flow pipe from the boiler should be connected with the end of the tank on one side of the central division, and the return pipe for leading the water back to the boiler should be connected at the same end on the other side of the division, a sufficient number of pipes being also connected with the flow and return pipes to heat the atmosphere to the temperature desired. It is convenient to have valves fixed in the flow and return pipes, so as to shut off bottom or top heat as may be required. In a larger house a tank may run along the front, across the end, and along the back tothe end whence it started ; and this may be either divided along the centre as in the former case, the water flowing the whole distance on one side the division and returning on the other, or a broad tank may occupy the front and back, and be connected at the end by an ordinary 4-inch pipe, the flow from the boiler being united with the front tank, and the return carried from the back tank into the boiler.

The tank system of heating is perhaps one of the readiest modcs of supplying bottom heat to plunging beds either for propagating or for growing plants, though the same end is practically attained by running some of the ordinary 4-inch pipes connected with the heating apparatus through a tank which can be charged with water when necessary, and emptied when heat is not required. When the plan is used for supplying both top and bottom heat, provision must be made to prevent too much of the steam or vapour from passing into the house ; and, on account of the danger of having too much damp at certain seasons, it is perhaps preferable to have a separate set of pipes for the supply of atmospheric heat.

Solar Heat.—The rays of the sun reflected from walls and other surfaces become a source of artificial heat. This species of heat, however, is materially affected by the admission of the air necessary to the health of the plants. Solar heat, if properly regulated by ventilation, is of immense importance in the ripening of all the finer fruits, as well as for the abundant development of blossoms in the case of flowering plants. In the orchard house, fruits are ripened by the influence of solar heat alone. To secure as

much solar heat during the day as possible, the ventilators should be opened early in the morning, and closed early in the afternoon.

_ 16. Ventilating Apparatus.—The object of ventilation 1s not so much to aid the respiration of the plants as to carry off noxious vapours and to regulate the moisture and temperature. The mechanical agitation both of the atmo- Sphere and of the foliage caused by a free circulation, provided it be not too cold or too rudely admitted, has also a beneficial influence on the health of the plants. All Ventilation, observes Mr M‘Intosh (Book of the Garden, i. 271), “is founded upon the simple principle that cold air is heavier and has a tendency to sink downwards, while hot air is light and rises to the top. At first sight it may appear that, for the purpose of ventilating any building, it 1s only necessary that holes should be made at the bottom of the apartment for the air to enter, and other holes be placed in the upper part for the air to escape. Practically, however, ventilation is far from being so simple an affair,” Since currents of air are very difficult to direct or control, to moderate, or even to regulate with very great nicety. Too frequently air is given only during the day, and is

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require fresh air by night as well as by day, and in all countries cool nights succeed even the hottest days.

The mode of ventilating plant houses formerly in use was by letting down the top roof sashes; this was often supplemented by having the front or upright sashes also made niovable, and more or less widely opened either outwards or laterally during the daytime. It is much more economical, however, and equally efficacious, to have the roof sashes fixed, aud the top ventilation effected by means of a lantern in the case of a span-roofed house, or by horizontal ventilators near the top of the back wall in a lean-to. The front ventilation may be effected by openings in the front wall opposite the heating pipes, by which means the cold air is warmed, which is the best plan in all houses where a high temperature has to be maintained, and is especially necessary in forcing-houses, on account of the risk of injury to the foliage from cold air ; or the front sashes may be made movable, which

is better in temperate houses. In the case of pits, where there are no front sashes provided, the ventilators are sufficient for the purpose. The sliding down of one sash over the other, as once generally and even now frequently practised, greatly augments the shade in oblique sunshine, and is strongly objectionable on that account. The lantern mode of con- struction obviates this, but in a lean-to, and even with span roofs, it is better to have shorter movable sashes, hung so as to open by being elevated at the lower edge instead of sliding one over the other. A very slight elevation is sufficient for the egress of vitiated air.

A successful plan of warming the fresh air, recommended many years ago by Mr T. Moore (Journ. Hort. Soc., i. 110), consists in passing the air after its admission by front ventilators through a heated chamber separate from the tank used as the heating medium, but admitting of com- munication with the tank chamber if necessary for the purpose of supplying moisture. The warmed fresh air is then led out in front of the tank, and carried forwards by the circulation up the slope of the roof, descending near the back wall to the floor, whence it is sucked into the heated chamber, mingling with the fresh air as it enters to repeat the circuit. A ventilator in the back wall provides the means of egress when this is required. Another plan, well adapted for forcing-houses, consists in fixing from end to end, below the hot-water pipes used for heating the structure, a zinc pipe of 6-inch or 8-inch diameter, and perforated with small holes, one end of the tube passing through an outer wall, and being fitted with a valve which can be wholly or partly closed at pleasure. Other means of accomplishing the same end may be adopted to suit parti- cular cases.

In order to secure the circulation of the confined air during the night, and thus to prevent an injurious rise of the temperature, and also to economize fuel, it is of ad- vantage where practicable to use shutters. These should consist of a light frame, readily movable, aud fitted so as to slide readily in grooves on a skeleton roof; and they should be covered with asphalted felt, or strong brown paper coated with tar, whichis much used in Germany for covering purposes, and is both durable and cheap. This should form a close outer covering, the ventilators being set open at bottom and top.

Formerly all ventilation had to be effected by the hand unaided, each sash being opened or shut separately, a matter of some urgency on the sudden outburst of sunshine. In all good ranges of glass, and in detached houses also, the work is now effected by machinery, many ingenious combinations of which are in use for this purpose.

17. Hygrometry.—F or the healthy growth of plants, Hygro. the regulation of the moisture is as necessary as the regu- metry. lation of the heat. A considerable degree of moisture is

excluded at night, often with an increase of fire-heat. Judicious horticulturists will reverse this, since plants

Soils.

necessary in the cases of most plants cultivated in a high temperature ; but the amount varies of course in different cases, and this presents one of the principal difficulties in the management of what is called a mixed collection, whether of stove or greenhouse plants. In the case of fruits, where a house is mostly devoted to one subject, whether grapes, peaches, pines, or melons, the requisite conditions can be more readily secured. The instrument with which the amount of moisture present in the atmo- sphere is measured is the hygrometer. The two hygro- meters most generally used are Daniell's and the dry and wet bulb, the former a more delicate instrument, best adapted for scientific observations, the latter a simpler instrument, better adapted for horticultural purposes, because requiring less delicate manipulation. It consists of two thermometers mounted on one frame, the readings of which when uncovered should correspond. One bulb is left uncovered, the other is covered with muslin, and a few threads of cotton, with their other ends immersed in water, keep it constantly moist. The temperature is lowered by the evaporation from the moistened bulb, and the difference in the readings of the two thermometers shows the degree of dryness. Mr Glaisher's instructions, which accompany the set of hygrometrical tables published by him, will be found of great assistance by every one making use of this instrument.

TIL. Garden Materials and Appliances.

18. Sodls and Composts.—The principal soils used in gardens, either alone, or mixed to form what are called composts, are—loam, sand, peat, leaf-mould, and various mixtures and combinations of these made up to suit the different subjects under cultivation.

Loam is the staple soil for the gardener ; it is not only used extensively in the pure and simple state, but enters into most of the composts prepared specially for his plants. For garden purposes loam should be rather unctuous or soapy to the touch when moderately dry, not clinging nor adhesive, and should readily crumble when a compressed handful is thrown on the ground. [If it clings together closely it is too heavy and requires amelioration by the admixture of gritty material; if it has little or no cohesion when squeezed tightly in the hand, it is too light, and needs to be improved by the addition of heavier or clayey material. Sound friable loam cut one sod deep from the surface of a pasture, and stacked up for twelve months in a heap or ridge, is invaluable to the gardener. When employed for making vine borders, loam of a somewhat heavier nature can be used with advantage, on account of the porous materials which should accompany it. For stone fruits a calcareous loam is best; indeed, for these subjects a rich calcareous loam used in a pure and simple state cannot be surpassed. Somewhat heavy loams are best for potting pine apples, for melons and strawberries, and may be used with the addition of manures only; but for ornamental plants a loam of a somewhat freer texture is preferable and more pleasant to work. Loam which con- tains much red matter (iron) should be avoided.

Sand is by itself of little value except for striking cuttings, for which purpose fine clean sharp silver sand is the best; and a somewhat coarser kind, if it is gritty, is to be preferred to the comminuted sands which contain a large proportion of earthy matter. River sand and the sharp grit washed up sometimes by the road side are excellent materials for laying around choice bulbs at planting time to prevent contact with earth which is perhaps manure-tainted. Sea sand may be advantageously used both for propagating purposes and for mixing in composts, For the growth of pot plants sand is

an essential part of most composts, in order to give them the needful porosity to carry off all excess of moisture from

the roots. If the finer earthy sands only are obtainable, they must be rendered sharper by washing away the earthy particles. Washed sand is best for all plants like heaths, which need a pure and lasting compost.

Peat soil is largely employed for the culture of American plants, as rhododendrons, azaleas, heaths, &c. In districts where heather and gritty soil predominate, the peat soil is poor and unprofitable, but selections from both the heathy and the richer peat soils, collected with judgment, and stored in a dry part of the compost yard, are essential ingredients in the cultivation of many choice pot plants, such as the Cape heaths and many of the Australian plants. Most monocotyledons do well in peat, even if they do not absolutely require it.

Leaf-mould is eminently suited for the growth of many free-growing plants, especially when it has been mixed with stable manure and has been subjected to fermentation for the formation of hot beds. In any state most plants feed greedily upon it, and when pure or free from decaying wood or sticks it is a very safe ingredient in composts ; but it is so liable to generate fungus, and the mycelium or spawn of certain fungi is so injurious to the roots of trees, attacking them if at all sickly or weakened by drought, that many cultivators prefer not to mix leaf-mould with the soil used for permanent plants, as peaches or choice ornamental trees. For quick growing plants, however, as for example most annuals cultivated in pots, such as balsams, cockscombs, globe-amaranths, and the like, for cucumbers, and for young soft-wooded plants generally, it is exceedingly useful, both by preventing the consolidation of the soil and as a manure. The accumulations of light earth formed on the surface in woods where the leaves fall and decay annually are leaf- mould of the finest quality.

The material known as cocoa-nut fibre refuse is analo- gous to leaf soil, and may be employed for similar purposes, It should be mixed with gritty matter to favour the passage of water, and indeed requires to be so mixed when in an advanced stage of decay, in order to prevent its collapse into a

close pasty mass. This cocoa-nut refuse is also a useful light material into which to plunge pots containing plants, as a preservative of the roots from the drying effects of the sun or the chilling effects of frost.

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Composts are mixtures of the foregoing ingredients in Com-|, varying proportions, and in combination with manures if posts’

necessary, So as to suit particular plants or classes of plants. The chief point to be borne in mind in making these mix- tures is not to combine in the same compost any bodies that are antagonistic in their nature, as for example lime and ammonia, In making up composts for pot plants, the fibrous portion should not be removed by sifting, except for small sized pots, but the turfy portions should be broken up by hand and distributed in smaller or larger lumps throughout the mass. When sifting is had recourse to, the fibrous matter should be rubbed through the meshes of the sieve along with the earthy particles. Before being used the turfy ingredients of composts should lie together in a heap only long enough for the roots of the herbage to die, not to decompose.

19. AManures.—These are of two classes, organic and Mam)

inorganic—the former being of animal and vegetable, the latter of mineral origin.

Farm-yard manure consists of the mixed dung of horses and Orgalt

cattle thrown together, and more or less soaked with liquid drain- man”

ings of the stable or byre. It is no doubt the finest stimulant for the growth of plants, and that most adapted to restore the fertile elements which the plants have abstracted from exhausted soils. This manure is best fitted for garden use when in a moderately fermented state.

Horse dung is generally the principal ingredient in all hot bed manure; and, in its partially decomposed state, as afforded by exhausted hot beds, it is well adapted for garden use. It 1s most

Ti ganic / ures. series, and one of the most important of the constituents of manures

peneficial on cold stiff soils. It should not be allowed to lie too long unmoved when fresh, as it will then heat violently, and the ammonia is thus driven off. To avoid this, it should be turned over two or three times if practicable, and well moistened—prcferably with farm-yard drainings.

Cow dung is less fertilizing than horse dung, but being slower in its action it is more durable ; it is also cooler, and therefore better for hot dry soils. Thoroughly decayed, it is one of the best of all manures for mixing in composts for florists' flowers and other choice

lants.

Pig dung is very powerful, containing more nitrogen than horse dung ; it is therefore desirable that it should undergo moderate fermentation, which will be secured by mixing it with litter and a portion of earth. When weeds are thrown to the pigs, this fer- mentation becomes specially desirable to kill their seeds. The drain- ings of a pig-stye form a most valuable liquid manure for vegetable crops

Night-soil isan excellent manure for all bulky crops, but requires to be mixed with earth or peat, or coal-ashes, so as both to deodorize it and to ensure its being equally distributed. Quick lime should not be used, as it dispels the greater part of the ammonia. When prepared by drying and mixing with various substances, night-soil is sold as poudrette, or desiccated night-soil, the value of which depends upon the materials used for admixture.

Malt-dust is an active manure frequently uscd as a top-dressing, especially for fruit trees in pots. It is rapid in its action, but its effects are not very permanent. Rape dust is somewhat similar in its character and action.

Bones are employed as a manure with decided advantage both to vegetable crops and to fruit trees, as well as to flowers. For turnips bone manure is

invaluable. The effects of bones are no doubt mainly due to the phosphates they contain, and they are most effectual on dry soils. They are most quickly available when dis- solved in sulphuric acid.

Guano isa valuable manure now much employed, and may be applied to almost every kind of crop with decided advantage. It should be mixed with six or eight times its weight of loam or ashes, eharred peat, charcoal-dust, or some earthy matter, before it is applied to the soil, as from its causticity itis otherwise not unlikely to kill or injure the plants to which it is administered.

Pigeon dung approaches guano in its power asmanure. It should be laid up in ridges of good loamy soil in alternate layers to form a compost, which becomes a valuable stimulant for any very choice subjects if cautiously used. The dung of the domestic fowl is very similar in character.

Horn, hoof-parings, woollen rags, fish, blubber, and blood are all good manures, and should be utilized if readily obtainable. Sawdust and tan are of less value.

Liquid manure, consisting of the drainings of dung-heaps, stables, cowsheds, &c., or of urine collected from dwelling houses or other sources, is a most valuable and powerful stimulant, and can be readily applied to the roots of growing plants. The urine should be allowed to putrefy, as in its decomposition a large amount of ammonia is formed, which should then be fixed by sulphuric acid or gypsum ; or it may be applied to the growing crops aftcr being freely diluted with water or absorbed in a compost heap. Li uid manures can be readily made from most of the solid manures when required, simply by admixture with water. When thus artificially compounded, unless for immediate usc, they should be made strong for convenience of storage, and applied as required much diluted.

Ammonia is the most powerful of the manures of the inorganic

generally, since it is the chief source whence plants derive their nitrogen. It is largely supplied in all the most fertilizing of organic manures, but when required in the inorganic state must be obtained from some of the salts of ammonia, as is sulphate, the muriate, or the phosphate, all of which, being

extremely energetic, require to be used with great caution. These salts of ammonia may be used at the rate of from 2 to 3 cwt. per acre as a top-dressing in moist weather. When dissolved in water they form active liquid manures.

Potash and soda are also valuable inorganic manures in the form of carbonates, sulphates, silicates, and phosphates, but the most extensively employed is the nitrate of potash. The manures of this Class are of course of value only in cases where the soil is naturally deficient in them. On this account the salts of soda are of less Importanes than those of potash. The value of wood ashes as a Manure very much depends upon the carbonate and other salts of potash which they contain.

Lime in the caustic state is beneficially applied to soils which Contain an excess of inert vegetable matter, and hence may be used for the improvement of old garden soils saturated with humus, or of peaty soils not thoroughly reclaimed. It does not supply the Place of organic manures, but only renders that which is present available for the nourishment of the plants. It also improves the texture of clay soils.

Gypsum, or sulphate of lime, applied as a top-dressing at the rate ot 2 to 8 ewt. per acre, has been found to yicld good results,

especially on light soils. It is also employed in the case of liquid manures to fix the ammonia.

_, Burnt clay has a very beneficial effect on clay land by improving its texture and rendering soluble the alkaline substances it contains. The clay should be only slightly burnt, so as to make it crumble down readily ; in fact, the fire should not be allowed to break through, but should be constantly repressed by the addition of material. The burning should be effected when the soil is dry.

Vegetable refuse of all kinds, when smother-burned in a similar way, becomes a valuable mechanical improver of the soil; but the preferable course is to decompose it in a heap with quick lime and layers of earth, converting it into leaf-mould.

Soot formsa good top-dressing ; it consists principally of charcoal, but contains ammonia, whence its valueas a manure isderived. It should be kept dry until required for use. It may also be used beneficially in preventing the attacks of insects, such as the onion aoe ee turnip fly, by dusting the plants or dressing the ground with it.

Common salt acts as a manure when used in moderate quantities, but in strong doses is injurious to vegetation. It suits many of the esculent crops, as onions, beans, cabbages, carrots, bect-root, asparagus, &c.; the quantity applied varics from 5 to 10 bushels per acre. It is used as a top-dressing sown by thehand. Hyacinths and other bulbs derive benefit from slight doses, while to asparagus as much as 20 Ib to the rood has been used with beneficial cffect. At the rate of from 6 to 10 bushels to the acre it may be used on garden lawns to prevent worm casts. For the destruction of weeds on gravel walks or in paved yards a strong dose of salt, applied either dry or in solution, is found very effective, especially a hot solution, but after a time much of it becomes washed down, and the residue acts as a manure; its continued application is undesirable, as gravel so treated becomes pasty.

20. Tools, Implements, &c. —With regard to garden tools, Tools.

instruments, implements, and machinery, it is only some of the more modern inventions and im- provements that can be touched on here. The two indispensable tools are the spade and the knife. The spade is com- | monly used for digging and trenching, | but much of this work is now bettcr done I by means of Parkes’s digging-fork (fig. i 42), which is both handier and lighter, and breaks up the ground better than the spade. The pickfork or Canter-

bury hoe (fig. 43) is a very useful tool for

breaking up the surface soil, the three- | pronged end being uscd for the looser \ | parts, and the mattock end for breaking _ clods, or when the

surface has become vi oe —* much consolidated. The drag (fig. 44) is ~““S8NE-FOF*- also useful—a light three-pronged tool, which may be used for loosening the soil amongst vegetable crops as well as

‘flower garden plants, and may also be sometimes employed,

if the tines are sufficiently narrow and pointed, to drag off weeds from the surface, The hand-fork (fig. 45), a short-

Fork.

Fia, 44,—Drag,

handled three-tined implement, is extremely handy for many purposes, such as loosening weeds for hand-weeding, or for planting or transplanting small subjects; it is also

very handy for plunging pots, either indoors or out, in tan-

sh-beds, or common soil. Hoes and rakes made with ane neck and socket, into which the handle is fitted, do not clog so readily as when they are driven into a ferruled handle. ;

For pruning purposes a variety of instruments have been invented, under the names of s¢cateurs, pruning-shears, pruning-scissors, &c., but nothing equals a well-tempered old-fashioned knife, varied in form, strength, and size to suit the particular object to be operated on. The averrun- cator is a useful instrument for cutting branches at a con- siderable elevation (12 to 15 feet) from the ground. Selby’s flower gatherer (fig. 46), which cuts and holds the

Fria. 46.—Selby’s Flower Gatherer.

Fia. 47.—Ridgway’s Hedge-Cutter.

flower at the same time, may be recommended, especially for the use of ladies. Some of the fruit gatherers also are in- genious and useful, A new instrument for clipping hedges, Ridgway's hedge-cutter (fig. 47), does its work quickly and well; and the same can be said for Adie's new lawn-edging machine.

For the destruction of insects Dean's and Appleby's and Dreschler's fumigators are all useful, but an equally efficient plan is to put a few live embers in a flower-pot, raised on two bricks so placed as not to close the hole at the bottom ; on these embers moistened tobacco or tobacco paper is to be put, and over all damped moss. This will burn slowly and fill the house with smoke, care being taken that the material, as it dries, is lightly sprinkled with water, so that it does not burst into a flame.

Sulphurators are instruments for distributing flowers of

sulphur, for the purpose of destroying mildew. In the case of green-

house __ plants, such as heaths, simply dusting with sulphur through a mus-lin bag or dredg- er is sufficient ; but in cases where vines are attacked with ® the Oidium or * vine-mildew, the u i saving of the —— A crop depends on Fic, 49.—Epps's Sulphurator. the prompt diffusion of sulphur over all the affected parts, and this could not be so readily done by any other con-trivance as by some one of the various forms of sulphurator (figs. 48, 49).

For the distribution of water in the form of spray, syringes are used, and of these there are none better than

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Read's patent, which acts by a piston and ball valve ; while for the more powerful garden engines, those manufactured by Read (fig. 50) and Warner have the preference.

Fia. 50.—Read’s Garden Engine.

Tallies of wood should be slightly smeared with white Tallies

paint and then written on while damp with a black-lead pencil. To preserve them from decay they should first be soaked in linseed oil. Zinc tallies are the best, on account of their durability, if written upon with a proper ink,—12 grains of bichloride of platinum dissolved in 1 oz. of dis- tilled water. Larger labels of various materials and patterns are provided for trees and shrubs, and other permanent out- door plants. Lead labels with stamped figures are very use- ful. For numbering pot plants, these may be wedge-shaped and bent over close to the pot-rim ; for collections of plants they should be small and light, so that the suspending wire may not cut into the bark of the plants. Zine labels with the names shown in relief are to be recommended when they can be obtained ready made, but are too expensive when they have to be specially prepared.

IV. Garden Operations.

21. Propagation.—The increase of plants, so far as the Prop’)

production of new individuals of particular kinds is con- tion. cerned, is one of the most important and constantly recur- ring of gardening operations. In effecting this, various processes are adopted, which will now be described.

(1) By Seeds.—This may be called the natural means of increas- Seeds |

ing the number of any particular kind of plant, but it is to be remembered that we do not by that means secure an exact reproduction of the parent. We may get a progeny very closely resembling it, yet each plant possessing a distinct individuality of its own; or we may get a progeny very unlike the parent, or 4 mixed progeny showing various degrees of divergence. Many seeds will grow freely if sown in a partially ripened state; but as 4 general rule seeds have to be kept for some weeks or months in store, and hence they should be thoroughly ripened. before being gathered. They should be sown in fine rich soil, and such as Wi 1 not readily get consolidated. In the case of outdoor crops, if the soil is inclined to be heavy, it is a good plan to cover all the smaller seeds with a light compost. Very small seeds should

only have a sprinkling of light earth or of sand, and sometimes only a thin layer of soft moss to exclude light and preserve an equable degree of moisture. Somewhat larger seeds sown indoors may be covere

to the depth of one-eighth or one-fourth of an inch, according to their size. Outdoor crops require to be sown, the smaller seeds from half an inch to an inch, and the larger ones from 2 to 4 inches

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PROPAGATION, |

under the surface, the covering of the smaller ones especially being light and open. Many seeds grow well when raked in ; that is, the surface on which they are scattered is raked backwards and forwards until most of them are covered. Whatever the seeds, the ground should be made tolcrably firm both beneath and above them; this may be done by treading in the case of most kitchen garden crops, which are also better sown in drills, this admitting the more readily of the ground being kept clear from weeds by hoeing. All seeds require a certain degree of heat to induce germination. _ For tropical plants the heat of a propagating house—75° to 80°, with a bottom heat of 80° to 90°—is desirable, and in many cases absolutely necessary ; for others, such as half-hardy annuals, a mild hot bed,

or a temperate pit ranging from 60° to 70°, is convenient ; while of

course all outdoor crops have to submit to the natural Ben ee of the season. It is very important that seeds should be sown when the ground is ina good working condition, and not clammy with moisture. ;

(2) By Offsets. —This mode of increase applies specially to bulbous plants, such as the lily and hyacinth, which produce little bulbs on the exterior round their base. Most bulbs do so naturally to a limited but variable extent; when more rapid inercase is wanted the heart is destroyed, and this induces

the formation of a larger number of offsets. The stem bulbs of lilies are similar in character to the offsets from the parent bulb. The same mode of increase occurs in the gladiolus and crocus, but their bulb-like permanent parts are called corms, not bulbs. After they have ripened in connexion with the parent bulb, the offsets are taken off, stored in a ea places, and at the proper season planted out in nursery beds.

(3) By Tubers.—The tuber is a fleshy underground stem, furnished with eyes which are either visible, as in the potato and in some familiar kinds of Tropeolwm (T. tuberosum) and of Oxalis (0. crenata), or latent, as in the Chinese yam (Dtoscorca Batatas). For a fuller description see Borany, vol. iv. p. 98. When used for propagation, the tubers are cut up into what are called “ sets,” every portion having an eye attached being capable of forming an independent plant. The cut portions of bulky sets should be suffered to lie a short time before being planted, in order to dry the surface and prevent rotting ; this should not, however, be done with such tropical subjects as caladiums, the tubers of which are often cut up into very small fragments for propagation, and of course require to be manipulated in a properly heated propagating ee No eyes are visible in the Chinese yam, but slices of the ong club-shaped tubers will push out young slioots and form inde- pendent plants, if planted with ordinary care,

(4) By Division. —Division, or partition, is usually resorted to in the case of tufted growing plants, chiefly perennial herbs ; they may be evergreen, as chamomile or thrift, or when dormant may consist only of underground crowns, as larkspur or lily-of-the- valley ; but in either case the old tufted plant being dug up may be divided into Separate pieces, each furnished with roots, and, when replanted, generally starting on its own account without much check, Suffruticose plants and even small shrubs may be propagated in this way, by frat planting them deeper than they are ordinarily grown, and then after the lapse of a year, which time they require to get rooted, taking them up again and dividing them into parts or separate plants. Box-edging and southernwood are examples, The same ends may sometimes be effected by merely working fine soil in amongst the base of the stems, and giving them time to throw out roots before parting them.

(5) By Swekers,—Root suckers are young shoots from the roots of plants, chiefly woody plants, as may often be seen in the case of the elm and the plum. The shoots when used for propagation must be transplanted with all the roots attached to thern, care being taken not to injure the parent plant. If they spring from a thick root it is not to be wantonly severed, but the soil should be removed and the sucker taken off by cutting away a clean slice of the root, which will then heal and sustain no harm. Stem suckers are such as proceed from the base of the stem, as is often Seen in the case of the currant and lilac. They should be removed

Fia, 51.—Suckering Iron.

in any case ; when required for propagation they should be taken with all the roots attached to them, and they should be as thoroughly disbudded below ground as possible, or they are liable to continue the habit of suckering. In this case, too, the soil should be carefully opened and the shoots removed with a suckering wi a sharp concave implement with long iron handle (fig. 51). Vhen the number of roots is limited, the tops should be shortened, and some care in watering and mulching should be bestowed on the plant if it is of value.

‘ 8) By Hunners.—A definition of runners will be found in neo vol. iv. p. 97. The young string-like shoots produced y the strawberry are a well-known example of them. The pro~

cess of rooting these runners should be facilitated by fixing them close down to the soil, which is done by small wooden hooked pegs or by stones ; hair-pins, short lengths of bent wire, &c., may also be used. After the roots are formed, the strings are cut through, and the runners become independent plants.

(7) By Proliferous Buds,—Not unlike the runner, though grow- Prolifer-

ing ina very different way, are the bud-plants formed on the fronds ousbuds. of several kinds of ferns belonging to the genera Asplenium, Woodwardia, Polystichum, Lastrea, Adiantum, Cystopteris, &c. In some of these (Adiantum caudatum, Polystichum lepidocauton) the rachis of the frond is lengthened out much like the string of the strawberry runner, and bears a plant at its apex. In others (Polystichum angulare proliferun.), the stipes below and the rachis amongst the pinne develop buds, which are often numerous and crowded. In others again (Woodwardia orientalis, Asplenium bulbiferwm), buds are numerously produced on the upper surface of the fronds. These will develop on the plant if allowed to remain. For propagation the bulbiferous portion is pegged down on the surface of a pot of suitable soil; if kept close in a moist atmosphere, the little buds will soon strike root and form independent plants. In the Cystopteris the buds are deciduous, falling off as the fronds acquire maturity, but, if collected and pressed into the surface of a pot of soil and kept close, they will grow up into young plants the following season.

(8) By Layers.—Layering consists in preparing the branch of a Layers. plant while still attached to the parent, bending it so that the pe operated on is brought under ground, and then tixing it there

y means of a forked peg. Some plants root so freely that they need only pegging down; but in most cases the arrest of the returning sap to form a callus, and ultimately young roots, must be brought about artificially, either by twisting the branch, by split- ting it, by girding it closely with wire, by taking off a ring of bark, or by “‘tonguing.” In tonguing the leaves are cut off the portion which has to be brought under ground, and a tongue or slit is then cut from below upwards close beyond a joint, of such length that, wheu the cut part of the layer is pegged an inch or two (or in larger woody subjects 3 or 4 inches) below the surface, the elevation of the point of the shoot to an upright position may

Fia, 52.—Propagation by Layers—a, tonguing ; b, ringing. open the incision, and thus set it free, so that it may be surrounded

by earth to induce it to form roots. The whole branch, except a few buds at the extremity, is covered with soil. The best seasons for these operations are early spring and midsummer, that is, before the sap begins to flow, and after

the first flush of growth has passed off. One whole summer, sometimes two, must elapse before the layers will be fully rooted in the case of woody plants ; but’ such plants as carnations and picotees, which are usually propa- gated in this way, in favourable seasons take only a few weeks to root, as they are layered towards the end of the blooming season in July, and are taken off and planted separately early in the autumn. Fig. 52 shows a woody plant with one layer prepared by tonguing and another by ringing. : :

In general, each shoot makes one layer, but in plants like the Wistaria or Clematis, which make long shoots, what is called serpentine layering may be adopted; that is, the shoot is taken alternately below and above the surface, as frequently as its length permits. There must, however, be a joint at the underground part where it is to be tongued and pegged, and at least one sound bud in each exposed part, from which a shoot may be developed to form the top of the young plant.

(9) By Circumposition.—When a plant is too high or its habit Cireum- does not conveniently admit of its being layered, it may often be position. increased by what is called circumposition, the soil being carried up to the branch operated on. The branch is to be prepared by ringing or notching or wiring as in layering, and a temporary stand made to support the vessel which is to contain the soil. The vessel may be a flower-pot sawn in two, so that the halves may be bound together when used, or it may be a flower-pot or box with a side slit which will admit the shoot ; this vessel is to be

filled compactly with suitable porous earth, the opening at the slit being stopped by pieces of slate or tile. The earth must be kept moist, which is perhaps best done by a thick mulching of moss, the moss being also.bound closely over the openings in the vessel, and all being kept damp by frequent syringings. Reid remarks of this method of propagation that he has effected it with clay and cow dung, well mixed, after the bark had been taken off all round, and wrapped about with a double or triple swaddling of straw or hay ropes (Scots Gardener, 1721). ‘

This process is sometimes found very useful in the case of choice conservatory plants which may be getting too tall for the house, such as a fine Dracena (fig. 53) or Yucca. Such a plant may be operated on wherever the stem has become firm and woody ; the top will not fail to make a fine young specimen plant, which might be removed in the course of about twelve months, while other shoots would no doubt be obtained from the old stem, which, with its head thus reduced, might be removed to quarters where it would not be an eyesore. The head would perhaps require steadying if the stem were loaded with a pot or box of soil, as at a in the figure. Mr Bain records (Paat. Mag. Bot., xvi. 46) a successful experiment of this kind with a Draceena Draco which was getting too tall for its position. An incision was made in the stem half an inch deep to the extent of half its circumference, lime being applied to the wound to dry up the sap. This incision was from time to time deepened (and _lime- dried) until severed, the top being suspended from the roof. After some months roots were protruded from between the woody structure and its bush-like covering, and the gigantic cutting was lowered into its place, and grew away freely. In this case Mr Bain was of opinion that success was due to the slowness of the process and the precautions taken to dry and harden the stem.

(10) By Grafts. —Grafting is so extensively resorted to that it is impossible here to notice all its phases. It is perhaps of most importance as the principal means of propagating our hardy kinds of fruit, especially the apple and the pear ; but the process is the same with most other fruits and ornamental hardy trees and shrubs that are thus propagated. The stocks are commonly divided into two classes :—(1) free stocks, which eonsist of seedling plants, chiefly of the same genus or species as the trees from which the scions are taken; and (2) dwarfing stocks, which are of more diminutive growth, either varieties of the same species or species of the same or some allied genus as the scion, which have a _tend- ency to lessen the expansion of the engrafted tree. The French Paradise is the best dwarfing stock for apples, and the quince for

ears. In determining the choice of stocks, the nature of the soil in which the grafted trees are to grow should have full weight. In a soil, for example, naturally moist, it is proper to graft pears on the quince, because this plant

not only thrives in such a soil, but serves to check the luxuriance thereby produced. The scions should always be portions of the wood of the preceding year, selected from healthy parents; in the case of shy-bearing kinds, it is better to obtain them from the fruitful branches. The scions should be taken off some weeks before they are wanted, and half- buried in the earth, since the stock at the time of grafting should in point of vegetation be somewhat in advance of the graft. During winter, grafts may be conveyed long distances, if carefully packed. If they have been six weeks or two months separated from the parent plant, they should be grafted low on the stock, and the earth should be ridged up round them, leaving only one bud of the scion ex- ete above ground. he best season for grafting apples and similar

hardy subjects is the month of March; but it may be commenced as soon as the sap in the stock is fairly in motion, and may be con- tinued during the first half of April.

/ Whip-grafting or Tongue-grafting (fig. 54) is the most usual mode of performing the operation. The stock is headed off by an oblique

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transverse cut as sliown at @, a slice is then pared off the side as at b, and on the face of this a tongue or notch is made, the cut being in a downward direction ; the scion c is pared off in a similar way by a single clean sharp

cut, and this is notched or tongued in the opposite direction as the figure indicates; the two are then fitted together as shown at d, so that the inner bark of each may come in contact at least on one side, and then tied round with damp soft bast as atc; next some grafting clay is taken on the forefinger and

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Fic. 54.—Whip-Grafting or Tongue-Grafting.

pushed down on each side so as to fill out the space between the top of the stock and the graft, and a portion is also rubbed over the ligatures on the side where the graft is placed, a handful of the clay is then taken, flattened out, and rolled closely round the whole point of junction, being finished off to a tapering form both above and below, as shown by the dotted line To do this deftly, the hands should be plunged from time to time in dry ashes, to prevent the clay from sticking to them.

Cleft-grafting (fig. 55) is another method in common use. The stock a is cleft down from the horizontal cut d, and the scion, when cut to a thin wedge form, as shown atc and c, is inserted into the cleft ; the whole is then bound up and clayed as in the former ease. This is not so good a plan as whip-grafting , it is improved by sloping the stock on one side to the size of the graft.

Fig. 55.—Cleft-Grafting.

Crown-grafting or Rind-grafting (fig. 56) is preferable to cleft- grafting, inasmuch as it leaves no open spaces in the wood. The stock 6 is cut off horizontally or nearly so, and a slit is then cut in the bark f, f, a wedge-shaped piece of ivory being inserted to raise the bark; the scion is then cut to the same wedge-shaped form g, h, and inserted in the space opened for it between the albumen and the bark, after which it is tied down and clayed over in the manner already described. }

Side-grafting is performed like whip-grafting, the graft being inserted on the side of a branch and not at the cut end of the stock. It may be practised

for the purpose of changing a part of the tree, and is sometimes very useful for filling ont vacant spaces, 1 trained trees especially. .

Inarching is another form of side-grafting. Here the graft is fixed to the side of the stock, which is planted or potted close to the plant to be worked. The branches are applied to the stock while yet attached to the parent tree, and remain so until united. In the case of trained trees, a young shoot is sometimes inarched to its parent stem to supply a branch where one has not been developed in the ordinary way.

For the propagation by grafts of stove and greenhouse plants the process adopted 1s whip-grafting or a modification of it. The parts

Fic, 56.—Crown-Grafting.

are, however, sometimes so small that the tongue of the graft is dispensed with, and the two stems simply pared smooth and bound together. In this way hardy rhododendrons of choice sorts, green- house azaleas, the varieties of the orange family, camellias, roses, rare conifers, and numerous other plants are increased. In small subjects soft cotton is used for tying instead of bast, and grafting- wax is substituted for grafting-clay. The best is the French eold mastic ‘‘L’Homme Lefort.” All grafting of this kind is done in the propagating house, at any season when grafts are obtainable in a fit state,—the plants when operated on being placed in close frames warmed to a suitable temperature.

Root-grafting is sometimes resorted to where extensive increase is an object, or where stem-grafting or other means of propagation are nt available. In this ease the seion is grafted directly on toa portion of the root of some appropriate stock, both graft and stock being usually very small ; the grafted root is then potted so as to cover the point of junction with the soil, and is plunged in the bed of the propagating house, where it gets the slight stimulus of a gentle bottom heat. Dahlias (fig. 57) and peonies may be grafted

Fie. 57.—Root-Grafting of Dahlia.

Fia. 58.—Root-Grafting of Woody Plant.

by inserting young shoots into the neck of one of the fleshy roots of each kind respectively—the best method of doing so being to cut a triangular section near the upper end of the root, just large enough to admit the young shoot when slightly pared away on two sides to give it a similar form. In the caso of large woody plants thus worked (fig. 58) the grafted roots, after the operation is completed, are planted in nursery beds, so that the upper buds only are exposed to the atmosphere, as shown at c in the figure.

(11) By Buds.—Budding is the inserting of a bud cut with a portion of bark of the plant to be propagated into the bark of the stock, where it is bound gently but firmly. Stone fruits, such as peaches, apricots, plums, cherries, &c., are propagated in this way, as well as roses, and many other plants. In the propagating house budding may be done at any season when the sap is in motion; but for fruit trees, roses, &c. , in the open air, it is usually done in July or August, when the buds destined for the following year are completely ormed in the axils of the leaves, and when the bark separates freely from the wood it covers. Those buds are to be preferred, as being best ripened, which occur on the middle portion of a young shoot.

The simplest and most generally practised form of budding is that called Shield-budding or T-budding (fig. 59). The operator should be ae with a budding-knife in which the eutting edge of the blade is rounded off at the point, and which has a thin ivory or bone handle, for raising the bark of the stock. A horizontal meision is made in the bark quite down to the wood, and from this 4 perpendicular slit is drawn downwards to the extent of perhaps an Inch, so that the slit has a resemblance to the letter T,asata

e bark on each side of the perpendicular slit being then cautiously opened, as at 5, with the handle of the knife, the bud and shield are inserted as shown ate. The upper tip of the shield is eut off hori-

zontally, and brought to fit the oark of the stock at the transverse incision. Slight tics of soft cotton wool or worsted, or even moist bast-matting, are then applied. In about a month or six weeks the ligatures may be taken away, when, if the operation has been

Fig. 59.—Shield-Budding,

successful, the bud will be fresh and full, and the shield firmly united to the wood. In the following spring a strong shoot will be thrown out, and to this the stock is headed down by gradations during the course of the summer.

To be successful the operation should be performed with a quick and light hand, so thatno part of the delicate tissues be injured, as would happen if they were left for a time exposed, or if the bud were forced in like a wedge. The union is effected as in grafting, by means of the organizable sap or cambium, and the less this is

| disturbed until the inner bark of the shield is pressed and fixed

against it the better. Inverted T-budding, in which the two inci- sions are in the form L, is for some reasons preferable to the more ordinary method,

(12) By Branch 1 ee ga by cuttings is the mode Branch It is cuttings.

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of increase most commonly adopted, next to that by seeds, effected by taking a portion from a branch or shoot of the plant, and placing itin the soil. There are great differences to be observed in the selection and treatment of cuttings. Sometimes soft green shoots, as in Verbena (fig. 60, a), are used; sometimes the shoots must be half-ripened, and sometimes fully matured. So of the mode of preparation ; some will root if cut off or broken off at any point and thrust into wet earth or sand in a warm place (fig. 60, a) ; others a to be cut with the utmost care just below a joint or leaf-base, and by a keen blade so as to sever the tissues without tearing or bruising; and others again after being cut across require to be gplit up fora short distance. It is usual and in most cases necessary to cut away the lower portion of a cutting up to just below the

Fic. 60.—Propagation by Cuttings.

noae or joint (fig. 60, b, d, ¢). The internodal parts will not often divide so as to form separate individual plants ; sometimes, however, this happens ; it is said that the smallest piece of Torenia asiatica, for instance, will grow. Then as to position, certain cuttings grow readily enough if planted outdoors in the open soil, some preferring shade, others sunshine, while less hardy subjects must be covered with a bell-glass, or must-be in aclose atmosphere with bottom heat, or must have the aid of pure silver sand to facilitate their rooting (fig. 60, c). Cuttings should in all cases be taken from healthy plants, and from shoots of a moderate degree of vigour. It is also important to select leafy growths, and not such as will at once run up to flower. Young shoots which have become moderately firm generally make the best cuttings, but sometimes the very softest shoots strike more readily. For all plants in a growing state spring is the safest time for taking cuttings.

Cuttings of deciduous plants should be taken off after the fall of

the leaf, and should have all underground buds carefully removed so as to prevent as far as possible the formation of suckers. These euttings should be about one foot in length, and should be planted at once in the ground so as to leave only the top with the two or three preserved buds exposed. If a clean stem, however, is desired, a longer portion may be left uncovered. ;

Cuttings of growing plants are prepared by removing with a sharp knife, and moderately close, the few leaves which would otherwise be buried in the soil; they are then eut clean across just below a joint; the fewer the leaves thus removed, however, the better, as if kept from being exhausted they help to supply the organizable matter out of which the roots are formed. Free-rooting subjects strike in any lightish sandy mixture ; but difficult subjects should have thoroughly well-drained pots, a portion of the soil proper for the particular plants made very sandy, and a surfacing of clean sharp silver sand about as deep as the length of the cutting (fig. 60, ¢). Mr Ayres, writing in the Gardeners' Chronicle (1843, p. 116), recom- mends 5-inch pots for cuttings; and these he prepares by placing over the hole at the bottom of each an inverted 38-inch pot, aroun it potsherds broken small, over these some compost made up of equal quantities of peat, sand, and leaf-mould, leaving about half an inch at top for white sand, which runs into the holes as the euttings are inserted. Mr Ayres advises that ''a stock of pots thus prepared should be kept in a frame or propagating house, as nothing is so injurious to cut- tings taken from plants growing in heat as to put them into cold soil, Cuttings cannot be too short if they have the necessary buds to form a plant; neither can they be inserted too shallow, REO if they arc made firm in the pots." Fic. 61.—Double Cutting Pot. All plants while striking may be kept in a temperature rather higher than that in which they grow naturally, and the soil about them should be kept moist, although they must not from want of drainage in any degree get sodden with wet. The humidity kept up about the cuttings is maintained by covering them with bell-glasses, or setting them in handlights or small glazed frames of convenient size.

A special contrivance for a cutting pot (fig. 61) was brought into notice many years ago by Mr A. Forsyth. A smaller pot was put into a larger one, the hole at the bottom being closed with clay a ; the bottom of the outer pot is filled with crocks b, so that the small pot is brought up to the level of the

larger one; and the space between the two pots c is filled with propagating soil, the cuttings being so planted that their cnds rest against the sides of the inner pot, which is then filled with water, and this passing slowly through the sides of the pots, just keeps the soil moistened.

moss, and then the

Fic. 62,—Leaf Cuttings.

Such delicate plants as heaths are reared in silver sand, a stra- tum of which is placed over the sandy peat soil in the cutting pot, and thus the cuttings, though rooting in the sand, find at once on the emission of roots congenial soil for them to grow in (fig. 60, ¢).

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tings planted during early summer in light rich soil. of pinks are called pipings (fig. 60, d), and are planted about June, while pansies may be renewed in this way both in spring and in

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Hardy plants, such as pinks, pansies, &c., are propagated by cut. The cuttings

autumn. (18) By Leaf Cuttings.—Many plants may be propagated by Leaf planting their leaves or portions of their leaves as cuttings, as, for cnt example, the herbaceous Gloxinia (fig. 62, a) and Gesnera, the succulent Sempervivum, Eeheveria, Pachyphytwm, and their allies and such hard-leaved plants as : Theophrasta (fig. 62, 6). The leaves are best taken off with the base whole, and should be planted

tings, |

in well-drained sandy soil; in ly eat

due time they form roots, and \ SJ _— ultimately from some latent bud KX \ RES

a little shoot which forms the (\ RS TR young plant. The treatment is RK Ss SA

precisely like that of branch cut- z

tings. Gloxinias, begonias, &c., row readily from fragments of : nee

the leaves cut elean coach the Fig 66. —Leat Sager

thick veins and ribs, and planted edgewise like cuttings. This class

of subjects may also be fixcd flat on the surface of the cutting

pot, by means of little pegs or hooks, the main ribs being cut across

at intervals, and from these points roots, and eventually young

tubers, will be produced (fig. 68).

(14) By Root Cuttings.—Some plants which are not easily increased Root | by other means propagate readily from root cuttings. Amongst the cuttings, indoor plants which may beso treated, the Bouvardia, Pelargonium, Aralia, and Wigandia may be mentioned. The modus operandi is to turn the plant out of its pot, shake away the soil so as to free the roots, and then select as many pieces of the stouter roots as may be required. These are cut up into half-inch lengths (some- times less), and inserted in light sandy soil round the margin of a cutting pot, so that the upper end of the root cutting may be level with the soil or only just covered by it. The pots should be watered so as to settle the soil, and be placed in the elose atmosphere of the propagating pit or frame, where they will need scarcely any water until the buds are seen pushing through the surface.

Thereare various herbaceous plants which may be similarly treated, such as sea-kale and horseradish, and, among ornamental plants, the beautiful autumn-blooming Anemone japonica and Senecio puleher. The sea-kale and horseradish require to be treated in the open garden, where the cut portions should be planted in lines in well-worked soil ; but the roots of the

Anemone and Senecio should be planted in pots and kept in a close frame with a little warmth till the young shoots have started.

Various hardy or- namental trees are also increased in this way, as the quince, elm, ro- binija, and mul- berry, and the rose amongst shrubs. The most important use to which this mode of propagation is put is, however, the inerease of roses, and of the various plums used « as stocks for work- ing the choicer = stone fruits. The method inthe latter case is to select roots averaging the thickness of the little finger, to cut these into lengths of about 3 or 4 inches, and to plant . them in lines just beneath the surface in nursery beds.

Fic. 64.—Cutting of Single Eye. The root cuttings of rose-stocks are prepared and treated in a similar way.

15) By Cuttings of Single Eyes.—This mode of propagation is Eye behacie by cutting the branches into short lengths, each containing cuttings |) one well-matured bud or eye, with ashort portion of the stem above and below. It is a common mode of propagating vines, the eyes

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being in this case cut from the ripened leafless wood. The eyes (fig. 64, a) are planted just below the surface in pots of light soil, which are placed in a hot bed or propagating pit, and in due time each pushes up a young shoot which forms the future stem, while from about its base the young roots are produced (fig. 64, 6) which convert it into an independent plant. In the case of plants with persistent leaves, the stem may be cut through just above and below the bud, retaining the leaf which is left on the cutting, the old wood and eye being placed beneath the oil and the leaf left exposed. In this way the india-rubber tree (Ficus elastica), for example, and many other tender plants may be increased with the aid of a brisk bottom heat. Many of the free-growing soft-wooded plants may also be grown from cuttings of single joints of the young wood, where rapid increase is desired ; and in the case of opposite- leaved plants two cuttings may often be made from one joint by splitting the stem longitudinally, each cutting consisting of a leaf and a perfect bud attached to half the thickness of the stem. 22. Planting and Transplanting.—In preparing a fruit – tree for transplantation, the first thing

to be done is to open a trench round it at a distance of from 3 to 4 feet, according to size. The trench should be opened to about two spades' depth, and any coarse roots which may extend thus far from the trunk may be cut clean off with a sharp knife. The soil between the trench and the stem is to be reduced as far as may seem necessary or practicable by means of a digging fork, the roots as soon as they are liberated being fixed on one side and carefully preserved. By working in this way all round the ball, the best roots will be got out and preserved, and the ball lightened of all superfluous soil, The tree will then be ready to lift if carefully prized up from beneath the ball, and if it does not lift readily, it will probably be found that a root has struck downwards, which will have to be sought out and cut through. Whenever practicable, it is best to secure a ball of earth round the roots. On the tree being lifted from its hole the roots should be examined, and all Which have been severed roughly with the spade should have the ends cut smooth with the knife to facilitate the emission of fibres. The tree can then be transported to its new position. The hole for its reception should be of sufficient depth to allow the base of the ball of earth, or of the roots, to stand so that the point Whence the uppermost roots spring from the stem may be 2 or 3 inches above the general surface level. Then the bottom being regulated so as to leave the soil rather highest in the centre, the plant is to be set in the hole in the position desired, and steadied there by hand. Next the roots from the lower portion of the ball are to be sought out and laid outwards in lines radiating from the stem, being distributed equally on all sides as nearly as this can be done; some fine and suitable good earth should be thrown amongst the roots as they are thus being placed, and worked in well up te the base of the ball. The soil cover- ing the roots may he gently pressed down, but the tree should not be pulled up and down, as is sometimes done, to settle the soil. This done, another set of roots higher up the ball must be laid out in the same way, and again another, until the whole of the roots, thus carefully laid, are embedded as firmly as may be in the soil, which may now receive another gentle treading. The stem should next be supported permanently, either by one stake or by thtee, according to its size: The excavation will now be filled up about two-thirds perhaps ; and if so the tree may have a thorough good watering, sufficient to settle the soil closely about its roots. After twenty-four hours the hole may be levelled in, with moderate treading, if the water has soaked well in, the surface being left slightly sloping upwards towards the stem of the tree. In transplanting

trees of the ornamental class, less need be attempted in | spect to providing new soil, although the soil should be made as congenial as practicable. Tn transplanting smaller subjects, such as plants for the flower garden, much less effort is required. The plant must

be lifted with as little injury to its rootlets as possible, and carefully set into the hole, the soil being filled in round it, and carefully pressed close by the hand. For moving small plants the garden trowel is'a very convenient tool, but we are inclined to give the preference to the hand-fork (fig. 45). For larger masses, such as strong-growing her- baceous plants, a spade or digging-fork will be requisite.

When seedlings of vigorous plants have to be " pricked out," a dibble (fig. 64) is the best implement to be used. The ground being prepared and, if necessary, enricned, and the surface made fine and smooth, a hole is made with the dibble deep enough and large enough to receive the roots of the seedling plants without doubling them up, and the hole is filled in by working the soil close to the plant with the point of the dibble. The pricking out of seedlings in pots in the propagating pit is effected in a similar way. The plants, indeed, often require to be re- moved and set from half an inch to an inch apart before they have become sufficiently developed to admit of being handled with any degree of facility, and for these a pointed stick of convenient size is used as a dibble. In extreme cases it is best to lift the little seedling on the end of a flattish pointed stick, pressing this into the new soil where the plant is to be placed, and liberating it and closing the earth about it by the aid of a similar stick held in the other hand.

Large trees may be successfully transplanted by the aid of transplanting machines, of which different forms are in use. These will be found figured and described in the various horticultural and arboricultural publications. See, €.g-, M'Intosh's Book of the Garden (ii. p. 374 sq.). The best season for transplanting deciduous trees is during the early autumn months. As regards evergreens opinions are divided, some preferring August and September, others April or May. They can be successfully planted at either

period, but for subjects which are at all difficult to remove the spring months are to be preferred.

23. Potting and Repotting.—Garden pots are made Potting.

with a comparatively large hole in the bottom, and those of the largest size have also holes at the side near the bottom ; these openings are to prevent the soil becoming saturated or soured with superabundant water. To prepare the pot for the plant, a broadish piece of potsherd, called a “ crock,” is placed over the large hole, and if there be side holes they also are covered. The bottom crock is made from a piece of a broken garden pot, and is laid with the convex side upwards ; then comes a layer of ir- regular pieces of crock of various sizes, about an inch deep in a 5-inch pot, 2 inches in an 11-inch or 12-inch pot, &c. The mode of crocking a pot is shown in fig. 65. A few of the coarser lumps from the outer edge of the heap of potting soil are spread over the crocks. The sameend, that of keeping the finer particles of Fi. the soil from mixing with the drainage

crocks, may be attained by shaking in a little clean moss. A handful or two of the soil is then put in, and on this the plant with its roots spread out is to be set a trifle higher than the plant should stand in the pot when finished off ; more soil is to be added, and the whole pressed firmly with the fingers, the base of the stem being just below the pot- rim, and the surface being smoothed off so as to slope a little outwards. When finished off, the pots should be well watered, to settle the soil; but they should stand till the water has well drained away, since, if they are moved about while the fresh soil is very wet, there will be a risk of its becoming puddled or too much consolidated. Larger plants do not need quite such delicate treatment,

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65.—Section of Pot showing Crocks,

but care should be taken not to handle the roots roughly. The soil for these should be less comminuted, and the amount of drainage material more ample. Larger bodies of soil also require to be more thoroughly

consolidated before watering ; otherwise they would settle down 80 as to leave an unsightly void at the pot-rim.

Some plants, especially when potted temporarily, may be dealt with ina simpler way. A single crock may be used jn some cases, and in others no crock at all, but a handful of half-decayed leaves or half-decayed dung thrown into the bottom of the pot. This mode of potting does well for bulbs, such as hyacinths, which are either thrown away or planted out when the bloom is over. The bedding plants generally may be potted in this way, the advantage being that at planting-out time there is less risk of disturb- ing the roots than if there were potsherds to remove. Plants of this character should be potted a little less firmly than specimens which are likely to stand long in the pot, and indeed the soil should be made comparatively light by the intermixture of leaf-mould or some equivalent, in order that the roots may run freely and quickly into it.

For epiphytal plants like orchids the most thorough drainage must be secured by the abundant use of potsherds, small pots being sometimes inserted inside the larger ones, or by planting in shallow pots or pans, so that there shall be no large mass of soil to get consolidated. For most of these the lightest spongy but sweet turfy peat must be used, this being packed lightly about the roots, and built up above the pot-rim, or in some cases freely mixed before use with chopped sphagnum moss and nodules of broken pots or of charcoal. The plants under these conditions often require to be supported by wooden pegs or sticks. Some of the species grow better when altogether taken out of the soil and fixed to blocks of wood, but in this case they require a little coaxing with moss about the roots until they get established. In other cases they are planted in open baskets of wood or wire, using the porous peat and sphagnum compost. Both blocks and baskets are usually suspended from the roof of the house, hanging free, so that no accumulation of water is possible. In these cases, however, the greatest caution is necessary to prevent the plants from suffering from drought.

When repotting is adopted as a temporary expedient, as in the case of bedding-out plants which it is required to push forward as much as possible, it will suffice if provision is made to prevent the drainage hole from getting

blocked, and a rich light compost is provided for the encouragement of the roots. When, however, a hard-wooded plant has to be repotted, the case is different ; it may stand without further potting for one year or two years or more, and therefore much more care is necessary. The old ball of earth must be freed from all or most of the old crocks without doing injury to the roots, and the sharp edge of the upper surface gently rubbed off. If there be any sour or sodden or effete soil into which the roots have not run, this should be carefully picked out with a pointed stick. The ball is to be set on the new soil just high enough that when finished the base of the stem may be about level with the pot-rim, towards which the surface should slope gently, and the space between the old ball and the sides of the pot is to be filled in gradually with the prepared compost, which is from time to time to be pressed down with a blunt-ended flat piece of wood called a potting-stick, so as to render the new soil as solid as the old. The object of this is to prevent the plant from starving by the water applied all running off by way of the new soil, and not penetrating the original ball of earth. When this amount of pressure is necessary, especially in the case of loamy composts, the soil itself should be rather inclined to dryness, and should in no case be suf-

ficiently moist to knead together into a pasty mass. In ordinary cases the potting soil should be just so far removed from dryness that when a handful is gently pressed it may hang together, but may lose its cohesion when dropped,

When plants are required to stand in ornamental china pots or vases, it is better both for the plants and for avoid- ing risk of breakage to grow them in ordinary garden pots of a size that will drop into the more valuable vessels. Slate pots or tubs, usually square, are sometimes adopted, and are durable and otherwise unobjectionable, only, their sides being less porous, the earth does not dry so rapidly, and some modification of treatment as to watering is neces- sary. For large conservatory specimens wooden tubs, round or square, are frequently used; these should be coated with pitch inside to render them more durable.

Various other contrivances take the place of garden pots for special purposes, Thus shallow square or oblong wooden boxes, made of light

inexpensive wood, are very useful for seed-sowing, for pricking out seedlings, or for planting cuttings. When the disturbance of the roots incidental to all transplanting is sought to be avoided, the seed or plant is started in some cases in squares of turf (used grassy-side downwards), which can when ready be transferred to the place the plant is to occupy. Cucumber and melon plants and vines reared from eyes are some- times started in this way, both for the reason above men- tioned, and because it prevents the curling of the roots apt to take place in plants raised in pots. Strips of turf are sometimes used for the rearing of early peas, which are sown in a warmish house or frame, and gradually hardened so as to bear exposure before removal to the open air.

24. Watering.—The guiding principle in watering plants Watey is to do it thoroughly when it is required, and to abstain ing. from giving a second supply till the first has been taken up.

When watering becomes necessary for kitchen-garden crops, the hose should be laid on and the lines of esculents allowed to drink their fill, if fresh succulent vegetables are desired. So also, if well-swelled and luscious fruits, such as strawberries, are required, there must be no parching at the roots. This applies even more strongly to conser vatory borders and to forcing-houses than to the outside fruit-tree borders, because from these the natural rain supply is in most cases more distinctly cut off, In the case of forcing-houses, the water should be heated before being applied to the borders containing the roots of the trees.

In the watering of pot plants the utmost care is requisite if the plant be a shy-growing or valuable one, and yet it is almost impossible to give any intelligible instruction for performing the operation. The roots should never be | suffered either to get thoroughly dry or to get sodden with excess of water. An adept will know by the ring of the pot on striking it with his knuckles whether water 1s wanted or not, according as it rings loud and clear or dull and heavy. With very choice subjects watering may be necessary two or three times a day in drying summer weather. It isa wrong though common practice to press the surface of the soil in the pot in order to feel if it 1s moist enough, as this soon consolidates it, and prevents it from getting the full benefit of aeration.

In all heated houses the water used should be warmed at least up to the temperature of the atmosphere, 80 a8 t0 avoid chilling the roots. This is also necessary the case of water used for syringing the plants, which should be done two or three times a day in all stoves and forcing- houses, especially during the period when the young growth is being developed. ‘The damping of all absorbent surfaces, such as the floors or bare walls, &e., is frequently necessary several times a day in the growing season, 80

as to keep up a humid atmosphere ; hence the advantage of laying the floors a little rounded, as then the water draws off to the sides against the kerbstone, while the centre remains dry for promenaders.

In cooler structures it becomes necessary in the dull season of the year to prevent the slopping of water over the plants or on the floor, as this tends to cause “ damping off,’ —the stems assuming a state of mildewy decay, which not unfrequently, if it once attacks a plant, will destroy it piece by piece. For the same reason cleanliness and free ventilation are of great importance.

25. Pruning.—Pruning is a very important operation in the fruit garden, its object being twofold,—(1) to give form to the tree, and (2) to induce the free production of flower buds as the precursors of a plentiful crop of fruit. To form a standard tree, either the stock is allowed to grow up with a straight stem, by cutting away all side branches up to the height required, say about 6 feet, the scion or bud being worked at that point, and the head developed there- from; or the stock is worked close to the ground, and the young shoot obtained therefrom is allowed to grow up in the same way, being pruned in its progress to keep it single and straight, and the top being cut off when the desired height is reached, so as to cause the growth of lateral shoots. Ifthese are three or four in number, and fairly balanced as to strength and position, little pruning will be required. The tips of unripened wood should be cut back about one-third their length at an outwardly placed bud, and the chief pruning thereafter required will be to cut away inwardly directed shoots which cross or crowd each other and tend to confuse the centre of the tree. Bushy heads should be thinned out, and those that are too large cut back soas to remodel them. If the

shoots produced are not sufficient in number, or are |

badly placed, or very unequal in vigour, the head should be cut back moderately close, leaving a few inches only of the young shoots, which should be pruned back to buds so placed as to furnish shoots in the positions desired. When worked at the top of a stem formed of the stock, the growth from the graft or bud must be pruned in a similar way. Three or four leading shoots should be selected to pass ere long into boughs and form a well-balanced skeleton for the tree ; these boughs, however, will soon grow beyond any artificial system the pruner may adopt.

Fi, 66.—Dwarf-Tree Pruning.

To form a dwarf or bush fruit tree the stock must be ee near the ground, and the young shoot produced trom the Scion or bud must be cut back to whatever height It is desired the dwarf stem should be, say 1} to 2 feet.

The young shoots produced from the portion of the new wood retained are to form the skeleton of the bush tree, and must be dealt with as in the case of standard trees. The growth of inwardly-directed shoots is to be prevented, and the centre kept open, the tree assuming a cup-shaped out-line. Fig. 66, reduced from M. Hardy’s excellent work, Traité de la Taille des Arbres Fruitiers, will give a good idea how these dwarf trees are to be manipulated, a showing the first year’s development from the maiden tree after being headed back, and @ the form assumed a year or two later.

In forming a pyramidal tree, the lateral growths, instead of being removed, as in the standard tree, are encouraged to the utmost ; and in order to strengthen them the upper part of the leading shoot is removed annually, the side branches being also shortened somewhat as the tree ad- vances in size. In fig. 67, reduced from M. Hardy’s work,

Fie, 67.—Pyramid Pruning.

a shows a young tree with its second year’s growth, the upright shoot of the maiden tree having been moderately headed back, being left longer if the buds near the base promise to break freely, or cut shorter if they are weak and wanting in vigour. The winter pruning, carried out with the view to shape the tree into a well-grown pyramid, would be effected at«the places marked by a cross line. The lowest branch would have four buds retained, the end one being on the lower side of the branch. The two next would be cut to three buds, which here also are fortunately so situated that the upper one is on the lower side of the branches. The fourth is not cut at all, its terminal bud being allowed to grow to draw strength into it. The fifth is an example where the bud to which the shoot should be cut back is wrongly placed ; a shoot resulting from such a cut is apt instead of growing outwards to grow erect, and lead to confusion in the form of the tree, to avoid XID — 31

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which it is tied down in its proper place during the summer by a small twig. The upper shoots are cut closer in, Near the base of the stem are two prominent buds, which would produce two vigorous shoots, but these would be too near the ground, and the buds should therefore be suppressed ; but, to strengthen the lower part, the weaker buds just above and below the lowest branch should be forced into growth, by making a transverse incision close above each. Fig. 67, b shows what a similar tree would be at the end of the third year’s growth.

Tn order to bring a young tree into the cordon shape, all its side branches are shortened back, either to form perma- nent spurs, as in the case of pears, or to yield annual young shoots, as in peaches and nectarines. The single-stemmed cordon may be trained horizontally, obliquely at any re- quired angle, or vertically if required, the first two arrange- ments being preferable. Ifa double cordon is required, the original young stem must be headed back, and the two best shoots produced must be selected, trained right and left, and treated as for the single cordon.

The forms chiefly adopted for trees trained to walls and espalier rails are the fan-shaped, the half-fan, and the hori- zontal, with their various modifications.

Of late years the close pruning of the young trees has been objected to, and the “ extension system” has, in many cases, been adopted. The maiden tree is headed down, and two shoots led away right and left. Two laterals should be allowed to grow from the upper side of them, one from near the base, the. other from near the middle, all others being pinched out beyond the second or third leaf during summer, but cut away to the last bud in winter. The tree will thus consist of six shoots, probably 3 teet to 4 feet long, which are not to be pruned unless they are unequal in strength, a defect which is rather to be remedied by summer pinching than by winter prun- ing. The second year three young shoots are to be left on each of the six, one close to the base, one about the middle,

and one at the point, the rest being rubbed off. These three shoots will produce laterals, of which one or two may

be selected and laid in; and thus a number of moderately strong fertile shoots will be obtained, and at the end of the season a comparatively large tree will be the result.

Fria. 68.—Pruning for Fra. 69. —The same Fan-Shaped Tree. —third year.

The method of pruning formerly adopted for the forma- tion of a fan-shaped tree was to head down the maiden plant to about two eyes, so placed as to yield a young shoot on each side (fig. 68), the supernumerary shoots being rubbed off while quite young, and the reserved shoots trained against the wall during the summer so as to get them well matured. The next year they were cut back again, often nearly to the base, in order that the lower pair of these shoots might each produce two well-placed young shoots, and the upper pair three young shoots. The tree would thus consist of teu shoots, to be laid out at regular distances, and then if closely cut the skeleton of the tree would be as in fig. 69. These main shoots were not again to be shortened back, but from each of them ~~three young shoots were to be selected and trained in two, on the upper side, one near the base, and the other half~~ way up, and one on the lower side placed about midway between these two; these with the leading shoot, which

was also to be nailed in, made four branches of the current year from each of the ten main branches, and the form of the tree would therefore be that of fig. 70. The other young shoots produced were pinched off while quite young, to throw all the strength of the tree into those which were to form its basis, and to secure abundant light and air. In after years the leading shoot was not to be cut back, but all

Fic. 70.—The same—fourth year.

the lateral shoots were to be shortened, and from these year by year other shoots were to be selected to fill up the area occupied by the tree.

In pruning for a horizontal tree the young maiden tree has to be headed back nearly to its base, and from the young shoots three are to be selected, the two best placed lower ones to forin an opposite or nearly opposite pair of main branches, and the best placed upper one to continue the erect stem (fig. 71). This upper shoot is at the next winter pruning to be cut down to within about a foot of the

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Fia. 71.—Pruning for Horizontally-Trained Tree. —third year.

point whence it sprung, and its buds rubbed off except the upper one for a leader, and one on each side just below it to furnish another pair of side shoots; these being trained in position, the tree would appear as in fig. 72. The same course is to be followed annually till the space is filled. Sometimes in very favourable soils and with vigorous trees two pairs of branches may be obtained in one season by summer-stopping the erect shoots and selecting others from the young growths thus induced, but more commonly the trees have to be built up by forming one pair of branches

tree is being formed weak shoots may be allowed to grow in a more erect position than it is ultimately intended they should occupy. Thus in four or five years the tree wil have acquired something the character of fig. 73, and will go on thus increasing until the space is filled.

The half-fan is a combination of the two forms, but as re- gards pruning does not materially differ from the horizontal, as two opposite side branches are produced in succession upwards till the space is filled, only they are not taken out so abruptly, but are allowed to rise at an acute angle and then to curve into the horizontal line.

In all the various forms of cordons, in horizontal training, and in fan and half-fan training, the pruning of the main branches when the form of the tree is worked out will vary in accordance with the kind of fruit under treatment. Thus in the peach, nectarine, apricot, plum, and cherry, which are commonly trained fan-fashion, the first two will have to be pruned so as to keep a succession of young annual shoots, these being their fruit-bearing wood. The others are generally pruned so as to combine a moderate supply of young wood with a greater or less number of fruit spurs. In the pear and apple the fruit is borne principally on spurs, and hence what is known as spur-pruning has to be adopted, the young shoots being all cut back nearly to their base, so as to cause fruit buds to evolve from the remain- ing eyes or buds. Cordons of apples and pears have to be similarly treated, but cordons of peaches and nectarines are pruned so as to provide the necessary annual succession of young bearing wood.

The nature of the cut itself in pruning is of more conse- quence, especially in the case of fruit trees, than at first sight may appear. The branches should be separated by a clean cut at an angle of about 45°, just at the back of a bud, the cut entering on a level with the base of the bud and passing out on a level with its top (fig. 74, a), for when

Cuts—Good and Bad.

cut in this way the wound becomes rapidly covered with new wood, as soon as growth recommences, whereas if the eut 1s too close the bud is starved, or if less close an ugly and awkward snag is left. Fig. 74, 6 and c, are examples of the former, and d, e¢, f of the latter. Dr Lindley has designated the cnt shown at fig. 74, 6 the cut to the quick (Gardeners’ Chronicle, 1847, p- 19) :—

“Tn order to avoid the risk of the ‘cut to the quick,’ some gardeners make use of the ‘snag cut’ (d, e, f), in which the wound 1s made on the same side of the branch as that oceupied by the bud, slanting downwards towards it. That plan is objectionable ; for it Involves the necessity of leaving behind a dead portion of the branch, to be removed at a later pruning, so the work must be done twice over; Moreover, it is an admission of a want of the skill required to make the ‘clean cut’ skilfully. Lastly, there is the ‘slivering cut’ (¢), in which a long ragged unequal shave is taken off the ranch, much too low in the beginning, and much too high at the end. It is the cut made by garden labourers. It is clumsy, ugly, awkward, and dangerous, for it is apt to injure the branch on which itis made. In all cases, the amputation should be made by one firm-drawn cut. The clean cut can be performed by a dexterous operator to within a shaving of the right line; and the mastery of this art is no mean acquisition.”

Tn the case of fruit trees, and indeed of deciduous plants Senerally, pruning requires to be done during the winter or resting period, and the earlier in that period the better, as then the buds become plump and full of sap, and produce strong shoots when the time for growth arrives. If, on the contrary, it is done while the plant is in full growth, the Whole system of the tree sustains a check, the circula- tion is deranged, the quality of the sap becomes deteriorated, and a dead stump or unhealthy shoot is the frequent result.

This, however, does not apply to the pruning of the herb- aceous or succulent growths of the current season, nor to soft-wooded plants generally, for this kind of pruning, called summer pruning, is essential to the formation of handsome specimens of the latter, and is a very important help in the formation of the frnit or blossom buds of fruit trees. Summer Pruning should be performed while the shoots are yet young and succulent, so that they may in most cases be nipped off with the thumb-nail. It is very necessary in the case of trees traincd to a flat surface, as a wall or espalier rail, to prevent undue crowding. In some cases, as, for example, with peaches, the super- fluous shoots are wholly removed, and certain selected

shoots reserved to supply bearing wood for next year. In others, as pears, the tops of the young shoots are removed, leaving three or four leaves and their buds at the base, to be developed into fruit buds by the additional nourish- ment thus thrown into them (fig. 75, a). One or two may

Fie, 75.—Summer Pruning for Spurs. push out a late summer growth, ; this will serve as a vent for the vigour of the tree, and if the lowermost only go to the formation of a fruit spur, the object will have been gained. They are cut to the last dormant bud in winter. But summer pruning has been much extended since the

introduction of restricted growth and the use of dwarfing stocks, Orchard-house trees, and also pyramidal and bush trees of apples, pears, and plums, are mainly fashioned by summer pruning ; in fact, the less the knife is used upon them, except in the necessary cutting of the roots in potted trees, the better. In the case of orchard-house plants no shoots are suffered to lengthen out, except as occasionally wanted to fill up a gap in the outline of the tree. On the contrary, the tops of all young shoots are pinched off when some three or four leaves are formed, and this is done again and again throughout the season. When this pruning is just brought to a balance with the vigour of the roots, the consequence is that fruit buds are formed all over the tree, instead of. a thicket of sterile and useless wood. Pyramidal and bush trees out of doors are, of course, suffered to become somewhat larger, and sufficient wood must be allowed to grow to give them the form desired; but after the first year or two, when the framework is laid out, they are per-mitted to extend very slowly, and never to any great extent, while the young growths are continually nipped off, so as to clothe the branches with fruit buds as closely placed as will permit of their healthy development.!

The Pruning of Flowering Plants is generally a much lighter matter than the pruning of fruit trees. If a young seedling or cutting of any soft-wooded plant is to be bushy, it must have its top nipped out by the thumb-nail or pruning-scissors at a very early stage, and this stopping must be repeated frequently. If what is called a well-furnished plant is required, an average of from 2 to 3 inches is all the extension that must be per-

1 On the gencral subject of pruning fruit trees the reader may use- fully consult Thompson’s Gardener’s Assistant, Bréhaut’s Modern Peach Pruner,

Forney’s Jardinier Fruitier, Hardy’s Traité de la Taille des Arbres Fruitiers, and Dubreuil’s Culture des Arbres et Arbrisseaux a Fruits de Table.

mitted—sometimes scarcely so much—before the top is nipped out ; and this must be continued until the desired size is attained, whether that be large or small. Then generally the plant is allowed to grow away till bloom or blooming shoots are developed. To forma pyramidal plant, which is a very elegant and useful shape to give to a decorative pot plant, the main stem should be encouraged to grow upright, for a length perhaps of 6 or 8 inches before it is topped ; this induces the formation of laterals, and favours their development. The best-placed upper young shoot is selected and trained upright to a slender stake, and this also is topped when it has advanced 6 or 8 inches further, in order to induce the laterals on the second portion to push freely. This process is continued till the required size is gained. With all the difficult and slow-growing plants of the hard-wooded section, all the pruning must be done in this gradual way in the young wood as the plant progresses.

Some plants, like pelargoniums, can only be kept hand- somely formed and well furnished by cutting them down severely every season, after the blooming is over. The plants should be prepared for this by keeping them rather dry at the root, and after cutting they must stand with little or no water till the stems heal over, and produce young shoots, or “break,” as it is technically termed. The appearance of a specimen pelargonium properly pruned is shown in fig. 76, in which a shows a young plant, the

Fig. 76.

head of which has been taken off to form a cutting, and whose buds are ready to break into young shoots. Three shoots will be produced, and these, after growing from 4 to 6 inches in length, should be stopped by pinching out the poiut, this giving rise to lateral shoots. These will blossom in due course, and, after being ripened thoroughly by full exposure to the sun, should be cut back as shown at 0. This is the proper foundation for a good specimen, and illustrates how all such subjects should be pruned to keep them stocky and presentable in form.

Root Pruning is most commonly practised in fruit tree cultivation. It is often resorted to as a means of restor- ing fertility in plants which have become over rank and sterile in growth. The effect of it, or of transplanting, is to reduce the supply of crude sap to the branches, and con- sequently to cause a check in their development. In root- pruning all roots that have struck downwards into a cold uncongenial subsoil must be pruned off if they cannot be turned in a lateral direction, and all the lateral ones that have become coarse and fibreless must also be shortened back by means of a clean cut with a sharp knife, while some hard rubbly material may if necessary be put under the tree before it is again planted, all its roots being laid out laterally, radiating as equally as possible from the centre. The operation is best performed early in autumn, and may be safely resorted to in the case of fruit trees of moderate age, and even of old trees if due care be exer- cised. In transplanting trees all the roots which may have become bruised or broken in the process of lifting should be cut clean away behind the broken part, as they then more readily strike out new roots from the cut parts. In all

these cases the cut should be a clean sloping one, and made in an upward and outward direction.

The root-pruning of pot-plants is necessary in the case of many soft-wooded subjects which are grown on year after year—pelargoniums and fuchsias, for example. After the close pruning of the branches to which they are annually subjected, and when the young shoots have shot forth an inch or two in length, they are turned out of their pots and have the old soil shaken away from their roots, the longest of which, to the extent of about half the existing quantity, are then cut clean away, and the plants repotted into small pots. This permits the growing plant to be fed with rich fresh soil, without having been necessarily trans- ferred to pots of unwieldy size by the time the flowering stage is reached.

Ringing.—One of the expedients for inducing a state of Rings fruitfulness in trees, is the ringing of the branches or stem, that is, removing a narrow annular portion of the bark, by which means, it is said, the trees are not only rendered productive, but the quality of the fruit is at the same time

improved. The advantage depends on the obstruction given to the descent of the sap. The ring should be cut out in spring, and be of such a width that the bark may remain separated for the season. A tight ligature of twine or wire answers the same end. The advantages of the operation may perhaps be gained by judicious root pruning, and it is not at all adapted for the various stone fruits.

26. Training.—What is called training is the guiding Trai of the branches of a tree or plant in certain positions which they would not naturally assume, the object being partly to secure their full exposure to light, and partly to regulate the flow and distribution of the sap. To secure the for- mer object, the branches must be so fixed as to shade each other as little as possible; and to realize the second, the branches must have given to them an upward or down- ward direction, as they may require to be encouraged or repressed, Something of the same vegetative vigour which is given to a plant or tree by hard pruning is afforded by training in an upward direction so as to pro- mote the flow of the sap; while the repression effected by summer pruning is supplemented by downward. train- ing, which acts as a check. One main object is the pre-

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Fia. 77.—Diagram illu. trating Branch Distribution.

servation of equilibrium in the growth of the several parts of the tree; and for this various minor details deserve attention. ‘Thus a shoot will grow more vigorously whilst waving in the air than when nailed close to the wall } conse- quently a weak shoot should be left free, whilst its stronger antagonist should be restrained ; and a luxuriant shoot may be retarded for some time by having its tender extremity pinched off to allow a weaker shoot to overtake 1t.

Mr Robert Thompson, who is to be regarded as an authority, says (Gardener’s Assistant, 340):—

‘A fair exposure to light is one of the eae objects to * borne in mind in training ; but the branches may be well vege as regards exposure to light, without being equally so with pay to the flow of sap. For instance, they may be disposed like the radii of a circle touching the circumference at equal distances (fig. 77, aa, bb cc, v). We shall, however, suppose that the cent

vertical shoot v has been cut back nearly to its base in order to furnish from buds there situated the rudiments of other branches. The sap flows with much greater force into the upright or nearly upright branchesthan it does into those having a horizontal position ; therefore branches radiating at equal distances, like those in the figure, would soon become very unequal in point of vigour; cc would of course be strong, aa comparatively weak, whilst bb would main- tain a somewhat intermediate condition. If, instead of training the shoots cc in a straight direction, we depress them at dd and bend them in the spon season as indicated by the curved line towards bb, we shall greatly check their over-luxuriance. On the other hand, by elevating the horizontal shoots at ee, and training them in the direction of the dotted line towards 60, those shoots will be thereby greatly invigorated. In short, by curving the upper branches downwards and the lower ones upwards, the flow of sap is checked in the former and promoted in the latter ; and the con- sequence is that aa and ce are equal to the medium 00 and to each other.” ;

By these and other expedients, and by the prudent use

of the knife, fruit trees may be readily trained into the forms indicated below, which are amongst the best out of the many which have been devised.

Fie. 78.—Pyramidal Training.

Fia. 79.—Training

en quenouille.

The training of standard and bush trees in the open ground has been already referred to under the section Pruning. When the growth of pyramids is completed, the outline is something like that of fig. 78, and very pretty trees are thus formed. It is better, however, especially if the tendency to bear fruit is rather slack, to adopt what the French call en quenowille training (fig 79), which consists in tying or weighting the tips of the branches so as to give them all.a downward curve. Pear trees worked on the quince stock, and trained en quenouille, are generally very fertile.

Fie. 80.—Horizontal Training.

Wall trees, it must be evident, are placed in a very un- natural and constrained position, and would in fact soon be reduced to a state of utter confusion, if allowed to grow unrestricted ; hence the following modes of training have been adopted.

Horizontal Training (fig. 80) has long been a favourite form in England. There is one principal ascending stem

from which the branches depart at right angles, at intervals of about a foot. Horizontal training is best adapted to the apple and the pear; and for the more twiggy growing slender varieties, the forms shown in fig. 81 have been recommended. In these the horizontal branches are placed wider, 18 to 20 inches apart, and the smaller shoots are trained between them, either on both sides, as at a, or deflexed from the lower side, as at 6. ‘The latter is an

Fie, 81.—Forms of Horizoutal Training.

excellent method of reclaiming neglected trees. Every alternate branch should be taken away, and the spurs cut off, after which the young shoots are trained in, and soon produce good fruit.

In Fan Training (fig. 82) there is no leading stem, but the branches spring from the base and are arranged somewhat like the spokes of a fan, This

mode of training is com-

monly adopted for the peach, nectarine, apricot, and Morello cherry, to which it is best adapted. Though sometimes adopted, it is not so well suited as the horizontal form for apples and pears, because, when the branches reach the top of the wall, where they must be cut short, a téte de saule, or hedge of young shoots, is inevitable. A modifica- tion of the fan shape (fig. 83) is sometimes adopted for

Fig. 83.—Modified Fan Training.

stone fruits, such as the apricot. In this the object is to establish a number of mother branches, and on these to form a series of subordinate members, chiefly composed of bearing wood. The mother branches or limbs should not be numerous, but well-marked, equal in strength, and regularly disposed. The side branches should be pretty

abundant, short, and not so vigorous as to rival the lead- ing members. ; ;

The Halffan mode of training, which is intermediate between horizontal and fan training, is most nearly allied to the former, but the branches leave the stem at an acute angle, a disposition supposed to favour the more equal distribution of the sap. Sometimes, as in fig. 84, two vertical stems are adopted, but there is no particular ad- vantage in this, and a single-stemmed tree is more man- ageable. The half-fan form is well adapted for such fruits as the plum and the cherry; and, indeed, for fruits of vigorous habit, it seems to combine the advantages of both the foregoing.

Trees must be fixed to the walls and buildings against which they are trained by means of nails and shreds, or in cases where it is desired to preserve the wall surface intact, by permanent nails or studs driven in in regular order. Sometimes the walls are furnished with galvanized wires, but this has been objected to as causing cankering of the shoots, for which, however, painting is recommended as a remedy, and which is also avoided, it is said, by crossing the tying material between the wire and the wood, and so preventing them from coming in contact. If they are adopted, the wires

should be close to the wall to prevent a cold draught between it and the tree. Care should be taken that the ties or fastenings do not eventually cut

Fic. 84.

into the bark as the branches swell with increased age. When shreds and nails are used, cast wall nails and ‘“‘ medicated shreds” are the best; the nails should be of small size for the young shoots.

For tying plants to trellises and stakes nothing is better than soft tarred string. Osier ties are sometimes used for espaliers. The training in of summer shoots on wall-trees is often done by means of slender twigs ; indeed the prun- ings of the trees themselves, stripped of their leaves, often serve the purpose very well; the ends are tucked under the adjacent fixed shoots, the young shoots to be fastened in being thus held close to the wall. Crooked shoots should be straightened at the principal or winter training ; this is done by pulling the convex side towards the straight line desired by means of the tie or shred, the next above and below being set so as to pull in the oppo- site direction.

In training greenhouse plants the young branches should be drawn outwards by means of ties fastened toa string or wire under the pot-rim; the centre then fills up, and slender stakes are used as required; but the fewer these are in number the better. Climbers are trained from the bottom around or across trellises, of which the cylin- drical or the balloon-shaped, or sometimes the flat oval or circular, are the best forms. The size should be adapted to the habit of the plant, which should cover the whole by the time flowers are produced. Bast fibre and raphia fibre are to be preferred for light subjects of this character, as they can be split to any degree of fineness; but the latter is not durable enough or strong enough for coarse-

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house climbers are made of slender round iron rods for

into which rings of similar metal are dropped; the rings

[roRore,

growing border flowers. Very durable trellises for green-

standards, having a series of hooks on the inner edge, may be graduated so as to form a broad open top, or may

be all of the same size, when the trellis will assume the cylindrical form. Fig. 85 shows a pot specimen of clematis

& a4 Hii

Fic. 85.—Clematis trained on Balloon-shaped Trellis.

The training of bedding plants over the surface of the soil is done by small pegs of birch wood or bracken, by loops of wire, or sometimes by loops of bast having the ends fixed in the soil by the aid of the dibble. The object is to fill up the blank space as quickly and as evenly as possible.

27. Forcing is the accelerating, by special treatment, Forcing! of the growth of certain plants, which are required to be had in leaf, in flower, or in fruit before their natural season,—as, for instance, the leaves of mint at Eastertide or the leafstalks of sea-kale and rhubarb at Christmas, the flowers of summer in the depth of winter, or some of the choicest fruits perfected so much before their normal period as to complete, with the retarded crops of winter, the circle of the seasons.

In the management of artificial heat for this purpose, a considerable degree of caution is required. The first stages of forcing should, of course, be very gentle, so that the whole growth of the plants may advance in harmony. A vety hot atmosphere would unduly force the tops, while the roots remained partially or wholly inactive; and a strong bottom heat, if it did not cause injury by its excess, would probably result in abortive growth. a

Any sudden decrease of warmth would be very prejudi- cial to the progress of vegetation through the successive stages of foliation, inflorescence, and fructification. But it is not necessary that one unvarying range of temperature should be kept up at whatever pains or risk. Indeed, in very severe weather it is found better to drop a little from the maximum temperature by fire heat, and the loss so occasioned may be made good by a

little extra heat applied when the weather is more genial. Night temperatures also should always be allowed to drop somewhat, the heat being increased again in the morning. In other words, the arti- ficial temperature should increase by day and decrease by

night, should rise in summer aud fall in winter, should, in short, imitate as nearly as possible the varying influence of the sun.

FLOWERS. |

For the growth of flowers generally, and for that of all

fruits, every ray of light to be obtained in the dull winter season is required, and therefore every possible care should be taken to keep the glass clean. A moist genial atmosphere too is essential, a point requiring unremitting attention on account of the necessity of keeping up strong fires. With moisture as with heat, the cultivator must hold his hand somewhat in very severe or very dull weather ; but while heat must not drop so as to chill the progressing vegetation, so neither must the lack of moisture parch the plants so as to check their growth.

There are some few subjects which when forced do not require a light house. Thus amongst flowers the white blossoms of the lilac, so much prized during winter, are produced by forcing the plant in darkness: Rhubarb and sea-kale among esculents both need to be forced in dark- ness to keep them crisp and tender, and mushrooms also are always grown in dark structures. In fact, a roomy mushroom house is one of the most convenient of all places for forcing the vegetables just referred to. The lilac would be better placed in a dark shed heated to about 60°, in which some dung and leaves could be allowed to lie and ferment, giving off both a genial heat and moisture.

One of the most important preliminaries to successful forcing is the securing to the plants a previous state of rest. The thorough ripening of the preceding season’s wood in fruit trees and flowering plants, and of the crown in peren- nial herbs like strawberries, and the cessation of all active

growth before the time they are to start into new growth, are of paramount importance. The ripening process must be brought about by free exposure to light, and by the application of a little extra heat with dryness, if the season should be unfavourable ; and both roots and tops must submit to a limitation of their water supply. When the ripening is perfected, the resting process must be aided by keeping the temperature in which they await the forcing process as low as each particular subject can bear.

V. Flowers.

28. Flower Garden and Pleasure Grounds. —Wherever there is a flower garden of considerable magnitude, and in a Separate situation, it should be constructed on principles of its own. The great object must be to exhibit to advantage the graceful forms and glorious hues of flowering plants and shrubs. Two varieties of flower gardens have chiefly prevailed in Britain. In one the ground is turf, out of which flower-beds, of varied patterns, are cut; in the other the flower-beds are separated by gravel walks, without the introduction of grass, When the flower garden 18 to be seen from the windows, or any other elevated point of view, the former is to be preferred ; but where the surface is irregular, and the situation more remote, and especially where the beauty of flowers is mainly looked to, the choice should probably fall on the latter.

The situation of the flower garden must be influenced by the nature of the lawns, and of the site of the mansion to Which it is attached. Generally speaking, it should not be at any great distance from the house; and in places Where there is no distant view of importance, it may be constructed under the windows. On the other hand, when the park is Spacious, and the prospects extensive and Picturesque, it is perhaps better that the flower garden should be at a little distance from and out of sight of the house, but easy of access in any sort of weather. In most A» even when it is in the vicinity of the mansion, the

ower garden should for security against ground game and other intruders be encircled with some sort of fence. In

detached localities the fences may be made sufficiently strong to prevent the intrusion of every species of vagrant ; it is not difficult to mask them with shrubs and trees. The style of the mansion should determine that of the flower garden, and also its position. The flower garden attached to an elaborate mansion, should, for the most part, occupy the lawn on the south, the east, or the west front; and tlie carriage-entrance, where possible, should be on the north front, the park extending nearly or quite up to the front door. This arrangement must, however, sometimes be de- parted froni in consequence of the difficultics of providing a proper approach to the entrance-door, and must also be regulated by the position of the principal rooms, which should if possible command a view of the flower garden.

When the garden is upon a large scale, and especially where a natural inclination in the ground exists, or can be formed artificially, terraces and parapet walls should be introduced, with flights of steps, and embellishments in connexion with them, such as fountains, statuary, sculpture, dc. Grass terraces alone have a mean appearance in such a position. The parapet walls afford excellent accommoda- tion for half-hardy and beautiful flowering plants.

With regard to flower-plots, when the figures are separated by turf, it is necessary that the little lawns or glades should have a certain degree of breadth, as nothing has a worse effect than overcrowding. A multitude of little figures should also be avoided, as they produce the disagreeable effect well named by Gilpin “spottiness.” In this sort of flower garden it is desirable that a gravel walk should skirt at least one side of the principal figures, for in the humid climate of Britain the grass would otherwise render them inaccessible with comfort during a great part of the year. In those gardens where turf is wholly or partly excluded, the compartments should be of a larger and more massive character. Narrow borders, bounded by parallel straight lines and concentric curves, should be avoided. ‘The centres of the figures should be filled with tall-growing shrubs, and even with an occasional low evergreen tree, such as a yew or a holly. The walks, arranged in long concave curves, may communicate here and there with one another. A dial, a few seats and arbours, with an urn or two or a vase, may be introduced with good effect,

The flower garden may include several different compart- ments. Tus, for example, there is the “ Rock Garden,” which should consist of variously grouped masses of large stones, those which are remarkable for being figured by water-wearing, or containing petrifactions or impressions, or showing something of natural stratification, being generally preferred. In the cavities between the stones, filled with earth, alpine or trailing plants are inserted, and also some of the choicest flowers. In proper situations, a small pool of water may be introduced for the culture of aquatic plants. Ina suitable position one of the walks is sometimes arched over with wire-work, and covered with ornamental climbing shrubs, forming a delightful promenade in the glowing days of summer. A separate compartment laid out on some regular plan is often set apart for roses, under the name of the “Rosery.” A moist or rather a shady border, or a section of the pleasure ground supplied with bog earth, may be devoted to what is called the “American Garden,” which, as it includes the gorgeous rhododendrons and azaleas, forms one of the grandest features of the establishment during the early summer, while if properly selected the plants are effective as a garden of evergreens at all seasons. The number of variegated and various-coloured hardy shrubs is now so great that a most pleasant plot for a “ Winter Garden.” may be arrayed with plants of this class, with which may be associated hardy subjects which flower during that season or very early spring, as the Christmas rose, and

Lawns.

Hardy annuals,

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amongst bulbs the crocus and snowdrop. Later on, the spring garden department is a scene of great attraction ; and some of the gardens of this character, as those of Cliveden and Belvoir, are among the most fascinating examples of horticultural art.

29. Lawns.—In the formation of lawns the ground must be regularly broken up so that it may settle down evenly, any deep excavations that may have to be filled in being very carefully rammed down to prevent subsequent settlement. The ground must also be thoroughly cleared of the roots of all

coarse perennial weeds, and be worked to a fine tilth ready for , turfing or sowing. The more expeditious method is of course to lay down turf, which should be free from weeds, and is cut usually in strips of 1 foot wide, 3 feet long, and about an inch in thickness. This must be laid very evenly and compactly, and should iwi, then be beaten down firmly ‘jj with the implement called a TANCE SRDBeE No he turf-beater (fig. 86). When 1G. 86.—Turf-Beater. there is a large space to cover, it is much the cheaper plan to sow the lawn with grass-seeds, and equally effective, though the sward takes longer to thicken. It is of the utmost importance that a good selection of grasses be made, and that pure seeds should be obtained. The following sorts can be recommended, the quantities given being those for sowing an acre of ground :—

Cynosurus cristatus—Crested Dog’s-tail…….:001+ bier

Festuca duriuscula—Hard Fescue …….:::eeeeeeeereeeeeeees

Festuca ovina—Sheep’s Fescue …….sseeeeesenereenes seat

Lolium perenne tenue……. artslweg Faia A eraaabiee 1

Poa nemoralis sempervirens—Evergreen Meadow-grass. ...

Poa trivialis—Trivial Meadow-grass…... .s…+++ Poser ais

Trisetum flavescens—Yellow Oat-grass…..... Pern osu

Trifolium repens—Dutch Clover…....sssssereeesrrerererns wi

The seeds should be thoroughly mixed, and very evenly sown, after which the surface should be raked over to bury them, and then rolled down while dry so as to finish it off smooth and level. When thus sown, lawns require to be promptly weeded. During the growing season established lawns should be mown at least once a week. They should be occasionally rolled, and towards autumn they require frequent sweepings to remove worm-casts.

Bed,

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30. Harpy ANNUALS.—Annual plants are those which grow up from seed, flower, ripen seed, and die in the course of one season— one year. They are useful in the mixed garden, for though in some cases they are of short duration, many of them are possessed of much beauty of hue and elegance of form. Annuals may be divided into three classes :—the hardy, which are sown at once in the ground they are to occupy; the half-hardy, which succeed best when aided at first by a slight hot bed, and then transplanted into the open air; and the tender, which are kept in pots, and treated as greenhouse or stove plants, to which departments they properly belong. Some of the more Pie annuals, hardy and half-hardy, have been very much varied as regards habit and the colour of the flowers, and purchases may be made in the seed shops of such things as China asters, stocks, Chinese and Indian pinks, larkspurs, phloxes, and others, amongst which some of the most beautiful of the summer flowers may be found.

The hardy annuals may be sown in the open ground during the latter part of March or beginning of April, as the season may determine, for the weather should be dry and open, and the soil in a free-working condition before sowing is attempted. In favourable situations and scasons some of the very hardiest, as Silene pendula, Saponaria, Nemophila, Gilia, &c., may be sown in September or October, and transplanted to the beds or borders for very early spring flowering. Those sown in spring begin to flower about June. The patches, if left to flower where they are sown, should be thinned out while young, to give them space for proper development. It is from having ample room that pricked out transplanted seedlings often make the finest plants. The soil should be rich and light.

The half-hardy series are best sown in pots or pans under glass in mild heat, in order to aceelerate germination. Those of them which are in danger of becoming leggy should be speedily removed to a cooler frame and placed near the glass, the young plants being pricked off into fresh soil, in other pots or pans or boxes, as may seem best in each case. All the plants must be hardened off gradu- ally during the month of April, and may generally be planted out some time in May, earlier or later according to the season,

The class of tender annuals, being chiefly grown for greenhouse decoration, should be treated much the same as sort-wotan plants, being sown in spring, and grown on rapidly in brisk heat, near the qs and finally hardened off to stand in the greenhouse when in

ower.

We add a select list of some of the more distinct annuals desir- —

able for general cultivation as decorative plants, and shall then mention a few of the most popular kinds separately :—

Acroclinium roseum : half-hardy, 1 ft., rose-pink or white ; everlasting, Agrostis pulchella: hardy, 6 in.; a most graceful grass for bouquets. Amberboa moschata atropurpurea (Sweet Sultan): hardy, 14 ft., purple; musk-scented. Bartonia aurea: hardy, 2 ft., golden yellow ; showy and free. Brachycome iberidifolia: half-hardy, 1 ft., blue or white with dark disk. Calendula officinalis Meteor : hardy, 1 ft., orange striped with yellow. Calliopsis bicolor (tinctoria) : hardy, 2 to 3 ft., yellow and chestnut-brown. Calliopsis Drummondii: hardy, 1 to 2 ft. golden yellow with red disk. Campanula Loreyi: hardy, 1} ft., purplish-lilac or white. Centaurea Cyanus: hardy, 8 ft., blue, purple, pink, or white ; showy. Clarkia pulchella : hardy, 13 ft., rosy-purple ; some varieties very handsome, Collinsia bicolor: hardy, 14 ft., white and purple ; pretty. Collinsia verna: hardy, 1 ft., white and azure; sow as soon as ripe. Convolvulus tricolor atroviolacea: hardy, 1 ft., white, blue, and yellow. This is the Convolvulus minor of gardens. Erysimum Peroffskianum : hardy, 2 ft., deep orange; in erect racemes. Eschscholtzia californica: hardy, 13 ft., yellow with saffron eye. Eschscholtzia crocea flore-pleno : hardy, 1} ft., orange yellow; double. Futoca viscida: hardy, 2 ft., bright blue with white hairy centre. Gaillardia Drummondii (picta): half-hardy, 13 ft., crimson, yellow margin. Gilia achillesefolia: hardy, 2 ft., deep blue; in large globose heads. Godetia Lindleyana : hardy, 2 to 3 ft., rose-purple, with crimson spots. Godetia Whitneyi: hardy, 1 ft., rosy-red, with crimson spots. The variety Lady Albemarle is wholly crimson, and very handsome. Gypsophila elegans : hardy, 1} ft., pale rose; branched, very graceful. Helianthus cucumerifolius: hardy, 3 to 4 ft., golden yellow, black disk; pranching, free, and bold without coarseness. Helichrysum bracteatum : half-hardy, 2 ft.; the incurved

crimson, rose, and other forms very handsome. Hibiscus Trionum (africanus): hardy, 13 ft., cream colour, black centre, Ibcris umbellata (Candytuft): hardy, 1 ft., white, rose, purple, crimson. Some new dwarf white and flesh-coloured varieties are very handsome. Kaulfussia amelloides: hardy, 1 ft., blue or rose; the var. kermesina is deep crimson. Koniga maritima (Sweet Alyssum): hardy, 1 ft., white ; fragrant, compact. Lavatera trimestris: hardy, 3 ft., pale rose showy malvaceous flowers. Leptosiphon densiflorus: hardy in light soil, 1 ft., purplish or rosy-lilac. Leptosiphon roseus ;: hardy in light soil, 6 in., delicate rose ; fine in masses. Linaria bipartita splendida: hardy, 1 ft., deep purple. Linum grandiflorum : hardy, 1 ft., splendid crimson * var. roseum is pink, Lupinus luteus: hardy 2 ft., bright yellow, fragrant. Lupinus mutabilis Cruckshanksii: hardy, 4 ft., blue and yellow; changeable. Lupinus nanus: hardy, I ft., ied pend es abundant flowering. Malcolmia maritima (Virginian Stock): hardy, 6 in., lilac, rose, or white, Malope trifida : hardy, 8 ft., rich ot purplish-crimson , showy. Matthiola greeca (Wallflower-lvd. Stock): hardy, 1 ft., various as in Stock, Mesembryanthemum tricolor: half-hardy, 3 in., pink and crimson, with dark centre. Mimulus cupreus: half-hardy, 6 in., coppery red, varying considerably. Mimulus luteus tigrinus: half-hardy, 1 ft., yellow spotted with red; var. duplex has hose-in-hose flowers. Mirabilis Jalapa: half-hardy, 3 ft., various colours ; flowers evening-scented. Nemesia floribunda: hardy, 1 ft., white and yellow; pretty and compact. Nemophila insignis : hardy, 6 in., azure bluc with white centre. Nemophila maculata : hardy, 6 in., white with violet spots at the edge Nigella hispanica: hardy, 14 ft., pale blue, white, or dark purple. (Enothera odorata: hardy, 2 to 3ft., yellow ; fragrant. Omphalodes linifolia (Venus’s Navelwort): hardy, 1 ft., white.

Papaver Rhoeas flore-pleno: hardy, 2 ft., scarlet and other colours ; showy. —

Papaver somniferum flore-pleno : hardy, 3 ft., white, lilac, rose, é&¢.; petals sometimes fringed. F

Petunia violacea hybrida : half-hardy, 14 ft., various colours ; sow In heat.

Pharbitis hispida: hardy, 6 ft., various ; the many-coloured twining Convolvulus major. ie

Platystemon californicus: hardy, 1 ft., sulphur yellow; neat and distinct,

Portulaca splendens: half-hardy, 6 in., crimson, rose, yellow, white, &c. single and double ; splendid prostrate plants for sunny reckwork. +

Pyrethrum Parthenium aureum : half-hardy, 1 ft.; grown for its golden foliage, and much used for bedding. ; y

Reseda odovata (Mignonette): hardy, 1 ft., greenish, but exquisitely fragrant ; there are some choice new sorts.

Rhodanthc maculata : half-hardy, 1} ft., rosy-pink or white ; larger flower-heads, than the next. i :

Bhodanthe Manglesii: half-hardy, 1 ft., rosy-pink; a drooping everlasting.

Salpiglossis sinuata: half-hardy, 2 to 3 ft., yellow, purple, crimson, &C.; much varied and beautifully veined.

Sanvitalia procumbens flore-pleno : half-hardy, 6 in., golden yellow; procumbent. ‘ ;

Saponaria calabrica: hardy, 6 to8 in., bright rose pink or white ; continuous blooming, compact-growing. ; , . Schizanthus pinnatus: hardy,1 to 2 ft., purple-lilac, prettily blotched ; curiously lobed flowers. ,

Schizopetalon Walkeri: hardy, 1 ft., white, sweet-scented at night ; curiously fringed petals.

Senecio elegans: half-hardy, 14 ft., white, rose, or purple; the various double forms are showy. J ;

Silene pendula : hardy, 1 ft., bright rose pink; very showy in masses ; var. compacta forms close dense tufts. :

Silene Pseudo-Atocion : hardy, 1 ft., rose pink; free-flowering.

Specularia Speculum : hardy, 6 in., reddish-violet ; free-flowering.

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Sphenogyne speciosa: half-hardy, 1 ft., orange-yellow, with black ring d the disk. 2 .

erTagetes signata: half-hardy, 1} ft., golden yellow; continuous blooming,

with elegant foliage. The Hrench and African marigolds, favourites of

are allied to this. ; A eiiccinin aduncum (Canary Creeper) : half hardy, 10 ft., yellow, fringed ;

an elegant climber. / Viscaria coli rosa: hardy, 1} ft., rosy-purple with pale centre ; pretty. Viscaria oculata cardinalis : hardy, 1 ft., rosy-crinison; very brilliant. Waitzia aurea: half-hardy, 1} ft., golden yellow; & showy everlasting. Xeranthemum annuum flore-pleno : hardy, 2 ft., lilac-purple ; floriferous. The following annuals are entitled to separate notice :— 31. The China Aster (Callistephus chinensis). The groups of asters are very numerous; but some of the best for ornamental gardening are the chrysanthemum-flowered, the peony-flowcred, the erown or cockade, and the globe-quilled, of each of which there are from six to a dozen distinct colours. What are called crown asters have a white eentre and dark crimson or purple circumference, and are very beautiful. The colours range from white and blush through pink and rose to crimson, and from lilac through blue to purple, in various shades. These should be sown early in April in pans, in a gentle heat, the young plants being quickly transferred to a cool pit, and there pricked out in rich soil as soon as large enough, and eventually planted out in the garden in May or June, in soil which has been well worked and copiously manured, where they grow from 8 to 18 inches high, and flower in great beauty towards the end of summer. They also make very handsome pot plants for the con- servatory. 32. The Stock (Matthiola annua), These also are much varied both in respect to habit and colour, and of some of the forms as many as two dozen colours are cultivated, some of which are very beautiful. The Ten-week and the large-flowered German are both favourite strains. The fragrance of these flowers renders them universal favourites. They should be treated much the same as

asters for autumn-blooming plants, but for early blooming require to be sown about August, and wintered in pots in a cold frame, for which purpose the Intermediate Stock is the best adapted (see Biennials, par. 41). They grow froin 1 to 2 feet high, according to the variety. Antirhi- 33, The Snapdragon (Antirrhinum majus), which grows about un. 2 feet high, should be sown in February in a warm pit; prick off in pots, and subsequently into boxes, drawing off into a cool frame when established, and planting out in May or June. They are not true annuals, but nay be treated as such. 34, The Chinese or Indian Pink (Dianthus chinensis, and its varieties Heddewigii and laciniatus) and several allied forms, which grow from 6 inches to a foot high, are very riehly coloured, and highly varied in marking. Sow in pits in gentle heat, in March, transferring them quickly after germination to a cool pit, that they may not get drawn or leggy; they may be planted out in May. They will also flower later on in favourable seasons, if sown out- doors early in April. 35. The Larkspur affords two distinct types, the Rocket Lark- spur (Delphinium Ajacis), which varies from a foot to a foot and a half, and the branching Larkspur (D. Consolida), growing 3 feet high, of each of which there are various colours, double and single. The candelabrum form of the latter is very handsome. Sow in Mareh in the open border where they are to flower. ?hlox 36. The Phlox Drummondii, a spreading plant about a foot high, rum- of which there are now many varieties of colour, is one of the most ondii, beautiful of all annuals, and very prolific of blossom. Sow in the Places where it is to flower, in April, in good firm soil. 37. The Sweet Pea (Lathyrus odoratus) is indispensable in every garden, especially Painted Lady (white and rose) and the improved forms called Invincible Scarlet and Invincible Black. Sow in rows or patches in February, and again in March, in good rich soil. i plants grow 3 to 4 feet high, and require stakes to support the ems, fasturs 38. The Nasturtium (Tropzolum majus), in its dwarf form known um. as Tom Thumb (T. m. nanum), is an excellent bedding or border flower, ts about afoot high, each plant forming a dense patch full of flowers, and blooming on for a considerable period if kept growing. The scarlet, the yellow, and the rose-coloured are very attractive. Sow in April in the beds or borders ; and again in May for a succession,

1a, 89, The Zinnia elegans, of which both single and double} forms are cultivated, grows about 2 feet high, and produces flowers of various

colours, the double ones being about the size of asters, and very handsome, The colours include white, yellow, orange, scarlet, crimson, and purple. It is half-hardy, and should be sown and treated much the same as the aster.

a Fe Harpy Brannrats.—Biennials live as uudeveloped plants

Ms. through one winter period. They require to be sown in the summer Months, about June or July, in order to get established before Tau they should be pricked out as soon as large enough, and aun have ample Space so as to become hardy and stocky. They Should be planted in good soil, but not of too stimulating a char-

| acter. Those that are perfectly hardy arc best planted where they

HARDY ANNUALS. |

Shina Aster.

Stock.

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are to flowcr in good time during autumn. This transplanting aets as a kind of cheek, whieh is rather beneficial than otherwise. Of those that are liable to suffer injury in winter, as the Brompton and Queen Stocks, a portion should be potted and wintered in cold frames ventilated as freely as the weather will permit.

The number of biennials is not large, but a few very desirable garden plants, such as the following, occur amongst them :—

Agrostemma coronaria (Rose Campion) : hardy, 13 ft., bright rose-purple or rose and white.

Beta Cicla variegata: hardy, 2 ft., beautifully coloured leaves and midribs, crimson, golden, &e.

Campanula Medium (Canterbury Bell): hardy, 2 ft., blue, white, rose, &c, The double-flowered varieties of various colours are very handsome. a apanula Medium calycanthema: hardy, 2 ft., blue or white ; hose-in-hose

owered.

Catananche coerulea: hardy, 2 to 8 ft., blue or white,

cous cretica: hardy, 4 to 5 ft., yellow, with two dark spots near centre ; in spikes,

Dianthus barbatus (Sweet William)’: hardy, 1 to 14 ft., crimson, purple, white, or parti-coloured.

Dianthus chinensis (Indian Pink): half hardy, 1ft., various; these flower earlier if treated as biennials.

Digitalis purpurca (Foxglove): hardy, 8 to 5 ft., beautifully spotted in the variety called gloxiniveflora,

Echium pomponium: hardy, 4 ft., rosy-pink,

Hedysarum coronarium (French Honeysuckle): hardy, 2 to 3 ft., scarlet or white ; fragrant.

Fore, hg tristis (Night-scented Rockct): hardy, 8 ft., dull purplish; fragrant at night.

Lunaria biennis (Monesty): hardy, 2 to 3 ft., purple; the silvery dissepiment attractive among everlastings.

- Gnothera Lamarckiana (Evening Primrose): hardy, 5 ft., bright yellow ; large,

Scabiosa atropurpurea (Sweet Scabious): hardy, 8 ft., dark purple, showy; the variety nana flore-pleno is dwarfer and has double flowers.

Silene compacta: half-hardy, 2 to 8 ft., bright pink; clustered as in §, Armeria,

Verbascum Blattaria: hardy, 3 to 4 ft., yellowish, with purple hairs on the filaments ; in tall spikes,

41. The most important of the biennials are the different kinds Stocks. of Stocks. The Intermediate Stoek (Matthiola annua intermedia) is one of the so-called scarlet stocks, and is very useful, when preserved through the winter in frames, for its dwarfness and early-tlowering habit. Itis used very extensively for furnishing jardiniéres, window boxes, flower beds, &c., during the London season, for which pur- pose it is sown in July and August, while if sown in spring it blooms in autumn, and furnishes a useful successional crop of flowers.

Of the East Lothian stock, which is a somewhat larger grower, there are some half dozen colours, those called New Crimson and Mauve Beauty being specially adinired ; these are sown in J uly and August for summer blooming, and early in spring for flowering in autumn.

42. The Brompton Stock (Matthiola incana simplicicaulis) is a robust plant, growing 3 feet high, with a long central flower stem bearing very large flowers, which are crimson, purple, or white. They require rieh soil, and should be sown in June or J uly, being pricked out into nursery beds, and planted in September in the borders where they are to bloom. Two or three plants should be put in one patch, as then any surplusage of single-flowered indi- viduals may be pulled away.

43, The Queen or Twickenham Stoek (Matthiola incana semper- florens) is less vigorous in habit than the Brompton, and is of more spreading habit, the plants growing about2 fect ¥iek with the lateral branches very much developed. There are the three usual colours, purple, scarlet, and white, the first-named being a speeial favourite, They require to be sown in June or July, and planted out in September, so as to get well established before winter, and if they have the advantage of good soil they will flower freely in

the early part of the ensuing summer. Sounetimes the plants acquire almost a woody habit, and live over the second year, but the flowers are not equal to those produced the first blooming season.

rosy-purple or white;

44, Harpy Perenntars.—This term includes, not only those Hardy fibrous-rooted plants of herbaceous habit which spring up from the peren- root year after year, but also those old-fashioned subjects known as nials, florists' flowers, and the hardy bulbs. Some of the most beautiful of hardy flowering plants belong to this class, and their great variety, as well as the long period through which they, one or other of them, yield their flowers, are beginning again to seeure them some of the consideration whieh has long been given mainly to bedding plants.

When the length of the flowering season is considered, it will be obvious that it is impossible to keep up the show of a single border or plot for six months together, since plants, as they are commonly arranged, come dropping into flower one after another; and even where a certain number are in bloom at the same time, they neces- sarily stand apart, and so the effects of contrast, which can be per- ceived only among adjacent objects, are lost. To obviate this defect, it has been recommended that ornamental plants should be formed into four or five separate suites of flowering, to be distributed over the garden, Not to mention the more vernal flowers, the first might contain the flora of May; the sccond that of June; the third that of July; and the fourth that of August and the following months. These compartments should be so intermingled that no particular class may be cntircly absent from any one quarter of the

garden. XII. — 32

Alstromeria.—Beautiful plants with fleshy tuberous roots, which are the better if not often disturbed. A. aurantiaea, 2 to 3 feet, orange streaked with red, in July and August ; A. chilensis, 2 to 3 feet, blood-red, streaked with yellow, affording many varieties. Deep sandy loam or peat. Should be planted at least 6 or 8 inches decp.

Alyssum.—Showy roekwork or front row border plants of easy culture in any light soil; the plants should be frequently renewed from cuttings A, saxatile, with greyish leaves, and deep yellow flowers, produced in April and May, and the dwarfer A. montanum are useful.

Amaryllis.—Noble half-hardy bulbs, for planting near the front wall ofa hot-house or greenhouse ; the soil must be decp, rich, and well-drained. A. Belladonna, the Belladonna Lily, 3 feet, has large funnel-shaped flowers in September, of a delicate rose colour. The variety A. blauda has paler flowers, almost white.

Anchusa.—Pretty boraginaceous herbs, easily grown. A. italica, 3 to 4 fcet, has blue star-like flowers. A. sempervirens, 14 feet, rich blue, is well siited for rough borders.

‘Androsace.—Pretty dwarf roek plants, requiring rather careful management and a gritty soil. A. Vitaliana, yellow; A. Wulfeniana, purplish-crimson; A. villosa, white or pale rose; A. lactea, white with yellow eye; in lanuginosa, delicate rose ; and A. Chamejasme, delicate rose, are some of

he best.

Antennaria.—Composite plants, with everlasting flowers. A. margaritacea, 14 to 2 feet, has white woolly stems and leaves, and white flower-heads.

Anthericum.—Charming border flowers. A. Liliastrum, St Bruno’s Lily, 11 feet, bears pretty white sweet-seented flowersin May; A. Hookeri (Chryso-pactron), 2 feet, with long racemes of bright golden yellow flowers, requires cool peaty soil.

Aquilegia.—The Columbine family, consisting of peautiful border flowers ingreat variety, ranging from 1 to2 or 3 feet in height. Besides the common

purple A. vulgaris with its numerous varieties, double and single, there are of ehoiee sorts A. alpina and A. pyrenaica, blue; A. glandulosa, A. jucunda, and A. corulea, blue and white ; A. leptoceras, blue and yellow; A. canadensis, A. Skinneri, and A. truncata (ealifornica), scarlet and yellow;

A. chrysantha, yellow; and A. fragrans, white or flesh-colour, very fragrant. Light rich garden soil.

‘Arabis.—Dwart close-growing evergreen cruciferous plants, adapted for rockwork and the front part of the flower border, and of the easiest culture, ‘A. albida forms a conspicuous mass of greyish leaves and white blossoms ; A. lucida, which is also white-flowered, bears its bright green leaves in roscttes, and has a variety with prettily gold-margined leaves.

‘Arenaria,—Evergreen rock plants of easy culture. A. graminifolia and A. lavieifolia are tufted, with grassy foliage and white flowers, while A. palearica, a creeping plant, has broad leaves and solitary white flowers.

Armeria.—The Thrift or Sea-Pink, of whieh the common form A maritima is sometimes planted as an edging for garden walks; there are three varietics, the common pale pink, the deep rose, and the white, the last two being the most desirable. ‘A. cephalotes, 1} feet, is a larger plant, sith tufts of linear lanee-shaped leaves, and abundant globular heads of deep rose flowers, in June and July.

Arum.—Remarkable plants, with tuberous roots, and erect hood-like spathes, enelosing the spike of flowers Coad A. crinitum, 1} feet, has pedate leaves, and fetid dark ehocolate hairy spathes ; A. Dracuuculus, 3 feet, has spotted stems, pedate leaves, and dull purple spathes; A. itali- cum, with grcenish spathes, has the cordate hastate leaves conspicuously veined with white.

Asclepias.—A. tuberosa is a handsome fleshy-rooted plant, very impatient of being disturbed, and preferring good peat soil; it grows 1 to 1; feet high, and bears corymbs of deep yellow and orange flowers in September. A. inearnata, 2 to 4 feet, produccs deep rose sweet-scented flowers towards the end of summer.

Asphodelus,—Handsome liliaceous plants, with fleshy roots, erect stems, and showy flowers, thriving in any good garden soil. A, albus, 4 {cet, A. wstivus, 4 feet, and A. ramosus, 4 feet, have all long tapering keeled Icaves, andjsimple or branched spikes of white flowers ; A. luteus, 2 fect, has awl-

shaped leaves and dense spikes of fragrant yellow flowers; A. capillaris is similar to A. luteus, but more slender and elegant. ;

‘Aster.—A very large family of autumn-blooming composites, including some ornamental species, all of the easiest eulture. Of these, A, alpinus, 1 foot, and A. Amellus, 14 feet, with its var. bessarabicus, have broadish blunt leaves, and large starry bluish flowers ; A. longifolius formosus, 2 feet, bright rosy lilac; A. elegans, 3 to 5 feet, small pale purple or whitish; A. laxus, 2 feet, purplish-blue ; A, pendulus, 23 feet, white, changing to rose; A. pyrensus, 2 to 3 feet, lilae-blue; A. turbinellus, 2 to 3 feet, matve-coloured, are showy border plants ; and A, Nove Angliz, 5 to 6 feet, Tosy-violet; A. eyaneus, 5 feet, plue-lilae; and A. grandifiorus, 3 feet, violet, are especially useful from their late-flowering habit. ‘

‘Astilbe.—-A. japonica, 1 to 14 feet, better known as Hoteia japonica or Spira japonica, thrives in peaty or sandy soil; its glossy tripinnate leaves, and feathery panicles of white flowers early in summer, are very attractive. It proves to be a fine decorative pot-plant, and invaluable for forcing during the spring. ;

Astragalus.—Showy pea-flowered plants, the smaller species adapted for rockwork; sandy soil. A. dasyglottis, 6 inches, has pluish-purple flowers 10 August and September; and A. monspessulanus, 8 inches, crimson-purple in July; while A. hypoglottis, 6 inches, produces in summer compact heads of pretty flowers, which are either purple or white. There are many Very ornamental kinds. ,

Aubrictia.—Beautiful dwarf spring-blooming rock plants, forming carpety tufts of flowers of simple erueiferous form. A. deltoidca is of a deep lilac-blue; A. Campbelliw is more compact and rather darker, approaching to purple; A. grandiflora and greca are_rather larger, put of a lighter hue. Light sandy soil. i

Bambusa.—The Bamboo family, some of which are hardy, at least in sheltercd positions, are elegant arborescent grasses. _B. japonica A Metake, 4 to 7 feet, has proadish leaves; B. nigra is about the same hee 9 but more slender; B. aurea, 6 to 10 feet, is slender and graceful; and »- (Arundinaria) falcata sometimes reaches 20 feet in height. : a Baptisia.—Stoutish erect-

growing, 2 to 3 feet, with smooth foliage ~ spikes of leguminous flowers. B. australis is purplish-blue, B. alba, wiite,

Before commencing to plant, it would be well to construct tables or lists of the plants, specifying their respective times of flower- ing, eolours, and altitudes. To diversify properly and mingle well together the reds, whites, purples, yellows, and blues, with all their intervening shades, requires considerable taste and powers of com- bination ; and aseertained failures may be rectified at the proper time the next season. The one great object aimed at should be to present an agreeable contrast ; and, as at particular seasons a mono- tony of tint prevails, it is useful at such times to be in possession of some strong glaring colours. White, for instance, should be much employed in July, to break the duller blues and purples which then preponderate. Orange, too, is very effective at this season. On the other hand, yellows are superabundant in autumn, and therefore reds and blues should then be sought for. The flower-gardener should have a smnall nursery, or reserve garden, for the propagation of the finer plants, to be transferred into the borders as often as is required.

‘Asa rule, all the fibrous-rooted herbaceous plants flourish in good soil which has been fairly enriched with manure, that of a loamy charaeter being the most suitable. Many of them also grow satis- factorily in a peaty soil if well worked, especially if they have a cool moist subsoil. Pentstemons and phloxes, amongst others, succeed wellinsoil of this character, but the surface must be welldrained ; the former are rather apt to perish in winter in loamy soil, if at all close and heavy. The herbaceous border should be a distinct compart- ment, and not less than 10 feet in width, backed up by evergreens. Such a border will take in about four lines of plants, the tallest being placed at the back and the others graduated in height down to the front. 1n the front row patches of the white arabis, the yellow alyssum, and the purple aubrietia, recurring at intervals of 5 or 6 yards on a border of considerable length, carry the eye forwards and give a balanced kind of finish to the whole. The same might be done with dianthuses or the larger narcissi in the second

row, with ponies, columbines, and phloxes in the third, and with

delphiniums, aconitums, and some of the taller yellow composites as helianthus and rudbeekia at the back. Spring and autumn flowers, as wellas those blooming in summer, should be regularly distributed throughout the border, which will then at no season be devoid of interest in any part. Many of the little alpines may be brought into the front line planted between suitable pieces of stone, or they may be relegated to a particular spot, and laced on an artificial rockery. Most of the hardy bulbs will do well enough in the border, care being taken not to disturb them while leafless and dormant. Some decp-rooting perennials do not spread much at the surface,

and only require refreshing from time to time by top-dressings. Others, asthe asters, spread rapidly; those possessing this habit should be taken up every second or third year, and, a nice patch being

selected for replanting from the outer portions, the rest may be either thrown aside, or reserved for increase ; the portion selected for replanting should be returned to its place, the ground having mean- while been well broken up. Some plants are apt to decay at the base, frequently from exposure caused by the lifting proeess going on during their growth ; these should be taken up annually in early autumn, the soil refreshed, and the plants returned to their places, care being taken to plant them sufficiently wee General Only a selection of some of the best of the decorative hardy per- list of | ennials can be noted, before we pass on to those popular subjects of hardy this class which have been directly influenced by the hybridizer and peren- improver. Many more might be added to the subjoined list :—

nials. Acena.—Neat trailing plants adapted for rockwork, thriving in sandy soil. A, microphylla and A. myriophylla have pretty spiny heads of flowers.

‘Acantholimon.—Pretty dwarf tufted plants, with needle-shaped leaves, adapted for rockwork. A. glumaceum and A. yenustum bear bright pink flowers in July and August. Light sandy loam.

‘Acanthus.—Bold handsome plants, with stately spikes, 2 to 3 feet high, of flowers with spiny bracts. A. mollis, A. latifolius, and A. longifolius are

broad-leaved sorts; A. spinosus and A. spinosissimus have narrower spiny toothed leaves.

Achillea.—Handsome composite plants, the stronger ones of easy culture in common soil. A. Eupatorium and filipendula, 3 to 4 feet, have showy yellow eorymbose flowers; A. rosea, 2 feet, rosy-erimson; and A. Ptarmica flore-pleno, 2 feet, double white flowers. Others suitable for front lines or rockwork are A. tomentosa, 9 inches, bright yellow; A. egyptiaca, 1 foot, silvery Icaves and yellow flowers ; A. umbellata, 8 inches, silvery leaves and pane flowers; aud A. Clavennee, 6 inches, with silvery leaves and pure white

owers.

Aconitum.—Handsome horder plants, the tall stems crowned by racemes of showy hooded flowers. ‘A, Camarum, 3 to 4 feet, has deep purple flowers in August; A, sinense, 14 to 2 feet, has large dark purple flowers in September ; A. variegatuin, 3 feet, has the flowers white edged with blue; A. autumnale, 3 feet, has pale blue flowers, and A, japonicum, 24 feet, deep blue flowers, both produced in September and October.

Adenophora.—Bell-shaped flowers. A. stylosa, 2 feet, pale blue, elegant ; A. denticulata, 14 feet, dark blue; and in A. liliifolia, 1} feet, pale blue, sweet-scented—all blooming during summer, Light soil.

Adonis.—A. vernalis, 1 foot, has large bright yellow stellate flowers in April. Deep light soil.

Ajuga.— ree-growing, dwarf, and showy. A. reptans, 8 inches, has erceping runners, which A. genevensis has uot; both bear handsome spikes of blue labiate flowers. Ordinary soil.

Allium.—Wardy bulbs of the garlie family, some species of which are peel aie the inflorescence is umbellate. In A. azureum, 1 to 2 feet, the { owers are deep-blue; in A. Moly, 1 foot, golden yellow; in A. neapoli-

anum, 12 feet, white, very handsome; in A. triquetrum, 8 inches, white

with green central stripes; in A. pedemontanum, 9 inehes reddish-vi . p : -violet very beautiful, the umbels Hodaltte. ; ‘

frequently divided and transplanted. The white and pink forms, a a

white and red quilled, and the variegated-leaved aucubeefolia, are S°

the best.

Roceonta.—Statcly poppyworts, 6 to 8 feet. B. cordata has heart-shape’

lobed leaves, and large panicles of small fiesh-coloured flowers. Sometw

called Macleaya. Deep sandy loam. 7 Brodica.—Pretty bulbous plants. B. grandifiora, 1 foot, has large ee

purple fiowers ; B. coccinea, 2 to 3 feet, has tubular campanulate no

flowers of a rich crimson with green tips. Sandy loam.

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Bulbocodium.—Pretty spring-flowering crocus-like bulbs. B. vernum, 4 to 6 inches high, purplish-lilac, blooms in March. Good garden soil,

Buphthalmum.—-Robust eomposite herbs with striking foliage, for the back of herbaceous or shrubbery borders. B. cordifolium, 4 feet, has large eordate leaves, and heads of rich orange flowers in cymose panicles in July. Also called Telekia speciosa. a J :

Calandrinia.—Showy dwarf plants for sunny rockwork, in light sandy soil. C. unibellata, 3 to 4 inches, much branched, with narrow hairy leaves, and corymbs of magenta-crimson flowers in the summer months.

Caltha.—Showy marsh plants, adapted for the margins of lakes, streamlets, or artificial bogs. C. palustris flore-pleno, 1 foot, has double brilliant yellow flowersin May. , . :

Calystegia.—Twining plants with running perennial roots. C. pubescens flore-pleno, 8 to 10 feet, has showy double-pink convolvuloid flowers in July; C. dahurica is a handsome single-flowered summer-blooming kind, with rosy- coloured flowers. é a .

Campanula.—Beautiful, as well as varied in habit and character. They are called bell-flowers. C, pulla, 6 inches, purplish, nodding, on slender erect stalks; C. turbinata, 9 inches, purple, broad-belled ; C. carpatica, 1 foot, blue, broad-belled; C. nobilis, 14 feet, long-belled, whitish or tinted with chocolate; ©. persicifolia, 2 feet, a fine border plant, single or double, white or purple, blooming in July; and C. pyramidalis, 6 feet, blue or white, in tall branching spikes, are good and diverse. ‘There are many other finc

ts. F a reiec. —Hold-tiabited composites of showy character; common soil. C. babylonica, 5 to 7 feet, has winged stems, silvery leaves, and yellow flower-heads from June to September ; C. montana, 3 feet, deep bright blue

white.

Se eranthes.—Showy free-flowering plants, for rockwork, banks, or stony soil, ©. ruber, 2 feet, branches aud blooms freely all summer, and varies with rosy, or crimson, or white flowers. It clothes the chalk cuttings on some English railways with a sheet of colour in the blooming season.

Cheiranthus.—Pretty rock plants, for light stony soils. C. alpinus, 6inches, grows in dense tufts, and bears sulphur-yellow flowers in May. C. ochro-leucus is similar in character.

Chionodoxa.—Charming dwarf hardy bulbous plants of the liliaceous order, blooming in the early spring in company with Scilla sibirica, and of equally easy cultivation. C. Lucilise, 6 inches, has star-shaped flowers of a brilliant blue with a white centre, and is the finest of the few known species. It blooms about April. ;

Colchicum.—Showy autumn-blooming bulbs (corms), with crocus-like flowers, all rosy-purple or white. C. speciosum, C. autumnale, single and double, C, byzantinum, and C, variegatum are all worth growing.

Convallaria.—C. majalis, the Lily of the Valley, a well-known sweet-scented favourite spring flower, growing freely in rich garden soil; its spikes, 6 inches high, of pretty white fragrant bells, are produced in May and June; the variety with gold-striped leaves is very ornamental. ‘

Coreopsis.—Effective composite plants, thriving in good garden soil. C. auriculata, 2 to 3 feet, has yellow and browu flowers in July aud August G Ce grandiflora, 3 to 4 feet, bright yellow, in August; C. tenuifolia, 2 fcet, rich golden yellow, in July. a

Corydalis.—Interesting and elegant plants, mostly tuberous, growing in good garden soil. C. bracteata, 9 iuches, has sulphur-coloured flowers in April, and C, nobilis, 1 foot, rich yellow, in May; C. solida, with purplish, and C. oka rad with white flowers, are pretty spring-flowering plauts, 4 to 6 inches high.

Cyclamen.—Charming tuberous-rooted plants of dwarf habit, suitable for sheltered rockeries, and growing in light gritty soil. C. europseum, reddish-purple, flowers in summer, and C. hederifolium in autumn.

Cypripedium.—Beautiful terrestrial orchids, requiring to be plantcd in peat soil, in a cool and rather shady situation. C. spectabile, 14 to 2 feet, white and rose colour, in June, is a lovely species, as is C. Calceolus, 1 foot, yellow and brown, iu May; all are full of interest and beauty.

Delphiniwm.—The Larkspur family, tall showy plants, with spikes of blue flowers in July. The popular garden varieties are notcd under par. 53. Other distinct sorts are D. grandiflorum and D, grandiflorum flore-pleno, 2 to 3 feet, of the richest dazzling blue, flowering on till September; D. chinense, 2 feet, blue, and its double-flowered variety, are good, as is D. Barlowi, 3 feet, a brilliant double blue purple. D. nudicaule, 2 feet, orange-scarlet, very showy, is best treated as a biennial, its brilliant flowers being produced freely in the second year from the seed. :

Dianthus.—Chiefly rock plants with handsome and fragrant flowers, the smaller sorts growing in light sandy soil, and the larger border plants in Yich garden earth. Of the dwarfer sorts for rock gardens, D. alpinus, D, exsius, D. deltoides, D. dentosus, D. neglectus, D. petreus, and D. glacialis

are good examples ; while for borders or larger rockwork D, plumarius, D. Superbus, D. Fischeri, D. cruentus, and the clove section of D. Caryophyllus are most desirable,

Dictamnus.—D. Fraxinella is a very characteristic and attractive plant, 2to 3 feet, with bold pinnate leaves, and tall racemes of irregular-shaped purple or white flowers. It is cverywhere glandular, and strongly scented.

Dielytra.—Very elegant plants, of easy growth in good soil. D. spectabilis, 2 to 3feet, has pxony-like foliage, and gracefully drooping spikes of heart-shaped pink flowers, about May, but it should have a sheltered place, as it suffers from spring frosts and winds; D. formosa and D. eximia, 1 foot, are also pretty rosy-floweredispecies.

Digitalis.—Stately erect-growing plants, with long racemes of pouch-shaped drooping flowers. ‘The native D. purpurea, or Foxglove, 8 to 5 feet, with its dense racemes of purple flowers, spotted inside, is very showy, but 18 surpassed by the garden variety called gloxinioides. The yellow-flowered

lutea and D. grandifiora are less showy. Good gardcn soil, and frequent Yrenewal from seeds.

Doronicum.—Showy composites of free growth in ordinary soil. D. catcasicum and D. austriacum, 1 to 13 feet, both yellow-flowered, bloom in Spring and early summer,

_Draba.—Good rockwork cruciferous plants. D. alpina, D. aizoides, D, ciliaris, D. Aizoon, and D. cuspidata bear yellow flowers in early spring; D. cinerea and D. ciliata have white flowers. Gritty well-drained soil.

‘racocephalum.—Handsome labiate plants, requiring a warm and well-

drained soil. D, argunense, 1} feet, D. austriacum, 1 foot, D. grandiflorum,

foot, and D. Ruyschiana, 14 feet, with its var. japonicum, all produce showy blue flowers during the summer months.

Echinacea.—Stout growing showy composites for late summer and autumn flowering, requiring rich deep soil, and not to be often disturbed. angustifolia, 3 to 4 feet, light purplish-rose, and E. intermedia, 3 to 4 feet, reddish-purple, are desirable kinds,

Epimedium.—Pretty plants, growing about afoot high, with elegant foliage, ni curious flowers, E. macranthum, white flowers, and E. rubrum, red, Th distinctly spurred; E. pinnatum and KE. Perralderianum, yellow, less so.

ey bloom In spring, and prefer a shady situation and a peaty soil.

*i th oon. Composite plants, variable in character. E. purpureus, 1: feet,

Uh pink flower-heads, having narrow twisted ray-florets; E. Roylei, 1 foot,

dark blue; and E. pulchellus, 1 foot, rich orange, flowering during the summer, are among the best kinds. Good ordinary garden soil. ;

Hrinus.—E. alpinus is a beautiful little alpine for rockwork, 3 to 6 inches, of tufted habit, with small-toothed leaves, and heads of pinkish-purple or, in a variety, white flowers, early in summer. Sandy well-drained soil.

Erodium.—Handsome dwarf tufted plants. E. Manescavi, 1 to 1} feet, has large purplish-red flowers iu summer; E. Reichardi, aminute stemless plant, has small heart-shaped leaves in rosette-like tufts, and white flowers striped with pink, produced successively. Light soil.

Eryngium.—vVery remarkable plants of the umbelliferous order, mostly of an attractive character. E. amethystinum, 2 feet, has the upper part of the stem, the bracts, and heads of flowers all of an amethystine blue. Some of more recent introduction have the aspect ef the pine-apple, such as E. bromelifolium, E. pandanifolium, and E, eburneum. Deep light soil.

Erythronium.—. dens canis, the Dog’s-Tooth Violet, is a pretty dwarf bulbous plant with spotted leaves, and rosy or white flowers produced in

eats and having reflexed petals. Mixed peaty and loamy soil, deep and cool,

Huphorbia.—Plants whose beauty resides in the bracts or floral leaves which surround the inconspicuous flowers. 1% aleppica, 2 fect, and lh. Characias, 2 to 3 feet, with greeu bracts, are fine plants for rockwork or sheltered corners.

Ferula,—Gigantic umbelliferous plants, with magnificent foliage, adapted for shrubbery borders or open spots on lawns, They have thick fleshy roots, deeply penetrating, and therefore requiring deep soil, which should be of a light or sandy character. F. communis, F. glauca, and F, tingitana, the last with glossy lozenge-shaped leaflets, grow 8 to 10 feet high; F. Ferulago, witli more finely cut leaves, grows 5 to 6 feet high. They flower in early spring, and all have a fine appearance when in bloom, on account of their large showy umbels of yellow flowers.

Funkia.—Pretty liliaceous plants, with simple conspicuously longitudinal-ribbed leaves, the racemose flowers funnel-shaped and deflexed. F. Sieboldi- ana, 1 foot, has lilac flowers; F. grandiflora, 18 inches, is white and fragrant ; F. cerulea, 18 inches, is violet-blue ; F. albo-marginata, 15 inches, has the leaves edged with white, and the flowers lilac. Rich garden soil.

Gaillardia.—Showy composite plants, thriving in good garden soil. G. aristata, 2 feet, has large yellow flower-heads, 2 or 3 inches across, in summer; G, Beselari and G. Loiselii have the lower part of the ray-florets red, the upper part yellow.

Galanthus.—The Snowdrop. Early spring-flowering amaryllidaceous bulbs, with pretty drooping flowers, snow-white, having the tips of the enclosed petals green. The common gort is G. nivalis, which blossoms on the first break of the winter frosts; G. Imperati and G. plicatus have larger flowers.

Gaura.—G. Lindheimeri, 3 to 5 feet, is much branched, with elegant white and red flowers of the onagraceous type, in long slender ramose spikes during the late summer and autumn months. Light garden soil ; not long-lived.

Gentiana.—Beautiful tufted erect-stemmed plants preferring a strong rich loamy soil. G. acaulis, known as the Gentianella, forms a close carpet of shining leaves, and in summer bears large erect tubular deep blue flowers. G. Andrewsii, 1 foot, has, during summer, large deep blue flowers in clusters, the corollas closed at the mouth; G. asclepiadea, 18 inches, purplish-blue, flowers in July.

Geranium,—Showy border flowers, mostly growing to a height of 14 or 2 feet, having decply cut leaves, and abundant saucer-shaped blossoms of considerable size. G. ibericum, platypetalum, aud Backhousianum are desirable purple-flowered sorts; G. sanguineum, a tufted grower, has the flowers a deep rose colour; and the double-flowered white and blue forms of e pratense and G. sylvaticum make pretty summer flowers. Good garden soil.

Geum.—Pretty rosaceous plants. The single and double flowered forms of G. chiloense, 2 feet, with brilliant scarlet flowers, and G. montana, 9 inches, yellow, are amongst the best sorts. Good garden soil.

Gynerium.—The Pampas-Grass, a noble species, introduced from Buenos Ayres; it forms huge tussocks, 4 or 5 feet high, above which towards autumn rise the bold dense silvery plumes of the inflorescence. It does best iu sheltered nooks,

Gypsophila.—Interesting earyophyllaceous plants, thriving in dryish situations. G. paniculata, 2 feet, from Siberia, forms a dense semi-globular mass of small white flowers from July onwards till autumn, and is very useful for cutting.

ITelenium,—Showy composites of free growth in lightish soil. H. autumnale, 4 feet, bears a profusion of yellow-rayed flower-heads in August aud September,

Melianthemum.—Dwarf subshrubby plants well suited for rockwork, and called Sun-Roses from their blossoms resembling small wild roses, and their thriving best in sunny spots. Some of the handsomest are H. roseum, mutabile, cupreum, andrhodanthum, with red flowers; Il. vulgare flore-

pleno, grandiflorum, and stramineum, with yellow flowers; and H. macranthum and papyraceum, with the flowers white.

Ielianthus,—The Sunflower genus, of which there are several ornamental kinds. IH, multiflorus, 4 feet, and its double-flowered varieties, bear showy golden yellow flower-heads in profusion, and are well adapted for shrubbery borders; If. orgyalis, 8 feet, has drooping willow-like leaves.

Telichrysum.—Composite plants, with the flower-heads of the scarious character known as Everlastings. H. arenarium, 6 to 8 inches, is a pretty species, of dwarf spreading habit, with woolly leaves and corymbs of golden yellow flowers, about July,

Ielleborus.—-Charming very early blooming dwarf ranunculaceous herbs. Hi. niger or Christmas Rose, the finest variety of which is called maximus, has white showy saucer-shaped flowers ; Il. orientalis, 1 foot, rose-coloured; fH. atrorubens, | foot, purplish-red; and IH. colchicus, 1foot, deep purple. Deep rich loam.

ITepatica,—Charming little tufted plants requiring’ good loamy soil, and sometimes uicluded with Anemone. H. triloba, 4 inches, has three-lobed leaves, and a profusion of small white, blue, or pink single or double flowers, from February onwards; H. angulosa, from Transylvania, 6 to 8 inches, is a larger plant, with sky-blue flowers.

fesperis,—Il. matronalis, 1 to 2 feet, is the old garden Rockct, of which some double forms with white and purplish blossoms are amongst the choicest of border flowers. They require a rich loamy soil, not too dry, and should be divided and transplanted into fresh soil annually or every second year, in the early autumn scason.

Iibiscus.—Showy malvaceous plants. H. Moscheutos, rose coloured, and If. palustris, purple, both North American herbs, 3 to 5 feet high, are suitable for moist borders or for boggy places near the margin of lakes.

Iberis.—The Candytuft, of which several dwarf spreading subshrubby species are amongst the best of rock plants, clothing the surface with tufts of green shoots, and flowering in masses during May and June. The best are

I. saxatilis, 6 to 10 inches; I. sempervirens, 12 to 15 inches; and I. Pruitii (variously called coriacea, carnosa, corresfolia), 12 iuches.

Lathyrus,—Handsome climbing herbs, increased by seeds or division. L. grandiflorus, 3 feet, has large rose-coloured flowers with purplish-crimson

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wings, in June; L. latifolius, the Everlasting Pea, 6 tlowers in the late summer and autumn ; the vars. albus, deep rose, are distinct. Ordinary garden soil. ;

Lavatera.—l. thuringiacea, 4 feet, is a fine erect-growing malvaceous plant, producing rosy-pink blossoms freely, about August and September. Good garden soil. ; ;

Leucojum.—Snowflake. Pretty early-blooming bulbs, quite hardy. L. vernum, 6 inches, blooms shortly after the snowdrop, and should have a light rich soil and sheltered position ; L. pulchellum, 13 feet, blooms in April and May; and L. xstivum, 2 feet, in May. All have white pendent flowers, tipped with green.

‘Liatris.—Pretty composites

feet, has hright rosy white, and superbus,

with the flower-heads collected into spikes. L. pumila, 1 foot, L. squarrosa, 2 to 3 feet, L. spicata, 3 to 4 feet, L. pycno- stachya, 3 to 4 feet, all have rosy-purplish flowers. Deep, cool, and moist soil.

Linaria.—Toadflax. Pretty scrophulariads, of which L. alpina, 3 to 6 inches, with bluish-violet flowers having a brilliant orange spot, is suitable for rockwork; UL. dalmatica, 4 feet, aud L. genistefolia, 3 fect, both yellow flowered, are good border plants.

Linum.— Flax. L. alpinum, 6 inches, large, dark blue; L. narbonense, 15 feet, large, blue; L. perenne, 1} feet, cobalt blue, and L. arboreum (flavum),

1 foot, yellow, are all pretty. The last is liable to suffer from damp during winter, and some spare plants should be wintered in a frame.

Lithospermum.—L. prostratum, 3 inches, is a trailing evergreen herb, with narrow hairy leaves, and paniculate brilliant blue flowers in May and June. Well adapted for rockwork or banks of sandy soil.

Lupinus.—Showy erect-growing plants with papilionaceous flowers, thriving in good deep garden soil. L. polyphyllus, 3 feet, forms noble tufts of palmate leaves, and long spikes of bluish-purple or white flowers in June and July; L. arboreus is gubshrubby, and has yellow flowers.

Lychnis,—Brilliant erect-growing caryophyllaceous plants, thriving best in beds of peat earth, or of deep gandy loam. L. chalcedonica, 3 feet, has dense heads of bright scarlet flowers, both single and double, in June and July; L. fulgens, 1 foot, vermilion; L. Haageana, 1} feet, scarlet; and L. grandiflora, 1 foot, coppery-orange, are all large-flowered and showy, but require a little protection in winter.

Malva.—M. moschata, 2 feet, with a profusion of pale pink or white flowers, and musky deeply-cut leaves, though a British plant, is worth introducing to the flower borders when the soil is light and free.

Mertensia.—M. virginica, 1 to 1} feet, azure-blue, shows flowers in drooping panicles in May and June. It does best in shady peat borders.

Mimulus. — Monkey-flower. Free-blooming, showy scrophulariaceous plants, thriving best in moist situations. M. cardinalis, 2 to 3 feet, has scarlet flowers, with the limb segments reflexed ; M. luteus and its many garden forms, 1 to 14 feet, are variously coloured and often richly spotted ; and M, cupreus, 8 to 10 inches, is bright coppery-red. M. moschatus is the Musk-plant, of which the variety Harrisoni is a greatly improved form, with much larger yellow flowers.

Monarda.—Handsome labiate plants, flowering towards autumn, and preferring a cool soil and partially shaded situation. M. didyma, 2 feet, scarlet or white; M. fistulosa, 3 feet, purple; and M. purpurea, 2 feet, deep purple, are good border flowers.

Muscari.—Pretty dwarf spring-flowcring bulbs. M. botryoides (Grape Hyacinth), 6 inches, blue or white, is the handsomest; M. moschatwn (Musk Hyacintl), 10 inches, has peculiar livid greenish-yellow flowers and a strong musky odour; M. monstrosum (Feather Hyacinth), bears sterile flowers broken up into a feather-like mass. Good garden soil.

M yosotis.—Forget-me-not. Lovely boraginaceous plants. M. dissitiflora, 6 to 8 inches, with large handsome and abundant sky-blue flowers, is the best and earliest, flowering from February onwards; it does well in light cool soils, preferring peaty ones, and should be renewed annually from seeds or cuttings. M. rupicola, 2 to 3 inches, intense blue, is a fine rock plant, preferring shady situations and gritty soil; M. sylvatica, 1 foot, blue, pink, or white, used for spring bedding, should be sown annually in August.

Nardosmia.—N. fragrans, the Winter Heliotrope, though of weedy habit, with ample cordate coltsfoot-like leaves, yields in January and February its abundant spikes, about a foot high, of greyish flowcrs scented like heliotrope ; it should have a corner to itself.

Nepeta.—N. Mussinii, 1 foot, is a compactly spreading greyish-leaved labiate, with lavender-blue flowers, and is sometimes used for bedding or for marginal lines in large compound beds.

Nierembergia.—N. rivularis, 4 inches, from La Plata, has slender creeping rooting stems, bearing stalked ovate leaves, and large funnel-shaped white flowers, with a remarkably long slender tube; especially adapted for rock-work, requiring moist sandy loam.

Ginothera.—The genus of the Evening Primrose, consisting of showy onagrads, all of which grow and blossom freely in rich deep soils. i. missouriensis (macrocarpa), 6 to 12 inches, has stout trailing branches, lance-shaped leaves, and large yellow blossoms; . taraxacifolia, 6 to 12 inches, has a stout crown from which the trailing branches spring out, and these bear very large white flowers changing to delicate rose; this perishes in cold soils, and should therefore be raised from seed annually. Of erect habit are di. speciosa, 1 to 2 feet, with large white flowers, G. fruticosa, 2 to 3 feet, with abundant yellow flowers; and Gi. serotina, 2 feet, also bright yellow.

Omphalodes.—Hlegant dwarf borageworts. 0. verna, 4 to 6 inches, a creeping shade-loving plant, has bright blue flowers in the very early spring; O. Luciliz, 6 inches, has much larger lilac-biue flowers, and is an exquisite rock plant for warm sheltered spots. Light sandy soil.

Onosma.—O. taurica, 6 to 8 inches, is a charming boraginaceous plant, from the Caucasus, producing hispid leaves, and cymose heads of drooping tubular yellow flowers. It is of evergreen habit, and requires a warm position on the rockwork, and well-drained sandy soil; or a duplicate should be sheltered during winter in a cold dry frame.

Ourisia.—Handsome scrophulariaceous plants, from Chili, thriving in moist well-drained peaty soil, and in moderate shade. O. coccinea, 1 foot, has erect racemes of pendent crimson flowers.

Papaver.—The Poppy. Very showy plants, often of strong growth, and of easy culture in ordinary garden soil. P. orientale, 3 feet, has crimson-scarlet flowers, 6 inches across, and tle variety bracteatum closely resembles it, but lias leafy bracts just beneath the blossom, P. alpinum, 6 inches, white with yellow centre; P. nudicaule, 1 foot, yellow, scented, aud P. pilosum, 1to 2 feet, deep orange, are ornamental smaller kinds.

Pentstemon.—The popular garden varieties are noticed under par. 63. Other distinct kinds are P, campanulatus, 14 feet, pale rose, of busly habit; P. humilis, 9 inches, bright blue; P. speciosus, cyananthus, and Jaffrayanus, 2 to 3 feet, all bright blue; P. barbatus, 3 to 4 feet, scarlet, in long terminal panicles; P. Murrayanus, 6 feet, with scarlet flowers and connate leaves; and P. Palmeri, 3 to 4 feet, with large wide-tubed rose- coloured flowers.

Phiomis.—Bold and showy labiates, growing in ordinarysoil. P. Russelliana Cunsrle tolls). 4 feet, yellow, and P. tuberosa, 3 feet, purplisl-rose, both with

owny hoary leaves, come in well in broad flower borders.

Physostegia,—Tall autumu-blooming labiates, of easy growth in ordinary

garden soils. P. imbricata, 5 to 6 feet, has pale purple flowers in closely im-pricated spikes.

Polemonium.—PFretty border flowers. feet, has elegant pinnate leaves, and long panicles of blue rotate flowers The variety called variegatum has very elegantly marked leaves, and ie sometimes used as a margin or otherwise in bedding arrangements. Good garden soil.

Polygonatum.—Hlegant liliaceous plants, with rhizomatous stems. P. multiflorum (Solomon’s Seal), 2 to 3 feet, with arching stems, and drooping white flowers from the leaf axils, is a handsome border plant, doing especially well in partial shade amongst shrubs, and also well adapted for pot culture for early forcing. Good garden soil.

Polygonum.—A large family, varying much in character, often weedy, but of easy culture in ordinary soil. P. vacciniifolium, 6 to 10 inches, is a pretty prostrate subshrubby species, with handsome rose-pink flowers, suitable for rockwork, and prefers boggy soil; P. affine (Brunonis), 1 foot, deep rose is a showy border plant, flowering in the late summer; P. cuspidatum, 8 to 10 feet, isa grand object for planting where a screen is desired, as it suckers abundantly, and its tall spotted stems and handsome cordate leaves have quite a noble appearance.

Primula,—Beautiful and popular spring flowers, of which many forms are highly esteemed in most gardens. _ P. vulgaris, 6 inches, affords numerous handsome single and double-flowered varieties, with various-coloured flowers for the spring flower beds and borders (par. 68). Besides this, P. Sieboldii (cortusoides amoena), 1 foot, originally deep rose with white eye, but now including many varieties of colour, such as white, pink, lilac, and purple; P. japonica, 1 to 2 feet, crimson-rose ; P. denticulata, 1 foot, bright bluish-lilac, with its allies P. erosa and P. purpurea, all best grown in a cold frame; P. viscosa, 6 inches, purple, and its white variety nivalis, with Pp. pedemontana and P. spectabilis, 6 inches, both purple; and the charming little Indian P. rosea, 3 to 6 inches, bright cherry rose colour, are but a few of the many beautiful kinds in cultivation.

Pulmonaria.—Handsome dwarf porageworts, requiring good deep garden soil. P. officinalis, 1 foot, has prettily mottled leaves and blue flowers; P. sibirica is similar in character, but has broader leaves more distinctly mottled with white.

Pyrethrum.—Composite plants of various character, put of easy culture P, Parthenium eximium, 2 feet, is a handsome double white form of ornamental character for the mixed border; P. uliginosum, 5 to 6 feet, has fine large white radiate flowers, in October; P. T'chihatchewii, a close-growing dense evergreen creeping species, with long-stalked white flower-heads, is adapted for covering slopes in lieu of turf, and for rockwork.

Ramondia, —R. pyrenaica, 3 to 6 inches, is a pretty dwarf plant, requiring a warm position on the rockwork, and a moist peaty soil more or less gritty ; it has rosettes of ovate spreading root-leaves, and large purple yellow-centred rotate flowers, solitary or two to three together, on naked stalks,

Ranunculus.—The florists' ranunculus is noticed iu par. 70. R. amplexi-caulis, 1 foot, white; R. aconitifolius, 1 to 2 feet, white, with its double variety R. aconitifolius flore-pleno (Fair Maids of France); and R. acris flore-pleno (Bachelor's Buttons), 2 feet, golden yellow, are pretty. Of dwarfer interest- ing plants there are R. alpestris, 4 inches, white; R. gramincus, 6 to 10 inches, yellow; R. parnassifolius, 6 inches, white ; and R. ruteefolius 4 to 6 inches, white with orange centre.

Rudbeckia,—Bold-habited composite plants, borders, and thriving in light loamy soil. The flower-heads have a dark- coloured elevated disk. R. Drummondii, 2 to 3 feet, with the ray-florets reflexed, yellow at the tip and purplish-brown towards the pase; R. fulgida, 2 feet, golden yellow with dark chocolate disk, the flower-heads 2 to 3 inches across; and R. speciosa, 2 to 3 feet, orange-yellow with blackish- purple disk, the flower-heads 3 to 4 inches across, are showy plants.

Salvia.—The Sage, a large genus of labiates, often very handsome, but some- times too tender for English winters. 8. Sclarea, 5 to 6 feet, is a very striking plant little more than a biennial, with branched panicles of bluish flowers issuing fron rosy-coloured bracts; S. patens, 2 feet, which is intense azure, has tuberous roots, and may be taken up, stored away, and replanted

in spring like a dahlia. 8. pratensis, 2 feet, blue, a showy native species, is quite hardy; the variety lupinoides has the centre of the lower lip white.

Saxifraga.—A very large genus, comprising plants of varied aspect, many of them handsome though simple in character, and most of them adapted for rockwork, requiring only ordinary good soil. Some of the larger growing species, now often called Megasea, are grand early-flowering border plants with broad leaves and large cymose clusters of rosy-pink flowers, ¢.g., 8. purpurascens, S. cordifolia, and 8. crassifolia, with their varieties. another group with silvery leaves there are representatives in S. longifolia, 8. cexsia, S. Cotyledon, 8. pectinata, and 8, Rocheliana; of the green mossy group in 8. hypnoides, S. ceratophylla, 8. muscoides, &c. ; and of the London Pride section in S. wmbrosa, 5. ‘Andrewsii, 8. Geum, and 8. Bucklandii. 8. oppositifolia, 2 to 3 inches, purple or white, is a brilliant plant for rock-work, forming a carpet over the surface of the stones.

‘Scilla.—Beautiful dwarf bulbous plants, thriving in well-worked sandy loam, or sandy peat. S. pbifolia, 3 inches, and S. sibirica, 4 inches, both iutense blue, are among the most charming of early spring flowers ; 8. patula, 6 to 8 inches, and 8. campanulata, 1 foot, with star-shaped greyish-blue flowers, freely produced, are fine border plants, as is the later blooming 8. peruviana, 6 to 8 inches, dark blue or white. :

Sedum.—Pretty succulent plants of easy growth, and mostly suitable for rockwork. They are numerous, varied in the colour of both leaves and foliage, and mostly of compact tufted growth. 58. spectabile, 1 to L feet, pink, in great cymose heads, is a fine plant for the borders, and worthy also of pot-culture for greenhouse decoration. Mention may also be made of the common 8. acre (Stonecrop), 3 inches, yellow, and its variety with yellow-tipped leaves. 2

Sempervivum.—House-Leek. Neat-growing succulent plants, forming rosettes of fleshy leaves close to the ground,

P. coruleum (Jacob’s Ladder), 2

well suited for shrubbery

in sandy

The flowers are stellate, eymosc, on stems rising from the eee out

- . a 1 Silene.—Pretty caryophyllaceous plants preferring sandy loam, and wel 6 inches, white, and 8. quadridentata,

Elizabetha, 4 inches, bright rose, and 8. Schafta, 6 inches, purplish-rose, also good kinds. Sisyrinchiwm.—Pretty dwart iridaceous plants, thriving In peaty soil. grandiflorum, 10 inches, deep purple or white, blooms about April, fine plant for pot-culture in cold frames. ; Spirea.— Vigorous growing plants of great beauty, preferring good deep rather moist soil; the flowers small but very abundant, in large corymbose or

spicate panicles. 2 feet, white;

borders 5

and is a

HARDY PERENNIALS. |

white; 8. palmata, 2 feet, rosy-crin:son ; and 8. venusta, 3 feet, carmine rose, are some of the best. ; ’

Statice.—Pretty plants with broad radical leaves, and a much-branched inflorescence of numerous small flowers. ‘S. latifolia, 2 feet, greyish-blue ; 8. tatarica, 1 foot, lavender-pink; 5. speciosa, 13 feet, rose colour; and 8. eximia 1} feet, rosy-lilac—are good border plants. S. bellidifolia, 9 inches, lavender ; 8. emarginata, 6 inches, purple; 8. globulariefolia, 9 inches, white ; and 8. nana, 4 inches—are good sorts for the rockery. :

Stenactis._S. speciosa, 1 to 2 feet, is a showy composite, of easy culture in good garden soil ; it produces large corymbs of flower-heads, with numerous narrow blue ray-florets surrounding the yellow disk. ’

Stipa.—S. pennata (Feather Grass), 1} feet, is a very graceful-habited grass, with stiff slender erect leaves, and long feathery awns to the flowers.

Stokesia.—S. cyanea, 2 feet, is a grand autumn-flowering composite plant, with blue flower-heads, 4 inches across. Sandy loam and warm situation.

Symphytum.—Rather coarse-growing but showy boraginaceous plants, succeeding in ordinary soil. S. caucasicum, 2 feet, with blue flowers changing to red, is one of the finer kinds for early summer blooming. :

Thalictrum.—Free-growing but rather weedy ranunculaceous plants, in many cases having elegantly cut foliage. ‘IT. aquilegifolium, 2 feet, purplish from the conspicuous stamens, the leaves glaucous, is a good border plant ; and T. minus has foliage somewhat resembling that of the Maidenhair fern. Ordinary garden soil. ; ae

Triteleia.—Charming spring-flowering bulbs, thriving in any good sandy soil. T. Murrayana, 8 inches, lavender-blue, and T. uniflora, 6 inches, white, are both pretty plants of the easicst culture, either for borders or

keries.

7 ng.—Splendid stoutish-growing plants of noble aspect, familiarly known as the Poker plant, from their erect rigid spikes of flame-coloured flowers; sometimes called Kniphofia, T. Uvaria, 3 to 4 feet, bright orange- red, passing to yellow in the lower flowers, is a fine autumnal decorative plant. They should be protected from frosts by a covering of ashes over the crown during winter. .

Trollius,—Showy ranunculaceous plants, of free growth, flowering about MayandJune. T’. asiaticus, 18 inches, deep yellow, globular ; T. asiaticus, 2 feet, lemon yellow ; and T. napellifolius, 2 to 2} feet, golden yellow, are all fine showy kinds. Rich and rather moist soil. ‘

Tulipa.—Splendid dwarfish bulbs, thriving in deep sandy well-enriched garden soil, and increased by offsets. They bloom during the spring and early summer months. T. Gesneriana, the parent of the florists’ tulip (par. 71), 12 to 18 inches, crimson and other colours; T. Eichleri, 1 foot, crimson with dark spot; T. Greigi, 1 foot, orange with dark spot edged with yellow, and having dark spotted leaves; T. oculus solis, 1 foot, scarlet with black centre; and T. sylvestris, 12 to 18 inches, bright yellow, are showy kinds.

Verbascum.—Showy border flowers of erect spire-like habit, of the easiest culture. V. Chaixii, 4 to 5 feet, yellow, in large pyramidal panicles; V. pheniceum, 3 feet, rich purple or white; and V. formosum, 6 feet, golden yellow in dense panicles, are desirable species.

Veronica.—The Speedwell family, containing many ornamental members ; all the hardy species are of the easiest cultivation in ordinary garden soil. The rotate flowers are in close erect spikes, sometimes branched. V. crassifolia, 2 feet, dark blue; V. incarnata, 1} feet, flesh-colour ; V. corymbosa, 14 feet, oat blue in corymbosely-arranged racemes ; V. gentianoides, 2 feet, grey with blue streaks; and V. virginica, 5 feet, white, are distinct.

Vinea.—Periwinkle. Pretty rock plants, growing freely in ordinary soil. V. herbacea, of creeping habit, with purplish-blue flowers; V. minor, of trailing habit, blue; and V. major, 1 to 2 feet high, also trailing, are suitable forthe rock garden. The last two are evergreen, and afford varieties which differ in the colour of their flowers, while some are single and others double.

Viola.—Violet. Charming dwarf plants, mostly evergreen and of tufted habit, requiring well-worked rich sandy soil. V. calcarata, 6 inches, light blue; V. cornuta, 6 to 8 inches, blue; V. lutea, 4 inches, yellow; V. altaica, 6 inches, yellow or violet with yellow eye; V, palmaensis, 6 to 8 inches, lavender-blue ; V. pedata, 6 inches, pale blue; and V. odorata, the Sweet Violet, in its many single and double flowered varieties, are all desirable.

Yucca.—Noble subarborescent liliaceous plants, which should be grown in every garden. They do well in light well-drained soils, and have a close family resemblance, the inflorescence being a panicle of white drooping tulip- shaped flowers, and the foliage rosulate, sword-shaped, and spear-pointed. Of the more shrubby-habited sorts Y. sloriosa, recurvifolia, and Treculeana, are good and distinct; and of the dwarfer and more herbaceous sorts Y. filamentosa, flaccida, and angustifolia are distinct and interesting kinds, the first two flowering annually.

The taste for cultivation of the class of plants of which the fore- going list embraces the more prominent members is on the increase, and our gardens will benefit by its extension; but we may hope that the folly of limiting the interest of the flower garden to this class of subjects alone, to the exclusion

of the brilliant bedding flowers Which have been evolved out of less showy materials by the

ardener’s skill, as some writers would seem to desire, may never e realized.

We now eceed to notice at greater length the more important plants of this class,—those to which horticulturists have devoted the greatest attention, with the result, in many cases, of largely in- creasing the varieties of these “ florists’ flowers.”

45. The Anemone (Anemone coronaria), often called the Poppy Anemone, isa tuberous-rooted plant, with parsley-like divided leaves, and large showy poppy-like blossoms on stalks of from 6 to 9 inches high ; the flowers are of various colours, but the principal are scarlet, ™mson, blue, purple, and white. There are also double-flowered vanleties, in which the stamens in the centre are replaced by a tuft of narrow petals. It is an old garden favourite, and of the double orms there are named varieties. They grow best in a loamy soil, pe with well-rotted manure, which should be dug in below the tubers, These may be planted in October, and for succession In J; anuary, the autumn planted ones being protected by a covering of leaves or short stable litter. They will flower in May and June, and when the leaves have ripened should be taken up into a dry room til] planting time. Anemones are easily raised from the seed, and a bed of the single varieties is a valuable addition to a flower- garden, as it affords, in a warm situation, an abundance of hand- Some and often brilliant spring flowers, almost as early as the snow-

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§. Filipendula flore-pleno, 1} feet, and 8. Ulmaria flore-pleno, 3 feet, both

drop or crocus, The genus contains many other lively spring blooming plants, of which A. hortensis and A. fulgens have less divided leaves and splendid rosy-purple or scarlet flowers; they require similar treatment. Another set is represented by A. Pulsa- tilla, the Pasque-flower, whose violet blossonis have the outer surface hairy ; these prefer a calcareous soil.

The splendid A. japoniea, and its white variety called Honorine Jobert, the latter especially, are amongst the finest of autumn blooming hardy perennials ; they grow well in light soil, and reach 2% to 3 fect in height, blooming eontinually for several weeks. A group of dwarf species, represented by the native British A. nemorosa and A. apennina, are amongst the most beautiful of spring flowers for planting in woods and shady places.

46. The Antirrhinwm (Antirrhinum majus) is very easily managed. Sown in heat, and forwarded until the general time for planting out, it becomes a summer annual, and may be so treated (par. 88); but uuder a slower and more hardy regime it may be sown in boxes in August, and pricked off into other boxes and wintered in a frame, for, though not often destroyed, it sometimes suffers greatly in a severe season. So treated, and planted out in well-prepared beds of good friable garden soil, it will become very showy and effective, and if a good strain of seed has been obtained many very beautiful kinds may generally be selected from the progeny. “The named sorts are propagated by cuttings, and wintered in a frame. Some of the double-flowered sorts are interesting. There are forms with white, yellow, rose, crimson, magenta, and variously mottled and striped flowers, some of them of great beauty, but the named sorts are too fugitive to make it desirable to record a list of them.

47, The Auricula (Primula Auricula), a native of the Alps, has been an inmate of British gardens for about three hundred years, and is still prized by florists as one of their choicest flowers. The auricula loves a cool soil and shady situation. The florists’ varieties are grown in rich composts, for the preparation of which numberless reeeipts have been given; but many of the old nostrums are now ex- ploded, and a more rational treatment has taken their place. Thus Mr Douglas, themost recent authority, writes (Hardy Florists’ Flowers) :—

“There is no mystery, as some suppose, about the potting, any more than there is about the potting inaterial. Thc compost should consist of turfy loam four parts, leaf-mould one part, sharp river or silver sand one part, and a few bits of broken charcoal mixed with it. The pots to be used should be from 3 te 4} inches in diameter, inside measure; about 1 inch of potsherds should be placed in the bottom of each pot, and over this some fibrous turf,

from which the fine particles of earth have been removed, ‘The old soil should ne shaken from the roots of the plants to be potted; and before potting cut off, if necessary, a portion of the main root. In potting press the soil rather firmly around the roots.”

Auriculas are best grown in a cold frame mounted on legs about 2 feet from the ground, and provided with hinged sashes. A graduated stage formed of wood battens 6 inches broad, with arise of 2inehes, should be fixed so as to take each one row of pots, with the plants standing at about 15 inches from the glass ; the spaces between the shelves should be closed, while the top board of the back and the front should be hinged so as to be let down when desired for ventila- tion, the sashes, too, being movable for the same purpose, and also to afford facilities for examining and attending to the plants. This frame should face the north, and stand under shelter of a wall or hedge. No protection will be needed except in very severe frosts, when two or three thicknesses of garden mats may be thrown over the glass, and allowed to remain on until the soil is thawed, should it become frozen.

Auriculas may be propagated from seed, which is to be sown as soon as ripe, in July or August, in boxes, kept under cover, and exposed only to the rays of the morning sun. When sced has been saved from thie finer sorts, the operation is one of considerable nicety, as it not unfrequently happens that the best seedlings are at first exceedingly weak. They generally flower in the second or third year, a few good sorts being all that can be expected from a large sowing. The established varieties are increased by taking off the offshoots, an operation which is performed at the time of potting in July or the beginning of August.

The original of the auricula is a hardy perennial herb, of dwarf habit, bearing dull yellowish blossoms. This and the eommoner forms raised;from seed, as well as one or twodouble forms, are interest- ing hardy border flowers. The choice florists’ varieties are divided into five classes :—the green-cdged, with the margins of the flowers green; the grey-edged, with the green margins powdered with meal so as to appear to be coloured grey ; the white-cdged, with the mealy powder so dense as to cover the green ; the selfs, which have none of the green variegation of margin seen in the fore- going, but are of some distinct eolour, as purple, maroon, &c., but have, like

the preceding, a white paste surrounding the eye ; and the alpines, which resemble the selfs in not having any green marginal variegation, but differ in having a yellow centre more or less dense, The individual flowers of the first three groups of florists' auriculas show four distinct cireles :—first the eye or tube, which should have the stamens lying in it, but sometimes has the pin-headed stigma instead, which is a defeet ; second, the paste or cirele of pure white surrounding the eye ; third, the body colour, a circle of some dark tint, as maroon or violet, which feathers out more or less towards

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the edgc, but is the more perfect the less it is so feathered, and is quite faulty if it breaks through to the outer eircle ; fourth, the margin, which is green or grey or white. These cireles should be about equal in width and clearly defined, and the nearer they are to this standard the more perfeet is the flower. In the group of selfs the eonditions are the same, except that there 1s no margin, and con- sequently the body eolour, which should be uniform 1m tone, extends to the edge. In the alpines there should be no paste or white surrounding the eye, but this space should be either golden-yellow or creamy-yellow, which makes two subdivisions in this group ; and the body colour is more or less distinctly shaded, the of a paler hue. There is besides a group of laced alpines, in which a distinct and regular border of colour surrounds each of the marginal lobes.

The following is a sclection of good sorts now obtainable in the respective groups :—

Green-edged.—Leigh's Col. Taylor, Booth's Freedom, Litton's Imperator, Ashton's Prince of Wales, Trail's Prince of Greens, Page's Champion.

Grey-edged.—Headly's George Lightbody, TLancashire's Lancashire Hero, Sykes's Complete, Kay's Alexander Meiklejohn, Walker's George Levick,

Headly’s C. E. Brown.

W hite-edged.—Heap’s Smiling Beauty, Hepworth’s True Briton, Ashworth’s Regular, Taylor’s Glory, Summerscale’s Catherina, Lee’s Bright Venus.

Selfs._Netherwood’s Othello, Campbell’s Pizarro, Spalding’s Blackbird,

Pohlman’s Garibaldi, Turner’s C. J. Perry, Lightbody’s Meteor Flag.

Alpines.—Turner’s J ohn Leech, Turner’s Bessie Ray, Gorton’s Diadem,

Turner’s A. F. Barron, Turner’s Jessie, Turner’s Susie Matthams.

48, The Carnation (Dianthus Caryophyllus), a native, as some suppose, of Italy, but occasionally found in an apparently wild state in England, has long been held in high estimation as a garden flower, not only for the beauty its blossoms. ‘The varieties are numerous, and are ranged under three groups, called bizarres, flakes, and picetees. The last, from their distinctness of character, are now generally looked upon as if they were a different plant, whereas they are, in truth, but a seminal development from the carnation itself, their number and variety being entirely owing to the assiduous endeavours of the modern florist to vary and to improve them.

The true carnations, as distinguished from icotees, are those which have the colours arranged in longitudinal stripes or bars of variable width on each petal, the ground colour being white. The bizarres are those in which stripes of two distinct amlaiie occur on the white ground, and it is on the purity of the white ground and the clearness and evenness of the striping that the technical merit of each variety rests. There are scarlet bizarres marked with scarlet and maroon, crimson bizarres marked with crimson and purple, and pink and purple bizarres marked with those two colours. The flakes are those which have stripes of only one colour on the white ground, and here we have purple flakes striped with purple, scarlet flakes striped with scarlet, aud rose flakes striped with rose colour. There are still the selfs, or those showing one colour only, as white, yellow, crimson, urple, &c., and these are cominonly called cloves.

The picotee differs from the carnation in having the petals laced instead of striped with a distinct colour; the subgroups bear the designations red-edged, purple-edged, rose-edged, and scarlet-edged, all having white grounds ; each group divides into two sections, the heavy-edged and the light-edged respectively. In the heavy- edged sorts the colour appears to be laid on in little touches, passing from the edge inwards, but so closely that they coalesce into one line of colour from 34, to #5 of an inch broad, and more or less feathered on the inner edge, the less feathered the better ; while the light- edged sorts display only a fine edge, colour on the white ground. To these have to be added yellow picotees, a group of great beauty, but deficient in correctness of marking.

Even the choice varieties of the carnation or picotee may be very successfully grown in most unfavourable localities; but the com- moner sorts, sueh as may be raised freely from seed, on account of their robust constitution, are perhaps to be preferred for the ordinary flower garden ; while the single-flowered sorts are by no means to be despised, especially those having decided colours. It is by selecting the best seedlings that new varicties of merit are produced. The established varieties are propagated by layers or by pipings, the former plan being adopted with strong healthy plants inanordinarily congenial season. The latter is sometimes had recourse to when the

lants do not produce young shoots of sufficient length to admit of their being layered; and the cuttings, planted under close glasses in a bed where there is a very slight bottom heat, will generally root. Layering is, however, a more expeditious mode. It is performed at the time the plants are in flower, oras soon after as possible, The rooted layers may beremoved and potted or planted out towards the end of September, or early in October, the choice sorts being potted in rather small pots and kept in a cold frame during winter, at which season the great enemy to be guarded against is damp.

The soil for carnations and picotees should be a good turfy loam, free from wireworm, and as fibry as it can be obtained ; to four parts of this add one part of rotten manure and one of leaf-mould, with sufficent sharp sand to keep it loose.

old lime rubbish, if attainable, will also be an advantage. This

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commonly called a wire edge, of |

HORTICULTURE

‘the last; a little coarsely-pounded gritty matter may be added

A moderate addition of |

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should be laid up ina dry place, and frequently turned over with the fork or spade, so as to be in a free friable condition for use towards the end of February or early in Mareh. As to the size of the blooming pots, Mr Douglas observes :—

“J do not care to use them larger than 10 inches in diameter, inside measure, and three plants may be put into a pot that size; a 9-inch pot may be used for a pair of a strong-growing sort, while weaker growers may be potted two in an 8-inch or even a 7-inch pot. If it is intended to propagate all the layers produced, that must be taken into account, as the plants will not have so good a chance ina small as in a large pot. After potting they should be kept in a well-ventilated frame until established, and set in the open air in an open sunny spot when the weather becomes genial, the flowering stems being tied up carefully as they grow up. At the flowering season they should be put in a thoroughly ventilated glass house, where they can be shaded from bright sunshine, or under the protection of a canvas screen to keep off rain and sun. Where there is any tendency in the flowers to burst the calyx on one side, the other divisions should be slit down a little, and the calyx should have a ligature, not too tight, of thread or matting; this, if done early, will prevent the petals falling aside and destroying the symmetry of the flower.”

The groups are so numerous that sorts would occupy too much space. may beobtained from Mr Dou las's book already referred to (Hardy Florists' Flowers) ; and critically descriptive lists of all the varieties then grown, by the highest authority, Mr E. S. Dodwell, will be found in the volumes of the Florist and Pomologist for 1876 and 1877.

49, The Chrysanthemum most popular of autumn flowers. it has long been introduced. The small-flowered pompons, and the grotesque-flowered Japanese sorts are of more recent date, the former having originated from the Chusan daisy, a variety introduced by Mr Fortune in 1846, and the latter having also been intro- duced by the same traveller about 1862. The plants may be in- creased by division, in March or April, the divided portions being planted in beds of rich soil, under ts shelter of a wall or fence, as a safeguard against cold and stormy weather. The shoots should be thinned out to about four or six from each root, and these should be staked as they grow up. They look extremely well in such a border, if arranged in two or three rows according to their heights, and with a judicious intermixture of colours, the advantage of growing them in this way being that a canvas screen can be put over them, by which means they not only flower in greater perfection, but last for alonger period. They are of the easiest culture, and may be grown readily enough even in town gardens,

The chrysanthemum is, however, of very great importance as a grecnhouse plant for autumn and winter flowering, and for this pur- pose, as well as for exhibition culture, it is generally raised from cuttings, or suckers, which are taken off by some growers about October, and planted singly in 3-inch pots, the plants being wintered in cold frames, and shifted into larger-sized pots about March ; they are topped when about 6 inches high, and the young shoots thus induced are again topped when 3 or 4 inches long. Others take short cuttings in March, and strike them quickly in a mild hotbed, airing freely as soon as rooted, and shifting and stop- ping as in the other case. 'As soon as fine weather sets in in June, the plants, having received one or two previous shifts aceording to the size which they are required to reach, should be plunged outdoors in a tolerably open spot, and there carefully watered and syringed. About the middle of July they should be shifted into their blooming ae the pompons requiring less room than the large-flowered and

apanese sorts, and after the end of July it is not advisable to con- tinue the topping—technically ‘ stopping ”—of the young shoots, as it may interfere with the blooming. ‘As soon as the flower-buds become visible, the plants are benefited by a watering of weak liquid manure two or three times a week. The pots should still be plunged in a bed of coal ashes or cocoa-nut refuse, till about the end. of September, when they should be put under glass as a precaution

against injury from autumn frosts, having, however, full ventilation is necessary until the flowers are

by day. Abundant root watering developed, when the supply may be slightly diminished, and the

atmosphere should be kept dryish by abundant veutilation. The compost used for potting in all the stages afterthe cuttings, for which any light earth will suffice, should consist of four parts loam to one of rotten dung and onc of leaf-mould, giving rather more leaf-mould and less manure for the first potting, and rather more manure for

to name a Selection of the best Ample information on this head

gorts 11-inch pots are large

advantageously. For the large-flowered and §-inch pots suflice

enough to produce very handsome specimens, for the pompons, but very useful plants may be had in smaller pots than these. For fine specimen flowers only a single shoot 1s allowed to grow up, and this goes on unstopped, and finally develops two or three very large flowers ; these latter require disbudding, as some sorts give the best flowers from the terminal buds, others from the side buds. The aphis or green fly is a great enemy to the plants, and must be kept under; dusting the hearts of the shoots wit tobacco powder is a safe and efficient remedy ; but, whatever be the method employed, it should be applied before the blossoms open. The following are a few of the best varieties in each section :—

Large-flowered.—Abbé Passaglia, Alfred Saltcr, Beethoven, Beverley, Ir Brock, Emily Dale, Empress of India, George Glenny, Golden Beverley,

(Chrysanthemum sinense) is one of the Chrys Tt isa native of China, whence them

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Jardin des Plantes, Lady Hardinge, Mrs George Rundle, Mrs Heale, Prince Alfred, Prince of Wales, Princcss of Wales, Venus, White Globe. These are allincurved flowers. ‘T’o them might be added, for their merit as conservatory specimen plants, Chevalier Domage, Crimson Velvet, Julie Lagravere, and Forsyth.

SP ep gncre Taine, Fair Maid of Guernsey, James Salter, and Wizard, carly sorts; Dr Masters, Fulton, Grandifiora, Hero of Magdala, Meg Merrilees, Purpureum album, Red Dragon, aud The Daimio, later sorts.

Anemone-flowered.—Acquisition, Empress, Fleurde Marie, Gluck, King of Anemones, Lady Margaret, Louis Bouamy, Miss Margaret, Miss Pcthers, prince of Anemones, Princess Louise, Sunflower.

Pompons.—Adonis, Andromeda, Brilliant, General Canrobert, Mdlle. Martha, Modtle, St Michael, Salamon. To these may be added of Anemone-flowered pompons—Antonius, Astrca, Calliope, Cedo Nulli (four colours), Firefly, Jean Hachette, Madame Montels, Marie Stuart, Miss Nightingale, Mr Astie, Perle, Rose Marguerite, Virginale. ;

Within the last few years a new type of dwarf-growing early-blooming varieties has sprung up, and these are now increasing in number. They come into flower iu August and September, and are extremely useful for filling up exhausted beds in the flower garden as well as for cutting. They are

cultivated exactly as the others. The following are useful sorts of this group: —Adrastus, Chromatella, Delphine Caboche, Frédéric Pelé, Madame Alphonse Dufoy, Madame Picoul, Precocité, and Scarlet Gem.

50. The Crocus sets our gardens aglow with its bright colours al- most as soon as winter has departed. These crocuses of the flower garden are mostly seminal varieties of C. vernus and C. aurcus, the former yielding the purple and striped, and the latter the yellow varieties. The headquarters of the genus is in eastern Europe and Asia Minor, but C. vernus is found wild in some parts of England. {t has been much improved by Dutch florists, and large quantities are annually imported from Holland. The crocus succeeds in any fairly good garden soil, and is usually planted near the edges of beds or borders in the flower garden, or in broadish patches at intervals along the mixed borders. The roots or corms should be planted 3inches below the surface, and as they become crowded they should be taken up and replanted with a refreshment of the soil, at least every five or six years, Crocuses have also a pleasing effect when dotted about on the lawns and grassy banks of the pleasure ground. Some of the best of the varieties are :—

Purple: David Rizzio, Sir J. Franklin. Shaded light blue: Lilaceus superbus. Blue tipped with white: Ne plusultra. Striped: Albion, La Majestueuse, Sir Walter Scott, Cloth of Silver. White: Caroliue Chisholm. Yellow: Large Dutch, Cloth of Gold.

The species of Crocus are not very readily obtainable, but those who make a speciality of hardy bulbs ought certainly to search them out and grow them. They require the same culture as the more familiar garden varieties ; but, as some of thein aré apt to suffer from excess of inoisture, it is advisable to plant them in prepared soil in araised pit, where they are brought nearer to the eye, and where they can be sheltered when necessary by glazed sashes,—which, however, should not be kept closed except when the plants are at test. The autumn-blooming kinds include many plants of very great beauty.

Of the spring-flowering species, there are C. aureus, Susianus, stellaris, sulphureus, chrysanthus, mesiacus, Olivieri, and vitellinus, having yellow flowers of various shades ; C. vernus, etruscus, Imperati,minimus, suaveolens, and veluchensis, with blue or lilac flowers; C. albiflorus,

Fleischerianus, versicolor, strictus, and biflorus, with white or whitish flowers. Of the autumn-blooming species, there are C. speciosus, Clusianus, medius, Orpha- nidis, longiflorus (odorus), Pallasii, Thomasii, Salzmannianus, nudiflorus, autumnalis, serotinus, Sieberi, Cartwrightianus, and byzantinus, with lilac or purple flowers; C. Boryauus, vallicola, hadriaticus, cancellatus, and Cambes-

sedianus, with white or whitish fiowers; and C. Scharojani with flowcrs of a rich saffron yellow.

51. The Crown Imperial (Fritillaria imperialis) grows up to a height

i erial, of abont 3 feet, the lower part of the stoutish stem being furnished

with leaves, while near the top is developed a coronal of large pendent flowers surmounted by a tuft of bright green leaves like those of the lower part of the stem, only smaller. The flowers are bell-shaped, yellow or red, and in some of the forms double. The plant grows freely in good garden soil, preferring a deep well-drained loam, and isall the better for a top-dressin g of manureas it approaches the flowering stage. Strong clumps of five or six roots of one kind have a very fine effect. It isa very suitable subject for the back Tow in mixcd flower borders, or for recesses in the front part of shrubbery borders. It flowers in April or early in May. There are a few named varieties, but the most generally grown are the single and double yellow, and the single and double red, the single red having also two variegated varieties, with the leaves striped Tespectively with white and yellow.

52. The florists’ Dahlia (Dahlia variabilis) yields two groups or varieties, which are known as show and fancy dahlias,—the former Consisting of al] self-coloured flowers and those light-ground ones Which are edged, tipped, or laced with a dark colour ; the latter, all

Oowers with the colour in stripes like a carnation, and all dark- a flowers tipped with white. Besides these there are bedding

a oe which are dwarf-growing sorts with decided colours, much Used in flower-gardens where large effects are required to be pro- weed ; and

pompon dahlias, which are very symmetrical small- Pa sorts, better adapted for cutting than the more bulky flowers – @ show varieties, _The single-flowered D. coccinea, a most brilli- Lie a elly effective ornamental plant, with some other allied an ie as recently attracted much attention, and can be com- fe ous an admirable half-hardy border flower, and well adapted cutting to fill large vases, It is rather more delicate than the

forms of D. variabilis, and the tuberous roots are very apt to be lost during winter, but it is readily raised from seeds, and if sown early flowers the same season. The varieties of the florists' dahlia selected for the flower garden should be those only which are of effective colours, whether selfs or others, and such as throw out their flower heads or long stalks clear of the foliage. The same remark applies to the pompons.

New varieties are procured from seed, which should be sown in pots or pans towards the end of March, and placed in a hotbed or propagating pit, the young plants being pricked off into pots or boxes, and gradually hardened off for plauting out in June ; they will flower the same season if the summer is a genial one. The older varieties are propagated by dividing the large tuberous roots, in doing which care must be taken to leave an eye to each portion of tuber, otherwise it will not grow. Rare varieties are sometimes grafted on the roots of others (see fig. 57, p. 237). The best and most general mode of propagation is by cuttings, to obtain which, the old tubers are placed in heat in F ebruary, and as the young shoots, which rise freely from them, attain the height of 8 inches, they are taken off with a heel, and planted singly in small pots filled with fine sandy soil, and plunged in a moderate heat. They root speedily, and are then transferred to larger pots in light rich soil, and their growth encouraged until the planting-out season arrives, which is about the middle of June.

Dahlias succeed best in an open situation, and in rich deep loam, but there is scarcely any garden soil in which they will not thrive, if it is manured. For the production of fine show flowers the ground must be deeplytrenched, and well manured annually. Thebranches as well as the blossoms require a considerable but judicious amount of thinning ; they also necd shading in some cases, and individual protection from rain and wind. They may stand

singly like com- mon border flowers, but have the most imposing appearance when seen in masses arranged according to their height. Florists usually devote a plot of ground to them, and plant them in lines 5 to 10 feet apart. This is done about the beginning of June, sheltering them if necessary from late frosts by inverted pots or in some other convenient way. Old roots often throw up a multitude of stems, which render thinning necessary. As the plants increase in height, they are furnished with strong stakes, to secure them from high winds. Dahlias flower on till they are interrupted by frost in autumn. The roots are then taken up, dried, and stored in a cellar, or some other place where they may be secure from fros and moisture. See article Danuta, vol. vi. p. 762.

53. The Delphinium, or Bee-Larkspur, is so called from the resem- Del- blance of the petals in the original species, D. elatum, to the hairy phininm. bodyofa bee. The original had comparatively small flowers, but by hybridizing they have been very much increased in size,and improved in quality, and now constitute one of the brightest ornaments of – the mixed border, or the shrubbery group, often throwing up second- ary blooming steins, especially if the first are removed in good time, instead of being allowed to form seeds. The colour varies from red- dish-blue to pale blne or grey, but the prevailing one is dark blue. Delphiniums need a good rich soil, that of a loamy character being the best. They must be replanted at least every second year, and the soil either renewed or well manured and thoroughly broken up. Replanting may be done equally well early in autumn or when growth recommences in spring. The commoner single varieties, such as the brilliant D. formosum, may be reproduced with but slight variation from seed, but the double ones must be propagated by division. Unless sown as soon as ripe the seed is apt to take long to vegetate. If novelties are required, the flowers can be cross- fertilized. For mere propagation the best method is division; for this purpose the stems should be cut down early, say in July, the offsets potted each into a small pot of light soil, and wintered in a frame. The plants should be well exposed to the sun, but sheltered from strong winds, and promptly and carefully staked. Ina mixed border they should be planted in one of the back rows; but their spire- like inflorescence is very effective when they are plantcd several together in a group or bed ju the front part of the shrubbery border.

They vary in height from 8 to 6 fect. The following are some of the best modern varieties :—

Single-jlowered.—Amabilis, Celestial, Gloire de St Mande, Madame Chaté Madaine Henri Jacotot, Mrs Gerard Leigh.

Double-slowered.—Barlowi, Clair Courant, grandiflorum plenum, Keteleeri, Manteau de Minerva, Roi Léopold.

54. The Gladiolus, described separately in vol. x. p. 732, has be- Gladio- come one of our most popular flowers, and is a striking ornament of lus. our gardens during the late summer months. The modern race of flowers has sprung from G. gandavensis, but others (see separate article)are grown to asmaller extent, and come in at an earlier season.

G. cardinalis, cruentus, and floribundus belong to this latter series, and are pretty subjects for the mixed borders, while for beds G. brenchleyensis, one of the early hybrids, is still one of the most brilliant and effective, the flowers being of a glowing scarlet. The choicer kinds afford a variety of eolours, including white, yellow, blush, rose, salmon, cerise, scarlet, crimson, and rosy-purple, many of them being prettily striped or blotched. Being tall (3 to 4 feet), and spare of leaves, they are most effective when planted in beds

tips of the leaves assume a withered appearance, to take up the bulbs, and to lay them sideways on the ground, covering them with an.inch or two of earth. About three weeks later they are again taken up and eleaned. In the store-room the roots should he kept dry, well-aired, and apart from each other.

Few plants are better adapted than the hyacinth for pot culture as greenhouse decorative plants ; and by the aid of forcing they may be had in bloom as early as Christmas. They flower fairly well in 5-inch pots , the stronger bulbs in 6-inch pots. To bloomat Christmas, they should be potted early in September, in a compost resembling that already recommended for the open-air beds ; and, to keep up a succession of bloom, others should be

potted at intervals of a few weeks till the middle or end of November. The bulbs should be planted about level with the soil, and if a little sand is put immedi- ately around them so much the better. The pots should besetinan open place on a dry hard bed of ashes, and. be covered over to a depth of 6 or 8 inches with thesame material; and when the roots are well developed, which will take from six to eight wecks, they may be re- moved toa frame, and gradually exposed to light, and then placed ina forcing pit in a heat of from 60° to 70°. When the flowers are fairly open, they may be removed to the greenhouse or conservatory.

The hyacinth may be very successfully grown in glasses for orna- ment in dwelling houscs. The glasses are filled to the neck with rain water, a few lumps of charcoal being dropped into them. The bulbs are placed in the hollow provided for them, so that their base just touches the water. This may be done in September or October. They are then set ina dark cupboard for a few weeks till roots are frecly produced, and then gradually exposed to light.

There are both single and double-flowered varieties, but the single are generally preferred, as the bells are arranged more closely, so that they form a better spike than the doubles. A few good sorts are named below :—

Reds.— Of singles—Cavaignac, Lina, Macaulay, Norma, Sultan's Favourite, Von Schiller, Vuurbaak, Josephine, Fabiola, Robert Steiger, Madame Hodgson, Emmeline. Of doubles—Lord Wellington, Waterloo, Milton.

Blues.—Of singles—Argus, Charles Dickens, Grand Lilas, Haydn, Lord Palmerston, Orondates, Baron von Tuyll, Bleu Morant, Leonidas, General Havelock, ¥eruck Khan, Von Humboldt; the last three very dark, Of doubles —Laurens Koster, Van Speyk, Bloksberg.

Whites.—Of singles—Grand Vainqueur, Mont Blanc, Queen of the Nether- lands, Grand Vedette, Madame Van der Hoop, La Franchise, La Grandesse, Elfrida (blush), Grandeur & Merveille (blush), alba maxima, Mirandoline, Queen Victoria. Of doubles—La Tour d'Auvergne, Prince of Waterloo, Jenny Lind.

Yellows.—Of singles—Ida, Bird of Paradise, Duc de Malakoff (striped with red). Of doubles—Jaune Supreme, Ophir d'Or, Croesus.

To these may be added the early-flowering single white Roman hyacinth, a small-growing pure white variety, remarkable for its fragrance, and well adapted for forcing, as it can be had in bloom if required by November. For windows it grows well in the small glasses commonly used for crocuses ;

and for decorative purposes should be es about five bulbs in a 5-inch pot, or in pans holding a dozen each. If grown for cut flowers it can be

planted thickly in boxes of any convenient size.

57. The Iris family includes a large number of kinds of various Iris, habit and character, all of them being plants of exceeding beauty, and remarkable for their brilliant colours, and for having the three outer segments of their flowers reflexed. There are two well-distin- guished groups called the bulbous and the rhizomatous. The hardier bulbous irises, including the Spanish iris (I. Xiphium), and the English iris (I. xiphioides), require to be planted in thoroughly drained beds in very light open soil, moderately en- riched, and should havea rather sheltered position. Both these pre- sent along series of beautiful varieties of the most diverse colours, flowering in June and July, the smaller Spanish iris being the earlier of the two. 'There are many other smaller species of bulbous iris. Being liable to perish from excess of moisture, they should have 4 well-drained bed of good but porous soil made up for them, in some sunny spot, and in winter should be protected by a 6-inch covering of half-decayed leaves or fresh eocoa-fibre refuse. To this set belong I. persica, reticulata, filifolia, Histrio, juncea, and others.

'he herbaceous perennial irises, known commonly as the flag irises, are for the most part of the easiest culture ; they grow in any goo free garden soil, the smaller and more delicate species only needing the aid of turfy ingredients, either peaty or loamy, to keep it light and open in texture. The earliest to bloom are the forms of Iris pumila, which blossom during March, April, and May, and are quite dwarf in habit. I. susiana and I. iberica, with singularly mottled flowers, also dwarf in habit, bloom in April and May ; and during the latter month and the following one most of the larger

species, suc as J. germanica, florentina, pallida, variegata, amoena, flavescens, sambucina, neglecta, ruthenica, &c., produce their gorgeous flowers. Of many of the foregoing there are, besides the typical form, acon-siderable number of named garden varieties.

The beautiful Japanese Iris Kempferi is of comparatively modern introduction, and though of a distinct type is equally beautiful with the better known species. In their outer segments they are rather spreading than deflexed, forming an almost circular flower, which becomes quite so in some of the very remarkable duplex varieties, in which six of these broad segments are produeed instead of three. Of this too there are numberless varieties cultivated under names. They require a sandy peat soil, on a cool moist subsoil.

furnished below with some bushy foliage plants, between which their spikes of brilliant flowers may appear ; or they may be planted in the _ nixed border, where clumps of half a dozen roots of one kind have a much finer appearance than when they are dotted about singly.

‘A deep sandy loam is the best soil for the gladiolus, and this should be trenched up in October and enriched with well-decomposed manure, consisting partly of cow dung, the manure being disposed altogether below the bulbs, a layer at the bottom of theupper trench, say 9 inches from the surface, and another layer at double that depth. The bulbs (technically, corms) should be planted in succes-

sion at intervals of two or three weeks through the months of March, April, and May. They should be planted about 3 inches deep, a little pure soil or sand being laid over each before the earth is closed in about them, an arrangeinent which may be advantageously followed with bulbous plants generally. In hot summer weather they should have a good mulching of half-rotten manure, and, as soon as the flower spikes are produced, liquid manure may occa sionally be given them with advantage. ;

The gladiolus is easily raised from seeds, which should be sown in March, in pots of rich soil placed in heat, the pots being kept near the glass after they begin to grow, and the plants being gradually hardened to permit their being placed out-of-doors in a sheltered spot for the summer. In October

they will have ripened off, and must be taken out of the soil, and stored in paper bags in a dry room secure from frost. ‘They will have made little bulbs from the size of a hazel nut downwards,’according to their vigour. In the spring they should be planted like the old bulbs, and the larger ones will flower during the season, while the smaller ones must be again harvested and planted out as before. :

The following are good varieties of their respective colours, but new varieties are continually appearing, which have at least the merit of constitutional vigour :—

Crimson, Scarlet, Red, &c.—Norace Vernet, John Waterer, Lord Brid- port, Victory, Virgil, Lord Napier, Hesperia, Magnificent, Astrea, Lycoris, Addison, Meyerbeer.

Rose, Salmon, d&:c.—Figaro, Mons. Legouve, Sappho, Madame? Furtado, Oberon, Grandeur, Ulysse, Milton, Ninon de ’Enclos, Sir Joseph Paxton.

Purple.—Antiope, Eugene Scribe, Robert Fortune, Lacéptde, Thomas Methven, Madame Vilmorin, La Favorite, Mozart.

White ground.—Accius, Mrs Reynolds Hole, Reine Blanche, Canova, Hogarth, Osci, Didon, Norma, Sylphide, Madame Adéle Souchet, Berthe Rabourdin.

Fellow,—-Citrinus, Nestor, Yellow King, Ophir, Croesus, Pactolo.

Holly- 55. The Hollyhock (Althea rosea), having been already treated

hock, of in this volume (page 102), it only remains to add that, though it is a perennial, it is not to be had in perfection unless a supply of young plants is raised annually. The early part of August may be considered as the season for the blooming of the hollyhock.

The following are a few good sorts for a beginner:—Acme, Black Gem, Constance, Conquest, ; Edward ‘Speed, Eleanor, Emperor, Fire King, Golden Drop, Incomparable, Jessie Dean, Joshua Clarke, Marvellous, Mr Chater, Octavia, Ruby Quecn, Scarlet Gem, Tyrian Prince.

Hya- 56. The Hyacinth (Hyacinthus orientalis), noticed underthe head-

cinth, ing HyacrnTu (q.v.), one of the most beautiful and fragrant of the spring flowers, is a native of the Levant, where it occurs abundantly, in form not unlike our common harebell. It has long been a favourite in the East; but it has been brought to its present arti- ficial perfection in Holland, chiefly since the beginning of the last century, and the bulbs are annually imported from Haarlem and its vicinity in very large numbers.

The hyacinth delights in a rich light sandy soil. The Dutceli in- eorporate freely with their naturally light soil a compost consisting of one-third coarse sea or river sand, onc-third rotten cow dung without litter, and one-third leaf-mould. The soil thus renovated retains its qualities for six or seven years, but hyacinths are not planted upon the same place for two years successively, intermedi- ary erops of narcissus, crocus, or tulips being taken. A good com- post for hyacinths is sandy loam, decayed leaf-mould, rotten cow dung, and sharp sand in equal parts, the whole being collected and laid up in a heap and turned over occasionally. Well drained beds made up of this soil, and refreshed with a portion of new compost annually, would grow the hyacinth to perfection. The best time to plant the bulbs is towards the end of October ; they should be arranged in rows, 8 inches asunder, there being four rows in each bed. The bulbs should be sunk about 3 or 4 inches decp, with a small quantity of clean sand placed below and around each of them. The beds should be covered with deeayed tan-bark, or half-rotten dung litter, and in severe weather may be covered with mats supported on hoops, which may be continued at night when the plants have grown up, but they should have full ex- posure to daylight. As the flower-stems appear, they are tied to little rods to preserve them from accident. if the bulbs are at all prized, the stems should be broken off as soon as the flowering is over, so as not to exhaust the bulbs; the leaves, however, must be allowed to grow on till matured, but as soon as they assume a yellow eolour, the bulbs may be taken up, the leaves cut off near their base, and the bulbs laid out in a dry airy shady place to ripen, after which they are cleaned of loose earth and skin, ready for storing. It isthe practice in Holland, about 2 month after the bloom, or when the

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Lia

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a rather heavy character.

and canadens

and peat, with plenty of sharp grit, and a cool moist bottom.

The margin of rhododendron beds, where there are sheltered recesses amongst the plants, suit many of the more delicate species well, partial shade and shelter of some kind being essential. The bulbs should be planted about 6 inches below the surface, which should at ouce be mulched over with half-decayed leaves or cocoa-

fibre to keep out frost.

Dr Wallace, who has paid much attention to the culture of these

plants, remarks, in his Notes on Lilies, that—

“Lilies require, so far as their roots are concerned, a cool bottom, abundant moisture, and for most kinds a free drainage.” He also recommends so that the roots may easily get into a m the scorching drying influence of the , 80 that the roots may be at work all y border, not exhausted by the roots 8 Obtain moisture, and yet not be

to “plant deeply, say 6 to 8 inches, moist subsoil, and be sheltered fro sun’s rays, to plant early in the autumn the winter, and to plant in a cool shad: of trees, where the roots may alway

saturated.”

The noble yellow band

plant when grown to perfection; and so are the varie

L. auratum, with its large white flowers, having a agnificent ties called

and numerous red or purple spots, is a m

rubro-vittatum and cruentum, which have the central band crimson instead of yellow. Of L. speciosum, also Japanese, the true typical

form and the

red-spotted and white varieties are grand plants for

late summer blooming in the conservatory. The tiger lily, I, tigrinum, and its varieties Fortunei, splendidum, and flore-pleno, are amongst the best species for the flower garden, L. Thunbergi-

anum and its

many varieties being also good border flowers. The

pretty L. Leichtlinii and colchicum, with drooping yellow fiowers, and the scarlet drooping-flowered L. tenuifolium make up, with

those already

mentioned, a series of the finest hardy flowers of the

summer garden. The Indian L. giganteum is perfectly distinct in character, having broad heart-shaped leaves, and a noble stem 10

feet high, be

aring a dozen or more large deflexed, funnel-shaped,

white, purple-stained flowers; and the Chinese L. cordifolium is similar in character, but dwarfer in habit,

For pot culture, the soil should consist of three parts turfy loam to one of leaf-mould and thoroughly rotted manure, adding enough pure grit to keep the mass porous. If leaf-mould is not at hand, turfy

peat may be

substituted for it. The plants should be potted in

October. The pots should be plunged in a cold frame and protected from frost, and about May may be removed to a sheltered and moderately shady place out-doors to remain till they flower, when they may be removed to the greenhouse. This treatment suits the gorgeous L. auratum, the splendid varieties of L. speciosum, and also the chaste-flowering trumpet-tubed 1. longiflorum and its varieties. 59. The Lobelia is familiar in gardens under two very different forms, that of the dwarf-tufted plants used for summer bedding, and that of the tall showy perennials. Of the former the best type is L. rinus, growing from 4 to 6 inches high, with many slender stems, bearing through along period a profusion of small but bright blue two- Pd flowers. That which is called speciosa offers the best strain of the dwarf lobelias, but the actual varictics are being constantly superseded by new sorts. A good variety will reproduce itself suffi- ciently true from seed for ordinary flower borders, but for formal Ing arrangements it is necessary to secure exact uniformity by

Propagating from cuttings. he herbaceous lobelias, of which L. fulgens may be taken as the

type, may be

called hardy except in so far as they suffer from damp

M winter; they throw upa series of short rosette-like suckers round the base of the old flowering stem, and these sometimes, despite all the care taken of them, rot off during winter. The roots should either be taken up in autumn, and planted closely side by side in

oxes of dry coal ashes, these being set for the time they are dormant either in a cold frame or in any airy place in the greenhouse; or they may be left in the ground, in which case a brick or two should

© put beside the plants, some coal ashes being first placed round them, and slates to protect the plants being laid over the bricks, one end testing on the

earth beyond. About February they should be Placed in a warm pit, and after a few days shaken out and the

suckers parted, and

potted singly into small pots of light rich earth.

After being kept in the forcing pit until well established, they

should be mo cold frame pr

ved to a more airy greenhouse pit, and eventually toa eparatory to planting out. They should have a loamy

Some species, as L. Marta-

tii, par-

rere CULTURE – 257

58. The Lily (Lilium) is a very popular family of hardy bulbous flowers, and one which takes a high position in public estimation. The species are very handsome, and some of them have long been grown. They are so numerous and varied that no general cultural instructions will be alike suitable to all. gon, candidum, chalcedonicum, Szovitsianum, and others, will grow in almost any good garden soil, and succeed admirably in loam of L. chalcedonicum has an especial dislike to peat, which on the other hand suits the tiger lily (L. tigrinum) well, and is indispensable for the beautiful American L. superbum e. ‘The choice and more delicate species, such as the grand L, auratum, speciosum, and Krameri, which have come to us in recent times from Japan, the Californian L. Humbold dalinum, &c., and the splendid hybrid L. Parkmanni, are more particular as to soil, and require a deep bed of mixed turfy loam

soil, well enriched with manure; they require copious waterings ‘when they start into free growth. These tall-growing lobelias make good pot plants, for which purpose the suckers should be parted and the strong ones only potted singly in autumn; they should be placed in a warm pit to induce them to

root freely, transferred when well established to an airy greenhouse shelf, and shifted on frequently during spring till they occupy pots a foot in diameter. The soil should be a very rich loam, top-dressing being given when they are coming into flower, and a very free supply of water 1s essential. They may be raised from seeds, which, being very fine, require to be sown carefully; but they do not flower usually till the second year except they are sown very early in heat. A few good sorts are—Carminata, Distinction, Excellent, Peach-blossoin, Ruby, and Victoria Regina.

60. The Narcissus is a garden flower of great beauty and consider- Nar- able variety of form. The species are all bulbous plants of low cissus, stature, and are with few exceptions perfectly hardy. There are five well-marked sections.

The Hoop-petticoat Narcissi, sometimes separated as the genus Corbularia, are not more than from 3 to 6 inches in height, and possess grassy foliage and yellow or white flowers. These have the coronet in the centre of the flower very large in proportion to the other parts, and much expanded, like the old hooped petticoats. The common hoop-petticoat, N. Bulbocodium, has comparatively large bright yellow flowers; N. tenuifolius is smaller and somewhat paler; N. citrinus is paler and larger; while N, monophyllus is white. The small bulbs should be taken up in autumn and replanted in January or February, according to the state of the season. They bloom about March or April. The soil should be free and open, so that water may pass off readily.

A second group is that of the Pseudo-Narcissi, constituting the genus 4jax of some botanists, of which the daffodil, N. Pscudo-Nar- eissus, is the type. In this the corona is also very large and pro- minent, but is more elongated and trumpet-shaped, Of this group the most striking species perhaps is N. bicolor, which has the Seige s almost white, and the coronet deep yellow ; it yields two ine varieties, Horsfieldii and Empress. N. cernuus (moschatus) and N. cernuus plenus are double and single forms of a cream-coloured species of great beauty; and besides these there are N. lobularis, nobilis, obvallaris, Telamonius, maximus, and others, amongst the most stately of the species, besides N. minor and minimus, which are miniature repetitions

of the daffodil. All these grow well in good garden soil, and blossom from March onwards, coming in very early in genial seasons.

Another group, the Mock Narcissi, with coronets of medium size, includes the fine varietics of N. incomparabilis, one of which is known as butter-and-eggs, N. poculiformis (montanus), N. odorus and odorus minor (Queen Ann's jonquil), N. juucifolius, and others. The hardier forms of this set thrive in the open border, but the

'smaller sorts, like Queen Ann's jonquil, are better taken up In

autumn, and replanted in February; they bloom freely about April or May.

The Polyanthus Narcissi form another well-marked group, whose peculiarity of producing many flowers on the stem is indicated by the name. In these the corona is small and shallow as compared with the perianth. Some of the hardier forms, as N. Tazetta itself, the type of the group, succeed in the open borders in light well- drained soil, but the bulbs should be deeply planted, not less than 6 or 8 inches below the surface, to escape risk of injury from frost. Many varieties of this form of narcissus are grown. They ad- mit of being forced into early bloom, like the hyacinth and tulip. They vary with a white creainy or yellow perianth, and a yellow, lemon, primrose, or white cup or coronet ; and, being richly fragrant, they are general favourites amongst spring flowers. The jonquils, noticed above, as well as the double white narcissus, are also grown in pots for early flowering; and the polyanthus narcissi are sometimes used for bedding out in the spring garden. The following varieties are good :—Bazelman inajor, Gloriosa, Sir Isaae Newton, white with yellow cup; Grand Monarque and White Pearl, white with pale yellow cup; Paper White, pure white, early; Bathurst, Perle d' Amour, and Sulphurine, yellow with yellow or orange cup; and Grand Primo, a very fine yellow. These are planted or potted about October, and treated in the same way as the hyacinth,

There remains another little group, the Pheasant's-eye Narcissi (N. poetieus), in which the perianth is large, spreading, and con- spicuous, and the coronet or cup very small and shallow. These pheasant's-eye narcissi, of which there are several species or well- marked varieties, as N. radiiflorus, poctarum, recurvus, &c., blossom in succession during April and May, and

all do well in the open borders as permanent hardy bulbs. N. biflorus, the primrose peerless, a two-flowered whitish yellow-cupped species, is equally hardy and easy of culture; N. gracilis is yellow-flowered and blooms later, as does the yellow-flowered N. J onquilla, better known as the jonquil, of which there are single and double flowered varieties, the latter species being a great favourite.

61. The Peony isa remarkablyshowy plant, of which two very dis- Peony,

tinet types occur in gardens :—one the stout-growing herbaceous

IT, — 33

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with fleshy tuberiform roots and annual stems, which mainly from Peonia albiflora and P. officinalis; the plants with half-woody

ermanent stems, which have sprung from the Chinese P. Moutan.

The herbaceous pxonies usually grow from 2 to 3 fect in height, and have large much-divided leaves, and ample flowers of varied and attractive colours, and of a globular form in the double varieties which are those most prized in gardens. mouths of May and June as well as later in the summer, and as orna- ments for large beds in pleasure grounds, shrubberies, few flowers equal them in gorgeous effect. A good loamy soil—rather light than heavy—suits them best, anda moderate supply of manure ‘3 beneficial. They are impatient of frequent transplantings or repeated divisions for purposes of propagation, but when necessary they may be multiplied by this means, care being taken that a sound bud is attached to each portion of the tubcrous roots.

The older varieties of P. albiflora include candida, festa, fragrans, Humei, Pottsii, Reevesii, rubescens, yestalis, Whitleyi, &c. ; those of P. officinalis embrace albicans, anemoniflora, Baxteri, blanda, rosea, Sabini, &c. The garden varieties of modern times are, however, still more beautiful, the

flowers being in many instances delicately tinted with more than one colour, such as buff with bronzy centre, carmine with yellowish centre, rose with orauge centre, white tinted with rose, &. We name a selection of a few of the light and dark coloured sorts, the former including tinted whites and yellows, and the latter crimsons, roses, pinks, &c. :—

Light-colowred Varieties :—Aurora, Boule de Neige, candida plena, carnea plena, Chamois, Cleopatra, delicata, festiva miaxima, Impératrice Charlotte, Leonie, Madame Calot, Madame Vilmorin, magnifica, Marie Lemoine, Vir-Siark-colowred Varieties :—Ambroise Verschaffelt, atrosanguinea, Bossuet, Dr Bretonneau, Gloire de Douai, Jeanne d'Arc, Madame Furtado, Modeste-Guérin, Mons. de Villeneuve, Oberlin, Prince Troubetskoi, purpurea superba, Reine des Roses, Souvenir de VExposition Universelle, Surpasse Pottsii, Vic- toire d'Alma.

The Siberian P. tenuifolia, with finely-cut leaves, and crimson flowers, is a graceful border plant, and its double-flowered variety is perhaps the most elegant of its race.

The Moutans or Tree Ponies are remarkable for their sub- shrubby habit, forming vigorous plants sometimes attaining a height of 6 to 8 feet, and producing in April or May magnificent flowers which vary in colour from white to lilac, purple, and rose. ‘These are produced on the young shoots, which naturally bud forth early in the spring, and are in consequence liable, unless protected, to be cut off by spring frosts. They require to be thoroughly ripened in summer, and therefore a hot season and a dryish situa- tion are desirable for their well-being ; and they require perfect rest during winter. Small plants with a single stem, if well matured so as to ensure their blossoming, inake very attractive plants when forced. ‘They are increased by grafting in autumn on the roots of the herbaceous pxonies.

Of the older varieties the most conspicuous ts papaverifolia, while the following are of more recent acquisition -—Atrosanguinea, globosa, lilacina,

picta, Reevesiana, salmonea, and versicolor. Other garden varieties are—Gloria Belgarum, alba grandiflora, Emperor of China, lactea, ocellata, pur-

purea, atropurpurea, Rollissoni, violacea purpurea, violacea plena, unicolor purpurea, Beauty of Canton, Blanche de Noisette, Comte de Flandre, Elizabeth d’Italie, Hendersoni, Impératrice, Joséphine, Leopoldii, Madame Stuart Low, Mandarin, Professeur Morren, Robert Fortune, Triomphe de Gand, and Souvenir de Gand.

62. The Pansy.—This popular flower, also called heartsease, has sprung from the native British Viola tricolor, which has probably been crossed with some of the allied_species of this large and varied genus. The modern varieties of the pansy consist in the main of three types :—the show varieties; the fancy varieties, obtained a few years ago from Belgium, and now very much improved ; and the bedding varieties, which are free-blooming sorts marked rather by effectiveness of colour in the mass than by

quality in the individual flower, The latter are extremely useful in spring flower gardening.

The pansy flourishes in well enriched garden soil, in an open but cool situation, a loamy soil being preferable. Cow dung is the best manure. The established sorts are increased by cuttings, whilst seeds are sown to procure novelties. ‘The cuttings, which should consist by preference of the smaller growths from the centre of the plant, may be planted early in September, in sandy soil, under a hand light or in boxes under glass, and as soon as rooted should be removed to afresh bed of fine sandy soil. The seeds may be sown in August or September. The bed may be prepared early in Sep- tember, to be in readiness for planting, by being well manured with cow dung and trenched up to a depth of 2 feet. The plants should be planted in rows at about a foot apart. In spring they should be mulched with half-rotten manure, and the shoots as they lengthen should be pegged down into this enriched surface to induce the formation of new roots. If the blooms show signs of exhaustion by the inconstancy of their eolour or marking, all the flowers should be picked off, and this top-dressing and pegging down process performed in a thorough manner, watering in dry weather, and keeping as cool as possible. Suecessional beds may be put in about February, the young plants being struck later, aud wintered

in cold frames. The fancy pansies require similar treatment, but are generally of a more vigorous constitution.

When grown in pots in a cold frame, about half a dozen shoots filling out a 6-inch pot, pansies are very handsome decorative objects The cuttings should be struck early in August, and the plants shifted into their blooming pots by the middle of October; a rich open loamy compost is necessary to success, and they must be keyt free of aphides. Both the potted plants and those grown in the open beds are benefited by the use of liquid manure.

The bedding pansies possess 2 dwarf compact free-branched habit of growth, which results in the production of a constant succession of flowers.

They are a hardy race, flowering freely from the early spring onwards. These, with the varieties of Viola lutea and Viola cornuta, have latterly acquired great prominence froin their utility in furnishing early flowers for the spring garden, and novelties are being rapidly produced.

63. The Pentstemon.—Many species of Pentstemon have been in- Pent troduced to our gardens, and rank amongst the finest of all the her- mon baceous perennials. The pentstemon of the florist has, however, sprung from P. Hartwegii, a suffruticose species, which has been more or less hybridized with P. gentianoides, P. Cobsea, and possibly some others. The plants are not absolutely hardy, but endure English winters unharmed in favoured situations. They are freely multi- plied by cuttings, selected from the young side shoots, planted early in September, and kept in a close eold frame or under a hand light till rooted. They should then be potted singly in smnall pots, and wintered in a cold fraine, the pots being plunged in ashes or cocoa-nut refuse, in order to keep the soil from drying too rapidly, and to prevent the frost from injuring the young roots, To obtain strong plants, they should be shifted into 5-inch pots early in March, and kept growing in well-ventilated frames until May. They flower freely in July and August and onwards till cut down by frosts. Smaller plants may be had by leaving the cuttings in the cutting pot during the winter, and introducing them to the propa- gating pit in February or March, when their young slots can be taken off, struck, potted, and grown on in frames till about May. Seedlings, if raised in heat in February or early in March, and pricked out and forwarded under glass till May, will flower the same year, but probably not so early as those raised from cuttings.

The following are good kinds, and varied in colour and character, but new ones appear every season, and sometimes show a marked advance on the older sorts:—Andrew Hunter, Apollon, Countess of Eglinton, Bon Villageois, Col. Long, The Bride, Dr St Paul, John F. Kinghorn, J: ohn M‘Pherson, Lady Coutts Lindsay, Molitre, Mrs A. Sturry, W. 2. Laird, Le Khédive, Black Knight, Stanstead Rival, Souvenir de St Paul, Georges Sand.

64. The Phlox, with its modern improvements, constitutes one of Phi the finest of hardy herbaceous plants. There are two types—the _ pyramidalis

or early-flowering sorts, which appear to grow best in the northern districts, and the decussata or late-flowcring sorts, which are taller and are those most frequently grown in English gardens.

The early-flowering phloxes are increased by division of the root or by cuttings which may be obtained about the middle or end of March, and strike readily under a hand glass. They should be grown in beds, and will make good blooming plants for the following year. The older or blooming plants should be grown in beds of deep rich loamy soil, mulched with half-rotten dung as they come on towards flowering. They should have abundance of water in dry weather. It is not advisable to allow more than five stems to grow up to flower. The varieties of this section flower a month or six weeks earlier than those of the decussate group, and are at the height of their bloom in J uly.

A few good sorts are—Duchess of Athole, Lady Napier, Miss Robertson, Per- fection, Waverley, Stella, Alexandra, Iona, Marquis, James Mitchell, Elvin, James Neilson, Miss Hunter, Bayard, Purple Emperor, Mauve Queen.

The late-flowering phloxes may be raised either from cuttings or by division, From cuttings in early spring vigorous young plants may be obtained which flower well the following season. By divi- sion of the older plants into separate rooted portions, plants are obtained which flower well the same year. The latter require 2 deeply trenched soil, thoroughly manured, aud should be well

watered in dry weather ; indeed, as they grow up to bloom, manure water may be given judiciously with advantage.

A good selection of these are—A. F. Barron, Liervalli, Lothair, Roi des Roses, Lucien Tisserand, Madame la Comtesse de Turenne, Madame Domage, Menottii, Mons. H. Low, Coccinea, Mrs Laing, Réve a’Or, Marie Saisson, Madame Thibaut, Madame Rempler, Gloire de Neuilly, J. K. Lord, La Candeur, Mons. Malet, Chanzy, Queen of Whites. ; 4

65. The Pink of the garden has resulted from the cultivation and Pi improvement of Dianthus plumarius. The pink is a great favourite | with florists, those varieties being preferred which have the margin | of the petals

entire, and which are well marked in the centre with | bright crimson or dark purple. Its grassy but glaucous foliage 1S much like that of the carnation, but the whole plant is ginaller, an! the greater portion of the colouring of the flowers forms 2 otch | near the base of the petal, instead of being laid on in stripes as 1 © the carnation, or confined to the outer edge as in the picotee. l ;

Pinks require a free loamy soil deeply trenched, and well enriched — with cow dung. They are readily increased by pipings (fig. 60, a taken off during the flowering period, and planted in light sol

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under a hand light, or in the open ground in a shady situation; they may be planted an inch apart in rows 2 or 3 inches asunder, and should be pressed firmly into the soil. When rooted, which will be about August, they should be planted 4 inches apart in a nursery bed, where they may remain till the latter part of September or the early part of October. The chief attention required during winter is to press them down firmly should they become lifted by frosts, and in spring the ground should be frequently stirred and kept free from weeds. As the flowering stems grow up they should be supported by sticks, and when the buds appear they should be assisted to burst regularly by tying a soft ligature round them. The pink is also raised from seeds, not only to obtain new varieties, but to keep up a race of

vigorous growing sorts. The seeds may be sown in Mareh or April, in pots in a warm frame, and the young plants may be pricked off into boxes and sheltered in a cold frame. They should be planted out in the early part of the summer in nursery beds, in which, if they have space, they may remain to flower, or the alternate ones may be transplanted to a blooming bed in September or the early part of October; in either case they will bloom the following summer. These will grow in any good garden soil, but the richer it is the better.

There is also a number of varieties which are useful for forcing during the early spring months. These are propagated from early pipings, and grown in nursery beds, being taken up in October, and potted in a rich loamy compost, and wintered in a cold pit till required for the forcing house. The varieties named Anne Boleyn, Lady Blaneh, Lord Lyons, Mrs Pettifcr, and Coccinea are good useful forcing sorts.

Of choice florists' varieties the number is not very large. The following would form a good selection :—Turner's Boiard, Dr Masters, Dr Maclean, Shirley Hibberd, Lord Kirkaldy, Godfrey, and Bertram; Maclean's Annie, Beauty, John Ball, and New Criterion; Marris's Excelsior and Vesta; Kirtland's Rev. G. Jeans; Bragg's Nonpareil and Goliath; and Hooper's Beauty of Bath.

66. The Polyanthus is one of the oldest of the florists' flowers, and is no doubt an umbellate form of the primrose, Primula vulgaris. For some time it has been held in low repute, but is now coming into greater favour, and novelties are being slowly produced. The florists' polyanthus has a golden margin, and is known as the gold laced polyanthus, the properties being very distinctly laid down and rigidly adhered to. The chief of these are—a clear unshaded blackish or reddish ground colour, an even margin or lacing of yellow extending round each segment and cutting through its centre down to the ground colour, and a yellow band surrounding the tube of exactly the same hue as the yellow of the lacing. The plants are quite hardy, and grow best in strong loamy soil, toler- ably well enriched with dung and leaf-mould; they should be – about October. Plants for exhibition present a much

etter appearance if kept during winter in a cold well-aired fraine. Of these, Cheshire Favourite, Earl of Lincoln, and Criterion, with black grounds, and Exile, Lancer, and Sunrise, with red grounds, are amongst the best.

For the flower borders what are called fancy polyanthuses are adopted. These are best raised annually from seed, the young crop each year blooming in succession. The seed should be sown as soon as ripe, the young plants being allowed to stand through the winter in the seed bed. In April or May they are planted out in a bed of rich garden soil, aul they will bloom abundantly the following spring. A few of the better thrum-eyed sorts should be allowed to ripen seed; the rest may be thrown away.

67. The Potentilla, as a specialty, is a flower of modern times.

The double-flowcred varieties are especially remarkable for their

ormamental qualities. A soil of a good loamy staple, enriched with rotten dung, will grow the potentilla to perfection. They may be in- creased, though not very freely, by parting them into as many pieces as there are crowns, the side growths being those which can usually be thus separated. This may be done in autumn or spring, and the plants will generally bloom the following season. The plants like an open situation, and are well suited for filling a small or modcrate- sized bed, as the foliage is of a neat and pleasing character when the Plants are not in bloom.

The followi Houtte, weet Fénelon,

good named sorts :—Chromatella, Le Vésuve, Louis Van Meteor, Pluton, Vulcan, Le Dante, Mars, Nigra, Caméléon,

Etna. 68. The Double Primrose is closely allied to the polyanthus. here are some very handsome varieties grown, as the crimson, White, yellow, purple, blue, and others. These all succeed under the treatment given to the choicer kinds of polyanthus (par. 66). 69. The Pyrethrum is quite a modern garden flower, extremely useful as blooming in the early summer months, and remarkable for its neat habit and the great variety of eharacter and colour which it Presents, Thetype forms are the P. roseum and P. carneum of botanists, hardy perennials, with finely cut leaves, and large flower- eads,

having in the one case a ray of deep rose-coloured and in the other of flesh-coloured ligulate florets surrounding the centre or disk. They bloom during the months of May and June, as well as ter on, and are always most welcome ornaments for the flower borders, and useful for cutting for decorative purposes.

The pyrethrum grows best in soil ofa loamy texture ; this should he well manured and deeply trenched up before planting, and should be mulched in the spring by a surface dressing of half-decayed manure. The plants may be increased by division, the side shoots being taken off early in autumn with a portion of roots attached. They may be placed either in separate beds or in the mixed flower border as may be required. In beds they can be supplemented as the season passes on by the intcrmixture of later-blooming subjects, such as gladioli. Slugs are often destructive to the young shoots. Seeds should be sown in spring ina cold frame, and the young plants should be put out into beds when large enough, and should flower the following May.

The following will make a useful selection of sorts :—Aurora, Bonamy, Boule de Neige, Brilliant, carminatum plenum, Charles Baltet, delicatum, Emile Lemoine, floribundum plenum, Gloire d'Italie, Hermann Stenger, Iveryanum, La Vestale, Le Dante, Madame Billiard, Minerva, Ne plus ultra, Prince of Wales, Solfaterre, Titiens,

70. The Ranunculus (R. asiaticus), a native of the Levant, is one of the older florists' flowers, which has sported into numberless varieties, but was formerly held in much greater esteem than it is at the pre- sent time. According to the canons of the florists, the flowers, to be perfect, should be of the form of two-thirds of a ball, the outline forming a perfect circle, with the centre close, the petals smooth- edged, the colour dense, and the marking uniform.

The ranunculus requires a strong and moist soil, with a fourth of rotten dung. The soil should be from 18 inches to 2 feet deep, and at about 5

inches below the surface there should be placed a stratum 6 or 8 inches thick of two-year-old rotten cow dung, mixed with earth, the earth above this stratum, where the roots are to be placed, being perfectly free from fresh dung. The tubers are planted in rows 5 or Ginches apart, and 8 or 4 inehes separate in the rows, the turbau sorts in October, the more choice varietics in February. They should be so close that the foliage may cover the surface of the bed. The autumn-planted roots must be sheltered from frost by old tan or sifted coal ashes. The plants when in flower should be covered with an awning ; when the leaves wither, the roots are to be taken up, dried, and stored. The ranunculus is readily propagated from seed obtained from semi-double sorts, which are often of themselvcs very beautiful flowers. It is generally sown in boxes in autumn or spring. The young plants thus raised flower often in the second, and always in the third year.

The turban varieties, which are very showy for the borders, arc of a fow positive colours, as scarlet, yellow, brown, carmine, and white. The florists' varieties have been bred from the Persian typc, which is more delicate.

The following sorts may be taken as the foundation of a collection :-— Apollo, Eliza, Marquis of Hertford, Helena, Interestor, Sincerity, Garibaldi, Enchanter, Flaminius, Coronation, Strephon, Melanchthon.

71. The Tul¢p (Tulipa Gesneriana) is a native of the East, whence it was introduced into Europe about the middle of the 16th een- tury. About the year 1685 its culture was very engrossing ; and, indeed, the rage for possessing rare sorts had becoine so great in Holland as to give rise to a strange species of gambling, known to the collectors of literary and scientific anecdotes by the name of Tulipo-mania. At present, though not to be met with in every garden, the finer tulips have yet some ardent cultivators, while cer- tain varieties, as the early Due Van Thol and its allies, and the double tulips of the Tournesol type, are much used for general garden decoration, and for forcing. The latter, however, spring from other species of the genus.

The florists' varieties of tulips, which have sprung from Tulipa Gesneriana, are arranged in separate classes named bizarres, bybloemens, and roses, according to their colour and marking. Tulips are readily raised from seeds, and the seedlings when they first flower are of one colour,—that is, they are

self-eoloured. Judged by the florists' rules, they are either good or bad in form, and pure or stained (white or yellow) at the base; the badly formed and stained flowers are thrown away, while the good and pure are grown on, these being known as "'breeder"' tulips. The breeder bulbs and their offsets may grow on for years producing only self-coloured. flowers, but after a time, which is varied and indefinite, some of the progeny " break," that is, produce flowers with the variegation which is so much prized. The flower is then said to be " rectified" ; it is a bizarre when it has a yellow ground marked with purple or red, a byblamen when it has a white ground marked with violet or purple, or a rose when it has a white ground marked with rose colour. One of the most important of the properties of a fine florists' tulip is that the cup should form, when expanded, from half to a third of a hollow ball, the divisions of the pcrianth being six in number, broad at the ends, and smooth at the edges, so that the divisions may scarcely show an indenture. Another is that the ground colour should be clear and distinet, whether white or yellow. The lcast stain at the base of the flower, technically called the "bottom," would render a tulip comparatively valueless. What are called feathered flowers are those which have an even closc feathering, forming an unbroken edging of colour all round, flamed flowers being those which have a beam or bold mark down the centre, not reaching to the bottom of the cup. Some flowers are both

feathered and flamed, and in all cases the colour must be uniformly distributed. '

Tulips are usually grown in beds, which should be made up, to the depth of about 2 feet, witha rich compost of about four parts loam to one of leaf-mould and onc of thoroughly decomposed man- ure, which should have been well mixed some time before required for use. The bottom of the bed must be thoroughly drained, and so arranged that the water may not only

soak down to the bottom, but find egress there. New soilis not required every year, but it should be deeply turned up and laid in ridges, and every third year it should be renewed to about a foot in depth, and the new soil well mixed with the old. The bed should be in an open but sheltered position, and should be got ready in Scptember or carly in October, the bulbs being planted in October or early in November, 6 inches apart, and 3 or 4 inches deep. The bed should be 4 feet wide— sufficient to take seven rows of bulbs, a little river sand being placed about each. An awning shéuld be placed over the bed when the buds show colour, in order to lengthen the duration of the flowers, and removed when the flowers fade. After the flowers have fallen, the seed-vessels are broken off close by the stem, to prevent the plant from exhausting itself in perfecting seed, and to direct its energies to the forming of the new bulb, and when the leaves and stalks turn brown the bulbs are taken up and laid out for a few days in a cool airy place, when they should be stored in drawers till planting time, being occasionally examined in case any of them decay.

Tulips are readily propagated by offsets, which are taken off from the parent bulbs, and nursed in separate beds till they be full grown. New varictics are raised from seed, and are from five to seven years old before they flower.

The following are a good selection of show tulips :— Bizarres.—Feathered : Demosthenes, Sir Joseph Paxton, Garibaldi, Com-

mander, Sulphur, George Hayward. Flamed: Excelsior, Dr Hardy, Surpass |

Polyphemus, Masterpiece, Ajax, William Lea.

Bybloemens.— Feathered: William Bentley, Friar Tuck, David Jackson, Bessie, Mrs Cooper, Talisman. ‘J7amed: Duchess of Sutherland, Nimbus, Talisman, Bacchus, Adonis, Carbuncle.

Roses.— Feathered: Charmer, Industry, Nauny Gibson, Lady Wilton, Mrs Lea, Madame St Arnaud. Flamed: Annie Macgregor, Lady Sefton, Mrs Barlow, Sarah Headly, Adair, Triomphe Royale.

For decorative purposes, as forcing and spring bedding, the following are some of the best sorts grown :—

Singles—Canary Bird, Couleur Cardinal, Couronne Pourpre, Duc Van

Thol, Duchesse de Parma, Keizerskroon, Proserpine, Roi Pépin, Bride of |

Haarlem, Pottebakker, White Pottebakker, Thomas Moore, Vermillon Brillant, Yellow Prince.

Doubles.—Couroune des Roses, Duke of York, Gloria Solis, Imperator Rubrorum, Mariage de ma Fille, Overwinnar, Rex Rubrorum, Tournesol, Yellow Tournesol, La Candeur

72. Harpy Trees Ancv Saruss.—Much of the beauty of the

trees and pleasure garden depends upon the proper selection and disposition of

shrubs,

ornamental treesand shrubs. It is to be regretted that this depart- ment of the garden is often greatly neglected, and the many orna- mental subjects introduced during the last half century are too frequently overlooked by planters and garden artistes. We can only afford space here for lists of some of the better and more uscful and ornamental trees and shrubs, old and new, supplemented by a brief notice of the rhododendron and its congeners, and of the rose.

The following list, which is not exhaustive, furnishes material from which a selection may be made to suit various soils and situa- tions. The shrubs marked * are climbers.

Hardy Deciduous Trees.

Laburnum. Larix—Larch. Liriodendron—Tulip. Magnolia. Morus—Mulberry. Negundo—Box-Elder. Ostrya—Hop Hornbeam. Paulownia.

Planera. Platanus—Plane. Populus—Poplar. Ptelea—Hop Tree. Pyrus—Pear, &c.

Acer—Maple. /esculus—Horse-Chestnut. Ailantus—Tree of Heaven. Alnus — Alder. Amygdalus—Almond. Betula—Birch. Carpinus—Hornbeam. Carya—Hickory. Castanea—Chestnut. Catalpa.

Celtis—Nettle Tree. Cerasus—Cheriry. Cercis—Judas Tree.

Cotoneaster. Quercus—Oak. Cratzegus—Thorn. Rhus—Sumach. Diospyrus. Robinia—Locust Tree,

Fagus—Beech. Salix— Willow.

Fraxinus—Ash. sophora. Ginkgo—Maidenhair Tree. Taxodium—Deciduous Cypress. Gleditschia—Honey Locust. Tilia—Lime. Gymnocladus—Kentucky Coffee Tree. | Ulmus—Elm. Juglans—Walnut. Virgilia. Kolreuteria. Xanthoceras.

Hardy Evergreen Trees. Abies—Silver Fir. Libocedrus. Araucaria—Chili Pine. Magnolia.

Arbutus—Strawberry Tree. Biota—Arbor Vite, Buxus—Box. Cedrus—Cedar. Cephalotaxus. Cryptomeria—Japan Cedar. Cupressus—Cypress,

Picea—Spruce Fir Pinus—Pine.

Quercus— Oak.

Retinospora. Sciadopitys—Umbrella Pine. Sequoia (Wellingtonia). Taxus—Yew.

Tlex—Holly. Thuiopsis. Juniperus—Juniper. Thuya—Arbor Vite. Laurus—Bay Laurel. Tsuga.

HORTICULTURE

[vLOWERs,

Hardy Deciduous Shrubs.

Abelia.

Acer—Maple. ésculus—Horse-Chestnut. Amelanchier. Ampelopsis.* Amyegdalopsis.

Aralia.

Aristolochia.* Berberis—Berberry. Bignonia *—Trumpet Flower. Calophaca.

Calycanthus—Carolina Allspicc.

Caragana. Cerasus—Cherry. Chimonanthus. Clematis.* Colutea—Bladder Scnna. Cornus—Dog wood. Cotoneaster. Crateegus—Thorn. Cydonia—Japan Quince. Cytisus—Broom, &c. Daphne.

Deutzia.

Edwardsia.

Eleagnus. Euonymus—Spindle Tree. Forsythia.*

Halesia—Snowdrop Tree. Hamamelis—Wych Hazel. Hibiscus—Althea frutex, &c. Hippophae—Sea Buckthorn. Hypcricum—St John's Wort. Jasminum *—Jasmine. Kerria.

Laurus—Laurel. Ligustrum—Privet.

Lonicera **—Honeysuckle Lycium.**

Magnolia.

Menispermum **—Moonseed. Periploca.** Philadelphus—-Mock Orange. Rhus—Wig Tree, &c. Ribes—Flowering Currant, Robinia—Rose Acacia, &c. Rosa—Rose.

Rubus *—Bramble. Spartium—Spanish Broom. Spireea. Staphylea—Bladder-Nut. Symphoricarpus—Snowberry. Syringa—Lilac. : Tamarix—Tamarisk. Viburnum—Guelders Rose, &c. Vitis—Vine,

Fremontia. Weigela. Genista.

Hardy Evergreen Shrubs. Akebia.* Hypericum—St John's Wort. Arbutus. Tlex— Holly. Aucuba—Japan Laurel. Jasminum **—Jagsmine. Azara. Kadsura.**

Lardizabala.* Laurus—Sweet Bay. Ligustrum—Privet.

Bambusa—Bamboo, Berberidopsis.* Berberis—Berberry.

Buddleia. Lonicera *—Honeysuckle.

Bupleurum. Magnolia.

Buxus—Box. Osmanthus.

Ceanothus. Pernettya.

Cerasus—Cherry-Laurel, &c. Phillyrea.

Cistus—Sun-Rose. Photinia.

Cotoneaster. Retinispora.*

Cratzegus—Thorn, Rhamnus—Alaternus,

Daphne. Rhododendron—Rose-Bay. | Desfontainea. Rosa *—Rose.

Erica—Heath. Ruscus.

Escallonia. Skimmia.

Euouymus. Smilax.*

Fabiana. Stauntonia.*

Fatsia (Aralia). Ulex—Furze.

Garrya. Viburnum—Laurustinus.

Griselinia. Vinca—Periwinkle.

Hedera*—Ivy. Yucca—Adam’s Needle.

73. The Rhododendron.—In places where the soil is suitable, the Rhodo. rhododendron, on account of its flowering qualities, is fast taking dendron,

the place of the laurel in the mixed shrubbery. This plant, with its associates the azalea, kalmia, andromeda, and the like, requires, generally speaking, a peaty soil, and a cool, rather moist situation; but, though a peaty soil is preferable, especially for the choice kinds, it is not essential. When, however, the soil is loamy, it must have incorporated with it a liberal portion of Icaf-mould and decayed manure, cow dung being preferable, and, if at all heavy, some clean road grit. ‘The plants do not thrive in soil which contains cal- careous matter.

These subjects, in view of the source of most of the originals, are commonly called American plants ; and a separate plot (called the American garden) is often set apart for them. For such a plot the catawbiense type of rhododendron is preferable, being hardier, producing better foliage, and comprising many of the finest flower- ing sorts. Such varieties as Sir Thomas Sebright, Old Port, Mrs Heneage, Michael Watecrer, H. W. Sargent, Alexander Dancer, Brayanum, Scipio, Everestianum, Minnie, Mrs John Clutton, J. Marshall Brooks, Sigismund Rucker, Mrs Milner, and fastuosum flore-pleno, may be counted on as sterling sorts, which will always give satisfaction. The varieties of Azalea, though de- ciduous in habit, are desirable on account of their brilliant and effective colours, and with them may be associated such subjects as Andromeda, Cassandra, Leucothoe, Dabeocia, Daphne Cneorum, the hardy Heaths, Gaultheria, Kalmia, Ledum, Pernettya, Rhodora, Vaccinium, and Zenobia.

74. The Rose.—The rose is so universal a favourite that some por- Rose.

tion of the garden must necessarily be devoted to it, if the situation be at all favourable. Roses will not, however, thrive in the vicinity of large towns, since they require a pure air, and do not endure asmoky atmosphere. The best soil for them is a deep rich strong loam free from stagnant moisture. Very light sandy or gravelly soils, or soils which are clayey and badly drained, are not suitable, and both must be greatly improved if rosc-growing

on them is attempted. Light soils would be improved by a dressing of strong loam in conjunction with cow dung or nightsoil ; the latter, provided it is properly pre- pared and not too fresh, is indeed the very best manure for roses in all but soils which are naturally very rich. Heavy soils are improved by adding burned earth or gritty refuse, with stable manure and leaf-mould or cocoa-fibre refuse ; and damp soils must necessarily be

drained. Roses require a constant annual supply of manure, and, if this is given as a mulching in autumn, it serves to protect their rootsthrough the winter. They also require liberal supplies of water during the growing season, and especially to be kept clear of aphides and other insect pests, which may be done by dusting them with snuff while moist, and washing it off with the syringe next day, or by syringing with dilute tobacco water or some of the many in- secticides now provided to facilitate this rather troublesome task. Some growers prefer roses grown on their own roots, some on the Manetti, and others on the brier stock. There is this to be said in favour of their own roots that, if the tops are killed down by accident or by severe weather, the roots will usually throw up new shoots true to their kind, which cannot be looked for if they are worked, though it is sometimes recommended to plant deep in order that the rose itself may learn to do without its foster parent the stock. ‘Too often, however, in the case of persons unfamiliar with roses, the choice rose dies, and the stock usurps its place. An open situation, not shaded, but sheltered from strong winds, is what the rose prefers. October and November are the best months for planting the hardy kinds. The tender varieties are better laid in in a sheltered place, and the planting deferred till March or April. In regard to pruning, roses vaty considerably, some requiring close cutting and others only thinning out ; some again may be safely pruned in autumn, and others are better left till spring. Instruc- tions on this point as to the several groups of varieties will be found in most rose catalogues. Where dwarf beds of roses are required, a good plan is to peg down to within about 6 inches from the ground the strong one year old shoots from the root. In due time blooming shoots break out from nearly every eye, and masses of flowers are secured, while strong young shoots are thrown up from the centre, the plant being on itsown roots. Before winter sets in the old shoots which have thus flowered

and exhausted themselves are cut away, and three or four or more of the strongest and best ripened young shoots are reserved for pegging down the following season, which should be done about February. Inthe meantime, after the pruning has been effected, plenty of good manure should have been dug in about the roots. Thus treated, the plants never fail to produce plenty of strong wood for pegging down each succeeding season.

75. BeppIna PLANTs.—This term is chiefly applied to those summer-flowering plants, such as pelargoniums, petunias, dwarf lobelias, verbenas, &c., which are employed in masses for filling the beds of a geometrical parterre. Of late years, however, more atten- tion has been bestowed on arrangements of brilliant flowering plants with those of fine foliage, and the massing also of hardy early- blooming plants in parterre fashion has been very greatly extended. Bedding plants thrive best in maiden soil, and therefore the beds should be occasionally wholly or partly renovated with fresh earth. A light loam, liberally manured with thoroughly rotten dung from an old hotbed or thoroughly decomposed cow droppings and leaf-mould, forms the best kind of compost, but in the case of free- growing plants, like pelargoniums, over-richness must be avoided. 76. Spring Bedding. —For this description of bedding, hardy plants only must be used; but even then the choice is tolerably extensive. For example, there are the Alyssums, of which A. saxatile and A. gemonense are in cultivation ; Antennaria tomentosa; Arabis albida; Aubrietias, of which the best sorts are A. Campbellie and A. grandiflora; the double Bellis perennis or Daisy ; the Wallflowers, including Cheiranthus Cheiri (the Common Wallflower), C. alpina, and ©. Marshallii ; Hepaticas, the principal of which are the varieties of H. triloba, and the blue H. angulosa; Iberis or Candytuft; Litho-spermum fruticosum ; Myosotis or Forget-me-not, including M. alpestris, M. dissitifiora, M. azorica, and M. sylvestris; Phloxes, like P. subulata, with its varieties setacea, Nelsoni, nivalis ; the single- flowered varieties of the Primrose, Primula vulgaris; Pyrethrum Par- thenium aureum, called Golden Feather; Sempervivum calcareum ; the pink-flowered Silene pendula; self-coloured varieties of the Pansy, V. tricolor, and of V. lutea and V. cornuta, as well as some recent hybrids. Besides these there are the various spring-flowering bulbs, such as the varieties of Hyacinthus, Tulipa, Narcissus, Fritil- laria, Muscari or Grape Hyacinth, Crocus, Scilla, and Galanthus or Snowdrop.

77. Summer Bedding.—There is great variety amongst the plants which are used for bedding out in the garden during the summer months, but we can note only some of the most important of them. Amongst them are the Ageratums, the old tall-growing sorts of which have been superseded by dwarfer varieties, as Imperial Dwarf and Swanley Blue; Alternantheras, the principal of which are A. amcena, amcena spectabilis, magnifica, paronychioides major aurea, and amabilis ; Alyssum maritimum variegatum ; some of the named varieties of Antirrhinum majus, especially the dwarf varieties ; Arundo Donax variegata ; Begonias ; Calceolarias ; Cannas; Centaurea ragusina ; Clematises, of which the hybrids of the Jackmanni type are best; Dahlia variabilis, and the single-flowered forms of D. coccinea; Echeverias, of which E. secunda and E. metallica are much employed; Gazanias; Heliotropium peruvianum ; Iresine ;

the Lantanas; Lobelias; Mesembryanthemum cordifolium variega- tum; Pelargoniums, of which the various classes of zonal or bedding varieties are unapproachable for effect and general utility ; Petunias ; Phloxes; Polemonium ceruleum variegatum; Pyrethrum Parthe- nium aurcum, especially useful as an edging to define the outline of beds upon grass; Troprolums, especially some of the varieties of T. Lobbianum; and Verbenas, the offspring of Tweedieana, chamedrifolia, and others. Few bulbs come into the summer flower gardens, but amongst those which should always be well re- presented are the Gladiolus, the Lilium, and the Tigridia.

78. Subtropical Bedding.—A few yearsago the late Mr John Gibson, then superintendent of Battersea Park, introduced the style of plant- ing known as subtropical gardening, from the usc that is made ot subtropical plants. In the climate of London and the south and west of England this new feature proved very successful, but less so in the north of England and in Scotland, except in very favoured localities. These subtropical materials may be used either in masses of one kind, or in groups arranged for contrast, or as the centres of groups of less imposing or of dwarfer-flowering subjects; or they nay be planted as single specimens in appropriate open spaces, in recesses,

or as distant striking objects terminating a vista. Some of the finest of these plants of bold and striking habit are found in the Aralia or Fatsia, the Wigandia, the Montagnea, the Uhdea, and the Ferdinanda; Aralia japonica and papyrifera are very fine, and so are Wigandia caracasana and Vigieri, Montagna heracleifolia (also known as Polymnia grandis), Uhdea bipinnatifida, and Ferdi- nanda eminens. Many palms, some tree ferns, and the noble Musas, especially Musa Ensete, do fairly well in sheltered situations. The Cannas afford great variety of size, form, and colour. The dif- ferent forms of Ricinus, which are of the bolder type of subjects, the more elegant Arundo Donax and its variegated variety, and the very graceful Arundo conspicua may also be named. Arundinaria falcata and other Bamboos, if grown in large pots or tubs and plunged in shady sheltered places during summer, give a striking tropical effect; and in warm situations some of these may be intro- duced as permanent plants. Of lesser subjects Centaurea ragusina and gymnocarpa, Erythrinas, Funkias, Gunnera scabra, and some of the Solanums, as §. marginatum and robustum, are all useful and effective ; and many others might be added.

79. Carpet Bedding or Mosaiculture consists in covering the surface of a bed, or aseries of beds forming a design, with close low-growing plants, in which certain figures are brought out by means of plants of a different habit or having different-coloured leaves. Sometimes, in addition to the carpet or ground colour, individual plants of larger size and handsome appearance are dotted symmetrically over the beds, an arrangement which is very telling. Some of the best plants for carpeting the surface of the beds are—Antennaria tomen- tosa, white; Sedum corsicum and glaucum, grey; and Sedum Lydium, Mentha Pulegium gibraltaricum, and Herniaria glabra, green. The Alternantheras, Amaranthuses, Iresines, and Coleuses furnish high and warm colours; while Pyrethrum Parthenium aureuin yields greenish yellow; Mesembryanthemum cordifolium variegatum, creamy yellow; Centaureas and others, white; and the succulent Echeverias and Sempervivums, glaucous rosettes, which last add much to the general effect.

80. GreENHOUSE PLants.—These are plants requiring the shelter Green-ofa glass house, provided with a moderate degree of heat, of which house 35° Fahr. may be taken as the minimum. The house should be plants.

opened for ventilation in all mild weather in winter, and daily throughout the rest of the year.

The following is a select list of miscellaneous decorative plants in addition to special subjects which will be noticed separately :—

Abutilon Boule de Neige has pure white drooping bell-shaped flowers.

Acacias are remarkably profuse-flowering plants with yellow flowers. A. armata and A. Drummondii are flowering bushes; A. lophantha has ample fern-like leaves; A. Riceana has pale yellow flowers in early spring, and is well suited for training up rafters or pillars.

Adenandra fragrans produces highly fragrant pink star-shaped flowers in May and June.

Agapanthus is very ornamental and easily grown, A. umbellatus having a large umbel of pale blue flowers, and A. umbellatus albiflorus white flowers.

Aphelexis embraces various species of close-growing plants, half procumbent in habit, producing handsome purplish-crimson and rosy-pink everlasting flowers freely on the points of the shoots in May and June.

Aralias have large palmate leaves.

Araucaria excelsa has regularly spreading branches resembling gigantic ostrich feathers. .

Begonias. The new tuberous-rooted hybrids are very showy, and continue to flower all through the summer and autumn.

Boronias are a fine group of hard-wooded shrubs, having chiefly pink flowers, which bloom profusely from the mature wood; the best examples of the family are B. pinnata, Drummondii, and serrulata.

Chorozemas are quick-growing slender-habited plants, with highly-coloured red andsyellow pea-shaped flowers, produced in racemes from the

axils of the leaves; C. varium, cordatum, and spectabile are fine and distinct.

Cordylines are stately plants, of which the principal are C. indivisa, with a noble crown of glaucous leaves marked by orange ribs, and C. australis with narrower leaves.

Cytisus racemosus is one of the best subjects for early spring blooming, of dense bushy habit, and bearing yellow flowers; C. Everestianus has flowers of a deep orange.

Daphne indica is unsurpassed for its perfume.

Agave.

Aloe.

Azalea.

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The Dasylirions have stout woody stems aud large heads of narrow leaves.

Epacris is a winter-flowering genus, easily grown and free-blooming, the principal sorts being E. hyacinthifiora candidissima, hyacinthiflora ear-minata, miniata, and the pure white onosmefiora flore-pleno nivalis. ;

Grevilleas are shrubs of slender habit, some having handsome flowers, while G. robusta and others almost rival the ferns in the elegance of their leaves.

Hydrangea Hortensia produces immense heads of bloom of a delicate pink, which continue long in flower, and may be changed to blue by the admixture of iron filings with the soil. .

Imantophyllum miniatum is a grand plant, the umbels of pale flame-red flowers being produced at various seasons. ;

Kalosanthes consists of spleudid flowering plants, which, however, rarely bloom well two years in succession. :

Lachenalia pendula, luteola, and tricolor are exceedingly pretty dwarf bulbs, useful about April and May. : ; f

Lapageria rosea is one of the very finest greenhouse climbers in existence, and bears waxy bell-shaped red fiowers, mottled with white; L. rosea alba is still more beautiful, a clear waxy white.

Lilium auratum, speciosum, and Krameri are fine, L. auratum being one of the noblest flowering plants in existence.

Mandevilla suaveolens, a strong-growing climber, bears beautiful, fragrant, trumpet-shaped white blossoms in August and September.

The Neriums are tall strong-growing subjects, with fiowers of great beauty, produced in cymes from the points of the mature shoots.

The Passifioras produce their showy singularly-formed flowers most profusely, and are very suitable for decorating the roof of a conservatory.

Pimeleas are free-growing, compact-habited plants, producing flower-heads from the points of the shoots; P. spectabilis rosea has flower-heads, white flushed with rose, almost as large as those of a guelder-rose ; P. Hendersoni has deep pink, P. hispida white, and P. elegans straw-coloured flowers.

Pleroma elegans is a free-flowering melastomaceous shrub, producing in succession its lovely saucer-shaped flowers of the most intense purple hue, from June to September.

Plumbago capensis is another abundant bloomer, and one of the very best of greenhouse climbers, with large bunches of delicate grey-blue flowers.

The Rhododendron furnishes a large eontingent, of which the most suitable are Countess of Haddington, Dalhousie, Edgworthii, Gibsoni, Thompsoni, javanicum, with jasminifiorum and its beautiful varieties, Princess Royal, Princess Alexandra, Princess of Wales, and Duchess of Edinburgh.

Statices include some very highly ornamental plants, especially 8. brassicecfolia, profusa, and imbricata.

Tacsonias are magnificent elimbers; indeed, T. Van Volxemii is one of the very finest of the climbing plants which flower in autumn.

Trachelospermum jasminoides, better known as Rhynchospermum, very fragrant, and moderately vigorous, is suitable for a pillar, and produces white flowers in May and June.

Tropeolums are charming pot climbers, of which may be mentioned T. azureum, brachyceras, speciosum, tricolorum, and J arrattii.

Vallota is a very ehoice evergreen bulb, V. purpurea producing highly-eoloured scarlet flowers, in umbels, in August and September.

81, -Agave.—Bold-habited succulent plants, some of the larger of which are well adapted for conservatory decoration and prominent situations on terraces, &c. The American Aloe, Agave americana, with its varieties variegata and mediopicta, all require to be kept moderately dry and safe from frost during the winter, and grow well in strong loam, sand, and rotten manure. Among others of the larger varieties are A. potatorum and miradorensis, and of the smaller ones, A. filifera, applanata, Verschaffeltii, and schidigera. Still smaller dense-growing sorts are A. Richardii, horrida, Victorie Regine, and Bessereriana.

82, Aloc.—Succulent plants,extremely variable in character. They all thrive best in a sandy loam, well drained, and not over watered. The old Partridge-breast Aloe, A. variegata, is well adapted for a window ; A. ferox, supralevis, and arborescens are tall plants ; A. saponaria, mitreformis, albocincta, and lineata are smaller;

83. Azalea.—The beautiful varieties now in cultivation have been bred from a few originals, natives of the hilly regions of India and China. They areperhaps unequalled asindoor decorative plants. The Chinese species, A. vittata, will commence to open its blooms in September, and other sorts keep up a succession for several months, for some of the varieties may be forced into bloom during the winter, and others flower through the spring

up to May and June. They are usually increased by grafting the half-ripened shoots on the stronger-growing kinds, the shoots of the stock and the grafts being in a similarly half-ripened condition, and the plants being placed in a moist heat of 65°. Large plants of inferior kinds, if healthy, may be grafted all over with the choicer sorts, so as to obtain a large specimen in a short time. They require a rich and fibrous peat soil, with a mixture of sand to prevent it getting water- logged. The best time to pot azaleas is three or four weeks after the bloomingis over. The soil should be made quite solid to prevent ‘ts retaining too much water. To produce handsome plants, they must while yonng be stopped as required. Specimens that have got leggy may be cut back just before growth commences. The lowest temperature for them during the winter is about 35°, and during their season of growth from 55° to 65° at night, and 75° by day, the atmosphere being at the same time well charged with mois- ture. They are liable to the attacks of thrips and red spider, which do great mischief if not promptly destroyed.

84. Calecolaria.—Originally introduced under various specific

forms from Chili and Peru, the calccolaria of the present day has Calceo- been developed into a highly decorative plant, in which the her- laria. baceous habit has prepouderated. The plants are now very gene-

rally raised annually from secd, which is sown about the end of

July in a mixture of loam, leaf-mould, and sand, and, being very small, must only be slightly covered. When the plants are large enough to handle they are pricked out an inch or two apart into

3-inch or 5-inch pots; when a little more advanced they are potted

singly. They should be wintered in a greenhouse with a night temperature of about 40°, occupying a shelf near the light. By the end of February they should be moved into 8-inch or 10-inch pots, using a compost of three parts good turfy loam, one part leaf- mould, and one part thoroughly rotten

manure, with a fair addition of sand. They need plenty of light and air, but must not be sub- jected to draughts. must be liberally supplied with manure water. of growth the plants are subject to the attacks of the green fly, for which they must be fumigated. grown, as a good strain of seed will yield satisfactory flowers.

When the pots get well filled with roots, they In the early stages

Named varieties are not now

The shrmbby calceolarias used for bedding are increased from cut-

tings, planted in autumn in cold frames, where they can be wintered, by the use of mats and a good layer of litter placed over the glass and round the sides as a protection from frost.

85. Camellia.—This favourite plant, a native of Japan, is deserv- Camellia

edly popular, on account of its glossyfoliage and magnificent flowers. It is usually propagated by cuttings, to furnish stocks on which the choicer kinds are grafted. a mixture of both, but in any case an addition of turfy fibre and of sand is also necessary. The plants should have abundance of water, especially in the growing season, and should be potted as they complete their growth and are about to set their flowers; they do not, however, require repotting so often as most plants. Fire heat need only be employed when the object is to obtain flowers in the autumn and winter months. season it becomes necessary to start the plants into growth cor-

It will succeed either in peat or loam or

To produce them at this respondingly early. When grown in cold houses, they do not

generally flower until about February or March, at which stage the

plants enjoy a temperature of 45° or 50°. When fire heat is applied to assist the opening of the flowers, it should not much exceed 55°, aud whilst the plants are subjected to this heat the atmosphere must on no account be

allowed to become dry, or the buds will probably drop. When making their growth they need an abundant supply of water at the roots, as well as copious syringings twice a day, but as terminal buds become visible they should be kept drier. Liquid manure is of great assistance to plants that have flowered very heavily, while they are making their growth, and the addition of a little soot imparts a dark-green colour to the leaves. If grown in an open-roofed light house, shade will be required during very bright weather whilst the young shoots are being developed, but if grown ina lean-to house facing the north, shade will not be required. It is sometimes necessary to move the plants out of the house after they have set their flowers, to keep them from coming on too rapidly. In this casc they should have placed over them a light framework and movable screen.

The scale is the most troublesome insect which attacks the camellia. To remove the white scale, the plants should be washed with a sponge and solution of soft soap as soon as their growth is completed, and again before the buds begin to swell. The brown scale may be got rid of by repeated washings with one of the many insecticides, such as Fowler's, but it should be applied at a tempera- ture of 90°. See CAMELLIA, vol. iv. p. 737.

Some of the best varieties are—Alba plena (old double white), Bealii, Bonomiana, candidissima, Chandler's Elegans, Contessa Lavinia Maggi, Countess of Ellesmere, Donckelaari, eximia, fimbriata, Henri Favre, imbricata, imbricata alba, Jubilee, Madame Ambroise Verschaffelt, Mathotiana, Mathotiana alba, Princess Mary, reticulata flore-pleuo, Saccot nova, and Valtavaredo.

86. Cincrarias can be raised freely from seeds, and though there Ciner- are named varieties in existence, a good strain of seed will yield aria. flowers almostas fine. They must be kept, especially while young, free from aphides, to which they are more than ordinarily subject. For spring flowering the seeds may be sown in April or May in well- drained pots or pans, in soil of three parts loam to two parts leaf- mould, with one-sixth sand ; cover the seed thinly with fine soil, and press the surface firm. When the seedlings are large enough to handle, prick them out in pans or pots of similar soil, and when more advanced pot them singly in 4-inch pots, using soil a trifle less sandy. They should be grown in shallow frames facing the

north, and, if so situated that the sun shines upon the plants in the middle of the day, they must be slightly shaded ; give plenty of air, and never allow them to get dry. When well established with roots, shift them into 6-inch pots, which should be liberally supplied with manure water as they get filled with roots. In winter they should be removed to a pit or house, where a little heat can be supplied whenever there is a risk of their getting frozen. They should stand on a moist bottom, but must not be subjeeted to cold draughts. When the flowering stems appear, give manure water at every alter- nate watering. Seeds sown in March, and grown on in this way,

Correa.

Cycla- men.

GEEENHOUSE PLANTS. |

will be in bloom by Christmas if kept ina temperature of from 40° to 45° at night, with a little more warmth in the day; and those sown in April and May will succeed them during the early spring months, the latter set of plants being subjected to a temperature of 38° or 40° during the night.

87. Correa.—This genus of Australian plants is extremely useful for winter flowering. The best of them is C. cardinalis, which affords a succession of tube-shaped crimson flowers during the whole of the winter. They arc increased by cuttings, and grown in rough peaty soil, with a slight addition of loam and sand. After the plants have done flowering, they should all get a little artificial warmth, plenty of moisture, and a slight shade, while they are making their growth, during which period the tips of the young shoots should be nipped out when 6 or 8 inches long. When the growth is complete, a half-shady place outdoors during August and September will be suitable, with protcction from parching winds and hot sunshine.

88. Cyclamen.—Of late years this flower has been so much im- proved that no plant of moderate size can be made to contribute wmore floral display in winter. It is raised from seeds in various shades of colour, from the purest white to a deep purple. The seeds should be sown in October or November, in well-drained seed- pans, in an equal mixture of fine loain aud leaf-mould with an addi- tion of sand, the seeds slightly covered, and the pans placed

near the light in a temperature of 50°. When the seedlings appear, they must be pricked out into 5-inch pots, six or eight in each, and wintered in a similar temperature and situation. In spring they must be potted singly in 3-inch pots, and thinly shaded during bright weather. When they have filled their pots with roots they should be repotted, using similar soil, into 4-inch pots, in which they arc to flower. In potting, the corms or tuberous roots should not be more than half covered with the soil. A low house or pit is the best place in which to grow them, shading them if requisite, giving plenty of air, watering regularly, and syringing overhead in the afternoon to keep down thrips and red spider. The tem- perature should range from 45° to 50°, with plenty of air. They should flowerin February and March. After blooming they should be placed in a pit where they can be shaded as required, and as they show signs of going to rest they should receive less water, but should not be allowed to get quite dry. In autumn they may be shifted into pots a size larger, and they will come into flower earlier than in the first year. It is not advisable to keep them after the third season. Some growers recommend after flowering to turn the plants out of their pots into a bed of prepared peat or leaf-soil in some half-shady spot, where they can be sprinkled overhead every after- noon during dry sunny weather, so as to encourage plenty of healthy foliage. In this case they should be lifted early in the autumn.

89. Erica.—The species of heaths cultivated in English green- houses are mostly South African, or have sprung from South African originals. They are of dense twiggy growth, with needle-shaped leaves, aud beautiful wax-like flowers, which in some or other of the kinds are produced almost throughout the year. During the winter and early months E. caffra, gracilis, vernalis, hiemalis, melanthera, persoluta, rubens, Willmorei, Sindryana, and others produce their blossoms ; later on bloom E. florida, aftinis, Cavendishiana, exquisita, ventricosa and its many varieties, and the charming aristata; next come HK. Savileana, Irbyana, Austiniana, Jacksoni, retorta major, and others, which last on till September, a few continuing till the end of the year. Heaths are propagated under bell-glasses by cuttings, which should be taken as soon in the spring as the wood is suiffi- ciently firm, and planted in silver sand, the lower leaves having been removed ; they should be kept in a temperature of 60°, and the glasses must be wiped occasionally to prevent the plants from damp- ing off, When rooted they

should be gradually inured to the air by the occasional removal of the glasses. In the spring following they should be potted singly into thumb pots, and kept close and moist until they take to the new soil. Heaths require peat soil, which for hard-wooded slow-growing kinds should be of a close hard texture, while for soft-wooded slow-growing sorts a mixture of two-thirds of hard peat with one of a softer nature, and for the soft-wooded quick- growing varieties equal quantitics of hard and soft peat should be used, with silver sand according to the composition of the peat. The pots must always be well drained, and the plants must never be allowed to become pot-bound. The best season for potting is in March and April, or in September when the summer heats are over. The new soil must be made asfirm as the old ball, so as to retain the water. A low span-roofed house, admitting abundance of light, is most suitable for these plants ; and they require air in abundancc, especially during the season of active growth. They have so great a dislike to fire heat that any degree of cold short of actual frost is preferable to it. When they have grown into specimen plants they should be set out of doors, from the latter part of July till the be-ginning of September, in order to enable them to resist the attacks of mildew. Watcr should never be given before the soil has got sufficiently dry to need it, nor should the plants be syringed over- head summer or winter. Especially is this the case with the hard- wooded kinds. See Harn, vol. xi, ip. 8d:

Some of the best of the earlier flowering heaths are—Z. affinis, aristata, Ber- giana, Candolleana, Cavendishiana, Devoniauna, florida, hiemalis, Lindleyana, Massoni major, mutabilis, propendens, Sindryana, tortilifiora, ventricosa and its varieties, Victoria, and Willmorei. The later ones are well repre- sented by E, Austiniana, ampullacea and its varieties, Aitoniana Turn- bullii, ferruginea superba, gemmifera elegans, Hartnelli, Irbyana, jasmini- flora alba, Marnockiana, obbata, Parmentieriaua rosea, Paxtoni, Savileana eel Spenceriana, Shanuoni, tricolor and its varieties, and vestita and its varieties.

90. Fuchsia.—This well-known decorative soft-wooded plant Fuchsia,

comes from the temperate parts of South America, but has bcen improved by selection and hybridization, Fuchsias strike readily from cuttings, the most usual method being to placc old plants in warmth about February, and as soon as they have pushed shoots a couple of inches or so in length, to take them off and put them in small pots, in a temperature of 60°; they will root in two or threo weeks, when they should be moved singly into 3-inch pots ; and they must be again shifted into 8-inch or 9-inch pots as soon as those they already occupy are moderately filled with roots. The leadin g shoot, as well as the side branches, should be topped two or three times during the spring, and a single stick placed to the main stem so as to keep it upright. They should be syringed in the after- noons, to promote growth and to keep down aphides and red spider. By the end of June or July such plants will be disposed to flower. A good compost for fuchsias consists of four parts good fibrous loam to two parts well-rotted manure and leaf-mould, with a fair sprinkling of sand. When larger plants are required the cuttings should be struck about the end of July or beginning of August, and kept gently growing through the autuinn and winter in 6-inch pots on a shelf near the glass, with a night temperature of 50°. At the end of February they should be shifted into 10-inch or 12-inch pots, and by the end of April they will be in a condition to move to 16-inch or 18-inch pots, and the temperature should be raised to 55°. The shape of the plants should be regulated by timely pinching of the shoots, the pyramidal and standard forms being the most elegant. The old plants may be kept during winter in any dryish place free from frost ; prune them back in spring, and repot in fresh soil. The varieties are constantly changing through the introduc- tion of novelties. Sce Fucusta, vol. ix. p. 806.

91. Heliotropiwm.—tThe Peruvian Heliotrope, Heliotropium peru- Helio- vianum, is a great favourite with cultivators, on aceount of the tropium.

delicious fragance of its blossoms, which has obtained for it the popular name of “‘cherry pie.” The plants are easily increased by cuttings, which are struck in July and August, or from young shoots obtained in heat in early spring; when rooted they should be potted singly into small pots, using as a compost fibry loam, sandy peat, and well-decomposed stable manure from an old hotbed. The plants soon require to be shifted into a pot a size larger. To securo early-flowering plants, cuttings should be struck in

August, potted off before winter sets in, and kept in a warm greenhouse. In the spriug larger pots should be given, and the plants shortened back to make them bushy. They require frequent shiftings during the summier, to induce them to bloom freely. There are many varieties, differing in habit and in the colour of their flowers.

The heliotrope makes an elegant standard. The plants must in this case be allowed to send up a central shoot, and all the side growths must be pinclied off until the necessary height is reached, when the shoot must be stopped and lateral growths will be pro- duced to formthce head. During winter they should be kept some- what dry, and in spring the ball should be reduced and the plants repotted, the shoots being slightly pruned, so as to maintain a symmetrical head. When they are planted out against the walls and pillars of the greenhouse or conservatory an abundance of highly- perfumed blossoms will be supplied all the year round. See HEuro- TROPE, vol. xi. p. 633.

92. Mesembryanthemum.—These are intcresting Cape plants, some Mesem- of them ofa very showy character, and others remarkable as curiosi- bryan- They belong to the class of succulents, and with the exception themum.

ties, of the curious sorts, all grow and strike freely in a mixture of loam and leaf-mould with a dash of sand. The flowering kinds should be kept only two or three years. Cuttings should be put in about May, and well exposed. They willstand a few degrces of frost, but should be kept from growing in winter.

The best flowering sorts, most of which are adapted for window-boxes, are —M. barbatum, blaudum, candeus, conspicuum, curviflorum, falcatum, formosum, glaucum, polyanthum, reflexum, retroflexum, roseum, aud specta- bile. These can be used for suuny summer beds very well, as those that require it can be pegged down. Of the curious varieties, some of tho choicest are M. agninum, albinum, caninum, felinum, murinum, tigrinum, vulpinum, dolabriforme, densum, fissum, lingueforme, minimum, obconel- lum, and octophyllum. These are all dwarf growers, and require more sand aud some brick rubbish in the soil; they should also have less water.

93. Pelargoniwm.—tThe various races of pelargoniums have sprung Pelar-

from the intermixture of some of the species obtained from the Cape. The older show-flowered varieties have been gradually acquired through a long series of years. The fancy varicties, as well as the French spotted varieties and the market type, have been evolved from them. The zonal racc, on the other hand, has been perfected within the last quarter of a century. In all the sections the varieties are of a highly ornamental character, but for general culti-

Petunia.

Primula,

‘shoots ; but they are slow growers, rather delicate in constitution,

vation the markct type is preferable for indoor purposes, while the vonals are effective either in the greenhouse or flower garden. Some of the Cape species are still in cultivation,—the leaves of many of them being beautifully subdivided, almost fern-like in character, and some of them deliciously scented. A few of these are well adapted for bedding out.

Some of the most striking of this set are—P. Blandfordianum, echina- tum, graveolens, melananthum, and Schottii; while the following have finely-scented leaves :—P. tissimum.] named Lady Plymouth, Fair Helen, ignescens, Moore’s Victory, Pretty Polly, quercifolium and its varieties, Shrubland Pet, and the various sports from Unique.

The best soil for pelargoniums isa mellow fibrous loam with good stable manure in about the proportion of one-fifth ; when used it should not be sifted, but pulled to pieces by the hand, and as much

sand should be added as will allow the water to pass freely through it.

lighter soil.

All the pelargoniums are readily increased by cuttings made from the shoots when the plants are headed down after flowering, or in the spring, when they will root freely in a temperature of 50°. They must not be kept too close, and must be very moderately watered. When rooted they may be moved into well-drained 3-inch pots, and should have the points pinched out in order to induce them to push out several shoots near the base. enough, to be trained in a horizontal direction ; and when they have made three joints they should have the points again pinched out. These carly-struck plants will be ready for shifting into 6-inch pots by the autumn, and should still be trained outwards, The show varieties after flowering should be set out of doors in a sunny spot to ripen their wood, and should only get water enough to keep them from flagging. In the course of two or three weeks they will be ready to cut back within two joints of where these were last stopped, when they should be placed in a frame or pit, and kept close and dry until they have broken. When they have pushed an inch or so, turn them out of their pots, shake off the old soil, trim the straggling roots, and repot them firmly in smaller pots if practicable ; keep them near the light, and as the shoots grow continue to train them outwardly. They require to be kept in a light house, and to be set well up to the glass; the night temperature should range about 45°; and air should be given on all mild days, but no cold currents allowed, nor more water than is necessary to kecp the soil from getting parched. The young shoots should be topped about the end of October, and when they have grown an inch or two be- yond this, they may be shifted into 7-inch pots for flowcring. The shoots must be kept tied out so as to be fully exposed to the light. If required to flower early they should not be stopped again ; if not until June they may be stopped in February.

The zonal varieties, which are almost continuous bloomers, are of much value as decorative subjects; they seldom require much pruning after the first stopping. For winter flowering, young plants should be grown on during the summer, and not allowed to flower. When blossoms are required, they should be placed close up to the glass in a light house with a temperature of 60°, only just as much water being given as will keep them growing. For bedding pur- poses the zonal varieties are best struck towards the middle of August in the open air, taken up and potted or planted in

boxes as soon as struck, and preserved in frames or in the greenhouse during winter.

The fancy varieties root best early in spring from the half-ripened

and very impatient of excess of water at the root.

94. Petwnia.—The varieties of petunia, especially the double forms, make admirable specimens for pot culture. These and the other named varieties are propagated by cuttings taken from stock plants kept through the winter on a dry warm shelf, and moved into a brisk moist heat in early spring ; the young shoots are planted in pans or pots filled with sandy soil, and, aided by a brisk bottom heat, strike root inafew days. They are tlicn potted singly into thumb- pots, and when once established are gradually hardened off, and after- wards repotted as required. ‘The shoots should be topped to make bushy plants, and their tops may be utilized as cuttings. The single varieties are raised from seeds sown in light sandy soil in heat, in the early spring, and very slightly covered. The plants need to be pricked out or potted off as soon as large enough to handle. Good strains of seeds supply plants suitable for bedding; but, as they do not reproduce themselves exactly, any sorts parti- oe required must be propagated, like the double ones, from cut-

ings.

95. Primula.—One of the most popular of winter and early spring decorative plants is the Chinese Primrose, Primula sinensis, of which some superb strains have during the last few years been obtained. For ordinary purposes young plants are raised annually from seeds, sown about the beginning of March, and again for succes- sion in April, and if needed in May. The seed should be sown in well-drained pans, in a compost of three parts light loam, one part well-rotted leaf-mould, and one part clean gritty sand, as it does

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capitatum, citriodorum, crispum, and odora- To these may be added, from amongst the earlier hybrids, those

The large-flowered and fancy kinds cannot bear so much water as most soft-wooded plants, and the latter should have a rather

These shoots are, when long

not germinate freely if the soil contains stagnant moisture. The surface should be pressed smooth and gently watered before sowing, and the seeds should be only just covered with some very fine com- post, half soil half sand, and over that a thin layer of chopped sphagnum to keep it damp, and obviate the necessity of watering. When the seeds germinate, remove the moss, and place them in a well-lighted position near the glass, shading them from the sun with thiu white paper, and giving water modcrately as required. When they are large enough to handle, prick them out in pans or shallow boxes, and, as soon as they have made leaves an inch long, pot thein singly in 3-inch pots, using in the soil a little rotten dung. They should then be placed in a light frame near the glass in an open situation, facing the north. When their pots are filled with roots they should be moved into 6-inch or 7-inch pots. The soil should now consist of three parts good loam broken with the hand, one part rotten dung and leaf-mould, and as much sand as will keep the whole open. They should be potted firmly, and kept in frames close up to the glass till September, excess in watering being care-fully avoided. In the autumn they should be transferred to a light house and placed near the glass, the atmosphere being kept dry by the occasional use of fire heat. Thenight temperature should be kept about 45°. When the flowering stems are growing up, manure water once or twice a week will be beneficial. The semi-double varieties are increased from seeds, but the fully double ones and any particular sort can only be increased by cuttings made by dividing the crowns with a portion of stem attached, the plants being first well dried, almost to shrivelling ; the cuttings should be placed in small pots in sandy soil, put in a moderate dryish heat, aud only just watered enough to prevent flagging. When they are well rooted, they may be potted like the others. In wintcr they require an intermediate temperature of 45° or 50° at night, and a little higher in the day, with air when the weather is suitable.

96. Richardia.—This plant, R. ethiopica, called also Calla eethio- Rich- pica and the Nile Lily, is a fine subject for greenhouse decoration ardia, during the spring months. Itisa stately tuberous-rooted perennial, with broad arrow-shaped leaves, and large white flower-spathes, that last long in beauty. The plants should be carefully divided about March, and planted out during May in well-enriched shallow trenches. Being semi-aquatics, they cannot be kept too moist all through the summer months. Plants kept in pots are generally neglected in this way, and hence are rarely seen in really first-class condition. The richardias are hardy if their crowns are kept under water; but a very little frost disfigures the foliage, and therefore they should be placed in the pits or the greenhouse towards the end of October. They may be had in flower during the winter, but in that case they must have a little warmth to give them a start.

97. Salvia.—Some of the Salvias or Sages are among the best and Salvia. most showy among soft-wooded winter-flowering plants, the blossoms being of a bright-glowing scarlet. The three most useful species are Ss. a iewdeac! S. Heeri, and S. gesnereflora, the first commencing to flowcr early in the autumn and lasting till Christmas, while the others follow immediately in succession, and continue in full beauty till April. Young plants should be propagated annually about Febru- ary, and after nursing through the spring should be grown outdoors in a fully exposed situation, where they can be plunged in some non-conducting material, such as half-decomposed leaves. The young shoots should be stopped to secure bushy plants, but not later than the middle of August. The most suitable compost for them is a mixture of mellow fibry loam enriched with a little mild thoroughly decomposed manure, made sufficiently porous by the addition of sand or grit. In spring, and during the blooming period, the temperature should be intermediate between that of a stove andgreenhouse. ‘There are other very ornamental species of easy growth, increased by cuttings in spring, and succeeding well in ordinary rich loamy soil. Of these S. angustifolia bears spikes of fine bright-blue flowers in May or June; S. chameedryoides, a dwarfish subject, has deep-blue flowers in August ; S. fulgens pro- duces scarlet flowers in August; and S. involucrata produces fine red flowers during the autumn. S. patens is a lovely blue free-blooming sort, flowering in August, the colour being unique.

98. Stove PLANTS. —For the successful culture of stove plants two Stove houses at least, wherein different a can be maintained, plants. should be devoted to their growth, The temperature during winter should range at night from about 55° in the cooler to 65° in the warmer house, and from 65° to 75° by day, allowing a few degrees further rise by sun heat. In summer the temperature may range

10° higher by artificial heat, night and day, and will often by sun

heat run up to 90° or even 95°, beyond which it should be kept down by ventilation. During the growing period the atmosphere must be kept moist by damping the walls and pathways, and by syringing the plants, according to their needs ; when growth is com- pleted less moisture will be necessary. Watering, which, except during the resting period, should generally be copious, is best done

in the forenoon; while syringing should be done early in the after- noon to admit of the foliage drying moderately before night. When

the pots become filled with roots, waterings of weak liquid manure

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STOVE PLANTS. |

draughts must be avoided.

nent Pe VU LY Ree

help very much towards a successful blooming.

In ventilating, cold

The following are select miscellaneous stove plants :—

Acalypha tricolor (Wilkesiana).

Aischynanthus Boschianus, Lobbi- anus, andsplendens.

Allamanda Chelsoni, Schottii, gran- diflora, Hendersoni, and nobilis.
Alocasia Jenningsii, Lowii, Veitchii, macrorrhiza variegata, and metal-

lica.

Anthurium crystallinum, regale, War- ocqueanum, Veitchii, magnificum, Scherzerianum, and Andréanum.

Aphelandra nitens and Roezlii.

Aralia elegantissima, filicifolia, and Veitchii.

Ardisia crenulata and Oliveri.

Aristolochia Duchartrei and _flori- bunda.

Bertolonia superbissima and Van Houttei.

Bignonia Chamberlaynii and venusta.

Bougainvillea glabra and spectabilis.

Centropogon Lucyanus.

Cissus discolor.

Clerodendrum fallax, Balfourianum, and splendens.

Combretum purpureum.

Croton angustifolius, trilobus Dis- raeli, Andréanus, gloriosus, majesti- cus, undulatus, Weismanniy, spiralis, and Williamsii.

Cyanophyllum magnificum.

Dieffenbachia Bausei, Leopoldii, Carderi, and splendens.

Dipladenia Brearleyana, regina, and amabilis.

Ficus elastica (India-rubber Plant).

Franciscea eximia, calycina, mag- nifica, and confertiflora.

Gardenia Stanleyana, citriodora, and florida.

Gesnera Cooperii, Donckelaari, and superba.

Hibiscus rosa sinensis miniatus semi- plenus, and its varieties—refulgens, zebrinus, puniceus, Collerii, fulgi- dus, schizopetalus, and Cooperii.

Hoya imperialis, carnosa, campanu- lata, and bella.

Ipomeea Horsfallize and Learii.

Ixora coccinnea, Colei, javanica, splen- dens, regina, and Williamsii.

Luculia gratissima.

Maranta fasciata, albo-lineata, roseo- lineata, Makoyana, regalis, roseo-picta, Veitchii, zebrina, and Massan- geana.

Medinilla magnifica and amabilis.

Nelumbium speciosum.

Nepenthes (Pitcher-Plant) Veitchii, sanguinea, levis, Stewartii, Wil- liamsii, Hookeri, and Rafflesiana.

Nymphexa Devoniana, dentata, and coerulea.

Pandanus graminifolius, elegan- tissimus, Vandermeerschii, and Veitchii.

Passiflora Raddiana (kermesina),

Decaisneana, Buonapartea, Hahnii, edulis, and princeps racemosa.

Pavetta borbonica.

Pentas carnea rosea.

Plumbago rosea. :

Rogiera cordata and gratissima.

Rondeletia speciosa major,

Stephanotis floribunda.

Spheerogyne latifolia.

Thyrsacanthus rutilans.

Tillandsia musaica, tessellata, Lin- deniana, and Zahnii.

ae fragrans (Monstera delici- osa).

Victoria regia.

Vinca rosea, rosea alba.

rosea oculata, and

99. Achimenes have scaly tubers, which are kept dry and in a state of rest in a temperature of 55° during the winter months, and started into growth about March, a second batch being started in Apvil. They should be placed 6 inches asunder in pans filled to within 14 inches of the rim with leaf-mould or cocoa-refuse, made rather sandy, and slightly covered with the soil. The pans should be set in a warm pit or frame, and the soil kept slightly moistened, and when the young shoots are a couple of inches long they may be placed six or eight in a 6-inch pot, ina soil of three parts fibrous loam and two parts leaf-mould, mixed witha little sand. The temperature should be from 65° to 70°, and they should be well exposed to light. When 6 inches long, pinch out the points to induce them to branch, and give more water, syringing overhead to keep red spider in check. As soon as the flower buds appear, give weak manure water two or three times a week. They should all through their growth have sufficient air to keep them from getting drawn, and when the flowers begin to open should be

gradually inured to bear the tem- perature of the conscrvatory. When they show signs of going to rest, less water may be given ; and after the tops have died down, the tubers may be stored in dry sand in a temperature of about 55°. Achimenes have also a fine effect grown in wire baskets from the roof of the plant house.

‘The following are good “kinds:—Ambroise Verschaffelt, belmontensis, Firefly, longifiora alba, longiflora major, Mauve Queen, Parsonsii, Rose Queen, Stella, and Williamsii.

100. Amaryllis, This genus, also called Hippeastrum, consists of splendid bulbous plants, of easy culture and free-blooming habit. Like other bulbs they are increased by offsets, which should be care- fully removed when the plants are at rest, and should be allowed to attain a fair size before removal. These young bulbs should be potted singly in February or March, in mellow loamy soil with a moderate quantity of sand, about two-thirds of the bulb being kept above the level of the soil, which should be made quite solid. They should be removed to a temperature of 60° by night and 70° by day, very earefully watered until the roots have begun to grow frecly, aftcr which the soil should be kept moderately moist. As they advance the temperature should be raised to 70° at night, and to 80° or higher with sun heat by day. They do not need shading, but should have plenty of air, and be syringed daily in the afternoon. When growing they require a good supply of water. After the decay of the flowers they should be returned to a brisk moist temperature of from 70° to 80° by day during summer to perfect their leaves, and then be ripened off in autumn. Through the winter they should have less water, but must not be kept entirely dry. The minimum temperature should now be about 55°, to be increased 10° or 15° in spring. As the bulbs get large they will occasionally need shifting into larger pots.

A few of the best sorts are — Ackermanni pulcherrima, aulica, conspicua, Duchess of Connaught, Hercules, Leopoldii, Meteor, Mrs Baker, Mrs

Morgan, Oriflamme, pardina, pyrrochroa, Queen Victoria, striata superba,

ae Unique, Virgil, and vittata. New varieties are being constantly e

101. Begonias are represented by numerous species, herbaceous Begonia.

and subshrubby. There arc several free-flowering hybrids, such as B. weltoniensis, Saundersii, fuchsioides, prestoniensis, ascotiensis, &c. ; there is the group of ornamental-leaved kinds represented by B. Rex; and there is the tubcrous-rooted free-blooming brilliant race, developed recently, mainly from B. boliviensis and B. Veitchili. Cuttings from flowering begonias root freely in sandy soil, placed in heat at any season when moderately firm, and as soon as rooted should be potted singly into 3-inch pots, in sandy loam mixed with leaf-mould and sand. They should be stopped to keep them bushy, placed in a light situation, and thinly shaded in the middle of very bright days. In a few weeks they will require another shift.

‘ They should not be overpotted, but instead assisted by manure water.

The pots should be placed in a light pit near the roof glass. The sum- mer-flowcring kinds will soon commence blooming, but the autumn and winter-flowering sorts should be kept growing on in a tempera- ture of from 55° to 60° by night, with a few degrees more in the day. The tuberous-rooted sorts require to be kept at rest in winter, in a medium temperature, almost but not quite dry. In February they should be potted in a compost of sandy loam and leaf-mould, and placed in a temperate pit until May or June, when they may be moved to the greenhouse for flowering. If they afterwards get at all pot-bound, weak manure should be applied. After blooming the supply of water must be again slackened, and in winter the plants should be stored ina dry place, secure from frost; they are increased by late summer and autumn cuttings, after being partially cut down.

102. Bowvardia.—These plants are best increased by cuttings Bou- taken offin April, and placed in a brisk heat in a propagating frame vardia,

with a close atmosphere. When rooted they should be potted singly into 38-inch pots in fibrous peat and loam, mixed with one-fourth leaf-mould, and a good sprinkling of sand, and kept in a tempera- ture of 70° by night and 80° during the day; shade when required; syringe overhead in the afternoon, and close the house with sun- heat. The plants should be topped to ensure a bushy habit, and as they grow must be shifted into 6-inch or 7-inch pots. After midsummer they should be moved to a cool pit, where they may re-

main till the middle of September, receiving plenty of air and space. They should then be removed to a house, and a portion of the plants should be put at once in a temperature of about 70° at night, with a few degrees higher in the day time, to bring them into flower. Others must be moved into heat to supply flowers in succession through the winter and spring. Some of the best kindsare B. elegans, Hogarth, jasminiflora, Maiden's Blush, and Vreelandii.

108. Cactws.—This old-fashioned name includes many modern Cactus.

genera of handsome or interesting succulents, the principal of which are briefly mentioned below. Cereus is well represented by C. speciosissimus, a quadrangular-stemmed spiny plant, requiring stove heat, and a loamy soil freely mixed with hard drainage material ; it must not be overpotted. chinocactus is a genus of dwarf fleshy spiny plants, which are slow growers, and must have plenty of sun heat ; they require sandy loam, with a mixture of sand and bricks finely broken, and must be potted firmly, and kept dry in winter. Echinopsis is a group of dwarfish plants resembling the Echinocacti, which bear flowers about a foot long, varying from white to deep rose. Epiphyllum is a group of handsome plants easily increased from cuttings, but from their drooping habit they are better adapted for grafting onthe Pereskia, so as to form small standards. The Pereskia stocks are struck during the winter or spring from cuttings placed in heat, and should be grown in sandy loam, the pots being well drained ; these must be kept to a single stem, and when a foot or 18 inches high, and of a firm woody texture, should be grafted with small pieces of the Epiphyllum. They may be grown for a con- siderable time in 6-inch or 7-inch pots, but must have free drainage. After grafting they should be grown on in heat and in plenty of light through the summer, but by the autumn should have less warmth and moisture. A winter temperature of 50° will be suffi- cient, but in January a portion may be started in a temperature of 60°, in which they will soon show flower. This treatment being continued they will last for many years, and go on inereasing in size. There are anumbcer of varieties of E. truncatum, differing chiefly in the amount and shade of rose colour or crimson in the flowers. Mammillaria consists of very interesting dwarf globular or cylin- drical plants, remarkable for the beautiful colour of their numerous spines, and the irregular arrangement of the mammille into which

their surface is broken up. They grow freely in a cool greenhouse, and require moderate watering in summer, with occasional syringing overhead. The spines are in some species whitc, in others yellow, or red, or brown, or almost black. Opwzntia is the prickly pear of southern Europe, or Indian fig of South America; the species are searcely ornamental plants, but are interesting on account of their variable development. The cochineal insect is reared on some of the larger-growing sorts. O. vulgaris and Rafinesquiana are hardy in the south of England. Phyllocactus is one of the most ornamental genera of cacti, and is of easy culture, requiring dry stove treatment. Cuttings strike readily in spring before growth has commenced ; they should be potted in 38-inch or 4-inch pots, well-drained, in loamy soil made very porous by the admixture of finely-broken crocks and

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Cala- dium.

Coleus.

Draceena.

Eucharis.

Gloxinia,

sand, and placed in a temperature of 60°; when these pots are filled with roots they arc to be shifted into larger ones, but overpotting must be avoided. During the summer they need eonsiderable heat, all the light possible, and plenty of air. In winter a temperature of 45° or 50° will be sufficient, and they must be kept tolerably dry at the root. By the spring they may have larger pots if required, and should be kept in a hot and fairly moistened atmosphere; and by the end of June, when they have made new growth, they may be turned out under a south wall in the full sun, water being given only as required. In autumn they are to be returned to a cool house, and wintered in a dry stove. The turning of them out- doors to ripen their growth is the surest way to obtain flowers, but they do not take on a

free blooming habit until they have attained some age. Amongst the best sorts are P. Ackermanni, J enkinsoni, crenatus, and speciosus.

104. Caladiwm.—These beautiful arads are increased by division of the young growths made in the spring. They should be potted in small pots in fibroussandy peat, welldrained, and kept inatemperature of 65° by night ; afterwards they should be changed into larger ones, using lumpy soil. The summer temperature may range about 68° or 70° by night, with an increase of 10° by day. The plants will go to rest towards autumn, and when the leaves have all died away the soil may be allowed to become nearly dry, and the pots may be set on a shelf, in a temperature of about 55°, till February.

105. Coleus.—These are very ornamental plants, the colourof their leaves being exceedingly varied, and often very brilliant. They areof theeasiest culture. Thecuttingsof young shoots should be propagated every year, about March, being planted in thumb pots, in sandy loam, and placed in a close temperature of 70°. Aftcr taking root they should be shifted into 6-inch pots, using ordinary light loamy eompost, containing abundance of leaf-mould and sand, and keeping them near thelight. They may be passed on into larger pots as often as required, but 8-inch pots will be large enough for general purposes, asthcycan be fed with liquidmanure. The youngspring-struck plants like a warm growing atmosphere, but by midsummer they will bear more air and stand in a greenhouse or conservatory. They should be wintcred in a temperature of 60° to 65°. The stopping of the young shoots must be regulated by the consideration whether bushy or pyramidal plants are desired.

106. Dracena.—These are extremely useful as decorative stove plants, and are easy to grow. They may be increased by euttings planted in sandy soil in a temperature of from 65° to 70° by night, the spring being the best time for propagation. The old stems laid flat in a propagating frame will push young shoots, which may be taken off with a heel when 2 or 3 inches long, and planted in sandy peatin 3-inch pots ; the tops can also be taken off andstruck. The established plants do best in fibry peat made porous by sand. In summer they should have a day temperature of 75°, and in winter one of 65°. Shift as required, using coarser soil as the pots become larger. By the

end of the summer the small cuttings will have made nice plants, and in the spring following they ean be kept growing by the use of manure water twice a week. Those intended for the con- servatory should be gradually inured to more air by midsummer, but kept out of cold draughts. When the plants get too large they can be headed down and the tops made cuttings. D. terminalis, with its bronzy leaves and rosy variegation, still ranks amongst the best sorts, but there are also many novel varieties of great merit and beauty. D. Goldieana is a grandly variegated species from tropical Africa, and requires more heat.

107. Eucharis.—This is themost chastely beautiful of all decorative plants, having white flowers, of a very distinct character. It isa bulbous plant, and is propagated by removing the offsets, which may be done in spring, potting them singly in 6-inch pots. It requires good loamy soil, with sand enough to keep the compost open,and should have a good supply of water and a temperature of 65° to 70° during the night, with a risc of 8° or 10° inthe day. During summer, growth is to be encouraged by repotting, but the plants should afterwards be slightly rested by removal to a night tempera- ture of about 60°, water being withheld for a time, though they must not go too long dry, the plant being an evergreen. By the turn of the year they may again- have more heat and more water, and this will probably induce them to flower. Aftcr this is over they may be shifted and grown again as before ; and, as they get large, they can cither be divided to form new plants or allowed to develop into nobler specimens. With a stock of the smaller plants to start them in succession, they may be had in flower all the ycar round.

108. Gloxinia.—The gloxinia, a charming decorativo plant,may be grown much in the same way as theachimenes. A good strain of seed will produce many superb and charmingly coloured varieties, and if sown early in spring, in a temperature of 65° at night, they may be shifted on into 6-inch pots, and in these may be flowered during the summer. The bulbs are kept at rest through the winter in a dry sand, in a temperature of 50°, and to yield a succession should be started at intervals, say at the end of February and the beginning of April. To prolong the blooming season, use weak manure water when the flower-buds show themselves.

109. Poinsettia. —The Poinscttia pulcherrima, with its brilliant

scarlet bracts, stands unrivalled amongst decorative plants. The Poin- white-bracted sort, P.“p. alba, is not so effective, but the double- settia, flowered P. p. plenissima, in which the cymose inflorescence is branched, is as briliant as the type, and keeps long in flower. They are increased by cuttings in spring, which when taken off with a heel strike freely in a brisk heat. They require good turfy loam, with an addition of one-sixth of leaf-mould and a httle sand, and should be kept in a heat of from 65° to 70° at night, with a riso of 10° by day. To prevent their growing lanky, they should be kept. with their heads‘almost touching the glass; and as the pots get filled with roots they must bo shifted into others, 8 inches or 10 inches in diameter. About August they may be inured to a heat of 50° at night, and should be brought to bear air night and day whilst the weather is warm, or they may be placed out of doors for a month under a south wall in the full sun. This treatment matures and prepares them for flowering. In autumn they must be removed to a house where the temperature is 50° at night, and by the end of September some of them may be put in the stove, where they will come into flower, the remainder being placed under heat later for succession. When in bloom they may be kept at about 55° by night, and so placed will last longer than if kept in a higher temperature.

110. Tydea.—These handsome plants, which have sprung from Tydea. the beautiful Achimenes picta, require similar treatment to achi- menes, except that, being winter bloomers, they must be started into growth at a different season, namely, the later spring months, as April and May. The summer-blooming sorts, which should be started earliest, should, as they come into flower, be removed to the conservatory. Theautumn and winter flowering sorts, being at first grown slowly in a gentle heat, must as they show flower have a nice growing temperature of 70° or 75° afforded them with abundance of light ; manure water may be given once a week, The tubers should be stored away dry in winter, like those of achimenes.

111. Orcurps.—For the successful cultivation of a mixed collec- Orchids, tion of tropical orchids, it is necessary that two or,three houses, in which different temperatures can be maintained, should be provided. The greater number of them are epiphytes or air plants, and heat and moisture afford all or nearly all the nourishment they require. The plants themselves arc the

better for being associated with such objects as ferns and palms, and the appearance of the houses is greatly im- proved by their being thus grouped.

The East Indian orchid house takes in those species which are found in the warm parts of the eastern hemisphere, as well as those from the hottest parts of the western, and its temperature should range from about 75° to 85° during the summier or growing season, and from 65° to 70° during winter. The Mexican or Brazilian orchid house accommodates the plants from the warm parts of South America, and its temperature should range from about 65° to 75° during summer, and from 60° to 65° in winter. A structure called the cool orchid house is set apart for the accommodation of the many lovely mountain species from South America and India, such as odontoglossums, masdevallias, &c., and in this the more uniform the temperature can be kept the better, that in summer varying between 60° and 70°, and in winterfrom 45° to 60°. A genial moist atmosphere must be kept up in the hottest houses during the growing season, with a free circulation of air admitted very cautiously by well- guarded ventilators. In winter, when the plants are at rest, little water will be necessary; but in the case of those plants which have no fleshy pseudobulbs to fall back upon for sustenance, they must not be suffered to become so dry as to cause the leaves to shrivel. In the Mexican house the plants will generally be able to with- stand greater drought occasionally, being greatly assisted by their thick pseudobulbs. In the cool or odontoglossum house a con- siderable degree of moisture must be maintained at all times, for in these the plants keep growing more or less continuously.

For potting or basketing purposes, or for plants requiring block- culture, the only materials admissible are light fibrous peat and. living sphagnum moss, which supply free drainage for the eopious supply of water required. The water should, however, be so used as not to run down into the sheathing bases of the leaves. While in flower, orchids may with advantage be removed to a drier and cooler situation, and may be utilized in the drawing-room or boudoir.

From amongst the great wealth of tropical orchids, now in cul- tivation, the following is a very limited selection of some of the most useful :-—

Ada.—Epiphytal: A. aurantiaca. ; oe

‘Aerides.—Epiphytal: A. afline, crassifolium, crispum, Fieldingii, Lobbit, nobile, odoratum, and suavissimum.

Angrecum.—Epiphytal : A. sesquipcdalc. :

Anguloa.—Terrestrial : A. Clowesii and Ruckeri.

Barkeria.—Cool epiphytal: B. elegans, Skinneri, and spectabilis. _

Bollew.—Epiphytal: B. Backhousiana, celestis, Lalindei, and Patinii.

Calanthe.—Terrestrial: C. Masuca, Veitchii, and vestita. ‘

Cattleya.—Epiphytal : C. amethystoglossa, bulbosa, Dowiana, exoniensis, gigas, labiata, lobata, Mossie, quadricolor, Skinneri, superba, and Trianz.

Coclogyne.—Epiphytal: C. barbata, cristata, Gardneriana, Lowii, pandurata, and speciosa. . ‘ ~

Cymbidium.—Tcrrestrial : C. eburneum, Lowianum, and Mastcrsil.

Cypripedium.—Terrestrial : C. Argus, barbatum superbum, caudatum, con-

Palms.

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color, Dayanum, Harrisianum, insigne Maulei, Schlimmi, Stonei, and superbiens.

Dendrobium.—Epiphytal : D. aggregatum majus, Ainsworthii, barbatulum, Bensoniw, chrysotis, chrysotoxum, crassinode, crystallinum, Devonianum, Falconeri, fimbriatum oculatum, formosum giganteum, lituiflorumi, nobile, Paxtoni, pulchellum, suavissimum, and Wardianum.

Dendrochilum.—Epiphytal: D. filiforme and glumaceum.

Disa.—Cool terrestrial: D. grandiflora and Barvellii.

Epidendrum.—Epiphytal: K. dichromum, Frederici Guilielmi, ibaguense; macrochilum, nemorale majus, and vitellinum majus.

- Lelia.—Epiphytal : L. anceps, autumnalis, cinuabarina, elegans, harpophylla, majalis, Perrinii, purpurata, and superbieus. ,

Limatodes.—Terrestrial: L. rosea.

Lycaste.—Cool epiphytal: L. Skinneri, with its many variations.

Masdevallia.—Cool epiphytal: M. Davisii, Harryana, ignea, Lindeni, tovarensis, aud Veitchiana.

Mesospinidium.—Cool epiphytal: M. sanguineum and vulcanicum.

Miltonia.—Epiphytal: M. spectabilis, with its fine variety Moreliana.

Odontoglossum.—Cool epiphytal: 0, Alexandra (crispum), Andersonianum, citrosmum, cirrhosum, grande, Hallii, Insleayi, membranaceum, Pescatorei, Phalenopsis, Roezlii, triumphans, vexillarium.

Oncidiwm.—Epiphytal : O. ampliatun majus, Barkeri, crispum, cucullatum, curtum, macranthum, Marshallianum, ornithorrhynchum, roseum, Papilio majus, sarcodes, and varicosum Rogersii.

Pescatoria.—Epiphytal ; P. Dayana, lamellosa, Roezlii, and Wallisii

Phajus.—Terrestrial : P. grandifolius and Wallichii.

Phalenopsis.—Epiphytal: P. amabilis, grandiflora, and Schilleriana.

Pleione (Indian Crocus).—Epiphytal: P, Hookeriana, humilis, lagenaria, maculata, preecox, Reichenbachiana, and Wallichiana.

Renanthera.—Epiphytal : R. coccinea and Lowii.

Saccolabium.—Epiphytal: S. ampullaceum, Blumei majus, guttatum, miniatum, and retusum.

Sobralia.—Terrestrial : S. macrantha splendens.

Sophronitis.—Epiphytal : S. grandiflora.

Stanhopea.—Epiphytal : 8. grandiflora, insignis, oculata, and tigrina.

Thunia.—Terrestrial: T. alba and Bensoniz.

Trichopilia.—Epiphytal: T. crispa, marginata, suavis, and tortilis.

; ait tia ae : V. Cathcartii, coerulea, ccerulescens, suavis, and ricolor.

Zygopetalum.—Epiphytal: Z. Gautieri, Mackayi, maxillare, and rostratum.

levigatum, Lowii, niveum,

curvifolium,

112. Pats, while quite young, form charming ornaments for the drawing-room and the dinner table. When more fully devcloped, and long before their full growth is attained, they are among the best ornamental foliaged conservatory plants. For the most part they are stove plants (75° to 80°), but after the growth is matured, many of them thrive for some time in the temperature of a dwelling house. They are of very easy cultivation, but require plenty of water and thorough drainage. The soil should consist of equal parts of loam, peat, and vegetable mould, with abundance of sand, and they thrive best in comparatively small pots. See Pans.

The following is a selection of useful species :—

Acanthophoenix.—Pinnate: A. crinita and Herbstii.

Acanthorrhiza.—Fan-leaved : A. stauracantha and Warscewiczii.

Areca.—Pinnate: A. alba, aurea, lutescens, and rubra.

Astrocaryum.—Pinnate: A. acaule, Murumuru, and rostratum.

Attalea.—Pinnate: A. funifera, nucifera, and speciosa.

Bactris.—Pinnate: B. baculifera, integrifolia, and simplicifrons.

Brahea.—Fan-leaved: B. filamentosa (a Californian species, having the cdges of the leaf-segments developed into long threadlike pendent filaments) and B. Roezlii.

Calamus.—Pinnate, and exceedingly handsome as young plants, but afterwards assuming the habit of climbers: C. adspersus, asperrimus, ciliaris, Flagellum, Impératrice Marie, Jenkinsianus, melanochetes, palembanicus, plumosus, and viminalis.

Caryota.—Pinnate : C. Cumingii is the dwarfest of the species, bipiunate, .

the leaves from 3 to 6 feet long; C. urens.

Ceroxylon.—Pinnate: C. andicola is a majestic species.

Chamoedorea.—Pinnate, and well suited for indoor} decoration during the winter months: C. Arenbergiana, desmoncoides, elegans, Ernesti-Augusti, glaucifolia, graminifolia, microphylla, and Warsccwiczii.

Chameerops.—Fan-leaved, comparatively dwarf, and admirably adapted for decoration : C. excelsa, Fortunei, humilis, and Martiana.

Cocos.—Pinnate : Shade-loving plants, some of which are most charming, especially C. Bonneti, elegantissima, plumosa, and Weddelliana.

Cyphokentia.—Pinnate: C. gracilis and macrocarpa (Kentia Lindeni).

Euterp2.—Pinnate: E. edulis.

Gconoma.—Pinnate : Sniall-growing and nearly all very handsome while young, especially G. congesta. clegans, gracilis, macrostachys, Martiana, Porteana, pumila, and Schottiana.

ITyophorbe.—Pinnate: H. amaricaulis, indica, and Verschaffeltii,

Jubea.—Pinnate: the Chilian J. spectabilis is highly decorative, and may be grown in the open during summer.

Kentia.—Pinnate: K. Baueri, Belmoreana, Fosteriana, sapida, and Wendlandiana are ornamental greenhouse palms.

Latania.—Fan-leaved: L. aurea, Commersoni, and rubra.

Licuala.—Fan-leaved: L. acutifida, elegans, and peltata.

Livistonia.—Fau-leaved, and of robust constitution: L. altissima, australis, Hoogendorpii, oliveeformis, and sinensis (Latania borbouica).

Malortiea.—Pinnate, dwarf elegant palms, well adapted for table decoration: M. gracilis and simplex.

Martinezia.—Pinnate, with singular erose lcaflets: M. erosa, granatensis, and Lindeniana.

, Oncosperma.— Pinnate: O. Van Houtteanum, a splendid plant for exhibition purposes.

Oreodoxa.—Pinnate, and while young beautiful as table plants, standing long in a room without injury ; O. oleracea and regia.

Phenicophorium.—Entire-leaved, magnificent ornaments in the stove: P. scchellarum, known also as Stevensonia grandiflora.

Pheenix.—The Date Palm of commerce, P. dactylifera, although conimon, is extremely ornamental, and so hardy that it may be used in almost any situa- tion during the summer months; other fine sorts are P. reclinata, rupicola, sylvestris, and tenuis,

J Titchardia.—Fan-leaved : P. aurea, grandis, macrocarpa, Martiana, and Pacifica.

Ptychosperma.— Pinnate, and of robust constitution: P. Alexandre, Cunninghamii (Seaforthia elegans), and rupicola.

Rhapis.—Fan-leaved, slender-stemmed, and of hardy constitution: R. flabelliformis and humilis.

Sabal.—Fan-leaved, noble plants reaching gigantic proportions: 8. Black-burniana and umbraculifera.

Thrinaz.—Fan-leaved, with slender petioles, and leaves much divided ; peculiarly light and elegant for table or other decoration: T. arborea, barbadensis, elegans, graminiflora, multiflora, parviflora, and radiata.

Trithrinazx.—Fan-leaved : T. mauritizformis,

Verschafeltia.—Entire-leaved, in the way of Pheenicophorium, and requir-ing strong moist heat: V. melanochetes and splendida (Regelia majestica) are remarkable for their long needle-like black spines.

Welfia.—Pinnate: W. regia.

113. Ferns.—These popular plants are usually increased by means Ferns,

of their spores, the ‘‘ dust” produced on the back of their fronds, The spores should be sown in well-drained pots or seed pans on the surface of a mixture of fibrous sifted peat and small broken crocks or sandstone ; this soil should be firmly pressed and well-watered, and the spores scattered over it, and at once covered with propagating glasses or pieces of shect glass, to prevent water or dry air getting to the surface. The pots should be placed in pans full of water, which they will absorb as required. A shady place is desirable, with tem- perature of 50° to 55° by night and 65° to 70° by day, or they may be set on a shelf in an ordinary propagating pit. The spores may be sown as soon as ripe, and when the young plants can be handled, or rather can be lifted with the end of a pointed flat stick, they should be pricked out into well-drained pots or pans filled with similar soil, and should be kept moist and shady. As they become large enough, pot them singly in 3-inch pots, and when the pots are fairly filled with roots shift on into larger ones.

The best time for a general repotting of ferns is in spring, just before growth commences. Those with creeping rhizomes can be propagated by dividing these into well-rooted portions, and, if a number of crowns is formed, thcy can be divided at that season. In most cases this cun be performed with little risk, but the glei- chenias, for example, must only be cut into large portions, as small divisions of the rhizomes are almost certain to die; in such cases, however, the points of the rhizomes canjbe led over and layered into small pots, several in succession, and allowed to remain unscvered from the parent plant until they become well-rooted. In potting the well-established plants, and all those of considerable size, the soil should be used in a rough turfy state, not sifted but broken, and one-sixth of broken crocks or charcoal and as nueh sand as will insure free percolation should be mixed with it.

The stove ferns require a day temperature of 65° to 75°, but do not thrive in an excessively high or close dry atmosphere. They require only such shade as will shut out the direct rays of the sun, and, though abundant moisture must be supplied, the atmosphere should not be loaded with it. The water used should always be at or near the temperature of the house in which the plants are growing. Some ferns, as the different kinds of Gymnogramma and Cheilanthes, prefer a drier atmosphere than others, and the former do not well bear a lower winter temperature than about 60° by night. Most other stove ferns, if dormant, will bear a temperature as low as 55° bynight and 60° by day from November to February. About the end of the latter month the whole collection should be turned out of the pots, and redrained or repotted into larger pots as required. This should take place before growth has commenced. Towards the end of March the night temperature may be raised to 60°, and the day temperature to 70° or 75°, the plants being shaded in bright weather. Such ferns as Gymnogrammas, which have their surface covered with golden or silver powder, and certain species of scaly- surfaced Cheilanthes and Nothochlena, as they cannot bear to have their fronds wetted, should never be syringed ; but most other ferns may have a moderate sprinkling occasionally (not necessarily daily), and as the scason advances, sufficient air and light must be admitted to solidify the tissues.

Space will only permit that we should append a list of choice ferns, which, however, might be much extended. We shall arrange them under the heads

of stove, greenhouse, and hardy.

Seleet Stove Ferns.

Acrophorus affinis, cherophyllus, and immersus (Leucostegia).

Acrostichum aureum.

Adiantum emulum, cardiochlena, caudatum, concinnum, cristatum, cuneatum, curvatum, farleyense, gracillimum, Hensloviaunm, lunnlatuni, macrophyllum, mundulum, peruvianum, polyphyllum, princeps, pulverulentuml, Seeniauni, subcordatum, tenerum, trapeziforme, Veitchianum, villosum, and Williamsii.

Alsophila armata, aspera, glauca, philippensis, pruinata, pycnocarpa, radens, and Tenitis.

Aglaomorpha Meyenianum. ‘

Anemia adiautifolia, cheilanthoides, collina, and mandioccana.

Anemidictyon Phyllitidis, and its several fornis—fraxinifolium, laciniatum, longifolium, and tessellatuin.

Aspidium trifoliatum.

Asplenium alatum, caudatum, cicutarium, erectum, Fabianum, ferulaceum, formosum, heterocarpum, horridum, laserpitiifolium, longissimum, myriophyllum, neo-caledonicum, planicaule, rachirhizon, rhizophorum, schizodon, serra, Veitchianum (Belangeri), and viviparum.

Blechnum brasiliense, gracile, Lanceola, longifolium, orientale.

Campyloneurum lucidum, repeus, nitidum, and decurrens,

Ceratoptcris thalictroides, an aquatic sub-annual species with proliferous sterile fronds.

Chetlanthes Borsigiana, cuneata, elegans, radiata, spectabilis, and viscosa.

occidentale, and

farinosa, frigida, pulveracea,

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Chamissoi, \glaucum, Menziesii, pruinosum, regale,

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Cibotium Barometz, and Schiedei.

Cionidium Moorei. 2 A eee .

Cyathea arborea, canaliculata, excclsa, insignis (Cibotium princeps), and serra.

Davallia aculeata, bullata, dissecta, divaricata (pclyantha), elata, elegans, fijiensis, Mooreana, ornata, pentaphylla, solida, and tenuifolia.

Dennstedtia cicutaria.

Deparia prolifera.

Dicksonia chrysotricha.

Dictyoxiphium panamense.

Didymochlena lunulata. =e peel

Diplazium alternifolium, ecltidifolium, grandifolium, Shepherdii, striatum, sylvaticum, and zeylanicum. ; :

Doryopteris collina, nobilis, palmata, and sagittefolia.

Drynaria coronans, diversifolia, morbillosa, and‘ quercifolia.

Elaphoglossum cuspidatum, T’Herminieri, scolopendrifolium, squamosum, and numerous other species.

Gleichenia dichotoma, furcata, pectinata, and pubescens.

Goniophlebium appendiculatum, colpodes, lachnopus, Lepidopteris, loriceum, squamatum, subauriculatum, and verrucosum.

Goniopteris asplenioides, crenata, Ghiesbreghtii, refracta, and reptans.

Gymnogramma chrysophylla and its variety Parsonsii; flexuosa, L'Herminieri, Pearcei, peruviana and_its variety argyrophylla; pulchella, sulphurea, tartarea, trifoliata, and Wettenhalliana.

Hlemitelia gvandifolia, horrida, Karsteniana, and speciosa.

Tlwmata alpina, heterophylla, and pedata.

THymenodium crinitum.

Hymenophyllum, any of the species.

Hymenostachys elegans.

Hypolepis repens.

Lastrea augescens, deltoidea, patens, recedens, and strigosa (crinita).

Lindscea cultrata, guianensis, and trapeziforniis.

Litobrochia aurita, denticulata, macroptera, podophylla, and tripartita.

Lomaria attenuata, fraxinifolia, L'Herminieri, and onocleoides.

Lygodictyon Forsteri.

Lygodium flexuosum, venustum,

Microlepia hirta cristata.

Nephrodium articulatum, unitum, and venustum.

Nephrolepis davallioides and its variety furcans; Duffii, ensifolia, exaltata, pectinata, pluma, tuberosa, and undulata.

Niphobolus costatus, Gardneri, and pertusus.

‘Nothochloena flavens, nivea, rufa, sinuata, and trichomanoides.

Oleandra articulata, neriiformis, and nodosa.

Olfersia cervina.

Onychiwm auratum.

Osmunda palustris (evergreen).

Philebodium areolatum, aureum, pulvinatum, and sporadocarpum.

Platyccrium alcicorne and its variety majus; biforme, grande, Hillii, Stemmaria, Wallichii, and Willinckii.

Pleocnemia Leuzeana.

Pleopeltis albo-squamata,

Polybotrya caudata and osmundacea.

Polypodium Diane, Paradisez, pectinatum, and Schkuhrii.

Polystichwm coniifolium, denticulatum, lentum, ordinatum, triangulum, and viviparum.

Ptcris argyrea, aspericaulis longifolia, quadriaurita, semipinnata, tricolor, serrulata and its many varieties.

Sadleria cyatheoides.

Sagenia cicutaria, macrophylla, Pica, and repanda.

Schizea dichotoma and elegans.

Stenosemia aurita.

Thamnopteris australasica and Nidus.

Thyrsopteris elegans.

Trichomanes, any of the species.

Select Greenhouse Ferns.

Acrophorus hispidus (Davallia Nove-Zelandiz).

‘Adiantum affine, assimile, cuneatum, decorum, cxcisum and its variety multifidum; formosum, glaucophyllum, hispidulum, reniforme, and sulphureum. ;

Alsophila australis, capensis, excelsa, and Leichardtiana.

Asplenium appendiculatum, pulbiferum, Colensoi, compressum, dimorphum, Dregeanum, [flabellifolium, flaccidum, Hemionitis (palmatum), jucidum, monanthemum, obtusatum, polyodon, and premorsum.

Balantium Culcita.

Blechnum australe and serrulatum.

Ccterach aureum.

Cheilanthes alabamensis, argentea, capensis, fragrans, hirta fllisiana, micromera, microphylla, pteroides, alld tenuifolia.

Cyathea Burkei, Cunninghamii, dealbata, Dregei, medullaris, and Smithii.

Cyrtomium caryotideum, falcatum, and Fortunei.

Pavallia canariensis and pyxidata.

Dennsteedtia davallioides Youngii.

Dicksonia antarctica, Berteroana, Sellowiana, squarrosa, and Youngie.

Doodia aspera and its varieties multifida and corymbifera; blechnoides, caudata and its variety confluens:; and media.

Gleichenia circinata and its variety glauca; Cunninghamii, dicarpa, flabellata, hecistophylla, rupestris, semivestita, and Spelunce.

THuwmata Tyermanni.

ymenophyllum eruginosum, crispatum, cruentum, demissum, dilatatum, flabellatum, flexuosum, fuciforme, polyanthos, pulchcrrimum, and scabrum.

Hypolepis Bergiana, distans, Millefolium, and tenuifolia.

Lastrea aristata variegata, decomposita, decurrens, elongata, erythrosora, glabella, hispida, laserpitiifolia, Sieboldii, and varia.

Litobrochia comans, macilenta, and vespertilionis.

Llavea cordifolia.

Lomaria australis, blechnoides, capensis, ciliata, discolor and its variety pipinnatifida; dura, fluviatilis, Fraseri, gibba and its variety Bellii; Gilliesil, lanceolata, magellanica, nuda, obtusata, Patersoui, and procera.

Loxsoma Cunninghaniii.

Nicrolepia cristata, platyphylla, scabra, and strigosa.

Niphobolus heteractis, Lingua, and rupestris.

‘Nothochlena canariensis, Eckloniana, .levis, lanuginosa, and Marantz.

Platyloma atropurpureum, bellum, Brownii, Calomelanos, cordatum, falcatum, flexuosum, and rotundifolium.

Pleopeltis Billardieri and pustulata.

Polystichum capense, falcinellum, frondosum, tripteron, venustum, and vestitum.

Pteris arguta, crenata, cretica albo-lineata, hastata, Kingiana, longifolia, semipinnata, serrulata and its many garden sports (angustata, Applebyana,

and volubile.

cyatheoides, Hookerii, pteroides, truncatum,

incurvata, leiorhiza, longissima, and Phymatodes.

lepidocaulon, proliferum,

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| corymbifera, cristata, cristata variegata, Goeziana, polydactyla, semifastigiata, Leyi, and fimbriata), tremula, and umbrosa, haat parbara (africana), Fraseri, hymenophylloides (pellucida), and superba. Trichomanes elongatum, reniforme, Woodsia mollis. Woodwardia orientalis, and radicans with its variety cristata.

Select Hardy Ferns.

Adiantum Capillus Veneris and the varieties incisum, magnificum, and cornubiense; and pedatum.

Allosorus crispus. j

Asplenium Adiantum nigrum and the variety grandiceps; alternans, angustifolium, ebeneum, fontanum ; lanceolatum and the variety microdon; marinum and the varieties ramosum, trapeziforme, subbipinnatum, and crenatum ; Trichomanes and the varieties incisum, Moulei, ramosum, multi-fidum, and cristatum.

AthyriumFilix foemina and the varieties corymbiferum, crispum, Frizelliz, Applebyanum, grandiceps, plumosum, Victoria, apiculatum, acrocladon, apuzforme, coronatum, Elworthii, gracillimum, Grantie, marinum, multi-

ceps, multifidum, polyclados, polydactylon, thyssanotum, é&c. ; and Goringianum pictum.

Blechnum Spicant and the varieties imbricatum, multifurcatum, ramosum.

Camptosorus rhizophyllus.

Ceterach officinarum.

Cyrtomium falcatum.

Cystopteris bulbifera, montana, and sudetica.

Dennstcedtia punctilobula (Dicksonia pilosiuscula).

Dictyogramma, japonica.

Diplazium lanceum an

Gletichenia alpina.

Hymenophyllum tunbridgense and unilaterale.

Lastrea semula (foenisecii), atrata, cristata ; Chanterie, dumetorum, lepidota ; erythrosora; Filix mas and the varieties Bollandis, cristata, cristata angustata, grandiceps, paleacea, Pinderi ; Goldiana, marginalis ; montana and the varieties crispa, cristata, Nowelliana; noveboracensis, remota, rigida, spinulosa and Thelypteris.

Lomaria alpina and chilensis.

Lygodium palmatum.

Nothochleena Marantee and vestita.

Onoclea sensibilis.

Onychium lucidum (japonicum).

Osmunda cinnamomea, spectabilis, gracilis, Claytoniana (interrupta), regalis and its variety cristata. z

Polypodium alpestre and its variety flexile ; Dryopteris, Krameri, Phegopteris, Robertianum (calcareum), vulgare and its varieties cambricum, cristatum, omnilacerum, pulcherrimum, semilacerum, and cornubiense.

Polystichwmn acrostichoides ; aculeatum and its varieties lobatum, multifldum, acrocladon, &c.; angulare and its varieties cristatum, grandiceps, Holeane, parvissimum, Pateyi, polydactylum, proliferum, proliferum Wollastoni, rotundatum, grandidens, imbricatum, plumosum, Kitsonix, pterophorum, tripinnatum, &c. ; falcinellum, Lonchitis, and setosunl.

Pteris aquilina, cretica albo-lineata, and scaberula.

Scolopendrium vulgare and its varieties acrocladon, Claphamii, columnare, Coolingii, crispum, crispum fertile, crispum minus, crispum latum, cristatum, laceratum, marginatum, multifidum, Stansfleldii, and many others.

Struthiopteris germanica, japonica, and pennsylvanica.

Trichomanes radicans.

Woodsia alpina, ilvensis, obtusa,

Woodwardia areolata, japonica,

See FERNS,

[FRUITS.

and venosum.

fragilis and the varieties angustata and Dickieana ;

thelypteroides.

dilatata and its varieties

and’polystichoides Veitchii. and virginica. vol. ix. pp. 100-107.

VI. Fruits.

114. Fruit Tree Borders. —No pains should be spared, in the preparation of fruit tree borders, to secure their thorough drainage. The soil is sometimes placed upon a pavement flooring supported by stone or brick piers, with a cavity below of 18 inches or 2 feet deep, into which air is admitted by small vertical eyes, placed along the edges of the walk, and covered with open iron gratings. This arrangement is expensive, and the same advantages can generally be secured by placing over the sloping bottom a good layer of coarse rubbly material, communicating with a drain in front to carry off the water, while earthenware drain tubes may be laid beneath the rubble from 8 to 10 feet apart, so as to form air drains, and provided with openings both at the side of the walk and also near the base of the wall. Over this rubbly matter, rough turfy soil, grass-side down- wards, should be laid, and on this the good prepared soil in which the trees are to be planted. Such an elaborate system of drainage is necessary only in the case of adhesive clayey subsoils. :

The borders should consist of three parts rich turfy cal- careous loam, the top spit of a pasture, and one part light gritty earth, such as road-grit, with a small portion (one- sixth) of fine lime and brick rubbish. They should not be less than 12 feet in breadth, and may vary up to 15 or 18 feet, with a fall from the wall of about 1 inch in 3 feet. The border itself should be raised a foot or more above the general level. The bottom of the border as well as that of the drain must be kept lower than the general level of the subsoil, else the soakage will gather in all the little de-

| Almond,

Apple.

FRUITS. |

pressions of its surface. Fruit-tree borders should not be at all cropped with culinary vegetables, or very slightly so, as the process of digging destroys

the roots of the trees, and drives them from near the surface, where they ought to be.

Shallow planting, whether of wall trees or standards, is generally to be preferred, a covering of a few inches of soil being sufficient for the roots, but a surface of at least equal size to the surface of the hole should be covered with dung or litter so as to restrain evaporation and preserve moisture. In the case of wall trees, a space of 5 or 6 inches is usually left between the stem at the insertion of the roots and the wall, to allow for increase of girth. Young standard trees should be tied to stakes so as to prevent their roots being ruptured by the wind-waving of the stems.

In the selection and distribution of fruit trees regard must of course be had to local situation and climate. The best walls having a south or south-east aspect are devoted to the peach, apricot, and fig. Cherries and the generality of plums succeed very well either on an east or a west aspect. In Scotland the mulberry requires the protection of a wall, and several of the finer apples and pears do not arrive at perfection without this help, and a tolerably good aspect. The wall-trees intended to be permanent are called dwarfs, from their branches springing from near the ground. Between these, trees with tall stems, called riders, are planted as temporary occupants of the upper part of the wall. The riders should have been trained in the nursery into good-sized trees, in order that when planted out they may come into bearing as speedily as possible.

Standard Fruit Trees should not be planted, if it can be avoided, in the borders of the kitchen garden, but in the outer slips, where they either may be allowed to attain their full size, or may be kept dwarfed. Each sort of fruit should be planted by itself, for the sake of orderly arrange- ment, and in order to facilitate protection when necessary by a covering of nets, Their produce is often superior in flavour to that of the same kind of fruit grown on walls.

115. The Almond, Amygdalus communis, is very ornamental in respect to its flowers in the early spring months, but of little value for its fruit. There are two varieties, one producing large flowers and sweet-kernelled fruits, and the other small flowers and bitter kernels. Every good garden should containa tree or two, especially of the sweet almond, for their ornamental

aspect in spring. The almond requires a warm light soil, well drained, and a sheltcred position and warm aspect. It is propagated by budding on the seedling almond, or for heavier soils on the plum stock. See ALMOND, Vol. i. p. 594.

116. The Apple, Pyrus Malus, is amongst the most useful of all our hardy fruits, and succeeds in loealities too cold for either the pear or the plum, while from its flowering later in the spring it is less liable to be cut off by frosts.

It may be propagated by seeds to obtain stocks for grafting, and also for the production of new varieties. The established sorts are usually increased by grafting, the method called whip-grafting being preferred. The stocks should be at least as thick as the finger ; and should be headed baek to where the graft is to be fixed in January, unless the weather is frosty, but in any ease before vegetation becomes active. The seions should be cut about the same time, and laid in firmly in a trench, in contact with the moist soil, until required.

The apple-tree will thrive in any good well-drained soil, the best being a good mellow calcareous loam, while the less iron there is in the subsoil the better. The addition of marl to soils that are not naturally caleareous very mueh improves them. The trees are liable to eanker in undrained soils or those of a hot sandy nature. Where the soil is not naturally rieh enough, it should be well manured, but not to the extent of encouraging over-luxuriance. It is better to apply manure in the form of a compost than to use it in a fresh state or unmixed.

To form an orehard, standard trees should be planted at from 25 to 40 feet betwecn the rows, aceording to the fertility of the soil and other considerations. The trees should be seleeted with clean, straight, self-supporting stems, and the head should be shapely and symmetrical, with the main branches well balanced. In order to obtain such a stem, all the leaves on the first shoot from the graft or bud should be encouraged to grow, and in the sccond season the

while the lateral shoots should be allowed to grow, but so that they do not compete with the leader, on which the growth of leaves should be encouraged in order that they may give additional strength to the stem below them. The side shoots should be removed gradually, so that the diminution of foliage in this direetion may not exceed the inerease made by the new branches and shoots of the upper portion. Dwarf pyramids, which oecupy less space than open dwarfs, if not allowed to grow tall, may be planted at from 10 to 12 feet apart. Dwarf bush trees may be planted from 10 to 15 feet apart, according to the variety and the soil. Dwarf bushes on the Paradise stoek are both ornamental and useful in small gardens, the trees being always conveniently under control. These bush trees, which must be on the proper stoek—the French Paradise—may be planted at first 6 feet apart, with the same distance between the rows, the space being afterwards increased, if desired, to 12 feet apart, by removing every alternate row.

"'Cordons" are trees trained to a single shoot, the laterals of which are kept spurred. They are usually trained horizontally, at about 14 feet from the ground, and may consist of one stem or of two, the stems in the latter ease being trained in opposite directions. In cold districts the finer sorts of apples may be grown against walls as upright or oblique cordons. From these cordon trees very fine fruit may often be obtained. The apple may also be grown as an espalier tree, a form which does not require much lateral space. The ordinary trained trees for espaliers and walls should be planted 20 feet apart. °

The fruit of the apple is produced on spurs which form on the branehlets of two years old and upwards, and continue fertile for a series of years. The principal pruning should be performed in summer, the young shoots if crowded being thinned out, and the superabundant laterals shortened by breaking them half through. The general winter pruning of the trees may take placc any time from the beginning of November to the beginning of March, in open weather. The trees are rather subject to the attacks of the American blight (Zriosoma mali), which may be removed by serubbing with a hard brush, by painting the affected spots with any bland oil, or by washing them with dilute paraffin and soft soap.

The following are a few of the most approved varieties of the apple tree, arranged in the order of their ripening, with the months in which they are in use:—

Dessert Apples. White Juneating …..... July. Ribston Pippin …..... Nov.-Mar Early Red Margaret…... Aug. Golden'Eippin) .....; Noy.-Apr (rish Peaches …s as:006 +0 Aug. Golden Reinette …..... Nov.-Apr Devonshire Quairenden ..Aug., Sept. | Northern Spy…..... Nov.-Apr. Duchess of Oldenburg….Aug., Sept. | Rosemary Russet …..... Nov.-Apr CORI Sooc on oe OR Ane eeneeS ug., Sept. | Ashmead's Kernel…..... Nov.-—May. Red Astrachan …..... Sept. Aromatic Russet …..... Dec.-Feb (erry Pippin sis ctcieves ose Sept., Oct. | White Winter Calville Dec.-Ma: Peasgood's Nonesuch ….Sept., Oct. {grown under glass) .. ees King of the Pippins…... Oct.—Jan. Braddick's Nonpareil ….Dec.—Apr. Cox's Orange Pippin…... Oct.-Feb. | Court-pend(d Plat …..... Dec.-Apr Court of Wick …..... Oct.-Mar. | Wyken Pippin …..... Dec.—Apr Blenheim Pippin …..... Nov.-Feb. | Cornish Gilliflower …... Dec.-May. S@MVONIR. seve ccc.» Nov.-Feb. | Golden Harvey …..... Dec.-May Sykehouse Russet…..... Nov.-Feb. | Scarlet Nonpareil…..... Jan.—Mar. earns Pippiny… .. +0. ss Nov.-Mar. | Cockle's Pippin …..... Jan.—-May. Herefordshire Pearmain..Nov.-Mar. | Lamb Abbey Pearmain…Jan.-May. Mannington's Pearmain..Nov.-Mar. | Old Nonpareil …..... Jan.—May. Mare ilimertemiery serene cients Nov.-Mar. | Sturmer Pippin …..... Feb.-June. Kitehen Apples.

Keswick Codlin…..... Aug., Sept. ; Gloria Mundi…..... Novy.-Jan. EOrgsusHeld' sic..6. 66050. Aug., Sept. | Blenheim Pippin …..... Nov.-Feb ManksiCodlin…....+. Aug.-Oct. | Tower of Glammis …... Nov.-Feb Ecklinville Seedling …..Aug.-Nov. | Warner's King …..... Nov.-Mar. Stirling Castle. ..... Aug.-Nov. | Alfriston ….....Nov.-Apr. SUMWC Rises ccs. seta ss aiafrrieiens Aug.-Nov. | London Pippin …..... Nov.-Apr Emperor Alexander…....Sept.-Dec. | Northern Greening …... Nov.-Apr Waltham Abbey Seedling Sept._Jan. | Reinette de Canada…... Nov.-Apr. Cellimigeiiie. ccc sscsec aces ct., Nov. | Bess Pool…..... Chale ae Noy.-May. GTAVENStEIN 0… sc00c56s Oct.-Dec. | Royal Russet …..... Nov.~~June Hawthornden …..... Oct.—Dec GOGHEDEEEY, .2).~~ . sisjs:0,00 Nov.-July. Baumann's Red Winter Oct.-J Winter Greening …..... Nov.-July.

IREIHECEC s.c.2s00000.0 Cu.van. | Rhode Island Greening .. Dec.-Apr. Mére de Ménage…..... Oct.-Jan. LTE Ceo G aoa Oo. dae Dec.—-Apr. Beautyiot Kent'..... Oct —Feb. Lane's Prince Albert. ....Jan.-June. Yorkshire Greening …...Oct.-Feb. Norfolk Beaufin …..... Jan.-June.

See APPLE, vol, ii. p. 211.

117. The Apricot, Prunus Armeniaea or Armeniaca vulgaris, is Apricot.

propagated by budding on the mussel or common plum stoek. The tree sueceeds in good well-drained loamy soil, rather light than heavy. It is usually grown as a wall tree, the cast and west aspects being preferred to the south, which induces mealiness in the fruit, though in Scotland the best aspects are necessary. The most usual and best mode of training is the fan method in the modi- fied form represented in par. 26, under fig. 83. The fruit is produced on shoots of the preceding year, and on small close spurs formed on the two-year-old wood. The trees should be planted about 20 feet apart. The summer pruning should commence early in June, at which period all the irregular fore-right and useless shoots are to be pinched off; and, shortly afterwards, those which remain arc to be fastened to the wall. At the winter pruning all

terminal bud should be allowed to develop a further leading shoot, | branches not duly furnished with spurs and fruit buds are to be

removed. Tho young bearing shoots are modcratcly pruncd at the points, care being, however, taken to leave a terminal shoot or leader to each branch. The most common error in the pruning of apricots is laying in the bearing shoots too thiekly ; diverge in fan training, and when they extend so as to be about 15 inches apart, a fresh branch should be laid in, to be again sub- divided as required. The blossoms of the apricot open early in spring, but are more hardy than those of the peach; the same

means of protection when necessary may be employed for both. If

the fruit sets too numerously, it is thinned out in June and in the beginning of July, the later thinnings being used for tarts. In the south of England, where the soil is suitable, the hardier sorts of apricot, as the Breda and Brussels bear well as standard trees in favourable seasons. In such cases the trees may be planted from 20 to 25 feet apart.

Forcing. —The ripening of the fruit of the apricot may be acceler- ated by culture under glass, the trees being either plantcd out like peaches, or grown in pots on the orchard-housc system. They must be very gently excited, since they naturally bloom when the spring temperature is comparatively low. At first a maximum of 40° only must be permitted ; after two or threc weeks it may be raised to 45°, and later on to 50° and 55°, and thus continued till the trees are in flower, air being frecly admitted, and the minimum or night temperature ranging from 40° to 45°. After the fruit is set the tempcrature should be gradually raised, being kept higher in clear weather than in dull. When the fruit has stoned, the temperature may be raiscd to 60° or 65° by day and 60° by night ; and for ripening off it may be allowed to reach 70° or 80° by sun heat.

The Moorpark is undoubtedly the best apricot in cultivation, and should be planted for all general pernenss ; the Peach is a very similar variety, not quite identical ; and the Hemskerk is also similar, but hardier. The Large Karly, which ripens in the end of July and beginning of Angust, and the Kaisha, a sweet-kernelled variety, which ripens in the middle of August, are also to be recommended. For standard trees in favourable localities the Breda und Brussels may be added. See APRICOT, vol. ii. p. 214.

118. The Cherry, Cerasus avium and C. vulgaris, is increased by budding on the wild gean, obtained by sowing the stones of the small black or red wild cherries. To secure very dwarf trees, the Cerasus Mahaleb has becn used for the May Duke, Kentish, Morello, and analogous sorts, but it is not adapted for strong-growing varicties like the Bigarreaus. The stocks are budded, or, morc rarcly, grafted, at the usual seasons. The cherry prefers a free, loamy soil, with a well-drained subsoil. Stiffsoilsand dry gravelly subsoils are both unsuitable, though the trees require a large amount of moisture, particularly the large-leaved sorts, such as the Bigarreaus. For standard trees, the Bigarreau section should be planted 30 feet apart, or more in rich soil, and

the May Duke, Morello, and similar varieties 20 or 25 feet apart ; while, as trained trecs against walls and espaliers, from 20 to 24 feet should be allowed for the former, and from 15 to 20 feet for the latter.

In forming the stems of a standard tree, the temporary side-shoots should not be allowed to attain too great a length, and should not be more than two years old when they are cut close to the stem. The first three shoots retained to form the head should be shortened to about 15 inches, and two shoots from each encouraged, one at the end, and the other 3 or 4 inches lower down. When these have become established, very little pruning will be required, and that chiefly to keep the principal branches as nearly equal in strength as possible for the first few years.

Espalier trees should have the branches about a foot apart, starting from the stem with an upward curve, and then being trained hori- zontally. In summer pruning the shoots on the upper branches must be shortened at least a week before those on the lower ones. After a year or two clusters of fruit buds will be developed on spurs along the branches, and those spurs will continue productive for an indefinite period.

For wall trees any form of training may be adopted ; but as the fruit is always finest on young spurs, fan-training is probably the most advantageous. A succession of young shoots should be laid in every ycar. The Morello, which is of twiggy growth, and bears on the young wood, must be trained in the fan form, and care should be taken to avoid the very common error of crowding its branches.

Foreing.—The cherry will not endure a high temperature nora close atmosphere. A heat of 45° at night will be sufficient at starting, this being gradually increased during the first few weeks to 55°, but lowered again when the blossom buds are about to open. After stoning the temperature may be again gradually raised to 60°, and may go up to 70° by day, or 75° by sun heat, and 60° at night. The best forcing cherries are the May Duke and the Royal Duke, the Duke cherries being of more compact growth than the Bigarreau tribe, and generally setting better ; nevertheless a few of the larger kinds, such as Bigarreau Napoléon, Black Tartarian, and St Mar- garet’s, should be forced for variety. The trees may be either planted out in tolerably rich soil, or grown in large pots of good turfy friable calcareous

loam mixed with rotten dung. If the plants are small, they may be ay into 12-inch pots in the first instance, and after a ycar shifted into 15-inch pots early in autumn, and plunged in

some loose or even very slightly fermenting material. The soil of

the branches naturally —

the pots should be protected from snow-showers and cold rains. Occasionally trees have been taken up in autumn with balls, potted, and forced in the following spring ; but those which ,have becn established a year in the pots are to be preferred. Such only as are well furnished with blossom-buds should be selected. The trecs should be removed to the forcing house in the beginning of December, if fruit be required very early in the season. During the first and second weeks it may be kept nearly close; but, as vegetation advances, air becomes absolutely necessary during the day, and even at night when the weather will permit. If forcing is commenced about the middle or third week of December, the fruit ought to be ripe by about the end of March. After the fruit is gathered, the trees should be duly supplied with water at the root, and the foliage kept well syringed till the wood is mature.

The following are some of the best varieties now in cultivation. B. signifies that they belong to the Bigarreau, D. to the May Duke, and M. to the Morello section ; K. indicates that they are specially adapted for culinary purposes; and b., m., and e. show that they are in ey at beginning, middle, and end respectively of the month stated :-—

Belle d’Orleans, B. .....b.m. June. | Archduke, D. ..... m. July Early Purple Gean, B. ....m. June. Royal Duke; Diss… 6… m. July Early Red Bigarreau, B. ..m.e. June. | Joc-o-sot, B…….....+.- m. July Early Jaboulay, B. .....e. June. Biittner’s Yellow, B…....m. July Early Lyons, B. .....e. June. Biittner’s Black Heart, B…m. July. Harly Rivers, B…….....< e. z une. la a B. evereiaueteieie otras m. J ie . e. June Mammoth, B. .... m. e. July

Black Tartarian, B SOI Ty cinky Reine Hortense, D. m Bigarreau Noir de aul Kentish, M., K. .

Schmidt, B.,..... y Morello, M., K. .. Frogmore Early, B…....b. July Bigarreau Napoléon, B. ..e. July aie oat coguamgge R : wy Duchesse de Palluau, D…e. ee

RelkwHIO1 ASB: ss\scleiemies . duly: , e. Ju Governor Wood, B. .....b. July. 4 cael B. sess b. ‘Aug.

: e. June, HOME Met atels elelelelteisiels!s © m.e. Au

May Duke, D, (on walls) { b. July. Biittner’s October,D. K. ..October.

See CHERRY, Vol. v. p. 586. ,

119. The Cranberry.—The American cranberry, Oxycoccus ma- Cran- crocarpus, grows freely in beds of peat soil or bog earth formed for berry. their reception in any damp situation. Beds are often prepared around the edges of a pond by depositing a layer of rubble or stones at the bottom, and over these a good thickness of peat or bog earth mixcd with sand, cxtending about 6 inches below and about 4 inches above the usual level of the water surface. On this bed the cranberry plants should be put in at 2 feet apart, in autumn or spring; spreading in all directions, they will soon cover the whole surface with a dense mat of trailing shoots.

The common cranberry, Oxycoccus palustris, a native of Britain, bears fruit which is inferior to that of the American cranberry in size and quality. The plants may be treated in the same manner, and in some places are very successfully cultivated. Sce CRran- BERRY, vol. vi. p. 545.

120. The Currants are among the most useful of small fruits. Currant. The red and the white currant are included as varieties under Ribes rubrum, the white being a pale-fruited variety of the red. The black currant is the produce of Ribes nigrum. Of both types there are several greatly improved varieties.

Red and white currants are readily propagated by cuttings. They succeed in any well-enriched garden soil, but thrive best in warm moist situations, where they enjoy an abundance of air ; occasionally they are trained perpendicularly against low walls or fences. As bushes they are best planted in compartments by themselves, at about 5 or 6 fect apart each way, and should be on clean single stems some 8 or 10 incheslong. They are sometimes trained as standards on single stems, 3 or 4 feet high, in which form the fruit is more accessible. The winter pruning consists in shortening the young bearing wood on the sides of the branches so as to form spurs of an inch or two in length. The leading shoots are left about 6 inches long. Some cultivators reduce the young shoots to about half their length as soon as the fruit begins to colour, which is found to increase the size and improve the flavour of the berries.

The black currant thrives best in a moist deep soil and shady situation. Its culture is much the same as that of the other cur- rants, but the young shoots are not spurred, all the pruning neces- sary being to keep the branches thinned ont so as to stand clear of each other, and to promote the formation of young wood. If the fruit is intended for preserving, it should not be gathered while wet, nor, if it can be avoided, immediately after a wet period.

Aphides often cluster in vast numbers at the extremities of the summer shoots, especially of red and white currants, and should be destroyed by cutting off and burning the parts infested, or by ap- plying some of the many insecticides.

The following are the best sorts of currants for general pur- poses:—

Red.—Red Dutch, Knight’s Large Red, Houghton Secdling or Orangeiicld (late), Gondouin or Raby Castle (late), Lace-leaved or Large Sweet Red, Chmapagne (flesh-coloured).

White.—White Dutch, Wilmot’s Large White.

Black.—Black Naples, Black Grape or Ogden’s, Lee’s Prolific, See CURRANTS, vol. vi. p. 715.

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FRUITS. |

121. The Fig, Ficus Carica, lives to a great age, and along the southern coast of England bears fruit abundantly as a standard ; but in Scotland and in many parts of England a south wall is indispensable for its successful cultivation out of doors,

Fig trees are propagated by cuttings, which should be put into pots, and placed in a gentle hotbed. They may be obtained more speedily from layers, which should consist of two or three years old shoots, and these, when rooted, will form plants rcady to bear fruit the first or second year after planting. The best soil for a fig bor- der is a friable loam, not too rich, but well drained; a chalky subsoil is congenial to the tree, and, to correct the tendency to over- luxuriance of growth, the roots should be confined within spaccs surrounded by a wall enclosing an area of about a square yard. The sandy soil of Argenteuil, near Paris, suits the fig remarkably well; but the best trees are those which grow in old quarries, where their roots are frec from stagnant water, and where they are sheltered from cold, while exposed to a very hot sun, which ripens the fruit perfectly. The fig succeeds well planted in a paved court against a building with a south aspect.

The fig tree naturally produces two sets of shoots and two crops of fruit in the season. The first shoots generally show young figs in July and August, but these in the climate of England very seldom ripen, and should therefore be rubbed off. The late or midsummer shoots likewise put forth fruit-buds, which, however, do not develop themselves till the following spring; and these form the only crop of figs on which the British gardener can depend.

The fig tree grown asa standard should get very little pruning, the effect of cutting being to stimulate the buds to push shoots too vigorous for bearing. When grown against a wall, it has been recommended that a single stem should be trained to the hcight of a foot. Above this a shoot should be

trained to the right, and another to the left ; from these principals two other subdivisions should be cncouraged, and trained 15 inches apart; and along these branches, at distances of about 8 inches, shoots for bearing, as nearly as possible of equal bg va should be encouraged, The bearing shoots produced along the leading branches should be trained in at full length, and in autumn every alternate one should be cut back to one eye. In the following summer the trained shoots should bear and ripen fruit, and then be cut back in autumn to one eye, while shoots from the bases of those cut back the previous antumn should be trained for succession. In this way every leading branch will be furnished alternately with bearing and successional shoots.

When protection is necessary, as it may be in severe winters, though it is too often provided in excess, spruce branches have been faund to answer the purpose exceedingly well, owing to the fact that their leaves drop off gradnally when the weather becomes milder in spring, and when the trees require less protection and more light and air. The principal part requiring protection is the main stem, which is more tender than the young wood.

Forcing.—The fig requires more heat than the vine to bring it into leaf. It may be subjected to a temperature of 50° at night, and from 60° to 65° in the day, and this should afterwards be in- creased to 60° and 65° by night, and 70° to 75° by day, or even higher by sun heat, giving plenty of air at the same time. In this temperature the evaporation from the leaves is very great, and this must be replaced and the wants of the swelling fruit supplied by daily watering, by syringing the foliage, and by moistening the floor, this atmospheric moisture being also necessary to keep down the red spider. When the crop begins to ripen, a moderately dry atmosphere should be maintained, with abundant ventilation when the weather permits.

The fig tree is easily cultivated in pots, and by introducing the plants into heat in succession the fruiting season may be consider- ably extended. The plants should be potted in turfy loam mixed with charcoal and old mortar rubbish, and in summer top- dressings of rotten manure, with manure water two or three times a week, will be beneficial. While the fruit is swelling, the pots should be plunged in a bed of fermenting leaves.

The following are afew of the best figs ; those marked F, are good forcing sorts, and those marked W. suitable for walls :—

Agen: brownish-green, turbinate.

Angélique (Madeleine), F., W.: yellow, turbinate.

_ Brown Ischia, F.: chestnut-coloured, roundish-turbinate.

Brown Turkey (Lee’s Perpetual), F., W.: purplish-brown, turbinate

Brunswick, W.: brownish-green, pyriform.

Col di Signora Blanca, F.: greenish-yellow, pyriform.

Col di Signora Nero: dark chocolate, pyriform.

Datte: pale dingy brown, pyriform.

Harly Violet, F.: brownish-purple, roundish.

Grizzly Bourjassotte: chocolate, round.

Grosse Monstreuse de Lipari: pale chestuut, turbinate.

Lucrezia: dull white, roundish.

Negro Largo, F.: black, long pyriform.

Royal Vineyard: purple, long pyriform.

White Ischia, F.: greenish-yellow, roundish-obovate.

White Marseilles, F., W.: pale green, roundish-obovate.

See Fie, vol. ix. p. 153.

122. The Gooseberry has a double parentage, Ribes Grossularia being the parent of the rough or hairy-fruitcd sorts, and R. Uva- crispa that of the

smooth-fruited ones. It prefers a loose rich

soil, which readily imbibes, but does not retain, much moisture. The plant is propagated by cuttings, and should be transplanted early in autumn, the trees, like those of the currant, being ranged in lines or grouped in compartments. ‘The trees should be formed with single stems a foot high; and the suckers, if aly spring up from the roots, should be carefully removed. F ormerly it was the practice in Scotland to spur all the annual wood; but now the black currant system of pruning is more generally and advantageously followed. The ground on which the bushes stand should be forked over once a year, but only slightly, so as not to disturb the roots, and manure should be applied either as a top-dressing or ina liquid form. The caterpillars which attack the plant may be destroyed by dusting the leaves with powdered white hellebore, which secms to be the only certain remedy, as cven hand-picking fails in some seasons when the caterpillars are very abundant, and the trees are numerous.

The gooseberry, like the currant, may be trained on walls or espaliers, to accelerate the ripening or increase the size of the fruit. The following is a good limited selection of sorts :—

Hairy Reds.—Red Champagne, Red Warrington, Keens’ Seedling, Rough Red, Lord Derby, Henson’s Seedling, Crown Bob, Companion.

Hairy Yellows.—Yellow Champague, Early Sulphur (very early) , Catharina, Fanny, Broom Girl.

Hairy Greens.—Karly Green Hairy, Glenton Green, Thunder.

Hairy Whites.—White Champagne, Bright Venus, White Lion, Trans-parent, Snowdrop, Fascination, Antagonist. Maid of the Mill, Early

qe” Whites.—Whitesmith, Cheshire Lass,

ite.

<_< Jteds.—London (very large), Plough Boy, Small Red Globe, Turkey ed. Smooth Yellows.—Smiling Beauty, Leveller, Gipsy Queen, Leader, Ringer. Smooth Greens.—Pitmaston Green-gage, Telegraph, Heart of Oak, Green

Overall, Shiner, General Markham.

Smooth Whites.— White Honey, White Fig, Careless, Freedom. See GOOSEBERRY, vol. x. p. 779.

123. The Medlar, Mespilus germanica, is a deciduous tree, native Medler.

of the middle and south of Europe, and found in hedges and woods in England. Its fruit is hard, acid, and unfit for eating till it loses its green colour and becomes “ bletted,” in which state it acquires an agrecably acid and somewhat astringent flavour.

The medlar is propagated by budding or grafting upon the white- thorn, which is most suitable if the soil is dry and sandy, or on the quince ifthe soilismoist. It produces the best fruit in rich, loamy, somewhat moist ground. The tree may be grown as a standard, and chicfly requires pruning to prevent the branches from crossing and rubbing each other. The fruit should be gathered in November, on a dry day, and laid out upon shelves in the fruit room. It becomes bletted and fit for use in the course of two or three weeks.

124. The Afelon, Cucumis Melo, is an annual tropical plant of Melon.

climbing or trailing habit, extensively cultivated in Persia and some parts of India. The plant requires artificial heat to grow it to per- fection, the rock and cantaloup varicties succeeding with a bottom heat of 70° and an atmospheric temperature of 75°, rising with sun heat to 80°, and the Persian varieties requiring a bottom heat of 75°, gradually increasing to 80°, and an atmospheric tempera- ture ranging from 75° to 80° when the fruit is swelling, as much sun heat as the plants can bear being allowed at all times. The melon grows best in rich turfy loam, somewhat heavy, with which a little well-rotted dung, especially that of pigeons or fowls, should be used,

in the proportion of one-fifth mixed in the compost of loam. Mclons are grown on hotbeds of fermenting manure, when the soil should be about a foot in thickness, or in pits heated either by hot water or fermenting matter, or in houscs heated by hot water, in which case the soil bed should be 15 or 18 inches thick. The fer- menting materials should be well prepared, and, since the heat has to be kept up by linings, it is a good plan to introduce one or two layers of faggots in building up the bed. A mixture of dung and leaves gives a more subdued but more durable heat.

For all ordinary purposes February is early enough for sowing the first crop, as well-flavoured fruits can scarcely be looked for before May. The sceds may be sown singly in 3-inch pots in a mixture of leaf-mould with a little loam, the pots being plunged ina bottom heat of 75° to 80°, and as near the glass as possible, in order that the young plants may not be drawn up. The hill or ridge of soil should be about a foot in thickness, the rest of the surface being afterwards made up nearly to the same level. If the fruiting bed is not ready when the roots have nearly filled the pots, they must be shifted into 4-inch pots, for on no account must they be allowed to get starved or pot-bound. ‘Two or three plants are usually planted in a mound or ridge of soil placed in the centre of cach light, and the rest of the surface is covered over to a similar depth as soon as the roots have made their way through the mound.

The mode of pruning and training is similar whether the plants are grown on a trellis or on the surface of a bed, with this difference that in the former casc the main stem has to be carricd up to a sufficient height to reach the trellis before it is stopped. When the plants are trained on the surface of the beds the tops should be pinched off as soon as the second rough leaf is fairly formed, the stopping being effected either long enough before planting to allow the buds to break, or not until the plants have taken fresh root after planting. Onc branch will thus be developed from the axil of cach

Mul- berry.

Neetar- ine.

Nut.

of the two leaves, and they should be trained one towards the front and the other towards the back of the frame, before reaching which the points should be pinehed off and lateral fruit-bearing shoots will then be produeed. ‘ ie

The melon being one of those plants which produce distinct male and female flowers (dicecious), it is necessary to its fertility that both should be produced, and that the pollen of the male flower should, either naturally by inseet agency, or artificially by the culti- vator’s manipulation, be conveyed to the stigma of the female flower ; this setting of the fruit is often done by stripping a male flower of its corolla, and inverting it in the centre of the fruit-bearing flower. After the fruit hasset and has grown to the size of an egg, it should be preserved from contact with the soil by placing it on a piece of tile or slate ; or if grown on a trellis by a little swinging wooden shelf, just large enough to hold it. In either case the material used should be tilted a little to one side, so as to permit water to drain away. Before the process of ripening commences, the roots should have a sufficient supply of moisture, so that none may be required from that time until the fruit is cut.

When the melon is grown in a house there should bea good depth of drainage over the tank or other source of bottom heat, and on this should be placed turfs, grass side downwards, below the soil, which should not be less than 15 and need not be more than 18 inches in thickness. The compost should be made moderately firm, and only half the bed should be made up at first, the rest being added as the roots require it. The melon may also be grown in large pots, sup- plied with artificial manure or manure water. The stems may be trained up the trellis in the usual way, or the rafters of a pine stove may be utilized for the purpose. If the trellis is constructed in panels about the width of the lights, it can be taken down and conveniently stowed away when not in use.

The presence of too much moisture either in the atmosphere or in the soil is apt to cause the plants to damp off at the neck, but the evil, if it appears, may be checked by applying a little fresh-slaked lime round the stem of the plant.

The varieties of melon are continually receiving additions which are more or less permanent. A great deal depends on getting the varieties true to name, as they are very liable to get cross- fertilized by insect agency. Some of the best are—

Scarlet-fleshed.—Scarlet Gem, and Read's Scarlet-fleshed.

White-fleshed.—Colston Basset Seedling, and Queen Emma.

Green-jleshed.—Victory of Bath, Eastnor Castle, and Egyptian.

125. The Mulberry, Morus nigra, is a deciduous tree, with monce- cious flowers, and oblong compound fruits, having a rich aromatic flavour and a fine subacid juice. The fruit is in request for the dessert during the months of August and September. It is anative of Persia, and succeeds well as a standard in the warmer parts of England, especially in sheltered situations, but in the north of England and the less favoured parts of Scotland it requires the assistance of a wall. The standard trees require no other pruning or training than an oceasional thinning out of the branches, and are generally planted on grassy lawns, to prevent the fruit being damaged when it falls.

The tree succeeds best in a rich, deep, and somewhat moist loam, but grows well in any good garden ground. It isusually propagated either by cuttings or layers, which latter, if made from the older branches of the tree, come sooner into bearing. Cuttings planted in the spring should consist of well-ripened shoots of the preceding year, with a joint of two-year-old wood at their base, or if planted in autumn should have the shoots well matured, and furnished with a heel of two-year-old wood. The branches and even stout limbs are sometimes employed as cuttings instead of the younger shoots, especially when the object is to obtain a bearing tree quickly. The branch should be planted deeply in autumn in good soil, and if necessary supported in an upright position by a stake. The most eommon mode of propagation, however, is by layering the young branches. The Pela, may be grown in pots, and gently forwarded in an orchard house, and under these conditions the fruit acquires a vichness of flavour and a melting character which is unknown in the fruit ripened outdoors. If cultivated in this way it requires

abundance of water while the fruit is swelling, and also frequent dressings of artificial fertilizers or doses of liquid manure.

196. ‘The Nectarine is merely a smooth-skinned variety of the peach, and will be included under that head (see par. 129).

127. The Nut, Corylus Avellana, or hazel-nut, one of our indi- genous shrubs, is the parent of the Filberts, Cob Nuts, and other improved varieties which are met with under cultivation. These suceeed best in a rich dry loam, deeply worked, and should receive from time to time a slight manuring. They are generally planted in the slip, but thrive best in an open quarter by themselves. The different varieties are propagated by layers, or more generally by suckers; or, if required, they may be grafted. The Cosford is a feyounre kind, being a thin-shelled nut, and having a kernel of high

avour. the Spanish nut, which grows fast, and does not send out suckers, dwarfish prolifie trees may be obtained ; and, by pruning the roots in autumn, the trees may be kept quite neat and bushy.

HORT CULT wee

some of the fruits thus grown, especially those of the pretty little

mended for stove

If either this or the filbert be grafted on small stocks of

[eRurts.

The county of Kent has long been celebrated for the culture of nuts for the London market. The young plants are alinost always suekers from old bushes, and are planted from 10 to 12 feet apart, being subsequently kept from crowding or shading each other by pruning. They are suffered to grow without restraint for about three years, and then, being cut down to within 12 or 18 inches of the ground, they will push out from near the top five or six shoots, which at the winter pruning in their second year are shortened one-third. A hoop of sufficient diameter is then placed within the branches, and the shoots are fastened to it at about equal distances. In the spring of the

fourth year all the laterals are eut back nearly to the principal stems, and from these eut-back laterals short shoots proceed, on which fruit may be expeeted in the follow- ing year. Those which have borne fruit are afterwards removed by the ‘knife. The leading shoots are always shortened about two- thirds. Every bearing twig is deprived of its top, and all suckers are carefully rooted out.

The nut being a moneecious plant, it is necessary in the winter or spring pruning to take care that a sufficiency of the male flowers— those produced in pendulous catkins—are preserved. The female flowers, which produee the fruit, are not visible till spring, and appear in the form of plump buds, producing from their apex several deep crimson threads, which are the styles to which the pollen from the catkins should be applied.

The best kinds of nuts for garden cultivation are Lambert’s Filbert, the oe the White Filberts, the Cosford, the Norwich Prolific, and Pearson’s

ie) .

128. The Orange, Citrus Aurantium, has been_ usually culti- Orange, vated in England for the beauty of the plant and the fragrance of its blossoms, rather than for the purpose of affording a sup ly of edible fruit. The latter can, however, be easily grown in a hot-house,

Tangierine variety, being superior in quality to the imported fruit. The best form of orange house is the span-roofed, with glass on both sides, the height and other conditions being similar to those recom- lants. The trees may be planted out, a row on each side a central path, in a house of moderate width. The borders must be carefully made, with a drainage bottom of from 9 to 12 inches of broken bricks or rubbly stones, and a drain leading to the exterior. Rough turf with the grassy side downwards should be laid over the drainage material, and then 18 inches of good turfy loam mixed with gritty sand or fine burnt ballast, to keep it per- meable to water. The trees, ifintended to be permanent, should be placed 10 to 12 feet apart. Bottom heat (about 80°) is beneficial ; but it is questionable if its advantages beneath a bed of soil are not more than counterbalanced by the risk of over-dryness, and the inconvenience of getting access to the heating pipes in case of repairs becoming necessary. It will generally be found more convenient to grow the

plants in pots or tubs, and then bottom heat ean be secured by placing them on or over a series of hot-water pipes kept near to or above the ground level. The pots or tubs should be thoroughly well drained. The temperature may be kept at about 50° or 55° in winter, under which treatment the trees will come into bloom in February ; the heat must then be inereased to 60° or 65° in the day time, and later on to 80° or 85°, Throughout the growing season the trees should be liberally watered, and thoroughly washed every day with the garden engine, eare being taken not to injure the young leaves ; this will materially assist in keeping down insects. The fruit may be expected to ripen from about the middle of October to January, and if the sorts are good will be of excellent quality. When the trees are at rest the soil must not be kept too wet, since this will produce a sickly condition, through the loss of the small feeding roots. ‘The trees require little pruning or training. When a branch appears to be robbing the rest, or growing ahead of them, it should be shortened back or tied down.

When grown for the production of flowers, which are always in great request, the plants must be treated in a similar manner to that already described, but may do without bottom heat.

The favourite sorts of oranges are the Tangierine, a delicious small-frnited carly variety; the Mandarin, which is larger than Tangierine; the St Michael’s, which is the most commonly grown ; the Maltese Blood, which is a very distinct sort with red flesh ; and the Plata or silver orange.

129. The Peach, Amygdalus Persica, or Persica vulgaris, is one Peach. of the most delicious of exotie garden fruits. There are two principal races, the Peach proper, which has fruits covered with a downy skin, and the Nectarine, which has fruits covered with a smooth skin. The peach and the nectarine would therefore appear to be distinct kinds of fruit, and indeed have an appreciable differenee of flavour ; but as both peaches and nectarines have been known to grow on the same branch, and individuals half-peach half-nectarine have been produced, they must be regarded as merely varieties 0 one kind of fruit. ‘Their treatment, moreover, is the same in every respect.

‘To perpetuate and multiply the choicer varieties, peaches and nectarines are budded upon plum or almond stocks. For dry situa- tions almond stocks

are preferable, but they are not long-lived, while for damp or clayey loams it is better to uso plums. Double-

working is sometimes beneficial ; thus an almond budded ona plum stock may be rebudded with a tender peach, greatly to the advan- tage of the latter. The peach border should- be composed of turfy mellow loam, such as is suitable for the vine and the fig; this should be used in as rough a state as possible, or not broken small and fine. The bottom should slope towards the outer edge, where a drain should be cut, with an outlet, and on this sloping bottom should be laid a thickness of from 9 inches to 12 inches of rough materials, such as broken bricks or mortar rubbish, over which should be ees a layer of rough turf with the grassy side down- wards, and then the good loamy soil to form the border, which need not be of greater depth than 18 inches, for the peach tree is most productive when the roots are kept near the surface. The borders should not be cropped heavily with culinary vegetables, as deep trenching is very injurious. Sickly and unfruitful trecs may often be revived by bringing up their roots within 5 or 6 inches of the surface. The experience of the last few seasons has, however, been so disastrous that it has been questioned whether it may not be better, in cold soils and bleak situations, to abandon outdoor peach culture, and to cover the walls with a casing of glass, so that the trees may be under shelter during the uncongenial spring weather.

The fruit of the peach is produced on the ripened shoots of the

receding year. If these be too luxuriant, they yield nothing but eaves ; and if too weak, they are incapable of developing flower buds. To furnish young shoots in sufhcient abundance, and of requisite strength, is the great object of peach training and pruning. Trees of slender-growing, twiggy habit naturally fall most readily into the fan form of training, and accordingly this has generally been adopted in the culture of peaches and nectarines. The old fan form is very nearly that of & 82 (p. 245). The young tree is, in many cases, procured when it has been trained for two or three years in the nursery ; but it is generally better to commence with a maiden plant, that is, a plant of the first year after it has been budded. It is then in ordinary practice headed down to five or six buds, and in the following summer from

two to four shoots, according to the vigour of the plant, are trained in, the laterals from which, if any, are thinned out and nailed to the wall. If there are four branches, the two central ones are shortened back at the subsequent winter pruning so as to produce others, the two lower ones being laid in nearly at full length. In the following season additional shoots are sentforth ; and the process is repeated till eight or ten principal limbs or mother branches are obtained, forming, as it were, the frame-work of the future tree. The branches may be depressed or elevated, so as to check or encourage them, as occasion may arise ; aud it is highly advantageous to keep them thin, without their becoming in any part deficient of young shoots. Sometimes a more rapid mode of formation is now adopted, the main shoots being from the first laid in nearly at full length, instead of being shortened. The pruning for fruit consists in shortening back the laterals which had been nailed in at the disbudding, or summer pruning, their length depending on their individual vigour and the luxuriance of the tree. In well-developed shoots the buds are generally double, or rather triple, a wood bud growing between two fruit buds; the shoot must be cut back to one of these, or else to a wood bud alone, so that a young shoot may be produced to draw up the sap beyond the fruit, which is generally desirable to secure its proper swelling. The pointof this leading shoot is subsequently pinched off, that it maynot draw away too much of the sap. If the fruit sets too abundantly, it must be thinned, first when as large as peas, reducing the clusters, and then when as large as nuts to distribute the crop equally ; the extent of the thinning must depend on the vigour of the tree, but one or two fruits ultimately left to each square foot of wall is a full average crop. The final thinning should take place after stoning.

The best-placed healthy young shoot produced from the wood buds at the base of the bearing branch is to be carefully preserved and in due time nailed to the wall. In the following winter this will take the place of the branch which has just borne, and is to be cut out. If there be no young shoot below, and the bearing branch is short, the shoot at the point of the latter may sometimes be preserved as a fruit bearer, ioe if the bearing branch be long it is better to cut it back for young wood. Itis the neglect of this which constitutes the principal fault in carrying out the English fan system, as it is usually practised. Seve- ral times during sum- mer the trees ought to

Fig. 87.—Montreuil Fan Training. be regularly examined, and the young shoots respectively topped

or thinned out ; those that remain are to be nailed to the wall, or braced in with pieces of slender twigs, and the trees ought occasionally to be washed with the garden engine.

_ The Montreuil form of training is represented by fig. 87. The prin-

cipal feature is the suppression of the direct channel of the sap, and the substitution of four or more commonly two mother branches, so laid to the wall that the central angle contains about 90°. The other branches are all treated as subordinate members. This form is open to the objection that, if the under branch should die, the upper one cannot be brought down into its place.

_ The form 4 la Dumoutier (fig. 88), so called from its inventor, 1s merely a refinement on the Montreuil method. The formation of

Fia. 88.—Dumoutier's Fan Training.

the tree commences with the inferior limbs and proceeds towards the centre, the branches being lowered from time to time as the tree acquires strength. What is most worthy of notice in this method is the inanagement of the subordinates in the pruning for fruit. When a shoot promises blossom, it is generally at some distance from the point of in-¢ sertion into the old wood, and the intermediate space is covered with wood buds. All the latter, there-j--- fore, which are between the old wood @ and the blossom ¢ in fig. 89, exceptthe lowest 6, are carefully piace aaa This 2 never fails to produce a shoot d, maa : i the growth of which is favoured by + psa ~~sheitienne: a — destroying the useless spray ¢ above the blossoms, and pinching off the points of those which are necessary to perfect the fruit. A re~~ placing shoot is thus obtained, to which the whole is invariably shortened at the end of the year.

Mr Seymour’s form (fig. 90) approaches more nearly to the French method than any other practised in England, but the direct channel of the sapis not suppressed. It will be seen that the bearing shoots are all on the upper side of the mother branches, and that these bearing shoots are wholly reproduced once a year. The one side of the annexed figure represents the tree after the winter pruning, the other (left hand) side before it has undergone that operation. On the latter side the young shoots will be seen to be in pairs, and at the winter pruning the lower one, or that which has borne fruit, is cut out, and the other is brought down into its place, and shortened to about 8 or 9 inches, care being taken to cut at a wcod bud. At

Fia. 90.—Seymour’s Fan Training.

tbe summer disbudding those buds which are best placed and at the same time nearest the base are left to supply the future year’s bearing wood. Some object that the annual excision of the bearing shoots produces a series of rugged and increasingly ugly protuber- ances at their base and along the upper surface of the principal branches; while others declare that this mode of training is the most perfect in theory that has been devised. We are inclined, how- ever, to prefer the old fan form, which when well executed is nearest the natural habit of the tree, and best adapted to the uncertain climate of England ; moreover, in all cases, ultra refinement for the sake of appearance is neither profitable nor judicious.

For cold and late situations, the late Thomas Andrew Knight recommended the eneouragement of spurs on the young wood, as such spurs, when close to the wall, generate the best organized and most vigorous blossoms, and generally insure a crop of fruit. They may be produced, by taking eare, during the summer pruning or disbudding, to preserve a number of the little shoots emitted by the yearly wood, only pinching off the minute succulent points. On the spurs thus formed blossom buds will be developed early in the following season. This practice is well adapted to cold situations.

Peach trees require protection, especially at the period of blos- soming, particularly in the north of England and in Scotland. Canvas or bunting screens are most effectual. By applying these carly in the scason, great benefit may be derived from retarding the blossom till the frosty nights of spring have passed. Wooden and glass copings are also very useful in warding off frosts.

Foreing.—The pruning and training of the trees in the peach house do not differ materially from the methods practised out of doors. It may also be statcd here that when occasion arises peach trees well furnished with buds may be transplanted and forced immediately without risking the crop of fruit, a matter of some importance when, as sometimes happens, a tree may accidentally fail. In the forcing of peaches fire heat is commonly applied about December or January ; but it may, where there is a demand, begin a month sooner. At first the house should be merely kept closed at about 45°, but the heat should gradually increase to 55° by the time the trees are in flower, and to 60° when the fruit is set, after which the house should be kept moist by sprinkling the walls aud paths, or by placing water troughs on the retarn pipes, and the temperature should range from 65° by day to 70° or more with sun heat. After the fruit has set, the foliage should be refreshed and cleansed by the daily use of the syringe or garden engine. When the fruit has stoned, that is, as soon as the kernels have been formed, the temperature should be raised to about 60° as a minimum, and to 70°, with 75° by sun heat, as a maximum. Water must now be copiously supplied to the border, and air admitted in abundance. After the end of April little fire heat is required. When the fruit begins to ripen, syringing must be discontinued till the crop is gathered, after which the syringe must be again occa- sionally used. Ifthe leaves should happen to shade the fruit, not only during the ripening process, but at any time after the stoning period, they should be gently turned aside, for, in order that the fruit may acquire good colour and flavour, it should be freely ex- posed to light and air when ripening ; it will bear the direct rays of the sun, even if they should rise to 100°, The trees often suffer from mildew, which is best prevented by keeping the borders of the peach house clear and sufficiently moist, and the house well ventilated.

The following are some of the best peaches and nectarines, arranged in the order of the times of their ripening :—

Peaches. Barly Beatrice. «veo 8 Say, | Dremfer-.-.~~ssseeeesees b. Sept Frogmare Golem «v7 Ang, — | Royal George…..~~.... {taser Rivers's Early York…..... bm. Aug: | Bellegarde….....-: b.m. Sept INSBOC je Seieeisiscteennt ns m,. Aug. Beem BAWeCT. .. .c..c.aene m. Sept Washington Rathripe….. m. Aug IDO Ghee cdppaaemone m. Sept. TU ATIVASUNVET ss « oc siccein no etials m.e. Aug Late Admirable…..... m.e. Sept. Crawford's Iarly,..... e. Aug Desse Tardive…..... e. Sept. b. Sept b. Oct.

Grosse Mignonnc…..... { b Sout Walburton Admirable .. { M4 Pert

ATs e. Aug e. Oct. INGDI@SBG¥. =. «5 ice esieeceses Lb. Sept SAV ayies «:coattiies.< silarete { b. Nev.

Neetarines.

Hgrd Naples oso ABB, | VloetbeMBtVe. oo… 48: AM IWIN eeaenoogaeoder oso: e. Aug. set (e. Aug. ae fe. 'Aug. Welbcck Seedling…..... 1b. Sept.

peacsee. ie Nae Ub. Sept Victoria (under glass)..... Sept. Prue ess. {f Aug. Pine apple.'.....—+++- b. Sept.

3 Db ea peel INES. oases b. Sept.

; e. Aug Whert Victor. esc. m.e. Scpt.

Pitmaston Orange …... { b. Sept. Stanwick (under glass)....m.e. Sept.

180. The Pear has originated in. part from the wild species, Pyrus communis, and in part from other species of the genus, including P. sinensis from China, P. Achras from Southern Russia, P, Sinai from Syria, and P. salicifolia from the Caucasus. Itmay be readily raised by sowing the pips of ordinary cultivated or of wilding kinds, these forming what are known as free or pear stocks, on which the choicer varieties are grafted for increase.

For new varieties the flowers should be fertilized with a view to combine, in the seedlings which result from the union, the desirable qualities of the parents. The dwarf and pyramid trees, more usually planted in gardens, are obtained by grafting on the quince stock, the Portugal quince being the best; but this stock, from its surface-rooting habit, is most suitable for thin shallow soils, or for those of a cold damp nature. Some of the fincr pears do not unite readily with the quince, and in this case double working is resorted to; that is to say, a Vigorous-growing pear is first grafted on the quince, and then the choicer pear is grafted on the pear introduced as its foster parent.

In selecting young pear trees for walls or espaliers, some persons prefer plants one year old from the graft, but trees two or three years trained are equally good. The trees should ke planted im- mediately before or after the fall of the leaf. The wall trees require to be planted from 25 to 80 feet apart when on free stocks, and from 15 to 20 feet when dwarfed. Where the trees are trained en pyra- mide, or en quenowille (see figs. 78, 79), they may stand 8 or 10

feet apart, but standards in orchards should be allowed at least 30 feet, and dwarf bush trees half that distance.

In the formation of the trees the same plan may be adopted as has already been described as suitable for the apple (par. 116). For the pear orchard a warm situation is very desirable, with a soil deep, substantial, and thoroughly drained. Any good free loam is suitable, but a calcareous loam is the best. The late Mr. Rivers recommends that pear trees worked on the quince should have the stock covered up to its junction with the graft. This is effected by raising up a small mound of rich compost around it, a contriv- ance which induces the graft to emit roots into the surface soil, and also keeps the stock from becoming hard or bark-bound. The fruit of the pear is produced on spurs, which appear on shoots more than one year old. The mode most commonly adopted of training wall pear-trees is the horizontal (see figs. 80, 81). For the slender twiggy sorts the fan form is to be

preferred, while for strong growers like Gansel's Bergamot, the half-fan or the hori- zontal is more suitable. In the latter form old trees are apt to acquire an undue projection from the wall, and become scraggy, to avoid which a portion of the old spurs should be cut out annually.

The summer pruning of established wall or espalier-rail trees consists chiefly in the timely displacing or rubbing off of the super- fluous shoots, so that the winter pruning, in horizontal training, is little more than adjusting the leading shoots and thinning out the spurs, which should be kept close to the wall, aud allowed to re- tain but two or at most three buds. In fan-training, the subordi- nate branches must be regulated, the spurs thinned out, and the young laterals finally established in their places. When horizontal trees lave fallen into disorder, the branches may be cut back to within 9 inches of the vertical stem and branch, and trained in afresh, or they may be grafted with other sorts, if a variety of kinds is wanted.

Summer and autumn pears should be gathered before they are fully ripe, otherwise they will not in general keep more than a few days. The Jargonelle, as Forsyth rightly advises, should be allowed to remain on the tree, and be pulled daily as wanted, the fruit from standard trees thus succeeding the produce of the wall trees. In reference to the Crassane, Mr G. Lindley recommends gathering the crop at three different times, the first a fortnight or more before it is ripe, the second a week or ten days after that, and the third when fully ripe. -The first gathering will come into eating latest, and thus the season of the fruit may be considerably prolonged. It is evident that the same method may be followed with other sorts which continue only a short time in a mature state.

The varieties of pears are very numerous, while comparatively few sorts are required in any ordinary garden, The following is a small selection of good sorts which do well in the climate of Britain, and they are arranged according to the months when they are commonly in use,—a period which, however, varies considerably in different seasons:—

Dessert Pears.

Doyenné GPS Sapo noe boccc July. Maréchal de Cour…..... Oct., Nov. Beurré de l'Assomption…Aug. Pitmaston Duchesse ' Oct., Nov.

JaTTONEMEC…....02 00000 Aug. d’Angouléme …..... oop f Souvenir du Congrés….. Aug., Sept. | Althorp Crassane…..... Oct.~~Dec. Williams’s Bon Chrétien..Aug., Sept. | Thompson’s…..... Nov. Beurré d’Amanlis…..... Sept. Huyshe’s Prince Consort..Nov., Dec. Madame Treyve…..... Sept. Passe Colmar…..... Nov., Dec. Beurré Superfin…..... Sept., Oct. | Winter Nelis…..... Noy.-Feb. Fondante d’Automne….Sept., Oct. | Chaumontel…..... Nov.-Mar. Baronne de Mcllo…..... Oct. Beurré d’Arenberg…..... Dec., Jan. Comte de Lamy…..... Oct. Glou Morceau…..... Dec., Jan. Louise Bonne of Jersey… .Oct. Huyshe’s Victoria. ..... Dec., Jan. Rigalkcl bp aBeoonpeuaiabn cated Oct. Ito chive) Lopes O Dec., Jan. Lil eP AWN: daepeoccageonr Oct., Nov. | Zéphirin Grégoire…..... Dec., Jan. IBGHEDG OSC wits uae se Oct., Nov. | Beurré de Jonghe…..... Dec.-Feb. Doyenné du Comice…... Oct., Nov. | Joséphine de Malines….. Jan,, Feb Duchesse d’Angouléme…Oct., Nov. | Easter Beurré…..... an.-Apr Gansel’s Bergamot…..... Oct., Nov Nec plus Meuris…..... Jan.-Apr. Marie Louise…..... Oct., Nov. | Nouvelle Fulvie…..... Feb., Mar. Kitchen Pears.

ie Gs CA aeeeenoogeen ec Oct.-Jan. Bellissime d’Hiver…..... Nov.-Apr. Black Worcester…....Nov.-Feb. | Catillac…..... Dec.—Apr. ¥lemish Bon Chrétien….Nov.-Mar. | Winter Franc Réal…..... Jan.—Mar. Vidi Gi Sponedecson sosuu: Nov.-Mar. | Uvedale’sSaint Germain. .Jan.—Apr.

131. The Pine-apple, Bromelia Ananas, or Ananassa sativa, Pine- requires for its cultivation a tropical climate similar to that of the apple.

West Indies—a mean temperature of 70° at the coldest and of 88° at the warmest season, with a range of about 10° between the night and day temperature. It also requires a supply of heat, averaging about 90°, to the soil in which the roots are placed, and hence it is grown in a hot-house, where it can be. supplied with bottom heat, by being plunged in a bed of fermenting material, such as tanner’s bark or decaying leaves, or by hot water applied either in pipes passing through hollow chambers, or shallow hot-water tanks placed beneath the plunging beds. The heat arising from violent fermenta- tion is, however, greater than the tender roots can bear, and if great watchfulness be not employed, the labour of many months may

be wasted ina singleday. Bottom heat should not exceed 95°, and may be brought down when active growth is not required to about 75°.

FRUITS. |

It must be regulated in its application by the amount of light and of warmth in the air. During the season when the plants are at rest it should be comparatively low; during their season of activo growth it should be considerable; and during their ripening season it should be highest of all.

The top spit of an old loamy pasture, including the turf, and mixed with about one-third the bulk of good well-rotted dung, forms a suitable compost for the pine-apple. The soil used at Meudon, where these fruits have been very successfully grown, is a sandy peat or leaf-mould obtained from a high-lying spot, where hard- wooded trees, chiefly beech, have long been growing. The late Mr Fleming, when at Trentham, used a mixture of three parts turfy maiden loam to one part of peat, these ingredients being mixed to- gether and laid under a wooden platform on which sheep were fed (which was so constructed that the dung and urine of the sheep fell through), and left there long enough to beeome well enriched. Other noted eultivators have recommended turfy loam and sheep or deer dung in the proportion of six of loam to three of the manure, one of leaf-mould being added. The compost should be prepared a considerable time beforehand, and frequently turned over and aerated; when uscd, it should be roughly broken with the spade, but not screened. Some cultivators, who do not otherwise enrich the soil, use half-ineh bones and soot at the time of potting in the proportion of’an 8-inch potful of each to a barrowful of fibrous surface soil. The plants when growing freely are benefited by the use of liquid manure of an ammoniacal eharacter.

The pine-apple is sometimes propagated by planting the crowns |

which grow on the fruit, but more eommonly from the suckers which appear at the base of the stem, these being a less time in arriving at a fruiting state. When removed from the fruit or stem, the crowns or suckers are trimmed and laid aside till the scar has dried, after which they are potted. This usually takes place during August or September, as the offsets should be allowed to obtain considerable size before they are removed, for

the reason that large suckers grow with more vigour and come sooner into fruit than those of smaller size. They should be placed in 4-inch or 8-inch pots, the soil being somewhat lighter then than that uscd afterwards. They may be slightly shaded for a short period, and in about eight or twelve days may reeeive a little water. The old routine of pine-apple culture embraced a period of three years, but this has been reduced by modern growers to about eighteen months.

The more rapid method was first brought into notice by Abercrombie. | Its chief features are the employment of more mature suckers at | the outset, and the aceeleration of the growth of the plants after-

wards by the application of a hotter and moister atmosphere than formerly, so as to obtain the growth of two summers in one.

The roots should be preserved in a fresh healthy state during winter, so as not to require being eut away, as was formerly done ; and this may be secured by giving very moderate and judicious waterings, and by keeping the bottom heat well under control. About the beginning of March, or earlier, the forwardest young plants from suckers are selected from the stock of suecession plants, and the earth and roots examined; they are then put into larger pots in good soil, and plunged in a bed having a genial bottom heat of about 85°. They require to be shaded for a few days, and after they begin to root should receive moderate waterings. As soon as the roots thicken in the balls of soil, which will be about the beginning of August, they are to be transferred into 10-inch or 12-inch pots, in which they will mature theirfruit. At eavh suceessive shift the ball of earth and roots is to be preserved entire. From March onwards the temperature is gradually increased as follows:—In March, 60° to 70° by night, 70° to 80° by day ; April 70° to 75° by night, 80° to 85° by a ; May 75° to 80° by night, 90° to 95° by day; June 80° to 85° by night, 95° to 100° by day. After the beginning of August the heat is allowed to decline gradually until it arrives at the winter temperature of 60°. While fire heat is used, the nocturnal temperature should not exceed 80°, and_ sufficient moisture must be supplied. To prevent the plants from being drawn, they should be allowed ample space—2 feet from plant to plant is not too much—and be placed as near the glass as possible. In August and September abundance of

air and more copious sup- plies of water are given. To prevent the roots from damping off in winter, water must be cautiously applied, and the pits should be heated by means of fire heat rather than by fermenting materials. Some gardeners apply this biennial mode of eultivation only to tho varieties of the Queen type, but our best cultivators for the most part adopt it in its main features for all varieties, and the fruit produced is finer than that grown upon the triennial course. Those, how- ever, who wish to cultivate such large and coarse sorts as the Providence may possibly find it necessary to take a longer period for fruiting them.

_ The period at which pine-apple plants first show their fruit stems is the most critical in their whole culture. The plant must be ofa certain age, or at least of a certain magnitude, before it will start freely or to good purpose. In the second year a Queen pine is capable of producing a perfect fruit ; and in the third year the large Varieties arrive at puberty. The solid part of the stem is then

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| is filled with roots.

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observed to have increased in bulk, and to have ascended consider- ably above the soil. Tho start is generally required to be made at a particular period, but the fruit stalks do not appear until the pot It is therefore necessary that the roots shall have nearly occupied all the new soil by the time the development of the fruit is required, aud care should be taken that in winter the tender fibres should suffer neither from drought nor from exces- sive moisture or heat. After tho plants show frnit they are never shifted; but the surface soil may be replaced by some fresh and rich eompost. Water is supplied from time to time, but should never be eolder than the average temperature of the house. Whilst the fruit is swelling, care must be taken to carry on the growth of the plant with equability and moderation. As the fruit approaches maturity, water is gradually withheld, lest the flavour should be im paired. Pine-apples should be cut a short time

before they obtain complete maturity; they donot keep sound long after being cut, and consequently, if they have to be kept over for a short period the plaut, pot and all, should be moved to a dryish moderately eool room.

The Hamiltonian system of pine growing was at one time more frequently adopted than now. Instead of the suckers being de- tached from their parent stems before fruiting, the base of the old stem was bared of leaves and earthed up with rich eompost, into whieh it rooted freely, each sucker thus producing a ripe fruit in from eight to twelve months from the time it was started. When this fruit was cut, the proeess was repeated till a third succession of fruit and a fourth were obtained, after which the sucker which bore the last fruit was cut off with 6 or 8 inches of the main stem, and potted so as to furnish another similar progeny of suckers. ‘

The Queen, as a quick-fruiting sort, and the larger Smooth-lcaved Cayenne, are the ehief favourites among eultivators. It may, how- ever, be useful to give the names of a few of the best varieties :—

Spineless-leaved Pine-apple.

Smooth-leaved Caycnne, fruit large, cylindrical : good in win

Spiny-leaved Pine-apples.

Black Jamaica : fruit oval, 4 to 5 ib; one of the best for winter use.

Charlotte Rothschild: fruit cylindrical, 7 to 11 1b; good in winter.

Enville : fruit pyramidal, 6 to 7 ib.

Lady Beatrice Lambton: fruit pyramidal, 11 Ib; good in winter; very juicy.

Lord Carington : fruit cylindrical, 5 to 7 ib; good in winter.

Prince Albert: fruit pyramidal, 6 to 8 tb; best in summer and autumn.

Queen : fruit cylindrical, 4 to 8 Ib; the best sort for general purposes.
Thoresby Queen: fruit roundish-ovate, 6 to 8 ib.

132. The Plwm, Prunus domestica, is considered a native of Plum.

England, but many of the best cultivated varicties have been intro- duced from France. ‘The fruit is not only prized for dessert, but also for culinary purposes.

Plums are propagated chiefly by budding on stocks of the Mussel, Brussels, St Julien, and Pear plums. The damson, wine sour, and other varieties, planted as standards, are generally increased by suckers. For planting against walls, trees which have been trained for two years in the nursery are preferred by some, but maiden trees can be very suecessfully introduced, and by a course of liberal treat- ment, with less hard pruning, may be more speedily got to a fruiting state. Any good well-drained loamy soil is suitable for plums, that of medium quality as to lightness being decidedly preferable. Walls with an east or west aspect are generally allowed to them, the dis- tance between the trees being from 20 to 30 feet. The horizontal mode of training is adopted by many, but the fan or half-fan forms are also very commonly followed, and where there is sufficient height probably the fan system isthe best. The shoots ought to be laid in nearly or quite at full length. The fruit is produced on small spurs on branehes at least two years old, and tlie saine spurs continue fruitful for several years. Standard plum trees should be planted 25 feet apart each way, and dwarfs 15 or 20 feet. Such trees require only to have a portion of their wood thinned out occasionally when they are young. The hardy kinds grown in this way are very productive.

In favourable seasons the erops require thinning, to relieve the branehes from the excessive weight. The unripe fruit, if fully grown and beginning to change colour, is quite fit forcooking. For dessert purposes the fruit should be allowed to remain on the tree as long as it will hang, and should be gathered by the stalk without dis- turbing the bloom. Such kinds as Coe’s Golden Drop and Ickworth Impératrice, if gathered dry, wrapped in tissue paper, and laid in a dry cool fruit-room, may be kept for months fit for use.

The following is a selection of good reliable varieties of plums, with their times of ripening :—

Dessert Plums.

Early Green Gage……... e. July. , Woolston Black……... b. Sept.

1 Hati e. July. TOMCTSOD!. «266-2 605 010 b.m. Sept eee ves p. Aug. | Kirke's…….----- b.m. Sept. Rivers's Early Apricot….. b. Aug. Hulings's Superb……... m. Sept. Denniston's Superb…..... m. Aug. | Reine Claude du Comte esos Oullinsi@olden'.....— m. Aug Hathermiss. 22.2… shee ees GNCSMGAPE. ci.506.- 220 oe eae m.e. Aug. | Coe's Golden Drop…..... e. pent 1 Aenea nnn ggeeogoonoAcG e. Aug. >t e. Sept. Washington… Sept. keine Claude de Bavay.. 4 1) Oct, Angelina Burdett…. 5 + "ae Ickworth Inrpératrice "a ee Purple Gage…..... -b. Sept. . fe. Oct. Tivamspeenar (CHIGS seep. cone b. Sept. Late Rivers ….....+. Ub. Nov

Quinee.

Rasp- berry.

Service.

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Culinary Plums. White Magnum Bonum….Sept.

¥arly Orleans…..---++-++- b.m. Aug.| Mitchelson's……~~... b. Sept. (Gr tancuscccccocedcas m. Aug. Pond's Seedling …….. b.m. Sept. ROLL CERTI ey ee) sisse elere eieiesieners) ete m. Aug. Victoria (Alderton).....b.m. Sept. Pershore…....~~—+-++-++005 m.e. Aug. | Crittenden's Damson…..... m. Sept. Orleaus: 2.60.22 ce cies wee ee e. Aug. Diamond. 2. cece ee rarstere @ m. Sept.

: e. Aug. SWWRER SOUT cic lcicialersieisisieieisieiaie m. Sept. Prince Engelbert … ...- Ub. pat Flee Gampotemen ccneee e. Sept.

= e. Aug. GRIN UES io osereceperensjerarele sielere e. Sept. Prince of Wales …....-. { b. Sept. | Belle de Septembre…....b.m. Oct.

133. The Quince, Cydonia vulgaris, is but little cultivated in Great Britain, two or three trees planted in the slip or orchard being in general found to be sufficient for a supply of the fruit ; in Scotland it seldom approaches

maturity, unless favoured by a wall. The fruit has a powerful odour, but in the raw state is austere and astringent; it, however, makes an agreeable marmalade, and is often used to give flavour and poignancy to stewed or baked apples.

The quince prefers a rich light and somewhat moist soil. The trce is generally propagated by euttings or layers, the former mak- ing the best plants, but being longer in growing. It is much used as a dwarfing stock for certain kinds of pears, and for this purpose the young plants when bedded out in the quarters shoul be shortened back to about 18 or 20 inches. Those required to form standard fruit-bearing trees should be trained up to a single stem till a height of 5 or 6 feet is attained.

There are three prineipal varieties of the quince, the Portugal, the apple-shaped, and the pear-shaped. The Portugal isa taller and more vigorous grower than the others, and has larger and finer fruit ; the apple-shaped, which has roundish fruit, is more productive, and ripens under less favourable conditions than either of the others ; while the pear-shaped has roundish-pyriform fruit, which ripens later than that of the apple-shaped variety.

134. The Raspberry, Rubus Ideus, which is found wild in Great Britain and in woods throughout Europe and Asiatic Russia, is propagated from suckers, which may be taken off the parent stools in Oetober, and planted in rows 5 or 6 feet apart, and at 3 feet asunder in the rows. It is the habit of the plant to throw up from the root every year a uumber of shoots or eanes, which bear fruit the subsequent year, and then decay. In dressing the plants, whieh is done immediately after the crop is gathered, all these exhausted stems are cut away, and of the young canes only three or four of the strongest are left, whieh are shortened about a third. The stems, being too weak to stand by themselves, are sometimes conneeted together by the points in the form of arches, or a stake is driven in midway between the plants, and half the canes are bent one way and half the other both being tied to the stake. Sometimes they are tied upright to stakes fixed toeach stool. The best support is, however, obtained by fastening the points of the shoots to a slight horizontal rail or bar, placed a foot and a half on the south side of the rows, by whieh meaus the bearing shoots are deflected from the

perpen- dicular to the sunny side of the row, and are not shaded by the annual wood. When this mode of training is adopted, the plan of planting 1 foot apart in the row. and leaving one or two eanes only to each shoot is preferable. The ground between the rows should never be disturbed by digging ; but an abundant supply of good manure should be given annuallyin autumn asa dressing, whieh should be forked in regularly to a depth of 4 or 5 inches. All surplus suckers should be got away early in the summer before they have robbed the roots, —five or six, to be reduced to the four best, being reserved to each root. Fresh plantations of raspberries should be made every six or seven years. The double-bearing varieties, which continue to fruit during autumn, require light soils and warm situations. ‘These should be eut elose down in February, as it is the strong young shoots of the current year which bear the late autumnal crops. The other varieties may be made to bear in autumn by cutting the stems half-way down at an early period in spring ; but, as with all other fruits, the flavour of the raspberry is best when it is allowed to ripen at its natural season.

The following are some of the finer sorts now in cultivation :—

Baumforth’s Seedling—a large summer-bearing red. Carter’s Prolific—a large summer-bearing red. Fastolf or Filby—a large summer-bearing red. M‘Laren’s Prolific—a large double-bearing red. Northumberland Fillbasket —a large summer red. October Red—a fine autumn-bearing red.

October Yellow—a fine autumn-bearing yellow. Prince of Wales—a large summer-bearing red.

. Red Antwerp—a large summer-bearing red. Rogers’s Victoria—a large autumn-bearing red. Round Antwerp—a large summer-bearing red. Sweet Yellow Antwerp—a large summer-bearing yellow.

135. The Service, Pyrus Sorbus or P. domestica, is a European tree which has been regarded as a native of England on the evidence of a single tree, which has probably been planted, now existing in the forestof Wyre. Though not much cultivated, its fruit is esteemed by some persons, and therefore two or three trees may very well be provided with a place in the orehard, or in a sheltered corner of the lawn. The tree is seldom produetive

till it has arrived at a goodly size and age. The fruit has a peculiar acid flavour, and, like the medlar, is fit for usc only when thoroughly mellowed by

being kept till it has beeome bletted. There is a pear-shaped variety, pyriformis, and also an apple-shaped variety, maliformis, both of whieh may be propagated by layers, and still better by grafting on seedling plants of their own kind. The fruit is some- times brought to market in winter.

136. The Strawberry of the garden has been obtained by the Straw- crossing of several speeies of Fragaria, the larger-fruited sorts from berry.

F. grandiflora, chilensis, and virginiana, and the smaller alpines from F. vesca. The alpine varieties should be raised from seeds; while the other sorts are continued true to their kinds by runners, If new varieties are desired, these are obtained by judicious erossing and seeding.

The seeds of the alpines should be saved from the finest fruit ripened early in the summer. They should at oncc be sown, either in a sheltered border outdoors or in pots. The soil should be rieh and light, and the seeds very slightly eovered by sifting over them some leaf-mould or old decomposed eow dung. When the plants appear and have made five or six leaves, they should be transplanted to where they are to remain for bearing. Theseeds sown in pots may be helped on by gentle heat, and when the plants are large enough should be pricked out in fine rieh soil, and in June transferred to the open ground for bearing ; they will produeea partial crop in the autumn, and a full one in the following scason. The same treat- ment may be applied to the choieer seedlings of the larger-fruited sorts from whieh new varieties are expected.

The runners of established sorts should be allowed to root in the soil adjoining the plants, which should, therefore, be kept light and fine, and as soon as a few leaves are produeed on each the seeondary runners should be stopped. When the plants have become well- rooted, they should at once be

planted out. They do best in a rather strong loam, and should be kept tolerably moist. The scarlet section prefers a rich sandy loam. The ground should be trenched 2 or 8 feet deep, and supplied with plenty of manure, a good proportion of whieh should lie just below the roots, 10 or 12 inches from the surface. The plants may be put in on an average about 2 feet apart. Mr Myatt, a well-known strawberry-grower for market, plants in rows 18 inehes apart, and the same distanee from plant to plant in the rows, but leaves a space of 30 inehes for an alley separating groups of three rows, and after the first year the middle row is cleared away. Some of the best growers allow 24 feet between the rows, with the plants 2 feet from eaeh other.

A mulehing of strawy manure put between the rows in spring serves to keep the ground moist and the fruit clean, as well as to afford nourishment tothe plants. Unless required, the runners are cut offearly, in order to promote the swelling of the fruit. The plants should be watered during dry weather after the fruit is set, and oeea- sionally till it begins to colour. As soon as the fruit season is over, the runners are again removed, and the ground hoed and raked. The plantation should be renewed every second or third year, or less frequently if kept free of runners, if the old leaves are eut away after the fruit has been gathered, and if a good top-dressing of rotten dung or leaf-mould is app A top-dressing of loam is beneficial if applied before the plants begin to grow in spring, but after that period they should not be disturbed during the summer either at root or at top. If the plants produce a large number of flower-seapes, each should, if fine large fruit is desired, have them reduced to about four of the strongest. The lowest blossoms on the seape will be found to produce the largest, carliest, and best fruits. The fruit should not be gathered till it is quite ripe, and then, if possible, it should be quite dry, but not heated by the sun. Those intended for preserving are best taken without the stalk and the ealyx.

Foreing.—The runners propagated for forcing are layered into 3-inch pots, filled with rich soil, and held firm by a peg or stone. If kept duly watered, they will soon form independent plants. The earlier they are secured the better. When firmly rooted they are removed and transferred into well-drained 6-ineh pots, of strong well- enriched loam, the soil being rammed very firmly into the pots, which are to be set in an open airy place. In severe frosts they should be covered with dry litter or bracken, but do not

necessarily require to be plaeed under glass. They are moved into the foreing houses as required. The main points to be kept in view in foreing strawberries are, first, to have strong stocky plants, the leaves of which have grown sturdily from being well exposed to light, and secondly, to grow them on slowly till fruit is set. When they are first introdueed into heat, the temperature should not exeeed 45° or 50° by fire heat, and air must be freely admitted ; should the leaves appear to grow upthin and delicate, less fire heat and more air must be given, but an average temperature of 55° by day may be allowed, and eontinued while the plants are in flower. When the fruit is set the heat may be gradually increased, till at the ripening period it stands at 65°, and oceasionally at 75° by sun- heat. While the fruit is swelling the plants should never be allowed to get dry, but when it begins to eolour no more water should be given than is absolutely requisite to keep the leaves from flag- ging. The plants should be removed from the house as soon as the crop is gathered. The forced plants properly hardened make

first-rate outdoor plantations, and if put out early in summer, in good ground, will often produce a useful autumnal crop.

The varieties are very numerous. The following are some of the best and most distinct of those now in cultivation, those marked * being specially suitable for forcing:—

Amateur—a brisk-fiavoured variety.

British Queen*—one of the best-fiavoured sorts; requires good cultivation.

Dr Hogg—a hardier form of British Queen.

Elton—late, and valuable for preserving.

Enchantress—a fine-flavoured late variety.

Filbert Pine *—an excellent high-flavoured sort.

Frogmore Late Pine—a good late sort.

James Veitch *— a large solid showy variety.

Keens' Seedling *—a fine old sort, of great merit for all purposes.

La Constante *—an excellent sort, of sprightly flavour.

La Grosse Sucrée *—large, and of excellent flavour.

Loxford Hall Secdling—one of the best late sorts.

Lucas *—a useful fine-fiavoured variety.

Myatt's Eliza—very high-flavoured, perhaps in this respect unequalled.

Oscar *—good for a general crop ; travels well.

President *—a useful brisk-flavoured sort. :

Sir Charles Napier *—a capital market fruit, rather acid.

Sir Harry—a favourite market fruit.

Sir Joseph Paxton *—an excellent large high-flavoured sort.

Vicomtesse Héricart de Thury *—good for all purposes; one of the best.

187. The Vine, Vitis vinifcra, a native of the shores of the Cas-

ian, and a deciduous climbing shrub, is hardy in Britain so ar as regards its vegetation, but not hardy enough to bring its fruit to satisfactory maturity, so that for all practical purposes the vine must be regarded as a tender fruit. Planted against a wall or a building having a south aspect, or trained over a sunny roof, such sorts as the Black Cluster, Black Prince, Pitmaston White Cluster, Royal Muscadine, Sweetwater, &c., will ripen in the warmest English summers so as to be very pleasant eating, but in cold summers the fruit is not eatable in the raw state, and can only be converted into wine or vinegar. For outdoor culture the long-rod system is generally preferred.

When the plant is grown under glass, the vine border should oc- cupy the interior of the house and extend outwards in thefront, but it is best made by instalments of 5 or 6 feet as fast as the pre- vious portions become well filled with roots, which may readily be done by packing up a turf wall at the extremity of the portion to be newly made ; an exterior width of 15 feet will be sufficient. Inside borders require frequent and thorough waterings. In well-drained localities the border may be partially below the ground level, but in damp situations it should be made on the surface ; in either case the firm solid bottom should slope outwards toward an efficient drain. A good bottom may be formed by chalk rammed down close. On this should be laid at least a foot thick of coarse hard rubbly material, a layer of rough turf, grass side downwards, being spread over it to prevent the compost from working down. The soil itself, which should be 24 or 8 feet deep, never less than’2

feet, should consist of five parts rich turfy loam, one part old lime |

rubbish or broken bricks, including a little wood ashes or burnt earth (ballast), one part broken charcoal, and about one part of half-inch bones, the whole being thoroughly mixed, and kept dryish till used.

Young vines raised from eyes are generally preferred for planting. The eyes being selected from well-ripened shoots of the previous year are planted about the end of January, singly, in small pots of light loamy compost, and after standing in a warm place for a few days should be plunged in a propagating bed, having a bottom heat of 75°, which should be increased to 85° when they have produced several leaves, the atmosphere being kept at about the same temperature or higher by sun heat during the day, and at about 75° at night. As soon as roots are freely formed the plants must be shifted into 6-inch pots, and later on into 12-inch ones, Theshoots are trained up near the glass, and, with plenty of heat (top and bottom) and of water, with air and light, and manure water occasionally, will form firm strong well-ripened canes in the course of the season. To prepare the vine for planting, it should be cut back to within 2 feet of the pot early in the season, and only 8 or 4 of the cyes at the base Should be allowed to grow on. The best time for planting is in spring, when the young shoots have just started. ~~The vines should be planted inside the house, from 1 to 2 feet from~~

~~the front wall, the roots being placed an inch deeper in the soil than before, carefully disentangled and spread outwards from the stem, and covered care~~ fully and firmly with friable loam, without manure. When the shoots are fairly developed, the two strongest are to be selected and trained in. When forcing is commenced, the vinery is shut up for two or three weeks without fire heat, the mean temperature ranging about 50°. Fire heat must be at first applied very gently, and may range about 55° at night, and from 65°to 70° by day, but a few degrees more may be given them as the buds break and the new shoots appear. When they are in flower, and onwards during the swelling of the berries, 85° may be taken as a maximum, running up to 90° with sun heat, and the temperature may be lowered somie- what when the fruit is ripe. As much ventilation as the state of the weather will permit should be given. A moist growing atmo- sphere is necessary both for the swelling fruit and for maintaining the health of the foliage. A due amount of moisture may be kept

up by the use of evaporating troughs and by syringing the walls and pathways two or three times a day, but the leaves should not be syringed. When the vines are in flower, and when the fruit is colouring, the evaporating troughs should be kept dry, but the aridity must not be excessive, lest the red spider and other hurtful insects should attack the leaves. In the course of the season the borders (inside) will require several thorough soakings of warm water,—the first when the house is shut up, this being repeated when the vines have made young shoots a few inches long, again when the vines are in flower, and still again when the berries are taking the second swelling after stoning. Outside borders require watcring in very dry summer weather only.

There are three principal systems of pruning vines, termed the long-rod, the short-rod, and the spur systems, and good crops have been obtained by each of them. It is admitted that larger bunches are generally obtained by the long-rod than by the spur system. The principle of this mode of pruning is to train in at considerable length, according to their strength, shoots of the last year’s growth for producing shoots to bear fruit in the present ; these

rods are afterwards cut away and replaced by young shoots trained up during the preceding summer; and these are in their turn cut out in the following autumn after bearing, and replaced by shoots of that summer's growth. By the short-rod system, short instead of long rods are retained ; they are dealt with in asimilar manner. The spur system has, however, become the most general. In this case the vines are usually planted so that one can be trained up under each rafter, or up the middle of the sash, the latter method being preferable. The shoots are cut back to buds close to the stem, which should be encouraged to form altcrnately at equal distances right and left, by removing those buds from the original shoot which are not conveniently placed. The young shoots from these budg,are to be gently brought to a horizontal position, by bending them a littlo at a time, and usually opposite about the fourth leaf the rudiments of a bunch will be developed. he leaf directly opposite the bunch must in all cases be preserved, and the young shoot is to be topped at one or two joints beyond the incipient fruit, the latter distance being preferable if there is plenty of room for the foliage to expand ; the lateral shoots, which will push out after the topping, must bo again topped above their first or second joints. If the bunches are too numerous they must be thinued before the flowers expand, and the berries also must be properly thinned out and regulated as soon as they aro well sct, care being taken, in avoiding overcrowding, that the bunches be not made too thin and loose.

The cultivation of vines in pots is very commonly practised with good results, and pot-vines are very useful to force for the earliest crop. The plants should be raised from eyes, and grown as strong as possible in the way already noted, in rich turfy loam mixed with about one-third of horse dung and a little bone dust. The tempera- ture should be gradually increased from 60° to 80°, or 90° by sun heat, and a bottom heat a few degrees higher must be maintained during their growth. As the roots require more room, the plants should be shifted from 38-inch pots into those of 6, 12, or 15 inches in diameter, in any of which larger sizes they may he fruited in the following season, but, to be successful in this, the young rod pro- duced must be thoroughly matured after it has reached its limit

| of growth.

The vine, both indoors and out, is very subject to the vine-mildew, which appears to the naked cye like a white powder ; when this is visible there isno effectual remedy, but if taken at the earliest stago it may be destroyed by dusting the whole plant, stem, leaves, and fruit, with sulphur. An equally destructive enemy is the vine louse, Phylloxera vastatrix. No certain easily applicd cure has yet been discovered, and practically the only sure remedy is to destroy tho vines, clear out the old infested soil, and cleanse the structures thoroughly in every part. ;

The number of varieties of grapes possessing some merit is con- siderable, but a very few of them will be found sufficient to supply all the wants of the cultivator. For general purposes nothing approaches the Black Hamburg (including Frankenthal) in merit. Those named below are more or less in requisition :—

Outdoor Grapes.

Black Cluster—small, rouudish-oval, black berries.

Black Prince—largish, oval, purplish-black berries.

Early Ascot Frontignan—round, amber-coloured berries ; musky flavour.

Early Saumur Frontignan—medium, round, pale-amber berries ; musky.

Early White Malvasia (Grove-end Sweetwater)—roundish, whitish-green berries.

July Frontignan—medium, round, blue-black berries; musky flavour,

Miller’s Burgundy (The Miller)—small, roundish-oval, black berries.

Royal Muscadine (Chasselas de Fontainebleau)—large, round, greenish-yellow berries ; one of the best white grapes, indoors or out.

Indoor Grapes.

Alicante—large, oval, blue-black berries ; late, and a good keeper.

Black Hamburg—large, roundish-oval, black berries; A 1 in every respect.

Black Monukka—medium, obovate-oblong, brownish-black, seedless, crackling berries; very pleasant eating; may be grown as a curiosity.

Buckland Sweetwater—large, roundish, pale amber berries.

Canon Hall Muscat—large, roundish, amber berries ; high musky flavour.

Chasselas Musqué—medium, round, pale amber berrics ; rich musky flavour,

Duchess of Buccleuch—small, round, greenish-white berries ; musky.

Walnut.

Orchard- house trees.

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Duke of Buccleuch—very large, roundish, greenish-amber berries. _
¥Foster's White Seedling—largish, roundish-oval, greenish-yellow berries.
Frankenthal (Victoria Hamburg)—large, roundish-oblate, black berries.
Grizzly Frontignan—medium, round, grizzly red berries ; musky.

Gros Colman—very large, round, black berries ; late, requires to hang long.
Gros Maroc—large, oval, purple-black berries ; very fine, late.

Lady Downe's—largish, roundish-oval, black berries ; late, a good keeper.
Madresfield Court—large, oval or oblong, black berries ; slightly musky.
Mill Hill Itamburg—very large, round or oblate, hammered, blue-black.
Muscat of Alexandria—large, oval, pale-amber berries ; musky flavour.
Muscat Hamburg—large, oval, black berries ; musky flavour.

Raisin de Calabre —large, round, transparent white berries ; late. Trebbiano —medium, roundish-oval, greenish-white berries; late.

Venn's Black Muscat—medium, oval, brownish-black berries ; musky.
West's St Peter's—largish, roundish-oval, blue-black berries; late.

White Frontignan—medium, round, greenish-yellow berries ; musky.

For the open wall, the Early Ascot Frontignan, Early White Malvasia, and Royal Muscadine may he preferred of the white sorts; and July Frontignan and Black Cluster of the blacks. For a greenhouse vinery, Black Hamburg and Madresfield Court, black; and Foster's White Seedling, Buckland Sweet- water, and Royal Muscadine, white. For early forcing, Black Hamburg and Muscat Hamburg, black ; Foster's White Seedling, Royal Muscadine, White ¥rontignan, and Duke of Buccleuch, white. For a general midseason crop, Black Hamburg or Frankenthal, and Lady Downe's, black; Grizzly Frontig- nan, reddish; and Muscat of Alcxandria and Raisin de Calabre, white. Yor hanging late, Alicante, Gros Colman, Gros Maroc, Lady Downce's, and West's St Pcter's, black; and Muscat of Alexandria and Trebbiano, white.

138. The Walnut, Juglans regia, is a lofty tree, native of Persia and Asia Minor. The fruit, whilst young and tender, is much used for pickling, and when ripe is a favourite article of the dessert. The tree succeeds in deep sandy or calcareous loams, and in stiff loams resting on a gravelly bottom. It requires free exposure to air and light. It is propagated by seeds, and occasionally by budding, grafting, or inarching for the perpetuation of special varieties. The trees form their heads naturally, and therefore little pruning is re- quired, it being merely necessary to cut off straggling growths, and to prevent the branches from interlacing. The best time for per- forming this is in the autumn, just after the fall of the leaf. Plants raised from the seed seldom become productive till they are twenty yearsold. The fruit is produced at the extremities of the shoots of the preceding year; and therefore, in gathering the crop, care should be taken not to injure the young wood. In some parts of England the trees are thrashed with rods or poles to obtain the nuts, but this is far from being a commendable mode of collecting them.

Besides the common walnut, there are several varicties cultivated, particularly the Thin-shelled and the Thetford or Highflyer, which last is by far the best walnut grown.

139. Orchard-house Trecs.—The fruits that may be successfully grown in unheated orchard-houses are peaches, nectarines, apricots, plums, figs,

cherries, pears, and apples; and all, except the last two, are more readily obtained in those which are judiciously heated.

The trees are sometimes planted out, and sometimes grown in pots. The potted trees are decidedly to be preferred, for those which are planted out are less at the command of the cultivator, and unless the houses are large are apt to outgrow the space; they do not indeed require so much attention as regards water, while pot trees entail very much labour in this respect from the time the fruit is fairly set until it is near the ripening stage; but on the other hand a much greater variety may be grown in this way, and the trees can be shifted from place to place, as required, with the utmost facility. While at rest in winter they can be set close together without injury, and may be continued in this way until they come into flower. After the setting of the fruit, the hardier sorts, as plums, pears, and apples, can be taken out, and put under temporary awnings till it is safe to plunge them beside the walks in the open quarters of the garden, where they grow and swell, if duly watered, as well as if established in the ground. two or three times a day, and besides this should have a dose of liquid manure occasionally, This removal of the hardier plants to the open air leaves more space under glass for the tenderer sorts.

The trees are most convenient when trained in the pyramidal form, or as compact bushes; and the summer treatment should consist in pinching back the points of all the growing shoots after they have formed two or three leaves.

The vigour of pot fruit trees is greatly due to judicious surface- dressing during the summer months. It should be applied at intervals of ten or twelve days, and should be made up of equal parts of horse-droppings, turfy loam, and malt dust, the whole being laid up in a heap and frequently turned. The dressing should not, however, be applied within three weeks of the ripening of the fruit.

The trees should be repotted in autumn as soon as the leaves have done their work, in similar compost to that first employed—good turfy loam, with about a sixth of rotted manure, anda sprinkling of bone dust. They are to be turned out of the pot, and a slice of about an inch in thickness pared off with a sharp knife, and are then to be replaced in a pot of the same size

as that in which they previously grew, unless in those cases where a larger one may be afforded, and then the roots need not be cut away. This disrooting may some- times be done before the leaves are quite ready to fall, in which case care is necessary to prevent the tree from flagging ; and, if the weather be hot, the tops should be kept moist by frequently dewing the foliage with the syringe, but no water must be given at the root for a day or two after repotting. If the wood has been well ripened,

In dry summer weather they need a good watering —

trees treated in this way will bear freely during the following season. Whether placed on the floor of the house, or plunged outdoors, the pots should stand on two bricks placed a little apart, so that worms cannot gain admittance by the draining-hole,

The fruit obtained from trees well cultivated in pots in an orchard- house will compare, as regards size and quality, with the best fruit ripened on an open wall or in a forcing-house; but, when grown without fire heat, it isof course but little in advance of the outdoor crops. To the amateur this mode of culture will be found to present many attractions.

VII. Vegetables.

140. Under this head we include those esculents which are largely eaten as “vegetables” or as “salads,” while the various “herbs” which are used chiefly for flavouring or garnishing will be referred to in a supplementary paragraph.

141. The Artichoke, Cynara Scolymus, is a stout-growing hardy Arti- perennial, cultivated for the sake of the immature flower-heads. choke,

in France the whole of the leaves of the involucre are eaten when in a young and tender state, cn poivrade, or with pepper, salt, and vinegar ; but the only parts of the flower-head used in England are the base of the leaves of the

involucre, and the immature floral receptacle called the bottom, freed from the bristly seed-down which is called the choke. In old plantations about to be destroyed the ecntral leaves are sometimes blanched and eaten; this edible part, like that of the nearly related cardoon (par. 150), is called the chard. The artichoke requires a deep cool dry soil, well enriched, and deeply trenched. It is propagated by parting the roots in April, the sets being planted in rows 4 or 5 fect asunder, and 2 feet apart in the rows. As the young plants afford a crop which suc- ceeds that of old plants, a new plantation is made in some gardens every year. During summer the artichokes require little other attention than to be kept clear of weeds. In November the decayed stems and leaves are removed, the ground cleared, and a cone of a foot deep of sifted coal-ashes, or rotten tan, or littery dung, is placed close round the base to defend the stools from frost. In April this is taken away, the stocks are examined, and two or three only of the strongest shoots are permitted to remain ; a dressing of manure is given—well-rotted hotbed dung or seaweed—and the ground between the rows is forked over. ‘he offsets, carefully removed, afford materials for young plantations. The heads are cut when nearly full grown, before the scales of the involucre open out.

The varieties most osteemed in England are the Green or French, which has conical heads, and is considered the highest flavoured; the Glohe, which has dull purplish heads, and is well adapted for a general crop; and the Purple, which is the earliest. The Laon is that most widely grown at Paris.

142, The Asparagus, Asparagus officinalis, is one of the most Aspa- delicate of our esculents, possessing well-marked diuretic properties, ragus,

and is grown extensively in private gardens as well as for market. The asparagus prefers a loose light deep sandy soil; the depth should be 8 feet, the soil being well trenched, and all surplus water got away. A considerable quantity of well-rotted dung or of recent sea- weed should be laid in the bottom of the trench, and another top- dressing of manure should be dug in preparatory to planting or sowing. Nitrate of soda appears to be the best artificial manure, and salt applied at the rate of 2 Ib to the square yard is a good dressing while the plants are growing. The beds should be 3 feet or 5 feet wide,.with intervening alleys of 2 feet, the narrower beds taking two

rows of plants, the wider ones three rows. The beds should run east and west, so that the sun’s rays may strike against the side of the bed. In some cases the plants are grown in equidistant rows 3 to 4 feet apart. Where the beds are made with plants -already prepared, either one-year old or two-year old plants may be used, for which a trench should be cut sufficient to afford room for spreading out the roots, the crowns being all kept at about 2 inches below the surface. Planting is best done in May, after the plants have started into growth. To prevent injury to the roots, it is, however, perhaps the better plan to sow the seeds in the beds where the plants are to remain,

The seed should be sown in March in slight drills; and itis a good precaution to sow more than is necessary, and to thin out towards the end of the first summer, to the distance of about 6 inches in the rows. The ground must be hoed and kept clear of weeds. Frequently slight crops of lettuce are taken from the surface of the beds, and of cauliflower from the spaces between them. The asparagus heads should not be cut before the third spring, and are not in perfection till the fourth or fifth.

The manuring of asparagus, which can scarcely be overdone, should be performed in the end of autumn, when the dead stems are removed. When the plants are in beds, the surface should be stirred with a fork; a layer of well-rotted hotbed dung should then be laid on, and the whole covered with a sprinkling of earth from the alleys. Ifthe plants are grown in rows, the manure is simply dug in between them by means of a digging fork, care being taken not to injure theroots. These operations are repeated annually, and no other culture is required; but it is necessary to observe a due

moderation in reaping the crop, as the shoots, when cut too freely, beeome gradually smaller. A considerable quantity of ground is consequently required to kecp up a supply. It is a general rule never to gather asparagus after peas have comc into season. To expericnce the finest favour of asparagus, it should be eaten immediately after having been gathered; if kept longer than one day, or set into water, its finer flavour is altogether lost. If properly treated, asparagus beds will continue to bear well for many years.

The asparagus grown at Argenteuil, near Paris, has acquired much notoriety for its large size and excellent quality. The French growers plant in trenches, instead of raised beds.

Forcing.—The most common method of forcing asparagus is to prepare, early in the year, a moderate hotbed of stable litter with a bottom heat of 70°, and to cover it with acommon frame. After the heat of fermentation has somewhat subsided, the surface of the bed is covered with a layer of light earth or exhausted tan-bark, and in this the roots of strong mature plants are closely placed. The crowns of the roots are then covered with 8 to 6 inches of soil. A common three-light frame may hold 500 or 600 plants, and will afford a supply for several weeks. After planting, linings are applied when necessary to keep up the heat, but care must be taken not to scorch the roots ; air must be occasionally admitted. Where there are pits heated by hot water or by the tank system, they may be advantageously applied to this purpose. A succession of crops must be maiutained by annually sowing or planting new beds. Mr Lindegard, of the Royal Gardens at Copenhagen, recommends the plan of forcing asparagus on the ground on which it grows, but the results obtained in this way are not so satisfactory.

The principal varieties are the Red-topped and the Green-topped, of which there are several reputed sub-varieties, as the Battersea, Gravesend, Giant, Colossal, &c., which differ but slightly from each other.

143. The Bean, Faba vulgaris, is an annual plant. The seeds are sown about 4 inches apart, in drills 24 feet asunder for the smaller and 3 feet for the larger sorts. The soil should be a rather heavy loam, deeply worked and well enriched. For an carly crop Marshall’s Early Dwarf Prolific and the Dwarf Crimson-seeded may be sown in November, and protected during winter in the same manner as early peas. An early crop may also be obtained by dib- bling in the seeds in November, sheltering by a frame, and in February transplanting them to a warm border. Successional crops of Karly Seville or Early Longpod should be sown in January and February, and the Longpods or Green Windsor in March, April, and May, for a general crop, while for later crops the Dutch Longpod may be sown in June or early in July. All the culture necessary is that the earth be drawn up about the stems. The plants are usually topped when the pods have set, as this not

only removes the black aphides which often settle there, but is also found to promote the filling of the pods.

The following are some of the best sorts:—

Harly.—Dwarf Crimson-seeded, Marshall’s Early Dwurf Prolific, Early Seville, Early Longpod.

Late.—Windsor, Green Windsor, Dutch Longpod.

See BEAN, vol. iii. p. 460, and AGRICULTURE, Vol. i. p. 360.

144, The Beet, Beta vulgaris, is a hardy biennial, native of the south of Europe, on tlic sea-coast. The boiled root is eaten cold, either by itself or as a salad ; it is also often used asa pickle. The beet prospers in a rich deep soil, well pulverized by the spade. If manure is required, it should be deposited at the bottom of the trench in preparing the ground. The seeds should be sown in drills 15 inches asunder, in April or early in May, and the plants are afterwards to be thinned to about 8 inches apart in the lines, but not more, as moderate-sized roots are preferable. The plants should grow on till the end of October or later, when a portion should be taken up for use, and the rest laid in in a sheltered corner, and covered up from frost. The roots must not be bruised, and the leaves must be twisted off—not closely cut, as they are then liable to bleed. In the north the crop may be wholly taken up in autumn, and stored in a pit or cellar, beyond reach of frost. If it is desired to have fresh roots early, the seeds should be sown at the end of February or beginning of March ; and if a succession

.is required, a few more may be sown by the end of March.

The Yellow Beets are not appreciated at table, and the White Sugar Beets are not suitable for garden culture. We shall only name a selection of the red-fleshed sorts :—Turnip-rooted or Egyptian (very early), Red Castelnau-dary (the type of our best beets), Pine-apple Short-top, Nutting’s Selected,

© ele Perfection of Beets, Sutton’s Dark Red, Dell’s Crimson or Osborn’s elect.

The White Beet, Beta Cicla, is cultivated for the leaves, which are used as spinach ; but for this they are a very sorry substitute. The midribs and stalks of the leaves are also stewed and eaten as sea- kale, under the name of Swiss chard. The culturc docs not differ materially from that of the red beet, but more space is required.

See Bret, vol. iii. p. 504, and AGRICULTURE, vol. i. p. 381.

145. The Borecole or Kale, Brassica oleracea acephala, includes several varieties which are amongst the hardiest of our esculents, and seldom fail to yield a good supply of winter greens. They require well-enriched soil, and sufficient space for full exposure to air ; and they should also be sown early, so as to be well “established and hardened before winter.

Bean,

Beet,

Borecole,

The main crops should be sown about the first week of April, or, in the north, in the third week of March, and a succession a month later. The Buda kale is sown in May, and planted out in September, but a sowing for late spring use may be made in the last week of August, and transplanted towards the end of September. To prevent over- crowding, the plants should be transplanted as soon as they are of sufficient sizc, but if the ground is not ready to receive them a sufficient number should be pricked out in some open spot. In general the more vigorous sorts should be planted in rows 2% feet or 3 feet and the smaller growers 2 feet apart, and 18 inches from plant to plant. In thesc the heads should be first used, only so much of the heart as is fresh and tender being cut out for boiling; side shoots or sprouts are afterwards produced for a long time in suc- cession, and may be used so long as they are tender enough to admit of being gathcred by snapping their stalks asunder.

The best of the borecoles or kales are—Dwarf Green Curled or Scotch Kale, very hardy, and from its dwarf habit often sheltered by snow; Cottager's Kale, very hardy, one of the most prolific and well-flavoured; Purple Borecole, very hardy. The following are less vigorous in growth, but are of excellent quality:—Jerusalem Kale, Egyptian Kale, Buda Kale,—the last two very hardy.

146, The Broccoli, Brassica oleracea botrytis asparagoides, is sup- Broccoli. posed to have sprung from the cauliflower, being, like it, of Italian origin, and differing chiefly in possessing greatcr hardiness of con- stitution. Miller indeed states (Gardeners' Dictionary) that the al known in his time were imported from the island of

ryprus.

The broccoli succeeds best in a fresh, loamy soil, somewhat firm in texture. For the autumn broccolis the ground can scarcely be toorich, but the winter and spring sorts, on ground of this character, are apt to become so succulent and tender that the plants suffer from frost even in sheltered situations, while plants less stimulated by manure and growing in the open field may be nearly all saved, even in severe winters. The main crops of the early sorts, for use in autumn, such as the Capes and Grange's, should be sown early in May, and planted out while young, to prevent them coming too early into flower; in the north they may be sown a fortnight earlier. The later sorts, for use during winter and spring, should be sown about the middle or end of May, or about ten days earlier in the north. The seed beds should be made in fresh light unexhausted soil; and if the season be dry, the ground should be well watered before sowing. If the young plants are crowding each other, they should be thinned. The ground should not be dug before planting them out, as the firmer it is the better; but a shallow drill may be drawn to mark the lines. The larger-growing sorts may be put in rows 3 feet apart, and the plants about 24 feet apart in the rows, and the smallcr-growing ones at from 2 to 24 feet between, and 1} to 2 feet intherows. If the ground is not prepared when young plants are ready for removal, they should be transferred to nursery beds and planted at 3 to 4 inches apart, but the earlier they can be got into their permanent places the better.

It is of course the young flower-heads of the plant which are caten. When these form, they should be shielded from the light, by bending or breaking down an inner leaf or two. In some of the sorts the leaves naturally curve over the heads. To prevent injury to the heads by frost in severe winters, the plants should be laid in with their heads sloping towards the north, the soil being thrown back so as to cover their stems; or they may be taken up and laid in closely in deep trenches, so that none of the lower bare portion of the stem may be exposed. Some dry fern may also be laid over the tops. .

The spring varieties are extremely valuable, as they come at a season when the finer vegetables are scarce. They afford a supply from March to May inclusive. In all cases great care should be taken to procure the seed true, as it is very liable to become deterio- rated through crossing by insect agency.

The following are good types of broccoli, but the varieties are frequently changing, in name at least, the supposed novelties being often merely good and pure stocks of older kinds :—

For autumn and winter use: Early Purple Cape, Early White Cape, Grange's, Veitch's Self-protecting Autumn, Snow's Superb Winter White, Osborn's Winter White, Backhouse's Winter.

For late winter and spring use: Knight's Protecting, Cooling's Matchless, Leamington, Chappel's Cream, Ellotson's Mammoth, Sutton's Perfection, Penzaice, Purple Sprouting. ;

For the latest supply: Cattell's Eclipse, Carter's Champion, Lauder's Goshen, Late White Protecting, Miller's Dwarf Late White.

147. The Brussels Sprouts, Brassica oleracea bullata gemmifera, Brussels have long been cultivated near Brussels. There appears to be no sprouts, information as to the plant's origin, but, according to the late Dr Van Mons, it is mentioned in the year 1213, in the regulations for holding the markets of Belgium, under the name of spruyten (sprouts). Itis very hardy and productive, and is much esteemed for the table on account of its flavour and its sightly appearance.

The seed should be sown about the middle of March, and again in the first or second week in April forsuccession. Any good garden soil is suitable. For an early crop it may be sown in a warm pit in February, pricked out and hardened in frames, and planted out in a warm situation in April. The main crop may be planted iu rows 2 feet asunder, the plants 18 inches apart. Thcy should be got out

Cabbage.

. Serymger’s Giant is a vigorous

early, so as to be well established and come into use before winter. The head may be cut and used after the best of the little rosettes which feather the stem have been gathered; but, if cut too early, it exposes these rosettes, which are the most delicate portion of the produee, to injury, if the weather be severe.

The earliest sprouts become fit for use in November, and they continue good, or even improve in quality, till the month of March following. Van Mons mentions that by successive sowings the sprouts are obtained in Brusselsfor the greater part of the year. “The most reliable crop is perhaps obtained from seed of the ordinary variety imported from Holland, but good English-raised seed, represented by Carter’s Perfeetion, may also be obtained. dwarf kind. We doubt, however, dwarf kinds, as the taller ones with longer stems, if sufficiently vigorous, must yield a larger produce.

In this place’ may be noted two hybrid sprouts, both raised by Mr Melville, at Dalmeny Park, near Edinburgh. They are the Albert Sprouts, a hardy green, long in running to secd, the result of a cross between the savoy and Brussels sprouts ; and the Dalmeny Sprouts, which grow 6 inches or 8 inches high, with a eompactly eabbaged head of moderate size, and a stem thickly set with cabbage- like sprouts, a cross obtained between the cabbage and Brussels sprouts. Both may be grown in the same way as the borecoles.

148. The Cabbage, Brassica oleracea eapitata, has sprung from the biennial B. oleracea of the British sea-coasts. The cabbage re- quires a weil-manured

and well-wrought loamysoil. It should have abundant water in summer, liquid manure being specially beneficial. Round London, where it is grown in perfection, the ground for it is dug to the depth of two spades or spits, the lower portion being brought up to the action of the weather, and rendered available as food for the plants ; while, the top-soil, containing the eggs and larve of many insects, being deeply buried, the plants are less liable to be attacked by the club. Farm-yard manure is that most suitable for the cabbage, but artificial manures such as guano, superphosphate of lime or gypsum, together with lime-rubbish, wood-ashes, and marl, may, if required, be applied with advantage.

The first sowing of cabbage should be made about the beginning of March, and should consist of Nonpareil or Enfield Market (also known as the Early Battersea) ; these will be ready for use in July and August, following the autumn-sown crops. Another sowing of the sanie sorts, or of the St John's Day, should be made in the last week of March or first week of April, and will afford a supply from August till November; and a further crop of such sorts as Early York, Little Pixie, Atkins's Matchless, or other kinds that heart quickly, may be made in May to supply young-hearted eabbages in the early part of winter. The autumn sowing, which is the most important, and affords the supply for spring aud early summer use, should be made about the last week in August, in warm localities in the south, and about a fortnight earlier in the north; or, to meet fluctuations of climate, it is as well in both cases to anticipate this sowing by another two or three weeks earlier, planting out a portion from each, but the larger number from that sowing which promises best to stand without running to seed. The sorts should be Enfield Market, Nonpareil, or Winnigstadt. These later sown plants will be ready for transplanting by the end of September or early in October, and may be placed in the ground previously oecu- pied by the pea or bean crop.

The cabbages grown late in autumn and in the beginning of winter are denominated Coleworts (vulg. Collards), from a kindred vege- table no longer cultivated. Two sowings are made, in the middle of June and in July, and the seedlings are planted a foot or 15 inches asunder, the rows being 8 or 10 inches apart. The sorts employed are the Rosette and the Hardy Green.

About London the large sorts, as Enfield Market, are planted for spring cabbages 2 feet apart each way ; but a plant from an earlier sowing is dibbled in between every two in the rows, and an inter- mediate row a foot apart is put in between the permanent rows, these extra plants being drawn as coleworts in the course of the winter. The smaller sorts of cabbage may be planted 12 inches apart, with 12 or 15 inches between the rows. The large sorts should be planted 2 feet apart, with 24 feet between the rows. The only culture required is to stir the surface with the hoe to destroy the weeds, and to draw up the soil round the stems.

The Red Cabbage, Brassiea oleracea capitata rubra, of which the Red Dutch is the most commonly grown, is much used for pickling. It is sown about the end of July, and again in March or April. The Dwarf Red and Utrecht Red are smaller sorts. The culture is in every respect the same as in the other sorts, but the plants have to stand until they form hard close hearts.

The Couve Tronchuda or Portugal Cabbage, Brassica olcraeea acephala costata, is of a distinct type and of excellent quality. The fleshy ribs of the leaves, cooked like sea-kale, are the only parts eaten. It is somewhat tender, and requires to be sown early in spring for use during the autumn.

the policy of planting

The names of the varieties of cabbage are ver i pad g Yy numerous, but, on comparing pes at Chiswick, Mr Barron reduces the garden varieties to about seventeen ypes, the best of which are :—Karly sorts: Atkins’s Matchless, Early York,

‘of April.

Little Pixie, Nonpareil, St John’s Day. Mid-season: Enfield Market (Batter- sea or Fulham), Rosette Colewort, Winnigstadt. Late sorts: Bacalan, Hardy Green Colewort, Pomeranian. See CABBAGE, vol. iv. p. 617. :

149. The Capsiewm is the produce of several species of the genus Capsi- Capsicum cultivated for the sake of their pods, which in a green eum,

state are used in salads and in pickles, and when ripe are powdered to form cayenne pepper. The pods, either green or ripe, are also used to make Chili vinegar.

The Annual Capsicum, Spanish Pepper, ot Guinea Pepper, Cap- sicum annuum, is the sort most commonly grown. ‘The seeds should be sown in a hotbed in February, the young plants being transferred successively into 3-inch, 5-ineh, and 8-ineh pots. They require a warm genial atmosphere, and a light rich soil, and should be assisted with liquid manure or sueh artificial fertilizers as Clay’s or Jackman’s. In the south of England they may be grown in the open air, ona warm sunny border, if planted out towards the end of June. The fruit ripens in September, and may be kept two or three years ina dry room. The Lird Pepper, C. baceatum, and the Chili, C. fruteseens, are both sub-shrubby plants, requiring stove heat. They should be grown in peaty soil, should not be over- potted, and should be kept dryish at the root in winter. The best cayenne pepper is prepared from C. frutescens, and C. baecatum is much relished by some persons. The Bell Pepper, C. grossum, and. the Large Sweet Spanish, are milder in flavour than the other sorts, and are much eaten in salads and also with cold meats. See CAYENNE PEPPER, vol. v. p. 280.

150. The Cardoon, Cynara Cardunculus, a perennial from the south Cangoon,

of Europe and Barbary, is a near relation of the artichoke (par. 141). The edible part, called the chard, is composed of the blanched and crisp stalks of the inner leaves. Cardoons are found to prosper on light deep soils. The seed is sown annually about the middle of May, in shallow trenches, like those for celery, and the plants are thinned out to 10 or 12 inches from each other ‘in the lines. In Scotland it is preferable to sow the seed singly in small pots, plae- ing them in a mild temperature, and ae them into the trenches after they have attained a height of 8 or 10 inches. Water must be copiously supplied in dry weather, both to prevent the for- ination of flower stalks and to increase the sueculenee of the leaves. In autumn the leaf-stalks are applied close to each other, and wrapped round with bands of hay or

straw, only the points being leftfree, Earth isthen drawn up around them to the height of 15 or 18 inches. Sometimes cardoons are blanched by a more thorough earthing up, in the manner of celery, but in this case the operation must be carried on from the end of summer. During severe frost the – tops of the leaves should be defended with straw or litter. Besides the common and Spanish eardoons, there are the priekly-leaved Tours cardoon, the red-stemmed cardoon, and the Paris eardoon, all of superior quality, the Paris being the largest and most tender. ‘The common artichoke is also used for the production of chard.

-151, The Carrot, Daucus Carota, has been much improved and (Carrot.

transformed from the wild state; it is probably a native of the sea- coasts of southern Europe, but is now abundant throughout Europe and Asiatic Russia. The earrot delights in a deep sandy soil, which should be well drained and deeply trenehed. In regard to the pre- paration of the ground, one of our best northern gardeners has said— ‘Trench in autumn ; trench deep and lay the manure at the bot- tom of the treneh; in spring rake down, lay on an inch of wood ashes, and dig them lightly in.” For the long-rooted sorts the soil should be at least 3 feet deep, but the Short Horn varieties may be grown in about 6 inches of good compost laid on the top of a less suitable soil. Peat earth may be usefully employed in lightening the soil. Good carrots of the larger sorts may be grown in unfavour- able’ soils by making large holes 18 inehes deep with a crowbar, and filling them up with sandy compost in which the seeds are to be sown. The main crop is sown at the end of March or beginning After sowing, it is only necessary to thin the plants, and keep them elear of weeds. The roots are taken up in autumn and stored during winter in a cool shed or cellar.

Forcing.—For a supply of young carrots in winter, a hotbed com- posed of 3 or 4 feet thick of leaves, or of 18 inches of dung, or of 2 feet of dung and leaves mixed, should be prepared about the end of November or beginning of December, and covered with a frame and lights. The bed should be surfaced with 8 or 9 inches of light soil, of which leaf-mould may form aconsiderable proportion, and the seed of Early Short Horn, Early Nantes, or French Foreing should be sown in drills 3 inches apart, and covered to the depth of 4 inch. The young plants should be thinned to 14 inches apart.

The tem- perature should range from 60° to 65°, as mueh light and air being given as possible, but the sashes should be covered at night, espe- cially in frosty weather. For succession sow again on a gentle hot- bed under glass early in February, and follow this by another sowing on @ warm sheltered south border early in March. The seed bed should be made up of light rich compost, in a situation well ex- posed to the sun. If these quick-growing sorts are preferred, small suceessional sowings should be made in May and again In July, James's Intermediate being substituted at the last sowing. Where

Cauli- flower.

HORTI ©

a little protection can be given by a frame jin winter, some of the Early Short Horn may be sown in August for spring use,

The following are good garden carrots :—Early: French Forcing, Early Nantes, Early Short Horn. Mid-season: James's Intermediate, Long Blunt Red. Main Crop: Long Surrey, Altrincham. See AGRICULTURE, vol. i. p.

369. ;

152. The Cauliflower, Brassica oleracea botrytis cauliflora, is said by our old authors to have been introduced from Cyprus, where, as well as on the Mediterranean coasts, it appears to have been cul- tivated for ages. It is one of the most delicately flavoured of vege- tables, the dense cluster formed by its incipient succulent flower- buds being the edible portion.

The sowing for the first or spring crop, to be in use in May and June, should be made from the 15th to the 25th of August for Eng- land, and from the Ist to the 15th of August for Seotland. In the neighbourhood of London the growers adhere as nearly as possible to the 2lst day. A sowing to produce heads in J uly and August takes place in February on a slight hotbed. A late spring sowing to produce cauliflowers in September or October or later, should be made early in April, and another about the 20th of May.

The cauliflower succeeds best in a rich soil and sheltered position ; but, to protect the young plants in winter, they are sometimes pricked out in a warm situation at the foot of a south wall, and in severe weather eovered with hoops and mats.

and-glasses throughout the winter. It is advantageous to prick out the spring-sown plants into some sheltered place, finally transplanted in May. The later crop, which may take place at various times, is treated like early cab- bages. After planting, all that is necessary is to hoc the ground, and draw up the soil about the stems.

It is found that cauliflowers ready for use in Oetober may be kept in perfeetion over winter. For this purpose they are lifted earefully with the spade, keeping a ball of earth attached to the‘roots. Some of the large outside leaves are removed, and any points of leaves that immediately overhang the flower are cut off. They are then placed either in pots orin hotbed frames, the plants being arranged close together, but without touching. In mild dry weather the glass frames are drawn off, but they are kept close during rain

before they are the transplanting of

_ Storms; and in severe frost they are thickly eovered with mats.

Celeriac,

The late Mr Barnes of Bicton informs us in the Gardeners’ Maga- ziné that his cauliflowers for spring are sown the first week of Oetober, in pans, in a little bottom heat; and about the end of the month, or the beginning of November, are potted into 3-inch pots, and plunged close to the glass. The plants are kept shifted on in some old melon-bed mould until the beginning of January, when they are shifted finally into 7-ineh pots. In the first week in Feb- ruary the ground is prepared. If wet, a little of the soil is taken out where each hand-glass is to stand, and replaced with dry dusty rubbish, in order to prevent the eauliflowers from getting the disease of ‘black legs.” Four plants are turned out under eacli hand-glass, If the weather proves dry,

a liquid manure, consisting of 1b of nitrate of soda to 1 hogshead of eow-dung water, with the addition of a few gallons of hot water, is applied, which causes the plants to grow in March as in May, and produce fine cauli-flowers carly in April. Mr Barnes states that by shifting on the plants until they are in 12-inch pots, and then placing them in a Vinery or peach-house, he.has had eauliflowers early in March.

Some of the best varieties of cauliflower are—the Walcheren, which, if true, is of excellent quality, and the most generally useful for autumn; Dwarf Erfurt, which is very dwarf and early, and good for summer and early autumn use; Early London, rather tall, but with a fine compact curd; Le-normand's, a second early ; Snowball, dwarf, compact, and quick-heading ; and Veitch's Autumn Giant, which is an excellent hardy sort for autumn.

158. The Celeriac, Apium graveolens rapaceum, the eéleri-navet of the French, is a variety of eelery in which the stem forms an uregular knob, which is the part used, either slieed in salads or eooked. Itis a hardy substitute for other kinds of celery. The Toots grow to 3 tbor 4 Ib weight. The plants should be reared like those of celery; and, some time before winter sets in, they should be taken up and stored amongst sand iu a shed or eellar.

154. The Celery, Apium graveolens, has been so much improved by cultivation as to have lost its acrid deleterious properties, and is now a stout suceulent plant, with a mild and agreeable flavour, and in the finer varieties with the stalks solid instead of hollow and pipy. The blanched portions only should, however, be used.

Celery is usually sown at three different times,—on a hotbed in the beginning of March, and in the open ground in March, and again in April. The seedlings, when about 2 inelies high, are pricked into rich soil, in whieh they are allowed to stand till they are 4 or 5 inches high. The first crop is defended by frames or hand-glasses, and is planted wide to admit of being lifted with balls of earth adhering to the roots. Towards the end of May trenclies for blanching the celery are prepared 3} or 4 feet apart, 15 inches

| wide at the bottom, and about a foot below the natural level of the surface. The soil at the bottom of the trench is to be earefully dug and manured, and a single row of plants placed in each trench. Somctimes, where a large supply is required, the trenehes are made 6 feet wide, and rows 15 or 18 inches apart are planted across the trenches. As the plants advance in growth, earth is laid up about the stalks of the leaves, and this is repeated at the end of every ten or fifteen days. Many delay the earthing-up until the plants have nearly attained their full size, when the operation is performed at onee ; but it is better to commence the earthing-up when the crop is half-grown, and to eomplete it by adding a little more soil at short intervals. Suceessional erops should be planted out from the. ist of June till the 1st of August. Celery loves a rich light soil, and will bear to be flooded with water at the root while growing.

The varieties of celery include some with red stalks and some with white. The latter, as they blanch more perfectly than the red, are sometimes preferred, but the red varieties blanch toa very delicate pink, and are generally better flavoured. Some of the best varieties are :— Whites : Early Dwarf Solid White (Incomparable White), Williams's Matchless White, Wright's Grove White. Reds: Leicester Red (Major Clarke's Solid), Ivery's Nonesuch, Sul- hani Prize Pink, Williams's Matchless Red. See CELERY, vol. v. p. 290.

155. The Chicory or Succory, by the Freneh as a winter salad, and when blanched is known by the name of Barbe de Capucin. When intended for winter use, it is sown in May or June, commonly in drills, and the plants are thinned out to 4 inehes apart. If at first the leaves grow very strong, they are eut off, perhaps in the middle of August, about an inch from the ground, so as to promote the produetion of new leaves, and check the formation of flower-stems. About the beginning of October the plants are raised from the border, and all the large leaves cut off; the roots are also shortened, and they are then planted pretty closely together in boxes filled with rich light mould, and watered when needful. When frost comes on, the boxes are pro- teeted by any kind of litter or haulm. – As the salad is wanted, they are removed into some place having a moderately increased tempera- ture, and where there is no light. Each box affords two erops of blanched leaves, and these are reckoned fit for cutting when about 6 inches long.

Another mode of obtaining the young leaves of this plant in winter is to sow seeds in a bed of light rich mould, or in boxes in a heat of from 55° to 60°, giving a gentle watering as required. The leaves will be fit to eut in a fortnight after sowing, aud the plants will afford a second crop,

In Belgium a varicty of ehicory called Witlogf is much preferred as a salad to the French Barbe de Capucin. The seeds are sown and the plants thinned out like those of the ordinary sort. They are eventually planted in light soil, in suceession, from the end of Oetober to February, at the bottom of trenches a foot or more in depth, and covered over with from 2 to 8 feet of hot stable manure, In a month or six weeks, ‘according to the heat applied, the heads are fit for use, and should be cut before they reach the manure, The plants might easily be forced in frames on a mild hotbed, or iu a mushroom-house, in the same way as sea-kale.

The sorts cultivated are the Common, the Improved, and the Witloef. That grown for mixing with coffee is a variety with larger fleshy roots. See Curcory, vol. v. p. 614.

156. The Chives, Allium Sehcenoprasum, is a hardy perennial, found in the North of England and in Cornwall, and growing in rocky pastures throughout temperate and northern Europe and Asiatie Russia, and also in the mountain districts of southern Europe. It is cultivated for the sake of its leaves, which are used in salads and soups as a substitute for young onions, It will grow in any good soil, and is propagated by dividing the roots into small clumps in spring or autumn ; these are planted from 8 to 12 inches apart, and soon form large tufts. The leaves should be cut frequently so as to obtain them tender and succulent.

fields in central Europe, and not unfrequent in Britain. In France it is used in salads during winter and spring as a substitute for lettuces, but it is less esteemed in England. The plant is raised from seed sown on a bed or border of light rieh earth, and should be weeded and watered, as occasion requires, till winter, when it should be proteeted,with long litter during severe frost. The largest plants should be drawn for use iu succession. Sowing may be made every two or three weeks from the beginning of August till October, and again in Mareh, if required in the latter part of the spring. The sorts

principally grown are the Round-leaved and the Italian, which last is sometimes referred to Valerianella eriocarpa.

158. The Cress, or Garden Cress, Lepidium sativum, is anannual Cress.

plant, native of western Central Asia. It is used in salads, the young plants being cut and eaten whilc still in the seed-leaf, form- ing, aloug with plants of the white mustard in the same stage of growth, what iscommonly called ‘small salad.” The seeds should be sown thickly broadcast or in rows in succession every ten or fourteen days, according to thedemand. The sowings may be made in the open ground from March till October, the earliest under hand-glasses, and the summer ones in a cool inoist situation ; but

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Cichorium Intybus, is much esteemed Chicory.

157. The Corn-Salad or Lamb’s Lettuce, Valerianella olitoria, isa Corn-weedy annual, native of southern Europe, but naturalized in corn- salad.

Cueum- ber.

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during winter they must be raised on a slight hotbed, or in shallow boxes or pans placed in any of the glass-houses where there is a tem- perature of 60° or 65°.

The Golden or Australian Oress is a dwarf, yellowish green, mild-flavoured sort, which is cut and eaten when a little more advanced in growth, but while still young and tender. It should be sown at intervals of a month from March onwards, the autumn sowing, for winter and spring use, being made in a sheltered situation.

The Curled or Normandy Cress is a very hardy sort, of good flavour. In this, which is allowed to grow like parsley, the leaves are picked for use while young ; and, being finely cut and curled, they are well adapted for

garnishing. 1¢ should be sown thinly in drills, in good soil in the open borders, in Mareh, April, and May, and for winter and spring use at the foot of a south wall early in September, and about the middle of October.

159. The Cucumber, Cueumis sativa, a tender annual, is cultivated both for stewing and pickling, but more usually and extensively for salads, Being an annual plant, it is usually increased by seeds, but it may be readily raised from euttings, which should consist of the tops of the leading branches, and should be planted in deep pots, half-filled with a compost of leaf-mould and sand, the pots being then covered with a pane of glass, and plunged in a brisk heat. To grow these plants suecessfully through the winter, a tropical heat must be maintained, for the method of doing which see p. 264. If properly heatcd hot-water pits or houses cannot be had, and hotbeds have to be employed, it is better not to attempt very early forcing, but to defer sowing till about the first week in February.

In hotbed culture, the preparation of materials for the seed-bed, which should consist of stable dung in a full state of fermentation, should be set about towards the middle of January. The dung should be turned over, well shaken, and mixed about three times at intervals of a few days. The bed should be made up in a sheltered situation open to the sun. The frame should then be set on, and the sashes kept elosed till the heat rises to 85° or so, when they should be tilted to allow the steam to pass off. In a few days the surface of the bed should be covered with a layer a few inches in thickness of light soil; and as soon as the heat of the bed ranges about 70° the seeds may be sown singly in 83-inch pots of sifted leaf-mould, with a lump of fibrous turf at the bottom for drainage, the seed being moderately pressed into the soil, and covered to the depth of about half an inch. The heat of the bed should range from 75° to 80°. After germination, the plants should be placed within 6 inches of the glass. When the plants have formed two joints, the growing point should be stopped above the second joint, the sueceeding young shoots being stopped above the second or third joint. Subsequently three or four of the shoots, as nearly equalin strength as possible, should be seleeted for principal branches, and the laterals from these should be allowed to fill out the frame and bear fruit ; they should be stopped at one or two joints above the fruit, and all weak shoots removed, being pinched off with the finger and thumb rather than cut, to avoid loss of

sap by bleeding. he cucumber is a nonecious plant, and at one time, in order to secure the swelling of the fruit, the female flowers were carefully fertilized ; but it is found that this is not necessary unless seed is required.

The fruiting-bed is to be made up in the same way as the seed- bed, only, as it is required to be more lasting, it is better to mix up tree leaves with the dung. The bed may be made up in the first week in February, and should be 4 feet high in front, and 4% feet at back. The frame should be put on at once, and the lights or sashes kept closed till the heat has risen to the surface. If dry the dung may require watering to keep up fermentation ; if it is moist and hot it may be found necessary to make holes with a stake in the sides of the bed to moderate the heat ; but unless it rises above 85° there is no danger of its injuring the roots. A few days before the plants are introduced some hillocks of soil should be put into the frame, in order that they may become thoroughly warmed. These should be so arranged that the plant is within 6 inches of the glass. ‘The plants themselves should be removed to the frame for a day or two before turning them out, the soil being moist, but not wet. A good medium compost may eonsist of two parts of turfy loam, one of peat, and one of leaf-mould, with the addition of some clean coarse sand; or of two parts turfy friable loam, two of turfy heath-mould, threc of leaf-mould, and one of clean coarse gand. If the loam be of a less fibrous nature, more peat or leaf- mould or some decayed dung should be used. The bottom heat should range from 75° to g0°, and the atmosphere should be kept moist, and at a temperature ranging from 70° to 80°, the latter by sun-heat. An abundance of light is also essential, but in very bright sunshine a thin shading is beneficial. The water used both at the roots and at the tops should always be warmed, and, while ventilation is to be duly attended to, a cold draught should be avoided,

Winter eucumbers are generally grown in small houses set apart for them (see p. 224). The seeds are sown in August, and planted out so as to become well established before the dull weather sets in.

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In the ease of culture in houses or pits, the heat, bottom and top, is maintained by hot-water pipes or tanks, and the branches are trained over trellises placed about a foot from the glass. The plants niust in this ease be

run up with a single stem, till they reach the upper side of the trellis, when the leader should be stopped in order to produce the branches necessary for covering the allotted space, and these must also be stopped when fruit-bearing laterals are required. These last should be stopped at one joint beyond the fruit, till it ean be seen whether or not a shoot will push from the same joint as the fruit, in which case the joint above the fruit is also to be pinched off. :

‘The hardier varieties of eucumber, especially the short prickly sorts, known as gherkins, aud used for pickling, are often grown under hand-glasses, a cavity having been made in a warm situation, and filled with hot dung and a small covering of earth. In the southern counties of England, pickling cuewmbers are sown in drills in the open ground. The earth is made fine and level, and at distanees of 34 feet, in rows 6 feet apart, shallow eirewlar hollows are formed with the hand, a foot wide, and half an inch deep in the middle, in each of which, about the beginning of June, eight or ten seeds are deposited. When the plants appear, they are thinned out to three or four, the weakest or least healthy being rejeeted, and all the further attention they require is oceasional cleaning and watering, aceording to the state of the weather.

Some of the most popular varieties of the cucumber arc :—

Spineless: Rollisson’s Telegraph, Carter’s Champion.

’s Improved, Empress Eugenie, Improved Man-

White-spined: Kenyons Hamilton’s Market Fa-

chester Prize, Latter’s Victory of England,

Black-tipped White-spined: Tender and True,

yourite, Blue Gown. Black-spined : Dr Livingstone,

See CUCUMBER, Vol. vi. p. 687.

160. The Egg Plant, Brinjal of the French, and of the tropical parts of Asia and Africa. vated for the fruits, which are eooked before they are eaten. The seed should be sown early in February in a warm pit, where the plants are grown till shifted into 8-ineh or 10-inch pots, in well- maunured soil. Manure water should be given oceasionally while the fruit is swelling, about four fruits being sufficient for a plant. The French growers sow them in a brisk heat in Deeember, or early in January, and in Mareh plant them out four or eight in a hot- bed with a bottom heat of from 60° to 68°, the sashes being gradually more widely opened as the season advances, until they may be taken off by about the end of May. The two main branches which are allowed are pinched to induee laterals, but when the fruits are set all young shoots are taken off in order to increase their size. The best variety is the Large Purple, which produees oblong fruit, some- times reaching 6 or 7 inches in length, and 10 or 12 inehes in eir- cumference. ‘he Chinese is also an oblong-fruited sort, with white fruit and more juicy flesh thau some of the other sorts. The fruit of ae : aia form almost exactly resembles the egg of the domes- tic fowl.

161. The Endive, Cichorium Endivia, of the northern provinees of China and other parts of Asia. As in the ease of the lettuee, the blanched hearts are used for salads and in soups. The main erop should be sown about the middle of June, ou a sced-bed of light rich soil, and the early erop about the middle of May. ‘The seeds should be scattered sparsely, that the plants may not come up in clusters. The seedlings should be transplanted into a rich soil in an open situation, at about a foot apart in rows, which for the curled-leaved_ sorts should be a foot asunder, and for the broad-leaved sorts 15inches. When the plants have reached their maturity, the leaves ave gathered up and tied together a little below the tips, and a few days later about the middle of the plant, and in two or three weeks they are found sufficiently blanched for use.

For winter use the seed should be sown about the middle of July, and a little additional in August. They should be planted in the same way as the earlier crops, but it is advisable, as they approach maturity, to draw the earth quite up about the leaves. At that season, too, the plants may be advantageously planted on sloping banks of eatth facing south. They may be blanched by inverting a garden pot with the drainage hole elosed, or a common garden

saueer 10 or 12 inehes in diameter, over the eentre of the plants as they grow flat on the earth. Later on they may be blanehed in boxes in the mushroom-house, or in a cellar, or by using blanching pots, such as are provided for sea-kale. The time oecupied in blanching varies from ten days in summer to three weeks in winter. A sufli- eient quantity to afford a supply for a week may be operated on at one time.

For proteetion during the winter it isa good plan to plant the endive on November, at 6 or 8 inches apart, on sloping sheltered banks facing the south, eovering it with litter in severe weather, but leaving it uncovered at all other times, A more eertain method to obtain a supply during that season is, however, either to take up the late-sown plants before frost sets in, and to plant them in dry earth or sand ina frame, or to place a frame over them where they grow. The early winter crops are sometimes planted at

Wenderson’s Al, Weedon’s Black Spine.

In Franee it is eulti-

Solanum Melougena, the Aubergine or Egg is a tender annual, native of South America plant.

is a hardy annual, native Endive.

Gourds.

Horse- radish,

Jeru- salem arti- choke,

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the back of a south wall, and when covercd up for blanching they will endure a considerable amount of cold.

There are two races of endives, the Curled (Chicorée frisée of the French), with crispy much-cut leaves, and the Batavian (Scarole of the French), with broad lettuce-like leaves. Some of the favourite sorts are—

Curled: French Small Green Curled, early; Large Green Curled ; Staghorn, for late crops; and Curled Picpus.

Batavian: Small Batavian, Round-leaved Batavian ; Lettuce-leaved, early ; and Fraser's Broad-leaved Batavian, for late crops.

162. The Garlic, Allium sativum, a hardy bulbous perennial, is propagated by separating the cloves of which the bulbs are composed, and planting them 2 to 3 inches deep in spring, at a few inches apart, in rows a foot asunder, in a light, rich, and rather dry soil, and in a warm situation. A few short rows will suffice in most cases, and, if required early, a small patch may also be planted about the end of October. After tle leaves have ripened, the bulbs may be taken up, sun-dried, tied in bunches by the stalks, and hung up in a dry airy cool store-room till wanted. Garlic is used for flavouring.

163. The Gourds cultivated in gardens for their esculent produce are varieties of several species of Cucurbita, the most commonly used being the vegetable marrow and the pumpkin.

The Vegetable Marrow, Cucurbita Pepo var., is the most important of the gourds used as an esculent, and furnishes in good seasons a very large supply for the table. 'The fruits are best when eaten quite young and not over-boiled, the flesh being then tender, and the flavour sweet and nutty.

Vegetable marrows require a warm situation and a rich soil free from stagnant moisture. 'They do well on a rubbish or old-dung heap, or in a warm border on little hillocks made up with any fer- menting material, to give them a slight warmth at starting. The seeds should be sown in a warm pit in April, and forwarded under glass, but in a very mild heat; the plants must be shifted into larger pots, and be gradually hardened previous to being planted out, when the mild weather sets in in May or June. The nse of hand- glasses makes it possible to transplant earlier than would otherwise be advisable. The seeds may be sown early in May in pots under a hand-glass, or towards the end of May in the open ground, if heat is not atcommand. The true vegetable marrow or succade gourd bears fruit of an oblong-elliptical shape, about 9 inches long,

ale-greenish while young, with whitish flesh, and scarcely any in-

ication of ribs ; when mature it.is of a pale yellow colour. There is a variety which is more oblong, grows to 15 or 18 inches, and has the surface slightly marked by irregular longitudinal obtuse ribs. The shoots may be allowed to run along the surface of the ground, or they may be trained against a wall or paling, or on trellises, As the gourds cross readily, care is necessary to keep any particular variety true. One of the best vegetable marrows is called Moore's Vegetable Cream.

The Custard Marrow, one of the Patissons or Crown Gourds, bears a peculiar-looking flattened fruit with scolloped edges, which has a sweeter and less nutty flavour than the true marrow.

The Pumpkin, Cucurbita maxima, grows to a very large size, some of the varieties, as the large yellow or Potiron jaunc, some- times producing fruit over 200 Ib in weight. The flesh of this is yellow, the ripe fruit, in which state only it is used, being of a pale salmony buff colour exteriorly. It will keep for some montlis in a dry airy place, and is used in soups or stews, or mashed like potatoes, or baked in pies. There are several varieties of this type. The cultivation of the pumpkin resembles that of the vegetable marrow, but it requircs abundance of space for its spreading vines.

Many of the other gourds (of which some are very ornamental) produce edible fruits, but as some, notably the orange gourd and the bottle gourd, arc cathartic and deleterious, they should not be indiscriminately eaten.

164. The Horseradish, Cochlearia Armoracia, or Armoracia rusticana, a hardy perennial, is cultivated for its long roots, or more properly underground rootstocks, which when scraped into shreds, or grated and made into a delicious sauce, are eaten with roast beef. Its properties are antiscorbutic. The horscradish requires a deep, rich, and rather moist sandy loam or alluvial soil, the object being to obtain long straight roots. One method of producing new plants is to plant the sets, consisting of the crowns of old roots, or of 1 or 2 inch lengths of the root itself, at the bottom of a trench 24 feet deep, the lower half of the soil being well manured ; only a single shoot should be retained, so as to produce one thick vigorous stick. The roots planted in spring are sometimes taken up in the wiuter following ;

if left to grow another year they become very much thicker, though less tender. In digging the roots the soil should be thrown back so as to lay them bare. Those that spring from the set are cut off, and it is manured and left to grow up again the follow- ing year. Before the ground becomes frost-bound, a supply should be dug up, and stored in damp sand for use during that emergency.

165. The Jerusalem Artichoke, Helianthus tuberosus, a hardy tuberous perennial, a species of sunflower, derives its epithet Jerusalem from a corruption of the Italian Girasole, a sunflower, and its name of Artichoke from the resemblance in flavour which its

tubers bear to that of the receptacles or ‘‘bottoms” of that plant. It is propagated by means of its tubers planted in the manner of potatoes, in rows 3 or 4 feet asunder, some time in February or March; by the autumn the new tubers will be fit for use. Asa matter of convenience, though the tubers themselves are hardy enough to bear the frosts of winter, they may be dug up about November, and stored in dryish sand. ‘They should have a well- manured soil, and the stems should not be allowed to be too crowded, which is in great measure obviated by planting them annually.

166. The Kidney Bean includes what is commonly known as the Kidney French Bean, Phaseolus vulgaris, and the Scarlet Runner, Phaseolus bean.

multiflorus, both very productive vegetables of excellent quality.

The Common Kidney Bean or French Bean, Phaseolus vulgaris, is a tender annual, and should be grown in a rich light loamy soil and a warm sheltered situation. The soil should be well enriched with hotbed dung. The earliest crop may be sown by the end of March or beginning of April. If, however, the tem- perature of the soil is below 45°, the beans make but little pyo- gress. The main crops shonld be got in early in May ; and a later sowing may be made early in July. The carlier plantings may be sown in small pots, and put in frames or houses, until they can be safely planted out-of-doors.

The earliest out-of-doors crop may be sheltered by means of thatehed hurdles, placed sloping on bearers supported by posts. The seeds should be covered 14 or 2 inches deep, the distance between the rows being about 2 feet, or for the dwarfest sorts 18 inches, and that between plants from 4 to 6 inches. The pods may be used as a green vegetable, in which case they should be gathered whilst they are so crisp as to be readily snapped in two when bent; but when the dry seeds are to be used, the pods should be allowed to ripen. As the green pods are gathered others will continue to be formed in abundance; but if old seed-forming pods are allowed to remain, the formation of young ones will be greatly checked.

Foreing.—The kidney bean may be easily forwarded in pots in a forcing-house, or in prepared soil inaheated pit. The bottom heat should range about 70°, and the atmospheric temperature should show a minimum of 60°, and a maximum of 70°, running up to 80° by sun-heat. The seed should be sown three or four in a 10- inch pot, nearly filled with light turfy soil and leaf-mould, or decom- posed cow dung, the stems being earthed up after the true leaves are formed ; and they must be well syringed and watered daily. To keep down the red spider, the under side of the leaves shonld be thoroughly moistened by syringing early in the morning with water at 60°; the house being then kept shut up till the air is raised to 75° or 80°, both surfaces will, in consequence of condensation, become thorouglily wetted. When the plants come into flower, plenty of air must be admitted. Kidney beans may thus be obtained fit for use, in six wecks or two months from the time of sowing. It may therefore be desirable to sow some seed in August to succeed the crops in the open ground, and, for succes- sion, in September and October ; for spring use sow in January, February, and March. The early dwarf sorts are thie best for forc- ing, such as Fulmer’s Early, Newington Wonder, Osborn’s Forcing, Williams’s Early Prolific, Syon House, and White Advancer.

The varieties of French beans being numerous, we here add the names of some of the most desirable for general cultivation :—

Early: White Canterbury, Fulmer’s Forcing, Minier’s First Early, Osborn’s Forcing, Sir Joseph Paxton, White Advancer.

Second Early: Canadian Wonder, bears late; Negro Long-podded, bears late; New Mammoth Negro, earlier than Canadian Wonder; Newington Wonder; Pale Dun; Syon House ; Williams's Prolific, bears late.

The Scarlet Runner Bean, Phaseolus multiflorus, differs from the common French bean in being a perennial, and in having tuberous roots, which, it may be stated, are narcotic and poisonous. These may be preserved through the winter in dryish earth in a frost-proof cellar, for an early crop the following season. The late Mr Cuthill mentions having found from experiment that plants raised from roots come into bearing just onc month earlier than those raised rom seed. 'The seeds of the runner beans should be sown in an open plot,—the first sowing in May, another at the beginning of June, and a third about the middle of June. In the London market-gardens they are sown 8 to 12 inches apart, in 4 feet rows if the soil is good. The twining tops are pinched or cut off when the plants are from 2 to 24 feet high, to save the expense of stak- ing. It is better, however, in private gardens to have the rows standing separately, and to support the plants by stakes 6 or 7 feet high and about a foot apart, the tops of the stakes being crossed about one-third down. Ifthe weather is dry when the pods are forming abundantly, plenty of tepid water should be supplied to the plants. In training the shoots to their supports, they should be twined from right to left, contrary to the course of the sun, or they will not lay hold.

The ordinary Scarlet Runner is most commonly grown, but there is a white-flowered variety which has also white seeds; this is very prolific and of excellent quality, and is now much grown for market. Another variety called Painted Lady, with the flowers red and white, is very ornamental, but not so productive. Carter's Champion is a large-podded productive variety.

167. The Kohl Rabi, or Turnip Cabbage, Brassica oleracea caulo-

Kohl Rabi.

Leek.

Lettuce.

rapa, is a biennial, the upper part of whose stem swells into a round fleshy mass, resembling a turnip, bnt produced above ground. Kohl Rabi is exceedingly hardy, withstanding both severe frosts and drought. It is not mueh grown in English gardens, though when used young it forms a good substitute for turnips. The seeds should be sown in May and June, and the seedlings should be planted shallowly in well-manured ground, 8 or 10 inches apart, in rows 15 inches asunder; and they should be well watered, so as to induce quick growth. ‘he bulbs will be fit for use when they are as large as—not larger than—an early turnip. The best sorts are Early White Vienna, and Early Purple Vienna,

168. The Leck, Allium Porrum, a hardy biennial, is said to be a native of Switzerland, but more probably comes from the East. The leeks, which prefer a light soil, are sown in beds about the iniddle of March, and later for a succession, and in June or July are planted out 6 inches asunder ; and in rows 15 or 18 inehes apart. When the weather is moist the plants are dropped upright into the hole made by the dibble, and no more earth than will just cover the fibres is allowed to fall in, the hole being left open to encourage the stem to swell out, and blanching is efieeted gradually by the earth washing into the hole. They are also planted in trenches like celery, and earthed up when they have made their growth. The leeks will be fit for use in September, and will last till the spring.

Pea sorts are—Early Netherlands, for early use; Large Rouen, one of the very best; London Flag, and Musselburgh, the latter being reputedly the hardiest; and Carentan, a very large hardy French sort.

169. The Lettuce, Lactuca sativa, is a hardy annual, highly esteemed asa salad plant, while its milky juice forms the lactucartwm of the materia medica. The London market-gardeners make pre- paration for the first main erop of Cos lettuces in the open ground early in August, a frame being set on a shallow hotbed, and, the stimulus of heat not being required, this is allowed to subside till the first week in October, when the soil, eonsisting of leaf- mould mixed with a little sand, is put on 6 or 7 inehes thiek, so that the surface is within 44 inches of the sashes. The best time for sowing is found to be about the 11th of Oetober. When the seeds begin to germinate the sashes are drawn quite off in favourable weather during the day, and put on,

but tilted, at night in wet weather. Very little watering is required, and the aim should be to keep the plants gently moving till the days begin to lengthen. In January a more aetive growth is encouraged, and in mild winters a considerable extent of the planting out is done, but in private gardens the preferable time would be February. The ground should be light and rich, and well manured below, and the plants put out at 1 foot apart each way. In Seca at this early season, the dibble, in closing in the soil, should be inserted on the south side of the plant. Frequent stirring of the ground with the hoe greatly encourages the growth of the plants. A second sowing should be made about the 5th of November, and a third in frames about the end of January or beginning of February. In March a sowing may be made in some warm situation ; suecessional sowings may be made in the open border till August, about the middle of which month acrop of Brown Cos and Hardy Hammersmith should be sown, the latter being the most reliable in a severe winter. These plants may be put out early in October on the sides of ridges facing the south or at the front of a south wall, beyond the reach of drops from the copings, the Hardy Hammersmith being planted 6 or 8 inches apart. Young lettuce plants should be thinned before they erowd or draw each other, and transplanted as soon as possible after two or three leaves are formed. Some cultivators prefer that the summer crops should not be transplanted, but sown where they are to stand, the plants being merely thinned out ; but trans- planting checks the running to seed, and makes the most of the ground.

Forcing.—For a winter supply by gentle forcing, the Hardy Hammersmith and Brown Dutch Cabbage lettuces, and the Brown Cos and Green Paris Cos lettuces, should be sown about the middle of August and in the beginning of September, in rich light soil, the plants being pricked out 3 inehes apart in a prepared bed, as soon as the first two leaves are fully formed. About the middle of Oetober the plants should be taken up carefully with balls attached to the roots, and should be placed in a mild hotbed of well-prepared dung (about 55°) covered about 1 foot deep with a compost of sandy peat, leaf-mould, and a little well-decomposed manure, The Cos and Brown Dutch varieties should be planted about 9 inches apart. Give plenty of air when the weather permits, and proteet from frost.

There are two races of the lettuce, the Cos lettuce, with crect oblong heads, and the Cabbage lettuee, with round or spreading heads,—the former generally crisp, the latter soft and flabby in texture. Some of the best lettuces for general purposes of the two classes are the following :—

Cos: White Paris Cos, best for summer; Green Paris Cos, hardier than the white ; Alphange Cos, stands well; Brown Cos, one of the hardiest and best for winter; Hicks's Hardy White Cos; Sugarloaf Bath Cos.

Cabbage: Hammersmith Hardy Green, very hardy, good for winter; Tom

Thumb; Brown Dutch; N eapolitan, best for summer; Grand Admiral, stands the winter well; Stanstead Park.

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[VEGETABLES.

170. The Mushroom, Agaricus campestris, is a well-known fun- Mush- gus of a speeially savoury eharacter ; it grows wild in Great Britain room,

on upland pastures, and appears to be indigenous to most regions of the globe. The plant is propagated by spores, the fine blaek dust seen to be thrown off when a mature specimen is laid on white paper or a white dish ; these give rise to what is known as the ''spawn" or myeelium, whieh consists of whitish threads permeating dried dung or similar substanees, and whieh, when planted in a proper medium, runs through the mass, and eventually appears in the form of the mushroom. 'This spawn may be obtained from old pastures, or decayed mushroom beds, and is purehased from nurserymen in the form of brieks charged with the inyeelium, and technically known as mushroom spawn. When once obtained, it may, like leaven, be indefinitely preserved. It may be produeed by placing quantities of horse dung saturated with the urine of horses, especially of stud horses, with alternate layers of rich earth, and eovering the whole with straw, to exclude rain and air; the spawn eommonly appears in the heap in about two months afterwards. The droppings of stall-fed horses, or of such as have been kept on dry food, should be made use of.

The old method of growing mushrooms in ridges out of doors, or on prepared beds either level or sloping from a back wall in sheds or eellars, may generally be ee with success, The beds are formed of horse droppings whieh have been slightly fermented and fre- quently turned, and may be made 2 or 3 feet broad, and of any length. A layer of dung about 8 or 10 inches thiek is first deposited, and covered with light dryish earth to the depth of 2 inches ; and two similar layers with similar coverings are added, the whole being made narrower as it advances in height. When the bed is finished, itis covered with straw to protect it from rain, and also froin parehing influences. In about ten days, when the mass is milkwarm, the bed will be ready for spawning, whieh consists of inserting sinall pieces of spawn brieks into the sloping sides of the bed, about 6 inches asunder.

Mr Cuthill describes a very simple mode of eulture. The ridge is built up of dung as it is brought fresh from the London stables ; in this fermentation soon sets in, and, when the heat of the bed declines to 80°, pieces of spawn bricks are inserted, a foot apart, in the sides of the bed, which is then moulded over, 2 inelies thick, pressed with the feet, and beaten with the spade, then watered, and beaten again with the spade, and finally smoothed down. The more the mould is pressed, the finer the crop, and the more solid the texture of the mushroom.

These ordinary ridge beds furnish a good supply towards the end of summer, and in autumn. To command a regular supply, how- ever, at all seasons, the use of a mushroom-house (see par. 13, p- 226) will be found very eonvenient. The material employed in all cases isthe droppings of horses, whieh should be collected fresh, and spread out in thin layers in a dry plaee, a portion of the short litter being retained well moistened by horse urine. It should then be thrown together in ridges and frequently turned, so as to be kept in an ineipient state of fermentation, a little dryish friable loam being mixed with it to retain the ammonia given off by the dung. With this or a mixture of horse-dung, loam, old mushroom-bed dung, and half-deeayed leaves, the beds are built up in suecessive layers of about 3 inelies thick, eael layer being beaten firm, until the bed is 9 or 10 inches thick. If the heat exceeds 80°, holes should be made to moderate the fermentation. The beds are to be spawned when the heat moderates, and the surface is then covered with a sprinkling of warmed loam, which after a few

days is made up to a thiekness of 2 inches, and well beaten down. The beds made partly of old mushroom-bed dung often contain suffieient spawn to yield a erop, without the introduetion of briek or cake spawn, but it is advisable to spawn them in the regular way. The spawn should be introduced an ineh or two below the surface when the heat has deelined to about 75°, indeed the bed ought never to exceed 80°. The surface is to be afterwards covered with hay or litter. The atmospheric temperature should range from 60° to 65° till the mushrooms appear, when it may drop a few degrees, but not lower than 55°. If the beds require watering, water of about 80° should be used, and it is preferable to moisten the covering of litter rather than the surface of the beds themselves. It is also beneficial, especially in the case of partially exhausted beds, to water with a dilute solution of nitre. For a winter supply the beds should be made towards the end of August, and the end of October.

171. The Mustard, Sinapis alba, or Brassiea alba, is a hardy annual, used asa small salad—generally accompanied by garden cress—while still in the seed-leaf. To keep up a supply, the seed should be sown every week or ten days. The sowings in the open ground may be made from March till October, carlier or later according to the

Mustard. —

Nastur- tium.

New Zealand spinach,

Onion,

VEGETABLES. |

season. The ground should be light and rich, and the situation warm and sheltered. Sow thickly in rows 6 inches apart, and sli htly eover the seed, pressing the surface smooth with the back o the spade. When gathering the crop, eut the young plants off even with the ground, or pull them up and cut off the roots, commencing at one end of arow. From October to March the sceds should be sown thickly in shallow boxes and placed in a warm house or frame, with a temperature not below 65°,

172, The Nasturtiwm, or Indian Cress, Tropeolum majus, is a perennial climber, native of Peru, but in cultivation treated as a hardy annual. The flowers are sometimes caten in salads, and are used for garnishing, and the leaves and young green fruits are pickled in vinegar as a substitute for capers. The plant should have a warm situation, and the soil should be light and well enriched : sow thinly early in April, either near a fence or wall, which may be utilized for its support, or in an open spot, where it will require stakes 6 to 8 fect high. _ Its flowers are no less ornamental than useful,

173. The New Zealand Spinach, Tetragonia expansa, is a half- hardy annual, native of New Zealand, sometimes used as a sub- stitute for spinach during the summer months, but in every way inferior to it. The seeds should be sown in March, on a gentle hotbed, having been previously steeped in water for several hours. The seedlings should be potted, and placed under a frame till the end of May, and should then be planted out, in light rich soil. The young leaves are those which are gathered for use, a succession being produced during summer and autumn.

174. The Onion, Allium Cepa, is a hardy bulbous biennial, which has been cultivated in Britain from time immemorial, but the native country of which isunknown. The onion should be grown in an open situation, and on a light, rich, well-worked soil, which has not been recently manured. The principal erop may be sown at any time from the middle of February to the middle of March, if the weather is fine and the ground sufficiently dry. The seed should be sown in shallow drills, 10 inches apart, the ground being made as level and firm as possible, and the plants should be regularly thinned, hoed, and kept free from weeds. At the final thinning they should be set from 8 to 6 inches apart, the latter distance in very rich soil. About the beginning of September the crop is ripe, which is known by the withering of the leaves ; the bulbs are then to be pulled, and exposed on the ground till well dried, and they are then to be put away in a store-room or loft, where they may be perfectly secured from frost and damp.

About the end of August a crop is sown to afford a supply of young onions in the spring months, Those which are not required for the kitchen, if allowed to stand, and if the flower-bud is picked out on its first appearance,

and the earth stirred about them, fre- quently produce bulbs equal in size and quality to the large ones that are imported from the Continent. A crop of very large bulbs may also be secured by sowing about the beginning of September, and transplanting early in spring to very rich soil. Another plan is to sow in May on dry poor soil, when a crop of small bulbs will be produced ; these are to be stored in the usual way, and planted in rich soil about February, on ground made firm by treading, in rows about a foot apart, the bulbs being set near the surface, and about 6 inches asunder. The White Spanish and Tripoli are good sorts tor this purpose.

To obtain a crop of bulbs for pickling, seed should be sown thickly in March, in rather poor soil, the seeds being very thinly covered, and the surface well rolled; these are’not to be thinned, but should be pulled and harvested when ripe. The best sorts for this crop are the Silver-skinned, Early Silver-skinned, Nocera, and Queen.

Forcing. —Onions may be forced like mustard and cress if required for winter salads, the sceds being sown thickly in boxes which are to be placed in a warm house or frame. The young onions are of course pulled while quite small.

The Potato Onion, Allium Cepa aggregatum, is propagated by the lateral bulbs, which it throws out, under ground, in considerable numbers. This variety is very prolific, and is useful when other sorts do not keep well. It is sometimes planted about inidwinter, and then ripens in summer, but for use during the spring and early summer it is best planted in spring. It is also known as the underground onion, from its habit of producing its bulbs beneath the surface,

The Tree Onion or Egyptian Onion, Allium Cepaproliferum, pro- duces small bulbs instead of flowers, and a few offsets also under- ground. These small stem bulbs are excellent for pickling,

The Welsh Onion or Ciboule, Allium fistulosum, is a hardy perennial, native of Siberia. It forms no bulbs, but, on account of its extreme hardiness, is sown in J uly or early in August, to furnish a reliable supply of young onions for use in salads during the early spring. These bulbless

onions are sometimes called Scallions, a name which is also applied to old onions which have stem and leaves but no bulbs.

The following are among the best varieties of onions for various purposes : —

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For summer and autumn.—Queen; Early White Naples: these two sorts are also excellent for sowing in autumn for spring salading. Silver. skinned ; Tripoli, including Giant Rocca,

For winter.—Brown Globe, including Magnum Bonum; White Globe; Yellow Danvers ; White Spanish, in its several forms ; Trébons, the finest variety for autumn sowing, attaining a large size early, ripening well, aud keeping good till after Christmas ; Strasburg (Deptford) ; Weathersfield Red ; Blood Red, strong-flavoured.

For pickling.— Queen, Early Silver-skinned, White Nocera, Egyptian.

175. The Orach or Mountain Spinach, Atriplex hortensis, native Orach.

of Tartary, is a tall-growing hardy annual, whose leaves, though coarsely flavoured, are used ag a substitute for spinach, and to cor- rect the acidity of sorrel. The White and the Green are the most desirable varieties. The plant should be grown quickly in rich soil. It may be sown in rows 2 feet apart, and about the same distance in the row, about March, and for succession again in June. , If need- ful, water must be freely given, so as to maintain a rapid growth.

176. The Oxalis crenata, Oca of the South Americans, is a Oxalis

tuberous-rooted half-hardy perennial, native of Peru. comparatively small, and somewhat acid; but if they be exposed to the sun from six to ten days, they become sweet and floury. In the climate of England they can only be

grown by starting them in heatin March, and planting out in June in a light soil and warm situation, They grow freely enough, but few tubers are formed, and these of small size. The fleshy stalks, which have the acid flavour of the family, may, however, be used in the same way as rhubarb for tarts. ‘The leaves may be eaten in salads. It is easily propa- gated by cuttings of the stems, or by means of sets like the potato.

177. The Oxalis Deppet, a bulbous perennial, native of Mexieo, has scaly bulbs, from which are produced fleshy, tapering, white, semi-transparent roots, about 4 inches in length, and 8 to 4 inches indiameter. They strike down into the soil, which should therefore be made light and rieh with abundance of decayed vegetable matter. The bulbs should be planted about the end of April, 6 inches apart, in rows 1 foot asunder, being only just covered with soil, and having a situation with a southern aspect. The roots should be dug up before they become affected by frost, but if protected they will con- tinue to increase in size till November. When taken up, the bulbs should be stored in a cool dry place for replanting, and the roots for use. The roots are gently boiled with salt and water, peeled and eaten like asparagus with melted butter and the yolks of eggs, or served up like salsafy and scorzonera with white sauce.

Its tubers are crenata.

Oxalis Deppei. ~

178. The Parsnip, Pastinaca sativa, is a hardy biennial, found in Varsnip.

temperate regions. Its long tapering fleshy whitish nutritious roots have a peculiar but agreeable flavour. It succceds best on a free sandy loam, which should be trenched and manured in the previous autumn, the manure being well buried. The seed should be sown thinly in March, in rows, 18 inches apart, and finally thinned out to1 foot apart. The leaves will decay in October or November, when a portion of the roots may be taken up and stored in dryish sand for immediate use, the rest being left in the ground, to be taken up as required, but the whole should be removed by Feb- ruary to a dry cool place, or they will begin to grow. The best sorts are the Hollow-crowned, the Maltese, and the Student.

179. The Pea, Pisum sativum, is a hardy annual, climbing by Pea,

means of the tendrils of its leaves, and has been cultivated from time immemorial. The seeds or pulse are very nutritious, whether eaten green or ripe, and those of the carly crops are esteemed as luxuries.

The pea prefers a friable calcareous loam, deeply worked, and well enriched with good hotbed or farm-yard manure. The early crops require a warm sheltered situation, but the later are better grown 6 or 8 feet apart, or more, in the open quarters, dwarf crops being in- troduced between the rows. The dwarf or early sorts may be sown 3 or 4 feet apart. The deep working of the soil is of importanec, lest the plants should suffer in hot dry weather from mildew or arrest of growth. The first sowing should be made about the beginning or middle of November, in front of a south wall, the plants being defended by spruce fir branches or other spray throughout the winter, In February sowin gs are sometimes made in flower-pots or boxes, and the young plants afterwards planted out. The main crop should be sown towards the end of February, and moderate sowings should be made twice a month afterwards, up to the beginning of July for the north, and about the third week in July for warmer districts. During dry hot weather late peas derive great benefit from mulching and watering. The latest sowings, at the middle or end of August, should consist of the best early sorts, as they are not so long in producing pods as the larger and finer sorts, and by this means the supply may be prolonged till October or November, As they grow up the earth is drawn to the stems, which are also supported by stakes, a practice which in a well-kept garden is always advisable, although it is said that the early varie- ties arrive sooner at maturity when recumbent. Where space permits, all the taller sorts are best sown in single rows at wide intervals of 20 or 80 feet.

Peas grown late in autumn are subject to mildew, to obviate which Mr Knight proposed to dig over the ground in the usual way, and to soak the spaces to be oceupied by the rows of peas thoroughly with water,—the earth on each side to be then collected so as to form ridges 7 or 8 inches high, these ridges being well watered,

Potato.

and the seed sown on them in single rows. If dry weather at any time set in, water should be supplied profusely onee a week.

To produce very early erops the French market-gardeners sow early in November, in frames, on a border having a good aspect, the seeds being eovered very slightly. The young plants are trans- planted into other frames in Deeember, the ground inside being dug out so as to be 18 or 20 inches below the sashes, and the earth thus removed placed against the outside of the frames. The young plants, when 3 or 4 inehes high, are planted in patehes of three or four, 8 inehes asunder, in four longitudinal rows. The sashes are eovered at night with straw mats, and opened whenever the weather is sufficiently mild. When 8 or 10 inches high, the stems are in- clined towards the baek of the frame, a little earth being drawn to their base, and when the plants come into blossom the tops are pinched out, above the third or fourth flower, to force them into bearing. As soon as they begin to pod, the soil may have a gentle watering, whenever sufficiently warmed by the sun, but a too vigor- ous growth at an earlier period would be detrimental. Thus treated the plants bear pods fit for gathering in the first fortnight in April.

‘A very convenient means of obtaining an early erop is to sow in 5-ineh pots, a few seeds in each, the plants to be ultimately planted out ou a warm border. Peas may also be obtained early if gently foreed in frames, in the same way as kidney beans, the dwarfest varieties being preferable. 5

For the very early peas the rows should range east and west, but for the main erops north and south. The average depth of the drills should be about 2 inehes for small sorts, and a trifle more for the larger kinds. The drills should be made wide and flat at bottom, so that the seeds may be better separated in sowing. The large sorts are the better for bcing sown 3 inehes apart. Chopped furze may be advantageously scattered in the drill before covering in, to cheek the depredations of mice, and before levelling the surface the soil should be gently trodden down over the seeds.

A good selection of sorts may be made from the following :—

Early ; Dillistone’s Early (Sutton’s Ringleader, Carter’s First oP); the earliest sort; Sangster’s No.1, a good form of Early Frame ; William 1., fine ; Laxton’s Alpha, the earliest wrinkled pea; Dickson’s First and Best ; Maclean’s Little Gem, a very dwarf wrinkled pea; Tom Thumb (Beck’s Gem), a very dwarf round pea, The last two are useful for forcing and for pots.

Second Early : Maclean’s Advancer, Standish’s Criterion, Laxton’s Marvcl, Carter’s Telephone, Dr Maclean, Premier, Carter’s Stratagem.

Late: James’s Prolific, Carter’s G. F, Wilson, Veitch’s Perfection; Ne Plus Ultra, the finest of all late peas, but a little delicate in cold wet soils and

seasons; General Wyndham, continues to produce very late ; British Queen, |

Champion of England, Laxton’’s Omega.

180. The Potato, Solanum tuberosum, is a half-hardy perennial, producing underground tubers, largely used as an eseulent. It thrives best in a rather light friable loam; and in thin sandy soils the produce, if not heavy, is generally of very good quality. Soils which are naturally wet and heavy, as well as those whieh are heavily manured, such as old garden ground, are not suitable. Indeed it is best, except when there is ample space, to grow only the earlier kinds in gardens. If the soil is of fair quality, the less manure used upon it the better, unless it be soot or lime. Gypsum, bone-dust, superphosphate of lime, and nitrate of soda may also be used, and wood ashes are advantageous if the soil contains much vegetable matter.

Potatoes are commonly propagated by dividing the tubers, leav- ing to each segment or ‘‘set”’ one or two eyes or buds. The ‘scts” are then planted by the aid of the dibble or spade, in rows ata distance varying from 15 inches to 3 feet, the distance being regulated by the height of the stems, and that between the sets varying from 6 to 12 inches, 8 inehes being a good average space for garden crops, with 2 feet between the rows. ‘The sets may be put in 6 inches deep. The late T. A. Knight suggested the planting of whole tubers orsets, at greater distances apart, by which means, he argued, a larger produce would be obtained ; he proposed to leave

4 feet between the rows, but that distance, except with the larger,

varieties, has been found to be too great. Though the planting of whole tubers instead of the cut sets has been thus highly recom- mended, yet according to some experiments made in the garden of the Horticultural Society at Chiswick the cut sets yield a mueh better return than whole ones. ‘The full-sized tubers are, however, preferable to smaller ones, as their larger buds tend to produce stronger shoots. It has also been found that the best returns are obtained from sets taken from the points of the tubers—not from their base. Mr Thomas Dickson of Edinburgh long ago observed that the most healthy and productive erop was to be obtained by planting unripe tubers, and proposed this as a preveutive of the disease ealled the “curl,” which sometimes attacks the young stemis, causing them and also the leaves to become crumpled, and few or no tubers to be produeed. It has also been noted that the spronting of the eyes of the potato may be accelerated if, while still unripe, it istaken up and exposed for some weeks to the influence of a seorehing sun. The best sets are those obtained from plants grown in elevated and open situations, and it is also beneficial to use sets grown on a different soil.

The earliest erops should, if possible, be planted in a light soil and in a warm situation, towards the end of February, or as early as

possible in March. In some cases the tubers for early erops are sprouted on a hotbed, the plants being pnt out as soon as the leaves can bear exposure. If the young sprouts are about 2 inches long, they may be planted out towards the end of Mareh ; if they are pro- teeted young potatoes will be procured in seven or eight weeks. It if, when the stems have grown a few inches

will improve the erop

above ground, the earth is drawn up to

them, but the operation will

delay its maturity for two or three weeks. Mr Knight reeommends as they appear, in order to inerease the pro-

removing the flowers duce. The fine early va

rieties, however, scareely p

roduee any flowers.

The main erop should be planted by the middle of Mareh, late undesirable. Those intended for storing soon as they are fairly ripe, unless they are attacked by the dire disease, in which case they must be taken up is observed ; or if they are then sufficiently preserving, but not fully ripe, the haulms or

planting being very should be dug up as

as soon as the murrain developed to be worth

shaws should be pulled out, to prevent th

them into the tubers tnbers, which can be p- 364.

e virus passing down

. this may be done without disturbing the dug afterwards. Sec AGRICULTURE, vol. 1.

Forcing. —The best foreing sorts are the Ash-leaf as a kidney, and the Early Market or Rector of Woodstock for around. The earliest crop may be planted in December, and successional ones in January and February. The mode of cultivation adopted by the London market gardeners is thus in substance explained by Mr Cuthill. A long treneh, 5 feet wide and 2 feet deep, is filled which soil to the depth of 6 inches is put. The sets employed are middle-sized whole potatoes, which are placed elo

bed, eovered with 2 i teeted with mats and s

nehes 0 traw, un

with hot dung, on

se together over the

f mould, and then hooped and pro- der whieh conditions they will sprout

in abouta month. A bed of the requisite length (sometimes 100

yards) is then prepared of about 2

is put on to the depth

potatoes are then carefully taken

shoots being removed

feet thickness of hot dung, soil

of 8 inches, and the frames set over all. The

except the main one, and

up from the striking bed, all the

they are planted 4

inches deep, radishes being sown thinly over them and eovered

lightly with mould. W about 6 inches in height,

the radishes fair play

few days, still the potato erop is alw nothing more is require 70°, admitting air when pr The crop is not dug up unti

Potatoes are also grown la

hen the haulm of the potato has grown to the points are nipped off, in order to give

. and, although this may stop growth for a

inthe open ground. The sets after having been

are planted out in January in trenelies 2 fee dung, the sets being planted 5 inches deep,

ays excellent. After planting d but to keep up the temperature to about acticable, and giving water as required. 1 it has eome to maturity.

rgely in hooped beds on a warm border

spronted, as above,

+ deep filled with hot and over all radishes

are sown. The ridges are then hooped over, allowing about 2 feet

of space in the middle

eovered with mats and straw, they are uncovered daily,

tection against possibl

Potatoes are sometimes grown in

, between the mould and

the hoop, and are

but as soon as the radishes come up and eovered again every night as a pro-

e frosts. This is continued till the potatoes are ready for digging in May.

pots in heat, sprouted sets being

planted in 11-ineh pots about two-thirds full of soil, and plaeed near foreing-houses, where a temperature of from 65° to 70° is to be maintained. The plants are earthed up as they advance in growth.

ung waxy tubers are produced during winter,

the glass in any of the

Small supplies of yo

in boxes placed in a mushroom

Oetober old seed tuber:

The varieties of the

Early.—Round : Early * Triumph, * Radstock Be

Old Ash-leaf, Myatt’s Ash-leat, Avalanche,

duly watered and

-house orin a eommon cellar. If in

s are placed in layers, alternately with a mix- ture of tree leaves and light mould, the young winter will often attain the size and appearanee of early potatoes ; they are, however, watery, and possess little flavour.

potato are very numerous, and much atten- tion has been paid during the last few years to new and improved kinds. The following are named as a limited selection of a few of the standard sorts in the several groups, those marked * having coloured skins, the rest being white :-—

Market, Rector of Woodstock, Porter’s Excelsior, auty, Bedfont Prolific, Breesee’s Climax. Kidney:

*Bountiful, * Beauty of Hebron.

Main Crop and Late.—Round : School Victoria, * Grampian, * Vermont Beauty, Perfection, Lapstone, Woodstock Kidney,

American Rose, Cattell’s Eclipse.

181. The Radish, Raphanus sativus, isa fleshy-rooted annual, un- Radish.)

tubers before mid-

the production of

Snowflake, International Kidney,

master, Regent, * Vicar of Laleham, Champion. Kidney: Covent Garden *Trophy, Magnum Bonum, *Late

known in the wild state. Some varieties of our wild radish, R. r, met with on the Mediterranean coasts, come

Raphanistrum, howeve

so near to it as to sugges

of the same species.

are two prineipal form The radish sueeeeds

but requires a warin sh

requiring to be netted over to proteet them from

crop may be sown ab

It is very popular as a

t that it may possibly be a cultivated race

raw salad. There

s, the spindle-rooted and the turnip-rooted.

in any well-worked not too heavy garden soil, eltered situation. The seed is generally sown broadeast, in beds 4 to 5 feet wide, with alleys between, the beds

out the middle of Decem

birds. The earliest

ber, the seed-beds

i OR

| Rampion.

a

| | Rhubarb.

———

being at once covered with litter, which should not be removed till the plants come up, and then only in the daytime, and when there is no frost. If the crop succeeds, which depends on the state of the weather, it will be in use about the beginning of March. Another sowing may be made in January, a third early in February, if the season isa favourable one, and still another towards the end of February, from which time till October a small sowing should be made every fortnight orthree weeks in spring, and rather more frequently during summer. About the end of October, and again in November, a late sowing may be made on a south border or bank, the plants being protected in severe weather with litter or mats. The winter ra:lishes, which grow to a large size, should be sown in the beginning of July and in Augnst, in drills from 6 to 9 inches apart, the plants being thinned out to 5 or 6 inches in the row. The roots become fit for use during the autumn. For winter use they should be taken up before scvcre frost sets in, aud stored in dry sand.

Forcing.—To obtain early radishes a sowing should be made about the beginning of November, and continued fortnightly till the middle or end of February ; the crop will generally be fit for usc about six weeks after sowing. The seed should be sown in light rich soil, 8 or 9 inches thick, on a

moderate hotbed, or in a pit with a temperature of from 55° to 65°. Gentle waterings must be given, and air admitted at every favourable opportunity ; but the sashes must be protected at night and in frosty weather with straw mats or other materials. Some of these crops are often grown with forced potatoes. The best forcing sorts are Wood's Early Frame, and the Early Rose Globe, Early Dwarf-top Scarlet Turnip, and Early Dwarf-top White Turnip.

Those best suited for Seiten) cultivation are the following :— ™ Spindle-rooted: Long Scarlet, including the sub-varieties Scarlet Short- top, Early Frame Scarlet, and Wood's Early Frame; Long Scarlet Short-top, best for general crop.

Turnip-rooted : Early Rose Globe-shaped, the earliest of all; Early Dwarf-top Scarlet Turnip, and Early Dwarf-top White Turnip; Earliest Erfurt Scarlet, and Early White Short-leaved, both very early sorts ; French Break-fast, olive-shaped ; Red Turnip, and White Turnip, for summer crops,

Winter sorts: Black Spanish, White Chinese, Californian Mammoth.

182. The Rampion, Campanula Rapunculus, is a tap-rooted biennial, native or naturalized in the south of England, and found on banks and in pastures in central and southern Europe, cxtend- ing to the Caucasus. The white fleshy roots, known as ‘‘ ramps,” are used raw as a salad, or boiled like asparagus. It is but little cultivated in England. The seed, which is very minute, aud should be nixed with sand before sowing to secure even distribution, is sown in drills 6 to 8 inches apart, about the end of May or beginning of June, in deeply worked ground, and in a cool situation, and the young plants are merely to be thinned and kept clear of weeds. The roots, which somewhat resemble small radishies, will be fit for use about November, and on the approach of frost, if taken up and stored in sand, they will keep fresh and firm till spring.

183. The Rhubarb of gardens is derived from differcnt species of Rheum, especially R. Rhaponticum and R. undulatuin. The parts chiefly utilized are the fleshy foot-stalks of the leaves, which are much used for preserves, puddings, and tarts, as well as for stew- ing,

Rhubarb requires an open situation and a rich dcep soil, which should be well manured, and prepared by deep trenching. To form a plantation, divisions of the old roots, each provided with a bud or crown, should be put in early in spring, the crown being set about 2 inches below the surface. They should stand 3 to 4 feet apart cach way, according to the habit of the variety. The plants will afford a supply in the fullowing spring. It is desirable to renew the plantation in the course of four or five years, shifting to new ground, When gathering the crop, the leaf-stalks should be bent downwards, and pulled off sideways, not cut. The flower-stems should be cut off as soon as they make thcir appearance, in order to strengthen the root. Established sorts must be increased by division, as seedlings do not reproduce the variety. Rhubarb may, however, be grown from seeds—a flower stein or two being allowed to grow up for the purpose of producing them. The seeds should be sown on a slight hotbed in spring, and transplanted out in rows in the inonth of May, no stalks being gathercd from them for the first two years.

Forcing.—Rhubarb may be forced in a variety of ways for early or winter use; it may have a pot or box set over the crown and covered up by warm litter, dung, or leaves like sea-kale ; or the roots may be taken up, potted, and set into any forcing-house at work, the crowns being kept in the dark so as to blanch the Stalks ; or they may be planted closely in long narrow boxes of moderate depth, and set in a mushroom-house or cellar, where there is a considerable temperature. The rhubarb will soon throw up its stalks, and these, being partially etiolated, possess a delicacy and flavour superior to those grown in the open air. It is easy, by varying the time of subjecting the boxes to the increased tempera- ture, to keep up a succession of rhubarb stalks, from the period at which kitchen apples become scarce or begin to lose their flavour, till green gooscberries come into season.

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The favourite old sorts of rhubarb were the Tobolsk and the Elford or Buck’s; the latter comes from R. undulatum, and is one of the best in flavour, as well as of a fine red colour. Other good sorts of more modern date are Mitchell’s Royal Albert, Dancer’s Early Scarlet, Myatt’s Linneus,

and Myatt’s Victoria, the last a large-growing thick-stalked kind, the others being all earlier sorts. Johnson’s St Martin’s and Salt’s Crimson Perfection are also favourite kinds ; and Stott’s Monarch grows to a very large size.

184. The Rocambole, Allium Scorodoprasum, is a hardy bulbous Rocan-
perennial, occurring in a wild state in sandy pasturcs and waste bole.

places throughout Europe, but not common in the south; in Britain it is found chiefly in the north of England and the south of Scotland. The plant is grown for the sake of its bulbs, which are smaller and milder than those of garlic, and consist of sevcral cloves chiefly produced at the roots. The cloves should be planted about the end of February or in March, and treated like the garlic or shallot. When mature, the bulbs should be taken up, dried, and stored for use.

185. The Salsafy (or Salsify), Tragopogon porrifolius, is a hardy Salsafy.

biennial, with long cylindrieal fleshy esculent roots, which, when properly cooked, are extremely delicate and wholesome ; it occurs in meadows and pastures in the Mediterranean region, and, in Britain, is confined to the south of England. The salsafy requires a free rich deep soil, which should be trenched in autumu, the manure used being placed at two spades’ depth from the surface. The first crop should be sown in March, and the main crop in April, in rows a foot from each other, the plants being afterwards thinned to 8 inches apart. In November the whitish roots should be taken up aud stored in sand for immediate use, others being secured in a similar way during intervals of mild weathcr.

186. The Savoy, Brassica oleracea bullata maior, is a near ally of Savoy.

the cabbage, but has bullate or blistered leaves ; it is more hardy, and, except in very sevcre seasons, instcad of suffering is rather im- proved in flavour by frost. The savoys come into use in autumn, and continue until the spring. The early crop should be sown in February, the main crop about the middle of March, and a month afterwards the latest crop. The rows of the smaller sortsshould be 15 inches, and those of the larger ones 2 fcet, apart.

The best sorts of savoys for garden culturc are :—

Tours, early and hardy ; Ulm, early, but not so hardy; Little Pixie, small, early, and good; Dwarf Green Curled, best for a general crop; Golden,

handsome and excellent. The large Drumhead savoy is more suitable for field culture, unless bulk of produce is required.

187. The Scorzonera, Scorzoncra lispanica, is a hardy perennial, Scor a native of Spain, but cultivated in gardcus for its fleshy cylindri- zonera,

cal roots, which resemble those of salsafy exccpt in being black out- side, and which are used in the same manner. They should be treated in every respect like salsafy (par. 185).

188. The Sea-kale, Crambe maritima, is a hardy perennial, grow- Sea-kale.

ing spontancously along the coasts of England, of Ireland, and of the Scotch lowlands, along the western coasts of Europe, and on the Baltic, reappearing on the Black Sea.

Sea-kale prefers a light dry soil, and wheu manure is necessary it should consist of sea-weed or well-rotted dung; ora dressing of salt or of nitrate of soda may be given. When it is raised froin secds, they should be sown in March or April in rows a foot asunder, the plants being thinned to 6 inches apart. In the following Marchi these should be planted out in trenched well-prepared ground, 2 feet asunder, in rows 24 to 3 feet apart. The top with the crown buds should be cut off before planting to prevent them from running up to seed. In the spring of the second year the young shoots if blanched will be fit for use, and therefore the summer growth should in every way be promoted by the use of water and liquid manure. Tolcrably blanched stalks may be produced by plants only nine months old from.the seed, and after two summers seedling plants will have acquired sufficient strength for general cropping. The sceds, instead of being sown in rows and transplanted, may be deposited in patches of three or four together, where they are to remain. In the autumn, after the leaves have been cleared off, the ground should be forked up, aud 6 or 8 inches’ depth of leaves or of light sandy soil laid over the plants, by either of which means they will be blanched, though not forced. The blanched sprouts should be cut for use

whilst they are crisp, compact, and from 3 to 6 inches in length, the stem being cut quite down to the base.

Sea-kale beds may be made equally well from cuttings of the roots, the extremities of the roots, technically called ‘‘ thongs,” being the parts best adapted for this purpose. They should be taken up in autumn, cut into lengths of about 4 inches, and laid aside in a heap of sand or earth till spring, when they should be planted out like the seedlings. Cuttings should not be taken from any but very healthy plants.

Forcing. —Sea-kale nay be forced in the open beds by the aid of sca-kale pots or covers, which are large enough to cover a plant, contracted a little at top, with a movable lid or cover. In the autumn the stalks are cut over, the decayed leaves removed, the ground loosened about the eyes, and a thin stratum of coal-ashes mixed with salt laid on the surface to keep down earth-worms. One of the earthenware pots or covers, or failing these a large inverted flower-pot, is placed over each plant or each patch of plants, and

Shallot.

Skirret.

Sorrel.

Spinach.

Tomato,

leaves of trees are closely packed round the pots, and raised to about afoot abovethcm. When fermentation eommenees, a thermometer should be occasionally introduced into a few of the pots, to aseertain that the temperature within does not exceed 60° Fahr., and the thickness of the leaves is to be regulated accordingly. In a month or six weeks the shoots will be ready for cutting, and by means of the movable lids they can be examined and the shoots gathered without materially disturbing the covering. If the crowns are thus covered up by about the end of October, the

crop may be cut by about the third week of December, and by starting a batch at yarious times a supply may be kept up till the middle of May.

Strong plants may also be taken up and planted on hotbeds, the sashes being kept covered close ; or they may be set thickly in boxes as recommended for rhubarb (par. 183), and placed in any hcated structure, or in the mushroom house; but, to have the shoots crisp and tender as well as blanched, light must be completely excluded. Besides the common purple-leaved, there is a green-leaved sort, which is said to blanch better.

189. The Shallot, Allium ascalonicum, isa native of Palestine, and is much used in cookery for high-flavoured soups and gravies, be- sides which it is excellent when pickled. It is a hardy bulbous perennial, and is propagated by offsets, which are often planted in September or Octobcr, but the principal crop should not be got in earlicr than February or the beginning of March. The mixing of soot with the manure has been recommended as a protection against maggots. In planting, the tops of the bulbs should be kept a little above ground, and it is a commendable plan to draw away the soil surrounding the bulbs when they have gotroot-hold. They should not be planted on ground recently manured. They require the same general treatment as garlic and rocambole,and should be stored in asimilar manner. They come to maturity about July or August. There are two sorts—the Common, and the Jersey or Russian, the latter being much larger and less pungent.

190. The Skirrct, Sium Sisarum, isa fleshy-rooted perennial, native of China and Japan, the roots of which are boiled, and after- wards scrved up like salsafy. It requires a free, deep, and much en- riched soil, and is generally raised from seeds, which should be sown in drills a foot apart about the end of March, the bed being well- watered in dry weather. The roots will be in use about November, and will continne fresh through the winter if carefully stored.

191. The Sorrel, Rumex Acetosa, is a hardy perennial, found throughout Europe, in Asiatic Russia, and in Nort America, The leaves are used, niore so on the Continent than in Britain, in soups, salads, and sauces. Sorrel grows freely in any good garden soil, and is increased by dividing the roots

during the early part of spring. They should be planted in rows 15 to 18 inches apart. The leaves, when fully grown, are gathered singly.

The common garden sorrel is much superior to the wild plant ; but the Belleville, which is the kind generally cultivated near Paris, is still better, its leaves being larger and not so acid. The Blistered- leaved, which has large leaves with a blistered surface, has the advantage of being slow in running to seed.

The #rench Sorrel, Rumex scutatus, is a hardy perennial, native of France and Switzerland, with densely-branched trailing stems. The leaves are roundish heart-shaped and glaucous; they are more acid than those of the common sorrel.

192. The Spinach, Spinacia oleracea, is an annual plant, whieh has been long cultivated for the sake of its succulent leaves. It should be grown on good ground, well worked and well manured ; and for the summer crops abundant watering will be necessary.

The first sowing of winter spinach should be made early in Aug- nst, and another towards the end of that month, in some sheltered but not shaded situation, in rows 18 inches apart,—the plants, as they advauce, being thinned, and the ground hoed. By the begin- ning of winter the outer leaves will have become fit for use, and if the weather is mild successive gatherings may be obtained up to the beginning of May. The Prickly-seeded and the Flanders are the best for winter ; and these should be thinned out early in the autumn to about 2 inches apart, and later on to 6 inches. The Lettuce-lcaved is a good succulent winter sort, but not quite so hardy.

Mo afford a succession of summer spinach, the seeds should he sown about the middle of February, and again in March ; after this period small quantities should be sown once a fortnight, as summer spinach lasts but avery short time. They are generally sown in shallow drills between the lines of peas. If a plot of ground has to be wholly occupied, the rows should be about a foot apart. The Round- leaved is the best sort for summer use.

193. The Tomato or Love Apple, Lycopersicum esculentum or Solanum Lycopersicum, is a tender annual from South America, much esteemed in England as an esculent, either raw or cooked.

Tomatoes were formerly raised from seed sown in gentle heat in February or early in March, potted singly into small pots, shifted on into larger pots, and gradually exposed to the air till about the end of May, when, if the season was favourable, they were planted out against a wall with a south aspect, or in the warmest situation at command. As they grew, they were nailed to the wall, or other-

wise supported. Only the earlier of the fruit ripened gut of doors in an average season; and when a fair quantity had set, the plants were stopped, the secondary branches being also stopped above the fruit, and laterals removed gradually. Undcr these circumstances the fruit began to ripen in August, successively coming to maturity, at which stage, and when perfectly dry, it had to be gathered and hung up or laid on shelves. The partially ripened fruit had to be got in before it was injured by frost, its maturation being completed in a vinery or other heated house, and, though not acquiring the full flavour, the forwardest of these late fruits thus became usable.

Forcing.—The outdoor treatment remains as above sketched out, but, owing to the precarious nature of the crop in bad seasons, large quantities are now grown under glass. MrG. T. Miles, of Wycombe Abbey Gardens, has explained in the Gardeners' Chronicle his mode of culture, of which the following is an abstract:—

"To grow it properly, it requires considerable heat and every possible ray of sunshine, as well as a free circulation of dry warm air. The compost should consist of about one-half rough turfy loam, one-fourth of roadside scrapings, and one-fourth of decomposed manure or horse-droppings, mode- rately fresh. For planting out, a ridge of soil 2 feet wide and 15 inches dcep should be placed on a warm bed of tan or leaves. For pot cultivation those from 12 to 15 inches in diameter are most appropriate, and these should not be quite filled, in order that surface dressings of the same material or of pure nianure may be applied afterwards. For early work asowing should be made in January, and the plants moved onwards until they have moderately filled 5-inch pots with roots, when they are transferred to the beds or fruiting-pots ; in each case the plants are kept about 2 feet apart. Other sowings may be made at intervals till about the end of August. From the last sowing a supply is obtained for a considerable period onwards through the winter months. The plants are restricted to one main stem, which is allowed a run of 6 feet or more, as the position may admit, and from this all laterals are removed in an early stage of growth. Top-dressings of rich materials should be applied when the surface soil becomes full of roots; copious supplies of stimulating manure-water are

also necessaly, and the fruits should be kept perfectly free from damp while they are ripening. For this purpose, if close

confined pits are used, a chink of air should be kept on continuously.”

be allowed to run freely over the back wall of a forcing house, and, if sufficiently fed, will bear fruit abundantly.

Mr Miles observes that these plants, when grown out of doors, are generally placed in an excellent position, but the main point—the enrichment of the soil—is overlooked or not sufficiently attended to. A portion of good soil should be provided for each plant, and heavy mulchings of manure should be placed upon the surface as soon as practicable aftcr planting, in order to prevent the soil becoming dry and parched. In these cases three or more main shoots are allowed to each plant, because it often happens that the space will not allow a good run, and a certain amount of growth with foliage is essential to the well-doing of the plants.

The following varieties afford considerable choice :—

Red-fruited: Early Gem, small, but a good cropper, and the quickest to ripen; Vick’s Criterion, small and free-bearing, particularly adapted for growing in small pots; Vilmorin’s Dwarf Early, dwarf and free-bearing ; Hathaway’s Excelsior, one of the finest, a great cropper; Trophy, large and very fine ; Conqueror, large and prolific.

Yellow-Sruited: Carter’s Green Gage, fine flavour.

Smaller-fruited: Cherry Red_and Burghley Pet, round, prolific, and agreeably flavoured ; Dickson’s Queen of Tomatoes, with pear-shaped, and Nesbit’s Victoria, with plum-shaped fruits, both being prolific sorts.

194. The Turnip, Brassica campestris Rapa, is a hardy biennial, found in corn-fields in various parts of England. The eultivated varieties have bulbiform roots, much esteemed as an esculent.

Turnips should be grown ina rich friable sandy loam, such as will produce medium-sized roots without much aid from the manure heap, and are better

flavoured if grown in fresh soil. In light dry soils well decomposed hotbed or farmyard manure is the best that can be used, but in soils containing an excess of organic matter, bone dust, superphosphate of lime, wood-ashes, or guano, mixed with light soil, and laid in the drills before sowing the seed, are bene- ficial by stimulating the young plants to get quickly into rough leaf, and thus to grow out of reach of the so-called turnip fly. ‘To get rid of this pest, it has been found beneficial to dust the plants with quicklime, and also to draw over the young plants nets smeared with some sticky substance like treacle, by which large numbers will be caught and destroyed. It has been also recommended as a palliative to sow thick in order to allow for a percentage of loss from this and other causes, and, as a preventive, to scatter gas-lime over the surface after the seed has been sown. Mr Thompson (Gardeners’ Assistant) also recommends the following remedy: — ‘Tn the first place, let a supply of water be brought close to hand, or say to each end of the quarter ; then let one person move steadily along one side of the piece of ground from one end to the other, delivering the water through a rose as he proceeds. The fleas will jump forward as the water approaches them, and a second person, following the first, will keep them on the hop forward, whilst a third will drive them still further, and so on till the whole are driven off the ground.”

The first sowing should be made on a warm border with the pro- tection of a frame or matted hoops, in January or February, the second on a well-sheltered border in March, after which a sowing once a month will generally suffice. In May and June the plot should be in a cool moderately shaded position, lest the plants

Tomatoes may also

of a distinct yellow colour, aud of

Turnip.

VEGETABLES. |

should snffer from drought. The principal autumn and winter sowings, which are the most important, should be made about the end of June in the northern districts, and in the beginning of July in warmer districts; a small

sowing may be made at the end of August to come in before the spring-sown crops are ready. If the weather is showery at the time of sowing, the seed speedily germinates, and the young plants should be kept growing quickly by watering with rain or pond water and by surface stirrings. he drills for the ear- liest sorts need not be more than 15 inches apart, and the plants may be left modcrately thick in the row ; the late crops should have at least 2 feet between the rows, and be thinned to 12 inches in the row, a free circulation of air about them being very important in winter. Asa provision against prolonged periods of severe weather, it has been recommended to lay the finest roots in rows, covering them well with soil, and leaving intact the whole of the foliage. The very latest sown crops of half-grown roots will prolong the supply until the earliest spring-sown crops are fit for use.

The following are the best sorts of turnips for garden crops:-

Karly Purple-top Munich, the earliest and best of all; Early White Strap-leaf, very quick growing, and good; Early Snowball, for summer use; Early White Stone, for summer sowing; Orange Jelly, for summer sowing; Yellow Finland, for winter use; Chirk Castle, for winter use. In addition to these, which have round roots, there are the Jersey Navet, an excellent oblong variety, and very hardy, and the Teltow, a small tapering-rooted sort, em-

ployed, on account of its piquant flavour, in ragouts, aud for seasoning. The Jatter should be sowu in April and July in sandy soil.

195. The Water Cress, Nasturtium officinale, is a hardy perennial, occurring wild in Britain, and also throughout Europe and Asiatic Russia, except the extreme north. It is highly prized asa salad, and accredited with powerful antiscorbutic properties. It may be pro- pagated from seed, but in forming plantations rooted divisions are usually employed. They should occupy positions where they ean be supplied with water from a spring, as this will be rarely frozen. The plant will not grow freely on a muddy bottom ; heuce this has to be replaced by gravel or chalk. A constant current of water is absolutely necessary ; and the plants should be disposed in rows parallel with the course of the stream. They thrive best in water about 14 inch in depth; this increases to about 8 inches when the plants begin to grow, and thereby check the current. In sunmer the tops of the plants must be kept

closely ent, and under proper conditions of water and soil they will yield a gathering once a week. In winter the water should be 4 to 5 inches deep, to obtain which the plants are left with more head. The time for the renewal of the beds is in May and June, and from September to November, the planting being done in succession ; those planted in May are fit to cut by August, and those planted in November are ready to gather in the spring. When collected for sale, the shoots are eut, not broken off, the latter plan being injurious. The water cress may also be grown in a ae border of rich light soil, kept con- stantly moist ; but the surface should be covered with a thin layer of sand to keep the leaves clean. It may be also grown in tubs par- tially filled with soil which is covered with water, in which case the water should be frequently changed, or in shallow pans set in stands of water. If protected from frost in a brick pit witha slight service of hot-water piping, it may be had in use throngh the winter. To secure this, pans are filled with loamy soil in October or November, and planted with the tops of outdoor cresses ; in about six weeks they will be fit to cut, and will furnish suecessional gatherings.

196. The Chinese Yam, Dioscorea Batatas, is a fleshy-rooted ae climber, native of China. It has annnal stems, and

eeply tee thick club-shaped fleshy roots, or rhizomes, full of starch, which when cooked acquire a mild taste like that of a potato, but have besides somewhat of a medicinal flavour. The roots grow 3 fect or upwards in length, and sometimes acquire a weight of more than 14 1b. The plant grows freely enough in deep sandy soil, moderately enriched. The sets, consisting of pieces of the roots, may be planted in March or April, and require no other culture than the staking of the climbing stems. They should not be dug up before November, the eliief increase in their sizo taking place in autumn. They sometimes strike downwards 2 or 3 feet into the soil, and must be. carefully dug out, the upper slender part being reserved for propagation, and the lower fleshy portion eaten after having been allowed a few days to dry.

197. CuLtinany HeErzs.—Besides the foregoing esculent and salad plants, there are several minor herbs used for flavouring and garnishing. For the most part they are dwarf perennial plants re- quiting to be grown on a dry

warm soil in an open sunny aspect, or annuals for which a warm sheltered border is the most suitable place ; and they may therefcre be conveniently grown together in the same compartment—an herb garden. The perennials should be transplanted either every year or every second year.

For winter use the tops of the most useful kinds of herbs should be cut when in flower or full leaf and quite dry, and spread out in au airy but shady place so as to part slowly with the mois- ture they contain, and at the same time retain their aromatic pro- perties. When quite dry they should be put into dry wide- mouthed bottles and kept closely corked. In this way such herbs

as basil, marjoram, mint, sage, savory, and thyme of the aromatic elass, balm, chamomile, horehound, hyssop, and rue of the medicinal class, as well as parsley, may be had throughout the season with almost the full flavonr of the fresh herb.

Angelica, Archangelica officinalis.—A stout biennial umbellifer ; sow in April, in deep rich soil. The stems and leaf-stalks are candied.

Anise, Pimpinella Anisum.—A slender umbelliferous annual; sow in May in light warm soil ; English suminers are scarcely warm enough to bring it to perfection.

Balm, Melissa officinalis.—A hardy labiate perennial; divide the roots in October ; dry for winter use.

_ Basil, Ocymum Basilicum.—A fragrant labiate annual ; sow in a gentle heat iu March, aud plant out on a warm border; or sow in a warm sheltered place in April or May ; or in winter sow in heat (65°-70°) in pots or boxes in rich light soil, once a month from November onwards; that sown in April or May should be cut when in blossom, and dried slowly for winter use.

_ Borage, Borago officinalis.—A stout native British annual, used for garnish- ing; sow in March and May in an open place, in good soil.

_ Burnet, Poterium Sanguisorba,—A hardy native perennial; divide the roots in October or February. It tastes like cucumber.

Caraway, Carum Carui.—A hardy umbelliferous biennial ; sow in April or May to flower the following summer.

Chamomile, Anthemis nobilis.—A hardy native British composite perennial of prostrate habit; divide the plants in autumu or spring, planting in rather poor dry soil ; the flower-heads should be gathered successively as they open, and earefully dried and stored.

Chervil, Anthriscus Cerefolium.—A hardy annual umbellifer ; sow in March, and again in October if required for spring use.

Coriander, Coriandrum sativum.—A hardy annual umbellifer ; sow in March in light loamy soil.

Dill, Anethum graveolens.—A hardy anuual umbellifer ; sow in March ou a warm border, in rich light soil.

Fennel, Foeniculum vulgare.—A hardy perennial umbellifer ; sow in March, or divide the roots at the same season.

Finochio, Feniculum dulce.—A somewhat tender kind of fennel, with two-ranked leaves, fleshy at the base, which part is blanched by earthing up like eelery; sow in March and successionally if requircd, in light very rich soil.

Horehound, Marrubium vulgare.—A hardy native labiate perennial, best raised annually from sceds sown early in March, or by selecting self-sown autumn seedlings.

IIyssop, UWyssopus officinalis.—A hardy evergreen suffruticose labiate plant; sow in March or April, young plants being more vigorous than older ones ; it mayalso be divided in spring.

Lavender, Lavandula yvera.—An aromatic undershrub of the labiate order,

| requiring a light warm dry soil, and increased by cuttings, or by slips taken

off with roots about March or April.

Marigold, Calendula officinalis.—A hardy composite annual; sow in March, in any garden soil.

Marjoram, Origanum Majorana.—A tender labiate, usually treated as an annual, and known as Knotted Marjoram; sow in Marcl in a slight heat, and plant out on a warm sunny border. The Pot Marjoram, Origanum Onites, and Winter Sweet Marjoram, Origannm heracleoticum, are hardy perennials, growing best in dry warm soils ; divide and transplant in autumn or spring ; a winter supply is provided by cutting the stems, when the plantis in flower, and drying in an airy shady place.

Mint, Mentha viridis.—A hardy native labiate perennial, often called Spear-Mint. The running underground roots should be taken up in February or March, and replanted in fresh good soil. The young tops may be obtained early by forcing; the leafy stems may also be cut when at their full growth in summer, and dried for wiuter use. The Peppermint, Mentha piperita, is cultivated like the spear-mint, only its runners grow above instead of beneath the ground, and require planting accordingly.

Parsley, Petroselinum sativum.—A hardy umbelliferous biennial ; sow iu February, again in May, and again in July to have a good supply, a portion of the last-sown crop being protected by frames or hand-lights, so as to be accessiblo in frosty weather; it likes a free soil of good quality, but not too richly manured.

Pennyroyal, Mentha Pulegium.—A hardy native labiate perennial, growing in moist situations, and best cultivated on a north border, is propagated freely enough by its running rooting stems, which should be well established early in autumn,

Rosemary, Rosmarinus officinalis. —An evergreen undershrub of the labiate order, just tender enough to be killed in all but the most sheltered situations by the most severe British winters, but surviving uninjured through those of ordinary severity. It requires a light dry soil and a sheltered situation, and is increased by cuttings or rooted slips taken off in spring. ;

Rue, Ruta graveolens.—A hardy evergreen rutaceous undershrub, which will grow freely in ordinary garden soil, and is propagated by cuttings or slips, or very freely by seeds, which ripen abundantly. J

Sage, Salvia officinalis.—A hardy evergreen undershrub, belonging to the labiates, of which there are two varieties, the green-leaved and the red-leaved, the latter beiug somewhat the hardiest; it is inereased by earthing up the outside stems, which after the lapse of a year may be taken off as rooted plants in the following April or May. .

Savory, Satureja hortensis.—A hardy labiate annual ; sow on a warm border in April; when the plants reachthe flowering stage, dry a portion for winter nse. The Winter Savory, Satureja montana, a hardy evergreen undershrub, is propagated by cuttings taken off in April and May, or by dividing the plant about April. . 7 A :

Tansy, Tanacetum vulgare.—A hardy composite native perennial, which soon grows thick and exhausts the soil, and s ould therefore be divided and transplanted every second year. If required earlier than the natural season, a root or two may be potted and set in a mild forcing-house or hotbed.

Tarragon, Artemisia Dracunculus.—A hardy perennial composite plant, which grows freely in light dryish soil, and is increased by division in October or March ; it should be transplanted every year or two. Tarragon may be had during the winter by potting a root or two early in December, and placing them in heat. : ;

Thyme, Thymus vulgaris.—A hardy evergreen undershrub, requiring a light dry warm soil, and an open but sheltered situation; it may be raised from seeds sown in April, and thinned out ; or the old roots may bedivided about April. The tops should be cut in summer, and preserved for winter use*iu the same way a8 savory and marjoram. The Lemon Thyme, Thymus citri-odorus, is of a more, decumbent habit, and may be parte and trausplanted in spring in genial weather during the month of April. a ;

Wormwood, Artemisia Absinthium.—A hardy native composite perennial, which will grow in any soil, but is most aromatic on those which are dry and poor. ‘The plants should be replaced annually in autumn, when self-

sown plants are generally to be found round about the old ones ; if not so produced, they can be provided by sowing the seeds during the summer.

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HORTICUATW Se

[CALENDAR.

VIIL—CALENDAR OF GARDEN OPERATIONS FOR GREAT BRITAIN.

JANUAR e

Kitchen Garden.—Wheel out manure and composts during frosty weather ; trench vacant ground not turned up roughly in autumn. Sow early peas in a cold frame for transplanting. Sow also Dilli- stone's Early, Alpha, or other first-crop peas, early in the month, and William I. and Advancer towards the end ; Early Seville and Early Longpod beans; and short-topped radish in two or three sowings, at a week's interval, all on a warm border; also Hardy Green and Brown Dutch lettuce in a frame or on south border. Plant shallots and Ashleaf potatoes on a warm border. Protect broccoli as it becomes fit for use, or remove to a dry shed or cellar ; lettuces and endive, which are best planted in frames ; and parsley in frames so as to be accessible.

Fruit Garden.—Plant fruit trees in open weather, if not done in autunin, which is the proper season, mulching over the roots to protect them from frost, and from drought which may occur in spring. Prune fruit trees in mild weather or in moderate frosts, nailing only in fine weather. Wash trees infested with insects, with a mixture of soap-suds, black sulphur, and tobacco water, or with Gishurst Compound. Take off grafts, and lay them aside in moist earth in a shady place.

Forcing.—Prepare manure for making up hotbeds for early cucumbers and melons, where pits heatcd with hot water are not in use ; also for Ashleaf potatoes. Sow also in heat mustard aud cress for salads, onions for salads ;

cclery to be pricked out for an early crop; and Early Horn carrot and kidney-beans on slight hotbeds. Force asparagus, sea-kale, and rhubarb, in hotbeds, in pits, in the mushroom-house, or in the open garden by the use of covers sur- rounded with warm litter. For pines keep up a bottom heat of 80°, and water sparingly ; for cucumbers a top heat Ofioes leaf and flower a temperature ranging from 65° to 75°. Keep forced strawberries with swelling fruit well watered. Plant vine eyes for propagation in a brisk heat.

Plant Houscs. —Give abundance of air to the grcenhouse, conserva- tory, and alpine frame in mild weather, but use little water.

Flower Garden.—Plant out tubers and bulbs ot border flowers, where neglected in autumn, deferring the finer florists' flowers till next month. Transplant herbaceous plants in light soils, if not done in autumn ; also deciduous trees, shrubs, and hedges. Lay edgings in fine weather. Sow mignonette, stocks, &c., in pots ; sow sweet peas, and a few hardy annuals, on a warm border. Give auriculas and carnations abundance of air, dry, to prevent damping off.

FEBRUARY.

Kitchen Garden.—Sow successional crops of Early Seville beans, and William I., Advancer, Criterion, and other peas in the beginning and end of the month ; early cabbages, to follow the last sowing in August ; red cabbages and savoys towards the end. Sow also Early Horn carrot ; Early Purple-top Munich turnip ; onions for a full crop in light soils, with a few leeks and some parsley. Sow lettuce

for vines in |

but keep the roots rather |

for succession, with radishes and Round-leaved spinach, twice in the course of the month; and small salads every fortnight. Plant Jerusalem artichokes, shallots, garlic, horse-radish, and early potatoes. Transplant for seed, if not done before, all the brassica tribe, including cabbage, cauliflower, turnip, &c. ; also carrots, onions, beet, celery, endive, leeks, and parsnips. Transplant to the bottom ofa south wall a portion of the peas sown in pots in

frames in November and January for the first crop. Sow Brnssels sprouts in gentle heat for an early crop.

Fruit Garden.—Prune apricots, peaches, nectarines, and plums, before the buds are much swelled; finish pruning apples, pears, cherries, gooseberries, currants, and raspberries, before the end of the month ; also the dressing of vines. Keep the fruit-room free from spoiled fruit, and shut it close. Cut down the double-bearing raspberries to secure strong autumn-fruiting shoots. Head back stocks preparatory to grafting.

Forcing.—Sow melons and cucumbers on hotbeds and in pits. Sow carrots, turnips, early celery, also aubergines or egg-plants, capsicums, tomatoes, and successional crops of kidney-beans ; cauli- flower and Brussels sprouts, in gentle heat, to be afterwards planted out. Plant carly potatoes on slight hotbeds. Continue the foroing of asparagus, rhubarb, and sea-kale. Pine-apple plants require little water ; plants in dung-frames especially should be kept free from damp ; shift the fruiting plants by the middle of the month, if not done in August. Commence or continue the forcing of the various choice fruits, as vines, peaches, figs, cherries, strawberries, &e. Pot roots of mint and place in heat to produce sprigs for mint sauce. Be careful to protect the stems of vines that are outside the forcing-houses.

Plant Houses. —Let the greenhouse and conservatory have plenty of air in mild weather. Pot and start tubcrous-rooted begonias. Pot young plants of amaryllis, and start the established ones. Put plants of fuchsias, petunias, verbenas, heliotropes, salvias, and other soft-wooded subjects, into a propagating house to obtain cuttings, &c., for the flower garden. Sow stocks, dahlias, and a few tender and half-hardy annuals, on a slight hotbed, or in pots. Propagate old roots of dahlias by cuttings of the young shoots in a hotbed. Sow petunias in heat, and prick out and harden for hedding out ; also gloxinias to be grown on in heat till the flowering season.

Flower Garden.—In dry open weather plant dried roots, includ- ing most of the finer florists’ flowers ; continue the transplanting of hardy bicnnial flowers and herbaceous plants. Sow in the last week inignonette, and hardy annuals, in a warm border, for subse- quent transplanting.

MARCH.

Kitchen Garden.—Sow main crops of wrinkled marrow peas ; Longpod and Windsor beans; Nonpareil or St John’s day cabbages ; onions, leeks, Early Horn carrots, parsnips, salsafy, scorzonera, Brussels sprouts, borecoles, lettuces, and spinach. In the begin- ning and also at the end of the month sow Early Strap-leafand Karly Snowball turnips, and savoys. In the last fortnight sow asparagus, cauliflower, chervil, coriander, dill, fennel, finochio, hyssop, marigold, savory ; also sea-kale, radishes, celery, celeriac, and most of the culinary aromatics, as parsley. Small salads should be sown

1 CALENDAR FOR THE UNITED STATES (chiefly for the Latitude of New York).

JANUARY.

Flower Garden and Greenhouse.—Little is to be done in either. In the greenhouse care must be used to protect against frost. Ventilate but little, and with care ; raise the ventilating sash only high enough to let the heated air from the greenhouse drive back the outer air so as not to chill the plants. To destroy the red spider, syringe the plants copiously at night, and splash the paths with water. The aphis, or “grcen fly,” must also be destroyed ; tobacco may be used. At this season roses, grape vines, and other plants are often affected by mildew; an effectual remedy is to paint the hot-water pipes with a mixture of sulphur and lime, put on as thick as ordinary whitewash, once each week until it is checked; but care must be taken not to apply it

n any surface at a higher temperature than 212°. Hyacinths and other fulbs that have been kept ina cellar or other dark cvol place may now be brought into the light of the greenhouse or sittIng room, provided they have filled the pots with roots. If they are not well rooted, leave them until they are, or select such of them as are best, leaving the others. In the outside flower garden little can be done except that shrubs may be pruned, or uew work, such as making walks or grading, performed, if weather permits.

Fruit Garden.—Pruning, staking up, or mulching can be done if the weather is such that the workmen can stand out. No plant is injured by being pruned in cold weather.

Grapery.—Graperies used for the forcing of foreign grapes may be started, beginning at a temperature of 50° at night, with 10° or 15° higher during the day. The borders must be covered sufficiently deep with leaves or manure to preveut the soil from freezing, as it would be destruction to the vines to start the shoots if the roots were frozen; hence, when forcing is begun in » sori the covering should be put on in November, before severe frosts

Vegetable Garden.—But little can be done in the Northern States except to prepare manure, and get sashes, tools, &c., in working order; but in sections of the ‘country where there is little or no frost the hardier kinds of seeds and plants may be sown and planted, such as asparagus, cabbage, cauliflower, carrot, leek, lettuce, onion, parsnip, peas, spinach, turnip, &. In any section where these seeds can be sownin open ground, it is an indica-

tion that hotbeds may be started for the sowing of such tender vegetables as |

tomatoes, egg and pepper plants, &c. ; though, unless in the extreme Southern States, hotbeds should not be started before the beginning or middle of February.

FEBRUARY.

Flower Garden and Greenhouse.—The directions for January will in the main apply to this month, except that now some of the hardier annuals may be sown in hotbed or greenhouse, aud also the propagation of plants by cuttings may be done rather better now than in January, as the greater amount of light gives more vitality to the cutting.

Fruit Garden.—But little can be done in most of the Northern States as yet,

| and in sections where there is no frost in the ground, it is likely to be too

wet to work; but in many Southern States this will be the best month for planting fruit trees and plants of all kinds, particularly strawberries, rasp-berries, blackberries, pear and apple trees, while grape vines will do, though they will also do well quite a month later. Grapery.—The graperies started

last month at 50° increased to 60°, with a correspondingly higher day temperature.

at night may now be Great care must be taken to syringe the leaves thoroughly at least once a day, and to deluge the paths with water, so as to produce a moist atmosphere. Paint the hot-water pipes with sulphur mixture, as recommended in Jauuary.

Vegetable Garden.—Leaves from the woods, house manure, or rcfuse hops from breweries may be got together towards the latter part of this month, and mixed and turued to get “sweetened” preparatory to forming hotbeds. Cabbage, lettuce, and cauliflower seeds, if sown early this month in hotbed or greevhouse, will make fine plants if transplanted into hotbed in March. This is preferable to the use of fall-sown plants. Manure that is to be used for the crop should be broken up as fine as possible, for the more completely manure of any kind can be mixed with the soil the better the crop will be, and, of course, if it is dug or ploughed in in large unbroken lumps it cannot ve properly commingled.

MARCH.

Flower Garden and Greenhouse.—The long now begiu to tell on the plants under glass. Examiue all plants that are vigorous and healthy; if the roots have matted the “ball” of earth they must be shifted into a larger-sized pot. Plants from cuttings struck last

days and bright sunshine will

every ten days. Make up beds for mushrooms with well-prepared dung towards the end ofthe month. Plant early potatoes in the first week, and a main crop during the last fortnight. Jerusalem arti- chokes, sea-kale, asparagus, and peas raiscd in frames, may now be planted ; also garlic and shallots. Full crops of cabbages should be planted out ; also cauliflowers under hand-glasses. Propagate by slips, or by earthing up the old stems, the various pot-herbs, as sage, savory, thyme, &c., and increase mint by dividing the roots.

Fruit Garden.—Finish the pruning of fruit trees before the middle of the month. Protect those coming into blossom. Begin grafting in the third week; dig and dress between the rows of

voseberries, currants, and other fruit trees, if not already done. ren wasps assiduously, as soon as they appcar.

Forcing.—Continue the forcing of melons and cucumbers, and the various fruits. Pot pine-suckers and crowns that have been kept in tan during winter, repotting those that require large pots, and about the middle of the month shifting them to the succession pit; give a top-dressing to the fruiting plants, turning the tan, and adding new bark to the pits, to keep up bottom-heat, where that is used. In the vinery and peach-house, attend to the keeping down of insects by syringing ; and promote the growth of the young shoots, by damping the walls and paths morning and evening. Sow capsicum, egg-plant, and tomato ; also in slight heat such tender herbs as basil and marjoram.

Plant Houses.—More water may be given than formerly. Sow seeds of greenhouse and hothouse plants ; also the different sorts of tender annuals ; pot off those sown last month ; sow cineraria for the earlicst bloom ; also Chinese primulas. Shift heaths and other hard- wooded subjects and stove-plants; plant tuberoses in pots for forcing. Legin to propagate greenhouse plants by cuttings; also coleuses by cuttings in heat, and chrysanthemums in moderate heat, potting them off as soon as rooted.

flower Garden and Shrubbery.—In the last week, sow hardy annuals in the borders, with biennials that flower the first season, as also perennials. Plant anemone and ranunculus roots; plant the corms of gladiolus. Transplant from the nursery to their final sites annuals sown in autumn, with biennials and herbaceous plants. Propagate perennials from root-slips and offsets. Protect tulips, hyacinths, and choice flowers from severe weather. Continuc to propagate the finer sorts of dahlias, both by cuttings and by division of the roots. Finish the pruning of all deeiduous trees and hedges as soon as possible. Attend to the dressing of shrubbcries; lay turf-cdgings, and regulate the surface of gravel walks.

APRIL.

Kitchen Garden.—Sow asparagus, sca-kale, Turnip-rodted beet, salsafy, scorzonera, skirret, carrots, and onions on heavy soils ; also marrow peas, Longpod and Windsor beans, turnips, spinach, celery, Enfield Market cabbage, savoys, Brussels sprouts, and German greens, for succession. Sow broccoli and kidney beans both in the second and in the last week, and lettuces and small salads twice or thrice during the month; sow angelica, caraway, also all sweet herbs, if not done last month. Sow vegetable marrow. Plant cauliflower, cabbages, sea-kale, lettuce ; and finish the planting of the main crops of potatoes ; divide and replant artichokes. Propagate all sorts of pot-herbs, and attend to the hoeing and

thinning of spinach, onions, turnips, &c. Earth up cabbages, cauliflower, peas, beams, and early potatoes. Stake up peas ; blanch ae and rhubarb in the open air, by covering with straw or eaves.

Fruit Garden,—If vines have been neglected to be pruned, rub off the buds that are not wanted; this is safer than pruning now. Protect the finer sorts of frnit trees on the walls. The hardier orchard-housc fruits should now be moved outdoors under temporary awnings, to give the choiccr fruits more space,—the roots being protected by plunging the pots. Mulch all newly-planted fruit trees, watering abundantly in dry weather.

Forcing.—Continue the preparation of succession beds and pits for cucumbers and melons. Sow basil in slight heat ; potand push on tomatoes and capsicums. Attend to the routine culture of the pinery, giving water and air when necessary. In the forcing-houses, from the variable state of the weather, considerable vigilance is required in giving air. Keep down red spider (Acarus) in the more advanced houses by frequent syringings and a well-moistened atmo- sphere. Continue the usual operations of disbudding and thinning of fruit, and take care to keep up the proper temperatures.

Plant Houses.—Still sow tender annuals if required; sow cinerarias and primulas. Proceed with all necessary shiftings. Propagate rare and fine plants by cuttings or grafting ; increase bouvardias by cuttings, and grow on

for winter flowering. Pot off tender annuals, and cuttings of half-hardy greenhouse plants put in during Feb- rnary to get them well established for use in the flower garden.

Flower Garden and Shrubbery.—Sow main or successional crops of annuals of all sorts—half-hardy annuals in warm borders, or on slight hotbeds. Biennials and perennials should be sown before the middle of the month. Plant out gladioli, if not done, tigridias, and fine stocks. Finish the transplanting of herbaceous plants by the end of the first week. Protect stage auriculas and hyacinths from extremes of every description of weather; and tulips from hoar-frosts and heavy rains. Plant out tender deciduous trecs and shrubs raised in pots; plant ont tea-roses, mulching the roots, Remove part of the coverings of all tender shrubs and plants in the first week, and the remainder at the end of the month. Form and repair lawns and grass walks, by laying turf and sowing perennial grass-seeds ; mow the lawns frequently ; plant evergreens.

May.

Kitehen Garden.—Sow Pinc-apple or Nutting’s beet in the first week, small salads every week, radishes and lettuces thrice, spinach once a fortnight, carrots and onions for late drawing, kidney beans in the first week and together with scarlet runners in the last fortnight; endive for an early crop; also peas and Long- pod and Windsor beans, cauliflowers, Early York or Little Pixie cab- bages, Brussels sprouts, borecole, broccoli, savoys, Buda kale, and German greens, for late crops. Sow anise and basil on a warm border ; and borage and parsley on open spots. Sow vegetable marrows and hardy cucumbers on a warm border in the last week ; sow cardoons in trenches, or (in the north) in pots under glass shelter ; sow chicory for salading. Plant asparagus. Continue hoeing and earth- ing up the several crops.

Fruit Garden.—Disbud peaches, nectarines, and other early trees against the walls; alsoattend to the thinning of fruit. Give occa-

CALENDAR FOR THE UNITED STATES—Continued. mouth may now be shifted, and the propagation of all plants that are likely | uncovered and tied up to stakes or trellises, and all new plantations of these

to be wanted should be continued. Hardier kinds of annuals may be sown; it is best done in shallow boxes, say 2 inches deep. Lawns can be raked off and mulched with short manure, or rich garden earth where manure cannot be obtained. Flower beds on light soils may be dug up so as to forward the work of the coming busy spring season.

Fruit Garden.—In many sections, planting may now be done with safety, provided the soil is light and dry, but not otherwise. Again at this season, although a trec or plant will receive no injury when its roots are undisturbed in the soil should a frost come aftcr planting, the same amount of freezing will and very often does greatly injure the plant if the roots are exposed.

Grapery.—The grapery started in January will have set its fruit, which should be thinned by one-third. The temperature may now be farther advanced to 70° at night, with 15° higher in the daytime. The same precautions must be used against mildew and insects as given in January. Graperies wanted for succession may be started in February or this month.

Vegetable Garden.—This is a busy month. In localities where the frost is out of the ground, if it isnot wet, seeds of the hardier vegetables can be sown. The list of seeds given for the Southern States in January may now be used at the North, while for most of the Southern States tender vege- tables, such as egg plant, okra, sweet potatoes, mclon, squash, potatoes, tomatoes, &c., may be sown and planted. Hotbeds must now be all started,

APRIL.

Flower Garden and Greenhouse.—Window and greenhouse plants require more water and ventilation. Due attention must be paid to shifting well-rooted plants into larger pots; and, if space is desired, many kinds of hardier plants can be safely put out in cold frames. Towards the end of the month it may be necessary to slightly shade the glass of the greenhouse. All herbaceous plants and hardy shrubs may be planted in the garden. The covering of leaves or litter should be taken off bulbs amd tender plants that were covered up for winter, so that the beds can be lightly forked and raked. Sow tender annual flower seeds in boxes inside. ;

Fruit Garden.—Strawberries that have been covered up with straw or leaves should be relieved around the plants, leaving the covering between

and other fruits may now be made.

Vegetable Garden.—Asparagus, rhubarb, spinach, &c., should be uncovered, and the beds hoed or dug lightly. Hardier sorts of vegetable seeds and plants, such as beets, cabbage, cauliflower, celery, lettuce, onions, parsley, parsnip, peas, potatoes, radishes, spinach, turnip, &c., should all be sown or planted by the middle of the inonth if the soil is dry and warm, and in all cases, where practicable, before the end of the month. It is essential, in sowing seeds now, that they be well firmed in the soil. Any who expect to get early cabbage, cauliflower, lettuce, or radishes, while planting or sowing is delayed until the time of sowing tomato aid egg plant in May, are sure to be disappointed of a full crop.

MAy.

Flower Garden and Greenhouse.—Window and gree house plants should be in their finest bloom. Firing may be entirely dispensed with, though care must still be exercised in ventilating. Every precaution must be used to keep the air moist. ‘‘Moss culture” may be tried, the common sphagnum or moss of the swamps, mixed with one-twentieth of its bulk of bone-dust, being laid_as a mulch on the top of the earth of the flower-pots; its effect is to shield the pots from the sun, and at the same time stimulate the roots to come to the surface. By the end of the month all of the plants that are wanted for the summer decoration of the flower border may be planted out, first loosening a little the ball of earth at the roots. If the weather is dry, water freely after planting. When the greenhouse is not to be used during the summer months, camellias, azaleas, and plants of that character should be set out of doors under partial shade ; but most of the other plants usually grown in the conservatory or window garden in winter may be set in the open border. Flower beds should be kept well hoed and raked, to prevent the growth of weeds next month. Lawns should be mown, and the edgings trimmed. Pelargoniums, pinks, monthly roses, and all the half hardy-kinds of flowering plauts should be planted early; but coleus, heliotrope, and the more tender plants shonld be delayed until the end of the month. Annuals that have bcen sown in the greenhouse or hotbed may be planted out, and

sceds of sncli sorts as mignonette, sweet alyssum, phlox Drummondii, portu-

hem. Raspberries, grape vines, &c., that have been laid down, may now be | laca, &c., may be sown in the beds or borders.

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sional washings with the, engine to keep down insects. Pick cater- pillars from gooseberries and wall trees on their first appearance. Remove from raspberrics and strawberries all suckers and runners that are not wanted.

_ Foreing.—Plant melons and cucumbers, and some basil, on the hotbeds prepared for vegetables in February, and now free. Plant out vegetable marrows and pumpkins on dung-ridges, under hand- glasses. Sow late crops of cucumbers and melons. Continue the routine culture of the pinery, shifting those intended for autumn and winter fruiting; give abundance of heat and water, keeping down insects.

Plant Houses. —Turn out hardy plants about the middle, and the more tender at the latter end of the month. Sow tender annuals for succession, potting and shifting those sown at an earlier period ; sow cinerarias for succession ; and a few hardy annuals and ten- week stock, &c., for late erops. Pot off all rooted cuttings. Put in cuttings of the different desirable species which are now fit for that purpose. Plant out in rich soil Richardias, to be potted up in autumn for flowering.

Flower Garden.—Sow annuals for succession in the last weck, also biennials and perennials in the nursery compartment, for planting out next year. Propagate plants of which more stock is required, either by cuttings or by dividing the roots. Plant out, during the last week, dahlias, hardy pelargoniums, stocks, and cal- ceolarias, protecting the dahlias from slight frosts. By the end of the month, masses of the following plants may be formed with safety in warm localities :—pelargonium, heliotropium, fuchsia, petunia, nierembergia, salvia, verbena, bouvardia, and lobclia. Protect tulips, ranunculuses, and anemones from the mid-day sun, and from

rains and winds. Remove the coverings from all tender plants in the open air.

Shrubbery.—Transplant all kinds of evergreens, this month and September being the proper seasons. The rarer conifers should be planted now and in June, after they have commenced to grow. Proceed with the laying down of lawns and gravel- walks ; and keep the former regularly mown.

JUNE.

Kitchen Garden.—Sow kidney beans for succession ; also the wrinkled marrow peas, and Seville Longpod, and Windsor beans for late crops. Sow salading every ten days ; also carrots, onions, and radishes for drawing young ; and chicory for salads ; sow endive for a full crop. In the first weck sow Early Munich and Yellow Fin- land turnips for succession, and in the third week for a full autman crop. Sow scarlet and white runncr beans for a late crop, and eabbages for coleworts. Make up successional mushroom beds early inthe month. Plant full crops of broccoli, Brussels sprouts, savoys, German greens, lecks, and early celery, with successional crops of cabbage and cauliflower. Iu the first fortnight of the month, plant hardy cucumbers for pickling, in a warm border, placing hand- glasses over them towards the end of the month. Plant out eapsi- cums on a warm border (south of England), also tomatoes along the bottom of a south wall. Pull and store winter onions, if ripe.

Fruit Garden.—Train and prune the summer shoots of wall and trellis and other trained trees. Mulch and water fruit trees and strawberries in dry weather, desisting when the fruit begins to ripen. Net over cherry-trees. Destroy aphides and other insects by

syringing with tobacco water, or by fumigating, or by dusting with tobacco powder. 2

Foreing.—Proceed with planting melons and cucumbers raised from seeds and cuttings, for late crops. Keep up the necessary temperatures for the ripening of the various fruits. Continue the routine operations in the pinery ; but, if very large-sized fruit is desired, remove the suckers from the stem, and apply heat and water in abundance. Shift suckers and succession plants in the beginning and middle of the month, as the state of the plants may require. The other forcing-houses must still have the necessary heat, but little water and abundance of air must be given to those wherein the fruit is beginning to ripen, and those in which the fruit is past ought to be constantly under a system of thorough ventilation.

Plant Houses. —These will now be occupied with tender green- house plants and annuals, and the more hardy plants from the stove. Shift, repot, and propagate all plants that are desirable. Sow fragrant or showy annuals, to flower in pots during winter; and grow on a set of decorative plants for the same object.

Flower Garden.—Plant out dahlias and other tender subjects if risk of frost is past. Take up bulbs and tuberous roots, and dry them in the shade before removing them to the store-room. Fill up with annuals and greenhouse plants those beds from which the bulbs and roots have been raised, After this season, keep always a reserve of annuals in pots, or planted on beds of thin layers of fibrous matter, so as to be readily transplanted. Layer carnations and pipe pinks in the end of the month. Keep the lawns closely mown.

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Kitchen Garden.—Watering will be necessary in each depart- ment, if the weather is hot and dry. In the first week, sow peas for the last crop of the season; also Dutch Lon pod beans, and French beans. In the last week, sow Yellow Finland turnip for a full winter crop, spinach for an early winter supply, and Enfield Market or Winnigstadt cabbage for early summer use. Sow endive, for autumn and winter use, in the beginning and end of the month ; also successional crops of lettuce and small salads. Make up succes- sional mushroom beds. Plant full crops of celery, celeriac, endive, about the middle and end of the month; late crops of broccoli, cauliflower,

and coleworts in the last week. Gather and dry medi- einal and pot herbs ; also propagate these by slips and cuttings.

Fruit Garden.—Continue the pruning and training of wall and espalicr trees, and the destruction of noxious insects. Plant straw- berries in pots for forcing next wintcr, and make new beds ont of doors as soon as well-rooted runners can be obtained. Propagate the different sorts of stone fruit trees, by budding on other trees, or on prepared stocks. Gather fruits of all kinds as they ripen.

Foreing.—Prune melons and cucumbers, giving air and water, and maintaining heat, &c. Continue the routine treatment in the pinery, but withhold water when the fruit begins to ripen ; push on the growth of the suckers on old plants, which will materially advance the fruiting period. The forcing-houses ought to have abundance of fresh air and moisture, along with the necessary heat.

Plant Houses. —V entilation will be necessary to keep down exces- sive heat; and attention must be paid to potting, shifting, and putting in cuttings, and giving abundance of water to the potted plants, both indoors and out. Sow calceolarias ; shift heaths, if

CALENDAR FOR THE UNITED STATES—Continued.

Fruit Garden.—The hay or leaf mulching on the strawberry beds should be removed and the ground deeply hoed, after which it may be placed on again to keep the fruit clean and the ground from drying. Where it has not been convenient before, most of the smaller fruits may yet be planted during

young shoots of vines or trees.

Vegetable Garden.—Attention should be given to new sowings and plantings for succession. Crops sown last month will have to be thinned out if large enough. Hoe deeply all transplanted crops, such as cabbage, caulifiower, lettuce, &c. Tender vegetables, such as tomatoes, egg and pepper plants, sweet potatoes, &c., can be planted out. Seeds of Lima beans, sweet corn, melon, okra, cucumbers, &c., should be sown ; and sow for sueeession peas, spinach, lettuce, beans, radishes, &e., every ten days.

JUNE.

Flower Garden and Greenhouse.—Tropical plants ean now be used to fill up the greenhouse during the summer months. It should be well shaded, and fine specimens of fancy caladiums, draceenas, coleus, crotons, palms, ferns, and such plants as are grown for the beauty of their foliage, will make avery attractive show. ‘The ‘‘moss culture” will be found particularly valuable for these plants. Hyacinths, tulips, and other spring bulbs may be dug up, dried, and placed away for next fall’s planting, and their places filled with bedding plants, such as coleus, achyranthes, pelargoniums, and the various white and coloured leaf plants. It will be necessary to mow the lawn once a week.

Fruit Garden.—The small fruits should be mulched about the roots, if this Hy yet been done. Grape vines outside as well as in should be dis-

Vegetable Garden.—Beets, beans, earrots, corn, cueumbers, lettuce, peas, and radishes may be sown for succession. This is usually a busy month, as many crops have to be gathered, and, if hoeing is not promptly seen to, weeds are certain to give great trouble. Tomatoes should be tied up to trellises or stakes if fine-flavoured and handsome fruit is desired, for if left to ripen on the ground they are apt to have a gross earthy flavour. .

JULY.

Flower Garden and Greenhouse.—Watering, ventilating, and fumigating (or the use of tobacco in other forms for destruction of aphides) must be

| at f tl h t be kept moist. Watch the first part of the month. Tobacco dust will dislodge most of the nume- | attended to, ‘THE Sul tee eee cae cP decade pe ee 3

rous kinds of slugs, caterpillars, or worms that make their appearance on the |

the plants that have been plunged out of doors, and see if any require re-potting. All plants that require staking, such as dahlias, roses, gladioli, and many herbaceous plants, should now be looked to. Carnations and other plants that are throwing up flower stems, if wanted to flower in winter,

should be cut back, that is, the flower stems should be eut off to say 5 inches from the ground.

Fruit Garden.—If grape vines show any signs of mildew, dust them over with dry sulphur, selecting a still warm day. The fruit having now been gathered from strawberry plants, if new beds are to be formed, the system of layering the plants in small pots is the best. Where apples, pears, peaches, grapes, &c., have set fruit thiekly, thin out at least one-half to two-thirds of the young fruit.

Vegetable Garden.—The first ten days of this month will yet be time enough to sow sweet corn, beets, lettuce, beans, cucumbers, and ruta-baga turnips. Such vegetables as cabbage, cauliflower, celery, &c., wanted for fall or winter use, are best planted this month, though in some sections they will do later. Keep sweet potatoes hoed to prevent the vines reoting at the joints.

AUGUST.

Flower Garden and Greenhouse.—But little deviation is required in these departments from the instructions for July. ;

Fruit. Garden. —Strawberries that have fruited will now be making “pynners” or young plants. These should be kept cut off close to the old plant, so that the full force of the root is expended in making the “ crowns i or fruit buds for next season’s crop. If plants are required for new beds, only the required number should be allowed to grow, and these should be layered in pots as recommended in July. The old stems of raspberries and black-berries that have borne fruit should be cut away, and the young shoots thinned to three or four canes to each hill or plant. If tied to stakes and topped when 4 or 5 fcet high, they will form three or four branches on a cane, and will make stronger fruiting plants for next year.

CALENDAR. |

they require it ; cut down pelargoniums past flowering, and plant the cuttings.

Flower Garden and Shrubbery.—Take up the remaining tuber- ous roots, such as anemones, ranuncnluses, &c., by the end of the first week ; fill up their places, and any vacancies that may have occurred, with annuals or bedding plants from the reserve ground. Repot auriculas, and sow auricula seed in boxes under glass. Pro- pagate herbaceous and other plants that have gone ont of flower, by means of cuttings and slips, especially those required for spring bedding ; propagate also the various summer bedding plants in- ereased by cuttings. Increase roses and American shrubs, by layer- ing, budding, or cuttings, and goon with the layering of carnations and picotees. Stake and tie up dahlias and strong herbaceous plants.

AUGUST.

Kitehen Garden.—Sow winter and spring spinach in the begin- ning and about the end of the month ; parsley and winter onions, for a full crop, in the first week ; cabbages abont the middle of the month, for planting ont in spring; cauliflower in the first half (Scotland) and in the second half (England) of the month ; Hardy Hammersmith and Brown Cos lettuce in the first and last week; small salads occasionally ; and Black Spanish radish, for winter erops. Plant out kales and broccoli for late crops; plant celery (earthing up the advancing crops as required), endive for succession, and a few coleworts. ‘Take up shallots, gariic, &c.

Fruit Garden.—Proceed in training and regulating the summer shoots of all fruit trecs as directed for the last three months. Net up, in dry weather, gooseberry and cnrrant bushes, to preserve the fruit till latein the autumn. Make new strawberry beds if required. Preserve the ripening fruits on the wall and other trees from in- sects, and destroy wasp nests. Gather frnits as they ripen.

Forcing. —Vhe routine of cultivation in hotbeds and pits may be |

continued. Sow, and propagate by cuttings, in the beginning of the month, cucumbers, to be afterwards grown in hot-water pits, or in boxes in the front of the pine-stove, for a winter crop. Make up mushroom beds for winter crop. In the pinery most of the sum- mer fruit will be cut by the middle of the month, when a general shifting of succession plants will take place ; as also a potting of suckers; bunt these will be strengthened by being allowed

to remain ou the old plants until the end of the month. In the forcing-houses, where the crops are past, part of the sashes may be removed, so as to permit thorough ventilation.

Plant Houses. —Attend to the propagation of all sorts of green- house plants by cuttings, and to the replacing in the greenhouse and stoves the more tender species, by the end of the month in ordinary seasons, but in wet weather in the second week. Sow half-hardy annuals, as Nemophila, Collinsia, Schizanthus, Rhodanthe, &c., to flower during winter.

Flower Garden and Shrubbery.—Sow in the second and the last week, on a warm border of a light sandy soil, with an cast as- pect, any free-flowering hardy annuals as Silene pendula, Nemophila, &c., for planting in spring ; and auricula and primula sceds in pots and boxes. Propagate all sorts of herbaceous plants by rooted slips ; layer chrysanthemumis ; take off layers of carnations, picotees, and pansies. Plant cuttings of bedding plants, and of bedding pelar- re ee re

CALENDAR FOR THE UNITED STATES—Continucd.

Vegetable Garden.—Woe deeply such crops as cabbage, cauliflower, and celery. The earthing up of celery this month is not to be recommended. Onions in many sections can be harvested. The proper condition is when the tops are turniug yellow and falling down. They are dried best by placing them in a dry shed in thin layers. Sow spinach for fall use, but not yet for the winter crop. Red top, white globe, and yellow Aberdeen turnips should now be sown ; ruta-baga turnips sown last month will need thinning, and in extreme Southern States they may yet be sown.

SEPTEMBER,

Flower Garden and Greenhouse.—The flower beds in the lawn should be at their best. If planted in “ribbon lines” or “ massing,” strict attention must be given to pinching off the tops, so that the lines or masses will present an even surface. Tender plants will require to be put in the greenhouse or housed in some way towards the end of this month ; but be careful to keep them as cool as possible during the day. Cuttings of bedding plants may now be made freely if wanted for next season, as young cuttings rooted in

of such soft-wooded plants as pelargoniums, fuchsias, verbenas, heliotropes, &c.; with roses and plants of a woody nature, however, the old plants usually do best. Dutch bulbs, such as hyacinths, tulips, crocus, &c., and nlost of the varieties of lilies, may be planted. Violets that are wanted for Winter flowering will now be growing freely, and the runners should be trimmed off. Sow seeds of sweet alyssum, candytuft, daisics, mignonette, pansies, &c.

Fruit Garden.—Strawberry plants that have been layered in pots may yet be planted, or in southern districts the ordinary ground layers can be planted. The sooner in the month both are planted the better crop they will give next Season ; and, as these plants soon make runners, it will be neccssary to trim them off. Attend to raspberries and blackberries as advised for last month, if they have not already been attended to.

_ Vegetable Garden.—It cabbage, cauliflower, and lettuce are wanted to plant Mm cold frames, the seed should be sown from about the tenth to the twentieth of this month; but Judgment should be exercised, for, if sown too early, cabbage and cauliflower are apt torun to seed. The hest date for latitude of New York igs September 15th. The main crop of spinach or sprouts that is wanted for winter or spring use should be sown about the same date, The

goniums in boxes for convenience of removal. Layer the tops of chrysanthemums, to obtain dwarf flowering plants. Transplant evergreens in moist weather, about the end of the month ; and pro- pagate them by layers and cuttings. Pot Neapolitan violets for forcing ; or plant out on a mild hotbed. Clip box edgings,

SEPTEMBER.

Kitchen Garden.—Sow small salading for late crops; and lettuce and spinach, if not done last month, for spring crops. Plant endive and lettnce at the foot of a south wall to stand the winter ; plant out cabbages from the

chief autumn sowing. Plant cauliflowers on a warm border in spaces such as can be protected by hand-lights. Thin the winter spinach, when large enough, that it may have space to grow. If broccoli be too rank or tall to withstand the winter, lift and lay nearly up to the neck in the earth, the heads sloping towards the north. Lift onions, and lay them out to ripen on a dry border or gravel-walk. Lift potatoes and store then.

Frutt Garden.—Finish the suminer pruning and training. Where the walls are heated, assist the maturing of peaches and nectarines, and the ripening of the young wood for next year, by fires during the day. Gather and lay up in the fruit-room with care the autumnal sorts of apples and pears. Prepare borders and stations for fruit trees during dry weather. Plant strawberries for a main crop. Repot orchard-house trees, disrooting if necessary.

Forcing.—Take care that late melons and cucumbers be not in- jured by getting too much water, and too little air. Sow a few kidney beans for an early forced crop. In the pinery at once take off and pot all strong suckers not done last month; the remainder may be taken off at the end of the month, and plantediin old tan in a frame or pit. Expel damp, and assist the ripening of late grapes aud peaches, with fires during the day. Prune early vines and peaches.

Plant Houses.—The various pot plants should now be put in their winter quarters. Keep up moderate temperatures in the stove, and merely repel frosts in the greenhonse, gnarding against damp, by ventilation and by the cautions use of water. Pot hya- cinths, tulips, and other bulbs for forcing; and propagate half-hardy plants by cuttings.

Flower Garden, &e.—Sow in the beginning of this month all half-hardy annnals required for carly flowering; also mignonette in pots, thinning the plants at an carly stage ; the different species of primula ; and the seeds of such plants as, if sown in spring, seldom come up the same season, but if sown in September and October, vegetate readily the succeeding spring. Put in cuttings of bedding pelargoniums in boxes, which may stand outdoors ex- posed to the sun, but shonld be sheltered from excessive rains. Continne the propagation of herbaceous plants, taking off the layers of carnations, picotees, pansies, and chrysanthemuns, by the end of the month ; choice carnations and picotees may be potted and wintered in cold frames if the

season is wet and ungenial. Plant evergreens ; lay and pnt in cuttings of most of the hard-wooded sorts of shrubby plants.

OCTOBER.

Kitehen Garden.—Sow small salading and radishes in the first week, and lettuces in frames on a shallow hotbed for planting out in spring. If the winter prove mild they will be somewhat earlier

earth should be drawn up to celery with a hoe preparatory to earthing up with aspade. Onions that were not harvested and dried last month must now be attended to. Turnips of the early or flat sorts may yet be sown the first week of this month in the Northern States, and in the South from two to four weeks later.

OCTOBER,

Flower Garden and Greenhouse.—In northern sections of the United States, tender plants that are still outside should be got under cover as early as possible. Delay using fire heat as long as possible, unless the nights become so cold as to chill the plants inside the house. Roses, carnations, camellias, azaleas, pelargoniums, and the hardier sorts of plants will do better if placed in a cold frame or pit until the middlc of November than they would in an ordinary greenhouse. Look out for insects. Fall bulbs of all kinds may be planted. Take up summer-flowering bulbs and tubers, such as dahlias, tuberoses, gladioli, cannas, caladiums, tigridias, and dry them off thoroughly,

| stowing them away afterwards in some place free from frost and moisture the fall make better plants for next spring’s use than old plants, in the casc |

during winter. Fruit Garden.—Strawberries that have been grown from pot-grown layers

| may yet be planted in Southern States; keep the runners trimmed off. : Fruit

trees and shrubs may be set out; but, if planting is deferred to the last of the month, the ground around the roots should be mulched to the thickness of 3 or 4 inches with straw, leaves, or rough manure, as a protection against frost.

Vegetable Garden.—Celcry will now be in full growth, and will require close attention to carthing up, and during the last part of the month the first lot may be stored away in trenches for winter. All vegetable roots not designed to be left in the ground during the winter should be dug up, such as beets, carrots, parsnips, sweet potatoes, &c. The cabbage, cauliflower, and lettuce plants grown from seed sown last month should be prickcd out in cold frames. If lettuce is wanted for winter usc, it may now be planted in the greenhouse or cold frame, and will be ready for use about Christmas. If asparagus or rhubarb is wanted for winter usc, it should be taken up and stowed away in pit, frame, shed, or ccllar for a month or two. It may then be taken into the greenhouse and packed closely together under the stage, and will be fit for use from January to March, according to the temperature of the house.

than those sown next month or in January. Plant parsley in pots or boxes to protect under glass in case very severe weather occurs. Plant cabbages in beds or close rows till wanted in spring ; and cauliflowers in the last week, to receive the protection of frames, or asheltered situation. Store potatoes, beet, salsafy, scorzonera, skirret, carrots, and parsnips, by the end of the month. Band and earth up cardoons.

Fruit Garden.—Such fruit trees as have dropped their leaves may be transplanted ; this is the best scason for transplanting (though with care it may be done earlier), whether the leaves have fallen or not. Protect fig-trees, if the weather proves frosty, as soon as they have cast their leaves. Plant ont raspberries. The orchard-house trees should be got under glass before the end of the month. Gather and store all sorts of apples and pears, the longest-keeping sorts not before the end of the month, if the weather be mild.

Foreing.—Maiutain the heat in hotbeds and pits by means of fresh dung linings. Give abundance of air in mild bright weather. Dress vines and peaches. Clean and repair the forcing-houses, and overhaul the heating apparatus to see it is in good working condi- tion. Plant chicory or witloef in boxes or on hotbeds for blanching. Sow kidney beans. Make up successional winter mushroom beds.

Plant Houses.—Replace all sorts of greenhouse plants. Fill the pits with pots of stocks, mignonette, and hardy annuals for planting out in spring, along with many of the hardy sorts of greenhouse plants; the whole ought to be thoroughly ventilated, except in frosty weather. From this time till spring keep succulent plants almost without water. Sow cyclamens. Begin to force roses, hya- einths, and a few other bulbs, for winter and early spring decora- tion. Plant hyacinths in glasses fur windows.

Flower Garden.—Sow a few pots of hardy annuals in a frame, or on a sheltered border, for successional spring use if required. Plant the greater part of the common border bulbs as hyacinths, narcissi, crocuses, and early tulips, about the eud of the month, with a few anemones for early flowering. Transplant strong plants of biennials and perennials to their final situations ; also the select plants used for spring bedding. Protect alpine plants, stage auriculas, and car- nations and picotees with glass frames; and half-hardy greenhouse plants, such as fuchsias, &c., about the end of the month, with coverings of broom or spruce-fir, preferring the latter. Take up, dry, and store dahlias and all tender tubers in the end of the month ; pot lobelias and similar half-hardy plants from the open borders. ‘Transplant all sorts of hardy evergreens and shrubs, especially in dry soils, giving abundance of water. Put in cuttings of all sorts of evergreens, &c. Plant out the hardicr sorts of roses,

NovEMBER.

Kitehen Garden.—Trench up all vacant ground as soon as cleared of its crops, leaving the surface as rough as possible. Sow Dilli- stone’s Early peas and Early Dwarf Prolific beans, in the second week, for an early crop; also in frames for transplanting. Protect endive, celery, artichoke, and sea-kale, with stable-litter or fern, or by planting the former in frames ; take up

late cauliflower, early broccoli, and lettuces, aud place them in sheltered pits or lay them in

HORTICULTWES

[CALENDAR.

— shed ; earth up celery ; manure and dress up asparagus eds,

Fruit Garden.—Plant all sort of fruit trees in fine weather—the earlier in the month the better. Protect fig-trees, Commence pruningand nailing. Gather and store the latest apples and pears. Examine the fruit room, and remove all decayed fruit.

Forcing.—Keep up the requisite degree of heat in hotbeds aud pits. Cucumbers and pines, on hotbeds, will require more than ordinary attention, to prevent them damping off from_too much moisture ; hence the advantage of hot-water heating. Force aspa- ragus, rhubarb, and sea-kale, in the mushroom-house, in pits, or in the open border under boxes or cases surrounded and eovered. by well-fermented stable dung and lcaves, Sow Early Horn carrot ; also kidney beans and radishes, on hotbeds. In the forcing-houses prune and train the trees ; fork over and dress the borders of such houses as have not been already done.

Plant-Houses.—The directions for the greenhouse and conser- vatory in January apply also to this month generally. Continue the forcing of roses, hyacinths, &c.

Flower Garden, &c.—Plant dried tubers of border flowers, but the finer sorts had better be deferred till spring. Plant tulips in the early part of the month. Put in cuttings of bedding calecolarias, choosing the shoots that will not run up to flower. Protect such half-hardy plants as are not already sheltered. Plant deciduous trees and shrubs so long as the weather continues favourable, and before the soil has parted with the solar heat absorbed during sum- mer. Dig and dress such flower borders and shrubberies as may now be cleared of annuals and the stems of herbaceous plants.

DECEMBER.

Kitchen Garden.—Collect and smother-burn all vegetable refuse, and apply it as a dressing to the ground. Sow a few peas and beans, in case of accident to those sown in November, drawing up the soil towards the stems of those which are above ground asa protection ; earth up celery ; blanch endive with flower-pots ; sow radishes ina very sheltered place. Attend to trenching and digging in dry weather.

Fruit Garden.—Plant all sorts of fruit trees in mild weather. Proceed with pruning and nailing wall-trees. Exaniine the fruit- room every week, removing promptly all decaying fruit.

Foreing.—The same degree of attention to hotbeds and pits will be necessary as in the last month. Continue the forcing of asparagus, rhubarb, and sea-kalc, in pits and in the mushroom-house. Proceed with the usual routine of culture commenced last month. Make the necessary preparations to begin forcing early or suceession crops by the last week of this or the first of next month.

Plant-Houses, Frames, &e.—Caruations and picotees in pots must be kept rather dry to prevent damping off. Heaths and Australian plants must be very sparingly watered, and kept with only fire heat enough to repel frost.

Flower Garden, &e.—Plant shrubs in open weather. Prune hardy roses and other hardy shrubs. Sweep and roll the lawns, and put in repair the gravcl-walks, keeping the surfaee frequently rolled. (T. MO.)

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NOVEMBER.

Flower Garden and Greenhouse.— Plants intended to be grown inside should now all be indoors. Keep a sharp look out for cold suaps, as they come very unexpectedly in November, and many plants are lost thereby. In cases where itis not convenient to use fire heat, 5° to 10° of cold can be resisted by covering the plants over with paper, and by using this before frost has struck the plants valuable collections may pe saved. When fire heat is freely used, be careful to keep up the proper amount of moisture by sprinkling the paths with water. Little can be done in the flower garden,

except to clean off all dead stalks, and straw up tender roses, vines, &c., and, wherever there is time, to dig up and rake the borders, as it will grcatly facilitate spring work. Cover up all beds in which there are hyacinths, tulips, and other bulhs with a litter of leaves or straw to the depth of 2 or 3 inches. If short thoroughly-decayed manure can be spared, a good sprinkling spread over the lawn will help it to a finer growth next spring.

Fruit Garden.—Strawberry beds should be covered (in cold sections) with hay, straw, or leaf mulching, to a depth not exceeding 2 inches. Fruit trees and grape vines generally should be pruned; and, if the wood of the vine is wanted for cuttings, or scions of fruit trees for grafts, they should be tied in small bundles aud buried in the ground until spring.

Vegetable Garden.—Celery that is to be stored for winter use should be put away before the end of the month jn all sections north of Virginia ; south of that it may be left in most places where grown throughout the winter if well covered up. The stalks of the asparagus bed should be cut off, and burned if there are berries on them, as the seeds scattered in the soil some- times produce troublesome weeds. Mulch the beds with 2 or 3 inches of rough manure. All vegetable roots that are yet in the ground, and not designed to be left there over winter, must be dug up in this latitude before the middie of the month, or they may be frozen in. Cover up onions, spinach, sprouts, cabbage, or lettuce plants with a covering of 2 or 3 inches of leaves, hay, or straw, to protect them during the winter. Cabbages that have headed may usually be preserved against injury by frost until the middle of next month, by simply pulling them up and packing them closely in a dry spot in the open field with the heads down and roots up. On approach of cold weather in December they should be covered up with leaves as high as the tops of the roots, or, if the soil is light, it may be thrown over theni, if leaves are not eonvenient. Cabbages will keep this way until March if the covering has not been put on tooearly. Plough all empty

ground if practicable, and, whenever time will permit, do trenching and subsoiling. Cabbage, cauliflower, and lettuce plants that are in frames should be regularly ventilated by lifting the gash on warm days, and on the approach of very cold weather they should be covered with straw mats or

shutters. In the colder latitudes, and even in the Middle States, it is absolutely necessary to protect cauliflower in this way, as it is much more tender than cabbage and lettuce plants.

DECEMBER.

Flower Garden and Greenhouse.—Close attention must be paid to protecting all tender plants, for it is not uncommon to have the care of a whole year spoiled by one night's neglect. Vigilance and extra hot fires will have to be kept up when the thermometer falls to 34° or 35° in the parlour or con- gervatory. It is well to set the plauts under the benches or on the walks of the greenhouse ; if they are in the parlour, move them away from the cold point and protect them with paper; this will usually save them even if the ther- mometer falls to 24° or 26°. Another plan in the greenhouse is to dash water on the pipes or flues, which causes steam to rise to the glass and freeze there, stopping up all the crevices. With plants outside that require strawing up or to be mulched, this will have now to be finished.

Fruit Garden.—In sections where it is an advantage to protect grape vines, raspberries, &c., from severe frost, these should be laid down as close to the ground as possible, and covered with leaves, straw, or hay, or with a few inches of soil.

Vegetable Garden.—Celery in trenches should receive the final covering for the winter, which is best done by leaves or light stable litter; in the latitude of New York it should not be less than 12 inches 'thick. Potatoes, beets, turnips, or other roots in pits, the spinach crop in the ground, or any other article in need of protection, should be attended to before the end of the month; manure and compost heaps should be forwarded as rapidly. as possible, and turned and mixed so as to be in proper condition for spring. Remove the snow that accumulates on cold frames or other glass structures, par- ticularly if the soil which the glass covers was not frozen before the snow fell; it may remain on the sashes longer if the plants are frozen in, since they are dormant, and would not be injured if deprived of light for eight or ten days. If roots have been placed in cellars, attention must be given to ventilation, which can be done by making a wooden box, say 6 by 8 inches, to run from the ceiling of the cellar to the eaves of the building above. (G2, 161.)

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HOSEA, the son of Beéri, the first in order of the minor prophets. The name Hosea (YYID, LXX. ’Noné, Vulg. Osee, and so our English version in Rom. ix. 25) ought rather to be written Hoshea, and is identical with that borne by the last king of Ephraim, and by Joshua in Num. xiii, 16, Deut. xxxii. 44. Of the life of Hosea we know nothing beyond what can be gathered from his prophecies. That he was a citizen of the northern kingdom appears from the whole tenor of the book, but most expressly from i. 2, where “the land,” the prophet’s land, is the realm of Israel, and vii. 5, where “our king” is the king of Samaria. The date at which Hosea flourished is given in the title, i. 1, by the reigning kings of Judah and Israel. He prophesied (1) in the days of Uzziah, Jotham, Ahaz, and Hezekiah, kings of Judah ; (2) in the days of Jeroboam the son of Joash, king of Israel. As Jeroboam II. died in the lifetime of Uzziah, these two determinations of the period of Hosea’s prophetic activity are not strictly coin- cident, and a question arises whether both are from the same hand or of equal authority. There is no doubt that the date of Jeroboam II. applies to chaps. i. and ii., which were written before the downfall of the dynasty of Jehu (i. 4), and while the nation was still enjoying the prosperity that distinguished Jeroboam’s reign. On the other hand, it seems equally certain that chaps. iv.—xiv. are in their present form a continuous composition dating from the period of anarchy subsequent to that king’s death. Thus it seeins natural to suppose, with Ewald and other scholars, that the name of Jeroboam originally stood in a special title to chaps. i, ii. (or to these along with chap. iii.), which was afterwards extended to a general heading for the whole book by the insertion of the words “of Uzziah – ... and in the days of.” As Hosea himself can hardly be supposed to have thus converted a special title into a general one, the scholars who take this view suppose

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further that the date by Judsean reigns was added by a later hand, the same perhaps which penned the identical date in the title to Isaiah. On this view the Judean date merely expresses knowledge on the part of some Hebrew scribe that Hosea was a contemporary of Isaiah. The plausibility of this hypothesis is greatly increased by the fact that there does not appear to be anything in the book of Hosea that is clearly as late as the reign of Hezekiah. On the contrary, the latter part of the book seems to have been written before the expedition of Tiglath Pileser against Pekah in the days of Ahaz. In that war Gilead and Galilee were conquered and depopulated (2 Kings xv. 29), but Hosea repeatedly refers to these districts as still form- ing an integral part of the kingdom of Israel (v. 1, vi. 8, xii. 11; contrast Micah vii. 14). Assyria is never referred to as a hostile power, but as a dangerous ally, from which some of the godless Ephraimites were ready to seek the help which another party expected from Egypt, but which in truth was to be found only in Jehovah (v. 13, vii. 11, vili. 9, xii. 1, xiv. 3). This picture precisely corresponds with what we read in 2 Kings xv. of the internal dissen- sions which rent the northern kingdom after the fall of the house of Jehu, when Menahem called in the Assyrians to help him against those who challenged his pretensions to the throne. Under Pekah of Israel, and Ahaz his contem- porary in Judah, the political situation was altogether changed. Israel was in alliance with Damascus, and Assyria made open war on thie allies (2 Kings xvi.). This new situation may be said to mark a crisis in the history of Old Testament prophecy, for to it we owe the magnificent series

of Isaiah’s Assyrian discourses (Isa. vii. seg.). But the events which stirred Judean prophets so deeply have left no trace in the book in which Hosea sums up the record of his teaching. He foresees that captivity and desolation lie in the future, but even in his last words of

pathetic exhortation he speaks to a nation which looks to Assyria for help and victory (xiv. 3). ‘Phe received chronology of the kings of J udah and Israel is notoriously precarious, and a comparison of the Assyrian monuments and eponym lists with the Biblical;data makes it probable that the period from the accession of Zachariah, son of Jeroboam II., to the fall of Samaria must be shortened by as much as twenty years, and that the interregnum which is commonly supposed to have followed J eroboam’s death must also be cancelled. This correction may be held to remove one difficulty in the title of our book, which on the current chronology assigns to Hosea some sixty years of prophetic activity. On the other hand, most Assyriologists agree that the expedition of Sennacherib, which fell in the fourteenth year of Hezekiah (2 Kings xviii. 13), took place in 701 B.c, In that case Hezekiah did not come to the throne till after the fall of Samaria (722-719), which the book of Hosea predicts as a future occurrence (ch. xiii, 16)—another argument against the authority of the title. There is still, however, a large element of uncertainty in the reconstruction of Hebrew chronology by the aid of the monuments. – One date bear- ing on our book may be taken as certain, viz., the war of Tiglath Pileser with Pekah in 734, and, according to our argument, Hosea committed his prophecies to writing before that year! A more exact determination of the date of the book has been sought by comparing viii. 9, 10, with the statement on the monuments that Tiglath Pileser received tribute from King Menahem (Minhimmi) of Samaria in 738 Bc. That Minhimmi of the monuments is the Menahem of the Bible there seems no good reason to doubt, in spite of the objections of Oppert and G. Smith. But it cannot be assumed that tribute was paid by him in 738 for the first time. The narrative in 2 Kings xv. 19 seems to indicate that the relations of Menahern to Assyria began earlier in his reign,” perhaps not long after his acces- sion, which may be dated with probability c. 750 B.C. : To sum up, the first part of Hosea’s prophetic work, corresponding to chaps i.—iii., lay in the years of external prosperity

immediately preceding the catastrophe of the house of Jehu in or near the year 750. The second part of the book is a summary of prophetic teaching during the subsequent troublous reign of Menahem, and must have been completed before 734 B.c. in chaps i.~~iii., to which we shall presently recur, the book throws little or no light on the details of Hosea's life. It appears from ix. 7, 8, that his prophetic work was greatly embarrassed by opposition, 'As for the prophet, a fowler's snare is in all his ways, and enmity in the house of his God." The enmity which had its centre in the sanctuary probably proceeded from the priests (comp. Amos vii.), against whose profligacy and profanation of their office our prophet frequently declaims—perhaps also from the degenerate prophetic guilds which had their seats in the holy cities of the northern kingdom, and with whom Tosea's elder contemporary Amos so indignantly refuses to be identified (Amos vii. 14). In chap. iv. 5 Hosea seems to comprise priests and prophets in one condemna~~ tion, thus placing himself in direct antagonism to all the

1 Some writers, including Dr Pusey, claim a later date for the book, identifying Shalman in x. 14 with Shalmaneser 1V., the successor of Tiglath Pileser. This identification is altogether arbitrary. If Beth- Arbel is Arbela beyond Jordan (Onom., ed. Lagarde, p. 88), the reference, as Schrader has shown (Keilinschr. und A. T., p. 283), may be equally well to Shalmaneser III., or to a king Shalamanu of Moab, who appears on the monuments as a tributary of Tiglath Pilescr.

2 See on the whole chronology of the period, Schrader, Keilin- schriften und A. T., Giessen, 1872 ; Id., Ketlinschriften und Geschichtse Sorschung, ibid., 1878; G. Smith, Assyrian Hponym Canon, London, 1875; Wellhausen's article in Job, f. Deutsche Theol., 1875, pp- 607 sq.; Oppert, Salonen et ses Succcssewrs, Paris, 1877.

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leaders of the religious life of his nation. Under such circumstances, and amidst the universal dissolution of social order and morality to which every

page of his book bears testimony, the prophet was driven to the verge of despair (ix. 7),and only the sovereign conviction of J ehovahi's infinite love and tender compassion to His people, even in their faithlessness and sin, upheld lim in the sure hope of the final repentance and restoration of Israel, which finds such exquisitely pathetic expression in the closing sentences of his prophecy. The hypothesis of Ewald, that he was at last compelled by persecution to retire from the northern kingdom, and composed his book in Judea, rests mainly on an improbable exegesis of several passages, and derives no valid support from the fact that the prophet, to whom the ideal unity of all the tribes of Jacob and the legitimate sovereignty of the house of David are cardinal doctrines, follows the house of Judah with constant interest and growing acquaintance with its internal condition.

The most interesting problem of Hosea's history lies in the'interpretation of the story of his married life (chaps. j.-iii.). We read in these chapters that God's revelation to Hosea began when in accordance witha divine command he married a profligate wife Gomer, the daughter of Diblaim. 'Three children were born in this marriage and received symbolical names, illustrative of the divine purpose towards Israel, which are expounded in chap. i. In chap. ii. the faithlessness of Israel to Jehovah, the long-suffering of God, the moral discipline of sorrow and tribulation by which He will yet bring back His erring people and betroth it to Himself for ever in righteousness, love, and truth, are depicted under the figure of the relation of a husband to an erring spouse. The suggestion of this allegory lies in the prophet's marriage with Gomer, but the details are worked out quite independently, and under a rich multi- plicity of figures derived from other sources. In the third chapter we return to the personal experience of the prophet. His faithless wife had at length left him and fallen, under circumstances which are not detailed, into a state of misery, from which Hosea, still following her with tender affection, and encouraged by a divine command, brought her back and restored her to his house, where he kept her in seclusion, and patiently watched over her for many days, yet not readmitting her to the privileges of a wife.

In these experiences the prophet again recognizes a parallel to Jehovah's long-suffering love to Israel, and the discipline by which the people shall be brought back to God through a period in which all their political and

religious institutions are overthrown. Throughout these chapters personal narrative and prophetic allegory are interwoven with a rapidity of transition very puzzling to the modern reader; but an unbiassed exegesis can hardly fail to acknowledge that chaps. i. and ii. narrate an actual passage in the prophet's life. The names of the three children are symbolical, but Isaiah in like manner gave symbolical names to his sons,'ernbodying prominent points in his prophetic teaching (Shear-jashub, Isa. vii. 3, comp. x. 21; Maher-shalal-hash-baz, viii. 3). And the name of Gomer bath Diblaim is certainly that of an actual person, upon which all the allegorists, from the Targum, Jerome, and Ephrem Syrus downwards, have spent their arts in vain, whereas the true symbolical names in the book are perfectly easy of interpretation. That the ancient inter- preters take the whole narrative as a mere parable is no more than an application of their standing'rule that every- thing in the Biblical history is allegorical which in its literal sense appears offensive to propriety (comp. Jerome's proem to the book). But the supposed offence to propriety

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seems to rest on mistaken exegesis and too narrow a con- ception of the way in which the Divine word was com- municated to the prophets. There is no reason to suppose that Hosea knowingly married a woman of profligate character. The point of the allegory in i. 2 is plainly infidelity after marriage as a parallel to Israel's departure from the covenant God, and a profligate wife (n'21 nwx) is not the same thing with an open prostitute (ny). The marriage was marred by Gomer's infidelity; and the struggle of Hosea's affection for his wife with this great unhappiness—a struggle inconceivable unless his first love had been pure and full of trust in the purity of its object

—furnished him with a new insight into Jehovali's dealings |

with Israel. Then -he recognized that the great calamity of his life was God's own ordinance and appointed means to communicate to him a deep prophetic lesson. The recognition of a divine command after the fact has its parallel, as Wellhausen observes, in Jeremiah xxxii. 8.

This explanation of the narrative, which is essentially Ewald's, has commended itself to not a few recent expositors, as Valeton, Wellhausen, and Nowack. It has the great advantage of supplying a psychological key to the conception of Israel or the land of Israel (i. 2) as the spouse of Jehovah, which dominates these chapters, but in the later part of the book gives way to the personification of the nation as God's son. This conception has, indeed, formal points of contact with notions previously current, and even with the ideas of Semitic heathenism. On the one hand, it is a standing Hebrew usage to represent the land as mother of its people, while the repre- sentation of worshippers as children of their god is found in Num. xxi. 29, where the Moabites are called children of Chemosh, and is early and widespread throughout the Semitic field (cf. Trans. Bib. Arch., vi. p. 488; Jour. of Phil., ix. p. 82). The combination of these two notions gives at once the conception of the national deity as husband ofthe land. On the other hand, the designation of Jehovah as Baal, which, in accordance with the

antique view of marriage, means husband as well as lord and owner, was current among the Israelites in early times (see BAAL), perrens, indeed, down to Hosea's age (ii. 16). Now it is highly probable that among the idolatrous Israelites the idea of a marriage between the deity and individual worshippers was actually current and connected with the immo- rality which Hosea often condemns in the worship of the local Baalim, whom the ignorant people identified with Jehovah. For we have a Punic woman's name, SYAMwN, "the betrothed of Baal" (Euting, Pwnische Steine, pp. 9, 15), and a similar conception existed among the Babylonians (Herod., i. 181, 182). But Hosea takes the idea of Jehovah as husband, and gives it an altogether different turn, filling it with a new and profound meaning, based on the psychical experiences of a deep human affection in contest with outraged honour and the wilful self-degradation of a spouse. It can hardly be supposed that all that lies in these chapters is an abstract study in the psychology of the emotions. It is actual human experience that gives Hosea the key to divine truth. Among those who do not recognize this view of the passage, the controversy between allegory and literalism is carricd on chiefly upon abstract assumptions. The extreme literalists, of whom Dr Pusey may be taken as the modern representative in England, will have it that the divine command justified a marriage otherwise highly improper, and that the offensive circumstances magnify the obedience of the prophet. This is to substitute the Scotist and Neo-Platonic notion of God for that of Scripture. On the other hand, the allegorists, who argue that God could not have enjoined on His prophet a mar- riage plainly improper and fitted to destroy his influence among the people, are unable to show that what is repulsive in fact is fit subject for a divine allegory. A third school of recent writers, led by Hengstenberg, and resting on a thesis of John Smith, the Cam- bridge Platonist, will have it that the symbolical action was trans- acted in what they allow themselves by a contradictio in adjecto to call an objective vision. This view has been adopted by Fair- bairn (Prophecy, ch. v. sec. ii.). The recent Continental literature of the controversy is catalogued by Nowack in his Commentary, P. XXxvi.

It was in the experiences of his married life, and in the Spiritual lessons opened to him through these, that Hosea first heard the revealing voice of Jehovah (i. 2). Like Amos (Amos iii. 8), he was called to speak for God by an Inward constraining voice, and there is no reason to think that he had any

connexion with the recognized prophetic societies, or ever received such outward adoption to office a8 was given to Elisha. His position in Israel was one of tragic isolation. Amos, when he had discharged his

mission at Bethel, could return to his home and to his friends ; Hosea was a stranger among his own people, and his home was full of sorrow and shame. Isaiah in the gloomiest days of Judah's declension had faithful disciples about him, and knew that there was a believing remnant in the land. Hosea knows no such remnant, and there is not a line in his prophecy from which we can conclude that his words ever found an obedient ear. For him the present condition of the people contained no germ or pledge of future amendment, and he describes the impending judgment, not as a sifting process (Amos ix. 9, 10) in which the wicked perish and the righteous remain, but as the total wreck of the nation which has wholly turned aside from its God. In truth, while the idolatrous feasts of Ephraim still ran their joyous round, while the careless people crowded to the high places, and there in unbridled and licentious mirth flattered themselves that their many sacrifices ensured the help of their God against all calamity, the nation was already in the last stage of internal dissolu- tion. To the prophet's eye there was "no truth, nor mercy, nor knowledge of God in the land—nought but swearing, and lying, and killing, and stealing, and adultery; they break out, and blood toucheth blood" (iv. 1, 2). The root of this corruption lay in total ignorance of Jehovah, whose precepts were no longer taught by the priests, while in the national calf-worship, and in the local high places, this worship was confounded with the service of the Canaanite Baalim. Thus the whole religious constitution of Israel was undermined. And the political state of the realm was in Hosea's eyes not more hopeful. The dynasty of Jehu, still great and powerful when the prophet's labours began, is itself an incorporation of national sin. Founded on the bloodshed of Jezreel, it must fall by God's vengeance, and the state shall fall with it (i. 4, iii. 4). This sentence stands at the head of Hosea's predictions, and throughout the book the civil constitution of Ephraim is represented as equally lawless and godless with the corrupt religious establishment. The anarchy that followed on the murder of Zachariah appears to the prophet as the natural decadence of a realm not founded on divine ordinance. The

nation had rejected Jehovah, the only helper. And now the avenging Assyrian is at hand. Samaria's king shall pass away as foam on the water. Fortress and city shall fall before the ruthless invader, who spares neither age nor sex, and thistles shall cover the desolate altars of Ephraim. But the ultimate theme of all prophecy is not judgment but redeerming love, and the deepest thought of every Hebrew seer is the sovereignty of Jehovah's grace in Israel's sin. Hosea could discern no faithful remnant in Ephraim, yet Ephraim in all his corruption is the son of Jehovah, a child nurtured with tender love, a chosen people, whose past history declares in every episode the watchful and patient affection of his father. And that father is God and not man, the Holy One who will not and cannot sacrifice His love even to the justest indignation (chap. xi). To the prophet who knows this love of Jehovah, who has learned to understand it in the like experience of his own life, the very ruin of the state of Israel is a step in the loving guidance which makes the valley of trouble a door of hope (ii. 15), and the wilderness of tribulation as full of promise as the desert road from Egypt to Canaan was to Israel of old. Of the manner of Israel's repentance and conversion Hosea presents no clear image, nay, it is plain that on this point he had nothing to tell. The certainty that the people will at length return and seek Jehovah their God and David their king rests, not on any germ of better things in Israel, but on the invincible supremacy of Jehovah's love, And so the two sides of his prophetic declaration, the passionate denuncia- tion of Israel's sin and folly, and the not less passionate XII. — 38

tenderness with which he describes the final victory of divine love, are united by no logical bond. The unity is one of feeling only, and the sob of anguish in which many of his appeals to a heedless people seem to end, turns once and again with sudden revulsion into the clear accents of evangelical promise, which in the closing chapter swell forth in pure and strong cadence out of a heart that has found its rest with God from all the troubles of a stormy life.

Traditions about Hosca.—Beért, the prophet's father, is identified by the Rabbins with Beérah (1 Chron. v. 6), a Reubenite prince carried captive by Tiglath Pileser. This view is already expressed by Jerome, Quest. in

Paralip., and doubtless underlies the state- ment of the Targum to Chronicles that Beérah was a prophet. For it is a Jewish maxim that when a prophet's father is named, he too was a prophet, and accordingly a tradition of R. Simon makes Isa, viii. 19, 20 a prophecy of Beéri (Kimchi in loc. ; Leviticus Rabba, par. 15). According to the usual Christian tradition, how- ever, Hosea was of the tribe of Issachar, and from an unknown town, Belemoth or Belemon (pseudo-Epiphanius, pseudo-Dorotheus, Ephrem Syr., ii. 284 ; Chron. Pasch., Bonn ed., i. 276). As the tradition adds that he died there, and was buried in peace, the source of the story lies probably in some holy place shown as his grave. 'There are other traditions as to the burial-place of Hosea. A Jewish legend in the Shalshelet hagqqabala (Carpzov, Introd., pt. iii, ch. vil. § 3) tells that he died in captivity at Babylon, and was carried to Upper Galilee, and buried at ND¥, that is, Safed (Neubauer, Géog. du Talmud, p. 227); aud the Arabs show the grave of Neby 'Osha, east of the Jordan, near Es-Salt (Badeker's Palestine, p. 887; Burckhardt's Syria, p. 358).

Literature.—Of the older commentaries on Hosea which have been fully catalogued by Rosenmiiller in his Scholia, it is sufficient to name, as books still practically useful, Le Mercier's Latin anno- tations, embodying a translation of the chief rabbinical expositions, and the English commentary of E. Pococke, Oxford, 1685, which is not surpassed in learning and judgment by any subsequent work. Among recent expositions the most important are those in Ewald's Propheten, Bd. i. (2d ed., Gottingen, 1867 ; Eng. trans., London, 1876); Hitzig's Kleine Propheten (3d ed., Leipsic, 1863); Keil's Kleine Propheten (Leipsic, 1866; Eng. trans., Edinburgh, 1868) ; Pusey's Minor Prophets, London, 1860 ; Reuss's Bible, part ii. (Paris, 1876); the Speaker's Commentary, vol. vi. (by Huxtable, London, 1876); Heilprin's Historical Poctry, vol. li. (New York, 1880); and the separate publications of Simson (Hamburg and Gotha, 1851), Wiinsche (Leipsic, 1868), and Nowack (Berlin, 1880). The last gives a list of recent Continental commentaries and mono- graphs, to which may be added Houtsma's " Bijdrage " (Theol. Tijdsch., 1875, p. 55 sg.). The English commentary of Williams (London, 1866) is of little importance ; Schmoller's commentary in Lange's Bibelwerk (1872; Eng. trans. , 1874) is adapted for homi- letical purposes. The theology of Hosea is ably discussed

by Duhm, Theol. der Propheten (Bonn, 1875), with which an essay by Smend (Stud. u. Krit., 1876) may be advantageously compared.

Texts and Versions.—The best edition of the Massoretic text is that with notes by S. Baer (Leipsic, 1878). From the great fac- simile of the Codex Babylonieus Petropolitanus Hosea and Joel have been separately published (St Petersburg, 1875). The most recent helps to the use of the VSS. are Nestle's appendix to the 6th edition of Tischendorf's Scptuagint (Leipsic, 1880), Lagarde's edition of the Targum from the Cod. Reuch. (Leipsic, 1872), Ceriani's facsimile editions of the great Ambrosian MSS. of the Syro-Hexaplar (Milan, 1874) and Peshito (Pars iii., Milan, 1879), and Field's Hexapla (vol. ii. 1870). An Arabic version directly translated from the Hebrew was published by Schroeter from a Bodleian codex in Merx's Archiv, 1869. A convenient and acces- sible edition of the Hebrew text of Hosea, with Targum and Rab- pinical commentaries, is H. v. d. Hardt's reprint (Gottingen, 1775) of R. Stephen's Paris text of 1566. , (W. BR. S.)

HOSHANGABAD, a British district in the chief com- missionership of the Central Provinces of India, lying be- tween 21° 40' and 22°59' N, lat. and between 76° 38' 30" and 78° 45' 30" E. long. It is bounded N. by the Narbada (Nerbudda), which separates it from the territories of Bhopal, Sindhia, and Holkar; E. by the Dudhi river, dividing it from Narsinghpur district; 8. by the districts of Western Berar, Betul, and Chhindwara ; and W. by Nimar. Hoshangabid may be described as a valley of varying breadth, extending for 150 miles between the Nerbudda and the SAtpura mountains. 'The soil consists chiefly of black basaltic alluvium, often more than 20 feet deep; but along the banks of the Nerbudda the fertility of the land compen-

sates for the tameness of the scenery. Towards the west, low stony hills and broken ridges cut up the level ground, while the Vindhyds and the Sdtpuras throw out jutting spurs and ranges. In this wilder country considerable regions are covered with jungle. On the south the lofty range which shuts in the valley is remarkable in mountain scenery, surpassing in its picturesque irregularity the Vindhydén chain in the north, Many streams take their rise amid its precipices, then, winding through deep glens, flow across the plain between sandy banks covered with low jungle, till they swell the waters of

the mighty Nerbudda, None of the streams are of any importance except the Tawa, which is interesting to the geologist on account of the many minerals to be found along its course. The boundary rivers, the Nerbudda and Tapti, are the only con- siderable waters in Hoshangabad. At Charwd a dense low jungle extends over a large region, but by far the finest timber is found at Bori and Denwa.

The census of 1877 showed a population of 463,625 (Europeans, 86; Eurasians, 10; aboriginal tribes, 89,029; Hindus, 364,679; Mahometans, 21,765; Buddhists and Jains, 1132). There are only four towns with a population exceeding 5000, viz., Hoshan- gabad, 11,613; Harda, 9170; Seoni, 7579; and Sohagpur, 7552. The total revenue in 1876-77 was £69,842; the total cost of officials and police, £14,733. There were 11 civil and revenue judges, and 22 magistrates. The number of police was 582. There were 94 Government schools, attended by 4024 pupils.

Of the total area of 4376 square miles only 1442 are culti- vated, and of the portion lying waste 825 are returned as culti- vable; 2455 acres are irrigated entirely by private enterprise. Wheat forms the staple crop of the district ; the other products are inferior grains, cotton, and sugar-cane. Hoshangabad does a con- siderable export trade in agricultural produce, receiving in return English piece-goods, spices, cocoa-nuts, salt, and sugar. The extent of made roads in Hoshangabad is returned at 498 miles. The Great Indian Peninsula Railway intersects the whole district from east to west, with stations at the principal towns. Besides roads and railway, the Nerbudda, with its tributaries, supplies means of communication by water for 150 miles during part of the year. The district is generally free from violent alternations of temperature, hot winds are rare, and the nights during the sultry weather and rains are always cool. The rainfall is exceedingly variable, ranging between the limits of 40 and 60 inches for the year. The prevailing diseases are fevers and bowel complaints. In 1876 five charitable dispensaries afforded medical relief to 18,206 in-door and out-door patients.

History.—Little is known of the history of Hoshangabad prior to the Marhattd invasion. When the Mughal troops occupied Handia, the eastern part of the district inhabited by Gonds, who still retain their possession, maintained a rude independence. About 1720 Dost Muhammad, the founder

of the Bhopal family, captured the town of Hoshangabad, and annexed a considerable territory with it. In 1750 Rajé Raghuji Bhonsla of Nagpur reduced the country east of Handid and south of the Nerbudda, except the portion held by Bhopal. In 1795 the rival dynasties of Bhopal and Nagpur came into conflict, and the town and fort of Hoshangabad were captured by the Nagpur forces. In 1802 the Bhopals retrieved their loss. The Nagpur army again besieged the fort, but failed in their attack, and contented themselves with burning the town. In 1809 Hoshangabad was again assailed by a Nagpur force, and the Bhopals, finding their communications with Bhopal cut off, sur- rendered. Overcome by these disasters, the Bhopals called in the Pindharis to their help, and till they were finally extirpated in 1817 the whole of this fertile region became a prey to ravage and massacre. Under the order which the British Government has restored, the prosperity of the country is gradually returning. In 1818 that part of the district held_by Nagpur was ceded under an agreement. In 1844 the-region of Harda Handia was made over by Sindhid in part payment of the Gwalior contingent, and by the treaty of 1860 became British territory.

HosHancApsp, the headquarters town of the above district, 22° 45’ 30” N. lat., 77° 46° E. long., is situated on the south side of the Nerbudda. Population (1877) 11,613. It is supposed to have been founded by Hoshang Shah, the second of the Ghori kings of Malw4; but it remained an insignificant place till the Bhopal conquest about 1720, when a massive stone fort was constructed, with its base on the river, commanding the Bhopél road. It sustained several sieges, and passed alternately into the hands of the Bhop4l and Nagpur troops. From 1818 it

has been the residence of the chief British officials in charge of the district. A church has been built, and a first-class jail constructed. The town has a dispensary and school- houses. It is the chief seat of the English piece-goods trade of the district, and has a brisk trade in cotton, grain, and bills of exchange.

HOSIERY. Under this name is embraced a wide range of manufactured textiles, which are classed together more on account of their manner of fabrication than from simi- larity of application or use. The term, as is quite

obvious, has its origin in hose or stockings; but although stockings continue to be one of the staples of hosiery, that department is only one of a very numerous and diversified range of applications of the entire industry, it having been officially stated that not fewer than 5000 distinct articles are made in the trade. All kinds of hosiery proper are made by the process of knitting, and the industry has principally to deal with the fabrication of knitted under- clothing.

The art of knitting is the youngest of all the important textile manufactures, and, compared with the others, its origin is quite modern. No certain allusion to the art occurs before the beginning of the 15th century. In an Act of Parliament of Henry VII. (1488) knitted woollen caps are mentioned. It is supposed that the art was first practised in Scotland, and thence carried into England, and that caps were made by knitting for some period before the more difficult feat of stocking-making was attempted. In an Act of Edward VI. (1553) “knitte hose, knitte peticotes, knitte gloves, and knitte slieves ” are enumerated, and the trade of hosiers is, among others, included in an Act dated 1563. Spanish silk stockings were worn on rare occasions by Henry VIIL, and the same much-prized articles are also mentioned in connexion with the wardrobe of Edward VI.

The peculiarity of knitting consists in the use of a single thread for the entire texture, and in the formation therewith of a singularly elastic yet strong and firm looped web.

The process of hand-knitting is universally known, and the endless details of fancy stitches and loops whereby ornamented work can be produced do not come within the scope of hosiery proper. While a vast quantity of the best and most comfortable hosiery is made witli implements so simple and inexpensive as four knitting wires or needles, the manufacturing industry is carried on with machinery of unsurpassed ingenuity and complexity. Moreover, domestic knitting machines, mostly of American origin, have of late years been introduced, and, although these can never be expected to attain the popular favour of the sewing-machine, yet they have been widely adopted.

In the year 1589 the stocking-frame, the machine which mechanically produces the looped stitch in hosicry, was invented by the Rev. William

Lee, a graduate of Cambridge, and native of Woodborough, near Nottingham. The fun- damental prin- Fig. 1. ciple of the apparatus consists in the substitution of a scpa- rate hooked or barbed needle for the support and working of each loop, in place of the system whereby an indefinite number of loops are skewered on one or more wires or needles. The method on which the machine is worked will be easily comprehended by aid of the accompanying diagram (fig. 1), which represents a few of Lee's peculiar barbed needles from a frame with yarn in process of knitting. At R is seen a thread of yarn passed over the needle stalks

and within the terminal hooks. The yarn, it will be ob- served, is waved or depressed between each pair of needles, whereby sufficient yarn is secured to form the separate loops of uniform size, and thus produce a regular equal fabric. The waving or depression of the yarn is produced by allowing thin plates of shaped metal termed sinkers to fall between each pair of needles after the yarn has been thrown across the whole range, and these sinkers, according to their depth of fall, carry down material for a large or small loop as the case may be. The elastic points of the needle-hooks are next pressed into a groove in the stem by means of a presser bar which acts on the whole row of barbs, and thus a range of temporarily closed metallic hooks is formed, through which the waved yarn is threaded. Over these hooks the loops of the already formed web SS have only to be drawn to form with the material R a new serics of loops ; the pressure is then relieved, and now R forms a new row in the work in place of S, and the operation is ready to be repeated for a succeeding row. It is not necessary here to enter into a description of the various mechanical devices by which Lee perfected the complex movements of his stocking-frame. It is sufficient to say that so perfectly did he succeed in his adaptations that to this day the essential features of his machine continue in use for the class of work to which he applied it. At first Lee was only able to work a flat even web, which when joined at the selvages made an unshapen cylinder ; but he soon learned to shape the work at pleasure by removing loops from time to time from the outer edges of the web for narrowing or taking in, and to reverse that process for widening or letting out.

Neither Lee nor any of his relatives during their lifetime reaped an adequate reward for the great boon he conferred on mankind. His stocking-frame came gradually into extensive use, and an important industry was thereby created. No improvement of essential consequence was effected on the apparatus till in 1758 Mr Jedediah Strutt, originally a Derbyshire farmer, adapted it to the production of ribbed work. Mr Strutt's invention consisted of an addition to the original frame, which could be brought into use or not according as plain or ribbed work was desired. The addition consisted of a set of ribbing-needles placed at right angles to Lee's plain needles, and at the intervals required for producing ribbed courses. On the completion of a row of plain loops, the rib needles are raised ; at their respective intervals they lay hold of the last-formed loop, and, bringing that through the loop which was on the rib- needle itself before, they give an additional or double loop- ing or twisting, which reverses the line of chaining, and produces the ribbed appearance characteristic of this variety of work. For his invention Strutt in conjunction with his brother-in-law Woollett, a hosier, secured a patent, and they commenced the manufacture at Derby, where their "'Derby-ribs " became exceedingly popular. The idea of adding parts to the plain frame of Lee, thus originated by Strutt, became the fertile source of a great number of the later adaptations and modifications of the apparatus. Strutt's invention was the starting-point of a great and most honourable business in the hands of himself and his family, and the elevation of his grandson, Lord Belper, to the peerage was a direct tribute to the industrial interests of the nation.

Down till almost the middle of this century only a flat web could be knitted in the machines in use, and for the finishing of stockings, &c., it was necessary to seam up the selvages of web shaped on the frame (fashioned work), or to cut and seam them from even web (cut work). The introduction of any device by which seamless garments could be fabricated was obviously a great desideratum, and it is a singular fact that a machine capable of doing that

in a perfect mauner should have been patented in 1816, while it was not seen in actual use in Nottingham, the capital of the hosiery trade, till 1845.

The inventor of the round stocking-frame was no other than Sir Marc I. Brunel, who in 1816 patented his machine under the name of the Z'ricoteur. In Brunel's apparatus the needles are fixed on the rim ofa rotating wheel. The yarn is delivered, the loops formed, the beards of the needles pressed down, and all the other operations performed by means ofa series of arms and wheels which act on the circumference of the

ring or circle of needles. As the working of such a machine

is continuous, and as several sets of wheels and arms may |

work simultaneously around a ring of sufficient diameter, Brunel's machine was really capable of doing work with very great rapidity. He appears not, however, to have regarded his invention as worthy of being pushed into notice, and it was not till 1845 that in an improved form it was brought forward as an original invention by Mr Peter Claussen, who, however, reaped no profit from his undoubted ingenuity and merit.

Another improvement of very great importance in the hosiery trade was effected through the invention of the tumbler needle, patented by Mr M. Townsend in 1858. The tumbler needle (fig. 2) consists of a stem some-what bulged uear the point. The bulged part contains a groove in which there is hinged a short pin. The pin is so placed that, when turned to the hooked or curved point, its own point falls into a spoon-like indent, thus forming a smooth metal loop. When reversed the pin falls into the groove of the stem, making a smooth stalk. In this way, as will be clear from the figure, when the yarn is caught in the curved point of the needles, the already formed loops in being brought forward to pass off the needles carry forward the hinged – pin and close the steel loop, over which they pass quite smoothly. The newly- fornied loop then pushes over the tumbler pin into its groove, and the hook is once more ready to seize the yarn as it passes along.

Fig. 2. The tumbler needle and the revolving frame to- gether form the basis of the various domestic machines

which are now in the market. In machines in which the tumbler needle is adopted the needles themselves move in grooves, each being carried

forward in succession as the feed of yarn comes opposite its position.

The varieties of frame now in use are embraced under narrow hand-machines, wide hand-machines, power rotary- frames, and power round-frames, the first two being exclu- sively used in the houses of the operatives, while the latter are factory machines driven by steam. “It will be an explanation of some interest,” says the late Mr Felkin, in a paper before the British Association (Nottingham meeting, 1866), “to those who are strangers to the process of these trades, to state that the hand-knitter of a stocking, if assiduous and clever, will knit 100 loops a minute, and that Lee on his first machine made 1000 of worsted, and on his second 1500 loops of silk per minute. The visitor may now see on the round frame, patented by Brunel in 1816, but since modified and improved, without any effort but to supply yarn, 250,000 loops of the finest textures made, in various colours, per minute, with safety,—an advance of 2500-fold upon the hand-knitter.”

The principle centre of the hosiery trade of the United Kingdom is Nottingham town and county ; and in Leicester- shire and Derbyshire the industry is also of importance. It was computed by Mr Felkin that the English hosiery trade gave employment in 1866 to about 150,000 persons, of whom about 100,000 were occupied in the preliminary

and finishing operations of winding, cutting, mending, seaming, &c. At that time the industry was largely domestic, frames being hired out to operatives; but the trade tends steadily towards factories. According to a par- liamentary return issued 31st July 1879, there were in the United Kingdom 186 hosiery factories, giving employment to 14,992 persons, 6683 males and 8309 females. Of these, 175 factories were in England, 10 in Scotland, and 1 in Ireland; and centred in Nottingham, Leicester, Lincoln. Rutland, and Derbyshire there were 173 of the establish- ments employing 13,680 of the operatives. The exports in 1878, which of course represent only a small proportion of the total output, amounted in value to £860,318. In the United States the industry is conducted on a manufacturing scale in New York State, Massachusetts, New Hampshire, Rhode Island, Vermont, Conncctcicut, and Maine; besides which family machines are extensively employed in that country. In Saxony also the trade is an important in-

dustrial feature, and there its development has been strik- ingly rapid. Throughout France, Spain, and Italy there are numerous frames at work, and indeed the trade may be regarded as in some degree commensurate with civilized industrial communities. (5. PA.)

HOSIUS, or Ostus, bishop of Cordova, the friend of Athanasius, and the favourite of Constantine, was born about 256 A.D.,most probably at Cordova, although from a passage in Zosimus it has sometimes been conjectured that he was believed by that writer to be a native of Egypt. Elected to the see of Cordova before the end of the 3d century, he narrowly escaped martyrdom in the persecution of Maximian (303-305) ; in 305 or 306 he attended the council of Illiberis or Elvira, his name appearing second in the list of those present ; and in 313 we find him already at the court of Constantine, he being expressly mentioned by name in a constitution directed by the emperor to Ceecilianus of Carthage in that year. In 323 he was the bearer and not impossibly the writer of Constantine's letter to bishop Alexander of Alexandria and Arius his deacon, designed to promote the cause of peace ; and, on the failure of the negotiations in Egypt, it was doubtless with the active concurrence of Hosius that the council of Nice was convened, He certainly took part in its proceedings ; according to some Roman Catholic writers he presided, and did so as representing the bishop of Rome, but both these statements are made on totally inadequate grounds. Equally doubtful is the assertion that he was the principal author of the Nicene creed ; but manifestly he powerfully influenced the judgment of the emperor in favour of the orthodox party. After a period of retirement in his diocese, Hosius presided in 347 at the fruitless synod of Sardica, which showed itself so hostile to Arianism ; and afterwards he spoke and wrote in favour of Athanasius in such a way as to bring upon himself a sentence of banislhi- ment to Sirmium (355). From his exile he wrote to Constantius IL. his only extant composition, a letter not unjustly characterized by Tillemont as displaying gravity, dignity, gentleness, wisdom, generosity, and in fact all the qualities of a great soul and a great bishop. Subjected to continual pressure, the old man, who was approaching, if he had not already passed, his hundredth year, was weak enough to sign the Arian formula adopted by the second synod of Sirmium in 357. Shortly afterwards he was permitted to return to his diocese, where he died in 359. Apart from some human touches of worldliness and latterly of weakness, Hosius was a consistent

and creditable as well as prominent defender of orthodoxy, and as such he is recognized even by those who most bitterly resent his apostasy.

See Tillemont, Mémoires, vol. vii. 300-321 (1700), and Hefele, Concilicngeschichte, vol. i.

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HOSPITAL is derived from the Latin hospitalis (adj.), and this again from the noun hospes, a host or guest. The place in which a guest was received was in Latin hospitium (hence the French, hospice), but in course of time the adjective became used as a noun, and the words hospitalis, hospitale, and hospitalia were adopted in the same sense as hospitiwm, by dropping the nouns domus, cubiculum, or cubicula. In this sense Vitruvius uses hospitalia to mean the chambers where guests were received. The English word hospital (often reduced to spital) comes from the old French hospital, now hépital, of which Littré says that it was remade from the Latin many centuries ago, although originally hospitalis had given rise quite regularly to hostel, now hétel. The three words, hépztal, hospice, and hétel, although from the same source, are used now in very different meanings, the first being usually re- stricted to establishments for temporary occupation by the sick and hurt, for the purposes of medical and surgical treatment ; the second (hospice) to places for permanent occupation by the poor, the infirm, the incurable, or the in- sane; and the last (Adétel) to dwellings, either public or private, for ordinary occupation. To the last, however, there is one exception, viz., when the term Aétel-Dieu (that is, hdtel de Dieu) is applied to the chief hospital or infirm- ary of a townor city. In English we have no equivalent to hospice, so that the word hospital has been, and is still, used in the double sense, viz., as a place for medical treat- ment, and also as a retreat or almshouse for the poor, the infirm, &c. On the other hand the word ¢njfirmary, which originally meant a place or room set apart in an establish- ment (such as a monastery) for the reception of the sick members, and also for those who were through age or infir- mity incapacitated from work, is not infrequently employed in the same sense as hospital, namely, as a separate estab- lishment for the treatment of the sick.

Although in ancient times there may have been places for the reception of strangers and travellers, it seems at least doubtful if there was anything of

the nature of a charitable institution for the reception of the sick, such as existed after the introduction of Christianity. The Bethesda of Scripture (Aramaic, from 3, a house, and S705, charity) was probably no more than a collection of mere sheds built round the pool to whose waters miraculous healing powers were attributed. Among the Greeks there seems little evidence of the existence of estab- lishments for the sick; evwv, described by Plato as a place of shelter for travellers, is also explained as a vogo-Kouetov, or hospital, by Suidas; but that lexicographer is a late writer (10th or 11th century a.p.), and the word voco- kometov itself does not appear to be earlier in use than the 4th century a.D. The word is used by St Jerome in the 4th century, and in the Code of Justinian in the 6th, from which it is possible Suidas may have got his definition, although evodoyxefov is distinctly used by Jus- tinian as a shelter for travellers, as indeed its name implies. Even for sick and wounded soldiers but little provision seems to have been made, although we do not know much of the valetudinarium, which appears to have existed in a Roman camp. That the Romans had a medical staff has been shown by the monuments discovered in Great Britain, and the subject has been carefully examined by the late Sir James Simpson (Z'ransactions of the Society of Antiquaries of Scotland, Edinburgh Monthly Journal of Medicine, &c.). Among the earliest hospitals on record are that said to have been founded by Valens in Cesarea 370-80 a.D., and the one built at Rome by Fabiola, a Roman lady and friend of St Jerome, although like most others of that and even later times both were probably almshouses as well.

The origin of our present hospitals must, however, be looked for in the monastic arrangements for the care of the

sick and indigent. Every monastery had its wjirmaria, managed by an infirmartus, in which not only were sick and convalescents treated, but also the aged, the blind, the weak, &c., were housed. In course of time separate build- ings were erected for the purpose, and special revenues, augmented from time to time by benefactions, appropriated for their maintenance. In numerous instances, however, the hospitals were converted into benefices by the priests, and the scandal had to be dealt with by the authority of gen-

eral councils, which, like that of Vienne, forbade the prac- tice. About the earliest distinct record of the building of a hospital in England is in the life of Lanfranc, arch- bishop of Canterbury, who in 1080 founded two, one for leprosy and one for ordinary diseases. The former is re- ferred to in the Vie de St Thomas le Martyr, a work of the 12th century. The establishments for the sick remained in the hands of the clergy until the Reformation, when some of the monasteries and church property were appropriated and set apart for the use of the sick. Of those the most noted instances were St Bartholomew's in Smithfield, St Thomas's in the Borough, Bethlehem or Bedlam, Bride- well, and Christ's Hospital, which were long known as the "Five Royal Hospitals." St Bartholomew's was a priory, founded by Rahere, a minstrel, in 1102, and the ancient hospital chapel is still the parish church of St Bartholo- mew the Less. It was handed over to the citizens of Lon- don as a hospital in 1547 ; it escaped the fire of 1666, and was rebuilt in 1729. St Thomas's was founded by Rich- ard, prior of Bermondsey, in 1213, surrendered in 1538, and purchased by the mayor and citizens of London in 1551, and opened for 260 sick. It was incorporated in 1553, rebuilt in 1693, added to in 1732, removed tempo- rarily to Surrey Gardens in 1862, and finally transferred to Lambeth, its present site, in 1871. Bethlehem (or Bedlam) was a priory, founded by Simon Fitzmary, in 1247, In 1547 it was handed over by Henry VIII. for the reception of lunatics. It was rebuilt. in 1676, and wings were added in 1733. The present building was constructed in 1810. Bridewell and Christ's Hospital early ceased to be receptacles for the sick. (For further information regarding charitable institutions see ENGLAND, vol. viii. p. 253.)

But the great movement in hospital building took place in the 18th century, and the following table from Dr Steele's paper, "' On the mortality of Hospitals" (Howard prize essay for 1876), gives a list of the chief institutions founded during that period :—

cic Odd Sad London. 225 Provincial, [223 Trish. Ses Aas Ams AMS WIESUNMIMSUCT) << 5.000) LLO [XOTK .s.ccccceesses| LeL0 Dublin, GUY Sieectss <=. D Salisbury .....) 1716 || Jervis Street .....) 1726 St George's ..... Cambridge .....| 1719 || Steevens's.....| 1733 EQNGONG cc sesscses.s|| 1 T40N || BIASEOL ~~.0… 0600006 1735 || Mercer's …….{ 1734 Middlesex ……..| 1745 || Edinburgh …….! 1736~~

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Ducange's Glossary, s.v. " Infirmaria." >

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During the present century the increase of hospitals has continued, seven general and many special having been founded in London alone. Dr Steele gives statistics of 27 metropolitan hospitals, having an aggregate of nearly 6000 beds, and receiving about 46,000 in-patients annually. This does not take into account the infirmaries attached to the workhouses or the metropolitan asylums hospitals. In addition to this probably from ten to twelve times the number of out-patients are treated in the course of the

ear. ' Hospitals are usnally divided into General and Special.

In General Hospitals cases of all kinds are admitted in some, whilst in others certain classes are excluded. Thus | cases of contagious zymotic disease are not adinitted now in many instances, especially in London since the estab- lishment of the metropolitan asylums, fever and small- pox hospitals. Lying-in cases, vencreal cases, &c., are also | frequently excluded.

Special Hospitals are of various kinds, such as lying-in hospitals, ophthalmic, lock (for venereal diseases), cancer, consumption, é&c., besides fever and small-pox hospitals. At the end of the last and begiuning of this century fever hospitals were generally called “ houses of recovery,” with a view of not alarming the people too much who had to resort to them. Special hospitals are also set apart for the treatment of diseases of children.

Besides the various civil hospitals there are also naval and military hospitals for the cure of sailors and soldiers.

Although hospitals have been intended as a blessing and benefit to the poor, they have too often proved the reverse, on account of the ignorance, on the part of their adminis- trators, of the true principles of health. So much was this the case formerly that it has been not infrequently debated | whether hospitals are or are not gigantic evils; and even where it is admitted that they are of value in cases of actual disease, it is still doubtful if they are really of benefit in cases of confinement. It may be of use to consider briefly the statistics of mortality at different times and in different places. It is very difficult to compare former death-rates with present or recent if we consider cases in bulk, because previous to the present century it was but little the cnstom to classify cases ; so that a preponderance of surgical cases might exist at one period and of medical at another, with a corresponding variation of the death-rate. Of course in some exceptional instances we can point to remarkable dif- ferences due to known causes of unhealthiness. Thus in the Hétel-Dieu of Paris, in the last century, a terrible mor- tality occurred, amounting to 1 in 44, or 220 per 1000 (Tenon) ;—and in the British hospitals at Scutari the mor- tality reached between 400 and 500 per 1000. In both of those cases there was inordinate crowding, such as is hardly likely to be met with again, But in dealing with ordinary hospitals there are so many modifying causes that the comparison, without careful analysis, may be mislead- ing. Thus Dr Steele has shown that in the last century (1730-1800) the death-rate of St Thomas’s was 86 per 1000, whilst that of Guy’s was 119; but this, as he points out, may have arisen from tlie latter being looked upon as an asylum for incurables. In 1875 the death-rates of the general hospitals in London ranged from 72 per 1000 in the Royal Free to 127 in King’s College ; in the Edinburgh Royal Infirmary it was 92, aud in the Glasgow 118. But it is when we examine the mortality of

special cases that the most instructive lessons are to be learned ; and the best for this purpose are surgical cases and lying-in cases. From these we gather that the mortality is pretty gencrally in the ratio of the size of the hospital and the consequent aggregation of patients, the crowding together of patients in the wards, the deficiency of ventilation, defective sewer- age arrangements, and the want of constant attention to |

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the details of cleanliness. Thus Sir James Simpson showed in his paper on “ Hospitalism ” the following statistics of mortality from amputations :—

Deaths per 1000. St Bartholomewis: cccoscccctes oe ceses eee

London Hospital, Whitechapel Guy’s Po) 2 aa aE eee oon ooccnne auc tisccncoo ae Nine London hospitals Royal Infirmary, Edinburgh

Bee e ewe tere cere eh ees eene sss eee setae ettesenstece

On the other hand, amputations in country practice give

a death-rate of only 108 per 1000.

Comparing the results with the size of the hospital, that

is, the aggregation of cases, we find :— Deaths per 1000. Large Parisian hospitals, with more than 600

beds: (RU MBSO% i. ices nicaaasicgeisccaguaesh ee 620 English hospitais, 301 to 600 beds …..... 410 ‘ yO ea, ea 300

i 5, MOL tomes 4 hike 230

s3 is Br UOML OU Sy ctuks ooune 180 Cottage hospitals under 25 beds ….. ..... . 140 Isolated rooms in country practice …..... 108

The question of lying-in cases is even more remarkable. Dr Lefort, having collected the statistics of 888,302 de- livered in hospitals, and of 934,781 delivered at home, shows that in hospitals 35 per 1000 die, and at home 43.

Dr Stcele gives the statistics of the four great lying-in hospitals of London, compared with the “extern-maternity” charities of Guy’s, St Bartholomew’s, and St Thomas’s :—

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Deaths per

Ta00 I 98-2 | 15°7 | 148 | 18°53 | 491 | S1 | 885

Baron Meydell, chief of the sanitary department of St Petersburg, has shown that in the largest lying-in hospital there, in which 2000 women are confined in a year, the death-rate is from 30 to 40 per 1000; in the second, in which about 1000 women per annum are received, only 25 die ; in the third, where 400 are received, only 20 die per 1000; in the small detached asylums of 2 or 3 beds, of which there are 11 in different parts of the city, giving accom- modation to 1600 women per annum, or about 155 each, only 9 per 1000 die; whilst amongst those confined in their own homes, including the poorest and most wretched, only 5 per 1000 die (Rapport du Congrés International d’Hygiéne et de Sauvetage, Brussels, 1876, vol. i. p. 226). These numbers correspond with the observations above.

It can also be shown that outbreaks of disease are coin- cident with individual overcrowding, whether the hospital be large or small. Thus the terrible mortality of the Hotel- Dieu of Paris in the last century was due as much to actual overcrowding as to the enormous aggregation of patients. The extraordinary spectacle was to be seen there of two or three small-pox patients, or several surgical cases, or some- times even four parturient women, lying in one bed. A large proportion of the beds were purposely made for four patients, and six were frequently crowded in, In the Salle St Charles and St Antoine there were 139 large beds (in- tended for four patients each, but often holding six), and 38 small beds for one patient each. Those beds were gene- rally full, giving under ordinary conditions 558

patients, and in times of pressure 836. To this might be added the Salle St Roch, opening directly from and really forming part of the great ward ; this contained 35 large beds and 3 small,—normal number of patients 143, with a possible increase to 213. This gives a grand total of 701 patients as a normal amount, with a possible increase to 1049.

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There was thus collected in one enormous ward a larger number of patients than any hospital in England contained altogether, if we except the Royal Naval Hospital at Has- lar. In addition, however, to the above inordinate num- ber, there were in the three stories placed above this great ward 1926 patients, which number might be increased to 2596,—without reckoning the serving staff of the institu- tion ;—or (including the wards on the Pont Double) a total in one block of building equal to 3418, which might be increased to 4320. The law forbade the hospital authori- ties to refuse admission to any one, and in 1773 there were 5000 patients in the hospital, which occupied a space of little more than 3 English acres,—giving a total gross area of only 30 square feet per head. The gross area per bed of the modern Hotel-Dieu is just ten times this amount, being 311 square feet, according to M. Tollet ; but even this is much too small, 100 square metres (1076 square feet) being the minimum proposed by Tollet, who estimates the general average per inhabitant of Paris at 430 square feet, whereas that of London is nearly double. We cannot point to any such overcrowding in England as that of the old Hétel-Dieu, but in many cases there has been enough to produce very grave results. The ill effects are seen in outbreaks of erysipelas, hospital gangrene, and sur- gical fever among surgical cases, and in puerperal fever in lying-in cases, —whilst in all communicable diseases the danger of spreading is greatly intensified. It was observed in 1877 in the General Lying-in Hospital, the year before it was closed for alterations, that when only two or three women were in a ward, puerperal disease rarely showed it- self, but that when, in consequence of pressure of applica- tions, five or six were put in, disease generally broke out. Similar results have been observed elsewhere.

Another great cause of mortality has been inefficient ven- tilation. If we can scatter our sick population and give them individually plenty of space in

their wards, we shall have done much,—but, if we do not also change the air sufficiently often we may still have evil results with all our care. Formerly no arrangements were made for ventilation in hospitals, schools, barracks, churches, or indeed in any buildings whatsoever. An immense deal remains to be de- sired in this direction still, but in recent hospitals, at least, more or less efficient means have been introduced, whilst efforts have been made to improve the conditions of the old. The want of fresh air aggravates all diseases, increases the power of infection, retards the convalescence, and hastens the death of patients ; moreover, it lowers the tone of the healthy, and is the most potent of all agents in the propagation of phthisis or destructive lung disease. The labours of the Royal Commission of 1857, appointed to inquire into the health of the army, brought out in full relief the disastrous effects of want of proper ventilation in the sleeping rooms of our soldiers. It was there shown that the death-rate of Her Majesty's Foot Guards was more than 20 per 1000 per annum, 67 per cent. greater than the death-rate at the same ages in Manchester, our most unhealthy town, double the general death-rate of England, and nearly three times that of the most healthy country districts. As regards phthisis alone the death-rate was 10°8 per 1000 from 1830-1836, and 11°9 from 1837 to 1846, or an average of 11-4 per 1000 for the period, an amount more than the total mortality of the civil male population of England and Wales at the same ages. In the army generally the proportion was 7°86. Siuce the evil was recognized steps have been taken to remedy the conditions, particularly in the direction of giving more Space in barrack-rooms, and securing a certain standard of airrenewal. The results are seen in the present death-rate from pkthisis, which is reduced to 2°5 per 1000, about one- third of the old, and not much above that of the best dis-

tricts in England. It is still, however, too high, as a large number of men are invalided for disease who go to swell the returns of sickness and mortality in civil life. That this is mainly owing to defective air renewal is evident from the fact that in civil life starvation, crowding, and poverty are insufficient to produce the same evil results we have seen in our army,—because, in all likelihood, the very wretchedness of the dwellings of the

poor has brouglit about an amouut of involuntary air renewal, which has been their safeguard.

Defective arrangements for the removal of excreta have constituted another cause of mortality. Water closets opening directly out of wards, and sinks, waste-pipes, bath- pipes, &c., in direct communication with the sewers, have been the means of introducing sewer poison into hospitals, producing surgical and puerperal diseases, enteric fever, and diphtheria, and aggravating every other form of malady.

A want of constant attention to the details of cleanliness has been a fertile source of hospital disease. Dr B. W. Richardson has traced out in a very instructive way the re- markable immunity of the Jews from epidemic and other diseases, and has shown that their religious attention to the details of the periodic cleansing enjoined by the Mosaic law appears to be the main cause of this notable circum- stance. An instructive instance of the importance of this point is recorded by Mr W. Cadge, surgeon of the Nor- wich Infirmary, which institution had long suffered from surgical diseases, such as erysipelas, pyzemia, and the like. These, it was supposed, were mainly due to the age and structural defects of the building, so that it was determined to pull it down and reconstruct it throughout. In the meantime a change of administration took place, and a new matron was introduced, who effected an entire alteration in the arrangements, and in particular insisted on an absolute and unremitting attention to every detail of cleanliness, both of building, clothing, bedding, and person. The result was an immediate cessation of the dreaded complications which had so vexed the hospital, and from that time there has been no return of them.

Faulty diet had also, doubtless, its influence on mor- tality, although its effects would be less easy to trace. One singular feature in the last century was the enormous allowance of beer given to patients in hospital,—from two to three pints being common, and the allowance sometimes reaching half a gallon per diem. The absence of fresh vegetables from the diet, not only of hospitals but also of the populace at large, probably introduced a scorbutic taint which may have had some part in aggravating or modify- ing disease.

Some influence must also be allowed to the indiscrimin- ate mixture of cases. The evil of this, especially in the more or less crowded state of the older hospitals, was re- cognized even in the last century, and was referred to by Tenon among others, Although the danger is materially lessened when ample space per bed is allowed, it is still unadvisable, not to say unfair, to place contagious cases with other patients. The argument has been advanced that by distributing infectious cases there is less danger of concentration of poison than when they are congregated together by themselves. With proper hygienic precautions, however, this concentration may be minimized, whilst the isolation of such cases gives the greatest immunity to others.

This question of concentration has been pushed still further, so as to bear against the existence of all hospitals whatsoever, and so far as lying-in hospitals are concerned we have seen that the objections are well founded. But when we consider the subject in its various aspects it must be admitted that it would be difficult to do without hos- pitals in some form or another. It would hardly be pos-

sible to afford people the same advantages of treatment, attendance, nursing, and comforts at their own homes, al- though in some cases the system of home treatment might be advantageously substituted, as has been done for so many years with so much success in Edinburgh and other towns of Scotland on the dispensary system. Another most im- portant aspect of the question is the necessity for hospitals as places of instruction for those entering the profession of medicine. Although it would be wrong to subordinate in any serious way the claims of patients of any class to the requirements of teaching, it must yet be admitted that the only sound way of learning medicine and surgery is by clinical or bedside instruction, and we may therefore reasonably demand that those who owe their treatment and care to public charity should be willing so far to contribute to the general welfare. Now it is clear that in dealing with large classes of students it would hardly be possible to convey proper clinical instruction except in a hospital. For this purpose the provincial hospitals ought to be more largely

utilized, in addition to the metropolitan ; at present the resources of the former are to a great extent wasted for teaching purposes.

Assuming then the necessity for hospitals, there still re- mains the question of the kind of hospital that should be constructed or approved of. It is certainly open to doubt whether we should continue to build monumental hospitals, and not rather construct slighter buildings, which may be destroyed and rebuilt from time to time, thus both scatter- ing patients over a wider area and lessening the risk from long accumulation of infective material. This latter has been named the cottage or hut system of construction. The difficulties attending it are chiefly connected with original expense of site and with the current expenses of nursing and administration. On the other hand, it may be urged with some reason that with correct hygienic manage- ment there is no reason why a large hospital should not be kept in a healthy condition.

We may now consider the principles of hospital construc- tion.

1. Locality and Site.—Hospitals are required for the use of the community in a certain locality, and to be of use they must be within reach of the centre of population. Formerly the greater difficulty of locomotion made it necessary that they should be actually in the midst of towns and cities, and to some extent this continues to prevail. It is at least doubtful if this be the best plan. Fresh and pure air being a prime necessity, as well as a considerable amount of space of actual area in proportion to popu- lation, it would certainly appear to be better to place hospitals as much in the outskirts as is consistent with considerations of use- fulness and convenience. In short, the best site would be open fields; but, if that be impracticable, a large space—a ‘“‘ sanitary zone,” as it is called by Tollet—should be kept permanently free between them and surrounding buildings, certainly never less than double the height of the highest building. The difference between the expense of purchase of land in a town and in the environs is generally considerable ;—and this is therefore an additional reason for choosing a suburban locality. Even with existing hospitals it would be in most cascs pecnniarily advantageous to dispose of the present building and site and retain only a receiving house in the town. St Thomas’s in London, the Hétcl-Dieu in Paris, and the Royal Infirmary in Manchester

are all ;» pd examples where this might have been carried ont. In noney however, has this been done, the first two having been rebuilt, at enormous outlay, in the cities as before, although not exactly in the same locality, while the last is still retained with a few structural alterations. In Edinburgh, on the other hand, an open space of a much more favourable character has been obtaincd, which, although within the ‘limits of the city, is almost rnral in character.

As regards the actual site itself, where circumstances admit of choice, a dry gravelly or sandy soil should be selected, in a posi- tion where the gronnd water is low and but little subject to tinc- tuations of level, and where the means of drainage are capable of being effectually carricd out. There should also be a cheerful sunny aspect, and some protection from the coldest winds,

2. Form of Building.—A form of building must be selected which answers the following conditions :—(a) the freest possible circulation of air round each ward, with no cul-de-sac or enclosed

spaces where air can stagnate; (b) free play of sunlight upon each ward during at least some portion of the day; (e) the possibility of isolating any ward, or. group of wards, cffectually, in case of infec- tious disease breaking ont; (d) the possibility of ventilating every ward independently of any other part of the establishment. Those conditions can only be fulfilled by one system, viz., a congeries of houses or pavilions, more or less connected with each other by covered ways, so as to facilitate convenient and economical administration. The older plans of huge blocks of building, arranged in squares or rectangles, enclosing spaces without free circulation of air, are obviously objectionable. Even when arranged in single lines or crosses they are not desirable, as the wards either communicate with each other or with common passages or corridors, rendering separation impossible. On this point it may be remarked that some of the buildings of the last century were more wiscly constructed than many of those in the first half of the present, and that the older buildings have been from time to time spoilt by ignoraut additions made in later times. The question next arises —Is it better to have pavilions of two or more stories high, or to have

single-storied huts or cottages, scattered more widely ? Where land is expensive the former plan is of course more ccono- mical, but where land is easily got the latter ought to be adopted. The pavilions may be arranged in various ways: they may be joined at one end by a corridor, or may be divided by a central corridor at right angles to them, &c. In fact, the plan is very elastic, and adapts itself. to almost any circumstances. A certain distance, not less than twice the height of the pavilions, ought to be preserved between them. By this means free circulation of air and plenty of light are secured, whilst scparation or isolation may be at once accomplished if required.

3. Foundations, Building Materials, &c.—It is of the first con- sequence that a hospital should be dry; therefore the foundation and walls ought to be constructed so as to prevent the inroads of damp. An impervious foundation has the further advantage of preventing emanations from the soil rising up in consequence of the suction force produced by the higher temperature of the internal atmosphere of the building itself. There should be free ventilation in the basement, and the raising of the whole on arches is a good plan, now generally carried out in hot climates. If the pavilions are two or more stories high it is advisable to usc fire-proof material as much as possible, but single-storied huts may be of wood. In any case effectual means of excluding damp must be employed. The interiors of wards ought to be rendered as non-absorbent as possible, by being covered with impervious coatings, such as glazed tiles (parian, though much used, is apt to crack), silicate paint, soluble glass, or the like. The ceilings ought to be treated in the same way as the walls, or, perhaps better still, they might be made like the deck of a ship, without any lath and plaster, so as to have nothing but the floor itsclf between room androom. For the floors themselves various materials have been suggested: in France there is a preference for flags (dalles), but in England wood is more liked; and indeed hard well-fitting wood, such as teak, oak, or pitch-pine, leaves nothing to be desired. The surface should be waxed and polished or varnished. Even deal floors can be ren- dered non-absorbent by waxing, by impregnating them with solid paraffin as recommended by Dr Langstaff, or by painting with soluble glass as suggested by Dr Luther of Philadelphia.

4, Shape and Arrangement of Wards,—It is now generally agrecd that wards should have windows on at least two opposite sides, and three main shapes have been proposed, viz., (#) long wards with windows down each side, and (geuerally) ouc at the further end ; (0) wards nearly square, with windows on three sides; and (e) circular wards, with windows all round. The first (a) is the form usually adopted in pavilions; (0) is recommended by Dr Folsom (Plans for the Johns Hopkins Hospital) ; and (e) has been suggested by Mr John Marshall, F.R.S. (Nad. Assoe. for Promotion of Social Scienee, 1878). Of these (b) seems the least to be commended, aud (¢) has not yet been tried in practice; we may thercfore confine our attention to the long or oblong wards. ‘he length is to be determined chiefly by the number of patients to be accommodated, but the breadth admits of less variation. Each bed should be a little dis- tance, say from 8 inches to 1 foot from the wall, and each bed may be reckoned as 6% feet long; this gives 74 feet on each side. Between the ends of the beds about 10 feet space is necessary, so that 25 or 26 feet of total breadth may be taken as a favourable width. The wards of the Herbert Hospital are 26 feet; but some exceed this, as, for instance, St Thomas’s, London, and the New Royal Infirmary, Edinburgh, 28 ; New Hétel-Dien, 29; and Lariboisiére, 80. There seems no necessity for cxceeding 26, but if the breadth be greater there ought to be more window-spacc,— the great difficulty being to get a wide space thoroughly veutilated. There ought to be only two rows of beds, one down each wall, with if possible a window to each bed, aud never less than one to every two beds.

5. Ventilation, Warming, and Lighting.—For ventilation two things are required,—sifficient space and sufficiently frequent change or renewal of air. As regards space, this must be considered

with reference both to total space and to latcral or floor space. Un- less a minimum of floor space be laid down, we shall always be in danger of overcrowding, for cubic space may be supplicd vertically with little or no advautage to the occupier. If weallowa minimum distance of 4 feet between the beds and 10 feet between the ends of the beds, this gives 100 square feet of space per bed ; less than this is undesirable. In severe surgical cases,

fever cases, and the like, a much larger space is required ; and in the Edinburgh New In- firmary 150 square feet is allowed. Cubic space must be regulated by the means of ventilation ; we can rarely change the air oftcner than three times an hour, and therefore the space ought to be at least one-third of the hourly supply. This ought not to be less than 4000 cubic fect per bed, even in ordinary cases of sickness, — and the third of that is 1333 cubic feet of space. With 100 square feet of floor space a ward of 134 feet high would supply this amount, and there is but little to be gained by raising the ceiling higher, — indced, 12 feet is practically enough. The experiments of Drs Cowles and Wood of Boston Report of State Board of Health of Massachusetts for 1879) show that above 12 feet there is little or no movement in the air except towards the outlct ventilator; the space above is therefore of little value as ventilation space. Additional height adds also to the cost of construction, increases the expense of warming, makes cleaning more difficult, and to some extent hampers ventilation. Whatever be the height of wards, the win- dows must reach to the ceiling, or there must be ventilators in the eciling or at the top of the side walls. If this be not arranged for a mass of foul air is apt to stagnate near the ceiling, and sooner or later to be driven down upon the inmates. The reasons for a large and constant renewal of air are of course the immediate removal aud dilution of the organie matter given off by the inmates ; and, as this is greater in quantity and more offensive and dangerous in sickness than in health, the change of air in the former case must be greater than in the latter. Hence in serious cases an amount of air practically unlimited is desirable,—the aim of true ventilation being to approach as near as possible to the condition of pure ex- ternal air. Without going too much into details, a few general rules may be laid down :—(1) Fresh air ought if possible to be brought in at the lowest part of the ward, warmed if necessary; (2) foul air ought to be taken out at the highest part of the ward ; (8) fresh air should reach each patient without passing over the bed of any other ; (4) the vitiated air should be removed from each paticnt without passing over the bed of any other ; (5) 4000 cubic feet of fresh air per head per hour should be the minimum in ordinary cases of sickness, to be increased without limit in severer cases ; (6) the air should move in no part of a ward ata greater rate than 14 feet per second, except at the point of entry, where it should not exceed 5 feet per second, and at the outlet, where the rate may be somewhat higher ; about 64 square inches of inlet and outlet scc- tional area ought to be supplied per

head as a minimum; (7) every opportunity ought to be taken of freely flushing the wards with air, by means of open windows, when this can be done with safety.

Warming is a question of great importance in most climates, especially in such a climate as ours, where cvery system of ventila- tion must involve either the warming of some portion of the in- coming air, or the contriving its delivery without too great lower- ing of temperature ; at the same time it cannot be too strongly in- sisted upon that the tendency is too much in the direction of allowing warmth to supersede freshness of air. Thcre are very few cases of discase (if any) that are not more injured by foul air than by low temperature ; and inthe zymotic diseases, such as typhus, entcric fevcr, smal]l-pox, &c., satisfactory results have been obtained even in winter weather by almost open-air treatment. At the same time a reasonable warmth is desirable on all grounds if it can be obtained without sacrificing purity of atmosphere. Forall practical purposes 60° to 63° F. is quite sufficient, and surgical and lying-in eases do well in lower temperatures. Various plans of warming have been recommended, but probably a combination is the best. It is unadvisable to do away altogether with radiant heat, although it is not always possible to supply sufficient warmth with open fire- places alone. A portion of the air may be warmed by bcing passed over a heating apparatus before it entcrs the ward, by having an air chamber round the fire-place or stove, or by the use of hot-water pipes in the ward itself. In cach case, however, the air must be supplied independently to each ward, so that no general system of ventilation is applicable.

The lighting of wards at night will be most convenicntly donc by means of gas, in the form of ajet over each bed, with a special ven- tilator to carry off combustion products, as in the Edinburgh New Infirmary.

6. Furniture of Wards.—This should be simple, elean, and non- absorbent ; the bedsteads of iron, mattresses hair, laid on spring bottoms without sacking. No curtains should be permitted.

7. Water.—The water-supply ought to be on the constant system, and plentiful ; 50 gallons per head per diem may be taken as a fair ininimum estimate,

8. Closets, Baths, &c.—The closets ought to be of the simplest

coustruction, the pans of earthenware all in one picce, the flushing arrangements moved by opening the door,—the supply of water ample. Each ward should have its own closcts, lavatories, &c., built in small annexes, with a cross-ventilated vestibule separating them from the ward. All the pipes should be disconnected from the drains, the closets by intercepting traps, the sink and waste pipes by being made to pour their contents over trapped gratings. The soil pipes should be ventilated, and placed outside the walls, protected as may be necessary from frost. Each ward should have a movable bath which can be wheeled to the patient's bedside.

9. Each ward should have attached to it a room for the nurse from which she can look into the ward, a small kitchen for any special cooking that may be required, a room for the physician or surgeon, and gencrally a room with one or two separate beds. No cooking should be done in the wards, nor ought washing, airing, or drying of linen to be allowed there.

10. Nursing.—The arrangements for nursing the sick have greatly improved in recent times, although controversy still goes on as to the best method of carrying it out. In arranging for the nursing in a hospital both efficiency and economy have to be con- sidered. Miss Nightingale recommends large wards of 32 beds each, as at the Herbert Hospital, on the ground that one head-nurse is sufficient for such a number by day and one nurse by night. In the Edinburgh New Infirmary the wards are not so large, the medical being arranged for 21, and the surgical for 14. patients. Circumstances must to a large extent determine the arrangement, but it seems desirable on the whole that the work of a nurse should be confined to a single ward at a time if possible. The duties of nurses ought also to be distinctly confined to attendance on the sick, and no menial work, such as scrubbing floors and the like, should be demanded of them; a proper statt of servants ought to be employed for such purposes. It is also desirable that a separate pavilion for lodging the nurses should be set apart, and that fair and reasonable time for rest and recreation should be allowed. Some discussion has taken placc as to the advisability of placing the nursing of a hospital in the hands of a

sisterhood or separate corporation. It will, however, be admitted that the best plan is for the nursing staff of each hospital to be special and under one head within the establishment itself, even although it may be con- nected with some main institution outside. The nursing must of course be carried on in accordance with the direotions and treatment of the physicians and surgeons,

11. The kitchen, laundry, dispensary, and other offices must be in a separate pavilion or pavilions, away from the wards, but with- in convenient acccss.

12. A separate pavilion for isolation of infectious cases is desir- able. This may be a wooden hut, or in some cases even a tent ; either is probably preferable to a permanent block of building.

13. A Disinfecting Chamber ought to be provided, where heat can be applied to clothes and bedding, for the destruction both of ver- min and of the germs of disease. It is advisable to expose all bedding and clothing to its influence after each occasion of wear. Although this may entail additional expense from deterioration of fabric, it is worth the outlay to secure immunity from disease. This plan is rigidly followed at the Royal South Hants Infirmary at Southampton. ;

14. It is of great importance that the wards should be periodically emptied, and kept unoccupied for not less than one month in each year, and longer if possible. During such period thorough cleans- ing and flushing with air could be carricd out, so as to prevent any continuous deposit of organic matter.

Up to quite lately hospital accommodation was confined to the larger towns, but the desirability of having it more accessible in smaller towns and villages has made itself more and more felt. Accordingly in many places cottage hospitals have been established withadvantage. One great advantage of the pavilion system is that the principles of its construction and arrangements are equally applicable to large and small establishments, so that we may either look upon a large hospital as an extension of a cottage hospital, or upon a small one as a section of a pavilion one. The importance of increased accommodation for the recep- tion of infectious cases is now very generally acknowledged, as shown not only by the establishment of

the Metropolitan Asylums Hospitals, but also of others in various parts of the country. In some instances they have apparently been the means of arresting the spread of disease and protecting the locality from epidemics.

Paying Hospitals, Pay-Wards, Provident Dispensaries. — The general object for which hospitals have been established may be stated to be the gratuitous medical and surgical treatment of the indigent sick. Many abuses have, how-

ever, crept in, and large numbers of persons yearly receive medical treatment gratuitously who are quite able to pay for it. ‘The numbers have been stated at one in four in London and one in two in Liverpool of the entire popu- lation. ‘To obviate this evil the establishment of paying ‘nstitutions has been much recommended. There is a large class above the very poor who are but ill able to afford the most skilled attendance and nursing at their own homes, which in most cases do not supply the accommodation necessary for sickness. It is not desirable, nor is it always their own wish, that those persons should be objects of charity, and the establishment of hospitals and dispensaries at which they could contribute something towards the ex- pense of their treatment and attendance would meet the difficulty to some extent. Numerous arrangements of the kind are to be found on the continent of Europe, in America, and in the British colonies. Attempts have recently been made to introduce the system into England, and it is highly desirable that it should be accomplished, if it can be done with fairness to all concerned.

Administration.—In the civil hospitals of Britain this is usually carried on by a body of governors, who are either specially appointed or are benefactors of the institution. From them an executive committee is chosen, or the execu- tive power may be vested in a single official, often the treasurer. A secretary or superintendent is usually charged with the financial and general management of the affairs of the hospital, whilst an apothecary superintends the phar- maceutic department, The treatment of the sick is of course entirely in the hands of the physicians and surgeons, whose

appointments are for the most part honorary, in the sense of being unpaid, and under whom resident medical officers act. The medical staff ought always to be repre- sented on the governing body as a means of preventing un- necessary friction. The appointment seems desirable in every hospital of a sanitary officer, whose duty it should be to watch and supervise the carrying out of every detail of ventilation, warming, cleanliness, disinfection, &c.

On the Continent hospitals are more directly under state control, and their arrangement is therefore consider- ably modified.

Naval and Military Hospitals—These are provided in all civilized countries for the care of the sailors and soldiers of the state. The two great English hospitals of Green- wich and Chelsea were founded as asylums for disabled and superannuated sailors and soldiers, but the former is now given up for that purpose, although a part is appropri- ated as a hospital for sick merchant seamen of all nations. The chief naval hospitals are those of Haslar, Plymouth, and Chatham. Haslar is the largest hospital in the country, having been originally intended for 2000 sick, and even now, with increased allowance of space per bed, accommodating 1500 patients. There are also hospitals in most of the principal naval stations abroad, such as Malta, Jamaica, Halifax, Hong-Kong, &c. The principal military hospitals are the Royal Victoria Hospital at Netley (the invaliding hospital of the army and the locality of the army medical school), the Herbert Hospital at Woolwich, the Cambridge Hospital at Aldershott, and numerous others at the principal stations. The cubic space allotted by regulation is 1200 cubic feet at home and 1500 to 2000 cubic feet in the tropics per bed. Formerly every regiment of cavalry and infantry and each battery or troop of artillery had its own hospital, but this plan is now given up, and station hospitals with a fixed staff are being arranged at the chief centres of military dis- tricts. In both the army and the navy the regulations place the administration and command of hospitals in the hands of the respective medical departments ; in the army this is as yet only partially carried out, but it has been

accomplished in the navy with the advantage of both efficiency and economy. In time of war general hospitals are established at the base of operations, whilst field hospitals move with the troops as the campaign progresses.

In France there have long been hospitals established for the navy, such as those at Rochefort, Toulon, Brest, é&c., as well as schools of instruction for medical officers. The chief military hospital is the Val de Grace at Paris, formerly a convent ; it is there that the medical school for the army is located. Large hospitals are also established in all the great stations. Great attention to military hos- pitals is also paid in Germany, Austria, and other countries of Europe. In most of them the administration is in the hands of the medical department, except in France, where the intendance still holds the reins, much to the disadvan- tage of efficiency and good working.

In the United States of America the army is small and chiefly employed on frontier duties, so that the hospitals are all what are called post hospitals, and as a rule are wooden huts or temporary structures, built to last ten years, and to hold 12 to 24 beds. There are, however, two permanent hospitals, one for cadets at West Point, and the other, the Barnes Hospital, at the Soldier's Home near Washington. All the arrangements are under the army medical department. The navy and the mercantile marine

were long amalgainated in America, so far as hospital

arrangements went. 'The Marine Hospital Service was formed in 1798, and the navy was not separated from it until 1811, although it was not for some years after that special naval hospitals were built. In connexion with the marine hospital service, hospitals have been established at a great number of ports, both sea, river, and lake. Up to 1870 each of these hospitals had its own organization, but since that time a regular service has been established under a supervising surgeon-general. A tax of 40 cents a month is levied for the service upon all seamen or members what- soever of aship's company. One of the finest hospitals is the Mercantile Marine Hospital at Chicago, a pavilion building of several stories, and of considerable architectural pretensions. But in America, as in Europe, the tendency has latterly been to abandon such monumental hospitals, and to construct single-storied pavilions on the hut or "arrack" principle,—the word barrack being

employed. in this sense as equivalent to the French larague, a wooden hut. Accordingly the new marine hospital at San Francisco has been thus constructed, three one-storied pavilions of Californian redwood radiating from the outside of a curved corridor, from the ends and inner centre of which project the administrative blocks. The cost is about £120 ($600) per bed, whereas the average cost of the older ones was fully seven times that amount, with the drawback that in course of time they became extremely unhealthy, and showed all the evils of hospitalism.

A brief notiee may be added here of the history of hospital eon- struction in recent times, particularly with reference to the pavilion system. It is to France that we must look for the commencement of that system, although it has been earried out with even greater suecess in other countries. Its origin may be traced to the diseus- sions whieh arose from time to time as to the advisability of recon- structing the Hétel-Dieu at Paris. So long ago as the 17th century, Desgodets, architcet to Louis XIV., presented a plan for reconstruet- ing the hospital in “ rayons.” But it was after the fire that took place in 1772 that the question was taken up with real interest. In 1773 it was proposcd to transfer the hospital to the plain of Grenelle, and in 1774 M. Petit proposed a radiating building of four stories at the base of the hill of Belleville (probably at no great distance from the existing hospital of Ménilmontant). M. le Roi presented a plan for a hospital at Chaillot, consisting of long single- story pavilions, arranged alternately, with the roof open at inter- vals,—each patient to be sercened off by partitions. Finally, the eommittee of the Académie des Sciences reported favourably in 1788 on a proposal of M. Poyet’s to construct a hospital on the Te des Cygnes (between Grenelle and Passy), consisting of isolated pavilions radiating from a central rotunda, the hospital to hold 5000

patients,—cach pavilion to be 115 fect long, by 24 broad and 14 to 15 high, to contain 34 to 36 patients, and to have windows to the ceiling. These proportions would give 77 to 80 square feet of floor space, 64 to 6} feet of wall space, and 1080 to 1200 cubic feet of total space, an immense advance upon then existing arrangements. The Revolution put a stop to those projects, and half a century elapsed before a pavilion building, as now

understood, was actually constructed. Curiously enough, revolution again stepped in to arrest the movement, for the first building of the kind, the Hépital Louis-Philippe, was begun in the last years of that monarch's reign, and suspended in consequence of the revolution of February 1848. Some years later, in 1854, it was completed and renamed Lariboisiére, from the name of the benefactress whose munificence helped to bring it to a successful conclusion. The building is oblong, enclosing a space in the centre, the front (south end) containing the adminis- tration, and the opposite (north) end the chapel, kitehens, &c. From the two sides the pavilion wards jut out. 'The building is on the whole not a good one; the distance between the pavilions is only half what is required, and the wards are frequently overcrowded. Unfortunately most of the defects, with some additional ones, have been reproduced in the new Hotel-Dieu. The new hospital at Méuilmontant, in the north-east of Paris, is also a pavilion one, differing somewhat in detail, but of great size, each pavilion having numerous stories. The military hospital at Vincennes is a good speciinen of modern construction. A small experimental pavilion, built on the suggestions of Dr Tarnier in the garden of the Mater- nité in Paris, merits notice. It consists of two stories, each con- taining four wards for one parturient woman each. The kitchen, office, &c., are in the centre, but the only access to each ward is by the verandah direct from the open air. The walls, floors, and ceil- ings are non-absorbent, and there is a space of 56 cubic metres, or nearly 2000 cubic feet for cach inmate. The chief objection is that there are no means of ventilation except by the door or window i— otherwise the plan is excellent. This plan of making each ward open directly from the open air was proposed by the late Sir James Simpson, as a means of improving the sanitary state of existing old. hospitals. The plans of M. Tollet ought not to be passed unnoticed. In addition to the ordinary principles of pavilion construction, he insists upon the ogival or Gothic form of architecture, which he thinks was adopted in the Middle Ages as much for sanitary as for architectural reasons.

In England the question of hospital improvement slept until the disasters at Scutari, in 1854-55, roused the attention of the Govern- meut and the public to the necessities of the case, and the report of the Army Sauitary Commission and of the Barrack and Hospital Committee, and Miss Nightingale's Notes on Hospitals, led the way in advocating hospital

reform. Unfortunately just before this movement the plans of Netley Hospital were made, and the build- ing begun on the corridor system. Efforts were made to arrest its eee, but unhappily without effect, and the country which has

ed the van in sanitary seience has as its chief military hospital a building far from satisfactory. The first pavilion hospital in England was the Blackburn Infirmary, built rather more than twenty years ago. The pavilions are there at right angles to a centre corridor, and are alternate ; a similar arrangement is followed out at the Children's Hospital at Pendlebury, near Manchester. St Thomas's at Westminster Bridge cousists of a row of parallel pavilions united by a corridor at one end. A plan practically identical was proposed for a new hospital at Valetta (Malta), but this building, though frequently referred to in books, has never been constructed. The Herbert Hospital at Woolwich consists of parallel pavilions jutting out from the sides of a centre corridor at right angles ; although it is now nearly twenty years old, it is still one of the best examples of a pavilion hospital. The latest pavilion hospital is the New Royal Infirmary at Edinburgh, to which reference has already been made, Every care seems to have been bestowed on its construction and arrangement ; the space allowed per head is ample and the site excellent.

In Germany the Friedrichshain Hospital at Berlin is one of the best specimeus of a pavilion building. The pavilions are 160 feet apart, six two-storied and four one-storied, with isolation wards and the necessary administrative buildings. The hut hospital erected during the late war at Tempelhof near the same city was a good example of how the pavilion system may be indefinitely extended, the huts being placed in échelon in wide zigzag lines.

In America great attention has been paid to the question of hospitals, especially since its importance was so roughly thrust upon the country's notico in the great civil war of 1861-64, Durin that time numerous plans were tried, and among others the old plan of Petit, Poyet, &c., namely, radiating pavilions from a circular or oval centre, which contained the offices aud administration. This plan was found not to be a good one, as it interfered with both lighting and ventilation. The earliest American hospital of any Size was the Pennsylvanian Hospital of Philadelphia, whieli was

begun in 1755, under the auspices of Dr Thomas Bond and Benjamin Franklin, and finished in 1805. It was also in Phila- delphia that the first pavilion hospital of a permanent character was

erected, the corner stone being laid in 1860 ; in it the pavilions are parallel, two stories besides basement and attics. The space allowed is ample, but the wards are too wide, nearly 31 feet. In New York there is a large amount of hospital accommodation—about 6000 beds, or about 1 in 1500 of the population. The New York Hospital new pavilions give 112 square feet of floor space and 1800 cubic feet of total space. The Roosevelt Hospital has somewhat the same dimensions, but with a much greater space for surgical patients. One peculiarity of arrangement in that building is that the closets are not at the end of the wards as usual, but in the centre, grouped round a central shaft which extends through all the stories, cellar aud basement. In this the water and steam pipes are placed, as also the foul linen shafts ; the closets are cleaned by a steam jet. This plan does not seem very commendable. The Massachusetts General Hospital at Boston is the oldest in America, execpt the Penusylvania Hospital. Since 1872 four new pavilions have been built on peculiar plans : two are square, one containing one large ward for 20 patients, and the other divided into small rooms of 2 beds each, giving each about 97 feet of floor space and 1500 to 1850 feet of total space ; the other two are oblong, divided into rows of single rooms, with a dividing corridor, something like an arrangement of prison cells. The floor space is about the same, with less height. ‘The Johns Hopkins Hospital at Baltimore will be memorable for the care bestowed upon the consideration of its plans, The one finally adopted is on the pavilion principle, scattered over a wide space of ground.

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HOSPITIUM. The power the Greeks possessed of travelling safely among other Greek states depended on the feeling which made hospitality a matter of religion, and looked on strangers as under the protection of Zeus Xenios. A stranger was received and protected during his stay. Violation of the duties of hospitality was likely to provoke the wrath of the gods; but it does not appear that any- thing beyond this religious sanction existed to guard the rights of a traveller. There is, however, no ground for the common statement that a stranger was ¢pso facto considered asanenemy. In truth he wasa guest. The roads were all sacred ; he who passed over them was the guest of the land ; he found along their courses statues of the tutelary deity of the road, generally Hermes ; and the offerings of food, é&c., in front of these he was at liberty to appropriate. Hence the word épyaov was used in the sense of a lucky find. (See Curtius, “ Griech. Wegebau,” Berlin Abhandl., 1854.) When the guest parted from his host he was

often presented with gifts (£éva), and sometimes a die | (aotpd&yados) Was broken between them. Each then took a part, a family connexiou was established, and the broken die served as a symbol of recognition ; thus the members of each family found in the other hosts and protectors *n case of need. As the foreigner was not recognized by the law of the state in which he travelled, he could appear in a court of justice only through his host. Similar customs seem to have existed among the Italian races. In Rome

there was a tie recognized by the law between host and guest, almost as strong as that which connected patron and client. Jupiter Hospitalis watched over the jus hospitii, As in Greece the conuexion often became hereditary ; and a tessera hospitalis was broken between the parties.

Besides this private connexion there was a custom according to which a state appointed among the citizens of another state one man called zpofevos to protect any of their citizens travelling in his country. Some- times an individual came forward voluntarily to perform these duties on behalf of another state (écAorpdéevos). Many cases occur where such an office was hereditary ;_ thus the family of Callias at Athens were proxenoi of the Spartans. We find the office mentioned ina Corcyreean inscription dating probably from the 7th century B.C., and it continued to grow more important and frequent throughout Greek history. There is no proof that any direct emolument was ever attached to the office, while the expense and trouble entailed by it must often have been very great. Probably the honours which it brought with it were sufficient recompense, ‘These consisted partly in the general respect and esteem paid to a proxenos, and partly in many more substantial honours conferred by special decree of the state whose representative he was, such as émyapia, yijs eyxryots, area, dovAia, mpocdpia, and sometimes full citizenship, Public hospitium seems also to have existed among the Italian races; but the circumstances of their history prevented it from becoming so important as in Greece.

HOTCH-POT (or Hotcy-potcu, Hopez-Popes), in law, is the name given to a rule of equity whereby a person, interested along with others in a common fund, and having already received something in the same interest, is required to surrender what has been so acquired into the common fund, on pain of being excluded from the distribution. The following is an old example given in Coke on Littleton : —“Tf aman seized of 30 acres of land in fee hath issue only two daughters, and he gives with one of them 10 acres in marriage to the man that marries her, and dies seized of the other 20 ; now she that is thus married, to gain her share of the rest of the land, must put her part given in marriage into hotch-pot; @e, she must refuse to take the profits thereof, and cause her land to be so mingled with the other that an equal division of the whole may be made between her and her sister, as if none had been given to her; and thus for her 10 acres she shall have 15, or

otherwise the sister will have the 20.” In the common law this seems to have been the only instance in which the rule was applied, and the reason assigned for it is that, inasmuch as daughters succeeding to lands take together as copareeners and not by primogeniture, the policy of the law is that the land in such cases should be equally divided. The law of hotch- pot applies only to lands descending in fee-simple. The same principle is noticed by Blackstone as applying in the customs of York and London to personal property. It is also expressly enacted in the Statute of Distributions (§ 5) that no child of the intestate, except his heir-at-law, who shall have any estate in land by the settlement of the intestate, or who shall be advanced by the intestate in his life time by pecuniary portion equal to the distributive

shares of the other children, shall participate with them in the surplus; but if the estate so given to such child by way of advancement be not equivalent to their shares, then such part of the surplus as will make it equal shall be allotted to him. It has been decided that this provision applies only to advancements by fathers, on the ground that the rule was founded on the custom of London, which never affected a widow’s personal estate. The heir-at-law is not required to bring any land which he has by descent or other- wise from the deceased into hotch-pot, but advancements made to him out of the personal property must be brought in. The same principle is to be found in the collatio bonorum of the Roman law: emancipated children, in order to share the inheritance of their father with the children unemancipated, were required to bring their pro- perty into the common fund. It is also found in the law of Scotland. “It seemeth,” says Littleton, ‘that tlus word hotch-pot is in English a pudding ; forin a pudding is not commonly put one thing alone, but one thing with other things together.”

HOTHO, Hervrich Gustav, was born at Berlin in 1802, and died in his native city on Christmas day 1873. He made a name for himself in Germany as an historian rather than as a critic of art. Yet he remained second to his contemporary Waagen in experience, grasp of subject matter, and subtlety of eye. Nor had he the good fortune which accompanied Waagen through life to find patrons and friends in all countries of Europe.

No one could have foreseen that Hotho would one day be an authority on art. During boyhood he was affected for two years with blind- ness consequent on an attack of measles. But recovering his sight he studied so hard as to take his degree at Berlin in 1826. A year of travel spent in visiting Paris, London, and the Low Countries determined his vocation. He came home delighted with the treasures which he had seen, worked laboriously for a higher examination, and passed as “docent” in esthetics and art history. In 1829 he was made professor at the university of Berlin. In 1833 Waagen accepted him as assistant in the museum of the Prussian capital; and in 1858, after the death of Schorn, he was promoted to the directorship of the print- room. ‘This was Hotho’s last step in life. When Waagen died he had hopes of succeeding him, but these hopes were disappointed, not because in this walk Hotho was unfitted for the duties he was ambitious of performing, but probably because his experience was not considered sufficiently exten- sive. During a long and busy life, in which his time was divided between literature and official duties, Hotho’s ambition had always been to master the history of the schools of Germany and the Netherlands. Accordingly what he published was generally confined to those countries. In 1842-43 he gave to the world his account of German and Flemish painting. From 1853 to 1858 he revised and published anew a part of this work, which he called ‘the school of Hubert van Eyck, with his German pre- cursors and contemporaries.” His attempt later on to write a history of Christian painting overtasked his strength, and was far from finished when the last sickness fell on him. Hotho’s name will be honourably remembered as that of an amiable and industrious man, earnest from the first in his effort to throw light on an obscure and _recon- dite subject. His training unfortunately confined him to one section of the field in which art history is comprised, and his comparative ignorance of Italian painting was the cause why he did not climb the last step to which Waagen had been able to ascend.

HOTMAN, or HotTomAn, FRANgoIs (1524-1590), oneof the most learned of French civilians, and a brilliant publicist, was born at Paris in 1524, of a family which had come, in the days of his grandfather, from Silesia. His father a

counsellor of the parliament of Paris, naturally hoped to see | his eldest son his successor, and gave him a legal education at Orleans. After three years' study he was made a doctor of laws, and immediately began to practise at the Paris bar. But the quibbles of pleading soon disgusted him, and to his father's annoyance he turned to the calmer study of juris- prudence. At the age of twenty-two he was named public lecturer with Baudouin at Paris, and at once gained high repute. The fortitude of Anne Dubourg under torture roused his latent enthusiasm for the Reformed opinions ; he at once gave up his career, and went in 1547 to Lyons, the outpost of Genevan theology, and thence to Geneva and Lau- sanne. At Lausanne he became professor of belles-lettres and history, and married a French refugee from Orleans ; in 1550 we find him in high repute as a teacher at Stras- burg, where he lectured for several years to large crowds of students. In 1560, in the beginning of the civil troubles, he attached himself to Antony of Navarre, and was trusted

with delicate missions from the Huguenot chiefs to German princes ; he even at one time carried credentials from Catherine de' Medici, and his speech at the Frankfort diet, which is extant, is "a model of eloquence and political shrewdness." After a while we find him professor at Valence, expounding the civil law with such success as to restore the failing credit of that university. Three years later he succeeded Cujas at Bourges ; but the civil war drove him to Orleans for refuge, whence he was sent down to Blois to negotiate the peace of 1568. He returned to Bourges only to encounter another outbreak of war and another flight, this time to Sancerre, where in the tedium of the obstinate siege he composed his Consolatio, a strik- ing work drawn from the Bible and St Augustine. The peace of 1570 restored him once more; but the St Bar- tholomew drove him away again ; and with wife and family he fled to Geneva, turning his back for ever on his country. As he went he shot at Charles IX. a Parthian shaft in his celebrated Pranco-Gallia, a treatise much censured by Catholics and Huguenots alike. It breathed the true spirit of research and of Huguenot independence and even republicanism ; for it boldly appealed, in the very citadel of hereditary succession, from rights of blood to popular election, and declared that the French monarchy rested on that foundation; the use soon made of the book by the Jesuits in their pamphlet war against Henry IV. added to its unpopularity. At Geneva Hotman was ap- pointed professor of Roman law,

and taught in peace for six years; in 1579, however, the threatening approach of the duke of Savoy frightened him away to Basel. Thence the plague sent him to Montbéliard in 1582, where he lost his faithful wife. After making trial of Geneva once more, he again in 1589 fled to Basel, where he died in 1590, and was buried in the cathedral.

Hotman was a man of unfeigned piety, nor were his firm and lofty ideas on religion ever shaken; the purity of his home-life, his devotion to wife and family, his‘courageous endurance of poverty and trouble, made him one of the finer characters of his age. His very timidity and restlessness were but the results of a parent’s anxiety for the safety of his children; the infinite horrors of unbridled war filled him with fears for them. It was his quick intelligence and passionate temperament that made him a wanderer, and even laid him open to the suspicion of cowardice. As an author, if not original, he certainly was not Scaliger’s ‘‘ vulgarcingenium.” His criticism is sound and acute, his learning beyond question scholarly and legal, his Latinity admirable, even eloquent; he is one of the best writers of his age ; and it is not to be urged severely against him that he cheated himself with that snare of clever and needy men,

alchemy, and sought to achieve the transmutation of metals.

His chief works were—the Anté-Zribonien (1567), a treatise to show that French law could not be based on Justinian; the Franco-Gallia (1578), with the pam- phicts in its defenee; his Controversia patrui et nepotis (1585); his Brutum Ful- men (1585), against the bull of Pope Sixtus; the Gonsolatio (published in 1593); A Preatise on the Eucharist (1566); A Life of Coligny (1575), with many other works on law, history, politics, or elassical seholarship. These are mostly forgotten; but in their day they placed Francis Hotman in the first rank among the learned and aceomplished authors of France. A collection of his letters was published at

-Amsterdam in 1700.

HOT 309

HOT SPRINGS, a post village in Hot Springs county, Arkansas, United States, is situated on a tributary of the Washita river, 55 miles S.W. of Little

Rock. Itis much resorted to by strangers on account of its hot springs, which are about sixty in number, and together have a daily flow of about 500,000 gallons. They vary in temperature from 93° to 150° Fahr., and their beneficial effects depend chiefly upon external application. The principal diseases in which they are efficacious are affections of the skin, malarial fever, and rheumatism. The number of persons who make use of them is about 20,000 annually. The town is well supplied with hotels and churches, The population, which in 1870 was 1276, was 0179 in 1880.

HOTTENTOTS was the generic name given by Euro- peans to the native tribes inhabiting the southern extremity of Africa, Some early writers termed them Hodmadods or Hodmandods, and others Hot-nots and Ottentots—all corruptions of the same word. The common denomination adopted by themselves was Khoi-Khoin (men of men), or Que Que, Kwekhena, t'?Kuhkeub, the forms varying accord- ing to the several dialects.

These aborigines, totally distinct as they were in their pri- mitive state from all other African races, have been gene- rally regarded as the most ancient inhabitants of the land. A little more than two centuries ago they were a numerous people, whose nomadic tribes or clans and faniilies were spread over the territory now distinguished as the Cape Colony ; and tradition, as well as the evidence afforded by names of places and surviving peculiarities of manners and language, points to their having in prehistoric times extended much further to the north-westward and eastward, where they have been supplanted by the Kaffre or Negro tribes. The freedom, security, and protection enjoyed by the Hottentots since the Cape of Good Hope became a portion of the British empire have in no small degree arrested the process of extermination of the race which was rapidly pro- ceeding at the close of last century. When Sir John Barrow described their condition in 1798, he estimated their numbers at about 15,000 souls. In 1806 the official return gave a population of 9784 males and 10,642 females. In 1824 they had increased to 31,000. At the census of 1865 they numbered 81,589; and the census of 1875 gave the Hottentot population within the Cape Colony at 98,561. In the returns for the last-men- tioned periods, however, the designation " Hottentot " has no doubt embraced many persons of mixed race. It is only at the mission stations or in their vicinity that any genuine

descendants of the early tribes are now to be met with. Beyond the colonial borders, however, they are numerically strong. Dr Theophilus Hahn gives the follow- ing as an approximate statement of their numbers (amount- ing in all to nearly 17,000) in Great Namaqualand and Damaraland :—Pure Mamaquas—Geikous, or Red Nation, 2500; Topnaars, 750; Kharo-oas, 300; Khogeis, 100; Ogeis, or Great Deaths, 800; Khau-goas, or Young Red Nation, 1000 ; Habobes, or Velschoendragers, 1800 ; Karagei-Khois, 800; Gaminus, or Bondlezwaarts, 2000 ; Gunungu, or Lowlanders, 200. Namaqua Hottentots or Oerlaams—Eicha-ais, or Afrikaaners, 800 ; Kowisis, 2500; Amas, 2000; Khauas, 700; Gei-Khauas, or Gobabis people, 600.

The pure Namaquas claim to be the aboriginal tribes, while the “ Oerlaam” are the new-comers, or those who migrated across the Orange river from the southern part of Cape colony. The latter tribes and many of the former may be said to be in a semi-civilized state, and have in a great measure adopted the customs, habits, language, and pursuits of the colonists. Some are in good circumstances, rich in waggons, horses, cattle, and sheep ; while others

retain all the improvident, idle, nomadic habits of the aborigiues.

The primitive character of the Hottentot or Khoi-Khoin has been greatly changed by their forced niigrations, and their gradual adoption of the habits of civilized life. The best information as to their original manners and customs is therefore to be obtained from the descriptions given of them by the older writers. The observations of Kolben, who was a resident at the Cape in the early part of last century, are by far the most complete; and, although doubts have been thrown upon some of his statements, yet travellers and missionaries who have resided among the tribes in Great Namaqualand confirm and endorse the greater part of them.

All authorities agree in representing the natural disposi- tion of the Hottentots as mild, placable, and ingenuous. Mutual affection was the greatest of their virtues. They held in contempt the man who could eat, drink, or smoke alone. They were hospitable to strangers ; indeed, their

muuificence often left them scarcely anything for them- selves. Another characteristic was indolence. While not deficient in talents or capacity, they seemed to lack the cnergy to call them into action, They did not, however, disdain to look after their cattle. Hunting they pursued for pleasure as well as sustenance, and when once aroused they were nimble and active, as well as bold and ardent. In personal appearance they were of a medium height, the females ratler smaller than the men, Their bodies were slender but well proportioned, with small hands and feet. Their skin was of a leathery brown colour; their face oval, with prominent projecting cheekbones; eyes dark chestnut or black and wide apart; nose broad and thick and flat at the root; chin pointed, and mouth large, with thick turned-up lips. Their woolly hair grew in short thick curly tufts on their head, and the beard very scanty. The women, especially as they advanced in years, had flabby breasts hanging down low; abnormal developments of fat were somewhat common among them; and cases occurred of extraordinary elongation of the labia minora and of the preputium clitoridis.1

The dress of the men was very simple. A cloak or kaross, varying according to the fashion of the tribe, was usually thrown across the shoulders and a smaller one across the loins. Those of the chiefs or captains were usually of tiger or wild-cat skins, those of the commonalty of sheep skins) They wore the cloaks all the year round, turning the hairy side inward in winter and outward in summer; they slept in them at night, and when they died they were interred in them. They had suspended around their necks little bags or pouches, containing their knives, their pipes and tobacco or daccha (Cannabis, or hemp), and an amulet of burnt wood. On their arms were rings of ivory. When they drove their herds to pasture they wore sandals on their fect, and some of them carried a jackal’s tail fastened on a stick to wipe their face with when heated and drive away the flies. The women also wore karosses, a lesser undcr a greater, fashioned much like those of the men, but with the addition of a little apron, to which were appended their ornaments. In a leather bag sus- pended round their neck they carried daily, whether at home or abroad, some victuals, together with their daccha, tobacco, and pipe. They also wore an ornamented skin cap on their heads, armlets of iron or copper on their arms, strings of beads round their wrists, and round their legs thongs of ox-hide sometimes covering half the leg or more.

They loved to besmear their bodies and their dress with

1 See paper by Messrs Flower and Murie in Journ. Comp. Anat. and Physiology, 1867; and Fritsch, Die EHingebornen Siid-Afrikas, Breslau, 1873.

greasy substances. The wealthy Hottentots were very lavish in the matter of butter and fat, the use of which was the grand distinction between ricli and poor. They also perfumed themselves with the powdered leaves of a shrub called by them bucchu (Diosma crenata). An oint- ment formed of soot and grease and the powder of bucchu was held in very high estimation,

The sites of their villages or kraals were usually on green meadow grounds. They never entirely exhausted the grass or herbage, but kept moving at intervals from one spot to another. The huts or tents, which they could strike, carry, or pitch where they chose, were ranged in circles, the area of which varied with the pastoral wealth of the community. The small cattle were placed inside the circle, and the larger cattle outside. In the centre of the huts a hole served for a fire-place, around which the members of tlie family were fond of squatting upon their haunches while they passed the tobacco pipe from one to another. On each: side of the hearth small excavations an inch or two deep were made in the ground, and thereon mats were spread upon which the men, women, and children rolled up in their karosses lay down and slept. Their household effects con- sisted only of some earthen vessels for cookery, tortoise shells for spoons and dishes, and calabashes, bamboos, and skins for holding milk and butter. The weapons for hunt- ing or warfare—the assegai, the bow and _poisoncd arrows, the shield, and the kerrie (a stick with a large knob at one end)—were also part of the furniture. Women were held in high repute: the most sacred oath a Khoi-Khoi could take was to swear by his sister or mother ; yet the females ate apart from the men, and did all the work of the kraal. Their usual food consisted of milk, the flesh of the buffalo, hippopotamus, antelope, or other game, and edible roots and bulbs or wild fruits. Cows’ milk was commonly drunk by both sexes, but ewes’ milk only by the women, and when cows’ milk was scarce the women were obliged to keep to ewes’ milk or water. Meats were eaten either roasted or boiled, but for the most part half raw,

without salt, spices, or bread. Some meats they carefully abstained from, such as swine's flesh. Hares and rabbits" were forbidden to the men, but not to the women; while the pure blood of beasts and the flesh of the mole were for- bidden to the women, but not to the men.

Their social pleasures consisted in feasting, smoking, dancing, and singing. Every signal event of life, and every change of abode and condition was celebrated with a feast. On the formation of a new kraal an arbour was constructed in the centre, and the women and children adorned and perfumed it with flowers and branches of trees and odorifer- ous herbs. The fattened ox was killed and cooked, and the men partook of it in the arbour, while the women sitting apart regaled themselves with broth. Upon such occasions they indulged in no other intoxication than what arose from their smoking tobacco or daccha,

Circumcisiou, which is common to the Kaffre tribes, was unknown to them, but when a youth entered upon manhood a particular ceremony was performed. One of the elders or officiating priests, using a knife of sharp quartz, made incisions on the young man's body, and afterwards be- sprinkled the same with urine. When a man for the first time distinguished himself by killing an elephant, hippopotamus, or rhinoceros, similar marks were made on his body, and were regarded as insignia of honour. There was no purchase of wives, but in every case of marriage the consent of the parents had to be first obtained. If his proposals were accepted, tlie suitor accompanied by all his kindred drove two or three fat oxen to the house from which he was to take his destined bride. There her assembled relations received them with kindly greetings and caresses; the oxen were then immediately slain, aud

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every one participated in the bridal feast. The nuptial ceremony was concluded by the priest bespriukling the happy pair. Among the colonial Hottentots these ancient usages have long been set aside; but they are still con- tinued among some of the surviving tribes north of the Orange river. Polygamy was practised, but not to any great extent. Divorce was much more common. Family names were perpetuated in a peculiar manner—the sons took the family name of the mother, while the daughters took that of

the father. Thus if the father's and mother's names were respectively Hagub and Daimiis, the sons would be called, according to their age, Daimab geib (big one), Daimiib ! naga mab (of lower standing), and Daimab { Kham (younger) ; and the daughters; Hagu-geis (eldest), Hagu ! nagamas (second), and Hagu { Khams (younger). The children were very respectful to their parents, by whom they were kindly and affectionately treated. Yet the superannuated or aged father or mother was sometimes exposed and left to die. Namaquas say this was done by very poor people if they had no food for their parents. But even when there was food enough, aged persons, especially women, who were believed to be possessed of the evil spirit or devil were placed in an enclosure of bushes with some meat and water, intended to be their last nourishment,

The Hottentots had neither warlike nor pastoral songs, and their musical instruments were but few and simple. One named the " gorah" was formed by stretching a piece of the twisted entrails of a sheep along a thin hollow stick about three feet in length in the manner of a bow and string. At one end there was a piece of quill fixed into the stick, to which the mouth was applied, and the tones were produced by inspiration and respiration. Another, the "ramkee," was constructed on the same principle as a guitar, with three or four strings stretched over a piece of hollow wood. The "rommel-pot" was a kind of drum. Reeds several feet long were likewise made use of as flutes,

The system of government was patriarchal. Each tribe had its hereditary "khu-khoi" or "gao-ao" or chief, and each kraal or encampment its captain. These met in council whenever any great matters affecting the privileges of the people had to be decided. They had no salary, but their persons were held in great reverence, and they were installed in office with solemnities and feasting. In certain tribes the hind part of every bullock which was slaughtered was sent to the chief, and this he distributed among the males of the village. He also collected sufticient milk at the door of his hut to deal out amongst the poor. A part of every animal taken in hunting was exacted by the chief, even though it was in a state of putrefaction when brought to him.

The captains assisted by the men of each kraal attended to the settlement of disputes regarding property and to the trial of criminals. A murderer was beaten or stoned to death; but if one escaped and was at large for a whole year, he was allowed to go unpunished. Adultery seldom occurred; if any one found parties in the act and killed them he was no murderer, but on the con- trary received praise for his deed. Women found offend-

1 These were always played at the reed-dance, which was commenced by a leader blowing on his reed, with head. bent forwards, and stamping his feet violently on the ground to beat time. He was fol- lowed by the other musicians, who, forming a circle, also stooped forward and stamped. The women first ran round the circle of reed- players, clapping their hands and singing, and giving their bodies various odd twists. Then they got into the circle, and the men stamped and blew the reeds around them, and thus they continued frequently a whole night with but little interruption. On some occa- Sions the performers described with appropriate action any incident of late occurrence, and in doing so the utmost poetical licence, as well as perfect freedom of speech, was permitted.

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ing were burnt. severely punished.?

The religious ideas of the Hottentots were very obscure. Vaillant says they had “neither priests nor temples, nor idols, nor ceremonials, nor any traces of the notion of a deity.” Kolben, Tachart, and others, however, assure us that they believed in an invisible deity or “Great Captain,” whom they named Tik-guoa (7’su-goab), a good man who did them no harm, and of whom therefore they need not be afraid. They also spoke of other captains of less power, and of a black captain named Gauna, who was the spirit of evil. The moon was a secondary divinity, supposed to have the disposal of the weather ; and on each occasion of the appearance of the crescent moon in the sky they assembled from night till morning, dancing, clapping hands, and singing their hymns.* Schmidt, the first mis- sionary to the Hottentots, says they also celebrated the anniversary of the appearance of the Pleiades above the eastern horizon. Hahn states that at the present day the Topnaars of Sandwich Harbour and of the ! Khomab moun- tains worship a being whom they name Tusib, the rain god. He also reports that he heard an old

Namaqua saying, “The stars are the souls of the deceased,” and mentions a form of imprecation, “Thou happy one, may misfortune fall on thee from the star of my grandfather.”

Their notion of the supreme being and their relations to a life hereafter also took the form of ancestor-worship. The deified hero was named Jeitsi-Hibib; and of him endless stories are told. The one most generally accepted is that he was a notable warrior of great physical strength, who once ruled the Khoi-Khoin, and that in a desperate struggle with one of his enemies, whom he finally overcame, he received a wound in the knee, from which event he got the name of ‘the wounded knee.” He was held in high repute for extraordinary powers during life, and after death he continued to be invoked as one who could still relieve and protect. According to the tradition still preserved among’ the Namaquas, Heitsi-Eibib came from the east. There- fore they make the doors of their huts towards the east, and those who possess waggons and carts put their vehicles alongside the mat-house with the front turned towards the east. All the graves are in true west-easterly direction, so that the face of the deceased looks towards the east. The spirit of Heitsi-Eibib is supposed to exist in the old burial places, and, whenever a heathen Hottentot passes them, he throws stones on the spot as an offering, at the same time invoking the spirit’s blessing and protection. Hahn asserts that there are many proofs which justify the con- clusion that, to the minds of the Khoi-Khoin, Heitsi-Fibib and Tsu-goab (the supreme being) were identical. Both were higher powers who took great care of men. Both were believed to have died and risen again. They killed the bad beings and restored peace on earth; they promised men immortality, understood the secrets of nature, and could foretell the future. The Heitsi-Eibega are to be found all over South Africa.4

Various ceremonies were practised to ward off the evil influence of ghosts and spectres, and charms were freely

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Theft, especially cattle-stealing, was

? The thief was bound hand and foot, and left on the ground with- out food for a long time; then, if his offence was slight, he received some blows with

a kerrie or stick, but if the case was an aggravated one, he was severely beaten, and then unloosed and ‘banished from the kraal. The family of even the woist criminal suffered nothing on his account in reputation, privilege, or property.

3 An interesting notice of this form of worship occurs in the journal of an expedition which the Dutch governor, Ryk van Tulbagh, sent to the Great Namaquas in 1752, which reached as far as the Kamob or Lion river (about 27° S. lat.).

“ On the religion and antiquities see Hahn’s papers, “ Graves of the Heitsi-Eibib,” in Cape Monthly Magazine, 1879, and “Der Hottentotische Zai-goab und der Griechische Zeus,” in Zettschr. Sir Geogr., Berlin, 1870.

Language.

language as ‘‘scx-denoting,” thus suggesting if not identifying its relationship, in original structure, with the North-African species of the same family, such as the Coptic and Old Egyptian, Galla, Berberic, Houssa, Ethiopic, and others. é

There are four dialectical varieties of the language, each with well-marked characteristics :—the Nama dialect, spoken by the Namaqua as well as by the Hau-Koin or Hill Damaras, a supposed Bantu or negro people who in some past period were conquered and enslaved by the Namaquas; the Kora dialect, spoken by the Korannas, or Koraquas, dwelling about the middle and upper part of the Orange, Vaal, and Modder Rivers; the Eastern dialect, spoken by the Gona or Gonaquas on the borders of Kaffreland ; and the Cape dialect, now no longer spoken but preserved in the records of early voyagers and settlers. Of these dialects the Nama is the purest. It is described in three grammars :—Wallmann’s (1857) and Haln’s in German, and Tindall’s (1871) in English, the last being the best; and the four Gospels, with a large amount of missionary literature, have been published in it. This dialect is commonly spoken by a native population of not less than 100,000 souls south and north of the Orange river, and in parts of Damaraland (or Hereroland) and the Kaokoveld.

The vocabulary is not limited merely to the expression of the rude conceptions that are characteristic of primitive races. lt possesses such words as kot, human being ; khoi-si, kindly or friendly ; koi-si-b, philanthropist ; Khoi-si-s, humanity ; tf ez, to think ; ff ef-s, thought ; amo, eternal ; amo-si-b, eternity ; tsa, to feel ; tsa-b, feeling, sentiment; tsa-kha, to condole ; ama, true ; ama-b, the truth; anu, sacred ; anu-si-b, holiness ; esa, pretty ; anu-xa, full of beauty.

A considerable mass of floating traditionary literature—fables, myths, and legends—exists amongst the Khoi-Khoin,—a fact which was first made known by Sir James Alexander, who in his journeyings through Great Namaqualand in 1835 jotted down the stories told him around the camp fire by his Hottentot followers. Since then missionaries and officials stationed in the country have made collections of them, and the result has been an unlooked for inine of literary lore among a nation whose mental ualifications it was customary to regard as of a very low grade. These Hottentot tales gencrally have much of the character of fables ; some are in many points identical with northern nursery tales, and suggestive of European origin or of contact with the white man ; but the majority bear evidence of being true native products. Bleek's Reynard the Fou in South Africa (1864) contains a translation of a legend written down from the lips of the Namaquas by the Rev. G. Kronlein, which is regarded as an excellent specimen of the national style. Another legend relating to the moon and the hare conveys the idea of an early conception of the hope of im- mortality. 1t is found in various versions, and, like many other stories, occurs in Bushman as well as in Hottentot mythology.

The supposed affinity of the Hottentot with the North African nations was first guessed at by the Rev. Dr Moffat from the resem- blance between the language of the Namaquas and that of some slaves in the market of Cairo. This relationship was afterwards suggested by the Rev. Dr James Adamson, of Cape Town, from the identity of the signs of gender in Namaqua and Coptic, and the appearance of persons of the Hottentot form and colour, with their grease and sibilo dye, among the representations on Nubian tombs. Then came Dr Bleek's philological researches, showing that the Hottentot language from the sexual gender of its nouns was one of the very extensive ''sex-denoting " family which has spread itself over North Africa,

Europe, and part of Asia, and that it moreover surpassed all the others in a faithful preservation of the primitive type. ‘This association of the language of the people of South Africa with that of their northern cousins promised to solve the problem of their pedigree and ancestry, for it at once suggested and implied early migrations of Hottentot and Bushmen from their primal home, and the intrusion upon them at some time or other of the Bantu or negroid tribes, who probably came from the west and drove the Hottentots on the eastern side of ‘Africa southward before them. But the assumed kinship of the Old Egyptians and Hottentots has been disputed by other eminent authorities, such as Von Gabelentz, Pott, Fr. Miiller, and Hahn, who have pronounced against it on ethnological and philological grounds, Hahn stoutly maintains that the Hottentots and Bush- men are but divisions of a single race—‘‘ the children of the samo mother”—who formed the primeval inhabitants of the whole of South Africa as far as the Zambezi.”

employed.! There was also a belief that in every fountain there was a snake, and that as long as the snake remained there water would continue to flow, but that. if the snake was killed or left the fountain it would cease. Offerings were sometimes made to the spirit of the fountain. Like all people sunk in barbarism, the Hottentots had great faith in witch-doctors, or sorcerers. When called to a sick- bed, these ordered the patient to lie on his back, and then pinched, cuffed, and beat him all over until they expelled the illness. After that they produced a bone, small snake, frog, or other object which they pretended to have extracted from the patient’s body. If the treatment did not prove efficacious, the person was declared bewitched beyond the power of any one to cure him. Sometimes a joint of a finger was cut off from the idea that the disease would thereby pass away. If death occurred, the corpse was interred on the day of decease. It was wrapt in skins, and placed in the ground in the same position it once occupied in the mother’s womb. Death was generally regarded in a very stoical manner.

The Hottentot language was regarded by the early travellers and colonists as an uncouth and barbarous tongue. The Portuguese called the native manner of speaking stammering ; and the Dutch compared it to the ‘gobbling of a turkey-cock.” These phonetic characteristics arose from the common use of “ clicks,””—sounds produced by applying the tongue to the teeth or to various parts of the gums or roof of the mouth, and suddenly jerking it

back. Three-fourths of the syllabic elements of the language begin with these clicks, and combined with them are several hard and deep gutturals and nasal accompaniments. The difficulty a European has in acquiring an accurate pronunciation is not so much in pro- ducing the clicking sound singly as in following it immediately with another letter or syllable. The four recognized clicks, with the symbols generally adopted to denote them, are as follows :— Dental = | ; palatal =4£ ; lateral = ||; cerebral = !. According to Tindall, one of the best grammarians of the language, the dental click (similar to a sound of surprise or indignation) is produccd by pressing the top of the tongue against the upper front teeth, and then suddenly and forcibly withdrawing it. The palatal click (like the crack of a whip) is produced by pressing the tongue with as flat a surface as possible against the termination of the palate at the gums, so that the top of the tonguc touches the upper front tecth and the back of the tongue lies towards the palate, and then forcibly withdrawing the tongue. The cerebral click (compared to the popping of the cork of a bottle of champagne) is produced by curling up the tip of the tongue against the roof of the palate, and withdrawing it suddenly and forcibly. The lateral click (similar to the sound used in stimulating a horse to action) is articulated by covering with the tongue the whole of the palate and producing the sound as far back as possible ; European learners imitate it by placing the tongue against the side teeth and then withdrawing it. “he easiest Hottentot clicks, the dental and cerebral, have been adopted by the Kaffres; and it is a striking circumstance, in evidence of the past Hottentot influence upon the Kaffre languages, that the clicking decreases amongst these tribes almost in propor- tion to their distance from the former Hottentot domain.

The language in its grammatical structure is beautiful aud regular. Dr Bleek describes it as having the distinctive features of the suffix-pronominal order or higher form of languages, in which the pronouns are identical with and borrowed from the derivative suffixes of the nouns. The words are mostly mono- syllables, always ending, with two exceptions, in a vowel or nasal sound. Among the consonants neither J, /, nor v are found. There are two g’s, g hard and g guttural, and a deeper guttural kh, Diphthongs abound. There is no article, but the definite or indefinite sense of a noun is determined by the gender. In the fullest known dialect (that spoken by the Namaqua) nouns are formed with eight different suffixes, which in nouns

designatin persons distinguish mase. sing. (-b), mase. plur. (-kw), mase. dua (kha), fem. sing. (-s), fem. plur. (-tz), com. sing. (-¢), com. plur. (-u), com. dual (-ra). The adjective is either prefixed to a noun or refcrred to it by a suffixed pronoun. This grammatical division of the nouns according to gender led to the classification of the il ee ee SS

the narratives of Vasco da Gama's first voyage to India round the Cape in 1497. They are described as small, of a brownish-yellow complexion, and an ugly appearance ; they freely bartered their sheep, but would not part with their cattle, on which the women noe,

2 See the linguistic part of Dr Fr. Miiller's work on the scientific results of the Novara expedition, and Hahn's contributions on the Hottentots in the Proceedings of the Geographical Society (Dresden, 1869) and in Globus (1870), and his Sprache der Nama (Leipsic, 1870).

1 If a Khoi-Khoi went out hunting his wife kindled a fire, and assiduously watched by it to keep it alive; if the fire should be extinguished her husband would not be lucky. If she did not make a fire, she went to the water and kept on throwing it about on the ground, believing that thereby her husband would be successful in getting game. Charms, consisting of bones, burnt wood, and roots of al shrubs cut into small pieces, were generally worn round

he neck,

The earliest accounts which we have of the Hottentots occur in History.

Folklore,

Ethno- graphical relations.

HOT—HOT

rode with pack saddles. In 1509 the Portuguese viceroy, Francisco d'Almarda, count of Abrantes, met his death in a dispute with these natives ; ahd down to the early part of the 17th century there was an idea that they were cannibals. Better knowledge was obtained after the Dutch East India

Company took possession of the Cape in 1652. Dutch governors the Hottentots received the Europcans in a friendly manner. – The Dutch upon their first settlement were not charge- able with cruelty or oppression to the natives. Their primary inten- tion when they erected a fort and took possession of Table Valley was merely to secure supplies of water, cattle, and other fresh pro- visions for their passing flects; and the only mode in which they could accomplish this object was by maintaining friendly relations with the aborigincs. These relations continued until 1659, when a collision occurred which led to some bloodshed.

To prevent disputes about pasturage and cattle forays in the future, one of Van Riebeck's successors purcliased in 1672, at the cost of goods about £10 value, from two of the Hottentot chiefs, who claimed to be hereditary sovercigns, all the conntry from the Cape peninsula to Saldanha Bay,—but on the condition that, where the colonists did not occupy the arable lands or pastures, the natives might erect their kraals and pasture their cattle freely.

During the years which followed, the European population, not- withstanding renewed hostilities in 1676 and 1677, considerably increased, and the settlement enlarged its boundaries, while the natives ejected from their former pastures retired upon their neigh- bours, and waged war among themselves. Simultaneously with the tribal disintegration and impoverishment which ensued, the occurrence of new and infectious diseascs made sad havoc; and, while the tide of European occupation was gradually advancing inland from the south, a similar movement by- the negro warrior tribes who have received the common appellation of Kaffres was taking place in the east, with the result that about the middle and the antl of the last century the former inhabitants of the land were but occupants on suffcrance. Straggling remnants still main- tained their independence, living in small kraals or societies, but the mass of them voluntarily took service with the colonists as herds- men, while others became hangers-on about the company's posts and grazing-farms, or roamed about the couutry, In 1787 the Dutch Government passed a law subjecting these wanderers to certain restrictions. They were required to have a residence, and were forbidden to change their place of abode without ‘‘ passes" or certificates from the authorities or their masters. Another provi- sion gave their employers the right to the services.of their children from eight to eighteen

years of age, if born on their estates. At the same time corporal punishment and confiscation of property were threatened against any colonist convicted of ill-treating Hottentots, or of forcibly separating them from their wives and children. The effect of these measures of restraint was to place the Hottentots in more immediate dependence upon the farmers, or to compel them to migrate to the northward beyond the colonial border. Those who chose the latter alternative had to encounter the hostility of their old foes, the Bushmen, who were widely spread over the plains from the Nieuwveld and Sneeuwberg mountains to the Orange river. The colonists also, pressing forward to those territorics, came in contact with these aboriginal Ishmaclites,—their cattle aud sheep, guarded only by a Hottentot. herdsman, offering the strongest temptation to the Bushman. Reprisals followed ; and the position became so desperate that the extermination of the Bushmen appeared to the Government the only safe alternative. ‘‘Commandoes” or military expeditions were sent out against them, and they werc hunted down like wild beasts. Within a period of six years, it is said, upwards of 3000 were either killed or taken. In consequence of certain measures of restraint and conciliation insisted on by the authorities at a later period, the Boers rose in rebellion, and a state of anarchy ensued, which was prevalent when the British Govern- ment took possession of the Cape in 1795. No sooner was the English standard raised in the country than the Hotteutots aban- doned their former masters and joined the British troops, a step which helped to bring about the prompt submission of the Boer insurgents. Tranquillity being thus restored, the Hottentots, fear- ing to return to their Dutch masters on the withdrawal of the British troops, requested the Government to make some provision forthem. This petition and appeal being neglected, many joined their barbarian neighbours, the Kaffres, and together with them fell suddenly upon the colonists all along the border and even as far westward as the district of George. It was not till 1800 that they were ultimately prevailed upon to deliver up their arms. The English governor of that day, Gencral Francis Dundas, showed an earnest desire to do justice to the Hottentots. Such as were disposed to enlist were embodied in a militia corps named the Cape Regiment, afterwards known as the Cape Mounted Rifles.

The Hottentots were not rescued from their state of servitude, or released from the restraints and disabilities imposed upon them by the Dutch

authorities until long after the British rule had been permanently established in South Africa. A proclamation issued in 1809 gave them a greater degree of sccurity in their contracts of

According. to the accounts given by the early i

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service with the colonists; and subsequent regulations provided for the better protection of their persons and property. But with the exception of those individuals who found asylums in the missionary institutions of the Moravian Brethren and of the London Missionary Society, or who served in the Cape regiment, thcy were still in the service of the farmers, subject to indentureship and to rigorous control in moving from place to place. At length in 1828 the representations of Euglish philanthropists prevailed; a law was promulgated effectually emancipating the Hottentots and all freo persons of colour from compulsory service and all other disabilities, and declaring them “to be in the most full and ample manner entitled to all and every right, benefit, and privilege to which any other British subjects within the colony were entitled.”

Following upon this the Government adopted a measure allotting certain lands for the use of Hottentot families, A tract known as the Kat River Valley, from which the Kaffre chief Macomo had been expelled for his aggressions against the colony, was set apart for them. It was divided into locations, upon which villages were laid out, each family receiving a number of acres as their allotment for cultivation, and the pasturage being reserved for commonage. Numbers of Hottentots soon made their appearance and settled on the spot. Some were possessed of a quantity of live stock, which they had carned in the service of the farmers, or at the mis- sion stations; but most of them owned no property. Those who had cattle assisted their poorer friends and relatives; those who had neither food nor friends lived upon ‘‘ veldkost,” i.e., the wild roots and bulbs dug out of the ground until the land they had planted returned them a harvest. Within a few years they surmounted their first difficultics, and their progress and prosperity delighted the friends of the coloured race. Threc or four years

afterwards, however, they suffered a good deal from Kaffre aggressions, and in 1835 had to bear the brunt of the war, being exposcd to the most determined attacks of the followers of Macomo and Tyali. They had scarcely recovered from the disasters then inflicted, when the outbreak of 1846 occurred, and all their able-bodied men had again to leave their homes and join the military encampments. When allowed to return to their locations, they found, like many other frontier inhabitants, the result of all their former labours destroyed ; their houses had to be rebuilt, their lands to be cultivated, and their families to be fed. From this time a spirit of dissatisfaction crept in amongst them. They complained that while doing burgher duty they had not received the same treatment as others who were serving in defence of the colony, that they got no compensation for the losses they had sustained, and that they were in various ways made to feel they were a wronged and injured race. The location of a disloyal Kaffre, named Hermanus, with a number of disorderly followers in their neighbourhood, served to corrupt and estrange the feelings of many, and a secret combination was formed with the Kaffres to take up arms to sweep the Europeans away and establish a Hottentot republic. In 1851 about 900 of them broke out into rebellion, and their numbers were increased by deserters from the Hottentot regiment of Cape Mounted Rifles, and by several Hottentots in the service of the frontier farmers. A small body, however, remained loyal, and with the missionaries and the local magistrates withstood the rebels until military aid came to thcir relicf. The Kat River population have since had a long period of peace and good government, and are now as loyal and happy as any subjects of the crown. (W. J. N.)

HOTTINGER, Jonann Hernricu (1620-1667), a Swiss philologist and theologian, was born at Zurich, 10th March 1620. He studied at Ghent, Groningen, and Leyden, and after visiting England was in 1642 appointed professor of church history in his native town. To the duties of that chair those of Hebrew at the Carolinum were added in 1643, and in 1653 he was appointed ordinary professor of logic, rhetoric, and theology. Nothwithstanding this plurality of offices he found time to publish a number of pamphlets, chiefly on the original text of the Old Testa- ment, which gained him such a reputation as an Oriental scholar that the elector palatine in 1655 appointed him professor of Oriental languages and biblical

criticism at Heidelberg. In 1661 he, however, again returned to Zurich, where in 1662 he was chosen principal of the uni- versity. In 1667 he accepted an invitation to become professor in the university of Leyden; but on the journey thither he was drowned along with three of his children by the upsetting of a boat while crossing the river Limmath.

Hottinger was the author of a variety of learned theological works, the principal of which are Historia ecelesiastiea, 9 vols., 1651-67 ; Thesaurus philologicus sew elavis Seripture, originally published in 1649 ; Ktymologicon orientale, sive Lexicon harmonicum heptaglotton, He also wrote a Hebrew aud a Chaldee grammar.

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HOUBRAKEN, Jacosus (1698-1780), Dutch engraver, was born at Dort, December 25, 1698. All that his father, Arnold Houbraken, bequeathed to him was a fine constitu- tion and a pure love for work. at Amsterdam, where for years he had to struggle inces- santly against difficulties. He commenced the art of engraving by studying the works of Cornelis Cort, Suyder- hoef, Edelinck, and the Visschers. He devoted himself almost entirely to portraiture, and as his reputation became known in and beyond the boundary of his country he soon found himself with commissions more than he could conveniently execute. Seeking happiness in the bosom of his family, and being temperate in his habits, he lived to an advanced age, and the work executed the last year of his life shows no failing of his power in the use of the burin. Among his best works are scenes from

the comedy of De Ontdekte Schijndeugd, executed in his |

eightieth year, after Cornelis Troost, who was called by his countrymen the Dutch Hogarth, with, however, very small title to such a distinction. Houbraken died on the 14th of November 1780, having nearly completed his eighty-second year.

Sce A. Ver Hull, Jacobus Houbraken et son Guvre Arnhem, 1875, where 120 engraved works are fully described.

HOUDON, Jean Anrorne (1740-1828), was the most distinguished sculptor produced by France in the latter half of the 18th century, He was born at Versailles in 1740, and at the age of nineteen, having learnt all that he could from Michel Ange Slodtz and Pigalle, Houdon carried off the prix de Rome and left France for Italy, where he spent the next ten years of his life. His brilliant talent, which seems to have been formed by the influence of that world of statues with which Louis XIV. peopled the gardens of Versailles rather than by the lessons of his masters, delighted Clement XIV., who, on seeing the St Bruno executed by Houdon for the church of St Maria degli Angeli, said “he would speak, were it not that the rules of his order impose silence.” In Italy Houdon had lived in the presence of that second Renaissance with which the name of Winckelmann is for ever associated, and the direct and simple treatment of the Morpheus which he sent to the Salon of 1771 bore witness to its influence. This work procured him his “agrégation” to the Academy of Painting and Sculpture, of which he was made a full member in 1775. Between these dates Houdon had not been idle ; busts of Catharine II., Diderot, and Prince Galitzin were remarked at the Salon of 1773, and at that of 1775 he produced, not only his Morpheus in marble, but busts of Turgot, Gluck, and Sophie Arnould, together with his well-known marble relief, ‘“Grive suspendue par les pattes.” He took also an active part in the teaching of the academy, and executed for the instruction of his pupils the celebrated Kcorché still in use, To every Salon Houdon was a chief contributor ; most of the leading men of the day were his sitters; his busts of D’Alembert, Prince Henry of Prussia, Gerbier, Buffon (for Catharine of Russia), and Mirabeau are amongst the most remarkable portraits of modern times ; and in 1778, when the news of Rousseau’s death reached him, Houdon started at onee for Ermenonville, and there took a cast of the dead man’s face, from which he produccd the grand and lifelike head at present inthe Louvre. The celebrated draped statue of Voltaire, now in the vestibule of the Théatre Francais, was exhibited at the Salon of 1781, to which Houdon also sent a statue of Marshal de Tourville, commissioned by the king, and the Diana executed for Catharine II. This work was refused; the jury alleged that a statue of Diana demanded drapery; without drapery, they said, the goddess became a “suivante de Vénus,” and not even the proud and frank chastity of the attitude and

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In 1707 he came to reside |

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expression could save.the Diana of Houdon (a bronze repro- duction of which is now in the Louvre) from insult. Whether Houdon felt annoyance at this folly does not appear; but three years later he very readily accepted an invitation to go to America, there to carry out a statue of Washington. With Franklin, whose bust he had recently executed, Houdon left France in 1785, and, staying some time with Washington at Philadelphia, he modelled the bust, with which he decided to go back to Paris, there to complete the statue destined for the assembly hall of the State of Virginia. After his return to his native country Houdon executed for the king of Prussia, as a companion to a statue of Summer, La Frileuse, a naif embodiment of shivering cold, which is one of his best as well as one of his best-known works. The Revolution interrupted the busy flow of commissions, and Houdon took up a half-forgotten project for a statue of St Scholastica, which had long been put on one side in a corner of his studio. He was immediately denounced to the convention, and his life was only saved by his instant and ingenious adaptation of St Scholastica into an embodiment of Philosophy. Under Napoleon, Houdon received little employment ; he was, however, commissioned to execute the colossal reliefs intended for the decoration of the column of the “Grand Army” at Boulogne (but which ultimately found a different destination) ; he also produced a statue of Cicero for the senate, and various busts, amongst which may be cited those of Marshal Ney, of Josephine, and of Napoleon him- self, by whom Houdon was rewarded with the legion of honour. After the fall of the first empire Houdon suddenly aged; he lost his memory, and slept away the closing years of his life. He died at Paris in 1828.

The most striking characteristic of his work is the life by whieh it is animated, and which is the result of marvellous skill in execu- tion and keenness in observation. He was, in all he did, great. His bust of Voltaire is deservedly one of the most famous in the whole range of modern sculpture, aud his genial reading of Rous- seau—a splendid yet brute virility tempered with the gift of tears —is a masterpiece of insight into character. But

Houdon’s power was no less triumphant in rendering the beauty of youth and the beauty of beautiful women. His Diana proved that he eould pene- trate the secret of an ideal of noble womanhood ; his heads of young girls have been compared with the graceful children of his contem- porary Greuze, but the innocent candour of Houdon’s work is entirely free from the self-conseiousness which disturbs the charm of La Cruche Cassée and her companions. Finally, Houdon can- not be elaimed, like Greuze, as representing the popular tendencies of the society to which he belonged; for, whereas Greuze, like most men, bore the stamp of his time on all he did, Houdon was one of those rare spirits who, doing the work of their own time, set their own seal thereto.

HOUND. ‘The foxhound, harrier, and beagle are now the only representatives of whatever varieties of hounds existed previously in England. The staghound proper is practically extinct, no pack of them having been kept since 1825, when the Devon and Somerset establishment was broken up and the pack sold. With the exception of Lord Wolverton’s black St Huberts, all hounds now used for stag-hunting are simply those of the foxhound breed entercd to deer instead of to fox. Most packs of staghounds are composed of hounds of the ordinary size, but it is said that the present master of the Devon and Somerset (1880) uses none under 25 inches, and excludes bitches altogether.

The modern English foxhound is about as near per- fection as he can well be, and his excellence is all the more wonderful that less than 200 years ago there does not seem to have been in existence any hound bearing a resemblance to him ; for, until fox-hunting by hounds kept for that especial purpose was instituted, there could have been no reason to breed foxhounds. According to old writers on hunting subjects, there appear to have been, amongst other varieties, the slow, plodding, southern hound, with a great square head and wondrous powers of working

Fox- hounds.

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on a scent, and the lighter northern hound; and as all animals improve under the care and guidance of man, until they assume the character of a distinct

breed, it is clear that such has been the case with foxhounds, the earlier breeders of which did their part towards the attainment of perfection, by breeding with much care and judg- ment from the best specimens at their disposal. Older breeders were satisfied if the result of their crossings possessed good noses, and were up to the standard of beauty of those days ; but the time came, in the days of the great Meynell, when pace had to be added to the list of foxhound virtues, owing to the use of better bred horses in the hunting field, and at the present day the development of pace without sacrificing nose is one of the greatest diffi- culties a breeder has to contend with.

The mastership of a pack of foxhounds is an undertaking of great responsibility. In the article HunTING mention is made of the difficulties which beset a master when he takes the field ; but after all, the greatest exercise of judg- ment is called for in relation to the kennels, for upon the master, in conjunction to a greater or less extent with the huntsman or kennel huntsman, rests the responsibility of selecting suitable sires and dams for the young hounds he intends to breed; of drafting such hounds as it is thought desirable to part with owing to their being over or under sized, or possessed of some failing; and of obtaining drafts from other establishments. More than one opinion exists as to what is the proper size for a foxhound, but some of the greatest authorities having expressed their conviction that from 21 to 22 inches for bitches and from 23 to 24 inches for dogs is the proper standard, a master could hardly do wrong in adopting it. A hound’s head should not be too large, nor, on the other hand, should it be too narrow, or else, like the greyhound, he will possess speed, but be deficient in nose. There was much truth in Mr Warde’s remark, who, on overhearing a stranger finding fault with his hounds for having such large heads, said, “Their knowledge boxes (as he called them) are large, but size has this advantage, that when they once put their noses down to the ground they cannot get their heads up again.” The neck should be neither too short nor throaty ; that is to say, there should be no dewlap. The shoulder should slope like that of the horse, and there should be plenty of muscle in the arm. Below the knee a hound should be quite straight, and the distance should be short between the knee and the foot, which must be short and round like a cat’s foot. So, too, with the hind legs; speed and strength alike call for great length from the hip to the hock, and as little as possible from the hock to the

foot ; the haunches or gaskins should be wide and well furnished with muscle. A flat-sided hound should be drafted at once, as he is sure to be a bad winded one ; so should one that stands over at the knee When looked at sideways. How to combine all the good points in one hound requires no little judgment, but appearance is not all that must be thought of ; the breeder must have an eye to nose, pace, stoutness, and the avoidance of certain faults in the field. In order to produce a good- looking puppy, dams and sires, perfect enough as regards make and shape, are often selected before they have taken the field long enough to have their good or bad points developed. Three years is quite early enough to begin to breed from any hound, male or female, and by that time it will be pretty well known what are the hunting capabilities of each. Out of every litter of whelps it may be necessary to destroy some,—four or five are quite enough for a mother to rear,—but a diversity of opinion exists amongst hunts- men as to which should be kept. As the points of a very young puppy cannot be seen, the selection is really one of colour ; some men prefer light colours, others dark ; the majority are in favour of the latter, light-coloured hounds

and horses being popularly supposed to have weak consti- tutions and uncertain tempers.

When the puppies are three or four days old the dew- claws should be severed with a small and sharp pair of scissors, and after another day or two it is usual to cut off about an inch of the tail. Rounding is the last operation that foxhounds are subjected to, and generally takes place as soon as the puppy has quite recovered from the distemper; it consists in cutting off the ends of the ears so that they may not be torn in going through cover. When about ten or twelve weeks old puppies are sent out to walk, and are not again received at the kennel till the beginning of the following April, soon after which date the distemper nay be looked for. At this crisis the great aim should be to keep the body in a healthy condition, and not to feed hounds too highly, whey and porridge only being given. After the return from walks, the huntsman and whips should give the young entry plenty of gentle exercise, at first in the couples; and nothing more need be done in the way of training until about eight or nine weeks before cubbing begins, when the

young hounds, who should hitherto have been exercised by themselves, should be put into the company of some older ones, and the exercise should be gradually extended until they can keep up for 2 or 3 miles with a horse going at half speed. The first day or two of cub-hunting is certain to be a somewhat unsatis- factory performance ; the young entry are sure to run riot; it cannot be helped at first, but they will soon learn better manners under the watchful eyes of the huntsman and whips, and in company of the old hounds, about a dozen of the latter being taken out with twice that number of young ones. ‘The sooner the puppies taste blood the better; it will help to teach them to stick to their proper game. Huntsmen therefore make every effort to bring a brace of cubs to hand the first day they go out, but this thirst after blood should not be indulged to any great extent afterwards, or the stock of foxes in{the country may be much impaired, and sport thereby diminished, There is perhaps nothing connected with hunting of more importance, and, it may be added, of greater interest, than good kennel manage- ment, First of all it is shown in the formation of a level pack; for where things are done properly it is not enough to get together a lot of honnds that are good in themselves, they must also be, as nearly as possible, of one size. Then again, they must all be equally fast—to use a common expression, a sheet should cover them when running. Lastly, they must be free from certain faults, such as muteness, babbling, and skirting. A mute hound is a terrible nuisance. A fox is found and goes away unper- ceived ; some time afterwards news is brought to the hunts- man that a single hound has been seen running hard a mile from cover. This is our mute friend, which got on to the line by himself and gave no notice to anybody. Buta young hound that is reticent with his tongue should not be too hastily set down as mute; he may have been flogged for proclaiming a scent, under the mistaken idea that he was running riot, and if so it would have the effect of checking his music. “Babbling” consists in a hound being too free with his tongue: after a fox has been found, the babbler announces the fact for the next ten minutes, and repeats his refrain whenever the least opportunity presents itself. A hound may give tongue too much without being an absolute babbler, but a noisy hound is pretty sure to become a babbler, and when he is so he should be drafted at once. A “skirter” is a hound that will not run with the pack, but is always taking a line of his own; like the babbler he should have every chance, but, if gentle as well as severe measures fail in effecting a reclamation, he too must be sent away. It goes

without saying that where good kennel management exists, the honnds will be well

Feeding of hounds.

Harriers.

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disciplined, both in and out of the kennel. To the unin- itiated, a visit to the kennel at feeding time is an interesting sight, notwithstanding the somewhat pungent smell of pudding and boiled horse. The hounds, as hungry as the proverbial hunter, stand anxiously awaiting the order to fall to, yet not daring to move until the order is given; and when the huntsman thinks a hound has eaten sufficient, the mere calling out of his name is sufficient to make him return to the benches, in spite of a desire for a more pro- longed stay at the trough. An extraordinary instance of discipline in the field is related by Colonel Cook in his work Observations on Fox-hunting, p. 202, With hounds as with horses, control over them will be best obtained by kindness: the popular idea is that huntsmen, whips, and feeders never set about their respective duties unless armed with a formidable whip to be used on all possible occasions ; but happily this is an entire mistake. The feeding of a pack of hounds is a matter calling for the exercise of great care and judgment, and cannot be properly carried out unless the establishment enjoy the services of a thoroughly trustworthy feeder. His duty is to cook the food, and to keep the utensils clean and the kennel sweet and wholesome. Hounds' food comprises both animal and vegetable substances. Objections have sometimes been made to admitting the former into the kennel fare at all, on the ground that it is likely to impair the powers of scent, but the exception does not seem to be well-founded, because wild dogs, as also wolves and foxes, are carnivorous animals and live by the use of their scenting powers; in moderation flesh is a necessity. Wheatmeal and barleymeal are eschewed, coarse oatmeal a twelvemonth old being the only thing fit to feed hounds with, The meal is boiled in a large iron boiler (a smaller one of the same metal being reserved for boiling the flesh), and during the cooking the feeder must be on the watch lest any of it stick to the bottom of the boiler. When sufficiently cooked it is turned out into coolers, On meat being given it is cut into small pieces and stirred into the pudding.

In the summer young cabbages, given once every four days, form a wholesome food, and are vastly superior to potatoes, swedes, or any other root. With proper diet, an occasional alterative, and plenty of exercise, hounds should seldom or never require to be plastered over with ointment in consequence of skin irrita- tions. ‘The benches should be littered with good dry wheat-straw, which should be taken out of the kennel and shaken up every morning when the hounds aro at exercise. Great cleanliness is indispensable ; the natural odour of a kennel is none of the sweetest, and if hounds are kept in the midst of dirt their powers of scent will speedily deteriorate. The harrier like the foxhound is a very different animal from what he was one hundred years ago. Then there were several sorts used in hare-hunting; first came the old southern hound, used principally in heavy countries; the second variety was a somewhat faster dog, with a sharp nose and pointed ears, and was best adapted for an open country ; thirdly, a rougher-coated hound; and lastly, the old fashioned blue mottled harrier, found in the Weald of Sussex and some parts of Kent, The first and last of the above list are said to have been endowed with wonderful scenting powers, and we are told that when these hounds were in use a run of six hours after a hare was no uncominon occurrence ; but they were so slow that the same authority tells us that they fatigued “the healthy foot-man very little.” It is probable that the Sussex blue mottled hound was the result of the first attempt to im- prove the old southern hound, and to obtain a species particularly suitable for hare-hunting, but since then almost all the traces of the old harrier have disappeared,

until at the present time the modern harrier is little more

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than a dwarf foxhound. fashioned harrier, the hare had time to indulge in all those wiles in which our forefathers delighted, and of which they wrote at length in the hunting treatises of their time ; but with the taste of the day in favour of pace, and with the

BOW When pursued by thie old-

modern harrier, the “ curious and lasting sport” of old has

been put an end to, and now the hare must, if the scent be moderately good, simply get away as far and as fast as possible.

The late Sir John Dashwood King, of West Wycombe Park, Bucks, is said to have been the breeder to whom the sportsman is indebted for the present race of harriers. His pack did not exceed 18 inches in height. The parent stock was a small foxhound from the duke of Grafton's kennel, named Tyrant, whose blood, form, and character were apparent throughout ; and so highly was the pack thought of that Lord Sondes, of Rockingham Castle, gave 700 guineas for it.

The beagle (see Doc) is used in hunting the hare, but Beagles.

from its diminutive size it is not possessed of great pace ; it is therefore generally followed on foot, but it is a good plan to have one person on horseback, in order that the pack may be stopped if they get away from the field and make for a cover.

The real otter hound bears a strong resemblance to Otter the old southern hound. The head is heavier than that hounds

of the foxhound, and the eyes are deeply set as in a blood hound. The coat is rough and somewhat wiry, but it should be thick. The otter hound is not very common, foxhounds being often used for otter hunting; but the Carlisle pack is of the true breed.

The reniarks already made on kennel management apply, for the most part, in the cases of hounds other than fox- hounds; all varieties need the same cleanliness and atten- tion, The different game for which the hounds are entered of course necessitate some trivial adaptation from the course pursued in foxhound kennels, but speaking generally the management is the same. (E. D. B.)

HOUNSLOW, a township, formerly a market-town, in the parishes of Isleworth and Heston, county of Middlesex, England, is situated on the great western coach road, and on a branch of the London and South-Western Railway, 9 miles from Hyde Park Corner. In the Domesday survey Hounslow is mentioned as Honeslowe and Hundeslawe. It consists chiefly

of one street about a mile in length. In the 17th century it numbered about 120 houses, principally alehouses and inns. Previous to the opening of the railway nearly 500 coaches passed through the town daily. Of late years it has considerably recovered from the depression caused by the opening of the railway, and a number of fine villas have been erected in the neighbourhood. A priory of friars of the Holy Trinity was founded at Hounslow in 1296, and existed till the dissolution of the monasteries. The priory chapel was used as a church till 1830, when it was demolished, and the present church in the later style of English architecture erected. Another church in the Early English style was erected in 1874, and a town-hall in 1857. The surrounding country is flat and uninterest- ing, and to the west of the town there was at one time an extensive heath, which, according to the survey of 1546, had an area of 4293 acres. It is the site of Roman and old British camps, and in later history was the scene of several important military rendezvous. For many years the heath was a favourite resort of highwaymen, the car- eases of whom used to be exposed on gibbets along the road, According to an Act passed in the 53d of George IIL, the heath has been enclosed, and it is now nearly all cultivated. In 1793 large cavalry barracks were erected upon it, and it also affords a site of extensive powder-mills, The population of the township in 1861 was 5760, and in 1871 it had increased to 9294.

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HOUSE-FLY. Although extremely abundant in indi. vidual representatives, by habit specially attached to man- kind, of widely extended range (North American and Abys- sinian exponents are absolutely identical with European), familiar from the earliest times, engrafted upon the litera- ture of all nations by proverbial and poetical allusions, and of later years affording material for much scientific micro- scopical investigation,—the dipterous species known to naturalists as Musca domestica apparently has two pecu- liarities opposed to these premises:—one, that its lack of salient external features would puzzle any but a profound dipterologist to define its specific attributes with absolute certainty; the other, that its earlier life history and trans- formations remained practically unknown (at all events to ordinary readers) up to the year 1873. It is scarcely within the province of this work to diagnose species; the instincts of the majority of readers will

probably direct them at once to the right insect, which may be roughly described as a quarter of an inch long, black, hairy, with a reddish oval vertical spot and golden orbits, three grey longitudinal bands on the thorax, an interrupted yellowish band at the base of the abdomen, which has lateral and apical golden spots, and the base of the wings yellowish- white. But not only allied species are liable to be confused with the house-fly; representatives of other genera, such as Anthomyia, Tachina, and Stomoxys, are often mistaken for it, and a puncture from the sliarp beak of the latter fly has often caused a wrong charge of blood-sucking to be brought against the subject of this notice, which has a short fleshy bilobed tongue incapable of penetrating the skin, though provided with a terminal framework of tracheal tubes, acting like a rasp, by using which it often annoys us in the heat of summer. As regards the second point, Linnzus, who first named the fly, left its transformations undescribed ; De Geer in 1776, and Bouché in 1834, described the larva and pupa, and correctly defined their habitat; but it has been reserved for Dr A. S. Packard, jun., the well-known American entomologist and biologist, to make a thorough investigation of their whole economy, which he has published in the Proceedings of the Boston Society of Natural History, vol. xvi. (for 1873-74), pp. 136-150, pl. iii,

The minute dull chalky white eggs (usually about 120 in number), elongate oval and cylindrieal in.shape, are laid by the parent fly in crevices of fresh manure in or about stables,—heat, and especially moisture, being required for thcir development. The larva are hatehed in twenty-four hours, and pass through three stages, averag- ing from five to seven days in all; in the second of its stages, thc larva has been observed to increase by one-third of its length in twenty-four hours. They resemble those of the well-known meat fly, Calliphora vomitoria, but are smaller, longer, more slender, trans-parent, smooth, and shining, and regularly conical. The prop-leg at the apex is also much smaller, and cannot be seen from above when the larva is in motion. They eat the decaying parts of the manure, leaving the bits of hayandstraw. The puparium, or pupa- ease, is a quarter of an inch long, eylindriecal, and dark brown, elosely resembling that of Stomoxys calcitrans, from which it ehiefly differs in the larger and squarer anal spiraeles and the smoother apex. The enclosed pupa is of the usual type of the cyelorhaphous Diptera, and is readily distinguishable from that of

Stomoxys by its broad spatulate labium and curved maxillary palpi; it rests in the case with the hard framework of the jaws of the old larva skin next the ventral side; and when the fly pushes its way out, after remaining from five to seven days ag a pupa, the upper end of the ease splits off just behind the suture between the thorax and abdomen. The term ‘“‘ pupa” is here used in a general sense, since intermediate stages of dc- velopment (variously ealled **pseudo-nymph ” or ‘‘ semi-pupa’’) in that condition occur in the Muscide, as in Hymenoptera, Coleoptera, &c.

On leaving the pupa-case, the fly runs about with its wings soft, small, and baggy, pressed to the side of the body, much as in the pupa. It is pale, with the colours not set, and the mem- branous portion of its forehead constantly distends with air as the fly moves, being conneeted with the trachex. From Mr Lowne’s

observations on the anatomy of the blow-fly, this organ is cvi- |

dently employed for pushing away the end of the puparium when the pupa slips out of its case.

The whole period of evolution being thus from ten to fourteen days only, and the number of eggs laid by each female fly so numer- ous, it will be readily seen that any slight personal ineonvenience to man, as produced by the habits of the perfect insect, are much more than compensated for by the unceasing labours of its larve as seavengers ; the benefit being the more direet as the work is invariably done elose to human habitations. The workings of tho law of nature, by whieh an excess of inerease in any one species is ehecked, are eonspicuously shown in the case of this insect. Not only do the ordinary parasites of its own class (some Hymeno- pterous, and in one recorded instance Coleopterous) attack it in its earlier stages, but certain common birds are partieularly addieted to it in the perfeet state (in which also a Chelifcr, a minute European representative of the scorpions, has also, been found parasitieally attaehed to it). The vegetable world also supplies some lethal agents in the shape of fungi (notably Empusa musce), individuals destroyed by which are constantly to be seen in autumn unable to move, and distended or ruptured by the expansion of the internal growth,

the white spores of which are finally to be observed scattered round their victim.

Trivial as the house-fly may appear even to entomologists, it is to be noted that recent observations by the German biologist Weissman on its development have resulted in his diseovery of its possessing ‘‘imaginal discs” in the early larval state—a structure deemed of sufficient value to suggest a new division of the whole Insecta into ‘‘ Diseota” and ‘ Adiscota.”

HOUSELEEK, Sempervivum, a genus of ornamental evergreen plants belonging to the natural order Crassu- lacee. About 30 species are known in gardens, some of which are hardy perennial herbs, and grow well in dry or rocky situations ; the others are evergreen shrubs or under- shrubs, fit only for cultivation in the greenhouse or con- servatory. The genus Sempervivum is distinguished from the nearly allied Sedum by having about 12 petals, and by the glands at the base of the ovary being laciniated if present. The common houseleek, &. tectorum, L. (Germ. Hauswurzel ; Fr. Joubarbe), is often met with in Britain on roofs of outhouses and wall tops, but is not a native. Originally it was indigenous in the Alps, but it is now widely dispersed in Europe, and has been introduced into America. The leaves are thick, fleshy, and succu- lent, and are arranged in the form of a rosette lying close to the soil. The plant propagates itself by offsets on all sides, so that it forms after a time a dense cushion or aggregation of rosettes. The flowering stem, which is of rather rare occurrence, is about a foot high, reddish, cylindrical, and succulent, and terminates in a level-topped cyme, reflexed at the circumference, of reddish flowers, which bloom from June to September. The houseleek has been known variously as the Houselick, Homewort, Great Houseleek, Sedum majus, and Crassula major altera, Sedum acre, L., being styled the Least Houseleek. In Gerniany it is sometimes called Donnerkraut, from being supposed to protect the house on which it grows from thunder. The leaves are said to contain malic acid in considerable quantity, and are reckoned by herbalists to possess cooling and astringent properties. The leaves, freshly bruised, are applied to hemorrhoids, boils, wens, and corns, and the expressed juice is used as a remedy for inflammation of the eyes and freckles, and especially for thrush (aphthz) in children, also for stings and burns, ery- sipelas and herpes.

Internally houseleek is used as a cooling remedy in dysentery and fluxes. The young leaves have also been eaten as salad, like Portulacca. WS. glutinosum, Ait., and S. balsamiferum, Webb, natives respectively of Madeira and the Canary Islands, contain a very viscous sub- stance in large quantity, and are used for the preparation of bird-lime ; fishermen in Madeira, after dipping their nets in an alkaline solution, rub them with this substance, render- ing them as tough as leather. S. montanum, L., indigenous in Central Europe, according to Gmelin, causes violent purging ; S. arboreum, L., 76 péya deiLwov of Dioscorides, is employed in Cyprus, the East, and northern Africa as

an external remedy for malignant ulcers, inflammations, and burns, and internally for mucous discharges.

See Britten and Holland, Dietionary of Plant Names, pp. 265-271 ; Fristedt, Joannis Franckenti Botanologia, p. 60; Rosenthal, Plan- tarum Diaphoricarum, p. 576.

HTLOUSSA, Housa, Haussa, or Hausa, an important people of the western Soudan, forming a main element in the population of the country between 12° and 13° N. lat., from the Niger in the south-west to Bornu in the east. By Barth they are identified with the Atarantians of Herodotus; and it is certain that at a comparatively early date they attained great political power. The seven original states of Biram, Daura, Gobir, Kano, Rano, Katsena, and Zegzeg, formed a great confederation or empire, which extended its authority over many of the neighbouring countries, and retained its pre-eminence till the beginning of the 19th century, when the Pullo (Fellata or Fulbe) rose upon its ruins. Physically the Houssa may be considered as the most typical of all the negro peoples : they are strongly and somewhat heavily built, and even where there has been a considerable intermixture of Barber or Pullo blood, their racial persistence is very marked. In intellectual qualities they hold the very foremost rank among the negroes; they are excellent agriculturists, and, almost unaided by foreign influence, they have developed a variety of industries, such as the making of cloth, mats, leather, and glass, as well as a very extensive trade. In Sierra Leone and the Gold Coast territory the Houssa form the backbone of the military police, and

under Captain Glover, who was the first to enrol them under the British flag, they did good service in the Ashantee campaigns.

The Houssa or Afnu language ranks as one of the richest and most cultivated in Africa; and it is not only the dominant vernacular throughout a large part of the Soudan, but serves as the means of communication in a great many places throughout the region to the south and west of the Lower Niger. At Idda, says Bishop Crowther (Proc. Roy. Geog. Soc, 1877), we found Houssa becoming more generally spoken by the inhabitants, and at Igbegbi it is one of the prevailing languages of the mixed popula- tion of that town. From Lagos, Badagry, and Porto Novo, and upwards to the Niger, wherever Mahometans are found, Houssa is spoken by them; through it the Koran is explained in the mosques throughout Yoruba. According to Dr Baikie (Observations on the Hausa and Fulfulde, printed for private circulation, Lond. 1861) there are two master dialects—the Daura or eastern, and the Gobir or western. Of these the latter is the more original, the other the more refined. The Katsena form is very pure, and closely resembles the Gobir; that of Kano is extremely corrupt, though not so much so as that of Zariya or Zozari. As an example of the richness of the vocabu- lary, Dr Crowther mentions that there are eight names for different parts of the day from cockcrow till after sunset.

See El Hage Abd Salam Shabeeny, Account of Timbuetoo and Haussa Territories, 1820; Norris, Dialogues and part of the New Testamentinthe English, Arabic, Haussa, and Bornu languages, 1853 ; Koelle, Polyglotta Africana, 1854; Barth, T’ravels in North and Cen- tral Afriea, vol. ii., London, 1857, and Central-Afrikanisehe Voka- bularien, Gotha, 1862 and 1866; Schon, Grammar of the Hausa Lan- guage, London, 1862; Id., Hausa Reading Book, 1877; and Id., A Dictionary of the Hausa Language, 1877. Schon has also produced Houssa translations of Gen. (1858), Matt. (1857), and Luke (1858).

HOUSTON, a city of the United States, capital of Harris county, Texas, and the next city in the State to Galveston as regards both population and commercial enterprise, is situated on the left bank of Buffalo bayou at the head of navigation, and at the junction of several railways, 50 miles north- west of Galveston. -The bayou is crossed at Houston by several bridges.

Most of the streets are shaded by fine avenues of trees, and the principal of them are traversed by tramway cars. The chief buildings are the city-hall

and market-house, completed in 1874, at a cost of 400,000 dollars, the masonic temple of the grand lodge of Texas, and the hotels, the largest of which is the finest in the State. The city is well supplied with schools and churches, and has two large public libraries. It is the principal railway centre of the State, and the depdt of an extensive and rich agricultural region, besides being the seat of important and varied manufactures. The recent deepening of the bayou so as to make it navigable for vessels drawing 9 feet of water has considerably increased the shipping trade, which is chiefly in lumber. The town possesses iron and brass founderies, railway machine shops, planing-mills, factories for cars, waggons, and agricultural implements, sheet-iron and tin works, a large flour-mill, beef-packing establishments, and manufactures of cotton, soap, Portland cement, and bone dust. In the neighbourhood there are extensive nurseries. The annual fair of the State of Texas is held at Houston. The city, which was named after Samuel Houston, noticed below, was settled in 1836, and

in 1837 it was for a short time the capital of the State.

In 1870 the popnlation was 9382, and in 1880 it had

increased to 17,000.

HOUSTON, Samvet (1793-1863), an American general

and statesman, was born near Lexington, Virginia, 2d

March 1793. On the death of his father, a soldier of the

revolution, in 1807, he removed with his mother to the

frontier, and settling in Blount county, Tennessee, was soon on familiar terms with the Cherokee Indians, For a while

he acted as clerk to a trader, and then as village school-

master; but in 1813, after a residence of nearly tliree

years among the Indians, he joined the United States

army. He served with Jackson in the war against Great Britain, and at the peace of 1815 had risen from the ranks to a lieutenancy. Although conscious of his success, and proud of having won Jackson's friendship by his bravery, he then resigned his commission and turned to the study and practice of law at Nashville. In 1823 Tennessee re- turned him to congress, and four years later he was elected governor of the State. He married in January 1829, and in the April following, without assigning any reason, he suddenly abandoned his home and his office, and took up his residence among the Cherokees, by whom he was formally adopted as a member of their nation. Returning to Washington, he successfully pleaded their cause against the Government agents who had wronged them. In 1832 he settled in Texas, and was soon after elected a member of the convention called for the purpose of framing a con- stitution for that State, then in difficulties with the Mexican Government. On March 2, 1836, Texas declared its independence, and, on the 2d of April following, won it on the field of San Jacinto, where Houston, who had been appointed commander-in-chief of the Texas forces, with a body of 783 raw troops, defeated 1600 Mexican veterans led by Santa Anna. On the recognition of the independ- ence of Texas, Houston was elected president of the new republic, and re-elected in 1841; and, when Texas was ad- mitted to the Union in 1845, he was returned as one of its two representatives to the senate. There he distinguished himself as a zealous friend of the Indians, opposing the Kansas and Nebraska bill in a memorable speech (3d March 1854), and voting against the Lecompton constitution of Kansas. His decided opposition to secession obliged him in 1861 to retire from the office of governor of Texas, which he had held from 1859. He died at Huntersville, Texas, 25th July 1863. The hero of San Jacinto was above all things an able soldier, wary, intrepid, and reso- lute ; but he also possessed as a legislator the qualities of rare foresight, cool discrimination, and fearless candour.

See his Life (New York, 1855), his Letters to the People (1856), and §. L. Knapp's History of Ameriea (New York, 1875).

HOUWAERT, Jean Baprisra (1533-1599), Flemish poet, was the most prominent of the rhetoricians of his day. He held the title of “ Counsellor and Master in Ordinary of the Exchequer to the Dukedom of Brabant.” As a patriot and a friend of the prince of Orange he played a prominent part in therevolution of the Low Countriesagainst Spain, and when the prince entered Brussels victoriously, September 23, 1577, Houwaert met him in pomp at the head of the two chambers of rhetoric, the “ Book” and the “ Garland of Mary.” He died at Brussels, March 11, 1599.

His existing works are of an allegorical and highly fantastic order, and prove him to have been a disciple of Matthys de Castelyn. He wrote the Commerce of Amorosity (Den Handcl der Amourens- heyt), consisting of four plays or moralities in verse, namely, Aineas and Dido, Narcissus and Echo, Mars and Venus, and Leander and Hero. His other principal poem is a didactic epie on the vanity of human love, Pegasides Pleyn, of den Lusthof der Maechden, These and other laborious and exemplary pieces gained him the title of the ‘‘ Homer of Brabant” from his eontemporarics. Houwaert prided himsclf on the introdnetion of elassical and mythological names into his poems, but he had little or nothing of the antique spirit.

HOVEDON, Roger or, an old English chronicler, was in all probability born at Howden, in the East Riding of Yorkshire, and was possibly a member of a family which had taken its name from the place. The date neither of his birth nor his death is known, and the first notice we have of him is as being sent in 1174 by Henry IL, on whom he was in attendance in France, to endeavour to induce the lords of Galloway to withdraw from their allegiance to the king of Scotland. He appears to have been recom- mended to the notice of Henry from his knowledge of law, and to have occupied a place in his household. It has been conjectured, but without much evidence, that he was a student of Oxford ; and the ascription to him of a volume of lectures is also without ground to support it. From the interest manifested in his history regarding the dispute between Archbishop Roger of York and Bishop Hugh of Durham in regard to synodal fees, it has been supposed that he himself held for some time the living of Howden, but this is likewise wholly devoid of direct corroboration. In 1175 he was employed by Henry in the delicate mission of inducing the monastic houses to send deputations to Woodstock for the purpose of choosing their rulers. In 1189, the last year

of Henry’s reign, he was appointed a justice itinerant for the forests in Northumberland, Cum- berland, and Yorkshire; and it is probable that after Henry’s death he retired to Howden, since from the number of his references to Yorkshire disputes it is evident that he must have been living in that county during the time that he compiled the latter portion of his Chronicle, As the Chronicle closes abruptly in 1201, it is probable that he did not live long beyond that date.

The work of Roger of Hovedon, which commences with the close of the Chronicle of Bede in 732, is divided by Professor Stubbs into four parts :—the Ist ending with 1148, and consisting chiefly of the Historia post Bedam, with a few alterations and additions; the 2d ending with 1169, based principally on the Melrose Chronicle, and from 1163 eomposed mainly of the-A Beckett letters contained in the collection made by Johu of Salisbury and Alan of Tewkesbury; the 3d ending with 1192, and virtually a condensation of Benedict’s Chronicle, with the occasional addition of unimportant details and several variations, many of which are inaccurate and of such a kind as to show that he wrote from memory; the 4th ending in 1201, and evidently a narrative of contemporary events. The work of Roger of Hovedon was eited in 1291 by Edward I., when claiming the lordship of Scotland, as one of the authorities in regard to the homage done by the earlier kings to his aneestors. The independ- ent value of the work belongs almost wholly to the last portion, although various documents of interest to be found nowhere else are ineorporated in the 2d and 3d portions.

The Chronicle was first printed in 1596 in Sir Henry Sayille’s collection of the Scriptores Post Bedam, and was reprinted at Frankfort in 1601. A translation of it by H. F. Riley, B.A., appeared in 1852, and forms part of Bohn’s Antiquarian Library; and it has been published in 4 yols., 1868-71, in the series of the Master of the Rolls, under the cditorship of Professor Stubbs, whose preface con- tains an claborate criticism of the work and a full account of the various MSS.

HOWARD, Henry. Sce Surrey, Eart or.

HOWARD, Joun (1726-1790), “the philanthropist,” was born in 1726, most probably on September 2, and at Enfield, where his father, a moderately wealthy retired London merchant, had a country house. His childhood was

spent at Cardington near Woburn, Bedfordshire, where his father had a small estate ; for seven years he was under the tuition of the Rev. John Worsley of Hertford (author of a Latin grammar and of a new translation of the New Testament) ; and he was afterwards placed for a short time at a private academy in London under Mr John Eanes, F.R.S. At the close of a very imperfect school education he was apprenticed by his father at a considcrable premium to a firm of grocers in the city; but on the death of the elder Howard in September 1742, by which he inherited considerable property, he bought up his indenture and devoted more than a year to foreign travel, during which he acquired some knowledge of French. Never constitu- tionally strong, he on his return to England settled in lodgings at Stoke Newington as a confirmed valetudinarian, his days being spent for the most part in hypochondriac idleness (for little importance can be attached to what have sometimes been called his studies in medicine and meteoro- logy). Having bcen nursed through an acute illness by an attentive landlady, a widow of some fifty-three years of age, he felt that he could offer no adequate return short of marriage for her motherly kindness, and they were united accordingly in 1752. Left a widower in less than three years, Howard broke up his establishment at Stoke New- ington in 1755, and resolved to go abroad, the recent occurrence of the earthquake at Lisbon attracting him to Portugal. The ship, however, in which he sailed was so unfortunate as to be taken by a French privateer, by whom both crew and passengers were carried to Brest, where they were treated with great harshness and almost starved. At Morlaix and at Carhaix Howard had further opportunities of observing the treatment to which prisoners of war were usually at that time subjected ; and when permitted on parole to return to England to negotiate an exchange for himself, he not only accomplished his personal object, but also successfully represented the case of those who had been his fellow-captives. Abandoning for the time his Lisbon scheme, he now retired to his property at Cardington, where he continued to interest himself in meteorological observa- tion, for some slight notes on which he obtained publication in the Transactions of the Royal Society, of which he had been admitted a member in 1756. After his marriage (April 1758) to Henrietta, eldest daughter of Edward Leeds of Croxton, Cambridgeshire, he continued to live a secluded life, partly at Cardington and partly on another property which he had purchased at Watcombe, Hampshire. In both places he distinguished himself as a kind landlord, and at Cardington especially he

displayed a highly enlight- ened philanthropy in his efforts to raise the condition of the poor by the construction of model cottages and by the erection of schools. In March 1765 his home was again desolated by the sudden and unexpected death of his wife, a few days after she had given birth to a son, her first and only child ; and soon Howard's drooping health and spirits imperatively demanded a change of air and scene. After visiting Bath and London, he in the spring of 1768 crossed to Holland ; and another brief stay at Cardington was followed by a prolonged tour in France, Switzerland, and Italy as far as to Naples, whence he returned in 1770 by Germany and the Rhine. Having resumed his former course of life at Cardington, he was in 1773 named high sheriff of Bedford, an office which, although as a noncon- formist he was unable to take the usual tests, he resolved to accept. 'The characteristic work of his life may be said to have now begun. When the assizes werc held he did

not content himself with sitting out the trials in open court; his inquisitiveness and his benevolence alike impelled him to visit the jail to which the prisoners had been condemned. Howard found it, like all the prisons of the time, wretchedly defective in all its arrangements; but what chiefly astonished and shocked him was an almost incredible abuse arising out of the circumstance that neither the jailer nor his subordi- nates were salaried officers, but were dependent for their livelihood on fees which they rigorously exacted from the prisoners themselves. He found it to be a fact that some whom the juries had declared not guilty, others in whom the grand jury had not found even such appearance of guilt as would warrant a trial, others whose prosecutors had failed to appear, were frequently detained in prison for months after they had ceased to be in the position of accused parties, until they should have paid the fees of jail delivery. (See Introduction to The State of the Prisons in England and Wales.) His prompt application to the justices of the county for a salary to the jailer in lieu of his fees was met by a demand fora precedent for charging the county with such an expense. This he undertook to find if such a thing existed. He went accordingly from county to county until his journey had extended to every town in England which contained a prison, but the object of his search eluded inquiry. He could find uo precedent for charging the county with the

wages of its servants, but he did find so many abuses in prison management which imagination had never conceived, and so many sufferings of which the general public knew nothing, and of which the law took no account, that he determined to devote to the exposure of those wrongs and the reform of those abuses whatever time and money might be needful. The task cost him a fortune, and the best remaining years of his life. The subject of prison reform, indeed, had not previously been wholly absent from the public mind. As early as the year 1728 the House of Commons had appointed a com- mittee to inquire into the state of Newgate, the Marshalsea, and other London prisons, where abuses had come to light which had caused the house to order the arrest of several governors of jails, who were tried for high mis- demeanours (see Reports of the Committee Apponted to Inquire into the State of the Gaols, 1729). Much more recently Popham, member for Taunton, had forced the unwilling legislature at least to discuss the propriety of paying fixed salaries to jailers out of the county rates ; but in February 1773 the bill after passing the second reading had been withdrawn with a view to its being again brought forward in an amended form. The way had thus been prepared for a friendly reception to anything Howard might have to say as the result of his investigations ; and at the close of his first rapid survey of the English prisons he was, through the influence of the supporters of Popham's bill, cited to appear before a committee of the whole house in March 1774. After his report had been received and he himself examined upon it, it was moved and carried, on the house resuming, 'that John Howard, Esq., be called to the bar, and that Mr Speaker do acquaint him that the House are very sensible of the humanity and zeal which have led him to visit the several jails of this kingdom, and to communicate to the house the interesting observations which he has made on that subject." Almost immediately an Act was passed which provided for the liberation, free of all charges, of every prisoner against whom the grand jury failed to find a true bill, giving the jailer a sum from the county rate in lieu of the abolished fees. This was followed in June by another requiring justices of the peace to see that the walls and ceilings of all prisons within their jurisdiction were scraped and whitewashed once a year at least ; that the rooms were regularly cleaned and ventilated ; that infirmaries were provided for the sick, and proper care

taken to get them medical advice; that the naked should be clothed ; that underground dungeons should be used as little as could be; and generally that such courses should be taken as would tend to restore and preserve the health of the prisoners. It was highly characteristic of the man that, having caused the provisions of the new legislation to be printed at his own private cost in large type, he sent a copy to every jailerand warder in the kingdom, determined that no one should be able to plead ignorance of the law if detected in the violation of its provisions. He then set out upon a new tour of inspection, from which, however, he was brought home by the approach ofa general election in September 1774. Siding with those who objected to the American policy of the Government, he had consented to stand as one of the anti-ministerial candidates for Bedford ; although, however, he was returned by a narrow majority along with his friend Whitbread, he was unseated after a scrutiny on account of the alleged disqualification of some of those voters who had supported him. He was thus left entirely free for the vigorous prosecution of the special task which he had assigned himself; and he began to have thoughts of publishing the immense mass of facts which he had so industriously collected, and which was still so rapidly accumulating. But after a tour which had extended to Scotland and Ireland, it occurred to him before going into print that his notes would be much enhanced in utility if supplemented with the regulations and arrangements of the more important Continental prisons. In April 1775, accordingly, he set out upon an extended tour through France, the Low Countries, and Germany. At Paris he was at first denied access to the prisons ; but by recourse to an old and almost obsolete law of 1717, according to which any person wishing to distribute alms to the prisoners was to be admitted and allowed to dispense his charity with his own hand, he succeeded in inspecting the Bicétre, the Force l'Evéque, and most of the other places of confine- ment, the only important exception being the Bastille. With regard to this last, however, he succeeded in obtaining pos- session of a suppressed pamphlet, which he afterwards translated and published in English, to the unconcealed chagrin of the French authorities. At Ghent he examined with special interest the great Maison de Force, then recently erected ; its distinctive features—useful labour, in the profits of which the prisoners had a share, and complete separation of the inmates by night—drew from him the exclamation that it was a "noble institution." At Amster- dam, as in Holland generally, he was much struck with the comparative absence of

crime, a phenomenon which he attributed to the industrial and reformatory treatment there adopted. In Germany he found little that was useful and much that was repulsive; in Hanover and Osnabriick, under the rule of a British sovereign, he even found traces of torture. Returning to England in autumn with his copious notes, he determined, before finally reducing them to order and sending them to press, to undertake another tour of England. This lasted for seven months (November 1775 to May 1776), and yielded results so important by way of correction and supplement that he resolved to give his Continental experience the benefit of a similar revision. On this occasion he extended his tour to several of the Swiss cantons. At last in 1777 appeared The State of the Prisons in England and Wales, with Preliminary Observa- tions, and an Account of some Foreign Prisons (Warrington). It met witha very favourable reception, although its author was fully justified in his statement in the preface that as the journeys were not undertaken for the traveller's amuse- ment, so the results of them were not published for general entertainment. It consists principally of a mass of minute statistical details, somewhat pedantically accumulated and very unmethodically arranged ; its most important section

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—that relating to " proposed improvements in the structure and management of prisons "—constituting less than a tenth part of the whole. One portion of his subject, indeed,— that relating to the ships used for transportation of convicts, —had been to some extent taken out of his hand by the passing in 1776 of the Act authorizing the hulk system ; but even in this connexion the appearance of his work was highly opportune. Following within a few years the pub- lication of Beccaria's work On Crimes and Punishments, it called public attention to the practical question of the treatment of criminals in a manner which compelled the adoption of remedial or at. least of palliative measures, although the full difficulty and delicacy of the problem had not as yet been thoroughly appreciated. One of the most immediate results was that Sir W. Blackstone and Mr Eden were requested to draft a bill for the establishment of penitentiary houses, where. by means of solitary imprison- ment, accompanied by well-regulated labour and religious instruction, the object of reforming the criminal and inuring him to habits of industry might be successfully pursued. New buildings

were manifestly necessary in order that the provisions of such an Act might be carried into effect ; and as no one seemed to know how to set about their construc- tion, Howard volunteered to go abroad again and collect plans and other information. On this errand (April 1778) he first went to Amsterdam, aud carefully examined the “ spin- houses” and “ rasp-houses” for which that city was famous ; next he traversed Prussia, Saxony, Bohemia, Austria, and Italy, everywhere inspecting prisons, hospitals, and work- houses, and carefully recording the merits and defects of each, In the course of this tour he was received with marked consideration and respect at more than one court q but the personal incident of greatest consequence was one which befel him on a voyage along the Tuscan coast. A sudden and violent storm had compelled the master of the small vessel in which he had taken a passage for Leghorn to seek the shelter of land; cold, wet, and exhausted, passengers aud crew reached a little island harbour, but only to find that through fear of the plague (they having sailed from a port supposed to be infected) a landing was refused them. Driven backagain upon the storm, they were carried by its violence to the coast of Algeria, where a similar experience was encountered, permission to enter the harbours there also being peremptorily denied. It was this occurrence which first directed Howard’s attention to the subject which engrossed his attention in after years, and in the investigation of which he ultimately lost his life. Leghorn at last reached, he hastened northwards through Lombardy, France, and Flanders, arriving in England in 1779. The information he had obtained having been placed at the service of the House of Commons, a bill was intro- duced and passed for building two penitentiary houses in Middlesex, Surrey, Kent, or Essex (as might be afterwards determined), and Howard was appointed first supervisor (19 Geo. III. cap. 74). The scheme, however, did not proceed without friction too trying for his patience; and after much time had been lost in interminable discussions with his colleagues as to the sites of the proposed buildings, he in January 1781 wrote to Lord Bathurst resigning his post before anything practical had been achieved. In 1780 he had published a quarto volume of 220 pages as an appendix (the first) to his State of Prisons; about the same time also he caused to be printed his translation of the suppressed French pamphlet on the Bastille ; but on obtaining release from his employments at home his passion for accumulating statistics urged him to new and more extended Continental tours, as far as to Denmark, Sweden, and Russia in 1781, and to

Spain and Portugal in 1783. The results of these journeys (which were full of curious

and romantic incidents) were embodied in 1784 in a second

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appendix, with the publication of which his direct labours in connexion with the subject of prison reform may be said to have ceased. The five remaining years of his life were chiefly devoted to researches on a different though cognate subject, that of the means which ought to be used for pre- vention of the plague, and for guarding against the propa- gation of contagious distempers in general. Having at the suggestion of his medical friends provided himself with a list of queries to be put to the physicians in attendance at the lazarettos he proposed to visit, he in November 1785 sailed for Holland, and thence travelling through France inspected the great lazaretto at Marseilles, though with cousiderable difficulty, owing to the unfriendliness of the authorities. He next passed through Florence, Rome, and Naples to Malta, whence he sailed by Zante to Smyrna, where his reputed medical skill opened all the prisons and hospitals to his inspection, and where he had ample oppor- tunities of studying the plague in its most. fatal form. He then went to Constantinople, where the fame of his skill had preceded him, and where some further fortunate practice greatly added to his prestige. Declining the hospitalities of the British ambassador, however, he devoted himself entirely to the care of the neglected poor, and per- sistently forced his way into infected caravanserais and pest-houses whither physician and dragoman alike declined to follow him. At length his researches seemed to be complete ; and with a great accumulation of papers and memoranda, he was preparing to return homewards by Vienna, when it occurred to his scrupulous mind that he still lacked one essential qualification for practically dealing with the matter which he had taken in hand; he had not as yet had any personal experience of quarantine discipline. Altering his plans accordingly, he returned to Smyrna, and, deliberately choosing a foul ship, took a passage to Venice that he might there undergo the usual confinement. A protracted voyage of sixty days, during which an attack by pirates gave Howard an opportunity of manifesting in a new form that personal bravery which was one of his

characteristics, was followed by a weary term of confine- ment which enabled him to gain, though at the cost of considerable hardship and suffering, the experience he had desired. While imprisoned in the Venetian lazaretto he received two pieces of intelligence which from very Opposite causes gave him acute pain. One was the announcement of a proposal that a statue should be erected commemorative of his services in the cause of humanity; to Howard as “a private man with some pecu- liarities,” desirous to retire into obscurity and silence, it presented itself as a “hasty and disagreeable measure,” “a distressing affair.” The other was the information that his only son, a youth of twenty-two years of age, after a course of flagrant misconduct, had lost his reason and had been put under restraint. Returning hastily by Trieste and Vienna (where he had a long and singular interview with the emperor Joseph II.), he reached England in February 1787. His first care related to his domestic concerns; after these had been put into such order as they admitted, he set out upon another journey of inspection of the prisons of the United Kingdom, at the same time busy- ing himself in preparing for the press the results of his recent tour. The somewhat rambling work containing them was published in February 1789 at Warrington, under the title An Account of the Principal Lazarettos in Hurope : with various Papers relative to the Plague, together with JSurther Observations on some Foreign Prisons and Hospitals, and additional Remarks on the present state of those in Great Britain and Ireland. In the conclusion (p. 235) he committed with some solemnity the result of his past labours to his country, and announced his intention of again visiting Russia, Turkey, and i countries, AIT. — 41

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and of extending his tour in the East, adding these words, “T am not insensible of the dangers that must attend such a journey. Trusting, however, in the protection of that kind providence which has hitherto preserved me, I calmly and cheerfully commit myself to the disposal of unerring wisdom. Should it please God to cut off my life in the prosecution of this design, let not my conduct be uncandidly imputed to rashness or enthusiasm, but to a serious, deliber- ate conviction that I am pursuing the path of duty, and to a sincere desire of being made an instrument of more extensive usefulness to my fellow-creatures than could be expected in the

narrower circle of a retired life.” The execution of the purpose he had thus expressed was delayed for some time by the necessity for making special arrange- ments with regard to his private affairs in consequence of the confirmed insanity of his son; but early in July 1789 he finally embarked in what proved to be his last journey. Travelling overland from Amsterdam by Hanover, Berlin, Konigsberg, and Riga to St Petersburg and Moscow, and so southwards, and visiting in passing the military hospitals that lay on his route, he reached Cherson in November. In the hospitals of this place and of the immediate neigh- bourhood he found more than enough to occupy his attention while he awaited the means of transit to Constantinople. Towards the end of the year his medical advice was asked in the case of a young lady who was suffering under the camp

fever then prevalent, and in attending her he himself took |

the disease, which terminated fatally on January 20, 1790. ‘‘ Give me no monument,” he had said, “‘ but lay me quietly in the earth ; place a sundial over my grave, and let me be forgotten ;” but a life like his had made such a burial even in a foreign land impossible, and his remains were followed, respectfully and sorrowfully, by many thousands to the grave, where they now lie near the village of Dauphigny on the road to St Nicolas. A statue by Bacon with a suitable inscription was afterwards erected to his memory in St Paul’s, London.

In personal appearance Howard is described as having been short, thin, and sallow,—unprepossessing apart from the attraction of a penetrating eye and a benevolent smile. “There was an animation in his manner and a quickness in his gait which corresponded with the activity of his mental powers. In his address he was dignified, kind, and con- descending, always adapting himself to the persons with whom he conversed; as free from a cringing servility amongst his superiors in station as he was from arrogancy towards those of lower rank” (Field). In point of intel- lectual ability he cannot be said to have been possessed of more than the ordinary endowments ; nor had education done all that was possible for the devclopment of those which he had. That he was of a deeply religious tempera- ment is abundantly shown by the meagre remains we have of his letters and diaries; while the greater part of his life shows that his enthusiasm of humanity was

the unusual yet normal outcome of the sincerest piety. His benevo- lent impulses were sustained by a rare degree of energy and determination, while they were guided by a remarkable delicacy of tact and an equally remarkable vigour of prac- tical common sense. It would be idle to speculate how far Howard's work could have been done when it was, and as it was, by a mau differently endowed. Doubtless the reforms which he inaugurated were reforms urgently called for by the spirit and enlightenment of his age; but this fact rather enhances than diminishes the imperishable glory which belongs to him of having been the foremost to give an articulate voice to that demand. 'In the scale of moral desert the labours of the legislator and the writer are as far below his asearth is below heaven. His kingdom was of a better world; he died a martyr after living an apostle" (Bentham).

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See Ancedotes of the Life and Character of John Howard, writicn by a Gentleman (1790); Aikin, View of the Character and Public Services of the late John Howard, Memoirs, by Baldwin Brown (1818), Taylor (1836), Hepworth Dixon (1849), Field (1850), and Stoughton (1853) ; and Correspondence of John Howard, with brief Memoir and Anecdotes (1855).

HOWE, Joun (1630-1706), one of the greatest of the later Puritan divines, was born May 17, 1630, at Lough- borough, Leicestershire, of which parish his father was minister. When hardly five years old he was removed to Ireland by his father, who, unable to support the ecclesi- astical policy of Archbishop Laud, had been ejected from his living. On the outbreak of the Irish rebellion in 1641, the exiles returned to England ; and, fixing his abode in Lancashire, the elder Howe conducted in person the studies of hisson, who in his seventeenth year (May 19, 1647) entered Christ's College, Cambridge, as a sizar, and in the following year took his degree of B.A. During his residence in this university he made the acquaintance of Cudworth, More, and Smith, from intercourse with whom, doubtless, as Calamy suggests, as well as from direct acquaintance with the Dialogues themselves, his mind received that " Platonic tinge" which is so perceptible in his writings. Immediately after graduation at Cambridge, he removed to Oxford, where he took the same degree in the following year, and, after

becoming a fellow of Magdalen College, proceeded M.A. in 1652. On leaving Oxford in that year he returned to his father's retreat in Lancashire, and received ordination at Winwick from the hands of Mr Herle, the minister of the parish, who was assisted by the ministers of the neighbouring chapelries. Sometime afterwards 'an unexpected conduct of divine providence" bore him to Great Torrington in Devonshire, where he spent some years as pastor. It was there that he preached those discourses which at a later period took shape in his treatises on The Blessedness of the Righteous and on Delighting in God. There also it was that he married the daughter of "his inner friend" Mr George Hughes. In the beginning of 1657 a journey to London accidentally brought Howe under the notice of Cromwell, who, struck by his appearance and preaching, made him his domestic chaplain. In this prominent position, which he had accepted with very great reluctance, his conduct as the almoner and confidential adviser of the Protector was such as to win the praises of even the bitterest enemies of his party. Without overlooking the due claims of the Puritans, he omitted no opportunity of helping pious and learned men of other denominations, Ward (afterwards bishop of Exeter) and Thomas Fuller having been among the number of those who profited by Howe's kindness, and who were not ashamed subsequently to express their gratitude for it. On the deposition of Richard Cromwell, Howe returned to Great Torrington, where, like all who had played a conspicuous part under the Common- wealth, he soon after the Restoration found himself an object of suspicion and hatred ; in 1662 the passing of the Act of Uniformity drove him from his parish. For several years he now led a wandering and uncertain life, preaching in secret as occasion offered to handfuls of trusted hearers. More than once his liberty was in imminent peril ; and it is alleged by Calamy, though on doubtful grounds, that for two months in 1665 he was imprisoned in the Isle of St Nicholas in Plymouth Sound. Impelled by the demands of pressing want, he in 1668 published the treatise entitled The Blessedness of the Righteous ; the reputation which he had acquired by it procured for him in 1669 an invitation from Lord Massarene of Antrim Castle, Ireland, to become his domestic chaplain. At Antrim, where he was soon joined by his family, he accordingly spent six years of quiet, during which he frequently preached in public, with the approval of the bishop of the diocese, and also found time

to produce the most eloquent of his shorter treatises, Zhe Vamty of Man as Mortal, and On Delighting in God ; there too he planned the largest (and also in some respect the greatest) of his works, The Living Temple. In the begin- ning of 1676 he accepted an invitation to become pastor of a nonconformist congregation in Silver Street, London ; and in the same year he published the first part of The Living Temple, entitled Concerning God's Existence and His Conversableness with Man: Against Atheism or the Epicurean Deism. In 1677 appeared his tractate On the Reconcileable- ness of God's Prescience of the Sins of Men with the Wisdom and Sincerity of His Counsels, Exhortations, and whatsoever means He uses to prevent them, which was attacked from vari- ous quarters, and had Andrew Marvel for oneof its defenders. His work On Thoughtfulness for the Morrow followed in 1681; those on Self-Dedication and Union among Protestants in 1682 ; and that on Zhe Redeemer's Tears wept over Lost Souls in 1684. During the earlier years that followed his settlement in London Howe had enjoyed comparative free- dom from annoyance on the ground of his nonconformity, and had been on intimate terms with many who already were or who afterwards became eminent in the Established Church, such as Stillingfleet, Tillotson, Sharp, and Kidder ; but the greater severity which began to be manifested in 1681, and which continued to be shown during the fol- lowing years, so interfered with his liberty that in 1685 he gladly accepted the invitation of Philip Lord Wharton to travel abroad with him. The tour extended over the greater part of a year. In 1686, matters still seeming hopeless in England, he determined to settle for a time at Utrecht, where he officiated along with Mead and others in the English chapel, and also read privately with English students at the university. Among his friends there was Burnet, the future bishop of Salisbury, by whose influence he obtained several confidential interviews with the prince of Orange. In 1687 Howe availed himself of the publica- tion by James IL. of the declaration for liberty of conscience to return to England, and in the following year he headed the procession of nonconformist ministers who went to congratulate William on his accession to the English throne. The remainder of his life, so far as recorded, was extremely uneventful. In 1693 he published three admirable dis- courses On the Carnality of Religious Contention, suggested by the disputes and divisions that had so abundantly occurred among the nonconformists as soon as liberty of doctrine and worship had been granted. In 1694 and 1695 he published various treatises

on the subject of the Trinity, the principal being A Calm and Solemn Inquiry concerning the Possibility of a Trinity in the Godhead. The second part of The Living Temple, entitled Animadversions on Spinosa and a French Writer pretending to confute him, with a recapitulation of the former part and an account of the destitution and restitution of God's Temple among Men, appeared in 1702. About this time he appears to have fallen into shattered health, but he was able in 1705 to give to the world a discourse On Patience in the Expectation of Future Blessedness, which proved to be his last work. He died in London on April 2, 1706.

Though excelled by Baxter as a pulpit orator, and by Owen in exegetical ingenuity and in almost every department of theological learning, Howe compares favourably with either as a sagacious and profound thinker, while he was much more successful in combining religious earnestness and fervour of conviction with large-hearted tolerance and cultured breadth of view. His style, moreover, though not altogether free from the literary faults which may almost be called characteristic of Puritanism, has often a stately yet grace- ful flow which the modern reader will look for in vain in most of Howe's theological contemporaries. The works published in his life-time, including a number of sermons and other occasional pieces besides those specified above, were collected into 2 vols. fol. in 1724, and again reprinted in 3 vols. 8vo. in 1848. A complete edition of the Whole Works, including much posthumous and additional matter, appeared with a Memoir in 8 vols. in 1822; this

was reprinted in 1 vol. in 1838. The Memoirs of Howe by Calamy, originally published in 1724, have been more than once reprinted, and form the basis of The Life and Character of Howe, with an 5 ned of his Writings, by Henry Rogers (1836; new cd.,

HOWE, Ricuarp Howe, Eart (1725-1799), English admiral, was born in 1725. By his father Emanuel Scrope Howe, second Viscount Howe in the Irish peerage, he was descended from an old family, several members

| of which attained distinction in war or in politics; and

his mother was the daughter of Baron Kielmansegge, master of the horse to George I. when elector of Han- over. Leaving Eton at the age of fourteen, Howe entered the navy as midshipman on board the "Severn," which

| then formed one of a squadron under Anson destined for

an expedition against Spain in the Pacific. Nothing is recorded as to the manner in which he conducted himself in the actions in which the squadron engaged, but he at any rate succeeded in winning the approval of his com-

mander, and in his twentieth year was made lieutenant. Shortly after this he was appointed to the command of a sloop-of-war, the “ Baltimore,” in which with the aid of the “Greyhound” frigate, commanded by Captain Noel, he signalized himself by defeating off the coast of Scotland two French vessels, of greatly superior metal to his own, which were carrying supplies and reinforcements to the Pretender. On his arrival in England he found that pre- vious to this action he had been raised to the rank of post-captain, and he served in this capacity on the coast of Guinea and on the Jamaica station. In 1748 he returned to England, and after spending three years chiefly in the study of naval tactics, he was in 1751 appointed to the “Glory,” of 44 guns, and employed on the coast of Africa. In May 1752 he was commissioned to the “ Dolphin” frigate, in which he was employed for some years in pro- tecting the trade in the vicinity of Gibraltar. Shortly after his return to England he was appointed in 1755 to the “‘ Dunkirk,” and joined the squadron of Admiral Boscawen, bound for America, In the course of the voyage thither Howe took a prominent part in capturing two French men-of-war, the “ Alcide” and the “Lys.” This action was virtually the commencement of the seven years’ war with France, in the course of which Howe in command of a small squadron succeeded in capturing from the French the island of Chaussé, and, after obtaining a commission to the ‘‘ Magnanime,” distinguished himself in the attacks made on the Isle of Aix, St Malo, and Cherbourg, mani- fested conspicuous courage and readiness of resource at the disaster of St Cas, and in the action with the French fleet under De Conflans disabled two of the enemy’s ships. Shortly before the close of the war Howe had married, and by the death of his brother Viscount Howe had inherited the family titles and estates. From 1758 till 1782 he represented Dartmouth in parliament ; in the latter year he was raised to the British peerage as Viscount Howe. In 1763 he re- ceived a seat at the board of admiralty, and in June 1765 he was appointed to the important office of treasurer of the navy, which he retained till August 1770. In October of this latter year he was made rear-admiral of the blue, and nominated commander in chief of the fleet intended to be employed in the Mediterranean in view of a probable rupture with Spain, which, however, did not take place. In 1775 he was promoted rear-admiral of the white, and in the following year he received the command of the squadron despatched to America, but owing to the insufficiency of his force he achieved no exploit of importance. After his return to England he was in

September 1782 appointed to the command of the Channel fleet, and ordered to proceed to the relief of Gibraltar, then besieged by the combined land and sea forces of France and Spain, when after suc- ceeding in supplying the garrison with stores and provisions

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he engaged at long ranges the united fleet which numbered 44 sail to his 34, and caused them to retreat to Cadiz. In January 1783 Howe succeeded Keppel as first lord of the admiralty, an office which he resigned in the following April, but again accepted under the Pitt ministry, holding it till July 1788. In July 1787 he was made admiral of the white, and shortly afterwards was raised to an earl- dom. In 1790 he was appointed to the command of a fleet intended to operate against the Spaniards, but peace was concluded before any action took place. On the com- mencement of the war with France after the Revolution he obtained the chief command in the Channel, and on the Ist of June 1794 gained a great victory over the French fleet off Ushant, dismasting ten of the enemy's ships and taking seven, one of which, the " Vengeur," sank as she was being towed away. On the 9th August of the same year he resumed the command of the Channel fleet, but in none of his cruises was he fortunate enough to meet any of the enemy's vessels ; and during the greater part of 1795 and 1796 ill health compelled him to remain on shore. In May 1797 he resigned his command. In the same year he was appointed with full powers to treat with the mutineers in the British fleet at Portsmouth and Spithead, and completely succeeded, through the confidence they had in the friendliness of his intentions, and by the firm and judicious measures he adopted, in eradicating the causes of discontent. During the latter years of his life Lord Howe suffered much froin ill health; and he died under a violent attack of gout, August 5, 1799. A splendid monument was erected to Howe in St Paul's Cathedral.

Lord Howe is entitled to the exceptional praise of never having failed to bear himself with credit and success in any of his enter- prises. The qualities in which he excelled were coolness, firmness, sea- manship, and caution — an excess of the latter virtue, however, tending perhaps on some occasions to diminish the lustre and eompleteness of his victories. He introduced a new and thorough system of naval tactics, evolutions, and signals, and

bestowed careful and minute attention on all the details of the service. In person he was tall and well-proportioned. His countenance was strongly marked, somewhat harsh in expression except when softened by his genial smile, and dark in complexion—although the sobriquet of Black Dick by which he was known in the navy was not due to this circumstance, but to a mezzotinto portrait of himself which hung in his cabin. The benevolent friendliness of his disposition secured him the strong affection and confidence as well as respect of his seamen, while no professional jealousy prevented him from doing full justice to the achievements of his ofticcrs.

HOWELL, James (1594-1666), a voluminous English author, best known by his collection of letters (Hpzstole L1o- Eliane) and his Instructions for Forreine Travell, which, in Mr Arber's phrase, form our first handbook for the Con- tinent. Howell, as he was proud to acknowledge, was a Welshman ; he was born probably at Abernant in Carmar- thenshire, where his father was minister. From the free grammar school at Hereford he proceeded to Jesus College, Oxford, in 1610, and there he took his degree of B.A, in 1613. About 1617 we find him holding the post of steward in Sir Robert Mansell's glass-works in Broad Street, and in the following year he was commissioned to go abroad to procure the services of some high-class workmen. It was not till 1622 that he returned home, having visited Holland, France, Spain, and Italy ; and these three or four years of foreign experience made a lasting impression on his character and his career. Not long after his return he was despatched to Spain in company with Lord Digby's embassy to try and settle a dispute about the unlawful seizure of an English vessel; but though he remained till the end of 1624 he was obliged to return without success: the Spaniards, irritated at the breaking off of the famous match, were in no mood for concessions. For some time Howell had no stable employment, but at length, in 1626, he went to York as secretary to Lord Scroop, lord president

wonderfully fortunate. In 1627 he was elected M.P. for Richmond ; in 1632 he was sent as orator with the embassy of the earl of Leicester to Denmark ; and in 1642 the king appointed him one of the clerks of the privy council. On suspicion of royalist leanings he was committed to the Fleet prison by

the Parliament in 1643, and, though he professed himself most humbly submissive to its authority, he was allowed to languish in confinement till 1648. He had acquired considerable fame by his allegorical AevdpoAoyia, published in 1640, and his Jnstructions for Forreine Travell, 1642; and now he was driven to maintain himself by his pen. He edited and supplemented Cotgrave's French and English dictionary, compiled Leaicon Yetraglotton, or an English, French, Italian, and Spanish Dictionary (London, 1660), translated various works from Italian and Spanish, and wrote a life of Louis XIII. In 1660 he presented a petition for confirmation in the place of clerk of the privy council ; and, though this was not granted him, the post of historiographer royal was created for his benefit. In 1661 lie made application for the office of tutor in foreign languages to the infanta Catherine of Braganza, and in the following year published an Lnglish Grammar translated into Spanish. He died in 1666, having realized to the last his favourite motto, ' Senesco non segnesco." Howell had no small ability and learning ; and all his writings are imbued with a certain simplicity and quaintness. His elaborate allegories, Discourses of Trees and the like, are now dead to the root ; his linguistic labours, though of worth in their tine, are a hundred times superseded; but his Letters (10th ed., 1737) are still almost models of their kind, and his Jnstructions, with their subtle observations and pithy parallels, are well worthy of their place in Mr Arber's series (London, 1869).

HOWITT, Wittram (1795-1879), a popular writer and poet, was born in 1795 at Heanor, Derbyshire, where the Howitts had long been settled. His mother and father being members of the Society of Friends, William was brought up, with his brothers, in the faith of that sect, and educated at the local schools of the society. What he thus learned was supplemented by studies in natural science and. modern literature and languages ; and his leisure, spent in the woods and by the brook, fostered that love of nature which brightened every page he wrote and won his readers' sympathy. A poem, published in 1814, on the Jnjluence of Nature and Poetry on National Spirit, was, so far as we know, his first printed work. He married in 1823 a Quaker lady, Mary Botham of Uttoxeter, who as poetess and prose-writer occupies a place in literature no less dis- tinguished than her husband's. The first joint book appeared in the year of their marriage under the title, The Forest Minstrel, and other Poems. After a pedestrian excur- sion to

Scotland, they took up their residence at Nottingham, Howitt engaging in the business of an apothecary. In 1824 he printed A Poet's Thoughts at the Interment of Lord Byron. We now find that both he and his wife had become known by thcir contributions, chiefly in rustic verse, to The Literary Souvenir, The Amulet, and other serial volumes of the day; these were collectively issued with additions in 1827 as The Desolation of Eyam (founded on the plague), Zhe Emigrant, and other Poems. In 1831 Howitt produced a work of the class specially his own, Z'he Book of the Seasons, or the Calendar of Nature, in which he drew a picture, from his own observations, of the appearances of mother earth in the garden, in the field, and by the stream during each of the twelve months. Of quite a different character was A Popular History of Priesteraft (1833), which ran through several editions, and gained him the favour of the active Liberals of his time, and the office of alderman of Notting- ham. It was followed, in 1835, by a cognate work in 2

of the north, and for a season he appears to have been | vols., entitled, Panteka, or Traditions of the most Ancient

Times. Having removed in 1837 to Esher, to be near the literary circles of the metropolis, Howitt there wrote in succession The Rural Life of England, 2 vols., 1838 ; Colonization and Christianity, 1838; The Boy's Country Book, 1839; and the first series (afterwards extended) of Visits to Remarkable Places, Old Malls, Battlefields, and Scenes illustrative of striking passages in English Listory and Poetry, 1840-42, in which he recorded impressions derived on the spot, and pictured each place with its in- habitants—freed, as he says, from the heaviness of the antiquarian rubbish piled upon them. Visiting Heidelberg in 1840, primarily for the education of their children, the Howitts remained in Germany two years, studying their neighbours, and busying their pens in descriptions of their new surroundings. In 1841 Howitt produced The Student Life of Germany, under the pseudonym of "Dr Cornelius," including translations of some of the most popular German songs. The next year he published The Rural and Do- mestic Life of Germany, with characteristic Sketches of its Cities and Scenery; in the year following a translation of Chamisso's Wonderful

History of Peter Schlemihl; and in 1844 The Life of Jack of the Mill, a version of Holthaus's Wanderings of a Journeyman Tailor, and German Experi- ences, addressed to the English, a satire on the social life of Germany. In 1845 appeared Life cn Dalecarlia, translated from the Swedish of Miss Bremer, The Renounced Treasure, and Johuny Darbyshire. The Aristocracy of England, a Listory of the English People, a political sketch, appeared in 1846, at the beginning of which year Howitt became connected with tle management and proprietorship of The People's Journal, a weekly paper. A disagreement leading to his withdrawal he started in 1847 a rival called owitt's Journal, but this was continued through three or four volumes only, though The People's Journal was merged in it. In 1847 Howitt had translated Ennemoser's L/istory of Mage, and written an original work entitled ZZomes and Haunts of the most eminent British Poets, 2 vols., which was succeeded by The Hall and the Hamlet, or Scenes and Characters of Country Life, and very speedily by Stories of English and Foreign Life (Bohn's Illustrated Library), in which Mrs Howitt assisted. Then appeared The Year- Book of the Country, or the Field, the Forest, and the Fere- side, and in 1851 a three-volume novel called Madam Dorrington of the Dene.

Under the associated names of husband and wife an interesting work was brought out in 1852, The Literature and Romance of Northern Europe: constituting a complete History of the Literature of Sweden, Denmark, Norway, and Iceland, in 2 vols. In June of that year Howitt, with two sons and some friends, set sail for Australia, where he spent two of the most trying years of his life, working in the gold diggings, and visiting Melbourne, Sydney, and other towns. Some account of the novel situations in which he was himself placed is given in A Boy's Adventures in the Wilds of Australia (1854). Shortly afterwards he returned to the suburbs of London, on this occasion to Highgate, and narrated more elaborately his experiences in Land, Labour, and Gold ; or Two Years in Victorta, with

Visits to Sydney and Van Diemen's Land, 2 vols., 1855, a |

work which speedily became popular, the condition of the

Australian colonies being then almost totally unknown in |

England. A further account of Australian life was given In 1857 in Tallangetta, the Squatter's Home, 3 vols. The

year before Howitt had commenced The Illustrated History

of Lngland for Messrs Cassell, the sixth and last volume of which appeared in 1861. While this work was in pro- gress he wrote in 1859 A Country Book of Amusements, and, in connexion with Mrs Hall and others, The Boy's Birthday Book, and in 1860 The Man of the People, 3 vols. From 1861 to 1864 Mr and Mrs Howitt were occupied on

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The Ruined Abbeys and Castles of Great Lritain, issuing, before its completion, The Wye, its Ruined Abbeys and Castles (1863); and the same year Howitt printed a series of Letters on Transportation, and the Cruelties Practised under the Game Laws, and a work of great research, The History of the Supernatural in all Ages and Nations, and in all Churches, Christian and Pagan, demonstrating a Universal Faith, 2 vols. To a man with the mental de- velopment of Howitt the miraculous became at all times an absorbing speculation; and he adds to these pages "his own conclusions from a practical examination of the higher phenomena through a course of seven years." If," he reasons, "you crush the supernatural you must crush the universe." Other works from Howitt's prolific pen were Sargent's Peculiar (1864); The History of Discovery in Australia, &e., 2 vols., 1865; The Ruined Abbeys of the Border (1865), and of Yorkshire (1865), jointly with his wife ; Woodburn Grange, a story of English country life, 3 vols., 1867; The Northern Heights of Loudon, an anti- quarian and topographical description of Hampstead, Highgate, &c, 1869; Zhe Mad War-Planet, and other Poems, 1871; The Religion of Rome, 1873. Suffering from bronchitis, Howitt had now made Rome his winter residence, passing the summer in Tyrol. He died at Rome on the 3d of March 1879.

HOWRAG, the largest and most important town in the district of Hooghly, Bengal, and the headquarters of the magisterial district of Howrah, is situated on the right bank of the Hooghly river, opposite Calcutta, and

forms a suburb of that city. Since 1785 it has risen from a small village to a town, with a magistrate, subordinate judge, é&c., of its own. The total area of Howrah and suburbs within municipal limits is 11:05 square miles; the population in 1872 numbered 97,784, of whom 54,098 were males and 43,686 females (Hindus, 79,335; Mahometans, 16,644; Christians, 1484 ; others, 354). The municipal income in 1871-72 was £13,994. The town is lighted with gas ; it contains several large and important dockyards, and is also the Bengal terminus of the East Indian Railway. Mills and manufactories of various sorts are rapidly developing. Communication with Calcutta is carried on by means of ferry steamers, and by a massive pontoon bridge, which was opened for traffic in 1874. Howrah is a suburban residence for many people who have their places of business in Calcutta. Sibpur, one of the suburbs of Howrah, situated opposite Fort-William, a small village at the commencement of the century, is now a flourishing little town. To the south of Sfbpur are the Royal Botanical Gardens and the Bishop's College.

HOXTER (Latin, HZuaaria), a town of Prussia, capital of a circle in the government district of Minden, province of Westphalia, is situated on the Weser at its confluence with the Grube and the Schelpe, and on a branch line of the Westphalian Railway, 2} miles S.W. of Holzminden. It is the seat of a provincial office and of a circle court, and possesses an Evangelical and a Catholic church, a synagogue, a gymnasium, a building-school, and a hospital. The Weser is crossed by a stone bridge about 500 feet in length, erected in 1833. On the Brunsberg adjoining the town there is an old watch-tower said to be the remains of a fortress built by Bruno, brother of Wittekind. Near

| Hoxter is the castle, formerly the Benedictine monastery,

of Corvey (see Convey). The principal manufactures of the town are linen, cotton, cement, and gum, and there is also a considerable shipping trade. The population in 1875 was 5645.

Hoxter in the time of Charlemagne was a villa regia, and was the scene of a battle between him and the Saxons, Under the protee- tion of the monastery of Corvey, founded in 816, it gradnally increased in prosperity. Ultimately it

asserted its independence and joined the Hansa League. It suffered severely during the

Thirty Years' War, being captured four several times. After the peace of Westphalia it was united to Brunswick ; in 1802 it was traus- ferrcd to Orange-Nassau, and in 1807 to Westphalia, after tlic dismem- berment of which in 1814 it came into the possession of Prussia.

HOYLE, Epmunp or Epmonp (1672-17 69), the first systematizer of the laws of whist, and author of a book on games, was boru in 1672. His parentage and place of birth are unknown, and few dctails of his life are recorded. For some time he was resident in London, and partially supported himself by giving instruction in the game of whist. For the use of his pupils he drew up a Short T'reatise on the game, which after circulating for some time in manu- script was printed by him and entered at Stationers' Hall in November 1742. The laws of Hoyle continued to be regarded as authoritative until 1864, since which time they have been gradually superseded by the new rules adopted by the Arlington and Portland clubs in that year. He also published rules for various other games, and his book on games, which includes the Short Treatise, has passed into many editions. The weight, of his authority is indi- cated by the phrase "according to Hoyle," which, doubtless first applied with reference to whist, has gained currency as a general proverb. Hoyle died at Cavendish Square, London, August 29, 1769.

HRABANUS MAURUS MAGNENTIUS (776-856), archbishop of Mainz, and one of tlie most prominent teachers and writers of the Carolingian age, was born of noble parents at Mainz about the year 776. Less correct forms of his name are Rabanus and Rhabanus. At a very early age he was sent to Fulda, where he continued until, on attaining the canonical age, le received deacon's orders (801); in the following year, at the instance of Ratgar his superior, he went along with Haimon (afterwards of Halberstadt) to complete his studies at Tours under Alcuin, who in recognition of his diligence and purity gave him the surname of Maurus, after St Maur the favourite disciple of Benedict. Returning after the lapse of two years to Fulda, he was entrusted with the principal charge of the school, which under

his direction rose into a state of great efficiency for that age, and sent forth such pupils as Walafrid Strabo, Servatus Lupus of Ferri¢res, and Otfrid of Weissen- burg. At this period it is most probable that his Lxcerptio from the grammar of Priscian, long so popular as a text- book during the Middle Ages, was compiled. In 814 he was ordained a priest ; but shortly afterwards, apparently on account of disagreement with Ratgar, he was compelled to withdraw for a time from Fulda. This "‘ banishment" is understood to have occasioned the pilgrimage to Palestine to which he alludes in his commentary on Joshua. Return- ing to Fulda on the election of a new abbot (Eigil) in 817, he himself five years afterwards (822) became superior. The duties of this office he discharged with efficiency and success until 842, when, in order to secure greater leisure for literature and for devotion, he resigned and retired to the neighbouring cloister of St Peter's. In 847 he was again constrained to enter public life by his election to succeed Otgar in the archbishopric of Mainz, which see he occupied for upwards of eight years. The principal inci- dents of historical interest belonging to this period of his life were those which arose out of his relations to Gottschalk ; they may be regarded as thoroughly typical of that cruel intolerance which he shared with all his contemporaries, and also of that ardent zeal which was peculiar to himself; but they hardly do justice to the spirit of kindly benevolence which in less trying circumstances he was ever ready to dis- play. He dicd at Winkel on the Rhine, February 4, 856. He is frequently referred to as St Rabanus, but incorrectly.

His voluminous works, many of which remain unpublished, com- prize commentaries on a considerable number of the books both of canonical and of apocryphal Scripture (Genesis to Judges, Ruth, Kings, Chronicles, Judith, Esther, Canticles, Proverbs, Wisdom,

Ecclesiasticus, Jeremiah, Lamentations, Ezekiel, Maccabecs, Matthew, the Epistles of St Panl, including Hebrews); and various treatises relating to doctrinal and practical subjects, including more than one scries of Homilies. Perhaps the most important is that De Institutione Clericorum, in three books, by which he did much to bring into prominence the views of Augustine and Gregory the Great as to the training which was requisite for

a right discharge of the clerical function ; the most popular has been a comparatively worthless tract De Laudibus Sanctee Crucis. Among the others may be men- tioned that De Universo Libri xxii., sive Etymologiarum Opus, a kind of dictionary or encyclopedia, designed as a help towards the his- torical and mystical interpretation of Scripture, the De Sacris Ordinibus, the De Disciplina Ecclesiastica, and the Martyrologium. All of them are characterized by erudition (he knew even some Greek and Hebrew) rather than by originality of thought. The poems are of singularly little interest or value, except as including one form of the ‘‘ Veni Creator.” In the annals of German philology a special interest attaches to the Glossaria Latino-Theodisca. A commentary, Super Porphyrium, printed by Cousin in 1836 among the Ouvrages inédits d@ Abélard, and assigned both by that editor and by Hauréan to Hrabanus Manrus is now generally believed to have been the work of a disciple.

The first nominally complete edition of the works of IIrabanus Maurus was that of Colvener (Cologne, 6 vols. fol., 1627). The Opera Omnia form vols. evii—cxil. of Migne’s Patrologie Cursus Completus. The De Universo is the subject of Compendiun der Naturwissenschayien an der Schule zu Fulda im IX. Jahrhundert (Berlin, 1880). Maurus is the subject of monographs by Schwarz (De Ehabano Mauro primo Germanie preceptore, 1811), Kunstmann (Historische Monographie iiber Hrabanus Magnenttus Maurus, 1841), Spengler (Leben des heii. Rhabanus Maurus, 1856), and Kohler (Rhabanus Maurus u. die Schule zu Fulda, 1870), Lives by his disciple Rudolphus and by Joannes Trithemius are printed in the Cologne edition of the Opera. See also Pertz, Monum. Germ. Hist., vols. i. and ii,; and Bahr, Gesch. d. rémischen Literatur im Karoling. Zeitalter, 1840.

HROSVITHA (frequently RoswirHa, and properly Hrortsuit), early medizval dramatist and chronicler, occupies a very notable position in the history of modern European literature. Her endeavours formed part of the literary activity by which the age of the emperor Otto the Great sought to emulate that of Charles the Great. The famous nun of Gandersheim has occasionally been confounded with her namesake, a learned abbess of the same convent, who must have died at least half a century earlier. The younger Hrosvitha was born in all probability about the year 935; and, if the statement be correct that she sang the praises of the three Ottos, she must

have lived to near the close of the century. Some time before the year 959 she entered the Benedictine nunnery of Gandersheim, a foundation which was confined to ladies of German birth, and was highly favoured by the Saxon dynasty. In 959 Gerberga, daughter of Duke Henry of Bavaria, and therefore niece of the emperor Otto J., was consecrated abbess of Gandersheim, and the earlier literary efforts of the youthful Hrosvitha (whose own con- nexion with the royal family appears to be an unauthenti- cated tradition) were encouraged by the still more youthful abbess, and by a nun of the name of Richarda.

The literary works of Hrosvitha, all of which were as a matter of course in Latin, divide themselves into three groups. Of these the first and least important comprises eight narrative religious poems, in- leonine hexameters or distichs. Their subjects are the Nativity of the Virgin (from the apocryphal gospel of St James, the brother of our Lord), the Ascension, and a series of legends of saints (Gandolph, Pelagius, Theophilus, Basil, Denis, Agnes). Like these narrative poems, the dramas to which above all Hrosvitha owes her fame seem to have been designed for reading aloud or recitation by sisters of the convent. For though there are indications that the idea of their repre- sentation was at least present to the mind of the authoress, the fact of such a representation appears to be an unwar- rantable assumption. The comedies of Hrosvitha are six in number, being doubtless in this respect also intended to recall their nominal model, the comedies of Terence. They were devised on the simple principle that the world, the flesh, and the devil should not have all the good plays to themselves. The experiment upon which the young Christian dramatist ventured was accordingly, although not absolutely novel, audacious enough. In form the

dramas of “ the strong voice of Gandersheim,” as Hrosvitha (possibly alluding to a supposed etymology of her name) calls herself, are by no means Terentian. They are written

in prose, with an element of something like rhythm, and |

an occasional admixture of rhyme. In their themes, and in the treatment of these, they are what they were intended to be, the direct opposites of the

lightsome adapter of Menander. They are founded upon legends of the saints, selected with a view to a glorification of religion in its supremest efforts and most transcendental aspects. The emperor Constantine's daughter, for example, Constantia, gives her hand in marriage to Gallicanus, just before he starts ona Scythian campaign, though she has already taken a vow of perpetual maidenhood. In the hour of battle he is himself converted, and, having on his return like his virgin bride chosen the more blessed unmarried state, dies as a Christian martyr in exile. The three holy maidens Agape, Chionia, and Irene are preserved by a humorous miracle from the evil designs of Dulcitius, to offer up their pure lives as a sacrifice under Diocletian's persecutions. Callimachus, who has Romeo-like carried his earthly passion for the saintly Drusiana into her tomb, and among its horrors has met with his own death, is by the mediation of St John raised with her from the dead to a Christian life. All these themes are treated with both spirit and skill, often with instinctive knowledge of dramatic effect—often with genuine touches of pathos and undeniable felicities of expression. In Dudlcitius there is also an element of comedy, or rather of farce. How far Hrosvitha's comedies were an isolated phenomenon of their age in Germany must remain undecided ; in the general history of the drama they form the visible bridge between the few earlier attempts at utilizing the forms of the classical drama for Christian purposes and the miracle plays. They are in any case the productions of genius; nor has Hrosvitha missed the usual tribute of the supposition that Shakespeare has borrowed from her writings.

The third and last group of the writings of Hrosvitha is that of her versified historical chronicles. At the request of the abbess Gerberga she composed her Carmen de Gestis Oddonis, an epic attempting in some degree to follow the great Roman model. It was completed by the year 968, and presented by the authoress to both the old emperor and his son (then already crowned as) Otto II. This poem so closely adheres to the materials supplied to the authoress by members of the imperial family that, notwithstanding its courtly omissions, it is regarded as an historical authority. Unfortunately only half of it remains; the part treating of the period from 953 to 962 is lost with the exception of a few fragments, and the period from 962 to 967is summarized only. Subsequently, in a poem (of 837 hexameters) De

Primordiis Cenobit Gandersheimensis, Hrosvitha narrated the beginnings of her own convent, and its history up to the year 919.

The Munich MS., which contains all the works enumerated above except the Chronicle of Gandersheim, was edited by the great Vienna humanist Celtes in 1501, and re-edited by the learned H. L. Schurzfleisch in 1707. The comedies have been translated into German by Bendixen (Liibeck, 1858), and into French by A. Magnin (Paris, 1845}, whose introduction gives a full account of the authoress and her works. A copious analysis of these plays will be found in Klein, Geschichte des Dramas, iii. 665-754. Gustav Freytag is the author of a treatise De Rosuitha poetria (Breslau, 1839); and at the beginning of Cohn's Shakspeare in Germany, Shakespearean parallels are suggested to certain passages in Hrosvitha's dramas. Her two historieal chronicles were edited by Pertz among the Monumenta Germanic (vol. iv.); for an appreeia- tion of them sce Wattenbach, Geschichtsquellen, 214-216, and Giesebrecht, Deutsche Kaiserzeit, i. 780, who mentions a German translation by Pfund. There is a complete cdition of the works of Hrosvitha by K. A. Barack (Nuremberg, 1858). J. Asehbach (1867) attempted to prove that Celtes had forged the productions which

he published under the name of Hrosyvitha, but le was refuted by R. Kopke (Berlin, 1869). (A. W. W.)

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HUANCAVELICA, or GuancaBetica, the chief town of a department of same name, Peru, is situated in a deep ravine, of an average width of one mile, at about 12,400 feet above sea level, and 160 miles south-east of Lima. It is well and regularly built, the houses being of stone, while several stone bridges span the stream that flows through the town. Huancavelica was founded in 1572 as a mining town by the viceroy Francisco de Toledo, and mining has continued to be the principal employment of the inhabitants. Close by is the famous quicksilver mine of Santa Barbara, with its subterranean San Rosario church, cut out of the cinnabar. Population in 1876, 3937.

HUANUCO, or Guanuco, the chief town of the Peru- vian department of the same name, is situated on the left bank of the river Huallaga near its junction with the Higueras, in a beautiful valley nearly 6000 feet above sea-level, and 180 miles north-west of Lima. The streets are laid out regularly, but the houses are mean-looking, As nearly every house is surrounded by a garden the limits of the town embrace a large area. Sweetmeats for the Lima market are almost the only manufacture, most of the inhabi- tants being engaged in mining and farming. Huanuco was founded in 1539 by Gomez Alvarado, and was shortly afterwards raised to a bishopric. In 1812 during an insurrection of the Indians of Panao it was plundered. The population in 1876 was 5263.

HUARAZ, chief town of the Peruvian department of Ancachs, and of a district to which it gives its name, is situated on the left bank of the river Santa, in a fertile valley of the Andes, about 190 miles N.N.W. of Lima. There is some export trade in cattle, wheat, sugar, and fruit; and in the vicinity considerable quantities of gold, silver, and copper are mined. A state railway 172 miles long, of which 82 miles are completed, is designed to connect Huaraz with Chimbote on the coast. Near the town there are ruins in the second or Cyclopean style of Inca architec- ture, sufficiently like the remains at Tiahuanca to allow us to assign Huaraz as the northern limit of the prehistoric Incarial empire, of which Tiahuanca was the southern boundary. Population in 1876, 4851.

HUBER, Francois (1750-1831), an emiment Swiss naturalist, especially distinguished by the originality and reach of his researches into the life history of the honey-bee, was born at Geneva, July 2,1750. He belonged to a family which had already made its mark in the literary and scien- tific world: his great-aunt, Marie Huber (1695-1753), was known as a voluminous writer on religious and theological subjects, andas the translator andepitomizer of The Spectator (Redaction du Spectateur Anglais & ce quil renferme de meilleur, Amst., 3 vols. 1753); and his father Jean Huber (1721-1786), who had served for many years as a soldier, was a prominent member of the coterie at Ferney, distin- guishing himself both by the rare skill with which he could reproduce the likeness of Voltaire by clipping paper and by other unpromising devices, and by the publication of a valuable series of Observations sur le vol des oiseaux (Geneva, 1784). From

an early age Frangois Huber displayed a dangerous ardour for study; and he was only fifteen years old when he began, in consequence of his ill-judged assiduity, to suffer from an affection of the eyes which gradually resulted in total blindness. Happily at once for his comfort and lis fame he had secured the affection of Marie Aimée Lullin. Having patiently waited till she was legally of age, she married the husband of her choice, and ministered to his wants till her death with such unceasing devotion that it was only, he said, wlien he lost her that he really felt he was blind. For many years her efforts were seconded by Francois Burnens, a servant, whom Huber had inspired with something of his own love of nature. The results of the investigations which were conducted by this

happily assorted trio, at once surprised and delighted the world. So skilfully did the blind man devise his cx- periments, and so carefully did his assistants conduct and register their observations, that the work Vouvelles Observa- tions sur les abeilles (Geneva, 1792; Paris, 1796; new ed., Paris, 1814; English translation, Edinburgh, 1806 and 1821) laid the foundation of all our scientific knowledge of the subject. Huber assisted Senebier in his Afém. sur influence de Vair, &c., dans la germination (Geneva, 1800); and we also have from his pen " Mém. sur l'origine de la cire". (Bibliotheque Britannique, tome xxv.), a "Lettre & M. Pictet sur certains dangers que courent les abeilles" (37). Brit., xxvii.), and " Nouvelles observ. rel. au sphinx Atropos" (Bib. Brit., xxvii.). He died at the age of eighty-one, December 22, 1831. De Candolle gave his name to a genus of Brazilian trees—Huberia laurina. Pierre Huber (1777-1840) followed in his father's footsteps. His best known work is Lecherches sur les mours des fourmis indigénes (Geneva and Paris, 1810; newed., Geneva, 1861), but he also contributed papers on various ento- mological subjects to several scientific periodicals.

Sec the account of Francois Huber by De Candolle in Bibi. Universelle, 1832; and the notice of Picrre in Bibl. Univ., 1866; also Haag, La France Protestante.

HUBER, Jonann (1830-1879), a philosophical and theological writer whose name is intimately connected in Germany, and indeed throughout Europe,

with the Old Catholic and other recent movements towards freedom and enlightenment, was born in very humble circumstances, on August 18, 1830, at Munich, where, originally destined for the priesthood, he early began the study of theology. By the writings of Spinoza and Oken, however, he was strongly drawn to philosophical pursuits, and it was in philosophy that he “habilitated ” (1854), and ultimately became pro- fessor (extraordinarius in 1859 and ordinarius in 1864). Along with Déllinger and others he attracted a large amount of public attention in 1869 by the challenge to the Ultramontane promoters of the Vatican council in the treatise Der Papst u. der Koncil, which appeared under the pseudonym of ‘ Janus,” and also in 1870 bya series of letters (“Rémische Briefe”), which were published in the Allgemeine Zeitung. The nature of the numerous contro- versies in which he became involved both before and after this main episode of his life may be gathered from the subjoined list of his published writings. He died suddenly of heart disease at Munich on March 20, 1879,

His treatise Veber die Willensfreihett (1858) was followed in1859 by Die Philosophie der Kirehenviter, which was promptly placed by the Roman authorities upon the Jndex, and which led ta the prohibition of all Catholic students from attending his lectures ; Johannes Seotus Erigena, 1861; Idee der Unsterblichkeit, 1864; Studien, 1865; Der Proletarier: zur Orientirung in der soeialen Frage, 1865 ; Der Jesuitenorden nach Verfassung u. Doktrin, Wissensehaft u. Geschichte, 1873; Der Pessimismus, 1876; Die Forsehung nach der Materie, 1877; Zur Philosophie der Astronomie, 1878; Das Geddehtniss, 1878. He also published adverse criticisms on Darwin, Strauss, Hartmann, and Haeckel; pamphlets on Das Pupstthum wa. der Staat, 1870, and on Die Freiheiten der franzdsisehen Kirehe, 1871; and a volume of Kleine Sehriften, 1871.

HUBERT (Hucusert or Hucusrecut, “the Bright- witted ”), St, bishop of Liége, was son of Bertrand, duke of Guienne, and held a prominent place in the court of the Frankish king Theodoric, and afterwards in that of Pippin of Heristal. He was passionately fond of the chase, but with the death of his wife Floribane all his taste for mundane enjoyments disappeared, and following the counsels of his friend and teacher, Bishop Lambert of Maestricht, he retired to the monastery of Stavelot, whence he afterwards undertook a pilgrimage to Rome, on occasion of which he was by pope

Sergius L appointed bishop of Tongeru. In 708 he succeeded Lambert in the see of Maestricht and Liége, to whose memory he erected a cathedral in the latter

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city. His death occurred in 727, and in 825 his remains (which, it is alleged, suffered no decay for many years) were removed to a Benedictine cloister in the Ardennes, which thenceforth bore his name, and ultimately became a con- siderable resort of pilgrims. St Hubert's day is November 3, but the date and circumstances of his canonization are not stated. His conversion, represented as having been brought about, while he was hunting on Good Friday, by a miraculous appearance of a stag bearing between his horns a beaming cross or crucifix, has frequently been made the subject of artistic treatment. He is the patron of hunters, and is also invoked in cases of hydrophobia and demoniac possession. Several orders of kniglithood have been under his protection ; among these may be mentioned the Bavarian, the Bohemian, and that of the electorate of Cologne.

See Jameson, Saered and Legendary Art ; Fétis, Légende de Saint Hubert, précédée dune préface bibliographique e Pune tntroduetion

historique, 1846; Des Granges, Vie de Saint Hubert, 1872; Heggen, Des hetligen Hubertus Leben u. Wirken, 1875.

HUBLI, a town in Dharwar district, Bombay, 15° 20' N. lat., 75° 12' E. long., situated 13 miles south-east of Dharwar, on the main road from Poona to Harihar ; it is 230 miles south-east from Poona, 142 miles from Bellari (Bellary), 90 miles from Karwar, and 97 miles from Kumpta (Coompta). Population (1872) 37,961. Situated on the main lines of communication to Harihar, Karwar, and Kumpta, the town has become the centre of the cotton trade of the southern Marhatté country. Besides raw cotton and silk fabrics, a general trade in copper vessels, grain, salt, and other commodities is conducted on a large scale. Hubli was formerly the seat of an English factory, which in 1673, with the rest of the town, was plundered by Sivaji, the Marhatta leader.

HUG, Evanrisre Ries (1813-1860), a celebrated French missionary-traveller, was born at Toulouse, Ist August 1813. In his twenty-fourth year he entered the congrega- tion of the Lazarists at Paris, and shortly after receiving holy orders in 1839 set forth fired by missionary zeal for China. At Macao he spent some eighteen months in the Lazarist seminary preparing himself under the instruction of Perboyre for the regular work of a missionary in the interior. Having at last acquired a sufficient command of the Chinese tongue, and modified his personal appearance in accordance with Chinese taste, he started from Canton clad in the flowing costume of the natives, with his skin dyed yellow, and wearing the inevitable queue. He at first superintended a Christian mission in the southern provinces, and then passing to Peking, where he perfected his know- ledge of the language, eventually settled in the Valley of Black Waters or He Shuy, a little to the north of the capital, and just within the borders of Mongolia. There, beyond the Great Wall, a large but scattered population of native Christians had found a refuge from the persecutions of Kia-King, to be united half a century later in a vast but vague apostolic vicariate. The assiduity with which Huc devoted himself to the study of the dialects and customs of the Tartars, for whom at the cost of much labour he trans- lated various religious works, was an admirable preparation for undertaking in 1844, at the instigation of the vicar apostolic of Mongolia, an expedition whose object was to dissipate the obscurity which hung over the country and habits of the Tibetans. September of that year found the missionary at Tolon-noor occupied with the final arrange- ments for his journey, and shortly afterwards, accompanied by his fellow-Lazarist, Joseph Gabet, and a young Tibetan priest who had embraced Christianity, he set out. To escape attention the little party assumed the dress of lamas or priests. Crossing the Hoang-ho at Shagan-Kooren, they advanced into the terrible sandy tract known as the

steppes of the Ortoos. After suffering dreadfully from want of water and fuel they entered Kansu, having recrossed the flooded Hoang-ho, but it was not till January 1845 that they reached Tang-Kinul on the boundary. Rather than encounter alone the horrors of a four months’ journey to Lhassa they resolved to wait for eight months till the arrival of a Tibetan embassy on its

return from Peking. Under an intelligent teacher they meanwhile studied the Tibetan language and Buddhist literature, and during three months of their stay they resided in the famous Kounboum Lamasery, which was reported to accommodate 4000 persons. Towards the end of September they joined the returning embassy, which comprised 2000 men and 3700 animals. Crossing the deserts of Koko-nur, they passed the great lake of that name, with its island of con- templative lamas, and, ascending with difficulty and hard- ship the tortuous snow-covered mountains of Chuga and Baylen-Bharat, they at last entered Lhassa on the 29th January 1846. Favourably received by the regent, they opened a little chapel, and were in a fair way to establish an important mission, when the Chinese ambassador inter- fered and had the two missionaries conveyed back to Canton, where they arrived in October of the same year. For nearly three years Huc remained at Canton, but M. Gabet, returning to Europe, proceeded thence to Rio de Janeiro, and died there shortly afterwards. Huc returned to Europe in shattered health in 1852, visiting India, Egypt, and Palestine on his way, and, after a prolonged residence in Paris, died 31st March 1860. His writings comprise, besides numerous letters and memoirs in the Annales de la Propagation de la Foi, the famous Souvenirs dun Voyage dans la Tartarie, le Thibet, et la Chine pendant les années 1844-46 (2 vols., Par., 1850; Eng, transl. by W. Hazlitt, 1851, abbreviated by M. Jones, Lond., 1867) ; its supple- ment, crowned by the Academy, entitled Z'Lmpire Chinois (2 vols, Par., 1854; Eng. transl., Lond., 1859); and an elaborate historical work, Le Christianisme en Chine, &e. (4 vols., Par., 1857-58; Eng. transl., Lond., 1857-58). These works are written in a lucid, racy, picturesque style, which has secured for them an unusual degree of popu- larity. The narrative of one of the most remarkable feats of modern travel, the Sowvencrs contain passages of so singular a character as in the absence of corroborative testimony to stir up a feeling of incredulity. That Huc was suspected unjustly has been amply proved by the later research of Bushnell, David, Prejevalski, Richthofen, and Colonel Montgomerie's " Pundits." But although his credibility has been firmly established, and although in his heroic enterprise he gathered a vast amount of novel and curious information, the fact remains that Huc was by no means a practical geographer, and that the record of his travels loses greatly in value from the want of precise scientific data.

See, for information specially relating to the whole subject, the Abbé Desgodin's Mission dw Thtbet de 1855 & 1870, Verdun, 1872 ;

and " Account of the Pundit's Journey in Great Tibet," in the Royal Geoyraphical Socicty's Journal for 1877.

HUCBALD (also called Hucpatpus and Husatpus) was born in or about 840, if we may believe the statement of his biographers to the effect that he died in 930, aged 90. Of his life little is known; not even the place of his birth can be ascertained, but he was no doubt a Frenchman ora Belgian. It is certain that he studied at the convent of St Amand in French Flanders, where his uncle Milo occupied an important position. Hucbald made rapid progress in the acquirement of various sciences and arts, including that of music, and at an early age composed a hymn in honour of St Andrew, which met with such success as to excite the jealousy of his uncle. It is said that Hucbald in consequence was compelled to leave St Amand,

and started an independent school of music and other arts at Nevers. In 860, however, we find him at St Germain d'Auxerre, bent upon completing his studies, and in 872 he is back again at St Amand ag the successor in the head- mastership of the convent school of his uncle, to whom he had been reconciled in the meantime. Between 883 and 900 Hucbald went on several missions of reforming and reconstructing various schools of music, including that of Rheims, but in the latter year he returned to St Amand, where he remained to the day of his death (June 25, 930, or, according to other chroniclers, June 20, 932), and where his most important works on music were written. Of the character of these works and of the reforms and improve- ments advocated by them it is not easy to give a correct idea ; not even their number is sufficiently certain, for some treatises have been attributed to Hucbald which are obviously not his, and others of which the authorship is at least doubtful. His largest and most authentic work is the Enchiridion Musice, published with other writings of minor importance in the first volume of Gerber's Scriptores ecclest- asteci, and containing a complete system of musical science as well as instructions regarding notation. Hucbald as a musical theorist may be called a precursor of Guido d'Arezzo, to whose hexachord system his tetrachord, that is, the use of four instead of seven letters, forms a kind of basis. His scales are founded on

strictly Greek principles, and cannot be said to mark a decided step in advance; neither is his system of notation much superior to the earlier ones, although here also he seems in a manner to fore- shadow Guido's use of the lines and spaces of the staff from which the modern method took its rise. Of great im- portance is the 13th chapter of the Huchiridion, which treats of the diaphony or organum,—in other words, of sing- ing in parts. Amongst other prescriptions it is curious to find the rule which recommends the use of parallel fifths and fourths, so strictly prohibited by later theorists, while, on the other hand, consecutive thirds, particularly eupho- nious to the modern ear, are excluded by Hucbald.

A good account of the monk of St Amand and his system will be found in Coussemaker's Mémoire sur Hucbald, Paris, 1841; Hawkins

(History, vol. i. p. 153) also gives a short notice of Hucbald, and mentions two epitaphs written in his honour by contemporaries.

HUCHTENBURG. Two brothers of this name prac- tised the art of painting in the second half of the 17th century. Both were natives of Haarlem. Jacob, the elder, of whom very little is known, studied under Berghem, and went early to Italy, where he died young about 1667. His pictures are probably confounded with those of his brother. In Copenhagen, where alone they are catalogued, they illustrate the style of a Dutchman who transfers Berghem's cattle and flocks to Italian landscapes and market-places.

John van Huchtenburg (1646-1733), born at Haarlem it is said in 1646, was first taught by Thomas Wyk, and afterwards induced to visit the chief cities of Italy, where, penetrating as far as Rome, he met and dwelt with his brother Jacob. After the death of the latter he wandered homewards, taking Paris on his way, and served under Van der Meulen, then employed in illustrating for Louis XIV. the campaign of 1667-68 in the Low Countries. In 1670 he settled at Haarlem, where he married, practised, and kept a dealer's shop. His style had now merged into an imitation of Philip Wouvermans and Van der Meulen, which could not fail to produce pretty pictures of hunts and robber camps, the faculty of painting horses and men in action and varied dress being the chief point of attrac- tion. Later on Huchtenburg ventured on cavalryskirmishes and engagements of regular troops generally, and these were admired by Prince Eugene and William

III., who gave the painter sittings, and commissioned him to throw upon canvas the chief incidents a the battles they

fought upon the continent of Europe. Amsterdam in 1733, Huchtenburg had done much by his pictures and prints to make Prince Eugene, King William, and Marlborough popular. Though clever in

depicting a mélée or a skirmish of dragoons, he remained —

second to Philip Wouvermans in accuracy of drawing, and inferior to Van der Meulen in the production of landscapes. But nevertheless he was a clever and spirited master, with great facility of hand and considerable natural powers of observation. ;

The earliest date on his pictures is 1674, when he executed the Stag-Hunt in the Museum of Berlin, and the Fight with Robbers in the Liechtenstein eolleetion at Vienna. (1690) in the Brussels gallery seems but the precursor of larger and more powerful works, sueh as the Siege of Namur (1695) in the ‘Belvedere at Vienna, where William III. is seen in the foreground aeeoinpanied by Max Emmanuel, the Bavarian eleetor. Three years before, Huchtenburg had had sittings from Prinee Eugene (Hague museum) and William III. (Amsterdam Trippenhuis). After 1696 he regularly served as court painter to Prinee Eugene, and we have at Turin (gallery) a series of eleven canvases all of the same size depieting the various battles of the great hero, commene- ing with the fight of Zentha against the Turks in 1697, and eon- eluding with the capture of Belgrade in 1717. Had the duke of Marlborough been fond of art he would doubtless have possessed many works of ourartist. All that remains at Blenheim, however, is a are of sketches of battles, whieh were probably sent to Churchill by his great contemporary. The pietures of Huchtenburg are not very numerous now in publie galleries. There is onein the National Gallery, London, another at the Louvre. But Copenhagen has four, Dresden six, Gotha two, and Munich has the well-known composition of Tallart taken Prisoner at Blenheim in 1704.

HUDDERSFIELD, a municipal and parliamentary borough and market-town of England, in the West Riding of Yorkshire, is beautifully situated on the slope of a hill in the valley of the Colne, a tributary of the Calder, 15 miles south of Bradford, aud 164 south-west of Leeds. It is surrounded by a network of railways, and is connected with the extensive canal system of Lancashire and York- shire. The town is built principally of stone, and has

meetings, afterwards converted into a theatre, and burnt almost to the ground February 15, 1880; the Gymnasium. Hall, erected in 1847, capable of accommodating 1000 persons, and transformed into public baths in 1879; the Infirmary, erected in 1831, a large and elegant stone edifice

_of the Doric order with wings and a portico, the latter

undergone within late years very extensive improvements, |

in regard to both its external appearance and its sanitary arrangements. The older portions of the town, where the streets were mean-looking and narrow, have almost dis- appeared, making way for handsome, spacious, and well- paved thoroughfares, whilst many,of the business premises possess considerable architectural merit. Among tlic churches deserving special mention are St Peter’s, the parish church, in the Perpendicular style, rebuilt in 1837 at a cost of £10,000, possessing chancel, nave, aisles, transept, and tower with peal of ten bells; Trinity Church, erected in 1819 at a cost of £12,000, in the Pointed style, with an embattled tower at the west end; St Paul’s, built by the parliamentary commissioners in 1831, in the Early English style, with a tower sur- mounted by a light spire; St Thomas’s, in the Transition Early English style, completed in 1859 at a cost of £10,000. Of the numerous Nonconformist places of worship, Ramsden Street (Congregational), Queen Street and Buxton Road (Wesleyan), and Brunswick Street (Free

Methodist) chapels are remarkable for their capacity, whilst |

High Street (New Connexion Methodist), New North Road (Baptist), and Highfield and Hillhouse (Congregational) have considerable architectural beauty. The principal other buildings, in addition to the many fine warehouses, are the Cloth-Hall, erected by Sir Thomas Ramsden in 1768, and extended in 1780,—a circular two-storied brick building, having a diameter of 80 yards, now fallen almost into disuse; the Armoury, erected as a riding- school, but now the headquarters of the rifle volunteers,

and also used for concerts and large public meetings; the |

Victoria Hall, a capacious building recently erected by the

Huddersfield Temperance Society ; the Philosophical Hall, |

, 900,000,000 gallons.

supported by four fluted columns, a large ward and medi- cated baths being added later ; the General Railway Station, in the Grecian style, erected in 1848, having in front a handsome statue of Sir Robert Peel; the Huddersfield College, in the Baronial style, established in 1838 for sons of gentlemen and tradesmen ; the Collegiate School, in the Gothic style, erected in 1839 ; the Huddersfield Club ; the Borough Club; the Masonic Hall (1838) ; the Corporation offices, in the Classic style (1877) ; the Town-Hall, also in the Classic style, but much richer (1880); the Guardians' offices (1880) ; the Ramsden Estate buildings, a handsome aud extensive block of the mixed Italian order; the Chamber of Commerce ; and a remarkably fine new market- hall, in the Gothic style, with a clock-tower and spire 106 feet in height, founded in 1878, and opened in 1880.

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Plan of Huddersfield.

The cost of the building was £28,000, and the sum paid by the corporation to Sir J. W. Ramsden, Bart., for the market-rights and site, was £25,790, in addition to £15,273 for the site and rights of the cattle-market. A public cemetery, off New North Road, the property of the corporation, with mortuary chapels for Churchmen and Nonconformists, was completed in 1855; and the cemetery at Almondbury was taken over by the corporation in 1868. The extensive gas-works are the property of the corporation, as are also the water-works, which afford an ample supply of excellent water, the reservoirs being capable of storing The cost has been over £750,000.

_A public park of 21 acres, called the Beaumont Park, is the

gift of Mr H. F. Beaumont ; the first sod was cut on May 29, 1880. There are fourteen handsome board schools, erected at a cost of about £120,000, twenty-one national schools, and one Roman Catholic school. The principal public societies are the mechanics' institution, the building for which, a large edifice in the Italian style, was opened in 1861, and the mechanics' institutes at Lindley and Lock- wood, each possessing handsome buildings. Huddersfield is a place of considerable antiquity, being mentioned in

in the Grecian style, originally used for lectures and public | Domesday, and is supposed by some to derive its name from *

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Oder or Hudard, a Saxon chief; but its importance dates from the establisliment of the woollen manufacture within the last century. It is the principal seat of the fancy woollen trade in England ; and it exceeds every other place in the variety of its manufacture of this class of textile fabrics, which includes doeskins, angolas, tweeds, worsted coatings and trouserings, Ulster cloths, mohairs, cashmeres, sealskins, fancy dress skirtings, kerseys, woollen cords, quiltings, a few broad cloths, and a large number of union materials. It also possesses silk and cotton spinning mills, iron foundries, engineering works for steam-engines, steam- engine boilers, and the machinery used in the various manufactures, chemical works, dye-houses, lead-piping and sanitary tube manufactories, and three organ factories. Handloom weaving is carried on in the surrounding vil- lages, but to a much less extent than formerly. A market fur woollen goods is held weekly.

Coal is abundant in the vicinity. There is a sulphurous spa in the Lockwood ward, with warm, cold, vapour, and shower baths. At Almondbury, 2 miles distant from the centre of the town, there was at one time a Saxon fortress, and by some writers the Roman station Cambodunum, mentioned by Antonine, is believed to have been situated there ; recent excavations, however, have proved almost conclusively that at Slack, just outside the opposite boundary of the borough, was the real Cambodunum. Kirklees park, 3 miles from Hudders- field, is popularly supposed to have been the burial-place of Robin Hood. Since 1832 Huddersfield has returned one member to parliament, and it became a municipal borough in 1868, with 12 wards, and a town council of 56 members. The area of the town was greatly increased at the time of its incorporation. The area of the par- liamentary borough is 10,998 acres, and that of the municipal borough 10,498 acres. The population of the

parliamentary borough in 1861 was 34,877; and in 1871,

owing chiefly to the increased area, it was 74,358. The |

population of the municipal borough in 1880 was estimated at 81,780.

HUDSON, a city of the United States of America, capital of Columbia county, New York, is situated on the. left bank of the Hudson river at the head of navigation, and on the Hudson and Boston and Hudson River Railways, 114 miles north of New York city. It stands on the ridge of a picturesque elevation called Prospect Hill, which after rising abruptly 60 feet from the river, slopes gradually to an elevation of 500 feet. The high river bank projects into the river in the form of a bold promontory, affording a delightful promenade, and having on either side a fine bay with depth of water sufficient for the largest ships,

The wharves are situated at the foot of the promontory |

and along the margin of these bays. The city is for the most part regularly built, with streets crossing each other at right angles, and a public square situated immediately above the wharves. Works to supply the city with water

have lately been constructed at a cost of 250,000 dollars, — The principal buildings are the court-house, constructed of |

marble and limestone and surmounted by a dome, the city hall and post-office, and theacademy. The city is also well supplied with other schools, and possesses three public libraries. Hudson at one time vied as a trading port with New York, and, although both its West India trade and its whale fishing have now been abandoned, it still carries on an important river trade, and has regular steam communi- cation with New York and Albany. It also possesses large iron smelting works, a stove-foundry, a tannery, a flour-mill, breweries, iron-foundries, and factories for pianos, carriages, paper, car wheels, and steam fire-engines. Hudson was settled in 1784, being then known as Claverack Landing. It became a city in 1785. The population, which in 1870 was 8615, was 8669 in 1880,

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HUDSON RIVER, or Nortu River, one of the largest and noblest rivers of the United States, and the principal river of the State of New York, is formed by the confluence of two small streams which rise in the Adirondack mountains in Essex county. About the middle of Warren county the river is joined by another of nearly equal size, the Schroon, which also has its rise in Essex county. After receiving the Sacondaga river 10 miles further south, the Hudson flows irregularly in an easterly direction to Sandy Hill, after which it keeps a very straight course almost due south until it falls into New York Bay. At Troy it receives the Mohawk, whose volume of water is greater than its own, and at Kingston the Wallkill, but its other tributaries, though numerous, are unimportant. Its total length is about 300 miles, and the length of its course from Sandy Hill 190 miles. At Glen’s Falls, near Sandy Hill, it makes a precipitous descent of 50 feet, whence there are various rapids of different velocities until it reaches Troy. It is tidal nearly up to Troy, and the fall from Albany, 6 miles below Troy, to the mouth of the river, a distance of 145 miles, is only 5 feet. By means of a lock and dam it is navigable to Waterford, a short distance above Troy, but large steamers do not pro- ceed further up than Hudson, 29 miles below Albany, and 116 from the mouth of the river. A short distance below Albany the navigation has been obstructed by shifting sands, the point at which the

difficulties are most formid- able being the “ overslaugh” at Castleton, but extensive operations have been for some time carried on in order to effect a permanent remedy for the obstructions. The breadth of the river at Albany is about 300 yards, and thence to Haverstraw, distant 34 miles from New York, it varies from 300 yards to 900 yards. From Haverstraw to Piermont it expands into Tappan Bay, with a length of 12 miles and a breadth of from 4 to 5, after which it narrows to a breadth of between 1 and 2 miles. The

_ scenery of the river is for the most part varied and beauti- | ful, generally picturesque, and in many places in the highest

degree striking and magnificent. In the upper part the views though not tame are a little monotonous, the gently sloping hills, with the variegated colours of wood and cultivated land and the occasional occurrence of a town or village, repeating one another without any marked feature to break their regularity. Below Troy, for a considerable distance, the number of islands renders much care in navi- gation necessary. Thirty miles from Troy noble views begin to be obtained of the Catskill mountains, towering up on the west bank, the nearest eminence at the distance of about 7 miles. Forty-six miles below Catskill is the large and flourishing city of Poughkeepsie, and 14 miles further down the prosperous city of Newburgh, a short distance below which, at the favourite summer resort of Cornwall Landing, the river enters the Highlands, passing

_ between a series of hills whose frequently precipitous sides

rise often abruptly from the water’s edge. The views in this part of the river are of a character in some respects unparalleled, and at several points they have an impres- siveness and surprising grandeur rarely equalled. The distance through which the river traverses this mountain scenery is about 16 miles, and about 10 miles after it is entered West Point is reached, a favourite landing place of tourists, the seat of the United States military academy, and historically interesting on account of Fort Putnam, now in ruins, built during the war of American independence, at which time a chain was stretched across the river to prevent the passage of British ships. After passing the pretty town of Peekskill the river widens into Haverstraw Bay, at the extremity of which is the headland of Croton Point. Below is the

wider expanse of Tappan Bay, upon which stands Tarrytown, famous both historically and from

its connexion with Washington Irving, whose cottage of Sunnyside is in the vicinity. At Piermont, where the bay ends, the range named the Palisades rises picturesquely from the water to the height of between 300 and 500 feet, extending along the west bank for about 20 miles, the left bank being level and dotted with hamlets and villas. At the mouth of the river on the west bank are Hoboken and Jersey city, and on the east bank New York city.

By the Erie canal the river is connected with Lake Erie, by the Champlain canal with Lake Champlain, and by the Delaware canal with the Delaware river ; and its commer- cial importance as a means of traffic is not excelled by that of any other river in the world. It was on the Hudson that Fulton, the inventor of steam navigation, made his first successful experiment. The Hudson River Railway skirts the east bank of the river from New York to Troy, whence it bends eastward on its way to Lake Champlain. On the west bank a railway runs from Jersey city to Albany, and branch lines from various centres touch both banks at several points. The Hudson has some valuable fisheries, the principal fish being bass, shad, and sturgeon. The attempts to stock it with salmon have not been very successful. Though Verrazzani in 1524 proceeded up the river Hudson a short distance in a boat, the first to demon- strate its extent and importance was Henry Hudson, from whont it derives its name. He sailed above the mouth of the Mohawk in September 1609.

HUDSON, Georce (1800-1871), the “railway king,” was born in York in 1800, was a successful linen draper in that city, and subsequently became the leading repre- sentative of the railway mania of 1845-46, Elected chair- man of the North Midland Company, he was for three years the ruling spirit of speculation and as the arbiter of capital held the key of untold treasures, All classes delighted to honour him, and, as if a colossal fortune were an insufficient reward for his public services, the richest men in England presented him with a tribute of £20,000. Deputy-lieutenant for Durham, and thrice lord mayor of York, he was returned in the Conservative interest for Sunderland in 1845, the event being judged of such public intercst that the

news was conveyed.to London by a special train, which travelled part of the way at the rate of 75 miles an hour. Full of rewards and honours, he was suddenly ruined by the disclosure of the Eastern Railway frauds. Sunderland clung to her generous representative till 1859, but on the bursting of the bubble he had lost influence and fortune at a single stroke. His later life was chiefly spent on the Continent, where he benefited little by a display of unabated energy and enterprise. Some friends gave him a small annuity a short time before his death, which took place in London, 14th December 1871. His name has long been used to point the moral of vaunt- ing ambition and unstable fortune. gambler," as Carlyle calls him in one of the Latter Day Pamphlets, was savagely and excessively reprobated by the world which had blindly believed in his golden prophecies. He certainly ruined scrip-holders, and disturbed the great centres of industry ; but he had an honest faith in his own schemes, and, while he beggared himself in their promotion, he succeeded in overcoming the powerful landed interest which delayed the adoption of railways in England long after the date of their regular introduction into America.

HUDSON, Henry, a distinguished English navigator, of whose personal history before April 19, 1607, or after June 21, 1611, absolutely nothing is known, and whose well-earned fame rests entirely on four voyages which were all unsuccessful as regarded their immediate object, the dis- covery of a commercial passage to China other and shorter than that by the Cape of Good Hope. The first of these, in quest of new trade and the passage to China by the

The "big swollen

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North Polc, was made for the Muscovy Company, with ten men and a boy, in the little " Hopewell" of 60 tons that had so successfully braved the dangers of Frobisher's last voyage twenty-nine years before. Sailing from the Thames on April 19, 1607, Hudson first coasted the east side of Greenland, and thence hugging the Arctic ice-barrier, pro- ceeded to the "north-east of Newland" to near 82° N, lat. He then turned back to seek, according to his chart, the passage round the north of Greenland into Davis Straits to make trial of Lumley's Inlet, or " the furious overfall "; but,

having traced the ice-barrier from 784° to 80°, he on July 27 became convinced that by this way there is no passage, and on August 15 he returned tothe Thames. Molineux's chart, published by Hakluyt about 1600, was Hudson's blind guide in this voyage, and the polar map of 1611 by Pontanus illustrates well what he attempted, and the valu- able results both negative and positive which he reached. He investigated the trade prospects at Cherrie Island, and recommended his patrons to seek higher game in Newland ; hence he may be called the father of the English whale- fisheries at Spitzbergen.

Next year Hudson was a second time sent by the Muscovy Company " to open the passage to China by the north-east between Newland and Nova Zemla;" this voyage lasted from April 22 to August 26, 1608. From June 12 to June 29, he raked the Barrentz Sea between 75° 30' N.W. and 71° 15' S.E. on the Goose coast of Nova Zemla, meeting with much ice and no great encouragement for trade, and deleting Willoughby Island from his chart. On July 6, " voide of hope of a north-east passage (except by the Way- gats, for which I was not fitted to try or prove), 1 therefore resolved to use all means I could to sayle to the north-west " (still harping on Lumley's Inlet and " the furious overfall"). The failure of this second attempt satisfied the Muscovy Company, which thenceforward directed all its energies to the profitable Spitzbergen trade.

In the Autumn of 1608 Hudson "had a call" to Amsterdam, where he saw Plancius, who gave him Way- mouth's journals, and Hondius, who supplied him with translations of certain Dutch papers. After some vacillating negotiations he finally undertook for the Dutch East India Company his important third voyage to find the passage to China "by the east or the west." With a mixed crew of eighteen or twenty men he left the Texel in the ""Half-Moon" on April 5, and by May 5 was in the Barrentz Sea, and soon afterwards among theice near Costin Sareh in Nova Zemla, where lie had been the year before. Some of his men becoming disheartened and mutmous (it is now supposed that he had arrived two or three months too early), he soon lost hope of effecting anything by that route, and submitted to his men, as alternative proposals, either to go to Lumley's Inlet and follow up Waymouth's light, or to make for North Virginia and seek the passage in about 40° lat., according to the letter and map sent him by his

friend Captain John Smith. The latter plan was adopted, and on May 14 Hudson set his face towards the Chesapeake and China. He touched at Stromo for water, and on June 15 off New- foundland in about 48° lat. the “ Half-Moon” “spent overboord her foremast.” This accident compelled him to put into Sagadahoc (44° 1’ lat.), where on July 18 a mast was procured, some communication with the Indians was had, and au unnecessary battle fought, in which the ship’s two “stone murderers” were employed. Sailing again on July 25, he was off Cape Cod on August 6, and on the 9th (38° 39’ lat.) “went with low sail because we were in an unknown sea.” On August 18 they made Smith’s Islands, 6 or 7 miles north of the entrance tothe Chesapeake. On August 28, beginning the survey where Smith left off at 37° 36’ according to his map, he coasted north to Sandy Hook, passing the “ overfall ” of the Delaware with scarccly

any notice, probably because a western inlet there would have taken him in amid Smith’s surveys. On September 3, in 40° 30’, he entered the fine bay now known by the name of New York. After having gone 150 miles up what is now the Hudson river, treating with the Indians, survey- ing the country, and trying the stream above tide-water, he became satisfied that this course did not lead to the South Sea or China, a conclusion in harmony with that of Cham- plain, who the same summer had been making his way south through Lake Champlain and Lake St Sacrement to the South Sea. The two explorers by opposite routes approached within 20 leagues of each other. On October 4 the “ Half- Moon ” weighed for the Texel, and on November 7 putin to Dartmouth, where she was seized by the English Govern- ment and the crew detained. The voyage had fallen short of Hudson’s expectations, but it served many purposes perhaps as important tothe world. Among other results it exploded Hakluyt’s myth, which from the publication of Lok’s map in 1582 to the 3d charter of Virginia in May 1609 he had lost no opportunity of promulgating, that near 40° lat. there was a narrow isthmus, formed by the sea of Verrazano, like that of Tehuantepec or Panama,

Hudson’s three failures served only to increase men’s confidence in the existence of a passage by the north-west, for the discovery of which a new

and strong joint-stock company was accordingly formed. The command was given to Hudson, who on April 10, 1610, sailed in the “ Discoverie ” of 70 tons, the ship that took Waymouth in 1602 in the same direction. How he penetrated through the long straits, discovered the great bay that bears his name, at once his mionument and his grave, how he and his men wintered in its southern extremity, how in coming north in the next summer, near the east coast, half way back to the straits, he, his son, and seven of his men, in a mutiny, were put into a shallop and cnt adrift on Mid- summer day 1611, is told in many books. The ringleaders and half the crew perished miserably, but the “ Discoverie ” was finally brought home to London. No more tidings were received of Hudson, but no one doubted the complete success of his voyage. A grander company was incorporated in 1612, under Prince Henry, to complete the exploration of the passage, and to find the lost discoverer and his com- panions. Sir Thomas Butler was the commander in 1612, and the “ Discoverie ” was again the chosenship. In 1613 the voyage was repeated by Gibbons, and once more in 1614 by Baffin; and the bay was thoroughly explored with the results which have long been universally familiar.

See Henry Hudson, the Navigator (Hakluyt Society, 1860)

HUDSON’S BAY COMPANY is a joint-stock associa- tiou formed for the purpose of importing into Great Britain the furs and skins which it obtains, chiefly by barter, from the Indians of British North America. The trading forts of the company are dotted over the immense region (ex- cluding Canada Proper and Alaska) which is bounded E. and W. by the Atlantic and Pacific Oceans, and N. and S. by the Arctic Ocean and the United States. From these forts the furs are despatched by boat or canoe to York Fort on Hudson’s Bay, whence they are shipped to England to be sold by auction.

In the year 1670 Charles IT. granted a charter to Prince Rupert and seventeen other noblemen and gentlemen, ineorporating them as the ‘* Governor and Company of Adventurers of England trading into Hudson’s Bay,” and securing to them “the sole trade and com- meree of all those seas, straits, bays, rivers, lakes, ereeks, and sounds, in whatsoever latitude they shall be, that lie within the entranee of the straits eommonly ealled Hudson’s Straits, together with all the lands and territories upon the

eountries, coasts, and eonfines of the seas, bays, &e., aforesaid, that are not already actually possessed by or granted to any of our subjects, or possessed by the subjeets of any other Christian prince or state." Besides the eom- plete lordship and entire legislative, judieial, and exeeutive power Within these vague limits (which the eompany finally agrecd to

aeeept as meaning all lands watered by streams flowing into Hud- son's Bay), the eorporation reeeived also the right to '' the whole and entire trade and traflie to and from all havens, bays, ereeks, rivers, lakes, and seas into whieh they shall find entranee or passage by water or land out of the territories, limits, or plaees aforesaid." The first settlements in the country thus granted, which was to be known as Rupert's Land, were made on James's Bay and at Church- hill and Hayes rivers; but it was long before there was any ad- vance into the interior, for in 1749, when an unsuccessful attempt was made in parliament to deprive the eompany of its charter on the plea of "non-user," it had only some four or five forts on the eoast, with about 120 regular employés. Although the eommereial suecess of the enterprise was from the first immense, great losses, amouuting before 1700 to £215,514, were inflieted on the eompany by the Freneh, who sent several military expeditions against the forts. After the cession of Canada to Great Britain in 1763, num- bers of fur-traders spread over that country, and into the north- western parts of the eontinent, and began even to eneroach on the Hudson's Bay Company's territories. These individual speeulators finally eombined into the North-West Fur Company of Montreal, of whieh Washington Irving has given an interesting deseription in his Astoria. The fierce competition whieh at onee sprang up between the eompanies was marked by features which sufficiently demonstrate the advantages of a monopoly in eommereial dealings with savages, even although it is the manifest interest of the mono- polists to retard the advance of civilization towards their hunting grounds. The Indians were demoralized, body and soul, by the abundance of ardent spirits with which the rival traders sought to attraet them to themselves ; the supply of furs threatened soon to be exhausted by the indiseriminate slaughter, even during the breeding season, of both male and female animals ; the worst pas- sions of both whitcs and Indians were inflamed to their fiercest, and eostly destruction of human life

and property was the result (see RED RIveR SETTLEMENT). At last, in 1821, the companies, mutu- ally exhausted, amalgamated, obtaining a licenee to hold for 21 years the monopoly of trade in the vast regions lying to the west and north-west of the older company's grant. In 1888 Hudson's Bay Company aequired the sole rights for itself, and obtained a new lieenee, also for 21 years. On the expiry of this, it was not renewed, and since 1859 the distriet has been open to all, the Hudson's Bay Company having no special advantages beyond its tried and splendid organization. The licences to trade did not of course affeet the original possessions of the eompany. 'These it retained till 1869, when they were transferred to the British Government for £300,000; in 1870 they were ineorporated with the Dominion of Canada. The eompany, which now trades entirely as a private eorporation, still retains one-twentieth of the entire grant, together with valuable blocks of land round the various forts ; and these possessions will doubtless, as the eountry becomes opened up and eolonized, yield a eonsiderable revenue at some future time.

For further information see the Report of the Scleet Parliamentary Committee in 1857; The Hudson's Bay Territories and Vancouver's Island, by R. M. Martin, 1849; An Examination of the Charter and Proceedings of the ITudson's Bay Conv- pany, &c., by J. E. Fitzgerald, 1849; Notes of a Twenty-five Years' Service in the

Hudson's Bay Territory, by J. Maclean, 2 vols., 1849; The Great Lone Land, 1872, and The Wild North Land, 1873, both by Captain W. F. Butler,

HUE, or Hue-roo (variously called QuaNG-DUK, Puv- THUA-THIEN, and SAn Hvs), the capital of the kingdom of Anam, is situated in a province of its own name, on the left bank of the Trudng-Tién or Hué river, which falls into the Chinese Sea about 8 miles further down in 16° 34' 28" N. lat. and 107° 38' 39" E. long. The surrounding country is a flat alluvial plain, traversed by streams and canals, and largely occupied by extensive rice-fields ; to the south-west, at a distance of about 3 or 4 miles, rise the Ai-van hills, of whieh Hondun has a height of 1445 feet. The centre of Hué is formed by the citadel, which was built in the reiga of Gialong (d. 1820) after the plans of the French colonel Olivier. It is 7323 feet square, has six equal bastions on each side, and is surrounded by ditches about 120 feet in

width, but not more than 5 or 6 feet in depth. Within are the royal residence, the houses of the ministers, the treasury, the arsenal, the barracks, &c.,—the royal residence, or Thanh Noi, having a special encincture of its own, measuring about 2290 feet each way. The inner town or citadel has a population of 30,000, inclusive of the garrison, and there are nearly as many in the suburbs and market- villages within a radius of 24 miles. The suburb of Mang- Sa (z.e., Fish Mouth) at the north-east corner of the citadel is the centre of the local traffic, and the neighbouring part of the river serves as an inner harbour. At the village Thanh Phuoc, about 2 miles below the town, are the winter

quarters for thc Anamese fleet, and in its vicinity is a ship- building yard and docks. On the landward slope of the sand-dune which lies between the sea and the lagoon at the river mouth stretches the village of Thuan, with about 1400 inhabitants, and serving as a sort of port to the capital. During the rainy season, October to January, the level of the Truong-Tién rises about 3 feet, and all the plain is laid under water. No European residents are permitted at Hué, except the members of the French legation, who have been allowed to erect consular buildings on the right bank of the river, there 1180 feet wide, directly opposite the citadel.

See J. Roy. Geogr. Soc., 1849; M. Dutreuil de Rhins, ‘‘ Notice géog. sur la rivitre de Hué,” in Bull. Soc. Géogr. de Paris, 1878.

HUELVA, onc of the eight provinces into which Andalucia has since 1833 been divided, is bounded on the N. by Badajoz, on the E. by Seville, on the S. and 8.W. by the Atlantic, and on the W. by Portugal, and has an area of 4122 square miles. With the exception of its south-east angle, wherc the province merges into the flat waste lands known as Las Marismas of the Guadalquivir, Huelva presents throughout its entire extent an agreeably varied surface, being traversed in a south-westerly direction by the western spurs of the Sierra Morena, The principal streams are the Odiel and the Tinto, which both fall into the Atlantic by navigable rias or estuaries; the Malagon, the Chanza, the Murtiga, which belong to the Guadiana system, and the Huelva, belonging to that of the Guadal- quivir, also take their rise in this province. Iron pyrites and manganese occur in the Sierra in

considerable quantities ; among many important mines, which are at present inactive, may be mentioned Lagunazo, Carpio, Lapilla, San Miguel, Monterubio, Sotiel, Coronada, San Telmo, Cueva de la Mora, and Toya. Those of Rio Tinto, situated to the north-east of Valverde del Camino, and near the source of the river Tinto, are ascertained to have been known to the Phcenicians and Romans. ‘They are at present wrought by an Anglo-German company ; in 1876 the output amounted to 329,305 tons; the number of men employed approached 5000. The mines of Tharsis and Calafias, and of Buitron and Poderosa, are of corresponding importance. Saline and other mineral springs are also of frequent occurrence in the province. The soil possesses great fertility, and produces excclllent pasturage; among the exports are included, besides corkwood and esparto, oranges, grapes, figs, oil, and wine. The only railways at present in the province are those con- structed for mineral traffic between Rio Tinto mines and Huelva (52 miles), between Tharsis and Huclva (30 miles), and between Buitron and Poderosa and San Juan del Puerto at the head of the Tinto estuary (44 miles); but a line from Huclva to Seville is at present in course of construc- tion. The towns of chief interest and importance in the provincc are, besides Huclva the capital, Ayamonte, Aracena, Valverde, La Palma, Niebla, and Moguer, with Palos its harbour. The population in 1877 was 210,641.

HvuEtva, the capital of the above province, is situated on the western shore of the triangular peninsula formed by the estuaries of the Odiel and Tinto, 53 miles west by south of Seville. Its streets are wide and well built, and among the public edifices may be mentioned two. parish churches, an Academia Onubense, two hospitals, and a theatre. The town has a considerable coasting trade in the produce of the province, and there is a limited manu- facture of csparto floor mattings; others of the inhabitants find employment in the sardine, tunny, and bonito fisheries of the neighbourhood. The chief source of the growing prosperity of Huelva, however, is in connexion with the extensive exportation of ore from the Tharsis and Rio Tinto mines. The total quantity of pyrites shipped amounted in 1872 to 261,373 tons, and in 1876 had risen to 442,201

tons (value £552,506). The exportation of manganese, however, which in 1868 amounted to 41,000 tons, did not in 1876 exceed 6972 tons (value £41,813); 7178 tons of precipitate of copper were valued at £279,956. For the accommodation of the Rio Tinto mineral traffic there is a fine pier 2682 feet long, 654 feet wide, and 434 feet above the level of the river at high-water, at which vessels of 2000 tons can be moored and loaded with ease. In 1876 the total number of vessels entering the port was 1409, with a tonnage of 278,594; of these 512 were British, with a tonnage of 237,610. The total imports amonnted to £315,856 ; from Great Britain, £149,939. Total ex-ports £918,506; to Great Britain, £833.968. Population

13,174 (1877).

Huelva is usually identified with the Onuba Aistuaria of Ptoleiny, the Onoba or Onuba of Strabo, Mela, and the numismatists, de- scribed in the Antonine Itinerary as situated on the estuary of the river Luxia, on the road from the mouth of the Anas to Augusta Emerita. There still exist vestiges of a Roman aqueduct, which, however, are fast disappearing. ‘The town is alleged to have been. founded by the Pheenicians; the name Welba or Wuelba is due to the Moors.

HUESCA, one of the three provinces into which the old northern Spanish kingdom of Aragon was divided in 1833, is bounded on the N. by France, E. by Lerida, 8. and S.W. by Saragossa, and W. and N.W. by Navarre. The total area is 7530 square miles. The surface is mountainous, especially in the north, which is occupied by the lofty offshoots of the Pyrenees, which there reach in Monte Perdido (Mont Perdu) the height of 11,430 feet. The chief river is the Cinca; but the want of natural streams has in some measure been made up for by a system of irrigation. Mineral springs are numerous throughout the province. The climate varies much according to the region; in the north cold winds from the snow-capped Pyrenees prevail, while in the south the warm summers arc often unhealthy from the humidity of the atmosphere. The leading industry of Huesca is agriculture, although only a limited proportion of the soil is under cultivation. There is good summer pasturage on the mountains, where cattle, sheep, and swine are reared. The mountains are richly clothed with forests of pine, beech, oak, and fir, and the southern regions produce abundant crops of cereals, vines,

mulberries, and numerous kinds of fruits and vegetables. The mineral resources include argentiferous lead, copper, iron, and cobalt, with limestone, millstone, gypsum, granite, and slate. The mining industry was formerly much more important, bat the difficulties of transport caused by the absence of good roads have much hindered the development of this and other resources of the province. Huesca exports timber, cereals, wine, oil, and some cattle, and imports iron, flax, and colonial and foreign goods. The Se fet aha which are unimportant, include brandy, winc, soap, linen, woollens, baize, and common crockery. The population in 1877 was

252,165.

Huesca, chief town of the above province, and the scat of a bishop, is pleasautly situated on an eminence

/ commanding an extensive view over the surrounding fertile | plain.

It stands near the right bank of the Isuela, 35 miles north-east of Saragossa. The town bears many traces of its antiquity. The streets in the older part are narrow and crooked, though clean, and many of the houses witness by their size and style to the former magnificence, and by their neglected and ruined aspect to the present decay of the place. The newer streets are wide, and the houses have some claims to regularity. There are several squares and plazas, in one of which rises the imposing Gothic cathedral, begun in 1400 and finished in 1515,and enriched with fine carving. In the same plaza is the old palace of the kings of Aragon, formerly given up for the use of the now closed Sertorio (the univer-

| sity), so named in memory of a school for the sons of native

chiefs, founded at Huesca by Sertorius in 77 n.c. (Plut., Sert. 15). Among the other prominent buildings are the interesting parish churches (San Pedro, San Martin, and San Juan), the archiepiscopal palace, the town-house, and various benevolent and religious houses. Huesca manufac- tures cloth, pottery, bricks, and leather. Its chief trade is in exporting fruit and

cereals, and in importing linen, cloth, silk, hardware, and colonial produce. The population in 1877 was 7760,

Huesca is a very ancient town. Strabo (iii. 161, where some editors read Jleosca) describes it as a town of the Ilergctes, and the scene of Sertorius's death ; while Pliny places the Oscenses in regio Vescitania. Plutarch (Joe. cit.) calls it a large city. Julius Cesar names it Vencedora; and the name by which Augustus knew it, Urbs victrix Osca, was stamped on its coins, and is still preserved on its arms. It fell under Saracen rule; but in 1096 Pedro I. of Aragon regained it, after winning the decisive battle of Alcoraz, as the termination of the two years' siege.

HUESCAR, chief town of a judicial district in the Spanish province of Almeria, is situated in a plain, sur- rounded by mountains on three sides, about 91 miles north- east of Granada. The town occupies a large area in pro- portion to the number of its houses, and although the older streets are narrow and tortuous, the newer quarters have wide and regular streets. Among the chief buildings are the court-house and the adjoining prison, the hospital, the foundling hospital, and three schools. There are two parish churches, dating respectively from 1498 and 1504. About three miles to the east are the ruins of Huescar la Vieja, a Carthaginian foundation. Pottery, woollen and hempen cloth, linen, and baize are manufactured at Huescar. There are also oil and flour mills. The export trade is not exten- sive. The population in 1870 was 5106.

HUET, Pierre Danizen (1630-1721), bishop of Avranches, is the last of those encyclopedic and massive scholars of whom France produced so many. He left no successor to his omnivorous learning, prodigious memory, and indomitable energy. He was born at Caen of a family formerly Huguenot. He lost both father and mother while still a child, and was brought up by his aunt, wife of the mathematician Gilles Macé, to whom he owed his respect for science. He says himself that the ardour of study did not possess him in earnest until in early manhood he was reading the Géographie Sacrée of Bochart, and suddenly became intoxicated with the desire of becom- ing a scholar. It may be remarked that a youth who was not already studious would hardly be reading such a book. However, the statement means that he began about that time to study not in earnest only

but with passion and fury. In Hebrew alone so great was his industry that he read through the Old Testament in the original no less than four-and-twenty times during his life. At the age of twenty he had already achieved a reputation as one of the most promising scholars of the time. He went at the age of twenty-one to Paris, where he formed a friendship with Gabriel Naudé, conservator of the Mazarin library. In the following year Bochart, being invited by Queen Christina to her court at Stockholm, took his friend Huet with him. This journey, in which he saw Leyden, Amsterdam, and Copenhagen, as well as Stockholm, resulted chiefly in the discovery of some fragments of Origen's Commentary on St Matthew, which gave Huet the idea of editing Origen. On his return to France he assisted at the foundation of the academy of Caen, and shortly afterwards quarrelled with his friend Bochart, who accused him of having sup- pressed a line in Origen in tho Eucharistic controversy. Shortly afterwards he removed to Paris, where he entered into close relations with Chapelain. At this time arose the famous dispute of Ancientsand Moderns. Huet took the side of the Ancients against Charles Perrault and Desmarets. Among his friends at this period were Corrart and Pellis-

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son. His taste for mathematics led him to the study of astronomy, and in 1672 he founded the Academy of Science at Caen. He next turned his attention to anatomy, and, being himself shortsighted, devoted his inquiries mainly to the question of vision and the formation of the eye. In this pursuit he made more than 800 dissections. He then learned all that was then to be learned in chemistry, and wrote a Latin poem on salt. All this time he was no mere book-worm or recluse, but was haunting the salons of Mlle. de Scudéry and the studios of painters; nor did his scien- tific researches interfere with his classical studies, for dur- ing this time he was discussing with Bochart the origin of certain medals, and was learning Syriac and Arabic under the Jesuit Parvilliers. Nor did he neglect the lighter walks of letters. He translated the pastorals of Longus, wrote a tale called Diane de Castro, and defended in a treatise on the origin of romance the reading of fiction. Then, being appointed assistant tutor to the Dauphin, he edited with the assistance of Anne Lefévre, afterwards Madame Dacier, the well-known edition of the classics ad wsum Delphini. He also continued to work upon

his edition of Origen, and issued one of his greatest works, the Demonstration Evan- gelique. It was at the age of forty-six that he took orders, a step which he had contemplated for some years. Two years later the king gave him the abbey of Aunay, where he wrote his Questions d'Aunay, sur l'accord dela Foi et de la Raison, his Critique de la Philosophie de Descartes, his Memorres pour servir & V Histoire du Cartésianisme, his dis- sertation on the site of the terrestrial paradise, and his dis- cussion with Boileau on the Sublime. In 1685 he was made bishop of Soissons, but after waiting for installation for four years he took the bishopric of Avranclies instead. He exchanged the cares of his bishopric for what he thought would be the easier chair of the Abbey of Fon- tenay, but there he was vexed with continual law suits. At length he retired to the Jesuits' House in the Rue Saint Antoine at Paris, where he ended his days, in 1721, amidst incessant labours maintained to the end, at the age of ninety-one. His great library and manuscripts, after being bequeathed to the Jesuits, were bought by the king for the royal library.

It is impossible liere to enter upon an estimate of the place in philosophy, literature, and scholarship now occu- pied by this remarkable and omnivorous student. It has been disputed whether a writer who could so strenuously advocate the claim of philosophy could have been at the same time an orthodox believer. Perhaps like many other men Huet separated his creed from his philosophy, and while he argued on Descartes forgot that he was a bishop. In the Huetiana will be found the most ready materials for arriv- ing at an idea of his prodigious labours, exact memory, and wide scholarship. His own autobiography, found in his Commentarius de rebus ad eum pertinentibus, was translated into English by Dr Aiken in 1726. It remains to be said that he owed the preservation of his faculties to extreme old age, and perhaps the prolongation of his life, to the rigid observance of a spare diet which he began at the age of forty, dining moderately, and taking no other supper than a little bouillon.

HUFELAND, Curistorpn WILHELM (1762-1836), a distinguished physician and writer on medical subjects, was born at Langensalza, 12th August 1762. His early education was carried on at Weimar, where his father held the office of court physician to the grand duchess. In 1780 he entered the university at Jena, and in the following year proceeded to

Gottingen, where in 1783 he graduated in the faculty of medicine. After assisting his father for some years at Weimar, he was called in 1793 to the chair of medicine at Jena, receiving at the same time the dignities of court physician and councillor at Weimar. In 1793 he

was placed at the head of the medical college and generally of state medical affairs in Berlin, with the title of privy councillor. He filled the chair of pathology and thera- peutics in the university of Berlin, founded in 1809, and +n 1810 became councillor of state. He died at Berlin in 1836.

Hufeland is celebrated as the most eminent practical physician of his time in Germany, and as the author of numerous works display- ing extensive reading and cultivated and critical faculty. The most widely known of his many writings is the treatise entitled Makrobiotik, oder die Kunst das mensehliche Leben zw verlangern, 1796. Of his practical works, all of the kind which cannot long retain their place in the literature of special science, the System of Practical Medicine (‘System der praktischen Heilkunde,” 3 vols., 1828) is the most elaborate. By medical writers Hufeland’s ser- vices in promoting and elevating the study of the art of medicine are highly extolled. His autobiography was published in 1863. Sketclies of his life and labours apveared shortly after his death by Augustin and Stourdza, 1837.

HUFELAND, Gorrites (1760-1817), a distinguished writer on political economy and law, was born at Dantzic on 19th October 1760. He was educated at the gymnasium of his native town, and completed his university studies at Leipsic and Gottingen. He graduated at Jena, and in 1788 was there appointed to an extraordinary professorship. Five years later he was made ordinary professor. His lec- tures on natural law, in which he developed with great acuteness and skill the formal principles of the Kantian theory of legislation, attracted a large audience, and contri- buted to raise to its height the fame of the university of Jena, then unusually rich in able teachers. In 1803, after the secession of many of his colleagues from Jena, Hufe- land accepted a call to Wiirzburg, from which, after but a brief tenure of a professorial chair, he proceeded to Lands- hut. From 1808 to 1812 he acted as burgomaster in his native town of Dantzic. Returning to

Landshut, he lived there till 1816, when he was invited to Halle, where he died in February 1817.

Hufeland's works on the theory of legislation—Essay upon the Fundamental Theorem of Natural Law (' Versuch iiber die Grund- satz Naturrechts," 1785), Handbook of Natural Law ("Lehrbueh des Naturrechts," 1790), Institutes of Positive Law (" Institutionen des gesammten positiven Rechts, 1798), and History and System of German Positive Law (" Lehrbuch der Geschichte und Encyclo- padie aller in Deutschland geltenden positiven Rechte," 1790)— are distinguished by precision of statement and clearness of deduc- tion. They form on the whole the best commentary upon Kant's Reehtslehve, the principles of which they carry out in detail, and apply to the discussion of positive laws. In political economy Hufeland's chief work is the New Foundation of National Eeonomy ('*Neue Grundlegung der Staatswirthschaftskunst," 2 vols., 1807 and 1813), the second volume of which has the special title, Theory of Money and Cireulation (" Lehre vom Gelde und Geld- umlaufe"). The principles of this work are for the most part those of the Wealth of Nations, which were then beginning to be accepted and developed in Germany ; but both in his treatment of fundamental notions, such as economic good and value, and in details, such as the theory of money, Hufeland's treatment has a certain originality. Two points in particular seem deserving of notice. Hufeland was the first among German economists to point out the profit of the entrepreneur as a distinct species of revenue with laws peculiar to itself. He also tends towards, though he does not explicitly state, the view that rent is a general term applicable to all payments resulting from differences of degree among productive forces of the same order. Thus the superior gain of a specially gifted workman or specially skilled employer is in time assimilated to the payment for a natural agency of more than the minimum efficiency. See Roseher, Geschichte der National- ékonomik tn Deutschland, pp. 654-662.

HUG, Jowann Leonnarp (1765-1846), Roman Catho- lic theologian and Biblical critic, was born at Constance, where his father was a locksmith, on June 1, 1765. After passing through the gymnasium of his native town, he proceeded in 1783 to the university of Freiburg, where he became a pupil in the seminary for the training of priests, and very early distinguished himself

in the departments of classical and Oriental philology as well as of Biblical exegesis and criticism. In 1787 he became superintendent

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of studies in the seminary, and he continued to hold this appointment until the breaking up of the establishment in 1790. In the following year he was called to the Freiburg chair of Oriental languages and Old Testament exegesis ; to the duties of this post were added in 1793 those of the professorship of New Testament exegesis. Steadily declin- ing calls to Breslau, Tiibingen, and (repeatedly) to Bonn, Hug continued to labour at his post in Freiburg for upwards of thirty years, varying the monotony of his work only by an occasional literary tour to Munich, Paris, or Italy. In 1827 he resigned some of his professorial work, but con- tinued in active duty until in the autumn of 1845 he was seized with a painful illness, which proved fatal on March 11 of the following year.

Hug's earliest publication was the first instalment or ''heft" of his Einleitung; in it he argued with much acuteness against Eichhorn in favour of the '' borrowing hypothesis" of the origin of the synoptical gospels, maintaining the priority of Matthew, the present Greek text having been the original. His subsequent works were dissertations on the origin of alphabetical writing (Die Erjind- ung der Buchstabensehrift, 1801), on the antiquity of the Codex Vatieanus (1810), and on ancient mythology (Ueber den Mythos der alten Vélker, 1812) ; a new interpretation of the Song of Solomon (Das hohe Lied in einer noch wnversuchten Deutung, 1813), to the effect that the lover represents King Hezekiah, while by his beloved is intended the remnant left in Israel after the deportation of the ten tribes ; and treatises on the indissoluble character of the matri- monial bond (De Conjugti Christiani vineulo indissolubili commen- tatio eaegetiea, 1816) and on the Alexandrian version of the Penta- teuch (1818). His Hinleitung in die Schriften des Newen Testaments, undoubtedly his most important work, was completed in 1808 (fourth German edition, 1847; English translations by Wait, London, 1827; and by Fosdick, New York ; French partial translation by Cellerier, Geneva, 1823). It is specially valuable in the portion relating to the history of the text (which up to the middle of the 3d

century he holds to have been current only in a kowh Zxdoors, of which recensions were afterwards made by Hesychius, an Egyptian bishop, by Lucian of Antioch, and i foe and in its discussion of the ancient versions. The authov's intelligence and acuteness are more completely hampered by doctrinal presuppositions when he comes to treat questions relating to the history of the individual books of the New Testament canon. From 1889 to his death Hug was a regular and important contributor to the Freiburger Zeitschrift fiir Kathol. Theologie.

HUGH, Sz, or Avaton (c. 1135-1200), bishop of Lincoln, was born of a noble family at Avalon, near Pontcharra in Burgundy, about 1135. At theage of eight he entered along with his widowed father the neighbour- ing priory of canons regular at Villarbenoit, where he was ordained deacon at nineteen. Appointed not long after prior of a dependent cell, Hugh was attracted from that position by the holy reputation of the monks of the Grande Chartreuse, whose house he finally entered despite an oath to the contrary which he had given his superior. There he remained about ten years, receiving priest's orders, and rising to the important office of procurator, which brought him into contact with the outer world. The wide reputa- tion for energy and tact which Hugh speedily attained penetrated to the ears of Henry Il. of England, and induced that monarch to request the procurator's assistance in establishing at Witham in Somersetshire the first English Carthusian monastery. Hugh reluctantly consented to go to England, where in a short time he succeeded in over- coming every obstacle, and in erecting and organizing the convent, of which he was appointed first prior. He speedily became prime favourite with Henry, who in 1186 procured his election to the see of Lincoln, Forced sorely against his will to accept this responsible post, Hugh nevertheless set himself actively and piously to discharge its important functions, although at least once a year he retired to live for a short period as a simple monk at Witham. He took little to do with political matters, maintaining as one of his chief principles that a churchman should hold no secular office. A sturdy upholder of what he believed to be right, he let neither royal nor ecclesiastical influence interfere with his conduct, but fearlessly resisted whatever seemed to

him an infringement of the rights of his church or diocese. But with all his bluff firmness Hugh had a calm judgment and a ready tact, which almost invariably left him a better friend than before of those whom he opposed; and the astute Henry, the impetuous Richard, and the cunning John, so different in other points, agreed in respecting the bishop of Lincoln. St Hugh's manners were a little apt to be boisterous at times, and his early monastic discipline had left him rigid and harsh ; but, though an ascetic to himself, "so that his whole life was a continued martyr- dom," he was distinguished by a broad kindliness to others, so that even the Jews of Lincoln wept at his funeral. He had great skill in taming birds, and for some years had a pet swan, which occupies a prominent place in all histories and representations of the saint. In 1200 Bishop Hugh revisited his native country and his first convents, and on the return journey was seized with an illness, of which he died at London, on November 16, 1200. Twenty years later he was canonized.

The chief life of St Hugh is the Magna Vita S. Hugonis (MS. in the Bodleian Library), written by Adam, the saint's private chaplain, of which a number of abridgments have been made at various dates. A Metrical Life of St Hugh of Avalon is preserved in two MSS. in the British Museum and the Bodleian Library. Both these Lives have been edited by the Rev. J. E. Dimock. The best modern source for information as to St Hugh and his time is Canon Perry's Life of St Hugh of Avalon, &c., 1879.

HUGH or Sr Cusr, Hugo (Ugo) deS. Caro or Carensis (c. 1200-1263), a learned compiler of the 13th century, was born at St Cher, a suburb of Vienne, Dauphiné, about the year 1200, became a student of theology and canon law in Paris, and in 1224 entered the Dominican cloister of St Jacob there (whence he is sometimes designated as Hugo de 8. Jacobo). After having taught theology for upwards of twenty years, in the course of which his learn- ing was frequently appealed to by those in authority for the solution of difficult questions, he was in 1245 created cardinal of St Sabina by Pope Innocent IV. He died at Orvieto in 1263.

His principal works are Correctorium Biblic, a revised text of the Vulgate, prepared about 1236, hitherto unprinted, but forming the basis of the Correctoriwm Biblice Sorbonicum ; Postilla in universa Biblia juxta

quadruplicem senswm, first printed in 1487 (Basel) and often since, as for example at Cologne in 1621 (8 vols. fol.) ; Specu- lum Eeclesic, a manual for the priesthood (ed. prin., Lyons, 1554); and Sacrorum Bibliorum Concordantic, in the preparation of which he was assisted by the members of the community to which he belonged, hence it is sometimes known as Concordantie S. Jacobi (Lyons, 1540; Basel, 1548). See Hist. Litt. de la France, vol. xix.

HUGH or Sr Vicror, Hugo a 8. Victore, sometimes also known as Hugh of Paris (c. 1097-1141), was born, probably in the neighbourhood of Ypres, about 1097, and is known to have received his early education in the cloister of Hamersleben near Halberstadt ; in 1115 he removed for the further advancement of his studies to the abbey of St Victor, which had recently been founded by William of Champeaux, the preceptor of Abelard, in the neighbour- hood of Paris. There the remainder of his life was spent in teaching or in studious retirement. He died in 1141.

The works of Hugh of St Victor, who was the intimate friend of St Bernard, share all the learning, acuteness, and mysticism of the theological school which then sought to neutralize the opinions and the influence of Abelard. Of chief importance are—Znstitutioncs Monastice, including the treatises De arca morali, De arca mystica, and De vanitate mundi; De Sacramentis Fidet, on the mysteries of the faith, and thusa complete exposition of Catholic theology; and De Hruditione Didascalica, in six books, which earned for its compiler the title of magister or didascalus. It forms a sort of eneyclopxdia of the sciences as then understood, viewed of course merely in their subordination to theology. In his treatment of Biblical introduc- tion, the sharpness with which he separates the apocryphal from the eanonical books has been noticed ; but in doing so it is important also to recollect that he seems to place on a par with the New Testament the canons, the decretals, and the writings of the fathers. An Augustinian in spirit and in language, so as to deserve the titles Alter Augustinus and Lingua Augustini, by

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which he is frequently designated, Hugo was still more eminently the disciple of Anselm and Abelard ; he, however, had a strongly marked

individuality of his own, which appears in his somewhat fully elaborated theory of knowing and being. All the know- able he assigns to one or other of three spheres, that of intelli- gence, that of science, and that of logic. That of intelligence embraces both theory and practice. Under theory fall to be classed theology, mathematics (arithmetic, musie, geometry, astronomy), and physics ; practice is equivalent to ethics. Science has to do with the practical arts and industries, while logic embraces grammar, rhetoric, and dialectic. In correspondence to the trichotomous division of man, as made up of body, soul, and spirit, he speaks of a threefold eye, that of the body, that of reason, and that of contem- plation. The last of these, by which God is discerned, has been totally destroyed by sin; the sccond has been much inipaired. Faith now takes the place of contemplation ; but by oratio and operatio it can attain to real convictions and genuine love. The doctrine of the Trinity he illustrates by the analogy of the human ey as spirit, wisdom, and love. _ The collected works have

een printed at Paris in 1528, at Venice in 1588, at Mainz and Cologne in 1617, and at Rouen in 1648. They oecupy three volumes (175-177) in Migne's Patrologice Cursus Completus. See Hist. Litt. de la France, vol. xii. ; Liebner, 17. v. S. Victor, (1832); Gorres, aie gue Mystik ; and other works bearing on this general subject.

HUGUENOTS, Tux. The word Huguenot first appears in France about the middle of the 16th century, and there is historical proof that it was imported from Geneva, where it had existed for some time as a political nickname in a form which connects it directly with the German-Swiss Eidgenossen, oath-comrades, confederates. In France it was used as a term of reproach for those who aimed at a reform of religion according to the pattern dis- played by Calvin in his famous Jnstitutio Christiane Keligionis. The name attached itself to the Reformers when, having shaken off all connexion with Lutheranism, they were beginning to organize themselves both as a church and as a political body. The Lutheran ideas, which had carly come into northern France by way of Metz and Meaux, had for a short time seemed likely to prevail at the court of Francis I., where the king's love of culture welcomed what- ever came from the land of the learned; the genius of Eras- mus, or the sharp satire of Hutten, or Luther's weighty tractates, all seemed to him at first to be so many protests against the darkness of a monkish past;

the hymns of Marot, the bright poetry of Margaret of Valois, the king's sister, harmonized not ill with the desire for a humanist reform which prevailed at the French court. But when the destructive enthusiasm of the artisans who embraced the new opinions, breaking out in attacks on the art-treasures of the churches, alienated the royal moderates, the simpler and more marked theology of the ‘‘ Sacramentarians ” of Geneva quietly replaced the Lutheranism of the first Reformers ; and by the middle of the 16th century the new Huguenots were an unpopular party, drawing their inspiration from Calvin, and bitterly disliked by the court and the bulk of the people of France. The persecutions, varied by protection, of the reign of Francis I. had given place to a vehement desire to crush the rising heresy ; the character of Henry II. and his chief advisers led them towards a thorough persecution.

Influenced by these repressive measures, and taught by Calvin's book and his frequent letters, the French Reformers now began to organize their infant churches. Hitherto they had been content to meet in quiet, to sing Marot's psalms, to listen to earnest prayer and practical discourse in some lowly chamber, deferring questions as to church government; now their ecclesiastical system began to develop itself. In 1555 the first Protestant French church was established at Paris, and almost immediately there sprang up fifteen communities, the largest being at Meaux, Poitiers, and Angers, each having its pastor, elders, and deacons, each ruling itself, and recognizing no common bond of union save that of charity and suffering, These were the heroic days of the Huguenot movement in

France, each little church striving only to fulfil the simplest ideal of Christian faith and practice, happiest when least observed, purest when least developed. ‘Three influences liad hitherto acted on French religious feeling :—that of the Lutherans, that of the ancient Vaudois churches of south-eastern France, represented by Faber, and lastly that of Calvin of Noyon, the Picard exile settled at Geneva. Now a fourth element came in: resistance had elicited organization, organization demanded leadership ; and, un-happily for France and the Huguenots, the movement fell too much into the

hands of secular chiefs, great lords who used it for their own political and selfish purposes.

In 1559 the churches of the Huguenots met in a first synod at Paris, eleven sending representatives. This body drew up a confession of faith, which bears throughout the mark of Calvin's hand, in its scrupulous orthodoxy, strong statements as to God's election of some to eternal life, and careful definitions of the nature and structure of the church ; the synod also issued a scheme of discipline to which the churches were all to conform. No church should take lordship over any other (a church being a single community under one pastor). Each " colloque" or synod should have a freely-elected president ; every pastor should come to the colloque, bringing each at least one elder or deacon from his church; this body was to meet at least twice a year; new pastors were to be appointed by it to vacant churches, on presentation by the elders and deacons; minute rules were laid down for church discipline ; it was ordered that provincial synods should be held in each province, and finally that there should be from time to time a general or national synod of representatives of the whole body.

Two years later the civil war broke out (see FRaNcE, vol. ix. pp. 560-564), and lasted over thirty years. At the beginning of this period we have some data as to the Huguenot strength: Beza tells us that in 1558 there were 400,000 of them ; a list presented by Condé to Catherine de' Medici is said to have contained the names of 2150 (some say 2500) churches ; and it is probable that the number of their open adherents had increased rapidly. John Correro, Venetian envoy in 1569, says that only one-thirtieth of the

common folk, but one-third of the nobles, were Huguenots, .

for the strength of the movement had undoubtedly come to lie in the noblesse. The list of the Huguenot churches given by Haag (La France Protestante, vol. 1., "¢ Pieces justificatives," No. xviii. p. 52) provides us with data as to their distribution in France. The two centres were Languedoc in the south, and the Orléanais in the middle of the country ; and a line drawn north-west to south-east through a point halfway between Paris and Orleans would nearly give the northern limit of Huguenot success. Normandy, thanks to the Chatillon influence, had many churches ; in Orleans and Burgundy they were well represented. In Guyenne and

throughout western France they had numerous com- munities. The little independent principality of Béarn, through the influence of Jeanne d'Albret, Henry IV.'s mother, was entirely Huguenot. On the other hand, though there were some churches in the fle de France and Champagne, they had little hold there; and Picardy was from the first profoundly hostile to them, while Paris became the headquarters of the Catholic League. Their churches sprang up with wonderful quickness at this time ; thus we see that all the 76 congregations in Languedoc named by Haag were established between 1558 and 1562. All were characterized by a like aptitude for organization ; their constitution, simple and popular, is a proof that under better auspices the French people might have well exercised the privileges of constitutional liberty; the Huguenots had a popular representation and frequent

deliberative assemblies. Between 1559 and 1598 they | as helpful for Catholics as for Protestants ;

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| held fifteen general church synods, and from 1573 to 1622

inany political assemblies, in which all questions bearing on the interests of the ‘‘ cause” were debated and decidod.

The subordination of the religious to the political interests of the Huguenots became inevitable after the massacre of St Bartholomew's day, 1572; while at the same time their organization assumed a more decidedly republican tone. The horror they felt at the violent action of Charles IX. seemed to free them from all allegiance to him; they looked to England and Germany for help, to Switzerland and the United Provinces for encouragement and political example. They at once drew up an independent constitu- tion, democratic and federative, framed chiefly after the Swiss pattern. Like all other attempts at a republican form of government, it had an aristocratic and a demo- cratic side, the latter for the time seeming to be the stronger. For the centre of their power was now pass- ing from the aristocracy to the burghers, from country chateaux to provincial towns. In the towns the only dis- tinction recognized was that of pastor and elders, and these might be, and mostly were, men of the people, chosen by the people. The great nobles who sided with them, the “ Poli- tique” princes, like Alengon or Damville-

Montmorency, winked for a time at this new “state within the state,” the germ of that Huguenot organization which later on hampered Richeliew’s path. Their system was based on the towns in their hands. In each an independent government was elected by popular suffrage, and was composed of a mayor, a council of twenty-four, and an elective chamber of seventy- five citizens, making up inall a hundred rulers. This body was a court of justice, with some amount of sovereignty. Thus, the twenty-four with the mayor had control over war, police, and “ things of highest importance,” though without the seventy-five they could neither pass nor abrogate laws, as to coin, taxation, truces, or terms of peace. The mayors and privy councils of the confederate towns were charged with the election of a general, a kind of Roman dictator, who was to have both a council to advise him and also five lieutenants to help and succeed him, if need were. Lastly, provision was made for a strict moral discipline.

Soon after this the Hugnenots established a system of “ generalities ” or districts, each with its own local estates, and over these provincial councils and a states-general, thus materially strengthening their independent organiza- tion. This system continued throughout the League- wars (1574-1589), during which the religious movement was controlled by a knot of selfish political leaders, and in the course of which their pomt of view completely changed: for, while in the beginning they had passion- ately called for popular institutions and the convocation of the states-general of France, in the end they became the followers of Henry of Navarre, as heir to the French crown, representative throughout of the anti-popular temper’of the Bourbon house. Under him the discontented. Huguenots again reorganized themselves into nine great circles, over each of which was a council of from five to seven members, elected by delegates from the churches, and having the duty of laying their independent taxation, of levying, commanding, and paying their own troops. There was also a general assembly for all the circles (after the pattern of the United Provinces) sitting in three estates— pastors, nobles, burghers ; the whole polity being represen- tative as an aristocratic republic. This general assembly sat frequently, sent embassies to foreign powers, sometimes acting as an independent body politic.

The discontent of the Huguenots at last extorted from Henry IV. the famous edict of Nantes (2d May 1598), a document which in the main only reproduced the more favourable of the earlier edicts. Its provisions were at least it was always

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being so modified as to show less and less favour to the Calvinists, who were little satisfied with it, dreamed of dominance, had hoped for equality, and were now put off with tolerance. For whatever Henry IV. might feel about their faith, he was determined, as he once told Sully, “to reduce to nothing the Huguenot faction,” to destroy their political independence, and by closing up

the civil strife to secure the solid establishment of the

central monarchy. The edict allows public exercise of the

Huguenot faith in the houses of nobles and gentry, and in

a few named towns; it gave the sectaries full civil rights, and made them eligible to all civil offices; in several par- liaments mixed chambers were established ; the education of their children was left in their own hands,

We find that about 1590 the Huguenots had exercise of their worship in about 3500 chateaux, and in about 200 towns or bourgs, chiefly in the south and west. In most parts of the uorth, except Paris and round Rouen and Amiens, they had oue place for worship in each bailliage or sénéchaussée. In 1598 we have a list of about 150 places granted by Henry IV. to the Huguenots for their safety, the chief groups being in the generalities of Bor- deaux and Montpellier, and in Poitou; these were either free towns, like La Rochelle, Nimes, Montauban, or towns belonging to private gentlemen, or towns belonging to the king, which had fallen into Huguenot hands during the wals.

Throughout the next quarter of a century we trace their history in a series of outbursts, indicating noble impa- tience and Calvinistic dissatisfaction. The siege and fall of La Rochelle (1627-1628) brought this period to an end.

During this time their number seems to have increased ; at the accession of Louis XIII. they had about 500 churches ; in 1622 and 1628 we have lists of 688 ; in 1637 no less than 720 are enumerated, though of these 49 were either vacant or suspended. Richelieu and Mazarin treated them with statesman-like prudence ; their synods were dis- couraged, their grumblings ceased ; they grew in piety and purity as the political arena was closed to them, and the noble houses one by one deserted them. This was the time of their material prosperity, and of their important contribution to the welfare of France which Louis XIV. so rudely cast away.

As that king got hold of his power, the tranquillity of the Huguenots waned. In 1657 they were forbidden to hold colloquies, lest perchance they should take to politics ; in 1659 they were practically told to hold no more synods, Soon the court went further : conversions were undertaken, Wherever a pastor could be bribed, won over, or got rid of, his “temple” was at once torn down ; the Huguenot wor- ship became almost impossible in towns, and lingered on in a few castles, whereby it fell still more under the royal displeasure. As his conscience grew morbid, under Madame de Maintenon’s direction, Louis XIV. became more eager to expiate his own crimes by punishing the heretics, Be- tween 1657 and 1685 520 churches were rooted up; Anquetil declares that 700 had been destroyed before 1685. All through this period, while thousands yielded to oppression or bribery, thousands also fled the land ; the emigration began in 1666 and went on for fifty years. It is probable that in 1660 there were over two millions of Huguenots, the best and thriftiest citizens in the land re is said, though no figures can be trusted, that in all fully a million of French subjects escaped from their inhospitable fatherland. At last in 1685, thinking that the Huguenots were as goo as suppressed, Louis XIV. revoked the edict of Nantes (see Francz, vol. ix. p- 579). The revocation was the sentence of civil death on all Huguenots; it crushed more than half the commercial and manufacturing industry of the kingdom. It is said that at the time of it there

They had

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were 1000 Huguenot pastors; of these over 600 escaped from France, 100 were slain or sent to the galleys, the remainder conformed or disappeared.

The war of 1689 called attention away from the perse- cuted remnant of the Huguenots, and they had a breathing Space in Languedoc, the Cevennes, and Dauphiné ; but directly the peace of Ryswick was signed, repression began again, and consequently, when the Spanish succession war commenced, the Huguenots of the “ Desert,” that is, of the country about Nimes, broke out after endless provocations into open war, which lasted two years, and for a while de- fied all the efforts of the court. Marshal Villars was at last sent down, and by mingled gentleness and severity he both Secured the submission of the gallant Cavalier, the chief leader of the Huguenots, and the defeat of the more deter- mined of the mountaineers. Throughout the rest of the century the down-trodden Protestantism of France was kept alive chiefly by the exertions of Antoine Court, the

apostle of the Desert, who never lost faith in the cause,

and who reorganized the dying churches, breathing into them fresh life. Though under the influence of oppression and excitement, the Huguenot story is here and there disfigured by fanatical outbursts of ‘the “ prophets” and “‘prophetesses,” still on the whole the account of their endurance is among the most remarkable and heroic records of religious history.

After the interference of Voltaire in behalf of Calas, their sufferings came almost to an end; the general change of opinion, the steady weakening of the Catholics, the in- dolence or good nature of the sovereign, forbade the scan- dals of the past, until at last in 1787, under Necker’s influence, Louis XVI. signed a memorable edict which restored, atter 102 years’ deprivatiou, their civil status to the Huguenots. The Revolution of 1789 carried justice a Stage further ; among the many titles of the Revolution to the gratitude of posterity none is more marked than the complete restoration of the non-Catholic elements of French society to their rights. From that moment to the present time the descendants of the Huguenots have had peace.

There are now about half a million Calvinists in France Q by the census of 1872 they numbered 467,531 souls, of whom about 100,000 were in the north, and the rest mostly in their old quarters in the south; in the Gard, the ancient Desert, nearly a quarter of the whole body still abide. Of late years the Protestant Church in France has shown a tendency to division into two parties, that of the more rigid Calvinistic opinions, and that of a more liberal

and less orthodox theology. In either case they form a group of loyal citizens, on whom French politicians now look with favour. The old reproach that “the Huguenots are all republicans” has at last turned to their credit.

The persecutions which checked all wholesome develop- ments at home, whether religious, literary, or commercial, were favourable to their growth abroad; and we consequently find that in literary and artistic excellence the Huguenots have taken their full share. Their first attention was naturally called to theology, in which the names of Calvin and Farel, Beza, Daillé, the Drélincourts, the learned S. Desmarets, Jortin, P. Jurieu, Labadie the mystic, the Le- cleres, the great Hebraist Mercier, Mestrezat the preacher, the old hero Duplessis Mornay, Salmasius, J. Saurin, first of Protestant orators, and a crowd of lesser men testify to their activity in this branch. Add to these the dictionary of Bayle, the works of the Basnages, Morin the Orientalist, Pithou, the Daciers, Etienne Dolet, Ramus, Le Févre of Etaples, above all Scaliger, as leaders in learning ; in history, Bénott, Bongars, Palma Cayet, Hubert Languet, Béroalde, and Rapin-Thoyras ; and with them the political writer Hotman. Of lawyers they claim Baudouin, Cujas, Coras, Doneau, Hérault, and Godefroy, famed as the most

learned of jurisconsults. In science they have the Cuviers, Desmaizeaux, Dubois the chemist, Paré, father of modern surgery, Papin, herald of the steam-engine, the physician Joubert, L’Ecluse the botanist, and the Hubers. In art they lay claim to Crispin, J. Cousin, Pallissy, Simon the engraver, the Picarts, and Goujon the architect. Their poets are Marot and Margaret of Valois. The general effect of this activity is hard to gauge: from Amsterdam and Berlin, Geneva and London, issued sermon, political pamphlet, controversial polemic; but these efforts had no settled audience, they failed to win the ear of France. The same is true of their religious heroism ; though it seemed to be exactly what was wanted to strengthen the national character, the confessors were scattered, like the Jews, among the nations, and ceased to affect the progress of their fatherland. In the Revolution we can see traces of their mental and moral activity ; it may be that their day of influence is not yet over. For their history isa standing marvel, illustrating

the abiding power of strong religious convictions, narrow in theory, pure in practice; they have stood as much ill-usage as has befallen any branch of Christ's church. It remains for their descendants to show to France that their creed goes well with freedom and advance,—tbat the religious instinct, so deeply implanted in man, is a true friend of orderly and rational national life. Religion which does not abuse its power, a freedom from divided allegiances, an aptitude for constitutional institutions, and an intelligent belief in the sovereignty of the people—these are the elements which the Huguenots of to-day can bring to the service of the republic under which they dwell safely, none making them afraid, Authoritics.—Calvin, Institutio Christiane: Religionis, and Lettres, ed. J. Bonnet, 1854; Haag, France Protcstante, 1846; Meaux, Luttes réligieuses au XVI. sitcle, 1879; Arquez, Assemblées politiques des Réformés, 1859; E. Hugues, Restauration de Protestantisme cn France, 1875; Mignet, Etablissement .. . dw Calvinisme & Geneve; G. de Félice, Hist. des Protestants cen France ; E. Bénoit, Hist. de V Edit de Nantes; ©. Coquerel, Eglises du Désert ; A. Court, Zroubles des Cévennes ; Bonnemtre, Hist. des Camisards; Guizot, Hist. de France, 1872; Merle d'Aubigné, Réformation au XVI. sidcle; Professor H. M. Baird, History of the Rise of the Huguenots, 2 vols., 1880. (G. W. K.)

HULL, or Krneston-upoy-Hutt, a municipal and parliamentary borough, and one of the principal seaport towns of England, is, though a county in itself, locally within the East Riding of Yorkshire, situated in 53° 44' N, lat. and 0° 10' W. long., on the west side of the Hull, where it discharges into the estuary of the Humber, 20 miles from the German Ocean at Spurn Head. By rail it is 41} miles east-south-east of York. Branch lines of the North-Eastern Railway connect it with the principal towns in the East Riding; and by means of the steam ferry across the Humber to New Holland it has communication with the Great Northern and the Manchester, Sheffield, and Lincolnshire Railways. The town stands on a level plain so low as to render embankments necessary to protect it from inundation, and the flatness of the surrounding country as far as the eye can reach is unbroken by anything that can be properly termed an elevation. The older portion of the town, which is completely enclosed between the docks on the north and west and the Hull and Humber on the east and south, was originally very densely inhabited, and its streets were narrow and irregular, but in this respect it has lately undergone great improvements. The streets in the modern quarter are spacious and regular, and the villas of the wealthier classes occupy the

suburbs. A pier front- ing the Humber affords a pleasant promenade. To the north of the town there is a public park presented in 1860 by Z. C. Pearson, then mayor of Hull. It is 27 acres in extent, is tastefully laid out, and contains full-sized marble statues of her Majesty the Queen and of the late Prince Consort. A botanic garden about 40 acres in ex-

tent was opened in 1880. There is a large public cemetery, which possesses separate chapels for churchmen and dis- senters. The town is supplied with water from springs about 4 miles distant, two condensing engines of 60 horse power each being employed in pumping it.

The principal public buildings are the town-hall in Low- gate, completed in 1866 in the Italian Renaissance style, having a very richly adorned fagade, with a central dome 135 feet in height resting on eight arches, and containing a clock and bell; the exchange in the same street, completed also in 1866, in a less ornate form of the Italian style, containing a hall 70 feet long by 40 feet wide, and the offices of the Hull chamber of commerce and the Hull guardian society for the protection of trade; the corn exchange in High Street, a plain building with a great hall 157 feet long by 36 feet wide; the custom-house in Whitefriargate ; Trinity House, a handsome brick build- ing in the Tuscan style, erected in 1753 by the guild of Trinity House, originally established in 1369; Charter- house, rebuilt in 1645, belonging to a foundation for the support “of the feeble and old,” which was established by Sir Michael de la Pole in 1384; the dock offices, an elaborate building in the Italian style; the royal institu- tion, a large and beautiful edifice in the Roman Corinthian style, opened by Prince Albert in 1854, possessing a museum, a library of 40,000 volumes, and accommodation for the meetings of the literary and philosophical society ; the new general post-office, in the modern Italian style, opened in 1877 ; the prison, constructed on the new model principle, opened in 1869; the music-hall, in the Renais- sance style; the theatre royal, opened in 1873, a stuccoed structure with a handsome Corinthian front; the public baths and washhouses, in the Tudor style, completed in 1850 at acost of £12,000. The only church: of spccial interest or architectural merit is that of Holy Trinity, on the west side of the market-place, a cruciform edifice in the floral Gothic style, originally founded at

the end of the 13th century, but of various dates, and lately com- pletely restored at a cost of over £30,000, having an extreme length of 272 feet, the breadth of the nave being 72 feet and that of the chancel 70 feet. It possesses a very fine west window, filled with stained glass in 1862 at a cost of £1000, and is surmounted at the intersection of the nave and transept by a noble tower, with finely decorated pinnacles, rising from the point of intersection to the height of 140 feet. St Mary's church in Lowgate, in the Perpendicular style, was originally founded in the beginning of the 14th century, but has been nearly all rebuilt since that period, the tower being erected in 1696, and the whole building restored in 1863-65 at a cost of £10,000. The principal educational establishments are the grammar school, founded in 1486; the Hull and East Riding college, a proprietary school for sons of gentlemen ; the Trinity House marine school, founded in 1716; Cogan's charity school for girls, founded in 1763; national, British, Catholic, Wesleyan, and school board schools; a ragged and industrial school ; and the Humber industrial school ship " Southampton." Among the other institutions for ministering to the intellectual wants of the community are the school of science and art, the literary and philosophical society, the royal institution, the mechanics' institution, the Hull church institute and library, the young people's Christian and literary institute, the Catholic institute, the Lyceum library and réeading-room, and the literary club. The charities and benevolent founda- tions are numerous, and, in addition to Charterhouse and Trinity House, already mentioned, include the infirmary, founded in 1782, and extended by the addition of two wings in 1840, and of detached fever wards in 1874; the Hull and Sculcoates dispensary, founded in 1814; the

hospital for sick children, opened in1873; the homeopathic dispensary; the blind institute; the borough lunatic asylum, erected in 1849, with accommodation for 160 patients ; the Hull workhouse, the Sculcoates union woikhouse , the seamen's and general orphan asylum; the sailors' home, opened in 1860; the sailors' orphan home and _ school, erected in 1863; Gregg's hospital, founded in 1416, Lister's in 1641, and Crowle's in 1661,

Hull ranks as the third port of the United Kingdom, being surpassed in the value of its exports and imports by London and Liverpool only. The original harbour occu- pied that part of the river Hull which faced the old town, but in 1774 an Act was passed for forming a dock on the site of the old fortifications, having its

d41 entrance at the upper end of the old harbour. This dock, known for some time as the Old dock, is*1703 feet long and 254 feet broad, and its area is 10 acres. In 1809 the Humber dock at the south end of the town was opened ; it is 914 feet long and 342 feet broad, and its area is 7 acres. These two docks were connected by a third, opened in 1829, at first named the Junction dock, its length being 645 feet and a breadth of 238 feet ; its area is 6 acres. After a visit paid to Hull by the Queen and Prince Albert in 1854, the name of the Old dock was changed to the Queen's dock, and that of the Junction dock to the Prince's dock. The Railway dock, opened in 1846, extends to 3 acres. In 1850 the Victoria dock was opened, on the

| east side of the river Hull, with entrances from it and the

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Plan of Hull.

Humber, and occupied an area of about 124 acres. In 1863 this dock was extended 7} acres eastward. In connexion with this dock was a timber pond of 94 acres, subsequently enlarged to 14 acres, and a new onc of 11 acres was about the same date constructed near it. The Albert dock, opened by the prince of Wales in July 1869, occupies an area of 24} acres, and has a length of 3370 feet, with a breadth at the eastern end of 480 feet, and at the western end of 200 feet. To the west of it an additional dock of 6 acres was opened in May 1880. A capacious graving dock, 460 feet long, which is entered from the last-mentioned dock is now (1880) in course of construction. Another dock of 24 acres, to the west of the new West dock, has been commenced. Rails in connexion with the North-Eastern Railway

are laid along the quays of the docks. In 1880 an Act was ob- tained for a railway from Hull to Barnsley, and a dock in connexion with it. The shipping trade of Hull is chiefly with the Baltic ports, Denmark, Norway, Ger- many, and Holland; but it has also regular steam com-

munication with the other principal ports of Europe, as well as with the United States, the Black Sea, Egypt, &c. In 1878 the number of ships that entered was 4996, with a tonnage of 1,750,977, and the number that cleared 4802, with a tonnage of 1,788,214. For the five years ending 1878 the average number of ships that entered was 4987, with a tonnage of 1,742,120, while 4857 cleared, with a tonnage of 1,726,151.

The value of imports of foreign and colonial merchandise in 1878 was £17,849,197, and the average value for the five years 1874-78 was £18,038,263. The value of exports of produce of the United Kingdom in 1878 was £19,109,797, and the average value for the five years was £21,267,391. Hull is one of the principal shipping ports for the manu- factures of Yorkshire and Lancashire, and imports large quantities of grain from Russia, Prussia, America, and the British colonies, and of timber from Norway and Sweden. The import of cattle is very large, and a commodious cattle depot has been constructed. The deep-sea fishing is

extensively prosecuted, and, in addition to several small steamers, employs about 450 boats, with 2500 hands.

tinued.

The staple industry of Hull is seed-crushing for oil and cake making. It possesses exteusive engineering works and foundries, large iron shipbuilding yards, rope-yards, sail-lofts, tanneries, breweries, flax and cotton mills, chemical works, and manufactures of blue and _ black

The principal histories of Hull are those of Gent, 1735, reprinted 1869 ; Hadicy, 1788; Tiekell, 1798; Frost, 1827; and Sheahan, 1864. See also

: Symons’s MHigh-Sireet, Hull, some years since, and Biographical Sketches inter- Whale-fishing, once an important industry, is now discon- |

lead, paints, colours, and varnishes, Portland and Roman | 1875 was 6096.

cement, phosphate of lime, tobacco, starch, paper, soap, furniture, and organs.

The population of the parliamentary borough, which |

was 84,690 in 1851, had in 1871 reached 123,408. population of the municipal borough in 1861 was 97,661, and in 1871 it had increased to 121,892. the municipal borough is 3635 acres, and of the parlia- mentary 4447 acres.

History.—Hull originated in the two nearly contiguous villages

of Myton and Wyke, the latter of which was a considerable port not long after the Norman Conquest. For some period the united

Edward I. it is also oceasionally mentioned as Hull. In 1298

Edward I., on returning from the battle of Dunbar, happened to pay | lecturer.

it a visit, when, struck with its advantages as a commercial port, he purchased it from the abbot of Meaux, with the purpose of fortify- ing it. He created the town a manor of itself, bestowed upon it the name of Kingston-upon-Hull, and issued a proclamation offering to all who settled init special advantages. In 1299 it received a royal charter constituting it a free borough. About the same time the improvements on its harbour were completed, and from this period its inerease in prosperity was rapid and uninterrupted. In 1316 a regular ferry was established between Hull and Barton in Lincoln- shire, and a few years later the town was fortified with walls and ditches. Much of the early prosperity of the town was due to the enterprise of the famous merchants, the De la Poles, who were high in favour with successive monarchs, and the head of which house was in 1385 created earl of Suffolk. Such was the importance of the town in the reign of

Edward I11. that in 1859 it supplied for the armament against France 16 ships and 466 seamen, the quota of London being 25 ships and 662 seamen, and that of Newcastle 17 ships and 314 seamen. In thereign of Richard II. the fortresses were repaired and a strong castle was erected on the east side of the river Hull. By Henry VI. additional charters were granted, erecting the town and liberties into a county in itself, under the designation of ‘‘ The Town and County of the Town of Kingston-upon-Hull,” constituting it a corporate town, and appointing, instead of a mayor and bailiffs, for its government a mayor, sheriff, and aldermen. In the Wars of the

Roses it strenuously maintained the cause of Lancaster; and so | 3 | the workers do not hibernate.

the queen hive-bee in having dense fringes of hairs on In the 15th, 16th, and 17th centuries it |

zealous was it in its loyalty that after the borough funds were exhausted additional money was raised by the sale of the materials of the market cross. suffered greatly from the plague, and in 1527 and 1549 mucli damage was caused by inundations. During the insurrection in 1536 called the Pilgrimage of Grace, originated by the dissolution of the monasteries, Hull was seized by the insurgents, but, after the disper- sion of the main body at Doncaster, the ringleaders in the town were seized by the magistratesand executed. During the second rebellion in Yorkshire in 15387 the town was taken possession of by the in- surgents headed by Sir Robert Constable, and held for a month, but the loyal inhabitants, surprising them in the middle of the night,

compelled them to surrender; many of them were executed, and the | body of Sir Robert Constable was hung in chains over the Beverley | gate. In 1540 Hull was visited by Henry VIII., who, after a careful

survey of the town and neighbourhood, gave directions for the erec- tion of a castle and other fortifications, for the cutting of a canal from Newland to Hull in order to provide ‘‘additions of fresh

erected by the De la Poles, but since then acquired by the crown. During the parliamentary war the possession of Hull was an object

of ambition to both parties on account of its importance as a depot |

for arms and militarystores. In 1642 the governor, Sir John Hotham, refused to admit Charles I. intothetown. In 1648 and 1644 it sus- tained two long sieges and many vigorous attacks by the royalists. In 1534 Hull was made the see of a suffragan bishop, but the office was abolished on the death of Edward VI. By the 33d of Edward I. the town returned burgesses to parliament. The privi- lege was afterwards for some time in abeyance till the 12th of Edward II., sinee which period it has returned two members. Among the eminent natives of Hull, besides the De la Poles, are Andrew Marvell, William Mason the friend of Gray the poet, William Wilberforce, and Major-General Perronet Thompson.

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The area of |

spersed with Historical Accounts of the Town, Ancient and Modern, &c., 1862; Wooley's Statutes relating to Kingston-upon- ful', 1830; Symons's IZullinia, or Selections from Local History, 1872, and Sketches of Hull Authors, 1879.

HULS, a town of Prussia, in the circle of Kempen, and government district of Diisseldorf,is situated at the terminus of a branch railway line to Crefeld and Diisseldorf, 4 miles north of Crefeld and 17 north-west of Diisseldorf. It possesses manufactures of damask and velvet, and in the neighbourhood ironstone is obtained. The population in

HULSE, Joun (1708-1789), founder of the Hulsean lectureship at the university of Cambridge, was born at Middlewich, in Cheshire, in 1708. Entering St John's College, Cambridge, he graduated in 1728, and on taking holy orders was presented to a small country curacy. His

father having died in 1753, Hulse succeeded to his estates

in Cheshire, where, owing to feeble health, he lived in retirement till his death in 1789. He bequeathed his estates to Canibridge University for the purpose of main-

taining two scholars at St John’s College, of founding a village was known as Myton-Wyke, but even before the reign of * o” a

prize for a dissertation, and of instituting the offices of Christian advocate and of Christian preacher or Hulsean By a statute in 1860 the Hulsean professorship of divinity was substituted for the office of Christian advocate, and the lectureship was considerably modified. The first course of lectures under the benefaction was delivered in 1820. In 1830 the number of annual lectures or sermons was reduced from twenty to eight; subsequently they were restricted to four. The annual value of the Hulse endowment is between £800 and £900, of which eight-tenths go to the professor of divinity and one- tenth to the prize and lectureship respectively. HUMBLE-BEE, a name applied by phonetic instinct under various inflexions (such as “ Bumble-bee ” in England provincially, and “ Hummel” in Germany) to the large bees of the genus Bombus (which, like the French “ Bourdon,”

is probably also suggested by the noise made by these | insects).

They belong to the social section of the great family Apide, of which the common hive-bee is the type, and, like that well-known insect, live in colonies composed of the two sexes and neuters, Instead of a single female (or queen), however, many are found in one nest; and The female also differs from

the pollen-plates of the hind legs, and a widened base to the hind tarsi, a structure necessitated by her having to work single-handed at the commencement of the season, as the workers and males do not survive the winter. Early in the spring these large hibernated females may be observed on the wing, each becoming the founder of a fresh colony, in which the neuters are first produced. There are two kinds of females, the smaller one only producing male eggs, but not surviving the winter. The number of individuals in a colony varies with the different species, and as a rule is least in those building their nest above ground. In one very common subterranean species, Bombus terrestris, as

: 1 | many as 107 males, 56 females, and 180 workers have water,” and for the improvement of Suffolk palace, originally —

been found in one nest. ‘There is considerable difference between the males, females, and neuters; the last two differ, however, but little except in size, whereas the males often exhibit a very varying coloration, and have structural peculiarities, such as an additional segment to the abdomen, longer antenna and tongue, no pollen-basket, &e. They have also no sting, whereas both female and worker are armed like the hive-bee. Great difficulty exists in referring these three constituents to their proper species, owing to individual variation, alteration with age, and the difficulty of secing all the members of a colony at the same time ; so that naturalists are not by any means agreed as to the specific

status of many of them, and the synonymy is very compli- cated. The nests are not constructed after the symmetrical fashion of those of the hive-bee, but consist of a collection of oval brownish cells, at first few in number, but receiving additions and extensions as the brood increases, and accom- panied by cells containing pollen andhoney. The workers assist in rearing the larva, and in disengaging the indivi- duals from their pupal integuments as they reach the perfect state ; and it has been noticed that this metamorphosis is accelerated by a kind of incubation. The nests are made under bushes, in banks, &c., sometimes as much as 5 feet from the surface. A well-known oue is made by the “‘Moss-carder” humble-bee, Bombus muscorum, which has often been observed collecting the natural material for its dome, working in line. As usual with provident or social animals, these interesting insects are subject to encroach- ment by parasites of various kinds; most noteworthy among which are some species (there are three or four in England) of the closely allied genus Apathus (or Psi- thyrus), superficially resembling exactly the true humble- bees, but with no pollen-collecting apparatus, and no workers. They exist apparently on friendly terms with their hosts, whose stores are at times materially preyed upon by the larvze of Volucella, a genus of Diptera or two- winged flies also resembling humble-bees. Various beetles, such as Antherophagus, Cryptophagus, Leptinus, &c., and the larvae of Tinea pellionella, a small moth, also occur in their nests,

_As regards distribution, the Bombi are found in Europe, America (North and South), Africa, India, China, and Java, but not in Australasia, where, indeed, it has even been attempted to introduce some species for the purpose of fertilizing the introduced clover, for which the structure of the native insects is apparently insufficient. It is, however, in the northern zone that they flourish best, their hardy nature enabling them to exist in the Arctic regions, as far as man has penetrated ; and the numerous additions con- tinually being made to the list of known species from the Caucasus, the Amur district, Turkistan, Arizona, &c., point, not only toa wide geographical range, but toa large adapta- tion to some useful end. The experiments of Darwin, Miller, and others show how important a part is played by humble-bees in the economy of nature as plant fertilizers ; and, though perhaps not exhibiting such highly-developed instincts as the hive-bee, they possess sufficient reasoning power to enable them, by perforating the base of the he of eccrtain flowers, to obtain otherwise inaccessible

oney.

HUMBOLDT, Friepricn Herricn ALEXANDER, BARoNn von (1769-1859), a distinguished naturalist and traveller, was born at Berlin, September 14,1769. His father, who Was a major in the Prussian army, belonged to a Pomeranian family of consideration, and was rewarded for his services during the Seven Years' War with the post of royal cham-berlain. He married in 1766 Maria Elizabeth von Colomb, widow of Baron von Hollwede, and had by her two sons, of whom the younger is the subject of this notice. The childhood of Alexander von Humboldt was not a promising one, as regards either health or intellect. His characteristic tastes, however, soon displayed themselves ; and from his fancy for collecting and labelling plants, shells, and insects he received the playful title of 'the little apothecary." The care of his education, on the unexpected death of his father in 1779, devolved upon his mother, who discharged the trust with constancy and judgment. Destined for a political career, he studied finance during six months at the university of Frankfort-on-the-Oder 3 and a year later, April 25, 1789, he matriculated at Géttingen, then eminent for the lectures of Heyne and Blumenbach. His vast and variéd powers were by this time fully developed ; and

during the vacation of 1789 he gave a fair earnest of his future performances in a scientific excursion up the Rhine, and in the treatise thence issuing, Mineralogische Beobacht- ungen tber einige Basalte am Khein (Brunswick, 1790). His native passion for distant travel was confirmed by the friendship formed by him at Gottingen with George Forster, Heyne's son-in-law, the distinguished companion of Cook's second voyage. Henceforth his studies, which his rare combination of parts enabled him to render at once multi- farious, rapid, and profound, were directed with extraor- dinary insight aud perseverance to the purpose of preparing himself for his distinctive calling as a scientific explorer. With this view he studied commerce and foreign languages at Hamburg, geology at Freiberg under Werner, anatomy at Jena under Loder, astronomy and the use of scientific instruments under Zach and Kéhler. His researches into the vegetation of the mines of Freiberg led to the publica- tion in 1793 of his Flore L'ribergensis Specimen ; and the results of a prolonged course of experiments on the phenomena of muscular irritability, then recently dis- covered by Galvani, were contained in his Versuche tiber die gereizte Muskel- und Nervenfaser (Berlin, nT), enriched in the French translation with notes by Blumen- bach.

In 1794 he was admitted to the intimacy of the famous Weimar coterie, and contributed (June 1795) to Schiller's new periodical, Die Loren, a philosophical allegory entitled Die Lebenskraft, oder der rhodische Genius. Inthe summer of 1790 he paid a flying visit to England in company with Forster. In 1792 and 1797 he was iu Vienna; in 1795 he made a geological and botanical tour through Switzerland and Italy. He had obtained in the meantime official employment, having been appointed assessor of mines at Berlin, February 29, 1792. Although the service of the state was consistently regarded by him but as an apprentice- ship to the service of science, he fulfilled its duties with such conspicuous ability that he not only rapidly rose to the highest post in his department, but was besides entrusted with several importantdiplomatic missions. Thedeathi of his mother, November 19, 1796, set him free to follow the bent of his genius, and, finally severing his official connexions, he waited for an opportunity of executing his long-cherished schemes of travel. On the postponement of

Captain Baudin's proposed voyage of circumnavigation, which he had been officially invited to accompany, he left Paris for Marseilles with Bonpland, the designated botanist of the frustrated expedition, hoping to join Bonaparte in Egypt. The means of transport, however, were not forthcoming, and the two travellers eventually found their way to Madrid, where the unexpected patronage of the minister d'Urquijo determined them to make Spanish America the scene of their explorations.

Armed with powerful recommendations, they sailed in the "Pizarro" from Corunna, June 5, 1799, stopped six days at Teneriffe for the ascent of the Peak, and landed, July 16, at Cumana. There Humboldt observed, on the night of the 12—13th of November, that remarkable meteor- shower which forms the starting-point of our acquaintance with the periodicity of the phenomenon ; thence he proceeded with Bonpland to Caracas; and in February 1800 he left the coast for the purpose of exploring the course of the Orinoco. This trip, which lasted four months, and covered 1725 miles of wild and uninhabited country, had the important result of establishing the existence of a communication between the water-systems of the Orinoco and Amazon, and of determining the exact position of the bifurcation. On the 24th of November the two friends set sail for Cuba, and after a stay of some months regained the mainland at Cartagena. Ascendingthe swollen stream of the Magdalena, and crossing the frozen ridgesof the Cordilleras, they reached

Quito after a tedious and difficult journey, January 6, 1802. Their stay there was signalized by the ascent of Pichincha and Chimborazo, and terminated in an expedition to the sources of the Amazon en route for Lima. At Callao Humboldt observed the transit of Mercury on November 9, and studied the fertilizing properties of guano, the introduc- tion of which into Europe was mainly due to his writings. A tempestuous sea-voyage brought them to the shores of Mexico, and after a year's residence in that province, followed by a short visit to the United States, they set sail for Europe from the mouth of the Delaware, and landed at Bordeaux, August 3, 1804.

Humboldt may justly be regarded as having in this memorable expedition laid the foundation of the sciences of physical geography and meteorology

in their larger bearings. By his delineation (in 1817) of “isothermal lines,” he at once suggested the idea and devised the means of compar- ing the climatic conditions of various countries. He first investigated the rate of decrease in mean temperature with increase of elevation above the sea-level, and afforded, by his investigations into the origin of tropical storms, the earliest clue to the detection of the more complicated law governing atmospheric disturbances in higher latitudes ; while his essay ou the geography of plants was based on the then novel idea of studying the distribution of organic life as affected by varying physical conditions. His dis- covery of the decrease in intensity of the earth’s magnetic force from the poles to the equator was communicated to the Paris Institute in a memoir read by him, December 7, 1804, and its importance was attested by the speedy emergence of rival claims. His services to geology were mainly based on his attentive study of the volcanoes of the New World. He showed that they fell naturally into linear groups, presumably corresponding with vast subter- ranean fissures; and by his demonstration of the igneous origin of rocks hitherto held to be of aqueous formation, he contributed largely to the spread of juster views than those then prevailing.

The reduction into form and publication of the encyclo- pedic mass of materials—scientific, political, and archzeo- logical—collected by him during his absence from Europe was now Humboldt’s most urgent desire. After a short trip to Italy with Gay-Lussac for the purpose of investigat- ing the law of magnetic declination, and a sojourn of two years and a half in his native city, he finally, in the spring of 1808, settled in Paris with the view of securing thie scientific co-operation required for bringing his great work through the press. This colossal task, which he at first hoped would have occupied but two years, eventually cost him twenty-one, and even then remained incomplete. With the exception of Napoleon Bonaparte, he was now the most famous man in Europe. A chorus of applause greeted him from every side. Academies, both native and foreign, were eager to enrol him among their members. Frederick William III. of Prussia conferred upon him the honour, without exacting the duties, attached to the post of royal chamberlain, together with a pension of 2500 thalers, afterwards doubled. He refused the appointment of Prussian minister of public instruction in 1810. In 1814 he accompanied the allied sovereigns to London. Three years later he was summoned by the king of Prussia to attend him at the congress

of Aix-la-Chapelle. Again in the autumn of 1822 he accompanied the same monarch to the congress of Verona, proceeded thence with the royal party to Rome and Naples, and returned to Paris in the spring of 1823.

The French capital he had long regarded as his true home. There he found, not only scientific sympathy, but the social stimulus which his vigorous and healthy mind eagerly craved. He was equally in his element as the lion

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of the salons and as the savant of the institute and the observatory. ‘Thus, when at last he received from his sovereign a summons to join his court at Berlin, he obeyed indeed, but with deep and lasting regret. The provincialism of his native city was odious to him. He never ceased to rail against the bigotry without religion, eesthe- ticism without culture, and philosophy without common sense, which he found dominant on the banks of the Spree. The unremitting benefits and sincere attachment of two well-meaning princes secured indeed his gratitude, but could not appease his discontent. At first he sought relief from the “nebulous atmosphere” of his new abode by frequent visits to Paris; but as years advanced his excursions were reduced to accompanying the monotonous “oscillations” of the court between Potsdam and Berlin. On the 12th of May 1827 he settled permanently in the Prussian capital, where his first efforts were directed towards the furtherance of the science of terrestrial magnetism. For many years it had been one of his favourite schemes to secure, by means of simultaneous observations at distant points, a thorough investigation of the nature and law of “magnetic storms ”—a term invented by him to designate abnormal disturbances of the earth’s magnetism. The meeting at Berlin, September 18, 1828, of a newly-formed scientific association, of which he was elected president, gave him the opportunity of setting on foot an extensive system of research in combination with his diligent personal observations. His appeal to the Russian Government in 1829 led to the establishment of a line of magnetic and meteorological stations across northern Asia; while his letter to the duke of Sussex, then (April 1836) president of the Royal Society, secured for the undertaking the wide basis of the British dominions. Thus that scientific con- spiracy of nations which is

one of the noblest fruits of modern civilization was by his exertions first successfully organized.

Tn 1811, and again in 1818, projects of Asiatic explora- tion were proposed to Humboldt, first by the Russian, and afterwards by the Prussian Government; but on each occasion untoward circumstances interposed, and it was not until he had entered upon his sixtieth year that he resumed his early réle of a traveller in the interests of science. Between May and November 1829 he, together with his chosen associates Gustav Rose and Ehrenberg, traversed the wide expanse of the Russian empire from the Neva to the Yenesei, accomplishing in twenty-five weeks a distance of 9614 miles. The journey, however, though carried out with all the advantages afforded by the immediate patronage of the Russian Government, was too rapid to be profitable. Its most important fruits were the correction of the preva- lent exaggerated estimate of the height of the Central-Asian plateau, aud the discovery of diamonds in the gold-washings of the Ural—a result which Humboldt's Brazilian ex- periences enabled him to predict, and by predicting to secure.

Between 1830 and 1848 Humboldt was frequently employed in diplomatic missions to the court of Louis Philippe, with whom he always maintained the most cordial personal relations. The death of his brother, Wilhelm von Humboldt, who expired in his arms, April 8, 1836, saddened the later years of his life. In losing him, Alexander lamented that he had "lost half himself." The accession of the crown prince as Frederick William IV., on the death of his father, in June 1840, added to rather than detracted from his court favour. Indeed, the new king's craving for his society became at times so importunate as to leave him only some hours snatched from sleep for the prosecution of his literary labours.

It is not often that a man postpones to his seventy-sixth year, and then successfully executes, the crowning task of

his life. Yet this was Humboldt's case. The first two volumes of the Xosmos were published, and in the main composed, between the years 1845 and 1847. The idea of a work which should convey, not only a graphic

description, but an imaginative conception of the physical world—which should support generalization by details, and dignify details by generalization, had floated before his mind for upwards of halfa century. It first took definite shape in a set of lectures delivered by him before the university of Berlin in the winter of 1827-28. These lectures formed, as his latest biographer expresses it, “the cartoon for the great fresco of the Kosmos.” The scope of this remarkable work may be briefly described as the representation of the unity amid the complexity of nature. In it the large and vague ideals of the 18th are sought to be combined with the exact scientific requirements of the 19th century. And, in spite of inevitable shortcomings, the attempt was in an eminent degree successful. Nevertheless, the general effect of the book is rendered to some extent unsatisfactory by its tendency to substitute the indefinite for the infinite, and thus to ignore, while it does not deny, the existence of a power outside and beyond those of nature. A certain heaviness of style, too, and laborious picturesqueness of treatment make it more imposing than attractive to the general reader. Its supreme and abiding value, however, consists in its faithful reflexion of the mind of a great man. No higher eulogium can be passed on Alexander von Humboldt than that, in attempting, and not unworthily attempting, to portray the universe, he succeeded still more perfectly in portraying his own comprehensive intelli- ence.

The last decade of his long life—his “ improbable” years, as he was accustomed to call them—was devoted to the con- tinuation of this work, of which the third and fourth volumes were published in 1850-58, and a fragment of a fifth appeared posthumously in 1862. In these he sought to fill up what was wanting of detail as to individual branches of science in the sweeping survey contained in the first volume. Notwithstanding their high separate value, it must be admitted that, from an artistic point of view, these additions were deformities. The characteristic idea of the work, so far as such a gigantic idea admitted of literary incorporation, was completely developed in its opening portions, and the attempt to convert it into a scientific encyclopaedia was in truth to nullify its generating motive. Humboldt’s remarkable industry and accuracy were never more conspicuous than in the erection of this latest trophy to his genius. Nor did he rely entirely on his own labours. He owed much of what he accomplished to his rare power of assimilating the thoughts and availing

himself of the co-operation of others, He was not more ready to incur than to acknowledge obligations. The notes to Kosmos overflow with laudatory citations, which were, indeed, the current coin in which he discharged his intellectual debts,

On the 24th of February 1857 Humboldt was attacked with a slight apoplectic stroke, which, however, passed away without leaving any perceptible trace. It was not until the winter of 1858-59 that his strength began to decline, and on the ensuing 6th of May he tranquilly expired, wanting but six months of completing his ninetieth year. The honours which had been showered on him during life followed him after death. His remains, pre- viously to being interred in the family resting-place at Tegel, were conveyed in state through the streets of Berlin, and received by the prince-regent with uncovered head at the door of the cathedral. The first centenary of his birth was celebrated September 14, 1869, with equal enthusiasm in the New as in the Old World; and the numerous monu- ments erected in his honour,

called by his name, bear witness to the universal diffusion of his fame and popularity.

Humboldt was never married, and seems to have been at all times more social than domestic in his tastes. To his brother’s family he was, however, much attached ; and in his later years the somewhat arbitrary sway of an old and faithful servant held him in more than matrimonial bond- age. By a singular example of weakness, he executed, four years before his death, a deed of gift transferring to this man Seifert the absolute possession of his entire property. It is right to add that no undue advantage appears to have been taken of this extraordinary concession. Of the qualities of his heart it is less easy to speak than of those of his head. The clue to his inner life might probably be found in a certain egotism of self-culture which influenced his affections as well as regulated his studies, His attach- ments, however, once formed, were sincere and lasting. He made innumerable friends ; and it does not stand on record that he ever lost one. His benevolence was through- out

his life active and disinterested. His early zeal for the improvement of the condition of the miners in Galicia and Franconia, his consistent detestation of slavery, his earnest patronage of rising men of science, bear witness to the large humanity which formed the ground-work of his character. The faults of his old age have been brought into undue prominence by the injudicious publication of his letters to Varnhagen von Ense. The chief of these was his habit of smooth speaking, almost amounting to flattery, which formed a painful contrast with the caustic sarcasm of his confidential utterances. His vanity, at all times conspicuous, was tempered by his sense of humour, and was so frankly avowed as to invite sympathy rather than provoke ridicule. After every deduction has been made, he yet stands before us as a colossal figure, not unworthy to take his place beside Goethe as the represen- tative of the scientific side of the culture of his country.

The best biography of Humboldt is that of Professor Karl Bruhns (3 vols., 8vo, Teeie 1872), excellently translated into English by the Misses Lassell, with the omission, however, of the exhaustive bibliographical notice and scientific summary contained in the original. The Voyage aux régions équinoriales du Nouveau Con- tinent, fait 1799-1804, par Alexandre de Humboldt et Aimé Bonpland, (Paris, 1807, &c.), consisted of thirty folio and quarto volumes, and comprised a considerable number of subordinate but important works. Among these may be enumerated Vue des Cordilléres et momiments des peuples indigenes de l Amérique, 2 vols., folio, 1810 5; Examen eritique de Uhistoire dela géographie du Nouveau Continent, 1814-34 ; Atlas géographique ct physiquedu royaume de la Nowvelle Espagne, 1811; Essai politique sur le royaume de la Nouvelle Espagne, 1811; Essai sur la géographie des plantes, 1805 (now very rare); and Relation historique, 1814-25, au unfinished narrative of his travels, including the Essat politique sur l’tle de Cuba. The Nova genera et species plantarum (7 vols. folio, 1815-25), containing descriptions of above 4500 species of plants collected by Humboldt and Bonpland, was mainly compiled by ©. S. Kunth; Oltmanns assisted in preparing the Reeucil dobscrrations astronomiques, 1808 ; Cuvier, Latreille, Valenciennes, and Gay-Lussae co-operated in the Reeueil d’observations de zoologie ct d’anatonvie comparee, 1805-38. Humboldt’s

Since his death considerable portions of his correspondence have been made pnblie. The first of these, in order both of time and of importance, is his Briefe an Varnhagen von Ense, Leipsic, 1860. This was followed in rapid succession by Briefweehsel mit einem Jungen Freunde (Friedriet Althaus), Berlin, 1861 ; Briefwechsel mit Heinrich Berghaus, 3 vols., Jena, 1863 ; Correspondance scientifique et littéraire, 2 vols., Paris, 1865-69 ; Lettres & Mare-Aug. Pietet, pub- lished in Le Globe, tome vii., Geneva, 1868 ; Briefe an Bunsen, Leipsic, 1869 ; Briefe an seinen Bruder Wilhelm, Stuttgart, 1880 ; besides some other collections of less note. An octavo edition of Humboldt's principal works was published in Paris by Th. Morgand, (A. M. C.)

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HUMBOLDT, Kart Wituetm von (1767-1835), the elder brothcr of the more celebrated Alexander von Humboldt, was born at Potsdam, on the 22d of June 1767. After being educated at Berlin, Gottingen, and Jena, in the last of which places he formed a close and lifelong friendship with Schiller, he married Fraulein von Dacherode, a lady of birth aud fortune, and in 1802 was appointed by the Prussian Government first resident and then minister plenipotentiary at Rome. While there he published a poem entitled Mom, which was reprinted in 1824. This was not, however, the first of his literary pro- ductions; his critical essay on Goethe's Hermann and Dorothea, published in 1800, had already placed him in the first rank of authoritics on esthetics, and, together with his family connexions, had much to do with his appointment at Rome; while in the years 1795 and 1797 he had brought out translations of several of the odes of Pindar, which were held in high esteem. On quitting his post at Rome he was made councillor of state and minister of public instruction. He soon, however, retired to his estate at Tegel, near Berlin, but was recalled and sent as ambassador to Vienna. in 1812 during the exciting period which witnessed the closing struggles of the French empire. In the following year, as Prussian plenipotentiary at the congress of Prague, he was mainly instrumental in inducing Austria to unite with Prussia and Russia against France ; in 1815 he was one of the signatories of the capitulation of Paris, and the same year was occupied in

drawing up the treaty between Prussia and Saxony, by which the territory of the former was largely increased at the expense of the latter. The next year he was at Frankfort settling the future condition of Germany, but was summoned to London in the midst of his work, and in 1818 had to attend the congress at Aix-la-Chapelle. The reactionary policy of the Prussian Government made him resign his office of privy councillor and give up political life in 1819; and from that time forward he devotcd himself solely to literature and study.

During the busiest portion of his political career, how- ever, he had found time for literary work. Thus in 1816 he had published a translation of the Agamemnon of Eschylus, and in 1817 corrections and additions to Adelung's ALithridates, that famous collection of specimens of the various languages and dialects of the world. Among these additions that on the Basque language is the longest and most important, Basque having for some time specially attracted his attention. In fact, Wilhelm von Humboldt may be said to have been the first who brought Basque before the notice of European philologists, and made a scientific study of it possible. In order to gain a practical knowledge of the language and complete his investigations into it, he visited the Basque country itself, the result of his visit being the valuable " Researches into the Early Inhabitants of Spain by the help of the Basque language" (Priifung der Untersuchungen tiber die Urbewohner LHas- paniens vermittelst der vaskischen Sprache), published in 1821. In this work he endeavoured to show, by an exami- nation of geographical names, that a race or races speaking dialects allied to modern Basque once extended through the whole of Spain, the southern coast of France, and the Balearic Islands, and suggested that these people, whom he identified with the Iberians of classical writers, had come from Northern Africa, where the name of Berber still perhaps perpetuates their old designation. Another work on what has sometimes been termed the metaphysics of language appeared from his pen in 1828, under the title of Ueber den Dualis; but the great work of his life, on the ancient Kawi language of Java, was unfortunately interrupted by his death on the 8th of April 1835. The linperfecs fragmen', was edited by his brether and Dr

Buschmann in 1836, and contains the remarkable introduc- tion on “ The Heterogeneity of Language and its Influence on the Intellectual Development of Mankind” (Ueber die Verschiedenheit des menschlichen Sprachbaues und thren Einfluss auf die geistige Entwickelung des Menschenge- schlechts), which has been since edited and defended against Steinthal’s criticisms by Professor Pott (2 vols., 1876). This essay, which has been called the text-book of the philosophy of speech, first clearly laid down that the character and structure of a language expresses the inner life and knowledge of its speakers, and that languages must differ from one another in the same way and to the same degree as those who use them. Sounds do not become words until a meaning has been put into them, and this meaning embodies the thought of a community. What Humboldt terms the inner form of a language is just that mode of denoting the relations between the parts of a sentence which reflects the manner in which a particular body of men regards the world about them. It is the task of the morphology of speech to distinguish the various ways in which languages differ from each other as regards their inner form, and to classify and arrange them accordingly. Other linguistic publications of Humboldt, which had appeared in the Z’ransactions of the Berlin Academy, the Journal of the Royal Asiatic Society, or elsewhere, were republished by his brother in the seven volumes of Wilhelm von Humboldt’s Gesammelte Werke (1841-52). These volumes also contain poems, essays on eesthetical subjects, and other creations of his prolific mind. Perhaps, however, the most generally interesting of his works, outside those which deal with language, is his correspondence with Schiller, published in 1830. Both poet and philosopher come before us in it in their most genial mood. For, though Humboldt was primarily a philosopher, he was a philosopher rendered practical by his knowledge of states- manship and wide experience of life, and endowed with keen sympathies, warm imagination, and active interest in the method of scientific inquiry. (A. H. 8.)

HUME, Davin (1711-1776), the most subtle meta- physician and one of the greatest historians and political economists of Great Britain, was born at Edinburgh, on the 26th April (O.S.) 1711. His father, Joseph Hume or Home, a scion of the noble house of Home of Douglas, was owner of a small estate’ in Berwickshire, on the banks of the Whitadder, called, from the sprirg rising in front of the dwelling-house, Ninewells. David was the

youngest of a family of three, two sons and a daughter, who after the early death of the father were brought up with great care and devotion by their mother, the daughter of Sir David Falconer, president of the college of justice. She survived till 1749, long enough to see securely established the foundations of the literary fame of the younger son, for whose powers she seems at one time to have entertained no great respect. ‘Our Davie,” she is reported to have said, perhaps with reference to what seemed his folly in rejecting more lucrative professions than that of literature, “ Our Davie ’s a fine good-natured crater, but uncommon wake- minded.”

Of Hume’s early education little is known beyond what he has himself stated in his Zife. He appears to have entered the Greek classes of the university of Edinburgh in 1723, and, he tells us, “passed through the ordinary course of education with success.” It is uncertain how long he remained at the university, though a passage in the remarkable letter first printed by Mr Burton fixes this with comparative definiteness.1 “‘ As our college education in Scotland, extending little further than the languages, ends commonly when we are about fourteen or fifteen, i

1 Burton’s Life. i. 39-32.

was after that left to my own choice in my reading.” We may conclude, then, that about the year 1726 Hume returned to Ninewells with a fair knowledge of Latin, slight acquaintance with Greek, and literary tastes decidedly inclining to ‘“‘books of reasoning and philosophy, and to poetry and the polite authors.” He has nowhere given any indications of an explicit character with regard to his reading, or to the works which contributed most in forming his own opinions ; and in his writings, save where the subject is of an historical kind, literary references are con- spicuous by their rarity. Yet it seems possible from what we know of the sources open to him, of his own preferences, of the problems ‘with which he first busied himself, and of the general current of his speculations regarding them, to infer with some exactness the course of his studies. It is to be noted that at a very early period of his life the dominant passion had declared itself. The love of literature for its own sake was combined with the keen overmastering desire for a literary reputation. At an unusually early age he had determined for

himself his future course, and no induce- ment was strong enough to make him swerve from it. His temperament, on the whole placid and even phlegmatic, readily inclined him to seek as his mode of life the golden mean, equally removed from such external influences as could distract or disturb contemplative repose. He practised what he taught and learned of the Stoic rules, and was concerned only to obtain such external fortune as would place him above the necessity of wasting his powers on temporary and transient objects. His prudence was as remarkable as his moderation ; and his life, on the whole, may be regarded as one of the most perfect and successful instances of constant devotion to literary aims. While he was thus fortunate in choosing early and maturely the object towards which all his industry was to be directed, he was no less fortunate in the selection of the special form of literary work to which he was to devote himself, It is clear that his inclinations at a very early age led him towards the analysis of human nature, from which all his later writings take their origin. Speculation upon the nature and certainty of knowledge, whether in its abstract form, that of mere psychology, or in its more concrete applica- tions, as in theology, seems to have been the earliest occu- pation of his thought ; and in this speculation we cannot doubt he was directed largely by the writings of Cicero and Seneca, though the main factor was unquestionably the great English works which had begun to exert their influence at the time. While we trace the matter of Hume's later reflexions to Locke, Berkeley, and Butler, we must not overlook the great part in his mental develop- ment which is due to the sceptical or academical writings of the earlier thinkers. The philosophical treatises of Cicero were familiar to Hume, whose writings have a colouring undeniably due to this source. The form in which he cast some of the most important of his speculations is an imitation, more or less conscious, of these ancient models. We see Hume, then, in the years during which the influences that mould a man's character and career are most actively at work, resolutely devoting himself to a life of literature, possessed by the most intense ambition for literary fame, and busying himself with reflexion upon those problems of 'philosophy and critics " in which, as he found, "nothing was yet established." His means were slender, and it was necessary for him, even in view of his primary object, to endeavour after independence. The first choice of a profession, that of law, made for him by his relatives, who thought it suited to his " studious habits, Sobriety, and industry," proved unsuccessful. Although his

intellect was acute and practical, yet at this period he was so entirely devoted to the more subtle and speculative problems that law could present nothing beyond a barren

waste of technical jargon. While his friends thought “he was poring over Voet and Vinnius, Cicero and Virgil were the authors he was secretly devouring.” The intensity of his studies, the agitation due to the novelty of the ideas which began to crowd upon him as he tried to carry out systematically the first principles of human knowledge which he learned from Locke and Berkeley, combined to throw him for a time into a state of physical exhaustion and lassitude. His health was gradually restored by more careful regimen ; but, as we learn from the curious diagnosis he made of his own state, the vigour requisite for protracted and connected speculation seemed to have vanished “I have collected,” he writes, the “rude materials for many volumes ; but in reducing these to words, when one must bring the idea he comprehended in gross nearer to lim, so as to contemplate its minutest parts, and keep it steadily in his eye, so as to copy these parts in order, this I found impracticable for me, nor were my spirits equal to so severe an employment.” In these circumstances he determined to try the effect of complete change of scene and occupation. “‘T resolved to seek out a more active life, and, though I could not quit my pretensions to learning but with my last breath, to lay them aside for sone time, in order the more effectually to resume them.” The effectual remedy which commended itself to him was the trial of a mercantile life, and early in 1734 he set out for Bristol, armed with recom- mendations to some eminent merchants. A residence of a few months was sufficient to convince him that in this attempt at least he had not hit the mark. He found “the scene wholly unsuitable” to him, and about the middle of the year 1734 set out for France, resolved to spend some years in quiet study and retirement. He visited Paris, resided for a time at Rheims, and then settled at La Fléche, famous in the history of philosophy as the school of Descartes. His health seems to have been perfectly restored, and during the three years of his stay in France his speculations were worked into systematic form in the Treatise of Human Nature. In the autumn of 1737 he was in London negotiating with publishers and printers regarding the appearance of his great work, and

carefully pruning and polishing it in preparation for the judgments of the learned. In January 1739 there appeared the first and second volumes of the Treatise of Human Nature, being an Attempt to Introduce the Lxperimental Method of Reasoning into Moral Subjects, containing book i., Of the Understanding, and book ii., Ofthe Passions. The third volume, containing book iii., Of Morals, was published in the following year. Few phrases are better known than the laconic seutence in which Hume, looking back on his own life, tells the tale of his first venture. ‘Never literary attempt was more unfortunate ; it fell dead-born from the press, without reach- ing such distinction as even to excite a murmur among the zealots.” But,” he adds, “ being naturally of a cheerful and sanguine temper, I very soon recovered the blow, and prosecuted with great ardour my studics in the country.” This brief notice, however, is not sufficient to explain the full significance of the event for Hume’s own life. The work undoubtedly failed to do what its author expected from it; even the notice, otherwise not unsatisfactory, which it obtained in the LZistory of the Works of the Learned, then the principal critical journal, did not in the least appreciate the true bearing of the Z’reatise on the current philosophical and theological discussions. Hume, who had been living in abstractions, to whom the disputes of the time had presented themselves in their real nature as fundamental differences of philosophical analysis, naturally expected that the world would see with as great clearness as he did the connexion between the concrete problems agitat- ing contemporary thought and the abstract principles on which their solution depended. Accordingly he looked for

the intensest opposition, and expected that, if his principles were received, the greatest of revolutions,a change in general conceptions of things, would ensue. Apart from all con- siderations of personal reputation, which undoubtedly had no small influence on him, he was, therefore, on the eve of the publication of his work, with justice perturbed “at the nearness and greatness of the event.” It is true that in the Treatise there is little or no direct reference to the theological questions which were then prolific in the pro- duction of literature, and probably this omission contributed towards the first failure of the work; but Hume, as before said, is invariably chary of his references, and one cannot doubt that he was himself fully alive to the fact that in his philosophic analysis the matters in debate in the theo- logical world had been reduced to their purest essence, had been brought back to first principles. Overlooking, then, the obvious fact that nothing is less common than systematic thinking, that the greater portion of opinion rests on the accidents of training and surroundings rather than on clearly perceived and rationally tested grounds, he anticipated an immediate and vehement onslaught on his work. His dis- appointment was great in proportion to the height of his expectations ; and though he never entirely relinquished his metaphysical speculations, though all that is of value in his later writings depends on the acute analysis of human nature to which he was from the first attracted, one cannot but regret that his high powers were henceforth withdrawn for the most part from the consideration of the foundations of belief, and expended on its practical applications, In later years he was accustomed to explain his want of success as due to the immature style of his early thoughts and exposi- tion, to the rashness of a young innovator in an old and well-established province of literature. ‘‘So vast an under- taking, planned before I was one-and-twenty, and composed before twenty-five, must necessarily be very defective.” The disclaimer of the 7’reatise in the preface to the Ingury concerning Human Understanding is well known. But all this has little foundation beyond the personal irritation of an author at his own failure to attract such attention as he deems his due. None of the principles of the Treatise are given up in the later writings, and no addition was made to them. Nor can the superior polish of the more mature productions overbalance the freshness and concen- trated vigour of the more youthful work. Hume is at his best in the Z’’reatise ; and it is curious to think what might have been the position of British

philosophy at the close of the 18th century had the success of his first attempt encouraged him to continue with equal zeal and undivided attention his early metaphysical speculations.

After the publication of the Zreatise Hume retired to his brother's house at Ninewells and carried on his studies, mainly in the direction of politics and political economy, adding to this, however, a wide if not exact reading in classical literature. In 1741 he published the first volume of his Essays, which had a considerable and immediate success. A second edition was called for in the following year, in which also a second volume was published. It is interesting to learn from one of Hume's letters that Butler, to whom he had sent a copy of his Zreatise, but with whom he had failed to make personal acquaintance, warily com- mended the Zssays to all his friends. The philosophical relation between Butler and Hume is one of the curious points in history. So far as analysis of knowledge is con- cerned bothi are in thorough harmony, and Hume's sceptical conclusions regarding belief in matters of fact are the foundations on which Butler's defence of religion rests. Butler, however, appears to retain, alongside of his destruc- tive theory of knowledge, confidence in the rational proofs

for the existence of God, and certainly maintains what may | sophical scntiments and principles."

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is probable that, though Butler never worked out the system of his belief, his theological principles will be found to rest ultimately on ethical grounds. Hume had the greatest respect for the author of the Analogy, ranks him with Locke and Berkeley as the originators of the experimental method in moral science, and in his specially theological essays, such as that ou Particular Providence and a Future State, has Butler's views specifically im mind. See BuTLER.

The success of the Hssays, though hardly great enough to satisfy the author's somewhat exorbitant cravings, was a great encouragement to Hume. He began to hope that his earlier and heavier work, if recast and lightened, might share the fortunes of its successor ; and at intervals through- out the next four years he occupied himself in reducing its

fundamental principles into a more succinct form, and in giving to them all the literary grace at his command. Meantime he continued to look about for some post which might secure him the modest independence he desired. In 1744 we find him, in anticipation of a vacancy in the chair of moral philosophy at Edinburgh university, moving his friends to do him good offices with the electors; and though, as he tell us, “the accusation of heresy, deism, scepticism, or theism, &c., &c., was started” against him, it had no effect, ‘being bore down by the contrary authority of all the good people in town.” To his great mortification, however, he thought he could discover that Hutcheson and Leechman, with whom he had been on terms of friendly correspondence, were giving the weight of their opinion against the propriety of electing him to such a post. The after history of these negotiations is obscure. Hume in all probability perceived that fortune was against him, and accepted in 1745 a very anomalous post, that of tutor or guardian or keeper to the marquis of Annandale, a harmless literary lunatic. Although the salary paid during the year Hume spent in this capacity “‘made a consider- able accession” to his fortune, the position was unmistak- ably false and painful. The letters relating to this episode of his life, first printed by Dr Thomas Murray, .1841 (see Burton’s Life, i. ch. v.), are not pleasant reading ; and the close of the connexion between Hume and his pupil ‘left the philosopher under the necessity of instituting an action for recovery of arrears due to him. The details of the affair are not sufficiently clear to enable a modern judge to assign either admiration or blame to Hume’s tenacity in » the matter of his rights.

In 1746 Hume accepted the office of secretary to General St Clair, and was a spectator of the ill-fated expedition to France in the autumn of that year. His admirable account of the transaction has been printed by Mr Burton. After a brief sojourn at Ninewells, doubtless occupied in prepar- ing for publication his Philosophical Hssays (afterwards entitled An Inquiry concerning Human Understanding), Hume was again associated with General St Clair, and in 1748 accompanied him as secretary in the embassy to Vienna and Turin. ‘The notes of this journey are written in a light and amusing style, showing Hume’s usual keenness of sight in some directions and his almost equal blindness in others. During his absence from England, early in the year 1748, the Philosophical Hssays were pub- lished ; but, to his great disappointment, the first reception of the work was little more

favourable than that accorded to the unfortunate Z’reatise. ‘On my return from Italy,” he writes, “I had the mortification to find all England in a ferment on account of Dr Middleton’s Free Inquiry, while my performance was entirely overlooked and neglected.” To the later editions of the work Hume prepared an “ Ad- vertisement” referring to the 7’reatise, and desiring that the Essays “may alone be regarded as containing his philo-
Not a few modern

be vaguely described as ana priori view of conscience. It | critics have accepted this disclaimer as of real value, but

in fact it has no significance; and Hume has himself in a striking letter to Gilbert Elliott indicated the true relation of the two works. “TI believe the Philosophical Essays contain everything of consequence relating to the under- standing which you would meet with in the Z’reatise, and I give you my advice against reading the latter. By shortening and simplifying the questions, I really render them much more complete Addo dum minuo. The philosophical principles are the same in both.” The Zssays are undoubtedly written with more maturity and skill than the 7’reatise; they contain in more detail application of the principles to concrete problems, such as miracles, providence, immortality ; but the entire omission of the discussion forming part li. of the first book of the Zeatise, and the great compression of part iv., are real defects which must always render the 7’reatise the more important work in the history of philosophy.

In 1749 Hume returned to England, enriched with “near a thousand pounds.” Two years he spent at Ninewells, and then in 1751 removed to Edinburgh, where for the most part he resided during the next twelve years of his life. These years are the richest so far as literary production is concerned. In 1751 he published his Political Discourses, which had a great and well-deserved success. In the same year appeared the recast of the third book of the Z’eatise, called Inquiry concerning the Principles of Morals, of which he says that “of all his writings, philosophical, literary, or historical, it is incomparably the best.” At this time also we hear of the Dialogues concerning Natural Religion, a work which Hume was prevailed on not to publish, but which he touched and retouched with the greatest care, and

evidently regarded with the greatest favour. The work itself, left by Hume with instructions that it should be published, did not appear till 1779.

In 1751 Hunie was again unsuccessful in the attempt to gain a professor's chair. A candidate unknown to fame then or afterwards was appointed to the chair of logic at Glasgow. In the following year he received the first public preferment that had ever fallen to his lot, the librarianship of the Advocates' Library in Edinburgh, small in emoluments, but rich in opportunity for literary work. His delight was great. In his playful style he writes to Dr Clephane, "I

have been ready to burst with vanity and self-conceit this |

week past, and, being obliged from decorum to keep a strict watch over myself and check all emphasis of that kind, I really begin to fiud my health injured by it." The usual objectious had been raised to his election without avail ; but, "what is more extraordinary, the cry of religion could not hinder the ladies from being violently my partisans, and I owe my success in a great measure to their solicita- tions. One has broke off all commerce with her lover because he voted against me; and W. Lockhart, in a speech to the faculty, said that there was no walking the streets, nor even enjoying one's own fireside, on account of their importunate zeal. The town says that even his bed was not safe for him, though his wife was cousin-german to my antagonist."

The only work published at this time which requires somewhat special notice is the set of essays called Political Discourses. In these Hume shows greater aptitude for economical inquiries, and makes greater advances in political economy, than any previous writer. Although only a few of the many subjects of discussion are touched upon, the general principles of the science are firmly expressed and illustrated with clearness that leaves nothing to be desired. The fundamental theorem, "everything in the world is purchased by labour, and our passions are the only causes of labour," on which Smith afterwards constructed his more elaborate system, is

used as the key to resolve the difficulties regarding the advantages of foreign trade, the causes of the efflux and influx of bullion, the general range of prices in a country, the influence of credit on prices and on trade, the conuexion of interest, profits, and the general conditions of industry, and the most economical modes of levying taxes. In many respects the analysis of the complex phenomena of commerce is more sound and thorough than that given in the Wealth of Nations, for Hume uever forgets that the ultimate causes of our economic movements are the “ customs and manners ” of the people, and always finds his solution by referring to the elementary factors of industry. It is curious that on the publication of the Wealth of Nations Hume indicated to Smith that he differed from him regarding the influence of rent on prices, the point from which the later advances of English political economy have taken their start. It is also remarkable that Hume had formed a much sounder judgment than Smith on the merits of the French Econo- mists. In short, the main errors of the Wealth of Nations are to be found in the deviations from the principles of the Political Discourses.

In 1753 Hume was fairly settled in Edinburgh, enjoying the dignity and delights of householding, and preparing for his new attempt in literature, the History of England) He had decided to begin the History, not with Henry VIL, as Adam Smith recommended, but with James L, considering that the political differences and parties of his time took their origin from that period, and that then, as he thought, “the misrepresentations of faction began chiefly to take place.” On the whole his attitude in respect to disputed political principles seems not to have been at first consciously unfair. “Iam sensible,” he writes to Clephane, “that the history of the two first Stuarts will be most agreeable to the Tories, that of the two last to the Whigs ; but we must endeavour to be above any regard either to Whigs or Tories.” As for the qualities necessary to secure success as a writer on history, he felt that he possessed them in a high degree ; and, though neither his ideal of an historian nor his equipment for the task of historical research would now appear adequate, in both he was much in advance of his contemporaries and predecessors. Naturally, then, he was “sanguine in his expectations of the success of his work.” “ But,” he writes in the well-known passage of his Life, “miserable was my disappointment. I was assailed by one cry of reproach, disapprobation, and even detestation ; . . .

what was still more mortifying, the book seemed to sink into oblivion. Mr Millar told me that in

1 ** About seven months ago," he writes to Dr Clephane, ''I got a house of my own, and completed a regular family, consisting of a head, viz., myself, and two inferior memibers, a maid and a cat. My sister has since joined me, and keeps me company. With frugality I can reach, I find, cleanliness, warmth, light, plenty, and contentment. What would you have more? Independence? I haveit ina supreme degree. Tonour? That is not altogether wanting. Grace? That will come in time. A wife? That is none of the indispensable requi- sites of life. Books? That is one of them; and I have more than I can use. In short, I cannot find any blessing of consequence which I ain not possessed of in a greater or less degree ; and without any great effort of philosophy, I may be easy and satisfied. As there is no happiness without occupation, I have begun a work which will employ me several years, and which yieldsme much satisfaction. "Tis a history of Great Britain, from the Union of the Crowns to the present time. I have already finished the reign of King James I. My friends flatter me (by which I mean that they don't flatter me) that I have succeeded. You know that there is no post of honour in the English Parnassus more vacant than that of history. Style, judgment, impartiality, care —everything is wanting in our historians; and even Rapin, during this latter period, is extremely deficient. I make my work very concise, after the manner of the ancients. It divides into three very moderate volumes : one to end with the death of Charles the First ; the second at the Revolution ; the third at the Accession, for I dare come no nearer the present times. The work will neither please the duke of Bedford nor Jaines Fraser; but I hope it will please you and posterity.

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a twelvemouth he sold only forty-five copies of it." This account must be accepted with great qualification. It expresses Hume's feelings rather than

the real facts. In Edinburgh, as we learn from one of his letters, the book succeeded well, no fewer than 450 copies being disposed of in five weeks. Nor is there anything in Hume's corre- spondence to show that the failure of the book was so com- plete as he declared it to have been. Within a very few years the sale of the History was sufficient to gain for the author a larger revenue than had ever before been known in his country to flow from literature, and; to place him in comparative affluence. At the same time the bitterness of Hume's feelings and their effect are of importance in his life. It is from the publication of the History that we date the extraordinary virulence of his hatred towards everything English, towards society in London, Whig priuciples, Whig ministers, and the public generally.1 He was convinced that to bea Scotchman and a Tory was to be an object of contempt and hatred to all Englishmen; and that on the whole there was a conspiracy to suppress and destroy everything that was Scotch.? As a consequence of these strong feelings, the remainder of the History became little better than a party pamphlet, written with a definite bias and a definite aim. The second volume, published in 1756, carrying on the nar- rative to the Revolution, was better received than the first ; but Hume then resolved to work backwards, and to show from a survey of the Tudor period that his Tory notions were grounded upon the history of the constitution. In 1759 this portion of the work appeared, and in 1761 the work was completed by the history of the pre-Tudor periods. The numerous editions of the various portions,—for, despite Hume's wrath and grumblings, the book was a great literary success,—gave him an opportunity of careful revision, which he employed to remove from it all the "' villainous seditious Whig strokes," and "plaguy prejudices of Whiggism " that he could detect lurking in it. In other words, he bent all his efforts towards making his History more of a party work than it had originally been, and in his effort he was entirely successful. It has been the business of subsequent historians to correct his misre- presentations so far as they referred to the period of which he had fair knowledge, and to supersede his accounts of those periods which his insufficient knowledge disabled him from treating in a manner worthy of him. The early portion of his History may be regarded as now of little or no value. The sources at Hume's comniand were few, and he did not even use them all. None the less, the History has a distinct place in the literature of England. It was the first attempt at a really comprehensive and thoughtful

1 “Tf a man have the misfortune, in the former place (7.¢e., London), to attach himself to letters, even if he succeeds, 1 know not with whoni he is to live nor how he is to pass his time in a suitable society. The little company there that is worth conversing with are cold and unsoci- able, or are warnied only by faction and cabal; so that a man who plays no part in publie affairs becomes altogether insignificant ; and, if he is not rich, he becomes even conteniptible. Hence that nation are fast relapsing into the deepest stupidity and ignorance.” —Burton, ii. 268. ‘‘There are fine doings in America. O! how I long to see America and the East Indies revolted, totally and finally-—the revenue reduced to half—publie credit fully discredited by bankruptey,—the third of London in ruins, and the rascally mob subdued.” —J0., ii. 417. “‘Our government has become a chimera, and is too perfect, in point of liberty, for so rude a beast as an Englishman, who is a man, a bad pipe too, corrupted by above a century of licentiousness.”—ZJb., ii, :

2“The rage and prejudice of parties frighten me ; and above all, this rage against the Scots, which is so dishonourable and indeed so infamous to the English nation. We hear that it increases every day without the least appearance of provocation on our part. It has fre- quently made me resolve never in my life to set foot on English ground.” —Burton, ii. 265; ef. ii. 148, 238. Perhaps our knowledge of Joln- son’s sentiments regarding the Scotch in general, and of his expressions

regarding Hume and Smith in particular, may lessen our surprise at this vehemence,

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treatment of historic facts, the first to introduce the social and literary aspects of a nation’s life as of importance only second to its political fortunes, and the first historical writing in an animated yet refined and polished style. It has received from later writers its due meed of praise and blame.?

While the History was in process of publication, Hume did not entirely neglect his other lines of activity. In 1757 appeared Four Dissertations: Lhe Natural History of Religion, Of the Passions, Of Tragedy, Of the Standard of Taste. Of these the dissertation on the passions is a very subtle piece of

psychology, containing the essence of the second book of the Treatise. It is remarkable that Hume does not appear to have been acquainted with Spinoza's analysis of the affections. The last two essays are contri- butions of no great importance to esthetics, a department of philosophy in which Hume was not strong. The Natural History of Religion is a powerful contribution to the deistic controversy ; but, as in the case of Hume's earlier work, its significance was at the time overlooked. It is an attempt to carry the war directly into a province hitherto allowed to remain at peace, the theory of the general development of religious ideas. Deists, though raising doubts regarding the historic narratives of the Christian faith, had never dis- puted the general fact that belief in one God was natural and primitive. Hume endeavours to show that polytheism was the earliest as well as the most natural form of religious belief, and that theism or deism is the product of reflexion upon experience, thus reducing the validity of the historical argument to that of the theoretical proofs.

In 1763 he accompanied Lord Hertford to Paris, doing the duties of secretary to the embassy, with the prospect of the appointment to that post. He was everywhere received "with the most extraordinary honours"; in fact, he was "'lionized.'"? The society of Paris was peculiarly ready to receive a great philosopher and historian, especially if he were known to be an avowed antagonist of religion. Hume basked in the sunshine of his popularity ; but at the same time he made some valuable friendships, especially with D'Alembert and Turgot, the latter of whom-admired sincerely and profited much by Hume's economical essays. In 1766 he left Paris and returned to Edinburgh ; but in the following year (1767) he accepted the post of under- secretary to General Conway, and spent two years in London. He settled finally in Edinburgh in 1769, having now through his pension and otherwise the handsome fortune of £1000 a year. The solitary incident of note in this period of his life is the ridiculous quarrel with Rousseau, an episode still amusing, and throwing much light upon the strange character of the great sentimentalist. Hume certainly did his utmost to secure for Rousseau a comfort- able retreat in England, but his usually sound judgment seems at first to have been quite at fault with regard to his protégé. That is surely an amusing likeness which Hume discovered between Rousseau and Socrates; and it is inte- resting to note the conflict between his preconceived opinion

3 We append the judgment of Macaulay on Hume's characteristic fault as an historian:—‘‘ Hume is an accomplished advocate. Without positively asserting much more than he can prove, he gives pro- minenee to all the circumstances which support his case; he glides lightly over those which are unfavourable to it ; his own witnesses are applauded and encouraged ; the statements which seem to throw dis- ctedit on them are controverted; the contradictions into which they fall are explained away; a clear and connected abstract of their evidence is given. Everything that is offered on the other side is scrutinized with the utmost severity ; every suspicious ciicumstance is a ground for argument and invective ; what cannot be denied is extenuated, or passed by without notice ; concessions even are sometimes made ; but this insidious candour only increases the effect of the vast mass of sophistry.”—AMiscell. Writings, ‘‘ History.” With this may bs compared the more favourable verdict by the late Prof. Brewer, in tha preface to his edition of the Student's Hume.

and that which detached circumstances gave him occasion to form. He finds “Rousseau a very modest, mild, well- bred, gentle-spirited, and warm-hearted man as ever I knew in my life,” and thinks he “conld live with him all his life in mutual friendship and esteem.” At the same time he cannot avoid remarking that Rousseau “is a great humorist” (7.¢., full of caprices); that though “ he intends seriously to draw his own picture in its true colours… nobody knows himself less ;” that hc would be unhappy in solitude, ‘as he has, indeed, been always in all situations.” The quarrel which all the acquaintances of the two philo- sophers had predicted soon came, and no language had expressions strong enough for Rousseau's hatred and distrust of his protector, Hume, it must be admitted, came well out of the business, and had the sagacity to conclude that, after all, his admired friend was little better than a madman,

In 1769 Hume settled in Edinburgh, and in onc of his most delightful letters he gives an animated descrip- tion of the domestic economy of his later years.! The house alluded to as that to which he was about to remove was built under his own directions at the corner of what is now called St David Street ; and we may picture it to our- selves as being, during the closing

period of Hume’s life, the centre of the most lively and cultivated society of Edinburgh. The gay and cheerful temper of the philo- sopher, his unfailing equanimity, and the solid goodness of his heart had made him many friends, even among those who dissented most from his religious views. The resolute strength with which he pushed speculation to its limits was combined with a perfect gentleness of disposition and an amiability that endeared him to all who had the pleasure of knowing him. He was singularly free from jealousy, and no feature of his character is more attractive than the unfailing cordiality with which he welcomed the literary successes of those who might have been thought his rivals. To Robertson and Smith, his personal friends, he is open and unrestrained in his praise and commendation 3 and his good services were ever exerted in their cause. To opponents of whose merits he was convinced, to Campbell and Reid, he was cordial and generous. His respect for his own profession led him always to encourage those who had engaged their fortunes in the perilous hazard of literary success, and to extend to them his good offices. For Black- well and for Smollett, in their misfortunes, he exerted him- self to the utmost. Nor was he without his recompense. During the closing decade of his life he was the acknow- ledged patriarch of literature ; the veneration and respect of his friends, for his character no less than for his abilities, were unbounded. The “ gaicty of his temper,” says Adam Smith, “so agreeable in society, and which is so often accompanied with frivolous and superficial qualities, was in him certainly attended with the most severe application, the most extensive learning, the greatest depth of thought, and a capacity in every respect the most comprehensive. Upon the whole, I have always considered him, both in his lifetime and since his death, as approaching as nearly i a’

1 **T live still, and must for a twelvemonth, in my old house in James’ Court, which is very cheerful, and even elegant, but too small to display my great talent for eookery, the seienee to which I intend to addict the remaining years of my life! Ihave just now lying on the table before me a receipt for making soupe a la reine, eopied with my own hand ; for beef and cabbage (a charming dish), and old mutton, and old elaret, nobody excels me. I make also sheep-head broth, ina manner that Mr Keith speaks of it for eight days after ; and the Duc de Nivernois would bind himself apprentiee to my lass to learn it. I have already sent a ehallenge to David Moncrief ;

you will see that in a twelvemonth he will take to the writing of history, the field I have deserted ; for, as to the giving of dinners, he ean now have no further pretensions. I should have made a very bad use of my abode in Paris, if I could not get the better of a mere provineial like him. All my friends eneourage me in this ambition, as thinking it will re- dound very much to my honour.”

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to the idea of a perfectly wise and virtuous man as perhaps the nature of human frailty will permit.”

In the spring of 1775 Hume was struck with a tedious and harassing though not painful illness. A visit to Bath seemed at first to have produced good effects, but on the return journey northwards more alarming symptoms de- veloped themselves, his strength rapidly sank, and, little more than a month after he had reached Edinburgh, he died (25th August 1776).

No notice of Hume would be complete without the sketch of his character drawn by his own hand :—“To conclude historically with my own character, I am, or rather was (for that is the style I must now use in speaking of myself, which emboldens me the more to speak my sentiments),—I was, I say, a man of mild dispositions, of command of temper, of an open, social, and cheerful humour, capable of attachment, but Little susceptible of enmity, and of great moderation in all my passions, Even my love of literary fame, my ruling passion, never soured my temper, notwithstanding my fre- quent disappointments. My company was not unacceptable to the young and careless, as well as to the studious and literary ; and as I took a particular pleasure in the company of modest women, I had no reason to bedispleased with the reception I met with from them. In a word, though most men anyWise eminent have found reason to complain of calumny, I never was touched, or even attacked, by her baleful tooth ; and, though I wantonly exposed myself to the rage of both civil and religious factions, they seem to be disarmed on my behalf of their wonted fury. My friends never had occasion to vindicate any one cireumstanee of my elaracter and eonduct ; not but that the zealots, we may well suppose, would have been glad to invent and propagate any story to my disadvantage, but they could never find any which they thought would wear

the face of proba- bility. I cannot say there is no vanity in making this funeral oration of myself, but I hope it is not a misplaced one ; and this is a matter of fact which is easily cleansed and ascertained." The more his life has become known, the more confidence we plaee in this admirable estimate.

The philosophical writings of Hume, which mark a distinct epoch in the development of modern thought, can here be considered in two only of the many aspects in which they present themselves as of the highest interest to the historian of philosophy. In the Treatise of Human Nature, which is in every respect the most complete exposition of Hume's philosophical conception, we have the first thorough-going attempt to apply the fundamental principles of Locke's empirical psychology to the construction of a theory of knowledge, and, as a natural consequenee, the first systematie criti- cism of the chief metaphysical notions from this point of view. Hume, in that work, holds the samc relation to Locke and Berkeley as the late J. S. Mill held with his System of Logie to Hartley and James Mill. In certain of the later writings, pre-eminently in the Dialogueson Natural Religion, Hume brings the results of his specu- lative criticism to bear upon the problems of curreut theological discussion, and gives in their regard as previously with respect to general philosophy the final word of the empirical theory in its carlier form. The interesting parallel between Hume and J. S. Mill in this second feature will not be overlooked.

In the first instance, then, Hume's philosophical work is to be regarded as the attempt to supply for empiricism in psyehology a consistent, that is, a logically developed theory of knowledge. In Locke, indeed, such theory is not wanting, but, of all the many in- consistencies in the Lssay on the Human Understanding, none is more apparent or more significant than the eomplete want of harmony between the view of knowledge developed in the fourth book and the psychological prineiples laid down in the earlier part of the work. Though Locke, doubtless, drew no distinction between the problems of psychology and of theory of knowledge, yet the diseussion of the various forms of cognitiongiven in the fourth book of the Essay seems to be based on grounds quite distinct from and in many respects inconsistent with the fundamental psychologieal principle of his work. The perception of relations, which, according to him, is the essenee of cognition,

the demonstrative character which he thinks attaches to our inference of God's existence, the intuitive knowledge of self, are doctrines incapable of being brought into harmony with the view of mind and its development which is the keynote of his general theory. To some extent Berkeley removed this radical in- consistency, but in his philosophical work it may be said with safety there are two distinct aspects, and while it holds of Locke on the one hand, it stretches forward to Kantianism on the other. Nor in Berkeley are these divergent features ever united into one harmoni- ous whole. It was left for Hume to approach the theory of know- ledge with full consciousness from the psychological point of view, and to work out the final consequences of that view so far as cog- nition is coneerned. The terms which he employs in describing the aim and scope of his work are not those which we should now einploy, but the declaration, in the introduction to the Treatise, that the seience of human nature must be treated according to the

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experimental method, is in fact equivalent to the statement of the principle implied in Locke's Essay, that the problems of psychology and of theory of knowledge are identical. And this view is the char- acteristic of what we may call the English school of philosophy.

In order to make perfectly clear the full significance cf the prin- ciple which Hume applied to the solution of the chief philosophical questions, it is necessary to render somewhat more precise and com- plete the statement of the psyehological view which lies at the foundation of the empirical theory, aud to distinguish from it the problem of the theory of knowledge upon which it was brought to bear. Without eutering into details, which it is the less necessary to do because the subject has been recently discussed with great fulness in works readily accessible, it may be said that for Locke as for Hume the problem cf psychology was the exact description of the contents of the individual mind, and the determination of the conditions of the origin and development of conscious experience in the individual mind. And the answer to the problem which was furnished by Locke is in effect that with which Hume started. The conscious experience of the individual is the result of interaction between the individual mind and the universe of

things. It is evi- dent that this solution presupposes a pecitiar conception of the general relation betwcen the mind and things which in itself re- quires justification, and which, so far at least as the empirical theory was developed by Locke and his successors, could not be obtained from psychological analysis. Either we havea right to the assumip- tion contained in the conception of the individual mind as standing in relation to things, in which case the grounds of the assumptiou must be sought elsewhere than in tho results of this reciprocal re- lation, or we have no right to the assumption, in which case refer- ence to the reciprocal relation can hardly be aceepted as yielding any solution of the psychological problein. But in any case,—and, as we shall see, Hume endeavours so to state his psychological premises as to conceal the assumption made openly by Locke,—it is apparent that this psychological solution does not contain the answer to the wider and radically distinct problem of the theory of knowledge. For here we have to consider how the individual in- telligence comes to knowany fact whatsoever, and what is meant by the cognition of a fact. With Locke, Hume professes to regard this problem as virtually covered or answered by the fundamental psychological theorein ; iin the superior clearness of his reply enables us to mark with perfect precision the nature of the difficulty inher- ent in the attempt to regard the two as identical. For purposes of psychological analysis the conscious experience of the individual mind is taken as given fact, to be known, #.¢., observed, discrimin- ated, elassified, and explained in the same way in which any one special portion of experience is treated. Now if this mode of treat- ment be accepted as the only possible method, and its results assumed to be conclusive as regards the problem of knowledge, the fundamental peculiarity of cognition is overlooked. In all cog- nition, strictly so-called, there is involved a certain synthesis or relation of parts of a characteristic nature, and if we attempt to discuss this synthesis as though it were in itself but one of the facts forming the matter of knowledge, we are driven to regard this relation as being of the quite external kind discovered by observa- tion among matters of knowledge. The difficulty of reconciling the two views is that which gives rise to much of the obscurity in Locke’s treatment of the theory of knowledge; in Hume the effort to identify them, and to explain the synthesis which is essential to eognition as merely the accidental result of external relations among the elements of conscious experience, appears with the utmost clear- ness, and gives the keynote of all

his philosophical work. The final perplexity, concealed by various forms of expression, comes forward at the close of the Z'reatise as absolutely unsolved, and leads Hume, as will be pointed out, to a truly remarkable confession of the weak- ness of his own system.

While, then, the general idea of a theory of knowledge as based upon psychological analysis is the groundwork of the Treatise, it is a particular consequence of this idea that furnishes to Hume the characteristic criterion applied by him toall philosophical questions. If the relations involved in the fact of cognition are only those dis- coverable by observation of any particular portion of known experi- ence, then such relations are quite external and contingent. The only necessary relation which can be discovered in a given fact of experience is that of non-contradiction ; the thing must be what it is, and cannot be conceived as having qualities contradictory of its nature. The universal test, therefore, of any supposed philosopli- cal principle, seeing that such principles are but expressions of relations among facts, is the possibility or impossibility of imagin- ing its contradictory. All our knowledge is but the sum of our conscious experience, and is consequently material for imagination. 'Let us fix our attention out of ourselves as muchas possible; let us chase our imagination to the heavens or to the utmost limits of the universe ; we never really advance a step beyond ourselves, nor can eonceive any kind of existence, but those perceptions which have appeared in that narrow compass. This is the universe of the imagination, nor have we any idea but what is there produced" (Works, ed. of 1854, i. 93, of. 1. 107).

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The course of Hume's work follows immediately from his funda-" mental prineiple, aud the several divisions of the treatise, so far as the theoretical portions are concerned, are but its logical eon- sequences. The first part of the first book contains a brief state- ment of the contents of mind, a description of all that observation can discover in conscious experience. The secoud part deals with those judginents which rest upon the formal elements of experience, space and time. The third part discusses the principle of real con- nexion among the elements of experience, the relation of cause and effect. The fourth part is virtually a consideration of the

ultimate significance of this conscious experience, of the place it is supposed to occupy in the universe of existence, in other words, of the re- lations between the conscious experience of an individual mind as disclosed to observation and the supposed realities of self and ex- ternal things. ,

In the first part Hume gives his own statement of the psycho- logical foundations of his theory. Viewing the conteuts of mid as matter of experience, he can discover among them only one distine- tion, a distinetion expressed by the terms impressions and ideas. Ideas are secondary in nature, copies of data supplied we know not whence. All that appears in conscious experience as primary, as arising from some unknown cause, and therefore relatively as origi- nal, Hume designates by the term impression, and claims to imply by such term no theory whatsoever as to the origin of this portion of experience. There is simply the fact of conscious experience, arising we know not how. Moreover, if we remain faithful to the fundaniental conception of the contents of mind as being merely matters of experience, it is evident in the first place that as impressions are strictly individual, ideas also must be strictly parti- cular, aud in the second place that the faculties of combining, discri- minating, abstracting, and judging, which Locke had admitted, are merely expressions for particular modes of having mental experience, 7.é., are modifications of conceiving (ef. i. 128 u., 137, 192). Thus at a single stroke Hume removes all the philosophical discussions that had centred round the problem of abstract ideas and the nature of judgment. It is merely by accidental concomitance, which on the subjective side is custom, that one fact, a word, sign, symbol, or type comes to stand fora series of resembling facts, while the comparison of perceptions, with resulting consciousness of their re- semblance or difference, is in itself a single, isolated pereeption (see i. 37, 38, 100).

Such, in substance, is Hume’s restatement of Loeke’s empirical view. Conscious experience consists of isolated states, each of which is as a fact and is related to others in a quite external fashion. It remains to be seen how knowledge can be explained from such a basis ; but, before proceeding to sketch Hume’s answer to this ques- tion, it is necessary to draw attention, first, to the peculiar device invariably resorted to by him when any exception to his general principle that ideas are secondary copies of impressions presents itself, and, secondly, to the nature of the substitute

offered by him for that perception of relations or synthesis which even in Locke's con- fused statements had appeared as the essence of cognition. When- ever Hume finds it impossible to recognize in an idea the mere copy of a particular impression, he introduces the phrase ''manner of conceiving." Thus general or abstract ideas are merely copies of a particular impression couceived in a particular manner, The ideas of space and time, as will presently be pointed out, are copies of impressions conceived in a particular manner. The idea of neces- sary connexion is merely the reproduction of an impression which the mind feels itself compelled to conceive in a particular manner. Such a fashion of disguising difficulties points, not only to an in- consistency in Hume's theory as stated by himself, but to the initial error upon which it proceeds; for these perplexities are but the consequences of the doctrine that cognition is to be explained from what can be discovered hy observation among the facts of experience, and observation can discover none but external relations. These external relations are, in fact, what Hume describes as the natural bonds of connexion among ideas, and, regarded subjectively as principles of association among facts of mental experience, they form the substitute he offers for the synthesis implied in knowledge. These principles of association deterniine the imagination to combine ideas in various modes, and by this mechanical combination Hume, for a time, endeavoured to explain what are otherwise called judgments of relation. It was impossible, however, for him to carry out this view consistently. The only combination which, even in appearance, could be explained satisfactorily by its means was the formation of a complex idea out of simpler parts, but it is absurd to describe the idea of a relation amoug facts as a complex idea ; and, as such relations have no basis in impressions, Hume is finally driven to a confession of the abso- lute impossibility of explaining them. Such confession, however, is only reached after a vigorous effort had been made to render some account of knowledge by the experimental method.

The psychological conception, then, on the basis of whieh Hume proceeds to discuss the theory of knowledge, is that of conscious experience as containing merely the succession of isolated impres-

| sions and their fainter copies, ideas, and as bound together by

mercly natural or external links of connexion, the principles of association among ideas. The foundations of cognition must be discovered by observation or analysis of experience so conceived. Hume wavers somewhat in his division of the various kinds of cog- nition, laying stress now upon one now upon another of the points in which mainly they differ from oneanother. Nor is it of the first importance, save with the view of criticizing his own consistency, that we should adopt any of the divisions implied in his exposition. For practical purposes we mayregard the most importaut discussions in the Treatise as falling under two heads. In the first place there are certain principles of cognition which appear to rest upon and to express relations of the universal elements in conscious experi- ence, viz., space aud time. The propositions of mathematics secm to be independent of this or that special fact of experience, and to remain unchanged even when the concrete matter of experience varies, ‘They are formal. In the second place, cognition, in any real sense of that term, implies connexion for the individual mind between the present fact of experience and other facts, whether past or future. It appcars to involve, therefore, some real relation among the portions of expericncc, on the basis of which relation judgments and inferences as to matters of fact can be shown to rest. The theoretical question is consequently that of the nature of the supposed relation, and of the certainty of judgments and inferences resting on it.

Hume’s well-known distinction between relations of ideas and matters of fact corresponds fairly to this separation of the formal and real problems in the theory of cognition, although that dis- tinction is in itself inadequate and not fully representative of Hume’s own conclusions.

With regard, then, to the first problem, the formal element in |

knowledge, Hume has to consider several questions, distinct in nature and hardly discriminated by him with suflicient precision. Fora complete treatment of this portion of the theory of knowledge,

there require to be taken into consideration at least the following |

points : (a) the exact nature and significance of the space and time relations in our experience, (b) the mode in which the primary data, facts or principles, of mathematical cognition arc obtained, (c) the nature, extent, and certainty of such data, in themsclves and with reference to the concrete material of experience, (d) the principle of inference from the data, however obtained. Not all of these points are discussed by Hume with the same fulness, and with regard to some of them it is difficult to state his conclusions. It will be of service, however, to attempt a summary of his treatment under these several heads,—the more so as almost all expositions of his philosophy are entircly defective in the account given of this cssen- tial portion. The brief statement in the Inquiry, § iv., is of no value, and indeed is almost unintelligible unless taken in reference to the full discussion contained in part ii. of the Treatise.

The nature of space and time as elements in conscious experience is considered by Hume in relation to a special problem, that of their supposed infinite divisibility. Evidently upon his view of con- scious experience, of the world of imagination, such infinite divisibility must be a fiction. The ultimate elements of experience must be real units, capable of being represented or imagined in isolation. Whence then do these units arise? or, if we put the problem as it was necessary Hume should put it to himself, in what orders or classes of impressions do we find the elements of space and time? Beyond all qnestion Hume, in endeavouring to answer this problem, is brought face to face with one of the difficulties inher- ent in his conception of conscious experience. For he has to give some explanation of the nature of space and time which shall identify these with impressions, and at the same time is compelled to recognize the fact that they are not identical with any single impression or set of impressions. Putting aside, then, the various obscurities of terminology, such as the distinction between the objects known, viz., ‘‘points” or several mental states, and the impressions themselves, which disguise the full significance of his conclusion, we find Hume reduced to the following as his theory of space and time. Certain impressions, the sensations of sight and touch, have in themselves the element of space, for these imnpres- sions (Hume skilfully transfers his statement to the points) have a certain order or mode of arrangement. ‘This mode of arrangement or manner of disposition is common to eoloured points and tangible points, and, considered separately,

is the impression from which our idea of space is taken. All impressions and all ideas are received, or form parts of a mental experience only when received, in a certain order, the order of succession. This manner of pre- senting themselves is the impression from which the idea of time takes its rise.

It is almost superfluous to remark, first, that Hume here deliber- ately gives up his fundamental principle that idcas are but the faintcr copies of impressions, for it can never be maintained that order of disposition is an impression, and, secondly, that he fails to offer any explanation of the mode in which coexistence and succession are possible elements of cognition in a conscious experience made up of isolated presentations and representations. For the consis- tency of his theory, however, it was indispensable that he should

insist upon the real, ¢.¢., presentative character of the ultimate units of space and time.

How then are the primary data of mathematical cognition to bo derived from an experience containing space and time relations in the manner just stated? It is important to notice that Hume, in regard to this problem, distinctly separates geometry from algebra and arithmetic, ¢.¢., he views extensive quantity as being cognized differently from number. With regard to geometry, he holds em- phatically that it is an empirical doctrine, a science founded on ob- servation of concrete facts. The rough appearances of physical facts, their outlines, surfaces, and so on, are the data of observation, and only by a method of approximation do we gradually come near to such propositions as are laid down in pure geometry. He definitely repudiates a view often ascribed to him, and certainly advanced by many later empiricists, that the data of geometry are hypothetical. The ideas of perfect lines, figures, and surfaces have not, according to him, any existence. (See Works, i. 66, 69, 78,97, and iv. 180.) It is impossible to give any consistent account of his doctrine re- garding number. He holds, apparently, that the foundation of all the science of number is the fact that each element of conscious experience is presented as a unit, and adds that we are capable of considering any fact or collection of facts as a unit. This

manner of conceiving is absolutely general and distinct, and accord- ingly affords the possibility of an all-comprehensive and perfect science, the science of discrete quantity, (See Works, i. 97.)

In respect to the third point, the nature, extent, and certainty of the elemeutary propositions of mathematical science, Hume's ntter- ances are far from clear. The principle with which he starts and from which follows his well known distinction between relations of ideas and matters of fact, a distinction which Kant appears to have thought identical with his distinction between analytical and syn- thetical judgments, is comparatively simple. The ¢deas of the quantitative aspects of phenomena are exact representatious of these aspects or quantitative impressions ; cousequently, whatever is found true by consideration of the ideas may be asserted regard- ing the real impressions. No question arises regarding the existence of the fact represented by the idea, and in so far, at least, mathe- matical judgments may be described as hypothetical. For they simply assert what will be found true in any conscious experience

| containing cocxisting impressions of sense (specifically, of sight and

touch), and in its nature successive. That the propositions are hypothetical in this fashion docs not imply any distinction between the abstract truth of the ideal judgments al the imperfect corre- spondence of concrete material with these abstract relations. Such distinction is quite foreign to Huinc, and can only be ascribed to him froman entire misconception of his view regarding the ideas of space and time. (For an example of such misconception, which is almost universal, see Riehl, Der philosophische Kriticismus, i. 96,

97.)

From this point onwards Hunie's tieatment becomes exceedingly confused. The identical relation between the idcas of space and time and the impressions corresponding to them apparently leads him to regard judgments of continuous and discrete quantity as standing on the same footing, while the ideal character of the data gives a certain colour to his inexact statements regarding the ex- tent and truth of the judgments founded on them. The emphatic utterances in the Inquiry (iv. 80, 186), and even at

the begin- ning of the relative section in the Teatise (i. 95), may be cited in illustration. But in both works these utterances are qualified in such a manner as to enable us to perceive the real bearings of his doctrine, and to pronounce at once that it differs widely from that commonly ascribed to him. ‘‘ It is from the idea of a triangle that we discover the relation of equality which its three angles bear to two right ones ; and this relation is invariable, so long as our idea remains the same” (i. 95). If taken in isolation this passage might appear sufficient justification for Kant’s view that, accordiug to Hume, geometrical judgments are analytical and therefore perfect. But it is to be recollected that, according to Hume, an idea is actually a representation or individual picture, not a notion or even a schema, and that he never claims to be able to extract the predicate of a geometrical judgment by analysis of the subject. The proper- ties of this individual subject, the idea of the triangle, are, accord- ing to him, discovered by observation, and as observation, whether actual or ideal, never presents us with more than the rough or general appearances of geometrical quantities, the relations so dis- covered have only aaeeoxinaats exactness. ‘‘ Ask amathematician what he means when he pronounces two quantities to be equal, and he must say that the idea of equality is one of those which cannot be defined, and that it is sufficient to place two equal qualities be- fore any one in order to suggest it. Now this is an appeal to the general appearances of objects to the imagination or senses” (iv. 180). ‘* Though it (i.¢., geometry) much excels, both in universality and exactness, the loose Judgments of the scnses and imagination, yet [it] never attains a perfect precision and exactness” (i. 97), Any exactitude attaching to the conclusions of geometrical reasoning arises from the comparative simplicity of the data for the primary

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So far, then, as geometry is concerned, Iiume’s opinion is perfectly definite. It is an experimental or observational science, founded on primary or immediate judgments (in his phraseology, pereeptions), of relation between facts of intuition; its conclusions are hypo- thetical only in so far as they do not imply the existence at the moment of corresponding real experience ;

and its propositions have noexact truth. With respect to arithmetic and algebra, the science of numbers, he expresses an equally definite opinion, but unfortu- nately it is quite impossible to state in any satisfactory fashion the grounds for it or even its full bearing. He nowhere explains the origin of the notions of unity and number, but mercly asserts that through their means we can have absolutely exact arithmetical pro- positions (Works, i. 97, 98). Upon the nature of the reasoning by which in mathematical science we pass from data to conclusions, Hume gives no explicitstatement. Ifwe were to say that on his view the essential step must be the establishment of identities or eqni- yalences, we should probably be doing justice to his doctrine of numcrical reasoning, but should have some difficulty in showing the application of the method to geometrical reasoning. For in the latter case we possess, according to Hume, no standard of equiva- lence other than that supplied by immediate observation, and con- sequently transition from one premise to another by way of reason- ing must be, in geometrical matters, a purcly verbal process.

Taken as a whole, the theory is perhaps the only consistcut development from the psychological principle with which Hume had started, and its incompleteness, even incoherence, points to the gravest defects of that principle. Hume has not offered even a plausible explanation of the mode by which it becomes possible for a consciousness made up of isolated Momentary impressions and ideas to be aware of coexistence and number, or succession. The relations of ideas are accepted as facts of immediate observation, as being themselves perceptions or individual elements of conscious experience, and to all appearance they are regarded by Huine as being in a sense analytical, because the formal criterion of identity is applicable to them. It is applicable, however, not because the predicate is contained in the subject, but because, such judgments of relation being thought as immediate facts of conscious experience, the supposition of their non-existence is a contradiction in terms. The ambiguity in his criterion, however, seems entirely to have escaped Hume’s attention.

A somewhat detailed considcration of Hume’s doctrine with regard to mathematical science has been given for the reason that this por- tion of his theory has becn very generally overlooked or misintcr- preted. It does not seem necessary to endeavour to follow his minute examination of the

principle of real cognition with the same fulness. It will probably be sufficient to indieate the problem as eonceived by Humie, and the relation of the method he adopts for solving it to the fundamental doctrine of his theory of knowledge.

Real cognition, as Hume points out, implies transition from the present inipression or feeling to something connected with it. As this thing can only be an impression or perception, and is not itself present, it is represented by its copy or idea. Now the supreme, all-comprchensive link of connexion between present feeling or im- pression and either past or future experience is that of causation. The idea in question is, therefore, the idea of something connected with the present impression as its cause or effect. But this is ex- plicitly the idea of the said thing as having had or as about to have existence,—in other words, belief in the existence of some matter of fact. What, for a conscious experience so constituted as Hume will admit, is the precise signifieance of such belicf in real existence ?

Clearly the real existence of a fact is not demoustrable. For whatever is may be conceived not to be. “No negation of a fact can involve a contradiction.” Existence of any fact, not present as a perception, cau only be proved by arguments from cause or effect. But as each perception is in consciousness only as a contin- gent fact, which might not be or might be other than it is, we must admit that the mind can conceive no necessary relations or con- nexions among the several portions of its experience.

lf, therefore, a present pereeption leads us to assert the existence of some other, this can only be interpreted as meaning that in sole natural, z.e., psychological, manner the idea of this other perception is excited, and that the idea is viewed by the mind in some peculiar fashion. The natural link of connexion Hunic finds in the snni- larities presented by expericnce. One facet or perception is discovered by experience to be uniformly or gencrally accompanied by another, and its occurrence therefore naturally excites the idea of that other. But when an idea is so roused up by a present im- pression, and when this idea, being a consequence of memory, has in itself a certain vivacity or liveliness, we regard it with a peculiar indefinable feeling, and in this feeling consists the immense differ- enee between mere imagination and belief. The mind is led easily and rapidly from the present

impression to the idcas of impressions found by experience to be the usual aceompaniments of the present fact. Theease andrapidity of the mentaltransitionis the sole ground for the supposed neeessity of the causal connexion between portions of experience. We mistake the subjective transition resting upou eustom or past experience for an objeetive connexion ialpen sbntt

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of special feelings. All reasoning about matters of fact is therefore a species of fecling, and belongs to the sensitive rather than to the cogitative side of our nature.

While it is evident that some such conclusion must follow from the attempt to regard the cognitive consciousness as made up of dis- counected feelings, it is equally clear, not only that the result is self-contradietory, but that it involves certain assumptions not in any way deducible from the fundamental view with which Hume starts. For in the problem of real cognition he is brought face to face with the characteristic feature of knowledge, distinction of self from matters known, and reference of transitory states to perma- nent objects or relations. Deferring his eriticism of the significance of self and object, Hume yct makes usc of both to aid his explana- tion of the belief attaching to reality. The reference of an idea to past experience has no meaning, unless we assume an identity in the object referred to. For a past impression is purely transitory, and, as Hume occasionally points out, can have no connexion of fact with the present consciousness. His exposition has thus a certain plausibility, which would uot belong to it had the final view of the permanent object been already given.

The final problem of Hume’s theory of knowledge, the discussion of the real significance of the two factors of cognition, self and external things, is handled in the Treatise with great fulness and dialectical subtlety.

As in the case of the previous problem, it is unnecessary to follow the steps of his analysis, which are, for the most part, attempts to substitute qualities

of feeling for the relations of thought which appear to be involved. The results follow with the ntmost ease from his original postulate. If there is nothing in conscious experience save what observation can disclose, while each act of observation is itself an isolated feeling (an impression or idea), it is manifest that a pernianent identical thing can never be an object of experience. Whatever permanence or identity is ascribed to an impression or idea is the result of association, is one of those "‘ pro-

ensities to feign" which are due to natural connexions among ideas. Ve regard as successive presentations of one thing the resembling feelings which are experienced in succession. Identity, then,

| whether of self or object, there is none, and the supposition of

objects, distinct from impressions, is but a further consequence of our " propensity to feign." Hume's explanation of the belief in external things by refereuce to association is well deserving of care- ful study and of comparison with the more recent analysis of the same problem by J. S. Mill. ’

At the close of his presentation of the empirical theory of cog- nition, Hume gives one of those comprehensive reviews of its sig- nificauee and its difficultics which mark the rare acuteness of his intellect. He has done what was possible to manufacture cognition out of the isolated, diseonnected statcs of meutal experienee. He has endeavoured to contemplate conscious experience ab extra, as itself an object of experience, and to admit nothing which was not capable of being presented in the fashion of an immediate fact of experience. And as thi result of the whole he has to confess thet his laboriously constructed theory of cognition is but a rope of sand, that no ingenuity can conjure coherence into elements assumed froni the outset as incoherent, that the attempt to regard cognition of a fact as being merely one isolated state leads to hope- less confusion. The passage in which, with the utmost frankness, he expresses his opinion on the sum total of his speculative analysis is so remarkable, both in reference to his own work and in referenec to later developments of philosophy, that it is well to quote it in full. In the Appendix to the Z'reatise he gives a brief réswmé of what he clearly recognized to be the cruz in his theory, the ex- planation of belief, a

cognition which involves the relation among themselves of the parts of experience, and then goes on to say :—

‘“If perceptions are distinct existences, they form a whole only by being connected together. But no conucxions among distinet existences are ever discoverable by human understanding. We only feel a connexion or determination of the thought to pass from one object to another. It follows, therefore, that the thought alone fecls personal identity, when, reflecting on the train of past percep- tions that compose a mind, the ideas of them are felt to be eonnected together and naturally introduce each other.

‘¢ However extraordinary this conclusion may seem, it need not surprise us. Modcru philosophers seem inclined to think that per- sonal identity aziscs from consciousness, and consciousness is nothing but areflected thought or perception. The present philosophy, there- fore, has a promising aspect. But all my hopes vanish when I come to explain the principles that unite our successive perceptions in our thought or consciousness. I cannot discover any theory which gives ine satisfaction on this head. ....

‘* In short, there are two principles which I cannot render con- sistent, nor is it in my power to renounce either of them ; viz., that all our distinet pereeptions are distinet existences, and that the nind never pereeives any real connexion among distinct emistences. Did our perceptions cither inhere in something simple or indi- vidual, or did the mind perceive some real connexion among them, there would be no difficulty in the case” (ii. p. 551). a

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The closmg sentences of this passage maybe regarded as pointing to the very essence of the Kantian attempt at solution of the problem of knowledge. Hume sees distinctly that if conscious experience be taken as containing only isolated states, no progress in explanation of cognition is possible, and that the only hope of further devclop- ment is to be looked for in a radical change in our mode of conceiv- ing experience. The work of the critical philosophy is the intro- duction of this new mode of regarding experienee, a mode which, in the technical language of philosophers, has received the title of transcendental as opposed to the psychological method

followed by Locke and Hume. It is because Kant alone perceived the full sig- nificance of the change required in order to meet the difficulties of the empirical theory that we regard his system as the only sequel to that of Hume. The writers of the Scottish school, Reid in particu- lar, did undoubtedly indicate seme of the weaknesses in Hume's fundamental conception, and their attempts to show that the iso- lated feeling cannot be taken as the ultimate and primary unit of eognitive experience are cfforts in the right direction. "But the question of knowledge was uever generalized by them, and their reply to Hume, therefore, remains partial and inadequate, while its effect is weakened by the uncritical assumption of principles which is a characteristic feature of their writings.

The results of Hume's theoretical analysis are applied by him to the problems of practical philosophy and religion. For the first of these the reader is referred to the article Eruics, where Huime's views are placed in relation to those of his predecessors in the same field of inquiry. His position, as regards the second, is very note- werthy. As before said, his metaphysic contains in abstracto the principles which were at that time being employed, uncritically, alike by the deists and by their antagonists. 'There can be no doubt that Hume has continually in mind the theological questions then current, and that he was fully aware of the mode in which his analysis of knowledge might be applied to them. A few of the less important of his criticisms, such as the argument on miracles, be- came then and have since remained public property and matter of general discussion. But the full significance of his work on the theological side was not at the time perceived, and justice has barely been done to the admirable manner in which he has reduced the theological disputes of the century to their ultimate elements. The importance of the Dialogues on Natural Religion, as a contribution to the criticisin of theological ideas and methods, ean hardly be over- estimated. A brief survey of its contents will be sufficient to show its general nature and its relations to such works as Clarke's De- monstration and Butler's Analogy. The Dialogues introduce three interlocutors, Demea, Cleanthes, and Philo, who represent three distinct orders of theological opinion. The first is the type of a certain priori view, then regarded as the safest bulwark against infidelity, of which the main tenets were that the being of God was capable of priori proof, and that, owing to the finitude of our faculties, the

attributes and modes of operation of deity were abso- lutely incomprehensible. The second is the typical deist of Locke's school, improved as regards his philosophy, and holding that the only possible proof of God's existence was a posteriori, from design, and that such proof was, on the whole, sufficient. The third isthe type of completed empiricism or scepticism, holding that no argu- ment, either from reason or experience, can transcend experience, and consequently that no proof of God's existence is at all possible. The views of the first and sccond are played off against onc another, and criticized by the third with great literary skill and effect. Cleanthes, who maintains that the doctrine of the incomprehensi- bility of God is hardly distinguishable from atheism, is compelled by the arguments of Philo to reduce to a minimum the conclusion capable of being inferred from experience as regards the existence of God. For Philo lays stress upon the weakness of the analogical argument, points out that the demand for an ultimate cause is no more satisfied by thought than by nature itself, shows that the argument from design cannot warrant the inference of a perfect or infinite or even of asingle deity, and finally, carrying out his principles to the full extent, maintains that, as we have no experience of the origin of the world, no argument from experience can carry us to its origin, and that the apparent marks of design in the structure of aniinals are only results from the conditions of their actual existence. So faras argument from nature is concerned, a total suspension of judgment is our only reasonable resource. Nor does the a priort argument in any of its forms fare better, for reason can never demonstrate a matter of faet, and, unless we know that the world had a beginning in time, we cannot insist that it must have had a cause. Demea, who is willing to give up his abstract proof, brings forward the ordinary theological topic, man's consciousness of his own imper- fection, misery, and dependent condition. Nature is throughout corrupt and polluted, but ''the present evil phenomena are rectified in other regions and in some future period of existence." Such a view satisfies neither of hisinterlocutors. Clcanthes, pointing out that from 4 nature thoroughly evil we can never prove the existence of an infinitely powerful and benevolent Creator, hazards the eonjec- ture that the deity, though all-benevolent, is not all-powerful. Philo, however, pushing his principles to thcir full consequences,

shows that unless we assumed (or knew) beforchand that the system of nature was the work of a benevolent but limited deity, we cer- tainly could not, from the facts of nature, infer the benevolence of its creator. Cleanthes's view is, therefore, an hypothesis, and in no sense an inference.

The Dialogues ought here to conclude. There is, however, ap-

pended one of those perplexing statements of personal opinion (for Hume declares Cleanthes to be his mouthpiece) not uncommon among writers of this period. Cleanthes and Philo come to an agree- ment, in admitting a certain illogical force in the a posteriori argu- ment, or, at least, in expressing a conviction as to God's existence, which me not perhaps be altogether devoid of foundation. Tho precise value of such a declaration must be matter of conjecture. Probably the true statement of Hume's attitude regarding the prob- lem is the somewhat inelancholy uttcrance with which the Dia- logues close. _ It is apparent, even from the bricf summary just given, that the Importance of Hume in the history of philosophy consists in the vigour and logical exactness with which he develops a particular metaphysical view. Inconsistencies, no doubt, are to be detected in his system, but they arise from the limitations of the view itself, and not, as in the ease of Locke and Berkeley, from imperfect grasp of the principle, and endeavour to unite with it others radically in- compatible. In Hume's theory of knowledge we have the final expression of what may be called psychological individualism or atomism, while his ethics and doctrine of religion are but the logi- cal consequences of this theory. So far as metaphysie is concerned, Hume has given the final word of the empirical school, and all ad- ditions, whether from the specifically psychological side or from the general history of human culture, are subordinate in character, and affect in no way the nature of his results. It is no exaggeration to say that the more recent English school of philosophy, represented by J. S. Mill, has made in theory no advance beyoud Hume. In the logie of Mill, e.g., we find much of a special character that has no counterpart in Hume, much that is introduced ab extra, froin general considerations of scientific procedure, but, so far as the groundwork is concerned, the System of Logie isa mere reproduction of Hume's doctrine of knowledge. Such a statement does not de- tract from the merits of the Logie or even from its originality, for it is remarkable how slight seems to have been the acquaintance of Mill with the

works of his greatest predecessor, but It does imply that, so far as solution of the philosophical problem is concerned, no advance has been made beyond the position of Hume. Thesame remark, indecd, may be applied to the few efforts of the later em- pirical writers in the region of metaphysics or theology. It is im- possible for any reader of Mill's remarkable posthumous essay on theism to avoid the reflexion that in substance the treatinent is identical with that of the Dialogues on Natural Religion, while on the whole the superiority in critical force must be assigned to the earlier work. All this merely shows how fully the conclusion one would naturally draw from Hume's writings has been borne out by the history of Iater thought. From his position, and on his lines, no further advance was possible. Fora new treatment of philosophi- cal problems a thorough revision of those premises, the adoption of new ground, was requisite. So far as one can see, the only systems of thought which have endeavoured or are endeavouring in a com- prehensive fashion to take up anew the work of philosophy are, on the one hand, the Kantian, with its extensive developmcuts, and, on the other, that of scieutific naturalism, which latter, thongh weak in its metaphysic, is yet penetrated with a truly philosophical spirit.

The chicf work for Hume's life is that of Mr J. H. Burton, Life and Correspond- ence of David Hume, 2 vols.,1846. Of his collected writings, the standard cdition has been till recently that of 1826 (reprinted 1854), in4 vols. The best edition, con- taining, in addition to philosophical introductions, much bibliographical iatter, is that of 1874, in 4 vols., by T. HW. Green and T, 11. Grose. Of works upon Hume, the numerous sketches and essays being omitted, the following are the most important:—Jodl, Leben und Philosophie David Lume's, 1872; Er Pficidercr, Hm- pirismus und Skepsis in David Hume's Philosophie, 1874 (containing good mnatter, but too much spun out); T, H. Green, " Introduction to the Treatise," in vol. i. of Hume's Works, 1874 (by far the most claborate and minute analysis of Ikume in his philosophical relation to Locke and Berkeley); Spicker, Kant, Hume, und Berkeley, 1875; Compayré, La Philosophie de David Hume, 1873, a Mcinoug, JTume- Studien, i.. 1877 (a very careful study of Hume's nominalism); V. Gizycki, Die Etluk David Hume's in threr geschichtlichen Stellung, 1878 (the most thorough exposition of Hume's utilitarianism); T. H. Huxley, ilume, 1879 (a clear repro- diction of the more popular results of

Wuime's philosophy, without criticlsm or historical treatment), Myr Leslie Stephen's English Thought in the Eighteenth Century, vol. i., 1876, contains the best account of Hume's theological position. Most works on the Kantian philosophy contain sections specially on Hume. The

treatments in the gencral histories of philosophy cannot be pronounced satis- factory. (R. AD.)

HUME, Josrrn (1777-1855), an eminent political reformer, was born in January 1777, of humble parents, at Montrose, Scotland. After completing his course of medical study at the university of Edinburgh he sailed in 1797 for India, where he was attached as surgeon to a regiment ; and his knowledge of the native tongues and his capacity for business threw open to him the lucrative offices of interpreter and commissary-general. On the

eve of Lord Lake's Mahratta war in 1803 his chemical knowledge enabled him to render a signal service to the administration by making available a large quantity of gunpowder which damp had spoiled. In 1808, on thie restoration of peace, he resigned all his civil appointments, and returned home in the prime of life, and in the posses- sion of a well-earned fortune. His first care on arriving in England was to study thoroughly the country and its resources, for which purpose he made various journeys, to see the actual state of the people and the practical opera- tion of the laws. In 1812 he took his seat for the borough of Weymouth and Melcombe-Regis; but he was soon obliged to resign it, when it was discovered by his Tory patron that he had had the audacity to talk of reform. Six years elapsed before he again entered the House, and during that interval he had made the acquaintance and imbibed the doctrines of James Mill and the philosophical reformers of the school of Bentham. He had joined his efforts to those of Mr Place, of Westminister, and other philanthropists, to relieve and improve the condition of the working classes, labouring especially to establish schools for them on the Lancasterian system, and promoting the formation of savings banks. In 1818, soon after his marriage with Miss Burnley, the daughter of an East India director, he was returned to parliament as memiber for the Aberdeen burghs. He was afterwards successively elected for Middlesex (1830), Kilkenny (1837), and for the Moutrose burghs

(1842), in the service of which constituency he died. From the date of his re-entering the House Hume began, unaided and alone, that course of reform in which he persevered to his death. He became the self-elected guardian of the public purse, withstanding every abuse of the public money, by challenging and bringing to a direct vote every single item of public expenditure. The difficulties Hume encountered in the course of his efforts to reduce the enormous burden of taxation under which the country groaned were aggravated by the confused state of the public accounts. But no obstacle daunted or discouraged him in his enlightened efforts as the pioneer of commercial, financial, and parliamentary reform. Other labours with which his name is connected deserve to be recorded. He unravelled the Orange Lodge conspiracy, the ramifications of which spread over England, Scotland, and the colonies, and the object of which was to make the duke of Cumberland king in place of William IV. He carried on a successful warfare against the old combination laws that hampered workmen and favoured masters ; he brought about the repeal of the laws prohibiting the export of machinery and of the Act preventing workmen from going abroad. He constantly protested against flogging in the army, the impressment of sailors, and imprison- ment for debt. He took up the question of lighthouses and harbours ; in the former he secured greater efficiency, in the latter he prevented useless expenditure. At first despised and ridiculed, afterwards dreaded for his tenacity of purpose, he ended by gaining the respect of friends and of foes, and the confidence of the whole nation, The breadth of his action, his singleness of aim, his perfect independence of all party or personal considerations, and an almost heroic earnestness and self-denial in carrying out his views, were the secrets of his influence, Himself as incorruptible as Aristides, he made it a special duty to hunt out and expose political corruption under whatever guise it lurked, and the whole army of place-hunters and jobbers found in him their most indefatigable and inexor- able foe. There were many abler, but there was no more useful member in the House during the greater portion of his parliamentary career. He died February 20, 1855. HUMERUS, Lars Jowansson (c. 1642-1674), Swedish poet, more commonly known as Lucidor the Unfortunate,

was born in Stockholm about the year 1642. His father, Captain Johan Erichsson, and his mother died in his infancy ; in 1656 he was entered as a student of the uni- versity of Upsala, at the expense of his patron, Admiral Wrangel, whose sons he afterwards conducted through Germany, Italy, France, England, and Holland, and back to Sweden in the autumn of 1668. He returned to Upsala, received a professorship, and took the pseudonym of Lucidor, which he employed until his death. He stayed but one year at Upsala, and in the winter of 1669 settled again in Stockholm. There one of his poems gave offence to the Government, and he was banished from the city for a year anda day. After his return he lived by his pen, writing odes and epithalamia for the rich burghers. He boasted that he would “live like a poet,” that is to say, with but slight regard for the conventions of society. He was murdered on the night of August 13, 1674, in a cellar at Stockholm, by a drunken soldier, Lieutenant Arvid Storm, with whom he was quarrelling. The body of the poet was carried out into the street ; but he only said, “TI am stabbed,” and died. Storm was condemned to death – for the murder, but was helped by his mother to escape. The stories, so long repeated, of Lucidor’s romantic intrigue with a lady of high rank, and his assassination in her arnis, must be relegated to the domain of fable.

Lucidor’s poems were not collected until aftcr his death, when they were published in a volume called Flowers of Helicon. He wrote verses, not merely in Swedish, but also in Latin, French, Ger- man, English, Italian, and Dutch. His style is deeply tinged with the prevalent fashion for conceit and tasteless ingenuity, but he possesses force and passion ; and he is certainly the most important Swedish writer between Stjernhjelm and Dahlstjerna. The best edition of his works is that published in 1876 by J. Linck, who has dedicated a great deal of time and care to the investigation of the life of Humerus,

HUMILIATI, a religious order founded at Milan early in the 12th century by certain noblemen of Lombardy, who, having been carried captive into Germany, had regained their freedom by their “humility,” did not, according to Helyot in his Ordres Monastiques, take the monastic vows till 1134, when they were induced to do so by St Bernard. In 1164 their ranks were recruited by other Milanese noble- men who had been similarly carried into Germany by Frederick Barbarossa. About 1151 the order was brought under

the rule of St Benedict, and in 1200 it was approved by Innocent III. Confirmed and privileged by succeeding popes, the Humiliati began to be corrupted by their popu- larity and prosperity, until, after a futile attempt to reform the order, Pius V. finally suppressed it in 1571, At that date they had ninety-four houses under their juris- diction. The wives of the original founders instituted a female order of JZumiliate, also called, from a prominent early member, the Vwns of Blassonz, which, exempted from Pius's bull of suppression, still has representatives in Italy.

HUMMEL, Jonann Nepomux (1778-1837), a celebrated composer and pianist, was born November 14, 1778, at Pressburg, in Hungary, and received his first artistic train- ing from his father, himself a musician in a humble way. In 1785 the latter received an appointment as conductor of the orchestra at the theatre of Schikaneder, the friend of Mozart and the librettist of the Magic Flute. It was in this way that young Hummicl became acquainted with the great composer, who took a great fancy to him, and even invited him to his house for a considerable period. During two years Hummel received the invaluable instruc- tions of Mozart, after which he set out with his father on an artistic tour through Germany, England, and other countries, his clever playing winning for the boy the admiration of amateurs. After his return to Vienna he completed his studies under Albrechtsberger, the celebrated contrapuntist, and Haydn, and for a number of years devoted himself cxclusively to composition. For eight

years (1803-1811) he held the appointment of orchestral | ix Ptolem. de astr. judicits,

conductor to Prince Eszterhazy, previously occupied by Haydn. It was not till 1816 that he again appeared in public as a pianist, his success being quite extraordinary. His gift of improvisation at the piano was especially admired, but his larger compositions also were highly appreciated, and for a time Hummel was considered one of the leading musicians of an age in which Beethoven was in the zenith of his power. In Prussia, which he visited in 1822, the ovations offered to him were unprecedented, and other countries—France in 1825 and 1829, Belgium in 1826, and England in 1830 and 1833—added further laurels to his crown. He died in 1837 at

Weimar, where for a long time he had been the musical conductor of the court theatre. His compositions are very numerous, and comprise almost every branch of music. He wrote amongst other things several operas, both tragic and comic, and two grand masses (Op. 80 and111). Infinitely more important are his compositions for the pianoforte (his two concerti in A minor and Bminor, and the sonata in F sharp minor), and his chamber music (the celebrated septet, and several trios, &c,). His experience as a player and teacher of the pianoforte was embodied in his Great Pianoforte School (Vienna), and the excellence of his method is further proved by such pupils as Heuselt and Ferdinand Hiller, Both as a composer and as a pianist Hummel continued the traditions of the earlier Viennese school of Mozart and Haydn ; his style in both capacities was marked by purity and correctness rather than by passion and imagination. In his compositions there is much that is now antiquated ; but to deny him all merit would be as uncritical as were his contemporaries in the opposite direction when they mentioned him in the same breath with Beethoven. HUMMING-BIRD, a name in use for more than two centuries, and possibly ever since English explorers first knew of the beautiful little animals to which, from the sound occasionally made by the rapid vibrations of their wings, it is applied. Among books that are ordinarily in natu- ralists' hands, the name seems to be first found in the Musceum Tradescantianum, published in 1656, but it therein occurs (p. 3) so as to suggest its having already been accepted and commonly understood ; and its earliest use, as yet discovered, is said to be by Thomas Morton in the New English Canaan, printed in 1632—a rare work reproduced by Peter Force in his istorical Tracts (vol. ii., Washington, 1838). Thevet, in his Singularitez de la France antaretique (Antwerp, 1558, fol. 92), has been more than once cited as the earliest author to mention Humming-birds, which he did under the name of Gouambuch; but it is quite certain that Oviedo, whose Hystoria general de las Indias was published at Toledo in 1525, preceded him by more than thirty years, with an account of the " paxaro mosquito" of Hispaniola, of which island "the first chronicler of the Indics" was governor.! This name, though now apparently disused in Spanish, must have been current about that time, for we find Gesner in 1555 (De avium natura, iii, p. 629) translating it literally into Latin as Passer muscatus, owing, as he says, his know- ledge of the bird to Cardan, the celebrated mathematician, astrologer, and physician, from whom we learn (Comment. 1 In the edition of Oviedo's work, published at Salamanea in

1547, the earliest the present writer has been able to see, the aeeount (lib. xiv. eap. 4) runs thus:—‘‘ Ay assi mismo enesta ysla vnos paxaricos tan nesros como vn tereiopelo negro muy bueno & son tan pequefios que ningunos he yo visto en Indias menores/ exeepto el que aea se llama paxaro miosqnito. El qual es tan pequefio que el bulto del es menor harto 0 assaz que le eabega del dedo pulgar de la mano. Este nole he Visto enesta Ysla pero dizen me que aqui los ay : & por esso dexo de hablar enel pa lo dezir déde los he visto que esen la tierra firme quado della se trate.” A modern Spanish version of this passage will be

found in the beantiful edition of Oviedo’s works published by the Academy of Madrid in 1851 (i, p. 444).

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Basel, 1554, p. 472) that, on his return to Milan from professionally attending Arch- bishop Hamilton at Edinburgh, he visited Gesner at Zurich, about the end of the year 1552.2. The name still survives in the French Oiseau-mouche; but the ordinary Spanish appellation is, and long has been, Zominejo, from tomin, signifying a weight equal to the third part of an adarme or drachm, and used metaphorically for anything very small. Humming-birds, however, are called by a variety of other names, many of them derived from American languages, such as Guainwmbi, Ourissia, and Colibri, to say nothing of others bestowed upon them (chiefly from some peculiarity of habit) by Europeans, like Picajlores, Chuparosa, and Froufrou. Barrere, in 1745, conceiving that Humming- birds were allied to the Wren, the Trochilus,? in part, of Pliny, applied that name in a generic sense (Ornith. Spee. novum, pp. 47, 48) to both. Taking the hint thus afforded, Linnzeus very soon after went further, and, excluding the Wrens, founded his genus Z’rochilus for the reception of such Humming-birds as were known to him. ‘The unfortunate act of the great nomenclator cannot be set aside; and, since his time, ornithologists with but few exceptions have followed his example, so that now-a-days Humming-birds are universally recognized as forming the Family Zrochilide. The relations of the Z’rochilid@ to other birds were for a long while very imperfectly understood. Nitzsch first drew attention to their agreement in many essential charac- ters with the Swifts, Cypselide, and placed the two

Families in one group, which he called Macrochires, from the great length of their manual bones, or those forming the extremity of the wing. The name was perhaps not very happily chosen, for it is not the distal portion that is so much out of ordinary proportion to the size of the bird, but the proximal and median portions, that in both Families are curiously dwarfed. Still the manus, in comparison with the other parts of the wing, isso long that the term Macro- chires is not wholly inaccurate. The affinity of the Z'rochi- lide and Cypselide, once pointed out, became obvious to every careful and unprejudiced investigator, and there are probably few systematists now living who refuse to admit its validity. More than this, it is confirmed by an examin- ation of other osteological characters. The "lines," as a boat-builder would say, upon which the skeleton of each form is constructed are precisely similar, only that whereas the bill is very short and the lead wide in the Swifts, in the Humming-birds the head is narrow and the bill long— the latter developed to an extraordinary degree in some of the Zrochilide, rendering them the longest-billed birds known.* Professor Huxley considers these two Families,

See also Prof. Morley's Life of Girolamo Cardano (ii. pp. 152,153). Under this name Pliny perpetuated (Hist. Naturalis, viii. 25) the confusion that had doubtless arisen before his time of two very distinet birds. As Sundevall remarks (Zentamen, p. 87, note), TpoxtAos was evidently the name commonly given by the ancient Greeks to the smaller Plevers, and was not improperly applied by Herodotus (ii. 68) to the species that feeds in the open mouth of the Cro- codile—the Pluvianus aegyptius of modern ornithologists—in whieh sense Aristotle (ist. Animalium, ix. 6) also uses it. But the received text of Aristotle has two other passages (ix. 1 and 11) wherein the word appears in a wholly different conuexion, and can there be only taken to mean the Wren—the usual Greek name of whieh wonld seem to be dpx:Aos (Sundevall, Om Aristotl. Djurarter, No. 54). Though none of his editors or commentators have suggested the possibility of sueh a thing, one can hardly help suspeeting that in these passages some early eopyist has substituted rpoxfaos for épxiAes, and so laid. the foundation of a curious error. It may be here remarked that the Croeodile of St Domingo is said to have the like offiee done for it by some kind of bird, which is ealled by Deseourtilz (Voyage, ili. p. 26), a '* Todier," but, as Geoffr. St Hilaire observes (Descr. de ? Egypte, ed. 2, xxiv. p. 440), is more probably a

Plover. Unfortunately the fauna of Hispaniola is not much better known now than in Oviedo’s days. Thus Docimastes ensifer, in which the bill is longer than both head and body together.

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together with the Goatsuckers (Caprimulgide), to form the division Cypselomorphe—one of the two into which he has separated his larger group Aigithognathe. However, the most noticeable portion of the Humming-bird’s skeleton is the sternum, which in proportion to the size of the bird is enormously developed both longitudinally and vertically, its deep kecl and posterior protraction affording abundant space for the powerful muscles which drive the wings in their rapid vibrations as the little creature poises itself over the flowers where it finds its food.}

So far as is known, all Humming-birds possess a protru- sible tongue, in conformation peculiar among the class Aves, though to some extent similar to that member in the Woodpeckers (Picid«)’—the “horns” of the hyoid apparatus upon which it is seated being greatly elongated, passing round and over the back part of the head, near the top of which they meet, and thence proceed forward, lodged in a

broad and deep groove, till they terminate in front of the |

eyes. But, unlike the tongue of the Woodpeckers, that of the Humming-birds consists of two cylindrical tubes, tapering towards the point, and forming two sheaths which contain the extensile portion, and are capable of separation, thereby facilitating the extraction of honey from the nectaries of flowers, and with it, what is of far greater importance for the bird’s sustenance, the small insects that have been attracted to feed upon the honey. ‘These, on the tongue

being withdrawn into the bill, are caught by the mandibles |

(furnished in the males of many species with fine, horny, saw- like teeth‘), and swallowed in the usual way. The stomach is small, moderately muscular, and with the inner coat slightly hardened. There seem to be no ceca. The trachea is remarkably short, the bronchi beginning high up on the

throat, and song-muscles are wholly wanting, as in all other Cypselomorphe.®

Humming-birds, as is well known, comprehend the smallest members of the class Aves. The largest among them measures no more than 8 inches and a half,® and the least 2

inches and three-eighths in length, for it is now admitted |

generally that Sloane must have been in error when he de- scribed (Voyage, ii. p. 308) the “Least Humming-bird of Jamaica” as “about 1} inch long from the end of the bill to that of the tail”—unless, indeed, he meant the proximal end ofeach, an interpretation, however, that will not save Edwards and Latham from the charge of careless misstatement, when they declare that they had received such a bird from that island. Next totheir generally small size, the best known characteristic of the Z’’rochilide is the wonderful brilliancy

of the plumage of nearly all their forms, in which respect

1 This is especially the case with the smaller species of the group, for the larger, though shooting with equal celerity from place to place, seem to flap their wings with comparatively slow but not less powerful strokes. The difference was especially observed with re- spect to the largest of all Humming-birds, Patagona gigas, by Mr Darwin.

2 The rescmblance, so far as it exists, must be merely the result of analogical function, and certainly indicates no affinity between the families.

3 It is probable that in various members of the Trochilide the struc- |

ture of the tongue, and other parts correlated therewith, will be found subject to several and perhaps considerable modifications, as is the case in various members of the Picide. At present there are scarcely

half a dozen species of Humming-birds of which it can be said that |

any part of their anatomy is known.

4 These are especially observable in Rhamphodon neevius and An- drodon equatorialis.

5. Mr Gosse (Birds of Jamaica, p. 180) says that Mellisuga minima, the smallest species of the Family, has ‘‘a real song ”—but the like is not recorded of any other.

6 There are several species in which the tail is very much elongated, such as the well-known Aithurus polytmus of Jamaica, and the re- markable Loddigesia mirabilis of Chachapoyas in Peru, which last was until lately only known from a unique specimen (Jbis, 1880, p. 152); but “ trochilidists” in giving their measurements do not take these extraordinary developments into account.

they are surpassed by no other birds, and are only equalled by a few, as, for instance, by the Wectaruniide, or Sun- birds of the tropical parts of the Old World, in popular estimation so often confounded with them, and even by some niistaken naturalists thought to be their allies.

The number of species of Humming-birds now known to exist considerably excceds 400 ; and, though none depart very widely from what a morphologist would deem the typical structure of the Family, the amount of modification, within certain limits, presented by the various forms is surprising and even bewildcring to the un-

| initiated. But the features that are ordinarily chosen by systematic

ornithologists in drawing up their schemes of classification are found by the “ trochilidists,” or special students of the Trochilide, insuf- ficient for the purpose of arranging these birds in groups, and char- acters on which genera can be founded have to be sought in the style and coloration of plumage, as well as in the form and propor- tions of those parts which are most generally deemed sufficient to furnish them. Looking to the large number of species to be taken into account, convenience has demanded what science would with- hold, and the genera established by the ornithologists of a preced- ing generation have been broken up by their

successors into multi- tudinous sections—the more adventurous making from 150 to 180 of such groups, the modest being content with 120 or thereabouts, but the last dignifying each of them by the title of genus. It is of course obvious that these small divisions cannot be here considered in detail, nor would much advantage accrue by giving statistics from the works of the latest trochilidists, Messrs Gould,' Mulsant,® and Elliot.2 It would be as unprofitable here to trace the successive steps by which the original genus Trochilus of Linnzus, or the two genera Polytmus and Mellisuga of Brisson, have been split into others, or have been added to, by modern writers, for not one of these professes to have arrived at any final, but only a provisional, arrange- ment ; it seems, however, expedient to notice the fact that some of the authors of the last century! supposed themselves to have seen the way to dividing what we now know as the Family Trochilidee into two groups, the distinction between which was that in the one the bill was arched and in the other straight, since that difference has been insisted on in many works. This was especially the view taken by Brisson and Buffon, who termed the birds having the arched bill *Coldbris," and those having it straight '' Oiscawx-mouches." The distinction wholly breaks down, not merely because there are Trochilidee which possess almost every gradation of decurvation of the bill, but some which have the bill upturned after the manner of that strange bird the Avocet," while it may be remarked that several of the species placed by those authorities among the '' Coli- bris" are not Humming-birds at all.

The extraordinarily brilliant plumage which most of the Trochi- lidee exhibit has been already mentioned, and in describing it orni- thologists have been compelled to adopt the vocabulary of the jeweller in order to give an idea of the indescribable radiance that so often breaks forth from some part or other of the investments of these feathered gems, In all save a few of other birds, the most imaginative writer sees gleams which he may adequately designate metallic, from their resemblance to burnished gold, bronze, copper, or steel, but such similitudes wholly fail when he has to do with the Trochilide, and there is hardly a precious stone—ruby, amethyst, sapphire, emerald, or topaz—the name of which may not fitly, and without any exaggeration, be employed in regard to Humming-birds. In some cases this radiance beams from the brow, in some it glows from the throat, in others it shines from the tail-coverts, in others it sparkles from the tip only

of elongated feathers that crest the head or surround the neck as with a frill, while again in others it may appear as a luminous streak across the cheek or auriculars. The feathers that cover the upper parts of the body very frequently have a metallic lustre of golden-green, which in other birds would be thought sufficiently beautiful, but in the Trochilide its sheen is overpowered by the almost dazzling splendour that radiates from the spots where Nature's lapidary has set her jewels. The flight feathers are almost invariably dusky—the rapidity of their movement would, perhaps, render any display of colour ineffective ; while, on the con- trary, the feathers of the tail, which, as the bird hovers over its food- bearing flowers, is almost always expanded, and is therefore comparar tively motionless, often exhibit arich trans|ueency, as of stained glass, but iridescent in a manner that no stained glass ever 1s—cinnamon

7A Monograph of the Trochilide or Humming-birds, 5 vols, imp. fol., London, 1861 (with Introduction in 8vo). ;

8 Histoire naturelle des Oiscaux-Mouches ow Colibris, 4 vols. with supplement, imp. 4to, Lyon-Genéve-Bale, 1874-77. oe

9 Smithsonian Contributions to Knowledge, No. 347, A Classification and Synopsis of the Trochilide, 1 yol. imp. 4to, Washington, 1879.

10 Salerne must be excepted, especially as he was rebuked by Buffon for doing what we now deem right. .

1 For example Avocettula recurvirostris of Guiana and A. euryplera

| of Colombia.

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and so to indigo and bottle-greeu, But this part of the Humming- bird is subject to quite as much modification in form as in colour, though always eonsisting of ten rectrices, It may be nearly square, or at least but slightly rounded, or wedge-shaped with the middle quills prolonged beyond the rest; or, again, it may be deeply forked, sometimes by the overgrowth of one ormore of the intermediate pairs, but most generally by the development of

the outer pair. In the last case the lateral feathers may be either broadly webbed to their tip, or acuminate, or again, in some forms, may lessen to the filiform ‘shaft, and suddenly enlarge into a terminal spatulation as in the forms known as ‘‘ Racquet-tails.”” The wings do not offer so much variation; still there are a few groups in which diversities occur that require notice. The primaries are invariably ten in number, the outermost being the longest, exeept in the single instance of Aithurus, where it is shorter than the next. The group known as “Sabre-wings,” comprising the genera Campyloptcrus, Eupetomena, and Sphenoproctus, present a most eurious sexual peculiarity, for while the female has nothing remarkable in the form of the wing, in the male the shaft of two or three of the outer primaries is dilated proximally, and bowed near the middle in a manner almost unique among birds, The feet again, diminutive as they are, are very diversified in form. In most the tarsus is bare, but in some groups, as Hriocnenis, it is clothed with tufts of the most delieate down, sometimes blaek, sometimes buff, but more often of a snowy whiteness. In some the toes are weak, nearly equal in length, and furnished with small rounded nails; in others they are largely developed, and armed with long and sharp elaws,

Apart from the well-known brillianey of plumage, of which enough has been here said, many Humming-birds display a largo amount of ornamentation in the addition to their attire of ercsts of various shape and size, elongated ear-tufts, projecting neck-frills, and pendant beards—forked or forming a single point. But it would be impossible here to dwell on a tenth of these beautiful modifications, each of which as it comes to our knowledge excites fresh surprise and exemplifies the ancient adage—mazxime miranda in minimis Natura. It must be remarked, however, that there are certain forms which possess little or no brilliant colouring at all, but, as most tropical birds -go, are very soberly clad. These are known to trochilidists as “Hermits,” and by Mr Gould have been separated as a Subfamily under the name of Phacthornithina, though Mr Elliot says he cannot find any characters to distinguish it from the Trochilide proper. But sight is not the only sense that is affected by Humming-birds. The large species known as Ptero- phanes temmincki has a strong musky odour, very similar to that given off by the Petrels, though, so far as appears to be known, that is the only one of them that possesses this property.?

All well-informed people are aware that the Trochilide are a Family peculiar to America and its islands, but one of the com- monest of common errors is the belief that Humming-birds are found in Africa and India—to say nothing even of England. In the first two cases the mistake arises from confounding them with some of the brightly-coloured Sun-birds (Nectariniide), to which British colonists or residents are apt to apply the better-known name ; but in the last it can be only due to the want of perception which dis- ables the observer from distinguishing between a bird and an insect —the object seen being » Hawk-Moth (Macroglossa), whose mode of feeding and rapid flight certainly bears some resemblance to that of the T'rochilidw, and hence one of the speeics (Jf. stellarum) is very generally called the "'Humming-bird Hawk-Moth." But though confined to the New World the Trochilide pervade almost every part of it. In the south Hustephanus galeritus has been seen flitting about the fuehsias of Tierra del Fuego in asnow-storm, and in the north-west Selatophorus rufus in summer visits the ribes- blossoms of Sitka, while in the north-east Trochilus colubris charms the vision of Canadians as it poises itself over the altheea-bushes in their gardens, and extends its range at least so far as lat. 57° N. Nor is the distribution of Humming-birds limited to a horizontal direction only, it rises also vertically. Orcotrochilus chimborazo and O. pichincha live on the lofty mountains whence each takes its trivial name, but just beneath the line of perpetual snow, at an elevation of some 16,000 feet, dwelling in a world of almost constant hail, slect, and rain, and feeding on the insects which resort to the indigenous flowering plants, while other peaks, only inferior to these in height, are no less frequented by one or more species. Peru and Bolivia produce some of the most splendid of the Family—the genera Cometes, Diphlogena, and Thawmastura, whose very names indieate the glories of their bearers. The eomparatively gigantie Patagona inhabits the west coast of South America, while the isolated roeks of Juan Fernandez not only afford a home to the Eustephanus before Mentioned, but also to two other species of the same genus which are not found elsewhere (sce Brrps, vol. iii. p. 745). The slopes

1 The specifie name of a speeies of Chrysolampis, commonly written by many writers moschitus, would lead to the belief that it was a mistake for moschatus, i.e., "musky," but in truth it originates with their earelessness, for though they quote Linneus as their authority they ean never have

referred to his works, or ‘they would have found the word to be mosquiius, the “ mosquito” of Oviedo, awkwardly, it is true, Latinized. If emendation be needed, muscatus, after Gesner’s example, is undoubtedly preferable.

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of the Northern Andes and the hill country of Colombia furnish perhaps the greatest number of forms, and some of the most beauti- ful, but leaving that great range, we part company with the largest and most gorgeously arrayed species, and their number dwindles as we approach the castern coast. Still there are many brilliant Hum- ming-birds common onough in the Brazils, Guiana, and Venezuela. The Chrysolampis mosquitus is perhaps the most plentiful. Thon- sands of its skins are annually sent to Europe to be used in the manufacture of ornaments, its rich ruby-and-topaz glow rendering it one of the most beautiful objects imaginable. In the darkest depths of the Brazilian forests dwell the russct-clothed brotherhood of the genus Phaethornis—the ‘ Hermits ”; but the great wooded basin of the Amazons seems to be particularly unfavourable to the Trochilide, and from Para to Ega there are scarcely a dozen specics to be met with, There is no island of the Antilles but is inhabited by one or more Humming-birds, and there are some very remark- able singularities of geographical distribution to be found (see Brrps, vol. iii. p. 749). Northwards from Panama, the highlands present many genera, wliose names it would be useless here to insert, few or none of whieh are found in South Ameriea—though that must unquestionably be deemed the metropolis of the Family, and advancing towards Mexico the numbers gradually fall off. Eleven speeies have been enrolled among the fauna of the United States, but some on slender evidence, while others only just cross the frontier line,

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(After Gosse.)

But little room is left to speak of the habits of Humming-birds, which is perhaps of the less consequence since the subject, as regards most of the species which in life have come under the observation of ornithologists, has becn so ably treated by writers like Waterton, Wilson, and Audubon, to say nothing of Mr Gosse, Mr Wallace, Mr Bates, and some others, while, whatever novelty further investigation may supply, it is certain that at present we lack information that will explain the origin or the function of the many modifications ot external structure of which mention has been made. But there is no one appreciative of the beauties of nature who will not recall to memory with delight the time when a live Humming-bird first met his gaze. The suddenness of the apparition, even when expected, and its brief duration, are alone enough to fix the fluttering vision on the mind's eye. The wings of the bird, if flying, are only visible as a thin grey film, bounded above and below by fine black threads, in form of a St Andrew's cross,—the eflect on the observer's retina of the instantaneous revérsal of the motion of the wing at eaeh beat—the strokes being so rapid as to leave no more distinct image. Consequently an adequate representation of the bird on the wing eannot be produecd by the draughtsman. Humming-birds show to the greatest advantage when engaged in contest with another, for rival eocks fight fiercely, and, as may be expected, it is then that their plumage flashes with the most glowing tints. But these are quite invisible to the ordinary spectator except when very near at hand, though doubtless efficient enough for their object, whether that be to inflame their mate or to irritate or daunt their opponent, or something that we cannot compass. Humming-birds, however, will also often sit still for a while, chiefly in an

exposed position, on a dead twig, occasionally darting into the air, either to catch a passing insect or to encounter an adversary; and so pugnacious are

Fic. 1.—Mellisuga minima on nest, natural size.

they that they will frequently attack birds many times bigger than themselves, without, as would seem, any provocation.

The food of Humming-birds consists mainly of insects, mostly gathered in the manner already described from the flowers they visit ; but, according to Mr Wallace, there are many species which he has never seen so occupied, and the ‘‘ Hermits ” especially seem to live almost entirely upon the insects which are found on the lower surface of leaves, over which they will closely pass their bill, balane- ing themselves the while vertically in the air. The same excellent observer also remarks that even among the common flower-frequent- ing species he has found the alimentary canal entirely filled with insects, and very rarely a trace of honey. It is this fact doubtless that has hindered almost all attempts at keeping them in confine- ment for any length of time—nearly every one making the experi- ment having fed his captives only with syrup, which is wholly in- sufficient as sustenance, and seeing therefore the wretched creatures gradually sink into inanition and die of hunger.

The beautiful nests of Humming-birds, than which the work of fairies could not be conceived more delicate, are to be seen in most museums, and will be found on examination to be very solidly and tenaciously built, though the materials are generally of the slightest —cotton-wool or some vegetable down and spiders’ webs. They vary greatly in form and ornamentatiou—for it would seem that the portions of lichen which frequently bestud them are affixed to their exterior with that object, though probably concealment was the

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Fic. 2.—Phaethornis eurynome, and nest. (After Gould.) original intention. They are mostly cup-shaped, and the singular fact is on record (Zool.

Journal, v. p. 1) that in one instance as the young grew in size the walls were heightened by the parents, until at last the nest was more than twice as big as when the eggs were laid and hatched. Some species, however, suspend their nests from the stem or tendril of a climbing plant, and more than one case has been known in which it has been attached to a hanging rope. These pensile nests are said to have been,found loaded on one side with a small stone or bits of earth to ensure their safe balance, though how the compensatory process is applied no one can say. Other species, and especially those belonging to the '* Hermit" group, Weave a frail structure round the side of a drooping palm-leaf. 'he eggs are never more than two in number, quite white, and hav- ing both ends nearly equal. The solicitude for her offspring dis- played by the mother is not exceeded by that of any other birds,

ut it seems doubtful whether the male takes any interest in the brood. (A. N.) HUNDRED, in England, is an ancient territorial division intermediate between the parish or township and the county. Such subordinate districts were also known in different parts of the county as wapentakes, wards, and sometimes shires. 'The name wapentake, which seems to have a dis- tinct reference to the military side of the organization, is generally connected with the Danish occupation, and is said to be found only in the Anglian districts, —Yorkshire, Lincolnshire, Nottinghamshire, Derbyshire, Rutlandshire,

and Leicestershire. In some parts of England a further intermediate division is to be found between the hundred and the county. Thus in Yorkshire we have the trithing, or as it is now called the riding, in Lincolnshire the soke, the lathe in Kent, and the rape in Sussex. The origin of these divisions is generally ascribed to the creative genius of Alfred, who, according to the popular theory, divided the country into counties, the county into hundreds, and the hundreds into tithings or towns. The exact opposite would appear to have been the real process, the larger division being formed by the aggregation of the smaller groups. The significance of the name hundred is a question of some difficulty. The simplest theory is the old one that the

hundred denoted first the group of a hundred families into which the community was divided, and then the district occupied by the group, just as the tithing represents ten families and the district which the ten families occupy. Another view is that the hundred is a term of measurement only, denoting a hundred hides of land. Or again, it has been supposed to be the district from which the complement of one hundred warriors was furnished to the host. The hundred as a group of persons is a well-known feature of the constitution of the German tribes, e.g., as described by Tacitus, the centent ex singulis pagis who formed the army, and the centent ex plebe comites who acted as assessors to the chiefs. The hundred as a territorial division in later times is equally common, The real connexion between them is a matter of conjecture. “It is very probable that the colonists of Britain arranged themselves in hundreds of warriors ; it is not probable that the country was carved into equal districts. The only conclusion that seems reasonable is that under the name of geographical hundreds we have the variously-sized pagi or districts in which the hundred warriors settled, the boundaries of these being determined by other causes” (Stubbs’s Constitutional History, vol. i.). As a territorial division, the hundred like the shire and the parish had its appropriate moot or court, of which the lords, the priest, and four representatives of the parish were members, and in which a specially selected body of twelve appears to have been charged with active judicial functions. The two leading features of the English constitution—represen- tation and trial by jury—thus appear in germ at least in the old constitution of the hundred.

The hundred is now for most of its ancient purposes an obsolete division. The hundred courts were for the most part extinguished by a section in the County Courts Act, 1867, which enacts that no action which can be brought in a county court shall thenceforth be brought in a hundred court, or other inferior court, not being a court of record. The court of record for the hundred of Salford is an example of the survival of this ancient jurisdiction.

Perhaps the most important of the surviving duties of the hundred is its liability to make good damages occasioned by rioters. The 7 and 8 Geo. IV. c. 31 consolidates and amends the laws relating to remedy against the hundred. The principal section enacts that, if any church, house, or other building or section shall be feloniously pulled down or destroyed, the

hundred or other district in the nature of a hundred by whatever name it shall be denominated shall be liable to yield full compensation to the persons damnified, provided such person, or his servant having charge of the property, appear before a justice of the peace within seven days after the commission of the offence, to give information. Actions of this kind must be commenced within three months after the offence. The 17 and 18 Vict. c. 104 (Merchant Shipping Act) gives the same remedy in the case of a wrecked ship if plundered by a riotous assemblage, the hundred in or nearest to which the offence was com- mitted being made liable.

}) Plate II. }) Position and

} General divisions.

| Hungary Proper

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I. GrocraPHy AND STATISTICS,

UNGARY (Hung., Magyarorsedg ; Ger., Ungarn; Fr., Hongrie; It., Ongaria), the second factor of the dual Austrian-Hungarian monarchy, is an extensive country in the south-eastern portion of Central Europe, lying between 44° 10’ and 49° 35’ N. lat. and between 14° 25’ and 26° 25′ Ti. long. It thus covers about 5 degrees of latitude and 12 of longitude, and contains an area of 124,234 square miles, or more than half of the whole Austrian- Hungarian realm, being larger than the United Kingdom of Great Britain and Ireland by about 3000 square miles. The kingdom of Hungary in its widest extent, or the “Realm of the Crown of St Stephen,” comprises Hungary Proper, with the former grand principality of Transylvania, the town and district of Fiume, Croatia and Slavonia, and the Miltary Frontier. Dalmatia, which both from its geo- graphical position and from historical associations ought also to form part of Hungary, sends its representatives to the Austrian Reichsrath.

Area in

Eng. Miles

Hungary Proper and Transylvania .,. ..... 108,263 as cnisesensilenontonsseiscstes ee snsiiiibars sve 8 Wrote and Slavonias……...0..css0secscsecessnssveeee 8,665 MERE YP TOUGIOE oo. 4..5….c02.nsscsccessensnsarecteosees 7,298 Wo tall 3.3 see. 124,234

In the article Austria (vol. iii pp. 115-141) the Austrian-Hungarian monarchy has already been treated of as a whole, and under the heading CroaTIA AND SLAVONIA (vol. vi. pp. 591-592) will be found further special infor- mation with reference to that province (see also Frumg, vol. ix. p. 273). In the present article we shall therefore treat generally of the lands belonging to the Hungarian crown, and more particularly of the ‘‘ mother country,” or Hungary Proper and Transylvania.

The province of Hungary Proper and Transylvania, now united under one administration, and sometimes officiall styled simply “Hungary,” lies between 44° 30’ and 49° 35’ N. lat. and between 16° and 26° 25’ E. long., and comprises an area of 108,263 English square miles. It is bounded on the N. by Moravia, Silesia, and Galicia ; on the E. by Bukowina and Moldavia; on the S. by Wal- lachia, Servia, and Croatia and Slavonia; and on the W. by Styria, Lower Austria, and Moravia. The narrow strip of country known as the Military Frontier, which stretches as a border line between Bosnia and Servia and the south of Croatia and Slavonia, prior to 1873 extended beyond the limits of that province, through Hungary Proper to Transylvania. The whole Military Frontier thus constituted formerly a joint crown land, consisting of the present Croatian-Slavonian frontier, and the so-called Servian-Banat frontier, now incorporated into the province of Hungary Proper and Transylvania. The political changes introduced between 1868 and 1876 will be con- sidered below.

With the exception of the short extent of seaboard on the Adriatic belonging to the Hungarian Littorale, the Hungarian monarchy is entirely surrounded by other countries. Its natural Loundaries are for the most part well defined: on the N.W. and N. it is separated from Moravia, Silesia, and Galicia by the Carpathian mountains ; on the E. and S.E. the Eastern Carpathians form a

natural barrier between Transylvania and Moldavia and Wallachia ; on the §. it is bounded by the Danube, Save, and Unna, which separate it from Servia and Bosnia; on the S.W. by Dalmatia and the Adriatic; and on the W., where its natural boundaries are not so clearly marked, by

Carniola, Styria, and Lower Austria. From the river | Lajta or Leitha, which, like the March, forms a portion of the boundary of the last-mentioned province, originate the terms Cisleithan and Trausleithan, sometimes applied to the collective provinces of Austria and of Hungary re- spectively.

The mountains of Hungary belong to the two great Moun- European systems, the Carpathians and the Alps. The tains.

former extend in a semicircular form over the north and east of the monarchy, enclosing the whole of the left basin of the Danube from Dévény near Pozsony (Pressburg) to Orsova, while spurs of the Styrian Alps traverse the country in the west; to these latter belong also the Bakony and Vértes ranges. The Central Carpathians consist of several groups, among which the TAtra mountains form the most imposing mass, having an average elevation of about 6000

feet, and attaining at some points an altitude of over 8000 feet. To the south of these are the various ranges of the Hungarian Ore-Mountains or Erzgebirge (Lipté, Zélyom, Bars, Hont), and the midland chains which connect the Carpathians with the Styrian Alps. The Eastern Carpa- thians and Transylvanian highlands cover the greater part of Transylvania, and the eastern portion of the old Servian- Banat; the Fogaras is the highest group, some crests of which, as, for instance, the Négoj, Bucsesd, and Vurfu Ourla, attain an elevation of between 8000 and 9000 feet. The low western mountains of Hungary which traverse Croatia and Slavonia belong to the Julian Alps. Taking a general survey, it will be observed that the greatest elevations are in the north of Hungary Proper, in the east and south of Transylvania, and in the eastern portion of the Banat. In the Northern Carpathians large plateaus are not unfre- quent, but in Transylvania the Alpine character pre- dominates. The sides of the Carpathians are generally covered with forests to a considerable height, and on some favourable slopes barley, oats, wheat, and rye are cul- tivated. The mountainous lands in the south-west of the Hungarian monarchy are in elevation much inferior

to those in the north and east, but their greater proximity to the sea and their frequently bare and rugged character cause them to have a considerable influence both on the climate and commercial relations of the country.

enclose two extensive plains, the smaller of which, called the “Little Hungarian Alféld” or ‘“Pressburg Basin,” covers an area of about 6000 square miles, and lies to the west of the Bakony and Matra ranges, which separate it from the “Pest Basin” or “ Great Hungarian Alfold.” This is the largest plain in Europe, and comprises an area of about 37,000 square miles, with an average elevation of from 300 to 350 feet above the level of the sea. The Pest Basin extends over the greater portion of central and southern Hungary, and is traversed by the Theiss and its numerous tributaries. This immense tract of low land, though in some parts covered with barren wastes of sand, alternating with marshes, presents in general a very rich and productive soil. The monotonous aspect of the Alféld is in summer time varied by the délz-bdb, or Fata Morgana.

The geological constitution of the mountains of Hungary Geology.

is on the whole similar to that of the Alps! The central axis is in some places composed of granite, on which crystal- line schists are superposed ; in other places the rocks are of Mesozoic age, and associated with Tertiary beds. Whilst

1 Cf. Dr Max Hantken, in Keleti’s Shiaze der Landeskunde Ungarns, p. 18, Budapest, 1874. Sl =2eG

The great Carpathian and Alpine mountain systems Plains,

Caverns.

the Paleozoic formations are of comparatively rare oceur- rence, the Mesozoic attain a very considerable developinent. These latter in part crop out at the base of the granite and schistose mountain masses, or themselves are the nucleus of more extensive ranges. In some neighbourhoods inde- pendent mountain groups are formed by Tertiary strata. Alluvial formations

constitute the general external crust out of which the mountains arise. Recent formations on the banks of rivers, more especially in the south at the junction of the Danube, Theiss, Temes, Drave, and Save, are mainly confined to the tracts subject to the inundations of the same, but are here and there, as in the neighbour- hood of Pest, Totis, Esztergom (Gran), and some parts of the Great Alféld, represented by accumulations of drift- sand; and in other places, as for instance on the left bank of the lake of Totis, and at Szomod in Komarom county, there are deposits of calcareous tufa.

The numerous caverns deserve a passing notice. One of them, the Aggtelek cave, in the county of Goémér, is about 50 feet in breadth by 16 in height, and extends in its recesses for a length of several thousand feet. In it various

at Foéldvér, and 3500 near Pétervarad (Petcrwardein). Among the extensive islands furmed by branches of the Danube are the Great Schiitt and the Csepel in its upper course. The Theiss, the greatest tributary of the Danube, rises in the north-east, in the county of Maramaros, and flowing first in a north-westerly and afterwards in a southerly direction ultimately joins the main river near Tittel, draining in its course the Great Hungarian Plain. Amongst the many affluents of the Theiss are (7.) the Bodrog, Saj6, and Zagyva, and (/.) the Szamos, K6rés, and the Maros, which last, after traversing Transylvania and eastern Hungary, joins the Theiss at Szeged. The Save, rising in Carniola, winds through Croatia, is fed by the Unna and Kulpa, and falls into the Danube at Belgrade. It will be observed that the whole river system of Hungary belongs to the Danube or the Theiss,—the Poprad, which runs through the county of Szepes (Zips), alone having a northerly course, and flowing to the Dunajec, an affluent of the Vistula. The south-western or Trans-Danubian division of Hungary Proper, although comparatively meagre in water-courses, includes the two principal lakes.

The Balaton or Platten-See, the largest lake, not only in Lakes Hungary, but in the whole of the Austrian-Hungarian 4nd

fossil mammalian remains have been found. The Fondcza

cave, in the county of Bihar, has also yielded fossils. No f marshes,

Rivers.

less remarkable are the Okno, Vodi, and Deményfalva caverns in the county of Liptdé, the Veterani in the Banat, and the ice cave at Dobsina in Gémér county. Of tho many interesting caverns in Transylvania the most remark- able are the sulphureous Biidés in the county of Haromszék, the Almas to the south of Udvarhely, and the brook- traversed rocky caverns of Csetate-Boli, Pestere, and Ponor in the southern mountains of Hunyad county.

Nature has amply provided the greater part of Hungary with both rivers and springs, but some trachytic and lime- stone mountainous districts shows marked deficiency in this respect. The Matra group, eg., is poorly supplied, while the outliers of the Vértes mountains towards the Danube are almost entirely wanting in streams, and have but few water sources. A relative scarcity in running waters prevails in the whole region between the Danube and the Drave. The greatest proportionate deficiency, however, is observable in the arenaceous region between the Danube and Theiss, where for the most part only periodical floods occur. This, however, is far from being the case in the north and east of the kingdom, where the rivers and streams are numerous. The misfortune is that the rivers of Hungary nearly all flow either mediately or immediately to the Danube, and are therefore not available in any other direction as a means of external communica- tion, and even within the country can only serve to a limited extent as water-ways. Thus the Theiss, the greatest wholly native river, is at the present time service- able for regular steam navigation only as far as Szolnok, while the Maros cannot be navigated except at certain seasons and for a portion of its course ; the Drave and the Save, in like manner, are only partly available for steam vessels. But although the length of permanent water-way in Hungary might be much increased by means of canals and other improvements, the Danube must still remain the only river communication with foreign countries, either by way of Austria or the Black Sea, on account of the insur- mountable obstacles to connectingthe small extent of Hungarian seaboard with the regions through which the Danube flows. This river, which is navigable during the whole of its course through Hungary, enters the monarchy at Dévény near Pressburg, and leaves it at Orsova on

the Turkish fronticr, receiving numerous tributaries in its course, among which are, on the right, the Raab, Drave, and Save, and, on the left, Waag, Neutra, Gran, Eipel, Theiss, Temes, and Czerna. The breadth of the Danube is about 900 feet near its entrance, 1400 at Budapest. 1800

dominions, lies between the counties of Veszprém, Somogy, and Zala, is about 47 miles in length by 3 to 9 in breadth, and with the surrounding marshes occupies an area of about 400 square miles. It is supplied by the river Zala, 31 small streams, and 9 springs, while its surplus waters are carried off by the Sid. Phenomena peculiar to the Balaton lake are, that it sometimes becomes violently agitated without any apparent cause, and that in seasons of severe cold the ice on its surface occasionally bursts with a loud report. It is navigable for steamers, and abounds in fish. The Ferté or Neusiedler See lies in the counties of Moson and Sopron, and witli the Hans4g marsh covers an area of some 130 square miles; it is about 23 miles in length by 6 to 8 in breadth, is very shallow, and its waters are strongly impregnated with salt and soda. In 1865 the bed became almost dry, but since 1870 it has filled again. ‘The other lowland lakes, as, for instance, the Palics near Szabadka (Maria-Theresiopel) and the Velencze in the county of Fehér, are much smaller. Morasses and pools are generally frequent in the vicinity of the Danube and Theiss. The most extensive marshy region is the Sdrrét, which covers a considerable portion of the counties of Jasz-Kun-Szolnok, Békés, and Bihar. The Ecsedi Lap in the county of Szatmdr is now for the most part drained ; and the Alibundr and Hlancsa marshes in the county of Torontdl will also be soon laid dry. Many thousands of acres of marsh land have already been re- claimed in Hungary, and hydraulic operations bid fair to still further reduce the extent of the marshy districts. In the deep hollows between the peaks of the Carpa- thians are to be found the curious mountain lakes called “eyes of the sea ;” of these there are at least thirty-eight in the Tatra alone.

The canals of Hungary are still far from sufficient for Canals

the wants of the country, although lately many improve- ments have been introduced, and enormous cuttings made in certain places to relieve the rivers from periodical over- flow. The most important canal is the Ferencz or “ Francis,” which traverses the county of Bics. Itis some 70 miles in

length, and shortens very considerably the passage between the Theiss and the Danube. A branch of this canal called Uj Csatorna, or “ New Channel,” extends from Kis-Sztapdr, a few miles below Zombor, to Ujvidék opposite Peterwardein. The Béga canal runs from Nagy-Becskerck, in the county of Torontal, to beyond Temesvar, but is not navigable throughout. Among other canals are the Versecz in the county of Temes; the Berzava

Sea- ports.

Climate.

CLIMATE. |

in the county of Torontal ; the Sié, which connects the Balaton with the Danube; the Kapos or Zichy in the counties of Somogy, Baranya, and Tolna 3 and the Sdrviz or Nador, which runs through the counties of Fehér and Tolna,

On the Adriatic, at the northern extremity of the short line of sea-coast known as the “ Hungarian Littorale,” lies the port of Frume (g.v.), which is the only direct outlet by sea for the produce of Hungary. Its commanding position at the head of the Gulf of Quarnero, and spacious new harbour works, as also its immediate conuexions with both the Austrian and Hungarian railway systems, render it specially advantageous as a commercial port. As shipping stations, Buccari, Portoré, Selce, Novi, Zengg, Cirquenizza, San Giorgio, Stinizza, Jablanac, and Carlopago are of comparative insignificance. The whole of the short Hungarian seaboard is mountainous, and subject to violent winds.

The climate of Hungary, owing to the physical configura- tion of the country, varies considerably. If we except Transylvania, three separate zones are roughly distinguish- able :—the “highland,” comprising the counties in the vicinity of the Northern and Eastern Carpathians, where the winters are very severe and continue for half the year; the ‘intermediate ” zone, embracing the tract of country stretching northwards from the Drave and Mur, with the Little Hungarian Plain, and the region of the Upper Alféld, extending from Budapest to Nyiregyhaza and Sarospatak; and the “great lowland” zone, including the main portion of the Great Hungarian

Plain, and the region of the lower Danube, where the heat during the summer months is almost tropical. In Transylvania the climate bears the extreme characteristics peculiar to mountainous countries interspersed with valleys; whilst that of the south-western Croatian and Frontier districts bordering on the Adriatic is modified by the neighbourhood of the sea. The minimum of the temperature is attained in January and the maximum in July. At Buda, which, if we exclude Transylvania, is near the centre of the kingdom, the mean average temperature (1862-77) in January is 31° 0’ and in July 71° 7’ ; at Kolozsvar (Klausenburg) in the same months it is 32° 7’ and 68° 9’ respectively. The rainfall in Hungary is small in comparison with that of Austria. At Buda, where the number of rainy days is 122,1 the rainfall is about 214 inches, whilst in the two Hungarian plains generally the rainy days are estimated not to exceed 96 annually. In the vicinity of the Carpa- thians, however, rain is very prevalent, amounting to between 30 and 40 inches. In these regions the greatest fall is during the summer, though in some years the autumn showers are heavier. Hail storms are of frequent occurrence in the Carpathians. On the plains rain rarely falls during the heats of summer ; and, generally speaking, the showers though violent are of but short duration, whilst the moisture is quickly evaporated owing to the aridity of the atmosphere. The vast sandy wastes mainly contribute to the dryness of the winds on the Great Hungarian Alféld. Occasionally, as in the year 1863, the whole country suffers much from drought ; but, on the other hand, disastrous floods not unfrequently occur, particularly in the spring, when the beds of the rivers and streams are inadequate to contain the increased volume of water caused by the rapid melting of the snows on the Carpathians. The low-lying arable and pasture lands in the vicinity of the Theiss and Maros are thus sometimes submerged for weeks, and in March 1879 the town of Szeged, situated at the point of junction

1 Strictly 122°7, the average, for the 16 years 1862-77 inclusive, being 35°3 for winter, 30°7 for spring, 29°2 for summer, and 27°5 for autumn.—Budapest Meteorologiai Viszonyai, issued (1879) by the Royal Hungarian Central Meteorologieal Institute.

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of these two rivers, was almost completely destroyed. In December of the same year the counties of Arad and Bihar were extensively inundated by the Maros and the Kérés. In 1838 the city of Pest, and in February 1876 several localities on the Danube, suffered disastrously from the sudden rising of that river. The average annual number of – suow showers is estimated at 23 for the two Hungarian plains, 44 for Transylvania, 50 for the northern, and 30 to 35 for the western and south-western portions of the monarchy. In 1866-67, and again in 1872-73, cholera was very rife ; of the 447,571 persons who were attacked by the epidemic in the latter case, 189,017, or over 42 per cent., died. Never- theless Hungary cannot, on the whole, be regarded as an unhealthy country, excepting in the marshy tracts, where intermittent fever and diphtheria sometimes exhibit great virulence.

The whole of Hungary, boast of the great variety and number of its natural productions. This is attributable partly to its geographical position, but chiefly to the varied nature of its surface and climate. The fertility of the soil, if we except the mountainous and sandy regions, is remark- able. The vegetable products include almost every description of grain, especially wheat and maize, besides Turkish pepper, rape- seed, hemp and flax, beans, potatoes, and root crops. Fruits of various descriptions, and more particularly melons and stone fruits, are abundant. In the southern districts almonds, figs, riee, and olives are grown. Amongst the forest and other trees are the oak, which yields large quantities of galls, the beech, fir, pine, ash, and alder, also the chestnut, walnut, and filbert. The vine is eulti- vated over the greater part of Hungary, the chief grape-growing districts being those of the Hegyalja (Tokay), Sopron, and Ruszt, Ménes, Szerémség, Szeckszdrd, Somlyé (Schomlau), Béllye and Villany,! Balaton, Neszmély, Visonta, Eger (Erlau), and Buda. Next to France, Hungary is the greatest wine-producing country in Europe, and the quality of some of the vintages, especially that of Tokay, is unsurpassed. roper and in Croatia and Slavonia there are many species of indi genous plants, which are unrepresented in Transylvania. Besides 12 species peculiar to the former grand-principality, 14 occur only there and in Siberia.

The fauna of Hungary includes about 14,000 species. The horned Fauna.

cattle are amongst the finest in Europe, and large herds of swine are reared in the oak forests. In 1870 the total number of cattle (including 73,243 buffalocs) was estimated at 5,279,198, and of swine at 4,443,279. Of sheep, the breed of which is now greatly improved, the number amounted to 15,076,997; of horses there were 2,158,819, asses 30,480, mules 3,266, and goats 572,951. The wild animals are bears, wolves, foxes, lynxes, wild cats, bad- gers, otters, martens, stoats, and weasels. Among the rodents there arc hares, marmots, beavers, squirrels, rats, and mice,—the last in enormous swarms. Of the larger game the chamois and deer are specially noticeable. Among the birds are the vulture, eagle, falcon, buzzard, kite, lark, nightingale, heron, stork, and bustard. Domestic and wild fowl are generally abundant. The rivers and lakes yield enormous quantities of fish, and leeches also are plentiful. The Theiss, once better supplied with fish than any other river in Europe, has for many years fallen off in its productiveness. The culture of the silkworm is chiefly carried on in the south—in the Military Frontier, and in Croatia and Slavonia. The principal bee- rearing localities are in the counties of Gémor, Szepes, and Mosony, the Military Frontier, and the former Saxon distriets of Transyl- vania. In 1870 the number of bee-hives was estimated at 617,407.

The chief mineral products arc coal, nitre, sulphur, alum, soda, Minerals,

saltpetre, gypsum, poreelain-carth, pipe-clay, asphalt, petroleum, marble, and ores of gold, silver, mercury, copper, ron, lead, zinc, antimony, cobalt,*and arsenic. The opals of Saxos are famous, and precious stones of various descriptions (calcedony, garnet, jaeinth, amethyst, carnelian, agate, rock-crystals, &c.) are met with in several localities. Amber occurs at Magura in Szepes county. Gold and silver are found chiefly in the districts of Selmecz (Schemnitz), Kérmocz (Kremnitz), Nagybanya, Szomolnok, Oravieza, Abrudbanya, and Zalatna. The average yearly yield of gold is equal in value to about £219,000, and that of silver to some £178,600. The sand of some of the rivers, as for instance tlie Maros, Szamos, Korés, and Aranyos, is auriferous. Iron is exten- sively produced in the counties of Gémér, Zdlyom, Liptd, Szepes, Saros, Borsod, Torna, Abauj, Szatmar, Bihar, and Krasso; coal in the neighbourhood of Pécsvarad, Oravicza, Salgé-Tarjan, and of

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2 The quantity of (Riesling grape) wines produeed on the arehduke Albrecht’s estates near Béllye and Villany is said to exceed 1,000,000 bottles annually.

but more especially Hungary Proper, can Flora,

Agri- culture.

Adminis- trative and political divisions.

364,

the river Sil. There are fine marble quarries at Piszke and the neighbouring Almas in the counties of Esztergom and Komarom, as also at various places in the counties of Baranya, Veszprem, Abatj, Szepes, and Lipto. The largest salt-mines are at Ronaszck, Sugatag, and Szlatina in the county of Maramaros, In Hun- gary Proper, and at Vizakna, Parajd, Torda, Deésakna, and Maros- ujvar in Transylvania. In 1877 the value of the salt produced was 12,369,599 florins, of other minerals 18,787,757 florins. The yearly worth of the whole mining produce of the Hungarian realm ig estimated at over £3,000,000, of which, however, the amount attributable to Croatia and Slavoniais comparatively small. There are several hundred cold and 64 warm mineral springs in Hungary Proper and in Croatia and Slavonia, whilst a relatively greater number are met with in Transylvania. Of warm springs the most famous are those of Buda, Mehddia, Eger (Erlau), Nagyvarad (Grosswardein), Sztubnya, Szlides, Harkany, Posteny, Krapina, and Teplitz. Among the cold mineral springs the more worthy of note are those of Suliguly, Borszék, Bartfa, Czigelka, Szulin, Pavad, Koritnicza, and Szalatnya; the Buda keseri viz (bitter water) is also much prized, and largely exported.

The general agricultural division of the soil is shown approxi- mately in the following table, adapted from Keleti’s Magyarorszdg Statistikdja:—

Total “for the Hungarian Realm.

Hungary Proper and Transyl- Finume. * yania.

Military

Slavonia. Frontier,

E, Acres,

1,213,464 465,012 32,112

EB. A. | E. Acres.

1,868,609 607,933

128,558

500,244 936,357

2,210,736 | 1,373,347

8,200 Acs 5,824,280 | 4,020,292

472,449 922,950

4,943,242

Eng. Acres.

23,865,703 9,147,793 837,676

“10,157,418

19,449,689 381,783

Eng. Acres.

26,947,892 10,221,694

999,423 11,595,832 23,034,407

389,983

MeadowS …0…cceecceeree AVAMECVATAS? cvccsseceocesss WPRSTHECR™...c.c0-cccsee0eee

Reedy tracts ……0-...

Total of productive soil Barren lands ….. ceases

73,189,231 6,417,042

63,840,062 5,021,384

.| 68,861,446 5,796,729 79,606,273

Since the year 1867 the administrative and political divisions of the lands belonging to the Hungarian crown have been in great measure remodelled. In 1868 Transylvania was definitively re- united to Hungary Proper, and the town and district of Fiume declared autonomous. In 1873 the Servian-Banat or Eastern Mili- tary Frontier was incorporated with Hungary Proper. In 1876 the whole administrative subdivision of Hungary into counties, dis- tricts, and sees was revised, and for the sake of uniformity one general system of counties was introduced, except for the Croatian- Slavonian Military Frontier, which is divided into border districts. The total number of subdivisions amounts to 80, of which 65 appertain to Hungary Proper and Transylvania, 1 to Fiume and district, 8 to Croatia and Slavonia, and 6 to the Croatian-Slavonian Military Frontier. Hungary Proper, according to ancient usage, is generally divided into four great divisions or circles, and Tran- sylvania has since 1876 been regarded as the fifth, Neither numerically nor according to territorial extent are the present 65 counties distributed equally among their respective circles, which must be regarded as geographical rather than political divisions, for they are not recognized in the judicial, fiscal, military, postal, and administrative relations of the country. The circles are—

Cis-Danubia (north and east of the Danube), containing 13 counties : Pest-Pilis-Solt-Kis-Kun, Bacs-Bodrog, Ndgrad, Hont, Esztergom, Bars, Zélyom, Lipto, Arva, Thurécz, Trencsén, Nyitra, Pozsony.

Trans-Danubia (south and west of the Danube), 11 counties: Moson, Sopron, Gyér, Komarom, Fehér, Veszprém, Vas, Zala, Somogy, Baranya, Tolna.

Cis-Tisia ® (north and west of the Theiss), 11 counties: Szepes, Gomér and Kis-Hont, Heves, Jasz-Nagy-Kun-Szolnok, Borsod, Torna, Abaiij, Saros, Zemplén, Ung, Bereg.

Trans-Tisia (south and east of the Theiss), 15 counties: Méramaros, Ugoesa, Szatmar, Szilagy, Szaboles, Hajdu, Bihar, Békés, Csandd, Csongrad, Arad, Torontal, Temes, Krassd, Sz6rény,

Trans-Kirdlyhdg6, or Transylvania, 15 counties: Alsé-Feher, Besztcreze-Naszéd, Brassé, Csik, Fogaras, Haromszék, Hunyad, Kis-Kiikill6, Kolozs, Maros-Torda, Nagy-Kikiillé, Szeben, Szolnok- Doboka, Torda-Aranyos, Udvarhely.

In the following list of divisions the foreign forms of the names of towns are given which are most frequently met with in the German and English press. Not being recognized offici- ally, these are falling into disuse in Hungary.

1 In good years the total produce of the vines for the whole of Hungary may be estimated at 390 million gallons, in ordinary years at 227, and in bad years at 91 million gallons,

2 The four circles of Hungary Proper had formerly their special political sig- nificance, owing to the so-called ‘ circular sittings,” where the deputies of each of the four circles met for tle preliminary discussion of parliamentary questions.

5 Formerly, but incorrectly Cis-Tibisca.

HUNGARY

[DIVISIONS.

Political and Administrative Divisions.

County Town.

No. County. Official Name. | Foreign Equivalent. Hungary and Transylvania. 1 | Pozsony Pozsony Pressburg P4 Nyitra Nyitra Neutra 3 | Trenesén Trencsén Trenesin 4 rva Als6-Kubin 5 } Lipté Lipt6-Szent-Mikl6s 6 | Thuréez Thuréez-Szent-Mditon 7 | Zélyom Beszterezebdnya Neusohl 8 Bars Aranyosmar6t a Hont Ipolység 10 | Noégrdd Balassa-Gyarmat 11 | Esztergom Esztergom Gran 12 | Komdrom Komdrom Komorn 13 | Gyér Gyor , Raab 14 | Moson Magyar-Ovdr Ungrisch-Altenburg 15 | Sopron Sopron Oedenburg 16 | Vas Szombathely Stein-am-Anger 17 Zala Zala-Egerszeg 18 | Veszprém Veszprém Veszprim 19 | Fehér Székesfehérvar Stuhlwcisscnburg 20 | Somogy Kaposvar 21 | Tolna Szegszdrd 22 | Baranya Pécs Fiinfkirchen 23 | Badcs-Bodrog Zombor a = F

The population of Hungary comprises a great variety of races, Popula- differing in language and religion, although united under one tion.

common sovereignty. At the census of 1870 the whole population, civil and military (exclusive of children under the age of six), amounted to 15,509,455, while the total civil population was 15,417,327; of these 7,653,560 were males and 7,763,767 females, the ages of 185 males and 196 females being given as over 100 cars.

On the occasion of the new political divisions that took place in 1878, a fresh census was taken of Croatia and Slavonia and the

RELIGION AND EDUCATION. |

Military Frouticr. This accounts for a slight diserepancy with the above number of the civil population in the total of the following table (from MM. Ballagi and Kirdly), in which the population is arranged according to the new administrative divisions :_—

Population. Hungary Proper and Transylvania .. .. 18,561,245! OE GG 0S: li 17,884 CON GT SECS 1,156,025 CO oie O01) Ce 691,095

15,426,249

According to the Magyar Statistikai Evkényv (Budapest, 1879), the number of births in Hungary Proper and Transylvania during the year 1876 was 628,849, viz., 320,470 boys and 308,379 girls; of these 238,060 boys and 21,889 girls were illegitimate. The number of deaths in that year was 478,684, of whom 250,698 were males and 227,986 females. The number of marriages was 135,011. At the census of 1870 there were in the whole Hungarian monarchy 180 cities and large towns, 769 rural towns, 16,376 villages, and 2,450,213 houses. Budapest,? the capital, contained 270,476 in- habitants, Szeged 70,179, and Szabadka (Maria-Theresiopel) 56,323. Four towns contained between 40,000 and 50,000 inhabitants, 3 between 30,000 and 40,000, and 21 betwcen 20,000 and 30,000. Zagrab (Agram), the capital of Croatia and Slavonia, had 19,857 inhabitants.

As regards nationality the Magyar or pure Hungarian race is the most numerously represented in the kingdom, amounting, accord- ing to Dr Konek (see Schwicker, Statistik des Kénigreiches Ungarn, 1877), to 6,176,612, or 40 per cent. of the whole civil population. The Magyar element is chiefly confined to Hungary Proper and Transylvania, only about 15,000 Magyars residing in Croatia and Slavonia. The German population amounts to 1,898,202 (12°38 per cent.), for the most part scttled in the western and north-western counties of Hungary Proper, bordering on Austria, also in the county of Szepes in the north, in the former Banat, and in the Saxon counties of Transylvania. The Roumanians, estimated at 2,608,120 (16°9 per cent.), are mostly resident in Transylvania and the counties immediately abutting on it. The Slovaks amount to 1,835,334 (11°9 per cent.), and the Ruthens to 469, 420 (8 per ceut.), the former chiefly located in the north and north-west and the latter in the north-east of Hungary Proper. The aggregate num- ber of Croats and Serbs is 2,880,985 (15°5 per cent.), chiefly con- fined to Croatia and Slavonia and the Military Frontier, where they form 97 per cent. of the population, to the former Servian-Banat, and the southern counties of Hungary Proper. The other nation- alitics, comprising Armenians, Greeks, Bulgarians, Macedo-Wal- lachians, Albanians, French, and Italians, are not largely repre- sented, their total number being estimated at only 48,654 (about 0°3 per _cent.); the Italians are, however, to be met with in con- siderable numbers at Fiume and in its vicinity. In the above statistics the Jews scattered over the country, and amounting alto- gether to rather more than half a million,

have been reckoned with the various nationalities where they happen to be settled. The Gipsies, classed partly as Magyars partly as Roumanians, and roughly estimated at 145,000, have their colonies in various parts of the monarchy, but more particularly in Transylvania, and in the county of Gémor in Hungary Proper. On the whole the Magyar element may be said to predominate in 27 of the 65 (new) counties appertaining to the mother country, the German or Magyar-German in 6, the Roumanian in 18, the Slovakian in 9, the Servian in 1, and the Ruthenian in 8. In 6 counties of Hungary Proper no one special nationality can be said to have the absolute majority.

The total number of the various confessions for the whole popu- lation (civil and military) has been computed thus :—

PI ALONG oo. 05. venccnnsnvescavieeonecerens oe 7,558,558 Oe NE. .c. scsene serharasseanoeoeonsecene 1,599,628 mmmmemian Catholies….....0…<:.006…0e.-...000., O83 O¥eck (Haatern) Church …....c0c0….c00ececcsecceee 2,589,319 a rr 646 acc acest caceaiecioaaitiies.. ace cvs 1,118,508 oe ce oa nnn nnne cooces 2,031,243 NE ei… oe veuis ShaWadsessceesccecsaceccose. 54,822 rier CHIStiaAn Sccts ….....00.. c.cssceccosccecee 2,138 EM i huts veil coe sceaacece 558,641 CP TOM-OUTISTIANS ... oo… nnessccsseccoseccavuce 224

15,509,455

_ The Roman Catholics are in overwhelming majority in 32 coun- ties, the adherents of the Greek (Eastern) Chureli in 11, the Greek Catholics in 10, and the Lutherans in 5. Further the Greek Orientalists have a majority in 6 counties, the Calvinists in 5, the Roman Catholics in 4, the Lutherans in 2, and the Greek Catholics in ee

1 The civil population of Hungary Proper and Transylvania at the end of 1876 was 13,670,624.

2 In 1876 the population of Budapest, including military, was 309,208.

5 Cf. Dr Jos. Bergl, Geschichte dor ungartschen Juden, Leipsic, 1879.

lcounty. The Roman Catholic Church has 4 archbishops: Esztcr- gom (Gran), Kalocsa, Eger (Erlau), and Zagrdb (Agram), and 17 real diocesan bishops; to the latter must be added, moreover, the chief abbot of Pannonhalma, who likewise enjoys episcopal rights. The primate is the archbishop of Esztergom, who also bears the title of prince, and whose special privilege it is to crown the sove- reigns of Hungary. The Greek Catholic Church, which is in con- nexion with the Romish communion, owns besides the archbishop of Esztergom the archbishop of Gyulafehérvar (Carlsburg), or rather Balasfalva (7.e., " Blasiusville"), and 6 bishops. . The Armenian Catholic Church is partly under the jurisdiction of the Roman Catholic bishop of Transylvania, and partly under that of the Roman Catholic archbishop of Kaloesa. The Greek (Eastern) Church in Hungary is subject to the authority of the metropolitan of Carlowitz and the archbishop of Nagyszeben (Hermannstadt); under the former are the bishops of Bacs, Buda, Temesvar, Versecz, and Pakracz, and under the latter the bishops of Arad and Kardnsebes, The two great Protestant communities are divided into ecclesiastical districts, five for each; the heads of these districts bear the title of superintendents. The Unitarians, chiefly resident in Transylvania, are under the authority of a bishop, whose see is Klausenburg. The Jewish communities are compriscd in ecclesiastical districts, the head direction being at Budapest. At the commencement of 1870 there were 19,858 clerics of various creeds in Hungary.

Since the ycar 1867 great improvements have been effected in Fduca- the educational system of Hungary, especially in Hungary Proper tion,

and Transylvania. Before that year public instruction was in the hands of the ecclesiastics of the various confesstons, and the public schools had in consequence more or less of a denominational char- acter, One of the first cares of the new responsible ministry of 1867 was to provide for the education of all children not attending the then existing scholastic establishments, by the introduction of supplementary non-denominational schools, By a law passed in 1868 the Government made it compulsory on children of both sexes between the ages of 6 and 12 to attend school, and it

morcover re- quired that children from 12 to 15 should attend the " repetition schools." The cducational system of Croatia and Slavonia is auto- nomous, being under the independent direction of the Croatian-Slavonian provincial government.

The various educational establishments may be divided into four classes :— common, middle, high, and special schools. In 1877 Hungary Proper and Transylvania had 15,486 belonging to the first- mentioned class ; of these 18,755 were private or denominational, and 1731 communal and state schools. These figures show a total increase of 2341 since the year 1865, when the number was only 18,145. It is estimated that at the end of 1877 there was one school for every 870 inhabitants. In that year the number of children between the ages of six and fifteen who came under the education act amounted to 2,127,950, and of these 1,559,636 or 78 per cent. attended ; whereas in 1869 the percentage of day scholars barely reached 48, showing an increase of 25 per cent. in the course of eight years. In 1874 there was already an attendance of 1,497,144, or nearly 70 per cent. The number of children who attended school in Croatia and Slavonia, with the Military Frontier, at that date was 73,635, making a general total for the whole of Hungary for the year 1874 of 1,570,779. On account of the variety of languages and races prevailing in many parts of Hungary, the education in numerous schools has to be conducted in two, and in several instances even in three languages. Out of 15,486 schools in Hungary Proper and Transylvania in 1877 Hungarian was used in 7024, German in 1141, Roumanian in 2773, Slovakian in 1901, Servian in 259, Croatian in 70, Ruthenian in 491, two languages in 1692, and three in 135. The aggregate number of tcachcrs in the above schools was 20,717.*

The middle schools consist of the gymnasia, real-schools, and similar institutions. In 1874 there were in Hungary Proper and Transylvania 146 gymnasia, with 1734 teachers and 26,278 pupils ; in 1877 the gymnasia had increased to 149, the teachers to 1814, and the pupils to 31,455. In 1874 there were 32 real-schools, with 387 teachers and 7748 pupils; in 1877 there were 265 such schools, with 383 teachers and 6647 pupils. The above results added together give an aggregate, for the year 1877, of 175 schools, 2197 teachers, and 38,102 pupils. With the omission of a few of a specially sectarian, teclinical, or private character, the total number of

middle schools at that time in the whole Hungarian monarchy (including Croatia and Slavonia and the Military Frontier) was, as nearly as can be computed, about 205, with some 2450 teachers, and 42,000 pupils. In the mother country there were also 51 training seminaries® for masters (2853 scholars), and 14 for mistresses (1188 scholars); of these 65 establishments, 16 of the former and 6 of the latter kind were statc, and the remaining 48 confessional, viz., 26 Roman Catholic, 8 Greck Eastern Church, 4 Lutheran, 9 Calvinist,

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4 Of the children who Ieft these schools in 1877, the percentage of those who could both read and write was 85, of those who could only read 15.

5 These figures refer to upper and lower real-schools fairly complete in their formation. The total number of real-schools, perfect and imperfect, in the mother country, including also Fiume, was 86 (viz., 24 upper and 12 lower).

® Chiefly for the lower or common sehool teachers,

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Manu- factures.

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and 1 Jewish. The number of commercial schools was 24, with 129 masters and 1114 pupils.

The high schools comprise the universities of Budapest, Kolozsvar (Klausenburg), and Zagrab (Agram), the Joseph-Polytechnie, the theological institutes, the law academies, &c. 'The Budapest uni- versity (founded at T'yrnau in 1685) has four faculties,—theology, jurisprudence, medicine, and philosophy. In the year 1877 the number of professors amounted to 166, and that of students to 2929 (in 1878 to 180 and 3117 respectively). The university of Kolozsvar was founded in 1872, and is similar in its organization to that of Budapest, excepting that it has a faculty

for mathematics and natural science, but none for theology. The number of pro- fessors in 1877 was 64, and that of students 391. Zagrab university was founded in 1869, but was not in active operation till 1874, and was even then incomplete in its formation. It has three faculties,—jurisprudenee, theology, and philosophy. The Joseph-Polytechnic, ranking as a high school at Budapest since 1871, had in 1877 as many as 56 professors with 800 students. The number of theological insti- tutions in Hungary Proper and Transylvania at that date was 45,1 with 284 professors and 1534 novices; 25 of these institutions were Roman Catholic, 4 Greek Catholic, 8 Greek Eastern Church, 7 Lutheran, 5 Calvinistic, and 1 Unitarian. There were, moreover, 12 law academies, with 115 professors and 1067 students. In 1878 thcre were 125 professors and 1048 pupils. In Croatia and Slavonia there werc 5 theological institutes (4 Roman Catholic and 1 Greek Eastern Church), with about 80 professors and some 200 students. The special schools are for particular branches of science and art. Among these are the school of design at Budapest; the music academy (founded 1875); several establishments for teaching mining, at Selmecz (Schemnitz), Nagyég, Felsi-Binya; farming and agriculture, at Magyar-Ovar (Altenburg), Keszthely, Kolozsvar, Debreczen ; and the management of forests, at Selmecz ; also in- stitutes for the blind, deat, and dumb, and for lunatics at Vacz (Waitzen), Budapest, and Pozsony; and schools for veterinary surgery, obstetrics, &c. There are, moreover, military seniinaries at Budapest, Kassa (Kaschan), Déva, Készeg (Giins), Fehértemplom, and Zagrab, and a naval school at Fiume.

The Hungarian academy of sciences is the supreme representative of the national culture. First constituted with royal sanction in 1830, the academy in 1879 consisted of 321 (224 home and 97 foreign) meinbers, arranged in 8 classes. Next follow the Kisfaludy (comprising in 1879 only 50 home and 15 foreign members) and Petoti societies of Budapest, the royal meteorological institute, and the medical and physical (natural science), historical, archeological, geological, geographical (founded 1872), and philological (1875) societies. To these must be added the Roman Catholic "St Stephen's union," the 'Protestant union," the Zagrab "South Slavonian Academy" (founded 1861), and the various Transylvanian and provincial learned societies.

As the industrial products and commerce of Hungary have been already described in the article AvsTRIA (vol. iii, p. 119-121), we need only add here a few remarks as to the chicf localities of certain trades and manufactures.

The principal machincfactorics, foundries, bell and typeworks, and works foriron and other metallic wares are at Pest, Buda, Temesvar, Resicza, Didsgyér, and Sopron (Oedenburg). Boat-building is carried on at the chief towns on the great rivers, especially at Szeged, Arad, Buda, Komarom (Komorn), and Gyér (Raab); steam-vessels are con- structed at Budaand Fiume. The glass manufacture, mostly carried on in the hilly districts, is not yet fully developed, and the articles are of an inferior quality. The best manufactories of stoneware and earthenware are those of Csakvar, Pécs (Fiinfkirchen), Rimaszombat, Murany, Papa, Készeg (Giins), Ig]é, Kérméczbanya, Zagrab, and Kra- pet of porcelain the mostimportant is that of Herend. Dcbreezen, >4pa, Selmeczbanya, and Szigetvar are famed for their clay pipes. The preparation of chemical stuffs is carried on chiefly at Pest, Nagyszombat (Tyrnau), Pozsony (Pressburg), Nagyszcben (Hermann-stadt), and Ujmoldova ; whilst Debreczen and Szcged are noted for their soap and candles. Oil factories are numerous, especially in Hungary Proper and Transylvania; the chief oil mills and refining honses are at Pest, New Pest, Rakospalota, Székesfehérvar (Stulil- weissenburg), Gyr, Pozsony, Kassa (Kaschau), Temesvar, Brassd, (Kronstadt), and Cservenka, which last has forty mills. The mann- facture of silk stuffs is still undeveloped, but there are spinneries at Nagyczenk, Hidja, Sopron, and Féltorony, also in the Banat, and in various parts of Transylvania and of the Frontier districts. Flax is mostly homespun, and confined to the commoner kinds of linen. There are factories for woollen yaru at Brassd, Nagyszeben, and Gurano, and for woollen stuffs at Losonez and Szakoleza. Coarse cloth is made in many parts of the kingdom. Leather is prepared at Kassa, Pozsony, Rozsnyé (Rosenau), Kérmend, Temesvar, Kés- mark, and Budapest. Paper is made at Didsgyér, Nezsider (Neu- siedl), Hermanecz, Szlabos, and Fiume. Breweries are chiefly to be found in the neighbourhood of the large towns, which contain a mixed population, as the Magyars are drinkers of wine and spirits

*1 To the above must be now added the * Rabbinersehule," opened October 4, 1877, and numbering (in 1878-79) 31 pupils.*

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rather than of beer; the brewcrics of Kébanya near Pest are the most extensive. The taste for beer is said to be increasing, although the total number of brewerics in Hungary has since 1860 been steadily falling, and many of the smaller establishments no longer exist, or have been absorbed. A considerable quantity of beer is, moreover, in:ported from Bohemia and the neighbourhood of Vienna. The largest sugar-works are those of Surany, Moson (Wieselburg), Szent-Miklds, and Edelény. The most important tobacco factories are those of Pest, Kassa, Debreczen, and Fiume.

As regards the number of factories exact data are not forthcoming. lt appears, however, that in 1874 there were in the whole kingdom altogether 82,570 spirit distilleries, of which 991 were substantial factorics and 81,579 rural stills. The breweries in activity at that date amounted to 247, of which 211 were in the mother country, and 36 in Croatia and Slavonia. There were, besides, 20 sugar re- fineries, and about 380,000 flour-mills of various descriptions, of which nearly 25,000 were in Hungary Proper and Transylvania. In fact the preparation of flour, which is, moreover, largely exported to Germany and Switzerland, is one of the most im- portant industries of Hungary.

According to a report of M. de Hicronimy, under secretary of Commu. state in the Hungarian ministry of public works, the length of nication,

Hungarian railways in operation in the year 1867 was only 1875 English miles. The length of railways constructed from that date to the year 1876 amounted to 2675 miles, and thus at the beginning of 1877 there were 4050 miles of railway in operation in Hungary. By the early part of 1879 the total length was about 7000 kilometres or 4400 miles. There are also some 18,000 miles of highways (good and bad), and more than 2500 miles of navigable river and canal communication. The imports (including those from Austria) may beroughly estimated at £45,000,000, and the exports at £35,000,000. There is also a considerable transit trade carried on between Austria and the western states and the regions of the lower Danube, estimated at £8,500,000 yearly. The number of freighted vessels that arrived

at the ports of the Hungarian Littorale in 1876 was 3524, the number that left 3862; of the former 909, and of the latter 926 were steamers.

Besides the several branches of the “ Austrian-Hungarian Bank” at Budapest, Kassa (Kaschau), Debreczen, and Temesvar, Hungary possesses about 120 industrial, commercial, and credit banks. There are, moreover, 12 chambers of comimerce and industry at Budapest, Pozsony (Pressburg), Kassa, Sopron (Oedenburg), Debreczen, Temes- var, Arad, Kolozsvar (Klausenburg), Brassé (Kronstadt), Fiume, Zagrab (Agram), and Eszék. The nuinber of savings banks is about 310 ; of other associations, such as loan societies, popular, mutual, and alliance banks, &c., the aggregate is over 200. In the year 1876 the number of post-office alee issued amounted to 1,832,757. The total number of telegraphic messages sent, received, or trans- mitted was 6,462,835. The aggregate of postal missives was 112,851,516; of these 46,617,106 were prepaid and 1,452,233 not prepaid letters ; 4,581,027 were registered, and 13,954,354 official Ictters ; 9,016,232 were post-cards; 28,876,062 were articles per newspaper, 1,364,490 per pattern, and 6,990,012 per book post.

The form of government in Hungary is that of a constitutional monarchy. The sovereign power is at present vested in the house of Hapsburg-Lorraine, whose descendants succeed by right of primo- geniture in the male line. By virtue of the Pragmatic Sanction, females may also reign in the event of there being no male successor. The king is the guardian of the laws, and the head of the army and of the executive. His power is limited by parliament, which con- sists of an upper and a lower house, and must be summoned yearly and elected triennially. The upper house comprises 407 members, viz., 8 princes of the reigning house, 31 Roman and Greek Catholic prelates, 11 standard-bearers, 57 lord-lieutenants of counties, 3 dukes, 219 counts, 81 barons, and 2 deputies for Croatia and Slavonia. The lower house, elected by the eligible tax-payers, consists of 446 members, of whom 408 represent Hungary Proper and Transylvania (including also Fiume), and 43 Croatia and Slavonia and the Military Frontier. The language used in the house is the Magyar, but the representatives of Croatia and Slavonia may use their native language. The executive is vested in a prest- dent of the cabinet and the following ministries :—court ; finance; interior; religion and education; justice; public works, agriculture,

industry, and commerce; honvéd (home-defence) ; and a ministry for Croatia and Slavonia. For matters relating to its special pro- vincial administration, Croatia and Slavonia has at Zagrab (Agram) its own government, at the head of which is the ban, who is nomi- nated by the king. The departments are three,—intenor and finance, religion and education, and justice. (For the relations of the kingdom of Hungary to the joint Austrian- Hungarian monarchy, and for the delegations, comparative reveune and ex- penditure, joint army, &c., see AUSTRIA, vol. iii. pp. 122, 128.)

The judicial power is independent of the administrative, tions of the minister of justice being to see that the laws are properly applied. The supreme courts of justice, as also those of second instance for Hungary Proper and Transylvania and Fiume, are at Budapest. There is also a secondary court of appeal at Maros-

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Vasarhely in Transylvania. The number of royal courts of justice in the mother country (including also Fiume) in 1877 was 66, and there were 375 circuit courts. Of the 23,033 criminals con- demned in 1877, 18,237 or 57°47 per cent. were completely illiterate, 1193 or 5°18 per cent. were able to read, 8314 or 36°10 per cent, could both read and write, and 289 or 1°25 per cent. were persons of superior education. As to the punishments awarded, 34 persons were condemned to death (of whom only 3 were exccuted), 13 were sentenced to prison with hard labour for life, 124 to

from 10 to 20 years' imprisonment, 272 to from 5 to 10 years, 3537 to from 1 to 5 years, and 19,058 to less than a year's imprisonment.

As regards the financial position of the kingdom, owing to the vast sums spent on state railways, the Fiume harbour works, and other large undertakings, the annual deficit rapidly increased until 1874, but from that date until 1878 it fell from about 33 to 21 million florins, the budget for the latter year giving a revenue of 219, 846,016 and an expenditure of 240,967, 435 florins.

The national colours are red, whitc, and green. The only order is that of St Stephen.

Crown and Arms of the Realm of St Stephen.

The shield contains four quarters :—1, azure, three leopards' heads crowned, or, for Dalmatia ;, 2, chequy, argent and gules, for Croatia ; 3, azure, on a fess wavy gules, cotised argent, a marten courant proper, in chief an estoile of six points or (Mars), for Slavonia; 4, coupé; the ehicf azure, a demi-eagle issuant Sable (/{ungarian nation), in chief [a sun or, and] moon argent (Szekler nation) ; the base or, seven towers (Siebenbiirgen) embattled four and three gules, over all a fesse gules, for Transylvania. In base enté, a double-headed eagle rising, contourné, for Fiwme, On an eseutcheon of pretenee, barry of eight, argent and gules, impaling, gules, on a triple mount vert, out of a crown or, a patriarehal eross argent, for Zfungary Proper; the bars argent representing emblematically the Danube, Theiss, Draye, and Save; the triple mount, the Tatra, Fatra, and Mdtra, The whole is surmounted in chief by the Hungarian erown, with two genii or angel supporters, The lower part of the crown is a cirelet inlaid with jewels and enamelled portraits, and heightened in the eentre by a figure of Christ in majesty forming the iniddle portion of the areh or upper part of the crown, which is sur- mounted by a slanting eross.

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The south-western portion of Hungary, as formed by the Danube, belonged to the Roman province of Pannonia ; the south-eastern portion, as formed by the Theiss (Ptol. iii. 8, § 4), to that of Dacia 3 the tract of country lying between these two rivers was inhabited by the Jazyges. As early as 274 a.p. Dacia was abandoned by the Romans to the Goths. In 376 the Huns crossed the Don, and, having overrun the intervening country, about 380 estab- lished themselves in Pannonia, where under Attila their Power was so vastly extended that in 432 the authority of the Romans entirely ceased. After the death of Attila (453) the greater part of the country fell into the hands of the Ostrogoths and Gepide. These yielded in their turn to the Longobardi, who in 526-548 gained possession of the whole of Panuonia. When the latter removed to Italy

in 568, the Avars entered, but they were reduced to subjec- tion by Charlemagne in 791-796.

The history of Hungary really begins with the appearance of the Magyars in Europe about the year 884. It is generally admitted that they were a branch of the Turanian stock, and descendants of the ancient Scythians ; certain affinities of language show them to be related to the Lapps, Esths, and Finns. They are believed to have wandered from the Ural mountains to the region of the middle Volga, and thence to have migrated westward over the Dnieper and the Bug. At the time of their crossing the Carpathians about 889, under the lead of Almos, they were divided into seven tribes, united by a compact which guaranteed justice and equality among their members. At the death of Almos in 889, the chiefs of the tribes elected his son Arpad successor. His followers overran the wholo of Hungary and Transylvania, extending their conquests beyond the ancient province of Pannonia. From the time of the conquest to the year 1000, Hungary was ruled by dukes, the regal title being first assumed by Vaik (Stephen). The following table gives the dates of accession of the Arpad dynasty, which ruled over Hungary for upwards of four centuries :-—

. Dukes. Ladislaus I., the Saint…. 1077 Arpad the Conqueror …... 889 | Coloman the Learned ….. 1095 Zottin erie SOE os 007) Stephen TW…....005 00. 1114 a BE 1131 Coc PRG 2 ee 1141 Vaik (afterwards Stephen 997 Stepleen ILE. 3. sccesdeceaccns 1161 J) Od et ee Ladislaus II. and Stephen 1162

- LY, (usurpets) ..... =

Kings. Stephen III. (again)..... 1162

Stephen I., the Saint…... BOE TEA IED sos sieescinBOGE) Bwierie os… occ ccsue, 1196 Ow SRE Yves cde boces 1041 | Ladislaus III..... 1204 Peter (again) .... 10@6 | Andyow TT. .....66.0… 1205 ee eS, er 1235 a rr Fs | Stephen V….....0..cccce0. 1270 OLOMM ONY 8s sole sss "assecenc 1063 | Ladislaus IV…..... 1272 GFE eee Suesdivgeonns sooese w07% | And¥ew IMl….....04…. 1290

The following ruled from the extinction of the native dynasty to the commencement of the Hapsburg period :—

Wenceslaus (usurper)..... 1301 | Uladislaus I. ..... 1442 Otho (usurper)..... 1805 | John Hunyady (Guber- 1446 Charles Robert (of Anjou) 1308 MEAILOM Wrersiste se, inioste isa oles

Louis 1., the Great …..... 1342 | Ladislaus V. (Posthum- 1453 Le Oe 1382 eee = 5 a ne 1385 | Matthias Hunyady (Cor- 1458 Maria and Sigismond …., 1386 ee

Albert of Austria…..... Bee? | Ulsdialowa ll. <.cc.ccsscsaeas 1490 Elizabeth ….. Be TOI BES aise esess:emminenicles 1516

Under Zolt4n and Taksony the Hungarians made various expeditions beyond the limits of their own country, spread- ing terror and devastation through Europe. They were ultimately checked, however, by the emperor Henry I, near Merseburg, in 933, and afterwards by Otho the Great at the Lech (955). These defeats caused the Hungarians to turn their attention to the consolidation of their power within their own territory. Geyza, who succeeded Taksony in 972, married a Christian princess, and also furthered the introduction of Christianity by entrusting the education of his son Vaik to Adalbert, bishop of Prague. On succeeding his father, Vaik applied for and received the title of "apostolic king" from the hands of Pope Sylvester IT., and was crowned in the year 1000 under the name of Stephen. This monarch, known as "St Stephen of Hungary," laid the foundation of many existing institutions. He sub- divided the land into counties, and provided it with an eccle- siastical organization, establishing bishoprics, and founding churches, chapels, convents, and schools. Having elevated the bishops to the highest posts of trust and power in the state, he forced the people to pay tithes to the clergy. He also created a national council, consisting of the lords temporal aud spiritual, and of the knights or lower nobility,

from which assembly the subsequent diets originated. Stephen dying in 1038, and leaving no heir, the queen Gisela contrived to gain the throne for her nephew Peter, but a portion of the nobles declared for Aba, who was of Arpadian blood. In the wars which ensued both princes perished, when Andrew I., who was nearly related to Stephen I., succeeded to the throne in 1047, but he was ultimately forced to yield it to his brother Béla I. The next

monarch's reign that offers anything worthy of notice is that of Ladislaus I., whose religious zeal gained him the appellation of " Saint," and who was distinguished on account of his conquest of Croatia (1089) and part of Galicia (1093), and for his victories over the Cumans (1086-89), the invaders of Transylvania and the neighbour- ing districts. His nephew Coloman, a brave and talented monarch, guarded the country against the depredations of the hosts of crusaders who passed through it during his reign. He also wrested Dalmatia from the Venetians (1102), and annexed it to the Hungarian kingdom. Coloman died in 1114, leaving the throne to his youthful son Stephen II., who soon entangled himself in, warfare with neighbouring princes. The reign of his successor Béla II. (1131-41), like that of the other kings of the 12th century, presents few features of interest. That of Andrew II. (1205-35) is celebrated on account of the 'Golden Bull," or Hungarian Magna Charta, ex- torted from the king by the nobles in the year 1222, after his return from a crusade forced upon him by the pope. The Golden Bull guaranteed that the states should be convoked annually, that no noble was to be arrested without being first tried and legally condemned, that the property of the nobility should be exempt from dues, that foreign service was to be rewarded, that appointments to the highest offices should be under the control of the diet. It also contained numerous other clauses granting certain freedoms, privileges, and exemp- tions to the nobility and the clergy, and included a proviso of the right of armed resistance to tyrannical measures on the part of the crown. This charter was duly sworn to by subsequent kings of Hungary, but the article relating to the right of appeal to arms was abrogated in 1687. A few years after the accession of Béla IV., son of Andrew II., the Tartars invaded and devastated the whole country, massacring great numbers of the population (1241-42). Béla did all in his power, by the introduction of German colonists, to retrieve the disasters inflicted by the invasion ; but his wars with Austria and Styria, and the revolts of his son Stephen, were prejudicial to the restoration of order. He, however, successfully repelled a second Tartar invasion in 1261. The reigns of the next two monarchs, Stephen V. (1270-72) and Ladislaus IV. (1272-90), are noticeable chiefly for the wars on behalf of Rudolf of Austria against Ottokar of Bohemia. Ladislaus is said to have been murdered in 1290 amidst violent commo- tions caused by his Cumanian amours, His successor Andrew III., the last king of the Arpad dynasty, after a short but disturbed reign, died in 1301, leaving no issue. On

the death of Andrew III. the royal dignity became an object of competition. One party elected Wenceslaus, son of the king of Bohemia and Poland (1301-5), and after him Otho of Bavaria (1305-8), both connected with the Arpadian house. Pope Boniface VIII. and the bishops successfully espoused the cause of Charles Robert of Anjou, nephew of the king of Naples, and related to the extinct dynasty through his mother, a daughter of Stephen V. Under Charles and his son Louis, which latter in 1370 succeeded Casimir III. on the throne of Poland, Hungary made great progress both at home and abroad. During the reign of Louis it became the most formidable state in Europe. Among many other territories he conquered |

Moldavia (1352) and Bulgaria (1365); he also greatly extended and developed the royal prerogatives in his own kingdom. Upon the death of Louis (1382), the states raised to the throne his daughter Maria, who, after the assassination of the pretender Charles II. (1386), reigned conjointly with her consort Sigismond of Brandenburg, son of the emperor Charles IV. In the early part of this reign the Turks under the sultan Bajazet infested some of the Hungarian provinces, and at length in 1396 utterly defeated Sigismond at Nicopolis, obliging him to fly the kingdom. During his absence a party headed by the palatine Gara raised the standard of rebellion, and upon his return deprived him of his liberty. Scarcely was he released when he met with a rival in Uladislaus, king of Poland, who had married Hedwig, second daughter of Louis, Elected emperor (1411), and afterwards king of Bohemia (1419), Sigismond, instead of providing for the safety of the country, employed his time in persecuting the Hussites. He ended his long and troublous reign 9th December 1437, and was succeeded by his son-in-law Albert, archduke of Austria.

The year 1439 witnessed the sudden death of Albert ; his widow, however, was soon delivered of a son, Ladislaus Posthumus. The states invited Uladislaus of Poland to the throne, and thus considerable dissensions existed until the death of the queen in 1442, when the party of Uladislaus secured his accession. At the commencement of his reign the Turks were several times defeated by John Hunyady (Corvinus), and they were at

length forced to conclude a truce for ten years. The Hungarians, having almost immediately bioken faith with the Turks, and taken the field against them, were completely routed at Varna on the 10th November 1444. In this battle Uladislaus met his end, whilst Hunyady escaped with a few followers. Amid the troubles which ensued the states proclaimed Hunyady "governor of Hungary" pending the absence of Ladislaus Posthumus, whom the emperor Frederick IL refused to deliver to the Hungarians to be acknowledged king. After the release and recognition! of Ladislaus in 1452, Hunyady resigned the office of governor, and was nominated generalissimo by the king.

After the fall of Constantinople in 1453, Mohammed II. made preparations for the conquest of Hungary, and in 1456 appeared before Belgrade with an army of 150,000 men. 'This force was, however, utterly routed on July 21, 1456, by the combined Hungarian, Italian, and Spanish troops, in all about 70,000 men, under the command of John Hunyady and the monk John Capistran. Soon after this victory, which resulted in the Turks raising the siege, Hunyady succumbed to dysentery aggravated by excessive fatigue, leaving behind him two sons, Ladislaus and Matthias. The former was executed by order of Ladislaus Posthumus, while the latter, after that monarch's death in November 1457, being supported by a strong party under the leadership of his uncle Michael Szilagyi, was elevated to the royal dignity on the 24th January 1458, under the title of Matthias I. The emperor Frederick, having disputed his right to the throne, and assumed the regal title himself, was forced by Matthias to surrender all claims to the Hungarian dominions, and to conclude a peace in July 1463. During the next few years Matthias was employed in reorganizing the military system and repelling the Turks. He after this turned his arms against Podiebrad, king of Bohemia (1468), ostensibly for tle purpose of defending the Catholics against the Hussites. Being victorious in these campaigns, Matthias in May 1469 caused himself to be proclaimed king of Bohemia and Moravia at Olmiitz. Meanwhile the Turks, taking advan-

1 He took the oath in 1453, but Frederick withheld the crown.

*John Zadpolya, being compelled to retire before the Haps- superior forces of Ferdinand, took refuge for a time in burg Poland, whence he sought the assistance of Soliman II. °7?*S*¥:*

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tage of the absence of the king, made incursions into the southern provinces of Hungary. This misfortune created a party against Matthias, who, having returned to Hungary

and restored order, marched against the Ottoman forces, and totally defeated them in a sanguinary battle on the plains of Kenyérmezé in Trausylvania (13th November 1479). After the death of Mohammed IL in 1481, Matthias renewed hostilities with tle emperor Frederick, and having taken Vienna (1485), made it the seat of his government. Matthias was not only an able and warlike monarch, but a patron of letters, and administered his kingdom with impartiality, subduing the rebellious nobles, and restoring order, law, arid prosperity.

At the death of Matthias, 6th April 1490, there were several pretenders to the throne, among them John Corvinus, a natural son of the late king, the emperor Frederick, and his son Maximilian. But the states disallowed their claims, and declared for Uladislaus of Bohemia, whose weak reign is marked chiefly by the insurrection of the peasantry in Transylvania, under Dézsa, which was suppressed with great bloodshed in 1514, as also for the collection made by Verbéczy of the common laws of the realm, entitled "Tripartitum Opus Juris Consuetudinarii Inclyti Regni Hungarie," which code was sanctioned by the king and the diet in 1514. Under this monarch and his son Louis IIJ., who succeeded him, the power of Hungary rapidly declined, and it was at length utterly overthrown by the Turks under Soliman the Magnificent. This power- ful ruler, having captured Belgrade and Peterwardein, advanced at the head of 200,000 men into the interior of the country, and annihilated the Hungarian army at the battle of Mohacs, 29th August 1526, In the carnage several prelates and the flower of the Hungarian nobility were destroyed, and Louis himself perished in his flight. The Ottomans, after pillaging Buda and spreading devasta- tion over the whole country, took their departure with many thousands of captives.

After the catastrophe at Mohdcs and death of Louis in 1526, a portion of the nobles declared for John Zapolya, waywode of Transylvania, who was accordingly crowned at Székesfehérvar (Stuhlweissenburg). Maria, the widow of Louis, immediately summoned a diet of the nobility of the western counties at Pozsony (Pressburg), who pronounced the election of Zapolya illegal, and proclaimed the queen's brother, Ferdinand of Austria, king of Hungary (16th December 1526). In the following August Ferdinand, having proceeded to Hungary, was again proclaimed king at Buda; he was afterwards crowned at Sz¢ékesfehérvar, 5th November 1527. With this monarch the Hapsburg period commences, the sovereign rulers of Austria after him succeeding to the title of the Hungarian crown. The following is a list of the kings of Hungary, and of the more prominent of the princes who ruled over Transylvania to the end of the 17th century :—

Hungary. INRAG IS UE ec scsi cae ances ne 1792 Ferdinand I. (rival John? 1526 Berdamigd V). .....0.00000 1835 PPONVE) ... 5 0000s0500s00% Francis Joseph (crowned 1848

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Transylvania,

Stepnen Bathori .. .. 1571 Stephen Bocskay …..... 1605 Gabriel Bathori …..... 1608 GabriellBethlen…..... 1613 George Rakéczy I. ..... 1631 Cit 05 1711 | George Rakéczy I1…..... 1648 Maria Theresa …..... he L740) John Kemeny <.....-----+— 1661 one ceeseeensees 1780 | Michael Apaffi I…..... 1661 (boos) |) i oe 1790 | Michael Apaffi II. 1690

1 The world-famed Bibliotheca Corvina is variously estimated to have contained from 5000 to 10,000 volumes, chiefly manuscripts, many of which were bought from Greek scholars who had fled from Constanti- nople, or had been copied in different parts of Italy.

The sultan listened to his request, and in 1529 conducted a large army into Hungary, took Buda by storm (3d Sep- tember), reinstated Zépolya, aud drove the Austrians before him to Vienna. Failing to take that city, Soliman in October retraced his steps, and after garrisoning Buda with Turkish

troops returned in triumph to Constantinople. After several years of desultory warfare between John and Ferdinand, their rival claims were ultimately settled by a treaty concluded at Nagyvarad (Grosswardein) on the 25th February 1538. By this treaty it was stipulated that John was to retain the title of king, together with Transyl- vania and the eastern portion of Hungary then in his possession, whilst Ferdinand was to hold the remainder, with the proviso that John's male descendants were to surrender all claims to the regal dignity. John having died on the 21st July 1540, his infant son Sigismond was crowned by the adherents of his father, and he was subsequently confirmed in his title to Transylvania by Soliman. This sultan, however, retained a great portion of Hungary in his own possession, and even placed a pasha as regent at Buda; he, moreover, compelled Ferdinand to pay him an annual tribute of 30,000 ducats. Ferdinand, having caused his son Maximilian to be crowned as his successor in 1563, died on the 25th July of the following year. When Maximilian succeeded to the throne, he found himself obliged to continue the war with the young Zapolya, whose cause was espoused by Soliman. In 1566 the sultan, advancing at the head of a large force, was arrested at the small fortress of Sziget by Nicholas Zrinyi, who with a garrison of 3000 men for four weeks heroically defied the whole power of the besiegers.? Soliman himself died shortly before the final assault on the citadel, which was overpowered only aftcr the destruc- tion of a large partof hisarmy. Inthe year 1570 Zapolya concluded peace with Maximilian, and on his death in the following year Stephen Bathori, with the consent of the sultan Selim, was elected prince of Transylvania. Maxi- milian, having in 1573 secured the succession of his son Rudolph to the throne of Hungary, died on the 12th October 1576.

By this time the Reformation had made considerable progress in Hungary, more especially among the higher classes, but with Rudolph the persecution of the Protestants commenced. In Transylvania, however, they met with a pro- tector in Stephen Bathori, from 1576 to 1586 distinguished as king of Poland. In 1604 the Protestants of Hungary, having raised the standard of freedom under Stephen Bocskay, defeated the generals of Rudolph in several engagements, and on the 23d June 1606 they forced him to conclude peace at Vienna, thus securing to themselves for a time their religious liberties. In 1608 Rudolph resigned the kingdom to his brother Matthias, who during his short reign showed great toleration towards the

adherents of the Reformed creeds. He died 20th March 1619, leaving the crown to his cousin Ferdinand II., the hero of the "Thirty Years' War." The accession of this monarch was signalized by the insurrection of the Protestants of Bohemia, and the renewal of persecutions in Hungary, fomented by the Jesuit prelate Peter Pazman. But the victories of the Transylvanian prince Bethlen Gabor (Gabriel Bethlen) over the imperialist troops forced Ferdinand to conclude the treaty of Nikolsburg, 31st December 1621. By this compact the privileges of the Protestants were declared inviolate,

2 In the Map Department of the British Museum there is a curions old print by H. van Schoel (1602), taken from an engraving by A. Lafrery (1566), which represents one of the Turkish attacks upon this fortress.

and Bethlen's claim to the principality of Transylvania and seven counties of Hungary Proper was established. The infringement of this treaty on the part of Ferdinand brought about a renewal of hostilities, which resulted in a second peace, concluded at Pozsony (Pressburg) in 1626. After the death of Bethlen in 1629, the Jesuits succeeded in gaining over several powerful families to the Roman Church, and the religious persecutions were renewed by Ferdinand III., who succeeded his father in 1637. The Transylvanians had elected George Rakéczy as their prince, who proclaimed himself the protector of Protestantism and of Hungarian liberty. Having drawn up a statement of grievances—those of the Protestants in particular—he laid the document before Ferdinand, who, however, paid no attention to it. Rdkéczy thereupon collected troops and gained several successes over the imperialists (1644), and in the next year formed a league with the Swedes. This coalition brought Ferdinand into desperate straits, and he therefore soon entered into a treaty of peace with Rakéczy at Linz (16th December 1645). By this treaty, confirmed at the diet held in 1647, RAkéczy was formally recognized as the legitimate prince of Transylvania. He died the year afterwards (1648), and was succeeded by his son George II. Rakéczy. The year 1657 witnessed the death of Ferdinand ITI., who was succeeded by his second son Leopold I.?

During the long reign of this monarch, so injurious to the cause of Hungarian liberty, Hungary was the theatre of intestine wars, insurrections, and the most tragic events. Shortly after his accession, Leopold became involved in war with the Turks, who had created Michael Apaffi prince of Transylvania in the place of his own partisan John Kemény. The Turks, although at first successful, were ultimately defeated by the imperialists at St Gotthard, lst August 1664. This victory enabled Leopold to conclude a hasty and disadvantageous peace at Vasvar (10th August) with the infidels, and to direct his whole energies against the Protestants. The irritation consequent upon this harsh treatment resulted in a conspiracy," which was organized by the Croatian ban Peter Zrinyi, Count Frangepan, Francis Rakéezy, and the chief justice Nddasdi, and had for its object the separation of Hungary from the house of Hapsburg. The plot having been discovered, the leaders were surprised, conveyed to Vienna, and, with the excep- tion of Rakdczy, executed (30th April 1671). Although an amnesty was proclaimed on the 6th of June of the same year, Leopold in February 1673 appointed a bigoted Catholic, John Caspar Ambringen, governor-general of the kingdom, and made every effort to extirpate the Protestant religion. The oppression becoming at last intolerable, the Protestants again rose in arms under Michael Teleki and Emeric Toékilyi (1678), and were subsequently supported by the grand vizier Kara Mustapha, who in 1683 marched straight to Vienna with a large force. The valour of Sobieski, king of Poland, delivered the city (12th Septem- ber 1683), and saved Austria from the threatened destruc- tion. In 1686 Buda was taken from the Turks by Charles of Lorraine, and these troublesome foes were at length driven out of most of the provinces and towns of Hungary where they had been settled for about a century and a half. The glory of these achievements was, however, tarnished by the emperor's revengeful treatment of the Hungarians, hundreds of whom, on suspicion of com- plicity with the enemy, were put to death upon the scaffold erected in the market-place of Eperies by order of General Caraffa, which remained standing from March

1 The elder son of Ferdinand ITI., who in 1647 had been designated Ferdinand IV., died in 1654. 7 Known as " Palatine Wesselényi's Plot." The palatine, however, died in 1667, prior to the failure of the movement,

1687 till the end of the year. Leopold at length granted a general amnesty, but obliged the diet to declare the throne hereditary in the house of Austria, and to abrogate the clause of the Golden Bull which allowed the right of armed resistance to tyranny (31st October 1687). The victories of Prince Eugene, which completed the conquests over the Turks, resulted in the peace of Carlowitz, January 26, 1699, by which the Porte abandoned Hungary and Transylvania to the emperor. On the 5th May 1705 Leopold died, and was succeeded by his eldest son Joseph I. In the year 1703 Francis Rakdéczy II. headed a new revolution, which lasted till May 1711, when peace was concluded at Szatmdr by Karoly, the chief of the Hungarian generals, The emperor Joseph J. died on the 17th April of the same year, and was succeeded by his brother the archduke Charles. From this time until 1848 no open rupture occurred between Hungary and her Hapsburg rulers.

By the treaty of Passarowitz, concluded 21st July 1718, Temesvar, the last of the Turkish possessions, reverted to Hungary. In 1722 Charles received the adhesion of the diet to the Pragmatic Sanction, which secured the right of succession to the throne in the female line. At the insti- gation of Russia hostilities were renewed against the Turks, but Prince Eugene being now dead, and no other leader of equal ability appearing in his place, the Austrians were subjected to a series of disgraceful defeats. These misfor- tunes were consummated by the humiliating treaty of Belgrade (18th September 1739), in accordance with which the emperor was forced to cede the fortress of Belgrade, with Servia and Austrian Wallachia. On the 20th October of the following year Charles died, leaving the throne to his daughter Maria Theresa. Her claims to the imperial dignity were almost immediately called in question by Prussia, Saxony, France, and Bavaria, and her hereditary dominions were invaded by hostile troops. Maria in despair fled to Pozsony (Pressburg), and summoned the Hungarian diet. Appearing before that assembly on the 11th September 1741, with her infant son Joseph in her arms, she appealed in Latin to the magnanimity and loyal spirit of the nobles. The result of her address 'was the unani- mous declaration on their part: " Moriamur pro 'rege nostro' Maria Theresa." Nor was this an empty burst of enthusiasm, for the "insurrectio" or general

rise of the nation was proclaimed, and a large army collected, and Hungarian blood was profusely shed in support of her cause. Maria repaid the devotion of her subjects by the zeal which she showed for their welfare, and the salutary changes which she effected in the country. Trausylvania was raised into a grand principality (1765), and the town and district of Fiume declared a corpus separatum of the Hungarian crown (23d April 1779). Maria Theresa also created an Hungarian guard, established several schools, and enlarged the university at Nagyszombat (Tyrnau), which in 1777 was transferred to Buda, and seven years later to Pest. But her efforts to ameliorate the condition of the peasantry, and the reforms which she introduced under the name of the Urburium (1765), which deter mined the rights of the tenant serfs in relation to the landowners, are among the chief merits of her reign. She died on the 29th November 1780, and was succeeded by her son Joseph II.

This philosophic monarch was wholly carried away by his zeal for reforms, which were both subversive of the constitution and opposed to the will of the nation. He refused to be crowned in Hungary, and thus avoided the obligations of the usual coronation oath. In defiance of ancient custom he carried the crown of St Stephen to Vienna, dispensed altogether with the use of diets, and governed the country autocratically by decrees. He issued

a general edict of toleration in religious matters (October 1781), but forced upon the people heavy taxes and foreign officials; he moreover enjoined the exclusive use of the German language in the schools, courts of justice, and public administration. The general discontent at these measures was heightened by the unfavourable issue of the war against Turkey ; and Joseph, shortly before his death (1790), found himself compelled to revoke nearly all his edicts, and promise redress to his irritated subjects, His brother and successor, Leopold II., appeased the Hungarians by more definitely confirming the rights and liberties of the nation than any of his predecessors. After a reign of only two years Leopold died, and was succeeded by his eldest sou Francis I. (1792). This monarch duly swore to maintain the laws and constitution of Hungary, but his efforts were eventually directed wholly against them. During the continuance of his war

with France he repeatedly convoked the states, only, however, for the purpose of obtaining supplies of men and money to carry on the struggle. 'Through the whole of this crisis the Hungarians faithfully supported the Austrian cause, and disdainfully rejected the offers of Napoleon in his pro- clamation of the 15th May 1809, calling upon them to rise for national independence. But at the end of the great war the Hungarian nation received little gratitude for its devotion. Francis for several years discontinued the hold- ing of the diet, and acted in direct violation of the consti- tution by levying troops and increasing the taxation to more than double. The opposition which these arbitrary measures provoked in the counties at length obliged him in 1825 to convene the states, and thus appease the wide- spread dissatisfaction.

To the holding of this diet, in which Count Stephen Széchenyi initiated the use of the Magyar instead of the accustomed Latin tongue, may be traced not only a reaction in favour of the native language, but also the commence- ment of the reform movement. The spirit of nationality was fully aroused, and liberal sentiments were diffused over the whole kingdom, notwithstanding the active opposition of the Viennese court influenced by Metternich, in the reigns of both Francis and his successor Ferdinand (1835). The diets of 1832, 1839, and 1843 passed several measures of reform, amongst which the most important were those demanding the official use of the Magyar language, the equality of the various Christian confessions, and the rights of the peasantry and of the non-ennobled citizens. Amongst the leaders of the liberal party the magnates were Count Louis Batthydnyi and Barons Nicholas Wesselényi and Joseph Eétvés, and the deputies Dedk, Klauzal, Fay, Beéthy, Balogh, Szemere, and Louis Kossuth. In the hope of intimidating the advanced liberals, the Viennese court in 1839 imprisoned Wesselényi and Kossuth, but they were released in 1840 owing to the amnesty then pro- claimed for political offenders. 'The publication of the Pesti Hirlap (Pest Gazette) was commenced in 1841 by Kossuth as the organ of the liberal party. This paper, the leading articles of which were written in a spirit directly opposed to the policy of the Government, gained an im- mense circulation, and considerably influenced the public mind, A pamphlet styled A Kelet Népe (The People of the East), written by Széchenyi in order to counteract the schemes of Kossuth, only served to add to the importance of the Pest? Hirlap. The conservative

journal Vildég (Light) was conducted by Count Aurél Dessewffy, who from 1833 until his death in 1842 was the leader of the conservative party.

ee iin intellectual and material improvement made rapid progress, especially in the Hungarian capital. Numerous works, literary and political, were published, the former due to the

encouragement offered by the Hungarian academy and the Kis- faludy society, the latter the outcome of the great political cx-

citement prevailing throughout the country. Clubs really if not avowedly political were established in most of the principal towns. Steam navigation of the Danube, the Budapest suspension bridge (commenced May 1840), and other improvements of the means of internal communication, which had received their first impulse from Count Széchenyi, were rapidly proceeded with. In order to encourage native trade and industry, long obstructed by toll and custom duties, Kossuth called into existence ~~the Védegylet (Pro~~ tection Union), the members of which pledged themselves to abstain from the use of Austrian manufactures until the tariff should be reformed. This association soon overspread the country, and affected Austrian trade so seriously that some manufacturers had to transport their factories into Hungary in order to save theni- selves from ruin. The establishment of this association, the liberal measures of the late diets, and the unanimity of national fcel- ing in Hungary Proper and Transylvania embarrassed the Govern- ment of Vienna, which could reckon only on the support of the Conservatives, whose numbers and moral influence were compara- tively small. Metternich therefore determined to annihilate the municipal independence of the counties, in whose assemblies lay the real strength of the Liberals, by the appointment of 'admin- istrators" paid by the court to fill the places of all absent lord- licutenants. This measure raised the political excitement of the nation to the highest pitch. The Liberals were soon divided into two parties, the so-called "municipalists," with Kossuth at their head, who urged the reaffirmation of the county institutions, and the "centralists," led by Szalay and Eétvés, who insisted upon the nomination*

of a responsible ministry. On the approach of the clections for the diet of 1847 these two partics agreed upon a common course of action. In November the diet was summoncd, when Kossuth appeared as a candidate for the county of Pest, and after a warm contest was elected. On the 12th November the diet was opened at Pozsony (Pressburg) by Ferdinand V. in person, who by addressing the assembled states in the Magyar language instcad of Latin produced a very favourable impression. The first act of the diet was the unanimous election of a successor to the late palatine Joseph in the person of his son the archduke Stephen. Thus far all was well, but the address to the throne containing clauses, inserted by Kossuth's party, deprecatory of unconsti- tutional measures by the Government, after passing the lower was rejected by the upper house, by which means the royal speech was practically ignored. At the commencement of the year 1848 an Act was carried through both houses, ordaining the exclusive use of the Magyar language in all branches of the administration, in legal documents, and in the schools and colleges. Certain pro- 'visions were, however, madc respecting Croatia and Slavonia.

Upon the news of the French revolution the diet was power- Events. fully impressed, and the Liberals assumed a more determined atti- of 1848,

tude. On the proposal of Kossuth it was unanimously resolved to send a deputation to Vienna demanding from the Government a responsible ministry, the abolition of all feudal burdens, the equalization of taxes, the extension of the franchise, freedom of the press, complete religious toleration, and several other mcasures of reform. On the 16th of March the address was presented to Fer- dinand, who, by reason of the troubled state of his Italian pro- vinces and the revolutionary aspect of Vienna, was compelled to yield his assent. The palatine archduke Stephen was nominated viceroy in Hungary, and Count Louis Batthyanyi entrusted with the formation of a ministry. The irritation of the Viennese Government at this enforced compliance with the Hungarian demands was increased by the choice of Kossuth as minister of finance. On the 11th April Ferdinand repaired to Pozsony (Pressburg), and the diet was closed with a Magyar speech from the throne.

But the Austrian Government, although compelled to abandon for the present its position of open and direct hostility to the national will of the Hungarians, was determined by other means to prevent the new reforms from being carried out. The plan adopted was that of secretly encouraging the southern non-Magyar nation- alities to assert their independence, and oppose by force of arms the consolidation of the new constitution. Croatia and Slavonia and the Banat refused to submit to the Hungarian rule, and demanded separate rights and autonomous administration ; while in Transylvania, the diet of which had proclaimed its reunion with Hungary Proper, the Wallachs and Saxons rose in arms against the Magyars. The whole of the south and south-west of the country was soon in a state of revolt, and a war of races was carried on

with indescribable fury. Representations to the court of Vienna

remained virtually unheeded, the emperor contenting himself with hypocritical proclamations against the rebels, and with placing at the disposal of the Hungarian ministry a few regiments of soldiers, whose officers were disaffected to the Hungarian cause.

It now became evident that the Hungarians, in order to retain their national existence, must rely entirely upon their own re- sources, and make an immediate and vigorous effort, more es- pecially as Jellachich, the newly-appointed ban of Croatia, was making preparations to march upon Pest. Ferdinand, who sti!

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professed his determination to defend the integrity of the Hun- garian monarehy, convoked the diet for the 5th of July, when it was opened by the palatine Stephen, as viceroy. At the sugges- tion of Kossuth a levy of 200,000 men and ample supplies for the purposes of national defenee were

unanimously voted ; but to thesc measures Ferdinand withheld his assent. On the 6th of September a deputation of a hundred members arrived at Vienna in order to urge upon the emperor the necessity of taking immediate and decisive steps to oppose the Croatian invasion. On the 9th of September they were admitted to an audience, but, receiving only an evasive answer, they straightway returned to Pest. The abor- tive result of the deputation, and an official report that Jellachich had crossed the Drave, were announeed to the diet on the 11th September, and brought matters to a crisis. A few days later the palatine archduke Stephen, who at the demand of the diet had set out for the camp, but failed in his efforts at mediation, fled to Austria. The emperor thereupon nominated Count Lamberg royal commissioner and conimander-in-chief of all the military forces in Hungary (September 25), but the dict pronounced his appointment illegal and invalid, and he was murdered on the Budapest bridge of boats by the infuriated populace (September 28). The Batthydnyi ministry now resigned, and a committee of national dcfence was formed under the presideney of Kossuth. On the 29th September, Jellachich, who had advanced to within 25 miles of Buda, was defeated at Veleneze, whence he fled towards Vienna during a three days' armistice that was granted to him by General Moga. Ferdinand now declared openly against the Hungarians, annulled the decrees of the diet, and nominated Jellachich generalissimo of the forces to be employed for the reduction of Hungary. While the Austrian Government, still further exas- perated at the march of a Hungarian force to Schwechat (30th October), was preparing for a general invasion, the Hungarian diet hastily equipped a large army to resist it. In the meantime a new Austrian ministry was formed at Vienna, and on the 2d December Ferdinand was induced to resign the imperial throne. He was sueceeded by his nephew arehduke Francis Joseph, son of Francis Charles, the heir-apparent, who refused to aecept the erown. The Hungarian diet, however, protested against this dynastie change as uneonstitutional.

On the 15th of December the main body of the Austrian army under Prince Windischgritz began to cross the western frontier of Hungary near Bruck on the Leitha, while the Hungarian army of the Upper Danube, commanded by Gorgei, who had succeeded Moga, retreated in the direction of Moson (Wieselburg). On the 18th December the second Austrian army corps oeeupied Pozsony (Pressburg), which the Hungarian troops had evaeuated,

and upon the same day Jellachich, who commanded the first army eorps, oeeu- pied Moson, compelling Gorgei to withdraw towards Gyor (Raab), Upon the oecupation of this town by the Austrians, on the 27th December, Gorgei removed to Babolna, where he hoped to effect a junction with Perezel, who had been ordered to reinforee him. But Perczel being overtaken and defeated at Méor on the 29th December by the troops of the ban, was obliged to beat a hasty retreat towards Sz¢kesfehérvar (Stuhlweissenburg). These reverses having rendered Budapest insecure, the diet and the committee of national defence on the 1st January 1849 transferred their seat to Debreczen, and on the night of the 4th and 5th the Hungarian troops marched out of the capital, which on the following day was taken possession of by Windischgratz. Perczel, who had gathered together the remains of his corps at Budapest, followed the Government by way of Szolnok, while Gorgei made a flank movement to the north, and led his corps by a circuitous route through the Carpathians to join the army on the Theiss. Windisehgritz, mindful of Schwechat, and, regard- ing the Hungarians as rebels, had refused to listen to a deputation headed by Count Batthydnyi making proposals of peace, and Batthyanyi himself was arrested. While the Austrian generals were making this rapid progress in Hungary Proper, the Polish general Bem had succeeded in organizing a large force in Transyl- vania, by means of whieh he reduced the refraetory Wallachs +o subjeetion, and drove the Austrians out of the principality, which had been foreed to submit to General Puehner.

In the diet now held at Debreczen Kossuth declared that the nation was on the verge of destruetion, and eould only be saved by extraordinary measures. But the inactivity of Windisehgritz, who, instead of hastening onwards to the Theiss, remained for several weeks at Pest, gave the committec of national defence time to con- eentrate its forces, procure war material, and make other provisions for a determined resistance. On the 12th of February Gorgei arrived at Kassa (Kaschan), and the two Hungarian armies conld now act in coneert. Meanwhile the national eause made little pro- gress in the south, a great portion of which was in the hands of the enemy. On the 14th February the fortress of Eszék in Slavonia was lost to the Hungarians ; that of Lipdtvar (Leopoldstadt) in the north had already fallen on the 2d of the same month.

At length the main body of the Austrians under Windischgratz advanced, and attaeked the Hungarians under the Polish general Dembinski on the 26th and 27th February at Kapolna. The

battle, though obstinately contested, proved indecisive, and tho Hungarians were obliged to retire beyond the Theiss in order to recruit their forces. A few days later, however, an Hungarian corps, withdrawn from the lower Danube, and commanded by Damjanics, routed the Austrians under Grammont at Szolnok (5th Mareh). Meanwhile the Russians, eoming to the aid of the Austrians, had penetrated into Transylvania and occupied Nagysze- ben (Hermannstadt) and Brassé (Kronstadt), but the Hungarians under Bem regained these fortresses on the 11th and 20th Mareh, and drove the Russians into Wallachia.

By the middle of Mareh an army of 120,000 men, provided with excellent generals and ample artillery, was concentrated on the Theiss. Towards the end of the month the Hungarians crossed the river at various points, and advanced on the road to Pest, under the command of Gorgei, Damjanies, Aulich, Klapka, and others,— Guyon having been nominated to the eommandership of Komarom (Komorn), the relief of which was the ultimate objeet of the cam- paign. The leadership of the Hungarian forces had meanwhile passed from Dembinski to Vetter, on aeeount of whose ill-health it was provisionally transferred on the 31st March to Gorgei. From this time the Austrians had to endure a rapid suecession of defeats, —at Hatvan (April 2), Tapid-Bieske (April 4), Isaszeg (April 6), Gédollo (April 7), and Vaez or Waitzen (April 10). In consequence of these reverses Windischgratz was recalled, and the chief com- mand of the Austrian troops was given to Baron Welden (April 12). In order to prevent the relief of Komdrom, Welden opposed the advance of Gorgei with a force under Wohlgemuth, ani was, however, defeated by Damjanics on the 19th April at N agy-Sarld, so that on the 22d the relief of the fortress of Komarom was effected upon the left bank of the Danube, Guyon having previously succeeded in passing through the hostile lines. The subsequent rout of the besieging forces at Uj-Szony on the 26th April completed the diseomfiture of the Austrians, and foreed them

to fly to the frontier. The ban Jellachiech meanwhile retreated to Croatia, and nearly the whole country was onee more in the hands of the Hungarians.

In the midst of these vietories Kossuth proposed in the diet at Debreezen the dethronement of the Hapsburg dynasty, and upon the 14th April an act to that effect was almost unanimously passed, although afterwards unfavourably received by Gorgei anda large portion of the army. The chief provocation to the passing of this extreme and, as it eventually proved, unfortunate measure was the promulgation of the new constitution on the 4th March by the emperor Francis Joseph, which made a tabula rasa of all the time- honoured laws, rights, and privileges of Hungary. The substance of the declaration of independence was as follows: " That the house of Hapsburg, having violated the integrity of the kingdom, treacher- ously levied war against the nation, and called in the aid of a foreign power to accomplish its aims, has trampled under foot all the treaties that united it to Hungary, and is therefore declared for ever excluded from the Hungarian throne." The form of government was to be settled afterwards by the dict, but in the meantime Kossuth was nominated governor, the eommittee of national defenee was dissolved, and a new responsible ministry formed under the presideney of Szemere.

It is generally admitted that, had the Hungarians followed up their victories by an immediate march upon Vienna, they would have been able to force the Austrian Government to terms, and thus have warded off the Russian invasion, the preparations for which were now being condueted upon an enormous scale. Instead, how- ever, of acting on the offensive across the Austrian frontier, the Hungarian eommander-in-ehief, Gorgei, after a few days delay at Komarom, made a retrograde movement towards the Hungarian eapital. On the 4th May he arrived before Buda, which was still in the possession of the Austrians, but it was in vain that he sum- moned the commander Hentzi to surrender. On the 15th began the regular bombardment of the fortress, and on the 21st it was taken by assault. On the 5th of June Kossuth made his entry into Pest, and the diet having adjourned its sittings at Debreczen, the Government returned to the capital. Every preparation was now set on foot for a desperate defence against the eombined armies of Russia and Austria, whieh by the middle of the month

had eom- pleted their arrangements, and had begun to invade the eountry at various points. Prince Paskewitch advanced from Galicia at the head of the main body of the Russian army, consisting of over 100,000 men, while Haynau crossed the western frontier with an Austrian force of 60,000, supported by a Russian division of 12,000 under Paniutin. On the Drave and the Styrian frontier Nugent commanded 12,000, and near Eszék was Jellaehich with 25,000 men. In Transylvania the combined Austrian and Russian forees under Puehner and Liiders amounted to 60,000; so that, including the garrisons of the fortresses in their hands, the allied forees were in all not less than 275,000 men with 600 guns. The whole available forees of Hungary did not amount to more than half this number, the army of the Upper Danube under Gorgei being 50,000, that of Perezel and Véesey in the south 30,000, the army of the north under Dembinski 12,000 ; while there were about 32,000 men under

Bem in Transylvania, and a few thousands under Kazinezy in the county of Maramaros. On the 19th of June the Russian corps under Liiders burst through the Red Tower Pass into Transylvania, and, having defeated the Hungarians, took the fortress of N agy-Szeben, whilst in the following month Brassé in like manner surrendered to the Austrians. at Hegyes, and forced to retire from the Bacska. In the meantime Haynau's operations on the Danube met with general success, while the Russian main army advanced over Eperies and Kassa into the interior of the country. These disasters to the Hungarian cause were aggravated by the want of unanimity between the Hungarian commander-in-chief and the Government, which, being again obliged to leave Pest, transferred its seat to Szeged (July 11). After varions sanguinary engagements with the invading forces in the vicinity of Komarom, Gorgei on the night of the 12th J uly left the fortress under the charge of Klapka. On the 15th and 17th Gorgei encountered the Russians at Vacz, and procecded thence over Vad- kert, Losonez, and Rimaszombat, where on the 21st the Russian offers of truce were refused. Gdrgei, closcly followed, finally crossed the Theiss on the 28th July near Tokay, whence he proceeded in the direction of Nagyvarad (Grosswardein) by routes to the cast of Debreczen. There on the 2d August his first army corps under Nagy Sandor was defeated by the troops of Paskewitch. The

Government had meanwhile removed to Arad, which fortress, having previously surrendered to the Hungarians, was made the last point of general concentration. In Transylvania the army of Bem had been overpowered on the 31st July at Segesvar (Schassburg) ; and in Hungary Proper Dembinski retreated first to Szeged and Széreg, whence he was repulsed on the 5th August by Haynau, and afterwards to Temesvar. There on the 9th he sutfercd an overwhelm- ing defeat. Upon the news of this catastrophe reaching Arad on the night of the 10th to 11th, Gorgei, who had already arrived there on the 9th by foreed marehes from Nagyvarad, induced Kossuth and the few ministers who were with him to lay down their authority, and upon the 11th received from them the supreme civil and military command. On the evening of the same day, after the departure of Kossuth for Lugos, the new dictator, believing further resistance hopeless, communicated with the Russian general Riidiger, offering to surrender at discretion. The sally of Klapka from Komarom, and his signal victory over the besieging Austrian army (August 3), were unknown at Arad. On August 13 Gorgei surrendered his army, consisting of some 24,000 men with 140 guns, to Riidiger at Széllés near Vilagos; on the 16th Kazinezy followed with his troops, and on the 17th Damjanics gave up the fortress of Arad, and on the 5th September a similar fate befell Peterwardcin,

A few thousand men followed Bem and Guyon to Turkey, whither Kossuth and the late ministers Szemere, Casimir Batthydnyi, and Mészaros, and the military leaders Dembinski, Vetter, Perezel, Kmetty, and Wysocki also eseaped. On the 2d to 5th October Komarom capitulated on honourable terms, General Klapka having refused to surrender until an amnesty and free passports had been granted by the Austrians. On the 6th October Aulich, Damjanics, Dessewfly, Kiss, Knézich, Lahner, Lazar, Leiningen, Nagy- Sandor, Péltenberg, Sehweidel, Térdk, and Vécsey met their end at Arad. On the same day Count Louis Batthyanyi, and subse- quently Prince Woronieczki, Baron Jeszenak, Csanyi, Perényi, and others suffered at Pest. By a deeree of Haynau, to whom the Russiaus had delivered up the prisoners of war, all officers below the rank of a general, if not consigned to prison, were pressed as privates into the Austrian service. The Hungarian commander-in- chief Gérgei, however, was pardoned, and interned at Klagenfurt in Carinthia.

Hungary now lay entirely prostrate, and was treated as a con- quered country. The Russians retreated to the north and cast, leaving the Austrians with their commander Haynau, who availed himself of the siege to inflict the greatest cruelties on the vanquished people. Many of the Hungarian nobility were condemned to long terms of imprisonment ; the estates of the richer patriots were confiscated ; and numerous Austrian and Bohemian officials were thrust upon the exhausted country. A rigorous censorship of the press was at the same time enforced. At length, in July 1850, Haynau was temoved from the chief authority. A milder régime was in- augurated by the archduke Albrecht, who arrived at Pest on the 14th October 1851 as the new civil and military governor. But it was only after the visit of the emperor to Hungary (5th June to 14th August 1852) that the military courts were closed. The whole country, now reduced to a province of the Austrian empire, was placed under the direct control of the central Government at Vienna. On the 1st May 1853 the new organization was earried into effect, and the Austrian civil code made applicable to Hungary. On the 8th September the Hungarian insignia of royalty, which had disappeared from Arad at the time of Kossuth's flight, were diseovered in the neighbourhood of Orsova ; they were conveyed on the 19th to Vienna, but were afterwards transferred to Buda. On the 17th April 1854 the state of siege was abolished, and on the 12th July 1856 an amnesty was proclaimed. On the 4th May of

Jellachich was, however, defeated on the 14th J uly |.

summary powers conferred on him by the state of

the following year the emperor visited Hungary, and on the 9th of the same month granted the restoration of their confiscated estates to late politieal offenders. In August he eommeneed a seeond progress through his Hungarian dominions, and availed himself of the oppor- tunity to express his sentiments of consideration for the people. Indeed, from this time (1857) both the emperor and the Govern- ment of Vienna seemed desirous of making the Hungarians forget the troubles of 1848 and 1849 by concessions

to the national will, whilst the encouragement given to improvements in the means of com- munication, and to the new projects for the regulation of the Theiss, as also the sehemes for the colonization of sparsely populated dis- tricts, are well worthy of notice. During the year the railways from Szeged to Temesvaér and from Szolnok to Debreezen were opened, By an imperial deeree issued at the end of 1858 agri- cultural colonists, if of one nationality and erecd, were allowed to settle in various parts of Hungary, with special exemptions from taxation. By a ministerial order of the 8th August 1859 the language used in the higher schools was for the future to be re- gulated according to circumstances of nationality, the predomi- nanee of German being thereby abolished. On the 21st of the same month the absolutist minister Bach was dismissed, in consequence of the ill- success of the Italian war, whieh was attributed to his ill- advised policy against the various nationalities of the realm. The so-called ' Protestant patent" of September Ist, which ostensibly granted the communes the free administration of their own educa- tional and religious matters, was, however, the cause of mucli dissatisfaction, and more than 2,800,000 Protestants petitioned for its withdrawal. In April 1860 the arehduke Albrecht was at lis ow desire removed from the civil and inilitary governorship of Hungary, and the master of the ordnanee, Benedek, a native Magyar, was appointed in his stead. The Hungarian members in the Reichsrath , specially summoned for the purpose of finding a definite form of settlement for the whole empire, now pnt forward claiins for the autonomy of their country, and by an imperial diploma of the 20th Oetober their wishes were partly met. Benedek was removed from the general governorship of the kingdom, whilst the Hungarian court chancellery was restored, and Baron Vay nominated chan- cellor. At the same time the ewria regia (supreme court of judi- cature) and the county assemblies were reinstituted, and thie Magyar recognized as the official language. Furthermore, the emperor on the 27th December granted the reannexation of the Temesvar Banat to Hungary Proper. In the following February it was decreed that their former constitutions shonld be restored to Hungary, Transylvania, and Croatia and Slavonia, and on the 6th of April the diet met at Buda, afterwards removing to Pest. But as the address sent to Vienna in June demanded the fullest autonomy for Hungary, and the Hungarians refused to yield their claims, in spite of the emperor's declared inability to aceede, the diet was dissolved by imperial decree on the 22d August. Mcan-*

while a new Hungarian court chancellor had been appointed in the person of Connt Forgach. Stringent measures were taken by the Government of Vienna to counteract the organized passive resist- ance of the counties, aud in many places the payment of the taxes was enforced by military aid. On the 27th October the holding of all public county meetings was forbidden, and administrators or coadjutors were in many counties thrust upon the lord-lieutenants, who were foreed to submit to the authority of the newly-appointed Government superintendent Count Palffy de Erdéd. On the 18th November 1862 a general amnesty was granted to those who were implicated by their hostility to the late Government measures. In the summer of 1868 Hungary suffered from a severe famine, but the Reichsrath voted 20 million florins to alleviate the dis- tress. On the 22d April 1864 Count Forgéeh was replaced by Count Arminius Zichy, who, on account of his unpopularity, was on the 26th June 1865 removed for Count George Majlath, a Conservative. In a visit to Budapest on the 6th to 9th June 1865, the emperor declared his willingness to do justice to the con- stitutional demands of the Hungarians, as far as was consistent with the integrity of the empire. On the 18th July Count Palify de Erdéd was replaced by Baron Sennyey, one of the leaders of the old Conservative party. On the 14th Deeember the diet was opened by the emperor in person, who assented to the prineiple of self-government for Hungary, and agreed to reeognize the Pragmatic Sanction as the basis of a settlement of the questions involved. The diet, however, demanded also an acknowledgment of the con- tinuity of the constitutional rights of 1848. After the outbreak of the war between Austria and Prussia the diet was prorogued (26th June 1866), Upon its reopening on the 19th November an imperial rescript was readin which the emperor aequiesced in the Hungarian demands for constitutional self-government, and promised to ap- point a responsible ministry. The result of the " compromise" effeeted by Baron Beust between the Austrian Government and the committee, headed by Deak, empowered by the Hungarian diet, was the dualistic system of the Austrian-Hungarian monarehy, as finally sanctioned on the 18th February 1867. This arrangement secured to Hungary the restoration of the constitutional, legal, and administrative autonomy of 1848, while the supreme command

and direction of the army were assigned to the emperor-king. A responsible ministry, including Barons Wenckheim and Eotvos, Count Miké, Melchior Lényay, and others, was formed on the 20th February 1867, under the presidency of Count Audrassy. On the 8th of the following June the emperor and empress were crowned king and queen of Hungary at Budapest, and a complete pardon was proclaimed to all political offenders both at home and abroad.

The reconciliation of the Magyars with the Hapsburg dyuasty being thus complete, both parties sought to throw a veil over the past by mutual concessions. Transylvania was incorporated with Hungary Proper, and a joint commercial contract was entered upon between Hungary and Austria. In like manner foreign affairs and joint finance were assigned to '"'common ministries." On the 8th of August 1868 the Hungarian house of representatives accepted the dual Government military scheme, by which the standing army remained under the direction of the imperial ministry of war. The Honvéd (home defence) army obtained its own special organization and commander-in-chief. The long-existing misunderstanding be- tween Hungary and Croatia was at length settled by the agreement concluded in September, which placed the relations of Croatia to the Hungarian crown on a more equable footing than hitherto. After the passing of various othcr measures of reform, including the emancipation of the Jews, a compulsory education act, and a special act (November 29) for the consolidation of all nationalities under the crown of St Stephen, the session of the Hungarian diet was closed on the 10th December 1868. In the elections for the next session (1869-72) the Dedk party, which had taken the lead in the previous dict, were returned by a large majority, aud in the new diet, opened April 23, 1869, the policy of concilia- tion still prevailed. The ministry from time to time underwent certain modifications, owing to the death of Baron Estvos, the minister of education (February 1871), the appointment of Count Lényay (May 1870) to the imperial ministry of finance, and his subsequent noniination to the presidency of the Hungarian council in the place of Count Andrassy, who in November 1871 succeeded Beust as foreign minister of Austria-Hungary. Meanwhile the finances of Hungary were becoming rapidly embarrassed owing to the repeated contraction since 1867 of enormous loans for state railways and costly publie works. The elections of 1872 were, however, again favourable to the

Dedk faction. At the end of November Lényay retired from the presidency of the ministry, and on the 1st December was succeeded by Szlavy, who in March 1878 obtained the consent of the diet to some additional taxes. In August the Military Frontier districts were placed under civil jurisdiction, the eastern portion or,the Servian-Banat frontier being incorporated with Hungary Proper. The new cabinet was not more fortunate than that which had preceded it in a solution of the financial question, and in March 1874 made room for a coalition ministry under Bitté, with Ghyezy as finance minister. Upon its resignation in February 1875, in consequence of the refusal of the house to grant further taxation, a strong liberal combination was formed by Tisza from members of the left and of the former Deak party. The new ministry, under the presidency of Wenckheim (3d March), was supported by an overwhelming majority in the elections for the new session (1875-78). On the 16th October Tisza, minister of the interior, was nominated president, and the financial difficulty was met by an advance in the income tax, and afresh loan. The death of Deak on the 29th January 1876 cast a gloom over the whole country. For some time previously he had withdrawn from the field of politics, where less moderate but more distinctly Magyarizing tendencies now prevailed. By its resolutions of the 24th and 27th March 1876 the diet deprived of their former privileges the so-called "Saxon" sees and districts in Transylvania. From these new counties were formed on the system adopted for the rest of Hungary, and were placed under tle general administra. tion. The number of royal free towns in Hungary was, morcover, much reduced, especially in the Transylvanian circle. The insur. rectionary state of the Slavic provinces of Turkey excited the apprehensions of the Magyars with regard to the Slav races of southern Hungary, and aroused a strong feeling of sympathy for the Porte. This was still further increased by the attitude of Russia, and the cordiality towards the Magyars evinced by the sultan Abdul Hamid II., who in 1877 presented the university of Budapest with a portion of the remains of the library of Matthias Corvinus. During the course of the war between Turkey and Russia the Magyars were with difficulty restraincd from open mani- festations in favour of the former and against the latter power. Nevertheless, after the conclusion of peace, Hungary had, in con- formity with the requirements of Art. XXV. of the Berlin Treaty (July 1878), to furnish her quota of troops for the occupation of Bosnia and the Herzegovina, a task effected only with a considerable loss of men, and an additional burden on

the state finances. The diet having been closed by the king on the 30th June, the new elections were held at the time the struggle for the occupation of Bosnia was progressing. The popular excitement in Hungary Proper was very great, both on account of the losses suffered by the ilungarian troops and the destruction by a violent thunderstorm

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of the town of Miskolez. On the 8d October Széll, minister of finance, resigned office ; other ministers also tendered their resig- nations, but were induced to retain their posts for atime. In the elections the majority of votes lad fallen to the Liberal or Govern- ment party. On the 20th October the Hungarian parliament was opened, and at the beginning of December the reconstruction of the ministry was completed, the only new members being, for finance Count Szapary, and for commerce Baron Kemény. On the 14th a sum of 20,000,000 florins was granted for the occupation expenses of the following year.

Early inthe spring of 1879 the attention of all parties was for a time distracted from political matters by the disastrous inundation of Szeged. At the beginning of May the friendly relations of the non-Magyar nationalities of Hungary, and more particularly of the Roumanians of Transylvania, towards the Magyars seemed to be endangered by the passing of the amended education bill ordering the state language to be taught in all the non-Magyar primary schools. The new law, as affecting many nationalities, is likely to have an important bearing ou the future of Hungary. The urgent necessity for more extended river embankments and a better system of dykes and dredging in the water-coursed levels of the midland Trans-Tisian counties became more than ever apparent in De- cember, when inundations of the triple Kords and the Maros submerged many villages, farms, and pasturages, devastated large portions of Nagyvarad (Grosswardein), Arad, and other low-lying communes, and rendered thousands of persons homeless. In Mareh 1880 a loan of 40,000,000 florins was raised for the purposes of regulating the Theiss and the Maros, and of rebuilding and securing the town of Szeged.

Bibliography.—Besides the great historical works in the native language, by Szalay, Jdszay, Szilégyi, Count Teleki, and Michael Horvath, noticed under LITERATURE below, and the wseful summary by Gideon Ladényi, Magyarorszag Térténelme (Debreczen, 1867), we mention for those who are unacquainted with Hungarian—Engel, Geschichte des ungrischen Reichs (Vienna, 1813-14, 5 vols.); Fessler, Geschichte der Ungarn und ihrer Landsassen (30 ed., Leipsic, 1867-68, 5 vols.); Maildth, Geschichte der Magyaren (2d, ed,, Ratisbon, 1852-53, 5 yols.); the German cdition of Szalay, by Wogerer (Pest, 1870-75, 3 vols.); Horvath, Kurzgefasste Geschichte Ungarns (Pest, 1863, 2 vols.), and Fiinfund- zwanzig Jahre aus der Geschichte Ungarns, 1823-48 (Leipsic, 1867, 2 vols.), both translated from the Hungarian; and Rogge, Oesterreich von Vilagos bis zur Gegenwart (Leipsie, 1872-73, 3 vols.). To these may be added—E, Szabad, Hungary Past and Present (Edinburgh, 1854); E. L. Godkin, Mistory of Ilungary and the Magyars (London, 1853); Sayous, {/istoire Générale des Iongrois (Paris, 1876, 2 vols.), and Histoire d2s Hongrois et de leur littérature politique de 1790 a 1815 (Paris, 1872). For the revolutionary period see Genl. Gorgei, My Life and Acts in Iungary (London, 1852, 2 yols.), and Genl, Klapka, Memoirs (London, 1850, 2 yols.), both translated from the German; and Szemere, Ziungary from 1848 to 1860 (London, 1860), See also A. J. Patterson, The Magyar's, thety Country and Institutions (London, 1869, 2 yols.), and the anonymous Francis Deak, a Memoir (London, 1880).

JIJ. LANGUAGE.

The Magyar or native Hungarian language is of Asiatic origin, belonging to the northern or Ural-Altaic (Finnic-Tataric) di- vision of the Turanian Family, and forming along with the Ugro- Ostiakian and Vogul dialects the Ugric branch of that family. The affinity existing between the Magyar and the Finnic languages, first noticed by Jolin Amos Comenius (Komensky) in the middle of the 17th century,! and later by Olav Rudbeck?, Leibnitz?, Strahlenberg, Eccard, Sajnovics®, and others, has been proved "' grammiatically " by Samuel Gyarmathi, in his work entitled Afinitas lingue Hun- garice cum lingwis Finnice originis grammatice demonstrate (Gottingen, 1799). The Uralian travels of Anthony Reguly (1843- 45), and the philological labours of Paul Hunfalvy and Joseph Budenz, may be said*

to have established it as an almost incontro- vertible fact. The chief points of resemblance to Turco-Tataric and Mongolic dialects have been specially treated by Arminius Vambéry (1870) and Gabriel Balint (1877), the well-known recent travellers in Central Asia. Kérési-Csoma for many years zealously but unsuccessfully sought after traces of the origin of the nation and the language in Tibet. His grammar and dictionary of Tibe- tan, published by the Asiatic Society in 1834, have, however, earned for him a lasting name. The theory of Paul Beregszasa that the Magyar is related to many of the so-called " Oriental" languages® has now few supporters. ,

Although for nearly a thousand years established in Europe and subjected to Aryan influences, the Magyar language has yet retained its essential Turanian features, and the etymology and syntax still preserve these as their chief characteristics. The grammatical forms are expressed, as in Turkish, by means of affixes modulated according to the high or low vowel power of the root or chief syllables of the word with which they are connected,—the former being represented pn rar a re

1 See Hunfalvy's " Die ungarische Sprachwissenschaft," Literarische Berichie aus Ungarn, Budapest, 1877, pp. 80-87. a…

2 Specimen usus lingue Gothice in eruendis atque illustrandis obscurissimts quibusdam Sacre Scripture locis; addita analogia linguce Gothice cum Sinica, necnon Finnice cum Ungarica, Upsala, 1717.

3 Hunfalvy, p. 81. 4 Id., pp. 82-86.

5 Demonstratio Idioma Ungarorum et Lapponum idem esse, Copenhagen und

Tyrnau, 1770, P cnt 6 Ueber die Aehnlichkiit der hungarischen Sprache mit den Morgenldndischen,

Leipsic, 1796.

*by ¢, 4, 6, wi, t%, the latter by a, d, 0, 6, 2, % ; the sounds é, 7, ¢ are regarded as neutral. Since the number of consonants exceeds that of the Latin alphabet which represents them, the following combina- tions, forming single articulations, and inseparable as consonants, are used to make up the deficiency :—cs, cz, gy, ly, ny, sz, ty, zs, and in a few words dzs. Among the striking peculiarities of the lan- guage arc the definite and indefinite forms of the active verb, ¢.g., ldtom, "I see" (definite, viz, "him," "her," "the man," &e.), latok, "1 see" (indefinite) ; the insertion of the causative, frequen- tative, diminutive, and potential syllables after the root of the verb, e.g., ver, "he beats"; veret, "he causes to beat"; vereget, ** he beats repeatedly"; verint, "he beats a little"; verhet, "he can beat ase the mode of expressing possession by the tenses of the irregular verb lenni, 'to be" (viz., van, "is"; vannak, 'are'; volt, "was"; lesz, " will be," &c.), with the object and its possessive affixes, C2935 nekem vannak kinyveim, literally, "to me are books—my "= "I have books"'; xcki volt kinyve, " to him was book—his" =" he had a book." Other characteristic features are the use of the singu- lar substantive after numerals, and adjectives of quantity, ¢.g., két ember, literally, "two man"; sok szé, "many word," &c.; the position of the Christian name and title after the family name, ¢.g., Olmosy Karoly tanér ur, " Mr Professor Charles Olmosy"' ; and the possessive forms of the nouns, which are varied according to the number and persou of the possessor and the number of the object in the following way: tollam, "my pen"; tollaim, "my pens"; tollad, "thy pen"; tollaid, 'thy peus"; tollwnk, 'our pen"; tollaink, "our pens," &c. But, although presenting no auxiliary verb "to have," no primitive possessive pronouns, no gender nor even separate pronominal forms and terminations for the distinction of the sexes, and (suffixed syllables or postpositions being used instead) hardly any true declension for objective terms, the Magyar far surpasses every Teutonic, Slavonic, Italic, and other Indo- European or Aryan language in the wealth of its verbal formations, as also in the power of harmonizing and assimilating the deter- minatives to the roots. Logical in its derivatives and in its gram- matical structure, the Magyar language is, moreover, copious in idiomatic expressions, rich in its store of words, and almost musical in its harmonious intonation. It is, therefore, admirably adapted for both literary and rhetorical purposes.*

The first Hungarian grammar known is the Grammatica Hun- gero-Latina of John Erdési alias Sylvester Pannonius, printed at Sarvar-Ujsziget in 1539. Among the grammatical works of recent date are the posthumous treatises of Nicholas Révai (Pest, 1809) ; the Magyar nyclumester of Samuel Gyarmathi, published at Klau- senburg in 1794 ; and the various grammars for the use of Germans, by J. Farkas (9th ed., Vienna, 1816), Mailath (2d ed., Pest, 1832), Kis (Vienna, 1834), Marton (8th ed., Vienna, 1836), Maurice Ballagi or (in German) Bloch (5th ed., Pest, 1869), Topler (Pest, 1854), Ried] (Vienna, 1858), Schuster (Pest, 1866), Charles Ballagi (Pest, 1868), Reméle (Pest and Vienna, 1869), Roder (Budapest, 1875), Fithrer (Budapest, 1878), and Ney (20th ed., Budapest, 1879). One of the best modern grammars for the French is that of C. E. De Ujfalvy (Paris, 1876). Two Hungarian grammars have also appeared in English by S. Wékey (London, 1852), and J. Csink (London, 1858),

The earliest lexicon is that of Gabriel (Mizsér) Pesti alias Pes- tinus Pannonius, Nomenclatura scx linguarum, Latine, Italice, Gallice, Bohemice, Ungarice, et Germanic (Vienna, 1538), which was several times reprinted. The Vocabula Hungarica of Bernar- dino Baldi (1588), the original MS. of which is in the Biblioteca Nazionale at Naples, contains 2899 Hungarian words with render- ings in Latin or Italian.' In the Dietionariwm wndecim linguarum of Calepinus (Basel, 1590) are found also Polish, Hungarian, and [nglish words and phrases. This work continued to be reissued until 1682. The Lexicon Latino-Hungaricum of Albert Molnar first appeared at Nuremberg in 1604, and with the addition of Greek was reprinted till 1708. Of modern Hungarian dictionaries the best is that of the Academy of Sciences, containing 110,784 articles in 6vols., by Czuezor and Fogarasi (Pest, 1862-74). The next best native dic- tionary is that of Maurice Ballagi, 4 Magyar nyelv teljes szétdéra, (Pest, 1868-73). In addition to the above may be mentioned the work of Kresznerics, where the words are arranged according to the roots (Buda, 1831-32); the Etymologisches Worterbuch…aus chines- tschen Wurzeln, of Podhorszky (Paris, 1877); the Magyar-ugor dsszchasonlité szdtdr (Magyar-Ugrian Comparative Dictionary) of Budenz (Budapest, 1872, &c.); and that of new words, with German and Latin equivalents, by Kunoss (Pest, 1843). Other and more general dictionaries for German scholars are those of Marton (Lezi- con trilingue Latino-Hungarico-Germanicum, Vienna, 1818-

23), A. F, Richter (Vienna, 1836), E. Farkas (Pest, 1848-51), Fogarasi (4th ed., Pest, 1860), Loos (Pest, 1869), and M. Ballagi (Budapest, 3d ed. 1872-74). There are, morcover, Hungarian-French diction- aries by Kiss and Karddy (Pest and Leipsic, 1844-48) and Babos and Molé (Pest, 1865), and English-Hungarian dictionaries by Dal- los (Pest, 1860) and Bizonfy (Budapest, 1878).

- *See Count Géza Kuun's " Lettere Ungheresi," La Rivista Europea, anno vi., vol. ii. fase. 3, pp. 561-62, Florence, 1875, :*

IV. LireraTuRE.

The comparatively restricted and unobtrusive character of the Magyar or native Hungarian literature is partly owing to the fact that there are so many other languages current in Hungary, but it is chiefly to be attributed to the almost exclusive recognition, through mauly centuries, of Latin as the vehicle of cultured thought. The Romish ecclesiastics who settled in Hungary during the 11th cen- tury, aud who found their way into the chief offices of the state, were mainly instrumental in establishing Latin as the predominant language of the court, the higher schools, and public worship, and of eventually introducing it into the administration. Having thus become the tongue of the educated and privileged classes, Latin continued to monopolize the chief fields of literature until the re- vival of the native language at the close of the 18th century.

Amongst the earliest Latin works that claim attention are the Early

*"Chronicle" (Gesta Hungurorwm), by the * anonymous notary"' of Latin King Béla, probably Béla I. (see Podhradezky,? Béla kirdly névtclen chro- jegyzdje, Buda, 1861, p. 48), which describes the early ages of Hun- nicles. garian history, and may be assigned to the middle of the 12th cen- tury ; the Carmen Miserabile of Rogerius ; the Liber Crontcorum of Simon Keézai, belonging to the end of the 13th century, the so- called "Chronicon Budense," Cronica Hi ungarorum, printed at Buda in 1478 (Eichhorn, Geschichte der Litteratur, ii. 319); and the Chronicon Rerum Hungaricarum of John Thuréczi.? An extraordi- nary stimulus was given to literary enterprise by king Matthias Cor- vinus, who attracted both foreign and native scholars to his court. Foremost amongst the Italians was*

Antonio Bonfini, whose work, Rerum Hungaricarum Decades IV., comprising Hungarian history from the earliest times to the death of King Matthias, was published with a continuation by Sambucus (Basel, 1568).4 Marzio Galeotti, the king's chief librarian, wrote an historical account of his reign. The most distinguished of the native scholars was John Cesinge alias Janus Pannonius, who composed Latin epigrams, panegyrics, and epic poems. The best edition of his works was published by Count S. Telcki at Utrecht in 1784,

As there are no traces of literary productions in the native or Magyar Magyar dialect before the 12th century, the early condition of thie litera- language is concealed from the philologist. It is, however, known ture. that the Hungarians had their own martial songs, and that their Earliest princes kept lyre and lute players who sang festal odes in praise of relics, the national heroes. In the 11th century Christian teachers intro- duced the use of the Roman letters, but the employment of the Latin Arpadian language was not formally decreed until 1114 (see Bowring, Poetry period of the Magyars, Introd. xix.). It appears, moreover, that up to that (1000-— date public business was transacted in Hungarian, for the decrces 1301). of King Coloman the Learned (1095-1114) were translated from that language into Latin. Among the literary relics of the 12th century are the " Latiatuc " or Halotti Beszéd funeral discourse and prayer in Hungarian, to which Débrentei in his Régi Magyar Nyelvemlékek assigns as a probable date the year 1171 (others, however, 1182 or 1183). From the Margit-Legenda, or " Legend of St Margaret," composed in the early part of the 14th century,® it is evident that from time to time the native language continued to be em- ployed as a means of religious edification. Under the kings of Anjou- the house of Anjou, the Magyar became the language of the court. Sigis- That it was used also in official documents and ordinances is shown mond by copics of formularies of oaths, the import of which proves period beyond a doubt that the originals belonged to the reigns of Louis (1301— I. and Sigismond ; by a statute of the town of Sajd-St- Peter (1408) 1437). relating to the wine trade; by the testament of Kazzai-Karacson (1413) ; and by other relics of this period published by Débrentei in vol. il. of the R. M. Nyclvemlékek. To the carly part of the 15th century may be assigned also the legends of "St Francis" and of "St Ursula," and possibly the original of

the Enek Pannénia megvétclérél, an historical ' Song about the Conquest of Pannonia.*

But not until the dawn of the Reformation did Magyar begin in any sense to replace Latin for literary purposes. The period placed by Hungarian authors betwcen 1437 and 1530 marks the first development of Magyar literature. ; ;

About the year 1437 two Hussite monks named Tamas and Jagelld- Baliut (i.e., Thomas and Valentine) adapted from older sources a Matthias large portion of the Bible for the use of the Hungarian refugees in or pre-Moldavia. To these monks the first extant Magyar version of part Refor- of the Scriptures (the Vienna or Révai Codex®) is directly assigned seers Se ee en ee Pelion

2 So also Jdmbor (A Magyar Frod. Tért., Pest, 1864,p. 104). Kérnyel, Imre, (1437 and others incline to the belicf that it was Béla I., and that consequently the 1530) " anonymous notary" belongs rather to the 11th than to the 12th eentury. :

3 An example of this work, printed on vellum in Gothic letter (Augsburg, 1488), and formerly belonging to the library of Matthias Corvinus, king of Hungary, may be seen in the British Museum. Of the three first-mentioned ehronicles Hungarian translations by Charles Szab6 appeared at Budapest in 1860, 1861, and

4 Both this and the later editions of Frankfort (1581), Cologne (1690), and Pressburg (1744) are represented in the British Museum.

5 The only eopy existing at the present time appears to have been transcribed at the beginning of the 16th century. Both this and the Halotti Beszéd (Pray Codcx) are preserved in the National Museum at Budapest.

6 This eodex contains Ruth, the lesser prophets, and pars of the Apoerypha.

| Aceording to Toldy, it is copied from an carlier one of the 14th century.

by Dibrentci, but the exact date either of this copy or of the original translation cannot now be ascertained. With approximate certainty may be ascribed also to Tamas and Balint the original of the still extant transeript, by George Nemeti, of the Four Gospels, the Jészay or Munich Codex (finished at Tatros in Moldavia in 1466). Amongst other important codices are the Jorddnszky Codex(1516-19), an incomplete copy of the translation of the Bible made by Ladislaus Batori, who dicd about 1456; and the Débdrentet or Gyulafehérvdr Codex (1508), containing a version of the Psalter, Song of Solomon, and the liturgical epistles aud gospels, copied by Bartholomew Halabori from an earlier translation (Kornyei, 4 Magyar nemzeti trodalomtérténet vdzlata, 1861, p. 30). Other relics belonging to this period are the oath which John Hunyady took when elected governor of Hungary (1446); a few verses sung by the children of Pest at the coronation of his son Matthias (1458) ; the Siralomének

produced two years afterwards at Vienna by Baron Liszti. The lyric and epic poems of Stephen Gyongyosi, who sang the deeds of Maria Széchy, the heroine of Murany, Afurdnyi Venus (Kassa, 1664), are samples rather of a gencral improvement in the style than of the purity of the language. Asa didaetic and elegiac poet Stephen Kohari is much esteemed, though his poems are of a very serious and contemplative turn. More fluent but not less gloomy are the sacred lyrics of Nyéki-Veres first published in 1636 under the Latin title of Tintinnabulum Tripudiantium. The songs and proverbs of Peter Beniczky, who lived in the early part of the 17th century, are not without merit, and have been several times reprinted. We may here mention that, from the appearance of the first extant printed Magyar work® at Cracow in 1531 to the end of the period we have just been treating of, more than 1800 publications in the native language are known.'

*Both Janos veszedelmén (Elegyupon John Both), written by a certain '*Gregori," as the initial letters of the verses show, and during the reign of the above-mentioned monarch ; and the Emilékdal Mdtyds kirdly haldléra (Memorial Song on the Death of King Matthias,*

The period comprised between the peace of Szatmar (1711) and Periodo the year 1772 is far more barren in literary results than even that decline which preceded it. The exhaustion of the nation from its protracted (1711- civil and foreign wars, the extinction of the court of the Transyl- 1772),

1490). To these may be addcd the rhapsody! on the taking of '¢ Szabacs " (1476); the Katalin-Legenda, a metrical ' Legend of St Catherine of Alexandria," extending to over 4000 lines; and the Feddéének (Upbraiding Song), by Francis Apathi.*

vanian princes wherc the native language had been cherished, and the prevalent use of Latin in the schools, public transactions, and county courts, all combined to bring about a complete neglect of the Magyar language and literature. Among the few prose

Nefor- In the next literary period (1530-1606) several translations of the | writers of distinction were Andrew Spangar, whose " Hungarian mation Scriptures are recorded. Among these there are—versions of the | Bookstore," Magyar Kényvidr (Kassa, 1788), is said to be the period Epistles of St Paul, by Bencdict Komjati (Cracow, 1533); of the | earliest work of the kind in the Magyar dialect ; George Baranyi, (1580- Four Gospels, by Gabricl (Mizsér) Pesti (Vienna, 1586); of the | who translated the New Testament (Lauba, 1754) ; the historians 1606). New Testament, by John Erdési (Ujsziget, 1541; 2d ed., Vienna, | Michael Cserei and Matthew Bél, which last, however, wrote chiefly 15742), and by Thomas Félegyhézi (1586) ; and the translations of | in Latin ; and Peter Bod, who besides his theologieal treatises com- the Bible, by Caspar Heltai (Klausenburg, 1551-65), and by Caspar | piled a history of Hungarian literature under the title Magyar Karoli (Vizsoly, near Géncz, 1589-90). The last, considered the | Athénds (Szeben, 1766). But the most celebrated writer of this best, was corrected and re-edited by Albert Molnar at Hanau in | period was the Jesuit Francis Faludi, the translator, through the 1608.3 Heltai published also (1571) a translation, improved from | Italian, of William Darrell's works. On account of the classic that by Blasius Veres (1565), of the Zripartitwm of Verboezy, and | purity of his style in prose Faludi was known as the " Magyar Chronika (1575) adapted from the Decades of Bonfini. Karadiin | Cicero." Not only asa philosophic and didactic writer, but also

1569 brought to light the earliest national drama, Balassi Menyhért. | as a lyric and dramatic poet he surpassed all his contemporaries. Among the native poets, mostly mere rhyming chroniclers of the | Another pleasing lyric poet of this period was Ladislaus Amade, the 16th century, were Csanadi, Tinddi, Nagy-Baczai, Bogati, Ildsvay, | naturalness and genuine sentiment of whose lightly running verses Istvanfi, Gorgei, Temesvari, and Valkai. Of these the best and | are suggestive of the love songs of Italian authors. Of considerable most prolific writer was Tinddi. Székely wrote in prose, with verse | merit are also the sacred lyrical melodies of Paul Radai in his Lelké introduction, a " Chronicle of the World" under the title of Cronica | hédolds (Spiritual Homage), published at Debreczen in 1715, ez vildgnac yeles dolgairél (Cracow, 1559). Csdktornya and Kakony | Among the didactic poets may be mentioned Lewis Nagy, George imitated the ancient classical poets, and Erdési introduced the | Kalmar, John Iley, and Paul Bertalanfi, especially noted for his hexameter. Andrew Farkas and the homilist Peter Melius | rhymed " Life of St Stephen, first Hungarian king," Dieséséges Sz. (Juhasz) attempted didactic verse ; and Batizi busied himself with | Istvdn elsé magyar kirdlynak élete (Vienna, 1751). sacred song and Biblical history. During the latter part of the The remaining three literary periods stand in special relatiouship 16th century and the beginning of the 17th two poets of a higher | to one another, and are sometimes regarded as the same. The first order appeared in Valentine Balassa, the earliest Magyar lyrical | two, marking respectively the progress of the " Regencration of the writer, and his contemporary John Rimay, whose poems are of a | Native Literature" (1772-1807) and the " Revival of the Lan- contemplative and pleasing character. guage " (1807-1830), were introductory to and preparatory for the 17th The melancholy state of the country consequent upon the perse- | third or " Academy" period, which dates from the year 1830, and century cutions of Rudolph I., Ferdinand II., and Leopold I., as also the | comprises the results of the native language and literature in the period continual encroachment of Germanizing influences under the Haps- | highest statc of cultivation. (1606- burgs, were unfavourable to the devclopinent of the national litera- In consequence of the general neglect of the Magyar language Regener- 1711) ture during the next literary period, dating from thc Peace of Vienna | during the reigns of Maria Theresa and her successor Joseph I1., ation

(1606) to that of Szatmar (1711). A few names were, however, distinguished in theology, philology, and poetry. In 1626 a Hun- garian version of the Vulgate was published at Vienna by the Jesuit George Kaldi, and another complete translation of the Scriptures, the so-called Komdomi Biblia (Komorn Bible) was made in 1685 by the*

the more important prose productions of the latter part of the 18th of the century, as for instance the historical works of George Pray, Stephen litera- Katona, John Engel, and Ignatius Fessler, were written either in ture

Latin orin German. The reaction in favour of the native literature (1772- manifested itself at first chiefly in the creation of various schools of 1807).

Protestant George Csipkés, though it was not published till 1717 at Leyden, twenty-nine years after hisdeath.> On behalf ofthe Catho- lies the Jesnit Peter Pazman, eventually primate, Nicholas Eszter- hazy, Simbar, Balasfi, and others were the authors of various works of a polemical nature. Especially famous was the Hodegus, kalauz of Pazman, which first appeared at Pozsony(Pressburg) in 1613. Among the Protestants who exerted themselves in theological and controver- sial writings were Németi, Alvinezy, Alexander Felvinczy, Marton- falvi, and Melotai, who was attached to the court of Bethlen Gabor. Telkibanyai wrote on " English Puritanism" (1654). The Calvin- ist Albert Molnar, already mentioned, was more especially remark- able for his philological than for his theological labours. Parispapai compiled an Hungarian-Latin Dictionary, Dietionaritum magyar és dedk nyelven (Locse, 1708), and Apaczai-Csere, a Magyar Eneyelope- dia (Utrecht, 1658). John Szalardi, Paul Lisznyai, Gregory Pctho, John Kemény, and Benjamin Szilagyi, which last, however, wrote in Latin, were the authors of various historical works. In polite litera- ture the heroic poem Zrinyidsz (1651), descriptive of the fall of Sziget, by Nicholas Zrinyi, grandson of the defender of that fortress, marks ahewerain Hungarian poetry. Of a far inferior character was the monotonous Mohdesi veszedelem (Disaster of Mohacs), in 13 cantos,

1 Virst made known by Coloman Thaly (1871) from a discovery by MM. E. Nagy and D, Véghelyi in the archives of the Csicsery family, in the county of Ung. _ 2 Onc of the only seven perfect copics extant of the Vienna (1574) edition is in the British Museum library. 2 A copy, with the autograph of the

cditor, is in the British Muscum. : A copy is in the British Museum library. There are two copies of this edition in the British Museum library.

poctry. Foremost among thesc stood the so-called " French" school, founded by George Bessenyei, the author of several dramatic pieces, and of an imitation of Pope's " Essay on Man," under the title of Az embernek prébdja (Vienna, 1772). Bessenyei introduced the use of rhymed alexandrines in place of the monotonous Zrinian measure. Other writers of the samc school were Laurence Orczy and Abraham Barcsay, whose works have a striking resemblance to each other, and were published together by Révai (1789). The songs and elegies of the short-lived Paul Anyos, cdited by Bacsanyi in 1798, show great depth of feeling. Versifiers and adapters from the French appeared also in Counts Adam and Joseph Teleki, Alexander Baréczi, and Joseph Péczeli, known also as the translator of Young's " Night Thoughts." The chief representatives of the strictly "classical" school, which adopted the ancient Greek and Latin authors as its models, were David Baréti Szabd, Nicliolas Révyai, Joseph Rajnis, and Benedict Virag. Among the most note- worthy works of Baréti are the Uj mértékre vett kiilémb versek (Kassa, 1777), comprising hexameter verses, Horatian odes, dis- tiches, epistles, and epigrams ; the Paraszti Majorség (Kassa, 1779- 80), an hexameter version of Vanitre's Pradiwm rustieum ; and an abridged version of ' Paradise Lost," contained in the Kélteményes munkaji (Komarom, 1802). Baréti, moreover, published (1810— 13) a translation of Virgil's Aneid and Eelogues. Of Barotis

6 The earliest, styled "Song on the Discovery of the right hand of the Holy King Stephen," and printed at Nuremberg by Anton Koburger in 1484, is lost.

7 See Chas. Szabé's Regi Magvar Konyvtar, Budapest, 1879. Cf. also Lit, Ber. aus Ungarn for 1879, Bd. iii. Heft 2, p. 433-434,

*purely linguistic works the best known are his Ortographia és Pro- sodia (Komarom, 1800); and the Kisded Szétér (Kassa, 1784 and 1792) or "*Small Lexicon" of rare Hungarian words. As a philo- logist Bardti was far surpassed by Révai, whosc linguistic labours have already been alluded*

to (see above, LANGUAGE) ; but asa poet he may be considered superior to Rajnis, translator of Virgil's Bucolies and Georgics, and author of the Megyar Helikonra vezetd kalauz (Guide to the Magyar Helicon, 1781). The "classical " school reached its highest state of culture under Virdg, whose poetical works, consisting chiefly of Horatian odes and epistles, on account of the perfection of their style, obtained for him the name of the " Magyar Horace." The Poctat Munkai (Poetical Works) of Virag were published at Pest in 1799, and againin 1822. Of his prose works the most important is the Magyar Széządok or " Prag- matic History of Hungary " (Buda, 1808 and 1816). Valyi-Nagy, the first Magyar translator of Homer, belongs rather to the " popu- lar" than the "classical" school. His translation of the Jliad appeared at Sarospatak in 1821. The establishment of the "national" or " popular" school is attributable chiefly to Andrew Dugonics, though his earliest works, Zroja veszedelme (1774) and Ulysses (1780), indicate a classical bias. His national romances, however, and especially Hielka (Pozsony, 1787) and Az arany per- eezek (Pest and Pozsony, 1790), attracted public attention, and were soon adapted for the stage. The most valuable of his productions is his collection of " Hungarian Proverbs and Famous Sayings," which appeared in 1820 at Szeged, under the title of Magyar pél- dabeszédek és jeles monddsok. The most noteworthy follower of Dugonics was Adam Horvath, author of the epic poems Hunnidsz (Gyor, 1787) and Rudolphidsz (Vienna, 1817). Joseph Gvadanyi's tripartite work Falusi notdrius (Village Notary), published between 1790 and 1796, as also his Ronté Pdl és gr. Benyowszky történeteik (Adventures of Paul Ronté and Count Benyowski), are humorous and readable, but careless in style. As writers of didactic poetry may be mentioned John Endrédy, Caspar Gobdl, Joseph Takacs, and Barbara Molnar, the earliest distinguished Magyar poetess.

Of a more general character, and combining the merits of the above schools, are the works of the authors who constituted the so- called " Debreczen Class," which boasts the names of the naturalist and philologist John Foldi, compiler of a considerable part of the Debreczeni magyar grammatiea ; Michael Fazekas, author of Ludas Matyi (Vienna, 1817), an epic poem, in 4 cantos; and Joseph Kovacs. Other precursors of the modern school were the poet and philologist Francis Verseghy, whose works extend to nearly forty volumes ; the gifted didactic prose writer, Joseph Karman;

the metrical rhymster, Gideon Raday ; the lyric poets, Szentjébi Szabé, John Bacsanyi, and the short-lived Gabriel Dayka, whose posthum- ous ' Verses" were published in 1813 by Kazinezy. Still more celebrated were Michael Csokonai and Alexander Kisfaludy. The former is one of the most original and genial of poets, his style somewhat resembling that of Petofi. The best edition of Csokonai's works was published by Toldy (Pest, 1844). The first volume of Alexander Kisfaludy's Him/fy, a series of short lyrics of a descriptive and reflective nature, appeared at Buda in 1801, under the title of Kesergé szerelem (Unhappy Love), and was received with such*

sometimes observable in his writings. His collective works were published at Buda by Dobrentei in 1842. Those of John Kis, the friend of Berzsenyi, cover a wide range of subjects, and comprise, besides original poetry, many translations from the Greek, Latin, French, German, and English, among which last may be mentioned renderings from Blair, Pope, and Thomson, and notably his trans- lation, published at Vienna in 1791, of Lowth's "Choice of Hercules." The style of Kis is unaffeeted and easy. As a sonnet writer none stands higher than Paul Szemere, known also for his rendering of Korner's drama Zrinyi (1818), and his contributions to the Elet és Literatura (Life and Literature). The articles of Francis Kolesey in the same periodical are among the finest spcci- mens of Hungarian esthetical criticism. The lyric poems of Kolesey can hardly be surpassed, whilst his orations, and niarkedly the Hmlék beseéd Kazinezy felett (Commemorative Speceh on Kazinezy), exhibit not only his own powers, but the singular excellence of the Magyar language as an oratorical medium. Andrew Fay, sometimes styled the 'Hungarian Alsop," was an industrious writer in almost every branch of literature during both this and the following period, but is now chiefly remembered for his Lredeti Mesék (Original Fables). The dramatic works of Charles Kisfaludy, brother of Alexander, won him enthusiastic recognition as a regenerator of the drama. His plays, moreover, bear a distinctive national character, the subjects of most of them referring to the golden era of the country. His genuine simplicity as a lyrical writer is shown by the fact that several of his shorter pieces have passed into

popular song. As the earliest Magyarizer of Servian folk-song, Michael Vitkovics did valuable service. Not without interest to Englishmen is the name of Gabriel Dibrentei, the translator of Shakespeare's " Macbeth,"' represented at Pozsony in 1825, and of Sterne's " Letters from Yorick to Eliza," Yortek és Eliza leveleit (Pest, 1828). But his chief merit in the eyes of his fellow-countrymen were his editorship of the Kolozsvar Erdélyi Muzeum (1814-18, vol. x.), and his Iaborious compilation of the Régi Magyar Nyelvemlékek (Memorials of the Magyar Language), which works are among the most important contributions to the literary history of the nation. An historical poem of a somewhat philosophical nature was produced in 1814 by Andreas Horvath under the title of Zirez emlékezete (Reminiscence of Zircz); but his Arpdd, in 12 books, finished in 1830, and published at Pest in the following year, is a great national epic. Among other poets of this period were Alois Szentmikldssy, George Gaal, Emil Buezy, Joseph Szasz, Ladislaus Téth, and Joseph Katona, author of the much- extolled historical drama Bank Bdn.1 Izidore Guzmics, the translator of Theocritus into Magyar hexameters, is chiefly noted for his prose writings on ecclesiastical and philosophical subjects. As authors of special works on philosophy, we find Samuel Kételes, John Imre, Joseph Ruszek, Daniel Eresei, and Paul Sarvari; as a theologian and Hebraist John Somossy ; as an historian and philo- logist Stephen Horvath, who endeavoured to trace the Magyar descent from the earliest historic times ; as writers on jurisprudence Alexander Kovy and Paul Szlemenics. (For an aceount of the his- torian George Fejér, the laborious compiler of the Codex Diplomati- cus, see FER, vol. ix. pp. 64, 65.)

applause as but few books have cver met with ; nor was the success of the second volume Boldog szerelem (Happy Love), which appeared in 1807, inferior. The Regék, or "Tales of the Past," were published at Buda from 1807 to 1808, and still further increased Kisfaludy's fame ; but in his dramatic works he was not equally successful. Journalistic literature in the native language begins with the Magyar Hirmondé

(Harbinger) started by Matthias Rath at Pozsony in 1780. Among

The establishment of the Hungarian Academy of Sciences? (17th Academy November 1830) marks the commencement of a new period, in period the

first eighteen years of which gigantic exertions were made as (com- regards the literary and intellectual life of the nation. The lan- mencing guage, nursed by the academy, developed rapidly, and showed its 1880). capacity for giving expression to almost every form of scientific knowledge. By offering rewards for the best original dramatic*

the magazines the most important was the Magyar Muzeum, established at Kassa (Kaschau) in 1788 by Baréti, Kazinczy, and Bacsanyi. The Orpheus (1790) was the special work of Kaziuczy, and the Urania (1794) of Karman and of Pajor.

Closely connected with the preceding period is that of the "Revival of the Language" (1807-1830), with which the name of Francis Kazinezy is especially associated. To him it was left to perfect that work of restoration begun by Baréti and amplified by Révai. Poetry and belles lettres still continued to ocoupy the chief place in the native literature, but under Kazinczy and his immediate followers Berzsenyi, Kélesey, Fay, and others, a correctness of style and excellence of taste hitherto unknown soon became apparent. Kazinczy, in his efforts to accommodate the national language to the demands of an improved civilization, availed himself of the treasures of European literature, but thereby incurred the opposition of those who were prejudiced by a too biased feeling of nationality. The opinions of his encmies were ventilated in a lampoon styled Mondolat. His bellelettristic works, or Szép Literatura (Pest, 1814-16), extend to 9 vols., consisting in great part of translations. His Eredeti Mukdi (Original Works), in 5 vols., appeared at Pest in 1836-45, under the joint editorship of Bajza and Toldy. Daniel Berzsenyi, whose odes are atnong the finest in the Hungarian language, was the correspond- ent of Kazinezy, and like him a victim of the attacks of the Mondolat. But the fervent patriotism, elevated style, and glowing diction of Berzsenyi soon caused him to be recognized as a truly national bard. A too frequent allusion to Greek mythological names is a defect

productions, the academy provided that the national theatre should not suffer from a lack of classical dramas. During the earlier part of its existence the Hungarian academy devoted itself mainly to the scientific development of the language and philological rescarch. Since its

reorganization in 1869 the academy has, however, paid equal attention to the various departments of history, archeology, national economy, and the physical sciences. The encouragement of polite literature was more especially the object of the Kisfaludy Society, founded in 1836.4

1 The subject is similar to that of Grillparzer's tragedy, Lin treuer Diener seines Herrn.

2 It was founded in 1825 through the generosity of Count Széehenyi, wlio de- voted his whole income for one year (60,000 flovins) to the purpose. It was soon supported by contributions from all quarters cxcept from the Government.

3 Among the earlier publications of the academy were the Tudomanytadr (Treasury of Scicnecs, 1834-44), with its supplement Literatura; the Aulfoldt jatekszin (Foreign Theatres); the Magyar nyelv rendszere (System of the Hun- garian language, 1846; 2d ed., 1847); various dictionarivs of scientific, mathe- matical, philosophical, and Jegal terms; an Hungarian-German dictionary (1835- 38); and a Glossary of Provincialisms (1838). The Nagy-Szétdr (Great Dictionary), begun by Czuezor and Fogarasi in 1845, was not issued till 1862-74. Among the regular organs of the academy are the "Transactions" (from 1840), in some 60 vols,, and the " Annuals."

4 Among its earlier productions were the Nemzeti kiényvtdr (National Library), published 1843-47, and continued in 1852 under the title Ujabb Nemzeti kényvtar, a repository of works by celebrated authors; the Awl/dldi Regénytdr (Treasury of Foreign Romances), consisting of translations; and some valuable collectious of proverbs, folk-songs, traditions, and fables. Of the many later publications of the Kisfaludy society the most important as regards English literature is tle Shakspere Minden Munkdi (Complete Works of Shakespeare), in 19 vols. (1864-7 8),

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Polite literature lad received a grcat impulse in the preceding

eriod (1807-30), but after the formation of the academy and the

Among recent lyricists who have attracted attention are the following :— Coloman Toth, who is also the author of several epic and dramatic pieces; John Vajda, whose Kisebb Kélteményck (Minor Poems), published by the Kisfaludy society in 1872, are partly written in the mode of Heine, and are of a pleasing but iwmelancholy character ; Josepli Lévay, known also as the translator of Shakespeare's Titus Andronicus, Taming of the Shrew, and Henry IV.; and Paul Gyulai, who, not only asa faultless lyric and epie poet, but as au impartial critical writer, is highly esteemed, and whose Romhdnyi is justly prized as one of the best Magyar poems that has appeared in modern times, 'To the above may be added the names of Charles Berecz, Joseph Zalar, Samuel Nyilas, Joseph Vida, Lewis Tolnai, the sentimental Ladislaus Szelestey, and tlic talented painter Zoltan Balogh, whose romantic poem

to which a supplementary vol., Shakspere Pdlydja (1880), containing a critical account of the life and writings of Shakespearc, has been added by Professor A. Greguss. Translations from Molivre, Racine, Corncille, Calderon, and Moreto have also been issued by the Kisfaludy society. 'The Evlapok w folyama, or "New Series of Annuals," from 1860 (Budapest, 1868, &c.) , is a chrestomathy of prize orations, and translations and original picces, both in poetry and prose.

Late Unitarian bishop of Transylvania, author of Vadrdézsdk, or " Wild-Roses" (1863), a collection of Szekler f olk-songs, ballads, and sayings.

with great power of conception, but his metaphors, following rapidly one upon the other, become often confused. Joseph Kiss in 1876 brought out a few lyric and epic poems of considerable merit. The Mesék of Augustus Greguss (1878), a collection of verse " Fables," belonging to the school of Gay, partake more of a didactic than lyrical nature, This feature is noticcable also in the Kéltemények (1873) of Ladislaus Torkos, and the

Modern Mesék (1874) of Ladislaus 2 mn An energetic satirical poet has recently appeared in Lewis arték.

As one of the latest remarkable productions of Magyar poetry, we must not omit to draw attention to the Salamon (1878) of Charles Szasz, which poem was rewarded with the prize of the academy. The subject, taken from the age of Hungarian chivalry, is artistically worked out from medieval legends, and gives an excellent descrip- tion of the times of St Ladislaus of Hungary. Charles Szdsz is generally better known as a metrical translator than as an original poet. He is the Magyarizer of Shakespeare's Anthony and Cleo- patra, Othello, Macbeth, Henry VIII., Winter's Tale, Romeo and Juliet, and Tempest, as also of some of the best pieces of Burns, Moore, Byron, Shelley, Milton, Béranger, Lamartine, Victor Hugo, Goethe, and others. A translator from Byron and Pope appeared also in Maurice Lukacs.?

Meanwhile dramatie literature has found many champions, of whom the most energetic is the late Edward Szigligeti, proprie Joseph Szathmary, who has enriched the Hungarian stage with more than a hundred pieces. Of these the most popular are comedies and serio-comic national dramas. His recently produced tragedy Béla IV. is also much admired. A less prolific but more classical writer appeared in Charles Obernyik, whose George Brankovies is, next to Katona's Bank Ban, one of the best historical tragedies in the lan- guage. Several of the already mentioned lyric and epic poets were, as we have shown in the case of Vorésmarty, occasional writers also for the drama. To these we inay add the gifted but unfortunate Sigismund Czaké, Lewis Dobsa, Joseph Szigeti, Ignatius Nagy, Joseph Szenvey (a translator from Schiller), Joseph Gaal, Charles Hugo, Lawrence Toth (the Magyarizer of the School for Seandal), Emeric Vahot, Alois Degré (equally famous as a novelist), Stephen Toldy, and Lewis Déczi, author of the popular prize drama Csék (The Kiss). Az ember tragocdidja (The Tragedy of Man), by Emcric Madach (1861), is a dramatic poem of a philosophical and contemplative character, and is not intended for the stage. Among the latest most successful dramatie pieces may be mentioned the Falw rossza (Village Scamp) of the late Edward Téth (1875), which represents the life of the Hungarian peasantry, aud shows both

oetic sentiment aud dramatic skill ; 4 szerelem hareza (Combat of

ove), by Count Géza Zichy ; Jskdriot (1876) and the prize tragedy Tamora (1879), by Anthony Varady ; Janus (1877), by Gregory Csiky ; and the dramatized romance Szép Mikhal (Handsome Michal), by Maurice Jékai (1877). The principal merit of this author's drama J/ilton (1876) consists in its brilliance of language. The Szerelem iskoldja (School of Love), by Eugene Rakosy, although in some parts exquisitely worded, did not meet with the applause accorded to his Ripacsos Pista Dolmdnya (1874). The Gré6f Dor- mdndt Kdélmdén (Count Coloman Dormandi) of Béla Bercsényi (1877) is a social tragedy of the French school. Among the most recent writers of comedy we single out Arpad Berczik for his 4 hdzasiték (The Matchmakers) ; Ignatius Stlyovsky for his Noi diplomatia (Female Diplomacy) ; and the above-mentioned Gregory Csiky for his Ellendllhatatlan (The Irresistible), produced on the stage in 1878. As popular plays the Sdrga esiké (Bay Foal) and A piros bugyelldris (The Red Purse) by Francis Csepreghy, have their own special merit, aud were often represented in 1878 and 1879 at Buda- pest and elsewliere.

Original romance writing, which may be said to have commenced with Dugonies and Karman at the close of the 18th, and to have

2 Besides the various translators from the English, as for instance William Gy6ri, Augustus Greguss, Ladislaus Arany, Sigismond Acs, Stephen Fejes, and Eugene Rdkosy, who, like those already incidentally mentioned, have assisted in the Kisfaludy society's version of Shakespeare's complete works, metrical trans- lations from foreign languages have, during the last few years, becn successfully made by Emil Abrdnyi, Dr Ignatius Barna, Anthony Vdrady, Andrew Szab6, Charles Bérezy, Julius Greguss, Lewis Déczi, Béla Erédi, Emeric Gdspdr, and many others. A Magyar version, by Ferdinand Barna, of the Aalewala was published at Pest in 1871. Faithful renderings by Lewis Szeberényi, Theodore Lehoczky, and Michael Fincicky of the popular poctry of the Slavic nationalities appeared in vols. i. and ii. of the Hazat nép kéltészet tara (Treasury of the Country's Popular Seng), commenced in 1866, under the auspices of the Kisfaludy society. In vol. iii, Roumanian folk-songs have been Magyarized by George Ennber, Julian Grozescu, and Joseph Vulcanu, under the title Romdn népdalok (Budapest, 1877). The Rdzsdk (Zombor, 1875) is a translation by Eugene Pay- lovits from the Servian of Jovan Joyanovits. Both the last-mentioncd works are

interesting from an ethnographical point of view. Versions from the English appear from time to time in the Budapesti Szemle (Budapest Review), conducted by Paul Gyulai. We may here note that for foreigners unacquainted with Mun- garian there arc, besides several special versions of Petéfi and of Arany, 21 anthologics of Magyar poetry in German, by Count Majldth (1825), J. Fenyéry and F. Toldy (1828), G. Stcinacker (1840, 1875), G. Stier (1850), K. M. Kertbeny (1854, 1860), A. Dux (1854), Count Pongrdcz (1859-61), A. M. Ricdl (1860), J. Nord- heim (1872), G. M. Henning (1874), A. von der Heide (1879), and others. Selec- tions have also becn published in English by Sir Johu Bowring (1830), 8. Wékcy in his grammar (1852), and E. D. Butler (1877), and in French bv H. Desbordes-Yalinore and C. E. De Ujfalvy (1878).

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found a representative in Francis Verseghy at the beginning of the 19th century, was afterwards revived by Fay in his Béliecky haz (1832), and by the contributors to certain literary magazines, espe- cially the durora, an almanack conducted by Charles Kisfaludy, 1821-30, and continued by Joseph Bajza to 1837. Almost simul. taneously with the rise of the Kisfaludy society, works of fiction assumed a more vigorous tone, and begau to present just claims for literary recognition. Far from adopting the levity of style too often observable in French romances, the Magyar novels, although en- livened by touches of humour, have generally rather a serious his- torical or political bearing. Especially is this the case with Nicholas Josika's Abaji (1836), A eschek Magyarorszdgon ('The Bohemians in Hungary), and dz utolsé Batori (The Last of the Bathoris), published in 1847. In these, as in many other of the romances of Josika, a high moral standard is aimed at. The same may be said of Baron Joseph Hotvos's Karthausi (1839), and Falu Jegyzije (Village Notary), published in 1845, and translated into English (1850) by O. Wenckstern (see Eérvis, vol. viii. p. 455). The Arvizkonyy or "Inundation Book," edited by Kétvos, 1839-41, is a collection of narratives and poems by the most celebrated authors of the time. Of the novels produced by Baron Sigismond Kemény the Gyulai Pdi (1847), in 5 vols., is, from its historical character, the most im- portant. His Mérj és né (Husband and Wife) appeared in 1853 (latest ed., 1878), the Rajongék (Fanatics), in 4 vols., in 1858-59. The graphic descriptious of

Hungarian life in the middle and lower classes by Lewis Kuthy won for him temporary renown; but his style, though flowery, is careless. Anothcr popular writer of great originality was Joseph Radakovics alias Vas-Gereben. The romances of Baron Frederick Podmaniczky are simpler, and rather of a narrative than colloquial character. The fertile writer Paul Kovacs excels niore particularly in humorous narration. Fay's singular powers in this direction were well shown by his Jévor orvos és Bakator Ambrus szolgdja (Doctor Javor and his servant Ambrose Bakator), brought out at Pest in 1855. The Beszélyck (Tales) of Ladislaus Beéthy were produced in the same year, his Pusztak fia (Son of the Pusztas) in 1857. Pleasing humorous sketches are con- tained also in Ignatius Nagy's Beszélyck (1843) and " Caricatures " or Torzképek (1844) ; in Caspar Bernat's Fresko képek (1847-50) ; in Gustavus Lauka's Vidék, and his 4 76 régi vildg (The Good Old World), published respectively in 1857 and 1863 ; and in Alexander Balazs's Beszélyet (1855) and Vikérdarabok (1865). Among authors of other historical or humorous romances and tales which have appeared from time to time are Francis Marton alias Lewis Abonyi, Joseph Gaal, Paul Gyulai, William Gyori, Lazarus Horvath, the short-lived Joseph Irinyi, translator of "Uncle Tom's Cabin," Francis Ney, Albert Palffy, Alexander Vachott and his brother Emeric (Vahot), Charles Szathmdry, Desider Margittay, Victor Vajda, Joseph Bodon, Atala Kisfaludy, John Kratky, and the several writers whose names and latest works are noticed at the end of this paragraph. But by far the most prolific and talented novelist that Hungary can boast of is Maurice Jékai, whose power of imagination and brilliancy of style, no less than his true representa- tions of Hungarian life and character, have earned for him a Euro- pean reputation. His earlier romances, publishcd before the revolu- tion of 1848, are chiefly of a social or political tendency. Of his more recent productions the best known are Egy magyar ndbob (A Magyar Nabob), with its continuation Kérpdthy Zoltdn, published in 1853 and 1854 respectively ; Szerelem bolondjai (The Fools of Love, 1867); Az w foldesur (The New Landlord), translated into English by A. J. Patterson (1868); Fekete gyémdntok (Black Diamouds, 1870); A jévd sedzad regénye (The Romance of the Coming Century, 1873); Az élet komédidsai (The Comedians of Life, 1876); the historical romance Szép Mikhdl (1876) already referred to; and his justly admired and vividly interesting work Egy az isten (God is One, 1877). The events of the last-mentioned novel, in which the Unitarians play

an important part, are sup- posed to take place between the years 1848 and 1859, and the scenes are laid partly in Transylvania, partly in Italy. Inhis 4 zévtelen vér (Nameless Castle, 1878), the author connects an epoch of French history with Hungarian, and gives an account of the Hungarian army employed so unsuccessfully against Napoleon in 1809. Rab Fidby (Captive Raby), produced in 1879, is a tale of the times of Joseph If. Defects occasioually observable in Jékai's works are want of unity, consistency, and probability. Of the novels pro- duced by other authors since 1870, we may mention 4 hol az ember kezdédik (Where the Man Begins), by Edward Kavassy (1871), in which he severely lashes the idling Magyar nobility ; Az én ismer- dsctm (My Acquaintances), by Lewis Tolnai (1871) ; and Anatol, by Stephen Toldy (1872) ; the versified romances Déli babok hise (Hero of the Fata Morgana), generally ascribed to Ladislaus Arany, but auonymously published, 4 szerelem hise (Hero of Love), by John Vajda (1873), and Taldlkozdsok (Rencounters) by the same (1877), and 4 Tiindérév (The Fairy Zone), by John Bulla (1876), all four interesting as specimens of narrative poetry; Kdlozdy Béla (1875), a tale of Hungarian provincial lifc, by Zoltan Bedthy, a pleasing writer who possesses a fund of humour, and appears to follow the best English models ; Edith története (History of Edith) by Joseph

Prém (1876) ; Nyomorisdg iskoldja (School of Misery), by the pro- lific author Arnold Vértesi (1878) ; Titkolt szerelem (Secret Love), by Cornelius Abranyi (1879), a social-political romance of some merit ; and Uj idék, avult emberek (Modern Times, Men of the Past), by L. Véka (1879). In the Jéthon (At Home), by Alois Degré (1877), the tale is made the medium for a satirical attack upon official corruption and Hungarian national vanity ; and in the Almok dlmodéja (Dreamer of Dreams), by John Asboth (1878), other national defects are aimed at. 4 rose szomszéd (The Bad Neighbour), by Charles Vadnay (1878), is a felicitous representa- tion of the power of love. The Az utolsé Bebck (The Last of the Bebeks), by the late Charles Pétery, is a work rich in poetic inven- tion, but meagre in historical matter. The reverse is the case with, the Lajos pap (Priest Lewis), by Charles

Vajkay (1879), the scene of which is placed at Pest, in the beginning of the 14th century. In this romance the interest of the narrative is weakeued by a super- abundance of historical and archeological detail.

As regards works of a scientific character, the Magyars until recently were confessedly behind hand as compared with many other European nations, Indeed, before the foundatiou of the Hungarian academy iu 1830, but few such works claiming general recognition had been published in the native language. Even in 1847 astro- nomy, pliysies, logic, and other subjects of the kind had to be taught in several of the lyceums through the medium of Latin. The violent political commotions of the next few years allowed but little opportunity for the prosecution of serious studies ; the sub- sequent quieter state of the country, aud gradual re-establishment of the language as a means of education, were, however, more favourable to the development of scientific knowledge.

In the department of philosophy, besides several writers of disser- tations bearing an imitative, didactic, or polemical character, Hun- gary can boast a few authors of independent and original thought. Of these one of the most notable is Cyril Horvath, whose treatises published in the organs of the academy display a rare freedom and comprehensiveness of imagination. John Hetényi and Gustavus Szontagh must be rather regarded as adopters and developers of the ethical teaching of Samuel K®ételes in the previous period. Hyacinth Ronay in his Mutatvény (Representation) and Jellemisme (Characteristics) endeavoured to popularize psychological studies. The philosophical labours of the already mentioned John Erdélyi aud of Augustus Greguss won for them well-deserved recognition, the latter especially being famous for his esthetical productions, in which he appears to follow out the principles of Vischer. The Lanulmdnyok (Studies) of Greguss were brought out at Pest in 1872. The reputation of John Szilasy, John Varga, Fidelius Beély, and Francis Ney arose rather from their works bearing on the subject of education than from thcir contributions to philosophy.

The labours of Stephen Horvath in the preceding period had pre- pared the way for future workers in the field of historical literature. Specially meritorious among these are Michael Horvath, Ladislaus Szalay, Paul

Jaszay, and Count Joseph Teleki. The Magyarok története (History of the Magyars), in 4 vols., first published at Papa (1842-46), and afterwards in 6 vols. at Pest (1860-63), and in 8 vols. (1871-73), is the most famous of Michael Horvath's numerous his- torical productions, Ladislaus Szalay's Magyarorszig története (History of Hungary), vols. i.-iv. (Leipsic, 1852-54), vols. v.-vi. (Pest, 1856-61), second edition, iv. (1861-66), is a most compre- hensive work, showing more particularly the progress of Hungarian legislative development in past times. His style is elevated and concise, but somewhat difficult. Magyar history is indebted to Paul Jaszay for his careful working out of certain special periods, as, for instance, in his 4 Magyar nemzet napjai a legrégibb wdotol az arany bulldig (Days of the Hungarian nation from the earliest times to the date of the Golden Bull). Count Joseph Teleki is famed chiefly for his Hunyadiak kora Magyarorszdégon (The Times of the Hunyadys in Hungary), vols. i,-vi. (Pest, 1852-63), x.~~xii. (1853~~ 57), the result of thirty years' labour and research. In particular departments of historical literature we find George Bartal, author of Commentariorum … libri XV., tom. i.-iii. (Pozsony, 1847), John Czech, Gustavus Wenczel, Frederick Pesty, and Paul Szlemenics, as writers on legal history ; Joseph Bajza, who in 1845 commenced a "History of the World," Alexander Szilagyi, some of whose works, like those of Ladislaus Kévary, bear on the past of Transylvania, others on the Hungarian revolution of 1848-49 ; Charles Lanyi and John Pauer, authors of treatises on Roman Catholic ecclesi- astical history ; John Szombathi, Emeric Révész, and Balogh, writers on Protestant church history ; William Frakndi, bio- grapher of Cardinal Pazman, and historian of the Hungarian diets; and Anthony Gévay, Aaron Sziladi, Joseph Podhradczky, Charles Szabé, John Jerney, and Francis Salamon, who have inves- tigated and elucidated many special historical subjects. For the medieval history of Hungary the Mdtydskori diplomatikai emlékek (Diplomatic Memorials of the Time of Matthias Corvinus), issued by the academy under the joint editorship of Ivan Nagy and Baron Albert Nyary, affords interesting material. As a masterly produc- tion based on extensive investigation, we note the Wesselényi Ferencz . . . osszeesktivése (The Secret Plot of Francis Wesselényi,

1664-71), by Julius Pauler (1876). Among the many historians of Magyar literature Francis Toldy alias Schedel holds the foremost place. As compilers of useful manuals may be mentioned also Joseph Szvorényi, Zoltan Besthy, Alexander Imre, Paul Jambor, Ladislaus Névy, John Kornyei, and Joseph Szinnyei, junior. For philological and ethnographical research into the origin and growth of the language none excels Paul Hunfalvy. He is, moreover, the warn advocate of the theory of its Ugrio-Fiunie origin, as estab- lished by the late Uralian traveller Anthony Reguly, the result of whose labours Hunfalvy published in 1864, under the title A Vogwl fold és nép (The Vogul Land and People). Between 1862 and 1866 valuable philological studies bearing on the same subject were pub- lished by Joseph Budenz in the Nyelvtudomdnyt kézlemények (Phi- lological Transactions). This periodical, issued by the academy, has during the last deeade (1870-80) contained also comparative studics, by Arminius Vambéry and Gabriel Balint, of the Magyar, Turkish-Tatar, and Mongolian dialects.

As compilers and authors of works in various scientific branches allied to history, may be particularly mentioned—in statistics and geography, Alexius Fényes, Emeric Palugyay, Alexander Konek,

_ John Hunfalvy, Charles Galgéczy, Charles Keleti, Leo Besthy, Joseph

Kérési, Charles Ballagi, and Paul Kiraly, and, as regards Transyl- vania, Ladislaus Kovary ; in travel, Arminius Vambéry, Ignatius Goldziher, Ladislaus Magyar, John Xantus, John Jerney, Couut Andrassy, Ladislaus Podianiezky, Paul Hunfalvy ; in astronomy, Nicholas Konkoly ; in archeology, Bishop Arnold Ipolyi, Florian Rémer, Emeric Henszlmann, John Erdy, Baron Albert Nyary, Francis Pulszky, and Francis Kiss; in Hungarian mythology, Bishop Ipolyi, Anthony Csengery,! and Arpad Kerékgyarté ; im numismatics, John Erdy and Jacob Rupp; and in jurisprudence, Augustus Karvassy, Theodore Pauler, Gustavus Wenezel, Emeric Csacské, John Fogarasi, and Ignatius Frank. Sinee 1867 great activity has becn displayed in history and its allied branches, owing to the direct cncouragement given by the Hungarian Historical Society, and by the historical, archological, and statistical com- mittees of the academy.

Notwithstanding the exertions of Paul Bugit to arouse an in- terest in the natural sciences by the establishment in 1841 of the "Hungarian Royal

Natural Science Association," no general acti- vity was manifested in this department of knowledge, so faras the native literature was concerned, until 1860, when the academy or- ganized a special committee for the advancement of matheimatical and natural science.2 The principal contributors to the " Transac- tions" of this section of the academy have been—for anatomy and physiology, Coloman Balogh, Eugene Jendrassik, Joseph Len- hossék, and Lewis Thanhoffer; for zoology, John Frivaldszky, John Kriesch, and Theodore Margé ; for botany, Frederiek Hazs- linszky, Lewis Juranyi, and Julius Klein ; for mineralogy and

ecology, Joseph Szabo, Max Hantken, Joseph Krenner, Anthony |

Koch, and Charles Hoffmanu; for physics, Baron Lorando Kot- vos, Coloman Szily, and Joseph Sztoezek ; for chemistry, Charles Than and Vincent Wartha; for meteorology, Guido Schenzl. As good text-books, for which the so-ealled " Ladies' Prize" was awarded by the academy, we may mention the Z'ermészettan (Physics) and Természettant foldrajz (Physical Geography) of Julius Greguss. Almost simultancously with the formation of the above-mentioned committee of the academy, the " Natural Seience Association \'

1 The translator of Macaulay.

2 See, however, J. Szinnyei and Son's Bibliotheca Hungarica historic naturals et matheseos, 1472-1875 (Budapest, 1878), where the number of Magyar works bearing on tho natural seiences and mathematics printed from the earliest date to the end of 1875 is stated to be 8811, of which 106 are referred to periodicals.

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showed signs of renewed animation, and soon advanced with rapid strides in the same direction, but with a more popularaim than the aeademy. This may be seen from the fact that between 1868 and 1878 the number of its

menibers increased from some 600 to about 5000. Since 1872, in addition to its regular organs, it has issued Hungarian translations of several popular scientific English works, as, for instance, Darwin's Origin of Species ; Huxley's Lessons in Physiology; Lubbock's Prehistoric Times ; Proctor's Other Worlds than Ours; Tyndall's Heat as a Mode of Motion, &c. Versions have also been made of Cotta's Geologie der Gegenwart and Helm- holtz's Populére Vorlesungen. As important original monographs we note—4z drapdly a Fiumei sbilben (Ebb and Flow in the Gulf of Fiume), by Emil Stalilberger (1874); Magyarorszdg pok- faundja (The Arachnida of Hungary), by Otto Hermann (1876-78); Magyarorszdg vaskivei és vasterményei (The Iron Ores and Iron Products of Hungary), by Authony Kerpely (1877); Magyarorszdg nevezetesedd dohdnyfajainak ehemiat . . . meguizsgdldsa (Chemical Exantination of the most famous Tobaccos of Hungary), by Dr Thomas Kosutany (1877).

In order to give a general idea of the dominant position that the native Hungarian literature has obtained during the last half cen- tury, we conclude our sketch with a few statistics of the number of books and periodicals issued from the press at various dates since the foundation of the academy. In the year 1831 there were 184 Magyar works published ; in 1858 there were 836 ; this number in 1874 increased to 946 ; in 1877 to 1067 ; and in 1878 and 1879 to 1312 and 1154 respectively. In 1879 there appeared also 111 German works, and 185 in other non-Magyar languages. In 1880 the number of Magyar periodicals was 10 ; in 1848-49 it increased to 80, but fell in 1850 to 9. In 1867, after the restoration of the Hungarian constitution, the number was again 80, and increased so rapidly during the next twelve years that by 1879 it reached 324, and has in the present year (1880) risen to 868, There are now, moreover, 197 newspapers and journals of all kinds in the non- Magyar languages, viz., 114 German, 61 Slavonic, 16 Roumanian, 4 Italian, and 2 Hebrew; so that there are at this date altogether 565 periodieals published in Hungary.

If we take a retrospective glance at the depressed state of the native language and literature as it was a century ago, when the first Magyar newspaper was published at Pozsony, Ist January 1780,3 and contrast its commanding position now,—or if we con- sider that, though constantly surrounded and pressed by foreign and antagonistic elements, the native

language and litcrature have not only not been overpowered, but have even gained the mastery, —we eannot fail to admire the determined perseverance of the ehampions of Magyar literature, and believe that the state language is destined to be a common and enduring bond of union between the various nationalities comprised under the crown of St Stephen.

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3 A Latin periodical, intended only for transmission abroad, and styled Mfer- curius Veridicus ex Hungaria, was issued weekly at Kassa as early as 1705. A German periodical was first published in Hungary about 1731,

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HUNS. The authentic history of the Huns in Europe | Quarrels soon arose, partly out of the circumstance that

practically begins about the year 372 a.p.,! when under a leader named Balamir (or, according tosome MSS., Balamber) they began a westward movement from their settlements in the steppes lying to the north of the Caspian. After crushing, or compelling the alliance of, various nations unknown to fame (Alpilzuri, Alcidzuri, Himari, Tuncarsi, Boisci), they at length reached the Alani, a powerful nation which had its seat between the Volga and the Don; these also, after a struggle, they defeated and finally enlisted in their service. They then proceeded, after a short interval, in 374 to invade the empire of the Ostrogoths (Greuthungi), ruled over by the aged Ermanaric, or Hermanric, who died (perhaps by his own hand) while the critical attack was still impending. Under his son Hunimund a sec- tion of his subjects promptly made a humiliating peace ; under Withemir (Winithar), however, who succeeded him in the larger part of his dominions, an armed resistance was organized; but it resulted only in repeated defeat, and finally in the death of the king. The representatives of his son Witheric put an end to the conflict by accept- ing the condition of vassalage. Balamir now directed his victorious arms still further westward against that portion of the Visigothic nation (or Tervingi) which acknowledged the-authority of Athanaric. The latter entrenched himself on the frontier which had separated him from the Ostrogoths, behind the " Grceutung-rampart"' and the Dniester; but notwithstanding all his precautions he was surprised by the enemy, who forded the river in the night, fell suddenly upon his camp, and compelled him to abandon his position. Athanaric next attempted to establish himself in the territory between the Pruth and the Danube, and with this object set about heightening the old Roman wall which Trajan had erected in north-eastern Dacia ; before his fortifications, however, were complete, the Huns were again upon him, and without a battle he was forced to retreat to the Danube. The remainder of the Visigoths, under Alavivus and Fritigern, now began to seek and ultimately were successful in obtaining (376) the permission of the emperor Valens to settle in Thrace ;

Athanaric meanwhile took refuge in Transylvania, thus abandoning the field without any serious struggle to the irresistible Huns. For more than fifty years the Roman world was undisturbed by any aggressive act on the part of the new invaders, who contented themselves with over- powering various other tribes which lived to the north of the Danube. In some instances, in fact, the Huns actually lent their aid to the Romans against third parties ; thus in 404-5 certain Hunnic tribes, under a chief or king named Uldin, assisted Honorius in the struggle with Radagaisus (Ratigar) and his Ostrogoths, and took a prominent part in the decisive battle which was fought in the neighbourhood of Florence. Once indeed, in 409, they are said to have crossed the Danube and invaded Bul- garia under perhaps the same chief (Uldis), but extensive desertions soon compelled a retreat. About the year 432, a noteworthy Hunnic king, Ruas or Rugulas, is mentioned, who made himself of such importance that he received from Theodosius II. an annual stipend or tribute of 350 pounds of gold (£14,000), along with the rank of Roman general.

1 In the existing text of Ptolemy (iii. 5, 25), who wrote about the end of the 2d century after the Christian era, a tribe of Chuni (Xofvox) is placed between the Basterne and the Roxolani on the Dnieper; Schafarik, however (Slav. Alt., i. 8322, 1842), suggests that this may be an interpolated passage. Dionysius Periegetes (c. 200 a.D.) is sometimes quoted as having named the Huns among the borderers on the Caspian in this order—Scyths, Huns (Odvvo:), Caspiani, Albani; but the true reading appears to be @odvvo: or Odvoa: (Zeuss, Die Deutschen u. d. Nachbarstéimme, p. 727). Eratosthenes, as quoted by Strabo (p. 514), gives in the same connexion Albani, Caspiani, and Kovfriot, Kovivrior, or Ovtrio.

the Romans had sought to make alliances with certain

‘Danubian tribes which Ruas chose.to regard as properly

subject to himself, partly also because some of the undoubted subjects of the Hun had sought and found refuge on Roman territory; and Theodosius, in reply to an indignant and insulting message which he had received about this cause of dispute, was preparing to send off a special embassy when tidings arrived that Ruas was dead, and that he had been succeeded in his kingdom by Attila and Bleda, the two sons of his brother Mundzuk (433).

Shortly afterwards the treaty of Margus (not far from the modern Belgrade), where both sides negotiated on horseback, was ratified. By its stipulations the yearly stipendium or tribute payable to Attila by the Romans was doubled 3 the fugitives were to be surrendered, or a fine of £8 to be paid for each of those who should be missing; free markets, open to Hun and Roman alike, were to be instituted ; and any tribe with which Attila might be at any time at war was thereby to be held as excluded from alliance with Rome. For eight years afterwards there was peace so far as the Romans were concerned; and during this period probably it was that the Huns proceeded to the extensive conquests to which the contemporary historian Priscus so vaguely alludes in the words :—" He (Attila) has made the whole of Scythia his own, he has laid the Roman empire under tribute, and he thinks of renewing his attacks upon Persia. The road to that eastern kingdom is not untrodden by the Huns ; already they have marched fifteen days from a certain lake, and have ravaged Media." They also appear before the end of this interval to have pushed west- ward as far as to the Rhone, and to have come into conflict with the Burgundians. Overt acts of hostility, however, occurred against the Eastern empire when the town of Margus (by the treachery of its bishop) was seized and sacked (441), and against the Western when Sirmium was invested and taken. In 445 Bleda died, and two years afterwards Attila, now sole ruler, undertook one of his most important expeditions against the Eastern empire ; on this occasion he pushed southwards as far as Thermopylz, Gallipoli, and the walls of Constantinople ; peace was cheaply purchased by tripling the yearly tribute (which accordingly now stood at 2100 pounds of gold, or £84,000 sterling) and by the payment of a heavy indem- nity besides. In 448 again occurred various diplomatic negotiations, and especially the embassy of Maximin, of which many curious details have been recorded by Priscus his companion. Then followed, in 451, that westward movement across the Rhine which was only arrested at last, with terrible slaughter, on the Catalaunian plains (according to common belief, in the neighbourhood of the modern Chalons, but more probably at a point some fifty miles to the south-east, near Mery-sur-Seine). The following year (452), that of the Italian campaign, was marked by such events as the sack of Aquileia, the destruction of the cities of Venetia, and finally, on the banks of the Mincio, that historical interview with Pope Leo I. which resulted in the return of Attila to Pannonia, where in 453 he died (see AtT1LA). Almost immediately afterwards, the empire he

had amassed rather than consolidated fell to pieces. His too numerous sons began to quarrel about their inheritance, while Ardaric, the king of the Gepidz, was placing himself at the head of a general revolt of the dependent nations. The inevitable struggle came to a crisis near the river Netad in Pannonia, ina battle in which 30,000 of the Huns and their confederates, including Ellak, Attila's eldest son, were slain, The nation, thus broken, rapidly dispersed; onc horde settled under Roman protection in Little Scythia (the Dobrudscha), others in Dacia Ripensis (on the confines of Servia and

Bulgaria) or on the southern borders of Paunonia. The main body, however, appear to have resumed the position on the steppes of the river Ural which they had left less than a century before; soon afterwards they reappear in history as the Bulgari (see Zeuss, Die Deutschen, &c., p. 710), divided into two sections, the Kuturguri and the less for- midable Uturguri, who for morethan seventy years (485-557) were a constant source of annoyance and danger to the Eastern empire, until they themselves fell under the rising power of the Avars. About the year 630 they succeeded in regaining their independence, under the leadership of a chief named Krobat, or more properly Kubrat, a person of great consequence, who made a treaty with the emperor Heraclius. After his death his dominions, according to Theophanes (who wrote about 800 a.p.), were divided among his five sons, of whom the eldest, Batbaias, remained with his own people near the Meotis, while the third, Asperuch, crossed the Danube. At a later period the first of these divisions came into close relations with the Khazars on the Volga, and their territory is spoken of as Great Bulgaria ; for a brief account of the Danubian or White" Bulgarians the article BuncGaria and the works there referred to may be consulted.

We have no adequate philological data for conclusively determining the ethnological position of the ancient Huns ; and, in the attempt to solve the problem by other means, the student is at all points much hampered by the vague- ness and inaccuracy with which designations, apparently ethnological, are applied by ancient writers. Since the publication of the Histoire Générale des Huns, des T'urcs, des Mongols, et des autres Tartares

Occidentaux of De Guignes (1756-58), it has been usual to identify the first mentioned with the Heungnoo or Hiungnu, a people who, about the end of the 3d century B.c., according to the Chinese annals, constituted a powerful empire extending from the Great Wall of China to the Caspian, but who, gra- dually falling into a state of anarchy, ultimately succumbed to the attacks of their enemies towards the close of the lst Christian century. Their subsequent history is very obscure; but it appears that one section of them fled west- ward and settled in the neighbourhood of the Ural river, and the extremely tempting hypothesis of De Guignes is that these were the direct ancestors of the Huns, who three centuries afterwards began, under Balamir, to exercise so formidable an influence on the affairs of Europe. If so, then the Huns in all probability belonged to the Turkish branch of the great Turanian race.

According to the totally distinct Jine of investigation followed by Roesler, however, the Bulgarians, and therefore the Huns whose descendants they were, are to be regarded as of Finnic origin (sec Romdnische Studien, p. 231 sqq.). It has only to be added that by medieval writers, both Byzantine and Western, the word Hun is used much as the word Scythian was used by the ancients, with the utmost generality. No very close connexion can be made cut be- tween the Huns and the Magyars (Ovyypor, Ugri, Wengri, Ungri, Ungiri, Hungari), who first became prominent about the 9th century and who were undoubtedly Finns.

Literature.—The contemporary authoritics upon the subject of the Huns during the period of their greatest ascendency in Europe are the fragments of the cight books of the rhetorician Priscus, Coneerning Byzantium and the Oceurrences connected with Attila, with the writings of Ammianus Marcellinus the Roman soldier, and of Jordanis the Gothic bishop. The account of the Huns given by the last-named must always be read in the light of the fact that as a Goth he could hardly avoid giving a somewhat exag- gerated picture of the great military power in the presence of which his own people had been able to show so little resistance. The truth of the somewhat elaborate sketch of the Huns by Ammianus has sometimes been doubted, but careful examination tends rather to establish its claim to bs regarded as trustworthy. After alluding

to their portentous ugliness (of which, however, the only features he specifies are the round shoulders and the scarred beardless cheeks),

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he proceeds to mention some of the habits which in his opinion stamp them as surpassing all other barbarians in rudeness of life. heir food, in addition to such roots as they are able to find, con- sists of the half-raw ficsh of any sort of animal, prepared for use by being carried for some time between their persons and the backs of the hardy little horses which are their almost inseparable com- panions. Houses they have none; and their clothing, which is made partly of linen and partly of the skins of field nice sewed to- gether, continues to be worn until it falls to pieces. Their weapons are javelins or spears tipped with bone, and (for close combat) the sword and lasso. In warfare they seldom fight in rank, the method of attack they prefer being to throw the encmy into con- fusion by repeated onset made in loose array. They are wholly without religion or sense of moral obligation. For later infor- mation we are dependent on the writers of the Byzantine his- tory (see Stritter, Memoria populorum olim ad Danubium, Pontwm Euxinum, Paludem Meotidem, Caucaswm, dc., ineolentium, ex sertptoribus Byzantinis erute ae digest, 1771-79, and the edition of the fragments of Menander Protector, published in the Bonn collection). For Chinese notices bearing or supposed to bear on the subject of the Huns, De Guignes, Visdelou, and De Mailla remain our chief authorities; to these should be added M. Stanislas Julien's series of papers on the Thukiu in the 6th series of the Journal Asiatique, and Mr Wylie's translations from the Han annals in the Journal of the Anthropological Institute. Other materials on the general subject will be found in the admirable notes to Le Bean's History of the Byzantine Empire, and in the editions of the Arme- nian historians by St Martin, Langlois, and Brosset. See also the History of Georgia by the last of these authors; the Chroniele of Nestor, which is made available to Western students in the edition of M. Paris; the works of Zeuss, Pallinaun, and Roesler already cited; Thierry, Histoire d' Attila et de ses Suecesseurs, 1864; Sayous, Les Origines et ' Epoque Paienne de U Histoire des Hongrois, 1874; Jirecek, Geseh. der Bulgaren, 1877; Hodgkin, Italy and

her Invaders, vol. ii., 1880; Kruse's edition of Al Bekhri, with notes; the Account of the Khazars by M. Harkavy; that of the Ephthalite or White Huns, by M. Vivien St Martin; and a series of papers by Mr Howarth " On the Westerly Drifting of Nomades," published in the Jowrnal of the Anthropological Institute.

HUNT, James Henry Leicu (1784-1859), one of the most delightfulof English essayists and miscellaneous writers, and especially remarkable for his connexion with the most eminent literati of his time, was born at Southgate, October 19, 1784. His father, the son of a West Indian clergyman, had settled as a lawyer in Philadelphia, and his mother was the daughter of a merchant of that city. Having embraced the loyalist side, Leigh Hunt's father was com- pelled to fly to England, where he took orders, and acquired some reputation as a popular preacher, but want of steadi- ness, want of orthodoxy, and want of interest conspired to prevent his obtaining any preferment. Leigh Hunt was educated at Christ's Hospital, of which school as it existed in his time he has left a lively account in his autobiography. An impediment in his speech, afterwards removed, pre- vented his being sent to the university. " For some time after I left school," he says, 'I did nothing but visit my school-fellows, haunt the book stalls, and write verses." These latter were published in 1802 under the title of Juvenilia, and, although the mere literary exercises of a clever boy, contributed to introduce him into literary and theatrical society. He began to write for the newspapers, published a volume of theatrical criticisms in 1807, and in 1808 quitted the War Office, where he had for some time filled a situation as clerk, to assume the editorship of the Examiner newspaper, a speculation of his brother John. The new journal soon acquired a high reputation for inde- pendence, both in political and literary criticism. It was perhaps the only newspaper of the time which owed no allegiance to any political party, but assailed whatever seemed amiss, "from a principle of taste," as Keats hap- pily expressed it. The taste of the attack itself, indeed, was not always unexceptionable ; and one upon the prince regent, unseemly and imprudent without doubt, but the chief sting of which lay in its substantial truth, occasioned (1813) a prosecution and a sentence of two years' imprison- ment in the Surrey jail. The effect was naturally to make Hunt a hero for the time being, and to give a political

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direction to the career of a man of letters. The position was an essentially false one, and led to an entire mis- understanding of Leigh Hunt's character and aptitudes alike on the part of his friends and his antagonists. For the time he was exceedingly popular; the cheerfulness and gaiety with which he bore his imprisonment, and his amus- ing devices to mitigate its severity, attracted general attention and sympathy, and brought him visits from Byron, Moore, Brougham, and others, whose acquaintance exerted much influence on his future destiny. In 1816 he made a permanent mark in English literature by the publication of his Story of Rimini. There is perhaps no other instance of a poem short of the highest excellence having produced so important and durable an effect in modifying the accepted standards of literary composition. The secret of Hunt's success consists less in superiority of genius than of taste, His refined critical perception had detected the superiority of Chaucer's versification, as adapted to the present state of our language by Dryden, over the sententious epigram- matic couplet of Pope which had superseded it. By a simple return to the old manner he effected for English poetry in the comparatively restricted domain of metrical art what Wordsworth had already effected in the domain of nature ; his is an achievement of the same class, though not of the same calibre. His poem is also a triumph in

the art of poetical narrative, abounds with verbal felicities,

and is pervaded throughout by a free, cheerful, and animated spirit, notwithstanding the tragic nature of the subject. It has been remarked that it does not contain one hackneyed or conventional rhyme. Other characteristic traits are less commendable, and the writer's occasional flippancy and familiarity, not seldom degenerating into the ludicrous, made lim a mark for ridicule and parody on the part of his opponents, whose animosity, however, was rather political than literary. These faults were still more conspicuous in other pieces published by him about this date. Ere long, however, Keats's " Lamia " and Shelley's "Julian and Maddalo" manifested the deliverance which he had wrought for English narrative poetry. Both these illustrious men belonged to the circle gathered around him at Hampstead, which also included Hazlitt, Lamb, Procter, Haydon,

Cowden Clarke, Dilke, Coulson, Rey- nolds, and in general almost all the rising young men of letters of Liberal sympathies. He had now for some years been married to Marianne Kent, who seems to have been sincerely attached to him, but was not in every re- spect a desirable partner. His own affairs were by this time in the utmost confusion, and he was only saved fron ruin by the romantic generosity of Shelley. In return he was lavish of sympathy to Shelley at the time of the latter's domestic distresses, and defended him with spirit in the Examiner, although he does not appear to have at this date appreciated his genius with either the discernment or the warmth of his generous adversary, Professor Wilson. Keats he welcomed with enthusiasm, and aided to the uttermost, though Keats seems to have subsequently felt that Hunt's example as a poet had been in some respects detrimental to him. After Shelley's departure for Italy (1818) Leigh Hunt's affairs became still more embarrassed, and the pro- spects of political reform less and less satisfactory. His health and his wife's failed, and he was obliged to discon- tinue his charming series of essays entitled the Indicator, having, he says, "almost died over the last numbers." These circumstances induced him to listen to a proposal, which seems to have originated with Shelley, that he should proceed to Italy and join Shelley and Byron in the estab- lishment of a periodical work in which Liberal opinions should be advocated with more freedom than was possible at home. The project was injudicious from every point of view ; it would have done little for Hunt or the Liberal cause

at the best, and depended entirely upon the co-operation of Byron, the most capricious of allies, and the most parsi- monious of paymasters. Byron's principal motive for acceding to it appears to have been the expectation of acquiring influence over the Examiner, aud he was exceed- ingly mortified on discovering when too late that Hunt had parted, or was considered to have parted, with his interest in the journal. Leigh Hunt left England for Italy in November 1821, but storm, sickness, and misadventure retarded his arrival until June 1822, a rate of progress which Peacock appropriately comparcs to the navigation of Ulysses,

Hunt's arrival in Italy was almost immediately followed by the tragic death of Shelley, which destroyed every pro- spect of success for the Liberal. Hunt was now virtually a dependant upon Byron, whose least amiable qualities were called forth by the relation of patron to an unsym- pathetic dependant, burdened with a large and trouble- sonie family, and who was moreover incessantly wounded in the most sensitive part by the representations of his friends that he was losing caste by the connexion. The Jnberal lived through four quarterly numbers, contain- ing contributions no less memorable than Byron's " Vision of Judgment" and Shelley's translations from Faust; but it produced little effect on the whole, and in 1823 Byron sailed for Greece, leaving his coadjutor at Genoa to shift for himself. The Italian climate and manners, how- ever, were entirely to Hunt's taste, and he protracted his residence until 1825, producing in the interim his matchless translation of Redi's Bacco in Toscana, and the religious work subsequently published under the title of The Religion of the Heart. In 1825 an unfortunate litigation with his brother brought him back to England, and in 1827 he committed the greatest mistake of his life by the publi- cation of his Lord Byron and his Contemporaries, The work is of considerable value as a corrective of merely idealized estimates of Lord Byron. But such a corrective should not have come from one who had lain under obliga- tions to Byron, however trifling, or however they might seem to be cancelled by subsequent unkindness. Leigh Hunt should also have considered that the materials for lis estimate of Byron were chiefly afforded by a residence under Byron's own roof. Apart from its obvious impropriety, the publication in itself is in general petty and carping. Hunt's attitude towards Byron is always that of the inferior; in proportion, therefore, as Byron is made to look small, Hunt appears stillsmaller. The book's reception was even more unfavourable than its deserts. British manliness and British cant were for once equally shocked, and the author especially writhed under the withering satire of Moore. For many years ensuing, the history of Hunt's life is that of a painful struggle with poverty and sickness. He worked unremittingly, but one effort failed after another. Two periodical ventures, the Z'atler and the London Journal, were discontinued for want of subscribers, although in the latter Leigh Hunt had able coadjutors, and it contained some of his best writing. His editorship of the JJonthly Repository, in which he succeeded W. J. Fox, was also unsuccessful. The adventitious circumstances which had for a time made the fortune of the

Lxaminer no longer existed, and Hunt's strong and weak points, his refinement and his affectations, were alike unsuited to the general body of readers. Str Ralph Esher, a romance of Charles the Second's period, was more successful, and Captain Sword and Captain Pen, a spirited contrast between the victories of peace and the victories of war, deserves to be ranked among his best poems. In 1840 his circumstauces were improved by the successful representation of his Legend of Florence, a play of great merit, although it has not maintained itself upon the stage. Lover's Amazements, a

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comedy, was acted several years afterwards ; and other plays are extant in MS. The pretty narrative poem of The Palfrey was published in 1842; and about this time he began to write for the Hdinburgh Review. In 1844 he was further benefited by the generosity of Mrs Shelley and her son, the present baronet, who, on succeeding to the family estates, settled an annuity of £120 upon him; and in 1847 Lord Jolin Russell procured him a civil list pen- sion of £200. The fruits of the improved comfort and augmented leisure of these latter years were visible in the production of some charming volumes. Foremost among these are the companion books, /magination and Fancy and Wit and Humour. Inthese Leigh Hunt shows himself as within a certain range the most refined, appreciative, and felicitous of critics. Homer and Milton may be upon the whole beyond his reach, though even here he is great in the detection of minor and unapprehended beauties; with Spenser and the old English dramatists he is perfectly at home, and his subtle and discriminating criticism upon them, as well as upon his own great contemporaries, is continually bringing to light beauties unsuspected by the readcr, as they were probably undesigned by the writer. His companion volume on the pastoral poetry of Sicily, quaintly entitled A Jar of Iloney from Mount LHybla, is almost equally delightful. Zhe Zown and Jfen, Women, and Books are partly made up from former material. The Old Court Suburb is an anecdotic sketch of Kensington, where he long resided before his final removal to Hammer- smith. In 1850 he published his autobiography, a naive and accurate piece of self-portraiture, full of affectations, but on that very account free from the affectation of unreality. It is more chary of portraits of contemporaries than might have been

expected, but contains very detailed accounts of some of the most interesting periods of the author's life, his education at Christ's Hospital, his imprison- ment, and his residence in Italy. In 1855 his narrative poems, original and translated, were collected under the title of Stories in Verse, with an interesting preface, He died at Putney, on August 28, 1859.

The character of Leigh Hunt is not easy ta delineate, not from any difficulty of recognizing or harmonizing its leading features, but from that of depicting the less admir- able traits in a manner consistent with the affection and respect to which it is entitled on the whole, His virtues were charming rather than imposing or brilliant; he had no vices, but very many foibles. His great misfortune was that these foibles were for the most part of an undig- nified sort, and, though it may seem a paradox, that they were so harmless, and on so miniature a scale. Leigh Hunt's affectation, for example, is not comparable to Byron's, or his egotism to Wordsworth's, and therefore its very pettiness excites a sensation of the ludicrous which the colossal self-consciousness of his contemporaries does

not produce. The very sincerity of his nature is detrimental |.

to him ; the whole man seems to be revealed in everything he ever wrote, and hence the most beautiful productions of his pen appear in a manner tainted by his really very pardonable weaknesses. Some of these, such as his help- lessness in money matters, and his facility in accepting the obligations which he would have delighted to confer, were unfortunately of a nature to involve him in painful and humiliating embarrassments, which seem to have been aggravated by the mismanagement of those around him, The notoriety of these things has deprived him of much of the honour due to him for his fortitude under the severest calamities, for his unremitting literary industry under the most discouraging circumstances, and for his uncompro- mising independence as a journalist and an author. It was his misfortune to be involved in politics, for which he had little vocation, and which embroiled him with

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many with whom he would otherwise have been on good terms. 'Though I was a politician," he says himself, "T had scarcely a political work in my library. Spensers and Arabian Tales filled up the shelves." He was in fact as thorough a man of letters as ever existed, and most of his failings were more or less incidental to that charactcr. But it is not every consummate man of letters of whom it can be unhesitatingly affirmed that he was brave, just, and pious.

Leigh Hunt's character as an author was the counterpart of lis character asa man. In some respects his literary position is unique. Few men have effected so much by mcre exquisiteness of taste in the absence of high creative power; fewer still, so richly endowed with taste, have so frequently and conspicuously betrayed the want of it. As Wordsworth could never see where simplicity of poetic diction lapsed into mere prose, so Hunt was incapable of discovering where familiarity became flippancy. While Wordsworth, however, is at worst wearisome, Hunt is some- times positively offensive tofastidious readers. This obser- vation principally refers to his poetry, which, in spite of such vexatious flaws, nevertheless possesses a brightness, animation, artistic symmetry, and metrical harmony, which lift the author out of the rank of minor poets, particularly when the influence of his example upon his contemporaries is taken into account. He excelled especially in narrative poetry, of which, upon a small scale, there are probably no better examples in our language than ' Abou ben Adhem " and "Solomon's Ring." He possessed every qualification for a translator, and it is to be regretted that his per- formances in that department are not more numerous and sustained. As an appreciative critic, whether literary or dramatic, he is hardly equalled; his guidance is as safe as it is genial. The no less important vocation of a censor was uncongenial to his gentle nature, and was rarely essayed by him.

The principal authoritics for Leigh Hunt's life are his Aztobio- graphy, published in 1850, and reprinted since his death with ad- ditions and corrections, and the two volumes of his Correspondence, published with a connecting thread of biography by his son in 1862. The references to him in the writings and biographies of his con- temporaries are innumerable. A full bibliography of his works, with excellent remarks, has been published by Mr Alexander Ireland. (R. G.)

HUNT, Witt1am Henry (1790-1864), water-colour painter, was born near Long Acre, London, March 28, 1790. Overcoming the usual parental objections, he was appren- ticed about 1805 to John Varley, the landscape-painter, with whom he remained five or six years, exhibiting three oil pictures at the Royal Academy in 1807. He was early connected with the society of painters in water-colour, of which body, then in a transition state, he was elected asso- ciate in 1824, and full member in 1827. To its exhibi- tions he was until the year of his death one of the most prolific contributors. Many years of Hunt's uneventful and industrious life were passed at Hastings. He died of apoplexy, February 10, 1864.

Hunt was one of the creators of the English school of water-colour painting. His subjects, especially those of his later life, are extremely simple ; but, by the delicacy, humour, and fine power of their treatment, they take rank second to works of the highest art only. Considered techni- cally, his works exhibit all the resources of the water-colour painter's craft, from the purest transparent tinting to the boldest use of body-colour, rough paper, and scraping for texture. His sense of colour is perhaps as true as that of any English artist. " He was," says Ruskin, "take him for all in all, the finest painter of still life that ever existed. Several fine and characteristic examples of Hunt's work, as the Boy and Goat, Brown Study, and Plums, Primroses, and Birds' Nests, are in the water-colour galleries at South Kensington.

Hh UW. HUNTER, Joun (1728~1793),—as physiologist and

surgeon combined, unrivalled in the annals of medicine,— born February 13,! 1728, at Long Calderwood, in the parish of Hast Kilbride, Lanarkshire, was the youngest of the ten children of John and Agnes Hunter. © His father, who died October 30, 1741,2 aged 78, was descended from the old Ayrshire family of Hunter of Hunterston, and his mother was the daughter of a Mr Paul, treasurer of QGlas- gow. Hunter is said to have made but little progress at school, being averse to its restraints and pursuits, and fond of country amusements. When seventeen years old hc repaired to Glasgow, where he for a short time assisted his brother-in-law, Mr Buchanan, a cabinetmaker, who had involved himself in pecuniary difficulties. Being desirous at length of some scttled occupation, he obtained from his brother

William permission to aid, under Mr Symonds, in making dissections in his anatomical school, then the most celebrated in London, intending, should he be unsuccessful there, to enter the army. He arrived accordingly in the metropolis in September 1748, about a fortnight before the commencement of his brother's autumnal course of lectures. After succeeding beyond expectation with the dissection of the muscles of an arm, he was entrusted with a similar part injected, and from the excellence of his second essay Dr Hunter predicted that he would become a good anatomist. Seemingly John Hunter had hitherto received no instruction in preparation for the special course of life upon which he had entered. His brother, with whom he was now inti- mately associated, was one of the most brilliant exponents of medical science, and enjoyed the society of the best cul- tured men of the age; but that it was through this circum- stance that, as stated by R. A. Stafford,? "he was taught to think," and that his mind, as has been surmised, had pre- vious to his coming to London been "idle, heedless, and aimless," can hardly be concluded in the face of what the future revealed of the practical and inquiring turn and the originality of his mental disposition. Rather we may assume, with B. B. Cooper, that Hunter was naturally gifted with powers of mind which rendered him to some extent in- dependent of the training required by less extraordinary intellects. Dr J. Ridge,® speaking of Hunter's permitted truancy from the grammar school, argues that early tuition and attainments, at least of the kind imparted, being in- consistent with a natural education of the senses, are not favourable to the production of extraordinary genius. Hunter's power of estimating what was worth doing, and what could be done, is by Dr Moxon' ascribed in part to his being "a man who had a free youth, not over-taught, nor over-strained ;" and, if it be true that "the early part of life, the school- time, has long been spent, and is spent, in pursuits which minister but little to the culture of tho mind, or to the communication and reception of knowledge useful to any class of society in proportion to the time consumed," it is possible that his dislike to scholastic exercises may have served to protect Hunter from influences opposed to that very endowment which made him pre- eminent as a teacher, namely, the power of perceiving the relation of numerous individual facts as illustrations of general principles.*

1The date is thus entered in the parish register, see Adams, Memoirs, Appendix, p. 208. The Hunterian Oration, instituted in 1813 by Dr Baillie and Sir Everard Home, is delivered at the Royal College of Surgeons on the 14th of February, which Hunter used to give as the anniversary of his birth.

- *Ottley's date, 1738, is inaccurate, see Simmons, Accownt of… W. Hunter, p. 7. Hunter's mother died Nov. 3, 1751, aged 66.*

3 Hunt. Orat., 1851, p. 6. 4 unt. Orat., 1858, p. 7. ia : sii on the Life, Disease, and Death of J. Hunter, p. 19,

$ See Oration before Hunterian Society, Aled. Times and Gasettc, March 1877, p. 224.

7R. Quain, Hunt. Orat., 1869, p. 19.

a Pay 385

Hard-working, and singularly patient and skilful in dissection, Hunter had by his second winter in London acquired sufficient anatomical knowledge to be entrusted with the charge of his brother's practical class, with the members of which, as also with the resurrection men, he was a universal favourite. In the summer months of 1749-50, at Chelsea Military Hospital, he attended the lectures and operations of Chesclden, on whose retirement in the following year he became a surgeon's pupil at St Bartholomew's, where Pott was one of the senior surgeons. In the summer of 1752 he visited Scotland, Hlome and, following him, Ottley state that Huuter began in 1754 to assist his brother as his partner in lecturing ; according, however, to the Zuropean Magazine for 1782, the office of lecturer was offered to Hunter by his brother in 1758, but declined by him on account of the "insuperable embarrass- ments and objections" which he felt to speaking in public. In 1754 he became a surgeon's pupil at St George's Hos- pital, where he was appointed house-surgeon in 1756.8 During the period of his connexion with Dr Hunter's school he, in addition to other labours, solved the problem of the descent of the testis in the foetus, traced the ramifications of the nasal and olfactory nerves within the nose, experiment- ally tested the question whether veins could act as absorbents, studied the formation of pus, and the nature of the placental circulation, and with his brother earned the chief

merit of practically proving the function and importance of the lymphatics in the animal economy. On June 5, 1755,9 he was induced to enter as a gentleman commoner at St Mary's Hall, Oxford, but his true instincts would not permit him, to use his own expression, "to stuff Latin and Greek at the university." Some three and thirty years later he thus significantly wrote of an opponent :—" Jesse Foot accuses me of not understanding the dead languages; but I could teach him that on the dead body which he never knew in any language dead or living." © Doubtless, however, linguistic studies would have served to correct in him what was perhaps a natural defect—a difficulty in the presenta- tion of abstract ideas which was not wholly attributable to the novelty of his doctrines,

An attack of inflammation of the lungs in the spring of 1759, apparently caused by overwork, having produced symptoms threatening consumption, by which the promis- ing medical career of his brother James had been cut short, Hunter, with a view to residence abroad for a season, obtained from Mr Adair in October 1760 the appointment of staff-surgeon in Hodgson and Keppel's expedition to Belleisle. With this he sailed in 1761. In the following year he served with the English forces on the frontier of Portugal, Whilst with the army he acquired the extensive knowledge of gunshot wounds embodied in his important treatise on that subject, published in 1794, in which, amongst other matters of moment, he insists on the rejec- tion of the indiscriminate practice of dilating with the knife followed almost universally by surgeons of his time. When not engaged in the active duties of his profession, he occupied himself with physiological and other scientific researches, Thus, in 176], off Belleisle, the conditions of

8 So in Home's Life, p. xvi., and Ottley's, p. 15. Hunter himself (Treatise on the Blood, p. 62) mentions the date 1755.

® Ottley incorrectly gives 1753 as the date. In the buttery book for 1755 at St Mary's Hall his admission is thus noted: " Die Junii 5° 1755 Admissus est Johannes Hunter superioris ordinis Commen- salis." Hunter apparently left Oxford after less than two months' residence, as the last entry in the buttery hook with charges for battels against his name is on July 25,1755. His name was, how- ever, retained on the books of the Hall till December 10, 1756. The writer is indebted to Dr John Griffiths, Keeper of the*

Archives, Ox- ford University, for the following record of Hunter's matriculation :— 'Ter? Trin. 1755.—Junii 5% Aul. S. Mar. Johannes Hunter 24 Johannis de Kilbride in Com. Clidesdale Scotise Arm. fil,"

10 Ottley, Life of J. unter, p. 22.

the coagulation of the blood were among the subjects of his inquiries! Later, ou land, he continued the study of human anatomy, and arranged his notes and memoranda on inflammation ; he also ascertained by experiment that digestion does not take place in snakes and lizards during hibernation, and observed that enforced vigorous movement at that season proves fatal to such animals, the waste so occasioned not being compensated, whence he drew tlie inference that, in the diminution of the power of a part attendant on mortification, resort to stimulants which in- crease action without giving real strength is inadvisable." A MS. catalogue by Hunter, probably written soon after his return from Portugal, shows that he had already made a collection of about two hundred specimens of natural and morbid structures.

On arriving in England early in 1763, Hunter, having retired from the army on half-pay, took a house in Golden Square, and commenced the career of a London surgeon. Most of the metropolitan practice at the time was held by Pott, C. Hawkins, Sharpe, Warner, Adair, and Tomkins ; and Hunter sought to eke out his at first slender income by teaching practical anatomy and operative surgery to a private class. His leisure was devoted to the study of comparative anatomy, to procure subjects for which he obtained the refusal of animals dying in the Tower menagerie and in various travelling zoological collections. In connexion with his rupture of a tendo Achillis,? in 1767, he performed on dogs several experiments which, with the illustrations in his museum of the reunion of such structures after division, laid the foundation of the modern practice of cutting through tendons for the relief of distorted and contracted joints. In the same year he was made a fellow of the Royal Society. His first contribution to the Philosophical Transactions, with the exception of a supple- ment to a paper by J. Ellis in

the volume for 1766, was an essay on post-mortem digestion of the stomach, written at the request of Sir J. Pringle, and read June 18, 1772, in which he first correctly explained that phenomenon as a result of the action of the gastric juice. Hunter, on December 9, 1768, was elected a surgeon to St George's Hospital, and, soon after, a member of the Corporation of Surgeons. He now began to take house-pupils. Among these were Edward Jenner, who came to him in 1770, and until the time of Hunter's death corresponded with him on the most intimate and affectionate terms, W. Guy, Kingston, Dr Physick of Philadelphia, and Everard Home, his brother- in-law. Mr Lynn and Sir A. Carlisle, though not inmates of his house, were frequent visitors there. His pupils at

1 Treatise on the Blood, p. 21.

2 See Adams, Afemoirs, pp. 32, 83. Cf. Hunter's Treatise on the Blood, p. 8, and Works, ed. Palmer, i. 604.—On the employment of Hunter's term 'increased action" with respect to inflammation, see Paget, Lect. on Surg. Path., 3d ed., p. 321 sqq.

3 According to Hunter, as quoted in Palmer's edition of his lectures, p. 437, the accident was " after daneing, and after a violent fit of the cranip;" Clift, however, who says he probably never danced, belicved that he met with the accident "in getting up from the dis- secting table after being cramped by long sitting " (see W. Lawrence, unt. Orat., 1834, p. 64).

"The subjects and dates of his subsequent papers in the Trans- actions, the titles of which give little notion of the richness of their contents, are as follows:—The torpedo, 1773; air-receptacles in birds, and the Gillaroo trout, 1774; the Gymnotus electricus, and the production of heat by animals and vegetables (supplemented in 1777), 1775; the recovery of people apparently drowned, 1776; the free martin, 1779 ; the communication of smallpox to the foetus in utero, and the occurrence of male plumage in old hen pheasants, 1780; the organ of hearing in fishes, 1782; the anatomy of a "new marine animal" described by Home, 1785; the specific identity of the wolf, jackal, and dog (supplemented in 1789), the effect on fertility of extir-pation of one ovarium, and the structure and economy of whales, 1787; observations on bees, 1793; and some remarkable caves in Bayreuth and fossil bones found therein, 1794. With these may be

included a paper by Home, from materials supplied by Hunter, on certain horny excrescences of the human body.

HUNTER

St George's included Abernethy, Cline, James Earle, and Astley Cooper. From the high reputation in their profes- sion which these one and all attained, some estimate may be formed of the weight and value of Hunter's personal influence and teaching. In 1770 he settled in Jermyn Street, in the house which his brother William had pre- viously occupied; and in July 1771 he married Anne, the eldest daughter of Mr Robert Home, surgeon to Burgoyne's regiment of light-horse.®

From 1772 till his death Hunter resided during autumn at a house built by him at Earl's Court, Brompton, where most of his biological researches were carried on. There he

| kept for the purpose of study and experiment the fishes,

lizards, blackbirds, hedgehogs, and other animals sent him from time to time by Jenner, tame pheasants and partridges, at least one eagle, toads, silkworms, and many more creatures obtained from every quarter of the globe. Bees he had under observation in his conservatory for upwards of twenty years; hornets and wasps were also diligently studied by him. On two occasions his life was in risk from his pets—once in wrestling with a young bull, and again when he fearlessly took back to their dens two leopards which had broken loose among his dogs. Choos- ing intuitively the only true method of philosophical dis- covery, Hunter, ever cautious of confounding fact and hypothesis, besought of nature the truth through the medium of manifold experiments and observations. ' He had never read Bacon," says Babington, "but his mode of studying nature was as strictly Baconian as if he had." 6 To Jenner, who had offered a conjectural explanation of a phenomenon, he writes, August 2, 1775: "JT think your solution is just; but why think? why not try the experi- ment? Repeat all the experiments upon a hedgehog? as soon as you receive this, and they will give you the solu- tion." Perhaps no man busily engaged in professional

| practice has ever conducted so many physiological and

pathological investigations in the animal world as Hunter ; and yet it was with him an axiom "that experiments should not be often repeated which tend merely to establish a principle already known and admitted, but that the next step should be the application of that principle to useful purposes" ("Anim. Cicon.," Works, iv. 86). During fifteen years he kept a flock of geese simply in order to acquaint himself with the developnient of birds in eggs, with refer- ence to which he remarked—" It would almost appear that this mode of propagation was intended for investigation." In his toxicological and other researches, in which his ex- perience had led him to believe that the effects of noxious drugs are nearly similar in the brute creation and in man, he had already, in 1780, as he states, "poisoned some thousands of animals." §

By inserting shot at definite distances in the leg-bones of young pigs, and also by feeding them with madder, by which all fresh osseous deposits are tinged,? Hunter obtained evidence that bones increase in size, not by the intercalation of new amongst old particles, as had been

5 Mrs Hunter dicd January 7, 1821, in Holles Street, Cavendish Square, London, in her seventy-ninth year. She was a haudsome and accomplished woman, and well fulfilled the social duties of her position. The words for Haydn's English canzonets were supplied by her, and were mostly original poems; of these the lines beginning '" My mother bids me bind my hair" are, from the beauty of the accom- panying music, amoug the best known. (See R. Nares in Gent. Mag., xci., pt. 1, p. 89, quoted in Nichols's Lit, Anec., 2d ser., vii. 638.)

5 Hamt. Orat., V842, p. 1b.

7 The condition of this animal during hibernation was a subject of special interest to Hunter, who thus introduces it, even in a letter of condolence to Jenner in 1778 on a disappointment in love :—" But let her go, never mind her. I shall employ you with hedgehogs, for I do not know how far I may trust mine."

8 See his evidence at the trial of Captain Doncllan, Works, i. 195.

® On the discovery of the dyeing of bones by madder, see Belchier, Phil. Trans., vol. xxxix., 1786, pp. 287 and 299.

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imagined by Duhamel, but by means of additions to their extremities and circumference, excess of calcareous tissue being removed by the absorbents. Some of his most extraordinary experiments were to illustrate the relation of strength of constitution to sex, He exchanged the spurs of a young cock anda young pullet, and found that on the former the transplanted structure grew to a fair size, on the latter but little; whereas aspur from one leg of a cock transferred to its comb, a part well supplied with blood, grew more than twice as fast as that left on the other leg. Another experiment of his, which required many trials for success, was the engrafting of a human incisor on the comb of a cock! The uniting of parts of different animals when brought into contact he attributed to the production of adhesive instead of suppurative inflammation, owing to their possession of "the simple living principle."2 The effects of habit upon structure were illustrated by Hunter's observation that in a sea-gull which he had brought to feed on barley the muscular parietes of the gizzard be- caine greatly thickened. A similar phenomenon was noticed by him in the case of other carnivorous birds fed on a vegetable diet.

It was in 1772 that Hunter, in order effectually to gauge the extent of his own knowledge, and also to correctly express his views, which had been repeatedly misstated or ascribed to others, commenced his lectures on the theory and practice of surgery, at first delivered free to his pupils and a few friends, but subsequent to 1774 on the usual terms, four guineas. Though Pott, indeed, had perceived that the only true system of surgery is that which most closely accords with the curative efforts of nature, a rational pathology can hardly be said to have had at this time any existence ; and it was generally assumed that a knowledge of anatomy alone was a sufficient foundation for the study of surgery. Hunter, unlike his contemporaries, to most of whom his philosophic habit of thought was a mystery, and whose books contained little else than relations of cases, and modes of treatment, sought the reason for each pheno- menon that came under his notice. The principles of surgery, he maintained, are not less necessary to be under-

stood than the principles of other sciences ; unless, indeed, the surgeon should wish to resemble "the Chinese philo- sopher whose knowledge consisted only in facts." In that case the science must remain unimproved until fresh facts arise. Too much attention, he remarked, cannot be paid to facts; yet a multitude of facts overcrowd the memory without advantage if they do not lead us to establish principles, by an acquaintance with which we learn the causes of diseases. Hunter's course, which latterly com- prised eighty-six lectures, delivered on alternate evenings between the hours of seven and eight, lasted from October to April. Some teachers of his time were content to dismiss the subjects of anatomy and surgery in a course of only six weeks' duration. The task of lecturing is said to have been to Hunter so formidable that at the commence- ment of each course he was obliged to take half a drachm of laudanum. His class was usually small, and never exceeded thirty. Among its members at various times were Abernethy, Carlisle, Chevalier, Cline, Coleman, Astley Cooper, Home, Lynn, and Macartney. Hunter was deficient in the gifts of a good extempore speaker, being in this respect a remarkable contrast to his brother William; and he read his lectures, seldom raising his eyes from the manuscript. His manner with his auditory is stated to

1 Essays and Observations, i. 55,56. ' May we not claim for him," says Sir Wm. Fergusson with reference to these experiments, " that he anticipated by a hundred years the scientific data on which the Set system of human grafting is conducted?" (Hunt. Orat., 1871, eplih).*

- *Essays and Observations, i. 115; ef. Works, i. 391.*

have been embarrassed and awkward, or, as Adams puts it (Obs. on Morbid Pois., p. 272), " frequently ungraceful," and his language always unadorned ; but that his "' expres- sions for the explaining of his new theories rendered his lectures often unintelligible" is scarcely evident in his pupils' notes still extant. His own and others' errors and fallacies were exposed with equal freedom iu his teaching. Occasionally he would tell his pupils, "You had better not write down that observation, for very likely I shall think differently next year;" and once to a question of Coleman's he replied, "Never ask me what I have said or what I have written; but, if you

will ask me what my present opinions are, [will tell you." He was always much gratified when, in the conversations that he encouraged his hearers to hold with him at the end of his lectures, he found that what he said was understood and appreciated.

In January 1776 Hunter was appointed surgeon-extra- ordinary to the king. He commenced in the same year his Croonian lectures on muscular motion, continued annually, except in 1777, till 1782: they were never published by him, being in his opinion too incomplete. In 1778 ap- peared the second part of his Z'reatise on the Natural History of the Human Teeth, the first part of which was published in 1771. It was in the waste of the dental alveoli and of the fangs of shedding teeth that in 1754-55, as he tells us, he received his first hint of the use of the absorbents. Abernethy (Phys. Lect., p. 196) relates that Hunter, being once asked how he could suppose it possible for absorbents to do such things as he attributed to them, replied, "Nay, [know not, unless they possess powers similar to those which a caterpillar exerts when feeding on a leaf." Hunter in 1780 read before the Royal Society a paper in which he laid claim to have been the first ta make out the nature of the utero-placental circulation. His brother William, who had five years previously described the same in his Anatomy of the Gravid Uterus, thereupon wrote to the Society attributing to himself this honour. John Hunter in a rejoinder to his brother's letter, dated February 17, 1780, reiterated his former statement, viz., that his discovery, on the evening of the day in 1754 that he had made it in a specimen injected by a Dr Mackenzie, had been communicated by him to Dr Hunter. Thus arose an estrangement between the two Hunters, which con- tinued until the time of William's last illness, when his brother obtained permission to visit him.

In 1783 Hunter was elected a member of the Royal Society of Medicine and of the Royal Academy of Surgery at Paris, and took part in the formation of "A Society for the Improvement of Medical and Chirurgical Knowledge." 3 It appears from a letter by Hunter that in the latter part of 1783 he, with Jenner, had the subject of colour-blindness under consideration. As in that year the lease of his premises in Jermyn Street was to expire, he purchased the twenty-four years' leasehold of two houses, the oue on the east side of Leicester Square, the other in Castle Street, with intervening ground. Between the houses he built in 1783-85, at an expense of above £3000, a

museum for his anatomical and other collections. These by 1782 had cost him £10,000, and contained preparations of numerous specimens presented by Sir Joseph Banks, the Honourable C. Greville, and Mr Walsh. The new edifice consisted of a hall 52 feet long by 28 feet wide, and lighted from the top, with a gallery all round, and having beneath it a lecture

3 The Transactions of the Society contain papers by Hunter on inflammation of veins (1784), intussusception (1789), a case of para- lysis of the muscles of deglutition (1790), and a case of poisoning during pregnancy (1794), with others written by Home, from materials supplied by him, on Hunter's operation for the cure of popliteal aneur- ism, on loose cartilages in joints, on certain horny excrescences of the human body, and on the growth of bones.

theatre, and a room used subsequently for the meetings of the Lyceum Medicum, a society instituted by Hunter and Fordyce. In April 1785 Hunter's collections were removed into it under the superintendence of Home and Bell,' and another assistant, André. Among the foreigners of dis- tinction that inspected the museum, which was now shown by Hunter twice a year,—in October to medical men, and in May to other visitors,—were Blumenbach, Camper, Poli, and Scarpa. In the acquisition of subjects for his varied biological investigations and of specimens for his museum, expense was a matter of small moment with Hunter. Thus at one time he endeavoured, at his own cost, to obtain in- formation respecting the Cetacea by sending out a surgeon to the North ina Greenland whaler, He is said, moreover, to have given, in June 1783, no less than £500 for the body of O'Brien, or Byrne, the Irish giant, whose skeleton, 7 feet 7 inches high, is so conspicuous an object in the museum of the College of Surgeons of London.?

Hunter, who in the spring of 1769-72 had suffered from gout, in spring 1773 from spasm apparently in the pyloric region, accompanied by failure of the heart's action (Ottley, Iife, p. 44), and in 1777 from vertigo with symptoms of angina pectoris, had in 1783 another attack of the last mentioned complaint, to which he was henceforward subject when under anxiety or excitement of mind.

In May 1785,° chiefly to oblige Sharp the engraver, Hunter consented to have his portrait taken by Sir Joshua Reynolds. He proved a bad sitter, and Reynolds made but little satisfactory progress, till one day Hunter, while resting his somewhat upraised head on his left hand, fell into a profound reverie—one of those waking dreams, seemingly, which in his lectures he has so well described, when ‘ the body loses the consciousness of its own existence.” The painter had now before him the man he would fain depict, and, turning his canvas upside down, he sketched out the admirable portrait which, since most skilfully restored by Mr H. Farrar, is in the possession of the Royal College of Surgeons. A copy of the same, by Jackson, acquired from Lady Bell, is to be seen at the National Portrait Gallery in South Kensington. St Mary’s Hall, Oxford, also possesses a copy. Sharp’s engraving of the original, published in 1788, is one of the finest of his productions. The volumes seen in Reynolds’s picture are a portion of the unpublished records of anato- mical researches left by Hunter at his death, which, with other manuscripts, Sir Everard Home in 1812 removed from his museum, and eventually, in order, it has been supposed, to keep secret the source of many of his papers in the Philosophical Transactions, and of facts mentioned in his lectures, committed to the flames.®*

1 Bell lived with Hunter fourteen years, z.e., from 1775 to 1789, and was employed by him chiefly in making and drawing anatomical pre- parations for the museum. He died in 1792 at Sumatra, where he was assistant-surgeon to the East India Company.

2 ©’Brien, dreading dissection by Hunter, had shortly before his death arranged with several of his countrymen that his corpse should be conveyed by them to the sea, and sunk in deep water; but his undertaker, who had entered into a pecuniary compact with the great anatomist, managed that while the escort was drinking at a certain stage on the march seawards, the coffin should be locked up in a barn. ‘There some men he had concealed speedily substituted an equivalent weight of paving-stones for the body, which was at night forwarded to Hunter, and by him taken in his carriage to Earl’s Court, and, to avoid risk of a discovery, immediately after suitable division boiled to obtain the bones. See Tom Taylor, Leicester Square, chap. xiv., 1874; cf. Annual Register, xxvi. 209, 1783.

3 See C. R. Leslie and Tom Taylor, Life and Times of Sir J. Reynolds, ii, 474, 1865. 4 Works, i. 265-266.

® A transcript of a portion of Hunter's MSS., made by Clift in 1793 and 1800, was edited by Professor Owen, in two volumes with notes, in 1861, under the title of Essays and Observations in Natural His- tory, Anatomy, Physiology, Psychology, and Geology. On the destruc- tion of Hunter's papers see Clift's " Appendix" in vol. ii. p. 497, also Prof. Flower, Introd. Lect., 7-9, 1870.

HUNTER

Among the subjects of Hunter's physiological investiga- tions in 1785 was the mode of growth of deer's antlers. As he possessed the privilege of making experiments on the deer in Richmond Park, he in July of that year had a buck there caught and thrown, and tied one of its external carotid arteries. He observed that the antler which obtained its blood supply therefrom, then half-grown, became in consequence cold tothe touch. Hunter debated with himself whether it would be shed in due time, or be longer retained than ordinarily. To his surprise he found, on re-examining the antler a week or two later, when the wound around the ligatured artery was healed, that it had regained its warmth, and was still increasing in size. Had, then, his operation been in some way defective? To determine this question, the buck was killed and sent to Leicester Fields. On examination Hunter ascertained that the external carotid had been duly tied, but that certain small branches of the artery above and below the ligature had enlarged, and by their anastomoses had restored the blood supply of the growing part. Thus it was evident that under "the stimulus of necessity," to use a phrase of the experimenter, the smaller arterial channels are capable of rapid increase in dimensions to perform the offices of the larger.6 It happened that, in the ensuing December, there lay in one of the wards of St George's Hospital a patient of Hunter's, admitted for popliteal aneurism. The disease must soon prove fatal unless by some means arrested. Should the surgeon, following the usual and commonly fatal method of treatment, cut down upon the tumour, and, after tying the artery above and below it, evacuate its con- tents? Or should he adopt the procedure, deemed by Pott generally advisable, of amputating the limb above it? It was Hunter's aii in

his practice, even if he could not dis- pense with the necessity, at least to diminish the severity of operations, which he considered were an acknowledgment of the imperfection of the art of healing, and compared to "the acts of the armed savage, who attempts to get that by force which a civilized man would get by stratagem." Since, he argued, the experiment with the buck had shown that collateral vessels are capable of continuing the circula- tion when passage through a main trunk is arrested, why should he not, in his aneurism case, leaving the absorbents to deal with the contents of the tumour, tie the artery in the sound parts, where it is tied in amputation, and preserve the limb? Acting upon this idea, he ligatured his patient's femoral artery in the lower part of its course in the thigh, in the fibrous sheath enclosing the space' since known as '¢ Hunter's canal."? Theleg was found, some hours after the operation, to have acquired a temperature even above the normal. At the end of January 1786, that is, in six weeks' time, the patient was well enough to be able to leave the hospital. Thus it was that Hunter inaugu- rated an operation which has been the means of pre- serving to hundreds life with integrity of limb— an operation which, as the Italian Assalini, who saw it first performed, testifies, "excited the greatest wonder,

6 In his Treatise on the Blood, p. 288, Hunter observes :—" We find it a common principle in the animal machine, that every part increases in some degree according to the action required. Thus we find . . . . vessels become larger in proportion to the necessity of supply, as for instance, in the gravid uterus ; the external carotids in the stag, also, when his horns are growing, are much larger than at any other time."

See Professor Owen, " John Hunter and Vivisection," Brit. Med. Journ., February 22, 1879, p. 284. In the fourth of his operations for popliteal aneurism, Hunter for the first time did not include the vein inthe ligature. His patient lived for fifty years afterwards. The results on the artery of this operation are to be seen m specimen 3472A (Path, Ser.) in the Hunterian Museuin.

8 Home, Zrans. of Soc. for Impr. of Med. and Chirurg. Knowl; i. 147, 1793. Excess of heat in the injured limb was noticed also in Huuter's second case

on the day after the operation ; and in his fourth case it reached 4°-5° on the first day, and continued during a fortnight.

HUNTER

and awakened the attention of all the surgeons in Europe."

Early in 1786 Hunter published his Treatise on the Venereal Disease, which, like some of his previous writings, was printed in his own house. Without the aid of the booksellers, 1000 copies of it were sold within a twelve- month, Although certain views therein expressed with regard to the relationship of syphilis have been proved erroneous, the work is a valuable compendium of observa- tions of cases and modes of treatment (cf. Hilton, Hunt. Orat., p. 40). Towards the end of the year appeared his Observations on certain parts of the Animal Ciconomy, which, besides the more important of his contributions to the Philosophical Transactions, contains nine papers on various subjects. By the death of Mr Middleton in 1786, Hunter became deputy surgeon-general to the army ; his appoint- ment as surgeon-general and as inspector-general of hospitals followed in 1790, on the death of Mr Adair. In 1787 he received the Royal Society's Copley medal as a testimony to the importance of his discoveries in natural history,and was also elected.a member of the American Philo- sophical Society. On account of the increase in his prac- tice and his impaired health, he now obtained the services of Home as his assistant at St George's Hospital. The death of Pott in December 1788 secured to Hunter the undisputed title of the first surgeon in England. He re- signed to Home, in 1792, the delivery of his surgical lec- tures, in order to devote himself more fully to the completion of his T'reatise on the Blood, Inflammation, and Gunshot Wounds, which was published by his executors in 1794. In this, his masterpiece, the application of physiology to practice is especially noticeable. Certain experiments described in the first part, pp. 62-64, which demonstrate that arterialization of the blood in respiration takes place by a process of diffusion of " pure air" or " vital air" (de., oxygen) through membrane, were made so early as the summer of 1755.

Hunter in 1792 announced to his colleagues at St George's, who, he considered, neglected the proper instruc- tion of the students under their charge, his intention no longer to divide with them the fees which he

received for his hospital pupils. Against this innovation, however, the governors of the hospital decided in March 1793. Subse- quently, by a committee of their appointing, a code of rules respecting pupils was promulgated, one clause of which, probably directed against an occasional practice of Hunter's, stipulated that no person should be admitted as a student of the hospital without certificates that he had been educated for the medical profession. In the autumn two young Scotchmen, ignorant of the new rule, came up to town and applied to Hunter for admission as his pupils at St George's. Hunter explained to them how he was situated, but promised to advance their request at the next board meeting at the hospital on the 16th October. On that day, having finished a difficult piece of dissection, he went down to breakfast in excellent spirits and in his usual health. After making a professional call, he attended the board meeting. There the interruption of his remarks in behalf of his applicants by a flat contra- diction from a colleague brought on one of the old spas- modic heart attacks; he ceased speaking, and retired into an adjoining room only in time to fall lifeless into the arms of Dr Robertson, one of the hospital 'physicians. After an hour had been spent in vain attempts to restore animation, his body was conveyed to his house in a sedan chair! Thus, in his sixty-fifth year, and in the height of

1 The record of Hunter's death in the St James Chronicle for October 15-17, 1793, p. 4, col. 4, makes no allusion to the imme- diate cause of Hunter's death, but gives the following statement :— "Joun Hunter.—This eminent Surgeon and valuable man was

his mental activity, died John Hunter, "whose range of thought nature alone could fill," and to whom, as to but few among all mankind, had been given wisdom to inter- pret the dark sayings of nature. His remains were interred privately on October 22, 1793, in the vaults of St Martin's in the Fields. Thence, on March 28, 1859, through the instrumentality of Mr Frank Buckland, they were removed to Abbot Islip's chapel in Westminster Abbey, to be finally deposited in the grave in the north aisle of the nave, close to the resting-place of Ben Jonson.

*Hunter was of about medium height, strongly built, and high- shouldered and short-necked. He had an open countenance, and large features, eyes light-blue or grey, eyebrows prominent, and hair reddish-yellow in youth, later white, and worn curled behind; and he dressed plainly and neatly. He rose at or before six, dis- sected till nine (his breakfast hour), received patients from half- past nine till twelve, at least during the latter part of his life, and saw his outdoor and hospital patients till about four, when he dined, taking, according to Home, as at other meals in the twenty years preceding his death, no winc. After dinner he slept an hour; he then superintended experiments, read or prepared his Icctures, and made, usually by means of an amanuensis, records of the day's dissections. "J never could understand," says Clift, " how Mr Hunter obtained rest: when I left him at midnight, it was with a lamp fresh trimmed for further study, and with the usual appointment to meet him again at six in the morning." Mr H. Leigh Thomas records? that, on his first arrival in London, having by desire called on Hunter at five o'clock in the morning, he found him already busily engaged in the dissection of insects. Rigidly economical of time, Hunter was always at work, and always he had in view some fresh enter- prise. He was once heard by Adams to express regret that men must die at all. To his museum he gave a very large share of his attention, being fearful lest the ordering of it should be incomplete at his death, and knowing of none who could continue his work for him. " When I am dead," said he one day to Dr Garthshore, *¢ you will not soon meet with another John Huntcr." Atthe time of his death he had anatomized certainly over 500 different species of animals, some of them repeatedly, and had madc numerous dis- sections of plants. The manuscript works by him appropriated and destroyed by Home, among which were his eighty-six surgical lectures, all in full, are stated to have been "literally a cartload" ; and many pages of lis records were written by Clift nnder his directions "at least half a dozen times over, with corrections and transpositions almost without end."*

To Hunter, as he himself observed, to think was a delight. His mind was framed for systematic investigation, aud hence, perhaps, arose the fatigue which, more particularly during the last ten years of his life, the desultory conversation of a mixed company would occasion him.? " My mind is like a bee-hive," was a remark of his to Abernethy, "a simile which struck me," says that writer, "on account of its correctness ; for, in the midst of buzz and

apparent confusion, there was great order, regularity of structure, and abund- ant food, collected with incessant industry from the choiccst stores ofnature." 4 Hunter was generally, though cheerfully, taciturn, and many a morning's labour with Clift was passed with scarcely a word of discourse. When, howevcr, he spoke—as while resting himself, and standing upright from his dissection after stooping for hours as if nailed to the object under investigation—he evinced both shrewd- ness and wit. In conversation his words were well chosen, and his remarks often wonderfully forcible and pointed ; and, when so dis- posed, he could put things in a very ludicrous point of view. He articulated slowly, and in consultation gave his opinion much as if lecturing, the enunciation of his not seldom novel doctrines being prefaced by some introductory illustration or history. A stranger to artifice and flattery, and open and unceremonious or cven blunt in speech, he readily communicated what he knew and thought, and thus did not always inspire others with a higher opinion of their personal consequence. '" We are but beginning to learn our profession," he would tell his friends; and he was wont to say that he was conscious of no peculiar talent, but that, if he had promoted professional know- ledge, it seemed to him to have arisen chiefly from his disposition to distrust opinions, and to examine every subject for himsclf. What views of his he confidently offered for acceptance were such as hie be- lieved to have a solid foundation in facts; and the blind enun- ciation by his fellow-practitioners of time-honoured crrors vexed

suddenly taken ill, yesterday, in the Council-room of St George's Hospital. After receiving the assistance which could be afforded by two Physicians and a Surgeon, he was removed in a close chair to his house, in Leicester Fields, where lie expired about two o'clock," Examination of the heart revealed disease involving the pericardium, endocardium, and arteries, the coronary arteries in particular showing ossific change. 2 Hunt. Orat., 1827, p. 5.

3 Home, Life, p. Ixv. 4 Hunt. Orat., 1819, p. 48.

his mind, which was naturally snsceptible, and was rendered the more so by excess of exertion, with repeatedly the additional strain of bodily disease.

“I know, I know,” said he to Abernethy, “1 am but a pigmy in knowledge, yet I feel as a giant when compared with these men.” The charges that his language was frequently coarse, and that swearing was with him a habit, as with many of his contemporaries and successors, have been indignantly rebutted by Clift.t Leigh Thomas describes the impression left by his first early morning interview with Hunter as “a mingled feeling of pro- found respect, surprise, and admiration ;” and by his assistants, pupils, and all with whom he had lived on intimate terms, he was both loved and venerated. His temper, Home states, was very warm and impatient, and when irritated not easily soothed. The hasty but not altogether illogical outburst of his anger when refused the post- mortcm examination of a child, the victim of some obscure malady, in the words, “ Then, sir, I heartily hope that yourself and all your family, nay all your friends, may die of the same diseasc, and that no one may be able to afford any assistance,” is in amusing contrast with the acknowledged benevolence of his character. To the kind- ness of his disposition, his fondness for animals, his aversion to operations, his thoughtful and self-sacrificing attention to his patients, and especially his zcal to help forward struggling practi- tioners and others in any want abundantly testify. “ Every man,” said he, ‘should be an economist, for if he has ever more money than his wants require he can assist the poor.” In a letter of his, introducing a patient to his brother William, we read: ‘ He has no money, and you have plenty, so that you are well met.” Pecuuiary means he valued no further than they enabled him to promote his rescarches ; and to the poor, to non-beneficed clergymen, professional authors, and artists his services were rendered without remuneration. His yearly income in 1763-74 was never £1000; it exceeded that sum in 1778, for several years before his death was £5000, and at the time of that event had reached above £6000. All his earnings not required for domestic expenses were, during the last ten years of his life, devoted to the improvement of his museum ; and his property, this excepted, was fonnd on his decease to be barely suffi- cient to pay his debts. By his contemporaries generally Hunter was respected as a master of the art and science of anatomy, and as a cautious and trustworthy if not an elegant or very dextcrous opera- tor. Few, however, perceived the drift of his biological researches. Although it was admitted, even by Foot,? that the idea after which his unique museum had been formed—namely, that of morphology as the only trne basis of a systematie zoological classification—was entirely*

*his own, yet his investigations into the strncture of the lower orders of animals were regarded as, after all, works of unpro- fitable curiosity. One surgeon, of no inconsiderable repute, is said to have ventured the remark that Mr Hunter's preparations were '*just as valnable as so many pig's pettitoes ;"° and the president of the Royal Society, Sir Joseph Banks, writing in 1796, plainly expressed his disbelief as to the collection being "an object of im- portance to the general study of natural history, or indeed to any branch of science except to that of medicine." 1t was ' without the solace of sympathy or encouragement of approbation, without collateral assistance," * and careless of achicving fame—for he held that "no man ever was a great man who wanted to be one "—that Hunter laboured to perfect his designs, and established the science of comparative anatomy, and principles which, however neglected in his life-time, became the gronnd-work of all medical study and teaching.*

In accordance with the directions given by Hunter in his will, his collection was offered for purchase to the British Government. But the prime minister, Mr Pitt, on being asked to consider the matter, exclaimed : " What! buy preparations! Why, I have not money enough to purchase gunpowder." He, however, consented to the bestowal of a portion of the king's bounty for a couple of years on Mrs Hunter and her two surviving children. In 1796 Lord Auckland undertook to urge upon the Government the advisability of acquiring the collection, and on June 13, 1799, parliament voted £15,000 for this pnrpose. Its custodianship, after refnsal by the College of Physicians, was unanimously accepted by the Corporation of Surgeons on the terms proposed. collection be open four hours in the forenoon, two days every week, for the inspection and cousultation of the fellows of the College of Physicians, the members of the Company of Surgeons, and persons properly introduced by them, a catalogue of the preparations and an official to explain it being at those times always at hand; that a course of not less than twenty-four lectures 5 on comparative anatomy and other subjects illustrated by the collection be given every year by some member of the Company ; and that the preparations be kept in good preservation at the expense of the Corporation, and be subject to the superintendence of a board of sixteen trustees. The fulfil- ment of these conditions was rendered possible by the receipt of fees

1 See Lawrence, unt. Orat., p. 60. See p. 266 of his malicious so-called Life of John Hunter, 1794. : Cf. J. H. Green, Hunt. Orat., 1840, p. 27. : Abernethy, Physiological Lectures, p. 11, 1817. . > Lustituted in 1806. 6 Inereased to seventeen in 1856.

These were in brief—that the |

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for examinations and diplomas, under the charter by which, in 1800, the Corporation was constituted the Royal College of Surgeons. A board of eurators was in that year appointed by the council of the college to provide for the management of the museum and the pre- paration of catalogues. In 1806 the eollection was placed in tem- porary quarters in Lincoln's Inn Fields, and the sum of £15,000 was voted by parliament for the erection of a proper and commodious building for its preservation and exteusion. This was followed by a grant of £12,500 in 1807. The collection was removed in 1812 to the new musenm, and opened to visitors in 1813. The greater part of the present edifice was built in 1835, at an expense to the college of about £40,000 ; and the combined Hunterian and collegiate col- lections, having been rearranged in what are now termed the western and middle museums, were in 1836 made accessible to tlie public. The erection of the eastern museum in 1852, on premises in Portugal Street bought in 1847 for £16,000, cost £25,000, of which parliament granted £15,000 ; it was opened in 1855.

Hunter's collection was cstimated to contain 18,682 specimens, viz., in the physiological department, 3745 in spirit, 965 osteolo- gical, 617 dry, 1968 zoological—total 7295; and in the patholo- gical, 1084 in spirit, 625 dry (including bones), 536 calculi and concretions; 218 monsters and malformations, and 215 microscopic —total 2678 ; and 3709 fossils. Since its acquisition by the col- lege, it has been greatly increased, notably by presentations from Sir William Blizard (1811) and Sir 8. L. Hammick (1851), and by pur- chase of specimens in the possession of Sir A. Lever (1806), Messrs Joshua Brookes (1828), Heaviside (1829), Langstaff, South (1835), Howship, Taunton (1841), Liston (1842), and Walker (1843), Sir Astley Cbter (1843), aud Dr Barnard Davis (Jan. 1880). The his- tological collection, of which the 215 Hunterian specimens are the nucleus, is the

result chiefly of the labours of Professor Quckett, and purchases from Dr Tweedy Todd, Mr Nasmyth, and Professor Lenhossek, and contained in July 1880 upwards of 12,000 spcci- mens. The library, the formation of which commenced in 1801, consisted in July 1880 of 37,668 vols., comprising 14,882 separate works, and 39,021 tracts, pamphlets, essays, theses, and reports.? Mr William Clift, whom, on February 14, 1792, Hunter received into his house to train as an assistant in his museum,® had the ex- elusive charge of the collection from the date of its owner's death to that of its purchase by the state. During this period, with two gallons of spirit meted out occasionally, and the pittance of 7s. a week for his own support out of the limited funds at the disposal of Hunter's executors, he contrived to maintain the whole in good condition. He was conservator of the musenm, as stated on the pedestal of his bust there, from 1800 to 1849. From 1825 to 1832 he was assisted by his son, William Home Clift. Professor Richard Owen held the office of assistant-conservator in 1882-85, and of con- servator in 1886-55, and Professor J. T. Quekett that of assistant- conservator in 1848-51, and of conservator from 1852 till his death in 1861, when he was succeeded by Professor William Henry Flower.

The scope of Hunter's labours may be defined as the explication of the various phases of life exhibited in organized structures, both animal and vegetable, from the simplest to the most highly differen- tiated. By hin, therefore, comparative anatomy was employed, not in subservience to the classification of living forms, as by Cuvier, but as a means of gaining insight into the principle animating and producing these forms, by virtue of which he perceived that, how- ever different in form and faculty, they were all allied to himself. In what does life consist ? is a question which in his writings he frequently considers, and which seems to have been ever present in his mind. Life, he taught, was a principle independent of struc- ture, most tenaciously held by the least highly organized beings, but capable of readicr destruction as a whole, as, ¢.g., by deprivation of heat or by pain, in young than in oldanimals. In life he beheld an agency working under the control of law, and exercising its functions in various modes and degrees. He perceived it, as Abernethy observes, to be "a great chemist," a power capable of manufacturing a variety of substances iuto one kind of generally distributed nutriment, and of furnishing from this a still greater variety of dissimilar substances. Like Harvey, who terms it the anima vegetiva, he

regarded it as a principle of self-preservation, which keeps the body from dissolution. Life is shown, said he, in renovation and action ; but, although facilitated in its working by mechanical causes, it can exist without action, as in an egg new-laid or undergoing incubation. It is not simply a regulator of tempera- ture ; it isa principle which resists cold, conferring on the structures which it endows the capacity of passing some degrees below the freezing-point of ordinary inanimate matter without snffering congelation. Hunter found, in short, that there exists in animals a latent heat of life, sct free in the process of death (sce Treatise on Sn ROA OL ee Se ee en ee

7 Calendar of the Royal College of Surgeons, July 8, 1880. —

8 See Sir hoe C. Brodie, "Autobiography," Works, ed. C. Hawkins, i. 41, 1865.

9 How clearly he held this view is seen in his remark (Treatise on the Blood, p. 28, of. p. 46) that, as the coagulating lymph of the blood is probably common to all animals, whereas the red eorpuseles are not, we must suppose the lymph to be the essential part of that fluid. Hunter was the first to discover that the blood of the embryos of red-blooded animals is at tirst colourless, re- sembling that of invertebrates. (See Owen, Preface to yol. iy. of Works, p. xiii.)

the Blood, p. 80). Thus he observod that sap if removed from trees froze at 32° Fahr., but within them might be fluid even at 15° ; that a living snail placed in a freezing mixture acquired first a tempera- ture of 28°, and afterwards of 32° ere it froze; and that, whereas a dead egg congealed immediately at 32°, a living egg did so only when its temperaturo had risen to that eae after a previous fall to 293°. The idea that the fluid and semifluid as well as the solid constitu- ents of the body contain the vital principle diffused through them he formed in 1755-6, when, in making drawings illustrative of the changes that take place in the incubated egg, he noted specially that neither the white nor the yolk undergoes putrefaction. The blood he, with Harvey, considered to possess a Vitality of its own, more or less independent of that of the animal in which it circulates, Life, he held, is preserved by the compound of the living body and the source of its solid

constituents, the living blood. It is to the susceptibility of the latter to be converted into living organized tissue that the union of severed structures by the first intention is due. He even inclined to the belief that the chyle has life, and he considered that food becomes "animalized " in digestion. Coagula- tion of the blood he compared to the contraction of muscles, and believed to be an operation of life distinct from chemical coagulation, adducing in support of his opinion the fact that, in animals killed by lightning, by violent blows on the stomach, or by the exhaustion of hunting, it does not take place. "Breathing," said Hunter, 'seems to render life to the blood, and the blood continues it in every part of the body."! Life, he held, could be regarded as a fire, or somcthing similar, and might for distinction's sake be called "animal fire." Of this the process of respiration might afford a constant supply, the fixed life supplied to the body in the food being

set free and rendcred active in the lungs, whilst the air carried off |

that principle which encloses and retains the animal fire.2 The living principle, said Hunter, is coeval with the existence of animal or vegetable matter itself, and may long exist without sensation. The principle upon which depends the power of sensation regulates all our external actions, as the principle of life does our internal, and the two act mutually on each other in consequence of ehanges produced in the brain. Something (the "materia vite diffusa') similar to the components of the brain (the 'materia vite coacervata"') may be supposed to be diffused through the body and even contained in the blood; between these a communication is kept up by the nerves (the "chord internuncise ").3 Neither a material nor a chemical theory of life, however, formed a part of Hunter's creed. 'Mere composition of matter," he remarked, "does not give life ; for the dead body has all the composition it ever had ; life is a property we do not understand ; We can only see the necessary leading steps towards it."4 As from life only, said he in one of his lectures, we can gain an idea of death, so from death only we gain an idea of life. Life, being an agency leading to, but not consisting of, any modification of matter, "either is something superadded to matter, or else consists in a peculiar arrangement of certain fine particles of matter, which being thus disposed acquire the properties of life." As a bar of iron may gain magnetic virtuc by being placed for a time in a special position, so perhaps the particles of matter arranged and long continued in a certain

posture eventually gain the power of life. 'I enquired of Mr Hunter," writes one of his pupils,5 "if this did not make for the Exploded Doctrine of Equivocal Generation ; he told me perhaps it did, and that as to Equivocal Generation all we c? have was negative Proofs of its not taking Place. He did not deny that Equivocal Generation happened ; there were neither positive proofs for nor against its taking place."

To exemplify the differences between organic.and inorganic growth, Hunter made and employed in his lectures a collection of crystal- lized specimens of minerals, or, as he termed them, " natural or native fossils."' Of fossils, designated by him " extraneous, fossils,"' because extraneous respecting the rocks in which they occur, he recognized the true nature, and he arranged them according to a system agreeing with that adopted for recent organisms. Thestudy of fossils enabled him to apply his knowledge of the relations of the phenomena of life to conditions, as exhibited in times present, to the elucidation of the history of the earth in geological epochs. He observed the non-occurrence of fossils in granite, but with his customary scientific caution and insight could perceive no reason for supposing it to be the original matter of the globe, prior to vegetable or animal, or that its formation was different from that of other rocks. In water he recognized the chief agent in producing terrestrial changes (of. Treatise on the Blood, p. 15, note); but the popular notion that the Noachian deluge might account for the marine organisms discovered on land he pointed out was untenable. From the diversity of the situations in which many fossils and allied living structures are found, he was led to infer that at various periods not only repeated oseillations of the level of the jJand, a

1 Treatise on the Blood, p. 63. 2 Essays and Observations, i. 113. 3 Treatise on the Blood, p. 89. 4 7b., p. 90. . 5 P. P. Staple, with the loan of whose volume of MS. notes of Hunter's "Chirur- sical Lectures," dated, on the last page, Sept. 20, 1787, the writer has been favoured by Dr W. H. Broadbent.

lasting thousands of centuries, but also great climatic variations, perhaps due to a change in the ecliptic, had taken place in geolo- gical times. Hunter considered that very few fossils of those that resemble recent forms are identical with them. He conceived that the latter might be varieties, but

that ifjthey are really dif- ferent species, then "we must suppose that a new creation must have taken place." It would appear, therefore, that the origin of Species in variation had not struck him as possible. That he believed varieties to have resulted from the influence of changes in the conditions of life in times past is shown by a somewhat obscure passage in his " Introduction to Natural History" (Essays and Ob- servations, i. 4), in which he remarks, " But, I think, we have reason to suppose that there was a period of time in which every species of natural production was the same, there being then no variety in any species," and adds that " civilization has made varieties in many species, whieh are the domesticated." Modern discoveries and doc- trines as to the succession of life in time are again foreshadowed by him in the observation in his introduction to the description of drawings relative to incubation (quoted in Pref. to Cat. of Phys. Ser., i. p. iv., 1833) that :—

"If we were eapable of following the progress of inerease of the number of the parts of the most perfect animal, as they first formed in suecession, from the very first, to its state of full perfection, we should probably be able to eompare it with some one of the ineomplete animals themselves, of every order of animals in the ereation, being at no stage different from some of those inferior orders ; or, in other words, if we were to take a series of animals from the more imperfect to the perfect, we should probably find an imperfeet animal eorre- sponding with some stage of the most perfect."

In pathological phenomena Hunter discerned the results of tlie perturbation of those laws of life by which the healthy organism subsists. With him pathology was a science of vital dynamics. He afforded principles bearing not on single complaints only, but on the effects of injury and disease in general. 'T'o attempt to set forth what in Hunter's teaching was new to pathology and systematic surgery, or was rendered so by, his mode of treatment, would be well-nigh to present an epitome of all that he wrote on those subjects. 'When we make a discovery in pathology," says Adams, writing in 1818, " we only learn what we have overlooked in his writings or forgotten in his lectures," Surgery, which only in 1745 had formally ceased to be associated with "the art and mystery of barbers," he raised to the rank of a scientific profession. His doctrines were, necessarily, not those of his age: while lesser minds around him were still dim with the mists of the

ignorance and dogmatism of times past, his lofty intellect was illumined by the dawn of a distant day.

See, besides the atove quoted publications, An Appeal to the present Parliament …. on the subject of the late J. Hunter's Museum, 1795; Sir C. Bell, A Lecture …. being a Commentary on Mr J. Hunter's Preparations of the Diseases of the Urethra, 1830; The President of the Royal College of Surgeons of England, Address to the Committee for the Erection of a Statue of Hunter, Lond., Mareh 29, 1859; Professor Owen, " Sketch of Hunter's Seientitic Character and Works," in Tom Taylor's Leicester Square, 1874, also in Hunter's Works, ed. by Palmer, vol. iv., 1837, and in Essays and Observations; the invaluable eatalogues of the Hunterian Collection issued by the Royal College of Surgeons; and numerous Hunterian Orations, In the Journal of a Voyage to New South Wales, by John White, is a paper eontaining directions for preserving animals, printed separately in 1809, besides six zoologieal deseriptions by Hunter; and in the Vatural History of Aleppo, by A. Russell, are remarks of Hunter's on the anatomy of the jerboa and the eamel's stomach. Notes of his leetures on surgery, edited by J. W. K. Parkinson, appeared in 1833 under the title of Hunterian Reminiscences. Hunter's Observations and Reflections on Geology, intended to serve as an intro-

duction to the catalogue of his collection of extraneous fossils, was published in 1859, and his Memoranda on Vegetation in 1860. (005 286 1th)

HUNTER, Wixtram (1718-1783), a celebrated physio- logist and physician, and the first great teacher of anatomy in England, was born May 23, 1718, at East Kilbride, Lanark. He was the seventh child of his parents, and an elder brother of John Hunter, the distinguished surgeon. When fourteen years of age he was sent to the university of Glasgow, where he studied for five years, He had originally been intended for the church, but, scruples con- cerning subscription arising in his mind, he followed the advice of his friend William Cullen (see CuLLEN, vol. vi. p. 694), and resolved to devote himself to physic. During 1737-40 he resided with Cullen at Hamilton, and then, with a view to increasing his medical knowledge before settling in partnership with his friend, he spent the winter of 1740— 41 at Edinburgh,

and thence went to London. There Dr James Douglas, an anatomist and obstetrician of some note, to whom he had been recommended, engaged his services as a tutor to his son, and asa dissector, and assisted him to enter as a surgeon's pupil at St George's Hospital, and to procure the instruction of the anatomist Dr Nicholls. Dr Douglas died in April 1742, but Hunter still continued to live with his family. In 1746 Hunter undertook in place of Mr Samuel Sharpe the delivery, for a society uf

naval practitioners, of a series of lectures on operative surgery, and so satisfactorily did he acquit himself of his task that he was requested to include anatomy in his-course. It was not long before he attained considerable fame as a lecturer; for not only was his oratorical ability great, but he differed from his contemporaries in the fulness and thoroughness of his teaching, and in the care which he took to provide for his hearers the best possible practical illustrations of his discourses. We read that the syllabus of Mr Nourse, published in 1748, 'totam rem anatomicam complectens," comprised only twenty-three lectures, exclusive of a short and defective "Syllabus Chirurgicus," and that at "one of the most reputable courses of anatomy in Europe," which Hunter had himself attended, the professor was obliged to demonstrate all the parts of the body, except the nerves and vessels (shown in a foetus) and the bones, ona single dead subject, and for the explanation of the operations of surgery used a dog! In 1747 Hunter became a member of the Corporation of Surgeons. In the course of a tour through Holland to Paris with his pupil J. Douglas in 1728, he visited Albinus at Leyden, and inspected with admiration his injected preparations. By degrees Hunter renounced surgical for obstetric practice, in which he ex- celled. He was appointed a surgeon-accoucheur at the Middlesex Hospital in 1748, and at the British Lying-in Hospital in the year following. The degree of M.D, was conferred upon him by the university of Glasgow, October 24,1750. About the same time he left his old abode at Mrs Douglas's, and settled as a physician in Jermyn Street. He became a licentiate of the College of Physicians, September 30, 1756. In 1762 he was consulted by Queen Charlotte, and in 1764 was made physician-extraordinary to her Majesty.

On the departure of his brother John for the army, Hunter engaged as an assistant Mr William Hewson, whom he subsequently admitted to partnership in his lectures. Hewson was succeeded in 1770 by Mr Cruikshank. Hunter became in 1767 a fellow of the Royal Society ; in 1768 a fellow of the Society of Antiquaries, and third professor of anatomy to the Royal Academy of Arts ; and in 1780 and 1782 respectively an associate of the Royal Medical Society and of the Royal Academy of Sciences of Paris. During the closing ten years of his life his health failed greatly. His last lecture, at the conclusion of which he fainted, was given, contrary to the remonstrances of friends, only a few days before his death, which took place March 30, 1783. He was buried in the rector's vault at St James's, Piccadilly.

*Hunter had in 1765 requested of the Hon. Mr Gren- ville the grant of a plot of ground on which he might establish "*a museum in London for the improvement of anatomy, surgery, and physic" (see ' Papers" at end of his Two Introductory Lectures, 1784), and had offered to expend on its erection £7000, and to endow in perpetuity a pro- fessorship of anatomy in connexion with it. His appli- cation receiving no recognition, he after many months abandoned his scheme, and built himself a house, with lecture and dissecting-rooms, in Great Windmill Street, whither he removed in 1770. In one fine apartment in this house was accommodated his collection, comprising anatomical and pathological preparations, ancient coins and medals, minerals, shells, and corals. His natural history specimens were in part a purchase, for £1200, of the executors of his friend Dr John Fothergill (see vol. ix. p. 475). Hunter's whole collection, together with his fine library of Greek and Latin classics, and an endowment of £8000, by his will became, after the lapse of twenty years, the property of the university of Glasgow. His paternal estate of Long Calderwood was left to his brother-*

if

was proved, it was made over to Jolin Hunter. Hunter was never married, and was a man of frugal habits. Like his brother John, he was an early riser, and a man of untir- ing industry. He is described as being in his lectures, which were of two hours' duration, " both simple and pro- found,

minute in demonstration, and yet the reverse of dry and tedious ;" and his mode of introducing anecdotal illustrations of his topic was most happy. Lecturing was to him a pleasure, and, notwithstanding his many profes- sional distractions, he regularly continued it, because, as he said, he "conceived that a man may do infinitely more good to the public by teaching his art than by practising it" (see " Memorial" appended to Introd. Lect., p. 120). Hunter was the author of several contributions to the Medical Obscrvations and Enquirics and the Philosophical Transactions. In his paper on the structure of cartilages and joints, published in the latter in 1748, he anticipated what Bichat sixty years afterwards wrote concerning the structure and arrangement of the synovial membranes. His Mcdcal Commentaries (pt.i., 1762, supplemented 1764) contains, among other like matter, details of his disputes with the Munros as to who first had successfully performed the injection of the ¢ubwié testis (in which, however, both he and they had been forcstalled by Haller in 1745), and as to who had dis- covered the true office of the lymphatics (of. ANATOMY, Vol. i. p. 815), and also a discussion on the question whether he or Pott ought to be considcred the earliest to have elucidated the nature of hernia congcnita, which, as a matter of fact, had been previously explained by Haller. In the Commentaries is exhibited Hunter's

one weakness—an inordinate love of controversy. His impatience of contradiction he averred to be a characteristic of anatomists, in whom he once jocularty condoned it, on the plea that 'the passive submission of dead bodies" rendered the crossing of their will the less bearable. His great work, The Anatomy of the Gravid Uterus, exhibited in Figures, fol. (see ANATOMY, vol. i. p. 816), was pub- lished in 1774. His posthumous works are Two Introductory Lectures, 1784, and Anatomical Description of the Human Gravid Uterus, 1794, which was re-edited by Dr Rigby in 1843,

See Gent. Mag., liii. pt. 1, p. 364, 1783; S. F. Simmons, An Account of the Life of W. Hunter, 1783; Adams's and Ottley's Lives of J. Hunter; Sir B. C. Brodie, Hunterian Oration, 1837; W. Munk, The Roll of the Royal College of Physicians of London, ii, 205, 1878; and the preceding article. (F. H. B.)

HUNTING. The circumstances which render necessary the habitual pursuit of wild animals, either as a means of subsistence or for self-defence,

generally accompany a phase of human progress distinctly inferior to the pastoral and agricultural stages; resorted to as a recreation, on the other hand, the practice of the chase in most cases indicates a considerable degree of civilization, and sometimes ulti- mately becomes the almost distinctive employment of the classes which are possessed of most leisure and wealth. It is only in some of its latter aspects, viz., as a "sport," pur- sued on fixed rules and principles, that hunting requires notice here.

The information we possess as to the field sports of the ancients is in many directions extremely fragmentary. With regard to the ancient Egyptians, however, we learn that the huntsmen constituted an entire subdivision of the great second caste ; they either followed the chase on their own account, or acted as the attendants of the chiefs in their hunting excursions, taking charge of the dogs, and securing and bringing home the game. The game was sought in the open deserts which border on both sides the valley of the Nile; but (by the wealthy) sometimes in enclosed spaces into which the animals had been driven, or in preserves. Besides the noose and the net, the arrow, the dart, and the hunting pole or venabulum were frequently employed. The animals chiefly hunted were the gazelle, ibex, oryx, stag, wild ox, wild sheep, hare, and porcupine ; also the ostrich for its plumes, and the fox, jackal, wolf, hyzna, and leopard for their skins, or as enemies of the farm-yard. The lion was occasionally trained as a hunt- ing animal iustead of the dog. The sportsman appears, occasionally at least, in the later periods, to have gone to coverin his chariot or on horseback ; according to Wilkinson,

in-law, Dr James Baillie, by whom, as soon as the will | when the dogs threw off in a level plain of great extent, it

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was even usual for him "to remain in his chariot, and, urging his horses to their full speed, endeavour to turn or intercept them as they doubled, discharging a well-directed arrow wheneverthey came within its range."! The partiality for the chase which the ancient Egyptians manifested was

shared by the Assyrians and Babylonians, as is shown by |

the frequency with which hunting scenes are found depicted on the walls of their temples and palaces, and also by the alleged fact that even their dresses and furniture were ornamented with similar subjects.2_ The game pursued

included the lion, the wild ass, the gazelle, and the hare,

and the implements chiefly employed seem to have been the javelin andthe bow. There are indications that hawk- ing was also known, magnificent parks, or " paradises," in which game of every kind was enclosed ; and perhaps it was from them that the Persian sovereigns borrowed the practice mentioned both by Xenophon in the Cyropedia, and by Curtius. Accord- ing to Herodotus, Cyrus devoted the revenue of four great

The Assyrian kings also maintained |

curious indications of the state of zoological knowledge in the author's time. Hunting scenes are frequently repre- sented in ancient works of art, especially the boar-hunt, and also that of the hare. In Roman literature allusions to the pleasures of the chase (wild ass, boar, hare, fallow deer, being specially mentioned as favourite game) are not wanting (Virg., G'eorg., iii. 409-413; ZLl., iii. 75; Hor., Od., i. 1, 25-28); it seems to have been viewed, however, witli less favour as an occupation for gentlemen, and to have been chiefly left to inferiors and professionals, The immense vivaria or theriotropheia, in which various wild animals, such as boars, stags, aud roe-deer, were kept in a state of

| semi-domestication, were developments which arose at a

towns to meet the expenses of his hunting establishments.

The circumstances under which the death of the son of Croesus is by the same writer (i. 54-45) related to have occurred incidentally show in what high estimation the recreation of hunting was held in Lydia. In Palestine game has always been plentiful, and the Biblical indica- tions that it was much sought and duly appreciated are numerous. As means of capture, nets,

traps, snares, and pitfalls are most frequently alluded to; but the arrow (Isa. vii. 24), the spear, and the dart (Job xli. 26-29) are also nientioned. There is no evidence that the use of the dog (Jos., Ant. iv. 8, 10, notwithstanding) or of the horse in

comparatively late period; as also were the venationes in the circus, although these are mentioned as having been known as early as 186 B.c. The bold and meagre poem of Gratius Faliscus on hunting (Cynegetica) is modelled upon Xenophon's prose work; a still extant fragment (315 lines) of a similar poem with the same title, of much later date, by Nemesianus, seems to have at one time formed the introduction to an extended work corresponding to that of Oppian. That the Romans had borrowed some things in the art of hunting from the Gauls may be inferred from

the name canis gallicus (Spanish galgo) for a greyhound,

hunting was known among the Jews during the period |

covered by the Old Testament history ; Herod, however, was a keen and successful sportsman, and is recorded by Josephus (B. J., i, 21, 13, compare Ant., xv. 7, 7; xvi. 10, 3) to have killed no fewer than forty head of game (boar,

which is to be met with both in Ovid and Martial; also in the words (canis) vertragus and scgusius, both of Celtic origin. According to Strabo (p. 200) the Britons also bred dogs well adapted for hunting purposes. The addic- tion of the Franks in later centuries to the chase is evi- denced by the frequency with which not only the laity but also the clergy were warned by provincial councils against. expending so much of their time and money on hounds,*

_ hawks, and falcons ; and we have similar proof with regard _ to the habits of other Teutonic nations subsequent to the

wild ass, deer) in one day. The sporting tastes of the — ancient Greeks, as may be gathered from many references |

in Homer (Jl., ix. 5388-545 ; Od., ix. 120; xvii. 295, 316; xix. 429 sg.), had developed themselves at a very early

his principles and embodies his experience in his favourite art of hunting. The treatise chiefly deals with the capture

of the hare ; in the author's day the approved method was |

to find the hare in her form by the use of dogs; when found

she was either driven into nets previously set in her runs, |

or else run down in the open. Boar-hunting is also de- scribed ; it was effected by nets into which the animal was pursued, and in which when fairly entangled he was speared. The stag, according to the same work, was taken by means

of a kind of wooden trap (zodoorpdBy) which attached |

itself to the foot. Lions, leopards, lynxes, panthers, and

bears are also specially mentioned among the large game; |

sometimes they were taken in pitfalls, sometimes speared by mounted horsemen.

introduction of Christianity. Originallyamong the northern nations sport was open to every one ° except to slaves, who were not permitted to bear arms; the growth of the idea of gaime-preserving was a gradual one, and kept pace with the development of feudalism. For its ultimate development

in Britain see' Forrsr Law, where also the distinction period; they first found adequate literary expression in the | work of Xenophon entitled Cynegeticus,3 which expounds —

As a writer on field sports Xenophon |

was followed by Arrian, who in his Cynegeticus, in avowed |

dependence on his predecessor, seeks to supplement such deficiencies in the earlier treatise as arose from its author's unacquaintance with the dogs of Gaul and the horses of Scythia and Libya, to about 2100 hexameters, by Oppian have also been pre- served ; the last of these is incomplete, and it is probable that a fifth at one time existed. The poem contains some good descriptive passages, as well as some very

1 See on this whole subject ch. viii. of Wilkinson's Ancient Egyp- tians (ii. 78-92, ed. Birch, 1878).

2 See Layard (Nineveh, ii. 481, 482), who cites Ammian. Marccll.,

xxvi. 6, and Athen., xii. 9. 3 Engl. transl. by Blane.

Four books of Cynegetica, extending |

between beasts of forest or venery, beasts of chase, and beasts and fowls of warren is explained. See also GamE Laws.

The English word "unt" (from henten, "to capture," and thus nearly equivalent to "chase," which is the doublet of the verb "to catch"; compare Ital. caccia, Fr. chasse) has come specially to be applied to the pursuit of the stag, hare, and fox, especially of the last-named, with horse, hound, and horn, as distinguished from other modes of capturing game. It thus corresponds to the French chasse au courre, as distinguished from chasse au tir, & Poiseau &c., and to the German Hetzjagd as distinguished from Busch, The origin of the sport in Britain does not admit of being historically traced. Doubtless the early inhabit- ants shared toa large extent in the habits of the other Celtic peoples; the fact that at least they kept good hunt- ing dogs is vouched for, as we have seen, by Strabo; and an interesting illustration of the manner in which these were used is given in the iuscription quoted by Orelli (z. 1603)—"Silvano Invicto Sacrum—ob aprum eximizformee captum, quem multi antecessores predari non potuerunt."

| When the period of Alfred the Great is reached, we have

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it on the authority of Asserius, his biographer, that before he was twelve years of age he "was a most expert and

4 Helin, Kulturnflanzen u. Hausthiere, p. 327.

5 References will be found in Smith's Dictionary of Christian Antiquities, art. " Hunting."

*6 ** Vita omnis in venationibus . . . consistit," Ces., B. G@., vi. 21. '*Quoties bella non ineunt, multum venatibus, plus per otium trans- igunt," Tacitus, Germ., 15.*

active hunter, and excelled in all the branches of that noble art, to which he applied with incessant labour and amazing success."! Of his grandson Athelstan it is related by William of Malmesbury that after the victory of Brunan- burgh he imposed upon the vanquished king of Wales a yearly tribute, which included a certain number of " hawks and sharp-scented dogs fit for hunting wild beasts." Ac- cording to the same authority, one of the greatest delights of Edward the Confessor was "to follow a pack of swift hounds in pursuit of game, and to cheer them with his voice." It was under the Anglo-Saxon kings that the dis- tinction between the higher and lower chase first came to be made,—the former being expressly for the king or those on whom he had bestowed the pleasure of sharing in it, while only the latter was allowed to the proprietors of the land. To the reign of Cnut belong the " Constitutiones de Foresta," according to which four thanes were appointed in every province for the administration of justice in all matters connected with the forests; under them were four inferior thanes to whom was committed immediate carc of the vert and venison." The severity of the forest laws which

prevailed during the Norman period is sufficient evidence |

of the sporting ardour of William and his successors. The Conqucror himself, we are told by his contemporaries, 'loved the high game as if he were their father ;" and the penalty for the unauthorized slaughter of a hart or hind was loss of both eyes.

Stag Hunting.—Although at an early period stag hunt- ing was a favourite recreation with royalty, it is difficult to say when the royal buckhounds were first established. It seems probable that in the reign of Henry VIII. the royal pack was kennelled at Swinley, where, in the reign of Charles IL. (1684), a deer was found that went away to Lord Petre's seat in Essex; only five got to the end of this 70 miles' run, one being the king's brother, the duke of York. George III. was a great stag hunter, and met the royal pack as often as possible.

The Devon and Somerset staghounds are the only pack in England that now pursue the wild red deer. In his interesting work, Zhe Chase of the Wild Red Deer, Mr Collyns says that the earliest record of a pack of stag- hounds in the Exmoor district is in 1598, when Hugh Polland, Queen Elizabeth's ranger, kept one at Simonsbath. The succeeding rangers of Exmoor forest kept up the pack until nearly 200 years ago, the hounds subsequently passing into the possession of Mr Walter of Stevenstone, an ancestor of the Rolle family. Successive masters continued the sport until 1825, when the fine pack, descended probably from the blood hound crossed with the old southern hound, was sold in London, It is difficult to imagine how the dis- persion of such a pack could have come about in such a sporting country, but in 1827 the late Sir Arthur Chichester got a pack together, and the country has been hunted ever since, the present master being Mr Fenwick Bissett. Stag hunting begins on the 12th of August, and ends on the 8th of October ; there is then a cessation until the end of the month, when the hounds are unkennelled for hind hunting, which continues up to Christmas; it begins again about Ladyday, and lasts till the 10th of May. The mode of hunting with the Devon and Somerset hounds is briefly this :—the whereabouts of a' warrant- able stag is conimunicated to tlle master by that important functionary the harbourer; two couple of steady hounds called tufters are then thrown into cover, and, having

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*1 Sve Strutt, Sports and Pastimes, who also gives an illustration, * taken from a manuscriptal painting of the 9th century in the Cotton Library," representing "a Saxon chieftain, attended by his huntsman ani a couple of hounds, pursuing the wild swine in a forest."*

Ce See Lappenhberg, Hist. of England under the Anglo-Saxon Kings (ii. 361, Thorpe's transl.).

singled out a warrantable deer, follow him until he is forced to make for the open, when the body of the pack are laid on. Very often two or three hours elapse before the stag breaks, but a run over the wild country fully atones for the delay. With all other packs of staghounds, except one in the New Forest, which hunts fallow deer, the quarry is the carted deer; the animal is turned out from a vehicle resembling a prison van in appearance, and the hounds are laid on after a quarter of an hour's law.

Fox Hunting.—It is only within comparatively recent Fox times that the fox has come to be considered as an anima] huntin

of the higher chase. William Twici, indeed, who was huntsman-in-chief to Edward II., and who wrote in Nor- man French a treatise on hunting, which still exists in an English translation, mentions the fox as a beast of venery, but obviously as an altogether inferior object of sport. Strutt also gives an engraving, assigned by him to the 14th century, in which three hunters, one of whom blows a horn, are represented as unearthing a fox, whicli is pursued by a single hound. The precise date of the estab- lishment of the first pack of hounds kept entirely for fox hunting cannot be accurately fixed. In the work of 'Nimrod " (C. J. Apperley), entitled Zhe Chase, there is (p. 4) an extract from a letter from Lord Arundel, dated February 1833, in which the writer says that his an- cestor, Lord Arundel, kept a pack of foxhounds between 1690 and 1700, and that they remained in the family till 1782, when they were sold to the celebrated Hugh Meynell, of Quorndon Hall, Leicestershire. Lord Wilton again, in his Sports and Pursuits of the English, says that 'about the year 1750 hounds began to be entered solely to fox." The eld of November 6, 1875, p. 512, con- tains an engraving of a hunting-

horn then in the posses- sion of the late master of the Cheshire hounds, and upon

the horn is the inscription :—"Thomas Boothby, Esgq,, –

Tooley Park, Leicester. With this horn he hunted the first pack of foxhounds then in England fifty-five years. Born 1677. Dicd 1752. Now the property of Thomas d'Avenant, Esq., county Salop, his grandson." These extracts do not finally decide the point, because both Mr Boothby's and Lord Arundel's hounds may have hunted other game besides fox, just as in Edward IV.'s time there were "fox dogs" though not kept exclusively for fox. On the whole, it is probable that Lord Wilton's surmise is not far from correct. Since fox hunting first commenced, however, the system of the sport has been much changed. In our grandfathers' time the hounds met early, and found the fox by the drag, that is, by the line he took to his kennel on his return from a foraging expedition. Hunting the drag was doubtless a great test of nose, but many good runs must have been lost thereby, for the fox must often have heard the hounds upwind, and have moved off before they could get on good terms with him. At the present day, the woodlands are neither so large nor so numerous as they formerly were, while there are many more gorse covers; therefore, instead of hunting the drag up to it, a much quicker way of getting to work is to find a fox in his kennel; and, the hour of meeting being later, the fox is not likely to be gorged with food, and so unable to take care of himself at the pace at which the modern foxhound travels.

On hunting days it is the master's duty to say what "a toaster.

covers are to be drawn, and to request the field to take up such positions as will enable the fox to have fair play. The management of the field requires considerable firm- ness, but the very strong language one sometimes hears is better avoided. Where a professional huntsman is em- ployed, he is responsible for the actual hunting, and the less he is interfered with by the master or anybody else the bettcr. The country should be hunted fairly through-

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out its length and breadth, not only for the sake of the subscribers living in the different districts, but with a view to sport. Woodlands of greater or less extent are to be found even in countries denominated open, and these places are generally strongholds for foxes, and should be regularly rattled throughout the season; if this be neglected, the foxes, instead of breaking quickly, will ring about the cover all day, and, what is worse, many small covers will be drawn blank by reason of their inhabitants seeking the quietude of the wood, The frequent hunting of woodlands, though conducive in the long run to sport, is not popular with the field. It is on the whole a matter for congratu- lation that most packs of hounds are now carried on by subscription. Little by little the expense attending a pack of hounds has increased until it has now assumed large proportions: the hounds must be of the best blood ; at least five horses per hunting day (exclusive of the master's) must be allowed for the hunt servants; no makeshifts for kennel or stable will be tolerated ; and the hunt servants must be men of known character. Under these circumstances, a master undertaking to keep hounds at his own expense incurs great cost for the benefit of others, or else, being judged by the standard of great estab- lishments, lays himself open to a charge of only half doing what he has put his hand to. If hunting is as popular as it is supposed to be, it is for every reason advisable that those who derive amusement from it should contribute something towards the general expenses. In establish- ments conducted upon a liberal scale, the annual cost will amount to about £620 a year for each day,in the week that the pack hunts; thus, a three days a week pack will cost about £1860 per annum, a four days a week pack £2480, and so on; but absolute efficiency cannot be maintained much under £520 per day.

The author of the Diary of a Huntsman says that, to be perfect, "'a huntsman should possess the follow- ing qualifications—health, memory, decision, temper, patience, a good ear, voice, and sight, courage and spirits, perseverance and activity; and with these he will make a slow pack quick." Should the master be his own huntsman, he will save about £300 a year, but he should unite as many as. possible of the above list of virtues to those he is possessed of in his capacity of master. The position of a huntsman is a peculiar one; he is the ser- vant of the master, yet the latter must to a certain extent make a confidant of him, as in cases of breeding, drawing the hounds for a day's hunting, and other matters. A huntsman must be fond of

his calling, or he will not be energetic in the pursuit of it; he must also be a bold horseman,—if a good one so much the better,—for nothing is more annoying to the master and the field than to see a huntsman refuse to cast his hounds in an obviously probable direction, because the doing so would necessitate jumping an ugly fence. Observation and decision are also indispensable. When hounds check, the proper course to pursue is very often suggested by some trifling incident which occurred perhaps ten minutes before, and which was noticed at the time without any particular weight being attached to it; for instance, some rooks might have been hovering on the left or right of the line the hounds were running ; or again, some hound that can be depended on diverges for a moment from the rest of the pack. The huntsman remembers this. when the check takes place, and tries in that direction, often with suecess. When once a check occurs, decision should be shown in acting promptly ; right or wrong, the huntsman must do something, and must have a reason for what he does. Authorities are not wanting who reckon youth as one of a huntsman's qualities; but huntsmen, like hunters, are not at their best until half worn out. There is so much to learn in the

nature of the fox, so many isolated cases must have been observed in order to deduce a principle from them, that a young man cannot possibly have the experience necessary to show the best sport, and our hunting records tell of men who have continued to ride boldly and to show no signs of age when fifty years old.

The method of hunting a pack of hounds varies some- what in different countries. One of the most accepted canons is that the huntsman should not interfere with his hounds more than is necessary. So long as hounds can hunt, it is best to let them do so, for if their heads are once got up by hallooing and lifting, they will not so readily settle down again; while hounds that are in the habit of being lifted and galloped off to a distant point whenever a check occurs, will generally look for assistance, and will make but little use of their own noses on cold scenting days. Some countries are naturally bad-scenting ones, and, in order to kill a fox in them, hounds must be lifted more than in others.

Huntsmen are often much abused, when drawing a large cover, for not going away with the first fox. There is a difference of opinion whether, if hounds are running one fox in cover, they should be stopped and put on the line of one that has gone away. Something will depend upon whether the cover was well worked during cub hunting or not, and whether foxes are plentiful or scarce, but after the lst of February the rule should be to go away with the first fox that breaks, or the hounds may get on a vixen.

The whipper-in, to be a success, must be content to suppress himself for the public good. When a "good thing" occurs, and the huntsman is going as hard as he can, and many of the field harder than they like, the whip, or, if two be kept, the second whip, should wait in cover and come on with the tail hounds. A good whip can do more in the furtherance of sport than any huntsman; in the in- terest, therefore, of fox hunting, there must be no rivalry, or rather no manifestation of it, between the huntsman and the whip. A noisy fellow is an abomination ; and the whip should carefully avoid rating a hound after seeing that his voice is entirely disregarded. Ifneeds be a hound must be flogged and that soundly, but he should never be struck without knowing what it is for; thus, it is of no use, twenty minutes after a hound has ceased to run riot, to get alongside of him, bellow out his name, and then flog him ; to warrant the use of the lash, he must be caught flagrante delicto, and must pay no heed to rating. Where, however, hounds have been properly entered and treated, they will require but little chastisement. On approaching a cover, one whip. should go on in advance and station himself on the lee side. of it, where he may often see a fox steal away as soon as the hounds are thrown in. Although some packs have only one whip, a second is very desirable, especially before Christmas, and in countries where there is much woodland. One whip can then go into cover and keep near the huntsman in readiness to obey any directions he may give, and the other is free to see to other matters.

The earth-stopper is an important functionary in coun- tries where there are many earths, for if he neglects his business blank days will probably result with annoying fre- quency. When properly carried out, earth-stopping con- sists in a man going round and stopping all the earths in the district to be hunted over during the day, so that when foxes return from finding their food, which they do some hours before it is light, they shall find their own

door barred against them. This involves the earth-stopper being astir shortly after 2 a.m., not the most pleasant hour of the twenty-four on a winter's day. If he gets to work late, he stops all the foxes in instead of out; and, when the cover is drawn, no one can understand how the fox which has been seen about for the last fortnight cannot be

The whipper- in.

The earth- stopper.

Cup hunting.

Hare hunting.

Otter hunting.

found at the moment when his presence is particularly desired.

Cub hunting carried out on a proper principle is one of the secrets of a successful season. To the man who cares for hunting, as distinct from riding, September and October are not the least enjoyable months of the whole hunting season. As soon as the young entry have recovered from the operation of "rounding," arrangements for cub hunting begin. The hounds must have first of all walking, then trotting and fast exercise, so that their feet may be hardened, and all superfluous fat worked off by the last week in August. So far as the hounds are concerned, the object of cub hunting is to teach them their duty ; it is a dress rehearsal of the November business. In company with a certain proportion of old hounds, the youngsters learn to stick to the scent of a fox, in spite of the fondness they have .acquired for that of a hare, from running about when at walk. When cubbing begins, a start is made at 4 or 5 a.M., and then the system is adopted of tracking the cub by his drag. A certain amount of blood is of course indispensable for hounds, but it should never be forgotten that a fox cub of seven or eight months old, though tolerably cunning, is not so very strong; the huntsman should not therefore be over-eager in bringing to hand every cub he can

find. It would be a move in the right direction if noses were not to be counted until the first of November.

Hare hunting, which must not be confounded with Courstne (q.v.), is an excellent school both for men and for horses. It is attended with the advantages of being cheaper than any other kind, and of not needing so large an area of country. Hare hunting requires considerable skill; Beckford even goes so far as to say— There is more of true hunting with harriers than with any other description of hounds… .. . In the first place, a hare, when found, generally describes a circle in her course which naturally brings her upon her foil, which is the greatest trial for hounds. Secondly, the scent of the hare is weaker than that of any other animal we hunt, and, unlike some, it is always the worse the nearer she is to her end." Hare hunting is essentially a quiet amusement ; no halloo- ing at hounds nor whip cracking should be permitted ; nor should the field make any noise when a hare is found, for, being a timid animal, she might be headed into the hounds' mouths. Capital exercise and much useful know- ledge are to be derived by running with.a pack of beagles. There are the same difficulties to be contended with as in hunting with the ordinary harrier, and a very few days' running will teach the youthful sportsman that he cannot run at the same pace over sound ground and over a deep ploughed field, up hill and down, or along and across furrows.

Otter hunting, which is less practised now than formerly, begins just as all other hunting is drawing to a close. When the waterside is reached an attempt is made to hit upon the track by which the otter passed to his ' couch," which is generally a hole communicating with the river, into which the otter often dives on first hearing the hounds. When the otter "vents" or comes to the surface to breathe, his muzzle only appears above water, and when he is viewed or traced by the mud he stirs up, or by air bubbles, the hounds are laid on. Notwithstanding the strong scent of the otter, he often escapes the hounds, and then a cast has to be made. When he is viewed an attempt is made to spear him by any of the field who may be within distance ; if their spears miss, the owners must wade to recover them. Should the otter be transfixed by a spear, the person who threw it goes into the water and raises the game over his head on the spear's point. If instead of being speared, he is caught by the hounds, he is soon worried to death by

them, though frequently not before he has inflicted some severe wounds on one or more of the pack.

Quitting the United Kingdom, we find that the elephant, hyzna, hunting leopard, and a small species of panther known as the ounce, are not only objects of chase, but are themselves trained to assist in the capture of other ani- mals, The elephant has been found of great service in lion and tiger hunting, his size affording comparative safety to the hunters seated on his back. The hyena, which re- sembles a dog in many particulars, is said to be as tractable, when properly trained, and to be of much use in the pur- suit of game. The hunting leopard or cheetah and the ounce are used in hunting a species of antelope. They have hoods put over their heads, and are taken in a small waggon into the field; when the deer is seen the hood is taken off and the animal starts in pursuit, followed by the hunter; when the game is secured the hood is again put on. In India field sports are largely indulged in, owing partly to natural facilities, and_ partly to the taste for hunting characteristic of the English resident there. 'Tigers are sometimes caught in traps, and sometimes shot in the jungle from the back of an elephant ; they seek to conceal themselves, and very rarely commence hostilities against mankind, but when severely wounded and brought to bay they fight courageously. Hunting the wild hog, or "pig sticking," as it is often termed, is a favourite sport in India; the ground is walked over by beaters, and when a hog is roused the two mounted huntsmen nearest to him start in pursuit, and endeavour to spearhim. The riding requires judgment and very good nerves: hollows, ravines, and cracks in the ground caused by the sun are numerous, and, as they are hidden by the tall grass, the horse cannot avoid them ; it is said that no horse can run down a hog in less than a mile, even over the best ground, while over a rough country the distance travelled amounts to three or four. The rider's aim is to blow the hog sufficiently before getting within spearing distance—for the charge of an untired hog is a dangerous affair ; but when near a thick cover the sportsman must try to spear him at all hazards, or make up his mind to lose him. The proper management of the spear requires considerable practice. Besides the above mentioned animals, the fox, jackal, wolf, hyzena, buffalo, and four-horned antelope are also objects of the chase.

Australia was formerly the scene of a great deal of kan- garoo hunting, but that animal is now comparatively scarce.

In Africa there is plenty of big-game hunting, the list including the elephant, lion, giraffe, hippopotamus, antelopes of various kinds, leopard, hyena, buffalo, jackal, and ostrich. Of these the larger and more dangerous animals are killed as opportunity offers, but the jackal is hunted by English settlers like a fox. Ostrich hunting is somewhat peculiar ; the bird is pursued by men on horseback, and, though over the ground it is swifter than a horse, it generally runs in a large circle, so that the riders, by describing a smaller circle and relieving one another, are enabled to keep tolerably near to it, and so to ride it down.

In North America the bison, an animal sometimes when full grown weighing as much as 142 stone, is pursued by the natives on horseback and then shot. The moose is chased towards a ravine or a snowdrift, and when he begins to flounder in the snow he is shot at by the hunters. The red deer is now hunted with staghounds upon the English prin- ciple. South America affords hunting after the puma, tapir, and wild bull, the lasso being the usual means of capture.

In Russia, bears, wolves, and wild boars are hunted. Wolves are found in Germany, where they are not only hunted by properly trained wolf-hounds, but are killed by any available means.

France offers facilities for hunting the wolf, wild boar,

Other kinds of hunting,

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Plate ITI.

Ouse and Nen.

HUN—

and deer, but the sport, though followed up with a con- siderable amount of enthusiasm, is not carried out in a manner strictly in accordance with English ideas. The weak point in French hunting is that the huntsmen do not seem to possess a particularly accurate knowledge of the habits and characteristics of the animal they pursue. Then again their system of kennel management is not what it might be. To show sport in the vast forests, the hounds should be in good health and well-trained, and there should be plenty of them. Of late years, however, more atten- tion has been paid to hound breeding and kennel manage- ment, and with encouraging results. (E. D. B.)

HUNTINGDON, or Hunts, an inland county of England, situated between 52° 9' and 52° 35' N. lat. and 0° 3' E. and 0° 30' W. long., and bounded on the N. and W. by Northampton, 8. by Bedford, and E. by Cambridge. Its extreme breadth is at the middle, from which it narrows gradually and irregularly towards its north and south ends. Its extreme length from north to south is about 30 miles, and its extreme breadth from east to west about 23 miles. The area extends to 229,575 imperial acres, or 358 square miles. Among English counties it is the smallest, with the exception of Middlesex and Rutland; and Rutland is the only English county it surpasses in population.

The surface of the county is low, and, with the exception of the Fen district, pleasantly undulating. For the most part it is bare of trees. A low ridge of hills enters the county from the south near Potton, and runs in a northward direction until it terminates in the Ouse valley near Hunt- ingdon; and a branch of the Cambridgeshire hills enters the south-east part of the county, and from Huntingdon runs north-west to Wansford. The north-eastern part of the county, comprising 50,000 acres, or one-fifth of its whole extent, belongs to the great " Fen" district extending throughout the counties of Cambridge, Lincoln, Northamp- ton, Norfolk, and Suffolk. The principal rivers are the The Ouse from Bedfordshire skirts the borders of the county near St Neots, and after flowing north to Huntingdon takes an easterly direction past St Ives into Cambridgeshire on its way to the Wash. It is navigable for barges as far as Bedford, and in the fen dis- trict constitutes a means of transport for the agricultural produce of the county. The Nen, which is also navigable, skirts the northern border, and quitting it at

Peterborough enters the Wash below Wisbeach, in Cambridgeshire. Various cuts and drains which join the Nen and Ouse are also made use of for navigation.

Geology, Soil, and Agriculture.—Geologically Hunt- ingdonshire belongs to what is known as the Oolite system. The low round hills inthe south-eastern part of the county are composed of ironsand. They contain a band of copro- lites, and there is a strip of greensand on the south-eastern border. The central and larger part of the county displays the Oxford clay, which lies between the middle and lower Oolite. It reaches a depth of nearly 100 feet, and passes under the Fens. The Fens are composed of fine mud, deposited formerly by the sea, intermixed with beds of peat, in which are frequently found the remains of animals, frequenters of the old forest, such as the elk, the red-deer, the bear, the beaver, and the wolf. The hills on the

border of Northampton are of the stonebrash or forest –

marble. The Oolite formation is very fossiliferous. Large masses of fossil wood converted into jet or iron pyrites are found in the Oxford clay. Glacier or boulder clay contain- ing chalk and flint deposits is met with in nearly every part of the county. The soil is generally fertile, and culti- vation is of an advanced kind. In the fen district the soil is of a blue peaty nature, resting on a subsoil of white marly clay. After being drained and mixed with clay it

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is very productive, but much damage is often done to the crops by the prevalence of frost and fogs. In the fen dis- tricts a four-years' system of cropping—green-crops, barley, seed-clovers, and wheat—is the most common. 'The " Meres" of Whittlesea, Ramsey, and Ugg, at one time much resorted to by sportsmen for their wildfowl and fish, have now been drained, and, notwithstanding the expensive- ness of the process, such is the fertility of their beds that the outlay was speedily more than repaid. The Oxford clay, which extends to an area of 120,000 acres, is of very various soils according as tle Oolite rocks crop to the sur- face. The greater part is under cultivation, and much im- provement has lately been effected by drainage; on account of the tenacity of the clay the drains often require to

be placed very close. Much of the soil is, however, undrained and uncultivated, and, though partly used for pasturage, must on the whole be regarded as mere wasteland. On tlie drained pasturage a large number of cattle are fed. In this district the system of cropping varies considerably, but a modification of the four-course shift is the most common—fallow sown sometimes with winter tares, tur- nips, mangold, or mustard; barley ; beans where tares were sown on the fallow, and clover where green crops were sown; wheat. A six-years' course of fallow, barley, seed-clovers, wheat, beans, and wheat is, however, not uncommon, especially on the best soils. The third district, comprising the gravel of the Ouse valley, embraces an area of 50,000 acres. On the banks of the Ouse it consists of fine black loam deposited by the overflow of the river, and its meadows form very rich pasture grounds. The upland district is under arable culture, and is generally cultivated on a four-course system of wheat, green crops, barley, and seed-clover. Market-gardening is prosecuted ; and willows are largely grown in the fen district. The farms vary in size from 200 to 500 acres, ranging chiefly between 200 and 300. 'The farm-houses are generally of an inferior kind, and the farm-buildings are often quite inadequate for the shelter and accommodation of the stock. The labourers generally live in villages and hamlets, in cottages of the most miserable description, having mostly mud walls ; but many cottages of a better class have been built within the last few years. The county is well sup- plied with turnpike roads ; and the parish and occupation roads, formerly in a bad state of repair, have been lately much improved. The most modern improvements in farm implements are in general use.

According to the agricultural returns for 1879 the total area of arable land was 209,610 acres, of which 96,533 were under corn crop, 21,931 under green crop, 17,121 under rotation grasses, 60,484 permanent pasture, and 13,531 fallow. The arca under woods was 20,714 acres. Wheat, which in 1879 cropped 43,129 acres, is much more largely grown than any other grain, and occurs twice in the six-years' shift system in use on the better lands. Barley (27,118 acres) is the more frequent corn crop in the four-years' shift system,—only 10,247 acres being under oats. The quality of barley on many soils is lean and in- ferior, and unsuitable for malting purposes. Beans and pease occupied 8948 and 6929 respectively. Mangold (3430 acres) and cabbage and similar green crops (2863 acres) are chiefly

used for the feeding of sheep. Under turnips there were only 3778 acres, and under potatoes 3083. The number of cattle in 1879 was 27,358, or an average of 13 to every 100 acres under cultivation, as compared with 16°9 for England and 21:0 for the United Kingdom. Of these the number of cows and heifers in milk or in calf was 7536. Though Stilton in Huntingdon gives its name to a celebrated cheese, that variety is now made exclusively in the counties of Lincoln and Leicester ; and dairy farm- ing is not now much followed. The milk is now chiefly

used for rearing calves. fattened in the field or the fold-yard, and are sold when rising three years old. They are mostly of the short- horn breed, large numbers of Irish shorthorns being wintered in the feus. Where there are no upland pas- tures the farmer usually purchases cattle in the autumn and sells them in the spring. The number of horses in 1879 was 11,057, or an average of 4:2 to every 100 acres under cultivation, as compared with 4°5 for Eng- land and 41 for the United Kingdom. Of these the number used solely for agricultural purposes was 7583. Most of the farmers breed cart horses, and the large farmers often rear weight-carrying hunters. The number of sheep in 1879 was 157,790, or an average of 75°3 to every 100 acres under cultivation, as compared with the same average for England and 68°0 for the United Kingdom. Great improvement in the breed has lately taken place, Leicesters and Lincolns being most common; they usually attain great weights at an early age. Lambs are occasionally sold at weaning time, but more frequently they are kept through the winter on the grass lands, being fed also on mangolds and other roots, with an addition of cake and corn. The number of pigs in 1879 was 19,990, or an average of 9°5 to cvery 100 acres under cultivation, as compared with 7:2 for England and 6°7 for the United Kingdom, They include Berkshire, Suffolk, and Neapolitan breeds, and a number of crosses. Many after having gleaned the stubbles are fattened on whey and various prepara- tions of inferior barley ; but breeding is also extensively practised.

According to the owners of lands return for 1873 the land was divided among 3903 proprietors, holding land the gross annual value of which was £444,890, Of the owners 452 per cent. possessed less than 1 acre, and tho

average value all over was £1, 19s. 43d. per acre. There were 13 proprietors holding upwards of 3000 acres, viz., Edward Fellowes, 15,629; Duke of Manchester, 13,835 ; William Wells, 5792; Marquis of Huntly, 5711; Hon. G. W. Fitzwilliam, 5202; Lord Chesham, 3787; Earl of Carysfort, 3654; Ecclesiastical Commissioners, 3559 ; Colonel Duncombe, 3407; W. Duberley, 3224; Earl of Sandwich, 3219; G. D. Newton, 3209; Richard H. Hussey, 3135.

Manufactures and Trade.—Agriculture is the principal industry, and none of the manufactures are extensive, the chief being paper and parchment. Madder is obtained in considerable quantities, and in nearly every part of the shire lime burning is carried on. Lace-making is practised by the female peasantry; and the other industries, which are not prosecuted beyond what is necessary to meet local wants, are printing, iron-founding, tanning, currying, brick and tile making, malting, and brewing.

Railways.—The middle of the county is traversed from south to north by the Great Northern, which enters it at St Neots and passes by Huntingdon to Peterborough. A branch from the Midland enters the middle of the county from Northampton, and passes by Graffham to Huntingdon, where it is joined by a branch which passes by St Ives to the Great Eastern in Cambridgeshire. From St Ives there is a branch to Wisbeach in Cambridgeshire, and another has been constructed to Stilton. On the Great Northern there is a branch from Holme to Ramsey.

Administration. —Huntingdonshire comprises four "hun- dreds." For parliamentary purposes it is an undivided constituency returning two members; and it contains one parliamentary borough, that of Huntingdon, formed of Huntingdon (4243) and Godmanchester (2363), and return- ing one member. Part of the represented city of Peter- borough is also in the county. The principal other towns are Ramsey (2378), St Ives (3291), St Neots (3200), and

HUN TENG DOR

Large numbers of cattle are | Kimbolton (1509).

The county has one court of quarter sessions. It is included in the south-eastern circuit, and circuit courts are held at Huntingdon. It forms part of the shrievalty of Cambridge, and ecclesiastically is in the diocese of Ely.

Population.—The population in 1841 amounted to 58,549, in 1851 to 64,183, in 1861 to 64,250, and in 1871 to 63,708 (31,381 males and 32,327 females). The increase in thirty years from 1841 has been 8°8 per cent., and since 1801 it has been 69°5 per cent.

History and Antiquities.—Previous to the Roman invasion Huntingdonshire, like the other Fen counties, was inhabited by the British tribe the Iceni, originally of Celtic origin, but considerably intermixed from Teutonic sources, although the Belge in all pro- bability did not subdue the country as far north as Huntingdon. During the Roman occupation it was included in the Roman pro- vince of Flavia Cesariensis. Two Roman stations are supposed to have been situated in the county, Durolipons (Godmanchester) and Durobrive at Water Newton ou the Nen. The Roman road Via Devana from Cambridge joined Ermine Street at Godmanchester, Ermine Street passing north-west by Water Newton into Northamp- ton. Under the name of Huntandunscyre, Huntingdon formed part of the kingdom of East Anglia, afterwards joined to Mercia. Shortly before the Conquest the earldom of Huntingdon was held by Swend, who, on receiving the earldom of Northampton, granted it to his son Waltheof, who married a niece of William the Conqueror ; and, on Waltheof's execution for high treason, it passed to a Norman soldier, Simon de St Liz, who married a daughter of Waltheof. On the death of St Liz, David, afterwards king of Scotland, married his widow, and inherited the earldom in her right, but on account of the subsequent feuds between the English and Scottish monarchs the earldom frequently exchanged hands between the heirs of St Liz and the heirs of David. It is at present borne by a branch of the Hastings family. A great part of the county was held by the monks, who erected two great abbeys at Ramsey and at Sawtry St Judith,and priories at Huntingdon,St Ives, St Neots, and Hinching- brook. Of these buildings all that now remains is the richly deco- rated ruined gateway of the abbey of Ramsey, and a dovehouse, a baru, and a few unimportant fragments at St Ives. There were two ancient castles at Huntingdon and Kimbolton ; the one at the latter place, now the seat of the Montagues, dukes of Manchester, was the

residence of Catherine of Aragon after her divorce from Henry VIII. Another mansion of interest is Hinchingbrook House, the ancient seat of the Cromwell family. Among the old churches may be men- tioned Alwalton, Conington, Hartford, Leighton Bromswold, and Ramsey, which contain remains of Roman architecture ; Buckden, Elton, Godmanchester, and St Neots, which contain good specimens of the Perpendicular ; Chesterton, Holywell, Sawtry, Upton, and Wooton, eich are partly Early English, The only events of his- torical importance connected with the shire are the capture of the castle of Huntingdon by the Royalists under Charles I. in 1645, and the rout at St Neots of one hundred horse under the command of the duke of Buckingham and the earl of Holland by the Par- liamentary soldiers, who took the earl of Holland prisoner.

Huntincpon, a municipal and parliamentary borough of England, capital of the above county, is situated on the left bank of the Ouse, and on three railway lines, 58 miles north of London, 15 miles north-west of Cambridge, and 19 miles south of Peterborough. It consists principally of one street about a mile in length, from which small streets branch off at various points. By a fine bridge erected in the 13th century it is connected with the muni- cipal borough of Godmanchester, which, consisting princi- pally of cottages, forms practically one of its suburbs, and is included in the parliamentary borough of Huntingdon. In Huntingdon there are two old churches—All Saints, probably dating originally from the time of the Normans, but re-erected in the time of Henry VIII, and St Mary's, probably occupying the site of the old priory, but rebuilt in the Gothic style after the fall of the old building in 1608, and restored in 1876. The church of Godmanchester, of the date 1625, is also a fine structure in the late Perpen- dicular, with a tower and spire. At the grammar school of Huntingdon, founded in 1200 by David, king of Scotland, but pulled down in 1877 for the erection of a new building, Oliver Cromwell received his education. Among the other schools are Walden's school for 64 boys, and a national school. 'There are also in Godmanchester a grammar school

- anda national school. The principal other buildings of Huntingdon are the county jail, completed in 1827 ; the militia barracks, erected in 1852; the

town and county hospital, erected in 1853 ; the corn exchange; the town-hall, whose ground floor is used for the courts of justice ; and the rooms of the literary and scientific institution. The house in which Oliver Cromwell was born is still standing. Of the three old monastic foundations formerly belonging to the town there are now no remains. The industries of Huntingdon and Godmanchester are very much alike. They possess iron-fouudries, breweries, tile- works, and oil and flour mills. The area of the parlia- mentary borough of Huntingdon is 6086 acres, the municipal boroughs of Godmanchester and Huntingdon occupying 4970 acres and 1116 acres respectively. In 1871 the population of the parliamentary borough was 6606, that of the municipal boroughs of Godmanchester and Huntingdon being respectively 2363 and 4243. –

Huntingdon existed in the time of the Saxons under the name of Huntantun, and in the Norman survey it is mentioned as Hunters- dune. The castle erected at it by Edward the Elder in 919, and afterwards enlarged by David, king of Scotland, was demolished by the orders of Henry II. In 1645 the town was plundered by the Royalists under Charles I. 'The origin of the town was doubtless closely connected with that of Godmanchester, which occupied the site of the Roman station Durolipons, and at which a castle is said to have been founded by Gormund (hence the name of the town, formerly Gormunchester), a Danish chief in the reign of Alfred the Great. Huntingdon was first incorporated in 1206 and God- manchester in 1605. From an early period Huntingdon returned two members to parliament ; but the Hetorm Act of 1867 reduced the representation to one member.

HUNTINGDON, Setina, Countess or (1707-1791), leader of a sect of Calvinistic methodists, known as the Countess of Huntingdon's Connexion, was the daughter of Washington Shirley, second Earl Ferrers. She was born at Stanton Harold, a mansion near Ashby-de-la-Zouch in Leicestershire, August 24, 1707, and in her twenty-first year was married to Theophilus, ninth earl of Huntingdon. The religious influence of her husband's sisters, and a dangerous illness soon after her marriage, tended to deepen the serious impressions which the young countess had experienced from childhood; and on the death of her husband in 1746, coming under the influence of the religious revival in which Wesley and Whitfield were at that time conspicuous, she resolved to join these preachers in actively furthering

their aims. In 1748 she gave Whitfield a scarf as her chaplain, and in that capacity he frequently preached in her town house to the most fashion- able audiences, in which sometimes such men as Chester- field, Walpole, and Bolingbroke were found. Reducing her personal expenditure, and disregarding the sneers of her aristocratic acquaintances, Lady Huntingdon spent her ample means in building chapels in different parts of England, and appointed ministers to officiate in them, under the impression that as a peeress she had a right to employ as many chaplains as she would. In 1768 she con- verted the old mansion of Trevecca, near Talgarth, in South Wales, into a theological seminary for training young ministers for the Connexion; and this, which she made her chief residence, she continued to support alone till her death. Up to 1779 Lady Huntingdon and her chaplains con- tinued members of the Church of England, but in that year the prohibition of her chaplains by the consistorial court from preaching in the Pantheon, a large building in London rented for the purpose by the countess, compelled her in order to evade the injunction to take shelter under the Toleration Act. This reluctant step, which placed her legally among dissenters, had the effect of severing from the Connexion several eminent and useful members. Till her death in London, June 17, 1791, Lady Huntingdon

intendence over her chapels and chaplains, and maintained her leading position as well by her genuine earnest piety and force of character as by her high social station and generous liberality. Her chapels and college were be- queathed to trustees ; and in 1792 the latter was removed to Cheshunt, in Hertfordshire, where it has since flourished. Several congregations of the Connexion have become nomi- nally as well as virtually Congregational chapels ; while, even by those which retain the original name, the Congrega- tional polity is practically adopted.

_ The Life of the Countess of Huntingdon was published at London, in 2 vols., in 1844; Zhe Coronet and the Cross, or Memorials of Selina, Countess of Huntingdon, by A. H. New, appcared in 1857.

HUPFELD, Hermann (1796-1866), an eminent Orien- talist and Biblical commentator and critic, was born March 31, 1796, at Marburg, where he studied philosophy and theology from 1813 to 1817; in 1819 he became a

teacher in the gymnasium at Hanau, but in 1822 he resigned that appointment. After studying for some time under Gesenius at Halle, he in 1824 “habilitated” in philosophy at that university, and in the following year he was appointed professor extraordinarius of theology at Marburg. There he received the ordiuary professorships of Oriental languages and of theology in 1827 and 1830 respectively ; thirteen years later he removed as successor of Gesenius to Halle. In 1865 he was accused by some theologians of the Hengstenberg school, before the minister of public worship, of having taught exegesis in a sense inconsistent with the recognized character of the Old Testament as a divine revelation. From this charge, however, lhe successfully vindicated himself, the entire theological faculty, including J. Miiller and Tholuck, bearing testimony to his essential orthodoxy. He died at Halle April 24, 1866.

His earliest works in the department of Scmitic philology (Exereitationes Atthiopicw, 1825, and De emendanda ratione lexico- graphice Semitiee, 1827) were followed by the first part (1841), mainly historical and critical, of an Ausfiihrliche Hebrdische Grammatik, which he did not live to complete, and by a “ pro- gram” on the early history of Hebrew grammar among the Jews (De ret grammatice apud Judeos initiis antiquissimisque serip- toribus, 1846). His principal contribution to Biblical literature, a valuable though prosaic exegetical and critical Uebersetzung wu. Auslegung der Psalmen, began to appear in 1855, and was completed in 1861 (2d ed. by Riehm, 1867-1871). Other writings are Ueber Begriff u. Methode der sogenannten biblisehen Einleitung (1844); De primitiva et vera festorum apud Hebreos ratione (1851-1864) ; Die Quellen der Genesis von newem untersueht (1853), in which he dissects that book into an original writing, or “ Urschrift,” by the older Elohist, and the contributions by the younger Elohist and by the Jchovist respectively, the work of the “ redactor”” having been comparatively trifling ; Die heutige theosophische u. mythologisehe Theologie u. Sehrifterkliérung (1861) ; and various contributions to the Studien u. Kritiken, to the Journal of the Deutsche Morgen- landische Gesellschaft, and to the Neue Evangelische Kirchenzeitung. See Riehm, Hermann Hupfeld (1867).

HURD, Ricuarp (1720-1808), bishop of Winchester, was born at Congreve, in the parish of Penkridge, Stafford- shire, where his father was a farmer,

on January 13, 1720. He received his early education at the grammar school of Brewood, in his native county, and made such progress in his studies that in October 1733 he was admitted a sizar of Emmanuel College, Oxford ; he did not begin residence, however, till a year or two afterwards. In 1739 he took the degree of B.A., and in 1742 he was ordained deacon,

-and for a short time had charge of the parish of Reymerston,

between Thetford and Norwich; but, having in the same year proceeded M.A. and been elected fellow of his college, he returned to Cambridge early in 1743. While residing there he was ordained priest in 1744, and in 1748 he pub- lished his Remarks on a late Book, entitled an Enquiry inte the Rejection of the Christian Miracles by the Heathen, by William Weston, B.D., 1746. This controversial treatise,

continued to exercise an active, and even autocratic, super- | which was characterized by considerable learning and

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ingenuity, Poetica of

was followed in 1749 by an edition of the Ars Horace (Q. Horatii Flacct Eyistola ad Pisones, with an English Commentary and Notes), which, as Gibbon has remarked, fully proved the title of its author to "the great but prostituted name of critic," and may still be read with interest, less, however, as an exposition of the original than as containing "a more valuable and better digested collection of criticisms tlian Horace ever wrote or intended to write." In 1750 Hurd was, through the recommendation of his friend Warburton, appointed one of the preachers at Whitehall; and in 1751 he published Q. Horatw Flacee Epist. ad Augustum, with an English Commentary and Notes, justly held by Gibbon to be superior in merit to the edition of the Ars Poetica.

In 1756 he accepted the college living of Thurcaston, Leicestershire, in the studious retirement of which he wrote and published a volume of Dissertateons ("On the Province of the Drama," 'On Poetical Imitation," and "On the Marks of Imitation," 1757), and another entitled Moral and

Political Dialogues (On Sincerity in the Commerce of the World," "On Retirement," "On the Age of Queen Elizabeth," and "On the Constitution of the English Government," 1759). Tho latter has proved the most popular of his writings, and was chiefly instrumental in pro- curing for him ata later period of his life the royal favour. In 1766 he was appointed preacher of Lincoln's Inn, and in 1767 he became archdeacon of Gloucester ; his elevation to the see of Lichfield and Coventry followed in 1774, and in 1776 he was selected to be preceptor of the prince of Wales and the duke of York. In 1781 he was translated to Worcester, and in 1783, on the death of Dr Cornwallis, he was pressed to accept the primacy, but declined it as "9 charge not suited to his temper and talents, and much too heavy for him to sustain, especially in these times." He died May 28, 1808.

Besides various sermons, charges, and other compositions of a more or less occasional character, Hurd published, in addition to the works already mentioned, a Dissertation on the Delicacy of Friendship (1755), a severe attack on Jortin, by whom Warburton had been assailed ; Letters on Chivalry and Romance (1762); Dis- sertation on the Idea uf Universal Poetry (1762) ; Dialogues on Foreign Travel (1764); and Discourse by way of Preface to the Quarto edition of Bishop Warburton's Works, containing some Account of the Life, Writings, and Character of the Author (1794). Remarks on Hume's Natural History of Religion (1757), a controversial tract which caused considerable irritation to that philosopher, was the joint production of Hurd and Warburton. The eolleected works of

'Hurd appeared in an edition of 8 vols. 8vo, in 1811 ; his Memoirs by Kilvert, were published in 1860.

HURDWAR. See HarpwAr.

HURON, Laks. See St LAWRENCE.

HURRUR. See Harar.

HUSBAND AND WIFE, Law rexatine To. For the modes in which the relation of husband and wife may be constituted and dissolved, see Marriace and Divorce. The present article will deal only with the effect of marriage on the legal position of the spouses. 'The per- son chiefly affected

is the wife, who probably in all politi- cal systems becomes subject, in consequence of marriage, to some kind of disability. The most favourable system scarcely leaves her as free as an unmarried woman; and the most unfavourable subjects her absolutely to the authority of her husband. In modern times the effect of marriage on property is perhaps the most important of its conse- quences, and on this point the laws of different states show wide diversity of principles.

The history of Roman law exhibits a transition from an extreme theory to its opposite. The position of the wife in the earliest Roman household was regulated by the law of Manus. She fell under the "' hand" of her husband, — became one of his family, along with his sons and daughters, natural or adopted, and his slaves. The dominion which,

so far as the children was concerned, was known as the patria potestas, was, with reference to the wife, called the manus. The subject members of the family, whether wife or children, had, broadly speaking, no rights of their own ; all were merged in the potestas of the husband and father. If thisinstitution implied the complete subjection of the wife to the husband, it also implied a much closer bond of union between them than we find in the later Roman law. The wife was at least a member of the family, and on her husband's death she succeeded, like the children, to freedom and a share of the inheritance. Manus, however, was not essential to a legal marriage ; its restraints were irksome and unpopular, and in course of time it absolutely ceased to exist, leaving no equivalent protection of the stability of family life. The later Roman marriage left the spouses comparatively independent of each other. The bond was easily dissolved, and while it lasted was loose and easy. The distauce between the two modes of mar- riage may be estimated by the fact that, while under the former the wife was one of the husband's immediate heirs, under the latter she was called to the inheritance only after his kith and kin had been exhausted, and only in prefer- ence to the treasury. It seems doubtful how far she had, during the continuance of marriage, a legal right to en- force aliment from her husband, although if he neglected her she had the unsatisfactory remedy of an easy divorce. The law in fact preferred to leave the parties to arrange

their mutual rights and obligations by private contracts. Hence the importance of the Law of Settlements (Dotes). The Dos and the Donatio ante nuptias were settlements by or on behalf of the husband or wife, during the continu- ance of the marriage, and the law seems to have looked with some jealousy on gifts made by one to the other in any less formal way, as possibly tainted with undue influ- ence. During the marriage the husband had the adminis- tration of the property, and its destination afterwards might depend on the nature of the settlement and the con- duct of the parties.

The manus of the Roman law appears to be only one instance of an institution common to all primitive societies, and suitable only to society in a primitive state. On the continent of Europe after many centuries, during which local usages were "brought under the influence of principles derived from the Roman law, a theory of marriage became established, the leading feature of which is the community of goods between husband and wife. Describing the prin- ciple as it prevails in France, Story (Conflict of Laws, § 130) says—" This community or nuptial partnership (in the absence of any special contract) generally extends to all the movable property of the husband and wife, and to the fruits, income, and revenue thereof… . It extends also to all immovable property of the husband and wife ac- quired during the marriage, but not to such immovable pro- perty as either possessed at the time of the marriage, or which came to them afterwards by title of succession or by gift. The property thus acquired by this nuptial partnership is liable to the debts of the parties existing at the time of the marriage ; to the debts contracted by the husband during the community, or by the wife during the community with the consent of the husband ; and to debts contracted for the maintenance of the family. ... . The husband alone is entitled to administer the property of the community, and he may alien, sell, or mortgage it without the concurrence of the wife." But he cannot dispose by will of more than his share of the common property, nor can he part with it gratuitously ater vivos. The community is dissolved by death (natural or civil), divorce, separation of body, or separation of property. On separation of body or of property the wife is entitled to the full control of her movable property, but cannot alien her immovable pro-

HUSBAND

perty without her husband's consent, or legal authority. | leaseholds) pass to the husband, subject to the wife's right

On the death of either party the property is divided in equal moities between the survivor and the heirs of the deceased.

Law of England.—The English common law has as usual followed its own course in dealing with this subject, andin no department are its rules more entirely insular and independent. The text writers all assume two fundamental principles, which between them establish a system of rights totally unlike that we have just described. Husband and wife are said to be one person in the eye of the law—wunica persona, guia caro una et sanguis unus. Hence a man cannot grant or give anything to his wife, because she is himself, and if there are any compacts between them before marriage they are dissolved by the union of persons. Hence, too, the old rule of law, now greatly modified, that husband and wife could not be allowed to give evidence against each other, in any trial, civil or criminal. The unity, however, is one-sided only ; it is the wife who is merged in the husband, not the hus- band in the wife. And when the theory does not apply, the disabilities of " coverture" suspend the active exercise of the wife's legal faculties. The old technical phraseology describes husband and wife as baron and femme; the rights of the husband are baronial rights. From one point of view the wife is merged in the husband, from another she is as one of his vassals. A curious example is the immunity of the wife in certain cases from punishment for crime committed in the presence and on the presumed coercion of the husband. 'So great a favourite," says Blackstone, "is the female sex of the laws of England."

The application of these principles with reference to the property of the wife, and her capacity to contract, may now be briefly traced.

The freehold property of the wife becomes vested in the husband and herself during the coverture, and he has the management and the profits. If the wife has been in actual possession at any time during the marriage of an estate of inheritance, and if there has been a child of the marriage capable of inheriting, then the husband becomes entitled on his wife's death to hold the

estate for his own life as tenant by the curtesy of England (curialitas).! Beyond this, however, the husband's rights do not extend, and the wife's heir at last succeeds to the inheritance. The wife cannot part with her real estate without the concur- rence of the husband; and even so she must be examined apart from her husband, to ascertain whether she freely and voluntarily consents to the deed.

With regard to personal property, it passes absolutely at common law to the husband. Specific things in the possession of the wife (choses in possession) become the property of the husband at once ; things not in possession, but due and recoverable from others (choses in action), may be recovered by the husband. A chose in action not re- duced into actual possession, when the marriage is dissolved by death, reverts to the wife if she is the survivor; if the husband survives, he can obtain possession by taking out letters of administration. A chose in action is to be distinguished from a specific thing which, although the pro- perty of the wife, is for the time being in the hands of another. In the latter case the property is in the wife, and passes at once to the husband ; in the former the wife has a mere jus in personam, which the husband may enforce if he chooses, but which is still capable of reverting to the wife if the husband dies without enforcing it.

The chattels real of the wife (z.e., personal property, dependent on, and partaking of, the nature of reality, such as

u Curtesy or courtesy has been explained by legal writers as "arising by favour of the law of England.' The word has nothing to do with courtesy in the sense of complaisance.

of survivorship, unless barred by the husband by some act done during his life. A disposition by will does not bar the wife's interest ; but any disposition inter vivos by the husband will be valid and effective.

The courts of equity, however, greatly modified the rules of the common law by the introduction of the wife's separate estate, v.e., property settled to the wife for her separate use, independently of her husband. The principle seems to have been originally admitted in a case of actual separation, when a fund was given for the maintenance of the wife while living apart from her husband. And the conditions under which separate estate may be enjoyed

have taken the court of chancery many generations to develop. No particular form of words is necessary to create a separate estate, and the intervention of trustees, though common, is not necessary. A clear intention to de- prive the husband of his common law rights will be suffi- cient to do so. In such a case a married woman is entitled to deal with her property as if she was unmarried, although the earlier decisions were in favour of requiring her binding engagements to be in writing or under seal. But it is now held that any engagements, clearly made with reference to the separate estate, will bind that estate, exactly as if the woman had been a femme sole. Connected with the doctrine of separate use is the equitable contriv- ance of restraint on anticipation, whereby property may be so settled to the separate use of a married woman that she cannot, during coverture, alienate it or anticipate the income. No snch restraint is recognized in the case of a man or of a femme sole, and it depends entirely on the separate estate ; and the separate estate has its existence only during coverture, so that a woman to whom such an estate is given may dispose of it so long as she is unmarried, but becomes bound by the restraint as soon as she is married. In yet another way the court of chancery interfered to protect the interests of married women. When a husband sought the aid of that court to get possession of his wife's choses in action, he was required to make a provision for her and her children out of the fund sought to be re- covered. This is called the wife's equity to a settlement, and is said to be based on the original maxim of chancery jurisprudence, that 'he who seeks equity must do equity." Two other property interests of minor importance are recognized. The wife's prn-money is a yearly allowance settled on her before marriage for the purchase of clothes and ornaments suitable to her husband's station, but it is not an absolute gift to the separate use of the wife; and a wife surviving her husband cannot claim for more than one year's arrears of pin-money. Paraphernalia are jewels and other ornaments given to the wife for the purpose of being worn by her, but not as her separate property. The hus- band may dispose of them by act inter vivos but not by will, unless the will confers other benefits on the wife, in which case she must elect between the will and the para- phernalia.

The corresponding interest of the wife in the property of the husband is much more meagre and illusory. Besides a general right to maintenance at her husband's expense, she has at common law a right to dower in her

husband's lands, and to a pars rationabilis (third) of his personal estate, if he dies intestate. The former, which originally was a solid provision for widows, has by the ingenuity of conveyancers, as well as by positive enactment, been reduced to very slender dimensions. It may be destroyed by a mere declaration to that effect on the part of the husband, as well as by his conveyance of the land or by his will.

The common practice of regulating the rights of husband, wife, and children by marriage settlements obviates the hardships of the common law—at least for the women of

the wealthier classes. The legislature by the Married Women's Property Acts of 1870 and 1874 has introduced changes, the benefit of which will probably be most keenly felt among the poor. The chief provisions are shortly these :—-(1) the earnings of a married woman in an occu- pation carried on by her apart from her husband are to be held as property settled to her separate use, independent of her husband, and her investments of such earnings are similarly protected ; (2) when a woman, married after the passing of the Act, becomes entitled during marriage to personal property as next of kin, or to any sum not exceed- ing £200 under a deed or will, such property shall belong to her for her separate use; where real property descends to her as heiress of an intestate, the rents and profits thereof shall belong to her for her separate use ; (3) in respect of property thus declared to be her " separate estate," she may sue in her own name ; on the other hand, her husband is not liable for debts contracted by her before marriage, except to

the extent to which he has received property in her right. |

Married women having separate estates are made liable for the maintenance of their husbands who may become charge- able to any union or parish, and of their children.

A married woman cannot make any contract binding on herself except as to separate estate. She can only bind her husband as his agent, but from the relation of the parties the fact of agency is easily implied. The strong- est case is that of a wife whose husband unjustifiably refuses to maintain her; in that case she is his agent, in the sense that he is bound by her contracts for necessaries supplied to her. By the Act of 1870 she can insure her own or her husband's life for her separate use.

Law of Scotland.—The law of Scotland on this head differs less from English law than the use of a very different terminology would lead us to suppose. The phrase communio bonorwm has been employed to express the interest which the spouses have in the movable property of both, but its use has been severely censured by a high authority as essentially inaccurate and misleading. Mr Patrick Fraser, in his elaborate and valuable treatise on Husband and Wife, contends that there is no real eommunity of goods, and no partnership or societas between the spouses. The wife's mov- able property, with certain exceptions, and subject to special agree- ments, becomes as absolutcly the property of the husband as it does in English law. The notion of a communio is, however, favoured by the peculiar rights of the wife and children on the dissolution of the marriage. Previous to the Aet 18 & 19 Vict. c. 23 the law stood as follows. The fund formed by the movable property of both spouses may be dealt with by the husband as he pleases dur- ing life ; it is increased by his acquisitions and diminished by his debts. The respective shares contributed by husband and wife return on the dissolution of the marriage to them or their representa- tives if the marriage be dissolved within a year and a day, and with- out a living child. Otherwise the division is into two or three shares, according as children are existing or not at the dissolution of the marriage. On the death of the husband, his children take one- third (LEGITIM, ¢.v.), the widow one-third (jus relict), and the remaining one-third (the dead's part) goes according to his will or to his next of kin. If there be no children, the jus relictw and the dead's part are each one-half. If the wife die before the husband, her representatives, whether children or not, are creditors for the value of her share. The statute above-mentioned, however, enacts that 'where a wife shall predeecase her husband, the next of kin, executors, or other representatives of such wife, whether testatc or intestate, shall have no right

to any share of tlie goods in com- munion; nor shall any legacy or bequest, or testamentary disposition

thereof by such wife, affeet or attach to the said goods or any portion |

thereof." It also abolishes the rule by which the shares revert if the marriage does not subsist for a yearanda day. Two later Acts apply to Scotland the principles of the English Married Women's Pro- perty Acts. These are the Aet 40 & 41 Vict. c. 29, which protects the earnings, &c., of wives, and limits the husband's liability for antenup- tial debts of the wife, and the Act 43 & 44 Vict. c. 26, which enables a woman to contract for a policy of assurance for her separate use. A wife's heritable property does not pass to the husband on marriage, but he acquires a right to the administration and profits. His courtesy, as in English law, is also reeognized. On the other hand, a widow has a ¢erce or liferent of a third part of the husband's heritable estate, unless she has accepted a conventional provision. American Law.—In the Ameriean States, the revolt against the comnron law theory of husband and wife has been carried further

than in England, and legislation tends in the direction of absolute equality between the sexes. "What are familiarly known as the Married Women's Acts," says a recent writer, "the product of American legislation during the last quarter of a century, aim to secure to the wife the independent eontrol of her own property, and the right to contract, sue, and be sued without her husband, under reasonable conditions" (Schouler's Law of Domestic Relations). Each State has, however, taken its own way and selected its own time for introducing modifications of the existing law, so that the legislation on this subject is now exceedingly complicated and diffi- cult. Schouler (op. ctt., p. 212) gives an aceount of the general result in the different States, from which the following is condensed : —IJn Maine, a liberal right in married women of holding property independently of husband's control, which the wife may, however, relax by written instrument authoriziug her husband to manage it ; in New Hampshire, the right to hold from strangers, and from her husband (not in fraud of creditors), and to keep earnings when deserted ; in Vermont, similar result effected by the Chancery Courts

without special legislation ; in Massachusetts, a liberal right to acquire separate property ; in Rhode Island, property exempt from husband's debts, but his control reeognized ; in Connecticut, some- what limited reeognition of separate estate ; in New York, the most liberal provisions as to property held before or aequired after m arriage —a complete emancipation from marital dominion ; a similar policy in the laws of New Jersey, Pennsylvania, and Maryland, effected in the last case by the courts rather than by statute ; in Ohio, general exemption of wife's estate from her husband's debts ; in Indiana, a peculiar policy, on the community system, wife's powers of transfer limited ; Ilinois, Wisconsin, Minnesota, and Kansas follow closely the legislation of Massachusetts ; in Iowa, limited recognition of wife's estate; in California, community of goods recognized after theSpanish system, formerly prevalent there,—so in Nevada ; in Oregon, wife's property exempt from husband's debts ; in Nebraska, liberal rights recognized in married women ; in Missouri, wife's property in land more particularly exempt from husband's debts ; in Kentncky, peeuliar restraint on husband's marital rights ; in Tennessee, wife's property protected, but her right to control not recognized ; in Arkansas a liberal policy prevails. The Southern States have been later in taking up this movement, but it is considered likely that they will follow the rest. The peculiar system of Homestead Laws in the Sonthern and Western States (described in artiele HomesrEaD) coustitutes an inalienable provision for the wife and family of the householder. (E. R.)

HUSCH, Husut, or Hust, chief town of the Roumanian province of Falciu, Moldavia, is situated on the right bank of the Pruth, about 40 miles south-east of Jassy. It is the seat of the district courts of justice, and of a bishop of the Greek Church. It possesses a cathedral and a normal school, and carries on an active trade in tobacco. The population in 1870 was estimated at 18,000. At Husch was signed in 1711 the treaty of the Pruth, between Russia and Turkey, which freed the army of Peter the Great from a position of great danger. :

HUSHIARPUR, a British district in the lieutenant- governorship of the Punjab, India, lying between 30° 58' and 32° 5' N. Jat. and between 75° 31' and 76° 41' 15" E. long. It forms the central district of the Jalandhar division, and is bounded N.E. by the district of Kangra and the native state

of Nalagarh, N. and N.W. by the river Dias, §.W. by Jalandhar, and 8. by the river Satlaj (Sutlej) and Ambala (Umballa) district.

The district of Hushidrpur falls into two nearly equal portions of hill and plain country. Its eastern face con- sists of the westward slope of the Kangra Mountains ; parallel with that ridge, a line of lower heights traverses the district from south to north, while between the two chains stretches a valley of uneven width, known as the Jaswan Dun. Its upper portion is crossed by the Soin torrent, while the Sutlej sweeps into its lower end by a break in the hills, and flows in a southerly direction till it turns the flank of the central range, and debouches west- wards upon the plains. This western plain consists of alluvial formation, with a general westerly slope owing to the deposit of silt from the mountain torrents in the sub- montane tract. The Bias has a fringe of lowland, open to moderate but not excessive inundations, and considered very fertile. A considerable area is covered by Government woodlands, under the care of the forest department.

HUS—HUS

The census of 1868 was taken over an area of 2086 square miles,

and showed a total population of 938,890 (males, 504,393 ; females, 434,497). Of these, the Hindus numbered 415,471; Mahometans, 317,967 ; Sikhs, 79,417; and "others," 126,035. The district contained nine municipalities in 1875-76, namely,—Hushiarpur (sce below), Urmar Tanda (13,970), Mukerian (5116), Dasuya (8677), Anandpur (6405), Hariana (7802), Garhdiwala (3874), Una (4908), and Miani (Meeanee) (7942). he total imperial revenue in 1872-73 was £148,708; the local revenue for expenditure on works of public utility, £14,856. Fifteen civil and revenue judges cxercised jurisdiction in the district. There were 321 schools, with 7066 pupils, receiving £2291 from the public funds. _ The cultivated area in 1868 amounted to 751,707 acres, out of an assessed total of 1,335,245. Rice is largely grown, owing to the abundance of marshy flats along the banks of the Bias. The other products are wheat, barley, gram, tobacco, jodr, maize, moth, mash, cotton, andsugar-cane. Thestate of agricultural knowledge is very backward, anal implements are of the simplest description. Only 17,836 acres are under irrigation, chiefly from an old canal in the northern corner. The trade of Hushiarpur is confined to its raw material, including

grain, sugar, hemp, safflower, fibres, tobacco, indigo, and cotton; of these, sugar forms by far the most important commercial item. The manufactures are of no importance. Several religious fairs are held, at Anandpur, Mukcrian, and Achintpurni, all of which attract an enormous concourse of people. The Jalandhar and Kangra road forms the chief route ; and good roads connect Hushiarpur and other centres with the neighbouring towns. The district, owing to its proximity to the hills, possesses a comparatively cool and humid climate. Malarious fever, cholera, and bowel com- plaints are the prevailing illnesses. The annual rainfallin 1871-72 was 82°6 inches. There are five charitable dispensaries.

The country around Hushidrpur formed part of the Katoch kingdom of Jalandhar. The state was eventually broken up, and the present district was divided between the rajds of Ditarpur and Jaswan. They retained undis- turbed possession of their territories until 1759, when the rising Sikh chieftains commenced a series of encroachments upon the hill tracts. In 1815 the aggressive mahdrdja, Ranjit Sinh, forced the ruler of Jaswan to resign his terri- tories in exchange for an estate on feudal tenure ; three years later the r4j4 of Ditérpur met with similar treatment. By the close of the year 1818 the whole country from the Sutlej to the Bias had come under the Government of Lahore, and after the first Sikh war in 1846 passed into the hands of the English Government. The deposed rajas of Ditarpur and Jaswadn received cash pensions from the new rulers, but expressed bitter disappointment at not being restored to their former sovereign position.

Chattar Sinh in 1848, found the disaffected chieftains ready for rebellion. They organized a revolt, but the two rdjas aud the other ringleaders were captured, and their estates confiscated.

Husx#idrpur, municipal town and administrative head- quarters of the above district, is situated on the bank of a broad sandy torrent. The population in 1868 numbered 13,022, comprising 6350 Hindus, 6002 Mahometans, 119 Sikhs, 62 Christians, and 489 "others." The town was founded, according to tradition, about the early part of the 14th century. In 1809 it was occupied by Ranjit Sinh. The mahérdja and his successors maintained a considerable cantonment one mile south-east of the town, and the British Government kept it up for several years after the annexa- tion.

Floods often cause much damage, to guard against which an embankment was raised in 1852, The civil station contains the district court-house and treasury, sessions-house, tahsél and police offices, dispeusary, staging bungalow, and sardz. Both station and town are plenti- fully wooded, and enjoy a good sanitary reputation. There is a trade in grain, sugar, and tobacco.

HUSKISSON, Wittram (1770-1830), statesman and financier, was descended from an old Staffordshire family of moderate fortune, and was born at Birch Moreton, Wor- cestershire, March 11,1770. Having been placed in his fourteenth year under the charge of his uncle Dr Gem, physician to the English embassy at Paris, he passed his

Accord- | ingly the outbreak of the Mooltan war, and the revolt of |

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early years amidst a political fermentation which led him to take a deep and absorbing interest in politics. But though he approved of the French Revolution, his sympa- thies were with the more moderate party, and he became a member of the " club of 1789," instituted to support the new form of constitutional monarchy in opposition to the anarchical attempts of the Jacobins. Even at this carly period he displayed his mastery of the principles of finance by a Dzscours delivered in August 1790 before this society, in regard to the issue of assignats by the Govern- ment. The Déscours gained him considerable reputation, but as it failed in its purpose he withdrew from the society. In January 1793 he was appointed by Mr Dundas to an office created with a view to direct the execution of the Aliens Act; and in the discharge of his delicate duties he manifested such ability that in 1795 he was appointed under secretary in the colonial department. In the follow- ing year he entered parliament as member for Morpeth, but for a considerable period he took scarcely any part in the debates, On the retirement of Pitt in 1801 he resigned office, and after contesting Dover unsuccessfully he with- drew for a time into private life. Having in 1804 been chosen to represent Liskeard, he was on the restoration of the Pitt ministry appointed secretary of the treasury, hold- ing office till the dissolution of the ministry after the death of Pitt in January 1806. After being elected for Harwich in 1807, he accepted the same office under the duke of Portland, but he withdrew from the ministry along with Canning in 1809. In the following year he published a pamphlet on the currency system, which confirmed his reputation as the ablest financier of his time ; but his free- trade principles did not accord with those of his party. When in

1814 he re-entered the public service, it was only as chief commissioner of woods and forests, but his influence was from this time very great in the commer- cial and financial legislation of the country. He took a prominent part in the corn-law debates of 1814 and 1815; and in 1819 he presented a memorandum to Lord Liverpool advocating a large reduction in the unfunded debt, and explaining a method for the resumption of cash payments, which was embodied in the Act passed the same year. In the following year he was named a member of the committee appointed to inquire into the causes of the agricultural distress then prevailing in the country, and the proposed relaxation of the corn laws embodied in the report was understood to have been chiefly due to his strenuous advocacy. In 1823 he was appointed president of the board of trade and treasurer of the navy, and shortly afterwards he received a seat in the cabinet. In the same year he was returned for Liverpool, having from 1812 re- presented Chichester. Among the more important legis- lative changes with which he was principally connected were a reform of the Navigation Acts, admitting other nations to a full equality and reciprocity of shipping duties ; the repeal of the labour laws; the introduction of a new sinking fund ; the reduction of the duties on manufactures and on the importation of foreign goods, and the repeal of the quarantine duties. In accordance with his suggestion Canning in 1827 introduced a measure on the corn laws proposing the adoption of a sliding scale to regulate the amount of duty. The bill passed the House of Commons, but a niisapprehension between Huskisson and the duke of Wellington led to the duke proposing an amendment, the

success of which caused the abandonment of the measure

by the Government. After the death of Canning in the same year Huskisson accepted the secretaryship of the colonies under Lord Goderich, an office which he continued to hold in the new cabinet formed by the duke of Wellington in the following year. . From the beginning the cabinet was rent by internal disputes, and, after succeeding with great

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difficulty in inducing the cabinet to agree to a compro- mise on the corn laws, Huskisson finally resigned office in May 1829 on account of a

difference with his col- leacues in regard to the disfrauchisement of East Retford. on the 15th September of the following year he was accidentally killed by a locomotive engine while present at the opening of the Liverpool and Manchester Railway.

HUSS, Joun (1369-1415), the Bohemian reformer and martyr, was born at Hussinecz, a market village at the foot of the Bohmerwald, and not far from the Bavarian frontier, most probably in 1369, and, according to some accounts, on July 6. His parents appear to have been well-to-do Czechs of the peasant class. Of his early life nothing is recorded except that, notwithstanding the early loss of his father, he obtained a good elementary education, first at Hussinecz, and afterwards at the neighbouring town of Prachaticz. At, or only a very little beyond, the usual age he entered the recently (1348) founded university of Prague, where he became bachelor of arts in 1393, bachelor of theology in 1394, and master of arts in 1396. In 1398 he was chosen by the Bohemian "nation" of the university to an examinership for the bachelor's degree; in the same year he began to lecture also, and there is reason to believe that the philosophical writings of Wickliffe, with which he had been for some years acquainted, were his text-books. In October 1401 he was made dean of the philosophical faculty, and for the half-yearly period from October 1402 to April 1403 he held the office of rector of the university. In 1402 also he was made rector or curate (capellarius) of the Bethlehem Chapel, which had in 1391 been erected and endowed by some zealous citizens of Prague for the purpose of providing good popular preaching in the Bohemian tongue. This appointment, which, so far as the aims of the pious founders were concerned, proved a singularly suc- cessful one, had a deep influence on the already vigorous religious life of Huss himself ; and one of the effects of the earnest and independent study of Scripture into which it soon led him was a profound conviction of the great value uot only of the philosophical but also of the theological writings of Wickliffe.*

This newly-formed sympathy with the English reformer did not, however, in the first instance at least, involve Huss in any conscious opposition to the established doctrines of Catholicism, or in any direct conflict with the authorities of the church; and for several years he continued to act in full accord with his archbishop (Sbynjek, or Sbynko, of Hasenburg). Thus in

1405 he, along with other two masters, was commissioned to examine into certain reputed miracles at Wilsnack, near Wittenberg, which had caused that church to be made a resort of pilgrims from all parts of Europe. The result of their report was that all pilgrimage thither from the province of Bohemia was prohibited by the archbishop on pain of excommunication, while Huss, with the full sanction of his superior, gave to the world his first published writing, entitled De Omni Sanguine Christi Glorificato, in which he declaimed in no measured terms against forged miracles and ecclesiastical greed, urging Christians at the same time to desist from looking for sensible signs of Christ's presence, but rather to seek Him in His enduring word. More than once also Huss, along with his friend Stanislaus of Znaim, was appointed to be synod preacher, and in this capacity he delivered at the provincial councils of Bohemia many faithful admonitions. As early as May 28, 1403, it is true, there had been held a university disputation about the new doctrines of Wickliffe, which had resulted in the condemnation of certain propositions presumed to be his;

1 From which the name Huss, or more properly Hus, an abbrevia- tion adopted by himself about 1396, is derived. Prior to that date he was invariably known as Johann Hussynecz, Hussinecz, Hussenicz, or De Hussynecz.

five years later (May 20, 1408) this decision had been ~ refined into a declaration that these, forty-five in number, were not to be taught in any heretical, erroneous, or offensive sense. But it was only slowly that the growing sympathy of Huss with Wickliffe unfavourably affected his relations with his colleagues in the priesthood. In 1408, however, the clergy of the city and archiepiscopal diocese of Pragué laid before the archbishop a formal complaint against Huss, arising out of strong expressions with regard to clerical abuses of which he had made use in his public discourses ; and the result was that, having first been deprived of his appointment as synodal preacher, he was, after a vain attempt to defend himself in writing, publicly forbidden the exercise of any priestly function throughout the diocese. Simultaneously with these proceedings in Bohemia, inter- national negotiations had been going on which had for their object the removal of

the long-continued papal schism, and it had in the interval become apparent that a satisfactory solution of the difficulties involved could only be secured if, as seemed not impossible, the supporters of the rival popes, Benedict XIII. and Gregory XIL., could be induced, in view of the approaching council of Pisa, to pledge them- selves to a strict neutrality. With this end King Wenceslaus of Boheniia had requested the co-operation of the archbishop and his clergy, and also the support of the university, in both instances unsuccessfully, although in the case of the latter the Bohemian "nation," with Huss at its head, had only been overborne by the votes of the Bavarians, Saxons, and Poles. There followed an expression of nationalist and particularistic as opposed to ultramontane and also to German feeling, which undoubtedly was of supreme im- portance for the whole of the subsequent career of Huss. In compliance with this feeling a royal edict (January 18, 1409) was issued, by which, in alleged conformity with Paris usage, and with the original charter of the university, the Bohemian "nation" received three votes, while only one was allotted to the other three "nations" combined ; whereupon all the foreigners, to the number of several thousands, almost immediately withdrew from Prague, an occurrence which Jed to the formation shortly afterwards of the university of Leipsic.

It was a dangerous triumph for Huss; for his popu- larity at court and in the general community had been secured only at the price of clerical antipathy every- where and of much German ill-will. Among the first results of the changed order of things were on the one hand the election of Huss (October 1409) to be again rector of the university, but on the other hand the appointment by the archbishop of an inquisitor to inquire into charges of heretical teaching and inflammatory preach- ing which had been brought against him. He had spoken disrespectfully of the church, it was said, had even hinted that Antichrist might be found to be in Rome, had fomented in his preaching the quarrel between Bohemians and Germans, and had, notwithstanding all that had passed, continued to speak of Wickliffe as both a pious man and an orthodox teacher. The direct result of this investigation is not known, but it is impossible to disconnect fromit the promulgation by Pope Alexander V., on December 20, 1409, of a bull which ordered the abjuration of all Wickliffite heresies and the surrender of all his books, while at the same time—a measure specially levelled at the pulpit of

Bethlehem Chapel—all preaching was prohibited except in localities which had been by long usage set apart for that use. This decree, as soon as it was published in Prague (March 9, 1410), led to much popular agitation, and provoked an appeal by Huss to the pope's better informed judgment; the archbishop, however, resolutely insisted on carrying out his instructions, and in the following July caused to be publicly burned, in the courtyard of his own

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'palace, upwards of 200 volumes of the writings of Wickliffe, while he pronounced solemn sentence of excommunication against Huss and certain of his friends, who had in the meantime again protested and appealed to the new pope (John XXIII). Again the populace rose on behalf of their hero, who, in his turn, strong in the conscientious eonviction that "in the things which pertain to salvation God is to be obeyed rather than man," continued unin- terruptedly to preach in the Bethlehem Chapel, and in the university began publicly to defend the so-called heretical treatises of Wickliffe, while from king and queen, nobles and burghers, a petition was sent to Rome praying that the condemnation and prohibition in the bull of Alexander V. might be quashed. Negotiations were carried on for some months, but in vain; in March 1411 the ban was anew pronounced upon Huss as a disobedient son of the church, while the magistrates and councillors of Prague who had favoured him were threatened with a similar penalty in case of their giving him a contumacious support. Ultimately the whole city, which continued to harbour him, was laid under interdict; yet he went on preaching, and masses were celebrated as usual, so that at the date of Archbishop Sbynko's death in September 1411, it seemed as if the utmost efforts of ecclesiastical authority had resulted in absolute failure.

The struggle, however, entered on a new phase with the appearance at Prague in May 1412 of the papal emissary charged with the proclamation of the papal bulls by which a religious war was decreed against the excommunicated King Ladislaus of Naples, and indulgence was promised to all who should take part in it, on terms similar to those which had been enjoyed by the earlier crusaders to the Holy Land. By his bold and thorough-going opposition to this mode of procedure against Ladislaus, and

still more by his doctrine that indulgence could never be sold without simony, and could not be lawfully granted by the church except on condition of genuine contrition and repentance, Huss at last isolated himself, not only from the archiepiscopal party under Albik of Unitschow, but also from the theological faculty of the university, and especially from such men as Stanislaus of Znaim and Stephen Paletz, who until then had been his chief supporters, A popular demonstration, in which the papal bulls had been paraded through the streets with circumstances of peculiar ignominy and finally burnt, led to intervention by Wenceslaus on behalf of public order; three young men, for having openly asserted the unlawfulness of the papal indulgence after silence had been enjoined, were sentenced to death (June 1412); the excommunication against Huss was renewed, and the interdict again laid on all places which should give him shelter,—a measure which now began to be more strictly regarded by the clergy, so that in the following December he had no alternative but to yield to the express wish of the king by temporarily withdrawing from Prague. A provincial synod, held at the instance of Wenceslaus in February 1413, broke up without having reached any practical result ; and the labours of a commission appointed shortly afterwards were equally unsuccessful in the attempt to bring about a reconciliation between Huss and his ad- versaries. The so-called heretic meanwhile spent his time partly at Kozihradek, some 45 miles south of Prague, and partly at Krakowitz in the immediate neighbourhood of the capital, sometimes varying the monotony of his life with an occasional course of open-air preaching, but finding his chief employment in maintaining with his numerous friends that copious correspondence of which some precious fragments still are extant, and in the composition of the largest and most exhaustive of all his printed works, the De Ecclesia, which subsequently furnished most of the material for the capital charges brought against him.

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During the year 1413 the arrangements for the meeting of a general council at Constance were agreed upon between Sigismund and Pope John XXIII. The objects originally contemplated had been the restoration of the unity of the church and its reform in head and members; but so great had become the prominence of Bohemian affairs that to these also a first place in the

programme of the approaching cecumenical assembly required to be assigned, and for their satisfactory settlement the presence of Huss was obviously necessary. His attendance was accordingly requested, and the invitation was willingly accepted as giving him a long- wished-for opportunity both of publicly vindicating himself from charges which he felt to be grievous and of loyally making confession for Christ. He set out from Bohemia on October 14, 1414, not, however, until he had carefully ordered all his private affairs, with a presentiment, which he did not conceal, that in all probability he was going to his death. The journey, which appears to have been under- taken with the usual passport, and under the protection of several powerful Bohemian friends (John of Chlum, Wenceslaus of Duba, Henry of Chlum) who accompanied him, was a very prosperous one; and at alinost all the halting places he was received with a consideration and enthusiastic sympathy which he had hardly expected to meet with anywhere in Germany. On November 3 he arrived at Constance, and took up quarters in the house which is still pointed out (Paulsgasse, 328); shortly after- wards there was put into his hands the famous imperial "safe conduct," the promise of which had been one of his inducements to quit the comparative security he had enjoyed in Bohemia. Of this safe conduct, the formal words of which have often been quoted, it would be absurd to say that it was intended to guarantee its holder against the infliction of due punishment should he be convicted by existing law of any crime; but there can be no doubt that both the letter and the spirit of it were scaudalously violated, when on November 28 Huss was arbitrarily seized and thrown into prison before any accusation what- ever had been formulated. Sigismund himself uever sought to defend this act, which was not done with his consent or authority ; the only excuse he ever alleged for having tolerated it was that otherwise in all likelihood the council would have been broken up. On December 4 the pope appointed a commission of three bishops to investigate the case against the heretic, and to procure witnesses; to the demand of Huss that he might be permitted to employ an agent in his defence a favourable answer was at first given, but afterwards even this concession to the forms of justice was denied. While the commission was engaged in the prosecution of its inquiries, the flight of Pope John XXIII. took place on March 20, an event which furnished a pretext for the removal of Huss from the Dominican convent to a more secure and more severe place of con- finement under the charge of the bishop of Constance at

Gottlieben on the Rhine. On May 4 the temper of the council on the doctrinal questions in dispute was for the first time fully revealed in its unanimous condemnation of Wickliffe, especially of the so-called " forty-five articles " as erroneous, heretical, revolutionary. It was not, however, until June 5 that the case of Huss himself came up for hearing ; the meeting, which was an exceptionally full one, took place in the refectory of the Franciscan cloister. Autograph copies of his work De Lcclesza, and of the controversial tracts which he had written against Paletz and Stanislaus of Znaim, having been laid before him and duly acknowledged, the extracted propositions on which the prosecution based their charge of heresy were read ; but as soon as the accused began to analyse them and to enter upon his defence, he was assailed by violent outcries, amidst which it was impossible for him to be heard, so that he

was compelled to bring his speech to an abrupt close, which he did with the calm remark ; "In such a council as this I had expected to find more propriety, piety, and order." It was found necessary to adjourn the sitting until June 7, on which occasion the outward decencies were better observed, partly no doubt from the circumstance that the emperor was present in person, The propositions which had been extracted from the De Ecclesia were again brought up, and the relations between Wickliffe and Huss were discussed, the object of the prosecution being to fasten upon the latter the charge of having entirely adopted the doctrinal system of the former, including especially a denial of the doctrine of transubstantiation. The accused defended himself by repudiating the charge of having abandoned the Catholic doctrine, while at the same time he gave expression to his hearty admiration and respect for the memory of Wickliffe. Being next asked to make an unqualified submission to the council, he expressed himself as unable to do so, while at the same tiie stating his willingness in all humility to amend his teaching wherever it had been shown to be false. With this the proceedings of the day were brought to a close. On June 8 the propositions extracted from the De Zcclesia were once more taken up with some fulness of detail ; some of these he repudiated as incorrectly given, others he defended; but when asked to make a general recantation he steadfastly declined on the ground that to do so would be a dishonest

admission of previous guilt. Among the propositions he could heartily abjure was that relating to transubstantiation ; among those he felt constrained un- flinchingly to maintain was one which had given great offence, to the effect that Christ, not Peter, is the head of the church to whom ultimate appeal must be made. The council, however, showed itself inaccessible to all his arguments and explanations, and its final resolution, as announced by D?'Ailly, was threefold :—first, that Huss should humbly declare that he had erred in all the articles cited against him; secondly, that he should promise on oath neither to hold nor teach them in the future ; thirdly, that he should publicly recant them. On his declining to make this submission he was removed from the bar, and it was obvious that the end could not be far off. The em- peror himself gave it as his opinion that it had been clearly proved by many witnesses that the accused had taught mauy pernicious heresies, and that even should he recant he ought never to be allowed to preach or teach again or to return to Bohemia, but that should he refuse recantation there was no remedy but the stake. During the next four weeks no effort was spared to shake the determination of Huss; but the spirit of the martyr rose within him as he saw his end approaching, and he steadfastly refused to swerve from the path which conscience had once made clear. "1 write this," says he, in a letter to his friends at Prague, 'in prison and in chains, expecting tomorrow to receive sentence of death, full of hope in God that I shall not swerve from the truth, nor abjure errors imputed to me by false witnesses." The sentence he expected syas pronounced on July 6 in the presence of the emperor and a full sitting of the council; once and again he attempted to remonstrate, but in vain, and finally he betook himself to silent prayer. After he had undergone the ceremony of degradation with all the childish formalities which are usual on such occasions, his soul was formally consigned by all those present to the devil, while he himself with clasped hands and uplifted eyes reverently committed it to Christ. He was then handed over to the secular arm, and immediately led off to the place of execution, the council meanwhile proceeding unconcernedly with the rest of its business for the day. Many touching incidents recorded in the histories make manifest the meekness, fortitude, and even cheerful-

ness with which he went to his dreadful death. After he had been tied to the stake and the faggots had been piled, he was for the last time urged to recant, but his only reply was :— God is my witness that I have never taught or preached that which false witnesses have testified against me. He knows that the great object of all my preaching and writing was to convert men from sin. In the truth of that gospel which hitherto I have written, taught, and preached, I now joyfully die." The fire was then kindled, and his voice as it audibly prayed in the words of the "Kyrie Eleison" was soon stifled in the smoke. When the flames had done their office, the ashes that were left and even the soil on which they lay were carefully removed and thrown into the Rhine,

Not many words are needed to convey a tolerably adequate estimate of the character and work of the "' pale thin man in mean attire,' who in sickness and poverty thus completed the forty-sixth year of a busy life at the stake. Huss was much less remarkable for the amount of his mental endowments and acquirements than for the candour with which he formed his convictions, the tenacity with which he held them, the unselfish enthusiasm with which he spoke them. He cannot be said to have added a single new item to the intellectual wealth of the world, but his contribution to its moral capital was immense. It might not be easy to formulate very precisely the doctrines for which he died, and certainly some of them, as, for example, that regarding the church, were suchas many Protestants even would regard as unguarded and difficult to harmonize with the maintenance of external church order; but his is undoubtedly the honour of having been the chief intermediary in handing on from Wickliffe to Luther the torch which kindled the Reformation, and of having been one of the bravest of the martyrs who have died in the cause of honesty and freedom, of progress and of growth towards the light.

The works of Huss are usually classed under four heads :—the dogmatical and polemical, the homiletical, the exegetical, and the epistolary. Of those belonging to the first category, the earliest was that De Omni Sanguine Christi Glorificato, already referred to; others, besides the De Ecclesia, are a Queestio de Indulgentiis, relating to the bull of Pope John XXIII. against Ladislaus, Responsio ad Scripta M. S. Paletz, Responsio ad Seripta M. S. de Znoyma, and a Refutation of the Writing of the Hight Doctors of Prague.

The sermons include several discourses relating to Anti- christ. It is worthy of note, in connexion With these, that by means of them and his other public teaching Huss exercised a con- siderable influence, not only on the religious life of his time, but on the literary development of his native tongue. His exegetical writings include A History of Jesus Christ according to the Four Gospels, A History of the Passion, An Exposition of 1 Cor. i-vil., Commentaries on the epistles of James, Peter, John, and Jude, and an Enarratio on Psalms cx.-cxviii. The Letters are arranged in two series, one of which, numbering fifteen, relates to the period of his exile under the interdict, while the other, fifty-six in all, belongs to the tizne when he lived in Constance. The De Eeelesia was printed by Ulrich von Hutten as early as 1520, others of the controversial writings by Otto Brunnfels in 1524; and Luther wrote an interesting preface to Epistole Quacdam published in 1587. The carliest collected edition of the Latin works was that of Nuremberg (Historia et Monumenta Joh. Huss atque Hieron. Pragensis), pub- lished in 1558 in 2 vols. folio; this was reprinted with a consider- able quantity of new matter in 1715. The Bohemian works have recently been edited by K. J. Erben (8 vols., Prague, 1866).

On Huss the best and most casily accessible information for the English readers is to be found in the Church Histories, especially in that of Neander (vol. ix., Engl. trans. 1858), and pre-eminently in Lechler's Wiclef (1873), translated py Lorimer (1878). Among the earlier authorities is Aneas Sylvius, De Bohe- morum Origine ac Gestis Ifistorta (1475). The Acta of the council of Constance (Labbe Cone., vol. xvi., 1731, or Von der Hardt, Concilium Const antiense, 1697-1700), as also Lenfant's Mistotre, must of course be consulted. Palacky's Geschichte Béhmens (1836-65) contains much valuable material carefully sifted. The carliest biography is that of Zitte, Lebensbeschreibung des Magisters Joh. Hus (1789-95). Monographs have in recent years been very numerous; among others may be mentioned Helfert, Studien wiber Hus u. Hieronymus (1853; this work is ultra-montane in its sympathies); Becker, Hus wu. Hieronymus von Prag (N érdlingen, 1858); Friedrich, Johann Hus (1863); Krummel, Joh. IZus, eine Kirchenhist. Studie (1863); 1d., Geschichte der bihm. Reformation (1866); Idfler, Hus u. der Abzug der Deutschen (1864); ld., Die Geschichtschreiber der Fusitischen Bewegung (1856-65); Id., Fontes Rerum Husiticarum;

Berger, Joh. Tus u. Kénig Sigismund (1872); Denis, Huss et la Guerre des FHussites (Paris, 1878). (J. §. BL.)

HUess PTEHS

HUSSITES. The arbitrary arrest and imprisonment of Huss at Constance in November 1415 created a very painful impression among all classes in Moravia and Bohemia, and called forth angry remonstrances as soon as it was known. While the nobles resorted to diplomacy, the masses rioted and in many instances attacked the clergy. The excitement was immensely intensified by the tidings of his death, which was freely characterized as a judicial murder; several priests were put to death by the infuriated populace, who cherished the memory of Huss as that of a patriot and a saint; and the archbishop himself, after having been beset in his own palace, with difficulty saved his life by flight. Public feeling found its first organized expression in a diet whicl. was hastily summoned to meet at Prague early in September; there a solemn protest, ultimately signed by 452 magnates and barons, was drawn up, in which the personal character of Huss as man, teacher, preacher, and author was warmly upheld, and the freedom of Bohemia and Moravia from error and heresy was as energetically asserted. Three days later the nobles who had signed this document formed themselves into a league, headed by two Bohemian barons and one from Moravia, by which they bound themselves to protect liberty of preaching on their estates, and to yield obedience to bishop or pope only in so far as might be in accordance with Scripture and the will of God. Matters of dispute were to be subjected to the arbitration of the rector and doctors in theology of the university of Prague. Soon afterwards a counter league was formed for the support of the council and curia; and civil war appeared to be imminent. The tension was further increased by the arrival of the bishop of Leitomischl, long the enemy of Huss, as legate from the council for the extirpation of heresy ; and by the pressure of the interdict under which the city of Prague continued to lie. In February 1416 the 452 nobles who had signed the protest in favour of Huss were summoned to appear before the council, while the anti-Hussite league was encouraged to prepare for a crusade; and the burning of Jerome of Prague in the following May still further revealed the prevailing disposi- tion of Catholic Christendom. Owing to the slowness, however, with which matters moved at

Constance, it was not until February 1418 that the new pope, Martin V. (Otto di Colonna), was able to issue various bulls and briefs, in which he laid all obstinate Hussites under the ban, and called upon all the ecclesiastical and civil authorities to proceed against them. The council also, shortly before its dissolution, drew up twenty-four articles for withdrawing the Bohemians from the prevailing heresy, bidding King Wenceslaus protect the rights of the Romish Church in his dominion, restore the banished clergy to their benefices, repress the Hussite preaching and hymn singing, dissolve the Hussite associations, and take the ringleaders into custody. To this policy the king after much vacillation began to give effect early in 1419, and forthwith the more prominent Hussites withdrew from court; among these were Nicolaus of Pistna, an able statesman, and the famous John Zizka, a practised soldier, who placed themselves at the head of the malcontents. By the end of the year the war, though it is usually reckoned from 1420, may be said to have begun. It divides itself into two periods—the defensive, which lasted from 1420 to 1425, and the offensive, which began with Procopius's invasion of Germany in 1427, and lasted until the com- mencement of negotiations with the council of Basel in 1431. The struggle had not proceeded very far, however, before it became manifest that the Hussite party was itself sharply divided in views and aims. All were agreed in warm and tender reverence for the memory of Huss, the evangelical preacher and the faithful servant of Christ ;

equally unanimous were they in holding the distinctive doctrine of the supreme authority of Holy Scripture, and in urging the reformation of the church. But all were not prepared to go equally far in the amount of reform they proposed. While the more radical section rejected such doctrines as those of purgatory and of the mediation of saints, held that priests in mortal sin could validly administer no sacrament, disapproved of penances, images, relics, mass in a foreign tongue, maintained the right of the pious laity, even of women, to preach, and regarded every building as in itself at least suitable for acts of divine worship, the more moderate or conservative section formu- lated their much simpler programme in the famous four articles of Prague (July 1420). These were—(1) free preaching of the word of God throughout the kingdom of Bohemia; (2) the administration of the

eucharist to all believers not in mortal sin, under both species according to the institution of Christ ; (3) deprivation of the clergy of the secular lordship they had assumed and of the secular property they had acquired to their own injury and to the prejudice of the civil power ; (4) prohibition and repression of all mortal sins and public scandals. The supporters of these articles, who were led by Baron Czenko of Wartenberg, and had in their number such men as Jakob von Mies, were strong in the town and university of Prague, and occasionally received the name of the Praguers, but ultimately came to be more generally known as Calixtines (from " calix") or Utraquists (from their claim to receive the communion "sub utraque specie"). The more radical party, from having taken up their headquarters at a strong- hold which had been fortified by Zizka and called Mount Tabor, some 65 miles southwards of Prague, received the name of Taborites. Whatever differences, however, may have separated the Hussites, all were united in offering resistance to the efforts made by Sigismund to crush them ; and at Deutschbrod in 1422, at Aussig in 1426, and finally at Taus (August 14, 1431), they inflicted signal defeats on his troops. Negotiations begun in 1431 with the council of Basel reached a termination only in November 1433, when the so-called "Compactata" or articles of agreement were signed by which the Calixtines were satisfied, com- munion under both species being granted to all who desired it, although the other concessions in the direction of the four articles of Prague were made in a somewhat illusory manner. The Taborites, or "Orphans" (as the followers of Zizka were. sometimes called after his death in 1424), failed, however, to find in the Compactata all that they required, and they speedily took the field again in a campaign which terminated disastrously for them at Hrib near Béhmischbrod on May 30,1434. In this battle both Procopius and his brother perished ; and soon afterwards the Taborites were compelled to surrender all the fortresses to which they had betaken themselves. Thenceforward they rapidly disappeared as a political party, although as a religious body they can be traced to about the middle of the century, when they gradually became merged in the so-called Moravians, or United Brethren of Bohemia. The Calixtines obtained from Sigismund in 1436 the formal re- cognition of the Compactata, which from that time had the force of law. Satisfied with this somewhat empty achieve- ment (which, however, was jealously guarded against the hostile attack of Pius II. in 1462), they gradually subsided into an inert conformity, so as to be but little

distinguished from the Catholics around them, At the time of the Reformation some returned to the Roman Church, while tlie rest attached themselves either to the Lutheran or to the Reformed creed, and Hussitism asa distinct form of Christian profession became extinct.

See Cochleus, Hist. Hussitarwm (1549); Palacky, Urkundliche Beitrige zur Gesch. d. Husitenkricges (1872-74). (J. 8, BL.)

HUSUM, a town in the Prussian province of Schleswig- Holstein, situated in a fertile district about 2} miles inland from the German Ocean, on the canalized Husumer Au, which forms its harbour and roadstead. It is a station on the branch railway from Ténning which joins the main line at Jiibek ; and it has steam communication with the North Frisian Islands (Nordstrand, Pellworm, Féhr, Sylt) and with England. Besides the old ducal palace and park, it possesses two court-houses and a gymnasium, and its public endowments are reckoned at £100,000. 'There is a con- siderable local trade; grain and cattle are exported ; and the oyster-beds in the neighbourhood yield during the season about 60,000 oysters daily. The population of the town in 1875 was 5765. Husum is first mentioned in 1252, and its first church was built in 1431. Wisby rights (see vol. xi. p. 449) were granted it in 1582, and in 1608 it was raised to the rank of a town by Duke Adolphus, who was also the builder of the castle. Husum is the birthplace of Forchhammer the archeologist, Forchhammer the mineralogist, and Theodor Storm the

oet.

HUSZT, a market-town in the county of Maramaros, Hungary, is situated at the confluence of the Nagy-Ag with the Theiss, and about midway on the line of railway from Szatmar-Németi to Maramaros-Sziget, 48° 10' N. lat., 23° 18' E. long. At Huszt there are Calvinist, Roman Catholic, and Old United Greek churches, royal law courts, and other Government offices. On an elevated and picturesque position near the town are the ruins of an old fortress. In the neighbourhood of Huszt flax and cereals are largely grown, and many of the inhabitants find employment in fishing. The population in 1870 was 6413, consisting for the most part of Magyars and Ruthenians.

HUTCHESON, Francis (1694-1746), an eminent writer on mental and moral philosophy, was born on the 8th of August 1694. His birthplace was probably the townland of Drumalig, in the parish of Saintfield and county of Down, Ireland.!_ Though the family had sprung from Ayr- shire in Scotland, both his father and grandfather were ministers of dissenting congregations in the north of Ireland. Young Hutcheson was educated partly by his grandfather, partly at an academy, where he is stated by his biographer, Dr Leechman, to have been taught 'the ordinary scholastic philosophy which was in vogue in those days." In the year 1710, at the age of sixteen, he entered the university of Glasgow, where he spent the next six years of his life, at first in the study of philosophy, classics, and general literature, and afterwards in the study of theology. On quitting the university, he returned to the north of Ireland, received a licence to preach, and was just on the point of settling down as the minister of a small dissenting congre- gation, when it was suggested to him by some gentlemen living in the neighbourhood of Dublin to start a private academy in that city. At Dublin his literary accomplish- ments soon made him generally known, and he appears to have rapidly formed the acquaintance of the more notable persons, lay and ecclesiastical, who then resided in the metropolis of Ireland. Among these is specially to be noted Archbishop King, author of the well-known work De Origine Mali, who, to his great honour, steadily resisted all attempts to prosecute Hutcheson in the archbishop's court for keeping a school without having previously sub- scribed to the ecclesiastical canons and obtained the epis- copal licence. Hutcheson's relations with the clergy of the Established Church, especially with the archbishops of Armagh and Dublin, Boulter and King, seem to have been of the most cordial description; and 'the inclination of his

1 See Belfast Magazine for August 1813.

friends to serve him, the schemes proposed to him for obtaining promotion," é&c., of which his biographer speaks, probably refer to some offers of preferment, on condition of his accepting episcopal ordination. These offers, how- ever, of whatever nature they might be, were unavailing ; " neither the love of riches nor of the elegance and grandeur of human life

prevailed so far in his breast as to make him offer the least violence to his inward sentiments."

While residing in Dublin, Hutcheson published anony- mously the four essays by which he still remains best known, namely, the Inquiry concerning Beauty, Order, Harmony, Design, and the Inquiry concerning Moral Good and Evil, in 1725, and the Hssay on the Nature and Con- duct of the Passions and Affections, and Illustrations upon the Moral Sense, in 1728. The original title of the former work (which reached a second edition in the next year) was— An Inquiry into the Original of our Ideas of Beauty and Virtue in two Treatises, in which the Principles of the late Earl of Shaftesbury are eaplained and defended against the Author of the Fable of the Bees; and the Ideas of Moral Good and Evil are established, according to the Sentiments of the Ancient Moralists, with an attempt to introduce a Mathematical Calculation on subjects of Moralty. The alterations and additions made in the second edition of these Essays were published in a separate form in 1726. To the period of his Dublin residence are also to be referred the "Thoughts on Laughter" (a criticism of Hobbes) and the "Observations on the Fable of the Bees," being in all six letters contributed to Hibernicus' Letters, a periodical which appeared in Dublin, 1725-27 (2d ed., 1734). At the end of the same period occurred the controversy in the columns of the London Journal with Mr Gilbert Burnet (probably the second son of Dr Gilbert Burnet, bishop of Salisbury), on the "True Foundation of Virtue or Moral Goodness." All these letters were collected in one volume, and published by Foulis, Glasgow, 1772.

In 1729 Hutcheson was elected as the successor of his old master, Gerschom Carmichael, to the chair of moral philosophy in the university of Glasgow. Tt is curious that up to this time both his essays and letters had all been pub- lished anonymously, though their authorship appears to have been perfectly well known. In 1730 he entered on the duties of his office, delivering an inaugural lecture (afterwards published), De Naturals Hominum Socralitate. The prospect of being delivered from the miscellaneous drudgery of school work, and of securing increased leisure for the pursuit of his favourite studies, occasions an almost boisterous outburst of joy :—" laboriosissimis, mihi, atque molestissimis negotiis implicito, exigua admodum erant ad bonas literas aut mentem colendam

otia; non levi igitur letitia commovebar cum almam matrem Academiam me, suum olim alumnum, in libertatem asseruisse audiveram." And yet the works on which Hutcheson's reputation was to rest had already been published.

The rest of Hutcheson's life, down to his death in 1746, was mainly spent in the assiduous performance of the duties of his professorship, including, of course, the prepara- tion of lectures for his classes. His reputation as a teacher attracted many young men, belonging to dissenting families, from England and Ireland, and he appears to have enjoyed a well-deserved popularity among both his pupils and his colleagues. Though somewhat quick-tempered, he was remarkable for his warm feelings and generous impulses. '¢ He was all benevolence and affection," says Dr Leechman ; 'none who saw him could doubt of it; his air and counte- nance bespoke it. It was to such a degree his prevailing temper that it gave a tincture to his writings, which were perhaps as much dictated by his heart as his head ; and if there was any need of an apology for the stress that in his scheme seems to be laid upon the friendly and public affec-

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tions, the prevalance of them in his own temper would at least form an amiable one."

Tn addition to the works already named, the following were published during Hutcheson's lifetime:—a pamphlet entitled Considerations on Patronage, addressed to the Gentlemen of Scotland, 1735; Philosophie Moralis Insti- tutio Compendiaria, Ethices et Jurisprudentie Naturalis Elementa continens, Lib. III., Glasgow, Foulis, 1742; Metaphysicee Synopsis Ontologiam et Pneumatologiam com- plectens, Glasgow, Foulis, 1742. The last work was pub- lished anonymously.

After his death, his son, Francis Hutcheson, M.D., pub- lished in two volumes, quarto, what is much the longest, though by no means the most interesting, of his works, A System of Moral Philosophy, in Three Books, London, 1755. To this is prefixed a life of the author, by Dr William Leechman, professor of divinity in the university of Glasgow. The only remaining work that we are able to assign to Hutcheson is a small treatise

on Logic, whichi, according to his biographer, was "not designed for the public eye," but which was published by Foulis at Glasgow in1764. This compendium, together with the Compendiwm of Metaphysics, was republished at Strasburg in lite.

Of all these works, however, those alone on which Hut-

cheson's philosophical reputation rests are the four essays, ©

and perhaps the letters, all published during his residence | mankin | approve of that which is virtuous or makes for the general good, but

in Dublin. To the more distinctive features of his philo- sophical system, so far as they may be gathered from these and his other works, we now proceed to draw attention.

In the publication of the first two essays, Hutcheson acted | . 3 btedl | recognized by Hutcheson, as it could hardly fail to be, in his

quite rightly in connecting his name on the title-page with that of Shaftesbury. There are no two names, perhaps, in the history of English moral philosophy, which stand in a closer connexion. The analogy drawn between beauty

and virtue, the functions assigned to the moral sense, the |

position that the benevolent feelings form an original and irreducible part of our nature, and the unhesitating adop- tion of the principle that the test of virtuous action is its

tendency to promote the general welfare, or good of the | we either mean—(1) that the action is necessary to obtain happiness

whole, are at once obvious and fundamental points of |

agreement between the two authors.

According to Hutcheson, man has a variety of senses, internal as well as external, reflex as well as direct, the general definition of a sense being

“any determination of our minds to receive ideas inde- pendently on our will, and to have perceptions of pleasure and pain” (Hssay on the Nature and Conduct of the Passions, sect. 1). He does not attempt to give an exhaustive enumeration of these “senses,” but, in various parts of his works, he specifies, besides the five external senses commonly recognized (which, he rightly hints, might be added to),—{1) consciousness, by which each man has a perception of himself and of all that is going on in his own mind (“Sensus quidam internus, aut conscientia, cujus ope nota sunt ea omnia, que in mente geruntur; hac animi vi se novit quisque, suique sensum habet,” Afetaph. Syn., pars i. cap. 2); (2) the sense

_ of beauty (sometimes called specifically “an internal sense”’) ; (3) a public sense, or sensus communis, “a determination to be pleased with the happiness of others and to be uneasy at their miscry ; ” (4) the moral sense, or “‘moral sense of beauty in actions and affections, by which we perceive virtue or vice, in ourselves or others ;” (5) a sense of honour, or praiseand blame, “ which makes the approbation or gratitude of others the necessary occasion of pleasure, and their dislike, condemnation, or resentment of injuries done by us the occasion of that uneasy scnsation called shame”; (6) a sensc of the ridiculous.

psychological division of this kind might result. , Of these “senses” that which plays the most important part 1

Hutcheson’s ethical system is the “ moral sense.” :

pronounces immediately on the character of actions and affections,

approving of those which are virtuous, and disapproving of those |

which are vicious. “His principal design,” he says in the pre- face to the two first treatises, “is to show that human nature was

not left quite indifferent in the affair of virtuc, to form to itself | | ber of persons to whom the happincss shall extend (and here the

observations concerning the advantage or disadvantage of actions, and accordingly to regulate its conduct. The weakness of our reason, and the

avocations arising from the infirmity and

It is plain, as the author confesses, that there may | be "other perceptions, distinct from all these classes," and, in fact, |

there seems to be no limit to the number of " senses" in which a | a | found the moral faculty with the moral standard.

It is this which |

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necessities of our nature are so great that very few men could ever have formed those long deductions of rcason, which show some actions to be in the whole advantageous to the agent, and their con- traries pernicious. The Author of nature has much better furnished us for a virtuous conduct than our moralists seem to imagine, by almost as quick and powerful instructions as we have for the pre- servation of our bodies. He has made virtue a lovely form, to excite our pursuit of it, and has given us strong affections to be the springs of each virtuous action." Passing over the appeal to final causes involved in this and similar passages, as well as the assump- tion that the " moral sense" has had no growth or history, but was "implanted" in man exactly in the condition in which it is now to be found among the morc civilized races, anassumption common to the systems of both Hutcheson and Butler, it may be remarked that the employment of the term "sensc" to designate the approving or disapproving faculty has a tendency to obscure the real nature of the process which gocs on in an act of moral approbation or dis- approbation. For, as is so clearly established by Hume, this act really consists of two parts :—one an act of deliberation, more or less prolonged, resulting in an intellectual judgment; the ether a reflex feeling, probably instantancous, of cither satisfaction or repugnance, —of satisfaction at actions of a certain class which we denominate as good or virtuous, of dissatisfaction or repugnance at actions of another class which we denominate as bad or vicious. By the in- tellectual part of this process we refer the action or habit to a certain class, and invest it with certain characteristics ; but no sooner is the intellectual process completed than there is excited in us a fecling similar to that which myriads of actions and habits of the game class, or deemed to be of the same class, have

excited in us on former occasions. Now, supposing the latter part of this process to be instantaneous, uniform, and exempt from error, the former cer- tainly is not. All mankind may, apart from their selfish interests,

surely they entertain the most widely divergent opinions, and, if left to their own judgment, would frequently arrive at directly opposite conclusions as to the nature of the particular actions and habits which fall under this class. This distinction is undoubtedly

analysis of the mental process preceding moral action, nor does he

| invariably ignore it, even when treating of the moral approbation or

disapprobation which is subsequent on action. Witness the follow- ing passages :—" Men have reason given them, to judge of the ten- dencies of their actions, that they may not stupidly follow the first appene of public good; but it is still some appearance of good which they pursue" (Inquiry concerning Moral Good and Evil, sect. 4). 'All exciting reasons presuppose instincts and affections ; and the justifying presuppose a moral scnse" (Illustrations upon the Moral Sense, sect. 1). " When we say one is obliged to an action,

to the agent, or to avoid misery ; or (2) that cvery spectator, or he himself upon reflexion, must approve his action, and disapprove his omitting it, if he considers fully all its circumstances. The former meaning of the word obligation presupposes sclfish affections, and the sense of private happiness ; the latter meaning includes the moral sense" (Jbid.). Notwithstanding these passages, however, it remains true that Hutcheson, both by the phrases which he employs to designate the moral faculty, and by the language in which he ordinarily describes the proccss of moral approbation, has done much to favour that loose and popular view of morality which, ignoring the difficultics that often attend our moral decisions, and the neces- sity of deliberation and reflexion, encourages hasty resolves and unpremeditated judgments. The term "moral sense" (which, it may be noticed, had already been employed by Shaftesbury, not only, as Dr Whewell appears to intimate in the margin, but also in the text of his Enquiry), if invariably coupled with the term "moral judgment," would be open to little objection; but, taken alone, as designating the

complex process of moral approbation, it is liable to lead not only to serious misapprehension but to grave practical errors. For, if each man's decisions are solely the result of an immediate intuition of the moral sense, why be at any pains to test, correct, or review them? Or why educate a faculty whose decisions are infallible? The expression has, in fact, the fault of most metaphorical terms ; it leads to an exaggeration of the truth which it is intended to suggest.

But though Hutcheson usually describes the moral faculty as acting instinctively and immediately, he does not, like Butler, con- The test or criterion of right action is with Hutcheson, as with Shaftesbury, its tendency to promote the general welfare of mankind. "In com- paring the moral qualities of actions, in order to regulate our elec- tion ainong various actions proposed, or to find which of them has the greatest moral excellency, we are led by our moral sense of virtue to judge thus—that, in equal degrees of happiness expected to proceed from the action, the virtue is in proportion to the num-

dignity or moral importance of persons may compensate numbers), and, in cqual numbers, the virtue is as the quantity of the happi-

ness or uatural good ; or that the virtuc is in a compound ratio of the quantity of good and number of en joyers. In the same manner, the moral evil, or vice, is as the degree of misery and number of sufferers ; so that that action is best which procures. the greatest happiness for the greatest nunibers, and that worst which, in like manner, occasions misery " (Inquiry coneerning Moral Good and Evil, sect. 3). What was subsequently called the utilitarian standard is here unhesitatingly adopted by Hutcheson ; and it is curious to notice that he actually employs the very phrase which became so celebrated in the mouth of Bentham, though afterwards reduced by that writer to the more simple expression " greatest happiness."

The adoption of an external standard, requiring mnch care and reflexion in its application, onght to have led Hutcheson to see that the moral faculty, by

which the standard was to be applied, is by no means so simple and instinctive as he imagined it to be, and that, consequently, these two parts of his system are in reality in- consistent.

As eonnected with Hutcheson's virtual adoption of the utilitarian standard, may be noticed a kind of moral algebra, proposed for the purpose of "computing the morality of actions." This calculus ocenrs in the Inquiry concerning Moral Good and Evil, sect. 3.

The most distinctive of Hutcheson's ethical doctrines, still remain- ing to be noticed, is what has been called the " benevolent theory" of morals. Hobbes had maintained that all our actions, however disguised under apparent sympathy, have their roots in self-love. Hutcheson not only maintains that benevolence is the sole and direct source of many of our actions, but, by a not unnatural recoil from the repellent doctrine of Hobbes, that it is the only source of those actions of whieh, on reflexion, we approve. "If we examine all the actions which arc acconnted amiable anywhere, and inquire into the grounds upon which they are approved, we shall find that, in the opinion of the person who approves them, they always appear as benevolent, or flowing from love of others and a study of their happiness, whether the approver be one of the persons beloved or~ profited or not; so that all those kind affections which incline us to inake others happy, and all actions supposed to flow from such affec- tions, appear morally good, if, while they.are benevolent toward some persons, they be not pernicious to others. Nor shall we find anything amiable in any action whatsoever, where there is no benevolence imagined ; nor in any disposition, or capacity, which is not supposed applicable to and designed for benevolent purposes" (Inquiry concerning Moral Good and Evil, sect. 3), Consistently with this position, actions which flow from self-love only are pro- nounced to be morally indifferent: "The actions which flow solely from self-love, and yet evidence no want of benevolence, having no hurtful effects upon others, seem perfectly indifferent in a moral sense, and neither raise the love or hatred of the observer" (Jbid.). But surely, by the common consent of civilized men, prudence, temperance, cleanliness, industry, self-respect, and in general, the " personal virtues," as they are called, are regarded, and rightly regarded, as fitting objects of moral approbation. Tis consideration could hardly escape any author, however wedded to his own

system, and Hutcheson attempts to extricate himself from the difficulty by laying down the position that a man may justly regard himself as a part of the rational system, and may thus "be, in part, an object of his own benevolence" (Jbid.),—a curious abuse of terms, which really concedes the question at issue. More- over, he acknowledges that, though sclf-love does not merit approba- tion, neither, exeept in its extreme forms, does it merit condemna- tion. "We do not positively condemn those as evil who will not sacrifice their private interest to the advancement of the positive good of others, unless the private interest be very small, and the public good very great"? (Illustrations upon the Moral Sense, sect. 6). The satisfaction of the dictates of self-love, too, is one of the very conditions of the preservation of society. " Self-love is really as neeessary to the good of the whole as benevolence, —as that attrac- tion which causes the cohesion of the parts is as necessary to the regular state of the whole as gravitation" (Inquiry concerning Moral Good and Evil, sect. 17). To press home the inconsistencies involved in these varions statements would be a superfluous task.

Hutcheson's benevolent view of human nature is illustrated also by his denying that malevolence is an original principle in the con- stitution of man. 'Perhaps our nature is not capable of desiring the misery of any being calmly, farther than it may be necessary to the safety of the innocent ; we may find, perhaps, that therc is no quality in any object which would excite in us pure disinterested malice, or calm desire of misery for its own sake" (On the Nature and Conduct of the Passions, sect. 3). Against this position of Hutcheson, propounded also by Butler (Scrm. ix.), it might be objected that, even amongst very young children, we often find a singular and precocious love of cruelty. This is, undonbtedly, one of the most curious facts in moral psychology, but it may perhaps be accounted for by supposing it to originate in a combination of morbid curiosity with an equally morbid love of power.

The vexed question of liberty and neeessity appears to be carefully avoided in Iintcheson's professedly ethical works. But, in the

Synopsis Mctaphysicce, he touches on it in no less than threc places, briefly stating both sides of the question, but evidently inclining to that which he designates as the opinion of the Stoics in opposition to what he designates as the opinion of the Peripateties. This is substantially the same: as the doctrine propounded by Hobbes and Locke (to the latter of whom Hutcheson refers in a note), namely, that our will is determined by motives in conjunction with our general character and habit of mind, and that the only true liberty is the liberty of acting as we will, not the liberty of willing as we will. Though, however, his leaning is clear, he carefully avoids dogmatizing, and speaks of the difficulty as "ardua questio," "queestio vexatissima, que doctorum et piorum ingenia semper torserat, atque de qua ntrinque frustra ad sensum cujusque internnm provocatur," earnestly deprecating the angry controversies and bitter dissensions to which the speculations on this subject had given rise.

If our limits allowed us sufficient space, it would be easy to trace the influence of Hutcheson's ethical theories on the systems of Hume and Adam Smith. The prominence given by these writers to the analysis of moral action and moral approbation, with the attempt to discriminate the respective provinces of the reason and the emotions in these processes, is undoubtedly due to the influence of Hutcheson. To a study of the writings of Shaftesbury and Hutcheson we might, probably, in large measure, attribute the unequivocal adoption of the utilitarian standard by Hume, and, if this be the case, the name of Hutcheson connects itsclf, through Hume, with the names of Priestley, Paley, and Bentham. Butler's Sermons appeared in 1726, the year after the publication of Hutcheson's two first essays, and the parallelism between the " conscience" of the one writer and the 'moral sense" of the other is, at least, worthy of remark.

In the sphere of mental philosophy and logie, Hutcheson's eon- tributions are by no means so important or original as in that of moral philosophy. In the former subject, the influence of Locke is apparent throughout. All the main outlines of Locke's philosophy seem, at first sight, to be accepted as a matter of course. Thus, in stating his theory of the moral sense, Hutcheson is peculiarly careful to repudiate the doctrine of innate ideas (see, for instance, Inquiry concerning Moral Good and Evil, sect. 1 ad fin., and sect. 4; and com- pare Synopsis Metaphysicce, pars i. eap. 2). Atthe same time, it

may be noticed that he shows more discrimination than does Locke in distinguishing between the two uses of this expression, and between the legitimate and illegitimate form of the doctrine (Syn. Alctaph., pars i. cap. 2). All our ideas are, as by Locke, referred to external or internal sense, or, in other words, to sensation and reflexion (see, for instance, Syn. Metaph., pars i. cap. 1; Logica Compend., pars. i. cap. 1; System of Moral Philosophy, book i. ch. 1). It is, however, a most important modification of Locke's doctrine, and one which connects Hutcheson's mental philosophy with that of Reid, when he states that the ideas of extension, figure, motion, and rest "are more properly ideas accompanying the sensations of sight and tonch than the sensations of either of these senses ;" that the idea of self accompanies every thought ; and that the ideas of num- ber, duration, and existence accompany every other idea whatsoever (see Essay on the Nature and Conduct of the Passions, sect. i. art. 1; Syn. Metaph., parsi. cap. 1, pars ii, cap. 1; Hamilton on Reid, p. 124, note). Other important points in which Hutcheson follows the lead of Locke are his depreciation of the importance of the so-called laws of thought, his distinction between the primary and secondary qualities of bodies, the position that we cannot know the inmost essences of things ("intimz rerum nature sive essentix "), though they exeite various ideas in ns, and the assumption that ex- ternal things are known only through the medium of ideas (Syn. Metaph., pars i. eap. 1), though, at the same time, we are assured of the existence of an external world corresponding to these ideas. Hutcheson attempts to account for our assurance of the reality of an external world by referring it to a natural instinct ("Idearnm plurimas ad res externas, tanquam earnndem imagines ant repra- sentationes, refcrre cogimur ab ipsa natura," Syn. AMetaph., pars i. cap. 1). Of the correspondence or similitude between our ideas of the primary qnalitics of things and the things themselves God alone can beassigned as the cause. his similitude has been effected by Him through a law of nature. " Hee prima qualitatum primari- arum perceptio, sive mentis actio quedam sive passio dicatur ; non alia similitudinis aut convenientiz inter ejnsmodi ideas et res ipsas causa assignari posse videtur, quam ipse Deus, qui certa nature lege hoc efficit, ut notiones, qu rcbus presentibus excitantur, sint ipsis similes, aut saltem earum habitudines, si non veras quantitates, depingant" (pars ii, eap. 1). Locke had repeatedly stated that "the primary qualities of bodies are resemblances of them, and their patterns do really exist in the bodies themselves" (sce, for instance,

Essay, bk. ii. ch. 8, sect. 15), and he also speaks of God "annexing " certain ideas to certain motions of bodies (Zbid., sect. 13, and elsewhere) ; but nowhere, we believe, does he propound a theory so precise and definite as that here propounded by Hutche- son, whieh reminds us at least as much of the speculations of Malebranche as of those of Locke.

Aongst the more important points in which Hutcheson diverges

from Locke is his account of the idea of personal identity, which he appears to have regarded as made known to us directly by conscious- uess. "Mentem suam eandem manere, sibi conscius est quisque, repetentia illa, sive perceptione intcrna, certissima, ast ineffabili, qua novit suam mentem a mente quavis alia onmnino diversam esse" (Syn. Metaph., pars. i. cap. 8). The distinction betwecn body and mind, "corpus" or "materia" and "res cogitans," is more emphatically accentuated by Hutcheson than by Locke. Gencrally, he speaks as if we had a direct consciousness of mind as distinct from body (see, for instance, Syn. Metaph., pars ii. cap. 3), though, in the posthumous work on Moral Philosophy, he expressly states that we know mind as we know body "by qualities immediatcly per- ceived though the substance of both be unknown" (bk. i. ch. 1). The distinction between perception proper and sensation proper, which occurs by implication though it is not explicitly worked out (see Hamilton's Leetures on Metaphysies, Lect. 24 ; Hamilton's edition of Dugald Stewart's Works, vol. v. p. 420), the imperfection of the ordinary division of the external senses into five elasses, the limitation of consciousness to a special mental faculty (severely criticized in Sir W. Hamilton's Leetures on Metaphysics, Lect. xii.), and the disposition to refer on disputed questions of philosophy not so much to formal arguments as to the testimony of consciousness ahd our natural instincts ("ad gravissima quedam in philosophia dogmata amplectenda, non argumentis aut ratiocinationibus, ex rerum perspecta natura petitis, sed potius sensu quodam interno, usu, atque nature impulsu quodam aut instinctu ducimur," pars ii. cap. 3) are also amongst the points in which Hutcheson supple- mentcd or departed from the philosophy of Locke. The last point can hardly fail to suggest to our readers the " common-sense philosophy" of Reid, and here it may be remarked that the

interest attaching to Hutcheson's psychological and metaphysical views consists very largely in the intermediate position which they occupy between the system of Locke and that of Reid and the later Scottish school. ing detached questions, he perhaps stands nearer to Locke, but in the general spirit of his philosophy he seems to approach more closcly to his Scottish successors.

The short Compendium of Logie, which is more original than such works usually are, is chiefly remarkable for the large proportion of psychological matter which it contains. In these parts of the book Hutcheson mainly follows Locke. The technicalities of the subject are passed lightly over, and the book is eminently readable. It may be specially noticed that he distinguishes between the mental result and its verbal expression [idea—term ; judgment—proposition], that he constantly employs the word "idea," and that he defines logical truth as "convenientia signorum cum rebus significatis" (or " pro- positionis convenientia cum rebus ipsis,'"' Syn. Metaph., pars i. cap. 3), thus implicitly repudiating a merely formal view of logic.

Hutcheson may claim to have been one of the earliest modern writers on esthetics. His speculations on this subject are contained in the Inquiry concerning Beauty, Order, Harmony, and Design, the first of the two treatises published in 1725, He maintains that we are endowed with a special scnse by which we perceive beauty, harmony, and proportion. This is a reflex sense, because it pre- supposes the action of the external senses of sight and hearing. It may be called an internal sense, both in order to distinguish its perceptions from the mere perceptions of sight and hearing, and because "in some other affairs, where our extcrnal senses are not much concerned, we discern a sort of beauty, very like, in many respects, to that observed in sensible objects, and accompanied with like pleasure" (Inquiry, &c., sect. 1). The latter reason leads him to call attention to the beauty perceived in universal truths, in the operations of general causes, and in moral principles and actions.

hus, the analogy between beauty and virtue, which was so favourite a topic with Shaftesbury, becomes also prominent in the writings of Hutcheson. Scattered up and down the treatisc, there are many important and

interesting observations which our limits prevent us from noticing. But to the student of mental philosophy it may be specially intcresting to remark that Hutcheson both applies the

principle of association to explain our idcas of beauty and also scts | limits to its application, insisting on there being "a natural power |

of perception or sense of beauty in objects, antecedent to all custom, education, or example" (see Inquiry, &c., sects. 6, 7; Hamilton's Lectures on Metaphysies, Lect. 44 ad fin.).

Hutcheson's writings gave rise, as they could hardly fail to do, to much controversy among those who were interested in ethical speculations. To say nothing of minor opponents, such as '"'Philaretus" (Mr Gilbert Burnet, alrcady alluded to), Dr John Balguy, author of two tracts on The Foundation of Moral Goodness,

able reputation in his time, the essays appear to have suggested, by antagonism, at least two works which hold a permanent place in the literature of English ethics. One of these is Butler's Dissertation on the Nature of Virtue, which is, throughout, a criticism of the main positions maintained by Hutcheson. The other is an answer of a far more complete and systematic character, Dr Richard Price's Treatise of Moral Good and Evil, which first appeared in 1757. In

If we confine ourselves to merely enumerat-..

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this work, the author maintains, in opposition to Hutcheson, that

| actions are 7 themselves right or wroug (an ambiguous expression, | which he isnot sufficiently careful to explain), that right and wrong

are simple ideas incapable of analysis, and that thesc ideas are per- ceived immediately by the understanding. Pricc's work is remark-

| able for the close similarity between many of the ideas and even

expressions contained in it and those which subsequently became so celebrated in the speculations of Kant. We thus sec that, not only by its direct but also by its indirect influence, through the replies which it called forth, the system of Hutcheson, or at least the system of Hutcheson combined with that of Shaftesbury, may be regarded as having contributed, in very large measure, to the forma-

tion and development of some of the most unportant of the modern schools of ethics.

_ The original editions of Hutcheson's various works have been already men- tioned. Several additions and alterations were made in the second edition (1726) of the Inguiry into the Original of our Ideas of Beauty and Virtue. This, as well as most of his other works, passed through various editions. Of the System of Moral Philosophy, however, published after Hutcheson's death, there is, we believe, one cdition only. Notiees of liutcheson occur in most histories, both of general philosophy and of moral philosophy, as, for instance, in part vii. of Adam Smith's Theory of Moral Sentiments; Mackintosh's Progress of Ethical Philo- sophy; Cousin, Cours d' Iistoire de la Philosophie Morale du XVI[Meme Siécle ; Whewcll's Lectures on the History of Moral Philosophy tn England; Bain's Mental and Moral Science ; Dr Noah Porter's Appendix to the English translation of Ueberweg's Jiistory of Philosophy; Mr Leslie Stephen's History of English Thought in the Eighteenth Century, &e. Of Dr Leechman's Biography of Hutehe- son we have already spoken. Professor Veitch gives an interesting account of his professorial work in Glasgow, Jfind, vol. ii. pp. 209-211. (T. F.)

HUTCHINSON, Joun (1616-1664), a Puritan soldier, son of Sir Thomas Hutchinson, was born at Nottingham in September 1616. After completing his education at Cambridge University he entered Lincoln's Inn, but soon became tired both of the study of law and the amusements of London, and was meditating travel on the Continent

"when he accidentally made the acquaintance of Lucy,

daughter of Sir Allan Apsley, whom he married in 1638. After his marriage. he returned to Owthorpe, where the study of divinity and politics gradually

led to a change of his sentiments in regard to the dispute between the parlia- ment andthe king. At first he did not find a clear call to join the Parliamentary army, but the efforts of the Royalists to seize him as a disaffected person soon dissipated his neutrality, and, becoming governor of Nottingham, he with great firmness and courage held the town and castle against internal treachery and external attacks till the triumph of the parliamentary cause. Having been chosen to represent Nottingham in the new parliament, he became a member of the high court of justice for the trial of the king, and gave his vote for his execution, but, disapproving of the subsequent political conduct of Cromwell, he took no further part in politics during the lifetime of the Protector. After the Restoration he became member for the county of

_ Nottingham, and he was included in the Act of Amnesty

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passed in favour of certain of the regicides. Subsequently, however, he was arrested upon suspicion of being concerned in a treasonable conspiracy ; and after an imprisonment of ten months in the Tower of London, and of one month in Sandown Castle, Kent, he died 11th September 1664. The life of Colonel Hutchinson is now only of interest from the manner in which it is narrated in the Afemoirs written by his wife, and first published in 1806, a work not only valuable for the picture which it gives of the time in which he lived, but for the simple beauty of its style, and the naiveté with which the writer records her senti ments and opinions, and details the incidents of her private life.

HUTCHINSON, Joun (1674-1737), the author of Moses's Principia and other works in which the so-called Hutchinsonian system is expounded, was born at Spenni- thorne, Yorkshire, in 1674, and after receiving an adequate

and Dr John Taylor of Norwich, a Presbyterian minister of consider- elementary education there, served as steward in several

families of position, latterly in that of the duke of Somerset, who ultimately obtained for him the post of riding purveyor to the master of the horse, a sinecure worth about £200 a year. In this employment he became acquainted with Dr Woodward, physician to the duke, and author of a work entitled The Natural History af the Earth, to whom ha

entrusted a large number of fossils of his own collecting, along with a mass of manuscript notes, for arrangement and publication, A misunderstanding as to the manner in which these should be dealt with was the immediate occa- sion of the publication by Hutchinson in 1724 of Afoses's Principia, part i., in which Woodward's Natural LHistory was bitterly ridiculed, his conduct with regard to the mineralogical specimens not obscurely characterized, and a refutation of the Newtonian doctrine of gravitation seriously attempted. It was followed by part ii, in 1727, and by various other works published at frequent intervals. Hutchinson died in 1737. A complete edition of all the publications of this author, along with his posthumous pieces, edited by Robert Spearman and Julius Bate, appeared in 1748 (12 vols.) ; an Abstract of these followed in 1753; and a Supplement, with Life by Spearman pre- fixed, in 1765.

Although the crude ideas of Hutchinson at the time of their first promulgation were successful, by their seeming devoutness, in com- mending themselves to some of the pious but dim-sighted and over- timid souls of that period, who had taken alarm at the atheistic conclusions they believed to be deducible from the Newtonian doc- trines, they are now too uninfluential, as well as too glaringly incon- sistent with the universally recognized principles of physics and philology, to call for any detailed analysis. heir nature may be almost sufficiently gathered from the titles of some of the works in which they are set forth, such as Moses's Prineipia, Part I. ; of the Invisible Parts of Matter, of Motion, of Visible Forms, and of their Dissolution and Reformation ; Moses's Prineipia, Part II. ; of the Cireulation of the Heavens; of the Cause of the Motion and Course of the Earth, Moon, de. ; of the Religion, Philosophy, and Emblems of the Heathens before Moses writ, and of the Jews after ; in Con- jirmation of the Natural History of the Bible ; Moses's Sine Prin- eipio, represented by

Names, Words, Types, Emblems ; with an introduction to show the Nature of the Fall, of Paradise, and of the Body and Soul; The Confusion of Tongues and Trinity of the Gentiles (being an account of the origin of Idolatry) ; Power Essen- tial and Mechanical, or what power belongs to God and what to his ereatures, in whieh the design of Sir I. Newton and Dr Samavel Clarke ts laid open; Glory or Gravity, wherein the Objects and Articles of the Christian Faith are exhibited ; The Religion of Satan, or Antichrist Delineated. Bishop Horne of Norwich, it may be inentioned, was during some of his earlier years an avowed Hutchin- — ; and Jones of Nayland continued to be so to the end of his

ife.

HUTCHINSON, Tuomas (1711-1780), governor of the province of Massachusetts, son of a wealthy merchant of Boston, was born there September 9, 1711. The son, being unsuccessful in commerce, studied law, and adopted it as his profession. He was representative of Boston in the general court for ten years, and was three times chosen speaker. From 1749 to 1766 he was a counsellor, in 1752 he was appointed judge of probate, from 1758 to 1771 he was lieutenant-governor, and in 1760 he became chief justice. In 1748 he carried a measure to substitute gold and silver for the paper currency, which had depreciated one-eighth in value. During the Stamp Act riots of 1765 his house was sacked by the mob ; and by his subsequent support of the general policy of the British Government he incurred increasing unpopularity. In 1767 he laid claim to a seat in the council on the ground of being lieutenant- governor, but on account of his political views his claims were set aside. On his appointment to the governorship of Massachusetts in 1769, he used every method to support the measures which the mother country sought to enforce against the colonists ; and in December 1773, on account of his refusal to permit the reshipment of teas on which a duty had been laid by the Government, several of the inhabitants of Boston emptied the tea into the bay. In January 1774 Hutchinson asked leave to resign his office, and in June he sailed to England, where he spent the remainder of his life. As the result of official inquiry into his conduct while governor of Massachusetts, he was re-

rhe: with a pension. He died at Brompton in June

Hutchinson was the author of the following works:—A Brigf Statement of the Claim of the Colonies, 1764; Collection of Original Papers relative to the History of the Colony of Massachusetts Bay, 1769; History of the Colony of Massachusetts Bay from 1628 to 1750, 2 yols., London, 1765-67; History of Massachusetts from 1749 to 1774, published posthumously in 1828.

HUTTEN, Utricn von (1488-1523), is one of those men who, like Erasmus or Pirckheimer, form the bridge between Humanists and Reformers. He lived with both, sympathized with both, though he died before the Reformation had time fully to develop itself. His life may be divided into four parts: —his youth and cloister-life (1485— 1504); his wanderings in pursuit of knowledge (1504— 1515); his strife with Ulrich of Wirtemburg (1515-1519) ; and his connexion with the Reformation (1519-1523). Each of these periods had its own special antagonism, which coloured Hutten's career: in the first, his horror of dull monastic routine ; in the second, the ill-treatment he met with at Greifswald ; in the third, the crime of Duke Ulrich ; in the fourth, his disgust with Rome and with Erasmus. He was born April 21, 1488, at the castle of Steckelberg, near Fulda, in Franconia, the eldest son of a poor and not undistinguished knightly family. As he was mean of stature and sickly his father destined him for the cloister, and he was sent to the Benedictine house at Fulda ; the thirst for learning there seized on him, and in 1504 he fled from the monastic life, and won his freedom with the sacrifice of his worldly prospects,and at the cost of incurring his father's undying anger. From the Fulda cloister he went first to Cologne, next to Erfurt, and then to Frank- fort-on-the-Oder on the opening in 1506 of the new uni- versity of that town ; there in that year he appears to have graduated in philosophy. When, however, the scholastic party displaced the Humanists, he wandered forth again ; in 1508 we find' him a shipwrecked beggar on the Pomeranian coast. In 1509 the university of Greifswald welcomed him; "Ulricus Huttenus poeta clericus Herbipolensis gratis intitulatus quia spoliatus omnibus bonis" is the honour- able record on the books of this his second Alma Mater. Here too the friends who at first received him so kindly became his foes; the sensitive ill-regulated youth, who took the liberties of genius, wearied his burgher patrons ; they could

not brook the poet's airs and vanity, and ill-timed assertions of his higher rank. Wherefore he left Greifs- wald, and as he went was robbed of clothes and books, his only baggage, by the servants of his late friends; in the dead of winter, half starved, frozen, penniless, he reached Rostock. Here again the Humanists, who were throughout full of charity and sympathy towards the luckless young scholar, received him gladly, and under their protection he wrote against his Greifswald patrons, thus beginning the long list of his satires and fierce attacks on personal or public foes. Rostock could not hold him long ; he wandered on to Wittenberg and Leipsic, and thence to Vienna, where he hoped to catch the emperor Maximilian's favour by an elaborate national poem on the war with Venice. But neither Maximilian nor the university of Vienna would lift hand for him, and he passed into Italy, that holy land of Humanist enthusiasm, where, at Pavia, he sojourned throughout 1511 and part of 1512. In the latter year his studies were rudely interrupted by war ; in the siege of Pavia by papal troops and Swiss, he was plundered by both sides, and escaped sick and penniless to Bologna; ou his recovery he even took service as a private soldier in the emperor's army.

This dark period lasted no long time; in 1514 he was again in Germany, where, thanks to his poetic gifts and the friendship of Hitelwolf von Stein, he won the favour of the elector of Mainz, Archbishop Albert of Brandenburg. Here high dreams of a learned career rose on him ; Mainz should be made the metropolis of a grand Humanist move-

ment, the centre of good style and literary form. golden dream was scattered by the murder in 1515 of his cousin Johu of Hutten by Ulrich, duke of Wiirtemburg. This outrage changed the whole course of Hutten's life ; satire, chief refuge of the weak, became his weapon ; with one hand he took his part in the famous Hpistole Obscuro- rum Virorum, and with the other launched scathing letters, eloquent Ciceronian orations, or biting satires against the duke. Though the emperor was too lazy and indifferent to smite a great prince, he condescended to bestow on Hutten the inexpensive honour of a laureate crown in 1517 ; as the poet tells us with pleased pride, the wreath was woven by the hands of fair Constantia, Conrad Peutinger's daughter. As recognized poet laureate of Germany, Hutten, who had been to

Italy, again attached himself to the electoral court at Mainz; and he was there when in 1518 his true friend Pirckheimer wrote, urging him to abandon the court and dedicate himself to letters. We have the poet's long reply, in an epistle on his " way of life," an amusing mixture of earnestness and vanity, self-satisfaction and satire ; he tells his friend that his career is just begun, that he has had twelve years of wandering, and will now enjoy himself a while in patriotic literary work ; that he has by no means deserted the humaner studies, but carries with him a little library of standard books. Pirckheimer in his burgher life may have ease and even luxury ; he, a knight of the empire, how cau he condescend to obscurity? He must abide where he can shine. And so, dazzled by his dream of an intellectual reform, Hutten chose the path which presently led him to his ruin.

In 1519 he issued in one volume his attacks on Duke Ulrich, and then, drawing sword, took part in the private war which overthrew that prince ; in this affair he became intimate with Franz von Sickingen, the champion of the knightly order (Ritterstand). Henceforth Hutten takes part in the Lutheran movement, while he becomes mixed up in the attempt of the " Ritterstand" to recover its posi- tion, and to assert itself as the militia of the empire against the independence of the German princes. It was soon after this time that he discovered at Fulda a copy of the mani- festo of the emperor Henry IV. against Hildebrand, and published it with comments as an attack on the papal claims over Germany. He hoped thereby to interest the new em- peror Charles V., and the higher orders in the empire, in behalf of German liberties ; but the appeal failed. What Luther had achieved by speaking to cities and common folk in homely phrase, because he touched heart and con- science, that the far finer weapons of Hutten failed to effect, because he tried to touch the more cultivated sympathies and dormant patriotism of princes and bishops, nobles and knights. And so he at once gained an undying name in the republic of letters and ruined his own career. He showed that the artificial verse-making of the Humanists could be connected with the new outburst of genuine German poetry. The Minnesinger was gone; the new national singer, a Luther or a Hans Sachs, was heralded by the stirring lines of Hutten's pen. These forma distinct epoch in the history of German national literature ; they have in them a splendid natural swing and ring, strong and patriotic, though unfor-

tunately addressed to knight and landsknecht rather than to the German people.

The poet's high dream of a knightly national regeneration had a rude awakening. The attack on the papacy, and Luther's vast and sudden popularity, frightened Elector Albert, who dismissed Hutten from his court. Hoping for imperial favour, he betook himself to Charles V.; but that cold young prince, who cared little for Humanists, and was not a German, would have none of him. So he returned to his friends, and they rejoiced greatly to see him still alive; for Pope Leo X, had ordered him to be

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arrested and sent to Rome, and assassins dogged his steps. He now attached himself more closely to Franz von Sickingen and the knightly movement. This also came to a disastrous end in the capture of the Ebernberg, and Sickingen's death ; the higher nobles had triumphed ; the archbishops avenged themselves on Lutheranism as in- terpreted by the knightly order. With Sickingen Hutten also finally fell. He fled to Basel, where Erasmus refused to see the sick hero, both for fear of his loathsome diseases, and also because the beggared knight was sure to borrow money from him.

Ulrich von Hutten is one of those men of genius at whom propriety is shocked, and whom the mean-spirited avoid. Yet through his short and buffeted life he was befriended, with wonderful charity and patience, by the chief leaders of the Humanist movement. For, in spite of his irritable vanity, his immoral life and habits, his odious diseases, his painful restlessness, Hutten had much in him that strong men could love. He passionately loved the truth, and was ever open to all good influences. He was a patriot, whose soul yearned for what was high, and soared to ideal schemes and a grand utopian restoration of his country. In spite of all, his was a frank and noble nature ; his faults chiefly the faults of genius ill-controlled, and of a life cast in the eventful changes of an age of novelty. A swarm of writ- ings issued from his pen ; at first the smooth elegance of his Latin prose and verse

seemed strangely to miss his real character ; he was the Ciccro and Ovid of Germany before he became its Lucian.

His chief works were his Ars versificandi (1511); the Nemo, (1518); a work on the Morbus Galliews (1519); the volume of Steckelberg complaints against Duke Ulrich (ineluding his four Ciceronian Orations, his Letters, and the Phalarismus) also in 1519 ; the Vadismus (1520); and the controversy with Erasmus at the end of his life. Besides these were many admirable poems in Latin and German. It will never be known with certainty how far Hutten was the parent of the celebrated Epistola Obseurorum Virorum, that famous satire on monastic ignorance as represented by the thco- logians of Cologne with which the friends of Reuchlin defended him. At first the eloister-world, not diseerning its irony, wel- comed the work as a defence of their position ; though their eyes were soon opened by the favour with which the learned world received it. The Epistole were eagerly bought up; the first part (41 letters) appeared at the end of 1515; early in 1516 there was a second edition; later in 1516 a third, with an appendix of seven letters ; in 1517 appeared the second part (62 letters), to which a fresh appendix of eight letters was subjoined soon after. Hutten, in a letter addressed to Robert Croeus, denied that he was the author, and is followed by Bayle in his Dictionary ; but there is no doubt as to his direct connexion with the book. Erasmus was of opinion that there were three authors, of whom Crotus Rubianus was the originator of the idea, and Hutten a chief contributor. D. F. Strauss, who dedicates to the subject a chapter of his admirable work on Hutten, concludes that he had no share in the first part, but that his hand is clearly visible in the second part, whieh he attributes in the main to him. To him is due the more serious and severe tone of that bitter portion of the satire.

For a eomplcte catalogue of the writings of Hutten, see Bocking's Index Bibliographicus Huttenianus (1858). The best biography (though it is also somewhat of a political pamphlet) is that of

Strauss (Ulrich von Iutten, 1857 ; 2d ed., 1871; English transla- tion by Sturge, 1874), with which may be compared the monographs by Potton (accompanying his translation in French of the Morbus Gallicus, 1865),

Mohnicke, Wagenseil, Von Brunnow, Biirek, and Gohring. See also Panzer (Ulrich von Hutten in literariseher Hinsicht, 1798); and K. Hagen (“ Ulrich von Hutten in poli- tischer Beziechung” in his Zur politischen Geschichte Deutschlands, 1824). (G. W. K.) HUTTON, Caarczs (1737-1823), the youngest son of Henry and Eleanor Hutton, was born at Newcastle-on-Tyne, August 14, 1737. His father was an underviewer in the coal-works in the neighbourhood, and died in June 1742; but his mother’s second husband, Francis Fraim, proved kind to the boy, and, in consequence of a slight accident to the elbow-joint of his right arm, sent him to school while his brothers worked in the pits. The most of his education he received in a school at Jesmond, kept by Mr Ivison, a clergyman of the church of England. There is reason to believe, on the evidence of two pay-bills, that for a short time in 1755 and 1756 Hutton worked in Old Long Benton colliery ; at any rate, on Ivison’s promo- tion to a living, Hutton succeeded to the Jesmond school, whence, in consequence of increasing pupils, he removed to Stote’s Hall. While he taught during the day at Stote’s Hall, he studied mathematics in the evening at a school in Newcastle. In 176C he married, and began the work of tuition on a larger scale in Newcastle, where he had among his pupils John Scott, afterwards Lord Eldon, chancellor of England. In 1764 he published his first work, Z’he Schoolmaster’s Guide, or a Complete System of Practical Arithmetic, which in 1770 was followed by his Z’reatise on Mensuration both in Theoryand Practice. In 1772 appeared a tract on Zhe Principles of Bridges, suggested by the destruction of Newcastle bridge by a high flood on 17th November 1771. Ona vacancy occurring in the professor- ship of mathematics at the Royal Military Academy, Woolwich, in 1773, Hutton became a candidate, and after a severe competitive contest was appointed to the post. He was made a fellow of the Royal Society in 1774, and at their request drew up an account of the calculations to determine the mean density and mass of the earth made by him from the measurements taken in 1774—76 at Schiehallion in Perthshire. This account appeared in the Philosophical Transactions for 1778, was afterwards re- printed in the second volume of his Z’racts on Mathematical and Philosophical Subjects, and procured for Hutton the degree of LL.D. from the university of Edinburgh. He was elected foreign secretary to the Royal Society in 1779, but his resignation in 1783 was brought about by the president Sir Joseph Banks, whose behaviour to the mathe- matical section of the society was somewhat high-

handed (sec Kippis's Observations on the late Contests in the Royal Society, London, 1784). After his Tables of the Products and Powers of Numbers, 1781, and his Mathematical Tables, 1785, he issued, for the use of the Royal Military Academy, in 1787 Elements of Conic Sections, and in 1798 his Course of Mathematics. The last, at the time it appeared, was much superior in mode of treatment to any existing work on the subject, and in succeeding editions the author incor- porated many new discoveries and methods. The two volumes of his Afathematical and Philosophical Dictionary, a most valuable contribution to scientific biography, were published in 1795, and the four volumes of Recreations in Mathematics and Natural Philosophy, mostly a translation from the French, in 1803. One of the most laborious of his works was the abridgment, in conjunction with Drs Shaw and Pearson, of the Philosophical Transactions, This undertaking, the mathematical and scientific parts of which fell to Hutton's share, was completed in 1809, and filled eightcen volumes quarto. Tutton's long-continued con- nexion (it extended over fifty-six years) with the mathie-

matical periodicals of his time, whether as contributor or editor, deserves a word of notice. His name first appears in the Ladies' Diary (a poetical and mathematical almanac which was begun in 1704, lasted on till 1871, and which contributed more to the study and improvement of mathematics than half the books professedly written on the subject") in the year 1764; ten years later he was appointed editor of the almanac, a post which he retained till 1817. Previous to his editorship of the Diary, he had begun a small periodical, Miscellanea Mathematica, which extended only to thirteen numbers ; subsequently to it, he published in five volumes Zhe Diarian Miscellany, which consisted of all the useful and entertaining parts of the Diary down to 1773, with many additional solutions and improvements. On the resignation, owing to failing health, of his professorship in 1807, he was allowed a pension of £500 a year. He died on 27th January 1823.

All the biographical notices of Hutton are unanimous in describing him as one of the most skilful of teachers, and the most amiable of men. His modesty and sim- plicity were as remarkable as his intellectual gifts. To his

friends and pupils he exhibited a warmth of personal affection that attached both to him in a very rare degree. It was also with him a sacred duty to seek out the poor aud unbefriended student of science, and promote and otherwise assist him to the best of his power.

HUTTON, James (1726-1797), one of the great founders of geological science, was born in Edinburgh on 3d June 1726. Educated at the high school and university of his native city, he acquired while still a student a passionate love of scientific inquiry. It had been decided that he should pursue a professional career, and he was accordingly apprenticed to a lawyer. But as instead of copying law papers he was sometimes found amusing his fellow-clerks with chemical experiments, his employer with much sagacity advised that a more congenial profession than the law should be chosen for him. The young apprentice, released from his engagement, chose medicine as the pursuit nearest akin to his favourite study of chemistry. He studied for three years at Edinburgh, and completed his medical education by an attendance of nearly two years at the medical classes in Paris, returning by the Low Countries, and taking his degree of doctor of medicine at Leyden in 1749. At the end of that year he came back to England, only to find, however, that though he had qualified himself to practise as a medical man there seemed hardly any opening for him. In the summer of the ensuing ycar he definitively abandoned the idea of following out the medical profession, and, having inherited a small property in Berwickshire from his father, resolved to devote him- self to agriculture. With the zeal and thoroughness characteristic of his disposition, he then went to Norfolk to learn the practical work of farming. Thereafter he extended his experience by a tour in Holland, Belgium, and the north of France. During these years he began to study the surface of the earth, looking into every pit, ditch, or river-bed that he saw, and gradually shaping in his mind the problem to which he afterwards devoted his energies. In the summer of 1754 he established himself on his own farm in Berwickshire, where he resided for fourteen years, and where he introduced the most improved forms of hus- bandry. As the farm was brought into excellent order, and as its management, becoming more easy, grew less interesting, he was finally induced to let it, and establish himself for the rest of his life in Edinburgh. This took place about the year 1768. ‘

From this period until his death in 1797 he lived unmarried with his three sisters. Surrounded by congenial literary and scientific friends, he devoted himself to those researches which have had so important an influence upon

HUYT—-fUE®

At that time geology in any proper | reality, yet that the impressions produced upon our minds, Mineralogy, however, had | being constant and consistent, become as much realities to Hutton's taste for chemistry |

the progress of science. sense of the term did not exist. made considerable progress. naturally led him into mineralogy. But he had conceived larger ideas than were entertained by the mineralogists of

standing of the history of the earth. For many years he continued to ponder over the subject, making during that time many excursions to different parts of the country to obtain materials for his researclies, or to test the hypotheses he had been led to form. At last, in the spring of the year 1785, he communicated his views to the recently established

the Earth, or an Investigation of the Laws Observable in the Composition, Dissolution, and [estoration of Land upon the Globe. In this remarkable work the doctrine is ex-

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us as if they precisely resembled things actually existing, and therefore that our moral conduct must remain the same

eI _as if our ideas perfectly corresponded to the causes his day. He desired to trace back the origin of the various minerals and rocks, and thus to arrive at some clear under- |

producing them. His closing years were devoted to the extension and republication of his Vheory of the Larth, of which two volumes octavo appeared in 1795. A third volume, necessary to complete the work, was left by him in manuscript, and is referred to by his biographer Playfair, but

seems to have disappeared. No sooner had this task been performed than he set to work to collect and systematize

_his numerous writings on husbandry, which he proposed Royal Society of Edinburgh in a paper entitled Theory of |

to publish under the title of Hlements of Agriculture. He

_had nearly completed this labour when an incurable disease _ brought his active career to a close on 26th March 1797.

pounded that geology is not cosmogony, but must confine |

itself to the study of the materials of the earth; that everywhere evidence may be seen that the present rocks of

the earth's surface have been formed out of the waste of | | whose enthusiasm for the spread of Hutton's doctrine was combined

older rocks; that these materials having been laid down under the sea were there consolidated under great pressure, and were subsequently disrupted and upheaved by the expansive power of subterranean heat ; that during these convulsions veins and masses of molten rock were injected into the rents of the dislocated strata; that every portion of the upraised land, as soon as exposed to the atmosphere, is subject to decay; and that this decay must tend to advance until the whole of the land has been worn away and laid

down on the sea-floor, whence future upheavals will once |

more raise the consolidated sediments into new land. In some of these broad and bold generalizations Hutton was

anticipated by the Italian geologists; but to him belongs |

the credit of having first perceived their mutual relations,

and combined them in a luminous coherent theory every-

where based upon observation.

It was not merely the ground beneath us to which Hutton directed his attention. He had long studied the changes of the atmosphere. of the Earth appeared contained also a Theory of Rain, which was read to the Royal Society of Edinburgh in February 1784. He contended that the amount of mois- ture which the air can retain in solution increases with augmentation of temperature, and therefore that on the mixture of two masses of air of different temperatures a portion of the moisture must be condensed and appear in visible form. He investigated the data available in his time regarding rainfall and climate in different regions of the globe, and came to the conclusion that the rainfall is everywhere regulated by the humidity of the air on the one

aerial currents in the higher atmosphere on the other.

The vigour and versatility of his genius may be under- stood from the variety of works which, during his thirty years' residence in Edinburgh, he gave to the world.

In the year 1792 he published a quarto volume entitled |

Dissertations on different Subjects in Natural Philosophy, in which he discussed the nature of matter, fluidity, co- hesion, light, heat, and electricity. Some of these subjects were further illustrated by him in papers read before the Royal Society of Edinburgh. He did not restrain himself within the domain of physics, but boldly marched into that of metaphysics, publishing three quarto volumes with the title An Investigation of the Principles of Knowledge, and

| population of about 5000.

of the Progress of Reason—from Sense to Science and Philo- ,

sophy.

In this work he develops the idea that the external | world, as conceived by us, is the creation of our own minds | influenced by impressions from

without, that there is no |

resemblance between our picture of the outer world and the |

_ with a rare gift of graceful and luminous cxposition.

It is by his Theory of the Earth that Hutton will be remembered with reverence while geology continues to be cultivated. The author's style, however, being somewhat heavy and obscure, the book did not attract during his lifetime so much attention as it deserved. Happily for science Hutton numbered among his friends John Playfair, professor of mathematics in the university of Edinburgh,

Five years

_ after Hutton's dcath he published a volume, Illustrations of the | Huttonian Theory of the Harth, in which he gave an admirable sum- ' mary of that theory, with numerous additional illustrations and

The same volume in which his Zheory |

arguments, This work is justly regarded as one of the classical contributions to geological literature. To its influence much of the sound progress of British geology must be ascribed. In the year 1805 a biographical account of Hutton, written by Playfair, was published in vol. v. of the Transactions of the Royal Society of Edinburgh. (A. GE.)

HUY, in Flemish Hoky, a town of Belgium, at the head

_ of an arrondissement in the province of Li¢ge, situated in

the most romantic portion of the Meuse valley near the coufluence of the Hoyoux, on the railway between Liége aud Namur, and about 20 miles west of the former city. It lies on both banks of the river, and the two portions are united by a bridge about 460 feet long. Of best note

| among the buildings are the town-house, the court-house,

the hospital, and the collegiate church of Notre Dame, which is an excellent specimen of Gothic architecture, dating originally from the 14th century, but restored in the course of the 16th and the 19th. The citadel of Huy is now demolished. It was a powerful fortress, constructed between 1817 and 1822 on the site of the older castle dismantled by the Dutch in 1718. Part of the works were excavated in the solid rock, and the whole building looked down on the valley of the Meuse with picturesque defiance, Of the industrial activity of the town the most important results are paper, tin-plate, zinc, iron, earthenware, and brandy ; and iron, zine, and coal are extensively wrought

in the vicinity. The population in 1876 was 11,774. hand, and the causes which promote mixtures of different |

Huy, in modern Latin Hotwm, Hogum, Huyuwm, aud Huum, existed at least as early as the 7th century, and according to some authorities it was founded in 148 by the emperor Antoninus. Coins of Charles the Simple are cxtaut with the legend ix Vico Hoio. The older name of the district in which it is situated was the Condroz, or territory of the Condrosii. Under the prince- bishops of Liége Huy was a prosperous place, and it possessed no fewer than fifteen churches, as well as a number of monasteries, fora It was in one of its suburbs that the abbey of Neufmoustier was founded by Peter the Hermit, who died aud was buried within its precincts (1115). Part of the cloisters are still standing ; and a monument was erected in 1858 by M. Godin, the owner of the grounds, to mark the site of the hermit's

| tomb. Huy was captured by the Dutch in 1595, and in 1693 it

was taken and burned by the French. The Dutch were in possession from 1702 till 1718, when they restored the town to the emperor. See Gorisscn's edition of Melard, fist. de la ville et du chdteau de Huy, Huy, 1839.

HUYGENS, CuristTriAan (1629-1695), mathematician, mechanician, astronomer, and physicist, was born at the Hague, April 14, 1629. He was the second son of Constan- tin Huygens, noticed below. From his father Christiaan

received the rudiments of his education, which was con- tinued at Leyden under Vinnius and Schooten, and com- pleted in the juridical school of Breda. His mathematical bent, however, soon diverted him from his legal studics,

and the perusal of some of his earliest theorems enabled

Descartes to predict his future greatness. In 1649 he accompanied the mission of Henry, count of Nassau, to Denmark, and in 1651 entered the lists of science as an assailant of the unsound system of quadratures adopted by Gregory of St Vincent. This first essay (Laetasis quadra- ture circult, Leyden, 1651) was quickly succecded by his Theoremata de quadratura hyperboles, ellipsis, et circult ; while, in a treatise entitled De circuli magnitudine inventa, he made, three years later, the closest approximation hitherto obtained to the ratio of the circumferenee to the diameter of a circle.

But another class of subjects was about to engage his attention. 'The improvement of the telescope was then justly regarded asa sine qua non for the advancement of astronomical knowledge. Owing, however, to the difficul- ties interposed by spherical and chromatic aberration, little progress had been inade in that direction when, in 1655, Huygens, working with his brother Constantin, hit upon a new method of grinding and polishing lenses. 'The im- mediate results of the clearer definition obtained were the detection of a satellite to Saturn (the sixth in order of dis- tance from its primary), and the resolution into their true form of the abnormal appendages to that planet. Each discovery in turn was, according to the prevailing custom, announced to the learned world under the veil of an anagram—removed, in the case of the first, by the publica- tion, early in 1656, of the little tract De Saturni luna observatio nova ; but retained, as regards the second, until 1659, when in the Systema Saturniwm the varying appear- ances of the so-called " triple planct " were clearly explained as the phases of a ring inclined at an angle of 20° to the ecliptic. His application of the pendulum to regulate the movement of clocks was another fruit of his astronomical labours, springing, as it did, from his experience of the need for an exact measure of time in observing the heavens. The invention dates from 1656; the Horologium, contain- ing a

description of the requisite mechanism, was published in the following year, and on the 16th of June 1657 Huygens presented his first " pendulum-clock" to the states-general.

His reputation now became cosmopolitan, As early as 1655 the university of Angers had distinguished him with an honorary degree of doctor of laws. In 1663, on the occasion of his second visit to England, he was elected a fellow of the Royal Society, and imparted to that body in January 1669 a clear and concise statement of the laws governing the collision of elastic bodies. Although these conclusions were arrived at independently, and, as it would secm, several ycars previous to their publication, they were in great measure anticipated by the communications on the same subject of Wallis and Wren, made respectively in November and December 1668.

Huygens had before this time fixed his abode in France. In 1665 Colbert made to him on behalf of Louis XIV. an offer too tempting to be refused, aud between the following year and 1681 his residence in the philosophic seclusion of the Bibliothéque du Roi was only interrupted by two short visits to his native country. His magnum opus dates from this period. The Horologium Oscillatorium, published with a dedication to his royal patron in 1673, contained original discoveries sufficient to have furnished materials for half a dozen striking disquisitions. His solution of the celebrated problem of the 'centre of oscillation " formed in itself an important event in the history of mechanics. Assuming as an axiom that the centre of gravity of any num-

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ber of interdependent bodies cannot rise higher than the point from which it fell, he arrived, by anticipating in the particular case the general principle of the conservation of vis viva, at correct although not strictly demonstrated con- clusions. His treatment of the subject is especially note- worthy as being the first successful attempt to deal with the dynamics of a system. The determination of the true rélation between the length of a pendulum and the time of its oscillation ; the invention of the theory of evolutes ; the discovery, hence ensuing, that the cycloid is its own evolute, and is strictly isochronous ; the ingenious although practi- cally inoperative idea of correcting the "circular error Por the pendulum by applying cycloidal

cheeks to clocks— were all contained in this remarkable treatise. The theorems on the composition of forces in circular motion with which it concluded formed the true prelude to the Principia, and would alone suffice to establish the claim of Huygens to the highest rank among mechanical inventors.

In 1681 he finally severed his French connexions, and returned to Holland. The harsher measures which about that time began to be adopted towards his co-religionists in France are usually assigned as the motive of this step. He now devoted himself during six years to the production of lenses of enormous focal distance, which, mounted on high poles, and connected with the eye-piece by means of a cord, formed what were called "aerial telescopes." Three of his object-glasses, of respectively 123, 180, and 210 feet focal length, are still in the possession of the Royal Society. He also succeeded in constructing an almost perfectly achromatic eye-piece, still known by his name. But his researches in physical optics constitute his chief title-deed to immortality. Although Hooke first proposed the wave theory of light, Huygens gave reality to the conception, . establishing it on a foundation so sure that it has never since been shaken. His powerful scientific imagination enabled him to perceive that an undulation may be broken up into an indefinite number of parts, each of which is the origin of a partial wave, and that the aggregate effect of all these partial waves will reconstitute the primary wave at any subsequent stage of its progress. This resolution of the main undulation is the well-known "Principle of Huygens," and by its means he was enabled to prove the fundamental laws of optics, and to assign the correct construction for the direction of the extraordinary ray in uniaxial crystals. These investigations, together with his discovery of the "wonderful phenomenon" of polarization, are recorded in his Traité de la Lumiere, published at Leyden in 1690, but composed in 1678. In the appended treatise Sur la Cause de la Pésanteur, he rejected gravitation as a universal quality of matter, although admitting the Newtonian theory of the planetary revolutions. From his views on centrifugal force he deduced the oblate figure of the earth, estimating its compression, however, at little more than one-half its actual amount.

Huygens was never married. He died at the Hague, June 8, 1695, bequeathing his manuscripts to the university of Leyden, and his

considerable property to the sons of his younger brother. In character he was as estimable as he was brilliant in intellect. Although, like most men of strong originative power, he assimilated with difficulty the ideas of others, his tardiness sprang rather from inability to depart from the track of his own methods than from reluctance to acknowledge the merits of his competitors.

In addition to the works already mentioncd, his Cosmotheoros—aspeculation concerning the inhabitants of the planets—was printed posthumously at the Hague in 1698, and appeared almost simultane- ously in an English translation. A volume entitled Opera Posthwma, Leyden, 1703, contained his " Dioptrica," in which the ratio between the respective focal lengths of object-glass and eye-glass is given as

the measure of magnifying power, together with the shorter essays De vitris figurandis, De corona et parheliis, &. An early tract De

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ratiocintis in ludo alew, printed in 1657 with Schooten's Evxercita- tiones Mathenvratiew, is notable as one of the first formal treatises on the theory of probabilities; nor should his investigations of the properties of the cissoid, logarithmic, and catenary be left unnoticed. His invention of the spiral watch-spring was explained in the Journal des Savants, February 25, 1675. An edition of his works. was published by 'S Gravesande, of which two quarto volumes appeared under the heading Opera varia, Leyden, 1724, and two supplementary ones entitled. Opera reliqua, Amsterdam, 1728. His scientific correspondence, edited from manuscripts preserved at Ley- den by P. J. Uylenbroek, was published with the title Christiani Hugenti aliorumque seculi XVII. virorum eelebrium Exereitationes Mathematiew et Philosophiew, The Hague, 1833. (A. M. C.)

HUYGENS, Sir Constantign or Constantin (1596- 1687), Dutch poet and diplomatist, was born at the Hague on the 4th of September 1596. His father, Christiaan Huygens, was secretary to the state council, and a man of great political importance. At the baptism of the child, the city of Breda was one of his sponsors, and the famous admiral Justinus van Nassau the other. From his earliest childhood he was trained in every polite accom-

plishment, and before he was seven he could speak French with fluency. He was taught Latin by Johannes Dedelus, and soon became a master of classic versification, As he grew up, he developed not only extraordinary intellectual gifts but great physical beauty and strength, and was one of the most accomplished athletes and gymnasts of his age ; his skill in playing the lute and in the arts of painting and engraving attracted general attention before he began to develop his genius as a writer. In 1616 he proceeded, with his elder brother, to the university of Leyden, He stayed there only one year, and in 1618 proceeded to London with the English ambassador Carleton; he re- mained in London for some months, and then went to .Oxford, where he studied for some time in the Bodleian Library, and to Woodstock, Windsor, and Cambridge; he was introduced at the English court, and played the lute before James I, The most interesting feature of this visit was the intimacy which sprang up between the young Dutch poet and the famous Dr Donne, for whose genius Huygens preserved through life an unbounded admiration. He returned to Holland in company with the English con- tingent of the synod of Dort, and in 1620 he proceeded to Venice in the diplomatic service of his country; on his return he nearly lost his life by a foolhardy exploit, namely, the scaling of the topmost spire of Strasburg. cathedral. In 1621 he published one of his most weighty and popular poems, his Batava Tempe, and in the same year he pro- ceeded again to London, as secretary to the ambassador, Wijngaerdan, but returned in three months. His third diplomatic visit to England lasted longer, from the 5th of December 1621 to the 1st of March 1623. During his absence, his volume of satires, Costelick Mal, dedicated to Jacob Cats, appeared at the Hague. In the autumn of 1622 he was knighted by James . He published a large volume of miscellaneous poems in 1625 under the title of Otiorum libri sex; and in the same year he was appointed private secretary to the stadholder. In 1627 Huygens married Suzanna van Baerle, and the young couple settled In a handsome house in the best part of the Hague; four sons and a daughter were born to them. In 1630 Huygens was called to a seat in the privy council, and he continued to exercise political power with wisdom and vigour for many years, under the title of the lord of Zuylichem. In 1634 he completed his long-talked-of version of the poems of Donne. In 1637 he had the misfortune to lose his admirable wife, and he immediately began to celebrate the virtues and pleasures of their married life in the remarkable didactic poem called Dagwerck, which was not published till long

afterwards. From 1639 to 1641 he occupied himself by building a magnificent house and garden outside the Hague, and by celebrating their beauties in a poem

entitled Hofwijck, which saw the light in 1654. In 1647 he wrote his beautiful poem of Oogentroost or " Eye Con- solation," to gratify his blind friend Lucretia van Trollo. He made his solitary effort in the dramatic line in 1659, when he brought out his comedy of Z'rijntje Cornelis, which deals, in rather broad humour, with the adventures of the wife of a ship's captain at Zaandam. In 1658 he rearranged his poems, and issued them with many additions, under the title of Corn Flowers. He proposed to the Government that the present highway from the Hague to the sea at Scheven- ingen should be constructed, and during his absence on a diplomatic mission to the French court in 1666 the road was made as a compliment to the venerable statesman, who expressed his gratitude in a descriptive poem entitled Zeestraet. Huygens edited his poems for the last time in 1672, and died in his ninety-first year, on the 28th of March 1687. His second son, Christiaan, the eminent astronomer, is noticed above.

Constantijn Huygens is the most brilliant figure in Dutch literary history. Other statesmen surpassed him in political influence, and at least two other poets surpassed him in the value and originality of their writings. But his figure was more dignified and splendid, his talents were more varied, and his general accomplishments more remarkable than those of any other person of his age, the greatest age in the history of the Netherlands, Huygens is the grand seigneur of the republic, the type of aristocratic oligarchy, the jewel and ornament of Dutch liberty. When we consider his imposing character and the positive value of his writings, we may well be surprised that he has not found a modern editor. It is a disgrace to Dutch scholarship that no complete collection of the writings of Huygens exists. His autobiography, De vita propria sermones, did not see the light until 1827, and his remarkable poem, Cluys- werck, was not printed until 1842. As a poet Huygens shows a finer sense of form than any other Dutch writer; the language, in his hands, becomes as flexible as Italian. His cpistles and lighter

pieces, in particular, display his metrical ease and facility to perfcc- tion. (E. W. G.)

HUYSMANS. Four painters of this family matriculated in the Antwerp guild in the 17th century. Cornelis the elder, apprenticed in 1633, passed for a mastership in 1636, and remained obscure. Jacob, apprenticed to Frans Wouters in 1650, wandered to England towards the close of the reign of Charles IL, and competed with Lely as a fashionable portrait painter. He executed a portrait of the queen, Catherine of Braganza, now in the national portrait gallery, and Horace Walpole assigns to him the likeness of Lady Bellasys, now catalogued at Hampton Court as a work of Lely. His portrait of Izaak Walton in the National Gallery shows a disposition to imitate the styles of Rubens and Van Dyke. According to most accounts he died in London in 1696. Jan Baptist Huysmans, born at Antwerp in 1654, matriculated in 1676-77, and died there in 1715-16. He was younger brother to Cornelis Huysmans the second, who was born at Antwerp in 1648, and educated by Gaspar de Wit and Jacob van Artois. Of Jan Baptist little or nothing has been preserved, except that he registered numerous apprentices at Antwerp, and painted a landscape dated 1697 now in the Brussels museum. But for the signature critics would assign this piece to his brother. Cornelis the second is the only master of the name of Huysmans whose talent was largely acknowledged. He chanced to receive lessons from two artists, one of whom was familiar with the Roman art of the Poussins, whilst the other inherited the scenic style of the school of Rubens. He combined the two ina rich, highly coloured, and usually effective style, which, however, was not free from monotony. Seldom attempting anything but woodside views with fancy backgrounds, half Italian, half Flemish, he painted with great facility, and left numerous examples behind. At the outset of his career he practised at Malines, where he married in 1682, and there too he entered into some busi- ness connexion with Van der Meulen, for whom he painted some backgrounds. In 1706 he withdrew to Antwerp,

where he resided till 1717, returning then to Malines,

where he died on the Ist of June 1727.

Though most of his pictures were composed for cabincts rather than churches, he sometimes emulated Van Artois in the production of large sacred pieces, and for many years his Christ on the Road to Emmaus adorned the choir of Notre Dame of Malines. In the gallery of Nantes, where three of his small landseapes are preserved, there hangs an Investment of Luxembourg, by Van der Meulen, of whieh he is known to have laid in the background. The two national galleries of London and Edinburgh contain each one example of his skill. Blenheim, too, and other private galleries in England, possess one or more of his pictures. But most of his works are on the Continent,—four a-piece in the Louvre, Augsburg, and Stuttgart; three a-pieee in Berlin, Brunswick, Cologne, and Munich; two in Cassel and St Petersburg; one at Antwerp, Brus- sels, Carlsruhe, Copenhagen, Dresden, and Hanover.

HUYSUM, Jaw van (1682-1749), was born at Amster- dam in 1682, and died in his native city on the 8th of February 1749. He was the son of Justus van Huysum, whose practice remained entirely local, but who is said to have been expeditious in decorating doorways, screens, and vases, A picture by this artist is still preserved in the gallery of Brunswick, representing Orpheus and the Beasts in a wooded landscape, and here we have some explanation of his son's fondness for landscapes of a conventional and Arcadian kind; for Jan van Huysum, though skilled as a painter of still life, believed himself to possess the genius of alandscape painter. Half his pictures in public galleries are landscapes, views of imaginary lakes and harbours with impossible ruins and classic edifices, and woods of tall and motionless trees,—the whole very glossy and smooth, and entirely lifeless. The earliest dated work of this kind is that of 1717, in the Louvre, a grove with maidens culling flowers near a tomb, ruins of a portico, and a distant palace on the shores of a lake bounded by mountains. In the picture market these landscapes are worth comparatively little, whilst the master's fruit and flower pieces are all the more appreciated, and good examples readily fetch from £800 to £900. It is doubtful whether any artist in this peculiar walk of art ever surpassed Van Huysum in representing fruit and flowers. It has been said that his fruit has no savour and his flowers have no perfume,—in other words, that they arc hard and artificial,—but

this is scarcely true. In substance fruit and flower are delicate and finished imitations of nature in its more subtle varieties of matter. The fruit has an incomparable blush of down, the flowers have a perfect delicacy of tissue. Van Huysum too shows supreme art in relieving flowers of various colours against each other, and often against a light and transparent background. He is always bright, sometimes even gaudy. Great taste and much grace and elegance are apparent in the arrangement of bouquets and fruit in vases adorned with bas reliefs or in baskets on marble tables. There is exquisite and faultless finish everywhere. But what Van Huysum has not is the breadth, the bold effectiveness, and the depth of thought of De Heem from whom he descends through Abraham Mignon.

Some of the finest of Van Huysum's fruit and flower pieces have been in English private collections :—those of 1723 in the earl of Ellesmere's gallery, others of 1730-32 in the collections of Hope and Ashburton. One of the best examples is now in the National Gallery (1736-87), which came from Mr Wells of Redleaf and Abraham Darby. No public museum has finer and more numerous specimens than the Louvre, which boasts of four landseapes and six panels with still life; then come Berlin and Amsterdam with four fruit and:, flower pieces; then St Petersburg, Munich, Hanover, Dresden, The Hague, Brunswick, Vienna, Carlsruhe, aud Copenhagen.

HWEN T'SANG (Hroven Tusanc, H1wEn T'sanc) is the most eminent representative of a remarkable and valuable branch of Chinese literature, known during the last half century, chiefly through the labours of Continental scholars. It consists of the narratives of Chinese Buddhists who travelled to India, whilst their religion flourished

there, with the view of visiting the sites consecrated by the history of Sakya Muni, of studying at the great convents which then existed in India, and of collecting books, reliques, and other sacred objects. In short, their objects and their narratives bear a strong analogy to the objects and narratives of the many pilgrimages to Palestine in the same and later ages which have come down to us in ecclesiastical collections.

The importance of these writings as throwing light on the geography and history of India and adjoining countries, during a very dark period, is great, and they have been the subject of elaborate commentaries by students in our own day, some of the chief of which will be noted at the end of this article. Several Chinese memoirs of this kind appear to have perished ; and especially to be regretted is a great collection of the works of travellers to India, religious and secular, in sixty books, with forty more of maps and illus- trations, published at the expense of the emperor Kao- T'song of the T'ang dynasty, 666 .D., with a preface from the imperial hand. We will mention the clerical travellers of this description who are known to us by name.

1. Shi-tao-'on (died 885) wrote a work on his travels to the 'western lands" (an expression applying often to India), which is supposed to be lost. 2. Fa-hian travelled to India in 399, and returned by sea in 414. His work, called Fo-Kwé-Ki, or Memoirs on the Buddha Realms, has been translated by Abel-Rémusat and Landresse, and again into English by the Rev. 8. Beale; Mr Laidlay of Calcutta also published a translation from the French, with in- teresting notes. 8. Hwai Seng and Sung-Yun, monks, travelled to India to collect books and reliques, 518-521. Their short nar- rative has been translated by the late Karl Fried. Neumann, and also by Mr Beale (along with Fa-hian). 4. Hwen T'sang, the subject of this notice. In relation to his travels there are two Chinese works, both of which have been translated with an immense appliance of labour and learning by M. Stanislas Julien, viz., (a) the Ta-T°ang-Si-Yu-Kt, or Memoirs on Western Countries isswed by the T'ang Dynasty, which was compiled under the traveller's own supervision, by order of the great emperor Tai-T'sung; and (b) a Biography of Hwen Tsang by two of his contemporaries. 5. The Itinerary of Fifty-six Religious Travellers, compiled and published under imperial authority, 780. 6, The Itinerary of Khi-Nie, who travelled (964-976) at the head of a large body of monks to collect books, &¢. Neither of the last two has been translated.

Hwen T'sang was born in the district of Keu-Shi, near Honan-Fu, about 605, a period at which Buddhism appears to have had a powerful influence upon a large body of educated Chinese. From childhood grave and studious, he was taken in charge by an elder brother who had adopted the

monastic life, in a convent at the royal city of Loyang in Honan. Hwen T'sang soon followed his brother's example. For some years he travelled over China, teach- ing and learning, and eventually settled for a time at the capital Chang-ngan (now Si-ngan-fu in Shensi), where his fame for learning became great. The desire which he entertained to visit India, in order to penetrate all the doctrines of the Buddhist philosophy, and to perfect the collections of Indian books which existed in China, grew irresistible, and in August 629 he started upon his solitary journey, eluding with difficulty the strict prohibition which was in force against crossing the frontier.

The "master of the law," as his biographers call him, plunged alone into the terrible desert of the Gobi, then known as the Sha-ho or " Sand River," between Kwa-chau and Igu (now Hami or Kamil), At long intervals he found help from the small garrisons of the towers that dotted the desert track. Very striking is the description, like that given six centuries later by Marco Polo, of the quasi-super- natural horrors that beset the lonely traveller in the wilder- ness—the visions of armies and banners; and the manner in which they are dissipated singularly recalls passages 1n Bunyan's Pilgrim's Progress. After great suffering Hwen T'sang reached Igu, the seat of a Turkish principality, and pursued his way along the southern foot of the T'ien-shan, which he crossed by a glacier pass (vividly described) in

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the longitude of Lake Issikul. In the valley of the Talas river he encounters the great khan of the Turks ona hunt- ing party,—a rencontre which it is interesting to compare with the visit of Zemarchus to the great khan Dizabulus, sixty years before, in the same region. Passing by the present Tashkend, and by Samarkand, then inhabited by fire worshippers, he reached the basin of the Upper Oxus, which had recently been the seat of the powerful dominion of the Haiathelah, Ephthalites, or White Huns, known in earlier days tothe Greeks as Zochari, and to Hwen T'sang (by the same name) as Z'wholo or Tukhara. His account of the many small states into which the Tukhara empire had broken up is of great interest, as many of them are identical in name and topography with the high valley states

and districts on the Upper Oxus, which are at this day the object of so much geographical and political interest.

Passing by Bamian, where he speaks of the great idols still so famous, he crosses Hindu-Kush, and descends the valley of the Cabul river to Nagarahara, the site of which, still known as Nagara, adjoining Jalélabad, has recently been explored by Mr W. Simpson, Travelling thence to Peshawar (Purushapira), the capital of Gandhara, he made a digression, through the now inaccessible valley of Swat and the Dard states, to the Upper Indus, returning to Peshawar, and then crossing the Indus (Sintu) into the decayed kingdom of Zawzla (Ta-cha-si-lo, Takshasil4), then subject to Kashmir. In the latter valley he spent two whole years (631-633), studying in the convents, and visiting the many monuments of his faith, We cannot follow his further travels in detail, and can only mention some of the chief points in his devious route. Such are Mathura (Jfot'ulo), whence he turned north to Thanesar and the upper Jumna and Ganges, returning south down the valley of the latter to Kanyakubja or Kanauj, then one of the great capitals of India. The pilgrim next entered on a circuit of the most famous sites of Buddhist and of ancient Indian history, such as Ayodhya, Prayaga (Allaha- bad), Kausimbhi, Sravasti, Kapilavastu the birthplace of Sakya, Kusinagara his death place, Pdtaliptitra (Patna, the Palibothra of the Greeks), Gaya, Rajagriha, and Nalanda, the most famous and learned monastery and college in India, adorned by the gifts of successive kings, of the splendour of which he gives a vivid description, and of which traces have recently been recovered. 'There he again spent nearly two years in mastering Sanskrit and the depths of Buddhist philosophy. Again, proceeding down the banks of the Ganges, he diverged eastward to Kamartipa (Assam), and then passed by the great port of Témralipti (Tamluk, the misplaced Tamalitis of Ptolemy), and through Orissa to Kanchipara (Conjeveram), about 640. Thence he went northward across the Carnatic and Maharashtra to Barakacheva (Baréch of our day, Barygaza of the Greeks). After this he visited Malwa, Kach'h, Surdshtra (peninsular Guzerat, Syrastrene of the Greeks), Sindh, Multan, and Ghazni, whence he rejoined his former course in the basin of the Cabul river. :

This time, however, hecrosses Pamir, of which he givesa re- markable account, and passes by Kashgar, Khotan (Kustana), and the vicinity of Lop

(Vavapa) across the desert to Kwa- chau, whence he had made his venturous and lonely plunge into the waste fifteen years before. He carried with him great collections of books, precious images, and reliques, and was received (April 645) with public and imperial enthusiasm. The emperor Tai-T'sung desired him to com- mit his journey to writing, and also that he should abandon the eremitic rule and serve the state. This last he declined, and devoted himself to the compilation of his narrative and the translation of the books he had brought with him from India, The former was completed 648 a.v. In 664

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Hwen T'sang died in a convent at Chang-ngan. Some things in the history of his last days, and in the indications of beatitude recorded, strongly recall the parallel history of the saints of the Roman calendar. But on the other hand we find the Chinese saint, on the approach of death, causing one of his disciples to frame a catalogue of his good works, of the books that he had translated or caused to be tran- scribed, of the sacred pictures executed at his cost, of the alms that he had given, of the living creatures that he had ransomed from death. " When Kia-shang had ended writing this list, the master ordered him to read it aloud. After hearing it the devotees clasped their hands, and showered their felicitations on him." Thus the " well-done, good and faithful," comes from the servant himself in self-applause.

The book of the biography, by the disciples Hwae-li and Yen-t'song, as rendered with judicious omissions by Stan. Julien, is exceedingly interesting ; its Chinese style receives high praise from the translator, who says he has often had to regret his inability to reproduce its grace, elegance, and vivacity. We cannot here give any idea of the uses which the accounts of Hwen T'sang have served in illustrating geography and history, but must refer to the appended list of works.

Fo-Kowe-Ki, trad. du Chinois, par Abel-Rémusat, revu et com- plété par Klaproth et Landresse, Paris, 1836; H. de la Vie de Hiouen-Thsang, &c., trad. du Chinois par Stanislas Julien, Paris, 1853: Alémoires sur les Contrées Oceidentales . . . trad. du Chinois en Frangais (par le méme), 2 vols., Paris, 1857-58; Jfémoire Analytique, &c., attached to the last work, by L. Vivien de St Martin; " Attempt to identify some of the Placcs

mentioncd in the Itinerary of Hiuan Thsang," by Major Wm. Anderson, C.B., in Journ. As. Soe. Bengal, xvi. pt. 2, p. 1188 (the enunciation of a singularly perverse theory) ; " Verification of the Itinerary of Hwan Thsang," &c., by Capt. Alex. Cunningham, Bengal Engineers, ibid., xvii. pt. 1, p. 476; Travels of Fah-hian and Sung-Yan, Buddhist Pilgrims, &c., by Sam. Beal, 1869; The Ancient Geography of India, by Major-Gen. Alex. Cunningham, R.E., 1871; ' Notes on Hwen Thsang's Account of the Principalities of Tokharistan," by Col. H. Yule, C.B., in Jowrn. Roy. As. Soe., new ser., vol. vi. p. 82; 'On Hiouen Thsang's Journey from Patna to Ballabhi," by James Fergusson, D.C.L., ibid., p. 218. (He Ya)

HYACINTH, also called JacrinTH, one of the most popular of garden flowers, "' supreme amongst the flowers of spring." It is no new favourite, having been in cultivation prior to 1597, at which date Gerard records the existence of six varieties, which are not indicated as particularly rare or novel. Rea in 1676 mentions several single and double varieties as being then in English gardens, and Justice in 1754 describes upwards of fifty single-flowered varieties, and nearly one hundred double-flowered ones, as a selection of the best from the catalogues of two then celebrated Dutch growers. One of the Dutch sorts, called La Reine de Femmes, a single white, is said to have produced from thirty-four to thirty-eight flowers in a spike, and on its first appearance to have sold for 50 guilders a bulb; while one called Overwinnaar or Conqueror, a double blue, sold at first for 100 guilders, Gloria Mundi for 500 guilders, and Koning Saloman for 600 guilders. Several sorts are at that date mentioned as blooming well in water-glasses. Justice relates that he himself raised several very valuable double-flowered kinds from seeds, which many of the sorts he describes are noted for producing freely.

The original of the cultivated hyacinth, S/Zyacinthus orientalis, is by comparison an insignificant plant, bearing on a spike only a few small narrow-lobed washy blue flowers. So great has been the improvement effected by the florists, and chiefly by the Dutch, that the modern hyacinth would scarcely be recognized as the descendant of the type above referred to, the spikes being long and dense, composed of a large number of flowers; the spikes produced by strong bulbs not unfrequently measure 6 or 7 inches

in length and from 7 to 9 inches in circumference, with the flowers closely set on from bottom to top. Of late

years much improvement has been effected in the size of the individual flowers and the breadth of their recurving lobes, as well as in securing increased brilliancy and depth of colour.

The peculiarities of the soil and climate of Holland are so very favourable to their production that Dutch florists have made a specialty of the growth of those and other bulbous-rooted flowers. An area of 125 acres is devoted to the growth of hyacinths in the vicinity of Haarlem, and is estimated to bring in a revenue of nearly £30,000. Some notion of the vast number imported into England annually may be formed from the fact that, for the supply of flowering plants to Covent Garden, one market grower alone produces from 60,000 to 70,000 in pots under glass, their blooming period being accelerated by artificial heat, and extending from Christmas onwards until they bloom naturally in the open ground.

In the spring flower garden few plants make a more effective display than the hyacinth. Dotted in clumps in the flower borders, and arranged in masses of well-contrasted colours in beds in the flower garden, there are no flowers which impart during their season—March and April—a gayer tone to the parterre. The bulbs are rarely grown a second time, either for indoor or outdoor culture, though with care they might be utilized for the latter purpose ; and hence the enormous numbers which are procured each re-curring year from Holland.

The first hyacinths were single-flowered, but towards the close of the 17th century double-fiowered ones began to appear, and till a recent period these bulbs were the most esteemed. At the present time, however, the single-flowered sorts are in the ascendant, as they produce more regular and symmetrical spikes of blossom, the flowers being closely set and more or less horizontal in direction, while most of the double sorts have the bells distant and dependent, so that the spike is loose and by comparison ineffective. For pot culture, and for growth in water-glasses especially, the single-flowered sorts are greatly to be pre- ferred. Few if any of the original

kinds are now in cultiva- tion, a succession of new and improved varieties having been raised, the demand for which is regulated in some respects by fashion. At the present day our nurserymen offer in their annual catalogues of select sorts between two and three hundred distinct varieties.

The earliest of all the hyacinths, and one which is very valuable for forcing into flower in winter, is called the white Roman hyacinth. Tt is small-flowered, but very sweet, and, if potted in September or October, as soon as the bulbs can be procured after importation, may easily be had in blossom by Christmas, when white flowers are so much sought after. Ofcourse this is done with the aid of a forcing-house, but a very high temperature is not required. The best soil for pot hyacinths is made up of two parts turfy loam, one part decayed Jeaf-mould, and one part well-decomposed cow dung, with sand enough to make it porous, and with sufficient drainage. :

The name of hyacinth is applied to several other plants having bulbous roots. The Cape hyacinth is Scilla corym- bosa ; the grape hyacinth, Muscari botryoides; the tassel hyacinth, fuscari comoswm, and the feathered hyacinth, Muscari comosum monstrosum; the starch hyacinth, Muscart racemosum; the star hyacinth, Scilla amena; the lily hyacinth, Scilla Liliohyacinthus; the hyacinth of Peru, Scilla peruviana; the wild hyacinth or blue-bell, Hyacin- thus non scriptus; the wild hyacinth of America, Camassia esculenta; the Missouri hyacinth, /Tesperoscordum lacteum ; aud the native hyacinth of Tasmania, Thelymitra media.

HYACINTHUS, a mythological figure connected with the Hyacinthia, a festival celebrated by the Spartans in honour of Apollo of Amycle, whose primitive image, stand-

ing on a throne, is described by Pausanias (iii. 19,4). The legend attached to the festival is to the effect that Hyacin- thus, a beautiful youth beloved by the god, was accidentally killed by him with a discus. From his blood sprang a dark- coloured flower called after him hyacinth, on whose petals is the word aia?, alas. The myth, like that of Linus (v. Brugsch, Die Adonis-Klage und das Linos-Lied), is one of the many popular representations of the beautiful spring vegetation slain by the hot sun of summer (which is

here and in many other legends denoted by the symbol of a discus). The sister of Hyacinthus is Polyboea, the much nourishing fertility of the rich Amyclean valley ; while his brother is Cynortas, the rising of the dog (the hot) star. But with the death of the spring is united the idea of its certain resuscitation ina new year; like Dionysus, the hero is not merely dead but elevated to heaven. The festival took place on the three hottest days of summer, 7th to 10th of the month Hecatombeus (which was called in Sicily Hyacinthius), and its rites were a mixture of mourning and rejoicing (Athen., iv. 17).

HYADES, five stars forming the head of the larger con- stellation, the Bull. Their rising along with the sun marks the opening of the rainy season, hence their name Hyades —the Rainy. As mythological figures they were said to be daughters of Atlas, who as a reward for some pious act were translated to heaven. The nature of the deed is variously stated: sometimes it is their long-continued grief for their brother Hyas, who was slain by a snake (or boar or lion); at other times it is their having acted as nurses of Dionysus Hyes. In the latter case they are counted as nymphs of Nysa. When their charge was threatened by Lycurgus they fled with him to Thetis or to Ino in Thebes. They are also described as nymphs of Dodona, who acted as nurses of the infant Zeus. In any case their character as clouds and rain-givers is obvious. Their number is sometimes given as two, also as three, especially in Attica, which leads Brunn to see them in the pediment of the Parthenon in the figures usually spoken of as "The Fates."

HYENA (Hyenide), a family of digitigrade carni- vorous mammals, approaching the Felidae or cats in the character of the dentition, while resembling the Viverridee or civets in the possession of a glandular pouch beneath the anus, and therefore usually classed asa transition group between these two families. It comprises a single genus (Hycena), and three species, which resemble each other and differ from all other carnivores in having both pairs of feet with four toes each. They are further characterized by the greater length of their fore legs as compared with those behind, by their well-developed although non-retractile claws, by their prickly cat-like tongue, and by the enormous strength of their jaws and teeth, which enables them to break open the hardest bones, and to retain what they have seized with the most unrelaxing grip.

The Striped Hyena (Hyena striata) is the most widely distributed and best known form, being found throughout India, Persia, Asia Minor, and the northern half of Africa, while, if the strand wolf (ZZycena villosa) of the Cape colonists is only a variety of this species, as many naturalists suppose, its range will be thereby extended to the southern extremity of the African continent. It resembles a wolf in size, and is of a greyish-brown colour, marked with indistinct longi- tudinal stripes of a darker hue, while the legs are trans versely striped as in the zebra. The hairs on its body are long, especially on the ridge of the neck and back, where they form a distinct mane, which is continued along the tail. The hyena is nocturnal in its habits, preferring by day the gloom of caves and ruins, or of the burrows which it occasionally forms, but coming forth at sunset to make night hideous with its unearthly howling, which, when the

animal is excited, changes into what has been compared to demoniac laughter, and hence the name of "laughing hyena," by which it is also known. The food of those creatures consists chiefly of carrion, and they thus perform a highly useful service in hot countries by devouring the remains of dead animals which might otherwise pollute the air. Soravenous, however, are they that even the bodies of the buried dead are not safe from their attacks, their power- ful claws enabling them to gain access to the newly interred bodies in the Eastern cemeteries, which they are said habit- ually to frequent. They also feed on the flesh of animals, which they hunt in packs. When driven by hunger they have thus been frequently known to enter villages by night and to carry off such domestic animals as they might chance tofind. Bruce, the African traveller, states that everywhere in Abyssinia they were a plague. "Gondar," he says, " was full of them from the time it turned dark till the dawn.

In short, the hyzena was the plague of our lives, the terror

of our night walks, the destruction of our mules and asses, which above all others are his favourite food." Although, in proportion to its size, possessing probably the most powerful teeth and jaws in the whole mammalian series, the pusillanimity of the hyzna is such as to prevent its attacking animals greatly inferior to itself in strength. The

Fig. 1.—Striped Hyena.

Arab, for this reason, holds it in contempt ; and, when he condescends to hunt the hyzna, he does not waste his ammunition upon it, but runs it down with dogs. It has usually been regarded as untameable ; this, however, is not the case, for when properly treated in captivity, it has been known to exhibit the greatest docility and attachment to its keepers; and Colonel Sykes states that in certain dis- tricts of Central India where those creatures abound they are as susceptible of domestication as ordinary dogs.

The Spotted Hyzna (Hyena crocuta) takes the place of the striped species in the southern half of the African con- tinent, to which it is confined. It resembles the other in size, but differs from it considerably in appearance, the stripes of the one being replaced by dark brown spots on a yellowish ground in the other, while in the " tiger-wolf," as this species is called at the Cape, the mane is much less distinct, According to Schweinfurth, who met with it in the heart of Africa, it is a much more powerful and savage animal than the northern form. Although averse to hunt- ing living prey, it takes to the chase when carrion is not to be had, and the same traveller was on one occasion startled by a spotted hyzena which darted past him, like lightning, in pursuit of an antelope. At the Cape it was formerly very common, and occasionally committed great havoc among the cattle, while it did not hesitate to enter the Kaffre dwellings at night and carry off the child sleeping by

its mother's side. By persistent trapping and shooting, its numbers have now been considerably reduced, with the result, however, of making it, like the hippopotamus of the same regions, exceedingly wary, so that it is not readily caught in any trap with which it has had an opportunity of becoming acquainted. Like the northern species, the

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paw. Ft Nee a ee Fia. 2.—Spotted Hyana, spotted hysena has been tamed, and has occasionally

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been trained to take the place of the dog. Its skin ex- hibits a considerable variety of colour and marking, and Schweinfurth found many skins in use among the Niam- niams of Central Africa, in the form of aprons. The brown hyena (Hyena rufa) is also a native of South Africa.

Although hyznas are now confined to the warmer regions of the Old World, their fossil remains show that they had a much more northerly range during Tertiary times. Abund- ant remains of a larger species than any now living have been found in the caves of England, France, and Germany. This species, known as the cave hyena (Hyana speloea), is supposed to have been most nearly allied to the spotted hyena of South Africa, but does not appear to have extended farther south than the middle of Europe. Remains which have been doubtfully identified as belonging to the striped species have also been found in the south of France, and others in Sicily and Algeria, undoubtedly belonging to the spotted form of South Africa, which must thus have had a much more northerly extension in Tertiary times. No remains of the hyena are known to occur in the New World.

HYBLA is the name of several cities in Sicily. A Sicilian goddess was named Hyblwa (Paus. v. 23. 6) ; hence doubtless the name was so common. The Hybla of which we hear most was founded by the Megarians, about the year 726 3.c., and is probably the same as Megara Hyblea. For some time it was a flourishing city ; a century after its foundation it founded in its turn the colony of Selinus. But about the year 481 B.c. it was completely destroyed by Gelon, tyrant of Syracuse. The mass of the inhabitants were sold as slaves; the richer were transported to Syra- cuse and there admitted as citizens) Among these was Epicharmus of Cos, who had been brought up in Megara. During the Athenian expedition to Sicily, Lamachus urged that they should occupy the deserted site. It must there- fore have had a fine harbour, whence we may consider that it probably lay beside the modern city of Agosta. A small settlement seems afterwards to have grown up on the site. An older city called Hybla, belonging to the native Siculi, lay not far off on the southern slope of Mount Etna, near the river Symethus, It is mentioned in the history of the Second Punic War ; and in the time of Cicero (Verr., iii. 43) it was @ flourishing place. It is exceedingly difficult to

separate the history of these two cities ; and no doubt the ancient writers themselves often do not clearly distinguish between them. The Hyblean honey, which was produced on the hills beside them, is often celebrated by the Latin poets. There was a third city of the same name on the road from Syracuse to Agrigentum.

HYBRIDISM. The Latin word hybrida, or hibrida, a hybrid or mongrel, is commonly derived from the Greek d@prs, an insult or outrage, with special reference to lust ; hence an outrage on nature, a mongrel.

As a general rule animals or plants belonging to distinct species are not able, when crossed with each other, to pro- duce offspring. There are, however, innumerable excep- tions to this rule; and hybridism is the word employed to denote these exceptions. It is an abstract term which signifies the more or less fertile crossing of distinct species. In scientific usage, the term "hybrid" is exclusively reserved to denote the result of a fertile cross between two distinct species, while the term "' mongrel" is the one which is as exclusively reserved to denote the result of a fertile cross between two varieties of the same species.

Until recently the interest attaching to hybridism was almost entirely of a practical nature, and arose from the fact, which is of considerable importance in horticulture, that hybrids are often found to present characters somewhat different from those of either parent species. But of late years the subject has acquired a high degree of scientific interest in relation to the theory of descent. On this account it has been so carefully and thoroughly treated by Mr Darwin that a brief exposition of its main facts and principles must necessarily be little more than a condensation of his already closely packed material.

Looking first to the general facts and principles of hybridism, apart from their bearing upon the theory of descent, the following may be regarded as the most im- portant :—

1. The laws governing the production of hybrids are identical, or nearly identical, in the animal and vegetable kingdoms.

2. The sterility which so generally attends the crossing of two specific forms is to be distinguished as of two kinds, which, although often confounded by naturalists, are in reality quite distinct. For the sterility may obtain between the two parent species when first crossed, or it may first assert itself in their hybrid progeny. In the latter case the hybrids, although possibly produced without any appearance of infertility on the part of their parent species, nevertheless prove more or less infertile among themselves, and also with members of either parent species,

3. The degree of both kinds of infertility varies in the case of different species, and in that of their hybrid progeny, from absolute sterility up to complete fertility. Thus, to take the case of plants, "when pollen from a plant of one family is placed on the stigma of a plant of a distinct family, it exerts no more influence than so much inorganic dust. From this absolute zero of fertility, the pollen of different species, applied to the stigma of some one species of the same genus, yields a perfect gradation in the number of seeds produced, up to nearly complete, or even quite complete, fertility; so, in hybrids themselves, there are some which never have produced, and probably never would produce, even with the pollen of the pure parents, a single fertile seed ; but in some of these cases a first trace of fertility may be detected, by the pollen of one of the pure parent species causing the flower of the hybrid to wither earlier than it otherwise would have done; and the early withering of the flower is well known to be a sign of incipient fertilization. From this extreme degree of sterility we have self- fertilized hybrids producing a greater and greater number of seeds up to perfect fertility."

H Y B—H Y B

4. Although there is, as a rule, a certain parallelism, there is no fixed relation between the degree of sterility manifested by the parent species when crossed and that which is manifested by their hybrid progeny. There are many cases in which two pure species can be crossed with unusual facility, while the resulting hybrids are remark- ably sterile; and, contrariwise, there are species which can only be crossed with extreme difficulty, though the hybrids, when produced, are very fertile. Even within the limits of the same genus, these two opposite cases may occur.

5. When two species are reciprocally crossed, ¢.¢., male A with female B, and male B with female A, the degree of sterility often differs greatly in the two cases. The sterility of the resulting hybrids may differ likewise.

6. The degree of sterility of first crosses and of hybrids runs, to a certain extent, parallel with the systematic affinity of the forms which are united. "For species belonging to distinct genera can rarely, and those belong- ing to distinct families can never, be crossed. The parallelism, however, is far from complete ; for a multitude of closely allied species will not unite, or unite with extreme difficulty, whilst other species, widely different from each other, can be crossed with perfect facility. Nor does the difficulty depend on ordinary constitutional differ- ences; for annual and perennial plants, deciduous and evergreen trees, plants flowering at different seasons, in- habiting different stations, and naturally living under the most opposite climates, can often be crossed with ease. The difficulty or facility apparently depends exclusively on the sexual constitution of the species which are crossed, or on their sexual elective affinity."

Such being the principal facts of hybridism, we may next consider the relation which they bear to the theory of descent. It is obvious that the most important point of contact between the former and the latter consists in this —that, although hybridism is occasionally possible as an exception to the general infertility of species cnter se, it is only, as it were, a partial exception; for, even when pro- duced, the hybrid progeny almost invariably manifest some greater or less degree of sterility, and this not only when crossed among themselves, but even when crossed with either of their parent species. The main facts of hybridism thus at first sight seem to support the time-honoured doctrine that there are placed between all species the barriers of mutual sterility, for the purpose of preventing any admixture of specific qualities by heredity, and so for the purpose of maintaining the immutability of specific types. And the apparent support which this doctrine thus receives from the main facts of hybridism is still further strengthened when these facts are contrasted with those which are supplied by the breeding of our domestic " varieties." For, in the latter case, and as an almost invariable rule, neither the organisms when crossed nor their resulting progeny show any indications of sterility, although the two parent varieties may differ from one another even more widely than do

many natural species which are wholly infertile when crossed. This very general distinction between natural species and domestic varieties has appeared to many competent persons in the present generation so profound and significant that they deem it to be in itself sufficient to discredit, if not to negative, the whole theory of the transmutation of species.

Now, when this distinction is thus posited as an objection to the theory of descent, we must first of all remember that this theory does not require the possibility of the com- mingling of specific types ; it requires, indeed, that specific types should not be immutably fixed, but it does not require that the causes of their mutation should depend upon their mutual crossing. 'The whole difficulty, therefore, which

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the theory of descent has here to meet is to explain why it is that natural species are fenced about, as it were, with the mysterious barriers of sterility, while no such seeming care appears to have been taken in the case of our domestic breeds—even thougli in the latter case artificial selection by the breeders may have produced more visible difference between the two parent races than that which natural selection is supposed to have produced between two natural species.

In answer to this difficulty, the most important con- sideration to begin with is one that is very generally lost sight of. The consideration is that mutual sterility between organic forms has been constituted by naturalists the chief criterion of specific distinction, and therefore it is merely to argue in a circle to maintain that specific distinction is of some transcendental nature because it is so invariably associated with this mutual sterility. If it were not for the fact of their mutual sterility, this and that species would probably not have been classified as such; and therefore it is now scarcely to be considered a matter of any great significance that all species present more or less of the peculiarity in virtue of which they are recognized as species. Or, otherwise stated, on the supposition that species have had a derivative origin, whenever the modification of a specific type has proceeded sufficiently far to induce sterility with allied types, the modified type is, for this reason, classified as a distinct species; otherwise, upon the sup- position, the species could scarcely have become separated out as adistinct

type. The argument which points to such sterility as evidence against this supposition is, therefore, so far inconclusive.

The case, however, ought not in fairness to be stated quite so strongly as this; for mutual sterility, although the chief, is not the only criterion of specific distinction. In forming their classifications, naturalists endeavour as much as possible to have regard to organisms in the totality of their structures andfunctions. It may therefore still be maintained that, although the above consideration as to mutual sterility being selected as the chief criterion of specificdistinction greatly mitigatesthe force of the argument that natural species differ from artificial breeds in being more or less sterile with one another, still this consideration does not altogether destroy that argument. For, on the one hand, it is not mutual sterility alone which is taken as a test of specific distinction; and, on the other hand, it generally so happens that the other qualities distinctive of any given species do not differ more widely from those which are distinctive of allied species than is the case with many of our domestic breeds. It therefore still remains a significant circumstance that, along with the differences distinctive of natural species, there almost invariably goes the protective attribute of mutual sterility; while the possibly greater differences distinctive of our domestic breeds are unaccompanied by any such protective attribute. But, again, this more refined objection can be met and satisfactorily excluded by the general consideration that " as species rarely or never become modified in one character, without being at the same time modified in many, and as systematic affinity includes all visible resemblances and dissimilarities, auy difference in sexual constitution between two species would naturally stand in more or less close relation with their systematic position."

But we are not confined to this general consideration alone. There are several other general considerations which tend still further to mitigate the difficulty, and there are several particular facts which together prove that the alleged distinction between natural species and domestic varieties is one, not of kind, but of degree. We shall, therefore, next proceed to state these general considerations and particular facts.

Upon the theory of descent, mutual sterility between specific types is nothing more than the expression of some certain amount of modification having taken place in the reproductive system of a changing form, which up to that time, and but for the fact of this modification, would have been classified by naturalists as a mere variety. Now the causes which act upon the reproductive system, both of animals and plants, and whether in the direction of sterility or prolificness, are at present hopelessly obscure. We cannot, therefore, expect to distinguish the causes which in the case of any given species have determined sterility. Nor is it necessary, for the meeting of the present difficulty, that this should be done; it is enough for this purpose to show that the causes which thus act upon the reproductive system are much too indistinct to admit of any argument being raised upon them. And this it is most easy to show; for it is not too much to say that the reproductive system is, generally speaking, of all parts of an organism the most delicately susceptible to slight changes in the conditions of life. Mr Darwin has adduced a vast array of facts on this head in his Variation of Animals and Plants under Domestication. As a result of this delicacy, there arises an apparent capriciousness in the ways and degrees in which the reproductive system is affected by slight changes in the con- ditions of life, by too close interbreeding, by grafting, and by many other causes. Thus, for example, the influences of domestication produce more or less sterility in numberless species of wild animals and plants, while in other species— and this, as we shall presently sce, is a matter of great im- portance in the present connexion—such influences are favourable to fertility. Now if we suppose, as in consistency we must suppose, that throughout the course of evolution the reproductive system has always been characterized by a sensitiveness to slight changes similar to that which we now observe, and if we remember that, in any case where these slight changes were sufficient to cause mutual sterility between the modified descendants of a common progenitor, a distinction of species must necessarily have arisen,—we shall cease to regard the present sterility of species iter se as anything more than what might be expected a priori, supposing the theory of descent with gradual modification to be true.

As evidence of the apparent capriciousness with which sterility may be manifested, owing to the slight and imperceptible causes on which it depends, special allusion must here be made to a highly remarkable and

significant fact that has been brought to light by the direct experiments of Mr Darwin. The following is his account of theso experiments :—

"Several plants belonging to distinct orders present two forms, which exist in about cqual numbers, and which differ in no respect except in their reproductive organs,—one form having a long pistil with short stamens, the other a short pistil with long stamens; both with differently-sized pollen grains. With trimorphic plants there arc three forms likewise differing in the length of their pistils and stamens, in the size and colour of the pollen grains, and in some other respects; and, as in each of the three forms there are two sets of stamens, there are altogethcr six sets of stamens and three kinds of pistils. These organs are so proportioned in length to each other that, in any two of the forms, half the stamens in each stand on a level with the stigma of the third form. Now I have shown, and the result has been confirmed by other observers, that in order to obtain full fertility with other plants, it is necessary that the stigma of the one form should be fertilized by pollen taken from the stamens of corresponding height in the other form. So that with dimorphic species two unions, which may be called legitimate, are fully fertile, and two which may be called illegitimate are more or less infertile. With trimorphic species six unions are legitimate or fully fertile, and twelve are illegitimate or more or less infertile. The infertility which may be obscrved in various dimorphic and trimorphic plants when they are illegitimately fertilized, that is, by pollen taken from stamens not corresponding in height with the pistil, differs much in degree up to absolute and utter sterility,— just in the same manner as occurs in crossing distinct specics."

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In this case we appear to have actual evidence of different stages of increasing sterility ix transitu, and this even within the limits of the same natural species. And if even such evidence as this can be resisted, there still remains one very important fact, which directly affects the whole alleged distinction between the sterility of natural species and the fertility of domestic breeds. This fact is that plants belonging to several species of the genus Passt- flora have been amply proved, not only to be completely fertile with plants belonging to other species, but even to be as completely infertile

with plants belonging to their own. Thus fruit could not be obtained from P. alata and P. racemosa except by reciprocally fertilizing them with each other's pollen; and similar facts have been observed by several experimentalists with regard to four or five other species of this genus. The fullest details on the subject are those given by Mr Scott in the Journal of the Linnean Society, vol. vill p. 168. Plants belonging to three species of the genus, viz., P. racemosa, coerulea, and alata, flowered for many years in Edinburgh, but, though repeatedly fertilized by Mr Scott and others with their own pollen, never produced seed. But when mutually crossed in various ways they all produced seed. After quoting this case Mr Darwin adds :—

'Returning to P. alata, I have received (1866) some interesting details from Mr Robinson Munro. Three plants, including one in England, have already been mentioned which were inveterately self-sterile, and Mr Munro informs me of several others which, after repeated trials during many years, have been found in the same predicament. At some other places, however, this species fruits readily when fertilized with its own pollen. At Taymouth Castle there is a plant which was formerly grafted by Mr Donaldson on a distinct species, name unknown, and ever since the operation it has produced fruit in abundance by its own pollen, so that this small and unnatural change in the state of this plant has restored its self- fertility. Some of the seedlings from the Taymouth Castle plant were found to be not only sterile with their own pollen, but with each other's pollen and with the pollen of distinct species. Pollen from the Taymouth plant failed to fertilize certain plants of the same species, but was successful on one plant in the Edinburgh Botanic Gardens. Seedlings were raised from this latter union, and some of their flowers were fertilized by Mr Munro with their own pollen; but they were found to be as self-impotent as the mother plant had always proved, except when fertilized by the grafted 'Taymouth plant, and except, as we shall see, when ferti- lized by her own seedlings, Yet Mr Munro fertilized eighteen flowers on the self-impotent mother plant with pollen from these her own self-impotent secdlings, and obtained, remarkable as the fact is, eighteen fine capsules full of excellent seed. I have met with no case in regard to plants which shows so well as this of P. alata on what small and mysterious causes complete fertility or complete sterility depends."

These cases in the genus Passiflora, although so highly remarkable, are not wholly unique. There is not, indeed, any other case of a natural species, the members of which are only fertile with members of another species; but there are several cases of natural species, the members of which are self-impotent, though freely fertile either with other plants of the same species, or with plants of different though allied species. This may perhaps be regarded as a transitional stage between the ordinary condition of plants and the extraordinary condition that obtains among species of the genus Passiflora. It occurs in individual plants of certain species of Lobelia and Verbascum, and among several genera of orchids. The cases of the latter are particularly remarkable, inasmuch as Fritz Miiller found from numerous experiments, not only that individual plants belonging to the several species were not fertilized by their own pollen, while freely so by pollen taken from distinct species, and even from distinct genera, but that the plant's own pollen was positively deleterious to its stigma, and acted as a polson to the destruction of the flower.

So much, then, for the facts which go to prove on what slight constitutional differences sterility may depend, and the consequent probability there is that it should generally

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be found to accompany a change of organization which is sufficiently great to be regarded by naturalists as a specific distinction. But the pleading must not end here. For there still remains to be adduced the fact, already mentioned as one of the general facts of hybridism, that " the degree of both kinds of fertility varies in the case of different species, and in that of their hybrid progeny, from absolute sterility up to complete fertility." As a matter of fact, the distinction between natural species and domestic varieties, upon which the whole discussion has hitherto proceeded, is in itself untenable; the infertility of natural species when crossed, although without question the general rule, is nevertheless not the invariable rule. We need not point to the highly anomalous case of Passiflora recently mentioned in another connexion, and probably to be explained as the result of cultivation ; for we appear to have sufficient evidence without it. It is true thata great deal of negative evidence has been published upon this point by

very competent experimentalists; but it seems impossible to resist the positive evidence of the Hon. and Rev. W. Herbert, whose distinguished success in hybridizing Mr Darwin attributes to "great horticultural skill, and to his having hot-houses at his command." Of his many results, which from being of a positive kind can scarcely be suspected of inaccuracy, it will be enough to quote the following :—" Every ovule in a pod of Crinum capense fertilized by C. revolutum produced a plant, which I never saw to occur ina case of its natural fecundation." Thus, as Mr Darwin in alluding to this case remarks, " we have perfect, or even more than commonly perfect, fertility in a first cross between two distinct species."

So far, then, as one side of the question before us is concerned, or that relating to the mutual infertility of natural species, enough has been said to show that it presents no real difficulty to the theory of descent. Indeed, in view of all that has now been said, the difficulty, as Mr Darwin has observed, is not so much to account for the sterility of natural species, as it is to account for the con- tinued, or even increased, fertility of our domestic varieties. Turning, therefore, to this other side of the question, we have to remember that the very same sensitiveness of the reproductive system, which in some cases leads to infertility under a change in the conditions of life, in other cases leads to increased fertility under an apparently similar change in the conditions of life. Thus it is that domestication produces such apparently capricious results with regard to fertility—inducing all degrees of infertility in some wild species, while not at all impairing, or even increasing, fertility in others. Consequently, when the question is as to why our domestic varieties do not become sterile inter se when so many natural species have become so, the answer is that the mere fact of their domestication proves that their wild or parent stocks must have been some of those species whose reproductive systems were not highly sensitive to changes in their condition of life, and therefore species which "might be expected to produce varieties little liable to have their reproductive systems injuriously affected by the act of crossing with other varieties which had originated in a like manner." Thus, on the inherently necessary view that our domestic varieties have all proceeded from species which were not easily affected in the direction of sterility, we are not surprised that under variation their reproductive systems should continue to manifest a high degree of tolerance. To this must be added that domestication, if it does not

produce sterility, seems well calculated to increase fertility. For if the causes inducing sterility (whatever they may be) are absent, ample and regular nutrition, combined with innumerable lesser benefits attending domestication, may well be supposed to favour fertility. And, asa matter of fact, according to Pallas, there is ®

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great deal of evidence to indicate that prolonged domesti- cation has a tendency to eliminate sterility ; so that wild species which when first domesticated intercross with difficulty, become in time able to intercross with facility. Such, for instance, appears to have been the case with tlie dog; for on the one hand all the domestic varieties of this animal are now freely fertile among themselves, and, on the other hand, there is independent evidence that these varieties have sprung from more than one natural species. Again, mention must not be omitted of the important fact that, although in the case of none of our varieties of domesticated animals is there any evidence of mutual sterility, yet among our varieties of domesticated plants a few cases have been observed of complete mutual sterility, which is in every way analogous to that which occurs between natural species. Thus, Gartner observed this to be the case with certain varieties of maize and Verbascum, Kélreuter with one kind of tobacco, and other experiment- alists with sundry varieties of gourdand melon. And here, let it be observed, we have the exact counterpart that evolutionists would desire to the experiments of Herbert above mentioned ; for while he was able to break down the general distinction between natural species and domestic varieties on the side of proving perfect fertility between certain natural species, these experimentalists have broken down the distinction on the side of proving perfect sterility between certain of our domestic varieties. Therefore, we may conclude that this side of the question, or that as to the fertility of our domestic varieties, presents as harmless an aspect towards the theory of descent as we have already seen to be presented by the other side of the question, or that as to the sterility of natural species.

Finally, there are two complementary considerations to be adduced, which may now be stated together. One is that the general principles of hybridism, as briefly stated at the beginning of this article, are really far from

indicative of having been instituted with any design of simply prevent- ing species from intercrossing. For, upon the view that they were so instituted, scarcely any one of them admits of a rational explanation. 'Thus, upon this view, no reason can be assigned why the degree of sterility should be so extremely variable in different species, when it must be supposed equally important that all species should be kept distinct ; nor can it be said why the degree of sterility should vary even among individuals of the same species. Neither can it be said why some species should cross with facility, and yet produce sterile hybrids, while other species cross with difficulty, and yet produce fertile hybrids. Why should species living in countries remote from one another, and therefore not able ina state of nature to come together, nevertheless prove as sterile inter se as species inhabiting the same country? Why, again, should there often be so great a difference in the result of a reciprocal cross between two species? Or why, indeed, should the production of hybrids have been permitted at all? As Mr Darwin ob- serves, 'to grant to species the special power of producing hybrids, and then to stop their further propagation by different degrees of sterility, not strictly related to the facility of the first union between their parents, seems a Strange arrangement."

The other and complementary consideration which has to be mentioned is that, on the counter supposition of all these general principles of hybridism being 'simply inci- dental," or dependent on unknown differences in the repro- ductive systems of species,—on this supposition we meet with sundry differences between wild species and domestic varieties which are fully analogous to their difference of fertility, and which yet cannot reasonably be supposed to serve any transcendental purpose. Thus, again to quote Mr Darwin :—

'"Some allied species of trees cannot be grafted on each other— all varieties can be so grafted. Some allied animals are affected in a very different manner by the same poison, but with varicties no sueh case until reeently was known, but now it has been proved that immunity from eertain poisons stands in some eases in correla- tion with the eolour of the hair. The period of gestation generally differs mueh with distinct speeies, but

with varieties until lately no sueh difference had been observed. The time reqnired for the ger- mination of seeds differs in an analogous manner, aud I am not aware that any differenee in this respect has as yet been detected with varieties. Here we have various physiological differences, and no doubt others could be added, between one species and another of the same genus, which do not occur, or oeeur with extreme rarity, in the case of varieties; and these differences are apparently wholly or in chief part incidental on othcr constitutional differences, just in the same manner as the sterility of crossed species is incidental on differences confined to the sexual system. Why, then, should these latter differenees, however serviceable they may indirectly be in keeping the inhabitants of the same eountry distinet, be thought of such parainount importance in eomparison with other incidental and funetional differenccs? No sufficient answer to this question can be given."

Upon the whole, therefore, it may be concluded that the difficulty which the facts of hybridism seem at first sight to raise against the theory of descent may be explained in harmony with the main requirements of that theory.

Animal Hybrids.—A few words may here be added with special reference to animal hybrids. As a general statement it may be said that hybrids, not only between specific but generic forms, are more easily produced in the case of animals than in that of plants. The hybrids, how- ever, when produced are, as a general rule, more sterile. Indeed, it is doubtful whether there is any single instance of a perfectly fertile hybrid having emanated from a cross between two animal species. Mr Darwin, however, says— '

'¢The hybrids from the common and Chinese gecse (4. cygnoides), spceeies which are so different that they have sometimes been ranked in distinct genera, have often bred in this country with eithcr pure parent, and in several instances inter se. This was effected by Mr Eyton, who raised two hybrids from the same parents, but from differ- ent hatches; and from these two birds he raised no less than eight hybrids (grandchildren of the pure geese) from one nest. In India, however, these cross-bred geese must be far more fertile ; for I am assured by two eminently capable judges, namely, Mr Blyth and Captain Hutton, that whole flocks of these crossed geese are kept in various parts of the country ; and, as they are kept for profit where

neither pure parent-species exists, thcy must certainly be highly or perfectly fertile.”?

It is somewhat remarkable that hitherto direct experi- ments on the hybridization of animals have been so few in number as compared with those on the hybridization of plants. This is the more to be regretted, because, as already observed, animals appear to display a somewhat greater aptitude for hybridizing than plants, and conse- quently furnish better material for ascertaining the furthest limits of systematic affinity within which a cross may prove fertile, But here direct experiments are wanting, and all we can say with certainty is that in animals, as in plants, no authentic instance is on record of progeny resulting from a union of two individuals separated from one another by more than a generic distinction.

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1 Since the above was published, Mr Darwin has himself proeured two of these hybrid geese, and from them (brother and sister) raised five “extremely fine birds from two hatches.” These five hybrids “‘ re- sembled in every detail their hybrid parents” (see Vature, Jan. 1,

1880).

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Graft-Hybridism.—The only other subject of importance that falls under the present heading, is that which has been appropriately called “graft-hybridism.” It is well known_ that, when two varietics or allied species are grafted together, each retains its dis- tinctive characters. But to this general, ifnot universal, rule there are on record several alleged exceptions, in which either the scion is said to have partaken of the qualities of the stock, the stock of the scion, or each to have affected the other. Supposing any of these influences to have been exerted, the resulting product would deserve to be called a graft-lybrid. It is clearly a matter of great interest to ascertain whether such formation of hybrids by grafting is really possible;

for, if even one instance of such formation could be unequivocally proved, it would show that sexual and ascxual reproduction are essentially identical.

The eases of alleged graft-hybridism are exceedingly few, con- sidering the enormous number of grafts that are made every year by horticulturists, and have been so made for centuries. Of these cascs the most celebrated are those of Adam's laburnum (Cytisus Adami) and the bizzarria orange. Adam's laburnum is now flour- ishing in numerous placcs throughout Europe, all the trees having been raised as euttings from the original graft, which was made by inserting a bud of the purple laburnum into a stock of the yellow. M. Adam, who made the graft, has left on reeord that from it there spraug the existing hybrid. There can be no question as to the truly hybrid character of the latter—all the peculiarities of both parent species being often blended in the same raceme, flower, or even petal; but until the experiment shall have been successfully repeated, there must always remain a strong suspicion that, not- withstanding the assertion and doubtless the belicf of M. Adam, the hybrid arose as a cross in the ordinary way:of seminal repro- duction. Similarly, the bizzarria orange, which is unquestionably ahybrid between the bitter orange and the citron, —since it presents the remarkable spectacle of these two different fruits blended into one, —is stated by the gardener who first succeeded in producing it to have ariscn as a graft-hybrid; but here again a similar doubt, similarly due to the need of corroboration, attaches to the statement. And the same remark applies to the still more wonderful ease of the so-called trifacial orange, which blends three distinct kinds of fruit in one, and which is said to have been produced by artifi- eially splitting and uniting the seeds taken from the three distinct species, the fruits of which now occur blended in the triple hybrid.

Tho other instances of alleged graft-hybridism are too numerous to be here noticed in detail; they refer to jessamine, ash, hazel, vine, hyacinth, potato, beet, and rose. Of these the eases of the vine, beet, and rose are the strongest as evidence of graft-hybrid- ization, from the fact that some of them were produced as the result of careful experiments made by very competent experimentalists. On the whole, the results of some of these experiments, although so few in number, must be regarded as making out a strong ease in favour of the possibility of graft-hybridism. or it must always

be remembered that in experiments of this kind, negative evidence, however great in amount, may be logically dissipated by a single positive result.

*History and Literature.—From time immemorial the leading facts of hybridism have been known in the case of the horse and the ass. 'The knowledge of corresponding facts as occurring in the vegetable kingdom necessarily dates from a time subsequent to that at which the sexual functions of plants became known, 7.¢., towards the end of the 17th century. 'The earliest recorded obser- vation of a hybrid plant is one by Gmelin ; the next is that of Thomas Fairchild, who in the second decade of the 18th century produced the cross which is still grown in gardens under the name of ** Fairchild's Sweet William." Later on in that eentury Linneus made a number of experiments on the eross fertilization of plants, and produced various hybrids ; but it was reserved for the labori- ous investigations of Kéolreuter, towards the end of that century (1751-1799), to found and largely to build the existing structure of our scientific knowledge upon this subject. To him also belongs the credit of first discovering the part played by insccts in the fer- tilization of flowers. He published most of his results at the St Petersburg Academy of Sciences. Nextin order of time deserve mention the works of Graf Lavola (Diseorso della Irritabilita @al- cunt Fiori nwovamente seoperta, 1764), and of Conrad Sprengel (Das entdeckte Geheimniss der Natur im Baw und in der Befruehtung der Blumen, 1793). The latter work is full of interesting observations on the connexion between the structure of flowers and the visita- tion of insects. Next we come to the celebrated horticulturist, Thomas Andrew Knight, who from 1787 for a number of years de- voted an immense amount of labour, with a large measure of results, to the improvemeut of fruit trees and vegetables by crossing. He published in the Philosophical Transaetions and in the Trans. Hort. Soe. During the first quarter of the present century the only names that in the present connexion call for mention are those of J. E. Smith (Flora Britanniea, 1800), Villars (Ro. Coll. Bot., 1809), Hoppe (Neues Bot. Taschenb., 1810), Guillemin and Dumas (" Obs. sur ?Hybridité d. Plant.," in Mfém. Paris Soe. Hist. Nat., 1833), Henschel, and Godron. During this period, besides Knight,*

already meutioned, there were two other English experimentalists at work, whose names deserve to be placed in the first rank among those which are associated with this subject. These are Swect, who published an important work on Geraniacee, and Herbert, whose work on Amaryllidee, together with sundry publications in the Journal of the Hortieultwral Society, very naterially advanced both the facts and the theory of hybridism. We say " theory," because it was in these publications that Herbert carried on his eelebrated controversy with Knight regarding the alleged sterility of hybrids. In 1828 there was published a prize essay by Wiegmann on a thesis which was sct several years before by the Berlin Academy of Sciences, and which embodied the question whether hybrid plants are necessarily sterile. We next come, in the second quarter of the present century, to the laborious researches of Gartner, the number of whose experiments in hybridizing has certainly not been surpassed, and probably has not been equalled, by that of any other experimentalist. His principal work is Verswehe wnd Beobachtwngen iiber die Bastarderzeugung im Pflanzenreiehe. In connexion with this period we may also mention the names of Braun, Wallroth, Zuccarini, Mcyer, Ziz, Koch, Schiede, Lasch, Reichenbach, A. P. de Candolle, Wimmer, Hornschuh, and Nageli. In 1854 a research of value was published by Klotzsch (Verhandl. Kgl. Preuss. Akad. Berlin), and others later by Regel, Godron, and Jordon. In 1860 a prize was offered by the French Academy of Scienees for the best essay on hybridism, with special reference to three points,—the fertility or sterility of hybrids, the cause of their sterility, and the constancy of type manifested by fertile hybrids. In 1865 this prize was awarded jointly to Naudin and Godron, the latter name being identified with researches upon the character of hybrids whieh deserve to be considered among the most im- portant of the preseut century. The next work of note appeared in 1865, by Max Wichura, on Die Bastardbefruchtung in Pflan- zenreich, &c. He combined, in one complex hybrid, six different species of Salix ; confirmed, in opposition to Godron, the doctrine of Kélreuter, Herbert, Gartner, and Naudin, that a hybrid is best fertilized by its own pollen; and found, in opposition to Naudin, that the progeny of hybrid willows retains its hybrid character. In 1865-6 Nageli published his important observations on naturally produced hybrids (Sttzwngsber. Akad. Miinchen, Math. Phys.). The highly important experiments of Darwin on dimorphic and _trimor- phic plants have been already alluded to. Those who within still more recent years have

contributed to the literature of hybridism are Caspary, Mendel, Seden, Dominy, Kellermann, Fr. Schultz, Timbal-Lagrave, Grenier, A. Kerner, Wirtgen, Michalet, Ritschl, Beckhaus, P. Ascherson, R. von Uechtritz, J. Schmalhausen, C. Haussknecht, V. von Borbas, Kuntze, Henniger, and W. O. Focke. The last-named author has just published an elaborate and valuable work on hybridism in plants (Die Pflanzen-Mischlinge, Berlin, 1881), giving a tabular series of all the known vegetable hybrids, and treating the entire subject in a very comprehensive manner.

On the subject of animal hybrids there is virtually no literature, save scattered records of fertile crosses among sundry spccies con- fined in various menageries; and these are without interest as bearing on any of the prineiples of hybridism. (G. J. RB.)

HYDE, a township of England in the parish of Stock- port, Cheshire, is situated near the river Tame and the Peak Forest canal, and on the Midland, and the Manchester, Sheffield, and Lincolnshire Railways, 74 miles east from Manchester and 6 north-east from Stockport. It is under the government of alocal board, and a county court is held there every Wednesday. St George's church, in the Perpen- dicular style, was erected in 1832, and St Thomas, in the Early English, was erected in 1868. The principal other public buildings are the mechanics' institute, the temperance hall, and the court-house. The town owes its importance to the cotton manufacture, and possesses weaving factories, spinning-mills, print-works, iron-foundries, and machine- works, 'There are extensive coal-mines in the vicinity. The old family of Elyde, to which the line of earls of Clarendon belonged, held possession of the township as early as the reign of John, but it was a mere village until the establishment of the cotton manufacture at the begin- ning of the present century. The population of the town- ship in 1861 was 13,722, and in 1871 it was 14,223.

HYDE, Epwarp, Earl of Clarendon. See CLARENDON,

HYDE, Tuomas (1636-1703), a distinguished Orientalist, was born at Billingsley, near Bridgnorth, in Shropshire, June 29, 1636. He inherited his taste for linguistic studies, and received his first lessons in some of the astern tongues, from his father, who was rector of the parish. In

his sixteenth year Hyde entered King's College, Cambridge, where, under Wheelock, professor of Arabic, he made such rapid progress in the Oriental languages that, after only one year of residence, he was invited to London to assist Brian Walton in his edition of the Polyglot Bible. Besides correcting the Arabic, Persic, and Syriac texts for that work, Hyde transcribed into Persic characters the Persian translation of the

Pentateuch, which had been printed in Hebrew letters at Constantinople in 1546. To this work, which_Archbishop Ussher had thought well-nigh impossible even for a native of Persia, Hyde appended the Latin version which accompanies it in the Polyglot. Having successfully accomplished these difficult tasks amidst the flattering acknowledgments of the most learned men of the day, Hyde entered Queen's College, Oxford, in 1658, where le was chosen Hebrew reader; and in 1659, in considera- tion of his singular erudition in Oriental tongues, he was admitted to the degree of M.A. In the same year he was appointed under-keeper of the Bodleian library, and in 1665 he became librarian-in-chief. Next year he was collated to a prebend at Salisbury, and in 1673 to the archdeaconry of Gloucester, receiving the degree of D.D. shortly afterwards. In 1691 the death of Pocock opened up to Hyde the Laudian professorship of Arabic; and in 1697, on the deprivation of Altham, he succeeded to the regius chair of Hebrew and a canonry of Christ Church. Under Charles II., James II., and William III., Hyde discharged the duties of Eastern interpreter to the court. Worn out by his unremitting labours, he resigned his librarianship in 1701, and died at Oxford, February 18, 1703. Hyde was an excellent classical scholar, and there was hardly an Eastern tongue accessible to foreigners with which his wide erudition had not made him familiar. He had even acquired Chinese, while his writings are the best testimony to his mastery of Turkish, Arabic, Syriac, Persic, Hebrew, and Malay. His books are still valuable; and, although later investigations and additional authorities have par- tially superseded and corrected his conclusions, he still deserves respect as one of the first scholars to direct atten- tion to the vast treasures of Oriental antiquity.

In his chief work, Historia Religionis veterum Persarum, 1700, Hyde made the first attempt to correct from Oriental sources the errors of the Greek and Roman historians who had described the religion of the ancient Persians, but through ignorance of the an- cient language of Persia he has been often misled by Mahometan authorities. His other writings and translations comprise Tabule Longitudinum et Latitudinum Stellarum fixarum ex observatione prineipis Ulugh Beight, 1665, to which his notes have given ad- ditional value; Quatwor Hvangelia et Acta Apostolorunr lingua Malaica, caracteribus Europeis, 1677; Epistola de Mensuris et Ponderibus Serum sive Sinenstwm, 1688, appended to Bernard's De

Mensuris et Ponderibus antiquis ; Abraham Peritsol Itiera Mundi, 1691; and De Ludis Orientalibus Libri If.,1694. With the excep- tion of the Historia Religionis, which was republished by Hunt and Costard in 1760, the writings of Hyde, including some unpub- lished MSS., were collected and printed by Dr, Gregory Sharpe in 1767 under the title Syntagma Dissertationum quas olim . . Thomas Hyde separatim edidit. There is a life of the author prefixed. Hyde also published a catalogue of the Bodleian Library in 1674.

HYDER ALI, or Hamar 'At, (c. 1702-1782), the Mahometan soldier-adventurer who, followed by his son Tippoo, became the most formidable Asiatic rival the English have ever had in India, was the great grandson of a fakir or wandering ascetic of Islam, who had found his way from the Punjab to Kulburga in the south, and the second son of the Arab wife of a naik or chief constable at Budikote, near Colar, in Mysore, and was born about the beginning of the 18th century. 'The elder brother who, like himself, was early turned out into the world to seek his own fortune, became a naik, and ultimately rosc to com- mand a brigade in the Mysore army, while Hyder, who never learned to read or write, passed the first forty-seven

years of his life aimlessly in sport and sensuality, sometimes, however, acting as the agent of his brother, and meanwhile acquiring auseful familiarity with the tactics of the French when at the height of their reputation under Dupleix. He is said to have induced his brother to employ a Parsee to purchase artillery and small arms from the Bombay Govern- ment, and to enrol some thirty sailors of different Europcan nations as gunners, and is thus credited with having been "the first Indian who formed a corps of sepoys armed with firelocks and bayonets, and who had a train of artillery served by Europeans." At the siege of Deonhully (1749) Hyder's services attracted the attention of Nunjeraj, the minister of the maharajah of Mysore, and he at once re- ceived an independent command; within the next twelve years his energy and ability had made him completely master of minister and maharajah alike, and in everything but in name he was ruler of the kingdom. In 1763 the conquest of Canara gave him possession of the treasures of Bednore, which he resolved to make the most splendid capital

in India, under his own name, thenceforth changed from Hyder Naik into Hyder Ali Khan Bahadoor ; and in 1765 he retrieved previous defeat at the hands of the Marhattas by the destruction of the Nairs or military caste of the Malabar coast, and the conquest of Calicut. Hyder Ali now began to occupy the serious attention of the Madras Government, which in 1766 entered into an agree- ment with the nizam to hold the district known as the Northern Circars from him, and to furnish him with troops to be used against the common foe. But hardly had this alliance been formed when a new and secret arrangement was come to between the two Indian powers, the result of which was that Colonel Smith's small force was met with a united army of 80,000 men and 100 guns. British dash and sepoy fidelity, however, prevailed, first in the battle of Changama (September 3, 1767), and again still more remarkably in that of Trinomalee, which lasted two days ; and the nizam's own capital of Hyderabad was threatened by Colonel Peach's expedition sent from Bengal. On the loss of his recently made fleet and forts on the western coast, Hyder Ali now began to make overtures for peace ; on the rejection of these, bringing all his resourccs and strategy into play, he forced Colonel Smith to raise the sicge of Bangalore, and brought his army within five miles of Madras. The result was the treaty of April 1769, provid- ing for the mutual restitution of all conquests, and for mutual aid and alliance in defensive war; it was followed by a commercial treaty in 1770 with the authorities of Bombay. Under these arrangements Hyder Ali, when defeated by the Marhattas in 1772, claimed English assist- ance, but in vain; this breach of faith stung him to fury, and thenceforward he and his son did not cease to thirst for vengeance. His time came when in 1778 the English, on the declaration of war, resolved to drive the French out of India. The capture of Mahe on the coast of Malabar in 1779, followed by the annexation of lands belonging to a dependant of his own, gave him the needed pretext. Again master of all that the Marhattas had taken from him, and with empire extended to the Kistna, he now summoned the French to his assistance, and, descending through the Chan- gama pass amid burning villages, reached Conjeveram, only forty-five miles from Madras, unopposed. Not till the smoke was seen from St Thomas's Mount, where Sir Hector Munro commanded some 5200 troops, was any movement made ; then, however, the British general sought to effect a junction with a smaller body under Colonel Baillie recalled from Guntoor. The incapacity of these officers, notwithstanding the splendid courage of their men, resulted in the

total loss of Baillie's force of 2800 (September 10,1780). Hastings, again appealed to, sent from Bengal Sir Eyre Coote, who, though repulsed at Chillumbrum, defeated Hyder thrice

successively in the battles of Porto Novo, Polliloor, and Sholingur, while Tippoo was forced to raise the siege of Wandewash, and Vellore was provisioned, On the arrival of Lord Macartney as governor of Madras, the English fleet captured Negapatam, took Trincomalee from the Dutch, and forced Hyder Ali to confess that he could never ruin a power which had such command of the sea. directing his attention to the west coast, where he sought the assistance of the French fleet, when his death took place suddenly at Chittore in December 1782.

For the personal character and administratiou of Hyder Ali see the History of Hyder Naik, written by Meer Hussein Ali Khan Kirmani (translated from the Persian by Colonel Miles, and pub- lished by the Committee of the Oriental Translation Fund), and the curious work written by M. Le Maitre de La Tour, commandant of his artillery (Histoire d'Hayder-Ali Khan, Paris, 1783). For the whole life and times see Wilks, Historical Sketches of the South of India, 1810-17; Aitchison's Treaties, vol. v. (2d ed., 1876); and Pearson, Memoirs of Schwartz, 1834.

HYDERABAD, or HarparAzdp ("the Territory of the Nizim"), an extensive realm of Southern India. This territory, inclusive of the Hyderabad Assigned Districts, known as Berar, lies between 15° 10' to 21° 41' N. lat., and 74° 40' to 81° 31' E. long, and is 475 miles in length from south-west to north-east, and about the same distance in breadth. The area of Berar is 17,728 square miles, and of the Nizdm's Territories 80,000 square miles,—the total area of the whole state being about 98,000 square miles. Itis bounded N. and N.E. by the Central Provinces, and §. and 8.E. by territory subject to the presidency of Madras, and W. by territory subject to the presidency of Bombay. The Country of the Nizim pre- sents much variety of surface and feature. In some parts it is mountainous, wooded, and picturesque, in others flat and undulating. The champaign lands are of all descrip- tions, including many rich and fertile plains, much good land not yet brought under cultivation, and numerous tracts too sterile ever to be cultivated. The

geological formations are on a large scale: in the. north-west the formations are volcanic, consisting principally of trap, but in some parts of basalt; in the middle, southern, and south-western parts the country is overlaid with gneissic formations. In the valley of the Wardha there are coal-fields; the quality of the coal is inferior, but good enough for railway purposes. Quarries of excellent lime- stone are worked for a considerable distance along the line of the Nizim's State Railway. The territory is well watered, rivers being numerous, and tanks or artificial pieces of water very abundant. The principal rivers are—the Godavari, with its tributaries the Dudna, the Manjira, and Pranhita ; the Wardha, with its tributaries the Penganga and Wainganga; and the Kistna, with its tributary the Tun-gabhadra. Many other streams (considerable rivers during the annual periodical rains) are discharged into these main channels of drainage. The climate may be considered in general good; and as there are no arid, bare deserts, the hot winds are less felt. In the vicinity of Hyderabad city, the annual mean temperature in the shade is 81° F., and the annual rainfall is estimated at 28 to 32 inches.

The soil is in geueral fertile, though in some parts it consists of chilka, a red and gritty mould, little fitted for purposes of agricul- ture. A low jungle springs up in any ground left uncultivated even for a year or two, and in process of time is enlivened by the growth of numerous trees. The principal crops are rice, wheat, maize, jodr, bdjra, rdgt, oil-seeds of various kinds, fruits and garden produce in great variety,"cotton, indigo, sugar-cane, and tobacco. Silk, the material known as ¢wsscr, the produce of a wild species of worm, is utilized on a large scale. Lac, suitable for use as a resin or dye, gums, and oils are found in great quantities. Hides, raw and tanned, are articles of some importance iucommerce. The chief mart for Deccan-bred horses, adapted for military or general pur- poses, is at a fair at Malegaon in the Bedar district. 'There is also

« horse bazaar near the capital, which is resorted to by merchants from almost cvery quarter of Asia.

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The principal exports are cotton, oil-seeds, country cloths, hides, metal ware, and agricultural produce; the imports are salt, grain, timber, European piece goods, and hardware. Among the manufac- tures of the country may be mentioned the ornamental ware of Bedar, the gold embroidered cloths of Aurangabad, Gulbarga, and other towns, and the excellent paper of different kinds which is inade by the inhabitants of Kaghazpur, near the fortress of Daulat- abad. Several railway lines pass through the state. The line con- necting Bombay with Madras traverses the south-western part ; the Great Indiau Peninsula Railway runs the line as far as Ratchur, where it is joined by the Madras Railway ; and from Wadi the Nizam's State Railway branches off to Hyderabad and Secunder- abad. The three principal roads in the state all pass through Hyderabad city.

No census of the population has been attempted in Hyderabad territory, with the exception of Berar or the Assigned Districts, But the population in the Nizam's Territory has been estimated at 9,000,000 persons. In the different parts of the territory the Marathi, the Kanarese, and the Telugu languages are spoken. The Marhattas are most numerous in the west. The Musalmans are chiefly to be met with in the capital, and everywhere in the service of Government. In addition there is a large admixture of Parsis, Sikhs, Arabs, Rohillas, aborigines, and others. The revenue of the Nizam's Territories, including Berar, may be stated in round num- bers at 40,000,000 rupees (say £4,000,000), including reccipts from allsources. About two-thirds of the above large sum is collected by the nizim's own Government from tracts under British rule. The remaining oue-third is realized by British officers, principally from Berar. The native Government has a mint situated at Hyderabad, anda currency ofits own. It issues a rupec,—namely, the hali sicca, or "rupee of the period."

History. —The fortunes of the family of the nizim were founded by Kamr-ud-din Asaf Jah, a distinguished soldier of the emperor Aurangzeb, who in 1718 was appointed Nizim-ul-Mulk (Regulator of the State) and Subahdar of the Deccan, but eventually threw off the control of the Delhi court. Asaf Jah died in 1748, and the right of accession to his power and authority was contested by his descendants. The claimants most favoured were two; the one, Naar Jang, a son of the deceased ruler, sccured the support of the English, the other Muzaffar Jang, a grandson, was supported by the

French. After a brief period of contest Muzaffar Jang became the prisoner of his rival, who, however, soon perished by the hands of some of his followers, and Muzaffar Jang was proclaimed subahdar of the Deccan. He, too, soon perished in a fray with some Pathan chiefs, so the seat of power was now unoccupied. Two brothers of Nasir Jang now claimed the dignity, but the contcst was averted by the sudden death of Ghazi-ud-diu, the elder brother. The English and French continued a struggle for power and influence in the Deccan, but the latter had to withdraw from the support of Salabat Jang, through the danger threatening thcir own possessions from the victories gained by Clive. In 1761 this weak prince was dethroned by his younger brother Nizim Ali, who afterwards put him to death. In 1765 he ravaged the Carnatic, but retired on the approach of a British force. Still the British Government was anxious to be on better terms with him, partly from a desire to obtain his concurrence to their reten- tion of a maritime district known as the Northern Circars, which they now occupied. In 1766 a treaty was concluded by which, on condition of a gift of the Circars, the British Government agreed to support the nizam, who on his part engaged to assist the British with histroops. In 1790, on the breaking out of a war with Tippoo, son of Hyder Ali Khan, a treaty of offensive and defensive alliance was concluded between the nizam, the peshwa, and the British Government. Tippoo purchased peace (1792) at the price of half his dominions, and the nizaim had no reason to be dissatisfied with his share of the spoil. On the fall of Seringapatam and the death of Tippoo Sultan, the nizim participated largely in the division of territory, under the treaty of 1799, and his share was increased on the peshwa's withdrawal from the treaty. In 1800 the subsidiary force with the nizam was further augmented, and the pecuniary payment for its maiutenance was commuted for a cession of territory. This territory is known to the present time under the title of the Ceded Districts. By the treaty of 1853 the nizam still retained the full use of the subsidiary force and contingent, but was released from the unlimited obligation of service in time of war; and the contin- gent ceascd to be part of the niz4m's army, and became an auxili- ary force kept up by the British Government for the uizam's use. In 1857, when the mutiny had broken out, the state of Hyderabad and the nizim's dominions became critical ; and an attack, which was repulsed, was made upon the residency. The Hyderabad con- tingent displayed its loyalty in the field against the rebels. In 1860 a fresh treaty was made by which the territorial acquisitions of the nizam

were increased, a debt of 50 lakhs of rupees was cancelled, and assigned districts in Berar, making up a gross revenue of 3,200,000 rupees (say £320,000), were taken in trust by the British Government. The nizam is the principal Mahomctan rulcr in India, and is entitled to a salute of twenty-one guns,

HYDERABAD

HypERABAD, the chief city and capital of the above state, is situated in 17° 21' 45" N. lat. and 78° 30' 10" E. long., on the river Musi, and stands at a height of about 1700 feet above sea level. No census of the population has been taken, but it has been estimated at 200,000. The scenery around Hyderabad is wild and picturesque, the country being hilly and dotted with numerous granite peaks and isolated rocks, Approached from the west, the appearance of the city is very striking,—the palace, the mosques, and the magnificent pile of buildings erected for the British residency towering above the outer wall. A large lake, a few miles south of Hyderabad, covering an area of 10,000 acres, supplies the town with water. The palace of the nizim, the mosques, and the British residency are the principal buildings. The palace has no pretensions to splendour, but is of considerable size. Hyderabad is a great Mahometan stronghold, and contains several mosques. The Jam& Masjid or "cathedral" mosque, so called after the one at Mecca from which it is designed, is large, and is crowned by minarets of an extraordinary height. In the environs of Hyderabad there are many fine gardens with gorgeous pavilions; that of the niz&m's minister has long been celebrated for its beauty. One of the most interesting places is the college, or Chér Mindr (so called from its four minarets), built upon four grand arches at which the four principal streets of the city meet. Above are several stories of rooms, and formerly eacli story was devoted to a science. On the north side of the Must is an extensive suburb known as the Begam or "Princess" bazaar. The British residency is in this quarter, and communication between it and the palace of the niz4m is maintained by a fine bridge. The residency is a very handsome building, and is remarkable as having been raised entirely by native work- men. It stands in ornamental pleasure grounds enclosed by a wall with two gateways. 'The staircase is the hand- somest in India, each step being asingle block of the finest granite. The principal private residence in tlie

city is the palace of the Béra Dari, or "Twelve Doors," which is now occupied by the minister of the nizdm, Sir Salar Jang.

History. —Hyderabad was founded in 1589, by Kutab Shah Mu- hammad Kuli, a descendant of Sultan Kuli Kutab Shah, the founder of the dynasty at Golconda in 1512, Muhammad Kuli removed the seat of government on account of its want of water and consc- quent unhealthiness, and built a new city on the banks of the Musi river, 7 miles from his former capital. He called it Bhdgnagar, "Fortunate City," from his favourite mistress, Bhagmati; but after her death he named it Hyderabad. The history of Golconda and of Hyderabad after 1589 are almost identical. Soon after estab- lishing himself in his new metropolis, Muhammad Kuli carried on an aggressive war with the neighbouring Hindu rajas. He cx- tended his conquests south of the Kistna river ; the strong fortress of Gandikota was captured ; and the town of Cuddapah was sacked. His troops penetrated to the frontiers of Bengal, and Muhammad Kul defeated the raja of Orissa and subjugated the Northern Circars. In 1608 an ambassador from the king of Persia arrived with a ruby studded crown and othcr magnificent gifts. When he retumed six years afterwards, he was accompanied by an officer of the court of Hyderabad, bearingreturn presents. In 1611 Muhammad Kuh died, after a most prosperous reign of thirty-four years. The principal memorials of this monarch are the palace and gardens of [laht Mahal, the Muhammadi gardens, the palace of Nabat Ghat, and the Jama Masjid or "' cathedral" mosque. During his reign nearly £3,000,000 was expended on public works, and £24,000 was dis- tributed every year among the poor. ;

Muhammad Kuli was succeeded by his son, Sultan Abdullah Kutab Shah. Mir Juma, the prime minister, whose son had in- volved him in a dispute with the court, finding himself unable to obtain favour from his own sovereign, determined to throw him- self on the protection of the Mughal emperor. Shah Jahan, espous- ing his cause, issued a mandate to Abdullah to redress the complaints of his minister ; but Abdullah was so incensed that he sequestrated Mir Jumla's property, and committed his son to prison. Shah Jahan now despatched Aurangzeb, his son, to carry his demands into effect by force of arms. Abdullah Kutab Shah was preparing an entertainment for Aurangzeb's reception, when he suddenly ad- vanced as an enemy, and took the king so completely by surprise

that he had only time to flee to the hill-fort of Goleonda, whilst Hyderabad fell into the hands of the Mughals, and was plundered and half burned before the troops could be brought into order. Abdullah did all in his power to negotiate reasonable terms, but the Mughals were inexorable, and he was at last forced to accept the severe conditions imposed on him.

Abdullah died in 1672, and was succeeded by his son-in-law Abt Husain, who in his youth had been notorious for dissipated habits. He fell entirely under the influence of a Marhatta Brahman, named Madhuna Panth, who became his prime minister. During this reign Aurangzeb again marched upon the city. The king shut himself in the fort of Goleonda, and Hyderabad was again left open to plunder. Madhuna Panth was killed in a popular tumult, and the king accepted such terms as he could obtain. A payment of £2,000,000 sterling in money and jewels was demanded. In 1687 Aurangzeb formally declared war against Abi Husain. The king bravely defended the fort of Golconda, but lost it by treachery, and was sent a captive to Daulatabad, where he resided until his death. Abu Husdin was a very popular monarch, and many anecdotes of his virtue are still current in the Deccan. Aurangzeb immediately took possession of all the territories of Bijapur and Golconda, but his occupation was little more than military.

No event of any importance occurred at Hyderabad until 1707, the year of Aurangzeb's death, when a dispute for the crown took place. His son, Prince Muazin, was victorious, and ascended the throne as Bahadur Shah. After he made a truce with the Mar- hattds, affairs in the Deccan remained quict until the end of his reign, in 1712. His death was followed by struggles amongst his sons.

HYDERABAD, or HarparAsap, a British district in the commissionership of Sind, India, lying between 24° 13' and 27° 15' N. lat., and between 67° 51' and 69° 22' E. long., with an area of 9053 square miles. It is bounded N. by Kairpur state, E. by Thar and Parkar political superintendency, S. by the same tract and the river Kori, and W. by the river Iudus and Karachi district. The district is a vast alluvial plain, 216 miles long and 48 broad. Fertile along the course of the Indus, it de- generates towards the east into sandy wastes, sparsely populated, and defying cultivation. The monotony is

re- lieved by the fringe of forest which marks the course of the river, and by the avenues of trees that line the irrigation channels which branch eastward from this stream. The south of the district has a special feature in its large natural water-courses (called dhoras) and basin-like shallows (chhaus), which retain the rains for a long time. A limestone range called the Ganga and the pleasant frequency of garden lands break the monotonous landscape. The soil, wherever irrigated, is very fertile. Very few species of the large wild animals are found; among birds, the bustard alone is remarkable. Venomous reptiles abound. The Indus sup- plies a large variety of fish, one of which, the pala, is peculiar to the river.

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Of the total arca of the district about one-half is uncultivable ; 2,300,000 aeres are cultivable though not eultivated, and 566,800 are under irrigation. Agriculture is entirely dependent upon arti- ficial irrigation, and is looked upon as a lottery, in which the culti- vator stakes a eertain amount of labour and seed, and takes his ehance of getting a return. If the water rises either too high or not high enough, he loses his erop. There are 317 canals, fifty of whieh are main channels, and tap the Indus direct ; the remainder are conneeting branehes. The principal crops are wheat, barley, oil-seeds, pulses, vegetables, jodr, bdy7a, til, rice, eotton, sugar-cane, chana, hemp, tobacco, water-melons, and indigo. The manufaetures of the distriet maintain the excellence for which they have been famous from early times, namely, that for lacquered work, gold and silver embroidery, striped and brilliant cloths known ag stisis and rhesis, and glazed pottery. Tle manufaeture of ear- pets, silk thread, and gold and silver ornaments is carried on to a large extent; salt also is produced in such quantities as to allow of a eonsidcrable exportation. The total number of fairs is 38, and the average attendanee about 5000. The roads of the distriet extend to 1925 miles in length, of which 263 are metalled, bridged, and marked with milestones. The ferries number 68 ; the one at Gidu- Bandar (34 miles from Hyderabad) is a steam ferry eonnecting Hyderabad with Kotri, on Sind Railway. There are 10 travellers' bungalows, 16 dharmsdlds, 4 dispensaries, a civil and police hospital, a convict hospital, and a charitable dispensary.

Considerable variations of climate are found within the district. In the north, the hot season of April and May is followed by two months of floods, the rest of the year being cold and dry. In the eentral divisions, the cold season succeeds the hot without any in- tervening inundations to graduate the transition ; and the ehange oeeurs sometimes with such suddenness that, to quote a local say- ing, "sunstroke and frost-bite are possible in one and the same day." In the south the temperature is more equable throughout the year, 60° F. and 100° F. representing the extremes. The rain- fallis very moderate ; and the district is healthy as compared with other parts of India.

The population is divided as follows :—Mahometans, 560,349 ; Hindus, 118,652 ; other creeds and tribes, 44,882 ;—total, 723,883. Of the Mahometans 373,705, or more than three-fifths, are Sinds. More important, however, as regards social status and personal eharaeter, are the Pathans, found ehiefly about Hyderabad and Upper Sind ; they number only 15,815 persons. As regards oecu- pation, the Hindus of the district may be called the shopkeeping class, the Mahomctans the artisan and agricultural.

The chief revenue and magisterial authority is vested in a col- lector and magistrate. He is assisted by the four deputy collectors of Hala, Tando Muhammad Khan, Naushahro, and Hyderabad tdluks, of which the distriet is composed. The poliee force is under the charge of a European district superintendent, and com- prises a total of 876 men, with 4 inspeetors and 19 chief constables. The average land revenue for 6 years (1868-74) was £111,655; drug revenue (1873-74), £5304 ; reecipts from the farming of liquor- shops (1873-74), £9640 ; imperial revenue (1874), £144,944 ; local revenue (1874), £12,434; forests yield an annual revenue of £11,216. The Government boys' sehools numbered 55 in 1874, with 3227 pupils; the girls' sehools 12, with 368 pupils. These figures in- clude the returns for the high, normal, engineering, and Anglo- vernacular sehools in Hyderabad city.

The loeal history of Hyderabad distriet is so mixed up with that of the province that little could be said of it separately which will not more properly find a place under the history of Sind. The battles of Miani (Meeanee) and Dabo, whieh decided the fate of Sind in favour of the British, were fought within its limits.

HYDERABAD, the chief town of the above district, in 25° 23' 5” N. lat. and 68° 24’ 51” E. long., had in 1872 a population of 35,272, of whom 13,065 were Mahometans, 16,889 Hindus, 367 Christians, and 4951 “others.” The municipal area is about 15 square miles. Upon the site of the present fort is supposed to have stood the ancient town of Nerdnkot, which in the 8th century submitted to Muhammad Kasim Sakifi. Its situation near the apex of the delta of the Indus had commended itself to in- vaders and conquerors of still earlier date. It is identified with Patala, a town which has been connected with a prehistoric Scythian migration into India (c. 625 B.c. 2). Alexander the Great founded or refounded a city called Patala in or near the same place, 325 B.c., and left in it a military settlement. The best archeological authorities regard the modern Hyderabad as the representative of this Patala of the Grecks. In 1768 the present city was founded by Ghul4m Shah Kalhora; and it remained the chief town of the province until 1843, when, after the

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| battle of Meeanee, it was surrendered to the British, and the capital transferred to Kurrachee (Karachi). The city is built on the most northerly hills of the Ganga range, a site of great natural strength. In the fort, which covers an area of 36 acres, are the arsenal of the province, trans- ferred hither from Kurrachee in 1861, and the residences of the ex-mirs of Sind. Hyderabad is the centre of all the provincial communications—road, telegraphic, postal. From the earliest times its manufactures—ornamented silks, silver and gold work, and lacquered ware—have been the chief of the province, and in recent times have gained prizes at the industrial exhibitions of Europe. The chief public institutions and buildings are the jail, Govern- meut schools, post-office, municipal markets, court-houses, civil and police hospital, charitable dispensary, library, travellers’ bungalow, and lunatic asylum. The barracks— occupied by artillery and infantry, European aud native— are built in twelve blocks, with hospitals, bazaar, &c., to the north-west of the city. The only noteworthy antiquities are the tombs of the Kabhora and Taélpur mirs.

HYDRA (the name is also found as Sidra, Nidra, Idero, &c., and the ancient form was Hydrea), an island of Greece, lying about 4 miles off the south-east coast of Argolis in the Peloponnesus, and forming along with the neighbouring islaud of Dhoko the Bay of Hydra. The © length of the main axis of the island, which runs from south- west to north-east, is about 11 miles, and the area is about 21 square miles ; but it is little better than a rocky and trec- less ridge with hardly a patch or two of arable soil. There was little exaggeration in the reply made by Antonios Kriezes to the queen of Greece: 'The island produces prickly pears in abundance, splendid sea captains, and excellent prime ministers." The highest point, Mount Ere, so called (according to Miaoules) from the Albanian word for wind, has an elevation of 1958 feet. The next in importance is known as the Prophet Elias, from the large convent of that name on its summit. It was there that the patriot Theodorus Colocotronis was imprisoned, and a large pine tree is still called after him. The fact that in former times the island was richly clad with woods is in- dicated by the name still employed by the Turks, Z'chamliza, tlie place of pines; but it is only in some favoured spots that a few trees are now to befound. Tradition also has it that it was once a well-watered island (hence the designation Hydrea), but the inhabitants are now wholly dependent on the rain supply, and they have sometimes had to bring water from the mainland. This lack of fountains is probably to be ascribed in part to the effect of earthquakes, which are not infrequent ; that of 1769 continued for six whole days. Hydra, the chief town, is built near the middle of the northern coast, on a very irregular site, consisting of three hills and the intervening ravines. From the sea its white and handsome houses present a picturesque and noble appearance, and its streets though narrow are clean and attractive. Besides the principal harbour, round which the town is built, there are three other ports on the north coast—Mandraki, Molo, Panagia, but none of them is sufficiently sheltered. Almost all the population of the island is collected in the chief town, which is the seat of a bishop, and has a local court, numerous churches, and a high school. Cotton and silk weaving, tanning, and ship- building are carried on, and there is a fairly active trade. The population in 1877 was 6811.

Hydra was of no importance in ancienttimes. The only fact in its history is that the people of Hermione (a city on the neighbouring mainland now known by the common name of Kastr7) surrendered it to Samian refugees,

and that from these the people of Troezen received it in trust. It appears to be completely ignored by the Byzantine chroniclers. In 1580 it was chosen asa refuge by a body

of Albanians from Kokkinyas in Troezenia; and other emigrants followed in 1590, 1628, 1635, 1640, &c. At the elose of the 17th

eentury the Hydriotes took part in the reviving eommerce of the Peloponnesus ; and in eourse of time they extended their range. About 1716 they began to build sakturia (of from 10 to 15 tons burden), and to visit the islands of the Aigean; not long after they introduced the latinadika (40-50 tons), and sailed as far as Alexandria, Constantinople, Trieste, and Veniee ; and by and by they ventured to Franee and even America. From the grain trade of South Russia more especially they derived great wealth. In 1813 there were about 22,000 people in the island, and of these 10,000 were seafarers. At the time of the outbreak of the war of Greek independence the total population was 28,190, of whom 16,460 were natives and the rest foreigners. One of their chief families, the Konduriotti, was worth £2,000,000. Into the struggle the Hydriotes flung themselves with rare enthusiasm and devotion, and the final deliveranee of Greeee was mainly due to the service rendered by their fleets.

See Pouqueville, Voy. de la Gréce, vol. vi.; Antonios Miaoules, Yrouvnua wept THs vycov Tdpas, Munieh, 1834; Id., Suvorriny toTopia TwY vavLaxXiwy Sia TwY TAOLWY TwY TpLwy vnowY, Tdpas, Terowy, kat Vapwv, Nauplia, 1833; Id., Ioropia rns vnoov Tdpas, Athens, 1874; G. D. Kriezes, Irropia rns vncov Tdpas, Patras,

1860.

HYDRANGEA, a popular flower much in request for the decoration of conservatories during the late summer season, many thousands being annually produced for the London market. The plant to which the name is most commonly applied is the LHydrangea Hortensia, a low deciduous shrub, producing rather large oval strongly-veined leaves in opposite pairs along the stem. It is terminated by a massive globular corymbose head of

flowers, which remain a long period in an ornamental condition. The normal colour of the flowers, the majority of which have neither stamens nor pistil, is pink; but by the influence of sundry agents in the soil, such as alum or iron, they become changed to blue. The part of the inflorescence which appears to be the flower is an exaggerated expansion of the calyx-leaves, the other parts being generally abortive. The perfect flowers are small, rarely produced in the species above referred to, but well illustrated by others, in which they occupy the inner parts of the corymb, the larger showy neuter flowers being produced at the circumference. A pure white variety, named Thomas Hogg, has been recently introduced, and is a very desirable plant.

There are upwards of thirty species, found chiefly in Japan, in the mountains of India, and in North America,

and many of them are familiar in gardens, J/, Lortensia is |

the most useful for decoration, as the head cf flowers lasts long in a fresh state, and by the aid of forcing can behad for a

the end of the summer, but they may be had earlier by means of forcing. ZZ. japonica is another fine conservatory plant, with foliage and habit much resembling the last- uamed, but this has flat corymbs of flowers, the central ones small and perfect, and the outer ones only enlarged and neuter, This also produces pink or blue flowers under the influence of different soils.

The Japanese species of hydrangea are sufficiently hardy to grow in any tolerably favourable situation, but except in the most sheltered localities they seldom blossom to any degree of perfection in the open air, the head of blossom depending on the uninjured development of a well-ripened terminal bud, and this growth being frequently affected by late spring frosts. They are much more useful for pot- culture indoors, and should be reared from cuttings of

shoots having the terminal bud plump and prominent, put |

in during summer, these developing a single head of flowers the succeeding summer. had by nipping out the terminal bud and inducing three or four

shoots to start in its place, and these, being steadily developed and well-ripened, should each yield its inflor-

escence in the following summer, that is, when two years | old. Large plants grown in tubs and vases are fine subjects |

for large conservatories, and may be used for decorating

Somewhat larger plants may be |

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terrace walks and similar places during summer, being housed in winter, and started under glass in spring.

The Indian and American species, especially the latter, are quite hardy, and some of them are extremely effective. The finest of these by far is the Hydrangea paniculata grandiflora, the branched inflorescence of which is under favourable circumstances a yard or more in length, and consists of large spreading masses of crowded white neuter flowers which completely conceal the few incon- spicuous fertile ones, The plant attains a height of 8 to 10 feet, and when in flower late in summer and in autumn is a very attractive object in the shrubbery.

HYDRAULICS. See Hypromecwanics.

HYDROCEPHALUS (dep, water, xefady, the head), aterm in medicine applied to two different forms of disease of the brain, both of which are attended with the effusion of fluid into its cavities, They are named respectively Acute and Chronic Hydrocephalus. They have different pathological associations, and have no necessary connexion with each other.

Acute Hydrocephalus is the term still largely employed to describe the disease now known to physicians as tuber- cular cerebral meningitis, that is, inflammation of the membranes of the brain produced by the presence of tubercle. This disease is most common in children under ten years of age, but is by no means limited to that period of life, and may affect adults. The

scrofulous or tubercular constitution is an important factor in this malady, which is admitted to be one of strongly hereditary tendency ; yet unquestionably there are many instances in which no sucli taint can be traced. In numerous cases it is manifestly connected with bad hygienic conditions, with insufficient or improper feeding, or with over exercise of the mental powers, all of which will doubtless more readily exert their influence where an inherited liability exists, and the same may be said regarding its occasional occurrence as one of the after consequences of certain of the diseases of childhood, especially measles aud hooping-cough.

Acute hydrocephalus is usually described as passing through certain stages ; but it must be observed, as regards at least its earlier manifestations, that, so far from being well defined, they are often exceedingly vague, and render this disease in an especial manner liable to escape detection

fora length of time, or to be confounded with others to considerable period for the ornamentation of the greenhouse |

and conservatory. Their natural flowering season is towards —

which at its commencement it bears an acknowledged resemblance, such, for instance, as typhoid fever or gastro- intestinal derangements. Nevertheless, there are certain typical features characterizing the discase in each of its stages which it is important to describe, as in many instances these present themselves with greater or less distinctness.

The premonitory symptoms of acute hydrocephalus are mostly such as relate to the general nutrition. A falling off in flesh and failure of strength are often observed for a considerable time before the characteristic phenomena of the disease appear. The patient, ifa child, becomes listless and easily fatigued, loses appetite, and is restless at night. There is headache after exertion, and the temper often undergoes a marked change, the child becoming unusually peevish and irritable. These symptoms may persist dur- ing many weeks; but on the other hand such premonitory indications may be entirely wanting, and the disease be developed to all appearance quite suddenly.

The onset is in most instances marked by the occurrence of vomiting, often severe, but sometimes only slight, and there is in general obstinate constipation. In not a few cases the first symptoms are convulsions, which, however, may in this early stage subside, and remain absent, or reappear at a later period. Headache is one of the most constant of the earlier symptoms, and is generally intense

‘ and accompenied with sharper paroxysms, which cause the

patient to scream, with a peculiar and characteristic cry. | to abolish its functions. In many instances the brain is

There is great intolerance of light and sound, and general nervous sensitiveness. Fever.is present to a greater or less extent, the temperature ranging from 100° to 103° Fahr.; yet the pulse is not quickened in proportion, being on the contrary rather slow, but exhibiting a tendency to irregularity, and liable to become rapid on slight exertion. The breathing, too, is somewhat irregular. Symptoms of this character, constituting the stage of excitement, continue for a period varying from one to two weeks, when they are succeeded by the stage of depression. There is now a marked change inthe symptoms, which is apt to lead to the belief that a favourable turn has taken place. The patient becomes quieter and inclines to sleep, but it will be found on careful watching that this quietness is but a condition of apathy or partial stupor into which the child has sunk. The vomiting has now ceased, and there is less fever; the pulse is slower, and shows a still greater tendency to irregularity than before, while the breathing is of markedly unequal character, being rapid and shallow at one time, and long drawn out and sinking away at another. There is manifestly little suffering, although the peculiar cry may still be uttered, and the patient lies prostrate, occasionally rolling the head uneasily upon the pillow, or picking at the bedclothes or at his face with his fingers. He does not ask for food, but readily swallows what is offered. The countenance is pale, but is apt to flush up suddenly for a time. The eyes present important altera- tions, the pupils being dilatcd or unequal, and scarcely responding to light. ‘There may be

double vision, or partial or complete blindness. Squinting is common in this stage, and there may also be drooping of an eyelid, due to paralysis of the part, and one or more limbs may be likewise paralysed.

To this succeeds the third or final stage, in which certain of the former symptoms recur, while others become intensi- fied. There is generally a return of the fever, the tem- perature rising sometimes to a very high degree. The pulse becomes feeble, rapid, and exceedingly irregular, as is also the case with the breathing. Coma is profound, but yet the patient may still be got to swallow nourish- ment, though not so readily as before. Convulsions are apt to occur, while paralysis, more or less extensive, affects portions of the body or groups of muscles. The pupils are now widely dilated, and there is generally complete blind- ness and often deafness. In this condition the patient's strength undergoes rapid decline, and the body becomes markedly emaciated. Death takes place either suddenly in a fit, or more gradually from exhaustion. Shortly before the fatal event it is not uncommon for the patient, who, it may be for many days previously, lay in a state of profound stupor, to awake up, ask for food, and talk to those around. But tho hopes which may thus be raised are quickly dispelled by the setting in of the symptoms of rapid sinking.

The duration of a case of acute hydrocephalus varies somewhat, but in general death takes place within three weeks from the onset of the symptoms, The diseaso may be said to be almost invariably fatal, yet it must be admitted that cases presenting all the principal symptoms of acute hydrocephalus do occasionally recover, though such instances are undoubtedly very rare. Indeed, the condition of the brain in this disease, as revealed on post mortem examination, renders its fatal character in no way surprising. The peculiar formation called tubercle is found deposited in the membranes of the brain, more particularly at its base. 'The irritation set up as a consequence of this is accompanied with the effusion of fluid into the arachnoid and ventricles, which by its pressure tends to produce softening and dostruction of the brain substance, and hence

found to be reduced to a state of complete disorganization. Besides this condition of the brain, there exists in most cases deposition of tubercle elsewhere, as in the lungs and

abdominal glands, and this may have given evidence of its

presence even before the head symptoms had appeared. This is especially the case in adults, in whom acute hydro- cephalus is more apt to arise as a complication in the course of pulmonary or other disease of tubercular origin than in the manner in which it occurs in children as above described.

With respect to treatment, little can be stated of an encouraging nature. Still it must be observed that much may be done in the way of prevention of this disease, and, in its earlier stages, even in the way of cure. It is most importaut in families where the history indicates a tuberculous or scrofulous tendency, and particularly where acute hydrocephalus has already occurred, that every effort should be used to fortify the system and avoid the causes already alluded to as favouring the development of the disease during that period in which children are liable to suffer from it. With this view wholesome food, warm clothing, cleanliness, regularity, and the avoidance of over- exertion, physical and mental, are of the utmost conse- quence.

Although there is but little that can be done when the disease has set in, yet the timely use of remedies may mitigate and even occasionally remove the symptoms. The severe headache may often be relieved by the applica- tion of one or two leeches to the temples, and by the frequent use of cold water or ice applied to the head. 'The treat- ment by blistering the scalp and administering mercury, formerly so much practised, is now acknowledged to be of no real efficacy ; and on the whole the maintenance of the patient's strength by light nourishment and the use of sedatives to compose the nervous system are the measures most likely to be attended with success. The bromide, with which may be combined the iodide of potassium, is the medicinal agent of most value for this purpose. Should convulsions occur, they are best treated by chloral or chloroform.

Chronic Hydrocephalus is a different form of diseasc from that last described, both as regards its pathology and its effects. It consists in an effusion of fluid into the serous cavities (arachnoid and ventricles) of the brain, not preceded by tuberculous deposit or acute inflammation, but apparently depending on chronic inflammatory changes affecting the membranes, and is to be regarded as a kind of dropsy. The disease is

frequently congenital, and its presence in the foetus is apt to be a source of difficulty in parturition, It is, however, more commonly developed in the course of the first six months of life ; but it occasionally arises in older children, or even in adults, as in the well- known instance of Dean Swift, who died from this disease.

Chronic hydrocephalus affects mostly children who bear evidence of a scrofulous, ricketty, or otherwise delicate constitution. The chief symptoms observed are the gradual increase in size of the upper part of the head out of all proportion to tho face or the rest of the body. Occurring at an age when as yet the separate bones con- stituting the skull havo not become welded, this enlarge- ment may go on to a very considerable extent in all direc- tions, but chiefly in the transverse and antero-posterior diameters, tho spaces between tho bones becoming more and more expanded, though ultimately, should the child survive, ossification takes place. In a well-marked case the deformity is very striking. The upper part of the forehead projects abnormally, and the orbital plates of the frontal bone being inclined forwards give a downward direction to the eyes, which have also peculiar rolling movements. 'The face is small, and this, with the enlarged

head, gives a remarkably aged expression to the child. There is generally defective development in other respects, the body being ill nourished, the bones thin, the hair scanty and fine, and the teeth carious or absent.

As illustrating the extent to which this disease may proceed, it may be mentioned that the average circum- ference of the adult head is about 22 inches, while in the child it is of course considerably less. In chronic hydro-cephalus the head of an infant three months old has becn known to measure 29 inches ; and in the well-known case of the man Cardinal, who died in Guy's Hospital, the head measured 33 inches. In the museum of the faculty of medicine in Paris there is a hydrocephalic skull measur- ing 39 inches. In aggravated cases the head cannot be supported by the neck, and the patient has to keep in the recumbent posture. The expansibility of the skull pre-vents destructive pressure on the braiu, yet this organ is materially affected by the presence of the fluid. The cerebral ventricles are widely distended, and the convolu- tions flattened, while occasionally the fluid escapes into

the cavity of the cranium, which it fills, pressing down the brain to the base of the skull. As a consequence of such changes, the functions of the brain are interfered with, and in general the mental condition of the patient is impaired to a greater or less extent. The child is dull and listless, irritable, and sometimes imbecile. The special senses become affected as the disease advances, especially vision, and sight is often lost, as is also hearing. Towards the close paralysis is apt to occur. Hydrocephalic children rarely live long, generally dying from the malady in a few years, or succumbing to some of the disorders of childhood, which they are little able to resist. Nevertheless there have been many instances of persons with this disease reaching maturity, and even living to old age. It must also be borne in mind that there are grades of this affection, and that children may present many of the symptoms of it in a comparatively slight degree, and yet recover, the head ceasing to expand, and becoming firmly ossified.

Various methods of treatment have been employed in this disease, but the results are seldom satisfactory. Com- pression of the head by bandages, and the administration of mercury with the view of promoting absorption of the fluid, are now little resorted to. Tapping the fluid from time to time through one of the spaces between the bones, drawing off a little, and thereafter employing gentle pressure, has been tried, but seldom with permanent benefit. On the whole, the plan of treatment which aims at maintaining the patient's nutrition by appropriate food and tonics, is at once the most rational and successful, provided it be resorted to in time to admit of the arrest of the progress of the symptoms. (J. 0. A.)

HYDROGEN (from véwp, water, and yevvdw, to generate) is a chemical element which in the free state occurs in volcanic gases, but exists for the most part in combination with oxygen as water. and the chief compounds of hydrogen have already been described in the article CuEmisTry, vol. v. pp. 478, 483, 491, 499, 544, &c., it is here only necessary to refer to the liquefaction of gaseous hydrogen.!

At the close of 1877 and in the beginning of 1878, not only hydrogen, but all the so-called permanent gases, were reduced to the liquid state, an achievement the more remarkable as it was the result of the simultaneous but entirely independent labours of two distinguished physi- cists, M.

Cailletet of Chatillon-sur-Seine and M. Pictet: of Geneva. The experiments of the former, who clearly demonstrated the possibility of liquefying acetylene, car- bonic oxide, hydrogen, methane, nitric oxide, nitrogen,

1 The statement in the article CHEMISTRY, vol. v. p. 479, that hydrogen has never been liquefied, was true at the date of publieation.

As its elemental characteristics |

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and oxygen, are described in detail in the Annales de Chimie et de Physique, ser. 5, vol. xv. p, 132; those of M. Pictet, who operated only upon oxygen and hydrogen, are detailed in the same journal, ser. 5, vol. xiii p. 145. The instrumental means employed by them were very dif- ferent, as will be evident from the following description.

M. Cailletet's apparatus is represented in the annexed sketch (fig. 1). The gas under experiment is contained in a stout glass tube of narrow bore of the form shown in fig. 2.

To fill this tube with gas, both ends being open, a globule of mer- eury is first introdneed at the lower curved extremity ; the tube is then placed in a nearly horizontal position, the eurved extremity is eonnected with the holder containing the gas, or with the apparatus in which the gas is being evolved, by means of caoutchouc tubing, and a current of the pure dry gas is passed through the tube until the air is entirely ex- pelled ; this being effected, the point opposite to the eurved extremity is sealed in the blowpipe flame; the tube is then brought into a vertical position, so that the globule of mercury eloses the lower ex- tremity, the eaoutchoue tube is withdrawn, and the tube AA thus filled is screwed into its place in the cylinder B. The lower part of the cylinder contains mercury, the upper _f part water. The pressure is ~ exerted by forcing a plunger into a massive steel cylinder filled with water by means of the screw and wheel scen on the left in fig. 1, the water being foreed from this cylinder through the fine eoiled tube into the upper part of the eylinder in which the glass tube is fixed ; by rapidly turn- ing the wheel seen on the right of the figure, a valve may be opened, allowing of the escape of the water, and thus the pres- sure on the gas may

be sud- denly withdrawn. The pressure to which the gas is submitted is measured by means of either of the manometers seen on the right. The gas may be cooled by surrounding the tube A with liquid sulphur dioxide, car- bon dioxide, or nitrous oxide, and the deposition of ice on the out- side of the cylinder containing the refrigerating liquid is prevented by eovering it with a glass cylinder or bell jar, under which is plaeed some desiceating material. By strongly eompressing a gas in this apparatus, and then suddenly relieving it from pressure, an enor- mous reduetion in its temperature is effected, owing to the sudden expansion of the gas, and it is under these circumstances that lique- faetion takes place in eases where pressure alone is ineffective. On submitting hydrogen to a pressure of nearly 300 atmospheres, and then suddenly withdrawing the pressure, M. Cailletet observed the formation of a fine mist in the interior of the tube ; the experiments of Andrews and his own previous observations had shown that this result afforded ineontestable proof of the presenee of liquid, if not of solid, particles.

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The general disposition of M. Pietet's apparatus is scen in fig. 3. It is of a much more complex character, but permits of the ex- periment being made on a comparatively very large scale. The condensation of the gas is effected in a eopper tube of narrow bore,

Fic. 8.—Pictet's Apparatus for Liquefaction of Gases.

conneeted at the one end with a manometer eapable of indicating pressures up to 800 atmospheres, and with a fine steel stop-eock, and at the other with a very strong wrought-iron vessel in which

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HYDROGEN

the hydrogen is gencrated by heating a perfeetly dry mixture of potassium formate with potassium hydroxide ; these two substances euter into reaction in accordance with the equation HCOOK+ HOK=K,CO, + Hg, the hydrogen being evolved in a perfectly regular manner when the temperature ismaintained at 225°. The dimensions of the condensation tube are— internal diameter ‘001 metre, exter- nal diameter ‘015 metre, length 4°16 metres ; and the retort has a eapacity of 1659 eubic eentimetres. The charge introduced con- sisted of 500 grammes potassium hydroxide and 1251 grammes potassium formate. The condensation tube is surrounded with a wider tube containing condensed earbon dioxide or nitrous oxide; these tubes are enclosed in the lower box seen in the sketcli. The upper box contains a tubular arrangement in whieh carbon dioxide or nitrous oxide from the gasholder is reduced to the liquid state. The pumps are such asare used in ice-making machines, one of each pair being an exhausting, the other a condensing pump; one pair of these pumpsis employed in condensing and volatilizing the sulphur dioxide, and the other in condensing and volatilizing the earbon dioxide or nitrous oxide. Figs. 4 and 5 show the appa- ratus in vertical section and in plan.

In working the apparatus, in the first plaee liquid sulphur dioxide from the reservoir secn between the first pair of pumps is eharged into the outer tube of the condenser in the upper box, and is eaused rapidly to evaporate by the aetion of the exhausting pump in con- nexion with the tube, while the other pump serves to recondense it in the reservoir, which is a kind of ‘iledae boiler provided with a cold water eireulation. The temperature of the liquid sulphur dioxide is thus redueed to – 65°C. ; on allowing the carbon dioxide or

Fia 4.—Vertical Section of Pictet’s Apparatus,

nitrous oxide to enter the inner tube of the condenser thus cooled, it begins to liquefy under a pressure of about 4 atmospheres, and the condensation of

the whole of the gas is effected at a pressure of from 4 to 7 atmospheres, the temperature of the liquid sulphur di- oxide fluctuating between – 65° and – 50°. The liquid earbon dioxide

Sa | oh (fs i ——=G Ua 2 a hea i = ae ibe Fie. 5. —Plan of Pictet's Apparatus, fall gaat)

characteristie rustling noise on the ground, recalling the sound of small seed falling. Moreover, the jet was not continuous as in the case of oxygen, but intermittent, each projection of matter being attended with the peculiar rustling noise alluded to; in fact, owing to the great reduction in temperature, due to the sudden volatilization of the liquid, portions became solidified in the tube. On closing the stop-eoek after sevcral seconds, the pressure being still 370 atmo-

(or nitrous oxide) thus obtained is then allowed to pass into the tube surrounding the condensation tube, and by the action of the second exhausting pump it is caused to evaporate so quickly that it solidi- fies. The temperature may thus be reduced to – 120° or even — 140°,

In deseribing his first experiment with hydrogen with this sane ratus, M. Pietet states that the pressure, having risen gradually during about 40 minutes, became stationary at about 650 atmo- spheres ; on then opening the stop-coek, the orifice being illumi- nated by a powerful eleetric light, an opaque jet of a highly char- aeteristie stecl-blue tint was seen to issue forth. At the same moment, a sharp hissing noisc like that produeed on plunging ared- hot bar of iron into water was heard, and simultaneously a highly

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— ~ spheres, the pressure fcll to 820 atmospheres, then slowly rose to 330 atmospheres, and remained constant for several minutes ; on now opening the stop-cock again, a jet issued of extremely short duration, aceom- panied with the violent projection of solid particles, but then nothing eseaped although the pressure was 315 atmospheres, an indication that the hydrogen had solidified in the interior of the tube. On ceasing to aspirate from the tube surrounding the condensation tube, and thus allowing the temperature of the latter to rise somewhat, diseharges took place with

increasing frequency, until after about a quarter of an hour the pressure fell to zero. nom |

Pictet thus succeeded in liquefying and solidifying hydrogen on January 10th, 1878, Cailletet having demonstrated its liquefaction on Deecmber 30th previously.

Archi- medes.

Alex- andrian school.

Fron- tinus,

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HYDROMECHANICS

HistoricaL Intropvuction.!

HE word Hydromechanics is derived from the Greek bdpo-wynxavikd, Meaning the mechanics of water and fluids in general The science is divided into three branches :—Hydrostatics, which deals with the equilibrium of fluids; Hydrodynamics, which deals with the mathe- matical theory of the motion of fluids, neglecting the viscosity ; and Hydraulics, in which the motion of water in pipes and canals is considered, and hydrodynamical

questions of practical application are investigated.

The science of hydromechanics was cultivated with less success among the ancients than any other branch of mechanical philosophy. When the human mind had made considerable progress in the other departments of physical science, the doctrine of fluids had not begun to occupy the attention of philosophers; and, if we except a few proposi- tions on the pressure and equilibrium of water, hydro- mechanics must be regarded as a modern science, which owes its existence and improvement to these great men who adorned the 17th and 18th centuries.

Those general principles of hydrostatics which are to this day employed as the foundation of that part of the science were first given by Archimedes in his work Ilept Tov dxoupnévwy, or De wis que vehuntur in humido, about 250 B.C., and were afterwards applied to experiments by Marinus Ghetaldus in his Promotus Archimedes (1603). Archimedes maintained that each particle of a fluid mass, when in equili-

brium, is equally pressed in every direction; and he in- .

quired into the conditions according to which a solid body floating in a fluid should assume and preserve a position of equilibrium. We are also indebted to him for that in- genious hydrostatic process by which the purity of the precious metals can be ascertained, and for the screw engine which goes by his name.

In the Greek school at Alexandria, which flourished under the auspices of the Ptolemies, the first attempts were made at the construction of hydraulic machinery. About 120 3.c. the fountain of compression, the siphon, and the forcing pump were invented by Ctesibius and Hero ; and, though these machiues operated by the pressure of the air, yet their inventors had no distinct notions of the preliminary branches of pneumatical science. The siphon is a simple instrument; but the forcing pump is a com- plicated and abstruse invention, which could scarcely have been expected in the infancy of hydraulics. It was pro- bably suggested to Ctesibius by the Lgyptcan Wheel or Noria, which was common at that time, and which was a kind of chain pump, consisting of a number of earthen pots carried round byawheel. In some of these machines the pots have a valve in the bottom which enables them to descend without mucli resistance, and diminishes greatly the load upon the wheel ; and, if we suppose that this valve was introduced so early as the time of Ctesibius, it is not difficult to perceive how such a machine might have led that philosopher to the invention of the forcing pump.

Notwithstanding these inventions of the Alexandrian school, its attention does not seem to have been directed to the motion of fluids. The first attempt to investigate this subject was made by Sextus Julius Frontinus, inspector of the public fountains at Rome in the reigns of Nerva and Trajan; and we may justly suppose that his work, entitled De Aqueeductibus Urbis

Rome Commentazius, contains all the hydraulic knowledge of the ancients. After describing

1 This historical sketch of the subject is a revised abridgment of that written by David Buchanan, and prefixed to the article HyDRo- DYNAMICS in the 8th edition of this work.

the nine ? great Roman aqueducts, to which he himself added five more, and mentioning the dates of their erection, he considers the methods which were at that time employed for ascertaining the quantity of water discharged from ajutages, and the mode of distributing the waters of an aqueduct or a fountain. He justly remarks that the flow of water from an orifice depended not only on the magnitude of the orifice itself, but also on the height of the water in the reservoir; and that a pipe employed to carry off a portion of water from an aqueduct should, as circumstances required, have a position more or less inclined to the original direction of the current. But as he was unacquainted with the true law of the velocities of running water as depending upon the depth of the orifice, we can scarcely be surprised at the want of precision which appears in his results.

It has generally been supposed that the Romans were ignorant of the art of conducting and raising water by means of pipes; but it can scarcely be doubted, from the statement of Pliny and other authors, not only that they were acquainted with the hydrostatical principle, but that they actually used leaden pipes for the purpose. Pliny asserts that water will always rise to the height of its source, and he also adds that, in order to raise water up to an eminence, leaden pipes must be employed.

Castelli and Torricelli, two of the disciples of Galileo, Casteni,

applied the discoveries of their master to the science of hydrodynamics. In 1628 Castelli published a small work, Della Misura dell' acque correnti, in which he gave a very satisfactory explanation of several phenomena in the motion of fluids in rivers and canals. But he committed a great paralogism in supposing the velocity of the water propor- tional to the depth of the orifice below the surface of the vessel.

imagined that it ought to move with the same velocity as if it had fallen through that height by the force of gravity. And hence he deduced this beautiful and important pro- position, that the velocities of fluids are as the square root of the head, allowing for the resistance of the air and the friction of the orifice. This theorem was published in 1643, at the end of his treatise De Motu gravium Projectorum. It was afterwards confirmed by the ex- periments of Raphael Magiotti on the quantities of water discharged from different ajutages under different pressures ; and, though it is true only in small orifices, it gave a new turn to the science of hydraulics.

After the death of the celebrated Pascal, who discoveréfl Pascal.

the pressure of the atmosphere, a treatise on the equilibrium of fluids (Sur VEquilibre des Liqueurs) was found among

2 These nine aqueducts delivered every day 14,000 quinaria, or abont 50,000,000 cubic feet of water, or about 50 cubic feet for the daily consumption of each inhabitant, supposing the population of Rome to have been a million, From measurements of Frontinus at the close of the 1st century, the total length of channels of aqueducts was 285 Roman miles (Roman mile=1618 English yards). The supply mea- – sured by Frontinus amounted to 13,470 quinaries,—outside Rome 3164, inside 10,306. Mcasured at the head the supply was 24,413 quinaries, the difference being due to waste, and to some of the channels having fallen into decay. Parker says :—"It has been com- pated by a French engineer that the supply to Rome was 332,306, 624 gallons daily. If we assume the population at a million, the rate was 382 gallons daily per person. In our day we consider 40 gallons sufii- cient, and many think this excessive." Modern supply varies from 24 to 50 gallons per head per day. ;

3 Plin. xxxvi. See also Palladius, De Re Rustica, ix., xi.; Herace, Epist., i. 10, 20; Ovid, Afet., iv. 122.

Torricelli, observing that in a jet where the water Topi. rushed through a small ajutage it rose to nearly the same celli. | height with the reservoir from which it was supplied,

Mariotte.

his manuscripts, and was given to the public in 1663. In the hands of Pascal hydrostatics assumed the dignity of a science. The laws of the equilibrium of fluids were demonstrated in the most perspicuons and simple manner, and amply confirmed by experiments. The discovery of Torricelli, it may be supposed, would have incited Pascal to the study of hydraulics. But as he has not treated this subject in the work mentioned, it was probably composed before that discovery had been made public.

The theorem of Torricelli was employed by many succeed- ing writers, but particularly by the celebrated Mariotte, whose labours in this department of physics deserve to be recorded. His Zraité du Mouvement des Eaux, which was published after his death in the year 1686, is founded on a great variety of well-conducted experiments on the motion of fluids, performed at Versailles and Chantilly. In the discussion of some points he has committed considerable mistakes. Others he has treated very superficially, and in none of his experiments does he seem to have attended to the diminution of efflux arising from the contraction of the

fluid vein, when the orifice is merely a perforation in a |

thin plate; but he appears to have been the first who

attempted to ascribe the discrepancy between theory and | experiment to the retardation of the water's velocity arising

from friction. His contemporary Guglielmini, who was

inspector of the rivers and canals in the Milanese, had | | that which a falling body would receive by descending

ascribed this diminution of velocity in rivers to transverse motions arising from inequalities in their bottom. But as Mariotte observed similar obstructions even in glass pipes, where no transverse currents could exist, the cause assigned by Guglielmini seemed destitute of foundation. The

French philosopher, therefore, regarded these obstructions as the effects of friction. of water which graze along the sides of the pipe lose a portion of their velocity; that the contiguous filaments,

having on this account a greater velocity, rub upou the |

former, and suffer a diminution of their celerity; and that the other filaments are affected with similar retardations proportional to their distance from the axis of the pipe.

In this way the medium velocity of the current may be |

diminished, and consequently the quantity of water dis- charged in a given time must, from the effects of friction, be considerably less than that which is computed from theory. Guglielmini was the first who attended to the motion of water in rivers and open canals (La Musura dell' acque correnti). Embracing the theorem of Torricelli,

which had been confirmed by repeated experiments, |

Guglielmini concluded that each particle in the perpen- dicular section of a current has a tendency to move with the same velocity as if it issued from an orifice at the same depth from the surface. The consequences deducible from this theory of running waters are in every respect repugnant

speexporionss? and it is really surprising that it should have e

en so hastily adopted by succeeding writers. Guglielmini liimself was sufficiently sensible that his parabolic theory was contrary to fact, and endeavoured to reconcile them by supposing the motion of rivers to be obstructed by trans- verse currents arising from irregularities in their bed. The solution of this difficulty, as given by Mariotte, was more sitisfactory, and was afterwards adopted by Guglielmini, who maintained also that the viscosity of water had a con- siderable share in retarding its motion.

The effects of friction and viscosity in diminishing the velocity of running water were noticed in the Principia of Sir Isaac Newton, who threw much light upon several branches of hydromechanics. At a time when the Carte-

sian system of vortices universally prevailed, this great man found it necessary to investigate that absurd hypothesis, angl in the course of his investigations he showed that the velocity of any stratum of the vortex is an arithmetical |

He supposes that the filaments | | his theory.

| conclusion, however, | known fact that jets of water rise nearly to the same height

HYDROMECHADRIS®

| mean between the velocities of the strata which enclose

it; and from this it evidently follows that the velocity of a filament of water moving in a pipe is an arithmetical mean between the velocities of the filaments which surround it. Taking advantage of these results, it was afterwards shown by Pitot that the retardations arising from friction are inversely as the diameters of the pipes in which the fluid moves. The attention of Newton was also directed to the discharge of water from orifices in the bottom of vessels, He supposed a cylindrical vessel full of water to be perforated in its bottom with a small hole by which the water escaped, and the vessel to be supplied with water in such a manner that it always remained full at the same height. He then supposed this cylindrical column of water to be divided into two parts,—the first, which he calls the "cataract," being an hyperboloid generated by the revolu- tion of an hyperbola of the fifth degree around the axis of the cylinder which should pass through the orifice, and the second the remainder of the water in the cylindrical vessel. He considered the horizontal strata of this hyperboloid as always in motion, while the remainder of the water was in a state of rest, and imagined that there was a kind of cataract in the middle of the fluid) When the results of this theory were compared with the quantity of water actually discharged, Newton concluded that the velocity with which the water issued from the orifice was equal to

through half the height of water in the reservoir. This is absolutely irreconcilable with the as their reservoirs, and Newton seems to have been aware of this objection. In the second edition of his Principia accordingly,

which appeared in 1714, he reconsidered He had discovered a contraction in the vein of fluid (vena contracta) which issued from the orifice, and found that, at the distance of about a diameter of the aperture, the section of the vein was contracted in the subduplicate ratio of two to one. He regarded, there- fore, the section of the contracted vein as the true orifice from which the discharge of water ought to be deduced, and the velocity of the effluent water as due to the whole height of water in the reservoir ; and by this means his theory became more conformable to the results ofexperience. This theory, however, is still liable to serious objections, The formation of a cataract is by no means agreeable to the laws of hydrostatics ; for when a vessel is emptied by the efflux of water through an orifice in its bottom, all the particles of the fluid direct themselves toward this orifice, aud therefore no part of it can be considered as in a state of repose.

The subject of the oscillation of waves, one of the most difficult in the science of hydrodynamics, was first in- vestigated by Newton. In the forty-fourth proposition of the second book of his Principia, he has furnished us with a method of ascertaining the velocity of the waves of the sea, by observing the time in which they rise and fall. Tf the two vertical branches of a siphon, which commun- cate by means of a horizontal branch, are filled with a fluid of known density, the two fluid columns, when in a state of rest, will be in equilibrium and their surfaces horizontal. But if the one column is raised above the level of the other, and left to itself, it will descend below that level, and raise the other column above it, and, after a few oscillations, they will return to a state of repose. Newton occupied himself in determining the duration of these oscillations, or the length of a pendulum isochronous to their duration ; and he found, by a simple process of reasoning, that, allowing for the effects of friction, the length of a syn- cbronous pendulum is equal to one-half of the length of the siphon, that is, of the two vertical branches and the

Bernoulli.

D'Alem- bert.

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horizontal one, and hence he deduced the isochronism of these oscillations. From this Newton concluded that the velocity of waves formed on the surface of water, either by the wind or by a body thrown into it, was in the sub- duplicate ratio of their size. When their velocity, there- fore, is measured, which can be easily done, the size of the waves will be determined by means of a pendulum which oscillates in the time that a wave takes to rise and fall.

Such was the state of hydrodynamics in 1738, when Daniel Bernoulli published his Hydrodynamica, sive de Viribus et Motibus Fluidorum Commentarti. The germ of Daniel Bernoulli's theory was first published in his memoir entitled Theorta Nova de Motu Aquarum per Canales quocunque fluentes, which he had communicated to the Academy of St Petersburg as early a3 1726. His theory of the motion of fluids was founded on two supposi- tions, which appeared to him conformable to experience. He supposed that the surface of a fluid, contained in a ves- sel which is emptying itself by an orifice, remains always horizontal ; and, if the fluid mass is conceived to be divided into an infinite number of horizontal strata of the same bulk, that these strata remain contiguous to each other, and that all their points descend vertically, with velocities inversely proportional to their breadth, or to the horizontal sections of the reservoir. In order to determine the motion of each stratum, he employed the principle of the conservatio viarvum vivarum, and obtained very elegant solutions. In the opinion of the Abbé Bossut, his work was one of the finest productions of mathematical genius. The uncer- tainty of the principle employed by Daniel Bernoulli, which has never been demonstrated in a general manner, deprived his results of that confidence which they would otherwise have deserved, and rendered it desirable to havc a theory more certain, and depending solely on the funda- mental laws of mechanics. Maclaurin and John Bernoulli, who were of this opinion, resolved the problem by more direct methods, the one in his /Zusxions, published in 1742, and the other in his Hydraulica nunc primum detecta, et demonstrata directe ex fundamentis pure mechanicis, which forms the fourth volume of his works. The method employed by Maclaurin has been thought not sufficiently rigorous ; and that of John Bernoulli is, in the opinion of Lagrange, defective in perspicuity and precision.

The theory of Daniel Bernoulli was opposed also by the celebrated D'Alembert. When generalizing James Bernoulli's theory of pendulums he discovered a prin- ciple of dynamics so simple and general that it reduced the laws of the motions of bodies to that of their equili- brium. He applicd this principle to the motion of fluids, and gave a specimen of its application at the end of his Dynamics in 1743. It was more fully developed in his Traité des Fluides, which was published in 1744, where he has resolved, in the most simple and elegant manner, all the problems which relate to the equilibrinm and motion of fluids. He makes use of the very same suppositions as Daniel Bernoulli, though his calculus is established in a very different manner. He considers, at every instant, the actual motion of a stratum as composed of a motion which it had in the preceding instant and of a motion which it has lost. The laws of equilibrium between the motions lost furnish him with equations which represent the motion of the fluid, Although the science of hydrodynamics had then made considerable progress, yet it was chiefly founded on hypothesis. It remained a desideratum to express by equations the motion of a particle of the fluid in any assigned direction. These equations were found by D'Alembert from two principles,—that a rectangular canal, taken in a mass of fluid in equilibrium, is itself in equilibrium ; and that a portion of the fluid, in passing from one place to another, preserves the same volume when the fluid is incompressible,

or dilates itself according toa given law when the fluid is elastic. His very ingenious method was published in 1752, in his Zssai sur la Resistance des Fiuides. It was brought to perfection in his Opuscules Mathématiques, and was adopted by Euler.

Before the time of D'Alembert, it was the great object of philosophers to submit the motion of fluids to general formule, independent of all hypothesis. Their attempts, however, were altogether fruitless; for the method of fluxions, which produced such important changes in the physical sciences, was but a feeble auxiliary in the science of hydraulics. For the resolution of the questions concern- ing the motion of fluids, we are indebted to the method of partial differences, a new calculus, with which

Euler enriched the sciences. This great discovery was first applied to the motion of watcr by D'Alembert, and enabled both him and Euler to represent the theory of fluids in formule restricted by no particular hypothesis.

The most successful labourer in the scicnce of hydro- Dubuat.

dyuamics was the Chevalier Dubuat, engineer in ordinary to the king of France. Following in the steps of the Abbé Bossut (Nouvelles expériences sur la resistance des fluides, 1777), he prosecuted the inquiries of that philosopher with uncommon ingenuity; and in the year 1786 he published, in two volumes, his Principes d'Hydraulique, which contains a satisfactory theory of the motion of fluids, founded solely upon experiments. Dubuat considered that if water were a perfect fluid, and the channels in which it flowed infinitely smooth, its motion would be continually accelerated, like that of bodies descending in an inclined plane. But as the motion of rivers is not continually accelerated, and soon arrives at a state of uniformity, it is evident that the viscosity of the water, and the friction of the channel in which it descends, must equal the accelerating force. Dubuat therefore assumes it as a proposition of fundamental importance that, when water flows in any channel or bed, the accelerating force which obliges it to move is equal to the sum of all the resistances which it meets with, whether they arise from its own viscosity or from the friction of its bed. This principle was employed by Dubuat in the first edition of his work, which appeared in 1779, but the theory contained in that edition was founded on the experiments of others. He soon saw, however, that a theory so new, and leading to results so different from the ordinary theory, should be founded on new experiments more direct than the former, and he was employed in the performance of these from 1780 to 1783. The experiments of Bossut having been made only on pipes of a moderate declivity, Dubuat found it necessary to supply this defect. He used declivities of every kind, and made his experiments upon channels from a line and a half in diameter to seven or eight square toises.

The theory of running water was greatly advanced by Prony.

the researches of Prony. From a collection of the best experiments by Couplet, Bossut, and Dubuat he selected eighty-two (fifty-one on the

velocity of water in conduit pipes, and thirty-one on its velocity in open canals); and, discussing these on physical and mechanical principles, he succeeded in drawing up general formulz, which afford a simple expression for the velocity of running water.

Eytelwein of Berlin published, in 1801, a valuable com- Eytel- pendium of Hydraulics, entitled Handbuch der Mechanik wem.

und der Iydraulik, which contains an account of many new and valuable experiments made by himself. He in- vestigates the subject of the discharge of water by com- pound pipes, the motions of jets, and their impulses against plane and oblique surfaces; and he shows theo- retically that a water wheel will have its cffect a maxi- mum when its circumference moves with half the velocity of the stream.

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Mallet A series of interesting hydraulic experiments was made | the more cumbrous water wheels previously in use.

and" at Rome in 1809 by Mallet and Vici. They found that | Shortly after the invention was made public, Fourneyron

Vici. pipe whose gauge was five ounces French measure (or | was awarded the prize of 6000 francs which was offered by 003059 French kilolitres) furnished one-seventh more water | the Society for the Encouragement of National Industry. than five pipes of one ounce, an effect arising from the | | The most extensive experiments on the discharge of water Recent velocity being diminished by friction in the ratio of the | from orifices are those made under the direction of the investi- perimeters of the orifices as compared with their areas. French Government by Poncelet and Lesbros (Eaperiences &t10™s.

Hachette, Hachette, in the year 1816, presented to tle National Iydrauliques, Paris, 1851). Boileau (Z'raité de la mesure Institute a memoir containing the results of experiments | des eaux cowrantes) has discussed these results and added which he had made on the spouting of fluids, and the | experiments of his own. Bornemann has re-examined all discharge of

vessels, The objects he had in view werc | these results with great care, aud has been able to express to measure the contracted part of a fluid vein, to examine | in formule the variation of the coefficients of discharge in the phenomena attendant on additional tubes, and to | different conditions (Civilingentewr, 1880), Very valuable investigate and describe the figure of the fluid vein, and | experiments leading to a modification of the usual formula the results which take place when different forms of orifices | for the discharge over weirs were made by Mr J. B. Francis are employed. Hachette showed in the second part of his | (Zowell Hydraulic Experiments, Boston, Mass., 1855). memoir that greater or lesser' volumes of water will be | Wiesbach also has made many experimental investigations discharged in the same time through tubes of different | of the discharge of fluids. figures, the apertures in all having the same dimensions. The friction of water investigated originally by Coulomb He also gave several remarkable results respecting other | at slow speeds has been measured for higher speeds by Mr fluids issuing out of orifices into air or a vacuum, W. Froude, whose researches have very great value in the

Investi: | Several very interesting experiments on the propagation | theory of ship resistance (Lepore of Brit. Assoc., 1869).

gations of waves'have been made by the brothers Weber! and by The flow of air and steam from orifices has been measured

ae Bidone. Mr John Scott Russell performed a number of | by many experimenters from Young to Saint Venant. Mr

"experiments on waves, which are described in the Mdin-| Napier in some interesting experiments first pointed out

burgh Transactions, vol. xiv., and in the British Association | that when the ratio of the pressures on the two sides of an

Report for 1837. The mathematical theory has been | orifice exceeded a certain limit the measured discharge was

worked out by Green, Stokes, Rankine, and other mathe- | very different from that calculated by the accepted formule.

maticians, but still offers an interesting field for the inves- | Since then numerous experiments have been made, and the

tigator. Stokes's Report of the British Association for | theory of the flow of elastic fluids has been discussed in

1846 on Recent Researches in Hydrodynamics gives an | numerous memoirs. The valuable investigations of Fliegner account of the subject as it existed at that date. | (Civilingenteur, 1878) deserve special mention.

Bidone. In 1826 Bidone,? besides his experiments on waves, A most valuable investigation of the flow of water in made a series on the velocity of running water at the | pipes and channels has been carried out with exceptional hydraulic establishment of the university of Turin, and he | accuracy and on a very large scale by the late M. Darcy, published an account of them in 1829. After giving a | and continued by his successor the late M. Bazin, at the description of his apparatus and method of experimenting, | expense of the French Government (Iecherches Hydrau- he gives the figures obtained from fluid veins, sections of | Jigues, Paris, 1866). The measurement of the flow in rivers which were taken at different distances from the orifice. has been extensively carried out, especially by German

Poncelet. In the year 1827 Poncelet published a Mémoire sur | engineers. Harlacher's Beitriige zur Hydrographie des les Rowes Hydrauliques & Aubes Courbes, containing his | Kénigreiches Bohmen contains exceedingly valuable measure- experiments on the undershot wheel with curved palettes, | meuts of this kind, and a comparison of the experimental which he had invented in the year 1824. The best | results with all the formule of flow which have been pro- undershot previous to the introduction of the Poncelet wheel | posed. Messrs Humphreys and Abbott's gaugings of the never developed more than 0°25 of the work of the water, | Mississippi for the United States Government, Mr Gordon's whereas this utilized 0°60 of that work, which is nearly | gaugings of the Irrawaddi, and Captain Cunningham's equivalent to the maximum effect of the breast wheel. | experiments on the Ganges Canal may be referred to as The principle on which the Poncelet wheel acts, and that | having materially advanced hydraulic science, which makes it utilize so much of the work of the water,

The first adequate theory of turbines is that of Poncelet is that the water is received by the curved floats without | in the Comptes Kendus de V Academie de Paris, 1838. any shock, and is discharged finally with a small velocity. | Redtenbacher's Theorte und Bau der Turbinen und Ven- This undershot wheel is much used in France, tilatoren (Mannheim, 1844) is the first complete treatise on

Four: Previous to the year 1827, the wheels required in the | the subject. Girard's turbine, which was of an entirely new

neyron. mills and manufactories of Germany and France were | type, was discussed in Le Génie industrielle, 1856-1857,

generally those which worked with the axis horizontal, or the tub and spoon wheels with the axis vertical ; but in that year a young mechanician named Fourneyron introduced a wheel working with the axis vertical, yet wholly different from the latter kind. Fourneyron showed that in existing wheels with a vertical axis the water left the wheel with considerable velocity in the direction of the motion of the wheel, and thus carried away and wasted much of the energy of the fall. By the introduction of a series of fixed guide blades, which gave the water initially a backward velocity of rotation, the water left the wheel with a much smaller velocity of discharge. He thus invented the first complete turbine, a kind of water motor which has largely superseded

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*? Wellenlehre auf Expert ipsi , perimente gegrundet, Leipsic, 1825. * Turin Memoirs, vol. xxv. fe i*

and lately by Fink (Civilingenieur, 1880). Important experiments on turbines were made by Francis (Lowell Hydraulic Experiments, Boston, Mass., 1855).

GENERAL PRINCIPLES.

Hydromechanics is the science of the equilibrium and motion of fluids, both elastic and non-elastic. A fluid is defined to be a substance which yields

continually to the | slightest tangential stress; and, consequently, when the fluid has come to rest, the stress across any surface in the fluid must be normal to the surface.

The stress considered in hydromechanics is always a pressure, as fluids are in general capable of sustaining only a slight tension without disruption (see CAPILLARY ACTION). The intensity of the pressure is measured, as in the subject of elasticity, by the number of units of force per unit of area.

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If an area a be pushed by P units of force, then the mean

i Le ; ‘ pressure p over the area a is —; or, if p be variable, then Q

at any point p= lt J , a being any small area cnclosing the ‘

point at which p is required, and P the number of units of force with which a is pushed.

The pressure across any surface being normal to the surface, it follows from the general equations of internal stress (see Exasticiry) that at a point the pressure is the same in all directions about tle point. This may be proved independently by considering the equilibrium of a tetra- hedron ABCD. Let », p’ be the pressures on the faces ABC, BCD, and resolve the forces parallel to the edge AD ; the face ABC will be pushed by a force p x area ABC, and the face BCD will be pushed by a force p’ x area BCD; and the projections of the areas ABC, BCD on a plane per- pendicular to AD being equal, it follows that p=p’.

If forces act throughout the fluid so that the pressure varies from one point to another, we must suppose the tetrahedron taken indefinitely small, and then the impressed forces, depending on the volume, may be neglected in com- parison with the forces acting on the faces, which depend on the surface of the tetrahedron.

When fluids such as exist in nature are in motion, the stresses across any surfaces are no longer normal, but tangential stresses are called into play,

the intensities of which depend upon the relative motion of the parts of the fluid ; those tangential stresses are said to be due to the viscosity of the fluid.

The difference between a solid and a fluid is that ina solid the tangential stress must exceed a certain amount before permanent shearing takes place, otherwise the stress being removed the solid regains its shape; in a fluid the slightest tangential stress produces a permanent deformation, and if continued long enough will cause a complete change of form, however great the viscosity of the fluid may be.} But little progress has been made in the theory of the motion of viscous fluids, those cases which have bcen worked out mostly falling under the head of the practical subject of hydraulics. In the theoretical subject of hydro- dynamics the motion of the so-called perfect fluids only is considered,—fluids in which no viscosity is supposed to exist, aud in which therefore the pressure at a point is the same in all directions.

Fluids are divided into two classes, incompressible fluids called liquids, and compressible fluids called gases. The so-called incompressible fluids are in reality compressible, but the compressibility being small is neglected in ordinary problems.

The compression of a substance is defined to be the ratio of the diminution of the volume to the original volume ; and the compressibility is defined to be the ratio of the compression to the pressure producing it. The elasticity or resilience of volume is the ratio of the pressure to the compression produced, and is therefore the reciprocal of the compressibility. Fluids, from the definition, possess only elasticity of volume; an elastic solid possesses in addition an elasticity of figure, called also the regzdity.

A table of the elasticities and compressibilities of liquids is given in Everett's Units and Physical Constants, ex- pressed in C. G. 8. units; for instance, at 8° C. the elasticity of water is 2°08 × 10°, and the compressibility per atmo- sphere is 4°81×107-5, The elasticity of water is also proved to exist, and can be determined from the velocity of sound in water; for instance, in water of density unity, the velocity is the square root of the elasticity, and there-

1 For examples of the difference between a soft solid and a very viscous fluid see Maxwell's cat, chap. xxi.

fore 144,000 centimetres per second, which agrees closcly with the velocity determined by experiment.

Compressible fluids or gases are assumed to obey the two gaseous laws.

The first gaseous law, discovered by Boyle, and gene- rally called Boyle's law, asserts that the pressure of a given quantity of a gas at a given temperature varies inversely as the volume, or directly as the density.

The density is defined to be the number of units of mass in the unit of volume, and the specific volume is the volume of the unit of mass. Hence Boyle's law asserts that the pressure of a gas at a given temperature varies as the density, or inversely as the specific volume.

Dalton generalized Boyle's law for a mixture of gases by enunciating the law that the pressure of a mixture of gases is the sum of the separate pressures each gas would have if it existed alone in the containing vessel.

If we suppose all the gases the same, we are led to Boyle's law, since, if a gramme of air in a centimetre cube produces a certain pressure, then two grammes will produce double the pressure, three grammes treble the pressure, and so on; hence the pressure varies as the density. This method of exhibiting Boyle's law is due to Rankine (Max- well, ZZeat, p. 27).

The second gaseous law was discovered by Charles, but it generally goes by Gay-Lussac's name. It asserts that under constant pressure the volume of a given quantity of every gas increases by about 7-5 of its volume at 0° C. for a rise of temperature of 1° C. Therefore, if v be the volume at 7° C, and v the volume at 0° C., then

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If we reckon temperature from — 273° C., aud put 273+7=1, then ¢ is called the absolute temperature, and — 273° C. is called the absolute zero; and the second gaseous law asserts that at a constant pressure the volume of a given quautity of gas is proportional to the absolute temperature.

Combined with Boyle's law, this leads to the result that

put, =Rt suppose, where p is the pressure, » the specifie volume, and ¢ the absolute temperature ; also, if p denotc the density,

p=, and p= Rpt. To determine the numerical value of vk, in C.G.S. units, sup-

ose at 80° C. a centimetre cube of air is 001 of a gramme, the eight of the barometer being 76 centimetres, and the numerical value of g to be 981; then p=981 × 1342 × 76=108 very nearly, t= 273 + 80 =3538, v=]. '

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Rea 353 == 2833. If the temperature is kept constant, then, an increment of pressure

dp producing a compression — a the elasticity of volume

and therefore at a constant temperature the elasticity is equal to the pressure.

Professor Maxwell (Heat, p. 171) has proved from first principles that the ratio of the elasticity of volume when no heat escapes is to the elasticity at constant temperature as the specifie heat at constant pressure to the specific heat at constant volume.

Consequently if y denotes the ratio of the specific heat at constant pressure to the specific heat at constant volume, and if the gas be compressed and no heat allowed to eseape, then

ad —_ of = ¥P 9 ap dy or a Laas Os or po = constant,

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Consequcatly, if p, p' be the pressures, v, vy the specific volumes, p, p' the densities, and ¢, t' the absolute temperatures at two diffe- rent states of a gas, when no heat has been allowed to escape, then

z-(4)-(s)=(E

since p at = 3 ; pv t The value of y for air is about 1:4; for instance, the velocity of

' dp + pay im e sound is Zp y > ; and, for dry airat7°C. , — =< 83 108 + oe a p 6 PRK i 273)'

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[HYDROSTATICS.

and therefore the velocity of sound in centimetres per second

= 33240 v(1 + a) = 33240 +607, nearly.

We have defined the density of a substance to be the number of units of mass in the unit of volume; for in- stance, with English units the density is the number of pounds in a cubic foot, and the density of water would be 62°5, a cubic foot of water being 1000 oz. But the den- sities of substances are generally tabulated relatively to water, and the old-fashioned name for the density relative to water was specific gravity. With French units of the centimetre and the gramme, a centimetre cube of water being a gramme, the density of water is unity.

PART I.—HYDROSTATICS.

Hydrostatics is the science of the equilibrium of fluids. When a fluid has come to rest there can be no tangential stress, and consequently the stress across any surface is normal to the surface, and therefore the same in all direc- tions about a point. We shall begin with a few elementary propositions about the equilibrium of liquids like water under gravity, and afterwards proceed to the consideration of the equilibrium of any fluid under any forces.

Prop. I. The pressure is the same at all points in a horizontal plane of a liquid at rest under gravity.

For, taking any two points in the same horizontal plane, and joining them, and describing about the joining line as axis an inde- finitely thin cylinder, then, since the weight and the pressures on the sides of the cylinder are normal to the axis of the cylinder, resolv- ing parallel to the axis of the cylinder, the pressures on the ends must be equal for equilibrum, and must therefore be of equal intensity.

Corollary. —It follows that the frec surface must be a horizontal plane, supposing the pressure uniform over it, and gravity to act in parallel vertical lines.

That the free surface is a plane is verified experimentally by the fact that objects are seen by reflexion at the surface undisturbed as in a plane mirror; and that it is a horizontal plane is verified by the fact that a plumb line and its image by reflexion at the surface always appear in the same straight line.

Prop. Il. The pressure at any point of a liquid at rest under gravity is proportional to the depth.

For, let P (fig. 1) be any point at a depth AP =2 in the liquid, and about AP as axis describe a cylinder, of sectional area a suppose. Then, considering the. equilibrium of the liquid in this cylinder, and resolving vertically, the pressure, p suppose, at P acting over the area a must balance the weight of the liquid in the cylinder, neglecting the atmospheric pressure, and there- fore

Pa= pra, = p=pe,

p denoting the weight of the liquid per unit of volume.

In practical hydrostatics the gravitation measure of forces is employed, and p the pressure is generally estimated in Ib per square inch, and then, an inch being the unit of length, z is given in inches, and p is the num- ber of pounds toa cubic inch of the liquid con- sidered.

Thus with water, taking a cubic foot of water Fig. 1. to be 62°4 Ib, p=tpge= 0-036 X2. If, however, e be measured in feet and p in tb per square inch, payee 0483 XZ.

Consequently the head of each foot of water produces a pressure of 0°433 Tb to the square inch.

With the French metric system of units, a centimetre cube of water is one gramme, and therefore with the centimetre as the unit of length and gramme as unit of weight, using gravitation units of foree, p=1, and p=z.

Even if the point C considered (fig. 2) should not be vertically below the actual free surface, it still follows that the pressure at

level of the common surface

| sea when the ship is rolling.

C is proportional to the depth below the free surface. For the pressure at C is equal to the pressure at D in the same horizontal lane, and this is proportional to the depth E, that is, to the depth CF. ---£ lf the atmospheric pressure w be taken into account, then

pratt pe, and generally, at different depths z and 2', p-p=pe-#); or the difference of the pressures at any two points of a liquid at rest under grayity is . proportional to the difference of the depths. Fig. 2. Corollary.—It follows from this that a liquid rises to the same

level in a series of communicating vessels (fig. 8), since the fluid must have onc horizontal plane as the free surface.

If liquids of different densities p and_p' be poured into the two branches of a bent tube, the heights of the free surfaces above the plane of separation will be inversely as the densities. For the pres- sure at the level of the common sur- face being constant, and in one case A due to a height % of liquid of density pand in the other casc to a height h' of liquid of density p', therefore

ph=ph’,

or h:h’=p’:p. P

The barometer (fig. 4) is in reality an instrument of this character, for a column of mercury, of density o and height % suppose, supports a column of air, which is of density p suppose, and, if homogeneous, would reach to a height H. Hence the pressure at the

= oh= pH ’ estimated in gravitation measure.

If the tube AB should not be ex- actly vertical, then A must be taken to denote the vertical distance between the level of the mercury at P and Q, which becomes difficult to estimate at

ja tel wl gy bop Te bg bg

When /is observed the temperature must also be observed; for at the same pressure the coefficient of linear expan- ic, 4 sion of A is the coefficient of cubical a expansion of mercury. For, if the density of mercury were halved, the height & would be doubled, and so on in any proportion.

— ee

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H is called the pressure height (Everett, Units and Physical Constants). For dry air at 0° C.,

H =7‘988 × 10° centimetres.

Prop. 111. To find the pressure on the bottom of a vessel of any – form containing liquid, the bottom of the vessel being supposed a horizontal plane. The pressure at any point of the base being the same and due to the depth below the free surface, whatever be the shape of the sides of the vessel, as in fig. 5, it follows that the pressure on the base AB is equal to the weight of the liquid contained in an imagin- ary cylinder, traced out by vertical lines round the base AB reaching to the surface.

In order to illustrate this, let there be four vessels A, B, C, D (fig. 6), having bottoms all of the same area, and closed by plates E, F, G, H, of the same weight. Let the plates also be

ept in their places by means of strings passing over pulleys and supporting equal weights w,w',w",w." The weights will measure the vertical forces acting on the plates, z.¢., the bases of the vessels. It will be found that water must be poured into each vessel to the same height to cause the plates to descend. The same will be the case whatever be the shapes of the vessels, and the extreme cases of a very large base acted upon by the pressure of water in a very con-

ee ats oe ee

Fig. 5.

tracted vessel, and of a very small area kept closed by a very small weight when the vessel is very much enlarged above, constitute what used to be called the hydrostatic paradox. Another kind of hydro-

Fig. 6.

static paradox is the hydraulic press, where water, pumped in with small exertion by a forcing pump of which the plunger is of small diameter, causes a second plunger of very much greater diameter to rise and produce a very great pressure.

Prop. LV. (Archimedes's Principle).—The resultant pressure of a fluid on a body immersed in it acts vertically upwards through the centre of gravity, and is equal to the weight of the displaced liquid.

For, suppose the body removed and its place filled up with fluid as it would be at rest, and imagine for clearness this fluid solidified. The fiuid pressures which act upon this solidified fluid are the same as before, and since the fluid is in equilibrium under its own weight and the fluid pressures, the resultant of the fluid pressures must be a single vertical force equal to the weight of the displaced liquid, and acting upwards through the centre of gravity of the displaced liquid.

Peratonry,—t8 a body float at rest in fluid, the weight of the body must be equal to the weight of the displaced finid, and the C.G.s of the body and displaced fluid must be in the same vertical line. For instance, the weight of water displaced by a ship is

equal to the weight of the whole ship, masts, rigging and all. When a balloon is at rest in the air, the weight of the balloon is equal to the weight of air displaced.

Archimedes's principle is employed to determine the densities of bodies ; for, if w be the weight of a body weighed in a balance in air (strictly speaking in vacuo), and if w' be its apparent weight when immersed in water, then ww', the resultant npward_pres- sure of the water, is equal to the weight of water displaced, and the density relative to water is therefore

w

ww

In very accurate weighings the weight of air displaced must be

taken into account, the real weight of a body being its apparent weight in air plus the weight of air displaced. Thus, if in air a pound of lead and a pound of feathers balance in a pair of scales, if placed under a receiver and the air exhausted the feathers would preponderate.

The densities of liquids and solids are also determined by hydro- meters, for a description of which consult the article HYDROMETER.

The numerical measure of the density of a substance being the quotient of the number of units of mass (or weight) by the number of units of volume, it follows that in a mixture of fluids the density of the mixture is the quotient of the number of units of mass in the component fluids by the volume of the mixture.

The volume of the mixture will in gencral be the sum of the voluines of the component fluids, except in some eases where the fluids combine chemically with each other. If equal volumes of the component fluids be taken, the density of the mixture will therefore be the arithmetical mean of the densities of the component fluids ; but if equal weights be taken, the density of the mixture will be the harmonical mean of the densities of the component fluids, no change of volume being supposed to take place.

Prop. V. To find the resultant vertical and horizontal pressures on one side of a portion of a surface immersed in fluid at rest under gravity.

The resultant vertical pressure is the weight of the superincum- bent fluid contained by vertical lines drawn round the bounding curve of the surface to the free surface. If, however, the free sur- face does not extend over the surface, we must suppose it made to do so by filling up the empty space with fluid. The line of action of the resultant vertical pressure passes through the centre of gravity of this superincumbent fluid.

The resultant horizontal pressure in any direction is equal to the resultant pressure on the plane area traced. out on a plane perpendi- cular to the given horizontal direction by horizontal lines drawn through the bounding line of the surface in the given direction ; this plane area is called the orthogonal projection of the surface on a plane perpendicular to the given direction. For, resolving in the given direction the weight of the enclosed liquid and the pressures on the cylindrical surface traced out by the horizontal lines acting in a direction at right angles, the horizontal components of the

ressures on the ends balance, which proves the proposition, The

ine of action of this horizontal pressure passes through the centre of pressure of the plane area (vide “ Centre of Pressure”).

If a plane area be immersed in homogeneous liquid at rest under gravity, the resultant force acting on one side of the area will be oi product of the area and the pressure at the centre of gravity of the area,

For, dA denoting an element of the area, and 2 its depth, the resultant pressure

= [ped A =p8A ;

which proves the proposition.

General Equations of Equilibrium of any Fluid at rest under any Forces.

If we take any arbitrary origin O, and three rectangular axes of reference Ox, Oy, Oz, then, if p be the pressure, p the density, and X, Y, Z the components of the impressed force per unit of mass at the point xyz, the equilibrium of the fluid in any closed surface S requires, resolving parallel to the axis of a,

J[nd8=[f[pXdadyde ,

the integrations extending respectively over the surface and through the volume of the space S, and J, m, 1 denoting the direction-cosines of the outward drawn normal at the surface element dS.

But by Green's transformation

S {tpi We dudydz, and therefore W/, WP dladyds =[f/pXdxdydz,

leading to the differential relation

——=pX. da Similarly, 2 =pY, 2 = pL

The three equations of equilibrium obtained by taking moments about the axis will be found to be satisfied identically.

Hence the space variation of the pressure in any direction is equal to the resolved force per unit of volume in that direction. The resultant force is therefore in the direction of the greatest space variation of the pressure, that is, normal to the surface of equal pressure ; and the lines of force must therefore be capable of being cut orthogonally by a'system of surfaces, which will be the surfaces

of equal pressure. XII. — 56

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If we neglect changes of temperature, then, the density at any point being a function of the pressure, it follows that surfaces of equal ' ee pressure are also surfaces of equal density, and thercforc Pei LE = i 3 are the partial differential coefficients with respect p dy p de to x,y,z of some function P of #,y,2 such that P= dp ; and there-

Pp fore also X,Y,Z must be the partial differential coefficients of some function — V, called the potential, such that the force in any direction is rate of diminution of V in that direction, and the con-

ditions of equilibrium = @ _X, &c., are equivalent to

p 2% dP dV ak Vai dP aV Tis ae > ay ee or P+V=constant.

If the temperature be variable, then the surfaces of equal pressurc and density need not be coincident; but, since the pressure is a function of the density and temperature only, it follows that the surfaces of equal temperature and of equal density must intersect in curves which lie on surfaces of equal pressure.

As an example of the use of the gencral equations, take the simplest case of a homogeneous liquid at rest under gravity; then, the axis of 2 being directed vertically downwards, the equations become

1 ®_), 1 @ey, 1 pte pha me eee! and therefore p=aw+gp%, w being the pressure at the level of the

origin.

We are here employing a new unit of force—the absolute unit— which is defined as the force which causes unit acceleration in the unit of mass. With the same units of length, time, and mass, the gravitation unit of force is g times the absolute unit of force ; for instance, in the equations p=pz, and p=gpz, the p in the first equa- tion ismeasured in gravitation units of force per unit of area, and in the second equation in absolute units of force per unit of area.

Again, suppose the density to vary as any power of the depth, and put

p= Ma” 5 d faut E = 9p = gue 5 GH nti, v+1

If the fluid be elastic, and the temperature uniform, p=Xp, and cp _ k ap _

and pa=at

i¢ p dz p dz

•

,

and integrating,

aw ok mes a .

Consequently, as we go upin the air, if the temperature be uniform, as the heights increase in arithmctical progression, the pressures and

densities diminish in geometrical progression. If H denote the pressure height, then

p=kp =gpH , and therefore Tee ; v and if »,, p, denote the pressures at levels 2, %, then

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BE, Po or 2 —%,~= TH log -. ;

=H x 2°3026 log, 2. Pe

For dry air at 0° C., taking H= 26,000 feet,

21 — 2) = 60,000 logo nearly.

2

—(Maxwell, Heat, ehap. xiv.)

The Figure of the Earth.

_ Suppose a fluid mass arranged under the gravitation of its parts in concentric spherical strata, the density increasing towards the centre for stability of equilibrium, and p being the density at a distance & from the eentre. If we suppose this mass to be rotating

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without relative motion of its parts about an axis, and to be slightly disturbed in consequence of the rotation from the spherical arrange- ment of the strata, we can gain an idea of the figure of the earth on the hypothesis of original fluidity.

*If w be the angular velocity, we must suppose a disturbing function, whose potential is 4w*7* sin 2@, added to the gravitation potential, @ being the angular distance from the axis of revolution and of figure. Denoting the zonal surface harmonic of the second degrec $u? —4, where v= cos 6, by Qo, the disturbing function may*

be written §w77?(1 — Qo);

and we shall assume in consequence that the disturbance of each stratum from the spherical form is also a zonal harmonic of the second degree, so that when disturbed the equation of a stratum will be

r=k(1 ~ 3eQs); and e, which is the ratio of the difference of the equatorial and polar

axes to the mean axis, is ealled the ellipticity of the stratum. The gravitation potential of a homogeneous spheroid of density p,

and bounded by r=k(1—%eQ,),

is the same as that of a homogeneous sphere of radius & and density | p, and of a distribution of mattcr on the sphere of radius k, of surface density — 3%eQ,p, neglecting ¢. Therefore, for an intcrnal point the potential is Qa pk? — Zrpr? — BsmperQ, ; and for an external point the potential is Ae Bea Tne oe Q:. Therefore, for the shell of density p, enclosed by the stratum r= k(1 — §eQs) and the consecutive stratum, the potential dU d =Anpkdke — temp 5) °Qydk for an internal point, and*

Le d 1

for an external point ; and, therefore, for any point in the interior of the whole mass on the stratum

r=k(1 — §eQz),

K K q M kq U= inf pkdk ae? m79Q, f° po oP 7 = yn 22 pop tre) alle)

3

rSo

M denoting the mass enclosed by the stratum of mean radius &, and K being the mean radius of the exterior stratum. Neglecting &,

BS Eve U = inf pkdk = serk?Q, ff poke

M Of a +(1 + 80) – eT 75 f paz, \hPe)ak .

The equation of equilibrium is, since the force in any direction is the rate of increase of the gravitation potential,

dp _ U — }0r(1 – Q,) =constant ;

and, supposing surfaces of equal pressure to be also surfaces of equal density, we must have to our order of approximation

U + 3w2k?(1 – Q.) =constant, over a surface of equal density, or, equating to zero the coefficient of Q.,

K de a f¥ a ae — nif pa dk — $73 f Pag (he)dk + 2ark?=0. Dividing by %2, and differentiating with respect to &, w" disappears, and we obtain d. Me ee ak*

and, differentiating again with respect to k,

ya – Me _ gum – snide Sr,

ake? a Anke! cP \Me=0 5

PB. Me_ ae M ak

a differential equation of the sccond order to determine Me, and therefore e, provided we know what function p and therefore M is of &.

Properly speaking, from the elasticities of the substances of the various strata we should know the relation between the pressure and the density, and then from the conditions of equilibrimn of the strata when undisturbed and in this spherical shape we could de- termine what function p is of &,— the pressure and density at a

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— 312 Me — daphie + inf pa (be)dh=0 5

0

or ke

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stratum with our approximations being the same in the undisturbed and disturbed states ; and therefore M

1 dp_ | 7. ee Laplace, on the assumption that the eubical elasticity is double the pressure, and therefore the pressure proportional to the square of the density, has integrated the differential equation for the cllip- ticity, —his assumption amounting to putting Ank? dp_ M dk More generally, to make the equation for the ellipticity integrable, we may put

—q, a constant.*

where a and 1 are constants, the negative sign being taken because dp dk equations for p, M, and Me to equations reducible to Bessel's differential equation, and therefore p, M, and e can be expressed by Bessel's functions.

Laplace's assumption amounts to putting »=2, and then the Bessel's funetions whieh occur are of the order 4, 3, and $.

in gk

is negative for stability. This assumption reduces the differential

Then p= where o is the density at the centre of the

earth, and therefore

w= Aisin gk — qk cos gk),

3 ai (aA-) sin a” cos gk

sin gk—qk cos qk

wit al sin?a sin cos = as a2 a

sin a-a cos @

and

?

where a=qK, and the value of g must be determined from the con- dition that the mean density of the earth is twice the density at the surface.

Centre of Pressure.

When a plane area is exposed to fluid pressure on one side, the resultant foree experienced by the area is a single foree perpendicular to the area, the sum of all the separate pressures, and acts through a definite point ealled the centre of pressure.

If p be the pressure at the point xy, the axes being taken in the plane of the area, then the resultant force

R=/[pdudy , and, if Z, ¥ denote the coordinates of the

centre of pressure, _ Sfepdudy _ ffypdady ——_—___———— y = —

oO [[paaily : JS {pdxdy ‘

The centre of pressure is therefore the C.G, of the plane area, supposed a lamina of vari- able density py. If p is uniform, the centre of pressure is obviously the C.G. of the area.

For a homogeneous liquid at rest under gravity, p is proportional to the depth below the surface, thatis, proportional to the perpen- dicular distances from the line of intersection of the plane of the area with the free surface of the liquid. If the equation of this line be

xcosaty sina-p=0, < Jfup-« eos a—y sin a)dady © [fo cos ay sin a)deedy a Sfyp-% cos a —y sin a)dady

If the origin be taken at the eentre of gravity of the area, and if the axes be the principal axes of the area, then

S{dxdy=A, the area, Jfudady=0, ffydudy=0, ffeydudy=0 Sfydudy=Aa?, J[ferdady=AP? ;

a and 6 being the semi-axes of the momental ellipse of the area. Therefore

then

and

es a 2 Oe . one al pa are ee

and therefore the centre of pressure is the antipole of the line of

intersection with the free surface, with respect to the momental ellipse.

The centre of pressure of a rectangular area, with a side in the free surface, is at $ of the depth of the lower side; of a triangle with vertex in the free surface and base horizontal is ¢ of the depth of the base ; of a triangle with base in the surface is 4 the depth of the vertex.

Metacentre.

We have found from Archimedes's principle the conditions of equilibrium of a floating body, and we must now examine whether the equilibrium is stable or unstable.

Let ACB (fig. 7) represent the eross section of a floating body, like a ship, and let G be the C.G. of the body, and H that of the liquid displaced, supposed homogeneous. Let the body be turned through a small angle in the plane of the paper, whose cireular measure is @, so that the volume of liquid displaced remains the same. Then, if W denote the weight of the body, and therefore also of the liquid displaced, the resultant foree due to the liquid on the body in the displaced position is a vertical foree W acting vertically upwards through H', the new C.G. of the displaced liquid.

In order that the volume displaced may remain unaltered, it is necessary that the line of interseetion of the two planes of flotation AB and DE should pass through the C.G. of the area of the eurve of flotation. For dA denoting an element of the area A of flota- tion, and x its distance from the line of intersection of the planes AB and DK, the element of volume traced out by dA when the body is displaced being ¢adA, we must have Jord =0, fedr=0; whieh proves that the line of intersection of the planes of AB and DE passes through the C.G. of the area of flotation.

The foree W acting upwards through H' is therefore equivalent to an equal foree W acting upwards through H, and a eouple, due to

the moment of the weight of AOD upwards and BOE downwards, the moment of which is therefore, in gravitation units,

pf ec?dA = poAk', k denoting the radius of gyration of the area A about the line whose

projection on the plane is O, Since HH' is the arc of a eurve, such that the tangent at H is

or

C Fig. 7 parallel to AB, therefore HH' is ultimately a straight line perpen-

dicular to GH, and W . HH'=peAr', tmeg PAK g Al HH"=06 W Tv if V be the volume of liquid displaced. ; . If H'M be drawn vertically upwards to mect HG in M, then M is ultimately the centre of curvature of the locus of H in the body, and is ealled the metacentre, and HH' A? =]t —_ ==. | HM =lt ; v If M lies above G, the fluid pressure tends to restore the body to its position of equilibrium, and the equilibrium is therefore stable ; but if M lies below G the equilibrium is unstable. Generally we see that, if planes be drawn eutting off constant

volumes from a solid, the principal radii of curvature of the locus Ak;?

or

of H, the centre of gravity of the volume cut off, will be and

ao where Vis the volume cut off, A the area of the cutting plane

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intercepted by the surfaces, and £,, kg the principal radii of gyration of this area about the eentre of gravity of the area. The vertical through H' will intersect HG only when the plane of displacement is a plane of symmetry, that is, if it is perpendicular to &, or k,.

Generally for finite displacements in a plane the locus of M will be the evolute of the curve which is the intersection of the plane with the locus of H.

The surface the locus of H is called the surface of buoyancy, and the surface which is the envelope of the planes of flotation is ealled the surfaee of flotation.

If 7), 7, be the principal radii of curvature of the surface of buoy- ancy, then

If R,, R, be the principal radii of gyration of the surface of flota- tion, Mons. E. Leelert has proved that Vdr, _ dl, "av? Bam ay-" For small oscillations, if we suppose the liquid pressure the same as if the liquid were at rest, the

body oscillates as if the surface of buoyancy moved upon a horizontal plane.

R,=—=J=7,+

Fig. 8.

Next, suppose a body completely immersed in heterogeneous liquid, which must for equilibrium be arranged in horizontal strata of equal density, and suppose p=/(z) the density of the liquid at any depth 2; let G be the centre of gravity of the body and H that of

the liquid displaced (fig. 8). When the body is in equilibrium, we must have G and H in the same vertical line, and

Sf [pdadyde=W,

the weight of the liquid displaced, using gravitation units of force again.

Suppose the axes of coordinates fixed in the body, and take GM as the axis of 2; suppose the body turned through a small angle @ about the axis Oy, and let H' be the centre of gravity of the dis- placed liquid in the new position. The density of the liquid dis- placed at a point P, whose coordinates are x, y, z, is now

S(NP)=/(@ cos 6+2 sin 6) =f (2+ 26) =S (2) + baf'(2),

neglecting 6? ; and, to the same order of approximation,

riyy — LL (se) + oa) day W

_ g Ahler e\dadyia | W

1

bee ee of the curves of buoyancy and of flotation, and of the metacentric » are given in the plates of illustration of a paper on the "Calculation of

the Stability of Ships," by W. H. Whi ituti of Naval Architects, Pree 1871, eS a

CHAN POs Sf faf@dadydz= 0, H lying in the axis of z.

lf the vertical through H' mect Oz in M, M is ealled the meta- centre, and is the centre of curvature of the locus of H, and

[HyDRosTATICs.

sinee

d ' ; 'Ake P da HM _ HH" _Sfer (z)dadydz S dz 0 W vw if AX denote the moment of inertia of a horizontal plane section of the body at a depth z, about the line of intersection with the plane of yz.*

We have here supposed that H' lies in the plane of xz; but this

will only be true for two directions of displacement. In general for any displacement, if %, 7, 2 be the coordinates of H',

Af fy Ne) + exf'@)} dadyde [fay z\dadyde a W a

and therefore 7=0, only when the axis of y is a principal axis of the body, supposed of density 2 2

When p is discontinuous, as in the case of the body floating in homogeneous fluid, then the integral /Ak?dp will have a term Ak?p, due to the discontinuity at the surface, and the rest of the integral

will vanish, becanse "3 =.

For a body floating wholly immersed in two liquids, the upper of uniform density p' and the lower of uniform density p,

(p~ p')AK?

HM= W

Tension of Flexible Surfaces exposed to Presswre.

In hydrostatics it is usual to determine the circumferential and longitudinal tension produced in a thin cireular cylinder, due to uniform internal pressure, aud also to determine the tension of a spherical surface, like a soap-bubble, due to the excess of the inter- nal pressure over the atmospheric pressure.

Let r be the internal radius of the cylinder, ¢ the thickness (sup- isa small), » the internal pressure, and ¢,?' the circumferential and

ongitudinal tension per unit of area caused by the pressure p.

If we suppose the eylinder divided into two halves by a diametral plane, and consider the equilibrium of unit length of either half under the resultant of the fluid pressure over the half-eylinder and the tensions at the ends of the diameters, the resultant of the ten- sions must balance the resultant of the fluid pressures, which is the resultant pressure on the diametral plane, since the resultant of the

uniform pressure on a closed surface is zero, Therefore Qte= pr ; or £8.

7 #

To determine the longitudinal tension ¢', consider that the resultant pressure on the end of the cylinder, which is p.a7, is balanced by the resultant of the tensions round a circumferential seam, which is ¢'e.2rr; and therefore*

Qatler =arpr? ;

ia ee or p = 2 3 and therefore f=tki.

Thus in a boiler, half an inch thick, and 8 feet in diameter. a pressure of 150 tb to the square inch makes ¢=5400, ¢'=2700.

For a sphere of internal radius 7, and small thickness e, supposing it divided by a diametral plane, then the resultant tension round the eireumference, te. 2rr, must balance the resultant fluid pressure p.n?,

supposing p the excess of the internal over the external pres- sure ; and therefore

Qrter=mpr? ; t a

or ran In the experiment with the Magdeburg hemispheres, where two hemispheres were joined by.an air-tight joint and the air say half exhausted, then, with a pound and inch as units, »=7°5, suppos- ing 15 the atmospherie pressure ; and if the diameter of the hemi- spheres be 8 feet, then =18; and the force required to separate the hemispheres would be

ax 182×7‘5=7634 bb.

The tension of flexible surfaces is considered more fully in the article CAPILLARY ACTION.

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PART II—HYDRODYNAMICS.

In considering the motion of fluids we shall suppose them non-viscous, so that whatever be the state of motion, the stress across any section is normal to the section, and therefore the stress is a pressure and the same in all direc- tions about a point, as in Hydrostatics.

Two methods are employed in hydrodynamics, called the Eulerian and Lagrangian, although both are due to Euler ; in the Eulerian we fix our attention on particular points of space, and observe the changes of pressure, density, and velocity which take place there, and in the Lagrangian we follow a particle of fluid and observe its changes. The first may be called the statistical and the second the historical method, according to Prof. J. C. Maxwell. The Eulerian method is generally employed except where the fluid has a moving boundary.

The Eulerian Form of the Equations of Motion.

The first equation to be established is the equation of continuity, which expresses the fact that the increase of matter inside a fixed surface is duc to the flow of fluid across the surface into the in- terior, ral ot gee there are no hypothetical sources or sinks in the interior of the surface.

Lemma.—The quantity of fluid, estimated in units of mass, which flows across a plane area in a given time is equal to the produet of the area, the den- – sity, the time, and the resolved part of the velocity per- pendieular to the area.

For if q be the

Fig. 9.

velocity, the quantity of fluid which flows across the area A in the tine ¢ will form an oblique eylinder of length g¢, with its generat-

ing lines in the direction of motion (fig. 9). 1f @ denote the angle between the uormal to the area and the velocity, the mass of the cylinder

= Apt cos 6,

which is therefore the flux across the area A in the time ¢. Gencrally, if S denote any fixed surface, M the mass of the fluid

inside it, and @ the angle which the normal drawn outwards at any

point of the surface makes with the velocity g at that point, then

rate of inerease of quantity of fluid inside the surface per

dt unit of time . = flux across the surface per unit of time = —f pq cos od8 ; or ar + fo1 cos @dS=0. (1),

the integral equation of continuity.

In the Eulerian equations of motion wu, v, w are taken to denote the components of the velocity gq parallel to the coordinate axes at the point wyz at the time ¢; uv, v, w are therefore functions of x, y, 2, the independent

variables, and d is used to denote partial differentiation with respect to these four independent variables.

To transfer the integral equation into the differential equation of continuity, we require Grecn's transformation, namely,

M EtG GE eetyts= [f+ 109 + 6/08 5

or, individually,

Wik F dndyde= Sf leds, MW idadyde— S/mna8, 4 1 aedyde=Sf nds ;

where the integrations extend respectively through the volume and over the surface of a closed space S; U,m,n denote-the direction- cosines of the outward drawn normal at the surface element dS, and t, », ¢ are continuous functions of a, y, z.

The integral equation of continuity may now be written

ad Af Gawieny +f[\lpu +mpv+npw)dS =0,

which by Green's transformation becomes

dp dpu dpv dp 3 We si ax +e EY) dadyde= 0,

leading to the differential equation of continuity

dp , dpu | dpv dpw _¢

Eee oe 2). dt' de' dy' de (2)

It is customary to establish the differential equation of continuity immediately by considering the fluid which enters and leaves an infinitesimal parallelepiped, whose edges are dx, dy, dz, in the time dt, but this requires us to suppose in succession each of the elements dx, dy, dz, though infinitesimal, to be infinite compared with the other two, and with the infinitesimal element of time dt; this viola- tion of the principles of the differential caleulus is avoided by establishing the equation in its integral form first.

We shall establish the equations of motion in a similar way by considering the rate of inerease of momentum in a fixed direction of the fluid inside the surface, and equating it to the momentum generated by the forces acting throughout the space S and by the pressures acting at the surface S,

Taking the fixed direction parallel to the axis of x, the rate of increase of momentum in that direction per unit of time, due to the fluid which crosses the surface, is

Sf (ipu2 + mpuv + npuw)dS , which by Green's transformation

ee dpu® dpuv , dpuw\ + andz + "i Cee) 'i

and, adding this to the rate of inerease of momentum per unit of time of the fluid inside the surface

dl Wh em daxdyde,

we obtain, as the total rate of increase of momentum per unit of time of the fluid which fills the space S,

dpu dpu? dpuv , dpuw Wi (ae + SE \ dadya

dy dz in the direction of the axis of x. The rate of generation of momentum in this direction by the forees of componcuts X,Y,Z per unit of mass in the interior is

Mf pXdaiyde,

and by the pressures at the surface is

-Jtpd8 ,

whieh by Green's transformation is equal to

HY 2 dudydz ; and therefore dpu dpu? dpuv , dpuw hed YT (G+ dy + Ge)dndyde d. ot) Alaa lah

leading to the differential equation of motion dpu dp? dpwv dpuw _ dy 7.

+

BP ax

8):

dt" dx dz 8) with two similar equations in y and z. These equations may be slightly simplified ; for dpu dpu? dpwv , dpuw dt dx dy dz

*- du ot os wt) M\ di "de dy de dp dpu dpw +u(Bs de * dy + de)' which reduces to the first line, the second line vanishing in conse- quence of the equation of continuity ; and therefore the equations of motion may be written*

dpv

du du du du 1 dp .

'dt oe dy a Ts az . . ° (4); with the two similar equations

dv dv _ dv, dv | 1 dp

oe a Se ae (9),

dw dw dw dw lL dp

As a rule these equations are established immediately by deter- mining the component accelerations of the fluid particle which is at xyzat the instant of time ¢ considered, and saying that these

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accelerations reversed, combined with the impressed forces per unit of mass, will form a system in equilibrium according to D'Alem- bert's principle.

To determine the component accelerations, suppose F any function of x, y, 2, t, and determine the rate of change of F per unit of time

for a moving particle; denoting this change by = , we have DF _it F(e4-wast, yt+vot, 2+-woe, t+ dt) — F(x,y,2,¢) dt dt nde" dy de? so that i "D a ad d dt dt ae tay ae – is called particle differentiation, because we follow the rate of change of the particle as it leaves the point xyz; but 7 _ ad¥ dF

*ae are the rates of change of F at the time ¢ at the point ra xyz, fixed in space. Consequently the component accelerations parallel to the axes of coordinates of a particle of fluid are du du du du ah + ay + "dy Ler r) dv du dw dv att Mae * ay ees dw dw dw a ap bar + "dy + pe) leading to the equations of motion last established. If K(a,y,2,t)=0 be the equation of a surface containing always the same particles of fluid, it follows from the preceding that*

DF . a dk a¥ d a¥ by a ae We |) ptm 8 ee el"

This is called the differential equation of the bounding surface, as particles of fluid once in the bounding surface always remain in it.

To integrate the equations of motion (4), (5), and (6), suppose the impressed forces due to a potential V, such that the force in any direction is the rate of diminution of V in that direction, then

dV aV aV , Se ae i gage ge and putting ee, ee ae ay a"? Mae 9" ie ado the equations may be written du dR ay 7 eS + 2 + = 0. (8), dv dR ap ome a a (9) oY Quy + Qe + Bo (10),

where oy si +50 and g?@=w?-+7+w? (Lamb, Motion of Fluids, Appendix D; also Proe. London Math. Soetety, vol. ix.).

A stream line is defined to be the actual path of a particle, and a line of flow to be a line such that the tangent at every point is in the direction of the velocity at the point; the stream lines and lines of flow are coincident only when the motion is steady ; and when the motion is irrotational, the lines of flow are orthogonal to the surfaces obtained by equating the velocity function to a constant.

A vortex line is defined to be a line whose tangent at any point is in the direction of the resultant w of the component angular velocities t, , (at that

point ; and w is called the spin (Clifford, Kinematic).

§n,¢ are called the components of molecular rotation (or spin) at xyz, for a reason to be explained afterwards; and when they vanish the motion is said to be irrotational, and a function ¢ exists, called the velocity function, such that

dp _ do de' ay a ae and, generally, the velocity in any direction is then the space varia- tion of ¢. When the motion is irrotational, equations (8), (9), and (10)

*become @p dR _ dxdt * dx*

U=

dp dR. do dR_ 'dydt dy ~? dzdt dz*

0;

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[HYDRODYNAMICS. and therefore a +R=H, dp il dp i) eas Zo Ae ie ar if Sf 2+V+50+ 9 Ey,

a constant throughout the fluid, which may, however, be a function of the time.

If, however, the motion be steady, that is, if the velocity at any point of space does not change with the time, then

au adv dw ap ee ee and the equations become dh = ~ Raia Deeh =a ; dR

aya ;

dk Ge 7 Bunt 2vg= 0;

dR dR. aR so that GR, aR dR _o. eles Te ay ee oF dR | dR .dR ae + gg gers

and therefore the surface R, = constant, contains both stream lincs and vortex lines; and therefore

d J? V + 49?=constant. (11)

along a stream line, and along a vortex line ; and if the motion is irrotational, the constant is the same for all the space filled with the fluid ; for then dB gh_, a_ dx dy dz Taking the axis of x for an instant in the direction of the normal to the surface R=constant, then #—0 and ¢=0, and (8), (9), and (10), if the motion is steady, reduce to a =2rf —2wn=2qw sin 9, where @ is the angle between the stream and the vortex line.

It is sometimes convenient to use moving axes of coordinates in Hydrodynamics, and the equations of motion then become

=0, 0, 0:

du du du aE 7 U3 t wet (Ut Yos – tw) 7 + (U0 + 2w, — eg) dy du 1 dp + (w + tw. – Yo) de i Pia ’

with two similar equations ; w, we, ws denoting the component angular velocities of the moving axes, and 2, v, w the components of the velocity of the fluid in space at the point xyz at the time ¢ parallel to the axes.

For if ¢ denote the component velocity of the particle ayz at the time ¢ ina direction fixed in space whose direction-cosines are 1, m, n, then S q=lut+nw+nw; and in the infinitesimal element of time dé the coordinates of the particle will have become

L+(U+Yws —2w_)dt , Y+(V+20, —Xwg)db , 2+ (W+ Lwe— You ;)aet 5 so that a ut ey Bw + YEE (wh yey~ ts) Ge (0-b 204 ~ tay) Se (wt tay — Yen) Get s+} T+ (wt yey ~ tay) G+ (vse tn) + (w+ tay Yor) get

dw dw dw dw + + (U-+ Yes — Zag) we (v-+2w, — Leg) dy + (W +209 — Yo) =

But, since 7, m, m are the direction-cosines of a line fixed in space, al dn

dm =Mw3 — NWe) Fe — bos ry at lw. — Mw,)

dt . D du du du : el TE 7 Pest Ww, + (u r Yo — Rtg) et (V+ Rony — Borg)

du + (ue + XW, – yor) Ge ee E+ (+20 ~ 09) +m | pn ert teas + (+ Yes — 2 ip ee dy adv + (w+ a0 — Yo), d aw dw +7 CFE 7 eta Pens + (Ut Ying — Beng) Fp + (V+ Ray — Beng) Fe dw (W m9 — Yor)

1 dp Pe ie u(22 heme p ay ae p dz

for all values of 2, m, n, leading to the equations of motion.

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As an example of the use of moving axes in hydrodynamics, eon- sider the liquid filling the ellipsoidal case ria yf? g2 @e ef

and first suppose the liquid to be frozen, and to have component angular velocities &, », ¢ about the axes, then

w= —YC+en, V= —RE+RL, W= yt YE. If the liquid now be suddenly melted, and additional component

angular velocities Q),.2,, 23 communicated to the ellipsoid about the axes, then (vide infra)

pie ee eu

wm my tent a gph + aap po 52 i? = 2

v= —2E+ OE + ea Mgt + pa a? ’ 72 — 2 ee

wW= —aynt yE+ or = aaa ;

and if U, V, W denote the component velocities of the liquid relative to the axes,

Qa? Dae

U=u+ YW, — ZWy ar pay = ane ’ 2b? 2b

V=v+20, — tw,= Pipe = ae ’ Wie: De

W=W4+ tw, – Yo, = Py gqint – mee ’

since w=2,+&, W,=2,+7, wz3=Q3+¢,

1, Wo, wg being the component angular velocities of the axes. We see that e y z tte ep, te 9

so that a liquid particle always remains on a similar ellipsoid. The hydrodynamical equations with moving axes, taking into account the mutual gravitation of the liquid, are

- ae + Ae + Fh oye $US + VEE + WHE 0 (1), “i – + By + Dron + ty +Ue +VE +we =0 (2), < E On + tog + 000 + UR ty tO (3); ie.e) where A-aM fos,

oo dn B= ‘ uf’ (PHA)?

i ax C= e Ys, anf (+a)P’

and PP=(a?+a)(P+a)(c2+A). With the above values of w, v, w, U, V, W, the hydrodynamical equations are of the form

1 dp 3 Ant Att ac+hy+gz=0, 1 dp P dy t Pythe+ py+fe=0, ee

‘ dnt +gx+fy +y72=0. The component accelerations in space of the liquid particle at xyz parallel to the axes are therefore on+thy+gz, he+Bytfz, gerfy +e;

and by the dynamical equations the rates of change of angular momentum about the coordinate axes are zero, and therefore

zm (gu-+fyt y2)y- (hae + By +f2)2} =0;

or f2my—2)=0, or Se -0)=0; and thercfore ==()5

and similarly g and / vanish. Therefore the hydrodynamical equations become

ap dg t (A+ a)e=0 6

dp dy + (B+B)y=0,

> [Ho [Ho lH

dp ge \C+Q)2=0;

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where

4c%(¢? — a?) ea? ai oT erap (Sean)

4b?(a? — 6?) a—b & Tara 88 (Greet 8) __ 4a(a? — 6?) a? — 2 ato 8 — \aare =) 4222-02), /B-@&, \?*

(e+e 1 Ai 46?(b? — c?) (e+ eap 4e°(~~a).,~~ ((e@ era Or Therefore, integrating,*

Be mT } (Ata)a®+(B+Aye+(C+7)2 f

and therefore the surfaces of equal pressure arc the similar and co-axial quadrics (A a)z? (B+ B)y? (C-y)2?=constant.

If we can make a, 8, y constant, and (A a)a?=(B,)0?=C+-y)c', the surfaces of equal pressure are similar to the external case, which can therefore be removed without affecting the motion.

This is the casc when the axis of revolution is a principal axis; and, supposing it the axis of z, then

2 =0, 2,=0, =0, 7=0.

If in addition we put 2;=0, or w,=%, we obtain the solution of the particular case considered by Jacobi, of a liquid ellipsoid of three unequal axes, rotating about its least axis in relative equi- librium ; or, putting a=, we

obtain Maclaurin's solution of the equilibrium of a rotating spheroid (Cam. Phil. Soc. Proe., iii.).

Equation (11) is called Bernoulli's equation, and for homogeneous liquids under gravity is a very useful principle in hydraulics ; the equation may be established from first principles by considcring the energy which enters and leaves a certain portion of a tube of flow. (Lamb, Jotion of Fluids, p. 23).

If homogeneous liquid be drawn off from a vessel, so large that the motion of the free surface may be neglected, then Bernoulli's equation becomes, P being the atmospheric pressure and A the height of the free surface,

P ae # =e gang ans ee ee aes

Va we

=constant ;

and in particular, for a jet issuing into the atmosphere, where p=P, aq' =g(h —2) §

or the velocity is due to the depth below the free surface.

Torricelli's theorem (De Motu gravium Projectorum, 1648). If we suppose fluid to escape according to this law from a large

closed. vessel in which the pressure is » where the motion is insen-

sible, and neglect the variations of velocity due to variations of level,

p being sufficiently great, then

2_p-P. – / (#2). 49 ae oe ;

If A be the sectional area of the jet (at the vena contracta), the quantity of fluid which escapes per unit of time is

Apq=A n/ {2p(p-P)} ; the momentum per unit of time is Apg@=2A(p—P) ; and the energy per unit of time is

ee Api! A(p-P)t, /=

Suppose, for instance, two equal pipes leading one from the steam space and the other from the water space of a steam boiler at a pressure p, and suppose Torricelli's theorem to hold for the rate of efflux of the'steam and water, then, if denote the density of steam, and p the density of water,

This is

(1) The velocity of steam jet _ wi P The velocity of water jet a" The quantity of steam jet _ oh o (2) The quantity of water jet p? (3) The momentum of stéam jet _y The momentum of water jet r The energy of steam jet _ nh va . The energy of water jet os

For instance, with steam at 8 atmospheres, or 120 lb to the

square inch, a, we =15 nearly . og

—(Rankine, Steam Engine, appendix).

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These principles assumed enable us to give a general explanation of the working of Giffard's injector. For, if the steam jet and water jet be directed at each other, with a small interval between, the superior energy and equal momentum of the steam jct will overcome the water jet, and the stcam will flow back into the boiler. But the steam jet, without losing its momentum, is capable of being mixed with water to such an extent as to become a condensed water jet, moving with the velocity of the water jet, and still entering the boiler, a valve preventing the reversal of the motion. Consequently, the amount of water carried into the boiler per unit of time will theoretically be at most the difference between the quantities which would escape by the water and the steam jets, and therefore

= An/(p— P(N 2p — V0) ;

and the efficiency of the injector, that is, the ratio of the water pumped in to the quantity of steam used, will be

- oa o 3 the efficiency of a pump being / .

o

With C.G.S. units, and a pressure of 8 atmospheres, for instance,

p-P=7× 108 very nearly, P —15, and p=1. Co

Therefore, if the diameter of the nozzles of the injector bed centi- metres, the delivery in grammes per second

= ford? /i4- 1001 — /35)

=2180d? ; and since 1 gallon is 4541 cubic centimetres, the delivery in gallons per minute

__ 2180 × 60 79

4541

= 28°78? nearly.

The Lagrangian Form of the Equations.

Here the independent variables which define a particle are the time ¢, and a, 0, c, the initial values of the coordinates x, y, z of a article of fluid (or else functions of the initial coordinates, but it is best to consider a, b, ¢ as the initial coordinates themselves). Here x, y, 2 do not refer to a fixed point in space, but are the variable coordinates of a fluid particle, and are functions of a, b, c, t, the independent variables ; and consequently

eo di ‘ dt’ dt ’ and the component accelerations of the fluid particle are du dv dw a di?

Consequently the equations of motion, assuming the existence of

the potential V, and putting p-/” 2 , and P+V=Q, ar

dQ. du aQ . dv aQ . dw g ao ae? em" oe a at ay ay dz : or multiplying by —— , and adding,

'da' da' da dQ du dx. dv

da "dt da' dt da' dt da ° °° with two similar equations*

aQ du dx dv dy . dw dz

"db "dt db di "db di "db ° (2),

*dQ du dx , dv dy , dw dz_*

ie Mia ae me ae 8 ws AB).

Since the elementary parallelepiped whose edges were initially da, db, de, becomes strained into a parallepiped of volume

A(x, 4,2) Farad therefore the equation of continuity is A(a,Y,2) d(a,b,c) °? or, if the fluid be a homogeneous liquid, d(x,4,2) d(a,b,c) When a, 6, ¢ are not the coordinates of a point actually occupicd by the fluid particle, this equation of continuity must be replaced by

ad $ ad(x,y,z) 3 dt | °d(a,b,c)

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[HYDRODYNAMICS. Cauchy's Integrals of Lagrange's Equations.

Eliminating Q by differentiation between (2) and (8)

*du dx du dx dv dy dv» dy d*w dz dw dz*

and integrating with respect to ¢,

du dx dudzx dv dy dv dy dw dz dw dz

Up, Vp) Wy being the initial values of u, v, w, and a, 6, ¢ the initial values of x, y, 2 Now

du du dx du dy du dz da du da dy da dz da' and therefore (de dee, (eee ania (ae ae eat, dy dz /d(b,c)'\dz du /)d(b,c)'\dx dy/d(b,c) db de' or putting dw adv du dw dv du a aoe 7 we Ci" aye AY, 2 U(2,x d(x,1 tia) * "atee) * Saag 8 with two similar equations Uy.) ad{c, a) p42) ad(a,)*

—

dz a). (ay) _

"a(c,a) " Sd(e,a) a(z,c) a(a,y) _

*Ta(a,b) * Sa(a,b)~*

f

a Therefore Ji= fogs + 10 + foo ;

ad ay ad In= bogs + nae + (ye '

dz dz dz UC= cig, t 0b + Coa '

(2, Y,2) h a es where Tape"

al

or, since J=-P0, therefore p

mo dz , ty dee Po ne ae (4),

dy (dy

= db es, 'de ° . . . . (5), dz © dz

= Wha, — oe (6).

Consequently if ,,¢ are ever zero they are always zero, and then dp dp

t=7 ie a and a velocity function ¢ exists.

For instance, if motion be generated from rest in a non-viscous fluid under forces due to a potential, a velocity function always exists, and the discovery of this velocity function for different cases is one of the chief problems to be solved in hydrodynamics.

A good example of the use of the Lagrangian equations of motion is given by the state of wave motion in deep water invented by Rankine ; he puts

piles e=atec © sin (w++) :

=

y=B+cc © cos (ot +4) :

and therefore the coordinates of a particle are given in terms of ¢ and a and p.

But a and B arc not the initial coordinates of a particle; for putting ¢=0, then the coordinates are

ae a a=a+ee oS

Ae a b=B+cc ¢ cos — :

Therefore A(zeyy) _ 1-e7? da, B) G d(a,b) _ pe = dey : a(a,y) _ therefore Aiea

and the equation of continuity is satisfied.

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Cauchy's integrals reduce to the single cquation Uwe, y) ¢ ba ¢ ?

a(a,b) or (= ¢ ? dv, du | OG ee eel where oe ma

(a,b) Alv,b) A(ru,a) and therefore De NEUE NOUS 6oaa, B) aa, B) dB, a) i TOW wa = ewe ¢ eos (w 4) ; B wn —cwe © sin (w) : therefore Uy=Cwe © cos = ,%=—cwe © sin = 'i B 1a, 6) —— and gg CMe ogo ¢ ; "aa, B) ae w therefore (=(= te a? Use 2 sinh — l-e e

and the motion eannot therefore have been generated from rest by natural forces; the fluid must have been ereated with the proper amount of spin at every point.

*B We have oY a —cwe ° sin (a 4) ; B oe —cwe * eos (w+) :*

and therefore the dynamical equations (1) and (2) become aQ aes a ——- ewe © sin (w+)=0, da c B

B te =o Lee 3 ¢ eos (wi +)+ew%s "¢=0; ap ¢

and therefore the integral of these two equations is is 298 Q +c?w%e -° cos (w +4) – ewe ¢=H, a constant. Q- fBev, =P gy, p p B

=f 98 gec © 0s (w+5) 3

Now

and therefore

sie 98 P _ gp + e(cw® — gle © cos (w+%)- 3 c?we orien ith p

A free surface is possible if Cw = 9, 2p De iam af 1 and then " "

Cw = go == a Qa The surfaces of equal pressure are trochoids, obtained by rolling a circle of radius ¢ on the under side of a line at a depth B—c, the

distance of the carried point from the centre being ce ¢ .

Trrotational Motion.

If liquid originally at rest be contained in a singly-eonnected space, then forces due to a singly-valued function V are not eapable of setting up any motion in the liquid, and any motion must be due to the motion of the bounding surfaee.

For, ¢ denoting the velocity function, by Green's theorem the kinetic energy

6 Af \ 2) (8) (ey hae

ad =10ffoF es;

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and therefore, if — =0, then T=0, and therefore

dp? _ (dp\? _ (dd \? (Ze) *(3) +(e) ~% dp_, 4h_, do_ ip 29? dyn? deo If we suppose the actual motien at any instant to have been in- stantaneously generated from rest by the application of proper im-*

pulses at the bounding surface, then, since no natural forces ean act impulsively throughout the liquid, the equations of impulse are

1 da 1 dw _ 1 daw

ode" ay" z denoting the impulsive pressure at any point of the liquid ; and therefore, 1f @ denote the velocity function, we can put

or

je S..

Since the work donc by an impulse is the product of the impulse into half the sui of the initial and final velocities, we sec how it is that the kinetic energy of the liquid

1 dp ed aha as a do =e ——_ as. 2 Moan

Also the kinetic energy acquired thus dueto the velocity function ¢ will be less than the kinetic energy of any other motion, wholly or partially rotational, but satisfying the equation of eontinuity, and the condition at the boundary that the normal velocity of the liquid is the normal velocity of the boundary.

Bor, ife¢,,:04, fares the velocities at any point of this new motion,

and T, the whole kinetic energy, T,-T=4 fff ut -wW+v 2 – v? +w,? – w?)dadydz

“4 HA (ty =)? (0, = 02+ (w, – 0)? dood ae We W(w, — %) +(v, — v) + w(w, – wv) dadydz. Le w(t, — w) + oy —v) +w(w,- w) dadydz fe se (204 — wv) +5e (v,-v) ae (w, — Ww) claodiyle ff Ua, — #) + m(v, — v) +2(w, -— w) ds

Hk _ (O45 (4-0) 42 (w, -w) dadydz

=0.

Then T, – T=$ Wa (a, — 6)? + (v, — v)? + (w, – w)? dadydz,

a positive quantity ; and therefore T, is always greater than T, a theorem due to Sir W. Thomson, If, however, @ be multiply- valued, and the space occupied by the Hquid multiply-connected, we can have circulation existingin the different circuits of the space even when the bounding surface is at rest, and the motion may still be differentially irrotational, and any motion of the bounding sur- face will not affect these circulations. For instance, we may have

= = tan — £ , and the liquid eirculating in any ring-shaped Tv*

But

surface, whose axis of figure is the axis of z.

To find the kinetic energy of a liquid in a multiply-connected space, the motion being differentially irrotational, but circulations existing in the circuits, the space occupied by the liquid must be rendered acyclic by barriers, which may be supposed to be membranes, moving with the velocity of the liquid ; and then, if ik be the cyclic constant of the value of ¢ in any circuit, we must suppose the value of ¢ on one side of the membrane to exceed the

value of ¢ on the other side by &, so that the integral //p 8 ds

over the membrane must be replaced by & Ml ae dS; so that to

the term 4 eff = over the outside surface must be added a n

number of terms of the form 4 pk /f ae dS, to express the energy due to the eirculation in the circuits; and the condition of

continuity shows that ot as over one of these membranes

which render a circuit acyelic is independent of the form of the

membrane. Mi = sy

On Flow, Circulation, and Vortex Motion.

ey : er : du, ay , dz

The line integral of the tangential velocity /(ute 46 ae i we) ds or /(udx+vdy-+wdz), from one point to another of a curve, is called the flow along the curve from the initial to the final point ; and, if the curve be closed, the line integral round the curve is called the circulation in the curve.

If a velocity function ¢ exist, then the flow=/dp= ¢, — ¢,, where #, and ¢, are the initial and final values of @; and therefore the flow is independent of the curve for all mutually reconcilable curves ; and the circulation in any closed curve, capable of being reduced to a point without leaving space for which ¢ is single-valued, is zero.

If through every point of a small closed curve the vortex lines be drawn, a tube is obtained and the fluid contained is called a vortex filament.

By analogy with the spin of a rigid body the component spin of the fiuid in any plane at any point is defined as the circulation round any infinitesimal area in the plane enclosing the point divided by twice the area. For in a rigid body, rotating about the axis of x with angular velocity ¢ suppose, the circulation round a curve in the plane of yz is

=w times twice the area of the curve. Nowif, in the fluid at the point xyz, we take the circulation round the elementary arca dydz, it is equal to

dw dv vdy (w cedy) de – (0+ ae — wdz

and therefore the component spin in the plane yz is ; a – =) ; which we have denoted by ¢ Similarly the component spins in the planes of zx and wy are 3(G-%)- and +(Z -=) =¢ respectively.

Since the circulation round any triangular area is the sum of the circulations round the projections of the area on the coordinate planes, the composition of the component spins &, , ¢ is accord- ing to the vector law. Hence in any infinitesimal part of the fluid the circulation is zero round every small plane curve passing through a certain linc, the resultant axis of spin of &, n, ¢at that point of the fluid. Consequently the circulation round any closed curve drawn on the surface of a vortex filament is zero ; and therc- fore, if at any two points of a vortex filament we draw the cross sections ABC, A'B'C', joined by the line AA', then, since the flow in AA' in the conrplete circuit ABCAA'B'C'A'A is taken in opposite directions, the resultant flow in AA' vanishes, and therefore the cir- culations in ABC, A'B'C', estimated in the same direction, are equal. This is expressed by saying that, at all points of a vortex filament, wa is constant, where a is the sectional area of the filament, and w the spin (Clifford, Kinematic, Book iii.).

_ So far the theorems about vortex motion are kinematical ; but, introducing Euler's equation of motion

Du ,dQ_4 Dv, dQ_4 Dw, da _ wa ae ay a a where q- f 2+, p D

then gy (uaa + ody + wdz)

_,, Ddx _, Ddy Ddz Du Dy Dw

a +0 it +w 77 +a de dy +a da

=udu+vdv+waw — iF) «ad, oe

de dy dz =4$dq°- dQ;

and therefore, by integration round a closed curve, 4 (ude + vdy + wide)=0 ;

and therefore the cireulation in any circuit composed of the same fluid particles is constant, and, if the motion is differentially irro- tational, is zero round all reconcilable paths.

The circulation round any small plane curve passing through the axis of spin at any point being always zero, it follows conversely that a vortex filament is always composed of the sae fluid particles ; and, since the circulation round any cross section is constant for different times, it follows from the previous kinematical proposi-

tions that aw is constant for all the time, and tho same at all points of a vortex filament.

_ Professor Clifford (Proc. London Mathematical Society, vol. ix.) has given a simple quaternion proof of the theorem—To determine the velocity at any point of a fluid, when the spin is given.

If o denote the velocity and » the spin at any point, then 2w=VvVe; also, if & denote the cubical expansion, k=-Svyvo. Hence the quatcrnion g or-k+ 2w is simply vo; consequently the problem to be solved is to determine o from the equation ead q=Vvo, q being given. Operating by v, Vy=V7e ; therefore o is the potential of vq; and therefore

VoD avi ; a> pf 2 & ’

where oa means the value of ¢ at the point a, dv, means an clement of volume at tho point b, and D,» the distance between the points a, 6. ’ Returning to Euler’s equations of motion, du, du, du du dQ ait at? he a ae ’

and eliminating Q,

- . °

?

dv ,dw du. dv , dw_ gee ele ea and, since by the equation of continuity

1 Dp du dv dw

ae a Ge nee exit)

p dt dat dyt de' therefore –

and similarly

——+— +> —. p p d@ pds p dz These equations, first given by Professor Stokes for homogeneous liquid, were gencralized for any fluid by Professor Nanson, Messenger of Mathematics, 1878. They may also be obtained immediately by the differentiation of Cauchy's integrals (4), (5), and (6), given above.

Plane Vortex Motion.

When a series of straight vertical vortices (called columnar vor- tices by Sir W. Thomson) are present in homogeneous liquid, bounded. by two horizontal planes, we can determine the motion of any vortex by supposing it due to the remaining vortices.

A single vortex will remain at rest, and cause a velocity at any point perpendicular to the plaue through the point and tho vortex inversely as the distance from the vortex.

If m denote the strength of the vortex, z.¢., the circulation in any circuit enclosing the vortex once, then the velocity at a distanco r

from the vortex will be a and the current function py will be T

oe log r, and the velocity function ¢ will be x 6, where @is the Tv

angle between any fixed plane and the plane through the vortex and the point. The surface of equal pressure under gravity will be of the form ant Bs hts = yh ee (2? + y?)(z = @) dreg '

the axis of the vortex being the axis of 2.

When there are more than one vortex present, each vortex moving with the velocity duc to the other vortices will describe the curve whose equation is

m p> on log 7 = constant, where m is tho strength of one of the remaining vortices, and r

the distance betwecn it and the vortex whose motion is considered ; this equation may also be written

Tir” = constant.

When the liquid is bounded bya vertical cylindrical surface, the motion of a vortex may be determined as due to a series of vortices considered as images of the original vortex, and so arranged as to

HYDRO a b

make the velocity aeross the boundary zero at every point of the beundary.

When the boundaries are plane surfaces, the images are the opti- eal images by reflexion of the original vortex, considered as posi- tive or negative, according as formed by an even or odd number of reflexions.

Thus the eurve deseribed by a vortex inside the angle bounded

by the planes ¢= =a is the Cotes’s spiral

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r eos nO=C,

and inside the space bounded by the planes a=0, =a, y=0, y=b is

eot? am (K = : i) +cot? am (x + ke) =constant, ke «@

ary (Quarterly Journal of Mathematics, vol. xv.).

A single vortex of strength m in a circular eylinder of radius a at a distance ¢ from the centre will move with the velocity duc to

wilere

2 a an image of strength—m at a distance ~ from the centre, and ¢

therefore describe a circle of radius ¢ with velocity

m a m c 2 a Tae 3 Qr aP ; Qn at—o??

2

and therefore in the periodic time ar (a? — 0”).

A single cireular vortex in infinite fluid will move with a certain velocity in the direction of its axis (“Vortex Motion,” Trans. R.S.E., 1869 ; “ Vortex Motien,” Helmholtz, Credle, 1858); and, if another equal circular vortex be projected coaxially after the first, the mo- tion of the first must be compounded with that duc to the second. Conscquently the first vortex will dilate and move slower till the second vortex passes through it, when it will contract and move faster till it passes through the second, and so on. This can be verified experimentally with smoke rings projected from the samc circular hole, or with half vortex rings, formed on the surface of water by drawing a semi-circular blade a short distance throngh the water,

The motion of a vortex ring projected perpendicularly against a plane boundary will be determined by compounding it with the motion due to an equal and opposite vortex ring, its optical image in the wall, The vortex ring will therefore spread out and move more slowly in the direction of its axis as it approaches the wall ; at the same time the molecular rotation, being inversely propor- tienal to the cress section of the vortcx, will be seen to increase.

Plane Motion of Liquids.

When the velocity of the fluid is always parallel to a fixed plane, we take this planc as the plane of zy, and theu w=0, and uw and v are functions of #

and y, and the stream lines are planc curves.

Considering only the cases where the fluid is incompressible, the equation of continuity beeomes

and therefore a function y exists, called the stream function, such that

and y=constant is the equatien of a line of flow. The spin at any point

ee (Gata):

2 \da? dy? , If the motion is irrotational, then ¢=0, and a velocity function @ exists such that gat de dy' a ody i _ r)

therefore y and # are conjugate functions of a and y, and Wt+ip=fla+ity).

By assigning particular values to this function, Helmholtz and Kirchhoff have diseovercd the solution of various problems of dis- continuous plane liquid motion, an aceount of which is given in Lamb's Motion of Fluids.

_The kinetic energy of the liquid bounded by two planes perpen- dicular to the axis of 2 at unit distance is

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aa dp, 1 dw ~e O/ atta 8) 0h when "t ; a are the rates of change of @ and wy in the direction i] of the outward drawn normal to the bounding curve at the element ds. : dy dp dp dy Since aa ac uae tae*

1 1

i i =S — a = Py therefore uly 5 p co) yp 5) p pd

We ean interchange ¢ and y, and make @ the stream function and y the velocity functien ; thus from any given irrotational motion in two dimensions another may be derived by turning the velocity through a right angle without altering its magnitude.

For instance, if the axis of z be a line source of delivery m, then, since the flow across any eylinder of radius ris m, the velocity must

be £2 ; and therefore Qarr mn m =—— lot 7, and) =——6): 1) ar 08) y 5,”
’

where 6 is the angle made bya planc through the axis of 2 and the point with a fixed plane.

If the values of @ and y be interchanged, we obtain a vortex round the axis of 2, of strength m.

Plane Motion in a Liquid due to the Motion of Rigid Cylinders perpendicular to their Ames.

Suppose a rigid cylindrical surface moving in the direction of the axis of x with velocity V, and other fixed rigid cylindrical surfaces to be present in the liquid, which is supposed for simplicity to be bounded also by two fixed planes perpendicular to the axis of 2 at unit distanec from each other, the generating lines of the eylin- ders being supposed parallel to the axis of z; then at all points cf the boundary of the moving surface

d

= = =normal velocity of fluid as =Vvelocity of boundary normal to itself a4 ds’ and therefore y= —Vy+constant; and at all points of the fixed

surfaces ov 0, and therefore y =constant.

3

We must therefore discovcr a function y which satisfies the

equation

*d*y 4 ay 0*

dz? aye and is equal to a constant round a fixed boundary, and equal to —Vy+constant round a moving boundary, moving with velocity V in the

direction of the axis of x ; and ¢, the conjugate function, ean then easily be written down.

Ez. 1. The moving cylinder a circular cylinder of radius a, and

the fixed cylinder a circular cylinder of radius b, both having the axis of yas axis. Then

U2 r y= — Va sin 6 oe lily a

2 2 ,

==VWes _ on p \ ain 6, -a \ r

and therefore aw bo? o> – hay a +7 } cos 6.

If ¢' denote the velocity function of liquid filling the cylinder r=4,

¢'=Vr cos 6, and therefore, when r=a, I Bs ry _ b? — a? a In determining the kinetic energy of the liquid intermediate to the cylind a 0 yhen r=0; and when r=a ea 1e cylinders, 7-=0 when r=0; ae therefore the kinetic energy of the liquid intermediate to the cylin- Doe é ders is coals of the kinetic energy of the liquid filling the cylinder

=a, Consequently, if the cylinder r=a be moved, the inertia to be overcome will be its own inertia, together with the inertia of a

452 24 92

mass of a liquid — called the cffective incrtia of the cylinder.

In particular, if b=, the cffective inertia is the mass of the cylinder, increased by a mass of liquid of equal volume with the cylinder ; and then

times the volume of the cylinder ; this is

Oye 2 y=- v= sin 0, ¢=-V = cos 6, so that as 5 a VO ery)

Ex. 2. The moving cylinder an elliptic cylinder, and the fixed cylinder a confocal elliptic cylinder.

Using elliptic coordinates &, 7, such that ¢ cosh y, c sinh 7 are the semi-axes of the confocal ellipse, ¢ cos &, ¢ sin ¢ of the confocal hyberbola passing through a point, 2c being the distance between the foci ; then x=c cosh y cos ¢, y=c sinh 7 sin ; and if y=a is the equation of the moving ellipse, 7=8 of the fixed ellipse, then

= — Ve sinh g lah (8 ~ 7) sin £ sinh (6 — a) satisfies the conditions that

: aay 0 (i) Get gen) (ii) w= – Ve sinh a sin = — Vy, when n=a,

(iii) ~=0, when 7=8. Therefore the conjugate function

@=Ve sinh g CORB =m) cog es

*sinh (8 — a) 30 that ; aT sinh a Pai Ae: p+ip= Ve Sith (G2 a) cos (E+%y *B).*

If 9' denote the velocity function of the liquid filling the elliptic

cylinder n=a, then ¢'=Vx=Ve cosh 7 cos §;

and round the ellipse »=a,

@_ _tanha ,

¢ tanh (B-a)' while at is the same for each, and ee vanishes when y = f; there- fore the kinetic energy of the liquid between »=a and = 8 is anti a of the kinetic energy of the liquid inside 7 =a, which is

4rpV°c? sinh « cosh a.

Hence the mass of the cylinder y=a must be increased by __tanha tanh (8 —- a) the effective inertia for motion in the direction of the major axis, the space between the cylindcr y=a and a fixed cylinder »=8 being filled with liquid.

Similarly for motion parallel to the minor axis,

eh +, , sinh (B— 7)

2 cosh (8~7) = Ve cosh eninge a) sin = (Quarterly Journal of Mathematics, vol. xvi.).

Ex. 3. When the moving and fixed cylinders are any two circular cylinders, not co-axial, the limiting points are taken as the foci of reference ; and, supposing 2c the distance between them, and t, » the dipolar system of coordinates, we have

sinh 7 sin & cosh — cos ~' =" a n—cosé° (2+)? +y? fa} (a—cP+y? '

L-C

times the mass of an equal volume of liquid to give

and then

jap ees are'

so that =constant is the equation of a circle passing through the two limiting points, and y=constant is the equation of an ortho- gonal circle.

If y=a be the moving cylinder, moving in the direction of the axis of x (the line of centres) with velocity V, and if 7=8 be the fixed cylinder, we must make

y= -Ve

sinh a ee, 1 CONS UAL, cosh a—cos &

a? 2. 6 : ; va 0 in the intervening

when y=a; Y=0 when y=; and "¥4%¥ a w n 8; an det dy

space. l

‘ For various expressions for y, consult the articles by Mr W. M. Hicks in the Quarterly Journal of Mathematics, vol. xvi.

HY DROMDURANITCE

[HYDRODYNAMICS. Now, expanding, oe se 1+ 25 om cos né, and therefore — v=- VOM ee COs né ,

and p= 2Veyen cosh 2(n—B) in nt.

sinh n(a— 8B) Similarly for a velocity V of the cylinder »=a perpendicular to the line of centres, the cylinder y= 8 being fixed,

=9VeSe-na Sinh_n(n – B) ¥ oe sinh n(a— B) ees

Pe a, cosh n(n – B) p=2VeSe sila) cos née.

Next, suppose a rigid cylindrical surface to be rotating about the axis of z with angular velocity w; we must have — AY _ velocity of

boundary normal to itself

and therefore y=} «(x?y) constant, at all points of the moving boundary, and y=constant, at all points of a fixed cylindrica boundary.*

Ew, 4. Take the two elliptic cylinders of Ex. 2, and suppose the cylinder »=a to be rotating with angular velocity w, and the cylinder »=8 to be fixed ; since

xv?+y?=4¢ (cosh 2n + cos 2é),

if we put = eg? Sith 28-7) oo oF vinings then (i) when n=a, ~=}we cos 2t = hw(x? + y?) + constant ; (ii) when m=8 ,¥=0; (ii Tat gan 8 5*

and therefore y satisfies the required conditions. — , cosh 2(B —n)

— we Bt OE and from the value of the kinetic energy of the intermediate liquid

Then

sinh 2(6 – a) the instantaneous value of the effective moment of inertia can be inferred. If the cylinder y»=8 be also rotating with angular velocity @, the cylinders will remain confocal, and the values of yand > will not

change; then eae sinh 2(n – a)+ sinh 2(8-7) sinh 2(8 — a)

= FepexeOSh (20 — a = B) cog op. si cosh (8 — a) ase _1,,,2S8inh (2n — a — 8) sii cosh (B— a) To find the kinetic energy of the liquid, since

de dy

- -/oF ar=/o°> dé;

cos 2

and sin 2é.

: d therefore T=4 fe a dé; and when n=a, and 7=8, i) "0 tw°ct tanh (B — a) sin 22¢; q ; Qi

therefore T =} pwct tanh (f — a) y sin 72d

0

*= 4arpw*ct tanh (B—-a) ; and, if & denote the effective radius of gyration of the liquid, T=42pwc?k*(sinh 8 cosh B—sinh « cosh a);*

sinh 8 cosh 6—sinh « cosh «a ab, – a,b

ee

~ 4° (aay ~ bby)(a,b, -— ab) where @,, 0, are the semi-axcs of the ellipse »=8, and a, 6 of the ellipse 7 =a. ;

Ex. 5. Suppose a sector, bounded by r=a and @=-ba, rotating

about the axis with angular velocity w ; we must put

therefore

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n=o Tv wtes 8 FONT a eos (Qn +1) 7 oman cos 2a n=0 a | =) see XEae 3) 2a,”

which satisfies the conditions v-y=—0, and y=4or? when 06=+a; in order that p=4wr? when r=a, we must have n=o

= 70 cos 20 2) Aon 41 008 (20+) go =4 wa? (1 A) ,

and therefore, by Fourier’s theorem,

Bog TOM 3) | pt . 2n+1 (Qn+1)r-4a (2n+1)r (2n+1)r+4e

When all the cylinders present rotate, as if rigidly connected, about the axis of 2 with angular velocity w at any instant, then y=to(z?+y?) + constant round the boundary of every cylinder ; and if we put y= —- 4o(2?+y?), then x is the stream function of the relative motion, relative to the cylinders, and satisfies the con-

ditions ox ek —2w at every point of the liquid, and x¥=con-

stant round the boundaries,) Since x involves w as a factor, which is a function of ¢ only, it

follows that — constant is the equation of a stream linc of the rela- @ tive motion, and any alteration in w does not affect the shape of the

relative stream lines, the liquid being frictionless, and the motion generated from rest.

Ex. 6. Put Pade ==-o=——— > spats then Tat Sha ~ 20

and the relative stream lines are similar ellipses.

Then Y=xty (0? + y?) 1 a-P Fara eH) a? —§? and therefore o= app

for the motion between two similar elliptic cylinders, rotating with angular velocity w. 2 _ p2 The velocity of any liquid particle is ae of what it would be if rigidly connected to the cylinders ; hence the effective radius of 4 3 ete 2 _ 42 t f the liquid is ~~”. Ryestion of the Bqnid ie S homogenous rigid body occupying the space. Ex, 7. Put

X= — Begg { 20? ?) +22 + 4? — a2} {202 – 99) a2 YP $B} then v?x = — 2w, and x=0, when

n/2(2? — y) +02 + y? — a? =0,*

/2(2? — y?) — 2 — y? +6? =0, which may therefore be taken as boundaries of the liquid. This

problem is due to Mr Ferrers. Again put

X= bang [eee —y)— a {Oy (ae +-y) — 0% ;

then v?x = — 2, and the hyperbolas Qala —y)—-a?=0, 2y(a+y)—b?=0 may be taken as boundaries, but these hyperbolas are only the previous ones turned through a quarter of a right angle. x. 8. When the liquid fills a rectangular cylinder bounded by x=+a, and y= +0 the conditions ay dy

*da? * dy?*

eX dy

d v= nn? when y= +4,

of the radius of gyration of the

— Qu,

and w= – 0 when z= ta,

are satisfied by putting

*x du Bx 40, 4 ten(KZ,) dy dye Ty Hen(Kt ce) J ry , Be By be _ He K SH) a 2° > ™ * bon Kk)*

K_ a | (Quarterly Journal of Mathematies, vol. xv.).

where

16 %=2 cosh (2+ 1) 58 cos (4+) In fact, if y= we 0 S| a wie i=0

: é b 2i-+1)3 cosh (2¢+1)2- (2¢+1)8 cosh (27+ oe

16 fe? cosh (26+ 1) cos (26+ 1) 58 + wb pe = | OES ata ee = (21+1)8 cosh (26+1) 5, dy dy

th 1) = #0 |

en Q) gat apn? (2) p=40(b? – y?) when «=a; (3) p=hola?-2?) wheny=+0; and therefore wp satisfies the required conditions, and is therefore the value of y required.

Ez, 9, Consider liquid filling the interior of a cylinder, whose cross section is an equilateral triangle of altitude A, and let a, B, y denote the perpendicular distances of a point in the interior from

the sides. If we put

~ 908

*x= 4 Th ay dx then da * dy? 2a,*

and x is the stream function of the relative motion, supposing the cylinder rotating with angular velocity w.

Therefore the cubic aSy=constant is the equation of the path of a liquid particle relative to the cylinder, when it is moved in any manner ; and also for the cylinder bounded by aBy=c, and apy = Cy.

We have supposed the liquid motion to have been generated from rest by the motion of the moving cylinders, but we might also have supposed the mae to have been of infinite extent, and streaming past the cylinders as fixed obstacles; in that case, the stream function of the relative motion x=y+ Vy, and x satisfies the

relations ax EX _9 dx?" dy? and x=constant, the equation of a stream line, and therefore also of a boundary ; also at infinity aX _ 9 9X_ an 7 For instance, if in liquid, moving with velocity—V parallel to the axis of x, the fixed circular cylinder r=a@ be introduced, then

Cmme Vv gene T= es 6+ Vy

=v(r-5) sin 6. r

*If the elliptic cylinder 7=« be introduced, then, since B=o, sinh n—cosh y sinh a—cosh a =Ve sinh 7 sin – Ve sinh a e~"** sin & = Vce* sinh (yn —-a) sin & =V(a+b) sinh (7 – a) sin & If the axis of z be horizontal, and the liquid supposed of infinite*

extent, and originally at rest, then a circular cylinder of density o, projected in any manner perpendicular to its length, will describe a

-+

x= Vy-Ve sinh a sin &

parabola with vertical acceleration re g

If, however, previously to projection, a vortex exist in the liquid, co-axial with the cylinder and of strength m, then any motion of the cylinder will not affeet the circulation of the liquid round the cylinder due to the vortex, and inequalities of pressure round the cylinder will arise from the vortex motion.

Lord Rayleigh has shown (Messenger of Mathematics, vol. vii.) that, if no forces act, the cylinder will describe a circle in the same direction as the circulation of the vortex in the periodic time

™ *&+P where the circulation of the vortex is 2xa%w, a being the*

ey ih radius of the cylinder.

If the axis of the eylinder be horizontal, and the influence of the boundaries of the liquid neglected, then the cylinder will describe a trochoid, and for a particular velocity of projection can be made to describe a horizontal straight line (Messenger of Mathematics, vol. ix. p. 113).

1 For the analogy between the motion of a liquid in a eylinder and the torsion of an elastie bar, pointed out by St Venant, consult Thomson and Tait"s Natural Philosophy, § 704.

HYDROME

On the Motion of a Solid through a Liquid.

If we take an origin O, and axes Ox, Oy, Oz fixcd in the body, then, if wu, v, w, Dp, 97, 7 denote the component linear and angular velocities of the pag | at any instant, the velocity function

me t+ Uhy + Wis + PX1 + IXat 71X39 where the y's J x's are functions of x, y, 2, depending only upon the shape of the body.

To determine y,, we may suppose the velocity w only to exist, and thus y, must satisfy the conditions—

(i) V'y,=0 5

(ii) a1, the cosine of the angle between the normal to

(2

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the surface and the axis of x, at the surface of the moving body ; (iii) ah 0, over a fixed surface. Similarly for p. and 3. To determine x,, we may suppose the velocity p only to exist, and

and then, J, m, 7 being the direction-cosines of the normal to the surface, x1 satisfies the couditions—

(i) v=: (ii) (iii) ino at a fixed surface.

Se ng y — mz at the surface of the moving body ;

Similarly ae a and x3.

For a cavity filled with liquid in the interior of a moving body, since the liquid moves as if solid when the moving body has a motion of translation only, therefore

W=2 5 e=Yy , y= The only eases practically solved are those where the bounding surfaces are similar or confocal surfaces of the second degree. Ex. 1. Consider the space between the ellipsoid 2 "5 ee rs rie 1 a 0? and a similar and alee situated ellipsoid rigidly —— with

Fe ve as for plane motion; and therefore

P=UL+ VY + Wet p —

it ; then obviously x)= G2 — MP es fe ej dey es lg Pre Tl ee ate

The liquid filling this space "will behave therefore an a body of

equal mass, and of principal radii of gyration — oe ee ee ' By oe? Peg a+b?

of the radii of gyration if the liquid were solidificd. Ex, 2. Consider the — filling the space between the ellipsoids

x = = 3+ re : ' (1) a —_ — — = 4 and ae Ay xz ( ); the ellipsoids being confocal, such that AP =A +Aq, by =U? + Ay, C207 + Ap ' ° dx = b= [esp B= [(re 7 – fp whcre P23 (a2+a)(b2+a)(e+a), and owe ae (8) P+rx Ptr eta

so that a?+A, b?+A, c?+A are the squares of the senti-axis of the confocal ellipsoid passing through wyz. Then

A+B+O=4 ; also, if p be the length of the perpendicular from the centre on the tangent planc to (3), P= (a? a)P dx dp Suppose the ellipsoid (1) moving with velocity uw, and the

ellipsoid (2) fixed, then y, can be made to satisfv the required con- ditions by putting

(U2 + a)m?+ (ce? +A)n3,

and therefore dn

y=Maz+NaAz, where M and N are constants.

For Viv, — 0, dy. dx dx dA and tl Nie ea 2 dn ue “a NA; “Pail N dn =Ml+NAl_—“?” _w (a 24 aye

) N -(m+na-o™

(2 25)!

= {M-N(B+O)} 7.

CHARICS Consequently, when A=0, We must have

M -N(,+0,)=1,

where Ay, By, Co are the values of A, B, C, when a=0, and A,, By C, when A=Ay ’

[HYDRODYNAMICS.

and when A=A,,

Hence i

N=” 5 a eee

= B,+C, :

sili 3 OF i

A+B, +0

and 5 ce ee ee

= ae Similarly

Yo= – 1 Bai Ba Gy = ;

Core ae a ae

_ ae Bae :

a” — ie, ea

If the inner ellipsoid had been fixed and the outer moved, we should have had

__ A+B FG, vi ieee Ao+ B+ 0 oA a0, ae , Mage Bea C mn Ag+ By – A; – B,

Next suppose the outer ellipsoid fixed, and the inner to have the angular velocity p ; then x, can be made to satisfy the required con- ditions by putting

xi= Myz+ N(B-C)yz,

where M and N are constants. For then v?x,=0, and

de dy. &) (2-5 fe | M+NB- ot(s pit Va, 8 dn du)? ‘ py -f 1 1 \2pye => | M w(B-0) | (Platyge.) – Nixa) is*

gNekiailitrrar =

= N(A B O(gy = x) lev ; which when A=0 must

= ny — mam Es —Y¥ –

pe and when A=A,; must=0. Therefore M and N must be determined from the equations

1,1 : Vk te M+ N(B, = Cy) (a +3)-NAotB, 4- Oo a-ze) ok eo BB?’ and

| M+ NOB, – 0) | (g54 z1)=0,

Similarly x, and x3 can be determined, and also xj, x», and x3 when the inner ellipsoid is fixed and the outer moved with given angular velocities.

When the outer ellipsoid is indefinitely great, then A,, B,, C, are zero, asalsois M. Then

Cc 1 1 il TA (By ~ Co) fe -ap (e B+ O,)(3r-z | X= N(B- C)yz.

To find the effective inertia of the inner ellipsoid, when the outer ellipsoid is fixed, and first for motion parallel to the axis of x;

=(}; but when a=0, ha, and the y, for the

+2,)-N Bit ONG

N=

and

when A=A,, >— ae

liquid in the interspace is – of the y, for the liquid

filling the inner ellipsoid ; and hence, since the kinetic energy

= 10/ oa, it follows that the kinetic energy of the liquid in

the interspace is _—®_—4 of the liquid filling the intciior

By +C)-B,-C, ellipsoid for motion parallel to the axis of x, and therefore the effective inertia parallel to the axis of x is

HYDRODYNAMICS.) HYDROMECHANICS

Apt Bi t+O,_. Bot+C)-B,- 0,' with similar expressions for the effective inertia parallel to the axes of y and 2.

If the outer ellipsoid be indefinitely large, then the effective inertia of the liquid parallel to the axis of x (since Ay=B,=C,=0)

Ag

a aaa G,'

which, in the case of the sphere, is half the effective inertia of the liquid inside the sphere, since in the sphere Ay=By=Co.

For a rotation about the axis of x of the inner ellipsoid, it follows in the same way that the effective inertia of the liquid in the inter- space is to the effective inertia of tho liquid filling the inner ellip- soid in the ratio of the y's of the two motions, which, supposing the outer ellipsoid indefinitely large,

(

*\ oa fl 1' ®-e (4+ 7)Bo — Cy) — (Ay + Bo+ me ? 4) a 0) ds © (Bo Co) +e) + (Ag + By + Cy)(0? = c) * and therefore the effective moment of incrtia of the liquid about the*

axis of x (oyer~ ay B. – hes ical ee eS ak.) el te "POTS — CE + 0) 4 (Ay +B, +O A' with similar expressions for the effective moment of inertia about the other axes. ; Ex. 3. In the case of two spheres and the liquid between, the x's are all zero, and, if the spheres be instantaneously concentric, y aan | oe af B= a8 ™ o(a8 442 4 2)

eet 42° \; "rah + ge) supposing a the radius of the moving, and a, that of the fixed

sphere. This is a particular case of the confocal ellipsoids, when a=b=c.

+e

For then ph +2A, an Se Peek es "1 RA and = OA i ie _ 2 é (tai "(a+aji 37° Therefore

1 2

(ee eg ae ™ o(=, 1 \ @-a" ~ OF)' a a

When the spheres are not concentric, expressions for the effective inertias have been obtained by the method of images by Mr W. M. Hicks (Philosophical Transactions, 1880).

The image of a source at P of strength m« outside a sphere is a a? OP the centre, a being the radius of the sphere, and a line sink

reaching from the image to the centre of line strength _ ; this a

source inside the sphere of strength oP at a distance from

combination will be found to produce no flow across the surface of the sphere.

Again for a source P of strength yu inside the sphere, the images be OP

from the centre, and a line sink — +. thence to

will be a source of strength at the inverse point of P, that is,

at a distance

OP infinity. In order that there should be no flow across thespherical boundary, another sink of equal strength must exist inside the sphiere, and the infinite parts of the line sinks will then cancel.

The determination of the y's and x's is a kinematical problem, as yet solved only for the cases we have mentioned, and the discovery of the solution of fresh problems is at present engaging the attention of mathematicians.

But supposing them determined for the motion of a body through liquid, then T, the kinetic energy of the body and the liquid, will be a quadratic function of u, v, w, p, 7, 7; so that we may put

2D = Cy1U? + Ogg" + Cag? + Cyy P+ Copq? + Cog?" + 2QeogvW+ . 1… 2eggrt .... 2qyup... in all twenty-one terms ; and, in order to determine the c's, we may

suppose all the velocities except one or two to vanish, and then we

see that y=M+pf/ly,as, CF) wo:

where M is the mass of the body,

y= Atp //xy(ny = mz)d8, . ieee

where A is the moment of inertia of the body about the axis of a; these are obtained by supposing all to vanish except % or p. If we suppose all to vanish except v and w, we find

P= qv +3, Mm dg m4 2 aT p f/oPd8+M(w +w*) |

= bag? + 5902 + poof] (va +s)aS ; or Cg = 3 WA (Yo Ms + vq)as = eM vznas – Mamas.

Similarly the other coefficients may be determined (Kirchhoff, Vorlesungen tiber Mathematische Physik, p. 240),

In particular cases of symmetry, the coefficients of the products of U,V, W, P, g, 7 can be made to vanish by a proper choice of axes; and in the case of the ellipsoid, the only case for which the coefficients have as yet been determined,

A =M he as Cy = M+ 4rpa “R+G,

and

(By – C,)(6%= 02)?

os b LO.eeey’ Cam At sememers A) + (At By FOOLS)

while ¢,,.. + vanish, the origin O being at the centre of the ellipsoid, and the axcs of the ellipsoid its principal axes.

In the case of a sphere of mean density o, projected in infinite liquid of density p, and subject to gravity, the sphere will describe a parabola, with vertical acceleration 7—P- 9,

o

Having expressed T nowas a quadratic function of w, v, w, p, 9,7

the cocflicients being functions of the re but independent of a

the position and orientation of the body, the Hamiltonian equations of motion lead to the equations

a (ar di\du

ad {dT aT aT av ae) & “dq He | eet af Oe tee

*aT aT = *y,. ay IF 7 >:*

For if P denote the resultant linear impulse in the direction, Jixed in space, whose direction-cosines are 1, m, n, then

T dT dT P= Pas = 9 x ee ae

and, differentiating with respect to the time, since

*dl d ad an 14; a pad MD » dP = 1 ad av = per -} av dé di\ du dv * dw ad (dT at ot +m| 255) ~ 2m * 5*

d (aT dT et oe wae) ~ Vie bs Paw =IX+mY+nZ,

for all values of 2, m, n. ; ; ; Again, taking a fixed origin, and supposing G the impulsive couple about a straight line through the origin fixed in space whose direction-cosines are 7, m, 1; a) — g—

aT dT ache (Fo . Yaw dv nage aT i. at » i) dq du dw

‘ Yau)’

dr adv where 2, y, # are the coordinates of the centre of the body.

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Differentiating with respect to the time, and supposing after- wards that the centre of the body and the fixed origin are colnci- ax dy dz

dent, then, since 7 =w, a? are, but z=0, y=0, z=0, aG_y{ 2(42)_ a0, g2T _gAT 9A) dt dt\ dp dq dr ae -aw Chat at "ar ~dt T +m (a) pw wg |

+ AS) 05 Pa whe fom dt\ dr dp "dq du dv =lL+mM+4+aN, for all values of 7, m, a. If no external forces act, theu three integrals of the equations of

motion are (1) T=constant ;

AN SiGe aaa x? : (2) (5) +(3) +(Z) =constant ;

g) aah at at, at a "" du dp' dv dq

—~ —~=coustant 5 dw dr ;

expressing the fact that the energy is constant, and also the force and couple constituents of the resultant impulse.

For a body like an ellipsoid, using single suffixes,

T= (cu? + cyv? + cg? + cyp? + 6,97 + Cer") §

and the integration of the equations of motion under no forces leads to hyperelliptic and double @ functions (Weber, Mathematische Annalen, vol. xiv.).

The equations of motion become

ase —cyrtewg=0. . . « « » (1); ad Ce —cwpt+cur=0. (2), ae —cugtcup=0. (3); dt d Ce — (C5 — 4)97 — (Cg – ¢g)vw=0 (4), dq cod. (eg-e)mp—(q— awu=0 . . () dr C6ap — (Ca —¢5)PY— (¢, —¢,)wo=0 (6). Multiplying the equations by w, v, w, p, g, 7, and adding, du ad d d; d d Cu + ev + os + Cpr

+ oat ny gro 0, or 4 (c,u?-+ cv? + cyw® +cyp? +059? +-cgr?)=T, aconstant . . (7).

Multiply (1) by ¢,w, (2) by cv, and (3) by csw, and add; then Cy uae a qn + coe a0, Oe eg ete a le il a

du

and

(8),

F being a constant, the resultant linear impulse of the motion.

Again, multiplying the equations (1 to 6) by cyp, cg, cgr, cu, c,v, cyw, adding and integrating,

Cup + C,0,09 + Cgcgwr=G, a constant

(9).

Equations (4), (5), (6) show that the body is acted upon by com- ponent couples about the principal axes (c,—cy)vw, (c3—c)wu, (c, -¢,)wv, the principal moments of inertia being supposed to be by, Oy Cg

If the body be of revolution, c;=c, and c,=c;, the motion can be expressed by elliptic functions. For equation (6) shows that r is constant, and equation (3) becomes

dw\? ea(7) = ¢”(ug ~ vp)?=c? {(u? + 0”)(p? +g?) —(up + og) il ¥2 C: (G- iz (te ee ee _) CaCaW) a (F? — c,2w or 3 cgr ao Cg)uP > — =o - (10), a biquadratic funetion of w, and therefore w is an elliptic function of t, the time. Put w=s cos f, v= ~s sin f; then from (1) and (2) d; : ; oF =¢,(Wv — Uv) = ¢,7s — ¢3(up +09q)w*

or of _ 03 U+VY

dt Cc, ur+v? a rational function of w; and therefore f is expressed in terms of the time by elliptic integrals of the third kind.

5)

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Again, put p=o cos g , g=-—a@ sing; then from (4) and (5)

d 5 , oot = 04(PY — PG) = (C4 – g)o7r + (Gy — Cg)(up + vg)w 5 dg _ C6 €,—C, Upt vg y tals a a rational function of w; and therefore g is expressed in terms of the time by elliptic integrals of the third kind.

In a state of steady motion, w is constant, and 2 ag 3 also

‘1

up +vqg=so; and therefore

a 6-6, 8. — —+4+ Se 5

1 a ee an ©

and we must therefore lave

7 > 42 €,) <4

pues, até, =o)

w ty wa

for the roots of this quadratic in s: o to be real. If we employ the Lagrangian coordinates x, y, 2, 6, >, p, and take OZ in the direction of the resultant linear impulse F, then

Z

A

Fig. 10.

(fig. 10) the eye being supposed at O the centre of the sphere, ¢,u=component momentum in direction OA= —F sin 6 cos¢ , cy = rf Ae OB=F sin@ sing , CW = i ‘iy OC=F cos 6;

ee equation (10) gives cos @ as an elliptic function of ¢. ince

D

p=sin ¢6-sin 6 cos $y, qg=cos #6+sin 6 sin py, equation (9) becomes c, sin b+cgrcos=G.. . ‘ dy G-—cgr cos 0 dtc sin 26 1 G-er 1 1 Gter 1 : —9 “oe, iI-cos@ 2° eo L+cose’

and therefore p will consist of elliptic integrals of the third kind. Equations (4), (5), (6) show that the body is acted upon at every instant by a couple whose axis is OF, of magnitude

(11) ;

or

= 3c, —Cy)w tan 6, Cy ; c, being supposed to be the equatorial moment of inertia of the ody. Tf OT be the direction of motion of O, then OT lies in the plane ZOC, and tan COT =-% tan 0. Cy We may determine the steady motion from elementary reasoning; for if OG be the axis of the resultant angular momentum (also lying in the plane ZOC) making an angle 8 with OC, and if » be the con- stant value of y, then Gu sin (@— 8) =impressed couple*

— 8 (c,-¢,)w tan 6. ¢*

1

G cos B=cgr, G sin B= — C4? $

But and p=-psin 0; therefore tan p— sin 0;

6

and if y be the angle made by the axis of instantaneous rotation

with OC, tan y= sin 6.

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Therefore Sas) P sin (-B8 sin (6 — B) = ¢gru ——_— Gu sin (0-8) = cern ere =Cgru(sin —cos tan B) =Cgr sin 6 — cu? sin 0 cos 0 = “3 (¢—¢,)w? tan 6; Cy s and, dropping the factor sin , C4 cos Ou? —-«¢ rp + 3(c — 3) i) 4 (ee 5 qt 3) cos 6 a quadratic equation in u, the condition for steady motion. The least admissible value of vr in order that the roots should be real is given by

c 2 Cer? 4 —§ (64 —C)cu , Cy Cc Cc or pa 4-8 (c, — C3) 4 w, Cy C6

In an oblate solid of revolution c,—c, is negative, and the roots of the quadratic in « are always real for all values of 7. In a prolate solid c,—c, is positive, and a certain spin 7 is required to keep the motion stable.

An interesting application is to determine the » er amount of rifling of a gun. The following table has been calculated, from the formule given below, by Captain J. P. Cundill, R.A., and the re- sults appear to agree very fairly with what is observed in practice.

Table calculated for Stability of Rotation of Projcctilcs.

= Minimum twist at muzzle of gun requisite to give stability

8 # ” of rotation=1 turn in n calibres.

(ol

‘a B Cast-iron com- , lid lead and

3 & ee mon shell. it te Sokid steel oe ee of

i) Tel Cavity=,f,ths 1 y=t L bullet, similar composi-

th ° vol. of shell. eS Density tion to M.-H.

gos Density of iron me =8-000. bullets.

tS =7°207. = ‘ Density =10°9.

Value of n. Value of n. | Value of n. Value of n.

2°0 |-49418 : F 71°08 ‘ 84°29 2°1 |°52082 59°84 66°59 67°66 78°98 2°2 |-54431 56°31 62°67 63°67 74°32 2°3 |°56643 53°19 59°19 60°14 70°20 2°4 158679 50°41 56°10 57:00 66°53 2°5 |60561 47°91 53°32 54°17 63°24 2°6 (62315 45°65 50°81 51°62 60°26 2°7 |63938 43°61 48°53 49°30 57°55 2°8 |°65454 41°74 46°45 47°19 55:09 2°9 {66868 40°02 44°54 45°25 52°72 3°0 |°68192 88°45 42°79 43°47 50°74 3‘1 |69434 36°99 41°16 41°82 48 82 3°2 |°70598 35°64 39°66 40°30 47-04 3°3 |‘71693 34°39 38°27 38°84 45°38 3°4 [72724 33 ‘22 36°97 37°56 43°84 3°5 173697 32°18 35°75 36°33 42°40 3°6 [74615 3111 34°62 85°17 41°05 3°7 \°75488 80°15 33°55 34°09 39°79 3°8 |‘76308 29°25 32°55 33°07 38°61 3-9 | °77082 28°40 31°61 32°11 37°48 4-0 |‘77820 27°60 30°72 31°21 36°43

Suppose the rifling at the muzzle makes one turn in x calibres, and 2a is the calibre and 8 the angle of the rifling ; then as A re — a ww “ an ¢s) Cg? If W=weight of shot, and W’=weight of air displaced, then cy= W + W’a, cg= W + Wy, C4 a! Wk? + Wk 320’, Cg — Wk, where k,, & are thie radii of gyration of the shot about an equatorial diameter and the axis, and &; of the air displaced, supposed rigidi- fied, about an equatorial axis; and then a, y, « will be certain quan- tities depending only upon the external shape of the projectile,

supposing the surrounding medium frictionless and incom- pressible.

? When, as in practice, the fraction y. is so small that its square

may be neglected,

2 2

*tan *B=% =4 mal —C,) ae = ee aia aii Wh? + Wk, 20! W+w Y We 14a a eas ae reo ‘ i a iar Ww’ W ke? WwW a*

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Pe kt

,

+ higher powers of ald which are neglected. co) p W s

Ww' =4 45 (a—-Y)

The only body for which a, -y, and a' have as yet been determined is the ellipsoid; and in the case of a prolate spheroid of semi-axes

aandc, pit oc oy GR Oamere 2 7 (C- ANe- a2? (C— A)(2 a2) + (24+ O)(2 +02) (2-+a%) where

-f ee an

ie eo ee

0 (B+ayte+a)}

_ ae c+A/(c? — a?) GPa?) (2g? Pe c—(P—a?)'

of dx oD (FAN A+A)

il i c+j(e-a) 2 ; (eat "See (P— a2) (Fah '*

and therefore 2 A+O= a :

Wave Motion in Liquids.

First consider plane waves propagated in the direction of the axis of x in liquid of depth h, the undisturbed surface being taken as the plane of zy and the axis of 2 drawn vertically upwards.

The equation of continuity, supposing a velocity function ¢ to

*exist, being ee 9 ae ge *’ we must first seek a solution of this equation, involving a periodic*

term of the form sin (sx — nt), where m= a , mae :

+

a being

the wave length and V the velocity of propagation of the waves. If we put 6=/(z) sin (mx —nt), then

oS mf=0,

ee

the solution of which, under the condition that a =0Q when

z= —h, is S(2)=A cosh m(z+h), and therefore g~=A cosh m(z+h) sin (mx — nt).

We must now endeavour to make the free surface a surface of equal pressure, and in order to do this we must suppose A small enough for its square to be neglected ; and therefore the square of the velocity is to be neglected too.

The dynamical equation then becomes

ran s a H, a constant ; and at the surface where z= 0,22 =0, and @ may be put= ; dp &o 2 therefore g ict ap =0, when z=0. Therefore Amg sinh mh -n? A cosh mh=0, or n2=mg tanh mh , or v2=9" tanh a Qa A If the depth 2 be very great compared with the wave length a, then neglecting the square of = ; 2 IX V oo

If the depth % be very small compared with the wave length a, then, neglecting the square of 4 ; V2=9h.

Next consider the more general case of wave motion propagated inthe direction of the axis of x at the common surface z=0 of two liquids, the

lower of density p and bounded below by the fixed plane z= ~h, and the upper of density p' and bounded by the fixed

| plane z=h', and suppose U and U' the mean velocities of currents

in the liquids making ang es a and a' with the axis of x; suppose in addition there is a surface tension T at the common surface of

the liquids. XII.—s8

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Denoting the velocity functions by @ and ¢',

`=U cosa. a#+U sina. y+A cosh m(z+h) cos (mx – nt) ¢'=U' cos a'. 2+U' sin a'. y+ A' cosh m(z–h') cos (max – nt) ; then and ¢' satisfy the equations of continuity, and the conditions that _ 0` *when z= -hA, and i when z='.*

dz dz

Supposing the cquation of the moving surface of separation to be 2=bsin(mz — nd), then the direction of motion of each liquid, relative to the moving surface of separation, must be a tangent to the surface, and therefore, when z=0, ;

dp ag'

az Soe se ag o. time dx' dx dx

or, neglecting A? and A', A sinh mh _ – A' sinh mh' _) Ucosa—V U'cosa'- V "' dividing out by the common factor m cos (mx —- nt), and therefore @=Ucosa.x+U sina. y+(U cosa— V)b cosh m(2+ 2) ons (ma — nt), sinh mh pcosh m(z —h') sinh mh'

¢' = U'cos a'.v + U'sin a'.y — (U'cosa' — V) cos(mx — nt).

The dynamical equations are d. p+gpz+p ot 4 py =H,

, ’ ’ ag’ U u Pp +9p’e+p e+ 4 p’g?=H’; and at the surface of separation, where z=0, we must haye ’ az ‘ p-p= ~T = mrb sin (mz —nt)

*=H -H’-9(p-p’)b sin (mx — nt) – p(U cos a—V) coth mh. nbd sin (ma —nt) — p’(U’ cos a’ -— V) coth mh’. nb sin (max — nt) -$ {U cos a—(U cos a— V) coth mh. mb sin (ma – nt) }2 ~% pU*sin 22-4 p(U cos a— V)®mb? cos %(ma — nt) +4 p’{U’ cos a +(U’ cos a’ – V’) coth ma’. md sin (ma – nt) }? +4 p’U” sin 2a’ +4 p’(U’ cos a’ — V)?mb? cos {ma — nt) ; and neglecting b? and equating to zcro the cocfficient of sin (mx — nt), m2T +-9(p — p’)— (U cos a— V)(mU cos a—n)p coth mh -(U’ cos a —V)(mU’ cos a’ —2)p’ coth mh’ =0,*

° . nN which, since — = V, reduces to NU

*mT +9(p — p’)—m(U cos a-V)%p coth mh —m(U’ cos a’ — V)*p’ coth mh’ =0,*

or, since ™ -= ‘ : t 7 T= (U cos a—V)’p coth 2eh + (U’cosd – V}p’coth 2

—g(p —p’)=9. If U=0, U’=0, p’=0, we find me | tanh 27! ; 27 Ap A as at first, if T=0. A discussion of the different cases that can arise is given by

Lord Rayleigh in his papers on the “ Instability of Jets” published in the Procecdings of the Royal Soctcty and of the London Mathe-

matical Society ; also in a paper by Sir W. Thomson in the Phil. ‘

Mag., 1871. .

In the last-mentioncd papcr an interesting application of the above equations is madc to determine the ripples produced by wind blowing over the surface of still water.

Put W0 , i= , | 62 – then mT +9(p — p’) —m V2 – m(U’ — V)2p’ =0,

Af W be the velocity of propagation of waves of the same length with no wind, then

nT + 9(p ~ p')~ mW%p + p')=0; P a ome, mie m ptp' ptp the minimum value of which for different values of i is given by

W2=2/(gT)V (0 ae! ; p+p

and then m= vi

rie P) –

Bau Vip +(U"— V)Pp'= W%(p +p)

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and therefore v= _v't,/ WwW? 22 2

Rae (p+p')" giving the velocitics of propagation of waves with and against the wind.

The lcast value of U" is less than (pte) times the least value pp of W2, and is therefore ptp' ! TT we Oe) :

If the wind be blowing with a velocity greater than this mini- mum value of U', the surface of the water as a plane level surface becomes unstable, and ripples are produced.

With C. G. 8S. units, g=981, T=81, p=1, p'='0012759, and then the minimum value of U' is about 664, equivalent to about 14°8 miles an hour. This velocity is of course much greater than what is required to ruffle the surface of water in reality, the dis- crepancy being due to the viscosity of the air.

In the casc of standing waves in a circular tank, cylindrical co- ordinates 7, 6, 2 being used, where

x=rcos 6, y=rsin 0, the equation of continuity becomes Pp 1 dp, 1 H a5 dr r dr r d' de If the liquid be of depth h, we must put p=, cosh k(z+h) cos 2xrnt, where 2 is the number of oscillations per second, and then Mo, 1 do 1

Moy, p20, oe aa ee a If we put ¢;=y cos m6, then Gh) 1 dbs Pag Ne opt; aaG -T)¥=0 Bessel's differential equation ; and therefore and o=AdJ m(kr) cos mé cosh k(z+h) cos Qarnt ; and & must be determined from the condition that

a 20, when r=a ;

or Jn(eay=0. ; At the free surface dp Cp _ i ae" or gk sinh kh — 42°n? cosh kh=0, or n? = x tanh kA.

For circular waves, m=0, and the roots of J, (ka)=0, are ke = 30802, 7016, 10873, 13°328) . .

| (Rayleigh, Sound, p. 274).

When thc tank is limited by the radial planc @=0, then the

slowest oscillation corresponds tom=4, and then

J, (ler) = Sin br

Vice' and Ji(ka) = af Ecos he – ad , a ka gives tan ka=ka, and therefore os 1°4308 wv

(Rayleigh, Sownd, p. 279). | ,

When the tank is bonnded by the radial planes 6=0, 0=§ 1, the slowest oscillation corresponds to m=, and then

1 /sin kr Jg(kr) "Te cos ir) ; and the cquation J'(#a)=0 leads to

bka 2h?a? — 8

For the discussion of the free oscillations of an ocean of uniform depth, covering a central nucleus, under the gravitation of the parts, and the surface tension at this free surface, consult Lamb's Motion of Fluids, p. 196, and Lord Rayleigh's papers in the Pro- cecdings of the London Mathematical Society. ;

The propagation of plane waves of longitudinal displacement in air, and the notes produced by open and closed pipes, have been con- sidered under the heading AcousTIcs.

When the air is limited by special surfaccs, the problem of its vibrations is worked out by Lord Rayleigh in the Proccedings of the London Mathematieal Society, 1872.

A list of references to the memoirs and treatises on the subject

tan ka=

| svill be found at the end of Lamb's Motion of Fluids. (A. G. G.)

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PART II.—HYDRAULICS.

I. THE DATA OF HYDRAULICS.

{ Units.—Except where other units are given, the units throughout this article are feet, pounds, pounds rer sq. {t., feet per second.]

1. Properties of Fluids:x—The fluids to which the laws | of practical hydraulics relate are substances the parts of |

which possess very great mobility, or which offer a very small resistance to distortion independently of inertia. Under the general heading Hydromechanics a fluid is defined to be a substance which yields continually to the slightest tangential stress, and hence in a fluid at rest there can be no tangential stress. But, further, in fluids such as water, air, steam, &c., to which the present division of the article relates, the tangential stresses that are called into action between contiguous portions during distortion or change of figure are always small compared with the weight, inertia, pressure, &c., which produce the visible motions it is the

object of hydraulics to estimate. On the other hand, while a fluid passes easily from one form to another, it opposes considerable resistance to change of volume.

It is easily deduced from the absence or smallness of the tangential stress that contiguous portions of fluid act on each other with a pressure which is exactly or very nearly normal to the interface which separates them. The stress must be a pressure, not a tension, or the parts would separate. Further, at any point in a fluid the pressure in all directions must be the same; or, in other words, the pressure on any small element of surface is independent of the orientation of the surface.

2. Fluids are divided into liquids, or incompressible fluids, and gases, or compressible fluids. Very great changes of pressure change the volume of liquids only by a small amount, and if the pressure on them is reduced to zero they do not sensibly dilate. In gases or compressible fluids the volume alters sensibly for small changes of pressure, and if the pressure is indefinitely diminished they dilate without limit.

In ordinary Hydraulics, liquids are treated as absolutely incompressible. In dealing with gases the changes of volume which accompany changes of pressure must be taken into account.

3. Viscous fluids are those in which change of form under a continued stress proceeds gradually and increases indefinitely. A very viscous fluid opposes great resistance to change of form in ashort time, and yet may be deformed considerably by a small stress acting for a long period. A block of pitch is more easily splintered than indented by a hammer, but under the action of the mere weight of its parts acting for a long enough time it flattens out and flows like a liquid.

All actual fluids are viscous. They oppose a resistance to the relative motion of their parts. This resistance diminishes with the velocity of the relative motion, and becomes zero in a fluid the parts of which are relatively at rest. When the relative motion of different parts of a fluid is small, the viscosity may be neglected without introduc- ing important errors. On the other hand, where there is considerable relative motion, the viscosity may be expected to have an influence too great to be neglected.

Measurement of Viscosity. Coefficient of Viscosity.—Suppose the plane ab, fig. 11, of area w,to move with the velocity V relatively to the surface cd and parallel to it. Let the space between be filled with liquid. The layers of liquid in contact with ab and cd adhere tothem. Tho intermediate layers all offering an equal resistance to shearing or distortion, the rectangle of fluid abcd will take the

form of the parallelogram a'b'cd. Further, the resistance to tho motion of ab may be expressed in the form

(1);

R=xwV hee whee «, isa coefficient the nature of which remains to be determined.

If we suppose the liquid between ab and ed divided into layers as shown in fig. 12, it will be clear that the stress R acts, at each divid-

| ing face, forwards in

thejdirection of mo- A if wo consider the upper layer, backwards if we te sider the lowerlayer. Now suppose the original thickness of the layer T increased tonT; if the bound- ing plane in its new ha has the ve- =

ocity nV, the shear- ---.------!-------- ing at each dividing face will be exactly the same as before, and the resistance must therefore be tho same. Hence,

R=«'w (nV) .. (2).

But equations (1) and (2) may both be expressed in one equation if « and x' are replaced by a constant varying in-

Fig. 12.

versely as the thickness of the layer. Putting kan ; =r ; R= poy i

or, for an indefinitely thin layer, R=pw = (3),

an expression first proposed by Navicr. The coefficient » is termed

the coefficient of viscosity.

Aceording to Maxwell, the value of u for air at 6° Fahr. in pounds, when the velocities are expressed in feet per second, is

= 0000 000 025 6(461° + 6) ;

that is, the coefficient of viscosity is proportional to the absolute temperature and independent of the pressure.

The value of w for water at 77° Fahy. is, according to Helmholtz and Piotrowski,

#=0°‘000 001 91,

the units being the same as before. For water « decreases rapidly with increase of temperature.

4. When a fluid flows in a very regular manner, as for instance when it flows in a capillary tube, the velocities vary gradually at any moment from one point of the fluid toa neighbouring point. The layer adjacent to the sides of the tube adheres to it and is at rest. The layers more interior than this slide on each other. But the resistance developed by these regular movements is very small. If in large pipes and open channels there were a similar regu- larity of movement, the neighbouring filaments would acquire, especially near the sides, very great relative veloci- ties. Boussinesq has shown that the central filament in a semicircular canal of 1 metre radius, and inclined at a slope of only 0:0001, would have a velocity of 187 metres per second,! the layer next the boundary remaining at rest. But before such a difference of velocity can arise, the motion of the fluid becomes much more complicated. Volumes of fluid are detached continually from the boundaries, and, revolving, form eddies traversing the fluid in all directions, and sliding with finite relative velocities against those surrounding them. These slidings develop resistances, incomparably greater than the viscous resistance due to movements varying continuously from point to point. The movements which produce the phenomena commonly ascribed to fiuid friction must be regarded as rapidly or even suddenly

varying from one point to another. The in- ternal resistances to the motion of the fluid do not depend

1 Journal de AM. Liouville, t. xiii., 1868 ; Mémoires de ? Académie

| des Sciences de l'Institut de France, t. xxiii., xxiv., 1877.

on the general velocities of translation at different points of the fluid (or what M. Boussinesq terms the mean local velo- cities), but rather on the intensity at each point of the eddy- ing agitation. The problems of hydraulics are therefore much more complicated than problems in which a regular

motion of the fluid is assumed, hindered by the viscosity of the fluid.

RELATION OF PRESSURE, DENSITY, AND TEMPERATURE OF LIQUIDS.

5. Density of Water.—Water at ordinary temperature and pres- sure contains 62°4 Ib per cubic foot, or 1000 kilogrammes per cubic metre. The density or weight per unit of volume will be designated by G. River and spring water is not sensibly denser than pure water, being at most 1-100000th heavier. Sea-water may be taken at 64 tb per cubic foot.

6. Compressibility of Liquids. —The most accurate experiments show that liquids are sensibly compressed by very great pressures, and that up to a pressure of 65 atmospheres, or about 1000 fb per square inch, the compression is proportional to the pressure. ''he chief results of experiment are given in the following table. Let V, be the volume of a liquid in cubic feet under a pressure p, tb per square foot, and V, its volume under a pressure py, Then the cubical compression is

Y= 75

t..

and the ratio of the increase of pressure p,—, to the cubical com- pression is sensibly constant. That is, (a- BM is constant.

This constant is termed the elasticity of volume, and is denoted by k& (Thomson). With the notation of the differential calculus,

a ee oe _av dV Vv

Canton. Oerstedt.

Colladon and | Regnault, Sturm. “ai

ale

45,990,000 45,900,000 | 42,660,000 | 44,090,000

52,900,000

y …./705,300,000

44,090,000

32,060,000

626,100,000 1604, 500, 000

AOE sh

23,100,000

According to the experiments of Grassi, the compressibility of water diminishes as the temperature increases, while that of ether, alcohol, and chloroform is increased.

7. Change of Volume and Density of Water with Change of Tem- perature.— Although the change of volume of water with change of temperature is so small that it may generally be neglected in ordi- nary hydraulic calculations, yet it should be noted that there is a change of volume which should be allowed for in very exact calcu- lations, The values of p in the

following short table, which gives data enough for hydraulic purposes, are taken from Professor Everett's System of Units.

Density of Water at Different Temperatures.

Temperature. p p G Density of Density of Rae a Cent.| Fahr. edi haat i in ib.

998272

0} 32:0 | °999884 62°316 1] 33°8 | °999941 '997839 | 62°289 2; 385°6 | °999982 "997380 | 62°261 3 | 37°4 | 1:000004 996879 | 62'229 4 | 39:2 | 1:000013 "996344 | 62°196 5 | 41°0 | 1:0000038 995778 | 62°161 6 | 42°8 | :999983 99469 _| 62°0938 7 | 446 | 999946 99236 | 61°947 8 | 46°4 | "999899 '99088 | 61°823 9 | 48°2 | '999837 "98821 | 61°688 10 | 50°0 | '999760 98583 | 61°540 11 | 51°8 | °999668 98339 | 61°387 12 | 53°6 | °999562 98075 | 61°222 13 | 55°4 | 999443 "97795 +; 61°048 14) 57°2 | 999312 97499 | 60°863 15 | 59°0 | -999178 '97195 | 60°674 16 | 60°8 | °999015 "96880 | 60°477 17 | 62°6 | '998854 "96557 =| 60°275 18 | 64:4 | °998667 95866 | 59°844 19 | 66:2 | -998473

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The weight per cubic foot has been calculated from the values of p, on the assumption that a cubic foot of water at 39°2° Fahr. is 62°425 tb. For ordinary calculations in hydraulics, the density of water (which will in future be designated by the symbol G) will be taken at 62°4 fb per cubic foot, which is its density at 53° Fahr. It may be noted also that ice at 32° Fahr. contains 57:2 tb per cubic foot. The values of p,are the densities in grammes per cubic centimetre.

8. Pressure Column. Free Surface Level.—Suppose a small verti- cal pipe introduced into a liquid at any point P (fig. 13). Then the liquid will rise in the pipe to a level OO, such that the pres- suredue tothecolumn in the pipe exactly balances the pressure onits mouth. Ifthe fluid is in motion the mouth of the pipe must be supposed ac- curately parallel to the direction of mo-

tion, or the impact of the liquid at the mouth of the pipe will have an influence on the height of the column.

Fig. 13. If this condition is complied with, the height of the column is a measure of the pressure at the point P. Let w be the area of section of the pipe, 2 the height of the pressure column, p the intensity of pressure at P; then

pw=Ghw tb, ma

that is, h is the height due to the pressure at p. The level OO will be termed the free surface level corresponding to the pressure at P,

RELATION OF PRESSURE, TEMPERATURE, AND DENSITY OF GASES.

9. Relation of Pressure, Volume, Temperature, and Density in Compressible Fluids, —Certain problems on the flow of air and steamare so similar to those relating to the flow of water that they are con- venicently treated together. It is necessary, therefore, to state as briefly as possible the properties of compressible fluids so far as knowledge of them is requisite in the solution of these problems. Air may be taken as a type of these fluids, and the numerical data here given will relate to air.

Relation of Pressure and Volume at Constant Temperature.—At constant temperature the product of the pressure p and volume V of a given quantity of air is a constant (Boyle's' law).

Let p, be mean atmospheric pressure (2116°8 tb per square foot), V, the volume of 1 tb of air at 32° Fahr. under the pressure yy. Then

pt ott 25 Po a ke

If G, is the weight per cubic foot of air in the same conditions,

2116°8 i 6 (2).

For any other pressure p, at which the volume of 1 tb is Vand the weight per cubic foot is G, the temperature being 32° Fahr.,

pV 4 = 26214 Or oe (3).

26214

Change of Pressure or Volume by Change of Temperature.—Let po, V,, G,, as before be the pressure, the volume of a pound in cubic fect, and the weight of a cubic foot in pounds, at 32° Fahr. Let p,V, G be the same quantities at a temperature ¢ (measured strictly by the air thermometer, the degrees of which differ a little from those of a mercurial thermometer). Then, by experiment,

460‘6+¢ T V=0,V se PY =Po 07606 4 32 Po Yo

a)

(4),

where 7, 7, are the temperatures ¢ and 32° reckoned from the abso lute zero, which is — 460°6° Fahr. ;

*tit Ol me A e 6 e e G Go To ga. Te, (5). Po If py=2116‘8, G)=*08075, 7) = 460°6 + 82=492°6, then P5327 . ° . e ° e 8 (5a).*

G

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II. KINEMATICS OF FLUIDS.

10. Moving fluids as commonly observed are conveniently classified thus : —

(1) Streams are moving masses of indefinite length, completely or incompletely bounded laterally by solid boundaries. When the solid boundaries are complete, the flow is said to take place in a pipe. When the solid boundary is incomplete and leaves the upper surface of the fluid free, it is termed a stream bed or channel or canal.

(2) A stream bounded laterally by differently moving fluid of the same kind is termed a current.

(3) A jeé is a stream bounded by fluid of a different kind.

(4) An eddy, vortex, or whirlpool is a mass of fluid the particles of which are moving circularly or spirally.

(5) Ina stream we may often regard the particles as flowing along definite paths in space. A chain of particles following each other along such a constant path may be termed a fluid filament or elementary stream.

1l. Steady and Unsteady, Uniform and Varying, Motion.—There are two quite distinct ways of treating hydrodynamical questions. We may either fix attention on a given mass of fluid and consider its changes of position and energy under the action of the stresses to which it is subjected, or we may have regard to a given fixed portion of space and consider the volume and energy of the fluid entering and leaving that spaee.

If, in following a given path ab (fig. 14), a mass of water @ has a con- stant velocity, the motion is said to be uniform. The kinetic energy of the mass a remains unchanged. If the velocity varies from ey to point of the path, the motion is called varying motion. If ata given point a in space, the particles of water always arrive with the same velocity and in the same direction, during any given time, then the motion is termed a

steady motion. On the | = a b

contrary, if at the point a Fig. 14.

the veloeity or direction varies from moment to

moment the niotion is termed unsteady. Steady motion is sometimes termed permanent motion. A river which exeavates its own bed is in unsteady motion so long as the slope and form of the bed is changing. It, however, tends always towards a condition in which the bed ceases to change, and it is then said to have reached a eondition of permanent regime. No river probably is in absolutely permanent regime, exeept perhaps in roeky

channels. In other cases the bed is scoured more or less during the rise of a flood, and silted again dur- ing the subsidence of the flood. But while many streams of a tor- rential character change the condition of their bed often and to a large extent, in others the changes are eomparatively small and not easily observed.

As a stream approaches a condition which would be strietly de- fined as one of steady motion, its regime becomes permanent. Hence steady motion and permanent regime are sometimes used as mean- ing the same thing. The one, however, isa definite term appli- cable to the motion of the water, the other a less definite term applicable in strietness only to the eondition of the stream bed.

12. Theoretical Notions on the Motion of Water.—The actual motion of the partieles of water is in most eases very complex. To simplify hydrodynamie problems, simpler modes of motion are assumed, and the results of theory so obtained are compared experi- mentally with the actual motions.

Motion in Plane Layers.—The simplest kind of motion in a stream is one in which the particles initially situated in any plane cross section of the stream continue to be found in plane cross seetions during the subsequent motion. Thus, if the particles in a thin plane layer ab (fig. 15) a are found again in a a' thin plane layer a'd' after any interval of time, the motion is said to be b motion in plane layers.

In sueh motion the inter- '

nal work in deforming Fig. 15. the layer may usually be disregarded, and the resistance to the motion is confined to the circumferenee.

Laminar Motion. —In the ease of streams having solid boundaries, itis observed that the central parts move faster than the lateral parts. To take account of these differences of velocity, the stream may be conceived to be divided into thin lamine, having cross sections somewhat similar to the solid boundary of the stream, and sliding on eaeh other. The different lamine ean then be treated as having differing velocities according to any law either observed

b’

or deduced from their mutual friction. A much closer approxi- mation to the real motion of ordinary streams is thus obtained.

Stream Line Motion.—In the preeeding hypothesis, all the par- tieles in each lamina have the same velocity at any given cross sec- tion of the stream. If this assumption is abandoned, the cross section of the stream must be supposed divided into indefinitely small areas, each representing the section of a fluid filament. Then these filaments may have any law of variation of velocity assigned to them. If the motion is steady motion these fluid filaments (or as they are then termed stream lines) will have fixed positions in space.

PPeriotic Unsteady Motion.—In ordiuary streams with rough boundaries, it is observed that at any given point the velocity varies from moment to moment in magnitude and direction, but that the average veloeity for a sensible period (say for 5 or 10 minutes) varies very little either in magnitude or velocity. It has hence been eonceived that the variations of direction and magnitude of the velocity are periodic, and that, if for each point of the stream the mean velocity and direction of motion were substituted for the ac- tual more or less varying motions, the motion of the stream might be treated as steady stream line or steady laminar motion.

13. Volume of Flow.—Let A (fig. 16) be any ideal plane surface, of area w, in a stream, normal to the direetion of motion, and let V

me

A fp \s H \ Vv H : NX .

be the velocity of the fluid. Then the volume flowing through the surface A in unit time is Q = wV . . ° . . ° ° ° (1).

Thus, if the motion is rectilinear, all the particles at any instant in the surface A will be found after one second in a similar surface A', at adistanee V, and as each particle is followed by a continuous thread of other particles, the volume of flow is the right prism AA'. having a base w and length V.

If the direction of motion makes an angle 6 with the norma] to the surfaee, the volume of flow is represented by an oblique prism AA' (fig. 17), and in that case

Q=woV cos 6.

If the velocity varies at different points of the surface, let the sur- face be divided into very small portions, for each of which the velocity may be regarded as constant. If dw is the area and v, or v eos 6, the normal velocity for this element of the surface, the

volume of flow is Q=/vde, or fv cos Odw ,

as the ease may be.

14. Principle of Continuity. —If we consider any completely bounded fixed space in a moving liquid initially and finally filled coutinuously with liquid, the inflow must be equal to the outflow. Expressing the inflow with a positive and the outflow with a nega- tive sign, and estimating the volume of flow Q forall the boundaries,

=Q=0.

In general the space will remain filled with fluid if the pressure at every point remains positive. There will be a break of con- tinuity, if at any point the pressure becomes negative, indieating that the stress at that point is tensile. In the case of ordinary water this statement. requires modification. Water contaius a variable amount of air in solution, often about one-twentieth of its volume. This air is disengaged and breaks the coutinuity of the liquid, if the pressure falls below a point corresponding to its tension. It is for this reason that pumps will not draw water to the full height due to atmospheric pressure.

os aaa ni of the Principle of Continuity to the case of a Stream. —If A,, A, are the areas of two normal cross sections of a stream, and V,, V, are the velocities of the stream at those sections, then, from the principle of continuity,

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that is, the normal velocities are inversely as the areas of the cross sections. This is true of the mean velocities, if at cach section the velocity of the stream varies. In a river of varying slope the velocity varies with the slope. It is easy therefore to see that in parts of large cross section the slope is smaller than in parts of small cross section.

SS oy

Fig. 18.

If we conceive a space in a Jiquid bounded by normal sections at A,, A, and between A,, A, by stream lines (fig. 18), then, as there is no How across the streain lines,

Vy — Ay Ve A,' as in a stream with rigid boundaries.

In the case of compressible fluids the variation of volume due to the difference of pressure at the two sections must be taken into account. If the motion is steady the weight of fluid between two cross sections of a stream must remain constant. Hence the weight flowing in must be the same as the weight flowing out. Let p,, p, be the pressures, v1, V the velocities, G,, G, the weight per cubic foot of fluid, at cross sections of a stream of areas Aj, A, The volumes of inflow and outflow are

A,v, and A,r, , and, if the weights of these are the same, Gy, Aq, = Gy Agry 5 and hence, from (5a) § 9, if the temperature is constant, PAM =PyAgry s «

(3).

II]. PHENOMENA OF THE DISCHARGE OF LIQUIDS FROM ORIFICES AS ASCERTAINABLE BY EXPERIMENTS.

15. When a liquid issues vertically from a small orifice, it forms a jet which rises nearly to the level of the free surface of the liquid in the vessel from which it flows. The difference of level h, (fig. 19) is so small that it may be at once suspected to be due either to air resistance on the surface of the jet or to the viscosity of the liquid or to fric- tion against the sides of the orifice. Neglect- ing for the moment this small quantity, we may infer, from the elevation of the jet, that each molecule on leaving the orifice possessed the velocity required to lift it against gravity to the height A. From or- dinary dynamics, the- relation between the velocity and height of projection is given by the equation

were n> Qu na = s

len

Fig. 19. va Qgh . As this velocity is nearly reached in the flow from well- formed orifices, it is sometimes called the theoretical velocity of discharge. This relation was first obtained by Torricelli. If the orifice is of a suitable conoidal form, the water issues in

(1).

filaments normal to the plane of the orifice. Let w be the area of the orifice, then the discharge per second inust be, from eq. (1), Q=wrv=wV 29h nearly

| (2). This is often termed the theoretical discharge.

Use of the term Head in Hydraulics,—The term head is an old millwright's term, and meant primarily the height through which a

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mass of water descended in actuating a hydraulic machine. Since the water in fig. 19 descends through a height A to the orifice, we may say there are h feet of head above the orifice. Still more genc- rally any mass of liquid h

feet above a horizontal plane may be said to have h feet of elevation head relatively to that datum plane. Further, sinco the pressure p at the orifice which produces outllow is

connected with 2 by the relation f= h, the quantity a may be

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termed the pressure head at the orifice. Lastly, the velocity v is

2 2

connected with h by the relation me so that z may be termed

the head due to the velocity v.

16. Coefficients of Velocity and Resistancc.—As the actual velocity of discharge differs from /2gh by a small quantity, let the actual velocity

=Va=CyW2gh . (3),

where ¢y is a coeflicient to be determined by experiment, called the coefficient of velocity. This coefficient is found to be tolerably con- stant for different heads with well-formed simple orifices, and it very often has the value 0°97.

The difference between the velocity of discharge and the velocity due to the head may be reckoned in another way. The total height heausing outflow consists of two parts,—one part h, expended in producing the velocity of outflow, another f, in overcoming the resistances due to viscosity and friction. Let

hiv Che s

where ¢, is a coefficient determined by experiment, and called tho cocficient of resistance of the orifice. It is tolerably constant for different heads with well-formed orifices. Then

Va=/2Ghe= nit ; (4).

The relation between c, and ¢, for any orifice is easily found :—

(5).

. (5a).

Thus if c»=0‘97, then cp-=0°0628. That is, for such an orifice about 6} per cent. of the head is expended in overcoming frictional resistances to flow.

Coefficient of Contraction—Sharp-cdged Orisices in Plane Surfaces. — When a jet issues from an aperture ina vessel, it may either spring clear from the inner edge of the orifice as at a or b (fig. 20), or it may adhere to the sides of the orifice as at c. The former con-

Y Y y

j Y y Y a

b

Fig. 20.

dition will be found if the orifice is bevelled outwards as at a, so as to be sharp edged, and it will also occur generally for a prismatic aperture ike b, provided the thickness of the vessel round the aper- ture is less than tho diameter of the jet. But if the thickness is greater the condition shown at ¢ will occur.

When the discharge takes place as at a or 0, the section of the jet is smaller than the section of the orifice. This is due to the formation of the jet from filaments converging to the orifice in all directions inside the vessel. The inertia of the filaments opposes sudden change of direction of motion at the edge of the orifice, and the convergence continues for a distance of about half the diameter of the orifice beyond it. Let w be the area of the orifice, and cw the arca of the jet at the point where convergence ceases ; then ¢ 1s a coefficient to bo determined experimentally for each kind of orifice, called the coefficient of contraction. When the orifice is @ sharp-edged orifico in

a "plane surface, the value of ¢, is on the average 0°64, or the section of the jet is very nearly five-eighths of the area of the orifice.

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Coefficient of Discharge.—In applying the general formula Q= wv to a stream, it is assumed that the filaments have a common velocity v normal to the section w. But ifthe jet contracts, it is at the con- tracted section of the jet that the direction of motion is normal to a transverse section of the jet. Hence the actual discharge when contraction occurs is

Qa = lod X Cow = Ctyeo'/ 2Gh , or simply, if c=cy ¢e, Qa =cw/2gh,

where c is called the coefficient of discharge. edged plane orifice c=0°97 × 0'64=0°62.

17. Experimental determin- ation of Ce, Cc, and c.—The coefficient of contraction ¢, is directly determined by measuring the dimensions of the jet. For this purpose fixed screws of fine pitch (fig. — 21) are convenient. These = are set to touch the jet, and = then the distance between = them can be measured at : leisure.

The coefficient of velocity is determined directly by measuring the parabolic path of a horizontal jet. ml!)

Let OX, OY (fig. 22) be . horizontal and vertical axes, Fig. 21, the origin being at the orifice. Let 4 be the head, and a, y the coordinates of a point A on the parabolic path of the jet. If va

Thus for a sharp-

Fig, 22.

is the velocity at the orifice, and ¢ the time in which a particle |

moves from O to A, then X=SVat; y=dge?. Eliminating ¢, hs 4 i

Then

Va oe /2gh dyh

If the jet is not initially horizontal, let OB (fig. 28) be any hori- zontal datum line, and lct the vertical distances OC, AD, BE be

Fig. 23.

measured, the point A being taken conveniently midway between

Oand B. Then ¥y,=OC— AD, and y,=OC- BE.

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) measuriug the discharge in a gauging tank for a given time. if Q is the measured volume discharged in one second,

Let a be the inclination of the jet at C to the horizontal, so that

¥_ cos a is its horizontal and vq sin a its vertical velocity at that point. If ¢is the time in which a particle moves from C to D, then

Zum cos al,

2

2

Yi = Va SID at — © :

Eliminating ¢, ey ge » y= tan a- 2—{(1+ tana).

2 804 !

Similarly,

=

Yg=x tan a— 5 (1+ tan?a). ava Hence

Ga aes | wv

bis gfx? + (dy – Yo)? } 4(241 – Yo)

wn te | EH) \/2gh BA(2y,- Yo)" where for h is to be put the depth of C below the free water sur- face. The coefficient of discharge is determined independently, by Then,

C= Q – wr/2gh ° 18. Coefficients for Bellmouths and Bellmouthed Orifices, —If an

| orifice is furnished with a mouthpiece exactly of the form of the

contracted vein, then the whole of the contraction occurs within the mouthpiece, and if the area of the orifice is mcasured at the smaller end, ct must be put=1. It is often desirable to bellmouth the ends of pipes, to avoid the loss of head which occurs if this is

| not done; and such a bellmouth may also have the form of the con- | tracted jet. Fig. 24 shows the proportions of such a bellmouth

or bellmouthed orifice, which approximates to the form of the con- tracted jet sufficiently for any practical purpose.

For such an orifice Weisbach has found the following values of the coefficients with different heads.

Head over orifice, in feet=h 66 1:64

11-48 | 55-77 | 337-93 Coefficient of velocity =¢y..| '959 | "967 | '975 | "994 | — 994 Coefficient of resistance =c,| '087 | °069j 052 | '012 | '012

As there is no contraction after the jet issues from the orifice, G=1, e=cy; and therefore h

= 20h = 2 . Q= cow 2gh aa! "Cts

19. Coefficients for Sharp-cdged or virtually Sharp-cdged Orifices, —The coefficient of velocity for sharp-edged orifices of different areas and under

different heads is not very accurately determined. Its mean value is about 0°96.

The coefficient of contraction is also dependent on circumstances the relative influence of which is not so perfectly known as is de- sirable. Its mean value for well-placed orifices in a plane surface is 0°64. For conditions similar in other respects, the contraction is less (that is, the area of the stream is greater) the smaller the orifice and the less the head. If the surface surrounding the orifice is not

| plane, the coefficient is greater for a surface convex to the interior

of the reservoir and less for a concave surface. The thickening of the edges of the orifice modifies the contraction in a slight degree, and if a border or rim is placed round part of the edge of the ori- fice, and projects inwards or outwards, the coefficient is very consider- ably altercd, and the contraction is then termed incomplete. If the orifice is placed in a contracted part of the vessel so that the water

| approaches the orifice with considerable velocity, the coefficient is | increased, and the contraction is said to be imperfect.

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The coefficient of discharge has been determined for sharp-edged orifiees under a great variety of conditions. Its mean value, taking the values of c, and ¢, given above, is 0°62.

For eircular orifices, sharp-edged and with eomplete and perfect contraction, Weisbach found the following values :—

Coefficients of Discharge for Sharp-edged Cireular Orifices.

Dtanicter of Orifice Coefficient of Discharge=c.

in Inches, Head 2 ft. Tlead 0°8 ft. 0-4 0°628 0°637 0°8 ‘621 629

12 614 022

1°6 607 614

Fe #

The following table, compiled by Mr Fanning (7’rcatise on Water Supply Engineering), gives values for rectangular orifices in vertical plane surfaces, the head being measured, not immediately over the orifice, where the surface is depressed, but to the still-water surface at some distance from the orifice. ‘The valnes were obtained by graphic interpolation, all the most reliable experiments being plotted and curves drawn so as to average the discrepancies.

Coefficients of Discharge for Rectangular Orifiecs, Sharp-cdged, in Vertical Plane Surfaces.

Ratio of Height to Width.

oo P . a : r=]

ae ee ae | ae ge |) Se ae | &F

ree aS 5 43 as 33 halen bar 3 1 43

wa fac | ae fan | 85) 85 | 85 | BS

[=] Qo —] o

*Or2 wa 63338 3 So 6293 | 6334 “4 on °6140 | ‘6306 | 6334 “5 oa ‘6050 | 6150 | °6318 | °6338 6 5984 | -6063 | 6156 } °6317 | 6332 a “ido “5994 | ‘6074 | ‘6162 | 6319 | -6328 8 6130 | 6000 | °6082 | °6165 | °6322 | -6326 9 6134 | 6006 | -6086 | °6168 | °6323 | 6324 1°0 be 6135 | ‘6010 | ‘6090 | *6172 | 6820} -6320 1°25 6188 | ‘6140 | *6018 | 6095 | °6173 | °6317 | 6312 1°50 6187 | 6144 | 6026 | °6100 | ‘6172 | -6313 | -6303 1°75 aie 6186 | 6145 | 6033 | 6103 | *6168 | °6807 | 6296 Z aa “6183 | -6144 | *6036 | °6104 | °6166 | °6802 | °6291 2°25 pid 6180 | 6143 | -6039 | 6103 | °6168 | °6293 | 6286 2°50 | 6290 | ‘6176 | 6189 | °6043 | 6102 | -6157 | -6282 | 6278 2°75 | 6280 | ‘6173 | ‘6136 | °6046 | ‘6101 | °6155 | -6274 | -6273 3 6278 | ‘6170 | *6182 | ‘6048 | 6100 | 6153 | -6267 | 6267 38°5 | 6250 |*

*6160 | 61238 | ‘6050 | -6094 | -6146 | 6254 | -6254 4 “6245 | 6150 | ‘6110 | *6047 | -6085 | -6136 | 6236 | -6236 4°5 | 6226 | 6138 | 6100 | ‘6044 | 6074 | -6125 | 6222 | -62292 5 ‘6208 | ‘6124 | 6088 | 60388 | °6063 | 6114 | -6202 ; -6202 6 6158 | 6094 |} ‘6063 | 6020 | 6044 | 6087 | 6154 | -6154 1h 6124 | ‘6064 | 6088 | ‘6011 | *6032 |} ‘6058 } °6110 | *6114 8 6090 | ‘6036 | 6022 | *6010 | 6022 | :6088 | °6073 | -6087 9 “6060 | ‘6020 | 6014 | -6010 | -6015 | 6020 | -6045 | -6070 10 -6035 | 6015 | -6010 | °6010 | °6010 | -6010 | -6030 | -6060 alts) 6040 | *6018 ; ‘6010 | ‘6011 | °6012 | 6013 } 6033 | -6066 20 “6045 | 6024 | -6012 | 6012 | ‘6014 | °6018 | -6036 | ‘6074 25 6048 | 6028 | ‘6014 | °6012 | 6016 | -6022 | -6040! -6083 30 “6054 | 6084 | 6017 | ‘6013 | °6018 | 6027 | -6044 | 6092 385 6060 | 6039 | 6021 | 6014 | 6022 | 60382 | -6049 | 61038 40 “6066 | 6045 | -6025 | 6015 | °6026 | 6037 | ‘6055 | 6114 45 6054 | 6052 | 6029 | -6016 | ‘6030 | 6048 | 6062 | -6125 50 “6086 | 6060 | *6084 | *6018 | °6035 | 6050 | -6070 | -6140*

20. Orifices with Edges of Sensible Thickness.—When the edges of the orifice are not bevelled outwards, but have a sensible thickness, the coefficient of discharge is somewhat altered. The following table gives values of the coefficient of discharge for the arrangements of the orifice shown in vertical seetion at P, Q, R (fig. 25), The plan of all the orifices is shown at 8. The planks forming the orifice and sluice were each 2 inches thick, and the orifices were all 24 inehes wide. The heads were measured immediately over the orifiee. The formula above becomes, in this ease,

Q=0b(H -h) af See

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‘is applied to part of

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Table of Cocficients of Discharge for Rectangular Vertical Orifices in Fig. 25.

Psu Height of Orifice, H—A, in feet. cee

2 Og 1°31 0°66 0°16 ee

=E°| P| @i Ri Pp.galelelele

*0°598, 0-644) 0-648) 0-634) 0°665} 0-668] 0°691 0°609| 0°653} 0°657| 0°640) 0°672) 0-675! 0°685 “787 | 0°612, 0°655) 0°659) 0°641| 0°674| 0-677) 0°684 *984 | 0°616) 0-656) 0°660) 0°641, 0°675| 0-678) 0°683) 0°693] 0° 0-618) 0°649} 0°653) 0°640; 0°676| 0°679] 0°678) 0°695 0°608) 0 632) 0°634) 0-638) 0°674| 0°676! 0°673) 0-694! 0: 0°602| 0-624; 0-626) 0°637| 0-673] 0°675] 0°672) 0°693 0°598; 0°620] 0°622) 0°637| 0°673) 0°674| 0°672) 0-692 0°596) 0-618) 0°620) 0°637| 0-672| 0-673] 0°672/ 0-692 0‘595| 0°615 0°672/ 0°671| 0°691 0°592) 0°670} 0-668) 0°689*

0°611

21. Partially Sup- pressed Contraction. — Since the contraction of the jetis duetothe DP convergence towards the orifice of the is- suing streams, it will 2 be diminished if for any portion of the edge of the orifice the convergenee is pre- vented. Thus, if an internal rim or border

the edge of the orifieeS (fig. 26), the conver- gence for so much of the edge is suppressed. For sueh cases Bidone found the following empirical formule ap- plieable :—

For rectangular ori- fices,

co=0‘62(1+0‘152); =

and for circular ori- fices,

com 0°62 +0128”), where 7 is the length ___ of the edge of the ori- fice over which the border extends, and p : is the whole length of Fig. 25.

edge or perimeter of the orifice. The following are the values of c;, when the border extends over }, 4, or # of the whole perimeter :—

Ce Ce Rectangular Orifices, _ Circular Orifices.

0°643 640

660

0°667 0°691

has shown, however, that these formule for suppressed contraction are not reliable.

22. Imperfect Contraction —If the sides of the vessel approach near to the edge of the orifice, they interfere with the convergence of the streams to which the eontraction is due, and the contraction is then modified. It is generally stated that the influenee of the sides begins to be felt if their distance from the edge of the orifice is less than 2°7 times the corresponding width of the orifice. The coefficients of contraction for this case are imperfectly known.

23. Orifices Furnished with Channels of Discharge.—These external borders to an : orifice also modify the contraction. : Fig. 26.

The following eoefficients of discharge were obtained with open- ings 8 inches wide, and small in proportion to the channel of approach (fig. 27, A, B, C).

hy in feet.

“656 | 1°640 | 3°28 | 4°92 3) 9°84

601 601 608 606 618 649

‘574

599 592

‘607

625 626 652

601 600 610 624

566 592 631

‘617

645

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24. Inversion of the Jct.—When a jet issues from a horizontal orifice, or is of small size compared with the head, it presents no marked peculiarity of form. But if the orifice isin a vertical surface, and if its dimensions are not sinall compared with the head, it undergoes a series of singular changes of form after leaving the orifice. These were first investigated by Bidone ; subsequently Magnus measured jets from different orifices; and lately Lord Rayleigh (Proc. Roy. Soc., xxix. 71) has investigated them anew.

Fig. 28 shows some remarkable forms, the upper row giving the shape of the orifices, and the others sections of the jet. The jet first contracts as described above, in consequence of the convergence

Slope Lin 20 1 Pest 4

ee Te TEES

Fig. 27.

of the fluid streams within the vessel, retaining, however, a form similar to that of the orifice. Afterwards it expands into sheets in planes perpendicular to the sides of the orifice. Thus the jet from a triangular orifice expands into three sheets, in planes bisecting at right angles the three sides of the triangle. Generally a jet from

a b

K S SS S S

SSNS N

SSS SSS

Fig.

mal to the common axis of the streams. If the directions of two streams intersect obliquely they spread into a symmetrical sheet perpendicular to the ee of the streams.

ow those portions of = a jet which proceed – from different portions of an orifice are con- ceived to behave in some degree like in- dependent meeting streams,

Let a, a (fig. 29) be two points in an ori- fice at depths h,, h, A from the free surface. – The filaments issuing ; at a, @ will have the Fig. 29. different velocities »/2gh, and »/2gh,. Consequently they will tend to describe

parabolic paths a,cb, and a,cb, of different horizontal range, and intersecting in the point c. But since two filaments

an orifice, in the form of a regular polygon of m sides, forms n sheets in planes perpendicular to the sides of the polygon. Y Bidone explains this by reference to the simpler case of meeting streams. If two equal streams having the same axis, but moving in opposite directions, mect, they spread out into a thin disk nor-

d é oa

MMO Vw

SSS

WL ud

[SSRRRRMMWvmd&E Q'._s_Ms-
_dMGHEGaQWHIMWM\s§\@§bdHdPIjI§\jJFjIO_ilIi_s— DIMM

SSWSAQQQVWW WW ss

SS

28.

cannot simultaneously flow through the same point, they must exercise mutual pressure, and will be deflected out of the paths they tend to describe. It is this mutual pressure which causes the ex- pansion of the jet into sheets.

Lord Rayleigh has pointed out that, when the orifices are small and the head is not great, the expansion of the sheets in directions per- pendicular to the direction of flow reaches a limit. Sections ikon at greater distance from the orifice show a contraction of the sheets until a compact form is reached similar to that at the first contrac- tion. This is shown in the elevation of the jet c. Bcyond this point, if the jet retains its coherence, sheets are thrown out again, but in directions bisecting the angles between the previous sheets. Lord Rayleigh accepts an explanation of this contraction first suggested by Buff, namely, that it is due to surface tension

or capillarity. The fluid is enclosed in an envelope of constant tension, and the recurrent form of the jet is due to vibrations of the fluid column, about a circular figure of equilibrium, superposed on the general progressive motion. Since the phase of vibration de- pends on the time elapsed, it is always the same at the same point in space, and thus the motion is steady and the boundary of the jet is a fixed surface.

In so far as the vibrations may be considered isochronous, the distance between consecutive corresponding points of the recurrent figure, or, as it may be termed, the wave length of the figure, is di- rectly proportional to the velocity of the jet, that is, to the square root of the headof water. For low heads the measurements confirm thislaw. For higher heads there is an increase of the wave lengths in a higher ratio than the velocity of the jet. This points to a de- parture from isochronous vibration, the nature of which is investi- gated in Lord Rayleigh's paper.

IV. THEORY OF THE STEADY MOTION OF FLUIDS.

25. The general equation of the steady motion of a fluid given under Hydrodynamics furnishes immediately three results as to the distribution of pressure in a stream which may here be assumed.

(a.) If the motion is rectilinear and uniform, the variation of pressure is the same as in afluid at rest. In astream flowing in an open channel, for instance, when the effect of eddies produced by the roughness of the sides is neglected, the pressure at each point is ously the hydrostatic pressure due to the depth below the free surface.

(b.) If the velocity of the fluid is very small, the distribution of pressure is approximately the same as in a fluid at rest.

(c.) If the fluid molecules take precisely-the accelerations which they would have if independent and submitted only to the external forces, the pressure

is uniform. Thus in a jet falling freely in the air the pressure throughout any cross section is uniform and equal to the atmospheric pressure.

(d.) In any bounded plane section traversed normally by streams which are rectilinear for a certain distance on either side of the sec- tion, the distribution of pressure is the same as in a fluid at rest.

DISTRIBUTION OF ENERGY IN INCOMPRESSIBLE FLUIDS.

26. Application of the Principle of the Conservation of Energy to Cases of Stream Line Motion.—The external and internal work done ona mass is equal to the change of kinetic energy produced. In many hydraulic questions this principle is difficult to apply, be- cause from the complicated nature of the motion ae it is difficult to estimate the total kinetic energy generated, and because in some cases the internal work done in overcoming frictional or viscous resistances cannot be ascertained ; but in the case of stream line motion it furnishes a simple and important result known as Bernouilli's theorem.

Let AB (fig. 30) be any one elementary stream, in a steadily movin, fluid mass. Then, from the steadiness of the motion, AB is a fixed

Fig. 30.

path in space through which a stream of fluid is constantly flowing. Let OO be the free surface and XX any horizontal datum line. Let w be the area of a normal cross section, v the velocity, p the intensity of pressure, and z the elevation above XX, of the elementary stream AB at A, and ,, 2, Vy, % the same quantities at B. Suppose that in a short time ¢ the mass of fluid initially occupying AB comes to A'‘B'. Then AA', BB' are equal to vt, v,¢, and the volumes of fluid AA', BB' are the equal inflow and outflow =Qt=wrt=w 1, in the given time. If we suppose the filament AB surrounded by other filaments moving with not very different velocities, the fric- tional or viscous resistance on its surface will be small enough to be neglected, and if the fluid is incompressible no internal work is done in change of volume. Then the work done by external forces will be equal to the kinetic energy produced in the time con- sidered.

The normal pressures on the surface of the mass (excluding the ends A, B)are at each point normal to the direction of motion, and dono work. Hence the only external forces to be reckoned are gravity and the pressures on the ends of the stream.

The work of gravity when AB falls to A' B' is the same as that of transferring AA' to BB'; that is, GQ¢ (¢—-2,). The work of the pressures on the ends, reckoning that at B negative, because it is opposite to the direction of motion, is (pw x vt) —(p,w, X vt) = Qt (p – py). The change of kinetic energy in the time ¢ is the differ- ae of the kinetic energy originally possessed by AA' and that

nally acquired by BB', for in the intermediate part A'B there is

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no change of kinetic energy, in consequence of the steadiness of the motion. But the mass of AA' and BB' is Sa and the change of

kinetic energy is therefore Fa – 9) . Equating this to the g

work done on the mass AB, Gas —- G t ee + t aad = t ee — ° Qe-m) + QUp-m)- FH – 5)

Dividing by GQé and rearranging the terms,

FP al

29° G = a9 Gt" or, as A and B are any two points,

2

ag t G ter constant =H

2 .

Now 2 is the head due to the velocity v,

(1);

(2).

£ is the head equiva-

G lent to the pressure, and z is the elevation above the datum (see § 15). Hence the terms on the left are the total head due to velocity, pressure, and elevation at a given cross section of the filament. z is easily seen to be the work 1n foot-pounds which would be done

by 1 fb of fluid falling to the datum line, and similarly « and

are the quantities of work which would be done by 1 fb of fluid due to the pressure p and velocity v. The expression on the left of the equation is, therefore, the total energy of the stream at the sec- tion considered, per tb of fluid, estimated with reference to the datum line XX. Hence we see that in stream line motion, under the restrictions named above, the total energy per tb of fluid is uni- formly distributed along the stream line. If the free surface of the fluid OO is taken as the datum, and —h, ~ h, are the depths of A and 3 measured down from the free surface, the equation takes the orm

a ee ; or generally v2. h=constant . (3a).

29 G 27. Second Form of the Theorem of Bernoulli.—Suppose at the

two sections A, B (fig. 31) of an elementary stream small vertical pipes are introduced,

which may be termed pressure columns

(§ 8), having their lower ends accurately parallel to the direction of flow. Insuch tubes the water will rise to heights corresponding to the pressures at A and B. Hence

= tc and oA.

Consequently the tops of the pressure columns A' and B' will be at total heights btomt +2 and vtdati+y above the datum

line XX. The difference of level of the pressure column tops, or the fall of free surface level between A and B, is therefore

p-P Pha (em) and this by equation (1), § 26, is

ve?-v

CO That is, the fall of free surface level between two sections is equal to the difference of the heights due to the velocities at the sections. The line A'B' is sometimes called the line of hydraulic gradient, though this term is also used in cases where friction needs to be taken into account. It is the line the height of which above datum

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is the sum of the elevation and pressure head at that point, and it falls below a horizontal line A"B" drawn at H feet above XX by

eo ,e 2 2 ° . ° the quantities om and baa , when friction is absent.

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28. Illustrations of the Theorem of Bernoullt.—In a lecture to the mechanical section of the British Association in 1875, the late

Mr W. Froude gave some experimental illustrations of the principle of Bernoulli, Mr A

Froude remarked that ___ a it was a common but 393

erroneous impression ee | that a fluid exercises in a contracting pipe A (fig. 32) an excess of pressure against C the entire converging surface which it meets, and that, conversely, as it enters an enlarge- : ment B, a relief "of Fig. 82

pressure is experienced by the entire diverging surface of the pipe. Further it is commonly assumed that when passing through a con- traction C, there is in the narrow neck an excess of pressure due to the squeezing together of

the liquid at that point. These im- pressions are in no respect correct ; the pressure is smaller as the section of the pipe is smaller and conversely.

Fig. 33.

Fig. 33 shows a pipe so formed that a contraction is followed by an enlargement, and fig. 34 one in which'an enlargement is followed by a contraction. 'The vertical pressure columns show the decrease of pressure at the contraction and increase of pressure at the en-

Fig. 34.

largement. The line abc in both figures shows the variation of free surface level, supposing the pipe frictionless. In actual pipes, however, work is expended in friction against the pipe; the total head diminishes in proceeding along the pipe, and the free surface level is a line such as ab,¢,, falling below abe.

- *Mr Froude further points out that, if a pipe contracts and enlarges again to the same size, the resultant pressure on the converging part*

A Fig. 35.

exactly balances the resultant pressure on the diverging part, so that there is no tendency to move the pipe bodily when water flows

through it. projected surface as HI, and t the pipe, normal to these projected surfaces, balance each other.

Thus the conical a AB (fig. 35) presents the same e pressures parallel to the axis of

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Similarly the pressures on BC, CD balance those on GH, EG, In the same way, in any combination of enlargements and contrac- tions, a balance of pressures, due to the flow of liquid parallel to the axis of the pipe, will be found, provided the sectional area and direction of the ends are the same.

The following experiment is interesting. Two cisterns provided with converging pipes were placed so that the jet from one was ex- actly opposite the entrance to the other. The cisterns being filled very nearly to the same level, the jet from the left hand cistern A entered the right hand cistern B (fig. 36), shooting across the free

Fig, 36.

space between them without any waste, except that due to indirect- ness of aim and want of exact correspondence in the form of the

orifices. In the actual experiment there was 18 inches of head in the right and 204 inches of hcad in the left hand cistern, so that about 24 inches were wasted in friction. It will be seen that in the open space between the orifices there was no pressure, ex- cept the atmospheric pressure acting uniformly throughout the system.

29. Pressure, Velocity, and Energy in Different Stream Lines. —The equation of Bernouilli gives the variation of pressure and velocity from point to point along a stream line, and shows that the total energy of the flow across any two sections is the same, Two other directions may be defined, one normal to the stream line and in the plane containing its radius of curvature at any point, the other normal to the stream line and the radius of curvature. For the problems most practically useful it will be sufficient to consider the stream lines as parallel to a vertical or horizontal plane. If the motion is in a vertical plane, the action of gravity must be

prdp i] i] A P|

/

i B

Q © Ry | s

> H

& 1

eee ee ee a

= ons,

| Oo} Fig. 87.

taken into the reckoning; if the motion is in a horizontal plane, the terms expressing variation of clevation of the filament will dis- appear. ‘

Let AB, CD (fig. 37) be two consecutive stream lines, at present assumed to be in a vertical plane, and PQ a normal to these lines making an angle @ with the vertical. Let P, Q be two particles mov- ing along these lines at a

rT distance PQ =ds, and let 2 be the height of Q above the horizontal plane with reference to which the energy is measured, v its velocity, and p its

1 The following theorem is taken from a paper by Professor Cotterill, “On

the Distribution of Energy in a Mass of Fluid in Steady Motion,” Phil. Mag., February 1876,

pressure. Then, if H is the total energy at Q per unit of weight of fiuid,

2

H=242 47, oe: +99 Differentiating, we get

dp vdv Gil=de ssc) ee ee tat 3 (1)

for the increment of energy between Q and P. But

dz=PQ cos ¢=ds cos ¢; 2

m, am ds cos (12),

where the last term disappears if the motion is in a horizontal plane.

Now imagine a small cylinder of section w described round PQ

as an axis. This will be in equilibrium under the action of its

centrifugal force, its weight and the pressure on its ends. But its

volume is wds and its weight Gwds. Hence, taking the com- ponents of the forces parallel to PQ—

2.

odp = 7 wds —Gw cos ods. p

where p is the radius of curvature of the stream line at Q. Conse-

quently, introducing these values in (1),

2

fa eo 242 has (2). 9p g gp ads Now it is already known that if, through any particle A, lines be drawn through B and C two particles near to A, such that AB and AC are at right angles at the instant eonsidered, then the mean an- gular velocity of these lines is the same in whatever direction they are drawn, and is equal to the angular velocity with which a small cylindrical element described round A would rotate if supposed sud- denly solidified. This mean angular velocity may be convenicntly called the molecular rotation, and will be denoted by (@). In the present case is the angular velocity of the tangent at Q, and o is the angular velocity, reckoned in the same direction, of a line per- pendicular to the tangent through P and Q. 'The sum of these is, therefore, twice the molecular rotation, and dH = 2" wyds ' (8). Now vds is constant, being the flow in an elementary stream of breadth unity, and thickness ds. Therefore the difference of energy between two consecutive elementary streams is proportional to the molecular rotation at any point of either.

CURRENTS. 30. Rectilincar Current.—Suppose the motion is in parallel straight stream lines (fig. 38) in a vertical plane. Then p is infinite, and from eq. (2), § 29,

ag g Comparing this with (1) we see that dp dz+~%=0;

+7 0;

oe 244 —constant , (4); or the pressure varies hydrostatically as in a fluid at rest. For two stream lines in a horizontal P plane, ¢ ie condiahl, ad —— Sp —— therefore p is constant. I ! Radiating Current.—Sup- dz pose water flowing radially ! ! between horizontal parallel ————————--- planes, at a distance apart ; =8. Conceive two cylin- a Fig. 38. drical sections of the current at radii r, and 7,, where the

velocities are v, and , and the pressures p, and po. Since the flow across each cylindrical section of the current is the same,

Q = 227150, = 277,52

10> Teo ra, (5). Tg

radius 0, if the current could be

The velocity would be infinite at ‘ Now, if the motion is steady,

conceived to extend to the axis. He Py le

G‘299 G 2g’*

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Hence the pressure increases from the interior outwards, in a way indicated by the pressure columns in fig. 39, the curve through the free surfaces of the pressure columns being, in a radial section, the

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Fig. 39.

quasi-hyperbola of the form zy?=c, This curve is asymptotic to a horizontal line, H feet above the line from which the pressures are measured, and to the axis of the current.*

Free Circular Vortex.—A free circular vortex is a revolving mass of water, in which the stream lines are concentric circles, and in which

the total head for each stream line is the same. Hence, if by any slow radial motion portions of the water strayed from one stream line to another, they would take freely the velocities proper to their positions under the action of the existing fluid pressures only.

For sueh a current, the motion being horizontal, we have for all the circular elementary streams

2

H= f+ —" constant ;

dp , vdv- oes (lle es eee ())5 7). Pts (7) Consider two stream lines at radii and r+dr (fig. 39). Then in (2), § 29, p=r and ds=dr,

2

Pe eu : gr g dv_ ar oe We vat (8), r

precisely as in a radiating current; and hence the distribution of pressure is the same, and formule 6, 6a are applicable to this case.

Free Spiral Vortex.—As in a radiating and circular current the equations of motion are the same, they will also apply to a vortex in which the motion is compounded of these motions in any pro- portions, provided the radial component of the motion varies in- versely as the radius as in a radial current, and the tangential component varies inversely as the radius as in a free vortex. Then the whole velocity at any point will be inversely propor- tional to the radius of the point, and the fluid will describe stream lines having a constant inclination to the radius drawn to the axis of the current. That is, the stream lines will be logarith- mic spirals, When water is delivered from the circumference

of a centrifugal pump or turbine into a chamber, it forms a free vor- tex of this kind. ‘The water flows spirally outwards, its velocity diminishing and its pressure increasing according to the law stated above, and the head along each spiral stream linc is constant.

31. Forced Vortex.—lf the law of motion in a rotating current is different from that in a free vortex, some force must be applied to cause the variation of velocity. The simplest case is that of a ro- tating current in which all the particles have equal angular velocity, as for instance when they are driven round by radiating paddles revolving uniformly. Then in equation (2), § 29, considering two cir- cular stream lines of radiir and r+dr (fig. 40), we have p=r, ds=dr. If the angular velocity is a, then v=ar and dv=adr. Hence

dH = or dy a atrdr = 20 tp : g g g

Comparing this with (1), § 29, and putting dz=0, because the motion is ‘horizontal, dp ardr _ 2dr .

G g ‘

2

P _#? | constant 9 ae n (9).

Let ,, 71, V, be the pressure, radius, and velocity of one cylin- drical section, », 72, V2 those of another ; then Pr ere a are? GC %& G a”

~< 2 22

Po qo ge n)=4 a

(10).

That is, the pressure increases from within outwards in a curve which in radial sections is a parabola, and surfaces of equal pressure are paraboloids of revolution (fig. 40).

oe

ae ee

DissIPATION OF HEAD IN SHOCK.

32. Relation of Pressure and Velocity in a Stream in Steady Motion when the Changes of Section of the Stream are Abrupt.— When a stream changes section abruptly, rotating eddies are formed which dissipate energy. The energy absorbed in producing

rotation is at once abstracted from that effective in causing the flow, and sooner or later it is wasted by frictional resistances due to the rapid relative motion of the eddying parts of the fluid. In such cases the work thus expended internally in the fluid is too important to be neglected, ~ : and the energy thus lost is com- monly termed en- erey lost in shock. uppose fig. 41 to it Pennait a stréarn, — —__ ———“_ sa aaa 2 having such an Lt abrupt change o section. Let AB, CD be normal sec- tions at points where ordinary stream line motion has not been dis-

Fig, 41.

turbed and where it has been re-established. Let w, p, v be the area of section, pressure, and velocity at AB, and w,, »,, v, corresponding quantities at CD. Then if no work were expended internally, and assuming the stream horizontal, we should have

p v eT v,” 1 Sau Te See ee 2 eee But if work is expended in producing irregular eddying motion, the head at the section CD will be diminished. Suppose the mass ABCD comes ina short time ¢ to A’B’C’D’. The resultant force parallel to the axis of the stream is

pot po(w,—@) — P10,

where p is put for the unknown pressure on the annular space be- tween AB and EF. The impulse of that force is

{pa+ py(or —) —pyo,}t ‘ The horizontal change of momentum in the same time is the differ- ence of the momenta of CDC’D’ and ABA’B’, because the amount of momentum between A’B’ and CD remains unchanged if the motion is steady. The volume of ABA’B’ or CDC’D’, being the inflow and outflow in the time ¢, is Q¢=wvt = ,0,¢, and the momen-

tum of these masses is FQ and F0nt . Thechange of momen-

tum is therefore “ Qi(v,—v). Equating this to the impulse,

G {pw +po(a, – @) — pyw, ft -o Qtr, —-2). Assume that p, =p, the pressure at AB extending unchanged ga the portions of fluid in contact with AE, BF which lie out of the path of the stream. Then (since Q=%) G (p-p)= sr -v)5

Ben Bi _2(%- 2) ;

G7 r (2); Bo Ot Sg Gt 2g Gi 2g 29 oh

This differs from the expression (1), § 26, obtained for cases where no sensible internal work is done, by the last term on theright. That

——— has to be added to the total head at CD, which is

9

42 , to make it equal to the total head at AB, or oe is g

G the head lost in shock at the abrupt change of section. But v —v, is the relative velocity of the two parts of the stream. Hence,

when an abrupt change of section occurs, the head due to the

= 2

relative velocity is lost in shock, or say foot-pounds of energy

.is wasted for each pound of fluid. Experiment verifies this result,

so that the assumption that y)=p appears to be admissible. If there is no shock,

se she G G' @%

If there is shock, Pi _ P _Ma(%=) | G G g

Hence the pressure head at CD in the second case is less than in the former by the quantity (v-%)°

29

or, putting wv,=w, by the quantity

vw w \? ree"

?

(4).

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V. THEORY OF THE DISCHARGE FROM ORIFICES AND MOUTHPIECES.

33. Minimum Coefficient of Contraction. Re-entrant Mouth- piece of Borda. —In one special case the coefficient of contraction can be determined theorctically, and, as it is the case where the convergence of the streams approaching the orifice takes place through the greatest possible angle, the coefficient thus determined is the minimum coefficient.

Let fig. 42 represent a vessel with vertical sides, OO being the free water surface, at which the pressure is pa. Suppose the liquid issues by a hori- zontal mouth- piece, which is re-entrant and of the greatest length which permits the jet to spring clear from the inner end of the orifice, without adhering to its sides. With such an orifice the velocity near the points CD is neg- ligible, and the pressure at those points may be taken equal to the hydrostatic pres- sure due to the depth from thefree surface. Let 2 be the

area of the mouthpiece AB, w that of the con- tracted jet aa. Suppose that in a short time ¢, the

Fig. 42.

mass OOaa comes to the position 0’0’ aa’; the impulse of the horizontal external forces acting on the mass during that time is equal to the horizontal change of momentum.

The pressure on the side OC of the mass will be balanced by the pressure on the opposite side OE, and so for all other portions of the vertical surfaces of the mass, excepting the portion EF opposite the

mouthpiece and tlie surface AaaB of the jet. On EF the pressure is simply the hydrostatic pressure due to the depth, that is, (YVa+Gh)n. On the surface and section AaaB of the jet, the horizontal re- sultant of the pressure is equal to the atmospheric pressure pa acting on the vertical projection AB of the jet; that is, the resultant pressure is—p.®. Hence the resultant horizontal force for the whole mass OOaa is (pa+Gh)Q—paQ=Gha. Its impulse in the time t is GhOt. Since the motion is steady there is no change of momentum between 0/0’ andaa. The change of horizontal momen- tum is, therefore, the difference of the horizontal momentum lost in the space OOO’0' and gained in the space aaa’a’, In the former space there is no horizontal momentum.

The volume of the space aaa’a’ is wvt; the mass of liquid in that

space is = wvt ; its momentum is Tat Equating impulse to

momentum gained, Ghat» San f g

w gh

a

But v= 29h, and a =ity 2

@

+ SH Ce 5

2

a result confirmed by experiment with mouthpieces of this kind. A similar theoretical investigation is not possible for orifices in plane surfaces, because the velocity along the sides of the vessel in the neighbourhood of the orifice is not so small that it can be neg- lected. The resultant horizontal pressure is therefore greater than GhQ, and the contraction is less, The experimental values of the coefficient of discharge for a re-entrant mouthpiece are 0°5149 (Borda), 0°5547 (Bidone), 0°5324 (Weisbach), values which differ little from the theoretical value, 0°5, given above.

384. Velocity of Filaments isswing in a Jet.—A jet is composed of fluid filaments or elementary streams, which start into motion at — point in the interior of the vessel from which the fluid is dis- fi arged, and gradually acquire the velocity of the jet. Let Mm,

g. 43, be such a filament, the point M being taken where the velo-

city is insensibly small, and m at the most contracted section of the

jet, where the filaments have become parallel and exercise uniform mutual pressure. Take the free surface AB for datum line, and let

>

WML a

Fig. 43.

Py Y, Ay, be the pressure, velocity, and depth below datum at M ; p, v, A, the corresponding quantities atm. Then § 26, eq. (8),

1 gO 8 ee ae ey ao. ow

oo ° G

But at M, since the velocity is insensible, the pressure is the hydro- static pressure due to the depth ; that is, o,=0, p)=patGh,. At Mm, p=, the atmospheric pressure round the jet. Hence, insert- ing these values,

vw ba 0422 vA, “hoz +fe_p;

G G v2 eg OM 2);

5 (2) 5

or v= NV 2gh=8:025VA- (2a).

That is, neglecting the viscosity of the fluid, the velocity of fila- ments at the contracted section of the jet is simply the velocity due to the difference of level of the frec surface in the reservoir and the orifice. If the ori- fice is small in dimen- sions compared with h, the filaments will all have nearly the same velocity, and if A is measured to the centre of the orifice, the equa- tion above gives the mean velocity of the jet.

Case of a Submerged Orifice. —Let the orifice discharge below the Fic, 44 Icvel of the tail water. gee Then using the notation shown in fig. 44, we have at M, v,=0,

2p =Ghy+pa; at m, p=Ghgt+pa. Inserting these values in (3), § 26, a vw Pa . 0+, +7

2

By ia tamh (3),

where / is the difference of level of the head and tail water, and may be termed the effective head producing flow.

Case where the Pressures are different on the Free Surface and at the Orifice. —Let the fluid flow from a vessel in which the pressure is) into a vessel in which the pressure is p, fig. 45. The pressure ~) will produce the same effect as a layer of fluid of thickness

i added to the head water; and the pressure p will

produce the same effect as a layer

of thickness P|

G added to the tail, water. Hence the

effective difference of level, or effec- tive head producing flow, will be

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and the velocity of discharge will be

We mny express this result by saying that differences of pressure at the free surface and at the orifice are to be reckoned as part of the effective head.

Hence in all cases thus far treated the velocity of the jet is the velocity due to the effective head, and the discharge, allowing for con- traction of the jet, is

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Q=cwv=cwN 2gh (5),

where w is the area of the orifice, cw the area of the contracted sec- tion of the jet, and % the effective head measured to the centre. of the orifice. If and w are taken in feet, Q is in cubic fect per second.

It is obvious, however, that this formula assumes that all the filaments have sensibly the- same velocity. That will be true for horizontal orifices, and very approximately true in other cases, if the dimensions of the orifice are not large compared with the head h. In large orifices in say a vertical surface, the value of A is different for different filaments, and then the velocity of different filaments is not sensibly the same.

SIMPLE ORIFICES—HEAD CONSTANT.

35. Large Rectangular Jets from Orifices in Vertical Plane Sur- faces.—Let an orifice in a vertical plane surface be so formed that it

roduces a jet 4A

aving a rect- 2——-——— angular contract- eapeliges ineglkay slkepa ed section with —~-4=——-4

vertical and hori- zontal sides. Let b (fig. 46) be the breadth of the jet, h, and he the depths below the free surface of its upper and lower surfaces. Con- sider a lamina of the jet between : the depths A and Fig. 46.

h+dh. Its normal section is bdh, and the velocity of discharge /2gh. The discharge per second in this lamina is therefore

*b\/2gh dh, and that of the whole jet is therefore he —— Q= if *on/ Qgh dh hy*

2 0/35 | hat – ny” | oft (6),

where the first factor on the right is a coefficient depending on the form of the orifice.

Now an orifice producing a rectangular jet must itself be very approximately rectangular. Let B be the breadth, Hy, Hy, the depths to the upper and lower edges of the orifice. Put

B(hty — fy”) B(H,”/- H,})*

Then the discharge, in terms of the dimensions of the orifice, instead of those of the jet, is

Q= $cBV29(H,! – H,’) (8),

the formula commonly given for the discharge of rectangular orifices. The coefficient cis not, however, simply the coefficient of contraction, the value of which is

(7),

=C . . ° . . .

B(hig — hy) B(H, ‘Sn H)) ; and not that given in (7). It cannot be assumed, therefore, that c in equation (8) is constant, and in fact it is found to vary for different values of 4 and – , and must be ascertained experimentally.

1

Relation between the Expressions (5) and (8).—For a rectangular orifice the area of the orifice is #=B(H,~~H,), and the depth mea~~ sured to its centre is 4 (H,+H,). Putting these values in (5),

Q, = ¢B(H, ~ H,)V9(H,+ Hy). From (8) the discharge is Qo= §eBV29(H, – H,*) Tlence, for the same value of ¢ in the two cases, al eS 3 Q * (H, – Hy)V4(H, + Ay)*

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(9).

If H, varies from 0 to oo =) varies from 0 tol. The following

2 2

table gives values of the two estimates of the discharge for different values of H2;

2

Hence it is obvious that, except for very small values of a, the

siinpler equation (5) gives values sensibly identical with those of (8). When a <_0°5 it is better to use equation (8) with values of

2

c determined experimentally for the particular proportious of orifice

which are in question. 36. Large Jets having a Circular Section from Orificcs in a Ver- tical Plane Surface.—Let fig. 47 represent the section of the jet,

Q O SSS

he er : 1 Sy' ; AS

OO being the free surface level in the reservoir. The discharge through the horizontal strip aabb, of breadth aa=6, between the hy +y and depths 2, +y+dy, is dQ=bn/j 29(y +4) fay « The whole discharge of the jet is d Q= /on/{20tn ty) hay «

~/0

But b=d sin ¢; y=4d(1—cos p); dy=4d sin ddd. Let

*Pe ba Qhy+a' then a d . ae 29 In +5) oa sin *@V1-—e cos ddd.*

From eq. (5), putting on Td, h=h + , ¢=1 when d is the dia- meter of the jet and not that of the orifice,

ante a/Ju(n4)h

*B_2 [sin *9V/{1- « 008 olde. v1 TSO ;*

A, =o, «=0 and Qu 2 : Q

For

and for hy= 0, e=1 and G.= 096.

1

So that in this case also the difference between the simple formula (5) and the formula above, in which the variation of head at differ-

ent parts of the orifice is taken into account, is very small.

NoTCHES AND WEIRS.

37. Notches, Weirs, and Byewashcs.—A notch is an orifice extend- ing up to the free surface level in the reservoir from which the dis- charge takes place. A weir is astructure over which the water flows, the discharge being in the same conditions as for a notch. The for- mula of discharge for an orifice of this kind is ordinarily deduced by putting H,=0 in the formula for the corresponding orifice, ob-

tained as in the preceding section. put H,=0 in (8). Then

Q=3 ¢ BV 2g n (11),

where H is put for the depth to the crest of the weir or the bottom of the notch. Fig. 48 shows the mode in which the discharge occurs in the case of a rectangular notch or weir with a level crest. As the free surface level falls very sensibly near the notch, the head H should be measured at some distance back from the notch, at a point where the velocity of the water is very sinall.

Since the arca of the notch opening is BH, the above formula is of the form

Thus for a rectangular notch,

Q=cx BHxkV2gH,

where k is a factor depending on the form of the notch and. express- ing the ratio of the mean velocity of discharge to the velocity due to the depth H.

38. Francis's Formula for Rectangular Notchcs.—The jet dis- charged through a rectangular notch has a section smaller than BH,

SSS =

(a) because of the fall of the water surface from the point where H is measured towards the weir, (b) in con- sequence of the crest contraction, (c) in consequence of the end contrac- tions. It may be pointed ont that while

the diminu- tion of the section of the jet due to the surface fall and to the crest contrac- tion is proportional to the length of the weir, the end con- tractions have near- ~ ly the same effect whether the weir is wide or narrow.

from 8 to 24 inches, and the length of

Mr F is's – perianal \ SSS that a perfect end | \ NSS contraction, when \ SS the heads varied : AAAS INAS S

the weir was not less Y ess 3S than three times ZL, ss 2 y ya ALY

the head, dimin- ; ished the effective Fig. 48. length of the weir by an amount approximately equal to one-tenth of the head. Hence, if / is the length of the notch or weir, and H the head measured behind the weir where the water is nearly still, then the width of the jet passing through the notch would be /— 02H, allowing for two end contractions. In a weir divided by posts there may be more than two end contractions. Hence, enerally, the width of the jet is 7— 0°1nH, where n is the number of end con- tractions of the stream. The contractions due to the fall of surface and to the crest contraction are proportional to the width of the jet. Hence, if cH is the thickness of the stream over the weir, measured at the contracted section, the section of the jet will be c(J- 0 1nH)H and (§ 37) the mean velocity will be g√2gH. Consequently the discharge will be given by an equation of the form

Q=%e(1 ~~0'InH)HV2gH =5:350(1~~ 0-InH)H .

This is Francis's formula, in which the coefficient of discharge c is much more nearly constant for different values of / and # than in

Fig. 49. ' Francis found for c the mean value 0°622, the weir being sharp-edged.

the ordinary formula.

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39. Triangular Notch (fig. 49).—Consider a lamina issuing be- tween the depths handh+dh. Itsarea, neglecting contraction, will be bdh, and thé velocity at that depth is V2gh. Hence the dis- charge for this lamina is

b\V/2gh dh. But B_ HH bay? H-h b=B H

Hence discharge of lamina H-h =—— “a Qgh dh ; and total discharge of notch os: ee -9=Bv% f° ah dh

0

=745B 9g Hi ’ or, introducing a coefficient to allow for contraction, Q=345cB’V2gH?.

When a notch is used to gauge a stream of varying flow, the ratio = varies if the notch is rectangular, but is constant if the notch is triangular. This led Professor James Thomson to suspect that the coefficient of discharge, c, would be much more constant with differ- ent values of H in a triangular than in a rectangular notch, and this has been experimentally shown to be the case. Hence a triangular notch is more suitable for accurate gangings than a rectangular notch, Fora PK triangular notch Professor J. Thomson

found c=0°617. It will be seen, as in § 37, that since 4BH is the area of section of the stream through the notch, the formula is

again of the form

Q=cx4BH xkV2gH ,

where k=,% is the ratio of the mean velocity in the notch to the velocity at the depth H. It may easily be shown that for all notches the discharge can be expressed in this form.

40. Weir with aBroad Sloping Crest.—Suppose a weir formed with a broad crest so sloped that the streams flowing over it have a move ment sensibly rectilinear and uniform (fig. 50). Let the inner edge be

so rounded as to prevent a crest contraction. Consider a filament aa', the point a being so far back from the weir that the velocity of approach,is negligible. Let OO be the surface level in the reservoir, and let a be at a height h" below 00, and h' above a'. Let h be the distance from OO to the weir crest and cthe thickness of the stream uponit. Neglecting atmospheric pressure, which has no influence,

the pressure at a is Gh"; at a' it is Gz. If v be the velocity at a',

v2 ~~ ah'+h" -2=h-¢ >

29

Q=be V2g(h-e) –

Theory does not furnish a value for e, but Q=0 for e=0 and for e=h. has therefore a maximum fora value of e between 0 andh,

obtained by equating a to zero. This gives c=3h, and, inserting

this value, rs. Q=0'385 bh V2gh ,

as a maximum value of the discharge with the conditions assigned. Experiment shows that the actnal discharge is very approximately equal to this maximum, and the formula is more legitimately ap- plicable to the discharge over broad-crested weirs and to cases such as the discharge with free upper surface through large masonry sluice openings than the ordinary weir formula for sharp-edged weirs. It should be remembered, however, that the friction on the sides and crest of the weir has been neglected, and that this tends to reduce a little the discharge. The formula is equivalent to the ordinary weir formula with c=0°577.

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Coefficients for the Discharge over Weirs, derived from the Experiments of Mr Blackwell.

with the same head, and the results were pretty uniform, the verging wing-boards ts very strongly marked.

Heads in

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When more than one experiment was made

resulting coefficients are marked with an (*). The effect of the con-

Sharp Edge. Planks 2 inehes thiek, square on Crest Crests 3 feet wide, inches 4 2 | sleet? 10 feet long, trom still | sroet | tofect | Sfeet | 6 fect | 10 fect Wing boards [3 feet long,\3 feet long,/3 feet long, |6 feéé long,| 10 feet Ne fae Reservoir. ung. long. long. long. long. — a level. {fall 1in 18,|fall lin 12.] level. long, level.) 7 in 18. 1 677 809 467 459 435} "754 452 B45 467 381 467 2 675 803 ***509*** *561* ***585*** *675 482 546 533 a 479* "495* 3 630 642" | °563** ***597*** *569* fs 441 537 "539 492* an ik 4 617 656 "B49 575* ***602*** *656 419 431* ***455 -497*** *ais B15 5 602* ***650*** *| °588 601* 609* 671 479 516 sore coe B18 Hes 6 593 at 593* 608* 576" ore* ***501*** *oe 531 507 513 543 ih ah me Cai 608** ***576*** *488 513 BOG 497 ts noe 8 581 606** ***590*** *548" '470 491 oat 38 468 B07 9 530 600* ***569 558*** *476 499* "498 480* "486 a 10 at 614* 539 534* sa aan Lee 465% "455 j 12 nae 525 534* 467" aah 14 549* As*

1 The discharge per second varied from 461 to "665 eubie feet in two experiments. The coefficient °485 is derived from the mean value.

SprcrAL CASES OF DISCHARGE FROM ORIFICES.

41. Cases in which the Velocity of Approach needs to be taken into Account. Rectangular Orifices and Notehes.—In finding . the velocity at the orifice in the preceding investigations, it has been assumed that the head A has been measured from the free surface of still water above the orifice. In many cases which occur in practice the channel of approach to an orifice or notch is not so large, relatively to the stream through the orifice or notch, that the velocity in it can be disregarded.

Let hy, h (fig. 51) be the heads measured from the free surface to the top and bottom edges of a rectangular orifice, at a point in the

pa ta ters

pacar eal

Fig. 51.

channel of approach where the velocity is w. fall of the free surface,

It is obvious that a

ur

has been somewhere expended in producing the velocity u, and hence the true heads measured in still water would have been h,) and a. Consequently the discharge, allowing for the velocity of approach, is

Q=8bV/ Gf (tg +h)I-(y +h}... – (I). And for a rectangular notch for which 2,=0, the discharge is Q= $b \/9g { (hg +h)'-¥' } : (2).

In cases where w can be directly determined, these formule give the discharge quite simply. When, however, w is only known as a function of the section of the stream in the channel of approach, they become complicated. Let © be the sectional arca of the channel

where , and 2, are measured. Then wae and Ui) '

This value introduced in the equations above would render them excessively cumbrous. In cases therefore where 2 only is known, it is best to proceed by approximation. Calculate an approximate value Q' of Q by the equation

Q"=3 cb By {ha — My ¥}

2

Q ; nearly. This value of } introduced in the equations

above will give a second and much more approximate value of Q. 49. Partially Submerged Rectangular Orifices and Notches.— When the tail water is above the lower but below the upper edge of the orifice, the flow in the two parts of the orifice, into which it is divided by the surface of the tail water, takes place under differ- ent conditions. A filament M,m, (fig. 52) in the upper part of the

Then }=

orifice issues with a head h/’ which may have any value between h,andh. But a filament Mym, issuing in the lower part of the orifice has a velocity due to h”—h’”, or h, simply. In the upper part

Fig. 52.

of the orifice the head is variable, in the lower constant. If Q,, Q. are the discharges from the upper and lower parts of the orifice, b the width of the orifice, then

=)

Qi ged 3g {= In Qa=cb (ig — h)V 2gh In the case of a rectangular notch or weir, 2;=0. Inserting this value, and adding the two portions of the discharge together, we get

for a drowned weir ae h Q =e Gh Ie -+) (4);

where hs is the difference of level of the head and tail water, and h, is the head from the free surface above the weir to the weir crest. If velocity of approach is taken into account, let) be the head due to that velocity; then, adding } to each of the heads in the equa- tions (3), and reducing, we get for a weir

Q=cbV2G | (in bh he – a+ b)P- 8H]. . 05);

an equation which may be useful in estimating flood discharges. Bridge Piers and other Obstructions in Streams.—When the piers

of a bridge are erected in a stream they create an obstruction to the

flow of the stream, which causes a difference of surface-level above

(3).

and below the pier (fig. 53). If it is necessary to estimate this differ- ence of level, the flow between the piers may be treated as if it occurred over a drowned weir. But the value of-c in this case is imperfectly known.

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43, Separating Weirs.—Many towns derive their water supply from streams in high moorland districts, in which the flow is ex: tremely variable. 'The water is collected in large storage reservoirs, from which an uniform supply can be sent to the town. In such cases it is desirable to separate the coloured water which comes down the streams in high floods from the purer water of ordinary flow. The latter is sent into the reservoirs ; the former is allowed to flow away down the original stream channel, or is stored in sepa- rate reservoirs and used as compensation watcr. 'To accomplish the scparation of the flood and ordinary watcr, advantage is taken of the different horizontal range of the parabolic path of the water falling ovér & weir, as the depth on the weir and,

consequently,

the veloeity

change. Fig. yj,

54 shows one "7; CREEK of these sepa- SS

rating weirs in the form in which they were first introduced on the Manchester Waterworks; fig 55 amore modern weir of the same kind designed by Mr Binnie for the Bradford Waterworks. When the quantity of water coming

Fig. 54.

Plan of

Cast Iron

9 fa SAL

INN.

: . 52 og We

Af s, X Nee) “ 134] ws ae at POS 4 OSs, an 2,

sew p Rate ements SEATS

Fig, 55.

down the stream is not excessive, it drops over tne weir into a trans- verse channel leading to the reservoirs. In flood, the water springs over the mouth of this channel and is led into a waste channel.

It may be assumed, probably with accuracy enough for practical purposes, that the particles describe the parabolas due to the mean velocity of the water passing over the weir, that is, to a velocity

§V2gh,

where / is the head above the crest of the weir.

Let cba be the width of the orifice and ac=y the difference of level of its edges (fig. 56). Then, if a particle passes from atodiné seconds,

w=tot”, y=§N29ht;

2

o ¥ ae 5 ’

which gives the width w for any given difference of level y and head h, which the jet will just pass over the orifice. Set off ad verti- cally and equal to 4g on any scale; af horizontally and equal to z Vv gh. Divide af, fe into an equal number of equal parts. Join @ with the divisions on ef. The intersections of these lines

a verticals from the divisions on af give the parabolic path of the jet.

MovuTHPIECES—HEAD CoNSTANT.

44, Cylindrical Mouthpieces.—When water issues from a short cylindrical pipe or mouthpiece of ’a length at least equal to 14 times itssmallest transverse dimension, thestream, after contraction within the mouthpicce, expands to fill it and issues full bore, or without contraction, at the point of discharge. The discharge is found to

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be about one-third greater than that froma simple orifice of the same size. On the other hand, the energy of the fiuid per unit of weight is less than that of the stream from a simple orifice with the same head, because part of the energy is wasted in eddies produeed at the point where the stream expands to fill the mouthpiece, the — pe being something like that which occurs at an abrupt change of section.

[HYDRAULICS,

>!

1

i a —— 7/77) \SSNau ea YY aS fae a a _ __ — SSS Soe is fa oe 7; Wes Dead phe Z} NAAN oes bane p enor ty RPT Y Y Yy WYN WA Ts. Xs eae ‘ ‘ LD e AAS St xX ‘ st oa I ! Y Smee cont ‘ae wy. ! ‘ eat | eo Ne Y Se 8 WY “ea a a WAS TU hn Z SYIG A. | G Y/ \ NA CU UIAD pn WMA he a ‘ \ 1 Sen kee ey ee j ! AEE SS OMS actR She ! ‘ coe vi bt eee ‘ ; Ms Ne \ 4 ‘ Sins WA Ror a or ; SA S\N a) i a, ee H ‘ \ i \ recta ! H mk a ‘ H Vy \ 5 i] 1 1 \ 1d ‘ f 34 ‘ \,

| NA H : VANE ; ! 1 NaN \ { | 1 1 \ \ \ ! | ‘ \ \i a ‘ 1 YM ey AE i 1 4 \ ! 1 1 \t 1 f \ \s ! r] 1 \ \y 1 H \ " ‘ i ae \i 1 ta Mt Sacco Ve

-

cafes

3 =

Fig. 56.

Let fig. 57 represent a vessel discharging through a cylindrical mouthpiece at the depth A from the free surface, and let the axis of the jet XX be taken . as the datum with reference to which the head is esti- mated. Let © be the area of the mouthpiece, w the area of the stream at the contracted section EF. Let v, p be the velocity and pressure at EF, and v,, p, the same quantities at GH. If the discharge is into the air, p, is equal to the atmo- spheric pressure Pa.

Fig. 57. The total head of any filament which goes to form the jet, taken at a point where its velocity is sensibly zero, is hs He ; at EF the

G Between EF and GH there is aloss of head due to abrupt change of velocity, which from eq. (3), § 32, may have the value (v-™)? oC Adding this head lost to the head at GH, before equating it to the

heads at EF and at the point where the filaments start into motion, —

ee + it ie 214 2 total head is an tat at GH it is 5 + o

*Po_ Po, Py , (om)? a+ a9 *G Tae ae 2g*

But wv=Ov,, and w=c,M, if c. is the coefficient of contraction within the mouthpiece. Hence

Vy) : Ce

2

V=—Y) = w

HYDRAULICS, | Supposing the discharge into the air, so that p,;=pa,

Pa M1 Pa 1 ys ha apie te ee(t 1)3

2 2

ere) ¢

1

Y= TS ac ee 2gh mE)

Ce

(1);

where the first term on the right is evidently the coefficient of velocity for the cylindrical mouthpiece in terms of the coefficient of contraction at EF. Let c-=0°64, the value for simple orifices, then the coefficient of velocity is

(2).

he : =0°87

2

rf Le G = 1) Ce

The actual value of c, found by experiment is 0°82, which does not

differ more from the theoretical value than might be expected if the

friction of the mouthpiece is allowed for. Hence, for mouthpieces of this kind, and for the section at GH,

Co= 0°82 ¢.=1:00 c=0°82, Q=0°822V 29h It is easy to see from the equations that the pressure p at EF is less than atmospheric pressure.

Eliminating v,, we get

mt = 3h nearly. (3) 5

or P=Pa- }Gh bb per sq. ft.

If a pipe connected with a reservoir on a lower level is introduced into the mouthpiece at the part where the contraction is formed (fig. 58), the water will rise in this pipe to a height

KL -h? = fh nearly.

If the distance X is less than this, the water from the lower rescrvoir will be forced continuously into the jet by the atmospheric pressure, and discharged with it. This is the crudest form of a kind of pump known as the jet pump.

45. Convergent Mouthpieces.—With convergent mouthpieces there is a contraction within the mouthpiece causing a loss of head, and a diminution of the velocity of discharge, as with cylindrical

mouthpieces. There is also a second contraction of the stream out- side the mouthpiece, Hence the discharge is given by an equation of the form

Q=c ee V 29h . (4),

where 2 is the area of the external end of the mouthpiece, and ceQ the section of the contracted jet beyond the mouthpiece.

Convergent Mouthpieces (Castel's Experiments).—Smaliest

diameter of orifice =0°05085 feet. Length of mouthpicce = 2°6 diameters.

Coefficient: of Contraction, Ce

Coefficient of Velocity, Cy

Coefficient of Discharge, Cc

Angle of Convergence.

0’ 999 830 829

36’ 1:000 866 866

1001 894 895

1:002 910 $12

1°004 920 924

998 931 “929

992 942 934

987 950 938

986 955 942

‘983 962 946

979 966 941

‘969 971 938

953 °970 924

°945 ‘971 918

°937 974 ‘913

919 975 896

887 980 869

48° 50’ ‘861 984 847

The maximum coefficient of discharge is that for a mouthpiece with a convergence of 13° 24’,

The values of cy and c, must here be determined by experiment. The above table gives values sufficient for practical purposes. Since the contraction be- yond the mouthpiece == increases with the ~ convergence, or, what is the same thing, c, diminishes, and on the other hand the loss of energy di- minishes, so that ¢y increases with the convergence, there is an angle for which the product Ce Cy; and consequently the discharge, is a maxi- mum.

46. Divergent Con- otdal Mouthpiece.— Suppose a mouth- piece so designed that there is no abrupt change in the E section or velocity Fig. 58. of the stream passing through it. It may have a form at the inner end approximately the same as that ofa simple contracted vein, and may then enlarge gradually, as shown in fig. 59. Suppose that at EF it becomes cylindrical, so that the jet may be taken to be of the diameter EF. Let w, v, p be the section, velocity, and pressure at CD, and ©, 4, p, the same quantities at EF, p, being as usual the atmospheric pressure, or pressure on the free surface AB. Then, since there is no loss of energy, except the small frictional resistance of the surface of the mouthpiece,

I Be 2? pp v7 Pi G 29 G 29 G : If the jet discharges

into the air, p=; A e3 and . ———— i 2g We w= /2gh;

or, if a coefficient is introduced to allow for friction,

0 =Cyr/2gh ;

where c, is about 0°97 if the mouthpicce is smooth and _—well- formed.

Q =, =co2/2gh.

Hence the discharge depends on the area of the stream at EF, and not at all on that at CD, and the latter may ; be made as small as we Fig. 59. please without affecting the amount of water discharged.

There is, however, a limit to this. As the velocity at CD is greater than at EF the presstire is less, and therefore less than atmospheric pressure, if the discharge is into the air. If CD is so contracted that p=0, the continuity of flow is impossible. In fact the stream disengages itself from the mouth-piece for some value of p greater than 0 (fig. 60).

From the equations,

Time of Emptying or Filling a Vertical-sided Lock Chamber. — Suppose the lock chamber, which has .a water surface of O square feet, is emptied through a sluice in the tail gates, of area w, placed below the tail-water level. Then the effective head producing flow through the sluice is the difference of level in the chamber and tail bay. Let H (fig. 63) be the initial difference of level, / the difference

whence we find that 4 will become zero or negative if

or, putting reaekae feet, if a > h+34

(2)

In practice there will be an intcrruption of the full bore flow with

a less ratio of 2 because of the disengagement of air from the water. w

But, supposing this does not occur, the maximum discharge of a mouthpiece of this kind is

ane, /29(i+%) ;

that is, the discharge is the same as for a well-bellmouthed mouth- piece of area , and without the expanding part, discharging into a vacuum.

| WWHHHHHMECQX<“

during an interval dé. Then in the time dé the volume in the chamber is altered by the amount — Qdh, and the outflow from the

sluice in the same time is cw 2gh dt. Hence the differential equation connecting / and ¢ is

cw 2gh dt+ah=0.

For the time ¢, during which the initial head H diminishes to any other value h,

~ ewr/ 2g H Vh 0 a

+ te yg VE NB)

eo Wacmnkas

BD the whole time of emptying, during which / diminishes from to 0,

2 /26

cw g

Comparing this with the equation for flow under a constant head, it will be seen that the time is double that required for the discharge of an equal volume under a constant head.

The time of filling the lock through a sluice in the head gates is

Fig. 61. exactly the same, if the sluice is below the tail-water level. But if

required for pumping enters at A. The water to be pumped enter the sluice is above the tail-water level, then the head is constant a B. The Lode oon at DD where "e sony > seactonk till the level of the sluice is reached, and afterwards it diminishes and the pressure least. Beyond DD the stream enlarges in section. with the time. and its pressure increases, till it is sufficient to balance the head due to the height of the lift, and the water flows away by the discharge pipe C.

Fig. 62 shows the whole arrangement in a ip eee way.

PRACTICAL USE OF ORIFICES IN GAUGING WATER.

49, If the water to be measured is passed through a known orifice under an arrangement by which the constancy of the head is en sured, the amount which passes in a given time can be ascertained by the formule already given. It will obviously be best to make the ori- fices of the forms for which the coefficients are most accurately de- termined ; hence sharp-edged orifices or notches are most commonly used.

Water Inch.—For measuring small quantities of water circular sharp-edged orifices have been used. The discharge from a circular orifice one French inch in diameter, with a head of one line above the top edge, was termed by the older hydraulic writers a water- inch. A common estimate of its value was 14 pints per minute, or 677 English cubic feet in 24 hours. An experiment by Bossut gave 634 cubic feet in 24 hours (see Navier's edition of Belidor's Arch. Hydr., p. 212).

Weisbach points out that measurements of this kind would be made more accurately with a greater head over the orifice, and he proposes that the head should be equal to the diameter of the orifice. Several equal orifices may be used for larger discharges.

50. Pin Ferrules or Measuring Cocks.—To give a tolerably definite supply of water to houses, without the expense of a meter, a ferrule with an orifice of a definite size, or a cock, is introduced in the service- pipe. If the head in the water main is constant, then a definite quantity of water would be delivered in a given time. The arrange- ment is not a very satisfactory one, and acts chiefly as a check on extravagant use of water. It is interesting here chiefly as an ex- ample of regulation of discharge by means of an orifice. Fig. 64 shows a cock of this kind used at Zurich. — It consists of three cocks, 48, Flow from aVessel when the Effective Head varies with the Time. | the middle one having the orifice of the predetermined size in a — Various useful problems arise relating to the time of emptying small circular plate, protected by wire gauze from stoppage by im- and filling vessels, reservoirs, lock chambers, &c., where the flow purities in the water. The cock on the right hand can be used by is dependent on a head which increases or diminishes during the | the consumer for emptying the pipes. The one on the left and operation, The simplest of these problems is the case of filling or | the measuring cock are connected by a key which can be locked by

emptying a vessel of constant horizontal section. a padlock, which is under the control of the water company.

A is the reservoir which supplies the water that effects the pump-

Fig. 62.

ing ; Bis the reservoir of water to be pumped ; C is the reservoir into which the water is pumped.

DiIscHARGE WITH VARYING HEAD.

HYDROME

51. Measurement of the Flow in Streams.—To determine the quantity of water flowing off the ground in small streams, whieh is available for water supply or for obtaining water power, small tem-

HYDRAULICS, |

Fig. 64.

per weirs are often used. Thesemay be formed of planks supported

y piles and puddled to prevent leakage. The measurement of the head may be made by a thin-edged scale at a short distance behind the weir, where the water aisrlase kil not begun to slope down to the weir and where the velocity of approach is not high. ‘The measure- ments are conveniently made from ashort pile driven into the bed of

Seale Weir

Ss Pe Ss

—s

Fig. 65,

‘the river, accurately level with the crest of the weir (fig. 65). Then if at any moment the head is h, the discharge is, for a rectangular

notch of breadth 0, _ Q = ebhr/2gh

where ¢=0°62; or, better, the formula in §38 may be used. Gauging weirs are most commonly in the form of rectangular notches; and care should be taken that the crest is accurately hori- zontal, and that the weir is normal to the direction of flow of the stream. If the planks are thick, they should be bevelled (fig. 66), and then the edge may be protected by a metal plate about ~;th inch thick to secure the requisite accuracy of form and sharpness of edge. In permanent gauging weirs a cast steel plate is sometimes used to form the edgo of the weir erest. The weir should be large enough to discharge the maximum volume flowing in the stream, and at the same time it is desirable that the minimum head should not be too small (say half a foot) to decreaso the effeets of errors of measurement.

Fig. 66. The section of the jet over

the weir should not exceed one-fifth the section of the stream behind the weir, or the velocity of approach will need to be taken

into acconnt. of this kind. If the flow is variable, the head 2 must be recorded at equidistant intervals of time, say twice daily, and then for each 12 hour period the discharge must be ealculated for the mean of the heads at the beginning and end of the time. As this involves a good deal of troublesome calculation, Mr Sang has proposed to use a scale so graduated as to read off the discharge in cubie feet persecond. The lengths of the principal graduations of such a scale are easily calcu- lated by putting Q=1, 2, 3… . in the ordinary formule for notches; the intermediate graduations may be taken accurately enough by subdividing equally the distances between the principal graduations. _ The accurate measurement of the discharge of a stream by means of a weir is, however, in practice, rather more difficult than might be inferred from the simplicity of the principle of the operation.

A triangular notch is very suitable for measurements

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Apart from the difficulty of selecting a suitable coefficient of dis- charge, which need not be serious if the form of the weir and the nature of its crest are properly attended to, other difficulties of measurement arise. The length of the weir should be very accu- rately determined, and if the weir is rectangular its deviations from exactness of level should be tested. Then the agitation of the water, the ripple on its surface, and the adhesion of the water to the seale on which the head is measured, are liable to introduce errors. Upon a weir 10 fect long, with 1 foot depth of water flowing over

an error of 1-1000th of a foot in measuring the head, or an error of 1-100th of a foot in measuring the length of the weir, would cause an error in computing the discharge of 2 cubic feet per minute.

52. Hook Gauge.—For the determination of the surface level of water, the most accurate instrument is the hook gauge used first by Mr U. Boyden of Boston, in 1840. It consists of a fixed frame with scale and vernier. In the instru- ment in fig. 67 the vernier is fixed to the frame, and the scale slides vertically. The scale earries at its lower end a hook with a fine point, and the scale can be raised or lowered by a fine pitched screw. If the hook is depressed below the water surface and then raised by the screw, the moment of its reaching the water surface will be very dis- tinctly marked, by the reflexion from a small capillary elevation of the water surface over the point of the hook. In ordinary light, differences of level of the water of '001 of a foot are easily detected by the hook gauge. If such a gauge is used to determine the heads at a weir, the hock should first be set accurately level with the weir erest, and a reading taken. Then the difference of the reading at the water surface and that for the weir crest will be the head at the weir.

58. Modules used in Irrigation.— In distributing water for irrigation, the charge for the water may be simply assessed on the area of the land irrigated for each consumer, a method followed in India; or a re- gulated quantity of water may be given to each eousumer, and the charge may be made proportional to the quantity of water supplicd, a method employed for a long time in Italy and other parts of Europe. To deliver a regulated quantity of Fie. 67 water from the irrigation channel, ee es arrangements termed modules are used. These are constructions intended to maintain a

constant or approximately constant head above an orifice of fixed size, or to regulate the size of the orifice so as to give a constant discharge, notwithstanding the variation of level in the irrigating channel.

54. Italian Module.—The Italian modules are masonry construe- tions, consisting of a regulating chamber, to which water is admitted by an adjustable sluice from the canal. At the other end of the chamber is an orifice in a thin flagstone of fixedsize. By means of the adjustable sluice a tolerably constant head above the fixed orifice is maintained, and therefore there is a nearly constant dis- charge of ascertainable amount through the orifice, into the channel leading to the fields which are to be irrigated.

XG —— WEE C—O

Fig. 68.

In fig. 68 A is the adjustable sluice by which water is admitted to the regulating chamber, B is the fixed orifice through which the water is discharged. The sluice A is adjusted from time to time by the canal officers, so as to bring the level of the water in the regulat-

ing chamber to a fixed level marked on the wall of the gee et When adjusted it is locked. Let w, be the area of the orifice ; ea

through the sluice at A, and a, that of the fixed orifice at B; let Mowitee. | “Onitice. | edge of h, be the difference of level between the surface of the water in the Orifice. canal and regulating chamber ; h, the head above the centre of the

Discharge per sec. in c. feet.

0°6165

Canal Mieditts scaneeapenerke

discharging orifice, when the sluice has been adjusted and the flow : 0°32 has become steady; Q the normal discharge in cubic feet per second. Canal

of Cremona …..... 0°131 | 0°7225 2°046

Then, since the flow through the orifices at A and B is the same, inian Module…..... ; : 0°6562 Q = 0,0, 2ghy = Cg, 2h, , 0°3204

where c, and ¢, are the coefficients of discharge suitable for the two orifices. Hence

0866

In the most elaborate Italian modules the regulating chamber is C0 arched over, and its dimensions are very exactly prescribed. 'Thus hy re | (3) . in the modules of the Naviglio Grande of Milan, shown in fig. 69,

ana the measuring orifice is cut in a thin st6ne slab, and so placed that Suppose now that in the interval between the visits of the canal the discharge is into the air with free contraction on all sides. The officer the level of the canal rises ,feet, causing the heads relatively adjusting sluice is placed with its sill flush with the bottom of the

to the orifices A and B to become hj and hi. Since the areas of the canal, aud is provided with a rack and lever and locking arrange- orifices are unchanged ment, The covered regulating chamber is about 20 feet long, with

hi, 004 a breadth 1°64 feet greater than that of the discharging orifice. At

aa precisely the normal level of the water in the regulating chamber,

and therefore i there is a ceiling of planks intended to still the agitation of the hh' h water. A block of stone serves to indicate the normal level of

Ah, ; the water in the chamber. The water is discharged into an open

d ; 2 2 channel 0°655 feet wider than the orifice, splaying out till it is 1°637

or the ratio of the effective heads above the orifices A and Bis un- | feet wider than the orifice, and about 18 feet in length. This ap- affected by the

change of level of the canal. Also paratus was invented in the 16th century, and is still used. The

greatest objection to it is the loss of level between the canal and

*hi 4 = h 5 . . . Cae * ida ai ie' A discharging channel. a ee precisely similar to an Italian ?*

Eliminating h}, we get module are in use in England, for discharging compensation water h! _ (hy thy t hyhe ; into streams from impounding reservoirs. The fullest account of : hy +h Italian modules is to be found in Colonel Baird Smith's Jtalian and the di ge i ai i Irrigation. arenes jap open ge 55. Spanish Module.—On the canal of Isabella I1., which supplies Q' = cya, 2ghs water to Madrid, a module much more perfect in principle than the (hy tha +h)e Italian module is employed. Part of the water is supplied for irriga- Be " ea ee tion, and asit is very valuable its strict measurements essential, The ' Se ae module (fig. 71) consists of two chambers one above the other, the That is, QL hythath upper chamber being in free communication with the irrigation Q hy + he canal, and the lower chamber discharging by a culvert to the fields.

In the arched roof between the chambers there isa circular sharp edged orifice in a bronze plate. Hanging in this there is a bronze plug of' variable diameter suspended from a hollow brass float. If

the water level in the canal lowers, the plug descends and gives an enlarged opening, and conversely. Thus a perfectly constant dis- charge with a varying head can be obtained, provided no clogging or | _ ,__|__I_ silting of the chambers prevents the free discharge of the water or the rise and fall of the float. — The theory of the module a7 ee et eet : is very simple. Let R (fig. SS SS SS a 70) be the radius of the iL Gyr —— "1 ie "wee opening, 7 the diameter Po GY age" of the plug at a distance h A a from the plane of flotation of the float, and Q the re- quired discharge of the 4, module. Then A YY Wy Y 7 YY GY Y Q=cn(R?~~72)V 29h. iy Y Y / Taking 0=0°68, ne REL Q=15°83(R?~~ 7°)VA ; Q = 2 aS ———————— ° ? a rf R- ea/h G Choosing a value for R, successive values of 7 can be found for different values of h, and from these the

If the orifice at B opened directly into the canal without any intermediate regulating chamber, the discharge would increase for a given change of L/ level in the canal in exactly the same ratio. Con- yf sequently the Italian module in no way moderates | the fluctuations of discharge, except so far as it Y, affords means of easy adjustment from time to time. ¢ It has further the advantage that the-cultivator, by observing the level of the water in the chamber, can always sce whether or not he is receiving the proper quantity of water.

On each canal the orifices are of the same height, and intended to work with the same normal head, the width of the orifices being varied to suit the demand for water. The unit of discharge varies on different canals, being fixed in each case by legal arrangements. Thus the Canal Lodi the unit of discharge or one module of water is the a through an orifice 1°12 feet high, 0°12416 feet wide, with a

ead of 0°32 feet above the top edge of the orifice, or ‘88 feet above the centre. This corresponds to a discharge of about 0°6165 cubic feet per second. Two modules would be the discharge of a similar ori-

Fig. 69.—Scale yay-

c Fig. 70. pies twice the width. The following table gives some examples | curve of the plug can bedrawn. The module shown in fig. 71 will erent units of discharge. discharge 1 cubic metre per second. The fixed opening is 0‘2 metre

HY DROME

diameter, and the greatest, head above the fixed orifice is 1 metre. The use of this module involves a great sacrifice of level between the eanal and the fields. The module is described in Lieutenant Scott Moncrieff’s Zrrigation in Southern Hurope.

56. Reservoir Gauging Basins.—In obtaining the power to store the water of streams in reservoirs, it is usual to concede to riparian owners below the reservoirs a right to a regulated supply through-

HYDRAULICS. |

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\ YG

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weZZi SS

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A, the object of which is to still the irregular motion of the water. The admission is regulated by sluices at 6, b, &. The water is dis- charged by orifices or notches at a, a, over which a tolerably con- stant head is maintained by adjusting the sluices at }, b, 6. At any time the millowners can see whether the discharge is given and whether the proper head is maintained over the orifices. To test at any time the discharge of the orifices, a gauging basin B is

ee ——- Yyyyywov

Uy Gy

UL Gb iid

Fig. 72.—Scale x45. provided. The water ordinarily flows over this, without entering it, on a floor of cast-iron plates. Ifthe discharge is to be tested, the water is turned for a definite time into the gauging basin, by suddenly

opening and closing a sluice at c. The volume of flow can be ascertained from the depth in the gauging chamber. A mechanical arrangement was designed for securing an absolutely coustant head over the orifices at a, a The orifices were formed

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out the year. This compensation water requires to be measured in such a way that the dalkewnem and others interested in the matter can assure themselves that they are receiving a proper quantity, and they are generally allowed a certain amount of control as to the times during which the daily supply is discharged into the stream.

Figs. 72 and 73 show an arrangement designed for the Manches- ter Water Works. The water enters ftom the reservoir a chamber

Vey

7, Z WA TIAT. SSESLLTLS, F Z GLEE LYS OILALL USL TILL EI i Liye Lidge Hy HOPI IS EIS SI:

asa

Fig. 73.—Scale 445. in a cast-iron plate capable of sliding up and down, without sensible leakage, on the face of the wall of the chamber. The orifice plate was attached by a link to a lever, one end of which rested on the wall and the other on floats fin the chamber A. The floats rose and fell with the changes of level in the chamber, and raised and lowered the orifice plate at the same time. This mechanical arrangement was not finally adopted, careful watching of the sluices

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at b, b, b, being sufficient to secure a regular discharge. The arrange- ment is then equivalent to an Italian module, but on a large scale. 57. Professor

Fleeming Jenkin's Constant Flow Valve.—In the modules thus far described constant discharge is obtained by vary- ing the area of the orifice through which the water flows. Professor

F. Jenkin has contrived a valve in which a constant pressure head. is obtained, so that the orifice nced not be varied (Roy. Scot. Society of Arts, 1876). Fig. 74 shows a valve of this kind suitable for a

Fig. 74.—Scale yy.

6 inch water main, The water arriving by the main C passes through an equilibrium valve D into the chamber A, and thence through a sluice O, which can be set for any required area of opening, into the discharging main B. The object of the arrangement is to secure a constant difference of pressure betwecn the chambers A and B, so that aconstant discharge flows through the stop valve O. The equilibrium valve D is rigidly connected with a plunger P loosely fitted in a diaphragm, separating A from a chamber B, connected by a pipe B, with the discharging main B. Any increase of the differ-

ence of pressure in A and B will drive the plunger up and close the:

equilibriuin valve, and conversely a decrease of the difference of pres- sure will cause the descent of the plunger and open the equilibrium valve wider. Thus a constant difference of pressure is obtained in the chambers A and B. Let w be the area of the plunger in square feet, p the difference of pressure in the chambers A and B in pounds per square foot, w the weight of the plunger and valve. Then if at any moment pw exceeds w the plunger will rise, and if it is less than w the plunger will descend. Apart from friction, and assuming the valve D to be strictly an equilibrium valve, since w and w are

constant, p must be constant also, and equal to @. By making w ®

small and w large, the difference of pressure required to ensure the working of the apparatus may be made very small. Valves work- ing with a difference of pressure of 4 inch of water have been con- structed.

58. Appold's Module.—This acts on the same general principle as the Spanish module, but it secures only an approximately constant discharge. On the other hand it involves no great sacrifice of level, and is not very likely to be affected by silting. It was contrived originally as an air regulator, but it has also been tried with success as a water module. It consists simply of a horizontal pipe with an

Fig. 75.—Scale vr.

enlarged chamber, in which hangs a heavy wedge-shaped pendulum. The pressure of the water on the upstream side of this pendulum keeps it in a position inclined to the vertical, and partially closing the orifice of discharge as shown by the dotted lines in fig. 75. Any increase of pressure will cause a greater inclination of the pen- dulum and decrease the orifice of discharge, and vice versa.

CHANICS

VI. STEADY FLOW OF COMPRESSIBLE FLUIDS.

59. External Work during the Expansion of Air.—If air expands without doing any external work, its temperature remains constant. This result was first experimentally demonstrated by Joule. It leads to the conclu- sion that, however air changes its state, the internal work done is proportional to the change of temperature. When, in expanding, air does work against an exter- nal resistance, either heat must be supplied or the temperature falls.

To fix the condi- tions, suppose one

ound of air confined

ehind a piston of one square foot area (fig. 76). Let the initial pressure be 7, and the volume of the air v,, and suppose this to expand to the pressure)»

[HYDRAULICS.

Fig. 76. and volume 2». ; corresponding pressure and volume at any intermediate point in the expansion, the work done on the piston during the

expansion from

If p and v are the

» to v+dv is pdv, and the whole work during v, to v, represented by the area abed, is

Fr? “ody. Vy

Amongst possible cases two may be selected. Case 1.—S0 much heat is supplied to the air during expansion that the temperature remains constant. Hyperbolic expansion.

Then PVU==PV1 + Work done during expansion per pound of air

-{” Soeeuih Y2 dv vy © veri f,

» , » =p, loge 2 = pry loge=1 . vy Po

the expansion from

(1).

Since the weight per cubic foot is the reciprocal of the volume per pound, this may be written

Pr joge Sa

G, ~ G

Then the expansion curve ab is a common hyperbola. Case 2.—No heat is supplied to the air during expansion. Then the air loses an amount of heat equivalent to the external work done and the temperature falls, Adiabatic expansion.

In this case it can be shown that

prl=pyn7,

where + is the ratio of the specific heats of air at coustant pressure and volume. Its value for air is 1°408, and for dry steam 1°135. Work done during expansion per pound of air

loge . (1a).

Ve dv = = ¥ undies Came a es} 1 y-1loy- aa oe en lla Sra és Pi | Ba A a 2 y-1 ; (3) oe*

The value of p,, for any given temperature can be found from the data already given.

As before, substituting the weights G,, G, per cubic foot for the volumes per pound, we get for the work of expansion °

fp 1 ~ 2 ses he ~ Th ail ala (BR) | = 9,V 1{[|— . « (2d); oA ors | Py Y (20)

60. Modification of the Theorem of Bernoulli for the Case of @ Compressible Fluid.—In the application of the principle of work to a filament of compressible fluid, the internal work done by the expan- sion of the fluid, or absorbed in its compression, must be taken into

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account. short time ¢. stream, velocity, and weight of a cubic foot at A, and Poy @g, Va, Gy the same quan- tities at B. Then, from the steadiness of motion, the weight of fluid passing A in any given time must be equal to the weight passing B: G1 w,0,¢ —_ Gyw,v,¢ .

Let z,, 2, be the heights of the sections A and B above any given datum. Theu the work of gravity on the mass AB in ¢ seconds is G10,4(2, — 2) = W(z, — %9)¢, where W is the weight of gas passing A or B per second. As in the case of an incompressible fluid, the work of the pressures on the

ends of the mass AB is POV yb — Pewee ,

- *2s \we.*

(2-

The work done by expansion of Wé pounds of fluid between A and B is wif "2 ndv. The change of kinetic energy as before is a (04? — v,7)¢. v

Fig. 77.

enon equating work to change of kinetic energy, Pi _ Pe "2 . : W(a,- 2+ (2- 2) wer wif pdv 3g (vq? — v,2)E ;

Bice atin f

Now the work of expansion per pound of fluid has already been |

given. If the temperature is constant, we get (eq. la, § 59) Pr Pa Me My Hh, Ta, ag 8G, ag 1 Ga, But at constant temperature 21 — 74 ; G, Ge, ee eon: ref ae 2 2g G, 8p, ' (2);

or, neglecting the difference of level,

Se Se ek 29 G, 1°85, \ Similarly, if the expansion is adiabatic (eq. 2a, § 59), i ae a ae (27 I. 8); 1+ G,t 29 "at Got bg G,y-1 4 1 5 @)s

or neglecting the difference of level

os -1 V9? — 0; aa 1 1 (2Vr] Po — + 1 — oa Y ae eren yg: ° (8a . 29 G,

- It will be seen hereafter that there is a limit in the ratio ° beyond

3

which these expressions cease to be true.

61. Discharge of Air from an Orifice.—The form of the equation of work for a steady stream of compressible fluid is .

i = 1- (2) yf, Py

*ee ae. "tg. tag *+G, +29 G, 7-1 the expansion being adiabatic, because in the flow of the streams of air through an orifice no sensible amount of heat can be communi- cated from outside.*

ss foe the air flows from a vessel, where the pressure is p, and the velocity sensibly zero, through an orifice, into a space where the pressure is Y,. Let v, be the velocity of the jet at a point where the convergence of the streams has ceased, so that the pressure in the jet is also y,. As air is light, the work of gravity will be small compared with that of the pressures and expansion, so that 2, 2 may be neglected. Putting these values in the equation above—

Buf m1 fy (my), G, G, 2g G,y-1 ‘

Dee! Oe FP, I = Ba)‘y G, Gy-1 Pi

2g «6G, ‘ =-1 _ 71 a (B)F _ Pa, G, (y-1 y-l\ ny, Ga But Py Pe BoB P)y. GY GY G, G\p,

+1

02 Th Y } _ (mV 4 a Gy-at 1 (F)7 f- (1); or vy SH Pe

29 y-1 G, Gf?

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Suppose, as before, that AB (fig. 77) comes to A’B’ in a. Let 1, #,, Vy G, be the pressure, sectional area of

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an equation commonly ascribedto Weisbach (Civilingenieur, 1856), though it appears to have been given carlier by St Venant and

Wantzel. It has already (§-9, eq. 4a) been seen that

fi _, Po Gy Gy 7’ where for air py) = 2116°8, Gy = °08075 and +, = 492°6. OP Pom fy (2) 7} (ay 2g Gy tm 7-1 Py : ; or, inserting numerical values, 042 “4 20, Po ial ; bg 18367, } 1- (2) ; . (2a);

which gives the velocity of discharge v, in terms of the pressure and absolute temperature, »,, 7), in the vessel from which the air flows, and the pressure p, in the vessel into which it flows. Proceeding now as for liquids,

and putting w for the area of the orifice and c¢ for the coefficient of discharge, the volume of air dis- charged per second at the pressure p, and temperature T) is

/ y-! Q.=cwr, =cw 2 1M } 1 (22) Y : k 7 a-16 Py

1

= 108 -7ew /[n} c (2) } a |

If the volume discharged is measured at the absolute temperature 7, in the vessel from which t Q, be that volume; then

PrQa!= PQ" 5 a=(2)9 Q 5

2 +1

ane a/ Lust (A)F-(2)F fT. BBY (RY -(By-43 ane / [stb

=108-7ew Vr. The weight of air at pressure p, and temperature 7, is

ressure p, and e air flows, let

Let

(4).

ee | " 53°2c, ° Hence the weight of air discharged is

*i nt al W=G,Q,=cw a/ [29 pachy | =2°048cwp, ped (5). *y*

Weisbach has found the following values of the coefficient of dis- charge ¢c :—

pounds per cubic foot.

Circular sharp-edged orifices …..... 0°563 ,, 0°788 Short cylindrical mouthpieces …..... 0°81 ,, 0°84 The same rounded at the inner end …..... 0°92 ,, 0:93 Conical converging mouthpieces…..... 0°90 ,, 0°99

62. Limit to the Application of the above Formule.—In the formule above it is assumed that the fluid issuing from the orifice expands from the pressure p, to the pressure p,, while passing from the vessel to the section of the jet considered in estimating the area w. Hence p, is strictly the pressure in the jet at the plane of the external orifice in the case of mouthpieces, or at the plane of the contracted section in the case of simple orifices. Till recently it was tacitly assumed that this pressure p, was identical with the general pressure external to the orifice. Mr R. D. Napier first dis-

covered that, when the ratio 22 exceeded a value which does not

Py greatly differ from 0°5, this was no longer true. In that case the expansion of the fluid down to the external pressure is not com- pleted at the time it reaches the plane of the contracted section, and the pressure there is greater than the general external pres- sure; or, what amounts to the same thing, the section of the jet where the expansion is completed is a section which is greater than the area c.w of the contracted section of the jet, and may be greater than the area w of the orifice. Mr Napier made experiments with

steam which showed that, so long as a 0‘5, the formule above

were trustworthy, when y, was taken to be the gencral external pressure, but that, if 22 <0°5, then the pressure at the contracted

1

section was independent of the external pressure and equal to 0°5p,. Hence in such cases the constant value 0°5, should be substituted in the formule for the ratio of the internal and external pres-

sures Ds ‘

P It is ‘easily deduced from Weisbach’s theory that, if the pressure }

external to an orifice is gradually diminished, the weight of air discharged per second increases to a maximum for a valne of the ratio

=0°‘527 for air = 0°58 for dry steam.

Fora further decrease of external pressure the discharge diminishes, —a result no doubt improbable. The new view of Weisbachi’s formula is that from the point where the maximum is reached, or not greatly differing from it, the pressure at the contracted section ceases to diminish.

Fliegner has shown (Civilingeniewr, xx., 1874) that for air flow- ing from well-rounded mouthpieces there is no discontinuity of the law of flow, as Napier’s hypothesis implies, but the curve of flow bends so sharply that Napier’s rule may be taken to be a good approximation to the true law. The limiting value of the ratio

Pa for which Weisbach’s formula, as originally understood, ceases

P to apply,tis for air 0°5767; and this is the number to be substituted for 22 in the formule when £2 falls below that value, For later

researches on tho flow of air, reference may be made to Zeuner’s aay (Civilingeniewr, 1871), and Fliegner’s papers (ibid., 1877,

1878).

VII. FRICTION OF LIQUIDS.

63. When a stream of fluid flows over a solid surface, or con- versely when a solid moves in still fluid, a resistance to the motion is generated, commonly termed fluid friction. It is due to the vis- cosity of the fluid, but generally the laws of fluid friction are very different from those of simple viscous resistance. It would appear that at all speeds, except the slowest, rotating eddies are formed by the roughness of the solid surface, or by abrupt changes of velocity distributed throughout the fluid ; aud the energy expended in pro- ducing these eddying motions is gradually lost in overcoming the viscosity of the fluid in regions more or less distant from that where they are first produced.

The laws of fluid friction are generally stated thus :~-

1. The frictional resistance is independent of the pressure between the fluid and the solid against which it flows. This may be verified by a simple direct experiment. Coulomb, for instance, oscillated a disk under water, first with atmospheric pressure acting on the water surface, afterwards with the atmospheric pressure removed. No difference in the rate of decrease of the oscillations was observed. The chief proof that the friction is independent of the pressure is that no difference of resistance has been observed in water mains and in other cases, where water flows over solid surfaces under widely different pressures.

9. The frictional resistance of large surfaces is proportional to the area of the surface.

3, At low velocities of not more than 1 inch per second for water, the frictional resistance increases directly as the relative velocity of the fluid and the surface against which it flows. At velocities of 4 foot per second and greater velocities, the frictional resistance is more nearly proportional to the square of the relative velocity.

In many treatises on hydraulics it is stated that the frictional resistance is independent of the nature of the solid surface. The explanation of this was supposed to be that a film of fluid remained attached to the solid surface, the resistance being generated between this fluid layer and layers more distant from the surface. At extremely low velocities the solid surface does not seem to have much iniluence on the friction. In Coulomb's experiments a metal surface covered with tallow, and oscillated in water, had exactly the same resistance as a clean metal surface, and when sand was scattered over the tallow the resistance was only very slightly increased. The earlier calculations of the resistance of water at higher velocities in iron and wood pipes and earthen channels seemed to give a similar result. These, however, were erroneous, and it is now well understood that differences of roughness of the solid surface very greatly influence the friction, at such velocities as are common in engineering practice. Darcy's experiments, for instance, showed that in old and incrusted water mains the resistance was twice or sometimes thrice as great as in new and clean mains.

64. Ordinary Expressions for Fluid Frietion at Velocities not Extremely Small.—Let f be the frictional resistance estimated in

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; velocities.

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pounds per square foot of surface at a velocity of one foot per second ; @ the area of the surface in square fect ; and v its velocity in feet per second relatively to the water in which it is immersed. Then, in accordance with the laws stated above, the total resistance of the surface is

R=fev? ih -3 « where f is a quantity approximately constant for any given surface, If

—29f G' ;

2

Rasa tiural att of. 2 a an

where ¢ is, like f, nearly constant for a given surface, and is termed. the coefficient of friction.

The following are average values of the coefficient of friction for water, obtained from experiments on large plane surfaces, moved in an indefinitely large mass of water.

Coefficient Frictional

of Friction, | Resistance in

' | tb per sq. ft.

if

New well-painted iron plate …….006 00489 00473 Painted and planed plank (Beaufoy)..... 00350 00339 Surface of iron ships (Rankine) ..... 00362 00351 Varnished surface (Froude) .....ss+esee 00258 00250 Fine sand surface Bay LE Baatanses stray 00418 00405 Coarser sand surface 4, — veeceeeeeeeeees 00503 “00488

The distance through which the frictional resistance is overcome is v feet per second. The work expended in fluid friction is therefore given by the equation—

Work expended =fwv foot-pounds per second j tes ” ” + AG*

The coefficient of friction and the friction per square foot of surface can be indirectly obtained from observations of the discharge of pipesandcanals. In obtaining them, however, some assumptions as to the motion of the water must be made, and it will be better therefore to discuss these values in connexion with the cases to which they are related.

Many attempts have been made to express the coefficient of friction in a form applicable to low as well as high velocities. The older hydraulic writers considered the resistance termed fluid fric- tion to be made up of two parts,—a part due directly to the distor- tion of the mass of water and proportional to the velocity of the water relatively to the solid surface, and another part due to kinetic energy imparted to the water striking the roughnesses of the solid surface and proportional to the square of the velocity. Hence they proposed to take

B

peat?

in which expression the second term is of greatest importance at very low velocities, and of comparatively little importance at veloci- ties over about $ foot per second. Values of £ expressed in this and similar forms will be given in connexion with pipes and canals.

All these expressions must at present be regarded as merely empirical expressions serving practical purposes. The frictional resistance will be

seen to vary through wider limits than these expressions allow, and to depend on circumstances of which they do not take account.

65. Coulomb's Experiments.—The first direct experiments on fluid friction were made , " K by Coulomb, who ~~ —€ lige wr, employed a circular ip disk suspended by a thin brass wire and oscillated in its own plane. His experi- ments were chiefly made at very low 'When the disk is rotated to any given angle, it oscillates under the action of its inertia and the torsion of the wire. The os- cillations diminish gradually in conse- quence of the work ; done in overcoming the friction of the disk. The diminution fur- nishes a means of determining the friction.

Fig. 78 shows Coulomb's apparatus. LK supports the wire and disk ; ag is the brass wire, the torsion of which causes the oscilla-

Fig. 78.

tions; DS is a graduated disk serving to measure the angles through which the apparatus oscillates. To this the friction disk is rigidly attached hanging in a vessel of water. The friction disks were from 4°7 to 77 inehes diameter, and they generally made one oscillation in from 20 to 30 seconds, through angles varying from 360° to 6°. When the velocity of the circumference of the disk was less than 6 inches per second, the resistance was sensibly proportional to the velocity.

Beaufoy's Experiments.—Towards the end of the last century Colonel Beaufoy made an immense mass of experiments on the resist- ance of bodies moved through water (Nautical and Hydraulic Experiments, London, 1834). Of these the only ones directly bearing on surface friction were some made in 1796 and 1798. Smooth painted planks were drawn through water and the resistance measured. For two planks differing in area by 46 square feet, at a velocity of 10 feet per second, the difference of resistance, measured on the difference of area, was 0°339 Ib per square foot. Also the resistance varied as the 1'949th power of thie velocity.

66. Mr Froude's Experiments.—The most important direct ex- periments on fluid friction at ordinary velocities are those made by Mr Froude at Torquay. The method adopted in these experiments was to tow a board in a still water canal, the velocity and the resist- anee being registered by very ingenious recording arrangements. The general arrangement of the apparatus is shown in fig. 79. AA is the board the resistance of which is to be determined. B is a cut- water giving a fine entrance to the plane surfaces of the board. CC is a bar to which the board AA is attached, and which is suspended by a parallel motion from a carriage running on rails above the still water canal. G isa link by which the resistance of the board is transmitted toa spiral spring H. A bar I rigidly connects the other end of the spring to the carriage. The dotted lines K, L indicate the position of a couple of levers by which the extension of the spring is eaused to move a pen M, which records the extensions on a greatly increased scale, by a line drawn on the paper cylinder N. This cylinder revolves at a speed proportionate to that of the carriage, its motion being obtained from the axle of the carriage wheels. A second pen O, receiving jerks at every second and a quarter from a clock P, records time on the paper cylinder. The scale for the line of resistance is ascertained by stretching the spiral spring by known weights. The boards used for the experiment were 3g inch thick, 19 inches deep, aud from 1 to 50 feet in length, cutwater included. A lead keel counteracted the buoyancy of the board. The boards were covered with various substances, such as paint, varnish, Hay's composition, tinfoil, &e., so as to try the effect of different degrees

(3) The average resistance per square foot of surface was much greater for short than for long boards ; or, what is the same thing, the resistance per square foot at the forward part of the board was greater than the friction per square foot of portions nore stern-

ward. Thus : Mean Resistance in

P ib per sq. ft. Varnished surface…....:....0. 2 ft. long 0°41 Da & 0°25 Fine sand surface .. .. 2), 0°81 Mi 0°405

This remarkable result is explained thus by Mr Froude :— "The portion of surface that goes first in the line of motion, in experiencing resistance from the water, must in turn communicate motion to the water, in the direction in which it is itself travelling. Consequently the portion of surface which succeeds the first will be rubbing, not against stationary water, but against water partially moving in its own direction, and cannot therefore experience so much resistance from it."

67. The following table gives a general statement of Mr Froude's results. In all the experiments in this table, the beards had a fine cutwater and a fine stern end or run, so that the resistance was entirely due to the surface. The table gives the resistances per square foot in pounds, at the standard speed of 600 feet per minute, and the power of the speed to which the friction is proportional, so that the resistance at other speeds is easily calculated.

Length of Surface, or distance from Cutwater, In feet.

20 feet. 50 feet.

**41| 390] 1°85) °*

WATHIBN 00 scnsneseoes

Paraffin | .., | °88| +870) 1°94] –

*Chih re 19-16] 30] -295] 1:99] « . Waligol a ttccttins cies? 1:93] 87] 725] 1:92} – *531| 447) 1°87] -474] ° Fine sand ……00 | 9:00} °81] 690} 2°00} – "480 °384| 2-06! +405] °337*

**584| 465] 2°00 +488) °*

588) 490) .

Columns A give the power of the speed to which the resistance is approximately

roportional. (ater B give the mean resistance per square foot of the whole surface of a

board of the lengths stated in the table. Columns C give the resistanee in pounds of a square foot of surface at the dis-

tance sternward from the eutwater stated in the heading.

Although these experiments do not directly deal with sur- faces of greater length than 50 feet, they indicate what would be the resistances of longer sur- faces. For at 50 feet the de- crease of resistance for an increase of length is so small that it will make no very great difference in the estimate of the frietion whether we suppose it to continue to diminish at the same rate or not to diminish at

all, For a varnished surface the friction at 10 feet per second

Fig. 79. The results obtained by Mr Froude may be summarized as follows : — (1) The friction per square foot of surface varies very greatly for different surfaces, being generally greater as the sensible roughness

of roughness of surface.

of the surface is greater. Thus, when the surface of the board was covered as mentioned below, the resistance for boards 50 feet long, at 10 feet per second, was—

MPOMOTNOP VOINIBN ..... 00. ...ccece see serene 0:25 tb per sq. ft. ES Fc icc ben BGK us «Aha nensenoveoit O47, 3 nee ee ne 0:405 ,, ”

0°488 ,, ne

; For other surfaces ,, ts gree With boards 50 feet long, For varnish or tinfoil the resistance varied as v8 For sand y2-00

a? 2 39

diminishes from 0°41 to 0°32 Ib per square foot when the length is increased from 2 to 8 feet, but it only diminishes

If the decrease of friction sternwards is due to the genera- tion of a current accompanying the moving plane, there is not at first sight any reason why

the decrease should not be greater than that shown by the experiments. The current accompanying the board might be assumed to gain in volume and velocity sternwards, till the velocity was nearly the same as that of the moving plane and the friction per square foot nearly zero. That this does not happen appears to be due to the mixing up‘of the current with the still water surrounding it. Part of the water in contact with the board at any point, and receiving energy of motion from it, passes afterwards to distant regions of still water, and portions of still water are fed in to- wards the board to take its place. In the forward part of the board more kinetic energy is given to the current than is diffused into sur- rounding space, and the current gains in velocity. At a greater distance back there is an approximate balance between the energy communicated to the water and that diffused. The velocity of the eurrent accompanying the board becomes constant or nearly con- stant, and the friction per square foot is tlirefore nearly constant also.

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VIII. STEADY FLOW OF WATER IN PIPES OF UNIFORM SECTION.

68. The ordixtary theory of the flow of water in pipes, on which all practical formule are based, assumes that the variation of velocity at different points of any cross section may be neglected. The water is considered as moving in plane layers, which are driven through the pipe against the frictional resistance, by the difference of pressure at or elevation of the ends of the pipe. If the motion is steady the velocity at each cross section remains the same from moment to moment, and if the cross sectional area is constant the velocity at all sections must be the same. Hence the motion is uniform. The most important resistance to the motion of the water is the surface friction of the pipe, and it is convenient to estimate this independently of some smaller resistances which will be accounted for presently.

In any portion of a uniform pipe, excluding for the present the ends of the pipe, the water enters and leaves at the same velocity. For that portion therefore the work of the external forces and of the surface friction must be equal. ee Let fig. 80 repre- ie eo sent a very short = portion of the pipe, of length di, be- tween cross sec- tions at z and z+dz feet above any horizontal da- tum line «xa, the pressures at the cross sections being pand p+dp tb per ; square foot. Fur- Fig. 80. ther, let Q be the volume of flow or discharge of

the pipe per second, © the area of a normal cross section, and x the perimeter of the pipe. The Q cubic feet, which flow through the space considered per second, weigh GQ ip, and fall through a height — dz feet. The work done by gravity is then

—GQdz ; a positive quantity if dz is negative, and vice versa. The resultant pressure parallel to the axis of the pipe is p— (p+dp)= — dp Ib per square foot of the cross section. The work of this pressure on the volume Q is — Qdp.

The only remaining force doing work on the system is the friction against the surface of the pipe. The area of that surface is x di.

The work expended in overcoming the frictional resistance per second is (see § 64, eq. 3)

v3 wet (Gxdlo- ’

i]

1

i}

1

‘

ardZ

‘

or, since Q= 1,

2

—(GXQ” dl; (GXQF di ; the negative sign being taken because the work is done against a

resistance. Adding all these portions of work, and equating the result to zero, since the motion is uniform,—

en 2? — GQdz – Qdp – (GQ a j Dividing by GQ, dp, »x wv dep 4 (% — dl=0. eo atts a 0 Integrating, . Patt VI. 2+ G ir) Bg constant .

Horizontal

~al oy

~-s.. yy hee 2 Geral

a

i ee

44----2

CF rey ——.

Fig. 81.

iat Let A and B (fig. 81) be any two sections of the pipes for which p, z, 2 have the valucs p,, %, 4, and pq, %, J, respectively.

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[WYDRAULICS. vy 2 Then m+ Pe (Xe wo ate ty a or, if 2,- 2,=L, rearranging the terms, js PL Po o ent (at e)-(at 8) ”

Suppose pressure columns introduced at A and B. The water will rise in those columns to the heights A and fe due to the

% +2) +2 is the quantity represented in the figure by DE, the fall of level of the pressure columns, or virtual fall of the pipe. If there were no friction in the pipe, then by Bernoulli’s equation there would be no fall of level of the pressure columns, the velocity being the same at Aand B. Hence DE or & is the head lost in friction in

the distance AB. The quantity a OB

AB OL of the pipe or virtual fall per foot of length. It is sometimes termed very conveniently the relative fall. It will be denoted by tle symbol 7.

The quantity © which appears in many hydraulic equations is

pressures p, and p, at A and B. Hence

is termed the virtual slope

oye the hydraulic mean radius of the pipe. It will be denoted m. Introducing these values, ¢ jae a = mi 2% L . For pipes of circular section, and diameter d,

(3).

79

“a

—. = —

eS ae 4

oo. @ he : Sie i ae a a a (4);

aie nae &. . (4a);

uy

Og ’ which shows that the head lost in friction is proportional to the head due to the velocity, and is found by multiplying that head by

the coefficient (= ,

70. Hydraulic Gradient or Line of Virtual Slope.—Join CD. Since the head lost in friction is proportional to L, any intermediate ressure column between A aud B will have its free surface on the ee CD, and the vertical

distance between CD and the pipe at any point measures the pressure, exclusive of atmos heric pressure, in the pipe at that point. If the pipe were laid along the line CD instead of AB, the water would flow at the same velocity by gravit without any change of pressure from section tosection. Hence C is termed the virtual slope or hydraulic gradient of the pipe. It is the line of free surface level for each point of the pipe

If an ordinary pipe, connecting reservoirs open to the air, rises at any point above the line of virtual slope, the pressure at that point is less than the atmospheric aan transmitted through the pipe. At such a point there is a liability that air may be disengaged,from the water, and the flow stopped or impeded by the accumulation of air. If the pipe rises more than 34 fect above the line of virtual slope, the pressure is negative. But as this is impossible, the con- tinuity of the flow will be broken. ;

If the pipe is not straight, the line of virtual slope becomes a curved line, but since in actual pipes the vertical alterations of level are generally small, compared with the length of the pipe, distances measured along the pipe are sensibly proportional to distances measured along the horizontal projection of the pipe. Hence the line of hydraulic gradient may be taken to be a straight line without error of practical importance.

a

Then

or

Fig. 82.

71. Case of a Uniform Pipe connecting two Reservoirs, when all the Resistances are taken into account.—Let h (fig.:82) be the difference of level of the reservoirs, and v the velocity, in a pipe of length L and diameter d. The whole work done per second is virtually the removal of Q cubic feet of water from the surface of the upper

reservoir to the surface of the lower reservoir, that is GQh foot-pounds. This is expended in three ways. (1) The head 7 » corresponding

2 s . to an expenditure of GQe foot-pounds of work, is employed in giving

energy of motion to the water. This is ultimately wasted in eddying motions in the lower reservoir. (2) A portion of head,

v which experience shows may be expressed in the form 6099 » corre-

2

sponding to an expenditure of GQ foot-pounds of work, is em-

ployed in overcoming the resistance at the entrance to the pipe. (3) As already shown the head expended in overcoming the surface fric-

2

, ean tle ; ay tion of the pipe is ¢5 og corresponding to GQ¢-+- « og foot-pounds of work. Hence

2 2 4L 4 GQh=GQT. + GQ. 5+ GO = ae 4L,\v? pie eee, (1 6+0T i (5) hd

v= 8025 (1+ G)d+4CL °

If the pipe is bellmouthed, ¢, is about = ‘08. the pipe is cylindrical, ¢,=0°505.

If the entrance to Hence 1+¢,=1°08 to 1°505.

In general this is so small compared with ¢ = that, for practical calculations, it may be neglected; that is, the losses of head other than the loss in surface friction are left out of the reckoning. It is only in short pipes and at high velocities that it is necessary to take account of the first two terms in the bracket, as well as the

third. For instance, in pipes for the supply of turbines, v is usually |

limited to 2 feet per second, and the pipe is bellmouthed. Then 1°08-—= 0067 foot.

29 2

2 to 4% feet per second, and then 15 =0‘1 to 0°5 foot. In

either case this amount of head is small compared with the whole virtual fall in the cases which most commonly occur.

When d and v ord and hare given, the equations above are solved quite simply. When vandh are given and d is required, it is better

In pipes for towns’ supply » may range from

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to proceed by approximation. -Find an approximate value of d by

assuming a probable value for ¢ as mentioned below. Then from

that value of d find a corrected value for ¢ and repeat the calculation. The equation above may be put in the form

alter oea 0) h a 4¢ +L 29 ,° (F from which it is clear that the head expended at the mouthpiece is equivalent to that of a length

(1+ ())d 4¢

of the pipe. Putting 1+¢,=1°505 and ¢=0°01, the length of pipe equivalent to the mouthpiece is 37°6d nearly. This may be added to the actual length of the pipe to allow for mouthpiece resistance in approximate calculations.

72. Coefficient of Friction for Pipes Discharging Water—From the average of a large number of experiments, the value of ¢ for ordinary

iron pipes is ¢=0°‘007567 . (7).

But practical experience shows that no single value can be taken applicable to very different cases. The earlier hydraulicians occupied themselves chiefly with the dependence of ¢ on the velocity. Hav- ing regard to the difference of the law of resistance at very low and . ordinary velocities, they assumed that ¢ might be expressed in the orm

B

Ps .

(=a+

The following are the best numerical values obtained for ¢ so ex- pressed :—

a B 0:006836 0°001116

0:00673 0°001211 0°005493 0°00143

Prony (from 51 experiments)

D'Aubuisson Eytelwein

Weisbach proposed the formula

B 0004289 = ¢-+—= = 0'003598 + —__—__ 8). ¢ art + a (8)

The following short table gives Weisbach's values of the coefficient of friction for different velocities in feet per second :—

73. Darcy's Experiments.—All previous experiments on the re- sistance of pipes have been siaeieoct bd by the remarkable researches carried out by the late Inspector-General of the Paris Water Works, M. Darcy. His experiments were carried out on a scale, under a variation of conditions, and with a degree of accuracy which leaves little to be desired, and the results obtained are of very great prac- tical importance. These results may be stated thus :—

(1) For new and clean pipes the friction varies considerably with the nature and polish of the surface of the pipe. For clean cast- iron it is about 14 times as great as for cast-iron covered with pitch.

(2) The nature of the surface has less influence when the pipes are old and incrusted with deposits, due to the action of the water. Thus old and incrusted pipes give twice as great a frictional resist- ance as new and clean pipes. M. Darcy's coefficients were chiefly determined from experiments on new pipes. He doubles these co- efficients for old and incrusted pipes, in accordance with the results of a very limited number of experiments on pipes containing incrus- tations and deposits.

(3) The coefficient of friction may be expressed in the form

¢ mean'. but in pipes which have been some time in use it ig ' P

sufliciently accurate to take (=a, simply, where a, depends on the diameter of the pipe alone, but a and § on the other hand depend both on the diameter of the pipe and the nature of its surface. The following are the values of the constants.

For pipes which have been some time in nse, neglecting the term depending on the velocity ;

(=a(ie 4) (9).

Yor drawn wrought-iron or smooth

cast-iron pipes 004973

00996

These coefficients may be put in the following very simple form, without sensibly altering their value :—

Porccloananypess cicwscsivivies….cceeebes (= '006(i +753) 12d (9a) For slightly incrusted pipes…..... ¢ 01 1 ao)

Darcy's Value of the Coefficient of Friction ¢ for Velocities not less than 4 inches per second.

Hl one .f Incrusted ipsam Pa apo 5 Bite Pipes. 2 0°00750 0°01500 18 00528 '01056 3 '00667 '013833 21 "00524 '01048 4 00625 '01250 24 00521 01042 5 '00600 '01200 a '00519 '01037 6 '00583 '01167 30 00517 01033 7 '00571 011438 36 '00514 '01028

8 00563 01125 42 00512 "01024

9 00556 01111 48 '00510 '01021 12 00542 01083 54 '00509 '01019 15 005383 '01067

These values of (are, however, only applicable when the velocity exceeds 4 inches per second. To embrace all cases Darcy proposes the expression

Bi

jae, 2) ee ies

. (10);

a v

which is a modification of Coulomb's, including terms expressing the influence of the diameter and of the velocity. For clean pipes Darcy found these valucs

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a =°001262 a, = 000833 B =°00206

B, = 00001042

74. Scraping Water Mains.—The influence of the condition of the surface of a pipe on the friction is shown by various facts known to the engineers of waterworks. Pipes are very often heated and dipped in pitch, which gives them a smooth hard surface and protects them from oxidation. Such pipes are known to give a discharge larger than that calculated by the ordinary

formule. In pipes which convey certain kinds of water oxidation proceeds rapidly, and the discharge is very perceptibly and sometimes very greatly diminished. In a main laidat Torquay the discharge diminished from this cause more than 50 per cent., and the supply became insufficient for the town. Mr Appold suggested an reper for scraping the interior of the pipe, and this was constructe and tried under the direction of Mr Froude. It was found that by scraping the interior of the pipe the discharge was increased 56 per cent. The ep ed requires to be repeated at intervals. After each scraping the discharge dimin- ishes rather rapidly by 10 per cent. and afterwards more slowly, the diminution in a year being about 25 per cent.

Fig. 83 shows a scraper for water mains, similar to Mr Appold's but modified in details, as constructed by the Glenfield Company, at Kilmarnock. A isa longitudinal section of the pipe, showing the B is an end view of the plungers, and C, D sec-

the main for introducing or

CITA | BIACEZZ

Z=

Fig. 83.—Scale 75.

spindle of these plungers are fixed eight steel scraping blades, with curved scraping edges fitting the surface of the main. The appa- ratus is placed in the main by removing the cover from one of the boxes shown at C, D. 'The cover is then replaced, water pressure is admitted behind the plungers, and the apparatus driven through

the main. At Lancaster, after twice scraping the discharge was increased 564 per cent., at Oswestry 544 per cent. The increased discharge is due to the diminution of the friction of the pipe by re- moving the roughnesses due to oxidation.

75. Reduction of a long Pipe of Varying Diameter to an Equiva- lent Pipe of Uniform Diameter. Dupuit's Equation.—Water mains for the supply of towns often consist of a series of lengths, the dia- meter being the same for

each length, but differing from length to length. In approximate calculations of the head lost in such mains, it is generally accurate enough to neglect the smaller losses of head and to have regard to the pipe friction only, and then the calcula- tions may be facilitated by reducing the main to a main of uniform diameter, in which there would be the same loss of head, Sucha uniform main will be termed an equivalent main.

oe ly----- so l2------- dfe———nalg a Le I ae eee A da 9 a yea i i ee eee le OM. 4 ‘ 1 B “a Fig. 84.

main of variable diameter, and B the

In fig. 84, let A be the } In the given main of variable diameter

equivalent uniform main.

A, let l,, I, .. be the lengths, di 5 Gy . the diameters, V1, Ug +... the velocities,

the slopes,

45 tage ees

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for the successive portions, and let J, d, v, and ¢ be corresponding quantities for the equivalent uniform main B. The total loss of head in A due to friction is = tl, + Iylg+ _ ott th 2g dy and in the uniform main

[wYDRAULICS.

2g Ea

If the mains are equivalent, as defined above, vo 41 vy 41, V7 41, 6o7 ad ioe eget oY ote

But, since the discharge is the same for all portions,

Tv w Tv F Pum Fry Tasty— os ses Cla a bynes 3 Vg = de by 1 ny os

Also suppose that ¢ may be treated as constant for all the pipes. Then

i @a 4 a*

*dds d, * dt' dy Oy G) cegetonaget ch ae a d d,8 gtr) sites sy «RAR*

which gives the length of the equi- valent uniform main which would have the same total loss of head for any given discharge.

76. Case of a Pipe of Uniform Diameter with Discharge diminishing uniformly along its Length.—In the case of a branch main the water is delivered at nearly equal distances te service pipes along the route. Such a main approximates to the case of a main of uniform diameter, with a discharge at each point diminished by an amount proportional to the distance from the origin. Let AB (fig. 85) be a main of diameter d and length L ; let Qo cubic feet per second enter at A, and let q cubic feet be delivered to service pipes per foot of its length. Then at any point C, J feet from A, the discharge is

Q=Q,-ql. Consider a short length di atc. The loss of head in that length is wt ddl_, Q? ddl gy eQrdl_ 64¢ j (ga $a a ee ee

16

Hence the whole head lost in the length AB will be 64¢

L te Sie A om air = SE gt aQol + 4g'L? fs (1)5

or, putting P=gL, the total discharge through the service pipes between A and B,

*64¢L i= SAC | Qt PQ)+4P*f (2) The discharge at the Cc end B of the pipe is 4_1j rT | B noha is put for the dis- 1«----------: de etee take ™ charge of the pipe i<---------- Ae sh when the flow into : Fic. 85 the service pipes is ' wer te ' stopped, under the same head fA, it may be shown that Q,=Q' 0°55P nearly If the pipe is so long that Qi=Q P-0, all the water passing into service pipes en route, 1 64¢L ~3 wd? Q. (3). "". Other Losses*

of Head in Pipes. —Most of the losses of head in pipes, other than that due to surface friction against the pipe, are due

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to abrupt changes in the velocity of the stream: produciug eddies, – The kinetic energy of these is deducted from the general energy of translation, and practically wasted.

Sudden Enlargement of Sec-

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tion. Suppose a pipe enlarges 7? = “ &

in section from an area wy to an d, > ——- |

area w, (fig. 86); then A120 ; genres eees Vy Wy

or, if the section is circular,

12 {1°38 [14 415

Abrupt Contraction of Section.—When water passes from a larger to a smaller section, as in figs. 87, 88, a contraction is formed, and

SS = SEN eee ames crc = === ——= —— 4 , —

Fig. 87. Fig. 88.

the contracted stream abruptly expands to fill the section of the pipe. Let w be the section and v the velocity of the stream at bd.

At aa the section will be c.w, and the velocity = ve, where ¢ is aw]

the coefficient of contraction. Then the head lost is Vv (2 zo 2 2 . 29 Ce 2g and, if c, is taken 0°64, : a re

(2).

The value of the coefficient of contraction for this case is, however, not well ascertained, and the result is somewhat modified by fric- tion. For water entering a cylindrical, not bellmouthed, pipe from a reservoir of indefinitely large size, experiment gives

2

=(° 5 Ce : 3) ° H.=0°505 5 oO) If there is adiaphragm at the mouth of the pipe as in fig. 88, let w, be the area of this orifice. Then the area of the contracted stream is ¢,w,, and the head lost is

. 2 v2 b.- (<< ;) 2g

2

if ¢, is put for (-= -1). % Cow,

Weisbach has found experimentally the following values of the coefficient, when the stream approaching the orifice was consider- ably larger than the orifice :—

(4)

When a diaphragm was placed in a tube of uniform section (fig. 89),

ee Re ee ee

Fig. 89.

the following values were obtained, w, being the area of the orifice, and w that of the pipe :—

1°05 {| 1°10 | 1°14 | 1°18 | 1°22 | 1°26 | 1°30 | 1°34 | 1°38 | 1°41 | 1°58 | 1°73 | 1-87 | 2-00

CHANICS

(4 :

% \h)° The head lost at the abrupt change of velocity has already been

shown to be the head due to the relative velocity of the two parts of the stream. Hence head lost

487

*— (%- 1)” (=) o,? dy \2 *y? . 2g Wo : 2g (2) zs 2g ; o? or Dem Gear kt Be we (1), if ¢. is put for the expression in brackets. 50 | 60 | 70 | 8°0 2°24} 2°45) 2°65] 2°83 “81 | 1°00 | 2°25 | 4:00 | 6°25 | 9:00 | 16-00 | 25-00 | 36-0 | 49°0*

Elbows.—Weisbach considers the loss of head

el 90) to be due to a ines ba contraction formed by the stream. From experiments with a pipe 1} inches dia- meter, he found the loss of head y? ben G5

cone)3

¢=0°9457 sin? § 42-047 sint :

~

‘ x 40° | 60° j 80° 120° | 130°, 0°139 | 0°364 | 0°740 1‘861 | 2°158 | 2°431

Hence at a right-angled elbow the whole head due to the velocity very nearly is lost.

Bends.—Weisbach traces the loss of head at curved bends to a similar cause to that at elbows, but the coefficients for bends are not very satisfactorily ascertained. Weisbach obtained for the loss of head at a bend in a pipe of circular section

90° 0984 | 1260 | 1°556

0-046

*vy / ho = & 2g ° . . . . * ° * . ° (6) ’*

d\i G=0°181 +1 87 (5)

where d is the diameter of the pipe and p the radius of curvature of the bend. For bends with rectangular cross sections

G=0°12443°104 (z)' , 2p

where s is the length of the side of the section parallel to the radius of curvature p.

09 | 1:0 977 | 1-408 | 1:978

0°6

643

0°9 2°271 | 3°228

Valves, Cocks, and Slwices.—These produce a contraction of the water-stream, similar to that for an abrupt diminution of section already discussed. The loss of head may be taken as before to be

vy , Yo= Cv 3g (7);

where v is the velocity in the pipe beyond the valve and ¢ a coefficient determined by ex-

periment. The following are Weisbach's re- — sults, Fig. 91. Sluice in Pipe of Rectangular Section (fig. 91). Section at

sluice=w, in pipe=o.

4

Sluice in Cylindrical Pipe (fig. 92).

For pipes not less than 1, or more than 4 feet in diameter, the mean values of ¢ are

opening 1 di} i For new pipes …...:eccceeeeeee cree seeeeeeees 0°00526

meter of pipe For incrusted pipes ….....scecessceseessseeens 0°01052.

*ot 1-00 | 0948 | -856 | 740 | *609 | ° ; “159 Using these values we get the very simple expressions— go= 0-00 | 0:07 | 0-26 | 0°81 | 2°06 | 5°52 97°8*

vy =55°31V di for new pipes (4a).

=39°11/di for incrusted pipes Within the limits stated, these are accurate enough for practical

purposes, especially as the precise value of the coe cient ¢ cannot be known for each special case.

Fig. 92. Fig. 93.

Cock in a Cylindrical Pipe (fig. 98). Angle through which cock is turned = 6.

=

Ratio of cross sec- tions…

o=

=

Ratio of cross sec- tions…

w=

25° 2°51

30° | 35° | 40°

10°8

1°54 3°91 | 6°22

18°7 | 32°6

78, Practical Calculations on the Flow of Water in Pipes.—In

the following explanations 7 it will be assumed that the ote pipe is of so great a length that only the loss of head ~~ in friction against the sur~~ face of the pipe needs to be considered. In general it is one of the four quan- tities d, 7, v, or Q which Fic. 94 requires to be determined. » oo For since the loss of head h is given by the relation h=7l, this need not be separately considered.*

There are then three equations (see eq. 4, § 69, and 9a, § 78) for the solution of such problems as arise :—

(=a(1+ isi)

where a=0°005 for new and =0°01 for incrusted pipes. ek (2) a Vee an ;

(1);

QaGdy. . . se ss

Problem 1. Given the diameter of the pipe and its virtual slope, to find the discharge and velocity of flow. Here d@ and 7 are given, and Q and v are required. Find ¢ from (1); then v from (2) ; lastly Q from (3). This case presents no difficulty.

By combining equations (1) and (2), ¥ is obtained directly :—

o- [Bai [Z,J , a ee GE

1

os 1+ tog For new pipes I 56-72 2a, For incrusted pipes = 80°24

to find the virtual slope and discharge. This also presents no special difficulty.

to find the virtual slope and velocity.

Problem 2. Given the diameter of a pipe and the velocity of flow, The discharge is given by (3); the proper value of ¢ by (1); and the virtual slope by (2).

Problem 3. Given the diameter of the pipe and the discharge, Find v from, (8); ¢ from If we combine (1) and (2) we get

v4 1 \v?

(io. s ee che ¢ 3 oe ee ae Se 2a(1 + 753) ga (5) 5 and, taking the mean values of ¢ for pipes from 1 to 4 feet diameter, given above, the approximate formule are

2

4=0°0008268 =. for new pipes }

(1) ; lastly 2 from (2).

. (5a). = 0°0006586 for incrusted pipes

Problem 4. Given the virtual slope and the velocity, to find the diameter of the pipe and the apenas: The diameter is obtained from equations (2) and (1), which give the quadratic expression

ag 20. gu

Sp dah' av ae ts & 6 ae M{(G(@te)i Qav? 1 gf if

2

= 0-00081 "- +083 for new pipes

d= (6a)

2

= 0°00062 = + 083 for incrusted pipes

are sufficiently accurate.

Problem 5. Given the virtual slope and the discharge, to find the diameter of the pipe and velocity of flow. This case, which often occurs in designing, is the one which is least easy of direct solution. From equations (2) and (3) we get—

pee Th gn4

If now the value of (in (1)is introduced, the equation becomes very cumbrous. Various approximate methods of meeting the difficulty may be used. : ;

(a) Taking the mean values of ¢ given above for pipes of 1 to 4 feet diameter we get

5 135¢ © [QS am [6 Pe ie 2 hook sae

5 /Q3 h =0°2216 oP for new pipes

2

=0‘2541 aff “for incrusted pipes ; u

equations which are interesting as showing that when the value of (is doubled the diameter of pipe for a given discharge 1s only in- creased by 13 per cent. ; :

(b) A second method is to obtain a rough value of d by assuming

(=a. This value is

*san |S 5 2 6 een BY */ anos o/s p/s- gut 4*

Then a very approximate value of ¢ is

- me ° ¢ a 1 + Jog” ;

and a revised value of d, not sensibly differing from the exact

*value, is , 7 a »_ * fe “Fe — oasis, /2./ ¢ ‘ a grt v*

(c) Equation 7 may be put in the form 1

*Ses nige e, 1 _ */82aQ? *.. .« ee ae! oa (1 + 55a)*

HYDREROM EF

HYDRAULICS. | Expanding the term in brackets,

1

S il i € e: Bal =” “Segoe Neglecting the terms after the second, 5/32a 5/Q? 1 a@= —er — — gm Ys i (a sca) _ %/32a 57Q2

gm A/ 7 +0°01667

(9a) ;

5 1320

“ =0°219 for new pipes*

ow

= 0252 for incrusted pipes.

and

79. Arrangement of a Pipe Network for Town’s Supply.—Exclud- ing the service pipes which directly supply the houses, the smallest branch water mains are made 3 to 4 inehes in diameter. For the smallest districts supplied, these are sufficient or more than sufficient to convey the neces-

sary supply, and in B R A 2 that ease the only

question arising is, to A

lay them out so that

their total length is

as small as possible. Fig. 95.

Thus if there are two places of consumption A and B there is choice of any of the three arrangements shown in fig 95, the prin- cipal main being shown by the dark line, and the branch mains by the thinner ones. If, however, the supply through the branch mains requires pipes of more than the minimum diameter, then the eondition to be fulfilled is that the sum of the products of the lengths ps aa meters shou ea WH Yi? minimum, because | H

the cost of the mains | when laid in place | P is very approximate- 7 | : ly proportional to 4 a their length and

diameter. Y

For a main de- Y //

livering water to i a ¥A

branch mains on Yj each side, the best . Whos position is that 6

whieh makes the ; branch mains of Fig. 96. equal diameter. Suppose water is to be supplied from an inter- mediate main along branch mains to a and b (fig. 96). Let Qu, Qs be the quantities to be delivered at a and b, and hq, hs the virtual

Fig.

between 14 and 43 feet per second. Occasionally the velocity in pipes reaches 10 feet per second, and in hydraulic machinery work- ing under enormous pressures even 20 feet per second. Usually the velocity diminishes along the main as the discharge diminishes, so as to reduee somewhat the total)loss of head which is liable to render the pressure insufficient at the end of the main. Mr Fanning gives the following

velocities as suitable in pipes for towns' supply :— Diameter in inches…..... 4 8 32 18 24 30 36 Velocity in feet per ser….2°5 3:0 35 45 5:3 62 7:0 80. Branched Pipe connecting Reservoirs at Different Levels,—Let A, B, C (fig. 98) be three reservoirs connected by the arrangement of 1pes shown,—A,, dh, Q1, V3 Lo, de, Qos Ye 5 ls, ds, Q;, Us being the ength, diameter, discharge, and velocity in the threc portions of

fall of the two branch mains, Then, according to Dupuit, the best position for the intersection M is that for which

or, if the consumption of water occurs uniformly throughout the length of the branch mains, then

Ja 9 /¥s

bs De In this way various points MN may be determined giving the position AMN for the niain, and afterwards the nearest convenient position ABC may be fixed.

In determining the consumption of water Q for any given locality,

the mode of supply must be taken into account. On the inter- mittent system, water is supplied for a period of ¢ seconds daily.

a

Then the discharge per second is , where N is the number of

inhabitants, and Qa the daily supply to each in cubic feet. With a constant supply the rate of flow is variable at different periods of the day, and the maximum rate of flow may be taken at 2°1 times the mean rate. Hence Ze this case the discharge to be provided for 2-1N d 2 7 = Sra ra Tt The daily supply to a district NQua is sometimes taken proportional to the area supplied, sometimes to the length of house frontage in the district.

in the mains is

Determination of the Diameters of Different Parts of a Water Main.

When the plan of the arrangement of mains is determined upon, and the mepelr to each locality and the pressure required is ascer- tained, it remains to determine the diameters of the pipes. Let fig. 97 show an elevation of a main ABCD. , ., R being the reservoir from whieh the supply is derived. Let NN be the datum line of the levelling operations, and H., Hy. . . the heights of the main above the datum line, H, being the height of the water surface in the reservoir from the same datum. Set up next heights AA,, BB,,... representing the minimum pressure height necessary for the adequate supply of each locality. Then A,B,C,D,. . . isaline which should form a lower limit to the line of virtual slope. Then if heights Da, Ho, he. . . are taken representing the actual losses of head in each length Ja, , 7, .. . of the main, AjBoC, will be the line of virtual slope, and it will be obvious at what points such as D, and Ky, the pressure is deficient, and a different choice of diameter of main is required. For any point z in the length of the main, we have Pressure height =H, — Hz – (§a+}s+ h.).

Where no other cireumstance limits the loss of head to be

assigned to a given length of main, a consideration of the safety of

the main from fracture by hydraulic shock leads to a limitation of the velocity of flow. Generally the velocity in water mains lies

----~

iD Sid SE ere i ae SR possi conidacsssactsarscaesenas

97.

the main pipe. Suppose the dimensions and positions of the pipes known and the discharges required.

If a pressure column is introduced at X, the water will rise to a height XR, measuring the pressure at X, and aR, Rd, Re will be the lines of virtual slope. If the free surface level at R is above b, the reservoir A supplies B

and ©, and if R is below , A and B supply C. Consequently there are three cases :—

I. Rabove d; Q)=Q,+Q;. IT. R level with 6; Q,=Q;; Ill. R below b; Q,+Q.=Qs.

To determine which case has to be dealt with in the given condi- tions, suppose the pipe from X to B closed by a sluice. Then there is a simple main, and the height of free surface h' at X can be deter- mined. For this condition

XII. — 62

b= 0.

490

1 Oe, hy 820% , hag-hW'= 2g d, gwd ? vg? Aly _82¢QMs

*h —he=€ og * a, gn'd®*

where Q! is the common discharge of the two portions of the pipe. Hence

fin =e Tyehg®

jhe Ugh®'

from which h' is easily obtained. If then h' is greater than hd, opening the sluice between X and B will allow flow towards B, and the case in hand is case I. If h' is less than 4», opening the sluice will allow flow from B, and the case is case III. If h' =hp, the case is case II., and is already completely solved.

The true value of A must lie between h' and hp. value of h, and recalculate Q,, Qa Q;. Then if

Choose a new

QQ, + Qs in case L., or Q, + Q.>Q, in case III,

the value chosen for / is too small, and a new value must be chosen If

Q) IIL.,

the value of h is too great. Since the limits between which / can vary are in practical cases not very distant, itis easy to approximate to values sufficiently accurate.

1X. FLOW OF COMPRESSIBLE FLUIDS IN PIPES.

81. Flow of Air in Long,Pipes.1—When air flows through a long pipe, by far the greater part of the work expended is used in over- coming frictional resistances due to the surface of the pipe. The work expended in friction generates heat, which for the most part must be developed in and given back to the air. Some heat may be transmitted through the sides of the pipe to surrounding materials, but in experiments hitherto made the amount so con- ducted away appears to be very small, and if no heat is transmitted the air,in the tube must remain sensibly at the same temperature during expansion. In other words, the expansion may be regarded as isothermal expansion, the heat generated by friction exactly neutralizing the cooling due to the work done. Experiments on the pneumatic tubes used for the transmission of messages, by Messrs Culley & Sabine, show that the change of temperature of the air flowing along the tube is much less than it would be in adiabatic expansion. ;

82. Differential Equation of the Steady Motion of Air Flowing in a Long Pipe of Uniform Section.—When air expands at afconstant absolute temperature 7, the relation between the pressure p in pounds per sqnare foot and the density or weight per cubic foot G is given by the equation

=CT

(1),

where e+53°15. Taking 7=521, corresponding to a temperature of 60° Fahr.,

als

er = 27690 foot-pounds . (2). The equation of continuity, which expresscs the condition that in steady motion the same weight of fluid, W, must pass through each cross section of the stream in the unit of time, is Gou=W-=constant . (3), where © is the section of the pipe and'w the velocity of the air. Combining (1) and (3),

= ct = constant

at (8a).

oe eee ee ine investigation was first givén in the Proc, Inst. of Civil Engineers, vol.

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[HYDRAULICS.

Since the work done by gravity on the air during its flow through a pipe due to variations of its level is generally small compared with the work done by changes of pressure, the former may in many cases be neglected.

Consider a short length dl of the pipe limited by sections A,, A, at a distance dl (fig. 99). Let p, u be the pressure and velocity at Ay, pt+dp and Fic, 99 w+du those at Ay. Fur- Pe ther, suppose that in a very short time dt the mass of air between AyA, comes to AgA; so that A,Aj=udt and A,Aj=(w+du)dt. Let © be the section, and the hydraulic mean radius of the pipe, and W the weight of air flowing through the pipe per second.

From the steadiness of the motion the weight of air between the sections A,Aj, and A,A; is the same. That is,

Wadi=Goudt=Ga(u+du)dt. By analogy with liquids

the head lost in friction is, for the length di (see § 69,

= a a a

s

i

1

1

i}

{

‘

a

~~

v

‘ 1 ‘ ‘

| |

‘ ! ! ‘ ‘ ‘

ae

ES °

eq. 3), e i

29 ™ Let Ha . Then the head lost is

Fa ;

and, since Wdé pounds of air flow through the pipe in

am the time considered, the work expended in friction is ~chwat dt. m

The change of kinetic energy in dé seconds is the difference of the kinetic energy of AyAg and A,Aj, that is,

W ag +du)-— wv g 2*

= Tududt=W dHdt .

The work of expansion when Qudt cubic feet of air at a pressure p expand to 2(w+du)dé cubic feet is

a pdudt. But from (3a)

“ap” ap And the work done by expansion is

crW = aat p ip

The work done by gravity on the mass between A) and A, is zero if the pipe is horizontal, and may in other cases be neglected with- out great error. The work of the pressures at the sections AjA, is

pawdt —(p+dp)a(u+du)dt = —(pdu+udp)odt . But from (3a) pu=constant , pdu+udp=0, and the work of the pressures is zero. Adding together the quan-

*tities of work, and equating them to the change of kinetic energy, ceTW lee WdHdt= – as dpdt — i; * aldt*

¢ H dH + ad + (—-dl=0,

Uy Sr dp + C=O hepdee 2 ha ee b a ut Ap’ wv ery and = “9g agp’

dH , 2g0?p

dl Cr ase ay eee i4a). oe tye? + Sm 9)

HYDRAULICS. |

For tubes of uniform section m is constant ; for steady motion W

is constant ; and for isothermal expansion + is constant. Integrat- Ing, 2p? Z ee Wa Oe a A ‘ ; og Met ¢ – constant (5); for Z=0, let H=H, and p=, ; and for i=1, let H=H,, and p=p,. H,, g@ I log Ht Weg = Po) + C7 =0 (5a),

where is the greater pressure and y, the less, and the flow is from A, towards Aj. By replacing W and H,

Cr Z apes = p)+ ie =()*

Hence the initial velocity in the pipe is ger(po” — Py”)

“al ai(caee ee 8)!

When Z is great, log = is comparatively small, and then

:

germ 1? — py”

— ped (2 Po

a very simple and easily used expression. section Hes , where d is the diameter :—

. J St wn oe | ‘ 7 4q0 py? or approximately Py gerd Uy=(1°1319 – 072642) (a . 7c). ss (Dos 4¢7 83. Coefficient of Friction for Air.—A discussion by Professor Unwin of the experiments by Messrs Culley & Sabine on the rate of transmission of light carriers through pneumatic tubes, in which there is steady flow of air not sensibly affected by any resistances other than surface friction, furnished the value ¢= 007. The pipes

were lead pipes, slightly moist, 2} inches (0°187 ft.) in diameter, and in lengths of 2000 to nearly 6000 feet.

Po log —”+ °6 Py

(7a),

For pipes of circular

(7d) ;

Some experiments on the flow of air through cast-iron pipes have

been made by M. Arson. He found the coeflicient of friction to vary with the velocity and diameter of the pipe. Putting

(=< +8. (8),

he obtained the following values—

Diameter of Pipe ¢ for 100 feet in Feet.

per second.

00484

00972 00640 00650 01525 00704 00719 03604 00941 00977 03790 00959 00997 04518 01167 01212

It is worth while to try if these numbers can be expressed in the form proposed by Darcy for water. For a velocity of 100 feet per Pee and without much error for higher velocities, these numbers agree fairly with the formula

3

ua) . (9),

(= 008(1 +

which only differs from Darcy's value for water in that the second term, which is always small except for very small pipes, is larger. Some more recent experiments on a very large scale, by M. Stockalper at the St Gotthard Tunnel, agree better with the value

(=0-0028(1 +793) :

These pipes were probably less rough than M. Arson's.

When the variation of pressure is very small, it is no longer safe to neglect the variation of level of the pipe. For that case we may neglect the work done by expansion, and then

Po

—-—-4}

0 1 Gy Gy precisely equivalent to the equation for the flow of water, z and z being the elevations of the two ends of the pipe above any datum, P, and p, the pressures, G, and G, the densities, and v the mean

velocity in the pipe. This equation may be used for the flow of coal gas,

(10),

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84. Distribution of Pressure ina Pipe in which Air is Flowing.— From equation (7a) it results that the pressure p, at J feet from that end of the pipe where the pressure is 9, is

pap s/ jr – See}.

(12);

mger which is of the form

p=Nal+b for any given pipe with given end pressures. The curve of free sur- face level for the pipe is, thercfore, a parabola with horizontal axis. Fig. 100 shows calculated curves of pressure for two of Mr Sabine's

30-00

Fig. 100.

experiments, in one of which the pressure was greater than atmo- spheric pressure, and in the other less.than atmospheric pressure. The observed pressures are given in brackets and the calculated pressures without brackets. 'The pipe was the pneumatic tube be- tween Fenchurch Street and

the Central Station, 2818 yards in length. The pressures are given in inches of mercury.

Variation of Velocity in the Pipe.—Let yo, tw) be the pressure and velocity at a given section of the pipe ; p, u, the pressure and velocity at any other section, From equation (3a)

.

uu p= we =constant ;

so that, for any given uniform pipe,

U P=UoPo»

Po

tom tig Pe. (12);

‘which gives the velocity at any section in terms of the pressure,

which has already been determined, Fig. 101 gives the velocity

Oo

Fig. 101. curves for the two experiments of Messrs Culley & Sabine, for which the pressure curves have already been drawn. It will be secn that the velocity increases considerably towards that end of the pipo where the pressure is least. «85. Weight of Air Flowing per Second.—The weight of air dis- charged per second is (equation 3a)— w- Ny ; er

From equation (76), for a pipe of circular section and diameter d,

wo ga? ae

mS a Cler (Po py) 5) Oo ng oe , = ‘$1! al Clg Po PY) t- (18).

Approximately pe: W=(-6916p)— -4488p)(#7) . (18a).

86. Application to the Case of Pnewmatie Tubes for the Trans- mission of Messages.—In Paris, Berlin, London, and other towns, it has been found cheaper to transmit messages in pneumatic tubes than to telegraph by electricity. The tubes are laid underground with easy curves ; the messages are made into a roll and placed in

a lisht felt carrier, the resistance of which in the tubes in London is only $oz. Acurrent of air forced into the tube or drawn through it propels the carrier. In most systems the current of air is steady and continuous, and the carriers are introduced or removed without materially altering the flow of air.

Time of Transit through the Tube.—Putting ¢ for the time of

transit from 0 to J, of dl t=-/ —; 0 UU

From (4a) neglecting = and putting mat =

From (1) and (3)

re =

= ‘Po gdp? r “fp, 2CW8cert Ps

gan

= BC Wacky (Po ~ Pr) (14).

But W Polo CT as gder 3 oe 6 Cough Po py); a ght. pd-pi.

(15).

If r=521°, corresponding to 60° F.,

ji oor Be Py

& (p?-v)

which gives the time of transmission in terms of the initial and final pressures and the dimensions of the tube.

. (15a);

Mean Velocity of Transmission.—The mean velocity is 4; or, for

r=521°,

Mean Velocities for Tubes of a length in ft.

/ ad (Po” —p,?)! i Jf Tp pe

(1

The following table gives some results:—

(16).

Absolute Pres- sures in ib per sq. inch.

Pi

1000 | 2000 | 3000

4000 | 5000

Vacuum Working. 99°4 70°3 57°4 67°2 47°5 88°8

Pressure Working. 57°2 | 40°5 | 383°0 74°6 52°7 43°1 84°7 60°0 49°0

49°7 34°4

44°5 30°1

Limiting Velocity in the Pipe when the Pressure at one End is diminished indefinitely. —If in the last equation there be put

p,=9, then ‘a. , =: pleas © ses 0°708 Js ?

where the velocity is independent of the pressure py at the other end, a result which ye must be absurd. Probably for lon, pipes, as for orifices, there is a limit to the ratio of the initial an terminal pressures for which the formula is applicable.

X. FLOW IN RIVERS AND CANALS.

87. Flow of Water in Open Canals and Rivers.—When water flows in a pipe the section at any point is determined by the form of the boundary. When it flows in an open channel with free upper surface, the section depends on the velocity duc to the dynamical conditions,

Suppose water admitted to an unfilled canal. The channel will gradually fill, the section and velocity at each point gradually changing. But if the inflow to the canal at its head is constant, the increase of cross section and diminution of velocity at each point attain after a time a limit. Thenceforward the section and

velocity at each point are constant, and the motion is steady, or per- manent regime is established.

CHANICS

If when the motion is steady the sections of the stream ere all equal, the motion isuniform. By hypothesis, the inflow Ov is con- stant for all sections, and Q is constant ; therefore v must be con- stant also from section to section. The case is then one of uniform steady motion. In most artificial channels the form of section is constant, and the bed has a uniform slope. In that case the motion is uniform, the depth is constant, and the stream surface is parallet to the bed. If when steady motion is established the sections are unequal, the motion is steady motion with varying velocity from section to section. Ordinary rivers are in this condition, especially where the flow is modified by weirs or obstructions. Short unob- structed lengths of a river may be treated as of uniform section without great error, the mean section in the length being put for the actual sections.

In all actual streams the different fluid filaments have different velocities, those near the surface and centre moving faster than those near the bottom and sides. The ordinary formule for the flow of streams rest on an hypothesis that this variation of velocity may be neglected, and that all the filaments may be treated as having a common velocity equal to the mean velocity of the stream. On this hypothesis, a plane layer abab (fig. 102) between sections normal to

the direction of motion is treated – eo

as sliding down the channel to Ie iy

[HYDRAULICS.

a'a'b'b' without deformation. The component of the weight parallel

to the channel bed balances the __&j j friction against the channel, and ~~ ai ip' in estimating the friction the ' "itt velocity of rubbing is taken to . be the mean velocity of the Fig. 102.

stream. In actual streams, however, the velocity of rubbing on which the friction depends is not the mean velocity of the stream, and is not in any simple relation with it, for channels of different forms. The theory is

therefore obviously based on an imperfect hypothesis, However, by taking variable values for the coefficient of friction, the errors of the ordinary formule are to a great extent neutralized, and they may be used without leading to practical errors. Formule have been obtained based on less restricted hy- potheses, but at present they are not practically so reliable, and are more complicated than the formule obtained in the manner de- scribed above. .

88. Steady Flow of Water with Uniform Velocity in Channels of Constant Section. —Let aa', bb' (fig. 108) betwo cross sections normal to

Fig. 103.

the direction of motion at a distance di. uniformly, the external forces acting on it are in equilibrium. Let Q be the area of the cross sections, x the wetted perimeter, pq +qr+7s,

Since the mass aa'bb' moves

Then the quantity m= ois termed thehydraulic mean

depth of the section. Let v be the mean velocity of the stream, which is taken as the common velocity of all the particles, 7, the

slope or fall of the stream in fect, per foot, being the ratio

of a section.

oa ab

The external forces acting on aa'bb' parallel to the direction of motion are three:—(a) The pressures on aa' and 0d', which are equal and opposite since the sections are equal and similar, and the mean pressures on each are the same. (2) The component of the weight W of the mass in the direction of motion, acting at its centre of gravity g. The weight of the mass aa'bd' is Gadi, and the component of the weight in the direction of motion is Gad/ x the cosine of the

angle between Wg and ad, that is, GQdl cos abe= Gadi" — Gail.

(c) There is the friction of the stream on the sides and bottom of the channel. This is proportional to the area xdi of rubbing surface and to a function of the velocity which may bo written f(v); /(v) being the friction per square foot at a velocity v. Hence the friction is — xd fv). Equating the sum of the forces to

zero, GNidl—xdl fr) =0, v 5 4 P Te -yi-mi ‘ : (1).

2

But it has been already shown (§ 63) that fv) =F ;

2,

Scam. (2).

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This may be put in the form v= af ENini=eN ind i ah oy

where ¢ is a coefficient depending on the roughness and form of the channel.

The coefficient of friction ¢ varies greatly with the degree of roughness of the channel sides, and somewhat also with the velocity. It must also be made to depend on the absolute dimensions of the section, to eliminate the error of neglecting the variations of velocity in the cross section. A common mean value assumed for ¢ is 0°00757. The range of values will be discussed presently.

It is often convenient to estimate the fall of the stream in feet per mile, instead of in feet per foot. If fis the fall in feet per mile

S=5280 7. and the above value of ¢ in (2a), we get the very

0°5 0°6 0°7 0°8 001025 | 0°00978 | 0°00944 | 0°06918

In using this value of ¢ when v is not known, it is best to procecd by approximation. Calculate a rough value of v by taking any mean value of ¢, for instance the one given in the preceding section, Then from this value of v calculate a revised value of ¢, and from this a new value of w.

90. Darcy & Bazin's Expression for the Coefficient of Friction.— Darcy & Bazin's researches have shown that ¢ varies very greatly for different degrees of roughness of the channel bed, and that it also varies with;the dimensions of the channel. They give for (an empirical expression (similar to that for pipes) of the form

(=o1+ 4). (6); where m is the hydraulic mean depth.

» (2a);

Putting this

0°01215 | 0°91907

. . ° . . °

For different kinds of chan- nels they give the following values of the coefficient of friction :—

Kind of Channel. I, Very smooth channels, sides of smooth cement or planed timber II. Smooth channels, sides of ashlar, brick- WOE, PIAAKGs… crcreisavcmasses thiathnils smayonte III. Rough channels, sides of rubble masonry or pitched with stone …. IV. Very rough canals in earth Y. Torrential streams encumbered with de- PINE elm ARN ester tiin sree Secwiceam itt

0‘00316 | O‘1

0°00401 | 0°23 0°82 4°10 8°2

000507

000846

The last values (Class V.) are not Darcy & Bazin's, but are taken from experiments by Ganguillet & Kutter on Swiss streams.

The following table very much facilitates the calculation of the mean velocity and discharge of channels, when Darcy & Bazin's value of the coefficient of friction is used. Taking the general formula for the mean velocity already given in equation (2a) above,

xs v=cNmi, where c= al' 4 , the following table gives values of ¢ for channels

of different degrees of roughness, and for such values of the hy- draulic mean depths as are likely to occur in practical calculations :—

Values of ¢ in v=cN mi, deduced from Darcy & Bazin's Values.

. n . n

] > ia, 3] ns So |9.9

g B/25|/45| 85 /we8 S/2s\/45|85/Pes

a. (32/32 /S2| 82 l225) 2. |s2/S2/S8/ 88 lee

SE iSol/seXl/aeolSslisSsllses |Solseslasiaa less

qx 20/82/3834 /0n a i SO|aa/23/0m 5A

2 || 8 Am |i a sl 2 || =| Be) aS | pe

B82 |OF (04 |G saa) 34 [4 |O8 (OA /GS [oze

eS |bs|s5/e2)/S4 leet] eS |es las les /sa gee

BA |S8|S2| 28 (28 135-54 | 82/82/28 lee |oa—

= | ° Ss /S90 od =a\|o 8 .F)

x 2\8s\2& BO |#5 &|| 5 Al Ee |aa| FO HS 5

*Oo| <4 > 2 o < S 2 251125 | 95] 57 * | 135) 110 | 72 “75 | 139 | 116 | 81 10. | 141 | 119 | 87 15 | 143 | 122 | 94 2°0 | 144] 124] 98 25 | 145 | 126 | 101*

30 104 35 105 40 106 45 107 50 108 55 109 6-0 110 65 110 70 110 75 111

8-0 lll

0°9

000899

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| simple and long-known approximate formula for the mean velocity

0°00883 | 0°00836 | 0°00812 | 0°90788 | 0:00769 | 0:00761 | 0:00755 | 000750

of a stream— eH deaf! a beak kos (3). The flow down the stream per second, or discharge of the stream, is Q=Q=AVmi. . . . 2 ws (De

89. Coefficient of Friction for Open Channels.—Various expressions have been proposed for the coeflicient of friction for channéls as for pipes. Weisbach, giving attention chiefly to the variation of the coefficient of friction with the velocity, proposed an expression of

the form (=o(1 + 4) Pca at we Nae ee v

and from 255 experiments obtained for the constants the values a=0°‘007409 ; 8=0°1920. This gives the following values at different velocities :—

(5),

91. Ganguillet & Kutter’s modified Darcy Formula,—Starting from the general expression v=c’ mi, Messrs Ganguillet & Kutter have examined the

variations of c for a wider variety of cases than those discussed by Darcy & Bazin. Darcy & Bazin's experiments are confined to channels of moderate section, and to a limited variation of slope. Ganguillet & Kutter brought into the discussion two very distinct and important additional series of results. The gaugings of the Mississippi by Messrs Humphreys & Abbot afford data of discharge for the case of a stream of pened y large section and of very low slope. On the other hand, their own measurements of the flowin the regulated channels of some Swiss torrents gave data for cases in which the inclination and roughness of the channels were exceptionally great. Darcy & Bazin's experiments alone were conclusive as to the dependence of the coefficient c on the dimensions of the channel and on its rough- ness of surface. Plotting values of c for channels of different in- clination indicated to Ganguillet & Kutter that it also depended ve i slope of the stream. Taking the Mississippi data only, they

oun

c = 256 for an inclination of 0°0034 per thousand, = 154 oF) " 0°02 " so that for very low inclinations no constant value of c independent of the slope would furnish good values of the discharge, 'In small rivers, on the other hand, the values of c vary little with the slope. As regards the influence of roughness of the sides of the channel a different law holds. For very small channels differences of rough- ness have a great influence on the discharge, but for very large channels different degrees of roughness have but little influence, and for indefinitely large channels the influence of different degrees of roughness must be assumed to vanish. The coefficients given by Darcy & Bazin are different for each of the classes of channels of different roughness, even when the dimensions of the channel are infinite. But, as it is much more probable that the influence of the nature of the sides diminishes indefinitely as the channel is larger, this must be regarded as a defect in their formula.

Comparing their own measurements in torrential streams in Switzerland with those of Darcy & Bazin, Ganguillet & Kutter found that the four classes of coefficients proposed by Darcy & Bazin were insufficient to cover all cases. Some of the Swiss streams gave results which showed that the roughness of the bed was markedly greater than in any of the channels tried

by the French engineers. It was neccssary therefore in adopting the plan of arranging the different channels in classes of approximately similar roughness to increase the number of classes. Especially an addi- tional class was required for channels obstructed by detritus.

To obtain a new expression for the coefficient in the formula

y= ah rind mi=eN mi j in which Darcy & Bazin take cee

7

o(1 ot -) m Ganguillet & Kutter procecded in a purely empirical way. They

found that an expression of the form a

B

c= i+

7m could be made to fit the experiments somewhat better than Darcy's

expression. Inverting this, we get

1 1

Lee a ae (7 a an/m

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an equation to a straight line having 4

° a 1 ~~—. for abscissa, — for im = ordinate, and inclined to the axis of abscisse at an angle the tan~~

gent of which is f

Plotting the experimental values of = and =e the points so m

found indicated a curved rather than a straight line, so that 6 must depend on a After much comparison the following form was arrived at—

where n is a coefficient depending only on the roughness of the sides of the channel, and A and Z are new coeflicients, the value of which remains to be determined. From what has been already stated, the coefficient ¢ depends on the inclination of the stream, decreasing as the slope ¢ increases.

Let ore ae a+ Lay Then c= ae a]/m

the form of the expression for ¢ ultimately adopted by Ganguillet & Kutter.

For the constants a, 1, p Ganguillet & Kutter obtain the values 93, 1, and 0°00155 for metrical measures, or 41°6, 1°811, and 0°00281 for English feet. The coefficient of roughness ™ is found to vary from 0°008 to 0°050 for either metrical or English measures.

The most practically useful values of the coefficient of roughness are given in the following table :—

Coefficient of

Nature of Sides of Channel. Roughness n.

Well-planed timber …...csssesesenee esceenneecusneneeesennnn cers 0°009 Coment plaster …...cssscsscerssenesseeceesecneeeneceneeenueeanees 0°010 Plaster of cement with one-third sand….....csecseeeee 0011 Unplanced planks …....c.ssseeee eevee eeesnees cis Qu dicen 0012 Ashlar and brickwork ….....010008 alos ye ais MRD ac so tas 0°013 Canvass on frames…..... tasrissnumndecta aotibeaen ecare wawerieey COOLS Rubble MASON .....+ccerenernens arnevensonqsig en fae ste: 0°017 Canals in very firm gravel …....sseerees an abetewondt: are 0°020 Rivers and canals in perfect order, frec from stones or , bik Grasset eee opalBelaeTUneroinemes nlsiies aoe wei aloata tae 0% Rivers and canals in moderately good order, not quite ? free from stones and — mee % sean sont

Rivers and canals in bad order, with weeds and detritus 0°035 Torrential streams encumbered with detritus …....+ 0‘050

Ganguillet & Kutter's formula is so cumbrous that it is difficult to use without the aid of tables.

Mr Lowis D'A. Jackson has published complete and extensive tables for facilitat- ' ing the use of the Gan- guillet & Kutter formula (Canal and Culvert Tables, London, 1878). To lessen

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of the coefficient of roughness. The difficulty is one which no theory will overcome, because no absolute measure of the roughness of stream beds is possible. For channels lined with timber or masonry the difficulty is not so great. The constants in that case are few and sufficiently defined. But in the case of ordinary canals and rivers the case is different, the coefficients having a much greater range. For artificial canals in rammed earth or gravel varies from 0°0168 to 0:0301. For natural channels or rivers varies from 0°020 to 0°035. In Mr Jackson's opinion even Kutter's numerous classes of channels seem inadequately graduated, and after careful examination he pro- poses for artificial canals the following classification : — I. Canals in very firm gravel, in perfect order …..... II. Canals in earth, above the average in order…..... n= 00225 ILI. Canals in earth, in fair order …....csceeseeseeeeeees n= 0'°025 IV. Canals in earth, below the average in order …..... n=0°0275 Y. Canals in earth, in rather bad order, partially over- n=0°03 grown with weeds and obstructed by detritus

1} DW GEA i % EE ET WAZ 'Plaste

la ¥ LX —= \ ". Ae an ote LEW iu. eR Z ES KE ; say NK ANT ANS = Fig. 104.

92. Forms of Section of Channels.—The simplest form of section for channels is the semicircular or nearly semicircular channel (fig. 104), a

form now often adopted from the facility with which it can be

Fig. 105.

executed in concrete. It has the advantage that the rubbing surface is less in proportion to the area than in any other form.

. In Cutting

— “ke Gre --- B14

v

calculation he puts the

Ma n{ 41°6 Ss ont onan

The following table gives a

formula in this form :—

)

J (M+1°811 selection of values of M, taken from Mr Jackson’s tables :—

Values of M forrx=

0-010 0°012 0-015 0°017 0°020 0°025 8°2260 | 3°8712 | 4°8390 | 5°4842 | 6°4520 | 8-0650 1‘8210 | 2°1852 | 2°7315 | 3°0957 | 3°6420 | 4°5525 11185 | 1°3422 | 1°6777 | 1°9014 | 2°2870 | 2°7962 0°8843 | 1:0612 | 1:3264 | 1°5033 | 1°7686 | 2°2107 0°7672 | 0°9206 | 171508 } 1°3042) 15344) 1°9180 0°6970 | 0°8864 | 1°0455 | 1°1849 | 1°3940 | 1:7425 0°5284 | 0°6341 | 0°7926 | 0°8983 | 1°0568 | 1°3210 0°4722 | 0°5666 | 0°7083 | 0°8027 | 0°9444 | 1°1805 0°4535 | 0°5442 | 0°6802 | 0°7709 | 09070 | 1°1337 0°4441 | 0°5329 | 0°6661 | 0°7550 | 0°8882 | 1°1102 0°4800 | 0°5160 | 0°6450 | 0°7310 | 0°8600 | 1°0750 0°4254 | 0°5105 | 0°6381 | 0°7232 | 0°8508 | 1:0635

One principal difficulty in the use of this formula is the selection

Fia. 106.—Scale 20 fect=1 inch.

Wooden' channels or flumes, of which there are examples ona large scale in America, are rectangular in section, and the same form is adopted for wrought and cast-iron aqueducts, Channels built with brickwork or masonry may be also rectangular, but they are often trapezoidal, and are always so if the sides are pitched with masonry laid dry. In a trapezoidal channel, let 6 (fig. 105) be the bottom breadth, b) the top breadth, @ the depth, and let the slope of the sides be » horizontal to 1 vertical. Then the area of section is Q=(b-+nd)d =(b) —nd)d, and the wetted perimeter yab + 2dV nF +1.

When a channel is simply cxcavated in earth it is always originally trapezoidal, though it becomes more or less rounded in course of time. The slope of the sides then depends on the stability of the earth, a slope of 2 to 1 being the one most com- monly adopted.

Figs. 106, 107 show the form of canals excavated in earth, the

former being the section of a Navigation Canal and the latter the | in the channel. Let 7 be the radius of the channel section ; then section of an Irrigation Canal. for a depth of water=«r, the hydraulic mean radius is wr and the

93. Channels of Circular Scction.—The following short table | area of section of the waterway vr®, where «, «, and y have the facilitates calculations of the discharge with different depths of water | following values : —

terms of radius ….... Hydraulic mean depth A in terms of radius …f 4 Waterway in terms of square of radius…...

Depth of water 4 re

**1278 | 1574 | °1852*

“1651 | +228

“870 |-450 |-582 |-614 |-709 |-795 |-885 |-979 | 1-075 | 1°175 | 1°276 | 1°871 | 1-470 | 1°571

|

94. Egg-Shaped Channels or Sewers.—\n sewers for discharging 96. Problem IV. Most Economical Form of Channel for given Side storm water and house drainage the volume of flow is extremely | Slopes. —Supposc the channel is to be trapezoidal in section (fig. 109), variable; and there is a great liability for deposits to be left when the | and that the sides are to have a given slope. Let the longitudinal flow is small, which are not removed during the short periods when | slope of the stream be given, and also the mean velocity. An infinite the flow is large. The sewer in consequence becomes choked. To | number of channels could be found satisfying the foregoing condi-

; tions. To render the pro- ,! Ua ro» H blem determinate, let it be

*\ aon > tot , ul OO ht 8 HG nn SEB OD seen * remembered that, since for*

Le {1 Qnanmnn = rr SLE a given discharge Qe x/x. S\ I Cll NE a a RSI QS MINIT ate GISeRAT Ee & Xs RTS PRS CLLjg@r Ha = 9 — fe UTR! other things being the SN RUSS EB WP M S SSR NSS same, the amount of ex-

MDM SSE — <4

“cavation will be least for

id =e that channel which has the

: c : ‘ i i an a ar least wetted perimeter. Let

obtain uniform scouring action, the velocity of flow should be con- | @ be the depth and } the bottom width of the channel, and let stant or nearly so; a complete uniformity of velocity cannot be | the sides slope m horizon-

*obtained with any form , tal to 1 vertical (fig. 110), * | of section suitable for ‘ 1 then d*

sewers, but an approxi- 4 N=(b+nd)d ; fi

mation to uniform i Tee

Welecics ix obisined by a ge making the sewers of Both @ and x are to be | , \ aaa antiiek,. Vasions minima. Differentiating, ;

forms of oval have been and equating to zero, Fig. 110. suggested, the simplest _ …...4..[_..---2 Sieh castnt cute Seka a db

being one in which “<<. Dae Gi + n)abd+nd -.

the “radius of the “s > . ra ae

crown is double the “Ss re eine area) 2

*ary of the invert, 6°: 7 db da * ave? |*

and the greatest width Hane

is two-thirds the cee dd’

height. The section ! (n- 2Nn?+1)d+b+nd=0

of such a sewer is : ‘ shown in fig. 108, the ; b= AN? +1-n)d.

numbers marked on ~Me-------2 But

the figure being pro- Fig. 108. __(otndya —

portional numbers. X b+2d\/ni+1—

95. Problems on Channels in which the Flow is Steady and at | Inserting the value of 6, Uniform Velocity.—The general equations given in §§ 88, 90 are Q ne 1-nd a

= =<

(=a(1 ale 4) : i Wt Pe DS xX 4dNVn24+1-2nd 2 a) } That is, with given slide slopes, the section is least for a given ¢ eee ee Hee os (2); | discharge when the hydraulic mean depth is half the actual depth. =_— (3) A simple construction gives the form of the channel which fulfils

Problem I. Given the transverse section of stream and discharge, | this condition, for it can be shown that when m = — the sides of

to find the slope. From the dimensions of the section find © and is i-ci i Ber fara (1) find ¢ feom (3) find 0, and lastly from (2) find ¢ the channel are tangential to a semi-circle drawn on the water line.

Problem II. Given the transverse section and slope, to find the Since Se. ; discharge. Find » from (2), then Q from (3). x 2 Problem III. Given the discharge and slope,and either the breadth, | therefore depth, or general form of the section of the channel, to determine its Q=hxd . – . (1).

remaining dimensions. This must generally be solved by ap roxi- | Let ABCD be the channel (fig. 109); from E the centre of AD drop mations. A breadth or depth or both are chosen, and the discharge perpendiculars EF, EG, EH on the sides. calculated. If this is greater than the given discharge, the dimen-

t sions are reduced and the discharge recalculated. : AB=CD=a; BC=d; EF=EH=c; and EG=d. Since m lies generally between the limits m=d and m=43d, where Q=area AEB+ BEC+CED,

d is the depth of the stream, and since, moreover, the velocity varies as Vm _ so that an error in the value of m leads only to a much less error in the value of the velocity cal- culated from it, we may proceed thus. Assume a value for SS ms and calculate v B G ¢ rom it. Let, be :

this first approxi- Fig, WF

=ac +hod.

act+4bd=(a+4b)d; and hence c=d.

That is, EF, EG, EH are all equal, hence a semicircle struck from E with radius equal to the depth of the stream will pass through F and H and be tangential to the sides of the channel.

To draw the chan- nel, describe a semi- circle on a horizontal linewithradius= depth aad of channel. The bot- Fig. 111. tom will be a horizontal tangent of that semicircle, and the sices tangents drawn at the required side slopes.

he above result may be obtained thus (fig. 111) :—

mation tov. Then — is a first approximation to , say 9). With v

s e 1 2 this value of © design the section of the channel ; calculate a second value for m; calculate from it a second value of v, and from that a second value for 2, Repeat the process till the successive values

x=2a+5. Putting these values in (1), of m approximately coincide. |

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2d

= —— l): Q=d(b+d eot B) ; omb+d eot B (2); Q +b arg Tt B "EDE 1) and (2 From (1) and (2), 2 sect ax 24 Saar cone sin p This will be a minimum for ax 2 __ 2. Ks agape t mena or T= 2 cosee, B-cotBp. .... (4). d Q sin B bid a 2-—cos B-

From (8) and (4), 7" fs — cos Y= 2 8 = 2 tan 48 . Proportions of Channels of Maximum Discharge for given Arca and Side Slopes. Depth of channel=d ; Hydraulic mean depth=%d ; Area of section=Q.

Top width=

Inclination twice length

of Sides to Horizon.

Bottom Width.

Area of Section ©.

Semicircle Semi-hexagon… Semi-square…..

WHNNN HHH HOH ROW Ferrera Cc ea !

3°325d2

Half the top width is the length of each side slope. The wetted perimeter is the sum of the top and bottoin widths.

97, Form of Cross Section of Channel in which the Mean Velocity is Constant with Varying Discharge.

In designing waste channels from eanals, and in some other eases, it is desirable that the mean velocity should be restricted within narrow limits with very different volumes of discharge. In channels of trapezoidal form the velocity increases and diminishes with the discharge. Hence when the discharge is large there is danger of erosion, and when it is small of silting or obstruction by weeds. A theoretical form of seetion for which the mean velocity would be constant ean be found, and, although this is not very suitable for practieal purposes, it ean be more or less approximated to in aetual channels.

Let fig. 112 represent the cross section of the channel. From the symmetry of the section, only half the channel need be considered.

Scale io Inch =1 Foot. Fig. 112.

Let obac be any section suitable for the minimum flow, and let it be required to find the curve beg for the upper part of the channel so that the mean velocity shall be constant. Take o as origin of coordinates, and let de, fg be two levels of the water above ob.

Let ob=> ; de=y, fo=ytdy, od=x, of=x+dx; eg=ds. The condition to be satisfied is that v=cN mt

should be constant, whether the water level is at ob, de, or fy. Consequently

m=constaut=k

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for all three sections, and ean be found from the seetion obac. Hence also

Increment of section _ydx _ k Increment of perimeter ds —

*ydic? = k*ds® = k*(dac? + dy”) ; and dz = we . Integrating, a=k log, (y+y?—k*) + constant ; and, since yay when z=0, 2 _ Jn2 x=k) log, Kill fe o + a — #2*

2 4

oe values for y, the values of x can be found and the curve rawn.

The figure has been drawn for a channel the minimum seetion of which is a half hexagon of 4 feet depth. Hencek=2; b= 92; the rapid flattening of the side slopes is remarkable.

98. Variation of Velocity in Different Parts of the Cross Section of a Uniform Stream.

Vertical Velocity Curve in a Stream.—If it is assumed that the resistanee to the relative sliding of the layers of water in a stream is of the nature of a viscous resistance, then the law of the distri- bution of velocity in a vertical longitudinal section of the stream can be determined theoretically. For simplicity, suppose the stream of uniform depth and indefinite width. Let fig. 113 show a por- tion of a vertical longi-

,

tudinal seetion

of the 2———

stream, and let OA, O'A' be the intersections with '

Me

' 1 '

'

1

>

this of two transverse seetions at a distance apart 1. Let ab, cd be the traces of two planes parallel to the free surface or to the bed, and let us consider the equilibrium of a layer abcd of widthunity. Let Oa=y, : ac=dy, and let v be the Fig. 118. velocity of the particles comprised in abcd, v being a function of y whieh is to be determined. Taking the eomponents of the forces acting on abcd, — to OO, the pressures on ac, bd, being pro- portional to the depth from the free surface, are equal and opposite; also, the frictions or viseous resistances on the lateral faces of the rism are zcro, since in a wide stream there is no relative sliding etween abcd and the layers on each side. There remain only the —— on the upper and lower surface, and the eomponent of the weight. The weight of the layer is GJ dy, and if is the slope of the stream the eomponent of the weight parallel to OO is Glidy. The frietion or viscous resistance on the face ad is proportional to its area and

to the differential coefficient ay (§ 8). The resistance is, therefore,

—kl i , the negative sign being used because, if v increases with y,

a is positive, while the action of the layers above ab is a retarding

action. 'I'he resistance on the face cd is similarly X/ 7 + wa@.

*dy * The resultant of the action of the layers above and below is, therefore, ita :*

When the motion is uniform,

; dv Glidy + kid —=0 ; ady + dy 0; dye _ Gt, dy” k integrating, adv Gt ee ye) dy ad +U ; 1Gi v= al tout ‘ an equation which gives the velocity vat any depth y. Ifon a vertical line OA (fig. 114), representing the depth of the stream, the values of v are set off horizontally, a parabolic eurve is obtained, termed the vertical velocity curve for the seetion considered. The constant v is evidently the surface velocity, being the value of for y=0. The parabola has a horizontal axis corresponding to the position of the filament of maximum velocity. If there is no resist- ance at the surface of the stream like that at the bottom and sides,

- (1); G&

cea ia YL Fig. 114.

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the maximum velocity should be at the surface, and theu c=0, and the equation becomes

Ge y= =v (2). Assuming this for the present, the mean velocity is h f vdy 1 Gi He (8). The bottom velocity is, putting the depth / for y in (2); =U — > ou ‘ and therefore Um=4(Qyt+v) . . . (4).

It is now understood that the motion in a stream is much more complete than the viscoustheory just stated assumes, The retarda- tion of the stream is much greater than it would be in simple motion of that kind. This has already been partly explained in the introduction to the present article. Nevertheless the viscous theory may probably be so modified as to furnish ultimately a true theory of streams.

99. Experimental Observations on the Vertical Velocity Owrve.—In obtaining the vertical velocity curve from direct observations in streams, a preliminary difficulty arises from the fact that the velocity at any given depth is not constant, and hence the motion in the strict sense is not steady. The velocities taken on a given vertical section at any given moment do not form when plotted any regular curve. But if a series of observations are

taken at each depth and the results averaged, the mean velocities at each depth when plotted give a regular curve, agreeing very fairly with the parabola, which might be expected from the theory above. Hence it may be in- ferred that the velocity at any given point fluctuates about a mean value, the fluctuatious being due to irregular eddying motions superposed on the general steady motion of the stream, and having an effect which disappears in the mean of a series of observations. For certain purposes these irregular motions may be ignored, and the constant mean velocity substituted for the actual varying ve- locities at each point. In the next place, all the best observations show that the maximum velocity is to be found, not at the free surface of the stream, but at some distance below it.

Influence of the Wind.—In the experiments on the Mississippi the vertical velocity curve in calm weather was found to agree fairly with a parabola, the greatest velocity being at %ths of the depth of the stream from the surface. With a wind blowing down stream the surface velocity is increased, and the axis of the parabola approaches the surface. On the contrary, with a wind blowing up stream the surface velocity is diminished, and the axis of the para- bola is lowered, sometimes to half the depth of the stream. The American observers drew from their observations the conclusion that there was an energetic retarding action at the surface of a stream like that due to the bottom and sides. If there were such a retarding action the position of the filament of maximum velocity below the surface would be explained.

It is not difficult to understand that a wind acting on surface ripples should accelerate or retard the surface motion of the stream, and the Mississippi results may be accepted so far as showing that the surface velocity of a stream is vagiabls when the mean velocity of the-stream is constant. Hence observations of surface velocity by floats or otherwise should only be made in very calm weather. But it is very difficult to suppose that, in still air, there is a resist- ance at the free surfacc of the stream at all analogous to that at the sides and bottom. Further, in very careful experiments, Boileau found the maximum velocity, though raised a little above its posi- tion for calm weather, still at a considerable distance below the surface, even when the wind was blowing down stream with a ve- locity greater than that of the stream, and when the action of the air must have been an accelerating and not a retarding action. Professor James Thomson has given a much more

probable explan- ation of the diminution of the velocity at and near the free sur- face. He points out that portions of water, with a diminished velocity from retardation by the sides or bottom, are thrown off in eddyiug masses and mingle with the rest of the stream. These eddying masses modify the velocity in all parts of the stream, but have their greatest influence at the free surface. Reaching the free surface they spread out and remain there, mingling with the water at that level and diminishing the velocity which would otherwise be found there.

100. Influence of the Wind on the Depth at which the Maximum

Velocity is found.—In the gaugings of the Mississippi the vertical velocity curve was found to agree well with a parabola having a

1 Pitot first showed, in 1782, that the velocity in a stream diminishes from the surface downwards; about sixty years after, Woltmann concluded that the vertical velocity curve was a parabola.

horizontal axis at some distance below the water surface, the ordi- nate of the parabola at the axis being the maximum velocity of the section. During the gaugings the force of the wind was registered ona scale ranging from 0 for acalm to 10for a hurricane. Arrang- ing the velocity curves in three sets —(1) with the wind blowing up stream, (2) with the wind blowing down stream, (3) calm or wind blowing across stream—it was found that an up stream wind lowered, and a down stream wind raised, the axis of the parabolic velocity curve. In calm weather the axis was at 3%ths of the total depth from the surface for all conditions of the stream.

Let h' be the depth of the axis of the parabola, m the hydraulic mean depth, f the number expressing the force of the wind, which may range from +10 to —10, positive if the wind is up stream, negative if itis down stream. Then Messrs Humphreys and Abbot find their results agree with the expression

F’ _0°31740°06f. m Fig. 115 shows the parabolie velocity curves according to the

American observers for calm weather, and for an up or down stream wind of a force represented by 4.

Fig. 115.

101. Bazin’s Formule for the Variation of Velocity in a Vertical Longitudinal Section of a Stream.—M. Bazin assumes that the ver- tical velocity curve is a parabola, and has investigated numerical values for the constants from his own and other experiments. Assuming the general equation already found, § 98,

van tey-s oe en Bie ie GR v will have the maximum value V, for a value of h’ of y which makes a zero. That is, Ae Sty h Gp? 8 eZ” and the maximum velocity is 1 Gi, Venty yz) = ¥ ~5 on

Inserting these values of v) and ¢ in (1), Gi, v= V-sy-h); or putting m= See , where / is the whole depth of the section,

vev-M(Le)’. gy Wale ee*

where M is constant for any given stream. v=V -M(x-a)? Then the mean velocity on the vertical is

A ra f° {Vv -M(w-a}} de-V-M(g- a+ at).

0

Let v, be the velocity at nh feet from the surface, v%—» the velocity at an equal depth from the bottom, 4(0n+ Vi—n)=V —- M(n?-n+a?~~a+4), =Um —M(n?~~ +8), Let n=}, end put 2 for the velocity at mid depth, then Ce ee A 3)

so that the mid depth velocity differs from the mean velocity by the small quantity 4, M only, whatever be the position of the axis of the parabola. Messrs Humphreys and Abbot have based on this pore. method of rapidly gauging rivers which will be described

ereafter. KIL = 5

Let Fa and ema, (2a).

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From a discussion of experiments in which the maximum velocity was at the surface, Bazin was led to take M=36°3Vhi . (4); and for that case the equation to the vertical velocity curve is (a=0) v=V — 36°3V hin. In the cases in which the maximum velocity was below the surface,

Bazin found that the difference between the maximum velocity V and the bottom velocity v» remained constant.

But, putting ted in the equation (2a), and », for the bottom

velocity, v1 = V —-M(1- a)? . . V -v, = M(1 – a)?=constant, for different positions of the axis of the parabola.

(5);

Let . M= az, ? where N is a constant ; then v=V-N

FeAl

l-«a

for any position of the axis of the parabola. But this must agree with the equation (4) above, for a=0; hence,

N=36°3V/hi; and the general equation for all cases becomes fie ea ee v=V-36-3Vii(7—) (6). Bazin has shown that this equation agrees well with experiments on artificial channels by himself, and on the Saone, Seine, Garonne,*

and Rhine, In all these the ratio – ranged from 1°10 to 1°18, ex-

cept in the case of the Rhine at Basel, for which the ratio was 1 lh The parameter oar lies between 13 and 20, and the ratio of —a

the depth at which the maximum velocity is found to the whole depth, =a, ranges from zero to 0‘2, except in some of the artificial channels, where it reached 0°35. The Mississippi experiments give different results, and Bazin inclines to believe that the method of experimenting was untrustworthy.

The extreme difference V-—7v» between the maximum and bottom velocity is found by Bazin to range from ¢ V to 4 V in artificial channels, being greater the greater the roughness of the sides. In natural streams it is more generally 4 V, but in the Rhine at Basel it reached 4V, the bed being covered with boulders.

Boileaw’s Formulce.—Boileau also assumes the vertical velocity curve to be a parabola; below the filament of greatest velocity the curve is expressed by the relation

v=A-By. ‘Gbe That is, the velocity curve is a parabola having its axis at the free surface of the stream. Above the filament of greatest velocity this law fails, and the velocities di- O P minish instead ‘ : of increasing. The vertical ve- locity curve is therefore such a curve as M’MM” (fig. 116), where the part MM” is a parabola hay- ing its vertex at*

8, and DM is

the maximum velocity. The YYWWooMMunAMM@”=u’«‘ee

part M’M does ‘ not follow the Fig. 116.

parabolic law. Let V be the maximum velocity DM, CMits depth= 9. Draw at M the tangent and normal to the parabola. Then PC is

the half parameter x . Let OS=V-+e, then CT=2CS=2c.

pet 1, and CM?=PC- CT;

a FC ee aes ~ 2 CM? @

Boileau finds c= Be? to benearly constant for very different streams. Thus from two experiments of his own on streams 0°2 and 0°3 metres deep, c=0°01070 and 0°01072. In Hennocque’s experiments on the Rhine, 2°45

metres deep, c=0°0107 ; and in the Mississippi experi- ments with a depth of 32 metres, c=0°0098 to 0°0113. Replacing A and B in (1) by the values now given

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| encroaching branches of the river.

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yf? Oe =F re : (2), an equation which gives the velocity v at any depth y from the sur- face in the region below the filament of maximum velocity. For the region above the filament of maximum velocity Boileau assumes

2

Gt V- Vee (3), where v is the velocity at the depth y and V' is the surface velo- city.

102. Ratio of Mean to Greatest Surface Velocity, for the whole Cross Section in Trapezoidal Channels.—It is often very important to be able to deduce the mean velocity, and thence the discharge, from observation of the greatest surface velocity. The simplest method of gauging small streams and channels is to observe the greatest surface velocity by floats, and thence to deduce the mean velocity. Now, for channels not widely differing from those experi- mented. on by Bazin, the expression obtained by him for the ratio of surface to mean velocity may be relied on as at least a good approximation to the truth. Let v be the greatest surface velo- city, Ym the mean velocity of the stream. Then, according to Bazin,

Vm=Vp — 25°4n/mt.

where ¢ is a coefficient, the values of which have been already given in the table in § 90, Hence

v= V'-¢

c meray Ml c ppt Pele ad He See Values of Coefficient e464" the Formula vm opapa?

Very Rough} Channels

: Very Smooth Rough BE Sal Smooth | Channels. | Channels. | Channels, |encumbered ey 8 Channels. | Ashlar or Rubble Canals in with

Cement. Masonry.

Brickwork. Detritus.

Noh ao ot

oRwpeH SSSSASCVOISUTURANHOOS eeseseeesesseosesco

8

103. River Bends.—In rivers flowing in alluvial plains, the wind- ings which already exist tend to increase in curvature by the scouring away of material from the outer bank and the deposition of detritus along the inner bank. The' sinuosities sometimes increase till a loop is formed with only a narrow strip of land between the two Finally a "cut off" may occur, a waterway being opened through the strip of land and the loop left separated from the stream, forming a horse-shoe shaped lagoon ormarsh. Professor James Thomson has pointed out (Proc. Royal Soc. 1877, p. 856; Proc. Inst. of Mech. Engineers, 1879, p. 456) that the usual sup- ; position is that the LAMM A, My water tending to go co forwards ina straight """q—> Q line, rushes against 2 the outer bank and scours it, at the same | time creatingdeposits at the inner bank. That view is very far from a complete ac- count of the matter, and Professor Thom- son hasgiven a much more ingenious ac- count of the action at the bend, which

2

My TAN Wwe

Mp

Yy Gp bd

he has completely § eae by expert~ MMM ment. P

When water moves Fig. 117.

round a circular curve under the action of gravity only, it takes a motion like that in a free vortex. Its velocity is greater parallel to the axis of the stream at the inner than at the outer side of the

bend. . Hence the scouring at the outer side and the deposit at the inner side of the bend are not due to mere difference of velocity of flow in the general direction of the stream; but, in virtue of the centrifugal force, the water passing round the bend presses outwards, and the free surface in a radial cross section has a slope from the inner side upwards to the outer side (fig. 118). For the greater part of the watcr flowing in curved paths, this diffcrence of pressure produces no tendency to transverse motion. But the water imme- diately in contact with the rough bottom and sides of the channel is retarded, and its centrifugal force is insufficient to bal- ance the pressure due to the greater depth at the out-

Inner Bank SN]

IB

side of the bend. (ESCO It therefore flows Section at MN. inwards towards ’

the inner side of Fig. 118.

the bend, carrying with it detritus which is deposited at the inner bank. Conjointly with this flow inwards along the bottom and sides, the general mass of water must flow outwards to take its place. Fig. 117 shows the directions of flow as observed in a small artificial stream, by means of light seeds and specks of aniline dye. The lines CC show the directions of flow immediately in con- tact with the sides and bottom. The dotted line AB shows the direction of motion of floating particles on the surface of the stream.

104, In every stream the discharge of which is constant, or may be regarded as constant for the time considered, the velocity at different places depends on the slope of the bed. Except at certain exceptional points the velocity will be greater as the slope of the bed is greater, and, as the velocity and cross section of the stream vary inversely, the section of the stream will be least where the velocity and slope are greatest. If in a stream of tolerably uniform slope an obstruction such as a weir is built, that will cause an altera- tion of flow similar to that of an alteration of the slope of the bed for a greater or less distance above the weir, and the originally uni- form cross section of the stream will become a varied one. In such cases it is often of much practical importance to determine the longitudinal section of the stream.

The cases now considered will be those in which the changes of velocity and cross section are gradual and not abrupt, and in which the only internal work which needs to be taken into account is that due to the frietion of the stream bed, as in cases of uniform motion. Further, the motion will be supposed to be steady, the mean velocity at each given cross section remaining constant, though it varies from section to section along the course of the stream.

Let fig. 119 represent a longitudinal section of the stream, AjA, being the water surface, B)B, the stream bed. Let A,By, A,B, be

A' A "

Fig. 119. cross sections normal to e direction of flow. Suppose the mass of water Ay)B,A,B, comes in a short time @ to C»D,)C, Dy, and let the work done on the mass be equated to its change of kinetic energy during that period. Let Z be the length A,A, of the portion of the stream ont pee and z the fall of surface level in that distance. Let Q be the discharge of the stream per second.

Change of Kinetic Energy.—At the end of the time @ there are as many particles possessing the same velocities in the space CyD) A,B, as at the beginning. The = AOS change of kinetic energy "40 =s = SSS S is therefore the difference of the kinetic energies of AyByCyDp and A,B,C,D,.

Let fig. 120 represent the cross section A,Bo, and let w be a small ele- ment of its area at a point where the velocity is v. Let M be the whole area of the cross section and w,) the mean velocity for the whole cross section. From the definition of mean velocity we have

wv

Let v=) +, where w is the difference between the velocity at the small element w and the mean velocity. For the whole cross section, Sww=0.

The mass of fluid passing through the element of section w, in 6

For the whole

section, the kinetic energy of the mass AyB)C)D, passing in @ seconds is

seconds, is er and its kinetic energy is Savi.

—— wv,

Ge "Og 2H to" + 309 + 8ugw? + w) ,

Ge 9 {p32 + Sww(8uy+ w)} ;*

The factor 8% +w is equal to 2u)+27, a quantity neccessarily positive. Consequently wv? > Ou,%, and consequently the kinetic energy of AyByCyD, is greatcr than

Gé Gé Bg Woreo® or Og eo" ;

which would be its value if all the particles passing the section had the same velocity wu. Let the kinetic energy be taken at

Ge G "oye, = ary Ou! ' where a is a corrective factor, the value of which has been esti- mated by Belanger at 1°1.1_ Its precise value is not of great

importance. In a similar way we should obtain for the kinetic energy of A,B,C,D, the expression

Se Oyin? = oo Qu! ’

where 0, w are the section and mean velocity at A,B,, and where a may be taken to have the same value as before without any import- ant error.

Hence the change of kinetic energy in the whole mass A,B)A,B, in @ seconds is

(uy?- to) «se we ee (I),

Motive Work of the Weight and Presswres.—Consider a small filament a ju, which comes in seconds to ¢gc,. The work done by gravity during that movement is the same as if the portion a eq were carried to ac,. Let dQ be the volume of ag¢y or ac}, and Yo, y; the depths of a, a from the surface of the stream. Then the volume’ aQ¢@ or GdQé pounds falls through a vertical height z+ y,— yo, and the work done by gravity is

G dQ (z+ 4, ~ Yo) –

Putting pa for atmospheric pressure, the whole pressure per unit of area at a is Gy)-+Pa, and that at a is —(Gy,+pa). The work of these pressures is

G(yo +42 – n~%)aQe,

=G(yp- 4;) dQ 6. Adding this to the work of gravity, the whole work is GedQe; or, for the whole cross section,

ee a Owe eRe OO)

Work expended in Overcoming the Friction of the Stream Bed.— Let A’B’, A”B” be two cross sections at distances s and s+ds from AjBy. Between these sections the velocity may be treated as uniform, because by hypothesis the changes of velocity from section to section are gradual. Hence, to this short length of stream the equation for uniform motion is applicable. But in that ease the eo in overcoming the friction of the stream bed between A’B’ and

is

uy GQ 4%

where wu, x, are the mean velocity, wetted perimeter, and section at A'B'. Hence the whole work lost in friction from A,B, to A,B,

will be 14 ue x ago /" oo Xas. es Veer Bote

Equating the work given in (2) and (8) to the change of kinetic energy given in (1), GQé@, oo tout yy a (w,2 — uo?) = GQz@ – GQe , ry "3 3

(4? — 149?) nf a =o—+—_2° — ds. 2= a 29 ate J 7, Q 8

1 Boussinesq has shown that this mode of determining the corrective factor a is not satisfactory.

500

105. Fundamental Differential Equation of Steady Varied Motion. — Suppose the equation just found to be applied to an indefinitely short length ds of the stream, limited by the end sections ad, a,),, taken for simplicity normal to the stream bed (fig. 121). For that

Fig. 121.

short length of stream the fall of surface level, or difference of level of aand a,, may be written dz. Also, if we write wfor up, and w+du for

Uo

ere : , w,, the term oat becomes " " . Hence the eauation applicable

to an indefinitely short length of the stream is

, udu x pw y dz stg tg a ae) oe) et ey From this equation some general conclusions may be arrived at as to the form of the longitudinal section of the stream, but, as the investigation is somewhat complicated, it is convenient to simplify it by restricting the conditions of the problem.

Modification of the Formula for the Restricted Case of a Stream flowing in a Prismatic Stream Bed of Constant Slope. —Let 7 be the constant slope of the bed. Draw ad parallel to the bed, and ae horizontal. Then dz is sensibly equal to a'c. The depths of the stream, # and h-+dA, are sensibly equal to ab and a'b', and therefore dh—-a'd. Also ed is the fall of the bed in the distance ds, and is equal to ids. Hence

dz=a'd=cd-a'c=ids—dh . . . » « (2). Since the motion is steady—

Q=Nu=constant. Differentiating, Adu+tudaA=0;

amas |S

Let x be the width of the stream, then dQ2=adh very nearly. Inserting this value,

du= – Sah icc ght eae Putting the values of du and dz found in (2) and (3) in equation (1),

' ure pte

*~ Xv an *~ a8 % **

Further Restriction to the Case of a Stream of Rectangular Section and of Indefinite Width.—The equation might be discussed in the form just given, but it becomes a little simpler if restricted in the way just stated. For, if the stream is rectangular, «h=0, and if «

, Q xh is large compared with h, ae daly nearly. Then equation (4)

becomes m ea dh 2qih 5 & ro i =a

106. General Indications as to the Form of Water Surface fur- nished by Equation (5).—Let A A, (fig. 122) be the water surface, B,B, the bed in a longitudinal section of the stream, and ad any sec- tion at a distance s from By, the depth ab being h. Suppose ByB,,

B,Ay taken as rectangular coordinate axes, then 7 is the trigono-

metric tangent of the angle which the surface of the stream at a

makes w.th the axis B)B,. This tangent = will be positive, if the

stream is increasing in depth in the direction B,B, ; negative, if the

stream is diminishing in depth from By towards B,. If 7 -=0, the

surface of the stream is parallel to the bed, as in cases of uniform motion. :

which case w is small, the numerator becomes equal to 1.

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But from equation (4)

dh a ft: kA

ght gr? iS GS er

which is the well-known general equation for uniform motion, based on the same assumptions as the equation for varied steady motion now being considered. The case of uniform motion is therefore a limiting case between two different kinds of varied motion.

Fig. 122. Consider the possible changes of value of the fraction kg ~ tae ur 1 = gn

As h tends towards the limit 0, and consequently wu is large, the

On the other hand if h=o, in For a

numerator tends to the limit — ©.

value H of h given by the equation

we fall upon the case of uniform motion. may be tabulated thus :—

For h=0 H DH the numerator has the value >0. 1.

Next consider the denominator. If becomes very small, in which case wu must be very large, the denominator tends to the limit— oo. As h becomes very large and w consequently very small, the

denominator tends to the limit 1. For i, or w=“ gh, the

The results just stated

-o 0

denominator becomes zero. Hence, tabulating these results as be-

fore :— For h=0 < we g g the denominator becomes -o 0 >O0 1.

2

107. Casc 1.—Suppose ar , and also h>H, or the depth greater

than that corresponding to uniform motion. In this case = is

3

positive, and the stream increases in depth in the direction of flow. In fig. 123 let B,B, be the bed, C,C, a line parallel to the bed and

Fig. 123.

at a height aboveit equal toH. By hypothesis, the surface AjA, of the stream is above C,C,, and it has just been shown that the depth

of the stream increases from B, towards B,. But going up stream

h approaches more and more nearly the value H, and therefore a

approaches the limit 0, or the surfaee of the stream is asymptotic | new water surface CC corresponding to Case 1 would be produced,

to C,C,. Going down stream h inereases and w diminishes, the oO c2ah

2

numerator and denominator of the fraetion ——— both tend

g towards the limit 1, and – to the limit 7, That is, the surface of

the stream tends to become asymptotie to a horizontal line D,D,.

The form of water surface here diseussed is produeed when the flow of a stream originally uniform is altered by the eonstruetion of a weir, The raising of the water surface above the level C,C, is termed the backwater due to the weir.

2

108. Case 2.—Suppose i> andalsoh

tive, and the stream is diminishing in depth in the direction of flow. In fig. 124 let @

B,B, be the =

stream bed as be- fore ; O,C, a line

*drawn parallel to * i, BoB, at a height By | t Dis*

0 . y ypo- WM lly YYyy ! ‘ thesis the surface MOTE irr Bi A, A,of the stream (OZ is below ©,C, i and thedepth has Fig. 124,

just been shown to diminish from B, towards B,. Going up stream h approaches the limit H, and = tends to the limit zero. That is, up

stream A,A, is asymptotie to C,C, Going down stream A

2

diminishes and w increases ; the inequality i> diminishes; the U2 17 Sagih ur 1~ oh

g consequently o tends to . That is, down stream A,A, tends toa

direction perpendicular to the bed. Before, however, this limit was reached the assumptions on which the general equation is based would eease to be even approximately true, and the equation would eease to beapplieable. The filaments would have a relative motion, which would make the influence of internal friction in the fluid too important to be neglected. A stream surface of this form may be produced if there is an abrupt fall in the bed of the stream (fig.

125).

Fig. 125.

On the Ganges canal, as originally constructed, there were abrupt falls precisely of this kind, and it appears that the lowering of the water surface and inerease of velocity whieh such falls oceasion, for a distanee of some miles up stream, was not foreseen. The result was that, the veloeity above the falls being greater than was intended, the bed was scoured and eonsiderable damage was done to the works, "When the eanal was first opened the water was allowed to pass freely over the crests of the overfalls, which were laid on the level of the bed of the earthen channel ; erosion of bed and sides for some miles up rapidly followed, and it soon beeame apparent that means must be adopted for raising the surface of the stream at those ae (that is, the erests of the falls). Planks were accord- ingly fixed in the grooves above the bridge arches, or temporary weirs were formed over which the water was allowed to fall ; in some eases the surface of the water was thus raised above its normal height, eausing a backwater in the

ehannel above" (Crofton's Report on the Ganges Canal, p. 14). Fig. 126 represents in an exaggerated form what probably oceurred, the diagram bein, intended to represent some miles' length of the eanal bed above the fall. AA parallel to the canal bed is the level eorresponding to uniform motion with the intended velocity of the eanal. In eon- sequenee of the presence of the ogee fall, however, the water surface would take some sueh form as BB, eorresponding to Case 2 above, and the veloeity would be greater than the intended velocity, nearly in the inverse ratio of the actual to the intended depth. By eon- structing a weir on the crest of the fall, as shown by dotted lines, a

denominator of the fraction tends to the limit zero, and

and by suitably choosing the height of the weir this might be made to agree approximately with the intended level AA.

dio B

Fig. 126. 109. Case 3.—Suppose a stream flowing uniformly with a depth

2 2

H< . Forastream in uniform motion Gr mt, orif the stream

2

is of indefinitely great width, so that m=H, then i = 7H, and

2

H=¢ i . Consequently the condition stated above involves that

oi ", or that i> £ . If such a stream is interfered with by the construction of a weir which raises its level, so that its depth at the weir becomes h, peal ; then for a portion of the stream the depth A will satisfy the eon-

2

ditions <— and h>H, which are not the same as those assumed

in the two previous cases. At some point of the stream above the

2

weir the depth & becomes equal to “, and at that point = becomes

infinite, or the surface of the stream is normal to the bed. It is ob- vious that at that point the influence of internal friction will be too great to be negleeted, and the general equation will eease to repre- sent the true eonditions of the motion of the water. It is known that, in eases such as this, there oeeurs an abrupt rise of the free surface of the stream, or a standing wave is formed, the conditions of motion in whieh will be examined presently.

It appears that the condition necessary to give rise to a standing

wave is that >>: Now ¢ depends for different channels on the

roughness of the ehannel and its hydraulic mean depth. M. Bazin has ealculated the values of ¢ for ehannels of different degrees of roughness and different depths given in the following table, and the corresponding minimum values of 7 for which the exceptional case of the production of a standing wave may occur.

Slope below which a Stand- ing Wave is impossible in feet per foot.

Standing Wave Formed.

Nature of Bed of Stream. Slope in feet | Least Depth per foot. in feet.

0°002 0°003 0°004

| 0°003 | |

0‘262 098 065 394 197 098

1°181

525 262

3°478 1°542

919

Very smooth cemented

anes 0°00147

0°004 0°006 0°004 0°006

0010 0006

0°010 0°015

0°00186

0‘002385

000275

STANDING WAVES.

110. The formation of a standing wave was first observed by Bidone. Into a small reetangular masonry ehannel, having a slope of 0°023 feet per foot, he admitted water till it flowed uniformly with a depth of 0°2 feet. He then placed a plank aeross-the stream whieh raised the level just above the obstruction to 0°95 feet. ‘He found that the stream above the obstruction was sensibly unaffected up toa point 15 feet from it. At that point the depth suddenly increased from 0°2 feet to 0°56 feet. The velocity of the stream in

the part unaffected by the obstruction was 5°54 feet per second. Above the point where the abrupt change of depth oceurred w?= 5542 = 30°7, and gh =32‘2 × 0‘2=6‘44; hence wu? was >gh. Just be-

low the abrupt change of depth u=5‘54x J 5 =1:97; w2=3‘88; and gh =32‘2 × 0°56 =18‘03 ; hence at this point w

The change of level at a standing wave may be found thus. Let fig. 127 represent the longitudinal section of a stream and

velocity w diminished and the depth / increased. Ata point C,

2

where h became equal to“ , the conditions for producing the stand-

ing wave oceurred. Beyond C the free surface abruptly rose to the level corresponding to uniform motion with the assigned slope of the lower reach of the canal.

_A standing wave is sometimes formed on the down stream side of bridges the piers of which obstruct the flow of the water. Some _ interesting cases of this kind are described in a paper on the ‘Floods in the ED 2, | epee mere! bey cecceeeere Nerbudda Valley” |= in the Proc. Inst. of Civil Engineers,

ys eal Sane [ao

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=

sents the section of the stream at ee 8 of the Towah iaduct, during the flood of 1865. The wn level is not exact iven b : Mr Hoosen, put Fig. 129. has been inferred from data given on another drawing. The velocity of the stream was not observed, but the author states it was probably the same as at the Gunjal river during a similar flood, that is 16°58 feet per second. Now, taking the depth on the down stream face of the pier at 26 feet, the velocity necessary for the production of a standing wave would be ING gh =4/(82‘2 × 26) =29 feet per second nearly. Butthe velo- eity at this point was probably from Mr Howden’s statements 16°58 x $9=25‘5 feet, an agreement as close as the approximate character of the data would lead us to expect.

*: oa yy——> | Vol. xxvii. p. 222, *

ue” ‘ uy by Mr A. C, How- : wi — den. Fig. 129 is ‘o 0 5 in! ‘ ; compiled from the +

es es : y Wi id data given in that :

\ eZ DT ddddddddddddlddddddddd (| paper. It repre-

Fig. 127.

ab, cd cross sections normal to the bed, which for the short distance considered may be assumed horizontal. Suppose the mass of water abed to come to a’d’c’d’ ina short time ¢; and let 2, % be the veloci- ties at ab and cd, Q),9, the areas of the eross sections. The force causing change of momentum in the mass abed estimated horizon- tally is simply the difference of the pressures on. ab and cd. Putting ho,h, for the depths of the centres of gravity of ab and cd measured down from the free water surface, the force is G(Aig% — 2,9) pounds, and the impulse in ¢ seconds is G (A M% — 44%) t second pounds. The horizontal change of momentum is the difference of the momenta of cde’d’ and aba’b’ ; that is,

S(O? = Np Up?)é °

Y

Wy yj

Hence, equating impulse and change of momentum, GAM — 24M)t = 2 (Quy? — Apey?)t 5

XI. ON STREAMS AND RIVERS.

112. Catchment Basin.—A stream or river is the channel for the discharge of the available rainfall of a district, termed its catchment basin. The catchment basin is surrounded by a ridge or watershed line, continuous except at the point where the river finds an outlet. The area of the catchment basin may be determined from a suitable contoured map on a scale of at least 1 in 100,000. Of the whole rainfall on the catchinent basin, a part only finds its way to the stream. Part is directly re-evaporated, part is

absorbed by vege- tation, part may escape by percolation into neighbouring districts. The following table gives the relation of the average stream dis- charge to the average rainfall on the catchment basin (‘Tiefenbacher).

AyQ ori hyQh = Pelee . ° . ° . (1 }e

For simplicity let the section be rectangular, of breadth B and depths H, and Hj, at the two cross sections considered; then iy =; Hy

and iyo SH, Hence H,?-H,? =a! ~ Hy.) But, since Qy%t)—=Q,%,, we have

2 0

Up =U a5? Hy

Loss by Evapora- tion, &c., in per cent, of total

Rainfall.

Ratio of average Discharge to average Kainfall.

ies Hee H.~~H ~ 2 (Fe — Hy) sw hog? goth 0 a4 g H, 0 ( ) This equation is satisfied if H)»=H,, which corresponds to the case of uniform motion. Dividing by H)~~ Hy, the equation becomes

———=

Cultivated land and spring- : . Hay, + H,) = 20" bead bog k Som Ce forming declivities…… } a te 67 to 70 Hy g : Wooded hilly slopes……+++- 85 to °45 55 to 65 Que? 1 1 Naked unfissured mountains…| ‘55 to “60 40 to 45 oe H=\ | 2H, +7 He | Pigg tht – + (4).

113. Flood Discharge.—The flood discharge can generally only be determined by examining the greatest height to which floods have been known to rise. 1’o produce a flood the rainfall must be heavy and widely distributed, and to produce a flood of exceptional height the duration of the rainfall must be so great that the flood waters of the most distant affluents reach the point considered, simultane- ously with those from nearer points. The larger the catchment basin the less probable is it that all the conditions

tending to pro- duce a maximum discharge should simultaneously occur. Further, lakes and the river bed itself act as storage reservoirs during the rise of water level and diminish the rate of discharge, or serve as flood moderators. The influence of these is often important, because very heavy rain storms are in most countries of comparatively short duration. Tiefenbacher gives the following estimate of the flood discharge of streams in Europe:—

In Bidone's experiment u,—5°54, and H =0°2, Hence H,=0°52, which agrees very well with the observed height.

Fig. 128.

111. A standing wave is frequently produced at the foot of a weir. Thus in the ogee falls originally constructed on the Ganges eanal a standing wave was observed as shown in fig. 128. The water falling over the weir crest A acquired a very high velo-

Flood discharge of Streams per Second per Square Mile of Catchment Basin.

eity on the steep slope AB, and the section of the stream at B | In flat coumtry «....-s-s-crereernee oe 8°7 to 12°5 cub. ft. became very small. It easily happened, therefore, that at B the | In hilly districts ….—.--+---- s:svecvre 17°5 to 225, In moderately mountainous districts…... 36°2 to 45:0,

depth new, In flowing al h rei g owing along the rough apron of the weir the In very mountainous districts ….....++. 50°0 to 75'°0_—s=ys,

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It has been attempted to express the decrease of the rate of flood | and from this the following values of the mean velocity are

discharge with the increase of extent of the eatchment basin by | obtaincd

empirical formule. Thus Colonel O'Connell proposes the formula y= Mv/z, where Mis a constant called the modulus of the river, the value of which depends on the amount of rainfall, the physical ehar- acters of the basin, and the extent to which the floods are moderated by storage of the water. If M is small for any given river, it shows that the rainfall is small, or that the permeability or slope of the sides of the valley is such that the water does not drain rapidly to the river, or that lakes and river bed moderate the risc of the floods. If values of M are known for a number of rivers, they may be used in inferring the probable discharge of other similar rivers, For British rivers M varies from 0°48 for a small stream draining meadow land to 37fortheTyne. Generally it is about 15 or 20. For large European rivers M varies from 16 for the Seine to 67°5 for the Danube. For the Nile M=11, a low value which results from the immense length of the Nile throughout which it receives no affluent, and probably also from the influence of lakes, For different tributaries of the Mississippi M varies from 18 to 56. For various Indian rivers it varies from 40 to 303, this variation being due to the great variations of rainfall, slope, and character of Indian rivers.

In some of the tank projects in India, the flood discharge has

been calculated from the formula D=C ¥/n?, where D is the dis- charge in cubic yards per hour from m square miles of basin. The eonstant C was taken= 61,523 in the designs for the Ekrooka tank, ari on Ganges and Godavery works, and=10,000 on Madras works,

114. Action of a Stream on its Bed.—If the velocity of a stream excceds a certain limit, depending on its size, and on the size, heavi- ness, form, and coherence of the material of which its bed is composed, it scours its bed and carries forward the materials, The quantity of material which a given stream can carry in suspension ~ depends on the size and density of the particles in suspension, and is greater as the velocity of the stream is greater. If in ~ one part of its course the velo- eity of a stream is great enough to scour the bed and the water becomes loaded with silt, and in a subsequent part of the river's eourse the velocity is diminished, then part of the transported material must be deposited. Probably deposit and scour = . . go on siinultane- ously over the whole river bed, but in some parts the rate

of scour is in excess of the rate of de- ___ sc. posit, and in other "| parts the rate of de- posit is in excess of the rate of scour. ing power at any given velocity. It is possible that the difference is strictly a difference of transporting, not of scouring action. Let fig. 180 represent a section of a stream. The material lifted at a will be diffused through the mass of the stream and deposited at different distances down stream. The average path of a particle lifted at a will be some such curve as abc, and the average distance of transport each time a particle is lifted will be represented by ac. In a deeper stream such as that in fig. 131, the average height to which particles are lifted, and, since the rate of vertical fall through the water may be assumed the same as before, the average distance a'¢ of a transport, will be greater. Consequently, al- though the scouring action may be identical in 3 the two streams, the velocity of transport of material down stream is greater as the depth of the stream is greater. The effect is that the deep stream excavates its bed more rapidly than the shallow stream.

115. Bottom Velocity at which Scour commences.—The following bottom velocities were determined by Dubuat to be the maximum Velocitics consistent with stability of the stream bed for different materials,

Darey and Bazin give, for the relation of the mean velocity v, and bottom velocity vs,

Vm = +10°87A/mé .

Vmimoma/ £ é mmme(I -10°87,/ ©) P

Taking a mean value for ¢, we get Vm =1°31204 ,

Fig. 180.

MMV

Fig. 131. Deep streams appear to have the greatest scour-

a-af!

But

R.Tyne

<== 7B MN s—Pemnn=—9 Meo Da

Bottom Velocity! Mean Velocity

. Broken stone, flint.....066. Cn alk, oft, SMALE 6:5 cou cincse ot seen dv0s ps MOCKS Ut) WOR 5 jesus sen ceria cmrvanciewe . Hard rock

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2. 3. 4, 5. 6 7 8 9

*The following table of velocities which should not be exceeded in channels is given in the Ingenicurs Taschenbuch of the Vereiu ** Htitte ” :—*

Bottom Velocity.

Mean Velocity.

Surface Velocity.

Slimy earth or brown clay Clay Firm sand

°26

52

1°02 2°30 3°08 4°90 6°00 10°36

36

1°51 3°15 4°08 6°10 7°45 12°15

Boulder bed

Conglomerate of slaty fragments Stratified rocks

Hard rocks

116. Regime of a River Channel.—A river channel is said to be in a state of regime, or stability, when it changes little in draught or form in a series of years. In some rivers the deepest part of the channel changes its position perpetually, and is seldom found in the same place in two successive years, The sinuousness of the river also changes by the erosion of the banks, so that in time the position of the river is completely altered. In other rivers the change from year to year is very small, but probably the regime is never perfectly stable except where the rivers flow over a rocky bed.

If a river had a constant discharge it would gradually modify its bed till a permanent regime was established. But as the volume Sduaget is constantly changing, and therefore the velocity, silt is deposited when the velocity decreases, and scour goes on when the velocity increases in the same place. When the scouring and silt- ing are considerable, a perfect balance between the two is rarely established, and hence continual variations occur in the form of the river and the direction of its currents. In other eases, where the action is less violent, a tolerable balance may be established, and the deepening of the bed by scour at one time is compensated by the silting at another. In that ease the general regime is permanent, though altcration is constantly going on. This is more likely to happen if by artificial means the erosion of the banks is prevented. Ifa river flows in soil incapable of resisting its tendency to scour it is necessarily sinuous (§ 103), for the slightest deflexion of the eurrent to either side begins an erosion which increases progres- sively till a considerable bend is formed. If such a river is straightened it becomes sinuous again unless its banks are pro- tected from scour,

117. Longitudinal Section of River Bed.—The declivity of rivers decreases from source tomouth. In their higher parts rapid and

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torrential, flowing over beds of gravel or boulders, they enlarge in volume by receiving affluent streams, their slope diminishes, their bed consists of smaller materials, and finally they reach the sea. Fig. 132 shows the length in miles, and the surface fall in feet per mile, of the Tyne and its tributaries,

The decrease of the slope is due to two causes. (1) The action of the transporting power of the water, earrying the smallest debris the greatest distance, causes the bed to be less stable near the mouth than in the higher parts of the river ; and, as the river adjusts its

slope to the stability of the bed by scouring or increasing its sinous- ness when the slope is too great, and by silting or straightening its course if the slope is too small, the decreasing stability of the bed would coincide with a decreasing slope. (2) The increase of volume and section of the river leads to a decrease of slope ; for the larger the section the less slope is necessary to ensure a given velocity.

The following investigation, though it relates toa purely arbitrary case, is not without interest. Let it be assumed, to make the con- ditions definite— (1) that a river flows over a bed of uniform resistance to scour, and let it be further assumed that to maintain stability the velocity of the river in these circumstances is constant from source to mouth: (2) suppose the sections of the river at all points are similar, so that, being the breadth of the river at any point, its hydraulic 4 D x mean depth is ab and its section is cb?, where a and ¢

velocity of the current, or from submersion of the tow paths, or from the headway under bridges becoming insufficient. Ordinarily the highest navigable level may be taken to be that at which the river begins to overflow its banks.

119, Relative Value of Different Materials for Submerged Works. — That the power of water to remove and transport different materials depends on their density has an important bearing on the selection of materials for

submerged works. In many cases, as in the aprons or floorings beneath bridges, or in front of locks or falls, and in the formation of training walls and breakwaters by pierres perdus, which have to resist a violent current, the materials of which the structures are composed should be of such a size and weight as to be able individually to resist the scouring action of the water. The heaviest materials will therefore be the best; and the different value of materials in this respect will appear much more striking, if it is remembered that all materials lose part of their weight in water. A block whose volume is V cubic feet, and whose density in air is w Yb per cubic foot, weighs in air wV hb, but in water only (w— 62°4) V tb.

Weight of a Cubie Foot in Ib.

are constants appli- nt he haere cable to all parts of] ‘ : thomivar; (8) lebane a eee eee 1873 1249 degen Fig. 188. AGHA fas soccer goeccrls aster 112-0 “49°6 the discharge in- Guahtes aac taace® 1700 107°6 creases uniformly in consequence of the supply from affluents, so cg he Sepilantagmial emia Cie AK 4 P

so 7s £ : : a amd BbOMO sonna cements reine lenis ees 144°0 81°6 that, if 7 is the length of the river from its source to any given M 116-144 | 53°6- 81°6 point, the discharge there will be £1, where & is another constant ASR aes, Gea ean

applicable to all points in the course of the river.

Let AB (fig. 138) be the longitudinal section of the river, whose source is at A; and take A for the origin of vertical and horizontal eoordinates. Let C be a point whose ordinates are x and y, and let the river at C have the breadth }, the slope ?, and the velocity v.

120. Inundation Deposits from a River.—When-a river carrying silt periodically overflows its banks, it deposits silt over the area flooded, and gradually raises the surface of the country. The silt is deposited in greatest abundance where the water first leaves the river.

; ; 7 | It hence results that the section of the country assumes a_ peculiar

Since velocity x area of section=discharge, vcb°=kl, or imal tl. | form, the river flowing in a trough along the crest of a ridge, from

cv | which the land slopes downwards on both sides. The silt deposited

Hydraulic mean depth =ab=a kt ; from the water forms two wedges, having their thick ends towards cv the river (fig. 184).

But, by the ordinary formula for the flow of rivers, mi= Cv? ;

But ¢ is the tangent of the angle which the curve at C makes with the axis of X, and is therefore= 92. Also, as the slope is small, t1=AC=AD=z nearly.

This is strikingly the case with the Mississippi, and that river is now kept from flooding immense areas by artificial embankments or levees, In India, the term deltaic seyment is sometimes applied to that portion of a river running through. deposits formed by inunda- tion, and having this characteristic section. The irrigation of the country in this case is very easy, a comparatively slight raising of the river surface by a weir or annicut gives a command of level which permits the water to be conveyed to any part of the district.

121. Deltas, —The name delta was originally given to the A-shaped portion of Lower Egypt, ineluded between seven branches of the Nile. It is now given to the whole of the alluvial tracts round river mouths formed by deposition of sediment from the river, where its velocity ig checked on its entrance to the sca. The characteristic feature of these alluvial deltas is that the river traverses them, not in a single channel, but in two or many bifurcating branches, Each branch

and, remembering that v is constant, 2¢vi ae CL eer

or y? = constant x x ;

so that the curve is a common parabola, of which the axis is hori- zontal and the vertex at the source. This may be considered an ideal longitudinal section, to which actual rivers approximate more or less, with exceptions

due to the varying hardness of their beds, and the irregular manner in which their volume increases.

118. Surface Level of River.—The surface level of a river is a plane changing constantly in position from changes in the volume of water discharged, and more slowly from changes in the river bed, and the circumstances affecting the drainage into the river.

For the purposes of the engineer, it is important to determine (1) the extreme low water level, (2) the extreme high water or flood level, and (3) the highest navigable level.

(1) Low Water Level cannot be absolutely known, because a river reaches its lowest level only at rare intervals, and because alterations in the cultivation of the land, the drainage, the removal of forests, the removal or erection of obstructions in the river bed, &c., gradually alter the conditions of discharge. The lowest level of which records can be found is taken as the conventional or approxi- mate low water level, and allowance is made for possible changes.

(2) High Water or Flood Level. —The enginecr assumes as the

highest flood level the highest level of which records can be ob- Shoal. tained. In forming a judgment of the data available, it must be

remembered that the highest level at one point of a river is not Fie. 135 always simultaneous with the attainment of the highest level at a ‘

other points, and that the rise of a river in flood is very different in different parts of its course. In temperate regions, the floods of rivers seldom rise more than 20 feet above low water level, but in the tropics the rise of floods is greater.

(3) Highest Navigable Level.—When the river rises above a certain level, navigation becomes difficult from the increase of the

has a tract of the delta under its influence, and gradually raises the surface of that tract, and extends it seaward. As the delta extends itself scaward, the

conditions of discharge through the different branches change. The water finds the passage through one of the branches less obstructed than through the others ; the velocity and scouring action in that branch are increased ; in the others they

diminish. The one channel gradually absorbs the whole of the water supply, while the other branches silt up. But as the mouth of the new main channel extends seaward the resistance increases both from the greater length of the channel and the formation of shoals at its mouth, and the river tends to-form new bifurcations AC or AD (fig. 135), and one of these may in time become the main channel of the river.

122. Field Operations preliminary to a Study of River Improve- ment.—There are required (1) a plan of the river, on which the positions of lines of levelling and cross sections are marked ; (2) a longitudinal section and numerous cross sections of the river; (8) a series of gaugings of the discharge at different points and in different conditions of the river.

Longitudinal Section.—This requires to be carried out with great aecuracy. A line of stakes is planted, following the sinnosities of the river and chained and levelled. The cross sectious are referred to the line of stakes, both as to position and direction. To determine the slope of the water surface great care is necessary.

123. Cross Sections. —A stake is planted flush with the water, and its level relatively to some poiut on the line of levels is determined. Then the depth of the water is determined ata series of points (if possible at uniform distances) in a line starting from the stake and perpendicular to the thread of the stream. To obtain these, a wire may be stretched across with equal distances marked on it. by hang- ing tags. The depth at each of these tags may be obtained by a light wooden staff, with a disk-shaped shoe 4 to 6 inches in diamcter. if the depth is great, soundings may be taken by a chain and weight. To ensure the wire being perpendicular to the thread of the stream, it is desirable to streteh two other wires similarly graduated, one above and the other below, at a distance of 20 to 40 yards, A number of

floats being then thrown in, it is observed whether they pass the same graduation on each wire.

For large and rapid rivers the cross section is obtained by sonnd- ing in the following way. Let AC (fig. 186) be the line on which soundings are required. A base line AB is measured out at right angles to AC, and ranging staves are set up at AB and at D in line with AC. A boat is allowed to drop down stream, and, at the moment it comes in line with AD, the lead is dropped and an ob- D server in the boat takes, with —— _

a box sextant, the angle | / AEB subtended by AB.

The sounding line may have / a weight of 14 Ib of lead, i and, if the boat drops down stream slowly, it may hang near the bottom, so that the observation is made instant- ly. In extensive surveys of the Mississippi observers with theodolites were sta- tioned at A and B. The theo- dolite at A was directed to- wards C, that at B was kept on the boat. When the boat : came on the line AC, the Fig. 136.

observer at A signalled, the sounding line was dropped, and the ob- server at B read off the angle ABE. By repeating observations a number of sonndings are obtained, which can be plotted in their proper position, and the form of the river bed drawn by connecting the extremities of the lines. From the seetion can be measured the seetional area of the stream Q and its wetted perimeter x ; and from these the hydraulic mean depth m ean be calculated.

124. Measurement of the Discharge of Rivers. —The area of cross section multiplied by the mean velocity gives the discharge of the stream. The height of the river with reference to some fixed mark should be noted whenever the velocity is observed, as the velocity and area of cross seetion are different in different states of the river. To determine the mean velocity various methods may be adopted ; and, since no method is free from liability to error, either from the difficulty of the observations or from uncertainty as to the ratio of the mean velocity to the velocity observed, itis desirable that more than one method should be used.

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INSTRUMENTS FOR MEASURING THE VELOCITY OF WATER.

125. Surface Floats are eonvenient for determining the surface velocities of a stream, though their use is difficult near the banks. The floats may be small balls of wood, of wax, or of hollow metal, so loaded as to float nearly flush with the water surface. To render them visible they may have a vertical painted stem. In experi- ments on the Seine, cork balls 13 inches diameter were used, loaded to float flush with the water, and provided witha stem. In Captain Cunninghami's observations at Roorkee, the floats were thin circular disks of English deal, 3 inches diameter and } inch thick. For observations near the banks, floats 1 inch diameter and + inch thick were used. To render them visible a tuft of cotton wool was used loosely fixed in a hole at the centre.

The velocity is obtained by allowing the float to be carried down, and noting the time of passage over a measured length of the stream. If v is the velocity of any float, ¢ the time of passing over a length

i, then vet . To mark out distinctly the length of stream over

which the floats pass, two ropes may be stretched across the stream at a distance apart, which varies usually from 50 to 250 feet, accord- ing to the size and rapidity of the river. In the Roorkee experi- ments a length of run of 50 feet was found best for the eentral two- fifths of the width, and 25 feet for the remainder, except very close to the banks, where the run was made 124 feet only. The longer the run the less is the proportionate error of the time observations, but on the other hand the greater the deviation of the floats from a straight course parallel to the axis of the stream. To mark the preeise position at which the floats cross the ropes, Captain Cun- ningham used short white rope pendants, hanging soas nearly to touch the snrface of the water. In this case the streams were 80 to 180 feet in width. In wider streams the use of ropes to mark the length of run is impossible, and

recourse must be had to box sex- tants or theodolites to mark the path of the floats.

Let AB (fig. 187) be a measured base line strictly parallel to the thread of the stream, and AA,, BB, lines at right angles to AB marked out by ranging rods at A and B,. Suppose observers stationed at A and B with sextants or theodo- A lites, and let CD be the path of any float down stream. As the float ap- proaches AA,, the observer at keeps it on the cross wire of his in- strument. The observer at A observes the instant of the float reaching the line AA,, and signals to B who then reads off the angle ABC. Similarly, as the float approaches BB,, the ob- server at A keeps it in sight, and when signalled to by B reads the angle BAD. The data so obtained are suf- ficient for plotting the path of the float and determining the distances AC, BD.

The time taken by the float in pass- ing over the measured distanee may Fic. 137 be observed by a chronograph, started 18. ‘ as the float passes the npper rope or line, and stopped when it passes the lower. In Captain Cunningham's observations two chrono- meters were sometimes used, the time of passing one end of the run being noted on one, and that of passing the other end of the run being noted on the other. The chronometers were compared im- mediately before the observations. In other eases a single chrono- meter was used placed midway of the run. The moment of the floats passing the ends of the run was signalled to a timekeeper at the ehronometer by shouting. It was found quite possible to count the chronometer beats to the nearest half second, and in some cases to the nearest quarter second.

126. Sub-surface Floats.—The velocity at different depths below the surface of a stream may be obtained by sub-surface floats, used precisely in the same way as surface floats. The most usual arrange- ment is to have a large float, of slightly greater density than water, connected with a small and very light surfaee float. The motion of the combined arrangement is not sensibly different from that of the large float, and the small surface x float enables an observer to note the = path and velocity of the sub-surface float. The instrument is, however, not free from objection. If the large submerged float is made of very nearly the same density as water, then it is liable to be thrown up- wards by very slight eddies in the water, and it does not

maintain its position at the depth at which it is intended to float. On the other hand, if the large float is made sen- sibly heavier than water, the indicat- ing or surface float must be made rather large, and then it to some ex- tent influences the motion of the submerged float. Fig. 138 shows one form of sub-surface float. It con- sists of a couple of tin plates bent at a right angle and soldered together at the angle. This is connected with a wooden ball at the surface by avery thin wire orcord. As the tin alone makes a heavy submerged float, it is better to attach to the tin float some pieces of wood to diminish its weight in water. Fig. 139 shows the form of submerged float used by Captain Cunningham. It consists of a hollow metal ball connected to a slice of cork, which serves as the

surface float. XIT. — 64

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Fig. 138.

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water, which ensures a constant coefficient of friction for the rubbing In order

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parts, and prevents any mud or grit finding its way in.

Fig. 139. Fig. 140. depth at which the heavier float swims, which is determined by the length of the connecting wire. Thus ifv, is the surface velocity and va the velocity at the depth to which the lower float is sunk, the velocity of the combined floats will be

= +04 2

Consequently, if v is observed, and v, determined by an experiment with a single float,

Va QU — U5 °

According to Captain Cunningham, the twin float gives better results than the sub-surface float.

128. Velocity Rods.—Another form of float is shown in fig. 141. This consists of a cylindrical rod loaded at the lower end so as to float nearly vertical in water. A wooden rod, with a metal cap at the bottom in which shot can be placed, answers better than anything else, and sometimes the wooden rod is made in lengths which can be screwed to- gether so asto suit streams of different depths,

129. Revy's Current Meter. —No instrument has been so much uscd in directly determining the velocity of a stream at a given point as the screw current meter. Of this there are a dozen varieties at least. As an example of the instrument in its simplest form, Mr Revy's meter may be selected. This is an ordinary screw meter of a larger size than usual, more carefully made, and with its details carefully studied (figs. 142, 143). It was designed after experience in gauging the great South American rivers. The screw, which is actuated by the water, is 6 inches in diameter, and is of the type of the Griffiths screw used in ships. The hollow spherical boss serves to make the weight of the screw sensibly equal to its dis- placement, so that friction is much reduced. On the axis aa of the screw is a worm which drives the counter. This consists of two worm wheels g and # fixed on a common axis. 'The worm wheels are carried on a frame attached to the pind. By means of a string attached to 7 they can be pulled into gear with the worm, or dropped out of gear and stopped at any instant. A nut m can be om | up, if necessary, to keep the counter per- manently in gear. The worm is two-threaded, and the worm wheel g has 200 teeth. Consequently it makes one rotation for 100 rotations of the screw, and the number of rotations up to 100 is marked by the passage of the graduations on its edge in front of a fixed index. The second worm wheel has 196 teeth, and its edge is divided into 49 divisions. Hence it falls behind the first wheel one division for a complete rotation of the latter. The number of hundreds of rotations of the screw are therefore shown by the number of divisions on h passed over by an index fixed to g. One difficulty in the use of the otdinary screw meter is that particles of grit, getting into the working parts, very sensibly alter the

friction, and therefore the speed of the meter. Mr Revy obviates this by enclosing the counter in a brass box with a glass face. This box is filled with pure

Fig. 142. —Scale 4 full size.

that the meter may place itself with the axis "rap to the current, it is pivoted on a vertical axis and directed by a large vane shown in fig. 148. To give the vane more direct- ing power the vertical axis is nearer the screw than in ordinary meters, and the vane is larger. A second horizontal vane is attached by the screws 2,x, the object of which is to allow the meter to rest on the ground without the motion of the screw Deing interfered with. The string or wire for starting and stopping the meter is carried through the centre of the vertical axis, so that the strain on it may not tend to pull the meter oblique to the current, The pitch of the screw is about 9 inches. The screws at x serve for filling the meter with water. The whole apparatus is fixed to a rod (fig. 143), of a length proportionate to the depth, or for very great depths it is fixed to a weighted bar lowered by ropes, a plan invented by Mr Revy. The instrument is generally used thus. The reading of the counter is noted, and it is

ut out of gear. The meter is then lowered into the water to the required position from a platform between two boats, or better from a temporary bridge. Then the counter is

ut into gear for one, two, or five minutes.

astly, the instrument is raised and the counter again read. The velocity is deduced from the number of rotations in unit time by the formule given below. For surface velocities the counter may be kept per- manently in gear, the screw being started and stopped by hand.

130. The Harlacher Current Meter.—A very interesting modification of the current meter is that made by Amsler Laffon of Schaffhausen, which is described in Heu- singer von Waldegg (Handb. der Ingeniewr-wissenschaften, iii. p. 284). In this the or- dinary counting apparatus is abandoned.

Fig. 143.

A worm drives a worm wheel, which makes an electrical contact once for each 100 rotations

of the worm. This contact gives a signal above water. With this arrangement, a series of velocity observations can be made, without removing the instrument from the water, and a number of practical difficulties attending the accurate starting and stopping of the ordinary counter are entirely got ridof, Fig 144 shows the meter. The worm wheel z makes one rotation for 100 of the screw. A pin moving the lever « makes the electrical contact. The wires b, c are led through a gas pipe B ; this also serves to adjust the meter

to any required position on the wooden rod dd. The rudder or

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vane is shown at WH. The galvanic current acts on the electro- magnet m, whieh is fixed in a small metal box eontaining also the battery. The magnet exposes and withdraws a coloured disk at an opening in the cover of the box.

Ls NB ZN Zz

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Moore’s Current Meter.—The difficulties in using the ordinary current meter have been overeome to a great extent by an arrange- ment of another kind, invented by Mr B. T. Moore (Proc. Inst.

| Ww : ba ~~6$~~- 4:2 F'o---------- s)he Scale ¢ Full Size. Fig. 145.

Civil Eng., xlv. 220). This instrument (fig. 145) can be lowered into the water to any required depth bya light cord or ehain. The counting arrangement inside the meter can be started or stopped at any instant. The instrument consists of a light brass frame carry-

ing an ogival head, and long rudder, cross-shaped in section. The frame is suspended in a stirrup, and if necessary a lead weight can be suspended below the meter. A rotating eylinder with serew blades is placed behind the ogival head. The centre of gravity of the instrument is aceurately in the intersection of the axis of the stirrup-bearings and the longitudinal axis of the instrument. The rotating cylinder is started by releasing a spring by acord. The recording mechanism is inside the rotating cylinder. The instrument is put in motion by a very small foree. Some experiments made by towing it in still water gave the following equations :— For speeds giving more than sixty rotations per minute,

$v=1'2R,$

where v is the velocity of the water relatively to the instrument in feet per minute, and R the number of rotations per minute. For lower speeds,

$v=R+12.$

It would appear therefore that the instrument will record velocities down to 12 feet per minute. Mr Moore states that a velocity at any depth down to 20 feet can be taken in five minutes, the meter being raised and lowered much more easily than when it is attached to a rod.

Determination of the Coefficients of the Current Meter.—Suppose a series of observations have been made, by towing the meter in still water, at different speeds, and it is required from these to ascertain the coefficients of the meter. A formula must be assumed to con- nect the observed velocities v

with the number of rotations per second 2. Then, in determining the coefficients of the formula from the given observations, the condition to be fulfilled is that the sum of the squares of the differences between the observed results and those given by the formula should be a minimum.

Let the formula assumed be of the form

v=an+B . (1). Then the difference in any case between the observed and caleul-

| ated quantity is v-an-f; and therefore ¥(v~an— 8)? is to bea

minimum.

The coefficients being independent, we must equate separately to zero the differential coefficients of the expression with respect to the two coefficients.

=[(v-an-p)n | =0; 2[(v- ans) | =0;

whence = (n) a+ 3(n)B = =(vn) ;sx X(n)a+ %(n)B=2(v) ;*

from which a and 8 are casily determined.

Exner has shown (Zettschrift fiir Bauwesen, 1875) that the relation between the velocity of the water and the number of rota- tions of the meter is better expressed by the formula

van/(atrt+ru?). 2. 1. 2 ee (2) than by that generally used. 1, is sensibly equal to the velocity at which the meter just ceases to revolve ; anda isa constant deter- mined by oe at different speeds. Other expressions have been given, but they are more complicated and not more aceurate than (1) and (2).

181. Darcy Gauge or Modified Pitot Tube.—A very old instrument for measuring velocities, invented or used by Pitot, consisted simply of a vertical glass tube with a night- angled bend, placed so that its mouth === was normal to the direction of flow (fig.

146).

The impaet of the .. V, stream on the mouth of the tube balances a eolumn in the tube, yy the height of whieh —a=a# is approximately

Bi oes Sl |

,

.)

t t { t}

h -<, where v is Fig. 146.

g as the velocity at the depth x. Placed with its mouth parallel to the stream the water inside the tube is nearly at the same level as the surfaee of the stream, and turned with the mouth down

2

stream, the fluid sinks a depth Was nearly, though the tube in

that case interferes with the free flow of the liquid and somewhat inodifies the result. Pitot expanded the mouth of the tube so as to form a funnel or bell mouth. In that case he found by experiment

vy h=1 O55"

The objection to this is that the motion of the stream is interfered with, and it is no longer certain that the velocity in front of the orifice is exactly the velocity of the unobstructed stream. Darcy preferred to make the mouth of the tube very small, partly to avoid interference with the stream, partly to check oscillations of the column. In that case he found the difference of level of two tubes, such as A and B, to be almost exactly

two tubes, formed of copper in the lower part, are united into one for strength, andthe mouths of the tubes open vertically and horizontally. The upper part of the tubes is of glass, and they are provided with a brass scale

and two verniers b, b. The wholeinstrument is supported on a vertical rod or small pile AA, the fixing at B permitting the instrument to be adjusted to any height on the rod, and at the same time allowing free rotation, so that it can be held parallel to the current. At cis a two-way cock, which can be opened or closed by cords. If thisisshut, the instrument can be lifted out of the stream for reading. The glass tubesare connected at top by a brass fixing, with a stop cock a, and a flexible tube and mouthpiece m. The use of this is as follows. If the velocity is required at a point near the surface of the stream, one at least of the water columns would be below the level at which it could be read. It would bein the copper part of the instrument. Suppose then a little air is sucked out by the tube m, and the cock a closed, the two columns will be forced up an amount corresponding to the difference between atmospheric pressure and that in the tubes. But the difference of level will remain unaltered.

When the velocities to be measured are not very small,'this instru- ment is an admirable one. It requires observation only of a single linear quantity, and does not require any time observation. The law connecting the velocity and the observed height is a rational one, and it is not absolutely necessary to make any experiments on the coefficient of the instrument. If we take

v=kn/2oh,

then it appears from Darcy's experiments that for a well-formed instrument & does not sensibly differ from unity. It gives the velocity at adefinite point inthe stream. The chief difficulty arises from the fact that at any given point in a stream the velocity is not absolutely constant, but varies a little from moment to moment. Darcy in some of his experiments took several readings, and deduced the velocity from the mean of the highest and lowest.

132. Hydrodynamometer of M. Perrodil.—This consists of a frame abed (fig. 148) placed vertically in the stream, and of a height not less than the stream's depth. The two vertical members of this frame are conuected by cross bars, and united above water by a circular bar, situated in the vertical plane and carrying a horizontal graduated circle ¢f This whole system is movable round its axis, being suspended on a pivot at g connected with the fixed support mn. Other horizontal arms serve as guides. The central vertical rod gr forms a torsion rod, being fixed at r to the frame abed, and,

passing .— — —-— freely upwards through the – guides, it carries a horizontal ——— – needle moving over the gradu- -——— ated circle ef. The support g, ——— which carries the apparatus, also receives in a tubular guide the end of the torsion rod gr and a set screw for fixing the upper end of the torsion rod when necessary. The impulse of the stream of water is received on a W circular disk x, in the plane of "SS the torsion rod and the frame abed. To raise and lower the Fig. 148. apparatus easily, it is not fixed directly to the rod mn, but to a tube &/ sliding on mn.

Suppose the apparatus arranged so that the disk « is at that level in the stream where the velocity is to be determined. The plane abed is placed parallel to the direction of motion of the water. Then the disk « (acting as a rudder) will place itself parallel to the stream on the down stream side of the frame. The torsion rod will be unstrained, and the needle will be at zero on the graduated circle. If then the instrument is turned by pressing the needle, till the plane abcd of the disk and the zero of the graduated circle is at right angles to the stream, the torsion rod will be twisted through an angle which measures the normal impulse of the stream on the disk x. That angle will be given by the distance of the needle from zero. Observ- ation shows that the velocity of the water at a given point is not constant. It varies between limits more or less wide. When the apparatus is nearly in its right position, the set screw at g is made to clamp the torsion spring. Then the needle is fixed, and the apparatus carrying the graduated circle oscillates. It is not then difficult to note the mean angle marked by the needle.

Let r be the radius of the torsion rod, 7 its length from the needle over ef to 7, and a the observed torsion angle. Then the moment of the couple due to the molecular forees in the torsion rod is

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Us _ LD

_One objection to the Pitot tube in its original form was the great difficulty and inconvenience of reading the height # in the immediate neighbourhood of the stream surface. Thisis obviated in the Darcy gauge, which can be removed from the stream to be read.

Fig. 147 shows a Darcey gauge. It consists of two Pitot tubes having their mouths at right angles. Inthe instrument shown, the

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a M Ed; ?

where E, is the modulus of elasticity for torsion, and I the polar moment of inertia of the section of the rod. If the rod is of circular section, l=4mr. Let R be the radius of the disk, and 2 its lever- age, or the distance of its centre from the axis of the torsion rod. The moment of the pressure of the water on the disk is*

Fo= hoo eR? ‘ 2g

where G is the heaviness of water and & an experimentul coefficient. Then

*Elf Wi aR et ; For any given instrument, **

v= cn/g, :

where ¢ is a constant coefficient for the instrument.

The instrument as constructed had three disks which could be used at will. Their radii and leverages were in feet

E= jn Tt disks… ccsscse. 0-052 0°16 er pe ee 0°105 0°32 ee ae 0-210 0-66

For a thin circular plate, the coefficient k=1‘12. In the actual instrument the torsion rod was a brass wire 0°06 inch diameter and 64 feetlong. Supposing a measured in degrees, we get by calculation

v=0°335/q; O‘1LE/q ; 0°042/¢ for the three disks.

Very careful experiments were made with the instrument. It was fixed to a wooden turning bridge, revolving over a circular channel of 2 feet width, and about 76 feet circumferential length. An allowance was made for the slight current produced in the channel, These experiments gave for the coefficient ¢, in the formula

vacVa, Ist disk, c= 0°3126 for velocities of 3 to 16 feet 2d ,, ry. 1d to 3} ,, od. 0°0349 ,, » less than 1} ,,

or values little different from the values calculated from the torsion.

The instrument is preferable to the current meter in giving the velocity in terms of a single observed quantity, the angle of torsion, while the current meter involves the observation of two quantities, the nuinber of rotations and the time. The current meter, except in some improved forms, must be withdrawn from the water to read the result of each experiment, and the law connecting the velocity and number of rotations of a current meter is less well-determined than that connecting the pressure on a disk and the torsion of the wire of a hydrodynamometer. At very low velocitics the current meter fails altogether.

The Pitot tube, like the hydrodynamometer, does not require a time observation. But, where the velocity is a varying one, and consequently the columns of water in the Pitot tube are oscillating, there is room for doubt as to whether, at any given moment of clos- ing the cock, the difference of level exactly measures the impulse of the stream at the moment. The Pitot tube also fails to give measurable indications of very low velocities.

PRocESSES FOR GAUGING STREAMS.

133. Gauging by Observation of the Maximum Surface Velocity.— The method of gauging which involves the least trouble is to deter- mine the surface velocity at the thread of the stream, and to deduce from it the mean velocity of the whole cross section. The maximum surface velocity may be determined by floats or by a current meter. Unfortunately, however, the ratio of the maximum surface to the mean velocity is extremely variable. Thus putting v, for the sur- face velocity at the thread of the stream, and vmfor the mean velocity

of the whole cross section, < has been found to have the following

0

values :—

Um

Vp De Prony, experiments on small wooden channels, 0°8164 Experiments on the Seine, vi -_ sig 0°62 Destrem and De Prony, experiments on the Neva, 0°78 Boileau, experiments on canals, ... nas oat 0°82 Baumgartner, experiments on the Garonne, 0°80 Briinings (mean), aa abe oye byt 0°85 Cunningham, Solani aqueduct, ... é oi 0°823

Various formule, either empirical or based on some theory of the vertical and horizontal velocity curves, have been proposed for determining the ratio“. Bazin found from his experiments the

wx e empirical expression Um = Vy ~ 25°44/mi ;

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where m is the hydraulic mean depth and ithe slope of the stream. In article 101, it has already been shown how from this formula the

ratio “= can be obtained for different kinds of channels.

0

In the case of irrigation canals and rivers, itis often important to determine the discharge either daily or at other intervals of time, while the depth and consequently the mean velocity is varying. Captain Cunningham, R.E. (Roorkee Prof. Papers, vol. iv. p. 47), has shown that, for a given part of such a stream, where the bed is regular and of permanent section, a simple formula may be found for the variation of the central surface velocity with the depth. When once the constants of this formula have been determined by measuring the central surface velocity and depth, in different con- ditions of the stream, the surface velocity can be obtained by simply ee the depth of the stream, and from this the mean velocity and discharge can be calculated. Let 2 be the depth of the stream, and v, the surface velocity, both measured at the thread of the stream. Then

Uo? = C2 |

where ¢ is a constant which for the Solani aqueduct had the values 1°9 to 2, the depths being 6 to 10 feet, and the velocities 34 to 44 feet. Without any assumption of a formula, however, the surface velocities, or still better the mean velocities, for different conditions of the stream may be plotted on a diagram in which the abscisse are depths and the ordinates velocities, The continuous curve through points so found would then always give the velocity for any observed depth of the stream, without the need of making any new float or current meter observations.

134. Mcan Velocity determined by observing a Series of Surface Velocities. —The ratio of the mean velocity to the surface velocity in one longitudinal section is better ascertained than the ratio of the central surface velocity to the mean velocity of the whole cross section. Suppose the river divided into a number of compartments by equidistant longitudinal planes, and the surface velocity observed in each compartment. From this the mean velocity in each com- partment and the discharge can be calculated. The sum of tho partial discharges will be the total discharge of the stream. When wires or ropes can be stretched across the stream, the compartments can be marked out by tags attached to them. Suppose two such ropes stretched across the stream, and floats dropped in above the upper rope. By observing within which compartment the path of the float lies, and noting the timo of transit between the ropes, the surface velocity in each compartment can be aceickelliet, The mean velocity in each compartment is 0°85 to 0°91 of the surface velocity in that compartment. Putting & for this ratio, and %, vg. . . for the observed velocities, in compartments of area %, Q,. . . then the total discharge is

Q = (Qh, + Agus + > &) e If several floats are allowed to pass over each compartment, the mean of all those corresponding to one compartment is to be taken as the surface velocity of that compartment.

This method is very applicable in the case of large streams or rivers too wide to stretch a rope across. The paths of the floats

are then ascertained in this way. Let fig. 149 represent a portion of the river, which should be

straight and free from obstruc-

tions. Suppose a base line AB

measured parallel to the thread C

of the stream, and let the mean A ah A 7

*cross section of the stream be *

*ascertained either by sounding \ ‘i *

the terminal cross sections AE, |

{

‘

*eye * 1 equidistant cross sections. Tho | NC*

i

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theodolites or box sextants. The floats are dropped in from a boat above AK, and picked up by another boat below BF. An observer with a chronograph or watch notes the time in which each float passes from AE to BF. The method of proceeding is this. The observer A sets his bie

theodolite in the direction AE, Fig. 149,

and gives a signal to drop a float. B keeps his instrument on the float as it comes down. At the moment the float arrives at Cin the line AE, the observer at A calls out. Beclamps hisinstrument and reads off the angle ABC, and the time observer begins to note the time of transit. B now points his instrument in the direction BF, and A keeps the float on the cross wire of his instrument. At the moment the float arrives at D in the line BF, the

observer B calls out, A clamps his instrument and reads off the angle BAD, and the time observer notes the time of transit from C to D. Thus all

BF, or by sounding a scries of cross sections are taken at right angles to the base line. Obser- vers are placed at A and B with / X

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the data are determined for plotting the path CD of the float and determining its velocity. By dropping in a series of floats, a num- ber of surface velocities can be determined. When all these have been plotted, the river can be divided into convenient compartments. The observations belonging to each compartment are then averaged, and the mean velocity and discharge calculated. Itis obvious that, as the surface velocity is greatly altered by wind, experiments of this kind should be made in very calm weather.

The ratio of the surface velocity to the mean velocity in the same vertical can be ascertained from the formula for the vertical velocity curve already given (§ 101). Exner, in Erbkam's Zeitsehrift for 1875, has given the following convenient formula, Let v be the mean and V the surface velocity in any given vertical longitudinal section, the depth of which is h

y 1+01478/K Vi 140°2216/h

If vertical velocity rods are used instead of common floats, the mean velocity is directly determined for the vertical section in which the rod floats. o formula of reduction is then necessary. The observed velocity has simply to be multiplied by the area of the compartment to which it belongs.

135. Mean Velocity of the Stream from a Series of Mid Depth Velocities. In the gaugings of the Mississippi it was found that the mid depth velocity differed by only a very small quantity from the mean velocity in the vertical section, and 1t was uninfluenced by wind. If therefore a series of mid depth velocities are determined by double floats or by a current meter, they may be taken to be the mean velocities of the compartments in which they occur, and no formula of reduction is neccssary. If floats are used, the method is precisely the same as that described in the last paragraph for sur- face floats, The paths of the double floats are observed and plotted, and the mean taken of those corresponding to each of the compart- ments into which the river is divided. The discharge is the sum of the products of the observed mean mid depth velocities and the areas of the compartments.

136. Boileau's Process for Gauging Streams, — Let U be the mean velocity at a given section of a stream, V the maximum velocity, or that of the principal filament, which is generally a little below the surface, W and w the greatest and lcast velocities at the surface. The distance of the principal filament from the surface is generally less than one-fourth of the depth of the stream; W isa little less than V; and U lies between W and w. As the surface velocitics change continuously from the centre towards the sides, there are at the surface two filaments having a velocity equal to U. The deter- mination of the position of these filaments, which Boileau terms the gauging filaments, cannot be effected entirely by theory. But, for sections of a stream in which there are noabrupt changes of depth, their position can be very a proximately assigned. Let A and J be the horizontal distances of the surface filament, having the velocity W, from the gauging filament, which has the velocity U, and from the bank on one side. Then

A a) W+2w TaN 7(W-w)'

¢ being a numerical constant. From gaugings by Humphreys and Abbot, Bazin, and Baumgarten, the values e=0‘919, 0°922, and 0‘925 are obtained. Boileau adopts as a mean value 0°922, Hence, if W and w are determined by float gauging or otherwise, A can be found, and then a single velocity observation at A fect from the filament of maximum velocity gives, without need of any reduction, the mean velocity of the stream. More conveniently W, w, and U can be measured from a horizoutal surface velocity curve, obtained from a series of float observations.

137. Direet Determination of the Mean Velocity by a Current Meter or Darcey Gauge.—The only method of determining the mean velocity at a cross section of a stream which involves no assumption of the ratio of the mean velocity to other quantities is this—a plank bridge isfixed acrossthe stream near itssurface. From this, velocities are observed at a sufficient number of points in the cross section of the stream, evenly distributed over its area. The mean of these is the true mean velocity ofthe stream. In Darcy and Bazin’s experi- ments on small streams, the velocity was thus observed at 36 points in the cross section.

When the stream is too large to fix a bridge across it, the observa- tions may be taken from a boat, or from a couple of boats with a gangway between them, anchored successively at a series of points across the width of the stream. The position of the boat for each series of observations is fixed by angular observations to a base line on shore.

138. Harlaeher’s Graphie Method of determining the Discharge from @ Series of Current Meter Observations.—Let ABC (fig. 150) be the cross section of a river at which a complete series of current meter observations have been taken, Let I., II., III... . be the verticals at different points of which the velocities were measured. Suppose the depths at I., II., IIL, .. . (fig. 150), set off as vertical ordinates in fig. 151, and on these vodiem ordinates suppose the velocitics

set off horizontally at their proper depths. Thus, if v is the measured velocity at the depth % from the surface in fig. 150, on vertical marked IIJ., then at III. in fig. 151 take ed=h and ae~».

Fig. 150. Then d is a pointin the vertical velocity curve for the vertical ITI., and, all the velocities for that ordinate being similarly set off, the

curve can be drawn. Suppose all the vertical velocity curves I. ... V. (fig. 151), thus drawn. On each of these figures draw verticals corresponding to velocities of x, 22, 8a… feet per second. Then for instance ed at III. (fig. 151) is the depth at which a velo- city of 2x feet per second existed on I I Tt the vertical III. in = fig. 150, and if ed is

set off at III. in

fig. 150 it gives a

point in a curve Picoecits passing _ through bd points of the section Fig. 151.

where the velocity was 22 feet per second. Set off on each of the verticals in fig, 150 all the depths thus found in the corresponding diagram in fig. 151. Curves drawn through the corresponding points on the verticals are curves of equal velocity.

The discharge of the stream per second may be regarded as a solid having the cross section of the river (fig. 150), as a base, and cross sec- tions normal to the plane of fig. 150 given by the diagrams in fig. 151. The curves of equal velocity may therefore be considered as contour lines of the solid whose volume is the discharge of the stream per second. Let 2% be the area of the cross section of the river, Q,, Q,.... the arcas contained by the successive curves of equal velocity, or, if these cut the surface of the stream, by the curves and that sur- face. Let x be the difference of velocity for which the successive curves are drawn, assuined above for simplicity at 1 foot per second. Then the volume of the successive layers of the solid body whose voluine represents the discharge, limited by successive planes passing through the coutour curves, will be

400(Q)+Q)), $2(Q, +0.) , and so on. Consequently the discharge is Qn Q=2 Bot Oe 40, + 05+ ee

The areas 0,0… . are easily ascertained by means of the polar planimeter. A slight difficulty arises in the part of the solid lying above the last contour curve. This will have generally a height which is not exactly , and a form more rounded than the other layers and less like a conical frustum. The volume of this may be estimated separately, and taken to be the area of its base (the area Q,) multiplied by § to 4 its height.

Fig. 152 shows the results of one of Professor Harlacher's gaugings worked out in this way. The upper figure shows the section of the river and the positions of the verticals at which the soundings and gaugings were taken. The lower gives the curves of equal velocity, worked outfrom the current meter observations, by the aid of vertical velocity curves. The vertical scale in this figure is ten times as great as in the other. The discharge calculated from the contour curves is 14°1087 cubic metres per second. In the lower figure some other interesting curves are drawn. Thus, the uppermost dotted curve is the curve through points at which the maximum velocity was found; it shows that the maximum velocity was always a little below the surface, and at a greater depth at the centre than at the sides. The next curve shows the depth at which the mean velocity for each vertical was found. The next is the curve of equal velocity corresponding to the mean velocity of the stream ; that is, it passes through points in the cross section where the velocity was identical with the mean velocity of the stream.

XII. IMPACT AND REACTION OF WATER.

When a stream of fluid impinges on a solid surface, it presses on the surface with a force equal and opposite to that by which the velocity and direction of motion of the fluid are changed. Generally, in problems on the impact of fluids, it is necessary to neglect the effect of friction between the fluid and the surface on which it moves.

139. During Impact the Velocity of the Fluid relatively to the Sur-

| face on which wt impinges remains unchanged in Magnitude.—Con-

HY DROME

sider a mass of fluid flowing in contact with a solid surface also in motion, the motion of both fluid and solid being estimated relatively to theearth. Theu the motion of the fluid may be resolved into two parts, one a motion equal to that of the solid, andin the same direc- tion, the other a motion relatively to the solid. The motion which

Left bank

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Maximum surface velocity =V=1-352

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the fluid has in common with the solid cannot at all be influenced by the contact. The relative component of the motion of the fluid can only be altered in direction, but not in magnitude. The fluid moving in contact with the surface can only have a relative motion parallel to the surface, while the pressure between the fluid and

An

730 9-24 9-80 11:8212-30 1441 14-80 16°9

Ti ti ek We ton ra

tio 10:1

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i 43

Fig. solid, if friction is neglected, is normal to the surface. The pressure therefore can only deviate the fluid, without altering the magnitude of the relative velocity. The unchanged common component and, combined with it, the deviated relative component give the resultant final velocity, which may differ greatly in magnitude and direction from the initial velocity.

From the principle of momentum the impulse of any mass of fluid reaching the surface in any given time is equal to the change of momentum estimated in the same direction. The pressure between the fluid and surface, in any direction, is equal to the change of momentum in that direction of so much fluid as reaches the surface in one second. If P, is the pressure in any direction, m the mass of fluid impinging per second, v, the change of velocity in the direction of P, due to impact, then

Pa=Mva . If », (fig. 153) is the velocity and direction of motion before impact, vy that after impact, then vis the total change of motion duc to impact. The resultant pressure of the fluid on the surface is in the direction of v, and is equal to v multiplied by the mass im- pinging per second. That is, putting for the resultant pressure,

P=m. Let P be resolved into two components,

Fig. 153. N and T, normal and tangential to the direction of motion of the

solid on which the fluid impinges. Then N isa lateral force pro- ducing a pressure on the supports of the solid, T is an effort which does work on the solid. If wu is the velocity of the solid, Tw is the work done per second by the fluid in moving the solid surface.

Let Q be the volume, and GQ the weight of the fluid impinging per second, and let v, be the initial velocity of the fluid before strik-

ing the surface. Then 42 Qn? is the original kinetic energy of Q

cubic feet of fluid, and the efficiency of the stream considered as an arrangement for moving the solid surface .s

_ Tu a 4 P tee 140. Jet deviated entirely in one Direction—Gcontrical Solution

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-

Br

2 17-30 19:57 19-80 2215 2230 24.80

Discharge per Second = Q=14-1087°%)™- Curves of equal velocity.

ao

Height scale =1:15

9 1

at 1

152.

(fig. 154).—Suppose a jet of water impinges on a surface ae with a velocity a, and let it be wholly deviated in planes parallel to the d See i

JS

*Sr *

%~

Se

\ NY YY Z Uy "dip ee ee ona b Uy Pu ae Uy YY, é Fig. 154,

figure. Also let ae be the velocity and direction of motion of the surface. Join cb; then the water moves with respect to the sur-

face in the direetion and with the velocity cb. As this relative velocity is unaltered by contact with the surface, take cd=cb, then cd is the relative motion of the water with respect to the surface at c. Take df equal and parallel to ae. Then fe (obtained by eompound- ing the relative motion of water to surface and common velocity of water and surface) is the absolute velocity and direetion of the water leaving the surface. Take ag equal and parallel to fe. Then, since ab is the initial and ag the final velocity and direetion of motion, gb is the total change of motion of the water. The resultant pressure on the plane is in the direetion gb. Join eg. In the tri- angle gae, ae is equal and parallel to df, and ag to fe. Henee eg is equal and eq to cd. But cd=eb=—relative motion of water and surface. ence the change of motion of the water is represented in magnitude and direction by the third side of an isoseeles tri- angle, of which the other sides are equal to the relative velocity of the water and surface, and parallel to the initial and final direc- tions of relative motion.

parallel to the jet. Its relative velocity is v- w when approaching the cup, and —(v—2) when leaving it. Henee its absolute veloeity when leaving the cup is w-(v-w)=2u-—v. The change of momen-

G tum per seeond = ~ w(v- u)jo- = w(v — u)(2u — v) = 2 w(v— uw),

Comparing this with ease 2, it is seen that the pres- sure on a hemispherical eup is double thaton a flat plane. The work done on

the cup= se (v- u)ru =

foot-pounds per seeond. The efficiency of the jet is greatest when v=2u ; in that ease the efficiency

=

If a series of enp vanes

Fig. 156.

are introduced in front of the jet, so that the quantity of water acted upon is wv instead of w(v—u), then the whole pressure on the ehain

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141. (1) A Jet impinges on a plane surface at rest, in a direction normal to the plane (fig. 155).—Let a jet whose section is » impinge with a velocity v on a plane surface at rest, in a direction normal to the plane. The particles approach the plane, are gradually deviated, and finally flow away parallel to the plane, having then no velocity in the original direction of the jet. The quantity of water impinging per second is wv. The pressure on the plane, which is equal to the change of

Yj ° are momentum per sccond, is a wr, = (2) If the plane is moving in the direc tion of the jet with the velocity +u, the quantity impinging per second is o(v-Fu). The momentum of this quantity before impact is < w(v-Fu) v. After impaet, Vv

of eups is G os _ & xu —0) = 2 = w(v-u). In this ease the.

efficiency is greatest when v= 2u, and the maximum efficiency is unity, or all the energy of the water is expended on the cups.

143. (5) Case of a Flat Vane oblique to the Jet (fig. 157).—This ease presents some diffieulty. The water spreading on the plane in all directions from the point of impact, different particles leave the plane with different absolute velocities. Let AB=v= velocity of water, AC=u= velocity of plane. Then, completing the parallelogram, AD represents in magnitude and direction the relative veloeity of water and plane. Draw AE normal to the plane and DE parallel to

the water still possesses the velocity + in the direction of the jet; and the momen-

tum, in that direction, of so much water Fig. 155.

as impinges in one second, after impact, is +G w(v-Fu)u. The pres- Fig. 157. the plane. Then the relative velocity AD may be regarded as eon-

sisting of two components, one AE normal, the other DE parallel to the plane. On the assumption that friction is insensible, DE is unaffected by impact, but AE is destroyed. Hence AE represents the entire change of velocity due to impact and the direction of that change. The pressure on the plane is in the direction AE, and its amount is—mass of water impinging per second x AE.

Let DAE=8, and let AD=v,. Then AE=v, cos 0; DE=», sin 0.

If Q is the volume of water impinging on the plane per sceond,

sure on the plane, which is the change of momentum per second, is the difference of these quantities or G w(v7Fu)?, This differs from

the expression obtained in the previous ease, in that the relative velocity of the water and plane vFu is substituted for v. The expression may be written P=2x Gx ate , where the last term is the volume of a prism of water whose section is the area of the jet and whose length is the head due to the relative velocity.

The pressure on the plane is twice the weight of that prism of | the change of momentum is“. Qu, cos 6. Let AC=u = velocity

g of the plane, and let AC inake the angle CAE=6 with the normal to the plane. The velocity of the plane in the direction AE=

water. The work done on the plane in this ease is Foo w(vpu)?

foot-pounds per second. There issue from the jet wv cubic feet per second, and the energy of this quantity before impact is a 5 wv, The efficiency of the jet is therefore y=2 Ore The value of « which makes this a maximum is found by differentiating and equating the differential coefficient to zero :— dn v= 4vu+ 3u? . Jen 2 (– =0;

uecos 8. The work of the jet on the plane= g Qu, eos 6 u cos 8. The

same problem may be thus treated algebraically (fig. 158). Let BAF=a, and CAF=8. The velocity v of the water may be deeom-

*w= or 4v. The former gives a minimum, the latter a maximum efficiency. Putting w= $v in the expression above, nm max. =3y * (8) If, instead of one plane moving before the jet, a series of planes are introduced at short intervals at the same point, the quantity of water impinging on the series will be wv instead of w(v —u), and the*

whole pressure=—wo(v-«). The work done is & ule -u). The Fig. 158.

posed into AF =v eos a normal to the plane, and FB=v sin a parallel to the plane. Similarly the velocity of the plane=u=AC=BD can be decomposed into BG =FE=w eos 3 normal to the plane, and DG= w sin 8 parallel to the plane. As friction is neglected, the velocity of the water parallel to the plane is unaffected by the impact, but its eomponent v eos anormal to the plane becomes after impact the same as that of the plane, that is, w eos 0. Hence the change of velocity during impact=AK=v cos a—w 008 8. The ehange of momentum per sccond, and consequently the normal pressure on

i ee . Page, oe" : efficiency 7 wru(y — u) A = au ") . This becomes

a maximum for a7 2(y —2u)=0, oru=4v. This result is often used

as an approximate expression for the velocity of greatest efficiency when a jet of water strikes the floats of a water wheel. The work wasted in this case is half the whole energy of the jet when the floats run at the best speed.

142. (4) Case of a Concave Cup Vane, velocity of water », velocity of vane in the same direction w (fig. 156).

G : : ! i = = > hy i If the eup is hemispherical, the water leaves the cup in a direction the, iy = LI 7° aa eae 8) e pressure 2

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direction in which the plane is moving is P=N cos 8=

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2 Q(v cos a—w cos 8) cos 8, and the work done on the plane is g

Pum Zao cos a —U Cos §)

« cos 8, which is the same expression as before, since AK=v, cos @= » cos a—u cos 6.

*In one second the plane moves so that the point A (fig. 159) comes to CO, or from the position shown in full lines to the posi- tion shown in dotted lines. If the plane remained sta- tionary, a length AB=v of the jet would impinge * on the plane, but, since*

Fig. 159. the plane moves in the same direction as the jet, only the length 1{B=AB— AH impinges on the plane.

cos $ cos 8

But AH=Ac & oe! wu ——, and therefore HB=v- w——. Let cos'a COs a cos a

w=sectional area of jet; volume impinging on plane per second

=Q=w vu : = cees a woe . Inserting this in the a formule above, we get G meet C08 a—u cos 3)? (De =o ees y cos a w 008 8). (2); Pu=& w ys? (v cos a—w cos 8)? . (3).

Three cases may be distinguished :—

(a) The plane is at rest. Then w=0, ra wv? cos a; and the

work done on the plane and the efficiency of the jet are zero. (6) The plane moves parallel to the jet. Then d=a, and

G a a ' an wu cos 2a (v—w)?, which is a maximum when w= jv.

*When w=4v then Pu max, — fy -w0? cos *a, and the efficiency*

== cos 2a, (c) The plane moves perpendicularly to the jet. Then 3=90°-2a ;

; sin a . ag cos }=sin a; and eae a — (vcosa-—wsina). This is a ' a*

maximum when w= 4v cos a When w= 4v cos a, the maximum work and the efficiency are the saine as in the last case.

144. Best Form of Vane to receive Water.—When water impinges normally or obliquely on a plane, it is scattered in all directions after impact, and the work carried away by the water is then generally lost, from the impossibility of dealing afterwards with streams of water deviated in so many directions. By suitably forming the vane, however, the water may be entirely deviated in one direction, and the loss of energy from agitation of the water is entirely avoided.

Let AB (fig. 160) be a vane, on which a jet of water impinges at the point A and in the direction AC. Take AC=v=velocity of water, and let AD represent in magnitude and direction the velo- city of the vane. Completing the parallelogram, DC or AE repre-

uN B

Fig. 160.

sents the direction in which the water is moving relatively to the vane. If the lip of the vane at Ais tangential to AE, the water will not have its direction suddenly changed when it impinges on the vane, and will therefore have no tendency to spread laterally. On the contrary it will be so gradually deviated that it will glide

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up the vane in the direction AB. This is sometimes expressed by saying that the vane receives the water without shoek.

145. Floats of Poncelet Water Wheels.—Let AC (fig. 161) repre- sent the direction of a thin horizontal stream of water having the

velocity,v. Let AB be a curved float moving horizontally with velo- city wu. The relative motion of water and float is then initially horizontal, and equal to v—w.

In order that the float may receive the water without shock, it is necessary and sufficient that the lip of the float at A should be tangential to the direction AC of relative motion. At the end of ?~™ seconds the float moving with the velocity w comes to the position A,B), and during this time a particle of water received at A and gliding up the float with the relative velocity v —u, attains a

height DE= a. At E the water comes to relative rest. It

then descends along the float, and when after 2(¥—= %) seconds the float has come to A,B, the water will again have reached the lip at A, and will quit it tangentially, that is, in the direction CA,, with a relative velocity ~ (v —w) = — \/2gDE acquired under the influence of gravity. The absolute velocity of the water leaving the float is therefore u—(v-—u)=2u-v. Ifuw—4 v, the water will drop off the bucket deprived of all energy of motion. The whole of the work of the jet must therefore have been expended in driving the float. The water will have been received without shock and discharged without velocity. This is the principle of the Poncelet wheel, but in that case the floats move over an arc of a large circle; the stream of water has considerable thickness (about 8 inches) ; in order to get the water into and out of the wheel, it is then necessary that the lip of the float should make a small angle (about 15°) with the direction of its motion. The water quits the wheel with a little of its energy of motion remaining.

146. Presswre on a Curved Surface when the Water is deviated wholly in one Direetion.—When a jet of water impinges on a curved surface in such a direction that it is received without shock, the pressure on the surface is due to its gradual deviation from its first direction. On any portion of the area the daa is equal and opposite to the force required to cause the deviation of so much water as rests on that surface. In common language, it is equal to the centrifugal force of that quantity of water.

Case 1. Surfuee Cylindrieal and Stationary.—Let AB (fig. 162) be the surface, having its axis at O and its radius =r, Let the water impinge at A tangentially, and quit the surface tangentially at B. Since the surface is at rest, v is both the absolute velo- city of the water and the velocity relatively to the surface, and this remains unchanged during con- tact with the surface, because the deviating force is at each point perpendicular to the

direction of motion. The water is deviated throughanangle BCD= AOB= ¢. Each particle of water of weight p exerts radially a centrifugal

Let the thickness of

Fig. 162.

2

force LY. Ti

the stream =¢ feet. Then the weight of water resting on unit of surface =Gt Ib; and the normal pressure per unit of surface Gi «v3

=n=— —_—

The resultant of the radial pressures uniformly dis-

tribvated from A to B will be a force acting in the direction OC bisecting AOB, and its magnitude will equal that of a force of intensity =m, acting on the projection of AB on a plane per- pendicular to the direction OC. The length of the chord

AB=2r sin £ ; let b=breadth of the surface perpendicular to the

plane of the figure. The resultant pressure on surface

2

=R-=2rb sin Tet. ae oF a4 ve sir. & ;

2 z g % which is independent of the radius of curvature. It may be in- ferred that the resultant pressure is the same for any curved sur-

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face of the same projected area, which deviates the water through the same angle.

Case 2. Cylindrical Surface moving in the Direction AC with Velo- city u.—The relative velocity =v-w. The final velocity BF (fig. 168) is found by combining the relative velocity BD=v-wu

=)

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‘, ies “s

*> *s. Ss.*

.

a “s,

the surface. Ot fone.

,

The resultant normal pressure R=2 (v =u)? sin. This resultant pressure may be resolved into two components P and L, one paral el and the other perpendicular to the direction of the

vane’s motion. The former is an effort doing work on the vane. The latter is a lateral force which docs no work.

& bi(v —u)? (1—cos ¢) ;

tangential to the surface with the velocity BE=w of The intensity of normal pressure, as in the last case, is

“a

=

The work doné by the jet on the vane is Pu= Suto -u)(1 -cos¢),*

P=R sin $

L=R cos _ bt(v —w)? sin ¢.

. which is a maximum when w= v. This result can also be ob- tained by considering that the work done on the plane must be equal to the energy lost by the water, when friction Is neglected.

If ¢=180°, cos ¢=—-1, 1-cos $=2; then P=2 Gp Moa

the same result as for a concave cup.

147. Position which a Movable Plane takes in Flowing Water.— . When a rectangular plane, movable about an axis parallel to one of its sides, is placed in an indefinite current of fluid, it takes a position such that tho resultant of the normal pressures on the two sides of tho axis passes through the axis. If, therefore, planes pivoted so

that tho ratio + (fig. 164)

is apie are placed in water, and the angle they to, 164,

make with the flinsotion of sages

the stream is observed, the position of the resultant of the pressures on the plane is determined for different angular positions. Experi- ments of this kind have been made by Herr Hagen. Some of his results are given in the following table :—

Larger Plane. Smaller Plane.

p=...

1-0 0-9

0°8

0-7

0°6

0-5 0-4

0°3

i=) bo

148. Effect of Friction during Impulsce.—Thus far the effect of the friction between the water and the surface which deviates it has been neglected. Nothing precise is known of its mode of action, and the following investigation is in part conjectural (Rankine, Steam Engine, p. 171, § 146).

Let it be assumed that the friction causes a loss of energy per second proportional to the height due to the velocity of the water

relatively to the surface ; that is, the head due to the relative

velocity being 5-, the loss of head duo to friction will be Ga the g

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whole energy due to the relative head being GOs, the loss of

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energy due to friction will be GQ i

Cylindrical Surface with Water deviated wholly in one Direction, Friction taken into account.—In Case 2, discussed in § 146, the velocity of the water relatively to the surface is v-—u. The quan- tity of water impinging yo second is b¢(v-—%). The loss of head

due to friction is f as

(v- uy?

*Goi 5g the loss due to friction, is Pu== bt(v — w)*u(1 — cos p) — Gbif*

The loss of energy due to friction is

The energy exerted on the surface, after deducting

(vu 2g ~ = mou} {w(t – cos $)-—f -_™ ; The efficiency when friction is taken into account becomes "a (v—4) | 2u(1 = cos $) -f (v— 4) FY

= ye

v3 Gbt(v — u) 9 and this becomes a maximum if as 1-cos ¢+f . 2-2co tf ' being greater than the speed when friction is neglected in the ratio 2(1-cos o) +f: 3(1—cos o +f). Suppose that the speed of greatest efficiency w has been found by experiment ;

(2u—v)(1 —cos ¢) fore

149. Direct Action distingwished from Reaction (Rankine, Steam Engine, § 147).

The pressure which a jet exerts on a vane can be distinguished into two parts, viz :—

(1) The pressure arising the velocity of the water into the velocity of the vane. 154, § 140, ad cos bac is the direct component of the water's velocity, or component in the direction of motion of vane. This is changed into the velocity ae of the vane. The pressure due to direct impulse is then

P,=GQ ab cose ; For a flat vane moving normally, this direct action is the only action producing pressure on the vane.

(2) The term reaction is applied to the additional action due to the direction and velocity with which the water glances off the vane, Itis this which is

diminished by the friction between the water and the vane. In,Case 2, § 146, the direct pressure is

Pact Wer

from changing the direct component of In fig.

That due to reaction is Py= i Got

If ¢<90°, the direct component of the water's motion is not wholly converted into the velocity of the vane, and the whole pressure due to direct impulse is not obtained. If ¢>90°, cos ¢ is negative and an additional pressure due to reaction is obtained.

150. Reaction of a Jet isswing from a Vessel.—Suppose a vessel filled with water (fig. 165), having an orifice of area w, from which water issues horizontally with avelo- — _, city v=V2gh. The volume dis- charged per second, neglecting con- traction, =wv. The momentum gene- rated per second in a horizontal direc-

tion —& wo; and this is equal to the

force producing the change of mo- mentum.

Heuce the horizontal force or reac- tion R, acting on the side of the vessel, opposite to the orifice, and equal and ; opposite to the force producing the momentum, is

Bo wr=2Gwh ;

this is the weight of a column of water the section of which is the area of the orifice, and the height is twice the head.

If the vessel moves in 4 direction opposite to that of the jet, with the velocity u, the absolute velocity of the water leaving the vessel

Fig. 165.

isv-u, The momentum generated per second is ; wro(v~u)=R.

Jet Propeller.—In the case of vessels propelled by a jet of water (fig. 166), driven sternwards from orifices at the side of the vessel, the water, originally at rest outside the vessel, is drawn into the-ship and eaused to move with the forward velocity V of the ship. Afterwards it is projected sternwards from the jets with a velocity v relatively to the ship, or v—V relatively to the earth. If Q is the total sectional arca of the jets, Qu is the quantity of water dis- charged per second. The momentum

Fig. 166.

generated per second in a sternward direction is ~ Qv(v—V), and this is equal to the forward acting reaction P which propels the ship.

The energy carried away by the water

rm = . Av(v-V). The useful work done on the ship PV=S aov-VV os

Adding (1) and (2), we get the whole work expended on the water, neglecting friction :— . G.-Y

Hence the efficiency of the jet propeller is ake a (3).

W v+V This increases towards unity as v Reaowsliag VY. In other words, the less the velocity of the jets exceeds that of the ship, and there- fore the greater the area of the orifice of discharge, the greater is the

*efficiency of the propeller. ; ; In the ** Waterwitch" » was about twice V. Hence in this case*

(1).

the theoretical efficiency of the propeller, friction neglected, was.

about 4. ; ; 151. Pressure of a Steady Stream in a Uniform Pipe on a Plane

normal to the Direction of Motion.—Let CD (fig. 167) be a plane

eS Soma ana eee een oN Rae eee a A Se on eee 2 Se RPE Oe

placed normally to the stream which, for simplicity, may be sup- posed to flow horizontally. The fiuid filaments are deviated in front of the plane, form a contraction at A,A), and converge again, leaving a mass of eddying water behind the plane. Suppose the section A)A, taken at a point where the parallel motion has not begun to be disturbed, and A,A, where the parallel motion is re- established. Then, since the same quantity of water with the same velocity passes AjA,, A,A, in any given time, the external forces produce no change of momentum on the mass A)AjA,Ag, and must therefore be in equilibrium. If Q is the section of the stream at AyA, or A,Ag, and w the area of the plate CD, the area of the contracted section of the stream at A,A, will be ¢ (Q-w), where ¢ is the coefficient of contraction. ence, if v is the velo- city at A A, or A,A,, and v, the velocity at A,A), VQ = Ce0,(Q— w) ; Q

(1).

Applying

=:

Ce(Q — w) Let 7, 9, ~_ be the pressures at the three sections. Bernoulli's theorem to the sections AyAy and A,Aj,

o.7 44%: G 2 G 2%

Also, for the sections A,A, and A,A., allowing that the head due to the relative velocity v, -—v is lost in shock :—

Pi OP £4

G'% G 29 29 ; (vy, —v)? ; Po-Py=G — (2); or, introducing the value in (1), Mee gm@-~))" (3).*

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Now the external forces in the direction of motion acting on the mass AjA,A,A, are the pressures 72, —.Qat the ends, and the reaction ~ R of the plane on the water, which is equal and opposite to the pressure of the water on the plane. As these are in

equilibrium, (Po – P)Q-R=0;

Q 2 42 é R~Ga(xg-5-1) i (4);

an expression like that for the pressure of an isolated jet on an in- definitely extended plane, with the addition of the term in brackets, which depends only on the areas of the stream and the plane. For a given plane, the expression in brackets diminishes as Q increases.

ibe e. p, the equation (4) becomes w@

2

R-Gy —

2g aga?)

v2 ReGoo XK,

were K depends only on the ratio of the sections of the stream and plane.

For example, let c, =0°85, a value which is probable, if we allow that the sides of the pipe act asinternal borders to an orifice, Then

2

iB) 1176282. . is °(; p-1 1)

(4a),

which is of the form

[a K=

i ©O 9 3°66

3 1:75

4 1°29 5 » ae

10 94

50 2°00 100 83°50

The assumption that the coefficient of contraction ¢, is constant for different values of p is probably only true when p is not very large. Further, the increase of K for large values of p is contrary to experienve, and hence it may be inferred that the assumption that all the filaments have a common velocity v, at the section A,A, and a common Velocity v at the section A,A, is not true when the stream is very much larger than the plane. Hence, in the expression

2

R=KGw9,

K must be determined by experiment in each special case. 152. Pressure on a Cylindrical Body of a Length about three times its Diameter.—A contraction of the stream is formed at A,A,

Fig. 168.

(fig. 168). Let the same notation be used, the subscript figures indi- cating the section to which the quantities belong. For sections AyAo, A, Ay,

Po, PM _ A 1,

*G‘29 Gag’ for sections A,A, and A,A,, allowing for the abrupt enlargement of the stream, ; 2 \ LY Mi So ee. WS Ue) G*ag9 Gtagt w% ? and for sections A,A,, AAs, allowing for another abrupt enlarge- ment,*

Pa,” _ Ps, 07 | (Ye—v)? G oo 2g at 3 + 29 + “Ss . Adding the three equations, we Ae (% =)? , (% = 2)? Po- Pe 29 29 ‘ From the principle of

momentum, (Po- P3)2-R=0 ;

(%1—%»)? , (v%-v)? noone

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Putting w for the section of the body, ¢. for the coefficient of con- traction, ¢.(Q—w) for the area of the stream . A,A,,

Vy =v 6,(Q— w) ; er” ee ’

or, putting p=

xe @

Pp p Vv) Ce(p— 1) 9 ers | Then . v R=K,Gwo 29 r) where

2/7 71 2 2

p = 7 =e : mie (55) & 1) +)

Taking ¢,-=0°85 and p=4, K,=0°467, a value less than before. Hence there is less pressure on the cylinder than on the thin plane.

1538. Distribution of Pressure on a Surface on which a Jet impinges normally.—The principle of momentum gives readily enough the total or resultant pressure of a jet impinging ona plane surface, but in some cases it is useful to know the distribution of the pressure. The problem in the case in which the plane is struck normally, and the jct spreads in all directions, is one of great complexity, but even in that case the maximum intensity of the pressure is casily assigned. Each layer of water flowing from an orifice is gradu- ally deviated (fig. 169) by contact with the surface, and during deviation exercises a centrifugal pressure towards the axis of the jet. The force exerted by each small mass of water is normal to its path, and inversely as the radius of curvature of the path. Hence the greatest pressure on the plane must be at the axis of the jet, and the pressure must de- crease from the axis outwards, in big. 169. some such way as is shown by the curve of pressure in fig. 170, the branches of the curve being probably asymptotic to the plane.

For simplicity suppose the jet is a vertical one. Let A, be the

depth of the orifice from the free surface, and , the velocity of dis-

|

ed

Fig. 170.

charge. Then, if w is the area of the orifice, the quantity of water impinging on the plane is obviously Q=wr,=0V 29h, ‘

that is, supposing the orifice rounded, and neglecting the coefficient of discharge. :

The velocity with which the fluid reaches the plane 1s, however, greater than this, and may reach the value

v=N2gh ;

where h is the depth of the plane below the free surface. The external layers of fluid subjected throughout, after leaving the orifice, to the atmospheric pressure will attain the velocity v, and will flow away with this velocity unchanged except by friction. The layers towards the interior of the jet, being subjected to a pressure greater than atmospheric pressure, will attain a less velocity, and so much less as they are nearer the centre of the jet.

c a But the pressure can in no case exceed the pressure a hk measured

in feet of water, or tue direction of motion of the water would be

reversed, and there would be reflux. Hence the maximum intensity of the pressure of the jet on the plane is A feet of water. If the pressure curve is

drawn with pressures represented by feet of water, it will touch the free water surface at the centre of the jet.

Suppose the pressure curve rotated so as to forma solid of revolu- tion. The weight of water contained in that solid is the total pressure of the jet on the surface, which has already been deter- mined. Let V= volume of this solid, then GV is its weight in pounds. Consequently]

G GV= Fined :

V=20r/hhy .

We have already, therefore, two conditions to be satisfied by the pressure curve. .

Some very interesting experiments on the distribution of pressure on a surface struck by a jet have been made by Mr J. 8. Beresford (Prof. Papers on Indian Engineering, No. cccxxii.), with a view to afford imformation as to the forces acting on the aprons of weirs. Cylindrical jets 4 inch to 2 inches diameter, issuing from a vessel in which the water level was constant, were allowed to fall vertically ona brass plate 9 inches in diameter. A small hole in the brass plate communicated by a flexible tube with a vertical pressure column. Arrangements were made by which this aperture could be moved y inch at a time across the area struck by the jet. The height of the pressure column, for each position of the aperture, gave the pressure at that point of the area struck by the jet. When the aperture was exactly in the axis of the jet, the pressure column was very nearly level with the free surface in the reservoir supplying the

2

jet; that is, the pressure was very nearl ". As the aperture moved J P Ty V3 Pp

away from the axis of the jet, the pressure diminished, and it became insensibly small at a distance from the axis of the jet about equal to the diameter of the jet. Hence, roughly, the pressure due to the jet extends over an area about four times the area of section of the jet.

Fig 171 shows the pressure curves obtained in three experiments with three jets of the sizes shown, and with the free surface level in the reservoir at the heights marked.

Experiment 1.

Experiment 2. Jet ‘475 in. diameter.

Experiment 3. Jet ‘988 in. diameter,

Jet 1:95 in. diameter,

*mm n -t n Qa lida & 19a lhe 3 Se u| Ke 8 Ega(<2) ¢. (cesice) @. eeeice| 2 pesics| gS |seslea| ge lleesi24) 38 Sg8(s2| 2 |\fesls| 2 |Sesies| ee games, F [gab ss) & | eaeaS) & 42 27°15 | 0 26°9 » | 05] 39-40 1 ,, | 05} 41°9 », | 08| 26°9 An ‘1 187°5-39°5|| ,, ‘1 = {41°5-41°8)) ,, 13] 26°8 41 y> | °18 |26°5~26°6 40°3 ag *23 |26°4-26‘5 39°2 3 28 |26°3-26°6 37°5*

8

As the general form of the pressure curve has been already indicated, it may be assumed that its equation is of the form

2

y=ab- (1).

But it has already been shown that for x=0, y=h, hence a=h,

HYDRAULICS. |

To determine the remaining constant, the other condition may be used, that the solid formed by rotating the pressure curve represents the total pressure on the plane. The volume of the solid is

oO Vv -{ Qrayde

0

2

CON Shs = rh, b xdz

0

- ah =n FD

“] log «2 – 0

“Jog eb” Using the condition already stated, ah

ah (2). loge} Sa we

Putting the value of } in (2) in eq. (1), and also r for the radius of the jet at the orifice, so that w=ar, the equation to the pressure curve is i at y=he? hy 7?»*

154. Resistance of a Plane moving through a Fluid, or Pressure of a Current on a Plane.—When a thin plate moves through the air, or through an indefinitely large mass of still water, in a direction normal to its surface, there is an excess of pressure on the anterior

POOR Tr ot Ree an eee nee.

er

Neat esisle

_Axis of Jet

1.

’

‘

‘

face and a diminution of pressure on the postcrior face. Let v be the relative velocity of the plate and fluid, 2 the area of the plate, G the density of the fluid, % the height due to the velocity, then the total resistance is expressed by the equation

2

R=/Go = pounds=/GOA ;

where fis a coefficient having about the value 1°3 for a plate moving in still fluid, and 1°8 for a current impinging on a fixed plane, whether the fluid is air or water. The difference in the value of the coefficient in the two cases is perhaps due to errors of experiment. There is a similar resistance to motion in the case of all bodies of " unfair" form, that is, in which the surfaces over which the water slides are not of gradual and continuous curvature.

The stress between the fluid and. plate arises chiefly in this way. The streams of fluid deviated in front of the plate, supposed for

HYDROMECHANICS

ween ey~ fae — 2 — oo == one ene ee oe eee pee nnn -180

0 0-5

Distance from Axis of Jet in Inches. Fia. 171.—Curves of Pressure of Jets impinging normally on a Plane.

D17

definiteness to be moving through the fluid, receive from it forward momentum. Portions of this forward moving water are thrown off laterally at the edges of the plate, and diffused through the surround- ing fluid, instead of falling to their original position behind the plate. Other portions of comparatively still water are dragged into motion to fill the space left behind the plate; and there is thus a pressure less than hydrostatic pressure at the back of the plate. The whole resistance to the motion of the plate is the sum of the excess of pressure in front and deficiency of pressure behind.

This resistance is independent of any friction or viscosity in the fluid, and is due simply to its inertia resisting a sudden change of direction at the edge of the plate.

osieriaseia made by a whirling machine, in which the plate is fixed on a long arm and moved circularly,' gave the following values of the coefficient f. The method is not free from objection, as the centrifugal force causes a flow outwards across the plate.

Approximate | Values of f. Area of Plate in sq. ft. Borda. Hutton. Thibault. 1°24 Rs 1°43 1525 1°784

There is a steady increase of resistance with the size of the plate, in part or wholly due to centrifugal action. Dubuat made experiments on a plane one foot square, moved in a straight line in water at 8 to 64 feet per second. Calling m the coefficient of excess of pressure in front, and n the coefficient of de- ficiency of pressure behind, so that f=m+n, he found the following values :—

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‘ ‘ ‘

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‘ ‘

‘

_.Water Level in Reservoir Me : ~ — A m=1; n=0°483; f=1°433. PAAR Sebel Pron meitainmaaaie tees seer ET eam Eat Ser ee The pressures were mea- ” sured by pressure columns.

4

: Experiments by Morin, Piobert, and Didion on plates of 0°3 to 2°7 square

: feet area, drawn vertically through water, gave f=2°18; but the experi- ments were made in a reservoir of comparatively small depth. For similar

plates moved through air they found f=1°‘36,aresult more in accordance with those which precede.

For a fixed plane in a moving current of water Mariotte found /f=1°25. Dubuat, in experiments in a current of water like mentioned the

‘

i i Waler Level in Reservoir II.

Pressure on Plate in Inches of Water.

above, values

n=0°670; Thibault ex-

those obtained m=1°‘186 ; i aed aaa ai oy | i posed to wind pressure : planes of 1°17 and 2°5 ‘ square feet area, and ! found f to vary from 1°568 to 2°125, the mean value being f=1°834, a result agreeing well with Du-buat.

155. Case when the Direction of Motion is oblique to the Plane. —The determination of the pressure between a fluid and surface in this case is of importance In many practical questions, for instance, in assigning the load due to wind pressure on sloping and curved roofs, and experiments have been made by Hutton, Vince, and Thibault on planes moved circularly through air and water on a whirling machine.

Let AB (fig. 172) be a plane moving in the direction R making an angle @ with the plane. The resultant pressure between the fluid and the plane will be a normal pressure N. The component R of this normal pressure is the resistance to the motion of the plane and the other component L is a lateral force resisted by the guides

which support the plane. Obviously R=N sin ¢; L=N cos ¢.

In the case of wind pressure on a sloping roof surface, R is the

horizontal and L the vertical component of the normal pres- sure.

In experiments with the whirling machine it is the resistance to motion, R, which is directly measured, Let P be the pressure on a plane moved normally throngh a fluid. Then, for the same plane inclined at an angle ¢ to its direction of motion, the re- sistance was found by Hutton to be

R= P(sin g)! 84? 08 4, A simpler and more con-

venient expression given by Colonel Duchemin is

2 sin'd =P ——___. # 1+ sin' Consequently, the total pressure between the fluid and plane is N=pP_2 sin @ 2P

1+ sin' cosee +sin d' and the lateral force is –

La? 2 sin eos d

14+sin'p In 1872 some experiments were made for the Aeronautical

Society on the pressure of air on oblique planes. These plates, of 1 to 2 feet square, were balanced by ingenious mechanism designed by Mr Wenham and Mr Spencer Browning, in such a manner that both the pressure in the direction of the air current and the lateral force were separately measured. These planes were placed opposite a blast from a fan issuing from a wooden pipe 18 inches square. The pressure of the blast varied from ,% to 1 inch of water pres- sure. The following are the results given in pounds per square foot of the plane, and a comparison of the experimental results with the pressures given by Duchemin's rule. These last values are obtained by taking P=3°31, the observed pressure on a normal surface :—

Angle between Plane and

Direction of Blast. i af Horizontal pressure R……..-...4 0-4 |0°61 | 2°73 | 3°31 Lateral pressure Dy oo… .e.ccesenaee 1°6 1:96 | 1°26 ahs Normal pressure V L? + h?..... 1°65 | 2°05 | 3°01 | 3°31 Teroe pressure by Ducheinin's 1:605 | 2°027 | 3-276 | 3°31

RESISTANCE OF SHIPS.

156. Down toa recent period the resistance of ships was supposed to be due to a difference between the pressure on the bow and stern, eaused by the pushing aside of the water, precisely as in the case of the "unfair" bodies whose resistance has just been discussed. Hence the resistance was supposed to be proportional to the immersed mid- ship sectional area of the vessel. It will be shown immediately, however, that in a "fair" body, completely immersed, there is no resistance of this kind, the pressure of the water closing in behind exactly balancing the excess of pressure on the bow. In such a body, therefore, the resistance is almost entirely due to the frictional drag of the water on the surface of the body, and is proportional to its skin area. 1n a ship, which is only partially immersed, a further resistance, which in some eases becomes very large, is due to the alteration of the surface level of the water causing a dissipation of energy in producing waves. .

157. Stream Line Motion of a Fluid past a submerged Body.— Consider a shipshape body, or body of fair form, that is, bounded by surfaces of continuous curvature, moving below the surface of a fluid, and for the moment let the friction of the fluid against the

*KKK *

Fig. 173.

surface of the body be supposed absent, In such conditions, the particles of fluid are gradually deviated sideways as the body passes, and gradually elose together again behind it. They are left after the operation in their original position with momentum unchanged ; there is, therefore, in this case no resistance due to the direct action of the inertia of the water.

The nature of the action is more conveniently studied by supposing the body at rest and the fluid flowing pastit. Let S, fig 173, repre- sent the immersed body surrounded by fluid which is flowing past it. The fluid partieles, arriving at A in the direction shown by the arrow, are gradually deviated as they approach S, gradually unite again after passing it; and, if the body is of fair form, that is, ifit presents no abrupt changes of section or

discontinuity of curvature, the stream lines or paths of the particles will be continuous lines, which take, at a sufficient distance B sternwards of 8S, their original direction of motion. The fluid surrounding S may then be con- eeived to be divided into an infinite number of elementary streams of continuous curvature. Suppose, for simplicity, S is a solid of revolution. Then, from the similarity of conditions in all directions, the elementary streams will be in planes drawn through the axis of 8.

Each elementary stream may be conceived as a mass of fluid fiow- ing steadily in an infinitely thin frictionless pipe. But it has already been shown that in a tortuous pipe, the ends of which are in the same direction, there is no resultant force due to the motion of the fluid which tends to displace the pipe, either due to its curva- ture or its changes of section. Consequently the whole mass of fluid exerts no resultant pressure on the body 8S past which it is flowing. Nor, if the fluid is at rest, will there be any resistance to the uniform motion of the body S through it. The resistance of the ship therefore cannot be due, like that of an unshipshape body, to the forward momentum impressed directly on the fluid. Ina frictionless fluid, and for a uniformly moving and wholly immersed body of fair form, the resistance: would be nz/.

With a fluid which is not perfectly frictionless, however, a resistance may be generated in this way. The particles of water exert a drag on the surface of the body over which they slide. They receive, either in consequence of their adhesion to the surface, or in consequence of impact on the roughnesses which project from it, a forward momentum, and the velocity at B is no longer, as in a frictionless fluid, the same as the velocity at A.

In the case of a ship which is only in part immersed there is another source of resistance. Considcring the elementary streams already defined as flowing along indefinitely thin frictionless pipes, it is obvious that there would be greater pressure in those parts where the cross section was large and the velocity small, and less pressure where the section was small and the velocity high. It will be seen from the diagram that the streams are large in cross seetion in the neighbourhood of the bow and stern, and small alon. the sides. There will therefore be an excess of pressure at bow an stern, and a diminution at the sides. But the free surface of the water in which the ship

floats is a surface of uniform pressure. Hence the water will be forced up at the bow and stern, and sink down in the space between, the variation of the hydrostatic pressure due to depth balancing the variation of pressure in the stream lines. There are thus formed waves accompanying the ship. So far as the ship in its passage through the water has to supply the waste of energy due to the diffusion of this wave motion in the surround- ing liquid, it suffers a resistance which may be termed the wave-, making resistance. This resistance would arise even in a frictionless' fluid.

It will be seen from the foregoing that the two principal causes of the resistance to the motion of a ship are the skin friction and the production of waves. The frictional resistance depends on the immersed surface of the ship, its roughness, and the velocity of the water relatively to the surface. Mr Froude eoncludes that no sensible error is committed if the frictional resistance is taken to be equivalent to that of a rectangular surfaee of equal area and of length (in the line of motion) equal to that of the ship and mov- ing at the same speed. Forsuch a rectangular surface Mr Froude's experiments already described furnish the means of calculating the resistance.

Experiments made on H.M. ship " Greyhound" appear to show that in well-formed, clean-bottomed ships, at speeds not exceeding 8 knots per hour, the frictional resistance is from 80 to 90 per eent. of the whole resistance, and that at the greatest speeds of the quickest ships the frictional resistance is from 60 to 70 per cent. of the whole resistance. For ships with foul bottoms the frictional resistance is a still larger fraction of the whole resistance.

The wave-making resistance is not yet fully understood, and involves considerations beyond the scope of the present article. For any given length of ship, with given proportions of entrance, middle body, and run, there is a limit of speed beyond which the resistance due to dissipation of energy in waves rapidly increases. Below that limit the resistance, being chiefly due to friction, in- creases nearly as the square of the speed. Above that limit the resistance increases as a higher power of the speed. In the trials of the " Greyhound " the resistance varied nearly as the square of the speed up to 8 knots per hour, as the cube of the speed at 10 knots, and as the fourth power of the speed at 12 knots.

158. Ratio of the Resistance of Models and of Actual Ships.—It will be understood from the foregoing explanations that the laws of the resistance of ships are complicated and at present imperfectly

known. Mr Froude has, however, indicated a way in which experi- ments, on comparatively small models, may be made so as to furnish very useful data as to the resistance of ships. In order that experi- ments on models may be serviceable, it is necessary that their resistance should be measured at speeds for which the different resistances bear the same proportion to each other as in the actual ship. Let d be the ratio of the dimensions of the model to that of the ship. Let R,, Ry, Ry… be the resistances of the model at speeds 01, %, 03… Then it may be expected that the actual

ship at speeds 7,Vd, v,Vd, vzVd . . . will have resistances R,, dha, Cie –

This law, however, is not strictly applicable to that part of the resistance which is due to friction, because of the diminution of the coefficient of friction for a given surface as the length increases. Hence, when the resistance of tho model has been ascertained, a correction must be made to allow for the different coefficient of friction of the ship. The frictional resistances of the model and of the ship are calculated from their immersed surfaces, using the co- efficients of friction suitable for their respective lengths. Deduct- ing the former and adding the latter to the observed resistance at the corresponding speeds, the total resistance of the ship is ascer- tained.

XII].—HYDRAULIC MACHINERY.

159. Hydraulic machinery may be broadly divided into hydraulic motor machines and pumps. In the former class, a quantity of water descending from a higher to a lower level, or from a higher to a lower pressure, drives a machine which receives energy from the water, and applies it to overcoming the resistances of other machines doing useful work. In the latter class, work done on the machine by a steam engine or other source of energy is employed in lifting water from a lower to a higher level. A few

machines such as the ram and jet pump combine the functions of motors and pumps.

WATER Morors.

In every system of machinery deriving energy from a natural water fall there exist the following parts :—

(1) A supply channel or head race, leading the water from the highest accessible level to the site of the machine. This may be an open channel of earth, masonry, or wood, laid at as small a slope as is consistent with the delivery of the necessary supply of water, or it may be a closed cast or wrought-iron pipe, laid at the natural slope of the ground, and about 3 feet below the surface. In some cases part of the head race is an open channel, part a closed pipe. The channel often starts from a small storage reservoir, constructed near the stream supplying the water motor, in which the water accumulates when the motor is not working. There are sluices or penstocks by which the supply can be cut off when necessary,

(2) Leading from the motor there is a tail race, culvert, or discharge pipe delivering the water after it has done its work at the lowest convenient level.

(3) A waste channel, weir, or bye-wash is placed on or at the origin of the head race, by which surplus water, in floods, escapes.

(4) The motor itself, of one of the kinds to be described presently, which either overcomes a useful resistance directly, as in the case of a ram acting on a lift or crane chain, or indirectly by actuating transmissive machinery, as when a turbine drives the shafting, belting, and gearing of a mill. With the motor is usually combined regulating machinery for adjusting the power and speed to the work done. This may be controlled in some cases by automatic governing machinery.

Water Motors with Artificial Sources of Energy.—The great convenience and simplicity of water motors has led to their adoption in certain cases, where no natural source of water power is available. In these cases, an

artificial source of water power is created by using a steam engine to pump water to a reservoir at a great eleyation, or to

mYprRrOomMmBheGAHANTCOS

O19

pump water into a closed reservoir in which there is great pressure. The water flowing from the reservoir through hydraulic engines gives back the energy expended, less so much as has been wasted in friction. Such arrangements are most useful where a continuously acting steam engine stores up energy by pumping the water, while the work done by the hydraulic engines is done intermittently.

160. Energy of a Water Fall. —Let H: be the total fall of level from the point where the water is taken from a natural stream to the point where it is discharged into it again. Of this total fall a por- tion, which can be estimated independently, is expended in overcom- ing the resistances of the head and tail races or the supply and dis- charge pipes. Let this portion of head wasted be h. Then the available head to work the motor is H= H:— h,. It is this available head which should be uscd in all calculations of the proportions of the motor. Let Q be the supply of water per sccond. Then

GQH foot-pounds per second

is the gross available work of the fall. The power of the fall may be rendered available in three ways. The GQ pounds of water may be placed on a macHine at the highest level, and descending in con- tact with it a distance of H feet, the work done will be (neglecting losses from friction or leakage)

GQH foot-pounds per second,

Or the water may descend in a closed pipe from the higher to the lower level, in which case, with the same reservation as before, the pressure at the foot of the pipe will be »=GH pounds per square foot. Ifthe water with this pressure acts on a movable piston like that of a steam engine, it will drive

the piston so that the volume described is Q cubic fect per second. Then the work done will be

PQ=GHQ foot-pounds per second

as before. Or lastly, the water may be allowed to acquire the velocity v=/2gH by its descent. Thc kinetic energy of Q cubic

2

feet will then be Q _ = GQH, and if the water is allowed to im-

pinge on surfaces suitably curved which bring it finally to rest, it will impart to these the same energy as in the previous cases. Generally, if Q feet-per second of water act by weight through a distance fy, at a pressure p due to hy feet of fall, and with a velocity v due to hg feet of fall, so that

hy +hyth,=H, then, apart from energy wasted by friction or leakage or imperfction of the machine, the work done will be

2

GQh, + pQ+ oe GQH foot pounds,

the same as if the water acted simply by its weight while descend- ing H feet.

161, Site for Water Motor.—Wherever a stream flows from a higher to a lower level it is possible to erect a water motor. The amount of power obtainable depends on the available head and the supply of water. In choosing a site the engineer will select a portion of the stream where there is an abrupt natural fall, or at least a considerable slope of the bed. He will have regard to the facility of construct- ing the channels which are to convey the water, and will take advantage of any bend in the river which enables him to shorten them. He will have accurate measurements made of the quantity of water flowing in the stream, and he will endeavour to ascertain the average quantity avail- able throughout the year, the minimum quantity in dry seasons, and the maximum for which bye-wash channels

must be provided. In many cases the natural fall can be increased by adam or weir thrown across the stream. The engineer will also examine to what extent the head will vary in different seasons, and whether it is necessary to sacrifice part of the fall and give a steep slope to the tail race to prevent the motor being drowned by backwater in floods.

In designing or selecting a water motor it is not sufficient to consider only its efficiency in normal conditions of work- ing. Itis generally quite as important to know how it will act with a scanty water supply or a diminished head. The greatest difference in water motors is in their adapta- bility to varying conditions of working. ;

162. Action of Water in a Water Motor.—Water motors

length of which is a little greater than the lift. A ram or may be divided into water-pressure engines, water wheels,

plunger R of the same length Level of Supply

and turbines. is attached to the cage. The Sa Water-pressure engines are machines with a cylinder and | water pressure admitted by a wie oa piston or ram, in principle identical with the corresponding | cock to the cylinder forces up ‘ part of a steam engine. ‘The water is alternately admitted | the ram, and when the supply to and discharged from the cylinder, causing a reciprocating | valve is closed and the dis- action of the piston or ram. It is admitted at a high | charge valve opened, the ram pressure and discharged at a low one, and consequently | descends. In this case the i work is done on the piston. The water in these machines | rain is 9 inches diameter, with t never acquires a high velocity, and for the most part the | a stroke of 49 feet. It con- kinetic energy of the water is wasted. The useful work | sists of lengths of wrought- : +3 due to the difference of the pressure of admission and | iron pipe screwed together per- i discharge, whether that pressure is due to the weight of a | fectly water-tight, the lower end i column of water of more or less considerable height, or is | being closed by a cast-iron ; artificially produced in ways to be described presently. plug. The ram works in a Water wheels are large vertical wheels driven by cylinder 11 inches

diameter, water falling from a higher to a lower level. In most | of 9 feet lengths of flanged water wheels, the water acts directly by its weight loading | cast-iron pipe. The ram passes one side of the wheel and so causing rotation. But in all | water-tight through the cylin- water wheels a portion and in some a considerable portion | der cover, which is provided P of the work due to gravity is first employed to generate | with double hat leathers to ‘ kinetic energy in the water; during its action on the water | prevent leakage outwards or \ wheel the velocity of the water diminishes, and the wheel | inwards. As the weight of . is therefore in part driven by the impulse due to the change | the ram and cage is much i of the water’s momentum. Water wheels are therefore | more than sufficient to cause a motors on which the water acts, partly by weight, partly | descent of the cage, part of by impulse. the weight is balanced. A WY Turbines are wheels, generally of small size compared | chain attached to the cage Z with water wheels, driven chietly by the impulse of the | passes over a pulley at the Y | water. Before entering the moving part of the turbine, | top of the lift, and carries at GY, the water is allowed to acquire a considerable velocity ; | its free end a balance weight Y h during its action on the turbine this velocity is diminished, | B, working in T iron guides. Y ; and the impulse due to the change of momentum drives | Water is admitted to the Gy the turbine. cylinder from a 4-inch supply Uj Roughly speaking, the fluid acts in a water-pressure | pipe through a two-way slide,] oa engine directly by its pressure, in a water wheel chiefly by | worked by a rack, spindle, ZY: its weight causing a pressure, but in part by its kinetic | and endless rope. The lift ‘ja Z: energy, and in a turbine chiefly by its kinetic energy, works under 73 feet of head, 3334 Y, which again causes a pressure. and lifts 1350 ib at 2 feet J ner second. ‘The efficiency is Water-Pressure Engines. cet by Mr Anderson at 75 Y : 163. In these water acts by simple pressure due to the | to 80 per cent.? GY : height of the column in the supply pipe or the pressure in | | The prineipal pre- Uj the supply reservoir. The water acts on a piston or ram judicial resistance to Zevel. of VA 7 ; which it displaces. When the height of the column ee oon nthe == YNN.. 7 : : s bl Weg ‘ exceeds 100 or 200 feet, or there is a pressure equivalent | friction of the cup Disqgharge awe to this, water wheels are inapplicable, and turbines have the | leathers, which make Ca disadvantage that in such circumstances their speed is very the joint between vas great. Then water-pressure engines maybe very conveniently es pee , ve Me adopted. In other cases they are generally too

cumbrous. | ments by Mr ton : ss (When an incompressible fluid such as water is used to | Hick give for the cu actuate piston engines, two special difficulties arise. One is | friction of | these : ys that the waste of work in friction is very great, if the water fo the follow. yr : ; : : : ing formula. Let Age ie ‘ attains considerable velocity; another is that there is great | F= the total fric- : ae oe straining action on the machinery. The violent straining | tioninpounds;d=. y, ASYING FF elo ‘ action due to the more or less sudden arrest of the motion | diameter of ram in 6 ee, of water in machinery is termed hydraulic shock. For a we on, ANNO : e : leathers are new ‘ EBL NG ! portant to keep the dimensions of the machinery small, or badly lubri- | Ad by me Mr Anderson gives 24 feet per second as the limiting cated ; i Wee i velocity. In large water-pressure engines used for pump- | ~ 0-00262 if the » ee. EON ae ys ing mines the average piston speed does not exceed } to 2 ee dition ry Wee sue feet per second. ml well jae aS A a Direct-Acting Hydraulic Lift (fig. 174).—This is the cated. “Fig. 174.

simplest of all kinds of hydraulic motor. A cage W is

i gee. 59 6 _ 2 eee } U mot j 1 The drawing and description of this ram are taken from Mr lifted directly by water pressure acting in a cylinder C, the

Anderson’s Chatham Lectures on Hydraulic Machinery,

MACHINERY. |

*Since the total pressure on the ram is = d*p, the fraction of the*

total pressure expended in overcoming the friction of the leathers is 005 , =°0033

a -to – a

Let H be the height of the pressure column measured from the free surface of the my reservoir to the bottom of the ram in its lowest position, Hs the height from the discharge reservoir to the same point, h the height of the ram above its lowest point at any moment, S the length of stroke, Q the area of the ram, W the weight of cage, R the weight of ram, B the weight of balance weight, w the weight of balance chain per foot run, F the friction of

the cup leather and slides. Then, neglecting fluid friction, if the ram is rising the accelerating force is

P,=G(H -2)Q-R-W+B-w(S-h)+wh-F, and if the ram is descending Po = — G(He -2)0+W+R-B+u(S—h)-wh-F.

If w =4GQ, P, and P, are constant throughout the stroke ; and

the moving force in ascending and descending is the same, if

B-W+R+0$-co tes . Using the values just found for w and B, P\=P,= 4GQ(H-Hs)-F. Let W+R+wS+B=U, and let P be the constant accelerating force acting on the system, then the acceleration is ve The velocity. at the end of the stroke is (assuming the friction to be

constant) o- /(25):

and the mean velocity of ascent is

4.

164, Self-Acting Hydraulic Hngines.—The admission and discharge valve in the lift just described is worked by hand at the required times. It is easy to see that mechanism like that used in steam engines can be applied to actuate the admission and discharge valves periodically, and the lift is then converted into a continuously acting engine.

Let H be the available fall to work the engine after deducting the loss of head in the supply and discharge pipes, Q the supply

of water in cubic feet per second, and y the efficiency of the engine. Then the horse-power of the engine is

_ 7GQH HP, = 550

The efficiency of large slow-moving pressure engines is = ‘66 to ‘8. In small motors of this kind probably 7 is not greater than ‘5. Let v be the mean velocity of the piston, then its diameter dis given by the relation

, & being in feet.

Q=7 dv in double-acting engines, => dv in single-acting engines. If there are ” cylinders put a for Q in these equations,

The mean velocity v is from 4 to 2 feet per second in large engines, Smaller engines working on high lifts may be run at a greater speed, but with a sacrifice of efficiency. The usual piston speed of Messrs Hastie's engines described below is 100 feet per minute. For pressures of less than 200 feet of head, the speed is less. The velocity of the water in the supply pipes may be 3 to 6 feet per second,

Tn large engines the admission and discharge valves are of very large size, and require very considerable force to move them. It is also desirable that they should open and close more rapidly than the eccentric-moved valves used in steam engines. In these engines the valves are made cylindrical, so that the water pressure causes no friction of the valve on its seating. They are moved by a weight which is released at the proper moment, or by a subsidiary water-pressure engine, the valves of which being small can be actuated automatically. Tolerably full details

of engines with mechanisin of this kind are to be found in Weisbach's Mechanics of Engineering.

Small pressure engines form extremely convenient motors for hoists, capstans, or winches, and for driving small machinery. They are usually rotative engines, and may be single or double acting. The single-acting engine has the advantage that the pressure of the piston on the crank pin is always in one direction; there is then no knocking as the dead centres are passed. Generally three single- acting cylinders are used, so that the engine will readily start in all positions, and the driving effort on the crank pin is very uniform.

Mr Brotherhood's well-known three-cylinder steam engine has been modified so as to be used as a water-pressure engine. The three cylinders are formed in one casting, The valve is a circular revolving disc with segmental ports, which pass over corresponding apertures in the valve seating during rotation. The valve seating is of lignum vitee, °

Fig. 175 shows a similar engine made by Messrs Hastie of Greenock. G, G, G are the? three plungers which pass out of the cylinders through cup leathers, and act on the same crank pin. A is the inlet pipe which communicates with the cock B. This cock controls the action of the engine, being so constructed

that it acts as a reversing valve when the handle C is in its extreme positions and as a brake when in its middle position. With the

oS

we

‘ qos XO é “NY — ee =i e VME. SX LIY Ih

Fig, 175.

Zs

handle in its middle position, the ports of the cylinders are in com-munication with the exhaust. Two passages are formed in the framing leading from the cock B to the ends of the cylinders, one being in communication with the supply pipe A, the other with the discharge pipe Q. These passages end as shown at E. The oscillation of the cylinders puts them alternately in communication with each of these passages, and thus the water is alternately admitted and exhausted.

In any ordinary rotative engine the length of stroke is invariable. Consequently the consumption of water depends simply on the speed of the engine, irre- spective of the effort overcome. If the power of the engine must be varied with out altering the number of rotations, then the stroke must be made variable. Messrs Hastie have contrived an exceed-

Fig. 176. ingly ingenious method of varying the stroke automatically, in

proportion to the amount of work to be done (fig. 176). The crank pin I is carried in a slide H moving in a disk M. In this is a double cam K acting on two small steel rollers J, L attached to the slide H. If the cam rotates it

moves the slide and increases or decreases the radius of the circlein which the crank pin I rotates. The disk M is keyed on a hollow shaft surrounding the driving shaft P, to which the cams are attached. The hollow shaft N has two snugs to which the chains RR are attached (fig. 177). The shaft P carries the spring case SS to which also are attached the other ends of the chains. When the engine is at rest the springs extend them- selves, rotating the hollow shaft N and the frame M, so as to placc the crank pin I at its nearest position to the axis of rotation. When

XII, — 66

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a resistance has to be overcome, the shaft N rotates relatively to P, compressing the springs, till their resistance balances the pressure due to the resist- ——— ance tothe rotation a

of P. The engine Je a

[HYDRAULICS.

the ram as there are plies of chain on the block tackle. B is the- balance weight of the cage.

In the use of accumulators on shipboard for working gun gear or steering gear,

ram is loaded by

then commences to j

work, the crank pin Je\ FO' being in the posi- tion in which the turning effort just , overcomes the re- f sistance. If the fS resistance dimin-| ishes, the springs } force out the chains and shorten the stroke of the plun- \© gers,and vice versa. © The following ex- periments, on an engine of this kind

*«**

MMI XO” XS OHA CG CKO) 4 NWA

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MN P

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i Pp 2 22 Ge

(0 OC OXG-—ai

Ae

working a_ hoist, ~~ ec — x show how the auto- ell matic arrangement Ga, a adjusted the water Fig. 177.

used to the work done. The lift was 22 feet and the water pressure in the cylinders 80 fb per square inch.

Weightlifted, | Chain eight lids} Cuny | 427 638 745 857 969 1081 1198

Water used, in galions….§ 2 10 U4 6 17 20 2 2

165. Accumulator Machinery—tit has already been pointed out that it is in some cases convenient to use a steam engine to create an artificial head of water, which is afterwards employed in driving water-pressure machinery. Where power is required intermittently, for short periods, at a number of different points, as, for instance, in moving the cranes, lock gates, &c., of a

dockyard, a separate steam engine and boiler at each point is very inconvenient ; nor can engines worked froma common boiler be used, because of the great loss of heat and the difficulties which arise out of condensation in the pipes. If a tank, into which water is continuously pumped, can be placed at a great cle- vation, the water can then be used in yeas machinery in a very convenient way. Each hydraulic machine is put in communication with the tank bya pipe, and on opening a valve it commences work, using a quantity of water directly proportional to the work done. No attendance is required when the machine is not working.

A site for such an elevated tank is, however, seldom avail- able, and in place of it a beautiful arrangement termed an accumulator, invented by Sir W. Armstrong, is used. This consists of a tall vertical cylinder ; into this works a solid ram through cup leathers or hemp packing, and the ram is loaded by fixed weights, so that the pressure in the cylinder is 700 tb or 800 ib per square inch. The pumping engines which supply the energy that is stored in the accumulator should be a pair coupled at right angles, so as to start in any position. The engines pump into the accumulator cylinder till the ram is at the top of its stroke, when by a catch arrangement the engines are stopped. If the accumu- lator ram descends, in consequence of water being taken to work machinery, the engines immediately recommence working. Pipes lead from the accumulator to each of the machines requiring to be driven. These pipes do not require to be of large size, as the pressure is 80 great. They are generally flanged pipes about 14 inches bore, the joints being made by a gutta-percha ring.

Fig. 178 shows in a diagrammatic way the scheme of a system of accumulator machinery. A is the accumulator, with its ram carry- ing a cylindrical wrought-iron tank W, in which weights are placed to load the accumulator. At R is one of the pressure engines worked from the accumulator, discharging the water after use into the tank T. In this case the pressure engine is shown working a set of blocks, the fixed block being on the ram cylinder, the running

block on the ram. The chain running over these blocks works a lift cage C, the speed of which is as many times greater than that of

springs, or by steam pressure acting on a piston much larger than the ram. Mr Tweddell has used accumulators with a pressure of 2000 tb per square inch to work hy- draulic riveting machinery. °

The amount of energy stored in the accumulator, having a ram d inches in _ dia- meter, a stroke of S feet, and work- ing at p pounds pressure persquare inch, is

4 pd28 foot-pounds.

the accumulator "phe iia) Cat

is 9 inches, the

stroke 20 feet, and ~ the pressure 800 tb per square inch, the work stored «

in the accumula- Gayy

tor when the ram is at the top of the stroke is 1,017,600 _— foot- pounds, that is,

enough to drive a mac

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hine requiring one horse power for about half

an hour. As, however, the pumping engine replaces water as soon as it is drawn off, the working capacity of the accumulator is very

much greater than this.

Water Wheels.

166.—Overshot and High Breast Wheels.—When a water fall ranges between 10 and 70 feet, and the water supply

is from 3 to 25 cubic feet per second, it is possible to con- struct a bucket wheel on which the water acts chiefly by its weight. If the variation of the head-water level does not exceed 2 feet, an overshot wheel may be used (fig. 179). The water is then projected over the summit of the wheel, and falls in a parabolic path into the buckets. With greater variation of head-water level, a pitch-back or high breast wheel is better. The water falls over the top of a sliding sluice into the wheel, on the same side as the head race channel. By adjusting the height of the sluice, the requisite supply is given to the wheel in all positions of the head-water level.

The wheel consists of a cast-iron or wrought-iron axle C supporting the weight of the wheel. 'To this are attached two sets of arms A of wood or iron, which support circular segmental plates termed shrouds B. A cylindrical sole plate dd extends between the shrouds on the inner side. The buckets are formed by wood planks or curved wrought-iron plates extending from shroud to shroud, the back of the buckets being formed by the sole plate.

The efficiency may be taken at 0°75. Hence, if h.p. is the effec- tive horse power, H the available fall, and Q the available water supply per second,

GQH hp. =0°'75 B50 =0°085 QH.

If the peripheral velocity of the water wheel is too great, water is thrown out of the buckets before reaching the bottom of the fall. In practice, the circumferential velocity of water wheels of the kind now described is from 44 to 10 feet per second, about 6 fect being the usual velocity of good iron wheels not of very small size. In order that the water may enter the buckets easily, it must have a greater velocity than the wheel. Usually the velocity of the water at the point where it enters the wheel is from 9 to 12 feet per second, and to produce this it must enter the wheel at a point 16 to 27 inches below the head-water level. Hence the diameter of an overshot

wheel may be

D=H – 1} to H – 23 feet. Overshot and high breast wheels work badly in back-water, and hence if the tail-water level varies, it is better to reduce the diameter of the wheel so that its greatest immersion in flood is not more than 1 foot. The depth d of the shrouds is about 10 to 16 inches. The number of buckets may be about

xD N=”.

Let v be the a velocity of the wheel. Then the capacity of that portion of the wheel which passes the sluice in one second is

MACHINERY. |

Q= (Dd-a”)

=v bd nearly, b being the breadth of the wheel between the shrouds. If, however, this quantity of water were allowed to pass on to the wheel the buckets would begin to spill their contents almost at the top of the fall. To diminish the loss from spilling, it is not only necessary to give the buckets a suitable form, but to restrict the water supply to one-fourth or one-third of the gross bueket capacity. Let m be the value of this ratio; then, Q being the supply of water per second, Q=mQ, =mbdv.

This gives the breadth of the wheel if the water supply is known. The form of the buckets should be determined thus. The outer element of the A bucket should be in NY the direction of mo- tion of the water entering relatively to the wheel, so that the water may enter without splashing or shock. The buckets should retain the water as long as pos- sible, and the width of opening of the buekets should be 2 or 3 inches greater than the thickness of the sheet of water entering,’

For a

Fig. 180. bucket (fig. 180, A), take ad=distance between two buckets on peri- phery of wheel. Make ed=} eb, and be=$ to $.ab. Join ed. For

wooden

an iron bucket (fig. 180, B), take ed=4 eb; be=% ab. Draw cO making an angle of 10° to 15° with the radius at c On Oe take a centre giving a circular arc passing near d, and round the curve into the radial part of the bueket de.

There are two ways in which the power of a water wheel is given off to the machinery driven. In wooden wheels and wheels with rigid arms, a spur or bevil wheel keyed on the axle of the turbine will transmit the power to the shafting. It is obvious that the whole turning moment due to the weight of the water is then transmitted through the arms and axle of the water wheel. When the water Wheel is an iron one, it usually has light iron suspension arms incapable of resisting the bending action due to the transmission of the turning effort to the axle. In that case spur segments are bolted to one of the shrouds, and the pinion to which the power is transmitted is placed so that the teeth in gear are, as nearly as may be, on the line of action of the resultant of the weight of the water in the loaded arc of the wheel.

167. The Poncelet Water Wheel.—When the fall does not exceed 6 feet, the best water motor to adopt in many cases is the Poncelet undershot water wheel. In this the water acts very nearly in the same way as in a turbine, and the Poncelet wheel, although slightly less efficient than the best turbines, in normal conditions of working, is superior to most of them when working with a reduced supply of water. A general notion of the action of the water on a Poncelet wheel has already been given in § 145. Fig. 181 shows its construction. The water penned back

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; WA Level of Tell Water |

Fig. 181. between the side walls of the wheel pit is allowed to flow to the wheel under a movable sluice, at a velocity nearly

equal to the velocity due to the whole fall. The water is guided down a slope of 1 in 10, or a curved race, and enters the wheel without shock. Gliding up the curved floats it comes to rest, falls back, and acquires at the point of discharge a backward velocity relative to the wheel nearly equal to the forward velocity of the wheel. Consequently it leaves the wheel deprived of nearly the whole of its original kinetic energy.

Taking the efficiency at 0°60, and putting H for the available fall, h.p. for the horse-power, and Q for the water supply per seeond,

h.p. =0°068 QH.

The diameter D of the wheel does not depend on the fall. With. a straight chanuel of approach the smallest convenient diameter is about 14 feet, with a curved channel 10 fect. The diameter is often taken at four times the fall.

Let H' be the fall measured from the free surface of the head-water to the point F where the mean layer enters the wheel; then the velocity at which the water enters is v=/2gH', and the best circumferential velocity of the wheel is V=0'55v to 0'6v. The

number of rotations of the wheel per second is Nat .

TT. The thickness of the sheet of water entering the wheel is very important. The best thickness aceording to experiment is 8 to 10 inches. The maximum thickness should not exceed 12 to 15 inches, when there is a surplus water supply. Let ¢ be the thickness of the sheet of water entering the wheel, and 6 its width ; then

beveQ; orb=®, ev

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Grashof takes e=4H, and then b= 6 a H/29H Allowing for the contraction of the stream, through the sluice may be 1°25 be to 1°3 be.

oS

the area of opening The inside width of the wheel is made about 4 inches greater than b.

Several constructions have been given for the floats of Poncelet wheels. One of the simplest is that shown in figs. 181, 182.

Let OA (fig. 181) be the vertical radiusofthe wheel. Set off OB, OD making angles of 15° with OA. Then BD may be the length of

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Fig. 182.

the close breasting fitted to the wheel. head race BC at a slope of 1 in 10. and ¢, draw EF and GH. Then surface layer entering the wheel. Take FK=0°5 to 07 H. Then K is the centre from which the bucket curve is struck and KF is the radius. The depth of the shrouds must be sufficient to prevent the water from rising over the top of the float. It is 4H to 3H. The number of buckets is not very important. They are usually 1 foot apart on the circumfer- ence of the wheel.

Draw the bottom of the Parallel to this, at distances 4¢ EF is the mean layer and GH the

Join OF, and make OFK =23°.

The efficiency of a Poncelet wheel has been found in experiments

to reach 0°68. It is better to take it at 0°6 in estimating the power of the wheel, so as to allow some margin.

In fic. 182 0; is the initial and v. the final velocity of the water, Vr parallel to the vane the relative velocity of the water and wheel, and V the velocity of the wheel.

Turbines.

168.—The name turbine was originally given in France to any water motor which revolved in a horizontal plane, the axis being vertical. The rapid development of this class of motors dates from 1827, when a prize was offered by the Societé d'Encouragement for a motor of this kind, which should be an improvement on certain wheels then in use. The prize was ultimately awarded to M. Fourneyron, whose turbine, but little modified, is still constructed.

Classification of Turbines.—In some turbines the whole available energy of the water is converted into kinetic energy before the water acts on the moving part of the turbine. Such turbines are termed Impulse Turbines, and they are distinguished by this that the wheel passages are never entirely filled by the water. To ensure this condition they must be placed a little above the tail water and dis- charge into free air.

Turbines in which part only of the available energy is converted into kinetic energy, before the water enters the turbine wheel, may be termed Reaction Turbines. In these the pressure is greater at the inlet than at the outlet ends of the wheel passages. The wheel passages must therefore be entirely filled, and the wheel may be and generally is placed below the tail-water level.

Next there is a difference of constructive arrangement of turbines, which does not very essentially alter the mode of action of the water. In axial flow or so-called parallel flow turbines, the water enters and leaves the turbine in a direction parallel to the axis of rotation, and the paths of the molecules lie on cylindrical surfaces concentric with that axis. In radial outward and inward flow turbines,

the water enters and leaves the turbine in directions normal to the axis of rotation, and the paths of the molecules lie exactly or nearly in planes normal to the axis of rotation. In outward flow turbines the general direction of flow is away from the axis, and in inward flow turbines towards

the axis. There are also mixed flow turbines in which the water enters normally and is dis- charged parallel to the axis of rotation.

Another difference of construction is this, that the water may be admitted equally to every part of the circumference of the turbine wheel or to a portion of the circumference only. In the former case, the condition of the wheel passages is always the same ; they receive water equally in all positions during rotation. In the latter case, they re- ceive water during a part of the rotation only. The former may be termed turbines with complete admission, the latter turbines with partial admission. A reaction turbine should always have complete admission. An impulse turbine may have complete or partial admission.

When two turbine wheels similarly constructed are placed on the same axis, in order to balance the pressures and diminish journal friction, the arrangement may be termed a twin turbine.

If the water, having acted on one turbine wheel, is then passed through a second on the same axis, the arrangement may be termed a compound turbine. The object of such an‘arrangement would be to diminish the speed of rotation.

Many forms of reaction turbine may be placed at any height not exceeding 30 feet above the tail water. They then discharge into an air-tight suction pipe. The weight of the column of water in this pipe balances part of the atmospheric pressure, and the difference of pressure, pro- ducing the flow through the turbine, is the same as if the turbine were placed at the bottom of the fall.

I. Impulse Turbines. (Wheel passages not filled, and discharging above the tail water.) (a.) Complete admission. (Rare.) (b.) Partial admission.

TI. Reaction Turbines.

(Wheel passages filled, dis- charging above or below the tail water or into a suction- pipe.)

(Usual.) | Alwayswith complete admission. ——-—— ————

sli ae Axial flow, outward flow, inward flow, or mixed flow.

Simple turbines ; twin turbines ; compound turbines.

169. The Simple Reaction Wheel.—It has been shown, in § 151, that, when water issues from a vessel, there is a reaction on the vessel tending to cause motion in a direction opposite to that of the jet. This principle was applied in a rotating water motor at a very early period, and the Scotch turbine, at one time much used, differs in no essential respect from

The old reaction wheel consisted of a vertical pi vertical axis, and supplied with water (fig. 183). of the vertical pipe two or more hol- low horizontal arms extended, at the ends of which were orifices from which the water was discharged. The reaction of the jets caused the rotation of the machine.

Let H be the available fall measured from the level of the water in the ver- tical pipe to the centres of the orifices, r the radius from the axis of rotation to the centres of the orifices, v the é velocity of discharge through the jets, & a the angular velocity of the machine. When the machine is at rest the water + issues from the orifices with the velocity «/2gH (friction being ne- glected). But when the machine rotates the water in the arms rotates a.so, and is in the condition of a forced vortex, all the particles having the same angular velocity. Consequently the pressure in the arms at the orifices is

ar?

ag

feet of water, and the velocity of discharge through the orifices is yaa d/ QgH + ar ‘

the older form of reaction wheel. e balanced on a rom the bottom

H+

MACHINERY. | If the total area of the orifices is w, the quantity discharged from the wheel per second is

Q=wv=wV 29H + ar”.

‘While the water passes through the orifices with the velocity v, the orifices are moving in the opposite direction with the velocity a7. The absolute velocity of the water is therefore

v—ar=/2gH + a? – ar.

The momentum generated per second is ag (v-ar) , which is nu-

merically equal to the force driving the motor atthe radius 7. The

work done by the water in rotating the wheel is therefore, per second, “ (v —-ar)ar foot-pounds.

The work expended by the water fall is GQH foot-pounds per second.

Consequently the efficiency of the motor is

_ (a ar)or {/2gH + or? — ar} ar | oe

2172

Let A/ 2gH + a2r? == ay + gl gH? ar ae H the =e) ee . #2 2ar =

which increases towards the limit 1 as ar increases towards infinity. Neglecting friction, therefore, the maximum efficiency is reached when the wheel has an infinitely great velocity of rotation. But this condition is impracticable to realize, and even, at practicable but high velocities of rotation, the friction would considerably reduce the efficiency. Experiment seems to show that the best efficiency is reached when ar=,/2gH. Then the efficiency apart from fric- tion is “5

a (\/2a2r? — ar)ar

a bo gl _ 0°4140?7? gH.

about 17 per cent. of the encrgy of the fall being carried away by the water discharged. The actual efficiency realized appears to be about 60 per cent., so that about 21 per cent. of the energy of the fall is lost in friction, in addition to the energy carried away by the water.

= 0°828,

170. General Statement of Hydrodynamical Principles necessary for the Theory of Turbines.

1. When water flows through any pipe-shaped passage, such as the passage between the vanes of a turbine wheel, the relation be- tween the changes of pressure and velocity is given by Bernoulli's theorem (§ 26). Suppose that, at a section A of such a passage, hy is the pressure measured in feet of water, v, the velocity, and z, the elevation above any horizontal datum plane, and that at a section

B the same quantities are denoted by hg, vp, 2. Then v, 5 v 2 h, -h,= 2 2g 1 + &y — 2y e (i). If the flow is horizontal, 2,=2,; and Vor — U 2 hy hy (1a).

2. When there is an abrupt change of section of the passage, or an abrupt change of section of the stream due toa contraction, then, in applying Bernoulli's equation allowance must be made for the loss of head in shock (§ 32). Let v,, v, be the velocities before and after the abrupt change, then a stream of velocity v, impinges on a stream at a velocity v, and the relative velocity is v;—-vg The

ae head lost is fey . Then equation (1a) becomes ae . hin =a (- Vp)? _ Va(— %,) 1 (2).

2

2g 2g g

To diminish as much as possible the loss of energy from irregular eddying motions, the change of section in the turbine passages must be very gradual, and the curvature without discontinuity.

3. Equality of Angular Impulse and Change of Angular Momen- tum.— Suppose that a couple, the moment of which is M, acts on a body of weight W for ¢ seconds, during which it moves from A, to A, (fig. 184). Let v, be the velocity of the body at Aj, v, its velocity at A,, and let »,, p, be the

perpendiculars from C on v, and v,. Then Mi is termed the angular impulse of the couple, and the quantity

WwW 7 (Vp Pq – 1 P1)

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is the change of angular momentum relatively to ©. Then, from the equality of angular impulse and change of angular momentum

>

W Mi= 9 (Vp P_g-%%Pr1) » Ww,

or, if the change of momentam is estimated for one second,

iss Teas ee

—<

WwW er} (_ Pg — 0 91)

Let 7}, 72 be the radii drawn from C to A,, A, and let W,, Wy be the components of %, %, perpendicular to these radii, making angles 8 and a with %, v, Then

V1 =W, SCC B; Vo= We SEC a}

D\=7) COS B; Po=7 COS a.

tees

> as

W . M=— (wr, – C

g (2°32 Wy”) (3), Fig. 184, where the moment of the couple is expressed in terms of the radii drawn to the positions of the body at the beginning and end of a — and the tangential components of its velocity at those points,

Now the water flowing through a turbine enters at the admission surface and leaves at the discharge surface of the wheel, with its angular momentum relatively to the axis of the wheel changed. It therefore exerts acouple — M tending to rotate the wheel, equal and opposite to the couple M which the wheel exerts on the water. Let Q cubic feet enter and leave the wheel per second, and let #,, w, be the tangential components.of the velocity of the water at the receiv- ing and discharging surfaces of the wheel, 7, r, the radii of those surfaces. By the principle above,

(4).

If @ is the angular velocity of the wheel, the work done by the water on the wheel is

‘ol m (wag – Wyr)

T-Ma=“% (wy, — W,r,)a foot-pounds per second . (5). 171. Total and Available Fall.—Let H: be the total difference of level from the head-water to the tail-water surface. Of this total head a portion is expended in overcoming the resistances of the head race, tail race, supply pipe, or other channel conveying the water. Let hp be that loss of head, which varies with the local con- ditions in which the turbine is placed. Then H=H: – bp is the available head for working the turbine, and on this the cal- culations for the turbine should be based. In some cases it is neces- sary to place the turbine above the tail-water level, and there is then a fall h from the centre of the outlet surface of the turbine to the tail- water level which is wasted, but which is properly one of the losses belonging to the turbine itself. In that case the velocities of the water in the turbine should be calculated for a head H-§, but the efficiency of the turbine for the head H.

172. Gross Efficiency and Hydraulic Efficiency of a Turbine.—Let Ta be the useful work done by the turbine, in foot-pounds per second, T; the work expended in friction of the turbine shaft, gearing, &c., a quantity which

varies with the local conditions in which the turbine is placed. Then the effective work done by the water in the turbine is

T=Tat tT: «

The gross efficiency of the whole arrangement of turbine, races, and transmissive machinery is

*pt) ee ike (6). And the hydraulic efficiency of the turbine alone is a. ane ,. q GQH 6 * . . e .*

It is this last efficiency only with which the theory of turbines is concerned. From equations (5) and (7) we get

1GQH = ea (wyry — WP ,)a; _ (Wry = W's) es ofl (8).

This is the fundamental equation in the theory of turbines. In general, w, and w,, the tangential components of the water's motion

1In general, because when the water leaves the turbine wheel it ceases to act on the machine, If deflecting vanes or a whirlpool are added to a turbine at the discharging side, then v, may in part depend on ¥., and the statement above is no longer true,

on entering and leaving the wheel, are completely independent. Pu ieee, ae That the efficiency may be as great as possible, it 1s obviously necessary that w.=0. In that case ar, is the circumferential velocity of the wheel at the inlet sur-

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SSSA ———

=; ie a a g z, = Lz WE i 4 YJ Q 7 4 , As 4

wees i ZZ ¢ f oS Sakanens % = = 4 gs – j } I SS, |

J

it ie Fig. 188. face. Calling this Vj, the equation ane in et Be : a It was first given by Herr v. Reiche w ‘urbinen-baues, . a 173. General Description of a Reaction Turbine.—Profes-

n= ‘ gi ; : This remarkably simple equation is the fundamental equation in ! SOF James Thomson’s inward flow or vortex turbine has been

SSS LCRA SSS

SSeS SSS

SSS Sass

ERSTE

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HYDROMEHE

selected as the type of reaction turbines. It is one of the best even in normal conditions of working, and the mode of regulation introduced is decidedly superior to that in most reaction turbines; it might almost be said to be the

MACHINERY. |

only mode of regulation which satisfies the conditions of | guide-blade chamber into the suction pipes.

efficient working, and it has been adopted in a modified

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pressure of the water acts, and the vanes are bounded on each side by dished or conical coverplates c,c. Joint- rings j, 7 on the cover plates make

a sufficiently water- tight joint with the casing, to prevent leakage from the The pressure near the joint rings is not very great, probably not one-

form in the Leffel turbine, which is now largely used in | fourth the total head. ‘The wheel vanes receive the water

America.

Figs. 185 and 186 are external views of the turbine case ;

without shock, and deliver it into central spaces, from which it flows on either side to the suction pipes. The

figs. 187 and 188 are the corresponding sections ; fig. 189 is | mode of regulating the power of the turbine is very simple.

the turbine wheel. The example chosen for illustration has suction pipes, which permit the turbine to be placed at any height less than 30 feet above the tail-water level. The water enters the turbine by cast-iron supply pipes at A, and is discharged through two suction pipes 8,8. The water on entering the case distributes itself through a rectangular supply chamber SC, from which it finds its way equally to the four guide-blade passages G, G, G, G. In these passages it acquires a velocity about equal to that due to half the fall, and is directed into the wheel at an angle of about 10° or 12° with the tangent to its circum- ference. The wheel W receives the water in equal propor- tions from each guide-blade passage. It consists of a centre plate p (fig. 189) keyed on the shaft aa, which passes through stuffing boxes on the suction pipes. On each side of the centre plate are the curved wheel vanes, on which the

yt A

174. Different Forms of Turbine Wheel. —The wheel of a turbine or part of the machine on which the water acts is an annular space, furnished with eurved vanes dividing it into passages exactly or roughly reetangular in cross section. For radial flow turbines the wheel may have the form A or B, fig. 191, A being most usual

The guide-blades are pivoted to the case at their inner ends, and they are connected by a linkwork, so that they all open and close simultaneously and equally. In this way the area of opening through the guide-blades is altered without materially altering the angle or the other conditions of the delivery into the wheel. The guide-blade gear may be variously arranged. In this example four spindles, passing through the case, are linked to the guide-blades inside the case, and connected together by the links J, J, Z on the outside of the case. A worm wheel on one of the spindles is rotated by a worm d, the motion being thus slow enough to adjust the guide-blades very exactly. These turbines are made by Messrs Williamson Brothers of Kendal, who supplied the drawing of the turbine.

Fig. 190 shows another arrangement of the same turbine, with some adjuncts not shown in the other drawings. In this case the turbine rotates horizontally, and the turbine case is placed entirely below the tail water. The water is supplied to the turbine by a vertical pipe, over whichis a wooden pentrough, containing a strainer, which prevents stieks and other solid bodies getting into the turbine.

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ALAIN

Vile Ute Mia CMM

Willd

UthYy

The turbine rests on three foundation stones, and, the pivot for the vertical shaft being under water, there is a screw and lever arrange- ment for adjusting it as it wears. The vertical shaft gives motion to the machinery driven by a pair of bevel wheels. On the right are the worm and wheel for working the guide-blade gear.

Ties fee. Fig. 191.

with inward, and B with outward flow turbines. In A the wheel vanes are fixed on each side of a centre plate keyed on the turbine shaft. The vanes are limited by slightly-coned annular cover

lates. In B the vanes are fixed on one side of a disk, keyed on the shaft, and limited by a cover plate parallel to the disk. Parallel]

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flow or axial flow turbines have the wheel as in C. The vanes are limited by two concentric cylinders.

Reaction Turbines.

175. Velocity of Whirl and Velocity of Flow.—Let acb (fig. 192) That

be the path of the particles of water in a turbine wheel. path will be in a plane normal to the axis of rotation in radial flow turbines, and on a cylin- drical surface in axial flow tur- bines. At any point ¢ of the path the water will have some velocity v, in the direction of a tangent to the , path. That velo- Fig. 192.

city may be resolved into two components, a whirling velocity w in the direction of the wheel's rotation at the point c, and a component u at right angles to this, radial in radial flow, and parallel to the axis in axial flow turbines. This second component is termed the velocity of flow. Let %, %, % be the velocity of the water, the whirling velocity and velocity of flow at the outlet surface of the wheel, and v',w,,u the same quantities at the inlet

surface of the wheel. Let a and @ be the angles which the water's direction of motion makes with the direction of motion of the wheel at those surfaces. Then

Wy = Vp COS B; Uy=V% sin B (10) Wy =Vy COS a} Ur=Vi SIN a

The velocities of flow are easily ascertained independently from the dimensions of the wheel. The velocities of flow at the inlet and outlet surfaces of the wheel are normal to those surfaces. Let 0, 9; be the areas of the outlet and inlet surfaces of the wheel, and

Q the volume of water passing through the wheel per second ; then

se vm Ge Oe ee ene @).

Using the notation in fig. 191, we have, for an inward flow turbine

(neglecting the space occupied by the vanes), Q)= 27 dy 5 M= Aridi Similarly, for an ontward flow turbine, Qo=2aryd; Q=Arrd . . and, for an axial flow turbine, Q)=Q= n(re-n?) jac ee CAC

(12a).

(12c).

Relative and Common Velocity of the Water and Wheel.—There is another way of resolving the velocity of the water. Let V be the

velocity of the wheel at the point c, fig. 1938. Then

the velocity of the water may be re- solved into a com- ponent V, which the water has in common with the wheel, and a com- ponent 2, which is the velocity of the water relatively to the wheel.

Velocity of Flow. —It is obvious that : the frictional losses Fig. 193. of head in the wheel passages will increase as the velocity of flow is greater, that is, the smaller the wheel is made. But if the wheel works under water, the skin friction of the wheel cover increases as the diameter of the wheel is made greater, and in any case the weight of the wheel and consequently the

journal friction increase as the wheel is made larger. +: is therefore desirable to choose, for the velocity of flow, as large a value as is consistent with the condition that the frictional losses in the wheel passages are a small fraction of the total head.

The values most commonly assumed in practice are these :—

In axial flow turbines, w,—=w:i=0°15 to 0-2 29H ; In outward flow turbines, v;— 0°25 29(H —) ,

Uy = 0°21 to 0°17 29(H — b) 5 In inward flow turbines, w= 0°125'V/2gH .

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(12);

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176. Specd of the Wheel.—The best speed of the wheel depends partly on the frictional losses, which the ordinary theory of turbines disregards. It is best, therefore, to assume for V, and Vi values which experiment has shown to be most advantageous.

In axial flow turbines, the circumferential velocities at the mean radius of the wheel may be taken

Vo= Vi=0°6V 29H to 0-66V2gHi . Ina radial outward flow turbine, V,;=0°56V29(H ~§) Vor Vine,

where 7p, 7; are the radii of the outlet and inlet surfaces. In a radial inward flow turbine,

V;=0'66,/2gH , ALE

3 If the wheel were stationary and the water flowed through it, the water would follow paths parallel to the wheel vane curves, at least when the vanes were so close that irregular motion was prevented. Similarly, when the wheel isin motion, the water follows paths rela- tively to the wheel, which are curves parallel to the wheel vanes. Hence the relative component,

v,, of the water's motion at c is tan- a to a wheel vane curve drawn through the pointc. Let, »» Yro be the velocity of the water and its common and relative components at the outlet surface of the wheel, and 2%, Vi, vr be the same quantities at the inlet surface ; and let 0 and » be the or the wheel vanes make with the inlet and outlet surfaces; en Vp2= A/ (p92 + Vo? — 2V qr C08) } Mm =A/(Vpe + VE-2V ies cos 0))

equations which may be used to determine ¢ and 6.

177. Condition determining the Angle of the Vanes at the Outlet Surface of the Wheel. — It has been shown that, when the water leaves the wheel, it should have no tangential velo- city, if the effi- ciency is to be as great as possible; that is, w)=09. Hence, from (10), cos B=0, B= 90", Uy=Vo, and the direction of the water's motion is normal to the

(13),

Fig. 194.

outlet surface of the wheel, radial in radial flow, and axial in axial flow turbines.

Drawing v) or % radial or axial as the case may be, and V, tan- gential to the direction of motion, vr can be found by the parallelo-

From fig. 194, tan Ts pe vile VL ot kyl Rees

0

gram of velocitics.

but @ is the angle which the wheel vane makes with the outlet sur- face of the wheel, which is thus determined when the velocity of flow u, and velocity of the wheel V, are known. When ¢ is thus determined,

2

U Vey = Uy cosec P= Vo aj 14 7a Wes

0

Correction of the Angle p to allow for Thickness of Vanes.—In: determining ¢, it is most convenient to calculate its value approxi- mately at first, from a value of w, obtained by neglecting the thick- ness of the vanes. As, however, this angle is the most important angle in the turbine, the value should be afterwards corrected to allow for the vane thickness.

Let

a « (da).

’ = fan) St. ta —s be the first or approximate value of ¢, and let ¢ be the thickness, and n the number of wheel vanes which reach the outlet surface of the wheel. As the vanes cut the outlet surface approximately at the angle ¢’, their width measured on that surface is ¢ cosec ¢’. Hence the space occupied by the vanes on the outlet surface is

*For A, fig. 191, néd, cosec } B, fig. 191, ntd cosec > : t yt ©, fig. 191, 2 (7-11) cosec > *

MACHINERY. |

Call this area occupied by the vanes w. Then the true value of the clear discharging outlet of the wheel is 2,—, and the true value

The corrected value of the angle of the vanes will

hind OE Hq it be

p =tan—! (16).

2. Se (Q) — w)Vo

178. Head producing Velocity with which the Water enters the Wheel.—Consider the variation of pressure in a wheel passage, which satisfies the condition that the sections change so gradually that there is no loss of head in shock. When the flow is in a hori- zontal plane, there is no work done by gravity on the water passing Seroagh the wheel. In the case of an axial flow

turbine, in which the flow is vertical, the fall d@ between the inlet and outlet surfaces should be taken into account.

Let V;, Vy be the velocities of the wheel at the inlet and outlet surfaces, V%, UV the velocities of the water, Ui, Uy the velocities of flow, Uri, Urg the relative velocities, hi, hy the pressures, measured in feet of water, Ti, 7) the radii of the wheel, a the angular velocity of the wheel.

At any point in the path of a portion of water, at radius 7, the velocity v of the water may be resolved into @ component V=ar equal to the velocity at that point of the wheel, and a relative com- ponent v,. Hence the motion of the water may be considered to consist of two parts :—(a) a motion identical with that in a forced vortex of constant angular velocity a; (b)a flow along curves parallel to the wheel vane curves. Taking the latter first, and using Bernoulli's theorem, the change of pressure due to flow through the wheel passages is given by the equation

The variation of pressure due to rotation in a forced vortex is ee PT h-hh = t i Orh Conscquently the whole difference of pressure at the inlet and outlet surfaces of the wheel is hi = Qo = h; Gi h"; ~ lope =, B", V2-V,? fs Ure? — Uns? 2g Y – Case 1. Axial Flow Turbines. —Vi=V »; and the first term on the

right, in equation 17, disappears. Adding, however, the work of gravity due to a fall of d feet in passing through the wheel,

coe @ Clee

Das 2 he lyn a

Case 2. Outward Flow Turbines. —The inlet radius is less than

(17a).

the outlet radius, and —— is negative. The centrifugal head

diminishes the pressure at the inlet surface, and increases the velocity with which the water enters the wheel. This somewhat increases the frictional

loss of head. Further, if the wheel varies in velocity ta 2 from variations in the useful work done, the quantity Ye=V 0 i. ereases when the turbine speed increases, and vice versa. Conse- quently the flow into the turbine increases when the speed increases, and diminishes when the speed diminishes, and this again augments the variation of speed. The action of the centrifugal head in an out- ward flow turbine is therefore prejudicial to steadiness of motion. For this reason ry :7; is made small, generally about 5:4. Even then a governor is sometimes required to regulate the speed of the turbine,

Case 3. Inward Flow Turbines.—The inlet radius is greater than the outlet radius, and the centrifugal head diminishes the velo- city of flow into the turbine. This tends to diminish the frictional losses, but it has a more important influence in securing steadiness of motion. Any increase of speed diminishes the flow into the tur- bine, and vice versa. Hence the variation of speed is less than the variation of resistance overcome. In the so-ealled centre vent wheels in America, the ratio 7; : 7) is about 5 : 4, and then the in- fluence of the centrifugal head is not very important. Professor James Thomson first pointed out the advantage of a much greater difference of radii. By making 7; :7,=2:1, the centrifugal head balances about half the head in the supply chamber. Then the velo-

city through the guide-blades does not exceed the velocity due to half the fall, and the action of the centrifugal head in securing steadiness of speed is considerable.

Since the total head producing flow through the turbine is H – }, and of this h;—h, is expended in overcoming the pressure in the wheel, the velocity of flow into the wheel is

me eg VIS V : tl — come) {t=

where c, may be taken 0°96. From (14a),

as),

It will be shown immediately that Vri= Ut COSEC 8 5

or, as this is a small term, and @ is on the average 90°, we may take, for the present purpose, v= wu; uearly.

Inserting these values, and remembering that for an axial flow turbine Vi=V,, }=0, and the fall d in the wheel is to be added,

V2 ei us rs ao H—-tH(1 4 Mo \, Me _)\), sa wei (H pe(1 + ts) + oe a)

For an outward flow turbine,

V2 Uo? a i= g -h-— gees a ce a / [20H p me ma)e 2:

For an inward flow turbine,

V2 U2 \ uit Fanos g ape 0 vC% o / [29| 8 m(1+ Hs)+sc | |.

179. Angle which the Guide-Blades make with the Cirewm ference of the Wheel.—At the moment the water enters the wheel, the radial component of the velocity is w, and the velocity is 1%. a “ vy is the angle between the guide-blades and a tangent to

e whee

y=sin% ,

t

This angle can, if necessary, be corrected to allow for the thickness of the guide-blades.

180. Condition Determining the Angle of the Vanes at the Inlet Sur- Jace of the Wheel.—The single condition necessary to be satisfied at the inlet surface of the wheel is that the water should enter the wheel without shock. This con- dition is satisfied if the direction of relative motion of the water and , wheel is parallel to the first ele- ment of the wheel vanes.

Let A (fig. 195) be a point on the inlet surface of the wheel, and let v: represent in magnitude and direction the velocity of the water entering the wheel, and Vi the velocity of the wheel. Completing the parallelogram, vi is the direction of relative motion. Hence the angle between vi and V; is the angle @ which the vanes should make with the inlet surface of the wheel.

181. Example of the Mcthod of Designing a Turbine. Professor James Thomson's Inward Flow Turbine.—

Fig. 195.

Let H=the available fall after deducting loss of head in pipes and channels from the gross fall; Q=the supply of water in cubic feet per second ; and n=the efficiency of the turbine. The work done per second is

nGQH, and the horse-power of the turbine is

nGQH hp. = BBO If 7 is taken at 0°75, an allowance will be made for the frictional losses in the turbine, the leakage, and. the friction of the turbine shaft. Then h.p. =0°085QH. The velocity of flow through the turbine (uncorrected for the space occupied by the vanes and guide-blades) may be taken

ui=uUy)= 0125 29H, XIT. — 67

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in which ease about ¢,th of the energy of the fall is carried away by the water discharged. The areas of the outlet and inlet surface of the wheel are then

— e 0-125V 2g

If we take 79, so that the axial velocity of discharge from the central orifices of the wheel is equal to 2, we get

79=0'3984 a / ae

If, to obtain considerable steadying action of the centrifugal head,

Qr7 glo = 2n7r;di=

7 = 2ry, then dy=de .

Speed of the Wheel.—Let V,.=0°66V 2gH, or the speed due to half the fall nearly. Then the number of rotations of the turbine per

seeond is V; . HVH). =5an7! 0579 Jie ;

also Vo> 2 Vin 0°38 291k ‘

Angle of Vanes with Outlet Surface.

Tan ee ie 3788 ; V, oe

¢=21° nearly.

If this value is revised for the vane thickness it will ordinarily become about 25°.

Velocity with which the Water enters the Wheel.—The head pro- dueing the velocity is

v2 uy? \ we u ae ees

=H {1 ~ -4356(1 + 0°0358) + -0156} = 0‘5646H. Then the velocity is = 96\/29(°5646H) =0°721V 29H. Angle of Guide-Blades.

Sin y= Mi = 0178 ; y= 10° nearly.

Tangential Velocity of Water entering Wheel. wi=v; C08 y=0‘7101V2gH. Angle of Vanes at Inlet Surface. wi-V; “7101-66. ” i aia, 0=68° nearly. Hydraulic Efficiency of Wheel. wie _. . bl lh =‘7101 × 66 ×2 =0°9373.

This, thowever, negleets the friction of wheel covers and leak- age. he efficieney from experiment has been found to be 0°75 to 0°80.

Cot @=

Impulse and Partial Aamaission Turbines.

182. The principal defect of most turbines with complete admission is the imperfection of the arrangements for working with less than the normal supply. With most forms of turbine the efficiency is considerably reduced when the regulating sluices are partially closed, but it is exactly when the supply of water is deficient that it is most important to get out of it the greatest possible amount of work. The imperfection of the regulating arrangements is, therefore, from the practical point of view, a serious defect. All turbine makers have sought by various methods to improve the regulating mechanism. Fourneyron, by divid-

ing his wheel by horizontal diaphragms, virtually obtained

three or more separate radial flow turbines, which could be successively set in action at their full power, but the

arrangement is not altogether successful, because of the

spreading of the water in the space between the wheel and guide-blades. M. Fontaine similarly employed two concentric axial flow turbines formed in the same casing. One was worked at full power, the other regulated. By this arrangement the loss of efficiency due to the action of the regulating sluice affected only half the water power. Many makers have adopted the expedient of erecting two or three separate turbines on the same waterfall. Then one or more could be put out of action and the others worked at full power. This is an excellent plan, but the separate turbines cost more than a single one. All these methods are rather palliatives than remedies. The movable guide-blades of Professor James Thomson meet the difficulty directly, but of course they are not applicable to every form of turbine.

A subsidiary defect of turbines with complete admission is their very great spced of rotation on high falls. . The turbine wheel cannot be increased in diameter without great increase of the fluid friction in the passages and on

the surface of the wheel, and it also becomes impossible in radial flow turbines to adjust properly the vane angles, if the diameter is made very large.

M. Callon, in 1840, patented an arrangement of sluices for axial or outward flow turbines, which were to be closed successively as the water supply diminished. By preference the sluices were closed by pairs, two diametrically opposite sluices forming a pair. The water was thus admitted to opposite but equal arcs of the wheel, and the forces driving the turbinc were symmetrically placed. As soon as this arrangement was adopted, a modification of the mode of action of the water in the turbine became necessary. If the turbine wheel passages remain full of water during the whole rotation, the water contained in each passage must be put into motion each time it passes an open portion of the sluice, and stopped each time it passes a closed portion of thesluice. It is thus put into motion and stopped twice in each rotation. This gives rise to violent eddying motions and great loss of energy in shock. To prevent this, the turbine wheel with partial admission must be placed above the tail water, and the wheel passages be allowed to clear themselves of water, while passing from one open portion of the sluices to the next.

But if the wheel passages are free of water when they arrive at the open sluices, then there can be no pressure other than atmospheric pressure in the space between the sluices and wheel. The water must issue from the sluices with the whole velocity due to the head; received on the curved vanes of the wheel, the jets must be gradually deviated and discharged with a radial velocity only, pre- cisely in the same way as when a single jet strikes a curved vane in the free air. Turbines of this kind are therefore termed turbines of free deviation. There is no variation of pressure in the jet during the whole time of its action on the wheel, and the whole energy of the jet is imparted to the wheel,{simply by the impulse due to its gradual change of momentum. It is clear that the water may be admitted in exactly the same way to any fraction of the circumference at pleasure, without altering the efficiency of the wheel. The diameter of the wheel may be made as large as con- venient, and thus the speed of rotation on high falls may be kept down to a manageable amount. The Poncelet water wheel is a turbine of free deviation, in which, how- ever, the action of gravity causes the water

to flow back along the vanes, so that it is discharged at the same point of the wheel at which it enters.

So long as the tail-water level is invariable, no difficulty

HYDROME

arises in adopting the system of partial admission. But if, as is more commonly the case, the tail-water level varies, then there is danger that the turbine will be drowned in flood time, and the essential condition of the system that the wheel passages should be empty when they come in front of the open sluices will not be satisfied. If the fall

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Fig.

placed below the tail-water level in a casing supplied with air by a small air-pump. It therefore always discharges freely into an atmosphere of air, the pressure of which, however, varies with the height of the tail-water level out- side the casing. _ Inside the casing the free water surface

| (TO

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is considerable, a portion of it may be sacrificed without much harm, and the wheel placed sufficiently high above the tail water to secure it from being drowned ; but with low falls this is impossible. The difficulty has been over- come by a method invented by M. L. D. Girard in 1849, and termed the hydropneumatic system. The turbine is

aN Wa p Gs

[AxzSs\\I f V~=S \ Weer

iY i

1g Ke

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ZEN My

Lp

WHIM YYWWU:«CZ!

Gx af

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1,

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196.

is maintained at an invariable level just below the dis- charge orifices of the wheel. 183. General Description of an Impulse Turbine or Turbine with

Free Deviation.—Fig. 196 shows a general sectional elevation of a Girard turbine, in which the flow is axial. The water, admitted

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above a horizontal floor, passes down through the annular wheel con- taining the guide-blades G, G, and thence into the revolving wheel WW. The re- volving wheel is fixed to a hollow shaft suspended from the pivot p. The solid inter- nal shaft ss is merely a fixed column support- ing the pivot. The advantage of this is that the pivot is accessible for lubrication and adjustment. B is the mortise bevel wheel by which the power of the turbine is

Fig. 197. given off, The sluices are worked by the hand wheel h, which raises

them successively, in a way to be described presently. a, a are the sluice rods. Figs. 197, 198 show the sectional form of the guide- blade chamber and wheel and the curves of the wheel vanes and guide- blades, when drawn on a plane develop- ment of the cylin- drical section of the wheel; , a, @ are the sluices for cut- ting off the water ; b, 6, b are apertures by which the en- trance or exit of air is facilitated as the buckets empty and

fill, Figs. 199, 200 show the guide- blade gear. a, a, @

Fig. 198. as before. At the topo. each sluice rod is a small block ¢, having a

are the sluice rods

projecting tongue, w plate d, d.

MOUATOAUATAN

Fig. 199.

revolves on it by means of the flanged rollers f, Inside, at the top, the cam plate is toothed, and gears into a spur pinion connected with the hand wheel 2. At gg is an inclined groove or shunt.

Sa ee eer JE | U =U

UU

Fig. 200.

When the tongues of the blocks ¢, ¢ arrive at g, they slide up to a second groove, or the reverse, according as the cam plate is revolved

ich slides in the groove of the circular cam This circular plate is supported on the frame ¢, and

in one direction or in the other. As this operation takes place with each sluice successively, any number of sluices can be opened or closed as desired. The turbine is of 48 horse power on 5°12 feet fall, and the supply of water varies from 35 to 112 cubic feet per second. The efficiency in normal working is given as 78 per cent. The mean diameter of the wheel is 6 fect, and the speed 2/74 re- volutions per minute.

184. Theory of the Impulse Turbine.—The theory of the impulse turbine does not essentially differ from that of the reaction turbine, except that there is no pressure in the wheel opposing the discharge from the guide-blades. Hence the velocity with which the water enters the whecl is simply

v= 0°96 29(H — 9) ,

where } is the height of the top of the wheel above the tail water. If the hydropneumatic system is used, then =0. Let Qn be the maximum supply of water, 7), 72 the internal and external radii of

‘| the wheel at the inlet surface ; then

*——. Te * ar(7q2 — 77’) The value of u;may be about 0 -45\/29(H — h), whence 7), 72 can be*

determined. The guide-blade angle is then given by the equation

v

uj 0°45 sin y=— = – os 5 1 ek y= 29°.

The value of 2, should, however, be corrected for the space oceupied by the guide-blades.

The tangential velocity of the entering water is Wi= Vj COS y= 0°82\/29(H — 9). The circumferential velocity of the wheel may be (at mean radius) V,;=0°5V29(H — 9). Hence the vane angle at inlet surface is given by the equation

6=55°.

The relative velocity of the water striking the vane at the inlet edge is wt=2t cosec 0=1°22u;. This relative velocity remains unchanged during the passage of the water over the vane ; conse- quently the relative velocity at the point of discharge is vro=1°22ci. Also in an axial flow turbine V)= Vi-

If the final velocity of the water is axial, then

Pay i eens ee me Veo Vet 1°22. x 0°45 This should be corrected for the vane thickness. Neglecting this, Uy=Vro Sin P= vei sin p= Ui cosec O sin d=0‘5ui. The discharging area of the wheel must therefore be greater than the inlet area in the ratio of at least 2 to 1. In some actual turbines the ratio is

7to8. This greater outlet area is obtained by splaying the wheel, as shown in the section (fig. 198).

=cos 24° 23',

185. The Hydraulic Ram.—The hydraulic ram is an ar- rangement by which a quantity of water falling a distance h forces a portion of the water to rise to a height h,, greater than 2. It consists of a supply reservoir (A, fig. 201), into which the water enters from some natural stream. A pipe s of considerable length conducts the water to a lower level, where it is discharged intermittently through a self-acting pulsating valve atd. The supply pipe s may be fitted with a flap-valve for stopping the ram, and this is attached in some cases toa float, so that the ram starts and stops itself automatically, according as thesupply cistern fills or empties. The pipe s should be as long and as straight as possible, and as it is subjected to considerable pressure from the sudden arrest of the motion of the water, it must be strong and strongly jointed. d is an air vessel, and e the delivery pipe leading to the reservoir at a higher level than A, into which water is to be pumped. Fig. 202 shows in section the construction of the ram itself. d is the pulsating discharge valve already mentioned, which opens inwards and downwards. 'The stroke of the valve is regulated by the cotter through the spindle, under which are washers by

ee eS

1 The drawings of this turbine have been taken partly from Meissner, Die Hydraulik, partly from Uhland, Skizzenbuch,

which the amount of fall can be regulated. At o is a | delivery valve, opening outwards, which is often a ball-valve Pumps.

but sometimes a flap-valve. The water which is pumped 186. The different classes of pumps correspond almost passes through this valve into the air vessel a, from which | exactly to the different classes of water motors, although it flows by the delivery pipe in a regular stream into the | the mechanical details of the construction are somewhat cistern to which the

water is to be raised. In the vertical | different. They are properly reversed water motors. chamber behind the outer valve a small air vessel is formed, | Ordinary reciprocating pumps correspond to water-pressure engines, Chain and bucket pumps are in principle similar to water wheels in which the water acts by weight. Scoop wheels are similar to undershot water wheels, and centrifugal pumps to turbines. = Reciprocating Pumps are single 7 GF or double acting, and differ from

Waa $ ta Sf iia a water-pressure engines in that the

Bt ES Sa oe Wy

. Sloe Se eee (|

s Oe ru = valves are moved by the water Vl instead of by automatic machinery. Fig. 201. They may be classed thus :—

in a brass screw plug 6. The hole is reduced to ;', inch in | valve on the ascent of the pump bucket is forced through diameter at the outer end of the plug and is closed by a | the bucket valve when it descends, and lifted by the small valve opening inwards. Through this, during the | bucket when it reascends. Such pumps give an inter- rebound after each stroke of the ram, a small quantity of | mittent discharge. air is sucked in which keeps the air vessel supplied with (2.) Plunger or Force Pumps, in which the water drawn its elastic cushion of air, through the foot valve is displaced by the descent of a The discharge valve d is of greater weight than the | solid plunger, and forced through a delivery valve. They statical pressure of the water on its under side. When, | have the advantage that the friction is less than that of therefore, the water is at rest in the supply pipe this valve | lift pumps, and the packing round the plunger is easily opens. In conse- accessible, whilst that round a lift pump bucket is not. quence of the flow The flow is intermittent. through thisvalve, (3.) The Double-acting Force Pump is in principle a the water in the double plunger pump. The discharge fluctuates from zero supply pipe ac- _{ to a maximum and back to zero each stroke, but is not quires a gradually arrested for any appreciable time. increasing _ velo- (4.) Bucket and Plunger Pumps consist of a lift pump city. The upward bucket combined with a plunger of half its area. The flowo the water, flow varies as in a double-acting pump. towards the valve (5.)

Diaphragm Pumps have been used, in which the d, increases the solid plunger is replaced by an elastic diaphragm, alter- pressure tending nately depressed into and raised out of a cylinder. to lift the valve, The variation of velocity of discharge would cause great and at last, if the waste of work in the delivery pipes when they are long, valve is not too and even danger from the hydraulic ramming action of the heavy, lifts and long column of water. An air vessel is interposed between closes it. The the pump and the delivery pipes, of a volume from 5 to forward momen- 100 times the space described by the plunger per stroke. tum of the column The air in this must be replenished from time to time, or in the supply pipe continuously, by a special air-pump. At low speeds not being destroyed exceeding 30 feet per minute the delivery of a pump is by the stoppage of : \ about 90 to 95 per cent. of the volume described by the the flow, the water Fig. 202. plunger or bucket, from 5 to 10 per cent. of the discharge exerts a pressure at the end of the pipe sufficient to open the | being lost byleakage. At high speeds the quantity pumped delivery valve 0, and to cause a portion of the water to flow | occasionally exceeds the volume described by the plunger, into the air vessel. As the water in the supply pipe comes to | the momentum of the water keeping the valves open after rest, the valve d opens again and the operation is repeated. | the turn of the stroke. Part of the energy of the descending column is employed The velocity of large mining pumps is about 140 feet in compressing the air at the end of the supply pipe and | per minute, the indoor or suction stroke being sometimes expanding the pipeitself. This causes a recoil of the water | made at 250 feet per minute. Rotative pumping engines which momentarily diminishes the pressure in the pipe | of large size have a plunger speed of 90 feet per minute. below the pressure due to the statical head. 'This assists | Small rotative pumps are run faster, but at some loss of in opening the valve d. Mr W. Anderson states that the | efficiency. Fire-engine pumps have a speed of 180 to 220 recoil of the water is sufficiently great to enable a pump to | feet per minute. be attached to the ram body instead of the direct rising pipe. The efficiency of reciprocating pumps varies very greatly. With this arrangement a ram working with muddy water | Small reciprocating pumps, with metal valves on lifts of may be employed to raise clear spring water. Instead of | 15 feet, were found by Morin to have an efficiency of 16 lifting the delivery valve as in the ordinary ram, the | to 40 percent., or on the average 25 per cent. When used to momentum of the column drives a sliding or elastic piston, |

pump water at considerable pressure, through hose pipes, the and the recoil brings it back. This piston lifts and forces | efficiency rose to from 28 to 57 per cent., or on the average, alternately the clear water through ordinary pump valves. | with 50 to 100 feet of lift, about 50 per cent. A large

YZ} ey Ui TECTED LT: YY,

and into this opens an aperture } inch in diameter, (1.) Lift Pumps.—The water drawn through a foot

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18 inches diameter, at speeds under 60 the following results :— Lift in feet 34 47 Efficieney 66 ‘70 The very large steam-pumps employed for waterworks, with 150 feet or more of lift, appear to reach an efficiency of 90 per cent., not including the friction of the discharge

pipes.

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pump with barrels feet per minute, gave

The Centrifugal Pump.

187. The efficiency of reciprocating pumps diminishes with the lift. When large quantities of water are to be raised on a low lift, no pump is so suitable as a centrifugal pump. The first pump of this kind which attracted notice was one exhibited by Mr Appold in 1851, and the special features of his pump have been retained in the best pumps since constructed. Mr Appold’s pump raised continuously

ES 1 | |! thes

;

| ‘ | } j \ i } Ht

Fig. rotation in a chamber somewhat larger than the pump. The use of this whirlpool chamber was first suggested by

Professor James Thomson. It utilizes the energy due to the whirling velocity of the water which in most pumps is wasted in eddies in the discharge pipe. In the pump shown guide-blades are also added which have the direction of the stream lines ina free vortex. They do not therefore inter- fere with the action of the water when pumping the normal quantity, but only prevent irregular motion. At Aisa plug by which the pump case is filled before starting. If the pump is above the water to be pumped, a foot valve is required to permit the pump to be filled. Sometimes instead of the foot valve a delivery valve is used, an air-pump or steam jet pump being employed to exhaust the air from the pump case. ! 188. Design and Proportions of a Centrifugal Pump.—The design of the pump disk is very simple. Let 7, 7» be the radii of the inlet and outlet surfaces of the pump disk, di, dy the clear axial width at those radii. The velocity of flow through the pump may be taken op same as for aturbine. IfQ is the quantity pumped, and H the L ?

(1).

Also in practice

Hence,

nim 2671 ,/ yl eat pole

outlet surface, v%» is

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a volume of water equal to 1400 times its own capacity per minute. It had no valves, and it permitted the passage of solid bodies, such as walnuts and oranges, without obstruc- tion to its working. Its efficiency was also found to be good.

Fig. 203 shows a centrifugal pump differing from ordinary centrifugal pumps in one feature only. The water rises through a suction pipe 8, which divides so as to enter the pump wheel at the centre on each side. The pump

disk or wheel is very similar to a turbine wheel. It is keyed on a shaft driven by a belt on a fast and loose pulley arrangement at P, The water rotating in the pump disk presses outwards, and if the speed is sufficient a continuous flow is maintained through the pump and into the discharge pipe D. The special feature in this pump is that the water, discharged by the pump disk with a whirling velocity of not inconsiderable magnitude, is allowed to continue

[HYDRAULICS.

2038.

Usually T= 2Ni 5 and dy=d; or 4d:

aecording as the disk is parallel-sided or coned. The water enters

the wheel radially with the velocity ww, and

— aT phy ce).

Fig. 204 shows the notation adopted for the the water enters the wheel with the velocity vi, the wheel is Vi. Completing the parallelogram, ri is the relative velo- city of the water and wheel, and is the proper direction of the wheel vanes. Also, by resolving, u; and wi are the component _velo- eities of flow and velocities of whir of the velocity 7 of the water. At the

velocities. Suppose while the velocity of

Fig. 204.

the final velocity of discharge, and the rest of the notation is similar

to that for the inlet surface. Usually the water flows eq

ally in all directions in the eye of the wheel, in that ease 0; is radial, Then, in normal conditions of work-

ing, at the inlet surface,

MACHINERY. | ORESH IES occa SSE ORRITE DY OFC REC CISA Se eres attr ajaccce nan daw sonere } tan @= ee cg : (4). t

Vv | Mi=Uy cosee 0=V ug + V2 If the pump is raising less or more than its proper quantity, @ will not satisfy the last condition, and there is then some loss of head in shock. At the outer circumference of the wheel or outlet surface,

x

Urq = Uy Ccosec d Wy = Vo — Uy cot

= a/ fu.2+ (Vo- Up cot ¢) Variation of Pressure in the Pump Disk.— Precisely as in the case

of turbines, it can be shown that the variation of pressure between the inlet and outlet surfaces of the pump is

= Vee — V? Vor 7 Unie

(5).

Inserting the values of v0, vri in (4) and (5), we get for normal conditions of working

2 V2 2 2 2 2 hyp Tim ¥2 Vi? U7 cosec @ wi +Vi 2 2g 29 Up? cosec 2p 5 wie

6).

2g 2g 2g (6)

Hydraulic Efficiency of the Pump.—Neglecting disk friction, journal friction, and leakage, the efficiency of the pump can be found in the same way as that of turbines (§ 172). Let M be the moment of the couple rotating the pump, and a its angular velocity; wo, 7 the tangential velocity of the water and radius at the outlet surface; wi, r; the same quantities at the inlet surface. Q being the dis- charge per second, the change of angular momentum per sccond is

a (Wo%p — Wit).

Hence M= 2 (Woy — Wits) » In normal working, w;=0. Also, multiplying by theangular velocity, the work done per second is

Ma= “a WoT os But the useful work done in pumping is GQH. Therefore the efficiency is _ GOH BH” gi

Ma = worpa WV

189. Case 1. Centrifugal Pump with no Whirlpool Chamber.—When no special provision is made to utilize the energy of motion of the water leaving the wheel, and the pump discharges directly into a chamber in which the water is flowing to the discharge pipe, nearly the whole of the energy of the water leaving the disk is wasted. The water leaves the disk with the more or less considerable velocity vo, and impinges on a mass flowing to the discharge pipe at the much slower velocity v. The radial component of vp is almost necessarily wasted, From the tangential component there is a gain of pressure

@).

Wy? — V4" 2 (Wy — Vs)? 2g 2g _%q(Wo — Ve) fou: which will be small, if v, is small compared with wy. Its greatest

2

value, if vs=4wWp, is 4 = , which will always bea small part of the whole head. Suppose this neglected. The whole variation of pressure in the pump disk then balances the lift and the head ~ necessary

to give the initial velocity of flow in the eye of the whecl.

*th” ypu Nor _ Mo? coset, ui? 2g – Bg 29 2g’ i Vo? _ Uo? cosec*d*

29 29 (8) ;

or Vo = (29H + u,? cosec?d) and the efficiency of the pump is, from (7), a ee on VowWo Vo(Vo— up cot ¢) _ V,2— up? cosec’@ (9)

~ BV (Vo — up cot)

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S335)

‘ ° V7 = U9?

For ¢=90°, I= Va ’

which is necessarily less than }. That is, half the work expended in driving the pump is wasted. By recurving the vanes, a plan intro- duced by Mr Appold, the efficiency is increased, because tlic velocity % of discharge from the pump is diminished. If ¢ is very small,

cosec ¢=cot ¢; _ Vo2+ tp cosec 2V> a

which may approach the value 1, as tends towards 0. Equation (8) shows that w» cosec cannot be greater then Vo. Putting

Uy = 0°25 2gH

we get the following numerical values of the efficiency and the circumferential velocity of the pump :—

and then n

p 7 0 90° 0-47 1°084/5gi 45° 0:56 106, 30° 065 rg 20° 0°73 a 10° 0-84 7.

cannot practically be made less than 20°; and, allowing for the fric- tional losses neglected, the efficiency of a pump in which ¢=20° is found to be about °60.

190. Case 2. Pump with a Whirlpool Chamber, as in fig. 208.—Pro- fessor James Thomson first suggested that the energy of the water after leaving the pump disk might be utilized, if a space were left in which a free vortex could be formed. In such a free vortex the velocity varies inversely as the radius. The gain of pressure in the vortex chamber is, putting 79, 7» for the radii to the outlet surface of wheel and to outside of free vortex,

if oa

The lift is then, adding this to the lift in the last casc, H= 5 Vo — Uy? cosce' + v92(1 — kK?) :

But Up? = Vo2— 2V otly Cot P+ Up2 cosce'? ;

(2-12)V,2—2kV qty cot — Kx,? cosce's (10).

1

sii Putting this in the expression for the cfficiency, we find a con-

siderable increase of efficiency. Thus with

o~=90° and k=}, g a small angle and k=},

n= nearly; n=1 nearly.

With this arrangement of pump, theiefore, the angle at the outer ends of the vanes is of comparatively little importance. A moderate angle of 30° or 40° may very well be adopted. The following numerical values of the velocity of the circumference of the pump

have been obtained by taking k=}, and u)=0-25V2gH.

p Loe, ss 90° '762√2gH 45° 's42—, 30° 'O14, 20° 1-028) ,,

The quantity of water to be pumped by a centrifugal pump neces- sarily varics, and an adjustment for different quantities of water can- not easily be introduced. Hence it is that the average efficiency of pumps of this kind isin practice less than the efficiencies given above. The advantage of a vortex chamber is also generally neglected. The velocity in the supply and discharge pipes is also often made greater than is consistent with a high degree of efficiency. Velocitics of 6 or 7 fect per second in the discharge and suction pipes, when the lift is small, cause a very sensible waste of energy; 3 to 6 feet would be much bettcr. Centrifugal pumps of very large size have been constructed. Messrs Easton and Anderson have made pumps for the North Sea Canal in Holland which deliver each 670 tons of water per

minute on a lift of 5 feet. The pump disks arc 8 feet diameter. Messrs J. and H. Gwynne constructed some pumps for draining the Ferrarese Marshes, which together deliver 2000 tons per minute. A pump made under Professor J. Thomson's direction for drainage works in Barbados hada pump disk 16 feet in diameter and a whirl- pool chamber 32 feet in diameter. The efficiency of centrifugal pumps when delivering less or more than the normal quantity of water is discussed in a paper in the Proc. Inst. of Civil Engineers, vol. liii. (W. C. U.)

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HYDROMETER. The object of the hydrometer is the determination of the density of bodies, generally of fluids, but some forms of the instrument are adapted to the determination of the density of solids.

It is shown in the article HypROMECHANICS that, when a body floats in a fluid under the action of gravity, the weight of the body is equal to that of the fluid which it displaces. It is upon this principle that the hydrometer is constructed, and it obviously admits of two modes of application in the case of fluids: either we may compare the weights of floating bodies which are capable of displac- ing the same volume of different fluids, or we may com- pare the volumes of the different fluids which are displaced by the same weight. In the latter case, the densities of the fluids will be inversely proportional to the volumes thus displaced.

Perhaps the simplest method of experimentally deter- mining the densities of different liquids is afforded by the series of areometrical glass beads, or hollow balls, first proposed by Dr Wilson, professor of astronomy in the university of Glasgow. As subsequently improved by Mrs Lovi, these beads were constructed in sets, each bead in the set differing in density from its predecessor by '002 (of the density of water). Each bead is numbered according to its density, and in order to determine the specific gravity of a liquid it is only necessary to throw into it the set of beads, or so many of them as are known to include between their extremes the density of the liquid, when all the beads whose densities exceed that of the liquid will sink, while those whose densities are less than that of the liquid will float. If there is a bead of exactly the same density as the liquid, it will rest in any position, provided it is com- pletely immersed. Failing this, all that is

immediately apparent is that the density is intermediate between that of the lightest bead that sinks and that of the heaviest that floats. For example, if all the beads numbered 1°466 and upwards sink, while those below 1°466 float, it is obvious that the density of the liquid is intermediate between 1:464 and 1°466. In the case of most fluids the intervals may be divided approximately by slightly warm- ing the liquid. Thus, if on heating the liquid 6° C. it is found that the bead 1:466 begins to sink, and on heating it still farther through 12° C. (7.e., through 18° C. altogether) the bead 1°468 begins to sink, then the density of the liquid is approximately 1:465.

The hydrometer is said by Synesius Cyreneus in his fifth letter to have been invented by Hypatia at Alexandria,! but appears to have been neglected until it was reinvented by Robert Boyle, whose "New Essay Instrument," as described in the Phil. Trans. for June 1675, differs in no essential particular from N icholson's hydrometer. This instrument was devised for the purpose of detecting counter- feit coin, especially guineas and half-guineas. In the first section of the paper (Phil. Trans., No. 115, p. 329) the author refers to a glass instrument exhibited by himself many years before, and " consisting of a bubble furnished with a long and slender stem, which was to be put into several liquors, to compare and estimate their specific gravities." This seems to be the first reference to the hydrometer in modern times.

In fig. 1 C represents the instrument used for guineas, the circular plates A representing plates of lead, which are used as ballast when lighter coins than guineas are examined. B represents "a small glass instrument for estimating the specific gravities of liquors," an account of which was

ee a a

1 In Micholson's Journal, vol. iii. p. 89, Citizen Eusebe Salverte calls attention to the poem "De Ponderibus et Mensuris " generally ascribed to Rhemnius Fannius Palamon, and consequently 300 years

older than Hypatia, in which the hydrometer is deseribed, and attri- buted to Archimedes.

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promised by Boyle in the following number of the Phil. Trans., but did not appear.

The instrument represented at B (fig. 1), which is copied from Robert Boyle's sketch in the Phil. Trans. tor 1675, is generally known as the com- mon hydrometer. It is usually made of glass, the lower bulb being loaded with mercury or small shot which serves as bal last, causing the instrument to float with the stem vertical. The quantity of mercury or shot inserted depends upon the den- sity of the liquids for which the hydrometer is to be employed, it being essential that the whole B of the bulb should be immersed in the heaviest liquid for which the instrument is used, while the length and diameter of the stem must be such that the hy- drometer will float in the lightest liquid for which it is required. The stem is usually divided into a number of equal parts, the divisions of the scale being varied in different instruments, according to the purposes for which they are employed.

Let V denote the volume of the instrument immersed (7.¢., of liquid displaced) when the surface,of the liquid in which the hydro- meter floats coincides with the lowest division of the scale, A the area of the transverse section of the stem, 1 the length of a scale division, 2 the number of divisions on the stem, and W the weight of the instrument. Suppose the suceessive divisions of the seale to be numbered 0, 1,2…. " starting with the lowest, and let wp, Why Wa. +. Wn be the weights of unit volume of the liquids in which the hydrometer sinks to the divisions 0, 1,2…. " respectively. Then, by the principle of Archimedes,

Fig. 1.—Boyle's New Essay Instrument.

W=Vw ; or Wy = bl Also W=(V+/A)w, or ei er is = IK and Wa= aE ;

or the densities of the several liquids vary inversely as the respee- tive volumes of the instrament immersed in them ; and, since the divisions of the scale correspond to equal increments of volume immersed, it follows that the densities of the several liquids in which the instrument sinks to the successive divisions form a harmonie series.

If V=NIA then N expresses the ratio of the volume of the in- strument up to the zero of the seale to that of one of the scale- divisions. If we suppose the lower part of the instrument replaced by a uniform bar of the same sectional area as the stem and of volume V, the indications of the instrument will be in no respect altered, and the bottom of the bar will be at a distance of N scale- divisions below the zero of the scale.

In this case we have

en P(N + pyla ’

or the density of the liquid varies inversely as N+p, that is, as the whole number of seale-divisions between the bottom of the tube and the plane of flotation.

If we wish the successive divisions of the scale to correspond to equal increments in the density of the corresponding liquids, then the volumes of the instrument, measured up to the successive divisions of the seale, must form a series in harmonieal progression, the lengths of the divisions inereasing as we go up the stem.

The greatest density of the liquid for which the instrument de-

scribed above can be employed is – while the least density is

yaar or a> where v represents the volume of the stem between n

HYDRO

the extreme divisions of the scale. Now, by increasing v, leaving W and V unchanged, we may increase the range of the instrument in- definitely. But it is clear that if we increase A, the sectional area of the stem, we shall diminish 2, the length of a scale-division corre- sponding toa given variation of density, and thereby proportionately diminish the sensibility of the instrument, while diminishing the section A will increase / and proportionately increase the sensibility, but will diminish the range over which the instrument can be em- ployed, unless we increase the length of the stem in the inverse ratio of the sectional area. Hence, to obtain great

sensibility along with a considerable range, we require very long slender stems, and to these two objections apply in addition to the question of porta- bility ; for, in the first place, an instrument with a very long stem re- quires a very deep vessel of liquid for its complete immersion, and, in the second place, when most of the stem is above the plane of flotation, this diminishes or may destroy the stability of the instru- ment when floating. The various devices which have been adopted to overcome this difficulty will be described in the account given of the anpeee hydrometers which have been hitherto gencrally em- loyed.

; The plan commonly adoptcd to obviate the necessity of incon- veniently long stems is to construct a number of hydrometers as nearly alike as may be, but to load them differently, so that the scale- divisions at the bottom of the stem of one hydrometer just overlap those at the top of the stem of the preceding. By this means a set of six hydrometers, each having a stem rather more than five inches long, will be equivalent to a single hydrometer with a stem of thirty inches. But, instead of employing a number of instruments differ- ing only in the weights with which they are loaded, we may employ the same instrument, and alter its weight either by adding mercury or shot to the interior (if it can be opened) or by attaching weights to the exterior. These two operations are not quite equivalent, since a weight added to the interior does not affect the volume of liquid displaced when the instrument is immersed up to a given division of the scale, while the addition of weights to the exterior increases the displacement. This difficulty may be met, asin Keene's hydro- meter, by having all the weights of precisely the same volume but of different masses, and never using the instrument except with one of these weights attached.

The first hydrometer intended for the determination of the densities of liquids, and furnished with a set of weights to be attached when necessary, was that constructed by Mr Clarke, and described by Dresaguliers in the Philo- sophical Transactions for March and April 1730, No. 413, p. 278. The following is Desaguliers's account of the instrument (fig. 2) :—

- *After having made several fruitless trials with ivory, because it imbibes spirituous liquors, and thereby alters its gravity, he (Mr Clarke) at last made a copper hydrometer, re- presented in fig. 2, having a brass wire*

of about 1 inch thick going through, and soldered into the wipe ball Bd. The upper part of this wire is filed flat on one side, for the stem of the hy- drometer, with a mark at m, to which it sinks exactly in proof spirits. There are two other marks, A and B, at top and bottom of the stem, to show whether the liquor be 5th above proof (as when it sinks to A), or #yth under proof (as when it emerges to B), when a brass weight such as C has been screwed on to the bottom at c, There are a great many such weights, of different sizes, fat marked to be screwed on £ instead of C, for liquors that differ more than roth from proof, so as to serve for the specific gravities in all such proportions as relate to the mixture of spirituous liquors, in all the variety made use of in trade. 'There are also other balls for showing the specific gravities quite to common water, which make the instru- meut perfect in its kind."

Clarke's hydrometer, as afterwards con- structed for the purposes of the excise, was provided with thirty-two weights to adapt it to spirits of different specific gravities, and eleven smaller weights, or "' weather weights" as they werecalled, which were attached to the instrument in order to correct for variations of temperature. The weights were adjusted for successive intervals of 5° Fahr., but for degrees intermediate between these no additional correction was applied. The correction for temperature thus afforded was not sufficiently accurate for excise purposes, and Mr Speer in his essay on the hydrometer (Tilloch's Phil. Mag., vol, xiv.) mentions cases in which this imperfect compensa-

*Fe (*Y*

Fia, 2.—Clarke's Hydrometer.

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tion led to the extra duty payable upon spirits which were more than 10 per cent. over proof being demanded on spirits which were purposely diluted to below 10 per cent. over proof in order to avoid the charge.

Desaguliers himself constructed a hydrometer of the ordinary type for comparing the specific gravities of different kinds of water (Desaguliers's

Laxperimental Philo- sophy, vol. ii. p. 234). In order to give great sensibility to the instrument, the large glass ball was made nearly 3 inches in diameter, while the stand consisted of a wire 10 inches in length and only ,4, inchin diameter. The instru- ment weighed 4000 grains, and the addition of a grain caused it tosink through an inch. By altering the quantity of shot in the small balls the instrument could be adapted for liquids other than water.

To an instrument constructed for the same purpose, but on a still larger scale than that of Desaguliers, M. De- parcieux added a small dish on the top of the stem for the reception of the weights necessary to sink the instru- ment to a convenient depth. The effect of weights placed in such a dish or pan is of course the same as if they were placed within the bulb of the instrument, since they do not alter the volume of that part which is immersed.

The first important improvement in the hydrometer after its reinvention by Boyle was introduced by Fahrenheit, who adopted the second mode of construction above referred to, arranging his instrument so as always to displace the same volume of liquid, its weight being varied accordingly. Instead of a scale, only a single mark is placed upon the stem, which is very slender, and bears at the top a small scale pan into which weights are placed until the instrument sinks to the mark upon its stem. The volume of the dis- placed liquid being then always the same, its density will be proportional to the whole weight supported, that is, to the weight of the instrument together with the weights re- quired to be placed in the scale pan.

Nicholson's hydrometer (fig. 3) combines the character- istics of Fahrenheit's hydrometer and of Boyle's essay in- strument.!. The following is the description given of it by Nicholson in the Manchester Memoirs, vol. ii. p. 374.

*"AA represents a small scale. It may be taken off at D. Diameter 14 inch, weight 44 grains. '*B a stem of hardened steel wire. '*¥ a hollow copper globe. stem 369 grains.*

'FF a stirrup of wire screwed to the globe at C.

“Ga small scale, serving likewise as a counter- poise. Diameter 14 inch. Weight with stirrup 1634 grains.

“The other dimensions may be had from the drawing which is one-sixth of the linear mag- nitude of the instrument itself.

*‘*In the construction, it is assumed that the upper scale shall constantly carry 1000 grains when the lower scale is empty, and the instrument sunk in distilled water at the temperature of 60° Fahrenheit to the middle of the wire or eres The length of the stem is arbitrary, as is like- é wise the distance of the lower mals from the FI. Arye a surface of the globe. But, the length of the stem 8°” § “ycrometer. being settled, the lower scale may be made lighter, and, consc- quently, the globe less, the greater its distance is taken from the surface of the globe ; and the contrary.”*

Diameter 44, inch. Diameter 25% inches. Weight with

In comparing the densities of different liquids, it is clear that this instrument is precisely equivalent to that of Fahrenheit, and must be employed in the same manner, weights being placed in the top scale only until the hydro- meter sinks to the mark on the wire, when the specific gravity of the liquid will be proportional to the weight of the instrument together with the weights in the scale.

In the subsequent portion of the paper above referred to,

1 Nicholson’s Journal, vol, i. p. 111, footnote.

Nicholson explains how the instrument may be employed as a thermometer, since, fluids generally expanding more than the solids of which the instrument is constructed, the instrument will sink as the temperature rises.

To determine the density of solids heavier than water with this instrument, let the solid be placed in the upper scale pan, and let the weight now

required to cause the instrument to sink in distilled water at standard temperature to the mark B be denoted by w, while W denotes the weight required when the solid is not present. Then W-vw is the weight of the solid. Now let the solid be placed in the lower pan, care being taken that no bubbles of air remain attached to it, and let w, be the weight now required in the scale pan. This weight will excced w in consequence of the water displaced by the solid, and the weight of the water thus dis- placed will be w,—, which is therefore the weight of a volume of water equal to that of the solid. Hence, since the weight of the solid itsclf is W—2, its density must be v2 ;

-

Tho above example illustrates how Nicholson's or Fahrenheit's hydrometer may be employed as a weighing machine for small weights.

In all hydrometers in which a part only of the instrument is immersed, there is a liability to error in consequence of the surface tension, or capillary action, as it is frequently called, along the line of contact of the instrument and the surface of the liquid (see CapmuaRry Action). This error diminishes as the diameter of the stem in reduced, but is sensible in the case of the thinnest stem which can be employed, and is the chief source of error in the employ- ment of Nicholson's hydrometer, which otherwise would be an instrument of extreme delicacy and precision, The following is Nicholson's statement on this point :—

"One of the greatest difficulties which attends hydrostatical experiments arises from the attraction or repulsion that obtains at the surface of the water. After trying many experiments to obviate the irregularitics arising from this cause, I find reason to prefer the simple one of carefully wiping the whole instrument, and especially the stem, with a clean cloth. The weights in the dish must not

be esteemed accurate while there is either a cumulus or a cavity in the water round the stem."

It is possible by applying alittle oil to the upper part of the bulb of a common or of a Sikes's hydrometer, and care- fully placing it in pure water,

to cause it to float with the upper part of the bulb and the whole of the stem emerging as indicated in fig. 4, when it ought properly to sink almost to the top of the stem, the surface tension of the water around the circumference of the circle of contact, AA', providing the additional support required.

The universal hydrometer of Mr G. Atkins, described in the Phil. Mag. for 1808, vol. xxxi. p. 254, is merely Nicholson's hydrometer with the screw at C projecting through the collar into which it is screwed, and terminating in a sharp point above the cup G. To this point soft bodies lighter than water (which would float if placed in the cup) could be attached, and thus completely immersed. Atkins's instrument was constructed so as to weigh 700 grains, and when immersed to the mark on the stem in distilled water at 60° F., it carried 300 grains in the upper dish. The hydrometer therefore displaced 1000 grains of distilled water at 60° F., and hence the specific gravity of any other liquid was at once indicated by adding 700 to the number of grains in the pan required to make the instrument sink to the mark on the stem. The small divisions on the scale corresponded to differences of #,th of a grain in the weight of the instrument.

_ The "Gravimeter," constructed by Citizen Guyton and described in Nicholson's Journal, 4to, vol. i. p. 110, differs from Nicholson's instrument in being constructed of. glass, and having a cylindrical bulb about 21 centimetres in length and 22 millimetres in diameter. Its weight is so adjusted that an additional weight of 5 grammes

Fig. 4.

HYDROMETER

must be placed in the upper pan to cause the instrument to sink to the mark on the stem in distilled water at the standard tempera- ture. The instrument is provided with an additional piece, or "plongeur," whose weight exceeds 5 grammes by the weight of water which it displaces ; that is to say, it is so constructed as to weigh 5 grammes in water, and consists of a glass envelope filled with mercury. It is clear that the effect of this " plongeur," when placed in the lower pan, is exactly the same as that of the 5 gramme weight in the upper pan. Without the extra 5 grammes the instru- ment weighs about 20 grammes, and therefore floats in a liquid of specific

gravity ‘8. Thus deprived of its additional weight it may be used for spirits. To usc the instrument for liquids of much greater density than watcr additional weights must be placed in the upper pan, and the “ plongeur” is then placed in the lower pan for the purpose of giving to the instrument the requisite stability.

Charles’s balance areometer is.similar to Nicholson’s hydrometer, except that the lower basin admits of inversion, thus enabling the instrument to be employed for solids lighter than water, the inverted basin serving the same purpose as the pointed sctew in Atkins’s modification of the instrument.

Adie’s sliding hydrometer is of the ordinary form, but can be adjusted for liquids of widely differing specific gravities by drawing out a sliding tube, thus changing the volume of the hydrometer while its weight remains constant.

Adic’s statical hydrometer is really a specific gravity balance, one of the arms of which is 24 inches in length, and the other 8 inches. A brass ball, whose volume is ‘01 gallon, is suspended from the shorter arm, and inimersed in the liquid whose density is to be determined. The ball is balanced by means of a weight which slides along the beam, and a smaller weight which also slides along the beam serves to make the necessary correction for temperature.

The hydrometer of Beaumé, which has been extensively used in France, consists of a common hydrometer raduated in the following manner. Certain fixed points were first coterntiided upon the stem of the instrument. ‘The first of these was found by immersing the hydrometer in pure water, and marking the stem at the level of the surface. This formed the zero of the scale. Fifteen standard solutions of pure common salt in water were then prepared, contain- ing respectively 1, 2, 8, ... 15 per cent. (by weight) of dry salt, ‘Che hydrometer was plunged in these solutions in order, and the stem having been marked at the several surfaces, the degrees so obtained were numbered 1, 2, 8,....15. These degrees were, when necessary, repeated along the stem by the employment of a pair of compasses till 80 degrees were marked off. The instru- ment thus adapted to the determination of densities exceeding that of water was called the hydrometer for salts.

The hydrometer intended for densities less than that of water, or the hydrometer for spirits, is constructed on a similar principle. The instrument is so arranged that it floats in pure water with most of the stem above the surface. A solution containing 10 per cent. of pure salt is used to indicate the zero of the scale, and the point at which the instrument floats when immersed in distilled water at 10° R, (544° F.) is numbered 10. Equal divisions are then

| marked off upwards along the stem as far as the 50th degree.

The densities corresponding to the several degrees of Beaumé's hydrometer are given by Nicholson (Journal of Philosophy, vol. i. p. 89) as follows :—

Beaumés Hydrometer for Spirits. Temperature 10° &.

*Degrees, | Density. | Degrees. | Density. | Negrees, | Density. 10 1:000 21 922 bl 86] 11 "990 22 '915 82 *856 12 '985 || 28 909 338 852 13 977 24 '903 34 "847*

14 970 25 897 35 842 15 963 26 "892 36 837 16 955 27 "886 37 832 17 949 28 880 88 "827

18 943 29 | 874 39 822

19 935 30 867 40 817 20 928

Degrees. | Density. Degrees. | Density. || Degrees. Density. 0 1:000 27 1:230 51 1°547 3 1°020 30 1°261 54 1°594 6 1:040 33 1°295 57 1°659 9 1:064 36 1°3383 60 lors 12 1:089 39 1:373 63 LiF 15 1114 42 1:414 66 1°848 18 1:140 45 1°455 69 1°920 21 Lele 48 1:500 12 2°000

1-200

HYDROMETER

having been employed by the latter to construct his instruments for the French revenue. The point at which the instrument floated in distilled water was marked 10° by Cartier, and 30° on Cartier's scale corresponded to 32° on Beaumé's.

Though constructed npon a very different principle from ordinary hydrometers, we may briefly refer here to Brewster's capillary hy- drometer or staktometer, which is based upon the difference in the surface tension and density of pure water, and of mixtures of alcohol and water in varying proportions. Ifa small piece of paper be bent into such a shape as this, /_, it may be made to rest upon the surface of water without being immersed. If now a drop of alcohol be placed on one corner of the paper, it will rush violently away and generally spin round, somewhat resembling the action of pieces of camphor, indicating that the surface tension of the water is dimin- ished by the presence of alcohol. Ifthe water be very pure it is suffi- cient to bring a drop of alcohol on the extremity of a pipette near to the paper, without touching either it or the water, and the vapour absorbed will produce the same effect. For other proofs of the same action see the article CAPILLARY ACTION. Now, if a drop of water be allowed to form at the extremity of a fine tube, it will go on increas- ing until its weight overcomes the surfaee tension by which it clings to the tube, and then it will fall. Hence any impurity which diminishes the surface tension of the water will diminish the size of the drop (unless the density is proportionately diminished). Now, according to Quincke, the surface tension of pure water in con- tact with air at 20° C. is 81 dynes per linear centimetre, while that of aleohol is only 25°5 dynes. Also, a small _o¢ percentage of alcohol produces much more than a pro- portional decrease in the surface tension when added ¥ to pure water. The capillary hydrometer consists simply of a small pipette with a bulb in the middle of the stem, the pipette terminating in a very fine capillary point. The instrument being filled with distilled water, the number of drops required to empty the bulb and portions of the stem between two marks m and n (fig. 5) on the latter is carefully counted, and the experiments repeated at different temperatures. The pipctte having been carefully dried, the process is repeated with pure alcohol or with proof spirits, and the strength of any admixture of water and spirits is determined from the corresponding number of drops, but the formula gene- rally given is not based upon sound data. Sir David Brewster found with one of these instruments that the number of drops of pure water was 784, while of proof spirit, sp. gr. 920, the number of drops required was 2117.

Perhaps the main object for which hydrometers have been con- structed is the determination of the value of spirituous liquors, chiefly for revenue

purposes, To this end an immense variety of hydrometers have been con- structed, differing mainly in the eharacter of their scales.

In Speer's hydrometer the stem has the form of an octagonal prism, and upon each of the eight faces-a scale is engraved, indicating the percentage strength of the spirit corresponding to the several divisions of the scale, the eight scales being adapted respectively to the temperatures 35°, 40°, 45°, 50°, 55°, 60°, 65°, and 70° F. Four small pins, which can be inserted into the counterpoise of the instrument, serve to adapt the instrument to the temperatures intermediate between those for which the scales are constructed. William Speer was supervisor and chief assayer of spirits in the port of Dublin. For a more complete ac- count of this instrument see Tilloch's Phil. Mag., vol. xiv. p. 151.

The hydrometer constructed by Mr Jones of Holborn, consists of a spheroidal bulb with a rect- angular stem (fig. 6). Between the bulb and counterpoise is placed a thermometer, which serves to indicate the temperature of the liquid, and the instrument is provided with three weights whieh can be attached to the top of the stem. On the four sides of the stem AD are engraved four scales corresponding respectively to the unloaded instru- ment, and to the instrument loaded with the re- spective weights. The instrument when unloaded pig 6 — Joneg's serves for the range from 74 to 47 above proof; when loaded with the first weight it indicates from .46 to 18 over proof, with the second weight from 13 over proof to 29 under proof, and with the third from 29 under proof to pure water, the graduation corresponding to which is marked W at the bottom of the fourth scale. One side of the stem AD is shown in fig. 6, the other three in fig. 7. The thermomcter is also provided with four scales corresponding to the scales above mentioned. Each scale has its zero in the middle corresponding to 60° F. If

Fia. 5.— Brewster's Stakto- meter.

Hydrometer.

the mercury in the thermometer stand above this zero the spirit must be reckoned weaker than the hydrometer indicates by the' number on the thermometer scale level with the top of the mercury, while if the thermometer indicate a tem- perature lower than the zero of the scale (60° F.) the spirit mmst be reckoned stronger by the scale reading. At the side of each of the four scales on the stem of the hydrometer is engraved a set of small numbers indicating the contraction in volume which would be experienced if the ' requisite amount of water (or spirit) were added to bring the sample tested to the proof strength.

The hydrometer constructed by Mr Dicas of Liverpool is provided with a sliding scale which can 2 adjusted for different temperatures, and which also indicates the contraction in volume incident on bringing the spirit to proof strength. It is provided with thirty-six different weights which, Fig. 7. with the ten divisions on the stem, form a scale from 0 to 370. The employment of so many weights renders the instrument ill-adapted for praetical work where speed is an object. It was adopted for the United States revenue by Act of Congress, August 10, 1790.

Quin's universal hydrometer is described in the Transactions of the Society of Arts, vol. viii. p: 98. It is provided with a sliding rule to adapt it to different temperatures, and has four scales, one of which is graduated for spirits and the other three serve to show the strengths of worts. The peculiarity of the instrument con- sists in the pyramidal form given to the stem, which renders the scale-divisions more nearly equal in length than they would be on a prismatic stem.

Atkins's hydrometer, as originally constructed, is described in Nicholson's Journal, 8vo, vol. ii. p. 276. It is made of brass, and is provided with a spheroidal bulb whose axis is 2 inches in length, the conjugate diameter being 14 inches. The whole length of the in- strument is 8 inches, the stem square of about 4 inch side, and the weight about 400 grains. It is provided with four weights, marked 1, 2, 3, 4, and weighing respectively 20, 40, 61, and 84 grains, which can be attached to the shank of the instrument at C (fig. 8), and retained there by the fixcd weight B. The scale engraved upon one face of the stem contains fifty-five divisions, the top and bottom being marked 0 or zero, and the alternate intermediate divisions (of which there

are twenty-six) being marked with the letters of the alphabet in order. The four weights are so adjusted that, if the instru- ment floats with the stem emerging as far as the lower division 0 with one of the weights attached, then replacing the weight by the next heavier causes the instrument to sink through the whole length of the scale to the upper division 0, and the first weight pro- duces the same effect when applied to the naked instruinent. The stem is thus virtu- ally extended to five times its length, and the number of divisions increased practically to 272. When no weight is attached the in- strument indicates densities from °806 to 843; with No. 1 it registers from ‘848 to ‘880, with No. 2 from ‘880 to ‘918, with No, 3 from ‘918 to ‘958, and with No. 4 from “958 to 1°000, the temperature being 55° F. It will thus be seen that the whole length of the stem corresponds to a difference ot density of about ‘04, and one division to about ‘00074, indieating a difference of little more than § per cent. in the strength of any ae sample of spirits. ? ae

The imerceent is provided with a sliding 1G. 8.—Atkins’s rule, with scales corresponding to the several Hydrometer. weights, which indicate the specific gravity corresponding to the several divisions of the hydrometer scale compared with water at 55° F. The slider upon the rule serves to adjust the scale for different temperatures, and then indicates the strength of the spirit in percentages over or under proof. The slider is also provided with scales, marked respectively Dicas and Clarke, which serve to show the readings which would have been obtained had the instru- ments of those makers been employed. The line on the scale marked “concentration” indicates the diminution in volume con- sequent upon reducing the sample to proof strength (if it is O. P.) or upon reducing proof spirit to the strength of the sample (if

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it is U. P.). By applying the several weights in succession in addition to No. 4, the instrument can be employed for liquids heavier than water; and graduations on the other three sides of the stem, together with an additional slide rule, adapt the instru- ment for the determination of the strength of worts.

Mr Atkins subsequently modified the instrument (Nicholson's Journal, 8vo, vol. iil. p. 50) by constructing the different weights of different shapes, viz., circular, square, triangular, and pentagonal, instead of numbering them 1, 2, 3 and 4 respectively, a figure of the weight being stamped on the sliding rule opposite to every letter in the series to which it belongs, thus diminishing the probability of mistakes. He also replaced the letters on the stem by the corre- sponding specific gravities referred to water as unity. Further information concerning these instruments and the state of hydro-metry in 1803 will be found in Mr Atkins's pamphlet On the Relation between the Speetfie Gravities and the Strength of Spiritwous Liquors, 1803 ; or Phil. Mag., vol. xvi. pp. 26-38, 205-212, 305- 312; vol. xvii. pp. 204-210 and 329-341.

In Gay Lussac's aleoholometer the scale is divided into 100 parts corresponding to the presence of 1, 2,.. . per cent. by volume of alcohol at 15° C., the highest division of the scale corresponding to the purest alcohol he could obtain (density °7947) and the lowest division corresponding to pure water. A table provides the necessary corrections for other temperatures.

Tralles's hydrometer differs from Gay Lussac's only in being graduated at 4° C. instead of 15° C., and taking alcohol of density "7939 at 155° C. for pure alcohol instead of '7947 as taken by Gay Lussac (Keene's Handbook of Hydrometry).

In Beck's hydrometer the zero of the scale corresponds to density 1000 and the division 30 to density '850, and equal divisions on the scale are continued as far as is required in both directions. The following table serves to indicate the relation between the degrees and the corresponding densities :—

Relation between Degrees of Beck's Hydrometer and Densities.

*a Density. ot Density. a Density. 2 9) o ' o o oY & | Greater | Less & | Greater | Less & | Greater | Less Q than than Q than than Q than than 1000. 1:000. 1:000. | 1°000. 1-000. – | 1-000. 1 | 1°006 | '994 || 25 | 1:172 | °872 || 48 1'393 | °780 9 | 1°012 | °988 || 26 | 1°181 | '867 || 49 1°405 | '776 3 | 1:018 | '988 |) 27 | 1°189 | '863 || 50 1417 | '773 4 | 1°024 | 977 || 28 | 1°197 | °859 || 51 1°429 | '769 5 | 1°030 | '971 |; 29 | 1°206 | '854 || 52 1441 | °766 6 | 1037 | '966 || 30 | 1°214 | °850 || 53 1°453 | °762 7 | 1043 | '960 || 81 | 1°223 | °846 54 | 1°466 | °759 8 | 1:649 | 955 || 82 | 1°282"| 842 5B | 1°478 | °756 9 | 1:056 | *950 |) 33 | 1°241 | °887 |) 56 1°491 | *752 10 | 1:063 | 944 || 34 | 1°250 | 883 | 57 1°504 | °749 | 11 | 1:069 | :939 || 35 | 1°259 | °829 | 58 | 1 518 | °746 19) Lore 934 36 | 1°268 "825 59 | 1°5382 742 13 | 1:0838 929 ar ||) L278 821 60 | 1°546 '739 14 | 1090 | 924 || 88 | 1°288 | *817 | 61 | 1 560 | °736 15 | 1°097 | 919 || 89 | 1:298 | '813 || 62 1°574 | °733 16 | 1:104 | '914 |} 40 | 1:308 j *810 || 63 1°589 | °730 17 | 1111 } 909 || 41 | 1°818 | 806 || 64 1°604 | '727 18 | 1118 904 42 | 1°328 *802 65 | 1°619 723 19 | 1:126 | °899 || 43 | 1°339 | -798 || 66 | 1 635 | °720 20 | 1°183 | °895 || 44 | 1°3849 | *794 67 | 1651 | "717 91 | 17141 | °890 || 45 | 1°860 | '791 || 68 | 1 667 | '714 99 | 1:149 | 885 || 46 | 1°371 | °787 || 69 | 1 683 | *711 93 | 1°157 | *881 || 47 | 1°882 | °783 || 70 1°700 | '708 24 | 1°164 876*

In the centesimal hydrometer of M. Francceur the volume of the stem between successive divisions of the seale is always ttoth of the whole volume immersed when the instrument floats in water at 4° C. In order to graduate the stem the instrument is first weighed, then immersed in distilled water at 4° C., and the line of flotation marked zero. The first degree is then found by placing on the top of the stem a weight equal to z}th of the weight of the instrument, which increases the volume immersed by z}ath of the original volume. The addition to the top of the stem of successive weights, each ,4,th of the weight of the instrument itself, serves to determine the successive degrees. The length of 100 divisions of the scale, or the length of the uniform stem the volume of which would be equal to that of the hydrometer up to the zero graduation, Fran- ceeur called the ' modulus" of the hydrometer. He constructed his instruments of glass, using different

instruments for different portions of the scale (Franceeur, Traité d'areometrie, Paris, 1842).

Dr Boriés of Montpellier constructed an hydrometer whieh was based upon the results of his experiments on mixtures of aleohol and water. The interval between the points corresponding to pure aleohol and to pure water Boriés divided into 100 equal parts, though the stem was prolonged so as to contain only 10 of these

divisions, the other 90 being provided for by the addition of 9 weights to the bottom of the instrument as in Clarke's hydrometer.

Sikes's hydrometer, on account of its similarity to that of Boriés, It is made

appears to have been borrowed from that instrument. of brass, and consists of a spherical ball A (fig. 9), 1°5 inches in diameter, below which is a weight B connected with the ball by a short conical stem C. The stem D is rectangular in section, and about 3} inches in length. This is divided into ten equal parts, each of which is subdivided into five. As in Boriés's instrument, a series of 9 weights, each of the form shown at E, serves to extend the scale to 100 principal divisions. In the centre of each weight is a hole capable of admitting the lowest and thickest end of the conical stem C, and a slot is cut into it just wide enough to allow the upper part of the cone to pass. Each weight can thus be dropped on to the lower stem so as to rest on the counter- poise B. The weights are marked 10, 20,. . . . 90; and in using the instrument that weight must be selected which will allow it to float in the liquid with a portion only of the stem submerged. Then the reading of the scale at the line of flotation, added to the number on the weight, gives the reading required. A small supernumerary weight F is added, which can be placed upon the top of the stem. F isso adjusted that when the 60 weight is placed on the lower stem the instrument sinks to Sikes' the same point in distilled water when F is attached F124. 9.—Sikes as in proof spirit when F is removed. Hydrometer.

The following table gives the specific gravities corresponding to the principal graduations on Sikes's hydrometer at 60° F. and at 62° F.,

together with the corresponding strengths of spirits. The latter are based upon the tables of Gilpin, for which the reader is referred to the Phil. Trans. for 1794.

Table showing the Densities corresponding to the Indications of

*Stkes's Hydrometer. g 60° F. 62° F, " 60° F, 62° F. i=} — i=} no 2S ae Spin siint | 23 Spit 48 piri pirit || 4.9 pirit eal E Density. per Density. per || 23 Density. per Density. eent eent. Ll eent. 0 | 815297 | 167-0 | 815400 166°5 51 |-905024 | 111°4 | 905138 1 | 816956 | 166-1 | 817059 | 165°6 52 | °906869 | 110-0 | 906983 2 | 818621 | 165°3 | 818725 | 164°8 53 | °908722 | 108°6 | :908837 3 | 820294 | 164°5 | 820397 | 1639 54 | °910582 | 107-1 | *910697 4 | 821973 | 163-6 | 822077 , 163°1 55 | 912450 | 105°6 | *912565 5 | -823659 | 162°7 | '823763 | 162°3 5G | °914326 | 104°2 | 914441 6 | 825352 | 161-8 | 825457 | 161-4 57 | °916209 | 102-7 | 916323 7 | 827052 | 160-9 | '827157 | 160°5 58 | 918100 | 101°3 | 918216 8 | -828759 | 160°0 | 828864 159-6 59 |°919999 | 99°7 | :920115 9 | -830478 | 159-1 } 880578 | 158°7 60 |:921906 | 98-1 | 922022 10 | °832195 | 158°2 | 832300 | 157°8 60x | 921884 | 98°1 | *922000 11 | :833888 | 157'3 | 833993 | 156°8 61 | °928760 | 96°6 | '923877 12 | °835587 "4 | °835692 | 155°9 62 | '925643 | 95:0 | 925760 13 | °837294 837400 | 155°0 63 |°9275384 | 98°83 | °927652 14 | °839008 839114 | 154:0 64 |°929433 | 91:7 | 929550 15 | 840729 840835 | 153-1 65 | °931339 | 90:0 | '931457 16 | *842458 *842564 | 152-1 66 | 933254 | 88:3 | 933372 17. '| 844193 844299 | 15171 67 | 9385176 | 86:5 | "9385294 18 | 845936 846042 | 150°1 68 |°9387107 | 84:7 | 987225 19 | 847685 *847792 | 149-1 69 | 939045 | 82-9 | 939163 20 | 849442 *849549 | 148-1 70 |+940991 | 81:1 | 941110 20 | '849393 849500 | 1481 70n | °940981 | 81:1 | 941100 21 | °851122 851229 | 147-1 71 | 942897 | 79°2 | 943016 22 | '852857 852964 | 14671 72 | 944819 | 77°83 | °944938 23 | °854599 *854707 | 145-1 78 |°946749 | 75°38 | 946869 94 | 856348 856456 | 144°0 74 | °948687 | 73°3 | 948807 25 | 858105 858213 | 142°9 75 | 950684 | 71:2 | -950753 26 | '859869 859978 | 141°8 76 | °952588 | 69:0 | 952708 27 «+| 861640 861749 | 1408 77 | 954550 | 66°8 | 954670 28 | 863419 863528 | 1397 78 |°956520} 644 | 956641 29 | 865204 *865313 | 138°5 79 |+958498 | 61:9 | 958619 30 | '866998 867107 | 137°4 80 | 960485 | 59°4 | 960606 80B | '866991 *867100 | 187°4 80B | 960479 } 59-4 | 960600 81 | 868755 "868865 | 136°2 81 | 962433 | 567 | 962555 82 |*

*870526 870636 | 185‘1 82 |°964395 | 53:9 | 964517 83 | 872305 “872415 | 153°9 83 | 966366 | 50°9 | 966488 34 874090 “874200 | 182°8 84 | 968344 | 47:8 | 968466 35 | °875883 *875994 | 131°6 85 | °970331 | 44°5 | 970453 36 | °877684 *877995 | 130°4 86 | 972325 | 41:0 | 972448 87 | 879492 879603 | 129-1 87 |°974328 |} 87-5 | 974451 88 | 881307 881419 | 127°9 8g |°976340 | 34-0 | 9764638 89 | °883129 *883241 | 126-7 g9 | -978359 | 30-6 | 978482 | 40 | 884960 *885072 | 125°4 90 | 980386 | 27+2 | 980510 40B | °884888 *885000 | 125-4 90B | 980376 | 27:2 | 980500 41 “886689 886801 | 124-2 91 | 982371 | 28-9 | “982496 42 888497 *888609 | 122°9 92 | °984374 | 20:8 | 984498 43 890312 890425 | 1216 93 | °986385 | 17:7 | 986510 44 | 892135 892248 | 1203 94 | 988404 | 14:8 | :988529 45 | 893965 *894078 | 119-0 95 | 990431 | 12:0 | 990557 46 | *895803 *895916 | 1176 96 | 992468 9-3 | 992593 47 “897647 897761 | 1163 97 | 994512 6°7 | 994637 48 899500 899614 | 1149 98 | 996565 4:1 | 996691 49 901360 901417 | 113°5 99 | °998626 1°8 | 998752 50 | 903229 903343 | 112-1 || 100 |1:000696 0°0 }1:000822 903186 908300 | 1127]*

Name of Bodies.

Metals,

Antimony, Cast …....+00» Zinc, cast

VOM GICHOL wis. s ever

Tin, cast

Tin, hardened

Iron, bar ….

Cobalt, cast

Steel, hard .

Steel, soft

Iron, font haminered Nickel, cast..

Brass, cast

Brass, wire

Nickel, hammered

CGUTRUIUOHANE. sc isvajcecsscs ccvssesveaces Copper, cast

Copper, wire

Copper, coin

Bismuth, cast

Silver, hammered

Silver, coin. ileduseoumnaes Sllver, pure, “cast « 5000 Rhodlum

Lead, cast ….

Palladium

Mercury eee) common Mercury, pure …. Gold, trinket .. waierieeese ee Gold, coin .

Gold, pure, cast ..

Gold, hammered .

Platinum, PU 2… Platinum, hammered .

MALT WAT) cevsoveses ses Platinum, laminated

Porcelain, Limoyes Porcolain, Nr Stone, paving.. ‘Stone, common .

Pebble, English… sncncaoseend Granite, Aberdeen .. ocotenaceneaengnd SESE: sqoseanoanobenconogad lass, green:. Crystal, rock . ae Granite, red Egyptian . Ba Granite, Cornish . Reesaciane Marble, Egyptian «

ppcondandboosaao0 STAGE... cceccccncersescsccsverseerscsacees Coral…..... ‘Pearl, Oriental .. Glass, bottle .

Marble, grecn Campanian z tek

Emerald of Peru .

Chalk, British…..0..,

MamDle (Pana, cescccccercsessocesens. Basalt, Giants’ Causeway . Glass, white …..... QUOT IUDDOIOIIO Limestone…..... ASDeStOS…..,.00008 Hornblendo..

White lead

Glass, British flint’.

Diamond, average….

Beryl, Oriental

Garnet, common…..... SOOCDCOOOTEEE Topaz, average

Sapphire, Oriental…

Garnet, preclous.

Ruby, Oriental…

Jargon of Ceylon

Loadstone The earth (mean of the globe)...

Resins, Gums, &c.

Gunpowder, loose ieee Living men.. Sept

Name of Bodles.

Gases, Hydrogen

Nitrogen

Qlcfiant gas. Atmospherle air…, Nitric oxide

HYDROMETER

Table of the Densities of Bodies (from Mr Tod's series of Tables).

Weight of a cubic foot in oz. and ib.

418°8750 449 °3750 450°4375 455°68765

'456°1875

466'9375

486°7500 488°1875

4885000 489-5625

497 '8125

517-4375

524°6875

534-0000

541°6250

549-0000

549°2500 554°8750

557-1875 613-8750

656°8750

658-3750

671°5000 687°5000 709°5000 737°5000

848-0000 87570000 981-8125

1102°9375

12086250 1210-0625

1218°7500

1271:0000

1315°0625 1379°3125

1437 5000

67°3750

78°7500

93°7500

1250000 127-0625

132°1250

1350000

142°5000 146°3125

147-2500

151°4000 157°5000 162°1250

16271250

163°6875 164°0625 165°0000

165-1250

165°8125 165°8750 166°3750 166°7500

167-0000

167°5000 167°7500 170°8125 171°3750 173°4875 174°0000 177°3125

179-0000

180°7500 184°3750 187°2500

187-5000

197°5000

208-0625 221-0000

221°8125 223°5000 237°5000 243°3750 264°3750 267°6875

276-0000 276‘8750

308°1250 325 °6250

52°2500 55°6875

Weight of ‘Number of a cubic inch in oz.

0Z,

3°8748 4°1608

4.1707

4°2193 4°2239 4°3234 4°5069 4°5202 4°5231 4°5329

46098

4°7910 4°8582

49444 50150 50833 50856

5°1377 5°1591 5°6840

60821 60960

6°2175 6°3657

6‘3694

6°8287 7°8518

81018 90908

10°2123 11°1446 11°2042

11:2847

11°7685 12°1765 12°7714 13°3101

0°62384 0°7 2337 0°86803

1:15740

1°17650 1°22337 1°25000 1°31944 1°35474 1°38020 1°39814 1°45833

150115

1°50115 1°51562 1°51909 1°52777 1°52893

1:53530

1°53587 1°53935 1°54976

1‘54629

1°55092 1°55324

1‘58159

1°58735

1‘60590

1°61111 1°64178 1°65740 1°67361 1°70717

173379 173611 182870 192650

2°04629 2°05881 2°06944 2°19907 2°25347 2°44791 2°47858 2°55555

256365 2‘85300

3°01504

048379

0°51562

Welght of a cubic foot In oz. and tb.

0043125 0868750 0607500 0613750 0625000 0651250 0694375

Weight of Number of) Number of cubic ft,

a cubic In.) cubic in.

In oz.

0Z.

0000399 0003414 0005625 0005682 0005787 0006030 0006429

In a Ib.

cubic in, 400695°6 46861°0 28444°4 28154°7 27648°0 26533°5 24885°6

cubic in. in a Ib.

cub. in. 3°8866 3°8431 3°8364 3°7920 3°7878 3°7007 3°5500 3°5896 3°5378 3°5296 8°4792 3°3395 3°2933 3°2359 3°1903 3°1476

31461

3°1140 3°0959 2°8149 2°6306 2°6246 2°57338 2°5134 2°4355 2°5134 2°0877

1:9748

1°7600 1°6124

1:4356

1°4280 1°4178 1°3595 1°3140 1°2528

1:2021

25°6474 21°9428 18°4320 13°8240 13°5996 13°0785 12°8000 12°1263 11°8103 11°7351 11°4437 10°9714 10°6584 10°6584 10°5566 10°5325 10°4727 10°4648 10°4214 10°4175 10°3861 10°3628 10°3473 10°3164 10°3010

101163

10°0831 9°3632 9°9310 9°7455 9°6536 9°5601 9°3721 9°2283 9°2160 8°7493

83052 78190 77903

7°7315 7°2800

71001

6°5361 6°4590 6°2608 6°2410 5°6081 5°3067

33°0717 31°0303

in a fb.

cubic ft.

231-8840

27°1186 16°4609 16°2932 16°0000 15°3550 14°4014

Name of Bodics.

— Gums, &c. Wax.. Icey, Gunpowder, close shaken… Tallow.. arenevees Butter Beeswax . Sodium…. CampliOr ss saness ses Rosin ….. EAGCH vers OPIN cssepeec ses Gum Arabic …..,.. HOWOY ccsssesscs sexes Bone, of an ox.. Bone, dry…. Phosphorus…. Alum.. 0 Gunpowder, solid . Nitre eRe ene)»: Ivory… :

Woods.

COU Ke recseeess ccs. Poplar Larch . Fir, North ‘of England .. Mahogany, Honduras.. Cedar, Amcrican

Cedar .

Cypress

Bilimpersce.

Pitch pine ….. Pear-tree Walnut…..

Fir, Mar Forest .. 000 Elder-tree ….. Orange-tree…....

Bir, Rigas.

MGQDICL cccssessscecnssasrecosseanees Oak, Dantzic…....

Yew, ae

Apple-tree …..

Yew, Spanish ..

ASTIN essesses

Beech …..

Oak, Cana

Logwood

Oak, English ..

Box, Frencl ….c.s+00

Brazil wood, red

Mahogany, Spanisl1…….....00. Oak, English, 60 years old….. Ebony, i aaa pandnnoon – Lignuni-vit@ .....

Liquids, Ether, sulphuric…….....+. Alcohol, absolute .. Brandy… are Bitumen, liquid . Turpentine, oil of . Ether, muriatic… Olivetoilisn… Moselle Wine …....cc0000 ons Whale Oil …....000 Proof ay. 000 Linseed oil . Castor Oil …....000 Wine, red port .. Wine of Burgundy… Wine of Bordcaux Wine, white Champagne W ater, distilled 1 cea ecogooaceaeodno Vinegar. Sea-water Milk … Ale (average) Blood, human

Aqua regia

Watcr of Dead Sea

Nitrous acid . on Nitric acid, or aquafortis Boracic acid

Sulphuric acid

Quicksilver.

Name of Bodies

Gases. Muriatic acid Carbonic acid…

Sulphurous acid.. Chlorine Fluosilicic acid…

Mydriodic acid…

Weight of a cubic foot in oz, and tb.

Weight of a cubic foot in oz. and fb.

Th.

0800000 0952500 1128125

°1388750

1527500

°2256875 °2687500

tb.

56°0625 58°1250

585625

58°8750 58°8750 59°7500 60°7500 61°8125

687000 718750 835625

90°7500

91:0000

103°6875 103°7500

1071250

107°1250

109-0625

118°7500 119°8125

15°0000 23°9875 34°0000 34°7500

35-0000 350625

36°1875 36°5625 37°2500 37°3750 37°5000 41°2500 41°3125 42°5625 43°3750 43°4375 44°0625 44°6875 46°5625 46°8750 47°1857

47-5000

49°2500 49 °5625 50°4375 52°8125 53°2500 54°5000

570625

60°6250 64°3750 64°3125 66°4250 78°1250 83°1875 83°3125

45-0000

49°7500 52°3125

53‘0000

54°3750 54°6250 57°1875 57°2500 57°6875 58°1250 58°7500 60°6250 61°8750 61°93875 62°1250 62°3125 62°5000 63°4375 64°1250 64°2500 64°3750 64°6875 65°3125 76°1250 77°1250

775000

90°7500 93°7500 114°3750

128-0000

o4]

Weight of |Number of

a cubic

incl in oz.

cubic in, in a tb.

OZ.

0°51909 0°53819 0°54224 0°54513 0°54513 0°55324 0°56250 0°56655 0°63657 0°66550 0°77372 0°84027

084259 0‘96006

0°96064

0-99184 0:99184 1-00983 109953 110987

0°13888 0°22164 0°31481 0°32175 0°32407 0°32465 0°33506 0°35854 0°34490 0°34664 0°34722 0°38194

038252

0°39467 0°40162 0°40219

0:40798

0°41377 0°43113 0°48402 0°43692 0°48981 0°45590 0°45891 0°46701 0°48900 0°49305

050694. 053125 056134

0°59606 0°59664 0°61516 0°67708 0°77025 0°77141

0-41666 046064

0°48437

049074

0°50347 0°50578 0°52951

0538009 053414

0°53819 0°54398

0‘56184

0°57291 0°57349 0°57523 0°57696

057870

0°58738 0°59375 0°59490 0°59606 0°59895 0°60474 0°70486 0°71412

0:71759 084024

0°86805

1:05902 1:06944

cub. in,

30°8227 29°7293 29°5069 29°3503

292993

28°9205

284444 279555

25°0909

240417

20°6791

19:0413 18-9890

16°6654 16°6554 16°1307

16-1307

15°8441 14°5515 14°4422

1152000

71°7660 50°8235 49°7266

49-3714 49-2833

47°7512 47°2615 46°3892 46°2341

46-0800

41°8909 41°8275 40°5991 39°8386 39°7812 39°2170 38°6685 37°1114 36°8640 36°6198 36°3789

35:0862 34-8656 34-2602

32°7195 32°4507 31°7064

30-2825 28-5030

26°8427

26-8680

26°0143 23°6307 20°7723

20-7411

38°4000 34°7487 33°0322 32°6037 31°9682 31°6338 80°2163 30°1834 29°9544 29°7290 29°4127 28°5030 27°9272

27 8990

27°8148

27-7311 276480 272396 269473

26°8949 26°8427 26°7130 26°4574 22°6995 22°4051 22°2580

19-0082 184000

15°1081

13-5000

Weight of |Number of/ Number of|

a cubic in.

in 02.

OZ.

0007407 0008819 0010445 0012858 0014143 0020896 0024884

cubic in, In a Tb.

cubic in. 21600°0 18141°7 15317°4 12442°8 11312°6 7656°6 6429°7

cubic ft. in a tb, cubic ft.

12:5000

10°4986

8‘8642

7°2007

65466 4:4309

3°7209

542

In the above table for Sikes’s hydrometer two densities are given corresponding to each of the degrees 20, 30, 40, 50, 60, 70, 80, and

90, indicating that the suecessive weights belonging to the particular

instrument for which the table has been ealeulated do not quite agree. The diserepancy, however, does not produce any sensible error in the strength of

the corresponding spirit.

‘A table which indicates the weight per gallon of spirituous liquors for every degree of Sikes’s hydrometer is printed in 28 and 24 Viet. c. 114, schedule B. ‘This table differs slightly from that given above, which has been abridged from the table given in Keene’s Handbook of Hydrometry, apparently from the equal divisions on Sikes’s scale having been taken as corresponding to equal increments of density.

Sikes’s hydrometer was established for the purpose of collecting the revenue of the United Kingdom by Act of Parliament, 56 Geo. III. e. 140, by which it was enacted that ‘tall spirits shall be deemed and taken to be of the degree of strength which the said hydrometers called Sikes’s hydrometers shall, upon trial by any officer or officers of the customs or excise, denote such spirits to be.” This Act came into force on January 5, 1817,and was to have remained in force until August 1, 1818, but was repealed by 58 Geo. III. e. 28, which established Sikes’s hydrometer on a permanent footing. By 8 and 4 Will. IV. e. 52, § 123, it was further enaeted that the same instruments and methods should be employed in determining the duty upon imported spirits as should in virtue of any Aet of Parliament be employed in the determination of the duty upon spirits distilled at home. It is the practice of the officers of the inland revenue to adjust Sikes’s hydrometer at 62° F., that being the temperature at which the imperial gallon is defined as containing 10 tb avoirdupois of distilled water. The specifie gravity of any sample of spirits thus determined, when multiplied by ten, gives the weight in pounds per imperial gallon, and the weight of any bulk of spirits divided by this number gives its volume at once in imperial

allons.

e Mr J. B. Keene of the Hydrometer Office, London, has constructed an instrument after the model of Sikes’s, but provided with twelve weights of different masses but equal volumes, and the instrument is never used without having one of these attached. When loaded with either of the lightest two weights the instrument is specifically lighter than Sikes’s hydrometer when unloaded, and it may thus be used for specific gravities as low as that of absolute alcohol. The volume of each weight being the same,

the whole volume immersed is always the same when it floats at the same mark whatever weight may be attached.

Besides the above, many hydrometers have been employed for special purposes. Twaddell's hydrometer is adapted for densities greater than that of water. The scale is so arranged that the read- ing multiplied by 5 and added to 1000 gives the specific gravity with reference to water as 1000. To avoid an inconveniently long stem, different instruments are employed for different parts of the seale as mentioned above.

The lactometer constructed by Dicas of Liverpool is adapted for the determination of the quality of milk. It resembles Sikes's hydrometer in other respects, but is provided with eight weights. It is also provided with a thermometer and slide rule, to reduce the readings to the standard temperature of 55° F.

'The mariue hydrometers, as supplied by the British Covernment to the royal navy and the merchant marine, are glass instruments with slender stems, and generally serve to indicate specific gravities from 1°000 to 1°040. Before being issued they are compared with a standard instrument, and their errors determined. They are employed for taking observations of the density of sea-water.

The salinometer is a hydrometer intended to indi- cate the strength of the brine in marine boilers in which sea-water is employed. Saunders's salinometer eonsists of an hydrometer which floats in a chamber through which the water from the boiler is allowed to flow in a gentle stream, at a temperature of 200° F. The peculiarity of the instrument eonsists in the stream of water, as it enters the hydrometer chamber, being made to impinge against a disk of metal, by which it is broken into drops, thus liberating the steam, which would otherwise disturb the instrument.

Say's stereometer is an instrument for the deter- é mination of the volumes, and henee of the densities, iG. 10 of bodies which cannot be conveniently measured by g as the ordinary hydrometer, as, for example, soluble sin t and porous bodies, powders, &e. The instruinent alicia consists of a glass tube PC (fig. 10), of uniform bore, terminating in a cup PE, the mouth of which can be rendered air-tight by the plate of glass E. The substanee

whose volume is to be determined is placed in the eup PE, and the tube PC is immersed in the vessel of mereury D, until the mereury reaches the mark P. The plate E is then placed on the cup, and the tube PC raised until

when only air is in the cup. becomes

whence .

. . «2 TV mass its density 1s—. v

Ey =i a)

the surface of the mercury in the tube stands at M, that in the vessel D being at C, and the height MC is measured. Let & denote this height, and let PM be denoted by b the volume of air in the cup before the body was inserted, v the volume of the body, a the area of the horizontal section of the | tube PC, and h the height of the mercurial barometer. Then, by Boyle's law,

Let 2 represent

(u-v+al)(h—-k)=(w-v)h, see v ae

The volume w may be determined by repeating the. experiment In this case v=0, and the equation

(u+al')(h—k') = uh, py Pica w=all zr «

Substituting this value in the expression for v, the volume of the

body inserted in the cup becomes known, and if m represents its

(W. G.)

HYDROPATHY is the treatment of disease by water, used outwardly and inwardly. Like many descriptive names, the word "hydropathy" is defective and even misleading, the active agents in the treatment being heat and cold, of which water is little more than the veliicle, and not the only one. Thermo-therapeutics (or thermi- therapy) is a term less open to objection. The name "hydropathy," however, as being itself an advance on an earlier and less

happy designation, “the water cure,” as having obtained general currency, is here employed.

Hydropathy, as a system, or mode of treatment complete in itself, dates from about 1829, when Vincenz Priessnitz (1801-51), a farmer of Grifenberg in Silesia, Austria, be- gan his public career in the paternal homestead, extended so as to accommodate the increasing numbers attracted by the fame of his cures. Two English works, however, on the medical uses of water had been translated into German in the century preceding the rise of the move- ment under Priessnitz. One of these was by Sir John Floyer, a physician of Lichfield, who, struck by the reme- dial use of certain springs by the neighbouring peasantry, investigated the history of cold bathing, and published in 1702 his “Wuxporovela, or the History of Cold Bathing, both Ancient and Modern.” The book ran through six editions within a few years, and the translation was largely drawn upon by Dr J. S. Hahn of Silesia, in a work pub- lished in 1738, On the Healing Virtues of Cold Water, Inwardly and Outwardly applied, as proved by Hxperience, The other work was that of Dr Currie of Liverpool, entitled Medical Reports on the Effects of Water, Cold and Warm, as a Remedy in Fevers and other Diseases, published in 1797, and soon after translated into German by Michaelis (1801) and Hegewisch (1807). It was highly popular, and first placed the subject on a scientific basis. Hahu’s writings had meanwhile created much enthusiasm among his countrymen, societies having been everywhere formed to promote the medicinal and dietetic use of water ; and in 1804 Professor Oertel of Ansbach republished them and quickened the popular movement by unqualified commen- dation of water drinking as a remedy for all diseases. In him the rising Priessnitz found a zealous advocate, and doubtless an instructor also. The origin of hydropathy is thus to be traced to an English source and to the medical profession. The broad conception that water had curative relations to the whole realm of disease seems to have been first grasped by a Capuchin monk of Sicily, Father Bernardo, who, at Malta, in 1724, obtained results by iced water alone, which, according to Hahn, caused a great stir through- out Europe ; but, owing to the excesses of his imitators, it was of no long duration. With this exception there is, as regards the remedial use of water, nothing in the history

of medicine that approaches in completeness the system of Priessnitz, though much leading up to it can be dis- covered, Among most primitive peoples, indeed, both in the Old and in the New World, the existence of one kind or another of hydropathic practice can be traced; and the fathers of medicine made frequent reference in their writings to the employment of water. The warm bath came into use at an early period (see Barus, vol. iii. p. 434) ; and the clyster, shower bath, douche, plunge, wet compress, drop bath, head and foot baths, are mentioned from time to time, as also combinations of heat and cold and primitive modes of sweating, until, before the end of the 17th century, all the processes of modern hydropathy, the wet sheet pack and induced cutaneous crisis alone excepted, had become known and were in a measure prac- tised. Prominent in the roll of names associated more or less with the advocacy of waterin earlier times are those of Asclepiades of Prusa (90 B.c.), surnamed Wvypodovrys ("cold bather"), Antoninus Musa (30 3.c.), famed for his cure of Augustus by cold water (comp. Hor., Hpist. i. 15, 3-5), Galen (180 .p.), Rhazes (923), Avicenna (1036), Cardan, and Van der Heyden. Raymond of Marseilles (1755) gained a prize for the best treatise on the applica- tions of cold water in disease, and another prize essay by Marteau shows what knowledge of the subject prevailed in his time.

At Griifenberg, to which the fame of Priessnitz drew people of every rank and many countries, medical men were conspicuous by their numbers, some being attracted by curiosity, others by the desire of knowledge, but the majo- rity by the hope of cure for ailments which had as yet proved incurable, Many records of experiences at Griifen- berg were published, all more or less favourable to the claims of Priessnitz, and some enthusiastic in their esti- mate of his genius and penetration; and from these alone can a knowledge of his practice and views be obtained, not a line having ever been written by this singular man. To Captain Claridge was due the introduction in 1840 of hydropathy to England, his writings and lectures, and later those of Drs Wilson, Gully, and Edward Johnson, making numerous couverts, and filling the establishments opened soon after at Malvern and elsewhere. In Germany, France, and America hydropathic establishnients multiplied with great rapidity. Antagonism ran high between

the old prac- tice and the new. Unsparing condemnation was heaped by each on the other; and a legal prosecution, leading to a royal commission of inquiry, served but to make Priessnitz and his system stand higher in public estimation.

But increasing popularity diminished before long that timidity which hitherto had in great measure prevented trial of the new method from being made on the weaker and more serious class of cases, and had caused hydro-pathists to occupy themselves mainly with a sturdy order of chronic invalids well able to bear a rigorous regimen and the severities of unrestricted crisis. The need of a radical adaptation to the former class was first adequately recognized by John Smedley, a manufacturer of Derbyshire, who, impressed in his own person with the severities as well as the benefits of "the cold water cure," practised among his workpeople a milder form of hydropathy, and began about 1852 a new era in its history, founding at Matlock a counterpart of the establishmentiat Griifenberg.

Whilst hydropathy as a system has been gaining favour with the people, and receiving ample acknowledgment from the more liberal members of the medical profession, indi- vidual measures have from time to time been advocated in the medical journals and adopted more or less widely in particular diseases. Brand of Berlin, Raljen and Jiirgensen of Kiel, and Liebermeister of Basel, between 1860 and 1870, employed the cooling bath in abdominal typhus with results

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whichi, after every deduction on the score of defective classi- fication had been made, were striking enough, and led to its introduction to England by Dr Wilson Fox, whose able monograph eommanded general acceptance. In the Franco- German war the cooling bath was largely employed, in conjunction frequently with quinine; and it now holds a recognized position iu the treatment of hyperpyrexia. The wet sheet pack has of late been much used in fevers of all kinds both in private and hospital practice ; and the Turkish bath, introduced about twenty-four years ago by Mr David Urquhart on his return from the East, and ardently adopted by Mr Barter of Cork, has become a public institution, and, with the "morning tub" and the

general practice of water drinking, is the most noteworthy of the many contributions by liydropathy to public health.

The theoretical basis of hydropathy is wide and funda- mental enough to include within its scope all disease. Each individual cell of the mass constituting in various forms and combinations the human body being in its growth and function dependent on and regulated by the nervous and vascular systems, themselves cellular, and every de rangement of these cells originating in or being attended with a derangement of their nervous and vascular supply, and that supply being powerfully and in quite diverse ways influenced by heat and cold,—all morbid conditions of the economy may be influenced materially by the regulated employment of heat and cold, which are entitled therefore to rank as powerful factors in therapeutics.

Hydropathy insists in quite a special way on the necessity of regarding disease first in relation to its cause. It next requires that whatever assistance may be afforded to the vis medicatriz nature should in the first place be similar in kind (¢.e., should be natural or physiological), rather than alien to it and drawn from sources remote and strange ; and, while proceeding on lines which have been common to all medical practice from an early period, it does so by agents hitherto strangely neglected, though not unknown, and effects its purpose in ways less open to objection than those it would displace. For example, when local deple- tion is required, as of the lung in pneumonia, or the brain in hemorrhagic apoplexy, the final withdrawal from the general circulation of a quantity of blood is deprecated as unnecessary for the attainment of the object in view, and prejudicial in the after period of convalescence. Hydro- pathy substitutes a diversion to parts indifferent, as the extremities and general cutaneous surface, and so material and sustained as tobe much more effectual ; while at the same time it holds in reserve the abstracted blood to perform its part in the restoration of strength. Where purgation is employed to derive blood from the brain, liver, or kidneys, a highly sensitive and vital membrane is more or less injured thereby, and convalescence proportionately imper- illed. Hydropathy selects the skin as more accessible than the mucous membrane of the alimentary tract, more service- able also, and less, if at all, susceptible of injury, either temporary or permanent. The skin can with safety be used for counter-irritation, and isa reservoir of capacity almost

unlimited, into which to divert the excess of blood from the brain or other part, while for purposes of excretion it is not inferior to the bowels themselves, and, unlike the latter, is left even more efficient than before. In the febrile state, a reduction of pulse and temperature, and relief from pain and sleeplessness, were commonly attempted, at the period when hydropathy was introduced, by depressants, as antimony, ipecacuanha, and perhaps large doses of alcohol, in combination with sedatives, as opium and chloral. Im- paired digestion and depressed vitality were results in some measure inevitable, and always of moment, especially in the

more protracted fevers, where recovery becomes a question

often of simple physical endurance. By means of the wet

sheet pack, cooling compresses, spongings, and allied mea- sures, these ends are attained with comparative ease, cer- tainty, and simplicity, and with entire freedom from objectionable secondary effects.

The agents of hydropathy are at once simple and complex,—simple in their elements, and complex in their combinations and modifications. They afford the physician a series of effects almost infinite in variety, both in kind and in degree, both immediate and remote. – According as heat and cold! are used in their extreme or their intermediate degrees, singly or in combination, successively or alter- nately, momentarily or continuously, dry or moist, and according as the primary action is utilized or the secondary, do their effects differ. 'The direct or primary effect of cold is to depress, cool, and deplete the part concerned. If its exhibition is brief, reaction (an important factor in hydro- pathic practice) quickly establishes an opposite condition, stimulating the part, and determining an increased flow of blood to it, with increase of its temperature and vital activity. If it is continuous, the primary depression is maintained, and the revulsive or secondary effect delayed or averted. The direct effect of heat is to increase the amount of blood present; but if the exhibition is brief, and evaporation is permitted, the contrary effect is pro- duced, viz., depression, coolness, and depletion ; if it is continuous, the primary effect is preserved. Thus with truth it may be said that cold heats and heat cools, while the converse holds good, and that by

simple variations of detail. From the intermediate temperatures (80° to 100°) simple sedative effects are obtained, with absence of second- ary or revulsive effects in proportion as the temperature of the part is approximated to. Results vary also accord- ing to the heat of the subject. In local inflammations, continuous cold benumbs and contracts, continuous heat soothes and relaxes. Momentary cold excites, heats by reaction, and intensifies inflammation ; while momentary heat soothes and ultimately cools the inflamed part by the after evaporation. In the earlier stages and acute varieties of inflammation, therefore, continuous cold or transient hot applications are appropriate, and brief applications of cold in the later, congestive, and chronic forms. But where the local inflammation coexists with general feverishness, con- tinuous cold as the local application is preferable, helping, as it does, to reduce the general exaltation of temperature. In collapse the low general temperature makes heat the best local application. On internal parts the application of heat and cold externally has definite therapeutic effects either identical or opposite (as remarked by John Hunter) through reflex or sympathetic nervous action. Through the vascular system also remote effects are produced, as in heating the lower extremities to derive blood from the brain. The counter relation also of the entire cutaneous surface to the internal organs, as the kidneys and alimen- tary mucous membrane, is, in hydropathy, largely utilized for remedial purposes. 'This sympathy is familiar enough in the etiology of disease, which may be said likewise of all the physiological laws applied to curative purposes in hydropathy.

The appliances and arrangements by means of which heat and cold are brought to bear on the economy are—(a) Packings, hot and cold, general and local, sweating and cooling ; (2) hot air and steam baths ; (c) general baths, of hot water and cold ; (d) sitz, spinal, head, and foot baths ; (e) bandages (or compresses), wet and dry ; also (f) fomentations and poultices, hot and cold, sinapisms, stupes, rubbings, and water potations, hot and cold.

(a.) Packings. —The full pack consists of a wet sheet enveloping the body, with a number of dry blankets packed tightly over it, in-

cluding a macintosh covering or not. In an hour or less these are removed and a general bath administered. The pack is a derivative, ee a

2 Roughly, and for practical purposes, temperature lower than 60° may be called cold; from 60° to 90°, temperate or tepid; from 90° to 100°, warm; and above 100°, hot (compare vol. iii. p. 440).

sedative, sudorific, and stimulator of cutancous excretion. There are numerous modifications of it, notably the cooling pack, where the wrappings are loose and scanty, permitting evaporation, and the application of indefinite duration, the sheet being rewetted as it dries; this is of great value in protracted febrile conditions. There are also local packs, to trunk, limbs, or head separately, which are derivative, soothing, or stimulating, according to circumstance and detail.

(b.) Hot air baths, the chief of which is the Turkish (properly, the Roman) bath, consisting of two or more chambers ranging in temperature from 120° to 212° or higher, but mainly used at 150° for curative purposes. Exposure is from twenty minutes up to two hours according to the effect sought, and is followed by a general bath, and occasionally bysoaping andshampooing. Itisstimulating, derivative, depurative, sudorific, and alterative, powerfully promoting tissue change by increaso of the natural waste and repair. It determines the blood to the surface, reducing internal congestions, is a potent diaphoretic, and, through the extremes of heat and cold, is an effective nervous and vascular stimulant and tonic. Morbid growths and secretions, as also the uremic, gouty, and rheumatic diathesis, are beneficially influenced by it. The full pack and Turkish bath have between them usurped the place and bettered the function of the once familiar hot bath. The Russian or steam bath and tho lamp bath are primitive and inferior varieties of the modern Turkish bath, the atmosphere of which cannot be too dry and pure.

(c.) General baths comprise the rain (or needle), spray (or rose), shower, shallow, plunge, douche, wave, and common morning sponge baths, with the dripping sheet, and hot and cold spongings, and are combinations, as.a

rule, of hot and cold water. They are stimulating, tonic, derivative, and detergent.

(d.) Local baths comprise the sitz (or sitting), douche (or spout- ing), spinal, foot, and head baths, of hot or cold water, singly or in combination, successive or alternate. The sitz, head, and foot baths are used 'flowing " on occasion. Rapid alternations of hot and cold water have a powerful effect in vascular stasis and lethargy of the nervous system and absorbents, yielding valuable results in local congestions and chronic inflammations.

(c.) Bandages (or compresses) are of two kinds,—cooling, of wet material left exposed for evaporation, used in local inflammations and fevers; and heating, of the same, covered with waterproof material, used in congestion, external or internal, for short or long periods. Poultices, warm, of bread, linseed, bran, &c., changed but twice in twenty-four hours, are identical in action with the heating bandage, and superior only in the greater warmth and consequent vital activity their closer application to the skin ensures.

(f.) Fomentations and poultices, hot or cold, sinapisins, stupes, rubefacients, irritants, frictions, kneadings, calisthenics, gymnastics, electricity, &e., are adjuncts largely employed in hydropathie practice. Water drinking, while still an important factor in hydro- pathy, has declined somewhat since the early times of the system.

But that which has from the first distinguished modern hydro- pathy, and still makes its strict. practice a thing apart, is the 'opisig" so called. It is related of Pricssnitz that, when a boy;of fourtcen, and treating a sprain, as was the native custom, with wet cloths, he observed an eruption appear beneath them, with immedi- ate recovery of the part. Gradually the significance and wider application of this eruption dawncd upon him, until it came to hold so prominent a place in his practice as to be regarded by many as his greatest discovery. The eruption coinciding in point of time with recovery as a rule, it was ealled the crisis, involving doubtless a reference to the term as used by Hippocrates and his successors. But with Priessnitz crisis attained a higher rank, a wider application, and a more definite character. He first showed it to be produciblo at will under given conditions of the patient, and amenable to direction and control. This eruption, it is claimed, appears only in morbid states of the blood

(cachexia) resulting from derangement or defect in the organs of assimilation or excretion or both (¢.g., gout, rheumatism), or from the presence of a specific poison (¢.g., syphilis). The continuous application to a given tract of skin of the heating bandage or poultice (mediums merely for the exhibition of warmth and moisture) stimulates, in a cumulative way, its vascular and nervous activity, and leads, it may be in a few days or weeks (in some cases hours, in others months), to an eruption, papular, then pustular, and ultimately resolving itself into a suppurating surface commensurate with the area covered by the bandage. There is, in the latter stage, a copious discharge of yellowish-green pus, usually foctid, varied occasionally with patches of brown, blue, or metallic green, and accompanied with itching, sometimes intense. The general temperature is not, as a rule, disturbed; the pulse, except perhaps for the first day or two, falls, if previously quick, to a natural rate ; the weight and strength, in the most favourable eases from the outset, and in the rest later on, increase, and it is not un- common to find the anomaly of a patient exulting in freedom from suffering and a return of the impulses of health simultaneously with the appearance of an extensive inflammation of the skin. The applications, continued without intermission and unaltered (save as cleanliness requires) for weeks or months, according to the nature of the case, are at last no more stained with pus but with serum

simply ; and finally, still without change of application, the skin will heal, or, at most, show a little psoriasis, pityriasis, or eczcma, or, it may be, but a faint tinge of red. The bandages are then withdrawn. The original symptoms mcauwhile have disappeared with more or less celerity and completeness ; and with the eruption has departed the disease that called for it and made it possible. Strength grows apace, no longer taxed by disease or crisis, until recovery in appropriate cases is absolute and secure.

Occasionally the cutaneous inflammation extends in the form of

soriasis, eczema, sudamina, a papular rush, or a succession of boils, invading parts untouched by the wet compress. ‘his is called a general crisis; it usually occurs in the last stage of the local one, sometimes after it has ceased, and is advantageous and transient. Debility, whether pre-

existing or consequent on the crisis, may call for some modification of its severity and duration, whether by instalments at proper intervals, or curtailment in the later stages, the natural emunctories being relied on to complete the work of purification at greater leisure. A residuum of incurable organic degeneration, as of the kidneys or liver, may likewise put limits to recovery, and provide perpetual material for crisis until the patieut is worn out ina vain and ignorant attempt at cure. It was the failure of the earlier hydropathists—through inexperience, default of medical education, or inordinate enthusiasm—to recognize these limitations, that brought crisis into its present discredit and com- parative desuetude. Where it is necessary from these or other causes to relieve the patient of the eruption, the substitution of simple ointment, unsalted lard, or other oleaginous or viscid material for the stimulating bandages: or poulticcs, permits the excitenient to subside, and, with occasional exceptions, the skin, in a few days, it may be hours, bears little trace of the eruption.

In the course of hydropathic treatment there occur, though rarely, attacks of diarrhoea, sickness, diuresis, or diaphoresis, which, having been observed frequently to mark the turning point in the history of the case, are held to be varieties of crisis, disturbances attendant on the expulsion of the materies morbi from the system.

The theory of crisis may be stated thus. The digestive and assimilative organs are, as is well known, involved, whether primarily or secondarily, in by far the majority of morbid conditions. Their product, the leo: undergoing constant renewal, becomes neces- sarily more or less impaired, —deprived of the blandness that pertains alone to a pure and perfect condition, with what may be termed an inflammatory disposition as the result. The most familiar, because pronounced, forms are the gouty, rheumatic, tubercular, and strumous diatheses. Later the excretory organs, in common with the whole economy, must more or less become deranged, with additions, in consequence, to the sum of morbid elements in the blood, such as uremic and biliary matters. A vicious circle of action and reaction is established from which escape is difficult, if not im- possible, in its more pronounced developments. The digestive dis- order begets imperfect and impure blood, and the morbid blood keeps up, and ceteris paribus increases, the initial and originating digestive disorder. In all but its most advanced stages

ordinary measures, hydropathic or other, may suffice to break this chain, 'and, by eliminating one or more of its links, render recovery possible, or accomplish it. It is when the complication is beyond their reach that the domain peculiar to crisis begins. The superior vascularity and vitality of the digestive organs—the alimentary tract of mucous membrane, the pancreas, and the liver—is what makes them (in addition to their susceptibility to injury through errors in diet) so commonly the seat of discased action. The highly nervous and vascular structure of the skin makes easy its elevation to at least an equality in vital activity with the mucous membrane. Warmth and moisture continuously applied to a given portion will, in time, effect this, aided doubtless by maceration and denudation of the cuticle and exposure of the sensitive cutis vera. It thus becomes the seat of greatest vital activity ; pre-eminence in morbid activity naturally follows, and a genuine metastasis is effected, such as the natural history of disease is rich in examples of. There is a decline, pro tanto, of the primary internal disorder under this combined pressure, first by the diversion of morbific elements, and then by the diversion of an appreciable quantity of the blood itself, and by counter-itritation, when the site of the vicarious inflammation has been selected with that in view. The aid of a sustained derivation to the entire cutaneous surface and the extremities is at the same time secured by means of the Turkish bath, full packs, and other stimulating agents, while, at the same time, due care is taken to eliminate and negative the original causes of diseasc. The sum of morbid activity is for the time being increased and intensified ; but, in the new location, no longer self-supporting and self-perpetuating, it is soouer or later cxhausted. The change in the relation of the materies morbi to the digestive systcm puts an end at one and the same tine to the originating and sustaining conditions. The failure of simple counter-irritation (where, as by sinapisms, vesicatories, &e., the irritant is derived from without) to effect the same result in many of the cases afterwards cured by crisis negatives of itself the view that the results of the latter are to be attributed to the element in it of counter-irritation alone.

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HYDROPHOBIA, from védwp, water, and PoBéw, to fear (Syn. Rabies, Lyssa), an acute infectious disease, occurring chiefly in certain of the lower animals, particularly the can- ine species, and liable to be communicated by them to other animals, andtoman. 'The main features of the disease are similar alike in the lower animals and men, but that peculiar symptom from which the malady derives its name, viz., the dread of water, appears only to affect the latter. Rabies as it manifests itself in animals belongs to the subject of veterinary medicine; the present notice refers only to hydro- phobia occurring in man. The disease has been known from early times, and is alluded to in the works of Aristotle, Xeno- phon, Plutarch, Virgil, Horace, Ovid, and many others, as well as in those of the early writers on medicine. Celsus gives detailed instructions respecting the treatment of men who have been bitten by rabid dogs, and dwells on the dangers attending such wounds. After recommending suction of the bitten part by means of a dry cupping glass, and thereafter the application of the actual cautery or of strong caustics, and the employment of baths and various internal remedies, he says: " Idque cum ita per triduum factum est, tutus esse homo a periculo videtur. Solet autem ex eo vulnere, ubi parum occursum est, aquee timor nasci, tdpodo- Biav Greeci appellant. Miserrimum genus morbi; in quo simul eger et siti et aque metu cruciatur ; quo oppressis in angusto spes est." Subsequently Galen described minutely the phenomena of hydrophobia, and recommended the ex- cision of the wounded part as a protection against the disease. Throughout many succeeding centuries little or nothing was added to the facts which the early physicians had made

known upon the subject. The malady was regarded with universal horror and dread, and the unfortu- nate sufferers were generally abandoned by all around them and left to their terrible fate. In later times the investiga- tions of Boerliaave, Van Swieten, John Hunter, Magendie, Breschet, Virchow, Reder, as also of Youatt, Fleming, Meynell, Hertwig, and others, have furnished important information ; nevertheless much remains obscure as to the nature and pathology of this formidable disease.

Whatever may be said as to the spontaneous development of rabies in animals—a view which is now generally dis- credited—there can be no doubt that in man the disease is

in every instance the result of the inoculation of the virus AIT. —- 69

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contained in the secretions of the mouth of the affected animal into a2 wound or abrasion of the skin or mucous membrane. In the great majority of cases (90 per cent.) this is due to the bite of a rabid dog, but bites of rabid cats, wolves, foxes, jackals, &c., are occasionally the means of conveying the disease. There is no evidence that the poison can be introduced into the system without an abrasion of the surface. But it must be observed that even of those who have undoubtedly been bitten by rabid animals, only a proportion subsequently suffer from hydrophobia. Thus where the bite has been inflicted on a part of the body pro tected by clothing, the virus may be wiped from the teeth of the animal before they penetrate the skin. Hence it is found that bites on exposed parts such as the face are very much more dangerous than on other parts which are ordin- arily covered. But further, individual susceptibility must be taken into account, for it is undeniable that many persons in whom the virus of rabies has been inoculated escape hydrophobia. John Hunter mentions one remark- able instance in which of twenty-one persons bitten by a rabid dog only one subsequently died from hydrophobia ; and a comparison of the best authorities would seem to show that the proportion of those who are attacked with the disease to those who are bitten is less than one-half, Numerous popular fallacies prevail on the subject of hydro- phobia, Thusit is supposed that the bite of an angry dog may produce the disease, and all the more if the animal should subsequently develop symptoms of rabies. The

ground for this erroneous notion is the fact, which is unquestionable, that animals in whom rabies is in the stage of incubation, during which there are few if any symptoms, may by their bites convey the disease, though fortunately during this early stage they are little disposed to bite. The bite of anon-rabid animal, however enraged, cannot give rise to hydrophobia. Another fallacious notion, not alto- gether of popular origin, but maintained by a few eminent professional authorities, is to the effect that there is no such disease as hydrophobia at all, but that the symptoms desig- nated by that name are entirely mental phenomena produced by the effect of fear of the consequences following a bite. It might be sufficient as a reply to this to point to the uni- form sequence of terrible symptoms which mark the pro- gress of the malady when it has commenced, and to its acute course and invariably fatal termination ; but there is the additional fact that very young children, in whom this feeling could scarcely be expected to operate, may suffer and die from hydrophobia.

The period of incubation of the disease, or that time which elapses between the introduction of the virus and the development of the symptoms, appears to vary in a remark- able degree, being in some cases as short as a fortnight, and in others as long as several months or even years. On an average it seems to be from about six weeks to three months. The rare instances of the appearance of hydro- phobia many years after the introduction of the poison are always more or less open to question as to subsequent inocu- lation. During the period of latency, in which the patient seems perfectly well, it is supposed that the poison is under- going a sort of multiplication, both in the previously wounded part and in the system at large, somewhat analo- gous to the fermentive process, and that ultimately it comes to tell with deadly effect upon certain portions of the nervous system.

When the disease is about' to declare itself it not unfre- quently happens that the wound, which had quickly and

entirely healed after the bite, begins to exhibit evidence of ©

irritation or inflammatory action, or at least to be the seat of morbid sensations such as numbness, tingling, or itching. The symptoms

characterizing the premonitory stage aregreat mental depression and disquietude, together with restless-

HYDROPHUBT.A

ness and a kind of indefinite fear. There is an unusual tendency to talk, and the articulation is abrupt and rapid. Although in some instances the patients will not acknow- ledge that they have been previously bitten, and deny it with great obstinacy, yet generally they are well aware of the nature of their malady, and speak despairingly of its consequences. 'There isin this early stage a certain amount of constitutional disturbance showing itself by feverishness, loss of appetite, sleeplessness, headache, great nervous excitability, respiration of a peculiar sighing or sobbing character, and even occasionally a noticeable aversion to liquids, These symptoms-— constituting what is termed the melancholic stage—continue in general for one or two days, when they are succeeded by the stage of excitement in which all the characteristic phenomena of the malady are fully developed. Sometimes the disease first shows itself in this stage, without antecedent symptoms.

The agitation of the sufferer now becomes greatly in- creased, aud the countenance exhibits anxiety and terror. There is noticed a marked embarrassment of the breathing, but the most striking and terrible features of this stage are the effects produced by attempts to swallow fluids. The patient suffers from thirst and desires eagerly to drink, but on making the effort is seized with a most violent suffocative paroxysm produced by spasm of the muscles of swallowing and breathing, which continues for several seconds, and is succeeded by a feeling of intense alarm and distress. With great caution and determination the attempt is renewed, but only to be followed with a repetition of the seizure, until the unhappy sufferer ceases from sheer dread to try to quench the thirst which torments him. Indeed the very thought of doing so suffices to bring on a choking paroxysm, as does also the sound of the running of water. The patient is extremely sensitive to any kind of external impression; a bright light, a loud noise, a breath of cool air, contact with any one, are all apt to bring on one of these seizures. But besides these suffocative attacks there also occur general convulsions affecting the whole muscular system of the body, and occasionally a

condition of tetanic spasm. These various paroxysms increase in frequency and severity with the advance of the disease, but alternate with intervals of comparative quiet, in which, however, there is intense anxiety and more or less constant difficulty of breathing, accompanied with a peculiar sonorous expira- tion, which has suggested the notion that the patient barks like a dog. In many instances there is great mental dis- turbance, with fits of maniacal excitement, in which he strikes at every one about him, and accuses them of being the cause of his sufferings,—these attacks being succeeded by calm intervals in which he expresses great regret for his violent behaviour. During all this stage of the disease the patient is tormented with a viscid secretion accumulat- ing in his mouth, which from dread of swallowing he is constantly spitting about him. There may also be noticed snapping movements of the jaws as if he were attempt- ing to bite, but these are in reality a manifestation of the spasmodic action which affects the muscles generally. There is no great amount of fever, but there is constipa- tion, diminished flow of urine, and often sexual excitement.

After two or three days of suffering of the most terrible description the patient succumbs, death taking place either in a paroxysm of choking, or on the other hand in a tranquil manner from exhaustion, all the symptoms having abated, and the power of swallowing returned before theend. The duration of the disease from the first declaration of the symptoms is generally from three to five days.

Post-mortem examination has not hitherto thrown much light upon this malady, but the subject is at the present time engaging the special attention of certain eminent pathologists, and important and valuable information may

be anticipated. The chief morbid changes which have been described are evidences of congestion and inflaminatory action in certain portions of the brain and spinal cord, but more particularly in the locality known as the " respiratory centre" of the medulla oblongata, where the accumulation of "leucocytes" around the small blood-vessels and in the surrounding nervous substanceare a prominent phenomenon. Similar changes have been found in the salivary glands. On the whole, however, it can scarcely be said

that the formidable array of symptoms above narrated are accounted for by these appearances, which in the opinion of some are in all likelihood merely the results of antecedent processes of an occult nature affecting the nerve centres and forming the essence of the disease.

That emotional disturbance is present is undeniable, for it is found that those cases of hydrophobia are less severe where there is no suspicion on the part of the sufferer of the nature of his complaint ; yet this only represents one of many elements. 'The function of the eighth pair of nerves (which are largely concerned in the processes of respiration and deglutition) is disturbed in a marked degree, and it is probable that this is the portion of the nervous system upon which the poison most powerfully exerts its specific action. But that the great nerve centres, viz., the brain and spinal cord as a whole, are profoundly affected, is manifest in the tendency to general convulsion, the remarkable hyperasthesia, and the mental perturbation of the patient.

The treatment of most avail in this disease is that which is directed towards preventing the absorption of the poisou into the system. This may be accomplished by excision of the part involved in the bite of the rabid animal, or, where this from its locality is impracticable, in the appli- cation to the wound of some chemical agent which will destroy the activity of the virus, such as potassa fusa, lunar caustic (nitrate of silver), or the actual cautery in the form of a red-hot wire, The part should be thoroughly acted

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[PIHE Hyprozoa form one of the three classes into

which the Colentera nematophora (distinguished from the Celentera porifera, or Sponges) have been divided,— recognized as such in the article Ca@LENTERA, to which the reader is referred. It results from observations made by Ernst Haeckel, since that article and the article Actinozoa were penned, that the Ctenophora should not be regarded as a class equivalent to the Zydrozoa and Actinozoa, nor as a subdivision of the latter class, but that they must be con- sidered as a peculiar modification of the medusiform Tydrozoa (see final paragraph). If this conclusion be accepted, it will be

necessary to divide the Hydrozoa into two primary groups or grades, for which the names Polypo- morpha and Ctenophora are proposed.

The Hydrozoa correspond to the Linnwan genera Hydra, Lubularva, Sertularia, and Medusa. The name was applied by Huxley in 1856 to a group corresponding to that termed Hydromeduse by Vogt (1851) and Meduse by Leuckart (1853), and embracing the forms placed by Gegenbaur in his Elements of Comparative Anatomy (1878) in four classes, viz., Hydromedusee, Calycozoa, Thecomeduscee, and Meduse. Our knowledge of the structure and life-history of the Iydrozoa, many of which, on account of their delicacy and oceanic habits, are excessively difficult to obtain in a state fit for investigation, has greatly extended within the last five years. Whilst in the two decades preceding this period the admirable researches of Huxley, Gegenbaur, Agassiz, and Allman had brought to light and systematized a vast mass of information with regard to these organisms, the later observations of Claus, the Hertwigs, Haeckel, and

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on by these agents, no matter what amount of temporary suffering this may occasion. Such applications should be resorted to immediately after the bite has been inflicted, or as soon thereafter as possible. Further, even though many hours or days should elapse, these local remedies should still be applied ; for if, as appears probable, some at least of the virus remains for long at the injured part, the removal or effectual destruction of this may prevent the dread consequences of its absorption. Every effort should be made to tranquillize aud reassure the patient.

When once the symptoms of hydrophobia have declared themselves, little can be achieved by the resources of the physician beyond palliating the agonizing sufferings and rendering easier the inevitably fatal event.

Medicines cannot be administered by the mouth, owing to the impossibility of swallowing and the distress occasioned by the effort to do so; they must therefore be given either by the bowel in the form of enema, by hypodermic injection, or by inhalation. The most approved and potent agents are opium,

belladonna, curara, chloral, and chloro- form inhalation. The vapour bath is also recommended. It need scarcely be said that those coming in contact with the patient should guard against the risk of being bitten during the paroxysms of excitement, or of being inoculated by the saliva, for although there are few if any well-authen- ticated cases of the disease being communicated in this way, yet the possibility must be admitted.

It should be remarked that occasionally an individual who may have at some time been bitten by a non-rabid dog manifests symptoms strongly resembling in many points those of hydrophobia. 'These are often simply the effect of fear, and have much of the hysterical element mixed up with them. They are generally of much less severity in every way than those of the true disease, and yield readily to treatment appropriate to the disturbed nervous condition. G0, &)

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Metschnikoff, have corrected, extended, and added to their history, especially in respect of embryological and histological detail, An epitome of the present condition of our knowledge of the group is afforded by the subjoined tabular classification of its families, orders, and sub-classes.

The definition and synonymy of the divisions recognized will be entered into, after a sketch has been given of the common structural features of typical JZydrozoa.

Ciass HYDROZOA. Sub-Class I. Scyphomeduse (syn. Ephyromeduse). Order 1, LucERNARLA. els fig. 19) Fam. 1. Eleutheroearpidse { ee ee Ge 28): Sub-Order 1. Cubostome. Fam. 1. Protephyride.

Haliclystus, Cratcrolophus. 2. Nausithoide…….ccecssree 8, Ephyrellidee.

Manania. 4, Atollidz., + 9 Cyclorchide. Sub-Order 2. Semostome.

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ereeer eevee

» 2 Cleistoearpidee …..... Order 2. DiscomEDus#& (Haeckel).

” Nausithoe.

” ”

Chrysaora (fig. 24, b).

Fam. 1. Pelagide Pelagia, Ay Ch (Oats oo papsenadenseo sen erene Cyansa. 3, Sthenonide …....e0c0e Sthenonia.

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4. Awrelide v.cscsosecssee Aurelia (figs. 26-31).

At Sub-Order 3, Rhizostomz. Cephea. Fam. 1. Tetragamelie ….....s0006 Cassiopeia. Rhizostoma (fig, 24, a). Crambessa.

{

. Charybdea (figs. 20-23).

4) eomOnOgaineligey …..-..6…c0e

Order 3, ConomEDUs@ (Haeekel). Fam.1. Charybdeide ….....

2. Bursaride.

» 98. Chiropsalmide.

Order 4. PeromEpus@ (Haeckel). Fam, 1. Periphyllide.

2. Pericryptide.

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Sub-Class II. Hydromedusz.

Order 1. GyMNOBLASTEA-ANTHOMEDUS. Fam. 1. Tubularidae …....ccccsesceee Hybocodon. Corymorpha (fig. 34). Pennaria. Vorticlava. { Penigoniu, (figs. 36, 37).

{fvbodot (fig. 35),

yn 2s Penmarida…rseeccccreres

gy 8. Eudemdrider o.ssseseeereeres Perigonium, Lizzia (fig. 44). Cladonema. Clavatella, Garveia, Stylactis. Dicoryne (fig. 40). {corm (fig. 45).

» 4, Cladonem{d2 ….....0.00008

5 ee Bimeride …sessseeeeeessere | yy G. Dicorynidae ….c0sscereeees

oy Fs COTYMUGE 00010 cevssceeereoeee Coryne.

Syncoryne (figs. 41, 46). ‘ $ Hydractinia (fig. 39). » 8. Hydractinidae oo… cae { Podocoryne. Clava-Turris (fig. 38). ay De CIAVIGI ve ceseeeeseeeeeeenennees Cordylophora,

é | Hydra (fig. 42). ” 10, Hydride eo cen eee nevecveecccnese . \ Protohydra(?).

Order 2. CALYPTOBLASTEA-LEPTOMEDUSZ.

*‘ 4 Plumniaria. Fam. 1. Plumularida….....cscce ‘Antennularia. . Sertularia. 17-2. Sertularidee .ccsseeereers { iaieriaen, Eucopide. aaa ts . Campanularia (fig. 43). » 3 Campanularide wos 4, pond ny g Obelia. somraaaaal ; Lafoea. i Phan Tima. Equorea. yy By LEQUOTIAE ..ssesseseneeeeseeren Zygodactyla, Rhegmatodes. Order 3, TRAcHoMEDUSm (Haeckel). Fam. 1. Pctasidee ..ccseseeeeeee Petasts. » 2. Trachynemidee…... ... Rhopalonema. ay B. AglAUridee vrereseeessscenesseees —— tans Liriope. 4 Geryomide.s.rsserssseneron *? Carmarina (figs. 48, 49).*

Order 4. NARCOMEDUSH (Haeckel).

Fam. 1. Cunanthide …..... Weecasents Cunina (figs. 50, 51).

», 2. Peganthidee …....sseceeeee Polyxenia. A Aigina, » 9, Aginide ….. An nocmacseced { Eginopsis dh, Gielen eee Order 5. HrpRocoraLLIn& (Moseley). ; Fam, 1. Milleporidee …....-+00+. Millepora (figs. 52, 58).

Sporadopora.

» 2. Stylasterida….....+4.4 Distichopora. Astylus (fig. 54).

Order 6. S:PHONOPHORA. Sub-Order 1. Physophoride.

Fam. 1. Athorybiadee …..... ve Athorybia. » 2 Physophoride …..... Physophora (fig. 57, C). Forskallia. » 8, AgalMida voces 4 Halistemma, Agalma (fig. 57, E). » 4 Apolemiades …...cerreree Apolemia. » 6. Rhizophyside …..... Rhizophysa. Sub-Order 2. Physalidee. Fam. 1, Physalidae…...ssseeeee vw. Physalia. Sub-Order 8. Calycophorida. 3 Fam. 1. Hippopodiide …..... Gleba. p Praya. » 2. Diphyide sieseeeeee Wveaknel Diphyes (fig. 57, A), Abyla, » 3. Monophyida…..... Spheronectes, Sub-Order 4. Discoidez. r Velella, Fam, 1. Velellidae ..cccsssesssesssees Porpita.

The IZydrozoa present a greater simplicity of ultimate structure than do any animal organisms possessed of as great a complexity of external form. Asin all Metazoa or Enterozoa, the life cycle of a hydrozoon starts with an egg which ~~is at first a single cell or unit of protoplasm, but proceeds after fertilization to multiply by transverse fission in such a way that the resulting cells or units are arranged in two layers, each one cell deep, disposed around a central cavity—the enteron or archenteron. The sac thus formed is known as a diblastula (figs. 1, 2, and 25). By the forma~~ tion! of a mouth to the sac, the enteron acquires the functions of a digestive retort in which food matters taken in at the mouth are brought into a chemical condition suitable for the nutrition of the surrounding cells. The two layers of cells (of which the outer only acquires additional layers?

; 1 In Hydromeduse the inner layer of cells forms by delamination, in Scyphomeduse by invagination. In the latter case the sac closes mo and the mouth is formed by a new opening.

It is probable that the numerous rows of cells described in the endoderm of Tubularia and Corymorpha by Allman, in his great mono- graph of the Tubularian Hydroids, are due to a plication of the

by the division of the primary cells, and that by no means in all cases) received from Allman (PAil. Trans., 1855) the names respectively of the ectoderm and the endoderm, having previously been shown by Huxley (1849) to be the fundamenta] mem- branous constituents of which the most varied parts of the more com- plex Hydrozoa—such as_ tentacles, swimming bells, and air-bladders— are built up in the adult condition. Huxley also pointed out the iden- tity of these membranes with the two primary layers of the vertebrate embryo. The endoderm and _ the ectoderm, which present themselves, as is now known, in the diblastula (or gastrula) phase of all Hnterozoa, re- main in Zydrozoa (and alsoin the allied Anatomy.)

groups of Celentera) as permanently distinguishable ele- nients of structure. This important disposition is associ- ated with and dependent on the simple character which the archenteron or primitive digestive space retains. Into what- ever lobes or processes the sac-like body may be, so to

Fic. 1.—Diagram of a Di- blastula. a, orifice of in- vagination (blastopore) ; b, archenteric cavity; ¢ endoderm: d, ectoderm. (From Gegenbaur's Ze- ments of Comparative

Fic. 2.—Formation of the Diblastula of Zucope (one of the Calyptoblastic Hydro-

medusce) by delamination. (From Balfour, after Kowalewsky.) A, B, C, three successive stages, ep, ectoderm; hy, endoderm; al, enteric eavity.

speak, moulded, whether tentacles or broader expansions, into these the cavity of the archenteron is extended in the first instance; and where the actual cavity is obliterated the endodermic cell-layer remains to represent it (Gefiiss- platte or endoderm-lamella, see figs. 7 and 16).*

*Conversely, whatever canals or spaces are discovered in the substance of a hydrozoon (excepting only the cavity of ectodermal otocysts) are simple and direct continuations of the one original enteric cavity of the diblastula, and all such spaces are permanently in free communication with one another.**

The whole of the Zydrozoa seem to present a lower grade of structure than the Actinozoa, in so far as the latter, whilst retaining permanently free communication between all parts of the archenteric space, yet exhibit a differentia- tion of this space into an axial and a periaxial portion—a digestive tube and a body cavity. The differentiation has only to proceed a step further, namely, to the closure or shutting off of the axial from the periaxial portion of the archenteric space, and we obtain the condition which characterizes the adult forms of the Celomata, or animals

nC ee a original endodermal cell-layer. The two kinds of cells in two layers figured by the same authority in the endoderm of Gemmellaria implexa, pl. vii. fig. 5, cannot, however, be thus explained.

3 Some solid tentacles, with a single axial row of endodermal cells, form an exception to this statement.

4 The observations of Eilhard Schulze cited in the article CELENTERA do not form any real exception to this statement.

HYDROZOA

with blood-lymph space distinct from digestive canal.) With the attainment of the ccelomate condition, the two fundamental cell-layers, ectoderm and endoderm, which still appear in the embryo, become so far interwoven, and their products so highly differentiated, that it is no longer possible to recognize them as anatomical structures in the adult.

The only deep-seated distinction between Hydrozoa and Anthozoa (the Actinozoa being thus termed when the Ctenophora are detached from them) appears to be the particular differentiation of the archenteric space in Anthozoa which has just been noted. It is no longer possible to separate the two groups from one another as Hxoarit and Endoarti, as was proposed by Rapp (Ueber die Polypen im Allgemeinen und die Actinien insbesondere, Weimar, 1829) —the first term indicating the Hydrozoa as possessed of external generative organs, whilst by the latter term the Anthozoa are pointed to as having internal generative organs. This distinction breaks down completely in the case of Lucernarta, and even in that of the so-called phanero- carpous and some otlier medusze which discharge their genital products by the mouth, and quite rarely by rupture of the outer body-wall. The tendency to form calcareous deposits in the deep layers of the ectoderm, or mesoderm, as it has been termed, exhibited almost universally by the Anthozoa (whence the name Coralligena applied to them), is distinctive of them, though it has been shown first by Louis Agassiz, and more fully and recently by Moseley, to be paralleled among Zydrozoa, by the external calcareous deposits of the abundant and widely distributed Millepores and Stylasterids. A minute distinction between Hydrozoa and Anthozoa, which does not, however, hold good uni- versally, is found in the form of the barbed threads ejected by the nematocysts. Instead of the complicated forms present in the latter group, the /7ydrozoa are usually pro- vided with either an unbarbed thread or one in which the barbs are confined to three at the base and a few minute barblets (fig. 5).

Fundamental Forms of the MTydrozoa.—The diblastula derived from the egg of a hydrozoon, when provided with a mouth, may be spoken of (as are the equivalent forms in other animals groups) as a person. Either this person elongates and develops tentacles in a circlet around or near the mouth, and usually becomes fixed by the aboral pole of the sac-like body, or the sac gradually assumes the form of a clapper-bell or of an umbrella with greatly thickened handle, the mouth being placed at the free end of the handle or of the clapper, and the animal freely swimming by the contractions and expansions of the dome of the bell (disc of the umbrella). The two forms of persons are known, —the former as the "hydriform" (2, 3 in fig. 16), the latter as the " medusiform" (4, 5, 6 in fig. 16).

The HYDRIFORM PERSONS usually occur as fixed branching colonies or trees (figs. 36 and 37) produced by lateral budding from an original hydra-form developed from a diblastula,

The hydriform person in its most fully developed state is seen in the colonies of Z'ubularia. In such a colony a nuinber of hydriform persons are united like the flowers of a plant on its branches (whence Allman's terms hydranth, hydrophyton). Each hydriform person (fig. 35) has an elongated body with oral and aboral pole. The mouth is placed centrally at the oral pole, which is somewhat enlarged and conical. At the apex of the cone, immediately around the mouth, is a circlet of small tentacles; at the base of the cone is a second circlet of larger tentacles ; the surface of the oral cone is termed the hypostome. In other genera

1 The Enterozoa or Metazoa admit of division into two grades—(1) the Celentera, including sponges, polyps, jelly-fish, and corals, and (2) the Celomata, including all remaining forms.

- *See, however, note to the paragraph headed Definition of the Hydrozoa, p. 555,*

(eg., Hydra, fig. 42) the smaller circle of tentacles is wanting ; in others, again, the tentacles are irregularly placed and not concentrated into one circlet (fig. 38). We regard the former as the typical condition, In the hydriform persons of the Scyphomeduse (figs. 26 and 27) the vertical axis is much shortened, the hypostome is flat, and the whole body cup-like or hemispherical.

The tentacles of the hydriform person are sometimes hollow (Zydra, Garveia nutans, Hydrocoralline), being mere prolongations of the sac-like body; but usually, though the endodermal cell-layer is continued into them, they are solid (2 in fig. 16). Very generally the tentacles of the hydra-form are indefinite in number, but in those belonging to the group of Scyphomeduse a primary series indicating four radii (perradial) can be distinguished, to which are added four intermediate to these, marking four secondary radii (interradial), whilst eight more placed between the eight of

the perradial and interradial series are known as adradial tentacles. The surface of the hydra- form may be entirely naked, or encased in a horny tube (perisarc) formed by the ectoderm: this may be confined to the aboral portion of the hydranth and to the common stem which unites the persons of a colony, or it may rise up and form a cup (or hydrotheca) around the oral region of the hydranth (figs. 32 and 33),

The bodies of all hydriform persons, as well as tle ten- tacles, are excessively contractile, and when hydrothece are present can be withdrawn into them.

The ectoderm or outer cell-layer furnishes the protective and contractile tissues of the hydra-form. Very usually it is not more than one or » two cells deep, and is sepa- 4 rated from the endoderm by »'\ \yj a structureless lamella of |pe firm consistence. IniTydra wee large cells of the ectoderm ,,, °5_ (neuro-muscular cells Kleinenberg) bound the external surface (fig. 3) and give off horizontal muscular processes which lie side by side on the structureless lamella— forming thus a deep muscular coat, the fibrous elements of

—Epidermo-muscular cells of Hydra. of m, muscular-fibre processes. (After Kleinenberg, from Gegenbaur.)

: = i of the body-wall of /ydra, showing ectoderm cells above, ss cate ental lamella" from three flagellate endoderm cells below. The latter are vacuolated, and contain each a nucleus and several durk granules. In the middle ectoderm cell are seen a nucleus and three nemato- cysts, with trigger hairs projecting beyond the cuticle. A large nematocyst, with everted thread, is seen in the right-hand ectodermal cell. (After F. E. Schulze.)

which are not independent cells. In larger species some of the fibres may become separated from the tegumentary or superficial cells, and acquire the character of independent nucleated corpuscles (Hydractinia, Van Beneden). No nervous elements nor sense-organs occur in any hydra-form (except perhaps the Lucernarie). In Antennularia some ectoderm cells are amcebiform, and project processes which change shape (nematophors). 'Tactile hairs (palpocils),

however, taclos are essentially tactile organs. the large cells of the ecto- derm (//ydra, Cordylophora, Allman, Kleinenberg, F. E. Schulze) are small nucleated cells which become con- verted into vesicles contain- ing a three-barbed (figs. 4 and 5) or simple filament (nematocysts), These are frequently grouped on the surface in wart-like pro- cesses or "batteries." Ne- ff matocysts also are found in § the endoderm; but it is prob- ' able that their presence there is due to their having been swallowed.

The endoderm is usually

occur on the ectodermal cells, and the solid ten- Placed in and between

derm cells project processes like the pseudopodia of Pro- tozoa, and suggests that solid food particles are incepted by them. T. J. Parker has published similar observa- [KJ /\ ee : on Hydra (1880). fu Fie. 6-— Vacuolated endoderm cells of cartl- the solid tentacles the en- laginous consistence from the axis of the dodermal cells are greatly {emscle of s Meduss (Cuniyo) Cm modified, forming a kind Anatomy.)

of skeletal tissue, each cell recalling by its vacuolation and firm cell-wall the characters of vegetable parenchyma (fig. 6). Inthe stems of Siphonophora endoderm cells give origin to muscular processes like those of the ectoderm (Claus), This latter fact has a morphological significance which cannot be too gravely estimated.

Generative products are not developed by any hydriform persons (excepting the Lucernari@), the sexual process being carried on by a distinct set of buds developed on the sides of hydriform persons. These buds either become medusi- form persons, or are degenerated representatives of such persons (sporosacs) (figs. 17 and 18). Even the fresh-water Hydra (fig. 42) does not appear to be an exception to this generalization. The single egg-cell of Hydra projects at the breeding season in an ectodermal covering, as a wart, from the lower part of the body. A conical eminence or two nearer the mouth contains the spermatozoa. Each ovarium and each spermarium represents an aborted gene- rative person. According to Kleinenberg the egg-cell and the sperm-cells are both derived from the ectoderm. The

Lucernarie develop internal generative organs (fig. 19) which correspond closely with those of the medusiform persons of the group Scyphomeduse (see below), with which they are classified. Both ova and testis are endodermal in origin in Lucernaria and in the medusiform persons of the Seyphomeduse, whilst they appear to be ectodermal in origin in the complete medusiform persons of Hydro- meduse, though in the degenerate medusiform persons known as sporosacs they may either or both have an endodermal origin.

_ MEpUsIFoRM PERSONS usually present themselves as isolated free-swimming individuals, but like hydriform

persons they have the power of producing new persons by budding (figs. 44, 45, and 46), which may become detached or may remain connected with the primary person (fig. 57) to form a freely swimming colony (Siphonophora) compar- able to the fixed colonies of hydriform persons. Medusi- form persons are often produced as the immediate result of the development of the diblastula without any intermediate hydriform phase (Pelagia among Scyphomeduse, T'racho- mecduse, Narcomeduse,and probably some Anthomeduscee and Leptomedusc), but quite as frequently originate as lateral buds upon the body-walls of hydriform persons (figs. 34, 37, and 43), or of other medusiform persons (see below), or as metameric fission-products of hydraforms. The typical medusa-form is a hemispherical cup (the xectocalyx, or umbrella, or disc), from the centre of which rises up a cylindrical or conical process (the manubrium, erroneously polypite) at the summit of which is the mouth (4, 5 in fig. 16). Four perradial (see above for use of this term) ten- tacle-like lobes very commonly surround the mouth, or numerous small tentacles (fig. 58), whilst the margin of the disc is beset with tentacles four in number, or a mul- tiple of four (sometimes six, or one only, or indefinite). The aboral pole is dome-like, and is never attached except in those forms which take their origin as buds on a hydri- form colony when the connexion exists at this point. The tentacles are, as in the hydriform persons, some solid, some hollow ; both occur in the same individual.

Fia. 7.—Portions of sections through the disc of meduse,—the upper one of Liezia, the lower of Aurelia, el, endoderm lamella, or vascular lamella; m, muscular processes of the ectoderm cclls in cross section; d, ectoderm; en, endoderm lining the enteric cavity; e, wandering endoderm cells of the gelatinous sub- stance, (After Hertwig.)

The body is not so completely hollowed out as in the hydriform persons. The mouth leads into a straight tube (the stomach) which occupies the axis of the manubrium, and expands at its insertion into the disc. The disc, even when thick and fleshy, is not fully excavated by the enteric cavity. In young forms the cavity does occupy it right up to the margin, but gradually the lumen disappears (fig. 29), leaving a series of canals and a continuous plate of endo- derm (fig. 7) formed by the coalesced walls of the space (the endoderm-lamella of the Hertwigs, see Organismus der Medusen, 1878; the vascular-lamella of Claus, " Polypen und Quallen der Adria," Weener Denksch., 1878). The peripheral portion of the lumen of the original enteric cavity forms the ring-canal, which runs all round the margin of the disc, and is continued into the hollow tentacles, The lumen is further retained at intervals in the form of radiat- ing canals connecting the axial enteric cavity with the ring- canal. These may be perradial, interradial, and adradial (see above as to tentacles of hydra-form), and may branch dichotomously in the disc or form networks.

The meduse are thicker and more fleshy to the touch than are the hydra-forms, and are at the same time trans- parent. This is entirely due to the enormous development of a structureless substance between ectoderm and endoderm, corresponding to the " Stutz-lamella" or structureless lamella of the hydra-forms. (See figs. 49 and 51, representing sections of Carmarina and of Cunina.)

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The remarkable development of this substance in a hyaline con- dition has led to the description of canals and spaces where none exist—the supposed spaces being really occupied by this hyaline substance. I'. E. Schulze's statements as to extra-enteric spaces in Sarsia are thus explained—and more decidedly the supposed circular and longitudinal canals attributed by some authors to the scyphi- stoma phase of Discomeduse. In the same

manner (according to Claus) Allman's observations on Stephanoscyphus are reconciled with those of F. E. Schulze on Spongicola—clearly the same form. Stephanoscyphus is devoid of either circular or longitudinal canals, and though it has four remarkable ridges on the enteric wall like those of the scyphistoma of Seyphomedusee (see fig. 26) stands in all probability very close indeed to the Tubularian genus, Perigonimus.

In a large number of medusa-forms the hyaline gelatinous substance is structureless, but in many of the larger Scy- phomeduse it is occupied by in-wanderingamceboid cells de- rived from the endoderm and by fibrous trabecule (fig. 8).

Fia. 8.—Gelatinous substance of the dise of Aurelia, showing-~a, fibrous tra- beculz, and 0, wandering endoderm eells, with amceboid movements. (From Gegenbaur.)

The wandering endodermal cells are nutrient in function, and represent so far isolated elements of the enteric canal system.

The medusiform person is fundamentally adapted to swimming movements. The muscular fibres are mostly transversely striated, and are as arule outgrowths of super-

Fig. 9.—Muscular eells of medusx (Lizzia). The uppermost is a purely museular eell from the sub-umbrella; the two lower are epidermo-muscular eells from the base of a tentacle; the upstanding nucleated portion forms part of the epidermal mosaie on the free surface of the body. (After Hertwig.)

ficial ectoderm cells as in Hydra (fig. 9), (though in some cases distinct cells) ; they are confined to a sheet spread on the oral face only of the disc or swimming-bell (sometimes called sub-umbrella), to the extensile manubrium and tentacles, and to an inwardly directed flup of the margin of the disc known as the velum (Ve in 4 of fig. 16), which is present in those meduse that are not flattened but conical (bell-like). The muscular fibres on the oral face of the disc and on the velum have a circular direction, interrupted in some cases by radial tracts. The direction of the swim- ming movements is obvious from this arrangement.

The velum is not a constant element in the medusa's dise ; it serves to contract the space by which water is expelled from beneath the bell in the act of swimming.

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All fully-developed Hydromeduse possess the velum, but only a few of the Scyphomeduse (Charybdwa). In the former the endoderm plate (vascular lamella) is not con- tinued into it; in the latter vessels of the enteric system are present in it (fig. 21), and, being probably morphologically distinct, it has been here termed the " pseudo-velum." Unlike the hydra-forms, the medusa-forms of Hydrozoa possess in addition to the tentacles highly-developed sense- organs and ganglionic nerve-centres and nerves, The sense- organs appear to be either eye-spots, or else otocysts, or to combiue the functions of both. In addition to these

are olfactory tracts or pits connected with the preceding. The sense-organs are placed along the margin of the disc (ence called marginal bodies), and are of three kinds: — (1) ocelli—rounded pigment spots, rarely provided with a

a Se

a i

Fig, 11.

Fra. 10.—Ocellus of a medusa (Lizzia Koellikert). oc, pigmented ectodermal cells; i, lens. (After Hertwig.)

Fig, 11.—Otocyst (formed entirely by ectoderm) of Phialidium, one of the vesienlate medusx. d}, superficial layer of ectoderm; d?, deep layer of ecto- derm; h, auditory cells of ectoderm; hh, auditory hairs; np, nerve body; nr}, upper nerve-ring; r, endoderm cells of the eircular canal. The otolith eavity is seen above h,

lens (Lizzia) (fig. 10), always placed at the base of a tentacle or in the radius of one on the oral surface (Zizzia), entirely ectodermal in origin ; (2)

vesiculi or otocysts—formed (as discovered by the Hertwigs, 1878) by an invagination of the ectoderm (fig. 11) containing concretions atid hair cells; either open or eutirely closed, generally numerous, and placed between tentacles, sometimes at the bases of tentacles (Obelia) ; (3) tentaculocysts—which are reduced and inodi- fied tentacles; into them alone of the three kinds of mar-

Fic. 12,—Simple tentaculocyst of one of the Trachomeduse (Rhopalonema velatum). 'The process carrying the otolith or concretion hk, formed by endoderm cells, is enclosed by an upgrowth forming the " vesicle," which is not yet quite closed in at the top. (After Hertwlg.)

ginal bodies do the endoderm and, in the more complex, the enteric canal system enter (figs. 12, 13, and 30). The endodermal sac forms the axis of the tentaculocyst, its cells secrete crystalline concretions, and it functions as an otocyst; pigment spots, which may have cornea, lens, and retina well developed, are formed sometimes to the number of six (Charybdea) on the ectoderm of the tentaculocyst (fig. 13). The olfactory sense-epithelium (fig. 14) is either dis- tributed in a continuous band on the margin of the disc (Zydromeduse, discovered here by the Hertwigs), or it ig

confined to deep pits (foves nervosz) from each of which | dermal cells ("sense-epithelium") in the neighbourhood a tentaculocyst arises (discovered in the Scyphomeduse in- | of the tentaculocysts and in the cells of those organs, dependently by Schafer and Claus). With some exceptions, | and to terminate without any plexiform connexion with medusze provided with ocelli are destitute of vesiculi, which | one another in the muscular fibres. Eimer has described alone occur in the vesiculate Leptomedusee. Tentaculocysts | very abundant and excessively fine fibres, often moniliform, which extend from epithelial cells in the neighbourhood of tentaculocysts and form a network traversing the gelatinous substance of the disc in every direction. This observation, though supported by the fact that such fibres are indi- cated by the extended experimental investigation of Eimer and of Romanes (Eimer, Die Medusen ; Romanes, Phil. Trans., 1876, et seq.), is not confirmed by other observers, and the fibres described are regarded as skeletal tissue. If Eimer's fibres do not exist, the muscular tissue of the

meduse must be regarded as acting to a large extent inde- pendently of nerve-control ; and this is borne out by Claus's observation of the absence of sense-organs and nerve-fibres from the swimming-bells of the Siphonophora (compound meduse). In the Hydromeduse the nerve ganglion cells are grouped in a continuous ring around the margin of the disc, separated horizontally into an inferior and superior portion by the insertion of the velum. The difference in the form of the nervous system has led Eimer to propose the names Cycloneura for the Hydromeduse and Zoponeura for the Scyphomeduse. Amongst the latter, however, Charybdea, having a continuous velum like Hydromeduse, has also a continuous nerve-ring.

Comparison and Relations of IH; ydriform and Medusiform Persons.—A simple shortening of the vertical axis, and a widening of the hypostome, with obliteration of the lumen (but not of the cells) of the endoderm over a considerable region of the disc thus produced, suffice to convert the hydra-form into the medusa-form.! This change of proportion made (fig. 16), the sense-organs of the medusiform person have to be added, and the change is complete. Thus it be- comes clear that we have to deal with one fundamental form, appearing in a lower, fixed, nutritive phase and a higher, locomotor, generative phase in the two cases respectively.

The phylogeny of the Hydrozoa and the historical relation- ship of the two phases (hydriform and medusiform) appears to be as follows. '

A two-cell-layered sac-like form, with mouth and with or without tentacles, was the common ancestor of Hydrozoa, Anthozoa, and Sponges. The particular form which the proximate ancestor of the Mydrozoa took (1 in fig. 16) is most nearly exhibited at the present day in Lucernaria and in the scyphistoma larva (hydra-tuba) of Discomeduse. It was a hemispherical cup-like polyp with tentacles in multiples of four, with four lobes to the wide enteric chamber. This polyp, after passing a portion of its life fixed by the aboral pole, loosened itself and swam freely by the contractions of the circular mascular fibres of its hypostome (sub-umbrella), and developed its ovaria and spermaria on the inner walls of the enteric chamber. This ancestor possessed, like its descendants, a very marked power of multiplication, either by buds or by detached fragments of its body. Accordingly it acquired definitely the character of multiplying by bud-

formation during the earlier period of its life; each of the buds so formed completed in the course of time its growth into a free swimming person. We must suppose that the peculiarities of the two phases of development became more and more distinctly developed, the earlier budding phase exhibiting a more elongated form and simple enteric cavity (hydra-form), which subsequently I I cl oS

Fig. 18. Fig, 14.

Fic. 13.—Tentaculocysts of medusa (A, of Pelagia; B, of Charybdea). a, the free tentacle hanging in the notch of the disc; b, stalk; c, enteric canal continued into it; 4, enlarged portion of the canal; e¢, concretions on endodermal cells; 7, pigmented ectoderm; 9, lens. (From Gegenbaur.)

Fig. 14.—Cells from the olfactory pits (fovea neryoxe) of Aurelia, (After Schafer.)

characterize to the exclusion of the ocelli and vesiculi the Trachomedusce and Narcomeduse among HH. ydromedusce and all the Scyphomedusce, except Lucernaria, where they are replaced by "' colleto-cystophors."

The nervous system has only recently been correctly recognized in medusw, though seen by Agassiz as long ago as 1849, and described both by Fritz Miiller and Haeckel in certain forms (Geryonidew) more recently (1860). It differs remarkably in the two great groups into which the Hydroza are divisible. In the Scyphomedusw there is no continuous nerve-centre, but around and about each tentaculocyst nerve-fibres and cells are grouped in such a way as to divide the dise into zones of nerve supply corre- sponding to the number of tentaculocysts (usually eight).

Fig. 15,—Seattered nerve ganglion cells, ¢, from the sub-umbrella of Aurelia aurita. (After Schifer.)

Both the Hertwiys (Werven-System der Medusen, 1878) and Eimer (Die Medusen, 1879) entirely missed in their re- searches the large nerve-fibres and prominent ganglion cells (fig. 15) which were discovered by Professor Schafer of University College, London (Phil. Trans., 1879), in the Scyphomeduse. The writer can confirm Schiifer's observa- tion of the

existence of such fibres and ganglion cells in the region of the circular muscular zone on the oral face of the disc of Aurelia, immediately beneath the flattened epithelium of the ectoderm. Professor Claus of Vienna has independently described ("Polypen und Quallen der Adria," 1878) similar nerve-cells and fibres in Chry- saora and Charybdea. Professor Schafer failed to ascer- tain satisfactorily the origin and termination of the fibres, which appear, however, to originate in superficial ecto-

1 This relationship, demonstrated by the Hertwigs' discovery of the endoderm layer of the medusa's disc, differs from that supposed to obtain by Professor Allman. He supposed the medusa's disc to represent the coalesced tentacles of a hydra-form, and cited the webbed tentacles of Laomedea flexuosa in support of the identification, which had at the time very much to commend it.

became changed in the course of the ontogeny (develop- ment of the individual) into the umbrella or disc-like form, with coalesced enteric walls and radial and circular surviving spaces (medusa-form). And now the ancestry took two distinct lines, which have given rise respectively to the two great groups into which the Hydrozoa are divi- sible—the Scyphomeduse and the Hydromeduse. In the one set the hydriform persons of a colony, instead of each becoming metamorphosed into a medusiform person, pro- ceeded each to break up into a series of transverse divisions ; each division became a medusiform person, and was liberated in its turn as a free swimming organism (figs. 26 and 27). We must suppose that this process began historically by the outgrowth of new tentacles around the point where the disc of a person fully transformed from the

Fic. 16.—Diagrains to exhibit the plan of structure of hydriform and medusiform persons (ull exeept 5 are vertical sections). A, base of tentacles, Margin of the disc; B, oral margin; Ma, manubrium; Ze, tentacle; CV, circular vessel ; EnL, endoderm lamella; of, otocyst; oc, ocellus olf, olfactory pit; H, hood of tentaculocyst; mg, genitalia developing in manubrium; dg, genitalia develop~ ing in the dise (wall of a radiating canal); @P, sub-genital pits of the sub- umbrella; GF, gastral filaments; Ve, velum. 1, Form intermediate between medusa-form and hydra-form. 2,

Hydra-form with wide disc, manubrium, snd solid tentacles (Tubularian). 3, Hydra-form with narrower disc, and hollow tentacles (Hydra). 4, Medusa-form with endoderm lamella on the left, the section passing through a radiating canal on the right; a velum, two possible positions of the genitalia, and two kinds of sense-organs are shown (Hydromeduse). 5, A similar medusa-form secn from the surface. 6, Section of Aurelia aurita, to show especially the nature of the sub-genital pits, GP, outside the genital frills, and the position of the gastral filaments GF, as well as the flattened form of the dise.

hydriform to the medusiform phase was loosened in its attachment and about to separate from the colony, The "hastening of events," a well-known feature of organic growth-sequences, would complete the development of the newly sprouting person before the loosened medusa had got well away, and so on with a third, fourth, and even with twenty such successive buds. The separation of the adult form from its fixed larva by fission has been justly compared by Louis Agassiz to the separation of the Comatula from its pentacrinoid larval stalk. If the stalk could only produce new Comatule, the analogy would be complete, Lucernaria is in the same way coniparable with the stalked crinoids, being an adult form which retains the characters exhibited by the immature phases of its congeners.

The Scyphomedusce do not, however, all exhibit a hydriform phase, and a production of meduse by the

"strobilation" or "metamerizing" of a scyphistoma. Some of them (Pelagia) "hasten events" so far that the diblastula never fixes itself, but becomes at once a single medusa, the hydriform phase of the ontogeny being alto- gether omitted. Certain peculiarities of the medusa's struc- ture, above all the possession of gastral filaments (solid filaments like tentacles projecting in four interradial groups near the genitalia into the enteric cavity), serve to unite Pelagia, which has no larval stage, and Lucernaria (which is always of intermediate character between hydra-form and medusa-form) with the numerous species which develop by the strobilation of hydriform larve.

The second line of descent which has given rise to those Hydrozoa known as Hydromeduse uot only acquired at the start a different mode of producing medusiform persons, but the medusiform persons acquired characters differing from those of the Scyphomeduse in important (but not fundamental) features. The larval stage in this series developed the property of budding to a very great degree, so as often to form fixed tree-like colonies of considerable size. Then the transformation of the identical colony- forming persons into free-swimming persons was finally and definitively abandoned, and only a late-appearing set of buds proceeded to complete the typical changes and to become meduse. The earlier-produced buds were thus arrested in development, and became specially modified for the purposes of a fixed life as members of a colony. Thus they acquired the elongate form and the Sporadic position of the tentacles which we see in some hydriform persons of the Lydromeduse group (figs. 38 and 40), and were adapted to nutrition solely (hence the term trophosome applied by Allman to such colonies), The characters of the mature generative person, with its power of detachment and free locomotion, being confined to the later buds borne on the sides of the hydriform persons or on special portions of the colony, we find that the former became more and more specialized as sewwal medusiform persons in proportion as the latter became specialized as asexual hydriform persons, and thus it is that we have the remarkable phenomenon of hydriform colonies, developed from the eggs of medusa, producing as it were crops of medusx (figs. 34 and 37) which detach themselves and swim away to deposit their eggs (alternation of generations). The Hydromeduse never produce medusz by strobilation or transverse division of a hydriform person, although in rare cases the cicatrix left by a detached medusa-bud has been observed to sprout and produce a hydriform person. Neither medusiform nor hydriform persons of the Hydromeduse series ever have gastral filaments (unless they are represented by the "villi" of the Siphonophora described by Huxley, Oceanic fHydrozoa), whilst the medusa-forms always possess a velum and a comparatively simple set (four, six, or eight) of radi- ating canals in the disc, the remains of the enteric lumen.

The complete differentiation of hydriform and medusi- form persons existing on one and the same colony having been attained in the Hydromeduse, further changes of a most remarkable character were

brought about in some of the descendants of these forms. The condition which we have so far noted is perpetuated at the present day in Bougainvillia (Eudendrium), Campanularia, and a vast number of the so-called hydroid polyps; others have undergone further adaptational changes. We have to notice at least four important additioual modifications independent of one another.

(1.) The hydriform stage was suppressed altogether, and, as in some Scyphomeduse, so here too the diblastula developed directly into a medusa (Trachomeduse, Narco- meduse, and probably some Leptomeduscee like Thaumantias and Aquorea, and some Aunthomeduse like Oceania and T'urritopsis),

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(2.) The medusiform persons being early produced did not is seen by the considerations just adduced to be fallacious. separate themselves from the colony, but the whole colony | The Hydromeduse, it is true, often (not always) develop became free (if it ever were fixed), the medusiform persons | their generative products from the ectoderm, and the geni- carrying the hydriform persons away with them. Thus the | talia frequently project as ridges and discharge themselves highly differentiated swimming and floating colonies of the | directly to the exterior in this division. The Hydromeduse Siphonophora originated. contrast in this respect with the Scyphomeduse and An-

(3.) The medusiform persons ceased to detach themselves | thozoa, which develop their genitalia from the endoderm, from the fixed hydriform persons or colonies, and developed | and are (to use Rapp's terms) Hndoarti whilst the former the ova and sperm within themselves, whilst still small in | are Hxoarii. But the bodies mistaken for external generative size and attached to the hydriform stock. Having once | organs by Rapp and other early observers in many hydroids, abandoned the detached, free-swimming life, the meduse | and in Hydra itself, are aborted degenerate medusa. underwent in different genera a varying amount of degene- (4.) A further set of changes, which have affected the ration and atrophy, of which we

have in existence all | original hydriform colonies and their medusa-buds so as to produce new complications of structure among the Hydro- medusc, are summed up under the head of " polymorphism." The differentiation of hydriform and medusiform persons is a case of dimorphism; a further distribution of functions, with corresponding modification of form, gives us "nolymor- phism." Polymorphism is unknown in the Scyphomeduse, and it is chiefly confined to two groups of Hydromeduse (the ¢ D ec Hydrocoralline and the Siphonophora). In the hydriform

colonies of Hydractinia (one of the Gymnoblastea-A nthome- pa, 1i=plagn haratng se gant dogepraton of he eles bal | dus) the outer hydriform persons of the solony (gS tinuations; the lighter shading represents the genital products (ova or sperm). differ in form from the rest, and have wart-like tentacles. In (phanerocodonic gonophor of Allman); B, modified medusiform person, with the same genus, and also in many Calyptoblastea, the hydri- margin of tho disc (nmbrella) united above and imperforate (mouthless) manu- | form persons which are destined especially to give origin vrtamuion of the enteric cavity into the umbrella,—rudimentary invaginalton to medusa-buds are devoid of tentacles and mouth, and above to form the sub-umbrella cavity; D, sporosac with manubrial portion are known a8 blastostyles (Allman), (fig. 43), Tn Hydro- coralline (fig. 53) elongated hydriform persons (dacty- lozooids) with no mouth and sporadic tentacles are set in series around a central short mouth-bearing person (gastro- zooids) forming the "cyclo-systems " of Mr Moseley (figs. 52and55). In the Siphonophora, in addition to nutritive (hydriform) persons and generative (medusiform) persons, 'there may be rows of swimming-bells (meduss devoid of mouth and of genitalia), covering-pieces (flattened medusz), and tentacle-bearers (hydriform persons with one long highly-developed tentacle), (see figs. 56 and 57).

Hypothesis of the Individuation of Organs.—The building up of complex individualities, such as a hydrozoon colony, a flowering plant, or a segmented worm or arthropod—in any one of which a number of common units are repeated, but with varied form and function in each part of the com- pound body—is generally admitted to be explicable in two ways, and which of the two explanations may be adopted in any one case must depend on the ultimate inference from a wide series of observations. The first

hypothesis, which undoubtedly applies to the ordinary hydriform colonies of Hydrozoa, to the segments of Tenia, and to plants formed by the repetition of phyllomes, is that an original unit like those which constitute the composite organism has freely budded, and repeated its own structure in the well-marked units which remain conjoined to form an aborescent or linear aggregate. This is '¢ eumerogenesis," and such aggregates may be termed eumeristic. By a division of labour and consequent modification of form , among the units of a eumeristic aggregate, such an aggregate may (in the course of phylogeny) acquire varied shape and definite grouping of its constjtuent units, and a high speci- alization as an individual. The high degree of individua- tion which may be thus attained is due to the more or less complete synthesis of o eumeristic colony. The more highly individuated Cheetopods and Arthropods are syn- thesized linear colonies. The cyclo-systems of the Hydro- coralline are undoubted examples of synthesized colonies. The second hypothesis is one which is applicable to cases which, in the absence of special evidence to the contrary, might be regarded as highly synthesized colonies. Accord- ing to this second hypothesis, such highly individuated composite organisms have not (in their phylogeny) passed

possible degrees, leading from the fixed " phanerocodonic gonophors" (Allman, pell-like genital buds) of many Siphonophora through the " adelocodonic gonophors" (genital buds with the bell no longer open but closed by the union of the margins of the disc) of Cordylophora to the sporosacs of Hydractinia, and even to the simple genital warts of the little degenerate Hydra viridis of fresh waters (see fig. 17, and explanation). By this process a large num-

Fic. 18.~Two female sporosaes (degenerate medusx) of Hydractinia echinata. (From Gegenbaur, after Van Beneden.) a, ectoderm; 8, endoderm; 0, egg- cells; g, enteric cavity. In A an invagination of the ectoderm, which is more complete in B, represents the rudiment of the sub-umbrella space.

ber of Hydromedusee (figs. 35, 38, 39, 40, and 42) have lost all evidence of the real characters of their medusa-forms, just as others. have suppressed the evidence of their hydra-forms by direct development from the egg ; and inasmuch as both these processes take place in genera having the closest

affinity with genera in which both hydra-form and medusa-form are fully preserved, it is not possible to erect groups similar to the Haplomorpha of Carus or the Monopsea of Allman for their reception, The difficulty of classification is, however, rendered very great, for a double system becomes necessary, which shall deal with the characters of hydriform and medusiform persons in parallel equivalent series. The difficulty is considerably enhanced when we find that iden- tical medusa-forms may spring from unlike hydra-forms, and, conversely, that closely allied hydra-forms may give rise to very different medusa-forms. The character first noticed by Rapp as distinguishing the hydroid polyps from the coral-polyps, namely, that of developing their genitalia as external bodies (Zxoarii) instead of internally (Endoarit),

through a eumeristic phase in which the units were well developed and alike, but the tendency to bud-formation (whether lateral, linear, or radial) has all along acted con- currently with a powerful synthetic tendency, so that new units have from the first made but a gradual and disguised appearance. This is "dysmerogenesis," and such ageregates as exhibit it may be called dysmeristic. In dysmeristic forms the individuality of the primary unit dominates from the first, and the merogenesis (segmentation or bud-forma- tion) can only show itself by partially here and more com- pletely there compelling (as it were) the organs or regions of the body of the primary unit to assume the form of new units, The arms of star-fishes are, when we consider them as derived from the antimera of a Holothurian, explained as examples of dysmerogenesis. So, too, the series of segments constituting a leech, and probably also the segments of a vertebrate. Eumerogenesis and dysmero- genesis are only variations of one process, merogenesis, and no sharp line can be drawn between them. Individuation may appear at any period in the phylogeny of a eumeristic aggregate and synthesize its units. On the other hand, in- dividuation is more or less completely dominant throughout the history of a dysmeristic aggregate, and is gradually broken down as a more and more complete analysis of the primary unit into new units is effected. It will be observed, however, that in dysmerogenesis, the form which individua- tion tends to preserve is that of the primary unit (notably the case in leeches as compared with the

ameristic flukes), whereas when we have eumerogenesis followed by synthesis the resulting form-individuality is something absolutely new. Thus, using the terms eumeromorph and dysmero- morph, we have—(1) synthesized eumeromorph simulates normal dysmeromorph ; (2) analysized dysmeromorph simulates normal eumeromorph.

Whether the fixed hydriform colonies of the Hydrozoa, with their more or less complete medusiform buds, and further, the floating colonies of Stphonophora, with their polymorphous units, are to be regarded as synthesized eumeromorphs or as dysmeromorphs, more or less analysed, is perhaps still open to discussion. The former view (that adopted here) is that held by Allman (Monograph of the Tubularian Hydroids, 1874), by Leuckart (1851), by Gegenbaur (Grundriss, 1874), by Claus (Grundztige der Zoologie, 1876), and by the Hertwigs (Organismus der Medusen, 1878). On the other hand, Huxley (Oceanic Hydrozoa, 1856), formerly Gegenbaur (Zur Lehre der Gene- rations-Wechsel, 1854), and, more recently, Ed. Van Beneden ("De la distinction originelle du testicule et de Vovaire," Bull. Acad. Roy. Belg., 1874) have held that the medusi- form person is a generative wart which has gradually assumed the characters of a bud, and that the various phases presented by it in different genera are so many more or less successful strivings after complete assumption of the hydra-form (from which the médusa-form is thus secondarily derived). Similarly the variously modified units of the siphonophiorous colony have been regarded as the organs of a parent unit which have each more or leag completely acquired the form of that parent unit, or, in other words, the colonies in question have been held to be dysmero- morphs. Recently ascertained facts as to the polymorphism of Hydrocoralline, but more especially the demonstration of the identity of structure of the meduse of the Scypho-medusan and Hydromedusan groups, and, further, the mode of development of the Scyphomeduse from the scyphistoma and the relations of the generative products to the enteric cavity, combine to render the view that the polymorphous and dimorphous colonies of Hydrozoa are synthesized eumeromorphs more probable, in the judgment of the present writer, than that which would explain them as dysmeromorphs.

The term "merogenesis," and its subordinate terms, "'eumerogenesis, dysmerogenesis," d&c., are applicable to units of the first order, namely, cells, as well as to the "persons" which are built up by them. Ordinary cell-division is an example of eumerogenesis; free-formation of nuclei, as in the fertilized ovum of Arthropods, is dysmero- genesis. A syncytium is usually a synthesized eumero- morph, but may be a dysmeromorph.

Definition of the Hydrozoa.—The Hydrozoa are Celentera nematophora, distinguished from the fellow-group Anthozva (the name applied to Actinozoa when the Ctenophora are removed from them) by not possessing the latter's constant and sharp differentiation of the arch-enteric cavity into axial digestive and periaxial septate portions, usually by a simpler form of nematocyst, and generally by lower histo- logical differentiation.

The following is a brief summary of the chief characters of the larger divisions of the Hydrozoa:—

*Snb-class I. ScypHomepusa,—These are I: ydrozoa which in the adult condition al- ways have four or eight interradial groups of ¢- gastral filaments ('" pha- celle" of Haeckel) (figs, 16 (6), 23,and 26). Thegenitalia (ovaria and _ sper- maria) are developed from endoderm, and are always interradial (in the four radii formed after the first Fic. 19.—Diagrammatic vertical section of a four). The hydraform —Zecernara nthe plane of an interaiug is nota * hydroid," but a dise, giving rise at a' to two groups of short polyp with broad fil: atredin in potion; aid eh Remponiempge-sha scyphi-. gue eens rary ot zat, ead stoma, which gives rise to septum which runs along the angular pro- medusa-forms "by trams- <2 ofthe tse. to which the letters verse fission (strobilation), interradial gastral filaments or phacelle. or itself develops genitalia 'tet Allman.)*

(Lucernarie). Combined visual and auditory organs in the form of modified tentacles (tentaculocysts) to the number of four, eight, or more occur on the edge of the disc (except in Lucernarie, where they are represented by the '"colleto-cystophors"), The medusa-form in some cases develops from the egg without the intermediate scyphistoma-stage (Pelagia, Charybdea'). The edge of its disc is provided with lappets, which cover the sensorial tentaculocysts (hence Steganophthalmia of Forbes), and is not provided with a velum (hence "Acraspeda" of Gegen- baur), excepting the

rudimentary velum of Awrelia (fig. 31) and the well-developed vascular velum (pseudo-velum) of Charybdea (fig. 21), There is no continuous marginal nerve-ring (except in Charybdea), but several separate marginal nerve centres (hence Toponeura of Eimer). The

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1 Quite recently the Hertwigs (Jenatsche Zetischr., bd. vi., new series, 1879) have insisted that in the Hydromeduse the genitalia (both ova and testes) are developed from the ectoderm, whilst in the Scyphomeduse and in the Anthozoa they develop from the endoderm, On this account they propose to abandon the grouping into Hydrozou and Anthozoa of Celentera nematophora, and suggest two groups, the Ectocarpee and the Endocarpee —the former equivalent to Hydro- meduse, the latter embracing Scyphomeduse and Anthoxoa, The Anthozoa exhibit a further predominance of the endoderm in its ex- tensive origination in them of muscular fibre, which but rarely and in small quantity develops from endoderm in the Hydromeduse or in the Scyphomeduse. The Hertwigs base their generalization on their own studies of meduse, but they have ignored the observations of Van Beneden on Hydractinia and of Ciamician on various Tubularians, in which the origin of either sperm or ova from endoderm is established. Recently Fraipont has repeated an observation of Van Beneden's on Campanularia, and shown conclusively that the ova in that form arise from endoderm. Weismann (Zoologischer Anzeiger, May 1880) shows the same for Plumularide and Sertularide; the reader is referred to his paper.

diblastula in all cases, as yet observed, is formed by in- vagination, the blastopore closing up (Balfour).

Fig. 23,

Fic. 20.—Charybdea marsuptalis (natural size, after Clans). The four annulated tentacles are seen devending from the four lappets placed at the four corners of the quadrangular nmbrella. These are interradial, Two of the four perradlal enteric pouches of the umbrella, representing radiating

canals, are scen of apale tint. Fg, gastral filaments (interradial); A, the modified perradial tentacles forming tentaculocysts; G@, corner ridge facing the observer and dividing adjacent pouches of the umbrella; GF, position of one of the genital bands.

Fra, 21.—View of the margin of the nmbretla of Charybdea marsupialis (natural size, after Claus). At the four comers are secn the lappets which support the long tentacles, and in the middle of each of the four sides is seen a tentaculo- eyst. Vel, the vascular velum or pseudo-velum, with its branched vessels.

Fr¢. 22.—Horizontal section through the umbrella and manubrium of Charybdwa marsupialis (modified from Claus). Ma, mannbrium; SR, side ridge (perradial); OR, corner ridges, separated by CG, the interradial corner groove; Ge, the genital Jumellee in section, projecting from the interradial angles on each side into UE, the enteric pouches of the umbrella; SU, the sub-umbrella space.

Fic. 23.—Vertical sections of Charybdea marsupialis, to the left in the plane of an interradius, to the right in the plane of a perradius. Afa, manubrium ; EAx, axial enteron; Gh, gastral filaments (phacelle); CG, corner groove; SR, side ridge; EnZ, endoderm lamella (line of concrescence of the walls of the enteric cavity of the umbrella, whereby its single chamber is broken up into four pouches); Ge, line of attachment of a genital band; £U, enteric pouch of the umbrella, in the left-hand figure, points to the caylty uniting neighbouring pouches near the margin of the umbrella and giving origin to TCa, the tentacular canal; Ve, velum; Fr, freuum of the velum; Ze, tentaeulocyst.

The binary division of the Hydrozoa was established by Esch- scholtz (System der Acalephen, 1829) whose Discophoree phanero- carpe correspond to the Seyphomcduse, whilst his Discophore eryptocarpe represent the Hydromeduse, The terms point to dis- tinctions which are not valid. In 1853 Kolliker used the term Dis-

cophora for the Scyphomedusee alone, an illegitimate limitation of the term which was followed by Louis Agassiz in 1860. Nichol- son hag used the term in the reverse sense for a heterogeneous assemblage of those medusz

not classified by Huxley as Lucernaridee, nor as yet recognized as derived from hydroid trophosomes. This use of the term adds to the existing confusion, and renders its abandonment necessary. The term Discomeduse was used for the Scyphomedusee by Haeckel in his Generelle Morphologie (exclud- ing Charybdea)—whilst Carus (Handbuch, 1867) confines the term Medusee" to them alone, which is objectionable, since it belongs as justly to the Hydromeduse. Forbes's term for them, Steganoph- thalmia, indicates a true characteristic, failing only in the Lwcer- naric, but its complementary term Gymnophthalmia is inaccurate. Similarly the terms Acraspeda and its complement Craspedota are inacceptable. Eimer his proposed to use the terms Toponeura and Cycloneura for the two divisions —but Charybdea appears to break down this division as so many others. The old term Acalephe, which is retained by Gegenbaur in its proper sense for all the Carlentera nematophora, is used as the designation of the Scypho- meduse alone by Claus (@rundziige der Zool., 1878), which cannot fail to produce confusion. The term Lucernaride, proposed so long ago as 1856 by Huxley (Med. Times and Gazette), most truly indi- cates the relationships of these organisms which he was the first to recognize, but it seeins desirable to restrict this term to the limited order in which Lucernaria is placed, and to employ for the larger group—Scyphomeduse—a term which is the true complement of the convenient name assigned to the other division of Hydrozoa, viz., Hydromeduse.}

Order 1. Lucernarie,—Scyphomedusee devoid of tenta- culocysts, with the aboral pole of the body prodnced into an adhesive disc by which the organism (which possesses the power of swimming by contraction of the circular muscular zone of the hypostome) usually affixes itself. The enteric cavity is divided into. four perradial chambers by four delicate interradial? septa. The genitalia are developed as four-paired ridges at the sides of the interradial septa cn the oral wall of the chambers (fig. 19). No reprodue- tion by fission nor "alternation of generations" is known in the group. At the edges of the disc capitate tentacles are developed in eight adradial ? groups ; between these are modified tentacles in some genera,—the marginal anchors or colleto-cystophors. The canal system which has sometimes been described in them is a product of erroneous observation. A very few genera and species of this order are known. They may be justly called the coenotype of the medusz (James Clark), and their relationship to

the free swimming forms may be compared, as was done by L. Agassiz, to the relationship of the stalked Crinoids to such forms as Coma- tula, Three species are not uncommon on the British coasts.

By Milne Edwards the animals forming this group were termed Podactinaria and associated with the A uthozoa. By Leuckart they were termed Calycozoa ; it is only of late that the closeness of their relationship to the Scyphomedusce has been fully recognized, though long since insisted on by Huxley and by James Clark. Haeckel in his new system of the medusee (Siteungsber. der Jenaische Gesclischaft fiir Medicin wnd Naturwiss., July 26, 1878) adopts for them the tenn Scyphomcduse in allusion to their permanently maintaining the distinctive features of the scyphistema larval form of the Acraspede, the term which he adopts from Gegenbaur for our Scyphomeduse.

Order 2. Discomeduse.—These are Scyphomeduse de- veloping as sexual medusiform persons by transverse fission from a scyphistoma, or else directly from the egg. 'They have eight tentaculocysts, four perradial, four interradial, and sometimes accessory ones (adradial). Four or eighit genital lobes (ovaria or spermaria or hermaphrodite) are developed from the endoderm forming the oral floor of the central region of the enteric cavity, which is produced into a corresponding number of pouches. The mouth is either a simple opening at the termination of a rudimentary manubrium (sub-order Cubostome), or it is provided with four or eight arm-like processes (sub-orders Semostome and Rhizostome). In the sub-order Rhizostome (fig. 24, a), the ie

1 Scyphomedusee (oxtpos, & cup) are meduse which are related by strobilation to Scyphistoma,—a wide-mouthed polyp with four gastral ridges. Hydromeduscee are medus related to a Hydra,—a narrower polyp, devoid of gastral ridges,—by lateral gemmation.

? For use of these terms see paragraphs on Aurelia below.

ee

edges of the oral opening fuse together at an early age and leave several sucker-like secondary mouths, which were formerly mistaken for independent persons. The central enteric chamber is continued through the dise by a com- plicated often reticulate system of radiating canals, which excavate the endoderm lamella.

In the Semostome and Rhizostome (not in the Cubostoma) four remarkable (respiratory) sub-genital pits (fig, 28) are hollowed out in the gelatinous substance of the sub-umbrella (oral face of the umbrella). These do not communicate, as

Fic. 25—Four stages in the development of Chrysaora. A, Diblastula stages B, stage after closure of blastopore ; C, fixed larva with commencing stomodsum ororal ingrowth ; D, fixed larva with mouth, short:tentacles, &c.; ep, ectoderm ; a ~ irae st, stomodzeum ; m, mouth; b/, blastopore. (From Balfour, after

aus.

has been erroneously supposed, with the genital organs, the products of which normally are evacuated by the mouth. In the Tetragamelian Rhizostome these pits remain distinct from one another as in Semostome, but in the Monogamelian Rhizostome they unite to form one continuous sub-genital cavity placed between the wall of the enteric cavity and the polystomous oral disc. The common English forms, Aurelia, Chrysaora, and Cyanea, are types of the Semo- stome, the somewhat less common WRhizostoma of the Monogamelian Rhizostome, whilst Nausithoe and Disco- medusa represent the simple Cubostome.

The writer has adopted the term used by Haeckel for this order, and is indebted to his preliminary notices of a large work on the Medusc, now in the press, for outlines of the classification and de- finitions which have been introduced with modifications in relation to these and the other Meduse. The term Discophora is used by Claus (@rundziige) for the Discomeduse. 1t is quite clear from the varied and inconsistent use by different authors of that term, and also of the terms Acalephee and Meduse, that they must be ejected altogether from use in systematic treatises.

The structure of the common Aurelia aurita and its

development have recently formed the subject of investiga- tion by Claus, Eimer, and others. As the current accounts

Fig. 26.—Later development of Chrysaora and Aurelia (after Clans). A, Seyphi- stoma of Chrysaora, with four perradial tentacles and horny basal perisare, B, Oral surface of later stage of scyphistoma of Aurelia, with commencement of four interradial tentacles. The quadrangular mouth is seen in the centre; the outline of the stomach wall, seen by transparency around it, is nipped in four places interradially to form the four gastric ridges. C, Oral surface of a sixteen-tentacled scyphistoma of Aurelia, The four gastric interradial ridges are seen through the mouth. D, First constriction of the Aurelia scyphistoma to form the pile of ephyre or young meduse (see fig. 27). The single ephyra carries the sixteen scyphistoma tentacles, which will atrophy aud disappear. The four longitudinal gastric ridges are seen by transparency. EK, Young ephyra just liberated, showing the eight bifurcate arms of the disc and the interradial single gastral filaments. F, Ephyra developing into a medusa by the growth of the adradial regions. The gastral filaments have increased to three in each of the four sets. .A, margin of the mouth; Ad, adradial radius; F, gastral filament; Jn, interradial radius; JG, adradrial gastral canal; JR=R, adradial lobe of the disc; X, lappet of a perradial arm; M, stomach wall; Ist, muscle of the gastral ridge; Mw, gastral ridge; Ms, mesoderm; O, tentaculocyst; P, perradial radius; #2, interradial radius ; Zi, adradial radius; SG, commencement of lateral vessel.

in text-books are very inadequate, a short sketch of the morphology of that form is appended here,

From the egg, according to the researches of Claus (whose figures, here repro- duced, refer more especially to the closely allied genus Chrysaora, up to the comple- tion of the scyphistoma), a single-cell-layered blastula de- velops which forms a diblastula by invagination (fig. 25, A, B, C). The orifice of invagination closes up, and the ciliated "planula" (as this stage used to be termed in all Celentera), after swimming around for a time, fixes itself, probably by p,,. 97.

—~Development of Aurelia,

the blastoporal pole. The true mouth then forms by inruption at the opposite pole. Two ten- tacles now grow out near the mouth opposite to one another (fig. 25, D), and are followed by two more (fig. 26), these indicating the four primary radii of the body which pass through the angles of the four-

sided mouth, and are termed yperradial.

Above to left, young scyphistoma with four perradial tentacles. Be- low to left, scyphistoma with six- teen tentacles and first constriction. To the right, strobila condition of the scyphistoma, consisting of thir- teen metameric segments; the up- permost still possesses the sixteen tentacles of the scyphistoma; the remainder have no tentacles, but are ephyre, each with eight bifid arms (processes of the disc). Each segment when detached becomes an ephyra, such as that drawn in fig. 26, E, F, (From Gegenbaur.)

Meanwhile

the aboral pole narrows and forms a distinct stalk, which in Chrysaora secretes a horny perisarc (fig. 25,

D). Four new tentacles, those of the intermediate or secondary radii, now appear between the first four, and are termed interradial. At the same time four longi- tudinal ridges grow forward on the wall of the enteric cavity (fig. 26), These interradial ridges have sometimes

Fra. 28.—Surfaee view of the sub-umbrella or oral aspeet of Aurelia aurtia, to show the position of the openings of the sub-genital pits, GP. In the centre is the mouth, with four perradlal arms eorresponding to its angles (compare fig. 26). The four sub-genital pits are seen to be interradial, 2 indicates the outline of the roof (aboral limit) of a sub-genital pit; y, the outline of its floor or oral limit, in whieh is the opening (compare 6 of fig. 16).

been erroneously described as containing each a longitudinal

canal connected with a circular canal at the base of the

tentacles. They are in reality solid, as is the margin of the hypostome from which the tentacles spring. It is in con- nexion with these four ridges that the gastral filaments will subse- quently appear, as also the genital organs either along their middle line or adradially to them. The ridges correspond to the mesenteries of the Anthozoa. Light additional tentacles placed one on each side of the perradial ten- tacles (or of the inter- radial, according as we may choose to regard the matter) next appear, and are distinguished as adradial. All the ten- tacles reaching an equal size, we obtain the ap- pearance seen in fig. 26, when the young scyphi- stoma is looked at from above. Looked at from the side, with its wide hypostome and _ short vertical axis, the scy-

Fic. 29.—Half of the lower surface of Aurelia aurita, The transparent tissues allow the enterie cavities and canals to be seen through them, a, marginal lappets hiding tentaeulo- eysts; 0, oral arms; ¥, axial or gastrie portion of the enterie cavity; gv, radiating and ana- stomosing canals of the enteric system; ov, ovaries. The gastral filaments near to these are not drawn. (From Gegenbaur.)

phistoma differs widely from an ordinary hydra-form, and.

approaches the medusa-form, to which its four longitudinal gastral ridges further assimilate it. The little creature is now about an eighth of an inch in height; in other genera, but not in Chrysaora, it may now multiply by the produc- tion of a few buds from its fixed basal disc. After nourish- ing itself for a period, and increasing to four or five times the size just noted, the vertical axis elongates and a series of transverse constrictions appear on the surface, marking off the body of the scyphistoma into a series of dises (figs. 26 and 27), each of which by the development

of tentacles and completion of the constriction will become a separate medusa (in its young state called “ ephyra ”). The tentacles of the Aurelia and the structure of the margin of its hypostome are very different from those of the scyphistoma. They are exhibited in their earliest condition

(when the Awrelia-medusa is first liberated from its attachment and is an ephyra) in fig. 26, E, F. The margin of the hypostome is drawn out into eight arms (which are not to be confused with tentacles); the end of each arm is bifid, carrying a pair of lappets—the marginal lappets which persist in the adult (see figs. 30 and 31). Be- tween the lappets is placed a short and peculiar tentacle, the tentaculocyst or sense-organ. The eight arms of the disc and their tentaculocysts are perradial and interradial As the organism grows, a set of eight adradial tentacles appear in the notches between the eight arms, but never attain any relatively large size in Aurelia. The asteroid arm-bearing

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Fig, 30,—Tentaculoeyst and inarginal lappets of Aurelia aurita. In the left-hand figure—MZ, marginal lappets; Z, tentaeulocyst; A, superior or abural olfactory pit; MZ, marginal tentacles of the disc. The view is from the aboral surface, magnified about 50 diameters. In the right-hand figure—A, superior or aboral olfactory pit; B, inferior or adoral olfactory pit; H, bridge between the two marginal lappets forming the hood; 7, tentaculocyst; nd, endoderm; Ent, canal of the enteric system continued into the tentaculoeyst; Con, endo- dermal eoneretion (auditory) ; oc, ectodermal pigment (ocellus), 'The drawing represents a section, taken in a radial vertical plane so as to pass through the long axis of the tentaeulocyst. (After Eimer.)

character of the margin of the disc is soon obliterated by the relative growth of the intermediate adradial areas, which become quite filled up, so that in the adult the tentaculocyst is carried in a notch instead of on a prominence, and is concealed by the two lappets (figs. 28 and 30). The margin of the disc between adjacent pairs of lappets gives rise to a fold which grows inwards (toward the mouth) during an early stage (fig. 31), and numerous small tentacles (the fringe) appear along the margin of the disc, which soon equal in size the first adradial tentacle. The in- growing fold is the velum or "pseudo-velum," and never increases in size, so that in the adult it is not observ- able. The tentacles also remain very small and fine in Aurelia,

forming a continuous fringe along the edge of the disc, interrupted only by the eight notches for the tentaculocysts (fig. 29).

The sixteen tentacles of the scyphistoma are necessarily attached to the most anterior of the pile of medusze ; they atrophy, but to what extent they may be metamorphosed to form the parts of the ephyra or young medusa has not been determined. The scyphistoma, having given rise to its pile of ephyre, may (in some genera, Aurelia!) redevelop its own kind of tentacles below the constriction marking off the last ephyra. Hence scyphistoma tentacles appear sometimes at the top and sometimes at the bottom

Fia. 31.—Part of the margin of the dise of a young Aurelia, to show the rudl- mentary velum, Vel, extending from the marginal Jappets, JfZ, on either side; 7", the small tentacles fringing the dise.

of the pile, which has led to diverse accounts of the mode of development of the ephyre.

Whilst changes are going on in the configuration of the margin of the disc of an ephyra on its way to the perfect form of the adult Aurelia, the enteric cavity has also under- gone most important changes. Foremost in importance is the development of a single gastral filament on each of the four gastral ridges which necessarily are present in the transverse slice (so to call it) of a scyphistoma, which becomes an ephyra (fig. 26). These rapidly increase in number as the ephyra grows. Further, the enteric cavity at first follows the outline of the ephyra, sending a process into each arm, but then by adhesion of its walls is converted into a four-lobed central chamber, a marginal canal, and an endoderm lamella. A system of canals, the arrangement of which is seen in figs. 29 and 31, subsequently opens out again certain lines and tracts of the conjoined endoderm walls.

In the adult Awrelia we find the mouth surrounded by four large arm-like perradial processes (figs. 25 and 29) (not tentacles), and leading through a short manubrium into a flattened four-lobed chamber, the lobes being inter-radial, and having on their oral floor numerous gastral filaments (rich in thread cells) (6 in fig. 16). Each pouch or lobe gives off a canal, which runs

towards the circular canal at the margin of the disc, but breaks up into three or four secondary canals on its way. Between the pouches come off eight other "radiating" canals (adradial), which do not branch, but go straight to the circular canal.

The oral floor of the concavity of each lobe of the enteric cavity is occupied by,a horse-shoe-shaped frill (fig. 29, ov), either testis or ovary (the sexes being in separate indi- viduals). The open arms of the horse-shoe are turned towards the centre of the disc, and the folds of the genital frill are so deep as to show themselves on the outer ecto- dermal wall of the disc. Here, however, there is a very remarkable arrangement, which has rarely, if ever, been correctly described and figured in our common Aurelia. The gelatinous substance of the disc is hollowed out on that part of the oral face corresponding to the position of the genital frills, so as to form four separate extensive pits orchambers. Each of these sub-genital pits has in Aurelia a small round opening on the oral face of the disc (fig. 28, GP), but is otherwise entirely closed, having no com- munication with the genital tissues, from which it is separated by a delicate layer of ectoderm (6 in fig. 16). The pits probably serve to admit water for respiratory pur- poses into close proximity with the genital tissues.

The whole enteric surface, including canals, is ciliated, whilst the ectoderm is not ciliated, but provided with groups of nematocysts.

The tentaculocyst in the adult Aurelia is relatively an extremely minute body, completely hidden by the two large marginal lappets (fig. 30,1). Above it (that is, on the aboral surface, as the Awrelia swims) is a deep pit (A), Schifer's fovea nervosa superior, sunk in a sort of bridge which connects the two lappets and overhangs the tenta- culocyst. A similar pit (the fovea inferior) exists on the oral surface. These have been recognized by Claus, Eimer, and the Hertwigs as olfactory organs. The tentaculocyst is seen in section in fig. 30 (right-hand figure), which ex- hibits its central cavity continuous with the enteric cavity, its ectodermal pigment spot (eye), and its endodermal mass of concretions (auditory organ).

The chicf muscular mass of Aurelia, except that of the oral arms, is a circular zone on the oral face of the disc. The muscular fibres are not distinct cells, but transversely- striated processes of the epidermic cells

(epidermo-muscular cells) (fig. 9). In the "arms" of other medusz, and pre- sumably of Awrelia, the muscular fibre is formed by inde- pendent nucleated cells (fig. 9).

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The nerve-epithelium from the olfactory pits of Aurelia is drawn in fig. 14. Starting from this and from the cells of the tentaculocysts are nerve-fibres, which spread themselves on the surface of the circular muscular zone in the neigh- bourhood of the tentaculocysts, and these are connected each and separately with large isolated nerve-ganglion cells (fig. 15). The nerve-fibre is continued beyond the cell, and in some instances has been traced into a broadened ex- pansion lying on a muscular fibre (Schiifer). The nerve-ganglion cells lie very superficially immediately below the flat epithelium of the body surface and between it and its muscular processes. .

The ova and spermatozoa of Aurelia develop in the genital frills from endoderm cells in separate individuals. They pass to the exterior through the mouth.

Order 3. Conomeduse,—Scyphomeduse with only four tentaculocysts, and these perradial. A broad velum (so- called pseudo-velum) of complete circular form is present, differing from that of the H7ydromeduse in the fact that it is penetrated by canals of the enteric system (Charybdea). The whole umbrella is bell-shaped. The genital organs are four pairs of lamelliform ridges (fig. 22) which are attached to the four narrow interradial septa that divide the large enteric cavity of the umbrella into four perradial gastro-canal pouches. The lamelliform genital glands hang freely in these pouches. At the edge of the umbrella are four

interradial lappet-like prolongations of the gelatinous sub- stance of the disc, which support each a long tentacle (fig.

20). The nerve-ring is complete, like that of the Hydro- medusce.

There is now no doubt that Charybdea, which has been placed in each of the two large divisions of the Hydrozoa, must be classed with the Seyphomeduse. The recent investigations of Claus (Arbeiten aus dem Zool.

Institut zu Wien, Ba. i. Hft. ii., 1878), as well as those of Haeckel and Fritz Miiller, lead to this conclusion. The term Conomeduse is adopted from Haeckel, who places here, besides Charybdeea and Tamoya, other forms, a fuller description of which may be expected in his forthcoming System der Medusen. In many respects—its quadrangular form, its marginal lappets, its broad enteric pouches in place of fine canals, its vascular velum, and its highly complicated tentaculocysts (fig. 13, B)—Charybdaa is peculiar. The simplicity of the enteric system and the arrange- ment of the genital glands brings it near to Lucernaria. The ex- istence of four interradial groups of gastral filaments, and the dis- position of the paired genital glands at the sides of the interradial septa, determine its position to be among the Seyphomeduse. Its development is not known. Figs. 20 to 23 illustrate the structure of Charybdcea.

Order 4. Peromedusee,—Scyphomedusce with four inter- radial tentaculocysts. The enteric system consists of three divisions,—an aboral main stomach with four interradial gastral ridges and filament groups ; a mid-stomach, which communicates by means of four perradial slits with a very large ring-sinus (occuping two-thirds of the umbrella) ; and thirdly, an oral portion or pharynx, with four wide per- radial pouches. The genital organs are four pairs of sausage-shaped interradial ridges lying on the oral floor of the ring-sinus,

This is a new group founded by Haeckel, of which we have at present no further details.

Sub-classIT. Hypromepusa.—Theseare Hydrozoa devoid of gastral filaments ; the sexual persons are always medusi- form, the genital glands are developed sometimes from ecto- dermal cells, sometimes from endoderm, and are always per- radial (in the radii of the first order), The medusiform per- sons always possess a muscular non-vascular velum (hence Craspedota) and a complete nerve-ring (hence Cycloneura of Eimer). The marginal sense-organs are either ocelli or oto- cysts or tentaculocysts. The diblastula, in all cases as yet observed, is formed by delamination (Balfour), The sexual medusiform persons may develop directly from the egg, but more usually the egg gives rise to a hydriform person—the hydroid—which differs from a scyphistoma in its elongate

vertical axis, the indefinite number (often also position) of its tentacles, and its frequent formation of a colony of large size by lateral budding. By lateral budding (not by

Fie. 32.—Diagram showing possible modifications of persons of a gymnoblastic Hydromedusa, a, hydrocaulus (stem); 6, hydrorhiza (root); ¢, enteric cavity ; d, endoderm; e, ectoderm; Jf, perisare (horny case); g, hydranth (hydriform person) expanded; g', hydranth (hydriform person) contracted; h;hypostome, bearing mouth at its extremity; 4, sacciform gonophor (sporosac) springing from the hydrocaulus; %', sporosac springing from m, @ modified hydriform person (blastostyle): the genitalia are seen surrounding the spadix or manu- brium; 7, medusiform person or medusa; ™, plastostyle. (After Allman.)

metameric fission) medusiform persons which alone develop sexual glands are produced on the hydriform colonies ;

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Fie, 33.—Diagram showing possible modifications of the persons of a Calypto- blastic Hydromedusa, Letters a to h same as in fig. 32. 7@, the horny eup or hydrotheca of the hydriform persons; 1, medusiform person springing from m, a modified hydriform person (blastostyle); m, the horny case or gonangium enclosing the blastostyle und its buds. This and the hydrotheea ¢ give origin to the name Calyptoblastea. (After Allman.)

these may separate from the colony, or may be retained in

a more or less degenerate form adherent to it, as generative buds or warts.

HYDROZOA

The medusiform persons of this group are the Discophore: crypto-

carpe of Eschscholtz, the Craspedota of Gegenbaur (1854), and the Hydromedusida of Kolliker (1858)—the last two authors at that time separating the hydriform persons as Hydroidea. Agassiz (1860) includes both sets of persons under the term

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Fig. 34.

Fig. 34.—Diagram of Corymorpha. A, & hydriform person giving rise to medusiform persons by budding from the margin of the disc; B, free swim- ming medusa (Steenstrupta of Forbes) detached from the same, with manu- prial genitalia (Anthomedusc) and only one tentacle. (After Allman.)

Fic, 35.—Diagram of Tubulariaindivisa. A single hydriform person a bearing a mele carrying numerous degenerate medusiform persons or sporosacs 6. (After Allman.)

Hydroida (together with Lucernaria), which also is the term adopted by Allman in his beautiful monograph (1 871-74). J. V.Carus, amend- ing the limitations given by Carl Vogt, was the first to use the term Hydromeduse in the sense here adopted (Handbuch der Zoologie, 1863), and it is now employed in the same sense by Gegenbaur (Elements of Comparative Anatomy, London, 1878), namely, to em- brace both the cryptocarpous meduse of Eschscholtz and the

Fig. 35.

Fic. 36.—Colony of Bougainvillea fruticosa, natural size, attached to the underside of a piece of floating timber. (After Allman.)

hydroids related to them. The term Hydromeduse is used unwisely by Claus (@rundziige d. Z.) for the whole group of Hydrozoa. It has been the practice of some authors to give a double classification of the group—one based on the characters of the medusiform per- sons, the other on that of the hydriform a. In the present article a double name will in some cases be assigned to a group— but the attempt is made to bring both sets of persons under one

system.

Order 1. Gymnoblastea-Anthomeduse.—These are Hydro- medusce which all, as far as is known, pass through a hydriform phase, but in which the medusiform persons may either reach full development or exhibit the extremest degeneration (Hydra). The ectoderm of the hydriform

persons may secrete a horny tubular protective case (perisare), but this does not form cups for the reception of the tentacular crown nor cases enclosing groups of medusi- form bads (gonangia).

The fully-developed medusiform

Fig. 87.—Portion of eolony of Bougainvillea (Endendrium) fruticosa (Anthomeduse- calyptoblastea) more magnified. (From Lubbock, after Allman.)

persons never possess otocysts nor tentaculocysts, but always ocelli at the base of the tentacles. The latter are usually four or six, corresponding to the same number of simple radial enteric canals, but may be more numerous or reduced to one or to two; rarely they are branched (Cladonema).

Fig. 40.

Fig. 38.—Diagram of Clava, showing a hydriform person surrounded by a

Fig. 38.

Fig. 39,

verticil of degenerate medusiform persons (sporosacs). (After Allman.)

Fic. 89.—Diagram of a colony of Hydractinia, showing four forms of persons. a, hydriform person; 6, moditied hydriform person, or blastostyle, bearing c, degenerate medusiform persons or sporosacs; d, modified hydriform person situated at the margin of the colony (dactylozooid). (After Allman.)

Fig, 40.—Diagram of a colony of Dicoryne, showing three forms of persons. a, normal hydriform person; 6, modified bud-bearing hydriform person (blasto- style); c, degenerate medusiform persons (sporosacs). (After Allman.)

The sexual glands are placed in the wall of the manubrium, either equally distributed all round it or in four separate

perradial groups, which are often divided into eight ad- radial groups by the perradial longitudinal muscles,

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This is a very well defined group, since the G@ymnoblastea of Allman, based on the characters of the hydriform persons—also known as J'ubularie and Gymnotoka—correspond exactly with the Anthomeduse of Haeckel's new system. Hydra is included here, though placed in a separate order by Allman. Some of the leading forms of hydriform and medusiform persons are given in the cuts (figs. 34 to 42). The greatest range in the amount of degenera- tion of the medusiform persons is seen even in genera of the same family—e.g., Turris and Clava—the former producing free meduse, the latter sessile sporosacs. The Occanidee of Gegenbaur (excluding the Williade, which Haeckel assigns to the next group) correspond on the whole to the medusa-forms of this order.

Fig. 41. Fig. 42,

Fig. 41.—Hydriform person of Syncoryne, witl medusiform persons budding from it, and shown in various stages of development, a, b, c,d, e. (From Gegenbaur, after Desor.)

Fig. 42.—Hydra viridis. ov, ovary; te, testis.

Order 2, Calyptoblastea-Leptomedusce.—These are Hydro- medusce of which the hydriform phase is known in a large number of cases, whilst of others only the medusa- forms are known ; none are known to develop directly from the egg to the medusa-form. As in the preceding group, the medusiform persons may reach full development or

Fig. 43.

Fig. 43,~Diagram of a colony of Campanularia, showing four forms of per-

Fig. 44,

sons. A, portion of a fixed colony; a, hydriform person; 5, bud-bearing hydriform person (blastostyle) ; B, free-swimming colony, being a sexless medusiform person (blastocheme of Allman), with modified medusiform persons budding from its radiating canals, as sporosacs. (After Allman.)

Fia. 44.—Medusiform person (Lizzia), one of the Anthomeduse, detached from a hydroid colony of the family Endendridew. Ocelli are seen at the base of the tentacles, and two medusiform buds on the sides of the manubrium, (After Allman.)

exhibit themselves as degenerate sexual sacs on the hydri-

form colonies. The ectoderm of the hydra-forms always

secretes a perisarc which forms a cup-like protection (hydro-

theca) to the tentacle-crown, and which also encloses the

group of medusa-buds in peculiar horny cases (gonangia),

The fully-developed medusiform persons (fig. 47) either XII. —- 71

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have no otocysts, but only ocelli (Ocellatw), or they have |

otocysts (fig. 11) (ectodermal sacs), four, eight, or over a hundred, not homologous with tentacles, and sometimes in addition ocelli (Vesiculate). The radial enteric canals are usually four or eight in number, but may be more numerous, whilst the marginal tentacles of the disc are either few or

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Fig. 45.

Fig. 45.—Medusiform person (Sarsia), one of the Anthomeduse, detached from a hydroid colony of the family Corynide. 6, the long manubrium, pearing (as an exception) medusiform buds; a, mouth.

Fig. 46.—Medusiform person, one of the Anthomeduse, detached from a hydro…

Fig. 46,

colony of Syncoryne. an exception) groups of medusiform buds.

very numerous, The genital glands always are placed in the course of the radial canals of the disc (not in the manu- brium), and stand out as groups of wart-like processes on the sub-umbrellar surface (fig. 43). Their mode of dis- charge is uncertain.

Fic. 47.—View of the oral surface of one of the Lepiomeduse (Irene pellucida, Haeckel), to show the numerous tentacles and the otocysts. ge, genital glands; M, manubrium; of, otocysts; re, the four radiating canals; Ve, the velum. The Calyptoblastea of Allman, Skenotoka of Carus, and Campanu-

larice of authors form a well-marked group of hydroids which, when

they give rise to free meduse, give rise to those termed Leptomedusce by Haeckel, corresponding to the Thawmantiade and Eucopide of

Gegenbaur's system. The calyptoblastic hydroid Leptoscyphus,which,

according to Allman, gives rise to a Lzzzia-like medusa (Antho-

medusce), is the only recorded exception to this correspondence.

The Aquoride and other meduse of similar structure have not been

traced into connexion with any hydriform trophosome, but we are

not justified therefore in concluding that they develop directly from the egg without hydriform phase. The chief point distinguishing the Leptomeduse as a lot from the Anthomeduse is the development of the generative bodies in the radial canals. This position is simi- lar to that occupied by the same organs in T'rachomeduse and

Scyphomeduse. Allman, however, considers the genital glands of

the Leptomeduse, not as mere glands like those of Aurelia or

Charybdea, but as a series of buds—a generation of aborted

medusz or sporosacs. In consequence he terms the medusa of the

Leptomedusee a blastocheme (or bud-producer), as distinguished from

a gonocheme (or genital-producer). In support of this view,

Ocelli are scen at the base of the tentacles, and also (as |

HYDROZOA

Allman (Monograph, 1874) adduees the various remarkable cases of production of buds by medusee which have been recorded (fig. 44, 45, 46), and, further, the very striking similarity between the structure of a lobe of the genital gland of Obelia and a sporosac such as we find in Hydractinia. It seems necessary to aeeept 'Allman's view on this niatter, unless we are prepared to abandon the homology of sporosacs with meduse in the case of hydriform persons.

The colonies of hydriform persons of the present group differ inter se according to the arrangement of the cups or hydrotheee. In Plumularide they are sessile, and all on one side of a branch ; in Sertularide they are sessile, and alternately placed on either side ; in Campanularide each cup is raised on a pedicel or stalk. The medusiform persons sometimes remain abortive and sessile in their gonangia.

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¥1¢.48.—Carmarina (Geryonia) hastata, one of the7rachomeduse. (After Haeckel.) a,nerve-ring; a', radial nerve ; b, tentaculocyst; ¢, circular canal; ¢, radiating canal; g", ovary ; h, peronia or cartilaginous process ascending from the carti- laginous margin of the disc centripetally in the outer surface of the jelly-like disc; six of these are perradial, six interradial, corresponding to the twelve solid larval tentacles, resembling those of Cunina; k, dilatation (stomach) of the manubrium; J, jelly of the disc; p, manubrium; ?, tentacle (hollow and tertiary, t.e., preceded by six perradial and six interradial solid larval tentacles) ; u, cartilaginous margin of the dise covercd by thread-cells ; v, velum.

Order 3. Trachomeduse,—Hydromedusce which have as sense-organs tentaculocysts. The otoliths (fig. 12) are

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*Fie. 49.—Diagram of vertical section of Carmarina hastata, passing on the right through the whole length of a radiating canal, and on the left through the outspread lobe of an ovary. /, gelatinous substance of the disc and gastric stalk (manubrium); *, radiating canal; rs, its outer, rl, its inner wall; 9, ovaries; &, stomach (dilatation of the manubrium); Z, tongue-like process of the gelatinous substance ; h, cartilaginous process ascending from the marginal ring at the site of a tentaculocyst; ¢, circular canal; 6, tentaculocyst; +, yelum; wk, cartilaginous marginal ring. (From Gegembaur.)*

formed by endodermic cells as in Scyphomeduse, and ocelli may or may not be present on the tentaculocyst.

The genital glands have the form of wide outgrowths or lamelliform enlargements in the course of the radial canals (figs. 48, 49). No hydriform phase is known in any member of this group, and one at least (Geryonia) has been observed to develop from the egg directly into the medusa- form.

Order 4. Narcomedusw.—These have the same characters as the Z'rachomeduse, excepting that the genital glands are in the wall of the manubrium or in pocket-like radial out- growths thereof (figs. 50 and 51). Further, the marginal tentacles of the disc possess peculiar "roots," which can be traced upwards into the gelatinous substance of the body. No hydriform phase has been observed in this group, whilst Aigina and Ayinopsis have been shown to develop directly from the ege to the medusa-form.

Fig. 50,—Cunina rhododactyla, one of the Varcomeduse. c, circular canal; h, " otoporps" (ear-rivets) or centripetal process of the marginal cartilaginous ring connected with tentaculocyst; &, stomach; 1, jelly of the disc; , radiat- ing canal (pouch of stomach); é¢, tentacles; ¢w, tentacle root. (After Haeckel.) The lappets of the margin of the disc, separated by deep notches, above which (nearer the aboral pole) the tentacles project from the disc (not mar- ginal therefore', are churactcristic of many Narcomeduse and Trachomeduse. Curtilaginous strands (the mantle rivets or peronie) connect the tentacle root with the solid marginal ring.

The two orders 7rachomeduse and Narcomeduscee are established by Haeckel in his new "system" for the peculiar forms classed by Carus as Haplomorpha, and by Allman as Monopsea. These latter names have reference to the fact that uo hydriform phase is known to occur in the life-history of these organisms, a fact which is not peculiar to them, and, if it should prove to be not universal amongst them, would by no means invalidate their claiin to a distinct posi- tion on the grounds afforded by the characters above given. They are remarkable for a certain hardness and stiffuess of the gelatinous substance of the disc, or at any rate of the cellular axis of the tentacles, on accout of which the orders are contrasted by Haeckel as D'rachyline with Anthomeduse and Leptomeduse, which are

termed Leptoline ; a curious parallelism as to the position of the genitalia exists between Anthomeduse and Nurcomeduse on the one hand and Leptoneduse and Trachomeduse, on the other. The orders present a very high degree of development, both in coarser and histological differentiation. At one time it was sup- posed, in accordance with Hacckel's observations, that Geryonia (Carmarina, fig. 48), one of the Trachomeduse, gave rise by buds from its enteric walls to young Cunine (Narcomeduse, fig. 50), but this has been explained by the obscrvations of Franz Schulze and of Uljanin as due to parasitism, young Cwunine in the condition of ciliated Planule entering the mouth and euteric chamber of the Carmarina. The same explanation probably applies (Claus) to the supposed internal buds of Cunina observed by Gegenbaur, Fritz Miller, and Metschnikow. The process is sufficiently remarkable according to the last observer, for the first generation of buds pro- duce a second generation by extcrnal gemmation, before attaining the characters of the parent Cunina. The anatomy of these forms

is fully given in Haeckel's memoirs in the Jenaische Zeitschrift, vols. i, and ii., 1864-66 ; also further dctails as to Carmarina are given in Eimer's Medusen, 1878.

Order 5. (Tydrocoralline.—These are Hydromeduse in

which the hydriform phase forms large colonies, presenting a copious calcareous deposit , in the ectodermal tissue (cce- nosteum of Moseley), leav- ing only the hydranths or ten- tacular region free from such | hardening. The medusiform persons are, at present, only known in the degenerate form of sporosacs, which occupy cavities (ampulla of Moseley) in the har- dened base of the colony (Stylasteride). No such cavities have been detected F's: 52,—Portion of the calcareous 7 = ; 1 corallum of Millepora nodosa, show- in others (Ailleporide), which ing the cyclical arrangement of the may, therefore, give rise to fydranths." Twice the mtual sise complete medusiform persons, (from Moseley.) In all a marked polymorphism has been observed (fig. 53), consisting in the differentiation of longer tentacle-like persons (dactylozooids) and shorter mouth-bearing persons (gastrozooids). The persons of both kinds are either scattered

irregularly or the dactylozooids are arranged around the gastrozooids in cyclosystems of greater or less definiteness, or in distinct rows (fig. 55). The position o these two kinds of hydriform persons is marked by definite groups of pits (cyclosystems) in the dried calcareous skeleton of the colonies, which simulate the calycles of the stony corals (Anthozoa).

Fig. 53.—Enlarged view of the surface of a living Millepora, showing five dactylozoolds surrounding a central gastrozooid. (From Moseley.)

Louis Agassiz was the first to recognize the true nature of the Milleporide, and his imperfect observations have been fully con- firmed and greatly extended by Mr Moseley (Phil. Trans. , 1878) who added the Stylasteride previously regarded as Anthozoa to the category of calcigenous hydroids, and founded the order of Hydrocoralline, The Stylasteride differ from the Milleporide in possessing a calcified axial style at the base of the dilated portion of each gastrozooid, and further in the ascertained development of sporosacs, and in the greater complication of their cyclosystems. These forms are abundant in tropical seas, and contribute with the Anthozoa and Corallines to the formation of coral reefs. ~~Adlopora and Stylaster occur off the Norwegian coast. The woodcuts illus~~ trating the strueture of this group are borrowed from Mr Moseley's Notes of a Naturalist on the " Challenger." ;

The nearest allies of the Hydrocoralline are such polymorphic Gymnoblastea as Hydractinia (fig. 89); the definite division of labour and the polymorphism in the former, together with their calci- genous peculiarity, entitle them to rank as a distinct order.

Order 6. Siphonophora.—These are Hydromeduse in which hydriform persons alone (Velella) or hydriform persons and sterile medusiform persons are united, under many special modifications of form, to constitute floating colonies of very definite shape and constitution. In addition to these are developed medusiform sexual persons which usually are sporosacs and only exceptionally attain full de- velopment so as to be liberated from the colony as free-swimming medusee (Velella, as Chrysomitra; Physalia, only liberating female meduse). The medusiform persons, where sufficiently

developed, exhibit the velum characteristic of ydro- meduse; the larger mouth-bearing nydriform persons, which are some- times the only representatives of their kind, are remarkable for differentiation into four regions,— a proboscis, a stomach, a basal ring, and a short stalk on which thie single tentacle of great length is situated (fig. 56, f). In the sub- order Physophoride (fig. 57, C) the persons are united by a short or long and spiral stem, terminated at one end by a flask-like air-sac (pneumatocyst); below the air-sac a biserial or multiserial range of swim- ming-bells (nectocalyces = medusz with suppression of manubrium, tentacles, and sense-organs) are placed. Covering pieces (hydro- phyllia, reduced medusve) and dactylozooids are affixed to the succeeding region of the stem, and alternate in definite order with the mouth-bearing hydriform persons (polyps or nutritive persons) and generative medusiform persons. In the sub-order Physalide the stem is con- verted into an air-sac, enormously enlarged, and the necto-

Fic, 54.—Portion of the coral- lum of Astylus subviridis (one of the Stylasteride), showing cyclosystems placed at. intervals on the branches, each with a central gastro- pore and zone of slit-like dac- tylopores. (After Moseley.)

Fia. 55.—Diagrams illustrating the suecessive stages in the development of the cyelosystems of the Stylasteride. 1, Sporadopora dichotoma. 2, 3, Allopora nobilis. , 4, Allopora profunda, 5, Allopora miniaced. 6, Astylus subviridis. 7, Distichopora coccinea, s, style; dp, dactylopore ; gp, gastropore; 0, in fig. 6, inner horseshoe-shaped mouth of gastropore. (After Moseley.) .

calyces and hydrophyllia are absent. In the sub-order Calycophoride the air-sac is not developed, the nectocalyces are in a biserial group, or reduced to two or to one. Dactylozooids are wanting. The modified persons (append- ages, Huxley) arise from the stem in groups, and can be withdrawn into the cavity of a swimming-bell (fig. 57, B).

HYDROZOA

Each group consists of a nutritive person, with long ten- tacle, of generative medusoids, and usually also an umbrella- shaped or funnel-like covering

piece. The latter separate in some Diphyida, and lead an independent life as Eudoxie.

In the suborder Discotde the stem is converted into a flattened dise with a system of canalicular cavities. Above this lies the air sac, a flattened reservoir of cartilaginous consistence. ‘he hydriform persons depend from the disc, centrally a large nutritive person surrounded by smaller similar persons carrying at their bases the generative medusoids; near the edge of the disc are dactylozooids. The medusoids develop into complete medusiform persons, and develop the genital products after liberation from the colony, when they are known as Chrysomitra.

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Fic. 56.—Diagram showing possible modifications of medusiform and hydri- form persons of a colony of Siphonophora. n, pneumatocyst; k, neeto- calyces (swimming bells); 1, hydrophyllium (covering-piece) ; i, generative medusiform person; g, dactylozooid with attached tentacle, 4; ¢, nutritive hydriform person, with branched grappling tentacle, f; m, stem. The thick black line represents endoderm, the thinner line ectoderm, (After Allman.)

The Siphonophoraalone, amongst the colonies formed by Hydrozoa, exhibit a high degree of division of labour aud consequent individua- tion. The mode of origin of such colonies has been discussed above. The locomotive habit, as contrasted with the sessile habit of other colonies, isno doubt correlated with the sharply defined individuality which they attain (compare Cristatella among Polyzoa), Velella and Physalia are occasionally seen on the southern and western shores of England, but as a rile the Siphonophora are met with only in the open ocean and in the Mediterranean. By some authorities the Siphonophora are assigned a distinct position among the Hydro- zoa, side by side with the Hydromedusee and Seyphomeduse ; their interpretation as floating colonies of Hydromeduse, an interpre- tation

necessitated by the structure of their medusiform persons, forbids their separation from that group.

Fossrz Hyprozoa.—The researches of Moseley have neces- sitated a redistribution of the group of Anthozoa known as the Tabulata. Among these appear to be a few Hydro- coralline, which occur in the fossil state. The Palzeozoic forms known as graptolites are by some authors assigned to the ydrozoa, but the grounds for placing them in this position are very slight, owing to the imperfect nature of the remains. A discussion of the small amount of structure which they present would be out of place here.

Remarkable Scyphomedusee have been obtained from the Solenhofen slates (Jurassic); excepting these, no noteworthy extinct Hydrozoa are known (see Haeckel in Zettsch. wiss.

HYDROZOA

Zool., vols. xv., xix., and Jenaische Zeitsch., vol. viii.,

1874).

Relationship of the Ctenophora to the Hydrozoa.—The remarkable medusa-form recently described by Haeckel (Sttzungsber. Jenaische Gesellsch., 1878) as Ctenaria cteno- phora, and classed by him amongst the Anthomeduse, seems to furnish a very direct transition from the structure of a medusa to that of such a ctenophor as Cydippe (Pleuro-

Fia 57.—Floating colonies of Siphonophora. group of appendages from the stem of the

A, Diphyes campanulata. B, A

same Diphyes. C, Physophora hydrostatica, D, Separate nectocalyx of the same. JZ, Cluster of female sporosacs (aborted medusx) of Agalma sarsii. a, stem or axis of the colony; a', pneumatocyst (air-bladder); m, nectocalyx; c, sub-umbrellar cavity of nectocalyx; v, radiating canals of the umbrella of the nectocalyx; 0, orifice formed by the margin of the umbrella;

¢, hydrophyllia in B, dactylozooids in C; n, stomach; #, tentacles; g, sporosacs, (From Gegenbaur.)

brachia). The woodcut and appended explanation (fig. 58)

copied from Haeckel's memoir will render the relations of the two forms clear. Ctenaria has the margin of its

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dise narrowed so as to give the organism a spherical form. The approximated margins bound an orifice leading to the sub-umbrella space. 'This orifice corresponds to the so- called mouth of a Cydippe. Further, Ctenaria has two, and only two, long-fringed tentacles, like those of Cydippe, and each springing from a pocket as in that genus, and on the surface of its spheroidal umbrella eight rows of differentiated ectodermal cells, which though not ciliated

Fic. 58.~~Ctenaria Clenophora (Haeckel), one of the Anthomeduse, connecting that group with the Ctenophora. A, lateral view of the entire medusa ; B, two horizontal views, that to the left representing the surface of the aboral hemi~~ sphere, that to the right a section passing nearly equatorially. a@, the eight (ciliated ?) rows of thread-cells, adradial in position, and corresponding to the eight ctenophoral zones of Pleurobrachia; 6, jelly of the unibrella; c, circular muscle of the sub-umbrella; d, longitudinal muscles of the sub-umbrella; e, stomachal dilatation of the enteric cavity; 7, the sixteen oral tentacles; g, the four perradial generative glands in the stomach wall (manubrium); A, the four perradial primary radiating canals; 7, the eight adradial bifurcations of the preceding; , ring canal in the margin of the umbrella; 7, velum; m, the two lateral tentacle pouches; n, the two lateral unilaterally fringed tentacles; o, the apical cavity (infundibulum) above the stomach. The canal system, with its four primary and eight secondary rami agrees in Ctenaria and Pleuro-brachia. The mouth of the latter is homologous with the margin of the umbrella of the former. The mouth of Ctenaria igs homologous with the junction of the so-called funnel of Pleurobrachia with its so-called digestive cavity. This last is the homologue of the sub-umbrellar cavity of Ctenaria, The apical opening or openings of the funnel of Ctenophora is paralleled by

the stalk canal of mednse, whilst the agreement between the tentacles and their pouches in Ctenaria and Pleurobrachia is eomplcte,

correspond closely in position with the eight ctenophoral ambulacra of Cydippe. The disposition of the enteric canal- system of C'tenaria is, as shown in the cut, also transitional in the direction of Cydippe. Apart from the existence of Ctenaria, the homologies suggested by Haeckel between Hydromeduse and Ctenophora are such as to commend themselves very strongly to acceptance. (E. R. L.)

HYDRUNTUM. See Orranro.

HYERES, a town of France, in the department of Var and arrondissement of Toulon, about 3 miles from the coast of the Mediterranean. It is connected by a branch line with the railway from Toulon to Cannes, and by dili-gences with the neighbouring towns. The town proper is situated on the south-eastern side of a steep hill (650 feet high) which forms one of the last buttresses of the Maurettes, a group of picturesque hills covered with olive, pine, and cork trees, and underwood of myrtles and other shrubs. In front, towards the south and south-east, a fertile 'plain, once famous for its orange groves, and now mainly occupied by vineyards and farms, stretches to the sea, while towards the south-west, across a narrow valley, rises a cluster of low but well-clad hills, The older part of the town, still on its eastern and northern sides gur-

rounded by its ancient and dilapidated wall, is a labyrinth of steep dirty streets; but the new quarters which have grown up at the foot of the hill have handsome boulevards and villas, many of them with beautiful gardens full of senti-tropical plants. Of best note among the objects of interest at Hyéres are the house (Rue Rabaton, No. 7) where Massillon was born; the cathedral or church of St Louis, a low building of the 12th century (restored in 1840), which belonged to the Cordeliers; and the ancient castle, crowning the highest part of the hill. The Place des Palmiers takes its name from the seven palm trees planted there in 1834. On the plain between the town and the sea are large nurseries, an excellent jardin d'ac- ' climatation, and the famed kitchen gardens which supply Paris with early fruits and vegetables and with roses in winter. There are extensive salt-beds on the peninsula of

Giens, which juts due south into the Mediterranean, where salt is made by the exposure of the sea-water to the sun. Up to the 14th century Hyéres was a larger and more im- portant town than Toulon; and in the 16th century it became famous as a winter resort. Catherine de' Medici at one time thought of making it the seat of a royal residence. At present the more brilliant social attractions of some of the neighbouring watering-places of the Riviera divert the more fashionable visitors from Hyéres. In climate it differs little from its more favoured compeers. From the east and north-east winds it is completely sheltered, but it lies open to the ravages of the mistral. The population "n 1872 was returned at 5881 for the town and 11,212 for the commune; in 1876 the corresponding figures were 6797 and 12,289. The islands of Hyéres (the Stcechiades —ai Zroixddes vpror—of the classical geographers), other- wise called Les {les d'Or, lie to the east of the peninsula of Giens, and form a protection to the roads of Hyéres, one of the great rendezvous of the French fleets. The principal islands are Porquerolles, which rises to a height of 600 feet, Port-cros, and Titan. The population is scanty. A marquisate of the lles d'Or was created by Francis I.

See Alphonse Denis, Promenades pittoresques & Hyeéres, 1842; Eugene Farene, Les réeits du touriste Provencal, 1859; Aufauvre, Hyeres et sa valleée, 1862; Joanne, Hyeres et Toulon, 1870; Len- théric, La Provenee maritime, 1880.

HYGIENE is the science, PracticaL HyGIENE the art, of preserving health. The name has been adopted from the French, from which language it has also been introduced into most other tongues; it is derived from the Greek byleva or tyeéa, health. Writings on health are among the oldest in the world, for the subject has engaged the attention of the profoundest thinkers and the most renowned leaders of men. We have only to point to the elaborate directions in the Mosaic laws for the preservation of health through scrupulous attention to cleanliness, the isolation of the sick, and extreme care in the use of wholesome articles of food and drink, Throughout the whole of their history the Jews enjoyed a remarkable immunity from epidemic disease, the most of the instances in which such disease occurred

being represented as those in which they departed from the law and doubtless relaxed the wholesome vigilance enjoined by it. In medixval and modern history they have often, even down to our own time, been spared the ravages of epidemics, when their Christian neighbours were perishing around them. Ignorant superstition often gave rise to the idea that they had poisoned the wells, and they fell victims to the fanaticism of the times. It is highly probable that the periodical cleansing of their dwellings, involved in the thorough search for the leaven which preceded the yeatly passover (Aishna, Pesachim, i. 11), had a notable influence in preventing that continuous deposition of organic matter, which is no doubt one most powerful factor in the production of zymotic disease. On the other hand, the filthy habits of the Christian populations offered a premium to plagues of every kind ; for there is no paralle] in ancient history to the terrible invasions of disease which from time to time ravaged Europe down to quite recent times.

Tt is the province of hygiene to seek out and determine the causes of disease, and to formulate rules for their prevention and removal. It may thus be called also preventive medicine, although this term does not quite express all that must be included. The progress of hygiene, such as it was, rested for many ages upon an empirical basis, and indeed to a large extent this is still the case. The subject has, however, in later times at least, been studied to considerable advantage, although much remains to be done. Two centuries ago the mortality of London was 80 per 1000-—at the present day it is under 23. A century ago ships could barely keep the sea for scurvy, whilst

jails and hospitals were in many cases the hotbeds of fatal disease ; now those conditions are rectified, or at least the means of rectifying them are known. Thirty years ago the English troops at home died at the rate of 20 per 1000— now their death-rate is less than one-half of this. A know- ledge of the causes and modes of propagation of disease being necessary in order to provide rules for its prevention, it is obvious that hygiene must be largely dependent upon the advances made in pathology and etiology ; hence the impossibility of any very marked progress in former. times, by reason of the

imperfection of the collateral sciences, and the want of the appliances more recently made available for inquiries of such a difficult and recondite character. Within this century, however, and especially within the last forty or fifty years, it has been possible to follow out the subject on a more strictly scientific basis, and so to lay a foundation, at least, on which to build a structure, which may one day entitle hygiene to a place among the more exact sciences.

The special subjects which hygiene embraces are the fol- lowing:—I. Those which concern the surroundings of man; such as meteorological conditions, roughly included under the head of climate ; the site or soil on which his dwelling is placed ; the character, materials, and arrangement of his dwelling ; the air he breathes ; the cleansing of his dwell- ing, and the arrangements for the removal therefrom of excreta and other effete matters.

Il. Those which concern the personal care of health; sucht as the food he eats and the water and other beverages he drinks; clothing; work and exercise; personal cleanliness ; special habits, such as the use of tobacco, narcotics, &e. ; control of sexual and other passions.

III. Certain points not directly included in the above ; such as the management of infancy; the prevention of disease; the hygiene of the sick-chamber; and the disposal of the dead.

It is obvious that it is impossible to draw any hard and fast line in these divisions, and that they must constantly run into and overlap each other. Such a division, however, gives a general idea of the scope of the science, and a brief consideration of the different sections will enable us to furnish a slight sketch of the nature of the subject.

1. Meteorological or (so-called) climatic conditions. Here temperature and humidity are the two points that obviously present themselves for consideration, but it is very difficult indeed to separate their influence from those of soil or site. It is also certain that much that has been attributed to climate is really due to other causes. It may be laid down as a general principle that, if moderate care be taken, man may preserve his health in almost any part of the world, although it must be admitted that in some places, such as hot and moist climates, disease causes appear to be more

easily called into action than under colder or drierconditions. Some diseases, such as yellow fever, appear to require a certain temperature for their development and propagation ; others, such as enteric (commonly called "typhoid") fever, appear to exist indiscriminately under any meteorological conditions; others, such as cholera, although undoubtedly originating in hot and moist countries, appear capable of being propagated in most parts of the world. In some cases great heat and dryness arrest disease, as used to be observed in Egypt, where the plague was commonly said to cease after St John's day. During the hot harmattan wind of the west coast of Africa small-pox is arrested, and successful vaccination becomes impossible. To the sick or delicate, meteorological conditions are of great importance, but this part of the subject belongs more to the treatment of disease than to general hygiene. To the healthy, meteorological conditions, however much they may affect personal comfort, are of comparatively little moment as

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regards health, so long as reasonable care is observed. In a healthy body an adaptation to circumstances rapidly takes place, and an equilibrium is soon established. Thus, it used to be supposed that great heat increased the temperature

of the body, but later observations have shown this to be

erroneous, and that the balance is soon re-established by the process of transpiration ;—should this, however, be arrested, then a rise of temperature may take place, and disease of a febrile character be established.

2. The soz or site of the dwelling is, however, of greater

moment, and much that has been attributed to climate has

been more truly due to locality. Soils are generally divided into moist and dry, permeable and impermeable, and again subdivided according to formation, composition, slope, &c. Healthy soils are those which are dry and permeable, or which have such a slope as renders drainage easy; on

the other hand, soils which are flat, moist, and impermeable are generally unhealthy. Soilscontaining muchorganic matter are to be avoided, such as alluvial soils generally, as well as all marshy districts. The air in soils is generally more or less impure, hence the unadvisability of occupying dwellings below the ground level or situated immediately onits surface. The water in the soil is a question of great importance, apart from the mere moisture. At varying distances from the surface, but everywhere, there exists a great subterranean lake or sea, known as the ground-water or water-table, which is constantly in motion, both vertically and horizontally. Its horizontal movement is towards the nearest water-course or towards the sea ; its vertical move- ment is determined by rainfall chiefly. Much importance has been attached to it, and the following points may be con- sideredas accepted by most hygienists :—(1) a permanently high ground-water, that is, within 5 feet of the surface, is bad, while a permanently low ground-water, that is, more than 15 feet from the surface, is good; and (2) violent fluctuations are bad, even with an average low ground-water ; a comparatively high ground-water with moderate and slow fluctuations may be healthy. According to the school of Pettenkofer, it is the ground-water which determines the spread of certain forms of disease, such as cholera and enteric fever. A previously high level, succeeded by a fall, with a certain height of temperature in the soil-air, is the condition believed by them to be the one most favourable for disease production. Healthy soils are the granites, metamorphic rocks, clay-slate, limestone, sandstone, chalk, gravel, and sand; unhealthy are—clay, sand and gravel with clay subsoil, alluvial soil, and marsh-lands, with the exception of peatlands. Among the unhealthy soils ought also to be included all " made" soils, particularly those that are formed so often in towns from rubbish of all sorts. Such soils ought not to be occupied as building sites for at least two years.

3. The sanitation of dwellings involves numerous points. The site has been considered in the previous section, but the importance of excluding soil emanations must be insisted upon. The placing of a dwelling in any spot of ground tends to exert an extractive force upon the soil, because the air of the dwelling is almost always warmer than the external air, and there is therefore a constant danger of sucking up the more or less impure soil-air into the dwell- ing. Not only is this a recognized source of disease, but fatal cases of direct poisoning have sometimes resulted, as wlien coal-gas has

escaped into the soil below or near a dwelling. An impervious foundation is therefore necessary, although this precaution is too often neglected, even in high-class dwellings. Honses ought to be so arranged that they may receive plenty of light, not merely for work or convenience, but as a matter of health. Sunlight, for full health, is as necessary as air, and this is now so strongly recognize! in America that in many of the hospitals in

that country rooms are provided where patients may take a "sun-bath."

The materials of which houses are built are various, Wooden dwellings have advantages, but there is always tlie danger of fire. Brick or stone is most commonly used, but very good dwellings may be made of concrete or even of mud. Probably the best material is good, sound, well- burnt brick. Dryness must be secured by means of damp- proof courses along the foundations, hollow walls, and cementing or slate-hanging externally. Non-absorbent surfaces internally are important, although some writers, such as Pettenkofer, &e., have been inclined to attribute the unhealthiness of dwellings to the impermeability of the walls obstructing air change. But where air can pass, organic matter can lodge and become a source of danger. It is better, therefore, to have non-absorbent surfaces as much as possible, and to provide for ventilation in other ways. Paint that can be washed is therefore better than paper ; if the latter is used it had better be glazed. Care should be taken to scrape off all old papers beneath, as they and the paste used with them tend to decompose and become injurious to health. Ceilings ought to be impervious as well as walls, and floors ought to be made of well-fitting seasoned wood, caulked, and oiled or varnished so as to make them water-tight.

Proper cubic space is a matter of great importance, for upon it depends the renewal ofair. The air of an air-space can seldom be changed oftener than three times an hour, hence the space ought to be large enough to allow of such rate of change providing enough of air for respiratory purposes. The furniture of rooms, especially sleeping rooms, ought not to be too massive; whilst curtains and hangings too often form traps for dust and organic matter.

The warming of houses is important, and is generally badly and wastefully done. The open fire-place has great advantages, but it is in many cases insufficient. Where any general system is employed it is better to warm the air in the room itself, as by pipes conveying hot water or steam, than to warm it before delivery. Overheated roonis are a source of ill-health. For sitting-rooms 60° to 65° is quite enough ; for a study or work-room 60° is sufficient, even in some cases less than this. A sleeping-room need never be above 60°, often with advantage below it. Fresh air ought not to be sacrificed to temperature, except under extreme circumstances. Dwellings should not be occupied for some time after building, till they are thoroughly dry, Rheumatism, chest diseases, écc., are very apt to arise from neglect of this precaution. .

Scrupulous attention to cleanliness is necessary in dwellings, and there is wisdom in their periodical vacation for a certain time, so as to let them lie fallow, as it were, and interrupt the continuity of deposit of organic matter,

Dwellings ought to be scattered over as wide an area as

possible, for statistics show that sickness and death-rate are often inversely proportional to the amount of area per head occupied by a community, The area per head in London is estimated at double that of Paris and many otlier cities, whilst at the same time its death-rate is smaller than that of any other large city in Europe.

4. Aur is the prime necessity of life. Food or water may be abstained from for a considerable time, and we may thus have an opportunity of replacing either should we doubt its purity or wholesomeness, but the atmosphere around us we must breathe or die. Hence the paramount necessity for having it pure. But, although this is apparently so obvious, attention to its importance has been very generally omitted. Air consists of a mechanical mixture of oxygen and nitrogen, in the proportion of nearly 21 per cent. of the former to 79 of the latter, with small quantities in addition of carbonic acid, moisture, organic matter,

&e. By respiration and combustion air becomes vitiated, the oxygen diminishing and the carbonic acid and organic and suspended matter increasing. Within certain limits the amount of carbonic acid is in itself immaterial to health, but it is important as a measure of the amount of orgauic matter, which is really the dangerous impurity. Air vitiated by respiration is also much more dangerous than when the carbonic acid is partly the result of combustion. It is now pretty generally admitted that air cannot be con- sidered as really good and fit for respiration in which the respiratory impurity reckoned as carbonic acid much ex- ceeds two parts in 10,000 by volume. On the other hand, if air can be kept down to this point, the condition may be looked upon as satisfactory. The amount of impurity given off by living beings varies of course with size, weight, age, sex, and work, but it may be allowed that under ordi- nary circumstances it amounts to about six cubic feet of carbonic acid per head in ten hours during repose. This requires an hourly supply per head of 3000 cubic feet of fresh air for its dilution, and this amount should be largely increased during work or in sickness (see Hosprrau). The diseases which have been shown to arise from the effects of vitiated air are widely prevalent, including such as con- sumption and other forms of scrofulous disorders, bronchitis and pneumonia, sore throat, &c, Crowded and ill-veuti- lated places also tend to increase the virulence and the rapidity of spread of the various communicable diseases.

5. Cleansing, including the removal of slops, excreta, &C., forms one of the most important and also most difficult of questions, The main principle is that all should be immediately and effectually removed from the house and its neighbourhood, and that there should be no possibility of reflux of foul air from drain or cesspool. The system of water-carriage is certainly the cleanest and most convenient, especially among large communities, but other systems find advocates. In villages and isolated houses the earth system and other dry methods have many advantages. The question of the disposal of sewage is a very large one, into which it is impossible to enter here. Hitherto all or almost all the material has been wasted by being poured into rivers or the sea, the streams being thus polluted and the shores rendered offensive. The object to be aimed at is to utilize a product of undoubted fertilizing influence, without endangering the health of the community. The diseases to be apprehended from imperfect methods of

sewage removal are enteric fever, cholera, diphtheria, sore throat, and an aggravation of most other diseases, especially those of an eruptive character. Ashpits ought to be especially attended to, their neglect being attended with much danger.

6. Water-supply, although included under the head of food and beverages, merits special consideration, so important is its relation to health, both directly as a drink and indi- rectly with reference to its many other uses. It is required for drinking, cooking, the cleansing of person, clothes, and dwelling, and the flushing of closets, sewers, and drains. The hygienic requirements are that water should be good in quality and sufficient in quantity. Good water should be clear, colourless, quite free from suspended matter, of a good lustre, and should have a pleasant sparkling taste, the latter qualities being due to the carbonic acid and atmo- spheric air dissolved in it, In its chemical composition it ought to be as free as possible from organic matter. The evidence in favour of communication of disease by means of drinking water is now very extensive, and we may cite diarrhoea, dysentery, ague, enteric fever, and cholera as among the diseases which may be conveyed through this chanuel. Numerous parasites also find their way into the human body by this means. Hard water is objectionable for cooking and washing, nor can it be recommended for drinking, although some insist upon a certain amount of

harduess being essential. impure, boiling, distilling, or filtering may be resorted to. The two former are the most efficacious, but the last has advantages of convenience if properly carried out. coal filters, if properly cleansed, or renewed sufficiently often, are useful, but it is better to have a material that purifies without risking any deterioration of the water itself. Such filters as the spongy iron and the carferal effect this. All filters, however, require the medium to be cleansed or renewed periodically. from dirty cisterns and from pipes being connected with

HYGIERE

In the case of water being

Char-

In a house the chief dangers are

drains and closets. All supply should be on the constant system, and no pipe supplying a closet should be resorted to for drinking purposes. All overflow pipes should deliver in the open air. The quantity of water required per head may be stated at a minimum of 12 to 16 gallons per diem where there is no general system of drainage, and about 25 gallons with drainage. In towns more than this is neces- sary, and from 30 to 50 gallons are desirable. In sickness generally double the amount is necessary that is required in health. The source of the water ought to be pure,— springs, deep wells, and upland surface water being the best. Shallow wells and rivers to which sewage gains access are most to be avoided.

7. For food and beverages the reader is referred to the article DIETETICS.

8. Work and Exercise.—The kinds of work performed by man are of course very various, but they may be reduced more or less to a uniform standard, which is usually reckoned as so many tons (or pounds) raised through one foot, or, tersely, as foot-tons or ton-feet. A fair day's work is generally taken at 300 foot-tons, a laborious day's work at 450, and the maximum to be expected, except under very special conditions, at 600. For this work a certain time should be allowed, as the strain increases (almost in a geometrical ratio) with the velocity. Usually speaking 50 foot-tons an hour is a fair amount, and this ratio is equal to a walk of three miles for an average man. The amount for meutal work has not been accurately calculated, but it may be safely assumed that a man of sedentary occupation ought to take exercise of a physical kind varying from 50 to 100 foot-tons per diem. In all cases his food ought to be proportioned to his work, for it is now recognized that man is a machine, whose work depends upon the energy derived from the food he eats.

9, Clothing and Personal Cleanliness.—Clothing should fulfil the functions of preserving warmth in cold weather, providing covering without being too oppressive in hot weather, keeping out wet in wet weather, and yet allowing sufficient transpiration for health, At the same time it ought to admit of frequent change and cleansing. Dr Parkes has pointed out that it is probably due in some measure to cleaner habits with reference to clothing that the diminution of typhus fever should have been so marked in recent

times. Personal cleanliness is also a matter of great importance, a daily general bath being advisable for every one. For animals as well as human beings it has been shown that cleanliness is conducive to improved appetite and general health. Filth is one of the prime factors in the production and propagation of most of the devastating plagues known to mankind,

10. Prevention of Disease.—This is a large question, on which we can only briefly touch. Much depends upon our knowledge of etiology or the remote causes of disease. The best rule for preventing disease is to follow out carefully the principles of general hygiene, laid down with reference to pure air, pure water, proper food, cleanliness, é&c. Some diseases may be more specially provided against, such as paroxysmal fevers by the use of quinine, and small- pox by vaccination, but for the great majority of diseases

ho such special preventive is known. Some diseases, such as typhus fever and plague, are successfully combated by scattering the population over a large area and inducing the freest ventilation, and to all diseases this plan may be applied with more or less effect. In those diseases which are known to be communicable, such as scarlet fever, isolation of the patients is an effectual means of arresting the spread ; but the poisons of others, such as measles and hooping-cough, are so subtle that isolation can only be looked upon as a measure of doubtful success, Much stress has been laid upon disinfection as a means of preveuting disease, and if properly carried out it has some efficacy. But it is a mistake to place too implicit reliance upon it as ordinarily practised. In dealing with clothing, bedding, &c., the best method is the application of heat, at or above the boiling-point of water, which may be done by means of dry heat, superheated steam, or boiling water. In fumigating places, burning sulphur or the vapour of chlorine or nitrous acid is used, but to be effectual the air must be rendered for the time irrespirable. The solid and liquid cisinfectants (so-called) are chloride of lime, the perman- ganates, carbolic acid, and a great many similar substances, many of which have been made the subjects of patents. A large number of them are merely deodorants. It may be stated generally that disinfectants are useful as adjuncts to other hygienic measures, but that they cannot replace them, except to a smallextent, and in avery imperfect way.

11. Disposal of the Dead.—The most frequent plan is interment in the earth, but it may well be a question if this be the best plan; it has certainly led to much evil When carried out near habitations. Two other plans have been suggested, viz., burial at sea (suggested by the late Dr Parkes) and cremation. The former is hardly likely to be resorted to, but the latter would be effectual in preventing the evil consequences of ordinary interment. At the same time the danger that it might too effectually conceal much secret crime has to be taken into account.

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HYGINUS, Carus Jutivs, a native of Spain, and the freedman of Augustus, by whom he was made chief of the Palatine library. He is said to have fallen into great poverty in his old age, and to have been supported by one C. Licinius. He was a voluminous author, and his works included topographical and biographical treatises, commen- taries on Cinna and on Virgil, and disquisitions on agricul- ture, bee-keeping, and the military art. All of these are lost. But there have come down under his name two school treatises on mythology, which have produced much discussion. They are entitled (1) Pabularwm Liber, con- taining 277 mythological legends, and valuable for the use made of the Greek tragedians; and (2) Poeticon Astrono- micon Libri IV., an astronomical treatise of little value. Both are abridgments ; both are by the same hand; but from the "tyro-like mistakes" in both they have been thought unworthy of the librarian of Augustus. It is not, however, impossible that they are early compositions of his, written before he had gained full command of the Latin language. A suggestion has also been made (Bursian in Fleckeisen's Jahrbuch, xciii. p. 773) that a work of Hy- ginus, named Genealogicv, was abridged by a grammarian of the latter half of the 2d century, who appended a treatise on the whole mythology arranged according to my- thological views. 'This text-book,

retaining the name of Hyginus, would be used in the schools, and would be from

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time to time altered and augmented. But in these, as in the many other opinions that have been advanced, there is nothing beyond conjecture.

HYGINUS (surnamed Gromaticus, from gruma, a sur- veyor's measuring rod), a writer on land surveying and castrametation, who flourished in the reign of Trajan (98-117 a.p.), There survive fragments of a comprehen- sive treatise De munitionibus castrorum or De castrameta- tone, and of a work De limitibus constituendis, which may be found in Lachmann's edition of the works of the Roman Gromatics (1848), i. 108—134.

HYGROMETRY. In the British Islands all are familiar with the arid character of the east winds of spring, and not a few are only too painfully aware of the discomfort experienced while under their influence ; and all are like- wise familiar with the opposite state of the atmosphere, most frequently and unmistakably occurring also with east winds, when every object feels damp and clammy to the touch, and horses on the streets are seen each with a steam: ing cloud of dense mist around it. In certain other climates, such as are met with in India and South Africa, these effects are greatly intensified, so that on the one hand the ivory scales of thermometers, quill pens, aud other objects curl up, articles of furniture open at the joints and split up, and the grass which covers the soil is reduced to a state of tinder; and on the other hand, everything becomes so permeated with moisture that, even in the interior of houses, furniture, books, and wearing apparel become sodden with wet. These different effects depend on the states of the air as regards the quantity of aqueous vapour diffused through it taken in connexion with the temperature, these varying from the completest possible saturation of the air, which is of occasional occurrence in the rainy season of some tropical climates, to that extreme desiccation of the air which sometimes happens in Great Britain in spring, but more completely and frequently in such dry summer climates as that of the Punjaub.

A large number of substances, such as sugar, flour, and bread, possess the property of absorbing moisture, and most gases, as well as air, absorb and retain aqueous vapour. The term hygrometry is employed to signify the measure- ment of the degree of dampness of substances, and to denote the processes by which their humidity is ascertained. The term, however, may be considered as restricted to the humidity of the atmosphere, owing to the paramount im- portance of that branch of the subject, and the slight and unsatisfactory knowledge we yet possess of the laws of hygrometry of other substances.

All organic substances contain pores for the conveyance of their juices, and are influenced by the accession of mois- ture, some of them very markedly so. Every species of wood is liable to these hygrometric changes, the amount of contraction and expansion being much greater across the grain of the wood than lengthways. Hence the panels of doors are fitted into grooves so as to allow of shrinkage, for, if secured at the edges, the panels must inevitably split. The hair of animals is also eminently hygrometric, curling and uncurling as the air becomes drier or moister, and it is because of the peculiar sensations accompanying these hygrometric changes that the cries and behaviour of many of the lower animals furnish valuable prognostications of weather changes. Similarly many manufactured objects, such as paper, cordage, &c., vary in weight, bulk, form, and elasticity with the varying degrees of humidity of the air, and other interesting prognostics have been drawn from these hygrometric changes.

In the earlier stages of the investigation of the hygro- metry of the air, the hygrometric properties of several sub- stances were made use of as instruments of observation. Of these may be named the twisted Indian grass (Oobeena

Hooloo), employed by Captain Kater on account of its | requisite precision the temperature at which the dew begins

remarkable property of twisting and untwisting according to the dampness of the air; a slip of whalebone cut across the fibres, used by De Luc; and the hygrometer of Saussure, which was formed of a hair from which the oily matter had been previously removed, and which stretches when moist and contrasts when dry. Experience has, however, shown that none of these hygrometers are satisfactory instruments, seeing they give inconsistent results, and are liable when in use to great and uncertain changes. Hence, while they serve to give the roughest idea of the state of the air as regards moisture, they have fallen into disuse as accurate instruments of observation of the hygrometry of the atmo- sphere. But in the intensely cold climates of Russia and Siberia, the hair hygrometer still continues to be used as an instrument of observation; and when we consider the tediousness and difficulty of making hygrometric observa- tions with the hygrometer in most general use when the temperature of the air descends below the freezing-point of water, the hair hygrometer should perhaps be considered as good an instrument as is available to put into the hands of ordinary observers in times of low temperature.

The most accurate hygrometers are those which are con- structed, not as the above, on the principle of absorption of vapour, but on the principles of condensation or evaporation. The well-known fact that the tempera- ture of a wet body is lower than that of a dry one when under the same atmospheric conditions was applied by Sir Johu Leslie to mea- sure the humidity of the air. Leslie's hygrometer (fig. 1), which is an adaptation of his differential thermomister, is formed by uniting two tubes having a ball blown on the end of each, into which some coloured sulphuric ether has been previously introduced. When both bulbs are at the same temperature, the fluid stands at the zero of the scale, but when one of them is covered with wetted piper or muslin the instrument shows the depression of temperature of the wetted bulb. In order to ascer- tain the quantity of moisture cor- responding to the reading of a Leslie's hygrometer, we must de- duct from the total quantity of moisture which the air of the tem- perature at the time of observa- tion is capable of holding the deficiency due to the degree of cooling shown by the hygrometer.

As no air is ever absolutely dry, but contains more or less moisture, it is evident that if any mass of air be cooled sufficiently it may be made to

deposit its moisture. A familiar example of the condensation of vapour is seen in the formation of dew on a tumbler filled with cold water and brought into a warm room. This dew is caused by the deposition of moisture from the air in contact with the cold surface of the glass, which is cooled down below the point of saturation. The temperature of the glass at the instant dew begins to form on its surface is termed the dew-point, which corresponds with the point of saturation of the air.

Daniell's and Regnault's hygrometers are constructed on the principle of this simple phenomenon, various contriv- ances being used for lowering the temperature quickly to any point that may be desired, and for observing with

Fic. 1.—Leslie's Hygrometer.

the bottom of the silvered capsule, while

metallic tube C, one end of which opens

| an observation as much ether is introduced

to form. In both cases ether is employed to lower the temperature.

Daniell's hygrometer consists of a glass tube bent at right angles at two points with a bulb at each extremity, one bulb being of black and the other of clcar glass, the latter covered with muslin. 'The liquid within the bulbs is ether, which at the time of being sealed is made to boil for the purpose of expelling the air. If the temperature of the two bulbs be made to differ from each other, all the ether is transferred from the warmer to the colder bulb. In making an observation the whole of the ether is first trans- ferred to the black bulb, and ether is then dropped on the muslin covering outside the clear bulb, This ether quickly evaporates, and in doing so rapidly lowers the temperature of the clear bulb so that the ether inside the black bulb distils over into the clear bulb, The result is a lowering of the temperature of the black bulb, and, as soon as this falls to the temperature of the dew-point of the air where the experiment is conducted, a ring of vapour begins to be formed outside the black bulb, more or less dulling its surface. At this instant a thermometer placed inside the tube with its bulb immersed in the

ether filling the black bulb is read, and the reading gives the dew-point of the air at the time.

Regnault's hygrometer is a little more complicated than Daniell's, but its indications are much more trustworthy. It consists (fig. 2) of a glass tube or cap- sule A, having on the bottom and a little way up a highly polished silver surface, and closed by a cork with two holes. Through one of these holes the stem of a thermometer B passes, having its bulb at

through the other hole passes a narrow

close to the bottom of the capsule, and the other end may, if desired, be connected with an aspirator or air-pump. In making

into the capsule A as will cover the bulb of the thermometer, and then by trans- mitting air through the tube C the ether vapour is withdrawn from the capsule A through another tube D. By this means the temperature of the ether is very rapidly reduced, and since the whole mass of the ether is agitated by the air-bubbles which rise through it from the bottom of the capsule, the cooling of the ether is equal throughout. The thermometer is then read quickly, but to ensure an accuracy to the tenth of a degree a second and a third experiment, conducted more slowly, should be made. As showing the rapidity with which observations can be made with this hygrometer, Henry F. Blanford on one 5, 9 Recnault's occasion made six observations In six minutes in the dry climate of Secundera- bad, when the temperature of the air was 93°, the dew- point 51°, and the relative humidity consequently 24°, The temperature of the air at the time of observation may be ascertained in the usual way, or by means of the thermo- meter E, if care be taken that its temperature is unaffected by the proximity of the person of the observer.

Owing to the expense and great trouble attending the use of hygrometers which give the dew-point directly by con- densation, another hygrometer has come into extensive use by which the dew-point is determined indirectly by evapo- ration. This is August's hygrometer, sometimes called

Hygrometer.

Mason's hygrometer, but more generally known as the dry and wet bulb hygromcter, which has the strong recom- mendation of being self-acting, and requiring only the read- ings of the two thermometers in making air observations. This hygrometer (fig. 3) consists of two thermometers a and 8 similar to each other in all re- spects except that one of them has a piece of muslin tied closely over the surface of its bulb c,

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by dying on his marriage day or in some other way, and he was invoked to propitiate him and avert a similar fate. He occurs often in the train of Aphrodite, along with Eros, Himerus, Pothus, &c, According to Orphic legend he was restored to life by Asclepins.

HYMENOPTERA (the Piezata of Fabricius, Hautfliger or Adenfliiger in German), an order of Insecta (so named from their wings being joined, as hereafter described) containing the insects commonly called bees, wasps, ants, ichneumons, gall-flies, saw-flies, and others less known

and kept constantly wet by a few threads of cotton which con- nect it with the water in the

which have received no English names, The main charac- General teristics of the order are these the possession of four character- wings, of which the anterior are always larger than the 4

vessel d. The water then which rises from the vessel by capil- lary attraction spreads over the muslin, and evaporates from its surface with more or less rapidity according to the dryness or moist- ness of the air; and the greater the dryness of the air the greater is the difference between the observed readings of the dry and the wet thermometers,

The formula for deducing the hygrometric state of the air from these two observations has been investigated by Professor Apjohn « (Trans. Roy. Irish Acad., vol. ~ xvii.), and has been already de- scribed (see ATMOSPHERE, vol. iii, p. 32). As it is very troublesome to go through the calculations for

each fresh observation, tables have been prepared which give the dew-point by inspection. The best of these tables in English measures are those of Glaisher, fifth edition, constructed empirically from direct experiments carried on at Green- wich, combined with Regnault's last revised tables relat- ing to aqueous vapour. 'There can be but one opinion as to the great service rendered to meteorology by Glaisher in the preparation of these tables, which give results approximately correct for high and moderate humidities and for situations at no great height above the sea; in other words, they may be regarded as accurate for at least such conditions as are presented by the climates of the British Islands. They are, however, insufficicnt, owing to the com- paratively large errors attending their use, for the reduction of observations made in elevated situations and in such arid states of the atmosphere as are of frequent occurrence in India and South Africa. The preparation of such tables remains still a serious desideratum in meteorology; and another desideratum equally important is the introduction _ of a simple, handy, and accurate method of observing the hygrometry of the air when its temperature descends below the freezing-point of water, some method which would in- volve only a minimum of manipulative skill and trouble in making an observation. See ATMOSPHERE, (A. B.

HYMEN, or Hymen aus, was originally the name of the song sung at marriages among the Greeks. As usual the name gradually produced the idea of an actual person whose adventures gave rise to the custom of this song. He occurs often in association with Linus and Ialemus, who represent similar personifications, and is generally called a son of Apollo and a Muse. In Attic legend he wasa beautiful youth who, being in love with a girl, followed her in a procession to Eleusis disguised as a woman, and saved the whole band from pirates. As reward he obtained the girl in marriage, and his happy married life caused him ever afterwards to be invoked in marriage songs.. At other times the tale is of an opposite character; Hymen was unfortunate either

Fic. 3.—Dry and Wet Bulb Hygrometer.

posterior, always of the same texture, and mostly with nervures arranged in regular patterns; a dense hard skin, smooth, shining, or very hairy; a mouth

always provided with mandibles adapted for biting, though the other mouth parts may be so modified as to serve for mastication, or for the sucking, or rather lapping, of liquids. The female is provided with an anal instrument connected with oviposi- tion, and sometimes serving for defence, in which case it is in communication with a poison gland. They undergo a regular transformation, and have larve provided with legs on the thorax and abdomen, or on the former part only, or (as is more often the case) entirely footless.

The wings have few nervures, and may be even entirely Wings.

devoid of them; when present they proceed from the base of the wing, or from the costa (the part which bounds the wing in front) towards the apex, which they may or may not reach. Connected with the lateral nervures are others (recurrent nervures) which unite them together, and form in this way regular cellules. The first two lateral nervures (those nearest the top) are the most important, and are called the "marginal" and "submarginal" respectively, The cellules which they form by means of the cross or re- current nervures are called the "marginal" and "sub- marginal cellules." Not unfrequently there is, towards the apical third of the costa, a thickened spot (considered by some to act as a counterpoise when the insect is flying) termed the ""'stigma" or "pterostigma." It is not always present, however, and when present may be very small, or, as in Pachylostica, very large and projecting. In a similar way the hind wing may contain lateral and cross uervures, but they are fewer in number and in importance, and may be entirely absent, although present in the larger pair. The arrangement of the nervures in the Zymenoptera undergoes, in the various families, great diversity; and, what is of great importance in classification, their form, in the different families, and even genera, is, within certain limits, remarkably constant. "On this account great attention has been paid to them; and each nervure and cellule has received a distinct name. The use of the nervures and cellules does not lead to the formation of artificial groups ; for we find that the existence of a particular arrangement of the nervures in a hymenopterous insect denotes the pre- sence of other characters. Each family indeed has its own form of wing, as will be seen from the accompanying figures. The relative value, however, of the neuration in classifica- tion is not always the same. It is of much greater import- ance,

for instance, with saw-flies than with bees. The wings are usually shorter than the body, and may be so short as to be useless for flight ; they may be even entirely absent. Apterous species are found in almost all the faini- lies. In most cases it is the females only which are thus deprived of the power of flight. But the opposite of this may exist; as, for instance, with a curious species of Chalcidide which lives in the nest of bees as a parasite. With ants, again, the ncuters are always wingless ; and the females lose their wings when they commence the formation of acolony. It is worthy of remark, too, that some Chalct-

Head.

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did and Oxyura, which are normally winged, occasionally appear in an apterous or semi-apterous condition. On the anterior margin of the hind wings are placed a number of very minute hooks, which fit into a thickened rim on the posterior margin of the front wings, so that the two become united, and strike the air as one whole. The wings are usually transparent, and, in certain arrangements of the light, are seen to be highly iridescent. Occasionally they are coloured in patclies, or are entirely black or bluc ; in the latter case, they are not unfrequently of a thickish texture and have a metallic lustre, as, ¢.g., in Hylotoma. The smaller forms (Chaleidide and Oxyura) have few or no nervures. Some of these have the wings deeply fringed ;

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Wings of Hymenoptera.

1. Tenthredinide: (ZZylotoma)—1, marginal; 2, appendicular; 3, 4, 5, 6, sub- marginal; 7, 8, 9, discoidal; 10, costal; 11, 12, branchial; and 13,

lanceolate cellules; a, 6, c, submarginal nervures ; d, basal nervures; e, Jf, recurrent ner- vures; st, stigma ; {co, costa. 2. Cynipide (Cynips), 3. Chalcidide (Peri- lampus). 4. Oxyura (Codrus). 5, Oxyura (Mymar). 7. Ichneumonidse (Zrogus). 8. Chrysidids (Cleptes). 10. Diploptera (Vespa). 11. Anthophilia (Apathus). and Mymar and Flabrinus have the wings as it were cleft and stalked ; that is to say, there is a long, thin stalk projecting from the thorax for a certain distance ; then it dilates into a number of deeply fringed branches (see fig. 5).

The head is seldom broader than the thorax. It is usually of a more or less globular shape, but may be much flattened and long. 'The compound eyes are placed along the sides, while the simple eyes, or ocelli, are arranged in a triangle on the vertex. Certain ants and Chalcidide are blind. Others have eyes, but want the ocelli. The mouth organs are, except with bees, adapted solely for mastication or for prehension ; while, in addition to performing these functions, wasps use them for building up or digging out their nests in the ground or wood. Some worker ants and other aculeates (especially males) have the mandibles enor- mously developed. Blastophaga, an insect found in figs, has a curious mandible, remarkable, not in itself, but by having attached to it an appendage whose use is supposed to be to clean away the juice of the fig from the mouth. The maxilla and labium are provided with jointed palpi.

6. Braconid (Bracon). 9. Formicidss (Formica).

HYMENOPTERA

The number of joints in the maxillary palpi is usually five, but may be more or less than that; the labial palpi are two- to fourjointed. It is with bees that the mouth parts (and especially the ligula) have their greatest development and specialization. With them the various parts (except the mandibles) are elongated to form a sucking tube, by means of which they lap up the nectar of flowers.

The form of the antenne is very variable. have three (Hylotoma) to sixty joints (ichncumons); may be very long and thin as in ichneumons, or scarcely projecting beyond the head as in Perga ; of uniform thickness, or dis- tinctly clavate as in Cimbea; bare, or very hairy. Then they often differ

very much in the males. Lophyrus (Tenthre- dinide) and many Chalcididehavethem pectiuated in various degrees ; they are deeply forked in Schuzocera ; and many others have them covered with long hair, although they are quite bare in the other sex. In some families the number of joints varies very much, but most Aculeata have the same number, namely, 13 in the male and 12 in the female. These appendages serve as sense organs, especi- ally for the discovery of food, and, in the male, for finding the female. At any rate an ichneumon (for instance) when searching for a larva in which to lay its eggs (and this has especially been noticed with those which oviposit in concealed larvee) keeps them in a state of continuous trembling motion, and males have also been observed to do the same when searching for the females.

The three divisions of the thorax—pro-, meso-, and meta- thorax—have pretty much the same relative proportions in all the families. The prothorax is small, 'The upper part is strongly articulated to the mesothorax, while the lower

is freer ; and it is by means of this lower part that the head is united to the thorax.

The metathorax is very large, as might be expected, from its having to take such an import- ant part in flight. As for the scutellum it varies more than any other portion of the thorax. Mostly it is flat, or at

least only slightly raised above the mesonotum ; but in

the smaller groups (Oxyura, Chaledide, Cynipide) its

form is sometimes very curious. In Agilips (Cynipide) and Agriotypes (Ichnewmontda) it is produced into a sharp more or less curved spine; in Luccela it is cup-shaped, that is to say, it is raised up, and has the centre hollow. It undergoes, however, its greatest development with some Chaleididw. In Chirocerus, for example, it is lengthened so much that it reaches the middle of the abdomen. The metathorax is never very large, nor does it exhibit any marked peculiarities. |

The legs show the same manifold diversity in form that we found to exist with the other appendages. The basal parts—the coxe and trochanters—are not usually of any size, except in the lower tribes, ¢.g., Chalcidide. In classifica- tion the trochanters are of value, for we find with the Aculeata they are joined to the femora by a single joint, whereas in all the other Hymenoptera there are two joints. Hence the bees, wasps, &c., form the division Monotrocha ; and the ichneumons, saw-flies, &c., are denominated Ditrocha. Some Chalcidide have the femora greatly thickened, and toothed on the under side ; but as a rule it does not show any striking peculiarity unless it be with some male insects. As might be expected from their more 'ntimate connexion with the habits of the insects, the tibia and tarsi vary according to the uses they are put to, apart from locomotion. With bees (at least with the non-parasitic species) they are employed to carry the pollen necessary for the nourishment of the young; for this purpose they are*

1 The enormous development of the hind femora in Chalcis and Leucaspis does not appear to give these insects extra leaping power. Other Chalcidide which have not thickened femora can leap consider- able distances.

They may Antenne,

Thorax.

Legs.

Ab- domen,

Repro- ductive organs.

iy wi NO P' TE Rh A

provided with hairs, or the apex of the tibie and base of the tarsi are flattened out to form a plate on which the pollen is stored for its easier and more economical convey- ance to the hive. They are richly spined in the sand-wasps, and are thus useful to the animals in digging out the nests which they form in the earth. At the base of the tibic are placed two spurs (calcaria), which, however, may be absent. Finally the tarsi are provided with plate-like processes termed patelle, which may be very largely

developed, especially with males ; and the front pair may terminate in large jointed raptorial claws, as is the case with Chelogynus (Oxyura),

The abdomen may be united to the metathorax in two ways: it may be joined to it by its entire width, or by a narrow pedicle only. In the former case the thorax and abdomen form as it were one whole, so that the body has the appearance of being composed of only two parts ; whereas in the other section the three divisions, head, thorax, and abdomen, are clearly separated, or specialized, It is only the Sirictde and Tenthredinide which have the abdomen united by the whole width. Thus the order becomes divided into two well-marked divisions, one repre- sented by the Tenthredinide (having the abdomen sessile) and the other by the Aculeata, Ichnewmonide (having it appeudiculated). The abdomen shows little variation in structure or form in the Tenthredinide ; but does so to a large extent with the others. Usually more or less globular and rounded, and not of any great length compared to the head and thorax, it is often very much compressed and sabre-like, as in Ophion, or very long and thread-like as in Pelecinus; then it may be joined to the thorax in such a way as to be semi-sessile, or by a very long, thin, thread- like pedicle (Pelopwus, many Chaleidide, and Cynipide). Between these two extremes there are all gradations, the form of the abdomen depending on the habits of the insect, upon its manner of self-defence or of oviposition. As re- gards the number of the segments, it varies. Itis 8 with the Penthredinide and with the Siricidwe, but in other groups it is less. Through one or other of the basal segments being greatly developed, and the terminal ones correspond- ingly reduced in size, some groups appear to have only 3 or 4 (Chrysidide). The Aculeata have always the same num- ber, namely, 7 in the males and 6 in the females. Some bees (Calioxys) and Chrysidide have the abdomen armed with spines or teeth at the apex.

The male and female organs are situated at the end of the abdomen. They are rarely conspicuous externally with the males; but in some females they are of great Jength, and may indeed exceed considerably the length of the body. However different in the various groups of Hymenoptera the organs connected witli the laying of the eggs may be, they are fundamentally constructed on the same plan in all of them, no matter how different they may appear or how various the ways in which they may be used. A typical

ovipositor in the /Zymenoptera may be described as being composed of three bristle-like organs,—one placed above, and the othersbelow. This upper bristle is channelled throughout, and has (when in use) the others pressed to it in such a way that the three together form a narrow tube, through which the egg passes, The two lower bristles are toothed at the lower end. These three parts are enclosed between a couple of two-jointed valves, situated at their base, which serve them as supports. Thus the ovipositor consists of five different parts. It exists under two forms. In the bees and wasps (Aculeata) it takes the form of a sting, or weapon of defence; and it is connected with a gland secreting a poison (the principal constituent being formic acid) which the insect injects by means of the sting into any thing that attacks it. Besides this defensive (or offensive) use to which it is put, it is employed by the

sand-wasps to benumb the larvee and other insects or spiders with which they store their nests for the use of their young, in such a way that they remain to all intents and purposes lifeless, yet still keeping fresh, until such time as the wasp- larvee escape from the eggs and are ready to feed on them. In the rest of the order—with ichneumons, saw-flies, d:c.— it is not used as an instrument of defence (some ichneu- mons, indeed, will attempt to pierce the hand with it when caught, but they are never able to do any harm); it is simply an instrument for laying the eggs, and is not connected with a poison gland, or at any rate with a gland secreting a poison similar to that of a wasp. A poison gland exists, for instance, with saw-flies, but its purpose and also the manner of its use are different from what they are in the case of the aculeates, Its function is to act on the plant in which the eggs are laid,—either to raise galls in which the larvee will find food and shelter, or to prevent the hole made by the ovipositor for the reception of the egg from closing in on the egg, and thereby crush- ing it; for we find that eggs laid, for example, on leaves are not closely pressed by the substance of the leaf, but have a more or less open space surrounding them.

From the observations of Kraepelin on the development of the ovipositor, it seems clear that the grooved central bristle and the two basal sheaths arise in the larva from papille situated on the under side of the ninth abdominal

segment, while the two lateral (or rather lower) bristles have their origin in similar papillee on the eighth, It would appear also highly probable that the parts are true appendages of the abdominal segments, rather than modi- fied portions of the body walls.

The ovipositor is either hidden (as is mostly the case) or may be exserted to a greater or less extent, Its length varies with the habits of the species; that is to say, the longer it is, the deeper, in wood, or in any other substance, does the larva, on which the ichneumon is a parasite, live. Species with long ovipositors occur in all the parasitic families, except the Oxyura and Chrysidide, With the last-mentioned family it istubular. It is strangely modified with the saw-flies. With them it forms a veritable sawing apparatus (hence the name of these insects), being broad, plate-like, and toothed in various ways and degrees accord- ing to the habits of the insects; according as the eggs are laid in leaves or in bark it is slender and thin or broad and thick. In the pupa state Wymenoptera with long ovipositors have them curled up on, and closely pressed to, the back. It is a curious circumstance that this embryonic condition of the ovipositor is retained in the perfect state by a few forms, as, e.g., Leucaspis.

As remarked at the beginning of this article, the Hymenoptera go through a regular metamorphosis—appearing in four distinct forms. The egg is generally longer than it is broad, and rounded at both ends. The skin is always thin, never sculptured, and rarely coloured ; the only instance of colour in any of their eggs known to the writcr being in those of certain saw-flies which are more or less greenish, and this colour may have bcen imbibed from the leaf. Many parasitic species (Ophion, Cynips, Mymar) have pedunculated eggs,—egos provided with a long pedicle or stalk, by means of which they are attached to the plant or insect, as the case may be. A Tryphon, for example, attaches her stalked eggs to the larva's skin ; it hangs by the stalk; and when the young tryphon-larva's development in the egg is matured it leaves it by the lower end, and then proceeds to bore its way into the inside of its victim. A curious phenomenon has been observed to take place in hymenopterous eggs shortly after being laid ; it is that they swell up (perhaps by imbibing moisture, although this cannot be the sole cause of the swelling) to double or more than double the size they were when laid. The number of eggs laid by a female varies of course with the

species. Colonial species lay the grcatest number ; but with them the eggs are not laid all at once, as is the case with solitary species. Some social forms lay comparatively few eggs, while, on the other hand, many saw-flies and ichneumons must lay some hundreds. Solitary bees and wasps do not lay many ; but it must be remembered that the

storing of food and the building and digging of the nest are works of labour and time.

Metamor- phoses. The egg.

The larves.

The pupa.

vie

The larve are of two sorts, Those of species with a petiolated abdomen are white, footless grubs, incapable of any extended motion ; nor is this necessary, for they have not to scek their food, which is provided for them by their mothers,—cither eollected and stored up for them in nests made by the female, as with bees and wasps, or by the eggs being placed in the bodies of other insects on which they live as parasites, or in galls upheaved on plants. It is, however, of interest to note that, while the larva after leaving the egg shows no trace of legs, yet they were present when it was in the egg. This shows clearly that the legs were lost through disuse. And this view is confirracd by the fact that the larvee of the lowest division of the Hymenoptera, those with a sessile abdomen, have jointed thoracic legs, and often abdominal legs as well, while they, for the most part, lead a free existence. In the lowest group of this division, the Sirieid@, as well as in those Tenthredinidce most nearly allied to them, the larve have only the thoracic or true legs. They live either boring in wood, as Sirex, or in stems of plants, as Cephus, or in leaves rolled together by silken threads, as Lyda. Except Lyda, Cephus, and Xyela, all the saw-fly larvee have the sual thoracic anda variable number of false or abdominal legs, which are in fact merely prolongations of the ventral surface of the body, as with many phytophagous Coleoptera ; nor have they any- thing like the claspers of lepidopterous caterpillars. With their similar habits and the presence of

these ventral legs, saw-fly larvae have a considerable resemblance to the caterpillars of Lepidoptera, but they may be known from them in two ways, —by always having more than five pairs of ventral legs (eight in Cimbex, seven in Ne- matus, and six in some Hylotomides), and never having more than two ocelli—one on each side of the head—instead of six on each side as in Lepidoptera. As with lepidopterous caterpillars, green is the prevailing colour of saw-fly larve. They agree with them, too, in their general habits: they live on the leaves of various plants, devouring them in different ways, roll down leaves, raise galls, and mine leaves, It is interesting to note further that, as with lepi- dopterous caterpillars, larvee which are innoxious and eaten by birds are either entirely green, or green with black, pink, or white stripes along the sides and back, while noxious larvee—those with bad smells or secretions which render thein unpalatable to birds—have bright contrasting colours with irregular markings, tubercles, &c., and they feed exposed, so that they may be readily seen and avoided. Some hymenopterous larva before becoming pup moult a certain number of times. According to Packard, a Bombus casts off its skin ten times; Zenthredinide do it five times; but many (all parasitic, and most aculeates) do not moult until they become pup; nor do they empty the contents of the stomach till then. The period during which a hymenoptcron remains in the larva state is seldom long; it may be eight or nine days, or a month or two, but this depends on the season of the year; for many larvae, which have not been able to reach maturity in the autumn, remain in the same condition until the following spring, when they pupate. In order that this period may be passed in quietness, a@ cocoon is usually spun by thelarva. For this purpose it is provided with a spinning apparatus, and a gland for secreting the silk required for the con- struction of the cocoon. With the Aewleata it is thin and almost transparent ; it is of a firmer consistency with ichueumons, and is often eoloured black, brown, or grey. Afierogaster and other Bra- econidee spin their cocoons in company, and often around the dead body of the larva which they have devoured. They may be placed together without any regularity, or elosely pressed in regularly ar- ranged rows like the cells in a hive. Some ichnenmons suspend their cocoons from twigs, &c., by means of a silken thread. Gene- rally the cocoon is single, but certain saw-flies (e.g., Cimbex) spin double ones,—a thin inner one (which may be separated from the outer one by a considerable space) placed inside an outer, harder, and more tenacious

covering. A cocoon, however, is not always spun. Cynipide never spin one, nor apparently do Chaleidide nor some ants, ¢.g., Myrmica. The empty skin of the caterpillar which they have devoured is utilized by some ichneumons instead of a co- coon ; galls serve the same purpose with others; while Hmphytus and other Zenthredinide bore into pithy stems, where they pass into pupe without any other protection. Finally, others make a cell in the earth for the same purpose.

The pupa resembles very elosely the perfect insect, save that the wings are not developed, although visible as pad-like structures along the sides. The legs and antenne are laid along the front of the body, enclosed in thin pellicles. In certain Chaleidide (Eulo- phus) the pupa is of that form called " coarceate ", that is to say, the entire body is enveloped in a case which conceals its form, and this case is hard and of some thickness, instead of being a mere thin transparent skin. When the insect leaves this pupal covering the latter retains its form intact. Most pupe are white. Many saw-fly pupe are green, with orange spots on the abdomen. A few Braconide (Apanteles) have orange-coloured pup.

In the pupa state Hymenoptera remain but a short time,—as a rule, not more than seven to ten days. They are not entirely quies- cent in this condition, but have considerable power of motion, especially if exposed to the light, or disturbed in any way. As the

insect gradually reaches maturity, the pupa becomes more or less black,—at first on the back of the thorax, then on the abdomen and

limbs. When maturity is gained, the insect splits the pellicles

which so closely envelop its body; the limbs are frecd ; the wings spread ont and lose their flabby consistency ; the nervures become hard and firm; the insect moves about, ejects from the anus a coloured liquid, and enters on its new mode of existence.

Hymenopterous insects procreate by the union of the two sexes. This takes place usually in the sunshine. Sometimes the connexion does not last more

than a few seconds, aud is not preceded by any preliminary courting. On the other hand many bees remain united for hours, and the genital parts of the male get torn and ruptured, so that it dies immediately after. Some species of Chalcididu have been observed coquetting together for more than an hour before uniting, Generally copulation takes place on the ground; but a few forms pair on the wing. The male Anthophora, for instance, carries the female with him into the air for the marriage flight. This is the reason why the male Anthophora is larger than the female, instead of being smaller, as is usually tle case,

While, as has been said, Hymenoptera reproduce by the

union of the two sexes, yet parthenogenesis or virgin repro-

duction is of not uncommon occurrence, and has been observed in all the families whose development for more than one generation can be traced with sufficient facility and accuracy. We meet with this phenomenon under (broadly speaking) two or three phases. Many females, if they

cannot get access to males, will readily lay eggs, which are

fertile and give issue to larvae ; but these larvee, when they reach maturity, yield invariably males. Any one can test this for himself with the teo common gooseberry grub, Nematus ribesti. The same thing occurs with wasps, ants, and bees. With saw-flies, again, there are some species whose males are quite unknown, although the species have been caught and bred from the larve in hundreds, e.g., Eriocampa ovata. Others have males, but they are ex- tremely rare, ¢.g., Nematus gallicola. It has been shown, too, that the species just mentioned and some others (Phyl- lotoma nemorata, Pecilosoma pulveratum, &c.) with males unknown readily lay fertile eggs. 'The queen bee can lay eggs which will produce males or females, by opening or closing the spermatic sac, and letting the eggs come in con- tact or not with the spermatic fluid. In the former case females will be the result, in the latter males. Worker bees, wasps, and ants deposit eggs which produce, however, only males. A still more curious phenomenon in connexion with the reproduction of some gall-insects (Cynipide) requires to be mentioned. In early spring will be found on oak leaves and flowers soft, juicy, greenish, globular pea-shaped galls. Out of these come in summer the

gall- flies represented by both sexes. In the autumn (also on oak leaves) are found those curious flat brownish galls commonly called "oak spangles," which by many are taken for fungi, and have indeed been described as such. These "spangle galls" retain very much the same form during the autumn and winter; then in March they swell up and become juicy, and a larva makes its appearance ; this soon becomes a pupa and finally a fly, but only in one sex, thefemale. It was long supposed that these two insects had no relationship with each other, that they belonged in fact to two distinct genera, for not only did the galls differ, but the insects themselves differed in the form of the body, the wings, &c. But it has recently been shown by Dr Adler that the two are forms of the same species, that there is an alternation of a spring bisexual form, with an autumnal unisexual one.

A dimorphism of another kind exists among the social bees, wasps, and ants. An ordinary colony of these insects consists of three sorts of individuals. There is the large female which founded the colony; then there

Use of the order to man.

Aquatic Species,

Emission

| of sound.

HYMENOPTERA

are the workers or neuters, undeveloped females on whom the work of the colony depends; and, lastly, there are the males. It is with ants that the workers are most pro- foundly modified. They are wingless, and there may be in a colony several sorts, each kind performing different, duties, and having the body modified in accordance with the work it has to do. Those which act as soldiers (when a special kind is set apart for this work), for instance, have the mandibles enormously developed; another sect may secrete honey for the benefit of the others, &c.

The Hymenoptera must be regarded as one of the most beneficial and useful to man of the insect orders. The pro- duce of the hive bee—wax and honey

—has been employed by man since the earliest ages, and forms an extensive article of commerce. The curious structures raised by Cynipide on the oaks of eastern Europe—galls—have long been used in the manufacture of ink. But, whatever the bee may have done in contributing to our luxuries, and the gall-fly in rendering easier the advance of knowledge, these are small benefits compared to the indirect advantages we de- rive from the labours of the parasitic species through the havoc they make among the insects which devour the pro- duce of our fields and gardens, and too often destroy the labours of the farmer and gardener. . When we remember that there are vast numbers of insects which destroy plants ; that many of these are so minute and obscure in their mode of life as to escape ordinary observation, save when the in- jury is done; and that others appear in enormous nuntbers, —it becomes evident that an insect which causes the death of a single caterpillar does good service, since that caterpillar would have (if left undisturbed) given, in all probability, origin to an imago which might give birth to hundreds of others. It is this which the ichneumons do,— they destroy the larvze of plant-devouring insects. Another division of Hymenoptera does equally good service. Tt has been shown by modern researches that without the aid of bees many flowers would never yield seed. Many plants cannot fertilize themselves, so that if bees did not carry the pollen from one plant to another, and thus effect fertiliza- tion, no seed would be produced. The red clover, for instance, would never produce seed if it were not for the humble bees fertilizing it in their visits in search of honey. 1t must, however, be confessed that some HH ymenoptera do very considerable damage to vegetation, especially saw-flies and ants. Of injurious saw-flies the most destructive are Lriocampa adumbrata, on fruit trees ; Nematus ribesit, which is so destructive to the gooseberry and red currant ; Athalia spinarum, at one time so destructive to the turnip (probably when it first took to feeding on it) ; and Cephus, in the stems of corn. The damage done by ants in Europe is small; but in the tropics the leaf-cutting ants do enor- mous damage by cutting down the leaves of trees (especially cultivated ones), which they convey into their nests, where they are used (according to Belt) to rear fungi upon which the ants feed.

The Hymenoptera are almost exclusively dwellers on land, and are essentially sun-loving insects. Two or three only live an aquatic or quasi-aquatic mode of life. Sir John Lubbock discovered two minute species of

Oxyura (Poly- nema) which descend into the water for the purpose of depositing their eggs in the eggs of aquatic insects. They use the wings as oars to swim in the water, and can remain in it for two hours. An ichneumon (Agriotypes) has long been known to live as a parasite in the bodies of caddis- worms ; and it has been observed to go down into the water to find the worms, which are said, when infested by the ichneumons, to anchor themselves by means of a silken thread.

Many ymenoptera give origin to sounds. The humming of bees is one of the most familiar and delightful of country

sounds. It is not yet quite clearly understood how it is caused, but there is evidence enough to show that the buzzing originates by the air impinging against the lips of the metathoracic and abdominal stigmas; although it is possible, too, that the rapid vibration of the wings (224 per second with the Bombus muscorum and 440 with the honey bee) may also have something to do with the production of sound, for a bee can give ont differently pitched notes according to its mood, as it is pleased or angry. Besides the buzzing sounds, a few other species chirp by means of the abdominal segments. Mudtilla stridulates by drawing in and out the raised striated surface of the third under the edge of the elongated second segment. The workers of Myrmuca stridulate in pretty much the same way.

The internal anatomy of the 17ymenoptera presents some interesting features. Their organs of secretion are numer- ous. The poison is secreted in two long ramose tubes; and from them it goes into a sac situated near the base of the sting. Wax is made in some of the abdominal segments. The salivary glands in the hive bee (worker) are very large and complicated. They are three in number, two (an upper and a lower) placed in the head, and the other in the front region of the thorax. Each gland is different, and has excretory ducts of its own. In the queen bee these are not nearly so much developed as in the worker, and they are even less in the drones. Many saw-fly larvee secrete fluids for purposes of defence. Some species of Z'enthredo secrete a blackish liquid, which they eject from the mouth; Perya throws out a gummy matter from the same orifice, and Cimbex an acid liquid from lateral pores. Then there are the silk-secreting glands

which most larve possess. The urinary vessels are always present, and may be as many as 150. According to Von Siebold, the aculeates have a long intestine and a stomach with many convolutions, while they are short in the terebrant forms. The trachee are well developed. Many dilatations are given off from the main stems, a pair at the base of the abdomen being exceptionally large. In connexion with the female organs of generation, it is worthy of remark that sebaceous glands and a copulatory pouch are absent in the Acueata, although present in the other section. The ovaries are two in num- ber, and consist of a number (it may be as many as a hundred) of distinct many-chambered tubes. Each tube in Athalia, for instance, contains 7 eggs, and, as there are 18 of such tubes in each ovary, there will be thus 250 eggs in all. In Platygaster the ovary is of a very exceptional nature, inasmuch as the egg tube is a close sac, so that it is burst when the egg is laid.

The most noteworthy and exceptional features in the developmental history of the Hymenoptera are those shown by some very minute species of O.cyura, which live in the bodies of Diptera (Cecidomyza), and in the eggs of beetles and dragon-flies, After the eggs of Platygaster have undergone segmentation, and the embryo has been formed, there leaves the egg a larva of a very unusual form. It is broad and rounded at the head, but contracted towards the tail, which terminates in four spined, bristle-like appendages, so that the larva has a considerable resemblance to a copepod. It is provided with a mouth and hook-like man- dibles, by the aid of which it anchors itself inside the body of its host (the larva of a Cecidomyia); there are a rudi- mentary stomach and antennz, but no trace of nerves, trachese, or organs of circulation. Soon it changes its form: the tail. with its bristles is thrown off; it becomes shaped somewhat like a hen's egg; the nervous, circulatory, and reproductive organs become visible, while the alimen- tary organs show an advance in structure. This second ec re ee

1 The wax is secreted on the ventral surface of the hive bee, but on the dorsal surface with the stingless bee of America (Melipona).

Internal anatomy.

Special-

ties in

develop-

ment.

Classifi- cation.

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larva is succeeded bya third, which differs from it in being longer and thinner, while the various organs have reached a further stage of advancement in complexity of structure.

The after course of its development does not differ from that of other [Zymenoptera.

early embryonic life. Classification.—As regards the classification of the Hymenoptera,

the order divides itself naturally into two great divisions, as has been already indicated. The Aculeata form a division distinguished with its connected poison-bag, and by the trochanter being joined to the femur by a single joint. The other division (that usually called Zerebrantia or Ditrocha) has a double joint to the trochanter, and the ovipositor is never used as

alike by the form of the sting,

a weapon of offence.

The Ditrocha are again divided into two sections, well distin- guished by the fori of the abdomen, by the larva, and by habits : the one (the Scewrifera) has the abdomen sessile, the larvee have legs, and they are phytophagous ; while the other (the Spieulifera) has the abdomen petiolated, the larve are apodal, and they are (except part of the Cynipide) animal feeders. The Seewrifera are further distinguished from all others by the form of the ovipositor, which forms either a short "saw," as in the Tenthredinida, or a stout exserted "borer," as in the Siricide; and they have another peculiarity in having at the bottom of the anterior wing a cellule,

termed the “ lanceolate cellule” (see fig. 1, above), which is found in no other family, and is of great use in classification. The Sccwrifera embraces the families Tenthredinide and Siricide (by some Cephus is made into a third family, while by others it is placed among the Zenthredinide, owing to its agreeing with the saw-flies in the form of the thorax and ovipositor, and by others with the Szrictde, because it has only one spine in the anterior leg, while the saw-flies have two). The species of Siricidw are few in number, and have a very wide distribution. They are larger than any Zenthredinide, and are indeed among the giants of the order. All live in wood, especially in Coniferw, and have occasion- ally done great damage to the forests in Germany. As they are easily imported along with timber, they very often make their appearance in out-of-the-way places and frighten ignorant people, although, of course, they are perfectly harmless.

The Spiculifera contain the families Cynipida, Chaleididw, Proc- totrypide, Evanide, Braconide, and Ichnewmontdee.

The Cynipide, or gall-flies, are small insects, rarely exceeding two lines in length. The antenne are straight, inserted in the middle of the face ; thejoints are variously shaped, and do not exceed 16 in number. The thorax is large ; the scutellum always forms a con- spicuous object, and its form is very varied. ‘The abdomen is much compressed, especially with the males; curled up over the apical segments is the long thin bristle-like ovipositor. A few species are apterous. There is always a radial cellule in the anterior wing, but few nervures and there is never a stigma. What distinguishes the Cynipide more especially is their habit of raising galls on plants to serve as food and lodgings for their young. These galls have the inmost diversified shapes, and are raised on all parts of a plant—the puds, leaves, roots, flowers, and fruit all being used by the gall insects. A gall may serve to shelter a solitary larva, or it may be so large as to contain many hundreds. The oak is the principal tree used by the Cynipide ; next is the rose, upon which is found the well-known “ bedeguar gall ” of Rhodites rosw, once used medi- cinally ; the maple, poppy, bramble, hawkweed, and some other plants have likewise their galls. All Cynipidw, however, are not gall-makers. One group deposit their eggs in the galls raised by the true gall-makers, when they are soft and young, and the larva of the cuckoo-fly lives on the gall at the expense of the legitimate owner, which is killed by the more

energetic intruder. Another group contains pure animal feeders, parasites which live at the expense of other insects (especially plant lice).

Closely allied to the Cynipide is the family Chalcidide, an immense tribe of very minute insects with brilliant metallic green bodies. Their wings have few nervures, and they never form closed cellules, but a stigma is always present. The antenne are always elbowed ; they have never more than 13 joints, and may have as few as 6. With the males they are sometimes flabellate, or covered with tufts of hair. Generally the ovipositor is short and concealed, but it may be exserted and much longer than the entire body. In either case it issues from the lower side of the belly. Apterous and seini-apterous species are not uncommon, In habits the Chalcididce

a Se

1 There is a radical distinction between the gall-making Cyntpide and the gall- making saw-fiies. The latter feed on the gall itself, so that in course of time it becomes reduced to a mere bladder; and the gall is fully formed before the larva leaves the egg. On the other hand, the development of Cynips and the growth of the gall go on at the same time,—the reason of this being that it feeds only on the juiee of the gall, which hardens and dries very soon after it makes its appcarance, so that necessarily the larva has to feed up rapidly. After the

gall has dricd the larva oceupies a ecll of harder matter than the rest of the gall, not much larger than its own bulk.

Polynema and Mymar (egg- parasites) go through somewhat similar changes in their

HYMENOPTERA

are very diversified. ‘They are parasites on insects of all orders and in all stages. While no definite line can be drawn, yet particular groups in the mass confine their attacks to certain families of insects. Thus Leweaspis and Chalets are attached to bees and other nest- building aculeates, the long-tailed Torymides to oak and other galls, the Enerytides to Homoptera (Coceus especially). Species of [sosoma appear to be herbivorous, and one

in Ameriea is destructive to corn, by raising gall-like struetures at the joints and thus cansing the plant to wither. Giraud has likewise described Jsosoma tobe a vegetable feeder, at any rate during a considerable portion of its life, as well as another species (Awlogymnus aeeris) which lives in galls on the maple. Those curious forms, Syeophaga and Blastophaga, which live in figs, appear undoubtedly to feed on their seeds.

The species of Proctotrypide (called also Oxywra), unlike those of the Chalcidide, axe dull-coloured insects, usually entirely black, or at best relieved by brown or red. They are distinguished from the last family by the non-elbowed antenne, which are 8- to 13- jointed. The wings in the sinaller forms may be without nervures, while in the higher they are much more developed than in the Chaleididce. The edges of the wings are deeply fringed with some species ; and other speeies have dense patches of hair on the thorax and abdomen. One group bears raptorial claws on the front tarsi; and, in connexion with this structure, it is worthy of notice that the late A. H. Haliday observed one species to kill and deposit in an empty straw a caterpillar, apparently for the purpose of laying its egos in it; so that in habits it approximates to the fossorial Hymenoptera, which some of them undoubtedly do in structure. The Oxy2ra are parasites. Some are attached to gall insects, others to aphides, while Diptera and eggs of insects of all orders afford nourishment to many.

The insects usually called "ichneumons" belong to two familics —the Ichncwmonide and Braconide. Both are readily distinguished from the families already mentioned by the wings being well pro- vided with nervures, which form regular cellules, by the greater number of joints in the antenne, and generally by their much greater size. The only radical distinctions between the groups are that the Zehnewmonide have two recurrent nervures, and a little joint in front of the second antennal joint, whereas this is absent in the Braconide, which have besides only one recurrent nervure. In habits there is no broad distinction between them. They are para- sites on insects of all orders. The Zvanidw are a small and some- what heterogeneous assemblage of insects, which do not agree very well in their structure ; but the typical species may be known by the abdomen being inserted in the middle or above the middle of the ietathorax.

As far as is known the family are parasitic on cock- roaches, and appear to be not very numerous in species.

In some respects the Chrysididw are intermediate between the Aculeata and the Terebrantia, for they have the single-jointed tro- chanter of the former, while in the structure of the ovipositor, in having the antennz 18-jointed in both sexes, as well as in habit, they agree with the latter. They are exceedingly brilliant insects ; their bodies are metallic, with shining green, purple, or golden hues. The abdomen hangs as it were from the thorax, and is somewhat concave on the underside. It can be bent under the thorax, so that the insect can roll itself up into a ball, which is its way of protect- ing itself when attaeked—its hard metallic coat of mail being im- pregnable against the mandibles of other insects. These insects differ from other terebrant Hymenoptera in the structure of the abdomen, for it has never more than four segments visible in the female and five in the male, while the ichneumons have always more. The terminal segments form a tube, which is used in oviposition. In habits the Chrysidide do not differ from the ichneumons, being parasites. They prey principally ou bees and wasps, whose nests they enter when the owners are absent, and shou d they be dis- covered their hard skin saves them from serious injury. Indeed the only portions of their bodies which can be inutilated are the wings. St Fargeau observed a bee do this to a chrysis ; she bit off the four wings, but did not thereby save her young, for as soon as the bee left, the now wingless parasite crawled into the nest and laid her eggs therein.

As hag been stated, the Aculcata are distinguished from all other Hymenoptera by having a sting, a single-jointed trochanter, and the antenne with 12 joints in the female and 13 in the male. They differ, too, in habits from the Zcrebrantia, for, although many of them are parasites, their parasitism is unlike that of the ichneumons. Parasitic Aevwleata earn their bread differently : they enter the nests of other aculeate species and lay their eggs in the food stored up there for the benefit of the young of the builder, which are starved or destroyed by the more vigorous larva of the parasite. In order to earry out their ends with greater ease, some parasites mimic the forms of the species npon which they prey. Thus dpathus rupestris is coloured exactly like Bombus lapidarius, its host. On the other hand the species of Nomada, an extensive genus of parasitic bees, do not resemble in

the least the bees on which they prey ; they have instead gaudily coloured, hairless bodies. Oue of the most interest- ing chapters in the history of the Aculeata is their nest building. The nests are built in all sorts of places and of all kinds of materials.

Many, like Andrena, dig in light soils a burrow, eonsisting of a | representatives of the order are found in all parts of the world, even narrow passage going down some inehes, and having at each side of | as far north as 78° to 83° N. lat., where Bombi and iehneumons it at intervals eells in which the food is stored. Wood is used by | were found by the naturalists attached to the Aretic expedition of others to form somewhat similar eells, which may be lined with | 1875-76. Many genera in all the familics have a very wide dis- pieees of leaves or flowers. The stems of brambles are utilized by a | tribution, e.g., Ophion and Pimpla among the ichneumons, Ody- large number of species of bees and fossorial Hymenoptcra. Osmia | nerus with the wasps, Megaehile with bees. Humble bees and uses empty shells for its habitation. Then others build up nests, | saw-flies are eharaeteristic of temperate, if not northern, latitudes; . Chalicodoma and other bees, with many wasps, eonstruet eells by | Afutilla of warm regions, although it also appears in aretie regions. eementing together bits of mud and clay. Social wasps form their Vespa is more limited in its range than the solitary wasps (Odynerus, large nests of paper made of masticated wood ; humble bees and the &c.), being absent froin Africa, Australia, and South Ameriea. hive bee do so by asecretion ealled wax. Some ants build upfrom the | Many individual speeies have a very extensive range. This has ground, of leaves, &c., nests shaped like a hay-staek, whieh in size | been brought about in some eases by the aid of man, In this way they may almost equal. An Indian speeies builds, at the ends of many pests have been earried over the globe, ¢.g., Nematus ribcsit, branches of trees, large nests of dead and living leaves matted | the gooseberry grub, which is now Spreading over the American together with a white web. Finally, the thorns of Acacia are | gardens; Lriocampa adumbrata, the slug worm of British fruit hollowed out by others to serve as a residence. trees, has reached New Zealand ; while, among ants, the house ant The Aculeata may be divided into five families— the Formicidae, | of Madeira (Phetdole pusilla) is now eosmopolitan. Many

species or ants, AMuttllide (eommonly ealled ‘“ solitary ants”), Fossores | are eommon to the Paleearetie and Nearctic regions, ¢.g., Megachile (sand-wasps, &e.), Diploptera, or true wasps, and Anthuphila, or ecntuncularis, Vespa vulgaris, Hemichroa rufa, Others have a bees. he antsare, asa rule, social insects, and their workers differ | wider geographieal range. The ant Solenopsis geminata, for instanee, from those of wasps and bees in being always wingless.!. What mor- | is found in India, the Eastern Archi pelago, South Ameriea, and the phologically inore espeeially distinguishes ants from other aeuleates | Hawaiian Islands, Hylotoma pagana, again, oceurs in the Southern is the structure of the abdomen, which at the base (on the peduncle | States of Ameriea, andall over Europe, and extends to India andJ apaul. or petiole) is provided either with a flattened plate-like projection There being no eomplete list of Hymenoptera, it is not easy to give Number or with two nodes. In the former ease, there is, as in Formica, | the nuinber of described species, but probably it is not much over of only a rudimentary sting, while in the latter there is an effieient | 17,000. The actual number, however, must be very much greater ; specics. one, as in Myrmica; but there are exceptions to both rules, A few probably it will be found to reach 70,000 or 80,000 ; for in those auts are solitary and parasitic in habits, and in this ease the female countries where anything like the same attention has been paid to is wingless. Closely allied to the ants are the Mutillide (by some | them as to beetles they are nearly as numerous; and in no eountry authors the two are plaeed in one group, Heterogena), whieh, how- | have they reeeived so much attention as Coleoptera. As regards ever, differ from them in being solitary, in having neither a seale nor | the number of British species, there are reeorded in the catalogues node, while the tibie are spined, and the tarsi ciliated. It is only | published by the Entomological Society of London, in 1871-2, 378 the males whieh are winged, and they have the abdomen spined and Aculeata, 1654 Ichneumonidee and Braeonide, and 825 Oxyura ; eurved at the apex. They are brightly coloured insects, and are | while 325 saw-flies were catalogued in 1878—in all about 2700, very numerous in speeies, So far as is known they are parasites on | Besides these there are about 150 Cynipide, and upwards of 1200 humble bees. The group of Fossores is a very extensive one. Their | Chalcidide have been deseribed by Franeis Walker ; but that num- habits are very interesting and varied even in the same genus. They | ber may safely be redueed to 600 or 700. are earnivorous, storing up (after having benumbed

but not killed) : eaterpillars, beetles, flies, aphides, &e., in eells formed or dug out Bibliography.—t. SYSTEMATIC.— Westwood, An Introduction to the Modern

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1860; 1d., them eertain peculiarities of structure in connexion with their habits, | Jchnewm. Suecica, 1871; Klug, Mongr. Siricum Germania, 1803; "Die Blattwes-

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ing home of pollen. This is done more especially on the legs. The Mayr and Giraud, on Chalcidide and Cynipidee, in Verh. d. 200l,-bot. Vereins in

Gat – 6 Wien; by Forster in the same Transactions and in Verh, des naturhist. Vereins basal joint of the tarsus is, for this purpose, flattened and com- | g, Proline Kheinlande u. Westphalens; by Hartig, on Cynipide in Germar's pressed, and eovered (at least on the inner side) with hair. This | Ze. J. Ents as well as papers by various authors in the Stettiner Entom. then, is a charaeter whieh distinguishes them from all other 5 atin i Berliner il re BU Lee ge be la re . im

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less bodies, as already remarked. pee be ; a ce Mey srt ac i al vaeue pecs

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1871.

have appeared mueh earlier in time than that. At the present day, (P. CA.)

HYMNS

Muses to address hymns to Zeus, and in his Theogonia he HE word "hymn" (Suvos) was employed by the | speaks of them as singing or inspiring "hymns" to all the ancient Greeks to signify a song or poem composed | divinities, and of the bard as "their servant, hymning the in honour of gods, heroes, or famous men, or to be recited | glories of men of old, and of the gods of Olympus." Pindar on some joyful, mournful, or solemn occasion. Polymnia | calls by this name odes, like his own, in praise of con- was the name of their lyric muse. Homer makes Alcinous querors at the public games of Greece. The Athenian entertain Odysseus with a "hymn" of the minstrel Demo- | dramatists (Euripides most frequently) use the word and its docus, on the capture of Troy by the wooden horse, The | cognate verbs in a similar manner ; they also describe by Works and Days of Hesiod

*begins with an invocation to the | them metrical oracles and apophthegms, martial, festal, * The wings, however, may be distinguished in the pups of the | 20d hymenzal songs, dirges, and lamentations or Incanta- neuters, thus showing clearly that they have been lost through disuse. ! tions of woe. XI pees)*

1. Classical Hymnody.

578

Hellenic hymns, according to this conception of them, have come down to us, some from a very early and others from a late period of Greek classical literature, Those which passed by the name of Homer were already old in the time of Thucydides. They are mythological poems – (several of them long), in hexameter verse, some very in- teresting. That to Apollo contains a traditionary history of the origin and progress of the Delphic worship ; those on Hermes and on Dionysus are marked by much liveliness and poetical fancy. Hymus of a like general character, but of less interest (though these also embody some fine poetical traditions of the Greek mythology, such as the story of Tiresias, and that of the wanderings of Leto), were written in the 3d century before Christ, by Callimachus of Cyrene. Cleanthes, the successor of Zeno, composed (also in hexa- meters) an "excellent and devout hymn" (as it is justly called by Cudworth, in his Intellectual System) to Zeus, which is preserved in the Zcloge of Stobzeus, and from which Aratus borrowed the words, " For we are also His off- spring," quoted by St Paul at Athens. The so-called Orphic hymns, in hexameter verse, styled reXera/, or hymns of initia- tion into the "mysteries" of the Hellenic religion, are productions of the 'Alexandrian school,—as to which learned men are not agreed whether they are earlier or later than the Christian era.

*The Romans did not adopt the word "hymn ;" nor have we many Latin poems of the classical age to which it can properly be applied, There are, however, a few,—such as the simple and graceful " Dian sumus in fide" (" Dian's votaries are we") of Catullus, and ' Dianam tenerz dicite virgines" ("Sing to Dian, gentle maidens *) of Horace,— which approach much more nearly than anything Hellenic to the form and character of modern hymnody.*

9, Hebrew Hymnody.

For tho origin and idea of Christian hymnody we must look, not to Gentile, but to Hebrew sources. St Augustine's definition of a hymn, generally accepted by Christian an- tiquity, may be summed up in the words, " praise to God with song" ("cum cantico"). Bede understood the " can- ticum" as properly requiring metre ; though he thought that what in its original language was a true hymn might retain that charactcr inan unmetrical translation. Modern use has eularged the definition: Roman Catholic writers extend it to the praises of saints; and the word now com- preliends rhythmical prose as well as verse, and prayer and spiritual meditation as well as praise.

The modern distinction between psalms and hymns is arbitrary (see Psazms). The former word was used by the LXX. asa generic designation, probably because it implied an accompaniment by the psaltery (said by Eusebius to have been of very ancient use in the East) or other instru- ments. The cognate verb " psallere" has becn constantly applied to hymns, both in the Eastern and in the Western Church; and the same compositions which they described generically as "psalms" were also called by the LXX. " odes" (i.¢., songs) and "hymns." The latter word occurs, e.g., in Ps. lxxii. 20 ("the hymns of David the son of Jesse"), in Ps. Ixv. 1, and also in the Greek titles of the 6th, 54th, 55th, 67th, and 76th (this numbering of the psalms being that of the English version, not of the LXX.). The 44th chapter of Ecclesiasticus, "' Let us now praise famous men," &e., is entitled in the Greek zarépwv tuvos, "The Fathers' Hymn." Bede speaks of the whole book of Psalms as called

'liber hymnorum," by the universal consent of Hebrews, Greeks, and Latins.

In the New Testament we find our Lord and His apostles singing a hymn (spvjoavres 2éndOov), after the institution of the Lord's Supper; St Paul and Silas doing the same (Suvowy rov Océv) in their prison at Philippi; St James re-

H ¥YOans

commending psalm-singing (WaAAérw), and St Paul " psalms and hymns and spiritual songs" (Warpots kal tpvous Kat gdais tvevrparixais). St Paul also, in the 14th chapter of the first epistle to the Corinthians, speaks of singing (Wadd), and of every man's psalm (éxacros tpav Wapov éxet), in a context which plainly has reference to the assem- blies of the Corinthian Christians for common worship. All the words thus used were applied by the LXX. to the Davidical psalms; it is therefore possible that these only may be intended, in the different places to which we have referred, But there are in St Paul's epistles several passages (Eph, v.14; 1 Tim. iii, 16; 1 Tim. vi. 15, 16; 9 Tim, ii. 11, 12) which have so much of the form and character of later Oriental hymnody as to have been sup- posed by Michaelis and others to be extracts from original hymns of the Apostolic age. Two of them are apparently introduced as quotations, though not found elsewhere in the Scriptures. A third has not only rhythm, but rhyme. The thanksgiving prayer of the assembled disciples, recorded in Acts iv., is both in substance and in manner poetical ; and in the canticles, " Magnificat," " Benedictus," &cc,, which manifestly followed the form and style of Hebrew poetry, hymns or songs, proper for liturgical use, have always been recognized by the church,

3, Eastern Church Hymnody.

The hymn of our Lord, the precepts of the apostles, the angelic song at the nativity, and " Benedicite omnia opera," are referred to in a curious metrical prologue to the hymnary of the Mozarabic Breviary, as precedents for the practice of the Western Church. In this respect, however, the Western Church followed the Eastern, in which hymnody prevailed from the earliest times.

Philo describes the " Therapeute " of the neighbourhood of Alexandria as composers of original hymns, which (as well as old) were sung at their great religious festivals,—the people listening in silence till they came to the closing strains, or refrains, at the end of a hymn or stanza (the "acroteleutia" and "ephymnia"), in which all, women as well as men, heartily joined. These songs, he says, were in various metres (for which he uses a number of technical terms); some were choral, some not; and they were divided into variously constructed strophes or stanzas.

Eusebius, who thought that the Therapeute: were com- munities of Christians, says that the Christian practice of his own day was in exact accordance with this description. Gibbon considered it to be proved, by modern criticism, that the Therapeutze were not Christians, but Essene Jews ; but he recognized in their customs "a very lively image of primitive discipline ;" and he states that the Christian religion was embraced by great numbers of them, and that they were probably, by degrees, absorbed into the church, and became the fathers of the Egyptian ascetics. Apollos, 'born at Alexandria," may possibly have been one of them.

*The practice, not only of singing hymns, but of singing them antiphonally, appears, Pliny to Trajan, to have been established in the Bithynian churches at the beginning of the 2d century. They were accustomed "stato die ante lucem convenire, carmenque Christo, quasi Deo, dicere secum invicem." This agrees well, in point of time, with the tradition recorded by the historian Socrates, that Ignatius (who suffered martyrdom about 107 a.p.) was led by a vision or dream of angels singing hymns in that manner to the Holy Trinity to intro- duce antiphonal singing into the church of Antioch, from which it quickly spread to other churches, There seems to be an allusion to choral singing in the epistle of Ignatius himself to the Romans, where he exhorts them, * yopos "having formed themselves into a choir"), to*

yevdpevot 2 t to the Father in Christ Jesus." A statement

"sing praise

Thera- pete.

Anti-

from the well-known letter of phonal

singing.

2d century,

3d century,

of Theodoret has sometimes been supposed to refer the origin of antiphonal singing toa niuch later date; but this seems to relate only to the singing of Old Testament Psalms (riv Aaviducny peAwdiav), the alternate chanting of which, by a choir divided into two parts, was (according to that statement) first introduced into the church of Antioch by two monks famous in the history of their time, Flavianus and Diodorus, under the emperor Constantius II.

Other evidence of the use of hymns in the 2d century is contained in a fragment of Caius, preserved by Eusebius, which refers to "all the psalms and odes written by faithful brethren from the beginning," as "hymning Christ, the Word of God, as God." Tertullian also, in his description of the " Agape," or love-feasts, of his day, says that, after washing hands and bringing in lights, each man was in- vited to come forward and sing to God's praise something either taken from the Scriptures or of his own composi- tion ("ut quisque de Sacris Scripturis vel proprio ingenio potest"). Bishop Bull believed one of those primitive compositions to be the hymn appended by Clement of Alexandria to his Pedagogus; and Archbishop Ussher considered the ancient morning and evening hymns, of which the use was enjoined by the Apostolical Constitutions, and which are also mentioned in the "Tract on Virginity " printed with the works of St Athanasius, and in St Basil's treatise upon the Holy Spirit, to belong to the same family. Clement's hymn, in a short anapestic metre, beginning orduov drwy ddadv (or, according to some editions, Baotred dyiwv, Adye ravdaydérwp—translated by Mr Chat- field, "O Thou, the King of saints, all-conquering Word "), is rapid, spirited, and well-adapted for singing. The Greek '"'Morning Hymn" (which, as divided into verses by Arch- bishop Ussher in his treatise De Symbolis, has a majestic rhythm, resembling a choric or dithyrambic strophe) is the original form of "Gloria in Excelsis," still said or sung, with some variations, in all branches of the church which have not relinquished the use of liturgies. The Latin form of this hymn (of which that in the English communion office is an exact translation) is said, by Bede and other ancient writers, to have been brought into use at Rome by Pope Telesphorus, as early as the time of the emperor Hadrian. A third, the Vesper or " Lamp-lighting" hymn ("is

idapdv dyias ddéys,”—translated by Canon Bright “Tight of Gladness, Beam Divine”), holds its place to this day in the services of the Greek rite. In the 3d century Origen seems to have had in his mind the words of some other hymns or hymn of like character, when he says (in his treatise Against Celsus); ‘We glorify in hymns God and His only begotten Son ; as do also the Sun, the Moon, the Stars, and all the host of heaven. All these, in one Divine chorus, with the just among men, glorify in hymns God who is over all, and His only begotten Son.” So highly were these compositions esteemed in the Syrian churches that the council which deposed Paul of Samosata from the see of Antioch in the time of Aurelian justified that act, in its synodical letter to the bishops of Rome and Alexandria, on this ground (among others) that he had prohibited the use of hymns of that kind, by uninspired writers, addressed to Christ.

After the conversion of Constantine, the progress of hymnody became closely connected with church controver- sies. There had been in Edessa, at the end of the 2d or early in the 3d century, a Gnostic writer of conspicuous ability, named Bardesanes, who was succeeded, as the head of his sect or school, by his son Harmonius. Both father and son wrote hymus, and set them to agreeable melodies, which acquired, and in the 4th century still

Ephraem retained, much local popularity. Ephraem Syrus, the first

Syrus.

voluminous hymn writer whose works remain to us, think- ing that the same melodies might be made useful to the

faith, if adapted to more orthodox words, composed to them a large number of hymns in the Syriac language, principally in tetrasyllabic, pentasyllabic, and heptasyllabic metres, divided into strophes of from 4 to 12, 16, and even 20 lines each. When a strophe contained five lines, the fifth was generally an “ephymnium,” detached in sense, and consisting of a prayer, invocation, doxology, or the like, to be sung antiphonally, either in full

chorus or by a separate part of the choir. The Syriac Chrestomathy of Hahn (published at Leipsic in 1825), and the third volume of Daniel's Thesawrus Hymnologicus, contain specimens of these hymns. Some of them have been translated into (unmetrical) English by the Rev. Henry Burgess (Select Metrical Hymns of Ephrem Syrus, &c., 1853). A con- siderable number. of those so translated are on subjects connected with death, resurrection, judgment, é&c., and display not only Christian faith and hope, but much sim- plicity and tenderness of natural feeling. Theodoret speaks of the spiritual songs of Ephraem as very sweet and profit- able, aud as adding much, in his (Theodoret's) time, to the brightness of the commemorations of martyrs in the Syrian Church.

The Greek hymnody contemporary with Ephraem fol- lowed, with some licence, classical models. One of its favourite metres was the Anacreontic; but it also made use of the short anapzstic, Ionic, iambic, and other lyrical measures, as well as the hexameter and pentameter. Its principal authors were Methodius, bishop of Tyre (who died about 311 a.p.), Synesius, who becanie bishop of Ptole- mais in Cyrenaica in 410, and Gregory Nazianzen, for a short time (380-381) patriarch of Constantinople. The merits of these writers have been perhaps too much depreci- ated by the admirers of the later Greek '" Melodists." 'They have found an able English translator in the Rev. Allen Chatfield (Songs and Hymns of Earliest Greek Christian Poets, &e., London, 1876). Among the most striking of their works are pvdeo Xpurré (" Lord Jesus, think of me"), by Synesius; cé rov dpOtrov povdpyny ("O Thou, the One Supreme") and rico. OéAas yeveoGar ("O soul of mine, repining "), by Gregory ; also dvwOev raphévor (" The Bride- groom cometh"), by Methodius. There continued to be Greek metrical hymn writers, in a similar style, till a much later date. Sophronius, patriarch of Jerusalem in the 7th century, wrote seven Anacreontic hymns; and St John Damascene, one of the most copious of the second school of " Melodists," was also the author of some long composi- tions in trimeter iambics.

An important development of hymnody at Constantinople Period arose out of the Arian controversy. Early in the 4th of Arian century Athanasius had rebuked, not only the doctrine of pune Arius, but the light character of certain hymns by which YS

he endeavoured to make that doctrine popular. When, towards the close of that century (398), St John Chrysostom was raised to the metropolitan see, the Arians, who were still numerous at Constantinople, had no places of worship within the walls; but they were in the habit of coming into the city at sunsct on Saturdays, Sundays, and the greater festivals, and congregating in the porticoes and other places of public resort, where they sung, all night through, antiphonal songs, with "acroteleutia " (closing strains, or refrains), expressive of Arian doctrine, often accompanied by taunts and insults to the orthodox. Chrysostom was apprehensive that this music might draw some of the simpler church people to the Arian side; he therefore organized, in opposition to it, under the patronage aud at the cost of Eudoxia, the empress of Arcadius (then his friend), a system of nightly processional hymn-singing, with silver crosses, wax-lights, and other circumstances of ceremonial pomp. Riots followed, with bloodshed on both sides, and with some personal injury to the empress's chief

eunuch, who seems to have officiated as conductor or director of the church musicians. This led to the suppression, by an imperial edict, of all public Arian singing ; while in the church the practice of nocturnal hymn-singing on certain solemn occasions, thus first introduced, remained an estab-lished institution.

Greek It is not improbable that some rudiments of the peculiar systemof system of hymnody which now prevails throughout the ae Creek communion, and whose affinities are rather to the

Hebrew and Syriac than to the classical furms, may have existed in the church of Constantinople, even at that time. Anatolius, patriarch of Constantinople in the middle of the dth century, was the precursor of that system ; but the reputation of being its proper founder belongs to Romanus, of whom little more is known than that he wrote hymns still extant, and lived towards the end of that century. The importance of that system in the services of the Greek church may be understood from the fact that the late Dr Neale computed four-fifths of the whole space (about 5000 pages) contained in the different service-books of that church to be occupied by

hymnody, all in a language or dialect which has ceased to be anywhere spoken.

The system has a peculiar technical terminology, in which the words "troparion," "ode," " canon," and " hirmus "" (efpuos) chiefly require explanation.

The troparion is the unit of the system, being a strophe or stanza, seen, when analysed, to be divisible into verses or clauses, with regulated cesuras, but printed in the books as a single prose sentence, without marking any divisions. The following (turned into English, from a " canon" by John Mauropus) may be taken

as an example :—"'The never-sleeping Guardian, | the patron of

my soul, | the guide of my life, | allotted me by God, | I hymn thee, Divine Angel | of Almighty God." Dr Neale and most other writers regard all these "' troparia"' as rhythmical or modu- lated prose. Cardinal J. B. Pitra, on the other hand, who in 1867 and 1876 published two learned works on this subject, main- tains that they are really metrical, and governed by definite rules of prosody, of which he lays down sixteen. According to him, cach " troparion" contains from three to thirty-three verses ; each verse varies from two to thirteen syllables, often in a continuous series, uniform, alternate, or reciprocal, the metre being always syllabic, and depending, not on the quantity of vowels or the position of consonants, but on an harmonic scries of accents.

In various parts of the services solitary troparia are sung, under various names, "contacion," "cecos," '"cathisma," &c., which mark distinctions either in their character or in their use.

An ode is a song or hymn compounded of several similar '¢ troparia,"— usually three, four, or five. To these is always pre- fixed a typical or standard " troparion," called the hirmus, by which the syllabic measure, the periodic series of accents, and in fact the whole structure and rhythm of the stanzas which follow it are regulated. Each succeeding " troparion " in the same "ode " contains the same number of verses, and of syllables in each verse, and similar accents on the same or equivalent syllables. The

“hirmus” may either form the first stanza of the “ode” itself, or (as is more frequently the case) may be taken from some other piece ; and, when so taken, it is often indicated by initial words only, without being printed at length. It is generally printed within commas, after the proper rubric of the “ode.” A hymn in irregular “stichera” or stanzas, without a ‘hirmus,” is called ‘

A: canon is a system of eight (theoretically nine) connected odes, the second being always suppressed. Various pauses, relieved by the interposition of other short chants or readings, occur during the singing of a whole “canon.” The final ‘ troparion ” in each ode of the series is not unfrequently detached in sense (like the ‘“‘ephymnia” of Ephraem Syrus), particularly when it is in the (very common) form of a “‘ theotokion,” or ascription of praise ts he mother of our Lord, and when it isa recurring refrain or

urden,

There were two principal periods of Greek hymnography constructed on these principles,—the first that of Romanus and his followers, extending over the 6th and 7th centuries, the second that of the schools which arose during the Tconoclastic controversy in the 8th century, and which continued for some centuries afterwards, until the art itself died out.

The works of the writers of the former period were

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collected in Zropologia, or church hymn-books, which School of

were held in high esteem till the 10th century, when they Romanus.

ceased to be regarded as church-books, and so fell into neglect. They are now preserved only in a very small number of manuscripts. From three of these, belonging to public libraries at Moscow, Turin, and Rome, Cardinal Pitra has lately printed, in his Analecta, a number of interesting examples,

the existence of which appears to have been unknown to the late learned Dr Neale, and which, in the cardinal's estimation, are in many respects superior to the "canons," &., of the present Greek service-books, from which all Dr Neale's translations (except some from Anatolius) are taken. Cardinal Pitra's selections include twenty-nine works by Romanus, and some by Sergius, and nine other known, as well as some unknown, authors. He describes them as having generally a more dramatic character than the "melodies" of the later period, and a much more animated style; and he supposes that they may have been originally sung with dramatic accompaniments, by way of substitution for the theatrical performances of Pagan times. As an instance of their peculiar character, he mentions a Christmas or Epiphany hymn by Romanus, in twenty-five long strophes, in which there is, first, an account of the Nativity and its accompanying wonders, and then a dialogue between the wise men, the Virgin mother, and J oseph. The magi arrive, are admitted, describe the moral and religious con- dition of Persia and the East, and the cause and adventures of their journey, and then offer their gifts. The Virgin intercedes for them with her Son, instructs them in some parts of Jewish history, and ends with a prayer for the salvation of the world.

The controversies and persecutions of the 8th and suc- Melod- ceeding centuries turned the thoughts of the " melodists " ists. of the great monasteries of the Studium at Constantinople and St Saba in Palestine and their followers, and those of the adherents of the Greek rite in Sicily and South Italy (who suffered much from the Saracens and the Normans), into a less picturesque but more strictly theological course ; and the influence of those controversies, in which the final success of the cause of "Icons" was largely due to the hymns, as well as to the courage and sufferings, of these confessors, was probably the cause of their supplanting, as they did, the works of the older school. Cardinal Pitra gives them the praise of having discovered a graver and more solemn style of chant, and of having done much to fix the dogmatic theology of their church upon its present lines of near approach to the Roman.

Among the " melodists " of this latter Greek school there were many saints of the Greek church, several patriarchs, and two emperors,—Leo the Philosopher, and Constantine Porphyrogenitus, his son. Their greatest

poets were Theodore and Joseph of the Studium, and Cosmas and John (called Damascene) of StSaba, DrNealc has translated into English verse several selected portions, or centoes, from the works of these and others, together with four selections from earlier works by Anatolius. Some of his translations, —particularly "The day is past and over," from Anatolius, and " Christian, dost thou see them," from Andrew of Crete, have been adopted into hymn-books used in many English churches ; and the hymn " Art thou weary," &c., which is rather founded upon than translated from one by Stephen the Sabaite, has obtained still more general popularity.

The older learning on the subject of Greek hymnody and church music is collected in a dissertation prefixed to the second volume for June of the Bollandists' Acta Sanctorum ; the more recent in Cardinal Pitra's Hymnographie de VEglise Grecque (Rome, 1867), and Analecta Sacra, &c. (Paris, 1876), in the Anthologia Graca Carminum Christianorum (Leipsic, 1871), and in Dr Daniel's Theswurus Hymnologicus. There is also an able paper on Cardinal Pitra's works, by M. E. Miller, in the Journal des Savants for 1876.

|

WESTERN CHURCH. |

4. Western Church Hymnody.

Tt was not till the 4th century that Greek hymnody was imitated in the West, where its introduction was due to two great lights of the Latin Church,—St Hilary of Poitiers and St Ambrose of Milan.

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by his name (about 530), appointed the Ambrosian hymns to be regularly sung in his offices for the canonical hours. Hence probably originated the practice of the Italian churches, and of others which followed their example, to sing certain hymns (Ambrosian, or by the early successors of the Ambrosian school) daily throughout the

Hilary. Hilary was banished from his see of Poitiers in 356, week, at "' Vespers," "Lauds," and "Nocturns," and on | and was absent from it for abont four years, which he | some days at "Compline" also—varying them with the spent in Asia Minor, taking part during that time in one | different ecclesiastical seasons and festivals, commemora- of the councils of the Eastern Church. He thus had full | tions of saints and martyrs, and other special offices. opportunity of becoming acquainted with the Greek church | Different dioceses and religious houses had their own pecu- music of that day; and he wrote (as St Jerome, who was | liarities of ritual, including such hymns as were approved thirty years old when he died, and who was well acquainted | by their several bishops or ecclesiastical superiors, varying with his acts and writings, and spent some time in or near | in detail, but all following the same general method. The his diocese, informs us) a "book of hymns," to one of | national rituals, which were first reduced into a form sub- which Jerome particularly refers, in the preface to the | stantially like that which has since prevailed, were probably second book of his own commentary on the epistle to the | those of Lombardy and of Spain, now known as the Galatians. Isidore, archbishop of Seville, who presided | "Ambrosian" and the "Mozarabic." That of Spain was over the fourth council of Toledo, in his book on the offices | settled in the 7th century by Leander and Isidore, brothers, of the church, speaks of Hilary as the first Latin hymn- successively archbishops of Seville. It contained a copious writer ; that council itself, in its 13th canon, and the pro- | hymnary, the original form of which may be regarded as logue to the Mozarabic hymnary (which is little more than canonically approved by the fourth council of Toledo (633), a versification of the canon), associate his name, in this | By the 13th canon of that council, an opinion (which even respect, with that of Ambrose. A tradition, ancient and | then found advocates) against the use in churches of any widely spread, ascribed to him the authorship of the remark- hymns not taken from the Scriptures,—apparently the same able ""Hymnum dicat turba fratrum, hymnum cantus opinion which had been held by Paul of Samosata,—was personet" ("Band of brethren, raise the hymn, let your | censured; and it was ordered that such hymns should be song the hymn resound"), which is a succinct nar- | used in the Spanish as well as in tlie Gallican churches, the rative, in hymnal form, of the whole gospel history; and penalty of excommunication being denounced against

all -is perhaps the earliest example of a strictly didactic | who might presume to reject them.

hymn. Both Bede and Hincmar much admired this com- The hymns of which the use was thus established and position, though the former does not mention, in connexion | authorized were those which entered into the daily and with it, the name of Hilary. The private use of hymns of | other offices of the church, afterwards collected in the such a character by Christians in the West may probably | "Breviaries;" in which the hymns "proper" for 'the have preceded their ecclesiastical use; for Jerome says | week," and for "the season," continued for many centuries, that in his day those who went into the fields might hear | with very few exceptions, to be derived from the earliest 'the ploughman at his hallelujahs, the mower at his hymns, | epoch of Latin Church poetry,—reckoning that epoch as and the vine-dresser singing David's psalms." Besides | extending from Hilary and Ambrose to the end of the this, seven shorter metrical hymns attributed to Hilary | pontificate of Gregory the Great. The '" Ambrosian" are still extant. music, to which those hymns were generally sung down to Ambrose. Of the part taken by Ambrose, not long after Hilary's | the time of Gregory, was more popular and congregational

death, in bringing the use of hymns into the church of Milan, we have a contemporary account from his convert, St Augustine. Justina, mother of the emperor Valentinian, favoured the Arians, and desired to remove Ambrose from his see. The "devout people," of whom Augustine's mother Monica was one, combined to protect him, and kept guard in the church. "Then," says Augustine, "it was first appointed that, after the manner of the Eastern churches, hymns and psalms should be sung, lest the people should grow weary and faint through sorrow; which custom has ever since been retained, and has been followed by almost all congregations in other parts of the world." He describes

than the " Gregorian," which then came into use, and after- wards prevailed. In the service of the mass it was not the general. practice, before the invention of sequences in the 9th century, to sing any hymns, except some from the Scriptures esteemed canonical, such as the "Song of the Three Children" (" Benedicite omnia opera"). But to this rule there were,

according to Walafridus Strabo, some occasional exceptions; particularly in the case of Paulinus, patriarch of Aquileia under Charlemagne, himself a hynin- writer, who frequently used hymns, composed by himself or others, in the eucharistic office, especially in private masses.

himself as moved to tears by the sweetness of these "hymns and canticles": —' The voices flowed into my ears; the truth distilled into my heart; I overflowed with devout

Some of the hymns called " Ambrosian" (nearly 100 in Am- number) are beyond all question by Ambrose himself, and brosian the rest probably belong to his time or to the following Y™™-*

affections, and was happy." 'To this time, according to an uncertain but not improbable tradition which ascribed the composition of the "Te Deum" to Ambrose, and connected it with the conversion of Augustine, is to be referred the commencement of the use in the church of that sublime unmetrical hymn,

It is not, however, to be assumed that the hymnody thus introduced by Ambrose was from the first used according to the precise order and method of the later Western ritual. To bring it into (substantially) that order and method appears to have been the work of St Benedict. Walafridus Strabo, the earliest ecclesiastical writer on this subject (who lived at the beginning of the 9th century), says that Benedict, on the constitution of the religious order known

century. Four, those beginning " Aterne rerum conditor"' ("Dread Framer of the earth and sky"), "Deus Creator omnium" ("Maker of all things, glorious God"), 'Veni Redemptor Gentium" (' Redeemer of the nations, come "), and "Jam surgit hora tertia" ('Christ at this hour was crucified "), are quoted as works of Ambrose by Augustine. These, and others by the hand of the same master, have the qualities most valuable in hymns intended for congre- gational use. They are short and complete in themselves ; easy, and at the same time elevated in their expression and rhythm ; terse and masculine in thought and language ; and (though sometimes criticized as deficient in theological precision) simple, pure, and

not technical in their rendering of the great facts and doctrines of Christianity, which they

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present in an objective and not a subjective manner. They have exercised a powerful influence, direct or indirect, upon many of the best works of the same kind in all succeeding generations. With the Ambrosian hymns are properly classed those of Hilary, and the contemporary works of Pope Damasus (who wrote two hymns in commemoration of saints), and of Prudentius, from whose Cathemerina (Daily Devotions") and Peristephana (' Crown-songs for Martyrs"), all poems of considerable, some of great length, —about twenty-eight hymns, found in various Breviaries, were derived, Prudentius was a layman, a native of Sara- gossa, and it was in the Spanish ritual that his hymns were most largely used. In the Mozarabic Breviary almost the whole of one of his finest poems (from which most churches took one part only, beginning 'Corde natus ex parentis") was appointed to be sung between Easter and Ascension-Day, being divided into eight or nine liymns ; and on some of the commemorations of Spanish saints long poems from his Peristephana were recited or sung at large. He is entitled toa high rank among Christian poets, many of the hymns taken from his works being full of fervour and sweetness, and by no means deficient in dignity or

- strength.

5th and 6th centuries.

These writers were followed in the 5th and early in the 6th century by the priest Sedulius, whose reputation per- haps exceeded his merit ; Elpis, a noble Roman lady, wife of the philosophic statesman Boetius; Pope Gelasius ; and Ennodius, bishop of Pavia. Sedulius and Elpis wrote very little from which hymns could be extracted ; but the small number taken from their compositions obtained wide popu- larity, and have since held their ground. Gelasius was of no great account as a hymn-writer; and the works of Ennodius appear to have been known only in Italy and Spain. The latter part of the 6th century produced Pope Gregory the Great, and Venantius Fortunatus, an Italian poet, the friend of Gregory, and the

favourite of Radegunda, queen of the Franks, who died (609) bishop of Poitiers. Eleven hymns of Gregory, and twelve or thirteen (mostly taken from longer poems) by Fortunatus, came into general use in the Italian, Gallican, and British churches. Those of Gregory are in a style hardly distinguishable from the Ambrosian ; those of Fortunatus are graceful, and some- times vigorous. He does not, however, deserve the praise given to him by Dr Neale, of having struck out a new path in Latin hymnody. On the contrary, he may more justly be described as a disciple of the school of Prudentius, and as having affected the classical style, at least as much as any of his predecessors.

The poets of this primitive epoch, which closed with the 6th century, wrote in the old classical metres, and made use of a con- siderable variety of them —anapestic, anacreontic, hendecasyllabic, asclepiad, hexameters and pentameters, and others. Gregory and some of the Ambrosian authors occasionally wrote in sapphics ; but the most frequent measure was the iambic dimeter, and, next to that, the trochaic. The full alcaic stanza does not appear to have been used for church purposes before the 16th century, though some of its elements were. In the greater number of these works, a general intention to conform to the rules of Roman prosody is manifest ; but even those writers (like Prudentius) in whom that conformity was most decided allowed themselves much liberty of deviation from it. Other works, including some of the very earliest, and some of conspicuous merit, were of the kind described by Bede as not metrical but "rhythmical,"—7.e. (as he explains the term "rhythm "), "modulated to the ear in imitation of different metres." It would be more correct to call them metrical—(¢.9., still trochaic or iambic, &c., but, according to new laws of syllabic quantity, depending entirely on accent, and not on the power of vowels or the position of consonants,—laws by which the future prosody of all modern European nations was to be governed. There are also, in the hymns of the primitive period (even in those of Ambrose), anticipations,—irregular indecd and inconstant, but certainly not accidental,—of another great innovation, destined to receive important developments, that of assonance or rhyme, in the final letters or syllables of verses. Archbishop Trench, in the introduction to his Sacred Latin Poetry, has traced the whole course

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of the transition from the ancient to the modern forms of versifica- tion, ascribing it to natural and necessary causes, which made such changes needful for the due development of the new forms of spiritual and intellectual life, consequent upon the conversion of the Latin speaking nations to Christianity.

- *From the 6th century downwards we see this transforma-*

For these additions, the com-

which, perhaps, some of the strongest examples may be

found in a volume published in 1865 by the Irish Archzeo- logical Society from a manuscript in the library of Trinity

College, Dublin. It contains a number of hymns by Trish gaints of the 6th, 7th, and 8th centuries,—in several instances fully rhymed, and in one mixing Erse and Latin barbarously together, as was not uncommon, at a much later date, in semi-vernacular hymns of other countries. The Mozarabic Breviary, and the collection of hymns used in the Anglo-Saxon churches, published in 1851 by the Surtees Society (chiefly from a Benedictine MS. in the college library of Durham, supplemented by other MSS. in the British Museum), supply many further illustrations of the same decline of taste:—such sapphics, eg., as the "Festum insigne prodiit coruscum" of Isidore, and the "'Q veneranda Trinitas laudanda" of the Anglo-Saxon books. The early medizval period, however, from the time of Gregory the Great to that of Hildebrand, was far from deficient in the production of good hymns, wherever learn- ing flourished. Bede in England, and Paul "the Deacon," _—the author of a fairly classical sapphic ode on St John the Baptist,—in Italy, were successful followers of the Ambrosian and Gregorian styles. Eleven metrical hymns are attributed to Bede by Cassander ; and there are also in one of Bede's works (Collectanea et Flores) two rhythmical hymns of considerable length on the Day of Judgment, with the refrains 'In tremendo die" and '" Attende homo," both irregularly rhymed, and, in parts, not unworthy of comparison with the " Dies Ire." Paulinus, patriarch of Aquileia, contemporary with

Paul, wrote rhythmical tri- meter iambics in a manner peculiar to himself. Theodulph, bishop of Orleans (793-835), author of the famous pro- cessional hymn for Palm Sunday in hexameters and penta- meters, "Gloria, laus, et honor tibi sit, Rex Christe Redemptor" ("Glory and honour and laud be to Thee, King Christ the Redeemer"), and Hrabanus Maurus, arch- pishop of Mainz (847-856), the pupil of Alcuin, and the most learned theologian of his day, enriched the church with some excellent works. Among the anonymous hymns of the same period there are three of great beauty, of which the influence may be traced in most, if not all, of the 'New Jerusalem" hymns of later generations, includ- ing those of Germany and Great Britain :—' Urbs beata Hierusalem" ('" Blessed city, heavenly Salem") ; ' Alleluia piis edite laudibus" (" Alleluias sound ye in strains of holy praise,"—called, from its burden, ' Alleluia perenne") ; and "Alleluia dulce carmen" ("Alleluia, song of sweetness"), which, being found in Anglo-Saxon hymnaries certainly older than the Conquest, cannot be of the late date assigned to it, in his Medieval Hymns and Sequences, by Dr Neale. These were followed by the "Chorus nove Hierusalem" ("Ye Choirs of New Jerusalem") of Fulbert, bishop of Chartres (1007-1028). This group of hymns is remarkable for an attractive union of melody, imagination, poetical colouring, and faith. It represents, perhaps, the best and

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tion making continual progress, each nation of Western century Christendom adding, from time to time, to the earlier hymns in its service- books others of more recent and fre- quently of local origin. memorations of saints, &c., as to which the devotion of one place often differed from that of another, offered especial opportunities. This process, while it promoted the develop- ment of a medieval as distinct from the primitive style, led also to much deterioration in the quality of hymns, of

own- wards.

Veni Creator.

Notker,

Se- quences.

highest type of the middle school, between the severe Am- brosian simplicity and the florid luxuriance of later times.

Another celebrated hymn, which belongs to the first medizval period, is the '" Veni Creator Spiritus " (" Come, Holy Ghost, our souls inspire"), The earliest recorded occasion of its use is that of a translation (898) of the relics of St Marcellus, mentioned in the Annals of the Benedictine order. It has since been constantly sung throughout Western Christendom (as versions of it still are in the Church of England), as part of the appointed offices for the coronation of kings, the consecration and ordination of bishops and priests, the assembling of synods, and other great ecclesiastical solemnities. It has been attributed — probably in consequence of certain corruptions in the text of Ekkehard's Life of Notker (a work of the 13th century) —to Charlemagne. Ekkehard wrote in the Benedictine monastery of St Gall, to which Notker belonged, with full access to its records; and an ignorant interpolator, regardless of chronology, added, at some later date, the word "Great" to the name of "the emperor Charles," wherever it was mentioned in that work. The biographer relates that Notker,—a man of a gentle contemplative nature, observant of all around him, and accustomed to find spiritual and poetical suggestions in common sights and sounds,—was moved by the sound of a mill-wheel to compose his "sequence" on the Holy Spirit, " Sancti Spiritus adsit nobis gratia" ("Present with us ever be the Holy Spirit's grace"); and that, when finished, he sent it as a present to "the emperor Charles," who in return sent him back, "by the same messenger," the hymn "Veni Creator," which (says Ekkehard), the same " Spirit had inspired him to write" ("Sibi idem Spiritus inspira- verat"). If this story is to be credited,—and, from its circumstantial and almost dramatic character, it has an air of truth,—the author of "Veni Creator" was not Charlemagne, but his grandson Charles the Bald, who succeeded to the royal crown in 840, about the time when Notker was born, and to the imperial in 875. Notker himself long survived that emperor, and died in 912.

The invention of " sequences" by Notker may be regarded as the beginning of the later medieval epoch of Latin hymnody. In the eucharistic service, in which (as has been stated) hymns were not generally used, it had been the

practice, except at certain seasons, to sing "laud," or "Alleluia," between the epistle and the gospel, and to fill up what would otherwise have been a long pause, by extend- ing the cadence upon the two final vowels of the " Alleluia " into a protracted strain of music. It occurred to Notker that, while preserving the spirit of that part of the service, the monotony of the interval might be relieved by intro- ducing at that point a chant of praise specially composed for the purpose. With that view he produced the peculiar species of rhythmical composition which obtained the name of "sequentia" (probably from following after the close of the " Alleluia"), and also that of '"prosa," because its structure was originally irregular and unmetrical, resembling in this respect the Greek "troparia," and the "Te Deum," "Genedicite," and canticles. That it was in some measure suggested by the forms of the later Greek hymnody seems probable, both from the intercourse (at that time frequent) between the Eastern and Western churches, and from the application by Ekkehard, in his biography and elsewhere (¢.g., in Lyndwood's Provinciale), of some technical terms, borrowed from the Greek terminology, to works of Notker and his school and to books containing them.

Dr Neale, in a learned dissertation prefixed to his collection of Sequences from medieval Missals, and enlarged in a Latin letter to Dr Daniel (printed in the fifth volume of Daniel's Thesaurus), has investigated the laws of cesura and modulation which are discover-

able in these works. Those first brought into use were sent by their author to Nicholas I. » pope from 858 to 867, who authorized

their use, and that of others composed after the same model by other brethren of St Gall, in all churches of the West.

Although the sequences of Notker and his school, which then rapidly passed into most German, French, and British Missals, were not metrical, the art of '"'assonance" was much practised in them. Many of those in the Sarum and French Missals have every verse, and even every clause or division of a

verse, ending with the same vowel "a,"—perhaps with some reference to the terminal letter of ' Alleluia." Artifices such as these naturally led the way to the adaptation of the same kind of composition to regular metre and fully developed rhyme. Dr Neale's full and large eollection, and the seeond volume of Dr Daniel's Thesaurus, contain numerous examples, both of the "proses," properly so ealled, of the Not- kerian type, and of those of the later school, which (from the religious house to which its chief writer belonged) has been ealled "Victorine." Most Missals appear to have contained some of both kinds. In the majority of those from which Dr Neale's speci- mens are taken, the metrical kind largely prevailed ; but in some {¢.9., those of Sarum and Liége) the greater number were Not-

erian.

Of the sequence on the Holy Ghost, sent by Notker (according to Ekkehard) to Charles the Bald, Dr Neale says that it "was in use all over Europe, even in those countries, like Italy and Spain, which usually rejected sequences"; and that, "in the Missal of Palencia, the priest was ordered to hold a white dove in his hands, while intoning the first syllables, and then to let it go." Another of the most remarkable of Notker's sequences, beginning " Media in vita" ("In the midst of life we are in death"), is said to have been suggested to him while observing some workmen engaged in the construction of a bridge over a torrent near his monastery. Miss Winkworth states that this was long used as a battle-song, until the custom was forbidden, on account of its being supposed to exercise a magical influence. A translation of it (" Mitten wir im Leben sind") is one of Luther's funeral hymns ; and all but the opening sentence of that part of the burial service of the Church of England which is directed to be 'said or sung" at the grave, "while the corpse is made ready to be laid into the earth," is taken from it.

The "Golden Sequence," " Veni, saucte Spiritus " ("Holy Spirit, Lord of Light"), is an early example of the transi- tion of sequences from a simply rhythmical to a metrical form. Archbishop Trench, who esteems it " the loveliest of all the hymns in the whole circle of Latin sacred poetry," is inclined to give credit to a tradition which ascribes its authorship to Robert II., king of France, son of Hugh Capet (997-1031). Others have assigned to it a later date,—some attributing it to Pope Innocent III., and some to

Stephen Langton, archbishop of Canterbury. Many translations, in German, English, and other languages, attest its merit. Berengarius of Tours, St Bernard of Clairvaux, and Abelard, in the 11th century and early in the 12th, followed in the same track; and the art of the Victorine school was carried to its greatest perfection by Adam of St Victor (who died between 1173 and 1194),—"the most fertile, and" (in the concurrent judg- ment of Archbishop Trench and Dr Neale) "the greatest of the Latin hymnographers of the Middle Ages." The archbishop's selection contains many excellent specimens of his works,

But the two most widely celebrated of all this class of compositions,—works which have exercised the talents of the greatest musical composers, and of innumerable trans- lators in almost all languages,—are the "Dies Ire" Dies Ire. (" That day of wrath, that dreadful day"), by Thomas de Celano, the companion and biographer of St Francis of Assisi (who died in 1226), and the "Stabat Mater Stabat dolorosa" ("' By the cross sad vigil keeping ") of Jacopone Mater. or Jacobus de Benedictis, a Franciscan humorist and reformer, who wag persecuted by Pope Boniface VIII. for his satires on the prelacy of the time, and died very old in 1306. Besides these, the 13th century produced the famous sequence "Lauda Sion Salvatorem" (' Sion, lift

Aquinas.

Medieval

hymus.

Bernard of Clair- vaux,

584

thy voice and sing "), and the four other well-known sacra- mental hymns of St Thomas Aquinas, viz., " Pange lingua gloriosi_ corporis mysterium" ("Sing, my tongue, the Saviour's glory"), " Verbum supernum prodiens 7 ("ne Word, descending from above "—not to be confounded with the Ambrosian hymn from which it borrowed the first line), " Sacris solemniis juncta sint gaudia" ("Let us with hearts renewed our grateful homage

pay"), and " Adoro Te devote, latens Deitas" (""O Godhead hid, devoutly I adore Thee "),—a group of remarkable compositions, written by him for the then new festival of Corpus Christi, of which he induced Pope Urban IV. (1261-1265) to decree the observance. In these (of which all but "Adoro Te devote," é&c., passed rapidly into Breviaries and Missals) the doctrine of transubstantiation is set forth with a wonderful degree of scholastic precision; and they exercised, probably, 4 not unimportant influence upon the general reception of that dogma. They are undoubtedly works of genius, powerful in thought, feeling, and expression.

These and other medieval hymn-writers of the 12th and 13th centuries may be described, generally, as poet-school- men. Their tone is contemplative, didactic, theological ; they are especially fertile and ingenious in the field of mystical interpretation. Two great monasteries in the East had, in the 8th and 9th centuries, been the principal centres of Greek hymnology; and, in the West, three monasteries,—St Gall, near Constance (which was long the especial seat of German religious literature), Cluny in Burgundy, and St Victor, near Paris,—obtained a similar distinction. St Gall produced, besides Notker, several dis- tinguished sequence writers, probably his pupils, —Hart- mann, Hermann, and Gottschalk,—to the last of whom Dr Neale ascribes the 'Alleluiatic Sequence" (' Cante- mus cuncti melodum nunc Alleluia"), well known in England through his translation, "The strain upraise of joy and praise." The chief poets of Cluny were two of its abbots, Odo (who died in 947) and Peter the Venerable (1122-1156), and one of Peter's monks, Bernard of Morlaix, who wrote the remarkable poem on "Contempt of the World" in about 3000 long rolling "leonine-dactylic " verses, from parts of which Dr Neale's popular hymns, " Jerusalem the golden," &c., are taken. The abbey of St Victor, besides Adam and his follower Pistor, was destined after- wards to produce the most popular church poet of the 17th century.

There were other distinguished Latin hymn-writers of the later medizval period besides those already mentioned. The name of St Bernard of Clairvaux cannot be passed over with the mere mention of the fact that he was the author of some metrical sequences. He was, in truth, the father, in Latin hymnody, of that warm and passionate form of devotion which some may consider to apply too freely to Divine Objects the language of human

affection, but which has, nevertheless, been popular with many devout persons, in Protestant as well as Roman Catholic churches. Spee, "Angelus," Madame Guyon, Bishop Ken, Count Zin- zendorf, and Frederick William Faber may be regarded as disciples in this school Many hymns, in various lan- guages, have been founded upon St Bernard's 'Jesu dulcis memoria" ("Jesu, the very thought of Thee"), " (Jesu dulcedo cordium" (" Jesu, Thou joy of loving hearts ") and "Jesu Rex admirabilis " ("O Jesu, King most wonderful "), —three portions of one poem, nearly 200 lines long. Cardinal Damiani, the friend of Pope Gregory VII., Marbode (bishop of Rennes) in the 11th, Hildebert (arch- bishop of Tours) in the 12th, and Cardinal Bonaventura in the 13th centuries, are other eminent men, who added poetical fame, as hymnographers, to high public distinction.

Before the time of the Reformation, the multiplication of sequences (often as unedifying in matter as unpoctical

in style) had done much to degrade the common conception of hymnody. In some parts of France, Portugal, Sardinia, and Bohemia, their use in the vernacular language had been allowed. In Germany also there were vernacular sequences as early as the 12th century, specimens of which may be seen in the third chapter of Miss Winkworth's Christian Singers of Germany. Scoffing parodies upon sequences are said to have been among the means used in Scotland to discredit the old church services. After the 15th century they were discouraged at Rome. They retained for a time some of their old popularity among German Protestants, and were only gradually relinquished in France. A new "prose," in honour of St Maxentia, is among the compositions of Jean Baptiste Santeul ; and Dr Daniel's second volume closes with one written in 1859 upon the dogma of the Immaculate Conception.

The taste of the Renaissance was offended by all deviations from Roman re-

*elassieal prosody and Latinity. Pope Leo X. directed the whole vision of body of the hymns in use at Rome to be reformed ; and a volume hymns. of "new eeclesiastieal hymns," prepared by Ferreri, a seholar of Vieenza, to whom Leo had committed that task, appeared in 1523, with the sanction of a later pope, Clement VII. The next step was to revise the whole Roman Breviary. That undertaking, alter passing through several stages under different popes (particularly Pius V. and Clement VIII.), was at last brought to a econelusion by Urban VIIL, in 1681. From this revised Breviary a large num- ber of medixval hymns, both of the earlier and the later periods, were excluded ; and in their places many new hymns, including some by Pope Urban himself, and some by Cardinal Bellarmine and another cardinal (Silvius Antonianus) were introduced. The hymns of the primitive epoch, from Hilary to Gregory the Great, for the most part retained their places (especially in the offices for every day of the week); and there remained altogether from seventy to eighty of earlier date than the 11th century. Those, however, which were so retained were freely altered, and byno means generally improved. The revisers appointed by Pope Urban (three learned Jesuits,—Strada, Gallucci, and Petrucei), professed tohavemade "as few changes as possible" in the works of Ambrose, Gregory, Pru- dentius, Sedulius, Fortunatus, and other " poets of great name." But some changes, even in those works, were made with consider- able boldness; and the pope, in the " constitution" by which his new book was promulgated, boasted that, 'with the exeeption of a very small number ('perpaucis'), which were either prose or merely rhythmical, all the hymns had been made conformable to the laws of prosody and Latinity, those which eould not be eorrected by any milder method being entirely rewritten." The latter fate befel, among others, the "beautiful "Urbs beata Hierusalem," which now assumed the form (to many, perhaps, better known), of *' Celestis urbs Jerusalem." Of the 'very few" whieh were spared, the chief were " Ave maris stella" (" Gentle star of ocean"), "Dies Ire," "'Stabat Mater dolorosa," the hymns of Thomas Aquinas, two of St Bernard, and one Ambrosian hymn, "' Jesu nos- tra Redemptio" ("O Jesu, our Redemption"), which approaches nearer than others to the tone of St Bernard. A then reeent hymn of St Francis Xavier, with scareely enough merit of any kind to atone for its negleet of prosody, " O Deus, egoamo Te" (" O God, I love Thee, not because"), was at the same time introduced*

without ehange. This hymnary of Pope Urban VIII. is now in general use throughout the Roman Communion.

The Parisian hymnary underwent three revisions—the first in Parisian 1527, when a new "Psaltery with hymns" was issued. In this revisions. such ehanges only were made as the revisers thought justifiable upon the principle of correcting supposed eorruptions of the original text. Of these, the transposition, " Urbs Jerusalem beata," instead of ' Urbs beata Hierusalem," may be taken asa typical example. The next revision was in 1670-1680, under Cardinal Péréfixe, pre- ceptor of Louis XIV., and Francis Harlay, suceessively arehbishops of Paris, who employed for this purpose Claude Santeul, of the monastery of St Magloire, and, through him, obtained the assist- ance of other French scholars, ineluding his more celebrated brother, Jean Baptiste Santeul, of the abbey of St Vietor,—better known as "Santolius Vietorinus." The third and final revision was completed in 1735, under the primacy of Cardinal Arehbishop de Vintimille, who engaged for it the services of Charles Coflin, then reetor of the university of Paris. Many old hymns were omitted in Archbishop Harlay's Breviary, and a large number of new compositions, by the Santeuls and others, was introdueed. It still, however, retained in their old places (without further changes than had been made in 1527) about seventy of earlier date than the 11th eentury,—ineluding thirty-one Ambrosian, one by Hilary, eight by Prudentius, seven by Fortunatus, three by Paul the Deacon, two each hy Sedulius, Elpis, Gregory, and Hrabanus Manrus, " Veni Creator," and ' Urbs Jerusalem beata." Most of these disappeared

in 1735, although Cardinal Vintimille, in his preface, professed to have still admitted the old hymns, except when the new were better —("veteribus hymuis locus datus est, nisi quibus, ob sententiarum vim, elegantiam verborum, et teneriores pietatis sensus, recentiores anteponi satius visum est"), The number of the new was, at the same time, very largely increased. Only twenty-one more ancient than the 16th century remained, of which those belonging to the primitive epoch were but eight, viz., four Ambrosian, two by Fortunatus, and one each by Prudentius and Gregory. The number of Jean Baptiste Santeul's hymns (who had died in 1697) rose to eighty-nine

; those by Coffin,—including some old hymns, e.g., "Jam lucis orto sidere " ("' Once more the sun is beaming bright"), which he substantially re-wrote,—were eighty-three ; those of other modern French writers, ninety-seven. Whatever opinion may be entertained of the principles on which these Roman and Parisian revisions proceeded, it would be unjust to deny very high praise as hymn-writers to several of their poets, especially to Coffin and Jean Baptiste Santeul. The noble hymn by Coffin, beginning—

"O luce qui mortalibus "'O Thou who in the light dost dwell,

Lates inaecessa, Deus, To mortals unapproachable,

Preesente quo sancti tremunt Where angels veil them from Thy rays,

*Nubuntque vultus angeli," And tremble as they gaze," and several others of his works, breathe the true Ambrosian spirit ; and though Santeul (generally esteemed the better poet of the two) delighted in alcaics, and did not greatly affect the primitive manner, there can be no question as to the excellence of such hymns as his "Fumant Sabeis templa vaporibus" ('Sweet incense breathes around"), " Stupete gentes, fit Deus hostia" (' Tremble, ye Gentile lands"), " Hymnis dum resonat curia cclitum" ("Ye in the house of heavenly morn"), and "Templi sacratas pande, Sion, fores" ("*O Sion, open wide thy gates"). It isa striking testimony to the merits of those writers that such accomplished translators as the Rev. Isaac Williams and the Rev. John Chandler appear (from the title page of the latter, and the prefaces of both) to have supposed their hymns to be "ancient" and "'primitive.'" Among the other authors associated with them, perhaps the first place is due to the Abbé Besnault, of Sens, who contributed to the book of 1735 the "' Urbs beata vera pacis Visio Jerusalem," in the opinion of Dr Neale "much superior" to the "'Coelestis urbs Jerusalem" of the Roman Breviary. This stood side by side with the " Urbs Jerusalem beata" of 1527 (in the office for the dedication of churches) till 1822, when the older form was at last finally excluded by Archbishop de Quelen.*

The Parisian Breviary of 1735 rebiained in use till the national French service-books were superseded (as they have lately been, generally, if not universally) by the Roman. "Almost all French dioceses followed, not

indeed the Breviary, but the example, of Paris ; and before the end of the 18th century the ancient Latin hymnody was all but banished from France.

*In some parts of Germany, after the Reformation, Latin hymns continued to be used even by Protestants. This was the case at Halberstadt until quite a recent date. In England, a few are still occasionally used in the older universities and colleges. Some, also, have been composed in both countrics since the Reformation. The "Carmina Lyrica" of John Jacob Balde, a native of Alsace, and a Jesuit priest in Bavaria, have received high commendation from very eminent German critics, particularly Herder and Augustus Schlegel. Some of the Latin hymns of William Alard, a Protestant refugee from Belgium, and pastor in Holstein (1572-1645), have been thought worthy of a place in Archbishop Trench's selec- tion. Two by W. Petersen (printed at the end of Haberkorn's supplement to Jacobi's Psalmodia Germanica) are good in different ways,—one, "Jesu dulcis amor meus" ("Jesus, Thee my soul doth love"), being a gentle melody of spiritual devotion, and the other, entitled Spes Sionis, violently controversial against Rome. An English hymn of the 17th century, in the Ambrosian style, "Te Deum Patrem colimus" ("Almighty, Father, just and good "), is sung on every May-Day morning by the choristers of Magdalen College, Oxford, from the top of the tower of their chapel; and another in the style of the Renaissance, of about the same date, *"Te de profundis, summe Rex" ("Thee from the depths, Almighty King"), is, or until lately was, sung as part of a grace by the scholars of Winchester College.*

*The principal ancient authorities on Latin hymnody are the 25th chapter ("De hymnis et cantilenis et incrementis ecorum") of the treatise of Walafridus Strabo, and a treatise of the 14th century ("De Psalterio observando"), by Radulphus, dean of Tongres in the Netherlands. Next to those are the first book of Clichtoveus's Elucidatoriwm Lcclesiasticwm (Paris, 1556); the chapter on Ambrosian and other hymns in the works of George Cassander (Paris, 1616) ; the Psalteriwm, &c., in the second volume of the works of Cardinal J. M. Thomasius (Rome, 1747) ; and the treatise "*De Hymnis Ecclesiasticis," prefixed to the Hymnodia Hispantea of Faustinus Arevalus (Rome, 1786). The present century, more especially within the last fifty years, has added much to the stores of learning*

accessible on this subject. In Germany, Rambach's Christian Anthology ; Mone's Hymni Latinit medii Avi; Daniel's

Thesaurus Hymnologicus ; and Mohnike's Hymnologische Forsch- ungen ; —and in England, Archbishop Trench's Sacred Latin Poetry ; Dr Neale's two collections of Latin Hymns and Sequences (Oxford, 1851 and 1852), aud his Essays on Liturgiology and Church His- tory ; the Oxford collection of Hymns from the Roman, Sarum, York, and other Breviaries (1838) ; the Psalter, &c., according to Sarum use, of Mr J. D. Chambers (1852) ; and the two volumes already referred to of Anglo-Saxon and Irish hymns, published in 1851 and 1865 by the Surtees Society and the Irish Archeological Society, have left little to be added by any future labourers in this field. The same period has also produced numerous English translations of Latin hymns, many of which are good and interesting, though perhaps few of the translators have overcome the inherent difficulties of their task sufliciently either to represent the char- acteristic merits of the originals, or to add to our vernacular hymns many adaptations really well-suited for popular use. The most important are—Mr Isaac Williams's Hymns Jrom the Parisian Breviary (1839), and Mr Chandler's Hymns of the Primitive Church (1837) ; Bishop Mant's volume of 1837, and the Rev. Edward Caswall's Lyra Catholiea (1849), both from the Roman Breviary ; the versions of Mr Chambers, in his Sarum Psalter, &c.; Dr Neale's Medieval Hymns and Sequences (1862), with his versions, separ- ately published, of some other works; and Hymns of the Latin Church, translated by David T. Morgan, with the originals appended (privately printed in 1871). The first lines, in English, given in this article, are generally adopted from some of these.

5, German Hymnody.

Luther was a proficient in and a lover of music. He Luther.

desired (as he says in the preface to his hymn-book of 1545) that this "beautiful ornament" might "in a right manner serve the great Creator and

His Christian people." The per- secuted Bohemian or Hussite Church, then settled on the borders of Moravia under the name of "United Brethren " (which their descendants still retain), had sent to him, on a mission in 1522, Michael Weiss, who not long after- wards published a number of German translations from old Bohemian hymns (known as those of the " Bohemian Brethren"), with some of his own. These Luther highly approved and recommended. He himself, in 1522, pub- lished a small volume of eight hymns, which was enlarged to 63 in 1527, and to 125 in 1545. He had formed what he called a "house choir" of musical friends, to select such old and popular tunes (whether secular or ecclesiastical) as might be found suitable, and to compose new melodies, for church use, His fellow labourers in this field (besides Weiss) were Justus Jonas, his own especial colleague; Paul Eber, the disciple and friend of Melanchthon; John Walther, choirmaster successively to several German princes, and professor of arts, &c., at Wittenberg ; Nicholas Decius, who from a monk became a Protestant teacher in Brunswick, and translated the "Gloria in Excelsis," &c.; and Paul Speratus, chaplain to Duke Albert of Prussia in 1525. Some of their works are still popular in Germany. Weiss's "Funeral Hymn," "Nun lasst uns den Leib begraben " (" Now lay we calmly in the grave"); Eber's "Herr Jesu Christ, wahr Mensch und Gott" ('Lord Jesus Christ, true Man and God"), and " Wenn wir in héchsten Nothen sein" ("When in the hour of utmost need"); Walther's ""New Heavens and new Earth" ("Now fain my joyous heart would sing") ; Decius's "To God on high be thanks and praise ;" and Speratus's "Salvation now has come for all," are among those which at the time produced the greatest effect, and are still best remembered.

Luther's own hymns, thirty-seven in number (of which about twelve are translations or adaptations from Latin originals), are for the principal Christian seasons ; on the sacraments, the church, grace, death, &c; and paraphrases of seven psalms, of a passage in Isaiah, and of the Lord's Prayer, Ten Commandments, Creed, Litany, and "Te Deum," There is also a very touching and stirring song on the martyrdom of two youths by fire at Brussels, in 1523-24. Homely and sometimes rugged in form, and for the most part objective in tone, they are full of fire, manly simplicity, and strong faith. Three rise above the

rest. One for Christmas, "Vom Himmel hoch da komm ich her" ("From Heaven above to earth I come "), has a reverent tenderness, the influence of which may be traced in many later productions on the same subject. That on salvation through Christ, of a didactic character, "' Nun freuet euch, lieben Christen g'mein" (" DearChristian people,

now rejoice"), is said to have made many conversious, and

to have been once taken up by a large congregation to

silence a Roman Catholic preacher in the cathedral of Pre-eminent above all is the celebrated para- phrase of the 46th Psalm : 'Hin' feste Burg ist unser Gott"

Frankfort.

("A sure stronghold our God is He"),—" the production "i

(as Ranke says) "of the moment in which Luther, engaged in a conflict with a world 'of foes, sought strength in the consciousness that he was defending a divine cause which could never perish." Carlyle compares it to "a sound of Alpine avalanches, or the first murmur of earthquakes."

Heine called it 'the Marseillaise of the Reformation."

Luther spent several years in teaching his people at Wittenberg to sing these hymns, which soon spread over Germany. Without adopting the hyperbolical saying of Coleridge, that "Luther did as much for the Reforma-

tion by his hymns as by his translation of the Bible," it may truly be affirmed that, among the secondary means by which the success of the Reformation was promoted, none was more powerful. in the streets and fields as well as the churches, in the

workshop and the palace, “by children in the cottage and

by martyrs on the scaffold.” It was by them that a con-

gregational character was given to the new Protestant worship. his success they owed partly to their metrical structure, which, though sometimes complex, was _recom- mended to the people by its ease and variety; and partly to the tunes and melodies (many of them already well

known and popular) to which they were set. They were used as direct instruments of teaching, and were therefore,

in a large measure, didactic and theological; and it may

be partly owing to this cause that German hymnody came

to deviate, so soon and so generally as it did, from the

simple idea expressed in the ancient Augustinian definition, and to comprehend large classes of compositions which, in most other countries, would be thought hardly suitable for church use. Fol- The principal hymn-writers of the Lutheran school, in lowers of the latter part of the 16th century, were Selnecker, Nicholas Luther. +fermann, and Hans Sachs, the shoemaker of Nuremberg, also known in other branches of literature. All these wrote some good hymns. They were succeeded by men of another sort, to whom Cunz gives the name of “ master- singers,” as having raised both the poetical and the musical standard of German hymnody :—Ringwaldt, Helmbold, Pappus, Schalling, Rutilius, and Weingartner. The prin- cipal topics of their hymns (as if with some foretaste of the calamities which were soon to follow) were the vanity of earthly things, resignation to the Divine will, and pre- paration for death and judgment. The well-known English hymn, “Great God, what do I see and hear,” is founded upon one by Ringwaldt. Of a quite different character were two of great beauty and universal popularity, com- posed by Philip Nicolai, a Westphalian pastor, during a pestilence in 1597, and published by him, with fine chorales, two years afterwards. One of these (the “Sleepers wake ! a voice is calling,” of Mendelssohn’s oratorio, S¢ Paul) belongs to the family of Advent or New Jerusalem hymns. The other, a “Song of the believing soul concerning the

Heavenly Bridegroom" ("Wie schén leucht't uns der Morgenstern," O morning Star, how fair and bright"), became the favourite marriage hymn of Germany. The hymns produced during the Thirty Years' War are characteristic of that unhappy time, which (as Miss

HYMNS

They were sung everywhere,—

[GERMAN.

Winkworth says) "caused religious men to look away Period of from this world," and made their songs more and more Thirty expressive of personal feelings. In point of refinement The and graces of style, the hymn-writers of this period excelled ; their predecessors. Their taste was chiefly formed by the influence of Martin Opitz, the founder of what has been called the "first Silesian school" of German poetry, who died comparatively young in 1639, and who, though not of any great original genius, exercised much power as a critic. Some of the best of these works were by men who wrote little In the famous battle-song of Gustavus Adolphus, published (1631) after the victory of Leipsic, for the use of his army, " Verzage nicht du Hauflein klein " ("Fear not, O little flock, the foe "), we have almost certainly a composition of the hero-king himself, the versification corrected by his chaplain Fabricius, and the music composed by Altenburg, whose name has been given to the hymn. This, with Luther's paraphrase of the 67th Psalm, was sung by Gustavus and his soldiers before the fatal battle of Liitzen. Two very fine hymns, one of prayer for deliverance and peace, the other of trust in God_under calamities, were written about the same time by Lowen-stern, a saddler's son, poet, musician, and statesman, who was ennobled after the peace by the emperor Ferdinand III. Martin Rinckhart, in 1636, wrote the "Chorus of God's faithful children" ("Nun danket alle Gott,"—' Now thank we all our God"), introduced by Mendelssohn in his " Lobgesang," which has been called the "Te Deum" of Germany, being usually sung on occasions of public thanks- giving. Weissel, in 1635, composed a beautiful Advent hymn ("Lift up your heads, ye mighty gates"), and Meyfart, professor of theology at Erfurt, in 1642, a fine adaptation of the ancient "' Urbs beata Hierusalem." The hymn of trust in Providence by Neumarck, librarian to that duke of Weimar who was a distinguished

general in the war (“ Wer nur den lieben Gott lisst walten ”—“ Leave God to order all thy ways ”), is scarcely, if at all, inferior to that of Paul Gerhardt on the same theme. Paul Flemming, a great traveller and lover of nature, who died young in 1639, also wrote excellent compositions, coloured by the same tone of feeling; and some, of great merit, were composed, soon after the close of the war, by Louisa Henrietta, electress of Brandenburg, granddaughter of the famous Admiral Coligny, and mother of the first king of Prussia. With these may be classed (though of later datc) a few striking hymns of faith and prayer under mental anxiety, by Anton Ulrich, duke of Brunswick, whose nominal conversion to Romanism cast a shade over the close of a life otherwise conscientious and honourable.*

The most copious, and in their day most esteemed, hymn- Heer- writers of this first half of the 17th century, were Heermann ™@™- and Rist. Heermann, a pastor in Silesia, the theatre (in a peculiar degree) of war and persecution, experienced in his own person a very large share of the miseries of the time, and several times narrowly escaped a violent death. His Devoti Musica Cordis, published in 1630, reflects the feel- ings natural under such circumstances. With a correct style and good versification, his tone is subjective, and the burden of his hymns is not praise, but prayer. Among his works (which enter largely into most German hymn-books), two of the best are the “Song of Tears,” and the “Song of Comfort,” translated by Miss Winkworth in her Christian Singers of Germany. Rist published about 600 hymns, Rist. “pressed out of him,” as he said, “by the cross.” He was a pastor, and son of a pastor, in Holstein, and lived after the peace to enjoy many years of prosperity, being appointed poet-laureate to the emperor, and finally ennobled.

The bulk of his hymns, like those of other copious writers, are of inferior quality; but some, particularly those for Advent, Epiphany, Easter Eve, and on Angels, are very

Dach.

Gerhardt.

Franck.

Scheffler,

Pietists.

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good. They are more objective than those of Heermann, and written, upon the whole, in a more manly spirit. Next to Heermann and Rist in fertility of production, and above them in poetical genius, was Simon Dach, professor of poetry at Konigsberg, who died in 1659. Miss Winkworth ranks him high among German poets, "for the sweetness of formand depth of tender contemplative emotion to be found in his verses."

The fame of all these writers was eclipsed in the latter part of the same century by three of the greatest hymno- graphers whom Germany has produced,—Paul Gerhardt (1604-1676), John Franck (1618-1677), and John Scheffler (1624-1677), the founder of the "second Silesian school," who assumed the name of " Angelus." Gerhardt is by universal consent the prince of Lutheran poets. His compositions (which may be compared, in many respects, to those of the Christian Year) are lyric poems, of considerable length, rather than hymns, though many hymns have been taken from them. They are, with few exceptions, subjective, and speak the language of individual experience. They occupy a middle ground between the masculine sim- plicity of the old Lutheran style and the highly wrought religious emotion of the later Pietists, towards whom they (on the whole) incline. Being nearly all excellent, it is not easy to distinguish among the 123 those which are entitled to the highest praise. Two, which were written one during the war and the other after the conclusion of peace, "Zeuch ein zu deinen Thoren" ("Come to Thy temple here on earth"), and 'Gottlob, nun ist erschollen," ("Thank God, it hath resounded"), are historically interesting. Of the rest, one is well known and highly appreciated in England through Wesley's translation, "Commit thou all thy ways," &c. ; and the Evening and Spring-tide hymns (" Now all the woods are sleeping," and 'Go forth, my heart, and seek delight ") show an exquisite feeling for nature; while nothing can be more tender and pathetic than "Du bist zwar mein und bleibest mein" ("Thou'rt mine, yes, still thou art mine own"), on the death of his son. Franck, who was burgomaster of Guben in Lusatia, has been considered by some second only to Gerhardt. If so, it is with a

great distance between them. His approach to the later Pietists is closer than that of Gerhardt. His hymns were published, under the title of Spiritual Zion, in 1674, some of them being founded on Ambrosian and other Latin originals. Miss Winkworth gives them the praise of a condensed and polished style and fervid and impassioned thought. It was after his conversion to Romanism that Scheffler adopted the name of " Angelus," and published (1657) his hymns, under a fantastic title, and with a still more fantastic preface. Their key-note is divine love; they are enthusiastic, in- tense, exuberant in their sweetness, like those of St Bernard among medizval poets. An adaptation of one of them, by Wesley, "Thee will I love, my Strength, my Tower," is familiar to English readers. Those for the first Sunday after Epiphany, Sexagesima Sunday, and Trinity Sunday, in Lyra Germanica, are good examples of his excellences, with few of his defects. His hymns are generally so free from the expression, or even the indirect suggestion, of Roman Catholic doctrine, that it has been supposed they were written before his conversion, though published afterwards. The evangelical churches of Germany found no difficulty in admitting them to that prominent place in their services which they have ever since retained.

Towards the end of the 17th century, a new religious school arose, to which the name of " Pietists" was given, and of which Philip Jacob Spener was esteemed the founder. He and his pupils and successors, August Hermann Francke and Anastasius Freylinghausen, all wrote hymns. Spener's hymns are not remarkable, and Francke's are not numer-

ous. Freylinghausen was their chief singer: his rhythm is lively, his music florid; but, though his book attained extraordinary popularity, he was surpassed in solid merit by other less fertile writers of the same school. The " Auf hinauf zu deiner Freude" (" Up, yes, upward to thy glad- ness") of Schade may recall to an English reader a hymn by Seagrave, and more than one by Lyte ; the " Malabarian hymn" (as it was called by Jacobi) of Schiitz, "All glory to the Sovereign Good," has been popular in England as well as Germany ; and one of the most exquisite strains of pious resignation ever written is "Whate'er my God ordains is right," by Rodigast.

Joachim Neander, a schoolmaster at Diisseldorf, and a Neander.

friend of Spener and Schiitz (who died before the full development of the " Pietistic " school), was the first man of eminence in the "Reformed" or Calvinistic Church who imitated Lutheran hymnody. This he did, while suffering persecution from the elders of his own church for some other religious practices, which he had also learnt from Spener's example. As a poet, he is sometimes deficient in art ; but there is feeling, warmth, and sweetness in many of his " Bundeslieder " or "Songs of the Covenant," and they obtained general favour, both in the Reformed and in Lutheran congregations. The Summer Hymn ("O Thou true God alone ") and that on the Glory of God in Creation (Lo, heaven and earth and sea and air") are instances of his best style.

*With the "Pietists" may be classed Schmolke and Dessler, representatives of the "Orthodox" division of Spener's school; Hiller, their leading poet in South Ger- many ; Arnold and Tersteegen, who were practically independent of ecclesiastical organization, though connected, one with the " Orthodox" and the other with the 'Reformed " churches; and Louis Count Zinzendorf. pastor in Silesia, called the Silesian Rist (1672-1737), was perhaps the most voluminous of all German hymn- writers. He wrote 1188 religious poems and hymns, a large proportion of which do not rise above mediocrity, His style, if less refined, is also less subjective and more simple than that of most of his contemporaries. Among his best and most attractive works (which, indeed, it would be difficult to praise too highly) are the "' Hosianna David's Sohn," for Palm Sunday,—much resembling a shorter hymn by Jeremy Taylor ; and the Ascension, Whitsuntide, and Sabbath hymns,—" Heavenward doth our journey tend," "Come deck our feast to-day," and " Light of light, enlighten me." Few hymns, of the subjective kind, are better than his '*T will not let Thee go, Thou Help in time of need ;" "O Friend of souls, how well is me;" and " Now the pearly gates unfold," &c. (1699-1769), who, falling into ill-health during the latter part of his ministry, published a Casket of Spiritual Songs, in a didactic vein, with more taste than power, but (as Miss Winkworth says) in a tone of "deep, thoughtful, practical piety." They were so well-adapted to the wants of his people that to this day Hiller's Casket is prized, next to their Bibles, by the peasantry of Wiirtemberg; and the numerous emigrants from that*

part of Germany to America and other foreign countries generally take it with them wherever they go. afterwards a pastor in Brandenburg, was a man of strong will, uncompromising character, and austere views of life, intolerant and controversial towards those whose doctrine or practice he disapproved, and more indifferent to sepa- ratism and sectarianism than the "Orthodox" generally thought right. His hymns, like those of our own Toplady (whom in these respects he resembled), unite with con- siderable strength more gentleness and breadth of sympathy than might be expected from a man of such a character.

Schmolke, a Schmolke,

Dessler was a greater poet than Schmolke. Dessler.

Hiller was a pastor in Wiirtemberg Hiller.

Arnold, a professor at Giessen, and Arnold.

Terstee- gen.

Zinzen- dorf.

Gellert.

Klop- stock.

Novalis.

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Tersteegen (1697-1769), who never formally separated himself from the " Reformed " communion, in which he was brought up, but whose sympathies were with the Moravians and Count Zinzendorf, was, of all the more copious German hymn-writers after Luther, perhaps the most remarkable man. Pietist, mystic, and missionary, he was also a great religious poet. His 111 hymns were published in 1731, in a volume called Zhe Spiritual Plower-garden. They are intensely individual, meditative, and subjective. Wesley's adaptations of two—" Lo! God is here; let us adore," and 'Thou hidden Love of God, whose source" —are well known. Among those

translated by Miss Winkworth, "O God, O spirit, Light of all that live," and 'Come, brethren, let us go," are specimens which exhibit favourably his manner and power. Miss Cox speaks of him as "a gentle heaven-inspired soul, whose hymns are the reflexion of a heavenly, happy life, his mind being full of a child-like simplicity ;" and his own poem on the child-character, which Miss Winkworth has appropriately con- nected with Innocents' day ("Dear Soul, couldst thou become a child")—one of his best compositions, ex- quisitely conceived and expressed—shows that this was in truth the ideal which he souglit to realize. The hymns of Zinzendorf are often disfigured by excess in the application of the language and imagery of human affections to Divine Objects ; and this blemish is also found in many later Moravian hymns. But one hymn, at least, of Zinzendorf may be mentioned with unqualified praise, as uniting the merits of force, simplicity, and brevity,— "Jesu, geh voran" (Jesus, lead the way"), which is taught to most children of religious parents in Germany. Wesley's "Jesus, Thy blood and righteousness" is a translation from Zinzendorf,

The transition from Tersteegen and Zinzendorf to Gellert and Klopstock marks strongly the reaction against Pietism which took place towards the middle of the 18th century. The Spiritual Odes and Songs of C. F. Gellert were pub- lished in 1757, and are said to have been received with an enthusiasm almost like that which " greeted Luther's hymns on their first appearance." It is a proof of the modera- tion both of the author and of his times that they were largely used, not only by Protestant congregations, but in those German Roman Catholic churches in which ver- nacular services had been established through the influ- ence of the emperor Joseph II. They became the model which was followed by most succeeding hymn-writers, and exceeded all others in popularity till the close of the century, when a new wave of thought was generated by the movement which produced the French Revolution. Since that time they have been, perhaps, too much depre- ciated. They are, indeed, cold and didactic, as compared with Scheffler or Tersteegen; but there is nevertheless in them a spirit of genuine practical piety ; and, if not marked by genius, they are pure in taste, and often terse, vigorous, and graceful.

Klopstock, the author of the Messiah, cannot be con- sidered great as a hymn-writer, though his "Sabbath Hymn" (of which there isa version in

Hymns from the Land of Luther) is simple and good. Generally his hymns (ten are translated in Mr Sheppard's Yoreign Sacred Lyre) are artificial and much too elaborate.

Of the "romantic" school, which came in with the French Revolution, the two leading writers are Frederick von Hardenberg, called " Novalis," and Frederick de la Motte Fouqué, the celebrated author of Undine and Sintram,— both romance-writers, as well as poets. The genius of Novalis was early lost to the world ; he died in 1802, just thirty years old. Some of his hymns are very beautiful; but even in such works as " Though all to Thee were faithless," and "If only He is mine,"

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there is a feeling of insulation and of despondency as to good in the actual world, which was perhaps inseparable

from his ecclesiastical idealism. Fouqué survived till 1843. Fouqué.

In his hymns there is the same deep flow of feeling, richness of imagery, and charm of expression, which distinguishes his prose works. The two missionary hymns—' Thou, solemn Ocean, rollest to the strand," and "In our sails all soft and sweetly,"—and the exquisite composition which finds its motive in the gospel narrative of blind Bartimeus, 'Was du vor tausend Jahren" (finely translated both by Miss Winkworth and by Miss Cox), are among the best examples.

The later German hymn-writers of the present century are numerous, and belong, generally, to the revived '¢ Pietistic" school. Some of the best, e.g., Arndt, Albertini,

Krummacher, and especially Spitta, have produced works Spitta.

not unworthy of the fame-of their nation. Mr Massie, the able translator of Spitta's Psaltery and Harp (published at Leipsic in 1833), speaks of it as having "obtained for him in Germany a popularity only second to that of

Paul Gerhardt." Such praise is hyperbolical; posterity alone can adjust the relative places of the writers of this and of former generations. In Spitta's poems (for such they generally are, rather than hymns) the subjective and meditative tone is tempered, not ungracefully, with a didactic element ; and they are not, like some contemporary hymns, disfigured by exaggerated sentiment, or by a too florid and rhetorical style.

The best and fullest modern collection of choice German hymnsis Authori- that of Baron von Bunsen, in his Versuch eines allgemeinen Gesang- ties.

und Gebctbuchs of 1833, unfortunately not reprinted after the first edition. This contains about 900 hymns. In his later Allgemeines evanyelisches Gesang- und Gebetbuch of 1846 the number was reduced to 440. Many other authors, besides those who have been here mentioned, are represented in these collections, and also in the excellent English translations contained in the Lyra Germanica of Miss Winkworth; Miss Cox's Sacred Hymns from the Ger- man} Miss Fry's Hymns of the Reformation ; Miss Dunn's Hymns from the German ; the Misses Borthwick's Hymns from the Land of Luther; and the Rev. Arthur T. Russell's Hymns for the Church of England. In Cunz's Geschichte des deutschen Kirchen- liedes (Leipsie, 1855), the number of German hymn-writers named considerably exceeds 300. Besides the volumes of mixed trans- lations from different authors just enumerated (of which the earliest is that of Miss Cox, 1841), translations of Luther's hymns were pub- lished by Mr John Hunt, of Preston, in 1858, and by Mr Massie, of Eccleston, in 1854. The Lyra Domestica of Mr Massie (which appeared in 1860) contains his translations from Spitta, A much earlicr serics of English versions of nincty-three mixed German hymns was published in 1722, 1725, and 1732, by John Christian Jacobi, under the patronage of Caroline, queen of George II. To this collection, entitled Psalmodia Germanica, a supplement, con- taining thirty-one more, and also two Latin hymns by Petersen, was added by John Haberkorn in 1765, with a dedication tothe mother of George III. Some of these are now sung (though not without considerable alteration) in English churches.

Much of the historical and critical information contained in the foregoing account of German hymuody has been taken from Miss Winkworth's book, entitled Christian Singers of Germany (Macmillan, 1869); and to her also

we arc in most instances in- debted for our English renderings of the first lines of hymns. The principal German authorities on the subject, Wackernagel's Das Deutsche Kirchenlied, Koch's Geschichte des Kirchenliedes u Kirch- engesanges, &c., are mentioned in her preface; to which may be added the work alrcady mentioned of F. A, Cunz.

6. British Hymnody.

After the Reformation, the development of hymnody was retarded, in both parts of Great Britain, by the example and influence of Geneva. Archbishop Cranmer appears at one time to have been disposed to follow Luther's course, and to present to the people, in an English dress, some at least of the hymns of the ancient church. Ina letter to King Henry VIII. (7th October 1544), among some new " processions" which he had him- self translated into English, he mentions the Easter hymn, "Salve, festa dies, toto memorabilis zvo" ("Hail, glad day,

Marot's Psalms,

Stern-

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to be joyfully kept through all generations"), of Fortunatus, In the two " Primers" of 1535 (by Marshall) and of 1539 (by Bishop Hilsey of Rochester, published by order of the vicar-general Cromwell) there had been several rude English hymns, none of them taken from ancient sources. King Henry's "Primer" of 1545 (commanded by his injunction of the 6th May 1545 to be used throughout his dominions) was formed on the model of the daily offices of the Breviary ; and it contains English metrical translations from some of the best-known Ambrosian and other early hymns. But in the succeeding reign different views pre- vailed. A new direction had been given to the taste of the "Reformed" congregations in France and Switzerland by the French metrical translation of the Old Testament Psalms, which appeared about 1540. This was the joint work of Clement Marot, valet or groom of the chamber to Francis 1, and Theodore Beza, then a mere youth, fresh from his studies under Wolmar at Orleans.

Marot's Psalms were dedicated to the French king and the ladies of France, and, being set to popular airs, became fashionable. They were sung by Francis himself, the queen, the princesses, and the courtiers, upon all sorts of secular occasions, and also, more seriously and religiously, by the citizens and the common people. They were soon perceived to be a power on the side of the Reformation. Calvin, who had settled at Geneva in the year of Marot's return to Paris, was then organizing his ecclesiastical system. He rejected the hymnody of the Breviaries and Missals, and fell back upon the idea, anciently held by Paul of Samosata, and condemned by the fourth council of Toledo, that whatever was sung in churches ought to be taken out of the Scrip- tures. Marot's Psalter, appearing thus opportunely, was introduced into his new system of worship, and appended to his catechism. On the other hand, it was interdicted by the Roman Catholic priesthood. Thus it became a badge to the one party of the "Reformed" profession, and to the other of heresy.

The example thus set produced in England the transla-

hold and tion commonly known as the " Old Version " of the Psalms.

Hopkins. 1

t was begun by Thomas Sternhold, whose position in the household of Henry VIII., and afterwards of Edward VL., was similar to that of Marot with Francis I., and whose services to the former of those kings were rewarded by a substantial legacy under his will. Sternhold published versions of thirty-seven Psalms in 1549, with a dedication to King Edward, and died soon afterwards. A second edition appeared in 1551, with seven more Psalms added, by John Hopkins, a Suffolk clergyman. The work was continued during Queen Mary's reign by British refugees at Geneva, the chief of whom were William Whittingham (afterwards dean of Durham), who succeeded John Knox as minister of the English congregation there, and William Kethe (or Keith), said by Strype to have been a Scotchman. They published at Geneva in 1556 a service-book, contain- ing fifty-one English metrical Psalms, which number was increased, in later editions, to eighty-seven. On the acces- sion of Queen Elizabeth, this Genevan Psalmody was at once brought into use in England,—first (according to a letter of Bishop Jewell to Peter Martyr, dated 5th March 1560) in one

London church, from which it quickly spread to others both in London and in other cities. Jewell describes the effect produced by large congregations, of as many as 6000 persons, young and old, women and children, singing it after the sermons at St Paul's Cross,—adding, "Id sacrificos et diabolum xgre habet; vident enim sacras conciones hoc pacto profundius descendere in hominum animos." The first edition of the completed " Old Version " (containing forty Psalms by Sternhold, sixty-seven by Hopkins, fifteen by Whittingham, six by Kethe, and the rest by Thomas Norton, a barrister, Robert Wisdom,

John Mardley, and Thomas Churchyard) appeared in

1562.

In the meantime, the Books of Common Prayer, &c., of 1549, 1552, and 1559 had been successively established as law by the Acts of Uniformity of Edward VI. and Queen Elizabeth. In these no provision was made for the use of any metrical psalm or hymn on any occasion whatever, exccpt at the consecration of bishops and the ordination of priests, in which offices (first added in 1552) an English version of " Veni Creator" (the longer of the two now in use) was appointed to be "said or sung." The canticles, 'Te Deum," ' Benedicite," &c., the Nicene and Athanasian Creeds, the ' Gloria in Excelsis," and some other parts of the communion and other special offices were also directed to be "said or sung ;" and, by general rubrics, the chanting of the whole service was allowed.*

The silence, however, of the rubrics in these books as to any other singing was not meant to exclude the use of psalms not ex- pressly appointed, when they could be used without interfering with the prescribed order of any service. It was expressly provided by King Edward's First Act of Uniformity (by later Acts made appli- cable to the later books) that it should be lawful "for all men, as well in churches, chapels, oratorics, or other places, to use openly any psalms or prayers taken out of the Bible, at any due time, not letting or omitting thereby the service, or any part thereof, men- tioned in

the book." And Quccn Elizabeth, by one of the injunc- tions issued in the first ycar of her reign, declared her desire that the provision made, "in divers collegiate and also some parish churches, for singing in the church, so as to promote the laudable service of music," should continue. After allowing the use of "a modest and distinct song in all parts of the common prayers of the church, so that the same may be as plainly understanded as if it were read without singing," the injunction procecded thus— And yet, nevertheless, for the comforting of such that delight in music, it may be permitted that in the beginning or in the end of the Common Prayer, either at morning or evening, there may be sung an hymn, or such like song to the praise of Almighty God, in the best sort of melody and inusic that may be conveniently devised, having respect that tlic sentence " (¢.¢., sense) 'of hymn may be understanded and perceived."

The 'Old Version," when published (by John Daye, for the Stationers' Company, "cum gratia et privilegio Regie Majestatis"), bore upon the face of it that it was "newly set forth, and allowed to be sung of the people in churches, before and after morning and evening praycr, as also before and after the sermon." The question of its authority has been at different times much debated, chiefly by Heylin and Thomas Warton on one side (both of whom disliked and disparaged it), and by Bishop Beveridge and the Rev. H. J. Todd on the other. Heylin says, it was "' permitted rather than allowed," which seems to be a distinction without much difference. " Allowance," which is all that the book claimed for itself, is authorization by way of permission, not of commandment. Its publication in that form could hardly have been licensed, nor could it have passed into use as it did without question, throughout the churches of England, unless it had been "allowed" by some authority then esteemed to be sufficient. Whether that authority was royal or ecclesiastical does not appear, nor (considering the proviso in King Edward's Act of Uniformity, and Queen Elizabeth's injunctions) is it very important. No inference can justly be drawn from the inability of inquirers, in Heylin's time or since, to discover any public record bearing upon this subject, many publi¢ documents of that period having been lost.

In this book, as published in 1562, and for many years afterwards, there were (besides the versified Psalms) eleven metrical versions of the "Te Deum," canticles, Lord's Prayer, c&c., dc. (the best of which is that of the

‘“Bene- dicite”); and also “Da pacem, Domine,” a hymn suitable to the times, rendered into English from Luther ; two origi- nal hymns of praise, to be sung before Morning and Evening Prayer ; two penitential hymns (one of them the “ Humble Lamentation of a Sinner”); and a hymn of faith, begin- ning, “ Lord, in Thee is all my trust.” In these respects, and also in the tunes which accompanied the words (stated by Dr Burney, in his Mistory of Music, to be German, and not French), there was a departure from the Genevan platform. Some of these hymns, and some of the psalms also (eg., those by Robert Wisdom, being alternative versions), were omitted at a later period; and many alterations and supposed amendments were from time to time made by unknown hands in the Psalms which remained, so that the text, as now printed, is in many places different from that of 1562.

Scotch Psalms.

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In Scotland, the General Assembly of the kirk caused to be printed at Edinburgh in 1564, and enjoined the use of,

a book entitled Zhe Form of Prayers and Ministry of the

Sacraments used in the English Church at Geneva, approved

and received by the Church of Scotland ; whereto, besides that was in the former books, are also added sundry other prayers, with the whole Psalms of David in English metre. This contained all the Psalms of the “Old Version” by Sternhold, Whittingham, and Kethe, but only thirty-seven of those by Hopkins, and none by any of the other English translators. Instead of those omitted, it had nineteen more

by Kethe and Whittingham ; one by John Pulleyn (one of

the Genevan refugees, who became Archdeacon of Col- chester); six by Robert Pont, Knox’s son-in-law, who was

a minister of the kirk, and also a lord of session; and fifteen signed with the initials I. C., supposed to be John

Craig.

So matters continued in both churches until the Rebellion. During the interval, King James I. conceived the project of himself making a new version of the Psalms, and appears to have translated thirty-one of them,—the correction of which, together with the translation of the rest, he entrusted to Sir William Alexander, afterwards earl of Stirling. Sir William having completed his task, King Charles the First (after having it examined and approved by several arch- bishops and bishops of England, Scotland, and Ireland) caused it to be printed in 1631 at the Oxford University Press, as the work of King James; and, by an order under the royal sign manual, recommended its use in all churches of his dominions. In 1634 he enjoined the Privy Council of Scotland not to suffer any other Psalms, " of any edition whatever," to be printed in or imported into that kingdom. In 1636 it was republished, and was attached to the famous Scottish Service-book, with which the troubles began in 1637. It need hardly be added that the king did not succeed in bringing this Psalter into use in either kingdom.

When the Long Parliament undertook, in 1642, the task of altering the liturgy, its attention was at the same time directed to psalmody. It had to judge between two rival translations of the Psalms—one by Francis Rouse, a member of the House of Commons, afterwards one of Cromwell's councillors, and finally provost of Eton; the other by William Barton, a clergyman of Leicester. The House of Lords favoured Barton, the House of Commons Rouse, who had made much use of the labours of Sir William Alexander. Both versions were printed by order of parlia- ment, and were referred for consideration to the Westminster Assembly. They decided in favour of Rouse. His version, as finally amended, was published in 1646, under an order of the House of Commons dated 14th November 1645. In the following year it was recommended by the parliament to the General Assembly at Edinburgh, who appointed a committee, with large powers, to prepare a revised Psalter, recommending to their consideration not only Rouse's book but that of 1564, and two other versions (by Zachary Boyd, and Sir William Mure of Rowallan), then lately executed in Scotland. The

result of the labours of this committee was the " Paraphrase " of the Psalms, which, in 1649-1650, by the concurrent authority of the General Assembly and the committee of estates, was ordered to be exclusively used throughout the church of Scotland. Some use was made in the preparation of this book of the versions to which the attention of the revisers had been directed, and also of Barton's ; but its basis was that of Rouse. It was received in Scotland with great favour, which it has ever since retained; and it is fairly entitled to the praise of striking a tolerable medium between the rude homeliness of the "Old," and the artificial modernism of the " New" English versions—-perhaps as great a success as was possible for such an undertaking. Sir Walter Scott is said to have dis-

suaded any attempt to alter it, and to have pronounced it, "with all its acknowledged occasional harshness, so beauti- ful, that any alterations must eventually prove only so many blemishes." No further step towards any authorized hymnody was taken by the kirk of Scotland till the follow- ing century.

In England, two changes bearing on church hymnody were made upon the revision of the Prayer-book after the Restoration, in 1661-1662. One was the addition, in the offices for consecrating bishops and ordaining priests, of the shorter version of '" Veni Creator" ("Come, Holy Ghost, our souls inspire"), as an alternativeform. The other, and more importaut, was the insertion of the rubric after the third Collect, at Morning and Evening Prayer: 'In quires and places where they sing, here followeth the Anthem." By this rubric synodical and parliamentary authority was given for the interruption, at that point, of the prescribed order of the service by singing an anthem, the choice of which was left to the discretion of the minister. Those actually used, under this authority, were for some time only unmetrical passages of Scripture, set to music by Blow, Purcell, and. other composers, of the same kind with the anthems still generally sung in cathedral and collegiate churches. But the word "anthem" had no technical signification which could be an obstacle to the use under this rubric of metrical hymns.

The “New Version” of the Psalms, by Dr Nicholas Tate and Brady and the poet-laureate Nahum Tate (both Irishmen), Brady. appeared in 1696, under the sanction of an order in council of William IIL, “allowing and permitting” its use ‘in all such churches, chapels, and congregations as should think fit to receive it.” Dr Compton, bishop of London, recommended it to his diocese. No hymns were then appended to it; but the authors added a “ Supplement” in 1703, which received an exactly similar sanction from an order in council of Queen Anne, In that Supplement there were several new versions of the canticles, d&c., and of the “Veni Creator ;” a variation of the old ‘“ Humble Lamentation of a Sinner ;” six hymns for Christmas, Easter, and Holy Communion (all versions or paraphrases of Scripture), which are still usually printed at the end of the Prayer-books containing the new version; and a hymn “On the Divine use of Music,”—all accompanied by tunes. The authors also reprinted, with very good taste, the excellent version of the “ Benedicite ” which appeared in the book of 1562. Of the hymns in this “Supplement,” one (“ While shepherds watched their flocks by night ”) greatly exceeded the rest in merit. It has been ascribed to Tate, but it has a character of simplicity unlike the rest of his works.

The relative merits of the “Old” and “New” versions Old and have been very variously estimated. Competent judges ee have given the old the praise, which certainly cannot be hi accorded to the new, of fidelity to the Hebrew. In both, pared. it must be admitted, that those parts which have poetical merit are few and far between; but a reverent taste is likely to be more offended by the frequent sacrifice, in the new, of depth of tone and accuracy of sense to a fluent common- place correctness of versification and diction, than by any excessive homeliness in the old. In both, however, some Psalms, or portions of Psalms, are well enough rendered to entitle them to a permanent place in our hymn-books,— especially the 8th, and parts of the 18th Psalm, by Sternhold; the 57th, 84th, and 100th, by Hopkins ; the 93d, 34th, and 36th, and part of the 148th, by Tate and Brady.

The judgment which a fastidious critic might be disposed to pass upon both these books may perhaps be considerably mitigated by comparing. them with the works of other labourers in the same field, of whom Mr Holland, in his interesting volumes entitled Psalmasts of Great Britain,

English congre- gational hymn- ody.

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enumerates above 150. Some of them have been real poets—the celebrated earl of Surrey, Sir Philip Sidney and his sister the countess of Pembroke, George Sandys, George Wither, John Milton, and John Keble. In their versions, as might be expected, there are occasional gleams of power and beauty, exceeding anything to be found in Sternhold and Hopkins, or Tate and Brady; but even in the best these are rare, and chiefly occur where the strict idea of translation has been most widely departed from. In all of them, as a rule, the life and spirit, which in prose versions of the Psalms are so wonderfully preserved, have disappeared. The conclusion practically suggested by so many failures is that the difficulties of metrical transla- tion, always great, are in this case insuperable 3 and that, while the Psalms (like other parts of Scripture) are abund- antly suggestive of motive and material for hymnographers, it is by assimilation and adaptation, and not by any attempt to transform their exact sense into modern poetry, that they may be best used for this purpose.

The order in council of 1703 is the latest act of any public autho- rity by which an express sanction has been given to the use of psalms or hymns in the Church of England. At the end, indeed, of many modern Prayer-books, there will be found, besides some of the hymns sanctioned by that order in council, or of those contained in the book of 1562, a Sacramental and a Christmas hymn by Dod- dridge ; a Christmas hymn (varied by Martin Madan) from Charles Wesley ; an Easter hymn of the 18th century, beginning 'Jesus Christ has risen to day ;" and abridgments of Bishop Ken's Morn- ing and Evening Hymns. These additions first began to be made in or about 1791, in London editions of the Prayer-book and Psalter, at the mere will and pleasure (so far as appears) of the printers. They have no sort of authority.

In the state of authority, opinion, and practice disclosed by the preceding narrative may be found the true explana- tion of the fact that, in the country of Chaucer, Spenser, Shakespeare, and Milton, and notwithstanding the example of Germany, no native congregational hymnody worthy of the name arose till after the commencement of the 18th century. Yet there was no want of appreciation of the power and value of congregational church music. Milton could write, before 1645,—

' There let the pealing organ blow To the full-voiced quire below In service high, and anthems clear, As may with sweetness through mine ear Dissolve me into ecstasies, And bring all Heaven before mine eyes."*

Thomas Mace, in his Music's Monument (1676), thus described the effect of psalm-singing before sermons, by the congregation in York Minster on Sundays, during the siege of 1644: "When that vast concording unity of the whole congregational chorus came thundering in, even so as it made the very ground shake under us, oh, the unutterable ravishing soul's delight ! in the which I was so transported and wrapt up in high contemplations that there was no room left in my whole man, body, soul, and spirit, for any- thing below divine and heavenly raptures ; nor could there possibly be anything to which that very singing might be truly compared, except the right apprehension or conceiving of that glorious and miraculous quire, recorded in the Seriptures at the dedication of the Temple." Nor was there any want of men well-qualified, and by the turn of their minds predisposed, to shine in this branch of litera- ture. Some (like Sandys, Boyd, and Barton) devoted them- selves altogether to paraphrases of other Scriptures as well as the Psalms. Others (like George Herbert, and Francis and John Quarles) moralized, meditated, soliloquized, and allegorized in verse. Without reckoning these, there were a few, even before the Restoration, who came very near to the ideal of hymnody.

First in time is the Scottish poet John Wedderburn, who translated several of Luther's hymns, and in his Compendi-

ous Book of Godly and Spiritual Songs added others of his own (or his brothers') composition, Some of these poems, published before 1560, are of uncommon excellence, uniting ease and melody of rhythm, and structural skill, with grace of expression, and simplicity, warmth, and reality of religious feeling. Those entitled "Give me thy heart," "Go, heart," and " Leave me not" (which will be found in a collection of 1860 called Sacred Songs of Scotland), require little, beyond the change of some archaisms of language, to adapt them for church or domestic use at the present day.

Next come the two hymns of "The New J erusalem," by an English Roman Catholic priest signing himself F. B. P. (supposed by the late Mr Sedgwick to be " Francis Baker, Presbyter "), and by another Scottish poet, David Dickson, Dickson. of which the history is given by Dr Bonar in his edition of Dickson's work. This (Dickson's), which begins 'O mother dear, Jerusalem," and has long been popular in Scotland, is a variation and amplification (by the addition of a large number of new stanzas) of the English original, beginning " Jerusalem, ny happy home," written in Queen Elizabeth's time, and printed (as appears by a copy in the British Museum) about 1616, when Dickson was still young. Both have an easy natural flow, and a simple happy render- ing of the beautiful Scriptural imagery upon the subject, with a spirit of primitive devotion uncorrupted by medizyval peculiarities. The English hymn (of which some stanzas are now often sung in churches) is the true parent of the several shorter forms,—all of more than common merit, — which, in modern hymn-books, begin with the same first line, but afterwards deviate from the original. Kindred to these is the very fine and faithful translation, by Drummond of Hawthornden (who was Dickson's contem- porary), of the ancient " Urbs beata Hierusalem" ('« Jeru- salem, that place divine"). Other ancient hymns (two of Thomas Aquinas, and the "Dies Ire") were also well translated, in 1646, by Crashaw, after he had become a Roman Catholic, and had been deprived by the parliament of his fellowship at Cambridge.

Conspicuous among the sacred poets of the first two Wither. Stuart reigns in England is the name of George Wither, an accomplished layman, of strong church principles, whose fate it was to be opposed and slighted while he was a staunch churchman and Royalist, and afterwards to be driven into the parliamentary and Puritan ranks; for which cause, probably, recognition

was denied to his genius asa poet by Dryden, Swift, and Pope. He had almost fallen into oblivion, when attention was recalled to his merits by the more discerning criticisms of Charles Lamb and Southey ; and, when his Hallelujah was republished in 1857 by Mr Farr, only two copies of it were known to exist, one in the British Museum, and another which had been in Mr Heber's library. His Hymns and Songs of the Church appeared in 1622-1623, under a patent of King James I., by which they were declared "worthy and profitable to be inserted, in convenient manner and due place, into every English Psalm- book to metre." This patent was opposed, as inconsistent with their privilege to print the "'singing-psalms," by the Stationers' Company, to Wither's great mortification and loss. His Hallelujah (in which some of the former Hymns and Songs were repeated) followed, after several intermediate publications of a different kind, in 1641. The Hymns and Songs were set to music by Orlando Gibbons, and those in both books were written to be sung, though for the most part privately, there being no evidence that the author contemplated the use of any of them in churches. They included, however, hymns for every day in the week (founded, as those contributed nearly a century afterwards by Coffin to the Parisian Breviary also were, upon the successive works of the days of creation) ; hymns for all

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Milton.

Jeremy Taylor.

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the church seasons and festivals, including saints' days ; hymns for various public occasions ; and hymns of prayer, meditation, and instruction, for a great number of different sorts and conditions of men and women, in a variety of the circumstances incident to human life,—being at once a " Ohristian Year" and a manual of practical piety. Many of them rise to a very high point of excellence,—particularly the "general invitation to praise God" (" Come, O come, in pious lays"), with which Hallelujah opens ; the Thanks- givings for Peace and for Victory, the Coronation Hymn, a Christmas, an Epiphany, and an Easter Hymn, and one for St

Bartholomew's day (Hymns 1, 74, 75, and 84 in part i, and 26, 29, 36, and 54 in part ii., of Hallelujah). All these are properly entitled to the designation of hymns, which can hardly be conceded to some others, of singular beauty, viz. the Cradle-song (Sleep, baby, sleep, what ails my dear"), the Anniversary Marriage Song (' Lord, living here are we"), the Perambulation Song (" Lord, it hath pleaséd Thee to say"), the Song for Lovers (" Come, sweet heart, come, let us prove"), the Song for the Happily Married ("Since they in singing take delight "), and that for a Shepherd ("Renownéd men their herds to keep ")— (Nos. 50 in the first part, 17 and 24 in the second, and 20, 21, and 41 in the third). There is also in the second part a fine song (No 59), full of historical as well as poetical interest, upon the evil times in which the poet lived, beginning— " Now are the times, these are the days, Which will those men approve Who take delight in honest ways And pious courses love ; Now to the world it will appear That innocence of heart

Will keep us far more free from fear Than helmet, shield, or dart."

Wither wrote, generally, in a pure nervous English idiom, and preferred the reputation of "rusticity" (an epithet applied to him even by Baxter) to the tricks and artifices of poetical style which were then in favour. It may be partly on that account that he has been better appreciated by posterity than by his contemporaries.

Cosin, afterwards bishop of Durham, published in 1627 a volume of "Private Devotions," for the canonical hours and other occasions. In this there are seven or eight hymns of considerable merit,—among them a very good version of the Ambrosian '" Jam lucis orto sidere," and the shorter version of the " Veni Creator," which was introduced after the Restoration into the consecration and ordination services of the Church of England.

The hymns of Milton (on the Nativity, Passion, Circum- cision, and " at a Solemn Music"), written about 1629, in his early manhood, were probably not intended for singing; but they are odes full of characteristic beauty and power.

During the Commonwealth, in 1654, Jeremy Taylor pub- lished, at the end of his G'olden Grove, twenty-one hymus, described by himself as "

celebrating the mysteries and chief festivals of the year, according to the manner of the ancient chureh, fitted to the fancy and devotion of the younger and pious persons, apt for memory, and to be joined to their other prayers." Of these, his accomplished editor, Bishop Heber, justly says :-—

" They are in themselves, and on their own account, very inter- esting compositions. Their metre, indeed, which is that species of spurious Pindaric which was fashionable with his contemporaries, is an obstacle, and must always have been onc, to their introduction into public or private psalmody ; and the mixture of that alloy of conceits and quibbles which was an equally frequent and still greater defilement of some of the finest poetry of the 17th century will materially diminish their effect as devotional or descriptive odes. Yet, with all these faults, they are powerful, affecting, and often harmonious ; there arc many passages of which Cowley need not have been ashamed, and some which remind us, not disadvantage- ously, of the corresponding productions of Milton."

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He mentions particularly the Advent hymn (" Lord, come away"), part of the hymn "On Heaven," and (as "more regular in metre, and in words more applicable to public devotion ") the " Prayer for Charity" (" Full of mercy, full of love").

The epoch of the Restoration produced in 1664 Samuel Restora- Crossman's Young Man's Calling, with a few 'Divine tion Meditations" in verse attached to it; in 1668 John 'a Austin's Devotions in the Ancient Way of Offices, with psalms, hymns, and prayers for every day in the week and every holyday in the year; and in 1681 Richard Baxter's Poetical Fragments. In these books there are altogether seven or eight hymns, the whole or parts of which are extremely good:—Crossman's " New, Jerusalem" ("Sweet place, sweet place alone »', one of the best of that class, and "My life's a shade, my days " Austin's " Hark, my soul, how everything," " Fain would my thoughts fly up to Thee," "Lord, now the time returns," " Wake all my hopes, lift up your eyes;" and Baxter's 'My whole, though broken heart, O Lord," and "Ye holy angels bright." Austin's

Offices (he was a Roman Catholic) seem to have attracted much attention. Theophilus Dorrington, in 1686, and afterwards Hickes, the non-juror, published variations of them under the title of Reformed Devotions; and the Wesleys, in their earliest hymn-book, adopted hymns from them, with little alteration. These writers were followed by John Mason in 1683, and Thomas Shepherd in 1692,— the former, a country clergyman, much esteemed by Baxter and other Nonconformists ; the latter himself a Nonconfor- mist, who finally emigrated to America. Between these two men there was a close alliance, Shepherd's Penitentral Cries being published as an addition to the Spiritual Songs of Mason. Their hymns came into early use in several Nonconformist congregations ; but, with the exception of one by Mason ("There is a stream which issues forth"), they are not suitable for public singing. In those of Mason there is often a very fine vein of poetry ; and later authors have, by extracts or centoes from different parts of his works (where they were not disfigured by his general quaintness), constructed several hymns of more than average excellence.

Three other eminent names of the 17th century remain to be mentioned, John Dryden, Bishop Ken, and Bishop Simon Patrick; with which may be associated that of Addison, though he wrote in the 18th century.

Dryden's translation of "Veni Creator" (a cold and Dryden,' laboured performance) is to be met with in many hymn- books. Abridgments of Ken's Morning and Evening Ken. Hymns are in all. These, with the Midnight Hymn (not inferior to them), first appeared in 1697, appended to the

third edition of the authors Manual of Prayers for Winchester Scholars. Between these and a large number

of other hymns (on the Attributes of God, and for

the Festivals of the Church) published by Bishop Ken

after 1703 the contrast is remarkable. The universal acceptance of the Morning and Evening Hymns is due to

their transparent simplicity, warm but not overstrained. devotion, and extremely popular style. Those afterwards published have no such qualities.

They are mystical, florid, stiff, didactic, and seldom poetical, and deserve the neglect into which they have fallen. Bishop Patrick's Patrick. hymns were chiefly translations from the Latin, most of

them from Prudentius. The best is a version of ' Alleluia

dulce carmen." Of the five attributed to Addison, not Addison. more than three are adapted to public singing ; one (" The spacious firmament on high ") isa very perfect and finished composition, taking rank among the best hymns in the English language.'

1 The authorship of this and of one other, " When all Thy mercies, O my God," has been made a subject of controversy,—being claimed

Watts,

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From the preface to Simon Browne's hymns, published in 1720, we learn that down to the time of Dr Watts the only hymns known to be "in common use, either in private families or in Christian assemblies," were those of Barton, Mason, and Shepherd, together with "an attempt to turn some of Mr Herbert's poems into common metre," and a few sacramental hymns by authors now forgotten, named Vincent, Boyse, and (Joseph) Stennett, Of the 1410 authors of original British hymns enumerated in Mr Sedgwick's catalogue, published in 1863, 1213 are of later date than 1707; and, if any correct enumeration could be made of the total number of hymns of all kinds published in Great Britain before and after that date, the proportion subse- quent to 1707 would be very much larger.

The English Independents, as represented by Dr Watts, have a just claim to be considered the real founders of modern English hymnody. Watts was the first to under- stand the nature of the want, and, by the publication of his Hymns in 1707-1709, and Psalms (not translations, but hymns founded on psalms) in 1719, he led the way in pro- viding for it. His immediate followers were Simon Browno and Doddridge. -Later in the 18th century,

Hart, Gibbons, Grigg, and Mrs Barbauld (the two first Independents, the two last Presbyterians), and Miss Steele, Medley, Samuel Stennett, Ryland, Beddome, and Swaine (all Baptists), succeeded to them.

Among these writers (most of whom produced some hymns of merit, and several are extremely voluminous), Watts and Doddridge are pre-eminent. It has been the fashion with some to disparage Watts, as if he' had never risen above the level of his Zymns for Little Children. No doubt his taste is often faulty, and his style very unequal, but, looking to the good, and disregarding the large quantity of inferior matter, it is probable that more hymns which approach to a very high standard of excellence, and are at the same time suitable for congregational use, may be found in his works than in those of any other English writer. Such are "When I survey the wondrous cross," " Jesus shall reign where'er the sun" (and also another adapta- tion of the same 72d Psalm), "Before Jchovah's awful throne" (which first line, however, is not his, but Wesley's), 'Joy to the world, the Lord is come," " My soul, repeat Tis praise," "' Why do we mourn departing friends," " There is a land of pure delight," "Our God, our help in ages past," "Up to the hills I lift mine eyes," and many more. It is true that in some of these cases dross is found in the original poems mixed with gold; but the process of separation, by selection without change, is not difficult. As long as pure nervous English, unaffected fervour, strong simplicity, and liquid yet manly sweetness are admitted to be characteristics of a good hymn, works such as these must command admiration.

Doddridge is, generally, much more laboured and arti- ficial; but his place also as a hymn-writer ought to be determined, not by his failures, but by his successes, of

SSeS for Andrew Marvell (who died in 1678), in the preface to Captain Thomson's edition (1776) of Marvell's Works. But this claim does not appear to be substantiated. The editor did not give his readers the means of judging as to the real age, charactcr, or value of a manuscript to which he referred ; he did not say that these portions of it were in Marvell's handwriting ; he did not even himsclf include them among Marvell's poems, as published in the body of his cdition; and he advanced a like claim on like grounds to two other poems, in very different styles, which had been

published as their own by Tickell and Mallet. It is certain that all the five hymns were first made public in 1712, in papers contributed by Addison to the Spectator (Nos. 441, 458, 465, 489, 513), in which they were introduced in a way which might have been expected if they were by the hand which wrote those papers, but which would have been improbable, and unworthy of Addison, if they were unpublished works of a writer of so much genius, and such note in his day, as Marvell. They are all printed as Addison's in Dr Johnson's cdition of the British Poets.

which the number is not inconsiderable. In his better works he is distinguished by a graceful and pointed, some- times even a noble style. His "Hark, the glad sound, the Saviour comes" (which is, indeed, his masterpiece), is as sweet, vigorous, and perfect a composition as can any- where be found. Two other hymns, " How gentle God's commands," and that which, in a form slightly varied, became the "O God of Bethel, by whose hand," of the Scottish " Paraphrases," well represent his softer manner.

Of the other followers in the school of Watts, Miss Steele Miss (1780) is the most popular and perhaps the best. Her Steele. hymn beginning "Far from these narrow scenes of night " deserves high praise, even by the side of other good perfor- mances on the same subject.

The influence of Watts was felt in Scotland, and among Ralph the first whom it reached there was Ralph Erskine, This Erskine. seems to have been after the publication of Erskine's Gospel Sonnets, which appeared in 173 2, five years before he joined his brother Ebenezer in the Secession Church, The Gospel Sonnets became (as some have said) a " people's classic "; but there is in them very little which belongs to the category of hymnody. More than nineteen-twenticths of this very curious book are occupied with what are, in fact, theological treatises and catechisms, mystical meditations on Christ as a Bridegroom or Husband, and spiritual enigmas, paradoxes, and antithetical conceits, versified, it is true, but of a quality of which such lines as—

“ Faith ’s certain by fiducial acts, Sense by its evidential facts,”

may be taken as asample. The grains of poetry scattered through this large mass of Calvinistic divinity are very few ; yet in one short passage of seven stanzas (“O send me down a draught of love”), the fire burns with a bright- uess so remarkable as to justify a strong feeling of regret that the gift which this writer evidently had in him was not more often cultivated. Another passage, not so well sustaincd, but of considerable beauty (part of the last picce under the title ‘“The Believer’s Soliloquy ”), became after- wards, in the hands of Berridge, the foundation of a very striking hymu (“O happy saints, who walk in light ”).

After his secession, Ralph Erskine published two para- phrases of the “Song of Solomon,” and a number of other “Scripture songs,” paraphrased, in like manner, from the Old aud New Testaments. In these the influence of Watts became very apparent, not only by a change in the writer’s general style, but by the direct appropriation of no small quantity of matter from Dr Watts’s hymns, with variations which were not always improvements. His paraphrases of 1 Cor. i, 24, Gal. vi. 14, Heb. vi. 17-19, Rev. v. iL; 12, vii. 10-17, and xii, 7-12 are little else than Watts transformed. One of these (Rev. vii. 10-17) is interesting as @ variation and improvement, intermediate between the original and the form which it ultimately assumed as the 66th “‘Paraphrase ” of the Church of Scotland, of Watts’s “What happy men or angels these,” and “These glorious minds, how bright they shine.” No one can compare it with its ultimate product, “How bright these glorious spirits shine,” without perceiving that Cameron followed Erskine, and only added finish and grace to his work,— both excelling Watts, in this instance, in simplicity as well as in conciseness.

Of the contributions to the authorized “ Paraphrases ” Scottish (with the settlement of which committees of the General Para- Assembly of the Church of Scotland were occupied from Phrases. 1745 or earlier till 1781), the most noteworthy (besides the two already mentioned) were those of John Morrison and those claimed for Michael Bruce. The obligations of these “ Paraphrases” to English hymnody, already traced in some instances (to which may be added the adoption from Addison of three out of the five “hymns” appended

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Method- ist hymns.

Charles Wesley.

Olivers.

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to them), are perceptible in the vividness and force with which these writers, while adhering with a severe simplicity to the sense of the passages of Scripture which they under- took to render, fulfilled the conception of a good original hyfun. Morrison's " The race that long in darkness pined " and "Come, let us to the Lord our God," and Bruce's "Where high the heavenly temple stands " (if this was really his), are well entitled to that praise. The advocates of Bruce in the controversy, not yet closed, as to the poems said to have been entrusted by him to John Logan, and published by Logan in his own name, also claim for him the credit of having varied the paraphrase " Behold, the moun- tain of the Lord," from its original form, as printed by the committee of the General Assembly in 1745, by some excel- lent touches.

Attention must now be directed to the hymns produced by the " Methodist" movement, which began about 1738, and which afterwards became divided, between those esteemed Arminian, under John Wesley, those who adhered to the Moravians, when the original alliance between that body and the founders of Methodism was dissolved, and the Calvinists, of whom Whitfield (himself no poet) was the leader, and Selina, countess of Huntingdon, the patroness. Fach of these sections had its own hymn-writers, some of whom did, and others did not, secede from the Church of England. The Wesleyans had Charles Wesley, Seagrave, Olivers, and Bakewell; the Moravians, Cennick and Ham- mond (with whom, perhaps, may be classed John Byrom, who imbibed the mystical ideas of some of the German schools); the Calvinists, 'Toplady, . Berridge, William Williams, Madan, Batty, Haweis, Rowland Hill, John Newton, and Cowper.

Among all these writers, the palm undoubtedly belongs to Charles Wesley. In the first volume of hymns published by the two brothers are several good translations from the German, believed to be by John Wesley, who, although he translated and adapted, is not supposed to have written any original hymns ; and the inflaence of German hymnody, particularly of the works of Paul Gerhardt, Scheffler, 'Tersteegen, and Zinzendorf, may be traced in a large pro- portion of Charles Wesley's works. He is more subjective and meditative than Watts and his school; there is a didactic turn, even in his most objective pieces (as, for example, in his Christmas and Easter hymns); most of his works are supplicatory, and his faults are connected with the same habit of mind. He is apt to repeat the same thoughts, and to lose force by redundancy—he runs some- times even to a tedious length; his hymns are not always symmetrically constructed, or well balanced and finished off, But he has great truth, depth, and variety of feeling ; his diction is mauly, and always to the point ; never florid, though sometimes passionate and not free from exaggera- tion; often vivid aud picturesque. Of his spirited style there are few better examples than "QO for a thousand tongues to sing," "Blow ye the trumpet, blow," " Rejoice, the Lord is King," and "Come, let us join our friends above ;" of his more tender vein, "Happy soul, thy days are ended ;" and of his fervid contemplative style (without going beyond hymns fit for general use), "O Thou who camest from above," "Forth in thy name, O Lord, I go," and "Eternal Beam of Light Divine." With those whose taste is for hymns in which warm religious feelings are warmly and demonstratively expressed, "Jesus, lover of my soul," is as popular as any of these.

Of the other Wesleyan hymn-writers, Olivers (originally a Welsh shoemaker, afterwards a preacher) is the most remarkable. He is the author of only two works, both odes, in a stately metre, and from their length unfit for congregational singing, but one of them, " The God of Abraham praise," an ode of singular power and beauty.

HYMNS

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The Moravian Methodists produced few hymns now Cennick. available for general use. The best are Cennick's " Children of the heavenly King," and Hammond's " Awake and sing Ham- the song of Moses and the Lamb," the former of which mond. (abridged), and the latter as varied by Madan, are found in many hymn-books, and are deservedly esteemed. Byrom, Byrom. whose name we have thought it convenient to connect with these, though he did not belong to the Moravian com- munity, was the author of a Christmas hymn ("« Christians awake, salute the happy morn") which enjoys great popu- larity in the county (Lancashire) of which he was a native ; and also of a short subjective hymn, very fine both in feel- ing and in expression, " My spirit longeth for Thee within my troubled breast."

The contributions of the Calvinistic Methodists to English Toplady. hymnody are of greater extent and value. Few writers of hymns had higher gifts than Augustus Montague Top- lady, author of "Rock of Ages," by some esteemed the finest in the English language. He was a man of ardent temperament, enthusiastic zeal, strong convictions, and great energy of character. "He had," says one of his biographers, "the courage of a lion, but his frame was brittle as glass." Between him and J ohn Wesley there was a violent opposition of opinion, and much acrimonious controversy ; but the same fervour and zeal which made him an intemperate theologian gave warmth, richness, and spirituality to his hymns, In some of them (particularly those which, like " Deathless principle, arise," are medita- tions after the German manner, and not without direct obligation to German originals) the setting is somewhat too artificial ; but his art is never inconsistent with a genuine flow of real feeling. Others (eg., "When languor and disease invade," and "Your harps, ye trembling saints ") fail to sustain to the end the beauty with which they began, and would have been better for abridgment. But in all- these, and in most of his other works, there is great force and sweetness, both of thought and language, and an easy and harmonious versification.

*Berridge, Williams, and Rowland Hill (all men remark- Berridge, able for eccentricity, activity, and the devotion of their Williams, lives to the special work of missionary preaching), though — not the authors of many good hymns, composed, or adapted "— * from earlier compositions, some of great merit. One of Berridge, adapted from Erskine, has been already mentioned ; another, adapted from Watts, is "Jesus, cast a look on me." Williams, a Welshman (who wrote " Guide me, O Thou great Jehovah"), was especially an apostle of Calvinistic Methodism in his own country, and lis hymns are still much used in the principality. Rowland Hill wrote the popular hymn beginning *' Exalted high at God's right hand."*

If, however, the number as well as the quality of good Cowper hymns available for general use is to be regarded, the nd authors of the "'Olney Hymns" are entitled to be placed Newiaay at the head of all the writers of this Calvinistic school.

The greater number of the Olney Hymns are, no doubt, homely and didactic ; but to the best of them (and they are no inconsiderable proportion) the tenderness of Cowper and the manliness of Newton give the interest of contrast, as well as that of sustained reality. If Newton carried to some excess the sound principle laid down by him, that "perspicuity, simplicity, and ease should be chiefly attended to, and the imagery and colouring of poetry, if admitted at all, should be indulged very sparingly and with great judgment," if he is often dry and colloquial, he rises at other times into "soul-animating strains," such as "'Glorious things of thee are spoken, Zion, city of our God ;" and sometimes (as in " Approach, my soul, the mercy seat") rivals Cowper himself in depth of feeling. | Cowper's hymns in this book are, almost without exception, worthy

19th century hymns.

R. Grant.

Bowdler.

Kelly.

Mont- gomery.

Collec- tions of hymns,

BRITISH. |

of his name. Among them are " Hark, Lord," "There is a fountain filled with blood," "Far from the world, O Lord, I flee," "God moves in a mysterious way," and "Sometimes a light surprises." Some, perhaps, even of these, and others of equal excellence (such as "O for a closer walk with God "), speak the language of a special experience, which, in Cowper's case, was only too real, but which could not (without a degree of unreality not desirable in exercises of public worship) be applied to themselves by all ordinary Christians.

During the first quarter of the present century there were not many indications of the tendency, which after- wards became manifest, to enlarge the boundaries of British hymnody. A few, indeed, of Bishop Heber's hymns, and those of Sir Robert Grant (which, though offending rather too much against John Newton's canon, are well known and popular), appeared between 1811 and 1816, in the Christian Observer. In John Bowdler's Ltemains, published soon after his death in 1815, there are a few more of the same, perhaps too scholarlike, character. But the chief hymn-writers of that period were two clergymen of the Established Church —one in Ireland, Thomas Kelly, and the other in England, William Hurn—who both became N onconformists, and the Moravian poet, James Montgomery, a native of Scotland,

Kelly was the son of an Irish judge, and in 1804 pub- lished a small volume of ninety-six hymns, which grew in successive editions till, in the last before his death in 1854, they amounted to 765. There is (as might be expected) in this great number a large preponderance of the didactic and commonplace. But not a few very excellent hymns may be gathered from them. Simple and natural, without the Vivacity and terseness of Watts or the severity of Newton, Kelly has some points in common with both those writers, and he is less subjective than most of the "Methodist " school. His hymns beginning "Lo! He comes, let all adore Him," and "Through the day Thy love hath spared us," have a rich melodious movement 3 and another, "We sing the praise of Him who died," is distinguished by a calm subdued power, rising gradually from a rather low to a very high key.

Hurn published in 1813 a volume of 370 hymns, which Were increased after his secession to 420. There is little in them which deserves to be saved from oblivion ; but one at least, "' There is a river deep and broad," may bear com- parison with the best of those which have been produced upon the same (and it is rather a favourite) theme.

The Psalms and Hymns of James Montgomery were published in 1822 and 1825, though written earlier. More cultivated and artistic than Kelly, he is less simple and natural, The namber of his valuable contributions to our hymnals is, upon the whole, considerable ; and, though it may be doubted whether he ever attains to the first rank, all must acknowledge that he stands high in the second. His "Hail to the Lord's Anointed," " Songs of praise the angels sang," and "Mercy alone can meet my case" are among his most successful efforts.

During this first quarter of the present century, the collections of miscellaneous hymns for congregational use, of which the example was set by the Wesleys, Whitfield, Toplady,.and Lady Huntingdon, had greatly multiplied ; and with them the practice (for which, indeed, too many precedents existed in the history of Latin and German hymnody) of every collector altering the compositions of other men without scruple, to suit his own doctrine or taste; with the effect, too generally, of patching and dis- figuring, spoiling, and emasculating the works so altered, substituting neutral tints for natural colouring, and a dead for a living sense. In the Church of England, the use of these collections had become frequent in churches and chapels (principally in cities and towns) where the senti-

my soul, it is the

ments of the clergy approximated to those of the Noncon- formists. In rural parishes, when the clergy were not of the " Evangelical" school, they were generally held in disfavour; for which (even if doctrinal prepossessions had not entered into the question) the great want of taste and judgment often manifested in their compilation, and perhaps also the prevailing mediocrity

of the bulk of the original compositions from which most of them were derived, would be enough to account. In addition to this, the idea that no hymns ought to be used in any services of the Church of England (except prose anthems after the third Collect), without express royal or ecclesiastical authority, continued down to that time largely to prevail among churchmen of the higher school. Two publications, in 1827,—Bishop Heber's Hymns, with a few added by Dean Milman, and Keble's Christian Y ear (not ahymn-book, but one from which several admirable hymns have been taken, and the well-spring of many streams of thought and feeling by which good hymns have since been produced), —introduced a new epoch, breaking down the barrier as to hymnody which had till then existed between the different theological schools of the Church of England. In this movement Bishop Mant was also one of the first to cooperate. It soon received a great additional impulse from the increased attention which, about the same time, began to be paid to ancient hymnody, and from the publication in 1833 of Bunsen's Gesangbuch. Among its earliest fruits was the Lyra Apostolica, containing hymns, sonnets, and other devotional poems, most of them originally contributed by some of the leading authors of the Tracts Jor the Times to the "British Magazine"; the finest of which is the pathetic 'Lead, kindly Light, amid th' encircling gloom," by John Henry (now Cardinal) Newman,—well known, and uni- versally admired. From that time hymns and hymn- writers rapidly multiplied in the Church of England, and in Scotland also, and their number is still on the increase. Nearly 600 authors, whose publications were later than 1827, are enumerated in Mr Sedgwick's catalogue of 1868, and many more have since appeared. Works, critical and historical, upon the subject of hymns, have also multiplied ; and collections for church use have become innumerable, — several of the various religious denominations, and many of the leading ecclesiastical and religious societies, having issued hymn-books of their own, in addition to those com. piled for particular dioceses, churches, and chapels, and to books (like Hymns Ancient and Modern) which have become popular without any sanction from authority. In these more recent collections, an improved standard of taste has become generally apparent. 'There is a larger and more liberal admission of good hymns from all sources than might have been expected from the jealousy, so often felt by churches, parties, and denominations, of everything which does not bear their own mint-mark ; a considerable (perhaps too large) use of

translations, especially from the Latin; and an increased (though not as yet sufficient) scrupulousness about tampering with the text of other men's works. To mention all the authors of good hymns since the commence- ment of this new epoch would be impossible ; but probably no names could be chosen more fairly representative of its characteristic merits, and perhaps also of some of its defects, than those of Josiah Conder and James Edmeston among English Nonconformists; Henry Francis Jiyte and Charlotte Elliott among evangelicals in the Church of England; John Mason Neale and Bishop Christopher Wordsworth among English churchmen of the higher school; and, in Scotland, Dr Horatius Bonar. Criticism, in this place, of the works of these and other living or recent authors, or of those of Heber and Keble, which are on everybody's lips, and in every- body's hands, would be at once premature and superfluous,

which appeared almost simultaneously Heber, Milman, Keble.

Mant:

Newman,

Ameri- can hynins.

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What has been said of British hymnody during the last fifty years is equally true of American. The American hymn-writers belong to the same schools, and have been affected by the same influences. Some of them enjoy a just reputation on both sides of the Atlantic. Among those best known are Bishop Doane, Dr Muhlenberg, and Mr Thomas Hastings; and it is difficult to praise too highly such works as the Christmas hymn, 'It came upon the midnight clear," by Mr Edmund H. Sears; the As- cension hymn, "Thou, who didst stoop below," by Mrs SE. Miles ; and two by Dr Ray Palmer, " My faith looks up to Thee, Thou Lamb of Calvary," and "Jesus, Thou joy of loving hearts," the latter of which is the best among several good English versions of "Jesu, dulcedo cordium."

Among the authorities of which use has been made in the fore- going account of British Hymnody are the Appendix on Scottish Psalmody in Mr

Laing's edition of Baillie's Letters and Journals; Mr Holland's Psalmists of Britain (1843); Mr J osiah Miller's Our Hymns, their Authors and Origin (1866); Mr John Gadsby's Memoirs of the Prineipal Hymn-wrtters, &c. (3d ed., 1861); the '¢ Annotations " of the Rev. Louis Coutier Biggs to Hymns Ancient and Modern (1867); and the late Mr Daniel Sedgwick's Comprehensive Index of Names of original Authors of Hymns, &e. (2d ed., 1863). Mr Sedgwick's name cannot be mentioned without special honour, as one of the most painstaking, sympathetic, and accurate of all modern students of British hymns.

7. Conclusion.

The object aimed at in this article has been to trace the general history of the principal schools of ancient and modern hymnody, and especially the history of its use in

the Christian church. For this purpose it has not been thought necessary to give any account of the hymns of Racine, Madame Guyon, and others, who can hardly be classed with any school, nor of the works of Cesar Malan and other quite modern hymn-writers of the Reformed churches in Switzerland and France.

On a general view of the whole subject, hymnody is seen to have been a not inconsiderable factor in religious worship. It has been sometimes employed to dis- seminate and popularize particular views, but its spirit and influence has been Catholic, on the whole. It has embodied the faith, trust, and hope, and no small part of the inward experience, of generation after generation of men, in many different countries and climates, of many different nations, and in many varieties of circumstances and condition. Coloured, indeed, by these differences, and also by the various modes in which the same truths have been appreliended by different minds (and sometimes reflecting partial and imperfect conceptions of them, and errors with which they have been associated in particular churches, times, and places), its testimony is, nevertheless, generally the same. It has upon it astamp of genuineness which cannot be mistaken. It bears witness to the force of a central attraction more powerful than all causes of difference, which binds together

times ancient and modern, nations of various race and language, churchmen and noncon- formists, churches reformed and unreformed; to a truefunda- mental unity among good Christians ; and to a substantial identity in their moral and spiritual experience. (S.)

HYPATIA (‘Yzaria or ‘Yrdreva), mathematician, philo-

sopher, and finally one of the martyrs of paganism, was the daughter and disciple of the mathematician and philo- sopher Theon,! and was born in Alexandria not earlier than 350 a.v.2 After a long period of study (partly, perhaps, in Athens) she became a distinguished lecturer on philosophy in her native town, and ultimately became the recognized head of the Neo-Platonic school there (¢. 400). The fascination of her great eloquence (she is said on more than one occasion to have proved an effective advocate in the courts of law), and the charm of a rare modesty and beauty, combined with her remarkable in- tellectual gifts to attract to her class-room a large number of disciples, over some of whom her influence was very great. Among these was Synesius, who afterwards (c. 410) became bishop of Ptolemais, several of whose letters addressed to her (77 puAccd py), full of chivalrous admira- tion and reverence, are still extant (Zpp. 10, 15, 16, 33, 80, 124, 153). In the conilicts between the various elements of Alexandrian society which took place shortly after the accession of Cyril to the patriarchate in 412, she became closely identified as counsellor and friend with the prefect Orestes, and in the same degree made herself an object of fear and hatred to the Nitrian monks and the fanatical Christian mob, by whom she was ultimately murdered under circumstances of revolting barbarity (Lent, 415). Socrates has related how she was torn from her chariot, dragged to the Casareum (then a Christian church), stripped naked, cut to pieces with oyster shells (éorpdxors dvetAov), and finally burnt piecemeal. Most pro- minent among the actual perpetrators of the crime was one Peter, a reader; but there seems little reason to doubt Theodoret’s assertion of Cyril’s real complicity.

Hypatia, according to Suidas, was the author of com-

ise FO) : For some account of whom see Suidas; compare Fabricius, Bibi. ce ves 178 sqq. (1804). He observed an eclipse in 365. > The date assigned

by Wernsdorf (Diss. Acad. IV. de Hypatia, Wittenberg, 1747). Hoche (Philologus, xv.) gives 370.

mentaries on the mathematician Diophantus and on the Conics of Apollonius of Perga, and also of an astronomical canon. Noneof these works have come down to our time ; but their titles, combined with expressions in the letters of Synesius, who consulted her about the construction of an astrolabe, would seem to indicate that she devoted herself specially to astronomy and mechanics. Of her philosophical opinions nothing is known, except that they shared the general eclectic features of the Alexandrian Neo- Platonism. A Latin letter to Cyril on behalf of Nestorius, which has sometimes been attributed to her, is undoubtedly spurious. It can be read in Baluze. The story of Hypatia appears in a considerably disguised yet still recognizable form in the legend of St Catherine as recorded in the Roman Breviary (Nov. 25), and still more fully in the Martyrologies (see Jameson, Sacred and Legendary Art, p. 467 sqq.).

The chief source for the little we know about Hypatia is the account given by Socrates (H. £., vii. 15). The article in Suidas, which Gibbon has characterized as "' curious and original," must be received with some caution. It is on his authority that the some- what doubtful statement is made that she was the wife of Isidorus the philosopher. She is the subject of an epigram by Palladas in the Anthology (ix. 400; ed. Jacobs), See Menage, Hist. Mul. Phil., p. 52; Fabricius, Bibl. Gr., ix. 187 sqgg.; Wernsdorf, op. ett, ; and the exhaustive monograph of Hoche in Philologus,xv. 435 sqq. (1860). An anonymous work entitled Hypatia, or the history of a most beautiful, most virtuous, most learned, and every way accomplished lady, who was torn to pieces by the clergy of Alexandria to gratify the pride, emulation, and cruelty of their arehbishop Cyril, commonly but wndeservedly styled Saint Cyril, was published in London in 1720. The history of Hypatia has also been made the basis of an attractive historical romance by Charles Kingsley (1853).

HYPERIDES ('Yzepei3ys), one of the ten Attic orators, was son of Glaucippus, of a noble family of the tribe Aigeis and the deme Collytus. He was probably younger than Lycurgus (born about 396 zc.) and older than

Demosthenes (born about 385 p.c.). Having studied under Tsocrates, he began life as a writer of speeches for the courts, and in 360 z.c. he prosecuted Autocles, a general charged with treason in Thrace. From the end of the Sacred War, 346-

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324 B.c., Hyperides supported Demosthenes in the struggle against Macedon ; but in the affair of Harpalus he was one of the ten public prosecutors of Demosthenes, and on the exile of his former leader he became the head of the patriotic party (see DemostHenss), He was the chief promoter of the Lamian War against Antipater and Craterus. After the decisive defeat of Crannon, 322 3.c,, Hyperides with the other orators demanded by Antipater was condemned to death by the subdued Athenians, but fled to Aagina and thence into sanctuary in the temple of Demeter at Hermione. Antipater's emissaries dragged him forth to be put to death at Athens. Hyperides was an ardent pursuer of "the beautiful," which in his time generally meant pleasure and luxury. His temper was easy-going and humorous; and hence, though in his development of the periodic sentence he followed Isocrates, the essential ten- dencies of his style are those of Lysias, whom he surpassed, however, in the richness of his vocabulary and in the variety of his powers. His diction was plain and forcible, though he occasionally indulged in long compound words probably borrowed from the Middle Comedy, with which, and with the everyday life of his time, he was in full sympathy. His composition was simple. He was specially distinguished for subtlety of expression, grace, and wit, as well as for tact in approaching his case and handling his subject matter. Professor Jebb sums up the criticism of Longinus in the phrase—" Hyperides was the Sheridan of Athens." Of his lost speeches we should perhaps regret most the AyAraxds, on the presidency of the Delian temple claimed by Athens and Delos, which was adjudged by the Amphictyons to Athens.

The extant works of Hyperides are—1, Fragment of the dmroroyia brép Auxdppovos, Pro Lycophrone, delivered before 349 B.C., incidentally interesting as throwing light on the order of marriage processions and other details of Athenian life, and on the Athenian government of Lemnos ; 2, "Ywtp 'Evtevimmov eloayyealas dmoroyla rps MoAveuxrov, Pro Eusenippo,

about 330 B.C., nearly perfect (a locus classicus on eisayyeAla:); 8, fragments of the Kara Anuoobevous, In Demosthenem, see above; 4, a considerable portion of the Adyos émirdpios, Oratio Funebris, over Leosthenes and his comrades who fell in the Lamian war, 322 B.C, after Antiphilus's victory over Leonnatus at Melitea. This isan elevated peers in the style of Isocrates, but in invention and sentiment the

est specimen we have of epideictic oratory. Of the epilogue a portion is preserved by Stobzus only. The MSS. are papyri—those of the first two speeches found by Joseph Arden, January 1847, that of the third speech by A. C. Harris, 1847, of the last by the Rev. H. Stobart, 1856, all at Thebes in Egypt. They are among the oldest extant MSS., dating within the limits 300 n.c. and 300 A.D.

Principal Editions.—All the remains, F. Blass, Leipsic, 1869: Aoy. émerad. and Umép 'Evéev., J.C. Cobet, Leyden, 1877; Kara An. (with facsimile of MS.), A. C. Harris, London, 1877; Karé Anu., Professor Churehill Babington, London, 1850; Orations for Lyc. and for Eusxen. (with facsimile of MS.), Id., Cambridge, 1853; The Funeral Oration, Id., ib, 1859. See also Oratores Aitici, J. G. Baiter and H. Sauppe, 1850. Translations.—German, W. S. Teuffel, Stuttgart, 1865-69 ; French, Huxen., 1860, Or. Fun., 1858, H. Caffiaux, Valenciennes.

See Egger in Mém. de l'Acad. des Inscript. et Belles Lettres, 1870; W. Troébst in Neue Jahrb. f. class. Philol., 1876; Herm. Hager in Curtius's Gram. Stud., 1870; Journ. of Philology, Cambridge, 1872-73; Mahly in Neue Jahrb. J. class, Philol. u. Pidagog., 1872; Professor R. C. Jebb,; The Attic Orators (vol. ii., eh, xxii, pp. 381-92), London, 1876; G. Bochnecke, Demosthenes, Lykurgos, Hy- perides, und ihr Zeitalter, Berlin, 1874. There is a Russian study by A. N. Schwarz, on the speech for Euxenippus, published at Moscow, 1875,

HYPERTROPHY (from ézép, over, and rpod%, nourish- ment), a term in medicine employed to designate an abnormal increase in bulk of one or more of the organs or component tissues of the body. In its strict sense this term can only be applied where the increase affects the natural textures of a part, and is not applicable where the enlargement is due to the presence of some extraneous morbid formation. Hypertrophy of a part may manifest

itself either by simply an increase in the size of its constituents, or by this combined with an increase in their number (hyperplasia). In many instances both are as- sociated.

The conditions giving rise to hypertrophy are the reverse of those already described as producing ATROPHY (9.0.). They are concisely stated by Sir James Paget as being

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chiefly or only three, namely :—(1) the increased exercise of a part in its healthy functions; (2) an increased accu- mulation in the blood of the particular materials which a part appropriates to its nutrition or in secretion ; and (3) an increased afflux of healthy blood.

Illustrations are furnished of the first of these conditions by the high development of muscular tissue under habitual active exercise ; of the second in the case of obesity, which is an hypertrophy of the fatty tissues, the elements of which are furnished by the blood ; and of the third in the occasional overgrowth of hair in the neighbourhood of parts which are the seat of inflammation. Obviously there- fore, in many instances, hypertrophy cannot be regarded as a deviation from health, but rather on the contrary as indicative of a high degree of nutrition and physical power. Even in those cases where it is found associated with dis- ease, it is often produced as a salutary effort of nature to compensate for obstructions or other difficulties which have arisen in the system, and thus to ward off evil consequences. No better example of this can be seen than in the case of certain forms of heart disease, where from defect at some of the natural orifices of that organ the onward flow of the blood is interfered with, and would soon give rise to serious embarrassment to the circulation, were it not that behind the seat of obstruction the heart gradually becomes hypertrophied, and thus acquires greater propelling power to overcome the resistance in front. Again, it has been noticed, in the case of certain double organs such as the kidneys, that when one has been destroyed by disease the other has become hypertrophied to such a degree as enables it to discharge the functions of both.

Hypertrophy may, however, in certain circumstances constitute a disease, as in Gorrre and ELEPHANTIAsts (q.v.), and also in the case of certain tumours and growtlis (such as cutaneous excrescences, fatty tumours, mucous polypi, é&c.), which are simply enlargements of normal textures. Hypertrophy does not in all cases involve an increase in bulk; for, just as in atrophy there may be no diminution in the size of the affected organ, so in hyper- trophy there may be no increase. This is apt to be the case where certain only of the elements of an organ undergo increase, while the others remain unaffected or are actually atrophied by the pressure of the hypertro- phied tissue, as is seen in the disease known as cirrhosis of the liver.

A spurious sort of hypertrophy is observed in the rare disease to which M. Duchenne has applied the name of pseudo-hypertrophic paralysis. This ailment, which ap- pears to be confined to children, consists essentially of a progressive loss of power accompanied with a remarkable enlargement of certain muscles or groups of muscles, more rarely of the whole muscular system. This increase of bulk is, however, not a true hypertrophy, but rather an excessive development of connective tissue in the substance of the muscles, the proper texture of which tends in con- sequence to undergo atrophy or degeneration. The appear- ance presented by a child suffering from this disease is striking. The attitude and gait are remarkably altered, the child standing with shoulders thrown back, small of the back deeply curved inwards, and legs wide apart, while walking is accompanied with a peculiar swinging or rock- ing movement. The calves of the legs, the buttocks, the muscles of the back, and occasionally other muscles, are seen to be unduly enlarged, and contrast strangely with the general feebleness. The progress of the disease is marked by increasing failure of locomotory power, and ultimately by complete paralysis of the limbs. The malady is little amenable to treatment, and, although often pro- longed for years, generally proves fatal before the pericd of maturity.

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JIYPOCHONDRIASIS (synonyms—the spleen, the

vapours). As the name implies (from 76 iroxdvéptov, Ta iroxévipia, the soft part of the body immediately under the xévdpos or cartilage of the breast- bone), hypochondriasis and its symptoms were referred by the ancients, and

indeed by physicians down to the time of Cullen, to diseases or derangements of one or more of the abdominal viscera. Cullen classified it amongst nervous diseases, and Falret more fully described it as a morbid condition of the nervous system characterized by depression of feeling and false beliefs as to an impaired state of the health. The subjects of hypochondriasis are for the most part members of fami- lies in which hereditary predisposition to degradation of the nervous system is strong, or those who have suffered from morbid influences affecting this system during the earlier years of life. It may be dependent on depressing disease affecting the general system, but under such cir- cumstances it is generally so complicated with the symp- toms of hysteria as to render differentiation difficult (see Hysteria). Hypochondriasis is often handed down from one generation to another in its individual form, but it is also not unfrequently to be met with in an individual as the sole manifestation in him of a family tendency to insanity. In its most common form it is manifested by simple false belief as to the state of the health, the intel- lect. being otherwise unaffected. We may instance the "vapourish" woman or the "splenetic" as terms society has applied to its milder manifestations. Such persons are constantly asserting a weak state of health although no palpable cause can be discovered. In its more definite phases pain or uneasy sensations are referred by the patient to some particular region, generally the abdomen, the heart, or the head. That these are subjective is apparent from the fact that the general health is good: all the functions of the various systems are duly performed; the patient eats and sleeps well; and, when any circumstance temporarily overrides the false belief, he is happy and comfortable. No appeal to the reason is of any avail, and the hypochondriac idea so dominates his existence as to render him unable to perform the ordinary duties of life. In its most aggravated form hypochondriasis amounts to actual insanity, delusions arising as to the existence of living creatures in the in- testines or brain, or to the effect that the body is materially changed, ¢.g., into glass, wood, &e. (see Insanity). The symptoms of this condition may be remittent; they may even disappear for years, and only return on the advent of some exciting cause. Suicide is occasionally committed in order to escape from the constant misery. As there is nothing to treat, medication is of no avail, and recovery can only be looked for by placing the patient under such morally hygienic conditions as

may help to take his mind off himself, More generally he lives through the attack rather than is cured of it.

See Cullen, Clinical Leetwres, pp. 39-57 (London, 1777); Georget,

De la Phys. dw Syst. Nerv, (Paris, 1819) ; Reynolds, System of

Medicine, vol. ii. p. 293 (London, 1868) ; Griesinger, Mental Patho- logy and Therapeuties (1867); Niemeyer, Practieal Medicine (1871).

HYPOTHEC (Hypotheca), in Roman law, is the most advanced form of the contract of pledge. A specific thing may be given absolutely to a creditor on the understanding that it is to be given back when the creditor's debt is paid ; or the property in the thing may be assigned to the creditor while the debtor is allowed to remain in possession, the creditor as owner being able to take possession if his debt is not discharged. Here we have the kind of security known as pledge and mortgage respectively. In the hypotheca, the property does not pass to the creditor, nor does he get possession, but he acquires a preferential right to have his debt paid out of the hypothecated property ;

that is, he can sell it and pay himself out of the proceeds, '

or in default of a purchaser he can become the owner himself. 'The name and the principle have passed into the law of Scotland, which distinguishes between conventional hypothecs, as bottomry and respondentia, and tacit hypo- thecs established by law. Of the latter the most im- portant is the landlord's hypothec for rent (corresponding to distress in the law of England), which extends over the produce of the land and the cattle and sheep fed on it, and over stock and horses used in husbandry. The law of agricultural hypothec has long caused much discontent in Scotland; its operation was restricted by 30 & 31 Vict. c. 42, and finally by 43 Vict. c. 12 it has been enacted that the "landlord's right of hypothec for the rent of land, including the rent of any buildings thereon, exceeding two acres in extent, let for agriculture or pasture, shall cease and determine." As a set off the landlord is to have the same rights and remedies against a tenant

when six months' rent or twelve months' rent is due and unpaid as he had formerly against a tenant when twelve months' rent or two years' rent respectively was due and unpaid.

HYRAX, a genus of diminutive plantigrade mammals, the position of which in the mammalian series has, owing to their apparent affinity with several widely different groups, given rise to considerable controversy. Approaching the hare in their external appearance and habits, the rhinoceros in their molar teeth and much of their skeleton, the hippopotamus in the form of their lower incisors, aud the sloth in the great number of their dorsal vertebra, they were at first classed with the rodents, and afterwards, by Cuvier, with the pachyderms, where they remained until, on the breaking up of that most heterogeneous of groups,

Cape Hyrax. Professor Huxley established the order Hyracoidea for their reception. They are small, rabbit-like creatures, the largest not exceeding 18 inches in length, covered with a thick soft fur with numerous bristles interspersed. Their ears and legs are short; the tail is represented only by a small tubercle; and their toes, of which they have four on each foot in front and three behind, are, with the excep- tion of the inner one on each hind foot, provided with flat hoof-like nails, 'They have twenty-one pairs of ribs —a larger number than is possessed by any other mammals except the sloths, which have twenty-three pairs. They are gregarious animals, dwelling in colonies in the crevices of rocks and in the caverns which abound in the hilly regions they frequent, and feeding on grass and other herbage, on roots, fruits, and the tender shoots of plants. There are, according to Dr Gray, thirteen species of Hyraxz, many of which are, however, regarded by other authorities as merely varieties. hey are all confined to the African continent with the exception of the Syrian byrax or daman (Hyrax syriacus), whose range extends from Abyssinia into Arabia,

Syria, and Palestine. This species is generally regarded as the "shaphan," rendered " conies" in the English Bible,

Which "are but a feeble folk, yet make their houses in |

the rocks ” (Prov. xxx. 26), They measure about a foot in length and 11 inches in height, and are of a greyish-brown colour above, fulvous on the flanks, and white beneath. They are active little creatures, darting in and out of their rocky shelters with remarkable agility. Bruce, who ob- served their habits in Abyssinia, states that large numbers of them were frequently to be seen sitting on great stones at the mouths of caves, basking in the sunshine, or enjoying the coolness of the summer evening. Of timid and gentle disposition, they can be readily tamed, although when roughly handled at first they are said to bite severely. The Cape hyrax (Hyrax capensis) or “badger” (dasse ; Dutch, Das ;.German, Dachs) is the largest known species, measur- ing about 18 inches in length. It frequents situations similar to those occupied by the Syrian form, and is exceed- ingly shy, peeping out of its rocky hiding places with a circumspection which is by no means uncalled for, as it forms a favourite food of lions, hyzenas, and the larger birds of prey. The latter, it is said, may often be seen perched, for hours, like statues on the rocks, watching their oppor- tunity to dart upon the luckless “ badger.” To guard against such surprises, they are said, when feeding, to place one of their number, usually an old male, as a sentinel, whose shrill prolonged cry gives timely notice of approaching danger. Like the “ conies,” they are readily tamed, and seem capable of considerable attach- ment, although their natural timidity and suspicion cause them to hide themselves on the appearance of a stranger. There are two species of hyrax, one in the south and the other in the west of Africa, which are said to be arboreal in their habits, making their abode in the holes of trees. Dr Gray has placed these ina separate genus—Dendrohyrax, The island of Fernando Po possesses a species peculiar to itself, while the genus is entirely wanting in Madagascar. No fossil remains of the hyrax have yet been found.

HYRCANTA, a province of Asia, south of the Caspian Sea, and bounded on the E. by the river Oxus, It was, however, a wide and indefinite tract, the extent of which is variously conceived. Its chief city is called Tape by Strabo, Zadracarta by Arrian. The latter is evidently the same as Carta, mentioned by Strabo as an important city. Some parts of the country were fertile, but the general idea prevalent among the classical writers is that it was a rude region of forests full of dangerous wild animals. Little ig known of the history of the country, as it seldom came into connexion with the

better known races, Xenophon says it was subdued by the Assyrians; Curtius says that 6000 Hyrcanians were in the army of the last Persian king Darius. Two towns named Hyrcania are mentioned, one in the country of Hyrcania, the other in Lydia. The latter is said to have derived its name from a colony of Hyr- cauians, transported thither by the Persians.

HYRCANUS (‘Ypxavés), a Greek surname, of unknown origin, borne by several Jews of the Maccabzean period.

Joun Hyreanus L, high priest of the Jews from 135 to 105 B.c., was the youngest son of Simon Maccabeus. In 137 Bc. he, along with his brother Judas, commanded the force which repelled the invasion of Judea led by Cendebeus the general of Antiochus VII, (Sidetes). On the assassination of his father and two elder brothers by Ptolemy, governor of Jericho, his brother-in-law, in Feb- Truary 135, he succeeded to the high priesthood and the Supreme authority in Judea. While still engaged in the struggle with Ptolemy, he was attacked by Antiochus with a large army (134), and compelled to shut himself up in Jerusalem ; after a severe siege peace was at last secured

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only on condition of a Jewish disarmament, and the pay- ment of an indemnity and an annual tribute, for which hostages were taken. In 129 he accompanied Antiochus as a vassal prince on his ill-fated Parthian expedition ; re- turning, however, to Juda before Winter, he escaped the final disaster. By the judicious mission of an embassy to Rome he now obtained confirmation of the alliance which his father had previously made with the growing western power; at the same time he availed himself of the weak- ened state of the Syrian monarchy under Demetrius II. to overrun Samaria, and also to invade Idumea, which he completely subdued, compelling its inhabitants to receive circumcision and accept the Jewish faith. After a long period of rest he directed his arms against the town of Samaria, which, in spite of the intervention of Antiochus, his sons Antigonus and Aristobulus ultimately took, and by his orders razed to the ground (c. 109 Bc.). He died in 105, and was succeeded by Aristobulus, the eldest of his five sons. The external policy of Hyrcanus was marked by considerable energy and tact, and, aided as it was by favouring

circumstances, was so successful as to leave the Jewish nation in a position of independence and of influ- ence such as it had not known since the days of Solomon. During its later years his reign was much disturbed, how- ever, by the contentions for ascendency which arose be- tween the Pharisees and Sadducees, the two rival sects or parties which then for the first time (under those names at least) came into prominence. Josephus has related the curious circumstances under which he ultimately transferred his personal support from the former to the latter,

Joun Hyrcanus IL, high priest from 78 to 40 B.c., was the eldest son of Alexander Jannzus by his wife Alexandra, and was thus a grandson of the preceding. When his father died in 78, he was by his mother forthwith appointed high priest, and on her death in 69 he claimed the succession to the supreme civil authority also; but, after a brief and troubled reign of three months, he was compelled to abdi- cate both kingly and priestly dignities in favour of his more energetic and ambitious younger brother Aristobulus II. In 68 it suited the policy of Pompey that he should be restored to the high priesthood, with some semblance of supreme command, but of much of this semblance even he was soon again deprived by the arrangement of the pro- consul Gabinius, according to which Palestine was in 57 3B.¢. divided into five separate circles (cvvodor, cvvédpia). For services rendered to Cesar after the battle of Pharsalia, he was again rewarded with the sovereignty (rpooracta rod eGvous, Jos., Ant., xx. 10) in 47 B.c., Antipater of Idumea, however, being at the same time made procurator of Judea. In 41 Bc. he was practically superseded by Antony's appointment of Herod and Phasael to be tetrarchs of Judzea ; and in the following year he was taken prisoner by the Parthians, deprived of his ears that he might be permanently disqualified for priestly office, and carried to Babylon. He was permitted in 33 z.c. to return to Jeru- salem, where on a charge of treasonable correspondence with Malchus, king of Arabia, he was put to death in 30 3.0.

See Josephus (Ant., xiii. 8-10; xiv. 5-13; Bell. Jud., 1. 23 i, 8-13), upon whose narrative all the modern accounts, as, ¢.g., those by Ewald, Gratz, and Hitzig in their Histories, are based.

HYSSOP (Hyssopus officinalis), a garden herb belonging to the natural order Zabiate, cultivated for use in domestic medicine. It is a small perennial plant about 2 feet high, with slender, quadrangular, woody stems ; narrowly elliptical, pvinted, entire, dotted leaves, about 1 inch long and = inch wide, growing in pairs on the stem; and long terminal, erect, half-verticillate, leafy spikes of small violet- blue flowers, which are in blossom from June to September. Two varieties of the plant occur in gardens, one having variegated leaves and the other reddish flowers, The

leaves have a warm, aromatic, bitter taste, and are believed to owe their properties to a volatile oil which is present in the proportion of { to 2 per cent. Hyssop is a native of the south of Europe, its range extending eastward to Siberia; it was introduced into England by Gerard in the year 1596. A strong tea made of the leaves, and sweetened with honey, was formerly used in pulmonary and catarrhal affections, and externally as an application to bruises and indolent swellings.

The Hedge Hyssop (Gratiola officinalis) belongs to the natural order Scrophulariacee, and is a native of marshy lands in the south of Europe, whence it was introduced into Britain nearly 300 years ago. Like Hyssopus offict- nalis, it has smooth opposite entire leaves, but the stems are cylindrical, the leaves twice the size, and the flowers solitary in the axils of the leaves and having a yellowish- red veined tube and bluish-white limb,' while the cap- sules are oval and many-seeded. 'The herb has a bitter, nauseous taste, but is almost odourless. In small quan- tities it acts as a purgative, diuretic, and emetic when taken internally. It was formerly official in the Edin- burgh Pharmacopeia, being esteemed as a remedy for dropsical and scrofulous affections. It has also been given sn the form of wine for hypochondriasis. It is said to have formed the basis of a celebrated nostrum for gout, called Hau médicinale, and in former times was called Gratia Dei, on account of its medicinal properties. When growing in abundance, as it does in some damp pastures in Switzerland, it becomes dangerous to cattle. G. peruviana is known to possess similar properties.

The hyssop ('e20b) of Scripture (Ex. xii. 22 5 Lev. xiv. 4, 63 Numb. xix. 6, 18; 1 Kings v. 18 (iv. 33); Ps. li. 9 (7); John xix. 29), a wall-growing plant

aie for sprinkling purposes, has long been the subject of learned isputation, the only point on which all have agreed being that it is not to be identified with the Hys- sopus officinalis, which is not a native of Palestine. No less than eighteen plants have been supposed by various authors to answer the conditions, and Celsius has devoted more than forty pages to the discussion of their several claims. By Tristram (Oaford Bible for Teachers, 1880) and others the caper plant (Capparis spinosa) is supposed to be meant ; but, apart from other difficulties, this identification is open to the objection that the caper seems to be, at least in one passage. (Eccl. xii. 5), otherwise designated (abiy- yonah). Thenius (on 1 Kings v. 18) suggests Orthotrichum saxatile. The most probable opinion would seem to be that found in Maimo- nides and many later writers, according to which the Hebrew ’ezob is to be identified with the Arabic sa atar, now understood to be Satureja Thymus, a plant of very frequent occurrence in Syria and Palestine, with which Thymus Scrpyllum, or Wild Thyme, and. Saturcja Thymbra are closely allied. Its smell, taste, and medi- cinal properties are similar to those of H. officinalis, In Morocco the sa’atar of the Arabs. is Origanwm compactum, Benth. ; and it appears probable, as suggested by Mr W. Carruthers, that several plants of the genera Thymus, Origanum, and others nearly allied in form and habit, and found in similar localitics, were used under the name of hyssop.

See Gerard, Herball, p. 578-582 ; Stillé and Maisch, National Dis- pensatory, p. 7512; Carruthers, in Bible Educator, vol. iv. p. 226-27 ; Thomson, The Land and the Book, p. 112; J. Smith, Bible Plants, p. 214; Furrer, art. ‘© Ysop,” in Schenkel’s Bibel-Leaicon, vol. ¥.

HYSTERIA, a term applied to a disordered condition of the nervous system, the anatomical seat and nature of which are unknown to medical science, but of which the symptoms consist in well-marked and very varied disturbances of nerve function. By the ancients and by modern physicians down to the time of Sydenham its symptoms were supposed to be due to disturbances of the uterus (Sorépa, whence the name), but itis now universally recognized that they are dependent on a variety of causes with which that organ has no neces sary connexion. The causes of hysteria may be divided into the predisposing, such as hereditary predisposition to nervous degeneration, sex, age, occupation, and national idiosyncracy ;

and the immediate, such as mental and physical exhaustion, fright, and other emotional influences, pregnancy, the puerperal condition, diseases of the uterus

cause. bility exists that hysteria presents itself to a greater or less

hysteria in the category of nervous diseases. asserted that certain races are more liable to the disease

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and its appendages, and the depressing influence of injury or general disease. and react in any given case; impossible to assign a particular cause in @ particular instance.

Fach and all of these causes may act in fact, it is nearly always

Perhaps, taken over all, hereditary predisposition to nerve-instability may be asserted as the most prolific It is often noticed in families in which this insta-

extent in a considerable number of its members as the sole indication of the diathesis. As regards age the condition

is apt to appear at the evolutional periods of life—puberty, pregnancy, and the climacteric—without any further assign- able cause except that first spoken of.

It is very frequent in girls between the ages of twelve and fifteen, and in women on the cessation of the menstrual flow. Itis much more common in the female than the male,—in the propor- tion of 20 to 1,—which circumstance points to the important influence of the uterus in causation, but definitely places It has been

than others—that for instance the Latins and the Slavs are more prone to it than other inhabitants of Europe. This, however, is doubtful ; in the more excitable races we

find on the whole a greater tendency to hysterical excite-

ment, in those whose national characteristic is calm and impassionateness a tendency to hysterical depression ; and it is probable that the greater prominence of the symptoms in the former may have masked the more subtle yet not less important manifestations of the disease presented in the latter. Occupation, or be it rather said want of occupation, is a prolific cause. This is noticeable in all classes of society: in the higher the idle luxurious woman concentrates herself upon herself, and the frivolity of her existence helps to aggravate the evil which may be innate in her constitution; in the lower classes the disease is not so prevalent except amoug women who live a vicious and excited life. The experience of prison authorities shows not only that women of the criminal classes are individually liable to the hysterical paroxysm, but that it is very apt to assume an epidemic form amongst them. There is no proof that any particular legitimate occupation tends to its develop- ment, 'Che depressing effects of almost any disease may be dircctly productive of hysteria, more especially those accompanied by pain and loss of sleep. There can be little doubt, however, that disease of the uterus and its append- ages has a greater tendency towards its production than disease of any other system. At the same time, hysteria seems to follow more frequently on the less severe than on the graver forms of uterine complaints.

In point of duration hysteria may be transient or chronic. In the first phase it consists of an explosion of emotionalism, generally the result of mental excitement, to which the popular term " hysterics" is applied. Such attacks are gencrally preceded and accompanied by a sensation of a lump in the throat (the "globus hystericus"), a flow of limpid urine, violent outbursts of alternate laughter and weeping, and sometimes even convulsion. In the chronic condition we find an extraordinary complexity of symptoms, both physical and mental. These are continuous, constitut- ing the "status hystericus," and paroxysmal. The physical symptoms are extremely diverse: there may be a pseudo- paralysis, the patient lying palsied wholly or partially, or there may be rigidity of one or more limbs, in either case the symptom persisting for weeks or months or even years ; there may be flushing or pallor of the face, an increase or decrease of temperature. Perversions of sensation are frequent symptoms ; these consist in complaint of pain, generally of a local character: a common instance is the sensation

of a nail being driven through the vertex of the head (“clavus hystericus ») or of increased sensibility of

particular parts. On the other hand loss of sensation may be complained of, or, as occasionally happens, hypereesthesia and anesthesia may be stated by an individual to exist in different parts of the body. The region of the spine is a very frequent seat of hysterical pain. Pain, more especially

when referred toa joint, is apt to be accompanied by swell-

ing. Both the motor and the sensory symptoms are in every instance out of all proportion to any assignable cause, and for the most part disappear suddenly, leaving the patient in perfect health. It is to such cases that the wonderful cures effected by quacks and charlatans may be referred. The mental symptoms have not the same tendency to pass away suddenly. They may be spoken of as interparoxysmal aud paroxysmal. The chief character- istics of the former are extreme emotionalism combined with a curious obstructiveness, a desire to be an object of importance, and a constant craving for sympathy. This is sought to be procured at an immense sacrifice of personal comfort, and to this may be referred a very large proportion of the motor and sensory symptoms above spoken of. The paroxysmal condition does not materially differ from the transient hysteric attack, except that convulsion is more common and more violent. The special senses of taste, sight, and hearing may be affected, sometimes temporarily obliterated. Hysteria may pass into absolute insanity. Treatment consists in attention to the general health, and to such special symptoms as may arise, notably those connected with the function of menstruation. The submis- sion of the patient to the best moral influences is of no mean importance. But it may be admitted that the results are generally unsatisfactory so far as medication is concerned, as the cure is usually spontaneous or dependent on some sudden meuital influence. See Ziemssen’s Cyclopedia of the Practice of Medicine, vol. xiv.; Reynolds’s System of Medicine, vol. ii. (J. B. T.) HYSTERO-EPILEPSY, a nervous disease of women, occurring during the fertile period of life, first observed and described by Professor Charcot of Paris. As yet it has been rarely observed in Great Britain. Its phenomena are very extraordinary, and serious doubts have been en- tertained by

eminent authorities as to their substantiality, it being asserted that they are merely manifestations of ordinary hysteria, intensified by a process of education. But these doubts are being rapidly dissipated by the observations of competent observers. The disease is of a paroxysmal nature, and its symptoms may be divided into inter-paroxysmal and paroxysmal. 'The former consist of extreme sensitiveness over the region of oue or (less fre- quently) both ovaries, and loss of tactile sensibility and complete insensibility to pain in one lateral half of the body, the side on which ovarian tenderness exists. Sight is sometimes implicated, manifested by a peculiar form of colour-blindness, Perhaps the most remarkable pheno- menon presented in this disease is that all these impair- ments of sensation may be shifted to the other side of the body on the application of magnets and plates of metals, the originally affected side regaining sensibility so long as the opposite one is insensible. In some cases the symp- toms are permanently bilateral. 'The paroxysm consists in violent general convulsion, epileptiform in character, which is at once checked by pressure over the tender ovary. The mental faculties are generally weakened, and the disease is for the most part incurable. (See Charcot, Lectures on Diseases of the Nervous System, New Sydenham Soc., 1877.) HYTHE, a municipal and parliamentary borough of Kent, England, and one of the original Cinque Ports, is beautifully situated at the foot of a steep cliff near the eastern extremity of Romney Marsh, about half a mile from the sea, on a branch line of the South-Eastern Rail- way, 66 miles E.S.E. of London, 16 S.W. of Dover, and

5 W. of Folkestone, It consists principally of one long handsome street running parallel with the shore. On the slope of the hill above the town stands the fine old church of St Leonard, partly Late Norman and partly Early English, with a tower rebuilt about 1750. In a vault under the chancel there is a collection of human skulls and bones supposed to be the remains of ancient Britons and Saxons slain in a battle which took place near Hythe in 456. Of late the church has been undergoing restoration at a considerable cost, and it is proposed to complete the chancel, which was originally left unfinished. At Lympne there are the remains of a Roman castrum, and excavations made some years ago brought to light many

interesting remains of the old Roman town, the Portus Lemanus. The site of the castrum is now occupied by the fine old castellated mansion of Studfall Castle, at one time the residence of the archdeacons of Canterbury, but at pre- sent used as a farm-house. Norman portions of the Lympne church originally built by Archbishop Lanfranc are still standing; and a small distance east from it ig Shipway or Shepway Cross, where the great assemblies relating to the Cinque Ports used to be held until they were removed to Romney. Several bronze implements and weapons were discovered near Hythe in 1873, during the excavation of the railway line from Hythe to Sand- gate. A mile north from Hythe is Saltwood Castle, of very ancient origin, but rebuilt in the time of Richard II. Hythe possesses a guild hall founded in 1794, and two hospitals, that of St Bartholomew founded by Haimo, bishop of Rochester, in 1336, and that of St John, of still greater antiquity but unknown date, and founded origin- ally for the reception of lepers. A Government school of musketrg, in which instructors of musketry for the army are trained, was established in 1854 ; and the Shorn- cliffe military camp is within 24 miles of the town. On account of its pleasant situation and its picturesque and interesting neighbourhood, Hythe has become a favourite watering-place. Baths were erected in 1854 at a cost of £2000, and the sea wall and parade has lately been ex- tended eastwards to Sandgate, the total length being 3 miles. From the town to the sea-shore there is a stately avenue of wych elms. The area of the municipal borough is 1744 acres, and of the parliamentary borough 3571 acres, The population of the municipal borough in 1871 was 3383, and of the parliamentary borough 24,078. The latter includes the municipal borough of Folkestone.

Hythe occurs in old documents as Hethe, and in Domesday Book as Hede. The word is derived from the Saxon Hyth, meaning a harbour. The present town of Hythe rose to importance after the decay of West Hythe by the withdrawal of the sea, West Hythe having previously succeeded to the Portus Lemanus, whose decay had been due to a like cause. Since the reign of Elizabeth the harbour has been choked up with sand. It is @ theory of some writers that the landing place of Julius Cesar on his first invasion of Britain was in the vicinity of Lympne. Anciently Hythe, with the parish of West Hythe, was within a "hundred" of its own. Along with Saltwood it was given in 1026 by Halfdan, a Saxon thane, to Christ Church in Cantcrbury;

and it was afterwards held for knight's service by Earl Godwine. According to Leland, it at one time had a fine abbey and four parish churches. It succeeded to the ancient privileges which West Hythe enjoyed as a Cinque Port, its quota bcing 5 ships, 105 men, and 5 boys. When Earl Godwine ravaged the coast of Kent in 1052 he took several ships from the harbour of Hythe. In 1293 the inhabitants with great valour repulsed the attacks of the sea- men of a French man-of-war who had disembarked in the harbour and were beginning to plunder the town. In the reign of Richard II. a great conflagration destroycd 200 of the houses and 5 of the ships in the harbour. Hythe and Saltwood were given by Arch- bishop Cranmer to Henry VIII. in lieu of other estates, and they continued vested in the crown until the 17th year of Elizabeth, when the town received a charter of incorporation. It is now governed by 4 aldermen and 12 councillors, one of whomis mayor. From the 42d year of Edward III. it possessed the privilege of returning two

members to parliament, but since 1832 it has returned only one.

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I is one of those symbols which the Greeks 'employed

differently from the Phoenicians. In Phoenician it denoted the palatal semi-vowel y, called in Hebrew yodh. The Greeks disliked this sound, and it vanished at an early time out of their language. Consequently they needed no symbol to represent it, and could use the Phoenician symbol to denote that for which the Phoenician alphabet gave them no help, namely, the vowel «. The symbol, however, had not at that time its present simple form, as may be seen by reference to the table at the end of the article ALPHABET. It was made up of several lines, and so it appears in the oldest Greek inscriptions, ¢.g., in those of Thera, about the 40th Olympiad, in which it is not unlike the later form of sigma (3). In the old Corinthian alphabet it sometimes has this form ; sometimes the angles to the left are rounded, so that it resembles ane. Generally, however, we find it in Greek simplified into the single straight line with which we are familiar. It has no other form in the Latin alphabet. In the last century before Christ, the Romans sometimes lengthened the symbol to denote the long vowel, so that

it reached above the top of the line, while the short vowel was expressed by a line of the usual length. This took the place of the older method by which the symbol was doubled to denote the long vowel; as aa, ee, % But it never became universal, nor was the lengthened symbol always put to the same use; for about the same time we find it used to denote the y sound in words like Maza, curus, where the Romans rightly thought it expedient to have a distinct mark for the semi-vowel. But this also was not permanent.

The value of the symbol is generally constant in all European languages, ancient or modern, with the exception of English. It is the vowel sound produced by raising the front of the tongue towards the palate, as high as it can be raised without touching. The lips are not rounded ; by rounding them, when the tongue is in this position, we should produce the sound of the French w or the German ii. The vowel may, however, be either open or close, and in either of these cases it may be short or long. Therefore we have four variations, of which, however, probably not more than two are found in any spoken language :—(1) the short open ¢, heard in English "sin" ; (2) the long open 2, which is not one of our spoken sounds, but can be produced in singing ; (3) the short close 7, which again is not English, but is the Italian short 7; (4) the long close ¢, which is the Italian long 7, and is also common in English ; but we denote the sound, not by 2, but by ee, as in " seen." It is generally supposed that the sound of ee stands to that of 2 in English as a long vowel to the corresponding short ; but this is not so; there is a difference in quality as well ; ee denotes (as has been just explained) a close vowel, whereas ¢ is open. It is true that in ordinary English the open vowel 2 only occurs short, and the close vowel long, therefore the confusion is natural. A Scotchman, however, finds no difficulty in pronouncing "seen" short.

It is practically necessary in English to denote the simple long ¢ sound by ee, because the English language has habitually altered the simple sound into a diphthong, and has retained for that diphthong the original spelling U: Thus in words like " pride," "mine," "fire," &c., the vowel had once in England the same sound as it has on the Con- tinent ; but now it is sounded as the diphthong az, though the spelling has not been changed. It appears from Mr Alexander J. Ellis's investigations into the history of English pronunciation that ¢ had become o diphthong in

the 16th century; but the exact date of the change must remain uncertain. There can be little doubt that its nature has been correctly explained by the same philologist. It consists in pronouncing the long vowel without sufficiently raising the tongue at the beginning of the sound; hence the sound is at first too open, and is modified into the proper 7 sound before it is terminated. Changes of this sort are natural in long vowels, because there is time to vary the original sound, either as a refinement, or, more robably, through mere inattention and laziness.

IAMBLICHUS, the chief representative of Syrian Neo-Platonism, is only imperfectly known to us in the events of his life and the details of his creed. We learn, however, from Suidas, and from his biographer Eunapius, that he was born at Chalcis in Ccele-Syria, the scion of a rich and illustrious family, that he studied under Anatolius and afterwards under Porphyry, the pupil of Plotinus, that he himself gathered together a large number of disciples of different nations with whom he lived on terms of genial friendship, that he wrote "various philosophical books," and that he died during the reign of Constantine,—accord- ing to Fabricius, before 333 A.D. His residence (probably) at his native town of Chalcis was varied by a yearly visit with his pupils to the baths of Gadara. Of the books referred to by Suidas only a fraction has been preserved. His commentaries on Plato and Aristotle, and works on the Chaldean theology and on the soul, are lost. For our knowledge of his system we are indebted partly to the fragments of these writings preserved by Stobseus and others, and to the notices of his successors, especially Proclus, partly to his five extant books, the sections of a great work on the Pythagorean philosophy. Besides these, Proclus (412-485) seems to have ascribed to him! the authorship of the celebrated book On the Egyptian Mysteries (so-called), and although its differences in style and in some points of doctrine from the writings just mentioned make it improbable that the work was by Iamblichus himself, it certainly emanated from his school, and in its systematic attempt to give a speculative justification of the polytheistic cultus of the day, marks the turning-point in the history of thought at which Iamblichus stood.

As a speculative theory Neo-Platonism had received its highest development from Plotinus. The modifications introduced by Iamblichus were the elaboration in greater detail of its formal divisions, the more systematic application of the Pythagorean number-symbolism, and chiefly, under the influence of Oriental systems, the thorough-going mythic interpretation of what the previous philosophy had still regarded as notional. It is on the last account, probably, that Iamblichus was looked upon with such extravagant veneration. Asa philosopher he had learning indeed, but little originality. But by using what he had to throw a haze of philosophy over the popular superstition, he acquired his fame. By his contemporaries he was accredited with miraculous powers (which he, however, disclaimed), and by his followers in the decline of Greek philosophy, and his admirers on its revival in the 15th and 16th centuries, his name was scarcely mentioned without the epithet " divine" or "most divine," while, not content with the more modest eulogy of Eunapius that he was inferior to Porphyry only in style, the emperor Julian regarded him as not even

1 Besides the anonymous testimony prefixed to an ancient MS. of Proclus, De Myst. viii. 8 seems to be quoted by the latter as Iamblichus's, Cf, Meiners, " Judicium de Libro qui de Myst. Aug, inscribitur," in Comment. Soc. Reg. Sci. Gott., vol. iv., 1781, p. 77.

second to Plato, and said that he would give all the gold of Lydia for one epistle of Iamblichus.

Theoretically, the philosophy of Plotinus was an attempt to harmonize the principles of the various Greek schools, At the head of his system he placed the transcendent incommunicable one (é duéBexrov), whose first-begotten is intellect (vots), from which proceeds soul (Wvxy), which in turn gives birth to dvors, the realm of nature. Immediately after the absolute one, Iamblichus introduced a second superexistent unity to stand between it and the many as the producer of intellect, and made the three succeeding moments of the development (intellect, soul, and nature) undergo various modifications. He speaks of them as intellectual (coi voepo/), supramundane (iarepkoopior), and mundane gods (éyxoopio). The first of

these—which Plotinus represented under the three stages of (objective) being (dv), (subjective) life (fw), and (realized) intellect (vos) —is distinguished by him into spheres of intelligible gods (@eot vonrot) and of intellectual gods (Geot voepoi), each subdivided into triads, the latter sphere being the place of ideas, the former of the archetypes of these ideas. Between these two worlds, at once separating and uniting them, some scholars think there was inserted by Iamblichus, as afterwards by Proclus, a third sphere partaking of the nature of both (Geol voyrol xat voepoi). But this supposition depends on a merely conjectural emendation of the text. We read, however, that "in the intellectual hebdomad he assigned the third rank among the fathers to the Demiurge." The Demiurge, Zeus, or world-creating potency, is thus identified with the perfected vots, the intellectual triad being increased to a hebdomad, probably (as Zeller sup- poses) through the subdivision of its first two members. As in Plotinus vods produced nature by mediation of Woy, so here the intelligible gods are followed by a triad of psychic gods. The first of these is incommunicable and supramundane, while the other two seem to be mundane though rational. In the third class, or mundane gods (6eo! éykoopiow), there is a still greater wealth of divinities, of various local position, function, and rank. We read of gods, angels, demons, and heroes, of twelve heavenly gods whose number is increased to thirty-six or three hundred and sixty, and of seventy-two other gods proceeding from them, of twenty-one chiefs (sj-yeudves) and forty-two nature- gods (Geol yeveovoupyot), besides guardian divinities, of particular individuals and nations. The world is thus peopled by a crowd of superhuman beings influencing natural events, possessing and communicating knowledge of the future, and not inaccessible to prayers and offerings.

The whole of this complex theory is ruled by a mathe- matical formulism of triad, hebdomad, é&c. , while the first principle is identified with the monad, vots with the dyad, and Wuxy with the triad, symbolic meanings being also assigned to the other numbers, "The theorems of mathe-matics," he says, "apply absolutely to all things," from things divine to original matter (¢Ay). But though he thus subjects all things to number, he holds elsewhere that numbers are independent existences, and occupy a middle place between the limited and unlimited.

Another difficulty of the system is the account given of nature. It is said to be " bound by the indissoluble chains of necessity which men call fate," as distinguished from divine things which are not subject to fate. Yet, being itself the result of higher powers becoming corporeal, a continual stream of elevating influence flows from them to it, interfering with its necessary laws and turning to good ends the imperfect and evil. Of evil no satisfactory account is given: it is said to have been generated accidentally.

In his doctrine of man Iamblichus retains for the soul the middle place between intellect and nature it occupies in the universal order. He rejects the passionless and

purely intellectual character ascribed to the human soul by Plotinus, distinguishing it sharply both from those above and those below it. He maintains that it moves between the higher and lower spheres, that it descends by a neces- sary law (not solely for trial or punishment) into the body, and, passing perhaps from one human body to another, returns again to the supersensible. This return is effected by the virtuous activities which the soul performs through its own power of free will, and by the assistance of the gods. These virtues were classified by Porphyry as political, purifying (xkafaprixai), theoretical, and paradigmatic; and to these Iamblichus adds a fifth class of priestly virtues ('epattxal dpera'), in which the divinest part of the soul raises itself above intellect to absolute being.

Iamblichus does not seem ever to have attained to that ecstatic communion with and absorption in deity which was the aim of earlier Neo-Platonism, and which Plotinus enjoyed four times in his life, Porphyry once. Indeed his tendency was not so much to raise man to God as to bring the gods down to men—a tendency shown still more plainly in the " Answer of Abamon the master to Porphyry's letter to Anebo and solutions of the doubts therein expressed," afterwards entitled the Liber de Mysteriis, and ascribed to Iamblichus.

In answer to questions raised and doubts expressed by Porphyry, the writer of this treatise appeals to the innate idea all men have of the gods as testifying to the existence of divinities countless in number and various in

rank (to the correct arrangement of which he, like Iamblichus, at- taches the greatest importance). He holds with the latter that above all principles of being and intelligence stands the absolute one from whom the first god and king spontaneously proceeds ; while after these follow the etherial, empyrcan, and heavenly gods, and the various orders of archangels, angels, demons, and heroes distinguished in nature, power, and activity, and in greater profusion than even the imagi- nation of Iamblichus had conceived. He says that all the gods are good (though he in another place admits the existence of evil demons who must be propitiated), and traces the source of evil to matter; rebuts the objection that their answering prayer implies passivity on the part of gods or demons; defends divination, soothsaying, and theurgic practices as manifestations of the divine acti- vity ; describes the appearances of the different sorts of divinities ; discusses the various kinds of sacrifice, which he says must be suitable to the different natures of the gods, material and immaterial, and to the double condition of the sacrificer as bound to the body or free from it (differing thus in his psychology from Iamblichus) ; and, in conclusion, states that the only way to happiness is through knowledge of and union with the gods, and that theurgic practices alone prepare the mind for this union —again going beyond his muster, who held assiduous con- templation of divine things to be sufficient. It is the passionless nature of the soul which permits it to be thus united to divine beings,—knowledge of this mystic union and of the worship associated with it having been derived from the Egyptian priests, who learnt it from Hermes.

On one point only does the author of the De Mysteriis seem not to go so far as Iamblichus in thus making philo- sophy subservient to priestcraft. He condemns as folly and impiety the worship of images of the gods, though his master held that these "simulacra" were filled with divine power, whether made by the hand of man or (as he believed) fallen from heaven. But images could easily be dispensed with from the point of view of the writer, who not only held that all things were full of gods (rdvra zAnjpyn Oeav, as Thales said), but thought that each man had a special divinity of his own—an id.os Saipwv—as his guard and companion.

Bibliography.—Of the five extant books of Iamblichus referred to above, (1) that On the Pythagorean Life (wep) rod TvOayoptxod Bud) was first edited, in Greek and Latin, by Areerius Theodoretus, 1598; again by Kuster, 1707; and by Kiessling, Leipsie, 1815-16 ; while a new edition is promised by E. Rhode, who discusses the sources, &e., of the work in the Rhcin. Musewn, vol. xxvi., 1871, pp. 554 sq.; of. vol. xxxiv., 1879, pp. 260 sg. (2) The Exhortation to Philosophy (Adyou mpotpemtixo) eis pirocoplay) was edited first along with the former in 1598, and again by Kiessling, Leipsie, 1813. (3) The treatise On the Gencral Science of Mathematics (x. Ths Kowhs padnuatinhjs) Was edited by Villoison, Anecd. Gruca, ii, 188-225, Venice, 1781; anda useful account of the same is given by J. G. Friis in his Introductio in Librum Iamblicht Tertiwn, 1790. (4) The book Onthe Arithmetic of Nicomachus (x. THs Nuxo- paxou &pOuntinhs elcaywyis), along with fragments on fate (x. eiuapuévns) and prayer (mw. edx7s), was edited in Greek and Latin by S. Tennulius, 1668 ; and (5) the Theological Principles of Arith- metic (Ocoroyotmeva Ths a&pOuntixi}s)—the seventh book of the series—by Ast, Leipsic, 1817. Two lost books, treating of the physical and ethical signification of numbers, stood fifth and sixth, while books on music, geometry, and astronomy followed.

The so-called Liber de Mysteriis was rendered into Latin by Marsilius Ficinus, Venice, 1497, fol., several times reprinted,—and again by N. Scutellius, Rome, 1556, 4to. The original Greek was edited, with Latin translation and notes, first by T. Gale, Oxford, 1678, fol., and more recently by G. Parthey, Berlin, 1857, 8vo.

There is a monograph on Iamblichus by Hebenstreit (De Lam- blichi, philosophi Syri, doctrina Christiane religioni, quam imitart studct, noxia, Leipsic, 1764), and one on the De Myst. by Harless (Das Buch ». d. égyp. Myst., Munich, 1858). The discussion by Meiners on the genuineness of the De Myst. has been already referred to, and seems to be conclusive against attributing it to Iamblichus. Thomas Taylor, the English Platonist, translated the Life of Pytha- goras and the Egyptian Mysteries (London, 1818 ; Chiswick, 1821). The best accounts of Iamblichus are those of Zeller, Phil. d. Griechen, iii. 2, pp. 618 sg., 2d ed., and Vacherot, Hist. de 0 Eeole @ Alexandrie, ii. 57 sq. (W. R. SO.)

IBADAN, a large and flourishing town of West Africa, in the Yoruba country, about 80 miles inland from Lagos, and about 50 miles to the north-east of Abeokuta. It occupies the slope of one of the hills of the Kong range, and stretches down into the valley through which the river Ona flows. The site is well drained by natural streams, but their waters are often polluted by the dead bodies flung out to the vultures. The mud walls by which the town is en- closed have a circuit of 18 miles, and it is encompassed by a circle of cultivated land about 5 or 6 miles in breadth. The houses are all low thatched structures, enclosing a square court, and the only break in the mud wall is the door ; but the monotony of the streets is relieved by orishas or idol-houses, and open spaces shaded with trees. Most of the population are engaged in agriculture ; but for a West-African town there is a great variety of handicrafts. The town is subject nominally to the king of Oya; but in reality it is not only an indépendent state but hasa number of vassal towns. The government is in the hands of two chiefs, a civil and a military, the bale and the balogun ; these together form the highest court of appeal. There is also an iyaloda or mother of the town, to whom are submitted allthe disputes of the women. Any one causing a fire in the town, whether intentionally or by accident, is deprived of his possessions and put in prison. Ibadan has long had a feud with Abeokuta ; and the two towns often engage in war with each other. In 1862 the people of Ibadan destroyed Ijaya, a neighbouring town of 60,000 inhabitants. Mr Hinderer, a missionary of the Church Society, established a station at Kudati on the outskirts of the town in 1853, and laboured there for seventeen years. The native church is still in a flourishing state. The population of Ibadan is not less than 100,000. The great bulk of the population consists of slaves. There are twenty-four mosques and several Mahometan schools in the town.

See Seventcen Years in the Yoruba Country: Memorials of Anna Hinderer, London, 1877, where a view of the town is given.

IBARRA, a city of Ecuador in South America, the capital of the province of Imbabura, is situated on a plain

about 2000 feet lower than Quito, from which it is 30 miles distant. Before the earthquake of 1868 it was a place of considerable prosperity, with

regular streets and well-built houses, and about 13,000 of a population, but in that terrible disaster it is estimated that no fewer than 10,000 of its inhabitants perished. Cotton and woollen stuffs, laces, hats, brandy, cordials, sugar, and salt were among its industrial products. Ibarra was founded in 1597 by Alvaro de Ibarra, the president of Quito. About a league distant was Carranqui, the birthplace of Atahu- allpa, the last of the Incas.

IBERIANS (Zberi, "IBnpes). To the question, Who are the Iberians? it is impossible to give a satisfactory answer in the form of a concise definition. While our knowledge of their actual history is comparatively slight, the position which they have acquired in modern ethnographical theory is at once a prominent and a perplexing one. It is almost impossible to hazard any statement in regard to them which will not find an impugning voice from one quarter or other. Historical, numismatical, linguistic, and anthropological evidences have been brought to bear on the problem of their affinity, and the result is on the whole not so much light as darkness visible.

The name Iberians seems to have been applied by the earlier Greek navigators to the peoples who inhabited the eastern coast of Spain ; and there is considerable probability in the suggestion that it originally meant the ripuarians of the Iberus or Ebro.! On the other hand, the term Iberia is said to have embraced in older Greek usage the country as far east as the Rhone (see Herodorus of Heraclea, Fragmenta Historiarum Greecarum, tom. i. p. 34), and by the time of Strabo it was the common Greek name for the Spanish peninsula,—Iberians meaning sometimes theinhabi- tants of the peninsula in general, and sometimes, it would appear, the peoples of a definite race or yévos. Of the tribal distribution of this race, of its linguistic social and political characteristics, and of the history of its relation to the other peoples of Spain, we have only the most general, fragmentary, and in part self-contradictory accounts. On the whole our historical evidence authorizes the assertion that in Spain, when it first became known to the Romans and Greeks, there existed a large number of separate and variously civilized tribes connected with each other by at least apparent identity of race, and by similarity (but not identity) of language, their general characteristics sufficiently differencing them from Pheenicians, Romans, and Celts. The statement that the mingling of these Iberians with the

immigrant Celts gave rise to the Celtiberians (Keltiberians) is in itself sufficiently probable, and has been impugned by nothing more precise than the general untrustworthiness of the author by whom it is made (Diodorus Siculus). Varro and Dionysius Afer went so far as to identify the Iberians of Spain with the Iberians of the Caucasus, the one regarding the eastern and the other the western settlements as of earlier date.

The only material relics which have come down to us with the imprint of the ancient Iberian or Celtiberian civilization are a variety of coins and a few inscriptions of dubious interpretation. So difficult has the reading of the legends of the coins been found that the Spanish numismatists have regularly catalogued them as the desconocidas or unknown; and the explanation of them has been sought now in Visigothic runes (Olaus Wormius and Olaus Rudbeck), now in Hebrew (L. J. Velasquez), now in Latin, and now in Celtic. By the general consensus of more modern investigators, however, their Iberian character is recognized, though the methods and results of

1 A very different etymology is offered by Basque-Iberian theorists ; M. Boudard, for example, derives the name from ibay-erri, the eountry of the river.

interpretation have been sufficiently various.) According to M. Heiss, the Celtiberian coins are found most frequently in the north-east and east of Spain, in smaller numbers in the centre, rarely in the south, and more rarely still in Portugal and Asturias. The legends, he maintains, belong to peoples who inhabited the country at the time when the Greeks were still coining pieces with the type of Apollo and the wheel,—that is, before the completion of the Roman

conquest. Their monetary system seems to have been imitated from that of the Roman republic, having a division analogous to that of the denarii and quinarii. The principal type on the reverse is either a horseman galloping with lance in rest or bear- ing a palm-branch or laurel-branch, or a man / leading two horses and {| \W brandishing a sword or \ a bow. The Latin coins of Bilbilis, Osca, Segobriga, &c., retain the type of the galloping

horseman. Pieces with inscrip- tions in the same alphabet and similar images are found in the district of Narbonne.

The following is a list of M. Heiss's prspeces identifications, and the accompanying alphabet is that which he has compiled from the coins :-—

OvriasAV, Turiaso; KLAQRI1QS, Kalaquri-qos, Calagurris; 14k, Jaca; PLPLIS, Pilpilis, Bilbilis; 1tovre, Nuro; NERENCON, Narbo; PAVRP, Perpinianum; CLSE, Celsa; sEQpRics, Segobrica; ALAAVN, Alavona ; SETISCON, Setisacon ; OLIGEM, Oligito; Gui, Gili; AAVsEs- con, Ausa, Ausenses; AVSECRT, Osicerda; LAAVRu, Laurona; csE, Cose; QNTRBA, Contrebia; SEQTZAS, Segontia; BRIRITZ, Bebryces ; HRNESQN; Huernes; HLSCAN, Iliosca, Osca; sEcISA, Segisa; TMANIAV, Dumania; ARci1L1Q8, Arcocili, Ocili; OELIEQS, Beliones; VRSONES, Balsiones.

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Fia.3.—Table of alphabets. The first column contains the English char- acters ; the second the archaie Greek; and the third the Celtiberian.

It was not till 1821 that the Iberian problem became an estab- lished piece de resistance in the ethnographical programme. In that year Karl Wilhelm Humboldt published his Priifung der

1 The most important contributions to the subject are P. A. Bou- dard's Htudes sur ? Alphabet ibérien, Paris, 1852, and Numismatique ibérienne, Béziers, 1859; and Aloiss Heiss, Notes sur les monnaies celtibériennes, Paris, 1865, and Deseription générale des monnates antiques de 0 Espagne, Paris, 1870.

Untersuchungen tber die Urbewohner Hispaniens vermittelst der Waskischen Sprache, Berlin, 1821. As a matter of course this was a work of exuberant learning and bold hypothesis; and partly through its inherent attractiveness, partly through the prestige of its author, the theory which it expounded met with general acceptance. The main arguments were these : —that the Iberians were one great people, speaking a distinct language of their own; that they were to be found in Sicily, Sardinia, and Corsica, in southern France, and even in the British Isles; and that the Basques of the present day were the distinctly recognizable rem- nants of the race which had elsewhere been expelled or absorbed. This last was the central and seminal idea of the work, and it has been the point round which the battle of scholarship has mainly raged. The principal evidence which Humboldt adduced in its support was the possibility of explaining a vast number of the ancient topographical names of Spain, and of other asserted Iberian districts, by the forms and significations of Basque. The first serious attack on the theory was made by Graslin (De I?' Ibérie, Paris, 1839), who maintained that the name Iberia was nothing but a Greek mis- nomer of Spain, and that there was no proof that the Basque people had ever occupied a wider area than at present ; and M. Bladé has since, in his Origine des Basques (Paris 1869), taken up the same line of argument and brought to bear on the subject a vast amount of laborious and many-sided erudition. His criticism is almost purely negative. Of the whole structure of the Iberian theory he would not leave one stone upon another. He holds that Iberia isa purely geographical term, that there was no proper Iberian people or race, that the whole Basque-Iberian theory is a modern fignient, that the Basques were always shut in by alien races, and that their affinity is still to seek. His main contention has met with some acceptance ;? but the great current of ethnographical speculation still flows in the direction indicated by Humboldt, though it breaks up into a number of distinct channels. The anthropological researches of Broca, Thurnam and Davis, Huxley, Busk, Virchow, Tubino, and others have proved the existence in Europe of a Neo- lithic race, small of stature, with long or oval skulls, and accustomed to bury their dead in tombs. Their remains have been found in Belgium and France, in Britain, Germany, and Denmark, as well as in Spain; but they bear a closer resemblance to the Basques than to any other living people. This Neolithic race has consequently been identified with the Basques and the Iberians ; and extrenie exponents of the theory do not

*hesitate to speak of the Iberian an- cestors of the people of England, recognizing the racial character- istics in the '*small swarthy Welshman," the 'small dark High- lander," and the " Black Celts to the west of the Shannon," as well as in the typical inhabitants of Aquitania and Brittany. (Compare the interesting réswmé of the whole question in Boyd Dawkins's Early Man in Britain, London, 1880.8) Some investigators go even further. M. D'Arbois de Jubainville, for example (Les premiers habitants de Europe, Paris, 1877), regards the Iberians as the de- scendants of the Atlantes (¢.¢., the hypothetical inhabitants of Plato's great western isle the Atlantis, see ATLANTIS), and maintains thatin Europe they possessedSpain, Gaul, Italy, and the British Isles, penetrated into the Balkan peninsula, and occupied a part of north- ern Africa, Corsica, and Sardinia. And in reviewing M. Jubainville's work in Revie d' Anthropologie (1877), M. Hovelacque considers that it has been clearly made out that a race with distinctly marked characteristics was at one time in possession of the south of France (or at least of Aquitania), the whole of Spain from the Pyrenees to the straits, the Canary Islands (the Guanchos), a part of northern Africa, and Corsica. Tubino, in his Los aborigenes tbericos (Madrid, 1876), argues that the builders of the megalithic monumeuts of Spain and northern Africa, the ancient Iberians, and the modern Basques and Andalusian mountaineers, as well as the Berbers* in at least one of their main elements, are all of kindred blood; and in so doing he impugns the theory of Broca and his school.*

Besides the works already mentioned, refereuce may be made to Hoffmann, Die Iberer iim Westen und Osten (Leips. 1838), and to Phillips, Ueber das iberische Alphabet (Vienna, 1870), Die LHin- wanderung der Iberer in die pyren. Halbinsel (Vienna, 1870), and several other works by the same writer.

IBEX, the common name of several closely allied species of ruminant mammals, belonging to the genus Capra or goats, inhabiting the loftiest regions of Europe, Asia, and Africa. The European ibex or steinboc (Capra tbex)

abounded during the Middle Ages among the higher

2W. van Eys, for example, “ La langue Ibérienne et la langue Basque,” in Revue de linguistique, goes against Humboldt; but Prince Napoleon and to a considerable extent A. Luchaire maintain the justice of his method and the value of many of his results. See Luchaire, Les origines linguistiques de l’ Aquitaine, Paris, 1877.

3 Mr Dawkins even accepts the very questionable identification of the Iberians of Spain with the Iberians of the Caucasus.

4 The connexicn of the Iberians with the Berbers was suggested by Bory de Saint Vincent in Hssat géologique sur le genre humain.

mountain ranges of Germany, Switzerland, and the Ural, but has since disappeared from the greater part of this area, being now almost wholly confined to the Alps which separate Valais from Piedmont, and to the lofty peaks of Savoy, where its continued existence is mainly due to the action of protective game laws. The ibex is a handsome animal, measuring about 44 feet in length and 24 feet high; its skin is covered in summer with a short fur of an ashy grey colour, and in winter with much longer yellowish-brown hair concealing a dense fur beneath. A short beard is present in the male in winter, but, as it dis- appears altogether in spring, Darwin regards this appendage as rudimentary. The horns, especially in the male, form a striking feature: rising from the crest of the skull, they bend gradually backwards, attaining a length in old specimens of about 2 feet; they are thick and flat, and have the anterior face ridged with knotty transverse bands. In the female the horns never exceed half a foot in length, and are much less rugose than in the male. The front legs are somewhat shorter than those behind, which enables the

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ibex to ascend the mountain slopes with more facility than it can descend, while its hoofs, according to Tschudi, are ‘as hard as steel, rough underneath, and when walking over a flat surface capable of being spread

out." These, together with its powerful sinews, enable it to take prodigious leaps, to balance itself on the smallest foothold, and to scale almost perpendicular rocks. The ibex lives habitually at a greater height than the chamois or any other of the Alpine mammals, its vertical limit being the line of perpetual snow. There it rests in sunny nooks during the day, descending at night to the highest woods to graze, and retiring at sunrise to its snowy fastnesses. This return journey forms the ibex hunter's opportunity. To get within gunshot the huntsman has usually to approach from above; accordingly he ascends to the limit of per- petual snow, and there passes the night among the daily haunts of the ibex, lying in wait from early dawn for its return. The ibexes are gregarious, feeding in herds of ten to fifteen individuals ; the old males, however, generally live apart from, and usually at greater elevations than, the females and young. They are said to give out a sharp whistling sound not unlike that of the chamois, but when greatly irritated or frightened they make a peculiar snorting noise. The period of gestation in the female is ninety days,

after which she produces—usually at the end of June—a.

single young one, which is able at once to follow its mother. These when caught young and fed on goat's milk can, it is said, be readily tamed; and in the 16th century young tamed ibexes were, according to Tschudi, frequently driven to the mountains along with the goats, in whose company they would afterwards voluntarily return. Even wild speci- mens have thus been known to stray among the herds of goats, although, strange to say, they at all times shun the society of the chamois. The ibex was formerly hunted largely for its flesh and skin; but, although the latter, owing to its scarcity, now commands a high price, the difficulty arising from the operation of the game laws, and above all the difficulty and danger inseparable from the sport, have reduced the number of hunters to a few hardy mountaineers, who find in the pursuit of the ibex the keenest enjoyment of life. For weeks the sportsman will follow a track across fields of ice, along narrow ledges, over precipices, and across chasms, nearly frozen to death at night, and often with little more than a crust of bread for sustenance, yet considering himself more

than repaid by the sight at last of his prey grazing within range of his rifle. Its flesh is said to resemble mutton, but has a flavour of game.

IBIS, one of the most sacred birds of the ancient Egyptians, which in modern times was identified by Bruce (Travels, v. p. 173, pl.) with the Abou-Hannes or " Father John" of the Abyssinians, and in 1790 received from Latham (Index Ornithologicus, p. 706) the name of Tantalus cthiopicus. This determination was placed beyond all question by Cuvier (Ann. du Muséum, iv. pp. 116-135) and Savigny (Hist. Nat. et Mythol. de '[bis) in 1805. They, however, shewed the removal of the bird from the Linnzan genus Z'antalus to be necessary, and, Lacépéde having some years before founded a genus Jbis, it was transferred thither, and is now generally known as I, ethiopica, though some speak of it as /. religiosa. No useful purpose would be served by dwelling on the vain attempts of older writers to discover what the much vene- rated bird was, or on the other synonyms applied to it br later ornithologists, some of whom (and among them the most recent) have shewn little acquaintance with the litera- ture of the subject. Nor can the Ibis be here treated from a mythological or antiquarian point of view. Savigny's memoir above noticed contains a great deal of very interest- ing matter on the subject. Wilkinson (Ancient Lgyptians, ser, 2, ii, pp. 217-224) has thereto added some of the results of modern research, and latest of all Mr Renouf in his Hubbert Lectures concisely explains the origin of the myth,

The Ibis is chiefly an inhabitant of the Nile basin in Nubia, from Dongola southward, as well as of Kordofan and Sennaar; whence (according to Savigny, whose oppor- tunities for observation seem to have been greater than those enjoyed by any European since his time) about mid- summer, as the river rises, it moves northwards to Egypt, and reaches the delta,' passing over the intermediate dis- tricts, in a way not unknown elsewhere among migratory birds. In Lower Egypt it bears the name of Abou-mengel, or " Father of the Sickle," from the form of its bill, but it does not stay long in that country, disappearing by all accounts when the inundation has subsided. Hence doubt- less arises the fact that almost all European travellers have failed to meet with it there,? since their acquaintance with

1 It has been said to occur occasionally in Europe (Greece and southern Russia), but further evidence is needed before the assertion can be taken as proved.

2Mr E. C. Taylor remarked some years ago (Ibis, 1859, p. 51), that the Buff-backed Heron, Ardea bubudcus, was made by the tourists' dragomans to do duty for the " Sacred Ibis," and this seems to be no novel practice, since by it, or something like it, Hasselqvist was mis- led, and through him Linneeus.

the birds of Egypt is mostly limited to those which frequent the country in winter, and consequently writers have not been wanting to deny to this species a place in its modern fauna (cf. Shelley, Birds of Egypt, p. 261); but, in December 1864, Von Heuglin (Journ. jtir Ornithologie, 1865, p. 100) saw a young bird which had been shot at Gata in the delta, and subsequently Mr E. C. Taylor (Zbis, 1878, p. 372) saw an adult which had been killed near Lake Menzaleh in November 1877. The old story told to Herodotus of its destroying snakes is, according to Savigny, devoid of truth,! and that naturalist found, from dissection of the examples he obtained, that its usual food was fresh- water univalve mollusks; but Cuvier asserts that he dis- covered partly digested remains of a snake in the stomach of a mummied Ibis which he examined, and there can be little doubt that insects and crustaceans, to say nothing of other living creatures, enter op occasion into the bird's diet.

The Ibis is somewhat larger than a Curlew, Vwmenius arquata, which bird it in appearance calls to mind, with a much stouter bill and stouter legs. The head and greater part of the neck are bare and black. The plumage is white, except the primaries which are black, and a black plume, formed by the secondaries, tertials, and lower scapulars, and richly glossed with bronze, blue, and green, which curves gracefully over the hind-quarters, The bill and feet are also black. The young lack the ornamental plume, and in them the head and neck are clothed with short black feathers, while the billis yellow. The nest is placed in bushes or high trees, the bird generally building in com- panies, and in the middle of August Von Heuglin (Orn. Nord Ost Afrika's, p. 1138) found that it had from two to four young or

much incubated eggs.? These are of a dingy white, splashed, spotted, and speckled with reddish-brown.

Congeneric with the typical Ibis are two or three other species, the S. melanocephala of India, the S. molucca, or S. strictipennis, of Australia, and the S. berniert of Mada- gascar, all of which closely resemble S. ethiopica; while many other forms not very far removed from it, though placed by authors in distinct genera,> are also known. Among these are several beautiful species such as the Japanese Creronticus nippon, the Lophotibis cristata of Madagascar, and the Scarlet Ibis,t Hudocimus ruber, of America; but here there is only room to mention more particularly the Glossy Ibis, Plegadis falcinellus, a species of very wide distribution in both hemispheres, being found throughout the West Indies, Central and the south-eastern part of North America, as well as in many parts of Europe (whence it not unfrequently strays to the British islands), Africa, Asia, and Australia. This bird, which is no doubt the second kind of Ibis spoken of by Herodotus, is rather smaller than the Sacred Ibis, and mostly of a dark chestnut colour with brilliant green and purple reflexions on the upper parts, exhibiting, however, when young little of this glossiness. One of the most remarkable things about this species is that it lays eggs of a deep sea-green colour, having wholly the character of Heron's eggs, and it is to be noticed that it often breeds in company with Herons, while the eggs of all other Ibises whose eggs are known resemble those of the Sacred Ibis. Congeneric with the Glossy Ibis, some

1The suggestion that the " flying serpents" whose remains were seen by Herodotus were locusts is perhaps plausible, but there is con- siderable difficulty in accepting it.

2 The Ibis has more than once nested in the gardens of the Zoolo- sige a and even reared its young there (Zdis, 1878, pp. 449-451, jolly 2abk,))

® For some account of these may be consulted Dr Reichenow's paper in Journ. fiir Ornithologie, 1877, pp. 148-156; Mr Elliot's in Proc. Zool. Society, 1877, pp. 477-510; and that of M. Oustalet in Vows. Arch. du Muséwm, ser. 2, i. pp. 167-184.

‘It is a popular error—especially among painters—that this bird Was the Sacred Ibis of the Egyptians. It was of course utterly un- known in the Old World until the discovery of the New.

three or four other species, all from South America, have been described ; but the propriety of deeming them distinct is questioned by some authorities.

Much as the Ibises resemble the Curlews externally, there is no real affinity between them. The Jbidide are more nearly related to the Storks, Ciconidee, and still more to the Spoonbills, Platalecde, with which latter many systematists consider them to form one group, the Z/emz- glottides of Nitzsch. They belong to the Pelargomorphee of Professor Huxley, one of the divisions of his Desmognathe, while the Curlews are Schizognathous. The true Ibises above spoken of are also to be clearly separated from the Wood-Ibises, Z’antalide, of which there are four or five species, by several not unimportant structural characters, which cannot here be particularized for want of space. Fossil remains of a true Ibis, Z. pagana, have been found in considerable numbers in the middle Tertiary beds of France.® (A. N.)

IBN BATUTA (1304-78), whose proper name was Abu-Abdullah Mahommed, one of the most remarkable of travellers and autobiographers, was born at Tangier in 1304. He entered on his travels at the age of twenty-one (1325), and closed them in 1355. Their compass was so vast that we can but give the barest outline of them.

He began by traversing the whole African coast of the Mediterranean from Tangier to Alexandria, finding time to marry two wives on the road. After some stay at Cairo, then probably tle greatest city in the world (excluding China), and an unsuccessful attempt to reach Mecca from Aidhab on the west coast of the Red Sea, he visited Palestine, Aleppo, and Damascus. He then made the pilgrimage to the holy cities of the Hedjaz, and visited the shrine of Ali at Meshed-Ali, travelling thence to Bussorah, aud across tle mountains of Khuzistan to Ispahan, thence to Shiraz, and back to Kufa and Baghdad. After an excur- sion to Mosul and Diarbekr, he made the hdj a second time, staying at Mecca three years. He next sailed down the Red Sea

to Aden (then a place of great trade), the singular position of which he describes, noticing its dependence for water-supply upon those great cisterns for preserving the scanty rainfall which have been cleaned out and restored in our own time. He continued his voyage down the African coast, visiting, among other places, Mombas, and Quiloa in 9° §. lat. Returning north he passed by the chief cities of Oman to New Hormuz, as he calls the city which had, not many years before, been transferred to the island where it became so famous. After visiting other parts of the gulf, he crossed the breadth of Arabia to Mecca, making the Adj for the third time. Crossing the Red Sea he made a journey of great hardship to Syene, and thence along the Nile to Cairo. After this, travelling through Syria, he made an extensive circuit among the petty Turkish sultan- ates into which Asia Minor was divided after the fall of the kingdom of Rum (or Iconium). He now crossed the Black Sea to Caffa, then mainly occupied by the Genoese, and apparently the first Christian city the Moor had seen, for he was much perturbed by the bell-ringing. He next travelled into Kipchak, or the country of the Mongol khans on the Volga, and joined the camp of the reigning khan Mahommed Uzbek, from whom the great and heterogeneous body that we know as Uzbeks is believed to have taken a name. Among other places in this empire he travelled to Bolgar (54° 54' N. lat.) in order to witness the shortness of the summer night, and desired to continue his travels north into the "' Land of Darkness," of which wonderful things were told, but was obliged to forego this. Rejoining the

5 Tt will explain what to the uninitiated may be a puzzle to state that the name " Zbis" was selected as the title of an ornithological magazine, frequently referred to in this and other articles, which made its first appearance in 1859, and has since continued to be published,

sultan's camp, he was allowed to join the cortege of one of the Khattins, who was a Greek princess by birth (probably an illegitimate one), and who was about to visit her own people, In her train he travelled to Constantinople, where he had an interview with the emperor Andronicus the Elder, whom he calls Jinjis (George). He tells us how, as he passed the city gates in the lady's train, he heard the guards muttering Sarakind /

Sarakinég/ Returning to the court of Uzbek, at Sarai on the Volga, he took his way across the steppes to Khwarizm and Bokhara, and thence through Khorasan and Cabul. On this journey he crossed the Hinpu Kusu (¢.v.), to which he gives that name, its first occurrence. 'Travelling on, he reached the Indus,— according to his own statement, in September 1333. This closes the first part of his narrative.

From Sind, which he traversed to the sea and back again, he proceeded by Multan, and eventually, on the invitation of Mahommed ughlak, the reigning sovereign, to Delhi. Mahommed was a singular character, full of pretence at least to many accomplishments and virtues, the founder of public charities, and a profuse patron of scholars, but a parricide, a fratricide, and as madly capricious, bloodthirsty, and unjust as Caligula. As Ibn Batuta pithily sums up the contradictions of his character, "there was no day that the gate of his palace failed to witness alike the elevation of some object to affluence and the torture and murder of some living soul." Heappointed the traveller to be kazi of Delhi, with a present of 12,000 silver dinars (rupees) and an annual salary of the same amount, besides an assignment of village lands. In the sultan's service he remained eight years; but his good fortune only stimulated his natural extravagance, and at an early period his debts amounted to four or five times his salary. At last he fell into disfavour, and retired from the court, only to be summoned again on a congenial duty. The emperor of China, the last of the Mongol dynasty, had sent a mission to Delhi which was to be reciprocated, and the Moor was to go as one of the envoys. The account of the journey through Central India to Cambay is full of interest. Thence the party went by sea to Calicut, which is classed by the traveller with the neighbouring Kaulam (Quilon), Alexandria, Sud&k in the Crimea, and Zayton (or CuincHEw, ¢.v.) in China, as one of the greatest trading havens in the world,—an interesting enumeration from one who had seen them all. The mission party was to embark in Chinese junks (the word used) and smaller vessels, but that carrying the other envoys and the presents, which started before he was ready, was wrecked totally ; the vessel that he had engaged went off with his property, and he was left on the beach of Calicut. Not daring to return to Delhi with such a tale, he remained about Honore and other cities of the western coast, taking part in various adventures, among others the capture of Sinddbur (or Goa), till he took it into his head to visit the Maldive

Islands. There he was made welcome, was nominated kazi, married four wives, and remained some months. But before long he was deep in quarrels and intrigues, and in August 1344 he left for Ceylon. In this island he made the pilgrimage to Adam's Peak ('The Footmark of our Father Adam," he calls it), of which he gives an interesting account. Thence hebetook himself to Ma'abar (the Coromandel coast), where he joincd a Musulman adventurer who had made himself master of much of that region, with his residence at Madura. After once more visiting Malabar, Canara, and the Maldives, he departed for Bengal, a voyage of forty-three days, landing at Sadkawan (Chittagong). The chief circumstance of his sojourn in Bengal was a visit made toa Musulman saint of singular character and pre-tensions, Shaikh Jaldluddin, who dwelt in a hermitage among the Silhet hills, and where his shrine (at Silhet) is

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still maintained as a place of sanctity under the name of Shah Jalal, Returning to the delta, he took ship at Sundrgdnw (ncar Dacca) on a junk bound for Java (ve., Java Minor of Marco Polo, or Sumatra). Touching on the coast of Arakan or Burmah, he reached Sumatra in forty days, and was hospitably received at the court of Malik al-Dhahir, a zealous disciple of Isl4m, which had then recently spread among the states on the northern coast of that island. The king provided him with a junk in which to prosecute his voyage to China. Some of the places which he describes on this line are hard to identify, but apparently one of them was the coast of Camboja. The port which received him in China was Zayton, famous in Marco Polo's book, and identified with the modern Chinchew. He also visited Sin-Kalan ('Great China" or Machin), a name by which Canton was then known to the Arabs, and professes to have visited also Khans4 (Kinsay of Marco Polo, z.e., Hangchau), and Khanbalik (Cambalue or Peking). The truth of his visit to these two cities, and especially to the last, is very questionable. The traveller's own history singularly illustrates the power of the free- masonry of Mahometanism in carrying him with a wel- come over all the known world, and some anecdotes of his adventures in China illustrate this even more forcibly.

We cannot follow in detail his voyage back, or tell how he saw the great bird Rukh (evidently, from his descrip- tion, an island lifted by refraction). Revisiting Sumatra, Malabar, Oman, Persia, Baghdad, he crossed the great desert to Tadmor and Damascus, where he got his first news of home, and heard of his father's death fifteen years before. Diverging to Hamath and Aleppo, on his return to Damascus he found the Black Death raging, so that two thousand four hundred died in one day. Revisiting Jeru- salem and Cairo, he made the Adj for a fourth time, and finally turned westward, reaching Fez, the capital of his native country, 8th November 1349, after an absence of twenty-four years. It was, he says, after all, the best of all countries. "The dirhems of the West are but little ones, 'tis true; but then you get more for them."

After going home to Tangier, he crossed into Spain and made the round of Andalusia, including Gibraltar, which had just then stood a siege from Alphonso XI. (whom the traveller calls "the Roman tyrant Adfunus"). In 1352 the restless man started for Central Africa, passing by the oases of the Sahara (where the houses were built of rock-salt, as Herodotus tells, and roofed with camel skins) to Tim- buctoo and Gogo on the Niger, a river which he calls the Nile, belicving it to flow down into Egypt, an opinion maintained by some up to the date of Landor's discovery. Being then recalled by his own king, he returned by Takadda, Hogar, and Tawat to Fez, which he reached in the beginning of 1354. This is the end of his recorded wanderings, which extended over a space of twenty-eight years, and in their main lines alone exceeded 75,000 miles.

By royal order his history was written down from his dictation by Mahommed Ibn Juzai, the king's secretary, a work concluded on the 13th December 1355. This editor ends the work with this appropriate colophon :—" Here ends what I have put into shape from the memoranda of the Shaikh Abu-Abdallah Mahommed Ibn Battta, whom may God honour! No person of sense can fail to see that this Shaikh is the Traveller of Our Age; and he who should call him The Traveller of the whole Body of Islam would not exceed the truth!" The traveller died in 1377-78, aged seventy-three.

Ibn Batuta's travels have only been known in Europe during the present century, and were known then for many years only by Arabic abridgments

existing in the Gotha and Cambridge libraries. Notices or extracts had been published by Seetzen (ce. 1808), Kozegarten (1818), Apetz (1819), and Burekhardt (1819), when in 1829 Dr §. Lee published for the Oriental Translation Fund a version

from the abridged MSS. at Cambridge, which attracted much interest. The French capture of Constantina at last afforded MSS. of the complete work, one of them the autograph of Ibn Juzai. And from these, after versions of fragments by various French scholars, was derived at last (1858-59) a careful edition and translation of the whole by M. Défrémery and Dr Sanguinetti, with a valuable index and other apparatus, in 4 vols. 8vo.!

Though there are some singular chronological difficulties in the narrative, and a good many cursory inaccuracies and exaggerations, there is no part of it cxcept the voyage to China in which its sub- stantial veracity is open to doubt. Nor can it be questioned, we think, that he really visited China, thongh it is probable that his visit was confined to the ports of the south. The whole of the second part of his story especially is full of vivacity and interest. His accounts, ¢.g., of the Maldive Islands, and of the Negro countries on the Niger, arc replete with interesting particulars, and appear to be accurate and unstrained. The former agrecs sur- prisingly with that given by the only other foreign resident we know of, viz., Pyrard de la Val, two hundred and fifty years later. His full and curious statements and aneedotes regarding the showy virtues and very solid vices of Sultan Mahommed Tughlak are in entire agreement with Indian historians, and add many fresh details.

To do justice to the traveller's own character, as he has uncon- sciously drawn it, would require the hand of Chaucer and his freedom of speech. Not deficient either in acuteness or in humanity ; full of vital energy and enjoyment ; infinite in curiosity ; daring, rest- less, impulsive, sensual, inconsiderate, extravagant ; superstitious in his regard for the Moslem saints and quacks, and plying devout observances when in diffieulties ; an agreeable companion, for he is always welcomed at first, but clinging like a horselcech when he finds a full-blooded subject, and hence apt to disgust

his patrons, and then to turn to intrigue against them,—such is the picture we form of this prince of Moslem travellers. (Gab WZ)

IBN EZRA. See ABENEZRA.

IBN KHALDOUN (1832-1406), a celebrated Arabic historian, poet, and philosopher, was born at Tunis on the lst Ramadhan 732 a.u. (February 8, 1332). His name was

Abu Zeid Abdarrahman, that of Ibn Khaldoun being a |

patronymic derived from an ancestor Khaldoun ibn Othman, who came over with a band of Arab warriors and settled at Carmona in Spain. The family afterwards established itself in Seville, which it quitted for Tunis on the approach of Ferdinand III. Ibn Khaldoun at an early age applied himself to the study of the various branches of Arabic learning with very great success, and entered the employ- ment of the sultan as private secretary at the age of twenty- one. Not believing, however, in the stability of his master's throne, he soon afterwards took refuge with and obtained employment under the Merinide sultan Abu Eindn at Fez. In the beginning of the year 1356, his integrity having been suspected, he was thrown into prison until the death of Abu Einan in 1358, when the vizier El Hasan ibn Omar set him at liberty, and reinstated him in his rank and offices. He here continued to render great service to Abu Salem, Abu Eindn's successor, but, having offended the prime minister, his position became less pleasant at court, and he sought and obtained permission to emigrate to Spain, where, at Granada, he was received with great cordiality by Ibn el Ahmer, who had been greatly indebted to his good offices when an exile at the court of Abu Salem. The favours and honours he received from the sovereign soon, however, excited the jealousy of the vizier, and he was driven back to Africa, where he was received with great cordiality by the sultan of Bujaiye, Abu Abdallah, who had been formerly his companion in prison. Jealousics and intrigues again drove him forth, this time to take refuge with the lord of Biskera, Ahmed ibn el Mozni. In answer to an appeal from the sultan of Tlemecn, Ibn Khaldoun raised a large force amongst the desert Arabs of the district, and passed over to the service of that prince. A few years later he was taken prisoner by Abd el Aziz, who had defeated the sultan of Tlemcen and seized upon the throne. He then entered a monastic establishment,

1p. Jose de 8. Antonio Moura previously published at Lisbon a Portuguese translation from a MS. obtained by him at Fez many years before.

and occupied himself with scholastic duties, until in the year 1370 he was sent for to Tlemcen by the new sultan, Abd el Aziz. After the death of Abd el Aziz he resided at Fez, enjoying the patronage and confidence of the regent. Aftcr some further vicissitudes he entercd the service of the sultan of his native town of Tunis, where he devoted hiniself almost exclusively to his studies. Having received permission to make the pilgrimage to Mecca, he set out and reached Cairo, where his reputation had already preceded him, and was presented to the sultan, El] Melek ed Dhaher Berkouk, who insisted on his remaining there, and in the year 1384 promoted him to the high rank of grand cadi of the Malekite rite for Cairo. This office he filled with great prudence and probity, and succeeded in removing a mass of abuses with which the administration of justice in Egypt was overgrown. A terrible misfortune now fell upon him ; the ship in which his wife and family, with all his property, were coming to join him, was shipwrecked, and every one on board lost. He endeavoured to find consolation in fresh devotion to his studies, and to the completion of his great work the History of the Arabs of Spain, in which he had long been engaged. At the same time he was removed from his office of cadi, which gave him still more leisure for his work. Three years later he made the pilgrimage to Mecca, and on his return lived in strict retirement at the village of Faiyoum until 1399, when he was again called upon to resume his functions as cadi. He was renloved and reinstated in the office no less than five times.

In the month of Rabia I. 803 a.H. (October to November 1400 a.p.), he was sent to Damascus, in connexion with the expedition intended to oppose the celebrated Timur or Tamerlane. When Timur had become master of the situation, Ibn Khaldoun let himself down from the walls of the city by a rope, and presented himself before the conqueror, who, charmed with his dignified appearance and his learned discourse, permitted him to return to Fgypt. Ibn Khaldoun died on the 25th Ramadhan 808 AH. (16th March 1406), at the age of sixty-four,

The great work by which he is known is a “ Universal History,” but it deals morc particularly with the history of the Arabs of Spain and Africa. Its Arabic title is Avédb el ‘Iber, wa diwdn el Mubtadd wal Khaber, fi atydm el ‘Arab wa ‘l’ Ajam wa’l Berber ; that is, ‘¢The Book of Examples and the Collection of Origins and Informa- tion respecting the History of the Arabs, Foreigners, and Berbers.” It consists of three books, an introduction, and an autobiography. Book i. treats of the influence of civilization upon man; book ii. of the history of the Arabs and other peoples from the remotest antiquity until the author’s own times; book iii. of the history of the Berber tribes and of the kingdoms founded by that race in North Africa. The introduction is an elaborate treatise on the science of history and the development of society, and the auto- biography contains the history, not only of the author himself, but of his family and of the dynasties which ruled in Fez, Tunis, and Tlemcen during his lifetime. An admirable edition of the Arabic text has been printed at Boulak (Cairo), and a part of the work has been translated by the late Baron de Slane under the title of Histoire des Berbéres (Algiers, 1852-56); it contains an admirable account of the author and analysis of his work. (E, H. P.)

IBN KHALLIKAN (1211-1282). Abu ’] Abbas Ahmed, better known as Ibn Khallikan,? author of the celebrated Arabic biographical dictionary, was born at Arbela on the 22d September 1211. Some of his biographers trace his descent to Jaafer the Barmecide, the well-known unfor- tunate friend and vizier of Haroun Alraschid. His life was that ofa scholar and literary man, and he was promoted in his later years to the office of cadi of Damascus. He died in the Najibiyeh College of that city on the 29th October 1282. His great work is the Avtdb Wafaydt el ‘Aiydn, ‘The Obituaries of Eminent Men,” and contains brief sketches of the lives of all the most important

2 By some scholars this surname is written Ibn Khillikan; but his own autograph signature recently found upon a manuscript in the University Library, Cambridge, gives the usually accepted form.

personages of Muslim history and literature, with many appropriate anecdotes illustrative of their personal character, and extracts from the works of such of them as were authors or poets. It is the most complete and at the same time the most universal and comprehensive biographical dictionary in the Arabic language, and is the indispensable companion of the student of Mahometan literature. Ibn Khallikan has many imitators, the best-known work of the kind being the Fuwdt el' Wafaydt, "Omissions of the Wafayat," by Saléh ed din Muhammed ibn Shakir, which has been published, as well as the work which it is intended to supplement, at the Boulak press.

Ibn Khallikan's work has been published in Arabic with an English translation by Baron MacGuckin de Slane for the Oriental Translation Fund of Great Britain and Ireland (Paris, 1842), and this edition, which is found in most public libraries, is the best and the most accessible one extant.

IBN SINA. See AvIcENNA.

IBO, Isu, Ico, or Esox, a district of West Africa, situated in the delta of the Niger, and mainly on the left or eastern bank of the river. The chief town, which is frequently called by the same name, but is more correctly designated Abo or Aboh, lies on a creek which falls into the main stream about 150 miles from its mouth, and con- tains from 6000 to 8000 inhabitants. The Ibo area strong well-built Negro race. Their women are distinguished by their embonpoint, which is considered by the people themselves as the perfection of beauty. The language of the Ibo is one of the most important in the Niger delta, and is gradually extending its area, The Rev. J. F. Schon began its reduction in 1841, and in 1861 hg published a grammar

of it (Oku Ibo Grammatical Elements, London, Chureli

Miss. Soc.), Isoama is the dominant dialect, being spoken by the Aboh, Elugu, Aro, and Abadja tribes.

See Captain W. Allen's Narrative, London, 1848; M. Burdo, Niger et Benué, Paris, 1880 (English trans. by Mrs Strange, 1880).

IBRAHIM PASHA (1789-1848), viceroy of Egypt, a real or adopted son of Mehemet Ali, was born at Cavalla in Roumelia in 1789. Early associated with the Egyptian army, he won a name for himself by successful operations against the rebel tribes of Upper Egypt and the fugitive Mamelukes in Nubia, before he entered his twenty-fifth year. In an expedition which he led in 1816 against the Wahhabees of Arabia, the young general was seriously hampered by the want of organized discipline among his troops, and on his triumphant return to Cairo in 1819 he eagerly availed himself of the services of some F'rench officers in his efforts to convert the Oriental turbulence of liis forces into the disciplined steadiness of the West. Ibrahim's next campaign was in Greece, whither he was ordered in August 1824 to support the Turkish sultan's attempts to restrain the risings of Hellenic nationality. The defeat of the Turkish and Egyptian fleet at Navarino (October 20, 1827) by the united English, French, and Russian squadrons was the signal for Ibrahim's recall from the Morea, which had suffered keenly at the hands of the eruel Oriental. In Egypt he at once set himself afresh to the work of reorganization in army and navy, and in 1831, when Mehemet Ali ordered an almost unprovoked invasion of Syria, Ibrahim was again at the head of the Egyptian army. Unchecked by the loss of 5000 men from cholera before leaving Egypt, he appeared suddenly on thie Syrian coast, took Gaza, Jaffa, and Kaiffa by surprise, and by the 29th of November had invested Acre. There he met with a stubboru resistance ; twice in vain he attempted to carry the seaport by storm, and in the midst of the siege he was called away, to meet an army of relief, commanded by Osman Pasha, governor of Aleppo. Near Tripoli he surprised Osman, who decamped without fighting, and returning hastily to Acre, he threw his whole force on the

place, carrying it (27th May 1832) with a loss of 1400 men. Without a pause he marched on Damascus, which offered no resistance. At Hims (July 28) he encountered and defeated a Turkish army of 30,000 men, with a force of 16,000, and passing swiftly through the defiles of Beylan, overtook and completely routed tlie retreating enemy at Adaneh. Another victory followed at Oulou-Kislak, and then, near Konieh, Ibrahim was met by the vizier Resheed Pasha at the head of 60,000 men. Favoured by a murky day

—an advantage which helped to counterbalance the great. disparity of his forces—he contrived to throw the Turkish army into confusion, and, by the capture of the vizier, converted an impending disaster into the most brilliant of his victories. Meantime his fleet, equally successful, had chased that of the sultan back to the Bosphorus, and the victor, without an army to oppose him, was within six marches of Constantinople. At the critical moment the order came from Mehemet Ali to await rein- forcements. But before these arrived the golden oppor- tunity was lost. The Russian army and fleet advanced to the protection of the Ottoman capital; the other Western powers combined in the effort to effect peace; and by treaty in February 1833 Syria and Adana were handed over to Mehemet on the condition of his paying tribute for them. As governor, Ibrahim reduced the new territory to order, and gave a strong impulse to industrial enterprise. But war again broke out in 1839, and at Nezeeb (24th June) Ibrahim dealt a second deadly blow to the Turkish power. Again the commands of Mehemet forbade him to follow up his success, and the campaign, cut short by the interference of the British, ended in the restoration of Syria to the Porte in 1841. After his retreat from Damascus, achieved with martial skill, although accompanied with serious losses, Ibrahim laid down his sword. Retiring to his estates in the plain of Heliopolis, he occupied himself in establishing cotton and olive plantations, till in 1844 he was called to succeed his father as viceroy. He died at Cairo, 9th November 1848, only a few months after the formal confirmation of his rank of viceroy. The finest qualities of a great commander were his, who out of semi- barbarous hordes fashioned a formidable army, and twice by his individual prowess threatened the overthrow of the Ottoman empire. His cruelty, the one blot on his valour, may be regarded as an accident of his life rather than as a fixed trait in his character. In times of peace, at least, he displayed the sagacity as well as the firmness of an en- lightened administrator. See Eaypr, vol. vil. p. 764.

IBRAILA, Brarta, Brauitow, or BRAILOW, a town, formerly of Wallachia, now of Roumania, situated on the left bank of the Danube, about 9 miles south of Galatz and 102 miles from the Sulina mouth of the river. It has a railway station within a quarter of a mile to the north-west on the Bucharest and Galatz line—a branch line coming down to the harbour; and it is the seat of a cham- ber of commerce, a tribunal of commerce, and an agency of the Danube Navigation Company. Most of the town lies about 45 or 50 feet above the level of the sea, there being only a very narrow strip of

low-lying ground (some 60 or 100 feet) between the edge of the river and the steep and lofty bank by which at this part its course is defined. Ibraila is one of the most regular places in Roumania, stand- ing, indeed, in this respect, next after Bucharest itself. Few of the houses, however, are more than two stories high. Towards the land it has the shape of a crescent, the curve of the outer streets being controlled by the direction of the old fortifications, which were dismantled in 1828, A wide and tree-planted boulevard—the Strada Bulivardului—separates the town proper from the suburban portion. There isa public garden along the brow of the bank towards the river. Besides the cathedral of St

Michael, a large Lut ungainly building of grey sandstone, there are seven Greek churches, a Roman Catholic church, a Protestant church, a Jewish synagogue, and a church belonging to the strange Russian sect of the Lipovani or Skoptsi. Ibraila has long had a large sliare in the trade of the Danube. In 1836 it was visited by 382 ships. In 1870 there entered 4936 vessels and 6697 cleared, with a respective total burden of 867,189 tous and 821,274 tons. Tn 1877 the exports included 87,002 quarters of whieat, 87,314 of maize, 80,938 of barley, 11,964 of rye, besides a large quantity of grain which appears under the returns for Galatz. The railway between Ibraila and Galatz takes a wide circuit, instead of following the direct line of the river. The population, according to Henke (Ruminien : Land und Volk, Leipsic, 1877), is 42,000, of whom 53 per cent. are Roumanians, 20 per cent. Greeks, 15 per cent. Jews, and the remainder Germans, &c. According to the Bulet. Soc. Geogr. Romane, 1876, the total is 28,000.

In the latter part of the 18th century Ibraila was several times taken by the Russians, and on one occasion (17 70) it was burned. By the peace of Bucharest (1812) the Turks retained the right of garrisoning the fortress. In 1828 it was gallantly defended by Soliman Pasha, who, after holding out from the middle of May till the end of June, was allowed to march out with the honours of war. At the peace of Adrianople the place was definitively assigned to Wallachia. It was the spot chosen by Gortschakoff for crossing the Danube with his division in 1854.

IBYCUS, a Greek lyric poet, who flourished about the 60th Olympiad—540 b.c.—was a native of Rhegium in Italy, but spent the greater part of his life at the court of Polycrates, tyrant of Samos. A curious story, not always accepted, is told in connexion with his death. While travelling in the neighbourhood of Corinth, the poet was waylaid and mortally wounded by robbers. As he lay dying on the ground, he saw a flock of cranes flying overhead, and called upon them to avenge his death. The murderers betook themselves to Corinth, and soon after, while sitting in the theatre, saw the cranes hovering above. One of them, either in alarm or jest, ejaculated, "Behold the avengers of Ibycus," and thus gave the clue to the detection of the crime. The phrase, "the cranes of Ibycus," passed into a proverb among the Ctreeks. Of the seven books of lyrics by Ibycus, which Suidas mentions, only a few frag- ments have come down to us, but these afford sufficient evidence to support Cicero's estimate of the author whom

he pronounces (7Z'wsc., iv. 33) from his writings "maxime |

vero omnium fiagrasse amore." Even from his mythical and heroic pieces, in which he was less successful, Ibycus did not exclude the erotic element. The dialect in which he wrote partook both of the Doric and of the /olic peculiarities. Tho best edition of the fragments is Jbyct Khegini Carminum Reliquic, edited by Schneidewin, and published at Gottingen in 1833.

ICA, Yca, or Ecoa, an inland city of Peru, capital of a district in the department of Lima, situated 170 miles south-south-east of the city of Lima, and 48 miles south- south-west of Pisco on the Pacific Ocean, with which it is connected by a railway. Between Pisco and Ica the country is a desolate and barren desert, but Ica itself lies in a fruitful valley surrounded by corn-fields and vineyards. On account of the frequent earthquakes the town has a very ruinous appearance, but it enjoys considerable prosperity, and ex-ports by way of Pisco large quantities of wheat, maize, cotton, cochineal, wine, and spirits. Originally the city, when founded in 1563, was built 4 miles south-east from where it now stands, the change of site taking place after a great earthquake in 1571. .Another severe earthquake in 1664 led to a new town being built close to the old one. The population is about 7000.

ICH is the solid crystalline form which water assumes when exposed to a sufficiently low temperature, It is

frequently precipitated from the air as hoarfrost, snow, or hail; and in the glaciers and snows of lofty mountain sys- tems or of regions of high latitude it exists on a gigantic scale, being especially characteristic of the seas and lands around the poles, which consequently have hitherto been practically inaccessible to man. Also in various parts of the world, especially in France and Italy, great quantities of ice form in caves, which, in virtue of their depth below the earth's surface, their height above the sea-level, or their exposure to suitable winds, or to two or more of these conditions in combination, are unaffected by ordinary climatic changes, so that the mean annual temperature is sufficiently low to ensure the permanency of the ice. The great ice supply for the island of Teneriffe is obtained from such a cave, which is 100 feet long, 30 feet broad, and from 10 to 15 fcet high, and which is situated on the Peak some 10,000 feet above the sea-level. Accord- ing to the Rev. S. Browne (Brit. Ass, Report, 1864), such cave-ice is generally peculiar in its columnar appear- ance, and apparently less easy to melt than ordinary surface ice.

In the mutual transformations of water and ice, many remarkable physical phenomena occur. Thus, during the process of melting a block of ice or of freezing a quantity of water, no change of temperature can take place so Jong as there is a thorough mixture of water and ice. Consequently, the " freezing-point" or temperature at which water freezes is a temperature so readily determined that it is conveniently employed as one of the standard temperatures in the gradua- tion of ordinary thermometer scales, such as the centigrade, the Fahrenheit, and the Réaumur. The centigrade scale, whose zero corresponds to this freezing-point of water, is the temperature scale that is employed throughout this article. In the act of freezing, water, though its tempera- ture remains unchanged, undergoes a remarkable expansion or increase of bulk, so that ice at 0° C. is less dense than water— a fact demonstrated at once by its power of floating. "Ground-ice" or "anchor-ice," which forms in certain cir- cumstances at the bottom of streams, is only an apparent exception to this relation between the densities of water in its solid and liquid states, being retained there by the cohesion between it and the stones or rocks which compose the river's bed. When forcibly released from this contact with the bottom, the ice at once ascends

to the surface. Ground-ice may thus be the lowest stratum of the once completely frozen mass of water, adhering to the bottom during the thawing and melting of the ice at the surface ; or it may even be formed under favourable conditions below briskly flowing water, probably by the action of eddies, which draw the surface water down through the warmer but denser liquid, and thus cool the stones and rocks at the bottom. As water then expands on freezing, so con- versely ice contracts on melting; and the ice-cold water thus formed continues to contract when heated until it» has reached its point of maximum density. Joule, from a series of careful experiments, determined the temperature at which water attains its maximum density to be 39°] Fahr., or very nearly 4°C. Hence water contracts as its temperature rises from 0° C, to 4° C.; but at higher temperatures it behaves like the great majority of other substances, expand- ing with rise of temperature. At no temperature, however, does water in the liquid state become less dense than ice, as the following table of relative densities shows :—

Density of ice at O°C. = 9175 oi water at 0°C. = '99988 és » 40. = 1:00000 09 so lOm CS = Goons o » 100°C, = -95866

Under the influence of heat, ice itself behaves as most solids do, contracting when cooled, expanding when heated.

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According to Pliicker, the coefficient of cubical dilatation at moderately low temperatures is 0001585. From a series of claborate experiments, Person deduced °505 as the specific heat of ice, or about half that of water; in other words, the heat required to raise 1 ib of water 1° C. will raise 2 Ib of ice through the same range of temperature or 1 tb of ice through 2° C.

Though no rise of temperature accompanies the melting of ice, there is yet a definite quantity of heat absorbed, and a corresponding amount of work done—mainly in altering the physical condition of the substance. The heat which disappears is transformed into other and less evident forms of energy,—as, for example, the energy of translatory motion, which is the chief characteristic, according to the recognized molecular theory of matter, of the molecule in the liquid as compared with the molecule in the solid.

The heat which is thus absorbed during the melting of unit miss of ice is called the latent heat of water, and its value in ordinary heat-units is 79°25, according to the determina- tion of Person. Hence as much heat is required to trans- form 1 Ib of ice at 0° OC. into water at the same tempcra- ture as would raise in temperature 1 tb of water through a range of 79°25 C., or 79°25 tb of water through a range of 1° C. The same amount of heat which is absorbed when ice becomes water is evolved when water becomes ice, 50 that the melting of ice is accompanied by the abstraction of heat from surrounding objects, that is, by a cocling effect; and the freezing of water by a heating effect. These thermal effects are generally masked by the pro- cesses whereby the change of state is effected; but the cooling which accompanies the melting of ice may be observed when pressure is used as the agent for accom- plishing the change. That ice can be so melted by increase of pressure was first pointed out by Professor James Thomson (now of Glasgow) in a paper published in the Transactions of the Royal Soctety of Hdinburgh for 1849 ; previous to that time the temperature of melting ice was believed to be absolutely constant under all conditions. Thomson showed that, since water expands on freezing, the laws of thermodynamics require that its freezing-point must be lowered by increase of pressure; and, by an ap- plication of Carnot's principle, he calculated that for every additional atmosphere of pressure the freezing-point of water was lowered by '0075 of a degree centigrade. This remarkable result was soon after verified, even to its numerical details, by his brother, Sir William Thomson (Proceedings of the Royal Society of Edinburgh, 1850). The Thomsons and Helmholtz have since then successfully ap- plied this behaviour of ice under pressure to the explanation of many curious properties of the substance. When two blocks of ice at 0° C. are pressed together or even simply laid in contact, they gradually unite along their touching surfaces till-they form one block. This regelation, as it is called, is due to the increased pressure at the various points of contact causing the ice there to melt and cool. The water so formed tends to escape, thus relieving the pres- sure for an instant, refreezing, and returning to the original temperature, This succession of mclting and freezing, with their accompanying thermal effects, goes on until the two blocks are cemented into one. Thus it is that a snowball is formed ; and in virtue of the same succession of pheno- mena does the glacier mould itself to its rocky bed and flow down the valley, behaving in many respects like a viscous fluid.

Ice forms over fresh water if the temperature of the air has been for a sufficient time at or below the freezing-point ; but not until the whole mass of water has been cooled down to its point of maximum density, so that the subsequent cooling of the surface can give rise to no convection currents, is the freezing possible. Sea-water, in the most favourable

ICH

circumstances, does not freeze till its temperature is reduced

to about —2° C.; and the ice, when formed, is found to have rejected four-fifths of the salt which was originally present. to freeze during cold clear nights by leaving it overnight in porous vessels, or in bottles which are enwrapped ill moistened cloth. The water then freezes in virtue of the cold produced by its own evaporation or by the drying of the moistened wrapper. still more elaborate forcing of the conditions. Shallow pits are dug about 2 feet deep and filled three-quarters full with dry straw, on which are set flat porous pans containing the

In the upper provinces of India, water is made

In Bengal the natives resort to a

water to be frozen. Exposed overnight to a cool dry gentle wind from the north-west, the water evaporates at the expense of its own heat, and the consequent cooling takes place with sufficient rapidity to overbalance the slow influx of heat from above through the cooled dense air or from below through the badly conducting straw.

The growing demand for ice for domestic, medicinal, and fee. other purposes has led, not only to the development of a machines,

regularly organized ice-trade, but also to the invention of machines for the manufacture of ice in countries which do not possess a sufficient home supply. The various types of machines which have been or are in use call for a brief description. Freezing-mixtures, such as the familiar snow and salt or the mixture of sulphate or phosphate of sodium and dilute nitric acid, may be dismissed with a word, since they are restricted in use to the

production of intense cold fora brief period of time, and are incapable of economic application to the formation of large quantities of ice.

All ice-machines which have proved of practical utility may be grouped under two great classes :—those which utilize the lowering of temperature that accompanies the rapid expansion of a compressed gas, and those which make use of the like thermal effect that results from the volatilization of some liquid. In machines of the first type, the gas usually employed is atmospheric air, which is first compressed to three or four atmospheres, and kept cool by circulating water or by other suitable means. Tt is then allowed to expand, and the heat necessarily absorbed during the expansion is drawn either from the water to be frozen or from a solution of brine which does not freeze at the ordinary freezing temperature, and thus becomes, 80 to speak, a vehicle for the cold. In 1849 Gorrie constructed such a machine, which, however, was unsatisfactory in its action, probably because the compressed air was not sufficiontly cooled and dried. More efficient in their action wero Kirk's machine (patented in 1863), and Windhausen's (1870), one of which at the Vienna exhibition produced 30 ewts. of ice per hour, at the cost of 1s. per ewt. The mode of action of Windhausen's is as follows. A piston works to and fro in acylinder, compressing the air in the one end and allowing it to expand in the other. The compressed and therefore heated air forces its way through a valve to the cooling chambers, from which it is led towards the other end of the cylinder. Here the inlet valve is so arranged that it closes at a certain position of the receding piston, thus permitting what air has entered to expand and cool. At the return stroke this cooled air is forced out through easily opening valves,—part going to cool the chambers into which the heated compressed air enters from the cylinder, and part passing to the refrigerator, from which after serving its purpose it is pushed on by the fresh supply of cooled air to the compressing end of the piston chamber. Such machines, to work economically, require large cylinders, tight-fitting pistons working with little friction, and perfect regulation in the motions of the various parts—conditions so difficult to fulfil that refrigeration by means of compressed air may be regarded as a practical failure. The machines constructed by the Bell-Coleman Mechanical Refrigeration

Company (Glasgow) utilize as the cooling agent a mixture of certain hydrocarbon gases which are obtained from the distillation of carbonaceous shale. The gas is compressed to a pressure of about 8 atmospheres, and, after being cooled by expansion, is carried off and consumed as fuel. These machines are not specially intended for the production of ice; but, as refrigerators, they are successfully employed for preserving meat on board ship.

Among machines of the second group there is a great variety of construction, because of the great differences which exist in the properties of the liquids used. Thus water, sulphuric ether, bisulphide of carbon, ammonia, methylic ether, sulphurous acid, and other substances lave been employed as refrigerating agents. In all cases, it is the so-called latent heat of vaporization that is utilized ; and did the efficiency of the method depend only on this, watcr would undoubtedly be the best material on account of the great latent heat of its vapour. But as important from a practical point of view are the vapour pressures that come into play throughout the range of temperature employed. Thus at 10° C. the pressure of water vapour is so small, only ‘012 of an atmosphere (and at lower tem- peratures of course it is still smaller), that, to make the evaporation of water an efficient means of refrigeration, the process must be conducted under a very much diminished | pressure. As early as 1755, Dr Cullen managed to freeze — water by its own evaporation in a vacuum; but this method, though greatly developed by Nairne, Leslie, and Vallance, can be applicd to the production of ice in small quantities only.

The same objection applies, of course, to sulphuric ether, © bisulphide of carbon, or any substance which boils under ordinary atmospheric pressure at a temperature above tliat of the air, Ether boils at 34°°8 C., and bisulphide of carbon at 46°°2 C.; and their vapour pressures at 10° C. are respectively °377 and ‘267 of an atmospliere.

_ producing intense cold, and redissolves in the boiler.

They |

thus volatilize much more readily than water, and require a |

comparatively slight vacuum to render their evaporation | In the ether |

sufficiently rapid for refrigerating purposes. machine, which may be taken as a type, the ether, on being

vaporized in the refrigerator under a partial vacuum, is |

drawn over and compressed to the liquid state in the con- denser, which is kept cool by circulating water.

evaporated, Perkins's machine (1834), Twining's patent of

and Siddeley and Mackay's apparatus are ether-machines ; and all except the first, which is hardly adapted for exten- sive freezing, surround the refrigerator with brine, which when cooled flows easily around and between the cases containing the water to be frozen. Van der Weyde (1869)

substituted naphtha, gasolin, or chimogene for the ether; _

and in Johnston and Whitelaw's machine bisulphide of

carbon is used somewliat similarly. The great difficulty |

in machines of the ether type is to prevent leakage, su as to keep the partial vacuum really efficient ; and moreover

ether, which is in most respects superior to all the other , substances employed, has an awkward tendency, under |

the influence of frequent condensations and rarefactions, to transform itself into less volatile isomers.

The great characteristic of ice-machines which employ ammonia, methylic ether, or sulphurous acid, as compared

witli those of the ether type, is that they work at increased |

instead of dithinished pressures, since these substances are gaseous at ordinary temperatures and pressures, and require for their liquefaction

either the production of a low tem- | perature or the application of a high pressure. For facility of reference the boiling points and vapour pressures at three different temperatures for these substances are given in the following table.

From the | condenser it is then led back to the refrigerator, to be re-_

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a é Vapour-Pressures esti- Mine of Subsiaue Bolling mated in Atmospheres.

Point.

At 10°, | At 20°, | At 30°,

rr |

AMONG eT oscccessnnsen onal — 38°°50C] 671 BPD Miethy Werether,.....ccccs 000d — 28°°65 3‘5 4:8 Sulphmronssacid ..14..0s00ccress — 10°08 Aes faa eas.

The best known of the ammonia machines is Carré’s (1859), the principle and construction of which are remark- ably simple. Two strong metal vessels, the boiler and refrigerator, are connected above by a tube. In the boiler a saturated solution of ammonia is raised to 130°-150° C. The ammonia is driven over under high pressure into the refrigerator, round which cold water circulates, and in which the ammonia is condensed to a liquid. The boiler is then placed in cold water, and as its temperature falls the pressure in the apparatus is relieved and the liquid ammonia in tlie refrigerator vaporizes rapidly, thereby The temperature to which the boiler must be raised at first is determined by the condition that the pressure in the boiler must correspond to the pressure of the ammonia vapour at the temperature of tle condenser. Now the pressure of ammonia vapour increases from 84 atmospheres at 20° ©. to 11$ at 30° C.; and this higher pressure is extremely difficult to keep up in such an apparatus as Carré’s, because of inevitable leakage. In warm countries, accordingly, the ammonia-macliine is practically useless because of the high pressures required ; andin temperate climates, where natural ice can be stored

throughout summer, an ice-machine is hot in such great demand. One great drawback to the efficient working of Carré's machine is the difficulty of keeping the refrigerating liquid free of water—only 75 per cent. of it being ammonia. To remedy this defect Reece inventcd his machine (1869). The essential part of this ingenious apparatus is an upright cylinder in which a descending current of strong ammonia solution, drawn originally from the boiler, is met by an ascending current of steam. The ammonia is thus separated from the water, and is driven off into a rectifier, from which, after being freed from any small quantity of water it may have carried along with it, it passes into a condenser where it is kept liquid by its own pressure. It is then allowed to collect

_in the refrigerator, where at the required moment the pres- 1850, Harrisou's machine (1857), Siebe's machine (1862), —

sure is relieved, permitting the ammonia to vaporize and escape to a separate chamber to be redissolved. Brine flowing through a coiled tube within the refrigerator is used as the vehicle for the cold produced; or even mere water may suffice if the object is simply to get a diminished temperature without freezing. Linde's ice-making machine, some twenty-two of which were in operation at the Diissel- dorf Exhibition of 1880, is the latest form of ammonia machine ; and its inventor claims for it superiority over all others as an economical refrigerator. The danger of explosion, one of the great disadvantages of ammonia, is obviated by carrying the liquefied gas through narrow iron tubes and by employing only a small quautity of the substance at one time. Blocks of ice are formed between

_ the spokes of a revolving drum, which, cooled internally

_by the evaporating liquid, dips into a tank of water,

Methylic ether is in some respects better than ammonia, having a higher boiling point, and requiring smaller pres- sures, without the necessity of heating. In Tellier's machine (described in the Annales de Chimie et de Physique for 1874), which is specially suitable for usc on board ship, the methylic ether evaporates in a closcd metallic vessel, the sides of which are in immediate contact with the water to be frozen or chilled.

Sulphurous acid, first successfully employed as a refriger-

Tce trade.

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ating agent by Pictet of Geneva (1876), and thereafter applied by Gamgee to the formation of his glaciarium or artificial skating rink, is in many respects far superior to any other known refrigerator. Thus it is more easily liquefied than ammonia and methylic ether, exerting a vapour pressure of only 43 atmospheres at 30° C. 3 it lias no chemical action upon metals or fats ; it is incombustible ; it is obtainable at small expense ; and it has, besides, good lubricating properties ;—in short, it seems to possess all the essentials of an efficient and economical refrigerator. In Pictet's machine, the liquid sulphurous acid passes under pressure from the econdeuser to the refrigerator, where on the pressure being relieved it vaporizes, cooling to ~~7° C. a current of brine which then flows round the tanks containing the water to be frozen. The sulphurous acid gas in the refrigerator is drawn over by an aspirating force~~ pump and recondensed in the condenser, which is kept cool by an ample supply of cold. water. By a special modification of the sulphurous acid machine, Pictet obtained as low a temperature as ~~73° C.; under this low tempera~~ ture he then compressed carbonic acid gas to a liquid, by the evaporation of which he produced such inteuse cold as to enable him to liquefy the so-called permanent gases under a pressure of several hundreds of atmospheres (Bibliotheque Universelle, 1878). Gamgee uses as his congealing liquid a solution of 4 parts of glycerin in 6 parts of water, which is conveyed in pipes beneath the water-surface to be frozen.

Machines which are capable of freezing water may in certain circumstances be much more efficiently employed to produce cooling without freezing. or instance, in curing- houses, breweries, sugar refineries, provision stores in hot climates, and in ships engaged in the transport of meat, where it is of importance to have the temperature moderately cool, it is usually by no means necessary to obtain ice. In many such cases, indeed, the production of ice would be a mere waste of labour. In tropical and subtropical climates refrigeration is of high importance from a°sanitary point of view ; and there seems little doubt that if a simple, economical, and thoroughly efficient means of cooling were discovered, houses would be cooled in warm

weather with the same care and regularity with which they are when uecessary heated. At present, however, the manufacture of ice and the artificial production of cold are arts still in their infancy, which have a powerful rival in the extensive and increasing ice-trade that has sprung up within the last half century.

The idea of trading in ice first occurred to a Boston merchant, named Tudor, who in 1805 shipped ice to Martinique. In 1833 American ice began to be imported into Calcutta, where it was sold for 3d. per pound—exactly half the price of the Bengal manufactured ice. In America, which was for long the great ice-exporting country of the world, supplying especially the West Indies, India, and China, the cutting and storing of ice form an important industry during the winter months. When the ice is suffi- ciently thick, 9 to 12 inches for home consumption, 20 inches for exportation, the surface is scraped free of all porous ice, and is marked out into squares of 5 feet each way. Along these lines the ice is grooved to a depth of 3 inches by means of a plough. An instrument like a harrow is drawn over the grooves so as to deepen them ; and, after the surface has been divided into smaller squares, the ice is cut up into blocks by means of handsaws. The blocks are then removed to large double-walled storehouses, many of which are capable of containing thousands of tons of ice, It is estimated that, in America, 2,000,000 tons of ice are cut and stored annually by compauies supplying New York and the middle States. New York city alone consumes as much as 500,000 tons perannum. A considerable quantity of ice from Wenham Lake near Boston was at one time imported

into Britain, but now the whole supply comes from Drobak near Christiania in Norway. The Norwegian ice is remark- ably solid and pure, and is superior in its staying power to English ice or to manufactured ice, The total quantity imported into the United Kingdom may be estimated roughly at 150,000 tons per annum, of which, the greater part is consumed in London, where it is retailed at from Ys. 6d. to 3s. 6d. per ewt. At present Norway is undoubtedly the great ice-store for the Old World; and quite recently (1880) Norwegian ice has been sold in the United States more cheaply than native ice. The transport on board ship offers practically no

difficulty, since, as long as the hold is kept dry and cool, there is very little loss, and in the lading no special care need be taken. For the storing in houses, see Icz-Houss. (c. GK.) ICEBERG, a floating mass of ice, which has broken off from such ice-sheets as cover Greenland, Spitzbergen, and other polar lands, constituting vast glacier systems ever crecping out and down from the central heights to the shores. As the glacier is pushed out to sea, the lower margin is exposed to the destructive action of the waves, and breaks up into fragments of endless variety of form. These severed blocks, many of which arehundreds of millions of tons in mass, drift to lower latitudes under the influence of polar currents, and gradually melt away in the warmer water. § Such is the natural history of icebergs, which, in their freshwater origin, are to be distinguished from the ice-fields, ice-floes, pack ice, and ice-hummocks, so familiar to the polar voyager. The iceberg, as it drifts along, melts most rapidly under water; and this unequal wasting must be accompanied by a change in the position of the centre of mass and a consequent shifting of the iceberg into its new position of equilibrium. Undermining and fracture also result; so that at length the mass of ice, however square-shaped or symmetrical it may have been originally, assumes a form irregular and fantastic in the extreme. The densities of ice and sea-water are nearly "92 and 1:03 respectively, so that only ~o3 or nearly jth of the iccberg is above water and visible. An iceberg observed by Sir John Ross and Lieutenant Parry was 2} miles long, 21 miles broad, and 153 feet high. Assuming the form to have been approximately a cone erected upon an elliptic base, the mass above water would be roughly 150 million tons—giving a total mass of nearly 15 hundred million tons, This iceberg, however, was by uo means of extraordinary dimensions. In the southern seas, great fleets of icebergs have been observed as far north as the latitude of Cape Horn; and some of these ice masses have towered to a height of 700 or 800 feet. The limiting latitude to which icebergs drift is lower in the southern than in the northern hemisphere, probably because of the comparative scarcity of land in the south polar regions. Thus, icebergs have been observed off the Cape of Good Hope in 34° 8. lat., while none has been noticed in the northern hemisphere lower than the 36th parallel. Generally speaking, the limiting latitudes may be fixed at 40° N. lat. and 35° S. lat. In the North Atlantic the distribution of icebergs is very remarkable, and indicates, in its peculiar way, the general set of ocean currents. _Ice- bergs, of course, can only drift along with some polar

current,—such, for example, as the Labrador current, which flows in a generally southerly direction round the coasts of Newfoundland and Nova Scotia. To the east of this track, in which icebergs abound during the early summer months, lies the region which is warmed by the waters of the Gulf Stream as it flows to the Scandinavian coast, and here floating ice is rarely seen. The same considerations regard- ing prevailing currents determine the distribution and limit of icebergs in the southern oceans, the great antarctic current that cools the coasts of Chili and Peru bearing upon

its broad expanse the fragments of the shining ice-cliffs of The climatic effect of an iceberg is some- times very marked ; and not unfrequently the lowering of the temperature indicates to the mariner the presence of floating ice even before it is near enough to be visible. great transporting agents, bearing away to the deep sea rocks, boulders, and stones, which are strewn along the ocean bed By this cause, rather than by the glacier in its integrity, some erratic blocks may doubtless have been transported at a time when the land was under

South Victoria.

Geologically considered, icebergs, like glaciers, are as the ice gradually melts.

water and exposed to ice-drift.

ICE-HOUSE. An ice-house, to supply ice for domestic use during the summer months, is one of the desirable The old form of ice- house was a well several feet deep, dug out on sloping

adjuncts of a country residence,

ground or against a bank. The bottom was made to slope towards a sunk drain, covered by an iron grating, to per- mit the water from the melted ice to pass away quickly ; while a dip in the drain or a bend in the pipe prevented air from entering at the bottom of the well. The ice was filled in through an opening in the dome, which had to be carefully closed.

A good form of ice-house is that recommended many years ago by Mr Bailey, gardener at Nuneham Park, Oxford, and described in the Gardener's Magazine of Botany (i, 82). This honse is shown in section and plan in fig. 1, where the dotted line indi- r cates the ground level. The well or receptacle for the ice @ is 10 zes8 fest 6 inches wide €%: at the base, and 3 feet wider near – the top ; the walls are hollow, the outer portion be- ing built of dry rough stone, and the inner wall and dome f of brick. The outer wall 6 might be replaced by a puddling of clay, carried up as the work pro- ceeds. Over the top is a mound of clay and soil g, which is planted ° with shrubs to keep the surface coolinsummer, 'The drain i carries off the water formed by the melted ice, and is provided with a trap h to pre- vent the ingress of air through the drain. There is a porch or lobby 6 provided with an outer and an inner door c, c; and there are apertures at d, d, to get rid of the condensed moisture, which, if not removed, would waste the ice. These ventilating doors should be opened every night, and closed again early in the morning. The most important conditions to be secured are dryness of the soil and of the enclosed atmosphere, compactness in the body of ice, which should be broken fine and closely rammed, and the exclusion as far as possible of air.

The Americans, who use large quantities of ice, always

oe

Fig. 1.

store it above ground. One of their ice-houses, of which

the elevation is shown in fig. 2 and the plan in fig. 3, described in Allan's Rural Architecture, is both simple and ornamental in character. The house may be 12 fect square,

or any larger size. A series of posts in pairs are set up 13 feet apart and 8 feet high, about 1 foot being inserted firmly in the ground; the distance between each pair is 3 feet. The tops being cut level all round, a plate 6 inches wide aud 4 to 6 inches deep is spiked on to each line of posts, the

two plates being strongly stayed by cross pieces so as to form a double frame. The inner face of each line of posts is now boarded up closely, leaving a space 64 feet by 3 feet at the sides, which are also boarded, to form a door-casing on each side. The spaces between the two lines of boards thus form acontinu- ous box, which is to be com- pletely filled up with moist tan, bark, or saw- dust, well pack- ed throughout. © There must be =

a drain tocarry Fig. 2.

off all water from the interior. Within the enclosed space some level joists are laid down, and on them loose planks to form a floor, which when covered 1 foot thick with straw is ready to receive the ice. The roof is formed of rafters, 4 inches by 3, long enough to project at least 4 feet outside the plates, to which they must be well secured by spikes. The rafters are tobe boarded over and covered with shingle, and a_ small opening left at the top to adniit a pipe 8 inches in diameter for a ventilator,over which a small ornamental cap, supported on four little Fig. 3.

posts, is to be placed. Asa finish to the projecting roof, brackets of 3 by 4 inch scantling, if the joists are of sawed stuff, or of rough limbs of trees to match the posts, if these are rough, may be introduced. After the ice is stored, a. close floor of boards should be laid on joists resting loosely on the wall plate (to admit of this upper floor being removed while the house is being filled), and they must be covered with 6 inches of tan or sawdust, or failing these with straw.

A still less expensive way of storing ice has been de- scribed by the late Mr Pearson of Kinlet in the Gardener's Journal (iii. 10). In this case the ice-stack was made on sloping ground close to the pond whence the ice was derived. The ice was beaten small, well rammed, and gradually worked up into a cone or mound 15 feet high, with a base of 27 feet, and protected by a compact covering of fern 3 feet thick. A dry situation with a sloping surface is necessary where this plan is adopted, and a small ditch should surround the heap, to drain away any water that may come from melted ice or from other sources.

Coast.

Interior.

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ICHELADWD

Plate IV. hee (in Danish, Island) is an island in the North |

Atlantic Ocean, immediately to the south of the polar circle, It extends from 63° 23’ to 66° 33’ N, lat., and from 13° 22' to 24° 35’ W. long. Its distance from the north of Scotland is 500 miles, from Norway 600 miles, and from Greenland 250 miles, The greatest length of the island is 300 miles, from east to west, and its greatest breadth 200 miles. The area is estimated at 39,200 square miles, 7000 more than that of Ireland.

The geological formation of the island is throughout vol- canic, It rests ona foundation of palagonite, or palagonite tufa, called in Icelandic “ méberg” ; aud on this foundation

*are raised plateaus of basalts, aud monntains of trachyte | The whole island seems to_*

and other volcanic ejections. have been filled up by volcanic agency. In some of the mountains the lavas occur in tolerably regular parallel strata or terraces, separated here and there by layers containing lignite, as in the similar volcanic plateaus of Faroe and Greenland.

The whole of the south coast, from Hornafjérdur in the south-east to Reykjanes in the south-west, is entirely un- broken by bays or firths. If such ever existed, they have been filled up by the glaciers and the sand and mud carried down from the volcanic ice-mountains situated close to the south coast. The coast-line is not, however, a straight liue, but a broad arch, as the land swells out in the middle south- wards to a considerable extent. On the north of Reykjanes a broad bay called Faxafléi (Faxi's Bay) cuts into the land ; it is bounded on the north side by Snefellsnes, and_has an area of 54 miles by 30. On the north side of Sne- fellsnes the long Breidifjérdur (Broadfirth) nearly cuts off the north-west peninsula from the rest of the island ; it is 80 miles long and 40 broad. The Breidifjorour is noted for its great number of small islands, most of them in- habited, and all of them affording breeding places for the eider duck. To the north of the Brei¥ifjérdur, innumerable bays cut into the peninsula at every turn, giving it some- what the look of the outstretched hand of a man; the longest of these is {safjardardjup (Icefirthdeep), 45 miles long. On the north side of the island, between Horn (Cape North) on the west and Melrakkaslétta (Fox Plain) on the east, there are several large firths. Furthest to the west is Hunafléi (Bearcubs' Bay), about 60 miles long, which nearly meets the Breidifjordur running in from the west; the tongue of land which separates them and con- nects the north-west peninsula with the rest of the island is hardly 5 miles broad. The other firths on the north side are Skagafjordur, Eyafjérdur (Firth of the Isles) 36 miles long, Skjalfandafjordur, and Axarfjordur (Axefirth). The Melrakkaslétta is separated from Langanes, the north-east point of Iceland, by the Jistilfjoréur (Thistlefirth). The whole of the east coast of the island is indented by numer- ous narrow firths like those found in the north-west peninsula, but none of them are of any great

length. Sailing round the island from point to point, the distance is 900 miles, but if we follow the coast-line it is not less than 2000 miles.

The centre of the island is a table-land, or rather a broad flattened ridge, sloping down to the north and the south, the average height of which above the level of the sea is about 9000 feet. It consists of arid sands and rugged tracts of lava, the most important of which bear the names of OdadSahraun (the Lava of Evil Deeds), Sprengisandur (Bursting Sand), and Stdrisandur (Big Sand). This wilder- ness is frequently broken by high and extensive ice-hills called jékull (plur, jéklar). The ice hills rise to the greatest

height in the south-east, where the most extensive ice-field in the island, called Vatnajékull, covers about 4000 square miles, The outliers of this ice-field come close down to the water, hardly leaving room for passage between them and the sea; some of these are the loftiest summits in the island, as Oreefajokull, which is 6466 feet high. South of the west end of the Vatnajokull, called Skaptarjokull, stretches an inhabited slope, interrupted by several small hills, and intersected by considerable streams. The east-most part is called Siéa; then follow Landbrot, Me@al- land, and Alptaver. West of this the land rises again in the Mfrdalsjékull and the Eyafjallajokull, the latter being 5593 feet high, and here again the mountains come close down to the sea, West of the Eyafjallajokull is the largest plain in the island, stretching westward to the mountain chain terminating in the low cape of Reykjanes, and backed on the north side by several isulated mountains, among which the far-famed Hecla is prominent; its height ap- proaches 5000 feet. This plain consists of stretches of grass land and marshes, affording abundance of grass for pasture and haymaking.

The southern and part of the eastern coasts of Faxafldi, as far as Reykjavik, are very barren and desolate, being almost entirely rugged lava tracts; but the lower parts of the hills then begin to be clothed with grass, affording pasture for sheep, cattle, and horses. North of Reykjavik is a long and narrow firth called Hvalfjoréur (Whalefirth), and further on a shorter one called Borgarfjérdur (Burgh- firth), Between the extremity of the latter and the central highlands there is a large and fertile district, consisting of grassy valleys, divided by low hills, and an extensive plain covered with marshy grasslands. This district is a fair specimen of many of the inhabited

parts of Iceland. The level land, the valley bottoms along the river banks, and in many cases the slopes of the hills, are covered with grass, but the soil is too frequently boggy and marshy. The hills are partly covered with heather, and in a few places with stunted dwarf birch. Districts similar in character to Borgarfjérdur are the Dalir (Dales) on the south side of Breidifjordur, the Hunavatnssfsla on the south side of Hiinafidi, the Skagafjordur, the F]jétsdalshéraé on the east side of the island, and the western half of the plain lying between Eyafjallajokull and the Reykjanes range of mountains. The north-west peninsula consists, as already stated, of narrow firths divided by high and narrow mountain ridges, seldom lower than 2000 feet. In some places the top is a thin rocky edge; in others it consists of sharp-pointed peaks, denuded of all vegetation. Even at a consider- able distance the different rocky strata may be distinguished. Sometimes these hills, or rather cliffs, rise perpendicularly out of the water to a height of a couple of thousand feet, affording breeding-places to an immense number of sea-fowl. More frequently the lower parts of these razor-backed hills slope towards the firths, the stony slopes being partly covered with grass or heather. The farms are therefore found along the shores and in short valleys cutting into the hills from the ends of the firths. The east coasts of Iceland present exactly the same character as that of the north-west peninsula. From the end of Eyafjordur a long and fertile valley, bounded on both sides by lofty moun- tains, runs due south into the country for about 25 miles. The north-east corer of the island, called Pingeyarsysla, has good sheep pasturage, although its hills and slopes are covered with heather instead of grass to a greater extent than most other districts of the island. It will thus be seen that the inhabited parts run round the coasts, and from

the end of the bays into the interior, the farms farthest inland being about 50 miles from the sea.

As the suow-line is at an altitude of from 2500 to 3000 feet, all the highest mountain-tops are cones covered with perpetual snow. Besides the ice-mountains already men- tioned, there are several on the western part of the

central highlands, such as Hofsjékull, Langjokull, Eiriksjokull, &c.; Sneefellsjékull, at the point of the peninsula separating the Faxafldi and Breidifjérdur, reaches the height of 4713 feet. All these mountains are snow-capped. Most parts of the island are studded with hills ranging in height from 2000 to 3000 feet. The tops are usually bare and rocky, but the slopes are to some extent covered with grass and heather.

Most of the mouutains of Iceland have been volcanoes, and at least twenty-five of them have been active within the historical period of the island, that is, the last 1000 years. It was observed by Mackenzie that there are two volcanic formations in the island, one consisting of flat sheets of basalt, the other of more irregular hilly accumulations of trachyte, obsidian, ashes, and other volcanic masses. The former of these, there can be little doubt, is of Tertiary age—a part of the great Miocene volcanic plateaus, which on the one hand extend southwards through the Faroe Islands and the west of Scotland to the north of Treland, and on the other stretch northwards and westwards far into Greenland, The other volcanic masses are of recent date. Iceland has thus been the theatre of volcanic activity at two widely separated periods, though we do not yet know whether during the interval the activity was wholly dormant. Of the existing volcanic mountains the best known is Hecla, from which eighteen eruptions have been recorded; the last took place in 1845-46. The intervals between the eruptions have varied greatly ; some- times it has remained quiet for six years only, at other times for seventy-two years. As with most other volcanoes, the height of this mountain varies with the eruptions. Thus before the eruption of 1845 its height was given on Gunlaugsson's map as 4951 feet, while Kjerulf measured the mountain in 1850, and found it to be only 4532 feet. The earliest historical eruption, that of 1104, is celebrated as the "sand-rain winter," the second, in 1158, as the " great darkness," from the quantity of ashes ejected. One feature of the Icelandic eruptions, not from Hecla only, but from other orifices in the island, has been the prodigious quan- tity of fine dust discharged and the great distance to which this material has been carried. Thus iu the year 1766 a column of ashes rose out of the crater of Hecla to a height of 16,000 feet into the air. Volcanic dust from the Icelandic vents has frequently been borne by upper air currents so as to fall upon the Faroe Islands, and has even been carried in considerable quantities as far as Norway on the one side and the north of Scotland on the

other. Next to Hecla, the Katla, or Kétlugja, in Mfrdalsjékull may be mentioned; its last eruption (the thirteenth known) took place in 1860. The most tremendous volcanic outbreak in Iceland was that which took place in 1783 in or near the Skaptarjékull, on the north-west border of the Vatna-jokull. Two principal lava streams flowed from it: one of them was 50 miles in length, from 12 to 15 miles in breadth, and 100 feet deep, and the other was 40 miles in length. It has been calculated that these two streams cover an area of 420 square miles. This eruption de- stroyed directly or indirectly one-sixth of the inhabitants of the whole island, or one-half of all the live stock. From nearly all the outliers of the Vatnajdkull eruptions now and tken take place. To the north of Vatnajokull a range of volcanic centres extends as far as Myvatu. The last out- break here took place in 1875, when fine volcanic dust was discharged in great quantity, some of it being carried as far as Norway. The sea around the coasts of Iceland has

been frequently disturbed by volcanic outbreaks, especially off Cape Reykjanes.

On account of the same volcanic activity, hot springs are Hot frequently met with throughout the island. The common springs.

name for them in Icelandic is “ hverr” (cauldron),

chief of these hot springs is Geysir (Gusher). GEYSERS,

The See

The only mineral worked to any extent in Iceland is Minerals.

sulphur; the principal mines are those of Krisuvik and Myvatn. Of the Iceland spar used for polarizing optical instruments, only one mine has been worked, tliat of Helgustadir in the east of the island. Limestone is found near Reykjavik, and has been worked a few years. Iron- ore is found in many parts of the island, but not in paying quantities, as suitable fuel is wanting. Aluminium occurs uear Cape Reykjanes, but no attempt has heen made to work the mine. Coal has also been found in one place, but has not

been worked. ‘There are considerable quan- tities of lignite, called in Icelandic surtarbrandur, in the north-west peninsula ; some successful attempts have been made to use it as fuel, but it has not been worked to any extent. Peat isfound, and is used as fuel, in most parts of the island.

Iceland is rich in streams and rivers, some of them Rivers,

carrying a large volume of water; as, however, the fall is steep in every case, they are not navigable even by small boats. The longest are Pjérs4, running southwards from the central highlands, and Skjélfandafijét and Jokulsé & Fjéllum in the north-east, running northward. The last- named river is 113 miles in length, the other two 108 miles each. Of other rivers may be mentioned the Hvita, part of which is called Olfus4, running nearly parallel with pjors4, Hvité in Borgarfjordur, Blanda running into Hina- fidi, Héradsvotn in Skagafjérdur, and Lagarfljét in the east, There are several rivers named Hvit4 (white river), so called from their milky waters, caused by the glacial mixtures carried down from the highlands. The principal waterfalls are—Skégafoss and Seljalandsfoss, south of Eyafjallajokull, Godafoss in Skjalfandafljdt, and Dettifoss in Jékuls4 4 Fjollum. Of the lakes Pingvallavatn, about 25 miles north-east of Reykjavik, and Mfvatn in the north-east of Iceland are the largest. The former is 25 miles in circumference, and the latter 36 miles ; its waters are studded with thirty-four small islands, affording breed- ing-places to a large number of water-fowl.

The climate of Iceland is not nearly so severe as might Climate.

be supposed from the latitude. At Reykjavik the mean temperature of the year is 39° Fahr., of the summer 53° and of the winter 29° 18’, The temperature of Akureyri is 32° for the year, that of the summer 45° 5’ and the winter 20° 7’. There is therefore great difference between the north and the south of the island. Another difference may also be noticed; while the climate of the south ig wet and variable, that of the north is dry and regular. The mean temperature of different years sometimes varies as much as 10°, and the mean temperature of the same month has been known to vary as much as 27°. One feature in the climate has been noticed by all travellers, that is, the clearness and purity of the atmosphere, rivalling that of Italy, mountains being seen distinctly at a distance of 100 miles. The rainfall is

considerable in the south and the east of the island, and snow-storms and gales are frequent in winter. Thunderstorms occur mostly in winter.

No cereal is grown in Iceland, but in some places there Vegeta- is found a kind of wild oats (Avena arenaria), called in tio.

Icelandic " melur." Potatoes, carrots, turnips, and several

kinds of cabbage have lately been cultivated with consider-

able success. The grasses, wild and cultivated, are of the

greatest importance to the inhabitants. The only trees

found are the dwarf birch, rarely higher than 12 feet, and XIT. — 78

Animals.

Tillage.

Live stock.

Manu- factures.

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some willow and juniper bushes. The wild flora of Ice- land is small and delicate, with bright bloom, the heaths being especially admired. Wild crowberries and bilberries are the only kind of fruit found in the island.

The only wild animal in Iceland is the fox, of which both white and blue varieties occur; they are hunted for thei: skins, and also because they often attack the sheep. The domestic animals are the cow, the horse, the sheep, tlie dog, and the cat. The cows are of a small breed, resembling English shorthorns in general, and especially Alderneys. The horses are also of a small breed, the average height being twelve hands; they are hardy and enduring ; many of them are never housed, and forage for themselves as best as they can throughout the winter. They are exported to Great Britain in considerable numbers, for use in the coal mines, The sheep generally are

of nearly the same size as the Scotch blackfaced sheep; they are not unfrequently secn with three or four horns. The genuine Iceland dog, with his pointed snout, short ears, curled tail, and short legs, has some resemblance to the Esquimaux dog and the Scotch collie. Reindeer were imported in the last century, but they fled to the mountains and became wild; they are now nearly extinct. There are said to be ninety different species of birds, fifty-four of them being water-fowl. The most remarkable of the birds of prey are the Icelandic falcon (Falco islandicus) and the eagle. The only game bird is the ptarmigan, which is brown in summer and white in winter. Of the water-fowl the eider duck is of the greatest importance on account of its valuable down ; the killing of it is therefore forbidden by law. Immense numbers of gulls, puffins, and guillemots are seen near their breeding places on the small islands and on the cliffs round the coasts. The hooper, or whistling swan, is found in large numbers in Iceland. The sea round the coast teems with cod, haddock, holibut, and the basking shark ; the fin- backed-whale and seals of various kinds are also met with, but in smaller numbers. In the lakes and rivers salmon and trout are caught in considerable quantities.

As no corn is grown, there is no agriculture to speak of, and only a little spade husbandry connected with the cultivation of kitchen gardens, where potatoes, turnips, and carrots are grown. The area thus under cultivation covers, according to the latest official returns, about 215 English acres throughout the island. The cultivation of the soil in Iccland can hardly indeed be said to have been at- tempted; such experiments, however, as have been made, have given good hope of success. Around every farmhouse is a field called "ttn," which is but rarely enclosed or fenced. This is the only part of the land which is cultivated at all, and all that is done there is to spread dung on the top of the soil in autumn and scrape it off in spring. Even this most primitive cultivation makes the grass twenty-five to fifty per cent. better than elsewhere. The haymaking season extends from the middle of July to the 20th of September. The grass is cut with small scythes, first in the home field, and then on the uncultivated grass-lands belonging to the farms. Many of the fishermen hire themselves to the farmers during the haymaking season ; and during the fishing season the farmers send their servants to the sea-coast to fish.

According to the latest official returns the cattle in the island numbered 20,378, the horses (ponies) 31,312, and the sheep 415,339. It is obvious, however, from the quantities of wool exported that the number of sheep must be at least double that stated in the returns.

The manufactures are confined to spinning, weaving, and knitting the wool of the sheep. A sort of tweed, called in Icelandic " vadmal," is the principal clothing of the inha- bitants. The spinning of the yarn is done by the women in winter, and almost every farm has an old-fashioned loom.

[CcHRLARD

In the north considerable quantities of jackets and stockings are knitted and exported.

The teade with Iceland is entirely in the hands of Danish Trade.

traders and a few Icelanders—who mostly reside in Copen- hagen. It consists almost entirely in exchange, or barter. The principal exports of the Icelanders are cod fish, about 6,000,000 ib annually; train oil, 9500 barrels; wool, 1,500,000 tb; eider down, 7000 Ib; and feathers, 20,000 Ib. Ponies are now exported to Scotland,—about 2000 a year; and a few cargoes of live sheep have been sent over during the last two years. All bread stuffs have to be imported, as well as groceries, spirits, wines, and beer, tobacco, salt, building materials, and other items. Since 1854 the trade has been open to all nations; but any vessel trading with Iceland had to take out a sea pass at the cost of 2s. 3d. per ton down to 1879, when this duty was abolished. On the other hand, a trifling duty has been laid on spirits and tobacco.

There being no roads in the island, but merely tracks Commu- trodden down by the feet of the ponies, there are no carts nication. nor carriages of any description. In the firths boats are chiefly used for conveying goods and passengers ; but all inland communication and conveyance is by ponies. These hardy animals carry each a burden of about 200 Ib weight, under which they walk about 25 miles a day. All travel- ling is also on ponies; two are considered necessary for every traveller, and on them he can make from 30 to 40 miles a day.

Formerly Iceland was divided into four quarters, the Divi- east, the south, the west, and north. Now the north and sions, the east are united under one governor, and the south and the west under another. 'The island is further divided into 18 s§slur (counties), and these again into 169 hreppur (rapes) or poor law districts. Ecclesiastically Iceland con- stitutes one bishopric, divided into 20 deaneries, and these again into 290 parishes.

Iceland is subject to the king of Denmark. According to the constitution granted to Iceland in 1874, the king shares the legislative power with the Al-thing, an assembly of 36 members, 30 of whom are elected by household suffrage, and 6 nominated by the king. The Al-thing meets every second year, and sits in two divisions, the upper and the lower. The upper division consists of the 6 members nominated by the king and 6 elected by the representatives of the people out of their own body. The lower division consists of the remaining 24 representative members.

The secretary for Iceland, who resides in Copenhagen, is responsible to the king and the Al-thing for the maiutenance of the constitution, and he submits to the king for confirma- tion the legislative measures proposed by the Al-thing. The king appoints a governor-general, who is resident in tlic island and carries on the government on the responsibility of the secretary in Copenhagen. Under the governor-general (landshéfSingi) are two under governors, one for the south and west, another for the north and east. Under these arc the sheriffs (s¥slumenn), who act as tax gatherers, notaries public, and judges of first instance; the sheriff has in every "hreppur" an assistant, called " hreppstjori." In every hreppur there is also a representative committee, consisting of from three to five members, who administer the poor laws, and look after the general concerns of the hreppur. These committees are controlled by the committees of the syslur (county boards), and these again are under the control of the amtsra% (quarter board), consisting of three members.

The administration of justice is carried out in the first Justice. instance by the sheriffs. From the sheriff courts appeals lie to the superior court at Reykjavik, consisting of three judges. Appeals may be taken in all criminal cases and most civil cases from this court to the supreme court at Copenhagen.

Govern- ment.

Religion.

Educa- tion.

National charac- teristics,

ICELAND

The state church of Iceland is the Lutheran; and all the Icelanders, without exception, belong to it. One bishop and 141 clergymen minister to the spiritual wants of the islanders. The bishop is appointed by the king. The parishes are 290, but the livings are only 141, from which it may be seen that many ministers have to serve two, aud some even three parishes. The king appoints some of the ministers, and the governor-general others, with the advice of the bishop. The ministers are paid partly from the revenues of church property, and partly from tithes.

The Icelanders have long been famous for their educatiou and learning, and it is no exaggeration to say that in no other country is such an amount of information found among the classes which occupy a similar position. A child of ten unable to read is not to be found from one end of the island to another. A peasant understanding several languages is no rarity, and the amount of general information which they possess might be envied by many who have had greater facilities for acquiring knowledge. Till within the last few years there were no elementary schools in the island; all children were taught by their parents or near neighbours. Now a few elementary schools have been started, but their number is still too small to make any general difference in the education. Tor classical and general education there is a college at Reykjavik, with seven professors and about one hundred students, There is also a college for ministers, with three professors. The general physician of the island, assisted by two medical men, gives lectures to medical students ; but those who propose to enter the legal profession have to attend the university of Copenhagen.

There is less difference in the material prosperity of the Icelanders than in that of the inhabitants of more advanced countries. One does not find the

abject poverty so often seen in large towns and among the agricultural population of some of the most civilized countries of Europe. On the other hand, wealthy men, or owners of extensive properties, are unknown, the richest man in Iceland deriving only £300 a year from his property. Although no abject

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poverty is seen, there are more paupers comparatively than in more populous countries, aud the poor-rates in many parishes exceed all the other taxes put together. The Icelanders are often too liberal in granting relief, which in many cases breeds idleness, carelessness, and want of forethought. It is also to be noticed that in few countries is it so easy to live with as little labour as in Iceland. On account of the climate, out-of-door work cannot be conducted for more than five months of the year at most, but even this time is not used with so much energy and skill as it might be. The haymaking, carried on for two mouths in the year, is the only work which is prosecuted with anything like energy. Fishing is prosecuted not continuously but periodically. The want of activity among the Icelanders is to be ascribed partly to their slow tem- perainent, and partly to their utter want of training. They are very foud of gathering any amount of miscellaneous information, but their want of training prevents them from turning it to practical account. There is no doubt that they are endowed with intellectual faculties of a superior kind, and, with proper training, might make far more of their country than they do at present. It appears that the island could easily support eight times the number of the present population, if its resources were properly developed. Crime is rare ; and the moral character of the Icelanders is about the same as that of the other countries of the north,

The census of 1870 returned the population of the island as 69,763. In 1801 the population was only 46,240; in 1880 it is estimated to have increased to 73,000. The birth-rate is about 33 per thousand, and the death-rate 24. Nearly the whole of the population live on isolated farms, the number of each family, including servants, being on an average seven. 'The chief town or village is Reykjavik, with about 2500 inhabitants. It is the seat of the governor-general, the bishop, the colleges, and the superior court. In the

north-west is fsafjér3ur, with about 400 inhabitants, and in the north Akureyri, with the same number. (3. A. H.)

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HIsrory.

With its isolated situation, inclement climate, scant natural advantages, and sparse population, Iceland is yet of high interest to the historian, philologist, and Jittérateur. To the first the excellence and exactitude of its historical records, the curious phases of life to which they bear witness, and the singular circumstances which have

Tlome rule granted.

determined the existence and life of the Teutonic community for a thousand years apart from the rest of the European family, are all attractive. By the philologist the island is reverenced as the home of a tongue which (though like our own it has suffered deep phonetic change) yet most nearly represents in a living form the tongue of our earliest Teutonic forefathers. And by many more than these | students Iceland is fondly regarded as the land where, long before

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the “literary eras” of England or Germany, a brilliant period of intellectual life produced and elaborated in its own distinct form of expression a literature superior to any north of the Alps before the Renaissance since the downfall of Old Rome in power, purity, and life.

To begin with history, in which we are chiefly concerned with the first and fourth periods of the island’s inhabited existence, and first the “settlement.” Shortly after the discovery of Iceland by the Scandinavian, ¢. 850 (it had

long becn inhabited by a small colony of Irish Culdees), a stream of iinmigration set in towards it, which lasted for sixty years, and resulted in the establishment of some 4000 homesteads scattered round the habitable fringe about the great bays and firths.

In this immigration three distinct streams can be traced. (1) About 870-890 four great noblemen from Norway, Ingolf, Ketil Heng, Skalla-Grim, and Thorolf, settled with their dependants in the south-west of the new found land. (2) In 890-900 there came from

the Western Islands Queen Aud, widow of Olaf the White, king of

Dublin, preceded and followed by a number of her kinsmen and relations (many like herself being Christians), Helgi Biolan, Biorn the Eastern, Helgi the Lean, Ketil the Foolish, &c., who settled the best land in the island (west, north-west, and north), and founded fami- lies who long swayed its destinies. Besides this most important immigration of all there came from the Western Islandsa fellowship of vikings seeking a free home in the north. They had colonized the west in the viking times; thcy had "fought at Hafursfirth," helping their stay-at-home kinsmen against the centralization of the great head-king, who, when he had crushed opposition in Norway, sailed after these turbulent colonists across the North Sea, and followed up his victory by compelling them to bow to his rule or fly again to fresh with his projects. Such were Ingimund the Old, Geirmund Hellskin, Thord Beardie (who had wed St Edmund's grand-daughter), Audun Shackle, Bryniulf the Old, Uni, to whom Harold promised the earl- dom of the new land if he could make the settlers acknowledge him as king, a hopeless project, and others by whom the north-west, north, and east were almost completely "claimed." (3) In 900-980 a few more incomers direct from Norway completed the settlement of the south, north-east, and south-east. Among them were Earl Hrollaug (half brother of Hrolf Ganger and of the first earl of Orkney), Hialti, Hrafnkcll Frey's priest, and the sons of Asbiorn. Fully 'three quarters of the land was settled from the west, and among these immigrants there was no small proportion of Irish blood. In 1100 there were 4500 franklins, i.¢., about 50,000 souls.

The unit of Icelandic politics is the homestcad with its franklin- owner (buendt), its primal organization the hundred-moot (thing), its tie the

godord or chieftainship. The chief who had led a band of kinsmen and dependants to the new land, taken a "claim"' there, and parcelled it out freely among them, naturally became their leader, presiding as priest at the temple feasts and sacrifices of heathen times, acting as president and speaker of their moot, and as their respon- sible representative towards the neighbouring chiefs and their clients. He was not a feudal lord nor a local sheriff, for any franklin could change his goSorS when he would, and the rights of "judgment by peers" were in full use ; moreover, the offfte could be bequeathed, sold, divided, or pledged by the possessor ; still the godi had con- siderable power and influence as long as the commonwealth lasted.

'At first there was no higher organization, but disputes between neighbouring chiefs and their clients, and uncertainty as to the law, brought about the Constitution of Ulfliot, c. 980, which appointed a central moot for the whole island, the Al-thing, and a speaker to speak a single " law" (principally that followed by the Gula-moot in Norway); the Reforms of Thord Gellir, 964, settling a fixed num- ber of local moots and chieftaincies, dividing the island into four quarters (thus characterized by Ari :—north, thickest settled, most famous ; east, first completely settled ; south, best land and greatest chiefs ; west, remarkable for noble families), to each of which a head- court, the' quarter-court," was assigned; and the Innovationsof Skaptt (ascribed in the saga to Nial) the Law-Speaker (d. 1030), who set up a "fifth court" as the ultimate tribunal in criminal matters, and strengthened the community against the chiefs. But here constitu- tional growth ceased: the law-making body made few and unimport- ant modifications of custom ; the courts were still too weak for the chiefs who misused and deficd them; the speaker's power was not sufficiently supported to enable him to be any more than a highly respected lord chief justice, whereas he ought to have become a justiza if anarchy was to be avoided ; even the ecclesiastical innovations, while they secured peace for a time, provoked in the end the struggles which put an end to the commonwealth.

Christianity was introduced c. 1000. Tithes were established in 1096, and an ecclesiastical code made c. 1125,

The first disputes about the jurisdiction of the clergy were moved by Gudmund in the 13th century, bringing on a civil war, while the questions of patronage and rights over glebe and mortmainland occu- pied Bishop Arni and his adversaries fifty years afterwards, when the land was under Norwegian viceroys and Norwegian law. For the eivil wars of the 13th century broke down and exterminated

haunts whence they could not so easily interfere

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the great houses who had monopolized the chieftaincies and abused their power for their own ends ; and after violent struggles (in which the Sturlungs of the first generation perished at Orlygstad, 1238, and Reykiaholt, 1241, while of the second generation Thord Kakali was called away by the king in 1250, and Thorgils Skardi slain in 1258) the submission of the island, quarter after quarter, took place in 1262-64, under Gizur's auspices, and the old Common Law was replaced by the New Norse Code " Ironside" in 1271.

The political life and law of the old days is abundantly illustrated in the sagas (especially Eyrbyggia, Hensa-Thori, Reyk-dela, Hrafnkell, and Niala), the two collections of law-scrolls (Codex Regius, c. 1235, and Stadarhol's Book, ¢. 1271), the Libellus, the Liber- fragments, and the Landnamabok of Ari, and the Diplomatarium. K. Maurer has made the subject his own in his Bettrage, Island, Grdgds, &c.

The medieval Icelandic church had two bishoprics, Skalholt (S.,W., and E.) 1056, and Holar (N.) 1106, and about 175 parishes (two-thirds of which belonged to the southern bishopric). They belonged to the metropolitan sce of Bremen, then to Lund, lastly to Nidaros, 1237. There were several religious foundations: Thingore (founded 1133), Thwera (1155), Hitardale (c. 1166), Kirkby Nuunery (1184), Stad Nunnery (1296), and Saurby (c. 1200) were Bene- dictine, while Ver (1168), Flatey after Holyfell (1172), Videy (1226), Madderfield Priory (1296), and Skrid Priory (14th century) were Augustinian, The bishops, elected by the people at the Al-thing till 1237, cnjoyed considerable power and influence, and were most of them distinguished men ; two, Thorlak of Skalholt and John of Holar, were

publicly voted saints at the Al-thing after due ex- amination of their claims to that distinction, and one, Gudmund, received the title of "Good" by decree of the bishop and chapter. Full details as to ecclesiastical history will be found in the Bishops' Lives (edited by Dr Vigfusson).

Iceland was not agricultural but pastoral, depending upon flocks Mode of

and herds for subsistence, for, though rye and other grain would life. grow in favoured localities, the hay, self-sown, was the only regular crop. In some districts the fisheries and fowliug were of importance, but nine-tenths of the population lived by their sheep and cattle, which gave them food, clothing, and such products for export as enabled them to import wood for building, iron for tools, a a few luxuries, as honey, wine, grain for brewing, and foreign clothes, fur, &e. Life on each homestead was regularly portioned out :—out-door oecupations—fishing, shepherding, fowling, and the important hay- making and fuel-gathering—occupying the summer ; while in-door business—weaving, tool-making, &c., filled up the long winter. The year was broken by the spring feasts and nioots, the great Al-thing meeting at midsummer, the marriage and arval gathcrings after the summer, and the long yule feasts at midwinter, There were but two degrees of men, free and unfrec, though only the franklins had any political power; and, from the very nature of the life, social intercourse was peculiarly unrestrained and unfettered ; godi and thrall lived the sane lives, ate the same food, spoke the same tongue, and differed little in clothing or habits. The poorest franklin was the social equal of the proudest chief, and in a few generations the freed man or landless dependant might be- come their peer in public estimation, provided he got a homestead of his own. The thrall had a house of his own and was rather villein or serf than slave, having rights and a legal price by law. During the heathen days many of the great chiefs passed part of their lives in Norway at the kimg's court, but after the establish- ment of Christianity in Iceland they kept more at home, still visiting the Continent, however, for purposes of state, suits with clergy, &c. But the trade was from the first in foreign (Norse) hands almost entirely.

The introduction of a church system brought little change. The great families put their members into orders, and so continued to enjoy the profits of the land which they had given to the church ; the priests married and

otherwise behaved like the franklins around them in every-day mattcrs, farming, trading, going to law like laymen ; so that, in spite of the efforts of the more earnest church reformers, the church was powerless to promote centralization against the feuds and jealousies of the great houses.

The old life in the commonwealth was turbulent and anarchic, Effects but free and varied ; it produced men of mark, and fostered bravery, of the adventure, and progress. The great chiefs were indeed only greater union franklings; but their wealth and comparative luxury gave them and leisure and opportunities for culture which raised them as examples change and leaders above their fellows; the pride of birth preserved a of law. nobility of feeling and_high standard of honour amid much of violence and chicane. But all this now ceased, and there was left but a low dead level of poor peasant proprietors without pride in the past, political interest in the present, or ambition of the future, careless of all save how to live by as little labour as possible, and pay as few taxcs as they could to their foreign rulers. The island received a foreign governor (Zari, Hirdstjori, or Stiptamtsmadr as he has been successively called), and was parcelled out into local counties (syslus'), administered by sheriffs (syslwmadr) appointed by the king. A royal court took the place of the Al-thing courts ;

The Re- The Reformation here as elsewhere had a one-sided effect: it | must surround emigrants who have never seen a road, a tree, ora forma- wakened men's minds, opening new vistas of hope and new fields of | plough, on their first taking up an agricultural life, are overcome, tion. thought, but it left their bodies and circumstances little changed, | the results may be very important to the mother country. or, if at all, forthe worse. Its necessary complement, a social and political revolution, never came to Iceland. The Hanse trade L ane replaced the English for the worse; and the wretched Danish ITERATURE, monopoly which succeeded it when the Danish kings began to act Poetry.—Iceland has always borne a high renown for song, but Poetry. again with vigonr, under the stimulus of European changes, was | has never prodaced a poet of the highest order, a fact for which ono still less profitable, The glebes and hospital lands were a fresh | can only account by noticing that the qualities which in other lands power in the hands of the crown, and the subservient Lutheran | were most sought for and admired in oetry were in Iceland lavished clergy became the

most powerful class in the island, while the bad | on the saga, a prosc epic, and that Icelandic poetry is to be rated very system of under-leasing at rackrent and short lease with unsecured | high for the one quality which its authors have ever aimed at— tenant right extended in this way over a great part, at least aquarter, | melody of sound. To these generalizations there are but few excep- of the better land, stopping any possible progress. The details of | tions, albeit, in considering the history of this branch of Icelandic the religious change are uninteresting: nearly all who took active | literature, we are at once met by an apparent contradiction to them, part in it on either side were men of low type, moved by personal | a group of poems which possess the very qualities of high imagina- motives rather than religious zeal ; and, though it should be noticed | tion, deep pathos, fresh love of nature, passionate dramatic power, that the fires of martyrdom were never lighted in Iceland, the story | and noble simplicity of language which Icelandic poetry lacks, The of the easily accepted Reformation is not altogether a pleasant one. | solution is that these poems do not belong to Iceland at all. They When it was once accomplished, the little knot of able men who | are the poetry of the 'Western Islands," – came to the front for two or three generations, stirred by the new It was among the Scandinavian colonists of the British coasts that Poetry life that had been breathed into the age, did nobly in preserving | in the first generations after the colonization of Iceland therefrom a of the the records of the past for a later time to value and appreciate, while | magnificent school of poetry arose, to which we owe works that for Western Odd and Hallgrimn exhibit the noblest impulses of their time. power and beauty can be paralleled in no Teutonic language till ceu- Islands. Decad- A new plague, that of the English, Gascon, and Algerine pirates, | turies after their date. To this school, which is totally distinct ence, marked the close of the 16th century and opening of the 17th, | from the Icelandic, ran its own course apart, and perished before causing widespread panic and some devastation in 1579, 1613-16, | the 13th century, the following works belong (of their authors we and 1627. Nothing points more to the helplessness of the natives' | have scarcely a name or two; their dates can be rarely exactly fixed ; condition than their powerlessness against these tiresome foes. But | but they lie between the beginning of the 9th and the end of the the 18th century is the most gloomy in Iceland's annals. Small-pox, | 10th centuries), classified into groups:— fainine, sheep disease, and the awful eruptions of 1765 and

1783 a. The Helgi trilogy (last third lost save a few verses, but pre- follow each other in terrible succession. Against such fearful | served in prose in Hromund Gripsson's Saga), the Raising of An- visitations, which reduced the population by about a fourth, little | ganty and Death of Hialmar (in Hervarar Saga), the fragments of could be done, and when the only man who might have roused the | a Wolsung Lay (part interpolated in earlier poems, part underlying Icelanders from their misery, distress, and impoverishment, thenoble | the prose in Volsunga, Saga), all by one poet, to whom Dr Vig- and patriotic Eggert Olafsson, a hero of the old type, was drowned | fusson would also ascribe Voluspa, Vegtamskvida, Thrymskvida, in full career in 1768, it is hardly to be wondered at that things | Grotta Song, and Volundar-kvida. "a grew from bad to worse, and that a listlessness and torpidity crept 6. The Dramatic Poems :—/lyting of Loki, the Lay of Skirnt, the over the national character, the effects of which it is only beginning | Lay of Harbard, and several fragments, all onc 'man's work, to to shake off. The few literary men, whose work was done and | whose school belong, probably, the Zay underlying the story of whose books were published abroad, were only concerned with the | Ivar's death in Skioldunga Saga, : ; past, and Jon Widalin is the one man of mark, beside Eggert c. The Didactic Poetry :—Grimnismal, Vafthrudnismal, Alvis- Olafsson, who worked and wrote for his own generation.} mal, &e. : , ' Modern _ Gradually the ideas which were agitating Hurope crept through d, The Genealogical and Mythological Poems :—Hyndla-Ltod, times. Scandinavia into Iceland, and, now that scholars and travellers of | written for one of the Haurda-Kari family, so famous in the Orkneys ;

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the local business of the local things was carried out by the (Areppstjori) bailiff, a subordinate of the sheriff ; and the goSord, things, quarter-courts, trial by jury, &., were all completely swept away by these innovations, which have continued with mere changes of detail till the present century. The power of the crown was increased by the confiscation of the great Sturlung estates, which were under-leascd to farmers, while the early falling off of the Norse trade threatened to deprive the island of the means of existence ; for the great epidemics and eruptions of the 14th century had gravely attacked its pastoral wealth and ruined much of its pasture and

fishery, for the time at least. The union of the Three Crowns transferred the practical rule of Iceland to Denmark in 1280, and the old Treaty of Union, by which the island had reserved its essen- tial rights, was disregarded by the absolute Danish monarchs ; but, though new taxation was imposed, it was rather their careless ueglect than their too active interference that damaged Iceland's interests, But for an English trade, which sprung up out of the half-smuggling, half-buccaneering enterprise of the Bristol mer- chants, the island would have fared badly indeed, for during the whole 15th century their trade with England, exporting sulphur, eider down (which the English taught them the value of), wool, and salt stock-fish, and importing as before wood, iron, honey, wine, grain, and flax goods, was their only link with the outer world. This period of Iceland's existence is torpid and eventless; she had got peace but with few of its blessings; all spirit seemed to have died with the commonwealth ; even shepherding and such agriculture as there had been sank to a lower stage ; waggons, ploughs, and carts went out of use and knowledge; architecture in timber became a lost art, and the fine carved and painted halls of the heathen days were replaced by turf-walled barns half sunk in the earth, and lasting at best a generation ; the large decked luggers of the old days gave way to small undecked fishing-boats ; it is needless to add that letters were neglected, and that all remembrance of the commonwealth perished utterly.

mark and influence had drawn attention to the island, its claims were more respectfully listened to. The Continental system, which, by its leading to the blockade of Denmark, threatened to starve Iceland, was neutralized by special action of the British Government, Trade and fishery grew a little brisker, and at length the turn came.

The rationalistic movement, an unlovely attempt at reform, eon

1 For the periods succeeding the union, Danish state papers and the Zistory of Finn Jonsson are the best authority,

headed by Magnus Stephenson, a patriotic, narrow-minded lawyer, did little good as far as church reform went, but was accompanied by a morc successful effort to educate the people by means of bringing within their

reach the practical knowledge of the day. A Useful Knowledge Society, such as Brougham delighted in, was formed and did some honest work. Newspapersand periodicals were published, and the very stir which the ecclesiastical disputes encouraged did good. When frec trade came, and when the free constitution ot Denmark had produced its legitimate effects, the intelligent and able endeavours of a few patriots such as Jon Sigurdsson were able to push on the next generation a step further, in spite of such physical obstacles as the sheep disease. Questions of a modern political com- plexion arose ; the cattle export controversy and the great home rule struggle began. The intelligence of a people whose love for knowledge and mental attainments have always been high seconded its leaders well, and after thirty years' agitation home rule was conceded in 1874, The absolute sysdwmadr and hirdstjori became popular officials assisted by elected boards. The .Al-thing, a mere council of powerless delegates, was replaced by a representative assembly of two chambers (composed of thirty membcrs chosen by a a popular and wide suffrage, and six crown nominees) with legislative powers, and other reforms were comprised in this grant. Further political changes, such as the introduction of ajury system to replace the Danish umpire-and-assessor procedure, are now being considered by the liberal party. There are many peculiar circumstances present in the condition of Iceland, the absence of towns, equality of society in a sense which exists in no other European community, difficulty of communication, and the intense conservatism and dis- like of activity or change which must necessarily characterize a com- munity so long isolated and " forced into lazy habits for lack of opportunity." Bunt that emigration should have begun, and fami- lies left the old home for Canada and the United States to seek a better climate, a richer soil, and the hopes of progress which are so distant athome, is certainlyremarkable ; and, if the difficulties which

Ynglinga-tal and Haust-léng, by Thiodulf of Hvin; Rig's Thul, &c.

- The Dirges and Battle Songs,—such as that on Hafur-jirth Battle, by Thiodulf of Hvin or Hornklofi, shortly after 870; Eirik's Dirge, between 950 and 969; the Dart-Lay on Clontarf Battle, 1014; Biarka-mai (fragments of which we have, and paraphrase of more is found in Hrolf Kraki's Saga and in Saxo).

There are also fragments of poems in Halfs Saga, Asmund Kappa- Pana's Saga, in the Latin verses of Saxo, and the Siield Lays by

Poetry of Green- land.

Poetry of

the con- mon- wealth,

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Bragi, &c., of this school, which closes with the Sun-Song, a power- ful Christian Dantesque poem, recalling some of the early composi- tions of the Irish Church, and with the 12th century Lay of Ragnar, Lay of Starkad, The Proverb Song (Havamal), and Kra- kumal, to which we may add those singular Gloss-poems, the Thulur, which also belong to the Western Isles.

To Greenland, Iceland's farthest colony, founded in the 10th century, we owe the two Lays of Ath, and probably Hymiskvida, which, though, as was to be expected, of a weirder harsher cast, yet belong to the Western Isles schooland not tolecland, In form all these poems belong to two or three classes :—kvida, an epic "cantilena"; tal, a genealogical pocm; drapa, songs of praise, &c., written in modifications of the old Teutonic metre which we know in Beowulf ; galdr and lokkr, spell and charm songs in a more lyric measure; and mal, a dialogue poem, and Jiod, a lay, in elegiac measure suited to the subject.

The characteristics of this Western school are no doubt the result of the contact of Scandinavian colonists of the viking-tide, living lives of the wildest adventure, tossed by war and storm, with an imaginative and civilized racc, that excrcised npon them a very strong and lasting influence (the effects of which were also felt in Iceland, but in a different way). The frequent intermarriages which mingled the best families of either race are sufficient proof of the close communion of Northmen and Celts in the 9th and 10th centurics, whilc there are in the poems themselves traces of Celtic mythology, language, and manners.'

When one turns to the early poetry of the Scandinavian conti- nent, preserved in the rune-staves on the memorial stones of Sweden, Norway, and Denmark, in the didactic Havamal, the Great Wolsung Lay (4.e., Sigurd II., Fafnis's Lay, Sigrdrifa's Lay), and Hamdismal, all continental, and all entirely consonant to the remains of our own Old English poctry in metre, feeling, and treat- ment, one can see that it is with this school: that the Icelandic '"'rmakers" are in sympathy, and that from it their verse naturally descends. The only difference between them is that, while the fundamental characteristics of shrewdness, plain straightforward- ness, and a certain stern way of looking at life are common to both, the Icclandie school adds a complexity of structure and ornament, an elaborate mythological and enigmatical phraseology, and a regularity of rhyme, assonance, Inxuriance, quantity, and syllabification, which it caught up from the Latin and Celtic poets, and adapted with exquisite ingenuity to its own main object, that of securing the greatest possible beauty of sound,

The first generations of Icelandic poets were very remarkable men, and resemble in many ways the later troubadours; the books of the kings and the sagas are full of their strange lives. Men of good birth (nearly always, too, of Celtic blood on one side at least), they leave Iceland young and attach themselves to the kings and earls of the north, living in their courts as their henchmen, sharing their adventures in weal and woc, praising their victories, and hymning their deaths if they did not fall by their sides—men of quick passion, unhappy in their loves, jealous of rival poets and of their own fame, cver ready to answer.criticism with a satire or with a sword-thrust,.but clinging through all to their art, in which they attained most marvellous skill.

Such men were Egill, the foe of Eirik Bloodaxe and the friend of Athelstan; Kormak, the hot-headed champion ; Eyvind, King Hakon's poet, called Skaldspoiler, because he copied in his dirge over that king the older and finer Liriks-mal; Guunlang, who sang at Aithelred's court, and fell at the hands of a brother bard Hrafn ; Hallfred, Olaf Tryggvason's poet, who lies in Iona by the side of Macbeth ; Sighvat, Saint Olaf's henchman, most prolific of all his comrades ; Thormod, Coalbrow's poet, who died singing after Stickle- stad battle; Ref, Ottar the Black, Arnor the carls' poet, and, of those whose poetry was almost confined to Iceland, Gretti, Biorn the

Hitdale champion, and the two model Icclandic masters, Einar Skulason and Markus the Lawman, both of the 12th century.

It is impossible to do more here than mention the names of the most famous of the long roll of poets which are noted in the works of Snorri and in the two Skalda-tal. It is evident that they inust differ greatly in style and tone, as they range from the rough and noble pathos of Hgill, the mystic obscurity of Kormak, the pride and grief of Hallfred, and the marvellous fluency of Sighvat, to the florid intricacy of Hinar and Markus.

The art of poetry, which stood to the Icelanders in lieu of music, was, and is still, much cultivated in the island ; scarcely any pro- minent man but knew how to turn a mocking or laudatory stanza, and down to the fall of the commonwealth the accomplishment was in high request. In the literary age the chief poets belong to the great Sturlung family, Snorri and his two nephews, Sturla and Olaf, the White Poet, being the most famous " makers" of their

1 Many of these poems were Englished in prose by the translator of Mallet, by B. Thorpe in his Semund's Edda, and two or three by Messrs Morris and Mag- nussen, as appendices to their translation of Volsunga Saga. Earlier transla- tions in verse are those in Dryden's Jfiscellany (vol. vi.), A. Cottle's Edda, Mathias's Translations, and W. Herbert's Old Icelandic Poetry. Gray's versions of Darradar-lied and Vegiamskvida are well known.

day. perfect kind, that the best examples of the whole of northern poetry are to be found. 'The last part, Hattatal, a treatise on metre, was written for Earl Skuli about 1222, in imitation of Karl Rognvald and Hall's Hattalykill (Clavis metrica), of 1150. Skaldskapar-mal, a gradus of synonyms and epithets, which con- tains over 240 quotations from 65 poets, and 10 anonymous lays— a treasury of verse—was composed e. 1230. quisite sketch of northern mythology, Gyl/a-ginning, was probably eae to the whole later.'

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Indeed, it is in Snorri's Hdda, a poetic grammar of a very

The second part,

The first part, an ex-

There is some of Sturla's poetry in nis Islewdinga Sage, and verses of Snorri occur in the Gram-

matical Treatise on figures of speech, &c., of Olaf, which contains

about one hundred and forty quotations from various authors, and was written about 1250.

Besides those sources, the Kings' Lives of Snorri and later authors contain a great deal of verse by Icelandic poets. King Harold Sigurdsson, who fell at Stamford Bridge 1066, was both a good critic and composed himself. Many tales are told of him and his poet visitors and henchmen. The Icelandic sagas also comprise much verse which is partly genuine, partly the work of the 12th and 13th century editors. Tus there are genuine pieces in Néal's Saga (chaps. 34, 78, 108, 126, 146), in Eyrbyggia, Laxdecla, Eyil's Saga (part only), Gretéla (two and a half stanzas, ¢f. Landnamabok), Biorn's Saga, Gunnlaug's Saga, Havard's Saga, Kormak's Saga, Viga-Glum's Saga, Erik the. Red's Saga, and Fostbredra Saga. In Nial's, Gisli's, and Droplaug's Sons' Sagas there is good verse of a later poet, and in many sagas worthless rubbish foisted in as ornamental wherever there was a chance of doing so.

To these may be added two or three works of a semi-literary kind, composed by learned men, not by heroes and warriors. Such are Konunga-tal, IHugsvinnsmal (a paraphrase of Cato's Distichs), Merlin's Propheey (paraphrased from Geoffrey of Monmouth by Gunnlaug the monk), Jomsvikinga-drapa (by Bishop Ketil), aud the Islendinga-drapa, which has preserved brief notices of several lost sagas concerning Icelandic worthies, with which Gudmundar- drapa, though of the 14th century, may be also placed.

Just as the change of law gave the pee)

had been in force since the end of the 11th century, when it over-

threw the old Icelandic poetry in favour of the Rimur.

The introduction of the Danz, ballads (or fornkveed?, as they are now called) for singing, with a burden, usually relating to a love- tale, which were immensely popular with the people and performed by whole companics at weddings, yule feasts, and the like, had relegated the regular Icelandic poetry to more scrious events or to the more cultivated of the chiefs. But these " jigs," as the Eliza- bethans would have called them, dissatisfied the popular ear in one way: they were, like our own old ballads, which they closely resembled, in rhyme, but void of alliteration, and accordingly they were modified and replaced by the " Rimur," the staple literary pro- duct of the 15th century. These were rhymed but also alliterative, in regular form, with prologue or mansong (often the prettiest part of the whole), main portion telling the tale (mostly derived in early days from the French romances of the Carlovingian, Arthurian, or Alexandrian cycles, or from the mythic or skrék-ségur), and epilogue. Their chief value to us lies in their having preserved versions of several French poems now lost, and in their evidence as to the feelings and bent of Icelanders in the " Dark Age" of the island's history. The ring and melody which they all possess is their chief beauty.

*Ofthe earliest, Olafsrima, by Einar Gilsson (¢. 1850), and the best, the Aristophanic Skida-rima (¢. 1480), by Einar Fostri, the names may be given. Rimur on sacred subjects was called " Diktur"; of these, on the legends of the saints' lives, many remain. The most not- ableof its class isthe Lilia of Eystein Asgrimsson, a monk of Holy- fell(c. 1850), a most "sweet sounding song." J.ater the poems of tac: famous John Arason, last Catholic bishop of Holar (¢. 1580), Lzomr ('*Gleam"') and Pislargrdtr (" Passion-tears "), deserve mentioli«.,., Taste has sunk since the old days; but still this Rimur poetry is popular and genuine, and in such hard and evil days as came upon Iceland after the fall of the old houses had destroyed such tradi- tional history and civilization as had fostered the saga, it is perhaps . rather a wonder that the torch was still alight than that its glimmer was feeble and smoky. Moreover, the very prosaic and artificial verse of Sturla and the last of the old school certainly deserved the oblivion which came over them, as a casual perusal of the stanzas scattered through Jslendinga will surcly prove. It is interesting to notice that a ccrtain number*

of kenningar (poetical paraphrases) have survived from the old school even to the present day, though the mass of them have happily perished. The change in the phonesis

2This prose Edda (from which the Eddic Lays got their name) has been partly turned into English by Sir G. W. Dasent, by the translator of Mallet, and by Mr Anderson, and will be found treated of more at length under Eppa. Mallet's Northern Mythology, a book whieh first drew Englishmen's attention to the religious ideas of their forefathers, is not to.be depended on in any way, be- longing, as it does, to the pre-seientifie age. Bunsen's speculations at a later date are entirely fanciful and visionary.

ow to an already Medi- erishing commonwealth, so the rush of medizval influence, which geval ollowed the union with Norway, merely completed a process which poetry.

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of the language is well illustrated by the new metres as compared with the old Icelandic Drott-kvedi in its varied forms. Most of the older Rimur and Diktur are as yct unprinted. Many of the

fornkvedi are printed in a volume of the old Nordiske Literatur-

Refor- mation period.

Modern poetry.

The saga,

Samfund.

The effects of the Reformation was deeply felt in Icelandic litera- ture, both prose and verse. 'he name of Hallgrim Petersen, whose Passion-hymns, 'the flower of all Icelandic poetry," have been the most popular composition in the language, is foremost of all writers siuce the Second Change of Faith. The gentle sweetness of thought, and the exquisite

harmony of wording in his poems, more than justify the popular verdict. His Hymns were finished in 1660, and published in 1666, two great Protestant poets thus being contem- poraries. A collection of Reformation hymns, adapted, many of them, from the German, the Holar-book, had preceded them in 1619. There. was a good deal of verse-writing of a secular kind, far inferior in every way, during this period. In spite of the many physical distresses that weighed upon the island, ballads (fornkvced?) were still written, ceasing about 1750, Rimur coinposcd, and more elaborate compositions published. .

The most notable names are those of the improvisatore Stephen the Blind; Thorlak Gudbrandsson, author of Ulfar-Rimur, d.1707 ; John Magnusson, who wrote Hristafla, a didactic poem ; Stefan Olafsson, composer of Psalms, Rimur, &e., d. 1688; Gunnar Palsson, the author of Gunnarslag, often printed with the Eddic poems, ¢. 1791 ; and the famous Eggert Olafsson, traveller, naturalist, and patriot, whose untimely death in 1768 was a great loss to his country, which his energy and talents might have roused from its torpor. His Bunadar-balkr, a Georgic written, like Tusser's Points, with a practical view of raising the state of agriculture, has always been much prized. Paul Widalin's ditties are very naive and clever.

The Reformation had produced a real poet, but the material rise of Iceland has not yet done so. Many have written, but few have shown any great talent ; perhaps the best has been Sigurd of Broad- firth, many of whose prettiest poems were composed in Greenland, like those of Jon Biarnisson before him, ¢. 1750 ; John Thorlaksson's translation of Milton's great epic into Eddic verse is praiseworthy in intention, but, as may be imagined, falls far short of its aim. He also turned Pope's Essay on Aan and Klopstock's Messiah into Ieelandic. Benedikt Grondal tried the same experiment with Homer in his Jlion's Kvedi, c. 1825. Thereis a fine prose translation of the Odyssey by Sweinbiorn Egillson, the lexicographer, both faithful and poetic in high degree. Many poems of varying but little merit will be found in the periodieals of this and last century, the serious verse being pseudo-elassic for the most part and falsetto in tone. The satiric verse, such as John Thorlaksson's on Magnus Stephen- son's projects and " reforms," and the ditties on all kinds of sujets ad occasion, are better, but much of their meaning is lost to a stranger. With the latest school of poets who have

*begun to imitate foreign metres(unalliterative)and to translate foreign poets, it is hardly worth while to linger. A translation of Shakespeare and of several of Byron's poems may be notieed as curiosities. Of minor oetry there is still an abundant crop ; even in Gimli, the far-off Canadian colony, '*In Memoriam" verses and wedding-hymns of irreproachable form, but wooden thought, are printed and admired. That Iceland, most idyllic of modern lands, is capable of supplying subject and material for something higher than all this there is no doubt ; but, before any- thing of real worth can be written, the old stock-in-trade of worn-out mythology and pseudo-patriotism must be thrown aside for ever.*

History and Biography.—tThe real strength of Ieelandic litera-

ture is shown in its most indigenous growth, the "Saga." This °

is, in its purest form, the life of a hero, composed in regular form, governed by fixed rules, and intended for oral recitation. It bears the strongest likeness to the epic in all save its unver- sified form; in both are found, as fixed essentials, simplicity of plot, chronological order of events, set phrases used even in describing the restless play of emotion or the changeful fortunes of a fight or a storm, while in both the absence of digression, Co..ment, or intrusion of the narrator's person is invariably maintained. The saga grew up in the quieter days which followed the Change of Faith (1002), when the deeds of the great families' heroes were still cherished by their descendants, and the exploits of the great kings of Norway and Denmark handed down with reverence from the mouths of those that had fought and sung by their side. Telling of stories was a recognized form of entertain- ment at all feasts and gatherings, and it was the necessity of the reciter whieh gradually worked them into a regular form, by which the memory was relieved and the artistic features of the story allowed to be more carefully elaborated. That this form was so perfect must be attributed to Irish infinence, without which indeed there would have been a saga, but not the same saga. It is to the west that the best sagas belong ; it is to the west that nearly every classic writer whose name we know belongs ; and it is precisely in the west that the admixture of Irish blood is greatest. In compar- ing the Irish tales with the saga, there will be felt decp divergencies in matter, style, and taste, the richness of one

contrasting with the chastened simplicity of the other ; the one's half-comic half-earnest

bombast is wholly unlike the other's grim humour; the marvellous, so unearthly in the one, is almost credible in the other ; but in both are the keen grasp of charaeter, the biting phrase, the love of action, and the delight in blood which almost assumes the garb of a religi- ous passion.

When the saga had been fixed by a generation or two of oral reciters, it was written down; and this stereotyped the form, so that afterwards when literary works were composed by learned men (such as Abbot Karl's Swerri's Saga and Sturla's Jslendinga) the same style was adopted.

Taking first the sagas relating to Icelanders, of which some thirty- Icelandic five or forty remain out of thrice that number, we find that they were sagas. first written down between 1140 and 1220, in the generation which succeeded Ari and felt the impulse his books had given to writing, on separate scrolls, no doubt mainly for the reciter's convenience ; that they then went through all the different phases which such popular compositions have to pass in all lands,—editing and compounding (1220-1260), padding and amplifying (1260-1300), and finally collec- tion in large MSS. (14th century). Sagas exist showing all these phases, some primitive and rough, some refined and beautified, some again diluted and weakened, aceording as their eopyists have been faithful, artistic, or foolish ; for the first generation of MSS. have all perished. We have also complex sagas put together in the 13th century out of the serolls relating to a given loeality, such a group as still exists untouched in Vapnfirdinga being fused into sueh a saga as Niala or Lawdela. Of the authors nothing is known ; we can only guess that some belong to the Sturlun gschool. Aecording to subject they fall into two classes, those relating to the older generation before Christianity and those telling of St Olaf's contem- poraries ; only two fall into a third generation.

Beginning with the sagas of the west, most perfect in style and Of the form, the earliest in subject is that of Gold-Thori ({e. 980), whose west, adventurous career it relates ; HZen-Thori's Saga tells of the burning of Blund-Ketil, a noble chief, an event which led to Thord Gelli's reforms next year (¢. 964) ; Gisli's Saga (960-80) tells of the career and death of that ill-

fated outlaw ; it is beautifully written, and the verses by the editor (13th century) are good and appropriate ; it has been Englished by Sir G. Dasent ; Zord's Saga (980) is the life of a band of outlaws on Whalesfirth, and especially of their leader Nord. Of later subject are the sagas of Havard and his revenge for his son, murdered by a neighbouring chief (997-1002) ; of the Heath Slaughter (990-1014), a typical tale of a great blood feud, written in the most primitive prose; of Guaniaug and Hrafn (980-1008), the rival poets and their ill-starred love. The verse in this saga is important and interesting. It has been Englished by Messrs Morris and Magnusson. 'To the west also belong the three great complex sagas Lgla, Kyrbyggia, and Laxdela. The first (870-980), after noticing the migration of the father and grand- father of the hero poet Eyill, and the origin of the feud between them and the kings of Norway, treats fully of Egill's career, his enmity with Eirik Bloodaxe, his service with AEthelstan, and finally, after many adventures abroad, of his latter days in Ice- land at Borg, illustrating very clearly what manner of men those great settlers and their descendants were, and the feelings of pride and freedom which led them to Ieeland. The style is that of Snorri, who had himself dwelt at Borg, and Dr Vigfusson is inclined to refer it tohim. yrbyggia (890-1031) is the saga of Politics, the most loosely woven of all the compound stories. It includes a mass of information on the law, religion, traditions, &c., of the heathen days in Iceland, and the lives of Kirik, the real diseoverer of Greenland, Biorn of Broadwick, a famous chief, and Snorri, the greatest states- man of hisday. Dr Vigfusson would ascribe its editing and comple- tion to Sturla the Lawman, ¢c. 1250. It is known to many English- men from Sir Walter Scott's paraphrase. Zaxdala (910-1026) is the saga of Romance. Its heroine Gudrun is the most famous of all Icelandic ladies. Her love for Kiartan the poet, and his career abroad, his betrayal by his friend Bolli, the sad death of Kiartan at his hands, the revenge taken for him on Bolli, whose slayers are themselves afterwards put to death, and the end of Gudrun, who becomes an anehorite after her stormy life, make up the pith of the story. The contrast of the eharacters, the rich style and fine dialogue which are so remarkable in this saga, have mueh in eommon with the best works of the Sturlung sehool. Mr Morris's Lovers of Gudrun is founded upon it. '

Of the north there are the sagas of Kormak (930-60), most primi: Of the tive of all, a tale of a wild poet's love and feuds, containing many north. notices

of the heathen times ; of Waterdale (890-980), relating to the settlement and the chief family in Waterdale ; of Hadlfred the Poet (996-1014), narrating his fortune at King Olaf's court, his love affairs in Iceland, and finally his death and burial at Iona; of Reck-dale (990), whieh preserves the lives of Askell and his son Viga-Skuti; of Swanf-dale (980-90), a cruel coarse story of the old days, with

some good scenes in it, unfortunately imperfect, chapters 1-10

being forged; of Viga-Glum (970-90), a fine story of a heathen hero, brave, crafty, and cruel; it has been Englished by Sir Edmund Head. To the north also belong the sagas of @rettd the Strong (1010-31), the life and death of the most famous of Icelandic out.

Of the east,

Of the south.

Of Green- land and North America.

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laws, the real story of whose career is mixed up with the mythical adventures of Beowulf, here put down to Gretti, and with late romantie episodes and fabulous folk-tales (Dr Vigfusson would ascribe the best parts of this saga to Sturla ; its last editor, whose additions would be better away, must have touched it up about 1300 ; Messrs Morris and Magnusson have Englished it), and_the stories of the Lightwater Men and Liot O' Vall (1009-60). Gud- mund the Mighty and his family and neighbours are the heroes of these tales, which form a little eycle. The Banda-manna Saga (1050-60), the ouly eomedy among the sagas, is also a northern tale; it relates the struggles of a plebeian who gets a chieftainey against the old families of the neighbourhood, whom he suceessfully outwits ; Ol-kofra Thattr is a later imitation of it in the same humorous strain. The sagas of the north are rougher and coarser than those of the west, but have a good deal of individual character.

Of tales relating to the east there survive the Weapon-firth eyele,—the tales of Thorstein the White (c. 900), of Thorstein the Staffsmittenr (ec. 985), Englished by Mr Morris, of Gunnar Thidrand's Bane (1000-1008), and of the Weapon-firth Men (975- 990), all relating to the family of Hof and their friends and kin for several gencrations,—and the story of Hrafnkell Frey's Priest (e. 960), the most idyllic of sagas and best of the eastern tales. Of later times there are Droplaug's Sons' Saga (997-1007), written probably about 1110, and preserved in the uncouth broken style of the original (a brother's revenge for his brother's death is the substanee of it; Brand-krossa Thattr is an appendix to it), and the tales of Thorstein Hall of Side's Son (e. 1014), and his brother Zhidrandi (c. 996), which belong to the cyele of Hall o' Side's Saga, unhappily lost ; they are weird tales of bloodshed and magic, with idyllie and pathetic episodes.

The sagas of the south are either lost or absorbed in that of Nial (970-1014), a long and complex story into whieh are woven the tales of Gunnar, Nial, and parts of others, as Brian Boroimhe, Hall o' Side, &e. It is, whether we look at style, contents, or legal and historical weight, the foremost of all sagas. It deals especially with law, the sole bond of a rough heathen community, and contains in itself, as it were, at once the pith and the moral of all early Ieelandic history. Its hero Nial, type of the good lawyer, +s contrasted with its villain Mord, the ensample of cunning, chicane, aud legal wrong-doing ; and a great part of the saga is taken u with the three cases and suits of the divorce, the death of Hoskuld, and the burning of Nial, which are given with great minuteness and care. The number and varicty of its dramatis persone give it the liveliest interest throughout. The women Hallgerda, Berg- thora, and Ragnhild are as sharply contrasted as the men Gunnar, Skarphedin, Flosi, and Kari, The nathos of such tragedies as the death of Gunnar and Hoskuld mal the burning is interrupted by the humour of the Al-thing scenes and the intellectual intcrest of the legal proceedings. The plot dealing first with the life and death of Gunnar, type of the chivalry of his day, then with the burning of Nial by Flosi, and how it eamc about, and lastly with Kari's revenge on the burners, is the ideal saga-plot, and affords ample room for the finest treatment of incident. The author must have been of the east, a good lawyer and genealogist, and have composed it about 1250, to judge from various internal evidence. It has been overworked by a later editor, ¢.

1300, who inserted many spurious verses. It has been translated by Sir G. Dasent.

Relating partly to Iceland, but mostly to Greenland and Wine- land (N. America), are the sagas of the Floe-Men (985-90), a good story of the adventures of Thorgils and of the struggles of ship- wrecked colonists in Greenland, a graphic and terrible picture ; and of Birik the Red (990-1000), two versions, one northern (Flatey- book), one western, the better (in Hawk's Book, and AM. 557, translated by the Rev. J. Sephton), the story of the discovery of Greenland and Wineland (America) by the Ieclanders at the end of the 9th century. Later are the story of Thormod and Thorgeir, the Foster Brethren (1015-30), a very interesting story, told in a quaint romantic style, of Thorgeir, the reckless henchman of King Olaf, and how his death was revenged in Greenland by his sworn brother the true-hearted Thormod Coalbrow's poet, who afterwards dies at Sticklestad. The tale of Einar Sookisson (e. 1125) may also be noticed. The lost saga of Poet Helgi, of which only fragments remain, was also laid in Greenland.

Besides complete sagas, such as have been noticed, there are embedded in the Kings' Lives numerous small thettir or episodes, small tales of Icelanders' adventures, often relating to pocts and their lives at the kings' courts ; one or two of these seem to be frag- ments of sagas now lost. Among the more notable are those of Orm Storolfsson, Ogmund Dijtt, Halldor Snorrason, Thorstein Oxfoot, Hromund Halt, Thorwald Tasaldi, Svadi and Arnor Her- lingar-nef, Audunn of Westfirth, Sneglu-Halli, Hrafn of Hrut-

ford, Hreidar Heimski, Gisli Illugison, Ivar the poet, Gull-Aisu Thord, Einar Skulason the poet, Mant the poet, &c.

The forged Icelandic sagas appear as early as the 18th century. They are very poor, and either worked up on hints given in genuine stories, or altogether apocryphal. Some of them have been com- posed within the present century.

ICELAND

About the year of the battle of blood of Queen Aud, who founded the famous historieal school of Iecland, and himsclf produeed its greatest mouuiment in a work which can only be compared for value with the English Domesday Book. Nearly all that we know of the heathen commonwealth may be traced to the collections of Ari. the style in which history should be eomposed in Iceland. It was he that sceured and put into order the vast mass of fragmentary tradition that was already dying out in his day. And perhaps it is the highest praise of all to him that he wrote in his own " Danish tongue," and so ensured the use of that tongue by the learned and cultured of after generations, when, had he ehosen to imitate the learned of other lands, not only would the freshness and life of the northern history as we have it have been crushed out, but the vernacular literature (heightened and purified by his influence as it has now been) would have sunk and disappeared. Ari's great works are Konungabok, or The Book of Kings, relating the history of the kings of Norway from the rise of the Yngling dynasty down to the death of Harald Sigurdsson in the year of his own birth. This book he composed from the dictation of old men such as Odd Kolsson, who had preserved traditions in their family and got information from contemporaries, from the genealogical poems, and froin the various dirges, battle-songs, and eulogia of the poets. It is most probable that he also compiled shorter Kings' Books relating to Denmark and perhaps to England. The Konungabék is pre- served under the Kings' Lives of Snorri, parts of it almost as they came from Ari's hands, for example, Ynglinga and Harold Fatr- hair's Saga, and the prefaces stating the plan and eritieal founda- tions of the work, parts of it only used as a framework for the magnificent superstructure of the lives of the two Olafs, and of Harald Hardrada and his nephew Magnus the Good. The best text of Ari's Konungabék (Ynglinga, and the sagas down to but not including Olaf Tryggvason's) is that of Frisbék.

The Book of Settlements (Landnamabék) is a most wonderful per- formance, both in its scheme and carrying out. It is divided into five parts, the first of which contains a brief account of the discovery of the island ; the other four, one by one taking a quarter of the land, de- scribe the name, pedigree, and history of each settler in geographical order, notice the most important facts in the history of his descend- ants, the names of their homesteads, their courts and temples, thus including mention of 4000 persons, one-third

of whom are women, and 2000 places. The mass of information contained in so small a space, the clearness and accuracy of the details, the immense amount of life which is somehow breathed into the whole, can hardly fail to astonish the reader, when he reflects that this colossal task was sketched out and aceomplished by one man, for his collaborateur Kolskegg merely filled up his plan with regard to part of the east coast, a district with which Ari in his western home at Stad was little familiar. Landnamabék has reaehed us in two complete editions, one edited by Sturla, who brought down the genealogies to his own grandfather and grandmother, Sturla and Gudny, and one by Hawk, who traces the pedigrees still later to himself.

Ari also wrote a Book of Icelanders (Islendingabék, ec. M27), which has perished as a whole, but fragments of it are embedded in many sagas and Kings' Lives ; it seems to have been a complete epitome of his earlier works, together with an aecount of the con- stitutional history, ecclesiastical and civil, of Iceland. An abridg- nent of the latter part of it, the little Libellus Islandorwm (to whieh the title of the bigger Liber—Islendingabék—is often given), made by the historian for his friends Bishops Ketil and Thorlak, for whom he wrote the Liber (c. 1137). This charming little book is, with the much later collections of laws, our sole authority for the Icelandie constitution of the commonwealth, but, " much as it tells, the lost Liber would have been of still greater importance." Kristni-Saga, the story of the christening of Iceland, is also a work of Ari's, "overlaid" by a later editor no doubt, but often preserving Ari's very words. This saga, together with several seattcred tales of early Christians in Iccland before the Change of Faith (1002), may have made up a section of the lost Liber. Of thie author of these works little personal is known. He lived in quiet days a quiet life; but he shows himself in his works, as Snorri describes him, "a man wise, of good memory, and a speaker of the truth." Surely, if Thucydides is justly accounted the first political historian, Ari may be fitly styled the first of scientifie historians.

'A famous contemporary and friend of Ari is Semund (1056- 1133), a great scholar and churehman, whose learning so im- pressed his age that he got the reputation of a magician. He was the friend of Bishop John, the founder of the great Odd-Verjar family, and the author of a Book of Kings from Harald Fairhair to Magnus the Good, in which he secms to have fixed the

exaet chronology of each reign. It is most probable that he wrote in Latin. The idea that he had anything to do with the poetic Edda in general, or the Swn's Song in particular, is of course unfounded and modern.

The flame which Ari had kindled was fed by his successors in the 12th century. irik Oddsson (ec. 1150) wrote the lives of Sigurd

Hastings was born one of the History.

It was he too that fixed Ari.

Semund.

Suc- cessors of Ari.

Snorri.

Kings' Lives

by other authors,

ren h AN D

Evil-deacon and the sons of Harold Gille, in his Hryggiar-Stykki

(Sheldrake), of which parts remain in the MSS. collections of

Kings' Lives, Morkin-skinna, &c. Karl J onsson, abbot of Thingore the Benedictine minister, wrote (c. 1184) a Life of Swerri from the lips of that great king, a fine racy biography, with a style and spirit ofitsown. Béglunga-Ségur tell the story of the civil wars which followed Swerri's death. They are probably by a contemporary. The Latin Lives of St Olaf, Odd's in Latin (c. 1175), compiled from original authorities, and the Legendary Life, by another

monk whose name is lost, are of the medixval Latin school of

Semund to which Gunnlaug belonged.

Snorri was known to his contemporaries as a statesman and poet ; to us he is above all an historian. His position asa poet and his authorship of the prose Hdda have been noticed above. Snorri was born in 1178, being on his mother's side sprung from the Myra family of Borg; he was brought up in fosterage with Semund's great grandson Jon Loptsson, a great chief. His career begins with his marriage, 1199, which made hima wealthy man. In 1205 he moved from Borg to Reekholt. He was twice lawman, and twice visited Norway, where he gained great influence with the king ; but when the civil war broke out he sided with Duke Skuli and disobeyed the king's orders, whereupon letters were sent out to his enemies to slay him (Skuli his patron having fallen), which command was carried out on the night of 22d Sept. 1241, his own friends and kins- men being his murderers. Snorri wrotc the Lives of the Kings, from Olaf Tryggvason to Sigurd the Crusader inclusive ; and we have them substantially as they came from his hand in the Great King Olaf's Saga, which has been interpolated with thettir and bits of other sagas in such a way as that they can be easily omitted; S¢ Olaf's Saga, as in Hetmskringla and the Stockholm MS. ; and the succeeding Kings' Lives, as in Hulda and Hrokkinskinna, in which, however, a few episodes have been inserted.

These works were no doubt indebted for their facts to Ari's labours, and to sagas written since Ari's death; but the style and treatment of them are Snorri's own. The fine Thucydidean speeches, the dramatic power of grasping character, and the pathos and poetry that run through the stories, along with a humour such as is shown in the Edda, and a varied grace of style that never flags or palls, make Snorri one of the greatest of historians.

Here it should be noticed that Heimskringla and its class of MSS. (Hirspennil, Jofraskinna, Gullinskinna, Fris-bok, and Kringla) do not give the full text of Snorri's works. They are abridgments made in Norway by Icelanders for their Norwegian patrons, the Life of St Olaf alone being preserved intact, for the great interest of the Norwegians lay in him, but all the other Kings' Lives being more or less cut down and mutilated, so that they cannot be trusted for historic purposes ; nor do they give a fair idea of Snorri's style. As Englishmen's knowledge of these works is often derived from Mr Laing's translation of a Danish version of Heimskringla (' Sea-Kings of Norway"), this caution is needed.

Agrip isa 12th century compendium of the Kings' Lives from Harold Fairhair to Swerri, by a scholastic writer of the school of Semund. As the only Icelandic abridgment of Norwegian history taken not from Snorri but sources now lost, it is of worth. Its real title is Konunga-tal.

Noregs Konunga-tal, now called Fagrskinna, isa Norsecompendium of the Kings' Lives from Halfdan the Black to Swerri's accession, probably written for King Hakon, to whom it was read on his death- bed. It is an original work, and contains much not found else- where. As non-Icelandic it is only noticed here for completeness.

Styrmi Karason, a contemporary of Snorri's, dying in 1245, was a distinguished churchman (lawman twice) and scholar. He wrote a Life of St Olaf, now lost ; his authority is cited. He also copied out Landnamabok and Swerri's Life, from his MSS. of which our surviving copies were taken.

Sturla, Snorri's nephew, of whom more must be said below, wrote the Lives.of Kings Hakon and Magnus at the request of the latter, finishing the first c. 1265, the latter c. 1280. King Hakon's Life is preserved in full ; of the other only fragments remain. These arc the last of the long and valuable series of historic works which Ari's labours began, from which the history of Norway for 500 years must be gathered.

A few books relating the history of other Scandinavian realms will complete this survey. In Skioldunga-bok was told the history of the early kings of Denmark, perhaps derived from

The Lives of St Knut and his Brethren aye of later origin and separate authorships, parallel to Snorri's Lives of the great Norwegian Kings, but earlier in date. The Lives of King Waldimar and his Son, written c, 1185, by a contemporary of Abbot Karl's, are the last of this series. The whole were edited and compiled into one book, often quoted as Skioldunga, by a 13th century editor, possibly Olaf, the White Poet, Sturla's brother, guest and friend of King Waldimar

II., as Dr Vigfusson has guessed. Jomsvikinga Saya, the history of the pirates of Jom, down to Knut the Great's days, also relate to Danish history. Scvcral versions of it exist,

The complex work now known as Orkneyinga is made up of the Earls' Saga, lives of the first great earls, Turf-Einar, Thorfinn, &c. ; the Life of St Magnus, founded partly on Abbot Robert's Latin life of him, ¢. 1150, an Orkney work, partly ou Norse or Icelandic bio- graphies; a Miracle-book of the same saint ; the Lives of Earl Lognwald and Sweyn the last of the vikings, and a few episodes such as the Burning of Bishop Adam. A scholastic sketch of the rise of the Scandinavian empire, the Moundation of Norway, dating ¢e. 1120, is prefixed to the whole. The Flatey-book text of this work has been translated by Mr H jaltalin in Mr Anderson's Orkneyinga Saga.

Fereyinga tells the tale of the conversion of the Fereys or Faroes, and the lives of its chiefs Sigmund and Leif, composed in the 13th ear from their separate sagas by an Icelander of the Sturlung school.

The saga has already been shown in two forms, its original epic Biogra- shape and its later development applied to the lives of Norwegian phies. and Danish kings and earls, as heroic but deeper and broader sub- jects than before. In the 18th century it is put to a third use, to tell the plain story of men's lives for their contemporaries, after satisfying which demand it dies away for ever.

These biographies are more literary and medieval and less poetic Lives of

than the Icelandic sagas and king's lives; their simplicity, truth, chiefs. realism, and purity of style are the same. They run in two parallel streams, some being concerned with chicfs and champions, some with bishops. The former, as morc important, will be taken first. They are mostly found embedded in the complex mass of stories known as Sturlwnga, from which Dr Vigfusson has extricated them, and for the first time set them inordcr. Among them are the sagas of Thorgils and Haflidt (1118-21), the feud and peacemaking of two great chiefs contemporaries of Ari; of Stwrla (1150-88), the founder of the great Sturlung family, down to the settlement of his great lawsuit by Jon Loptsson, who thereupon took his son Snorri the his-

torian to fosterage,—a humorous story but with traces of the de- cadence about it, and glimpses of the evil days that were to come 5 of the Burning of Onund (1185-1200), a tale of feud and fire-raising in the north of the island, the hero of which, Gudmund Dyri, goes at last into a cloister; of Hrafn Sweindiornsson (1190-1213), the noblest Icclander of his day, warrior, leech, seaman, craftsman, poet, and chief, whose life at home, travels and pilgrimages abroad (Hrafn was onc of the first to visit Becket's shrine), and death at the hands of a foe whom he had twice spared, are recounted by a loving friend in pious memory of his virtues, ¢. 1220; of Aaron Miorletfsson (1200-55), a man whose strength, courage, and adventures befit rather a henchman of Olaf Tryggvason than onc of King Hakon's thanes (the beginning of the feuds that rise ronnd Bishop Gndmund are told here), of the Swinefell-men (1248-52), a pitiful story of a family feud in the far east of Iceland.

But the most important works of this class are the Islendinga Sturla Saga and Thorgils Saga of Lawman Sturla. Sturla and his brother Thords- Olaf were the sons of Thord Sturlason and his mistress Thora. He son the was born and brought up in prosperous times, when all was fair for his- the Sturlnngs, but his manhood was passed in the midst of strife and torian. war, in which his family fell one by one, and he himself, though a peaceful man who cared little for politics, was more than once forced to fly for his life. While in refuge with King Magnus, in N orway, he wrote his two sagas of that king and his father. After his first stay in Norway he came back in 1271, with the new Norse law- book, and served a sccond time as lawman. The Lslendinga must have been the work of his later years, composed at Fairey in Broad- firth, where he dicd, 30th July 1284, aged about seventy years. The saga of Thorgils Skardi (1252-61) seems to have been the first of his works on Icelandic contemporary history; it deals with the life of his own nephew, especially his career in Iceland from 1252 to 1258. The second part of Jslendinga (1242-1262), which relates to the second part of the civil war, telling of the careers of Thord Kakali, Kolbein the Young, Earl Gizur, and Hrafn Oddsson. The end is imperfect, there being a blank of some years before the frag- mentary ending to which an editor has affixed a notice of the author's death. The first part of Islendinga (1202-42) tells of the beginning and first part of the civil wars, the lives of Snorri and Sighvat, Sturla's uncles, of his cousiu and namesake Sturla Sighvats- son, of

Bishop Gudmund, and Thorwald Gizursson,—the fall of tho Sturlungs, and with them the last hopes of the great houses to main- tain the commonwealth, being the climax of the story.

Sturla's power lics in his faithfulness to nature, minute observ- ance of detail, and purity of style. The great extent of his subject, and the difficulty of dealing with it in the saga form, are most skil- fully overcome ; nor does he allow prejudice or favour to stand in the way of the truth, a thing hard to avoid for onc writing of con- temporary events in which his own kinsmen have been concerned.

He ranks below Ari in value and below Snorri in power ; but no one else can dispute his place in the first rank of Icelandic writers.

Of the ecclesiastical biographcrs, an anonymous Skalholt clerk ig

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Bishops' the best. He wrote Hunger-waker, lives of the first five bishops of

lives. Skalholt, and biographies of his patron Bishop Paul, and also of Sé Thorlak. They are full of interesting notices of social and church life. Thorlak was a Jearned man, and had studied at Paris and Lincoln, which he left in 1161. These lives cover the years 1056- 1193. The Life of St John, a great reformer, a contemporary of Thorodd, whom he employed to build a church for him, is by another author (1052-1121). The Life of Gudmund, as priest, recounts the early life of this Icelandic Becket till his election as bishop (1160-1202) ; his after career must be sought out in Jslend- inga. It is written by a friend and contemporary. A later life by Arngrim, abbot of Thingore, written c. 1350, as evidence of his subject's sanctity, tells a good deal about Icelandic life, &e. The Lives of Bishops Arni and Lawrence bring down our knowledge of Icelandic history into the 14th century. The former work is un- happily imperfect; it is the record of the struggles of church and state over patronage rights and glebes, written ¢. 1315; it now covers only the years 1269-91; a great many documents are given in it, after the modcrn fashion. The latter, Lawrence's Life, by his disciple, priest

Einar Haflidason, is a charming biography of a good and pious man, whose chequered career in Norway and Iceland is picturesquely told (1324-31). It is the last of the sagas. Bishop Jon's Table- Talk (1325-39) is also worth noticing ; it con- tains many popular stories which the good bishop, who had studied at Bologna and Paris, was wont to tell to his friends.

Annals. The Annals arc now almost the sole material for Icclandic his- tory; they had begun earlier, but after 1331 they got fuller and richer, till they end in 1480. The best are Annales Regi, ending 1306, Einar Haflidason's Annals, known as ' Lawman's Aunals,"' reaching to 1392, and preserved with others in Flatey-book, and the New Annals, last of all. The Teelandic Diplomatarium, edited by Jon Sigurdsson, contains what remains of deeds, jnventorics, letters, &c., from the old days, completing our scauty material for this dark period of the island's history.

Litera- After the union and change of law genuine tradition died out

ture of with the great houses, and the kings' lives and biographies ceased

foreign to please. The ordinary medieval literature reached Iceland through

origin. Norway, and every one began to take delight in it and put it into a vernacular dress, so neglecting their own classics that but for a few collectors like Lawman Hawk they would have perished entirely.

Roman- The Norwegian kings, Hakon Hakonson, c. 1225, and Hakon ae

tic c. 1305, employed Icelanders at their courts in translating the

sagas, French romances of the Alexander, Arthur, and Charlemagne cycles, Some forty or fifty of these Riddara-Sigur (Romances of Chivalry) still remain. They reached Iceland and were eagerly road, many Rimur being founded on them. Norse versions of Mary of Brittany's Lays, the stories of Brutus and of Troy, and

Scien- part of the Pharsalia translated are also found. The Speculum

tific Regale, with its interesting geographical and social information, is

works, also Norse, written c. 1240, by a Halogalander. The computistic and arithmetical treatises of Stiorn-Odd, Biarni the Number-skilled, d. 1173, and Hawk the Lawman, d. 1334, and the geography of Ivar Bardsson, a Norwegian, c. 1340, are of course of foreign origin. A few tracts on geography, &., in Hawk's book, and a Guide to the Holy Land, by Nicholas, abbot of Thwera, d. 1158, complete the list of scientific works.

Mythical The stories which contain the last lees of the old mythology

sagas, and pre-history seem to be also non-Icelandic, but stuffed out and amplified by Icelandic editors, who probably got the plots from the Western Islands. Wolswunga Saga and Hervarar Saga contain quotations and paraphrases of lays by the Helgi poet, and Half's, Ragnar's, and Asmund Kappabana's Sagas all have bits of Western poetry in them. Hrolf Kraki's Saga paraphrases part of Biarka- mal; Hromund Gripsson's gives the story of Helgi and Kara (the lost third of the Helgi trilogy); Gautrek's, Arrow-Odd's, Frithiof's Sagas, &c., contain shreds of true tradition amidst a mass of later fictitious matter of no worth. With the Riddara-Ségur they enjoyed great popularity in the 15th century, and gave matter for many Rimuw. Thidrek's Saga, a late version of the Wolsung story, is of Norse comprsition, c. 1280, from North German sources.

Re- The medieval religious literature of Western Europe also reached

ligious and influenced Iceland, and the Homilies (like the Laws) were,

works, according to Thorodd, the earliest books written in the vernacular, antedating even Ari's histories. The lives of the Virgin, the Apostles, and the Saints fill many MSS. (edited in four large volumes by Professor Unger), and are the works of many authors, chiefly of the 13th and 14th centuries (of course they were known in Latin long before); amongst them are the lives of SS. Edward the Con- fessor, Oswald of N orthumbria, Dunstan, and Thomas of Canterbury. Of the authors we know Priest Berg Gunsteinsson, d. 1211; Kygri- Biorn, bishop-elect, d. 1237 ; Bishop Brand, d. 1264 ; Abbot Runolf, d. 1307; Bishop Lawrence's son Arni, c. 1830; Abbot Berg, ¢. 1340, &c. A paraphrase of the historical books of the Bible was nade by Bishop Brand, d. 1264, called Gydinga Ségur. About 1310 King Hakon V. ordered a commentary on the Bible to be made, which was completed down

to Exodus xix. To this Brand's work was afterwards affixed, and the whole is known as Sttorn. The Norse

version of the famous Barlaam and Josaphat, made for Prince Hakon, c. 1240, must not be forgotten.

The post-classical literature falls chiefly under three heads,— Post. religious, literary, aud scientific. Under the first comes foremost classical the noble translation of the New Testament by Odd Gottskalksson, litera- gon of the bishop of Holar. Brought up in Norway, he travelled ture. in Denmark and Germany, and took upon him the new faith before Re- he returned to Iceland, where he became secretary to Bishop ligious Ogmund of Skalholt. Here he began by translating the Gospel of works. Matthew into his mother-tongue in secret. Having finished the remainder of the New Testament at his own house at Olves, he took it to Denmark, where it was printed at Roskild in 1540. Odd afterwards translated the Psalms, and several devotional works of the day, Corvinus's Epistles, &c. He was made lawman of the north and west, and died from a fall in the Laxa in Kios, June 1556. Three years after his death the first press was set up in Iceland by John Matthewson, at Breidabolstad, in Hunafloe, and a Gospel and Epistle Book, according to Odd's version, issued from it in 1562. In 1584 Bishop Gudbrand, who had brought over a splendid fount of type from Denmark in 1575 (which he completed with hisown hands), printed a translation of the whole Bible at Holar, incorporating Odd's versions and some books (Proverbs and the Son of Sirach, 1580) translated by Bishop Gizar, but supplying most of the Old Testament himself. This fine volume has been the basis of every Bible issued for Iceland till 1826, when it was replaced by a bad modern version. For beauty of language and faithful simplicity of style the fmer parts of this version, especially the New Testament, have never been surpassed in any tongue; they stand worthily beside the work of 'Tyndale, Luther, and Ulfila, foremost monuments of the Teutonic tongues.

The most notable theological work Iceland ever produced is the Post¢ll-Book of Bishop John Widalin (1666-1720), whose bold homely style and stirring eloquence made " John's Book," as it is lovingly called, a favourite in every household, till in the present century it has been replaced for the worse by the more sentimental and polished Danish tracts and sermons.

Theological literature is very popular, and many works on this subject, chiefly translations, will be3fonnd in the lists of Icelandic bibliographers.

The Renaissance of Iceland dates from the beginning of the 17th Literary century, when a school of antiquarians arose and era themselves works. to the task of reconstructing their country's history from the remains their pious care gathered and preserved. Arngrim Jons- son's Brevis Commentarius, 1593, and Crymogea, 1609, were the first-fruits of this movement, of which Bishops Odd, Thorlak, and Bryniulf (worthy parallels to Parker and Laud) were the wise and earnest supporters. 'The first (d. 1630) collected much material for church history. The second (d. 1656) saved Sturlunga and the Bishops' Lives, encouraged John Egilsson to write his New Hunger- waker, lives of the bishops of the Dark Ages and Reformation, and helped Biorn of Skardsa (d. 1655), a bold and patriotic antiquary (whose Annals continue Einar's), in his researches. The last (d. 1675) collected a fine library of MSS., and employed the famous copyist John Erlendsson, to whom and the bishop's brother, John Gizurarsson (d. 1648), we are much beholden for transcripts of many lost MSS. :

Torfeus (1686-1719) and Bartholin, a Dane (d. 1690), roused the taste for northern literature in Europe, a taste which has never since flagged ; and soon after them Arui Magnusson transferred all that remained of vellum and good paper MSS. in Iceland to Den- mark, and laid the foundations of the famous library and bequest, for which all Icelandic students are so much beholden. For over forty years Arni stuck to his task, rescuing every scrap he could lay hands on from the risks of the Icelandic climate and careless- ness, and when he died in 1780, aged fifty-seven, only one good MSS. remained in the island. Besides his magnificent collection, there are a few MSS. of great value at Upsala, at Stockholm, and in the old royal collection at Copenhagen. Those in the university library in the latter city perished in the fire of 1728. Sagas were printed at Upsala and Copenhagen in the 17th century, and the 'Arna-Magnean fund has been working since 1772. In that year appeared also the first volume of Bishop Finn Johnsson's Historia Ecclesiastica Islandice, a work of high value and much erudition, containing not only ecclesiastical but civil and literary history, illustrated by a well-chosen mass of documents, 870-1740. It has been continued by Bishop P. Peterson to modern times, 1740-1840. The results, however, of

modern observers and scholars must be sought for in the periodicals, Safn, Felagsrit, Ny Felagsrit, and others. John Espolin's Arbekr is very good up to its date, 1821. By far the best history of Icelandic classic literature is the bril- liant sketch by Dr Vigfusson, Prolegomena to Sturlunga Saga, Oxford, 1879, to which we must here acknowledge our obligations. It replaces much earlier work, especially the Seiagraphia of Halfdan Einarson, 1777, and the Saga-Bibliotck of Miller. The numerous editions of the classics by the Icclandic societies, the Danish Société des Antiquités, Nordiske Literatur Samfund, and the new Gammel Nordisk Literatur Samfund, the splendid Norwegian editions of Unger, the labours of the Icelanders Sigurdsson and

Scien- tific works.

Miscel- laneous,

ICHLAND

Gislason, and of those foreign scholars in Scandinavia and Germany who have thrown themselves so heartily into the work of illustrating, publishing, and editing the sagas and poems (men like Munch, Bugge, Bergmann, Mobius, and Maurer, to name only a few), can only be referred to here.

The first modern scientific work is the [ter per patriam of Eggert Olafsson and Biarni Paulsson, which gives a careful and correct account of the physical peculiarities—fauna, flora, &c.—of the island as far as could be done at the date of its appearance, 1772. The island was first made known to "the world " by this book and by the sketch of Unuo von Troil, a Swede, who accompanied Sir Joseph Banks to Iceland in 1772, and afterwards wrote a series of 'letters' on the land and its literature, &c. This tour was the forerunner of an endless scries of '" travels," of which those of Hooker (1809), Mackenzie (1810), Henderson (1818), Gaimard (1838-43), Paijkull (1867), and, lastly, that of Captain Burton, an excellent account of the land and people, crammed with informa- tion of every kind (1875), are the best.

The maps by Olson and his colleagues, by Gunnlaugson, and by the French Admiralty are good. Kalund's work on the historical geography of the island is valuable and interesting. Safn and other periodicals above mentioned contain many able papers on scientific and sociological matters.

Iceland is an interesting ficld for the pathologist and physician, and numerous medical treatises, Ieelandic and foreign, have attacked it. Dr Hjaltalin, the present medical director, is perhaps the best modern authority,

The cathedral high school merged into a college in 1801, which was fixed at Bessastad during its palmiest days (1805-46), and is now at Reykjavik. Among its lists of masters several distinguished names figure, for example, Sweinbiorn Egilsson, whose Homeric translations were issued as college " programs." A law school has been recently formed at Reykjavik and a technical school at Médruvellir. The museum and library, both at Reykjavik, still in the rudimentary state, are to be newly housed and extended.

Iceland is emphatically a land of proverbs, which occur on almost every page of the dictionary, while of folk-tales, those other keys to the people's heart, there is plentiful store. Early work in this direction was done by Jon Gudmundsson, Olaf the Old, and John Olafsson in the 17th century, who all put traditions on paper, and their labours have been completed by the magnificent collection of Jon Arnason (1862-64), who, inspired by the example of the Grimms, spent great toil on his self-imposed task. Many tales are but i echoes of the sagas ; many were family legends, many the old fairy tales we all know so well, dressed in a fres garb suited to their new northern home; but, besides all these, there are a number of traditions and superstitions not found elsewhere, the mass of which is of indigenous growth and origin. Some of Arnason's collections have been put into English by Messrs J. G. G. Powell and E. Magnusson, and Sir G. Dasent.

A few translations of popular and famous books, such as the Arabian Nights, one or two classics, and a tale, Pilir og Stulka ("Lad and Lass"), 1850, complete the notabilities of Icelandic biblio- graphy. Mr Lidderdale has prepared a list of Icelandic-printed books, which itis hoped may be published ; the excellent Catalogus of Mobius is of use for dates, &c., of editions.

Unlike England and France, Iceland has had but one golden age of literature upon which all her fame must rest. Of its creations it has been truly said that they fill a placc none others could take in the high ranks of Aryan classics. The noblest of them are dis- tinguished by pure and strict

form, noble heroic subject, and simple truthful self-control of style and treatment, free alike from over- wrought sentiment or extravagant passion, and raised equally above euphemism and commonplace, but ever inspired by a weird Aischylean power, grim and tendcr, and splendid as that which breathes through those historical books of the Old Testament, to which alone should the masterpicces of Iceland's greatest writers be compared.

LANGUAGE.

The relations of Icelandic to the other Teutonic tongues may be best shown by a chronological treatment. _ It presents the following anomalies:—on the one hand, it has a highly inflexional grammar, a pure vocabulary, and a simple syntax, points which would place it side byside with Gothic ; but, on the other hand, itshows such strong marks of contraction and such deep phonetic changes, especially in the vowels, as can only be paralleled in the modern English. It is further noteworthy for its unity or lack of dialectic variation, and possesses exceptional advantages for the philologist in the com- plete series of documents dating from the 11th century downwards in which its history may be most accurately and minutely studied.

There is little doubt but that the Teutonic tribes of the 4th cen- tury all spoke one language, that, in fact, of which the remains of Ulfila (which may be supplemented by a few inscriptions, such as those of the Golden Horn and the earliest Danish rune-stones, and a few stray words preserved in classic authors) afford us such a noble specimen. The first differentiation occurred when the English colony scparated in the 5th century from the parent stock, and,

following its own course of development, already by the time of Bede presented many new and peculiar characteristics in form and vocabulary. With the changes which produced the High German dialects it does not behove us to deal here, so we may pass on to the Viking Tide (775-925), the results of which were felt over a wide area, and are evidenced by the changes which gave to the tongue of those tribes that took part in it a distinctly Scandinavian character. z

Just as the earlier movement left its mark in Old English, so this one is elcarly seen in the speech of the Scandinavian colonies of the West, especially in Icclandic, but it is still well marked in the Eastern Scandinavian dialects—Swedish, Danish, &c., as the fol- lowing points common to all east and west, and marking them off clearly from all other Teutonic tongues, will show :—strong stem- contraction reducing all words as far as possible to a trochaic form; t-umlaut carried out very fully and consistently; the suffixing of the article; and a peculiar vocabulary which has ehcsen out of the common Teutonic stock certain words for daily use, rejecting others which are common to all the other sister tongues—e.g., eld for fire, ekkia for widow, gamol for old, eigt for not, ok for and, gira for do, taka for niman, &c. The later Danish rune-stones and those of Sweden, published by Wimmer, Siive, Dybeck, &e., will be the best documents for this stage of the Scandinavian tongue.

We may now leave the Eastern Scandinavian dialects to follow their own course, which has led them through a path not entirely dissimilar to that which English has taken, and confine ourselves to the Western Colonial dialects. Those in their earliest monu- ments, the rune-stones of Man, the coins of the " Danish " kings and earls in Ireland and England, the lays of the Western poets in the Edde collection, and the earliest poetry of such Icelandic bards as Egill and Kormak, exhibit certain idiosyncrasies which show them to have already started on their own career. Such are the u-umlant, the loss of w before 7 and J, the simplification of the vowel system (all aggravations, as it were, of the Scandinavian peculi- arities noticed above, while their vocabulary is, as one would expect, affected by the introduction of many English, Gaelic, and Latin words, especially those relating to ideas unknown in earlier heathen days, ecclesiastical terms, &c.), Of these western colonies we are only concerned with the most important, Iceland; the Orkneys and Hebrides have no linguistic monuments later than the Edda lays of the 10th and 11th, and epigonic poetry and rhyined gradus- jingles of the 12th century; the influence of the Danes on our dialects and book-English must be left to English philologists ; while in Ireland only a few personal and local names now betray to the ear the former presence of the Ostman.

The fact that one of the first Icelandic writers, c. 1120, Ari's Earliest contemporary, Thorodd, is a grammarian, and one of no mean power, stage of is our greatest help towards ascertaining the phonesis of the tongue Ice- during the heroic age; and his evidence is supplemented by the Jandic, Icelandic poets, whose strict adherence to metres, which depend for their effect on a delicate harmony of sound and a rigid observance of quantity, is absolutely to be trusted. Thorodd's scheme for the proper phonetic representation of Icelandic (which the English student may contrast with that of Orm, our first spelling reformer) is briefly as follows. The letters b,c,d,/,g, 1,7, 2,9,7,8,¢, are used in their ordinary classic values (c always hard), the capitals B,K,D,F, G,L,M,N,P,R,8,T, being employed for the doubled letters bb, &c. (each consonant of these doubles was of course separately and dis- tinctly pronounced as in Italian now, and, as Mr A. J. Ellis has proved, in Latin formerly); pis used as in Old English for th; A for the aspirate pure or combined Al, hn, &c.; both these are of unvary- ing form ; a for es, gs, and y for ng can only be found in medial and final positions. Thus we get twenty-cight consonants. 'I'he vowels, a, ¢,1,0,u,y,0,@ long and short, have their ordinary valucs [pal. 4,¢,1,0,U,1,E,ai and aa, ee, &c,], and to them Thorodd has added ao [a] long and short. All these vowels may also be nasalized, d,é, &c., making twenty-seven in all; 7 and «, whether consonantal or vocal, do not vary in form. The following points characterize the tongue at this period:— adherence to o in the terminations, right employ- ment of the subjunctive, which has since gone completely ont of use, retention of s in inflexion and the substantive verb. Quantity was strictly observed in speaking, and also accent, and no doubt people, as in Old England, spoke mnch inore clearly, slowly, and energetically than they do now. The introduction of quantitative metres measured by syllables is no doubt to be ascribed to Celtic influence, as are the line-rhymes and assonances and rhyme-endings, which, as any reader of Snorri's Hatta-tal or Earl Rognwald's Hatta-lykill will see at the first glance, completely separated Ice- landic poetry from the original Teutonic metric of the Continental rune-stones, of Beowulf, and of Havamal.

Thorodd's scheme was unfortunately never used in its strict completeness, but it is partly cmployed in the following MSS., which are of the highest authority for this era of the Icelandic :— Elucidarius, c. 1130, ed. facsimile;

Libellus, c. 1150, ed. Mobius; the Law Scroll-fragments affixed by W. Finsen to the end of his ed. of Cod. Regius Grdgds; the Stockholm Homilies, c. 1145, ed. Wisen ; Physiologus, AM. 673, ed. facsimile; Agrip, ec. 1185, ed.

13th century changes.

16th century ehanges.

Absence of dialects.

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Dahlerup. For others see Table II. Prolegomena to Stwrlunga Saga, Oxford, 1879.

The first era of change, ascribed by Dr Vigfusson to about the lifetime of Snorri, is the mark left by the civil wars and the eon- nexion with Norway (our 14th century Wars of the Roses transition isin many respects its parallel). It is secn in the normal spelling of the editions of the sagas, &c., and is best exemplified by the famous AM. 132, c. 1300, and the Annales Regii, 1290-1306 (accurately printed in pp. 348-91, vol. ii., Sturlunga Saga, Oxford, 1879),—the loss of the s replaced by 7, the vanishing of the w- wmlauted d, the confusion of and , w and ¢, ao and ¢o (the latter of each couple prevailing), the hardening of the dental finals and the blurring of st, sk, &c. intoz. This stage of spelling and pronunciation is that which should be adhered to in all works which must be printed in an uniform way, dictionaries, grammars, classic editions, &c. The student may be cautioned not to take the vagaries of Norse scribes, or Noricized Icelanders (such as Hawk) for important phonetic variations,

The second era of change is that which accompanied the Refor- ination, and witnesses to the mental and physical stir produced by that movement. It is only heard in the spoken tongue (for all books, savo a few printed during the last few years, follow the normal type of the 14th and 15th century MSS. with few variations), but it ig none the less deep and important. Its leading features are the loss of quantity and intonation, the confusion of the vowels y and w, wand ai, ey and aw, aw and d, etitand eyy ¥ (the latter taking the

sound of the former in each case), the diph- thongization of the long vowels 7, 4 0, #,—all changes which from their symmetry must have taken place at one date,—the differentia- tion of doubled and touching consonants, Ji, nn, gn, &c., and of final r. The vocabulary, which during the connexion with Norway and England through the "Dark Age" had been enriched with many French and English words, now received an important augmentation in anew religious terminology from Germany, while the intercourse with Denmark began to leave its mark in loan-words and Danicisms, the stock of which tended greatly to increase, till a reaction arose in the present century, which, though excusable, has been carried to laughable lengths. The metre of Icelandic poctry had begun to show signs of medizval influence (of French origin) even before the death of Snorri, as a ditty in Stwrlunga shows. During the Dark Age the Rimur metric system, depending largely on time-ending and burden for new effects though still retaining line rhyme and allitera- tion (the latter being absolutely essential), revolutionized poetry, and later the hymus of the Reformation, shaking themselves free from the somewhat monotonous beat of the Rimur, contain examples of many new and ingenious metres.

The absence of dialects in Iccland results from the essential unity of life in that island, and the lack of any of the conditions which during the Middle Ages produced. dialects in England, Germany, aud France, such as town-life with its guilds and varied interests, the great corporations, ecclesiastical, legal, and medical, which by their necessary use of Latin cut off the most highly educated classes from exercising any influence on the vernacular, and the easte influences of chivalry, &c., which sometimes, as in England, allowed the upper classes to use a separate foreign language. In early times before the Danish conquest there were no dialects, because, life being single, king and serf, soldier and peasant, mer- chant and priest must live and speak alike. So we see in our own

days the newspaper, the state schovl, the railway, the conscription, and the theatre, all tending to bring about in each great European state a sameness of life, thought, and speech through every nook and comer of its area.

The general characteristics of the Icelandic tongue are those of a spoken speech, par excellence,—a pure and correct vocabulary well suited to the every-day needs of a pastoral lifc, a pithy and homely vigour of idiom (this shows especially in the saws and proverbs which often recall those of Spain), a delicacy and regularity of syntax, which can express much with few and simple means, and an accuracy of terminology well becoming a legal-minded people. All these salient characters strike every observer, but the full beauty and power of the tongue as a vehicle of the highest expression can only be tested by a careful study of the masterpieees written in it. No one that has not read the finest chapters of Mala or Olaf Tryggvasson's Life, the Tales of Snorri, or a Gospel in Odd's trans- lation, not to speak of other works almost equally worthy of mention, can judge fairly of the capacity, force, and sweetness of this most classic language.

A few words are due to those whose labours have rendered the Philo- The oldest philologist, logical an anonymous grammarian of the works.

task of mastering it easy and pleasant. Thorodd, has been noticed; next generation, ¢. 1175, attempted a classification of letters and sounds; Sturla's brother Olaf, the White Poet, applied the figures, &e., of Donatus and Priscian to Icelandic, in which task he was followed by a continuator. All these treatises were published along with the Zhulwr, rhymed glossaries (compiled in the Western Islands, probably in the Orkneys), in vol. ii. of the AM. edition of the Edda, to a MS. of which they are found affixed, Copenhagen,

1832.

Of modern works, those of Rask, the founder of modern Icelandic philology, Egillson, the learned author of the Poetic Lewicon, other- wise well known by his translation of Homer, and Fritzner, the first real Icelandic lexicographer, deserve reverent mention. But for all practical purposes their labours have been superseded and their designs fulfilled by Dr Gudbrand Vigfusson, whose Ieelandic- English Dietionary, Oxford, 1869-75, must, whether one looks to its scientific philology, completeness, accuracy, Or arrangement, be yronounced the best existing dictionary of any Teutonic tongue. 't comprises a grammar and phonology, &c. The university of Oxford has recently published, under the editorship of Messrs Vigfusson

and Powell, a very complete Ieclandie Prose Reader. In the scattered opuscula of Dr Bugge, as well as in his notes to the poetic Edda, are to be found many interesting "equations" and observations on the langauge and comparative mythology of Scandinavia.

To English philologists the study of Icelandic is of high import- ance, as bearing upon the grammar and vocabulary of our most important dialect, the Northumbrian, to a scientific knowledge of which it is absolutely necessary. A list of words oceurring in every-day English which we owe to the Scandinavian settlers of the Danelaw will be found in the Oxford Ieelandic Reader. To Irish scholars the old northern tongue is also of interest, as not only did those who spoke it borrow much from their Celtic friends and foes, but there was also a certain amount of reflex action which it would be desirable to fully trace out. As the most re ular and pure of the Teutonic dialects, its value to the comparative philologist is sufficiently obvious. (B. ¥. P.)

ICELAND MOS83, 0 lichen, Cetrarza islanazca (Achar.), whose erect or ascending foliaceous habit gives it something of the appearance of a moss, whence probably the name. The thallus has a pale chestnut colour, and grows to a height of from 3 to 4 inches, the branches being channelled or rolled into tubes, which terminate in flattened lobes with fringed edges. It grows abundantly in the mountainous regions of northern countries, and specially it is char- acteristic of the lava slopes and plains of the west and north of Iceland. As met with in commerce it is a light-grey harsh cartilaginous body, almost destitute of odour, and having a slightly bitter taste. It contains about 70 per cent, of lichenin or lichen-starch, a body isomeric with common starch, but wanting any appearance of structure. It also yields a peculiar modification of chlorophyll, called thallochlor, fumaric acid, licheno-stearic acid, and cetraric acid, to which last it owes its bitter taste, In medicine it is used as a mild tonic, and at the same time it forms a nutritious and easily digested amylaceous food, being used in place of starch in some preparations of cocoa. It is not,

however, in great request, and even in Iceland it is only habitually resorted to in seasons of acarcity.

I-CHANG, or Y-cHana, also called Y-LIN in some maps, a town of China, in the province of Hoo-pih, one of the four new ports opened to foreign trade by treaty in 1877. It is situated in 30° 42’ N. lat. and (approximately) 111° 20’ E. long,—363 geographical miles up the Yang-tze- Keang from Hankow. Built on the left bank of the river just where it escapes from the ravines and gorges which for 350 miles have imprisoned its channel, J-chang is exposed to considerable risk of floods; in 1870 the waters rose as much as 20 feet in one day, and the town had many of its houses and about half of its wall swept away. The first English vessels to make the ascent of the river as far as I-chang were those of Admiral Sir James Hope’s expedition «1 1861. In 1878 the port was visited by 16 Chinese steamers with a burden of 5440 tons, and the net value of the trade was 71,014 Hk. taels (of about 6s.); in the following year the net value had increased to 612,508 Hk. taels. Trepang was one of the principal articles. The

Chinese population is estimated at 33,560 (Deutsches Handels Archiv, 1880); and in 1878 there were fifteen foreign residents.

See Journ. of R. Geogr. Soe. , 1862; and Blakiston, Five Months on the Yang-tee-Keang, 1862.

ICHNEUMON (Herpestes), a genus of small carnivor- ous mammals belonging to the family Viverride, and resembling the true civets in the elongated weasel-like form of the body and in the shortness of the limbs. There are, according to Gray (British Museum Catalogue, 1869), 22 species of ichneumons, the great majority of which are confined to the African continent, the remainder occurring in Persia, India, and the Malay archipelago, and one, the Andalusian ichneumon (H. Widdringtonii, Gray), in the Sierra Morena of Spain, the last probably an African

straggler. The Egyptian and Indian ichneumons are the forms best known. The former (Ierpestes ichnewmon, L.) is aninhabitant = ;

of Egypt and the north of Africa, where it is known to foreign _resi- dents as ‘ Pha- Egyptian Ichneumon.

raoh's rat." When full grown it is about the size of the domestic cat. It is covered with a fur of long harsh hairs of a tawny grey colour, darker on the head and along the middle of the back, its legs reddish and its feet and tail black. It feeds on rats and mice, birds and reptiles, and for this reason is occasionally domesticated. Its fondness for eggs leads it to search for those of the crocodile, buried as these usually are beneath a thin covering of sand on the river banks ; and its services in thus checking the multiplication of those reptiles were so appreciated by the ancient Egyptians that they regarded the ichneumon as a sacred animal, and when it died buried it, says Herodotus, "in holy reposi- tories." It is, however, equally fond of poultry and their eggs, and its depredations among fowls considerably detract from its undoubted merits as a vermin-killer. During the inundations of the Nile it is said to approach the habitations of man, but at other seasons it keeps to the fields and to the banks of the crocodile-frequented river. The Indian ichneumon or mungoos (ZZenpestes griseus, Desm.) is con: siderably smaller than the Egyptian form; its fur is of a pale grey colour, the hairs being largely white-ringed, while the cheeks and throat are more or Jess reddish. Like the preceding species, it is frequently domesticated, and is then put to a similar use. It is especially serviceable in India as a serpent killer, destroying not only the eggs and young of these creatures, but attacking without hesitation and killing the most venomous adult snakes. The fact that it invariably survives those encounters has led to the belief that it either enjoys immunity from the effects of snake poison, or that after being bitten it has recourse, as the Hindoos have always maintained, to the root of a plant as an antidote. Neither of these suppositions has stood the test of scientific examination, for it has been found that when actually bitten it falls a victim to the poison as rapidly as other mammals, while there is no trustworthy evidence of its seeking a vegetable antidote. The truth seems to be that the mungoos by its exceeding agility and quickness of eye avoids the fangs of the snake while fixing its own teeth in the back of the reptile's neck. The whole Thanatophidia of India stand in awe of this tiny but tenacious mammal, and seek to escape from its presence. The mungoos, on the other hand, never hesitates to attack; the moment he sees his enemy, "his whole nature," says 2recent spectator of one of those fights, "appears to be changed. His fur stands on end, and he presents the incarnation of intense rage. 'The snake invariably attempts

to escape, but, finding it impossible to evade the rapid onslaught of the mungoos, he raises his crest and lashes out fiercely at his little persecutor, who seems to delight in dodging out of the way just in time. This goes on until the mungoos sees his opportunity, when like lightning he rushes in and seizes the snake with his teeth by the back of the neck close to the head, shaking him as a terrier does arat. These tactics are repeated until the snake is killed," The mungoos is equally dexterous in killing rats and other four-footed vermin.

ICHNEUMON-FLY is a general name applied to parasitic insects of the section Pupivora (or Hntomophaga), order Hymenoptera, from the typical genus Ichnewmon, belonging to the chief family of that section,—itself fanci- fully so called after the Egyptian mammal (Llerpestes), notorious for its habit of destroying the eggs of reptiles. The species of the families Ichneumonide, Braconide, Livaniide, Proctotrypide, and Chalcidide are often indis- criminately called "Ichneumons," but the term is perhaps properly applicable only to the first and second of these, which are respectively equivalent to the Zchnewmones genuine and J. adsciti of older naturalists, chiefly differing in the former having two recurrent nerves to the anterior wing, whilst the latter has only one such nerve. The Ichneumo- nidce proper are one of the most extensive groups of insects, and have been much studied by entomologists since the time of Linnzeus and Gravenhorst. Their sexual differences of colour, &c., are, however, often so great that fresh discoveries are constantly being made with regard to their true specific relations, as well as new species detected by biological observers, Gravenhorst described some 1650 European species, to which considerable subsequent addi- tions have been made; and at the latest computation of the English Jchnewmonide (in 1872, by the Rev. T. A. Marshall), 1186 species, contained in 136 genera, were recognized,—439 Braconide being also enumerated. There are 6 subfamilies of the Ichnewmonide, viz., the Ichneu- monides, Cryptides, Agriotypides, Ophionides, Tryphonides, and Pimplides, differing considerably in size and facies, but united in the common attribute of being in their earlier stage parasitic upon other insects. They have all long narrow bodies; a small free head with long filiform or setaceous antenne, which are never elbowed, and have always more than sixteen

joints; the abdomen attached to the thorax at its hinder extremity between the base of the posterior cox, and provided in the female with a straight ovipositor often exserted and very long; and the wings veined, with perfect cells on the disk of the front

air. 4 The parasitic habits above alluded to render these flies of very great importance in the economy of nature, as they effectually serve to check any inordinate increase in the numbers of injurious insects. Without their aid, indeed, it would in many cases be impossible for the agriculturist to hold his own against the ravages of his minute hexapod foes, whose habits are not sufficiently known to render artificial checks or destroying agents available. The females of all the species are constantly on the alert to discover the proper living food for their own larvee, which are hatched from the eggs they deposit in or on the eggs, larvee, or pups of other insects of all orders, chiefly Lepidoptera, the caterpillars of butterflies and moths being specially attacked (as also are spiders). Any one who has watched insect life, even in a suburban garden, during summer, can hardly have failed to notice the busy way in which the parent ichneumon, a small four-winged fly, with constantly vibrating antenna, searches for her prey; and the clusters of minute cocoons round the remains of some unfortunate cabbage-butterfly caterpillar, which has had just enough vitality left in it to crawl instinctively to a proper

place for undergoing that change to pupa which it will never make, must also have been observed by many. This is the work of Apanteles (or Microgaster) glomeratus, one of the Braconidae, which in days past was a source of disquictude to naturalists, who believed that the life of the one defunct larva had transmigrated into the numerous smaller Hies rcared from it. Ichneumon-flies which attack external feeders have a short ovipositor ; but those attached to wood-fceding insects have that organ of great length, for the purpose of reaching their concealed prey. Thus a species from Japan (Bracon penetrator) has its ovipositor nine times the length of the body; and the large species of Rhyssa and Ephialtes, parasitic on Sirex and large wood- boring beetles in temperate Europe, have very long instru- ments (with which when handled they will endeavour to sting,

sometimes penetrating the skin), in order to get at their secreted victims. This length of ovipositor is, in the female of aspecies of Pelecinus, common in the boreal parts of North America in pine forests, replaced by an excessively attenuated development of abdomen, causing the insect to

resemble a small dragon-fly, and fulfilling the same mechanical purpose. A common reddish-coloured species of Ophion (O. obscurum), with a sabre-shaped abdomen, is noteworthy from the fact of its eggs being attached by stalks outside the body of the caterpillar of the puss-moth (Diranura vinula). Lepidopterists wishing to breed the latter cut off the eggs of the parasite with scissors.

The larve of the ichneumon-flies are white fleshy cylindrical footless grubs; the majority of them spin silk cocoons before pupating, often in a mass (sometimes almost

geometrically), and sometimes in layers of different colours

and texture.

The reader desirous of investigating more fully the structure and habits of this interesting family will, in addition to the older works of Gravenhorst, Esenbeck, Wesmael, and Haliday, find much matter in the recent writings of Brischke, Cresson, Provanohcr, Holmgren, Woldstedt, Tischbein, Vollenhoven, Forster, Kriechbaumer, 'l'asch- enberg, F. Smith, C. G. Thomson, and Rondani. The last-nen- tioned author has published (in the Bulletin of the Italian Ento- mological Society, 1871-78) a valuable list of parasitic insects and the species to which they are attached. (E. C. R.)

LCR THY OL wes

CHTHYOLOGY? is that branch of zoology which treats of the internal and external structure of fishes, their mode of life, and their distribution in space and time. According to the views generally adopted at present, all those Vertebrate animals are referred to the class of Fishes which combine the following characteristics:—they live in water, and by means of gills or

branchiw breathe air dissolved in water; the heart consists of a single ventricle ~~and single atrium ; the limbs, if present, are modified into fins, supplemented by unpaired median fins ; and the skin is either naked, or covered with scales or with osseous plates or bucklers. With few exceptions fishes are ovipar~~ ous. There arc, however, as we shall sec hereafter, not a few membors of this class which show a modification of one or more of these characteristics, and which, neverthe- less, cannot be separated from it. The distinction between the class of Fishes and that of Batrachians is very slight indeed.

History AND LITERATURE. The commencement of the history of ichthyology coin-

Aristotle, cides with that of zoology generally. Aristotle (384-322

B.c.) had a perfect knowledge of the general structure of fishes, which he clearly discriminates both from the aquatic animals with lungs and mamma, é.e., Cetaceans, and from the various groups of aquatic invertebrates. According to him, "the special characteristics of the true fishes consist in the branchiz and fins, the majority having four fins, but those of an elongate form, as the eels, having two only. Some, as the Murena, lack the fins altogether. The rays swim with their whole body, which is spread out. The branchiz are sometimes furnished with an operculum, some- times they are without one, as in the cartilaginous fishes, _.. No fish has hairs or feathers ; most are covered with scales, but some have only a rough or a smooth skin. The tongue is hard, often toothed, and sometimes so much adherent that it scems to be wanting. The eyes have no lids, nor are any ears or nostrils visible, for what takes the place of nostrils is a blind cavity; nevertheless they have the senses of tasting, smelling, and hearing. All have blood. All scaly fishes are oviparous, but the cartilaginous fishes (with the exception of the sca-devil, which Aristotle places along with them) are viviparous. All have a heart, liver, and gall-bladder; but kidneys and urinary bladder are

1 From ix@ds, fish, and.Adyos, doctrine or treatise.

absent. 'They vary much in the structure of their intes- tines: for, whilst the mullet has a fleshy stomach like a bird, others have no stomachic dilatation. Pyloric ceca are close to the stomach, and vary in number; there are even

some, like the majority of the cartilaginous fishes, which have none whatever. Two bodies are situated along the spine, which have the function of testicles ; they open to- wards the vent, and are much enlarged in the spawning season. 'The scales become harder with age. Not being provided with lungs, fishes have no voicc, but several can emit grunting sounds. They sleep like other animals. In most cases the females exceed the males in size; and in the rays and sharks the male is distinguished by an appendage on each side of the vent."

Aristotle's information on the habits of fishes, their migrations, mode and time of propagation, and economic uses, is, so far as it has been tested, surprisingly correct. Unfortunately, we too often lack the means of recognizing the species of which he gives a description. His ideas of specific distinction were as vague as those of the fishermen whose nomenclature he adopted ; it never occurred to him that vernacular names are subject to change, or may be entirely lost in course of time, and the difficulty of identify- ing his species is further increased by the circumstance that sometimes several popular names arc applied by him to the same fish, or different stages of growth are designated by distinct names. The number of fishes known to Aristotle seems to have been about one hundred and fifteen, all of which are inhabitants of the Augean Sea.

That one man should have discovered so many truths, and laid go sure a basis for future progress in zoology, is less surprising than the fact that for about eighteen centuries a science which seemed to offer particular attractions to men gifted with power of observation was no farther ad- vanced. Yet such is the case. Aristotle's disciples, as well as his successors, remained satisfied to be his copiers or commentators, and to collect fabulous stories or vague notions. With very few exceptions (such as Ausonius, who wrote a small poem, in which he describes from his own observations the fishes of the Moselle) authors entirely ab- stained from original research; and it was not until about the middle of the 16th century that ichthyology made a new step in advance by the appearance of Belon, Rondelet, and Salviani, who almost simultaneously published their great works, by which the idea of species was established definitely and for all time.

Belon,

Salviani,

Rondelet.

HISTORY. |

P. Belon travelled in the countries bordering on the eastern part of the Meditcrranean, in the years 1547-50 ; he collected rich stores of positive knowledge, which he embodied in several works. The one most important for the progress of ichthyology is that entitled De aquatilibus libri duo, Paris, 1553. Belon knows about one hundred and ten fishes, of which he gives rude but generally recog- nizable figures. In his descriptions he pays regard to the classical as well as to the vernacular nomenclature, and states the outward characteristics, sometimes even to the number of fin-rays; frequently also he gives the most conspicuous anatomical peculiarities. Although Belon but rarely gives definitions of the terms used by him, it is not generally very difficult to ascertain the limits which he intended to assign to each division of aquatic animals, He very properly divides them into such as are provided with blood and those without it,—two divisions correspondin gin modern language to vertebrate and invertebrate aquatic animals. The former are classified by him according to size, the further subdivisions being based on the structure of the skeleton, mode of propagation, number of limbs, form of the body, and physical character of the habitat.'

The work of the Roman ichthyologist, H. Salviani (1514-72), bears evidence of the high social position which the author held as physician to three popes. Its title is Aquatilium animalium historia, Rome, 1554-57, fol. It treats exclusively of the fishes cf Italy. Ninety- two species are figured on seventy-six plates, which, as re- gards artistic execution, are masterpieces of that period, although those specific characteristics which nowadays constitute the value of a zoological drawing were entirely overlooked by the author or artist. No attempt is made at a natural classification, but the allied forms are generally placed in close proximity. The descriptions are quite equal to those given by Belon, entering umuch into the details of the economy and uses of the several species, and were evidently composed with

the view of collecting in a read- able form all that might prove of interest to the class of society in which the author moved. Salviani's work is of a high order, very remarkable considering the age in which he lived. It could not fail to convey valuable instruction, and to render ichthyology popular in the country to the fauna of which it was devoted, but it was not fitted to advance ichthyology as a science generally; in this respect Salviani is not to be compared with Rondelet or Belon.

G. Rondelet (1507-57) had the great advantage over Belon of having received a medical education at Paris, and especially of having gone through a complete course of instruction in anatomy as a pupil of Gucntherus of Andernach. This is conspicuous throughout his works— Libri de piscibus marinis, Lyons, 1554; and Universe aquatuium historie pars altera, Lyons, 1555. Neverthe- less they cannot be regarded as more than considerably enlarged editions of Belon's work. For, although he worked independently of the latter, and differs from him in nume- rous details, of which he had a much more extensive know- ledge, the system adopted by him is characterized by the Same absence of the true principles of classification. His work is almost entirely limited to European and chiefly to Mediterranean forms, and comprises no less than one hundred and ninety-seven marine and forty-seven fresh- water fishes. His descriptions are more complete and his figures much more accurate than those of Belon ; and the Specific account is preceded by introductory chapters, in which he treats in a general manner of the distinctions, the external and internal parts, and.the economy of fishes. Like Belon, he had no conception of the various categories of classification—confounding, for instance, throughout his work the terms "genus" and ." species"; but he had an intuitive notion of what his successors called a "species,"

and his principal object was to collect and give as much information as possible regarding such species.

For nearly a century the works of Belon and Rondelet continued to be the standard works on ichthyology; but the science did not remain stationary

during that period. The attention of naturalists was now directed to the fauna of foreign countries, especially of the Spanish and Dutch possessions in the New World; and in Europe the estab- lishment of anatomical schools and academies led to careful investigation of the internal anatomy of the most remark- able European forms. Limited as these efforts were as to their scope, being restricted either to the fauna of some par- ticular district or to the dissection of a single species, they were sufficiently numerous to enlarge the views of naturalists, and to destroy that fatal dependence on preceding autho- rities which had continued to keep in bonds the minds of such men even as Rondelet and Belon. The most note- worthy of those engaged in these inquiries in tropical countries were W. Piso and G. Margrav, who accompanied as physicians the Dutch governor, Prince Maurice of Nassau, to Brazil (1637-44).

Of the men who left records of their anatomical re- searches, we may mention Borelli (1608-7 9), who wrote a work De motu animalium, Rome, 1680, 4to, in which he explained the mechanism of swimming and the function of the air-bladder; M. Malpighi (1628-94), who examined the optic nerve of the sword-fish; the celebrated J. Swammerdam (1637-80), who described the intestines of numerous fishes ; and J. Duverney (1648-1730), who investigated in detail the organs of respiration,

A new era in the history of ichthyology commences with Ray, Willughby, and Artedi, who were the first to recog- nize the true principles by which the natural affinities of animals should be determined. Their labours stand in so intimate a connexion with each other that they represent but one great step in the progress of this science.

J. Ray Willughby (1635-72). reform in the method of treating the vegetable and animal PY: kingdoms had become necessary; that the only way of bringing order into the existing chaos was by arranging the various forms according to their structure; that they must cease to be burdened with inapplicable passages and quo- tations from ancient writers, and to perpetuate the vague and erroneous notions of their predecessors. They therefore substituted facts for spcculation, and one of the first re- sults of this change, perhaps the most important, was that, having recognized “

species" as such, they defined the term, and fixed it as the starting point of all sound zoological knowledge.

Although they had divided their work so that Ray attended to the plants principally, and Willughby to the animals, the //istoria piscium, Oxf., 1686, which bears Willughby's name on the title page, and was edited by Ray, is clearly their joint production. A great part of the observations contained in it were collected during the journeys they made together in Great Britain and in the various countries of Europe ; and it is no exaggcration to say that at that time these two Englishmen knew the fishes of the Continent, and especially those of Germany, better than any native zoologist.

By the definition of fishes as animals with blood, breathing by gills, provided with a single ventricle of the heart, and either covered with scales or naked, the Cetaceans are excluded. The fishes proper are arranged primarily according to the cartilaginous or the osseous nature of the skeleton, and then subdivided according to the general form of the body, the presence or the absence of ventral fins, the soft or the spinous structure of the dorsal rays, the number of dorsal fins, &e No fewer than four

(1628-1705) was the friend and guide of F. Ray ani They found that a thorough Willugh-

Artedi.

Linneus.

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hundred and twenty species are thus arranged and described, of which about one hundred and eighty were known to the authors from personal examination,—a comparatively small proportion, but descriptions and figures still formed in great measure the substitute for our modern collections and museums. With the increasing accumulation of forms, the want of a fixed nomenclature had become more and more felt.

Peter Artedi would have been a great ichthyologist if Ray or Willughby had not preceded him. But he was fully conscious of the fact that both had

prepared the way for him, and therefore he did not fail to reap every possible advantage from their labours. Born in 1705 in Sweden,

he studied with Linnzus at Upsala; from an early period

he devoted himself entirely to the study of fishes, and was engaged in the arrangement and description of the collec- tion of Seba, a wealthy Dutchman who had formed what was perhaps the richest museum at that time, when he was accidentally drowned in one of the canals of Amsterdam in the year 1734, at the age of twenty-nine. His manu- scripts were fortunately secured by an Englishman, Count Clifford, and edited by his early friend Linneus. The work is divided into the following parts :—-

(1) In the Bibliotheca Ichthyologica Artedi gives a very complete list of all preccding authors who had written on fishes, with a critical analysis of their works. (2) The Philosophia Ichthyotogica is devoted to a description of the external and internal parts of fishes; Artedi fixes a precise terminology for all the various modifi- cations of the organs, distinguishing between those characters which determine a genus and such as indicate a specics or merely a variety ; in fact he establishes the method and principles which subsequently have guided every systematic ichthyologist. (3) The Genera Pisctum contains well-defined diagnoses of forty-five genera, for which he has fixed an unchangeable nomenclature. (4) In the Species Piscium de- scriptions of seventy-two species, examined by himself, are given, — descriptions which even now are models of exactitude and method. (5) Finally, in the Synonymia Piscium references to all previous Authors are arranged for every spocies, very much in the manner which is adopted in tho systematic works of the present day.

Artedi has been justly called the Father of Ichthyology. So admirable was his treatment of the subject, that even Linnzeus could only modify and add to it. Indeed, so far as ichthyology is concerned, Linnzeus has scarcely done any- thing beyond applying binominal terms to the species properly described and classified by Artedi. His classifi- cation of the genera appears in the 12th edition of the Systema thus :—

A. Amphibia Nantes.—Spiraculis compositis.——Petromyzon, Raia, Squalus, Chimera. Spiraculis solitariis.—Lophius, Acipenser, Cyclopterus,

Balistes, Ostracion, Tetrodon, Diodon, Centriscus, Syngnathus, Pegasus.

B. Pisces Apodes.—Murena, Gymnotus, Trichiurus, Anarrhichas, Ammodytes, Ophidium, Stromateus, Xiphias.

C. Pisces Jugulares.—Callionymus, Uranoscopus, Trachinus, Gadus, Blennius.

D. Pisces Thoracict.—Cepola, Echcneis, Cottus, Scorpena, Zeus, Pleuronectes, Cheetodon, Sparus, Labrus, Scicena, Perca, Gasterosteus, Scomber, Mullus, Trigla.

E. Pisces Abdominaies.—Cobitis, Amia, Silurus, Teuthis, Lori- caria, Salmo, Fistularia, Esox, Elops, Argentina, Atherina, Mugil, Mormyrus, Exoccetus, Polynemus, Clupea, Cyprinus,

Coryphena, Gobius,

Two contemporaries of Linneus, L. T. Gronow and J. T. Klein, attempted a systematic arrangement of fishes ; both had considerable advantages for the study, especially in possessing extensive collections ; but neither exercised any influence on the progress of ichthyology.

The works of Artedi and Linnzus led to an activity of research, especially in Scandinavia, Holland, Germany, and England, such as has never been equalled in the history of biological science. Whilst some of the pupils and followers of Linnzus devoted themselves to the examina- tion and study of the fauna of their native countries, others procesded on voyages of discovery to foreign and distant lands. Of these latter the following may be

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but, not possessing either any critical discernment, those noble monuments For ichthyology it Bloch and Lacépéde, research,

especially mentioned:—O. Fabricius worked out the

fauna of Greenland; Kalm collected in North America,

Hasselquist in Egypt and Palestine, Brtinnich in the Mediterrauean, Osbeck in Java and China, Thunberg in Japan; Forsk&l examined and described the fishes of

the Red Sea ; Steller, Pallas, S. T. Gmelin, and Giildenstedt

traversed nearly the whole of the Russian empire in Europe Others attached themselves as naturalists to the celebrated circumnavigators of the last century, such as the two Forsters (father and son) and Solander, who accom- panied Cook ; Commerson, who travelled with Bougain- ville; and Sonnerat. Numbers of new and remarkable forms were discovered by those men, and the foundation was laid for a knowledge of the geographical distribution ot

and Asia.

animals.

Of those who studied the fishes of their native countries, the most celebrated were Pennant (Great Britain), O. F. Miiller (Denmark), Duhamel (France), Meidinger (Austria), Cornide (Spain), and Parra (Cuba).

The mass of materials brought together by those and other zoologists was so great that, not long after the death of Linneus, the necessity made itself felt for collecting Several compilers under- took this task; they embodied the recent discoveries in new editions of the classical works of Artedi and Linnzus, a knowledge of the subject or

them in a compendious form.

they only succeeded in burying under a chaotic mass of rubbish. was fortunate that two men at least, made it a subject of prolonged original

Mark Eliezer Bloch (1723-1799), @ physician of Berlin,

had reached the age of fifty-six when he commenced to write on ichthyological subjects. life a work in which he intended not only to give full de- scriptions of the species known to him from specimens or drawings, but also to illustrate each species in a style truly magnificent for his cution of which most men would have despaired of. he accomplished not only this task, but even more than he at first contemplated.

To begin at his time of

time, was an undertaking the exe- Yet

His work consists of two divisions :—(1) Oeconomische Naturgeschichte der Frsche (2) Naturgeschtchte der auslandischen Fische, Berl., 1785- 95, The first division, which is devoted to a description of the fishes of Germany, is entirely original, and based upon the author's own observations. His descriptions as well

as figures were made from nature, and are, with but few

exceptions, still serviceable ; indeed many continue to be the best existing in literature. Bloch was less fortunate, and is much less reliable, in his natural history of foreign fishes, For many of the species he had to trust to more or less incorrect drawings and descriptions by travellers ; frequently, also, he was deceived as to the origin of specimens which he acquired by purchase. Hence his accounts contain numerous confusing errors, which it would have been difficult to correct had not nearly the whole of the materials on which his work is based been preserved in the collections at Berlin.

After the completion of his great work Bloch occupied himself with systematizing. He prepared a general system of fishes, in which he arranged not only those de- scribed in his great work, but also those with which he had afterwards become acquainted from the descriptions of others. 'The work was ably edited and published after Bloch's death by a philologist, J. G. Schneider, under the title If. F. Blochit Systema ichthyologie iconibus CX. ilus- tratum, Berl., 1801. The number of species enumerated in it amounts to 1519. The system is based upon the

number of the fins, the various orders being termed Hencle-

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Bloch.

Deutschlands, Berl., 1782-84 ; ©

Lacépéde.

capterygit, Decapterygii, &c. We need not add that an artificial method like this led to the most unnatural com- binations and distinctions.

Bloch's Naturgeschichte remained for many years the standard work, and, with its great number of excellent illustrations, proved a most useful guide to the student. But as regards originality of thought Bloch was far sur- passed by his contemporary, B. G. E. de Lacépéde, born at Agen, in France, in 1756,a man of great and general erudition, who became professor at the museum of natural history in Paris, where he died in 1826.

Lacépéde had to contend with great difficulties in the preparation of his Histoire des Poissons, Paris, 1798-1803, 5 vols., which was written during the most disturbed period of the French Revolution. A great part of it was composed whilst the author was separated from collections and books, and had to rely on his notes and manuscripts only. Even the works of Bloch and other contemporaneous authors remained unknown, or at least inaccessible, to him for a long time. We need not therefore be surprised that his work abounds in the kind of errors into which a compiler is liable to fall. Not only does the same species appear under two or more distinct specific names, but it sometimes happens that the author so little understands the source from which he derives his information that the description is referred to one genus and the accompanying figure to another. The names of genera are unduly multiplied; and the figures with which the work is illustrated are far inferior to those of Bloch. Thus the influence of Lacépéde on the progress of ichthyology was vastly less than that of his fellow-labourer; and the labour laid on his succes- sors in correcting the numerous errors into which he had fallen probably outweighed the assistance which they de- rived from his work.

The work of the principal cultivators of ichthyology in the period between Ray and Lacéptde was chiefly systematizing and describing; but the internal organization of fishes also received attention from more than one great anatomist. Haller, Camper, and Hunter examined the nervous system and the organs of sense; and above all Alexander Monro, secundus, published a classical work, The Structure and Physiology of Fishes explained and compared with those of Man and other Animals, Kdin., 1785.

The electric organs of fishes (Zorpedo and Gymno- tus) were examined by Réaumur, Allamand, Bancroft, Walsh, and still more exactly by J. Hunter. The mystery of the propagation of the eel called forth a large number of essays, and even the artificial propagation of Salmonide was known and practised by Gleditsch (1764).

Bloch and Lacépéde's works were almost immediately succeeded by the labours of Cuvier, but his early publi- cations were of necessity tentative, preliminary, and frag- mentary, so that some little time elapsed before the spirit infused into ichthyology by this great anatomist could exer- cise its influence on all the workers in this. field. Several of such ante-Cuvierian works must be mentioned on account of their importance to our knowledge of certain faunas. The Descriptions and Figures of Two LHundred Wishes collected at Vizagapatam on the Coast of Coromandel, Lond., 1803, 2 vols., by Patrick Russel, and An Account of the Fishes found in the River Ganges and its Branches, Kdin., 1822, 2 vols., by F. Hamilton (formerly Buchanan), were works distinguished by greater accuracy of the drawings (especially the latter) than was ever attained before. A Natural Iistory of British Fishes was published by E. Donovan, Lond., 1802-8; and the Mediterranean fauna formed the study of the lifetime of A. Risso (Jchthyologze de Nice, Paris, 1810; and Histoire naturelle de ? Hurope AMéridionale, Paris, 1827). A slight beginning in the description of the fishes of the United States was made

by 8. L. Mitchell, who published, besides various papers, a Memoir on the Ichthyology of New York, in 1815.

G. Cuvier (1769-1832) did not occupy himself with the Cuvier.

study of fishes merely because the class formed part of the Regne Animal, but devoted himself to it with particular predilection. The investigation ot their anatomy, and especially of their skeleton, was taken up by him at an early period, and continued until he had succeeded in com- pleting so perfect a framework of the system of the whole class that. his immediate

successors required only to fill up those details for which their master had had no leisure. Indefatigable in examining all the external and internal characters of the fishes in a rich collection, he ascertained the natural affinities of the infinite variety of forms, and accurately defined the divisions, orders, families, and genera of the class, as they appear in the various editions of the Réegne Animal. His industry equalled his genius: he formed connexions with almost every accessible part of the globe; not only French travellers and natu- ralists, but also Germans, Englishmen, Americans, rivalled one another in assisting him with collections; and for many years the museum of the Jardin des Plantes was the centre where all ichthyological treasures were deposited. Thus Cuvier brought together a collection the like of which had never been seen before, and which, as it contains all the materials on which his labours were based, must still be considered as the most important. Soon after the year

1820, Cuvier, assisted by one of his pupils, A. Valenciennes, Valen- ‘ commenced his great work on fishes, Hzstovre naturelle des ciennes.

Poissons, of which the first volume appeared in 1828. The earlier volumes, in which Cuvier himself took his share, bear evidence of the enthusiasm with which both authors devoted themselves to their task. After Cuvier’s death in 1832, the work was left entirely in the hands of Valen- ciennes, whose energy and interest gradually slackened, rising to their former pitch in some parts only, as, for instance, in the treatise on the herring. He left the work unfinished with the twenty-second volume (1848), which treats of the Salmonoids. ‘Yet, incomplete as it is, it is indispensable to the student.

The system finally adopted by Cuvier is the following :—

A, POISSONS OSSEUX. I. A BRANCHIES EN PEIGNES OU EN LAMES.

1. A Machoire Supéricure Libre. a. Acanthoptérygiens.

Percoides. Sparoides. Branehies labyrinthiqucs. Polynémes. Chétodonoides. Lophioides. Mulles, Seomberoides. Gobioides. Joues euirassces. Muges. Labroides. Seienoides. b. Malacoptérygiens. Abdominaua. Subbrachicns. Apodes. Cyprinoides. Gadoides. Murenoides. Siluroides. Pleuronectes. Salmonoides. Discoboles. Clupeoides. Lucioides.

2. A Méchoire Supérieure Fiméc. Sclérodermes. Gymnodontes. II. A BrAncntEs EN ForME DE Hovrras. Lophobranehes. B. CARTILAGINEUX OU CHONDROPTERYGIENS. Sturioniens. Plagiostomes, Cyelostomes.

We have only to compare this system with that of Linnzeus if we wish to measure the gigantic stride made by ichthy- ology during the intervening period of seventy years. The various characters employed for classification have been examined throughout the whole class, and their relative importance has been duly weighed and understood. Though Linneus had formed a category of "Amphibia Nantes" for fishes with a cartilaginous skeleton, which should coincide with Cuvier's wane Cartilagineux,"

he had failed to understand the very nature of cartilage,

apparently comprising work of tess firniness than ordinary bone.

fishes. Adopting the position and development of the ven-

tral fins as a highly important character, he had been obliged to associate fishes having rudimentary and inconspicuous ventral fins, like Zrichiurus, Xiphias, &¢., with the true

eels. The important category of "family" appears now

in Cuvier's system fully established as intermediate between Important changes in Cuvier's system have been made and proposed by his successors, but in the

genus and order.

main it is still that of the present day.

Cuvier had extended his researches beyond the living forms, into the field of paleontology ; he was the first to observe the close resemblance of the scales of the fossil Palconiscus to those of the living Polypterus and Lepidos- teus, the prolongation and identity of structure of the upper caudal lobe in Palwoniscus and the sturgeons, the presence of peculiar "fulera" on the anterior margin of the dorsal fin in Palconiscus and Lepidosteus, and inferred from these facts that the fossil genus was allied either to the stur- But it did not occur to him that

geons or to Lepidosteus. there was a close relationship between those recent fishes.

Lepidosteus and, with it, the fossil genus remained in his sys-

tem a member of the order of Malacopterygit abdominates. It was left to L. Agassiz (1807-73) to point out the importance of the structure of the scales as a characteristic,

and to open a path towards the knowledge of a whole new

subclass of fishes, the Ganoider.

Impressed with the fact that the peculiar scales of Poly- pterus and Lepidosteus are common to all fossil osseous

fishes down to the Chalk, he takes the structure of the scales generally as the base for an ichthyological system, and distinguishes four orders :-—

1. Placoids.—Without scales proper, but with scales of enamel,

sometimes large, sometimes small, and reduced to mere points (Rays, Sharks, and Cyclostomi, with the fossil Hybodontes). 2. Ganoids.

—With angular bony scales, covered with a thick stratum of

enamel: to this order belong the fossil Lepidoides, Sauroides, Pycnodontes, and Ceelacanthi; the recent Polypterus, Lepidosteus, Sclerodermi, Gymnodontes, Lophobranches, and Siluroides ; also the Sturgeons, © 3. Ctenoids.—With rough scales, which have their free margins denticulated :

Chetodontide, Pleuronectide, Percidea, Polyacanthi, Sciznidex, Sparide, Scorpenide, Aulostomi. 4. Cyc- loids. —With smooth scales, the hind margin of which lacks denti- culation: Labride, Mugilide, Scombride, Gadoidci, Gobiide, Murenide, Lucioidei, Salmonide, Clupeide, Cyprinide.

We have no hesitation in affirming that if Agassiz had had an opportunity of acquiring a more extensive and intimate knowledge of existing fishes before his energies were absorbed in the study of fossil remains, he would himself have recognized the artificial character of his classification. The distinctions between cycloid and ctenoid scales, between placoid and ganoid fishes, are vague, and ean hardly be maintained. So far as the living and post- Cretacean forms are concerned, he abandoned the vantage-ground gained by Cuvier ; and therefore his system could never supersede that of his predecessor, and finally shared the fate of every classification based on the modifications of one organ only. But Agassiz has the merit of having opened an immense new field of research by his study of the infinite variety of fossil forms. In his principal work, Recherches sur les Poissons fossiles, Neuchatel, 1833- 43, 4to, atlas in fol., he placed them before the world arranged in a methodical manner, with excellent descrip- tions and illustrations. His power of discernment and penetration in determining even the most fragmentary remains is truly astonishing ; and, if his order of Ganoids is an assemblage of forms very different from what is now understood by that term, he was at any rate the first who recognized that such an order of fishes exists.

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under this term any skeletal frame- Hence he con- sidered Lophius, C'yclopterus, Syngnathus to be cartilaginous

| 1 ¢¢ Description of Ceratodus," Phil. Trans., 1871, ii.

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The discoverer of the Ganoidei was succeeded by their J. Miller. explorer, Johannes Miiller (1801-58). In his classical memoir Ueber den Bau und die Grenzen der Ganoiden, Berl., 1846, he showed that the Ganoids differ from all the other osseous fishes, and agree with the Plagiostomes, in the

structure of the heart. By this primary character, all heterogeneous elements as Siluroids, Osteoglosside, dei, were eliminated from the order as understood by Agassiz. On the other hand, he did not recognize the affinity of Lepidosiren to the Ganoids, but established for it a distinct subclass, Dipnoi, which he placed at the opposite end of the system. By his researches into the anatomy of the lampreys and Amphiowxus, their typical distinctness from other cartilaginous fishes was proved; they became the types of two other subclasses, C'yclostomi: and Leptocardit.

Miiller proposed several other not unimportant modifica- tions of the Cuvierian system ; and, although all cannot be maintained as the most natural arrangements, yet his researches have given us a much more complete knowledge of the organization of the Teleosteous fishes, and later inquiries have shown that, on the whole, the combinations proposed by him require only some further modification and another definition to render them perfectly natural.

The discovery (in the year 1871) of a living representa- tive of a genus hitherto believed to be long extinct, Cera- todus, threw a new light on the affinities of fishes. The writer of the present article, who had the good fortune to examine this fish, was enabled to show that, on the one hand, it was a form most closely allied to Lepidosiren, and, on the other, that it could not be separated from the Ganoid fishes, and therefore that Lepidoseren also was a Ganoid,—a relation already indicated by Huxley in a previous paper on "Devonian Fishes." This discovery led to further considera- tion! of the relative characters of Miiller's subclasses, and to the system which is followed in the present article.

Having followed the development of the ichthyological system down to the most recent date, we have to retrace our steps to enumerate the most important contributions to ichthyology which appeared contemporaneously with or sub- sequently to the publication of the great work of Cuvier and Valenciennes. As in other branches of zoology, almost every year was marked by increased activity. For the sake of convenience we may arrange these works under three heads.

I. VOYAGES, CONTAINING GENERAL ACCOUNTS OF ZOOLOGICAL , COLLECTIONS.

A. French.—1. Voyage autour du monde sur les Corvettes de S. M. I' Uranie et la Physicienne, sous le commandement de M. Freycinet, «« Zoologie—Poissons," par Quoy et Gaimard, Paris, 1824. 2. Voyage de la Coquille, ' Zoologie," par Lesson, Paris, 1826-30. 3. Voyage de I' Astrolabe, sous le commandement de M. J. Dumont d' Urville, " Poissons," par Quoy et Gaimard, Paris, 1834. 4. Voyage aw Péle Sud par M. J. Dumont @ Urville, " Poissons," par Hombron et Jac- quinot, Paris, 1853-4. B. English.—1. Voyage of H.M.S. Sulphur, ' Fishes," by J. Richardson, Lond., 1844-45. 2. Voyage of H.ILSS. Erebus and Terror, *Fishes," by J. Richardson, Lond., 1846. 3. Voyage of H.M.S. Beagle, "Fishes," by L. Jenyns, Lond., 1842. 4. Voyage of H.M.S8. Challenger, "Fishes," by A. Giinther.*

C. German.—1. Reise der ssterreichischen Fregatte Novara, '

Biblio- graphy.

IJ. Fauna. A. Great Britain.—1. R. Parnell, The Natural History of the Fishes of the Firth of Forth, Edin., 1838. 2. W. Yarrell, A His- tory of British Fishes, 3d edit., Lond., 1859. 3. J. Couch, History of the Fishes of the British Islands, Lond., 1862-65.

B. Denmark and Seandinavia.—1. H. Kroyer, Danmark's Fiske, Copenhagen, 1838-53. 2. 8. Nilsson, Skandinavisk Fauna, vol. iv. "Fiskarna," Lund, 1855. 3. Fries och Ekstrém, Skandinavians Fiskar, Stockh., 1836.

C. Russia.—1. Nordmann, "Ichthyologie Pontique," in Demi- doff's Voyage dans la Russie méridionale, tom. iii., Paris, 1840.

D. Germany.—1. Heckel und Kner, Die Siisswasser-fische der

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bsterreichischen Monarchic, Leips., 1858. 2. C.'T. E. Sicbold, Die Siisswasser-fische von Mittelewropa, Leips., 1868.

E. Italy and Mediterranean.—1. Bonaparte, Leonografia della Fauna Italica, tom. iii., Pesci," Rome, 1832-41. 2. Costa, Fauna del Regno di Napolt, " Pesci," Naples, about 1850.

F. France.—1. E. Blanchard, Les Poissons des cawx douces de la France, Paris, 1866.

G. Spanish Peninsula.—The freshwater fish fauna of Spain and Portugal was almost unknown, until F. Steindachner paid some visits to those countries for the purpose of exploring the prin- cipal rivers. His discoveries are described in several papers in the Sitzungsberichtc der Akademie zu Wien. B. du Bocage and F. Capello made contributions to our knowledge of the marine fishes on the coast of Portugal (Jorn. Scienc. Acad. Lisb.).

H. North America,—1. J. Richardson, Fauna Loreali-Americana, part iii, "Fishes," Lond., 1886. The specics described in this work arc nearly all from the British possessions in the north. 2. Dekay, Zoology of New York, part iv., "Fishes," Now York, 1842. 3. Re- ports of the United States Commission of Fish and Fisheries, 5 vols., Washington, 1873-79, contain much valuable information. Besides these works, numerous descriptions of North American freshwater fishes have been published in the reports of the various U. 8. Govern- ment expeditions, and in North American scientific journals, by Storer, Baird, Girard, W. O. Ayres, Cope, Jordan, Brown Goode, &c., but a good general, and espccially critica], account of the fishes of the United States is still a desideratum.

I. Japan.—l. Fauna Japonica, ' Poissons," par H. Schlegel, Leyden, 1850.

J. Hast Indies; Tropical parts of the Indian and Pacific Oceans. —l. E. Riippell, Atlas 2u der Reise im Nordlichen Afrika, Frankf., 1828. 2. E. Riippell, Newe Wirbelthicre,-"' Fische," Frankf. , 1887. 3. R. L. Playfair and A. Giinther, Zhe Fishes of Zanzibar, Lon., 1876. 4. C. B, Klunzinger, Synopsis der Fische des Rothen Mcers, Vienna, 1870-71. 5. F. Day, The Fishes of India, Lond., 1865, 4to, contains an account of the freshwater and marine spccics. 6. A. Giinther, Die Hische der Siidsee, Hamburg, 4to, from 1873 (in progress). 7. Unsurpassed in activity, as regards the exploration of the fish fauna of the East Indian archipelago, is P. Bleeker (1819-78), a surgeon in the service of the Dutch East Indian Government, who, from the

year 1840, for nearly thirty years, amassed immense collections of the fishes of the various islands, and described them in extremely numerous papers, published chiefly in the journals of the Batavian Society. Soon after his return to Europe (1860) Blecker commenced to collect the final results of his labours in a grand work, illustrated by coloured plates, Atlas Ich- thyologique des Indes Orientalcs Néerlandaises, Amsterd., fol., 1862; the publication of which was interrupted by the author's death in

1878.

K. Africa. —1. A. Giinther, " The Fishes of the Nile," in Pethe- rick's Travels in Central Africa, Lond., 1869. 2. W. Peters, Naturwissenschaftliche Reise nach Mossambique, iv., "Flussfische," Berl., 1868, 4to.

L. West Indies and South America.—l. L. Agassiz, Selecta genera et species Piscium, que in itinere per Brasiliam collegit J. B. de Spix, Munich, 1829, fol. 2. F. de Castelnau, Animaux nou- veaux ou rares, recueillis pendantl expedition dans les parties centrales de V Amérique du Sud, " Poissons," Paris, 1855. 3. L. Vaillant and F. Bocourt, Mission scientifique au Mexiquc et dans V Amérique cen- trale, "Poissons," Paris, 1874. 4. F. Poey, the celebrated naturalist of Havana, devoted many years of study to the fishes of Cuba. His papers and memoirs are published partly in two periodicals, issued by himself, under the title of Memorias sobre la Historia natural dela Isla de Cuba (from 1851), and Repertorio Fisico-natural de la Isla de Cuba (from 1865), partly in North American scientific journals. And, finally, F. Stcindachner and A. Giinther have pub- lished many contributions, accompanied by excellent figures, to our knowledge of the fishes of Central and South America.

M. New Zealand.—1. F. W. Hutton and J. Hector, Fishes of New Zealand, Wellington, 1872.

N. Arctic Regions.—1. C. Liitken, " A Revised Cataloguc of the Fishes of Greenland," in Manual of the Natural History, Gcology, and Physics of Greenland, Lond., 1875, 8vo. 2. The fishes of Spitzbergen were examined by A. J. Malmgren (1865).

III. ANATOMICAL WorRKS.

The number of authors who have investigated the anatomy of fishes is almost as great as that of faunists ; and we should go beyond the limits of the present article if we mentioned more than the most eee and successful. M. H. Rathke, J. Miiller, J. Hyrtl, and

. Stannius left scarcely any organ uncxamined, and their researches had a direct bearing either on the relation of the class of fishes to the other vertebrates, or on the systematic arrangement of the fishes themselves. E. FE. von Baer, F. de Filippi, ©. Vogt, W. His, W. K. Parker, and F. M. Balfour investigated their embry- ology; A. Kélliker and G. Pouchet their histology. The osteology was specially treated by G. Bakker, F. C. Rosenthal, L. Agassiz, and C. Gegenbaur ; the nervous system by Gottsche, Philipeaux,

Stannius, L. de Sanctis, L. Sticda, Baudelot, and Miclucho-Maclay; the organ of hearing by E. H. Webcr, ©. Hasse, and G. Retzius. The electric fishes werc examined by E. Geoffroy, C. Matteuci, P. Pacini, T. Bilharz, and Max Schultze. The development and metamorphosis of the lampcrns was made the subject of research by H. Muller, M. Schultze, and P. Owsjannikow; Miiller's exami- nation of Branchiostoma was continued by J. Marcusen, A. Kova- levsky, L. Stieda, W. Miiller, C, Hasse, T. H. Huxley, and F. M. Balfour. The most comprehensive accounts of the anatomy of fishes are contained in the subjoined works, which have been chicfly followed in the following anatomical description :—

1. H. Stannius, Zootomie der Fische, 2d edit., Berl., 1854. 2. R. Owen, Anatomy of Vertcbratcs, vol. i., Lond., 1866. 3. R. Owen, Lectures on the Comparative Anatomy and Lhysiology of the Verte brate Animals, part i., "Fishes," Lond., 1846. 4. T. H. Huxley, Manual of the Anatomy of Vertebratcd Animals, Lond. pelSiile

It has been mentioned above that the great work of Cuvier and Valenciennes had been left incomplete. Several authors, therefore, have supplied detailed accounts of the orders omitted in that work. Miiller and Henle published an account of the Plagiostomes, and Kaup of the Muranide and Lophobranchii

; while A. Duméril com- menced au Ifistotre naturelle des Poissons ou Ichthyologie générale, of which, however, only two volumes appeared, containing a complete account of the Plagiostomes (Paris, 1865) and of the Ganoids and Lophobranchs (Paris, 1870).

The activity which had prevailed in ichthyology since the publication of the Z/istotre naturelle by Cuvier and Valen- ciennes had been so great, and the results of the numerous investigations were scattered over such a multitude of publications, that it ultimately became imperative to collect all these materials in one comprehensive work. This was done in the Catalogue of Fishes, published by the trustees of the British Museum, in eight volumes (Lond., 1859-70). Besides the species previously described, many new forms were added, the total number of species referred to in those volumes amounting to 8525. As regards the sys- tematic arrangement, Miiller's system was adopted in the main, but the definition of the families was much modified. This, however, need not be further entered on now, as it will become sufficiently apparent in the systematic portion of this article.

For fuller details than can be given here regarding the structure, classification, and life-history of fishes, the reader is referred to the Introduction to the Study of Fishes, by A. Giinther, Edin., 1880.

EXTERNAL PARTS.

In the body of a fish tour parts are distinguished,—the head, trunk, tail, and fins; the boundary between tho first and second is generally indicated by the gill-open- ing, and that between the second and third by the vent. The form of the body and the relative proportions of these principal parts are subject to greater variation than is to be found in any other class of vertebrates. In fishes which are endowed with the power of steady and more or less rapid locomotion, a deviation from that form of body which we observe in a perch, carp, or mackerel is never excessive. 'The body is a simple, equally-formed wedge, compressed or slightly rounded, well fitted for cleaving the water. In fishes which are in the habit of moving on the bottom, the whole body, or at Jeast the head, is vertically depressed and flattened ; and the latter may be so enor- mously enlarged that the trunk and tail appear merely as an appendage. In one family of fishes, the Pewronectida or flat-fishes, the body is compressed into a thin disk ; they

swim and move on one side only, which remains constantly directed towards the bottom, a peculiarity by which the symmetry of all parts of the body has been affected. In fishes moving comparatively slowly through the water, and able to remain (as it were) suspended in it, a lateral compression of the body, in conjunction with a lengthen- ing of the vertical and a shortening of the longitudinal

Head.

Mouth.

Nostrils,

axis, is found. This deviation from the typical form may proceed so far that the vertical axis greatly exceeds the longitudinal in length ; generally all the parts of the body participate in this form, but in one kind of fish (the Ortha- goriscus or sun-fish) it is chiefly the tail that has been shortened, that being reduced so much as to present the ap- pearance of being cut off. An excessive lengthening of the longitudinal axis, with a shortening of the vertical, occurs in eels and eel-like fishes, and in the so-called band-fishes. They are bottom-fish, capable of insinuating themselves into narrow crevices and holes. The form of the body in these long fishes is either cylindrical (snake-like), as in the eels and many codfishes, or strongly compressed, as in the band-fishes (Trichiurus, Regalecus, &c.). It is chiefly the tail that is lengthened, but frequently the head and trunk partici- pate more or less in this form. Every possible variation occurs between these and other principal types of form. The old ichthyologists, even down to Linnzus, depended in great measure on them for classification ; but, although the same form of body often obtains in the same groups of fishes, similarity of form by no means indicates natural affinity ; it only indicates similarity of habits and mode of life.

The External Parts of the Head.—The eye divides the head into the ante-orbital and post-orbital portions. In most fishes, especially in those with a compressed head, it is situated on the side and in the anterior half of the length of the head; in many others, chiefly those with a do- pressed head, it

is directed upwards, and sometimes situated quite at the upper side; in a very few, the eyes look obliquely downwards. In the flat-fishes both eyes are on the same side of the head, either the right or the left, always on that which is directed towards the light, and coloured.

Fishes in general, as compared with other Vertebrata, have large eyes. Sometimes these organs are enormously enlarged, indicating either that the fish is nocturnal in its habits, or lives at a depth to which only a part of the sun's rays penetrate. On the other hand, small eyes occur in fishes inhabiting muddy places, or great depths, to which scarcely any light descends, or in fishes in which the want of an organ of sight is compensated by the development of other organs of sense. In a few fishes, more particularly those inhabiting caves or the greatest depths of the ocean, the eyes have become quite rudimentary and hidden under the skin.

In the ante-orbital portion of the head, or the snout, are situated the mouth and nostrils.

The mouth is formed by the intermaxillary and maxillary bones or the intermaxillary only in the upper jaw, and by the mandibular bone in the lower, These bones are either bare or covered by integument, to which frequently labial folds or lips are added. As regards form, the mouth offers as many variations as the body itself, according to the nature of the food, and the mode of feeding. It may be narrow, or extremely wide and cleft nearly to the hind margin of the head; it may be semi-elliptical, semi-circular, or straight in a transverse line; it may be quite in front of the snout (anterior), on its upper surface (superior), on its lower (inferior), or extending along each side (lateral); sometimes it is subcircular, organized for sucking. The jaws of some fishes are modified into a special weapon of attack (sword-fish, saw-fish); in fact, throughout the whole class of fishes the jaws are the only organ ever specialized for this purpose, weapons on other parts of the body being purely defensive.

Both jaws may be provided with skinny appendages, barbels, which, if developed and movable, are sensitive organs of touch.

In the majority of fishes the nostrils exhibit a double

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[EXTERNAL

opening on each side of the upper surface of the snout, the openings of each side being more or less close together. They lead into a shallow groove, and only in one family (the Myxinoids) perforate the palate. In this family, as well as in the lampreys, the nasal aperture is single. In

Fiq. 1.—Head of Mordacia mordaz, showing the single nostril and seven branchial openings.

many eels the openings are lateral, the lower perforating the upper lip. In the sharks and rays (figs. 2, 3, 4) they are at the lower surface of the snout, and more or less confluent. And, finally, in the Dipnoi (fig. 35) and other Ga- noids, one at least is within the labial bound- ary of the mouth.

The space across the forehead, between the orbits, is called the inter-orbital space; that below the orbits, the infraorbi- tal or suborbital region.

In the postorbital part of the head there are distinguished, at least in most Teleosteous fishes and many Ganoids, the praoperculum, a sub-semicircular bone, gene- rally with a free and often serrated or vari- ously-armed margin ; the operculum, form- ing the posterior mar- gin of the gill-open- ing; and the suboper- culum and interoper- culum along its in- ferior margin. All these bones, collec- tively called opercula, form the gill-cover, a thin bony lamella covering the cavity containing the gills. The gill-opening is

Fic. 2.—Confluent nasal and buccal cavities of Chiloscyllium trispeculare; tooth of the natural size.

Fic. 3.—Nostrils of Raia lemprieri, with nasal Gills. a foramen, or slit, be- flaps reverted,

hind or below the head, by which the water that has been taken up through the mouth for the purpose of breathing is again expelled. This slit may extend from the upper end of the operculum all round the side of the head to

the symphysis of the lower jaw; or it may be shortened and finally reduced to a small opening on any part of the mar- gin of the gill-cover. Sometimes (Symbranchus) the two openings, thus reduced, coalesce, and form what externally appears as a single opening only. The margin of the gill- cover is provided with a cutaneous fringe, in order more effectually to close the gill-opening; and this fringe is sup- ported by one or several or many bony rays, the branchio- stegals, The space on the chest between the two rami of the lower jawand between the gill-openings iscalled the isthmus. The sharks and rays differ from the Teleosteous and Ganoid fishes in having five branchial slits (six or seven in Hecanchus and Heptanchus), which are lateral in the sharks, and at the lower surface of the head in the rays

Trunk.

Tail,

Fins.

PARTS. |

(fig. 4). In M€yxine only the gill-opening is at a great distance from the head ; in that family (Cyclostomz) it is either ‘single or there are six or more on each side (fig. 1), as in the lampreys,

Fic. 4 —Lower aspect of head of Rata lemprierd,

The Trunk and Tail.—In the trunk are distinguished the back, sides, and abdomen. It gradually passes in all fishes into the tail, the termination of the abdominal cavity and the commencement of the tail being generally indicated by the position of the vent. The exceptions are numerous : not only may certain abdominal organs, such as the sexual, extend to between the muscles of the tail, but the intestinal traet itself may pass far backwards, or it may even be reflected forwards, so that the position of the vent may be either close to the extremity of the tail or to the foremost part of the trunk.

In many fishes the greater part of the tail is surrounded by fins, leaving finless only a small portion between the dorsal, caudal, and anal fins ; this finless part is called the free portion or the peduncle of the tail.

The Fins, —The fins are divided into vertical or unpaired, and horizontal or paired fins. Any of them may be pre- sent or absent; and their position, number, and form are most important guides in determining the affinities of fishes,

The vertical fins are situated in the median dorsal line, from the head to the extremity of the tail, and in the ventral line of the tail. In fishes in which they are least developed or most embryonic, the vertical fin appears asa simple fold of the skin surrounding the extremity of the tail. In its further progress of development in the series of fishes, it gradually extends further forwards, and it may reach even the head and the vent. In this embryonic condition the fin is generally supported by fine rays, which are the continuations of, or articulated to, other stronger rays supported by the processes or apophyses of the vertebral column. This form of the vertical fin is very common,—for instance in the eels, and many Gadoid, Blennioid, and Ganoid fishes, in which the rays have ceased, besides, to be simple rods, show- ing more or less numerous joints (simple articulated rays,

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Fic. 5.—1, Simple ray ; 2, spine; 38, simple ar- ticulated ray (soft); 4, branched ray (soft).

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fig. 5). Branched rays are dichotomously split, the joints increasing in number towards the extremity.

The continuity of the vertical fin, however, is interrupted in the majority of fishes, and three fins are then distin- guished: one in the dorsal line—the dorsal fin ; one in the ventral line behind the anus—the anal fin; and one confined to the extremity of the tail—the caudal fin.

The caudal fin is rarely symmetrical so that the upper half is equal to the lower; the greatest degree of asym- metry obtains in fishes with a

heterocercal termination of the vertebral column. In fishes in which it is nearly sym- metrical it is frequently prolonged into an upper and lower

Fic, 6.—Teterocercal tail of Acipenser. a, fulcra: b, osscous bucklers,

lobe, its hind margin being concave or more or less deeply excised ; in others the hind margin is rounded, and, when the middle rays greatly exceed in length the outer ones, the fin assumes a pointed form.

Many and systematically important differences are ob-

| served in the dorsal fin, which is either spiny-rayed (spinous)

(Acanthopterygian), or soft-rayed (Malacopterygian). In the former, a smaller or greater number of the rays are simple and without transverse joints; they may be flexible, or so much osseous matter is deposited in them that they appear hard and truly spinous (fig. 7); these

Fig. 7.—Labraz lupus (Bass), an Acanthopterygian with anterior spinous and posterior soft dorsal fin.

spines form always the anterior portion of the fin, which is either detached from or continuous with the remaining jointed rays. 'The spines can be erected or depressed at the will of the fish ; if in the depressed position the spines cover one another completely, their points lying in the same line, the fish is called homacanth ; but if the spines are asymmetrical, alternately broader on one side than on

Fia. 8.—Saurus undosquamis, a Malacopterygian with anterior soft dorsal and additional adipose fin.

the other, the fish is called heteracanth. The spinous division, as well as the one consisting of jointed rays, may again be subdivided. In the Malacopterygian type all the

Fa. 9.—Salmo salar (Salmon), with abdominal ventral fins,

The anal fin is built on the same plan as the dorsal; it may be single, or there may be more than one; it may also be long or short, or entirely absent ; in Acanthopterygians its foremost rays are frequently simple and spinous.

Fre. 10.—Jfullus barbatus (Red Mullet), with thoracic ventral fins.

The horizontal or paired fins consist of two pairs, the pectorals and ventrals.

The pectoral fins (with their osseous supports) are the homologues of the anterior limbs of the higher Vertebrata. They are always inserted immediately behind the gill opening,—either symmetrical, with a rounded posterior

Fic, 11.—Burbot (Lota vu'garis), with jugular ventral fins.

margin, or asymmetrical, with the upper rays longest and strongest ; in Malacopterygians with a dorsal spine the upper pectoral ray is frequently developed into a similar defensive weapon.

The ventral fins are the homologues of the bind-limbs, |

and are inserted on the abdominal surface, either behind the pectorals (Pisces or Pinne abdominales) (fig. 9), or below them (Pisces or Pinnee thoracice) (fig. 10), or in advance of them (Pisces or Pinne jugulares) (fig. 11). They are generally narrow, and composed of a small number of rays, the outer of which is frequently osseous.

For the definition of the smaller systematic groups, and the determination of species, the numbers of the spines and rays are generally of the greatest importance. This holds

good especially for the ventral rays, by the number of which the Acanthopterygian affinities of a fish can nearly always be determined. The numbers of the dorsal and anal rays generally correspond to the number of

vertebrae in a certain portion of the spinous column, and are therefore constant specific, generic, or even family characters ; but when their number is very great, a proportionally wide margin must be allowed for variation, and the taxonomic value of this character becomes uncertain. The numbers of the pectoral and caudal rays are rarely of any account.

The fins are organs of motion, but it is chiefly the tail and the caudal fin by which the fish impels itself forward. To execute energetic locomotion, the tail and caudal fin are strongly bent with rapidity, alternately towards the right and left; whilst a gentle motion forwards is effected by a simple undulating action of the caudal fin, the lobes of which act like the blades of a screw. Retrograde motions can be made by fishes in an imperfect manner only, by for- ward strokes of the pectoral fins. When the fish wants to turn towards the left, he gives a stroke of the tail towards the right, the right pectoral acting simultaneously, whilst the left remains pressed close to the body. Thus the pectoral fins assist in the progressive motions of the fish, but rather by directing its course than by acting as power- ful propellers. The chief function of the paired fins is to maintain the balance of the fish in the water, which is always most unsteady where there is no weight to sink it: when the pectoral of one side, or the pectoral and ventral of the same side, are removed, the fish loses its balance and falls on the side opposite; when both pectorals are removed, the fish's head sinks; on removal of the dorsal and anal fins the motion of the fish assumes a, zigzag course; de- prived of all fins, it floats like a dead fish, with the belly upwards, the back being the heavier part of the body.

In numerous groups of fishes which live in mud, or are able to pass a longer or shorter time in soil periodically dried and hardened during the hot season, forms occur en- tirely devoid of, or with only rudimentary, ventral fins (Cyprinodon, Ophiocephalide, Galaxude, Siluride). The chief function of these fins being to balance the body of the fish whilst swimming, it is evident that in fishes moving during a great part of their life over swampy ground, or through more or less consistent mud, this function of the ventral fins ceases, and nature can readily dispense with these organs altogether.

In certain fishes the shape and function of the fins are considerably modified: thus, in the rays, locomotion is almost entirely effected and

regulated by the broad and expanded pectoral fins actiug with an undulatory motion of their mar- gins, similar to the undulations of the long vertical fins of the flat-fishes; in many blennies the ventral fins are adapted for walking on the sea-bottom ; in some Gobioids (Periophthal-

Fig. 12.—Pertophthalmus koelreuteri.

mus), Trigloids, Scorpzenioids, and Pediculati the pectoral fins are perfect organs of walking; in the gobies, Cycloptert, and Discoboli the ventral fins are transformed into an ad- hesive disk (see fig. 13); and finally in the flying-fish the pectorals act as a parachute. In the eels and other snake- like fishes, the swimming as well as the gliding motions are effected by several curvatures of the body alternately to-

Skin.

Scales.

PARTS. |

wardstheright and left, resembling the locomotion of snakes. In the Syngnathi (pipe-fishes) and Hip- pocampi (sea-horses), whose body admits of but a slight degree of lateral curvature, and whose caudal fin is generally small if Z present at all, locomotion is very limited, #% and almost wholly dependent on the action of the dorsal fin, which consists of a rapid undulating movement. : a eee sed eos The hig of "PR"

fishes is either covered with scales, or naked, or provided with more or less numerous scutes of various forms and sizes. Some parts, like the head and fins, are more frequently naked than scaly. All fishes provided with electric organs, the majority of eels, and the lampreys are naked. Scales of fishes are very different from those of reptiles,—the latter being merely folds of the cutis, whilst the former are distinct horny elements, developed in grooves or pockets of the skin, like hairs, nails, or feathers.

Very small or rudimentary scales are extremely thin, homogeneous in structure, and more or less imbedded in the skin, and do not cover each other. When more developed, they are imbricated (ar- ranged in the manner

cf tiles), with the posterior part extruded and free, the surface of the anterior portion being usually covered by the skin toa greater or less extent. On their surface (fig. 14) may be observed a very fine striation coucentric with and parallel to the margin, and coarser striz radi- ating from a central point towards the hind margin. Scales without a covering of enamel, with an entire (not denticulated) posterior margin, and with a concentric stria- tion, are called cycloid scales. Ctenoid scales (figs. 15, 16)

Fic, 14.—Cycloid scale of Scopelus resplendens (magn.).

Fie. 15.—Ctenoid scale of Gobius Fic, 16.—Ctenoid scale of Lethrinus ommaturus (magno.). (magn.).

are generally thicker, and provided with spinous teeth on the posterior edges of the layers of which the scale con- sists. In some species, only the layer nearest to the margin is provided with denticulations (fig. 15). Scales the free surface of which is spiny, and which have no denticulation on the margin, have been termed sparoid scales ; but their distinction from ctenoid scales is by no means sharp, and there are even intermediate forms between the cycloid and ctenoid types. Both kinds of scales may occur, not only in species of the same genus of fishes, but in the same fish.

Ganoid scales are hard and bony, covered with a layer of enamel ; they are generally rhombic or quadrangular, rarely rounded and imbricate, and are arranged in oblique rows, those of one row being linked together by an articulary process. This type of scales, common in fossil Ganoid fishes, occurs among. recent fishes in Lepidosteus and Polypterus only.

Finally, in sharks, the Balzstidw, and others, true scales are absent, and are replaced by the ossified papill of the cutis (fig. 18), which give the surface the appearance of fine-

Fie, 17.—Ganoid scales of Dapedius.

grained shagreen. These generally small bodies, as well as the large osseous scutes (figs. 6 and 20) of the rays, stur-

Fic, 18.—Dermal papille of AMonacanthus trossulus.

geons, &c., have been comprised under the common name pla- coid scales, a term which is being deservedly abandoned.

Fic. 19.—Dermal papillx of Monacanthus hippocrepis (magn.).

Along the side of tle body of osseous fishes runs a series of perforated scales, which is called the lateral line (fig. 23). The perforating duct is simple at its base, and may be simple also at its outer opening (fig. 21), or (a frequent case) the portion on the free surface of the scale is ramified (fig. 22). The lateral line runs from the head to the tail, sometimes reaching the caudal fin, sometimes stopping short of it, sometimes advancing over its rays. Some species have several lateral lines, an upper one following the dorsal, a lower the abdominal outline, while a third runs along the middle as usual. The lee ramen nag? rte scales of the lateral line are sometimes 8c Rata clavata, larger than the others, sometimes smaller; sometimes they are modified into scutes; sometimes there are no other scales besides these, the rest of the body being naked. The foramina of the lateral line are the outlets of a muciferous duct which is continued on to the head, running along the infraorbital bones, and (W sending off a branch 4 into the preopercular Z . margin and mandible. rig. 21.—Cycloid scale from the lateral line of The muciferous system tine Tinea CRS is abundantly provided with nerves, and has therefore been considered to be the seat of a sense peculiar to fishes,

but there cannot be any doubt that its function is the excretion of mucus, although probably mucus is excreted also from the entire surface of the fish.

The scales, their structure, number, and arrangement, constitute an important character for the determination of

Fic, 22.—Cycloid scale from the lateral line of Labrichthys laticlavius (magn.). fishes. In most scaly fishes they are arranged in oblique transverse

scries ; and, as the number of scales in the lateral line generally corresponds to the number of transverse series, it is usnal to count the scales in that line. To ascertain the number of longitudinal series of scales, the

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Roach (Leuciscus rutilus). Li=Lateral

Fic. 23.—Arrangement of scales in the line from lateral line to ventral fin,

linc; ¢ = transverse line; a, tranyerse scales are counted in one of the transverse series, generally in that running from the commencement of the dorsal fin,

or the middle of the baek, to the lateral line, and from the lateral line down to the vent or ventral fin, or the middle of the abdomen.

OSTEOLOGY.

In order readily to comprehend the following account of the modifications of the skeleton in the various sub- classes aud groups of fishes, the student should acquaint

| himself with the terms used for the numerous bones of the fish skeleton, as well as with their relative position. For this purpose we commence this section with an account of the skeleton of the Zeleostet, which is composed of the greatest number of specialized bones, and is most readily accessible. The skeleton of any of the more common kinds of osseous fish may serve for this purpose ; that of the perch

was chosen by Cuvier, and is employed here (fig. 24), as it was in the last edition of the present work.

In the Teleosteous fishes the spinous column consists of completely ossified amphiccelous vertebrae ; its termination is homocercal—that is, the caudal fin appears to be more or less symmetrical, the last vertebra occupying a central position in the base of the fin, and being united to a flat fan-like bone, the hypural (70 in fig. 24), on the hind margin of which the fin-rays are fixed. The hypural is but a union of modified hemapophyses which are directed backwards, and the actual termination of the notochord is bent upwards, and lies along the upper edge of the hypural, hidden below the last rudimentary neural elements. In some Teleosteans, as the Salmonide, the last vertebrae are conspicuously bent upwards: in fact, strictly speaking, this homocercal condition is but one of the various degrees of heterocercy, different from that of many Ganoids in this respect only, that the caudal fin itself has assumed a higher degree of symmetry.

The neural and hemal arches generally coalesce with the centrum, but there are many exceptions, inasmuch as some portion of the arches of a species, or all of them, may show the original division,

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Fig. 24.—Skeleton of the Perch.

The vertebrae are generally united with one another by zygapophyses, and frequently similar additional articu- lations exist at the lower parts of the centra. Parapo- physes and ribs are very geueral, but the latter are inserted on the centra and the base of the processes, and never on their extremifies.

The spinal column consists of abdominal and caudal vertebrae, the coalescence of the parapophyses into a com- plete hemal ring and the suspension of the anal fin generally forming a sufficiently well-marked boundary be- tween the abdominal and caudal regions (fig. 24).

In the |

vertebrae. The centrum of the first vertebra or atlas is very short, with the apophyses scarcely indicated; neither the first nor the second vertebra has ribs. All the other abdominal vertebrae, with the exception of the last or the two last, are provided with ribs, many of which are bifid (72). A series of

flat spines (74), called interneurals, to which the spines and rays of the dorsal fins are articulated, are supported by the neural spines, the strength of the neurals and inter- neurals corresponding to that of the dermal spines (75). The caudal vertebre differ from the abdominal in having the hemapophyseal elements converted into spines similar

perch there are twenty-one abdominal and as many caudal ‘ to the neurals, the anterior being likewise destined to sup-

Vertebra,

Sleull.

OSTEOLOGY. |

port a series of interhwmals (79), to which the anal rays are articulated.

There is a great amount of variation as regards the degree in which the primordial cartilaginous cranium per- sists; it is always more or less replaced by bone; fre. quently it disappears entirely, but in some fishes like the Salmonide or Hsocide, the cartilage persists to the same or even to a greater extent than we shall find in the Ganoidei holostet. Besides the bones preformed in cartilage there are a great number of membrane-bones, that is, bones originating in membranous or tegumentary tissue. The different kinds of these membrane-bones occur with greater or less con- stancy throughout the subclass Zeleoste?; they often coalesce with and are no longer separable from the neigh- bouring or underlying cartilage-bones.

1. Cartilage-Bones of the Primordial Skull.—The basi- occipital (5 in figs. 25-27) has retained the form of a vertebral centrum; it is generally concave behind, the

SS Fic. 25.—Skeleton of Perch’s Skull. concavity containing remains of the notochord. The ex- occipitals (10) are situated on the side of the basioccipital, and contribute the greater portion of the periphery of the foramen magnum. The supraoccipital (8) is intercalated hetween the exoccipitals, and forms a most prominent part by its median crest, which sometimes extends far forward on the upper side of the skull, and offers

attachment to the dorsal portion of the large lateral muscle of the trunk. A transverse supraoccipital ridge, coming from each side of the hase of this crest, runs outward to the external angles of the bone. When the interior portion of this bone remains cartilaginous, some part of the semicircular canals may be lodged in it.

The region of the skull which succeeds these bones en- |

closes at least the greater portion of the labyrinth, and its component parts have been named with reference to it by some anatomists.! The alisphenoids (11) (prooticum) form sutures posteriorly with the basi- and ex-occipitals, and meet each other in the median line at the bottom of the cerebral cavity; they contribute to the formation of a hollow in which the hypophysis cerebri and the saccus vasculogsus are received ; in conjunction with the exoccipital they form another hollow for the reception of the vestibulum; generally they are perforated by the trigeminal and facial nerves. The paroccipitals (9) (epiotecwm) lodge a portion of the posterior vertical semicircular canal, and form a pro- jection of the skull on each side of the occipital crest, to which a terminal branch of the scapular arch is attached. The mastoid (12+13) (opisthoticum) occupies the postero- external projection of the head ; it encloses a part of the external semicircular canal, is generally united to a membrane-bone, the superficial squamosal, which emits a

1 As first proposed by Huxley.

process for the suspension of the scapular arch, and is frequently, as in the perch, divided into two separate bones, ;

The anterior portion of the skull varies greatly as regards form, which is chiefly dependent on the extent of the cere-

Fig. 26.—Hyoid arch, branchial apparatus, and scapulary arch of the Peren.

bral cavity; if the latter is advanced far forwards, the lateral walls of the primordial cranium are protected by more developed ossifications than is the case if the cerebral cavity is shortened by the presence of a wide and deep orbit. In the latter case parts which normally form the side of the skull are situated in front of the brain-case, between it and the orbit, and, being generally reduced in extent, are often replaced by membranes ; the interorbital septum especially may thus be reduced to a membrane. The most constant ossifications of this part of the skull are the orbitosphenoids (14), which join the upper anterior margin of the alisphenoids; superiorly the olfactory and inferiorly the optic nerves pass between them out of the cranium. They vary much with regard to their development : they are small in Gadoids; larger in the perch, pike, Salmonoids, Macrodon, and the Clupeoids; and very large in Cyprinoids and Siluroids, in which they contribute to the formation of the side of the brain- case. The single Y-shaped sphenoideum anterius (15) (ethmoid of Owen and basisphenoid of Huxley) is as frequently absent as present ; each lateral branch is con-nected with an orbitosphenoid, whilst the lower branch rests upon the long basal bone; it forms the anterior mar- gin of the fossa for the hypophysis. Finally, to this group of cartilage-bones belongs also the postfrontal (4), a small bone from which the infraorbital ring is suspended.

The centre of the foremost part of the skull is occupied by the ethmoid (3), which shows great variations as regards its extent and the degree of ossification ; it may extend backwards into the interorbital septum, and reach the orbitosphenoids, or it may be confined to the extremity of the skull; it may remain entirely cartilaginous, or it may ossify into a lamina which separates the two orbits and encloses an anterior prolongation of the brain-case, along which the olfactory nerves pass,—modifications occurring again in higher vertebrates. A paired ossification attached to the forepart of the ethmoid is the prefrontals (2), which form the base of the nasal fossa.

2. Membrane-Bones attached to the Primordial Skull.— To this group belong the parietals (7) and frontals(1). The latter form the upper margin of the orbits, and extend from the nasal cavities to the occipital. They are enlarged at the

- expense of the parietals, which are of much smaller extent

than in higher vertebrates, and are separated from each other by the anterior prolongation of the supraoccipital. The squamosal (12) has been mentioned above in connexion with the mastoid. The prefrontal (2) and supraorbital are always small, and the latter is frequently absent. The lower surface of the skull is protected by the basisphenoid (parasphenoid) (6), a very long and narrow bone extending from the basioccipital beyond the brain-capsule to between the orbits, where it forms the support of the interorbital septum. Anteriorly it is connate with another long hammer-shaped bone (16), the vomer. Both these bones, especially the latter, may be armed with teeth.

3. Cartilage-Bones of the Alimentary Portion of the Visceral Skeleton of the Skwll.—The suspensorium consists of three cartilage-bones, and affords a base for the opercular apparatus as well as a point of attachment to the hyoid, whilst in front it is connected with the pterygo-palatine arch (fig. 27). These are the hyomandibular (23), sym-

Fia. 27.—Lower view of Skull of Perch.

plectic (31), and quadrate (26); they are connected by means of the metapterygoid (27) with the pterygoid (24) and entopterygoid (25), the foremost bone of the arch being the palatine (22). Of these bones the uppermost, the epitympanic or hyomandibular (23), is articulated by n double articulary head with the mastoid and posterior frontal. Another articulary head is destined for the opercular joint. The mesotympanic or symplectic (31) appears as a styliform prolongation of the lower part of the hyomandibular; it is cartilaginous in the young, but almost completely ossified inthe adult. The position of this bone is noteworthy, because, directly inwards from its cartila- ginous junction with the hyomandibular, there is situated the uppermost piece of the hyoid arch, the stylohyal. The next bone of the series is the pretympanic or metapterygoid (27), a flat bone forming a bridge towards the pterygoid, and not rarely absent in the

subclass. Finally, the large triangular hypotympanic or quadrate (26) has a large condyle for the mandibular joint. The palatine arch proper is formed by three bones: the entopterygoid (25) is an oblong and thin bone attached to the inner border of the palatine and pterygoid, and increasing the surface of

the bony roof of the mouth towards the median line; it constitutes also the floor of the orbit; the pterygoid (or os transversum) (24) starts from the quadrate, and is joined by suture to the palatine, which is toothed in the perch and many other fishes, and reaches to the vomer and anterior frontal. The piece of the mandible which articulates with the quadrate is the articulary bone (35), distinctly part of Meckel's cartilage ; it sends upwards a coronoid process to which the masticatory muscles, as well as a ligament from the maxillary, are attached ; it also sends forwards a long-pointed process to be sheathed in a deep notch of the dentary piece. Frequently another por tion of cartilage below the articulary remains persistent, or is replaced by a separate membrane-bone, the angular.

4, Membrane-Bones of the Alimentary Portion of the Visceral Skeleton of the Skull.—The suspensorium has one tegumentary bone attached to it, viz, the preoperculum (30); it is but rarely absent, as for instance in Murenophis; as it is quite a superficial bone, and frequently armed with spines (as in the perch), its form and configuration constitute an important item in the description of many fishes. The premaxillary (17) and maxillary (18) of the Z'eleostei appear to be also membrane-bones, although they are clearly analogous to the upper labial cartilages of the sharks. The premaxillaries sometimes coalesce into a single piece (as in Diodon, Mormyrus), or they are firmly united with the maxillaries (as in all Gymnodonts, Serrasalmo, &c.). The relative position and connexion of these two bones differ much, and form a valuable character in the discrimination of the various families. In some, the front margin of the jaw is formed by the premaxillary only, the two bones having a parallel position, as in the perch, in which case the maxillary is constantly toothless; in others, the premaxillary is shortened, allowing the maxillary to enter, and

to complete, the margin of the upper jaw; and finally, in many, no part of the maxillary is situated behind the premaxillary, but the entire bone is attached to the end of the premaxillary, forming its continuation. In the last case the maxillary may be quite abortive. The mobility of the upper jaw is greatest in those fishes in which the premaxillary alone forms its margin. The form of the premaxillary is subject to great variation: the beak of Belone and Xiphias is formed by the prolonged and coalesced premaxillaries. The maxillary consists sometimes of one piece, sometimes of two or three. The principal membrane-bone of the mandible is the dentary (34), to which is added the angular (36) and rarely a smaller one, the splenial or os operculare, which is situated at the inner side of the articulary.

5. Cartilage-Bones of the Respiratory Portion of the

Visceral Skeleton of the Skull.—With few exceptions all the ossifications of the hyoid and branchial arches belong to this group. The hyoid arch is suspended by a slender styliform bone, the stylohyal (29), from the hyomandibulars ; it consists of three segments, the epihyal (37), the ceratohyal (38), which is the longest and strongest piece, and the basihyal, which is formed by two juxtaposed pieces (39, 40). Be- tween the latter there is a median styliform ossicle (41), extending forwards into the substance of the tongue, called the glossohyal or os linguale.

The branchial arches (figs. 26 and 28) are enclosed within the hyoid arch, with which they are closely con- nected at the base. In the perch and in the majority of Teleosteans they are five in number, of which four bear gills, whilst the fifth (56) remains dwarfed, and is beset with teeth ; it is called the lower pharyngeal bone. The arclies adhere by their lower extremities to a chain of ossicles (53, 54, 55), the basibranchials, and, curving as they ascend, nearly meet at the base of the cranium, to which they

are attached by a layer of ligamentous and cellular tissue. Each of the first three branchial arches consists of four pieces movably connected with one another. The lowest is the hypobranchial (57), the next, a much longer one, the

Tia. 28.—Hyoid bone of the Perch. ceratubranchial (58), and, above this, a slender and short

irregularly-shaped epibranchial. In the fourth arch the hypobranchial is absent. The uppermost of these segments, especially of the fourth arch, are dilated, and more or less confluent ; they are beset with fine teeth, and generally distinguished as the upper pharyngeal bones. Only the ceratobranchial is represented in the fifth arch or lower pharyngeal. On their outer convex side the branchial segments are grooved for the reception of large blood- vessels and nerves; on the inner side they support horny processes, called the gill-rakers, which do not form part of the skeleton.

6. Membrane-Bones of the Respiratory Portion of the Visceral Skeleton of the Skull.—These include the oper- cular pieces, viz., the operculum (28), suboperculum (32), and interoperculum (33). The last of these is the least constant ; it may be entirely absent, and represented by a ligament extending from the mandible to the hyoid. 'The operculum is the principal piece, situated behind, and movably united with, the vertical limb of the preeoperculum. There is an articulary cavity at its upper anterior angle for its junction with the hyomandibular. The interoperculum is connected by ligament with the angular piece of the mandible, and is also attached to the outer face of the hyoid, so that the gill-covers cannot open or shut without the hyoid apparatus executing a corresponding movement. The remaining membrane-bones are the urohyal (42),a single bone, which is connected by ligament with the anterior extremity of the humeral arch, and separates the musculi sternohyoidei, serving as an increased surface for their insertion ; and, finally, the branchiostegals (43), which vary greatly in number, but are always fixed to the ceratohyals and epihyals by ligaments; the branchiostegal membrane is extended between them.

7. Dermal Bones of the Skull.—To this category are referred some bones which are ossifications of, and belong to, the cutis. They are the turbinals (20), the suborbitals

(19), and the supratemporals. They vary much. with regard to the degree in which they are developed, and are seldom entirely absent. Nearly always they are wholly or partly transformed into tubes or hollows, in which the muciferous canals with their numerous nerves are lodged. Those in the temporal and scapulary regions are not always developed ; on the other hand, the series of those ossicles may be continued on to the trunk, accompanying the lateral line. The foremost suborbital is termed the praorbital.

The pectoral arch or shoulder-girdle of the Teleosteous Pectoral

fishes exhibits but a remnant of a primordial cartilage, which is replaced by two ossifications,! the caracoid (51) and scapula (52) ; posteriorly they offer attachment to two series of short rods (53), of which the proximal are nearly always ossified, whilst the distal frequently remain small cartilaginous nodules hidden in the base of the pectoral rays ; they have been termed carpals and metacarpals. The bones by which this portion is connected with the skull are membrane-bones, viz., the clavicle (48), with the postclavicle (49 + 50), the supraclavicle (47), and the post-temporal (46). By this last bone the shoulder-girdle is suspended from the skull; it is attached, in the perch, by a triple prong to the occipital and mastoid bones. The clavicle completes the arch below by the symphysis or natural connexion of the bones of each side, Many Tele- osteous fishes lack pectoral fins, and in them the pectoral arch is frequently more or less reduced or rudimentary, as in many species of Murcenide. In others the membrane-bones are exceedingly strong, contributing to the outer protective armour of the fish, and then the clavicles are generally suturally connected in the median line. The postclavicula and the supraclavicula may be absent. It is only exceptionally that the shoulder-girdle is not suspended from the skull, but from the anterior portion of the spinous column (Symbranchide, Murcenide, Notacanthide). The number of elements in each of the two series of basalia never exceeds five, but may be smaller; and the distal series is absent in Siluroids.

The pubic bones (80) of the Teleosteous fishes undergo Pubic many modifications of form in the various families, but bones.

they are essentially of the same simple type as in the

‘perch, viz., a pair of flat or styliform simple boncs, to

which the ventral fins are articulated,

The bones of the skull of the fish have received so many different interpretations that no two accounts agree in their nomenclature, so that their study is a matter of con- siderable difficulty. The table of synonyms given on p. 644 will tend to overcome difficulties arising from this cause ; it contains the terms used for the different bones of the skeleton by Cuvier, those introduced by Owen, and finally the nomenclature of Stannius, Huxley, and Parker. Those adopted here are printed in italics. The numbers in the table are those used in the preceding pages and in figs. 24-28,

Modifications of the Skeleton.

We now proceed to pass briefly in review the modifi- cations of the skeleton in the principal types of fishes, commencing at the lowest, and pointing out its gradual development in the other three subclasses.

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Fic. 29.—Branchiostoma lanceolatum, a, mouth; 6, vent; c, abdominal porus. The lowermost subclass of fishes, which comprises one

form only, the Lancelet (Branchiostoma [s. Amphioxus|

lanceolatum), possesses the skeleton of the most primitive .

1 Parker’s nomenclature is adopted here.

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. Frontal principal . Frontal antérieur . Ethmoid

. Frontal postéricar . Basilaire

. Sphénoide

. Pariétal

. Interpariétal or occipital supéri- eur

. Occipital externe

. Occipital lateral

. Grand aile du sphénoide

. Mastoidien

. Rocher

. Aile orbitaire

. Sphenoide antérieur

. Vomer

. Intermaxillaire

. Maxillaire supéricur . Sousorbitaires

. Nasal

. Palatine

. Femporak

. Tramsverse

. Ptérygoidien interne

. Jugal

. Tympanal

. Opereulaire

. Styloide

. Préopercule

. Sympleetique

. Sousopereule

. Interopercule

. Dentaire

. Articulaire

. Angulaire

38. Grandes pitces latérales 40. Petites pivces latérales . Os lingual

. Queue de los hyoids

. Rayon branchiostége . Surscapulaire

. Scapulaire

. Humeral

50. Coraecoid

51. Cubital

54. Radial

53. Os du carpe

53 bis, 54, 55. Chainc intermédiaire 56. Pharyngiens infcrieurs 57. Pidce interne de partie inférieure de Varceau branchiale 58. Piéce externe do. do. 59. Stylet de prémitre areeau branchiale . Partie supérieure de larceau branchiale . Os pharyngicn supérieur

. Rayons de la peetorale

68. Vertébres abdominales

. Vertébres caudales

. Plaque triangulaire et verticale

. Céte . Appendices or stylets . Interépineux

. Epines et rayons dorsales

. Apophyses épincuses inféricures

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OWEN.

Frontal Prefrontal Nasal Postfrontat Basioccipital

Basisphenoia Parietal Supraocectpitatl

Pavoccipital

Exocctpital

Alisphenoid

Mastoid

Petrosal and Otostcal

Orbitosphenoid

Ethmoid and Ethmio- turbinal

Vomer

Futer- or Pre-maxillary

Maxillary

Infraorbital ring

Tur binal

Palatin

Lipitympanie

Pterygoid

Eutopterygoid Hypotympanie Pretympanic

Opereulum

Stylohyal

Prooperculwm Mesotympanic Suboperculwne Inicroperculum

Dentary

Articulary

Angular

Epihyal, Ceratohyal) Basthyal { Glossohyatl

Urohyat

Branchiostegal Suprascapula Scapula Coracoid Epicoracoid Radius

Ulna

Carpals

Basibranchials Lower Pharyngeals

Hypobranchial

Ccratobranchial Upper cpibranchial of Jjirst branchial arch

Epibranchials

Pharyngobranehial Gill-rakers

Peetoral rays

Abdominal vertchi ce Caudal vertebra [Aggregated interheemals] Caudal rays

Rib

Epiplcural spines

Interneural spines

Dorsal rays and spines First interneural Rudimentary caudal rays Interheemal spines

Pubic

Ventral spine

STANNIUS.

Os frontale

Os frontale anterius Os ethmoideum

Os frontale posterius Os basilare

Os sphenoideum basilare }

Os parietale Os occipitale superius

Os occipitale externum

Os occipitale laterale

Ala temporalis

Os mastoideum + os extraseapulare

Oberflichliche Knochen-lamelle

Ala orbitalis Os sphenoideum anterius

Vomer

Os intermaxillare

Os maxillare

Ossa infraorbitalia

Os terminale

Os palatinum

Os temporale

Os transversum s. pterygoideum ex- ternum

Os pterygoideum

Os quadratojugale

Os tympanicum

Opereulum

Os styloideum

Preopereulunt

Os symplecticune

Subopereulum

Interoperculum

Os dentale

Os articulare

Os angulare

Segmente der Zungenbein-Schenkel Os linguale s. entoglossum

Radii branchiosteg1 Omolita . Seapula

Clavicula

Ossa carpi

Ossa metacarpl

Copula Ossa pharyngea inferiora

Segmente der Kiemenbogen-Schenkel

Os pharyngeum superius

Brustflossen-Strahlen

Bauehwirbel

Schwanzwirbel

Vertieale Platte

Schwanzflossen-Strahlen

Rippen

Muskel-Grathen

Ossa interspinalia s. obere Flossen- trager

Riickenflossen-Strahlen u. Stacheln

Untere Flossentrager 3ecken Bauchflossen-Stachel

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TABLE of Nomenclature used by Cuvier, Owen, Stannius, Huczley, &e., to indicate the Bones in the Skeleton of a Fish.

HvXLEY, PARKER, &c.

Lateral ethmoid (Parker) Sphenotie (Parker

Sometimes referred to as " Basal"*

Epioticum (Huxley)

Prooticum (Huxley) Opisthoticum"

+ Squamosal (Huxley) Alisphenoid (Huxley)

Basisphenoid (Huxley)

Hyomandibular (Huxley)

Mesopterygoid (Parker) Quadrate (Huxley) Mctapterygoid (Huxley)

Basibranchiostegal (Parker)

Post-temporal (Parker) Supraclavicula (Parker) Clavicula (Parker) Postelavicula (Parker) Coracoid (Parker) Scapula (Parker) Basalia (Huxley) Brachials (Parker)

Upper pharyngeals

Hypural (Huxley)

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1 Pterotie of Parker.

OBTEOLOGY, |

type. The vertebral column is represented by a simple chorda dorsalis or notochord only, which extends from one extremity of the fish to the other, and, so far from being expanded into a cranial cavity, is pointed at its anterior end as well as at its posterior. It is enveloped in a simple membrane like the spinal cord and the abdominal organs,

Fig. 80.—Anterior end of body of Branchiostoma (magn.). d,chorda dorsalis; e, spinal cord; J, cartilaginous rods; g, cye; , branchial rods; é, labial carti- lage; &, eral cirrhi,

and there is no trace of vertebral segments or ribs; a series of short cartilaginous rods, however, above the spine evidently represent apophyses, A maxillary or hyoid apparatus, or elements representing limbs, are entirely absent,

The skeleton of the Cyclostomata (or Marsipobranchii) (lampreys and sea-hags) shows a considerable advance of development. It consists of a notochord, the anterior pointed end of which is wedged into the base of a cranial capsule, partly membranous, partly cartilagin- ous. This skull, therefore, is not movable upon the spinal column, No vertebral segmentation can be

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Fig. 31.—Upper (A) and side (B) views, and vertical section ©, of the skull of Petromyzon marinus, in the form of an X% (figs. 32-34),

distance along the lower side of the spinal column, and a lateral, which is ramified into a skeleton supporting the branchial apparatus. A stylohyal proccss and a subocular arch with a palato-pterygoid portion may be distinguished. The roof of the cranial capsule is membranous in Myxine and in the larvae of Petromyzon, but more or less cartilagin- ous in the adult Petromyzon and in Bdellostoma.

The Chondropterygians exhibit a most extraordinary diversity in the development of their vertebral column ; almost every degree cf ossification, from a notochord without a trace of annular structure to a scries of completely ossified vertebra, being found in this order. The sharks in which the notochord is persistent are the Holocephali (if they be'reckoned as belonging to this order) and the genera Votidanus and Lchinorhinus. In' the other sharks the segmentation is complete, each vertebra having a deep conical excavation i front and behind, with a central canal through which the notochord is continued ; but the degree in which the primitive cartilage is replaced by concentric or radiating lamelle of bone varies greatly in the various genera, and according to the age of the individuals. In the rays all the vertebra are completely ossificd, and the anterior ones confluent into one continuous mass. In the majority of Chondropterygians the extremity of the vertebral column shows a decidedly heterocercal condition, and only a few, like Sywatena and some rays, possess a diphycercal tail.

The advance in the development of the skeleton in Chondropterygians beyond the primitive condition of the previous subclasses manifests itself further by the presence of neural and hemal elements, extending to the foremost part of the axial column; but of these the hemal form a closed arch in the caudal region only, whilst on the trunk they appear simply as a lateral longitudinal ridge. The neural and hemal apophyses are either merely attached to the axis, as in Chondropterygians with persis- tent notochord (the rays and some sharks) ; or their basal portions penetrate like wedges into the substance of the centrum, so that, in a transverse

section, in consequence of C the difference in their texture, they appear The in-

a, notochord ; b, basis cranii; c, inferior, and d, lateral process of basis; e, auditory capsule; /, sub- ocular arch; g, stylohyal process; A, olfactory capsule; 4, cthmo-vomerine plate; &, palato-pterygoia terspaces between the neurapophyses of the

portion of subocular arch; 7, m,n, accessory labial or rostral cartilages, with o, appendage; 7, lingual vertebree are not filled by fibrous membrane,

cartilage ; g, neural arches; 1, branchial skeleton; s, blind termination of the nasal duct between the

notochord and cesophagus, observed in the notochord, but neural arches are repre- sented by a series of cartilages on each side of the spinal chord. In Petromyzon (fig. 31) the basis cranii emits two prolongations on each side, an inferior, extending for some

as in other fishes, but by separate cartilages (laminz or cartilagines intercrurales), to which frequently a series of terminal pieces is superadded, which must be regarded as the first appearance of the interneural spines of the Zeleostec and many Ganoids. Similar terminal pieces

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are sometimes observed on the heemal arches. Ribs are either absent or but imperfectly represented (Carcharias).

The substance of the skull of the Chondropterygians is cartilage, interrupted especially on its upper surface by more or less extensive fibro-membranous fontanelles. Superficially it is covered by a more or less thick shagreen-

Fig. 32. Figs. 32, 33, 34.—Lateral view, longitudinal section, and transverse section of

Fig. 33. Tig. 34.

caudal vertebra of Basking Shark (Selache maxima). (After Hasse.) a, centrum; 6, neurapophysis; c, intercrural cartilage; d, heemapophysis; e, spinal canal; jf, intervertebral cavity; g, central canal for persistent portion of notochord; /, heemal canals for blood-vessels.

like osseous deposit. The articulation with the vertebral column is effected by a pair of lateral condyles. In the sharks, besides, a central conical excavation corresponds to that of the centrum of the foremost vertebral segment, whilst in the rays this central excavation of the skull receives a condyle of the axis of the spinous column. The cranium itself is a continuous undivided cartilage, in which the limits of the orbit are well marked by an anterior and posterior protuberance. The ethmoidal region sends horizontal plates over the nasal sacs, the apertures of which retain their embryonic situation upon the under surface of theskull, In the majority of Chondropterygians these plates are produced conically, forming the base of the soft projecting snout; and in some forms, especially in the long-snouted rays and the saw-fishes (Pristzs), this prolongation appears in the form of three or more tubi- form rods. As separate cartilages there are appended to the skull a suspensorium, a palatine, a mandible, a hyoid, and rudimentary maxillary elements, The suspensorium is movably attached to the side of the skull. It generally consists of one piece only, but in some rays of two. In the rays it is articulated to the mandible only, their hyoid possessing a distinct point of attachment to the skull. In the sharks the hyoid is suspended from the lower end of the suspensorinm together with the mandible. What is generally called the upper jaw of a shark is, as Cuvier has already stated, not the maxillary, but the palatine. Tt consists of two simple lateral halves, each of which arti- culates with the corresponding half of the lower jaw, which is formed by the simple representative of Meckel's cartilage. Some cartilages of various sizes are generally developed on each side of the palatine, and one on each side of the mandible. 'They are called labial cartilages, and seem to represent maxillary elements. The hyoid consists generally of a pair of long and strong lateral pieces, and a single mesial piece. From the former, cartilaginous filaments (representing branchiostegals) pass directly outwards. Branchial arches, varying in number, and similar to the hyoid, succeed it. They are suspended from the side of the foremost part of the spinous column, and, like the hyoid, bear a number of filaments.

The vertical fins are supported by interneural and inter- hzmal cartilages, each of which consists of two or more pieces; to these fins the fin-rays are attached without articulation. The scapular arch of the sharks is formed by a single coracoid cartilage bent from the dorsal region downwards and forwards. In some genera (Scylliwm,

Squatina) a small separate scapular cartilage is attached to the dorsal extremities of the coracoid; but in none of the Elasmobranchs is the scapular arch suspended from the skull or vertebral column; it is merely sunk and fixed in the substance of the muscles. Behind, at the point of its greatest curvature, three carpal cartilages are joined to the coracoid, which Gegenbaur has distinguished as propterygium, mesopterygium, and metapterygium, the first occupying the front, the last the hind margin of the fin. Several more or less regular transverse series of styliform cartilages follow. They represent the phalanges,

| to which the horny filaments which are imbedded in the

skin of the fin are attached. In the rays, with the excep- tion of torpedo, the scapular arch is intimately connected with the confluent anterior portion of the vertebral column, The anterior and posterior carpal cartilages are followed by a series of similar pieces, which extend like an arch for- wards to the rostral portion of the skull, and backwards to the pubic region. Extremely numerous phalangeal elements, longest in the middle, are supported by the carpals, and form the skeleton of the lateral expansion of the so-called disk of the ray's body, which thus, in fact, is nothing but the enormously enlarged pectoral fin.

The pubic is represented by a single median transverse cartilage, with which a tarsal cartilage articulates. The latter supports the fin-rays. 'To the end of this cartilage is also attached, in the male Chondropterygians, a peculiar accessory generative organ or clasper.

The Holocephali differ from the other Chondropterygians in several important points of the structure of their skeleton, and unmistakably approach certain Ganoids. That their spinal column is persistently notochordal has been men- tioned already. Their palatal apparatus, with the suspen- sorium, coalesces with the skull, the mandible articulating with a short apophysis of the cranial cartilage (autostylic skull). The mandible is simple, without anterior symphysis. The spine with which the dorsal fin is armed articulates with a neural apophysis, and is not immovably attached to it, as in the sharks. The pubic consists of two lateral halves, with a short, rounded tarsal cartilage.

The skeleton of the Ganoid fishes presents extreme varia- tions with regard to the degree in which ossifications replace the primordial cartilage. Whilstsome exhibit scarcely any advance beyond the Plagiostomes with persistent cartilage, others, as regards the development and specialization of the several parts of their osseous framework, approach the Teleosteans so closely that their Ganoid nature can be demonstrated by, or inferred from, other considerations only. All Ganoids possess a separate gill-cover.

The diversity in the development of the Ganoid skeleton is well exemplified by the few representatives of the order in the existing fish fauna. Lowest in the scale in this respect are those with a persistent notochord, and an autostylic skull, that is, a skull without separate suspen- sorium—the fishes constituting the suborder Dipnoi, of which the existing representatives are Lepidosiren, Proto- pterus, and Ceratodus,and the extinct (so far as demonstrated at present) Dipterus, Chirodus (and Phaneropleuron 1). In these fishes the notochord is persistent, passing uninter- ruptedly into the cartilaginous base of the skull. Some Dipnoi are diphy-, others hetero-cercal. Neural and hemal elements and ribs are well developed.

The primordial cranium of the Dzpnor is cartilaginous, but with more or less extensive ossifications in its occipital, basal, or lateral portions, and with large tegumentary bones, which, from this suborder upwards in the series, will be found to exist throughout the remaining forms of fishes. A strong process descends from the cranial cartilage, and offers by means of a double condyle (fig. 35, s) attachment to corresponding articulary surfaces of the lower jaw. Maxil-

lary and intermaxillary elements are not developed, but are perhaps represented in Ceratodus by some inconstant rudi- mentary labial cartilages situated behind the posterior nasal opening. Facial cartilages and an infraorbital ring are de- veloped, at least in Ceratodus. The presence of a pair of small teeth in front indicates the vomerine portion (v) which remains cartilage, whilst the posterior pair of teeth are im- planted in a pterygo- palatine ossification (?), which sometimes is paired, sometimes con- tinuous. The base of the skull is constantly covered by a large basal ossification (0). The hyoid is well developed, sometimes reduced to a pair of ceratohyals, sometimes with a basi- hyal and glossohyal. The skeleton of the branchial apparatus ap- proaches the Teleosteous type, less so in Lepido- – seren than in Ceratodus, Fig. 35.—Palatal view of skull of Ceratodus.

in which five branchial arches are developed, but with the lateral and mesial pieces reduced in number. A large oper- culum, and a smaller sub- or inter-operculum are present.

The scapular arch consists of a single median transverse cartilage, and a pair of lateral cartilages which bear the articular condyle for the pectoral limb. The latter cartilages form the base of a large membrane-bone, and the whole arch is suspended from the skull by means of an osseous supraclavicle. The fore-limb of the Dipnor (fig. 36) greatly differs ex- ternally from the pectoral fin of other Ganoid fishes. It is covered with small scales along the middle, from the root to its extremity, and sur- rounded by a rayed fringe similar to the vertical fin (crossopterygian type of fin). A muscle split into numerous fascicles extends all the length of the fin, which is flexible in every part and in every direction. The cartilaginous framework sup- porting it is joined to the scapular arch by an oblong cartilage, followed by a broad basal cartilage (a), gene- rally single, but sometimes showing traces of a triple division. Along the middle of the fin runs a jointed axis (b), the joints gradually be- coming smaller and thinner towards the extremity ; each joint bears on each side a three-, two-, or one- jointed branch (c, d). This axial arrangement of the pectoral skeleton, which evidently represents one of its first and lowest conditions, has been

termed the archipterygium by Gegenbaur. It is found in Ceratodus and other genera, but in Lepidosiren the jointed axis only has been preserved, while rudimentary rays are added in Protopterus.

The pubic consists of a single flattened subquadrangular cartilage, produced into a long single anterior process. Posteriorly it terminates on each side in a condyle, to which the basal cartilage of the ventral paddle is joined.

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Fig. 86.—Fore-limb of Ceratodus.

The endoskeleton of the paddle is almost identical with that of the pectoral.

The Ganoid fishes with persistent notochord, but with a hyostylic skull (that is, a skull with a separate sns- pensorium), consist of the suborder Chondrostet, of which the existing representatives are the sturgeons (Actpenser, Ncaphirhynchus, Polyodon), and the extinct the Chon- drosteidee, Paleoniscide, and (according to Traquair) Platy- somidee.

Their spinal column does not differ essentially from that of the Dipnot. Segmentation is represented only so far as the neural and heemal elements are concerned. All are eminently heterocercal. Ribs are present in most, but are replaced by ligaments in Polyodon.

The primordial cranium of the sturgeons consists of per- sistent cartilage without ossifications in its substance, but superficial bones are still more developed and specialized than in the Dipnoz ; so it is, at least, in the true sturgeons, but less so in Polyodon (fig. 37). The upper and lateral

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Fie. 37.—Skull of Polyodon. (After Traquair.) m, nasal cavity; 87, sSquamosal ; mh, hyomandibular ; sy, symplectic; pa, palato-pterygoid; m, Meckelian carti- lage; mz,maxillary; d,dentary; 2,hyoid; op, operculum; br, branchiostegal; s.cl, supraclavicular ; p.cl, postclavicular; cl, clavicle; é.cl, infraclavicular.

parts of the skull are covered by well-developed membrane- bones. The lower surface of the skull is covered by an ex- tremely large basal bone, which extends from the vomerine region on to the anterior part of the spinal column. The nasal excavation in the skull is rather lateral than inferior. The ethmoidal region is generally much produced, forming the base of the long projecting snout. The suspensorium is movably attached to the side of the skull, and consists of two pieces, a hyomandibular and a symplectic, which now appears for the first time as a separate piece, and to which the hyoid is attached. The palato-maxillary apparatus is more complex than in the sharks and Dipnoi; a palato- pterygoid consists of two mesially-connected rami in Polyodon, and of a complex cartilaginous disk in Acipenser, being articulated in both to the Meckelian cartilage. In addition, the sturgeons possess one or two pairs of osseous rods, which, in Polyodon at least, represent the maxillary, and therefore must be the representatives of the labial car- tilages of the sharks. The Meckelian cartilage is more or less covered by tegumentary bones. In the gill-cover, besides the operculum, a sub- and inter-operculum may be distinguished in Actpenser. The hyoid consists of three pieces, of which the posterior bears a broad branchiostegal in Polyodon.

In the scapulary arch the primordial cartilaginous elements scarcely differ from those of the Dipnoi. The membrane-bones are much expanded, and show a continu- ous series suspended from the skull. Their division in the median ventral line is complete. The pectoral is supported by a cartilaginous framework (fig. 38) similar to that of Ceratodus, but much more shortened and reduced in its periphery, the branches being absent altogether on one side of the axis. This modification of the fin is analogous to the heterocercal condition of the end of the spinous column. ‘To the inner corner of a basal cartilage (a) a short axis (b) is joined, which on its outer side bears a

few branches (d) only, fxed to the basal cartilage. The dermal fin-rays are opposed to the extremities of the S branches, as in the Depnot.

The pubic consists of a paired cartilage, to which tarsal pieces supporting the fin-rays are attached.

The other existing Ganoid fishes have the spinous column entirely or almost entirely ossificd ; these have been comprised under the common name Holostei. They form, however, | three very distinct types; several | attempts have been made to co- ordinate with them the fossil forms, but this task is beset with extreme difficulties, of which no satisfactory solution has as yet been advanced.

The Polypteroidet have their spinous column formed by distinct osseous amphiccelous vertebree, that is, vertebre with concave anterior Acipenser, and posterior surfaces. It is nearly diphycercal. The neural arches, though ossified, do not coalesce with the

Fig, 38.—Fore-limb of

Fic, 39.—Skull of Polypterus. (After Traquair.) I. Upper aspect of the primor- dial cranium, with the membrane-bones removed. IJ. Lower aspect of the same. 111. Side view, with the membrane-boncs. 1V. Lower aspect of the skull, part of the bones being removed on one side. The parts shaded with oblique lines are cartilage of the primordial skull. An, angular; ao, anteorbital; Ar, articulary; B, basal; D, dentary ; Z, ethmoid; F, frontal; d/a, mastoid; Mp, metapterygoid; Mz, maxillary; V, nasal; 0, operculum ; Oc, occipital ; Pa, parietal; Pl, palatine; Pmz, premaxillary ; po, postorbital ; Prf, prefrontal ; Pt, post-temporals ; Péf, postfrontal ; Pdr, pterygoid ; Q, quadrate ; S, suspenso- rium; So, suboperculum ; Sp, sphenoid ; Spd, splenial ; Sé, supratemporals; 7, tympanic lamina; 7u, turbinal ; v, vomer ; 2 2, small ossicles ; a’ z’, spiraculars.

centrum, and form one canal only for the myclon. There are no intermediate elements between the neural spines.

the remaining branches © being | Interneurals are developed, but are simple, articulating

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with the dermoneurals. The abdominal vertebre have parapophyses developed with epipleural spines. Only the caudal vertebree have hemal spines, which, like the interhemals, agree in every essential respect with the opposite neurals. Ribs are inserted, not on the para- pophyses, but on the centra, immediately below the para- pophyses.

The skull of Polypterus (fig. 39) shows a great advance towards the Teleosteous type, the number of separable bones being greatly increased. They are arranged much in the same fashion as in Zeleostet, but a great portion of the primordial cranium remains cartilaginous. The mem-. brane-bones which cover the upper and lower surfaces of the brain-case are so much developed as to cause the under- lying cartilage to disappear, so that a large vacuity or fontanelle exists in the substance of the upper as well as of the lower cartilaginous wall. Of ossifications belonging to the primordial skull must be noticed the single occipital with a mastoid on each side, They are separated by persistent cartilage from the sphenoids and postfrontals ; the former, which are the largest ossification of the prim- ordial cranium, enclose the anterior half of the brain cavity. Finally, the nasal portion contains a median ethmoid and a pair of prefrontal bones. Only a very small portion of the bones described are visible externally, nearly the whole of the primordial cranium being covered by the membrane-bones. Of these are seen on the upper surface a pair of parietals, frontals, " nasals," and turbinals; on the lower surface a large cross-shaped basal, anteriorly bordered on each side by a pterygoid, parallel to a palatine which forms a suture with the double vomer. The suspensorium has in front a metapterygoid and quadrate bone, and an operculum and suboperculum are attached to it behind. Preemaxillaries and mazxillaries are now fully developed, but immovably attached to the skull. The lower jaw is ossified, and consists of an articulary, angular, dentary, and splenial. Of labial cartilages a rudi- ment at the angle of the mouth has remained persistent. The side of the skull, in front of the operculum, is covered by a large

irregularly-shaped bone (7) (correspond- ing to the "tympanic lamina" of Ceratodus, fig. 35, q), | held by some to be the preoperculum ; along its upper

circumference lies a series of small ossicles, of which two may be distinguished as spiraculars, as they form a valve for the protection of the spiracular orifice of these fishes. An infraorbital ring is represented by a preorbital and post- orbital only.

Each hyoid consists of three pieces, none of which bear branchiostegals, the single median piece being osseous in front and cartilaginous behind. Four branchial arches are developed, the foremost consisting of three, the second and third of two, and the last of a single piece. There is no lower pharyngeal. Between the rami of the lower jaw the throat is protected by a pair of large osseous laminee (gular plates), which have been considered to represent the urohyal of osseous fishes. The scapulary arch is almost entirely formed by the well-developed membrane-bones, which in the ventral line are suturally united. The pectoral fin is supported by three bones, pro-, meso-, and meta-pterygium, of which the dilated iniddle one alone bears rays, and is excluded from the articulation with the shoulder-girdle.

The pubic consists of a paired bone, supporting the fin-rays are attached.

In the Lepidosteotdet the vertebra are completely ossified and opisthoccelous, having a convexity in front and a con- cavity behind, as in some amphibians. Though the end of the body externally appears nearly diphycercal, the termination of the vertebral column is, in fact, distinctly'

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heterocercal. The caudal fin is suspended from hema- pophyses only, and does not extend to the neural side of the vertebral column. The neural arches coalesce with the centrum; the interneurals are simple. The abdominal vertebree have parapophyses, to which the ribs are attached. Only the caudal vertebrae have hmal spines,

In the skull of Lepedostews the cartilage of the endo- cranium is still more replaced by ossifications than in Poly- pterus, those ossifications, moreover, being represented bya greater number of discrete bones. The membrane-bones in particular are greatly multiplied: the occipital, for instance, consists of three pieces ; the vomer is double, as in Polypterus ; the maxillary consists of a series of pieces firmly united by suture. The symplectic reaches tle lower jaw, so that thearticulary is provided with a double joint,viz., for the symplectic and quadrate ; the component parts of the lower jaw are as numerous as in reptiles, a dentary, splenial, articulary, angular, supra-angular, and coronary being dis- tinct. The sides of the head are covered with numerous bones, and a preoperculum is developed in front of the gill-cover, which, again, consists of an operculum and sub-operculum.

Each hyoid consists of three pieces, of which the middle is the longest, the upper bearing the largest of the three branchiostegals which Lepidosteus possesses ; a long and large glossohyal is intercalated between the lower ends of the hyoids. There are five branchial arches, the hindmost of which is modified into a lower pharyngeal; upper pharyngeals are likewise present as in the majority of Teleosteous fishes, but there is no gular plate.

Of the scapulary arch the two halves are separated by a suture in the median line; the membrane-bones are well developed, only a remnant of the primordial cartilage remaining; the supraclavicle is very similar to that of Teleosteous fishes, and in a less degree the post-temporal. The base to which the limb is attached is a single osseous plate, supporting on its posterior margin semi-ossified rods in small number, which bear the pectoral rays. he pubic consists of a paired bone. The elements representing a tarsus are quite rudimentary, and reduced in number (two or three),

The vertebral column of the Amioided shows unmistakable characters of the Palzichthyic type. The arrangement of its component parts is extremely simple. The centra of the amphiccelous vertebre are well ossified, but the neural and hemal arches do not coalesce with the centra, from which they are separated by a thin layer of cartilage. All the vertebrae do not possess apopliyses: in the caudal portion of Amia only every alternate vertebra is provided with them. The heterocercal condition of the spinous column is

well marked; as in the other JZolostei, the hindmost vertebre are turned upwards, become gradually smaller in size, and lose their neural arches, the hzmals remaining developed to the end, Finally, the column terminates in a thin cartilaginous band, which is received between the lateral halves of the fifth or sixth upper caudal ray. The interneurals and interhemals are simple. Only the abdominal vertebree have parapophyses, with which the ribs are articulated.

The configuration of the skull, and the development and arrangement' of its component parts, approach so much the Teleostean type, that perhaps there are greater dif- ferences in skulls of truly Teleostean fishes than between the skulls of Amia and of many Physostomi. Exter- nally the cranium is entirely ossified ; the remains of the cartilaginous primordial cranium can only be seen in a section, and are of much less extent than in many Physo- stomous fishes. The immovable intermaxillary, the double vomer, tlie double articulary cavity of the mandible for Junction with the quadrate and symplectic bones, remind

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us still of similar conditions in the skull of Lepidosteus ; but the mobility and formation of the maxillary, the arrange- ment of the gill-covers, the development of a preoperculum, the suspensorium, the palate, the insertion of a number of branchiostegals on the long middle hyoid piece, the com- position of the branchial framework (with upper and lewer pharyngeals), are as in the Teleosteous type.

The scapular arch is composed entirely of the membrane- bones found in the Z'eleoste', and the two sides are loosely united by ligament. The base to which the limb is attached 1s cartilaginous ; short semi-ossified rods are arranged along its hinder margin, and bear the pectoral rays,

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In the lowest vertebrate, Branchiostoma, the whole of the muscular mass is arranged in a longitudinal band running along each side of the body ; itis

vertically divided into a number of flakes or segments (myocommas) by apo- neurotic septa, which serve as the surfaces of insertion to the muscular fibres, But this muscular band has no con- nexion with the notochord except in its foremost portion, where some relation has been formed to the visceral skeleton, A very thin muscular layer covers the abdomen. In the Cyclostomes also the greater portion of the muscular system is without direct relation to the skeleton, and, again, it is only on the skull and visceral skeleton that distinct muscles have been differentiated for special functions.

To the development of the skeleton in the more highly organized fishes corresponds a similar development of thie muscles: the maxillary and branchial apparatus, the pectoral and ventral fins, the vertical fins and especially the caudal, possess a separate system of muscles. But the most noteworthy is the muscle covering the sides of the trunk and tail (already noticed in Lranchiostoma), which Cuvier described as the 'great lateral muscle," and which, in the higher fishes, is a compound of many smaller segments (myocommas), corresponding in number with the vertebre, Each lateral muscle is divided by a median longitudinal groove into a dorsal and ventral half; the depression in its middle is filled by an embryonal muscular substance which contains a large quantity of fat and numerous blood-vessels, and therefore differs from ordi- nary muscle by its softer consistency, and by its colour, which is reddish or greyish. Superficially the lateral muscle appears crossed by a number of white parallel tendinous zigzag stripes, forming generally three angles, of which the upper and lower point backwards, the middle one for- wards. These are tlie outer edges of the aponeurotic septa between the myocommas. Each septum is attached to the middle and to the apophyses of a vertebra, and, in the abdominal region, to its rib; frequently the septa receive additional support by the existence of epipleural spines,

In connexion with the niuscles reference has to be made to the electric organs with which certain fishes are provided. That these have been developed out of muscular substance is more than probable, not only from the examination of peculiar muscular organs (the function of which is still conjectural) occurring in the rays, and in Aformyrus and Gymnarchus, but especially from the re- searches into the development of the electric organ of Torpedo. The fishes possessing fully developed electric organs, with the

power of accumulating electric force and communicating it in the form of shocks to other animals, are the electric rays (Zorpedinide), the electric sheath-fish of tropical Africa (M/alapterurus), and the electric eel of tropical America (Gymnotus). The structure and arrange- ment of the electric organ are very different in these fishes,

In Torpedo tlie electric. organs are large, flat, uniform bodies, lying one on each side of the head, bounded behind by the scapular arch, and laterally by the anterior crescent-shaped tips of the peetoral fins. They consist of an assemblage of vertical hexagonal prisms, whose ends are in contact with the integuments above and below ; and each prism is subdivided by delicate transverse septa, forming cells filled with a clear, trembling, jelly-like fluid, and lined within by an epithelium of nucleated corpuscles. Between this epithelium and the transverse septa and walls of the prism there isa layer of tissue on which the terminations of the nerves and vessels ramify. Hunter counted four hundred and seventy prisms in each battery of Torpedo marmorata, and demonstrated the enormous supply of nervous matter which they receive. Each organ receives one branch of the trigeminal nerve and four branches of the vagus, the former, and the three anterior branches of the latter, being each as thick as the spinal chord (electric lobes).

™ *Malapterurus the electric organ extends over the whole body, but is thickest on the abdomen ; it lies between two aponeurotic membranes below the skin, and consists of rhomboidal cells which contain arather firm gelatinous substance. The electric nerve takes its origin from the spinal chord, does not enter into connexion with ganglia, and consists of a single enormously-strong primitive fibre, which distributes its branches in the electric organ.*

The electric eel is the most powerful of electric fishes. Its electric organ consists of two pairs of longitudinal bodies, situated immediately below the skin, above the muscles,—one pair on_ the back of the tail, and the other pair along the anal fin. Each fasciculus is composed of flat partitions or septa, with transverse divisions between them. The outer edges of the septa

appear in nearly parallel lines in the direction of the longitudinal axis of the body, and consist of thin membranes, which are easily – torn ; they serve the same purpose as the columns in the analogous organ of the torpedo, making the walls or abutments for the perpendicular and transverse dissepi- ments, which are exceedingly numerous, and so closely aggregated as to seem almost in contact. The minute prismatic cells, intercepted between these two sorts of plates, contain a gelatinous matter ; the septa are about igth of an inch from each other, and a length of one inch

eo tains a series of two hundred and forty cells, giving ¥%: 40.—Brain of Pereh.*

an enormous surface to the electric organs. The whole apparatus is supplied with more than two hundred nerves, which are the continuations of the rami anteriores of the spinal nerves. In their course they give out branches to the muscles of the back, and to the skin of the animal. In the Gymnotes, as in the torpedo, the nerves supplying the electric organs are much larger than those bestowed on any part for the purposes of sensation or movement.

The phenomena attending the exercise of this extra- ordinary faculty closely resemble muscular action. The time and strength of the discharge are entirely under the control of the fish. The power is exhausted after some time, and needs repose and nourishment to restore it. Tf the electric nerves are cut and divided from the brain, the cerebral action is interrupted, and uo irritant to the body has any effect in exciting electric discharge; but if their ends be irritated the discharge takes place, just as a musele is excited to contraction under similar circumstances. Singularly enough, also, the application of strychnine causes simultaneously a tetanic state of the muscles and a rapid succession of involuntary electric discharges. The strength of the discharges depends entirely on the size, health, and energy of the fish, an observation completely agreeing with that made onthe efficacy of snake-poison. Like this latter, the property of the electric force serves two ends in the economy of the animals which are endowed with it: it is necessary to them for overpowering, stunning, or killing the creatures on which they feed, whilst incidentally they use it as the means of defending themselves from their enemies.

The most simple condition of the nervous central organ known in vertebrates is found in Branchiostoma. In this fish the spinal cord tapers at both ends, no anterior cerebral swelling, or anything approaching a brain, being present. It is band-like along its middle third, and groups of darker cells mark the origins of the fifty or sixty pairs of nerves which accompany the intermuscular septa, and divide into

lobes; , nervus optieus ; trochlearis; r, nervus trigeminus; §, abducens; v, fourth ventricle.

a dorsal and a ventral branch, as in other fishes. The two anterior pairs pass to the membranous parts above the mouth, and supply with nerve filaments a ciliated depression near the extremity of the fish, which is considered to be an olfactory organ, and two pigment spots, the rudiments of eyes. An auditory organ is absent. The spinal cord of the Cyclostomes is flattened in its whole extent, band- like, and elastic; also in Chimera it is elastic, but flattened in its posterior portion only. Jn all other fishes it is cylindrical, non-ductile, and generally extend- ing along the whole length of the spinal canal, The Plectognaths offer singular exception in this respect, that the spinal cord is much shortened, the posterior portion of the canal being occupied by a long cauda equina ; this shortening of the spinal cord has. become extreme in the sun-fish (Orthagoriscus), in which it has shrunk into a short and conical appendage of the brain. In the devil-fish (Lophius) also a long cauda equina partly con- ceals the cord which terminates on the level of about the twelfth vertebra.

The brain of fishes is relatively small; in the burbot (Zota) it has been estimated to be the ricth part of the weight of the entire fish, in the pike the zs'g3th part, and in the large sharks it is relatively still smaller.

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I. Upper aspect. lobes; c, hemispheres; ¢, lobi inferiores; 7, hypophysis; g, lobi posteriores; ¢, olfactory

a, ecrebellum; 6, optic

o, nervus olfaetorius; p, nervus oculo-motorius ; g, nervus nervus acousticus; ¢, nervus vagus; wu, nervus

The brain of osseous fishes (fig. 40) viewed from above shows three protuberances, respectively termed the prosen- cephalon, mesencephalon, and metencephalon, the two anterior of which are paired, the hindmost being single. The foremost pair are the hemispheres, which are solid in their interior, and provided with two swellings in front, the olfactory lobes. The second pair are the optic lobes, which generally are larger than the hemispheres, and succeeded by the third single portion, the cerebellum. The optic lobes possess a cavity (ventriculus lobi optici), at the bottom of which some protuberances of variable development represent the corpora quadrigemina of higher animals. On the lower surface of the base of the optic lobes, behind the crura cerebri, two swellings are observed, the lobi inferiores, which slightly diverge in front for the passage of the infundibulum, from which a generally large hypophysis or pituitary gland is suspended. The relative size of the cerebellum varies greatly in the different osseous fishes: in the tunny and silurus it is so large as nearly to cover the optic lobes; sometimes distinct transverse grooves and a median longitudinal groove are visible. The cerebellum possesses in its interior a cavity which communicates with the anterior part of the fourth ventricle. The medulla oblongata is broader than the spinal cord, and contains the fourth ventricle. In most fishes a perfect roof is formed over the fourth ventricle by two longitudinal pads, which meet each other in the median line (lobi posteriores).

The brain of Ganoid fishes shows great similarity to that of the Zeleostei; there is, however, considerable diversity in the arrangement of its various portions in the different types. In the sturgeons and Polypterus (fig. 41) the hemispheres are more or less remote from the mesen- cephalon, so that in an upper view the crura cerebri, with the intermediate entrance into the third ventricle (fissura

cerebri magna), may be seen. A vascular membranous gac, epiphysis, containing lymphatic fluid, takes its origin from the third ventricle, its base being expanded over the anterior interspace of the optic lobes, and the apex being

Fie. 41.—Brain of Polypterus. (After Miiller.) JI. Upper, II., Lateral, ITT.

Lower aspect. a, medulla; 6, corpora restifurmia; c, cerebellum; d, lob)

optici; ¢, hypophysis; /, fissura cerebri magna; g, nervus opticus; g', chiasma;

h, hemispheres ; 7, lobus olfactorius ; 4, sinus rhomboidalis (fourth ventricle). fixed to the cartilaginous roof of the cranium. This struc- ture is not peculiar to the Ganoids, but is found in various stages of development in Teleosteans, marking, when pre- sent, the boundary between the prosencephalon and mesen- cephalon, 'The lobi optici are essentially as in Teleosteaus, The cerebellum penetrates into the ventriculus lobi optici, and extends thence into the open sinus rhomboidalis. At its upper surface it is crossed by a commissure formed by the corpora restiformia of the medulla.

As regards external configuration, the brain of Lepid- osteus and Amita approach still more the Teleosteous type. The prosencephalon, mesencephalon, and metencephalon are- contiguous, and the cerebellum lacks the prominent transverse commissure at its upper surface. The sinus rhomboidalis is open.

The brain of Chondropterygians (fig. 42) is more developed than that of other fishes, and is distinguished by well-marked cha- racters. 'These are—first, the prolong.- tion of the olfactory lobes into pedicles of greater or less length, which dilate into great ganglionic masses, where they come into contact F's. 42.—Brain of Carcharias. (After Owen.) ac,

S nervus acousticus; 5, corpus restiforme; c,cere- with thie olfactory bellum ; d, lobus opticus; e, hypophysis ; g, nervus sacs; secondly, the

opticus; A, hemisphere; 7, lobus olfactorius; 7,

: olfactory pedicle; &, nervus olfactorius ; /, epi- space which gene- rally intervenes be-

physis; m, nervus oculo-motorius; ¢é, nervus trigeminus; ¢v, nervus vagus, tween the prosencephalon and mesencephalon, as in some Ganoids; thirdly, the large development of the meten- cephalon.

The cerebellum is very large, overlying a portion of the optic lobes and of the sinus rhomboidalis, and is often transversely grooved. The side-walls of the fourth ventricle, which are formed by the corpora restiformia, are singularly folded, and appear as two pads, one on each side of the cerebellum (lobi posteriores or lobi nervi trigemini).

The brain of the Cyclostomes represents a type different

from that of other fishes, showing at its upper surface three pairs of protuberances in front of the cerebellum ;

they are all solid. The foremost pair are the large olfactory tubercles, which are extremely large in Petro- myzon. They are followed by the hemispheres, with a single body wedged in between their posterior half; iu Petromyzon, at least, the vascular tissue leading to an epiphysis seems to be connected with this body. Then follows the lobus ventriculi tertii, distinctly paired in Myxinoids, but less distinctly in Petromyzon. The last pair are the corpora quadrigemina. According to this in- terpretation, the cerebellum would be absent in Myxinoids, and represented in Petromyzon by a narrow commissure only, stretching over the foremost part of the sinus rhom- boidalis. In the Myxinoids the medulla oblongata ends in two divergent swellings, free and obtuse at their ex- tremity, from which most of the cerebral nerves take their origin.

Two very important conditions require mention. The first relates to the optic nerves, viz, to their mutual relation immediately after their origin, which is very characteristic of the subclasses of fishes. In the Cyclo- stomes they have no further connexion with each other, each going to the eye of its own side. In the Teleostei (fig. 40, n) they simply cross each other (decussate), so that the one starting from the right half of the brain goes to the left eye and vice versa. Finally, in the Palwichthyes (fig, 41, 7') the two nerves are fused together, immediately after their origin, into a chiasma.

The second noteworthy peculiarity occurs in the distri- bution of the nervus vagus; it emits a strong branch, called nervus lateralis, which accompanies the lateral mucous system of the trunk and tail. This is either a single longitudinal stem, gradually becoming thinner behind, and running superficially below the skin (Sal- monide, Cyclopterus) or deeply between the muscles (sharks, Chimera), or is divided into two parallel branches (most Z'eleoste:) ; thus in the perch there are two branches on each side, the superficial one supplying the lateral line, whilst the deep-seated branch communicates with the spinal nerves and supplies the septa between the myocom- mas and the skin. In fishes which lack the lateral muciferous system aud possess hard integuments, as the Ostracions, the lateral nerve is more or less rudimentary. It is entirely absent in Myxinoids, but the gastric branches of the vagus are continued, united as a single nerve, along the intestine to the anus.

Fishes possess all the spino-cerebral nerves of the higher Vertebrata, with the exception of the nervus acces- sorius, A separate nervus hypoglossus is also absent, but elements froin the first spinal nerve are distributed over the area normally supplied by this nerve in higher ver- tebrates. The number of spinal nerves corresponds to that of the vertebra, through or between which they pass out.

A sympathic nervous system appears to be absent in Branchiostoma, and has not yet been clearly made out in the Cyclostomes. It is well developed in the Palczchthyes, but without the cephalic portion. This latter is present in all osseous fishes, in which the communication of sympathy has been found to exist between all the cerebral nerves, except the olfactory, optic, aud acoustic. The sympathic trunks run along each side of the aorta and the

back of the abdomen into the hemal canal, communicate in their course with the ventral branches of each of the spinal nerves, and, finally, often blend together into a common trunk beneath the tail. At the points of communication with the cerebral and spinal nerves ganglia are frequently developed, from which nerves emerge which are distri- buted to the various viscera.

1 For a more detailed account of the spino-ccrebral nerves, see Jn- treduction to the Study of Fishes, by A. Giinther.

ORGANS OF SENSE.

Organ of Smell.—It is characteristic of the organ of smell in fishes that it has no relation whatever to the re- spiratory function, with the exception of the Dipnoi, in which possibly part of the water received for respiration passes through the nasal sac.

The olfactory organ is single in Branchiostoma and the Cyclostomes. In the former a small depression on the front end of the body, clothed with a ciliated epithelium, is re- garded as a rudimentary organ of smell. In the adult Petromyzon a membranous tube leads from the single opening on the top of the head into the cartilaginous olfac- tory capsule, the inside of which is clothed by membranes prolonged into a posterior blind tube (fig. 31, s), which penetrates the cartilaginous roof of the palate, but not the mucous membrane of the buccal cavity. In the Myxinoids the outer tube is strengthened by cartilaginous rings like a trachea; the capsule is lined by a longitudinally folded pituitary membrane, and the posterior tube opens backwards on the roof of the mouth, the opening being provided with a valve. In all other fishes the organ of smell is double, there being one on each side; it consists of a sac lined with a pituitary membrane, and may be provided with one or with two openings, or may have none. these openings is very different in the various orders and suborders of fishes.

It is certain that fishes possess the faculty of perceiving odours, and that various scents attract or repel them.

Organ of Sight.—The position, direction, and dimen- sions of the eyes of fishes vary greatly. In some they have an upward aspect, and are often very close together; in others they are lateral, and in a few they are even directed downwards. Inavery few this organ appears to be entirely absent. In some Gobioids and Trachinoids (Pertophthal- mus, Boleophthalmus, Uranoscopus, &c.) the eyes, which are on the upper side of the head, can be elevated and de- pressed at the will of the fish. In the range of their vision and in their acuteness of sight, fishes are very in- ferior to the higher classes of vertebrates, yet at the samc time it is evident that they perceive their prey, or approach- ing danger, from a considerable distance ; and it would appear that the visual powers of a Pertophthalmus (fie.22), when hunting insects on the mud-flats of the tropical coasts, are quite equal to those of a frog.

The eye of Branchtostoma (fig. 30, g) is of the most rudi- mentary kind, It is simply a minute speck coated with a dark pigment, and receiving the end of a short nerve. In Myxinoids the minute rudiment of the eye is covered by skin and muscles. This is also the case in many of the blind Teleosteous fishes; whilst in the former fishes, however, the organ of sight has not attained to any degree of development, the rudimentary eye of blind Teleostei is a retrogressive formation, in which a lens and other portions of the eye can often be recognized. In fishes with a well-developed eye it is imbedded in a layer of gelatinous and adipose substance, which covers the cavity of the orbit, A lachrymal gland is absent. In the Chondropterygians the eyeball is supported by and moves on a cartilaginous peduncle of the orbital wall. In the majority of Teleosteans, and in Acipenser, a fibrous ligament attaches the sclerotic to the wall of the orbit. The proper muscles of the eyeball are always present. In all fishes the general integument

of the head passes over the eye, and becomes transparent where it entcrs the orbit; sometimes it simply passes over the orbit, sometimes it forms a circular fold. The anterior and posterior portions may be specially broad,

becoming the seat of an adipose deposit (adipose eyelids), as in Scomber, Caranx, Mugil, &c. fishes the extent of the eyelids varies with the seasons ;

In many of these

during the spawning season they are so much loaded with fat as nearly to hide the wholeeye. Many sharks possess a

nictitating membrane, developed from the lower part of the

palpebral fold, and moved by a proper set of muscles.

The form of the bulbus (fig. 43) is subhemispherical, the cornea (co) being flat. If it were convex, as in higher vertebrates, it would be more liable’to injury ; but, asit is level with the side of the head, the chances of injury by friction are diminished. The sclerotica (sc) is cartilaginous in Chon-dropterygians and Acipensers, fibrous and of varying thickness in Teleosteans, in the majority of which it is supported by a pair of cartilaginous or ossified hemi- spheroid cups ©. In a few fishes, as in Ceratodus, Xiphias, the cups are confluent into one cup, which possesses a foramen behind to allow the passage of the optic p,, nerve (0). ‘

The membranes situated pees the © sclerotica and retina are collectively ealled ea wie fi choroidea, and are three in ata The ore rasan, one in immediate contact with the sclero- membrana vasculosa; 1%, tic, and continued upon the iris, is by no membrana uvea; oe

“48 roid gland; 7, retina; 7, means constantly present ; it 1s the mem- processus faleiformis; 7, brana argentea (a), and is composed of mi- humor vitreus; /, lens; ¢, eroscopical crystals reflecting a silvery or itis. sometimes golden lustre. ‘I’he middle layer is the membrana vas- eulosa or Halleri (v), the chief seat of the ramifieations of the choroid vessels ; the innermost layer is the membrana Ruyscheana or uvea (w), which is composed of hexagonal pigment-cclls, usually of a deep- brown or black colour.

In many Z’eleostei a rete mirabile surrounds the entry of the optic nerve ; it is situated between the membrana argentea and vasculosa, and called the choroid gland (ch). It reeeives its arterial blood from the artery issuing

from the pseudobranchia, the presence of a choroid gland being always combined with that of a pseudobranehia. Teleosteans without pseudobranchia have no choroid gland. In the Paleichthyes, on the other hand, the pscudobranchia is present and a choroid gland absent.

The iris (¢) is merely the continuation of the choroid membrane ;

its capability of contracting and expanding is much more limited than in higher vertebrates. The pupil is generally round, some- times horizontally or vertically elliptical, sometimes fringed. In the rays and Plewronectide a lobe descends from the upper margin of the pupil, and the outer integument overlying this lobe is coloured and non-transparent,—a structure evidently preventing light from entering the eye from above. In most Teleostet a fold of the choroidea, ealled the processus falciformis (f), extends from the vicinity of the entrance of the optie nerve to the lens, It seems to be constantly absent in Ganoids.

The vitreous humour (hk), which fills the posterior cavity of

the eye-ball, is of a firmer consistency than in the higher verte- brates. The lens is spherical, or nearly so, firm, denser towards the centre, and lies in a hollow of the vitreous humour. When a falciform process is present, it has one end attached to the lens, which is thus steadied in its position. It is eomposed of concentric layers consisting of fibres, which in the nucleus of the body have marginal teeth, by which they are interlocked together. In Petro- myzon this serrature is absent, or but faintly indicated. The anterior cavity of the eye is very small in fishes, in conse- quence of the small degree of convexity in the cornea ; the quantity of the aqueous humour, therefore, is very small, just sufficient to float the free border of the iris; and the lessened refractive power of the aqueous humour is compensated by the greater convexity of the lens.

Organ of Hearing. —No trace of an organ of hearing has been found in Branchiostoma. In the Cyclostomes the labyrinth is enclosed in externally visible cartilaginous capsules laterally attached to the skull; it consists of a single semicircular canal in the Myxinoids, whilst the Petromyzontes possess two semicircular canals with a vestibulum.

In all other fishes the labyrinth consists of a vestibule

43.—Vertical through cye of Xiphias. (After Owen.) co, cornea;

section

sclerotica ; 0, nervus

ORGANS OF SENSE, |

and three semicircular canals, the vestibule dilating into one or more sacs, which contain the otoliths. A tympanuin, tympanic cavity, and external parts are entirely absent in the class of fishies.

In the Chondropterygians and Dipnoi, the labyrinth is

In

enclosed in the cartilaginous substance of the skull. the former the excavation in the car- tilage is larger than the membranous labyrinth, but nearly corresponds to it in ¥EWS form ; the part which receives the mem- - Pple! branous vestibulum is called vestibulum TaN cartilagineum, from which a canal issues , and penetrates to the surface of the Fro. 44.—otolith of skull, where it is closed by the skin in eae eee sharks, but opens by a minute foramen nner aspect. ‘ in rays.

The otolithic contents are soft and chalklike.

In the Teleosteans the sac which contains the otoliths lies on each side of the base of the cranial cavity, and is often divided by a septum into two compart- ments of un- equalsize,each containing a firm and solid otolith (fig 44); these bodies possess indented mar- gins, frequent- ly other im- pressions and grooves, in which nerves from the N. acousticus are lodged; they vary much in size and form, but in both respects show a y remarkableconstancyin the way same kind of fishes. Out- wards the vestibule is in coutact with the osseous side wall of the skull, in- / \ wards with the metence- phalon and medulla ob- longata; it contains another firm concretion, and opens by five foramina into the three semicircular canals.

The terminations of the / acoustic nerve are distri- / buted over the vestibular Wi concretion and the ampulli- form ends (fig. 45) of the semicircular canals, without wy being continued into the ~~; _ ‘ait

5 .., Fia.45.—Communication between auditory latter, which are filled with organ and air-bladder in the Carp. (After fluid. The semicircular ¥y,,H- Weber), 4. bansunenoid; dock eanals (fig. 45) are some- baroednital: 7, alspendid; 9 neural times lodged in the cranial and fourth vertebrae ; h’, 1’, parapophyses bones,sometimes partly free of second and thd vetebre: “proces in the cranial cavity. Many theair-bladder ; 4,7, m, chain of ossicles ; Teleostei have fontanelles pull; g, q, canales semicirculares; r, in the roof of the skull, sinus impar. closed only by skin or very thin bone at the place where the auditory organ approaches the surface, by which means

Me

n, air-bladder; 0, vestibulum; p, p, am-

rUHTSRTOLoagy

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sonorous undulations must be conducted with greater ease

to the ear.

In many Teleostet a most remarkable relation obtains between the organ of hearing and the air-bladder. In the most simple form this cennexion is established in Percoids and the allied families, in which the two anterior horns of the air-bladder are attached to fon- tanelles of the occipital region of the skull, the vestibulum occupy- ing the opposite side of the membrane by which the fontanelle is closed. he condition is similar, but more complicated, in many Clupeoids, The anterior narrow end of the air- bladder is produced into a canal at the base of the skull, and divided into two very naitow branches, which again bifurcate and terminate in a globular swelling. An appendage of the vestibulum meets the anterior of these swellings, and comes into close contact with it. In addition, the two

vestibules communicate with each other by a transverse canal, crossing the cranial cavity below the brain.

‘The connexion is effected by means of a chain of ossicles in Siluride, Characinidee, Cyprinide, and Gymnotide. A canal issues from the communication between the vestibule and its sac, and meeting that from the other side forms with it a common sinus impar (fig. 45, 7), lodged in the substance of the basioccipital ; this communicates on each side by a small orifice with two sub- spherical atria, on the body of the atlas, close to the foramen mag- num. Each atrium is supported externally by a small bone (m); a a third and larger bone (x) completes the communication with the anterior part of the air-bladder, From the sinus impar a bifid canal penetrates into the alisphenoids, in which it terminates. In Cobitis and several loach-like Siluroids the small air-bladder consists of two globular portions placed side by side, and wholly included within two bulle formed by the modified parapophyses of the second and third vertebre. The three ossicles on each side are present, but concealed by the fore part of the osseous bulla.

Organ of Taste-—Some fishes, es ecially vegetable feeders, or those provided with broad molar-like teeth, masticate their food ; and it may be observed in carps and other Cyprinoid fish that this process of mastication frequently takes some time. But the majority of fishes swallow their food rapidly, and without mastication, and therefore we may conclude that the sense of taste cannot be keen. The tongue is often entirely absent, and, even when it exists in its most distinct state, it consists merely of ligamentous or cellular substance, and is never furnished with muscles capable of producing the movements of exten- sion or retraction as in most of the higher vertebrates. A peculiar organ on the roof of the palate of Cyprinoids is per- haps adapted for the perception of this sense; in these fishes the palate between and below the upper pharyngeal bones is cushioned with a thick, soft, contractile substance, richly supplied with nerves from the nervus vagus and nervus glosso-pharyngeus.

Organs of Touch.—The faculty of touch is more de- veloped than that of taste, and there are numerous fishes which possess special organs of touch. Most fishes are very sensitive to external touch, although their body may be

protected by hard horny scales. They perceive impres- sions even on those parts which are covered by osseous scutes, in the same manner as a tortoise perceives the slightest touch of its carapace. The seat of the greatest sensitiveness, however, appears to be the snout and the labial folds surrounding the mouth. Many species possess soft and delicate appendages, called barbels, which are almost constantly in action, and clearly used as organs of touch. Among the 7'riglide and allied families, there are many species which have one or more rays of the pectoral fin detached from the membrane, and supplied with strong nerves. Such detached rays (also found in the Polynemide and in Bathypterois) are used partly for locomotion, partly for exploring the ground over which the fish moves.

Some fishes appear to be much less sensitive than others, or at least lose their sensitiveness under peculiar circum- stances. It is well known that a pike whose mouth has been lacerated and torn by the hook continues to yield to the temptation of a bait immediately afterwards. The Greenland shark, when feeding on the carcase of a whale, allows itself to be repeatedly stabbed in the head without abandoning its prey. A pair of congers are so

dead to external impression at the time of copulation, and, as it were, so automatically engaged, that they have been taken by the hand together out of the water.

Orcans oF NUTRITION AND DIGESTION.

Fishes are for the most part either exclusively carnivorous |

or herbivorous, but not a few feed on vegetable as well as animal substances, or on mud containing alimentary matter in a living or decomposing state. Generally they are very voracious, especially the carnivorous kinds, and the rule of 'Seat or be eaten" applies to them with unusnal force. They are almost constantly engaged in the pursuit and capture of their prey, the degree of their power in these respects depending on the dimensions of the mouth and gullet and the strength of the teeth and jaws. Ifthe teeth are sharp and hooked, they are capable of securing the most slender and agile animals ; if with teeth of this kind are combined a

wide gullet and distensible stomach, the fish is able to overpower and swallow others larger than itself ; if the teeth are broad, strong molars, they are able to crush the hardest alimentary substances; if they are feeble, they are only serviceable in procuring some smiall or inert and unresisting prey. Teeth may be wanting altogether. Whatever the prey, in the majority of cases it is swallowed whole ; but some of the most voracious fishes, like some sharks and Characinida, are provided with cutting teeth, which enable them to tear their prey to pieces if too large to be swallowed whole. Auxiliary organs, similar to the claws of some carnivorous mammals and birds, for the purpose of seizing and overpowering their prey before it is torn by the teeth, are not found in this class ; but in a few fishes the jaws themselves are modified for that purpose. In the sword-fishes the bones of the upper jaw form a long dagger-shaped weapon, with which they not only attack large animals, but also frequently kill fishes on which they feed. The saw-fishes are armed with a similar but still niore complex weapon, the saw, which is side with large teeth implanted in deep sockets, specially adapted for killing and tearing the prey before it is seized and masticated by the small teeth within the mouth. Fishes show but little choice in the selection of their food, and some devour their own offspring indiscriminately with other fishes. Their digestive powers are strong and rapid, but are affected in some degree by the temperature, which, when it sinks below a certain point, lowers the vital powers of these cold-blooded animals. On the whole, marine fishes are more voracious than those inhabiting fresh waters ; and, whilst the latter may survive total abstinence from food for weeks or months, the marine species succumb to hunger within a few days.

The organs of nutrition, manducation, and deglutition are lodged in two large cavities—an anterior (the mouth or buccal cavity), and a posterior (the abdominal cavity). In the former the alimentary organs are associated with those fulfilling the respiratory functions, the transmission of food to the stomach and of water to the gills being performed by similar acts of deglutition. The abdominal cavity com- mences immediately behind the head, so, however, that an extremely short thoracic cavity for the heart is partitioned off in front. Besides the alimentary organs it contains also those of the urogenital system and the air-bladder. The abdominal cavity is generally situated in the trunk only, but in numerous fishes it extends into the tail, being con- tinued for some distance along each side of the hemal

apophyses. In numerous fishes the abdominal cavity opens outwards by one or two openings. A single porus abdominalis in front of the vent is found in Lepidosiren and some stur- geons ; a paired one, opening on each side of the vent, in Ce- ratodus, some species of sturgeon, Lepidosteus, Polypterus,

armed on each |

Amia, and all Chondropterygians. As in these fishes semen and ova are discharged by their proper ducts, the abdominal openings may serve for the expulsion of semen, and of those ova only which, having lost their way to the abdominal aperture of the oviduct, would be retained in the abdominal cavity. In those Teleosteans which lack an oviduct a single porus genitalis opens behind the vent.

Mouth.—The mouth of fishes shows extreme variation with regard to form, size, and position. Generally opening in front, it may be turned upwards, or it may lie at the lower side of the snout, as in most Chondropterygians, sturgeons, and some Teleosteans. In most fishes the jaws are covered by the skin, which, before passing over the jaws, is often folded, forming more or less fleshy lips. In the sharks the skin retains its external character even within the teeth, but in other fishes it changes into a mucous membrane. A tongue may exist as a more or less free and short projec- tion, formed by the glossohyal and a soft covering, or may be entirely absent. Salivary glands anda velum palati are absent in fishes.

Teeth.—With regard to the dentition, the class of fishes offers an amouut of variation such as is not found in any of the other classes of vertebrates. As the teeth form one of the most important elements in the classification of fishes, their special arrangement and form will be referred to in the account of the various families and genera. Whilst not a few fishes are entirely edentulous, in others most of the bones of the buccal cavity, or some of them, may be toothed, as the bones of the jaws, the palatines, pterygoids, vomers, basi-sphenoid, glossohyal, branchial arches, upper and lower pharyngeals. In others teeth may be found fixed in some portion of the

buccal membrane without being supported by underlying bone or cartilage; or the teeth have been developed in membrane overlying one of the dentigerous bones mentioned, without having become anchylosed to the bone. When the tooth is fixed to the bone the attachment has generally been effected by the ossification of the bone of the tooth, but in some fishes a process of the bone projects into the cavity of the tooth ; in others the teeth are implanted in alveoli. In these, again, frequently a process of bone rises from the bottom, on which the tooth rests.

Many of the class, especially predatory fishes, with long, lancet-shaped teeth, have all or some of these capable of being bent towards the interior of the mouth. Such "hinged" teeth resume at once the upright position when pressure is removed from them. They are, however, depressible in one direction only, thus offering no obstacle to the ingress, while they oppose the egress of prey. Mr C. 8S. Tomes has shown that the means by which this mechanism is worked are different in different fishes; for, whilst in the Pediculati and Gadoids (hake) the elasticity resides solely in the tissue of the hinge (the tooth being as resilient as ever after everything else is severed), in the pike the hinge is not in the least endowed with elasticity, but the bundles of fibres proceeding from the interior of the dentine cap are exceedingly elastic

The teeth may be, and generally are, very different as regards size or form in the different parts of the mouth ; they may be also different according to the age or sex of the fish (Raia). The teeth may be few in number and isolated, or placed in a single, double, or triple series, distant from one another or closely set; they may form narrow or broad bands, or patches of various forms. As regards form, they may be cylindrical or conical, pointed, straight, or curved, with or without an angular bend near their base ; gome are compressed laterally or from the front backwards (the latter may be triangular in shape, or truncated at the top like the incisors of mammals) ; they may have one apex (cusp) only, or be bi- or tri-lobate (bi- or tri-cuspid), or may

AND DIGESTION.] —

have the niargins denticulated or serrated. teeth may be confluent, and form a cutting edge in both jaws, which assume the shape of a parrot's beak. In

some the apex is hooked or provided with barbs. Again, some teeth are broad, with flat or convex surface, like molar teeth. With regard to size, the finest teeth are like fine flexible bristles, ciliiform or setiform; or, if very short and anchylosed to the bone, they appear only as inconspic- uous asperities of the bone. Very fine conical teeth arranged in a band are termed villiform teeth; when they are coarser, or mixed with coarser teeth, they are cardlike (dents en rape or en cardes) ; molar-like teeth of very small size are termed granular.

In all fishes the teeth are shed and renewed during the whole course of their life. In fishes which have coni- pound teeth, as the Dipnor, Chimeroids, Scart, Gymno- donts, as well as in those which have apparently perma- nent teeth, as in the saw of Pristis, the detrition of the surface is made up by a constant growth of the tooth from its base. When the teeth are implanted in alveoli, they are generally succeeded by others in the vertical direction; but in other forms they succeed one another side by side. In the majority of fishes the new tooth is not developed (as in reptiles and mammals) in a diverticulum of the sac of its predecessor, but, like it, from the free surface of the buc- cal membrane. Generally there are more than one tooth growing which are in various stages of development, des- tined each to replace the others in function. This is very conspicuous in sharks, in which the whole phalanx of their numerous teeth is ever marching slowly forwards (or in some backwards), in rotatory progress, over the alveolar border of the jaw, the teeth being successively cast off after having reached the outer margin and fulfilled for a longer or shorter period their special function.!

Lntestines,—The intestinal tract is divided into four portions,—the cesophagus, the stomach, the small and the large intestine ; two or more of these divisions may cvalesce in fishes and become indistinguishable. But it is char- acteristic of the class that the urinary apertures are con- stantly situated behind the termination of the intestinal tract.

In Branchiostoma the whole intestinal tract is straight, and coated with a ciliated mucous membrane. 'The liver is represented by a green-coloured ccecal diverticulum of the stomachic dilatation. In the C'yclostomé the intestinal tract is likewise straight, and without clearly defined divisions.

*The Paleichthyes show differences in the structure of their intestinal tract as considerable as are found among the Teleoste', but they have this in common that the absorbent surface of their intestine is enlarged by the development of a spiral valve, evidence of the presence of which in extinct Palwichthyes is still preserved in the fossilized fzeces or coprolites, so abundant in some of the older strata. * In Chondropterygians (fig. 46) the stomach is divided into a cardiac and a pyloric portion, the former frequently terminating in a blind sac, and the latter varying in length. The pyloric portion is bent both at its origin and its end, and is separated from the short duodenum (called Bursa entiana in these fishes) by a valve ; the ductus hepaticus and ductus pancreaticus enter the duodenum. This is succeeded by the straight intestine, provided with the spiral valve, the coils of which may either be longitudinal and wound verti- cally about the axis of the intestine, as in Carcharias, Galeocerdo, Thalassorhinus, and Zygena, or they may be transverse to that axis, as in the other genera. The number of gyrations in the latter case varies ; there may eee elo shory, rectus, pees*

_ 4 The richest materials for our knowledge of the teeth of fishes are contained in Owen's Odontography, Lond., 1840, 8vo.

Compressed | cloaca, which contains also the orifices of the urogenital

ducts. Only the beginning and end of the intestinal tract are fixed by mesenterial folds.

Fic, 46.—Siphonal stomach and spiral valve of Basking-Shark (Selache). (After Home and Owen.) a, cesophagus; 6, cardiac portion of stomach; c¢, pyloric portion; d@, pouch intermediate between stomach and duodenum, with circular valves at both ends; e, duodenum; J, valve of intestine; g, ductus hepaticus; h, spleen.

The structure of the intestinal tract of Teleosteous fishies is subject to so numerous modifications that we should go beyond the limits of the present article were we to attempt to enter into details. Great differences in this respect may be found even in groups of the same natural families, Frequently the intestinal tract remains of nearly the same width throughout its course, and only the entrance of the various ducts serves as a guide for the distinction of its divisions, An intestine of such uniform width may be straight and short, as in Scombresocide, Symbranchide, or it may be more or less convoluted and long, as in many Cyprinide, Doradina, &c. On the whole, carnivorous fishes have a much shorter and simpler intestinal tract than the herbivorous.

In the majority of Teleosteans, however, the cesophagus, stomach, duodenum, small intestine, and rectum can be more or less clearly distinguished, even exteinally.

There are two predominant forms of the stomach, inter- mediate forms, however, being numerous. In the first, the siphonal, it presents the form of a bent tube or canal, one-half of the horse-shoe being the cardiac, the other

the pyloric portion. In the second, the cecal, the cardiac division is prolonged into a long descending blind sac, the cardiac and pyloric openings of the stomach lying close together (Clupea, Scomber, Thynnus, &c.).

The duodenum always receives the hepatic and pancreatic secretions, and also those of the appendices pylorice, which, in varying numbers (from 1 to 200), are of very common occurrence in Teleosteans. They vary also in length and width, and whilst the narrowest serve only as secretory organs, the widest are frequently found filled with the same contents as the intestine.

Glands.—The liver of fishes is distinguished by the great quantity of fluid fat (oil) which it contains. The gall-bladder is but rarely absent; it is attached to the right lobe, or towards the centre ; in some fishes, however, it is detached from the liver and connected with it by the cystic duct only. The bile may be conveyed by one or more hepatic ducts into a common duct which is continued towards the gall-bladder as ductus cysticus, and towards the duodenum as ductus choledochus; or some of the hepatic ducts enter the gall-bladder directly, or the duodenum directly, without communicating with the common duct. Individual varia- tions in this respect are of comnion occurrence.

pterygians, in Acipenser, and in many Teleosteans,

The spleen, which is substantially a lymphatic gland, may be mentioned here, as it is coustautly situated in the immediate vicinity of the stomach, generally near its cardiac portion. With the exception of Branchiostoma, it is found in all fishes, and appears as a rounded or oblong organ of dark red colour.

ORGANS OF RESPIRATION.

Fishes breathe the air dissolved in water by means of cills or branchie. The oxygen consumed by them is not that which forms the chemical constituent of the water, but that contained in the air which is dissolved in the water. Hence fishes transferred to water from which the air has been driven out by

a high temperature, or in which the air absorbed by them is not replaced, are speedily suffocated. The absorption of oxygen by fishes is comparatively small; it has been calculated that a man consumes fifty thousand times more than is required by a tench. Some fishes, how- ever, evidently require a much larger supply of oxygen than others: eels and carps, and other fishes of similar low vitality, can survive removal from their element for days, the small quantity of moisture retained in their gill- cavity being sufficient to sustain life, whilst other fishes, especially such as have very wide gill-openings, are immedi- ately suffocated after being taken out of the water. In some fishes noted for their muscular activity, like the Scombride, the respiratory process is so energetic as to raise the temperature of their blood far beyond that of the medium in which they live. A few fishes, especially such as are periodically compelled to live in water thickened into mud by desiccation and vitiated by decomposing substances, breathe atmospheric air, and generally have special contrivances for this purpose. These are so much habituated to breathing air that many of them, even when brought into pure water of normal condition, are obliged to rise to the surface at frequent intervals to take in a quantity of air, and, if they are kept beneath the surface by means of a gauze net, they perish from suffocation, The special contrivances consist of additional respiratory organs, lodged in cavities either adjoining the gill-cavity or com- municating with the ventral side of the cesophagus, or of the air-bladder which enters upon respiratory functions (Dipnoi, Lepidosteus, Ama).

The water used by fishes for respiration is received by the mouth, driven to the gills by an action similar to that of swallowing, and expelled by the gill-openings, of which there may be one or several on each side behind the head, or rarely one only in the median line of the veutral surface.

The gills or branchiw consist essentially of folds of the mucous membrane of the gill-cavity (lamin branchiales), in which the capillary vessels are distributed. Tn all fishes the gills are lodged in a cavity, but during the embryonic stage the Chondropterygians have the gill-laminz extended into long filaments projecting beyond the gill-cavity, and in afew young Ganoids external gills are superadded to the internal.

In Branchiostoma the dilated pharynx is perforated by numerous clefts, supported by cartilaginous rods (fig. 30, h). The water passes between these clefts into the peritoneal cavity, and makes its exit by the porus abdominalis, situated considerably in advance of the vent. The water is propelled by cilia.

In the Cyclostomes the gills of each side are lodged in a series of six or more antero-posteriorly compressed sacs, separated from each other by intervening septa. Each sac communicates by an inner duct with the cesophagus, the

A pancreas has beeu found hitherto in all Chondro- |

water being expelled by an outer duct. In Bdellostoma each outer duct has a separate opening, but in A/yxine all the outer ducts pass outwards by one common gill-opening on each side. Inthe lampreys the ducts are short, the outer ones having separate openings (fig. 1). The inner ducts lead into a single diverticulum or bronchus, situated below the cesophagus, blind behind, and communicating in front with the pharynx, where it is provided with two valves by which the regurgitation of the water into the buccal cavity is prevented.

The same type of branchial organs persists in Chondro- pterygians, which possess five, rarely six or seven, flattened pouches with transversely plaited walls. The septa between them are supported by cartilaginous filaments rising from the hyoidean and branchial arches. Each pouch opens by a cleft outwards, and by an aperture into the pharynx, without intervening ducts. The anterior wall of the first pouch is supported by the hyoidean arch. Between the posterior wall of the first aud the anterior of the second sac, and between the adjacent walls of the succeeding, a branchial arch with its two series of radiating cartilaginous filaments is interposed. Consequently the first and last pouches have one set of gill-lamine only, viz., the first on its posterior and the last on its anterior wall. The so-called spiracles on the upper surface of the head of Chondroptery- gians must be referred to in

connexion with the respira- tory organs, They are the external openings of a canal leading on each side into the pharynx, and situated generally close to and behind the orbit. They frequently possess valves or an irregularly indented margin, and are found in all species during the embryonic stage, but it is only in some that they remain persistent. The spiracles are the remains of the first visceral cleft of the embryo, and in the foetal state long branchial filaments have been observed to protrude as from the other branchial clefts.

The Holocephalt and Ganoidei show numerous deviations

from the Chondropterygian type, all leading towards the Teleosteans. As a whole they take an intermediate posi- tion between the preceding types and the Teleosteans, but they show a great variation among themselves, and have in common only the imperfect separation of the branchial sacs and the presence of a single outer bran- chial aperture. In the Z'eleoste' the gills with their supporting branchial arches lic in one undivided cavity ; more or less wide clefts between the arches lead from the pharynx to the gills, and a more or less wide opening gives exit to the water after it has washed the gills. The interbranchial clefts have sometimes nearly the same extent as the branchial arches ; sometimes they are reduced to small openings, the integu- ments stretching from one arch to the other. Sometimes there is no cleft behind the fourth arch, in which case this arch has only a uniserial gill developed. The gill-opening likewise varies much in its extent, and when reduced to a foramen may be situated at any part of the posterior boundary of the head. In the Symbranchide the gill- openings coalesce into a single narrow slit in the median line of the isthmus. In the majority of Teleosteans the integument of the concave side of the branchial arches develops a series of horny protuberances of various form, the so-called gill-rakers. These serve to catch any solid corpuscles or substances which would be carried into the gill-cavity with the water. In some fishes they are seti- form, and make a complete sieve, whilst in others they are merely rough tubercles, the action of which must be very incomplete if they have any function at all.

The majority of Teleosteans possess four complete gills.

The gills of the Teleosteans, as well as of the Ganoids, are sup-

ported by a series of solid cartilaginous or horny pointed rods, arranged along the convex edges of the branchial arches. Arches

bearing a complete gill have two series of those rods, one along each edge ; those with uniserial gills bear one row of rods only. The rods are not part of the arch, but fixed in its integument, the several rods of the one row corresponding to , those of the other, forming pairs (feuillet, Cuvier) (fig. 47). Each rod is covered by a loose mucous membrane posing from oue rod to its fellow opposite, which again is finely plaited transversely, the extent of surface being greatly increased by theso plaits. In most Teleostet the branchial lamella are compressed, and taper towards their free end, but in the Lopho- branchs their base is attenuated and the end enlarged. The mucous membrane contains the finest terminations of the vessels, which, being very superficial, impart a blood-red colour to living gills. The arteria branchialis, the course of which lies in the open canal in the convexity of the branchial arch, emits a branch (a) for every pair of lamellez, which ascends (b) along the inner edge of the laniella, and supplies every one of the transverse plaits with a branchlet. The latter break up into a fine net-work of capillaries, from which the oxygenized blood is collected into venous branchilets, return- ing by the venous branch (d@), which occupies the outer edge of the lamella.

The so-called psoudobranchie (fig. 48) are the remains of an anterior gill which had respira- tory functions during the embryonic life of Si the individuals, By a change in the circulatory Nc system these organs have lost those functions, — and appear in the adult fish as retia mirabilia, pio. 47. pair of

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as they receive oxygenized blood, which, after branchial Jamelle ing passed through their capillar (magnified) of the having passed t g pillary system, pnee® Steck

is carried to other parts of the head. In Paleichthyes the pseudobranchia is a rete mira- bile caroticum for the brain and eye; in Tele- osteans a rete

mirabile ophthalmicum only. Pseudobranchie are as frequently absent as present in Chondropterygians as well as Tele- osteans. Among the Ganoids, the organs occur in Ceratodus, Acipenscr, Polyodon, and Lepidostcus, and are absent in Lepidosiren, Protopicrus, Scaphirhynchus, Poty- pterus, and Amia.

In Chondropterygians and sturgeons the pseudobranchie are situated within the spiracles ; in those in which spiracles have bee come obliterated, the pseudo- branchie lie on the suspen- sorium, hidden below cellular tissue ; but pseudobranchie are not necessarily coexistent with spiracles. In the other Ganoids and Teleosteans the pseudo- branchie (fig. 48, 2) are within the gill-cavity, near the base of the gill-cover; in Ceratodus even rudiments of the gill- rakers (a', x") belonging to this embryonic gill are preserved, part of them (x) being at- tached to the hyoid arch. Pseudobranchie are frequently hidden below the integuments of the gill-cavity, and have the appearance of a glandular body rather than of a gill.

Accessory _ respiratory organs for retaining water or breathing air are found in the Labyrinthici, Ophioce- phalide, certain Siluride, and Lutodira.

Air-bladder.—The air- bladder, one of the most characteristic organs of fishes, is a hollow sac, formed of several tunics, containing gas, situated in the abdominal cavity, but outside the peritoneal sac, entirely closed or communicating by a duct with the intestinal tract. Being compressible, its special functions consist in altering the specific gravity of the fish or in changing the centre of gravity. In a few fishes it assumes the function of the organ of higher vertebrates of which it is the homologue

of arteria branchi- alis; 6, ascending branch of the same; c, branch of vena branchialis; d, de- scending branch of the same; e, trans- verse section through the branchial arch.

Fig. 48.—Gills of Ceratodus. x, arcus aorts; gl, glossohyal; ch, ceratohyal ; u, attachment of the first gill to the walls of the gill-cavity; h, pseudo-branchia; 2', xz", two series of gill-rakers belonging to the pseudobranchia

—viz., of alung. The gas contained in the air-bladder is secreted from its inner surface. In most freshwater fishes it consists of nitrogen, with a very small quantity of oxygen and a trace of carbonic acid; in sea-fishes, especially those living at some depth, oxygen predominates, as much as 87 per cent. having been found. Davy found in the air- bladder of a fresh-run salmon a trace of carbonic acid and 10 per cent. of oxygen, the remainder of the gas being nitrogen.

An air-bladder is absent in Leptocardii, Cyclostomi, Chondropterygii, and Holocephali, but occurs in all Ganoids, in which, besides, its respiratory functions mors or less clearly manifest themselves. Its occurrence in Tele- osteans is very irregular, closely allied species sometimes differing from each other in this respect; it shows in this subclass the most extraordinary modifications, but has no respiratory function whatever.

Constantly situated within the abdominal cavity, below the vertebral column, but outside the sac of the peritoneum which covers only its ventral portion, the air-bladder is fre- quently prolonged into the tail, the prolongation being either single and lodged between the non-united parapo- physes, or double and penetrating between the muscles and hemapophyses of each side. In the opposite direction pro- cesses of the air-bladder may penetrate into the skull, as has been mentioned above (p. 653). In some fishes the air-bladder is almost loose in the abdominal cavity, whilst in others it adheres most intimately by firm and short tissue to the vertebral column, the walls of the abdomen, and the intestines. In the Cobitina and many Siluroids it is more or less completely enclosed in osseous capsules formed by the vertebrae,

There are two tunics in the greater number of air- bladders,—an extremely thin internal one, frequently shin- ing with a silvery lustre, containing crystalline corpuscles, sometimes covered witha pavement-epithelium, and a thicker outer one of a fibrous texture, which sometimes attains to considerable thickness and yields isinglass. The outer wall is strengthened in many fishes by muscular layers for the compression of the whole organ or of some portion of it.

A distinction has been made between air-bladders which communicate by a duct with the intestinal tract and those which are entirely closed. It is to be remembered, however, that at an early stage of development all air-bladders are provided with such a duct, which in some fishes is more or less completely obliterated, being then represented by a fine ligament only. Air-bladders without duct are found in Acanthopterygians, Pharyngognaths, Anacanths, and Lophobranchs. They may consist of a single cavity, or may be divided by constrictions into two or three chambers situated behind one another; they may consist of two lateral divisions, assuming a horseshoe-like form, or of a single sac with a pair of simple or bifid processes in front or behind. The families of Scicenide and Polynemide possess air-bladders with a most extraordinary develop- ment of appendages rising from each side. Air-bladders with a pneumatic duct are found in Ganoids and Physo-stomes, the duct entering the dorsal side of the intestinal tract, with the exception of Polypterus and the Dipnoi, in which it enters on the ventral side of the cesophagus. In most cases the orifice is in the cesophagus, but in some it is in the cardiac portion of the stomach, as in Acpenser, or in its blind sac, as inmany Clupeoids. The air-bladder may be single, or may consist of two divisions situated one behind the other (fig. 45); its inner surface may be per- fectly smooth, or it may form manifold pouches and cells. If two divisions are present the anterior possesses a middle elastic membrane which is absent in the posterior ; each

division has a muscular layer, by which it can be separately XIT. — 83

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compressed, so that part of the contents of the posterior may be driven into the elastic anterior division, and we versa. The posterior division being provided with the ductus pneumaticus does not require the elasticity of the anterior.

Some Siluroids possess a peculiar apparatus for volun- tarily exercising a pressure upon the air-bladder. From the first vertebra a process takes its origin on each side, expanding at its end into a large round plate ; this is applied to the side of the air-bladder, and by pressing upon it expels the air through the duct ; the small muscle moving the plate rises from the skull.

The connexion of the air-bladder with the organ of hearing in some Physostomes has been described above, p.

653.

In the modifications of the air-bladder hitherto mentioned, the chief and most general function is a mechanical one: this organ serves to regulate the speci- fic gravity of the fish, to aid it in maintaining a par- ticular level in the water, in rising or sinking, in raising the front part of its body or depressing it, as occasion may require. Yet a secretion of gas from the blood into its cavity must take place; and if this be so, it is not at all impossible that an exchange of gases between the two kinds of blood is also effected by means of the extraordinary development of retia mira- bilia in many air-bladders.

In all fishes the arteries of the air-bladder take their origin from the aorta or the system of the aorta, and its veins return either to the portal, the vertebral, or the hepatic veins ; like the other organs of the abdominal cavity, it receives arterial blood and returns venous blood.

Whilst the air-bladders of some Ganoids, anatomi- cally as well as functionally, closely adhere to the Tele- osteous type, that of Ama is more cellular and lung- like in its interior than the Teleosteous air-bladder, and Polypterus approaches the Dipnot, not only in having a laterally divided air-bladder, but also in its pneumatic duct entering the ventral side of the oesophagus. The air- bladder of the Dipno? possesses still further the anatomical characteristics of a lung and assumes its functions, though, as it coexists with gills, only periodically or in an auxiliary

Fic, 49,—Lung of Ceratodus, opened in its lower half to show its cellular pouches, a, right half; 0, left half; ¢, cellular pouches; ¢, vena pulmonalis; j, arte- rial blood-vessel; oe, esophagus, opened to show glottis (g/.).

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manner. The ductus pneumaticus is a membranous bronchus, entering the ventral side of the oesophagus, and provided at its entrance with a glottis. In Ceratodus (fig. 49) the lung is still a single cavity, but with a symmetrical arrangement of its internal pouches; it has no pulmonary artery, but receives branches from the arteria cceliaca. Finally, in Lepidosiren and Protopterus the lung is com- pletely divided into lateral halves, and by its cellular structure approaches most nearly that of a reptile ; it is supplied with venous blood by a true pulmonary artery.

ORGANS OF CIRCULATION.

The blood-corpuscles of fishes, with one exceptiou, are of an elliptic shape; this exception is Petromyzon, which possesses circular, flat, or slightly biconvex blood-corpuscles. They vary much in size; they are smallest in Teleosteans and Cyclostomes, those of Acerina cernua measuring 37/57 of an inch in their longitudinal, and s7‘59 in their transverse diameter. So faras it is known at present the Salmonide have the largest blood-corpuscles among Teleosteans, those of the salmon measuring 35; by zeso in., approaching those of the sturgeon. Those of the Chondropterygians are still larger ; and finally, Lepidosiren has blood-corpuscles not much smaller than those of Perennibranchiates, viz., shy by gitin. Branchiostoma is the only fish which does not possess red blood-corpuscles.

Fishes, in common with the other vertebrates, are pro- vided with a complete circulation for the body, with another equally complete for the organs of respiration, and with a particular abdominal circulation, terminating at tlie liver by means of the vena porte ; but the peculiar char- acteristic consists in this, that the branchial circulation alone is provided at its base with a muscular apparatus or heart, corresponding to the right half of the heart of mam- malia and birds.

The heart is situated between the branchial and abdo- minal cavities, between the two halves of the scapulary arch,—rarely farther behind, as in Symbranchide. It is enclosed in a pericardium, generally separated entirely from the abdominal cavity by a diaphragma, which is, in fact, the anterior portion of the peritoneum, strengthened by aponeurotic fibres. In some fishes, however, there is a communication between the pericardial and

peritoneal sacs, viz., in the Chondropterygians and Acipenser, whilst in the Myxinoids the pericardial sac is merely a continuation of the peritoneum.

Relatively to the size of the body, the heart is very small. It consists of three divisions :—the atrium, with a large sinus venosus into which the veins enter; the ven- tricle ; and a conical hollow swelling at the beginning of the arterial system, the structure of which forms one of the most important characters used in the classification of fishes. In all Paleichthyes (figs. 50 and 51) this swelling is still a division of the pulsating heart, being provided with a thick muscular stratum; it is not separated from the ventricle by two valves opposite to each other, but its interior is fitted with a plurality of valves, arranged in transverse series more or less numerous in the various groups of the subclass. Lepidosiren and Protopterus offer an example of a modification of this valvular arrangement, their valves being longitudinal, each valve in fact being formed by the confluence of several smaller ones situated behind one another. This Paleichthyan type is called conus arteri-osus.

In Cyclostomes and Teleosteans (fig. 52) the enlargement is a swelling of the artery, without muscular stratum and without contractility ; with the exception of the Myxinoids, +ts walls are thick and fibrous with many trabeculz and pouches, but it has no valves in its interior, and is separated

from the ventricle by two valves opposite to each other. This Teleostean type is called bulbus aorte.

The sinus venosus sends the whole of the venous blood by a single orifice of its anterior convexity into the atrium ;

two thin membranous valvules turned towards the atrium prevent the blood from re-entering the sinus, A pair of other valves between the atrium and ventricle have the same function. The walls of the ventricle are strong, and,

Fig. 50. Fig. 51.

Fig. 50 —Heart of Lepidosteus osseus. 1. External espect. Il. Conus arteriosus opened. a, atrium; 6, conus arteriosus; v, ventricle; 2, branchial artery for third and fourth gill; &, for the second; /, for the first; m, branch for the opercular gill; d, single valve at the base of the conus ; ¢,/,g, transverse rows of Ganoid valves.

fia. 51.—Heart of Ceratodus. a, atrium; ®, conus arteriosus; d, papillary valve within the conus; ¢,/,9, transverse rows of Ganoid valves; H, 7, anterior arcus aorte ; &, J, posterior arcus aorte ; v, ventricle. internally, it is furnished with powerful fleshy trabeculee. The bulbus or conus arteriosus is prolonged into the branchial ar- tery, which soon divides, sending off a branch to each branchial arch, On re- turning from the respiratory

organ the branchial veins assume the

structure and functions of ar- teries. Several branches are sent off to dif- ferent portions of the head and to the heart, but the main trunks unite to form the great artery which carries the blood to the

viscera and £0.Fie. 52.—Bulbus aorte of erie — vy goo a, section through part of the wall of ventricle; 6, section all the parts of through the bulbus; c, Telcosteous valves of the ostium the trunk and _ arteriosum; d, accessory valves, of rudimentary nature : ° and inconstant ; e, trabeculae carne of the bulbus. tail, and which,

therefore, represents the aorta of higher animals. The circulatory system of Branchiostoma and of the Dipnot shows essential differences from that of other fishes.

Branchiostoma is the only fish which does not possess a muscular heart, several cardinal portions of its vascular system being contractile. A great vein extends forwards along the caudal region below the notochord, and exhibits contractility in a forward direction ; it is bent anteriorly, passing into another tube-like pulsatory trunk, the branchial heart, which runs along the middle of the base of the pharynx, sending off branches on each side to the branchiz ; each of these branches has a small contractile

dilatation (bulbillus) at its base. The two anterior branches pass directly into the aorta ; the others are branchial arteries, the blood of which returns by branchial veins emptying into the aorta. The blood of the intestinal veins is col- lected in a contractile tube, the portal vein, below the in- testine, and distributed over the rudimentary liver. Of all ~ fishes, the portal vein is contractile in Myxinoids only.

In Dipnot a rudimentary partition of the heart into a right and a left division has been observed ; this is limited to the ventricle in Ceratodus, but in Lepidosiren and Pro- topterus an incomplete septum has been observed in the atrium also. All Dipnot have a pulmonal vein, which enters the atrium by a separate opening, provided with a valve. The pulmonal artery rises in Lepidosiren and Pro- topterus from an arch of the aorta, but in Ceratodus it is merely a subordinate branch, rising from the arteria cceliaca.

URINARY ORGANS.

'In Branchiostoma no urinary organs have been found.

In Myxinoids these organs are of very primitive struc- ture ; they consist of a pair of ducts, extending from the urogenital porus through the abdominal cavity. Each duct sends off at regular intervals from its outer side a short wide branch (the uriniferous tube), which communi- cates by a narrow opening witha blind sac. At the bottom of this sac there is a small vaso-ganglion (Malpighian corpuscle), by which the urine is secreted.

In the lampreys the kidneys form a continuous gland- like body, with irregular detached small portions. The ureters coalesce before they terminate in the urogenital papilla.

In Chondropterygians the kidneys occupy the posterior half or two-thirds of the back of the abdominal cavity, outside the sac of the peritoneum (as in all fishes), which forms a firm tendinous horizontal septum. The kidneys of the two sides are never confluent, and generally show a convoluted or lobulated surface. The ureters are short ; each is dilated into a pouch, and communicating with its fellow terminates by a single urethra (which also

receives the vasa deferentia) behind the end of the rectum in the large common cloaca.

In Ganoids the kidneys occupy a similar position as in Chondropterygians, but these fishes differ considerably with regard to the termination and the arrangement of the ends of the urogenital ducts. ‘

The kidneys of Teleosteans are likewise situated outside the peritoneal cavity, immediately below some part of the vertebral column, and vary exceedingly with regard to form and extent. Sometimes they reach from the skull to between the muscles of the tail, sometimes they are limited to the foremost part of the abdominal cavity (in advance of the diaphragm), but generally their extent corresponds to that of the abdominal portion of the vertebral column. The ureters terminate, either separate or united, in a urinary bladder, varying in shape, which opens by a short urethra behind the vent. The urinary opening may be separate from or confluent with that of the genital ducts, and is frequently placed on a more or less prominent papilla (papilla urogeni- talis). If separate, the urinary opening is behind the

genital; and if a papilla is developed, its extremity is perforated by the urethra, the genital opening being situated nearer the base. A few Teleosteans show an arrangement similar to that of Chondropterygians and Dipnoi, the urogenital openings being in the posterior wall of the rectum (Symbranchide, Pediculati, and some Plectognathi).

ORGANS OF REPRODUCTION.

All fishes are dicecious, or of distinct sex. Instances of so-called hermaphroditism are, with the exception of Serranus, abnormal individual peculiarities; such have been observed in the cod-fish, in some Plewronectide, and in the herring. Either the generative organ of one side was found to be male and that of the other female, or the organ of one or both sides was observed to have been developed partly into an ovary, partly into a testicle. In the European species of Serranus a testicle-like body is

attached to the lower part of the ovary ; but many specimens of this genus are undoubtedly males, having normally developed testicles only.

The majority of fishes are oviparous (comparatively few viviparous), the embryos being developed either in the ovarium or in some dilated portion of the oviduct.. In viviparous fishes actual copulation takes place, and the males of most of them are provided with copulatory or intromit- tent organs. In oviparous fishes the generative products are, during sexual excitement, discharged into the water, a very small quantity of semen being sufficient for effectual impregnation of a number of ova dispersed in a considerable quantity of water,—circumstances which render artificial impregnation more practicable than in any other class of animals.

In Branchiostoma the generative organs occupy the ventral side of the abdominal cavity, into which they dis- charge their contents. No ducts are developed in either sex.

In the Cyclostomes the generative organ is single, and fixed to or suspended from the median line of the back of the visceral cavity by a duplicature of the peritoneum (mesoarium), the testicle and ovary being distinguishable by their contents only. These escape by dehiscence of the cells or capsules and rupture of the peritoneal covering into the abdominal cavity, and are expelled, by reciprocal pressure of the intertwined sexes, through the porus genitalis.

The ova of the lampreys are small and globular, like those of Teleosteans. Those of Myxine have a very peculiar shape when mature; they are of an oval form, about 15 millimetres long and 8 millimetres broad, enveloped in a horny case, which at each end is provided with a bundle of short threads, each thread ending in a triple hook. Whilst in the mesoarial fold, the eggs are attached to one another by means of these hooks, and after being expelled they probably fix themselves by the same means to other objects. As in all fishes producing ova of large size, the number of ova matured in one season is but small.

In Teleosteans the generative organs are comparatively large. In some families the ovaries are without a closed covering and without oviducts, as in Salmonide, Galaxiide, Notopteride, Murenide, and others. The surface of

such an open ovary—as, for instance, that of the salmon—is transversely plaited, the ova being developed in capsules in the stroma of the laminz ; after rupture of the capsules the mature ova drop into the abdominal cavity, and are expelled by the porus genitalis. The ovaries of the other Teleosteans are closed sacs, continued into oviducts. Fre- quently such ovaries coalesce into a single body, or one in which the division is effected internally only by a more or less complete septum. In the viviparous Teleosteans the embryos are developed within the ovary, notably in the

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Fic. 53.—Ditrema argenteum, with fully developed young, ready for expulsion by the genital oritice, 0; a, folds of the ovarian sac; v, vent.

The ova of Teleosteous fishes are extremely variable in size, quite independently of the size of the parent species. The ova of large and small individuals of the same species, of course, do not differ in size; but, on the whole, larger individuals produce a greater number of ova than smaller ones of the same species. The larger the size of the ova is in a species, the smaller is the number produced during one season. 'The ova of the eel are almost micro- scopic. The numbers of ova in the small-sized roe of the herring, lump-fish, halibut, and cod- fish have beeu estimated respectively at 25,000, 155,000, 3,500,000, and 9,344,000. Larger in size and fewer in number are those of Anten- narius, Salmo, Aspredo, Lophobranchs, «ec. Those of Gastrosteus are comparatively the lar-

Fie. 54.— Ovum of Arius boakii (Cey- lon), show- ing embryo.

gest ; and the Siluroid genus Arius, the males Nat. size. of which take care of their progeny, produces ova from

5 to 10 millimetres in diameter. The ova of all Teleosteans are perfectly globular and soft-shelled. Teleosteans with- out oviduct deposit them separated from one another ; whilst in many Teleosteans with an oviduct, the ova are enveloped in a glutinous substance, secreted by its glands, swelling in the water and forming lumps or chords, in which the ova are aggregated.

Instances of the female taking care of her progeny are ex- tremely rare in fishes. At present only two examples are known, that of the Siluroid genus Aspredo, and the Soleno- stoma. Inthe former (fig. 55), during the time of propagation, the integuments of the lower side of the flat trunk of the female assume a soft and spongy texture. After having deposited the eggs, the female attaches them to and presses them into the spongy integument, by merely lying over them. She carries them on her belly, as the Surinam toad (Pipa) carries her ova on her back. When the eggs are hatched the excrescence on the skin disappears, and the ab- domen becomes as smooth as before. In Solenostoma the inner side of the long and broad ventral fins coalesces with the integuments of the body, a large pouch being formed for the reception of the eggs. There isa peculiar provision for the retention of the eggs in the sac, and probably for the attachment of the embryo. The inner walls of the sac are lined with long filaments, arranged in series along the ventral rays, and more numerous and longer at the base ot the rays than in the middle of their length, behind which they disappear entirely.

The testicles of the Teleosteans are always paired, and occupy the same position as the ovaries. Their size varies extraordinarily at the different seasons of the year. Vasa deferentia are constant. In the males of viviparous Teleo- steans the urogenital papilla is frequently enlarged, and clearly serves as an intromittent organ.

Many Teleostei take care of their progeny, but with the exception of Aspredo and Solenostoma, as mentioned above,

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it is the male on which this duty devolves. In some, as in Cottus, Gastrosteus, Cyclopterus, Antennarius, Ophiocepha- lus, Callichthys, the male constructs with more or less skill anest, and jealously guards the ova deposited in it by the female. The male of some species of Arius carries the ova (fig. 54) about with him in his capacious pharynx. The species of Chromis inhabiting the sea of Galilee are said to take care of their ova in the same manner. And, finally, in the Lophobranchs, nature has aided this instinct by the development of a pouch on the abdomen or lower side of the tail, In the Syngnathide this pouch is formed by a fold of the skin developed from each side of the trunk and tail, the free margins of the fold being firmly united in the median line, whilst the eggs are being hatched in the inside of the pouch. In LHippocampus the pouch is completely closed, with a narrow anterior opening.

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Fic. 55.—Abdomen of Asprevo batrachus, with the ova attached ; at @ the ova are removed, to show the spongy structure of the skin, and the processes filling the interspaces between the ova. (Natural size.)

The genital organs of Ganoids show diversity of structure similar to that found in Teleosteans, but on the whole they approach the Batrachian type. The ovaries are not closed, except in Lepidosiren ; all Ganoids possess oviducts. In the sturgeons the oviduct as well as the vas deferens is repre-

sented by a funnel-shaped prolongation of the peritoneum, which communicates with the wide ureter. The inner aperture of the funnel is on a level with the middle of the testicle or ovary, while the outer is within the ureter ; and it is a noteworthy fact that only at certain periods of the life

of the fish is this outer aperture found to be open,—at other times the peritoneal funnel appears as a closed blind sac within the ureter. The mode of passage of the semen into the funnel is not known.

In Polypterus and Amia proper oviducts, with abdomi- nal apertures in about the middle of the abdominal cavity, are developed ; they coalesce with the ureters close to the common urogenital aperture.

In Ceratodus a long convoluted oviduct extends to the foremost limit of the abdominal cavity, where it opens by a slit at a considerable distance from the front end of the long ovary ; this aperture is closed in sexually immature specimens. The oviducts unite close to their commor opening in the cloaca, During their passage through the oviduct the ova receive a gelatinous covering secreted by its mucous membrane. This is probably also the case in Lepidosiren, which possesses a convoluted oviduct with secretory glands in the middle of its length.

The ova of Ganoids, so far as they are known at present, are small, and enveloped in a gelatinous substance. Inthe sturgeon as many as 7,635,200 have been counted. Those of Lepidosteus seem to be the largest, measuring 5 milli- metres in diameter with their envelope, and 3 millimetres without it. They are deposited singly, like those of newts.

In Chondropterygians (and Holocephalt) the organs of re- production assume a more compact form, and are more free owing to a lengthened attachment to the back of the abdo- minal cavity. The ovaries of the majority are paired (single in the Carchartide and Scylliide, one remaining undevel- oped). But the oviducts are always paired, with a common aperture beginning immediately behind the diaphragma. They consist of

two divisions, separated by a circular valve; the upper is narrow, and is provided within its coats with a gland which secretes the leathery envelope in which

Fic. 58.—Ventral fins and claspers of Chiloscyllium trispeculare.

most of the Chondropterygian ova are enclosed ; the lower forms the uterine dilatation in which the embryos of the viviparous species are developed. Generally the vitelline sac of the embryos is free, and has no connexion with the uterus, which in these cases has merely the function of a protecting pouch; but in Carcharias and Mustelus laws a placenta uterina is formed, the vascular walls of the vitel- line sac forming plaits fitting into those of the membrane of the uterus. The ends of the uteri open into the cloaca by a common aperture behind the ureter. The testicles are always paired, rounded, and situated in

the anterior part of the abdominal cavity, covered by the

liver. The vas deferens opens with the urethra in a papilla within tlie cloaca.

The so-called claspers of Chondropterygians (fig. 56) are characteristic of all male individuals. They are semi- ossified appendages of the pubic, with which they are

movably joined, and special muscles serve to regulate their movements. Sometimes, they are armed with hook-like osseous excrescences (Selache). They are irregularly convo- luted longitudinally, and, when closely pressed to each other, form a canal open at their extremity. A gland, which discharges a secretion abundantly during the season of propagation, is situated at the base of the canal, and opens into it. It is still doubtful whether the generally adopted opinion that their function con- sists in holding the female during copulation is correct, or whether they are not rather an intromittent organ, the canal of which conducts, not only the secretion of their proper gland, but also the impregnating fluid. The ova of the oviparous Chondropterygians are large, and few in number; they are successively impregnated, and the impregnation must take place before they

are invested with a tough leathery envelope, which would be impenetrable to the semen, that is, before they enter the uterus; therefore, copulation must take place in all these fishes. The form of the egg-shell differs in the various genera; usually (fig. 57) they are flattened and quadrangular, with each of the); four corners produced, and fre- 9 uently prolonged into, length pret. which serve ae ai i agclane ents @ he. pePen attachment of the ova to other "tra! size. fixed objects. In Motidanus the surfaces are crossed by numerous ridges. In Cestracion the egg is pyriform, with two broad ridges or plates wound edgewise round it, the two ridges forming five spires. The eggs of Callorhynchus have received a protective resemblance to a broad-leaved fucus, forming a long depressed ellipse, with a plicated and fringed margin.

GrowTH AND VARIATION OF FISHES.

Changes of form normally accompanying growth (after absorption of the vitelline sac) are observed in all fishes, but in the majority these affect only the proportional size of the various parts of the body. Relatively to the size of the head, the eyes in young fishes are always larger than in the adult; and again, the head is relatively larger than the body. Changes amounting to metamorphosis have been hitherto observed in Petromyzon only. In the larval condition (Ammocetes) the head is very small, and the toothless buccal cavity is surrounded by a semicircular upper lip. The eyes are extremely small, hidden in a shallow groove; and the vertical fins form a continuous fringe. In the course of three or four years the teeth are developed, and the mouth changes into a perfect suctorial organ ; the eyes grow; and the dorsal fin is separated into two divisions. In Malacopterygians and Anacanths the em- bryonal fringe from which the vertical fins are developed is much longer persistent than in Acanthopterygians. A meta- morphosis relating to the respiratory organs, as in Batra- chians, is indicated in the class of fishes by the external gills with which foetal Plagiostomes and the young of some Ganoids, viz., the Protopterus and Polypterus, are provided.

One of the most extraordinary changes by which, during

VOMTHRYOLmeG yY

[GROWTH AND

growth, the form and position of several important organs are affected, occurs in flat-fishes (Plewronectide) ; their young are symmetrically formed, with a symmetrical mouth, and with one eye on each side, and therefore keep their body in a vertical position when swimming. As they grow they live more on the bottom, and their body, during rest, assumes a horizontal position ; in consequence, the eye of the lower side moves towards the upper, which alone is coloured; and in many genera the mouth is twisted in the opposite direction, so that the bones, muscles, and teeth are much more developed on the blind side than on the coloured. In a great number of other Yeleoste: certain bones of the head show a very different form in the young state. Ossification proceeds in those bones in the direction of lines or radii which project in the form of spines or pro- cesses ; as the interspaces between these processes are filled with bone, the processes disappear entirely, or at least project much less in the older than in the younger indi- viduals. The young of some fishes may be armed with a long powerful preeopercular or scapular spine, or may show a serrature of which nothing remains in the adult fish except some ridges or radiating lines. These processes seem to serve as weapons of defence during a period in the life of the fish in which it needs them most. In not a few in-

Fig. 58.—Tholichthys osseus (six times the natural size).

stances a portion of this armature is so much developed that the disappearance of its most projecting parts with the growth of the fish is not only due to its being surrounded by other bone, but partially, at least, caused by absorption. The Carangide, Cyttide, Squamipinnes, Xiphude, offer instances of such remarkable changes. A fish described as Tholichthys osseus (fig. 58) is probably the young of a Cyttoid, the suprascapula, humerus, and praoperculum forming enormously enlarged plates. In another fish (fig. 59) these bones appear still enlarged, and the frontals de- A velop a remarkably long and == ‘ curved horn above the orbit. =: In the Tholichthys-stage of

Pomacanthus (specimens 10 millimetres long), the frontal bone is prolonged into a straight lancet-shaped process, uearly half as long as the body; the suprascapular and preopercular processes cover and hide the dorsal and ventral fins. ‘The plates attached to the shoulder-girdle re- main

persistent until the young fish has assumed the form of the adult; thus they are still visible in young Cheeto- don citrinellus, 30 millimetres long, in which the specific characters are already fully developed (fig. 60). 'The sword- fishes with ventral fins (Histiophorus) belong to the Tele- osteans of the largest size; in young individnals, 9 milli- metres long (fig. 61), both jaws are produced, and armed

Fra. 59.—Tholichthys-stage of Heniochus (?).

VARIATION. |

with pointed teeth; the supraorbital margin is ciliated ; the parietal and preeoperculum are prolonged into long spines ; the dorsal and anal fins are a low fringe ; and the ventrals make their appearance as a pair of short buds. When 14 millimetres long the young fish has still the same armature on the head, but the dorsal fin has become much higher, and the ventral filaments have grown to a great length. At a third stage, when the fish has attained .—Toung Chatto

to a length of 60 millimetres, citrinellus (30 mill. long).

the upper jaw is considerably prolonged beyond the lower, losing its teeth ; the spines of the head are shortened, and the fins assume nearly the shape which they retain in

Fia. 61.—Young Sword-fish (Histiophorus), 9 mill. long. Atlantic. (Magn.) mature individuals. Young sword-fishes without ventral fins (Xiphias) undergo similar changes ; and, besides, their skin is covered with small rough excrescences longitudin-

Fia 62.—Young Sword-fish (//isttophorus), 60 mill. long. Mid-Atlantic.

ally arranged, which continue to be visible after the young fish has in other respects assumed the form of the mature (fig. 63).

Fic. 63.—Xiphias gladius, young, about 8 inches long.

The Plectoguaths show changes no less extraordinary : a remarkable form caught in the South Atlantic, and named Ostracion boops, is cousidered by Liitken to be the young of a sun-fish (Ortha- goriscus). In still very young but more advanced sun-fishes (18 to 32 millimetres) the vertical diameter of the body is not much less than the longitudinal, and may even exceed it; and small conical spines are scattered Over its various parts. Fig. 64.—Ostracion boops (much magnified), The caudal fin is developed long after the other vertical fins.

Similar changes take place in a number of other fishes, and in many cases the young are so different that they have been described as belonging to distinct genera: thus Priacantichthys has proved to be the young of Serranus,

Lhynchichthys that of Holocentrum, Cephalacanthus of Dactylopterus, Dicrotus of Thyrsites, Nauclerus of Nau- crates, Porthmeus of Chorinemus, Lampugus of Coryphena, Acronurus of Acanthurus, Keris of Naseus, Porobronchus of Fierasfer, Couchia of Motella, Stomiasunculus of Stomias, &c.

The fins are most frequently subject to changes during growth; but, whilst in some fishes parts of them are pro- longed into fila- ments with age, in others the filaments exist during the early life-periods only; whilst in some a part of the dorsal or of the ventral fins is normally de- veloped in the young only, in others those very parts are peculiar to the mature age. The integuments are similarly altered: in some species the young only have asperities on the skin, in others the young are smooth and the old have a tubercu- lar skin ; in some the young only have a hard bony head, in others (some Siluroids) the osseous carapace of the head and neck, as it appears in the adult, is more or less covered with soft skin whilst the fish is young,

In not a few fishes the external changes bear a relation to the sexual development (Callionymus, many Laby- rinthici Cyprinodonts). These secondary sexual differ- ences do not show themselves in the male

individual till it commences to enter upon its sexual functions, and it may require two or more seasons before its external characteristics are fully developed. Immature males do not differ externally from the old female. The secondary sexual characters of the male consist principally in the prolonga- tion of some of the fin-rays, or of entire fins, and in Sal- monide in the greater development of the jaw-bones. The coloration of the male is in many fishes nuch brighter and more variegated than that of the female, but is permanent in comparatively few (as insome Callionymus, Labrus mixtus); generally it is acquired immediately before and during the season of propagation only, and lost afterwards. Another periodical change in the integuments, also due to sexual influence and peculiar to the male, is the exerescence of wart-like tubercles on the skin of many Cyprinoids ; they are developed chiefly on the head, but sometimes extend over the whole body and all the fins,

With regard to size, it appears that in all Teleosteous fishes the female is larger than the male; in many Cyprino- donts the male may be only one-sixth of the bulk of the female or even less. In Palwichthyes we possess few ob- servations on the relative size of the sexes, but such as have been made tend to show that, if a difference exists at all, the male is generally the larger (Lepidosteus). In the rays (Raia) the sexes, after they have attained maturity, differ in the development of dermal spines and the form of the teeth, the female being frequently much rougher than the male. There is much variation in this respect in the different species ; but the males are constantly distinguished by an oblong patch of erectile clawlike spines on each pectoral fin, and by having the teeth (all, or only a portion) pointed, and not obtuse, like those of the females. In sharks no secondary sexual differences have been observed ; the male Chimeride possess a singular comb-like cartila- ginous appendage on the top of the head, which can be erected or depressed into a groove, both the appendage and the anterior part of the groove being armed with hooklets. The use of this singular organ is not known.

Fig. 65.—Young of Orthagoriscus, 18 and 32 mill. long (natural size),

The majority of Z'eleoster are mixogamous—that is, the males and females congregate on the spawning ~~beds, and, the number of the former being in excess, several males attend to the same female, frequently changing from one to another. The same habit has been observed in Lept~~ dosteus. Gastrosteus is truly polygamous, several females depositing their ova in the same nest, guarded by one male only. Some Teleosted (Ophiocephalus), and probably all Chondropterygians, are monogamous ; aud it is asserted that the connexion between the pair is not merely tem- porary, but lasts until they are separated by accident. All those Teleosteans also are probably monogamous which bring forth living young.

Hybridism is another source of changes and variations within the limits of a species, and is by no means So rare as has been hitherto believed ; it is apparently of excep- tional occurrence, merely because the life of fishes is more withdrawn from our direct observation than that of ter- restrial animals. It has been observed among species of Serranus, Pleuronectide, Cyprinide, Clupeide, and especi- ally Salmonide. As with other animals, the more certain kinds of fishes are brought under domestication, the more readily do they interbreed with other allied species. It is characteristic of hybrids that their characters are very vari- able, the degrees of affinity to the one or the other of the parents being inconstant ; and, as these hybrids are known readily to breed with either of the parent race, the variatious of form, structure, and colour are infinite. Of internal organs the teeth, the gill-rakers, and the pyloric appen- dages are those particularly affected by such mixture of species.

Some fishes are known to grow rapidly (in the course of from one to three years) and regularly to a certain size, growth being definitely arrested after the standard has been attained. Such fishes may be called " full-grown," in the sense in which the term is applied to warm-blooded verte- brates; the sticklebacks, most Cyprinodonts, and many Clupeoids (herring, sprat, pilchard) are examples of this regular kind of growth.1 But in the majority of fishes the rate of growth is extremely irregular, and it is hardly possible to know when growth is actually and definitely arrested. All seems to depend on the amount of food and the more or less favourable circumstances under which the individual grows up. Fishes which rapidly grow to a de- finite size are short-lived, whilst those, Teleosteans as well as

Chondropterygians, which steadily and slowly increase in size attain to a great age. Carp and pike have been ascertained to live beyond a hundred years.

Abundance or scarcity of food, and other circumstances connected with the localities inhabited by fishes, affect considerably the colour of their muscles and integuments ; the periodical changes of colour in connexion with their sexual functions have been referred to above. The flesh of many eleostet is colourless, or but slightly tinged by the blood ; that of Scombride, and most Ganoids and Chon- dropterygians, is more or less red ; but in badly-fed fishes, as well as in very young ones, the flesh is invariably white (anemic). Many fishes, like the Salmonide, feed at times exclusively on crustaceans, and the colouring substance of these invertebrates, which by boiling and by the stomachic secretion turns red, seems to pass into their flesh, impart- ing to it the well-known "salmon" colour. The colora- ic pein at

tion of the integuments of many marine fishes, again, is dependent on the nature of their surroundings. In those which habitually hide themselves on the bottom, in sand, between stones, or among seaweed, the colours of the body readily assimilate to those of the vicinity, and are thus an important element in the economy of their life. The changes from one set or tinge of colours to another may be rapid and temporary, or more or less permanent; in some fishes—as in the Pediculatz, of which the sea-devil, or Lophius, and Antennarius are members—scarcely two 'ndividuals are found exactly alike in coloration, and such differences are only too frequently mistaken for specific characters. The changes of colour are produced in two ways,—either by an increase or decrease of the pig- ment-cells, or chromatophors (black, red, yellow, d&c.), 'n the skin of the fish, or by the rapid contraction or expansion of the chromatophors which happen to be developed. The former change is gradual, like every kind of growth or development ; the latter, owing to the great sensitiveness of the cells, is rapid, but certainly involuntary. In many bright-shining fishes—as mackerels, mullets—the colours appear to be brightest in the time intervening between the capture of the fish and its death, a pheno- menon clearly due to the pressure of the convulsively- contracted muscles on the chromatophors. External irritation readily excites the chromatophors to expand—a fact unconsciously utilized by fishermen, who, by scaling the red mullet immediately before its death,

produce the desired intensity of the red colour of ,the skin, without which the fish would not be saleable, It does not, how- ever, require such strong measures to prove the sensitiveness of the chromatophors to external irritation, the mere change from darkness into light is sufficient to induce them to contract, the fish appearing paler, and vice versa, In trout which are kept or live in dark places, the black chromatophors are expanded, and, consequently, such specimens are very dark-coloured ; when removed to the light, they become paler almost instantaneously.

Total absence of chromatophors in the skin, or albinism, is very rare among fishes ; much more common is incipient albinism, in which the dark chromatophors are changed ‘nto cells with a more or less intense yellow pigment. Fishes in a state of domestication, like the crucian carp of China, the carp, the tench, and the ide, are particularly subject to this abnormal coloration, and are known as the common gold-fish, the gold-tench, and the gold-orfe. But it occurs also not rarely in fishes living in a wild state, and has been observed in the haddock, flounder, plaice, carp, roach, and eel,

It will be evident from the foregoing remarks that the amount of variation within the limits of the same species due either to natural growth and development, or to external physical conditions, or to abnormal accidental circumstances—is greater in fishes than in any of the higher classes of vertebrates. The amount of variation is greater in certain genera or families than in others, and it is much greater in Teleosteans and Ganoids than in Chondropterygians. Naturally, it is greatest in the few species that have been domesticated, which we shall men- tion in the following section.

Domestication, Tenacity oF Lirz, HIBERNATION, &c.

1 This applies only to individuals growing up under normal condi- tions. Dr H. A. Meyer has made observations on young herrings. Individuals living in the sea had attained at the end of the third month a length of 45 to 50 millimetres, whilst those reared from artificially impregnated ova were only from 30 to 35 millimetres long. When the latter had been supplied with more abundant food, they grew pro- portionally more rapidly in the following months, so that at the end of the fifth month they had reached the same length as their brethren in the sea, viz., 65 to 70 millimetres,

certain climatic limits—viz., the carp, crucian carp (European and Chinese varieties), tench, orfe or ide, and goramy. The first two have accompanied civilized man almost to every part of the globe where he has effected a permanent settlement.

Only a few fishes are thoroughly domesticated—that 18, Domesti- bred in captivity, and capable of transportation within cation.

Acclima- tization.

Artificial

impreg- J. L. Jacobi, a native of Westphalia,

ACCLIMATIZATION. |

Attempts to acclimatize particularly useful species in countries in which they are not indigenous have been made from time to time, but have been permanently successful in a few instances only, the failures being due partly to the choice of a species which did not yield the profitable return expected, partly to utter disregard of the difference of climatic and other physical conditions between the original and the new homes of the fish. The first success- ful attempts at acclimatization were made with domestic species, viz., the carp and goldfish, which were transferred from Eastern Asia to Europe. Then, in the early part of the present century, the Javanese goramy was acclimatized in Mauritius and Guiana, but no care seems to have been taken to insure permanent advantages from the successful execution of the experiment. In these cases fully developed individuals were transported to the country in which they were to be acclimatized. The most successful attempt of recent years is the acclimatization of the trout and sea-trout, and probably.also of the salmon, in Tasmania and New Zealand, and of the Californian salmon (Sulmo quinnat ?), in Victoria, by means of artificially-impregnated ova. In transporting these ice was employed, in order to retard their development generally, and thus to preserve them from destruction during the passage across the tropical zone.

Artificial impregnation of fish-ova was first practised by in the years 1757-63,

nation of who employed exactly the same method which is followed

ova.

Tenacity | of life.

Absti- nence from food,

now; and there is no doubt that this able observer of nature conceived and carried out his idea with the distinct object of advantageously restocking water-courses that had become unproductive, and increasing production by fecundating and preserving all ova which, in the ordinary course of propagation, would be left unfecundated or might accidentally perish. Physiology soon turned to account Jacobi's discovery, and artificial impregnation has proved to be one of the greatest helps to the student of embryology.

Fishes differ in an extraordinary degree with regard to tenacity of life. Some will bear suspension of respiration ——caused by removal from water, or by exposure to cold or heat—for a long time, whilst others succumb at once. Nearly all marine fishes are very sensitive to changes in the temperature of the water, and will not bear transporta- tion from one climate to another. This seems to be much less the case with some freshwater fishes of the temperate zones ; the carp may survive after being frozen in a solid block of ice, and will thrive in the warmest parts of the temperate zones. On the other hand, some freshwater fishes are so sensitive to a change in the water that they perish when transplanted from their native river into another apparently offering the same physical conditions (gray- ling, Salmo hucho). Some marine fishes may be trans- ferred at once from salt into fresh water, like sticklebacks, some blennies, and Cottus, &c. ; others survive the change when gradually effected, as many migratory fishes; whilst others, again, cannot bear the least alteration in the composition of the salt water (all pelagic fishes). On the whole, instances of marine fishes voluntarily entering brackish or fresh water are very numerous, whilst fresh- water fishes proper but rarely descend into salt water.

Abstinence from food affects different fishes in a similarly different degree. Marine fishes are less able to endure hun- ger than freshwater fishes,—at least in the temperate zones, no observations having been made in this respect on tropical fishes. Goldfishes, carps, and eels are known to be able to subsist without food for months, without showing a visible decrease in bulk; whilst the Trigloids, Sparoids, and other marine fishes survive abstinence from food for a few days only. In freshwater fishes the temperature of the water has great influence on their vital functions generally, and

consequently on their appetite. Many cease to feed alto- gether in the course of the winter; a few, like the pike, are less inclined to feed during the heat of the summer than when the temperature is lowered, _ Captivity is easily borne by most fishes, and the appliances introduced in modern aquaria have rendered it possible to keep in confinement fishes which formerly were con- sidered to be intolerant of captivity, and even to induce them to propagate.

Wounds affect fishes generally much

Captivity.

less than higher Injury

vertebrates. _A Greenland shark continues to feed though from Its head is pierced by a harpoon or by the knife, so laggy Wounds.

as the nervous centre is not touched; a pike will survive the loss of its tail, or a sea-perch that of a portion of it, and a carp that of half its snout. Some fishes, however, are much more sensitive, and perish even from the super- ficial abrasion caused by the meshes of the net during capture (Jfullus).

The power of reproduction of lost parts in Teleosteous Repro-

fishes is limited to the delicate terminations of their fin-rays and the various tegumentary filaments with which some are provided. These filaments are sometimes developed in an extraordinary degree, imitating the waving fronds of the seaweed in which the fish hides. The ends of the fin- rays and also the filaments are frequently lost, not only by accident, but also merely by wear and tear; and, as these organs are essential for the preservation of the fish, their reproduction is necessary. In Dipnot, Ceratodus, and Pro-topterus, the terminal portion of the tail has been found to have been reproduced, but without the notochord.

duction of lost parts.

Hibernation has been observed in many Oyprinoids and Hiberna-

Mureenoids of the temperate zones. a condition of complete torpidity, as reptilesand mammals do, but their vital functions are simply lowered, and they hida in sheltered holes, and cease to go abroad in search of their food. Between the tropics a great number of fishes (especi- ally Siluroids, Labyrinthici, Ophiocephaloids, the Dipnot) are known to survive long-continued droughts by passing the dry season in a perfectly torpid state, imbedded in the hardened mud. /Protopterus, and probably many of the other fishes mentioned, prepare for themselves a cavity large enough to hold them, and coated on the inside with a layer of hardened mucus, which preserves them from complete desiccation. It has been stated that in India fishes may survive in this condition for more than one season, and that ponds, known to have been dry for several years and to a depth of many feet, have swarmed with fishes as soon as the accumulation of water released them from their hardened bed.

They do not fall into to.

The principal benefit derived by man from the class of Ecouo- fishes consists in the abundance of wholesome and nourish- ™¢ uses.

ing food which they yield. In the polar regions especially, whole tribes are entirely dependent on this class for subsistence; and in almost all nations fishes form a more or less essential part of food, many, in a preserved con-dition, being most important articles of trade. Their use in other respects is

of but secondary importance. Cod- liver oil is prepared from the liver of some of the Gadoids of the northern hemisphere and of sharks, isinglass from the swim-bladder of sturgeons, Scizenoids, and Polynemoids, and shagreen from the skin of sharks and rays.

The flesh of some fishes is constantly or occasionally Poison-

poisonous. less intense irritation in the stomach and intestines, inflam- mation of the mucous membranes, and not rarely death. The fishes which appear always to have poisonous proper- ties are—Clupea thrissa, Clupea venenosa, and some species of Scarus, T'etrodon, and Diodon. There are many others which have occasionally or frequently ciused symp- toms of poisoning. Poey enumerates no less than seventy- XII. — 84

When eaten, it causes symptoms of more or ver . snes.

1CnTHYOLOG:

rally lies hidden in the sand. One or more of the erected spines penetrate the skin, and the poison is injected into the wound by the pressure of the foot on the poison-bags. Death has frequently been the result.

The most perfect poison-organs hitherto discovered in fishes are those of Zhalassophryne, a Batrachoid genus of fishes from the ,. coasts of Central "3& America. In these 3 fishes again the#%

operculum and the Lee

666 [GEOLOGICAL two different kinds from Cuba; and various species of Sphyrena, Balzstes, Ostracion, Caranz, Lachnolemus, Tetragonurus, Thynnus, have been found to be poisonous in all seas between the tropics. All or nearly all these fishes acquire their poisonous properties from their food, which consists of poisonous Medusw and corals, or of decomposing substances. Frequently the fishes are found to be eatable if the head and intestines are removed immediately after capture. In the West Indies it has been ascertained that all the fishes living and feeding on certain coral banks are poisonous. In other fishes the poisonous properties are developed at certain seasons of the year only, especially the season of propagation; as

the barbel, pike, and burbot, whose roe causes violent diarrhoea when eaten during the season of spawning.

two dorsal spines #3=s2= are the weapons. % . The former (fig. e

. . . Aa) ES Poison-organs are more common in the class of fishes than | vertically —styli- 2¢ ye; Aes

f ly believed, but th h lusively | f d 2 ENS was formerly believed, but they seem to have exclusively | form, ana very ae =. SS

the function of defence, and are not auxiliary in procuring food, as in venomous snakes. Such organs are found in the sting-rays, the tail of which is armed with one or more powerful barbed spines. Although they have no special

week mobile; it isarmed FP AS Se song te 0 360," So—

spine, eight lines = 6%

7…

long, and of the'? same form as the hollow venom-fang of a snake, being perforated at its base and at its extremity. A sac covering the base of the spine dis- charges its con- tents through the apertures and the canal in the inte- rior of the spine. The structure of the dorsal spines is similar. There are no secretory glands imbedded in the membranes of the sacs, and the fluid must be secreted by their mucous membrane. The sacs have no external mus- cular layer, and are situated iminediately below the thick loose skin which envelops the spines to their extremity ; the ejection of the poison into a living animal, therefore, can only be effected, as in Synanceia, by the pressure to which the sac is subjected the moment the spine enters another body

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Fia. 69.—Operenlar part of the poison-apparatus of Thalassophryne (Panama). 1. Hinder half of the head, with the venom-sac in situ. a, lateral*

line and its branches; 8, gill-opening; c, ventral fin; d, base of peetoral fin; e, base of dorsal, 2. Opereulum with the perforated spine.

Fic. 66.—Portion of tail, with spines, of Aetobatis narinart, a Sting-ray from the Indian Ocean. a, natural size of spine.

organ secreting poison, or canal in or on the spine by which the venomous fluid is conducted, the symptoms caused by a wound from the spine of a sting-ray are such as cannot be accounted for merely by the mechanical lacera- tion, the pain being intense, and the subse- quent inflammation and swelling of tlie wounded part terminating not rarely in gangrene, The mucus secreted from the surface of the fish and inoculated by the jagged spine evidently possesses venomous properties. This is also the case in many Scorpeenoids, and in the weever (Trachinus),

in which the dorsal and opercular spines GEOLOGICAL DISTRIBUTION.

lave the same function as the caudal spines of the sting-rays ; in the weevers, however, the spines are deeply grooved, the groove being charged with a fluid mucus. In Synanceia the poison-organ (fig. 67) is still more developed: each dorsal spine is +n its terminal half provided with a deep groove on each side, at the lower end of which lies a pear-shaped bag containing the milky poison; it is prolonged into a membranous duct, lying in the groove of the spine, and open at its point. The native fishermen, well acquainted

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Fig. 67.—A dorsal spine, with poison-bags, of Synanceiaver- rucosa (Indian Ocean).

Fig. 68.—Thalassophryne reticulata. with the dangerous nature of these fishes carefully avoid handling them; but it often happens that persons wading with naked fect in the sea step upon the fish, which gene-

Of what kind the fishes were which were the first to make their appearance on the globe, whether or not they were identical with or similar to any of the principal types existing at present, are questions which probably will for

ever remain hidden in mystery and uncertainty. The supposition that the Pharyngobranchs and Cyclostomes, the lowest of the vertebrate series, must have preceded the other subclasses, is an idea which has been held by many zoologists, and, as the horny teeth of the Cyclostomes are the only parts which under favourable circumstances could have been preserved, palzeontologists have ever been searching for this evidence.

Indeed, in deposits belonging to the Lower Silurian and Devonian, in Russia, England, and North America, minute, slender, pointed horny bodies, bent like a hook, with sharp opposite margins, have been found and described under the name of " ee More frequently they possess an elongate basal he in which there is generally a ee larger tooth with rows of similar but smaller ne denticles on one or both sides of the larger : tooth, according as this is central or at one end of the base. In other examples there is no prominent central tooth, but a series of more or less similar teeth is implanted

on a straight or curved base. Modifications of these ar- rangements are very numerous, and many palzontologists still entertain doubts whether the origin of these remains is not rather from annelids and mollusks than from fishes.

The first undeniable evidence of a fish, or, indeed, of a vertebrate animal, occurs in the Upper Silurian rocks, in a bone-bed of the Downton Sandstone, near Ludlow. It consists of compressed, slightly curved, ribbed spines, of less than 2 inches in length (Onchus); small shagreen- scales (Z'helodus) ; the fragment of a jaw-like bar with pluricuspid teeth (Plectrodus) ; the cephalic bucklers of what seems to be a species of Pteraspis; and, finally, coprolitic bodies of phosphate and carbonate of lime, including recognizable remains of the mollusks and crinoids inhabit- ing the same waters. But no vertebra or other part of the skeleton has been found. 'The spines and scales seem to have belonged to the same kind of fish, which probably was a Plagiostome. It is quite uncertain whether or not the jaw (if it be the jaw of a fish) belonged to the buckler- bearing Pteraspis, the position of which among Ganoids, with which it is generally associated, is open to doubt.

No detached undoubted tooth of a Plagiostome or Ganoid scale has been discovered in the Ludlow deposits; but this much is certain, that those earliest remains in Paleozoic rocks belonged to fishes closely allied to forms occurring in greater abundance in the succeeding formation, the Devonian, where they are associated with undoubted Paleichthyes, Plagiostomes as well as Ganoids.

These fish-remains of the Devonianor Old Red Sandstone can be determined with greater certainty. They consist of spines, the so-called "ichthyodorulites," which show suffi- ciently distinctive characters to be referred to several genera, one of them, Onchus, still surviving from the Silurian epoch. All these spines are believed to be those of Chondropterygians, to which order some pluricuspid teeth (Cladodus) from the Old Red Sandstone in the vicinity of St Petersburg have been likewise referred.

The remains of the Ganoid fishes are in a much more perfect state of preservation, so that it is even possible to obtain a tolerably certain idea of the general appearance and habits of some of them, especially of such as were provided with hard carapaces, solid scales, and ordinary or bony fin-rays. A certain proportion of them, as might have been expected, remind us, as regards their external form, of Teleosteous fishes rather than of any of the few still existing Ganoid types; but it is contrary to all analogy and to all paleontological evidence to suppose that those fishes were, in their internal structure, more nearly allied to Teleosteans than to Ganoids. If they were not true Ganoids, they may justly be supposed to have had the essential characters of Palcichthyes. Other forms even at that remote geological epoch exhibit so unmistak- ably the characteristics of existing Ganoids that no one can entertain any doubt with regard to their place in the system. In none of these fishes is there any trace of verte- bral segmentation.

The Palwichthyes of the Old Red Sandstone, the systematic position of which is still obscure, are the Cephalaspide from the Lower Old Red Sandstone of Great Britain and Eastern Canada; Pterichthys, Coccos- teus, Dinichthys, and Asterolepis (genera which have been combined in one group, Placoderme) ; and Acan- thodes and allied genera, which combined

numerous branchiostegals with Chondropterygian spines and a shagreen-like dermal covering.

Among the other Devonian fishes (and they form the majority) two types may be recognized, both of which are unmistakably Ganoids. 'The first approaches the still living Polypterus, with which some of the genera like Diplopterus singularly agree in the form and armature of

the head, the lepidosis of the body, the lobate pectoral fins, and the termination of the vertebral column. Other genera, as LHoloptychius, have cycloid scales ; many have two dorsal fins (Holoptychius), and, instead of branchio- stegals, jugular scutes ; others have one long dorsal con- fluent with the caudal (Phaneropleuron). In the second type the principal characters of the Dipnoi are manifest ; and some of them—for example, Dipterus, Paledaphus, Holodus—approach so closely the Dipnod which still survive that the differences existing between them warrant a sepa- ration into families only.

_ Devonian fishes are frequently found under peculiar circumstances, enclosed in the so-called nodules. These bodies are elliptical flattened pebbles, which have resisted the action of water in consequence of their greater hardness, whilst the surrounding rock has been reduced to detritus by that agency. Their greater density is due to the dis- persion in their substance of the fat of the animal which decomposed in them. Frequently, on cleaving one of these nodules with the stroke of the hammer, a fish is found embedded in the centre. At certain localities of the Devonian, fossil fishes are so abundant that the whole of the stratum is affected by the decomposing remains, einitting a peculiar smell when newly opened, and acquir- ing a density and durability not possessed by strata with- out fishes. The flagstones of Caithness are a remarkable instance of this.

The fish-remains of the Carboniferous formation show a great similarity to those of the preceding. They occur throughout the series, but are very irregularly distributed, being extremely rare in some countries, whilst in

others entire beds (the so-called bone-beds) are composed of ichthyolites. In the ironstones they frequently form the nuclei of nodules, as in the Devonian.

Of Chondropterygians the spines of Onchus and others still occur, with the addition of teeth indicative of the existence of fishes allied to the Cestracion type (Cochliodus, Psammodus), a type which henceforth plays an important part in the composition of the extinct marine fish faune. Another extinct Selachian family, that of the Hybodonts, makes its appearance, but is known from the teeth only.

Of the Ganoid fishes, the family Palaondscede (Traquair) is numerously represented ; others are Ccelacanths (C- acanthus, Ihizodus), and Saurodipterini (Megalichthys). None of these fishes have an ossified vertebral column, but in some eee) the outer surface of the vertebrae is ossified into a ring; the termination of their tail is heterocercal. The Carboniferous Uronemus and the Dev- onian Phaneropleuron are probably generically the same ; and the Devonian Dipnoz are coutinued as, and well repre- sented by, Ctenoduts.

The fishes of the Permian group are very similar to those of the Carboniferous. A type whicli in the latter was but very scantily represented, namely the Platysomide, is much developed. They were deep-bodied fish, covered with hard rhomboid scales possessing a strong anterior rib, and pro- vided witha heterocercal caudal, long dorsal and anal, short non-lobate paired fins (when present), and branchiostegals. Paleoniscus appears in many species; the Sauride are represented by Pygopterus and Acrolepis, and Cestracionts by Janassa and Strophodus.

The passage from the Paleozoic into the Mesozvic era is not indicated by any marked change so far as fishes are concerned. The more remarkable forms of the Trias are shark-like fishes represented by ichthyodorulites, lke Nemacanthus, Liacanthus, and Hybodus ; and Cestracionts represented by species of Acrodus and Strophodus. Of the Ganoids, Calacanthus, Amblypterus (Palaoniscide), and Saurichthys persist from the Carboniferous epoch. Cera- todus appears for the first time (Muschel-Kalk of Germany).

Thanks to the researches of Agassiz, and especially of Sir P. Egerton, the ichthyological fauna of the Lias is perhaps the best knownof the Mesozoic era, one hundred and fifty-two specieshaving beendescribed. Of the various localities, Lyme Regis hasyielded more than any other, nearly all the Liassic genera being represented there by no fewer than seventy-nine species. The Hybodonts and Cestracionts continue in their fullest development. Holocephales (J schyodus), true sharks (Paleoscyllium), rays (Squaloraia, Arthropterus), and stur- geons (Chondrosteus) make their first appearance ; but they are sufficiently distinct from living types to be classed in separate genera, or even families. The Ganoids, especi- ally Lepidosteoids, predominate over all the other fishes : Lepidotus, Semionotus, Pholidophorus, Pachycormus, Hugna- thus, Tetragonolepis, are represented by numerous species ; other remarkable genera are Aspidorhynchus, Belonostomus, Saurostomus, Sauropsis, Thrissonotus, Conodus, Ptycholeprs, Endactis, Centrolepis, Legnonotus, Oxygnathus, Heterolejn- dotus, Isocolum, Osteorhachis, Mfesodon. These genera afford evidence of a great change since the preceding period, the majority not being represented in older strata, whilst, on the other hand, many are continued into the succeeding Oolitic formations. The homocercal termination of the vertebral column begins to supersede the heterocercal, and many of the genera have well-ossified and distinetly segmented spinal columns. The cycloid form of scales also becomes more common,—one genus (Leptolepis) being, with regard to the preserved hard portions of its organization, so similar to the Teleosteous type that some paleontologists refer it (with much reason) to that subclass.

As already mentioned, the Oolitic formations show a great similarity of their fish fauna to that of the Lias; but still more apparent is its approach to the existing fauna.

Teeth have been found which cannot even generically be

distinguished from Movtidanus. The rays are represented

by genera like Spathobatis, Belemnobatis, Thaumas ; the

Holocephali are more numerous than in the Lias (Ischyodus, Ganodus). The most common Ganoid genera are Caturus, Pycnodus, Pholidophorus, Lepidotus, Leptolepis, all of whicli liad been more or less fully represented in the Lias. Cera- todus also is continued into it.

The Cretaceous group gives clear evidence of the further advance towards the existing fauna. Teeth of sharks of existing genera, Carcharias (Corax), Scyllium, Notedanus, and Galeocerdo, are common in some of the marine strata, whilst Hybodonts and Cestracionts are represented by a

small number of species only ; of the latter one new genus, –

Ptychodus, appears and disappears. A very characteristic Ganoid genus, Ifacropoma, comprises homocercal fishes with rounded ganoid scales sculptured externally and pierced by prominent mucous tubes. Caturus becomes extinct. Teeth and scales of Lepidotus (with Spherodus as subgenus), clearly a freshwater fish, are widely distri- buted in the Wealden, and finally disappear in the Chalk ; its body was covered with large rhomboidal ganoid scales. Gyrodus and Aspidorhynchus occur in the beds of Voirons, Ceelodus and Amiopsis (allied to Ama) in those of Comen, in Istria. But the Paleichthyes are now in the minority ; undoubted Teleosteans have appeared for the first time ou the stage of life in numerous genera, many of which are identical with still existing fishes. The most of these are Acanthopterygians, but Physostomes and Plectognaths are likewise well represented, most of them being marine. Of Acanthopterygian families the first to appear are the Berycide, represented by several very distinct genera :— Beryx; Pseudoberyzx, with abdominal ventral fins; Derycop- sis, with cycloid scales; Homonotus, Stenostoma, Spheno- cephalus, Acanus, Hoplopteryx, Platycornus, with granular scales; Podocys, with a dorsal extending to the neck ; Acrogaster, Macrolepis, Rhacolepis, from the Chalk of Brazil.

Lon TRY CLV

[GEOGRAPHICAL

The position of Pycnosterynx is uncertain ; it approaches certain Pharyngognaths. True Percide are absent, whilst the Carangide,

Sphyrenide, Cataphracti, Gobude, Cot tide, and Sparide are represented by one or more genera. Somewhat less diversified are the Physostomes, which belong

principally to the Clupeide and Dercetide, most of the

genera being extinct; Clwpea is abundant in some localities. Sconelide (IIemisaurida and Saurocephalus) occur in the Chalk of Comen in Istria, and of Maestricht. Of all Cre- taceous deposits none surpass those of the Lebauon for the number of genera, species, and individuals ; the forms are exclusively marine, and the remains in the most perfect condition.

In the Tertiary epoch the Teleosteans have almost entirely replaced the Ganoids ; a few species only of the latter make their appearance, and they belong to existing genera (Lepi- dosteus, Acipenser). The Chondropterygians merge more and more ito recent forms ; Holocephali continue, and still are better represented than in the present fauna. The Teleosteans show even in the Eocene a large proportion of existing genera, and the fauna of some localities of the Miocene (Oeningen) is almost wholly composed of them. Of the whole more than one-half have already been found to belong to existing genera, and there is no doubt that the number of distinct genera now seemingly extinct will be lessened as the fossils come to be examined with a better knowledge of the living forms. The distribution of the fishes differed widely from that of our period, many of our tropical genera occurring in localities which are now in- cluded within our temperate zone, and being mixed with others that nowadays are restricted to a colder climate,—a combination which continues throughout the Pliocene.

A few families of fishes, like the freshwater Salmomde, seem to have put in their appearance in Post-Pliocene times; not much attention, however, has been paid to fish- remains of these deposits ; and such as have been incident- ally examined furnish evidence of the fact that the distri- bution of fishes has not undergone any further essential change down to the present period.

GEOGRAPHICAL DISTRIBUTION.

In an account of the geographical distribution of fishes the freshwater forms are to be kept separate from the marine. When we attempt, however, to draw a line between these two kinds of fishes, we meet with a great number of species and of facts which would seem to render that distinction very vague, 'There are not only species which can gradu- ally accommodate themselves to a sojourn in either salt or fresh water, but there are also some that seem to be quite indifferent to a rapid change from the one into the other ; so that individuals of one and the same species (Gastrosteus, Gobius, Blennius, Osmerus, Retropinna, Clupea, Syngna- thus, &c.) may be found some distance out at sea, whilst others live in rivers far beyond the influence of the tide, or even in inland fresh waters without outlet to the sea. The majority of these fishes belong to forms of brackish- water fauna; and, as they are not an insignificant portion of the fauna' of almost every coast, we shall have to treat of them in a separate chapter.

Almost every large river offers instances of truly marine fishes ascending for hundreds of miles of their, course, and not periodically, or from any apparent physiological necessity, but sporadically throughout the year. This is evidently the commencement of a change in a fish's habits; and, indeed, not a few of such fishes have actually taken up their permanent residence in fresh waters, as species of Ambassis, Apogon, Dules, Therapon, Sciceena, Blennius, Gobius, Atherina, Mugil, Myxus, Hemirhamphus, Clupea, Anguilla, Tetrodon, Trygon,—all forms originally marine.

water genera descending rivers and sojourning in the sea for a more or less limited period ; but these instances are much Jess in number than those in which the reverse obtains. We may mention species of Salmo (the common trout, the northern charr), and Siluroids (as Arius, Plotosus). Coregonus, a genus so characteristic of the inland lakes of Europe, Northern Asia, and North Amcrica, nevertheless offers some instances of species wandering by the effluents into the sea, and taking up their residence in salt water, apparently by preference, as Coregonus oxy- rhynchus. But of all the freshwater families none exhibit so great a capability of surviving the change from fresh into salt water as the (astrostecde (sticklebacks) of the northern hemisphere, and the equally diminutive Cyprino- dontide of the

tropics ; not only do they enter into, and live freely in, the sea, but many species of the latter family inhabit inland waters, which, not having an outlet, have become briny, or impregnated with a larger proportion of salts than pure sea-water. During the voyage of the "Challenger" a species of Fundulus (F. nigrofasciatus) which inhabits the fresh and the brackish waters of the Atlantic States of North America was obtained, with Scopelids and other pelagic forms, in the tow-net, midway between St Thomas and Teneriffe.

Some fishes annually or periodically ascend rivers for the purpose of spawning, passing the rest of the year in the sea, as sturgeons, many Salmonoids, some Clupeoids, lampreys, &c. The first two evidently belonged originally to the freshwater series, and it was only in the course of their existence that they acquired the habit of descending to the sea, perhaps because their freshwater home did not furnish a sufficient supply of food. These migrations of freshwater fishes have been compared with the migrations of birds ; but they are much more limited in extent, and do not, as is the case with birds, impart an additional element to the fauna of the place to which the fishes migrate.

The distinction between freshwater and marine fishes is further obscured by geological changes, in consequence of which the salt water is gradually being changed into fresh, or vice versa. These changes are so gradual, and spread over so long a time, that many of the fishes inhabiting such localities accommodate themselves to the new con- ditions. One of the most remarkable and best studied instances of such an alteration is the Baltic, which, during the second half of the Glacial period, was in open and wide communication with the Arctic Ocean, and evidently had the same marine fauna as the White Sea. Since then, by the rising of the land of Northern Scandinavia and Finland, this great gulf of the Arctic Ocean has become an inland sea, with a narrow outlet into the North Sea, and, in consequence of the excess of fresh water pouring into it over the loss by evaporation, it has been so much diluted as to be nearly fresh at its northern extremities ; and yet nine species, the origin of which from the Arctic Ocean can be proved, have survived the changes, propa- gating their species, and agreeing with their brethren in the Arctic Ocean in every point, but remaining comparatively smaller. On the other hand, fishes which we must regard as

true freshwater fishes, like the rudd, roach, pike, perch, enter freely the brackish water of tle Baltic. In- stances of marine fishes being permanently retained in fresh water in consequence of geological changes arc well known: as Cottus quadricornis in the large lakes of Scandinavia ; species of Gobius, Blennius, and Atherina in the lakes of northern Italy ; Comephorus, which seems to be a dwarfed Gadoid, in the depths of Lake Baikal. Car- charias gungeticus in inland lakes of the Fiji Islands, is another instance of a marine fish which has permanently established itself in fresh water.

On the other hand, we find fishes belonging to fresh- ;

Thus there is a constant interchange of species in pro- gress between the freshwater and marine faune, and in not a few cases it would seem almost arbitrary to refer a genus or even a larger group of fishes to the one or the other ; yet there are certain groups of fishes which entirely, or with but few exceptions, are, and apparently during the whole period of their existence have been, inhabitants either of the sea or of fresh water ; and, as the agencies operating upon the distribution of marine fishes differ greatly from those influencing the dispersal of freshwater fishes, the two series must be treated separately. The most obvious fact that dry land, which intervenes between river systems, pre- sents to the rapid spreading of a freshwater fish an obstacle which can be surmounted only exceptionally or by a most circuitous route, whilst marine fishes may readily and voluntarily extend their original limits, could be illustrated by a great number of instances. Without entering into details, it may suffice to state, as the general result, that no species or genus of freshwater fishes has anything like tlie immense range of the corresponding categories of marine fishes, and that, with the exception of the Siluroids, no fresliwater family is so widely spread as the families of marine fishes. Surface temperature or climate, which is, if not the most, one of the most important physical factors in the limitation of freshwatcr fishes, similarly affects the distribution of marine fishes, but in a less degree, and only in the case of those which live near the shore or the surface of the ocean ; it ceases to exercise its influence in propor- tion to the depth, the true deep-sea forms being entirely exempt from its operation.

Light, which is pretty equally distributed over the localities inhabited by freshwater fishes, cannot be considered as an important factor in their distribution, but it contributes to the formation of the impassable barrier between the surface and abyssal forms of marine fishes Altitude has stamped the fishes of the various alpine provinces of the globe with a certain character, and limited their distribution; but the number of these alpine forms is comparatively small, ichthyic life being extinguished at great elevations even before the mean temperature equals that of the high latitudes of the Arctic region, in which some freshwater fishes flourish, On the other hand, the depths of the ocean, far exceeding the altitude of the highest mountains, still swarm. with forms specially adapted for abyssal life. That other physical conditions of minor and local importance, under which freshwater fishes live, and by which their dispersal is regulated, are more complicated than similar ones of the ocean, is probable, though perhaps less so than is generally supposed ; for the fact is that the former are more acces- sible to observation than the latter, and are thercfore more generally and more readily comprehended and acknowledged. It will thus be neccessary to treat of the two series separately, not only because many of the most characteristic forms of the marine and the freshwater series are found, on taking a broader view of the subject, to be sufficiently distinct, but also because their distribution depends on causes different in their nature as well as in the degree of their action. Whether the oceanic areas corre- spond in any way to the terrestrial will be seen in the sequel,

FRESHWATER FISHES.

Having shown above that numerous marine fishes enter fresh waters, and that some of them have permanently established themselves therein, we have to eliminate from the category of freshwater fishes all such adventitious elements. They are derived from forms the distribution of which is regulated by other agencies, and which therefore would obscure the relations of the faunze of terrestrial regions if they were included in them, They will be

mentioned with greater propriety along with the fishes constituting the fauna of brackish water.

The true freshwater fishes are all embraced in the fol- lowing families and groups :—

Dipnoi, with 4 species; Acipenseride and Polyodontide, 26 ; Amiide, 1; Polypteride, 2 ; Lepidosteide, 8; Pereina, 46 ; Grystina, 11 ; Aphredoderide, 1 ; Centrarehina, 26; Dules, 10 ; Nandide, 7; Polyeentride, 3 ; Labyrinthiei, 30 ; Luciocephalide, 1; Gastrosteus, 10 ; Ophioeephalida, 31 ; Mastaecembelide, 13 ; Chromides, 105 ; Comephoride, 1 ; Gadopside, 1; Siluride, 572 ; Characinide, 261; Haplochitonide, 3; almonide (8 genera ex- cepted), 135; Pereopside, 1 ; Galaxiide, 15; Mormyride (and Gymnarehide), 52 ; Esocide, 8; Umbride, 2; Cyprinodontide, 112 ; Heteropygii, 2 ; Cyprinide, 724; Kneriidex, 2; Hyodontide, 1; Pantodontide, 1; Osteoglosside, 5 ; Notopteride, 5; Gymno- tide, 20; Symbranchide, 5; Petromyzontide, 12. Total, 2270 species.

As in every other class of animals, these freshwater genera aud families vary exceedingly with regard to the extent of their geographical range,— some extending over more than the half of the continental areas, whilst others are limited to one continent only, or even to a very small portion of it, As a general rule, a genus or family of freshwater fishes is regularly dispersed and most developed within a certain district, the species and individuals becoming fewer towards the periphery as the type recedes more from its central home, some outposts, however, fre- quently being pushed far beyond the outskirts of the area occupied by it. At the same time remarkable instances exist of closely allied forms occurring, almost isolated, at most distant points, without being connected by allied species in the intervening space, and of members of the same family, genus, or species inhabiting the opposite shores of an ocean, and separated by many degrees of abyssal depths.

The dispersal of freshwater fishes has been effected in various ways ; probably all the causes are still in operation, most of them working so slowly and imperceptibly as to escape direct observation. From the great number of fresh- water forms which we see at the present day already acclimatized or gradually becoming acclimatized in the sea, or periodically or sporadically migrating to it, we must conclude that, under certain circumstances, salt water may cease to be an impassable barrier at some

period of the existence of freshwater species, and that many of them have passed from one river through salt water into another. Secondly, the headwaters of some of the largest rivers, the mouths of which are at opposite ends of the continents which they drain, are sometimes distant from each other a few miles ouly; the intervening space may easily have been bridged over for the passage of fishes by a slight geological change affecting the level of the watershed, or even by temporary floods; aud a communication of this kind, if existing for a limited period only, would afford the ready means for an exchange of a number of species previ- ously peculiar to one or the other of those river or lake systems. Some fishes provided with gill-openings so narrow that the water moistening the gills cannot readily evaporate, and endowed, besides, with an extraordinary degree of vitality, like many Siluroids (Clarias, Callichthys), eels, &c., are enabled to wander for some distance over land, and thus may reach a watercourse leading them thousands of miles from their original home. Finally, fishes or their ova may be accidentally carried by waterspouts, or by aquatic birds or insects, to considerable distances.

Freshwater fishes of the present fauna were already in existence when the great changes in the distribution of land and water took place in the Tertiary epoch; and, having seen that salt water is not an absolute barrier to the spreading of freshwater fishes, we can now more easily account for those instances of singular disconnexion of certain families or genera. It is not necessary to assume that there was a continuity of land stretching from the

present coast of Africa to South America, or from South America to New Zealand and Australia, to explain the presence of identical forms in localities so distant ; it suffices to assume that the distances were lessened by intervening archipelagoes, or that an alteration has taken place in the level of the land area.

Dispersal of a type over several distant continental areas may be evidence of its great antiquity, but does not prove that it is of greater antiquity than

another limited to one region only. Geological evidence is the only proof of the antiquity of a type. Thus, although the Dipnot occur in the continents of Africa, South America, and Australia, and their present distribution is evidently the consequence of their wide range in Paleozoic and Secondary epochs, the proof of their high antiquity can be found in their fossil remains only, The Siluroids, for example, have a still grea'er range, but their wide distribution is of compara- tively recent date, as the few fossil remains that have been found belong to the Tertiary epoch. The rapidity of dis- persal of a type depends entirely on its power to accommo- date itself to a variety of physical conditions, and on tle degree of vitality by which it is enabled to survive more or less sudden changes under unfavourable conditions ; proof of this is afforded by the family of Siluroids, many of which can suspend for some time the energy of their re- spiratory functions, and readily survive a change of water.

To trace the geological sequence of the distribution of an ichthyic type, and to recognize the various laws which have governed and are still governing its dispersal, is one of the ultimate tasks of ichthyology. But the endeavour to establish by means of our present fragmentary geological knowledge the divisions of the fauna of the globe leads us into a maze of conflicting evidence; as Mr Wallace truly observes, "any attempt to exhibit the regions of former geological ages in combination with those of our own period must lead to confusion." Nevertheless, as the different types of animals found at the present day within a particular area have made their appearance therein at distant periods, we should endeavour, in giving an account of the several zoo-geographical divisions, to decide, so far as we can, the following questions :—

1, Which of the fishes of an area should be considered to be the remnants of ancient types, probably spread over much larger areas in preceding epochs?

9. Which are to be considered to be autochthonous species, that is, forms which in the Tertiary epoch or later came into existence within the area to which they are still limited, or from which they have since spread 4

3 Which are the forms which must be considered to be immigrants from some other region 1

It is the aim of every philosophical classification to indicate the degrees of affinity which obtain between the various categories In dividing the earth's surface into zoological regions, the two families, Cyprinidae and Stluride, the former of which yields a contingent of one-third and the latter of one-fourth of all the known freshwater species of our period, afford most important guidance for the estima- tion of those degrees of affinity. The Cyprinoids may be assumed to have originated in the alpine region dividing the temperate and tropical parts of Asia; endowed with a greater capability than any other family of freshwater fishes of acclimatizing themselves in a temperate as well as in a tropical region, they spread north and south as well as east and west; in the Pre-Glacial epoch they reached North America, but they have not had time to penetrate 'nto South America, Australia, or the islands of the Pacific. The Siluroids, principally fishes of the sluggish waters of the plains, well adapted for surviving changes of the water in which they live, and for living either in mud or in sea- water, flourish most in the tropical climate in which this

type evidently had its origin. They came into existence after the Cyprinoids, their fossil remains being found only in Tertiary deposits in India, none in Europe. They rapidly spread over the areas of land within the tropical zone, reaching Northern Australia from India, and one species migrating even into the Sandwich Islands, pro- bably from South America. The coral islands of the Pacific still remain untenanted by them. Their progress into temperate regions was evidently slow, only very few species having penetrated into the temperate parts of Asia and Europe, and the North American species, although more numerous, showing no great variety of structure, all belonging to the same group (Amiurina). Towards the south their progress was still slower, Tasmania, New Zea- land, and Patagonia being without any representative, whilst the streams of the Andes of Chili are inhabited by a few dwarfed forms identical with such as are characteristic of similar localities in the more northern and warmer parts of the South American continent. These remarks may serve to introduce the following division of the fauna of freshwater fishes :-— I, Tus Norrurrn Zone.—Characterized by Acipenseride. Few Siluride. Numerous Cyprinide.

Salmonide, Esocide. 1. Europo-Asiatic or Palwarctic Region.—Characterized hy

absence of osseous Ganoidei; Cobitide and Barbus numerous,

2. North American Region.—Characterized by osscous Ganoi- dei, Amiurina, and Catostomina; but no Cobitide or Barbus.

I], Tus Equatrorian Zonz.—Charactcrized by the development of Siluride.

A. Cyprinoid Division.—Charactcrized by presence of Cypri- nide and Labyrinthici.

1. Indian Region.—Characterized by [absence of Dipnoi!] Ophiocephalids, Mastaccmbelide. Co- bitide numerous,

2. African Region.—Characterized by presence of Dipnoi and Polypteride. Chromides and Chara- cinide numerous. Mormyridx. Cobitide absent.

A. Acyprinoid Division.—Characterized by absence of Cypri- nide and Labyrinthici.

1. Tropical American or Neotropical Region.—Char- acterized by presence of Dipnoi. Chromides and Characinide numerous. Gymnotide.

2. Tropical Pacific Region,—Characterized by pre- sence of Dipnoi, Chromides and Characinide absent.

Ill. Toe Sovrnurn Zonz.—Charactcrized by absence of Cypri- nid, and scarcity of Siluride. MHaplochitonidem and Ga- laxiide represent the Salmonoids and Esoces of the northern zone. One region only,

1. Antarctic Region.—Characterized by the small number of species ; the fishes of—

a. The Tasmanian sub-region,

b. Tho New Zealand sub-region, and

c. The Patagonian sub-region, being almost identical.?

In the following account wo begin with a description of the equatorial zone, this being the one from which the two principal families of freshwater fishes seem to have spread.

EquaTor1AL ZonE.—Roughly speaking, the borders of this zoological zone coincide with the geographical limits of the Tropics of Cancer and Capricorn ; its characteristic forms, however, extend in undulating lines several degrees both northwards and southwards. Commencing from the west coast of Africa, the desert of the Sahara forms a well-marked boundary between the equatorial and northern zones ; as the boundary approaches the Nilc, it makes a sudden sweep towards the north as far as northern Syria (Mastacembelus, near Aleppo and in the Tigris; Claritas and Chromides, in the Lake of Galilee), crosses through

1 These will probably be found.

? We distinguish these sub-regions, beeause their distinction is jus- tified by other classes of animals ; as regards freshwater fishes they are even less distinct than Europe and northern Asia,

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Persia and Afghanistan (Ophiocephalus) to the southern ranges of the Himalayas, and follows the course of the Yang-tse-Keang, which receives its contingent of equatorial fishes through its southern tributaries. Its continuation through the North Pacific may be considered as indicated by the tropic, which strikes the coast of Mexico at the southern end of the Gulf of California. Equatorial types of South America are known to extend so far northwards; and, by following the same line, the West India Islands are naturally included in this zone.

Towards the south the equatorial zone embraces the whole of Africa and Madagascar, and seems to extend still farther south in Australia, its boundary probably following the southern coast of that continent; the

detailed distribu- tion of the freshwater fishes of south-western Australia has been but little studied, but the few facts which we know show that the tropical fishes of that region follow the principal water-course, the Murray river, far towards the south and probably to its mouth. The boundary line then stretches to the north of Tasmania and New Zealand, coinciding with the tropic until it strikes the western slope of the Andes, on the South American continent, where it again bends southward to embrace the system of the Rio de la Plata.

The four regions into which the equatorial zone is divided arrange themselves into two well-marked divisions, one of which is characterized by the presence of Cyprinoid fishes, combined with the development of Labyrinthici, whilst in the other both these types are absent. The boundary between the Cyprinoid and Acyprinoid division seems to follow Wallace's line,—a line drawn from the south of the Philippines between Borneo and Celebes, and farther south between Bali and Lombok. Borneo abounds in Cyprinoids ; from the Philippine Islands a few only arc known at present, and in Bali two species have been found ; but none are known from Celebes or Lombok, or from islands situated farther east.

Taking into consideration the manner in which Cypri- noids and Siluroids have been dispersed, we are obliged to place the Indian region as the first in the order of our treatment ; and indeed the number of freshwater fishes which appear to have spread from it into the neighbouring regions far exceeds that of the species which it has received from them.

The Jndian Region comprises the whole continent of Asia south of the Himalayasarid the Yang-tse-Keang,and includes the islands to the west of Wallace's line. Towards the north-east the island of Formosa, which also by other parts of its fauna shows the characters of the equatorial zone, has received some characteristic Japanese freshwater fishes, for instance, the singular Salmonoid Plecoglossus. Within the geographical boundaries of China the freshwater fishes of the tropics pass gradually into those of the northern zone, both being separated by a broad debateable ground. 'The affluents of the great river traversing this district are more numerous from the south than from the north, and carry the southern fishes far into the temperate zone. Scarcely better defined is the boundary of this region

towards the north-west. Before Persia passed through the geological changes by which its waters were converted into brine and finally dried up, it seems to have been inhabited by many characteristic Indian forms, of which a few still survive in the tract intervening between Afghanistan and Syria; Ophiocephalus and Discognathus have each at least one representative, Macrones has survived in the Tigris, and Mastacembelus has penetrated as far as Aleppo. Thus freshwater fishes belonging to India, Africa, and Europe are intermingled in a district which forms the connecting link between the three continents. Of the freshwater fishes of Arabia we are almost entirely ignorant ; we only

know that the Indian Discognathus lamta occurs in the reservoirs of Aden (having also found its way to the oppo- site African coast), and that the ubiquitous Cyprinodouts thrive in the brackish pools of northern Arabia.

In analysing the list of Indian fishes, we find that out of 40 families or groups of freshwater fishes 12 are represented in this region, and that 625 species are known to occur in it, or two-sevenths of the entire number of freshwater fishes known. 'This large proportion is principally due to the development of numerous local forms of Siluroids and Cyprinoids, of which the former show a contingent of about 200, and the latter of about 330 species. The combined development of those two families, therefore, and their undue preponderance over the other freshwater types, is the principal characteristic of the Indian region. The second important character of its fauna is the appar- ently total absence of Ganoid and Cyclostomous fishes. Every other region has representatives of either Ganoids or Cyclostomes, some of both.

Of the autochthonous freshwater fishes of the Indian region, some are still limited to it, viz., the Nandina, the Luctocephalide (of which one species only exists in the archipelago), of Siluroids the Chacina and Bagariina, of Cyprinoids the Semiplotina and Homalopterina ; others are very nearly so, such as the Labyrinthici, Ophiocephalide, Mastacembelida, of Siluroids the Silwrina, of Cyprinoids the Rasborina and Danionina, and the Symbranchide.

The regions to which the Indian has least similarity are the North American and the Antarctic, as they are the most distant. Its affinity to the other regions is of very different degrees :—

1. Its affinity to the Europo-Asiatie region is very slight, and is indicated almost solely by three groups of Cyprinoids, viz., the Cyprinina, Abramidina, and Cobitidina. these groups north and south of the Himalayas is due to their common origin in the highlands of Asia; but the forms which descended into the tropical climate of the south are now so different from their northern brethren that most of them are referred to dis- tinct genera. The only genera which are still common to both regions are (1) the true barbels (Barbus), a genus which of all Cyprinoids has the largest range over the Old World, and of which some one hundred and sixty species have been described, and (2) the moun- tain barbels a ee &e.), which, peculiar to the alpine waters of Central Asia, descend a short distance only towards the tropical plains, but extend farther into rivers within the northern temperate districts. the Cobitidina appear to have been identical with those of Barbus, but they have not spread into Africa.

2. There exists a great affinity between the Indian and African regions; seventeen out of the twenty-six families or groups found in the former are represented by one or more species in Africa, and many of the African species are not even generically different from the Indian. As the majority of these groups have many more representatives in India than in Africa, we may reasonably assuine thatthe African species have been derived from the Indian stock ; but probably this is not the ease with the Siluroid group of Clariina, which with regard to species is nearly equally distributed between the two regions, the African species being referable to three gencra (Clarias, Heterobranehus, Gymnallabes, with the sub-genus Chan- nallabes), whilst the Indian species belong to two gencra only, viz., Clarias and Heterobranchus. On the other hand, the Indian region has derived from Africa one freshwater form only, viz., Htroplus, a member of the family of Chromides, so well represented in tropical Africa and South America. Etroplus inhabits sonthern and western India and Ceylon, and has its nearest ally ina Madagascar freshwater fish, Puretroplus. Considering that other African Chromides have acclimatized themselves at the present day in saline water, we think it more probable that Etroplus should have found its

way to India through the occan than over the eonnceting land arca, where, besides, it does not occur.

3. Nocloser affinity exists between the Indian and Tropical Ameri- can regions than is indicated by the character of the equatorial zone generally. With two exceptions, no genus of freshwater fishes occurs in India and South America without being found in the in- termediate African region. Four small Indian Siluroids (Sisor, Erethistes, Pseudechencis, and E.xostoma) have been referred to the South American Hypostomatina; but it remains to be seen whether this combination is based upon a sufficient agreement of their internal structure, or whether it is not rather artificial. On

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the other hand, the occurrence and wide distribution in tropical Amcrica of a fish of the Indian family Symbranchide: (Symbranehus marmoratus), which is not only congeneric with, but also most elosely allied to, the Indian Symbranchus bengalensis, furnishes one of those extraordinary anomalies in the distribution of animals of which no satisfactory explanation can at present be given.

_4. The relation of the Indian to the Tropical Pacific region eon- sists ouly in its having eoutributed a few species to the poor fauna of the latter. This immigration must have taken place within a recent period, because some species now inhabit the fresh waters of tropical Australia and the South Sea Islands without having in any way changed their specific characters, as Lutes calea- rifer, species of Dules, Plotosus anguillaris; others (species of Arius) differ but little from their Indian congeners. All these fishes must have migrated by the sea, a supposition which is supported by what we know of their habits. We need not add that India has not received a single addition to its freshwater fish fauna from the Pacific region.

It may be mentioned, before concluding these remarks on the Indian region, that peculiar genera of Cyprinoids aud Siluroids inhabit the streams and lakes of its alpine ranges in the north. Some of them, like the Siluroid genera Glyptosternum, Huglyptosternum, Pseudecheneis, have a folded disk on the thorax between their horizontally spread pectoral fins ; by means of this they adhere to stones at the bottom of the mountain torrents, and without it they would be swept away into the lower courses of the rivers. The Cyprinoid genera inhabiting similar localities and the lakes into which alpine rivers pass,—such as Oreinus, Schizothorax, Ptychobarbus, Schizopyyopsts, Diptychus, Gymnocypris,—are distinguished by peculiarly enlarged scales near the vent, the physiological use of which has not yet been ascertained. These alpine genera extend far into the Europo-Asiatic region, where the climate is similar to that of their southern home. No observations have heen made by which the altitudinal limits of fish life in the 'Himalayas can be fixed, but it is probable that it reaches the line of perpetual snow, as in the European Alps, which at that height are inhabited by Salmonoids. Griffith found an Oreinus and a loach, the former in abundance, in the Helmund at Gridun Dewar, altitude 10,500 feet, and another loach at Kaloo at 11,000 feet. j

The African Region comprises the whole of the African continent south of the Atlas and the Sahara. It might lave been conjectured that the more temperate climate of its southern extremity would have been accompanied by a conspicuous difference in the fish fauna. But this is not the case; the difference between the tropical and southern parts of Africa consists simply in the gradual disappearance of specifically tropical forms, whilst Siluroids, Cyprinoids, and even Labyrinthici penetrate to its southern coast ; no new form has entered to impart to South Africaa character distinct from the central portion of the continent. In the north-east the African fauna passes the Isthmus of Suez and penetrates into Syria ; the system of the Jordan presents so many African types that it has to be included ina description of the African region as well as of the Europo-Asiatic. This river is inhabited by three species of Chromis, one of Hemichromis, aud Clarvas macracanthus, a common fish of the upper Nile. Madagascar clearly belongs to this region. Besides some gobies and Dules, which are not true freshwater fishes, four Chromides are known. To judge from general accounts, its freshwater fauna is pvorer than miglit be expected; but, singular as it may

appear, collectors have hitherto paid but little attention to the freshwater fishes of this island. The fishes found in the freshwaters of the Seychelles and Mascarenes are brackish-water fishes, such as Fundulus, Haplochilus, Elops, Mugil, &e.

Out of the 40 families or groups of freshwater fishes 15 are represented in the African region, or three more than in the Indian region; of two of them, however, viz., the Ophiocephalide and Mastacembelidw, a few species only

have found their way into Africa. On the other hand, the number of species is much less, viz., 255, being only two-fifths of the known Indian species. The small de- gree of specialization and localization is principally due to the greater uniformity of the physical conditions of this continent, and to the almost perfect continuity of the great river systems, which take their origin from the lakes in its centre. This is best shown by a comparison of the fauna of the upper Nile with that of the West African rivers. The number of species known from the upper Nile amounts to 56, and of these not less than 25 are absolutely identical with West African species. There is au uninter- rupted coutinuity of the fish fauna from the west to the north-east, and the species known to be common to both extremities may be reasonably assumed to iuhabit also the great reservoirs of water in the centre of the continent. A greater dissimilarity is noticeable between the west and north-east fauna on the one hand and that of the Zambezi on the other ; the affinity between them is merely generic, and all the fishes hitherto collected in Lake Nyassa have proved to be distinct from those of the Nile, and even from those of other parts of the system of the Zambezi.

Unlike India, Africa does not possess either alpine ranges or outlying archipelagoes, the fresh waters of which would swell the number of its indigenous species ; but, when its fauna becomes better known than at present, the great difference in the number of species between this and the Indian regions may possibly be somewhat lessened.

The most riumerously represented families are the Silu- roids, with 61 species; the Cyprinoids, with 52; the Mormyride, with 51; the Characinida, with 35; and the Chromides, with 29. There is not, therefore, that great

preponderance of the first two families over the rest which we noticed in the Indian region; in Africa there is a comparatively greater variety of distinct freshwater types, making the study of its fauna an unflagging plea- sure such as is scarcely reaclied in the study of the other region. With the forms peculiar to it there are combined those of India as well as of South America.

In tropical Africa there are still remnants of Ganoids,— Protopterus (Lepidosiren) annectens and Polypterus bichir, with the singularly modified Calamoichthys. The first two range from east to west, and are accompanied by an Osteoglossoid (Heterotis), which has hitherto been found in the Nile and on the west coast only. Autochthonous and limited to this region are the Mormyride, Pan- todontide, and Kneriide, a singular type somewhat akin to the loaches. Of Siluroid genera the most charac- teristic are Synodontis, Rhinoglanis, and the electric Malapterurus ; of Characinoids, Citharinus, Alestes, X eno- charax, Hydrocyon, Distichodon, Ichthyborus.

The regions to which Africa (like India) has least similarity are again the North American and Antarctic. Its affinity with the Europo-Asiatic region consists only in its having received, like the latter, a branch of the Cypri- noids, the African carps and barbels, which on the whole resemble Indian more than Europo-Asiatic forms. Its similarity to Australia is limited to the two regions possess- ing Dipnoous and Osteoglossoid types. But its relations to the other two regions of the equatorial zone are near and of great interest.

1. Africa has in common with India the Siluroid groups of the Clariina, Silurina, and Bagrina, and more especially the small but very natural family of Notopteride, represented by three species in India, and by two on the west coast of Africa. It would be hazardous to state at present in which of the two regions these fishes first made their appearance, but the discovery of reinains of Noto- pteride and Silurina in Tertiary deposits of Sumatra points to the Indian region as their original home. 'We are in less doubt about the other fishes common to the two regions; they are clearly im- migrants into Africa from the east, and it is a remarkable fact that these immigrants have penctrated to the most distant limits of

Africa in the west as well as in the south, viz., the Labyrinthici, represented by two genera closely allied to the Indian Anabas ; the Ophiocephalide and Mastacembclidw, a few species of which have penetrated to the west coast, while, singularly enough, they are absent froni the eastern rivers; the Ariinw, represented by several species, of which one or two are identical with Indian, having ex- tended their range along the intervening coasts to the east coast of Afriea. The Cyprinoids also afford an instance of an Indian species ranging into Africa, viz., Discognathus lamta, which seems to have crossed at the southern extremity of the Red Sea, as it is found in the reservoirs at Aden and in the hill-streams of the opposite coast- region of Abyssinia.

2. No suchi direct influx of species and gencra has occurred from South America into Africa, yet the affinity of their freshwater fishes is striking. Two of the most natural families of fishes, the Chromides and Characinide, are peculiar and (with the exception of Htroplus) restricted to them. 'The African and South Amcrican Dipnot are closely allied to each other. The Pimcelodina, so char- acteristic of tropical America, have three representatives in Africa, viz., Pimclodus platychir, P. balayt, and Auchenoglanis biscutatus ; the Doradina are another Siluroid group restricted to these two continents.! Yet, with all these points of close resemblance, the African and South American series are, with the exception of the two species of Pimclodus, generically distinct,—which shows that the separation of the continents must have been of old date. On the other hand, the existence of so many similar forms on both sides of the Atlantic affords much support to the supposition that at a former period the distance between the present Atlantic continents was much less, and that the fishes which have diverged towards the east and west are descendants of a common stock which had its home in a region now submerged under some intervening part of that ocean. Be this as it may, it is evident that the physical conditions of Afriea and South America have remained unchanged for a con- siderable period, and are still sufficiently alike to preserve the iden- tity of a number of peculiar freshwater forms on both sides of the Atlantic. Africa and South America are, moreover, the only con- tinents which have produced in freshwater fishes, though in very different families,

one of the most extraordinary modifications of an organ—the conversion, that is, of muscle into an apparatus creating electric force.

The boundaries of the Neotropical or Tropical American Region have been sufficiently indicated in the definition of the equatorial zone. A broad and most irregular band of country, in which the South and North American forms are mixed, cxists in the north, offering some peculiarities which deserve fuller attention in the subsequent descrip- tion of the relations between the South and North Ameri- can faune.

Out of the 40 families or groups of freshwater fishes, 9 only are represented in the tropical American region. This may be accounted for by the fact that South America is too much isolated from the other regions of the equatorial zone to have received recent additions to its fauna. On the other hand, the number of species (672) exceeds that of every other region, even of the Indian, with which, in regard to the comparative development of families, the neotropical region shows a close analogy, as will be seen from the following table :—

Indian.—Siluridx, 200 species ; Cyprinide, 330 ; Labyrinthici, 25 ; Ophiocephalidw, 80 ; Mastacembelide, 10.

Neotropical.—Siluride, 276 species; Characinide, 226; Chro- mides, 80 ; Cyprinodontide, 60; Gymnotide, 20.

In both regions the great number of species is due to the development of numerous local forms of two families, the Characinide in the New World taking the place of the Cyprinide of the Old. To these are added a few smaller families with a moderately large number of species, which, however, is only a fraction of that of the leading fami- lies, the remainder being represented by a few species only. The number of genera within each of the two re- gions belonging to the two principal families is also singularly alike ; the Indian region having produced about 45 Siluroid and as many Cyprinoid genera, whilst the Neo- tropical region is tenanted by 54 Siluroid and 40 Chara-

1 We have left out of consideration here the Artina and Cyprino- donts, which can pass with impunity through salt water, and are spread over much

larger areas.

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cinoid genera. These points of similarity between the two regions cannot be accidental ; they indicate that agreement in their physical and hydrographical features which in reality exists. Of Ganoids, we find in tropical America one species only, Lepidoseren paradoxa, accompanied by two Osteoglossoids (Osteoglossum bicirrhosum and Arapaima gigas). Autochthonous and limited to this region are the Polycentride; all the non-African genera of Chromides and Characinide ; of Siluroids, the Hypophthalmina, Aspredi- nina, and Stegophilina, and the majority of Pimelodina, Hypostomatina, and Doradina ; the herbivorous Cyprino-douts or Limnophage, and numerous insectivorous Cypri- nodonts or Carnivore ; and the Gymnotide (electric eel). The relations to the other regions are as follows :—

1. The resemblances to the Indian and Tropical Pacific regions partly date from remote geological epochs, or are partly due to that similarity of physical conditions to which we have already referred. We have again to draw attention to the unexplained presenee in South America of a representative of a truly Indian type (not found in Africa), viz. Symbranchus marmoratus. On the other hand, a direct genetic affinity exists between the Neotropical and African regions, as has been noticed in the deseription of the latter, a great part of their freshwater fauna eonsisting of descendants from a common stock.

2. A comparison of the specifically Neotropical with the speci- fically North American types shows that no two regions ean be more dissimilar. It is only in the intervening borderland, and in the large West Indian islands, that the two faune mix with cach other.

climate (produeed by different altitudes) within limited districts, the hot and moist alluvial plains surrounding the Mexican Gulf, offer a variety of conditions most favourable to the intermixture

of the types from the north and the south. Still the interchange of

peeuliar forms appears to be only beginning ; none have yet pene- trated beyond the debateable ground, and it is evident that the

land eonnexion between the two continents is of eomparatively

recent date,—a view whieh is confirmed by the identity of the marine fishes on both sides of Central America,

Cuba—which is the only island in the West Indies that hag a number of freshwater fishes sufficient for the determination of its zoo-geographical relations—is inhabited by several kinds of a perch (Centropomus), freshwater mullets, Cyprinodonts, one species of Chromid (an Acara), and Symbranchus marmoratus. All these fishes are found in Central America, and, as they belong to forms known to enter brackish water more or less freely, it is evident that they have crossed either from that region or from the main- land of South America. But with them there came a re- markable North American type, Lepidosteus. Lepidosteus viridis, which is found in the United States, has penetrated on the mainland to the Pacific coast of Guatemala, where it is common at the mouth of the rivers and in brackish-water lakes along the coast ; it probably crossed into Cuba from Florida. A perfectly isolated type of fishes inhabits the subterranean waters in the caves of Cuba (two species of Lucifuga). The eyes are absent, or quite rudimentary, as in most other cave animals. Singularly, it belongs to a family (Ophiditde) the members of which are strictly marine ; and its nearest ally is a genus, DBrotula, the species of which are distributed over the Indo-Pacific Ocean, one only occurring in the Caribbean Sea. This type must have witnessed all the geological changes which have taken

place since Cuba rose above the surface of the sea, A |

similar mixture of forms of the tropical and temperate types of freshwater fishes takes place in the south of South America ; its details have not yet been so well studied as in the north, but this much is evident, that, whilst in the east tropical forms follow the Plate river far into the tem- perate region, in the west the temperate fauna finds still a congenial climate in ranges of the Andes, situated close to, or even north of, the tropic.

Like the Indian region, the Tropical American has a peculiar alpine fauna, the freshwater fishes of which, how-

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We need not enter into the details of the physical features of Central America and Mexico ; the broken ground, the diversity of

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ever, belong to the Siluroids and Cyprinodonts. The former are small, dwarfed forms (Arges, Stygogenes, Brontes, Astroblepus, Trichomycterus, Eremophilus), and have a perfectly naked body, whilst the representatives in the lowlands of at least the first four genera are mailed. The alpine Cyprinodonts, on the other hand (Orestzas), ex- ceed the usual small size of the other members of this family, and are covered with thick scales, but have lost their ventral fins. Some of these alpine forms, like 7'rzchomyc- terus, follow the range of the Andes far into the Southern Temperate region. 'The majority are found at a height of 15,000 feet above the level of the sea,and a few still higher.

The Tropical Pacific Region includes all the islands east of Wallace's line, New Guinea, Australia (with the excep- tion of its south-eastern portion), and all the islands of the tropical Pacific to the Sandwich group. Comparing the area of this region with that of the others, we find it to be the poorest, not only in point of the number of its species generally (36), but also in the possession of peculiar forms. The paucity of freshwater fishes is due, in the first place, to the arid climate and the deficiency of water in the Aus- tralian continent, as well as to the insignificant size of the freshwater courses in the smaller islands. Still this can- not be the only cause; the large island of Celebes, which, by its mountainous portions, as well as by its extensive plains and lowlands, would seem to offer a favourable variety of conditions for the development of a freshwater fauna, is, so far as has been ascertained, tenanted by seven freshwater fishes only, viz.,2 Arcus, 2 Plotosus, 1 Anabas, 1 Ophiocephalus, 1 Monopterus, all of which are the com- monest species of the Indian region. New Guinea has not yet been explored, but, from the faunz nearest to this island, we expect its freshwater fishes will prove to be equally few in number, and identical with those of

Celebes and North Australia,—a supposition confirmed by the few small collections which have reached Europe. Finding, then, that even those parts of this region which are favour- able to the development of freshwater fishes have not pro- duced any distinct forms, and that the few species which inhabit them are unchanged or but slightly modified Indian species, we must conclude that the whole of this area has remained geologically isolated from the other regions of this zone since the commencement of the exist- ence of Zeleoste?, and that, with the exception of Ceratodus and Osteoglossum, the immigration of the other species is of very recent date.

Fossil remains of Ceratodus have been found in the Liassic and Triassic formations of North America, England, Germany, and 'India; it is, therefore, a type which was widely spread in the Mesozoic epoch. Although it would be rash to conclude that its occupation of Australia dates equally far back, for it may have reached that continent long afterwards, yet it is evident that, as it is one of the most ancient of the existing types, so it is certainly the first of the freshwater fishes which appeared in Australia. Osteoglossum, of which no fossil remains have yet been found, is proved by its distribution to be one of the oldest Teleosteous types. There must have been a long gap of time before these ancient types were joined by the other Teleostet. All of them migrated through the intervening parts of the ocean from India. Most of the Plotosina, some of the Ari, Dules, and Atherinichthys, also Nanno- perca (allied to Apogon), were among the earliest arrivals, being sufficiently differentiated to be specifically or even generically (Onidoglanis, Nannoperca) distinguished ; but somo others, like Anabas scandens, Lates calcarifer, Dules marginatus, must have reached the Australian continent quite recently, for they are undistinguishable from Indian specimens.

FRESHWATER FISHES. |

In south-western Australia a mingling of the scanty fauna with that of the southern temperate parts takes place. Oligorus macquariensis (the Murray cod), which has a congener on the coast of New Zealand, ascends high up the Murray river, so that we cannot decide whether this Percoid should be located in the tropical or the temperate part of Australia. Several Galaxias

also extend to the con- fines of Queensland, and will probably some day be found members of this region.

In the smaller Pacific islands the freshwater fishes exhibit a remarkable sameness ; they comprise two or three species of Dules, several eels, an atherine, and some gobies, mul- lets, and other fishes which with equal readiness exchange fresh for salt water, and which would at once reach and occupy any streams or freshwater lakes that might be formed on an island.

The Sandwich Islands are the only group among the smaller islands which are tenanted by a Siluroid, a species of Arius, which is closely allied to Central American species, and therefore vrobably migrated from tropical America.

NorTHERN ZONE.—The boundaries of the northern zone coincide in the main with the northern limit of the equa- torial zone ; but, as has been already indicated, they over- lap the latter at three different points. This happens in Syria, as well as east of it, where the mixed fauns of the Jordan and the rivers of Mesopotamia demand the in- clusion of this territory in the northern zone as well as in the equatorial ; in the island of Formosa, where a Sal- monoid and several Japanese Cyprinoids flourish ; and in Central America, where a Lepidosteus, a Cyprinoid (Sclero- gnathus meridionalis), and an Amiurus (A. meridionalis) represent the North American fauna in the midst of a host of tropical forms.

There is no separate arctic zone for freshwater fishes; ichthyic life becomes extinct towards the pole wherever the fresh water remains frozen throughout the year, or thaws for a few weeks only ; and the few fishes which ex- tend into high latitudes, in which lakes are open for two or three months in the year, belong to types in no wise differ- ing from those of the more temperate south. The highest latitude at which fishes have been obtained is 82° N. lat., whence the late Arctic Expedition brought back specimens of charr (Salmo arcturus and Salmo naresii).

The ichthyological features of this zone are well marked. The Chondrosteous Ganoids or sturgeons, and the families of Salmonidce and Hsocide, are limited to and characteristic of it; Cyprinoids flourish with the

Salmonoids, both families preponderating in numbers over the others, whilst the Siluroids are few in number and in variety.

The two regions into which this zone is divided are very closely related to one another, and their affinity is not unlike that which obtains between the sub-regions of the southern zone. Several species are common to both, viz., Acipenser sturio, A. maculatus, Perca fluviatilis, Gastrosteus pungitius, Salmo salar, Esox luctus, Lota vulgaris, Petro- myzon marinus, P. fluviatilis, and P. branchialis ; and all recent investigations have resulted in giving additional evidence of the affinity and not of the diversity of the two regions,

In Europe and temperate Asia, as well as in North America, mountain ranges elevated above the line of per- petual snow would seem to offer physical conditions favour- able for the development of a distinct alpine fauna. But this is not the case, because the difference of climate between the mountain districts and the lowlands is much less in this zone than in the equatorial. Consequently the alpine freshwater fishes do not essentially differ from those of the plains ; they are principally Salmonoids, and in Asia there are also mountain-barbels and loaches, Salmo

orientalis was found by Griffith to abound in the tribu- ae of the Bamian river at an altitude of about 11 000 eet,

The Palearctic or Europo-Asiatic Region.—The west- ern and southern boundaries of this region coincide with those of the northern zone, so that only those which divide it from North America need to be in- dicated. Behring's Strait and the Kamtchatka Sea have been conventionally taken as the boundary, but this is shown to be artificial by the fact that the animals of both coasts, so far as they are known at present, are not sufficiently distinct to be referred to two different regions. As to the freshwater fishes, those of north-western America and of Kamtchatka are but imperfectly known, but there can be little doubt that the same agreement exists between them as is the case with other classes of animals. The Japanese islands

exhibit a decided Palearctic fish fauna, which includes Barbus and Cobitioids, forms strange to the North American fauna. A slight influx of tropical forms is perceived in the south of Japan, where two Bagrina (Pseudobagrus aurantiacus and Liocassis longirostris) have established themselves for a considerable period, for both are peculiar to the island, and have not been found else- where.

In the east, as well as in the west, the distinction be- tween the Europo-Asiatic and the North American regions disappears almost entirely as we advance farther towards the north. Of four species of the genus Salmo known from Iceland, one (S. salar) is common to both regions, two are European (8. fario and S. alpinus), and one is a peculiarly Icelandic race (S. nivalis). So far as we know the Salmo- noids of Greenland and the tract adjoining Baffin's Bay, they are all very-closely allied to European species, though they may be distinguished as local races.

Finally, as we have seen above, the Europo-Asiatic fauna mingles with African and Indian forms in Syria, Persia, and Afghanistan. Capoeta, a Cyprinoid genus, is charac- teristic of this district, and well represented in the Jordan and the rivers of Mesopotomia. Out of the 40 families of freshwater fishes 13 are represented in this region; the number of species is comparatively small, viz., 360.

Assuniing that the distribution of Cyprinoids has taken its origin from the alpine tract of country dividing the Indian and Palearctic regions, we find that this type has found in the temperate region as favourable con- ditions for its development as in the tropical. Out of the 360 species no less than 215 are Cyprinoids. In the countries and on the plateaus immediately adjoining the Himalayan ranges those mountain forms which we men- tioned as peculiar to the Indian Alps abound, and extend for a considerable distance towards the west and east, mixed with other Cyprinina and Cobitidina. The repre- sentatives of these two groups are more numerous in Cen- tral and Eastern Asia than in Europe and the northern parts of Asia, where the Leuciscina predominate.

The Cyprinoids, in their dispersal northwards from the south, are met from the opposite direction by the freshwater Salmonoids. 'These fishes are, without doubt, one of the youngest families of Z'eleostez, for they did not

appear before the Pliocene era; they flourished at any rateduring the Glacial period, and, as is testified by the survivors which we find in isolated elevated positions, like the trout of the Atlas,

of the mountains of Asia. Minor, and of the Hindu Kush, they spread to the extreme south of this region, At the present day they are most numerously represented in its northern temperate parts ; towards the south they become fewer, but increase again in numbers and species whiere- ever a great elevation offers them the snow-fed waters which they affect. In the rivers of the Mediterranean, Salmonoids are by no means rare, but they prefer tlie upper courses of those rivers, and do not migrate to the sea, with the exception, perhaps, of some species in the rivers of the North Adriatic.

The pike, Umbra, and several species of perch and stickle- back are also clearly autochthonous species of this region. Others belong to marine types, and seem to have been re- tained in fresh water at various epochs,—as the freshwater Cottus (miller's thumb) ; Cottus quadricornis, which in- habits Jakes of Scandinavia, whilst other individuals of the same species are strictly marine; the burbot (Lota vulgaris) ; and the singular Comephorus, a dwarfed and much changed Gadoid which inhabits the greatest depths of Lake Baikal.

Remnants of the Paleichthyic fauna exist in the stur- geons and lampreys. The former inhabit in abundance the great rivers of eastern Europe and Asia, periodically ascending them from the sea; their southernmost limits are the Yang-tse-Keang in the east, aud towards the centre of this region the rivers flowing into the Adriatic, Black, and Caspian Seas, and Lake Aral. None are known to have gone beyond the boundaries of the northern zone. If the lampreys are justly reckoned among freshwater fishes, their distribution is unique and exceptional. In the Palearctic region some of the species descend periodically to the sea, whilst others remain stationary in the rivers ; the same has been observed in the lampreys of North America. They are entirely absent in the equatorial zone, but reappear in the temperate zone of the southern hemi- sphere. Many points in the organization of the Cyclo- stomes indicate that they are a type of great antiquity.

The remaining Palearctic fishes are clearly immigrants from neighbouring regions: thus Stlurus, Macrones, and Pseudobagrus have migrated from the Indian region, Amiurus and, as mentioned above, Catostomus from North America. The Cyprinodonts are restricted to the southern and warmer parts, and all belong to the carni- vorous division. 'The facility with which these fishes accommodate themselves to a sojourn in fresh, brackish, or salt water, and even in thermal springs, renders their general distribution easily comprehensible, but it is impos- sible to decide to which region they originally belonged ; their remains in Tertiary deposits round the Mediterranean are not rare.

The boundaries of the North American or Nearetve Region have been sufficiently indicated. The main features and the distribution of this fauna are identical with those of the preceding region. Out of the 40 families of fresh- water fishes 19 are found in this region. The proportion of Cyprinoid species to the total number of North Ameri- can fishes (135 : 339) appears to be considerably less than in the Palearctic region, but we cannot admit that these figures approach the truth, as the Cyprinoids of North America have been much less studied than those of Europe; of many scarcely more than the name is known. This also applies ina great measure to the Salmonoids, of which only half as many as are found in the Palearctic region have been sufficiently described to be worthy of consideration. North America will, without doubt, in the end show as many distinct races as Europe and Asia.

Cyprinoids belonging to living as well as extinct genera existed in North America in the Tertiary period. At present the Cyprinina, Leuciscina, and Abramidina are well

represented, but there is no representative of the Old World genus Barbus, or of the Cobitidina ;1 Rhodeina are also absent, On the other hand, a well-marked Cypri- noid type is developed—the Catostomina, of which one species has, as it were, returned into Asia. Very charac- teristic is the group of Cenétrarchina, allied to the perch, of which there are some thirty species;

there are two Grystina. Of the sticklebacks there are as many species as in Europe, and of pike not less than seven species have been distinguished. Umbra appears to be as local as in Europe. Some very remarkable forms, types of distinct families, though represented by one or two species only, complete the number of North American autochthonous fishes, viz., Aphredoderus, Percopsis, Hyodon, and the Heteropygit (Amblyopsis and Chologaster). The last are allied to the Cyprinodonts, differing from them in some points of the structure of their intestines. The two genera are extremely similar, but Chologaster, which is found in ditches in the rice-fields of South Carolina, is provided with eyes, and wants the ventral fins. Amblyopsis is the cele- brated blind fish of the Mammoth Cave of Kentucky ; it is colourless and eyeless, and has rudimentary ventral fins, which occasionally may be entirely absent.

A peculiar feature of the North American fish fauna is that it has retained, besides the sturgeons and lampreys, representatives of two Ganoid families, Lepidosteus and Amia. Both these genera occur in Tertiary formations ; whilst the former is represented in Europe as well as in North America, fossil remains of Ama have been found in the western hemisphere only.

It is difficult to account for the presence of the Amu- rina in North America. They form a well-marked division of the Bagrina, which are well represented in Africa and the East Indies, but are absent in South America ; it is evident, therefore, that they should not be regarded as immigrants from the south, as is the case with the Palearctic Siluroids. Nor again, has the connexion between South and North America been established sufficiently long to admit of the supposition that these Siluroids could have spread in the interval from the south to the northern parts of the conti- nent, for some of the species are found as far north as Pine Islands Lake (54° N. lat.).?

SouTHERN ZonE.—The boundaries of this zone have been indicated in the description of the equatorial zone ; they overlap the southern boundaries of the latter in South Australia and South America, but we have not at present the means of exactly defining the limits to which southern types extend northwards. This zone includes Tasmania, with at least a portion of south-eastern Australia (Zasmanian sub- region), New Zealand and the Auckland Islands (New Zealand sub-region), and Chili, Patagonia, Tierra del Fuego,

andthe Falkland Islands (Mwegian sub-region). No fresh- water fishes are known from Kerguelen's Land, or from islands beyond 55° 8. lat. The southern extremity of Africa has to be excluded from this zone so far as freshwater fishes are concerned.

With regard to its extent as well as to the number of species, this zone is the smallest of the three, the number of species known being 11 in the Tasmanian, 8 in the New Zealand, and 18 in the Fuegian sub-region. Yet the ichthyological features of this zone are well marked ; they consist in the presence of two peculiar families, each of which is analogous to a northern type, viz., the Haplocha- tonide, which represent the Salmonidw (Haplochiton being 1 Cope has discovered in a Tertiary freshwater deposit at Idaho an extinct genus of this group, Diastichus. He considers this interesting fact to be strongly suggestive of continuity of territory between Asia and North America.—Proc. Am. Phil. Soc., 1873, p. 55.

2 Leidy describes a Siluroid (Pimelodus) from the Tertiary deposits

of Wyoming territory.—Contrib. to 'the Extinct Vert. Fauna of the Western Territ., 1873, p. 193.

the analogue of Salmo, and Prototroctes that of Coregonus), and the Galaxide, which are the pikes of the southern hemisphere.

Although geographically widely separate from each other, the freshwater fishes of the tliree divisions are nevertheless so closely allied that conclusions drawn from this group of animals alone would hardly justify us in regarding these divisions as sub-regions. One species of Galaxias (G. at- tenuatus) and three of lampreys are found in all three, or at least in two of the sub-regions. Percichthys is in Chili the autochthonous form of the cosmopolitan group of Percina. Diplomystax, an Arioid fish of Chili, and Nematogenys seem to have crossed the Andes from tropical America at a comparatively early period, as these genera are not repre- sented on tlie eastern side of South America; Zrichomyc- terina occur on both sides of the Andes, which they ascend to aconsiderable height. etropinna is a true Salmonoid, allied to the northern smelt (Osmerus), and representing it in

the southcrn hemisphere. In both these genera part of the specimens live in the sea, and ascend rivers periodically to spawn ; anothcr part remain in rivers and lakes, where they propagate, never descending to the sea, this fresliwater

race being constantly smaller than their marine brethren. |

That this small Teleostean of the northern hemisphere

should reappear, though in a generically modified form, in |

New Zealand, without having spread over other parts of the southern zone, is one of the most remarkable and at present inexplicable facts of the geographical distribution of freshwater fishes.

Brackisu-WAtTER FisHes.

On those parts of a coast at which there is a mixture of fresh and salt water, either in consequence of some river emptying itself into the sea, or from accumulations on the land-surface forming lagoons which are in uninter-rupted or temporary communication with the sea, there flourishes a peculiar brackish-water fauna cliaracterized by the presence of fishes found sometimes in the sea, and sometimes in pure fresh water.

This fauna can be somewhat sharply defined if a limited district only is taken into consideration ; thus, the species of the brackish-water fauna of Great Britain, of the Pacific coist of Central America, of the larger East India islands, &c., can be enumerated without mucli hesitation. But difficulties occur when we attempt to generalize in the enuineration of the forms referable to the brackish-water fauna, because the genera and families enumerated include certain species and genera which have habituated them- selves exclusively either to a freshwater or a marine exist-ence, auld also because a species of fish may be at one locality an inhabitant of brackisli water, at another of the sea, and at a third of fresh water. The circumstance that these fishies can live either in the sea or in fresh water has enabled them to spread readily over the globe, a few only being limited to particular regions ; in dividing the earth's surface into natural zoological regions, therefore, the taxonomist receives no assistance

from the brackish-water forms. The following fishes may be referred to tlus fauna :—

1. Species of Ratide (Raia, Trygon). 2. Ambassis. 3. Therapon. 4. Numerous Seiwnide of the equatorial zone. 5. Polynemida. 6. Numerous species of Caranz (or horse mackerels) of the equatorial vone. 7. Species of Gastrosteus. 8. The most important genera of the gobies (Gobtina); Gobiws (nearly cosmopolitan), Sieydium, Boleophthalmus, Periophthalmus, Eleotris (equatorial). 9. Amblyo- pina. 10. Trypauchenina. 11. Many species of Blennius. 12. The majority of Atherinidw. 13. Most Mugilide. 14. Many Pleuro- neetide. 15. Several Silurida, as especially the gencra Plotosus, Cnidoglanis, Arius. 16. Many Cyprinodontidw. 17. Species of Clupea. 18. Chatoessus. 19. Megalops. 20. Anguilla (eels). 21. Numerous Syngnathide.

This list could be considerably increased if an enume-

ration of species, especially of certain localities, werc at- tempted ; but this is more a subject of local interest, and would carry us beyond the scope of a general account of the distribution of fishes.

Marine Fisues.

Marine fishes fall, with regard to their mode of life and distribution, into three distinct categories :—

1. Shore Jishes—that is, fishes which chiefly inhabit parts of the sea in the immediate neighbourhood of land either actually raised above, or at least but little submerged below, the surface of the water. They do not descend to any great depth,—very few to 300 fathoms, and the majority live close to the surface. The distribution of these fishes is determined, not only by the temperature of the surface water, but also by the nature of the adjacent land and its animal and vegetable products,— some being confined to flat coasts with soft or sandy bottoms, others to rocky and fissured coasts, others to living coral formations. If it were not for the frequent mechanical and

involuntary removals to whicli these fishes are exposed, their distribution within certain limits, as it no doubt originally existed, would resemble still more that of freshwater fishes than we find it actually does at thie present period.

2. Pelagic Fishes—that is, fishes which inhabit the surface and uppermost strata of the open ocean, and approach the shores only accidentally, or occasionally (in search of prey), or periodically (for the purpose of spawn- ing). The majority spawn in the op2n sea, their ova and young being always found at a great distance from the shore. With regard to their distribution, they are still subject to the influences of light aud the temperature of the surface water ; but they are independent of the variable local con- ditions which tie the shore fish to its original home, and therefore roam freely over a space which would take a freshwater or shore fish thousands of years to cover in its gradual dispersal. Such as are devoid of rapidity of motion are dispersed over similarly large areas by the oceanic cur- rents, more slowly thau the strong swimmers, but not less surely. An accurate definition, therefore, of their dis- tribution within certain areas equivalent to the terrestrial regions is much less feasible than in the case of shore fishes.

3. Deep-Sea Iishes—that is, fishes which inhabit such depths of the ocean that they are but little or not at all influenced by light or the surface temperature, and which, by their organization, are prevented from reaching the sur- face stratum in a healthy condition. Living almost under identical tellurian conditions, the same type, the same species, may inhabit an abyssal depth under the equator as well as one near the arctic or antarctic circle ; and all that we know of these fishes points to the conclusion that no separate horizontal regions can be distinguished in the abyssal fauna, and that no division into bathymetrical strata can be attempted on the base of generic much less of family characters.

Chondropterygit,

Shore Fishes.

The principal types of shore fishes are the following :—

CHONDROPTERYGI1.—Holucephala, 4 species. Plagiostomata—Carchariide (part), 12; Scylliide, 30; Cestraciontide, 4 ; Spinacide (part), 8; Rhinide, 1; Pristiophoride, 4; Pristide, 5 ; Rhinobatide, 14; Torpedinide, 15; Raiide, 34; Trygonide, 47. :

ACANTHOPTERYGII.—Percide (part, includ. Pristipomatide), 625

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species ; Mullida, 35; Sparide, 180; Squamipinnes, 130 ; Cir- rhitide, 40 ; Hetcrolepidina, 12 ; Scorpxnide, 120 ; Cottidee (part), 100; Cataphracti (part), 20 ; Trachinide, 100; Scieenide, 100; Sphyrenide, 15 ; Trichiuride, 17; Elacate, 1; Nomcide (part),

5; Cyttide, 8; Stromateus, 9; Mene, 1; Carangide (part), 180; Kurtidex, 7; Gobiodon, 7; Callionymina, 30; Discoboli, 11; Batrachide, 14; Pediculati (part), 11; Blenniide, 90; Acantho- clinide, 1; Tcuthidide, 30 ; Acronuride, 60; Hoplognathide, 3 ; Malacanthide, 3; Plesiopina, 4; Trichonotide, 2; Cepolide, 7 ; Cohiesocidee, 21; Psychrolutide, 2; Centriscide, 7 ; Fistulariide, 4.

ACANTHOYTERYGIE PUARYNGOGNATUI. — Pomacentride, 150 species ; Labride, 400 ; Embiotocide, 17.

ANACANTUIUN1.—Gadopside, 1 species; Lycodidw, 15; Gadide (part), 50; Ophidiide (part), 40; Pleuronectide, 160.

Puysostomi.—Saurina (part), 16 species ; Salmonide (part), 7 ; Clupeide (part), 180 ; Chirocentridx, 1; Chilobranchus, 1; Muren- ide (part), 200; Pegaside, 4.

LoPHOBRANCHH, 120 species.

PLECTOGNATHI, 178 species.

CycLosToMATA.—Myzinide, 5 specics.

LEPTOCARDHU, 2 species.

Total number, 3587 spccies.

These types of shore fishes are distributed over the fol- lowing oceanic areas :—

1. The Arctic Ocean.

II. The Northern Temperate Zone.

A. The Temperate North Atlantic. 1. The British district. 2. The Meditcrranean district. 3. The North American district. B. The Temperate North Pacific. 1. The Kamtchatkan district. 2. The Japanese district. 3. The Californian district. III. The Equatorial Zone. A. The Tropical Atlantic. B. The Tropical Indo-Pacific. GC. The Pacific coast of Tropical America. 1. The Central American district. 2. The Galapagos district. 3. The Peruvian district.

IV The Southern Temperate Zone.

1. The Cape of Good Hope district. 2. The South Australian district. 3. The Chilian district.

4, The Patagonian district.

V. The Antarctic Ocean.

As with freshwater fishes, the main divisions of the shore-fish faune are determined by their distance from the equator, the equatorial zone of the freshwater series corre- sponding entirely to that of the shore-fish series. But as marine fishes extend farther towards the poles than fresh- water fishes, and as the polar types are more specialized, a distinct arctic and antarctic fauna may be separated from the faune of the temperate zones. The two subdivisions of the northern temperate zone in the freshwater series are quite analogous to the corresponding divisions in the coast series. In the southern hemisphere the shore fishes of the extremity of Africa form a separate district of the temper- ate zone, whilst the freshwater fishes of South Africa were found to be tropical types. The marine series of the southern temperate zone is also much more diversified than the freshwater

series, and admits of further subdivision, which, although in some degree indicated in the freshwater series, does not entirely correspond to that proposed for the latter.

_ Arctic Ocran.—The shore fishes clearly prove a con- tinuity of the arctic circumpolar fauna, as the southern limit of which we may indicate the southern extremity of Greenland and the Aleutian Archipelago, or 60° N. lat.

Towards the north, fishes become less in variety of species and fewer in number of individuals, and only very few genera are restricted to this fauna.

The highest latitude at which shore fishes have been observed is 83° N. _ The late Arctic Expedition collected at and near that latitude specimens of Cottus quadricorms, Icelus hamatus, Cyclopterus spinosus, Liparis fabricn, Gym- nelis viridis, and Gadus fabric. The number would

probably have been larger were it not that the difficulties of collecting fishes in those high latitudes are almost in- superable for the greater part of the year.

So far as we know, the fishes north and south of Behring's Straits belong to the same generic or family types as those of the corresponding latitudes of the eastern hemi- sphere, though the majority are specifically distinct. But the information we possess of the fishes of the northern- most extremity of the Pacific is extremely scanty and vague. Farther south, whence now and then a collection reaches Europe, we meet with some European species, as the herring, holibut, and hake.

Chondropterygians are very rare. Of Acanthoptery- gians the families of Cottede, Cataphracti, Discobolt, and Blenniide are well represented, and several of the genera are characteristic of the arctic fauna. Characteristic also is the development of Gadoid fishes, of which some thirteen species, belonging to Gadus, Merluccius, and Molva, form one of the principal

articles of food for the inhabitants of the coasts of the Arctic Ocean. The Blen- noid Anacanthini or Lycodide are limited to the Arctic and Antarctic coasts. Ammodytes and a few flat-fishes (Hippoglossoides and Pleuronectes) are common in the more temperate parts. Labroids only exceptionally penetrate so far towards the north. Physostomes are very rare, and are represented only by a few species of Clupea and by Mallotus. The arctic climate is still less favourable to the existence of Lophobranchs, only a few of Syngna- thus and Nerophis being present in the more southern latitudes, to which they have been carried by oceanic currents from their more congenial home in the south. Scleroderms and Plectognaths are entirely absent. The Gadoids are accompanied by MJywine, which thrives in them as a parasite.

NortHern Temperate Zone.—Temperate North At- lantic.—This part of the fauna may be subdivided into three districts :—

1. The fishes of the north-eastern shores, viz., of the British Islands, of Scandinavia so far as it is not included in the arctic fauna, and of the continent of Europe south- wards to about 40° N. lat.: British district.

2. Tho fishes of the Mediterranean shores and of the adjoining shores of the Atlantic, including the Azores, Madeira, and the Canary Islands : Mediterranean district.

3. The fishes of the western shores, from 60° to about 30° N. lat. : North American district.

1. The British district shows scarcely any marked distinctive features ; the character of its fauna is simply intermediate between that of the Arctic Ocean and the Meditcrranean district ; truly arctic forms disappear, while such as are also found in the Mediter- ranean make their appearance. With regard to the abundance of individuals and variety of fishes also, this district forms a transition from the north towards the south.

Besides the few arctic Chondropterygians, all of which extend into this district, the small shore dog-fishes are well represented (Mustelus, Galeus, Seylliwm, Pristiurus); the ubiquitous Rhina or monk-fish is common ; of

rays, Raia predominates in a variety of species over Z'orpedo and T'rygon, which are still rare.

Of Acanthopterygians, Centridermichthys, Icelus, Triglops, and Aspidophoroides do not cxtend from the north into this district ; and Cottus, Anarrhichas, Centronotus, Sticheus, and the Discobolt disappear within its limits. Nearly all the remainder are genera which are also found in the Mediterranean district. The following are the principal forms known to propagate on these shores: Labrazx ; Scrranus, Polyprion, Dentex ; Mullus; Cantharus, Pagrus, Pagellus ; Sebastes ; Cottus, Trigla, Agonus; Trachinus ; Scicena (2); Zeus; Trachurus, Capros ; Callionymus ; Discoboli; Lophius; Anarrhichas, Centronotus, Sticheeus ; Blenniops, Zoarees (not in the Mediterranean) ; Cepola ; Lepadogaster.

Of the Anacanthini the Gadoids are as numerous as in the Arctic Ocean, most being common to both districts ; but, whilst the majority show their northern origin by not extending into the Mediterranean, Ammodytes and most Pleuronectide prove themselves to be the more southern representatives of this order. In the British district we find Hippoglossus, Hippoglossoides, Rhombus,

Phrynorhombus, Plewroncetcs, Solea, and only the first two are not met with in the Mediterranean.

Labroids are common ; with the exception of the North American Tautoga, all the other genera are met with.

Physostomes are not well represented, viz., by onc species of Osmerus, one of Engraulis, one of Conger, and about five of Clupea.

Syngnathus and Nerophis become more common as we proceed southwards; but the existence of Scleroderms and Plectognaths is indicated by single individuals only, stragglers from their south- ern home, unable to establish themselves in a climate ungenial to them.

The Gadoids are accompanied by Myzxine; and Branchiostoma may be found in all suitable localities.

2. The Mediterranean district is distinguished by a great variety of forms; yet, with the exception of a few genera established for single species, none of the forms can be considered peculiar to it ; and even that small number of peculiar genera is more and more diminished as our knowledge of the distribution of fishes advances. Some genera are identical with those found on the western coasts of the Atlantic and in the West Indies; but a most remarkable and unexpected affinity obtains with another very distant fauna, viz., that of Japan. The number of genera common to the Mediterranean district and the Japanese coasts is larger than that of the genera common to the Mediterranean and the opposite American coasts.

The Chondropterygians found in the British district continue in the Mediterranean, their number being increased by Centrina, Spinax, Pteroplatea, and some species of Khinobatus, a genus more numerously represented in the tropics. Torpedo and Trygon are common.

The greatest variety belong to the Acanthopterygians, which are represented by fifty-seven genera.

The Labridw are as common as in the British district, or even more so, and are represented by the same genera. But, besides these, some other Pharyngognaths, properly belonging to the tropical Atlantic, have fully established themselves, though only by a few species, viz., Glyphidodon and Heliastes, Cossyphus, Novacula, Julis, Coris, and Scarus.

The Gadoids show a marked decrease of development; and the species of Gadus, Gadiculus, Mora, Strinsia, Phycis, and Molva which are peculiar to the Mediterranean seem to inhabit rather the colder water of moderate depths than the surface near the shore. Motella, however, proves also to be a true shore fish in the Mediter- ranean, at least in its adult state. Ophidiwm and Ficrasfer appear now besides Ammodytes. As the Gadoids decrease, so the Pleuro- nectide increase, 9 genera being found in this district.

The variety of Physostomes is small, the following only having to be added to those of the British district: Sawrus (a tropical genus), Aulopus ; Congromurena, Heteroconger, Myrus, Ophichthys, Arena.

The Lophobranchs are more numerous in species and individuals than in the British district; and, besides Syngnathus and Nerophis, several species of Hippocampus are common. A few specics of Balistes also occur.

Myxine is lost in this district, whilst Branchiostoma is abundant.

3. The shore fishes of the North American district consist, as on the eastern coasts of the North Atlantic, of northern (about 50 genera) and southern (about 30)elements ; but they are still more mixed with each other than on the European coasts, so that a boundary line cannot be drawn between them. The affinity to the fauna of the eastern shores is great, but almost entirely limited to the gencra composing the fauna of the British district. British genera not found on the American coasts are—G@aleus, Scyllinum, Chimera, Mullins, Pagellus, Trigla, Trachinus, Zeus, Callionymus. The southern elements of North America are rather derived from the West Indies, and have no special affinity to Mediterranean forms ; very few of the non-British Mediterranean fornis extend across the Atlantic ; instead of a Mediterranean we find a West Indian element. Many of the British species range across the Atlantic, and inhabit in an unchanged condition the northern parts of this district ; and from the frequent occurrence of isolated specimens of other British species on the North American coast, we may presume that many more occasionally cross the Atlantic, but without being able to obtain a permanent footing.

The genera peculiar to this district are few in number, and com- posed of very few species, viz., Hemitripterus, Pammelas, Chasmedes, Cryptacanthodes, and Tautoga.

Temperate North Pacific.—This fauna shows a great affinity to that of the Temperate North Atlantic, not only in including a considerable proportion of identical genera, and even of species, but also in having its constituent parts similarly distributed. Our knowledge of the ichthyology of this fauna, however, is by no means complete, and the details of the distribution of the

fishes of these shores have still to be worked out; nevertheless, three divisions may be

io which, for the present, may be defined as fol- OWS :—

1. The fishes of the north-western shores, to about 37° N. lat., including the corresponding northern parts of Japan: Kamtchatkan district. This corresponds to the British district of the Atlantic.

2. The fishes of southern Japan and the corresponding shores of the continent of Asia, between 37° and 30° N.

lat. : Japanese district, which corresponds to the Medi- terranean.

3. The fishes of the eastern shores southwards to the latitude of San Francisco : Californian district. This corre- sponds to the North American district of the Atlantic.

Too little is known of the shore fishes of the coasts be- tween San Francisco and the tropic to enable us to treat of it as a separate division.

The shore fishes of the North Pacific generally are com- posed of the following elements :— :

a. Arctic forms which extend into the Arctic Ocean, and the majority of which are also found in the British district.

6. Peculiar forms limited to the North Pacific, like the Heterolepidina, Embiotocide, and certain Cottoid and Blen- nioid genera.

c. Forms identical with fishes of the Mediterranean.

d. Peculiar forms limited to the southern parts of Japan.

e. Tropical forms which have entered the North Pacific from the south.

1, To the Kamtchatkan district we can assign but a sinall list of fishes, probably because of the imperfect manner in which its fauna has been explored. At present we have positive knowledge of the occurrence of only two Chondropterygians, viz., Chimera and Raia; the species of the latter genus seem to be much less numerous than in the Atlantic. Of Acanthopterygians 15 genera are known. Labroids are absent ; they are clearly a type unable to endure great cold ; of the Embiotocoids which represent them in the Pacific, one species only (a species of Ditrema) is known from this district.

The Gadoids are, so far as we know at present, sparsely repre- sented, viz., by isolated species of Gadus, Motella, and Lotella, the last being an inhabitant of moderate depths rather than of the surface. Htppoglossus, Plewronectes, and Parophrys seem to occur everywhere in suitable localities.

The Physostomes are nearly the same as in the British district, viz., a smelt ({ypomesus), probably also the arctic Mallotus, an anchovy, several species of Clupea, and the conger-eel. A very singular Salmonoid fish, Salanx, which is limited to the north- western Pacific, occurs in great abundance. The Lophobranchs also correspond in their development to those of the British distriet, Nerophis being replaced by Urocampus. Neither Myxinoids nor Branehiostoma have as yet been found.

2. The Japanese district is, like the Mediterranean, distinguished by a great variety of forms. Of 102 genera known to inhabit these coasts, 18 are peculiar to it, 58 occur in the Mediterranean, though also in other districts. This resemblance to the Mediterranean is even greater than would appear from a comparison of the genera, inasmuch as a considerable number of species are identical in both districts. Three of the Berycoid genera have hitherto been found in the Japanese and Mediterranean districts and nowhere else. Another very singular fact is that some of the most characteristic

enera, like Mullus, Zeus, Callionymus, Centriscus, inhabit the

fediterranean and Japanese districts, but have never reached the op- posite Amcrican coasts, either in the Atlantic or the Paeific; although, at least in

the latter, the oceanic currents would rather favour than obstruct their dispersal in the direction of America. Bold as the hypothesis may appear, we can only account for the singular dis- tribution of these shore fishes by assuming that the Mediterranean and Japanese seas were in direct and open communication with each other within the period of the existence of the present Teleosteous fauna.

Gadoids have disappeared, or are represented by forms inhabiting moderate depths. Neithcr Ifyxine nor Branehiostoma are as yet known to have becn found.

3. The Californian district ineludes a marked northern element, the principal constituents of which are identical with types occurring in the corresponding district of the Atlantic, viz., the North American, as exemplified by Discoboli, Anarrhichas, Centronotus, Cottus, Hippoglossus, Clnpea (harengus), &c. But it possesses also, in the greatest degree of development, some types almost peculiar to itself, as the Heterolepidina, some remarkable Cottoid and Blennioid genera, and more especially the Embiotocoids—viviparous Pharyngognaths—which replace the Labroids of the other hemi-

sphere. Gadoids are much less numerous than inthe North Ameri- can district.

Indian forms will be found to have entered this district from the south.

EquaroriaL Zonze.—As we approach the tropic from the north, the types characteristic of the arctic and tem-

perate zones become rarer, and disappear altogether, to be replaced by the greater variety of tropical types.

Chondropterygians, the Chimeride, Spinacide, Austelus,

and Raia do not pass the tropic, or appear in single species only; and of Teleosteans, the Berycide, Pagrus, the Letero-

lepidina, Cottus and allied genera, Lophius, Anarrhichas, Sticheus, Lepadogaster, thus, the Labride and Embiotocide, the Lycodide, Gadule,

and marine Salmonide either entirely disappear, or retire

from the shores and surface into the depths of the ocean.

With regard to variety of forms, as well as to number of individuals, this zone far surpasses either of the temperate zones ; in this respect, the life in the sea is like that on the

land. Shore fishes are not confined to the actual coast line, but abound on the coral reefs with which some parts of the

Atlantic and Pacific are studded, and many of which are below the surface of the water. The abundance of animal and vegetable life which flourishes on these renders them the

favourite pasture grounds for the endless valiety of coral- fishes (Squamipinnes, Acronuride, Pomacentride, Julide,

Plectognathi, &c.) and for the larger predatory kinds. The

colours and grotesque forms of the fishes of the tropics justly excited the admiration of the earliest observers. Scarlet, black, blue, pink, red, yellow, &ec.,

anything that art can produce.

Their various forms, also, contributed to increase transport."

Of Chondropterygians the Seyllvidle, Pristis (saw-fishes), Rhinobatide, and Trygonide attain to the greatest develop- ment. Of Acanthopterygians Centropristis, Serranus, Plectropoma, Mesoprion, Priacanthus, A pogon, Pristipoma, Hemulon, Diagramma, Gerres, Scolopsis, Synagris, Cesto, Mullide, Lethrinus, Squamipinnes, Cirrhites, some genera of Scorpenide, Platycephalus, Scienide, Sphyrena, Caranx, Equula, Callionymus, Teuthis, Acanthurus, Na- seus, are represented by numerous species , and the majority of these genera and families are limited to this zone. Of

Pharyngognaths the Pomacentride, Julidina, and Scarina are met with near every coral formation in a living con- dition. Of Gadoids, a singular minute form, Bregmaceros, is almost the only representative, the other forms belonging to deep water, and rarely ascending to the surface. Flat- fishes (Pleuronectide) are common on saudy coasts, and the majority of the genera are peculiar to the tropics. Of Physostomi only the Saurina, Clupeide, and Murenide are represented, the Clupeide being exceedingly numerous in individuals, whilst the Muraenide live more isolated, but show a still greater variety of species Lophobranchii and Sclerodermi are generally distributed Branchiostoma has been found on several coasts.

Geographically it is convenient to describe the coast fauna of the tropical Atlantic separately from that of the Indo-Pacific Ocean. The differences between them, how- ever, are far less numerous and important than between the

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The southern forms are but little known, but it may be anticipated that, owing to the partial identity of the faune of the two coasts of the isthmus of Panama, a fair proportion of West

Of

Psychrolutes, Centriscus, Notacan-

are arranged in patterns of the most bizarre fashion, mingling in spots, lines, or bands, and reminding us of the words of Captain Cook when describing the coral-reefs of Palmerston Island: “The glowing appearance of the mollusks was still inferior to that of the multitude of fishes that glided gently along, seemingly with the most perfect security. The colours of the different sorts were the most beautiful that can be imagined—the yellow, blue, red, black, &c., far exceeding

the richness of this submarine grotto, which could not be surveyed without a pleasing

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freshwater or terrestrial faunce of continental regions. The majority of the principal types are found in both, many of the species being even identical ; but the species are far more abundant in the Indo-Pacific than in the Atlantic, owing to the greater extent of the archipelagoes in the former. But for the broken and varied character of the coasts of the West Indies, the shores of the tropical Atlantic would, by their general uniformity, afford but a limited variety of conditions for the development of specific and generic forms, whereas the deep inlets of the Indian Ocean, with the varying configuration of their coasts and the different nature of the bottom, its long peninsulas, and its archipelagoes, and the scattered islands of the tropical Pacific, render this part of the globe the most per- fect for the development of fish life. The fishes of the Indian and Pacific Oceans (between the tropics) are almost identical, and the number of species ranging from the Red Sea and the east coast of Africa to Polynesia, even to its most westerly islands, is very great indeed. This Indo-Pacific fauna, however, does not reach the Pacific coast of South America. The wide space devoid of islands east of the Sandwich Islands and the Marquesas group, together with the current of cold water which sweeps northwards along the South American coast, has proved to be a very effectual barrier to the castward extension of the Indo-Pacific fauna of coast fishes; and, consequently, we find an assemblage of fishes on the American coast and at the Galapagos Islands, sufficiently marked to constitute a distinct zoologi- cal division.

Tropical Atlantic.—The boundaries of the tropical Atlantic extend zoologically a few degrees beyond the northern and southern tropics, but, as the mixture with the types of the temperate zone is very gradual, no distinct boundary line can be drawn between the tropical and tem- perate faunv.

Types almost exclusively limited to it and not found in the Indo-Pacific are few in number, as Centropristis, Rhypticus, Heemulon, Malthe. A few others preponderate with regard to the, number of species, as Plectropoma, Sargus, Trachynotus, Batrachide, and Gobiesocide. The Scisenoids are equally represented in both oceans. All the remainder are found in both, but are in a minority in the Atlantic, where they are sometimes represented by one or two species only (for instance, Lethrinus).

Tropical Indo-Pacific Ocean.—The ichthyological boun- daries of this part of the tropical zone may be approxi- mately given at 30° N. and 8. lat. ; on the Australian coasts it should probably be placed still farther south, viz., at 34°; it includes, as mentioned above, the Sandwich Islands, and all the islands of the South Sea, but not the American coasts.

Some eighty genera of shore fishes are peculiar to the Indo-Pacific, but the greater number consist of one or a few species only ; comparatively few havea plurality of species, as Diagramma, Lethrinus, Hquula, Teuthis, Amphiprion, Dascyllus, Cheerops, Chilinus, Anampses, Stethojulis, Cores, Coilta.

The sea-perches, large and small, which feed on crusta- ceans and on other small fishes, and the coral-feeding Pharyn- gognaths, are the types which show the greatest generic and specific variety in the Indo-Pacific. Then follow the Squamipinnes and Murcenide, the Clupeide and Caran- gide,—families in which the variety is more that of species than of genus. The Scorpende, Pleuronectide,

Pacifie Coasts of Tropical America.—As boundaries

within which this fauna is comprised may be indicated 30° N. and 8. lat., as in the Indo-Pacific. Its distinction from the Indo-Pacific lies in the almost entire absence of coral- feeding fishes. There are scarcely any Squamipinnes, Pharyngognaths, or Acronuridw, and the Teuthyes are entirely absent. The genera that remain are such as are found in the tropical zone generally, but the species ate entirely different from those of the Indo-Pacific. They are mixed with a sprinkling of peculiar genera, consisting of one or two species, like Discopyge, Hoplopagrus, Doy- dixodon, hut they are too few in number to give a strik- ingly peculiar character to this fauna.

Three districts are distinguishable, viz., the Central American, the Galapagos, and Peruvian. We add a few remarks on the first only.1 That district shows so close an affinity to the Tropical Atlantic that, if the two were not separated by the neck of land uniting North and South America, they would most assuredly be regarded as em- bracing a single fauna. With

scarcely any exceptions the genera are identical, and of the species found on the Pacific side nearly one-half have proved to be the same as those of the Atlantic. The explanation of this fact has been found in the existence of communications between the two oceans by channels and straits which must have been open till within a recent period. The isthmus of Central America was then partially submerged, and appeared as a chain of islands similar to that of the Antilles; but as the reef-building corals flourished chiefly north and east of those islands, and were absent to tle south and west of them, reef fishes were excluded from the Pacific shores when the communications were destroyed by the upheaval of the land.

SourHern TEMPERATE Zong.—This zone includes the coasts of the southern extremity of Africa from about 30° S. lat., of the south of Australia, with Tasmania, and of New Zealand, and the Pacific and Atlantic coasts of South America between 30° and 50° S. lat.

The most striking character of this fauna is the reappear- ance of types inhabiting the corresponding latitudes of the northern hemisphere, and not found in the intervening tropical zone. 'This interruption of the continuity in the geographical distribution of shore fishes is exemplified by species as well as genera, for instance—Chime@ra monstrosa, Galeus canis, Acanthias vulgaris, Acanthias blainvillit, Rhina squatina, Zeus faber, Lophius piscatorius, Centriscus scolopax, Engraulis encrasicholus, Clupea sprattus, Conger vulgaris. Instances of genera are still more numerous :—Cestracion, Spinax, Pristiophorus, Raia; Callanthias, Polyprion, Histiopterus, Cantharus, Box, Girella, Pa- gellus, Chilodactylus, Sebastes, Aploactis, Agonus, Lepidopus, Cyttus, Psychrolutide, Notacanthus ; Lycodes, Merluccius, Lotella, Phycis, Motella; Aulopus; Urocampus, Soleno- ynathus ; Myxine.

Naturally, where the coasts of the tropical zone are con- tinuous with those of the temperate, a number of tropical genera enter the latter, and genera which we have found between the tropics, as well as in the temperate zone of the northern hemisphere, extend in a similar manner towards the south. But the truly tropical forms are absent ; there are no Squamipinnes, scarcely any Mfullide, no Acronurs, no Teuthyes, no Pomacentride (with a single exception on the coast of Chili), only one genus of Julidina, no

Scarina, which are replaced by another group of Pharyn- gognaths, the Odacina. The Labrina, so characteristic of the temperate zone of the northern hemisphere, reappear In a distinct genus (Malacopterus) on the coast of Juan Fer- nandez. ;

The family of Berycide, equally interesting with regard

1 For the others the reader is referred to Giinther's Introduction to the Study of Fishes, p. 280.

to their distribution in time and in space, consists of tem- perate and tropical genera. The genus by which this family is represented in the southern temperate zone (Lrachichthys) is much more nearly allied to the northern than to the tropical genera.

The true Cottina and Heterolepidina (forms with a bony stay of the prwoperculum, which is generally armed) have not crossed the tropical zone ; they are replaced by fishes ex- tremely similar in general form, and having the same habits, but lacking that osteological peculiarity. Their southern analogues belong chiefly to the family 7rachinide, and are types of genera peculiar to the southern hemisphere,

The Discodoli of the northern hemisphere likewise have not penetrated to the south, where they are represented by Gobiesocide. These two families replace each other in their distribution over the globe.

Nearly all the Plewronectide (but they are not numer- ous) belong to distinct genera, some, however, being

remarkably similar in general form to the northern Pleuro- nectes.

With Gadoids Myzxinide reappear, one species being extremely similar to the European Mywine. Bdellostoma is @ genus peculiar to the southern temperate zone.

As in the northern temperate zone, so in the southern the number of individuals and the variety of forms is much less than between the tropics. 'This is especially apparent on comparing the numbers of species constituting a genus. In this zone genera composed of more than ten species are the exception, the majority having only from one to five.

The proportion of genera limited to this zone is very high, about 65 out of a total number of 170 being peculiar to it.

1. The Cape of Good Hope district. Many of the genera found in this district are northern forms (Chimera, Galeus, Seyllium, Acanthias, Torpedo, Raia, Dentex, Cantharus, Box, Sagrus, Pagrus, Pagellus, Chrysophrys; Scbastes, Sphyrena Lepidopus, Thyrsites; Zeus; Lophius; Motella), which in con- junction with the peculiarly southern types (Callorhynchus, Chilo- dactylus, Agriopus, Clinus, Genypterus, Bdellostoma) leave no doubt that this district belongs to the southern temperate zone, whilst the freshwater fishes of South Africa are members of the tropical fauna. Only a few (Rhinobatus, Narcine, Astrape, and Sphyrena) have entered from the neighbouring tropical coasts. The development of Sparoids is greater than in any of the other districts of this zone, and may be regarded as one of its distinguishing features.

2. The South Australian district compriscs the southern coasts of Australia (northwards to about the latitude of Sydney), Tasmania, and New Zealand. It is the richest in the southern temperate zone, partly in consequence. of a considerable influx of tropical forms on the eastern coast of Australia, where they pene- trate farther southwards than would be expected from rey geographical considerations, partly in consequence of the thoroug manner in which the ichthyology of New South Wales and New Zealand has been explored. Of the 120 genera hitherto found in this district 42 are peculiar.-

The shore fishes of New Zealand are not so distinct from those of south-eastern Australia as to deserve to be placed in a separate dis- trict. With the exception of the genera which cnter this zone from the tropics, and 'sich are more numerous on the Australian coast than on that of New Zealand, and a few very local genera in addition, the remainder are identical. Many of the South Australian species, too, are found also on the coasts of New Zealand. The principal points of difference are the extraordinary development of

Mon- acanthus on the coast of South Australia, and the a total absence in Australia of Gadoids, which in the New Zealand fauna are represented by 6 genera. ;

3. The Chilian district extends over 20 degrees of latitude ee) and is nearly straight. In its northern and warmer parts it is of a very uniform character; it is there exposed to high and irregular tides, and to remarkable and sudden changes in the levels of land and water, which must seriously interfere with fishes living and pro- pagating near the shore. No river of considerable size interrupts the monotony of the physical' conditions, to offer an additional element in favour of the development of littoral animals. In the southern parts, where the coast is lined with archipelagoes, the climate is too severe for most fishes. All these conditions combine to render this district comparatively poor as regards variety of shore fishes ; they belong to 45 genera, of which 6 only are not found iit

other districts of this zonc. Three are peculiar, viz., AMcndosoma, Myzxodes, and Malacopterus ; Porichthys and Agonus have penetrated thus far southwards from the Peruvian and Californian districts ; and Polyprion is one of those extraordinary instances in which a very specialized form oceurs at almost opposite points of the globe, without having left a trace of its previous existence in, or of its passage through, the intermediate space.

4. Our knowledge of the fauna of the Patagonian district is, with the exception of the neighbourhood of the mouth of the Rio de la Plata, in too fragmentary a state to deserve further notice here.

Antarctic Ocran.—To this fauna we refer the shore fishes of the southernmost extremity of South America, from 50° §. lat., with Tierra del Fuego and the Falkland Islands, and those of Kerguelen's Land, with Prince Edward's Island. No fishes are known from the other oceanic islands of these latitudes.

In the southern hemisphere surface fishes do not ex- tend so far towards the pole as in the northern; none are known beyond 60° $. lat., and the Antarctic fauna which is analogous to the Arctic inhabits coasts more than

ten degrees nearer to the equator. It is very probable that the shores between 60° and the Antarctic Circle are inhabited by fishes sufficieatly numerous to supply part of the means of subsistence for the large seals which there pass at least some portion of the year, but hitherto none have been obtained by naturalists ; all that the present state of our knowledge justifies us in saying is, that the general char- acter of the fauna of Magellan's Straits and Kerguelen's Land is extremely similar to that of Iceland and Greenland.

As in the Arctic fauna, Chondropterygians are rare, and are represented by Acanthias vulgaris and species of Rava. Holocephali have not yet been found so far south, but Callorhynchus, which is not uncommon near the northern boundary of this fauna, may prove to extend into it.

As to Acanthopterygians, Cataphracti and Scorpamde are represented as in the Arctic fauna, two of the genera (Sebastes and Agonus) being identical. The Cottide are replaced by six genera of Trachimde, remarkably similar in form to Arctic types; but Déscobol' and the characteristic Arctic Blennioids are absent.

Gadoid fishes reappear, but are less developed ; as usual they are accompanied by Mya«ine. The reappearance of so specialized a genus as Lycodes is most remarkable. Flat- fishes are few as in the north, and belong to peculiar genera.

Physostomes are probably not entirely absent, but hitherto none have been met with so far south. Lopho- branchs are rare, as in the Arctic zone ; it is noteworthy, however, that a peculiar genus, with persistent embryonic characters (Protocampus), is rather common on the shores of the Falkland Islands.

Pelagic Fishes.

Pelagic fishes,—that is, fishes inhabiting the surface of mid-ocean, — belong to various orders, viz., Chondropter- ygians, Acanthopterygians, Physostomes, Lophobranchs, and Plectognaths. Neither Anacanths nor Pharyngognaths con- tribute to this series of the marine fauna. The following genera and families are included in it :—

Chondropterygii.—Carcharias, Galeocerdo, Thalasso- rhinus, Zygena, Trienodon, Lamnide, Rhinodon, Notida- nide, Lemargus, Euprotomicrus, Hchinorhinus, Isistius ; Myliobatidee.

Acanthopterygii.—Dactylopterus, Micropteryx, Scom- brina, Gastrochisma, Nomeus, Centrolophus, Coryphenina, Seriola, 'Temnodon, Naucrates, Psenes, Xiphiidw, Anten- narius.

Physostomi.—Sternoptychide, Scopelus, Astronesthes, Scombresocide (majority).

Lophobranchit.— Hippocampus.

' Plectognathi.—Orthagoriscus, and some other Gymno- onts,

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Pelagic fishes differ much from one another in their

mode of life. The majority are excellent swimmers, which not only can move with great rapidity, but are also possessed of great powers of endurance, and are thus enabled to con-

tinue their course for weeks, apparently without the neces- sity of rest ; such are many sharks, scombroids, dolphins, pilot-fish, sword-fishes. In some, as in Dactylopterus and Exoccetus, the ability to take flying leaps out of the water is superadded to the power of swimming (flying-fishes). But in others the power of swimming is greatly reduced, as in Antennarius, Hippocampus, and Gymnodonts ; they frequent places in the ocean covered with floating seaweed, or drift on the surface without resistance, at the mercy of wind and current. The Zcheneis or sucking-fishes attach themselves to other large fishes, ships, or floating objects, and allow themselves to be carried about, unless change of climate or want of food obliges them to abandon their temporary carrier. Finally, another class of pelagic fishes come to the surface of the ocean during the night only ; in the day time they descend to some depth, where they are undisturbed by the

rays of the sun or the agitation of the surface-water; such are Brama, the Sternoptychide, Scopelus, Astronesthes,—fishes the majority of which are provided with those extraordinary visual organs that we find so much developed in the true deep-sea fishes. Indeed, this last kind of pelagic fishes constitutes a connecting link with the deep-sea forms.

Pelagic fishes, like shore fishes, are most numerous in

the tropical zone ; and, with few exceptions (Echinorhinus, Psenes, Sternoptychide, Astronesthes), the same genera are represented in the tropical Atlantic as well as in the Indo-Pacific. The number of identical species occurring in both these oceans is great, and probably still greater than would appear from systematic lists, in which there are retained many specific names that were given at a time when species were believed to have a very limited range. The pelagic fauna of the tropics gradually passes into that of the temperate zones, only a few genera, like Cybium, Psenes, Antennarius, being almost entirely confined to the tropics. All the other tropical genera range into the temperate zones, but their representatives become fewer with the increasing distance from the equator. North of 40° N. lat. many genera have disappeared, or are met with in isolated examples only, as Carcharias, Zygeena, Notidanus, Myliobatide, Dactylopterus, Echeneis, Nomeus, Coryphoena, Schedophilus, Seriola, Temnodon, Antennarius, Sternoptychide, Astronesthes, Lxocoetus, Tetrodon, Diodon 3 and only one genus of sharks, Galeocerdo, approaches the Arctic Circle. Some few species, like Antennarvus, Scopelus, are carried by currents near to the farther confines of the temperate zones ; but such occurrences are accidental, and these fishes must be regarded as entirely foreign to the fauna of those latitudes. On the other hand, some pelagic fishes inhabit the temperate zones, whilst their occurrence within the tropics is very problematical; thus, in the Atlantic, Thalassorhinus, Selache, Leemargus, Centrolophus, Diana, Ausonia, Lampris (all genera composed of one or two species only). Besides the shark mentioned, no other pelagic fishes are known from the Arctic Ocean. We possess very little information about the pelagic fish- fauna of the southern oceans. This much only is certain, that the tropical forms gradually disappear ; but it would be hazardous, in the present state of our knowledge, to state even approximately the limits of the southward range of a single genus. Scarcely more is known about the

appearance of types peculiar to the southern temperate zone,—tfor instance, the gigantic shark Rhinodon repre- senting the northern Selache, near the coasts of South Africa, and the Scombroid genus Gastrochisma, in the South Pacific.

MARINE FISHES. |

The largest of marine fishes, Rhinodon, Selache, Car- charodon, Myliobatidee, Thynnus, Xiphiide, Orthagoriscus, belong to the pelagic fauna. Young fishes are frequently found in mid-ocean, which are the offspring of shore fishes normally depositing their spawn near the coast. The manner in which this fry passes into the open sea is unknown; for it has not yet been ascertained whether it is carried by currents from the place where it was deposited originally, or whether shore fishes sometimes spawn at a distance from the coast. We may remember that shore fishes inhabit not only coasts but also submerged banks with some depth of water above, and that, by the action of the water, spawn deposited on these latter localities is very liable to be dispersed over wide areas of the ocean. Embryos of at least some shore fishes hatched under abnormal conditions seem to have an abnormal growth up to a certain period of their life, when they perish. The Leptocephali must be regarded as such abnormally developed forms. Fishes of a similar condition are the so-called pelagic Plagusie, young Pleuronectoids, the origin of which is still unknown. As already mentioned, flat-fishes, like all the other Anacanths, are not otherwise represented in the pelagic fauna.

Deep-Sea Fishes.

The knowledge of the existence of deep-sea fishes is one of the recent discoveries of ichthyology. It was only about twenty years ago that, from the evidence afforded by the anatomical structure of a few singular fishes obtained in the North Atlantic, an opinion was expressed that these fishes inhabited great depths of the ocean, and that their organization was specially adapted for living under the physical abyssal conditions. These fishes agreed in the character of their connective tissue, which was so extremely weak as to yield to, and to break under, the slightest pressure, so that the greatest difficulty was experienced in preserving their body in its continuity. Another singular circumstance was that some of the examples

were picked up floating on the surface of the water, having met their death whilst engaged in swallowing or digesting other fishes not much smaller in size if not actually larger than themselves.

The first peculiarity was accounted for by the fact that, if those fishes really inhabited the great depths supposed, their removal from the enormous pressure under which they lived would be accompanied by such an expansion of gases within their tissues as to rupture them, and to cause a separation of the parts which had been held together by the pressure. The second circumstance was explained thus. A raptorial fish organized to live at a depth of between 500 and 800 fathoms seizes another usually inhabiting a depth of between 300 and 500 fathoms. In its struggles to escape, the fish seized, being nearly as large or strong as the attacking fish, carries the latter out of its depth into a higher stratum, where the diminished pressure causes such an expansion of gases as to make the destroyer with its victim rise with increasing rapidity towards the surface, which they reach dead or ina dying condition. Specimens in this state are not rarely picked up; and as, of course, it is but comparatively few that can by accident fall into the hands of naturalists, occurrences of this kind must happen very often.

The existence of fishes peculiarly adapted for the deep sea has thus been a fact maintained and admitted for some time in ichthyology ; and as the same genera and species were found at very distant parts of the ocean, it was further stated that those deep-sea fishes were not limited in their range, and that, consequently, the physical conditions of the depths of the ocean must be the same or nearly the same ever the whole globe. That deep-sea fishes were not

of a peculiar order, but chiefly modified forms of surface types, was another conclusion arrived at from the sporadic evidence collected during the period which preceded sys- tematic deep-sea dredging.

Nothing, however, was positively known as to the exact depths inhabited by those fishes until observations were made during the voyage of H.M.S. "Challenger." The results obtained by this expedition afforded a surer and more extended basis for our knowledge of deep-sea fishes.

The physical conditions of the deep sea, which must affect the organization and distribution of fishes, are the follow- ing :—

1. Absence of sunlight. Probably the rays of the sun do not penetrate to, and certainly do not extend beyond, a depth of 200 fathoms, therefore we may consider this to be the depth where the deep-sea fauna commences. Absence of light is, of necessity, accompanied by modifications of the organs of vision and by simplification of colours.

2, The absence of sunlight is in some measure compen- sated by the presence of phosphorescent light, produced by many marine animals, and also by numerous deep-sea fishes.

3. Depression and equality of the temperature. At a depth of 500 fathoms the temperature of the water is already as low as 40° Fahr., and perfectly independent of the temperature of the surface-water ; and from the greatest depth to about 1000 fathoms beneath the surface the tem- perature is uniformly but a few degrees above the freezing point. Temperature, therefore, ceases to offer an obstacle to the unlimited dispersal of the deep-sea fishes.

4, The increase of pressure by the water. The pressure of the atmosphere on the body of an animal at the level of the:sea is 15 Ib per square inch of surface ; but under water the pressure amounts to a ton weight for every 1000 fathoms of depth.

5, With the sunlight, vegetable life ceases in the depths of thesea. All deep-sea fishes are therefore carnivorous,— the most voracious feeding frequently on their own offspring, and the toothless kinds being nourished by the animalecules which live on the bottom, or which, "like a constant rain," settle down from the upper strata towards the bottom of the sca.

6. The perfect quiet of the water at great depths. The agitation of the water caused by the disturbances of the air does not extend beyond the depth of afew fathoms; below this surface-stratum there is no movement except the quiet flow of ocean-currents, and near the bottom of the deep sea the water is probably in a state of almost entire quiescence.

The effect upon fishes of the physical conditions described is clearly testified by the modification of one or more parts of their organization, so that every deep-sea fish may be recognized as such without the accompanying positive evidence that it has been caught at a great depth ; and, wce versa, fishes reputed to have been obtained at a great depth, and not having any of the characteristics of the dwellers of the deep sea, must be regarded as surface fishes.

The most striking characteristic found in many deep-sea fishes is in relation to the tremendous pressure under which they live. Their osseous and muscular systems are, as compared with the same parts of surface fishes, very feebly developed. The bones have a fibrous, fissured, and cavern- ous texture; they are light, with scarcely any calcareous matter, so that the point of a needle will readily penetrate thern without breaking. The bones, especially the vertebra, appear to be very loosely connected with one another ; and it requires the most careful handling to avoid the break- ing of the connective ligaments, The muscles, especially the great lateral muscles of the trunk and tail, are thin, the fascicles being readily separated from one another or torn, and the connective tissue being extremely loose, feeble, or

apparently absent. This peculiarity has been observed in the Trachypteride, Plagyodus, Ohiasmodus, Melanocetus, Saccopharynx. But we cannot assume that it actually obtains whilst those fishes exist under their natural con- ditions. Some of them are most rapacious creatures, which must be able to execute rapid and powerful movements to catch and overpower their prey; and for that object their muscular system, thin as its layers may be, must be as firm, and the chain of the segments of their vertebral column as firmly linked together as in surface fishes. It is evident, therefore, that the change which the body of those fishes has undergone on their withdrawal

from the pressure under which they live is a much aggravated form of the affection that is experienced by persons reaching great altitudes in their ascent of a mountain or in aballoon. In every living organism with an intestinal tract there are accuinulations of free gases; and, moreover, the blood and other fluids, which penetrate every part of the body, contain gases in solution. Under greatly diminished pressure these gases expand, so that, if the withdrawal from a depth is not an extremely slow and gradual process, the various tissues must be distended, loosened, ruptured ; and what is a vigorous fish at a depth of 500 fathoms or more appears at the surface as a lvosely-jointed body which, if the skin is not of sufficient toughness, can only be kept together with difficulty. At great depths a fibrous osseous structure and a thin layer of muscles suffice to obtain the same results for which, at the surface, thickness of muscle and firm osseous or cartilaginous tissue are necessary.

The muciferous system of many deep-sea fishes is de- veloped in an extraordinary degree. We find in fishes which are comparatively little removed from the surface (that is, to depths of from 100 to 200 fathoms) the lateral line much wider than in their congeners or nearest allies which live on the surface, as in Zrachichthys, Hoplostethus, many Scorpenide. But in fishes inhabiting depths of 1000 fathoms and more the whole muciferous system is dilated ; it is especially the surface of the skull which is occupied by large cavities (Macruride, deep-sea Ophidiide), and the whole body seems to be covered with a layer of mucus. These cavities collapse and shrink in specimens which have been preserved in spirit for some time, but a brief re- immersion in water generally suffices to show the immense quantity of mucus secreted by them. The physiological use of this secretion is unknown; it has been observed to have phosphorescent properties in perfectly fresh specimens.

The colours of deep-sea fishes are extremely simple, their bodies being either black or silvery; in a few only are some filaments or the fin-rays of a bright scarlet colour. Among the black forms albinoes are not rare.

The organ of sight is the first to be affected by a sojourn in deep water. Even in fishes which habitually live at a depth of only 80 fathoms, we fiud the eye of a propor- tionally larger size than in their representatives at the

surface. In such fishes the eyes increase in size with the depth inhabited by them, down to the depth of 200 fathoms, the large organs being necessary to collect as many rays of light as possible. Beyond that depth small-eyed as well as large-eyed fishes occur, the former having their want of vision compensated by tentacular organs of touch, whilst the latter have no such accessory organs, and evidently see only by the aid of phosphorescence. In the greatest depths blind fishes occur, with rudimentary eyes and without special organs of touch,

Many fishes of the deep sea are provided with more or less. numerous, round, shining, mother-of-pearl-coloured bodies, imbedded in the skin. These so-called phosphores- cent or luminous organs are either larger bodies of an oval or irregularly elliptical shape placed on the head, in the

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vicinity of the eye, or smaller round globular bodies arranged symmetrically in series along the side of the body and tail, especially near the abdominal profile, less frequently along the back. The former kind of organs possess in the interior a lenticular body, like the lens of an eye, and are considered by some naturalists true organs of vision (accessory eyes), the function of the latter, which have a glandular structure, being left unexplained by them.

There is no doubt that the functions of these organs have some relation to the peculiar conditions of light under which the fishes provided with them live, these fishes being either deep-sea forms or nocturnal pelagic kinds. And itis highly probable that all produce and emit phosphorescent light, enabling the fishes to see in the darkness of the night or of the depths of the sea.

Whenever we find in a fish long delicate filaments de- veloped in connexion with the fins or the extremity of the tail, we may conclude that it is an inhabitant of still water and of quiet habits. Many deep-sea fishes (Z'rachypteride, Macruride, Ophidiide, Bathypterois) are provided with

such filamentous prolongations, the development of which is

perfectly in accordance with their sojourn in the absolutely quiet waters of abyssal depths.

Some of the raptatorial deep-sea fishes have a stomach so distensible and capacious that it can receive a fish of twice or thrice the bulk of the destroyer (Melanocetus, Chiasmodus, Saccopharyna). Deglutition is performed in them, not by means of the muscles of the pharynx, as in other fishes, but by the independent and alternate action of the jaws, as in snakes, These fishes cannot be said to swallow their food ; they rather draw themselves over their victim, after the fashion of an Actinia.

Before the voyage of H.M.S. "Challenger," scarcely thirty deep-sea fishes were known. This number is now much increased, six times as many new species and genera having been discovered. Modifications of certain organs, perfectly novel, and of the greatest interest, were found ; but, singularly, no new types of families were discovered, —nothing but what might have been expected from our previous knowledge of this group of fishes.

The fish fauna of the deep sea is chiefly composed of forms or modifications of forms which we find represented at the surface in the cold and temperate zones, or which belong to the class of nocturnal pelagic fishes. The Chondropterygians are few in number, not descending to a greater depth than 600 fathoms. The Acanthopterygians, which form the majority of the coast and surface faunas, are also scantily represented; genera identical with surface types are confined to the same inconsiderable depth as the Chondropterygians, whilst those Acanthopterygians which are so much specialized for a life in the deep sea as to deserve generic separation range from 200 to 2400 fathoms. Three distinct families of Acanthopterygians belong to the deep-sea fauna, viz, Z'rachypteride, Lophotide, and Notacanthide ; they consist of three, one, and two genera respectively.

Gadide, Ophidiide, and Macruride are very numerous, ranging through all depths; they constitute about one- fourth of the whole deep-sea fauna.

Of Physostomi, the families of Sternoptychide, Scopelide, Stomiatide, Salmonide, Bathythrisside, Alepocephalide, Halosauride, and Murenide are represented. Of these the Scopeloids are the most numerous, constituting nearly another fourth of the fauna. Salmonide are only repre- sented by three small genera. Bathythrisside include one species only, which is probably confined in its vertical as well as its horizontal range ; it occurs at a depth of about 350 fathoms in the seaof Japan. The Alepocephalide and Halosauride, known before the "Challenger" expedition from isolated examples only, prove to be true, widely-

spread, deep-sea types. Eels are well represented, and seem to descend to the greatest depths. d/yxine has been ob tained from a depth of 345 fathoms.
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The greatest depth hitherto reached by a dredge in which fishes were enclosed is 2900 fathoms. But the specimens thus obtained belong to a species (Gonostoma microdon) which seems to be extremely abundant in upper strata of the Atlantic and Pacific, and were therefore most likely caught by the dredge in its ascent. The next greatest depth, viz., 2750 fathoms, must be accepted as one at which fishes do undoubtedly live,—the fish obtained from this depth of the Atlantic, Bathyophis ferox, showing by its whole habit that it is a form living on the bottom of the ocean.

CLASSIFICATION.

The class of fishes is divided into four subclasses :-—

I. Palwichthyes.—Heart with a contractile conus arte- riosus; intestine with a spiral valve; optic nerves non- decussating, or only partially decussating.

II. Zeleostet.—Heart with a non-contractile bulbus arteriosus; intestine without spiral valve; optic nerves decussating. Skeleton ossified, with completely separated vertebree.

III. Cyclostomata.—Heart without bulbus arteriosus ; intestine simple. Skeleton cartilaginous and notochordal. One nasal aperture only. No jaws;

mouth surrounded by a circular lip.

IV. Leptocardii.—Heart replaced by pulsating sinuses : intestine simple. Skeleton membrano-cartilaginous and notochordal. No brain; no skull.

Subclass J.—Palwichthyes.

This subclass comprises the sharks and rays and the Ganoid fishes. Though it is based upon a singular con- currence of most important characters, its members exhibit as great a diversity of form, and as manifold modifications

in the remainder of their organization, as the Z'eleostet. The

Paleichthyes stand to the Zeleostei in the same relation as the Marsupials to the Placentalia. Geologically, as a sub- class, they were the predecessors of Teleosteous fishes ; and it is a remarkable fact that all those modifications which show an approach of the ichthyic type to the Batrachians are found in this subclass. It is divided into two orders, —the Chondropterygit and the Ganouder.

Orver I.—Chondropterygtt.

Skeleton cartilaginous. Body with medial and paired fins, the hinder pair abdominal. Vertebral column generally heterocercal, the upper lobe of the caudal fin produced. Gills attaehed to the skin by the outer margin, with several intervening gill-openings ; rarely one external gill-opening only. No gill-cover. No air- bladder. Two, three, or more series of valves in the conus arteriosus. Ova large and few in number, impregnated and, in some species, developed within a utcrine cavity. Embryo with deciduous external gills. Males with intromittent organs attached to the ventral fins.

This order, for which, also, the name Hlasmobranchit has been roposed (by Bonapartc), comprises the sharks, rays, and chimeras. t isdivided into two suborders,—Plagtostemata and Holoeephaln.

Susorver I. Plagtostomata.—From five to seven gill-openings. Skull with a suspensorium and the palatal apparatus detached. Teeth numerous.

The Plagiostomes differ greatly from each other with regard to the general form of the body. In the sharks, or Selachoidet, the body is elongate, more or less cylindrical, gradually passing Into the tail; the gill-openings are lateral. In the rays, or Batotdet, the gill-openings are always placed on the abdominal aspect of the fish ; the body is depressed, and the trunk, which is surrounded by the immensely developed pectoral fins, forms a broad flat disk, of which the tail appears as a thin and slender appendage. Spiracles are always present ; the number of gill-openings is constantly five ; there is no anal fin ; the dorsal fins, if present, are situated on the tail. Some of the rays, however, approach the sharks in having the caudal apetion less abruptly contracted behind the trunk.

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Fossil Plagiostomes are very numoroug in all formations. Some

of the earliest determinable fish remains aré, or are believed to be, derived from Plagiostomes. Those which can be referred to any of the familics specified below will be mentioned in due course; but there are others, especially fin-spines, which leave us in doubt to which group of Plagiostomes their owners had affinity: as Onehus, from the Upper Silurian, continuing to Carboniferous formations ; Dimerucanthus, Homacanthus, from the Devonian; Oraeanthus, Gyracanthus, Tristyehius, Astroptychius, Ptychacanthus, Sphena- eanthus, &c., from Carboniferous formations; Leptacanthus, from the Coal to the Oolite ; Cladacanthus, Cricacanthus, Gyropristis, anil Lepracanthus, from the Coal-measures ; Nemacanthus, Liacanthus, from the Trias ; Astracanthus, Myriacanthus, Pristacanthus from the Jurassic group.

A. Selachoidei, Sharks.

Family 1. Carehariide.—Kye with a nictitating membrane. Mouth crescent-shaped, inferior. Anal fin present. Two dorsal fins, the first opposite to the

space between the pectoral and ventral fins, without spine in front.

Genera: Carcharias (Blue Shark), Galcocerdo, Galeus (Tope), Zygena (Hammerhead), Austelus (Hound), Hemigaleus, Loxodon, Lhalassorhinus, Tricnodon, Leptocareharias, and Triaecis. Fossil: Corax and Hemipristis.

Family 2. Lamnide. —Eyc without nictitating membrane. Anal fin present. Two dorsal fins, the first opposite to the space between the pectoral and ventral fins, without spine in front. Nostrils not confluent with the mouth, which is inferior. Spiracles absent or minute,

Genera: Lamna (Porbeagle), Carcharodon, Odontaspis, Alopecias (Fox-Shark), and Selache (Basking Shark). Fossil: Carcharopsis, Oxytes, Sphenodus, Gomphodus, and Aneistrodon.

Family 3. Rhinodontide.—No nictitating membrane. Anal fin present. Two dorsal fins, the first nearly opposite to the ventrals, without spine in front. Mouth and nostril near the extremity of the snout.

This small family comprises one species only, Rhinodon typieus, a gigantic shark, whieh is known to exceed 50 feet in length.

Family 4. Notidanidce.—No nictitating membrane. One dorsal fin only, without spine, opposite to the anal. Dentition uneqnal in the jaws ; in the upper jaw one or two pairs of awl-shaped teeth, the following six being broader, and provided with several cusps, one of which is much stronger than the others. Lower jaw with six large comb-like teeth on each side, besides the smaller posterior teeth. Gill-openings wide, six in number in Hexanehus, seven in Heptanchus. Fossil teeth belonging to this type have been found in Jurassic and later formations (Notidanus and llopos).

Family 5. Seylliidcee.—Two dorsal fins, without spine, the first above or behind the ventrals; anal fin present. No nictitating membrane. Spiracle always distinct. Mouth inferior. Teeth small, several series generally being in function.

Genera: Seyllium (Dog-Fishes), Pristiwrus, Paraseylliwm, Gin-glymostoma, Stegostoma, Chiloseyllium, Crossorhinus. Fossil: Seyt- liodus,

Paleoseylliwm, Thyellina.

Family 6. Hybodontide.—Two dorsal fins, each with a serrated spinc. Teeth rounded, longitudinally striated, with one larger aud from two to four smaller lateral cusps. Skin covered with shagrcen.

Extiuct. From Carboniferous, Liassic, and Triassic formations. Several genera have been distinguished ; and, if Cladodus belongs to this family, it was represented even in the Devonian.

Family 7. Cestraectontide.—No uictitating membrane. Two dorsal fins, the first opposite to the space between the pectoral and ventral fins ; anal fin present. Nasal and buccal cavities confluent. Teeth obtuse, several series being in function.

This family is one of particular interest, because representatives of it occur in numerous modifications in Primary and Secondary strata. Their dentition is uniformly adapted for the prehension and mastication of crustaceous and hard-shelled animals, The fossil forms far exceeded in size the species of the only surviving genus, Cestraeion (tle Port Jackson Shark) ; they make their appearance with Ctenoptychius in the Devonian ; this is succeeded in the Coal- measures by Psammodus, Chomatodus, Petrodus, Coehliodus, Poly- rhizodus, &c., and in the Trias and Chalk by ae Acrodus, Theetodus, and Ptychodus. Of the 25 genera known, 22 have lived in the periods preceding the Oolitic.

Family 8. Spinaeide.—No membrana nictitans. Two dorsal fins; no anal, Mouth but slightly arched ; a long, dcep, straight, oblique groove on each side of the mouth. Spiracles present ; gill- openings narrow. Pectoral fins not notched at their origin.

Genera: Centrina, Acanthias (Spiny Dog-Fish), Centrophorus, Spinax, Centroseyllium, Seymnus, Lemargus (Greenland Shark), Eehinorhinus, Euprotomterus and Jsistius. The largest of these fishes is the Greenland shark, which attains to a length of 15 feet, and is common in the Arctic regions. Fossil genera: Paleospinax and Drepanephorus, from Cretaceous and Jurassic formations.

Family 9. Rhinide.—No anal fin; two dorsal fins. Spiracles present. Pectoral fins large, with the basal portion prolonged

forwards, but not grown to the head. Gill-openings rather wide, lateral, partly covered by the base of the pectoral. Spiracles wide, behind the eyes. Teeth conical.

*One genus only: the ‘ Angel-Fish,” or ‘*Monk-Fish” (hina squatina), which approaches the rays as regards general form and habits. Extinct forms, closely allied to the “Angel-Fish,” are found in the Oolite, and have been described as Zhawmas. The Carboniferous genus Orthacanthus may have been allied to this family, but it was armed with a spine immediately behind the head.*

Family 10. Pristiophoride:. —The rostral cartilage is produced into an excecdingly long, flat lamina, armed along each edge with a series of teeth (saw).

These sharks so greatly resemble the common saw-fishes as to be easily confounded with them, but their gill-openings are lateral,

and not inferior. Only one genus is kuown, Pristiophorus, which

occurs in the Australian and Japanese seas, Sgualoraia, from the Lias, is supposed to have its nearest affinitics to this family.

B. Batoidei, Rays.

Family 1. Pristide.—The snout is produced into an exceedingly long flat lamina, armed with a series of strong teeth along each edge (saw).

One genus only : Pristis (Saw-Fishes).

Family 2. Rhinobatide.—Tail strong and long, with two well- developed dorsal fins, and a longitudinal fold on each side; caudal developed. Disk not excessively dilated, the rayed portion of the pectoral fins not being

continued to the snout. Teeth obtuse, granular, the dental surfaces of the jaws being undulated.

Genera: Rhynchobatus, Rhinobatus, and Trygonorhina. Fossil : Spathobatis and Trigorhina.

Family 3. Torpedinide ((Electric Rays).—Trunk a broad, smooth disk. Tail with a longitudinal fold on each side; a rayed dorsal fin is generally, and a caudal always, present. Anterior nasal valves confluent into a quadrangular lobe. vertical hexagonal prisms between the pectoral fins and the head.

Genera: Torpedo, Narcinc, Hypnos, Discopyge(from Peru), Astrape, and Tenera. A large fish, with the general appearance of a torpedo, has been found at Monte Bolca; and Cyclobatis, from the Upper Cretaceous Limestone of Lebanon, is probably another extinct repre- sentative of this family.

Family 4. Raiidew. —Disk broad, rhombic, generally with asperities

The pectoral No electric organ; no serrated caudal

or spines ; tail with a longitudinal fold on each side. fins extend to the snout. spine.

Genera: Raia (Rays and Skates), Psanumobatis, Sympterygia, Platyrhina, Fossil: Arthropterus.

Family 5. Trygonide.—The pectoral fins are uninterruptedly continued to, and are confluent at, the extremity of the snout. Tail long and slender, without lateral longitudinal folds ; vertical fins none, or imperfectly developed, often replaced by a strong serrated spine.

*<—— : Urogymnus, Trygon (Sting-Rays), Urolophus, DPtcro- latea. a Fainily 6, Myliobatide (“ Devil-Fishes,” “*Sca-Devils,” or “ Hagle-Rays”).—The disk is very broad, in consequence of the great de- velopment of the pectoral fins, which, however, leave the sides of the head free, and*

reappear at the cxtremity of the snout as a pair of detached (cephalic) fins. Viviparous.

Genera: Myliobatis, Actobatis, Rhinoptera, Diccrobatis, Cerato- ptera. Fragmentary portions of thcir tessellated dentition are com- mon in Tertiary formations.

SuporpER II. Holoccphala.—One external gill-opening only, covered by a fold of the skin, which encloses a rudimentary cartila- ginous gill-cover ; four branchial clefts within the gill-cavity. 'The maxillary and palatal apparatus coalesceut with the skull.

This suborder is represented in the living fauna by one family only, Chimoeride ; it forms a connecting link with the following order of fishes, the Ganoids. In external appearance, and as re- gards the structure of their organs of propagation, the chimeras are sharks. The females are provided with "claspers" in connexion with the ventral fins, and the ova are large, encased in a horny capsule, and few in number; there is no doubt that they arc im- preguated within the oviduct, as in sharks. The males are pro- vided with a singular erectile appendage, spiny at its extremity, and received in a groove on the top of the head. On the other hand, the relations of the chimeras to the Ganoid, and, more especially, to the Dipnoous type become manifest in their notochordal skeleton and continuity of cranial cartilage. The spine in front of thie first dorsal fin is articulated to the neural apophysis, and not merely im- planted in the soft parts ; it is immovable as in sharks. A cartila- ginous operculum makes its appearance, and the external gill-opening is single. The dentition is that of a Dipnoid, each "jaw" being armed with a pair of broad dental plates, with the addition of a pair of smaller cutting teeth in the upper "jaw." Fossils of similar dental combination are not rare in strata commencing with the Lias and the bottom of the Oolitie series; but it is impossible to decide in every case whether the fossil should be referred to the

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An electric organ composed of

[CLASSIFICATION.

Holocephalous or the Dipnoous type. According to Newberry, Chimeroid fishes commence in the Devonian with Rhynchodus, the remains of which were discovered by himin Ohio, Undoubted Chimeroids are Elasmodus, Psaliodus, Ganodus, Ischyodus, Edaph- odon, and Elasmognathus, principally from Mesozoic and Tertiary formations. Very similar fossils occur in the corresponding strata of North America. A single species of Callorhynchus has been dis- covered by Hector in the Lower Greensand of New Zealand.

'The living chimeras are few in number, and remain within very moderate dimensions, probably not exceeding a length of 5 feet, inclusive of their long filamentous, diphycercal tail. They are referred to two gencra, Chimera and Callorhynchus.

OrvER II.—Ganoidei.

Skeleton cartilaginous or ossified. Body with medial and paired fins, the hinder pair abdominal. Gills free, rarely partially attached to the walls of the gill-cavity. One external gill-opening only oneach side; agill-cover. Air-bladder with a pneumatic duct. Ova small, impregnated after exclusion. Embryo sometimes with external gills.

To this order belong the majority of the fossil fish remains of Paleozoic and Mesozoic age, whilst it is very scantily represented in the recent fauna, and evidently verging towards total extinction. The knowledge of the fossil forms, based on mere fragments of the hard parts of the body only, is very incomplete, and therefore their classification is in a most unsatisfactory state. In the following list only the most important groups will be mentioned.}

Hight suborders may be distinguished at present.

SuporpER I. Placodermi.—Extinct. The head and pectoral region of the body encased in great bony sculptured plates, with dots of enamel ; the remainder of the body naked, or with ganoid scales ; skeleton notochordal.

Comprises the oldest vertebrate remains, from Devonian and Car- boniferous formations.

Genera: Pterichthys, Coccosteus, Dinichthys, Cephalaspis, Auchen- aspis, Didymaspis, Pteraspis, Scaphaspis, Cyathaspis, Astrolepis,

SuporDER II. Acanthodint.—Extinct. Body oblong, compressed, covered with shagreen ; skull not ossified ; caudal fin heterocercal. Large spines, similar to those of Chondropterygians, in front of some of the median and paired fins. The spines are imbedded be- tween the muscles, and not provided with a proximal joint.

Genera: Acanthodes, Chiracanthus, from Devonian and Car- boniferous formations.

SuporvER III. Dipnot.—Nostrils two pairs, more or less with- in the mouth; limbs with an axial skeleton. Lungs and gills. Skeleton notochordal. No branchiostegals.

Family 1. Strenidce.—Caudal. fin diphycercal ; no gular plates ; scales cycloid. A pair of molars, above and below, and one pair of vomerine teeth.

Genera : Lepidosiren and Ceratodus,

Lepidosiren (including Protopterus) has the body eel-shaped, with one continuous vertical fin. The limbs are reduced to filaments. Vomerine teeth conical, pointed. Each dental lamina or molar with strong cusps, supported by vertical ridges. Conus arteriosus with two longitudinal valves. Ovaries closed sacs. Two species are known : —L. paradoxa, from the system of the river Amazon, and L. (Protopterus) annectens, which abounds in many localities of the west coast of Africa, is spread over the whole of tropical Africa, and in many districts of the central parts forms a regular article of food.

Ceratodus has the body elougate, compressed, with onc continu- ous vertical fin. ‘The limbs are paddle-shaped, with broad, rayed fringe. Vomerine teeth incisor-like ; molars with flat, undulated surface, and lateral prongs. Conus arteriosus with transverse series of valves. Ovaries transversely lamellated.

Two species, C. forstert and C. miolepis, are known from fresh waters of Queensland. The specimens obtained hitherto have come from the Burnett, Dawson, and Mary rivers, some from the fresh waters of the upper parts, others from the lower brackish portions. The fish is said to grow to a weight of 20 Ib and tc a length of 6 fect. Locally, the settlers call it " Flat-head," ' Burnett-Salmon," or "Dawson-Salmon," and the aborigines " Barramunda," a name which they appear to apply also to other large-scaled freshwater fishes, as the Osteoglosswm leichardti. In the stomach there is gene- rally found an enormous quantity of the leaves of plants growing on the banks of rivers, evidently eaten after they had fallen into the water and when in a decomposing condition. The flesh of the fish ig salmon-coloured, and is much esteemed as food. The barra- munda is said to be in the habit of going on land, or at least on mud-flats; aud this assertion appears to be borne out by the fact

*1 For a study of details we have to refer to Agassiz, Poissons Fossiles, Owen, Paleontology, Edin., 1861, 8vo; Huxley, * Preliminary Essay upon the Systematic Arrangement of the Fishes of the Devonian Epoch," in dem. Geolog. Survey, December 10, 1861, and 'Illustrations of the Structure of Crossopterygian Ganoids," ibid., December 12, 1866; Traquair, The Ganoids of the British Carbuni- ferous Formations, part 1, " Paleoniscide," Palzontogr. Soc. Lond., 1877; and «On the Structure and Affinities of the Platysomide," in Trans. Roy. Soc. Edin. vol, xxix.*

that it is provided with a lung. It is much more probable, how- ever, that it riscs now and then to the surface of the water in order to fill its lung with air, and descends again until the air is so much deoxygenized as to render a renewal of it necessary. As the barramunda has perfectly developed gills, as well as the lung, we ean hardly doubt that, when it is in water of normal composi- tion, and pure enough to yield the necessary supply of oxygen, these organs are sufficient for the purpose of breathing, and that the respiratory function rests with them alone. But when the fish is compelled to sojourn in thick muddy water charged with gases which are the products of decomposing organic matter (and this must very frequently be tlie case

during the droughts which annu- ally exhaust the creeks of tropical Australia), it commences to breathe air with its lung in the way indicated above. If the medium in which it happens to be is altogether unfit for breathing, the gills cease to have any function ; if it is irrespirable in a less degree the gills may still continue to assist the lung. The barra- munda, in fact, can breathe by either gills or lung alone, or by both simultaneously.

The discovery of Ceratodus does not date farther back than the year 1870. It proved to be of the greatest interest, not only on account of the relation of this creature to the other living Dipnoi and Ganoidei, but also because it threw fresh light on those singu- lar fossil teeth which are found in strata of the Triassic and Jurassic formations in various parts of Europe, India, and America. These teeth vary greatly in general shape and size; they are sometimes 2 inches long, much longer than broad, depressed, with a flat or slightly undulated always punctuated crown, with one margin con- vex, and with from three to seven prongs projecting on the opposite margin.

Family 2. Ctenododipteride,—Caudal fin heteroccrcal ; gular plates ; scales cycloid. Two pairs of molars and one pair of vome- rine teeth.

Extinct. Diptcrus (Ctenodus), Heliodus, from Devonian strata.

Family 3. Phaneropleuride.—Caudal fin diphycercal; vertical fin continuous; gular plates ; scales cycloid. Jaws with a series of minute conical teeth on the margin.

Extinct. Phaneropleuron, from Devonian and Carboniferous for- mations.

SuBoRDER IV. Chondrostci.—Skeleton notochordal; skull cartila- ginous, with dermal ossifications ; branchiostegals few in number or absent. Tecth minute or absent. Integuments naked or with bucklers, Caudal fin heterocercal, with fulcra. WNostrils double, in front of the eyes.

Family 1. Acipenscride.—Body elongate, sub-cylindrical, with five rows of osseous bucklers. Snout produced, subspatulate or conical, with the mouth at its lower surface, small, transverse, pro- tractile, toothless. Four barbels in a transverse series on the lower side of the snout. Vertical fins with a single series of fulcra in front. Dorsal and anal fins approximate to the

caudal. Branchio- stegals none. Air-bladder large, simple, communicating with the dorsal wall of the cesophagus.

F Genera: Acipenscr and Scaphirhynchus (Sturgeons, Hausen, terlet).

Family 2. Polyodontidw.—Body naked, or with minute stellate ossifications. Mouth lateral, very wide, with minute teeth in both jaws. Barbels none. Caudal fin with fulcra. Dorsal and anal fins approximate to the caudal.

Genera: Polyodon and Pscphurus. Fossil: Chondrosteus.

Suzorper V. Polypteroidei.—Paired fins with axial skeleton, fringed ; dorsal fins two or more. Branchiostegals absent, but generally gular plates. Vertebral column diphycercal or heterocer- cal. Body scaly.

Family 1. Polypteride.—Scales ganoid ; fins without fulera. A series of dorsal spines, to each of which an articulated finlet is attached ; anal placcd close to the caudal fin, the vent being near the end of the tail. Abdominal portion of the vertebral column much longer than the caudal. ,

Genera: Polypterus and Calamoichthys. Polypterus is confined to tropical Africa, occurring in abundance in the rivers of the west eoast and in the upper Nile; it is rare in the middle and lower Nile. There is only onc species known, Polypterus bichir (“ Bichir ” being its vernacular uame in Egypt), which varies in the number of the dorsal finlets, the lowest being eight, the highest eighteen. It attains to a length of 4 fcet. Nothing is known of its mode of life, observations on which are very desirable. Calamoichthys (from Old Calabar) is distinguished from Polyptcrus by its greatly clon- gated form and the absence of veutral fins. :

Family 2. Saurodipteride.—Scales ganoid, smooth like the sur- face of the skull. Two dorsal fins ; paired fins obtusely lobate. Teeth conical. Caudal fin heterocercal.

Extinct. Diplopterus, Megalichthys, and Ostcolepis, from Devon- ian and Carboniferous formations.

Family 8. Colacanthide.—Scales cycloid. Two dorsal fins, each supported by a single two-pronged interspinous bone ; paired fins obtusely lobate. Air-bladder ossified } notochord persistcnt, diphycercal.

Extinct. Celacanthus, from Carboniferous strata. Several other genera, from the Coal formations to the Chalk, have been associated with it:—Undina, Graphiwrus, Macropoma, Holophagus, Hoplo- pygus, Rhizodus.

Family 4. Holoptychide.—Scales cycloid or ganoid, sculptured. Two dorsal fins; pectorals narrow, acutely lobate ; dentition den- drodont.

Extinct. Genera: Holoptychius, Sawrichthys, Glyptolepis, Den- drodus, Glyptolemus, Glyptopomus, Tristichopterus, Gyroptychius, Strepsodus, from Devonian and Carboniferous strata.

SUBORDER VI. Pycnodontoide?.—Body compressed, high and short or oval, covered with rhombic scales arranged in decussating pleuro- lepidal lines. Notochord persistent. Paired fins without axial skeleton. Teeth on the ‘alate and hinder part of the lower jaw molar-like. Branchiostegals, but no gular plates. Extinct.

Family 1. Plewrolepide.—Homocercal. Body less high. Fins with fulera.

Genera: Pleurolepis and Homeolepis, from the Lias.

Family 2. Pycnodontide.—Homocercal. The neural arches and ribs are ossified ; the roots of the ribs are but little expanded in the older genera, but are enlarged in the Tertiary forms, so as to simulate vertebre. Paired fins not lobate. Obtuse teeth on the palate and the sides of the mandible; maxilla toothless ; incisor-like teeth in the intermaxillary and front of the mandible. Fulcra absent in all the fins.

Genera: Gyrodus, Mcsturus, Microdon, Celodus, Pycnodus, Mesodon, from Mesozoic and Tertiary formations.

SusoRDER VII. Lepidosteoidei.—Scales ganoid, rhombic ; fins generally with fulcra; paired fins not lobate. Preoperculum and interoperculum developed; generally numerous branchio- stegals, but no gular plate.

Family 1. Lepidostetdw.—Scales ganoid, lozenge-shaped. Skele- ton completely ossified ; vertebra convex in front and concave be- hind. Fins with fulcra; dorsal and anal composed of articulated rays only, placed far backwards, close to the caudal. Abdominal part of the vertebral column much longer than caudal. Branchio- stegals not numerous, without enamelled surface. Heterocercal.

Lepidosteus. —This genus existed as early as Tertiary times; their remains have been found in Europe as well as in North America. In our period they are limited to the temperate parts of North America, Central America, and Cuba. Three species can be distinguished, which attain to a length of about 6 feet. They feed on other fishes; and their general resemblance to a pike has gained for them the vernacular names of "Gar-Pike" or " Bony Pike."

Family 2. Sauride.—Body oblong, with ganoid scales ; verte- bre not completely ossified ; termination of the vertebral column homocercal ; fins generally with fulcra. Maxillary composed of a single piece ; jaws with a single series of conical pointed teeth. Branchiostegals numerous, enamelled, the anterior forming broad gular plates.

Extinct. Genera: Semionotus, Hugnathus, Cephenoplosus, Afa- crosemius, Propterus, Ophiopsis, Pholidophorus, Pleuropholis, Pachycormus, Ptycholepis, Conodus, Eulepidotus, Lophiostomus,

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Family 38. Stylodontide.— Body rhombic or ovate, with ganoid scales ; vertebra not completely ossified ; termination of the vertc- bral column homocercal ; fins with fulera, Maxillary composed of a single piece ; jaws with several series of teeth, the outer ones equal, styliform. Dorsal fin very long, extending to the caudal. Branchiostegals numerous.

Extinct. TZetragonolcpis, from the Lias.

Family 4. Sphwrodontide.—Body oblong, with rhonibic ganoid scales ; vertebre ossified, but not completely closed ; homocercal ; fins with fulcra. Maxillary composed of a single piece; teeth in several series, obtuse; those on the palate globular. Dorsal and anal fins short. Branchiostegals.

Extinct. The type genus of this family is Lepidotus. :

Family 5. Aspidorhynchide.—Body clongate, with ganoid scales; jaws prolonged into a beak ; termination of the vertebral column homocercal. Fins with fulcra ; a series of enlarged scales along the side of the body. Dorsal fin opposite to the anal.

Extinct: Mesozoic. Genera: Aspidorhynchus and Belonostomus.

Family 6. Paleoniscide.—Body fusiform, with rhombic ganoid seales. Notochord persistent, with the vertebral arches ossified. Heterocercal. All the fins with fulcra; dorsal short. Branchio- stegals numerous, the foremost pair forming broad gulars. Teeth small, conical, or cylindrical.

Extinct. Gencra: from the Old Red Sandstone—Chirolepis and Acrolepis ; from Carboniferous rocks—Cosnwptychius, Elonichthys, Nematoptychius, Cycloptychius, Microconodus, Gonatodus, Rhadin- ichthys, Myrtolepis, Urosthenes ; from the Permian—Rhabdolepis, Paleoniscus, Amblypterus, and Pygopterus; from the Lias— Centrolepis, Oxygnathus, Cosmolepis, and Thrissonotus.

Family 7. Platysomide.—Body generally high, compressed, covered with rhombic ganoid scales arranged in dorso-ventral bands. Notochord persistent, with the vertebral arches ossified. Hetero- cercal ; fins with fulera ; dorsal fin long, occupying the posterior

half of the back. Branchiostegals numerous. Tecth tubercular or obtuse.

Extinct. —Eurynotus, Benedcnins, Mesolepis, Hurysomus, Chirodus (M‘Coy), Platysomus.

SyBORDER VIII. Amoidet.—Vertebral column more or less com- pletely ossified, heterocercal. Body covered with cycloid scales.

ranchiostegals present.

Family 1. ossified vertcbre ; homocercal ; fins with fulera. gcries, small, pointed.

Extinct. Caturus, from the Oolite to the Chalk. Family 2. Leptolepidec.—Scales cycloid. homocercal ; fins without fulera ; dorsal short.

bands, with eanines in front.

Extinct, but lcading to the living representative of this suborder. Gonera: Thrissops, Leptolepis, from the Lias and Oolitc. These fishes, so far as the preserve from Teleosteous fishes, to which they are referred by some paleeon- tologists.

Genera ; from Carboniferous and Permian formations Wardichthys,

Family 3. Amiidw.—Skcleton entircly ossificd ; a single large homocercal ; fins without fulcra ; a long soft dorsal Abdominal and caudal parts of the vertebral coluinn subequal

gular plate ; fin. in extent. Branchiostegals numerous.

Amia.—The “Bow-Fin” or ‘ Mnd-Fish” (A. calva) is not uncom-

mon in many of the fresh waters of the United States ; it grows to

a length of 2 feet. Little is known about its habits ; small fishes, crustaceans, and aquatic insects have been found in its stomach. Wilder has observed its respiratory actions ; it rises to the surface,

and, without emitting any air-bubble whatever, opens the jaws widely, and apparently gulps in a large quantity of air ; these acts of respiration are

more frequently performed when the water is foul

or has not been elanged ; and there is no doubt that a conversion

of oxygen into carbonic acid is effected, as in the lungs of aerial

vertebrates.

Fossil remains occur in Tertiary deposits of North America, which

have been distinguished as Protamia and Hypamia.

Subclass II.—Teleostet. Heart with a non-contractile bulbus arteriosus ; intestine

without spiral valve; optic nerves decussating; skeleton ossified, with completely formed vertebra ; vertebral column

branchiz free.

diphycercal or homocercal ;

The Teleostei form the majority of the fishes of the and are the geological successors of the Paleichthyes, undoubted Teleostei not ranging farther back

present fauna,

than the Chalk period. 'This subclass comprises an infinite variety of forms; and as, naturally, many Ganoid fishes lived under external conditions similar to those of certain Teleostet, and led a similar mode of life, we find not a few analogous forms in both series,—some Ganoids resembling externally the Teleosteous Siluroids, others the Clupeoids, others the Cheetodonts, others the Scombresoces, &c. But there is no direct genetic relation between these fishes, as some naturalists have been inclined to believe.

The T'eleostei are divided into six orders :—

I. Acanthopterygii.—Part of the rays of the dorsal, anal, and ventral fins non-articulated spines. The lower pharyn- geals separate. Air-bladder, if present, without pneumatic duct in the adult.

Il. Acanthopterygii Pharyngognathi.—Part of the rays of the dorsal, anal, and ventral fins non-articulated spines. The lower pharyngeals coalesced. Air-bladder without pneumatic duct.

Ill. Anacanthini.—Vertical and ventral fins without spinous rays. Ventral fins, if present, jugular or thoracic. Air-bladder, if present, without pneumatic duct. Lower pharyugeals separate.

IV. Physostomi.—All the fin-rays articulated ; only the first of the dorsal and pectoral fins is sometimes ossified. Ventral fins, if present, abdominal, without spine. Air- bladder, if present, with a pneumatic duct.

V. Lophobranchii.—Gills not laminated, but composed of small rounded lobes, attached to the branchial arches. Gill- cover reduced to a large simple plate. A dermal skeleton replaces more or less soft integuments.

VI. Plectognathii—A soft dorsal fin opposite te the anal ;

LOR THVTOLOCE

Caturide.—Notochord persistent, with partially Tceth in a single

Vertebra ossified ;

Tecth minute, in

parts are concerned, cannot be distinguished

soft dorsal, both being many-rayed.

tecth on the side; palate gencrally toothless. by a spinous and soft portion of nearly equal development. fin with threc spines. rally branched, but in one genus simple. one spine and five rays.

[CLASSIFICATION.

sometimes elements of a spinous dorsal. or reduced to spines. pneumatic duct. or naked.

Ventral fins none, Gills pectinate ; air-bladder without Skin with rough scutes, or with spines,

Onver I.—Acanthopterygit.

Part of the rays of the dorsal, anal, and ventral fins are non- articulated, more or less sharp-pointed lle The lower pharyn- geals are generally separate. Air-bladder, if present, without pneumatic duct in the adult.

Division 1. Acanthopterygii Perciformes.—Body more or less compressed, clevated or oblong, but not elongate ; the vent is remote from the extremity of the tail, behind the ventral fins if they are present. No prominent anal papilla. No superbranchial organ. orsal fin or fins occupying the greater portion of the back ; spinous dorsal well developed, generally with stiff spines, of moderate extent, rather longer than, or as long as, the soft ; the soft anal similar to the soft dorsal, of moderate extent or rather short. Ventrals thoracic, with one spine and with four or five rays.

Family 1. Percide.—The scales extend but rarely over the vertical fins, and the lateral line is generally present, continuous from the head to the caudal fin. All the teeth simple and conical; no barbels. No bony stay for the preoperculum.

A large family, represented by numerous genera and species in fresh waters, and on all the coasts of the temperate and tropical regions. Carnivorous.

Fossil Percoids abound in some formations, for instanee, at Monte Bolca, where species of Labraw, Lates, Smerdis and Cyclopoma (both extinct), Dudes, Scrranus, Apogon, Therapon, and Pristipoma have becn recognized. Paraperca is a genus recently discovered in the Marls of Aix-en-Provence. A species of Perca is known from the freshwater deposits of Oeningen.

The living genera are—Perca (Perch), Sintperca, Percichthys, Labrax (Bass), Latcs, Psammoperca, Percalabrax, Accrina (Pope), Licioperca, Pileoma, Bolcosoma, Aspro, Centropomus, Enoplosus, Centropristis,

Anthias, Callanthias, Serranus (Sea-Perch), Anyper- odon, Prionodes, Plectropoma, Trachypoma, Polyprion, Grammistes, Rhypticus, Aulacocephalus, Myriodon, Diploprion, Mesoprion, Glaucosoma, Dulcs, Therapon, Lielotes, Pristipoma, Conodon, Hemulon, Hapalogenys, Diagramma, H; yperoglyphe, Lobotes, Histio- pterus, Gerres, Scolopsis, Hetcrognathodon, Dentex, Symphorus, Synagris, Mena, Smarts, Coesio, Erythriehthys, Oligorus (Murray- Cod), Grystes, Arripis, Huro, Ambassis, Apogon, Chilodipterus, Lanioperea, Acropoma, Scombrops, Pomatomus, Priacanthus, Cen trarchus, Bryttus, Pomotis, Etclis, Niphon, Aprion, Apsilus, Penta- ccros, Velifer, Datnioides, Percilia.

Family 2. Squamipinnes.—Body compressed and elevated, covered with scales, either finely ctenoid or smooth. Lateral line continuous, not continued over the caudal fin. Mouth in front of the snout, generally small, with lateral cleft. Teeth villiform or setiform, in bands, without canines or incisors. Dorsal fin consisting of a spinous and soft portion of nearly equal develop- ment ; anal with three or four spines, similarly developed as the The vertical fins more or less densely covercd with small scales. The lower rays of the pectoral fin branched, not enlarged ; ventrals thoracic, with one spine and five soft rays.

Genera: Cheetodon, Chelmo, Heniochus, Holacanthus, Pomacan- thus, Scatophagus, Ephippus, Drepanc, Hypsinotus, Scorpis, Atypichthys, Towotes. Some of these genera occur also in Tertiary formations. The majority of these fishcs are inhabitants of the tropical seas, and abound chiefly in the neighbourhood of coral-reefs (Coral-Fishes). The beauty and singularity of distribution of the colours in some of the genera, as Chatodon, Heniochus, Holacanthus, is scarcely surpassed in any other group of fishes. They are of small size, and are carnivorous, feeding on small invertebrates.

Family 3. Afullide.—Body rather low and slightly compressed, covered with large thin scales, with or without an extremely fine serrature. Two long erectile barbels are suspended from the hyoid, and are received between the rami of the lower jaw and the opercula. Mouth in front of the snout, with the cleft lateral and rather short ; teeth very feeble. Eye latcral, of moderate size. Two short dorsal fins remote from each other, the first with feeble

spines ; anal similar to the second dorsal. Ventrals with one spine and five rays. Pectorals short.

Genera : Mullus and Upencus (Red Mullets).

Family 4. Sparide (Sea-Breams).—Body compressed, oblong, covered with scales, the serrature of which is very minute, and sometimes altogether absent. Mouth in front of the snout, with cleft lateral. Hither cutting teeth in front of the jaws, or molar One dorsal fin, forined Anal The lower rays of the pectoral fin are gene- Ventrals thoracic, with Genera!

Cantharus, Box, Scatharus, Oblata, Crenidens, Tre

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pterodon, Paehymetopon, Dipterodon, Gymnoerotaphus, Girella, Lephrecops, Doydixodon, Haplodaetylus, Sargqus (Sheep's Head), Lethrinus, Spherodon, Pagrus, Pagellus, Chrysophrys, and Pime- leplerus.

The extinct forms found hitherto are rather numerous : the oldest

come from the Cretaceous formation of Mount Lebanon ; some ~

belong to living genera, as Sargus, Pagellus ; of others from Eocene and Miocene formations no living representative is known—Sparn- odus, Sargodon, Capitodus, Soricidens, Astma.

The MHoplognathide are a very small family distinguished by confluent teeth, and allied to the sea-breams.

Family 5. Cirrhitide.—Body oblong, compressed, covered with eycloid scales; lateral line continuous. Mouth in front of the snout, with lateral cleft. Cheeks without a bony stay for the preoper- culum. Dentition more or less complete, composed of sinall pointed teeth, sometimes with the addition of canincs. One dorsal fin formed by a spinous and soft portion, of nearly equal development. Anal with three spines, generally less developed than the soft dorsal, The lower rays of the pectoral fins simple and generally

enlarged; ventrals thoracic, but remote from the root of the pectorals, with one spine and five rays.

Genera : Cirrhites, Chironemus, Chilodaetylus, Mendosoma, Nema-dactylus, and Latris.

Family 6. Seorpenide.—Body oblong, more or less compressed, covered with ordinary scales or naked. Cleft of the mouth lateral or subvertical. Dentition feeble, consisting of villiform teeth, and generally without canines. Some bones of the head armed, especially the angle of the preoperculum, its armature receiving additional support by a bony stay, connecting it with the infraorbital ring. The spinous portion of the dorsal fin equally or more de- veloped than the soft aud the anal. Ventrals thoracic, gencrally with onc spine and five soft rays, sometimes rudimentary.

Gencra: Sebastes, Scorpena, Glyptauchen, Lioseorpius, Setarches, Pterots, Apistus, Agriopus, Synanecia, Micropus, Chorismodactylus, Tenianotus, Centropogon, Pentaroge, Tetraroge, Prosopodasys, Aplo- aetis, Triehopleura, Hemitripterus, Minous, and Pelor.

Family 7. Nandide.—Body oblong, compressed, covered with scales. Lateral line interrupted. Dorsal fin formed by a spinous and soft portion, the number of spines and rays being nearly equal ; anal fin with three spines, and with the soft portion similar to the soft dorsal, Ventral fins thoracic, with one spinc, and five or four rays. Dentition more or less complete, but fecble.

Genera : Plesiops, Trachinops, Badis, Nandus, and Catopra.

Family 8. Polyccntride.—Body compressed, deep, scaly. La- teral line none. Dorsal and anal fins long, both with numerous spines, the spinous portion being the more developed. Ventrals thoracic, with one spine and five soft rays. Teeth feeble. Pseudo- branchiz hidden.

Genera : Polyeentrus and Monocirrhus.

Family 9. Tcuthidide.—Body oblong, strongly compressed, covered with very small scales. Lateral line continuous. A single scries of cutting incisors in cach jaw ; palate toothless. One dorsal fin, the spinous portion being the more developed ; anal with seven spines. Ventral fins thoracic, with an outer and an inner spine, and with three soft rays between.

Genus: Teuthis.

Diviston II. Acanthopterygit Beryetformes.—Body compressed, oblong, or elevated ; head with large muciferous cavities, which are covered with a thin skin. Ventral fins thoracic, with one spine and more than five soft rays (in Monocentris with two only).

The family of Beryeide has a very remarkable geographical dis- tribution, which has been noticed at pp. 679, 681. Members of this family belong to the oldest Teleosteous fishes, the majority of the Acanthoptcrygians found in the Chalk being Berycoids. Berya, Holoeentrum, and Myripristis lave becn found in several species, with other genera now extinct:—Psewdoberyx, Berycopsis, Homonotus, Stenostoma, Sphenoecphalus, Aecanus, Hoplopteryx, Platyeornus, Podocys, Acrogaster, Maerolepis, and Rhaeolepis. P

Living gencra: AMonocentris, Hoplostethus, Traehichthys, Anoplo- gaster, Beryx, Melamphaes, Polymixia, Myripristis, and Holocentrum.

Division III. Acanthopterygii Kurtifornes.—One dorsal fin only, much shorter than the anal, which is long and many-rayed. No superbranchial organ.

One family, Kurtide.

Genera: Pempheris and Kurtus.

Division IV.

Family. Polynemide.—Body oblong, rather compressed, covered with smooth or very fcebly ciliated scales. Lateral line continuous. Snout projecting beyond the mouth, which is inferior, with lateral cleft. ye lateral,

large. Villiform tecth in the jaws and on the palate. Ventrals thoracic, with one spine and five rays.

Genera : Polynemus, Pentanemus, and Galeoides. ;

Division V. Acanthopterygtt Seiceniformes —The soft dorsal is more, generally much more, developed than the spinous and the

anal. No pectoral filaments ; head with the muciferous canals well developed.

Family. Seiaentde.—Body rather elongate, compressed, covered with ctenoid scales. Lateral line continuous, and frequently extending over the caudal fin. Mouth in‘front of the snout. Eye lateral, of moderate size. Teeth in villiform bands, some- times with the addition of canines; no molars or incisor-like teeth in the jaws ; palate toothless. Preeoperculum unarmed, and without bony stay. Ventrals thoracic, with one spine and five soft rays. Bones of the head with wide muciferous chanuels, Air- bladder frequently with numerous a pendages.

Genera: Larimaus, Pogonias (Drum), Mieropogon, Umbrina, ques, Nebris, Lonehurus, Seicena (Meagre), Paechyurus, Otolithus, Ancylodon, and Collichthys.

Division VI. Acanthopterygii Xiphiiformes.—The upper jaw is produced into a cuneiform weapon.

One family, Xtphcide (Sword-Fishes), with the genera Xiphias and Histtophorus.

Division VII. Acanthopterygii Trichiuriformes. —Body elongate, compressed or band-like ; cleft of the mouth wide, with several strong teeth in the jaws or on the palate. The spinous and soft

ortions of the dorsal fin and the anal are of nearly equal extent, ong, many-rayed, sometimes terminating in finlets ; caudal fin forked, if present.

The family of Triehiuride is composed of the following living genera: Nealotus, Nesiarchus, Aphanopus Euoxymetopon, Lepidopus (Scabbard-Fish), Z'riehtwrus (Hair-Tail), Epinuila, Thyrsites, and Gempylus. It was well represented in the Chalk and later forma- tions by Hnehodus, Anenchelum, Nemopteryx, Xiphopterus, Henvt- thyrsites, and Triehiurichthys. Two other genera, Paleorhynehus aud Hemirhynehus, belong to a distinct though allied family.

Division VIII.

Family 1. Aeronwridw.—Body compressed, oblong or elevated, covered with minute scales. Tail generally armed with one or more bony plates or spines, which are developed with age, but absent in very young individuals. Eye lateral, of moderate size. Mouth small ; a single series' of more or less compressed, sometimes denticulated, sometimes pointed incisorsin each jaw; palate tooth- less. One dorsal fin, the spinous portion being less developed than the soft ; anal with two or three spines ; veutral fins thoracic. Nine abdominal and thirteen caudal vertebre.

Genera : Acanthurus (Surgeon), Naseus, and Prionurus.

Extinct species of Acanthurus and Naseus have been discovcred in the Monte Bolca formation.

Family 2. Carangide.—Body more or less compressed, oblong or elevated, covered with small scales or naked ; eye lateral. Teeth, if present, conical. No bony stay for the preoperculum. The spinous dorsal is less devcloped than the soft or the anal, either continuous with, or separated from, the soft portion ; some- times rudimentary. Ventrals thoracic, sometimes rudimentary or entirely absent. No prominent papilla near the vent. Gill-opening wide. Ten abdoininal and fourteen caudal vertebrae.

Genera: Caranx (Horse-Mackerel), Argyriosus, Micropteryx, Sertola, Sertolella, Seriolichthys (Yellow-Tails), Nauerates (Vilot- Fish), Chorinemus, Liehia, Temnodon (Blue-Fish), Lactarius, Paropsis,

Traehynotus, Pammelas, Psettus, Platax, Zanelus, Anomalops, Capros (Boar-Fish), Antigonia, Diretmus, Equula, and Gazza.—Members of this family appear first in Cretaceous formations, where they are represented by Platax and some caranx- like genera (Vomer and Aipiehthys). They are more numerous in Tertiary formations, especially in the strata of Monte Bolca, where some still existing genera occur, as Zanelus, Platax, Caranx (Carangopsis),

horus. ‘ Family 3. Cyttide.—Body elevated, compressed, covered with small scales, or with bucklers, or naked ; eye lateral. Teeth conical, small, No bony stay for the preoperculum. Dorsal fin composed of two distinct portions. Ventrals thoracic. No prominent papilla near the vent. Gill-opening wide. More than ten abdominal and more than fourteen caudal vertebree.

Genera : Zeus (John Dory) and Cyttus.

Family 4. Stromateide.—Body more or less oblong and com- pressed, covered with very small scales ; eye lateral. Dentition very feeble ; cesophagus armed with numerous horny, barbed pro- cesses. No bony stay for the preoperculum. Dorsal fin single, long, without distinct spinous division. More than ten abdominal and more than fourteen caudal vertebre.

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Genera : Stromateus and Centrolophus.

Family 5. Corypheenide.—Body compressed ; eye lateral. Teeth small, conical, if present ; cesophagus smooth. No bony stay for the preopereulum. Dorsal fin single, long, without distinet spinous division. More than ten abdominal and more than four- teen caudal vertcbre.

Genera: Coryphena (Dolphin), Brama, Taraetes, (Sun-Fish), Pteraclis, Sehedophilus, Diana, Ausonia, Mene. Goniognathus.

Family 6. Nomeide.—Body oblong, more or less compressed, covered with cycloid scales of moderate size; eye lateral. No bony stay for the preoperculum. Dorsal fin with a distinct spinous portion separated from the soft ; sometimes finlets ; caudal forked. More than ten abdominal and more than fourteen caudal vertebra.

Genera : Gastrochisma, Nomeus, Psencs, and Cubiceps.

amily 7. Scombride.—Body oblong, scarcely compresscd, naked or covered with small seales ; eye lateral. Dentition well developed. No bony stay for the preoperculum. Two dorsal fins ; generally finlets. Ventrals thoracic, with one spine and five rays. More than ten abdominal and more than fourteen caudal vertebre.

Genera : Scomber (Mackerel), Thynnes (funny, Bonito, Albacore), Pelamys, Auzxis, Cybiwm, Elacate, and Echencis (Sueking-T'ish).

Family 8. Trachinide.—Body elongate, low, naked or covered with seales. Teeth small, conical, No bony stay for the preoper- culum. One or two dorsal fins, the spinous portion being always shorter and much less developed than the soft; the anal similarly developed as the soft dorsal ; no finlets. Ventrals with onc spine and five rays. Gill-opening more or less wide. 'Ten or more than ten abdominal and more than fourteen eaudal vertebra.

Genera: Uranoscopus, Leptoscopus, Agnus, Anema, Kathetostoma, Traehinus (Weever), Chantpsodon, Percis, Sillago, Bovichthys, Bathydraco, Cheenichthys, Aphritis, Acanthaphritis, Eleginus, Chi- marrhichthys, Cottoperea, Percophis, Trichodon, Pinguipes, Latilus, Opisthognathus, Pscudochromis, Cichlops, Pscudoplesiops, Notothenia, and Harpagifcr. Fossil : Callipteryx, Traehinopsis, and Pscudoelc-

inus. 'i Malacanthus is the type of a family allied to the Lrachinida.

Family 9. Batrachide.—Head broad and thick ; body elongate, compressed behind ; skin naked or with small scales. No bony stay for the preopereulum. Teeth conical, small or of modcrate size. 'he spinous dorsal consists of two or three spines only ; the soft and the anal long. Ventrals

jugular, with two soft rays ; nectorals not pediculated. Gill-opeuing a more or less vertical slit iSerore the pectoral, rather narrow.

Genera : Batrachus, Thalassophryne, and Porichthys.—DPsychro- lutes and Neophrynichthys are allied forms.

Family 10. Pediewlati.—Head and anterior part of the body very large, without scales. No bony stay for the preoperculum. Teeth villiform or rasp-like. The spinous dorsal is advanced forwards, composed of a few more or less isolated spines, often transformed snto tentacles, or entirely absent. V entral fins jugular, with four or five soft rays, sometimes absent. The carpal bones are prolonged, forming a sort of arm, terminating in the pectoral. Gill-o ening redueed to a small foramen, situated in or near the axil. Gills two and a half, three, or three and a half; pseudobranchie gencrally absent.

Genera : Lophius (Fishing-Frog, Angler), Ceratias, Hinanto- lophus, Mclanocctus, Oncirodes, Antennarius, Brachionichthys, Saccarins, Chaunax, Malthe, Halieutea, Halieutichthys, Dibranchus, and Afgaonichthys.

Family 11. Cottide.—Form of the body oblong, sub-cylindrieal. Cleft of the mouth lateral. Dentition feeble, generally in villiform bands. Some bones of the head are armed ; and a bony stay con- nects the preopercular spine with the infraorbital ring. Two dorsal fins (rarely one), the spinous being less developed than the soft and the anal. Ventrals thoracic, with five or less soft rays.

Genera: Cottus (Bull-head, Miller's Thumb), Oentridermiehthys,

Teelus, Platyeephalus, Hoplichthys, Bunoeottus, Rhamphocottus, Triglops, Podabrus, Blepsias, Nautichthys, Scorpenichthys, Hemt- lepidotus, Artedius, Ptyonotus, Polyeaulus, Bembras, and Trigla (Gurnards). Family 12. Cataphracti.—Form of the body clongate, sub-cylindri- cal. Dentition feeble. Body completely cuirassed with osseous keeled scales or plates. A bony stay connects the angle of the preoperculum with the infraorbital ring. Ventrals thoracic.

Genera: Agonus, Aspidophoroides, Siphagonus, Peristethus, Dactylopterus (Flying Gurnard).

Family 18. Pegaside.—Body entirely covered with bony platcs, anehylosed on the trunk and movable on the tail. Barbels none. The margin of the upper jaw is formed by the intermaxillaries and their cutaneous prolongation, which extends downwards to the extremity of the maxillarics. Gill-cover formed by a large plate, homologous to the operculum, preoperculum, and subopereulum ; interopereulum a long fine bone, hidden below the gill-plate. One rudimentary branchiostegal. The gill-plate is united to the istlimus by a narrow membrane ; gill-openings narrow, in front of the base of the pectoral fin. Gills four, lamellated. Pscudobranchie and

Lanpris Fossil :

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naked or tubercular.

phorichthys, Sicydium, Lentipes, Trypanchen, Callionymus (Dragonet), Benthophilus, An-

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air-bladder absent. One short dorsal and a similar anal fin, oppo- site to each other. Ventral fin present. Ovarian saes elosed.

One genus only is known, Pegasus.

Division IX. Acanthopteryii Gobiiformes.—The spinous dorsal, or spinous portion of the dorsal, is always present, short, either composed of flexible spines, or much less developed than the soft ; the soft dorsal and anal of equal extent. No bony stay for the angle of the properculum. Ventrals thoracic or jugular, if present, composed of one spine and five, rarcly four, soft rays. A prominent anal papilla.

Family 1. Discoboli (Lump-Suckers).—Body thick or oblong, Teeth small. Ventral fins with one spine and five rays, all being rudimentary and forming

the osseous sup-

port of around disk, which is surrounded by a cutaneous fringe.

Gill-openings narrow, the gill-membranes being attached to the isthmus. Genera: Cyelopterus and Liparis.

Family 2. Gobiide (Gobies).—Body elongate, naked or scaly.

Teeth generally small, sometimes with canines. 'The spinous dorsal fin, or portion of the dorsal fin, is the less developed, and eomposed

of flexible spincs; anal similarly developed as the soft dorsal.

Sometimes the ventrals are united into a disk. Gill-opening more or less narrow, the gill-membranes being attached to the isthmus.

Genera: Gobius, Latrunculus, Euctenogobius, Lophiogobius, Do- liiehthys, Apocryptes, Evorthodus, Gobiosoma, Gobiodon, Triceno- Periophthalmus, Boleophthalmus, Eleotris,

blyopus, Orthostomus, Dlatyptera, erhaps, Oxuderces.

Division X. Acanthopterygii Blenniiformes.—Body low, sub- cylindrieal or compressed, elongate. Dorsal fin very long; the spinous portion of the dorsal, if distinct, is very long, as well developed as the soft, or much more ; sometimes the entire fin is composed of spines only ; anal more or less long ; eaudal fin sub- truncated or rounded, if present. Ventral fins thoracic or jugular, if present. —

Family 1. Cepolidew.—Body very elongate, compressed, covered with very small cyeloid seales; cyes rather large, lateral. Teeth of moderate size. No bony stay for the angle of the preoperculum. One very long dorsal fin, which, like the anal, is composed of soft rays. Ventrals thoracic, composed of one spine and five rays. Gill-opening wide. Caudal vertebree exceedingly numcrous.

Genus: Cepola (Band-Fishes). An allied family are the Tricho- notide, with Trichonotus and Hemcroeetes.

Family 2. Hetcrolepidotidee.—Body oblong, compressed, scaly ; cyes lateral; cleft of the mouth latcral; dentition feeble. The angle of the preoperculum connected by a bony stay with the infraorbital ring. HOw long, with the spinous and soft portions equally developed ; anal clongate. spine and five rays.

Genera: Chirus, Ophiodon, Agrammus, Zantolepis.

Family 3. .Blewntidew. —Body elongate, low, more or less cylindrical, naked or covered with scales, which generally are small. One, two, or three dorsal fins occupying nearly the whole length of the back, the spinous portion, if distinct, being as much developed as tho soft, or more ; sometimes the entire fin is composed of spines ; anal fin long. Ventrals jugular, composed of a few rays, and sometimes rudimentary or cntirely absent. Pseudobranchie gencrally pre- sent.

Genera: Anarriiclas (Wolf-Fish), Blenwius (Blenny), Chasmodes, Petroscirtes, Salarias,Clinus, Cristiceps, Cremnobates, L'ripterygium, Sticheus, Blenniops, Centronotus, NXiphidion, Cryptacanthodes, Patcecus, Zoarecs, Blennophis, Nemophis, Plagiotremus, Neoclinus, Cebidichthys, Myzxodes, Heterostichus, Dietyosoma, Lepidoblennius, Daetyloscopus, Gunellichthys, Uroeentrus, Sticheopsis, Sticharvun, Notograptus, Pholidiehthys, and Pscudoblennius.—Closely allied is Acauthoelinus.

Family 4. 'Mastacembelide.—Body elongate, eel-like, covered with very small scales. Mandible long, but little movable. Dorsal fin very long, the anterior portion composed of numerous short isolated spines; anal fin with spines anteriorly. Ventrals none. The humeral arch is not suspended from the skull. Gill- openings reduced to a slit at the lower part of the side of the head.

Genera: Rhynehobdella and Mastacembelus.

Drvision XI. Aeanthopterygit Mugiliformes.—Two dorsal fins more or less remote from eaeh other ; the anterior cither short, like the posterior, or composed of feeble spines. Ventral fins with one spine and five rays, abdominal,

Family 1. Sphyreenidee.— Body elongate, sub-cylindrical, covered. with small cyeloid scales ; lateral line continuous. Cleft of the mouth wide, armed with strong tecth. yc lateral, of moderate size. Vertebra twenty-four.

Genera : Sphyrena (Barracuda). Fossil: Portheus, Saurocephalus.

Family 2. Atherinids _—Boidy more or less clongate, sub-cylin- drical, covered with scales of moderate size ; lateral line indistinct. Cleft of the mouth of moderate width, with the dentition feeble.

Luetogobius, Oxymctopor, and,

Ventrals thoracic, with one

Sphyreenodus, Hypsodon,

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Kye lateral, large or of moderate size. bree very numerous.

Genera: Athcrina, Atherinichthys, and Tetragonurus.

Family 3. AMfugilide (Grey Mullets).—Body more or less oblong and compressed, covered with cyeloid seales of moderate size; lateral line none. Cleft of the mouth narrow or of moderate width, with or without feeble teeth. Eye lateral, of moderate size. Gill-open- ing wide. The anterior dorsal fin composed of four stiff spines. Vertebrae twenty-four.

Genera: Mugil, Agonostoma, and Afyzus.

Division XII. Acanthopterygti Gastrosteiformes —The spinous dorsal is composed of isolated spines, if present; the ventrals are either thoracic or have an abdominal position in consequence of the prolongation of the pubic bones which are attached to the humeral areh. Mouth small, at the end of the snout, which is generally more or less produced.

Family 1. Gastrostcide.—Body elongate, compressed. Cleft of the mouth oblique ; villiform teeth in the jaws. Opercular bones not armed ; infraorbitals covering the cheek ; parts of the skeleton forming incomplete

external mail. Scales ~~none, but generally large scutes along the side. Isolated spines in front of the soft dorsal fin. Ventral fins abdominal, joined to the pubie bone, com~~ posed of a spine anda smallray. Branchiostegals three.

One genus only: Gastrosicus (Sticklebacks).

Family 2. Fistulariidw.—Fishes of greatly elongated form ; the anterior bones of the skull are much produced, and form a long tube, terminating in a narrow mouth. 'Teeth small ; scales none, or small. The spinous dorsal fin is either formed by feeble isolated spines or entirely absent ; the soft dorsal and anal of moderate length; ventral fins thoracie or abdominal, composed of five or six rays, with- out spine; if abdominal, they are separate from the pubic bones, which remain attached to the humeral arch. Branchiostegals five.

Genera: Fistularia, Aulostoma, Auliscops, and Aulorhynchus. The first three occur also in Kocene formations. Other fossil genera are Uvrosphen aud Rhamphosus,

Division XIII.

One family, Centriscide, with two genera, Centriseus (Trumpet- Fish, Bellows-Fish) and Amphisitle.

Division XIV. Acanthopterygit Gobiesociformes.—No spineus dorsal ; the soft and the anal short or of moderate length, situated on the tail; veutral fins subjugular, with an adhesive apparatus between them. Body naked.

Genera: Chorisochismus, Cotylis, Sicyascs, Gobicsox, Diploercpis, Crepidogaster, Trachclochismus, Lcpadogaster, and Leptopterygius.

Division XV. Acanthopterygii Channiformes.—Body elongate, eovered with scales of moderate size ; no spine in any of the fins ; dorsal and anal long. No superbranchial organ, only a bony pro- mineuee on the anterior surface of the hyomandibular.

Genera : Ophioccphalus and Channa.

Division XVI. Acanthopterygii Labyrinthibranehit.—Body com- pressed, oblong or elevated, with scales of moderate size.

Family 1. Labyrinthict.—Dorsal and anal spines present, but in variable number ; ventrals thoracic. Lateral line absent, or more or less distinetly interrupted. Gill-opening rather narrow, the gill-membranes of both sides coalescent below the isthmus, and scaly ; gills four ; pseudobranchie rudimentary or absent.

Genera: Anabas, Spirobranchus, Ctenopoma, Polyacanthus, (Paradise-Fish), Osphromenus (Goramy), Trichogaster, Betta, and Micracanthus.—Allied to this family is Lueioeephalus.

Division XVII. Acanthopterygit Lophotiformcs.—Body ribbon- shaped, with the vent near its extremity; a short anal behind the vent ; dorsal fin as long as the body,

Only one genus is known of this division or family, Lophotes.

Division XVIII. Acanthopterygit Teentiformes (Ribbon-Fishes). —Body ribbon-shaped; dorsal fin as long as the body; anal absent; eaudal rudimentary, or not in the longitudinal axis of the fish.

Genera: Trachypterus, Stylophorus, and Regalccus.

Diviston XIX. Acanthopterygit Notacanthiformes.—Dorsal fin short, composed of short, isolated spines, without a soft portion. Anal fin very long, anteriorly with many spines ; ventrals abdo- minal, with more than five soft and several unarticulated rays.

One genus only : Notacanthus.

Gill-openings wide. Verte-

Orver I].—Acanthopterygii Pharyngognathi.

Part of the rays of the dorsal, anal, and ventral fins are non- artieulated spines. The lower pharyngeals coalesced. Air-bladder without pneumatic duet. ;

Family 1. Pomacentridee.—Body short, compressed, covered with ctenoid seales. Dentition feeble ; palate smooth. The lateral line does not extend to the caudal fin, or is interrupted. One dorsal fin, with the spinous portion as well developed as the soft, or more. 'Two, sometimes three, anal spines; the soft anal similar to the soft dorsal. Ventral fins thoracic, with one spine and five soft

rays. Gills three and a half; pseudobranchie and air-bladder present. Vertebre, twelve abdominal and fourteen caudal.

Genera: Amphiprion, Premnas, Dascyllus, Lcpidozygus, Pom- aecntrus, Glyphidodon, Parma, and Heliastes. Fossil: Odontcus.

Family 2. Labridw.—Body oblong or elongate, covered with cycloid scales. The lateral line extends to the caudal, or is in- terrupted. One dorsal fin, with the spinous portion as well developed as the soft, or more so. The soft anal similar to the soft dorsal. Ventral fins thoracie, with one spine and five soft rays. Palate without teeth. Lranchiostegals five or six; gills three and a_ half; pseudobranchie and _ air-bladder present. Pyloric appendages none ; stomach without cecal sac.

Genera : Labrus and Crenilabrus (Wrasses), Tautoga, Ctenolabrus, Acantholabrus, Centrolabrus, Lachnolemus, Malacopicrus, Cossyphus, Chilinus, Epibulus, Ananupses, Platyglossus, Novacula, Julis, Coris, Cherops, Xiphochilus, Scmicossyphus, Trochocopus, Decodon, Picr- agogus, Clepticus, Labrichthys, Labroides, Duymeria, Cirrhilabrus, Doratonotus, Pscudochilinus, Hemigymnus, Gomphosus, Chceilio, Cymolutcs, Pscudodax, Scarus, Searichthys, Callyodon, Pseudo- scarus, Odax, Coridodax, Olistherops, and Siphonognathus. Fossil : Nummopalatus, Phyllodus, Taurinichthys, and Egcrtonia,

Fainily 3. Embiotocide.—Body eompressed, elevated or oblong, covered with cycloid scales ; lateral line continuous. One dorsal fin, with a spinous portion, and with a scaly sheath along the base, which is separated by a

groove from the other scales; anal with three spines and numerous rays; ventral fin thoracic, with one spine and five rays. Small tecth in the jaws, none on tho palate. Pseudobranchix present. Stomach siphonal; pyloric appendages none. Viviparous.

Genera: Ditrema and Hystcrocarpus.

Family 4. Chromides.—Body olevated, oblong or elongate, scaly, the seales being generally etenoid. Lateral line interrupted or nearly so. , One dorsal fin, with a spinous portion ; three or more anal spines ; the soft anal similar to the soft dorsal. Ventral fins thoracic, with one spine and five rays. Teeth in the jaws small, palate smooth. Pseudobranchise none. Stomach exeal; pyloric appendages none.

Genera: Etroplus, Chromis, Hemichromis, Paretroplus, Acara, Heros, Nectroplus, Mesonauta, Pctenia, Uaru, Hygrogonus, Cichla, Crenicichla, Chatobranchus, Mesops, Satanoperca, Geophagus, Sym- physodon, and Ptcrophyllum.

OrvER II].—Anacanthini.

Vertical and ventral fins without spinous rays. The ventral fins, if present, are jugular or thoracic. Air-bladder, if present, without pneumatic duct.

Division I. Anacanthinit Gadoidet.—Head and body symmetric- ally formed.

Fainily 1. Lycodidew.—Vertical fins confluent. Ventral fin, if present, small, attached to the humeral arch, jugular. Gill-opening narrow, the gill-membranc being attached to the isthmus,

Genera: Lycodes, Gymnclis, Uroneetes, Microdesmus, Blen- nodesmus, and Maynca.

Family 2. Gadide.—Body more or less elongate, covered with small smooth scales. One, two, or three dorsal fins, oceupying nearly the whole of the back ; rays of the posterior dorsal well developed ; one or two anal fins. Caudal free from dorsal and anal, or, if they are united, the dorsal with a

separate anterior portion. Ventrals jugular, composed of several rays, or, if they are reduced to a filament, the dorsal is divided into two. Gill- opening wide; the gill-membranes generally not attached to the isthmus. Pseudobranchie none, or glandular, rudimentary. An air-bladder and pyloric appendages generally present.

Genera: Gadus (Cod-Fish, Haddock, Whiting, Pollack, Coal-Fish), Gadiculus, Mora, Strinsia, Halargyreus, Mclanonus, Merluccius (Hake), Pscudophycis, Lotella, Physiculus, Uraleptus, Lomoncema, Phycis, Haloporphyrus, Lota (Burbot), Molva (Ling), Afotclla (Rockling), Raniceps, Bregmaccros, Murcenolepis, Chiasmodus, and Brosmius. Fossil remains are rare: Nemopicryx and Paleogadus from the scliists of Glarus, a formation believed to have been the bottom of a very deep sea. In the elay of Sheppey species oecur allied to Gadus, Mcrluceins, and Phyeis.

Family 3. Ophidiidw.—Body more or less elongate, naked or scaly. Vertical fins generally united ; no separate anterior dorsal or anal; dorsal occupying the greater portion of the back. Ventral fins rudimentary or absent, jugular. Gill-openings wide, the gill-mein- branes not attached to the isthmus.

1. Brotulina: Ventral fins present, attached to the humeral areli. Genera : Brotula, Lucifuga, Bathynectes, Acanthonus, Typhlonus, Aphyonus, Rhinonus, Sirembo, Pteridium, Brotulophis, Halidesmus, Dinematichthys, and Bythites.

2. Ophidiina: Ventral fins replaced by a pair of bifid filaments (barbels) inserted below the glossohyal. Genera: Ophidiwm and Genypteras. ;

3. Ficrasfcrina : No ventral fins whatever; vent at the throat. Genera: Ficrasfer and Eneheliophis.

4. Ammodytina: No ventral fins whatever ; vent remote from the

head ; gill-openings very wide, the gill-membranes not being united. Genera: Ammodytes (Sand-Eels) and Bleekeria.

5. Congrogadina : No ventral fins whatever ; vent remote from the head ; gill-openings of moderate width, the gill-membranes

being united below the throat, not attached to the isthmus. Genera : Congrogadus and Haliophis.

Family 4. Macruridee. —Body terminating in a long, compressed, tapering tail, covered with spiny, keeled, or striated seales.

similar to that of the second dorsal; no caudal. racic or jugular, eomposed of several rays. Deep-sea Gadoids.

Genera: Aacrurus, Coryphanvides, Macruronus, Malacocephalus, and Bathygadus.

Division IL. Anacanthini Pleuronectoidet.—Head and part of the body unsymmetrically formed. This division consists of one family

only: Plewronectide (Flat-Fishes).

Genera : Psettodes, Hippoglossus (Holibut), phritis, Rhombus (Turbot, Brill, Knot), Arnoglossus, Pscudorhombus, Rhomboidichthys, Citharus, Anticitharus, Brachypleura, Samarvs, Psettichthys, Citharichthys, Hemirhombus, Paralichthys, Liopsetta, Lophonectes, Lepidopsetia, Thysanopsetta, Pleuronectes (Plaiee, Dab, Flounder), Rhombosolea, Parophrys, Psammodiscus, Ammutretis, Peltorhamphus, Nematops, Loops, Peecilopsetta, Solea (Sole), Synaptura, Atsopia, Gymnachirus, Cynoglossus, Solcotalpa, Apionichthys, Anvmopleurops, Aphoristia, and Plagusia.

Hippoglossoides, Te-

Orper 1V.—Physostomi.

All the fin-rays articulated, only the first of the dorsal and pec-

toral fins is sometimes ossified. Ventral fins, if present, abdominal, without spine. (except in Scombresocidw).

Family 1. Silwrida@.—Skin naked or with osseous scutes, but

without seales. Barbels always present; maxillary bone rudimen-

tary, almost always forming a support to a maxillary barbel. Mar-

gin of the upper jaw formed by the intermaxillaries only. Sub- opereulum absent. Air-bladder generally preseut, eommunicating with the organ of hearing by means of the auditory ossicles. pose fin present or absent.

A large family of freshwater fishes, represented by numerous genera, which cxhibit a great varicty of form and structure of the Their first appearance is indicated by some fossil remains in Tertiary deposits of the highlands of Padang in Sumatra, where Psendeutropius and Bagartus, types well represented in the living In North America also spines

fils.

Indian fauna, have been found. referable to “‘ Cat-Fishes ” have been found in Tertiary formations.

From the great number of different generic types this family has

been arranged under eight subdivisions :— 1. Siluride Homaloptere. A. Clariina ; Clarias, Heterobranchus. B. Plotosina : Plotosus, Cnidoglanis, Copidoglanis, Chaca. 2. Siluride Heteroptere.

A. Silurina : Saccobranchus, Silurus, Schilbe, Eutropius, Silurichthys, Wallago, Belodontichthys, Entropiichthys, Cryptopterus, Callichrous, Hemisilurus, Siluranodon, Ailia, Schilbichthys, Lais, Pseudeutropius, Pangasius, Helicophagus, Silondia.

3. Siluridee Anomalopterc. A. Hypophthalmina : Hypophthalnus, Helogenes. 4, Siluride Proteroptere.

A. Bagrina: Bagrus, Chrysichthys, Pseudobagrus, Liocassis, Bagroides, Acrochordonichthys, Akysis.

B. Amiurina : Amiurus, Hopladelus, Noturus.

C. Pimelodina: Platystoma, Sorubim, Hemisorubim, Platystomatichthys, Phractocephalus, Piramutana, Platy- nematichthys, Piratinga, Bagropsis, Sciades, Pimelodus, Pirinampus, Conorhynchus, Notoglanis, Callophysus, Lophiosilurus, Auchenoglanis.

D. Artina: Arius, Galeichthys, Genidens, Paradiplomystax, Diplomystax, Alurichthys, Hemipimelodus, Ketengus, Osteogeniosus, Batrachocephalus, Atopochilus.

E. Bagartina: Bagarius, EKuglyptosternum, Glyptosternum.

5. Silurida Stenobranchic.

A. Doradina : Ageniosus, Tetranematichthys, Kuanemus, Auchenipterus, Glanidium, Centromochlus, Trachelyo- pterus, Cetopsis, Astrophysus, Doras, Synodontis.

B. Rhinoglanina : Rhinoglanis, Callomystax.

C. Malapterurina, Malapterurus.

6. Siluride Proteropodes.

A. Hypostomatina : Stygogenes, Arges, Brontes, Astrople- bus, Callichthys, Chetostomus, Plecostomus, Hypopto-

oma, Loricaria, Acestra, Sisor, Erethistes, Exostoma,

. we am . Aspredinina: Aspredo, Bunoccphalus, B 1] – ichthys, Harttia. B é : ie

Clarotes, Macrones, Bagrichthys, Rita,

TCH TH FOLUG®

One short anterior dorsal ; the second very long, continued to the end of the tail, and composed of very feeble rays; anal of an extent Ventral fins tho-

Whiff), Phrynorhombus (Top-

Air-bladder, if present, with a pneumatic duct

Adi-

[CLASSIFICATION.

7. Silurida Opisthoptere. A. Nematogenyina: Weptapterus, Nematogenys. BR. Trichomycterina: 'Trichomycterus, Eremophilus, Pari- odon.

8. Siluridew Branchicole: Stegophilus, Vandellia.

Family 2. Scopelide:.—Body naked or scaly. Margin of the. upper jaw formed by the intermaxillary only ; opercular apparatus sometimes incompletely developed. Barbels none. Gill-opening very wide; pseudobranehiz well developed. Air-bladder none. Adipose fin present. 'The eggs are enclosed in the sacs of the ovary, and exeluded by oviducts. Pyloric appendages few in nuniber or absent. Intestinal traet very short.

Genera: Saurus, Bathysaurus, Bathypterois, Harpodon, Scopclus, Ipnops, Paralepis, Sudis, Plagyodus, Aulopus, Chlorophthalmus, Scopelosaurus, Odontostomus, and Nannobrachium. Fossil : Osme- roides, Hemiswurida, Parascopelus, and Anapterus.

Family 3. Cyprinide.—Body generally covered with scales ; head naked. Margin of the upper jaw formed by the intermaxil- laries. Belly rounded, or, if trenchant, without ossifieations. No adipose fin. Stomach without blind sac. Pyloric appendages none. Mouth toothless ; lower pharyngeal bones well developed, falciform, subparallel to the branchial arches, provided with teeth, whieh are arranged in one, two, or three series. Air-bladder large, divided into an anterior and posterior portion by a eonstriction, or intoa rightora left portion, enclosed in an osseous capsule. Ovarian saes elosed.

The family of " Carps " is the one most numerously represented in the fresh waters of the Old World and of North America. Numerous fossil remains are also found in Tertiary freshwater formations ; the majority can be referred to existing genera: Barbus, Thynn- ichthys, Gobio, Leuciscus, Tinca, Amblypharyngodon, Mhodeus, Cobitis, Acanthopsis ; only a few showing

characters different from those of living genera : Cyclurus, Hexapsephus, Mylocyprinus.

There is much less diversity of forms and habits in this family than in the Siluroids; but the genera are sufficiently numerous to demand a further subdivision of the family into groups.

1. Catostomina : Catostomus, Moxostoma, Seleroguathus, Car-

iodes.

e 2, Cyprinina : Cy rinus (Carp), Carassius, Catla, Cirrhina, Dangila, Osteochilus, abeo, Barynotus, Tylognathus, Abrostomus, Discognathus, Crossochilus, Gymnostomus, ee eeeae! Capoeta, Barbus (Barbel), Thyunichthys, Barbiehthys, Ambly- rhynchichthys, Albulichthys, Oreinus, Schizothorax, Ptychobarbus, Gyinnocypris, Schizopygopsis, Diptychus, Aulopyge, Gobio (Gud- geon), Ceratiehthys, Bungia, Pimephales, Hyborhynehus, Cam- postoma, Hybognathus, Ericymba, }'seudorasbora, Cochlognathus, Exoglossum, Rhiniehthys.

3. Rhoteichthyina : Rhoteichthys.

4, Leptobarbina : Leptobarbus.

5. Rasborina : Rasbora, Luciosoma, Nuria, Aphyocypris, Ambly-pharyngodon.

6. Semiplotina : Cyprinion, Semiplotus.

7, Xenocypridina : Xenocypris, Paracanthobrama, leucus.

8. Leuciscina: Leueiscus (White-Fish, Roach, Chub, Daee, Rudd, Minnow), Myloleucus, Ctenopharyugodon, Mylopharodon, Para- phoxinus, Meda, Graodus, Tinea (Teneh), Leueosomus, Chondro- stoma, Orthodon, Aerochilus.

9. Rhodeina : Achilognathus, Rhodeus, Pseudoperilampns.

10. Danionina: Danio, Pteropsarion, Aspidoparia, Barilius, Bola, Schaera, Opsariichthys, Squaliobarbus, Ochetobius.

11. Hypophthalmichthyina : Hypophthalmichthys.

12. Abramidina : Abramis (Bream), Aspius, Alburnus (Bleak), Leucaspius, Rasborichthys, Elopichthys, Pelotrophus, Acantho- brama, Osteobrama, Chanodichthys, Sniiliogaster, Culter, Pelecus, Eustira, Chela, Pseudolabuca, Cachius.

13. Homalopterina : Homaloptera, Psilorlhynchus.

14. Cobitidina (Loaeles): Misgurnus, Nemaehilus, Cobitis, Lepidocephalichthys, Acanthopsis, Botia, Oreonectes, Lepido- cephalus, Acanthophthalmus, Apua, Paramisgurnus. amily 4. Knervide.—Body scaly, head naked. Margin of the upper jaw formed by the intermaxillaries. Dorsal and anal fins short, the former belonging to the abdominal portion of the vertebral

Mystaeo-

eolumn. Teeth none, either in the mouth or pharynx. Barbels none, Stomach siphonal; no pyloric appendages. Pseudobranchie

none. Branchiostegals three; air-bladder long, not divided. Ovaries closed.

One genus : Kneria.

Family 5. Characinide.—Body covered with scales, head naked ; barbels none. Margin of the upper jaw formed by the intermaxil- laries in the middle and by the maxillaries laterally. Generally a small adipose fin behind the dorsal. Pyloric appendages more or less numerous ; air-bladder transversely divided into two portions, and communicating with the organ of hearing by means of the auditory ossicles. Pseudobranehiz none.

1, Erythrinina: Macrodon, Erythrinus, Lebiasina, Nannostomus, Pyrrhulina, and Corynopomia.

CLASSIFICATION. |

2. Curimatina : Curimatus, Prochilodus, Cxnotropus, Hemiodus, Saccodon, Parodon.

3. Citharinina : Citharinus.

4. Anastomatina: Leporinus, Anostomus, Rhytiodus.

5. Nannocharacina : Nannocharax.

6. Te:ragonoptcrina: Alestes, Tetragonopterus, Chirodon, Megalo- brycon, Gastropclecus, Piabueina, Scissor, Pseudochalceus, Aphyo- charax, Chalceus, Brycou, Chalcinopsis, Bryconops, Creagrutus, Chalcinus, Piabuca, Paragoniates, Agoniates, Nannethiops, and Bryconzthiops.

7. Hydrocyonina : Hydrocyon, Cynodon, Anaeyrtus, Hystvi- codon, Salminus, Oligosarcus, Xiphorhamphus, Xiphostoma, aud Sarcodaces.

8. Distichodontina : Distichodus.

9. Ichthyborina : Ichthyborus and Phago.

10. Crenuchina : Crenuchus and Xeuocharax.

11. Serrasalmonina : Mylesinus, Serrasalmo, Myletes, and Cato-

prion. : Family 6. Cyprinodontidcee.—Head and body covered with scales; barbels none. Margin of the upper jaw formed by the intermaxil- laries only. Teeth in both jaws; upper and lower pharyngeals with cardiform teeth. Adipose fin none; dorsal fin situated on the hinder half of the body. Stomach without blind sac ; pyloric appendages none. Pseudobranchie none; air-bladder simple, with- out ossicula auditus.

1. C. Carnivore: Cyprinodon, Characodon, Fitzroyia, Haplochilus, Fundulus, Limnurgus, Lucania, Rivulus, Cynolebias, Orestias, Jenynsia, Gambusia, Pseudoxiphophorus, Belonesox, Anableps.

2. C. Limnophage: Peecilia, Mollienesia, Platypeecilus, Girardiuus. Fossil remains are referable to Cyprinodon and Peecilia.

Family 7. Heteropygit.—Head naked ; body covered with very small scales ; barbels none. Margin of the upper jaw formed by the intermaxilaries. Villiform teeth in the jaws and on the palate. Adipose fin none. Dorsal fin belonging to the caudal portion of the vertebral column, opposite to the anal. Ventral fins rudimen- tary or absent. Vent situated before the pectorals. Stomach excal; pyloric appendages present. Pseudobranchie noue; air- bladder deeply notched anteriorly.

Genera : Amblyopsis (Blind-Fish of the Mammoth Cave) and Chologastcr.

Family 8. Umbridcee.—Head and body covered with scales; barbels none. Margin of the upper jaw formed by the intemmnaxillaries mesially and by the maxillaries laterally. Adipose fin none ; the dorsal fin belongs partly to the abdominal portion of the vertebral column. Stomach siphonal; pyloric appendages none ; pseudo- branchie glandular, hidden ; air-bladder simple.

One genus : Umbra.

Family 9. Scombresocidw.—Body covered with scales ; a series of keeled scales along each side of the belly. Margin of the upper jaw formed by the intermaxillaries mesially and by the mavillaries laterally. Lower pharyngeals united into a single bone. Dorsal fin opposite the anal, belonging to the caudal portion of the verte- bral column. Adipose fin none. Air-bladder generally present, simple, sometimes cellular, without pneumatie duct. seudo- branchise hidden, glandular. Stomach not distinct from the in- testine, which is quite straight, without appendages.

Genera: Belone (Gar-Pike), Scombresox, Hemirhamphus, Ar- rhamphus, Exocetus (Flying-Fish). Fossil : Holosteus.

Family 10. HLsocide.—Body covered with scales; barbels none. Margin of the upper jaw formed by the intermaxillaries mesially and by the maxillaries laterally. Adipose fin none; the dorsal fin belongs to the caudal portion of the vertebral column. Stomach without blind sac; pyloric appendages none. Pseudobranechie glandular, hidden ; air-bladder simple ; gill-opening very wide.

One genus only : Esox (Pike).

Family 11. Galaxiidew.—Body naked; barbels none. Margin of the upper jaw chiefly formed by the intermaxillaries, which are short, and continued by a thick lip, behind which are the maxil- laries. Belly rounded ; adipose fin none ; dorsal opposite to anal. Pyloric appendages in small number. Air-bladder large, simple ; pseudobranchie none. The ova fall into the cavity of the abdomen before exclusion.

Genera: Galaxias and Neochanna.

Family 12. Aformyride.—Body and tail scaly ; head scaleless ; barbels none. The margin of the upper jaw is formed in the middle by the intermaxilaries, which coalesce into a single bone, and laterally by the maxillaries. Suboperculum and interopercu- lum present, the latter very small. On each side of the single parietal bone a cavity leading into the interior of the skull, and covered with a thin bony lamella. All the fins are well developed (Mormyrus) ; or caudal, anal, and ventral fins are absent (Gym- narchus). No adipose fin. Pseudobranchie none ; gill-openings reduced toa short slit. Air-bladder simple. Two ceca pylorica behind the stomach.

Genera: Mormyrus and Gymnarchus. ;

Family 13. Sternoptychide.—Body naked, or with very thin deciduous scales ; barbels none. Margin of the upper jaw formed

‘Belly rounded.

by the maxillary and intermaxillary, both of which are toothed ; opercular apparatus not completely developed. Gill-opening very wide ; pseudobranchie present or absent; air-bladder simple, if present. Adipose fin present, but generally rudimentary. Series of phosphorescent bodies

along the lower parts. The eggs are enclosed in the sacs of the ovarium, and exeluded by oviducts.

Genera: Sternoptyx, Argyropelecus, Polyipnus, Coccia, Mauwro- licus, Chauliodus, Gonostoma, Photichthys, and Diplophos.

Family 14. Stoméatidee.—Skin naked, or with exceedingly delicate scales ; a hyoid barbel. Margin of the upper jaw formed by the intermaxillary and maxillary, which are both toothed ; opercular apparatus but little developed. Gill-opening very wide ; pseudo- branchia none, The eggs are cnclosed in the sacs of the ovarium, aud excluded by oviducts.

Genera: Astronesthes, Stomias, Echiostoma, Malacostcus, and Bathyophis.

Family 15. Salmonidw.—Body generally covered with scales ; head naked ; barbels none. Margin of the upper jaw formed by the intermaxillaries iesially aud by the maxillaries laterally. A small adipose fin behind the dorsal. Pyloric appendages gencrally numerous, rarely absent. Air-bladder large, simple ; pseudobranchix present. The ova fall into the cavity of the abdomen before exelusion.

Genera: Salmo (Sahnon, Trout, Charr), Oncorhynchus, Brachy- mystax, Luctotrutta, Pleeoglossus, Osmerus (Smelt), Retrowinna, Hypomesus, Thaleichthys, Mallotus (Capelin), Coregonus (Gwyniad, Pollan), Thymallus (Grayling), Salanx, Argentina, Microstoma, Bathylagus, Fossil: Osmeroides, Acrognathus, and Aulolepis.

Family 16. Percopside.—Body covered with ctenoid seales; head naked, Margin of the upper jaw formed by the intermaxilarics ouly; opercular apparatus complete. Barbels none. Gill-openings wide. Adipose fin present.

One genus only : Percopsis.

Family 17. ZHaplochitonide.—Body naked or scaly (cycloid). Margin of the upper jaw formed by the interinaxillary ; opereular apparatus complete. Barbels none. Gill-opening wide ; pseudo- branchie. Air-bladder simple. Adipose fin present. Ovaries laminated ; the eggs fall into the cavity of the abdomen, there being no oviduct. Pyloric appendages none.

Genera: Haplochiton and Prototroctes.

Family 18. Gonorhynchide.—Head and body entirely covered with spiny scales ; mouth with barbels. Margin of the upper jaw formed by the intermaxillary, which, although short, is continued downwards as a thiek lip, situated in front of the maxillary. Adi- pose fin none ; the dorsal fin is opposite to the ventrals, and short, like the anal. Stomach a without blind sac ; pyloric appen- dages in small number. seudobranehiz ; air-bladder absent. Gill-openings narrow.

One genus only : Gonorhynchus.

Family 19. Hyodontidee.—Body covered with cycloid scales ; head naked ; barbels none. Margin of the upper jaw formed by the intermaxiNaries mesially and by the maxillaries laterally, the latter being articulated to the end of the former. Opercular appa- ratus complete. Adipose fin none ; the dorsal fin belongs to the caudal portion of the vertebral column. Stomach horseshoe-shaped, without blind sac; intestine short; one pyloric appendage. Pseudo- branchie none ; air-bladder simple. Gill-openings wide. The ova fall into the abdominal cavity before exclusion.

Onc genus only : Hyodon (Moon-Eye).

Family 20. Pantodontide.—Body covered with large cycloid scales ; sides of the head osseous. Margin of the upper jaw formed by the single intermaxillary mesially and by the maxillaries laterally. The dorsal fin belongs to the caudal portion of the verte- bral column, is short, and opposite and similar to the anal. Gill- openings wide ; gill-covers consisting of a preoperculum and oper- culum only. Branchiostegals numerous. YPseudobranchiz none ; air-bladder simple. Stomaeh without czcal sac; one pyloric ap- pendage. Sexual organs with a duct.

One genus: Paniodon.

Family 21. Osteoglosside.—Body covered with large hard scales, composed of pieces like mosaic. Head scaleless ; its integumeuts almost entirely replaced by bone; lateral line composed of wide openings of the mucous duct. Margin of the upper jaw formed by the intermaxillaries mesially and

by the maxillaries laterally.' The dorsal fin belongs to the caudal portion of the vertebral coluinn, is opposite and very similar to the anal fin ; both approximate to the rounded caudal (with which they are abnormally confluent). Gill- openings wide ; pseudobranchiz none ; air-bladder simple or cellu- lar. Stomach without cecal sac ; pyloric appendages two.

Genera: Osteoglossum, Arapaima, and Hetcrotis.

Family 22. Clupeide.—Body covered with scales ; head naked; barbels none. Abdomen frequently compressed into a serrated edge. Margin of the upper jaw formed by the intermaxillaries mesially and by the maxillaries laterally ; maxillaries composed of at least three movable picces. Opercular apparatus complete, Adipose fin none ; dorsal not elongate ; anal soinetimes very lony, Stomach with a blind sac; pyloric appendages numerous, Gill-

apparatus mach developed, the gill-openings being generally very wide, Pseudobranchie generally present. Air-bladder more or less simple.

Genera: Engraulis (Anchovies), Coilia, Chatoessus, Clupea (Her- ring, Sprat, Shad, Mossbanker, Menhaden, Ale-Wife, Pilehard, Sar- dine), Clupcoides, Pellounla, Clupeickthys, Pellona, Pristigaster, Albula, Elops, Megalops, Chanos, Dussumicria, Etrumcus. Several of these genera have been found in Tertiary formations ; other fossils are: Thrissopater, Leptosouiits, Opisthopteryx, Spantodon, Lalee, Plating, Celogastcr, Rhinellus, Seombroclupea, Crossognathus, Spathodactylus, Chirocentrttcs, and Hemitrichas. .

Family 23. Bathythriside. —

Family 24. Chirocentride.—Body covered with thin, deciduous scales ; barbels none. Margin of the upper jaw formed by the intermaxillaries mesially and by the maxillaries laterally, both bones being firmly united in juxtaposition, _ Opercular apparatus eomplete. Adipose fin none: the dorsal fin belongs to the eaudal portion of the vertebral column. Stomach with a blind sac ; intes- tine short, the mucous membrane forming a spiral

fold ; pyloric appendages none. Pseudobranehic none ; air-bladder incompletely divided into cells ; gill-opening wide.

One genus only: Chirocentrus,

Family 25. Alepocephalide.—Body with or without scales ; head naked ; barbels none. Margin of the upper jaw formed by the sntermaxillaries and maxillaries, the former being placed along the upper anterior edge of the latter, Opercular apparatus complete. Adipose fin none ; the dorsal fin belongs to the caudal portion of the vertebral column. Stomaeh eurved, without blind sae ; pylorie appendages in moderate number. Pseudobranchie ; air-bladder absent. Gill-openings very wide.

Genera: Alepocephalus, Bathytroctes, Platylroctes, and Xenoderni-achithys.

Family 26. Notopleride.—Head and body scaly ; barbels none. Margin of the upper jaw formed by the imterimaxillaries mesially and by the maxillaries laterally. Opereular apparatus incomplete. Tail prolonged, tapering. Adipose fin none. onal short, belong- ing to the eaudal portion of the vertebral column ; anal very long. Stomach without blind sae; two pyloric appendages. Pseudo- branchic none ; air-bladder present, divided in the interior. The ova fall into the cavity of the abdomen before exclusion. On each side a paricto-mastoid eavity leading into the interior of the skull.

One genus only : Notopterus.

Family 27. Halosawride. — Body covered with eycloid scales ; head sealy ; barbels none. Margin of the upper jaw formed by the intermaxillaries mesially and by the maxillaries laterally. Oper- enlar apparatus ineomplete. Adipose fin none. The short dorsal belongs to the abdominal part of the vertebral column ; anal very long. Stomach with a blind sae ; intestine short ; pyloric appen- dages in moderate number. Pscudobranehie none,

One genus only : Lalosaurus.

Family 28. IJoplopleuride.—Body generally with four series of subtriangular seutes, and with intermediate seale-like smaller ones. One (?)

dorsal only ; head long, with the jaws produced.

Extinct. Genera: Derectis, Leptotrachelus, Pelargorhynchus, Plinthophorus, Sawrorhamphus, Eurypholis, Ischyrocephalus.

Family 29. Gymnotide, —H ead scaleless ; barbels none. Body elon- gate, cel-shaped. Margin ofthe upper jaw formed in themiddle by the itermaxillaries and laterally by the maxillaries, Dorsal fin absent or reduced to an adipose strip ; caudal generally absent, the tail terminating ina point. Anal fin exeeedingly loug. Veutrals none. Extremity of the tapering tail capable of being reproduced, Vent situated at, or at a short distance behind, the throat. Humeral arch attached to the skull. Ribs well developed. Gill-openings rather narrow.

Genera: Steruarchus, Ranyphichthys, Sternopygus, Carapus, Gymuotus (Klectrie Eel).

Family 30. Symbranchide.—Dody clongate, naked or covered with minute scales ; barbelsnone. Margin of the upper jaw formed by the intermaxillaries only, the well-developed maxillarics lying behind and parallel to them. Paired fins none. Vertical fins rudi- : : mentary, redueed to more or less distinet cutaneous folds. Vent which the mouth of some of thein 1s armed. situated at a great distance behind the head. Ribs present. Gill-Family 1. Petromyzontidee (Lampreys).—Body eel-shaped, naked. openings eonfluent into one slit situated on the ventral surface. Subject to a metamorphosis ; in the perfect stage with a suetorial Air-bladder none. Stomach without cecal sae or pylorie append- } mouth armed with teeth, simple or multicuspid, horny, sitting ona ages. Ovaries with oviduets. soft papilla. M axillary, mandibulary, lingual, and suetorial teeth

Genera: Auphipnous, Monopterus, Symbranchus, Chilobrauchus. | may be distinguished. Eyes present (in mature animals). External

Family 31. A/wranide (Ecls).—Body elongate, eylindrical or band- | nasal aperture in the middle of the upper side of the head. The shaped, naked or with rudimentary scales. Vent situated at a | nasal duet terminates without perforating the palate. Seven great distance from the head. Ventral fins none. Vertical fins, if branchial gae3 and apertures on eaeh side behind the

head; the present, confluent, or separated by the projecting tip of the tail. | inner branchial ducts terminate jn a separate common tube, Intes- Sides of the upper jaw formed by the tooth-bearing maxillaries, | tine with a spiral valve. Eggs small. The larve without teeth, the fore part by the intermaxillary, which is more or less eoalescent | and with a single continuous vertical fin. with the vomer and cthmoid. Humeral arch not attaehed to the Genera: Petronyzon, Mordacia, and Geotria. skull. Stomach with a blind sae; no pyloric appendages. Organs Family 2. Mywinide.— Body eel-shaped, naked. The single of reproduction without efferent duets, e nasal aperture is above the mouth, quite at the extremity of the

Genera: Nemiehthys, Cyema, Saccopharyuax, Synaphobranchus, Anguilla, Conger, Congromurana, Murenesox, Nettastoma, Sauren- ehclys, Oxycouger, Hoplunnis, Myrus, Myrophis, Paramyrus, Chilo- rhinus, Mureenichthys, Ophichthys, M oringua, Murana, Enchelycore.

Orver V.— Lophobranchit.

The gills are not, laminated, but composed of sinall rounded lobes attached to the branehial arches. Gill-cover reduced to a large simple plate.

Family 1. Solenostomidic.—Gill-openings wide. Two dorsal fins, the rays of the anterior not articulated. All the other fins well developed.

One genus only : Solenostoma, which was preeeded in the Tertiary epoch by Soleworhynchus (Monte Postale).

Family 2. Syngwathide. —Gill-openings reduced to a very small opening near the upper posterior angle of the gill-cover. One soft dorsal fin; no ventrals, and sometimes one or more of the other fins are also absent.

ipe-Fishes and Scahorses. Fossil remains oceur at Monte Bolea. Besides species of Siphonostoma and Syngnathus (Pscudosyngnathus), remains of an extinct genus, Calamostoma, allied to Hippocampus, but with a distinet eandal fin, have been found.

Genera: Stphonostoma, Syngnathus, Doryichthys, Nerophis, Protocampus, Ichthyocampus, Nannocampus, Urocampus, Lepto- ichthys, Celouotus,

Stignatophora, Gastrotokeus, Solenognathus, Phyllopteryx, IIippocampus.

Orprr VI.—Plectognathi.

Teleostcous fishes with rough scales, or with ossifications of tle cutis in the form of scutes or spincs; skin sometimes entirely naked. Skeleton incompletely ossified, with the vertebre in small number, Gills peetinate ; a narrow gill-opening in front of the pectoral fins. Mouth narrow ; the bones of the upper jaw generally firmly united. A soft dorsal fin, belonging to the caudal portion of the vertebral column, opposite to the anal; sometimes elements of a spinous dorsal besides. Ventral fin none, or reduced to spines. Air-bladder without pneumatic duct.

Family 1. Se/erodermt.—Snout somewhat produced ; jaws armed with distinct tecth in small number. Skin with scutes, or rough. The elements of a spinous dorsal and ventral fin generally present.

Genera: Z'riacanthus, Balistes (File-Fish), Monacanthus, Anacan- thus, Ostracton (Coffer-Fish). Fossil: Acanthoderma, Acantho- pleurus, Glyptocephalus.

Fainily 2. G@ymnodontes,—Body more or less shortened. The bones of the upper and lower jaw are confluent, forming a beak with a trenchant edge, without teeth, with or without median suture. A soft dorsal, caudal, and anal are developed, approximate. No spinous dorsal. Pectoral fins ; no ventrals.

Genera: Zriodon, Tetrodon (Globe-Fish), Diodon (Sea- Hedge- hog), Orthagoriscus (Sun-Fish).

Subclass I1I.—Cyclostomata.

Skeleton cartilaginous and notochordal, without ribs and without real jaws. Skull not separate from the vertebral colunn. No limbs. Gills in the form of fixed sacs, with- out branchial arches, six or seven in nuinber on each side. One nasal aperture only. Heart without bulbus arteriosus. Mouth anterior, surrounded by a circular or subcir- cular lip, suctorial. Alimentary canal

straight, simple, without cecal appendages, pancreas, or spleen. Generative outlet peritoneal. Vertical fins rayed.

The Cyclostomes are most probably a very ancient type. Unfortunately the organs of these creatures are too soft to be preserved, with the exception of the horny denticles with

head, which is provided with four pairs of barbels. Mouth without lips. Nasal duct without cartilaginous rings, penctrating the palate. Onc median tooth on the palate, and two comb-like scrics of teeth on the tonguc. Branchial apertures at a great distance from the head ; the inner branchial ducts lead into the cesophagus. A series of mucous sacs along cach side of the abdomen. Intestine without spiral valve. Eggs large, with a horny case provided with threads for adhesion. Genera: Myzxine and Bdellostoma (Hag-Fish).

Subclass 1V.—Leptocardii.

Skeleton membrano-cartilaginous and notochordal, rib- less. No brain. Pulsating sinuses in place of a heart.

ICHTHYOSAURUS (from iy6vs, a fish, and catpos, a lizard), a genus of extinct reptiles, the species of which are the only known representatives of the order Zchthyopterygia. Upwards of thirty of these have been described, all of Mesozoic age, the genus so far as is certainly known appearing for the first time in the Liassic formation where it most abounds, continuing throughout the Oolitic, and disappearing before the close of the Cretaceous period. In Britain its remains have been found in greatest abundance in the Lias of Lyme Regis, although it occurs more or less commonly throughout the whole of that formation from the south of Dorsetshire through Somerset and Leicester to the Yorkshire coast. They are found in rocks of similar age in France and Germany ; and Sir Edward Belcher ob- tained remains of a Liassic ichtlyosaur from an island in 77° 16’ N. lat..—one of many proofs that in Mesozoic times a comparatively warm climate must have prevailed within the Arctic Circle. Remains of true ichtlyosaurs have not yet been found on the American continent, although Professor Marsh lately (1877)

described portions of the skeleton of a saurian obtained from strata of Jurassic age in the Rocky Mountains which seems to have differed from Old World ichthyosaurs chiefly in the absence of teeth, the jaws being "entirely edentulous and destitute even of a dentary groove." For the reception of this form Professor Marsh proposes to institute a new order—Sauranodonta; but it has been suggested, on the other hand, that Sauranodon should rather be regarded as the type of a new family of the old order Zchthyopterygia.

Owing to the comparative abundance and excellent preservation of ichthyvsaurian remains, the hard parts of those creatures have been studied under exceptionally favourable circumstances, and much has thus been learnt

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Blood colourless. Respiratory cavity confluent with the abdominal cavity ; branchial clefts in great number, the water being expelled by an opening in front of the vent. Jaws none.

This subclass is represented by a single family (Cirro- stomt) and by one or two genera (Branchiostoma and Lqagionichthys) ; it is the lowest in the scale of fishes, and lacks so many characteristics, not only of this class, but of the vertebrata generally, that Haeckel, with good reason, separates it into a distinct class, that of Acrania. The various parts of its organization have been duly noticed in the former parts of this article. (a. ©. G.)

placed not in distinct sockets, as in the crocodile, but in a common alveolar groove. These, as they became worn, were replaced by a succession of young teeth, which budded up at the base of the old. The neck in the ichthyosaurus was extremely short, and not marked by any constriction. The vertebre resembled those of fishes in being deeply biconcave. The tail was long and tapering; in many specimens this organ has been found to be fractured at about a fourth of its length from the extremity, and, as the

vertebrae of the same region seem to have been flattened

vertically, Professor Owen regards it as probable that these reptiles were provided with a tegumentary caudal fin like that of the Cetacea, only vertical instead of horizontal ; the sole evidence of the presence of such a horizontal fin in extinct whales would be the horizontally flattened condition of the last caudal vertebra, should any of these chance to be preserved. Ichthyosaurians were provided with two pairs of limbs in the form of paddles, which externally must have borne considerable resemblance to the anterior limbs of dolphins and other Cetacea. They differed, how- ever, very markedly from these in the possession of a bony apparatus, stretching, in the case of the front pair, from one shoulder joint to the other, on which the anterior paddles were supported. This "scapular arch," according to Professor Owen, resembled, "im the number, shape, and disposition of its bones," the same parts in the Australian Ornithorhynchus, a mammal which leads, as Zchthyosaurus did, an aquatic life, obtaining its food at the bottom of lakes and rivers, but having to rise frequently to the sur- face to breathe. The hind limbs were in almost all the species much smaller than the pair infront. The skeleton of each of the paddles consisted mainly of a large number —in some species exceeding a hundred—of small poly-

of their structure and, by inference therefrom, of their | gonal bones arranged in more than five closely packed

life history. They were large marine reptiles, measuring in some instances 30 feet in length, and somewhat re- sembling in appearance the dolphins of the present day. Like these they were air-breathers, and must therefore have come to the surface to breathe, although being cold- blooded they were no doubt able, like the aquatic saurians of our own period, to remain much longer under water than the warm-blooded Cetacea. The ichithyosaurian head was large, and was prolonged into a more or less elongated snout, certain species rivalling in this respect the gavial of the Ganges. The brain cavity, on the other hand, was remarkably small. The eyes were enormously large, the orbit in Ichthyosaurus platyodon—the largest known species —having been found to measure 14 inches in long diameter. This huge eyeball was protected by a ring of bony sclerotic plates similar to those found in rapacious birds and in turtles and lizards of the preseut day. The jaws, which in Ichthyosaurus platyodon have been known to measure 6 feet in

length, were rendered still more formidable by their array of strong, conical, pointed teeth, numbering in some instances over one hundred and eighty, and

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longitudinal rows, the whole covered with skin, and form- ing a highly elastic organ of locomotion. The ichthyosaur was provided with slender ribs along the vertebral column from the anterior part of the neck to the tail; a sternum, however, was wanting, the abdominal walls being strength- ened by the development of transverse arcuated bones. As no trace of horny scales or bony scutes has ever been detected in connexion with those reptilian remains, it may be assumed that these sea-saurians, as they have been called, were, like the Cetacea of the present day, covered with a smooth or wrinkled skin unprovided with any of those dermal appendages.

From a study of their bony structure it may be inferred that these huge aquatic reptiles inhabited the open sea, occasionally visiting the shores, where their powerful paddles enabled them to crawl on land, and where, like seals, they probably loved to bask in the sunshine. That they were predatory in their habits—the tyrants indeed of Mesozoic seas—might be inferred from our knowledge of their jaws and teeth; and this is amply confirmed by an examination of the half-digested contents of their stomachs.

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Their food seems to have consisted chiefly of ganoid fishes and the smaller reptiles, and as the vertebrae and other remains of young ichthyosaurs have occasionally been found mixed with these, there is reason to believe that they, like many other mariue animals, did not hesitate to devour the weaker members of their own species. In several instances tolerably complete skeletons of sinall ichthyosaurs have thns been found enclosed within the ribs of larger indi- viduals of the same species, and their occurrence gave rise to the evidently erroneous conjecture that those reptiles might have been viviparous. The fact that the entombed specimeus have in almost every case been found with the Viead turned towards the tail of the euclosing animal was supposed to favour this view; the discovery, however, of

additional specimens may at any time deprive this argument of the little value it has, and recently Professor Merian described a specimen from the Upper Lias of Wiirtemberg ‘n which the included ichthyosaur lay with its head towards that of the enveloping specimen. ‘The nature of their food is indicated, not only by the occurrence, in what from its position must have been the stomach, of the hvf-digested remains of fishes and reptiles, but also by the presence of similar relics, aud especially of the scales of fishes, in their feces. The coprolites of the ichthyosaurians are oval bodies measuring usually from 2 to 4 inches in length, and exhibiting on their surface the impression of the spirally convoluted internal surface of the intestine. These copro- lites consist chiefly of phosphate of lime, and occur in great abundance in ccrtain Liassic beds, where, says Buck- land, they look ‘like potatoes scattered on the ground.” The species of the genus Ichthyosaurus differ from each

other chiefly in the proportion of certain parts of the body

and of the teeth. Professor Huxley has divided them

into two groups :—(1) those which have relatively short

snouts and short paddles, with fonr carpalia, including therein such forms as J. intermedius and I. communis, the latter remarkable as having its anterior paddles tliree titnes the length of the pair behind ; and (2) those with louger snouts, long paddles, and three carpalia, including such forms as I. longirostris and I. tenwirostris, which their snouts rival the gavial of the Ganges, and J. platyodon, in which the fore and hind limbs are of equal length. ICONIUM (Greek ’Ixdmov), an ancient city of Asia Minor, now, under the name of Cogni, Konieh, Kontyeh, Konijah, or Konia, the capital of the Turkish vilayet of Caramania, is situated 310 miles east from Smyrna, at the entrance to an extensive and elevated plain which forms the centre of Asia Minor. To the eastward this plain stretches beyond th> horizon, but the city is enclosed on other sides by a semicircle of snow-covered mountains. It lies at the foot of Mount Taurus, and the country immedi- ately around it, watered by streams from the surrounding mountains, is occupied by fruitful gardens and orchards, forming an oasis in the midst of wide-stretching barrenness and desolation. The numerous richly adorned mosques, chapels, shrines, and monumeuts attest the former import- ance of the city when in

the zenith of its power and pro- sperity, and lend additional brightness and picturesqueness to its appearance as seen from a distance ; but on closer inspection the splendour is seen to be 89 intermixed with squalor and decay as to degenerate into tawdriness. Ancient walls about 2 miles in circumference surround the older part of the town, but one half of the inhabited portion is outside their boundaries. These walls were built by the Seljuk sultans in the 13th century of large square blocks of stone which have evidently formed part of more ancient edifices; and they are flanked by square towers richly adorned with cornices, demi-lions couchant, eagles with outspread wings, and Arabic inscriptions. The gateways are ornamented with alto-rilievos representing figures jn

in the length of

procession. Great part of the space inside the walls is occupied by crumbling ruins of houses, and by dilapidated mosques half-buried in rubbish and overgrown by weeds. Of the ancient Greek city there are now no remains, but Greek inscriptions are to be found in the ancient walls erected by the Turkish conquerors, and bas-reliefs and other relics have been dug up at various periods. Modern Konieh lies to the south-west of the old town, half of it being outside the walls. The honses are one-storied, nuplastered, and built mostly of sun-dried bricks and wood. Among the numerous monuments of saints and sheiks is the famous green monument of Mevlana-Djelal-eddin-Rimi, the poet and founder of the spinning dervishes, large numbers of whom have taken up their quarters in the surrounding gardens. The most beautiful building of the city is the court mosque, with a lofty and finely tapering minaret glittering with porcelain. Of the old residence castle situated on the hill within the bound- aries there are now only a few reinains, great part of it having been used in building the Konak or palace of the pasha, Adjoining the ruins of the castle there is an old Byzantine chapel dedicated to St Thecla. Below the castle, and forming part of the western wall of the town, there is another fortress in a pretty good state of preservation, and for many years used as a state prison. ‘he bazaar has a miserable appearance, and the principal goods exposed for sale are English and Swiss cottons and Nuremberg wares, the oppressive regulations

of the Turkish Government in regard to the importation of salt having rendered the rearing of sheep wholly unprofitable, and thus entirely destroyed the native cloth-weaving industry. The umber of dwelling-houses is about 7000, of which 150 are Armenian; and the population numbers in all proba- bility between 40,000 and 50,000.

Jconium was situated on the military road between Antioch of Pisidia and Derbe. By Strabo (xii. 6, 1) it is spoken of as a small town (roaAlxviov), but by Pliny (Z. V., v. 25) as a very celebrated city. Xenophon (Anab., i. 2, 19) mentions it as the nearest town to Phrygia; but Cicero (Ad Div., iii. 6-8; xv. 4) calls it the capital of Lycaonia; while Ammianus Marcellinus (xiv. 2) reckons it as belonging to Pisidia. In the time of Pliny its terri- tory formed a tetrarchy which embraced fourteen cities, many of them of considerable size. The apostle Paul visited Iconium on his first missionary tour from Antioch, and founded a Christian community there, but on account of the hostility of the Jews he deemed it expedient to retire to Lystra. Subsequently he twice yisited the city; and it is the scene of the apocryphal story of Paul anl 'Thecla, mentioned by many of the carly fathers. About this time it became a Roman colonia, its Roman name being Claudia or Claudiconium. A Christian synod met at Iconium in 235. Under the rule of the Byzantine emperors the city con- tinued to flourish, but in 708 it was conquered by the Arabs an'l incorporated in the caliphate. Having been conquered by the Sel- juk Turks in 1074, Kilidj Arslan J. in 1097 made it his resi- dence, and the capital of a kingdom whose rulers were named sultans of Iconium, and which inay be regarded as the cradle of the Ottoman power. On May 18, 1190, Frederick Barbarossa, after a victory over the Turks on the 7th, captured the town, but failed to storm the castle. From 1244 the sultans were alternately deposed and reinstated by the khans of the Mongols, until the dismember- ment of the sultanate on the death of Masoud II. in 1294, when their territories were added to Caramania, which in 1892 acknow- ledged the sovereignty of the Porte, and in 1486 was incor- porated with the Ottoman empire. On 80th December 1832 the city was the scene of a victory over the Turks by Ibrahim Pasha. See Kinneir, Z'ravels in Asia Minor; Hamilton, Researches in Asia Minor ; Leake, Geography of Asia Minor; Chesney, Euphrates Expedition ; Texier, Asie Mincure ; and E. Sherling in the Berlin Zeitschrift fiir allgemeine Erdkunde for 1864.

ICONOCLASTS. Sec Imace WorsuHIP.

ICTERUS, a bird so called by classical authors, and supposed by Pliny to be the same as the Galgulus, which nearly all writers agree in considering to be what we now know as the Golden Oriole (Oriclus galbula).! At any

x The number of aa by which this species was known in ancient times—Chloris or Chlorion, Galbula (akin to Galgulus), Parra, and

rate it signified one in the plumage of which yellow or green predominated, and hence Brisson did not take an unhappy liberty when he applied it in a scientific sense to some birds of the New World of which the same could be said. 'These are now held to constitute a distinct Family, /cteride, intermediate it would seem between the Buntines (vol. iv. p. 525) and Srarzines (g. v.) ; and, while many of them bear the vulgar name of Troopials (the English equivalent of the French Zroupiales, first used by Brisson), others are known as the American GRacKLES (vol. xi. p. 26). The typical species of Icterus is the Oriolus icterus of Linneeus, the Jcterus vulgaris of Daudin and modern ornithologists, an inhabi- tant of northern Brazil, Guiana, Venezuela, occasionally it is said visiting some of the Antilles and of the United States, but without much apparent proof. Thirty-three species of the genus Jcterus alone, and more than seventy others belonging to upwards of a score of genera, are recognized by Messrs Sclater and Salvin (Womenclator, pp. 35-39) as belonging to the Neotropical Region, though a few of them emigrate to the northward in summer. It would of course be impossible here to dwell upon them, but Cassicus and Ostinops may perhaps be named as the most remarkable. They are nearly all gregarious birds, many of them with loud and in most cases, where they have been observed, with melodious notes, rendering them favourites in captivity, for they readily learn to whistle simple tunes, which are admirably reproduced by their clear voice. Some have a plumage wholly black, others are richly clad, as is the well-known Baltimore Oriole, Golden Robin, or Hangnest of the United States, Zcterus baltimore, whose brightly contrasted black and orange have conferred upon it the name it most commonly bears in North America, those colours being, says Catesby (Birds of Carolina, i. p. 48), the tinctures of the armorial bearings of the

Calverts, Lords Baltimore, the original grantees of Mary- land, but probably more correctly those of their liveries. The most divergent form of Jcterid@ seems to be that known in the United States as the Meadow-Lark, Sturnella magna or S. ludoviciana, a bird which in aspect aud habits has considerable resemblance to the Larks of the Old World, Alaudide, to which, however, it has no near affinity, while Dolichonyx oryzvorus, the Rice-bird, with its very Bunting- like bill, is not much less aberrant. (A. N.)
IDAHO, a north-western territory of the United States, was originally a part of Oregon, from which it was separated in 1863. It lies on the Pacific slope, with the exception of a small portion in its south-eastern corner, which is drained into the Great Salt Lake of Utah. It is bounded on the N. by British Columbia and N.E. by Montana; on the E. by Wyoming; on the S. by Utah and Nevada ; and on the W. by Oregon and Washington. The boundaries are the meridians (111° and 117° W. long.) and the 42d and 49th parallels of N. lat., except that in the N.E. the Bitterront range separates the territory from Montana, and the Snake river forms part of the western limit. The area of the territory is imperfectly known, but may be set down approximately at 86,300 square miles. The mean elevation is about 4700 feet. The lowest point, which is on Snake river, at the mouth of the Clearwater, is about 1000 feet above the sea, while the highest mountains rise nearly to 10,000 feet. The surface is very diversified ; the northern portion is largely mountainous, with several fine broad valleys. In the southern portion a large area within the

Vireo—miay be readily explained by its being a very common and con- spicuous bird, as well as one which varied in plumage according to age and sex (cf. OrI0LE). Owing to its general colour, Chloris was in time transferred to the GREENFINCH (vol. xi. p. 165), while the names Galbula, Parra, and Vireo have since been utilized by ornithologists (of. JacamaRr and Jacana).

great bend of the Snake river is occupied by an immense plain of basalt. South of the Snake the country is an alternation of broad valleys and narrow abrupt mountain ranges,

The principal mountains are the Bitterroot and Salmon River chains, with their spurs and subordinate ranges. They attain a height of from 8000 to nearly 10,000 feet. The Snake River plain lies south of these mountains, ex- tending east and west nearly across the territory. This is a field of basalt, seamed and crevassed, with little vegeta- tion, and that consisting principally of Artemisia. The soil here is a shifting sand; and there is little surface water, as the streams sink and flow underneath.

The principal river is the Snake, the south fork of the Columbia. It is a rapid stream with numerous falls, three of which, the American, Shoshone, and Salmon or Fishing, are very considerable. It is navigable only in its lower eourse. Several of the branches of the Snake, the Salmon, Clearwater, and Spokane, are large streams, but are not navigable, and are of value only for irrigation and mining purposes.

et i] ce)

Map of Idaho.

The climate, like that of other portions of the north- western United States, is characterized by great aridity of atmosphere and slight rainfall. In the south the aridity is such that large areas are almost desert; but in the mountainous regions of the north the rainfall is much greater, and agricultural operations can be carried on to some extent without irrigation. The northern part, being principally mountainous, is covered with forests of conifers, chiefly species of pine, spruce, fir, and tamarack. In the open valleys the vegetation consists mainly of the various kinds of grasses known collectively as "bunch grass." On the Snake River plains there is little wee growth

except Artemisia, while the country south and east of the Snake is covered with this and with grasses, with a little scattered timber (Coniferce and aspens) on the mountains. A rough estimate gives as the area covered by

forest 40,000 square miles, by useful grasses 25,000 square miles, and by Artemisia 21,300 square miles.

Though the bison formerly ranged over this whole region, it is now practically extinct. The moose is still occasionally seen, and, rarely the Rocky Mountain goat (Aploceras montanus). The wapiti, the mountain sheep (Ovis mon- tana), and various species of deer are still abundant in the monntains, while the antelope or pronghorn abounds in the plains. Grizzly, black, and cinnamon bears, the American panther, the wild cat, and the wolverine are not unfrequently met with in the unsettled regions. Among the smaller quadrupeds, the prairie dog and gopher are abundant in the valleys and on the plains. Birds of many species are plentiful, especially in the mountain regious. Of reptiles, several species of rattlesnakes and lizards,

including horned toads (Phrynosoma), are characteristic of .

the arid plains, where they are numerous.

The southern portion of this territory has been the scene of comparatively recent volcanic action, which has covered enormous areas with basalt. The mountains of this portion are mainly of the Silurian and Carboniferous ages. The ranges of the northern portion are known to be mainly Eozoic; but the geology of that section has yet to be investigated.

The administration of the territory is in the hands of a governor, secretary, and chief justice, all appointed by the president of the United States, and a treasurer, comptroller, and superintendent of public instruction, who, as well as the members of the two houses of the legislature, are elected by the people. The territory is represented in Congress by a delegate, also elective. The population in 1880 was 32,946, distributed thus iu the several counties :—

County. Population.; County. Population. PN lone canneries sense eter te AGH IMINGZALOLCEs…..semeeenenter ss 4483 ONIUUUTSE cenigcinee nen cugentererats Ue |) Cwelilpeapganeoooonsngeness Sepee: 6952 Beseiae. 32.5.2… eevee SQA CMe Owe liee,. .....coestene onnltreoaans 1427 Gans She onesteen stron aoeigerrnc ochieador SOMBRE Shioshon Crs sncaene

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The principal settlements are Malade, Boisé (the capital of the territory), Idaho, Buenavista, and Silver City.

The agricultural, grazing, and mining interests of Idaho are but commencing their development. In the valleys of the southern portion the Mormons arc raising abund- ant crops of cereals, with the aid of irrigation, In the valleys of the lower Snake, the Boisé, Clearwater, Salmon, and Spokane rivers, wheat, oats, rye, and other grains are cultivated to some extent. Large portions of the territory are well adapted for grazing, and this is now being turned to account.

The mineral wealth has not yet, owing to difficulty of transportation, been developed to any great extent ; but it is known to be important. Gold and silver are found, the former both in vein and in placer deposits. The principal vein deposits now being worked are in the Salmon River and Owyhee mountains. Placers have been worked in nearly every county of the territory, and have paid well. During the year 1880 many new and rich deposits have been discovered in the Wood River district, in the Salmon River mountains, and there has been a considerable influx of mining population.

The Utah and Northern Railroad crosses the south- eastern portion of the territory, from Utah to Montana.

The total number of Indians in Idaho is about 6000,

1 Unorganized, and attached to Nez Percé county.

IDI—IDO

consisting of the tribes known as the Nez Percé, Ban- nack, Shoslione, Coeur d'Aléne, Spokane, Pend' Oreille, and Kootenai. They are under the control of the Govern- ment, and most are settled on reservations. (4. G.)*

IDIOCY. See Insaniry.

IDLE, a town of the West Riding of Yorkshire, in the parish of Calverley, is pleasantly situated on an eminence near the river Aire, on the Great Northern Railway, 9 miles north-west of Leeds and 3 north of Bradford. The staple imanufacture is woollen cloth; there are also worsted mills, and a cotton-warp factory. There are several stone aud slate quarries in the neighbourhood. The church of the Holy Trinity, erected in 1830 in the Later English stylc, is a handsome structure with embattled tower crowned with pinnacles; and there are national and other schools, an oddfellows' hall, a mechanics' institute, and a church institnte. The population (includ- ing Windhill, which is a separate vicarage) in 1861 was 9155, and in 1871 it had reached 12,036.

IDOLATRY. The word <«idwdodAarpeta (cdololatria, afterwards shortened occasionally to eiSoAarpeia, idolatria) occurs in all four times in the New Testament, viz., in 1 Cor. x. 14, Gal. v. 20, 1 Pet. iv. 3, Col. iii, 5. In the last of these passages it is used, obviously in a typical sense, to describe the sin of covetousness or ' mammon-worship." In the other places it is employed in its natural sense, but with the utmost generality, to indicate all the rites and practices of those special forms of Paganism with which Christianity first came into collision. It can only be understood by reference to the LXX., where eidwAov (like the word "idol" in A.V.) occasionally translates indiffer- ently no fewer than sixteen words by which in the Old Testament the objects of what the later Jews called "strange worship" (72 73) are denoted (see Trom- mius, Concordantie). In the widest acceptation of the word, idolatry in any form is absolutely forbidden in the second commandment, which runs " Thou shalt not make unto thee a graven image; [and] to no visible shape in heaven above, or in the earth beneath, or~in the water under the earth, shalt thou bow down or render service" (see Decatoaus, vol. vii. p. 15). For some account of the various interesting questions connected with the many practical departures from this law which are recorded in the history of the Israelites the reader is referred to the article Jews; those differences as to the interpretation of the prohibition which have so seriously divided Christendom are discnssed under the head of Imac WorsuIpP.

In the ancient church, idolatry was naturally reckoned among those magna crimina or great crimes against the first and second commandments which involved the highest ecclesiastical censures. Not only were those who had gone openly to heathen temples and partaken in the sacrifices (sacrificati) or burnt incense (thurificati) held guilty of this crime; the same charge, in various degrees, was incurred by the libellatici, whose renunciation of idolatry had been private merely, or who otherwise had used unworthy ineans to evade persecution, by those also who had feigned themsclves mad to avoid sacrificing, by all promoters and encouragers of idolatrous rites, and by idol makers, incense sellers, and architects or builders of structures connected with idol worship. Idolatry was made a crime against the state by the laws of Constantius (Cod. Theod., xvi. 10. 4, 6) forbidding all sacrifices on pain of death, and still more by the statutes of Theodosius (Cod. Zheod., xvi. 10. 12) enacted in 392, in which sacrifice and divination were declared treasonable and punishable with death ; the use of lights, incense, garlands, and libations was to involve the forfeiture of house and land where they were used ; and all who entered heathen temples were to he fined. See Bingham, Antigg., bk. xvi. c. 4.

IDR—IFF

IDRIA, @ mining town in Austria, in the duchy of Carniola and circle of Loitsch, situated in a narrow Alpine valley on the river Idrizza, 28 miles north-north- east of Trieste. It is the seat of a circle court and of an office of mines, the building used for whicl: is the old castle of Gewerkenegg or Gewerkenburg, built in 1527 by the miuers during the lordship of the Venetian republic. The town also possesses a handsome church, a high school, a mining school, and a theatre. Linen weaving, lace making, and gin distilling employ a considerable number of the inhabitants, but the origin and prosperity of the town are due to the rich mines of quicksilver which were accidentally discovered in 1497. Sinee 1580 they lave been under the management of the Government. The mercurial ore lies in a bed of clay slate, and is found; both mingled with schist and in the form of cinnabar. A special excellence of the ore is the greatness of the yield of pure metal compared with the amount of the refuse. 'The mine is reached by a shaft 150 fathoms deep, and the descent is accomplished partly by means of ladders and partly by steps cut out of the solid rock, The number of miners

employed is about five hundred ; they wear a peculiar uniform. – Formerly the mines were wrought by state prisoners, but notwithstanding the unhealthiness of the employment it is now largely sought after on account of the high wages offered to the workmen, as well as the pension allowed them when disabled, and the provision that is made for their widows and orphans. In 1870 improved ovens for smelting the ore were erected. The yearly yield of the mines is about 290 tons. The population of Idria in 1869 was 3813.

IDRISI. See Eprist.

IDUMEA (‘Idovpala) is the Greek form of the Hebrew Edom (O78), a district south of the Holy Land. The name Edom is restricted in the Bible to the mountain country south-east of the Dead Sea, and to the chain of Mount Hor near Petra. The word means “red,” and the title was no doubt derived from the red colour of the cliffs of Nubian sandstone, which form the greater part of this chain. The coast or desert of Edom was bounded by the desert of Zin (the present ’Arabah) on the W., by the desert of Paran on the 8.W., and extended as far as Ezion- geber and Eloth, at the head of the Gulfof Akabah. It is identified with Mount Seir, the possession of Esau (Gen. xxxii. 3). In later times, however, we find that the term Idumea receives a considerable extension, embracing all the pastoral couutry south of Judea, and extending even within the borders of Philistia. Bethsura (Beit Sr), Acra-battine (Acrabbim), and Hebron are in 1 Mace. iv. and v. alluded to as within or near its limits.

By Josephus the term Idumea is used with this more extended meaning, embracing au area of 3000 square miles. It answers to the Biblical term Negeb (“dry ”) applied to the south country, where the formation is a soft chalk, and which is inhabited by nomadic pastoral tribes. Josephus divides the Idumean district into minor divisions, viz., (1) Gobalitis (“ mountains”), the original Seir or Edom ; (2) Amalekitis (“the land of Amalek”), west of the former; (3) Acrabattine (‘the scorpion land”), the ancient Acrabbim south-west of the Dead Sea. The frontier towns on the nerth were Tekoa, Bethsura, and Bethgubrin (Beit jibrin), and among the more important places within the district were Hebron, Petra, Arad, Malatha (Tell el Mth), Beersheba, Rehoboth, Elusa (Xhalasah), Eboda (’Abdeh), &c. Josephus

speaks of Upper Idumea, apparently the district round Hebron, and enumerates Begabris (Beit jibrin) and Caphar Topha (Z'ufdth, near Hebron) among its towns. . :

In the Talmud Eleutheropolis (Beit jibrin) is placed in Idumea (Midrash Yalkut, Gen. xxxiii., and Bereshath Rabba, ch. vi.). Jerome defines Idumea as extending from

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Eleutheropolis to Petra and Eloth. The south boundary of the Holy Land, as defined in the Talniud, included Idumea, the reason being that the Idumeans had embraced Judaism about 140 B.c. (Joseph., Ant., xiii, 9,1). Strabo (lib. xvi.) speaks of the Edomites as of Nabathean or Arab origin. Pliny (Hf. W., v. 12) makes the country extend southwards to the Serbonian bog (near the present Port Said). Ptolemy (v. 15), in the middle of the 2d century, restricts the name toa district west of Jordan, including Elusa (Khalasah) and Gemmaruris (probably Jemrirah in the Hebron hills). The original Edom is called by this geographer Arabia Petrea.

The aboriginal inhabitants of Idumea were the Horim or 'cave dwellers" expelled by Esau. Mount Seir is said to have been named after one of their chiefs (Geu, xxxvi. 20, Deut. ii. 12). Jerome speaks of the natives of this country as still dwelling in caves, and in common with the Talmudic writers attributes to them the great caverns at Eleutheropolis. The inhabitants appear to have been always nomadic and pastoral, they were mingled with the Jews (tribe of Simeon) and with the Hittites. At the time of the great siege of Jerusalem the Idumeans fought in concert with the Jews (Jos. B. J., vi. 8, 2), and the Romans applied the name Idumea very loosely to the whole of southern Palestine, including even Jerusalem. At the present day the habit of living in caverns is very marked in this district, the rock being soft and easily excavated. The soil is generally a soft white marl, producing a rich herbage in spring, and supporting numerous flocks. (c. RB ¢.)

IFFLAND, Aveust Witnetm (1759-1814), a Ger- man actor and dramatic author, was born in Hanover on the 19th of April 1759. His father was registrar at the war office of Hanover, and intended tliat his son should be a clergyman. Young Iffland, however, preferred the stage to theology, and at

the age of eighteen went to Gotha in order to prepare himself for a theatrical career. At that time the greatest actor in Germany was Eckhof, a man of undoubted genius, for whom Lessing repeatedly expressed the warmest admiration in his Hamburgische Dramaturgie. Iffand was fortunate enough to receive instruction from him in Gotha, and under his guidance made such rapid progress that he was able in 1779 to accept an engagement at the theatre in Mannheim, then the most famous of the German theatres. He soon stood high in his profession, and extended his reputation by frequeutly appearing at the leading theatres in different parts of the country. In 1796 he settled in Berlin, where he became director of the national theatre of Prussia; and in 1811 he was made general director of all representations before royalty. On the 22d of September 1814 he died. His plays are almost entirely destitute of imagination; but they display a thorough mastery of tlie technical necessities of the stage, and a remarkable power of devising effective situa- tions. His best characters are simple and natural, fond of domestic life, but too much given to the utterance of sen- timental commonplace. His best known plays are Die Jager, Dienstpflicht, Die Advocaten, Die Miindel, and Die fagestolzen, all of which are still occasionally represented. Iffland was a dramatic critic as well as a dramatic author, and German actors place high value on the reasonings and hints respecting their art which are to be found in his Almanach fiir das Theater. As an actor he fell far short of his master, Eckhof, whose style was marked by spontaneity and passion, while Iffland's acting always bore traces of elaborate study. Hence he failed in great tragical parts ; but he was unexcelled in his day in the skill with which he interpreted dramatic conceptions representing the course of ordinary middle class life. Within these limits he was almost equally distinguished in his capacity for rendering comic and pathetic effects. In 1798-1802 Iffland issued

his Dramatic Works (with au autobiography) in 16 volumes, to which, in 1807-9, he added 2 volumes of New Dramatic Works. Two selections from his writings were afterwards published, the one in 10, the other in 11 volumes.

See K. Duncker, Jfland in seinen Schriften als Kiinstler, Lehrer, und Director der berliner Bihne ; and Koffka, [ftand wad Dalberg.

IGLAU, or Jrmzava, one of the oldest towns of Moravia, and second only to Briinn in respect of size and population, 's situated about 50 miles west-north-west of that city, and on the right bank of the Iglawa, close to the Bohemian frontier, in 49° 25' N. lat. and 15° 34' E. long. Isglau is the capital of a circle of the same name, the seat of the judicial authorities, aud the military headquarters of the district. It consists of the town proper and the suburbs of Frauen, Pirnitzer, and Spital. Among the principal buildings are the churches of St James, St Ignatius, St John, and St Paul, the town-hall, a gymnasium, @ high school, a military seminary, civil and criminal courts, several hospitals, and the barracks formed from a monastery abolished by order of the emperor Joseph II. There is alsoa fine cemctery, containing some remarkable monuments. The industrial establishments comprise cloth and linen weaving, paper, earthenware, and glass factories; potash, vinegar, and dye works ; tanneries, iron foundries, a large brewery, and an extensive cigar factory, employing over 2000 hands. Fairs are periodically held in the town ; and the trade in timber, cereals, and linen and woollen goods is generally brisk. The population in 1870 amounted to about 20,200, most of whom were Germans or of German extraction.

At avery early date Iglau enjoyed exceptional privileges, and they were confirmed by King Weneeslaus III. in the year 1250. The town-hall contains a collection of municipal and mining laws dating as far back as 1389. At Iglau, on July 5, 1436, the treaty was inade with the Hussites, by which Sigismund was aeknow- ledged King of Bohemia. A granite column near the town marks the spot where Ferdinand I., in 1527, swore fidelity to the Bo- hemian states. During the Thirty Years' War lglau was twiee

eaptured by the Swedes. In 1742 it fell into the hands of the

Prussians, and in December 1805 the Bavarians under Wrede were

defeated near the town by the archduke Ferdinand d' Este. IGLESIAS, a town of Sardinia, capital of a district in

the province of Cagliari, is beautifully situated amongst

limestone hills about 3 miles from the west coast, and at the terminus of a railway line from Cagliari, 34 miles west- north-west from that town. It is the seat of the suffragan bishop of Cagliari, and possesses a cathedral, an episcopal palace, four convents, a Jesuit college, and the ruins of old fortifications. The town is abundantly supplied with water from various springs. The surrounding country is highly productive, and there is an active trade in wine, oil, fruits, cheese, corn, and other agricultural products. Lead. and zinc are obtained in the neighbourhood. The population of the town in 1871 was 66380.

IGLO, formerly Nevporr, a mining town of North Hungary, in the county of Szepes or Zips, is pleasantly situated on the Hernad, and on the Kaschau-Oderberg line of railway, about 5 miles south of Locse (Leutschau), in 48° 56' N. lat. and 20° 33' E. long. Among the few public buildings are Lutheran and Roman Catholic churches, a gymnasium, a teachers' seminary, a circuit court, and the usual Government offices. There are, moreover, factories for the manufacture of stoneware, fuller's earth, linen, and paper ; also sawmills, steam flour mills, and iron foundries. In the vicinity are extensive iron and copper mines and stone quarries. The inhabitants of the town and neighbour- hood are chiefly employed in mining, bee-keeping, flax- growing, agriculture, and trade. The population (including that of Great and Little Iglé-Hnilecz) amounts to 6691, mostly German by nationality and Lutheran by creed. Iglé was formerly the capital of the sixteen privileged Zips

towns, and its origin may be traced to Saxon eolonists of the 12th century.

IGL—IGU

IGNATIUS, Sr. See Arosrotic FatHERs, vol. ii. p. 196.

IGNATIUS DE LOYOLA, St. See Loyora.

IGNORANTINES (Fréres [gnorantins), as the Brethren of the Christian Schools (/réres des Ecoles Chrétiennes) are commonly though improperly called, are a religious frater-

nity founded at Rheims in 1679, and formally organized

in 1683, by the priest Jean-Baptiste de La Salle, for the purpose of affording a free education, especially in religion, to the children of the poor. The name Ignorantine was given either on account of the low class of the pupils, or from a clause in the rules of the order forbidding its members to learn or teach Latin. Other popular names applied to the order are Fréres de Saint-Yon, from the house at Rouen, which was their headquarters from 1705 till 1770, Freres & quatre bras, from their hanging sleeves, and Fréres Fouetteurs, from their former use of the whip (fouet) in punishments. The brethren, although not allowed by their rules to enter holy orders, take the usual vows of chastity, poverty, and obedience. They are dis- tinguished by a peculiar coarse black dress, consisting of a cassock, a hooded cloak with hanging sleeves, and a broad- brimmed hat. The order, approved by Pope Benedict XIIL in 1725, rapidly spread over France, and although expelled after the Revolution of 1789, was recalled by Napoleon in 1803, and formally recognized by the French Clovernment in 1808. Since then its members have pene- trated into nearly every country of Europe, and into America, Asia, and Africa. In France alone they number more than 1300 schools for young and old, attended by upwards of 300,000 pupils, taught by some 8000 masters. See IMistoire du Vénérable J.-B. de la Salle, by A. Ravelet, 2d ed., Paris, 1874.

IGUALADA, a town of Spain, in the province of Bar- celona, is situated on the left bank of the Noya, in a rich agricultural and vinebearing country, 32 miles north-west of Barcelona. It consists of an old and a new town, the former dilapidated and dirty, with narrow and irregular streets and the remains of a fortress and ramparts, while the latter possesses regular and spacious streets and many fine houses. Among the public buildings are an old Gothic church, a town-hall, two conventual buildings, a clerical college, a hospital, and military barracks. The former commercial prosperity of Igualada has now much declined, but its industries are still considerable, and comprise cotton spinning, cotton and woollen weaving, and the manufac- ture of firearms, leather, hats, and brandy. There is also some trade in corn. Population in 1877, 11,882.

IGUANA (Iguanide), a family of lizards belonging to the suborder Pachyglosse or “ thick-tongued,” and compris- ing 56 genera and 236 species. With a single undoubted exception, all the genera of this extensive

family belong to the New World, being specially characteristic of the Neotropical region, where they occur as far south as Patagonia, while extending northward into the warmer parts of the Nearctic region as far as California and British Columbia. The single non-American genus — Brachylophus —occurs in the Fiji Islands. The iguanas are characterized. by the peculiar form of their teeth, these being round at the root and blade-like, with serrated edges towards the tip, resembling in this respect the gigantic extinct reptile iguanodon. The typical forms belonging to this family are distinguished by the large dewlap or pouch situated beneath the head and neck, and by the crest, composed of slender elongated scales, which extends in gradually diminishing height from the nape of the neck to the extremity of the tail. The latter organ is very long, slender, and compressed, while its vertebree, in common with those of certain other lizards, possess thin unossified septa traversing their centres. Tt is owing to the weakness thus produced in their vertebral column that, when cauglit

by the tail, they are able to part so readily with the portion seized. The tongue is generally short and not deeply divided at its extremity, nor is its base retracted into a sheath; it is always moist and covered with a glutinous secretion. The prevailing colour of the iguanas is green ; and, as the majority of them are arboreal in their habits, such colouring may be generally regarded as protective. Those on the other hand which reside on the ground have much duller, although as a rule equally protective hues; thus Darwin observed on the shore at Bahia a terrestrial member of this family, which from its mottled appearance could hardly be distinguished from the surrounding surface. Iguanas, however, possess to an extent only exceeded by the chameleon the power of changing their colours, their brilliant green becoming transformed in an instant, under the influence of fear or irritation, into more sombre hues and even into black. They differ greatly in size, froma few inches to several feet in length. One of the largest and most widely distributed is the common iguana (Iguana tuberculata), which occurs in South America and the West Indies. It attains a length of 5 feet, and is of a greenish

Iguana. colour occasionally mixed with brown, while the tail is

surrounded with alternate rings of those colours. Its food consists of vegetable substances, which it obtains from the forest trees among whose branches it lives and in the hollows of which it deposits its eggs. These are of an oblong shape, about an inch and a half in length, and are said by travellers to be very pleasant eating, especially when taken raw, as they usually are, and mixed with farina. They are timid, defenceless animals, depending for safety on the comparative inaccessibility of their arboreal haunts and their protective colouring, which is rendered even more effective by their remaining still on the approach of danger. Otherwise they exhibit few signs of animal intelligence. 'The iguana," says Bates (Zhe Naturalist on the Amazon), "is one of the stupidest animals Tever met. The one I caught dropped helplessly from a tree just ahead of me; it turned round for a moment to have an idiotic stare at the intruder, and then set off run- ning along the path. I ran after it and it then stopped as

a timid dog would do, crouching down and permitting me to seize it by the neck and carry it off." Along with several other species the common iguana is much sought after in tropical America ; the natives esteem its flesh a delicacy, and capture it by slipping a noose round its neck as it sits in fancied security on the branch of a tree. Although chiefly arboreal, many of the iguanas take readily to the water; and there is at least one species, Oreocephalus ertstatus, which leads for the most part an aquatic life. These marine lizards occur only in the Galapagos Islands, where they are never seen more than 20 yards inland, while they may often be observed in companies several hundreds of yards from the shore, swimming with great facility by means of their flattened tails, Their feet are all more or less webbed, but in swimming they are said to keep these organs motionless by their sides. Their food consists of marine vegetation, to obtain which they dive beneath the water, where they are able to remain, without coming to the surface to breathe, for a very considerable time. Though they are thus the most aquatic of lizards, Mr Darwin, who studied their habits during his visit to those islands, states that when frightened they will not enter the water. Driven along a narrow ledge of rock to the edge of the sea, they

preferred capture to escape by swimming, while if thrown into the water they immediately returned to the point from which they started. A land species belonging to the allied genus Zrachycephalus also occurs in the Galapagos, which differs from most of its kind in forming burrows in the ground,

IGUANODON, a genus of extinct Dinosaurian reptiles, the remains of which have been found in greatest abund- ance in the Wealden, a delta formation of the south-east of England. They also occur, though more sparingly, in the Lower Greensand, where lately (1879) Professor Prestwich announced the discovery in the " Kimmeridge Clay" of what are as yet the earliest known remaits of these reptiles. Although no complete skeleton of the iguanodon has been found, such bones of it as have been obtained prove it to have been one of the largest terrestrial animals known. Thus its femur in one instance measured from 4 to 5 feet in length, with a circumference of 22 inches at its narrowest part. 'These and other measurements led Dr Mantell—the original discoverer of Zguanodon—and others to conclude that it probably attained a length of from 50 to 60 feet. Its front limbs appear to have been small, while the hind pair attained enormous development, and from the structure of the latter, which may be regarded as intermediate between those of existing reptiles and of birds, the iguanodon is supposed to have either habitually or occasionally walked on its hind legs like a bird. This supposition is rendered all the more probable by the discovery in the saine strata of gigantic three-toed footsteps in pairs such as might have been formed by the iguanodon had it walked in this bipedal manner. 'The teeth of these animals formed one of their most marked characteristics,— bearing a striking resemblance to the teeth of existing iguanas in their blade-like form and serrated edges, but differing from these as well as from those of all other known reptiles in internal structure. Like existing iguanas they were probably herbivorous, using their teeth for cutting and tearing their tough vegetable food; unlike these, however, they appear to have used their teeth also for the purpose of mastication. This is shown by the deeply worn condition in many cases of the crowns of their teeth, which, from being sharp and incisor-like, gradually assumed a molar-like form. As the old teeth were thus reduced by 'Stear and wear," they were gradually replaced by a fresh dental crop. The front portion of the jaws was

destitute of teeth, the upper part being beak-like, while the lower was hollowed out like the same region in the parrot.

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Professor Owen regards this as an arrangement to facilitate the protrusion of what was probably a long prehensile tongue—an organ which the iguanodon may be supposed. to have employed in stripping the foliage from the trees. There is no fossil evidence to show that it possessed either scutes, scales, or any other form of dermal armour. IGUVIUM. See Evcunine Tastes and GuBBIO. TLCHESTER, formerly [VELCHESTER, a market-town of Somersetshire, is situated in the valley of the river Ivel or Yeo, 33 miles south-south-west of Bath, and 5 miles north- north-east of Yeovil railway station. It is connected by a stone bridge with the village of Northover on the other side of the river. The principal buildings are the parish church of St Mary, an old edifice in the Early English style, with a small octagonal tower, and the town-hall. It possesses almshouses, founded in 1426, and national schools. There are no manufactures or trade, and the importance of the town belongs wholly to the past. Under the Romans it was a military station, and bore the name of Ischalis. Anciently it was a place of considerable ex- tent, and was defended by walls and a deep moat. Traces of these fortifications are still to be found, and numerous Roman remains have been discovered at different periods. During a rebellion against William Rufus in 1088, the town was successfully defended against Robert Mowbray, one of the leaders of the insurgents. Before the Reform Act of 1832, when it was disfranchised, [chester returned two members to parliament. The county jail was there until 1846. The population of the town in 1871 was 751. {LE-DE-FRANCE, an old district of France, forming a kind of island, bounded by the Marne, the Seine, the Oise, the Aisne, and the Ourcq. Until the end of the Carlovingian dynasty it was included in the domains of the crown. The government of fle-de-France, named after this district, now embraces the department of the Seine, together with the greater part of Seine-et-Oise, Seine-et Marne, Oise, and Aisne, and a small part of Loiret and Niavre. It was bounded on the N. by Picardy, on the W. by Normandy, on theS. by Orléannais and Nivernais, and on the E. by Champagne. Its capital was Paris. ILFRACOMBE, a market-town, seaport, and watering- place of Devoushire, is picturesquely situated

on the Bristol Channel, and at the terminus of a branch of the London and South-Western Railway, 11 miles north by west of Barnstaple, and 50 miles north-west by west of Exeter. he parish is under the government of a local board of health, established in 1857. The old town, built on the cliffs above the harbour, consists of a principal street about a mile in length, with smaller streets branching off from it. Behind the old town many fine villas and marine residences rise in beautiful terraces commanding picturesque and magnificent views. The heights or torrs overspread with foliage form a sort of semicircle round the town, stretching westwards toa considerable distance ; and it is sheltered from the sea by the Capstone Rock. Hillsborough Rock, on the east side of the harbour, with a height of about 500 feet, has near its summit some remains supposed to be of Celtic origin. On Lantern Rock, at the west side of the harbour, a lighthouse has been erected. For access to the bathing ground, which is confined to a few small coves at the foot of the rocks, three tunnels have been cut through the solid rock. Inland the country pre- sents a beautiful variety of hill and dale, clothed with woods and possessing a rich and luxuriant vegetation. The principal public buildings are the parish church, dating from the 12th century, and recently restored, and St Philip and St James's Church, recently erected at a cost of over £10,000, the town-hall erected in 1860, the market- house of the same date, the baths, and the assembly rooms. Waterworks were completed in 1866 at a cost of £7000.

IGU—IULI

"The harbour, formed wholly of a natural basin, admits vessels of more than 200 tons burden, and there is a pier

850 feet in length. Herring fishing is prosecuted, but the shipping trade has considerably declined. The population of the parish, which in 1861 was 3851, was 4721 in 1871.

The name of the town is differently spelt in old documents, the variations being Ilfordscombe, Alfredscombe, Alfrincombe, Ilfar- combe, and Ilfridcombe. In the latter part of the 13th century it obtained a grant for holding a fair and market, and in the reign of Edward III. it was a place of such importance as to supply him with six ships and ninety-six men for his armament against Calais. During the Parliamentary war, being garrisoned

for the Round- heads, it was in 1644 captured by the Royalists, but in 1646 it fell into the hands of Fairfa

ILHAVO, a town of Portugal, province of Beira and dis- trict of Alveiro, is situated on the Atlantic Ocean, 8 miles south-west of Alveiro and 34 north-west of Coimbra. It is inhabited chiefly by fishermen, but has a celebrated manu- factory of glass and porcelain, the Vista-Alegre, at which the art of glass-cutting has reached a high degree of perfection. Salt is largely exported. The population is about 6000.

ILI, one of the principal rivers of Central Asia, in what is now the Russian province of Semiryetchensk. The head-stream, called the Tekes (French form, Tekesse), rises at a height of 11,600 feet in the Ulabas mountains, which lie to the E. of Lake Issyk-kul, about 79° 50' E. long. and 49° 40' N. lat. At first it flows eastward and north- eastward through a mountainous gorge which gradually widens into a valley of considerable breadth between the Tjian-Shan range on the south and the Kara-Tau and the Temur-lik or Nan-Shan on the north, Meeting the Kunges (French form, Koungesse) from the east, the river takes a westerly direction ; and under the name of Ili it continues to hold westward for about 300 miles, to the neighbour- hood of the military post of Ili or Ilijsk in 77° 5' E. long. The valley between 79° 30' and 82° E. long. is about 50 miles wide, and the portion above the town of Kuldja (Old Kuldja) is fertile and populous, Tarantchi villages following each other in rapid succession, and the pastures being well stocked with sheep and cattle and horses. At Tlijsk the river turns north-west, and at length, after traversing a district of desert and marsh, it falls by at least seven mouths into the Balkhash Lake, the first bifurcation of the delta taking place about 115 miles up the river. From Old Kuldja to New Kuldja, according to Captain Fischer (1871), the Ili is navigable for only two and a half months at most, and even then considerable difficulty is occasioned by the shoals and banks. From New Kuldja to Ilijsk (280 miles) navigation is easy when the water is high, and practicable even at its lowest condition. The section from Ilijsk to Lake Balkhash (about 240 miles) was explored in 1856 at the instance of Mr Kutznezoff, who had a boat built on the lake and towed up stream ; he found a passable channel all the way, but no practical use has since been made of it. Except in the deltaic portion, the river has a rapid current and the water

is turbid. At Llijsk there is a ferry on the road from Kopal to Vyernoe. The principal tributaries of the Ili are the Kash, the Belluluko, and the Kur-Tcharyn. A vast number of streams flow towards it from the mountains on both sides, but the great proportion of them are used up by the irri- gation canals, and never reach their natural goal. The wealth of coal in the valley is said to be great, and the Chinese worked gold and silver with profit. Fort Ili or llijsk, a modern Russian establishment, must not be con- founded with Ili, the old capital of the Chinese province of the same name. The latter, otherwise known as Hoi- yuan-tchen, New Kuldja (Gulja), or Mantchu Kuldja, was formerly a city of 70,000 inhabitants, but now lies com- pletely deserted. Old Kuldja, Tatar Kuldja, or Nin Yuan is now the principal town of the district. See KuLbsa.

ILI—ILL

*See Baer and Helmersen, Beitrage zur Kenntniss des Russ. Reiches, xx.; Semenow in Petermann's Afittheilungen, 1858; Slovar Ross. imp.; Radloff, "Das Ili-Thal und seine Bewohner," in Petermann's Mittheilungen, 1866 ; Hellwald, Die Lussen in Centralasien ; Vam- bery, "The Tekes Valley," in Occan Highways, vol. i.; Sewerzow, Erforschung des Thian-Shan-Gebirgssystem (1875); A. W. Dilke, '** On the Valley of the Ili," in Proc. Roy. Geog. Soc., 1874.*

ILIOS, or In1um. See Troy.

ILKESTON, a market-town of Derbyshire, is situated on a hill commanding fine views of the Erewash valley, and on the Erewash branch line of the Midland Railway, 8 miles west by north of Nottingham, and 9 east-north-east of Derby. The town is under the government of a local board of health, and has a county court. The prin- cipal buildings are the parish church of St Mary's in the Norman and Early English style, with lofty pinnacled tower ; the town-hall erected in 1868 ; and the mechanic's institute. National schools have been recently erected. The manufactures of the town are principally hosiery and lace, and various kinds of stoneware. Coal and iron are wrought in the neighbourhood. An alkaline mineral spring, resembling the seltzer water of Germany, was discovered in 1830, and baths were then erected, which were after- wards extended. The waters are used both externally and internally, and are efficacious in rheumatism, gout, spinal

affections, liver complaints, and kindred ailments. The principal constituents of the water are carbonic acid, sulphuric acid, muriatic acid, lime, magnesia, and soda. The towu, which is very ancient, obtained a grant for a market and fair in 1251. It was formerly the seat of the assizes, which were transferred to Nottingham on account of the plague. The population of the parish in 1861 was 8374, and of the town 3330, and the popu- lation of the parish and local board district in 1871 was

9662.

ILLE-ET-VILAINE, a maritime department of France, formed out of part of the old province of Brittany, is situated on the north-west coast, between 47° 38' and 48° 37 N. lat. and 1° and 2° 14' W. long. It is bounded on the N. by the sea and the department of Manche, on the E. by Mayenne, on the 8. by Loire-Inférieure, and on the W. by Morbihan and Cotes-du-Nord. It takes its name from its two principal rivers, the Ille aud the Vilaine. The former joins the Vilaine at Rennes after a course of 18 miles through the department, and the latter, which rises in Mayenne, flows past the towns of Vitré, Rennes, and Redon. The stream is tidal up to the port of Redon, and is navigable for barges as far as Rennes. The Vilaine receives the Meu and the Seiche, which are both navigable. There are two other navigable streams, the Airon and the Rance. The Ille-et-Rance canal connects the town of Rennes with those of Dinan and St Malo. The depart- ment forms one vast plateau, broken by ranges of low hills, which decline on the one side to the English Channel and on the other to the Bay of Biscay. The sea-coast line is partly rocky and partly marshy, the marshy portions being in many places defended against the encroachments of the sea by artificial dams. There are also morasses in many parts of the interior, with a number of stagnant lakes, a circumstance which renders the atmosphere very humid. The sky is seldom bright, for the south-west winds, while they keep the temperature mild, also bring frequent showers, and in spring and autumn thick fogs prevail. The soil is thin and not very fertile, but lately has been improved by the use of artificial manure. The only truly fruitful portion is that round Dol. About two-thirds of the soil is under culture, one-ninth in meadows, one-fifteenth in wood, and one-sixth waste. Cereals of all kinds are grown, but the principal are wheat, rye, and barley. Potatoes, flour, and hemp are also largely grown, and tobacco is cultivated to some extent. Apples and pears

| are the principal fruit, and the cider of the canton of Dol has a high reputation. The vine is cultivated in the southern districts. Cheese, said to equal Gruyére, is made in considerable quantities, and the butter of Rennes has a reputation equal to that of the best in France. Large numbers of horses and cattle are raised. The horses belong to the small hardy Breton breed, and are much in demand as post and artillery horses. Notwithstanding the extent of heath land very few sheep are kept. The principal manufactures are leather, sea-salt, glass, paper, and linen. Iron ore is obtained in considerable quantities, and there are also lead and zinc mines, as well as slate quarries. The population is of Celtic origin, and the dialect is a mixture of Celtic and French. Ille-et-Vilaine is divided into the arrondissements of Fougéres, St Malo, Montfort, Redon, Rennes, and Vitré, with 43 cantons and 350 communes. The chief town is Rennes, and the principal seaport St Malo. The department has an area of 2597 square miles. The population in 1872 was 589,532, and in 1876 it had

reached 602,712. ILLINOIS

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LLINOIS, the twenty-first in the order of admission Plate V.

and the fourth in rank of population of the States of the American Union, is one of the group of States formed out of the " North-West Territory." Its boundaries, begin- ning at the point where the Wabash river joins the Ohio, pass thence north by that river, by the west line of Indiana, and by Lake Michigan to 42° 30' N. lat., thence west to the Mississippi river, thence south by that river to its con- fluence with the Ohio river, and thence, by that, north- easterly to the mouth of the Wabash. It has an area of 55,414 square miles, extending with varying width from 42° 30' to 36° 59' N. lat.

Surface and Soil.—Illinois is a great plain, with its highest section in the north, on Lake Michigan; thence it imperceptibly declines to the south-west, in which direction its principal rivers flow to the Mississippi. A small tract in the north-west, which 'includes the lead mines, is hilly and broken, and there are bluffs along the Mississippi, some of which rise 300 to 400 feet. A

ridge extends across the south end of the State, constituting the fruit district of the region, called " Egypt" on account of its never-failing fertility. On this ridge or swell of clay land are grown all the varieties of berries, grapes, plums, peaches, apples, and all kinds of vegetables in great profusion, which find prompt sale in Chicago and the northern counties by reason of reaching market at early dates in the season. Excepting along the rivers, and where there has been extensive tree planting, the greater part of the State consists of a vast level or slightly undulating treeless prairies. Much of this has been reclaimed from swamp land by systematic drainage, and is found to be the strongest and most productive soil of the State. To the eye the surface of the State is as level as that of an ocean in calm. The general slope from the watershed rarely exceeds 1 foot to the mile, and the fall of the Illinois river in a course of 300 miles to the south-west, is, for most of the distance, but 1 inch to the mile. The origin of the prairies is still a matter of speculation, but there is an opinion that in a former geological age the whole State was the bed of a vast shallow freshwater lake. The prairie soil is a black fine humus mould, formed of the decayed vegetation, and underlain at varying depths by clay. The soil is of great fertility, and much of it seemingly inexhaustible. Over these prairies for hundreds of miles

the plough never touches stone, pebble, or even sand. A luxuriant native grass formerly sustained herds of buffalo, and from the still unbroken prairie surface are annually

mown thousands of tons of the wild grass for hay, which is as nutritious and brings as high a price in market as "tame hay." All the cereals, roots, fruits, grasses, and vegetables of the temperate zone are grown in Illinois, and gome of the semi-tropical productions, as cotton and amber cane. Because of the richness of the soil, cultivators still plough very shallow, and neglect manuring, or even rotation of crops, in the larger portion of the State. It is usual to plant maize for ten or twenty years in succession, only changing the crop to wheat, oats, barley, buckwheat, or rye when the market prices of these cereals promise larger profits than maize. Upon any sign of exhaustion, the pro- ductiveness may be restored by deeper

ploughing, grass- ing, fallowing, and applying barnyard manure. In half a century there has never been a bad failure of crops; twice or thrice there has been insufficient rain, and as often too much, and once a frost in summer ; but the injury in no one year was so great or so widespread as to produce gene- ral distress among farmers.

Minerals.—Coal is found in nearly all parts of the State; it is bituminous, a small proportion being cannel. The beds vary from 34 to 8 feet in thickness. The Coal- measures are part of the general formation extending from beyond the Mississippi river in Missouri, across Illinois and parts of Indiana and Ohio, and into Kentucky. It is esti- mated that three-fourths of the surface area of the State are underlain by beds of coal. There are twelve separate and well-defined beds of from 4 to 8 feet in thickness. The State is supplied with coal for consumption, not only from

the mines of Illinois, but also from those of Indiana and

Ohio by rail, and with anthracite from Pennsylvania by lake. The coal mined in the State is between 3,500,000 and 4,000,000 tons annually. west part of the State, are lead mines which have been worked for half a century, and which at one time made Galena the most prosperous city in the State. Salt springs are found in the south-east counties. Stone suitable for building is found in various parts of the State. An inexhaustible field of limestone, called " Lemont marble," is found near Chicago, and has been largely used in rebuilding that city.

State Lands.—The lands in the State were thus classi- fied in the years 1878 and 1880 :—in the former year there were 25,639,304 acres of improved and 8,635,953 of unimproved lands (total, 34,275,257), while in the latter year the numbers were 96,174,566 and 8,204,505 (total, 34,379,071 acres). The city and town lots num- bered 365,344 improved and 486,731 unimproved in 1878, and 374,664 improved and 484,932 unimproved in 1880. The railroads hold 13,253 acres of land and 3028 city and town lots.

The improved lands were under cultivation in 1878 and 1880, as follows :-—

Pedn con serccesre oeeens Heness Misia eoecelevarts's) Gove, vereracurejansrmene.sye:s:s)e Pees eererseeereereescserersacees

Other field products…….- Enclosed pasture …….+ (Oye liso inonee eo nosoencooeeccane W ooland «0.2.0… 0.0. -caene-nac>

3,982,807 | 3,708,567

Agricultural Products.—The great crops of Illinois are maize or Indian corn, wheat, and hay ; and much atten- tion is also given to the raising of live stock. The State produces more wheat than any other State in the Union. The farms number about 247,000. We give full agricul- tural returns for 1879, and those for 1880 so far as com- pleted to December of that year:—

Near Galena, in the north-

$17,000,000, but is The Illinvis river is formed by the union of the Kankakee and Des Plaines rivers, south-west of Chicago. It receives, besides the rivers named,

TLL IWOeTs

ea nn a nn

Average Acres per hele. eee. Total Value. Bushels. Wheat. 1879 2,440,800 18% 45,417,661 | $39,930,639 1880 3, 256,350 174 56,508,309 | 46,497,160 Maize.

1879 7,918,881 38 305,913,377 97,483,052

1880 | Returns not | completed. Oats.

1879 1,631,139 334 54,664,569 12,059,162

1880 1,749,391 35 62,709,062 | 12,858,247 Hay. Tons.

1879 2,332,278 2,578,736 16,428,012

1880 2,259,857 3,486,584 | 22,589,691

eee (nena (eres ee aaa

The following table gives returns for 1879 :—

Acres. Quantity. Value. nS 235,078 | 4,238,824 bush.| $1,991,401 Barley cen. mee as 578,911 ,, 265,951 PAStUTE,..c.00.s. 4,193,884 ast 12,319,620 Orchards….. .....| 290,646 ne 2,497,687 Potatoes…....6. 90,351 | 7,125,932 ,, 3,506,758 Sorghum……..... 14,949 | 1,524,705 galls. 579,257 Flax seed …....- a 990,447 bush. 1,296,758 Hogs sold…....+ 1,984,194 16,640,061 Fat cattle sold… as 16,751,450 Fat sheep sold … 518,884

Railways.—In 1850 Congress granted to the State, to aid in the construction of a railway from Cairo to Galena and Chicago, alternate sections of land along the route ; the State transferred the grant of land to the Illinois Central Railroad Company, a corporation composed mainly of English capitalists, conspicuous among whom was Richard Cobden. 'These capitalists furnished the money and con- structed the road, and they and their successors still own the property. The railway lies wholly within the State, though it works other lines extending south to New Orleans and west to the Missouri river. Its completion gave that impetus to the construction of railways to Chicago and across the State which has contributed so largely to the rapid development of the resources of Illinois. The State is now admirably supplied with railways, their extent reach- ing 6849 miles. They cross every county in the State ; indeed, they are so numerous and so interlaced that there are few if any localities more than 10 miles from a railway, while a large proportion of the shipping points have the benefit of more than one route by which to ship and receive merchandise. The great trunk lines leading west from the Atlantic and from Canada have their termini at Chicago, or at some other point in Lllinois, while those leading from the States west of the Mississippi also ter- minate in Illinois, or crossing the State run further east. The system of railway government somewhat resembles that of England. A railway commission, appointed by the State, exercises a general supervision, and enforces the penalties for violations of law. The receipts of the forty-six rail- ways doing business in Illinois amounted in 1879-80 to $138,659,155 ; the working cxpenses to $73,089,185 ; and the net income to $61,093,612.

Inland Navigation.—In addition to the railway traffic, there is much business done by steamboats at Cairo, East St Louis, Alton, Quincy, Rock Island, and other points on the Ohio and Mississippi rivers, though transportation by river has declined much of late years. The Illinois and Michigan canal is 93 miles long, and connects Lake Michigan at Chicago with the Illinois river, at the head of the navigation of that river. This canal has cost now too stnall for the service needed.

which junction occurs 45 miles

the waters of the Fox, Sangamon, and Vermilion ri vers, and of some smaller streams. Its general direction is south- west to the Mississippi, into which it falls. The State has expended much money improving the navigation by locks and dams, and this improvement when completed, with the enlargement of the canal to the capacity of steamboat navigation, will be one of the most extensive works of interior water communication in the world, being over 400 miles long, and connecting the waters of the Atlantic, through the St Lawrence river and the lakes, and through the Mississippi river, with the Gulf of Mexico. Rock river rises in Wisconsin, flows rapidly to the south-west through Illinois, and joins the Mississippi near Rock Island. On this river manufacturing establishments are rapidly increasing, the water power being regarded as equal to any in the country. The other rivers are the Kaskaskia, Embarras, Little Wabash, Big Muddy, and Chicago river, the last-named an inlet from Lake Michigan, furnishing a commodious harbour, 8 miles long, in which an average of 400 vessels find shelter during the winter season. The extent of the commerce on the lake is shown by the custom- house returns. During 1880 the steam vessels arriving at Chicago had a total burthen of 2,141,879 tons, the sailing vessels 2,456,337 tons; the clearances showed about the same figures,

Manufactures.—The statistics of manufactures for 1870 gave as results 13,597 establishments, employing 82,979 operatives. Since that date the increase in manufactures throughout the State has been general, embracing all branches of manufacturing industry. The following are the statistics for Cook county (including Chicago) in 1880 : —number of establishments, 3752; capital, $80,693,102; average numberof hands, 113,507; wages paid,

$37,615,381; value of material used, $180,807,706 ; value of products, $253,405,695. These figures for Cook county alone in 1880 exceed in several particulars those for the whole State in 1870; and the increase in the State during the ten years may be regarded as proportionate to that in Cook county. The abundance of coal, the proximity to the Lake Superior iron and copper mines, the unlimited means of transportation, the supply of lumber, the cheapness of food, the superior water power in various parts of the State, have all tended to make Illinois a large and convenient seat of manufactures. The iron and steel establishments of the State rank with the largest in the country. On Rock Island, in the Mississippi river, the U. S. Govern- ment has an arsenal for the manufacture of ordnance. The establishment is the most extensive in the United States, and‘the buildings and workshops cover nearly the entire island.

Administration.—The territory embraced in the present State of Illinois was ceded in 1765 by France to Great Britain; then it became a possession of the colony of Virginia ; in 1787 it was made acounty in the North-West Territory ; from 1800 to 1809 it was a county in the territory of Indiana; in 1809 it was erected into a terri- tory ; and in December 1818 was admitted into the Union asa State. On its admission to the Union a constitution providing a form of government was adopted ; in 1848 this was superseded by another, and this again was set aside in 1870 by the third and present constitution, which pro vides the ordinary State government of three departments, executive, legislative, and judicial. The executive, con- sisting of a governor and other officers, are elected every four years; the legislature, or general assembly, consists of a senate of 51 members, elected by as many districts ; the term of senators is four years, one half, or as near as may be, retiring every two years. The house of repre- Sentatives consists of 153 members, 3 elected in each senatorial district every two years. In electing representa-

tives, the voter may give his three votes for one, two, or three candidates. This cumulative voting is peculiar to the constitution of Illinois ; it hasbecome popular. The judi- ciary consists of one supreme court of seven judges, seve- ral district appellate courts of limited jurisdiction, circuit courts in such number as may be needed, and one county court, including probate jurisdiction, in each county. Each county and each township has its

own local govern- ment. Every male citizen resident one year in the State may vote. This constitution when adopted was regarded as a great improvement and advance in State government, and many of its provisions have since been adopted by other States. The sessions of the legislature are held at Spring- field, which since 1836 has been the capital of the State.

Revenue, Debts, Taxation.—In 1836-88 the State was seduced into ascheme of internal improvements. The population was then less than half a million, but the debt created was $14,000,000, to construct railways and a canal. In three years the scheme was abandoned, and the State in July 1841 suspended payment of in- terest. In 1845 the legislature levied a tax to pay the current in- terest; in 1848 an irrepealable tax was levied to pay the principal ; all the overdue and unpaid interest was funded in interest-bearing bonds. Credit was restored, and in December 1880 the State was free of all debt. Taxation is imposed by a rate levied on all real and personal property, according to a previous valuation, made by local assessors, revised by county boards, and again revised and equalized by a State board. The total assessment or valuation of the property in the State for taxation averages not more than one- fourth of the value at which the property can be sold. The consti- tution limits the rate of taxation (except to pay debts) by counties to 75 cents on each $100 of the official valuation. The same valu- ation governs all taxation, the maximum rate being fixed by law. Iu like manner all municipal corporations are (since 1870) prohibited from incurring any debt, for any purpose, exceeding, with previ- ous debts, 5 per cent. on the official valuation of the property with- in their territorial jurisdiction. An annual tax is required in each municipality to pay the interest and a portion of the principal of all existing debts. Under these stringent requirements, municipal debts in Illinois are gradually decreasing. The State, without be- coming responsible for municipal debts, acts as trustee, and through its officers collects and disburses the taxes to pay principal and in- terest of these local debts. The latter were contracted mainly in aid of railroads, and bore an average rate of 9 per cent. interest.

The gross taxation for all purposes, including schools, for 1878 and 1879 was as follows:—

1878. 1879,

$3,614,855 5,557,446 7,576,882 10,941,658

$2,712,626 4,730,095 6,182,420 9,827,959

State taxes

County taxes

City taxes

Town taxes and others.

$27,690,841

$22,953,100

The valuation of all the property in the State for taxable pur- poses, for the year 1880, was $786,616,394. The rate of tax levied for State purposes, and to pay cost of asscssment and collection, is 36 cents on each $100 of the property valuation given, which, as above stated, is about one-fourth of the real value. In 1880 lauds (except railroad lands) were valued at $890,594,627, and city and town lots at $182,808,928 ; total lands and lots, $573, 408,555.

The State is in receipt of a permanent revenue from the I1linois Central Railroad Company. In consideration of the cession of land, in 1850, by the State, the company contracted to pay into the State treasury half-yearly 7 per cent. of the gross annual earn- ings of the line. This was to be in licu of all other taxes on the property of the company. This contract is now a source of large revenue to the State. Up to November 1, 1855, the payment to the State was $29,752 ; the payment in 1880 was $368,349. The total payments to the State, at the close of 1880, amounted to

$8,307,217. ; :

Education and Charities.—The public school system is liberally supported in Illinois. The permanent school fund yields about $60,000, to which the State adds $1,000,000 annually, and this is distributed among the counties. Many counties and districts have invested school funds. The aggregate of these local funds is $5,500,000, the interest of which is applied to support schools. In addition each school district levies such taxes as may be needed for its schools, and may borrow money to build schoolhouses. In

1878 the receipts of revenue for schools $9 634,727, the expenditure to $7,526,109. of children in the State (1878) of the school age, six to twenty-

one years, was 1,102,021; of these 706,733 were enrolled as attending the public schools, and 41,406 as attending private schools, 748,139. the State was 11,714; male teachers 947 5, female teachers

amounted to

12,817, teachers in private schools 1017—total teachers

23,309. Salaries of male teachers range from $15 to $225 per month, of female teachers from $10 to $115 per month.

Five months in each year is the minimum term of the public schools, ten months the general term. Except the income from invested funds, school revenues are obtained The State has established two

from direct taxation. normal universities, providing the buildings and grounds, _-one at Normal, M‘Lean county, the other at Carbondale, Jackson county. i

Champaign, maintained and liberally endowed by the State.

There are also several other universities and colleges, includ-

ing medical and theological, in various parts of the State.

All schools supported in whole or in part by public money

must be non-sectarian in their instruction and government.

Under the general supervision of a board of charities, the State maintains four hospitals for the imsane, at Jack- sonville, Elgin, Anna, and Kankakee; an institution for

educating the blind, and one for educating the deaf and an asylum for imbecile chil- dren; an eye and ear infirmary; a home for soldiers’

dumb, both at Jacksonville ;

orphans ; and a correctional or reformatory school for boys.

All these institutions are provided with spacious grounds The annual expenditure for the maintenance of these charities is about $1,000,000. This

and extensive buildings.

does not include the cost of buildings and grounds, on which over $5,000,000 have been expended. other asylums for the insane are maintained by local authorities.

The population of Illinois, which now comprises 102 counties, was as follows at the dates given :—

TED iictang snare meetin DMS | WS60,. cccpncsincae er ee 851,470 jay acme TEA. Te cp eames oti 1,711,951 te eee BR MED, [MO iss snsnnsese toon 2,539,891 10 ee. G55 AWS | 1880 vo .0..cessee nema 3,080,824 en 476,183

The following cities had a population in 1880 exceeding 5000 :-—

CHICAGOs…..sercsrereeeneees 503,304) Decatur ….ccccccceeersireere 9,449 PEO Tle aeteeereararnarisisel ie 29,815 | Cairo…...ccsceerereesccenscees 9,017 QWUMEY,.. «jasc cnieee etait 27,275 | Hl gin …...csecccsenseceeeeners 8,606 Springfield…....c0sseeee 19,746 | Galema…....ccsssesseeseeeees 8,205 Bloomington ….-..sseees 17,184 } Streator.. ...ceceesseeceeeeees 8,088 DOTS rversayrs « wazays o Shacosteteiewrar 16,145 | Ottawa ….cccceeecceeseeeeees 8,010 Roeletiondae. vais… « scwisua'iawr 13,136 | Danville …....scceeeeeer eens 7,751 AMIBONE, cpminnt seweriesamraet™ 11,825 | Moline …...sceceeseeeeenneees 7,740 Rock Tslaaid)..cicscecn ae 11,660 | La Salle…....ceeecseseeeeeens 7,250 Galesburg …....scccceseerees 11,446 | Pekin. ....cccecseeseeeteeeeee 6,508 Faclwommvallesss. :saineamsansen 10,927 | Mattoon…....cseceeeeeees 6,106 Belleville… sis satetaaianernate Ramilcalleeevtuirins vs sisnwnrnianims 6,027 East St Louis Sher MM ais scnwinss vaneenacns 5,841 Freeport…...ssccessseseeee PYG SHOU sarees vnieneweresere 5,440 Alltaniencinntiestte ts. tagu ome 9,500 | Monmouth…..scseeeeecnes 5,004

The density of the population in 1880 was 55°6 persons per square mile. (J. W. 8.—J. ME.)

ILLUMINATI, or "Enlightened," is a title which at different times has been given to, or assumed by, various sects or orders of mystics, on the ground of the superior knowledge of God and of divine things which they claimed. Among these may be mentioned that of the Spanish " Alombrados" or " Alumbrados," which arose about the year 1520, and which before its final disappearance about a century later afforded numerous victims to the Inquisition, especially at Cordova. Ignatius Loyola, while a student

at Salamanca (1527), was tried by an ecclesiastical com- |

The number

and parochial schools; total attending The whole number of school districts in

There is an industrial university at

Several

ILL—ILL

mission for alleged sympathy with its views, but was acquitted with an admonition. Under the name of Illuminés a similar sect appeared in Picardy in 1628, and afterwards entered into close relations with the Cuérinets or followers of Pierre Guérin ; but by its anti- nomianism it soon provoked repressive measures, to which it finally succumbed in 1635, The history of another sect of Llluminés, which appeared in the south of France about 1722, is very obscure, butit is said to have subsisted. until 1794. The title of Illuminati has often been popularly bestowed also on Rosicrucians, Martinists, and Sweden- borgians; but one of the most recent as well as most important applications of this elastic word has been to denote a secret society, or senii-political semi-religious order, which made some stir in Germany, especially in the southern and Catholic portions of it, from 1776 to 1784. It was founded on May 1, 1776, by Adam Weishaupt, professor of canon law at Ingolstadt, and an ex-Jesuit, and set before it as its general

purpose the discouragement of tyranny, superstition, and ignorance, and the furtherance of the cause of reason, freedom, and virtue. The name originally assumed for the order was the Society of the Perfectibilists (Gesellschaft der Perfectibilisten). Politi- cally its tendencies were republican, and in religion it was free-thinking, having a distinct aversion to Christian ritual and Christian dogmas alike. The entire subserviency of its members (who on admission were pledged to blind obedience to the orders of their superiors) was secured by a strict system of secret confessions and monthly reports, checked by mutual espionage. Beginning with a narrow circle of disciples carefully chosen from among his own students, Weishaupt gradually extended his propaganda from Ingolstadt to Eichstadt, Freising, Munich, and else- where, special attention being given to the enlistment of young men of wealth, rank, and social importance. As the order increased in numbers its organization naturally became more complicated, and was ultimately considerably influenced by the intimate relations which were established with masonic lodges at Munich and Freising in 1780. About the same time an important impulse was given to its prosperity in middle and northern Germany by the ambition and energy of a newly acquired member, Baron Adolf von Knigge, who had his headquarters at Frankfort-on-the-Main. It was to him that the society was indebted for the extremely elaborate constitution (never, however, actually realized) according to which the entire membership was divided into three great classes, in the first of which were to be included the "novices," the " minervals," and the "Jegser illuminati," while the second consisted of "free- masons" ('" ordinary," "Scotch," and.' Scotch knights"), and the third or "mystery class" was subdivided into the two grades of priests and regents and of magus and king. Fach member of the order had given him a special name, generally classical, by which alone he was referred to in official communications ; all correspondence was con- ducted in cipher ; to increase the mystification, towns and provinces were invested with new and altogether arbitrary designations. At its period of greatest development the order included in its operations a very wide area, extending from Italy to Denmark, and from Warsaw to Paris ; at no time, however, do its numbers appear to have exceeded two thousand. Its aims and method, which, as plainly appears in portions of Goethe's Wilhelm Meister, were somewhat 'n accordance with the taste of the period, met with more or less sympathy and approval from Goethe himself and from Herder,! from the grand-dukes

Ernest II. of Gotha and Karl August of Weimar, as well as from other persons of influence and repute (Bode, Nicolai). A rupture which

1 Perthes, Das Deutsche Stautsleben vor der Revolution, p. 262.

took place between Weishaupt and Knigge in 1784 greatly accelerated the public expression of a counter feeling of suspicion and dislike which had been slowly gathering strength, and in 1785 the Bavarian Government issued an edict which proved fatal to the order. Many of its members were imprisoned or compelled to leave their homes ; Weishaupt himself was deprived of his chair and banished the kingdom.

See Grosse Absichten des Ordens der Illwminaten (with Appen- dices, Munich, 1786); and Weishaupt's Vollstandige Geschichte der Verfolgung der Illuninaten (1787), and Kurze Rechtfertigung meiner Absiehten (1787).

ILLUMINATION is a term which has long been used to signify the embellishment of written or printed text or de- sign with colours, and especially with gold, more rarely also with silver. The lustre of the former metal may probably have led to the adoption of the word in this sense. The Latin verb aluminare, with the meaning of "to decorate," occurs as early as the 8th century; and in the first portion of the Loman de la Rose, composed before 1260, enlwminer is found with a similar meaning, while Dante (Purgat., xi. 79) alludes to this kind of painting and its French desig- nation as 'quell' arte, che alluminar é chiamata in Parisi." In Early English we find the forms enlomyne, luminen, limnen, whence limn. Of synonymous use with these terms we find in the Middle Ages the words mintare and minia- tura, from minium, a red pigment, in early use for decorat- ing MSS. Miniature employed in connexion with the art of illumination now, however, generally signifies a picture or portrait as distinguished from mere ornament or ornate letters.)

The research into the past which has characterized the present century has exteuded to the art of illumination, and, following the lead of D'Agincourt, Mabillon, and others, has by the examination of medieval decorated inanuscripts thrown a vast amount of light upon the arts of the past. In spite

of iconoclasm in the East, the burn- ing of Arabic MSS. in Spain, and the destruction and dissipation of libraries which unhappily accompanied the Reformation, a considerable number of beautiful and elaborate volumes lave come down to us where larger and more exposed works of art have perished. They therefore supply many a lacuna in art history. Conformably to the unity which pervaded all art work in the Middle Ages, a close correspondence in style has been recognized between the ornamentation of MSS. of different periods and contem- poraneous architecture and other arts. The architect, the decorator, the glass-stainer, and other artists have conse- quently learned, and with great profit, to scarch their pages for ornamental motives, details, and colouring, in thorough harmony with ancient styles, which no other source supplies so copiously. Invaluable materials too for the history of costume are found in the miniatures with which they abound.

The earliest writing of which monuments exist, the Egyptian, was often enhanced by the use of colour. In the ritual papyri, directions, &c., are written in red to dis- tinguish them from the main text, just as was subsequently done in mediseval liturgical MSS.—a practice from which the term rubric is derived. A few scattercd passages in

Latin classic authors (notably Ovid, Seneca, Varro, .

Martial, Pliny the Elder, J. Capitolinus) prove the occa- sional use of rubrication and of pictorial embellishment of MSS. among the Romans. The earliest decorated MSS., at least of European execution, which have reached us date from the 4th and 5th centuries of our era, and are of ex- treme rarity. Of these one of the most celebrated is the Virgil written in elegant capitals preserved in the Vatican, in which the adornment is limited to rectangular pictures

(miniatures) painted in the antique manner seen in the |

707

Pompeian frescos, the body colour laid on with a free brush and without black outlines. It may be taken as the type of a class of MSS. of which very few specimens are extant, A different type of early calligraphy, which was

much esteemed, is found in the Codex Argenteus, now at Upsala, written about 360, containing Ulfila's Moeso- Gothic version of part of the Scriptures. It is written in gold and silver letters on vellum stained a red purple. The art of thus staining vellum, perhaps with the murex, was afterwards lost, and in the 8th and 9th centuries was imitated by painting the vellum.

After the 2d century art rapidly declined in the West, owing to the corruption and anarchy of the empire. It found a home, however, at Constantinople, where inter- course with Persia resulted in a style which blends Oriental magnificence with Western vigour and variety, and is de- stined, as we are about to see, to exercise a dominant in- fluence upon the art of Europe for many centuries. This style, known as the Byzantine, is distinguished by very characteristic details, and by its lavish use of gold, especially in backgrounds. Meanwhile Christianity had been planted in remote Ireland, which proved such favour- able soil that the isle was already at the beginning of the 6th century renowned for its learning and sanctity, and was the seat of numcrous monasteries and seminaries, where a native style of art was developed, wholly distinct from any- thing else which the world has seen. Its principal features are spirals, extremely ingenious plaits, and interlacements of attenuated lacertine animals and birds of conventional form. The human figure is sometimes introduced, but becomes objectionable, through the ignorance of drawing and of anatomy usually characteristic of semi-civilized attempts to portray the highcr organisms. The work is further distinguished by a degree of minuteness, intricacy, and precision baffling to the modern draughtsman. It is seen in its highest perfection in the Book of Kells, pre- served in the library of Trinity College, Dublin, and in the Lindisfarne Gospels in the British Museum. This style, known as the Celtic or Anglo-Celtic, was transplanted by Irish missionaries to Lindisfarne, Bobbio, St Gall, Wiirz- burg, Luxeuil, and other places, where volumes displaying this peculiar ornamentation are still treasured. The influ- ence of Anglo-Celtic art is very apparent in the subsequent " Carlovingian style" which arose in France and Germany under the fostering care of Charlemagne, and of Alcuin, whom he had invited to France to direct the progress of learning and the arts. The gospels found upon the knees of the great emperor when his tomb at Aix-la-Chapelle was opened, the gospels of St Servin de Toulouse, those of St Medard de

Soissons, the Bible of San Calisto monastery at Rome, and the Harleian Codex aureus of the British Museum are justly renowned examples of this majestic and magnificent style, in which the pages glow with gold and purple, and the Roman acanthus, Celtic in- terlacements, and Byzantine details combine in harmoni- ous variety. A text written wholly or partially in gold ink is another characteristic of the epoch. About this period too are found those gigantic initials which from containing figures relating to the text have been called in France Historiées, A new style had also arisen in England, in which the debased Roman acanthus was largely developed. This conventional foliage is here seen skilfully combined with gold bars, which surround the page, and forma border at the commencement of books, &e. This style has been called the Opus Anglicum. It often displays a masterly free- dom and spirit, and a peculiar 'fluttering outline," which also characterizes the spirited pen-drawings frequently found in MSS. of the period. The finest specimens of this style, among which are the benedictional of St Ethelwold, belonging to the duke of Devonshire, and a couple of vol-

umes in the public library, Rouen, were probably executed at Hyde Abbey, Winchester.

The apprehensions of the year 1000 as the end of the world tended greatly to paralyse art. As these fears died away, however, the Romanesque style of architecture was being developed, especially in the Rhine-lands. This was favoured, by numerous Greek artists who, deprived of their livelihood by Eastern iconoclasm, had migrated westwards, and deeply impressed the Byzantine character upon the architecture of central and western Europe. Simultane- ously there arose a bold sweeping style of ornament, characterized by fine rounded curves and Byzantine details, but also by a tendency to naturalism, and, in books, by large initials. The Byzantine gold backgrounds were still a glowing feature, which indeed continued through the whole subsequent progress of illumination. From the 11th century gold leaf was applied to the vellum upon a substratum of fine plaster, and could be so highly bur- nished as to exhibit the rich lustre of a polished lamina of the solid metal. As skill in drawing increased, nature was more copied, and

towards the 14th century natural foliage, conventionally treated, constitutes the main portion of the ornament. The oak, the vine, and especially the ivy, are frequent, springing in free spirited curves from decorated initials, or extending into a border round the whole or part of the page. The initials decrease in size whilst they gain in excellence of execution, and illumination, considered as decorative design, is generally considered to have reached its highest perfection about this period. The pictures of sacred subjects gradually lose Byzantine rigidity and assume dramatic expression, pose, and grouping. And towards the 15th century tbe blue or gold background begins to be abandoned for natural scenery and acces- sores. Towards the commencement of the 15th cen- tury illumination was liberally fostered by John, duke of Berri, brother of Charles V. His magnificence in this branch of art awoke the emulation of Philip the Bold, duke of Burgundy, and of the duke of Bedford, the regent of France, in the same direction. For the last-named was painted the celebrated Bedford Hours, now in the British Museum, part of the workmanship of which has been ascribed to Jan, Hubert, and Margaretta van Eyck. As perfect mastery of drawing and facility of realistic execution were gained, illumination as adecorative art became debased in design. Borders of gold or richly coloured grounds, over which are scattered exquisitely painted flowers, fruit, and insects, surround pages of text or miniatures wrought with supreme manual dexterity, but not unfrequently of meretricious composition. In juxtaposition with this rich and copious ornamentation (the primary end of the book), the text, already less black and massive than in preced- ing centuries, too often dwindles into insignificance. The Hours of Anne of Brittany, preserved at the Louvre, is one of the most celebrated specimens of 16th century illumina- tion of this style.

The character of Italian illumination differs considerably from that which marked the art in central or northern Europe. It had arisen by slow degrees from the devasta- tion which Italy had suffered in the early centuries of the Christian era. The scriptoria of Ravenna, Siena, Florence, Bologna, Perugia, Ferrara, in the 13th and 14th centuries, produced illuminated volumes worthy of their growing schools of painting, and were especially celebrated for the elaboration of large choral books.

The Renaissance, with its revival and enrichment of classical forms, was fully reflected in the illumisator's art, which was largely employed in smaller volumes for secular subjects, and was patronized by the Italian princely families, and finally reached its culmination in the hands of such artists as Girolamo dei Libri, whose drawing is very

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accurate, and attains a microscopic delicacy of stippling,

and his pupil Giulio Clovio, who in his composition makes large use of the human figure, and with an imitation of Michelangelo's manner combines unrivalled minuteness of execution. Long after the invention of printing the popes and doges retained official illuminators in their service; and some of the most elaburate and costly volumes were executed subsequently to the introduction of the press. The typographical multiplication of books, however, proved fatal to the art. The early productions of the press, indeed, had blank spaces left for initials and miniatures, which were painted in by hand, often very roughly. 'These were soon replaced by printed designs intended to be gilt and coloured, which reflected the character of contemporaneous art, as far as the technical difficulties of the yet imperfect press allowed. The custom of adorning sumptuous volumes with engraved initials and other ornament has continued to the present time, with an increasing tendency to naturalism.

The visitor to the public libraries and museums of Moscow and St Petersburg will have there admired the rich display of Slavonic illuminated MSS. of peculiar style, intricate design, careful execution, and frequently fine colour. he leading features of Russian art were derived from Byzantium, but, as Russian archeologists maintain, were blended with a native element, and a true national style arose in the 12th and continued to the 16th century, when the influence of the Renaissance began to be felt.

The fecund art of Constantinople was also the parent of another style—the Arabian or Mahometan—which, how- ever, contains a previously existing Oriental element. The style began to develop in the 7 th century. It is geome- trical or constructive in character, the use of symbolisin or representations of animals or plants being forbidden in the sect of Omar.

Inscriptions in cufic characters are often happily used as a decorative feature ; rich colouring of red blue and gold prevails. The Turkish and Moresque styles are modifications of the Arabian. Illumination was carried in this style to the highest degree of splendour. Casiri's Bibliotheca Arabico-Hispana Escurialensis conveys some idea of the former magnificence of the Moorish libraries in Spain.

In India illumination, though of great antiquity, does not present those transitions of style which mark the development of western art. Like Indian art generally, its special characteristics are profusion, richness, harmony, repose, and perhaps monotony, with very extensive em- ployment of flowers. Persian art was derived from India. It reflects the Persian love of flowers and symbolism, and the treatment is more free and natural than in India. It seems to have reached its highest perfection about the 15th and 16th centuries of our era, but is still continued, 'The execution of a magnificent MS. of the Zhousand and One Nights was undertaken under the auspices of the present shah. 'The absence of any attempt to shade or give relief to the design is, it should here be mentioned, a characteristic of all Oriental design.

During the earlier part of the Middle Ages the art of illumination was in Europe mostly practised in the scrip- torium or apartment devoted to the elaboration of MSS. which was attached to each monastery. In later times the art was practised by lay artists. Illuminators as well as patrons of illumination were occasionally found among the highest ranks; Saint Dunstan and King René may be snstanced. And some distinguished painters were also 'lluminators. All Western MSS. of fine quality were executed upon vellum. Materials were mostly prepared with great care by the artists themselves, or under their direction, and as a rule are found to have well stood the test of time.

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The price given in recent years for MS. volumes valuable for their beauty or antiquity often reaches many hundreds of pounds sterling. A folio Vulgate of the 9th century was purchased by the British Museum in 1836 for £750. The Ledford Hours, acquired with other MSS. for the same establishment, has been valued at over £2000. At the

French art fetched above £3000.

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ILLYRIA is the name applied to the country that lies to the east of the Adriatic Sea. The usual Greek name is Illyris, though the older writers generally use the expression of "IAAvpio. The common name in Latin is Illyricum. The term Illyria is occasionally used in both languages, and has become the recognized name in English. The boundaries of the country thus known varied very much at different periods, and can be described only along with its history. Fora short time, in the 4th and 3d centuries B.c., there was some slight government under monarchs whose power was acknowledged by the whole country ; but in general the land was either a province of some couquering race or the abode of isolated tribes with little or no common feelings or ainis.

The origin and character of its oldest inhabitants are involved in the obscurity that still shrouds the ethno- logy and early history of all south-eastern Europe. The Greeks acknowledged some affinity of race between themselves and the Illyrians in the legend that Cadmus retired from Thebes with his wife Harmonia and settled in Illyria, where he became the father of Illyrius, the eponymous ancestor of the whole race. In harmony with this myth, the general consensus of modern investigation tends to the view that

at an early period the whole of Europe south of the Danube, together with the centre and west of Asia Minor, were peopled by kindred races, some of whose names are preserved to us as Leleges, Thracians, Pelasgi, Illyrians, &c. If we divide the Indo- European tribes that peopled Europe into two great families, the northern and the southern, we shall find that the Thraco-Illyrian tribes must be distinguished from the Slavonic tribes who dwelt immediately north of them, and who are closely akin to the Lithuanian and other tribes of the northern family. On the other hand, it would not be easy to draw any line of demarcation at this early time between the IIyriaus and their neighbours on the west, south, and east. Separation of nationalities was produced afterwards by growiug civilization, which developed dis- tinct national characters and well-defined countries.

At this early period then we may say that the Danube, as the boundary between the northern and the southern

family, was the limit of the Illyrian tribes towards the | north. In other directions they shaded off into kindred © Adriatic.

tribes of similar manners and language. Various causes led to a very unequal development of civilization among these tribes. Intercourse with stranger races like the Phoenicians, and amalgamation with kindred immigrant

races, such as the Jonians and Dorians, raised some of these —

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tribes rapidly to the highest stage of civilization. But these new races were attracted by the more favourable conditions of the Greek peninsula, and few of them found their way to the northern countries. Some traces of early Ionian settlers in Illyria are found (see Curtius, Die Ionier

: : vor der tonischen Wanderung, p. 46); but they a t Didot sale in Paris a MS. executed in the highest style of | als); bu legge al

seem to have pernianently affected the character of the natives. As Greece became civilized, it sent forth its own colonists to occupy most of the

favourable sites along the Mediterranean coasts. But, whereas Thrace with its rich mines had a line of Hellenic colonies along its southern shore, very few were planted in Illyria. Accord- ing to Strabo, the shore was full of fine harbours, and the coast land was very fertile; but he adds that the people were barbarous and warlike. Ou this account it was that Greek colonization never spread on the [lyrian coast. Dyrrachium or Epidamnus was almost the only Greek colony, and its history for centuries showed one continuous conflict with the barbarous natives, which pre- vented its growth. Macedonia again found a family of Greek refugees who established themselves as petty chiefs, and gradually spread their power, with civilization and settled rule, over the whole country. Nothing of the kind happened to Illyria ; the chiefs who rose at times to power were always apparently as barbarous as their followers. In these unpropitious circumstances, the Illyrian tribes remained in their primitive barbarous condition later than almost any of their neighbours, and when many of the surrounding states had hecome civilized, Illyria was divided from them by the line separating barbarism from civiliza- tion. Naturally their characteristics resembled closely those of the ruder Thracian tribes, and both are described by the Greek historians as tattooing their bodies and offer- ing human victims to their gods. Their women seem to have had a high position socially, and to have even exer- cised political power. Queens are mentioned more than once as their rulers. This reminds us of the German tribes, whose women also were much respected; and we know that among the Greeks women were much freer and more respected in the older time before Oriental influence had affected native customs. It is said that chastity was not held in much account by the women of Illyria; but it must be remembered that people whose women are kept more secluded are very apt to ascribe such a character to the freer life of other races,

The Illyrians are said by Herodotus (ix. 43) to have attacked the temple of Delphi. Brasidas with his small army of Spartans was assaulted by them on his adventurous march (424 B.c.) across Thessaly and Macedonia to attack the Athenian colonies in Thrace. The earlier history of the Macedonian kings is one constant struggle against the Illyrian tribes. The migrations of the Gauls at the beginning of the 4th century disturbed the country between the Danube and the Adriatic. The Scordisci and other Gallic tribes settled there, and forced the Illyrians towards the south. The necessities of defence

seem tv have united the Illyrians under a chief Bardylis (about 383 B.c.) and his son Clitus. Bardylis nearly succeeded in destroying the rising kingdom of Macedonia; King Amyntas was defeated, and a few years later Perdiccas was defeated and slain. But the great Philip crushed them completely, and annexed part of their country. During the next century we hear of them as pirates. Issuing from the secluded harbours of the coast, they ravaged the shores of Italy and Greece, and preyed on the commerce of the The Greeks applied to Rome for help. Hel- lenism had proved too weak to civilize the northern races ; it was left to the stronger organization of Rome to absorb them. Teuta, the Illyrian queen, at first scorned the Roman demands for redress, and even murdered the

ambassadors; but the two Illyrian wars (229 and 219 p.c.) ended in the submission of the Illyrians, a consider- able part of their frontier being annexed by the conquerors. In 168 3.c. Gentius, the Illyrian king, provoked the third Illyrian war, the result of which was the annexation of the whole country by the Romans. J'requent rebellions oc- curred, but at last the natives accepted the Roman civiliza- tion. During the empire, the country was one of the best recruiting grounds for the Roman legions; and in troubled times many Illyrian soldiers fought their way up from the ranks to the imperial purple. Claudius, Aurelian, Probus, Diocletian, and Maximian were all sons of Illyrian peasants. 3

In the time of the republic Illyricum comprised the country between the Liburnians, a kindred race, on the north and Epirus on the south. Under the empire the importance of the country made its name spread over all the surrounding districts. In the 2d century after Christ, the Illyricus Limes included Noricum, Pannonia, Moesia, Dacia, and Thrace. Constantine added Greece, Epirus, and Macedonia, taking from it Thrace and part of Moesia, and made it one of the four divisions of the Roman empire governed by a "praefectus pretorio." When tle empire was divided, Illyricum was halved. Illyris Barbara or Romana, including Noricum, Pannonia, &c., was an- nexed to the Western empire; while Illyris Greeca, includ- ing Macedonia, Epirus, and Greece, formed part of the Eastern empire. The Via Egnatia, the great line of road which connected Rome with

Constantinople and the East, led across Illyricum from Dyrrachium to Thessalonica.

In the wreck of the Roman empire Illyria suffered severely. In the 4th century the Goths ravaged it repeatedly, but these, the most civilized of the barbarian invaders of Rome, with their warlike aristocracy, passed on, and were succeeded by wilder tribes. Slavs, as also Huns and other nomadic races from the East, in succession devastated the country. An agricultural population could no longer maintain itself, and all the elements of civilization disappeared, Justinian (527-565) tried in vain to defend the country by a series of forts; his armies were defeated time after time, and at last he allowed the Huns to make settlements south of the Danube. Rome gave up the defence of civilization against the inroads of barbarism, and. bribed the barbarians to be quiet. Still the Via Egnatia was defended, as the artery of communication and the highway of commerce between Constantinople and the west. The open country, however, even south of the great road, was abandoned to the Slavs and Huns. 'The older Illyrians partly united with these races, partly went farther south, encroaching on the Greek people, and the name of one of their tribes, Albani, is preserved in the modern name of their descendants, the Albanians.

Heraclius (610-641 a.p.) settled Slavonic peoples all along the coast of Illyria as far south as Dyrrachium. The states which were thus created were of great importance in the Dark Ages. The republic of Narenta vied for a time with that of Venice; and the commerce of Ragusa was so rich that it has given its name to all wealthy merchant vessels or "argosies." The name of Illyria had by this time disappeared from history ; and the country was now divided between these powerful merchant cities and the states of Bosnia, Croatia, Servia, Rascia, and Dalmatia. Jn literature the name was preserved, and the scene of Shakespeare's comedy Twelfth Night is laid in Illyria. Politically the name was revived in the beginning of this century, when the small kingdom of Illyria to the north of the Adriatic was constituted at the peace of Vienna, 1809. In 1849 the territorial distribution of the Austrian empire was remodelled, and Ilyria again disap- peared. (W. M. RA.)

ILORI, or Inoriy (the Alourie of the Landers' expedi- tion), an important town of the Yoruban territory of Western Africa, situated about 60 or 70 miles south of the Niger, and about 160 miles north-north-east of Lagos. The wall has a circuit of 12 miles, but is badly kept in repair. Along the south-eastern side flows a small stream which joins the Asa, a tributary of the Niger. The inhabitants are Yorubas, Fellatah (Pullo), Houssas, Gambarees, Bornuese, and Nufes or Papas. Most of them speak Yoruban. An extensive native trade is carricd on at Torin, the Houssa caravans importing manufactured goods of various sorts, not only from Central Africa, but even from the coasts of the Mediterranean. The trade from the Guinea coast on the other hand is confined to brandy, guns, and powder. The variety of local industries is very considerable: Rohlfs mentions beautiful leather goods, carved wooden vessels, finely plaited mats, embroidered work, pottery of various kinds, shoes of yellow and red leather, and, what was unique in his experience of Negro tribes, the manufacture of cheese. The population is estimated at from 60,000 to 70,000, exclusive of the resident traders from foreign parts. 'There are a number of mosques in the town, and the Mahometans are the dominant power, but the lower classes maintain their pagan customs. About 1820 Tori declared itself independent of Yoruba, and assisted in the destruction of Oyo.

See R. F. Burton, Abeokuta and the Cameroons Mountains, Lond., 1863; G. Rohlfs, Quer durch Afrika, Leipsic, 1874.

IMAGE WORSHIP. In the present article the word "image" will be employed to denote any artificial repre- sentation, whether pictorial or sculptural, of any person or thing, real or imaginary, which is used as a direct adjunct of religious services. This definition of the word shuts out from present consideration, though at some points by an almost imperceptible boundary, the worship of all merely natural symbols, whether animate or inanimate, conventional or the reverse. Thus, for example, every form of animal worship is excluded by it, and also the cultus connected with memorial stones of which traces so unmistakable are found in the Old Testament and in almost every other ancient literature (the dido. Aurapot or ddyippévor, Batrvdo., lapides uncti, batyli, of classical writers). So far as images («ixdves, imagines) are merely more or less perfect productions of pictorial or plastic art, they fall to be treated under PAINTING,

SCULPTURE, Mosarc, &c.; so far as they have been regarded as aids to devotion and spiritual instruction, or made the objects of religious veneration, the history of their introduction and of the various aspects under which they have been viewed forms a large and not unimportant chapter in the history of religion in general and of the Christian church in particular. Only the outlines of that listory can be indicated here. Most religions of which the history has been traced give distinct indications of a primitive period in which " idols " were unknown. 'Thus in India "the worship of idols is a secondary formation, a later degradation of the more primitive worship of ideal gods" (M. Miiller). In the Vedic hymns it is the appearances of nature themselves that are worshipped as symbols of unseen deity ; and the present image worship of the Hindus is most probably Post-Buddhistic in its origin. The testimonies of the Greek historians (Herod., i. 131; Strabo, p. 732; Diog. Laer., De Vit. Phil., prom. 6) as to the absence of religious images from the worship of the ancient Persians is confirmed by all the more recent direct investigations into the primitive life of that branch of the Aryan race. There is the same concurrence of testimony as regards the ancient Greeks ;} the powers of nature were in the first instance

-21Qe@ Schoemann, Gricch, Alterthiimer, ii, 197 sq.

IMAGE WORSHIP

worshipped through natural symbols,—such as serpents,

trees, meteoric stones,—and in some cases temples occurred Even in the

which contained no visible symbol at all, Honieric poems, the allusions to images of the gods are but few: where an image is mentioned (as in JU. vi; 301), it is evident that it was of the rudest description, and but little indebted to human art. cultus of ancient Rome. It was carried on without the use of images until the comparatively late period at which the state entered into relations with Etruria, Magna Grecia, and Sicily.!' The date of the oldest statue in Rome, that of Diana on the Aventine, can be given with considerable precision as between 577 and 534 B.c. As regards the ancient Germans also, we have the testimony of Tacitus that down to his time at least their gods were still invisible

and had neither temples nor images.2- And, whatever be

our construction of the primitive history of the Semitic races, there can be little doubt, so far as the Jews at

least are concerned, of the correctness of their own impres- sion that "idolatry," in the strict etymological sense of that word, was not the most primitive form of religion practised

among tliem. The decalogue contains a direct precept against the

making of any "graven image" (pesel or pasil), for

religious uses at least (Ex. xx. 4,5; Deut. v. 8,9; with which compare Deut. iv. 15-18). The "graven images" contemplated in the passage last cited are images of men, quadrupeds, birds, reptiles, and fishes; and the manner in

which the prohibition is made is fitted to suggest that all

these "likenesses" had made their appearance and already become objects of religious veneration prior to its pro- mulgation. Nothing certain, however, is known as to the "strange gods" alluded to in Gen. xxxv. 4 as having been buried by Jacob under the oak at Shechem; nor can much be said with regard to the "teraphim" which are first mentioned as having been worshipped in one of the branches of the family of Terah (Gen. xxxi. 19), but aro often subsequently referred to as having been used in the time of the judges (Judg. xvii. 5; cf. xviii. 30), and at various stages throughout the history both of the northern and of the southern kingdom (Hos. iii. 4; Zech. x. 2; 3 Kings xxiii. 24). Sometimes they must have been but small; but from other passages it may be inferred that they may have been, occasionally at least, of human form and size (1 Sam. xix. 13, 16). Much obscurity attaches also to the calf worship of which an instance occurred in the wilderness (Ex. xxxii. 4), and which was a prominent feature in the religion of the northern kingdom from the days of Jeroboam to the end; it is a disputed question whether the cult was of Egyptian or of purely Semitic origin. The difficulty in Lev. xvii. 7, and perhaps also in Deut. xxxii. 17, Ps. evi. 37, is by some interpreters explained by a reference to the Egyptian goat worship (Mendes); if so, these passages contain no allusion to image

worship. 'The various forms of the Baal cultus so often referred to in the Old Testament were no doubt Semitic; there are no explicit references to any images, however, in this connexion; and in point of fact (see Baa.) that deity was generally represented in his '"high- places," not by images, but by obelisks or pillars. That the plastic arts, even in a religious connexion, were not wholly discouraged among the Jews, appears from what we read, not only about the brazen serpent in the wilderness, but also about the existence in tabernacle and temple of such figures as cherubs (Ex. xxv. 18-20; xxvi. 1; xxxvi.

1 See Preller, dm. Mythologie, p. 10, &c. The statement of Plut- arch (Numa, 8), that for 170 years after the foundation of the city images were unknown, recurs in many later writers.

? The statements of Tacitus on this head, as well as those of later historians are discussed very fully in Grimm's Deutsche Mythologie, i. p. 93 sgg. .

The same remark applies to the

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35; 1 Kings vi, 23, 32, 35) executed in various materials, lions, oxen, lotus flowers, and pomegranates (cf, Ex. xxxi. 4, 5). The graphic descriptions of the process of idol- making, both 'graven images" and "molten images" in Isa. xl, and xliv. (with which may be compared Wisd. xv.; see also the reference in Isa. xxx. 22 to molten images overlaid with a precious metal) show that the exercise of those arts was far from being confined, at the periods to which these passages relate, within the limits fixed by the second commandment, After the captivity, however, there developed itself among the Jews a steadily growing tendency to interpret the language of the law with the most stringent literality; and at the time of the Roman occupation the masses, under Pharisaic influences, showed a sensitiveness on the subject of iinages which in certain recorded instances led to very striking results. Thus, the existence of trophies in the theatre at Jerusalem was violently objected to; Vitellius found it necessary to avoid Judea in his march from Antioch to Petra, lest the Holy Land should be defiled by the presence of the Roman eagles ; at the outbreak of the Jewish war the house of Antipas at Tiberias was destroyed because it was adorned with sculptures

(Joseph., Ant., xv. 8. 12 5 evar. ot: V7, 12). This aversion to every exercise of the imitative arts, as regards living things at least, passed over from Judaism to Mahometanism.3

As regards the attitude towards religious images assumed by the primitive Christian church, several questions have often been treated as one which cannot too carefully be kept quite apart. There can be no doubt, for example, that the early Christians were absolutely unanimous in utterly condemning all heathen image-worship and the various customs, many of them obviously immoral, with which it was associated ; it is needless to multiply citations from the fathers in proof of so undisputed a fact. A form of iconolatry specially deprecated in the New Testament was the then prevalent adoration of the images of the reigning emperors (see Rev. xv. 2). It is also tolerably certain that, if for no other reasons besides the fewness, obscurity, and poverty of the early converts to Christianity, the works of art seen in their meeting houses cannot possibly at first have been numerous, Along with these reasons would certainly cooperate towards the exclusion of visible aids to devotion, not only the church's vivid recollection of what Christ had been, and its living sense of His continued real though unseen presence, but also, during the first years, its constant expectation of His second advent as imminent. In point of fact it was a common accusation brought against the Christians by their encmies that they had "no altars, no temples, no known images" (Min. Fel., Oct., c. 10), that 'they set up no image or form of any god" (see Arnob., Adv. Gent., vi. 1; similarly Celsus) ; and this charge was never denied. Ata comparatively early date indeed we read of various Gnostic sects calling in the fine arts to aid their worship ; thus Irenzeus (Z/er. i. 25, 6), speaking of the followers of Marcellina, says that "they possess images, some of them painted, and others formed from different kinds of material; and they maintain that a likeness of Christ was made by Pilate at that time when Jesus lived among men. They crown these images, and set them up along with the images of the philosophers of the world; that is to say, with the images of Pythagoras and Plato and Aristotle and the rest. They have also other modes of honouring these images after the same manner as the Gentiles" (cf Aug., De Her.,c. 7). It is

3 On the pre-Islamitic polytheism of Arabia, and the extent to which it consisted in the worship of living animals or their images, see a sug-

gestive paper by Prof. W. Robertson Smith on " Animal Worship and Animal Tribes among the Arabs and in the Old Testament" in the Journal of Philology, vol. ix. p. 75-100 (1880).

also well known that the emperor Alexander Severus round a place for several Scripture characters and even for Christ in his lararium (Lamprid., Vit. Alex. Sev., ¢. 29). But there is no evidence that such a use of images extended 'tself at that early period to orthodox Christian circles ; and the presumption is all the other way. The first unmistakable indication of the actual public use of the painter's art for directly religious ends does not occur indeed until the year 306 a.p., when the synod of Elvira, Spain, decreed (can. 36) that '" pictures ought not to be in a church, lest that which is worshipped and adored be printed on walls."? that all that is forbidden is any attempt at delineating the divine; others considering that the synod contemplated frescos only and not pictures, which could be more readily hidden from profanation in times of persecution ; others taking the canon in the broadest sense as directed against the exhibition in churches of pictures of sacred subjects. case, and particularly if the last theory be adopted, it is evident that the use of sacred pictures in public worship was not at the beginning of the 4th century a thing wholly unknown within the orthodox church in Spain ; and the presumption is that in other places, about the same period, the custom was looked upon with a more tolerant eye. Indications of the existence of allied forms of sacred Christian art prior to this period are not wholly wanting. It seems possible to trace some of the older and ruder frescos im the catacombs back to a very early century ; and it is certain that Bible manuscripts were often copiously illuminated and illustrated even 4th century.

An often-quoted passage from Tertullian

(De Pudic., c. 10, ¢f. ¢. 7) shows that in his day the com- munion cup was wont to bear a representation of the Good Shepherd. Clement of Alexandria (Peedag., iii. 11) men- suitable devices

tions the dove, fish, ship, lyre, anchor, as for Christian signet rings.

During the 4th and following centuries the tendency to

enlist the fine arts in the service of religion and the church may be said to have steadily advanced ; not, however, 80 with the formal sanction of any regular ecclesiastical authority, and certainly not without strong protests raised by more than one powerful voice. From a passage in the writings of Gregory of Nyssa (Orat. de Laudibus Theodort Martyris, c. 2) it is easy to see how the stories of recent martyrs would offer themselves as tempting subjects for the painter, and at the same time be considered to have received from him their best and most that this feeling was very wide-

far as appears,

permanent expression ; spread is shown in many places by Paulinus of Nola (ob. 431), from whom we gather that not only martyrdoms, and Bible histories, but also symbols of the Trinity were in his day freely represented pictorially. Augustine (De Cons. E»., i. 10) speaks less approvingly of those who look for Christ and His apostles "on painted walls" rather than in Tis written word. How far the Christian feeling of the 4th and 5th centuries was from being thoroughly settled in favour of the employment of the fine arts is instructively shown by such a case as that of Eusebius of Ceesarea, who in reply to a request of Constantia, sister of Constantine, for a picture of Christ, wrote that it was unlawful to possess images pretending to represent the Saviour either in His divine or in His human nature, and added that to avoid the reproach of idolatry he had actually taken away from a lady friend the pictures of Paul and of Christ which she had.2 Similarly Epiphanius in a letter to John, bishop

1 Placuit picturas in ecclesia esse non debere, ne quod colitur et adoratur in parietibus depingatur. See Hefele, Conciliengesch., i. 170.

2 The letter, which is most probably, though not certainly, genuine, appears in the Acta of the second council of Nice.

The scope of this prohibition has been very differently viewed by interpreters,—some thinking

In any

before the middle of the

IMAGE WORSHIP

of Jerusalem, tells how in a church at Anablatha near Bethel he had found a curtain painted with the image " of Christ or of some other saint," which he had torn down and ordered to be used for the burial of some pauper. The passage, however, reveals, not only what Epiphanius thought on the subject, but also the fact that such pictures must have been becoming frequent. Nilus, the disciple and defender of Chrysostom, permitted the symbol of the cross in churches and also pictorial delineations of Old and New Testament history, but deprecated other symbols, pictures of martyrs, and most of all the representation of Christ. In the time of Gregory the Great the Western Church at last obtained something like an authoritative declaration on the vexed question about images, but in a sense not quite the same as that of the syuod of Elvira. Serenus of Marseilles, on account of what he considered to be flagrant abuses, had ordered the removal and destruction of all sacred images within his diocese; this vigorous action called forth several letters from Pope Gregory (viii. 2,111; ix. 4, 11), in which he utterly disapproved of that violent course, and, for the first time clearly drawing the distinction which has ever since been authoritative for the Roman Church, pointed out that "it is one thing to worship a picture and another to learn from the language of a picture what that is which ought to be worshipped. What those who can read learn by means of writing, that do the uneducated learn by looking at a picture… . That, therefore, ought not to have been destroyed which had been placed in the churclies, not for worship, but solely for instructing the minds of the ignorant." Here it may be mentioned with regard to the symbol of the cross, that its public use dates from the time of Constantine, though, according to many Christian archeologists it had, prior to that date, a very important place in the so-called " dis- ciplina arcani." The introduction of the crucifix was decidedly later, and originally the favourite combination was that of the figure of a lamb lying at the foot of the cross; the Trullan council in 692 by its 82d canon enjoined that this symbol should be discontinued, and that where Christ was shown in connexion with His cross He should be represented in His human nature.

It was not until the 8th century that the religious and theological questions which seem naturally to connect themselves with image worship were at last distinctly raised +n the Eastern Church in their entirety, and argued in what from some points of view might fairly be called an exhaus- tive manner. 'The controversy began with the edict by which Leo the Isaurian, in the tenth year of his reign (726), sought to deliver the church from what he called "the idolatry of image worship." The text of that edict is not extant, but it seems to have been directed exclusively against such "idolatrous" homage as appeared to be involved in the established custom of prostration before them. The use of the strong word "idolatrous" at once led to a keen controversy, in which it was urged by the theologians that a "relative worship" (xpookdvyats oXeTtK)) might, without idolatry, be given to the image of Christ. Among those who took this ground was the famous John of Damascus, who retorted upon the iconoclastic emperor with charges of Judaizing and even of Manichzean leanings. Leo, unconvinced, but finding that his first edict had been wholly ineffectual, four years later (430) issued a second decree, of a more sweeping character than the first, inasmuch as all the holy images were ordered to be removed, and all recalcitrant bishops summarily ejected from their posts. This proceeding called forth further arguments from the theologian of Damascus, through whose influence the 'conoclasts were anathematized in such churches as were not too directly and entirely under the political influence of Constantinople, At the same time (730) Pope Gregory

IMAGE WORSHIP

If. addressed to the emperor two important controversial letters in favour of images. They are preserved in the Acta of the second council of Nice. Apart from their direct historical importance, they are of considerable interest as literary and theological curiosities. To the objection which had of course been urged from the decalogue, he replied that the prohibition there was directed simply against the idolatry of Canaan, and could not have been intended in a sense inconsistent with the fact that Moses had been commanded to make cherubim and the like. Christ Himself was an image, the image of God. The charge that the iconoduli prayed to stones, walls, and pictures was easily met ; and the further difficulty that six cecumenical councils had met and separated, but enjoined nothing about images, it was

held, told distinctly against the iconoclasts, for the same councils had equally failed to urge upon men the duty of taking their necessary food. Heedless of Gregory's remonstrances, the emperor continued, during the remaining twelve years of his life, to carry on the struggle with but little effect; the religious use of images was too intimately interwoven, not only with the church life, but also with the domestic habits of his people, to yield even to the most determined efforts of an arbitrary despotism. In 741 Leo was succeeded by Constantine Copronymus (741-775), who fully shared the iconoclastic views of his father, and in 754 convoked a council, attended by three hundred and thirty-eight bishops, but never recognized as cecumenical, which under his influence declared all reverencers of images to be men who had lapsed into idolatry ; decreed that " Christ in His glorified humanity, though not incorporeal, was yet exalted above all the limits and defects of a sensuous nature, too exalted therefore to be figured by human art in an earthly material after the analogy of any other human body"; and pronounced anathema on all who attempted to express by visible colours the form of the Logos in His incarnation, and on all who delineated dumb and lifeless pictures of the saints, which could never serve any profitable end. All images whatso- ever of sacred persons or things were ordered to be ejected from Christian churches; and to set them up either in public or in private buildings was forbidden under the gravest ecclesiastical penalties. The stringency of these decrees was justified by arguments drawn from reason and Scripture, as well as by appeals to such names as those of Gregory, Chrysostom, Athanasius, Epiphanius, and Eusebius. The attempt to enforce the decisions of the council as imperial laws was in many instances marked by oppres- Siveness and cruelty, and the general feeling of the com- munity, fostered diligently by a numerous class of its most energetic and pious members, the monks, continued unchanged in its aversion to iconoclasm ; and, although at the end of his reign Constantine succeeded in imposing upon every citizen of Constantinople an oath never again to worship an image, there can be little doubt that in a vast number of households secret leanings to image worship had been intensified rather than weakened by repressive measures. During the early part of the brief reign (775- 779) of Leo IV. Chazarus, the stringency of the law was somewhat rclaxed, until it was discovered that the empress (Irene) was herself a secret iconolater, when she was brought into disgrace, and numbers of her accomplices were seized and imprisoned. On

the death of Leo, Irene became regent for her infant son Constantine, and, as was to be expected, used the power which she now possessed in favour of the cause she had long had at heart. With the assistance of the monks, after an abortive attempt to hold a synod at Constantinople in 786, there met at Nice in 787 a general council (the seventh cecumenical), the proceedings of which are of considerable historical importance. It was there decided that, not only the figure of the cross, but also other

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holy images (Christ, the Virgin Mary, angels, and saints), whether painted or executed in mosaic or other material, might be set up in churches, placed on holy vessels and vestments, on walls and panels, in houses and by highways, and were to be honoured with dowacpds and zpooxtvvyots, though not with Aarpeia, which is given to the divine nature alone. The decrees, which were sigued by all present, were afterwards solemnly ratified at a final session (the eighth) held in Constantinople, and thus, after a struggle of sixty-one years, the worship of images asserted in the Greek Church that ascendency which, with only one brief interruption of a few years, it has ever since maintained.

The decisions of this Eastern council were in full harmony with the personal views and practices of the popes, who, however, were compelled to show considerable moderation in the attitude they assumed. The Latin Church also, as is shown by the writings of Agobard of Lyons and Claudius of Turin, contained strongly iconoclastic elements, which, if full scope had been given them, might conceivably have altered very considerably the current of Western opinion. On political as well as on religious grounds, however, it was felt to be inexpedient to push matters on either side to extremes ; very important therefore at this juncture was the step taken by the emperor Charlemagne in the publi- cation of his De Impio Imaginum Oultu Libri IV., com- monly called the Libri Carolini, in which, condemning alike the fanaticism of iconoclasts and the superstition of iconoduli, he maintained the right of images to exist for pur- poses of commemoration and ornament (propter memoriam reruin gestarum et ornamentum). At the synod of Frank- fort-on-the-Main, held in 794, his general position was

maintained, and adoration of images (adoratio et servitus imaginum) was wholly condemned, Great injustice was done, however, to the fathers of the second Nicene council when they were accused of maintaining that the same worship ought to be given to images of saints as to the Holy Trinity,—a doctrine which they had been at special pains to repudiate. The settlement which had been obtained in 787 did not subsist entirely undisturbed even in the Eastern Church. In 815, two years after Leo the Armenian had ascended the throne, a council convoked by him at Constantinople formally abolished the decrees of Nice, and again banished the images from the churches. The new controversy, with which the name of Theodore of the Studium is still more prominently associated than was that of John of Damascus with its previous phase, went on with vicissitudes very similar to those which had formerly occurred during the reign of Leo and his suc- cessors Michael (820-830) and Theophilus (830-842), At length, during the regency of the empress Theodora, the decrees of Nice were reaffirmed by asynod at Con- stantinople, and the banished images were triumphantly and finally reintroduced into the metropolitan church on the day which on the first Sunday in Lent is still cele- brated throughout the Greek Church as a great festival under the name of éoprj or ravpyvpis THs épOodokias. One incident in this sccond iconoclastic controversy had been the mission of an embassy by Michael Balbus to Louis the Pious in 825. The reply was given through the synod of Paris, held in that year: in open disagreement with the opinions of Pope Hadrian L, the relatively neutral ground taken up at the synod of Frankfort was maintained.

Down to the close of this period the "'images" spoken of in ecclesiastical controversy are almost entirely pictures or mosaics,—the religious use of sculptures, and particularly of statues (dydéApara, avopidvres, orpAou), being little known, and, so far as known, disapproved. This distinction docs not indeed appear in the actual decrees of the council of Nice; but it is clearly drawn in the statements of the patriarch Germanus aud by Stephen Bostrenus, as quoted

in the proceedings (Act. ii.), Such remains of Christian antiquity as the statue of Hippolytus, recently dug up at Ostia, and usually assigned to a date not later than the 5th century, as also the sitting figure of St Peter, dating from the same period, now secn in St Peter's, Rome, have no 'mmediate connexion with the subject of this article. The same remark applies to the still earlier statue at Paneas referred to by Eusebius (7. Z., vii. 18), said to have been raised in honour of Christ by the woman mentioned in Matt. ix. 20; if it was really intended to represent Christ at all and not rather the emperor Hadrian, it was, at all

those executed in rude archaic style, and even now the painter of pictures intended for religious uses must bear in mind the monk's famous criticism on Titian. Nude or incompletely draped figures are forbidden, and only half lengths are permitted "ut omnis stulte cogitationis occasio tollatur." No representation of the Godhead or of the Trinity is attempted. Although it is in the records of a Constantinopolitan council that the earliest extant notice of the crucifix occurs, that symbol is not now used in the East.

The litcrature of the subject is immense. The most important

monographs are—from the Catholic point of view, Maimbourg, Histoire de U Hérésie des Iconoclastes (Paris, 1679-82); from the Pro-

events, obviously no object of special veneration. About the 9th century, however, "graven images" seem to have become more common. 'Thus in tho treatise De Imaginibus (c. 31) of Agobard of Lyons (08. 840), there is an obvious controversial allusion to molten or moulded statues of angels or holy men, With the gradual introduction of the architecture commonly known as Gothic, there came in a great advance in plastic art. The new cathedrals gave scope for and even demanded a wealth of decoration formerly unknown, until it seemed as if, not only the entire Biblical history, but all the Acta Sanctorum, were to be artistically told in wood and stone, The earliest extant sculptures in stone or stucco cannot be carried farther back than the llth century. But the discussion of their date and character belongs to the artistic rather than to the religious side of the subject.?

At the period of the Reformation it was unanimously felt by the reforming party that, with the invocation of saints and the practice of reverencing

their relics, the adoration of images ought also as matter of course to cease. The leaders of the movement were not all, however, per- fectly agreed on the question as to whether these might not in some circumstances be retained in churches. Luther, it is well known, had no sympathy with the iconoclastic outbreaks which history mentions as having taken place with some frequency at this period; he classed images in themselves as among the "adiaphora," and condemned only their cultus; so also the " Confessio Tctrapolitana" leaves Christians free to have them or not, if only due regard be had to what is expedient and edifying. The '" Heidelberg Catechism," on the other hand, emphatically declares that images are not to be tolerated at all in churches. This position, which is that of all the reformed churches, has an obvious connexion with their view as to the division of the decalogue, they following Origen on this question while the Lutherans adhere to the Philonic arrangement (see DECALOGUE),

At the council of Trent (session xxv.) the Church of Rome finally formulated the doctrine on the subject of images which is still of authority within its communion. That doctrine is avowedly based on the decrees of the second council of Nice. It is declared that images of Christ, the Virgin Mary, and other saints are to be set up and retained, especially in churches, and that 'due" honour and veneration are to be accorded them by kissing and prostration. Warnings are appended, however, against their superstitious abuse somewhat in the spirit of Gregory the Great's letter and of the decision of the Frankfort synod.

The Greek Church continues tenaciously to adhere to the decrees of the second Nicene council, and has not yielded to any of the artistic impulses which have elsewhere made themselves so powerfully felt. The sacred pictures which abound everywhere, and are treated with extraordinary reverence and affection, are for the most part very defective eesthetically. Indeed the preference seems to be given to

1 Such works as Lubke's Kunstgeschichte may be consulted in this

connexion; also Didron's Iconographie and Jameson's Sacred and Legendary Art, =

testant, Daillé, De Imaginibus (Leyden, 1642), and Spanheim, Historia Imaginum restituta (Leyden, 1686). councils, Labbé or Mansi must be consulted ; the learned compila-. tion of Goldast, Imperialia decreta de cultu imaginwm in utroque imperio promulgata collecta et illustrata (Frankfort, 1608), will also be found useful. Kuiser (Frankfort, 1812). 'The sections relating to image worship in the great work of Chemnitz (Hxamen Cone. Trid., pars 4) are charac- terized by learning and moderation. of course, in all the chureh histories; with most fulness and in- sight in that of Neander. also in the histories of Gibbon and Milman. logical details are also given in Augusti's Denkwiirdigkeiten, vol. xi. (Leipsic, 1831).

For the acts of the

Compare Schlosser, Gesch. der bilderstitrmenden

The whole subject is treated,

The iconoclastic controversy is dealt with Copious arehzo-

(J. 8. BL.) IMAM is the name given to the priest who leads the

prayers of a Mahometan congregation, and is – exactly equivalent to Antistes. In the Koran, chap. ii. v. 118, it is

said of Abraham, " Verily, I will set thee as an imam (high

priest or model) for men." In Turkey the imam, besides his

function as a minister, performs the rites of circumcision, marriage, and burial. He is distinguished only by avoid- ing gay colours in his dress and wearing a white turban. In Persia the imdm is also called a mujtahid; he has no secular duties. Tho title has been always borne by the caliphs or successors of Mahomet, the earlier ones having, like the Prophet himself, conducted the services in person, and addressed the people in a khutbah or homily on the great weekly gathering on Fridays. The title thus came to signify head of the faith, and as such is claimed and used by the present sultans of the Osmanli dynasty in Turkey, the last of the legitimate caliphs, E} Mutawakkel, having in 1517 .p. ceded his prerogatives to Selim L., the

first Ottoman sultan, and his heirs. The caliphate (see CatrrH) is also called Hl Imémah, the imamate. The Shiah sect hold that the office of imd4m was specially assigned by Mahomet to Ali ibn Abi Talib, his cousin and son-in-law, and passed from him to his legitimate male issue by Fatima Mahomet's daughter. The first im4m then was Ali; the next two were Ali's sons Hasan and Husein (see Hasan); then came Ali Zein el 'Abidin, son of Husein. His son Zeid founded the sect called the Zeid- tyeh, who recognized him asimém. 'This sect split into two subdivisions, one of which declared that the imam ought to be designated by his predecessor, the other that the imamate was elective, but must be confined to the descen- dants of Fatima. The twelve iméms generally received by the Shiahs do not, however, include Zeid, but are the following :—(1) Ali ibn Abi Talib ; (2) El Hasan his son; (3) El Husein, Ali's other son ; (4) Ali Zein el "Abidin, son of Husein ; (5) Mohammed el Bakir, son of Zein el Abidin ; (6) Jaafer es Sadik, son of El Bakir ; (7) Musa el Kadhim, son of Jaafer; (8) Ali er Ridha, son of Musa ; (9) Mohammed et Taki, son of Er Ridha ; (10) Ali el Had{, son of Et Taki; (11) Hasan el Askari, son of El HAdi. Here the chain of succession breaks off, the twelfth

imam being Mohammed el Mehdi, surnamed Abu Kasim,

who was predicted by the Prophet, and whois yet to come, The title imam is also applied to the founders of the four

great orthodox sects of Mahometans.

IMBROS, or Imvro, an island in the Aigean Sea,

lying west of the southern end of the Thracian Chersonese,

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about 14 miles from the mouth of the Dardanelles, To

the north-west, at a distance of 17 miles, lies the island of

Samothraki; and about the same distance to the south- east is Lemnos, The area of Imbros is estimated at 105 square miles, and its population, which is

mainly of Greek origin, is about 10,000. With its bare mountain ridges aud sides it has no small similarity to Attica, Hagios Tlias, or St Elias, is the highest summit, 1859 feet above the sea-level. According to Franz von Loher about a third of the island could be turned into a very garden by an industrious and skilful race; but at present not morc than one-tenth is under cultivation. Wheat, barley, and oats are grown, as well as a dye-plant locally called bouia. A German company is working lignite in the island. The only stream of importance has surrendered its ancient name of Ilissus for the simple appellation of peyddos rorauds or Big River. The valley through which it flows is the only considerable tract of arable land in the island, and contains the four villages of Theodoro, Kastro, Gliki, and Panagia. astro, which lies on the coast, is the site of the ancient town which bore the same name with the island; but the only remains of antiquity are part of the mole, portions of the town-wall, and a number of tombstones. A hill above the town presents with its summit so great a likcness to a medieval castle that it has requently been described as such. The archeological investigations of Conze have brought to light a few inscriptions of secondary intcrest, which mainly serve to confirm the Attic character of Imbrian civilization. Attic and Trojan coins are not unfrequent ; and traces are found of the worship of the Cabiri, Cybele, and Zeus Hypsiotes. Imbros plays no great part in history; though the name occurs as early as the //iad and the Homeric Mymns. Herodotus mentions its subjugation to the Persians by Otanes. In later times it was distinctly recognized as an Athenian colony. The numerous watch-towers and diminutive strongholds. observed throughout the island would indicate that it had its share in the busy warlike existence of the Middle Ages. Along with Samothraki, Lemnos, and Hagiostrati, Imbros belongs administratively to the Vilayet of the Islands, or Jesair bahr i Safid of Asiatic Turkey. It is the seat of a metropolitan of the Greek Church, with the title of exarch of the Jfigean.

Sec Richter, Wallfahrten nach dem Morgenilande, Berlin, 1822 ; Mustoxides, Yrouvnuara loTopika wept THS vnGoV IuBpov, Constantinople, 1845; Louis Lacroix, Les tles de la Greece, 1853 ; Blau and Schlottmann, in Berichten der Konigl. preuss, Akad. der W issenseh., 1855 ; Conze, Reise auf den Inseln des Thrakisehen Meeres, Han- over, 1860; Von Loher, Grieehische Kiistenfahrten, Bielcfeld, 1876.

IMERITIA, a district in Transcaucasia, extends from the left bank of the Tzhenys-tzkalys to the range of hills that separate it from Georgia on the east, and is bounded on the south by Akhalzikh. Anciently a part of Colchis, and included in Lazia during the Roman empire, Imeritia was nominally under the dominion of the Greek emperors. In the early part of the 6th century it became the theatre of wars between Justinian and Chosroes, and was devast- ated by subsequent hostile incursions, reviving only on becoming united to Georgia. It flourished until the reign of Queen Thamar, but after her death (1212) the country became impoverished through strifeand internal dissensions. Reunited to Georgia, it became known in 1259 as Imier, whence Imeritia (1469). In 1621 was made the earliest appeal to Russia for aid; in 1650 the first Russian envoys were received at Koutais, the capital ; and in 1769 a Russian force expelled the Turks. In 1804 the monarch declared himself a vassal of Russia, and in 1810 the little kingdom was definitively annexed to that empire. Imeritia,

fingrelia, and Gouria, provinces not officially recognized as distinct, are now included in the Russian government of Koutais, See Grorata,

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_ IMMACULATE CONCEPTION. The dogma of the immaculate conception of the Virgin Mary, as held by the Church of Rome, istothe effect that "the most blessed Virgin was, in view of the merits of Jesus Christ the Saviour of the human race, by the singular grace and favour of Almighty God, from the first moment of her conception in the womb of her mother, preserved free from all taint of original sin." The "pious opinion" that the mother of Christ had during her life been preserved from sin in a way in which no other human being ever had been may be traced back to a coniparatively early period : indeed, without it her cultus (for some account of the growth of which sce Mary) as it had developed itself long before the 9th century, would have been impossible. The actual history of an explicit doctrine of her immaculate conception, however, so far as has hitherto been discovered, may be said to begin, in the year 1140, with the letter of remonstrance which Bernard of Clairvaux wrote to the canons of the cathedral at Lyons (Zp. 174), who, without consulting the Roman see, had

recently intro- duced into their church a festival in celebration of that doc- trinc. Bernard argued vigorously against this on the ground of its novelty, its unscripturaluess (Ps. li. 5), and its ab- surdity :—"On the same principle," said he, " you would be obliged to hold that the conception of her ancestors, in an ascending line, was also a holy one, since otherwise she could not have descended from them worthily, and there would then be festivals without number." How the recipi-

ents, who, it is stated, claimed to have learned their pecu-

liar rite froma document communicated by the Virgin her- self, were affected by this letter, is not recorded. Among controversial treatises which appcared shortly afterwards are mentioned those of Potho of Priim and the Abbot de la Celle against the doctrine, and that of the English monk Nicolas in its favour. In the 18th century all the leading theologians, such as Alexander Halensis (p. iii, qu. 10, membr. 2), Albertus Magnus (Comm. in Sent., iii. 3), Bona- ventura (Comm. in Sent., iii, 3. 1, 2), and Thomas Aquinas (Summa, p. iii, qu. 27, art. 1-3), took the view of St Bernard, their contribution to the theology of the subject consisting in an accurate definition of the moment at which the Virgin's sanctification in the womb must be held to have taken place. During the same century the feast of the Conception became very popular, and in 1263 it was ac- cepted by a general chapter of the Franciscans at Pisa, without reference, however, to the question of immaculacy. Of great importance to the subsequent history of the dogme was the appearance in the theological world, towards the beginning of the 14th century, of Duns Scotus, the " subtle doctor " of the Franciscans, who, as in so many other points, so also in this, came into conflict with the still more illus- trious 'Doctor Angelicus," the Dominican Aquinas. In one part of his Commentary on the Sentences of Peter of Lom- bardy (lib. iii., dist. 3, qu. 1, sec. 9) he declares for the think- ableness and even probability of Mary's having been pre- served intact from original sin ; in a later passage (dist. 18, qu. 1, scc. 13) the doctrine is categorically stated. It was upon this disputed point that the long and bitter contro- versy between the two great mendicant orders chiefly turned. In 1389, the Spanish Dominican Joanncs de Moutesono having maintained in a disputation at Paris that the view of the Scotists was unscriptural and heretical, the university, without committing itself on the main point, condemned his

violent theses, and this condemnation was concurred in by the Avignon pope, Clement VII. The members of the entire

1 The allegation that it was taught by Anselm of Canterbury is based partly upon a spurious tract attributed to him and partly on un- authentic legend. His actual opinion is explicitly enongh stated in the treatise Cur Deus Homo, c. 18:—" Virgo tamen ipsa, unde as- sumptus est, est in iniquitatibus concepta, et in peccatis concepit eam mater ejus."'

Dominican order, for their refusal to acquiesce, were for several years excluded from the privileges of the university. In the beginning of the 15th century the famous chancellor, John Gerson, accepted the new dogma, and applied in its favour the well-known doctrine of development. At the council of Basel (in the 36th session, held September 17, 1439) it was defined and declared that the doctrine was con- sistent with faith, reason, and Scripture, and therefore to be approved and embraced ; the contrary doctrine was not con- demned, but it was forbidden to preach or to teach it. The university of Paris now made subscription to the doctrine of the Immaculate Conception acondition for its degrees, and various other universities entered into a solemn compact to use every exertion for its spread, but the controversy was far

from having been brought to a close even by the action of

Pope Sixtus IV., who in 1483 published a bull threatening with excommunication any one who should accuse of heresy either the advocates or the impugners of the doctrine, the point having not yet been decided by the apostolical see. In its fifth session (1546) the council of Trent, after formu- lating its decree on the subject of original sin, sought to effect a compromise between Dominicans and Franciscans by appending a declaration that it did not intend that this doctrine should be applied to the blessed and immaculate Virgin Mary, but that the constitutions of Sixtus IV. were still to be observed. In the beginning of the 17th century the field of battle was transferred to Spain, where, under the predominant influence of the Franciscans and Jesuits, medals were struck, pictures painted, statues erected, and

persecutions set on foot in honour of the Virgin ‘sin pe-

cado concebida”; and embassies were sent to Rome, both by Philip IIL. and by Philip IV., to recognition of the popular doctrine.

for a long time, however, to maintain their attitude of re- serve. Paul V. (1617) forbade all public dispute on the subject, and Gregory XV. (1622) extended the prohibition

even to private discussions, except in the case of Dominicans But gradually the papal sympathies became

“anter se.” more pronounced under J esuit influences ; ave the feast of the Conception an octave ;

Clement IX. Clement XI.,

in 1708, made it a festival ‘ de praecepto ” for all Christen- endeavoured to reconcile St

dom; while Benedict XIV. Bernard with the more modern tendencies of Roman Catholic theology, by insisting upon subtle distinctions be- tween the “ conceptio activa” and the “ conceptio passiva”

of Mary. In the pontificate of Gregory XVI. several pre-

lates received papal permission to describe her conception as immaculate; and in 1849 Pius TX. was induced to ad- dress to his bishops from Gaeta an encyclical, inviting them to state how far the dogmatic definition of the dogma would meet their wishes and the wishes of those undcr their charge. A large majority declared themselves strongly in favour of the proposal, and the ultimate result was that in December 8, 1854, the pope, in presence of a numerous concourse of cardinals, patriarchs, archbishops, and bishops assembled in St Peter’s, Rome, solemnly promulgated the bull “ In- effabilis Deus,” by which the doctrine of the Immaculate Conception finally became for the Roman communion an article of faith, the denial of which is accounted to be heresy.+

The feast of the Immaculate Conception is observed in the Roman Church on December 8, In the Greek Church there is a festival in honour of the conception of St Anne

1 The words are " Auctoritate Domini Nostri Jesu Christi, beatorum Apostolorum Petri et Pauli, ae Nostra, declaramus, pronuntiamus et definimus, doetrinam, que tenet Beatissimam Virginem Mariam in primo instanti suze Conceptionis fuisse singulari Omnipotentis Dei gratia et privilegio, intuitu meritorum Christi Jesu, Salvatoris humani gene- ris, ab omni originalis culpe labe preservatam immunem, esse 2 Deo revelatam, atque idcirco ab omnibus fidelibus firmiter constanterque credendam.

obtain more explicit The popes continued

(the mother of Mary), for which December 9 was fixed by a constitution of the emperor Emanuel Comnenus in the

12th century. Her deliverance from the reproach of sterility is what is celebrated ; there is no reference to anything analogous to the Roman doctrine. It may be re- marked that strong expressions as to the absolute purity of Mary are found in the Koran (iii. 37), and still more iv later Mahometan writings; but the Christian doctrine of sin is so utterly foreign to Islam that no precise theological construction of these expressions is possible.

IMMERMANN, Karv Leserecut (17 96-1840), dra- matist and novelist, was born April 24th, 1796, at Magdeburg. From the gymnasium of his native city he passed in 1813 to study law at the university of Halle, but his career there was interrupted by the commotions consequent upon Napoleon's escape from Elba. Immermanp was prevented by illness from taking part in the earlier campaign, but he served in the Prussian army in 1815, was present at Ligny and Waterloo, and marched into Paris with Bliicher. He went back to Halle to finish his studies, and held official positions at Oschersleben, Miinster, and Magdeburg successively, before he became judge of a district on the Rhine, near Diisseldorf. The attention which his writings had already excited won him a warm welcome from the artistic

circle which then made Diissel- dorf famous, and there he spent the rest of his life, dividing his time amongst his judicial duties, his unsuccessful attempt to raise the theatre there to a permanent classic level of art and refinement, and a platonic literary friend- ship with the countess of Ahlefeldt. The last, begun at Minster and terminated only at his marriage with a granddaughter of the chancellor Niemeyer in 1839, ex- ercised a marked influence over his genius. Immermann died at Diisseldorf, August 25, 1840. His dramas are perhaps better suited for the study than for the stage. Though somctimes rough and forbidding, they are marked by considerable insight into character; the comedies are by no means destitute of comic force. Signs of a close study of Shakespeare are abundant. In his semi-humor- ous romances Immermann is at his best, and it is by those that he will be chiefly remembered.

His ehief works are the following: the tragedies— Vale of Ron- ceval, Edwin, Petrarea, 1822; King Periander, 1823; Cardenio and Celinde, 1826; Frederick IL, 1828 ; and Ghismonda, 1889; and the comedies— Prinecs of Syracuse, 1821; Eye of Love, 1824 ; Dis- guises, 1828 ; School of the Pious, 1829. Besides these he wrote the mythical play, Merlin, 1881; the trilogy of Aleais, 1832 ; the dramatic poem, Zhe Tragedy im the Tyrol, 1827 ; and the romanees— Tulifantehen, 1827, Die Epigonen, 1836 (perhaps his best work), and AMiinchhausen, @ Story in Arabesques, 1839. He published two volumes of poems (1822 and 1832), and began 7'ristan and Isolde, 1842. His miseellaneous writings include a translation of Ivanhoe ; On the Mad Ajax of Sophoeles, 1826 ; Miseellen, 1830 ; The Hermit's Window, 1822 ; Journal of a Traveller, 1838 ; Memorabilien (unfinished), 1840 ; and Theaterbriefe, 1851. The collected works were published in 14 vols. in 1835-48. See Putlitz's Rarl Immermann, sein Leben wnd seine Werke, 1870.

IMMORTELLE, or Evertastinc. The immortelle plant belongs to the division Z'ubuliflore of the natural family Composite, and is scientifically known as Gnapha- lium (Ifelichrysum) orientale of Linneus. It is a native of North Africa, Crete, and the parts of Asia bordering on the Mediterranean; and it is cultivated in many parts of Europe. It first became known in Europe about the year 1629, and has been cultivated since 1815. In common with several other plants of the same group, known as " everlast-

ings," the immortelle plant possesses a large involucre of dry scale-like or scarious bracts, which preserve their appearance when dried, provided the plant be gathered in proper condition. The chief supplies of Helichrysum orventale come from Lower Provence, where it is cultivated in large quantities on the ground sloping to the Mediterranean, in positions well exposed to the sun, and usually in plots sur-

rounded by dry stone walls. The finest flowers are grown on the slopes of Bandols and Ciotat, where the plant begins to flower in June. It requires a light sandy or stony soil, and is very readily injured by rain or heavy dews. It can be propagated in quantity by means of offsets from the older stems. The flowering stems are gathered in June, when the bracts are fully developed, all the fully-expanded and immature flowers being pulled off and rejected. After being dried, they are sent to Paris in boxes containing 100 bundles, with the flowers placed outwards and the stems in the centre. The immortelle is sold by weight or by the bundle, the price varying from 14d. to 3d. per bundle, according to size, or from 12s. to 18s. per hundredweight, according to quality. A well-managed plantation is pro-ductive for eight or ten years. The plant is tufted in its growth, each plant producing 60 or 70 stems, while each stem produces an average of 20 flowers. About 400 such stems weigh a kilogramme. A hectare of ground will pro- duce 40,000 plants, bearing from 2,400,000 to 2,800,000 stems, and weighing from 54 to 64 tons, or from 2 to 3 tons per acre. The colour of the bracts is a deep yellow. The natural flowers are commonly used for garlands for the dead, or plants dyed black are mixed with the yellow ones. The plant is also dyed green or orange-red, and thus em- ployed for bouquets or other ornamental purposes.

The following is a list of the more important everlasting flowers :— Acroclinium rosewm ; Ammobium alatum; Gnaphalium orientale and other species; Helichrysum bracteatum, macranthuwm, and com- positum, from Australia, and H. vestitwm, from the Cape of Good Hope; Helipterwm canescens and Sandforti, from South Africa; Rhodanthe Manglesti, maculata, and atrosangwinea, from Swan River; Waitzia nitida and nivea, from Swan River; and Xcran- themum annuum. Frequently these

everlastings are mixed with bleached grasses, as Lagurus ovatus, Briza maxima, Bromus brize- formis, or with the leaves of the Cape silver tree (Leucadendron argenteum), to form bouquets or ornamental groups,

IMOLA, the ancient Yorum Cornelu, a town of Italy, capital of a circle in the province of Bologna, is situated in a fruitful and charming plain on the old A'milian way, near the river Santerno (ancient Vatrenus), 21 miles south- east of Bologna and 46 north-west of Rimini, on the rail- way connecting those towns. It is the seat of a bishop and of a subprefecture. The town is surrounded by walls flanked with towers, and its streets are spacious and lined with arcades. It possesses a cathedral with an octagonal tower, an old castle, a gymnasium, a technical school, a school of music, a public library, orphanages for boys and girls, a hospital, and a corn exchange. The manu- facture of wine is the principal industry, but a special kind of cream of tartar is also made, and there is considerable trade in corn, hemp, flax, rice, and silk, The population of the town in 1871 was 9355 and of the commune 28,398. In 1876 the population of the commune was 28,678.

The ancient Forum Cornelit is said to have derived its name from its founder the dictator Sulla, According to Cicero, it was occupied by Octavian during the civil war which followed the death of Cesar, and Martial mentions it in the third book of his epigrams as the place wlicre he was at that time residing. The modern name of the town is, according to Paulus Diaconus, derived from that of the old citadel. 'I'he town, after its destruction in 538 by Narses, general of the emperor Justinian I., was rebuilt by the Lombards, after which it remained under the lordship of Bologna till the end of the 13th century. In 1272 it was taken possession of by the Pagani, and in 1292 by the Alidosii, from whom it was seized in 1472 by Duke Philip Maria Visconti of Milan. Under the pontificate of Alexander VI. it was incorporated with the States of the Church. In 1708 it was captured by the imperialists, and in 1797 by the French.

IMPEACHMENT, an exceptional, and now rare, form of procedure against criminals in England, in which the House of Commons are the prosecutors and the House of Lords the judges. It differs from procedure by bill of

attainder, which follows the ordinary forms of legislation in both Houses, and takes effect in an Act of Parliament,

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In impeachment the form of procedure is strictly judicial. When the House of Commons has accepted a motion for impeachment, the mover is ordered to proceed to the bar of the House of Lords, and there impeach the accused "in the name of the House of Commons, and of all the Com- mons of the United Kingdom." The charges are formu- lated in articles, to each of which the accused may deliver a written answer. The prosecution must confine itself to the charges contained in the articles, though further articles may be adhibited from time to time. The Commons ap- point managers to conduct the prosecution, but the whole House in committee attends the trial. The defen- dant may appear by counsel. The president of the House of Lords is the lord high steward, in the case of peers im- peached for high treason; in other cases the lord chan- cellor. The hearing takes place as in an ordinary trial, the defeuce being allowed to call witnesses if necessary, and the prosecution having a right of reply. Atthe end of the case the president " puts to each peer, beginning with the junior baron, the questions upon the first article, whether the accused be guilty of the crimes charged therein. Each peer in succession rises in his place when the question is put, aud standing uncovered, and laying his right hand upon his breast, answers, 'Guilty' or 'Not guilty,' as the case may be, 'upon my honour.' Each article is proceeded with separately in the same manner, the lord high steward giving his own opinion the last" (May's Parliamentary Practice, c. xxiii.). Should the accused be found guilty, judgment follows if the Commons move for it, but not otherwise. The Commons thus retain the power of pardon in their own hands, and this right they have in several cases expressly claimed by resolution, declaring thatit is not par- liamentary for their lordships to give judgment "until the same be first demanded by this House." An impeachment, unlike other parliamentary proceedings, is not interrupted by prorogation, nor even by dissolution. Proceedings in the House of Commons preliminary to an impeachment are subject to the ordinary rules, and in the Warren Hastings case an Act was passed to prevent the preliminary proceed- ings from discontinuance by prorogation and dissolution. A royal pardon cannot be pleaded in bar of an

impeach- ment. The point was raised in the case of the earl of Danby in 1679, and the rule was finally settled by the Act of Settlement. Persons found guilty on impeachment may be reprieved or pardoned like other convicts. Impeachment will lie against all kinds of crimes and misdemeanours, and against offenders of all ranks. In the case of Simon de Beresford, tried before the House of Lords 4 Edward III., the House declared 'that the judgment be not drawn into example or consequence in time to come, whereby the said peers may be charged hereafter to judge others than their peers," from which Blackstone and others have inferred that 'a commoner cannot be impeached before the Lords for any capital offence, but only for high mis- demeanours." In the case of Fitzharris in 1681], the House ot Commons in answer toa resolution of the Lords suspend- ing the impeachment, declared it to be their undoubted right "'to impeach any peer or commoner for treason or any other crime or misdemeanour." And the House of Lords has in practice recognized the right of the Commons to im- peach whomsoever they will. The procedure has, however, been reserved for great political offenders whom the ordi- nary powers of the law might fail to reach. It has now fallen into desuetude. The last impeachments were those of Warren Hastings (1788-95) and Lord Melville (1805), but an unsuccessful attempt was made by Mr Anstey to im- peach Lord Palmerston in 1848. The earliest recorded in- stances of impeachment are those of Lord Latimer in 1376, and of Pole, earl of Suffolk, in 1386. From the time of Edward IV. to Elizabeth it fell into disuse, "partly,"

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says Hallam, " from the loss of that control which the Commons had obtained under Richard II. and the Lan- castrian kings, and partly from the preference the Tudor princes had given to bills of attainder or pains and penalties when they wished to turn the arm of parliament against an obnoxious subject." Revived in the reign of James L., it became an instrument of parliamentary resist- ance to the crown, and it was not unfrequently resorted to in the first three reigns after the Revolution.

Tn the constitution of the United States the procedure of impeachment is an almost exact copy of that described above. The House of Represeutatives

are the accusers, and appoint managers to conduct the prosecution at the bar of the senate. 'The vote of the senate is taken by putting the question separately to each member, and a majority of two-thirds is required for a conviction. In the separate States it partakes of the same quasi-political character — neither the prosecutors nor the judges being the same as in ordinary criminal offences. The most noted instances of impeachment in the United States are those of Associate Justice Chase in 1804, of President Andrew Johnson in 1868, and of Judge Barnard, New York, in 1872. The object of impeachment is the removal of public officers for malversation in office, which is followed sometimes by dis- qualification for any future appointment.

INCENSE! is the perfume (fumigation) arising from certain resins and gum-resins, barks, woods, dried flowers, fruits, and seeds, when burnt, and also the substances s0 burnt. In its literal meaning the word " incense " ig one with the word "perfume," the aroma given off with the smoke (per fumum?) of any odoriferous substance when burnt, But, in use, while the meaning of the word " per- fume" has been extended, so as to include everything sweet in smell, from smoking incense to the invisible fresh fra- grauce of fruits and exquisite scent of flowers, that of the word "incense," in all the languages of modern Europe in which it occurs, has, by an opposite process of limitation, been gradually restricted almost exclusively to frankincense (sce FRANKINCENSE). Frankincense has always been ob- tainable in Europe in greater quantity than any other of the aromatics imported from the East; it has therefore gradually come to be the only incense used in the religious rites and domestic fumigations of many countries of the West, and at last to be popularly regarded as the only "true" or "genuine" (ie, "franc") incense (see Littré's Fr. Dict., and Skeat's Htym. Dict. of Lngl. Lang.).3

The following is probably an exhaustive list of the substanecs available for incense or perfume mentioned in the Hebrew Scrip- tures: ~~*Algum or almug wood (almug in 1 Kings x. 11, 12; algum iu 2 Chron. ii. 8, and ix. 10, 11), generally identified with sandal*~~

wood (Santalum album), a native of Malabar and Malaya ; aloes, or OS ee eS

1 Incensum (or incensum thuris) from ineendere ; Ital. and Portug. ineenso ; Span. incienso ; Fr. encens. The substantive oceurs in an inscription of the Arvalian protherhood (Marini, Gli Atti c Monuments de' fratelli Arvali, p. 639), but is frequent only in ecclesiastical Latin. Compare the elassical sufimentum and sufitus from sufio. For "ineense" Ulfila (Luke i. 10, 11) has retained the Greek @vpiapa (thymiama); all the Teutonic names (Germ. Weihrauch; Old Saxon Wiroc; Icel. Reykelsi; Dan. Régyelse) seem to belong to the Christian period (Grimm, Deutsche Mythologie, 1. 50).

2 The etymological affinities of Gv, @vos, thus, Suffio, fumus, and the Sanskr. dhwma, are well known. Sce Max Miller, Chips, i. 99.

3 Classical Latin has but one word (thus or tus) for all sorts of in- cense, Libanus, for frankincense, occurs only in the Vulgate. Even the "'ground frankineense " or " ground pine " (Ajuga Chamepitys) was known to the Romans as Tus terre (Pliny), although they called some plant, from its smelling like frankineense, Libanotis, and a kind of Thasian wine, also from its fragranee, Libanios. The Latino- barbarie word Olibanum (quasi Oleuwm Libani), the common name for frankineense in modern commerce, is used in a bull of Pope Benediet IX. (1083), It may here be remarked that the name " European frankineense" is applied to Pinus Tada, and to the resinous exudation ("Burgundy pitch") of the Norwegian spruce firs (Abies excelst). The 'incense tree" of America is.the Jciea guianensis, and the "in- conse wood" of the same continent J, heptaphylia.

native of India beyond the

lign aloes (Heb. ahdlim, ahiéléth),

produced by Alocxylon Agat- lochum, a native of Cochin-China, and Aquilaria Agallocha, a Ganges (compare vol. i. p. 597); balm (Ileb. tsort), the oleo-resin_of Balsamodendron Opobalsamum and B. gileadense ; bdellium (Heb. bdélah), the resin produced by Balsamodendron rocburghti, B. Mukul, and B. pubescens, all natives of Upper India (Lassen, however, identifies bdélah with musk); calamus (Heb. kaneh ; sweet calamus, kench bosem, Ex. xxx. 23, Ezck. xxvii. 19; sweet eane, kaneh hattob, Jer. vi. 20,

Isa. xliii. 24), identified by Royle with the Andropogon Calamus aromaticus or roosa grass of India ; cassia (Heb. kiddal) the Cinna- momum Cassia of China (see vol. v. p. 184); cinnamon (Heb. kinnamon), the Cinnamomum zcylanicum of the Somali country, but cultivated largely in Ceylon, where also it runs wild, and 1 Java ; eostus (Heb. ketztoth), the root of the Aueklandia Costus, native of Cashmere; frankincense (Heb. Icbénah), the gum-resill of Boswellia Frercana and B. Bhau-Dajiana of the Somali country, aud of B. Cartertt of the Somali country and the op- posite coast of Arabia (compare vols, viii. p. 122, and ix. p. 709) galbanum (Heb. helbenah), yielded by Ophoidia galbanifera of Khorassan, and Galbanwm officinale of Syria; ladanum (Heb. Jé, translated ‘“‘myrrh” in Gen. xxxvil. 265, xlifi. 11), the resinous exudation of Cistus ereticus, C. ladantferus, and other species of ‘rock rose” or “rose of Sharon” ; myrrh (Heb. mér), the gum- resin of the Balsamodendron Myrrha of the Somali country and opposite shore of Arabia ; onycha (Heb. sheheleth), the celebrated odoriferous shell of the ancients, the operculum or “+ mail” of iw species of Strombus or “ wing shell,” formerly well-known in Europe under the name of Slatta byzantina ; it is still imported into Bombay to burn with frankincense and other incense to bring out their odours more strongly ; saffron (Heb. karkém), the stig- mata of Crocus sativus, a native originally of Cashmere ; spikenard (Heb. nerd), the root of the Nardostachys Jatamansi of Nepal and Bhutan ; stacte (Heb. nata/), generally referred to the Styrax officinale of the Levant, but Hanbury has shown that no stacte or storax is now derived from 8. offeinale, aud that all that is found in modern commerce is the product of the Liquidambar orientale of Cyprus and Anatolia.

Besides these aromatic substances named in the Bible, the follow- ing must also be enumerated on account of their common use as incenso in the East ; benzoin or gum benjamin (see vol. iii. p. 581), first mentioned among Western writers by Ibn Batuta (1325-1349) under the name of lubdn d@’ Javi (i.c., olibanum of Java), cor- rupted in the parlance of Europe into benjamin and benzoin ; camphor, produced by Cinnamomum Camphora, the “camphor laurel” of China and Japan, and by Dryobalanops aromatiea, a native of the Indian Archipelago, and widely used as incense throughout the East, particularly in China (compare vol. iv. p. 761) ; elemi, the resin of an unknown tree of the Philippine Islands, the elemi of old

writers (see vol. viii. p. 122) being the resin of Boswellia Frereana ; gum-dragon or dragon's blood, obtained from Calamus Draeo, one of the ratan palms of the Indian Archipelago, Dracena Draco, a liliaceous plant of the Canary Islands, and Pterocarpus Draco, & leguminous tree of the island of Socotra (seo vol. vii. p, 389); rose- malloes, a corruption of the Javanese rasamala, or liquid storax, the resinous exudation of Liquidambar Altingra, a native of the Indian Archipelago (an American Liquidambar also produces a rose- malloes-like exudation); star anise, the starlike fruit of the Lllictum anisatwm of Yunan and south-western China (compare vol. ii. p. 58), burnt as incense in the temples of Japan ; sweet flag, the root of Acorus Calamus, the bach of the Hindus, much used for incense in India (sce vol. ix. p. 280). An aromatic earth, found on the coast of Cutch, is used as incense in the temples of western India. The animal excreta, musk and civet, also enter into the composition of modern European pastils and elous fumants. Balsam of Tolu, pro- duced by Ayroxylon toluiferum, a native of Venezuela and New Granada ; balsam of Peru, derived from Myroxylon Pereire, a native of San Salvador in Central America ; Mexican and Brazilian elemi, — by various species of Iciea or 'incense trees," and the © iquid exudation of an Ameriean species of Liquidambar, are all used as incense in America. Hanbury quotes a faculty granted by Pope Pius V. (August 2, 1571) to tho bishops of the West Indies per- mnitting the substitution of balsam of Peru for the balsam of the Kast in the preparation of the chris to be used by the Catholic Church in America. The Sangre del drago of the Mexicans is a resin resembling dragon's blood obtained from a euphorbiaceous tree, Croton Draco.

Probably nowhere can the actual historical progress from the primitive use of animal sacrifices to the later refinement of burning incense be more clearly traced than in the pages of the Old Testament, where no mention of the latter solemnity occurs before the period of the Mosaic legisla- tion; but in the monuments of ancient Egypt the authentic traces of the use of incense which still exist carry us back to a much earlier date. From Meroo to Memphis the

commonest subject carved or painted in the interiors of the of some contemporary Phrah or Pharaoh worshipping the presiding deity with oblations of gold and the firstlings of the fruits, flowers, wine, anointing oil, Generally he holds in one hand the censer, and with the other darts the pastils or osselets of incense into it ; sometimes he offers incense in one hand and makes One of the best known of these representations is that carved on the (1533 Bc.) on the The tablet represents Thothmes before his guardian deity, the sun-god Ra, pour- ing a libation of wine on one side and offering incense on The ancient Egyptians used various substances

They worshipped Ra at sunrise with resin, at mid-day with myrrh, and at sunset with an elaborate confection called kuphi, compounded of no fewer than sixteen ingredients, among which were honey, wine, raisins,

temples is that silver vessels, rich vestments, gems, flock and herd, cakes, and incense. the libation of wine with the other, memorial stone placed by Thothmes IV, breast of the Sphinx at Gizeh,!

the other. as incense.

resin, myrrh, and sweet calamus, While it was being mixed, holy writings were read to those engaged in the operation,

According to Plutarch, apart from its mystic virtues arising from the magical combination of 4 × 4, its sweet odour had a benign physiological effect on those who offered it.2 The censer used was a hemispherical cup or bowl of bronze, supported by a long handle, fashioned at one end like an open hand, in which the bowl was, as it were, held, while the other end within which the pastils of incense were kept disk, In embalming their dead the

was shaped into the hawk's head crowned with a as the symbol of Ra.3 Egyptians filled the cavity of the belly with every sort

of spicery, except frankincense (Herod., ii 86), which was regarded as specially consecrated to the worship of the gods. In the burnt offerings of male kine to Isis, the carcase of the steer, after evisceration, was filled with fine bread, honey, raisins, figs, frankincense, myrrh, and other aromatics,

and thus stuffed was roasted, being basted all the while by pouring over it large quantities of sweet oil,

and then eaten with great festivity. How important the consumption of frankincense in the worship of the gods became in Hgypt is shown by two of its

monuments, which are of the greatest interest and value for the light they throw on the early history of the commerce of the Indian Ocean. One is an inscription in the rocky valley of Hammamat, through which the desert road from the Red Sea to the valley of Egypt opens on the green fields and It was cut on

palm groves of the river Nile near Coptos. the rocks by an Egyptian nobleman named Hannu, who states that he was sent by Pharaoh Sankhara, 2500 z.c.,

with a force gathered out of the Thebaid, from Coptos to

the Red Sea, there to take command of a naval expedition to the Holy Land of Punt, " to bring back odoriferous gums." Punt is identified with the Somali country, which is now known to be the native country of the trees that yield the bulk of the frankincense of commerce. The other bears the record of a second expedition to the same land of Punt, undertaken by command of Queen Hasop, 1600 Bc. It is preserved in the vividly chiselled and richly coloured decorations which portray the history of the reign of this famous Pharaoh on the walls of the "Stage Temple" at Thebes. The temple is now in ruins, but the entire series of gorgeous pictures recording the expedition to "the balsam land of Punt," from its leaving to its returning to Thebes, still remains intact and undefaced.4

- *Brugsch, Zyypt under the Pharaohs, i. 77-81, 414-419.*
- *Plutarch, De Iside et Ostride, c. 52. In Parthey's editiou (Berlin, 1850) other recipes for the manufacture of kuphi, by Galen and Dioscorides, are given; also some results of the cditor's own ex- periments,*

° Wilkinson, Ancient Egyptians, i. 493; ii. 49, 398-400, 414-416,

- *Brugsch, Loypt under the Pharaohs, i., 303-812.*

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These are the only authenticated instances of the export of incense trees from the Somali country until Colonel Playfair, then political agent at Aden, in 1862-64, col- lected and sent to Bombay the specimens from which Dr Birdwood prepared his descriptions of them for the Linnean Society in 1868. King Antigonus is said to have had a branch of the truo frankincense tree sent to him.

Homer tells us that the Egyptians of his time were emphatically a nation of druggists (Od. iv. 229, 230). This characteristic, in which, as in many others, they remarkably resemble the Hindus, the Egyptians have maintained to the present day ; and, although they have changed their religion, the use of incense among them continues to be as familiar and formal as ever. The kohl or black powder with which the modern, like the ancient, Egyptian ladies paint their languishing eyelids, is nothing but the smeeth of charred frankincense, or other odoriferous resin, which is brought with frankincense, and _phials of water from the well of Zem-zem, by the returning pilgrims from Mecca. They also melt frankincense as a depilatory, and smear their hands with a paste into the composition of which frankincense enters, for the purpose of communi- cating to them an attractive perfume. Herodotus (iv. 75) describes a similar artifice as practised by the women of Scythia (compare also Judith x. 3, 4). In cold weather the Egyptians warm their rooms by placing in them a brazier, "'chafing-dish," or "standing-dish," filled with charcoal, in which incense is burnt; and in hot weather they refresh them by occasionally swinging a hand censer by a chain through them—frankincense, benzoin, and aloe wood being chiefly used for the purpose.®

In the authorized version of the Bible, the word "incense" translates two wholly distinct Hebrew words. In various passages in the latter portion of Isaiah (xl.—Ixvi.), in Jere- miah, and in Chronicles, it represents the Hebrew lebénah, more usually rendered "frankincense"; elsewhere the original word is ketoreth (Ex. xxx, 8,9, Lev. x. 1, Num. vil. 14, &c.), a derivative of the verb sitter (Pi.) or hiktir (Hiph.), which verb is uscd, not only in Ex. xxx. 7, but also in Lev. i. 9, iii, 11, ix. 13, and many other

passages, to denote the process by which the "savour of satisfac. tion" in any burnt offering, whether of flesh or of incense is produced, Sometimes in the authorized version (as in 1 Kings iii, 3, 1 Sam. ii, 28) it is made to mean ex- plicitly the burning of incense with only doubtful pro- priety. The expression 'incense (ketoreth) of rams" in Ps. Ixvi. 15 and the allusion in Ps. cxli. 2 ought both to be understood, most probably, of ordinary burnt offerings.© The "incense" (ketoreth), or "incense of sweet scents" (ketoreth sammim), called, in Ex. xxx. 35, "a confection after the art of the apothecary," or rather "a perfume after the art of the perfumer," which was to be regarded as most holy, and the imitation of which was prohibited under the severest penalties, was compounded of four "sweet scents" (sammim),' namely stacte (nataph), onycha (sheheleth), galbanum (helbenah), and "pure" or "fine" frankincense (lebonah zaccah), pounded together in equal proportions, with (perhaps) an admixture of salt (memullah).® It was then to be "put before the testi- mony" in the "tent of meeting." It was burnt on the altar of incense (see ALTAR, vol. i. p. 640) by the priest every morning when the lamps were trimmed in the holy place,

5 See Lane, Mod. Egyptians, pp. 84, 41, 139, 187, 438 (ed. 1860). §See Wellhausen, Gesch. Israels, i. 70 sqg., who from philological

and other data iufers the late date of the introduction of incense into the Jewish ritual.

7 According to Philo (Opera, i. 504, ed. Mangey), they symbolized

respectively water, earth, air, and fire.

8 Other accounts of its composition, drawn from Rabbinical sources,

will be found in various works on Jewish antiquities ; see, for example, Reland, Antig. Saor. Vet. Hebr., pp. 39-41 (1712).

and every evening when they were lighted or "set up" (Ex. xxx. 7,8). A handful of it was also burnt once a year in the holy of holies by the high priest on a pan of burning coals taken from the altar of burnt-offering (Lev.

xvi. 12, 13). Pure frankincense (lebonah) formed part of the meat offering (Lev. ii. 16, vi. 15), and was also presented along with the shew bread (Lev. xxiv. 7) every Sabbath day (probably on two golden saucers; see Jos., Ant., iii. 10, 7). The religious significance of the use of incense, or at least of its use in the holy of holies, is distinctly set forth in Lev. xvi. 12, To.

The Jews were also in the habit of using odoriferous substances in connexion with the funeral obsequies of distinguished persons (see 2 Chron. xvi. 14, xxi. 19; Jer. xxxiv. 5). In Am. vi. 10 "he that burneth him " probably means 'he that burns perfumesin his honour." References to the domestic use of incense occur in Cant. ili. 6, Prov. xxvii. 9, of. vii. 17.

The "marbles" of Nineveh furnish frequent examples of the offering of incense to the sun-god and his consort (2 Kings xxiii. 5). The kings of Assyria united in them- selves the royal and priestly offices, and on the monuments they erected they are generally represented as offering incense and pouring out wine to the tree of life. They probably carried the incense in the sacred bag which is so frequently seen in their hands and in those also of the common priests. According to Herodotus (i. 183), frank- incense to the amount of 1000 talents' weight was offered every year, during the feast of Bel, on the great altar at his temple in Babylon.

The monuments of Persepolis and the coins of the Sas- sanians show that the religious use of incense was as com- mon in ancient Persia asin Babylonia and Assyria. Five times a day the priests of the Persians (Zoroastrians) burnt incense on their sacred fire altars. In the Avesta (Vendidad, Fargard xix. 24, 40), the incense they used is named vohu gaono. It has been identified with benzoin, but was probably frankincense. Herodotus (iii. 97) states that the Arabs brought every year to Darius as tribute 1000 talents of frankincense. The Parsees still preserve in western India the pure tradition of the ritual of incense as followed by their race from probably the most ancient times.

The Ieamayana and Mahabharata afford evidence of the employment of incense by the Hindus, in the worship of the gods and the burning of the dead, from the remotest antiquity. Its use was obviously continued by the Buddhists during the prevalence of their religion iu India, for it is still used by them in Nepal, Tibet, Ceylon, Burmah, China, and Japan. These

countries all received Buddhism from India, and a large propor- tion of the porcelain and earthenware articles imported from China and Japan into Europe consists of in- numerable forms of censers. The Jains all over India burn sticks of incense before their Jina. The commonest incense in ancient India was probably frankincense. The Indian frankincense tree, Boswellia thurifera, Colebrooke (which certainly includes B. glabra, Roxburgh), is a doubtful native of India. It is found chiefly where the Buddhist re- ligion prevailed in ancient times, in Bihar and along the foot of the Himalayas and in western India, where it particularly flourishes in the neighbourhood of the caves of Ajanta. It is quite possible therefore that, in the course of their widely extended commerce during the one thousand years of their ascendency, the Buddhists imported the true frankincense trees from Africaand Arabia into India, and thatthe accepted Indian species are merely varieties of them. Now, however, the incense in commonest use in India is benzoin. But the consumption of all manner of odoriferous resins, gum resins, roots, woods, dried leaves, flowers, fruits, and seeds in India, in social as well as religious observances, is enormous.

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The grateful perfumed powder abir or randa is composed either of rice, flour, mango bark or deodar wood, camphor, and aniseed, or of sandalwood or wood aloes, zerunbet, zedoary, rose flowers, camphor, and civet. The incense sticks and pastils known all over India under the names of ud-buti ("benzoin-light") or aggar-ki-butt ('wood aloes light ") are composed of benzoin, wood aloes, sandal- wood, rock lichen, patchouli, rose-malloes, / lacourtia leaf (talisput-tree), mastic, and sugar candy or gum. The abir and aggir butis made at the Mahometan city of Bijarpur in the Mahratta country are celebrated all over western India. The Indian Mussulmans indeed were rapidly degenerating into a mere sect of Hindus before the Wahabi revival, and the more recent political propaganda in support of the false caliphate of the sultans of Turkey ; and we therefore find the religious use of incense among them more general than among the Mahometans of any other country. They use it at the ceremonies of circumcision, besmellah (teaching the child "the name of God"), virginity, and marriage. At marriage they burn benzoin with nim seeds to keep off evil spirits, and prepare the bride- cakes by putting a quantity of benzoin between layers of

wheaten dough, closed all round, and frying them in clarified butter. For days the bride is fed on little else. In their funeral ceremonies, the moment the spirit las fled incense is burnt before the corpse until it is carried out to be buried. The begging fakirs also go about with a lighted stick of incense in one hand, and holding out with the other an incense-holder (literally, "incense chariot"), into which the coins of the pious are thrown. Large "incense trees" resembling our Christ- mas trees, formed of incense-sticks and pastils and osselets, and alight all over, are borne by the Shiah Mussulmans in the annual procession of the Mohurrum, in commemoration of the martyrdom of the sons of Ali. The worship of the tulsi plant, or holy basil, by the Hindus is popularly explained by its consecration to Vishnu and Krishna. It grows on the four-horned altar before the house, or in a pot placed in one of the front windows, and is worshipped every morning by all the female members of every Hindu household. It is possible that its adora- tion has survived from the times when the Hindus buried their dead in their houses, beneath the family hearth. When they came intoa hot climate the fire of the sacrifices and domestic cookery was removed out of the house ; but the dead were probably still for a while buried in or near it, and the tuls: was planted over their graves, at once for the salubrious fragrance it diffuses and to represent the burning of incense on the altar of the family lar.

As to the @vea mentioned in Homer (/I. ix. 499, and elsewhere) and in Hesiod (Works and Days, 338), there is some uncertainty whether they were incense offerings at all, and if so, whether they were ever offered alone, and not always in conjunction with animal sacrifices. That the domestic use, however, of the fragrant wood Gvov (the Arbor vite or Callitris quadrivalvis of botanists, which yields the resin sandarach) was known in the Homeric age, is shown by the case of Calypso (Od. v. 60), and the very similarity of the word Ovov to Ovos may be taken as almost conclusively proving that by that time the same wood was also employed for religious purposes. It is not probable that the sweet smelling guns and resins of the countries of the Indian Ocean began to be introduced into Greece before the 8th or 7th century B.c., and doubtless AiBavos or MBavwrds first became an article of extensive commerce only after the Mediterranean trade with the East had been opened up by the Egyptian king Psammetichus (670 B.c.). The new Oriental word is frequently employed by Herodotus; and there are abundant

references to the use of the thing among the writers of the golden age of Attic literature (see,

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for example, Aristophanes, Plwt., 1114; Frogs, 871, 888 ; Clouds, 426 ; Wasps, 96, 861). Frankincense, however, though the most common, never became the only kind of incense offered to the gods among the Greeks. 'Thus the Orphic Hymns are careful to specify, in connexion with the several dcitics celebrated, a great variety of substances appropriate to the service of each; in the case of many of these the selection seems to have been determined not at all by their fragrance but by some occult considerations which it is now difficult to divine.

Amoug tle Romaus the use of religious fumigations long preceded the introduction of foreign substances for tho purpose (see, for example, Ovid, Fast. i. 337 sq., "Et non exiguo laurus adusta sono"). Latterly the use of frankin- cense ("'mascula thura," Virg., Hei. viii. 65) became very prevalent, not only in religious ceremonials, but also on various state occasions, such as in triumphs (Ovid, ist, iv. 2, 4), and also in connexion with certain occurrences of domestic life. In private it was daily offered by the de- vout to the dar familiaris (Plaut., Awlul., prol., 23); and in public sacrifices it was not only sprinkled on the head of the victim by the pontifex before its slaughter, and afterwards mingled with its blood, but was also thrown upon the flames in which it was roasted.

No perfectly satisfactory traces can be found of the use of incense in the ritual of the Christian Church during the first four centuries. It obviously was not contemplated by the author of the epistle to the Hebrews ; its use was foreign to the synagogue services on which, and not on those of the temple, the worship of the primitive Christians is well known to lave been originally modelled ; and its associa- tions with heathen solemnities, and with the evil repute of those who were known as "thurificati," would still further militate against its employment. Various authors of the ante-Niceue period have expressed themselves as distinctly unfavourable to its religious, though not of course to its domestic, use. 'Thus Tertullian, while (De Cor, Mial., 10) ready to acknowledge its utility in coun- teracting unpleasant smells ('si me odor alicujus loci offenderit, Arabize aliquid incendo"), is

careful to say that he scorns to offer it as an accompaniment to his heartfelt prayers (Apol., 30, cf. 42). Athenagoras also (Legat., 13) gives distinct expression to his sense of the needlessness of any such ritual ("tho Creator and Father of the universe does not require blood, nor smoke, nor even the sweet smell of flowers and incense") ; and Arnobius (Adv. Gent., vii. 26) seeks to justify tho Christian neglect of it by the fact, for which he vouches, that among the Romans themselves incense was unknown in the time of Numa, while the Etruscans had always continued to be strangers to it. Cyril of Jerusalem, Augustine, and the Apostolic Constitutions make no reference to any such feature either in the public or private worship of the Christians of that time. The earliest mention, it would seem, occurs in tle Apostolic Canons (can. 3), where the Ovpéapa is spoken of as one of the re- quisites of the eucharistic service. It is easy to perceive how it should inevitably have come in along with the whole circle of ideas involved in such words as " temple," "altar," "priest," which about this time came to be so generally applied in ecclesiastical connexions. Evagrius (vi. 21) mentions the gift of a Ovpsrarypiov by Chosroes the king of Persia to the church of Jerusalem; and all the Oriental liturgies of this period provide special prayers for the thu- rification of the eucharistic elements. The oldest Ordo Romanus, which perhaps takes us back to within a century of Gregory the Great, enjoins that in pontifical masses a subdeacon, with a golden ccuser, shall go before the bishop as he leaves the secretarium for the choir, and two, with censers, before the deacon gospeller as he proceeds with the

t21 gospel to the ambo. And less than, two centuries after- wards we read an order in one of the capitularies of Hinc- mar of Rheims, to the effect that every priest ought to be provided with a censer and incense. That in this portion of their ritual, however, the Christians of that period were not universally conscious of its direct descent from Mosaic institutions may be inferred perhaps from the " benediction of the incense" used in the days of Charlemagne, which runs as follows: " May the Lord bless this incense to the extinction of every noxious smell, and kindle it to the odour of its sweetness." Even Thomas Aquinas (p. iii. qu. 83, art. 5) gives prominence to this idea.

The character and order of these historical notices of incense would certainly, were there nothing else to be con- sidered, justify the conclusion

which has been generally adopted, that its use was wholly unknown in the worship of the Christian Church before the 5th century. On the other hand, we know that in the first Christian services held in the catacombs under the city of Rome, incense was burnt as a sanitary fumigation at least. Tertullian also distinctly alludes to the use of aromatics in Christian burial: "the Sabzeans will testify that more of their merchandise, and that more costly, is lavished on the burial of Christians, than in burning incense to the gods," And the whole ar- gument from analogy is in favour of the presumption of the ceremonial use of incense by the Christians from the first. It is natural that little should be said of so obvious a practice until the fuller development of ritual in a later age. The slighting references to it by the Christian fathers are no more an argument against its existence in the pri- mitive church, than the similar denunciations by the Jewish prophets of burnt offerings and sacrifices are any proof that there were no such rites as the offering of incense, and of the blood of bulls and fat of rams, in the worship of the temple at Jerusalem. There could be no real offence to Christians in the burning of incense. Malachi (i. 11) had already foretold the time when among the Gentiles, in every place, incense should be offered to God. Gold, with myrrh and frankincense were offered by the Persian Magi to the infant Jesus at his birth ; and in Revelation viii. 3, 4 the image of the offering incense with the prayers of the saints, before the throne of God, is not without its significance. If also the passage in Ambrose of Milan (on Luke i. 11), where he speaks of "us" as "adolentes altaria" is to be translated '"incensing the altars," and taken literally, it is an unequivocal testimony to the use of incense by the Christian Church in, at least, the 4th century.

The Missal of the Roman Church now enjoins incensa- tion before the introit, before the gospel, and again at the offertory, in every high mass; the use of incense also occurs when the sacrament is exhibited, at consecrations of churches and the like, in processions, in the office for the burial of the dead, and at the exhibition of relics. On high festivals the altar is censed at vespers and lauds.

In the Church of England the use of incense was gradu- ally abandoned after the reign of Edward VI., until the ritualistic revival of the present day. Its use, however, has never been abolished by law. A "Form for the

Consecra- tion of a Censer" occurs in Sancroft's Form of Dedication and Consecration of a Church or Chapel (1685). In various works of reference (as, for example, in Motes and Queries, 3d ser., vol. vili. p. 11) numerous sporadic cases are men- tioned in which incense appears to have been burnt in churches ; the evidence, however, does not go so far as to show that it was used during divine service, least of all that it was used during the communion office. At the coronation of George III., one of the king's grooms appeared "in a scarlet dress, holding a perfuming pan, burning perfumes, as at previous coronations."

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INCEST, carnal connexion between persons 80 related that marriage could not take place between them according to the Levitical rules. In England incest has not generally been treated as a crime, although, along with other offences against morals, it was made punishable by death in 1650. Since the Restoration it has, to use Blackstone's plirase, been left to the "feeble coercion of the spiritual courts." Under the divorce law, incest is one of the aggravations of adultery which entitle a wife to divorce her husband. In the law of Scotland, it is a crime nominally punishable with death, but the penalty usually inflicted is penal servitude for life. This sentence was actually pronounced on a man +n 1855, In the United States, as in England, incest is not an indictable offence at common law, but it has been made so by the legislation of some of the States.

INCHBALD, Mrs Exizapern (1753-1821), an English actress, dramatic author, and novelist, was born 15th October 1753. She was the daughter of a farmer at Standingfield, ncar Bury St Edmunds, Suffolk, her maiden name being Simpson. On account of the death of her father in her eighth year, she and her sisters never enjoyed the advantages of school training or of any regular supervision in their studics, but they nevertheless seem to have acquired at an early period refined and literary tastes. A favourite amusement of the family was readings, chiefly of a dramatic kind, and Elizabeth, notwithstanding that she was afflicted with an impedi- ment of speech, which drove her into solitude, soon conceived a strong desire, not only to see the great world, but to become an actress. After making an

attempt with little success to secure an engagement in a Norwich theatre, she in April 1772 left secretly for London, where she made the acquaintance of several managers and actors, but with no better fortunc. In June she, however, married Mr Inchbald, a comedian in Drury Lane Theatre, and in September following she made her debut as an actress in the character of Cordelia, her husband taking the part of Lear. For several years she acted along with her husband in the provinces, but notwithstanding her great beauty and her good mental aptitude for acting, the impediment in her speech, by rendering rapidity and ease of utterance impossible, prevented her from attaining to more than very moderate excellence. After the death of her husband in 1778 she continued for some time on the stage, but her success as a dramatic author led her to retire in 1789. She died at Kensington, August 1, 1821.

Mrs Inchbald's plays amount to nineteen in all. Some of them were for a time very successful, especially Wives as they were and. Maids as they are. Among the others may be mentioned Such Things Are; The Married Afan; The Wedding Day; The Mid- night Hour ; Everyone has hts Fault ; and Lovers' Vows. She also edited a collection of the British Theatre, with biographical and critical remarks, 25 vols., 1806-1809 ; a Coddection of Farees, 7 vols., 1809; and Zhe Modern Theatre, 10 vols., 1809. Her fame, how- ever, now rests chiefly on her two novels, 4 Simple Story, and Nature and Art. These works possess many minor faults and in-. accuracies, but on the whole their style is easy, natural, and grace- ful; and if they are tainted in some degree by a morbid and t exaggerated sentiment, and display none of that faculty of creation possessed by the best writers of fiction, the pathetic situations, and the deep and pure feeling pervading them, secured for them a wide but now a waning popularity. Some time before her death Mrs Inchbald destroyed an autobiography for which she had been offered £1000 by Phillips the publisher ; but her Memoirs, compiled by J. Boaden, chiefly from her private journal, appeared In 1833 in two volumes. An interesting account of Mrs Inchbald is contained | in Records of a Girlhood, by Frances Ann Kemble, 1878.

INCUBATION. Sce Brrps, vol. iii. p. 779, and Re- propuction. For Artiric1AL INCUBATION, see PouLTRY.

INDEPENDENTS, a religious denomination whose distinctive ecclesiastical principle is that the individual congregation or church is a society strictly voluntary and autonomous, standing directly under the authority of Jesus Christ, living in immediate dependence on Him, and

For the manufacture of the incense now used in the Christian churches of Europe there is no fixed rule. The books of ritual are agreed that Ex. xxx. 34 should be taken asa guide as much as possible. It is recommended that frankincense should enter as largely as possible into its composition, and that if inferior materials be employed at all they should not be allowed to preponderate. In Rome olibanum alone is employed; in other places benzoin, storax, aloes, cascarilla bark, cinnamon, cloves, and musk are all said to be occasionally used. In the Russian Church, benzoin is chiefly employed. The Armenian liturgy, in its benediction of the incense, speaks of " this perfume prepared from myrrh and cinnamon."

The preparation of pastils of incense has probably come down in a continuous tradition from ancient Egypt, Babylonia, and Phoenicia. Cyprus was for cen- turies famous for their manufacture, and they were still known in the middle ages by the names of pastils or osselets of Cyprus.

Maimonides, in his More Nevochim, states that the use of incense in the worship of the Jews originated as a cor- rective of the disagreeable odours arising from the slaughter and burning of the animals offered in sacrifice, There can be no doubt that its uso throughout the Last is based on sanitary considerations ; and in Europe even, in the time when the dead were buried in the churches, it was recog- nized that the burning of incense served essentially to preserve their salubrity. But evidently the idea that the odour of a burnt-offering (cf. the xvioys 7dbs diirpyy of Odyss. xii. 369) is grateful to the deity, being indeed the most essential part of the sacrifice, or at least the vehicle by which alone it can successfully be conveyed to its destination, is also a very early one, if not abso- lutcly primitive ; and survivals of it arc possibly to be met with even among the most highly cultured peoples whero the purely symbolical nature of all religious ritual is most clearly understood and maintained. Some such idea plainly underlies the familiar phrase "a sweet savour," more literally '(a savour of satisfaction," by which an acceptable offering by fire is so often denoted in the Bible (Gen.

viii. 21, Lev. i. 9, e¢ passim ; of. Eph. v. 2). It is easy to imagine how, as men grew in sensuous appreciation of pleasant perfumes, and in empirical knowledge of the sources from which these could be derived, this advance would naturally express itself, not only in their domestic habits, but also in the details of their religious ceremonial, so that the custom of adding some kind of incense to their animal sacrifices, and at length that of offering it pure and simple, would inevitably arise. Ultimately, with the development of the spiritual discernment of men, the "offering of incense" became a mere symbolical expres- sion for prayer (see Rev. v. 8, viii. 3, 4). Clement of Alexandria expresses this in his well-known words: " The truo altar of incense is the just soul, and the perfume from it is holy prayer." (So also Origen, Cont. Cels., viii. 17, 20.) The ancients were familiar with the sanitary efficacy of fumigations. The energy with which Ulysses, after the slaughter of the suitors, calls to Euryclea for "fire and sulphur" to purge (literally " fumigate ") the dining-hall from the pollution of their blood (Od. xxii. 481, 482) would startle those who imagine that sanitation is a peculiarly modern science. There is not the slightest doubt that the censing of things and persons was first practised for acts of purification, and thus became sym- bolical of consecration, aud finally of the sanctification of the soul. The Egyptians understood the use of incense as symbolical of the purification of the soul by prayer. Catholic writers generally treat it as typifying contrition, the preaching of the gospel, the prayers of the faithful, and the virtues of the saints. (a. B.)

INDEPENDENTS

responsible to Him alone for its beliefs and acts as a Christian society. Its ideal stands distinguished, on the one hand, from Episcopacy by having no gradations of

ministerial or clerical orders, or persons above the indi- vidual congregation invested with administrative or judicial authority, and, on the other hand, from Presbytery

by having no gradation of courts or representativo bodies possessed of legislative and judicial functions.

distinctions imply others. Episcopacy and Presbytery

are essentially organized and incorporativo systems, build-

ing all the societies they comprehend into a political unity, but Independency is essentially voluntary and individual- izing, satisfied with a spiritual unity, refusing to permit its various societies to be built into a political organism, lest it should do violence to the rights of conscience, or prevent or even supersede tho duty of the oxercise by the individual of his own judgment in matters of religion. Episcopacy and Presbytery regard the collective organiza- tion as the church, but Independency the individual congregation, investing it with the attributes and _pre- rogatives the other systems reserve for the organized whole. Its members possess equal rights, and aro bound by equal obligations. They constituto a state whose citizens are all enfranchised, and aro so because citizenship is limited to the qualified, who, having sought it voluntarily, voluntarily retain it. Independency may be said to affirm its ecclesiastical in order that it may realize its religious principle, that religion is purely a matter of the conscience, not to be created, extended, or reformed by any political mechanism or agencies, but by moral means, through men who seek to have it believed aud embodied by men for reasous that commend themselves to the conscience, freo and unconstrained. It thus holds that the best service the state can render to religion is to leave it freo to live and act according to its own nature, in obedience to its own laws, prompted by its own impulses, guided by its own spirit and judgment.

Independency rose in tho reign of Elizabeth, and may be said to have been born of the despair of seeing religion reformed and vivified on any one of the then followed lines. The peculiar condition of tho Anglican Church at this period is well enough known. There were men in it who wished it to be independent of Rome, but to remain as far as possible Catholic while Anglican, and there were men who wished it to be conformed in doctrine and polity to those churches of the Continent that were by pre-eminence the Reformed. These latter were the Puritans, and their endeavour was to reform the church through the state, to persuade or compel tho constitutive aud sovereign will to make it such as they could conscientiously approve. But it was inevitablo in a time of strong religious feeling that some more daring spirits should endeavour to break through the anomalies of the Puritan position. If their consciences demanded, and the civil authority

refused, reform, was it either right or dutiful to submit to the civil authority as against the conscience? Was there no other way of reformation than by its consent? Was the Chris- tian man relieved from all responsibility and obligation to obey conscience when the magistrato forbade him to do 807 In so forbidding, was not the magistrate stepping out of his own province? Was the church he could so rule as to prevent the realization of the Scriptural ideal a rightly conceived and constituted church? Was it the apostolical way so to work as to plant, to purge, to organize churches only as Cesar gave consent? And could any but the apostolical way be right ?

These were the questions that created Independency. In the writings of the first Independent, Robert Browne (see Brown, Rozerr), lies the first crude attempt at an answer. He is possessed with the idea that reformation

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ig necessary, and is to be accomplished, not by the state, but by the action and cooperation of men who are them- selvesreformed and renewed. The Puritans have committed two great mistakes : they have imagined that reformation is a thing of polity only, to be carried out by changes in the organism, as it were, or structure of the church, leaving many, perhaps the immense majority, of the individuals who constitute it unreformed 3 and they have waited and are waiting to have the work done through aud by the magistrate. Browno sets himself absolutely against both positions. "The kingdom of God," he says, "was not to be begun by whole parishes, but rather of the worthiest, be they ever so few."! This means that a church cannot be created by any political act out of such material as it finds in a parish, but only of the godly, men who are consciously and sincerely Christian. So he defincs a church as "a companiec or number of Christians or believers, who, by a willing covenant made with their God, are under the government of God and Christ, and kepe his lawes in one holie communion."? his idea of a church was as unlike as possible to the Church of England ideal, and mado it as it actually existed so offensive to Browne that he held communion withit to be a cardinal sin. But it also made him particularly impatient with what he called the 'wickednesse of those preachers which will not reforme themselves and their charge, because they

will tarie till the magistrate commaunde and compell them." This led him to discuss principles and state positions that curiously anticipate some of the most modern views as to the relation of the civil authority to religion and the church.4 But the times were not ripe for cither the criticism or the realization of Browne's ideas. They were extravagances to his own day; failure attended him everywhere—due partly, perhaps, to the angularities of the man, and partly to the prematurity of tho system; his name was covered with ridicule ;, and Brownist became the epithet the early Independents most disliked and resented.

But the problems that nad exercised Browne were too vital to religion to be his alone. They occupied many minds, and of these not a few looked in a similar direction for a solution. Geneva was at once the strength and the weakness of the Puritans ;—their strength, because it gave them their ideal realized ; their weakness, because it made them think that the only method of realization was in and through the state. The Puritan leaders were mainly scientific theologians, like Cartwright and Travers, Perkins and Rainolds, men who strenuously adhered alike in doctrine and polity to the principles and methods of their school. But the earliest Independents were men of simpler minds, educated indeed as well as the English universities could educate them, but of less specific and elaborate training. They studied their own times and interpreted their own duties in the light of the New Testament, and

lA True and Short Deelaration, Both of the Gathering and Joyn- ing toyether of eertain Persons, and alsoof the Lamentable Breaeh and Diuision w fell amongst them, p. 6. This is to a ccrtain degree autobiographical, a story of Browne's struggles and failurc to realize his ideal, But see Dexter's Congregationalism of the Last Three Hundred Years, pp. 82, 92 ff.

2See A DBooke w Sheweth the life and Manners of all true Christians, and howe unlike they are unto Turkes and Papistes and ITeathen Folke, &c, (Middlebyrgh, 1582), definition 35.

3So runs the sub-title of one of the tracts he published while ab Middleburg —A Treatise of Reformation without Tarying for Anie

1582).

: a ee he says, “they (the magistrates) may doe nothing con- cerning the Church, but onelie civilie, and as civile Magistrates ; that is, they have not that authoritie ouer the church, as to be Prophetes or Priestes, or spiritual] Kings, as they are Magistrates over the same ; but onelie to rule the common wealth in all outwarde Justice, to main- taine the right welfare and honor thereof with ontwarde power, bodily punishment, and civill forcing of men.”—A Treatise of Reformation,

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inferred that as the apostles had proceeded they ought to proceed, that the methods proper to the apostolic age were also the methods proper to their own. These methods were individual, not national; churches were founded, religion created and reformed, not by civil authorities or agencies, but by preachers who persuaded men to belicve, gathered the believers into communities or brotherhoods, each standing in a fraternal relation to all the rest, noue occupying a position of political superiority or dependence. The early Independents believed that in this way only was it possible to reform religion in England, and they acted on their belief, separating themselves from the Anglican Church, forming themselves into communities on what they regarded as the Scriptural model, and working in what was conceived to be the apostolic method. But separation from the church was a capital crime, equal toa denial of the royal supremacy ; and so every inveterate separatist became liable to death. And early Independency was not without its martyrs. In the summer of 1583 two men, Thacker and Coppin, were executed at Bury St. Edmunds for refusing to conform to the church, and “dispersinge of Brownes bookes and Harrisons bookes.” They justified their refusal on the ground that “her Majestie was chieffe ruler civilie, but no further.” Two much more remarkable men, who met with a similar fate, were John Greenwood and Henry Barrowe. Both were graduates of Cambridge; Greenwood had been ordained a priest ; Barrowe was a barrister, 2 member of Gray’s Inn. ‘He made,” as we know on the authority of Lord Bacon,! “a leap from a vain and libertine youth toa preciscness in the highest degree, the strangeness of which alteration made

him very much spoken of." Both became separatists, and were very active in the numerous conven- ticles that were then being held in and about London. Their principles were not so extreme as Browne's, their position being, as it were, intermediate between his and the Puritan. In his notion of the church as a society of tlie godly or the converted, politically independent alike as regards other churches and the state, they agree with him ; in his notion of its rigidly democratic constitution, they differ, inclining more to leave its government in the hands of certain specially chosen men. Their ideal is a sort of Presbyterial Independency. 'They think of the church as "A companie of Faithfull people; separated from the vnbelievers and heathen of the land: gathered in the name of Christ, whome they truelie worship, and redily obcy as their only King, Priest, and Prophet: ioyned together as members of one bodie: ordered and gouerned by such officers and lawes as Christ in His last will and Testament hath thereunto ordeyned," &e.?

Of course, this conception placed them in direct anta- gonism to both the Genevan and Anglican ideals and methods. They condemn "Mr Calvine" because "he made no scruple to reccave all the whole state, even all the profane ignorant people, into the bozome of the church, to administer the sacramentes vnto them."? They condemn ae on a Libel" ; Letters and Life, by Spedding, vol. ik; Yk :

2 A Collection of certaine Lettcrs and Conferences, lately passed be- twixt certaine Preachers and Two Prisoners in the Fleet (1590), p. 67. These letters were addressed to the Puritan leaders, and state the radical point of divergence of the two systems. This was the church idea; Grecnwood and Barrowe, in all their prison Conferences, which were many, fall back on this idea :—" Christ's church always consisteth of a holy free people, separate from the world, rightly called and oe unto Christ, walking forth in faith and obedience."

- *Barrowe, A Brief Discouerte of the False Church (1590), p. 33. This is Barrowe's principal work, but he and Greenwood were both prolific and vigorous writers. They hada lengthy controversy with Mr George Gifford, a " Conformable Puritan," who charged them with being the*

“ Donatists of England.” They and the Puritans were curiously most deeply at feud. Yet it was only natural. The Puri-

tans were anxious to show that they’ had no kinship with the Brownists, the Brownists were anxious to drive the Puritans to the

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the Church of England because it comprehends “all the profane and wicked of the land,’ and maintain that ‘Christ is onely head of His church, and His lawes may no man alter”; that the prince is no more than a mere member of it; that, if he sin, not to excommunicate him is to neglect “ God’s judgmentes, their dutie and the prince’s salvation.” The Anglican Church was thus conceived as founded on a wrong principle, worked in a wrong method, and hindered rather than helped by its dependence on the state. Whitgift asked Barrowe whether, if the prince delayed or refused to reform abuses, the church should proceed without him ; and his answer was, ‘it might and ought, though all the princes of the world should prohibit the same upon pain of death.” Ideas like these logically involved separation as a duty ; the ideas they contradicted as logically madeit a crime. The age was not without the courage of its convictions; and Barrowe and Greenwood died for theirs, April 6, 1593. Shortly afterwards (May 29) John Penry or Ap Henry, a friend and associate, expiated the same sin in the same way.

In spite of the severely repressive measures of the (lovernment, the Independents continued to multiply. In the last decade of the 16th century numerous separatist communities were formed,® especially in London and the eastern and north-eastern counties. Their conventicles were often surprised, and in 1596 it was reckoned that as many as twenty-four had died in prison, representing of course but a small proportion of those actually confined. Plainly England had as yet no room for Independency, and the Independents who wished to keep a good conscience were forced to think of seeking a home elsewhere. Cer- tain of their leaders had, indeed, in 1592 organized a church in London, with Francis Johnson as its pastor, and Grecnwood as its teacher; but they were so watched and hunted and harassed—fifty-six of its members having been scized at one time and imprisoned—that they resolved, con- vinced by the fate of Barrowe,

Greenwood, and Penry that a peaceable life in England was impossible, to emigrate ina body. Holland was then the common refuge of the distressed for conscience' sake, the place where the outcasts alike of France and Spain and England found a free and even generous home. The Independents, after trying Campen and Naarden, settled finally at Amsterdam. There they completed their church organization, appointing Francis Johnson pastor and Henry Ainsworth teacher. Johnson was a native of Richmond in Yorkshire, had been a fellow of Christ's College, Cambridge, had been expelled the university for publicly teaching the Presbyterian polity, and had become pastor of the English merchants' church at Middleburg. here he had been zealous against the Inde- pendents, had helped to seize and destroy an edition of one of Barrowe's works, but, preserving a copy, had read it and been persuaded to adopt its views. He returned to Eng- land, associated himself with the author, and became, as we have seen, the pastor of the first Independent church in England. He was a pragmatic man, self-willed, empha- sizing his separatism, easily drifting into controversies and consequent divisions on minute questions alike of conduct and opinion. Ainsworth (see AINSWORTH, HENRY) was an logical outcome of their position—scparation. Barrowe's first reply to Gifford was the 'Plain Refutation, wherein is discovered the Forgery of the whole Ministry; the Confvsion; False Worship ; and Anti-Christian Disorder, of these Parish Assemblies called the Church of England" (1591).
4 Tbid., p. 9.

5 In 1593, in a debate on a Bill to explain the statute 28d of Eliz. 1580, and for the further reducing "disloyal subjects to obedience," Sir Waltcr Raleigh declared that there were 'as many as twenty thousand " Brownists in England. He was anxious that they should be "'rooted out of the commonwealth," but was alarmed lest the law that was needed to do so should turn out to be capable of use against liberaleminded Conformists like himself. See D'Ewes, p. 517, Au. 35 Eliz,

altogether nobler spirit, devout, simple-minded, erudite, one who "had not his better for the Hebrew tongue in the university (of Leyden) nor searce in Europe," anxious only to be allowed to search out the meaning of Scripture

and teach it to his people. The church under these two men had a somewhat troubled history, and divided at length, part going with Johnson, part with Ainsworth, the cause of the division being as to the office and power of the elder, The former held that the church had power to elect, but not to depose, the elders, who were its real gov- ernors, but the latter held that the elders were responsible to the church, which had the power, as to appoint, so also to depose and excommunicate them. Johnson was moving away from Independency, as it is now understood, but Ainsworth towards it. Their church is significant as an attempt to realize the ideal of Barrowe and Greenwood, a provisional or tentative Independency, but no more.

A much more successful attempt at realizing the Indepen- dent ideal was made at Leyden under the leadership of John Robinson (see Rosrnson, Joun), He and his people came from Scrooby, in Nottinghamshire. Their head- quarters had been at first at Gainsborough-on-Trent. In 1606 one section of the church under John Smyth—who was to become the most extreme of separatists, discovering that baptism by a corrupt church was none, to rebaptize himself and become founder of the General Baptists—emigrated to Amsterdam ; the other organized themselves under Robinson at Scrooby. Bunt peace was impossible ; flight became necessary. So in 1607 and 1608 they suc- ceeded in escaping in detachments to Holland, settling first in Amsterdam, ultimately in Leyden. 'There the fine qualities of Robinson found a congenial soil, and developed as they could not have done in the less generous air of England, Leyden helped to make English separatism into Independency. What is developed in antagonism is ill de- veloped, full of exaggerations, undue emphases, antitheses so sharply stated as to be almost, even when true, danger- ously near the false. A proscribed faith may be strong, but can never be sweet; and the strength that is bitter is not a purely religious strength. So Independency in Eng- land in the days of Whitgift and Bancroft was too much hated and hunted to be able to say the best word and do the best thing for itself. But Independency in Leyden,—breathing the free air of the Dutch republic, living in open fellowship with all its institutions, braccd by its strong en- thusiasm for liberty, its robust religious faith, its brilliant and fruitful intellectual activity, then at its best and brightest in the young university of the city,—was Inde- pendency planted where it could do approximate justice to its own ideal. The influence of the changed conditions soon became manifest in its happier

spirit. The church at Leyden lost the narrow and ungenerous spirit of sepatatism, pleaded for the duty of communion with the godly in the Church of England and the other reformed churches. On this point Robinson wrote with eloquence and acted with courage, his spirit growing the larger the longer he lived. While professing "a separation from the English national, provincial, diocesan, and parochial church, and churches, in the whole former state and order thereof," he yet confessed and declared that he had still "the same faith, hope, spirit, baptism, and Lord" as in the Church of England, that he enjoyed fellowship with her "many thousands" of godly sons, and that occasional "hearing of the word of God as there preached" was both lawful and necessary to him as a Christian man. This most generous spirit and conduct involved Robinson in a long and bitter controversy with Helwys and other extreme Separatists, who held approval of anything or any one a ee eee ee ee

! Robinson, Works, iii. 877-8.

US connected with the Anglican Church to be altogether asin; but it in no way modified the rigour of his Independency. His definition of a church is almost identical with Barrowe's: "A company, consisting though but of two or three, separated from the world, whether unchristian or anti-christian, and gathered into the name of Christ by a covenant made to walk in all the ways of God known unto them, isa church, and so hath the whole power of Christ.'"? Its independence, its sufficiency as a church alike in what concerned idea and reality, he strenuously maintained. Thus "neither was Peter or Paul more one, whole, entire, and perfect man, consisting of their parts essential and integral, without relation unto other men, than is a parti- cular congregation, rightly instituted and ordered, a whole, entire, and perfect church immediately and independently, in respect of other churches, under Christ."3 Above a church so conceived there could be no authoritative person or court, ecclesiastical or civil; it was armed with all the powers necessary to do the will of its Head, and to interfere with it was an unlawful interference with rights it had received from Him. Office did not exalt a man above the brotherhood; the clergy were but Christians, and good only as Christians, To saintship, and not to office, was promised the forgiveness of sins. 'The estate of asaint is most happy and blessed, though the person never so much as come near an office ; but, on the contrary, an

officer, if he be not also and first a saint, is a most wretched and accursed creature." Acts to be acts of the church must be collective, done, not by the clergy or the officers only, but by the brethren as well.5 The church was, indeed, an ecclesia, an assembly, called out and called together by the public preaching of the word, but forming in its collective and corporate character a body possessed of' supreme authority, ofall the attributes, rights, and prerogatives that belong to those who rule. It is evident that a conception of this kind was full of promise. It showed a firm trust in the capabilities of individual Christian men to exercise the rights of citizenship within the kingdom of God. It made it in the highest degree wrong for any ruler or body of rulers to enforce their own belief on the people. And it was as opposed to ecclesiastical as to civil tyranny, whether in its Episcopal or Presbyterial form. Robinson, indeed, was far from seeing or courageously deducing all the consequences implied in his Independency. He was even illogical enough to state, though in a hesitating way, principles radically incompatible with it. He concedes "that godly magistrates are by compulsion to repress public and notable idolatry," by some penalty "to provoke their subjects universally unto hearing for their instruction aud conversion" ; but he denies that any king is at liberty to inflict death upon all that refuse to be drawn into covenant with God, or remain wicked and unrepentant.® He knows well enough the utmost coercion can do. '" By this course of compulsion many become atheists, hypocrites, and familists, and, being at first constrained to practise against conscience, lose all conscience afterwards," Liberty is too complex a notion to be easily and in all its bearings grasped; and liberty in religion too great a thing to be suddenly and all at once understood and realized.

The Leyden church is the parent of Independency alike in England and America. In 1616 Henry Jacob, a native of Kent, a graduate of Oxford, one of Johnson's converts, pastor awhile of a church at Middleburg, then a resident with Robinson at Leyden, returned to England, and founded an Independent church at Southwark. In 1620 a little company led by Elder Brewster and Deacon Carver sailed from Delfthaven, landed in the-midst of a severe and stormy

2 Robinson, Works, ii. 182. 3 Tbid., iii. 16. MTCuar, 31, 228; 5 Ibid., 449, S Toid., ii, 314, 815.

winter on the North American coast, and there laid the foundations of the New England States, witli all they were to be and to create. Jacob had been all through his exile anxiously looking towards England. In 1609 he lad addressed to King James "An Humble Supplication for Toleration,'! in which he begs that "each particular church may be allowed to partake in the benefit of the said toleration, may have, enjoy, and put in execution and practice this her right and privilege," viz. "to elect, ordain, and deprive her own ministers, and to exercise all the other points of lawful ecclesiastical jurisdiction under Christ." 'This may be regarded as a clear and explicit statement of the early Independent position, its claim for toleration based on its conception of the Christian chureli, its plea for liberty of worship based on its principle of individualism and the rights of the individual conscience. With what was here asked it would at any time in the 17th century have been satisfied, but the Anglican policy of Elizabeth, and James, and Charles I. proceeded on this principle, that to allow diversity was to destroy unity, to permit the growth of elements that would prove fatal to the church, involve the denial of the royal authority and the break-up of the state. Yet the very severity of the Anglican policy strengthened Independency. It helped to identify the struggle for liberty of conscience with the struggle for English liberty.

Up to 1640 little formal progress was made. Churches did not multiply; Land was too active, and the Star Chamber too vigorous. But the real progress was immense. Statesmen were persuaded that a system which required so harsh a policy could not be right. Religious men who could not conform went to live in lands and under laws where obedience to conscience was possible. There was a double emigration, to the Continent and to New England. In Arnheim, Thomas Goodwin and Philip Nye ministered to a small congregation; in Rotterdam, Hugh Peters and William Ames, the most skilled, scholastic, and disputatious theologian of the early Independents, who came from his professorial chair at Franeker in 1682 to die at Rotterdam a year later. Tere, too, when Ames was dead and Peters gone to New England, came Jeremiah Burroughs, William Bridge, and Sidrach Simpson, all of them names that were to be conspicuous and influential in days to come.

But the emigration to New England was much the more important alike as regards its influence on Independency and English history. It has been calculated that in the period 1620-1640 upwards of 22,000 Puritan emigrants (tlie figures have been placed as high as 50,000) sailed from English and Dutch ports. The reasons that compelled their departure determined their quality; they were all men of rigorous consciences, who loved their fatherland much, but religion more, not driven from home by merean- tile necessities or ambitions, but solely by their determina- tion to be free to worship God. They were, as Milton

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1 An Humble Supplication for Toleration, and Liberty to enjoy and observe the Ordinances of Jesus Christ in the Administration of his Churches in lieu of Human Constitutions (1609 ; no place or printer). In the following year Jacob published a work on The Divine Beginning and Institution of Christ's true Visible or Ministerial Church ; and in 1612 a sequel to the above, A Declaration and Plainer Opening of certain Points (published at Middleburg). This latter is remarkable as containing the earliest use, in the ecclesiastieal sense, of the word "Tndependent." "Where each ordinary congregation giveth their free eonsent in their own government, there certainly each is an entire and indepeident body-politie, and endued with power immediately under and from Christ, as every proper Church is, and ought to be," p. 13. It is interesting to note that the above Supplication is the earliest plea for toleration in the English language, but a few years later appeared a much more thoroughgoing work, Religious Peace, or a Plea for Liberty of Conscience (1614). This was by Leonard Busher, a Baptist, and to this body belongs the honour of being the first to de- velop the liberty implied in Independeney. See Busher's and other tracts on 'Liberty of Conscience" in publications of Hanserd Knollys Society.

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said,? "faithful and freeborn Englishmen and good Christians constrained to forsake their dearest home, their friends, and kindred, whom nothing but the wide ocean and the savage deserts of America could hide and shelter from the fury of the bishops." Men so moved so to act could hardly be comnionplace; aud so among them we find characters strong and marked,

with equal ability to rule and to obey, as Bradford and Brewster, Winslow and Staudish, Winthrop and Dr Samuel Fuller, and men so inflexible in their love of liberty and faith in man as Roger Williams and young Tarry Vane. And as were the people so were their ministers. Of these it is enough to name Johu Cotton, able both as a divine and as a statesman, potent in England by his expositions and apologies of the " New England way," potent in America for his organizing and administrative power; Thomas Hooker, also famed as an exponent and apologist of the " New England way," whose book was commended to theologians at home by Thomas Goodwin, and whose early death was lamented by Cotton

in lines which told how " Zion's beauty did most clearly shine In Hookcr's rule and doctrine, both divine ;"

John Eliot, famous as the "apostle of the Indians," first of Protestant missionaries to the heathen; Richard Mather, whose influence and work were carried on by his distin- guished son, and his still more distinguished grandson, Cotton Mather. The motives and circumstances of the emigrants determined their polity; they went out as churches and settled as church states. They were all Puritans, but not all Independents—indeed, at first only the men from Leyden were, and they were throughout more enlightened and tolerant than the men of the other settlements. Winthrop's company were noncomformists but not separat- ists, esteemed it 'an honour to call the Church of England, from whence we rise, our dear mother," emigrated that they might be divided from her corruptions, not from herself.% But the new conditions, backed by the special influence of the Plymouth settlement, were too much for them ; they became Independent,—first, perhaps, of necessity, then of conviction and choice. Only so could they guard their ecclesiastical and their civil liberties. These, indeed, were at first formally as well as really identical. In 1631 the general court of the Massachusetts colony resolved, " that no man shall be admitted to the freedom of this body politic, but such as are members of some of the churches within the limits of the same." Church and state, citizenship in the one and membership in the other, thus became identical, and the foundation was laid for those troubles and consequent severities that vexed and shamed the early history of Independency in New England, natural enough when all their circumstances are fairly considered, indefensible when we regard their idea*

of the relation of the civil power to the conscience and religion, but explicable when their church idea alone is regarded. And this latter was their own standpoint ; their acts were more acts of church discipline than those of civil penalty. Meanwhile, the growth of the New England States and | their Independency in religion exercised extraordinary influence in England. It encouraged the Puritans, opened to them a refuge from the Anglican tyranny, showed them an English state where the bishop had ceased to trouble and where their own principles were active and realized. Laud thoroughly comprehended the situation, saw that Independency in the colonies must be struck down if Anglican policy was to succeed at lioome. They were a 2 «© Of Reformation in England," bk. ii., Works, p. 14 (ed. 1884). 3 "The Humble Request of His Majesties Loyall Subjects, the Governour and the Company late gone for New England," 1630; referred to in Young's Chron. Massach., pp. 295-299 (1846).

4 Dexter, Congregationalism of the Last Three Hundred Years, p. 420.

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receptacle for schismatics, " from whence, as from the bowels of the Trojan horse, so many incendiaries might break out to inflame the nation ;" and so it would be necessary to send them a bishop " for their better government, and back him with some forces to compel, if he were not otherwise able to persuade, obedience."! But home politics alone were too much for Laud ; and on his downfall and tlie outbreak of the civil war New England Independency became, on account of its influence on the ecclesiastico-political question, still more potent in English affairs. The Independent party in the Westminster Assembly—which had been called to advisa parliament—was small, but influential. Its ministerial members were Thomas Goodwin, a ponderous but learned and conscientious man; Philip Nye, a skilful debater and adroit man of business; Jeremiah Burroughs, a man of sweet manners and gentle disposition, but great prudence and firmness ; William Bridge, and Sidrach Simpson. These were all marked by conspicuous moderation of view, but the lay members, like Lord Saye and Sele and Sir Harry Vane, were more advanced, especially on the cardinal question of toleration. The importance of the New England States was at once recognized by the parliamentary Independents, who made an effort to

bring over their three inost eminent ministers, John Cotton, John Davenport, and Thomas Hooker. The effort failed ; but in place of the men books and pampliets, expository and defensive of the "New England way," were discharged in quick succession upon the English public. What gave New England its importance was this—it was the first realization on a large scale of the principles of Independency. Here they had been tried under most difficult conditions, and liad proved thoroughly successful, capable of maintaining order in the churches, religion in the state, purity of doctrine, and efficiency of discipline. What Geneva had been to the Puritans under Elizabeth New England was now to the Independents—it was their religious ideal realized, their polity commended by an illustrious example. They were no longer, as in the days of John Robinson or Henry Jacob, the apologists of an unpopular and strange theory, hitherto unrealized save on a scale and under conditions that made it ridiculous, charged with all the evils that could be proved logically certain to follow from it. On the contrary, they had now behind them the church-state beyond the ocean, and they could proudly tell how men of English blood, who had fled from the Anglican oppression, liad tried Independency and prevailed. So there was the amplest controversy on the points at issue, the Scotch divines being specially active on the one side, and American divines, pre- faced and introduced and explained by English, on the other. The controversy did something to lessen the distance between Presbyterians and Independents, and did much to strengthen the position of the latter in England. It showed that independence did not inean isolation, that churches that refused to be organized into a political unity still

constituted a Christian brotherhood, that societies that were

so jealous of their freedom and rights as to deny to every external authority judicial and legislative functions could yet seek and follow fraternal advice, and mect in common

councils to advise and be advised. But the Westminister | Assembly and the English Parliament did not approve the | 'church. But in the case of the Independents there was not even an abortive attempt at comprehension. did not ask what they knew they would not receive.

“New England way,” and the Independents had to be con- tented to plead for toleration. This, indeed, became their great demand—the point on which they and the Presby- terians differed radically. Here the Presbyterians were inflexible. Toleration was to them the very man of sin. But to the Independents it was the very condition of continued existence. Without it England would be no better for them under Presbytery than it had been under Episcopacy. As to the nature and degree of this toleration, PS Heylyn, Life of Laud, p: 269.

they were divided into two sections, one moderate, the other more advanced. To the former belonged the ministerial members of the assembly, who wished only a limited toleration. They did not desire all views to be tolerated, but only the views of good men, men of pious, tender consciences, not those of infidels or blaspliemers. But the more advanced section courageously advocated absolute toleration, denied that so long as a man was a peaceable citizen the magistrate had any right to interfere with his conscience or conscientious beliefs. 'To this section belonged Harry Vane, Henry Burton, John Goodwin of Coleman Street, ablest and most restless of controversial- ists in that controversial age; Roger Williams, now a Baptist, but still an Independent, home from America, bringing with him the MS. of a great book on this very subject ; finally, above all, John Milton. These were the advanced guard, and theirs was the section that made Independency so immense a political power in the England of the Commonwealth.

This is not the place to inquire into the causes of the sudden and extraordinary ascendency of the Independents in the time of the Commonwealth. Enough to say, it was due to causes both political and religious—to what may be termed the transmutation of a great religious into a great political question. The men Independency formed and forced to the front were remarkable men, strong of will, clear of eye, mighty through faith in their principles. And their principles were precisely of the kind suited to the emergency, republican and revolutionary, but steeped in the commanding emotions and enthusiasms of religion. They were principles that ennobled man, that asserted the rights of the individual, that made it an easy matter to deal with the divine rights of kings, or kings too assertive of their rights and forgetful of their duties. So the Inde- pendents had the incalculable advantage of always seeing clearly before them, knowing their end and never being in any doubt about the way to it. Besides, their theory of the church fell in with the spirit of the Commonwealth. It made but small distinction between clergy and laity, and the man with the gift of speech could easily exercise it in preaching. So the army when new modelled, formed of

/men of spirit and conviction, became quite a nursery of | Independents, and men like Richard Baxter found that in it there were quite as many ready to edify as wishful to be edified. Religion thus became, not a matter for the clergy, but the possession of the people, not simply the concern of the church, but the business of the whole nation.

There was considerable diversity in theological opinion. The moderate men were Calvinists, but among the cxtreme men were Arminians, like John Goodwin, and men as yet of no recognized school, like John Milton. Independency,

In short, meant the equal concern of every man in religion, alike in its deepest 'mysteries and most practical precepts ; ' and so in a period of religious enthusiasm and ferment it

naturally came to the front and took the lead. But the extent of its power under the Commonwealth was the

/ measure of the disfavour that came to it after the Restora- tion.

The Presbyterians had been mainly instrumental in the bringing back of Charles, and so it had been indecent had no attempt been made to comprehend them within the

And they They only wished to be tolerated, to be allowed to live, and no more. At first they thought that this might be. Philip Nye had seen the king, and was hopeful. But their illusions were soon dispelled. In 1661 the Corporation Act was passed, which disqualified Nonconformists for municipal offices; in 1662 the Act of Uniformity, which drove upwards of two thousand ministers out of the church, and

silenced all who did not conform; in 1663 the Conventicle Act, which prevented N onconformist congregations meeting, not allowing in houses more than five persons beyond the family to be present at once. In 1665 the Five Mile Act forbade non-conforming ministers to come withiu 5 miles of any corporate borough ; in 1670 the Conventicle Act was made more

rigorous; and in 1673 the Test Act made Nonconformists ineligible for offices, civil, naval, or military, under the crown. Charles, indeed, iu his weak way, tried to be more generous than his church or parliament, wished to tolerate the Nonconformists that he night the better tolerate the Roman Catholics. Out of this feeling came the Declaration of Indulgence in 1672, —which was, inciden- tally, the means of proving the strength of dissent, three thousand applications being made for licences to use or erect places of worship; but parliament resisted, and Charles gave way.

In the dark days that had now come to them, the Inde- pendents, it may well be said, lived with patient courage, aud learned through their sufferings. They had men among them that adorned their adversity, and made even their sudden obscurity illustrious. John Owen, late vice- chancellor of Oxford, massive, erudite, the ideal of the scholastic theologian, building up with patient skill his loved science and fencing it round with the sort of argu- ments his age understood ; Thomas Goodwin, less varied but more subtle, not so broad but quite as analytic as Owen, dealing with rich delight in the dialectical subtleties that pleased his age; John Howe, with a soul above the narrowness aud bitterness of his day, serene in the midst of his troubles, living in sublime contemplation on " the Living Temple," or the " Vision of God "; Joseph Caryl and William Greenhill, quaint expositors, rich in the lore then used to explain the Old Testament ; Theophilus Gale, the equal of Cudworth in his knowledge of the ancient world, full of the great and fruitful idea he has embodied in his Court of the Gentiles,—these were some of the ejected from church or university, and they may help to show the quality of the men who were now, because of their Inde- pendency, outcasts from the Church of England, and for it deprived of their common rights as citizens. 'Their conduct under Jaincs showed that they would not purchase their own privileges at the expense of the public safety, and under William their fidelity to the constitution and liberties of England had itsfirst reward inthe Actof Toleration. This was but a small concession, and one that by the Occasional Conformity Act of Anne was almost as good as repealed. But what had been done could not be altogether undone. The coming in of the Hanoverian dynasty brought a more | liberal spirit into politics, and history has ever since, with an occasional period of declension, been a progressive movement towards freedom. As one by one its principles and claims have been admitted by the state, England has

become a roomicr and healthier place for spirits who feel that for religion to be religious it must be free.

In estimating the work done in England by the Tndepen- dents, it is necessary to bear in mind the extent to whicli they have supplemented the deficiencies of the Anglican Church. But for them religion in many places would have almost, perhaps altogether, died out. They have helped to quicken and deepen the religious consciousness and life of the English people. Their preachers, too, have not been without influence, which is the more remarkable as from the time of the Act of Uniformity till a few years ago they were excluded from the national universities. Soon after the passing of the Act of Toleration we find Independent preachers rising to eminence. The Foster who was celebrated in Pope's couplet—

" Tet modest Foster, if he will, exeel Ten metropolitans in preaching well— | 1Works, ii, 245 (ed. 1759).

was an Independent, and as vigorous as a thinker as he was eloquent as a preacher, his answer to Tindal anticipating in its leading lines the celebrated argument of Butler in his Analogy. Isaac Watts is a name that must still be honoured, and Vhilip Doddridge a name that must be mentioned with respect. Edward Williams did much to revive the study of theology in the end of last century and early years of this, and Dr Pye Smith showed that within dissent scholarship and theological learning were still possible. The last generation had not a few men of distine- tion. The names of Henry Rogers, Joseph Gilbert, J. Angell James, Dr Winter Hamilton, Dr Ralph Wardlaw, Dr Robert Vaughan, his distinguished sou Alfred Vaughan, -Dr Halley, the historian of Nonconformity in Lancashire, and Thomas Binney of London are names representative of the kind of men that Independency can still produce.

But to complete this sketch of the Independents we must add one other element—the work done by their academies and colleges. 'They have always believed in an educated ministry, and when cast out of the universities one of their very first acts was to found academies. These they had great difficulty in maintaining, because of the operation of the oppressive acts passed in Charles II.'s reign; but in spite of the difficulties they contrived to doso. Theophilus Gale had an academy; so had Samuel

Cradock, Thomas Doolittle, Richard Frankland, and others of the ejected ministers. It was possible to keep these only by the most frequent changes of place, so as to elude the vigilance of the authorities. When toleration was granted, the academies were able in the greater quiet they now enjoyed to do better work. One of these may serve as a sample. At Gloucester and then at Tewkesbury was an academy conducted by the Rev. Samuel Jones. Here were educated Thomas Secker, afterwards archbishop of Canterbury ; Joseph Butler, bishop of Durham, and author of the Analogy; Samuel Chandler, one of the finest scholars of his day, who remained in poverty the scholar and the Christian Nonconformist still; and Jeremiah Jones. We know, on the authority of an early lctter of Secker's, the method of education followed in Tewkesbury; and certainly, measured by the standard of the day, it was as thorough as the education was ample. Out of these academies the present Congregational colleges have grown.

It is unnecessary to attempt any exposition of the principles of Independency. These have been made ap- parent in the progress of this sketch. It may simply be said here that the Independents conceive their church order as the primitive and apostolic, and that out of their idea of the constitution and order of the primitive Christian churches their own system has grown. They believe that their conception of the church necessarily involves frecdom of conscience, the interference with no man's belief, the concession of equal rights to all churches or religious societies by the state, and they may well remember with pride that John Locke based his plea for toleration on a conception of the church essentially akin to theirs! Their notion of the pastoral office is in no respect sacerdotal, but +s based on the Old Testament idea of the prophet, on the New Testament idea of the preacher—the man who by help or inspiration of God speaks for God to men. And the call to his office comes through the people ; the divine choice is expressed through the men the divine word enlightens and the divine Spirit guides. Their theology has been predominantly Calvinistic, though of the more moderate type; but there has always been variety of theo- logical opinion, subscription and the uniformity it attempts to secure being alike impossible to Independency.

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For statistics of the denomination and the reasons which have induced it to assume the name Concregationalist see CONGREGATIONALISM. » = ;

Authorities. —Fletcher, History of Inde : Heywood and Wright, gee fee ee “ ‘ 1854; Vaughan, Memorials of the Stuart Dynasty, 2 vols.,1&31; oar Williams, The Bloudy Tenent of Persecution, cd. Underhill, 1848 ; Hanbury, Historical Memorials relating to the Independents, 3 vols., 1839-44; Carlyle, Cromwell’s Letters and Speeches, 1845; Under- hill, Traets on Liberty of Conscience and Persecution, 1846 ; Masson, Life of Milton, 6 vols., 1859-80; Vaughan, The Proteetorate of Cromwell, 2 vols, 1839; Stoughton, Church and State Two Hun- dred Years Ago, 1862; Underhill, Broadmead Records, 1847; Gould, Doewments relating to Act of Uniformity, 1862; Calamy, Nonconformists’ Memorial, 3 vols., 1802; Toulmin, Protestant Dissenters in England, 1814; Stoughton, Religion in England under Queen Anne and the Georges, 2 vols., 1878; Bennet, History of Dissenters during the last Thirty Years, 1839; Barclay, Inner Life of the Religious Societies of the Commonwealth, 1877; Vaughan, English Nonconformity, 1862; Pricc, History of Protestant Noncon- formity in England, 2 vols., 1836-38; Bogue and Bennet, History of Dissenters, 4 vols., 1808-12; Wilson, History and Antiquities of Dissenting Churches, &c., 4 vols., 1808-14; Stoughton, Leclesias- tical History of England, 5 vols., 1867-74; Dexter, The Congrega- tionalism of the Last Three Hundred Years, 1880; Neal, History of the Puritans, 5 vols.; Waddington, Congregational History, 5 vols., 1869-80. (A. M. F.)

INDEX is a word that may be understood either specially as a table of references to a book or, more gene- rally, as an indicator of the position of required information on any given subject. According to classical usage, the Latin word index denoted ‘a discoverer, discloser, or informer; a catalogue or list; an inscription; the title of a book; and the fore or index-finger. Cicero also used the word to express the table of contents to a book, and explained his meaning by the Greek form syllabus. Shakespeare uses the word with the general meaning of a table of contents or preface—thus Nestor says (Z’rovdus and Cressida, i. 3)—

‘ And in such indexes, although small pricks To their subsequent volumes, thcre is scen The baby figure of the giant mass.” Table was the usual English word, and index was not thoroughly naturalized until the beginning of the 17th century, and even then it was usual to explain itas ‘index or table.” By the present English usage, according to which the word table is reserved for the summary of the contents as they occur in a book, and the word index for the arranged analysis of the contents, we obtain an advantage not enjoyed in other languages ; for the French table is used for both kinds, as is ¢xdice in Italian and Spanish. There is a group of words each ot which has its distinct meaning but finds its respective place under the general heading of index work; these are calendar, catalogue, digest, inventory, register, summary, syllabus, and table! The value of indexes was recognized in the earliest times, and inany old books have full and admirably constructed ones. A good index has sometimes kept a dull book alive by reason of the value or amusing character of its contents.*

Mr Carlyle refers to Prynne’s J/istrio-Mastix as ‘a book .

still extant, but never more to be read by mortal ;” but the index must have given amusement to many from the curious character of its entries, and Attorney-General Noy particularly alluded to it in his speech at Prynne’s trial. Indexes have sometimes been used as vehicles of satire, and the witty Dr William King was the first to use them as a weapon of attack. His earliest essay in this field was the index added to the second edition of the Hon. Charles Boyle’s attack upon Bentley’s Dissertation on the Epistles of Phalaris, 1698.

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sense is dated 1547—“a Pye of all the names of such Balives as been to accompte pro anno regni regis Edwardi Sexti primo.”

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To serve its purpose well, an index must be compiled with care, the references being placed under the heading that the reader is most likely to seek. An index should be one and indivisible, and not broken up into several alpha- bets; thus every work, whether in one or more volumes, ought to

have its complete index. This important rule has been often neglected in English books, and is almost universally rejected in foreign ones, to the great incon venience of readers. The mode of arrangement calls for special attention ; this may be either chronological, alpha- betical, or according to classes, but great confusion will be caused by uniting the three systems. The alphabetical arrangement is so simple, convenient, and easily under- stood that it has naturally superseded the other forms, save In some exceptional cases. Much of the value of an index depends upon the mode in which it is printed, and every endeavour should be made to set it out with clear- ness. In old indexes the indexed word was not brought to the front, but was left in its place in the sentence, so that the alphabetical order was not made perceptible to the eye. There are few points in which the printer is more likely to go wrong than in the use of marks of repetition, and many otherwise good indexes are full of the most perplexing cases

of misapplication in this respect. The oft-quoted instance— Mill on Liberty —— on the Floss

actually occurred in a catalogue. There appears now to be a revived interest in indexes, and as books daily increase the need of some satisfactory digest of information becomes more keenly felt. In 1877 the Index Society was formed with the object of making and printing indexes of books unprovided with them, of compiling and printing indexes of particular subjects, and of gradually preparing a universal index for reference. In order to obtain uni- formity in the compilation of indexes a series of rules for indexing have been drawn up by the society. Several. publications have already been issued to the subscribers.

Lhe following is a list of some of the most important indexes, both of words and of subjects. The chief indexes of words are dictionaries, but these are a special class by themselves. Next come concord- ances : the first one to the Bible was compiled by Hugo of St Cher in 1247, the first English concordance to the New Testament_was published in 1536, and to the whole Bible in 1550, compiled by John Marbcck. Other Biblical concordances are those of R. F. Hervey, 1579; C. Cotton, 1622 (frequently reprinted) ; J. Downame, 1632 ; R. Wickens, 1655; S. Newman, 1650, 3d ed. 1682; A. Cruden, 1737 (this superscded all works of the same character) ; and R.

Young, 1880. The following concordances may also be mentioned : —to the Psalter, 1834; to the Prayer Book, 1851; to the flvad, by G. L. Prendergast, 1875, to Shakespeare, by 8. Ayscough (1790), by F. Twiss (1805), by Mrs Cowden Clarke (1845), by J. O. Halliwell (Handbook Index, 1866), and ry A. Schmidt (1874), and to Shakespeare's Poems, by Mrs H. H. Furness, 1874; to Milton's Paradise Lost (1741), and to his Poetical Works, by H. J. Todd (1809), by G. L. Prendergast (1857), and by Cc. D. Cleveland (1867); to Pope's Works, by E. Abbott, 1875 ; to Tennyson's Works, by D. B. Brightwell, 1869, and another published by Strahan, 1870 ; to In Memoriam (1862); to Keble's Christian Year, 1871; and to Watts's Psalms, by D. Guy, 1774. A large number of historical works have been supplied with indexes in separate volumes. Among the more important indexes of prose writers are those of the works of Samuel Richardson (1755), Joanna Southcott (n. d., and 1815), John Strype (1828), and T. Carlyle (1874); The Wellington Despatches (1839) ; Wesley's Journals (1872). A large number of series of publications of societies and of periodicals have been supplicd with general indexes. othe Indexcs to the Statutes and to the Journals of the Houses of Parliament are perhaps the most elaborate works of the kind ever published. In 1778 a sum of £12,900 was voted for indexes to the Journals of the House of Commons. Few parliamentary papers are issued without a satisfactory index being added. Most of the indexes mentioned above refer to particular books, but in 1848 Mr W. F. Poole published in New York an index to sub- jects treated in reviews and other periodicals ; a second edition was published in 1853 as An Index to Periodical Literature. A greatly enlarged edition is now in preparation with the co-operation of English and American librarians. A larger work of a similar char- acter for scicntific literature, but arranged under authors' names

instead of subjects has been compiled by the Royal Socicty and is entitled Catalogue of Scientific Papers (1800-73), 8 vols. 4to, 1867- 1879. (A. B. W.)*

INDEX LIBRORUM PROHIBITORUM is the title borne by the official list of those books which on doctrinal or moral grounds the Roman Catholic

Church, under penalty of ecclesiastical . censures, authoritatively forbids the members of her communion to possess or to read. Most Governments, whether civil or ecclesiastical, have at all times in one way or another acted on the general principle that some control may and ought to be exercised over the literature circulated among those under their jurisdiction ; for various examples, both in ancient and in modern times, reference may be made to the article BrstiocrapHy (vol. iii, p. 658). The earliest known instance of a list. of pro- scribed books being issued with the authority of a bishop of Rome is sometimes assigned to the pontificate of Gelasius (494) and sometimes to that of Hormisdas (514), but most probably ought not to be dated earlier than the 8th century. The document is for the most part, as its name implies, a Notitia Librorum Apocryphorum qui non recipiuntur, and chiefly consists of an enumeration of such apocryphal works as by their titles might be apt to mis- lead the unwary into attaching an undue weight to their teaching (the " Acts " of Philip, Thomas, Peter, Philip, and the Gospels of Thaddeus, Matthias, Peter, James the Less, and others). Its concluding paragraph, however, sweep- ingly declares all the writings of Simon Magus and of many other heretics who are mentioned by name, as also of many more whose names have been completely forgotten (minime retinentur), to be repudiated, eliminated entirely from the Romau Catholic and Apostolic Church, and eternally condemned.! Subsequent pontiffs continued to exhort the episcopate and the whole body of the faithful to be on their guard against heretical writings, whether old or new; and one of the functions of the Inquisition when it was established was to exercise a rigid censor ship over books put in circulation. The bishops in their dioceses had always, however, a considerable discretion. With the discovery of the art of printing, and the wide and cheap diffusion of all sorts of books which ensued, the need for new precautions against heresy and immorality in literature made itself felt, and more than one pope (Sixtus IV. in 1479 and Alexander VL in 1501) gave special direction to the archbishops of Cologne, Mainz, Treves, and Magdeburg regarding the growing abuses of the printing press ; in 1515 the Lateran council formulated the decree De Impressione Librorum, which required that no work should be printed without previous examination by the proper ecclesiastical authority, the penalty of unlicensed printing being excommunication of the culprit, and confiscation and destruction of the books. The council of Trent in its fourth session, 8th April 1546, forbade the sale or possession of any anonymous

religious book which had not previously been seen and approved by the ordinary; in the same year the university of Louvain, at the command of Charles V., prepared an "Index" of pernicious and forbidden books, a second edition of which appeared in 1550. In 1557, and again in 1559, Pope Paul IV., through the Inquisition at Rome, published what may be regarded as the first Roman Jndex in the modern ecclesiastical use of that term (Index auctorum et librorum gui tanquam heeretici aut suspects aut perverst ab Officio S. Rk. Inquisitionis reprobantur et in universa Christiana republica interdicuntur). All anonymous works published since 1519 were condemned without exception in thus Index, which directed its hostility chiefly against works

1 Tiardouin, Conc., ii. 940 ; Labbé, Conc., ii. 988-941. The whole document has also been reprinted in Smith's Dict. of Chr. Antig., art. _ Prohibited Books."

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that seemed unfavourable to the claims of the Roman curia, or maintained the superiority of councils over popes. A list of sixty-two printers of heretical books was appended. At the 18th session of the council of Trent (26th February 1562), in consideration of the great increase in the number of suspect and pernicious books, and also of the ineflicacy of the many previous "censures" which had proceeded from the provinces and from Rome itself, certain fathers were appointed to enquire into these " censures," and to consider what ought to be done in the circumstances. At the 25th session (4th December 1563) this committee of the council was reported to have completed its work, but as the subject did not seem (on account of the great number and variety of the books) to admit of being properly discussed by the council, the result of its labours was handed over to the pope (Pius IV.) to deal with as he should think proper. In the following March accordingly were published, with papal approval, the Index librorum

prohibitorum, which continues to be reprinted and brought

down to date, and the "Ten Rules" which, supplemented and explained by Clement VIII, Sixtus V., Alexander VIL, and finally by Benedict XIV. (10th

July 1753), still regulate the preparation of that catalogue. By the first of theso rules the condemnation of all books already con- demned by pope or council prior to 1515 is renewed ; by the second the works of "heresiarchs" (Luther, Zwingh, Calvin, Schwenkfeld, Hitbmaier) are condemned whatever be their subject, but it is provided that the non-religious works of those who are heretics merely may on examina- tion and approval be permitted; the third and fourth relate to translations of the Bible; the fifth orders the expurgation of lexicons, concordances, and similar com- pilations by heretics ; the sixth discourages the circulation of books in the vulgar tongue about controversies between Catholics and heretics; the seventh, eighth, and ninth relate to obscene or grossly superstitious publications ; the tenth contains various details of procedure about the licensing of books, and concludes with the declaration that the possessor or reader of heretical books is forthwith to be excommuni- cated, while the possessor or reader of books prohibited on other grounds falls into mortal sin, and is to be dealt with severely at the discretion of the bishop. The business of correcting the Index to date is now in the hands of an ecclesiastical board known as tho "Congregation of the Index," which consists of a prefect (who is always a cardinal) and other cardinals, with whom are associated the "consulters" and " examiners of books " (qualisicatores). The Index Librorum Expurgandorum or Expurgatorius catalogues the works which may be read after the deletion of specified passages. Bishops have the power of granting at their discretion the right to read forbidden books, except in some reserved cases, where the papal dispensation is required. The Roman Index is unfortunately very far from being an exhaustive catalogue of works inconsistent with Catholic orthodoxy, and thus lacks the interest and vast importance it would otherwise have had for the biblio- grapher.

The early Reformers, by their attitude towards writings which from their point of view seemed objectionable, fur- nished many an argumentum ad hominem to the Catholics (see Gretser's learned work, De Jure et More prohibendi, expurgandi, et abolendi libros heereticos et noxtos, 1603) ; thus we find Calvin writing to the ministers at Frankfort about one of the books of Servetus, with a view to its being burnt (Zp. 153). Gradually, however, all the Protestant churches have recognized the expediency of leaving indi- viduals and communities practically free to select for their instruction and

amusement the works which in the consci- entious exercise of their own responsible judgment they may find best adapted to their wants.

Plate VI.

General deserip- tion.

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INDIA

NDIA is a great empire of Asia, composed of twelve provinces under direct British administration, and about one hundred and fifty feudatory states and princi- palities, which equally with the British provinces acknow- ledge the paramount sovereignty of the British crown. The whole empire contains close on 14 million square miles, and 240 millions of inhabitants. The area, there- fore, is almost equal to, and the population is just equal to, the area and population of all Europe, less Russia. 'The people exactly double Gibbon's estimate of 120 millions for all the races and nations which obeyed Imperial Rome. The Name.—The natives of India can scarcely be said to have a word of their own by which to express their common country. In Sanskrit, it would be called " Bharata-varsha," from Bharata, a legendary monarch of the Lunar line; but Sanskrit is no more the vernacular of India than Latin is of Europe. The name " Hindustdn," which was at one time adopted by European geographers, is of Persian origin, meaning "' the land of the Hindus," as Afgh4nistan means " the Jand of the Afghans." According to native usage, however, " Hindustan" is limited either to that portion of the peninsula lying north of the Vindhya mountains, or yet more strictly to the upper basin of the Ganges where Hindi is the spoken language. The " East Indies," as opposed to the "West Indies," is an old- fashioned and inaccurate phrase, dating from the dawn of maritime discovery, and still lingering in certain parlia- mentary papers. "India," the abstract form of a word derived through the Greeks from the Persicized form of the Sanskrit sindhu, a "'river," pre-eminently the Indus, has become familiar since the British acquired the country, and is now officially recognized in the imperial title of the sovereign.

Tur Country.

General Outline.—India, as thus defined, is the middle of the three irregularly shaped peninsulas which jut out southwards from the mainland of Asia, thus corresponding roughly to the peninsula of Italy in the map of Europe. Its form is that of a great triangle, with its base resting upon the Himalayan range, and its apex running far into the ocean. The chief part of its western side is washed by the Arabian Sea, and the chief part of its eastern side by the Bay of Bengal. It extends from the 8th to the 35th degree of north latitude, that is to say, from the hottest regions of the equator to far within the temperate zone. The capital, Calcutta, lies in 88° E. long. ; so that when the sun sets at six o'clock there, it is just past mid-day in England, and early morning in New York. The length of India from north to south, and its greatest breadth from east to west, are both about 1900 miles; but the triangle tapers with a pear-shaped curve to a point at Cape Comorin, its southern extremity. To this compact dominion the English have added, under the name of British Burmah, the strip of country on the eastern shores of the Bay of Bengal. But on the other hand, the adjacent island of Ceylon has been artificially severed, and placed under the colonial office. Two groups of islands in the Bay of Bengal, the Andamans and the Nicobars ; one group in the Arabian sea, the Laccadives; and the outlying station of Aden at the mouth of the Red Sea, are all politically included within the Indian empire; while dots on the shore of the peninsula itself, representing Portuguese and French settle- ments, break at intervals the continuous line of British territory.

India is shut off from the rest of Asia on the north by

a vast mountainous region,

and Nepal, with the great table-land of Tibet behind. The native principality of Kashmir occupies the north-western angle of India, with Eastern Turkestan stretching to the north beyond it. At this north-western angle (in 35° N, lat., 74° E. long.) the mountains curve southwards, and India is separated by the well-marked ranges of the Sufed Koh and Suldiman from Afghanistan 3 and by a southern continuation of lower hills (the Halas, écc.) from Baluchistdn. The last part of the western land frontier of India is formed by the river Hab, and the boundary ends at Cape Monze, at the mouth of its estuary, in 24° 50' N, lat., 66° 38' E. long." Still farther

southwards, India is bounded along the W. and 8.W. by the Arabian Sea and Indian Ocean. Turning northwards from the southern extremity at Cape Comorin (8° 4’ 20” N. lat., 77° 35’ 35” FE. long.), the long sea-line of the Bay of Bengal forms the main part of its eastern boundary. But on the north-east, as on the north- west, India has again a land frontier. The Himalayan ranges at the north-eastern angle (in about 28° N. lat., 97° E. long.) throw off spurs and chaius to the south-east. These spurs, which have been but imperfectly explored, and may possibly constitute an independent mountain system, separate the British provinces of Assam and Eastern Bengal from Independent Burmah. ‘They are known successively as the Abar, Nagd, Patkoi, and Barel ranges. Turning almost due south in 25° lat., they culmi- nate in the Blue Mountain (7100 feet), in 22° 37’ N. lat., 93° 10’ E. long., and then stretch southwards under the nanie of the Arakan Yomas, separating British Burmah from Independent -Burmah, until they again rise into the mountain of Myeng-mateng (4700 feet), in 194° of N. lat. Up to this point, the eastern frontier follows, generally speaking, the watershed which divides the river systems of the Brahma- putra, Meghna, Kuladan (Koladyne), &c., in Bengal and British Burmah, from the Irawadi basin in Independent Burmah. But from near the base of the Myeng-mateng Mountain, in about 194° lat., the British frontier stretches almost due east, in an artificial line which divides the lower districts and delta of the Irawadi in British Burmah from the middle and upper districts of that river in Independent Burmah. Stretching south-eastwards from the delta of the Trawadi, a confused succession of little explored ranges separates the British province of Tenasserim from the native kingdom of Siam. ‘The boundary line runs down to Point Victoria at the extremity of Tenasserim (9° 59’ N. lat., 98° 32’ E. long.), following in a somewhat rough manner the watershed between the rivers of the British territory on the west and of Siam on the east.

The empire included within these boundaries is rich in Three varieties of scenery and climate, from the highest mountains “gions.

in the world to vast river deltas raised only a few inches above the level of the sea. It forms a continent rather than a country. But if we could look down on the whole from a balloon, we should find that India consists of three separate and well-defined tracts. ‘The first includes the lofty

Himdlaya mountains, which shut it out from the rest of Asia ; and which, although for the most part beyond the British frontier, form an overruling factor in the physical geography of northern India. The second region stretches southwards from the base of the Himalayas, and comprises the plains of the great rivers which issue from them. 'The third region slopes upward again from the edge of the river plains, and consists of a high three-sided table-land, sup- ported by the Vindhy4 mountains on the north, and by the

known in the ageregate as the poun- Himalayas, amid which lie the independent states of Bhutdn daries.

Hima- layas.

River plains.

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Fastern and Western Ghats, which run down the coast on either side till they meet at a point near Cape Comorin. The interior three-sided table-land thus enclosed is broken by peaks and ranges, interspersed with broad expanses of level uplands, and covers the whole southern half of the peninsula.

The first of the three regions isthe Himdlaya mountains and their offshoots to the southward. The Himdlayas— literally, the "' Dwelling-place of Snow," from the Sanskrit hima, frost (Latin, hems, winter), and dlaya, a house— comprise a system of stupendous ranges, the loftiest in the world. They are the modus of Ptolemy (among other names), aud extend in the shape of a scimitar, with its edge facing southwards, for a distance of 1500 miles along the northern frontier of India. At the north-eastern angle of that frontier, the Dihang river, the connecting link between the Tsan-pu (Sangpu) of Tibet and the Brahmaputra of Assam, bursts through the main axis of the range. At the opposite or north-western angle, the Indus in like manner pierces the Himalayas, and turns southwards on its course through the Punjab. The Himalayan region has been fully described in a separate article, vol. xi. p. 821.

This wild region is in many parts impenetrable to man, and nowhere yields a passage for a modern army. It should be' mentioned, however, that the Chinese outposts extend as far as a point only 6000 feet above the Gangetic plain, north of Khatmandu. Indeed, Chinese armies have seriously threatened Khatmandu itself; and Sir David Ochterlony's advance from the plains of Bengal to that city in 1816 is a matter of history. Ancient and well-known trade routes exist, by means of which merchandise from the Punjab finds its way over heights of 18,000 feet into Eastern Turkestan and Tibet. The Muztagh (Snowy Mountain), the Karakoram (Black Mountain), and the Changchenmo are the most famous of these passes.

The Himalayas not only form a double wall along the north of India, but at both their eastern and western extremities send out ranges to the south, which pro- tect its north-eastern and north-western frontiers. On the north-east, those offshoots, under the name of the Naga and Patkoi mountains, &c., form a barrier between the

civilized British districts and the wild tribes of Upper |

Burmah. The southern continuations of these ranges,

known as the Yomas, separate British from Independent

Burmah, and are crossed by passes, the most historic of which, the Aeng or Au, rises to 4668 (formerly given at 4517) feet, with gradients of 472 feet to the mile.

On the opposite or north-western frontier of India, the mountainous offshoots run down the entire length of the British boundaries from the Himalayas to the sea. As they proceed southwards, their best marked ranges are in turn known as the Sufed Koh, the Sulaiman, and the Hala mountains. These massive barriers have peaks of great height, culminating in the Takht-i-Suldiman or Throne of Solomon, 11,317 feet above the level of the sea. But the mountain wall is pierced at the corner where it strikes

southwards from the Himalayas by an opening through –

which the Kabul (Cabul) river flows into India. An ad- jacent opening, the Khyber Pass (rising to 3373 feet), the Kuram Pass to the south of it, the Gwalari Pass near Der& Ismail Khan, the Tal Pass debouching near Dera Ghazi Khan, and the famous Bolan Pass (5800 feet at top) still farther south, furnish the gateways betwecn India and Afghanistan. The Hala, Brahui, and Pab mountains form the southern hilly offshoots betwecn India and Baluchistan, and have a much less elevation.

The wide plains watered by the Himalayan rivers form the second of the three regions into which we have divided India. They extend from the Bay of Bengal on the east to the Afghan frontier and the Arabian Sea on the west,

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and contain the richest and most densely crowded provinces of the empire. One set of invaders after another has from prehistoric times entered by the passes at their eastern and north-western frontiers. They followed the courses of the rivers, and pushed the earlier comers southwards before them towards the sea. About 150 millions of people now live on and around these river plains, in the provinces known as the lieutenant-governorship of Bengal, Assam, the North-Western Provinces and Oudh, the Punjab, Sind, Rajputana, and other native states.

he vast level tract which thus covers northern India is River One of these systems,

watered by three distinct river systems, systems takes its rise in the hollow trough beyond the Himalayas, and issues through their western ranges upon the Punjab as the Sutlej and Indus. The second of the three river systems also takes its rise beyond the double wall of the Himalayas, not very far from the sources of the Indus and the Sutlej. It turns, however, almost due east instead of west, enters India at the eastern extremity of the Himdlayas, and becomes the Brahmaputra of Assam and Eastern Bengal. ‘Thesc rivers collect the drainage of the northern slopes of the Himalayas,

and convey it, by long and tortuous although opposite routes, into India. Indeed, the special feature of the Himalayas is that they send down the rainfall from their northern as well as from their southern slopes to the Indian plains. Of the three great rivers of northern India, the two longest, namely the Indus with its feeder the Sutlej and the Bralmiaputra, take their rise in the trough on the north of the Himalayas. 'The third river system of northern India receives the drainage of their southern slopes, and eventually unites into the mighty stream of the Ganges. In this way the rainfall, alike from the northern and southern slopes of the Himdlayas, pours down into the river plains of Bengal.

Throughout the river plains of northern India, two Crops,

harvests, and in some provinces three, are reaped each year. These crops are not necessarily taken from the same land; but in many districts the best ficlds have to yield two harvests within the twelve montlis. In Lower Bengal, pease, pulses, oil-seeds, and green crops of various sorts are reaped in spring; the early rice crops in September ; the great rice harvest of the year, and other grains, in November and December. Before these last have been gathered in, it is time to prepare the ground for the spring crops, and the Bengal husbandman knows no rest except during the hot weeks of May, when he is anxiously waiting for the rains. But it should always be remembered that rice is the staple crop in only a limited area of India, and that it forms the everyday food of only a comparatively small proportion of the population. It has been cstimated that, in the absence of irrigation, the rice crop requires an annual rainfall of at least 36 inches; and an Indian pro- vince requires an avcrage fall of not less than 50 or 60 inches in order to grow rice as its staple crop. A line might almost be drawn across Behar, to the north of which the food of the people ceascs to be rice and becomes wheat and millets, &c. There are, indeed, great rice-growing tracts in irrigated or low-lying districts of north-western India, but their produce is consumed by the richer classes or exported.

A detailed account of the most important products will be gcenery. |

found under the heading of "Agriculture," farther on in the present article. They are here alluded to only so far as is necessary to give a general idea of the scenery of the river plains. In the northern and drier regions along the

upper courses of the rivers, the country rises gently from their channels in fertile undulations, dotted with mud _ villages and adorned with noble trees. Mango groves scent the air with their blossom in spring, and yield their abundant fruit

in summer. hanging roots ; the stately pipal, with its green masses of foliage ; the leafless wild cotton-tree, glowing with heavy crimson flowers; the tall, feathery tamarind, and thie quick-growing bdbul, rear their heads above the fields. Ag the rivers approach the coast, the palms begin to take possession of the scene. The ordinary landscape in the delta. is a flat stretch of rice-fields, fringed round with evergreen masses of bamboos, cocoa-nuts, date-trees, areca, and other coronetted palms. 'This densely peopled tract seems at first sight bare of villages, for each hamlet is hidden away amid its own grove of plantains and wealth- giving trees. The bamboo and cocoa-nut play a conspicuons part in the industrial life of the people; and the number of products derived from them, including rope, oil, food, and timber, has been dwelt on with admiration by many writers.

The crops also change as wo sail down the rivers. In the north, the principal grains are wheat, barley, Indian corn, and a variety of millets, such as jodér (Iolcus Sorghum) and bdjra (LHolcus spicatus). In the delta, on the other hand, rice is the staple crop and the universal diet. Ina single district, Rangpur, 295 separate kinds of rice are known to the peasant, who has learned to grow his favourite crop in every locality, from the solid field, which yields the dman harvest, to the swamps 12 feet deep, on the surface of whose waters the rice ears may be seen struggling upwards for air. Sngar-cane, oil-seeds, flax, mustard, sesamum, palma-christi, cotton, tobacco, indigo, safflower, turmeric, ginger, coriander, capsicum, cummin, and many precious spices and dyes are grown both in the North-Western or Upper Provinces, and in the moister valleys and delta of Lower Bengal. A whole pharmacopcia of native medicines, from the well-known aloe and castor- oil to obscure but valuable febrifuges, is derived from shrubs, herbs, and roots. Resins, gums, varnishes, scents, and a hundred articles of commerce or luxury are collected in the fields or forests. Vegetables of many sorts, both indigenous and imported from Europe, form a large part

of the food of the people. The melon and huge yellow pumpkin spread themselves over the thatched roofs ; fields of potatoes, yams, and brinjal are attached to the home- steads, The tea-plant is reared on the hilly ranges that skirt the plains both in the north-west and in Assam; the opium poppy about half down the Ganges, around Benares and Patna; the silk-worm mulberry still farther down in Lower Bengal ; while the jute fibre is essentially a crop of the delta, and would exhaust any soil not fertilized by river floods. Even the jungles yield the costly lacdye and tasar silk cocoons. The mahud, also a product of the jungle, produces the fleshy flowers which form a staple article of food among the hill tribes, and when distilled supply a cheap spirit. The sd/, sissu, tun, and many other indigenous trees yield excellent timber. Flowering creepers, of gigantic size and gorgeous colours, festoon the jungle; while each tank bears its own beautiful crop of the lotus and water-lilies. Nearly every vegetable product that feeds and clothes a people, or enables it to trade with foreign countries, abounds.

We come now to the third division of India, namely the three-sided table-land which covers the southern half or more strictly peninsular portion of India. This tract, known in ancient times as the Deccan (Dakshin), literally "the right hand or south," comprises the Central Provinces, Berar, Madras, Bombay, Mysore, and the native territories of the nizim, Sindhia, Holkar, and other feudatory states. It had in 1872 an aggregate population of over 90 millions, For the sake of easy remembrance, therefore, we may take the inhabitants of the river plains in the north to be now nearly 150 millions, and those of the southern three-sided

Northern table- land.

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The spreading banyan, with its colonnades of j

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table-land at nearly 100 millions. The Deccan, in its local The acceptation, is restricted to the high tract between tle Deccan. Narbada (Nerbudda) and the Kistna rivers; but it is popularly understood to include the whole country south

of the Vindhyas as far as Cape Comorin. It slopes up

from the southern edge of the Gangetic plains, Three ranges of hills support its northern, its eastern, and its western side ; and the last two meet at a sharp angle near

Cape Comorin.

The northern side rests on confused ranges, running with a general direction of east to west, and known in the aggregate as the VindhyA mountains. The Vindhyds, however, are made up of several distinct hill systems. Two sacred peaks guard the flanks in the extreme east and west, with a succession of ranges stretching 800 miles between, At the western extremity, Mount Abu, famous for its exquisite Jain temples, rises, as a solitary outpost of the Aravalli hills, 5650 feet above the Rajputana plain, like an island out of the sea. Beyond the southern limits of that plain, the Vindhya range of modern geography runs almost due east from Cuzerat, forming the northern wall of the Narbadé valley. The Satpura mountains stretch also east and west to the south of that river, and form the watershed between it and the Tapti. Towards the heart of India the eastern extremities of these two converge in the highlands of the Central Provinces and their lofty level plains. Passing still farther east, the hill system finds a continuation in the Kaimur range and its congeners, which eventually end in the outlying peaks and spurs that form the western boundary of Lower Bengal, and abut on the old course of the Ganges under the name of the Rajmahal hills. On the extreme east, Mount Parasn4th—like Mount Abu on the extreme west, sacred to Jain rites— rises to 4400 feet above the level of the Gangetic plains. The various ranges of the Vindhyds, from 1500 to over 4000 feet high, form, as it were, the northern wall and buttresses which support the central table-land. Though now pierced by road and railway, they stood in former times as a barrier of mountain and jungle between northern and southern India, and formed one of the main obstruc- tions to welding the whole into an empire. They consist of vast masses of forests, ridges, and peaks, broken by cultivated valleys and broad high-lying plains.

The other two sides of the elevated southern triangle are Ghats. known as the Eastern and Western Ghats (Ghauts). These start sonthwards from the eastern and western extremities of the Vindhyd system, and run along the

eastern and western coasts of India. The Eastern Ghats stretch in fragmentary spurs and ranges down the Madras Presidency, here and there receding inland and leaving broad level tracts between their base and the coast. The Western Ghats form the great sea-wall of the Bombay Presidency, with only a narrow strip between them and the shore. In many parts they rise in magnificent precipices and headlands ont of the ocean, and truly look like colossal " passes or landing- stairs" (ghdts) from the sea. The Hastern Ghats have an average elevation of 1500 feet. The Western Ghats ascend more abruptly from the sea to an average height of about 3000 feet, with peaks up to 4700, along the Bombay coast, rising to 7000 and even 8760 in the upheaved angle which they unite to form with the Eastern Ghats, towards their southern extremity.

The inner triangular plateau thus enclosed lies from 1000 to 83000 feet above the level of the sea. But it is dotted with peaks and seamed with ranges exceeding 4000 feet in height. Its best known hills are the Nilgiris (Neilgherries), with the summer capital of Madras, Utakamand, 7000 feet above the sea. The highest point is Doddbetta Peak (8760 feet), at the upheaved southern angle. The interior plateau is approached by several

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Western famous passes from the level coast-strip ou the western

Ghats.

Fastern Ghats.

Rivers of Bay of Bengal. Southern Madras Presidency, viz., the Godavari, the Krishna, and

table- land.

side. The Bor-Ghat, for example, ascends a tremendous ravine about 40 miles south-east of Bombay city, to a height of 1798 feet. In ancient times this pass was regarded as the key of the Deccan, and could be held by a

small band against any army attempting to penetrate from the coast. A celebrated military road was constructed by the British up the Bor-Ghat, and practically gave the command of the interior to the then rising port of Bombay. A railway line has now been carried up the pass, twisting round the shoulders of mountains, tunnelling through intervening crags, and clinging by a narrow ledge to the face of the precipices. At one point the zigzag is so sharp as to render a circuitous turn impossible, and the trains have to stop and reverse their direction on a levelled terrace. The Thall Ghat, to the north of Bombay, has in like manner been scaled both by road and railway. Another cele- brated pass, farther down the coast, connects the military centre of Belgium with the little port of Vingurla. 'These "landing-stairs " from the sea to the interior present scenes of rugged grandeur. The trap rocks stand out, after ages of denudation, like circular fortresses flanked by round towers, from the mass of hills behind,—natural fastnesses, which in the Marhatt4 times were rendered impregnable to Oriental warfare. To the south of Bombay, the passes climb up from the sea through thick forests, the haunt of the tiger and the stately bison. Still farther down the coast, the western mountain wall dips down into the Palghat valley, a remarkable gap, 25 miles broad, and leading by an easy route, only 1500 feet above the sea at its highest point, from the sea-board to the interior. A railway now extends by this passage from Beypur across the peninsula to Madras.

On the eastern side of India, the Ghats form a series of spurs and buttresses for the elevated inner plateau, rather than a continuous mountain wall They are traversed by a number of broad and easy passages from the Madras coast. Through these openings the rainfall of the southern half of the inner plateau reaches the sea. The drainage from the northern or Vindhydn edge of the three-sided table-land falls into the Ganges. The Narbad4 (Nerbudda) and Tapti carry the rainfall of the southern slopes of the Vindhyés and of the Satpura hills, in almost parallel lines, into the Gulf of Cambay. But from Surat, in 21° 9° lat., to Cape Comorin, in 8° 4' lat., no large river succeeds in reaching the western coast from the interior table-land. The Western Ghats form, in fact, a lofty unbroken barrier between the waters of the central plateau and the Indian Ocean. 'The drainage has therefore to make its way across India to the eastwards, now turning sharply round project- ing ranges, now tumbling down ravines, or rushing

along the valleys, until the rain which the Bombay sea-breeze has dropped upon the Western Ghats finally falls into the In this way the three great rivers of the

the Kaveri (Cauvery), rise in the mountains overhanging the western coast, and traverse the whole breadth of the central table-land before they reach the sea on the eastern shores of India.

The physical geography and the political destiny of the two sides of the Indian peninsula have been determined by the characteristics of the mountain ranges on either coast. On the east, the country is comparatively open,and was everywhere accessible to the spread of civilization. On the east, therefore, the ancient dynasties of southern India fixed their capitals. Along the west, only a narrow strip of lowland intervenes between the barrier range and the seaboard. The inhabitants of those tracts remained apart from the civilization of the eastern coast. To this day one of their ruling races, the Nairs, retain land-tenures and

social customs, such as polyandry, which mark a much ruder stage of human advancement than Hinduism, and in other parts of India only linger among isolated hill tribes. On the other hand, the people of the western coast enjoy a bountiful rainfall, unknown in the inner plateau and the east. The monsoon dashes its rain-laden Rainfall clouds against the Western Ghats, and pours from 250 to of oo 100 inches of rain upon their maritime slopes from Khdn-j0q desh down to Malabar. By the time that the monsoon

has crossed the Western Ghats, it has dropped the greater

part of its aqueous burden, and central districts, such as Bangalore, obtain only about 35 inches. ‘The eastern coast

also receives @ monsoon of its own; but, except in the neighbourhood of the sea, the rainfall throughout the Madras presidency is scanty, seldom exceeding 40 inches

in the year. The deltas of the three great rivers along

the Madras coast form, of course, tracts of inexhaustible fertility ; and much is done by irrigation on the thirsty inland plateau to husband and utilize both the local rainfall and the accumulated waters which the rivers bring down. ;

In the valleys, and upon the elevated plains of the central Crops.

plateau, tillage has driven back the jungle to the hilly recesses, and fields of rice and many kinds of smaller grain or millets, tobacco, cotton, sugar-cane, and pulses spread over the open country. The black soil of the Deccan is proverbial for its fer- tility ; and the level strip between the Western Ghats and the sea rivals even Lower Bengal in its fruit-bearing palms, rice harvests, and rich succession of crops. The deltas on the eastern side have from time immemorial been celcbrated as rice-bearing tracts. The interior of the table-land, as may be inferred from the scanty rainfall, is liable to drought. The people contend against the calamitics of nature by varied systems of irrigation,—drawing their water-supply in some districts from wells, in others from tanks and reservoirs, or from ae artificial lakes formed by dam- ming up the ends of river valleys. They thus store the rain brought during a few months by the monsoon, and husband it for use throughout the whole year. The food of the common people consists chiefly of small grains, such as jodr, bdjra, and rdgt. The great export is cotton, with wheat from the northern districts of Bombay. 'The pepper trade with Malabar dates far beyond the age of Sindbad the Sailor, and probably reaches back to Roman times. Cardamoms, spices' of various sorts, dyes, and many medicinal drugs are also grown.

It is on the three-sided table-land, and among the hilly spurs Minerals.

which project from it, that the mineral wealth of India les id. Coal-mining now forms a great industry on the north-eastern side of the table-land, in Bengal, and also in the Central Provinces. The commercial aspects of this and similar undertakings will be dealt with in a later section of the present article. Beds of iron- ore and limestone have been worked in several places, and hold out a possibility of a new era of enterprise to India in the future. Many districts are rich in building stone, marbles and the easily worked

laterite. Copperand other metals exist in small quantities. Gold dust has from very ancient times been washed out of the river-beds, and gold-mining is being attempted on scientific prin- ciples in Madras and Mysore. ;

Of the three regions of India, now briefly surveyed, the first, or the Himélayas, lies for the most part beyond the British frontier, but a knowledge of it supplies the key to the ethnology and history of India. The second region, or the great river plains in the north, formed the theatre of the ancient race-movements which shaped the civilization and the political destinies of the whole Indian peninsula, The third region, or the triangular table-land in the south, has a character quite distinct from either of the other two divisions, and a population which is now working out a separate development of its own. Broadly speaking, the Himalayas are peopled by Turanian tribes ; the great river plains of Hindustan are still the home of the Aryan race; the triangular table-land has formed an arena for a long struggle between that gifted race from the north and what is known as the Dravidian stock in the south.

To this vast empire the English have added British British Burmah, consisting of the lower valley of the Irawadi Burmah. (Irrawaddy) with its delta, and a long flat strip stretching down the eastern side of the Bay of Bengal. Between the

narrow maritime tract and the Irawadi runs a backbone of lofty ranges, These ranges, known as the Yoma (Roma) mountains, are covered with dense forests, and both his- torically and geographically separate the Irawadi valley from the strip of coast. The Yoma (Roma) ranges have peaks exceeding 4000 feet, and culminate in the Blue Mountain (7100 feet). They are crossed by passes, one of which, the An or Aeng, rises to 4668 feet above the sea- level. A thousand creeks indent the seaboard; and the whole of the level country, both on the coast and in the Trawadi valley, forms one vast rice-field. The river floats down an abundant supply of teak and bamboos from the north. Tobacco, of an excellent quality, supplies the little cigars which all Burmese (men, women, and children) smoke. Arakan and Pegu, or the provinces of the coast strip and the Irawadi valley, contain mineral oil-springs. Tenasserim forms a long narrow maritime province,

which runs from the mouths of the Irawadi southward to Point Victoria, where the British territory adjoins Siam. It is rich in tin mines, and contains iron-ores equal to the finest Swedish, besides gold and copper in smaller quantities, and avery pure limestone. Rice and timber form the

important changes in physical geography. The Nummulitic (Eocene) strata were laid down on the eroded edges of some of the older beds, and in a long trough within the Silurian gneiss of the Ladékh axis, On the south of this true Himdlayan region there is a band of country known

as the Lower Himalaya, in which the beds are often greatly Lower disturbed, and even completely inverted, over great areas, Hima- the old gneiss apparently overlying the sedimentary rocks, 1#Y3-

This Lower Himalayan region is about 50 miles wide, and consists of irregular ridges, varying from 5000 to 8000 feet in height, and sometimes reaching 12,000 feet.

Resting upon the gueiss, but often through inversion apparently underlying it, in the neighbourhood of Simla, 1s a series of unfossiliferous beds (schists, quartzites, sand- stoues, shales, limestones, &c.) known in descending order as the Krél, Infra-Krél, Blaini, and Infra-Blaini beds. In the Krdél beds is a massive limestone (Krél limestone) probably representing the limestone of the Dir Panjal range, which is most likely of Carboniferous age, The Blaini and Infra-Blaini beds are probably Silurian. The Lower Himalayan range ends at the Sutlej valley, west of which the continuation of the central range is

staple exports of Burmah; and rice is also the universal food of the people. British Burmah, with Tenasserim, has an area of 88,556 square miles, and had a population, in

followed immediately by the third or Sub-Himdlayan Sub- range. This occurs almost always on the south of the Himé- Lower Himalayas; it is

*composed of later Tertiary ¥**

*Himi- * The flimdlayan Region.—The geology of this district is | is occasionally absent, and then the great plain slopes layas. – far more complex and less fully known than that of the up to the base of the Lower Himalayan region. It is Peninsular area. Until the ground has been carefully gone | within the Sub-Himdlayan range that the famous SiwAlik Siwéliks. over by the Geological Survey, many points must remain | beds occur, long since known for their vast stores of extinct doubtful; probably even then the problems will not be | mammalia. Of about the same age are the Manchhar fully solved, as large areas of the Himalayas (Nepal and | beds of Sind, which also contain a rich mammalian fauna. Bhutan) are at present inaccessible to Europeans. The | The Lower Manchhars probably correspond to the Ndhan Gneiss. oldest rock of the Himélayas is gneiss, but its age is quite beds, the lowest of the Siwdliks; they rest upon the Gaj unknown. It generally differs in character from the gneiss | beds, which are probably Upper Miocene. From this it of the Peninsula, and also from that of Assam and Burmah. | would seem that the lowest Siwdliks are not older than The Himalayan gneiss is usually white and grey, its Upper Miocene. The higher Siwdlik beds are considered felspars being orthoclase and albite; it contains much | by Mr W. T. Blanford to be Pliocene, and to this later mica and mica schist, and is generally much more uniform period he also refers the mammalian beds of Pikermi in in character than the gneiss of the Peninsula. The latter | Greece. These have a large number of fossils in common is usually pink, its felspar being orthoclase and oligoclase ; | with the Siwdliks ; but they contain, at their base, a marine it contains little mica schist, but often has quartzite and | band with Pliocene shells. The Manchhar and Siwdlik hornblendic rock. Hornblende occurs in the syenitic | beds are chiefly of freshwater origin, ; gneiss of the Northern Himdlayan (or Ladakh) range. The | The Salt Range in the north-west of the Punjab has, in Salt Central Central Himdlayan region may be roughly described as | addition to its economic value, a special geological im- HINaES: gneissie*

axes.

1876, of just under 3 millions of persous.

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For geological purposes India may be mapped out into the three geographical divisions of the Himalayan region, the Indo-Gangetic plain, and Peninsular India.

consisting of two gneissic axes, with a trough or synclinal valley between them, in which fossiliferous beds have been deposited and are now preserved. The gneiss of the southern or main axis (the "central gneiss" of Dr Stoliczka) is the oldest ; that of the northern or Ladakh axis comes next in age. The gneiss of the Ladakh axis is generally syenitic, or is that variety of the Himalayan gneiss already described as containing hornblende. It is probably an extremely altered condition of ordinary marine sediment. The gneiss of the central axis is the ordinary kind ; it is penetrated by granite, which ranges along some of the highest peaks. Between these two gneissic axes occurs the basin-shaped valley, or the Hundes and Zanskar synclinal. In this valley fossiliferous rocks are preserved, giving representatives of the Silurian, Carboniferous, Trias- sic, Jurassic, and Cretaceous formations. All these seem there to have followed each' other without important breaks orunconformities; but after the deposition of the Cretaceous rocks of the Himalayan region, there appear to have been

rocks (Siwaliks, &c.), which range parallel with the main chain. Generally the Sub-Himdlayas consist of two ranges, separated by a broad flat valley ("dun" or "doon "); the southern slope, overlooking the great Indo-Gangetic plain, is usually the steepest. Below Naini Tal and Darjiling (Darjeeling), the sub-Himdlayan range is wauting ; on the Bhutdn frontier the whole range

portance; and from that point of view it is one of the most interesting districts in India, Representatives of most of the great European formations of Silurian and later epochs are found there ; and throughout all the vast length of time represented by these formations there is here no direct evidence of any important break in succession, or unconformity. The lowest beds (salt marl, probably Silurian) and the highest (Siwdliks) are found throughout the range. But the others cannot all be traced con- tinuously throughout; some occur well developed in one place, some in another. All the principal fossiliferous beds of the Jurassic, Triassic, and Carboniferous formations are confined to the western part of the range.

The Jndo-Gangetic Plain covers an area of about 300,000 Indo-

square miles, and varies in width from 90 to nearly 300 Gangetic It rises very gradually from the sea at either end ; Pain.

miles. the lowest point of the watershed between the Punjab rivers and the Ganges is about 924 feet above the sea. This point, by a line measured down the valley, but not fol-

Tts age.

Alluvial deposits.

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lowing the winding of the river, is about 1050 miles from the mouth of the Ganges and 850 miles from the mouth of the Indus, so that the average inclination of the plain, from the central watershed to the sea, is only about 1 foot per inile, It is less near the sea, where for long distances there ig no fall at all. It is generally more near the watershed; but there is here no ridge of high ground between the Indus and the Ganges, and a very trifling change of level would often turn the upper waters of one river into the other. It is not unlikely that such changes have in past time occurred ; and if so an explanation is afforded of the occurrence of allied forms of freshwater dolphins (Platanista) and of many other animals in the two rivers and in the Brahmaputra.

There is no evidence that the Indo-Gangetic plain existed as such in Pre-Tertiary times. Itis highly probable that the Jurassic and Cretaceous coast-line ran across the northern part of the Bay of Bengal, and that most of the area now occupied by the Gangetic plain was then above the sea. Probably the Jurassic traps of the Réjmahal hills, west of the delta of the Ganges, were continuous with those of Sylhet, east of the delta. Marine J urassic and Cretaceous beds are absent from the margins of the truc Gangetic plain ; so too are marine Eocene beds. In Eocene times the sea spread up the Punjab; but that too was land only in Miocene times.

The alluvial deposits of the plain, as made known by the boring at Calcutta, prove a gradual depression of the area through the later Tertiary times. There are peat and forest beds, which must have grown quietly at the surface, alternating with deposits of gravel, sand, and clay. The thickness of the delta deposit is unknown ; 481 feet was proved at the bore hole, but probably this represents only a very small part of the deposit. Outside

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defined line between these and thie Transition rocks. Vindhyan beds are divided into two groups.

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sist of gneiss, which occurs in three districts:—a very Peninsu- extending to Ceylon ; larIndia,

large part of Bengal and Madras, the Aravalli; and Bundelkhand. Of these formations, the gneiss of Bundelkhand is known to be the oldest, because the oldest Transition rocks rest upon it; whereas the same Transition rocks are altered and intersected by granitic dykes which proceed from the gneiss of the other districts. The Transition rocks are of great but unknown age. are of very old Palwozoic age, perhaps Pre-Silurian. long before the earliest Vindhyan rocks were laid down the Transition rocks had been altered and contorted. The great movements of the earth's crust which produced that contortion are the latest which have taken place to any great extent in the Indian Peninsula. In more recent times there have been local disturbances, and large faults have in places been found; but the greater part of the Peninsula rocks are only slightly disturbed, and the most recent of the great and wide-spread earth movements of this region date back to Pre-Vindhyau times. The Vind- are generally sharply marked off from older rocks; but in the Godavari valley there is no well- The The lower, with an estimated thickness of only 2000 feet, or slightly

more, cover a large area,—extending, with but little change of character, from the Son valley in one direction to

Cuddapah, and in a diverging line to near Bij&pur—in each case a distance of over 700 miles. The upper Vind-

hyans cover a much smaller area, but attain a thickness of about 12,000 feet. beds of sandstone and shale, with some limestones. yet they have yielded no trace of age is consequently unknown.

The Vindhyans are well-stratified As fossils, and their exact So far as the evidence

The Vindhyan rocks which succeed them Vindhyan But rocks.

the delta, in the Bay of Bengal, is a deep depression known as the "swatch of no ground" ; all around it the soundings are only of 5 to 10 fathoms, but they very rapidly deepen to over 300 fathoms. Mr J. Ferguson has shown that the sediment is carried away from this area by the set of the currents; probably then it has remained free from sediment whilst the neighbouring sea bottom has gradually been filled up. Ifso, the thickness of the alluvium is at least 1800 feet, and may be much more.

The Indo-Gangetic plain dates back to Eocene times ; the

goes, it appears probable that they are of very ancient Paleozoic age, perhaps Pre-Silurian. The total absence of fossils is a remarkable fact, and one for which it is difficult to account, as the beds are for the most part quite unaltered. Even if they are entirely of freshwater origin, we should expect that some traces of life from the waters or neigh- bouring land would be found.

The Gondwana series is in many respects the most Gond- interesting and important series of the Indian Peninsula. wana The beds are almost entirely of freshwater origin. Many °™%

origin of the Himalayas may be referred to the same period. Numerous minor disturbances occurred in the area which is now northern India during Palsozoic and Secondary times, but the great disturbance which has resulted in the formation of the existing chain of the Himalayas took place after the deposition of the Eocene beds. Disturbances even greater in

amount occurred after the deposition of the Pliocene beds. 'The Eocenes of the Sub-Himdlayan range were deposited upon uncontorted Palzeozoic rocks, but the whole has since been violently contorted and disturbed. There are some indications that the disturbing forces were more severe to the eastward during middle Tertiary times, and that the main action to the westward was of later date. It seems highly probable that the elevation of the mountain ranges and the depression of the Indo-Gangetic plain were closely related. This view gains some support from a glance at the map, where we see that the curves of the great mountain chains are strictly followed by those of the great alluvial plain. Probably both are due to almost contemporary movements of the earth's crust ; these move- ments, though now of vastly diminished intensity, have not wholly ceased. 'The alluvial deposits prove depression in quite recent geological times; and within the Himélayan region earthquakes are still common, whilst in Peninsular India they are rare.

Peninsular India.—The oldest rocks of this arca con-

subdivisions have been made, but here we need only note the main division into two great groups :—Lower Gondwanas, 13,000 feet thick ; Upper Gondwanas, 11,000 feet thick. The series is mainly confined to the area of country between the Narbadé and the Son on the north and the Krishna on the south ; but the western part of this region is in great part covered by newer beds. The lowest Gondwanas are very constant in character, wherever they are found; the upper numbers of the lower division show more variation, and this divergence of character in different districts becomes more marked in the Upper Gondwana series. Disturbances have occurred in the lower series before the formation of the upper.

The Gondwdna beds contain fossils which are of very great interest. In large part these consist of plants which grew near the margins of the old rivers, and which were carried down by floods, and deposited in the alluvial plains, deltas, and estuarine areas of the old Gondwana period. So vast was the time occupied by the deposition of the Gondwana beds that great changes in physical geography and in the vegetation repeatedly occurred. The plants of the Lower Gondwanas consist chiefly of acrogens (Hgutsetacewe and ferns) and gymnogens (cycads and conifers), the former

being the more abundant. The same classes of plants occur in the Upper Gondwanas ; but there the proportions are reversed, the conifers, and stil]

Panchet group.

Talcher group.

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Damodar series and coal- fields,

Raniganj coal-field.

Karhar- bari cval- field.

Damodar

iron- tone,

GEOGRAPHY. |

more the cycads, being more numerous than the ferns, whilst the Hquisetacee are but sparingly found. But even within the limits of the Lower Gondwana series there are great diversities of vegetation, three distinct floras occurring in the three great divisions of that formation. In many respects the flora of the highest of these three divisions (the Panchet group) is more nearly related to that of the Upper Gondwanas than it is to the other Lower Gondwana floras.

One of the most interesting facts in the history of the Gondwana series is the occurrence near the base (in the Talcher group) of large striated boulders in a fine mud or silt, the boulders in one place resting upon rock (of Vindhyan age) which is also striated. There seems good reason for believing that these beds are the result of ice- action. They probably nearly coincide in age with the Permian beds of Western Europe, in which Professor Ramsay long since discovered evidence of glaciation. But the remarkable fact is that this old ice-action occurred within the tropics, and probably at no very great height above the sea.

The Daémodar series, the middle division of the Lower Gondwanas, is the chief source of coal in Peninsular India, yielding more of that mineral than all other formations taken together. The Karharbdri group is the only other coal-bearing formation of any value. The Ddmodars are 8400 feet thick in the Raniganj coal-field, and about 10,000 feet thick in the Satpura basin. They consist of three divisions ; coal occurs in the upper and lower, ironstone (without coal) in the middle division. The Ranfganj coal- field is the most important inIndia. So far as is yet known, it covers an area of about 500 square miles, extending about 18 miles from north to south and about 39 miles from east to west ; but it extends further to the east under the laterite and alluvium. It is traversed by the Damodar river, along which run the road from Calcutta to Benares and the East Indian Railway. From its situation and im- portance this coal-field is better known than any other in India. Much has been learnt concerning it since the last examination by the Geological Survey, and our remarks are in great part based on recent reports by Mr H. Bauerman. The upper or Raniganj series (stated by the Geological Survey to be 5000 feet thick) contains eleven seams, having a total thickness of 120 feet, in the eastern district, and thirteen seams, 100 feet thick, in the western district. The average thickness of the seams worked is from 12 to 18 feet, but occasionally a seam acquires a great thickness— 20 to 80 feet. The lower or Bardkhar series (2000 feet thick) contains four seams, of a total thickness of 69 feet. Compared with English coals those of this coal-field are of but poor quality ; they contain much ash, and are generally non-coking. The seams of the lower series are the best, and some of these at Sdnktoria, near the Bardkhar river, are fairly good for coke and gas. The best coal in India is in the small coal-field at Karharbari. The beds there are lower in the series than those of the Raniganj field; they belong to the upper part of the Talcher group, the lowest of the Gondwana series. The coal-bearing beds cover an area of only about 11 square miles ; there are three seams, varying from 9 to 33 feet thick. The lowest seam is the best, and this is as good as English steam coal. This coalfield, now largely worked, is the property of the Hast Indian Railway, which is thus supplied with fuel at a cheaper rate than any other railway in the world. Indian coal usually contains phosphoric acid; which greatly lessens its value for iron-smelting. ‘ .

The Damodar series, which, as we have seen, is the chief source of coal in India, is also one of the most important sources of iron. The ore occurs in the middle division, coal in the highest and lowest. The ore is partly a clay

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ironstone, like that occurring in the Coal-measures of England, partly an oxide of iron or hematite. It generally contains phosphorus, which prevents its use in the pre- paration of the finer qualities of steel. A similar difficulty attends the use of the Cleveland ore of North Yorkshire. Experiments have been in progress for years in search of a process which shall, in an economical manner, obtain iron from Cleveland ore free from phosphorus, latterly, it is hoped, with some success. If this be so, India will be a great gainer. Excellent iron-ore occurs in the Meta- morphic rocks south of the Damodar river. Laterite (see below) is sometimes used as ore, It is very earthy and of a low percentage; but it contains only a comparatively small proportion of phosphorus,

The want of limestone for flux, within easy reach, is generally a great drawback as regards iron-smelting in India. Kankar or ghutin (concretionary carbonate of lime) is collected for this purpose from the river beds and alluvial deposits. It sometimes contains as much as 70 per cent. of carbonate of lime; but generally the amount is much less and the fluxing value proportionally diminished. The real difficulty in India is to find the ore, the fuel, and the flux in sufficiently close proximity to yield a profit.

The enormous mass of basaltic rock known as the Deccan Deccan trap 1s of great importance in the geological structure of trap.

the Indian Peninsula. It now covers an area of about 200,000 square miles, and probably formerly extended over a much wider area. Where thickest, the traps are at least 6000 feet thick. They form the most striking physical features of the country, many of the most promi- neut hill ranges being the denuded edges of the basaltic flows. The great volcanic outbursts which

produced this trap commenced in the Cretaceous period and lasted on into the Eocene period.

Laterite is a ferruginous and argillaceous rock, varying Laterite.

from 30 to 200 feet thick, which often occurs over the trap area, but is also found in other districts. As a rule it makes rather barren land ; it is highly porous, and the rain rapidly sinks into it. Laterite may be roughly divided into two kinds, high-level and low-level laterites. The former, which covers a large area of the high basaltic plains, is believed by Mr R. B. Foote to be very fre- quently the product of decomposition of the trap, and to have been thus formed in the place in which it is now found. Sometimes the high-level laterite overlies gneiss or other rocks; and in these cases it has probably been transported. The low-level laterite is generally more sandy in character, and is often associated with gravels, In most cases this has clearly been carried down to its present position, probably largely by subaerial action, aided by rains and streams. Possibly in some cases it has been spread out along the coasts by marine action. The low-level laterite fringes the coast of the Peninsular more or less from near Bombay on the west and Orissa on the east to Cape Comorin. It is not continuous throughout these districts ; and it is of very varying width and eleva- tion. The age of the high-level laterite is unknown. Its formation probably extended throughout a long period of time, much of which must be of very ancient date ; for the laterite, together with the underlying basalt, has suffered extensive denudation.

The mercantile aspects of the coal, iron, and other mineral products of India will be fully treated of under a subse- quent section (pp. 764-66). The geologist comes in this matter to the same conclusion as the economist, viz., that the mineral wealth of India, as represented by its precious stones, was the product of forced labour, and that the search for them in our days can scarcely repay the working expenses.

[For the above section on Geology we are indebted to Mr W. Topley of the Eng- lish Geological Survey.] XIT. — 93

Meteor- ology.

Hima- Jayas.

Indus plain.

Gangetic plain.

METEOROLOGY.

The great peninsula of India, with its lofty mountain ranges behind and its extensive seaboard exposed to the first violence of the winds of two oceans, forms an excep- tionally valuable and interesting field for the study of meteorological phenomena. But only within the last few years have trustworthy statistics been obtained for some of its most important registration stations.

Meteorological Geography.—After the general description of the country which has been given at the beginning of this article, it is only necessary here to sketch very briefly the meteorological geography of the peninsula. The follow- ing sentences are condensed from an interesting account in the first Report on the Meteorology of India (for 1875), by Mr H. F. Blanford. From the gorge of tle Indus to that of the Dihong (Brahmaputra), a distance of 1400 miles, the Himalayas form an unbroken watershed, the northern flank of which is drained by the upper valleys of these two rivers ; while the Sutlej (Satlaj), starting from the southern foot of the Kailas Peak, breaks through the watershed, dividing it into two very unequal portions, that to the north-west being the smaller. The average elevation of the Himalaya crest may be taken at not less than 19,000 feet, and therefore equal to the height of the lower half of the atmosphere ; and indeed few of the passes are under 16,000 or 17,000 feet. Across this mountain barrier there appears to be a constant flow of air, more active in the day-time than at night, northwards to the arid plateau of Tibet. There is no reason to believe that any transfer of air takes place across the Himdlayas in a southerly direction, unless, indeed, in those most elevated regions of the atmo- sphere which lie beyond the range of observation ; but a noc- turnal flow of cooled air, from the southern slopes, is felt as a strong wind where the rivers debouch on the plains, more especially in the early morning hours ; and

this probably contributes in some degree to lower the mean temperature of that belt of the plains which fringes the mountain zone.

At the foot of the great mountain barrier, and separating it from the more ancient land which now forms the high- lands of the peninsula, a broad plain, for the most part alluvial, stretches from sea to sea. On the west, in the dry region, this is occupied partly by the alluvial deposits of the Indus and its tributaries and the saline swamps of Kahhch (Cutch), partly by the rolling sands and rocky surface of the desert of Jaisalmir and Bikanir, and the more fertile tracts to the eastward watered by the Linai. Over tlie greater part of this region rain is of rare occur- rence; and not infrequently more than a year passes with- out a drop falling on the parched surface. On its eastern margin, however, in the neighbourhood of the Aravalli hills, and again on the northern Punjab, rain is more fre- quent, occurring both in the south-west monsoon, and also at the opposite season in the cold weather. As far south as Sirsa and Mult4n (Mooltan), the average rainfall does not much exceed 7 inches.

The alluvial plain of the Punjab passes into that of the Gangetic valley without visible interruption. Up or down this plain, at opposite seasons, sweep the monsoon winds, in a direction at right angles to that of their nominal course ; and thus vapour which has been brought by winds from the Bay of Bengal is discharged as snow and rain on the peaks and hillsides of the Western Himalayas. Nearly the whole surface is under cultivation, and it ranks among the most productive as well as the most densely populated regions of the world. The rainfall diminishes from 100 inches in the south-east corner of the Gangetic delta to less than 30 inches at Agra and Delhi, and there is an average difference of from 15 to 25 inches between the northern and southern borders of the plain.

ENDLTA

stretch up between the hills which connect the Himalayan Bengal. system with that of the Burmese peninsula. or the valley of Assam and the Brahmaputra, is long and narrow, bordered on the north by the Himalayas, on tho south by the lower plateau of the Garo, Khasi, and Nags hills. pied by swamps and jhzls, separates the Garo, Khasi, and Naga hills from those of Tipperah and the Lushai country. The climate of these plains is damp and

equable, and the rainfall is prolonged and generally heavy, especially on the southern slopes of the hills. of some interest has been noticed, more especially at the stations of Sibsagar and Silchar, viz, the great range of the diurnal variation of barometric pressure during the afternoon hours,—which is the more striking, since at

of the Western Himalayas, this range is less than in the open plains.

the encircling ranges by tlie broad Indo-Gangetic plain, divided into two unequal parts, by an almost continuous land. chain of hills running across the country from west by south to east by north, just south of the Tropic of Cancer. This chain may be regarded asa single geographical feature, forming one of the principal watersheds of the peninsula, the waters to the north draining chiefly into the Narbada and the Ganges, those to the south into the Tapti, the

[PHYSICAL

Eastward from the Bengal delta, two alluvial plains Eastern

The first,

The other, short and broad, and in great part occu-

A meteorological peculiarity

Rurki (Roorkee), Lahore, and other stations near the foot

The highlands of the peninsula, which are cut off from Central are table-

Godavari, the Mabanadi, and some simaller streams. Ina meteorological point of view it is of considerable importance. Together with the two parallel valleys of the Narbadé (Nerbudda) and T4pti (Taptee), which drain the flanks of its western half, it gives, at opposite seasons of the year, a decided easterly and westerly direction to the winds of this part of India, and condenses a tolerably copious rainfall during the south-west monsoon.

Separated from this chain by the valley of the Narbada on the west, and that of the Son on the east, the plateau of Mdlw4 and Baghelkhand occupies the

space intervening between these valleys and the Gangetic plain. On the western edge of the plateau are the Aravalli hills, which run from near Ahmadabad up to the neighbourhood of Delhi, and include one hill, Mount Abu, over 5000 feet in height. This range exerts an important influence on the direction of the wind, and also on the rainfall, At Ajmir (Ajmere), an old meteorological station at the eastern foot of the range, the wind is predominantly south-west, and there and at Mount Abu the south-west monsoon rains are a regularly recurrent phenomenon,—which can hardly be said of the region of scanty and uncertain rainfall that extends from the western foot of the range and merges in the Bikanir desert.

The peninsula south of the Satpura range consists chiefly Southem of the triangular plateau of the Deccan, terminating plateau abruptly on the west in the Sahyédri range (Western Ghats), and shelving to the east (Eastern Ghats). This plateau is swept by the south-west monsoon, but not until it has surmounted the western barrier of the Ghats; and hence the rainfall is, as a rule, light at Poona and places similarly situated under the lee of the range, and but moderate over the more easterly parts of the plateau. The rains, however, are prolonged some three or four weeks later than in tracts to the north of the Satpuras, since they are also brought by the easterly winds which blow from the Bay of Bengal in October and the early part of November, when the recurved southerly wind ceases to blow up the Gangetic valley, and sets towards the south-east coast.

This was formerly thought to be a north-east monsoon, and is still so spoken of by certain writers ; but the rainy wind is really a diversion‘of the south-west monsoon.

Southern India.

Burmah,

Tempera- ture,

GEOGRAPHY. |-

At the junction of the Eastern and Western Ghats rises the bold triangular plateau of the N ilgiris, and to the south of them come the Anamalais, the

Palnis (Pulneys), and the hills of Travancore. These ranges are separated from the Nilgiris by a broad depression or pass known as the Palghét Gap, some 25 miles wide, the highest point of which is only 1500 feet above the sea. This gap affords a passage to the winds which elsewhere are barred by the hills of the Ghat chain. The country to the east of the gap receives tlie rainfall of the south-west monsoon ; and during the north-east monsoon ships passing Beypur meet with a stronger wind from the land than is felt elsewhere on the Malabar coast. According to Captain Newbold, this gap "affords an outlet to those furious storms from the eastward which sweep the Bay of Bengal, and, after traversing the peuinsula, burst forth through it to the neighbouring sea."

In the strip of low country that fringes the peninsula below the Ghats, the rainfall is heavy and the climate warm and damp, the vegetation being dense and characteristically tropical, aud the steep slopes of the Ghats, where they have not been artificially cleared, thickly clothed with forest,

In Burmah, the country around Ava, as well as the hill country to the north, has suffered from severe earthquakes, one of which destroyed Ava in 1839, The general meri- dianal direction of the ranges and valleys determines the direction of the prevailing surface winds, this being, how- ever, subject to many local modifications. wppear, from Dr Anderson's observations of the movement of the upper clouds, that throughout the year there is, with but slight interruption, a steady upper current from the south-west, such as lias been already noticed over the Himalayas. The rainfall in the lower part of the Irawadi valley, viz., the delta and the neighbouring part of the province of Pegu, is very heavy; and the climate is very mild and equable at all seasons. But higher up the valley, and especially north of the Pegu frontier, the couutry is drier, and is characterized by a less luxuriant vegetation, and a retarded and more scanty rainfall.

Observatories.—Meteorological observatories have been established at one hundred and three stations in India (including British Burmah and the Andamans). These observatories are situated at all elevations, from the highest, Leh (11,538 feet above mean sea-level) and Chakrata (7051 feet), to Negapatam (15 feet) and Sagar Island, the lowest, which is only 6 feet above mean sea-level.

Temperature of the Air.—From the average annual mean tempera- tures of 83 stations (derived from the means of three or more years) the following fignres are taken. In the following four stations in this list, the average mean yearly teimpcrature was over 82° F, ; —Trichinopoli, 82°8°; Vizagapatam, 82°7°; Madras, 82°4°; and Madura, 82°2.° All of these stations are in the Madras Presidency. The next highest means are returned by Negapatam (also in Madras), 81:9° ; Cuttack and Port Blair, each 80°5°; False Point, 80°20°; Goa, 79°9°; Cochin, 79°8°; Sagar Island, 79°5°; Deesa, 79°4°; and Calcutta, 79°2°. The mean annual temperature of Bombay is 78°8°, so that it is the coolest of the three presidency towns. The lowest means are obtained at the hill stations of Darjiling, 53°9°; Simla, 54:°4°; Murree, 55:8°; and Chakrata, 56°1°, Between these and the next coolest stations is a great gap, Ranikhet following with 60°4°, Pachmarhi with 68°7°, and Rawal Pindi with a yearly mean of 69°4°. The highest mean monthly temperatures given are :—95° at Multan, in June; 94°3° at Delhi, in June; 94°1° at Jhansi, in May; 93°6° at Lucknow, in June. The lowest monthly means are returned by the four coldest hill stations mentioned above, the figures being :—Murree—January 37°7°, February 39°4°; Simla —January 39°6°, February 41°1°; Chakrata—January 40°8°, February 42°9°; Darjiling —January 40°7°, February 43°2°.. The mean temperature at Leh in January 1s 17°6°, and in December 24°4°.

Atmospheric Pressure.—The meteorological report for 1877 con- tains a table showing the annual mean pressure at 72 stations, cor- rected (except in the case of Madras) to the Calcutta standard, which reads 0°011 inch higher than that of Kew. From that table the following figures are obtained. 'The mean yearly pressuro at the highest stations is—23°274 at Chakrata, 23°371 at Darjiling, 24°058

But it would.

at Ranikhet, 26-416 at Pachmarhi, and 26:932 at Bangalore. The greatest annual mean pressures returned are—29°862 at Negapatam, 29°856 at Madras, 29°822 at Bombay, and 29-821 at False Point,

__ ftainfall.—The average annual rainfall at 294 stations is recorded in the 1877 meteorological report, from which the following figures have been obtained :— ~

In the Punjab the highest average fall (123°21 inches) is at Dharmsala, which is situated on the face of the hills, and exposed to the full force of the monsoon ; the next highest recorded is little more than half that amount, or 68°61 inches at Simla. The lowest average falls in the Punjab are—6°16 inches at Muzaffargarh, 6°93 at Multan, 7°35 at Dera Ghazi Khan, and 8°23 at Dera Ismail Khan. All these stations are protected by the Suldimdén range from the monsoon.

In Rajputana and Central India the maximum at Jaipur (Jeypore), and the minimum, 60°85 at highest poiut in this part of India,

In the North-Western Provinces the heaviest average falls are at Naini Tal (94°17 inches) and Dehra (70°06), both of which lie high ; the minimum average fall is 24°32 at Aligarh, the next lowest figures being 26°18 at Muttra (Mathura), 26°46 at Agra, and 26°74 at Etah—all stations on the plains.

In Oudh the maximum rainfall is at Sultanpur, 46°72 inches ; and the minimum at Rai Bareli, 39°99 inches,

The following stations of Bengal have an average rainfall of more than 100 inches :—Jalpdiguri, 12216 ; Darjiling, 119-25 ; and Kueh Behar, 119°05—all at the base of the hills ; Noakhali, 107‘52, and Chittagong, 105°61, both on the north-east coast of the Bay of Bengal. ‘lhe lowest averages aro returned by Chapra, 37°06 inchies ; Patna, 38°21; and Gaya, 41°38. The average rainfall for Bengal is 67 inches,

Assam possesses in Cherra Poonjee (Chara Punji) the station with the largest recorded rainfall in the world, ‘The registered fall during the three years ending 1876 averaged 368°41 inches. A total fall of 805 inches was

reported in 1861, of which 366 were assigned to the single month of July. In 1850 Dr Hooker registered 30 inches in twenty-four hours, and returned the fall from June to November of that year at 530 inches. In the four days 9th to 12th September 1877, 56°19 inches were registered. 'The following stations in Assam have also a very high rainfall :—Silchar, 121°07 ; Sylhet, 15380 ; Dibrngarh, 116°48 ; and Tura, 115°76. The lowest recorded averages in Assam are at Samaguting (52°58 inches) and Gauhati (69°23 inches), both on the northern side of the hills separ- ating Cachar from Assam.

In the Central Provinces the highest average falls are at Pach- marhi (82°20 inches) and Balaghat (64°11 inches) ; lowest averages, Khandwa, 32:26 inches, and Bednur, 41'21 inches.

In Bombay, three stations on the Ghats are recorded as having an average rainfall of over 250 inches, viz. :—Matheran, 256°75 inches . Malcolmpet (Mahdableshwar), 252°25; and Baura (Fort), 251°80. The lowest average rainfalls recorded in Bombay are—12'99 inches at Mandargi ; 17°25 at Dhulia ; and 19°93 at Gokak. The average rainfall for Bonibay is 67 inches.

In Sind the average rainfall is very low, varying from 16°31 inches at N agar, and 11°78 at Umarkot, to 5-09 at Shikérpur, and 4°28 at Jacobabad.

In Madras the highest averages recorded are—135°60 inches at Cannanore ; 131°91 at Mangalore; 125°68 at Tellicherri ; 113°62 at Calicut ; and 112°15 at Cochin—all on the west coast. The lowest falls recorded are—at Bellary, 16°06 ; Tuticorin (sheltered by the Ghats), 18°50; Guti (Gooty), 20°85; and Coimbatore, 20°90." All these stations lic low. The average fall at the stations on the east coast is about 41 inches. The average rainfall for Madras is 44 inches.

The rainfall along the coast of British Burmah is heavy, 4s might be expected, the following averages being reeorded :—Sandoway, 218°58 inehes ; Tavoy, 195°47; Maulmain, 191°34 ; Akyab, 189°28 ; Khyouk-hpyu, 170°76. The smallest rainfall is at Thayet-myo (51°04) and Prome (59°46), sheltered by the Yoma rarige.

The rainfall at Port Blair, in the Andamans, is also naturally heavy, the average being returned as 116‘25 inches.

Sun-spot Cycles. —The conclusions arrivedat by the Indian meteorological department on the subject of the sun-spot cycles, which have been engaging tle attention of scientific men, are thus summed up in the 1877 report ~~—In con~~ clusion, the following are the more important inferences that the meteorology of India in the years 1877 and 1878 appear to suggest, if not to establish. There is a tendency at the minimum sun-spot periods to prolonged excessive pressure over India, to an unusual development of the winter rains, and to the occurrence of abnormally heavy snowfall over the Himalayan region (toa greater extent probably in the western than the eastern Himélayas). This appears also to be usually accompanied by a weak

average is 20°27 Mount Abu, the

Rainfall,

Sun-spot cycles and rainfall.

Flora.

Hima- layas,

North- west.

740

south-west monsoon. ‘The characteristics of a weak mon- goon are—great irregularity in the distribution of the rainfall over the whole of India, and the occurrence of heavy local rainfalls, which tend, by a law of rainfall and of air-motion, to recur over the same limited areas. The irregularity of rainfall distribution is often shown by the persistent and prolonged absence of rain over considerable areas. These areas of drought and famine are partly marked off by nature, depending to arcertain extent on the geographical features and position of the district. Thus the rains are more likely to fall below the amount necessary for cultiva- tion in the dry region

of the Deccan or in Upper India, than over the Malabar coast area or the province of Bengal."

FLORA

Unlike many other large geographical areas, India is remarkable for having no distinctive botanical features peculiar to itself. It differs conspicuously in this respect from such countries as Australia or South Africa. Its vegetation is in point of fact of a composite character, and is constituted by the meeting and more or less blending of adjoining floras,—of those of Persia and the south-eastern Mediterranean area to the north-west, of Siberia to the north, of China to the east, and of Malaya to the south-east.

Our space does not admit of any minute discussion of the local features peculiar to separate districts, but regarded broadly, four tolerably distinct types present themselves.

Himélayan.—The base of the Himalayas is occupied by a narrow belt forming an_ extreme north-western extension of the Malayan type described below. Above that there is a rich temperate flora which in the eastern chain may be regarded as forming an extension of that of northern China, gradually assuming westwards more and more of a European facies. Jfagnolia, Aucuba, Abelia, and Skimmia may be mentioned as examples of Chinese genera found in the eastern Himalayas, and the tea-tree grows wild in Assam. The same coniferous trees are common to both parts of the range. Pinus longifolia extends to the Hindu-Kush ; P. excelsa is found universally except in Sikkim, and has its European analogue in P. Feuce, found in the mountains of Greece. Abies smithiana extends into Afghanistan; Abies webbiana forms dense forests at altitudes of 8000 to 12,000 feet, and ranges from Bhutau to Kashmir; several junipers and the common yew (Tacus baccata) also occur. 'The deodar (Cedrus Deodara), which is indigenous to the mountains of Afghanistan and the north-west Himdlaya, is nearly allied to the Atlantic cedar and to the cedar of Lebanon, a form of which has recently been found in Cyprus. A notable further in- stance of the connexion of the western Himalayan flora with that of Europe is the holm oak (Quercus Ilex), which is characteristic of the Mediterranean region.

The upper levels of the Himalayas slope northwards gradually to the Tibetan uplands, over which the Siberian temperate vegetation ranges. This is part of the great temperate flora which, with locally individualized species, but often with identical genera, ranges over the whole of the temperate zone of the northern hemisphere. In the western Himalayas this upland flora is marked by a strong admixture of European species, such as the columbine (Aquilegia) and hawthorn (Crategus Oxyacantha). These disappear rapidly eastward, and are scarcely found beyond Kumaun.

North-Western.—This is best marked in Sind and the Punjab, where the climate is very dry (the rainfall averag- ing less than 15 inches), and where the soil, though fertile, is wholly dependent on irrigation for its cultivation. The flora is a poor one in number of species, and is essentially identical with that of Persia, southern Arabia, and Egypt.

INDSE

The low scattered jungle contains such characteristic species as Capparis aphylla, Acacia arabica.(babul), Populus euph- ratica (the " willows" of Ps. cxxxvii. 2), Salvadora persica (erroneously identified by Royle with the mustard of Matt. xiii, 31), tamarisk, Zizyphus, Lotus, &e. tenths of the Sind vegetation is estimated to be indigenous to Africa. east direction, and then blends insensibly with that of the western peninsula; some species representing it are found in the upper Gangetic plain, and a few are widely distri- buted in dry parts of the country.

ing "the bulk of the flora of the perennially humid and regions of India, as of the whole Malayan peninsula, th

cally from the Ceylon species ; rubber-yielding trecs are

grandis), which is indigenous to the Malayan archipelago,

[PHYSICAL GEOGRAPHY.

More than_ niue-

The dry flora extends somewhat in a south-

Malayan.—This Sir Joseph Hooker describes as form- Assam

e Malayan penin- sula.

Upper Assam valley, the Khasi mountains, the forests of the base of the Himalaya from the Brahmaputra to Nepal, of the Malabar coast, and of Ceylon." It is not of course intended that over this wide and disjointed area there is an actual identity of species; but the affinities and general agreement of facies are sufficiently close to leave no doubt that they belong essentially to one and the same flora. A few illustrations must suffice :— pitcher-plants (WVepenthes), so richly developed in Borneo, occur at Singapore, on the Khast mountains, and in Ceylon, while they are absent from the western peninsula ; wood-oil trees (Dipterocarpee), which abound in the forests of the Malayan archipelago, are well represented by species individualized by isolation in the Malayan peninsula, Ceylon, and southern India; the gamboge of Singapore is scarcely distinguishable botani-

characteristic, such are the climbing Apocynacee found in the Malayan peninsula and Boraco, and the well-known Ficus elastica, indigenous to Assam and Java; numerous palms and several species of Cycas also distinguish this flora from that of the western peninsula. Teak (Z'ectona

is native to both peninsulas as far as 25° N. lat., and is more tolerant of a dry climate than most of its associates,

Western Peninsula.—This type is difficult to characterize, Wester

and is in many respects intermcdiate between the two just India. preceding. It occupies a comparatively dry area, with a rainfall under 75 inches. In respect to positive affinities, Sir Joseph Hooker has pointed out some rejations with the flora of tropical Africa as evidenced by the prevalence of such genera as Grewia and Impatiens, and the absence, common to both countries, of oaks and pines which abound in the Malayanarchipelago. 'The annual vegetation which springs up in the rainy season includes numerous genera, such as Sida and Indigofera, which are largely represented both in Africa and Hindustan. Palms also in both countries are scanty, the most notable in southern India being the wild date (Phenix sylvestris); Borassus and the cocoa- nut are cultivated. The forests, though occasionally very

dense, as in the western Ghats, are usually drier and more open than those of tle Malayan type, and are often scrubby. The most important timber trees are the toon (Cedrela Toona), sil (Shorea robusta), the present area of which forms two belts separated by the Gangetic plain, satin wood (Chlorocylon Swietenia), common in the drier parts of the peninsula, sandalwood, especially charac- teristic of Mysore, iron-wood (Mfesua ferrea), and teak, which has already been alluded to.?

1 For a general sketch of the flora of India recourse must still be had to the introductory essay to the Flora Indica, published by Hooker and Thomson in 1855. The Flora of British India, the preparation of which is (1881) in progress at Kew, will comprise brief descriptions of all the species known to science up to the date of publication. But although no complete analysis of the vegetation is yet possible, its general features are now tolerably well understood.

[For the above scetion on the Flora we are indebted to Mr W. T. T. Dyer of Kew.]

Mamn- mals.

Lion.

Leopard,

ANIMALS. |

Witp ANIMALS,

Mammals.—First among the wild animals of India must be mentioned the hon (Felis leo), which is known to have been not uncommon within historical times in Hindustan Proper and the Punjab. At present, the lion is supposed to be confined to the sandy deserts of Guzerat,

ndia they are shot on foot. In Assam they are sometimes speared from boats, and in the Himalayas they are said to be ensuared by bird-lime. Rewards are given by Govern- ment to native shkdris for the heads of tigers, varying in time and place according to the need. In 1877, 819 persons and 16,137

cattle were reported to have been killed by tigers; on the other side of the account, 1579 tigers were reported slain, and £3777 was paid in rewards. The leopard or panther (7. pardus) is far more common than the tiger in all parts of India, and at least equally destructive to life and property. The greatest length of the leopard is about 7 feet 6 inches. A black variety, as beautiful as it is rare, is sometimes found in the extreme south of the peninsula, and also in Java. The cheetah or hunting leopard (Gueparda jubata) must be carefully dis- tinguished from the leopard proper. This animal appears to be a native only of the Deccan, where it is trained for hunting the antelope. In some respects it approaches the dog more nearly than the cat tribe. Its limbs are long, its hair rough, and its claws blunt and only partially retractile.

The speed with which it bounds upon its prey, when loosed from the cart, exceeds the swiftness of any other mammal. If it misses its first attack, it scarcely ever attempts to follow, but returns to its master. Among other species of the family /'e/idw found in India may be mentioned the ounce or snow leopard (/'. wncia), the clouded tiger (F macroscelts), the marbled tiger cat (/, marmorata), the jungle cat (Z. chaus) and the common viverrine cat (Ff. viverrina).

Wolves (Canis lupus) abound throughout the open wolf Their tribe.

country, but are rare in the wooded districts, favourite prey is sheep, but they are also said to run down antelopes and hares, or rather catch them by lying in ambush. Instances of their attacking man are not uncom- mon, In 1827 upwards of thirty children were carried off by wolves in a single pargand; and the story of Romulus and Remus has had its counterpart in India within recent times. The Indian wolf has a dingy red- dish-white fur, some of the hairs being tipped with black. By some naturalists it is regarded as a distinct species, under the name of Cans pallipes. Three distinct varieties, the white, the red, and the black wolf, are found in the Tibetan Himalayas. The Indian fox (Vulpes bengalensis) is comparatively rare, but the jackal (C. aureus) abounds everywhere, making night hideous by its

never-to-be- forgotten yells. The jackal, and not the fox, is usually the animal hunted by the packs of hounds occasionally

kept by Europeans. The wild dog or dhole (C. dhola) is Dog.

found in all the wilder jungles of India, including Assam and British Burmah. Its characteristic is that it hunts in packs, sometimes containing thirty dogs, and does not give tongue. When once a pack of wild dogs has put up any animal, whether deer or tiger, that animal's doom is sealed. They do not leave it for days, and finally bring it to bay, or run it down exhausted. These wild dogs have sometimes been half domesticated, and trained to hunt for the use of man. A peculiar variety of wild dog exists in the Karen hills of Burmah, thus described from a specimen in confinement. It was black and white, as hairy as a skye- terrier, and as large as a medium-sized spaniel. It had an invariable habit of digging a hole in the ground, into which it crawled backwards, remaining there all day with only its nose and ferrety eyes visible. Among other dogs of India are the pariah, which is merely a mongrel, run wild and half starved ; the poligar dog, an immense creature peculiar to the south; the grey-hound, used for coursing ; and the mastiff of Tibet and Bhutan. The striped hyena (Jlycena striata) is common, being found wherever the wolf is absent. Like the wolf, it is very destructive both to the flocks and to children.

Of bears, the common black or sloth bear (Ursus labiatus) Bear.

is common throughout India wherever rocky hills and forests occur. It is distinguished by a white horse-shoe mark on its breast. Its food consists of ants, honey, and fruit. When disturbed it will attack man, and it is a dangerous antagonist, for it always strikes at the face. The Himalayan or Tibetan sun bear (U. tebetanus) is found along the north, from the Punjab to Assam. During the summer it remains high up in the mountains, near the limit of snow, but in the winter it descends to 5000 feet and even lower. Its congener, the Malayan sun bear (Helarctos malayanus), is found in British Burmah, where also there is a smaller species (J/. ewryspolus), and a very large animal reported to be as big as the American grizzly,

The elephant (H/ephas indicus) is found in many parts Ele- Contrary to what phant.

of India, though not in the north-west. might be anticipated from its size and from the habits of its African cousin, the Indian elephant is now, at any rate, au inhabitant, not of the plains, but of the hills; and even on the hills it is usually found among the higherridges and plateaus, and not in the valleys. From the peninsula of

Rhinoce- ros.

Wild hog.

Wild ass,

742

India the elephant has been gradually exterminated, being only found now in the primeval forests of Coorg, Mysore, and Travancore, and in the tributary states of Orissa. It still exists in considerable number along the tardz or sub- montane fringe of the Himalayas. The main source of supply at the present time is the confused mass of hills which forms the north-east boundary of British India, from Assam to Burmah. 'Two varieties are there distinguished, the gunda or tusker, and the makna or hine, which has no tusks. The reports of the height of the elephant, like those of its intelligence, seem to be exaggerated. The maxi- mum is probably 12 feet. If hunted, the elephant must be attacked on foot, and the sport is therefore dangerous, ospecially as the animal has but few parts vulnerable to a bullet. The regular mode of catching elephants is by means of a sheda or gigantic stockade, into which a wild herd is driven, then starved into submission, and tamed by animals already domesticated. The practice of captur- ing them in pitfalls is discouraged as crucl and wasteful. Elephants now form a Government monopoly everywhere in India. 'he shooting of them is prohibited, except when they become dangerous to man or destructive to the crops ; and the right of capturing them is only lcased out upon conditions. A special law, under the title of "The Ele- phants Preservation Act" (No. VI. of 1879), regulates this licensing system. Whoever kills, captures, or injures an ele- phant, or attempts to do so, without a licence, is punishable by a fine of 500 rupees for the first offence ; and a similar fine, together with six months' imprisonment, for a second offence. In the year 1877~78 a total of two hundred and sixty-four elephants were captured in the province

of Assam, yielding to Government a revenue of £3600. In the season of 1873-74 no less than fifty-three were captured at one time by Mr Sanderson, the superintendent of the Kheda Department in Mysore, who has made a special study of the Indian elephant, as Sir 8. Baker has of the same animal in Ceylon. Though the supply is decreas- ing, elephants continue to be in great demand. Their chief use is in the timber trade, and for Government trans- port. They are also bought up by native chiefs at high prices for purposes of ostentation. Of the rhinoceros, four distinct varieties arc enumerated, two with a single and two with a double horn. The most familiar is the J¢hinoceros unicornis, commonly found in the Brahmaputra valley and in the Sundarbans. It has but one horn, and is covered with massive folds of naked skin. It sometimes attains a height of 6 feet; its horn, which is much prized by the natives for medicinal purposes, seldorn exceeds 14 inches in length. It frequents swampy, shady spots, and wallows in mud like a pig. The inveterate antipathy of the rhinoceros to the elephant seems to be mythical. The Javan rhinoceros (Zt. sondaicus) is found in the same localities. It also has but one horn, and mainly differs from the foregoing in being smaller, and having less prominent "shields." The Sumatran rhino- ceros (/2. sumatrensis) is found from Chittagoug southwards through Burmah. It has two horns and a bristly coat. The hairy-eared rhinoceros (f. Jasiotis) is only known from a specimen captured at Chittagong.

The wild hog (Sus scrofa, var. indica) is well known as affording the most exciting sport in the world—"pig- sticking." It frequents cultivated situations, and is the most mischievous enemy of the villager. A rare animal, called the pigmy hog (Porculia salviania), exists in the tardi of Nepal and Sikkim, and has been shot in Assam. Its height is only 10 inches, and its weight does not excecd 12 ib.

The wild ass (Astzus onager) is confined to the sandy deserts of Sind and Kachhch (Cutch), where, from its speed and timidity, it is almost unapproachable.

Many wild specics of the sheep and goat tribe arc to be

found in the Himalayan ranges. The Ovis ammon and Sheep O. poli are Tibetan rather than Indian species. The wréal and and the shapu are kindred species of wild sheep, found goats. respectively in Laddkh and the Suldimén range. The former comes down to 2000 feet above the sea, the latter

is never seen at altitudes lower than 12,000 feet. The barhal, or blue wild sheep, and the markhur and takr (both

wild goats) also inhabit the Himalayas. A variety of the

ibex is also found there, as well as in the highest ranges of southern India. The saraw (Nemorhadus rubida), allied

to the chamois, lias a wide range in the mountains of the north, from the Himalayas to Assam and Burmah.

The antelope tribe is represented by comparatively few Antelopes,

*species, a8 compared with the great number peculiar to Africa. 'Che antelope proper (Antilope bezoartica), the *« black buck" of sportsmen, is very generally distributed. Its special habitat is salt plains, as on the coast-line of Guzerat and Orissa, where herds of fifty does may be seen, accompanied by a single buck. The doe is of a light fawn colour, and hasnohorns. The colour of the buck is a deep brown-black above, sharply marked off from the white of the belly. Hisspiral horns, twisted for three or four turns like a corkscrew, often reach the length of 30 inches. The flesh is dry and unsavoury, but is permitted meat for Hindus, even of the Brahman caste. The nélgat or blue cow (Portax picta) is also widely distributed, but specially abounds in Hindustan Proper and Guzerat. As with the antelope, the male alone has the dark blue colour. The nilgai isheld peculiarly sacred by Hindus, from its fancied kinship to the cow, and on this account its destructive inroads upon the crops are tolerated. The four-horned antelope (Tetraceros quadricornts) and the gazelle (Gazella bennetti) are also found in India. The chau (Pantholops hodgsont) is confined to the Himalayan plateaus.*

The king of the deer tribe is the sémbhar or gerau (tus Deer.

aristotelis), erroneously called "elk" by sportsmen. It is found on the forest-clad hills in all parts of the country. It is of a deep-brown colour, with hair on its neck almost like a mane; and it stands nearly 5 feet high, with spreading antlers nearly 3 feet in length. Next in size is the swamp deer or bara-singha, signifying "twelve points" (Rucervus duvaucelli), which is common in Lower Bengal and Assam. 'The chetdl or spotted deer (Asis maculata) is generally admitted to be the most beautiful inhabitant of the Indian jungles. Other species include the hog deer (Cervus porcinus), the barking deer or muntjac (Cervulus vaginalis), and the mouse deer (Meminna rndica). The musk deer (Joschus moschiferus) is confined to Tibet.

The ox tribe is represented in India by some of its Bison. noblest species. The gaur (Bibos gaurus), the "bison" of sportsmen, is found in all the hill jungles of the country, in the Western Ghats, in Central India, in Assam, and in British Burmah. This animal sometimes attains the height of 20 hands (close on 7 feet), measuring from the hump above the shoulder. Its short curved horns and skull are enormously massive. Its colour is dark chestnut, or coffee- brown. From the difficult nature of its habitat, and from the ferocity with which it charges an enemy, the pursuit of the bison is no less dangerous and no less exciting than that of the tiger or the elephant. Akin to the gawr, though not identical, are the gaydl or mithan (B. frontalts), con- fined to the hills of the north-east frontier, where it is domesticated for sacrificial purposes by the aboriginal tribes, and the tsine or banting (B. sondaicus), found in Burmah. The wild buffalo (Bubalus arnt) differs from the tame Buffalo. buffalo only in being larger and more fierce. The finest specimens come from Assam and Burmah. The horns of the bull are thicker than those of the cow, but the horns of the cow are larger. A head has been known to measure 13 feet G6 inches in circumference, and 6 feet 6 inches

Rat. tribe.

Birds.

Reptiles.

between the tips. The greatest height is 6 fect, colour is a slaty black; the hide is immensely thick, with scanty hairs. Alone perhaps of all wild animals in India, the buffalo will charge unprovoked. Evcn tame buffaloes seem to have an inveterate dislike to Europeans.

The rat and mouse family is only too numerous. Con- spicuous in it is the loathsome bandicoot (dfus bandicota), which sometimes measures 2 feet in length, including its tail, and weighs 3 ib. It burrows under houses, and is very destructive to plants, fruit, and even poultry, More interesting is the treo rat (df. arboreus), a native of Bengal, about 7 inches long, which makes its nest in cocoa-nut palms and bamboos. The voles or field mice (genus Arvicola) occasionally multiply so exceedingly as to diminish the out-turn of the local harvest, and to require special measures to be organized for their suppression.

Birds.—The ornithology of India, though it is not con- sidered so rich in specimens of gorgeous and variegated plumage as that of other tropical regions, contains many splendid and curious varieties. Some are clothed in nature's gay attire, others distinguished by strength, size, and fierceness. The parrot tribe is the most remarkable for beauty. So various are the species that we cannot even enumerate them, and must refer for details to the scientific works on the subject.1_ Among birds of prey, four vultures are found, including the common scavengers (Gyps indicus and Gt. bengalensis). The eagles compriso many species, but none to surpass the golden eagle of Europe. Of falcons, there are the peregrine (F. pere- grinus), the shain (F. peregrinator), and the lagar (Lf. Jugger), which are all trained by the natives for hawking ; of hawks, the shikara (Astur badius), the sparrow hawk (Accipiter nisus), and the crested goshawk (Astur trivir- getus). Kingfishers of various kinds, and herons are sought for their plumage. No bird is more popular with natives than the maina (Acridotheres tristis), a member of the starling family, which lives contentedly in a cage, and can be taught to pronounce the name of Krislina. Water-fowl are especially numerous. Of game- birds, the floriken (Sypheotides auwritus) is valued as much for its rarity as for the delicacy of its flesh. Snipe (Gal- linago scolopacina) abound at certain seasons, in such

numbers that one gun has been known to make a bag of eighty brace ina day. Pigeons, partridges, quail, plover, duck, teal, sheldrake, widgeon—all of many varieties— complete the list of small game. The red jungle fowl (Gallus ferruginesis), supposed to be the ancestor of our own poultry, is not good eating; and the same may be said of the peacock (Pavo cristatus), except when young. The pheasant does not occur in India Proper, though a white variety is found in Burmah.

Lteptiles.—The serpent tribe in India is numerous ; they Swarm in all the gardens, and intrnde into the dwellings of the inhabitants, especially in the rainy season. Mest are comparatively harmless, but the bite of others is speedily fatal.2 The cobra di capello (Vaga tripudians)— the name given to it by the Portuguese, from the appear- ance of a hood which it produces by the expanded skin about the neck—is the most dreaded. It seldom exceeds 3 or 4 feet in length, and is about an inch and a quarter thick, with a small head, covered on the forepart with large smooth scales; it is of a pale brown colour above, and the belly is of a bluish-white tinged with pale brown or yellow. The Russelian snake (Dabota russellit), about 4 feet in length, is of a pale yellowish-brown, beautifully variegated with large oval spots of deep brown, with a white edging. Its bite is extremely fatal. Itinerant Epionen eotry about these serpents, and cause them to

- *See especially Jerdon and Gould. * See Sir J. Fayrer's Thanatophidia*

assume a dancing motion for the amusement of the spec- tators. They also give out that they render snakes harm- less by the use of charms or music,—in reality it is by extracting the venomous fangs. But, judging from the frequent accideuts which occur, they sometimes dispense with this precaution. All the salt-water snakes in India are polsonous, while tle freshwater forms are wholly innocuous. Sir J. Fayrer has demonstrated that there is no cure for the bite of the cobra, if the snake is full- grown, and if its poison fang is full and is not interfered with by clothing. The most hopeful remedy in all cases of snake bite is the injection of ammonia. The loss of life from this cause in India is painful to contemplate, nor does any means of diminishing the evil seem feasible. It is impossible to exterminate poisonous snakes altogether, even in England. In India the impossibility is yet more evident, from the greater number of the snakes, the character of the country, and the scruples of the people. Something, however, is being effected by the offer of

rewards. In 1877 a total of 16,777 persons are reported —

to have been killed by snakes, as compared with only 819 by tigers. In the same year, rewards to the amount of £811 were given for the destruction of 127,295 snakes.

The other reptiles include two varieties of crocodile (C. porosus and C. biporcatus) and the gavial (Gavialis gangeticus), These are more ugly in appearance than de- structive to human life. Scorpions also abound.

Frishes.—All the waters of India—the sea, the rivers, and the tanks—swarm with a great variety of fishes, which are caught in every conceivable way, and furnish a considerable proportion of the food of the poorer classes. They are eaten fresh, or as nearly fresh as may be, for the art of curing them is not generally practised, owing to the exigencies of the salt monopoly. Iu Burmah the favourite relish of nga-pi is prepared from fish; and at Godlanda, at the junction of the Brahmaputra with the Ganges, an important station has recently been established for salting fish in bond. The indiscriminate slaughter of fry, and the obstacles opposed by irrigation dams to breeding fish, are said to be causing a sensible diminution in the supply in certain rivers. Measures of conservancy have been suggested, but their execution would be almost impractic- able. Among Indian fishes, the Cyprinide or carp family and the Silurvde or cat-fishes are best represented. From the angler's point of view, by far the finest fish is the mahstr, found in all hill streams, whether in Assam, tho Punjab, or the South. One has been caught weighing 60 ib, which gave play for more than seven hours. Though called the salmon of India, the mahsir is really a species of barbel. 'The most recent authority on Indian fishes and their economic aspects is Dr Francis Day.

In this connexion may be mentioned tlie swsw or Gangetic dolphin (Platanista gangetica), which is often erroneously called a porpoise. Both the structure and habits of this animal are very singular. It measures from 6 to 12 feet in length, and in colour is sooty-black. Its head is globular, with a long, narrow, spoon-shaped snout. Its eyes are rudimentary, like those of the mole; and its ear-orifices are no bigger than pin-holes. Its dentition, also, is altogether abnormal. It frequents the Ganges and Indus from their mouths right up to their tributaries within the hills. A specimen has been

taken at least 1000 miles above Calcutta. Ordinarily its movements are slow, for it wallows in the muddy bed of the river, and but rarely comes to the surface to blow. The susw belongs to the order Cetacea ; and inquiries have recently been directed to the point whiether its blubber might not be utilized in commerce,

Fishes,

Insects. —The insect tribes in India may be truly said to Insects,

be innumerable ; nor has anything like a complete classi- fication been given of them in the most scientific treatises.

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The heat and the rains give incredible activity to noxious or troublesome insects, and to others of a more showy class, whose large wings surpass in brilliancy the most splendid colours of art. Stinging musquitoes are innumerable, and moths and ants of the most destructive kind, as well as others equally noxious and disagreeable. Amongst those which are useful are the bee, the silk-worm, and the insect that produces lac. Clouds of locusts occasionally

[POPULATION.

ignorant villagers were naturally aroused by the counting, which they imagined to be preliminary to some fresh exac- tion by the Sarkar or Government. Only in two cr three cases was any real opposition offered; and there is little reason to believe thatany material evasion was accomplished.

The total population of British India was ascertained to General amount to 191,096,603 persons, on an area of 898,381 results, square miles, being an average of 212 persons per square mile.

Popula- The population of India, with British Burmah, amounts | average of 163 persons per square mile.

tion. to 240 millions, or, as already mentioned, exactly double The following tables exhibit the results of the census of the number which Gibbon estimated for the Roman empiie | 1872 ina tabular form, arranged according to provinces in the height of its power. But the English Government, and aggregates of native states, as presented to Parliament like the Roman, has respected the rights of native chiefs | in 1879 in the Statistical Abstract for British India, who are willing to govern peaceably and well, and one-third | No. XIII. for 1877-78. For certain details the Memo- of the country still remains in the hands of hereditary randum on the Census of 1872 presented to Parliament in rulers. Their subjects (including Mysore) make up 54 1875 has been used. No really important changes in the inillions, or over one-fifth of the whole Indian people. The | returns will be made till the next census, but slight alter- British territories (including Mysore, temporarily under | ations or adjustments are from time to time effected. British administration), therefore comprise only two-thirds Arca and Population of India under British Administration. of the area of India, and less than four-fifths, or 191 —$$$$ $e millions, of its inhabitants. Sa stiles Population.

Census. For the first time in the history of India an attempt was

appear, which leave no trace of green behind them, and give the country over which they pass the appearance of a desert, Dr Buchanan saw a mass of these insects in his journey from Madras to the Mysore territory, about 3 miles in length, like a long narrow red cloud near the horizon, and making a noise somewhat resembling that of a cataract. Their size was about that of a man's finger, and their colour reddish. They are swept north by the wind till they strike upon the outer ranges of the Himalayas,

THE PEOPLE.

made in the years 1871-72 to ascertain the population of

per square mile.

to the square mile.

persons.

Under Governor-General—

Deducting the frontier province of Assam and British Burmah beyond the sea, the average is 243 persons The population of the several native states is returned, partly from actual enumeration and partly from mere guessing, at 49,155,746 persons, on an area of 575,265 square miles, being an average of 85 persons The French possessions have an area of 178 square niles and a population of 271,460 persons ; the Portuguese possessions, 1086 square miles and 407,712 The aggregate figures for all India, therefore, are 1,474,910 square miles and 240,931,521 persons, or an

the country by actual counting. The results obtained on Pa oe aus, age 2,711 396,889 that occasion, though in certain points they leave much to Berar ….....-ceeessesesee cas seeees 17,711 | 2,227,654 be desired, may be accepted generally as a tolerable eee seeeeeanereeeeeaaeessseennes 29,325) 5,055,412 approximation to the truth. Prior to this census, occasional | ee pe ERE ane — enumerations had been made, with varying degrees of Media… cc cceeedseiisusheco ae 138,856 | 31,672,613

accuracy, in some of the provinces ; while in others mere conjectural estimates had been allowed to pass uncriticized.

Bombay (including Sind).....

128,142

Under Lieutenant-Governors—

16,349,206

‘ ae : : : emoallieed ances vcaneeenecntin ear 156,200} 60,502,897 In Bengal, for example, where statistical inquiry was 1n a ‘Nal fu. Welbon Provinces ok 81, 403 30,781,204 backward state, the Government had year by year accepted TE hea Mie Re mm: 104,975 | 17,611,498

a loose estimate of 42 millions for the population under its control, and based upon this all its calculations for legislation and finance. The census of 1872 disclosed

Under Chief-Commissioners— OMe sasaccracamensssnasimeunaantnee Central Provinces ….....+ Brisk Wipmal see. caceecs oes eee

23,992 84,208 88,556

11,220,232 8,201,519 2,747,148

a total of nearly 67 millions for Bengal and Assam, being een 45,302| 4,162,019 an increase upon the estimate of more than one-half. In —_ ——— Berar, or the Assigned Districts of Hyderabad, a census Total …..ssccceeeereeseee ceeees 898,381 | 191,096,603

had been taken in 1867, in the Punjab in 1868, and in Oudh in 1869. In these provinces, therefore, it was con- sidered impolitic to trouble the people by a fresh enume- ration. 'Throughout all the rest of India under British administration, including the native state of Mysore, a general census was effected on uniform principles, which may be said to have begun in November 1871 and ended in August 1872. So far as possible, the work was done in a single night; but im certain remote and uncivilized tracts it was of necessity prolonged over several months. Considering the absolute novelty of the undertaking, at least in some provinces, and the scanty means at the dis- posal of the authorities, the general accuracy of the results may be regarded with not a little satisfaction. Subsequent local investigations tend to show that the numbers were under rather than overstated. In a few cases paid enume- rators were engaged; but generally the work was left to

Area in Sq. Miles.

Under Governor-General— Central India and Bundel-

89,098 130,989 80,000

4,399 7,584 37,988 5,125 114,742

Hyderabad (Haidarabad,

Nizam's Dominions)..... IMT POAT siys. sis so cman emteceacrnres Undér Bengal….05..cc0cae+-soe-e », North-Western Provinces PGA assess vgeies

omer Central Provinces ….....

Population.

8,360,571 10,192,871 9,000,000

2,000, 225

126,000 9,328,440

657,018 5,367,042 1,049,710 3,289,392 6,784, 482

inked 49,155,746

the ordinary staff of each district, assisted by the police, the landlords, and their agents. The total expenditure throngh- out all British India was only £82,203, being at the rate of less than half a farthing per head. The suspicions of the

1 Mysore will be handed back in 1881 to the administration of its native rdjd.

2 Oudh is incorporated for most purposes with the N.W. Provinces.

3 The arca of the wild country in which the population is not reckoned has been excluded in calculating these averages

Density of popu- lation.

-

Urban popula. tion.

In- habited houses,

Age and sex,

POPULATION. | Total Area and Population of All Indta.

Area in Sq. Miles,

898,381 | 191,096,603

575,265 | 49,155,746

1,086 407,712 178 271,460

Density per

Population. 5q. Mile

Under British admini- stration

Native States

Portuguese Possessions …

French Possessions

212

85.

chiefly in towns.

Grand total 163

1,474,910 | 240,931,521

According to the report of the registrar-general upon the English census of 1871, "any density of a large country approaching 200 to a square mile implies mines, manufactures, or the industry of cities." But in India a density of thrice this limit, or 600 to the square milo, is often attained throughout large districts which are entirely dependent upon agriculture. Saran, for example, in North Behar, with an area of 2654 square miles and no town exceeding 50,000 inhabitants, has an average density of 778 to the square mile, with a maximum of 984 in the purely agricultural thdnd or police circle of Mashrak. Taking the valley of the Ganges as a whole, from

Saharan- pur down to Calcutta, the average density is about 500 to the square mile, or nearly double that of the United Kingdom.

This high density is obtained without the presence cf many large towns or centres of manufacturing life. Of the total number of 493,444 towns and villages in British India, only 44 are returned as having more than 50,000 inhabitants, 374 as having from 10,000 to 50,000, and 1070 as having from 5000 to 10,000. The 44 towns with more than 50,000 inhabitants have an aggregate urban population of a little more than 54 millions, or less than 3 per cent. of the total population of British India; whereas the 34 towns in England and Wales exceeding the same limit have an aggregate urban population of nearly 74 millions, or 32 per cent. of the total. Taking a lower limit, there are 139 towns in British India with more than 20,000 inhabitants, having an aggregate of 8,484,066, or less than 44 per cent. of the total.

Towns with more than 100,000 Inhabitants.

(CCC Se eee (novo 0)| Banpalore®..... ..c0. 142,513 DOMME 2c osiiswcessaswes see Gaded05 | Amiritiar…..... 1s-» 142,881 RS oiis cvceiinnn veneers oe |MPNOTE? ounces ees ecaseaees 128,441 500) Dee MOG DUT ..... +. .cece verses 122,770 IREWATGR esse cc cvesses scenes VSMUSSUNBROOME Cnc. co costes sos 118,886 0 OE eee 160,553 | Ahmadabad…..... 116,873 PMG iawinivainveseveese UGSH9OON Tan Goon (.....-..-sse0+0 108,000 ME iii ceiisvsin'eninnnne « TOC BEG cian. oe censessceses 107,149 PAIR. oo ..cecesscseseee 143,693 | Bareilly….....0+ oer 102,982

The total number of inhabited houses enumerated in British India is 37,041,259. The average number of houses per square mile is 41, ranging from 102 in Oudh to 6 in British Burmah. The average number of persons per house is 5°15, being pretty uniform throughout. Contrary to the experience of the United Kingdom it is found that the number of inmates to each house is lower in the towns than in the country, the reason assigned being that the shop- keepers do not bring their familics into the towns with them. The houses are grouped into a total of 493,444 villages or townships, giving an average of 75 houses and 386 persons to each. The average area of cach village or township is '55 of a square mile. The villages seem to be

largest in Bombay, with 614 inhabitants each, and smallest in British Burmah, with 195 inhabitants.

Out of the total of 191,096,608 persons in British India, 98,055,381 are returned as males and 92,580,886 as females, leaving 460,336 of whom the sex was unspecified. The proportion of males to females is thus as 100 to 94. In England the females outnumber the males in the proportion of 105 to 100, an excess attributed mainly toemigration. In India, whence there is practically no emigration, it might be expected that this excess of females would disappear, and the two sexes be found on an cquality. In the two great provinces of Bengal and Madras this is practically the case, the excess of females being not greater than 1 per cent., and the proportion being maintained uniformly throughout the districts. But in Oudh the excess of males is 7 per cent., in Bombay 8 per

1 With suburbs, but excluding Howrah. 2 With suburbs.

cent., in the North-Western Provinces 12 per cent., and in the Punjab as high as 16 per cent. We have no reason to suppose that the approximate equality of boys and girls does not hold good in the births throughout India, as in other countries ; aud therefore this great excess of males can only be assigned to two causes—(1) defective registration of females, especially of girls, and (2) female infanticide formerly, and carelessness of infant female life at the present day. Of the existence of these causes we possess independent testimony. In 1870 an act of the legislature was passed applying special regulations to villages or tracts suspected of infanticide, which is the besetting sin of certain high caste tribes of Rajputs. In one tribe of Meerut district only 8 girls under 12 were found to 80 boys. The act is put in force wherever there are less than 54 girls to 100 boys, but the exact limit is at the discretion of Government. The crime is now almost stamped out.

The returns according to age throw some light upon this question. Children under 12 number altogether 66,969,764, and adults above 12 number

123,200,022, leaving 926,817 unspecified. The propor- tion of children to adults is, therefore, as 54 to 100, the correspond- ing proportion in England being 41 to 100. The highest proportion of children (62 to 100) is found in the Central Provinces, where the aboriginal tribes are strongest ; and the lowest proportion (50 to 100) in the North-Western Provinces. An examination of the Bengal returns, district by district, also leads to the conclusion that the aboriginal tribes are more prolific than the Hindus proper. Sub- dividing these returns according tosex, we discover an extraordinary disparity. Of the adults, 62,022,461 are males and 61,197,561 are females. The proportion of male adults to females is, therefore, about 100 to 99, as compared with 100 males to 94 females in the general population. But on turning to the children under 12, we find as many as 35,787,564 boys to only 31,182,200 girls, or 100 boys to only 87 girls. This arises from the defective registration of girls, females under 12 being often returned as women.

The following table shows the population of British Religious India as roughly subdivided according to religion. division.

Broadly speaking, it may be said that at least nineteen out of every twenty people in India are either Hindus or Mahometans, and that there are seven of the former to two of the latter.

Population according to Religion in British India.

Religion. Number. Traets where most numerous.

South; and Upper Valley of Ganges.

Sind, Punjab, Eastern Bengal, and North-West Provinces,

139,343,820 | 7307 40,867,125 2145 |

ceeteneoen

2,832,851 1:49 | British Burmah only, cupgeteaaGortenoho 1,174,436 ‘62 | Punjab only. CHUBHATIST....0s0 50080. 897,682 ‘47 +| Extreme South,

Others3…....csesee0.| 5,417,304 268 | Central Provinees and Bombay. Unspecified.,,..... 561,069 22

The schedules of the census fail entirely to give a satis- Ethnical factory classification of the races among which the vast ‘ivision.

population of India is divided. Using language as our criterion, the people might perhaps be arranged in five classes:—(1) The old races of the south, known as the Dravidian stock, which includes, not only the great peoples using the literary languages of Tamil, Telugu, Malayalam, and Kanarese, but also scattered tribes speaking dialects of the same family, who are found as far north as the hills of Chutid Nagpur; (2) the hill tribes of Central India, from the Bhils of Bombay to the Santals of Bengal, whose physical characteristics are negroid, and whose family of languages has received the name of Kolarian; (3) the tribes of Indo-Chinese origin, who inhabit the southern slopes of tho Himdlayas, the greater part of the Assam valley, and the whole of Burmah;—it seems probable that the semi-Hinduized low castes of Northern Bengal also belong to this stock; (4) high-caste Hindus, or that off- shoot of the august Aryan race which has imposed its language, its religion, and its name upon the greater part of the country; (5) successive waves of Mahometan con- querors, Arab, Afghan, Mughal, and Persian, who form in the aggregate but an infinitesimal element in the general population. Whether pure Aryans are now to be traced in any other class than that of the Brahmans af RS 5:1 ee ai, a_i ee

3 Professing for the most part varions forms of aboriginal belief.

XII, — 94

Mahome- tans,

746

may perhaps be disputed. Even the so-called Rajputs have probably a considerable admixture of Scythic blood. The Vaisya or third caste of Manu’s system is admitted to be almost extinct, while his Sudras are to be found in the pre-existing non-Aryan population.

Principal Divisions of the Population.

Race, &e. Number. Tracts where mosf numcrous.

ITindus. Bréhmans RAJPUtS vrcsecseseseerceeeeees

ae

5,641,138 –

N.-W. Provinces, Oudh, Bengal, Madras. N.-W. Provinces, Bengal, Oudh, Punjab. Madras.

Bengal, Central Provinces, Assam. South and West.

; 8,712,998 17,716,825 595,815

Aboriginal tribes ….....

Native Christians …..... Mahometans,

Mughals …..-ssscsssossees| 219,755

Afghdns or Pathdns…...| 1,841,693

SAVV10Sletceescccaversessosa!) SNUG IDe

Shaikh acceresrseveceesveevee| 4,700,320

Foreignen's.

Punjab. Do.

69,000 | Bombay city and Surat. Bengal.

Manipuris .. Assam. Arabs …... Bombay, Persians Do. Armenians Chinese ….

MGVAY Sie essere sasisinn

Bengal. Burmah,

0.

Bombay.

Caleutta, Madras, and Bombay cities. of whom 75,700 are British.

108,000

Eurasians and a

121,000

Portuguese EUropeans ..sesccsserseeeeses

Among Mahometans, who number in all 40,227,552, four classes are commonly distinguished. Afughals, or the descendants of the last conquering race, number only 219,755, of whom nearly half are to be found in the Pun- jab. Afghdns or Pathdns on the other hand, from their proximity to the frontier, are much more strongly repre- sented, numbering 1,841,693 in all, chiefly in the Punjab and in the Rohilkhand division of the North-West. Sayyids, who claim to be lineally descended from the prophet, num- ber 790,984 ; and Shaikhs, 4,700,320. The remainder are unspecified, but the following tribes or classes among Indian Musalmdns are worthy of notice. In Bengal the vast majority of the Mahometans manifestly belong to the same race a8 the lowest castes of Hindus. They are themselves subdivided into many classes, which in their devotion to hereditary occupations are scarcely to be dis- tinguished from Hindu castes. Of late years a reforming spirit has arisen, leading them to abandon the polytheistic customs and festivals which they shared with their Hindu fellow-villagers. In the Punjab, besides the Pathan im- migrants from across the frontier, Islam has taken 4 strong hold of the native population. The census re- turned upwards of 1,300,000 Jats, 700,000 Rajputs, and 424,000 Gujars among the Musalmans. Here, again, the Mahometans are not strongly distinguished from their Hindu brethren. Baluchis from beyond the frontier num- ber 235,000 in the Punjab, and 145,000 in Sind. Bombay possesses three peculiar classes of Musalmans, each of which is specially

devoted to maritime trade,—the Memons, numbering 49,000, chiefly in Sind; the Borahs, 86,000, mainly in Guzerat ; the Khojahs, nearly 18,000, of whom half live in the island of Bombay. In southern India the majority are known as Dakhani Musalmins, being de- scendants of the armies led by the kings and nawébs of the Deccan. But the two peculiar races of the south are the Moplas (613,000) and the Labbays (312,000), both of which are seated along the coast and follow a seafaring life. They are descended from the Arab traders who settled there in very early times, and have been recruited partly by voluntary adhesions and partly by forcible con- versions during the persecutions of Hyder AH and Tipt Sultan. The Moplas of Malabar are notorious for repeated outbreaks of bloody fanaticism.

The Mahometans are most numerous, as might be

expected, along the valley of the Indus, from Karachi (Kurrachee) to Peshawar. In the Bombay province of Sind they number 78 per cent. of the total population. In the Punjab generally the proportion is 53 per cent., rising to 93 per cent. in the frontier district of Peshdwar. In the North-Western Provinces and also in Oudh the proportion of Mahometans nowhere exceeds 23 per cent., though that part of the country was the scat of successive Musalmén empires for many centuries. In Lower Bengal, on the other hand, the faith of Islam has exercised a more permanent effect upon the population, especially in the valley of the Brahmaputra, The average of Mahometans in the whole province is 33 per cent., rising to 80 per cent. in the deltaic districts of Bogré and Rajshabi. Here, again, it is found that the Mahometans are not most numerous in the neighbourhood of the great Musalmdn capitals, Gaur, Rajmahal, Dacea, and Murshiddbéd, but in the densely populated agricultural tracts, where the semi-aboriginal tribes appear to have willingly embraced Islam in prefer- ence to remaining outcasts beyond the exclusive pale of Hinduism.

The Sikhs are almost entirely confined to the Punjab, Sikbs.

where they number only 6°50 per cent. of the population. Their stronghold is the country between thie rivers Ravi and Sutlej (Satlaj), including the historical cities of Lahore, Amritsar, Ambala (Umballa), and Jalandhar. In no dis- trict do they form more than 17 per cent.

Of the total number of 897,682 Christians, about Christians.

250,000 are believed to be Europeans or to have European blood in their veins) The south of India is the only part where the exertions of the missionaries can be said to be visible in the statistics of population. In the Madras presidency generally, Christians number 533,760, or 1°71 per cent. of the total. Of these, about 416,000 are returned as Roman Catholics, and about 118,000 as Protestants. Nearly one-fifth of all the Christians are found in the single district of Tinnevelli, and they are numerically next strongest in Madura, Tanjore, Trichinopoli, South K4nara, and Malabar. Christianity has been known in southern India for many centuries. A Pehlevi inscription in the ancient church of the St Thomas' Mount near Madras city indicates a settlement of Manichzeans or Persian Chris- tians on the eastern coast, as well as on the west ; and tradi- tion speaks of the preaching of the apostle St Thomas in Madras, Tinnevelli, and Malabar. The adherents of the Syrian church in Malabar, Travancore, and Cochin are the most ancient Christian community in the south. After these come the Roman Catholics, who trace their origin to the teaching of St Xavier and the Madura Jesuits. The Protestant churches date only from about the beginning of the present century, but their progress since that time has been considerable. In Bombay there are 126,063 Christians, of whom nearly 83,000, chiefly Indo-Portuguese, are returned as Roman Catholics. In Bengal the Christians number only 90,763, but since the date of the census missionary effort has been very successful among the hill tribes of Chutié Nagpur. In the North-Western Provinces there are 22,196 Christians, in the Punjab 22,154, in the Central Provinces 10,477, in Mysore 25,676, in Coorg 2410, and the remainder are scattered over Assam, Berar, and Ajmir. In British Burmah the Christians are pro- portionately more numerous than in any other province, amounting to 52,299, or 1°90 per cent., chiefly converts from the hill tribe of Karens. It should be remembered that the above figures are exclusive of the native states, in which the Christians

amount to about 700,000, making a total in round numbers of 14 millions for all India.

An attempt was made at the time of the census to ascertain the Occupa professions and occupations of the male adults, but the results tions.

cannot be accepted as even approximately accurate. The totals,

Specific infirmi- ties.

Vital sta- tistics.

AGRICULTURE. |

however, are here given for what they may be worth. Out ofa classified total of about 62,000,000 adult males, 2,232,000, or 3°6 per cent., were returned as professional or in Government service : 3,844,000, or 6-2 per cent., as in domestic service ; 34,844,000, ot 562 per cent., as agricultural ; 3,224,000, or 5-2 per cént., as com- mercial ; 8,122,000, or 13°1 per cent., as industrial ; 7,626,000, or 12°3 per cent., as labourers ; and 2,108,000, or 3:4 per cent., as in- depeudent and non-productive.

An attempt was also madc to collect statistics of persons afflicted with certain specific infirmities, but here again the results possess little value. The number of insane persons and idiots was returned at 67,000, or 1 in 2700 of the population, being less than 4th of the rate prevailing in England. he deaf and dumb numbered 134,000, or 1 in 1340, a proportion about half as great again as in England ; the blind numbered 354,000, or rather less than 1 in 500, which is double the English rate ; the lepers numbered 96,000, or 1 in 1875.

Returns of both births and deaths are now regularly collected over almost the entire area under British administration. In towns the returns are furnished through the municipalities, while in the rural tracts the agency employed is the police. The figures thus obtained are for the most part so evidently inadequate that it would only be misleading to reproduce them in this place. Suffice it to say that the sanitary commissioner acccpts as approximately correct a calculation which estimates the average duration

of life in India at thirty years and eight months, which is equivalent to an annual death-rate of 82°57 per thousand. During 1877, the year of famine, the ascertained death-rate in Madras rose to 53°2, while the ascertained birth-rate fell to 16°3 per thousand. Both these rates are, of course, mere approximations to the truth, but they serve to indicate how famine attacks a people from two sides. In 1877 the death-rate among European troops in India was 12°71 per thousand, being the lowest ever recorded; among native troops, 13°38 per thousand ; and in the public jails, 61°95 per thousand, rising to 176°01 per thousand in the jails of Madras.

AGRICULTURE.

The cultivation of the soil is the occupation of the Indian people, in a sense which is difficult to realize in England, and which cannot be adequately expressed by figures. As the land tax forms the mainstay of the im- perial revenue, so the rdéyat or cultivator constitutes the unit of the social system. The organized village commu- nity contains many other members besides the cultivators, but they all exist for his benefit, and all alike are directly maintained from the produce of the village fields. Even in considerable towns, the traders and handicraftsmen almost always possess plots of land of their own, on which they raise sufficient grain to supply their families with food. The operations of rural life are familiar to every class. They are enveloped in a cloud of religious sanctions, and serve to mark out by their recurring periods the annual round of common life. According to the returns of the general cen- sus of 1872, the number of adult males engaged in agricul- ture amounts to nearly 35 millions, or 56:2 per cent. of the total. To these ouglt to be added almost all the labourers, an additional 74 millions, or 12°3 per cent.,—- thus raising the grand total of persons directly supported by the land to more than two-thirds of the entire number of adult males, besides those indirectly or incidentally con- nected with it.

But though agriculture thus forms the staple industry of the country, its practice is pursued in different provinces with infinite variety of detail. . Everywhere the same per- petual assiduity is found, but the inherited experience of generations has taught the cultivators to adapt their simple methods to differing circumstances. For irrigation, native patience and ingenuity have devised means which com- pare favourably with the colossal

projects of Government. Manure is copiously applied to the more valuable crops whenever manure is available, its use being limited by poverty and not by ignorance. The rotation of crops is not adopted as a principle of cultivation ; but in practice it is well known that a succession of exhausting crops cannot be taken in consecutive seasons from the same field, and the ad- vantage of fallows is widely recognized. The periodicity of the seasons usually allows two, and sometimes three, har- vests in the year, but not necessarily, nor indeed usually, on

the same fields. For inexhaustible fertility, and for reten- tiveness of moisture in a dry year, no soil in the world can surpass the regar or " black cotton-soil" of the Deccan. In the broad river basins, the inundations deposit annually

a fresh top-dressing of silt, thus superseding the necessity of manures.

The name of rice has from time immemorial been so Rice.

closely associated with Indian agriculture, that it is diffi- cult to realize how comparatively small an area is planted with this crop. If we except the deltas of the great rivers aud the long strip of land fringing the western coast, rice may be called an occasional crop throughout the remainder of the peninsula. But where rice is grown, it is grown to the exclusion of all other crops. In British Burmah, out of a total cultivated area of 2,833,520 acres in 1877-78, as many as 2,554,853 acres, or 90 per cent., were under rice, Independent Burmah, on the other hand, grows no rice, but imports largely from British territory. For Bengal, unfortunately, no general statistics are available. But taking Rangpur as a typical district, it was there found that 14 million acres, out of a classified total of a little over 1? million acres, or 88 per cent., were devoted to rice. Similar proportions hold good for the province of Orissa, the deltas of the Godavari, Kistna, and Kaveri (Cauvery), and the lowlands of Travancore, Malabar, Kanara, and the Concan, Tor the North-Western Provinces and Oudh, again, no agricultural statistics are available ; but though rice, grown in damp

localities, or with the help of irriga- tion, forms a favourite food for the upper classes, the local supply requires to be supplemented by importation from Bengal. Throughout the remainder of the country, except in Assam, which is agriculturally a continuation of the Bengal delta, the cultivation of rice occupies but a subor- dinate place. The average out-turn per acre in Bengal has been estimated at 15 maunds, or 1200 tb, of cleaned rice. In the years 1877-78, when famine was raging in southern India, the total exports of rice from Calcutta amounted to more than 16 million cwts. In British Burmah there is but a single rice harvest in the year, corresponding to the dman of Bengal. The grain is reddish in colour and of a coarse quality; but the out-turn is much higher than in Bengal, reaching in some places an average of 2000 and 2500 ib per acre. The annual exports of rice from Burmah amount to about 12 million cwts. Besides being practically the sole crop grown in the deltaic swamps, rice is raised in patches in all the hill-valleys, from Coorg to the Himalayas.

Wheat is grown to some extent in almost every district ; \Wheat.

but, broadly speaking, it may be said that wheat does not thrive where rice does, nor, indeed, anywhere south of the Deccan. The great wheat-growing tract of India is the Punjab, where, in 1877-78, nearly 7 million acres, or 37 per cent. of the total cultivated area, were under this crop. For the North-Western Provinces and Oudh, in default of actual statistics, it has been estimated that the total area under wheat is as large as in the Punjab, though the relative proportion is less. Wheat is also grown in Behar and in the districts of Bengal that lie south of the Ganges. In the Central Provinces, in 1877-78, wheat was grown on 23 per cent. of the cultivated area, being the chief crop in the districts of HoshangAbad, Narsinhpur, and Sagar, In Bombay the corresponding proportion was less than 5 per cent., and in Sind 12 per cent. It has been conjectured that the total area under wheat in India is equal to the area under the same crop in the United States. Nor is the general out-turn contemptible, averaging about 13 bushels per acre in the Punjab, as compared with an average of 154 bushels for the whole of France. The quality, also, of the grain is high enough to satisfy the demands of English millers; and "Calcutta Club No. 1" commands 4 price in Mark Lane not much below that of the

Millet.

Oil- seeds,

Vege- tables.

Fruits.

finest Australian or Californian producc. Unfortunately, when a prosperous trade with Europe seemed on the point of establishing itself, the terrible year 1877-78 supervened, and India will now have to fight against the position of vantage occupied by the United States. According to the system of classification in Upper India, wheat ranks as a rabi or spring crop, being reaped at the closc of the cold weather in April and May. Wherever possible, it is irri- gated ; and the extension of canals through the Gangetic Doab has largely contributed to the substitution of wheat for inferior cereals.

Taking India as a whole, it may be affirmed that the staple food grain is neither rice nor wheat, but millet, which is probably the most prolific grain in the world, and the best adapted to the vicissitudes of a tropical climate. Ex- cluding the special rice-growing tracts, varieties of millet are grown more extensively than any other crop from Madras, in the south, at least as far as Rajputana, in the north, The two most common kinds are great millet (Holcus Sorghum or Sorghum vulgare), known as jodr or jawdrtin the languages derived from the Sanskrit, as jonna in Telugu, and as cholam in Tamil; and spiked millet (Holcus spicatus vel Penicillaria spicata), called bdjra in the north and kambw in the south. In Mysore and the neighbouring districts rdgi (Hleusine coracana), called ndchani in Bombay, takes the first place. According to the Madras system of classification, these millets all rank as "dry crops," being watered only by the lozal rainfall, and sown under either monsoon; farther north, they are classed with the kharéf or autumn harvest, as opposcd to wheat, Indian corn is cultivated to a limited extent in all parts of the country; barley, in the upper valley of the Ganges, throughout the Punjab, and in Himalayan valleys , oats, only as an

experimental crop by Europeans. Jodr and rdgi, but not bdjra, are invaluable as fodder for cattle.

Oil-seeds also form an important crop in all parts of the country, being perhaps more universally grown than any other, as oil is necessary, according to native customs, for application to the person, for food, and for burning in lamps. In recent years the cultivation of oil-seeds has re- ceived an extraordinary stimulus owing to the demand for export to Europe, especially to France ; but as they can be grown after rice, &c., as a second crop, this increase has hardly at all tended to diminish the production of food grains. 'The four chief varieties grown are mustard or rape seed, linseed, ¢é/ or gingelly (sesamum), and castor-oil. Bengal and the North-Western Provinces are at present the chief sources of supply for the foreign demand, but gingelly is largely exported from Madras, and, to a smaller extent, from Burmah.

Vegetables are everywhere cultivated in garden plots for household use, and also on a larger scale in the neighbour- hood of great towns. Among favourite native vegetables, the following may be meutioned :—the egg-plant, called brinjal or baigan (Solanum Melongena), potatoes, cabbages, cauliflower, radishes, onions, garlic, turnips, yams, and a great variety of cucurbitaceous plants, including Cucumis sativus, Cucurbita maxima, Lagenaria vulgaris, Trichos- anthes divica, and Benincasa cerifera. Of these, potatoes, cabbages, and turnips are of recent introduction. Almost all English vegetables can be raised by a careful gardener. Potatoes thrive best on the higher elevations, such as the Khasi hills, the Nilgiris, the Mysore uplands, and the slopes of the Himdlayas ; but they are also grown even in lowland districts. They were first introduced into the Khasi hills in 1830, and they now constitute the principal crop, the annual export to the Calcutta market being more than 7000 tons, valued at £50,000.

Among cultivated fruits are the following :—Mango (Mangifera indica), plantain (Musa paradisiaca), pine-apple

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[ac RICULTURE.

(Ananassa sativa), pomegranate (Punica Granatum), guava (Psidium pomiferum et P. pyriferum), tamarind (Tama- rindus indica), jack (Artocarpus integrifolia), custard-apple (Anona squamosa), papaw sei Papaya), shaddock (Ct- rus decumana), and several varieties of fig, melon, orange, lime, and citron. According to the universal verdict of Europeans, no native fruits can compare with those of Eng- land. But the mangoes of Bombay, of Multan, and of Maldah in Bengal, and the oranges of the Khasi hills, enjoy a high reputation; while the guavas of Madras are made into an excellent preserve.

Among spices, for the preparation of curry and other Spices.

hot dishes, turmeric and chillies hold the first place, being very generally cultivated. Next in importance come ginger, coriander, aniseed, black cummin, and fenugreek, Pepper proper is confined to the Malabar coast, from Kanara to Travancore. Cardamoms are a valuable crop in the same locality, and also in the Nepalese Himdalayas. Pén or betel-leaf is grown by a special caste in most parts of the country. Its cultivation requires constant care, but is highly remunerative. Betel-nut or areca is chiefly grown in certain favoured localities, such as the deltaic districts of Bengal and the highlands of southern India.

Besides betel-nut (Areca Catechu), the palms of India in- clude the cocoa-nut (Cocos nucifera), the bastard date (Phenix sylvestris), the palmyra (Borassus flabelliformis), and the true date (Phenix dactylifera). The cocoa-nut, which loves a sandy soil and a moist climate, is found in greatest perfection along the strip of coast-line that fringes the west of the peninsula, where it ranks next to rice as the staple product. The bastard date, grown chiefly in the country round Calcutta aud in the north- east of the Madras presidency, supplies both the jaggery sugar of commerce and intoxicating liquors for local con- sumption. Spirit is also distilled from the palmyra, espe- cially in the neighbourhood of Bombay and in the south-cast of Madras. 'The true date isalmost confined to Sind.

Sugar is manufactured both from the sugar-cane and from the bastard date-palm, but the total production is in- adequate to the local demand. The best cane is grown in the North-Western Provinces, on irrigated land. It is an expensive crop, requiring much attention, and not yielding a return within

the year; but the profits are proportion- ately large. In Bengal the manufacture of sugar for exportation has declined during the century; but in Jessor district the preparation of date-sugar is a thriving and popular industry. The manufacture of sugar is everywhere in the hands of natives, except in the casc of the Aska factory in the Madras district of Ganjim, and the Ashtagram factory in Mysore. Both these factories, which use sugar-cane and not date, have received honourable notice at exhibitions in Europe.

Cotton holds the first place among agricultural products grown for export. From the earliest times, cotton has been grown in sufficient quantities to meet the local demand, and even in the last century there was some slight export which was carefully fostered by the East India Company. But the present importance of the crop dates only from the crisis in Lancashire caused by the American War. Prior to 1860 the exports of raw cotton from India used to average less than 3 millions sterling a year; but after that date they rose by leaps, until in 1866 they reached the enormous total of 37 millions. Then came the crash, caused by the restoration of peace in the United States, and the exports fell, until they now average little more than 8 millions a year. 'The fact is that Indian cotton has a short staple, and cannot compete with the best American cotton for spinning the finer qualities of yarn. But while the cotton famine was at its height, the culti-vators were intelligent enough to make the most of their

Palms,

Sugar.

Cotton.

Cotton- growing tracts.

Jute.

Indigo.

AGRICULTURE. |

opportunity. The area under cotton increased enormously, and the growers managed to retain in their own hands a fair share of the profit.

The principal cotton-growing tracts are the plains of Guzerat and Kathiawar, whence Indian cotton has received in the Liverpool market the historic name of Surat; the highlands of the Deccan ; and the deep valleys of the Central Provinces and Berar. The best native varicties are found in the Central Provinecs and Berar, passing under the trade names of Hinganghat and Amrdoti. 'These varictics have been successfully introduced into the Bombay distriet of Khandesh. Experiments with seed from New Orleans have been conducted for sevcral years past on the Government farms in many parts of India; but it cannot be said that they have resulted in success except in the Bombay district of Dharwar, where exotic cotton has now generally supplanted thie indigenous staple. In 1875-76 the total area under cotton in the Bombay presidcney, including Sind and the native states, amounted to 4,516,587 acres, with a yicld of 2,142,835 ewts. Of this total, 583,854 acres, or 18 per cent., were sown with exotic cotton, including that from the Central Provinces and also that from New Orleans, with a yield of 248,767 ewts. The average yield was about 53 Ib of cleaned cotton per acre, the highest being in Sind and Guzerat, and the lowest in the southern Marhattd country. In the same year the total exports were 3,887,808 cwts., valued at £10,678,761. In 1877-78 the area under cotton in the Central Provinces was 837,083 acres, or 5 per cent, of the total cultivatcd area, chiefly in the districts of Wardha, Nagpur, and Raipur. The average yield was about 59 tb per aere. The total exports to Bombay, including re-exports from Berar, were about 300,000 ecwts., chiefly in compressed bales, valued at £672,000. In thesaine year the area under eotton in Berar was 2,078,278 acres, or 32 per cent. of the total cultivated area, ehiefly in the two districts of Akola and Amraoti. The average yicld was as high as 67 tb of cleaned cotton per acre. The total export was valued at £2,354,946, almost entirely railway-borne. In Madras the avcrage area under cotton is about 1,500,000 acres, chiefly in the upland districts of Bellary and Karnul, and tlic low plains of Kistna and Tinnevelli. The total exports in 1875-76 were 733, 420 ewts., valued at £1,652,849. In Bengal the cultivation of cotton ison the decline. The local demand is satisfied by imports from the North-Western Provinces and from the bordcring hill tracts, where a very short-stapled variety of cotton is extensively cultivated.

The total area under cotton in Bengal is estimated at only 162,000 acres, ylelding 138,000 cwts. of cleaned cotton. Of this, 31,000 acres were in Saran, 28,000 in the Chittagong hill tracts, and 20,000 in Cuttaek. Throughout the North-Western Provinces, and also the Punjab, sufficient cotton is grown to meet the wants of the village weavers. The total exports of raw cotton from Indian ports in 1878-79 were 2,966,569 ewts., valued at £7,914,091, besides cotton twist and yarn to the value of £937,698, and cotton manu- factures valued at £1,644,125.

Jute ranks next after cotton as a fibre crop. The exten- sion of its cultivation has been equally rapid, and it is yet more limited in its area, being confined to northern and eastern Bengal. In this tract, which extends from Pur- niah to Godlpdrd, north of the Ganges for the most part, and along both banks of the Brahmaputra, jute is grown on almost every variety of soil. The chief characteristic of the cultivation is that it remains entirely under the con- trol of the cultivator. Practically a peasant proprietor, he increases or diminishes his cultivation according to the state of the market, and keeps the profitsin hisown hands. The demand for jute in Enrope has contributed more than any administrative reform to raise the average standard of com- fort throughout eastern Bengal. In 1872, when specula- tion was briskest, it is estimated that about 1 million acres were under jute, distributed over sixteen districts, which had a total cultivable area of 23 million acres. The total export from Calcutta in that year was about 7 million ewts,, valued at £4,142,548. Both quantities and prices have since somewhat declined, but the business remains on a stable footing. In 1878-79 the total export of raw jute from India was 6,021,382 cwts., valued at £3,800,426, besides jute manufactures to the value of £1,098,434.

Indigo, though relatively of less importancethan formerly, is still the foremost staple grown by European capital. In Bengal Proper its cultivation has greatly declined since the early years of this century. English planters lave aban- doned the districts of Hugli (Hooghly), the Twenty-four Par- gands, Dacca, Faridpur, Rangpur, and Pabné, which are

dotted with the sites of ruined factories. In Nadiyd, Jessor, Murshiddbad, and Maldah, the industry is still carried on, but it has not recovered from the depression caused by the indigo riots of 1860, and the emancipa- tion of the peasantry by the Land Act of 1859. Dye of superior quality is manufactured in Midnapur, along the frontier of the hill tracts. But indigo cultivation on the old scale still flourishes in North Behar, from which is derived one-half of the total exports from Calcutta. No accurate statistics of area are available; but in Tirhut alone there are fifty-six principal concerns, with seventy outworks, producing annually about 20,000 maunds of dye ; in Sdran, thirty principal concerns and twenty-five out- works, producing about 12,000 maunds; in Champaran, seven large concerns, producing also 12,000 maunds.! It has been estimated that the total amount of money annu- ally distributed by the planters of North Behar cannot be less than 1 million sterling. Across the border, in the North-Western Provinces, indigo is grown and manu- factured to a considerable extent by uative cultivators. In the Punjab, also, indigo is an important crop, especially in the districts of Multan, Muzaffargarh, and Der& Ghazi Khan. In Madras, where it is grown and manufactured entirely by the natives, the total area under indigo is about 300,000 acres, chiefly in the north-east of the presidency, extending along the coast from Kistna to South Arcot, and inland to Karnul aud Cuddapah. The exports of indigo from all India in 1878-79 amounted to 105,051 cwts., of the value of £2,960,463.

The opium of commerce is grown and manufactured in Opium

two special tracts,—(1) the valley of the Ganges round Patnd and Benares, and (2) a fertile table-land in Central India, corresponding to the old kingdom of Malwa, for the most part still under the rule of native chiefs, among whom Sindhia and Holkar rank first. In the latter of these two regions the cultivation of poppy is free, and the duty is levied as the opium passes through the British presidency of Bombay; in the former, the cultivation is a strict Govern- ment monopoly. Opium is also grown for local consumption throughout Rajputdéna, and to a very limited extent in the Punjab and the Central Provinces. Throughout the rest of India it is absolutely prohibited. In the Ganges valley, the cultivation is supervised from two agencies, with their headquarters at Patné and Ghazipur, at which two towns alone the manufacture is conducted. In 1872 the total area under

poppy was 560,000 acres; the number of chests of opium sold was 42,675; and the sum realized was £6,067,701, giving a net revenue of £4,259,376. The whole of this was exported from Calcutta to China and the Straits Settlements. The amount of opium grown in native states and exported from Bombay is about equal, thus raising the average exports of opium to about 12 nuillions sterling, of which about 74 millions represent net profit to Government. In 1878-79, 91,200 chests of opium were ex-

'ported, of the value of £12,993,985, of which £7,700,000

represented the net profit to Government.

Under the Bengal system annual engagements arc entered into Bengal by the cultivators to sow a certain quantity of land with poppy ; system,

and it is a fundamental prineiple that they may agree or refuse to cngage as they please. As with most other Indian industries, a pecuniary advance is made to the cultivator before he commences operations, which is balanced when he delivers over the opium at the subordinate agencies. He is compelled to deliver his whole produce, being paid at a fixed rate aecording to quality. In the beginning of April the cultivators bring in their opium to the subordinate Government agencies, where it is examined and weighed, and the accounts are settled. The final process of pre- paring the drug in balls for the Chinese market is conducted at the two central Government ageneies at Patna and Ghazipur. This generally lasts until the end of July, but the balls are not dry cnough to be packed in chests until October.

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1 The factory maid of indigo weighs 74 Ib 10 oz.

Tobacco.

Coftee.

Tobacco is grown in every district of India for local consumption. The soil aud climate are favourable ; but up to the present time the quality of native-cured tobacco is so inferior that it finds no market in Europe. The principal tobacco-growing tracts are Rangpur and Tirhut in Bengal, Kaira in Bombay, and the delta of the Godavari and Coimbatore and Madura districts in Madras. The two last-mentioned districts supply the raw material for the well-known "Trichinopoli cheroot," almost the only form of Indian tobacco that finds any favour with Europeans ; the produce of the / éxkds or alluvial islands in the Goda- vari is manufactured into "'coconadas." The tobacco of northern Bengal is largely exported to British Burmabh, for the Burmese, who are great smokers, do not grow sufficient for their own needs. In the year 1876-77 the total registered imports of tobacco into Calcutta were 400,000 cwt., valued at £261,000, of which more than half came from the single district of Rangpur. Tobacco is also grown for export in the hill tracts of Chittagong. The tobacco of Tirhut is chiefly exported towards the west. The total area under tobacco in that district is estimated at 40,000 acres, the best quality being grown in pargand Saressa of the Tajpur subdivision.

Since 1875 a private firm of capitalists, backed by Government support, has begun to grow tobacco and manufacture it for the European market. The scene of operations is two abandoned stud- farms at Ghaaipur in the North-Western Provinces, and at Pusa in the Bengal district of Tirhut. In the year 1878-79 about 240 acres in all were cultivated with tobacco, and the total crop was about 160,000 lb. No less than five English or American curers were cmployed. Some of the produce was exported to England as 'cured leaf'; but the larger part was put upon the Indian market in the form of "manufactured smoking mixture." This mixture is in demand at regimental messes and canteens, and has already found its way to Australia. The enterprise may now be said to have passed beyond the stage of experiment, and has probably opened a new sphere alike for Indian agriculture and Muropean capital. 'The one essential condition of success is skilled supervision in the delicate processes of tobacco-curing. Tobacco to the value of £128,239 was exported from India in 1878-79.

The cultivation of coffee is confined to southern India, though attempts have been made to introduce the plant both into British Burmah and into the

Bengal district of Chitta- gong. The coffee tract may be roughly defined asa section of the landward slope of the Western Ghats, extending from Kanara in the north to Travancore in the extreme south. That tract includes almost the whole of Coorg, the districts of K4dur and Hassan in Mysore, and the Nilgiri hills, en- larged by the recent annexation of the Waindd. Within the last few years the cultivation has extended to the Shevaroy hills in Salem district, and to the Palni hills in Madura,

Unlike tea, coffee was not introduced into India by European enterprise ; and cven to the present day its eultivation is largely followed by the natives. 'The Malabar coast has always enjoyed a direct commerce with Arabia, and at an early date gave many con- verts to Isl4m. One of these converts, Baba Budan by name, is said to have gone on a pilgrimage to Mecca and to have brought back with him the coffee berry, which he planted on the hill range in Mysore still called after him. According to local tradition this happened about two centuries ago. The shrubs thus sown lived on, but the cultivation did not spread until the beginning of the present century. The state of Mysore and the Baba Budan range also witnessed the first opening of a coffee-garden by an English planter about 1840. The success of this experiment led to the ex- tension of coffee cultivation into the neighbouring tract of Manjard- bad, also in Mysore, and into the Waindd subdivision of the Madras district of Malabar.. From 1840 to 1860 the enterprise made slow progress ; but since the latter date it has spread with great rapidity along the whole line of the Western Ghats, Glearing away the primeval forest, and opening a new era of prosperity to the labour- ing classes. The following statistics show the area under coffee for the year 1877-78 :—in Mysore, 128,438 acres, almost confined to the two districts of Hassan and Kadur; in Madras, 58,988 acres, chiefly in Malabar, the Nilgiris, and Salem; in Coorg, 45,150 acres ; total, 232,576 acres, exclusive of Travancore. The average rate of produce is estimatcd at about 3 cwts. per acre of mature plant. The total export of coffee in 1878-79 was 342,268 cwts., valued at £1,548,481,

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[AGRICULTURE.

The cultivation of tea in India commenced within thie Tea.

memory of men still living in 1881, and the industry now rivals indigo as a field for European capital. planting the enterprise owes its origin to the initiation of

Unlike coffee-

Government, and has never attracted the attention of the

natives. arly travellers reported that the tea-plant was indigenous to the southern valleys of the Himalayas ; but

they were mistaken in the identity of the shrub, which was the Osyris nepalensis. The real tea (Thea viridis), a plant akin to the camellia, grows wild in Assam, being commonly found throughout the hilly tract between the valleys of the Brahmaputra and the Barak. There it sometimes attains the dimensions of a large tree; and from that, as well as from other indications, it has been plausibly inferred that Assam is the original home of the plant, which was thence introduced at a prehistoric date into China. The real progress of tea-planting in Assam dates from about 1851, and was greatly assisted by the promulgation of the Waste-land Rules of 1854. By 1859 there were already fifty-one gardens in existence, owned by private individuals ; and the enterprise had extended from its original headquarters in Lakhimpur and Sibsdgar as far down the Brahmaputra as Kamrip. In 1856 the tea-plant was discovered wild in the district of Cachar in the Barak valley, and European capital was at once directed to that quarter. At about the same time tea-planting was introduced into the ueighbour- Tea- hood of the sanatorium of Darjiling (Darjeeling), among the growing Sikkim Himalayas. The success of these undertakings mel engendered a wild spirit of speculation in tea companies both in India and at home, which reached its climax in 1865. The industry recovered but slowly from the effects of this disastrous crisis, and did not again reach a stable position until 1869. Since that date it has rapidly but steadily progressed, and has been ever opening new fields of enterprise. At the head of the Bay of Bengal in Chitta- gong district, side by side with coffee on the N {lgiri hills, on the forest-clad slopes of Chutid Nagpur, amid the low- lying jungle of the Bhutan Dwars, and even in Arakan, the energetic pioneers of tea-planting have established their industry. Different degrees of success may have rewarded them, but in no case have they abandoned the struggle. The market for Indian tea is

practically inexhaustible. There is no reason to suppose that all the suitable localities for its growth have yet been tried ; and we may look for- ward to the day when India shall not only rival but super- sede China in her staple product.

The following statistics, unless it is otherwise stated, refer to the year 1877-78 :—

The total arca taken up for tea cultivation in Assam, including Area and both the Brahmaputra and the Barak valleys, was 736,082 acres, of out-turn which 538,961 acres were fit for cultivation; the total number of sepia-of tea. rate estates was 1718; the total out-turn was 28,352,298 Ib, at the average rate of 286 Ib per acre under mature plant. In Bengal, the area taken up was 62,642 acres, of which 20,462 acres were under mature plant, including 18,120 acres in the single district of Darjiling ; the number of gardens was 221 ; the out-turn was 5,768,654 ib, at the rate of 282 Ib per acre under mature plant. In the North-Western Provinces, there were, in 1876, 25 estates in the districts of Kumaun and Garhwal, with an out-turn of 578,000 Ib, of which 350,000 Ib were sold in India to Central Asia merchants ; and in 1871, 19 estates in Dehra Dun, with 2024 acres under tea, and an out-turn of 297,828 tb. In the Punjab, there were 10,046 acres under tea, almost entirely confined to Kangra district, with an out-turn of 1,113,106 tb, or 111 tb per acre. In Madras, the area under teaon the Nilgiris was 3160 acres ; the exports from the presidency were 183,178 tb, valued at £19,808. Excluding the figures just given for Madras, the whole of the Indian tea is shipped from the port of Calcutta, and almost the whole is sent to the United Kingdom. The total exports for 1878-79 were 34,800,027 ib, valued at £3,170,118. Of the total supply, about 26,000,000 1b came from Assam, about 8,000,000 1b from Bengal, 787,000 ib from the North-Western Provinces, and 684,000 Ib from the Punjab. In the previous year the exports of tea from the Punjab to Central Asia were returned at 1,217,840 tb, valued at £181,634, being a con- siderable decrease on the year before.

Area of principal crops.

Approximate Arca in Acres occupied by the Principal Crops in some Indian Provinces in 1877-1878.

AGRICULTURE. | ‘ B F eps. (ee aia, Sind. oe 4,600,000 | 1,195,000 | 512,000 oQQ0 SOO OO MOORE CAGE CBE Cee eee 16,000 561,000 354,000 ‘Millets and inferior grains…..... 10,600,000 | 5,800,000 934,000 |PrRINe Slo ncacoae# = cee eee eee 1,600,000 830,000 115,000 Seeheneilins setans 800,000 | 628,000 | 180,000 EM atten eeninte cairicee sasals 1,000,000 1,850,000 70,000 nsenode ee 60,000} 35,000 | 6,000 Re neti aie acre ow tendbivindae es 120,000 14,000 10,000 hotb aoc OUGn CORRE enc eee 21,000 50,000 4,000

The introduction of the quinine-yielding cinchona into India is a remarkable example of success rewarding the indefatigable exertions of a single man. When Mr Clements Markham undertook the task of transporting the seedlings from South America in 1860, cinchona had never before been reared artificially. But the novel experi- ment in arboriculture has not only been successfully con- ducted, but has proved remunerative from a pecuniary point of view. A cheap febrifuge has been provided, in the form of the mixed cinchona alkaloids, for the fever-stricken population of the Indian plains, while the surplus bark sold in Europe more than repays interest upon the capital expended. These results have been pro- duced from an expenditure of about £100,000. The head- quarters of cinchona cultivation are on the Nilgiri hills, where Government owns several plantations covering an aggregate of about 1000 acres, with about 570,000 full- grown plants. rom the Government plantations cin- chona seeds and plants are annually distributed to the public in large quantities ; and there are now several private plantations rivalling the Government estates in area, and understood to be very valuable properties. The varieties of cinchona most commonly cultivated are C. officinalis and C. succirubra ; but experiments are being con- ducted with C. Calisaya, C. pubescens, C. lanceolata, and C. pitayensis, When the success of the enterprise was secure, Government somewhat curtailed the extcnt of its own operations. No fresh land was taken up, but the plantations were kept free from weeds. The quino- logist’s department was abolished,~~and the bark sold in its raw state. From the central establishment on the Nilgiris cinchona has been introduced into the Palni hills in Madura district, into the Waindd, and into the state of Travancore. Plantations have also been success~~ fully opened by Government near Merkara in Coorg, on the Baba Budan hills in Mysore, and in Sitang district in British Burmah. Failure has attended the

experiments made at Mahabaleshwar in the Bombay presidency, and at Nongklao in the Khasf hills, Assam. But the success of the Government plantation at Darjiling, in northern Bengal, rivals that of the original plantation on the Nilgiris, The area has been gradually extended to more than 2000 acres, and the bark is manufactured into quinine on the spot by a Government quinologist, 'The species mostly grown is C'. succirubra, which supplies a red-coloured bark, rich in its total yield of alkaloids but comparatively poor in quinine proper. Efforts are being made to increase the cultivation of C. Calisaya, which yields the more valuable bark, but is diffienlt to propagate.

The following are the finaneial results of the two Government plantations in 1877-78. On the Nilgiris the crop was 138,808 ih, of which 182,951 fb were shipped to England, and the rest supplied to the Madras and Bombay medieal departments. The total receipts were £35,875, and the total expenditure £6977, thus showing a net profit of £28,898. At Darjiling the crop amounted to 344,225 tb of bark, which was all handed over to the quinologist, and yielded 5162 ib of the febrifuge. The total rceeipts were £9707, of which £6188 represents the amount debited to Government departments

for the sale of febrifuge and bark, while £3519 was derived from sales to the publie. The total expenditure was £8554, of whieh

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Punjab, Bie ae eee Mysore. | Berar, 400,000 | 4,550,000 | 2,555,000 | 540.000 31,000 7,000,000 3,600,000 |... 11,000 525,000 3°200°000 | ¢ 140,000 hy 8,400,000 hie 800,000 | 1,860,000 15,000 | 180,000 460,000 660,000 | 840,000 10,000 15,000 | 2,080,000

80,000 48000 17,000 19,000 17,000

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£5790 was expended upon the plantation, and £2764 on the quino- logist's department. 'The net profit, therefore, was £1158, which 1s expeeted shortly to rise to £4000 a year, as more of the young plants come into bearing.

Siulk,—Sericulture in India isa stationary, if not a declin- ing, industry. The large production in China, Japan, and girk. the Mediterranean countries controls the European markets, and onan average of years the imports of raw silk into India now exceed the exports. The East India Company from the first took great pains to foster the production of silk. As early as 1767, two years after the grant of the financial administration of Bengal had been conferred upon the Company, we find the governor, Mr Verelst, personally urging the zaminddrs, gathered at Murshiddbad for the ceremony of the puinyd, "to give all possible encourage- ment to the cultivation of mulberry." In 1769 a colony of reelers was brought from Italy to teach the system followed in the filatures at Novi. The first silk prepared in the Italian method reached England in 1772, and Bengal silk soon became an important article of export. Similar efforts started at Madras in 1793 were abandoned after a trial of five years, Sericulture is said to have been intro- duced into Mysore by Tipu Sultan, and for many years continued to prosper. But recently the worms have been afflicted by a mysterious epidemic; and despite the enter- prise of an Italian gentleman who imported fresh broods from Japan, the business has dwindled to insignificance. Bengal has always been the chicf seat of mulberry cultiva- tion. When the trading operations of the Company ceased in 1833, they owned eleven head factories in that province, cach supplied by numerous filatures to which the culti- vators brought in their cocoons. The annual export of raw silk from Calcutta was then about 1 million Ib. But in those days the weaving of silk formed a large portion of the business of the factories. In 1779 Rennel wrote that at Kasimbazdr (Cossimbazar) alone about 400,000 ib were consumed in the several European factories. In 1802 Lord Valentia describes Jangipur as "the greatest silk station of the Company, with 600 furnaces, and giving employment to 3000 persons."

When the Company abandoned trade on its own account, sericulture was forthwith taken up by private enterprise, and it still clings to its old headquarters. At the present time the cultivation of the mulberry is mainly confined to the Rajshahi and Bardwain divisions of Lower Bengal. That

branch of agriculture, together with the rearing of the silk-worms, is conducted by the peasantry themselves, who are free to follow or abandon the business. The destina- tion of the cocoons is twofold. They may either be sent to small native filatures, where the silk is roughly wound before being consumed in the hand-looms of the country ; or they may be brought to the great European factories, which generally use steam machinery and consign their produce direct to Europe.

The cultivation of the mulberry is chiefly carried on in the districts of Rajshahi, Bogra, Maldah, Murshidabad, Birbhum, Bardwén, and Midnapur. No accurate statis- tics are available, but in Rajshahi alone the area under mulberry is estimated at 80,000 acres. The variety

Silk- worms.

Lac.

Farming.

Cattle.

grown as food for the silk-worms is not the fruit-tree that is common in England, but a comparatively small shrub.

Besides the silk-worm proper (Bombyx mort), fed upon the mulberry, several other speeics of silk-yielding worms abound in the jungles of India, and are utilized, and in some cases domesti- eated, by the natives. 'Throughout Assam especially, an inferior silk, produced in this way, has from time immemorial furnished the common dress of the people. These "' wild silks" are known to commerce under the generic name of dasar or tusser, but they are really the produce of several distinct varieties of worm, fed on many different trees. The worm that yields tasar silk in Chutia Nagpur has been identified as the caterpillar of Antherwa paphia. When wild, it feeds indiscriminately upon the sdl (Shorea robusta), bauer (Zizyphus Jujuba), and other forest trees; but in a state of semi-domestication it is exelusively reared upon the dsan (Ter- minalia alata),

which grows conveniently in elumps. The cocoons are sometimes collected in the jungle, but more frequently bred from an earlier generation of jungle cocoons. The worms require constant attention while feeding to protect them from erows and other birds. They give three crops in the year—in August, November, and May—of which the second is by far the most im- portant. The tasar silk-worm is also found and utilized throughout the Central Provinces, in the hills of the Bombay presideney, and along the southern slope of the Himalayas. During the past twenty years repeated attempts have been made to raise this in- dustry out of its preearious condition, and to introdnce ¢asar silk into the European market. That the raw material abounds is eer- tain, but the great difficulty is to obtain it ina state that will be aeceptable to European manufacturers. Native spun silk is only fit for native hand-looms. In Assam two distinet qualities of silk are made, known as erté and mugd. The former is obtained from the cocoons of Phalena cynthia, and the worm is fed, as the native name implies, upon the leaves of the eastor-oil plant (Jticinus communis). This variety may be said to be entirely domesticated, being reared indoors. Muga silk is obtained from the eoeoons of Saturnia assamungis. The moth, which is remarkable for its size, is found wild in the jungle, but the breed is so far domesticated that cocoons are brought from one part of the province to another, and the sém tree is artificially propagated to supply the worms with food. Raw silk was exported in 1878-79 to the extent of 1,534,715 Ib, valued at £623,871, besides manufactured silk of the value of £195,897.

The collection of lac is in a somewhat similar position to that of tasar silk. The lac insect abounds on certain jungle trees in every part of the country, and from time immemorial it has been collected by thie wild tribes in order to be worked up into lacquered ware. European en- terprise has tried, with small success, to place the industry upon a stable and remunerative basis. Though lacis to be found everywhiere, the foreign exports are almost entirely confined to Calcutta, which draws its supplies from the hills of Chutia Nagpur, and to a less degree from Assam and Mirzdpur in the North-Western Provinces. Laesis known to commerce both as a gum (shellac) and as a dye. The total exports in 1879 were 91,983 cwts., valued at £300,072.

Farming.—The efforts of Government to improve the native methods of agriculture, by the establishment of model farms under skilled European supervision, have not been generally successful.

Stock.—Throughout the whole of India, except in Sind and the western districts of the Punjab, horned cattle are the ouly beasts used for ploughing. The well-known humped breed of cattle predominatcs everywhere, being divided

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1 Model farms have been abandoned in Bengal, in Assam, and in the Punjab. In the North-Western Provinces valuable experiments are prosecuted. In Bombay there are three model farms, and in the Central Provinees one, on which the common erops of the country are raised at aloss. The Saidapet farm, near the city of Madras, is the only establishmentat which important experiments have been conducted on a scale and with a perseverance sufficient to yield results of value. This farm was started by the governor, Sir William Denison, in 1865, and has been for the past nine years under the management of Mr Robertson. It now (1881) covers an area of 250 acres in a ring fence. Many important experiments have been made, of which some have pro- duced encouraging results, indicating the general direction in which im- provements may be effected in the agricultural practice of the presi- dency. Ithas been proved that many of the common " dry crops" can

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| Arabs.

[AGRICULTURE.

into many varieties. Owing partly to unfavourable con- ditions of climate and soil, partly to the insufficiency of grazing ground, and partly to the want of selection in breeding, the general condition of the cattle is miserably poor. As cultivation advances, the area of waste land available for grazing steadily diminishes, and the prospects of the poor beasts are becoming worse rather than better. Their only hope lies in the introduction

of fodder crops as a regular stage in the agricultural course. There are, how- ever, some fine breeds in existence. In Mysore the amrit mahdl, a breed said to have been introduced by Hyder Al{ for military purposes, is still kept up by Government. In the Madras districts of Nellore and Karnul the indi- genous breed has been greatly improved under the stimulus of cattle shows and prizes, founded by British officials. In the Central Provinces there is a peculiar breed of trotting bullocks which is in great demand for wheeled carriages. The large and handsome oxen of Guzerat in Bombay and of Hariana in the Punjab are excellently adapted for draw- ing heavy loads in a sandy soil. The worst cattle are to be found always in the deltaic tracts, but there their place

is to a large extent taken by buffaloes. These last are Buffaloes,

more hardy than ordinary cattle; their character is main- tained by crossing the cows with wild bulls, and their milk yields the best gi, or clarified butter. In British Burmah, the returus show that the total number of buffaloes is just equal to that of cows and bullocks, being about 700,000.

Along the valley of the Indus, and in the sandy desert Camels.

which stretches into Rajputana, camels supersede cattle for agricultural operations. In the Punjab, the total estimated number of camels is 170,000. horses has generally deteriorated since the demand for military purposes has declined witli the establishment of British supremacy. In Bengal Proper, and also in Madras, it may be broadly said that horses are not bred. The chief breeds in Bombay are those of the Deccan and of Kathidwar, in both of which provinces Government main- tains establishments of stallions. The Punjab, however, is the chief source of remounts for the cavalry regiments, the total number of horses in that province being returned at 80,000, in addition to 50,000 ponies. About the beginning of the present century, a stud department was organized to breed horses for the use of the Bengal army, but this system was abolished as extravagant and ineffi- cient under the governor-generalship of Lord Mayo. Remounts are now obtained in the open market; but the Government of the Punjab still maintains about 180 stallions, including 60 imported from England and 40 The best horses are bred by the Baluchi tribes along the western frontier. The best ponies come from Burmah, Manipur (the original home of the now well- known game of

polo), and Bhutén. Four great horse fairs are held in the year—at Rawal Pindi, Der& Ghazf Khan, Jhang, and Dera Ismail Khan—at which about 4500 horses were cxhibited in 1877-78, anda total sum of about £1300 was awarded in prizes; the average price given for native cavalry remounts was only £17. In recent years much attention has been paid in the Punjab to the

breeding of mules for military purposes ; and the value of Mules.

these animals was conspicuously proved in the course of OE

be profitably eultivated for fodder at all seasons of the year. Those most strongly recommended are yellow cholam (Sorghum vurjare), guinea grass (Panicum jumentaceum), and horse-gram (Dolichus uniflorus). Sugar-cane and rice also yield excellent fodder when cut green. Atten- tion has also been given to subsoil drainage, deep ploughing, the fertilizing powers of various manures, and the proper utilization of irrigation water. It has been decided to establish a school of agri- culture ut Saidapet in connexion with the model farm, with subordinate branches in the districts, so as to diffuse as widely as possible the agricultural lessons that have been already learned. In the year 1877-78 the total expenditure at Saidapet on both farm and school of agriculture was about £6000.

The breed of Horses,

PEND PA

the operations in Afghanistan in 1879-80, Government maintains about fifty donkey stallions, of which four were imported from Spain, twenty-eight from Arabia, and twelve from Bokhara. Some of the mules bred reach the

AGRICULTURE, | vfs 3) between the valleys of the Brahmaputra and the Barak

(see ante, p. 742). Sheep and goats are commonly reared in Sheep the wilder parts of the country for the sake of their wool, and Both their weight for the butcher and their yield of wool 8°

height of 15 hands. The catching of elephants is now a Government monopoly or under Government supervision, except in Malabar and Travancore where the old proprie- tors retain the right. The chief source of supply is the north-east frontier, especially the range of hills running

and as a department of the administration, are beginning to receive their proper share of attention. Up to a re- cent date the destruction of forests by timber cutters, by charcoal burners, and above all by nomadic cultivation, was allowed to go on everywhere unchecked. The ex- tension of cultivation was considered as the chief care of Government, and no regard was paid to the impro- vident waste going on on all sides. But as the pressure of population on the soil became more dense, and the con- struction of railways increased the demand for fuel, the question of forest conservation forced itself into notice. It was recognized that the inheritance of future generations was being recklessly sacrificed to satisfy the immoderate desire for profit. And at the same time the importance of forests as affecting the general meteorology of a country was being learned from bitter experience in Europe. On many grounds, therefore, it became necessary to preserve what remained of the forests in India, and to repair the mischief of previous neglect even at considerable expense. In 1844 and 1847 the subject was actively taken up by the Governments of Bombay and Madras. In 1864 Dr Brandis was appointed inspector-general of forests to the Government of India, and in the following year an act of the legislature was passed (No. VII. of 1865). The regular training of candidates for the Forest Department in the schools of France and Germany dates from 1867. In the short interval that has since elapsed, sound principles of forest administration have been gradually extended. In- discriminate timber-cutting has been prohibited, the burning of the jungle by the hill tribes has been confined within bounds, large areas have been surveyed and demar- cated, plantations have been laid out, and, generally,

forest conservation has become a reality.

From the point of view of administration, the forests are classi- fied as "reserved" or open." The reserved forests are those under the immediate control of officers of the Forest Department : they are managed as tlie property of the state, with a single eye to conservancy and their future

development as a source of national wealth, Their limits are demarcated after survey, nomadic eulti- vation by the hill tribes is prohibited, cattle are exeluded from grazing, destruetive creepers are cut down, and the hewing of tim- ber, if permitted at all, is placed under stringent regulations, The open forests are less earefully guarded ; but in them also certain Kinds of timber-trees are preserved. A third class of forest lands consists of plantations, on whieh large sums of money are spent annually, It is impossible to preseut in a single view the entire result of the labours of the Forest Department. In 1872-73 the

are exceedingly low. In Mysore, and with considerable success at the Saidapet farm, attempts have been made to improve the breed of sheep by crossing with merino rams. Pigs of great size and most repulsive appearance are reared, and eaten by the lowest of out-castes,

- Return of Approximate Numbers of Agricultural Stock and I mplements in some Indian Provinces in 1877-1878, | stock, 5: Bomb s af Madras FE nd ote Punjab. Bae Bee ae Mysore. Berar, CE oc cccccsccevesesccces sees. 3,500,000 | 3,300,000 7 ae i oo recceceeceisscccsseccs 8,000,000 | 2,380,000 |$6 570,000 | 5.200.000 , 2 PP OMAIOGS coco coc cseccsercccscs 1,332,000 | 1,630,000 |§ ° ’ es 662,000 Fi Nae ee [SIIPSES 5b adds aa ORR eTO Cee eee 21,500 85,000 12,000 4,900 6,500 eee, 18,000 EDO FOSO 52,000 82,000 5,800 14,000 26,000 [Dem Re57S ahoo one enn ee ee eee 128,000 90,000 290,000 22,000 37,000 17,000 Gre Sees sicimusnsyiaess miles spaaventé 45 she 170,000 i Se ie im ie 604 ee si oe 1,324 si as MTOSTIBE RCH G Gs sce stececsseccseapercsotees 4,600,000 ese a. 2,700,000 3, 300, 000 3,850,000 641,000 20,000 1,590,000 386,000 ocr ccrtcstecseciss, 250,000 be ” 132,000 | 102,000 32,000 2,700 MET SMI ci «sss tais’osdigsanas veces 284,000 380,000 98,000 286,000 194,000 83,000 89,000 os ii csc sawtsiensoescesvaress 2,023,000 1,080,000 1,747,000 764,000 293,000 558,000 115,000 Se ee ee a Forests. The forests of India, both as a source of natural wealth | total area of reserved forests in Tudia was estimated at more than

6,000,000 aeres ; and the area has probably been doubled since that date. Inthe same year the total forest revenue was £477,000, as compared with an expenditure of £295,000, thus showing a sur- plus of £182,000. By 1877-78

the revenue had inereased to £664,102, of which £160,308 was derived from British Burmah, and £126,163 from Bombay. The forest exports in that year in- cluded—teak, valued at £406,652; lac and lae-dye, £362,008; eaoutchoue, £89,381 ; and gums, £183,685. But no figures that cau be given exhibit adequately the labour aud the benefits of the Forest Department, which is gradually winning back for the eountry the fee-simple of her forest wealth, when it was on the point of being squandered beyond possibility of redemption.

The practice of nomadic cultivation by the hill tribes Nomadic may conveniently be described in connexion with forest cultivation.

conservation, of which it is the most formidable enemy. In all the great virgin forests of India, in Arakan, on the north-east frontier of Assam and Chittagong, throughout the Central Provinces, and along the line of the Western Ghats, the aboriginal tribes raise their crops of rice, cotton, &ec., in this manner. A similar system has been found to prevail in Madagascar ; and indeed, from its simplicity and its appropriateness it may fairly be called the most primitive mode of agriculture known to the human race, Known as toungya in Burmah, jém on the north-east fron- tier, dahya in Central India, Ai2 in the Himalayas, and kumdrt in the Western Ghats, it is practised, without any material differences, by tribes of the most diverse origin. Its essential features are the burning down of a patch of forest, and sowing the crop with little or no tillage on the clearing thus formed. The tribes of the western coast break up the cleared soil with a sort of hoe-pick and spade or even with the plough ; in other parts the soil is merely scratched with a knife, or the seed is scattered on its sur- face without any cultivation at all. In some cases a crop is taken off the same clearing for two or even three years ill succession, but more usually the tribe moves off every year to a fresh field of operations. To these nomad culti- vators the words rhetorically used by Tacitus of the primi- tive Germans are strictly applicable—Arva per annos mutant ; et superest ager. The wanton destruction thus wrought in the forests is simply incalculable. In addition to the timber-trees deliberately burned down to clear the soil, the fire thus started not unfrequently runs wild through the forest, and devastates many square miles. Wherever timber has any value from the proximity of a market, the first care of the Forest oe is to pro- All, — 95

Trriga- tion.

Tot hibit these fires, ard to assign heavy penalties for any infringement of its rules. The success of a year's operations is mainly estimated by the degree in which the reserves have been saved from the flame.

But vast tracts of country yet remain in which it would be equally useless and impossible to place restraint upon nomad cul- tivation, which is admitted to yield a larger profit than ordinary cultivation with the plough. A virgin soil, manured many inches deep with ashes and watered by the full burst of a tropieal rain- fall, returns forty and fifty-fold of rice, which is the staple grain thus raised. In addition to rice, Indian corn, millet, oil-seeds, and cotton are sometimes grown in the same clearing, the seeds being all thrown into the ground together, and each erop ripening in succession at its own scasou. Except to the cyes of a forest officer, a patch of jem cultivation is 4 very picturesque sight. Men, women, and children all work together with a will, for the trees must be felled and burned, and the seed sown, before the monsoon breaks.

Irrigation is everywhere dependent upou the two supreme considerations of water supply and land level. 'The sandy desert that extends from the hills of Rajputana to the basin of the Indus is more absolutely closed to irrigation than the confused system of hill and valley in Central India. Farther west, in the Indus valley, irrigation becomes possible, and in no part of India has it been conducted with greater perseverance and success. 'The entire province of Sind, and hardly less the lower districts of the Punjab, are absolutely dependent upon the floods of the Indus. Sind has been compared to Egypt, and the Indus to the Nile ; but, in truth, the case of the Indian province is the less favourable of the two. In Sind the average rainfall is barely 10 inches in the year, the soil is a thirsty saud, and, above all, the river does not run in confined banks, but wanders at its will over a wide valley. The rising of the Nile is a beneficent phenomenon, whose effects can be calculated with tolerable precision, and which the in- dustry of countless generations has brought under control for the purposes of cultivation. In Sind the inundation is an uncontrolled torrent, which oftentimes does as much harm as good. Broadly speaking, no crop can be grown in Sind except under irrigation, and therefore the total culti- vated area of about 3 million

acres may be regarded as entirely dependent upon artificial water-supply. The sup- ply is derived from the river by two main classes of canals —(1) inundation chamnels, which only fill when the Indus is in flood, and (2) perennial channels, which carry off water by means of dams at all seasons of thie year. The former are for the most part the work of ancient rulers of the country, or of the cultivators themselves; the latter have been constructed since the British conquest. In both cases care has been taken to utilize abandoned channels of the river. It is impossible to present a complete view of the results of irrigation, for in some provinces, as in Sind, it is treated as a department of land administration, while in others it is almost entirely conducted by private enterprise.

In 1876-77 about 900,000 acres in Sind were returned as irrigated from works for which eapital and revenue accounts are kept, the chief being the Ghar, Eastern and Western Nara, Sakhar (Sukkur), Phuleli, and Pinyari; the total receipts were about £190,000, almost entirely credited under the head of land revenue. In the same year about 445,000 acres were irrigated from works of which revenue accounts only are kept, yielding about £75,000 in land revenue. Throughout the remainder of the Bombay presidency irrigation is conducted on a comparatively small scale, and mainly by private enterprise. In the Concan, along the coast, the heavy Teal rain- fall and the annual flooding of the numerous small crecks permit rice to be grown without artificial aid. In Guzerat the supply is drawn from wells, and in the Deccan from tanks; but both these are liable to fail in years of deficient rainfall. Government hasnow undertaken a few comprehensive scheines of irrigation, which mostly conform to a common type—damming up the end of a hill valley so as to form an immense reservoir, aud then conducting the water over the fields by channels, which are in some cases of considerable length. In 1876-77 the total area in Bombay (excluding Sind) irrigated from Government works was about 180,000 acres, yielding a revenue of about £42,000. In the same year the total expenditure

‘to be useful for navigation.

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on irrigation (inclusive of Sind) was £235,000, —£65,000 under the

head of extraordinary and £170,000 of ordinary outlay. In some parts of the Punjab irrigation is only one degree less

necessary than in Sind, but the sources of supply are more nume- rous. valleys of the rivers, water can be obtained by digging wells from

In the northern tract, under the Himalayas, and in the upper

10 to 30 feet below the surface. In the south, towards Sind, in- undation channels are usual; while the upland tracts that rise between the basins of the main rivers are now in course of being supplied by the perennial canals of the Government. According to the returns for 1877-78, out of a grand total of 22,640,894 acres under cultivation, 5,000,481 were irrigated by private individuals and 1,618,854 by public channels, giving a total under irrigation of 6,619,335 acres, or 29 per cent of the cultivated area. The principal Government works are the Western Jumna canal, the Bari Doab canal, and the Sirhind, the last of which, with the largest expenditure of all, is still incomplete. Up to the close of 1877-78 the total outlay had been £3,645,189 ; the total income in that year was £263,053, of which £171,504 was classified as direct and £91,549 as indirect ; the total reveune charges on works in operation were £224,316, of which £146,419 was for maintenance and £77,897 for interest, thus showing a surplus of £38,737. On the Western Jumna canal alone the net profit was £83,112.

The North-Western Provinces present in the great dod, or high land between the Ganges and the Jumna, a continuation of the physical features to be found in the Upper Punjab. The local rain- fall, indecd, is higher, but before the days of artificial irrigation occasional deficiency repeatedly resulted in terrible famines. It is in this tract that the British Government has been perhaps most successful in averting the calamity of drought. In Sind irrigation is an absolute necessity; in Lower Bengal it may be regarded almost as a luxury; but in the great river basins of Upper India it serves the twofold object of saving the population from the vicissitudes of the season and of introducing more valuable crops and a higher stage of agriculture. Concerning private irrigation from wells in the North-Western Provinces no information is available. The great Government works are the Ganges

canal, the Eastern Jumna canal, the Agra canals, and the Lower Ganges canal, the last of which is not yet complete. Up to the close of 1877-78 the total outlay had been £5,673,401. The gross income in that year was £438,136, of which £337,842 was erived from water rates and £100,294 from enhanced land revenue ; the work- ing expenses amounted to £143,984, leaving £294,152 for surplus profits, or 6°77 per cent. on the total capital expended on works in operation. The total area irrigated was 1,461,428 acres, of which more than two-thirds were supplied by the Ganges caual. Of the total area, 415,659 acres were under wheat and 139,374 under sugar-cane.

Into Oudh no irrigation works have yet been introduced by Government. A tolerable local rainfall, the annual overflow of the rivers, and an abundance of low-lying swamps combine to furnish a water supply that is ample in all ordinary years. According to the settlement returns, out of a total cultivated area of 8,276,174 acres, 2,957,397 acres, or nearly 36 per cent., are irrigated by private individuals; but this figure must include low lands watered by natural overflow.

Throughout the greater part of Bengal there is no demand for artificial irrigation, but the solicitude of Government has undertaken to construct works in those exceptional tracts where experience has shown that occasional drought is to be feared. In the lower valleys of the Ganges and the Brahmaputra, and along the deltaic seaboard, flood is a more formidable enemy than drought, and embankments there take the place of canals. The Public Works Department has altogether about 2800 miles of embankments under its charge, upon which £79,105 was expended in 1877-78, either as direct outlay or in advances to landowners. The broad strip of northern Bengal and Behar, stretching between the Himalayas and the Ganges, is also rarely visited by drought; though, when drought does come, the excessive density of the population brings the danger of famine very near. In Saran alone it has been found necessary to carry out a comparatively small scheme for utilizing the discharge of the river Gandak. The great irrigation works in Bengal are two in number, and belong to two different types. (1.) In the delta of Orissa an extensive system of canals has been constructed on the

attern of those lower down on the Coromandel coast, which are intended to avert the danger of both drought and flood, and also In average seasons, 7.¢., in five years out of six, the local rainfall is sufficient for the rice crop, which is there the sole staple of cultivation ; and therefore it is not to be expected that these canals will be directly remuncrative. But ou the other hand, if they save the province from a repetition of the disastrous year 1865-66, the moncy will not have been expended in vain. (2.) In South Behar the flood discharge of the Son has been intercepted, after the system of engineering followed in the North-West, so as to irrigate a comparatively thirsty strip of land extending along the sonth bank of the Ganges, where distress has ere now been severely felt. In this case also, the expenditure

must be regarded rather as an insurance fund against famine than as reproductive outlay, The works are not yet coniplete, but the experience already gained proves that irrigation is wanted even in ordinary seasons. Up to the close of 1877-78 the total expendi- ture on capital account for all the irrigation works in Bengal was £4,653,903; the gross income for the year was £49,477; the working expenses were £70,286; and the estimated interest on capital, at 43 per cent., amounted to £203,971, thus showing a net deficit of £224,780. The area irrigated was about 400,000 acres.

In the Madras presidency, and generally throughout southern India, facilities for irrigation assume a decisive importance in determining the character of agriculture. Crops dependent on the rainfall are distinguished as “ dry crops,” comprehending the large class of millets. ice can only be grown on “ wet land,” which means land capable of being irrigated. Except on the Malabar or western coast, the local rainfall is nowhere sufficiently ample or suffi- ciently steady to secure an adequate water supply. Lverywhere else water has to be brought to the fields from rivers, from tanks, or from wells. Out of the total cultivated area of Madras, only 15 per cent. is classified as “ wet land ;” the rest is at the mercy of the monsoons. From time immemorial an industrious population has made use of all the means available to store up the rainfall and direct the river floods over their fields. The upland areas are studded with tanks, which sometimes cover square miles of ground; the rivers are crossed by innumerable

anicuts, or dams by which the floods are diverted into long aqueducts. Most of these works are now the property of Government, which annually expends large sums of money in inaintenance and repairs, looking for remunera- tion only to the augmented land revenue. The average rate of assessinent is 9s. 6d. per acre on irrigated land, as compared with only 2s. 3d. per acre on unirrigated land. It is, therefore, not only the duty but the manifest advantage of Government to extend the facilities for irrigation wherever the physical aspect of the country will permit. The deltas of the Godavari, the Kistna, and the Kaveri (Cauvery) have within recent years been traversed by a network of canals and thus guaranteed against any risk of famine. Smaller works of a similar nature have been carried out in other places ; while a private company, with a Government guarantee, has under- taken the more difficult task of utilizing ona grand scale the waters of the Tungabhadra amid the hills and vales of the interior. According to the latest statistics, the tetal irrigated area of the presidency is about 5 million acres, yielding a land revenue of about 2 millions sterling. Of this total, 1,680,178 acres, with a revenue of £739,778, are irrigated by cight great systems, for which revenue and capital accounts are kept. The minor works consist of about 35,000 tanks and irrigation canals, and about 1140 anicuts or dams across streams.

In Mysore, tanks, anicuts, and wells dug in the dry beds of rivers afford the means of irrigation, but wet cultivation is there even rarer thanin Madras. Aftcr the disastrous famine of 1876-78 some comprehensive schemes of throwing embankments across river valleys were undertaken by Government. In the Central Provinces irrigation still remains a matter of private enterprise. According to the settlement returns, out of a total cultivated area of 18,610,508 acres, 804,370 acres, or 6 per cent., are irrigated by private individuals. The only Government work is a tank in the district of Nimar. In British Burmal, as in Lower Bengal, em- bankments take the place of canals, being classed as " irrigation works" in the annual reports. Within the last few years Govern- ment has spent about £318,000 under this heading, in order to save the low rice-fields along the Irawadi from destructive inundation.

The following figures, applying to India as a whole, partially show how the Government has performed its duty as a landlord in undertaking productive

public works. During the ten years ending March 1878 a total sum of £10,457,702 was expended on irrigation under the budget heading of " extraordinary," as compared with £18,686,321 expended on state railways in the same period. In the twelve months ending at the same date irrigation yielded a gross income of £495,142, as compared with £548,528 derived from state railways; while £370,747 was charged to revenue account against irrigation and £420,754 against statc railways.

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INTERNAL CoMMUNICATION.

Railways.—Vhe existing system of railway communica- Railways,

tion in India dates from the administration of Lord Dalhousie, who brought to bear upon this question an experience gained at the Board of Trade when railway speculation in England was at its height. The first Indian line was projected in 1843 by Sir Macdonald Stephenson, who was afterwards active in forming the East India Railway Company ; but that premature scheme was blighted by the financial panic that followed soon afterwards in England. Bombay, the city that has most benefited by railway enter- prise, saw the first sod turned in 1850, and the first line of 3 miles to Thand (Tanna) opened in 1853. The elaborate minute drawn up by Lord Dalhousie in the latter year still faithfully represents the railway map of India at the present day, though modified in detail by Lord Mayo's reform of 1869, Lord Dalhousie's scheme consisted of a few trunk lines, traversing the length and breadth of the peninsula, and connecting all the great cities and military cantonments. These trunk lines were to be constructed by private companies, to whom Government should guarantee a minimum of 5 per cent. interest on their capital expended, aud from whom it should demand in return a certain measure of subordination. The system thus sketched out was promptly carried into execution, and by 1871 Bombay was put into direct railway com- munication with the sister presidencies of Calcutta and Madras. The task Lord Mayo had to undertake was the development of traffic by means of feeders which should tap the districts of production and thus open up the entire country. 'The means he determined to adopt was the

con- struction of minor lines by the direct agency of the state, on a narrower gauge, and therefore at a cheaper rate, than the existing guaranteed railways.

The guaranteed lines, including the East Indian, which was transferred to Government in 1879 in accordance with terms applicable to all alike, comprise the following:—the East Indian, running up the valley of the Ganges from Calcutta (Howrah) as far as Delhi, with a branch to Jabalpur; the Great Indian Penin- sular, which starts from Bombay and sends one arm north-east to Jabalpur, with a branch to Nagpur, and another south-east to the frontier of Madras; the Madras line, with its terminus similarly at Madras city, and two arms running respectively to the Great Indian Peninsular junction at Raichur and to Beypur on the oppo- site coast, with branches to Bangalore and Bellary; the Oudh and 'ohilkhand, connecting Lucknow and Moradabad with Cawnpur and Benares; the Bombay, Baroda, and Central India, which runs due north from Bombay through the fertile plain of Guzerat, and is destined ultimately to be extended across Rajputana to Delhi; the Sind, Punjab, and Delhi, consisting of three sections, one in Lower Sind, another from Delhi to Lahore, and the third from Lahore to Multan; the South Indian (the only one on the narrow gauge), in the extreme south, from Cape Comorin to Madras city ; and the Eastern Bengal, traversing the richest portion of the Gangetic delta. The state lines are too numerous to be described singly. They in- clude the extension from Lahore to Peshawar on the north-west frontier, which at present stops short at Jhelum; the " missing link," from Multan to Hyderabad, thus bringing the Punjab into direct connexion with its natural seaport at Karachi (opened throughout in 1878); the line up the valley of the Irawadi from Rangoon to Prome; and several short lines which have been con- structed entirely at the expense of native states.

Statistics of Indian Railways for 1878.

i i

~~594,249 |/£10,404,758 |£5,206,938 |£5,197,815~~

~~38,495,748 | 8,171,617~~

PGtale.…….-.....| 8215 (£115,059,454

of 5 feet 6 inches; the state lines follow as a rule the narrow or metre gauge of 3‘281 feet.

Roads.—As the railway system of India approaches its completion, the relative importance of the roads naturally

These figures show 1 mile of railway to every 109 square miles of the area of British India, or to every 179 square iniles of the area of the entire peninsula. The average cost of construction per mile is almost exaetly £14,000. The guaranteed railways, embracing the great trunk lines throughout India, are on the “ broad gauge

Roads.

River naviga- tion.

796

diminishes. Froma military point of view, rapid communi- cation by rail has now superseded the old marching routes as completely as in any European country. Like Portsmouth in England, Bombay in India has become the national har- bour for the embarkation and debarkation of troops. On landing at Bombay, all troops proceed for a short rest to the healthy station of Deolali on the plateau of the Deccan, whence they can reach their ultimate destinations, however remote, by easy railway stages. The Grand Trunk Road, running up the valley of the Ganges from Calcutta to the north-west frontier, which was first planned in the 16th century by the Afghan emperor Sher Shah and was brought to completion under the administration of Lord George Bentinck, is now for the most part untrodden by troops. But though the railway system occupies the first place for military and commercial purposes, the actual mileage and economic importance of roads have greatly increased. They do not figure in the imperial balance-sheet, nor do they strike the popular imagination, but their construction and repair constitute two of the most important duties of the district official. A few lines, such as the continuation of the Grand Trunk Road in the Punjab, are still substi- tutes for the railways of the future.

~~*Others, which climb the passes of the Himilayas, the Western Ghats, or the Nilgiris, will probably never be superseded. The great majority, however, are works of local utility, serving to promote that ease and regularity of communication upon which the existence of civilization so largely depends. The substitution of the post-cart for the naked runner, and that of wheeled traffic for the pack-bullock, are silent revolutions effected under British rule.*~~

~~*The more important roads are all carefully metalled, the material employed in most provinces being kankar or calcareous limestone. In Lower Bengal and other deltaic tracts, where no kind of stone exists, bricks are roughly burnt and then broken up to supply metal for the roads. The minor streams are crossed by permanent bridges, with foundations of stone, and not unfrequently iron girders. The larger rivers have temporary bridges of boats thrown across them during the dry season, which give place to ferries in time of flood. Avenues of trees afford shade and material for timber. Most of these main lines are under the charge of the Public Works Department. The burden of maintaining the minor roads has, by a recent administrative reform, been thrown upon the local authorities, who depend for their pecuniary resources upon district committees and are often compelled to act as their own engineers. No statistics are available to show the total mileage of roads in British India, or the total sum expended on their maintenance.*~~

~~*Inland navigation is almost confined to the four great rivers, the Ganges, the Brahmaputra, the Indus, and the Irawadi. 'These all flow through broad valleys, and from time immemorial have been the chief means of conveying the produce of the interior to the sea, South of the Gangetic basin there is not a single river that can be called navigable. Most of the streams in that tract, though mighty torrents in the rainy season, dwindle away to mere threads of water and stagnant pools during the rest of the year, The Godavari and the Narbada, whose volume of water is ample, are both obstructed by rocky rapids which engineering skill has hitherto been unable to overcome. total sum of 14 millions sterling has been in vain expended upon the former river. Indeed, it may be doubted whether water carriage is able to compete, as regards the more valu- able staples, with communication by rail. After the East Indian Railway was opened, steamers*~~

~~ceased to ply upon the Ganges; and the steam flotilla on the Indus simi- larly shrank to insignificance when through communica- tion by rail became possible between Multan and Karachi.~~

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~~[COMMERCE.~~

~~On the Brahmaputra and its tributary the Barak, and on the Irawadi, steamers still run secure from competition. But it is in the Gangetic delta that river navigation attains its highest development. There the population may be regarded as half amphibious. Every village can be reached by water in the rainy season, and every family keeps its boat. The main channels of the Ganges and Brahmaputra and their larger tributaries are navigable all the year through. During the rainy months road-carriage is al- together superseded. All the minor streams are swollen by the rainfall on the hills, and the local downpour ; while fleets of boats sail down with the produce that has accumu- lated in warehouses on the river banks. The statistics of this subject belong rather to the department of internal trade, but it may be mentioned here that the number of laden boats registered at certain of the river-stations in Bengal in the year 1877-78 was 401,729.~~

~~The great majority of the Bengal rivers require no attention from Government, but the system known as the three Nadiy4 rivers is only kept open for traffic by close supervision. A staff of engineers is constantly employed to watch the shifting bed, to assist the scouring action of the current, and to advertize the trading community of the depth of water from time to time. In the year 1877-78 a total sum of £9522 was expended on this account, while an income of £32,494 was derived from tolls.~~

~~The artificial water channels of India may be divided into two Canals. classes—(1) those confined to navigation, and (2) those primarily constructed for purposes of irrigation. Of the former class the most important examples are to be found in the south of the pen- insula, On both the Malabar and the Coromandel coasts the strip of lowland lying between the mountainsand the sea affords natural facilities for the construction of an inland canal running parallel to the shore. In Malabar the salt-water lagoons or lakes, which form such a prominent feature in the local~~

~~*geography, merely required to be supplemented by a few cuttings to supply continuous water communication from the port of Calicut to Cape Comorin. On the cast coast, the Buckingham canal, running north from Madras city as far as the delta of the Kistna, has been completed with- out any great engineering difficulties. In Bengal there are a few artificial canals of old date, but of no great magnitude, in the neighbourhood of Calcutta. The principal of these form the system known as the Calcutta and Eastern canals, which consist for the most part of natural channels, artificially deepened in order to afford. a safe boat route through the Sundarbans. Up to the close of the year 1877-78 a capital sum of £360,332 had been expended by Government on these canals, and the gross income in that year was £44,120 ; after deducting cost of repairs, &c., charged to revenue account, and interest at the rate of 44 per cent., a net profit was left amounting to £8748. The Hijili tidal canal in Midnapur district, which cuts off a difficult corner of the Higli (Hooghly) river, yielded a net revenue of £3171 in the same year.*~~

~~*Most of the great irrigation works, both in northern and southern India, have been so constructed as to be available also for naviga- tion. The general features of these works have been already de- scribed. The works of the Madras Irrigation Company on the Tungabhadra were not made available for navigation until 1879. 'scheme is now under the consideration of the Bengal Government for joining the Midnapur and Orissa canal systems, and extending the line of water communication farther southward through the Chilk4 Lake as far as Ganjim, 400 miles from Calcutta.*~~

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~~*The trade of India may be considered under four heads : —(1) sea-borne trade with foreign countries ; (2) coasting trade; (3) frontier trade, chiefly across the northern moun- tains ; (4) internal traffic within the limits of the empire. Sea-borne Trade.—With an extensive seaboard, India Sea-borne has but few ports. Calcutta monopolizes the commerce, not trade. only of Lower Bengal, but of the entire basins of the Ganges and the Brahmaputra. Bombay is the sole outlet for the agricultural wealth of Guzerat, the Deccan, and the Central Provinces ; while Karachi (Kurrachee) performs a similar office for the Indus, and Rangoon for the Irawadi. The natural value*~~

~~*of these four ports has been permanently confirmed by the construction of the main lines of railway communication. In the south of India only is sea-borne*~~

~~*Growth of trade.*~~

~~*COMMERCE. | INDIA 757*~~

~~trade distributed along the coast. The western side has a succession of tolerable harbours, from Goa to Cochin, On the east there is not a single safe roadstead nora navigable river, but ships anchor some distance off the shore at Madras, and at other points, generally near the mouths of the rivers. Of the total foreign trade of India, Calcutta and Bombay control about 40 per cent, each; Madras has 6 per cent,, Rangoon 4 per cent., and Karachi 2 per cent., leaving a balance of only 8 per cent. for all the remaining ports of the country. Calcutta and Bombay may be called the two centres of collection and distribution, to a degree without a parallel in other countries ; and the growth of their prosperity is identical with the development of Indian commerce.~~

~~Foreign Trade of India for Forty Years, classified according to Quinquennial Periods, in Millions Sterling.~~

~~a meme~~

~~Average Imports. Average Exports. Periods. Cotton Total : Total Balance Manu 'ac- | Merchan-| 7 eee cum Merchan-| 17¢8-| of Trade fame, dise, sure, otton. dise, | Sure. | including 1840-44 | 3-19 769 | 276 | 234 | 1414 | 0-48 1845-49 376 9:14 3:07 1:68 15°68 1:32 1850-54 5°15 11:06 479 3:14 19:02 1:00 1855-59 6-94 15:58 soley) 3-11 24°93 0:92 1860-64 10°92 23°97 17:09 15°56 42:15 1:02 1865-69 15°74 31:70 17°62 25°98 55°86 1°80 1870-74 17°56 33:04 8:26 17°41 56 25 1:59 1875-79 18°89 88°36 9°86 11°52 60°32 2:81 General . i 'i . : — — \ 10°27 21:32 | 9:34 | 1009 | 3604 | 1-37~~

~~The preceding table, which has been compiled from materials furnished by the Parliamentary Abstract for 1879, demands a few words of explanation. The average of quinquennial periods has been taken in order to coun. teract, as far as possible, accidental fluctuations. The two columns giving the imports of treasure and the exports of raw cotton both show exceptional increases between 1855 and 1869, due mainly to the effects of the Mutiny and of the American War. Far more instructive are the three columns giving the imports of cotton manufactures and of total merchandise and the exports of total mer- chandise. ach of these three, without exception, exhibits a progressive increase in every one of the eight quin- quennial~~

periods. In the full period of forty years the value of cotton goods imported has multiplied sixfold ; the value of total merchandise imported has multiplied fivefold ; and the value of total merchandise exported has multiplied more than fourfold.

Before examining in detail the history of some of the chief staples of trade, it may be convenient to give in this place the statistics of asingle year,—1877-1878, which was a year of inflation, despite the incidence of faniine in southern India. In 1877-78 the aggregate volume of foreign sea-borne trade exceeded 126 millions sterling in value. The transactions of Government show an import of £2,138,182 and an export of £36,615. The imports of merchandise were £39,336,003, and of treasure £17,355,460; total imports, £56,691,463. The exports of merchandise were £65,185,713, and of treasure £2,155,136 ; total exports, £67,340,849. These figures show an excess of exports over imports (including treasure) amount- ing to £8,494,250, and an excess of treasure imported to the amount of £15,200,324. The total number of vessels that entered and cleared was 12,537, with an aggregate of 5,754,379 tons, or an average of 459 tons each. Of the total tonnage 76 per cent. was British, 7 per cent. British Indian, 4 per cent. native, and 13 per cent. foreign,—American, Italian, and French being best represented in the latter class. There was also a land-borne frontier trade esti- mated at 72 millions—imports into India 4} millions, exports 3 millions. 'The grand total of the land-borne and sea-borne foreign trade of India in 1878, was 134 millions. .

The following tables give the principal items, together with the totals, of import and export for 1877-78, showing the quantities wherever possible, as well as the values :—

1 The plus sign (+-) stands for exeess of exports, or so-ealled favourable balanee of trade; the minus sign (—) stands for excess of imports,

Foreign Trade of British India in 1877-78, Imports,

Quantities, Value, £ AN OEE | senprpaernerons ORpBEOE GABE ais 0bn oun 597 Coal and coke…..... tons! |, 601,159 a 1,007,939 Cotton twist and yarn… bi, 86,194,125 | 2,850,408 Cotton piece-goods— pines Grey 500000 . yds, oti 992,537,579 | 11,562,853 W Wit© sessssesseesonvesnn ns

~~_ — 215,624,360 | 2,936,109 Colounedisermssssstecers ” nO 150,548,718 | ; 2,454,108 OUMe ISOS. reverence ain ae 369,248 Total eotton goods…….. eas ee eae | 172,716 TJurdware and cutlery …….. es Pr ie “448,228 Liquors— , Ale, beer, porter …... gals.) 1,328,077 313,070 Spirits sale vales tree arsaseees oH 737,714 647,661 Wines and liqueurs… ,, 496,733 436,020 Other SOTES...seseserrsere ; 14,160 4,808 Total liquors…….. * 9» [ss 2,576,684 |——-——_ 1,401,559 MMachinienyeicn.vesserss cee ies Agi 850,997 Metals— ‘ COPD awerreesessecseeces ewts, 320,108 1,498,175 seen gy |) Ee 1,435,561 aaa 330,789 671,728 Total metals …….. » |-————-__—:3, 088,618 ——3,605,464 Provisions)...ssc… comens vag F 858,797 Railway plant… ome as 200 907,002 Salt Siisiss sani 4 ‘ doo 254,281 nae 401,365 Silk, raw.. Scnd0s0pNOoO ae 2,102,930 an 678,069 Silk, manufactured .,.... yds, ‘ia 8,328,716 fod 804,883 Spices . “an 03,123, 137 A 488,884 Sugar Musudcctonenretel cs tete 500 475,105 ay 798,036 Woollen goods ….....00… yds, Ans 7,069,693 G0 782,781 Miscellaneous ..,.....0cc0sesees r ais 5,571,693 Tota] merchandise…... on 39,336,003 AIRGAS UTC y~~

~~See~~

~~58,829,645~~

~~Grand total …..... fasta ————————E Eee eee~~

~~Exports, | Quantities Value. £ £ COMIC OE. tans vssieeeeneenners ib ae 33,300,624 60 1,338,499 COLTON PAW oc .-caessstevess ef ae 387,416,624 fa 9,883,534 Cotton pieee-goods …... yds. ne 17,546,591 éa0 442,286 COMBO tWiStiet.s.ssrseerres Ib sie 15,600,291 wae 682,058 ING GOW, ..0cet es ssrseeeednereennes! aie 120,605 tas 3,494,834 ORN@riGVOS i oesscsesaccies ” one 735,838 ont 406,660 Grain— Riee… »» | 18,428,886 6,950,276 Wheat…..... coon oy || Che OD 2,856,990 OPLEMSORIS)....cceeres yy 879,806 826,834 Total crain,svemnesssete . ~——25,648,342 — 10,134,100 Hiides and skins …..... no. Bi 22,916,317 a 3,756,887 RUUUERy UEW. saiseester voseiselerae CWS see 5,450,276 900 3,518,114 Jute, manufactured ….. =poneo6 toa ae 50 771,127 Lae, excepting lae-dye ewts. oni 95,075 m0 883,039 (US) Gnosnnopacaadooetasnocouugbagero 6 ack ocd 206 871,552 OPM. ..505.0000 0505.59 CHGSES ees 92,820 son 12,374,355~~

~~Saltpetre…..:.ecscosseeses. OWES, ase 389,002 an 379,002 Seeds— WINS CO Mertree ess sausesessaly 7 7,198,918 4,224,429 MRAMOMeccccsesciesescereres: oN 3,193,488 1,918,483 Gingelly or til…..... ,, | 1,158,802 848,226 OUCH SONUST ec. seccerecess etsy 635,812 369,191~~

~~12,187,020 |— __ ——._ 7,860,284~~

~~Total SCCS,.....000868 yy |—~~

~~SSI MME sisesceacsieeciesisaseseesu ID as 1,512,819 sa 708,549 Silk, manufactured…... yds. a0 1,535,458 200 151,080 i nern oer 13,805,035 5 226,515 844,125 RAG 745,851~~

~~33,459,075 ” 3,044,571~~

~~56,939 ~ 406,652~~

~~oF 11,102,233 dot 93,037~~

~~Wool, raw rn ine 23,075,823 an 943,645 Woollen manufactures…..... 860 800 207,873 MiSCe]llanGOis …ecccerrecessoveoaes 000 on AOD 1,874,929 Total Indian produce …. ey she ie 63,143,533 Foreign merehandise…..... + “0 0 2,042,180 Treasure 2,165,136 Government stores 36,615 Grand total are Fy; B08 67,377,464~~

~~As regards the imports, the first thing to notice is thé principal enormous predominance of two items-—cotton goods and imports. treasure. On an average of the last forty years, cotton goods form 33 per cent., or exactly one-third of the total, and treasure an additional 30 per cent. Next in order come metals (copper, which is largely used by native smiths, slightly exceeding iron); Government stores, in- cluding munitions of war, boots, liquor, and clothing for soldiers, and railway plant ; liquors, entirely for European consumption ; coal, for the use of the railways and mills ; railway plant for the guaranteed companies ; provisions,~~

~~Cotton goods.~~

~~*Treasure,*~~

~~*Exports.*~~

~~*758*~~

~~*machinery and mill-work, and manufactured silk. It will thus be seen that, with the single exception of Manchester goods, no articles of European manufacture are in demand for native consumption, but only for the needs of the civi- lized administration, and no raw produce, except copper, iron, and salt.*~~

~~*Considering that England's export trade with India thus mainly depends upon piece-goods, it is curious to recollect the history of cotton manufacture. In the beginning of the 17th century the industry had not been introduced into England, and whatever demand there was for cotton in that country was satisfied by circuitous importations from India itself, where cotton-weaving is an immemorial industry. In 1641 " Manchester cottons," in imitation of Indian calicoes and chintzes, were still made of wool. Cotton is said to have been first manufactured in England in 1676. To foster the nascent industry, a succession of statutes were passed prohibiting the wear of imported cottons ; aud it was not until after the inventions of Ark- wright and others and the application of steam as a motive power had secured to Manchester the advantage of cheap production that these protective measures were entirely removed, In the present century Lancashire has rapidly distanced her instructors. During the five years 1840-45 the annual import of cotton manufactures into India aver- aged a little over £3,000,000 sterling. In each subse- quent quinquennial period there has been a steady in- crease, until in the year 1877-78 the import reached the unprecedented total of £20,000,000 sterling, or an increase of more than sixfold in less than forty years.*~~

~~*The importation of treasure is perhaps still more extra- ordinary, when we bear in mind that it is not consumed in the using, but remains permanently in the country. Dur- ing the same period of forty years the net import of trea- sure, deducting export, has reached the enormous aggregate of just 319 millions sterling, or more than £1, 6s. 6d. per head of the 240 million inhabitants of the peninsula. Of course, by far the larger portion of this was*~~

~~silver, but the figures for gold are by no means inconsiderable. Dur- ing the ten years ending with 1875, when the normal value of silver in terms of gold was but little disturbed, the total net imports of treasure into India amounted to just 99 millions ; of this total 624 millions were in silver and 364 millions in gold, the proportion of the latter metal being thus considerably more than one-third of the whole. On separating the re-exports from the imports, the attraction of gold to India appears yet more marked, Of the total imports of gold only 7 per cent. was re-exported, while for silver the corresponding proportion was 19 per cent. Roughly speaking, it may be concluded that India then absorbed about £3,000,000 sterling of gold a year. The supply is drawn chiefly from China, Ceylon, Great Britain, and Australia. The depreciation of silver that has since taken place has caused an enormous increase in the import of silver and a corresponding increase in the export of gold. The figures since 1876 do not show the normal state of things, But even in 1877-78, when the value of silver was at its lowest, though India drew upon its hoards of gold for export tothe amount of more than 1 million sterling, it yet imported more than 14 millions, showing a net import of half a million of gold. It has been estimated that the gold circulation of India amounts to about 1,620,000 gold mohars, as compared with £158,000,000 of silver and £2,960,000 of copper. In addition, 10 million sovereigns are said to be hoarded in india, mainly in the Bombay presidency, where the impression of St George and the Dragon is valued on religious grounds.~~

~~When we tum to the exports, the changes that have taken place in relative magnitude demand notice.~~

~~ILNDPA~~

~~[coMMERCE.~~

~~In 1877-78 raw cotton for the first time for many years falls into~~

~~the second place, being surpassed by the aggregate total of food grains ; surpasses indigo, factures are nearly as valuable as colfee. value though not in quantity, exceed the exports ; the trade in raw silk is about equally balanced ; while spices, once the glory of Eastern trade, were exported to the value of only £226,515, as compared with imports more valuable~~

~~*oil-seeds show as a formidable competitor to cotton; jute and tea comes close behind ; while cotton manu- The imports of sugar, in*~~

~~*and also twofold larger. The export of raw cotton has been subject to excessive variations. Raw*~~

~~*At the close of the last century eottou was sent to England in cotton, small quantities, chiefly the produce of the Central Provinces, eol-*~~

~~*leeted at Mirzapur and shipped at Calcutta, Guzerat, despatched from Surat. export same year the English returns show only 2000 bales of East*~~

~~*or the produce of In the year 1805 the total of cotton from Surat was valued at £108,000; in the*~~

~~*Indian cotton imported into Great Britain, But this figure was far below the average, for by 1810 the corresponding nuniber of bales had risen to 79,000, to sink again to 2000 in 1813, and to rise to 248,000 in 1818. Bombay did not begin to participate in this trade until 1825, but has now acquired the practical monopoly, since the railway has diverted to the west the produce of the Central Provinees. In 1834, when the commerce of India was first thrown open, 38,000,000 tb were exported. Analysing the exports of cotton during the forty years sinee 1840, we find that in the first quinquennial period they averaged 234 millions sterling in value, and did not rise perceptibly until 1858, when they first touched 4 millions. From that date the increase was steady, even before the American exports were eut off by war in 1861. India then made the most of her opportunity, though quantity and quality did not keep pace with the augmented price. The highest figures of value was attained with 374 millions sterling in 1865, and the highest figure of quantity with 803,000,000 Ib in 1866. "henceforth the decline has been constant, though somewhat irregu- lar, the lowest figures both of quantity and value being those of 1878-79. The most reeent feature of the trade is the comparatively small amount shipped to the United Kingdom, and the even distri- bution of the rest among Continental ports. The export of raw eotton in 1878-79 amounted to £7,914,091, and of twist and cotton goods to £2, 581,823.*~~

~~Second in,importanee to cotton as a raw material of British manu- Jute, facture comes jute, the trade in which is a creation of less than thirty years. At the time of the London Exhibition of 1851 jute fibre was practically untried and unknown, while attention was even then actively drawn to rlea or China grass, which reniains to the present day unmanageable by any cheap process. Fron time immemorial jute has been grown in the swamps of Eastern Bengal, and has been 'woven into coarse fabrics for bags and even clothing. As early as 1795 Dr Roxburgh called attention to the commercial value of the plant, which he grew in the Botanical Gardens of Caleutta and named "jute," after the language of his Orissa gardeners, the Ben- gali word being pdt or koshta. In 1828-29 the total exports of jute were only 364 cwts., valued at £62. From that date the trade steadily grew, until in the quinquennial period ending 1847-48 the exports averaged 234,055 cwts. The Crimean war, which cut off the supplies of Russian flax and hemp from the Forfarshire weavers, made the reputation of jute. 'Taking quinquennial periods, the ex- port of jute rose from an average of 969,724 cwts. in 1858-68 to 2,628,100 cwts. in 1863-68 and 4,858,162 cwts. in 1868-73, The highest figures reached were in the year 1872-73, with 7,080,912 cwts., valued at £4,142,548. The export of raw jute in 1878-79 reached £3,800,426, and of manufactured jute £1,098, 434.~~

~~The export of grain, as already noticed, is now in the aggregate larger than that of cotton. The two chief items are rice and wheat. Rice and Rice is exported from British Burmah, from Bengal, and from wheat. Madras. From the point of view of the English produce market~~

~~rice means only Burmese rice, which is annually exported to the~~

~~large amount of about 12 million cwts., valued at 3 millions ster-~~

~~ling. In the Indian tables this is all entered as consigned to the United Kingdom, though, as a matter of faet, the rice fleets from Burmah only call for orders at Falmouth, and are thence diverted to various English or Continental ports. India has a practical mono-~~

~~poly of the European market. An export duty is levied on rice in~~

india at the rate of 3 dnnds per maund, or about 6d. per ewt. A similar duty on wheat was repealed in 1875, and that trade has since conspicuously advanced. In 1874-75 the export of wheat was about 1 million ewts. Forthwith it increased year by year, until

in 1877-78 it exceeded 6} million cwts., valued at nearly 3 millions sterling. In the following year the quantity fell away to almost nothing, owing to the general failure of the harvest in the produc-

{ng districts. The Punjab is the principal wheat-growing tract in India, but hitherto the chief supplies have come from the North-

Western Provinces and Oudh, being collected at Cawnpur and

thence despatched by rail to Calcutta. in 1879 was valued at £9, 802,363.

Oil-seeds, also, were freed in 1875, the duty previous to that date Oil-seeds. having been 8 per cent. ad valorem. Ten years before, the average

The total export of grains

export was only about 4 million ewts. a year; but the fiscal change, coinciding with an augmented demand in Europe, has caused an in- crease of threefold. In 1877-78 the total export amounted to 12,187,020 cwts., valued at more than 7} millions Sterling. Of this Bengal contributed 7,799,220 cwts., and Bombay 3,179,475 cwts. Linseed and rape are consigned mainly to the United Kingdom, while France takes almost the entire quantity of fi or gingelly. The export of oil-seeds in 1878-79 was valued at £4,682,512, Indigo In actual amount, though not in relative importance, indigo holds and dyes. its own in the face of competition from aniline dyes. The export of 1877-78 amounted to 120,605 cwts., valued at £3,494,334, being the highest figures on record. Of this total Bengal yielded 99,402 cwts., and Madras 16,899 cwts. In 1878-79 the export of indigo amounted to 105,051 cwts., valued at £2,960, 463. The most noticeable feature in this trade is the diminishing proportion sent direct to England, and the wide distribution of the remainder. Of other dyes, safflower has

~~*greatly fallen off, being now only in demand fora rouge in China and Japan ; the export in 1877-78 was 3698 cwts., valued at £14,881. The export of myrobalans, on the other hand, was greatly stimn- lated by the Russo-Turkish war, which interrupted the supply of valonia and galls from Asia Minor. The quantity rose from 286,350 cwts. in 1875-76 to 537,055 cwts. in 1877-78, valued in the latter year at £230,526. Practically the whole is sent to the United Kingdom. 'Turmeric, also, exhibits an increase to 146,865 cwts. in 1877-78, valued at £123,766, of which the United Kingdom took about one-half. LLac-dye, like other kinds of lac, shows a depressed trade, the exports in 1877-78 having been 9570 cwts., valued at £29,009.*~~

~~*No other export has made snch steady progress as tea, which has multiplied more than fourfold in the space of ten years. In 1867-68 the amount was only 7,811,429 tb; by 1872-73 it had reached 17,920,439 tb ; and in 1878-79, without a single step of retrogres- sion, it had further risen to 34,800,027 tb, valued at £3,170,118. Indian tea has now a recognized position in the London market, generally peers abont 4d. per Ib higher in value than Chinese tea, but it has failed to win acceptance in most other countries, excepting Australia. The exports of coffee from India are stationary, if not declining. The highest amount during the past ten years was 507,296 cwts. in 1871-72, the lowest amount 298,587 ewts. in 1877-78, valued at £1,338,499. In 1878-79 the export was 342,268 cwts., valued at £1,548, 481.*~~

~~*Cotton Of manufactured goods, cotton and jute deserve notice, though and jute by far the greater part of the produce of the Indian mills is con- manufac- sumed locally. The total valne of cotton goods exported in 1878-79*~~

~~*Tea.*~~

~~*Coffee.*~~

~~*FN DY) A*~~

~~*759*~~

~~*while in 1877-78 grey goods nt to Aden, Arabia, Zanzibar,*~~

~~amounting to over 10 million yards, and Jute manufactures consist of gunny bags, gunny cloths, and rope and twine, almost entirely the produce of the Calcutta mills. In all of these the value of the exports is in- creasing faster than the quantity, having multiplied nearly four- fold in the last five years. In 1877-78 the total export of Jute mannfactures was valued at £771,127, and in 1878-79 at £1,098,434. Gunny bags, for the packing of wheat, rice, and wool, were exported in 1877-78 to the number of more than 264 millions, valued at £729,669. Of this total £298,000 (includ- ing by far the most valuable bags) was sent to Australia, £162,000 to the Straits, £80,000 to the United States, £77,000 to Egypt, £32,000 to China, and £81,000 to other countries, this comprising a considerable quantity destined for England. In 1878-79 the export of gunny bags had increased to 454 millions, valued at a million sterling. Of gunny cloth in pieces nearly 3 million yards were exported in 1877-78, almost entirely to the United States, valued at £35,610 ; in 1878-79 these exports had increased to up- wards of 43 million yards. Of rope and twine 4428 cwts. were exported, valued at £5443.~~

~~The following tables, being taken from Indian returns, do not in all cases show the real origin of the imports or the ultimate desti- nation of the exports, but primarily the countries with which India has direct dealings. London still retains its historical pre-eminence as the first Oriental mart in the world, whither buyers flock from the other countries of Europe to satisfy their wants, Germans go there for wool, Frenchmen for jute, andallnationsalike for rare dyes, spices, and drugs. Though the opening of the Suez Canal has restored to the maritime cities of the Mediterranean some share of the business that they once monopolized, yet, on the other hand, the advantage of prior possession, the growing use of steamers, and the certainty of being able to obtain a return freight, all tend to favour trade with England carried in English bottoms. As the result of these con- flicting influences, the trade of India with the United Kingdom, while in actual amount it remains pretty constant, shows a relative decrease as compared with the total trade.~~

~~being about 8 million yards ; from the Bombay mills Were se and the Mekran coast, valued at £141,509.~~

~~Distribution of Principal Exports of Raw Produce in 1877-78, in Cuts.~~
~~Wheat.~~

~~Rice, Indigo.~~

~~United Kingdom ….~~

~~5,731,349~~

~~tures. Was £1,644,125, being an increase of nearly threefold as compared Fee Teen —_—- oo ae 116‘674 20°00 with 1874-75. The exports of twist and yarn, spun in the Bombay 68,839 my a mills, increased from 3 million tb in 1874-75 to 15} million tb in : a sats 1877-78, valued in the latter year at £682,058. ‘The chief places of 845‘810 9839 destination were—China, 13,762,138 tb; Aden, 1,181,120 Tb; and Aa an 12,417 Arabia, 393,371 tb. The export of twist and yarn in 1878-79 was eden ete 4,148 valued at £987,698. Piece-goods belong to two classes. Coloured Chae ses pas = goods, woven in hand-looms, are exported from Madras to Ceylon Sian SeEMeAES., 1,022,431 and the Straits, to the annual value of about £230,000, the quantity Distribution of Foreign Trade of India in 1877-1878 (excluding treasure). iil ear France. Italy. log Australia, inti Se ae ts,| Ceylon. Mauritius. £ £ £ £ £ £ £ £: £ PUMVOMS i6..1.0060.100..4| 82,211,308 451,105 | 349,229 | 279,717 | 298,298 1,408,673 | 1,079,702 | 530,555 ee TPR POUES iinaiiiiiser essen 29,298,152 | 5,963,057 | 1,867,690 | 1,980,340 | 449,740 | 12,634,935 | 2,343,285 | 2,496,323 | 1,117,9 essen 0nst 61,509,455 | 6,414,162 | 2,216,919 | 2,210,057 | 748,088 | 14,038,608 | 3,422,987 3,026,878 1, 7ee Per cent of grand tot. 49 5 1°8 1°8 6 13 3 2°6 ; Tan ; i : f the Suez The opening of the Suez Canal in 1869, while it has stimulated | both exports and imports was returned at £34,890, 445. O — Canal every Fe attmacitt of trade into greater activity, has not materially total number of vessels, 280,913, with ee tons, ea : trade. changed its character. As might be anticipated, the imports, being craft. Bombay and Madras divide Bee oe cae ae = for the most part of small bulk and high value, first felt the advan- native craft ; while in Bengal and ae a ange pao a ue Pp a tages of thisroute. In 1875-76 asmnch as 85 percent. of the imports portion of the coasting traffic is carrie me a i 8 ms iN from Europeand Egypt (excluding treasure) passed through the canal, | 1877-78, the year of famine, the ae ee 0 ql a die a aa but only 29 per cent. of the~~

exports. In 1878-79 the proportion | 319,624, the tonnage to 15,732,246 tons, an ra ieee ie of imports was substantially the same, while that of exports had | £67,814,446. By far the largest ee W a ae 4. Tea es risen to 64 per cent., showing that snch bulky commodities as | of 1,137,690 tons, valued at 13 a at ai thet ca Tae, ee cotton, grain, oil-seeds, and jute were beginning to participate in | the faniine-stricken districts from the sea sie a ae nae se ee the advantages of rapid traffic. The actual values of canal trade in | come raw cotton and cotton goods. ae oan e a ween 1877-78, the year of its greatest development, were 29 iillions | amounted to 387,438 cwts., valued at 957, ' in tae Poni sterling'for imports, and 23 millions for exports. It is estimated | was merely transshipped fron one port to soy 'a 1 eee ral es ee ore | alin a ee ee India by the equivalent of thirty-six days, the route round the Cape | valu Da oe : iece- i i ngal and Madras. 'The total value of the cotton piece pane more than 11,000 miles, that through the canal less than 3000 eee Pony Sal agate 4it tonya ny goods Coasting In 1873-74, which may be regarded as a normal year, though the | sent from Bombay to Bengal and to Sind in nearly equal propor-

vessels engaged in the coasting trade that cleared and entered was 294,374, with an aggregate of 10,379,862 tons; the total value of

tions, and about 2 million yards of coloured goods from: Madras. Stimulated by the activity of the grain trade, the exports of gunny bags from Calcutta coastwise rose to a total value of nearly

"80 . UN D ft A [COMMERCE.

£960,000. The trade in betel-nuts amounted to nearly 44 million ib, valued at over £500,000. Burmah consumes most of these, obtaining its supplies froin Bengal ; while Bombay gets considerable quantities from Madras, from the Conean and Goa, and from Bengal. Sugar (refined and unrefined) figures to the large amount of £900,000, of which the greater part came from Bengal. The move- ments of treasure coastwise show a total of just 5 millions sterling, being exceptionally augmented by the conveyance of silver to Burmah. in payment for rice supplied to Madras.

Frontier The following table exhibits the totals of the trade conducted

~~*trade. along the landward frontier of the Indian empire, so far as figures are available:—*~~

~~*Registered Frontier Trade of India in 1877-1878.*~~

~~*the upper castes of Sudras have devoted themselves to general trade; but there again the J ain Marwaris from ltaj- puténa and the North-West occupy the front rank. Their head-quarters are in Murshidabdd district, and their agents are to be found throughout the valley of the Brahmaputra, as far up as the unexplored frontier of China. They pene- trate everywhere among the wild tribes ; and it is said that the natives of the Khasi hills are the only hillmen who do their own business of buying and selling. In the North-Western Provinces and Oudh the traders are generi- cally called Baniyas; and in the Punjab are found the Khatris, who have perhaps the best title of any to regard themselves as descendants of the original Vaisyas. According to the general census of 1872, the total number of persons in all India returned as connected with cem- merce and trade was 3,224,000, or 52 per cent. of the adult males.*~~

~~*Local trade is conducted either at the permanent bdzdrs Local of great towns, at weekly markets held in certain villages, trade. at annual gatherings primarily held for religious purposes, or by means of travelling brokers and agents. The culti- vator himself, who is the chief producer and also the chief customer, knows little of the great towns, and expects the dealer to come to his own door. Each village has at least one resident trader, who usually combines in his own per- son tle functions of money-lender, grain dealer, and cloth seller. The simple system of rural economy is entirely based upon the dealings of this man, whom it is the fashion sometimes to decry as a usurer, but who is really the one tlirifty person among an improvident population. Abolish the money-lender, and the general body of cultivators would have nothing to depend upon but the harvest of a single year. The money-lender deals chiefly in grain and in specie. In those districts where the staples of export are largely grown, the cultivators commonly sell their crops to travelling brokers, who re-sell to larger dealers, and so on until the commodities reach the hands of the agents of the great shipping houses. The wholesale trade thus rests ultimately with a comparatively small number of persons, who have*~~

~~agencies, or rather corresponding firms, at the great central marts. Buying and selling in their aspects most characteristic of India are to be seen, not at these great towns, nor even at the weekly markets, but at the fairs which are held periodically at certain spots in most districts. Religion is always the original pretext of these gatherings or melds, at some of which nothing is done be- yond bathing in the river, or performing various supersti- tious ceremonies. But in the majority of cases religion has become a mere excuse for secular business. Crowds of petty traders attend, bringing all those miscellaneous articles that can be packed into a pedlar's wallet ; and the neighbouring villagers look forward to the occasion to satisfy alike their curiosity and their household wants.~~

~~Imports,~~

~~Exports. | Total.~~

~~Afghanistan and adjoin- ing hill tribes, ... +. Kashmir, Ladakh, ei~~

~~£ £ £ 671,000 718,000 | 1,889,000 |.~~

~~630,000 | 374,000 | 1,004,000~~

~~1,054,000 | 638,000 | 1,687,000 77,000 | 30,000 | 107,000 1,664,000 | 1,762,000 | 3,426,000 69,000 | 57,000 | 126,000~~

~~Geen SusA no aesoos eae BOD Nepal ….cccessecessreessssserees North-East Frontier tribes Independent Burmah …..... Sat aeneinee AGSUAn EO naendoDnoooS~~

~~Ke 4,165,000 | 3,574,000 | 7,739,000~~

~~Internal In any community raised above primitive barbarisia~~

~~trade. the aggregate volume of its internal trade must be far greater than that of its foreign commerce ; but, from the nature of the case, it is impossible to estimate its amount or even to describe adequately its general charac- ter. On the one hand, there is the wholesale business connected with foreign commerce in its earliest stages—the collection of agricultural~~

~~*produce from a thousand little villages, its accumulation at a few great central marts, and its despatch to the seaboard ; in return for which manu- factured articles are distributed by the same channels, though in the reverse direction. On the other hand, there ig the interchange of commodities of native growth and manufacture, sometimes between neighbours, but also be- tween distant provinces. With a few unimportant excep- tions, free trade is the rule throughout the vast peninsula of India, by land as well as by sea. The Hindus possess a natural genius for commerce, as is shown by the daring with which they have penetrated into the heart of Central Asia, and to the east coast of Africa. Among the benefits which British rule has conferred upon them is the removal of the innumerable shackles that a short-sighted despotism had imposed upon their talents.*~~

~~*Trading Broadly speaking, the greater part of the internal trade*~~

~~*classes. yemains in the hands of the natives. Europeans control the shipping business, and have a share in the collection of some of tle more valuable staples of exports, such as cotton, jute, oil-seeds, and wheat. But the work of distri- bution and the adaptation of the supply to the demand of the consumer naturally fall to those who are best acquainted with native wants. Even in the presidency towns the retail shops are generally owned by natives. The Vaisya, or trading caste of Manu, has no longer any separate existence ; but its place is occupied by several well-marked classes. On the western coast the Parsis, by the boldness and extent of their operations, tread close upon the heels of the most prosperous English houses. In the interior of the Bombay presidency, business is mainly divided between two classes, the Baniyas of Guzerat and the Marwaris from RAjputdna. Each of these profess a peculiar form of religion, the former being Vishnuvites of the Vallabhachari sect, the latter Jains. In the Deccan their place is taken by Lingdyats from the south, who again follow their own form of Hinduism, which is an heretical species of Siva worship. Throughout Mysore, and in the north of Madras, Ling4yats are still found, but along the eastern sea- board the predominating classes of traders are those named Chetties and Komatis. In Bengal many of*~~

~~*It is, of course, impossible to express accurately in figures the Provin- extent of internal trade, but the following statistics will serve in cial some*~~

measure to show both its recent development and its actual trade. amount. They are based upon the registration returns that have

been collected for some years past in certain provinees. In 1863-64

the total external trade of the Central Provinees, both export and import, was estimated to amount to 102,000 tons, valued at £3,909,000. By 1868-69, after the opening of the J abalpur through railway, it had inereased to 209,000 tons, valued at £6,795,000. In 1877-78, the year of famine in southern India, the corresponding figures were 635,000 tons and £9,378,000, show-

ing an inerease in fourteen years of more than sixfold in quantity,

and considerably more than twofold in value. The comparatively small inerease in value is to be attributed to the exclusion from the

later returns of opinm, which merely passes through in transit from Mdlwé. In 1874-75 the total external trade of the Punjab amounted to about 600,000 tons, valued (but probably overvalued)

at about £16,000,000. In 1877-78 it had increased to nearly 900,000 tons, valued at £17,500,000. The total trade of Behar in

Village indus- tries.

INDUSTRIES, |

1877-78 was valued at £16,000,000. But perhaps the signifieance of sueh enormons totals will beeome plainer if we take the ease of a single mart, Patna, whieh may elaim to be eonsidered one of the most important eentres of inland traffie in the world. Favourably situated on the Ganges, near the eonfluence of the Son and the Gogra, where the prineipal trade routes branch off to Nepal, it has beeome a great changing station for the transfer of goods from river to rail. In the year 1876-77 the total registered trade of Patna (excluding the Government monopoly of opium, and pro- bably omitting a good deal besides) was valued in the aggregate at 7} millions sterling. Many artieles are ineluded twiee over, both as exported and

~~*imported, but the imports alone amounted to more than 4 millions. Among the prineipal items on one side or the other may be mentioned—European piece-goods, £1,217,000; indigo, £789,000 ; oil-seeds, £557,000; salt, £389,000; sugar, £274,000 ; food grains, £258,000; hides, £185,000 ; saltpetre, £156,000.*~~

~~*MANUFACTURES.*~~

~~*Though India may be truly described as an agricultural and not a manufacturing country, yet it would be errone- ous to infer that it is destitute of the arts of civilized life. It has no swarming hives of industry to compare with the factory centres of Lancashire, nor a large mining population, living under the soil rather than on it. In short, it has not reached that modern stage of industrial development which is based upon the use of coal and the discoveries of physical science. But in all manufactures requiring manual dexterity and artistic taste India may challenge comparison with England in the last century. The organization of Hindu society demands that the neces- sary arts, such as those of the weaver, the potter, and the smith, should be practised in every village. The pride and display of the rival kingdoms, into which the country was formerly divided, gave birth to many arts of luxury that have not yet been entirely forgotten in the decayed capitals. When the first European traders reached the coast of India in the 16th century, they found a civilization among both "Moors" and "Gentoos" at least as highly ad- vanced as their own. In architecture, in fabrics of cotton and silk, in goldsmith's work and jewellery, the people of India were then unsurpassed. But while the East has stood still, or rather retrograded (for, in the face of keen competition, to stand still is to retrograde), the West has advanced with a gigantic stride which has no parallel in the history of human progress. On the one hand, the downfall of the native courts has deprived the skilled workman of his chief market, while, on the other, the English capitalist has enlisted in his service forces of nature against which the village artisans in vain try to compete. The fortunes of India are bound up with those of a country whose manufacturing supremacy depends upon a great export trade. 'The tide of circumstances, more in- exorable than artificial enactments, has compelled the weaver to exchange his loom for the plough, and has crushed out a multitude of minor handicrafts. Political economy, judging only by the*~~

~~*single test of cheapness, may approve the result ; but the philosopher will regret the in- creasing uniformity of social conditions, and the loss to the world of artistic tendencies which can never be restored.*~~

~~*Historically the most interesting, and still the most im- portant in the aggregate, of all Indian industries are those conducted in every rural village of the land. The Hindu village system is based upon division of labour quite as much as upon hereditary caste. The weaver, the potter, the blacksmith, the brazier, the oil-presser, are each mem- bers of a community, as well as inheritors of a family occupation. On tlie one hand, they have a secure market for their wares, and, on the other, their employers have a guarantee that their trades shall be well learned. Sim- plicity of life and permanence of employment are here happily combined with a high degree of excellence in desion and honesty of execution. The stage of civilization below these village industries is represented by the hill*~~

~~*END YSA*~~

~~*761*~~

~~*tribes, especially those on the north-east frontier, where the weaving of clothes is done by the women of the family,—a practice which also prevails throughout Burmah. A higher stage may be found in those villages or towns which pos- sess a little colony of weavers or braziers noted for some specialty. Yet one degree higher is the case of certain arts of luxury, such as ivory carving or the making of gold lace, which chance or royal patronage has fixed at some capital now perhaps falling into decay. One other form of native industry owes its origin to European interference. Many a village in Lower Bengal and on the Coromandel coast still shows traces of the time when the East India Company and its European rivals gathered large settle- ments of weavers round their little forts, and thus formed the only industrial towns that ever existed in India. But when the Company abandoned its manufacturing business in 1833, these ceutres of industry rapidly declined ; and the once celebrated muslins of India have been driven out of the market of the world by Manchester goods.*~~

~~*Cotton weaving may be called the oldest indigenous in- Cotton The Greek name for cotton fabrics, s¢n- weaving.*~~

~~dustry of India.~~

~~don (cw8dv), is etymologically the same as that of India or Sind; in later days Calicut on the Malabar coast has given us "calico." Cotton cloth, whether plain or orna- niented, has always been the single material of clothing for both men and women, except in Assam and Burmah, where silk is preferred, perhaps in reminiscence of an extinct trade with China. When European adventurers found the way to India, cotton and silk always formed part of the rich cargoes they brought home. The English, in especial, appear to have been careful to fix their earliest settlements amid a weaving population—at Surat, at Calicut, at Ma- sulipatain, at Hooghly. In delicacy of texture, in purity and fastness of colour, in grace of design, Indian cottons may still hold their own against the world ; but in the matter of cheapness they have been unable to face the competition of Manchester.~~

~~In 1870 the Madras Board of Revenue published a valuable report upon hand-loom weaving, from which the following local figures are taken. The total number of looms at work in that presideney, with its general population of 31 millions, was returned at 279,220, of which 220,015 were in villages and 59,205 in towns, showing a considerable inerease upon the corresponding number in 1861, when the mohiarfa or assessed tax upon looms was abol- ished, The total estimated consumption of twist was 31,422,712 Ib, being at the rate of 112 Ib per loom. Of this amount, about one- third was imported twist and the remainder country-made. The total value of the cotton goods woven was returned at 3} millions sterling, or £12, 10s. per loom, but this was believed to be much under the truth. The export of country-made cloth in the same year was about £220,000. Jn the Central Provinees (population 8 millions), where hand-loom weaving is still fairly maintained, and where statisties are more trustworthy than in other parts, the num- ber of looms is returned at 87,588, employing 145,896 weavers, with an annual out-turn valued at £828,000. In 1878-79 the export of Indian piece-goods from the Central Provinees was valued at £162,642. As regards Bengal, hand-loom weaving 1s generally on the deeline. The average consumption of piece-goods throughout the province is estimated at about 5s. per head, and the returns of registered trade show that European picee-goods are distributed from Caleutta at the rate of about 2s. 5d. per head. In Midnapur, Nadiya, and Bardwan the native weavers still~~

~~hold their own, appears from the large imports of European twist; but in the eastern districts, which have to balance their large exports of jute, rice, and oil-seeds, the imports of European cloth rise to the high figure of Qs. 7d. per head. No part of India has suffered more from English competition than Bombay, where, however, the introduction of steam machinery is beginning to restore the balance. Twist from the Bombay mills is now generally used by the hand-loom weavers of the presidency, and is largely exported to China. But it is in the finer fabrics produced for export that the west of India has suffered most. Taking Surat alone, the export by sea of piece-goods at the beginning of the century was valued at £360,000 a year. By 1845 the value had dropped to £67,000, rising again to £184,000 in 1859 ; but in 1874 it was only £4188.~~

~~Silk weaving is also a common industry everywhere, silk Silk | fabrics, or at least an admixture of silk in cotton, being weavine-~~

~~XIL. — 96~~

~~Em- broidery.~~

~~Carpet weaving.~~

~~762~~

~~universally affected as a mark of wealth. Throughout British Burmah, and also in Assam, silk is the common material of clothing, being made up by the women of the household. In Burmah the bulk of the silk is imported from China, generally in a raw state; but in Assam it is obtained from two or three varieties of worms, which are generally fed on jungle trees and may be regarded as semi-dozmesticated. Bengal is the only part of India where sericulture, or the rearing of the silk-worm proper on mul- berry, can be said to flourish. The greater part of the silk is wound in European filatures, and exported in the raw state to Europe. The native supply is either locally con- sumed, or sent up the Ganges to the great cities of the North-West. A considerable quantity of raw silk, especially for Bombay consumption, is imported from China. Tasar silk, or that obtained from the cocoons of semi-domesticated worms, does not contribute much to the supply. As com- pared with cotton weaving, the manufacture of silk fabrics may be called a town~~

~~*and not a village industry. These fabrics are of two kinds—(1) those composed of pure silk, and (2) those witha cotton warp crossed by a woof of silk. Both kinds are often embroidered with gold and silver. The mixed fabrics are known as mashru or sufi, the latter word, meaning "permitted," being used because the strict eeremonial law will not allow Mahometans to wear clothing of pure silk, They are largely woven in the towns of the Punjab and Sind, at Agra, at HIyderabad in the Deccan, and at Tanjore and Trichinopoli. Pure silk fabrics are either of simple texture, or highly ornamented in the form of hkinkhabs or brocades. The latter are a specialty of Benares, Murshiddbad, Ahmadabad, and Trichinopoli. Printed silks are woven at Surat for the wear of Pars{ and Guzerati women. Quite recently mills with steam machinery have been established at Bombay, which weave silk fabrics for the Burmese market, chiefly ldéngyis, tamains, and patsoes. 'The silk manufactures exported from India consist almost entirely of the handkerchiefs known as bandannas and corahs, with a small proportion of tasar fabrics. 'The trade appears to be on the decline, the total exports having decreased from 2,468,052 yards, valued at £238,000, in 1875-76 to 1,481,256 yards, valued at £147,000, in 1877-78. But in 1879 the value had again risen to £195,897; and the returns for 1874-77 were unusually high.*~~

~~*Embroidery has already been referred to in the two pre- ceding paragraphs. The groundwork may be either silk, cotton, wool, or leather. The ornament is woven in the loom, or sewn on afterwards with the needle. Muslin is embroidered with silk and gold thread at Dacca, Patna, and Delhi. Sind and Cutch (Kachhch) have special embroideries of coloured silk and gold. Leather-work is embroidered in Guzerat. In some of the historical capitals of the Deccan, such as Gulbargah and Aurangabad, velvet (makhmal) is gorgeously embroidered with gold, to make canopies, umbrellas, and housings for elephants and horses, for use on state occasions. Not only the goldsmith, but also the jeweller lends his aid to Indian embroidery.*~~

~~*Carpets and rugs may be classified into those made of cotton and those made of wool. The former, called satranjis and dards, are made chiefly in Bengal and nor- thern India, and appear to be an indigenous manufacture. The woollen or pile carpets known as alin and kalicha are those which have recently attained so much popularity in England, by reason of the low price at which the out- turn of the jail manufactories can be placed in the market.*~~

~~*The art was probably introduced into India by the Mahometans. The historical seats of the industry are in Kashmir, the Punjab, and Sind, and at Agra, Mirzapur, Jabalpur, Warangal in the Deccan, Malabar, and Masuli-patam. Velvet carpets are also made at Benares and*~~

~~*IL aNY aD*~~

~~*Murshidabad, and silk pile carpets at Tanjore and Salem. At the London Exhibition of 1851 the finest Indian rugs*~~

~~*(INDUSTRIES.*~~

~~*came from Warangal, the ancient capital of the Andhra*~~

~~*dynasty, about 80 miles east of Hyderabad. Their char- acteristic feature was the exceedingly fine count of the stitches, about 12,000 to the square foot. also perfectly harmonious in colour, and the only examples*~~

~~*‘“ “They were*~~

~~*in which silk was used with an entirely satisfactory effect” (Birdwood). The price was not less than £10 per square*~~

~~*yard. The common rugs, produced in enormous quantities*~~

~~*in the jails at Lahore, Jabalpur, Mirzipur, Benares, and Bangalore, sell in England at 7s. 6d. each.*~~

~~*_ Gold and silver and jewels, both from their colour and Jeweller’s their intrinsic value, have always been the favourite work. material of Oriental ornament. Even the hill tribes of Central India and the Himalayas have developed some skill in hammering silver into brooches and torques. Imitation of knotted grass and leaves seems to be the origin of the simplest and most common form of gold ornament, the early specimens consisting of thick gold wire twisted into bracelets, &c. A second archaic type of decoration is to be found in the chopped gold jewellery of Guzerat. That is made of gold lumps, either solid or hollow, in the form of cubes and octahedrons, strung together on red silk. Of artistic jeweller’s work, the best*~~

~~*known examples come from Trichinopoli, Cuttack, Delhi, and Kashmir. Throughout southern India the favourite design is that known as swdmi, in which the ornamentation consists of figures of Hindu gods in high relief, either beaten out from the surface or fixed upon it by solder or screws. The hammered repoussé silver work of Cutch (Kachhch), though now entirely naturalized, is said to be of Dutch origin. Similar work is done at Lucknow and Dacca. The goldsmith's art contributes largely to embroidery, as has already been mentioned. Gold and silver thread is made by being drawn out under the appli- cation of heat. The operation is performed with such nicety that one rupee's worth of silver will make o thread nearly 800 yards long. Before being used in the loora this metallic thread is generally twisted with silk.*~~

~~*Precious stones are lavishly used by Indian jewellers, who care less for their purity and commercial value than for the general effect produced by a blaze of splendour. "But nothing can exceed the skill, artistic feeling, and effectiveness with which gems are used in India both in jewellery proper and in the jewelled decoration of arms and jade" (Birdwood).*~~

~~*Iron Work.—'The chief duty of the village smith is, of Tron course, to make the agricultural implements for his fellow- work, villagers. But in many towns in India, often the sites of former capitals, iron work, especially in the manufacture of arms, still retains a high degree of artistic excellence.*~~

~~*Cutlery—The blade of the Indian talwdér or sword is Cutlery sometimes marvellously watered, and engraved with date and fire- and name, sometimes sculptured in half-relief with hunting a scenes, sometimes shaped along the edge with teeth or notches like a saw. Matchlocks and other firearms are made at several towns in the Punjab and Sind, at Monghyr in Bengal, and at Vizianigaram in Madras. Chain armour, fine as lacework and said to be of Persian origin, is still manufactured in Kashmir, Rajputdna, and Cutch (Kachhch). Ahmadnagar in Bombay is famous for its spear-heads. Both firearms and swords are often dama- scened in gold, and covered with precious stones. In fact, the characteristic of Indian arms, as opposed to those of other Oriental countries, is the elaborate goldwork hammered or cut upon them and the unsparing use of gems, Dama- scening on iron and steel, known as ku/t, is chiefly practised in Kashmir, and at*~~

~~Guzerat and Sidlkot in the Punjab. Damascening in silver, which is chiefly done upon bronze,~~

~~Brass and copper work,~~

~~Pottery.~~

~~Sculp- ture an~~

~~carving,~~

~~INDUSTRIES, |~~

~~is known as bidart work, from the ruined capital of Bidar in the niz4m's dominions, where it is still chiefly carried on.~~

~~Brass and Copper.—The village brazier, like the village smith, manufactures the necessary vessels for domestic use. Chief among these vessels is the Jota, or globular bowl, universally used in ceremonial ablutions. The form of the lota, and even the style of ornamentation, has been handed down unaltered from the earliest times. Benares enjoys the first reputation in India for work in brass and copper. In the south, Madura and Tanjore have a similar fame; and in the west, Ahmadabad, Poona, and Nasik. At Bombay itself large quantities of imported copper are wrought up by native braziers. The temple bells of India are well known for the depth and purity of their note. In many localities the braziers have a special repute either for a peculiar alloy or for a particular process of orna- mentation. Silver is sometimes mixed with the brass, and~~

~~in rarer cases gold. The brass or rather bell-metal ware of~~

~~Murshiddbad, known as Lhdgrai, has more than a local repu- tation, owing to the large admixture of silver in it.~~

~~Pottery is made in almost every village, from the small vessels required in cooking to the large jars used for storing grain, and occasioually as floats to ferry persons across a swollen stream. But, though the industry is universal, it has hardly anywhere risen to the dignity of a fine art. Sind is~~

~~*the only province of India where the potter's craft is pursued with any regard to artistic considerations ; and there the industry is said to have been introduced by the Mahometans. Sind pottery is of two kinds, encaustic tiles and vessels for domestic use. In both cases the colours are the same,—turquoise blue, copper green, dark purple, or golden brown, under an exquisitely transparent glaze. The usual ornament is a conventional flower pattern, pricked in from paper and dusted along the prick- ing. The tiles, which are evidently of the same origin as those of Persia and Turkey, are chiefly to be found in the ruined mosques and tombs of the old Musalman dynasties ; but the industry still survives at the little towns of Saidpur and Bubri. Artistic pottery is made at Hyderabad, Karachi, Tatta, and Hala, and also across the border, at Lahore and Multan in the Punjab. The Madura pottery also deserves mention from the elegance of its form and the richness of its colour. The North-Western Provinces have, among other specialties, an elegant black ware with designs in white metal worked into its surface.*~~

~~*Carving and Inlaying.—Stone sculpture is an art of the dhighest antiquity in India, as may be seen in the early ' memorials of Buddhism. Borrowing an impulse from*~~

~~*Greek exemplars, the Buddhist sculptors at the commence- ment of our era freed themselves from the Oriental tradition which demands only the gigantic and the grotesque, and imitated nature with some success. But with the revival of Brahmanism Hindu sculpture again degenerated ; and so far as the art can still be said to exist, it possesses a religious rather than an esthetic interest. In the cities of Guzerat, and in other parts of India where the houses are built of wood, their fronts are ornamented with elaborate carving. Wood-carving, an important industry in Western India, is said, perhaps erroneously, to owe its origin to Dutch patronage, though the models of the carvers are evi- dently taken from their own temples. The favourite materials are blackwood, sandal-wood, and jack-wood. The supply of sandal-wood comes from the forests of the Western Ghats in Kanara and Mysore, but some of the finest carving is done at Surat and Ahmaddbdd. Akin to sandal-wood carving is the inlaying of the miscellaneous articles known as " Bombay boxes." 'This art is known to be of modern date, having been introduced from Shiraz in*~~

~~Persia towards the close of the last century. It consists of~~

~~binding together in geometrical patterns strips of tin-wire,~~

~~sandal-wood, ebony, ivory,and stag's horn, At Vizagapatam,~~

~~in Madras, similar articles are made of ivory and stag's horn, with scroll-work edged in to suit European taste. At Mainpuri, in the North-Western Provinces, wooden boxes are inlaid with brass wire. The chief seats of ivory-carving are Amritsar, Benares, Murshidabdd, and Travancore, where any article can be obtained to order, from a full-sized palanquin to a lady's comb. Human figures in clay, dressed to the life, are principally made at Krishnagar in Bengal, Lucknow, and Poona.~~

~~It remains to give some account of those manufactures proper, Cotton conducted by steam machinery and under European supervision, mills. which have rapidly sprung up in certain parts of India during the past few years. These comprise cotton, jute, silk, and beer.~~

~~The first mill for the manufacture of cotton yarn and cloth by machinery worked by steam was opened at Bombay in 1854. The enterprise grew with scarcely a check, until by 1879 the total number of mills throughout India was 58, with about 14 million spindles and 12,000 looms, giving employment to upwards of 40,000 persons—men, women, and children. Of this total, 30 mills, or more than half, were in the island of Bombay, which now possesses a busy manufacturin § quarter with tall chimney stalks, recalling the aspect of a Lancashire town ; 14 were in the cotton-growing districts of Guzerat, also in the Bombay presidency ; 6 were in Calcutta and its neighbourhood ; 3 at Madras; 2 at Cawnpur in the North-Western Provinces; 1 at Nagpur in the Central Provinces ; 1 at Indore, the capital of Holkar's dominions ' and 1 at Hyderabad, the residence of the nizim. Like the jute mills of Bengal, the cotton factories of Bombay have suffered of late years from the general depression of trade.~~

~~*The Indian mills are, almost without exception, the property of joint-stock companies, the shares in which are largely taken up by natives. The overlookers are skilled artisans brought from England, but natives are now beginning to qualify themselves for the post. The operatives are all paid by the piece ; and, as compared with other Indian industries, the rate of wages is high. In 1877, at Bombay, boys earned from 14s. to £1 a month; women, from 16s. to £1; and jobbers, from £3 to £6, 10s. Several members of one family often work together, earning among them as much as £10 a month. The hours of work are from six in the morning to six at night, with an hour allowed in the middle of the day for mealsand smoking. A Factory Act, to regulate the hours of work for children and young persons and to enforce the fencing of dangerous machinery, &c., is now (1881) under the consideration of the legislative council.*~~

~~*Besides supplying the local demand, these mills are gradually beginning to find a market in foreign countries, especially for their twist and yarn. Between 1872-73 and 1878-79 the export of twist from Bombay increased from 1,802,868 1b, valued at £97,162, to 21,271,059 ib, valued at £883,665, or an increaso of nearly twelvefold in quantity and ninefold in value. Within the same period of eight years the export of grey piece-goods increased from 4,780,834 yards, valued at £75,495, to 14,993,336 yards, valued at £198,380. The twist and yarn are mostly sent to Chinaand Japan, the piece-goods to the coast of Arabia and Africa. The figures for the coasting trade also show a corresponding growth, the total value of twist carried from port to port in 1878-79 having been £804,996, and of piece-goods (including hand-loom goods) £654,553. Mr O'Conor, who has devoted much attention to the matter, thus summarizes his opinion regarding the future of the Indian cotton mills in his Review of Indian Trade for 1877-78 :—'* Whether we can hope to secure an export trade or not, it is certain that there is a sufficient outlet in India itself for the manufactures of twice fifty mills ; and, if the industry is only judiciously managed, the manu- factures of our mills must inevitably, in course of time, supersede Manchester goods of the coarser kinds in the Indian market."*~~

~~*The jute mills of Bengal have sprung up to rival Dundee, just as Jute Bombay competes with Manchester; but in the former case the capi- mills. tal is mostly supplied by Europeans. They cluster thickly round Calcutta,*~~

extending aeross the river into Hooghly district ; and one has been planted at Sirajganj, far away up the Brahmaputra in the middle of the jute-producing country. In 1879 the total number of jute mills in India was 21, of which all but two were in Bengal, and the number is annually inereasing. The weaving of jute into gunny eloth is an indigenous industry throughout northern Bengal, chiefly in the district of Purniah and Dinajpur. The

unny is made by the semi-aboriginal tribe of Koch, Rajbanst or Pali, both for clothing and for bags; and, as with other industries praetised by non-Hindu raees, the weavers are the women of the family, and not a distinet caste. In 1877-78 just three million bags were imported into Calcutta from Pabna district, being the product of the Sirdjganj mills. The total exports by sea and land of both power-loom and hand-made bags numbered 80 millions, of which not more than 6 millions were hand-made. The East Indian Rail-

Brew- ing.

Paper.

Leather.

Tron.

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way took 20 millions for the grain marts of Behar and the North- Wostern Provinces (chiefly Patnd and Cawnpur) ; and 1 million

went as far as Ludhidna in the Punjab. 'The total exports by sea

exceeded 57 millions, of which 32 millions represent interportal, and 25 millions foreign trade. Bombay took as many as 16 mil- lions, and British Burmah 12 millions. In fact, Caleutta supplies bagging for the whole of India. The forcign trade may be given in greater detail, for gunny weaving is perhaps the single Indian industry that aims at a foreign market. The total export of jute manufactures (both bags and cloth) in 1872-73 was valued at £200,669. By 1878-79 the valuc had risen to £1,098,434, or an

~~*increase of fivefold in six years. Within the same period the ex- ports to the United Kingdom alone increased from 21,200 bags, valued at £585, to 7 million bags, valued at £184,400. The other countries which take Indian gunuy bags are the following, with the values for 1877-78 :—Australia, £298,186; Straits Settlements, £161,772; United States, £79,795; Egypt, £76,726 ; China, £32,121.*~~

~~*Brewing has recently become established as a prosperous business at the large hill stations on the Himalayas. There are now about twelve breweries in India, including five in the Punjab and North- Western Provinces, at Mari (Murree), Simla, Kasanli, Masuri (Mus- soorie), and Naini Tal, and two in the Madras presidency, at Utaka- mand and Bellary. The total quantity of beer brewed was returned at 2,162,888 gallons in 1877 and 1,522,769 gallons in 1878, the diminution being due to the termination of a contract between the Commissariat Department and one of the Masuri breweries. The total quantity of Noek imported in 1878-79 was 2 million gallons by Government and 1 million gallons on private account, so that the Indian breweries now satisfy just one-third of the entire demand. At Simla imported beer sells at over 18s. per dozen, while that from the local brewery can be obtained for 11s. per dozen. The hops are entirely imported, for the experimental plantation of 100 acres established by the raja of Kashmir has not yet proved a prac- tical success. The imports of hops show a steady increase from 1529 cwts. in 1875-76 to 1807 cwts. in 1876-77, and 2135 cwts. in 1877-78.*~~

~~*The steam paper-mills established in the neighbourhood of Cal- cutta and at Bombay have almost entirely destroyed the local manufactures of paper which once existed in many parts of the country. The hand-made article, which was strong thongh coarse, and formed a Mahometan specialty, is now no longer used for official purposes. Besides manufacturing munitions of war, the Government possesses a large leather factory at Cawnpur, which turns out saddlery, &c., of excellent quality. Indeed, leather manu- factures are an important local industry in Oudh and the North- Western Provinces, and are conducted on such a scale as to pre- clude the import from England, except in the case of articles de luxe.*~~

~~*MINERALS.*~~

~~*The Indian peninsula, with its wide area and diversified features, supplies a great store of mineral wealth, charac- terized both by variety and unusual richness. In utilizing this wealth, English enterprise has met with many rebuffs. Much capital has been expended with no other result in many cases than disappointment. But the experience has not been thrown away; and the mining industry, now established on a sure basis, is rising into an important position in a country which ought gladly to welcome any employment other than the universal pursuit of agriculture.*~~

~~*Tron.—In purity of ore, and in antiquity of working, the iron deposits of India probably rank first in the world. They are to be found in every part of the country, from the northern mountains of Assam and Kumaun to the extreme south of the Madras presidency. Wherever there are hills, iron is found and worked to a greater or less ex- tent. The indigenous methods of smelting the ore, which are everywhere the same, and have been handed down un- changed through countless generations, yield a metal of the finest quality in a form well suited to native wants. But they require an extravagant supply of charcoal ; and even with the cheapness of native labour the product cannot compete in price with imported iron from England. Euro- pean enterprise, attracted by the richness of the ore and the low rate of wages, has repeatedly tried to establish iron- works on a large scale; but hitherto every one of these attempts has ended in failure, alike in Madras, in the Central Provinces, in the Raniganj coal-field, and in Kumaun. At the present time iron is manufactured only*~~

~~*IN®SUTS*~~

~~*[INDUSTRIES,*~~

~~*by peasant families of smelters, each working on a very small scale; and even this industry is languishing under the competition of English imports. The initial difficulty in India is to find the three elements of iron working—namely, the ore, the flux, and the fuel—sufficiently near to each other; the second difficulty is the choking of the furnaces from the excessive quantity of ash in the coal.*~~

~~*Coal has been known to exist in India since 1774, and is said to have been worked as far back as 1775. There are now altogether fifty-eight collieries*~~

~~*in the country, with an annual out-turn of about 1 million tons. In India, as elsewhere, coal-mining and railway extension have gone hand in hand. Coal is comparatively worthless unless it can be brought to market by rail; and the price of coal is the chief element in determining the expenses of railway working. The his- tory of coal in India has, on the whole, been one of con- tinual progress. 'The first mine, at Raniganj, dates from 1820, and has been worked regularly up to the pre- sent time. In 1878 its output was 50,000 tons. For twenty years no new mine was opened; but the com- mencement of the East India Railway in 1854 gave a fresh impetus to the industry, and since that date collieries have been opened at the rate of two or three every year. The largest number of additions was seven, in 1874. By 1878 the total number of collieries in connexion with the East Indian system was fifty-six. From these are supplied, not only the railway itself, but also the jute mills of Calcutta, and the river steamers of Lower Bengal. In 1877-78 the railway used 308,000 tons of coal from its own collieries at Karharbéri and Srir4mpur, and sent exactly the same quantity to Calcutta. In that year the imports of coal into Caleutta by sea were only 80,000 tons, so that Calcutta now uses about 80 per cent. of Indian to 20 per cent. of foreign coal. Bombay, on the other hand, and also Madras are entirely supplied with coal from England. The collieries in the Central Provinces, which are the only others worked on a large scale, are limited to the supply of the Great Indian Peninsula Railway. They are two in number,—(1) the Warora colliery, under the management of the Public Works Department, and (2) the Mohpént colliery, which has been leased to the Narbadé Coal Com- pany. 'The total area of the Ran{ganj coal-field has been estimated at 500 square miles. In this "black country" of India, which is dotted with tall chimuey-stalks, six Euro- pean companies are at work, besides many native firms. At first coal was raised from surface quarries, but regular mining is now carried on, according to the system of "pillar and stall." The seams are entirely free from gas, so that the precautions usual in England against explosion are found unnecessary. The miners are all drawn from the aboriginal low-castes, chiefly Santals and Bauris, who are noted for their endurance and docility. Bauris work with the pick, but Santals will consent to use no other tool than the crowbar. Wages are high, and the men look well-fed, though they waste their surplus earnings in drink. The great drawback of Indian coal is its large proportion of ash, varying from 14 to 20 per cent., as against 3 to 6 per cent. in English coal. This places it at a*~~

~~great dis- advantage alike for iron-smelting and locomotive pur- poses. But it has been proved that, with efficient fire- grates and proper manipulation, 135 Ib of Warora coal will do the work of 100 tb of English coal.~~

~~Salt, an article of supreme necessity to the Indian Salt. peasant who eats no meat, is derived from three main sources, exclusive of importation from Europe :—(1) by evaporation from sea-water along the entire double line of seaboard from Bombay to Orissa, but especially in Guzerat and on the Coromandel coast ; (2) by evaporation from in- land lakes, of which the Sambhar Lake in Rajputana affords the chief example; (3) by quarrying solid hills of salt in~~

~~Coal.~~

~~no rival elsewhere in the world. The chief of these has | Australia. The principal localities are in the Waindd Rock- given its name to the Salt Range, running across the dis- (Wynaad) subdivision of the Nilgiri district and in Kolar salt. ——_tricts of Jhelum (J hilam) and Shabpur, from the bank of | district of Mysore. Gold-washing has always been prac- the Jhelum river to Kalabagh in Bannu district. Similar | tised there; and the remains of old workings show that at deposits are found beyond the Indus in Kohat district, | some unknown period operations have been conducted ona where the salt is of two kinds, red and green, and in the large scale. hill state of Mandi bordering on Kangra district. The _ From about 1875 to 1886 individual pioneers were prospecting salt is found in the red marls and sandstones of the | in that region. Crushing the quartz by rude native methods, they Devonian group. In some cases it can be obtained from | proved that it contained a larger proportion of gold than is known open quarries ; but more generally it is approached by ye Hee BPO, Seuss These pede on the southern regular mining by pick and blasting, through wide galleries. rising in one ae i i dit, 'The he a ae eal aoe The principal mine is at Keora in Jhelum district, now | a fineness of slightly over 20 carats. In 1879 Government sum- called after Lord Mayo. The total annual out-turn in the | moneda practical mining engineer from Australia, whose report Punjab is returned at about 50,000 tons, yielding a revenue Rey pelet aig Camera) Sie quartz reefs as of great to Government of more than £400,000, In 1877-78 the | {aang thickness and, Nighy auierous "One ret in Kol~~

~~actual figures of revenue were—(1) from the Salt Range, | perton. In order to attract capital, Government proposed to grant £426,000, (2) from Kohat, £8000, (3) from Mandi, mining leases at a dead rent of Rs. 5 (10s.) per acre, subject to no £6000. a pe tax. Up to 1880 the enterprise had scarcely In southern India salt made by evaporation is almost | Sf actual working with elaborate macllinery realine she premise hela universally consumed. Lower Bengal, especially eastern | out by competent investigators, gold-mining will be established as Bengal, uses salt imported from Cheshire at low rates | 20 important industry in southern India, of freight, and paying the excise duty at Calcutta or Copper is known to exist in many parts of the country Copper. other port of entry. In Orissa and south-western Bengal | in considerable quantities. 'The richest mines are in the both imported salt and salt made by solar evaporation are | lower ranges of the HImalayas, from Darjiling westward to consumed, the latter being alone considered pure for | Kumaun. .The ore occurs in the form of copper pyrites, religious purposes or for the priests. often accompanied by mundic, not in true lodes, but dis- Salt- Saltpetre.—At one time India had almost a monopoly of | seminated through the slate and schist. The miners are petre. the supply of saltpetre upon which Europe depended for | almost always Nepalis, and the remoteness of the situation its gunpowder. In combination with other saline sub- | has deterred European capital. The extent of abandoned stances it occurs as a white efflorescence upon the surface | workings proves that these mines have been known and of the soil in many parts of the country, especially in the | worked for many years. The best seams show a proportion upper valley of the Ganges. Its preparation leaves common | of copper slightly above the average of Cornish ore, but the salt as one of the residuary products; and consequently | ordinary yield is not more than about 4 percent. The fiscal reasons have tended to limit the manufacture to the | mines resemble magnified rabbit-holes, meandering passages most remunerative region, which is found in North Behar. | being excavated through the rock with little system. The The manufacture is simple, and entirely in the hands of a | tools used are an iron hammer and chisel, and sometimes a special caste of natives, called Nuniyds, who are conspicu- | small pick. After extraction, the ore is pounded, washed, ous for their capacity of enduring hard work. As is the | and smelted on the spot. The price obtained for the metal case with most Indian industries, they work under a system | is Rs. 2.8.0 per 3 sers, or at the rate of about 10d. a of~~

~~money advances from middle-men, who are themselves | pound. Copper-ore, of fair purity and extending over a sub-contractors under the large houses of business. In | considerable area, also occurs in Singbhim district of former times the East India Company engaged in the | Chutid Nagpur, where there are many deserted diggings manufacture on its own account; when it abandoned all | and heaps of scoriw. In 1857 a company was started to private trade, its works were taken over by European | re-open the workings at these mines; but, though large firms, but these have in their turn retired from the busi- | quantities of ore were produced, the enterprise did not prove ness, which is nowina state of decline, partly owing tothe | remunerative, and was finally abandoned in 1864, A general fall in price, and partly to the restrictions imposed | similar attempt to work the copper found in Nellore district hy the salt preventive department. The exports of salt- | of Madras also ended in failure. petre from Calcutta are fairly constant, averaging about Lead occurs in the form of sulphuret or galena along Lead. 450,000 ewts. a year, of which one-half goes to the United | the Himalayas on the Punjab frontier, and has been worked Kingdom. More than two-thirds of the total comes from | at one place by an English company. ae Behar, chiefly from the districts of Tirhut, Saran, and Tin is confined to the Burmese peninsula. Very rich Tin. Champaran, thovgh Patna is the railway station for de- deposits, yielding about 70 per cent. of metal, occur over spatch to Calcutta. Cawnpur, Ghazipur, Allahabad, and | a large extent of country in Mergui avd Tavoy districts of Benares, in the North-Western Provinces, send small the Tenasserim region. The ore is washed and smelted, quantities, while a little comes from the Punjab. usually by Chinese, in a very rough and unscientific way. Gold. Gold exists in many parts and probably in considerable | Recent experiments made bya European firm seem to show quantities. Herodotus affirms that the Indians were the | that the deposits, though rich and extensive, are not sufii- only nation who paid their tribute to Darius in gold; and ciently deep to repay more elaborate processes. — there is some reason for believing that the " Ophir" of King Antimony, in the form of surmd, which is largely use Os Solomon is to be identified with the Malabar coast. Nearly | by the i aaah La As oe maar from oe mony. i i xtreme | hill states of the Punjab. is also found in Mysore an every hill stream is washed for gold, whether in tlie e 2 sone 1S GROIN, Hoh TeMoREG A~~

~~*INDUSTRIES.* |~~

~~*the north-east of the Punjab. The last is the only case in which salt can be said to exist as a mineral. It occurs in solid cliffs, which for extent and purity are stated to have*~~

~~*south, in the central plateau, or on the north-east and north- west frontiers. It is true that gold-washing is everywhere a miserable business, affording the barest livelihood ; but*~~

~~*INDIA*~~

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~~*prominently drawn to the possibility of extracting gold from the quartz formation of southern India, which bears many points of resemblance to the auriferous quartz reefs of*~~

~~*Burmah. been thoroughly ascertained, include an ore of cobalt used*~~

~~*for colouring enamel.*~~

~~*Petroleum is produced chiefly in Independent Burmah, Mineral*~~

~~*et th é ld obtained in this way cannot In rf . Ae eee ountiof gol ? but it has also been found on British territory in Pegu, in ol.*~~

~~*be insignificant. In recent years attention has been*~~

~~*Lime- stone.*~~

~~*Other*~~

~~*stones.*~~

~~*Dia-*~~

~~*monds,*~~

Assam, and in the Punjab. Near the village of Ye-nang- yaung in Upper Burmah, on the banks of the Irawadi, there are upwards of one hundred pits or wells with a depth of about 250 feet, from which petroleum bubbles up in in- exhaustible quantities. The annual yield is estimated at 11,000 tons, of which a considerable quantity is exported. Petroleum wells are also found in the British districts of Akyab, Kyouk-hpyu, and Thayet-myo, which first attracted British capital with most promising results in 1877. In Assam petroleum occurs in the neighbourhood of the coal- fields in the south of Lakhimpur district, and was worked in conjunction with the coal by a European capitalist in 1866. In the Punjab petroleum is worked by the Public Works Department at two spots in Rawal Pindi district. In 1873-74 the total yield was only 2756 gallons. Stone.—The commonest and also the most useful stone of India is kankar, a nodular form of impure lime, which is found in almost every river valley, and is used uni- versally for metalling the roads. Lime for building is derived from two sources,—(1) from burning limestone and kankar, and (2) from the little shells so abundantly found in the marshes. Calcutta derives its chief supply from the quarries of the Khasi hills in Assam, known as "Sylhet lime," and from the Susunia quarries in Bankura district. The Gangetic delta is destitute of stone, nor does the alluvial soil afford good materials for brick-making or pottery. But a European firm has recently established large pottery-works at Raniganj in Bardwan, which employ about five hundred hands, and carry out contracts for drain- age pipes and stoneware. The centre of the peninsula and the hill country generally abound in building-stone of excel- lent quality, which has been used locally from time imme- morial. Among the finest stones maybe mentioned the pink marble of Rajputana, of which the historical buildings at Agra were constructed, the trap of the Deccan, the sandstone of the Godavari and the Narbadd, and the granite of southern India. Quarries of slate are scattered through the peninsula, and are'sometimes worked by Euro- pean capital. Mica and tale are also quarried to make ornaments. Among the hills of Orissa and Chutid Nagpur household vessels and ornaments are skilfully carved out of an indurated variety of potstone. Precious Stones.—Despite its legendary wealth, which is really due to the accumulations of ages, India cannot be said to be naturally rich in precious stones. Under the Mahometan rule diamonds were a distinct source of state

~~*revenue; and Akbar is said to have received a royalty of £80,000 a year from the mines of Panna. But at the present day the search for them, if carried on anywhere in British territory, is an insignificant occupation. The name of Golconda has passed into literature; but that city, once the Musalman capital of the Deccan, was rather the home of diamond-cutters than the source of supply. It is believed that the far-famed diamonds of Golconda actually came from the sandstone formation which extends across the south-east borders of the nizim's dominions into the Madras districts of Ganjim and Godavari. A few worthless stones are still found in that region. Sambalpur, on the upper channel of the Mahanadi river in the Central Provinces, is another spot once famous for diamonds. So late as 1818 a stone is said to have been found there weighing 84 grains and valued at £500. 'The river valleys of Chutié Nagpur are also known to have yielded a tribute of diamonds to their Mahometan conqueror. At the present day the only place where the search for diamonds is pursued as a regular industry is the native state of Panna (Punnah) in Bundelkhand. The stones are found by digging down through several strata of gravelly soil and washing the earth. Even there, however, the pursuit is understood to be unremunerative, and has failed to attract European*~~

~~*capital. About other gems little information is available. Other Turquoises are said to be found near Multan in the Pun- gems. jab, though far inferior to the Persian stones. Independent Burmah yields many valuable gems ; and some excitement has been caused by the discovery of sapphire mines just across the Siamese frontier. Poor pearl fisheries exist off the coast of Madura district in the extreme south, and in the Gulf of Cambay; but the great majority of Indian pearls come either from Ceylon or from the Persian Gulf. In the year 1700 the Dutch obtained a lease of all the pearl fisheries along the Madura coast, and sublet the right of fishing to native boatmen, of whom seven hundred are said to have taken licences annually at the rate of 60 écus per boat. The town of Cambay in Guzerat is celebrated for its carving in carnelian, agate, and onyx. The stones come from the neighbourhood of Ratanpur, in the state of Rajpipla. They are dug up by*~~

~~*Bhil miners, and subjected to a process of burning before being carved. The most valued colour for carnelians is red, but they are also found white and yellow. Lapis lazuli is found in the mountains of the north, and freely used in the decoration of temples and tombs.*~~

~~*FAMINES,*~~

~~*As the agriculture of India is mainly dependent upon the bounty of nature, so is it peculiarly exposed to the vicissitudes of the seasons. In any country where the population is dense and the means of communication back- ward, the failure of a harvest, whether produced by drought, by flood, by blight, by locusts, or by war, must always cause much distress. Whether that shall develop into famine is merely a matter of degree, depending upon a combination of circumstances—the comparative extent of the failure, the density of the population, and the practicability of imports.*~~

~~*Drought, or an inadequate supply of rain, is undoubtedly Cause of the great cause of wide-spread famine. No individual famine. foresight, no compensating influences, can entirely prevent those recurring periods of continuous drought with which large provinces of India are afflicted. An average rainfall, if irregularly distributed, may affect the harvest to a moderate degree, as also may flood or blight. The total failure of a monsoon may result in a general scarcity, sufficiently severe to arouse the solicitude of Government. But famine proper, or wide-spread starvation, is caused only by a succession of years of drought. The cultivators of India are not dependent upona single harvest or upon the crops of one year. In the event of a partial failure, they can draw for their food supply either upon their own grain pits or upon the stores of the village merchants. The first sufferers, and those who suffer most in the end, are the class who live by daily wages. But small is the number that can hold out, either in capital or credit, against a second year of insufficient rainfall; and not impossibly a third season may prove adverse. All the great famines in India of which we have record have been caused by drought, and usually by drought repeated over a series of years.*~~

~~*This being so, it becomes necessary to inquire into the Water water supply, which varies extremely in different parts of supply. the country. It can be derived only from three sources— (1) local rainfall, (2) natural inundation,*~~

~~and (3) artificial irrigation from rivers, canals, tanks, or wells. Any of these sources may exist separately or together. In only a few parts of India can the rainfall be entirely trusted, as both sufficient in its amount and regular in its distribu- tion. Those favoured tracts include the whole strip of coast beneath the Western Ghats, from Bombay to Cape Comorin; and the greater part of the provinces of Assam and Burmah, together with the deltaic districts at the head of the Bay~~

~~FAMINES. |~~

~~of Bengal. There the annual rainfall] rarely, if ever, falls below 100 inches ; artificial irrigation and famine are alike unknown. The while of the rest of the peninsula may be described as liable, more or less, to drought. In Orissa, the scene of one of the most severe famines of recent times, the average rainfall exceeds 60 inches a year; in Sind, which has been exceptionally free from' famine under British rule, the average falls to less than 10 inches, The local rainfall, therefore, is not tlie only element to be con- sidered. Broadly speaking, artificial irrigation has pro- tected, or is now in course of protecting, certain fortunate regions, such as the eastward deltas of the Madras rivers and the upper valley of the Ganges. The rest, and by far the greater portion, of the country is still exposed to famine. Nor is it easy to see any remedy. Meteorological science may teach us to foresee what is coming ; but it may be doubted whether it is in our power todo more than alleviate. Lower Bengal and Oudh are watered by natural inundation as much as by the local rainfall; Sind derives its supplies mainly from canals filled by the floods of the Indus; the Punjab and the North-West Provinces are dependent largely upon wells; the Deccan with the entire south is the land of tanks and reservoirs. Bnt in all these cases, when the rainfall has failed over a series of years, the artificial supply must likewise fail after no long interval, so that irrigation becomes a snare rather than a benefit, Water works on a scale adequate to guarantee the whole of India from drought are not only above the possibilities of finance; they are also beyond the reach of engineering skill.~~

~~Famine 'Taking the example of the famine of 1876-78, the most~~

~~1876-78. wide spread and the most prolonged that India has yet known, we may say that the drought commenced in Mysore by the failure of the~~

~~*monsoon in 1875, and that all fear of distress in the North-West Provinces did not pass away until 1879. But it will always be known in history as the great famine in the south, Over the entire Deccan, from Poona to Bangalore, the south-west monsoon failed to bring its usual rainfall in the summer of 1876. In the autumn of the same year the north-east monsoon proved deficient in the south-eastern districts of the Madras presi- dency. The main food crop, therefore, entirely perished throughout an immense tract of country; and, as the harvest of the previous year had also been short, prices rapidly rose to famine rates. In November 1876 it was first officially recognized that starvation was abroad in the land, and that Government must adopt measures to keep the people alive. From that time until the middle of 1878, & period of more than eighteen months, the campaign against famine was strenuously conducted, with various Vicissitudes. The summer monsoon of 1877 proved a failure ; some relief was brought in October of that year by the autumn monsoon ; but all anxiety was not removed until the arrival of a normal rainfall in June 1878. Mean- while the wave of drought had reached northern India, Where it found the stocks of grain much depleted to meet the famine demand in the south. Bengal, Assam, and Burmah were the only provinces that escaped scot free in that disastrous year. The North-West Provinces, the Punjab, Rajputana, and the Central Provinces alike suffered from drought through all the summer of 1877, and from its consequences well into the following year. When once famine gets ahead of relief operations, all is over. The flood of distress bursts through the embankment. Starva- tion and all the attendant train of famine diseases sweep away their thousands. 'The total expenditure of Govern- ment upon famine relief on this occasion may be estimated at about 8 millions sterling, not including the indirect loss of revenue nor the amount debited against the state of Mysore. For this large sum of money there is but little to show in*~~

~~*the way of works constructed. The largest number of persons in receipt of relief at one time in Madras was 2,591,900 in Septeniber 1877 ; of these only 634,581 were nominally employed on works, while the rest were*~~

~~gratuitously fed. From cholera alone the deaths were re- turned at 357,430 for Madras, 58,648 for Mysore, and 57,252 for Bombay. Dr Cornish, the sanitary conmmissioner of Madras, well illustrated the effects of the famine by con- trasting the returns of births and deaths over a series of years. In 1876, when famine with its companion cholera was already beginning to be felt, the births registered in Madras numbered 632,113 and the deaths 680,381. In 1877, the year of famine, the births fell to 477,447, while the deaths rose to 1,556,312. In 1878 the results of the famine showed themselves by a still further reduction of the births to 348,346, and by the still high number of 810,921 deaths, In 1879 the births recovered to 476,307, still considerably below the average, and the deaths diminished to 548,158. These figures are, of conrse, not accurate; but they serve to show how long the results of famine are to be traced in the vital statistics of a people.}~~

~~The first great famine of which we have any trustworthy re- Previous- cord is that which devastated the lower valley of the Ganges in famines. 1769-70. One-third of the population is credibly reported to have perished. 'The previous season had been bad; and, as not uncom- monly happens, the break-up of the drought was accompanied by disastrous floods. Beyond the importation into Calcutta and Mur- shidabad of a few thousand mawnds of rice from the fortunate dis- tricts of Bakarganj and Chittagong, it does not appear that any public measures for relief were taken or proposed. The next great famine was that which afflicted the Carnatic from 1780 to 1783, and has been imanortalized by the genius of Burke. It was primarily caused by the ravages of Hyder Ali's army.~~

~~1 With regard to the deaths caused by the famine and the diseases connecled with it, the Famine Commissioners thus report:—"It has been estimated, and in our opinion on substantial grounds, that the mortality which occurred in the provinces under British administration during the period of famine and drouglit extending over the years 1877 and 1878 amounted, on a population of 197 millions, to 5} millions in excess of the deaths that would have occurred had the seasons been ordinarily healthy ; and the statistical returns have made certain what has long been suspected, that starvation and distress greatly check the fecundity of the population. It is probable that from this cause the number of births during the same~~

~~period has been lessened by 2 millions ; the total reduction of the population would thus amount to about 7 millions. Assuming the ordinary death roll, taken at the rate of 35 per mille, on 190 millions of people, the abnormal mortality of the famine period may be regarded as having increased this total by about 40 per cent." But when estimated over a period of years the effect of famine as a check upon the population is small. The Famine Com- missioners calculate that, taking the famines of the past thirty years, as to which alone an estimate of any value can be made, the abuormal deaths caused by famine aud its diseases have been less than 2 per mille of the Indian population per annum. As a matter of fact cultivation quickly extended after the famine of 1877-78, and there were in Bom- bay and Madras 120,000 more acres under tillage after the long pro- tracted scarcity than before it.~~

~~Execu- tive council.~~

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~~the population proves the danger to which an isolated province is exposed. Thre people of Orissa died because they had no surplus stocks of grain of their own, and beeause importation was absolutely impracticable. Passing over the prolonged drought of 1868-70 in the North-West Provinees and Rajputana, we eome to the Behar seareity of 1873-74, which first attracted the interest of England. Warned by the failure of the rains, and watched and stimulated by the exeited sympathy of the public at home, the Government earried ont in time a comprehensive scheme of relief. By the expenditure of 64 millions sterling, and the importation of one million tons of rice, all risk even of the loss of life was prevented. 'The eompara- tively small area of distress, and the facilities of eonrmunication by rail and river, alone permitted the accomplishment of the feat, whieh remains unparalleled in the annals of famine. During the recent famine in southern India the authoritics worked with no less energy, and eharitable bounty was far more eonspicuous, yet the con- ditions of the ease predestined failure. The stricken tract was many times larger than Behar. No early warning was given. The rain- fall failed, not once, but for three suecessive seasons, and, above all, adequate impovtation and distribution of grain were physical~~

~~*impossibilities. The people were dying while the grain that could have kept them alive was rotting on the beach of Madras or on the railway sidings of Upper India. What adiministrative enterprise can accomplish where the cireumstances are within the compass of human control may be learned from the case of Bombay. In that presidency the famine affected about 34,000 square miles of country, with a population of about 5,000,000 souls. The highest number of persons in receipt of relief at one time was 529,000 in June 1877, of whom the great majority were employed on remunerative works. The importation of grain was left entirely free ; and within twelve months 268,000 tons were brought by rail and 166,000 tous by sea into the distressed districts. The total gross eost to Government was estimated at 14 millions, of which about 1 million will be returned.*~~

~~*ADMINISTRATION.*~~

~~*The supreme authority over all British India, both for executive and legislative purposes, is vested by a series of Acts of Parliament! in the viceroy or governor-general- in-council, subject to the ultimate sanction of the secretary of state in England. Every executive order and every legis- lative statute runs in the name of the " Governor General- in-Council";2 but in certain exceptional classes of cases? a power is reserved to the viceroy to act independently of his council. This council is twofold. First, there is the ordinary or executive council,* usually composed of about six oficial members besides the viceroy, which may be compared with the cabinet of a constitutional country. It meets regularly at short intervals, discusses and decides upon questions of foreign policy and domestic administra- tion, and prepares measures for the legislative council. Its members divide among themselves the chief departments of state, such as those of foreign affairs, finance, war, public works, &c. ; while the viceroy combines in his own person the duties both of constitutional sovereign and prime minis- ter. Secondly, there is the legislative council,® which is constituted by the same members as the preceding, with the addition of the governor of the province in which it inay be held, and official delegates from Madras and Bom- bay, together with certain nominated members represent- ing the non-official native and European communities. The meetings of the legislative council are held when and*~~

~~*1 The chief of these Acts are 18 Geo. IIT. e. 63; 38 Geo. Ill. c. 52;*~~

~~*8 and 4 Will. IV. c. 85; 21 and 22 Vict. c. 1065 and 24 and 25 Vict. c. 67.*~~

~~*2 A style first authorized by 33 Geo. IN. e. 52,*~~

~~*8 "Cases of high importance and essentially affecting the public interest and welfare" (33 Geo. IIT. c. 52, § 47); " when any measure is proposed whereby the safety, tranquillity, or interests of the British possessions in India may in the judgment of the governor-general be essentially affected" (3 and 4 Will. IV.c. 85, § 49); '* cases of emer- gency" (24 and 25 Vict. c. 67, § 23).*~~

~~*4 he lineal descendant of the original council organized under the charters of the Company, first constituted by parliamentary sanction in 1773 (13 Geo. III. c. 68, § 7).*~~

~~*: Originally identical with the executive council, upon which legis- lative powers were conferred by 13 Geo. III. c. 63, § 36. The distinc- tion between the two councils was first recognized in the appointment of 'the fourth member" (3 and 4 Will, IV. ¢, 85, § 40).*~~

~~*§ 39.*~~

~~*INDIA*~~

~~*[ADMINISTRATION.*~~

~~*as required. They are open to the public; and a further guarantee for publicity is insured by the proviso that draft bills must be published a certain number of times in the Gazette. As a matter of practice, these draft bills have usually been first subjected to the criticism of the several provincial governments. In regard to the supreme judicial authority there is no such uniform system. The presidencies of Madras and Bombay, and also two of the three great provinces which have been created out of the old presidency of Bengal, and are now known as the lieutenant-governor- ships of Bengal and the North-Western Provinces, have each a high court,® supreme both in civil and criminal business, with an ultimate appeal to the*~~

~~*judicial committee of the privy council in England. Of the subordinate pro-vinces, the Punjab has a chief court, with three judges ; the Central Provinces, Oudh, Mysore, and Berar have each a judicial commissioner, who sits alone; while in Assam and British Burmah the chief commissioner, or supreme executive officer, is also the highest judicial authority.*~~

~~*The law administered in the Indian courts consists mainly of (1) the enactments of the Indian legislative councils above described and of the bodies which pre- ceded them, (2) statutes of the British parliament which apply to India, (3) the Hindu and Mahometan laws on domestic inheritance or other cases affecting the Hindus and Mahometans, and (4) the customary law affecting particular castes and races. Much has been done towards consolidating individual sections of the Indian law; and in the Indian penal code, together with the codes of civil and criminal procedure, we have memorable examples of such efforts.*~~

~~*But, though the governor-general-in-council is theoreti- cally supreme over every part of India alike,' his actual authority is not everywhere exercised in the same direct manner. For ordinary purposes of administration British India is partitioned into provinces, each with a government of itsown; and certain of the native states are attached to those provinces with which they are most nearly connected geographically. These provinces, again, enjoy varlous degrees of independence, in accordance with the course of their historical development. The two sister presidencies of Madras and Bombay still retain many marks of their original equality with Bengal. They each have an army and a civil service of their own. 'They are each adminis-tered by a governor appointed direct from England, with an executive and a legislative council, whose functions are analogous to those of the councils of the governor- general' They thus possess a domestic legislature ; and in administrative matters, also, the interference of the viceroy is a somewhat remote coutingency. Of the other provinces, Bengal, or rather Lower Bengal, occupies a pecu- liar position. Like the N orth-Western Provinces and the Punjab, it is administered by a single official, with the style of lieutenant-governor, who is controlled by no executive council; but, unlike those two provinces, Bengal has a legislative council, so far preserving a sign of its early pre- eminence. The remaining provinces, whether ruled by a lieutenant-governor or by a chief commissioner, may be re- garded from*~~

~~an historical point of view as fragments of the original Bengal presidency, which as thus defined would be co-extensive with all British India that is not appropriated either to Madras or to Bombay. The lieutenant-governors and most of the chief commissioners are chosen from the covenanted civil service. In executive matters they are the practical rulers ; but, excepting the lieutenant-governor of Bengal, they have no legislative authority. To com-~~

~~6 First constituted out of the Supreme Courts and the Sudder (Sadr) Courts in 1861 (24 and 25 Vict. c. 104).~~

~~73 and 4 Will. IV. c. 85, §$ 39 and 65.~~

~~8 94 and 25 Viet. c. 67, § 42.~~

~~Provin- cial~~

~~admin- istration.~~

~~ADMINISTRATION. |~~

~~plete the total area of territory under British administra- tion, it is necessary to add certain guasi-provinces, under the immediate control of the viceroy. These consist of Ajmir (Ajmere), transferred from Rajputana; Berar, or the dis- tricts assigned by the nizim of Hyderabad ; the state of Mysore, to be restored in 1881 upon terms to its native r4j4; and the tiny territory of Coorg, in the extreme south.~~

~~Another difference of administration, though now of less importance than in former times, derives its name from the old regulations, or uniform rules of law and practice which preceded the present system of acts of the legislature. These regulations, originally intended to be universal in their application, have been from time to time withdrawn so far as regards certain tracts of country which from their backward state of civilization or other causes seemed to~~

~~Non- require exceptional treatment. In non-regulation territory,~~

~~regula- broadly speaking, a larger measure of discretion is allowed~~

~~tion ter- ty the officials, both in the collection of revenue and in the~~

~~ritory. administration of civil justice; strict rules of procedure yield to the necessities of the case, and the judicial and executive departments are to a great extent combined in the same hands. Closely connected with this indulgence in favour of the personal element in administration, a wider field is also permitted for the selection of the administrative staff, which is not confined to the covenanted civil service, but includes military officers on the staff and also uncove- nanted civilians. The title of the highest authority in a non-regulation district is not that of collector-magistrate, but deputy commissioner ; and the supreme authority in a non-regulation province is usually styled, not lieutenant- governor, but chief commissioner. 'The Central Provinces and British Burmah are examples of non-regulation pro- vinces; but non-regulation districts are to be found also in Bengal and the North-Western Provinces, where their existence can always be traced by the office of deputy commissioner.~~

~~Alike in regulation and in non-regulation territory the unit of administration is the district,—a word of very definite meaning in official phraseology. The district officer, whether known as collector-magistrate or as deputy commissioner, is the sole responsible head of his jurisdic- tion.~~

~~Upon his energy and character rests ultimately the efficiency of the Indian Government. Not only are his own special duties so numerous and so vast as to be bewildering to the outsider, but the work of his subordinates, European and native, largely depends upon the stimulus of his redial oxainple. HIs position has been compared to that of the French préfet ; but such a comparison is unjust in many ways to the Indian district officer: he is nota creature of the HIome Office, who takes his colour from his chief and represents only officialism, but an active worker in every depart- ment of popular well-being, with a large measure of individual initi- ative. As the very name of collector-magistrate implies, his main functions are twofold. HIe is a fiscal officer, charged with the col- lection of the revenue from land and other sources; and he is a civil and criminal judge of first instance. But this explanation of his title by no means exhausts his multifarious duties. HIe does in his local sphere all that the home secretary is supposed to do in~~

~~*Eng- land, and a great deal more ; for he is the arom of a pater- nal and not of aconstitutional government. Police, jails, education, municipalities, roads, sanitation, dispensaries, are all to him matters of daily concern; while, in addition, he is expected to make himself acquainted with every phase of the social life of the natives and with each natural aspect of the country. Besides being a*~~

~~*lawyer, an accountant, and a clerk, he ought also to possess no mean knowledge of agriculture, political economy, and engineering.*~~

~~*Districts The total number of districts in British India is two and sub- hundred and thirty-eight. They vary greatly in size and in districts. number of inhabitants. 'The average area is 3778 square miles, ranging from an average of 6612 square miles in Madras to an average of 1999 square miles in Oudh. The average population is 802,927, similarly ranging from an average of 1,508,219 in Madras to an average of 161,597 in Burmah, The Madras districts are thus*~~

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~~*both the largest and tue most populous. In every pro- vince but Madras, the districts are grouped into larger areas, known as divisions, each under the charge of a com- missioner. But these divisions are not properly units of administration, as the districts are. They are aggregates of units, formed only for convenience of supervision, so that an intermediate authority may exercise the universal watchfulness which would be impossible for a distant lieutenant-governor. 'The districts are again partitioned out into lesser tracts, which are strictly units of adminis- tration, though subordinate ones. The system of parti- tioning, and also the nomenclature, vary in the different provinces; but generally it may be said that the sub- division or tahsil is the ultimate unit of administration. The double name indicates the twofold principle of separa- tion: the subdivision is properly the charge of an assistant magistrate or executive officer, the tahst/ is the charge of a deputy-collector or fiscal officer ; and these two offices may or may not be in the same hands. Broadly speaking, the subdivision is characteristic of Bengal, where revenue duties are in the background, aud the tahsil of Madras,*~~

~~*where the land settlement requires attention year by year. There is no administrative unit below the subdivision or tahsil. The thdnd, or police division, only exists for police purposes. The pargand, or fiscal division under native rule, has now but an historical interest. The village still remains as the agricultural unit, and preserves its indepen- dence for revenue purposes in certain parts of the country. The township is peculiar to Burmah.*~~

~~*The judicial jurisdictions coincide for the most part with the magisterial and fiscal boundaries. But, except in Madras, where the districts are large, a single civil and sessions judge, ¢.¢., the supreme judicial officer under the high court, sometimes exercises jurisdiction over more than one district. As has been already mentioned, in non-regu- lation territory judicial and executive functions are com- bined in the same hands.*~~

~~*The preceding sketch of Indian administration would be incom-*~~

~~*lete without a reference to the secretariat, or central office, which in some sense controls and gives life to the whole. From the secre- tariat are issued the orders which regulate or modify the details of administration; into the secretariat come all the multifarious reports from the local officers, to be there digested for future reference. But though the secretaries may enjoy the advantages of life at the presidency capitals, with phe? salaries and better prospects of promotion, it is recognized that the efficiency of the empire rests ultimately upon the shoulders of the district officers, who bear the burden and heat of the day, with few opportunities of winning fame or reward.*~~

~~*Land Settlement.—As the land furnishes the main source Land of Indian revenue, so the assessment of the land tax is the settle- main work of Indian administration. No technical term ™2+ is more familiar to Anglo-Indians, and none more strange to the English public, than that of land settlement. No subject has given rise to more voluminous controversy. It will be enough in this place to explain the general principles upon which the system is based, and to indicate the chief differences of application in the several provinces. That the state should appropriate to itself a direct share in the pro- duce of the soil is a fundamental maxim of Indian finance, that has been recognized throughout the East from time immemorial. 'The germs of*~~

~~rival systems can be traced in the old military and other service tenures of Assam, and in the poll tax of Burmah, &c. The exclusive development of the land system is due to two conditions,—a compara- tively high state of agriculture and an organized plan of ad- ministration,—both of which are supplied by the primitive village community. During the lapse of untold genera- tions, despite domestic anarchy and foreign conquest, the Hindu village has in many parts preserved its simple cus- toms, written in the imperishable tablets of tradition. The land was not held by private owners, but i occupiers under~~

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~~the petty corporation; the revenue was not due from indi- viduals, but from the community represented by its head- man. Theaggregate harvest of the village fields was thrown into a common fund, and before the general distribution the head-man was bound to set aside the share of the state. No other system of taxation could be theoretically more just, or in practice less obnoxious to the people. Such is 'an outline of the land system as it may be found at the present day throughout large portions of India both under British and native rule ; and such we may fancy it to have been universally before the Mahometan conquest. The Musalma4ns brought with them the avarice of conquerors, and a stringent system of revenue collection. Under the Mughal empire, as organized by Akbar the Great, the share of the state was fixed at one-third of the gross produce of the soil; and a regular army of tax-collectors was permitted to intervene between the cultivator and the supreme govern- ment, The entire vocabulary of the present land system is borrowed from the Mughal administration. The zaminddr himself is a creation of the Mahometans, unknown to the early Hindu system. He was originally a mere tax- collector, or farmer of the land revenue, who agreed to furnish a lump sum from the tract of country assigned to him. If the Hindu village system may be praised for its justice, the Mughal farming system had at least the merit of efficiency. Shdh Jdhén and Aurangzeb extracted a larger land revenue than the British do. When the government was first undertaken by the Hast India Com- pany, no attempt was made to understand the social system upon which the land revenue was based. The~~

~~*caminddr was conspicuous and useful ; the village com- munity and the cultivating rdéyat did not force them- selves into notice. The zaminddér seemed a solvent person, capable of keeping a contract ; and his official position as tax-collector was confused with the proprietary rights of an English landlord. The superior stability of the village system was overlooked, and in the old provinces of Bengal and Madras the village organization has gradu- ally been suffered to fall into decay. The consistent aim of the British authorities has been to establish private pro- perty in the soil, so far as is consistent with the punctual payment of the revenue, The annual Government demand, like the succession duty in England, is universally the first liability on the land ; when that is satisfied, the registered landholder has powers of sale or mortgage scarcely more re- stricted than those of a tenant in fee-simple. At the same time the possible hardships, as regards the cultivator, of this absolute right of property vested in the owner have been anticipated by the recognition of occupancy nights or fixity of tenure, under certain conditions. Legal rights are everywhere taking the place of unwritten customs. Land, which was before merely a source of livelihood to the cultivator and of revenue to the state, has now become the subject of commercial speculation. The fixing of the revenue demand has conferred upon the owner a credit which he never before possessed, by allowing him a certain share of the unearned increment. 'This credit he may use improvidently, but none the less has the land system of India been raised from a lower to a higher stage of civiliz- ation. .*~~

~~*The means by which the land revenue is assessed is known as settlement, and the assessor is styled a settlement officer. In Ben- gal the assessment has been accomplished once and for all, but throughout the greater part of the rest of India the process is con- tinually going on. The details vary in the different provinces; but, broadly speaking, a settlement may be described as the ascertain- ment of the agricultural capacity of the land. Prior to the settle- ment is the work of survey, which first determines the area of every village and frequently of every field also. Then comes the settle- ment officer, whose duty it is to estimate the character of the soil,*~~

~~*the kind of crop, the opportunities for irrigation, the means of com- munication and their probable development in the future, and all*~~

~~*INDIA*~~

~~*great rival, Francis, superior advantages of a permanent assessment. in 1789, a more accurate investigation into the agricultural*~~

~~*[ADMINISTRATION,*~~

~~*other circumstances which tend to affect the value of the produce. With these facts before him, he proceeds to assess the Government demand upon the land according to certain general principles, which may vary in the several provinces. settlement report, which records, as in a Domesday Book, the en- tire mass of agricultural statistics concerning the district.*~~

~~*The final result is a*~~

~~*Lower Bengal and a few adjoining districts of the*~~

~~*North-Western Provinces and of Madras have a perma- nent settlement, z. ¢., the land revenue has been fixed in perpetuity. When the Company obtained the diwdni or financial administration of Bengal in 1765, the theory of a*~~

~~*settlement, as described above, was unknown. The exist- ing Mahometan system was adopted in its entirety. n-*~~

~~*gagements, sometimes yearly, sometimes for a term of years, were entered into with the zaminddrs to pay a lump*~~

~~*sum forthe area over which they exercised control. If the offer of the zaminddér was not deemed satisfactory, another contractor was substituted in his place. But no steps were taken, and perhaps no steps were possible, to ascertain in detail the amount which the country could afford to pay.*~~

~~*For more than twenty years these temporary engagements*~~

~~*continued, and received the sanction of Warren Hastings, the first titular governor-general of India. Hastings's was among those who urged the At last,*~~

~~resources of Bengal was commenced, and the settlement~~

~~based upon this investigation was declared perpetual by~~

~~Lord Cornwallis in 1793. The zamindars of that time were raised to the status of landlords, with rights of transfer and inheritance, subject always tothe payment in perpetuity of a rent-charge. In default of due payment, their lands were liable to be sold to the highest bidder. The aggre- gate assessment was fixed at sikkd Rs. 26,800,989, equi- valent to Co.'s Rs. 28,587,722, or say 2? millions sterling. By the year 1871-72 the total land revenue realized from the same area had increased to Rs. 35,208,866, chiefly owing to the inclusion of estates which had escaped the original assessment for various reasons. While the claim of Government against the zaménddrs was thus fixed for ever, it was intended that the rights of the zaminddrs over their own tenants should be equally restricted. But no detailed record of tenant-right was inserted in the settle- ment papers, and, as a matter of fact, the cultivators lost rather than gained in security of tenure. The same English prejudice which made a landlord of the zaminddr could recognize nothing but a tenant-at-will in the rdyat. By two stringent regulations of 1799 and 1812 the tenant was practically put at the mercy of a rack-reuting landlord. If he failed to pay his rent, however excessive, his property was rendered liable to distraint and his person to im- prisonment, At the same time the operation of the revenue sale law had introduced a new race of zaminddrs, who were bound to their tenants by no traditions of hereditary sympathy, but whose sole object was to make a profit out of their newly purchased property. The rack- Land rented peasantry found no protection in the law courts until law 1859, when an Act was passed which restricted the land- of 1858 lord's powers of enhancement in certain specified cases. The zaminddr is the only person recognized by the revenue law; but in a large number of cases the zamindar has in effect parted with all his interest in the land by means of the creation of perpetual leases or patnis. 'These leases are usually granted in consideration of a premium or lump sum paid down, and there is nothing to prevent the patniddr from creating an indefinite series of sub-tenures beneath his own. The permanent settlement was not preceded by any systematic survey. But in the course of the past thirty years the whole of Bengal has been subject to a professional~~

~~*survey, which determined the boundaries of every village, and issued maps on the scale of 4 inches to the mile.*~~

~~*Rayat- wart — settle- ment.*~~

~~*ADMINISTRATION, |*~~

~~*This survey, however, has only a topographical value. No statistical inquiries were made, and no record obtained of rights in the soil. Even the village landmarks then set up have fallen into decay.*~~

~~*The permanent settlement was confined to the three pro- vinces of Bengal, Behar, and Orissa, according to their boundaries at that time. Orissa Proper, which was con- quered from the Marhattds in 1803, is subject to a tem- porary settlement, of which the current term of thirty years will not expire until 1897. The assessment is identical with that fixed in 1838, which was based upon a careful field measurement and upon an investigation into the rights of every landholder and under-tenant. The settlement, however, was made with the landholder, and not with the tenant, and in practice the rights of the cultivators are no more secure than in Bengal. In Assam Proper, or the valley of the Brahmaputra, the system of settlement is simple and effective. The cultivated area is artificially divided into mauzds or blocks, over each of which is placed a native official or maueddd r. Every year the mauzdddr ascertains the area actually under cultivation, and then assesses the fields according to their character, at a certain prescribed rate.*~~

~~*The prevailing system throughout the Madras presidency is the rdyatwért, which takes the cultivator or peasant proprietor as its rent-paying unit, somewhat as the Bengal system takes the zaminddr. This system cannot be called indigenous to the country, any more than the zamindédri of Bengal. If any system deserves that name, it is that of village assessment, which still lingers in the memories of the people in the south. When the British declared them- selves heir to the nawd4b of the Carnatic at the opening of the present century, they had no adequate experience of revenue management. The authorities in England favoured the zaminddri system already at work in Bengal, which appeared at least calculated to secure punctual payment. The Madras Government was accordingly instructed to enter into permanent engagements with zaminddrs, and, where no*~~

zaminddrs could be found, to create substitutes out of enterprising contractors) The attempt resulted in failure in every case, except where the zaminddrs happened to be the representatives of ancient lines of powerful chiefs. Several of such chiefs exist in the extreme south and in the north of the presidency. Their estates have been guaranteed to them on payment of a peshkash or permanent tribute, and are saved by the custom of primogeniture from the usual fate of subdivision. Throughout the rest of Madras there are no zaminddrs either in name or fact. The influence of Sir Thomas Munro afterwards led to the adoption of the rdyatwéri system, which will always be associated with his name. According to this system, an assessment is made with the cultivating proprietor upon the land taken up for cultiva- tion year by year. Neither zaminddr nor village officer intervenes between the cultivator and the state, which takes directly upon its own shoulders all a landlord's respon- sibility. The early rdéyatwéri settlements in Madras were based upon insufficient experience. They were preceded

by no survey, but adopted the crude estimates of native

officials. Since 1858 a department of revenue survey has been organized, and the old assessments have been every- where revised. : Nothing can be more complete in theory and more difficult of exposition, than a Madras rdyatwdrt settlement. First, the entire area of the district, whether cultivated or uncultivated, and of each field within the district is accurately measured. The next step is 'to calculate the estimated produce of each field, having regard to every kind of both natural and artificial advantage. Lastly, a rate is fixed upon every field, which may be regarded as roughly equal to one-third of the gross and one-half of the net produce. 'The elaborate nature of these inquiries and calculations may be inferred from the fact that as many as thirty-five different rates are some-

tines struck for a single district, ranging from 6d. to £1, 4s. per acre. The rates thus ascertained are fixed for aterm of thirty years; but during that period the aggregate rent-roll of a district is liable to be affected by several

~~*considerations. New land may be taken up for cultivation, or old land may be abandoned ; and occasional*~~

~~*remissions are permitted under no less than eighteen specified heads. Such matters are discussed and decided by the collector at the jamabandi or court held every year for definitely ascertaining the amount of revenue to be paid by each rdéyat for the current season. This annual inquiry hassometimes been mistaken by care- less passers-by for an annual reassessment of each rdyat's holding. It is not, however, a change in the rates for the land which he already holds, but an inquiry into and record of the changes in his former holding or of any new land which he may wish to take up.*~~

~~*In the early days of British rule no system whatever prevailed throughout the Bombay presidency ; and even at the present time there are tracts where something of the old confusion survives. The modern " survey tenure," as it is called, dates from 1838, when it was first introduced into one of the tdlukas of Poona district, and it has since been gradually extended over the greater part of the presi- dency. As its name implies, the settlement is preceded by survey. Each field is measured, and an assessment placed upon it according to the quality of the soil and the crop. This assessment holds good, without any possibility of niodification, for a term of thirty years. The average rate varies from a maximum of 4s. 6d. an acre in the rich black soil lands of Guzerat to a minimum of 10d. an acre in the barren hills of the Concan.*~~

~~*The primary characteristic of the Bombay system is its sim- plicity. he field is the unit, and its actual 'occupier is the only person recognized by the revenue law. HIe knows exactly what he will have to pay, and the state knows what it will receive, during the currency of the term. The assessment is, in fact, a rent-charge liable to be modified at intervals of thirty years. Secondly, the system is characterized by its fairness to the tenant. HIe possesses "a transferable and heritable property, continuable without ques- tion at the expiration of a settlement lease, on his consenting to the revised rate." To borrowa metaphor from English law, his position has been raised from that of a villein to that of a copyholder. In exchange for the mere leave to exist and till the soil he has received a right of property in the soil he*~~

~~*tills, and he stands forth a free man. If the Bombay peasants have not reaped all the advantages from this system that might have been hoped for, the fault rests, not with the system, but with themselves. They were unequal to the responsibilities of property which they had not won by their own exertions, but which the state (perhaps prematurely) cast upon them.*~~

~~*The North-Western Provinces and the Punjab have a similar land system. In that part of India the village community has preserved its integrity more completely than elsewhere. Government therefore recognizes the village, and not the zaminddr's estate or the rdyat's field, as the unit of land administration. Throughout the North- Western Provinces, indeed, the village is commonly owned by proprietors with the title of zaminddr, whereas in the Punjab the community is still the proprietor. But this is a distinction of tenure rather than of administration. In both cases alike the state recognizes only the village, and makes its arrangement with the owners of the village, whether they be one or many, whether they be individuals, a corporation, or a bhdydchdra (brotherhood). The survey there becomes a more comprehensive undertaking than in Madras or Bombay. In addition to measurement, and agri- cultural appraisement and calculation, it includes the duty of drawing up an exhaustive record of all rights and sub-tenures existing in every village. The proprietors are alone responsible for the revenue; but, when the state limits its claims against them, it is no less careful to define at the same time the rights of other parties interested in the soil. The term of settlement both in the North-Western Provinces and in the Punjab is thirty years. The principle of assessment is that the Government revenue shall be equal to one-half of the improved rent, leaving the other half as the share of the landlord, who is liable for due payment, and has the trouble of collecting it from the*~~

~~*Land revenue.*~~

~~*Salt ad- mninistra- tion.*~~

~~*cultivators. The average rate of assessment is about 9s, 1ld. per acre in the North-Western Provinces, and 1s. 4d. in the Punjab.*~~

~~*The Oudh télukddérs resemble English landlords even more closely than do the zaminddrs of Bengal. In origin the majority were not revenue-farmers, but territorial mag- nates, whose influence was derived from feudal authority as much as from mere wealth. Their present legal status dates from the pacification that followed on the mutiny of 1857. The engagement then entered into has been described as a political treaty rather than a revenue assessment. The great télukddrs were invited to become responsible each for a gross sum payable from the territory over which he exercised feudal rights. This sum was fixed in perpetuity ; and the exceptional position of the tdlukdars was recognized by conferring upon them, not only the right of succession by primogeniture, but also the privilege of bequest, —a privilege unknown alike to Hindu and Mahometan law. Land not comprised in tdlukddrt estates was settled in the ordinary way with its proprietors or zaminddrs for a term of thirty years. The whole of Oudh has since been accurately surveyed.*~~

~~*The Central Provinces contain many varieties of land tenure, from the feudatories, who pay only a light tribute, to the village communities, who are assessed in the usual manner after survey. Population is sparse and agriculture backward, so that the incidence of land revenue is every- where low. The survey was conducted generally on thie Punjab system, adopting the village and not the field as the unit of measurement. 'The current settlement for a term of thirty years will expire in 1897.*~~

~~*In 1873-74 the total land revenue realized from territory under British administration in India amounted to £20,919,256, which is raised to £22,768,144 by the in- clusion of certain local rates and cesses levied on land. This latter figure shows an average of 9-4d. per acre of gross area and 2s. 4°7d. per head of total population. The highest rate of assessment appears to be that in Bombay, which is 3s. 10°4d. per head ; the lowest, 1s, 27d. per head in Bengal and Assam.*~~

~~*Salt Administration.—Next to land, salt contributes the largest share to the Indian revenue; and, where salt is locally manufactured, its supervision becomes an important part of administrativeduty. Up towithin quite recent times the tax levied upon salt varied extremely in different parts of the country, and a strong preventive staff was required to be stationed along a*~~

~~*continuous barrier hedge, which almost cut the peninsula into two fiscal sections. The reform of Sir J. Strachey in 1878, by which the higher rates were reduced and the lower rates raised, with a view to their ultimate equalization over the whole country, effectually abolished this old engine of oppression. Communication is now free; and it has been found that prices are absolutely lowered by thus bringing the cousumer nearer to his market, even though the rate of taxation be increased. In the Punjab and Rajputina salt administration has thus become, as in Lower Bengal, a simple matter of weighing quantities and levying a uniform tax. In Bombay, also, the manufacture is now conducted with a minimum of expense at large central depdts in Guzerat under a thorough system of excise supervision. Along the western coast, however, from Orissa to Cape Comorin, the process of evaporating sea-water is everywhere carried on as a private industry, though on Government account. As with poppy cultivation in Bengal, the manufacture of salt is a monopoly, which can only be defended by the peculiar circumstances of thecase. No one is compelled to manufacture, and rights of property in a salt-pan are strictly respected, while the state contrives, by means of a careful staff of supervisors, to obtain the maximum of profit with a minimum of inter-*~~

~~*INDIA*~~

~~*"the total cost to 3 dnnds 5°6 pies per maund. The price*~~

~~*(ADMINISTRATION.*~~

~~*ference. 'The system as at present carried on has been gradually developed out of the experience of nearly a cen- tury. The manufacturers belong to the same class as ordinary cultivators; and, as a rule, their condition is somewhat more prosperous, for they possess an hereditary privilege with a commercial value. They do not work upon a system of advances, as is the case with so many other Indian industries ; but they are paid at a certain rate when they bring their salt to the Government depot. This rate of payment, known as kudivaram, is at present fixed at an average of 1 dnnd 5'8 pies per maund of 822 ib; the other expenses of the salt department, for supervision, d&c., raise*~~

~~now charged to the consumer by the Madras Government is Rs. 2.8.0 per maund, the balance being net profit. The equal rate of salt duty which will ultimately prevail throughout all India is Rs. 2.8.0 per maund, or 7s. a cwt. This rate is already (1881) levied in Madras, Bombay, the North-Western Provinces, and the Punjab, but in Bengal a higher rate is provisionally in force of Rs. 2.14.0 per maund, or 8s.a cwt. In British Burmah only 3 dnnds per maund, or 6d. a cwt., is charged for local consumption, and a transit duty of 1 per cent. ad valorem for salt sent across the frontier.~~

~~Excise.—Excise, like salt, is not only a department of revenue Excise. collection, but also to a great extent a branch of the executive. In other words, excise duties in India are not a mere tax upon the consumer, levied for convenience through the manufacturer and retail dealer, but a species of Government monopoly. The only excisable articles are intoxicants and drugs ; and the avowed object of the state is to check consumption not less than to raise revenue. Details vary in the different provinces, but the general plan of administration is the same. he right to manufacture and the right to retail are both monopolies of Government permitted to private individuals only upon terms. Distillation of country spirits is allowed according to two systems,—either to the highest bidder under strict supervision, or only upon certain spots set a art for the purpose. The latter is known as the sadr or central distillery system. The right of sale is also usually farmed out to the highest bidder, subject to regulations fixing the minimum quantity of liquor that may be sold at one time. The brewing of beer from rice and other grains, which is universal among the hill tribes and other aboriginal races, is practically untaxed and unrestrained. The European breweries recently established at several hill stations pay a tax at the rate of 6d. a gallon. Apart from spirits, excise duties are levied upon the sale of a number of intoxicating or stimulant drugs, of which the most important are opium and gdnjd or bhang. Opium is issued for local consumption in India from the Govern- ment manufactories at Patné and Benares, and sold through private retailers at a monopoly price. This drug is chiefly consumed in Assam, Burmah, and the Punjab. Gdnjd is an intoxicating pre- paration made from the flowers and leaves of Indian hemp (Cannabis sativa, var. indica). The cultivation of hemp for this purpose is almost confined to a limited area in Rajshdhi district, Bengal, and to the farther valleys of the HImalayas, whence the drug is imported under the~~

~~*name of charas. Its abuse is sometimes a cause, not only of crime, but also of insanity. Government attempts to check con- sumption—first, by fixing the retail duty at the highest rate that will not encourage smuggling, and, secondly, by continually raising that rate as experience allows. Scientifically speaking, gdnjd con- sists of the flowering and fruiting heads of the female plant ; bhang or siddhi, of the dried leaves and small stalks, with a few fruits ; while charas is the resin itself, collected in various ways as it naturally exudes. No duty whatever is now levied upon tobacco in any part of India. The plant is universally grown by the culti- vators for their own smoking, and, like everything else, was subject to taxation under native rule; but the impossibility of accurate excise supervision has caused the British Government to abandon the impost.*~~

~~*The municipalities at present existing in India are a creation of Munici-*~~

~~*the legislature and a branch of the eneral system of administration. palities.*~~

~~*Their origin is to be traced, not in the native panchdyat, but in*~~

~~*the necessity for relieving the district officer of some of the details*~~

~~*of his work. The panchdyat or elective council of five is one of*~~

~~*the institutions most deeply rooted in the HIndu mind. By it*~~

~~*the village community was governed, the head-man being only the*~~

~~*executive official, not the legislator or judge; by it all caste dis*~~

~~*putes were settled ; by it traders and merchants were organized into owerful guilds, to the rules of which even European outsiders have*~~

~~*he to submit; by it the Sikh army of the £hdlsd was despotically*~~

~~*governed, when the centralized system of Ranjit Sinh fell to pieces*~~

~~*Fiance.*~~

~~*lievenue.*~~

~~at hisdeath. But the Hindu village organization had been greatly broken up under Mughalrule. The modern municipal committee is a body appointed by Government, on the nomination of the collector to assist him in the discharge of his local duties, and to assess new modes of taxation. Police, roads, and sanitation are the three main objects for which a municipality is constituted. Outside a munici-~~

~~ality these objects are (in different provinces) the care of the col- ector, of some member of his subordinate staff, or of a local fund board. Within municipal limits they are delegated toa committee, who practically derive their authority from the collector's sanction, implied orexpressed. Except in the great towns, the municipalities cannot be said to enjoy any of the attributes of corporate life. How- ever, as education advances, and with it the desire and capacity of self-government, the municipal committee will doubtless form the germ from which free local institutions will in the future be de- veloped. In 1876-77, excluding the three presidency capitals, there were altogether 894 municipalities in British India, with 12,381,059 inhabitants, or just 7 per cent. of the total population. Out of an aggregate number of 7519 members of municipal committees con- cerning whom information is available, 1794 were Europeans and 5725 natives; 1863 were ex-officio, 4512 nominated, and 1144 elected,—the last class being almost confined to the North-Western and Central Provinces. The financial statistics of these municipali- ties are given in a subsequent section.~~

~~Imperial Finance.—It is impossible to present a concise view of Indian finance, such as shall be at once accurate and intelligible. In the first place, the aggregate figures of revenue and expenditure are officially returned according to a system which, though necessary for purposes of account, usually misleads the English financier. The whole system of administration is based npon the view that the British power is a paternal despotism, which owns, in a certain sense, the entire soil of the country, and whose duty it is to perforin the various functions of a wealthy and onlightened proprietor. In addition, it takes on itself the business of a manufacturer and trader on a grand scale, as in the case of opium and salt. All these con- siderations tend to swell the totals on both sides of the balance-sheet with large items,~~

which, on strict analysis, ought to be eliminated as mere matters of account. The actual taxation on the people of British India for 1878, as will be shown below, was 34 millions, or under 8s. 8d. per head of the population. In the second place, the methods of keeping the public accounts have been subjected to frequent changes during recent years, to such an extent as to render comparative statements of totals valueless.

The following table, which has been compiled from the Par- liamentary Abstract for 1877-78, exhibits the gross imperial revenue and expenditure of India for that year, according to the system of accounts adopted at the time. For the reasons already given, it is practically impossible to analyse these statements in such a way as to show the actual amount raised by taxation, and the actual amount returned in protection to person and property. It is equally impossible to compare the totals with those for

revious years. The only profitable plan is to take some of the items and explain their real meaning.

Gross Revenue. Gross Expenditure.

Land revenuc ……c00.008 £20,026,086 | Collection—Land ……00+. £2,531,325 Tributes and contributions… 675,120 Salt we. — 39,858 Forest 664,102 i «e- 2,661,266 Excise 2,457,075 … 2,380,902 Assessed taxes ……..0 «. 86,110 e. 1,646,093 Provincial rates ……..ce.cc0e 238,504 | Interest on debt .. 5,028,318 KETESEOMISW s,s seccssccccescessdeasasss 2,622,296 | Administration ……..cccecesscere 1,805,368 AUN sceeMilcvcsteessecoeianestsesccoses 6,460,082 | Law and justice ……..cc000 3,319,673 WUE ences Saseccvecessesesasscsevee 9,182,722 | Marine and inland navigation 542,202 SUL EMER CSE orci sos 4iosscyaileisswes see 2,993,483 | Ecclesiastical' …..s.scsccecsresecc 58,039 UPA secs ecvessssibsssesaiecass eA COOMA CCNCAl! iassscescstsescsscscsscccess GLLALO BAOGOICC. .c2ncvossseccceseesceiesees 847,694 | Political agencies ……. 468,975 PROVE RUAN crs .ossccccecesssensvees OSU) | POMC: ..50ccessiesssesesase0 see 2,158, 237 Taw and justice ……..000.00. 913,221 | Education.……..cssecccoseseeess 738,020 Public works (ordinary) ……. 371,539 | Stationery and printing ……. 425,644 DTI QATIOM Gc: ssciccenessiccees ec es 495,142 | Loss by exchange.……..06. 1,653,377

~~*URLGRNQN WAYS s.css0.cccscoccsevoes SONI ON MAUI jslsccieittc/sssssscsressesescosees seen 16,639,761 Guaranteed railways (net).... 6,129,765 | Famine relief ……ssssee+ 5)345,775 Miscellaneous …….+.2. 3,055,593 | Provincial payments.……. 247,034*~~

Public works (ordinary) ..... 3,676,274 Productive public works—Maintenance ……s0000..00 791,601 Interest and surplus profits 6,572,955 Miscellaneous ……..ccccesceseeree 2,019,872 £3,543,087 — sesesersssesesenes LOPAILE2, 512,088

i £58,969 301

Deficiency of gross revenue as compared with gross APCLICNUUUINC eislss oa s caverece ee

Revenue.—It will be seen from the above statement that the larger Retin of the gross revenue is not derived from taxation at all.

ublic works, ineluding railways, alone yield about 74 millions sterling, or nearly 18 per cent. of the total. If we add the itenisof post office and telegraphs, which also represent payment for work done or services supplied, the proportion rises to nearly 14 per cent. Then the sum of 9 millions gross, or 63 millions net, derived from opium, being somewhat more than an additional 15 per cent. of the gross revenue, is admitted to be no charge upon the native tax-payer, but a voluntary contribution to the Indian exchequer by the Chinese consumer of the drug. Nearly one-third of the total toss revenue is thus accounted for. The land revenue, amounting

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to just 20 millions in an garters bad year, cannot be passed over so lightly. Whether it should be roperly regarded as a tax, or only as rent, is an abstruse problem for political economists to settle ; but, in any case, it is paid without question, as an im- memorial perquisite of the state. It yields 34 per cent., or more than one-third of the gross revenue. The importance of the land tax from the point of view of administration has been considered ina previous section. Setting aside provincial rates and assessed taxes as Insignificant in their amount and variable in their incidenee, we are left with four prineipal headings,—excise, customs, salt, and etainps,—which together eoustitute the indisputable taxation of the people. The total amount

~~*yielded by these four items is just 144 millions, being nearly 25 per cent., or one-fourth of the whole. Salt alone yields 64 millions, or 11 per cent. On the total popula- tion of 191 millions, the gross revenue of 59 millions shows an in- cidence of 6s. 24d. per healt The land tax alone shows an incidence of 2s, 1fd. per head, the four taxes proper of 1s. 64d. per head. The whole revenue of British India of the nature of actnal taxa- tion, including land revenue, excise, assessed taxes, provincial rates, customs, salt, and stamps, amounted in 1878 to £34, 883,586, or 3s. 77d. per head. The rate was about 4s. per head in 1880.*~~

~~*Of the four items, excise and stamps are buth almost entirely creations of British rule. Excise is simply a tax upon intoxicating liquors and deleterious drugs, levied both on the manufacture and on the sale, aceording to different systems in different provinces. Like the corresponding duty in England, it is voluntarily ineurred, and presses hardest upon the lowest classes. But, unlike the English excise, it can hardly be called an elastic source of revenue, for the rate is intentionally kept so high as to discourage consump- tion. No duty whatever is levied upon tobacco. Stamps, as in England, is an ambiguous item. The greater part is derived from fees on litigation, and only a comparatively trifling amount from stamps proper on deeds of transfer, &c. Customs are divided into import and export duties, both of which have been so greatly lightened in reeent years that their permanent muintenance must be considered donbtful. At the present time (1881) import duties, usually at the rate of 5 per cent. ad valorem, are levied upon a comparatively long list of commodities, of which the chief are cotton goods above a certain degree of tineness. All duties on ex- ports have now been removed, with the single exception of that on rice, which brings in about £500,000 a year. hat is levied at the rate of 3 dnndsa maund, or about 6d. per cwt., being equivalent to an ad valorem rate of about 10 per cent. India, including Burmah, possesses a practical monopoly of the supply of rice to Europe, and therefore the tax falls upon the consumer rather than upon the native producer. The salt tax is a matter of more import- auce and of greater difficulty. As an impost upon an article of prime necessity, and as falling with greatest severity upon the lowest classes, it violates the elementary rules of political economy. On the other hand, it may be urged that this tax is familiar to the people, and levied in a manner which arouses no discontent, and that it is the only means available of spreading taxation*~~

~~*proper over the community. Recent reforms have tended to equalize the incidence of the salt tax over the entire country, with the immediate result of abolishing arbitrary and vexatious customs lines, and with a view to its ultimate reduction.*~~

~~*Expenditure.—Putting aside the cost of collection and civil Expen-*~~

~~*administration, which explain themselves, the most important items diture.*~~

~~*of expenditure are army, interest on debt, famine relief, loss by exchange, and public works, to which may be added the complex item of payments in England. Military expenditure averages fully 16 millions a year, being thus considerably more than the whole amount obtained from taxation proper. Of this total, about 12 millions represent payments in India, and 4 millions payments in England. On non-effective services nearly 2 millions are expended in England and less than £700,000 in India. Regimental pay accounts for nearly 7 millions, the commissariat for abont 2 millions in India, and stores for another million in England. In 1877-78 the total capital of the Indian debt was returned at over 1464 millions sterling, being just 15s. 4d. per head of the population. The total charge for interest was 5 muillions, being at the rate of £3, 14s. 4d. per cent. ; but this excludes the interest to be credited against expenditure on reproductive public works, which is entered under another heading. In 1840 the debt amounted to only 30 millions, but it gradually increased to 52 millions in 1857. Then came the Mutiny, which added 42 millions of debt in four years. The rate of increase was again gradual but slow till about 1874, when famine relief conspired with public works to cause a rapid augmentation, which has continued to the present time. The most significant feature in that augmentation is the larger proportion of debt contracted in England. During the last ten years the silver debt has risen only 10 millions, whereas the gold debt has risen 28 millions. No charge has recently pressed harder upon the Indian exchequer than that of famine relief. Apart from loss by reduced revenue, the two famines of 1874 and 1877-78 have caused a direct expenditure onc haritable and relief works, amounting in the aggre- gate to nearly 15 millions. Loss by exchange is an item which hag*~~

~~*Police.*~~

~~*Jails.*~~

~~*774 INDIA [ADMINISTRATION.*~~

~~*cnly lately taken its place in the accounts, and is duc to the circum- stance that large payments in gold ee to be nade in England by means of the depreciated rupee. It is, of course, not a matter of expenditure proper, but inerely the result of a peculiar mode of book-kceping, which estimates the rupec at the arbitrary value of 95, In 1869-70 the loss by exchange was more than balanced by an equally nominal entry of gain by exchange on the other side of the ledger. 1n 1876-77 this item attained its maximum of nearly 1% million net. The expenditure on public works is provided from three sourees—(1) the eapital of private companies, with a Govern- ment guarantee, (2) loans for the construction of railways and eanals, (3) current revenue applied towards such works as are con- sidered to be not directly remuuerative. In 1877-78 the total capital raised by the guaranteed railway companies was 954 millions, and the net earnings were 5 millions, thus showing on the average*~~

~~*29 millions were expeuded under the second head upon works classed as reproductive or extraordinary, of which 19 millions were appro- priated to state railways and 10 millions to irrigation. The amount spent from revenue upon ordinary public works in 1877-78 was nearly 33 millions. The division of the expenditure into that paid in India and that paid in England becomes of importance when it ig remembered that the latter portion requires to be provided in gold. In 1877-78, out of the total expenditure of 624 millions, 484 inillions, or 78 per eeut., were paid in India, and 14 millions, or 22 per cent., in England, including the guaranteed interest of the railway companies. °*~~

~~*Local Finance.—Independent of imperial finance, and likewise*~~

~~*Native Troops.*~~

~~*Artillery.| Cavalry. | Engineers | Infantry. Neate*~~

~~*Bengal army ….....+ +. 748 | 18,016 Miadiraa” 4, ...0+-.50% ae 1,748 BomWay ys… see 153 3,587*~~

~~1,241 | 48,806 | 122 1,461 | 31,081] 8 5387 | 22,296| 72~~

~~Towtals,....::. 901 3,239 | 102,183 | 202~~

~~Police. Excluding the village watch, which is still maintained as a subsidiary force in many parts of the country, the total regular police of all kinds in Bnitish India in 1877 consisted of a total strength of 157,999 officers and men, being an average of one police- man to every 74 square miles of total area or to every 1096 of the total population. The total cost of maintenance was £2,511,704, of which £2,165,073 was payable from imperial or provincial revenues. The former figure gives an average cost of £3 per square mile of areca and 3d. per head of population. The average pay of each: constable was 7 rupees a month, or £8, 8s. @ year.~~

~~Jails.—In 1877 the total number of places of confinement in British India, including central and district jails and lock-ups, was 636 ; the total number of prisoners admitted during the year, or remaining over from the previous year, was 587,288; the daily average was 118,456—113,087 males and 5369 females. These figures show 1 male prisoner to every 868 of the male population, 1 female prisoncr to every 17,244 of the female ge ae and 1 prisoner to every 1618 of the total population of both scxes. The~~

~~laces of transportation for all British India are the Andaman and iiie pba Islands, where there are two penal establishments; these coutained in 1877 a daily average of 9145 convicts. .~~

~~EDUCATION.~~

~~The existing system of education in India is mainly dependent upon the Government, being directly organized by the state, at least in its higher departments, assisted throughout by grants-in-aid, and under careful inspection. But at no period of its history has India been an altogether unenlightened country. The origin of the Deva-Nagari alphabet is lost in antiquity, though that is generally ad- mitted not to be of indigenous invention. Inscriptions on stone and copper, the palm-leaf records of the temples, and in later days the wide-spread manufacture of paper, all alike indicate, not only the general knowledge, but also the com- mon use, of the art of writing. From the earliest times the caste of Brahmans has preserved,~~

~~*by oral tradition as well as in MSS., a literature unrivalled alike in its antiquity and in the intellectual subtlety of its contents. The Mahometan invaders introduced the profession of the historian, which reached a high degree of excellence, even*~~

~~*Total.*~~

~~*68,933 34,293*~~

~~*38,355 | 2,549*~~

~~*| ee | enon | SASS, <9 ——————"*~~

~~*124,871 | 12,239 | 4,347*~~

~~*independent of certain sums annually transferred from the imperial Local exchequer to be expended by the provincial governments, there is finance, another Indian budget for local revenue and expenditure. hat consists of an income derived mainly froin cesses upon land, and ex- pended to a great extent upon minor public works. In 1877-78 local revenue and expenditure were each returned at about 34 millions. Municipal Finance.—Yet a third budget is that belonging to the Muni- municipalities. The three presidency towns of Calcutta, Madras, cipal and Bombay had in 1876-77 a total municipal income of £668,400, finance, of which £519,322 was derived from taxation, being at the rate of 7s. per head of population. In addition, there were 894 minor municipalities, with a total population of 12,381,059. Their aggre- gate income was £1,246,974, of which £979,088 was derived from taxation, being at the rate of 1s. 7d. per head. In the presidency*~~

~~*| towns, rates upon houses, &c., are the chief source of income ; but a satisfactory balance-sheet. In the ten years ending with 1878 |*~~

~~*in the district municipalities, excepting Bengal, octroi duties are more relied upon. On the side of expenditure the chief items are conservancy, roads, and police.*~~

~~*Army.—At the present time (1881) the entire constitution of the Army. Indian army is under the consideration of a commission. The ex- isting*~~

~~organization is based upon the historical division into the three esi of Bengal, Madras and Bombay. There are still three~~

~~ndian armies, each composed of both European and native troops, with their own commanders-in-chief and separate staff, though the commander-in-chief in Bengal exercises a supreme authority over the other two. Thereis also a fourth army, known as the Punjab fron- tier force, which, though on the Bengal establishment, is under the immediate orders of the lieutenant-governor of the province.~~

~~Established Strength of the Indian Army in 1877-78.~~

~~European Troops.~~

~~tne | | re | EE ae | |~~

~~29,420} 854 | 40,288 | 104,216 8,271 | 628 | 12,733| 47,026 8.971| 339) 11,710 | 38,355~~

~~45,962 64,726 | 189,597~~

~~as compared with contemporary Europe. Through all changes of government vernacular instruction in its sim- plest form has always been given, at least to the children of respectable classes, in every large village. On the one hand, the éols or seminaries for teaching Sanskrit philosophy at Benares and Nadiyd recall the schools of Athens and Alexandria; on the other, the importance attached to in- struction in accounts reminds us of the picture which Horace has left of a Roman education. Even at the present day knowledge of reading and writing is, owing to the teaching of Buddhist monks, as widely diffused throughout Burmah as it is in some countries of Europe. English efforts to stimulate education have ever been most success- ful when based upon the existing indigenous institutions. During the early days of the East India Company's rule the promotion of education was not recognized as a duty of Government. The enlightened mind of Warren Hastings did indeed anticipate his age by founding the Caleutta madrasa for Mahometan teaching, and by affording steady patronage alike to Hindu pandits and European students. But Wellesley's schemes of imperial dominion did not extend beyond the establishment of a college for English~~

~~officials. Of the Calcutta colleges, that of San- skrit was founded in 1824, when Lord Amherst was governor-general, the medical college by Lord William Bentinck in 1835, the Hooghly madrasa by a wealthy native gentleman in 1836. The Sanskrit college at Benares had been established in 1791, the Agra college in 1823. Meanwhile the missionaries made the field of vernacular education their own. Discouraged by the official authori- ties, and ever liable to banishment or deportation, they not ouly devoted themselves with courage to their special work of evangelization, but were also the first to study the vernacular dialects spoken by the common people. Just as two centuries earlier the Jesuits at Madura, in the~~

~~= All Officers,~~

~~Univer- sities,~~

~~Colleges,~~

~~ADMINISTRATION. |~~

~~extreme south, composed works in Tamil, which are still acknowledged as classical by native authors, so did the Baptist mission at Serampur, near Calcutta, first raige Bengali to the rank of a literary dialect. The interest of the missionaries in education, which has never ceased to the present day, though now comparatively overshadowed by Government activity, had two distinct aspects, They studied the vernacular, in order to reach the people by their preaching and to translate the Bible; and they taught English, as the channel of non-sectarian learning.~~

~~At last the Government awoke to its own responsibility in the matter of education, after the long and acrimonious controversy between the advocates of English and ver- nacular teaching had worn itself out. The present system dates from 1854, being based upon a comprehensive despatch sent out by Sir C. Wood (afterwards Lord Halifax) in that year. At that time the three universities were founded at Calcutta, Madras, and Bombay ; English-teach- ing schools were established in every district ; the benefit of grants-in-aid was extended to the lower vernacular institutions and to girls' schools; and public instruction was erected into a department of the administration in every province, under a director, with a staff of~~

~~*inspectors, In some respects this scheme may have been in advance of the time ; but it supplied a definite outline, which has gradu- ally been filled up with each succeeding year of progress. A network of schools has now been spread over the country, graduated from the indigenous village institutions up to the highest colleges. All alike receive some measure of pecuulary support, which is regular inspection ; and a series of scholarships at ouce stimulates efficiency and opens a path to the university for children of the poor. educational institutions of all sorts in British India was 66,202, attended by an aggregate of 1,877,942 pupils, showing an average of one school to every 14 square miles, and nine pupils to every thousand of the population. In the same year the total expenditure upon education from all sources was £1,612,775, of which £782,240 was con- tributed by the provincial governments, £258,514 was derived from local rates, and £32,008 from municipal grants. These items may be said to represent state aid, whileendowments yielded £37,218, subscriptions £105,853, and fees and fines £277,039. The degree in which edu- eation has been popularized and private effort has been stimulated may be estimated from the fact that in Bengal the total of voluntary payments now exactly balances the total of Government grants.*~~

~~*Universities.—The three universities of Calcutta, Madras, and Bombay were incorporated in 1857, on the model of the university of London. They are merely examining bodies, composed of a chancellor, vice-chancellor, and senate, with the privilege of conferring degrees in arts, law, medicine, and civil engineering. The governing body, or syndicate, consists of the vice-chan- cellor and certain members of the senate. Quite recently a fourth university, on the same plan, has been founded at Lahore for the Punjab. Though not themselves places of instruction, the universities control the whole course of igher education by means of their examinations. The entrance examination for matriculation 18 open to all; but when that is passed candidates for higher stages must enrol themselves in one or other of the affiliated colleges. In the ten years ending 1877-78 9686 candidates success- fully passed the entrance examination at Calcutta, 6381 at Madras, and 2610 at Bombay, Many fall off at that stage, and very few proceed to the higher degrees. During the same ten years 952 graduated B.A., and only 254 M.A., with honours, at Calcutta; 496 B.A. and 14 M.A. at Madras ; 217 B.A. and 28 M.A. at Bombay. Calcutta possesses by far the*~~

majority of graduates in law and medicine, while Bombay is similarly distinguished in engineering.

In 1877-78 the total expenditure on the four universities was £22,098.

_ rhe colleges or institutions for higher instruction may be divided into two classes,—those which teach the arts course of the univer- sities, and those devoted to special branches of knowledge. Accord- ing to another principle, they are classified into those entirely sup-

INDIA

- dents,

justified by the guarantee of

In 1877-78 the total number of

'administration. In addition to the

175

and those which only receive grants-in-aid, The latter class comprises the missionary colleges. In 1877-78 the total number of colleges, including medical and engineering colleges and Mahometan madrasas, was 82, attended by 8894 stu- Of these, 35 colleges with 3848 students were in Bengal

Prapet

e year the total expenditure on th f

at the rate of £21 per sensi Te ee Boys' Schools, —This large class includes man may be subdivided either according to the character of the instruc- tion. Siven, or according to the proportion of Government aid they receive. The higher schools are those in which not only is English taught, but that langnage is also the medium of instruction. They educate up to the standard of the entrance examination at the universities, and train generally those candidates who seek employ- ment in the upper grades of Government

~~service. As far as possible one of these schools, known as the zilé or district school, is estab- lished by Government at the head-quarters of many others receive grants-in-aid. The middle schools, as their name implies, are intermediate between the higher and the primary schools, Generally speaking, they are~~

~~ported by Government and~~

~~1877-78 the baie ete on both higher and middle schools e lo~~

~~pathsdlds or village schools, 1 In 1871-72 the total number of primary schools under inspection was only 2451, attended by number of schools had risen to 16,042, and the number of pupils to 360,322, being an increase of about sixfold in six years. In the latter year the total expenditure from all sources was £78,000, towards which Government contri- buted only £27,000, thus showing how state aid stimulates private outlay, The North-Western Provinces owe their system of primary instruction to their great lieutenant-governor, Mr Thomason, whose constrnctive talent can be traced in every department of the tahstli or middle schools already referred to, he drew upa scheme for establishing halkabandt or primary schools in every central village (whence their name), to which the children from the surrounding hamlets might resort. HIs scheme has since been largely developed by means of the edu- cational cess added to the land revenue. In Bombay the primary schools are mainly supported out of local funds raised in a similar manner. In British Burmah, ou the other hand, primary education is still left to a great extent in the hands of Buddhist monks, who receive no pccuniary support from Government. The monastic schools are only open to boys, but there are also lay teachers who admit girls to mixed classes. Government has hardly any schools of its own in Burmah, the deficiency being supplied by several missionary bodies, who obtain state aid. In many parts of the Madras presidency, also, the missionaries possess a practical mono- poly of education at the present day. In 1877-78 the amount of money expended upon lower and primary schools in British India was £406,185, or just one-fourth of the total educational budget.~~

~~Girls' Schools.—Of late years something has been done, though not much, to extend the advantages of education to girls. In this, as in other educational matters, the missionaries have been the pioneers of progress. In~~

~~a few exceptional places, such as Tinne- velli in Madras, the Khasi hills of Assam, and among the Karen tribes of Burmah, female education has a real existence, for in these places the missionaries have influence enough to overcome the pre- Judices of the people. But elsewhere, even in the large towns and among the English-speaking classes, all attempts to develop the intelligence of women are regarded with scarcely disguised aversion. Throughout the North-Western Provinces, with their numerous and wealthy cities, and a total female population of 15 inillions, only 6550 girls attended school in 1877-78. In Bengal, with just double the inhabitants, the corresponding number was less than 12,000. Madras, British Burmah, and to a small degree Bombay and the Punjab, are the only provinces that contribute to the following statistics in any tolerable proportion :—Total girls' schools in 1877-78, 2002 ; number of pupils, 66,615; mixed schools for boys and girls, 2955; pupils, 90,915; total amount expended on girls schools, £78,729, of which £27,000 was devoted to the 12,000 girls of Bengal.~~

~~Normal and other Special Schools, &c.—In 1877-78 the normal and technical schools numbered 155, with a total of 6864 students;~~

~~y varicties, which Schools,~~

~~News- papers.~~

~~Books.~~

~~Abori- ginal tribes.~~

~~776~~

~~the total expenditure was £54,260, or an average of nearly £7 per student. School mistresses, as well as masters, are trained in these institutions; aud there also the missionaries have shown themselves active in anticipating a work which Government subsequently took up. Of schools of art, the oldest is that founded by Dr A. Hunter at Madras in 1850, and taken in charge by the Education Depart- ment in 1856. This school, as also those at Caleutta and Bombay, has been very successful in developing the industrial eapacities of the people, and training workmen for publicemployment.~~

Museuins have been established at the provincial eapitals and many other large towns. Sehools for European and other foreign races have also attracted the attention of Government. In 1877-78 the number of such institutions was 104, with 9121 pupils; the expenditure from all sourees was £80,197, or an average of nearly £9 per pupil. Foremost among these are the asyluins for the orphans of British soldiers, established at hill stations (e.g. Utakumand and Sanawar) in memory of Sir Henry Lawrence.

Newspapers and Books. —Closely connected with the subjeet of education is the steady growth of the vernacular press, which is ever busy issuing both newspapers and books. The missionaries were the first to cast type in the vernacular languages, and to em- ploy native compositors. The earliest newspaper was the Bengili Simdchar Darpan, which was issued in 1835 by the Baptist Mission at Serampur. For many years the vernacular press preserved the marks of its origin, by being limited almost absolutely to theo- logical controversy. The missionaries continued their work ; and they were encountered with their own weapons by the theistic seet of the Brahma Samaj, and also by orthodox Hindus. So late as 1850 the majority of newspapers were still seetarian rather than political, but during the last twenty years the vernacular press has gradually risen to become a powerful engine of political discussion.

the nuniber of newspapers regularly published in the several ver- naculars at the present time is said to reach the formidable total of 230. The aggregate number of copies issued is estimated by Mr Roper Lethbridge at about 150,000; but the circulation proper, that is, the actual number of readers, is infinitely larger. In Bengal the vernacular press suffers from the competition of English news- papers, some of which are entirely owned and written by natives. In the north-west, from Lucknow to Lahore, about 100 news- papers are printed in Hindustani or Urdu, the vernacular of the Mahometans throughout India, Many of these are conducted with considerable ability and enterprise, and may fairly be deseribed as representative of native opinion in the large towns. The Bombay journals are almost equally divided between Marathi and Guzerathi. Those in the former language are characterized by the traditional independence of the race of Sivaji; those in the latter language are the organs of the Parsis and of the trading community. The newspapers of Madras printed in Tamil and

~~*Telugu are politically unimportant, being still for the most part devoted to religion.*~~

~~*As regards books, or rather registered publications, in the ver- nacular languages, Bengal takes the lead; while the Punjab, Bombay, the North-Western Provinces, and Madras follow in order. In 1877-78 the total number of registered publications was 4890, of which 544 were in English, 3064 in one of the vernaculars, 719 in a classical language of India, and 563 bilingual. Of the ver- nacular works, 709 dealt with religion, 663 with poetry and the drama, 330 with language, 195 with science, 181 with fiction, 146 with law, and 95 with medicine.**~~

~~*HIsTorRy.*~~

~~*Non-Aryan or Aboriginal Races.*~~

~~*Our earliest glimpses of India disclose two races strug- gling for the soil. The one was a fair-skinned people, who had lately entered by the north-western passes—a people of Aryan (literally "noble ") lineage, speaking a stately language, worshipping friendly and powerful gods. The other was arace of a lower type, who had long dwelt in the land, and whom the lordly new-comers drove back before them into the mountains, or reduced to servitude on the plains. The comparatively pure descendants of these two races in India are now nearly equal in number, there being about 18 millions of each; their mixed progeny, sprung chiefly from the ruder stock, make up the mass of the present Indian population.*~~

~~*The lower tribes were an obscure people, who, in the absence of a race-name of their own, are called the non- Aryans or aborigines. They have left no written records ; indeed, the use of letters, or of the simplest hieroglyphics,*~~

~~*Se ee 4 In the preparation of the administrative sections and statistics, the writer specially acknowledges the assistance of Mr J. 8, Cotton.*~~

~~*INODTS*~~

~~*[nisTORY.*~~

~~*was to them unknown. The sole works of their hands which have come down to us are the rude stone circles and upright slabs or mounds beneath which, like the primitive peoples of Europe, they buried their dead. From these we only discover that, at some far distant but unfixed period, they knew how to make round pots of hard, thin earthenware, that they fought with iron weapons, and that they wore ornaments of copper and gold. The coins of imperial Rome have been found in their later graves. Earlier remains, lying in the upper soils of large areas, prove that these ancient tomb- builders formed only one link in a chain of primeeval races. Long before their advent, India was peopled, as far as the depths of the Central Provinces, by tribes unac- quainted with the metals, who hunted and warred with polished flint axes and other deftly-wrought implements of stone similar to those dug up in northern Europe. And even these were the successors of yet ruder beings, who have left their agate knives and rough flint weapons in the Narbadd valley. In front of this far-stretching back- ground of the Bronze and Stone Ages, we see the so-called aborigines beiug beaten down by the newly arrived Aryan race.*~~

~~*The struggle is commemorated by the two names which the victors gave to the early tribes, namely, the Dasyus, or 'Cenemies," and the Dasas, or " slaves." The last remains to this day the family name of multitudes of the lower class in Bengal. 'The new-comers from the north prided them- selves on their fair complexion, and their Sanskrit word for "colour" (vurna) came to mean "race or "caste." Their earliest poets, at least three thousand and perhaps four thousand years ago, praised in the Fag-Veda their gods, who, "slaying the Dasyus, protected the Aryan colour," who "subjected the black-skin to the Aryan man." More- over, the Aryan, with his finely-formed features, loathed the squat Mongolian faces of the aborigines. One Vedic singer speaks of them as " noseless " or flat-nosed, while another praises his own " beautiful-nosed" gods. The same unsightly feature was commented on with regard to a non-Aryan Asiatic tribe, by the conipanions of Alexander the Great on his Indian expedition, at least a thousand years later. The Vedic hymns abound in scornful epithets for the primitive tribes, as "disturbers of sacrifices," "oross feeders on flesh," "'raw-eaters," "lawless," " not- sacrificing," 'without gods," and " without rites." As time went on, and these rude tribes were driven back into the forest, they were painted in still more hideous shapes, till they became*~~

~~*the “ monsters ” and “demons” of the Aryan poet and priest. Their race-uame Dasyu, “enemy,” thus grew to signify a goblin or devil, as the old Teutonic word for enemy has become the English “ fiend.”*~~

~~*Nevertheless, all of them could not have been savages. We hear of wealthy Dasyus, and even the Vedic hymns speak much of their “seven castles” and “ninety forts.” In later Sanskrit literature the Aryans make alliance with aboriginal princes ; and when history at length dawns on the scene, we find some of the most powerful kingdoms of India ruled by dynasties of non-Aryan descent. Nor were they devoid of religious rites, nor of cravings after a future life. ‘They adorn,” says a very ancient Sanskrit treatise,” “the bodies of their dead with gifts, with raiment, with ornaments, imagining that thereby they shall attain the world to come.” These ornaments are the bits of bronze, copper, and gold, which we now dig up from beneath their rude stone monuments. In the great Sanskrit epic which narrates the advance of the Aryans into southern India, a non-Aryan chief describes his race as “of fearful swiftness, unvielding in battle, in colour like a dark blue cloud.”8*~~

~~*2 Chandogya Upanishad, quoted in Muir’s Sanskrit Texts, 3 Ramayana.*~~

~~*HISTORY. |*~~

~~*Thrust back by the Aryans from the plains, these primi- tive peoples have lain hidden away in the recesses of the mountains, like the remains of extinct animals which zoologists find in hill-caves. India thus forms a great museum of races, in which we can study man from his lowest to his highest stages of culture.*~~

~~*Among the rudest fragments of mankind are the isolated Anda- man islanders in the Bay of Bengal. The old Arab and European voyagers described them as dog-faced man-eaters. The English officers sent to the islands in 1855 to establish a settlement found themselves surrounded by quite naked cannibals of a ferocious type, who daubed themselves when festive with red earth, and mourned in a suit of olive-coloured mud. They used a noise like weeping to express friendship or joy, bore only names of common gender, which they received before birth ; and their sole conception of a god was an evil spirit who spread disease. For five years*~~

~~they repulsed every effort at intercourse by showers of arrows; but the officers slowly brought them to a better frame of mind by building sheds near the settlement, where these poor beings might find shelter from the tropical rains, and receive medicines and food.~~

~~The Anamalai hills, in southern Madras, form the refuge of a whole series of broken tribes. Five hamlets of long-haired wild- looking Puliars live on jungle products, miee, or any small animals~~

~~Pi pe A~~

~~U7~~

~~for a yearly gift of cloth, hoes, and grain. Their very names bear witness to their former wild life. One tribe, the Akas of Assam, Is divided into two clans, known respectively as " The eaters of a thousand hearths," and 'The thieves who lurk in the cotton-~~

~~field."~~

~~_ Whence came these primitive peoples, whom the Aryan invaders found in the land more than three thousand years ago, and who are still scattered over India, the fragments of a prehistoric world? Written records they do not possess. Their oral traditions tell us little, but such hints as they yield feebly point to the north. They seem to preserve dim memories of a time when the tribes dwelt under the shadow of mightier hill ranges than any to be found on the south of the river plains of Bengal. 'The Great Mountain " is the race-god of the Santals, and an object of worship among other tribes. The Gonds, in the heart of of Central India, have a legend that they were created at the foot of Dewdlagiri Peak in the Himalayas. Till lately they buried their dead with the feet turned northwards, so as to be ready to start again for their ancient home in the~~

~~north,~~

~~The language of the non-Aryan races, that record of 2 Non- nation's past more enduring than rock inscriptions or tables Aryan of brass, is being slowly made to tell the secret of their Jan- origin. It already indicates that~~

~~the early peoples of India 8°°8* belonged to three great stocks, known as the Tibeto-Tibeto- Burman, the Kolarian, and the Dravidian. The Tibeto-Burmese.~~

~~they can catch, and worship demons. Another clan, the Munda- vars, shrink from contact with the outside world, and possess no fixed dwellings, but wander over the innermost hills with their cattle, sheltering themselves under little leaf-sheds, and seldom re- ma'ning in one spot more than a year. The thick-lipped small- bodied Kaders, ' Lords of the Hills," are a remnant of a higher race. They file the front teeth of the upper jaw as a marriage ecre- mony, live by the chase, and wield some influence over the ruder |~~

~~forest-folk. These hills, now very thinly peopled, abound in the great stone monuments (kistvaens and dolmiens) which the primi- tive tribes used for their dead. The Nairs of south-western India still practice polyandry, according to which a man's property de- scends not to his own but to his sister's children. hat system also appears among the Himalayan tribes at the opposite extremity of India.~~

~~In the Central Provinces the aboriginal races form a large pro- portion of the population. In certain districts, as in the feudatory state of Bastar, they amount to three-fifths of the inhabitants. The most important race, the Gonds, have made some advances in civi- lization ; but the wilder tribes still cling to the forest, and live by the chase, and some of them are reported to have used, within a few years back, flint points for their arrows. The Marids wield bows of great strength, which they hold with theirfeet while they draw the string with both hands. A still wilder tribe, the Maris, fly from their grass-built huts on the approach of a stranger. Once a year a messenger comes to them from the local raja to take their tribute of jungle products. He does not enter their hamlets, but beats a drum outside, and then hides himself. The shy Maris creep forth, place what they have to give in an appointed spot, and run back again into their retreats.~~

~~Further to the north-east, in the tributary states of Orissa, there is a poor tribe, 10,000 in number, of Juangs or Patuas, literally the "* leaf-wearers," whose women formerly wore no clothes. Their only vestige of covering was a few strings of beads round the waist with a bunch of leaves tied before~~

~~*and behind. 'Those under the British influence were clothed in 1871 by order of Government, and their native chief was persuaded to do the same work for the others. This leaf-wearing tribe had no knowledge of the metals till quite lately, when foreigners eame among them, and no word exists in their native language for iron or any other metal. But their country abounds with flint weapons, so that the Juangs form a remnant to our own day of the Stone Age. " Their huts," writes the officer who knows them best, "are among the smallest that human beings ever deliberately constructed as dwellings. They measure about 6 feet by 8. The head of the family and all the females huddle together in this one shell, not much larger than a dog-kennel." The boys and the young men of the village live in one large building apart by themselves; and this custom of having a common abode for the whole male youth of the hamlet is found among many of _the aboriginal tribes in distant parts of India. The Kandhs of Orissa, who kept up their old tribal ritual of human sacrifice until it was put down by the British in 1835-45, and the Santals in the west of Lower Bengal, who rose in 1855, are examples of powerful and highly developed non-Aryan tribes.*~~

~~*Proceeding to the northern boundary of India, we find the slopes and spurs of the HImalayas peopled by a great variety of rude tribes. As a rule they are fierce, black, undersized, and ill-fed. They formerly eked out a wretched subsistence by plundering the more civilized hamlets of the Assam valley, — a means of livelihood which they are but slowly giving up under British rule. Some of the wild- est of them, such as the independent Abars, are now employed as a sort of irregular police, to keep the peace of the border, in return*~~

~~*Burman tribes cling to the skirts of the Himdlayas and their north-eastern offshoots, They crossed over into India by the north-eastern passes, and in some prehistoric time had dwelt in Central Asia, side by side with the forefathers of the Mongolians and the Chinese. Several of the hill languages in Eastern Bengal preserve Chinese terms, others contain Mongolian. Thus the Ndgds in Assam still use words for three and water which might almost be under- stood in the streets of Canton.*~~

~~*The following are the twenty principal dialects of the Tibeto-Burman group: —(1) Céchari or Bodo, (2) Garo, (3) Tripura or Mrung, (4) Tibetan or*~~

~~*Bhutia, (5) Gurung, (6) Murmi, (7) Newar, (8) Lepcha, (9) Miri, (10) Aka, (11) Mishmi dialects, (12) Dhimal, (13) Kandwari dialects, (14) Mikir, (15) Singpho, (16) Naga dialects, (17) Kuki dialects, (18) Burmese, (19) Khyeng, and (20) Manipuri.*~~

~~*'It is impossible," writes Mr Brandreth, 'to give even an ap- proximate number of the speakers included in this group, as many of the languages are either across the frontier or only project a short distanee into our own territory. The languages ineluded in this group have not, with perhaps one or two exceptions, both a cerebral and dental row of consonants, like the South-Indian languages ; some of them have aspirated forms of the surds, but not of the so- nants ; others have aspirated forms of both. The languages of this group, even those which most diverge from each other, have several words in common, and especially numerals and pronouns, and also some resemblances of grammar. In comparing the resembling words, the differences between them consist often less in any modi- fication of the root-syllable than in the various additions to the root. Thus in Burmese we have zd, 'ear ;' Tibetan, rna-ba ; Magar, na-kep ; Newar, nai-pong ; Dhimal , nd-hdthong ; Kiranti dialects, nd-pro, nd-rék, nd-phik ; Naga languages, te-na-ro, te-na- rang; Manipuri, na-kong; Kupui, ka-nd; Sak, aka-nd; Karen, na-khw; and soon. It can hardly be doubted that such additions as these to monosyllabic roots are principally determinative syllables for the purpose of distinguishing between what would otherwise have been monosyllabic words having the same sound. Theso de- terminatives are generally affixed in the languages of Nepal and in the Dhimal language ; prefixed in the Lepcha language, and in the languages of Assam, of Manipur, and of the Chittagong and Arakan hills. Words are also distinguished by difference of tone. The tones are generally of two kinds, described as the abrupt or short, and the pausing or heavy ; and it has been remarked that those languages which are most given to adding other syllables to the root make the least use of the tones, and vice versa; where the tones most prevail the least recourse is had to determinative*~~

~~*syllables."*~~

~~*The Kolarians, the second of the three non-Aryan stocks, Kol- seem also to have entered Bengal by the north-eastern 4°"*~~

~~passes. 'They dwell chiefly in the north, aud along the north-eastern edge of the three-sided table-land which covers the sonthern half of India. Some of the Dravidians, or third stock, appear, on the other hand, to have found their way into the Punjab by the north-western passes. They now inhabit the southern part of the three-sided table-land, as far down as Cape Comorin, the southernmost part of India. It appears as if the two streams of the Kolarian tribes from the north-east and the Dravidians from the north-west had converged and crossed each other in Central India. The Dravidians proved the stronger, broke up the Kolarians, thrust aside their fragments to east and west, and then rushed forward in a mighty body to the south.~~

~~It thus happened that, while the Dravidians formed a vast mass in southern India, the Kolarians survived only as isolated tribes, scattered so far apart as soon to forget their common origin. One of the largest of the Kolarian races, the Sautals, dwells on the extreme eastern edge of the three-sided table-land of Central India, where it slopes down into the Gangetic valley of Lower Bengal. The Kurkus, a broken Kolarian tribe, inhabit a patch of country about 400 miles to the west, and have for perhaps thousands of years been cut off from the Santals by moun- tains and pathless forests, and by intervening races of thie Dravidian and Aryan stocks. The Kurkus and Santals have no tradition of a common origin; yet at this day the Kurkus speak a language which is little else than a dialect of Santali. The Savars, once a great Kolarian tribe, mentioned by Pliny and Ptolemy, are now a poor wan- dering race of woodcutters of northern Madras and Orissa. Yet fragments of them have lately been found deep in Central India, and as far west as Rajputana on the other side.~~

~~The nine principal languages of the Kolarian group are—(1) Santali, (2) Mundari, (3) Ho, (4) Bhumiy, (5) Korwa, (6) Kharria, (7) Juang, (8) Kurku, and perhaps (9) Savar. Some of them are separated only by dialectical differences.~~

~~*"The Kolarian group of languages," writes Mr Brandreth, " has both the cerebral and dental row of Ictters, and also aspirated forms, which last, according to Caldwell, did not belong to carly Dravidian. There is also a set of four sounds, which are perhaps peculiar to Santali, called by Skrefsrud semi-consonants, and which, when fol- lowed by a vowel, are changed respectively into g, J, 4; aud 6. Gender of nouns is animate and inanimate, and is distinguished by difference of pronouns, by difference of suffix of a qualifying noun in the genitive relation, and by the gender being denoted by the verb. As instances of the genitive suffix, we have in Santali 7n- ren hopon, 'my son,' but in-ak orak, 'my house.' There is no dis- tinction of sex in the pronouns, but of the animate and inanimate gender. The dialects generally agree in using a short form of the third personal pronoun suflixed to denote the number, dual and plural, of the noun, and short forms of all the personal pronouns are added to the verb in certain positions to express both number and person, both as regards the subject and object, if of the animate gender,—the inanimate gender being indicated by the omission of these suffixes. No other group of languages, apparently, has such*~~

~~*a logical classification of its nouns as that shown by the genders of both the South-Indian groups. The genitive in the Kolarian group of the full personal pronouns is used for the possessive pronoun, which again takes all the post-positions, the genitive relation being thus indicated by the genitive suffix twice repeated. The Kolarian languages generally express grammatical relations by suffixes, and add the post-positions directly to the root, without the intervention of an oblique form or genitive or other suffix. They agree with the Dravidian in having inclusive and exclusive forms for the plural of the first personal pronoun, in using a relative participle instead of a relative pronoun, in the position of the governing word, and in the possession of a true causal form of the verb. They have adual, which the Dravidians have not, but they have no negative voice. Counting is by twenties instead of by tens, as in the Dravidian. The Santali verb, according to Skrefsrud, has twenty-three tenses, and for every tense two forms of the participle and a gerund."*~~

~~*The compact Dravidians in the south, although in after- days subdued by the higher civilization of the Aryan race which pressed in among them, were*~~

~~never thus broken~~

~~IN®DYVA~~

~~from the root sey,~~

~~[HISTORY.~~

~~into fragments. Their pure descendants consist, indeed, of small and scattered tribes ; but they have given their~~

~~languages to 46 millions of people in southern India.~~

~~That some of the islands in the distant Pacific Ocean were peopled either from the Dravidian settlements in India, or from an earlier common source, remains a conjectural induction of philologers, rather than an established etlimo-~~

~~logical fact.1 The aboriginal tribes in southern and~~

~~western Australia use almost the same words for J, thow,~~

~~he, we, you, &c., as the fishermen on the Madras coast, and resemble in many other ways the Madras hill tribes, as in the nse of their national weapon the boomerang.~~

~~Bishop Caldwell recognizes twelve distinct Dravidian lan-~~

~~guages:—(1) Tamil, (2) Malaydlim, (3) Telugu, (4) Kanarese, (5) Tulu, (6) Kudugu, (7) Toda, (8) Kota,~~

~~(9)~~

~~Gond, (10) Khond, (11) Urdon, (12) Rajmahal.~~

~~'In the Dravidian group," writes Mr Brandreth, 'there is a~~

~~vational and an irrational gender of the nouns, which is distin- guished in the plural~~

~~*of the nouns, and sometimes in the singular also, by affixes which appear to be fragmentary pronouns, by corre- sponding pronouns, and by the agreement of the verb with the noun, the gender of the verb being expressed by the pronominal suffixes. 'To give an instance of verbal gender, we have in Tamil, 'to do,' seyd-dn, 'he (rational) did ;'—seyd-dl, 'she (rational) did ;' seyd-adu, 'it (irrational) did ;' seyd-dr, 'they (the rationals) did ;' seyd-a, 'they (the irrationals) did ;'—the full pronouns being avan, "he ;' aval, 'she ;' adu, 'it ;' avar, 'they ;' avet, 'they.' This distinction of gender, though it exists in inost of the Dravidian languages, is not always carried out to the extent that itisin anil. In Telugu, Gond, and Khond it is preserved in the plural, but in the singular the feminine rational is merged in the irrational gender. In Gond the gender is further marked by the noun in the genitive relation taking a different suffix, according to the number and gender of the noun on which it depends. In Urdéon the feminine rational is entirely merged in the irrational gender, with the exception of the pronoun, which preserves the 'listinction between rationals and irrationals in the plural; as as, 'he,' referring to a god or a man ; dd, 'she,' or 'it,' referring to a woman or an irrational object ; but dr, 'they,' applies to both men and women ; abrd, 'they,' to irrationals only. 'rhe rational gen- der, besides human beings, includes the celestial and infernal deities ; and it is further subdivided in some of the Janguages, but in the singular only, into masculine and feminine. An instance of this subdivision in the Tamil verb was given above.*~~

~~*"The grammatical relations in the Dravidian are generally ex- pressed by suffixes. Many nouns have an oblique form, which is a remarkable characteristic of the Dravidian group ; still, with the majority of nouns, the post-positions are added directly to the nomi- native form. Other features of this group are—the frequent use of formatives to specialize the meaning of the root ; the absence of relative pronouns, and the use instead of a relative participle, which is usually formed from the ordinary participle by the same suffix as that which Dr Caldwell considers as the oldest sign of the genitive relation ; the adjective succeeding the substantive ; of two substan- tives, the determining preceding the dctermined; and the verb being the last member of the sentence. There is no true dual in the Dra- vidian languages. In the Dravidian languages there are two forms of the plural of the pronoun of the first person, one including, the other excluding, the person addressed.*~~

~~*As regards the verbs, thero is a negative voice, but no passive voice, and there is a causal form."*~~

~~*We discern, therefore, long before the dawn of history, masses of men moving uneasily over India, and violently pushing in among still earlier tribes. They crossed the snows of the Himalayas, and plunged into the tropical forests in search of new homes. Of these ancient races fragments now exist in almost exactly the same stage of human progress as they were when described by Vedic poets over three thousand years ago. Some are dying ont, such as the Andaman islanders, among whom only one family in 1869 had so many as three children. Others are increasing, like the Santals, who have doubled them- selves under British rule. Taken asa whole, and including certain half-Hinduized branches, they number 17 ,716,825, or say 18 millions, equal to three-quarters of the population of England and Wales. But while the bolder or more*~~

~~*Se aaa 1 See the authorities in Bishop Caldwell's Comparative Grammar of*~~

~~*the Dravidian Languages, pp. 78-80, &c. (ed. 1857).*~~

~~*Aryan Trace,*~~

~~*HISTORY. |*~~

~~*isolated of the aboriginal races have thus kept themselves apart, by far the greater portion submitted in ancient times to the Aryan invaders, and now make up the mass of the Hindus.*~~

~~*In Bengal and Assam the aborigines are divided into nearly sixty distinct races. In the North-Western Pro- vinces sixteen tribes of aborigines are enumerated in the census of 1872. In the Central Provinces they number 1? millions,—the ancient race of Gonds, who ruled the central table-land before the rise of the Marhattas, alone amounting to 14 millions. In British Burmah the Karens, whose traditions have a singularly Jewish tinge, number 330,000. In Oudh the nationality of the abori- ginal tribes has been stamped ont beneath successive waves of Rajput and Mahometan invaders. In centres of the ancient Hindu civilization, the aboriginal races have become the low-castes and out-castes on which the social fabric of India*~~

~~*rests. A few of them, however, still preserve their ethnical identity as wandering tribes or jugglers, basket-weavers, and fortune-tellers. Thus the Nats, Bediyas, and other gipsy clans are recognized to this day as distinct from the surrounding Hindu population.*~~

~~*The aboriginal races on the plains have supplied the hereditary criminal classes, alike under the Hindus, the Mahometans, and the British. Formerly organized robber communities, they have, under the stricter police administration of our days, sunk into petty pilferers, But their existence is still recognized by the Criminal Tribes Act, passed in 1871, and occasionally enforced within certain localities of northern India.*~~

~~*The non-Aryan hill races, who figured from Vedic times downwards as marauders and invaders, have ceased to be a disturbing element. Many of them appear as pre- datory clans in Mahometan and early British India. They sallied forth from their mountains at the end of the autumn harvest, pillaged and burned the lowland villages, and retired to their fastnesses laden with the booty of the plains. The measures by which many of these wild races have been reclaimed mark some of the most honourable episodes of Anglo-Indian rule. Cleveland's Hill-Rangers in the last century, and the Bhils and Mhairs in more recent times, are well-known examples of marauding races being turned into peaceful cultivators and loyal soldiers. An equally salutary transformation has taken place in many a remote forest and hill tract of India. The firm order of British rule has rendered their old plundering life no longer possible, and at the same time has opened up to them new outlets for their energies. Their char- acter differs in many respects from that of the tamer population of the plains. Their truthfulness, sturdy loyalty, and a certain joyous bravery, almost amounting to playfulness, appeal in a special manner to the English mind. There is scarcely a single administrator who has ruled over them for any length of time without finding his heart drawn to them, and leaving on record his belief in their capabilities for good.*~~

~~*Primitive Hinduism.*~~

~~*We have seen that India may be divided into three regions. Two of these, the Himalayas in the north and the three-sided table-land in the south, still form the retreats of the non-Aryan tribes. The third, or the great river*~~

~~*plains, became in very ancient times the theatre on which a nobler race worked out its civilization.*~~

~~*That race belonged to the splendid Aryan or Indo- Germanic stock, from which the Bréhman, the Rajput, and the Englishman alike descend. Its earliest home seems to have been in Central Asia. From this common camping- ground certain branches of the race started for the east, others for the west. One of the western offshoots founded*~~

~~*the Persian kingdom ; another built Athens and Lacedm- mon, and became the Greek nation; a third went on to Italy, and reared the city on the seven hills which grew into imperial Rome. A distant colony of the same race excavated the silver-ores of prehistoric Spain ; and, when we first catch a sight of ancient England, we see an Aryan settlement fishing in willow canoes, and working the tin- mines of Cornwall, Meanwhile other branches of the Aryan stock had gone forth from the primitive home in Central Asia to the east. Powerful bands found their way through the passes of the HImalayas into the Punjab, and ee themselves, chiefly as Brahmans and Rajputs, over ndia,*~~

~~*The Aryan offshoots to the east and to the west alike asserted their superiority over the earlier peoples whom they found in possession of the soil. The history of ancient Europe is the story of the Aryan settlements around the shores of the Mediterranean ; and that wide term, modern civilization, merely means the civilization of the western branches of the same race. The history and development of India consist of the history and development of the eastern offshoots of the Aryan stock who settled in that land. In the west, the Aryan speech has supplied the modern languages of Europe, America, and England's island empires in the southern Pacific. In the east, HInduism and Buddhism, the religions of the Indian branch of the Aryans, have become the faiths of more than one- half of the whole human race, and spread Aryan thought and culture throughout Asia to the utmost limits of China and Japan,*~~

~~*We know little regarding these noble Aryan tribes in Its home From words in Cen- preserved in the languages of their long-separated descend- '4! Asia.*~~

~~*their early camping-ground in Central Asia.*~~

~~*ants in Europe and India, scholars infer that they roamed over tle grassy steppes with their cattle, making long halts to rear crops of grain. They had tamed most of the domestic animals, were acquainted with some metals, under- stood the arts of weaving and sewing, wore clothes, and ate cooked food. They lived the hardy life of the temperate zone, and the feeling of cold seems to be one of the earliest common remembrances of the eastern and the western branches of the race. Ages afterwards, when the Vedic singers in hot India prayed for long life, they asked for "a hundred winters." The forefathers of the Greek and the Roman, of the Englishman and the HIndu, dwelt together in Asia, spoke the same tongue, worshipped the same gods. 'The languages of Europe and India, although at first sight they seem wide apart, are merely different forms of the original Aryan speech. This is especially true of the common words of family life. The names for father, mother, brother, sister, and widow are the same in most of the Aryan languages, whether spoken on the banks of the Ganges, of the Tiber, or of the Thames. Thus tho word daughter, which occurs in nearly all of them, has been derived from two Sanskrit roots meaning "to draw milk," and preserves the memory of the time when the daughter was the little milk-maid in the primitive Aryan household. jae*~~

~~*The ancient religions of Europe and India had a similar origin. They were to some extent made up of the sacred stories or myths which our common ancestors had learned while dwelling together in Central Asia. Some of the Vedic gods were also the gods of Greece and Rome; and to this day the Deity is adored by names derived from the same old Aryan root by Brahmans in Calcutta, by Protestant clergymen at Westminster, and by Catholic priests in Peru.*~~

~~*The Vedic hymns exhibit the Indian branch of the Vedas.*~~

~~*Aryans on its march to the south-east and in its new homes. The earliest songs disclose the race still to the*~~

north of the Khyber Pass, in Cabul; the later ones bring it as far as the Ganges. 'Their victorious advance east- wards through the interniediate tract can be traced in the Vedic writings almost step by step. One of their famous settlements lay between the two sacred rivers, the Saraswati and the Drishadvati,—supposed to be the modern Sarsuti near Thanesar, in the Punjab, and the Ghaggar, a day's marcli from it. That fertile strip of land, not more than 60 miles long by 20 broad, was fondly remembered by

them as their Holy Land, "fashioned of God, and chosen .

by the Creator." As their numbers increased, they pushed eastwards along the base of the Himalayas, into what they afterwards called the Land of the Sacred Singers (Brdah- marshidesha), Their settlements practically included the

five rivers of the Punjab, together with the other great

river-system formed by the upper courses of the Jumna and the Ganges. posed ; and the steady supply of water led the Aryans to settle down from their old state of wandering pastoral tribes into communities of husbandmen. The Vedic poets praised the rivers which enabled them to make this great change—perhaps the most important step in the progress ofarace. 'May the Indus," they sang, "the far-famed giver of wealth, hear us,—(fertilizing our) broad fields with water." The Himdalayas, through whose passes they had

reached India, and at whose southern base they long dwelt, made a lasting impression on their memory. The |

Vedic singer praised '"'Him whose greatness the snowy ranges, and the sea, and the serial river declare." In all its long wanderings through India the Aryan race never forgot its northern home. There dwelt its gods and holy singers, and their eloquence descended from heaven among men.

early Aryan settlements in the Punjab. The age of this venerable hymnal is unknown, The Hindus believe, with- out evidence, that it existed " from

~~*before all time," or at least 3001 years B.c.,—nearly 5000 years ago. European scholars have inferred from astronomical dates that its composition was going on about 1400 B.c. But these dates are themselves given in writings of later origin, and might have been calculated backwards. We only know that the Vedic religion had been at work long before the rise of Buddhism in the 6th century B.c. Neverthe- less, the antiquity of the 2ig-Veda, although not to be expressed in figures, is abundantly established. The earlier hymns exhibit the Aryans on the north-western frontiers of India just starting on their long journey. Before the embassy of the Greek Megasthenes, at the end of the 4th century B.c., they had spread their influence as far as the delta of Lower Bengal, 1500 miles distant. At the time of the Perplus the southernmost point of India had become a seat of their worship. ' What a series of*~~

~~*centuries must have elapsed," writes Weber, " before this —*~~

~~*boundless tract of country, inhabited by wild and vigorous*~~

~~*tribes, could have been brought over to Brahmanism !" The Brahmans declare that the Vedic hymns were*~~

~~*directly inspired by God. Indeed, in our own times, the*~~

~~*INDIA*~~

†

~~*[HISTORY.*~~

~~*chieftain acts as father and priest to the tribe ; but at the gveater festivals he chooses some one specially learned in holy offerings to conduct the sacrifice in the name of the people. The chief himself seems to have been elected ; and his title of Vis-pati, literally " Lord of the Settlers," survives in the old Persian Vis-paiti, and as the Lithuanian Wiéz-patis in central Europe at this day. Women enjoyed a high position, and some of the most beautiful hymns were composed by ladies and queens. Marriage was held sacred, Husband and wife were both " rulers of the house" (dampatt), and*~~

~~*drew near to the gods together in prayer. The burning of widows on their husbands' funeral-pile was*~~

~~*unknown, and the verses in the Veda which the Bréhmans afterwards distorted into a sanction for the practice have*~~

~~*In them the Vedic hymns were com-*~~

~~*the very opposite meaning. "Rise, woman," says the gacred text to the mourner ; "come to the world of life. Come to us. Thou hast fulfilled thy duties as a wife to thy husband,"*~~

~~*The Aryan tribes in the Veda are acquainted with most Early They have blacksmiths, coppersmiths, and Aryan goldsmiths among them, besides carpenters, barbers, and life.*~~

~~*of the metals.*~~

~~*other artisans. They fight from chariots, and freely use the horse, although not yet the elephant, in war. They have settled down as husbandmen, till their fields with the plough, and live in villages or towns. But they also cling to their old wandering life, with their herds and " cattle- pens." Cattle, indeed, still form their chief wealth, the coin (Latin, pecunta) in which payments of fines are made ; and one of their words for war literally means "a desire for cows." They have leamed to build "ships," perhaps large river-boats, and seem to have heard something of the sea, Unlike the modern Hindus, the Aryans of the*~~

~~*Veda ate beef, used a fermented liquor or beer made from The Jig-Veda forms the great literary memorial of the*~~

~~*the soma plant, and offered the same strong meat and drink to their gods. Thus the stout Aryans spread eastwards through northern India, pushed on from behind by later arrivals of their own stock, and driving before them, or reducing to bondage, the earlier "black-skinned" races. They marched in whole communities from one river-valley to another, each house-father a warrior, husbandman, and priest, with his wife, and his little ones, and cattle.*~~

~~These free-hearted tribes had a great trust in themselves and their Rarly re-gods. Like other conquering races, they believed that both them- ligion.~~

~~selves and their deities were altogether superior to the people of the land and their poor rude objects of worship. Traded this noble self-confidence is a great aid to the success of a nation, Their divinities—in Sanskrit, Devata, literally "the Shining Ones"— were the great powers of nature. They adored the Father-heaven, (Dyaush-pitar, the Dies-piter or Jupiter of Rome, the Zeus of Greece, the Low German Duus, and, through the old French god-demon Dus-tus, the Deuce of English slang), together with Mother-earth, and the Encompassing Sky (Varuna in Sanskrit, Uranus in Latin, Owranos in Greek). Indra, or the aqueous vapour that brings each autuinn the precious rain on which plenty or famine still de-~~

~~| pends, received the largest number of hymns. By degrees, as the settlers realized nore and more keenly the importance of the peri-~~

~~great theistic church of Bengal, which rejects Brahmanical ©~~

~~teaching, was rent into two sects on the question of the divine authority of the Veda. hymns were composed by certain families of Rishis or psalmists, some of whose names are preserved. The fag- Veda is a very old collection of 1017 of these short lyrical poems, chiefly addressed to the gods, and containing 10,580 verses. They show us the Aryans on the banks of the Indus, divided into various tribes, sometimes at war with each other, sometimes united against the " black-skinned" aborigines, Caste, in its later sense, is unknown. Each father of afamily is the priest of his own household. The~~

~~| a young wife, rousing every As a matter of fact, the |~~

~~odical rains in their new life as husbandmen, he became the chief of the Vedic gods. "The gods do not reach unto thee, O Indra, nor men ; thou overcomest all creatures in strength." Agni, the God of fire (Latin ignt-s), ranks perhaps next to Indra in the num- ber of hymns addressed to him as "the youngest of the gods," '¢the lord and giver of wealth." The Maruts are the Storm Gods, '~~

~~*The terrible blood-drinking deities of modern Hinduism are scarcely known in the Veda, Buffaloes are indeed offered; and one hymn points to a symbolism based on human sacrifices, an early practice apparently extinct before the time of the Vedic singers. The great horse sacrifice was substituted for the flesh and blood of a man. But, as a whole, the hymns are addressed to bright,*~~

~~*Caste,*~~

~~*HISTORY. |*~~

~~*friendly gods. Rudra, who was destined to become the Siva of the Hindus, and the third person, or Destroyer, in their Triad, is only the god of Roaring Tempests in the Veda ; Vishnu, the second person or Preserver, in the Hindu Triad, is but slightly known as the deity of the Shining Firmament; while Brahina, the first person, or Creator, has no separate existenee in these simple hymns. The names of the dreadful Mahadeva, Durga, Kali, and of the gentler Krishna and Rama, are equally unknown in the dig-Veda. ie*~~

~~*While the aboriginal raees buried their dead under rude stone monuments, the Aryan—alike in India, in Greeee, and in Italy— male use of the funeral-pile as the most solemn method of severing the mortal from the immortal part of man. As he derived his natural birth from his parents, and a partial regeneration, or second birth, from the performanee of his religious duties, so the fire, by setting free the soul from the body, completed the third or heavenly birth. HIs friends stood round the pyre as round a natal bed, and commanded his eye to go to the sun, his breath to the wind, his limbs to the earth,—the water and plants whence they had been de- rived. But "as for his unborn part, do thou, Lord (Agni), quieken it with thy heat; let thy flame and thy brightness quieken it; eon- vey it to the world of the righteous." The doetrine of transmigra- tion was unknown. The eirele round the funeral-pile sang with an assuranee that their friend went direet to a state of blessedness and reunion with the loved ones who had gone before.*~~

~~*The hymns of the Rig-Veda were composed, as we have seen, by the Aryans in their colonies along the Indus, and on their marcli eastwards towards the Jumna and upper Ganges. The growing numbers of the settlers, and the arrival of fresh Aryan tribes from behind, still compelled them to advance.*~~

~~*From the Land of the Sacred Singers Manu describes them as spreading through "The Middle Land" (AMadhyadesha), comprising the whole river systems of Upper India as far east as Oudh and Allahabad, with the Himalayas as its northern and the Viudhyd ranges as its southern boundary. The conquest of the vast new tracts thus included seems not to have commenced till the close of the Rig-Vedic era, and it must have been the work of many generations. During this advance the simple faith of the Rig-Vedic singers was first adorned with stately rites, and then extinguished beneath them. The race progressed from a loose confederacy of tribes into several well-knit nations, each bound together by the strong central force of kingly power, directed by a powerful priesthood and organized on a firm basis of caste.*~~

~~*Whence arose this new constitution of the Aryan tribes into nations, with castes, priests, and kings? We have seen that, although in their earlier colonies on the Indus each father was priest in his fainily, yet the chieftain, or lord of the settlers, called in some man specially learned in holy offerings to conduct the great tribal sacrifices. Such men were highly honoured, and the famous quarrel which runs throughout the whole Veda sprang from the claims of two rival sages, Vashishtha and Visvdmitra, to perform one of these ceremonies. The art of writing was unknown, and the hymns and sacrificial words had to be handed down by word of mouth from father to son. It thus happened that the families who learned them by heart became, as it were, the hereditary owners of the liturgies required at the most solemn offerings to the gods. Members of these households were chosen again and again to conduct the tribal sacrifices, to chant the battle-hymn, to implore the divine aid, or to pray away the divine wrath. Even the Rig-Veda recognizes the importance of these sacrifices. "That king," Says a verse, "before whom marches the priest, he alone dwells well-established in his own house, to him the people bow down. The king who gives wealth to the priest, he will conquer, him the gods will protect." The tribesmen first hoped, then believed, that a hymn or prayer which had once acted successfully, and been followed by victory, would again produce the same results. The hymns became a valuable family property for those who had composed or learned them. The 2ig-Veda tells how the prayer of Vashishtha prevailed "in the battle of the ten kings," and how that of Visvamitra "preserves the tribe of the Bharats.*~~

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~~The potent prayer was termed bréhma, and he who offered it brdhman. Woe to all who despised either! " Whoso- ever, says the Rig-Veda, "scoffs at the prayer (brdhma) which we have made, may hot plagues come upon him, may the sky burn up that hater of Brahmans" (6rdhma-dvish}, Certain families tlins came to have, not only an hereditary claim to conduct the great sacrifices, but also the exclusive knowledge of the ancient hymns, or at any rate of the traditions which explained their symbolical meaning. They naturally tried to render the ceremonies solemn and im- posing. By degrees a vast array of ministrants grew up around each of the greater sacrifices, There were first the ofticiating priests and their assistants, who prepared the sacrificial ground, dressed the altar, slew the victims, and poured out the libations ; second, the chanters of the Vedic hymns ; third, the reciters of other parts of the service ; fourth, the superior priests, who watched over the whole, and corrected any mistakes,~~

~~Meanwhile other castes had been gradually formed. As the Aryans moved eastwards from the Indus, some of the warriors were more fortunate than others, or received larger shares of the conquered lands. Such families had not to till their fields with their own hands, but could leave that work to be done by the aboriginal races whom they subdued. In this way there grew up a class of warriors, freed from the labour of husbandry, who surrounded the chief or king, and were always ready for battle. It seems likely that these kinsmen and "companions of the king" formed an important class among the early Aryan tribes iu India, as they certainly did among the ancient branches of the race in Europe, and still do at the petty courts of India, Their old Sanskrit names, Kshattriya, Rdjanya, and Réjbansi, mean "connected with the royal power," or "of the royal line" ; their usual modern name Rdjput means " of royal descent." In process of time, when the Aryans settled down, not as mere fighting clans, but as powerful nations, in the middle land along the Jumna and Ganges, this warrior class grew in numbers and in power. The black races had been reduced to serfdom, or driven back into the Himalayas and the Vindhyds, on the north and the south of that fertile tract. The incessant fighting, which had formed~~

~~*the common lot of the tribes on their actual migra- tion eastwards from the Indus, ceased. A section of the people laid aside their arms, and devoted themselves to agriculture or other peaceful pursuits. The sultry heats of the Middle Land must also have abated their old northern energy, and led them to love repose. 'Those who, from family ties or from personal inclination, preferred a soldier's life had to go beyond the frontier to find an enemy. Distant expeditions of this sort could be undertaken much less conveniently by the husbandman than in the ancient time, when his fields lay on the very border of the enemy's country, and had just been wrested from it. Such expedi- tions required and developed a class of regular soldiers whose presence was not constantly needed at home for tilling the land. The old warrior-companions and kinsmen of the king formed a nucleus round which gathered all the more daring spirits, and laid the foundation of a military caste. The Aryans on the Ganges, in the " Middle Land," thus found themselves divided into three classes—first, the priests, or Brahmans ; second, the warriors and king's com- panions, called in ancient times Kshattriyas, at the present day Rajputs; third, the husbandmen, or agricultural settlers, who retained the old name of Vaisyas, from the root vis, which in the Vedic period had included the whole "people." These three classes gradually became distinct castes ; intermarriage between them ceased, and each kept more and more strictly to its hereditary employment. But they were all recognized as belonging to the "twice-born" or Aryan race, were all present at the great national*~~

~~*Brah- mans.*~~

~~*India, as at the present day,*~~

~~*sacrifices, and all worshipped the same bright gods. Beneath them was a fourth or servile class, called Sidras, the remnants of the vanquished aboriginal tribes whose lives had been spared. 'These were " the slave-bands of black descent," the Dasas of the Veda. They were distin- guished from their " twice-born » Aryan conquerors as being only "once-born," and by many contemptuous epithets. They were not allowed to be present at the great national sacrifices, nor at the feasts which followed them. They could never rise from their servile condition, and to them was assigned the severest toil in the fields, and all the hard and dirty work of the village*~~

~~*community. Of the four Indian castes, three had a tendency to increase. As the Aryan conquests spread, more aboriginal tribes were reduced to serfdom as Stidras. The warriors, or Kshattriyas, would constantly receive additions from the more wealthy or enterprising members of the cultivating class. When an expedition or migration went forth to subdue new terri- tory, all the colonists would for a time lead a military life, and their sons would probably all regard themselves as Kshattriyas. In ancient times entire tribes, and at the present day the mass of the population throughout large tracts, thus claim to be of the warrior or Rajput caste. Moreover, the kings and chief fighting-men of aboriginal races who, without being conquered by the Aryans, entered into alliance with them, would likely assume names of the warrior or Kshattriya rank. We see this process going on before our eyes among many of the abori- ginal peoples. The Brahmans, in their turn, seem at first to have received into their body distinguished families of Kshattriyan descent. In later times, too, we find that sections of aboriginal races were 'manufactured " into Brahmans. The Vaisya or cultivating caste did not tend. *n this mauner to increase. No one felt ambitious to win his way into it, except perhaps the poor Sidras, to whom any change of condition was forbidden. 'The Vaisyas themselves tended in early times to rise into the more | honourable warrior class, and at a later period to be mingled with the labouring multitude of Sudras and mixed*~~

~~*rN wise*~~

~~*descent. In many provinces they have almost disappeared as a distinct caste from the modern population. In ancient the three conspicuous castes were (1) the priests and (2) warriors, of Aryan birth, and (3) the serfs or Sidras, the remnants of earlier races. The Kshattriyas or Rajputs, at any rate in some parts of India, seem to represent a quite separate ethnical movement from that of the Brahmans—that is to say, either a different Aryan migration into India, or an altogether distinct race of perhaps Scythic origin. The Sudras had no rights, and, once conquered, ceased to struggle against their fate. But a long contest raged between the priests and warriors for the chief place in the Aryan commonwealth.*~~

~~*In order to understand that contest, we must go back |*~~

~~*to the time when the priests and warriors were simply fellow-tribesmen. The priestly or Brahman caste grew slowly out of the families of Rishis who composed the Vedic hymns, or were chosen to conduct the great tribal | sacrifices. In after times the whole Brahman population of India pretended to trace their descent from seven Rishis. But the composers of the Vedic hymns were some- times kings or distinguished warriors rather than priests ; the Veda itself speaks of these royal Rishis (Rdjarshis). When the Brahmans put forward their claim to the highest rank, the warriors' or Kshattriyas were slow to admit it; and, when the Brahmans went a step farther, and declared that only members of their families could be priests, or gain admission into the priestly caste, the warriors disputed their pretensions. In later ages the Brahmans, having the exclusive keeping of the sacred writings, effaced from*~~

~~*them, us far as possible, all traces of the struggle. They |*~~

~~*[HISTORY.*~~

~~*taught that their caste had come forth from the mouth of God, divinely appointed to the priesthood from the begin- ning of time. Nevertheless, a large body of Vedic verses and Sanskrit texts has now been brought to bear upon the struggle between the Brihmans and Kshattriyas for the highest rank.'*~~

~~*In many of the Aryan tribes, however, the priests failed to establish themselves as an exclusive order. Indeed, the four castes, and especially the Brahman caste, seem only to have obtained their full development amid the plenty of the Middle Land (Jfadhyadesha), watered by the Jumna and the Ganges. The earlier Aryan settlements to the west of the Indus remained outside the caste system; the later Aryan offshoots to the south and east of the middle land only partially carried that system with them. But in the Middle Land itself, with Delhi as its western capital and the great cities of Ajodhya and Benares on its eastern frontier, the Brahmans grew by degrees into a compact, learned, and supremely influential body, the makers of Sanskrit literature. Their language, their religion, and their laws became in after times the standards aimed at throughout all India. They naturally denounced all whio did not submit to their pretensions, and stigmatized the other Aryan settlements who had not accepted their caste system as lapsed*~~

~~*tribes or outcastes (Vrishalas). Among the lists of such fallen races we read the name afterwards applied to the Ionians or Greeks (Yavanas). The Brah- mans of the middle Jand had not only to enforce their supremacy over the powerful warriors of their own kingdoms, but to extend it among the Aryan tribes who had never fully accepted the caste system. That must have been the slow work of ages, and it seems to have led to bitter feuds. See BRAHMANISM, vol. iv. p. 201.*~~

~~*While the Brahmans claimed religion, theology, and philosophy Brah- as their special domain, and the chief sciences and arts as supple- manical mentary sections of their divinely-inspired knowledge, they secured law Their earliest Dharma- codes.*~~

~~*their social pene by codes of law. sistras, or legal writings, belong to the Sutra period, or scholastic development, of the Veda. But their two great digests, upon which the fabric of HIndu jurisprudence has been built up, are of later date. The first of these, the code of Manu, is separated from the Vedic era by a series of Bréhmanical developments, of which we possess only a few of the intermediate links. It is a compilation of the customary law current probably about the 5th century B.c., and exhibits the social organization which the Brahmans, after their eer en ES*~~

~~*1 The quarrel between the two sages Visvamitra and Vashishtha, which runs through the whole Veda, is typical of this struggle. Visvamitra stands as a representative of the royal-warrior rank, who claims to perform a great public sacrifice. The white-robed Vashishtha represents the Brahmans or hereditary priesthood, and opposes the warrior's claim, In the end Visvamitra established his title to conduct the sacrifice; but the Brahmans explain this by saying that his virtues and austerities won admission for him into the priestly family of Bhrigus. HIe thus became a Brahman, and could lawfully fill the priestly office. Visvamitra serves as a typical link, not only between the priestly and the worldly castes, but also between the sacred and the profane sciences. HIe was the legendary founder of the art of war, and his son Susru-fa is quoted as the earliest authority on Indian medicine. 'These two sciences of war and medicine form upa- Vedas, or supplementary sections of the divinely inspired knowledge of the Brahmans. Another royal Rishi, Vitahavya, " attained the con- dition of Brahmanhood,*~~

~~*venerated by mankind," by a word of the saintly Bhrigu. Parasu-Rama, the divine champion of the Brahmans, was of warrior descent by his mother's side. Mann, their legislator, sprang from the warrior caste } and his father is expressly called '* the seed of all the Kshattriyas." But when the Brahmans had firmly established their supremacy they became reluctant to allow the possi- bility of even princes finding an entrance into their sacred order. King Ganaka was more learned than all the Brahmans at his court, and per- formed terrible penances to attain to Brahmanhood. Yet the legends leave it doubtful whether he gained his desire. The still more holy but probably later Matanga wore his body to skin and bone by a thousand years of austerities, and was held from falling by the hand of Indra himself. Nevertheless, he could not attain to Brahmanhood. The reformer, Gautama Buddha, who in the 6th century before Christ overthrew the Brahman supremacy, and founded a new religion, was 4 prince of warrior descent, perhaps born in too late an age to be adopted into and utilized by the Brahman caste.*~~

~~*HISTORY.*~~ |

~~*successful struggle for the supremacy, had established in the Middle Land of Bengal. The Brahmans, indeed, claimed for their laws a divine origin, and ascribed them to the first Manu, or Aryan man 30 millions of years ago. But, asa matter of fact, the laws of Manu are the result of a series of attempts to codify the usages of, some not very extensive centre of Brahmanism in northern India, —a metrical digest of local custonis condeused by degrees from a legen- dary mass of 100,000 couplets (slokas) into 2684, They may pos- sibly have been reduced to their final form of a written code with: a view to sccuring the system of caste against the popular movement of Buddhism, and thus giving a rigid fixity to the privileges of the Brahinans.*~~

~~*The second great code of the HIndus, that of Yajnavalkya, belongs to a period when Buddhism had established itself, and probably to a territory where it was beginning to succumb to the Brahmanical reaction. It represents the Brahmanical side of the great coutro- versy (although a section of it deals with the organization of mona- steries), refers to the execution of deeds on metal plates, and altogether marks au advance in*~~

~~*legal precision. Its compilation be- longs to a period apparently not earlier than the 2d century A.D., and certainly not later than the 6th or 7th.*~~

~~*These codes deal with Hindu lawin three branches, namely—(1) domestic and civil rights and dutics, (2) the administration of justice, (3) purification and penance. They stereotyped the un- written usages which regulated the family life and social organiza- tion of the old Aryan communities in the middle land. They did not pretend to supply a body of law for all the numerous races of India, but only for Hindu communities of the Brahmanical type. It is doubtful whether they quite accurately represent the actual customary law even in such communities, for they were apparently drawn up with a view to asserting and maintaining the special pri- vileges of the Brahmans. This they effect by a rigid demarcation of the employments of the people, each caste or division of a caste having its own hereditary occupation assigned to it ; by stringent rules against intermingling the castes by marriage ; by forbidding the higher castes, under severe penalties, to eat or drink or hold social intercourse with the lower; and by punishing the lower castes with still more cruel penances for defiling by their touch the higher castes, or in any way infringing on their privileges. They exhibit the Hindu community in the four ancient divisions of priests, warriors, cultivators, and serfs (sedras), But they disclose that this old Aryan classification failed to represent the actual facts even of the Aryan communities in northern India. They admit that the mass of the people did not belong to any one of the four castes, and ascribe its origin to mixed concubinage or illicit connexions. The ancient Bralimanical communities in northern India, as revealed by the codes themselves, consisted—first, of an Aryan element divided into priests, warriors, and cultivators, all of whom bore the proud title of the twice-born, and wore the sacred thread ; second, of the subjugated races, " the once-born" Sudras; and third, of the vast residue of the Varna-sankara, literally the ' mingled colours," a great but uncertain number of castes to whom was assigned a mixed deseent from the four recognized classes. The same division exists to this day. According to the census of 1871, the separate tribes and castes in Lower Bengal do not fall short of a thousand ; in the North-Western Provinces the Hindu population was arranged under two hundred aud ninety-one specified castes besides numerous sub- divisions. The distinctly*~~

~~recognized "mixed castes" throughout British India cannot be estimated at less than three hundred, and probably amount to many more.~~

~~As the Brahmans spread their influence eastwards and southwards from the Middle Land, they carried their codes with them. The number of their sacred law books (Dharma-sdstras) amounted to at least fifty-six, and separate schools of Hindu law sprang up. Thus the Dayabhaga version of the law of inheritance prevails in Bengal while the Mitakshara commentary on Yajnavalkya is current in~~

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~~the Kulin Brahmans, The structure of their industrial organization varices, from the nomadic husbandry of the Burmese to the long chain of tenures which in Bengal stretches from the proprietor through a series of middle- inen to the actual tiller of the soil. livery stage in human progress is represented, from the hunting tribes of the central plateau to the rigid trade- guilds of Guzerat. The Hindu legislators recognized that each of these diverse stages of social development had its own usages and common law. Vriha- spati says : "The laws (dharma) practised by the various countries, castes, and tribes, they are to be preserved ; otherwise the people are agitated." Devala says: ' What gods there are in any country, . and whatsoever be the custom and law anywhere, they are not to be despised there ; the law there is such." Varahamihira says: 'The custom of the country is first to be considered; what is the rule in each country, that is to be done." The most learned Eng- lish scholar in southern India has thus summed up the matter : ' By custom only can the. Dhamna-sastra [Hindu law] be the rule of others than Brahmans [only one-thirtieth of the population of Madras], and even in the case of Brahmans it is very often super- seded by custom." }~~

~~The English, on assuming the government of India, wisely de- clared that they would administer Justice according to the customs of the people. But the high courts enforce the Brahmanical codes with a comprehensiveness and precision unknown in ancient India. Thus in Bengal the custom of sagat, by which deserted or divoreed wives ainong thc lower castes marry~~

~~again, was lately tried accord- Ing to " the spirit of Hindu law "; while in Madras learned judges have pointed out a divergence between the Hindu law as now ad- ministered and the actual usages of the people. Those usages are unwritten and uncertain. The Hindu law is printed in many accessible forms, and Hindu barristers are ever pressing its principles upon the courts. Efforts at comprehensive codification in British India are thus surrounded by special difficulties, for it would be im- proper to give the fixity of a code to all the unwritten half-fluid usages current among the three-hundred unhomogeneous castes of Hindus, while it might be fraught with future injustice to exclude any of them. Lach age has the gift of adjusting its institutions to its actual wants, especially among tribes whose customs have not been reduced to written law. Many of those customs will, if left to themselves, die out; others of them, that prove suited to the new social developments under British rule, will live. But the process of natural selection must be, to some extent, the work of time, and not a single act of conscious legislation. This has been recognized by the ablest of Anglo-Indian codifiers. They apply the word code to the systematic arrangement of the rules relating to some well- marked section of juristic rights, or to some executive department of the administration of justice. "In its larger sense," write the Indian Law Commissioners, 1879, " of a general assemblage of all the laws of a community, no attempt has yet been made in this country to satisfy the conception of a code. The time for its reali- zation has manifestly not arrived."~~

~~The Brahmans were not merely the depositaries of the sacred books, the philosophy, the science, and the laws of the ancient Hindu commonwealth; they were also the creators and custodians of its secular literature. They had a practical monopoly of Vedic learning, and their policy was to trace back every branch of knowledge and intellectual effort to the Veda.~~

~~In order to understand the long domination of the Brahmans and the influence which they still wield, it is necessary to keep in mind their position as the great literary caste. Their priestly supremacy has been re- peatedly assailed, and was during a space of several~~

~~Madras and throughout southern and western India, But all modern recensions of Hindu law rest upon the ancient codes ; and these codes, as~~

we have seen, only recorded the usages of certain

hundred years overthrown. But throughout twenty-two Brahman

centuries they have been the counsellors of HIndu princes ae t °

Brahmanical centres in the north, and perhaps did not fairly record even them. As the Brahmans gradually moulded the population of India into HInduism, such codes proved too narrow a basis for dealing with the rights, duties, and social organization of the people. The later HIndu Icgislators, accordingly, inculcated the recognition of the local usages or land-law of each part of the country, and of each class or tribe. While binding together and preserving the historical unity of the Aryan twice-born castes by systems of law founded on their ancient codes, they made provision for the customs and diverse stages of civilization of the ruder peoples of India, over whom they established their ascendency. By such provisions, alike in religion and law, the Brahmans incorporated the Indian races into that loosely coherent mass known as the HIndu population.

It is to this plastic element that HInduism owes its success; and it is an element which English administrators have sometimes over-looked. The races of British India exhibit many stages of domestic institutions from the polyandry of the Nairs to the polygamy of

and the teachers of the HIndu people. They represen the early Aryan civilization of India ; and the essential history of the HIndus is a narrative of the attacks upon the continuity of that civilization,—that is to say, of attacks upon the Brdhmanical system of the Middle Land, and of the modifications and compromises to which that system has had to submit. Those attacks range them- selves under six epochs :—first, the religious uprising of the half-Braéhmanized Aryan tribes on the east of the Middle Land, initiated by the preaching of Buddha in the 6th century B.c., culminating in the Buddhist kingdoms

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1 Dr Burnell's Ddya-Vibhdgha, Introd. p. xv.; see also The HIndu Law as administered by the HIgh Court of Judicature at Madras, by J. Nelson,

~~*M.A., District Judge of Cuddapah, chaps. iii, and iv.*~~

~~*(Madras, 1877).*~~

~~*over its purity, by missionaries to spread its doctrines, and by an authoritative collection of its sacred books. In 244 pc. Asoka convened at Patna the third Buddhist council of one thousand elders. Evil men, taking on them the yellow robe of the order, had given forth their own opinions as the teaching of Buddha. Such heresies were now corrected ; and the Buddhism of southern Asia practically dates from Asoka's council. In a number of edicts, both Asoka's before and after the synod, he published throughout India edicts. the graud principles of the faith. Such edicts are still found graven deep upon pillars, in caves, and on rocks, from the Yusafzai valley beyond Peshawar on the north-western frontier, through the heart of Hindustan, to Kathiawar and the Central Provinces on the south and Orissa in the east. 'Tradition states that Asoka set up 64,000 memorial columns or topes ; and the thirty inscriptions extant in our own day show how widely these royal sermons were spread over India. In the year of the council, the king also founded a state department to watch over the purity and to direct the spread of the faith. A minister of justice and religion (Dharma Mahdmatra) directed its operations ; and, one of its first duties being to proselytize, he was specially charged with the welfare of the aborigines among whom its missionaries were sent. Asoka did not think it enough to convert the inferior races without looking after their material interests. Wells were to be dug and trees planted along the roads; a system of medical aid was established throughout his kingdom and the conquered pro- vinces, as far as Ceylon, for both man and beast. Officers were appointed to watch over domestic life and public morality, and to promote instruction among the women as well as the youth.*~~

~~*Asoka recognized proselytism by peaceful means as a state duty. The rock inscriptions record how he sent forth missionaries " to the utmost limits of the barbarian countries," to "intermingle among all unbelievers " for the spread of religion. They shall mix equally with Brahmans and beggars, with the dreaded and the despised, both within the kingdom 'and in foreign countries, teaching better things." Conversion is to be effected by*~~

~~*persuasion, not by the sword. Buddhism was at once the most intensely missionary religion in the world and the most tolerant. This character of a proselytizing faith which wins its victories by peaceful means, so strongly impressed upon it by Asoka, has remained a prominent feature of Buddhism to the present day. Asoka, however, not only took measures to spread the religion ; he also endeavoured to secure its orthodoxy. He collected the body of doctrine into an authoritative version, in the Magadhi language or dialect of his central kingdom in Behar,—a version which for two thousand years has formed the canon (pitakas) of the southern Buddhists.*~~

~~*The fourth and last of the great councils was held under King Kanishka, according to one tradition, four hundred years after Buddha's death. The date of Kanishka is still uncertain ; but, from the evidence of coins and inscriptions, his reign has been fixed in the Ist century after Christ, or, say, 40 ap. Kanishka, the most famous of the Saka conquerors, ruled over north-western India and the adjoin- ing countries. His authority had its nucleus in Kashmir, but it extended to both sides of the Himalayas, from Yarkand and Khokan to Agra and Sind. His council of five hundred compiled three commentaries on the Buddhist faith. These commentaries supplied in part materials for the Tibetan or northern canon, drawn up at a subsequent period. The northern canon, OF, as the Chinese proudly call it, the 'greater vehicle of the law," includes many later corruptions or developments of the Indian faith as originally embodied by Asoka (244 Bc.) in the " lesser vehicle," or canon of the southern Buddhists.*~~

~~*about the commencement of our era, and melting iuto modern Hinduism abont the 8th century A.D. ; second, warlike inroads of non-Brahmanical Aryans or other races from the west, commencing with the Greek invasions in the 4th century B.c., and continuing under the Greeco-Bactrian empire and its successors to probably the 3d or 5th century A.D. ; third, the influence of the non-Aryan tribes of India and of the non-Aryan low-castes incorporated from them, an influence ever at work, indeed by far the most power ful agent in dissolving Brahmanism into Hinduism, but represented in a special manner by the non-Aryan king- doms about the 7th and 8th centuries A.D. ; fourth, the reaction against the low beliefs, priestly oppression, and bloody rites which resulted from this compromise between Prahmanism and aboriginal worship, a reaction which re- ceived an*~~

~~*impetus from the preaching of Sankar-Acharjya, who founded a philosophical Sivaite sect in the 8th or 9th century, and received its full development under a line of great Vishnuvite reformers from the 12th to the 16th cen- turies A.D.; fifth, Mahometan invasions and the rule of Islam, 1000 to 1765 a.p.; sixth, the English supremacy, and the great popular upheaval which it has produced in the 18th and 19th centuries.*~~

~~*Buddhist Period. (6th century B.c. to 8th century A.D.)*~~

~~*Bud- The first great solvent of Brahmanism was the teaching*~~

~~*dhism. of Buddha. 'The life of this celebrated man has three sides,—its personal aspects, its legendary developments, and its religious consequences upon mankind. Inu his own person Buddha appears as a prince and preacher of ancient India. In the legendary developments of history Buddha ranks as a divine teacher among his followers, as an incar- nation of Vishnu among the HIndus, and apparently as a saint of the Christian church, with a day assigned to him in both the Greek and Roman calendars. As a religious founder he left behind him a system of beliefs which has gained more disciples than any other creed in the world, and which, after a lapse of twenty-four centuries, is now professed by 500 millions of people, or more than one- third of the human race.*~~

~~*The life of Buddha is related at length under BuppuIsy, vol. iv. p. 424. In this place it is unnecessary to give more than a brief sketch of the history of Buddhism in India.*~~

~~*On the death of Buddha, five hundred of his disciples met in a cave near Rajagriha, to gather together his sayings. This was the first council, They chanted the lessons of their master in three great divisions—the words of Buddha to his disciples, his code of discipline, and his system of doctrine. These became the three collections of Buddha's teaching, and the word for a Buddhist council means literally "a singing together." A century after- wards, a second council of seven hundred was held at Vaisali, to settle disputes between the more and the less strict followers of Buddhism. It condemned a system of ten "indulgences" which had grown up, but it led to the separation of the Buddhists into two hostile parties, who afterwards split into eighteen or more sects.*~~

~~Spread During the next two hundred years Buddhism spread ° Bud- over northern India, perhaps receiving anew impulse from dhim. the Greek kingdoms in the Punjab. Abont 244 B.c. Asoka, the king of Magadha or Behar, became a zealous convert to Buddhism. He is said to have supported 64,000 Buddhist priests ; he founded many religious houses, and his kingdom is called the Land of the Monasteries (Vihara or Behar) to this day. He did for Buddhism what Con- stantine afterwards effected for Cliistianity ; he organized it on the basis of a state religion. This he accomplished by five means—by a council to settle the faith, by edicts promulgating its principles, by a state department to watch~~

~~Bud- dhist mis- sionary efforts.~~

~~Bud- dhism and Brah- manism.~~

~~HISTORY. |~~

~~The Kanishka commentaries were written in the San- skrit language, perhaps because the Kashmir and northern priests who formed his council belonged to isolated Aryan colonies, which had been little influenced by the growth of the Indian vernacular dialects. In this way Kanishka and his Kashmir council (? 40 a.p.) became in some degree to the northern or Tibetan Buddhists what Asoka and his Patna council (244 8.c.) had been to the Buddhists of Ceylon and the south.~~

~~The missionary impulse given by Asoka quickly bore fruit. In the year after his great council at Patnd his son Mahindo carried Asoka's version of the Buddhist scriptures in the Magadhi language to Ceylon. He took with him a band of fellow-missionaries; and soon afterwards his sister, the princess Sanghamitta, who had entered the order, followed with a company of nuns, It was not, however, till six hundred years later (410-432 A.D.) that the holy books were rendered into Pali, the sacred language of the southern Buddhists. About the same time missionaries from Ceylon finally established the faith in Burmah (450 a.p.). The Burmese themselves assert that two Buddhist preachers landed in Pegu as early as 207 B.c. Some indeed place their arrival just after the Patna council (244 B.c.), and point out the ruined city of Tha-ton, between the Tsi-tang and Salwin estuaries, as the scene of their pious labours. Siam was converted to Buddhism in 638~~

~~*a.p. ; Java received its missionaries direct from India between the 5th and the 7th centuries, and spread the faith to Bali and Sumatra. While southern Buddhism was thus wafted across the ocean, another stream of missionaries had found its way by Central Asia into China. Their first arrival in that empire is said to date from the 2d century B.c., although it was not till 65 a.D. that Buddhism there became an established religion. The Greeco-Bactrian kingdoms in the Punjab and beyond it afforded a favourable soil for the faith, The Scythian dynasties that succeeded them accepted it, and the earliest remains which recent discovery has unearthed in Afghdn- istin are Buddhist. Kanishka's council, soon after the commencement of the Christian era, gave a fresh impetus to the faith. Tibet, south Central Asia, and China lay along the great missionary routes of northern Buddhism ; the Kirghis are said to have carried Buddhist settlements as far west as the Caspian ; on the east, the religion was introduced into the Korea in 372 a.p., and thence into Japan in 552.*~~

~~*Buddhism never ousted Brahmanism from any large part of India. The two systems co-existed as popular religions during more than a thousand years (244 B.c. to about 800 A.D.), and modern Hinduism is the joint product of both. Certain kings and certain eras were intensely Buddhistic ; but the continuous existence of BrAhmanism is abundantly proved from the time of Alexander (327 3.c.) downwards. The historians who chronicled his march, and the Greek ambassador Megasthenes, who succeeded them (300 B.c.) in their literary labours, bear witness to the predominance of the old faith in the period immediately preceding Asoka. Inscriptions, local legends, Sanskrit literature, and the drama disclose the survival of Brahman influence during the next six centuries (244 B.c. to 400 a.p.). From 400 A.D. we have the evidence of the Chinese pilgrims, who toiled through Central Asia into India as the birthplace of their faith. Fa-Hian entered India from Afghanistan, and journeyed down the whole Gangetic valley to the Bay of Bengal in 399-413 a.p. He found Brahman priests equally honoured with Buddhist monks, and temples to the Indian gods side by side with the religious houses of his own faith, Hwen Tsang also travelled to India from China by the Central Asia route, and has left a fuller record of the state of the two religions in the 7th century. His*~~

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~~Journey extended from 629 to 645 a.p., and everywhere throughout India he found the two faiths eagerly competing for the suffrages of the people. By that time, indeed, Bréhmanism was beginning to assert itself at the expense of the other religion. The nionuments of the great Buddhist monarchs, Asoka and Kanishka, confronted him from the time he neared the Punjab frontier ; but so also did the temples of Siva and his " dread " queen Bhima. Through- out north-western India he found Buddhist convents and monks surrounded by "swarms of heretics." The political power was also divided, although the Buddhist sovereigns predominated. A Buddhist monarch ruled over ten king- doms in Afghanistan. At Peshawar the great monastery built by Kanishka was deserted, but the populace remained faithful. In Kashmir king and people were devout Buddhists, under the teaching of five hundred monasteries and five thousand monks. In the country identified with Jaipur, on the other hand, the inhabitants were devoted to heresy and war.~~

~~Buddhist influence in northern India seems, during the 7th century A.D., to have centred in the fertile dodb or plain between the Jumna and the Ganges. At Kanauj (Kanydkubja), on the latter river, HIwen Tsang found a powerful Buddhist monarch, Sild4ditya, whose influence reached from the Punjab to north-eastern Bengal, and from the HImdlayas to the Narbad4 river. There flourished one hundred Buddhist convents and ten thousand monks. But the king's eldest brother had been lately slain by a sovereign of eastern India, a hater of Buddhism ; and two hundred temples to the Brahman gods reared their heads under the protection of the devout Sfladitya himself. This monarch seems to have been an Asoka of the 7th century A.D., and he practised with primitive vigour the two great Buddhist virtues of spreading of the faith and charity. The former he attempted by means of a general council in 634 a.p. Twenty-one tributary sovereigns attended, together with the most learned Brdhman and Buddhist monks of their kingdoms. But the sole object of the con- vocation was no longer the undisputed assertion of the Buddhist religion. It dealt with the two distinct phases of the religious life of India. First there was a discussion between the Buddhists and Brahmans, especially of the Sankhya and Vaiseshika schools, and then followed a dis- pute between the two Buddhist sects who~~

followed respec- tively the northern and the southern canons, known as " the greater and the lesser vehicle of the law." The rites of the populace were of as composite a character as the doctrines of their teachers. On the first day of the council a statue of Buddha was installed with great pomp; on the second, an image of the sun-god; on the third, a figure of Siva.

Silddita held a solemn distribution of his royal trea- sures every five years. HIwen Tsang describes how on the plain near Allahabad, where the Ganges and the Jumna unite their waters, all the kings of the empire, and a vast multitude of people, were feasted for seventy-five days. Sifladitya brought forth the stores of his palace, and gave them away to Bréhmans and Buddhists, monks and heretics, without distinction. At the end of the festival he stripped off his jewels and royal raiment, gave them to the bystanders, and, like Buddha of old, put on the rags of a beggar. By this ceremony the monarch commemorated the Great Renunciation of the founder of the Buddhist faith, aud at the same time practised the highest duty inculcated alike by the Buddhist and Brahmanical religions, namely, almsgiving. HIwen Tsang describes a distribu- tion on a smaller scale in the western kingdom of Valabhi (circa 636 a.D.). "For seven days every year the king holds a great assembly at which he distributes to the multitude of recluses choice dishes, the three garments, medicine, the seven precious things, ae rare objects of

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great value. After giving all these in alms he buys them back at double price." The intellect of this king, we are told, was weak and narrow.' Similar "fields of charity " seem to have been held by many Buddhist princes in memory of the Great Renunciation. The vast monastery of Nalanda in Behar formed a seat of learning which recalls the universities of mediaeval Europe. Ten thousand monks and novices of the cighteen schools there studied theology, philosophy, law, science, especially medicine, and practised their devotions. 'They were supported from the royal funds.

~~*Hwen Tsang travelled from the Punjab to the mouth of the Ganges, and made journeys into southern India. But everywhere he found the two religions mingled. Gaya, which holds so high a sanctity in the legends of Buddha, had already become a great Brahman centre. On the east of Bengal, Assam had never been converted to Buddhism. In the south-west, Orissa was a stronghold of the faith ; at the seaport of Tamluk at the mouth of the Hugli (Hooghly), the temples to the Brahman gods were five times more numerous than the convents of the faithful. On the Madras coast Buddhism flourished ; and indeed throughout southern India the faith seems still to have been in the ascendant, although struggling against Brahman heretics and their gods.*~~

~~*During the next two centuries Bradhmanism gradually became the ruling religion. There arc legends of persecu- tions instigated by Brahman reformers, such as Kumarila Bhatta and Sankar-Acharjya. But the downfall of Buddhism seems to have resulted from natural decay, and from new movements of religious thought, rather than from any general suppression by the sword. Its extinction is contemporaneous with the rise of Hinduism, and belongs to a subsequent part of this sketch. In the 11th century, only outlying states, such as Kashmir and Orissa, remained faithful ; and before the Mahometans fairly came upon the scene Buddhism asa popular faith had disappeared from India. During the last ten centuries Buddhism has been a banished religion from its native home. But it has won greater triumphs in its exile than it could ever have achieved in the land of its birth. It has created a literature and a religion for more than a third of the human race, and has profoundly affected the belicfs of the rest. Five hundred inillions of men, or 35 per cent. of the inhabitants of the world, still follow the teaching of Buddha. Afghanistan, Nepal, Eastern Turkistan, Tibet, Mongolia, Manchuria, China, Japan, the Eastern Archipelago, Siam, Burmah, Ceylon, and India at one time marked the magnificent cir- cumference of its conquests. Its shrines and monasteries stretched in a continuous line from the Caspian to the Pacific, and still extend from the confines of the Russian empire to the equatorial archipelago. During twenty-four centuries Buddhism has encountered and outlived a series of powerful rivals. At this day it forms one of the three great religions of the world, and is more numerously followed than either Christianity or Islam. In India its influence has survived its separate existence. It not only left*~~

~~*behind it a distinct sect, but it supplied a basis upon which Brahmanism finally developed from the creed of a caste into the religion of the people. 'This Buddhistic influence on Hinduism will be afterwards noticed. The distinct sect is known as the Jars (¢.v.), who number about half a million? in India. The noblest survivals of Buddhism in India are to be found, not among any peculiar body, but in the religion of the people; in that principle 1 Ae ee a*~~

~~*1 Report of Arch. Survey, Western India, for 1874-75, p. 83.*~~

~~*2 Returned by the census of 1872 as 485,020 Buddhists" in India, besides the 2,447,831 Buddhists in Burmah. Except in a few spots, chiefly among the spurs of the Himalayas and in south-eastern Bengal, the Indian Buddhists may be generally reckoned as Jains.*~~

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~~*by the historians and men of Alexander the Great in 327 B.c. now lost, are condensed in Strabo, Pliny, and Arrian. afterwards Megasthienes, as Greek ambassador resident at a court in the centre of Bengal (306-298 B.c.), had oppor- tunities for the closest observation. Greeks and Romans concerning India practically dates from his researches, 300 B.c.°*~~

~~*crossed the Indus above Attock, and a*~~

~~*the Jhelum*~~

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~~*of the brotherhood of man, with the reassertion of which each new revival of Hinduism starts; in the asylum which the great Hindu sects afford to women who have fallen victims to caste rules, to the widow and the out-caste ; in that gentleness and charity to all men, which take the place of a poor-law in India, and give a high significance to the half-satirical epithet of the "mild" Hindu.*~~

~~*Greek-Roman Period.*~~

~~*The external history of India commences with the Greek 'nvasion in 327 B.c. Some indirect trade between India and the Levant seems to have existed from very ancient times. Homer was acquainted with tin? and other articles of Indian merchandise by their Sanskrit names ; and a long list has been made of Indian products mentioned in the Bible.t But the first Greek historian who speaks clearly of India was Hecataus of Miletus (549-486 B.C.) ; the knowledge of Herodotus (450 B.C.) ended at the Indus ; and Ctesias, the physician (401 B.c.), brought back from his residence in Persia only a few facts about the products of India, its dyes and fabrics, monkeys and parrots. India to the east of the Indus was first made known in Europe science who accompanied Their narratives, although Svon*~~

~~*The knowledge of the*~~

~~*Alexander the Great entered India struggle, over the intervening territory of the Taxiles ® to (Hydaspes). He found the Punjab divided into petty kingdoms, jealous of each other, and most of them inclined to join an invader rather than to oppose*~~

~~*him. One of these local monarchs, Porus, disputed the*~~

~~*passage of the Jhelum, with a force which, substituting guns for chariots, exactly equalled the army of Ranjit Sinh, the ruler of the Punjab in the present century.' Plutarch gives a vivid description of the battle from Alexander's own letters. Having drawn up his troops at a bend of the Jhelum, about 14 miles west of the modern field of*~~

~~*3 Greek, Kassiteros ; Sanskrit, Kastira ; hence, subsequently, the name of Cassiterides given to the Scilly Islands. Hlephas, ivory, through the Arabian eleph (from Arabic el, the, and Sanskrit aha, domestic elephant), is also cited.*~~

~~*4 Dr Birdwood's andbook to the British Indian Section of the Paris Exhibition of 1878, pp. 20-35.*~~

~~*5 The fragments of the Indica of Megasthenes, collected by Dr Schwanbeck, with the first part of the Indica of Arrian, the Periplus Maris Erythret, and Arrian's Account of the Voyage of Nearchus, have been translated in two*~~

~~most useful volumes by Mr J. W. M'Crindle, M.A. (Triibner, 1877 and 1879). The Indica of Ctesias, with the 15th Book of Strabo, is also promised; and the difficult sections referring to India in tated, would complete a work of the highest value to Indian history.~~

~~6 The Takkas, said to be a Turanian race, were the earliest inhabit- ants of RAwal Pindi district. They gave their name to the town of Takshasila or Taxila, which Alexander found "a rich and large city, the most populous between the Indus and Hydaspes" (Arrian); it is identified with the ruins of Deri Shahan. Taki or Asarur, on the road between Lahore and Pindi Bhatiydn, was the capital of the Punjab in 688 A.D. .~~

~~7 Professor Cowell, who thinks that the Greeks probably exaggerated the numbers of the enemy, judiciously remarks :—' Porus, one of several who occupied the Punjab, is said to have had 200 elephants, 300 chariots, 400 horse, and 30,000 efficient infantry ; which, as observed by Sir A. Burnes, is (substituting guns for chariots) exactly the establishment of Ranjit Sinh, who was master of the whole Punjab and several other territories (Cowell, App. iii. to Elphinstone's Hist. Ind., p. 262, ed. 1866). General Cunningham, who has given a lucid account, of the battle, with an excellent map, Anc. Geog. of India, pp. 159-177 (ed. 1871), states the army of Alexander at "about 50,000 men, including 5000 auxiliaries under Mophis of Taxila."~~

~~early in 327 B.c., Alex- dvanced, without a ander.~~

~~Ptolemy's Geographia, properly anno-~~

~~Greek invasion,~~

~~sion,~~

~~HISTORY. |~~

~~Chilianwala,' the Macedonian general crossed under shelter of a tempestuous night. The chariots hurried out by Porus stuck in the muddy bank of the river, and in the general engagement which followed his elephants refused to face the Greeks, and, wheeling round, trampled his~~

~~*own army under foot. His son fell early in the onset ; Porus him- self fled wounded, but, on tendering his submission, was confirmed in his kingdom, and became the conqueror's trusted friend.*~~

~~*Alexander built two memorial cities on the scene of his victory,—Bucephalia on the west bank, near the modern Jalalpur, named after his beloved charger slain in the battle, and Nicsea, the present Mong, on the east side of the river.*~~

~~*Alexander advanced south-east through the kingdom of the younger Porus to Amritsar, and, after a sharp bend backward to the west, to fight the Cathei at Sangala, he reached the Beas (Hyphasis). There, at a spot not far from the modern battlefield of Sobrdéon, he halted his victorious standards." He had resolved to march to the Ganges ; but his troops were worn out by the heats of the Punjab summer, aud their spirits broken by the hurricanes of the south-west monsoon. The native tribes had already risen in his rear, and the conqueror of the world was forced to turn back before he had crossed even the frontier province of India. The Sutlej, the eastern districts of the Punjab, and the mighty Jumna still lay between him and the Ganges. A single defeat might be fatal to his army; if the battle on the Jhelum had not gone in his favour, not a Greek would have reached the Afghan side of the passes. Yielding at length to the clamour of his troops, he led them back to the Jhelum. He there embarked 8000 of them in boats previously prepared, and floated down the river; the remainder of his army marched in two divisions along the banks.*~~

~~*The country was hostile, and the Greeks held only the land on which they encamped. At Multdn (Mooltan), then as now the capital of the southern Punjab, he had to fight a pitched battle with the Malli, and was severely wounded in taking the city. His enraged troops put every soul within it to the sword. Farther down, near the confluence of the five rivers of the Punjab, he made a long halt, built a town,—Alexandria, the modern Uchch,—and received the submission of the neighbouring states. A Greek garrison and satrap, left there by Alexander, laid the foundation of a lasting influence. Having constructed a new fleet suitable for the greater rivers on which he was now to embark, he proceeded southwards through Sind, and followed the course of the Indus until he reached the ocean. In the apex of*~~

~~the delta he founded a city—Patala—which remains to this day under the name of Hyderabad, the capital of Sind.? At the mouth of the Indus Alexander beheld for the first time the majestic phenomenon of the tides. One part of his army he shipped off under the command of Nearchus to coast along the Persian Gulf ; the other he himself led through southern Baluchistan and Persia to Susa, where, after terrible losses from want of water and famine on the march, he arrived in 325 B.c.~~

~~During his two years' campaign in the Punjab and Sind, Alexander captured no province, but he made alliances, founded cities, and planted garrisons. He had trans- 1 And about thirty miles south-west of Jhelum town,~~

- ~~The change in the course of the Sutlej has altered the old position of that river to the Beas at this point. The best small map of Alexander's route is No. V. in General Cunningham's Anc. Geog. of India, p, 104 (ed. 1871)—64 miles to the inch.~~

- ~~For its successive appearances in history, see General Cunning- ham's Anc. Geog. of India, pp. 279-287, under Patala or Nirankot. He gives an excellent map of Alexander's campaign in Sind at p. 248. Patala (Pattala, Pitasila, or Pattale) was formerly identified with Thatha, a town near to where the western arm of the Indus bifureates~~

~~rive Commerce and Navigation of the Erythreean Sea, p. 156, ed. 1879),~~

~~ferred much territory to chiefs and confederacies devoted to his cause; every petty court had its Greek faction ; and the detachments which he left behind at various positions, from the Afghan frontier to the Beas, and from uear the base of the Himalayas to the Sind delta, were visible pledges of his return. At Taxila (Deri-Shahan) and Nicea (Mong) in the northern Punjab, at Alexandria (Uchch) in the southern Punjab, at Patala (Hyderabad) in Sind, and at other points along his route, he estab- lished military settlements of Greeks or allies. A large body of his troops remained in~~

~~*Bactria ; and, in the parti- tion of the empire which followed Alexander's death in 923 3B.c., Bactria and India eventually fell to Seleucus Nicator, the founder of the Syrian monarchy.*~~

~~*Meanwhile a new power had arisen in India. Among the Indian adventurers who thronged Alexander's camp in the Punjab, each with his plot for winning a kingdom or crushing a rival, Chandra Gupta, an exile from the Gangetic valley, seems to have played a somewhat ignominious part. He tried to tempt the wearied Greeks on the banks of the Beas with schemes of conquest in the rich south-eastern provinces ; but, having personally offended their leader, he had to fly the camp (326 B.C.).*~~

~~*In the confused years Magadha*~~

~~*which followed, he managed, with the aid of plundering kingdom.*~~

~~*hordes, to form a kingdom on the ruins of the Nanda dynasty in Magadha, or Behar (316 Bo.).4 He seized the capital, Pataliputra, the modern Patna, established himself firmly in the Gangetic valley, and compelled the north-western principalities, Greeks and natives alike, to acknowledge his suzerainty.5 While, therefore, Seleucus was winning his way to the Syrian monarchy during the eleven years which followed Alexander's death, Chandra Gupta was building up an empire in northern India. Seleucus reigned in Syria from 312 to 280 3c, Chandra Gupta in the Gangetic valley from 316 to 292 po, In 312 B.c. the power of both had been consolidated, and the two new sovereignties were soon brought face to face.*~~

~~*In that year Seleucus, having recovered Babylon, pro- ceeded to re-establish his authority in Bactria and the Punjab. In the latter province he found the Greek influence decayed. Alexander had left behind a mixed force of Greeks and Indians at Taxila. No sooner was he gone than the Indians rose and slew the Greek governor ; the Macedonians massacred the Indians; a new governor, sent by Alexander, murdered the friendly Punjab prince, Porus, and was himself driven out of the country by the advance of Chandra Gupta from the Gangetic valley. Seleucus, after a war with Chandra Gupta, determined to ally himself with the new power in India rather than to oppose it. In return for five hundred elephants, he ceded the Greek settlements in the Punjab and the Cabul valley, gave his daughter to*~~

~~*Chandra Gupta in marriage, and stationed an ambassador, Megasthenes, at the Gangetic court (circa 306-298 B.c.). Chandra Gupta became familiar to the Greeks as Sandrocottus, king of the Prasii ; his capital, Pataliputra,® or Patna, was rendered into Pali- bothra. On the other hand, the names of Greeks and kings of Grecian dynasties appear in the rock inscriptions,*~~

~~*under Indian forms.'*~~

~~*Megasthenes has left a life-like picture of the Indian people. Mega- Notwithstanding some striking errors, the observations which he gthenes; jotted down at Patua, three hundred years before Christ, give as*~~

~~*4 Corpus Inscriptionum Indicarwm, i. Pref. vii, , :*~~

~~*5 For the dynasty of Chandra Gupta sce Numismata Orientalia (Ceylon fasciculus), pp. 41-60. : be*~~

~~*6 The modern Patnd, or Pattana, means simply " the city." For its identification with Pataliputrapura and Mr Ravenshaw's crucial dis- coveries see General Cunningham's Anc. Geog. India, p. 452 seg.*~~

~~*? The Greeks as Yonas (Yavanas) are the Idoves or Ionians. In the 13th edict of Asoka five Greek princes appear: Antiochus (of Syria), Ptolemy (Philadelphus of Egypt), Antigonus (Gonatus of Macedon), Magas (of Cyrene), Alexander (II. of Epirus).*~~

~~*INDT a*~~

~~*India. 'The purest specimens have been found in the Punjab, where the Ionians settled in greatest force. AS we proceed eastward from the Punjab, the Greek type begins to fade. Purity of outline gives place to luscious- ness of form. In the female figures, the artists trust more and more to swelling breasts and towering chignons,and load the neck with constantly accumulating jewels. Never theless, the Grecian type of countenance long survived in Indian art. It is perfectly unlike the present coarse con- ventional ideal of sculptured beauty, and may even be traced in the delicate profiles on the so-called sun temple at Kandrak, built in the 12th century a.p. on the remote Orissa shore.*~~

Tt must suffice to indicate the ethnical and dynastic Ethnical

influences thus brought to bear upon India, without influ- attempting to assign dates to the individual monarchs, °”°° The chronology of the twelve centuries intervening between the Greeco-Bactrian period and the Mahometan conquest still depends on a mass of conflicting evidence derived from inscriptions, legendary literature, unwritten traditions, and coins.4 Four systems of computation exist, based upon the Vikram4ditya, Saka, Seleucidan, and Parthian eras. Inthe midst of this confusion we see dim masses moving southwards from Central Asia into India. The Greco-Bactrian kings are traced by coins as far as Muttra on the Jumna; and Sanskrit texts have recently revealed their advance through the Middle Land of the Brahmans (Madhyadesha) to Saketa (or Ajodbya), the capital of Oudh, and to Patnd in Behar.® The credentials of the Indian embassy to Augustus in 22-20 B.c. were written on skins,— a circumstance which indicates the extent to which Greek usage had overcome Bréhmanical prejudices. During the century preceding the Christian era Scythian or Tartar hordes began to supplant the Greeco-Bactrian influence in the Punjab.*

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accurate an account of the social organization in the Gangetic valley as any which existed when the Bengal Asiatic Society commenced its labours at the end of the last century (1785). Up to the time of Megasthenes the Greek idea of India was a very vague one. Their historiaus spoke of two classes of Indians,—certain mountain- ous tribes who dwelt in northern Afghanistan under the Caucasus or HIndu Kush, and a maritime race living on the coast of Balu- chistin. Of the India of modern geography lying beyond the Indus they practically knew nothing. It was this India to the cast of the Indus that Megasthencs opened up to the Western world. HIe describes the classification of the people, dividing them, however, into seven castes instead of four,!—namely, philosophers, husband- men, shepherds, artisans, soldiers, inspectors, and the counsellors of the king. The philosophers were the Brahmans, and the pre- scribed stages of their life are indicated. Mcgasthencs draws a dis- tinction between the Brdhmans (Bpaxpaves) and

~~*the Sarmane (Sapudvat), from which some scholars have inferred that the Bud- dhist Sarmanas were a recognized class fifty years before the council of Asoka. But the Sarmane also include Brahmans in the first and third stages of their life as students and forest recluses.* The inspectors? or sixth class of Megasthenes have been identified with Asoka's Mahdmdtra and his Buddhist inspectors of morals.*~~

~~*The Greek ambassador observed with admiration the absence of slavery in India, the chastity of the women, and the courage of the inen. In valour they excelled all other Asiatics ; they required no locks to their doors; above all, no Indian was ever known to tell a lie. Sober and industrious, good farmers, and skilful artisans, they scarcely ever had recourse to a lawsuit, and lived peaceably under their native chiefs. The kingly government is portrayed almost as described in Manu, with its hereditary castes of councillors and soldiers. Megasthenes mentions that India was divided into one hundred and eighteen kingdoms; some of which, such as that of the Prasii under Chandra Gupta, excreised suzerain powers. The village system is well described, each little rural unit seeming to be an in- dependent republic. Megasthenes remarked the exeniption of the lugbandmeun (Vaisyas) from war and public services, and enume- rates the dyes, fibres, fabrics, and products (animal, vegetable, and ynineral) of India. Husbandry depended on the periodical rains ; and forecasts of the weather, with a view to " make adequate pro- vision against a coming deficiency," formed a special duty of the Brahmans. " The philosopher who errs in his predictions observes silence for the rest of his life."*~~

~~*Before the year 300 z.c. two powerful monarchies had thus begun to act upon the Brahmanism of northern India, from the east and from the west. On the east, in the Gangetic valley, Chandra Gupta (316-292 B.c.) firmly consolidated the dynasty which during the next century produced Asoka (264-223 B.c.), established Buddhism throughout India, and spread its doctrines from Afghanistan to China, and from Central Asia to Ceylon. On the west,*~~

~~*Scythic and Non-Aryan Influences.*~~

~~*About 126 3.c. the Tartar tribe of Su is said to have Expul- driven out the Greek dynasty from Bactria, and the Graeco- siou of Bactrian settlements*~~

~~*inthe Punjab were overthrown by the pian Tue-Chi® The Scythian migrations towards India culmi- aynasty,*~~

~~*nated in the empire of Kanishka, who held the fourth*~~

~~*the heritage of Seleucus (312-280 n.c.) diffused Greek*~~

~~*Buddhist council, circa 40 a.D., and practically became the*~~

~~*Greco- influences, and sent forth Greco-Bactrian expeditions to | royal founder of northern Buddhism. The Scythic element Scy- Bactrian the Punjab. Antiochus Theos (grandson of Seleucus played an important part in the history of northern India, thians. cme Nicator) and Asoka (grandson of Chandra Gupta), who Under Kanishka and his successors a connexion was estab- ruled these two monarchies in the 3d century B.c., made | lished with the Buddhist nations of central and eastern Asia, a treaty with each other (256). In the next century | traces of which survived to the time of HIwen Tsang Eucratides, king of Bactria, conquered as far as Alexander's (629-645 a.p.) in the name of China-pati, about 10 miles royal city of Patala, and possibly sent expeditions into | to the west of the Beas river.' China-pati is said to have Cutch and Guzerat, 181-161 3B.c. Of the Greeco-Bactrian | been the town which Kanishka appointed for the residence monarchs, Menander advanced farthest into North-Western | of his Chinese hostages. It has been suggested that the India, and his coins are found from Cabul, near which he | Aswamedha, or great horse sacrifice, in some of its Indian probably had his capital, as far as Muttra on the Jumna. developments at any rate, was based upon Scythic ideas. The Buddhist dynasty of Chandra Gupta profoundly | "It was in effect," writes Mr Edward Thomas, "a martial modified the religion of northern India from the east ; | challenge, which consisted in letting the victim who was the empire of Seleucus, with its Bactrian and later off- | to crown the imperial triumph at the year's end go free to shoots deeply influenced the science and art of Hin- wander at will over the face of the earth, its sponsor being _ dustan from the west. bound to follow its hoofs, and to conquer or conciliate" Greek Brahman astronomy owed much to the Greeks, and | the chiefs through whose territories it passed. Such a peas what the Buddhists were to the architecture of northern | prototype seems to him to shadow forth the life of the*~~

~~India, that the Greeks were to its sculpture. Greek faces and profiles constantly occur in ancient Buddhist statuary, and enrich almost all the larger museums in~~

~~1 Ancient India as described by Megasthenes and Arrian, being Sragments of the Indika, by J. W. M'Crindle, M.A., p. 40 (ed. 1877). Brahmacharins and Vanaprasthas (bAdBior). Weber very properly declines to identify the Zapudva: exclusively with the Buddhist Sarmana., Hist. Ind. Lit., p. 28 (ed. 1878). The Єpopor (Diodorus, Strabo), éxfoxomo: (Arrian).~~

~~Central Asia communities of the horseman class, "among~~

~~nc a~~

~~4 The evidence is well indicated in the Report of the Archeological Survey of Western India for 1874-75, p. 49 (Mr E. Thomas's monograph).~~

~~5 Weber, Iist. Ind. Lit., p. 251~52, with his valuable notes, ing Goldstiicker (ed. 1878).~~

~~6 De Guignes, supported by coins. Appendix to Elphinstone's History of India,~~

~~7 General Cunningham's Anc. Geng. Ind., p. 200.~~

~~quot-~~

~~Professor Cowell on the evidence of p- 269 (ed. 1866).~~

~~HISTORY. | FN DTA 789 whom a steed captured in hostile forays had so frequently to be traced from camp to camp, and surrendered or fought for at last." }~~

~~An effort has been made to trace Buddha himself~~

~~to a Scythic origin. He belonged to a royal stock of~~

~~Sakyas ; and the Chinese records supply an intermediate~~

~~*link between his birthplace in Bengal and the supposed*~~

~~*home of his race in Central Asia. It is inferred from then:*~~

~~*) that a branch of the Scythian hordes who overran western Asia about 625 3B.c. made its way to Patala on the Indus,*~~

~~*the site selected by Alexander in 325 3.0. for his head.*~~

~~*| quarters in that delta, aud still the capital of Sind under the name of Hyderabad. One portion of these Patala Scythians weut westwards by the Persian Gulf to Assyria ; another section eventually moved north-east into the Gangetic valley, and became the Sdkyas of Kapilavastu, among whom Buddha was born? HIs dying command, that he should be buried according to the old cnstom of his race, and a mound erected over his remains, is opposed to the Indo-Aryan form of obsequies by cremation ; but it is essentially in accord with the Scythian mode of disposing of the dead. In the topes or funeral mounds of Buddhism is seen a reproduction of the royal Scythian tombs of which Herodotus speaks. It is therefore argued that the Christian fathers trace back, by no accident, the Manichean doctrine to ons "Scythianus," whose disciple Terebinthus took the name of Buddha.*~~

~~*the side of each other in Central Asia, and who may have advanced together during the great Scythian movement towards India on the decline of the Bactrian empire. Without pressing such identifications too closely in the service of particular theories, the weight of authority is in favour of a Scythian origin for this most numerous and most industrious section of the population of the Punjab.° A similar descent has been assigned to certain of the Rajput tribes. Colonel Tod, still the standard historian of Rajasthan, strongly insisted on this point. Some relation- ship between the Jats and the Rajputs, although obscure, is acknowledged ; and, although the jus conaubii no longer exists between them, an inscription shows that they intermarried in the 5th century A.D.1° Professor Cowell, indeed, regarded the arguments for the Scythic descent of the Rajputs as inconclusive.!! But the whole evidence now collected was not before him; and authorities of great weiglit lave deduced alike from local investigation? and from Sanskrit literature! a Scythic origin for the Jats, and for some at least of the Rajput*~~

~~tribes. We shall see that the Scythian hordes also supplied certain of the Non- Aryan or so-called aboriginal races of India.~~

~~The Scythic settlement was not effected without a struggle. As Chandra Gupta advanced from the Gangetic valley, and rolled back the tide of Greco-Bactrian conquest (circa 312-306 3.c.), so the Indian heroes of the first century before and after Christ are native princes who stemmed the~~

~~from Professor H. H. Wilson to General Cunningham,~~

~~1° Inscription discovered in Kotah state ; No. 1 of Inscription Ap-~~

~~Sey- Whatever may be the value of this conjecture, the | torrent of Scythian invasion. Vikraindditya, king of Ujjain, Expul- thian influence of the Scythian dynasties in northern India is an | won his paramount place in Indian story by driving out sion of — historical fact. The northern or Tibetan form of Buddhism, | the invaders, An era, the Samvat, beginning in 57 B.c. ee 'represented by Kanishka and his council in 40 a.p., made | was founded in honour of lis achievements, Its date !4°""""* its way down to the plains of Hindustan, and during the | seems at variance with his legendary victories over the next six centuries competed with the earlier Buddhism of Scythian Kanishka in the first century after Christ; 5 but Asoka. The Chinese pilgrim in 629-645 a.p. found both | his very name suffices to commemorate his struggle against the northern or Scythic and the southern forms of Buddhism | the northern hordes as Vikramaditya Sakari, or the enemy in full vigour in India. He spent fourteen months at | of the Scythians. His reign forms the Augustan era of China-pati, the town where Kanishka had kept his Chinese | Sanskrit literature ; and tradition has ascribed the highest hostages in the Punjab ; and he records the debates between | efforts of the Indian intellect during many centuries to the the northern and southern sects of Buddhists in Oudh, | poets and philosophers, or nine gems, of his court, As Behar, Kathiawdr, and at other places. The Scythic | Chandra Gupta, who freed India from the Greeks, is influence in India was a dynastic as well as a religious one. | celebrated in the drama Mudrd-rdkshasa, so Vikramaditya, Theevidenceof coins and the names of Indian tribes of reign- | the vanquisher of the Scythians, forms the central royal ing families, such as the Sakas, Huns, and Nagas, point to personage of the Hindu stage. Scythian settlements as far south as the Central~~

~~Provinces? Vikramaditya's achievements, however, formed no final Many scholars believe that the Scythians poured down | deliverance, but merely an episode in a long struggle upon India in such masses as to supplant the previous | between the Indian dynasties and new races from the population. The Jits or Jats,5 who form nearly one-half | north. Another popular era, the Saka (literally the of the inhabitants of the Punjab, are identified with the ® It should be mentioned, however, that Dr Trumpp believes them Get; their great subdivision the Dhe, with the Dahe, to be of Aryan origin (Zeitsch. d. Deutsch. Morg. Gesellsch., xv. p. Scythian whom Strabo places on the shores of the Caspian. This | 690). See Mr J. Beames's admirable edition of Sir Henry Elliot's | settle- view has received the support of most eminent investigators, Glossary of the Laces of the North-Western Provinces, vol. i. pp. | ments. 103-137 (ed. 1869).~~

~~the director-general of the archswological survey.' The existing division between the Eastern Jats and the Dhe has, indeed, been traced back to the contiguity of the Massa-getae or Great Gete® and the Dahe, who dwelt by Sener ee eee eae WO Cvemny~~

~~1 Report of Archeological Survey of Western India, pp. 37, 38, 1876. But see, in opposition to Mr Thomas's view, M. Senart in the French Journ. Asiatique, 1875, p. 126.~~

- ~~Catena of the Buddhist Scriptures fvom the Chinese, by 8. Beal, pp. 126-130 (Triibner, 1871). # Merc: 1¥. 71,02, ate.~~

~~4 "*T believe," says the greatest living authority on Indo-Chinese Buddhism, "the legend of Sdkya was perverted into this history of Scythianus."—S. Beal, Catena, ut supra, p. 129, footnote.~~

~~5 Muir's Sanskrit Texts, chap. v. vol. i, 1868; C. Grant's Gazetteer of the Central Provinces, \xx. &c., Nagpur, 1870; Reports of the Archeological Survey of India and of Western India; Professor H. H. Wilson (and Dr F. Hall), Vishnu Purana, ii. 134.~~

~~5 The word occurs as Jats and Jats, but the identity of the two forms has been established by reference to the Ain-i-Akbari. Some are Hindus, others Mahometans.~~

7 See, among other places, part iv. of his Archeological Report, p. 19.

8 Massa means "great" in Pelilevi.

pendix to Colonel Tod's Annals and Antiquities of Rajasthan, vol. i. p. 701, note 3 (Madras reprint, 1878).

™ Appendix to Elphinstone's Hist. Ind., pp. 250 seg. (ed. 1866).

12 Tod's Rajasthan, pp. 52, 488, 500, &c., vol. i. (Madras reprint,

1873).

18 o Fitz-Edward Hall's edition of Professor H. H. Wilson's Vishnu Purdna, vol. ii. p. 134. The Hunas, according to Wilson, were 'the White Huns, who were established in the Punjab and along the Indus, as we know from Arrian, Strabo, and Ptolemy, confirmed by recent discoveries of their coins and by inscriptions." "I am not prepared," says Dr Fitz-Edward Hall, "to deny that the ancient Hindus when they spoke of the Hunas included the Huns. In the Middle Ages, however, it is certain that a race called Hina was understood by the learned of India to form a division of the Kshattriyas."—Professor Dowson's Dict. Hind. Mythology, &c., p. 122.

M4 Samvatsara, 'the year." The uncertainty which surrounds even this long accepted finger-post in Indian chronology may be seen from Dr J. Fergusson's paper "On the Sika and Samvat and Gupta Eras," Journal Roy. As. Soc., new series, vol. xii., especially p. 172.

> 'The Hushka, Jushka, and Kanishka family of the RAjé Tarangini, or chronicles of Kashmir, are proved by inscriptions to belong to the 4th century of the Selencidan era, or the Ist century A.D.

Early Indian dynas- ties.

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Scythian), takes its commencement in 78 A.p.,! and is supposed to commemorate the defeat of the Scythians by a king of southern India, Salivthana.2 During the seven conturies which followed, three powerful

~~monarcliies, the Sihs, Guptas, and Valabhis, established themselves in northern and western India. The Sdhs of Surdshtra are traced by coins and inscriptions from 60 or 70 B.o. to after 935 a.p3 After the Sihs come the Guptas of Kanauj,? in the North-Western Provinces, the Middle Land (Madhya- desha) of ancient Brahmanism. The Guptas introduced an era of their own, commencing in 319 Boc., and ruled in person or by viceroys over northern India during one hundred and fifty years, as far to the south-west as Kathidwar, The Gupta dynasty was overthrown by foreign invaders, apparently a new influx of Huns or Tartars from the north-west (450-470 a.p.). The Valabhis succeeded the Guptas, and ruled over Cutch, the north-western districts of Bombay® and Malwa, from 480 to after 722 a.pD.6 The Chinese pilgrim gives a full account of the court and people of Valabhi (630-640 weD?); Buddhism was the state religion, but heretics (Brihmans) abounded; and the Buddhists themselves were divided between the northern school of the Scythian dynasties and the southern or Indian school of Asoka. The Valabhis seem to have been overthrown by the early Arab invaders of Sind in the 8th century.~~

~~The relations of these three Indian dynasties, the Sihs, Guptas, and Valabhis, to the successive hordes of Scythians who poured down on northern India are obscure. There is abundant evidence of a long-continued struggle, but the attempt to assign dates to its chief episodes has not yet produced results which can be accepted as final. Two Vikramaditya Sakaris, or vanquishers of the Scythians, are required for the purposes of chronology; and the great battle of Korur, near Multan, at which the Scythian hosts perished, hns been shifted backwards and forwards from 78 to 544 ap.' The truth seems to be that, during the first six centuries of the Christian era, the fortunes of the Scythian or Tartar races rose and fell from time to time in northern India. They more than once sustained great defeats; and they more than once overthrew the native dynasties. Their presence is abundantly attested during the century before Christ, represented by Vikramaditya (57 z.c.); during the first century after Christ, represented by the Kanishka family (2 B.c. to 87 a.p.); and thence to the time of Cosmas Indicopleustes, about 535 a.p. The latest writer on the subject ® believes that it was the White Huns who overthrew the Guptas between 465 and 470 a.p. He places the great battles of Kortr and Maushari, which 'freed India from the Sikas and Hunas," between 524 and 544 A.p. Cosmas~~

~~*Indicopleustes, who traded in the Red Sea about 535 a.p., speaks of the Huns as a powerful nation in northern India in his days.®*~~

~~*1 Monday, 14th March, 78 a.p., Julian style.*~~

~~*2 General Cunningham. See also Mr E. Thomas's letter, dated 16th September 1874, to the Academy, which brings this date within the period of the Kanishka family (2 B.c. to 87 a.D.).*~~

~~*3 By Mr Newton. See Mr E. Thomas, "'On the Coins of the Sah Kings," Archwol. Rep. Western India, p. 44, 1876; and Dr J. Fer- gusson, Journ. Roy. As. Soc., 1880.*~~

~~*4 Now a town of only 17,000 inhabitants in Farrakhdbad district, but with ruins extending over a semicircle of 4 miles in diameter.*~~

~~*5 Lat-desa, including the collectorates of Surat, Broach, Kaira, and parts of Baroda territory.*~~

~~*° oe is worked out in detail by Mr E. Thomas, wt supra, pp. 80-82.*~~

~~*7 78 a.D. was the popularly received date, commemorated by the Sdka era; ' between 524 and 544 a.p." is suggested by Dr Fergusson (p. 284 of Journ. Roy. As. Svc., vol. xii.) in the latest discussion of the subject during 1880.*~~

~~*fos J. Fergusson, ué supra, pp. 282-284, &c.*~~

~~*Topographia Christiania, lib. xi. p. 338, Paris, 1707; apud Fergusson, ut supra.*~~

~~*LNT &*~~

~~*[HISTORY.*~~

~~*While Greek and Scythic influences had thus been at Non- work in northern India during nine centuries (327 3.c. to Aryan 544 a.p.), another element was profoundly affecting the oe*~~

~~: : : ies, future of the Indian people. In a previous section we have traced the fortunes, and sketched the present condition, of the non-Aryan "aborigines." The Brahmanical Aryans never effected anything like a complete subjugation of these earlier races. The tribes and castes of non-Aryan origin still number about 18 millions in British territory; the castes who claim a pure Aryan descent are under 17 millions. The non-Aryans have influenced the popular dialects of almost every province, and in southern India have given their speech to 46 millions of people. The Vedic settlements along the five rivers of the Punjab were inerely colonies or confederacies of Aryan tribes, who had pushed in among a non-Aryan population. When an Aryan family advanced to a new territory, it had often, as vn the case of the Pandava brethren, to clear the forest and drive out the aboriginal people. This double process con- stantly repeated itself ; and so late as 1657 a.D., when the Hindu r4j4 founded the present city of Bareilly, his first work was to cut down the jungle and expel the Katheriyas. The ancient Brdhmanical kingdoms of the Middle Land, or Madhyadesha, in the North-Western Provinces and Oudh, were surrounded by non-Aryan peoples. All the legendary advances beyond the centre of Aryan civilization, narrated in the epic poets, were made into the territory of non- Aryan races. When we begin to catch historic glimpses of India, we find the most powerful kingdoms ruled by non- Aryan princes. Thus the Nandas, whom Chandra Gupta succeeded in Behar, were a Sidra or non-Aryan dynasty; and, according to one account, Chandra Gupta and his grandson Asoka came of the same stock.!°~~

~~The Buddhist religion did much to incorporate the non- Aryan tribes into the Indian polity. During the long struggle against Graeco-Bactrian and Scythian inroads (327 B.c. to 544 a.D.), the Indian aboriginal races must have had an ever-increasing importance, whether as enemies or allies, At the end of that struggle we discover them in some of the fairest tracts of northern India, In almost every district throughout Oudh and the North-Western Provinces ruined towns and forts are ascribed to aboriginal races who ruled at different periods, according to the local legends, between the 5th and 11th centuries A.p. When the Mahometan conquest supplies an historical footing after 1000 a.p., non-Aryan races were in possession of some of these districts, and had been lately ousted from others.~~

~~The statistical survey has brought to light many traces of these obscure peoples. It would be impossible to follow that survey through each locality; but we propose, with the utmost brevity, to indicate a few of the results. Starting from the west, Alexander the Great found Rawal Pindi district in the hands of the Takkas or Takshaks, from whom its Greek name of Taxila was derived. This people has been traced toa Scythian migration about the 6th century 3.0.11 Their settlements in the 4th century B.c. seem to have extended from the Paropamisan range' in Afghanistan deep into northern India. Their Punjab capital, Takshdsila or Taxila, was the largest city that Alexander found between the Indus and the Jhelum (327~~

~~a~~

~~10 The Mudré-rakshasa represents Chandra Gupta as related to the last of the Nandas ; the commentator on the Vishnu Purdna says he was the son of a Nanda by a low-caste woman. Professor Dowson's Dict. HIndu Mythology, &c., p. 68 (Triibner, 1879).~~

~~11 Such dates have uo pretension to be anything more than intelligent conjectures based on very inadequate evidence. With regard to the Takshaks, see Colonel Tod and the authorities which he quotes, Rdjds- than, vol. i. 58 passim; 98 seg. (Madras reprint, 1873).~~

~~12 Where Alexander found them as the Pare-tace—pahért, or HIll Tacs (7).~~

~~Non- Aryans of uorth- ern India,~~

~~Ghak- kars,~~

~~HISTORY. |~~

~~B.¢.).1 Salih4vana, from whom the Saka or Scythian era took its commencement (78 A.D.), is held by some authorities to have been a Takshak.? In the 7th century a.p. Taki,3 perhaps derived from the same race, was the capital of the Punjab. The Scythic Takshaks are supposed to have been the source of the great serpent race, the Takshaks or Nagas, who figure so prominently in Sanskrit literature and art, and whose name is still retained by the Naga tribes of our own day. The words Nig4 and Takshak in~~

Sanskrit both mean "a snake," or mythological tailed monster. The Takshaks are identified with the Scythian Takkas, and the Nagas have been connected with the Tartar patriarch Nagas, the second son of El-kh4n.4 The two names, however, seem to have been applied by the Sanskrit writers to a variety of non-Aryan peoples in India, whose religion was of an anti-Aryan type. We learn, for example, how the four Pandu brethren of the Mahabharata turned out the snake-king Takshaka from his primeval Khandava forest. The Takshaksand Nagas were the tree and serpent worshippers, whose rites and objects of adoration have impressed themselves so deeply on the architecture and sculpture of India. The names were applied in a confused manner to different races of Scythic origin ; and the greatest authority on tree and serpent worship in India has deliberately selected the term " Scythian" for the anti- Aryan elements which entered so largely into the Indian religions both in ancient and modern times. The Chinese records give a full account of the Nagd geography of ancient India. They enumerate numerous and powerful Naga kingdoms, from which Buddhism derived many of its con- verts. The Chinese chroniclers, indeed, classify the Naga princes of India into two great divisions, as Buddhists and non-Buddhists. The serpent worship which formed so typical a characteristic of the Indo-Scythic races led the Chinese to confound them with the objects of their adora- tion; and the Indian Nadgés and their rites seem to have supplied the Dragon races of Chinese Buddhism and of religious and secular art in China.

As the Greek invaders found Rawal Pind{ district in possession of a Scythic race of Takkas in 327 B.., so the Musalman conqueror found it inhabited by a fierce nou- Aryan race of Ghakkars thirteen hundred years later. The Ghakkars for a time imperilled the safety of Mahmud of Ghazni in 1008 a.p. Ferishta describes them as savages addicted to polyandry and infanticide. The tide of Mahometan conquest rolled on, but the Ghakkars remained in possession of their submontane tract, In 1205 they slew the second Mahometan conquerer of India, Muhammad Ghori, in his tent, and ravaged the Punjab to the gates of Lahore; and, in spite of conversion to Islam by the sword, it was not till 1525 that they made their submission to Babar in return for a grant of country. During the next two cen- turies they rendered great services to the Mughal dynasty against the Afghan usurpers, and rose

~~*to high influence in the Punjab. Driven from the plains by the Sikhs in 1765, the Ghakkar chiefs maintained their independence in the*~~

~~*Murree (Marri) Hills till 1830, when they were crushed —. _ ea*~~

~~*1 Arrian. The Brahman mythologists, of course, found an Aryan pedigree for so important a person as King Taksha, and make him the son of Bharata, and nephew of Réma-chandra !*~~

- ~~*Tod, Rajasthan, i. 95 (ed. 1873).*~~
- ~~*Taki, or Asarur, 45 miles west of Lahore. General Cunningham, Anc. Geog. Ind., p. 191, and map vi. (ed. 1871). This Taki lies considerably to the south-east of the Takshdsila of Alexander's expedition,*~~

~~*4Tod, Rajasthan, i. 53 (ed. 1873).*~~

~~*® Dr J. Fergusson's Tree and Serpent Worship, p. 71-72. (India Museum, 4to, 1868). For the results of more recent local research, see Mr Rivett-Carnac's papers in the Journ. of the As. Soc., Bengal, 'The Snake Symbol in India," " Ancient Sculpturings on Rocks," "Stone Carvings at Mainpuri," &c.; and the Hon. Rao Sahib Vish- vaniks Narayan Mandlik's "Serpent Worship in Western India," and other essays, in the Bombay As. Soc. Journal.*~~

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~~*after a bloody struggle, In 1849 Rawal Pindi passed, with the rest of the Sikh territories, under British rule. But the Ghakkars revolted four years afterwards, and threatened Murree, the summer capital of the Punjab, so late as 1857. They now number only 10,153 persons, described by the British officers as "a fine spirited race, gentlemen in ancestry and bearing, and clinging under all reverses to the traditions of noble blood."*~~

~~*We have selected the inhabitants of Rawal Pindt district to illustrate the long-continued presence and vitality of the non-Aryan races in India. We*~~

~~*shall deal more briefly with other parts of the country. Proceeding inwards to the North-Western Provinces, we find traces of an early Buddhist civilization having been overturned by rude non- Aryan races, In Bareilly district, for example, the wild*~~

~~*Ahirs from the north, the Bhils from the south, and the Bhils.*~~

~~*Bhars from the west seem to have expelled highly developed Aryan communities not long before 1000 a.p, Still farther to the east, all remains of prehistoric masonry in Oudh and the North-Western Provinces are assigned either to*~~

~~*the ancient Buddhists or to a medizval race of Bhars. The Bhars.*~~

~~*Bhars appear to have possessed the north Gangetic plains in the centuries coeval with the fall of Buddhism. Their — kingdoms extended over most of Oudh, and lofty mounds covered with ancient groves still mark the sites of their forgotten cities. They are the mysterious " fort-builders " to whom the peasantry ascribe any ruin of unusual size. In the western districts their power is said to have been crushed by the Sharki dynasty of J aunpur in the end of the 14th century. In the eastern districts of the north Gan- getic plain, the Bhars figure still more prominently in local traditions, and an attempt has been made to trace their continuous history. In Gorakhpur district a movement of aboriginal Tharus and Bhars seems to have overwhelmed the early outposts of Aryan civilization several centuries before Christ. They afterwards became vassals of the Buddhist kingdom of Behar on the south-east, and on the fall of that power, about 550, the Bhars regained their independence. The Chinese pilgrim in the 7th century comments on the large number of monasteries and towers in this region— the latter probably monuments of the struggle with the aboriginal Bhars, who were there finally crushed between the 7th and 10th centuries.*~~

~~*As we advance still farther eastwards into Bengal, we find that the non-Aryan races have within historical time supplied a large part of the Hindu population. In the*~~

~~*north the Koch established their dominion upon the ruins Koch.*~~

~~of the Aryan kingdom of Kamrip, which the Afghan king of Bengal had overthrown in 1489. The Koch gave their name to the native state of Kuch (Cooch) Behar, and their descendants, together with those of other non-Aryan tribes, form the mass of the people in the neighbouring British districts. Some eluded the effects of their low origin by becoming Musalmans, and thus obtained that social equality which Isl4m grants to all mankind. The rest have merged more or less into the Hindu population ; but masses of them claim, in virtue of their position as an old dominant race, to belong to the Kshattriya caste. They call themselves Rajbansis, a term exactly correspond ing to the Rajputs of western India. The rdj4s of Kuch Behar lay claim to a divine origin, in order to conceal their aboriginal descent; and all remembrance of the Koch tribe is carefully avoided at court.~~

~~Proceeding still eastwards, we enter the adjacent valley of Assam, until last century the seat of another non-Aryan ruling race. east about 1350 (?), had firmly established their power by 1663, gradually yielded to HInduism, and were over- powered by fresh invasions from Burmah between 1750 and 1820, when the valley was annexed to British India.~~

~~The Ahams entered Assam from the south- Ahams,~~

~~Non- Aryans south of the Ganges.~~

~~Mahome- tan in- vasions.~~

~~Mahmid~~

~~of Ghazni. |~~

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~~By the Burmese the Ahams have been completely crushed as a dominant race, and their national priests, to the number of 179,000, have been forced to till the soil to gain their living. But the people of Assam are still so essentially made up of aboriginal races and their HInduized descendants that not 65,000 persons of even alleged pure Aryan descent can be found in a population exceeding 4 millions.~~

~~*We have hitherto confined our survey to the country on the north of the Ganges. If we pass to the southern Gangetic plain, we find that almost every tract has tradi- tions of a non-Aryan tribe, either as a once dominant race or as lying at the root of the local population. The great division of Bundelkhand contains several crushed peoples of this class, and takes its name from the Bundelas, a tribe of at least semi-aboriginal descent. As we rise from the Gangetic plain into the highlands of the Central Provinces, we reach the abiding home of the non-Aryan tribes. One such race after another—Gaulis, Nagas, Gonds, Ahirs— ruled from the Sdtpura plateau. If we turn to the lower provinces of Bengal we find the delta peopled by masses of non-Aryan origin. One section of them has merged 'nto low-caste Hindus; another section has sought a more equal social organization by accepting the creed of Mahomet. But such changes of faith do not alter their ethnical type; and the Musalman of the delta differs as widely in race from the Afghan as the low-caste Hindu of the delta differs from the Brahman. Throughout southern India the non-Aryan elements make up almost the entire population, and have supplied the great Dravidian family of languages, spoken by 46 millions of people.*~~

~~*Mahometan Period.*~~

~~*At the very time that Buddhism was being crusned out of India by the Bralimanic reaction, a new faith was being born in Arabia, destined to supply a youthful fanaticism which should sweep the country from the Himalayas to Cape Comorin, and from the western to the eastern sea. Muhammad, commouly known as Mahomet, the founder of Islam, died at Medina in 632 a.D., while the Chinese pilgrim Hwen Tsang was still on his travels. The first Mahometan invasion of India is placed in 664, only thirty-two years after the death of the prophet. The Punjab is said to have been ravaged on this occasion with no per- manent results. The first Mahometan conquest was the outlying province of Sind, which from the point of view of geology may be regarded as a continuation of the desert of Baluchistan. In 711, or seventy-nine years after the death of Mahomet, an Arab army under Muhammad Kasim invaded and conquered the Hindus of Sind in the name of Walid L., caliph of Damascus, of the Bene-Umyyeh line. In the same year Roderic, the last of the Goths, fell before the victorious Saracensin Spain. But in India the bravery of the Rajputs and the devotion of the Brahmans*~~

~~*seem to have afforded a stronger national bulwark than existed in western Europe. In 750 the HIndus rose in rebellion and drove out the Musalman tyrant, and the land had rest for one hundred and fifty years.*~~

~~*The next Mahometan invasion of India is associated with the name of Sultén Mahmud of Ghazni. Mahmtud was the eldest son of Sabuktagin, surnamed Nasr-ud-din, in origin a Turkish slave, who had established his rule over the greater part of modern Afghanistan and Khorasan with Ghazni as his capital. In 977 Sabuktagin is said to have defeated Jdipal, the HIndu r4j4 of Lahore, and to have rondered the Punjab tributary. But his son Mahmud was the first of the great Musalman conquerors whose names still ring through Asia. Mahmud succeeded to the throne in 997, During his reign of thirty-three years he extended the limits of his father's kingdom from Persia on the east*~~

~~*INDTA*~~

~~*[HIsTORY.*~~

~~*to the Ganges on the west; and it is related that he led his armies into the plains of India no less than seventeen times. In 1001 he defeated Rdjé Jadipal a second time, and took him prisoner. But Anandpal, the son of Jaipal, raised again the standard of national independence, and gathered an army of Rajput allies from the furthest corners of HIndustan. 'The decisive battle was fought in the valley of Pesh4war. Mahmud won the day by the aid of his Turkish horsemen, and thenceforth the Punjab has been a Mahometan province, except during the brief period of Sikh supremacy. The most famous of Mahmud's invasions of India was that undertaken in 1024 against Guzerat. The goal of this expedition was the temple dedicated to Siva at Soninath, around which so many legends have gathered. It is reported that Mahmud marched through Ajmir, to avoid the desert of Sind; that he found the HIndus gathered on the neck of the peninsula of Somnath in defence of their holy city ; that the battle lasted for two days; that in the end the Rajput warriors fled to their boats, while the Brahman priests retired into the inmost shrine; that Mahmud, introduced into this shrine, rejected all entreaties by the Brahmans to spare their idol, and all offers of ransom ; that le smote the image with his club, and forthwith a fountain of precious stones gushed out. Until the British invasion of Afghanistan in*~~

~~*1839, the club of Mahmud and the sandal-wood gates of Sommath were preserved at the tomb of the great conqueror near Ghazni. The club has now disappeared, and the gates carried back to India by General Nott are recognized to be a clumsy forgery, To Mahometans Mahmud is known, not only as a champion of the faith, but as a munificent patron of literature. The dynasty that he founded was not long-lived. Fourteen of his descendants occupied his throne within little more than a century, but none of them achieved greatuess. A blood- feud arose between them and a line of Afghan princes who had established themselves among the mountains of Ghor. In 1152 Bahram, the last of the Ghaznivide Turks, was overthrown by Allah-ud-din of Ghor, and the wealthy and populous city of Ghazni was razed to the ground. But even the Cthoride conqueror spared the tomb of Mahmud.*~~

~~*Khusru, the son of Bahram, fled to Lahore, and there established the first Mahometan dynasty within India. It speedily ended with his son, also called Khusru, whom Muhammad Ghori, the relentless enemy of the Ghaznivide house, carried away into captivity in 1186.*~~

~~*The Afghans of Ghor or Ghur thus rose to power on the downfall of the Turks of Ghazni. The founder of the family is said to have been Izzud-din al Husdin, whose son Allah-ud-din destroyed Ghazni, as already mentioned. Allah-ud-din had two nephews, Ghiyds-ud-din and Muiz- ud-din, the latter of whom, also called Shahab-ud-din by Musalmdn clironiclers, and generally known in history as Muhammad Ghori, is the second of the great Mahometan conquerors of India. In 1176 he took Multan and Uchch ; in 1187 Lahore fell into his hands; in 1191 he was repulsed before Delhi, but soon afterwards he redeemed this disaster. Hindustan Proper was at that period divided between the two Rajput kingdoms of Kanauj and Delhi. Muhammad Chori achieved his object by playing off the rival kings against each other. By 1193 he had extended his conquests as far east as Benares, and the defeated Rajputs migrated in a body to the hills and deserts now known as Réjputana. In 1199 one of his lieutenants, named Bakhtiyar, advanced into Bengal, and expelled by an audacious stratagem the last Hindu raja of Nadiy&. The entire northern plain, from the Indus to the Brahmaputra, thus lay under the Mahometan yoke. But Muhammad Ghori never settled himself permanently in India. His favourite residence is said to*~~

~~*have been the old capital of Ghazni, while he governed his Indian conquests through the agency*~~

~~*Slave dynasty.*~~

~~*Allah- ud-din.*~~

~~*Muham- mad Tughlak,*~~

~~*HISTORY. |*~~

~~*of a favourite slave, Kutab-ud-din. Muhammad Ghori died in 1206, being assassinated by some Ghakkar tribesmen while sleeping in his tent by the bank of the Indus; on his death both Ghor and Ghazni drop out of history, and Delhi first appears as the Mahometan capital of India.*~~

~~*On the death of Muhammad Ghori, Kutab-ud-din at once laid aside the title of viceroy, and proclaimed himself sultan of Delhi. He was the founder of what is known as the slave dynasty, which lasted for nearly a century (1206-1288). The name of Kutab is preserved in the minar, or pillar of victory, which still stands amid the ruins of ancient Delhi, towering high above all later structures. Kutab himself is said to have been successful as a general and an administrator, but none of his successors has left a mark in history.*~~

~~*In 1294 Allah-ud-din Khilji, the third of the great Mahometan conquerors of India, raised himself to the throne of Delhi by the treacherous assassination of his uncle Firoz II, who had himself supplanted the last of the slave dynasty. Allah-ud-din had already won military renown by his expeditions into the yet unsubdued south. He had plundered the temples at Bhilsa in central India, which are admired to the present day as the most interest- ing examples of Buddhist architecture in the country. At the head of a small band of horsemen, he had ridden as far south as Deogiri in the Deccan, and plundered the Marhatté capital. When once established as sultén, he planned more extensive schemes of conquest. One army was sent to Guzerat under Alaf Khan, who conquered and expelled the last Rajput king of Anhalwdér or Patan. Another army, led by the sultan in person, marched into the heart of Rajputdéna, and stormed the rock-fortress of Chitor, where*~~

~~*the Rajputs had taken refuge with their women and children. A third army, commanded by Malik Kafur, a Hindu renegade and favourite of Allah-ud-din, penetrated to the extreme south of the peninsula, scattering the unwarlike Dravidian races, and stripping every Hindu temple of its accumulations of gold and jewels. To this day the name of Malik Kafur is remembered in the remote district of Madura, in association with irresistible fate and every form of sacrilege.*~~

~~*Allah-ud-din died in 1316, having subjected to Islam the Deccan and Guzerat. Three of his descendants followed him upon the throne, but their united reigns extended over only five years. In 1321 a successful revolt was headed by Ghiyas-ud-din Tughlak, governor of the Punjab, who is said to have been of Turkish origin. The Tughlak dynasty lasted for about seventy years, until it was swept away by the invasion of Timur, the fourth Mahometan conqueror of India, in 1398. Ghiyas-ud-din, the founder of the line, is only known for having removed the capital from Delhi to a spot about 4 miles further to the east, which he called Tughlakabad. His son and suc- cessor, Muhammad Tuglilak, who reigned from 1325 to 1351, is described by Elphinstone as "one of the most accomplished princes and one of the most furious tyrants that ever adorned or disgraced human nature." He wasted the treasure accumulated by Allah-ud-din in purchasing the retirement of the Mughal hordes, who had already made their appearance in the Punjab. When the internal circulation failed, he issued a forced currency of copper, which is said to have deranged the whole commerce of the country. At one time he raised an army for the in- vasion of Persia. At another he actually despatched an expedition against China, which perished miserably in the Himalayan passes. When Hindustén was thus suffering from his misgovernment, he conceived the project of trans- ferring the seat of empire to the Deccan, and compelled the inhabitants of Delhi to remove a distance of 700 miles to Deogiri or Daulatabad. And yet during the reign of this*~~

~~*sultan both the Tughlak dynasty and the city of Delhi are said to have attained their utmost growth. Muhammad was succeeded by his cousin*~~

~~*Firoz, who likewise was not content without a new capital, which he placed a few miles north of Delhi, and called after his own name. Meanwhile the remote provinces of the empire began to throw off their allegiance to the sultans of Delhi. 'The independence of the Afghan kings of Bengal is generally dated from 1336, when Muhammad Tughlak was yet on thethrone. The com- mencement of the reign of Allah-ud-din, the founder of the Bahmani dynasty in the Deccan, is variously assigned to 1347 and 1357. Zafar Khan, the first of the Ahmadabad kings, acted as an independent ruler from the time of his first appointment as governor of Guzerat in 1391. These and other revolts prepared the way for the fourth great in- vasion of India under Timur (Tamerlane).*~~

~~*Accordingly, when Timur invaded India in 1398, he encountered but little organized resistance. Mahmiud, the last of the Tughlak dynasty, being defeated in a battle out- side the walls of Delhi, fled into Guzerat. The city was sacked and the inhabitants massacred by the victorious Mughals. But the invasion of Timur left no permanent impress upon the history of India, except in so far as its memory fired the imagination of Babar (Baber), the founder of the Mughal dynasty. The details of the fighting and of the atrocities may be found related in cold blood by Timur lumself in the Afalfuzat-i-Timiéri, which has been translated in Elliot's LWistory of India as told by its own Historians, vol. iii. Timir marched back to Samarkand as he had come, by way of Cabul, and Mahmud Tughlak ventured to return to his desolate capital. He was succeeded by what is known as the Sayyid dynasty, which held Delhi and a few miles of surrounding country for about forty years. The Sayyids were in their turn expelled by Beloli, an Afghan of the Lodi tribe, whose successors removed the seat of government to Agra, which thus for the first time became the imperial city. In 1525 Babar (Baber), the fifth in descent from Timur, and also the fifth Mahometan con- queror, invaded India at the instigation of the goveruor of the Punjab, won the victory of Panipat over Ibrahim, the last of the Lodi dynasty, and founded the Mughal empire, which lasted, at least in name, until 1857.*~~

~~*Before entering upon the story of the Mughal empire, it is desirable to give a short sketch of the condition of southern India at this period, which marks a turning point in Indian history. The earliest local traditions agree in dividing the extreme south into four provinces, Kerala, Pandya, Chola, and*~~

~~*Chera, which together made up the country of Dravida, occupied by Tamil-speaking races. Of these kingdoms the greatest was that of Pandya, with its capital of Madura, the foundation of which is assigned on high authority to the 4th century B.c. Other early southern cities whose sites can be identified are Combaconum and Tanjore, the successive capitals of the Chola kingdom, and Talkad in Mysore, now buried by the sands of the Kaveri (Cauvery), the capital of the Chera kingdom. The local Purana, or chronicle of Madura, gives a list of two Pandyan dynasties, the first of which has seventy-three kings, the second forty-three. Parakrama, the last king of the second dynasty, was overthrown by the Mahometan invader, Mélik Kafur, in 1324; but the Musalmans never established their power in the extreme south, and a series of HIndu lines ruled at Madura into the 18th century. No other Dravidian kingdom can boast such a continuous succession as that of Madura. The chronicles enumerate fifty Chera kings, and no less than sixty-six Chola kings, as well as many minor dynasties which ruled at various periods over fractions of the south. Little confidence, however, can be placed in HIndu gene- alogies, and the early history of — races yet*~~

~~*Timur's invasion.*~~

~~*Dynasties of south- ern India.*~~

~~*Maho- metan dynas- ties in Deccan.*~~

~~*Mughal dynasty,*~~

~~*remains to be deciphered from mouldering palm leaves and the more trustworthy inscriptions on copper and stone. Authentic history begius with the HIndu empire of Vijayanagar or Narsingha, which exercised an ill-defined sovereignty over the entire south from the 12th to the 16th century. The foundation of the city of Vijayanagar is assigned to the year 1118, and to an eponymous hero, Raja Vijaya, the fifth of his line. Its extensive ruins are still to be traced ou the right bank of the Tungabhadra river within the*~~

~~Madras district of Bellary. The city itself has not been inhabited since it was sacked by the Mahometans in 1565, but vast remains still exist of temples, fortifications, tanks, and bridges, haunted by beasts of prey and venomous reptiles. The empire of Vijayanagar represents the last stand made by the national faith in India against conquering Islam. For at least three centuries its sway over the south was undisputed, and its rajas waged wars and concluded treaties of peace with the sultans of the Deccan on equal terms.~~

~~The earliest of the Mahometan dynasties in the Deccan was that founded by Allah-ud-din in 1347 or 1357, which has received the name of the Bahmani dynasty from the supposed Brahman descent of its founder. The capital was first at Gulbargah, and was afterwards removed to Bidar, both which places still possess magnificent palaces and mosques in ruins. Towards the close of the 14th century the Bahmani empire fell to pieces, and five independent kingdoms divided the Deccan among them. These were— (1) the Adil Shéhi dynasty, with its capital at Bijapur, founded in 1489 by a son of Amurath IL, sultin of the Ottomans ; (2) the Kutab Shahi dynasty, with its capital at Golconda, founded in 1512 by a Turkoman adventurer ; (3) the Nizam Shahi dynasty, with its capital at Ahmad- nagar, founded in 1490 by a Brahman renegade, from the Vijayanagar court ; (4) the Imad Shahi dynasty of Berar, with its capital at Ellichpur, founded in 1484 also by a Hindu from Vijayanagar ; (5) the Barid Shahi dynasty, with its capital at Bidar, founded about 1492 by one who is variously described as a Turk and a Georgian slave. It is, of course, impossible here to trace in detail the history of these several dynasties. In 1565 they combined against the Hindu raja of Vijayanagar, who was defeated and slain in the decisive battle of Talikota. But, though the city was sacked and the supremacy of Vijayanagar for ever destroyed, the Mahometan victors did not themselves advance into the south. The Naiks or feudatories of Vijayanagar everywhere asserted their independence. From them are descended the well-known Palegars of the south, and also the present raja of Mysore. One of the blood- royal of Vijayanagar fled to Chaudragiri, and founded a line which exercised a prerogative of its former sovereignty by granting the site of Madras to the English in 1639. Another scion claiming the same high descent lingers to the present day near the ruins of Vijayanagar, and is known as the raja of Anagundi, a feudatory of the nizim of Hyderabad. Despite frequent internal~~

~~strife, the sultans of the Deccan retained their independence until conquered by the Mughal emperor Aurangzeb in the latter half of the 17th century. To complete this sketch of India at the time of Babar's invasion it remains to say that an independent Mahometan dynasty reigned at Ahmadabad in Guzerat for nearly two centuries (from 1391 to 1573), until conquered by Akbar ; and that Bengal was similarly independent, under a line of Afghan kings, with Gaur for their capital, from 1336 to 1573. When, therefore, Babar invaded India in 1525, the greater part of the country was pope but it did not recognize the authority of the~~

~~ghan sultan of the Lodi dynasty, who resided at Agra, and also ruled the historical capital of Delhi. After having won the battle of Panipat, Babar was no more acknowledged~~

~~DPN DP Te~~

~~as emperor of India than his ancestor Timur had been. Babar, however, unlike Timur, had resolved to settle in the plains of HIndust4n, and carve out for himself a new empire with the help of his Mughal followers. task was to repel an attack by the Rajputs of Chitor, who seem to have attempted to re-establish at this time a HIndu empire. memorable for the vow made by the easy living Babar that~~

~~[HISTORY,~~

~~His first~~

~~The battle was fought at Sikri near Agra, and is~~

~~he would never again touch wine. Babar was again victorious, but died shortly afterwards in 1530. HIe was succeeded by his son HIumayun, who is chiefly known as being the father of Akbar. In HIuméaytn's reign the Afghan subject Afghans rose in revolt under Sher Shah, a native revolt. of Bengal, who for a short time established his authority~~

~~over all HIndustén. HIumdytin was driven as an exile into Persia; and, while he was flying through the desert of Sind, hisson Akbar was born to him in the petty fortress~~

~~of Umarkot. But Sher Shah was killed at the storming~~

~~of the rock-fortress of Kdlinjar, and Humayun, after many vicissitudes, succeeded in re-establishing his authority at Lahore and Delhi.~~

~~Humayun died by an accident in 1556, leaving but a Akbar. circumscribed kingdom, surrounded on every side by active foes, to his son Akbar, then a boy of only fourteen years. Akbar the Great, the real founder of the Mughal empire as it existed for two centuries, was the contemporary of our own Queen Elizabeth (1558-1603). He was born in 1542, and his reign lasted from 1556 to 1605. When his father died he was absent in the Punjab, fighting the revolted Afghans, under the guardianship of Bairam Khan, a native of Badakshan, whose military skill largely con- tributed to recover the throne for the Mughal line. For the first seven years of his reign Akbar was perpetually engaged in warfare. His first task was to establish his authority in the Punjab, and in the country around Delhi and Agra. In 1568 he stormed the Rajput stronghold of Chitor, and conquered Ajmir. In 1570 he obtained possession of Oudh and Gwalior. In 1572 he marched in person into Guzerat, defeated the last of the independent sultans of Ahmadabad, and formed the province into a Mughal viceroyalty or subah. In the same year his generals drove out the Afghans from Bengal, and reunited the lower valley of the Ganges to Hindustan. Akbar was then the undisputed ruler of a larger portion of India than had ever before acknowledged the sway of one man. But he continued to extend his conquests throughout his lifetime. In 1578 Orissa was annexed to Bengal by his Hindu general Todar Mall, who forthwith organized a revenue survey of the whole province. Cabul submitted in 1581, Kashmir in 1586, Sind in 1592, and Kandahar in 1594, Atlast he turned his arms against the Mahometan kings of the Deccan, and wrested from them Berar; but the permanent conquest of the south was reserved for Aurangzeb.~~

~~If the history of Akbar were confined to this long list of conquests, his name would on their account alone find a high place among those which mankind delights to remember. But it is as a civil administrator that his reputation is cherished in India to the present day. With regard to the land revenue, the essence of his procedure was to fix the amount which the cultivators should pay at one-third of the gross produce, leaving it to their option to pay in~~

~~money or in kind. The total land revenue received by Akbar amounted to about 164 millions sterling. Comparing the area of his empire with the corresponding area now under the British, it has been calculated that Akbar, three hundred years ago, obtained 155 millions where they obtain only 134 millions,—an amount re- presenting not more than one-half the purchasing power of Akbar's 154 millions. The distinction between Ahdlst~~

~~Jahangir,~~

~~Shah Jahan.~~

~~HISTORY. |~~

~~land, or the imperial demesne, and jagir lands, granted revenue free or at quit rent in reward for services, also dates from the time of Akbar. Ag regards his military system, Akbar invented a sort of feudal organization, by which every tributary r4jé took his place by the side of his own Mughal nobles. In theory it was an aristocracy based only upon military command ; but practically it accom- plished the object at which it aimed by incorporating the hereditary chiefships of Rajputana among the mush- room creations of a Mahometan despotism. Musalmans and Hindus were alike known only as mansabddrs or commanders of so many horse, the highest title being that of amir (ameer), corrupted by European travellers into umrah or omrah. The third and last of Akbar's char- acteristic measures were those connected with religious innovation, about which it is difficult to speak with pre- cision, The necessity of conciliating the proud warriors of Rajputana had taught him toleration from his earliest days. His favourite wife was a Rajput princess, and another wife is said to have been a Christian. Out of four hundred and fifteen of his mansabddrs whose names are recorded, as many as fifty-one were Hindus. Start- ing from the broad ground of general toleration, Akbar was gradually led on by the stimulus of cosmopolitan discussion to question the truth of his inherited faith. The counsels of his friend Abul Fazl, coinciding with that sense of superhuman omnipotence which is bred of despotic power, led him at last to promulgate a new state religion, based upon natural theology, and comprising the best practices of all known creeds. In this strange faith Akbar himself was the prophet, or rather the head of the church. Every morning he worshipped the sun in public, as being the representative of the~~

~~divine soul that animates the universe, while he was himself worshipped by the ignorant multitude.~~

~~Akbar died in 1605, in his sixty-third year. He lies buried beneath a plain slab in the magnificent mausoleum which he had reared at Sikandra, near his capital of Agra. As his name is still cherished in India, so his tomb is still honoured, being covered by a cloth presented by Lord Northbrook when viceroy in 1873.~~

~~The reign of Jahangir, his son, extended from 1605 to 1627. It is chiefly remarkable for the influence exercised over the emperor by his favourite wife, surnamed Nur Mahal, or the Light of the Harem. The currency was struck in her name, and in her hands centred all the intrigues that made up the work of administration. She lies buried by the side of her husbaud at Lahore, whither the seat of govern- ment had been moved by Jahangir, just as Akbar had previously transferred it from Delhi to Agra. It was in the reign of Jahangir that the English first established themselves at Surat, and also sent their first embassy to the Mughal court.~~

~~Jahangir was succeeded by his son Shah Jahan, who had rebelled against his father, as JAhangir had rebelled against Akbar. Shdh Jalhdn's reign is generally regarded as the period when the Mughal empire attained its greatest magnificence, though not its greatest extent of territory. He founded the existing city of Delhi, which is still known to its Mahometan inhabitants as Jahandbad. At Delhi also he erected the celebrated peacock throne ; but his favourite place of residence was Agra, where his name will ever be associated with the marvel of Indian architecture, the Taj Mahal. That most chaste and most ornamental of buildings was erected by Shah Jahan as the mausoleum of his favourite wife Mumtaz Mahal, and he himself lies by her side. It is said that twenty thousand workmen laboured on the work for twenty years. Besides the Taj, Shah Jahan also built at Agra within the old fort the palace and the pearl mosque, both of which, like the~~

~~*Taj, have been preserved to be objects of admiration to the present day. Shah Jahan had four sons, whose fratricidal wars for the succession during their father's lifetime it would be tedious to dwell upon. Suffice it to say that Aurangzeb, by mingled treachery and violence, supplanted or overthrew his brothers and proclaimed himself emperor in 1658, while Shah Jahan was yet alive.*~~

~~*Aurangzeb's long reign, from 1658 to 1707, may be regarded as representing both the culminating point of Mughal power and the beginning of its decay. Unattrac- tive as his character was, it contained at least some elements of greatness. None of his successors on the throne was anything higher than a debauchee or a puppet. He was the first to conquer the independent sultans of the Deccan, and to extend his authority to the extreme south. But even during his lifetime two new Hindu nationalities were being formed in the Marhattds and the Stkhs ; while im- mediately after his death the nawabs of the Deccan, of Oudh, and of Bengal raised themselves to practical in- dependence. Aurangzeb had indeed enlarged the empire, but he had not strengthened its foundations, During the reign of his father Shah Jahan he had been viceroy of the Deccan or rather of the northern portion only, which had been annexed to the Mughal empire since the reign of Akbar. His early ambition was to conquer the Mahometan kings of Bijapur and Golconda, who, since the downfall of Vijayanagar, had been practically supreme over the south. This object was not accomplished without many tedious campaigns, in which Sivaji, the founder of the Marhatta confederacy, first comes upon the scene. In name Sivaji was a feudatory of the house of Bijapur, on whose behalf he held the rock-forts of his native Ghats; but in fact he found his opportunity in playing off the Mahometan powers against one another, and in rivalling Aurangzeb himself in the art of treachery. In 1680 Sivaji died, and luis son and successor, Sambhaji, was betrayed to Aurangzeb and put to death. The rising Marhatt4é power was thus for a time checked, and the Mughal armies were set free to operate in the eastern Deccan. In 1686 the city of Bijapur was taken by Aurangzeb in person, and in the following year Golconda also fell. No independent power then remained in the south, though the numerous local chieftains, known as pdlegdrs and natks, never formally submitted to the Mughal empire. During the early years of his reign Aurangzeb had fixed his capital at Delhi, while he kept his dethroned father, Shah Jahan, in close*~~

~~confine- ment at Agra. In 1682 he set out with his army on his victorious marcli into the Deccan, and from that time until his death in 1707 he never again returned to Delhi. In this camp life Aurangzeb may be taken as representative of one aspect of the Mughal rule, which has been pictur- esquely described by European travellers of thatday. They agree in depicting the emperor as a peripatetic sovereign, and the empire as held together by its military high- ways no less than by the strength of its armies. The great road running across the north of the peninsula, from Dacca in the east to Lahore in the west, is generally attributed to the Afghan usurper, Sher Shah. The other roads branching out southward from Agra, to Surat and Burhanpur and Golconda, were undoubtedly the work of Mughal times. Each of these roads was laid out with avenues of trees, with wells of water, and with frequent sardis or rest-houses. Constant communication between the capital and remote cities was maintained by a system of foot-runners, whose aggregate speed is said to have surpassed that of a horse. Commerce was conducted by means of a caste of bullock-drivers, whose occupation in India is hardly yet extinct.~~

~~On the death of Aurangzeb in 1707, the decline of the Mughal empire set in with extraordinary rapidity. Ten~~

~~Aurangzeb,~~

~~Rise of Marhatta power.~~

~~Decline of Mughal empire.~~

~~796~~

~~emperors after Aurangzeb are enumerated in the chronicles, put none of them has left any mark on history. HIs son and successor was Bahadur Shah, who reigned only five years. Then followed in order three sons of Bahadur Shah, whose united reigns occupy only five years more. In 1739 Nadir Shah of Persia, the sixth and last of the great Mahometan conquerors of India, swept like a whirl- wind over HIndustan, and sacked the imperial city of Delhi. henceforth the Great Mughal (M ogul) became a mere name, though the hereditary succession continued unbroken down to our own day Teal power had passed 'nto the hands of Mahometan courtiers and~~

~~Marhatta generals, both of whom were then carving for themselves kingdoms out of the dismembered empire, until at last British authority placed itself supreme over all. From the time of Aurangzeb no Musalman, however powerful, dared to assume the title of sultan or emperor, with the single ex-~~

~~ception of Tipw's brief paroxysm of madness, The name of~~

~~nawdb, corrupted by Europeans into "nabob," appears to be an invention of the Mughals to express delegated autho- rity, and as such it is the highest title conferred upon Mahometans at the present day, as mahdrdja is the highest title conferred upon HIndus. At first nawdbs were only found in important cities, such as Surat and Dacca, with the special function of administering civil justice ; criminal justice was in the hands of the hotwdl. The corresponding officials at that time in a large tract of country were the subahddr and the faujddr. But the title of subahddr, or viceroy, gradually dropped into desuetude, as the paramount power was shaken off, and nawdb became a territorial title with some distinguishing adjunct, During the troubled period of intrigue 'and assassination that followed on the death of Aurangzeb, two Mahometan foreigners rose to high position as courtiers and generals, and succeeded in transmitting their power to their sons. The one was Chin Kulich Khan, also called Asof Jah, and still more commonly NizAm-ul-Mulk, who was of Turkomdn origin, and belonged to the Sunni sect. His independence at Hyderabad in the Deccan dates from 1712. The other was Saddat Ali Khan, a Persian, and therefore a Shid, who was appointed subalddr or naw&b of Oudh in 1720. Thenceforth these two important pro- vinces paid no more tribute to Delhi, though their heredi- tary rulers continued to seek formal recognition from the emperor on their succession, The Marhattds were in pos- session of the entire west and great part of the centre of the peninsula; while the rich and unwarlike province of Bengal, though governed by an hereditary line of nawdbs founded by Murshid Kuli Khan in 1704, still continued to pour its wealth into the imperial treasury. The central authority never recovered from the invasion of Nadir Shah in 1739, who carried off plunder variously estimated at from 8 to 30 millions sterling The Marhattds closed round Delhi from the south, and the Afghans from the west. The victory of Panipat, won by Ahmad Shah Durdni over the united Marhatté confederacy in 176], gave the~~

~~*Mahometans one more chance of rula But Ahmad Shaéh had no ambition to found a dynasty of his own, nor were the British in Bengal yet ready for territorial conquest. ShdAh Alam, the lineal heir of the Mughal line, was thus permitted to ascend the throne of Delhi, where he lived during the great part of a long life as a puppet in the hands of Mahddaji Sindhia) He was succeeded by Akbar II, who lived similarly under the shadow of British protection, Last of all came Bahadur Shah, who atoned for his association with the mutineers in 1857 by banish- ment to Burmah. Thus ended the Mughal line, after a ps which covers three hundred and thirty years. ih ahometan rule remodelled the revenue system, and has left behind forty millions of Musalmans in British India. .*~~

~~*INDIA*~~

~~*[uistory.*~~

~~*Early European Settlements.*~~

~~*Mahometan invaders have always entered India from the north-west. Her new conquerors approached from tlie sea and from the south. From the time of Alexander to that of Vasco da Gama, Europe had enjoyed little direct inter- course with the East. An occasional traveller brought back stories of powerful kingdoms and of untold wealth ; but the passage by sea was unthought of, and by land many wide deserts and warlike tribes lay between. Cora- merce, indeed, never ceased entirely, being carried on chiefly by the Italian cities on the Mediterranean, which traded to the ports of the Levant. But to the Europeans of the 15th century India was practically an unknown land, which powerfully attracted the imagination of spirits stimu- lated by the Renaissance, and ardent for discovery. All the learning on this subject has been collected by Dr Birdwood in his admirable Z2eport on the Old Records of the India Office (1879), from which the present section is largely borrowed. In 1492 Christopher Columbus set sail under the Spanish flag to seek India beyond the Atlantic, bearing with him a letter to the great khan of Tartary. The expedi- Vasco da tion under Vasco da Gama started from Lisbon five years Gama. later, and, doubling the Cape of Good Hope, cast anchor off the city of Calicut on the 20th May 1498, after a pro- longed voyage of nearly eleven months. From the first Da Gama encountered hostility from the " Moors," or rather*~~

~~*Arabs, who monopolized the sea-borne trade ; but he seems to have found favour with the zamorin, or HIndn raja of Malabar. It may be worth while to recall the contem- porary condition of India at that epoch. An Afghan of the Lodi dynasty was on the throne of Delhi, and another Afghan king was ruling over Bengal. Ahmadabdd in Guzerat, Gulbargah, Bijapur, Almadnagar, and Ellichpur in the Deccan were each the capital of an independent Mahometan kingdom ; while the Hindu raja of Vijayanagar was recognized as paramount over the entire south, and was perhaps the most powerful monarch to be found at that time in all India. Neither Mughal nor Marhatté had yet appeared above the political horizon.*~~

~~*After staying nearly six months on the Malabar coast, Da Gama returned to Europe by the same route as he had come, bearing with him the following letter from the zamorin to the king of Portugal: 'Vasco da Gama, a nobleman of your household, has visited my kingdom and has given me great pleasure. In my kingdom there is abundance of cinnamon, cloves, ginger, pepper, and precious stones. What I seek from thy country is gold, silver, coral, and scarlet." The arrival of Da Gama at Lisbon was celebrated with national rejoicings scarcely less enthusiastic than lad greeted the return of Columbus. If the West Indies belonged to Spain by priority of discovery, Portugal might claim the East Indies by the same right Territorial ambition conspired with the spirit of proselytism and with the greed of commerce to fill all Portuguese minds with the dream of a mighty Oriental empire. The early portu. Portuguese discoverers were not traders or private adven- guese ex- turers, but admirals with a royal commission to conquer peditions. territory and promote the spread of Christianity A second expedition, consisting of thirteen ships and twelve hundred soldiers, under the command of Cabral, was despatched in 1500. "The sum of his instructions was to begin with preaching, and, if that failed, to proceed to the sharp determination of the sword." On his outward voyage Cabral was driven by stress of weather to the coast of Brazil. Ultimately he reached Calicut, and established factories both there and at Cochin, in the face of active hostility from the natives. In 1502 the king of Portugal obtained from Pope Alexander VI. a bull constituting him "Jord of the navigation, conquests. and trade of Ethiopia,*~~

~~*Albu- querque.*~~

~~*Arabia, Persia, and India." In that year Vasco da Gama sailed again to the East, with a fleet numbering twenty vessels, He formed an alliance with the rdjds of Cochin and Cananore against the zamorin of Calicut, and bombarded the latter in his palace. In 1503 the great Alfonso d'Albuquerque is first heard of, as in com- mand of one of three expeditions from Portugal. In 1505 a large fleet of twenty-two sail and fifteen thousand men was sent under Francisco de Almeida, the first Portuguese governor and viceroy of India. In 1509 Albuquerque succeeded as governor, and widely extended the area of Portuguese influence. Having failed in an attack upon Calicut, he seized Goa, which has ever since remained the capital of Portuguese India. Then, sailing round Ceylon, he captured Malacca, the key of the navigation of the Indian archipelago, and opened a trade with Siam and the Spice Islands. Lastly, he sailed back westwards, and, after penetrating into the Persian Gulf and the Red Sea, returned to Goa only todiein 1515. In 1524 Vasco da Gama came out to the East for the third time, and he too died at Cochin. For exactly a century, from 1500 to 1600, the Portuguese enjoyed a monopoly of Oriental trade.*~~

~~*'*From Japan and the Spice Islands to the Red Sea and the Cape of Good Hope, they were the sole masters and dispensers of the treasures of the east; while their possessions along the Atlantic coast of Africa and in Brazil complete their maritime empire. But they never commanded the necessary resources either of military strength or personal character for its maintenance and defence. They were also in another way unprepared for the commerce of which they thus obtained the control. Their national character had been formed in their secular contest with the Moors, and above all things they were knights errant and crusaders, who looked on every pagan as an enemy at once of Portugal and of Christ. It is impossible for any one who has not read the contemporary narratives of their discoveries and conquests to conceive the grossness of the superstition and the cruelty with which the whole history of their exploration and subjugation of the Indies is stained. Albuquerque alone endeavoured to conciliate the good will of the natives, and to live in friendship with the Hindu princes, who were naturally better pleased to have the Portuguese, as governed by him, for their neigh- bours and allies than the Mahometans*~~

~~*whom he had expelled or sub- dued. The justice and magnanimity of his rule did as much to extend and confirm the power of the Portuguese in the East as the courage and success of his military achievements ; and in such veneration was his memory held by the Hindus, and even by the Mahometans, in Goa that they were accustomed to repair to his tomb, aud there utter their complaints, as if in the presence of his shade, and call upon God to deliver them from the tyranny of his successors. The cruelties of Soarez, Sequeyra, Menezes, Da Gama, and succeeding viceroys drove the natives to desperation, and encouraged the toe of western India in 1567 to form a league against the*~~

~~*»ortuguese, in which they were at once joined by the king of Achin. Their undisciplined armies were not able to stand against the veteran soldiers of Portugal, 200 of whom, at Malacca, utterly routed and put to flight a force of 15,000 of the enemy. When, in 1578, Malacca was again besieged by the king of Achin, the sinall garrison of Portuguese succeeded in inflicting a loss on him of 10,000 men and all his cannon and junks. Twice again, in 1615 and for the last time in 1628, it was besieged, and on each occasion the Achinese were repulsed with equal bravery and good fortune. But these incessant attacks on the Portuguese evinced the decline of their empire, while the increased military forces sent ont to the East proved an insupportable drain on the revenues and population of Portugal.*~~

~~*"*In 1580 the crown of Portugal, consequent on the death of King Sebastian, became united with that of Spain, under Philip I1.,—an event which proved the last fatal blow to the maritime and commer- cial supremacy of Portugal. It proved fatal in many ways, but chiefly because the interests of Portugal in Asia were subordinated to the European interests of Spain. In 1640 Portugal again becaine a separate kingdom, but in the meanwhile the Dutch and English had appeared in the Eastern Seas, and before their indomitable com- petition the Portuguese trade and dominion of the Indies withered away as rapidly as it had sprung up. 'The period of the highest development of Portuguese commerce was probably from 1590 to 1610, on the eve of the subversion of their political power by the Dutch, and when their political administration in India was at its lowest depth of degradation. At this period a single fleet of Portu- guese merchantmen sailing from Goa to Cambay or Surat would number as many*~~

~~*as 150 or 250 'carracks.' Now only oue Portu- guese ship sails from Lisbon to Goa in the year."*~~

~~*INDIA*~~

~~*OT*~~

~~*The ouly remaining Portuguese possessions in India are Goa, Daman, and Diu, all on the west coast, with an area of 1086 square miles and a population of 407,712 souls. The general census of 1871 also returned 426 Portuguese dwelling in British India, not including those of mixed descent, of whom about 30,000 are found in Bombay and 20,000 in Bengal, chiefly in the neighbourhood of Dacca and Chittagong. he latter are known as Firinghis ; and, excepting that they retain the Roman Catholic faith and European surnames, are scarcely to be distinguished either by colour or by habits of life from the natives among wliom they live.*~~

~~*The Dutch were the first European nation to break Dutch through the Portuguese monopoly. During the 16th cen- settle- tury Bruges, Antwerp, and Amsterdam became successively ™ents.*~~

~~*the great emporia whence Indian produce, imported by the Portuguese, was distributed to Germany and even to England. At first the Dutch, following in the track of the English, attempted to find their way to India by sailing round the north coasts of Europe and Asia. William Barents is honourably known as the leader of three of these arctic expeditions, in the last of which he perished. The first Dutcliman to double the Cape of Good Hope was Cornelius Houtman, who reached Sumatra and Bantam in 1596. Forthwith private companies for trade with the East were formed in many parts of the United Provinces, but in 1602 they were all amalgamated by the states-general into "The Dutch East India Company." Within a few years the Dutch had established factories on the continent of India, in Ceylon, in Sumatra, on the Persian Gulf, and on the Red Sea, besides having obtained exclusive possession of the Moluccas. In 1618 they laid the foundation of the city of Batavia in Java, to be the seat of the supreme government of the Dutch possessions in the Fast Indies, which had previously been at Amboyna. At about the same time they discovered the coast of Australia, and in North America founded the city of New Amsterdam or Manhattan,*~~

~~*now New York. During the 17th century the Dutch maritime power was the first in the world. The massacre of Amboyna in 1623 led the English East India Company to retire from the Eastern seas to the continent of India, and thus, though indirectly, contributed to the foundation of the British Indian empire. The long naval wars and bloody battles between the English and the Dutch within the narrow seas were not terminated until William of Orange united the two crowns in 1689. In the far East the Dutch ruled without a rival, and gradually expelled the Portuguese from almost all their territorial possessions. In 1635 they occupied Formosa; in 1640 they took Malacca, a blow from which the Portuguese never recovered ; in 1651 they founded a colony at the Cape of Good Hope, as a half-way station to the East; in 1658 they captured Jaffnapatam, the last stronghold of the Portuguese in Ceylon; in 1664 they wrested from the Portuguese all their earlier settlements on the pepper-bearing coast of Malabar. The rapid and signal downfall of the Dutch colonial empire is to be explained by its short-sighted commercial policy. It was deliberately based upon a monopoly of the trade in spices, and remained from first to last destitute of the true imperial spirit, Like the Phoenicians of old, the Dutch stopped short of no acts of cruelty towards their rivals in commerce ; and, like the Phcenicians, they failed to introduce a respect for their own higher civilization among the natives with whon they came in contact. The knell of Dutch supremacy was sounded by Clive, when in 1758 he attacked the Dutch at Chinsurah both by land and water, and forced them to an ignominious capitulation. In the great French war from 1781 to 1811 England wrested from Holland every one of her colonies, though Java was restored in 1816 and Sumatra in exchange for Malacca in 1824, At the present time the Dutch flag flies nowhere on the mainland of India, though the quaint houses and regular canals at Chinsurah, at Negapatam, at Jaffnapatam, and at*~~

~~*English maritime expedi-*~~

~~*tions.*~~

~~*Overland enthusiasm in England to trade directly with India. expedi- 1583 three English merchants, Ralph Fitch, James New-*~~

~~*tions.*~~

~~East India Com-~~

~~pany.~~

~~any petty ports on the Coromandel and Malabar coasts, ac a lk: of familiar scenes in the Netherlands. In the census of 1872 only seventy Dutchmen were enumerated throughout the whole of India.~~

~~The earliest English attempts to reach India were made by the North-West Passage. In 1496 Henry VII. granted letters patent to John Cabot and his three sons (of wliom one was the better known Sebastian) to fit out two ships for the exploration of that route. They failed, but discovered the island of Newfoundland, and sailed along the coast of America from Labrador to Virginia. In 1553 the ill-fated Sir Hugh Willoughby attempted to force a passage along the north of Europe and Asia, the successful accomplishment of which has been reserved for a Swedish savant of our own generation. Sir Hugh perished miser- ably, but his second in command, Chancellor, reached a harbour on the White Sea, now Archangel. Thence he penetrated by land to the court of the grand-duke of Moscow, and laid the foundation of "the Russia Company for carrying on the overland trade between India, Persia, Bokhara, and Moscow." Many subsequent attempts were made at the North-West Passage from 1576 to 1616, which have left on our modern maps the imperishable names of Frobisher, Davis, Hudson, and Baffin. Meanwhile, in 1577, Sir Francis Drake had circumnavigated the globe, and on his way home had touched at Ternate, one of tlie Moluccas, the king of which island agreed to supply the English nation with all the cloves it produced. "The first Englishman who actually visited India was Thomas Stephens, in 1579, unless there be any foundation in fact for the statement of William of Malmesbury, that in the year 883 Sighelmus of Sherborne, being sent by King Alfred to Rome with presents to the pope, proceeded from thence to the East Indies to visit the tomb of St Thomas at Mylapore (Mailapur, also called Saint Thomé, a suburb of Madras), and brought back with him a quantity of jewels and spices. Stephens was educated at New College, Oxford, and was rector of the Jesuits' College in Salsette. His letters to his father are said to have roused great In~~

~~*berry, and Leedes, went out to India overland as mer- cantile adventurers, The jealous Portuguese threw them into prison at Ormuz, and again at Goa. At length Newberry settled down as a shopkeeper at Goa, Leedes entered the service of the Great Mughal, and Fitch, after a lengthened peregrination in Ceylon, Bengal, Pegu, Siam, Malaeea, and other parts of the East Indies, returned to England."*~~

~~*The defeat of the "Invincible Armada" in 1588, at which time the crowns of Spain and Portugal were united, gave a fresh stimulus to maritime enterprise in England; and the suecessful voyage of Cornelius Houtman in 1596 showed the way round the Cape of Good Hope into waters hitherto monopolized by the Portuguese.*~~

~~*The foundation of the English East India Company was on this wise :—"In 1599 the Dutch, who had now firmly established their trade in the East, having raised the price of pepper against us from 3s. per tb to 6s. and 8s., the merchants of London held a meeting on the 22d September at Founders' Hall, with the lord mayor in the chair, and agreed to form an association for the urpose of trading directly with India. Queen Elizabeth also sent Sir John Mildenhall by Constantinople to the Great Mughal to apply for privileges for the English company, for which she was then preparing a charter, and on the 31st December 1600 the English East India Company Was Incorporated by royal charter under the title of 'The Governor and Company of Merchants of London trading to the East Indies.' " The original company had only one hundred and twenty-five share- holders, and a capital of £70,000, which was raised to £400,000 in 1612, when voyages were first undertaken on the joint-stock account. Courten's association, known also as "'The Assada Merchants," from a factory founded by them in Madagascar, was established in 1635 but, after a period of internecine rivalry, united with the London*~~

~~*IN DP EA*~~

~~*[HISTORY.*~~

~~*Company in 1650. In 1655 the "Company of Merchant Adven- turers" obtained a charter from Cromwell to trade with India, but united with the original company two yeurs later. A more formidable rival subsequently*~~

~~appeared in the English company, or '*General Society trading to the Kast Indies,' which was incorpor- ated under powerful patronage in 1698, with a capital of 2 millions sterling. According to Evelyn, in his Diary for March 5, 1698, "the old East India Company lost their business against the new company by ten votes in parliament, so many of their friends being absent, going to see a tiger baited by dogs." However, a com- promise was speedily effected through the arbitration of Lord Godolphin in 1702, and the London and the English companies were finally amalgamated in 1709, under the style of "The United Company of Merchants of England trading to the East Indies." At the same time the Company advanced a loan to the state of £38,190,000 at 3 per cent. interest, in consideration of the exclusive privilege to trade to all places between the Cape of Good Hope and the Straits of Magellan.~~

~~The early voyages of the Company, from 1600 to 1612, are distin- guished as the "separate voyages," twelve in number. The sub- scribers individually bore the expenses of each voyage, and reaped the whole profits. With the exception of the fourth, all these separate voyages were highly prosperous, the profits hardly ever falling below 100 per cent. After 1612 the voyages were conducted on the joint-stock account.~~

~~The following chronological sketch of the progress of the Company in the East is quoted almost verbatim from Dr Birdwood's valuable report :—~~

~~TeThe English were everywhere opposed from the first, as the English Dutch had been, by the Portuguese ; but James Lancaster succeeded settle- in the first voyage (1602) in establishing commercial relations with ments. the king of Achin, and at Priaman in the island of Sumatra, and with the Moluccas, and at Bantam, where he settled a factory or 'House of Trade' in 1603. In 1604 the Company undertook their second voyage, commanded by Sir Henry Middleton, who extended their trade to Banda and Aniboyna, The success of these voyages was so great that it induced a number of private merchants to endeavour to obtain a participation in the trade; and in 1606 James I. granted a licence to Sir Edward Michelborne and others to trade 'to Cathay, China, Japan, Corea, and Cambaya.' Michelborne, however, on arriving in the East, instead of exploring new sources of commerce as the East India Company were doing, followed the pernicious example of the~~

~~*Portuguese in plundering the native traders among the islands of the Indian Archipelago. He in this way secured a considerable booty, but brought great disgrace on the British name, and much hindered the Company's business at Bantam. In 1608 Captain D. Middleton, in command of the fifth voyage, was prevented by the Dutch from trading at Banda, but succeeded in obtaining a cargo at Pulo Way. In that yearalso Captain Hawkins in the third voyage, commanded by Captain Keeling, proceeded from Surat as envoy from James I. and the East India Company to the court of the Great Mughal. He was graciously received by the emperor (Jahangir), and remained three years at Agra. In 1609 Captain Sharpey, who had conducted the fourth voyage, obtained the grant of free trade at Aden, and a cargo of pepper at Priaman. In that year also the Company constructed the dockyard at Deptford, —which was the beginning, observes Sir William Monson, 'of the increase of great ships in England.' In 1611 Sir Henry Middleton, in command of the sixth voyage, arrived before Cambay, and resolutely fought the Portuguese, who tried to beat him off, and obtained some important concessions from the native powers. In 1610-11 also Captain Hippon, commanding the seventh voyage, succeeded in establishing agencies at Masuli- patain and in Siam, and at Patania or Patany on the Malay peninsula, and a factory at Pettipollee.*~~

~~*"In 1614 the Company's fleet, of the tenth voyage, under Captain Best, was attacked off Swalley, the port of Surat, at the mouth of the river Tapti, by an overwhelming force of Portuguese, who were utterly defeated in four successive engagements, to the great astonishment of the natives, who had hitherto considered them to be invincible. The first fruit of that decisive victory was the Surat settlement of a factory at Surat, with subordinate agencies at Gogra, factory. Ahmadabad, and Cambay. Trade was also opened with the Persian Gulf. In 1614 an agency was established by Mr Edwards of the Surat factory at Ajmir. In 1615 Sir Thomas Roe was sent out by James I. as ambassador to the court of Jahangir, and succeeded in placing the Company's trade in the Mughal dominions on a more favourable footing. The factory at Surat was the chief seat of the Company's government in western India until the presidency was trausferred to Bombay in 1685. In 1618 the English established a factory at Mocha, while the Dutch compelled them to resign all pre- tensions to the Spice Islands. In that year also the Company failed in its attempt to open a trade with Dabul,*~~

~~*Baticola, and Calicut, through a want of sincerity on the part of the zamorin. In 1619 it was permitted to settle a factory and build a fort at Jask, in the Persian Gulf.*~~

~~*"Tn 1619 also the ' Treaty of Defence' with the Dutch, to prevent*~~

~~*Dutch and Portu- guese rivalries.*~~

~~*HISTORY. |*~~

~~*disputes between the English and Dutch companies, was ratified. When it was proclaimed in the East, hostilities solemnly ccased for the space of an hour, while the Dutch and English fleets, dressed out in all their flags and with yards manned, saluted each other ; but the treaty ended in the smoke of that stately salutation, and perpetual and fruitless contentions between the Dutch and English companies went on the same as ever, Up to that time the English company did not possess any portion of territory in sovereign right in the Indies, excepting in the island of Lantore or Great Banda. That island was governed by a commercial agent of the Company, who had under him thirty Europeans as clerks, over- seers, and warehousemen ; and these, with two hundred and fifty armed Malays, constituted the only force by which it was protected.*~~

~~*'In the islands of Banda and Pulo Roon and Rosengyn the Company*~~

~~*English factories.*~~

~~*Hooghly factory.*~~

~~*possessed factories, in each of which were ten agents. At Macassar and Achin also they possessed factories or agencies, the whole being subordinate to Bantam. Such was the precarious situation of the English Company in the East at the commencement of their long struggle for commercial equality with the Dutch, whose ascendency in the Indian Archipelago was already firmly established on the basis of territorial dominion and authority. In 1620 the Dutch, notwith- standing the Treaty of Defence concluded the previous year, expelled the English from Pulo Roon and Lantore, and in 1621 from Bantam. The fugitive factors attempted to*~~

~~*establish themselves first at Pulicat and afterwards at Masulipatam on the Coromandel coast, but were effectually opposed by the Dutch. In 1620 also the Portuguese made an attack upon the English fleet under Captain Shillinge, but were again defeated with great loss, and from that tiie the estima- tion in which the Portuguese were held by the natives of India steadily declined, while that of the English was proportionately raised. In that year the Company established agencies at Agra and Patna. In 1622 the English, joining with the Persians, attacked and took Ormuz from the Portuguese, and obtained from Shah Abbas a grant in perpetuity of the customs of Gombroon. This was the first time that the English took the offensive against the Portuguese. In the same year the Company succeeded in re-establishing their factory at Masulipatam.*~~

~~*"On the 17th February 1623 occurred the 'Massacre of Amboyna ;' and from that time the Dutch remained masters of Lantore and the neighbouring islands, and of the whole trade of the Indian Archipelago, until these islands were recaptured by the English in the great naval wars which commenced in 1793. In 1624 the English, unable to oppose the Dutch, withdrew nearly all their factories from the Archipelago, the Malay peninsula, Siam, and Japan. Soine of the factors and agents retired to the island of Lagundy in the Strait of Sunda, but were forced, by its unhealthi- ness, to abandon it.*~~

~~*"In 1625-26 a factory was established at Armagdon on the Coro- mandel coast, subordinate to Masulipatam ; but in 1628 Masulipatam was, in consequence of the oppressions of the native governor, for a time abandoned in favour of Armagdon, which then mounted twelve guns and had twenty-three factors and agents. In 1629 the factory at Bantam was re-established as an agency subordinate to Surat; and in 1630 Armagéon, reinforced by twenty soldiers, was placed under the presidency of Surat. In 1632 the factory was re-estab- lished at Masulipatam, bya firman, known as the 'Golden Firman,' from the king of Golconda. In 1634, by a firman dated February 2, the Company obtained from the Great Mughal liberty to trade in Bengal, without any other restriction than that their ships were to resort only to Pippli in Orissa. The Portuguese were in the same year expelled from Bengal. In 1634-35 Bautam was again raised toan independent presidency, and an agency was established at Tatta, or 'Scindy.' In 1637*~~

~~*Courten's Association (chartered 1635) settled agencies at Goa, Baticola, Karwar (Carwar), Achin, and Rajapur. Its ships had in 1636 plundered some native vessels at Surat and Diu, which disgraced the Company with the Mughal authorities (who could not comprehend the distinction between the Company and the Association), and depressed the English trade with Surat, while that of the Dutch proportionately increased. In 1638 Armagdon was abandoned as unsuited for com- merce ; and in 1639-40 Fort St George, Maderaspatam (' Chince- patam '), was founded by Francis Day, and the factors at Armagdon were at once removed to it. It was made subordinate to Bantam, until raised in 1683 to the rank of a presidency. In 1640 the Company established an agency at Bussorah, and a factory at Karwar. Trade having much extended, the Company's yard at Deptford was found too small for their ships, and they pur- chased some copyhold ground at Blackwall, which at that time was a waste marsh, without an inhabitant; and there they opened another dockyard, in which was bnilt the ' Royal George,' of 1200 tons, the largest ship yet seen in England. In 1642 the factories at Balasore and Hugli (Hooghly) were established. im 1645, in consequence of services rendered by Dr Gabriel Broughton, surgeon of the ' Hopewell,' to the emperor Shah Jahan, additional privileges were granted to the Company ; and in 1646 the governor of Bengal, who had also been professionally benefited by Broughton, made con- cessions Which placed the factories at Balasore and Hooghly on a*~~

~~*END IgA*~~

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~~*more favourable footing. In 1647 Courten's Association established its colony at Assada, in Madagascar. In 1652 Cromwell declared war against the Dutch on account of their accumulated injuries against the Company. In 1653 the Company's factory at Lucknow was withdrawn. No record has been found of its establishment. In 1658 the Company established a factory at Kasimbazar (Cossim- bazar, ' Castle Bazaar'), and their establishments in Bengal were made subordinate to Fort St George instead of Bantam.*~~

~~*"In 1661 Bombay was ceded to the British crown as dower of Catharine of Braganza. It was not delivered u Portuguese until 1665, and was transferred to the East Tile Com- pany in 1668. The seat of the western*~~

~~*presidency was removed to it from Surat in 1685. At that time the Company's establishments in the East Indies consisted of the presidency of Bantam, with its dependencies of Jambee, Macassar, and other places in the Indian Archipelago ; Fort St George and its dependent factories on the Coromandel coast and Bengal; and Surat, with its affiliated dependency of Bombay, and factories at Broach, Alimadabad, and other places in western India, and at Gombroon and Bussorah in the Persian Gulf and Euphrates valley. In that year also (1661) the factory at Biliapatam was founded. In 1668 the factories which had been established at Patna, Balasore, and Késimbazar were ordered to be discontinued, and purchases made only at Hooghly. In 1664 Surat was pillaged by Sivaji, but Sir George Oxenden bravely defended the English factory ; and the Mughal emperor, in admiration of his conduct, granted the Company an exemption from customs for one year.*~~

~~*'In 1681 Bengal was separated from Madras, and Mr Hodges appointed 'agent and governor' of the Company's affairs 'in the Day of Bengal, and of the factories subordinate to it at Kasimbazar, Patna, Balasore, Maldah, and Dacca. A corporal of approved fidelity, with twenty soldiers, was to be a guard to the aget's person at the factory of Hooghly, and to act against interlopers,' In 1683 Fort St George (Madras) was constituted a presidency. In 1684 Sir John Child was made 'captain-general and admiral of India,' and Sir John Wyborne 'vice-admiral and deputy governor of Bombay ;' and in 1685 the seat of the presidency was transferred from Surat to Bombay. In 1686 the factory at Hooghly was much oppressed by the governor of Bengal, and the Company's business in India generally suffered from the wars of the Mughals and Marhattds, Sir John Child was therefore appointed ' governor-general,' with full power in India to make war or peace, and ordered to proceed to inspect the Company's possessions in Madras and Bengal, and arrange for their safety. On the 20th of December the Company's agent and council quitted the open factory at Hooghly, and retired to Sutanati (Cal- cutta), Tegnapatam (Fort St David) was first settled in this year (1686), and definitively established in 1691-92. In 1687 the Company retired from all its factories and agencies in Bengal to Madras, but established the settlement of Fort York at Bencoolen. In 1689 the Company's factories at Vizagapatam and Masulipatam were seized by the Mahometans, and the factors massacred. It was in 1689 also that at last*~~

~~*the Company determined to consolidate their posi- tion in India on the basis of territorial sovereignty, in order to acquire the political status of an independent power in their relations with the Mughals and Marhattds. To this end they passed the following resolution for the guidance of the local governments in India:—' The increase of our revenue is the subject of our care, as much as our trade ; 'tis that must maintain our force when twenty accidents may interrupt our trade ; 'tis that must make us a nation in India; without that we are but a great number of interlopers, united by His Majesty's royal charter, fit only to trade where nobody of power thinks it their interest to prevent us; and upon this account it is that the wise Dutch, in all their general advices that we have seen, write ten paragraphs concerning their government, their civil and military policy, warfare, and the increase of their revenue, for one paragraph they write concerning trade.'"*~~

~~*It will be convenient to refer in this place to the other European nations who attempted at various times to open trade with the East. The Portuguese at no time attempted to found a company, but always maintained their Eastern trade as a royal monopoly. The first incorporated company was the English, established in 1600, which was quickly followed by the Dutch in 1602. The Dutch conquests, however, were made in the name of the state, and rank as national colonies, not as private possessions.*~~

~~*1642, the fifth (Colbert's) in 1644. the union of the French Hast and West India, Senegal, and China companies under the name of "The Company of the Indies," in 1719. The exclusive privileges of the company were, by the king's decree, suspended in 1769, and the cone was final)*~~

~~*abolished by the National Assembly in 1796. The first Danis*~~

~~*East India Company was founded in 1612, and the second in 1670. The settlements of Tranquebar and Serampur were both founded in 1616, and acquired by the English by purchase from Denmark in 1845. Other Danish settlements on the mainland of India were Porto Novo, and Eddova and Holcheri on the Malabar coast. The com-*~~

~~*part of the Acquisi- by the tion of*~~

~~*Next came the French French, whose first East India Company was formed in 1604, the and second in 1611, the third in 1615, the fourth (Richelieu's) in Danish The sixth was formed by factories,*~~

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~~*pany founded by the Scotch in 1695 may be regarded as having been still-born ; and the " Royal Company of the Philippine Islands, incorporated by the king of Spain in 1733, had little to co with India proper ; of more importance, though but short-lived, was : I he Ostend Company," incorporated by the emperor of Austria in 1728, sts factors being chiefly persons who had served the Datch and Englisheompanies. But the opposition of the maritime powers foreed the court of Vienna in 1727 to suspend the company's charter for seven years. The Ostend company, after passing throngh a very trying existence, prolonged through the desire of the Austrian Government to participate in the growing East India trade, became bankrupt in 1784, and was finally extinguished by the regulations which were prescribed on the renewal of the English East India Company's charter in 1793. The last nation of Europe to engage in maritime trade with India was Sweden. When the Ostend company was suspended, a number of its servants were thrown out of employment, of whose special knowledge of the Hast Mr Henry Koning, of Stockholm, took advantage, obtaining a charter for the '"'Swedish Company," dated June 13, 1731. This company was reorganized in 1806, The extent to which foreign nations now earry on direct dealings with India may be inferred approximately from the following figures, taken from the census report of 1871. There were then in British India about 8000 inhabitants of conti- nental Europe ; but of these the nationality of only 2628 was more particularly specified, chiefly in Bengal. Germans numbered 759, French, 631; Portuguese, 426 ; Italians, 282 ; Greeks, 127; Swedes, 73; Russians, 72; Dutch, 70; Norwegians, 58; Danes, 45 ; Spaniards, 32; Belgians, 20 ; Swiss, 19; Turks, 18.*~~

~~*British Empire (1765 to 1881). The political history of the British in India begins in*~~

~~*the 18th ceutury with the French wars in the Carnatic. Fort St George, the nucleus of Madras, was their earliest territorial possession, properly so called, in India, having been founded by Thomas Day in 1639. The land on*~~

~~which it stood, with an area round of about 5 miles in length by 1 mile in breadth, was purchased from the raja of Chandragiri, who claimed to be the lineal descendant of the Hindu emperors of Vijayanagar. 'The French settlement of Pondicherri, about 100 miles lower down the Coronandel coast, was established in 1672, and for many years the English and French traded side by side, without either active rivalry or territorial ambition, The English, especi- ally, appear to have been submissive to the native powers at Madras no less than in Bengal. They paid their annual rent of 1200 pagodas (say £500) to the deputies of the Mughal empire, when Aurangzeb annexed the south, and on two several occasions bought off a besieging army with a heavy bribe.~~

~~On the death of Aurangzeb in 1707, the whole of southern India became practically independent of Delhi. In the Decean Proper, the Nizdm-ul-Mulk founded an independent dynasty, with Hyderabad for its capital, which exercised a nominal sovereignty over the entire south, The Carnatic, or the lowland tract between the central plateau and the eastern sea, was ruled by a deputy of the nizim, known as the nawdb of Arcot, who in his turn asserted claims to hereditary sovereignty. Further south, Trichinopoli was the capital of a Hindu raja, and Tanjore formed another Hindu kingdom under a degenerate descendant of the line of Sivaji. Inland, Mysore was gradually growing into a third Hindu state, while every- where local chieftains, called pdlegdrs or natks, were in semi-independent possession of citadels or hill-forts.~~

~~In that condition of affairs the flame of war was kindled between the English and the French in Europe in 1745. Dupleix was at that time governor of Pondicherri, and Clive was a young writer at Madras. An English fleet first appeared on the Coromandel coast, but Dupleix by a judicious present induced the nawab of Arcot to interpose and prevent hostilities. In 1746 a French squadron arrived, under the command of La Bourdonnais. Madras 'surrendered almost without a blow, and the only settle- ment left to the English was Fort St David, a few miles south of Pondicherri, where Clive and a few other fugi-~~

~~*tives sought shelter. The nawdb, faithful to his policy of impartiality, marched with 10,000 men to drive the French out of Madras, but he was signally defeated by a French force of only four hundred men and two guns. In 1748 an English fleet arrived under Admiral Boscawen*~~

~~*and attempted the siege of Pondicherri, while a land force*~~

~~*co-operated under Major Lawrence, whose name afterwards became associated with that of Clive. The French success- fully repulsed all attacks, and at last peace was restored by the treaty of Aix-la-Chapelle, which gave back Madras to the English (1748).*~~

~~*The first war with the French was merely an incident in the greater contest in Europe. The second war had its origin in Indian politics, while England and France were at peace. The easy success of the French arms had inspired Dupleix with the ambition of founding a French empire in India, under the shadow of the existing Mahometan powers. Disputed successions at Hyderabad and at Arcot supplied him with the opportunity that he lacked. On both thrones he placed nominees of his own, and for a short time posed as the supreme arbiter of the entire south. In boldness of conception, and in knowledge of Oriental diplomacy, Dupleix has had probably no rival. But he was no soldier, and he was destined in that sphere to encounter the "heaven-born genius" of Clive. For the English of Clive. Madras, under the instinct of self-preservation, were com- pelled to maintain the cause of another candidate to the throne of Arcot in opposition to the nominee of Dupleix. This candidate was Muhammad Al, afterwards known in history as Wala-jah. The war that then ensued between the French and English, each with their native allies, has been exhaustively described in the-pages of Orme. The one incident that stands ont conspicuously is the capture and subsequent defence of Arcot by Clive in 1751. This heroic feat, even more than the battle of Plassey, established the reputation of the English for valour throughout India. Shortly afterwards Clive returned to England in ill-health, but the war continued fitfully for many years. On the whole, English influence predominated in the Carnatic, and their candidate, Muhammad Alf, maintained his position at Arcot. But the French were no less supreme in the Deccan, whence they were able to take possession of the coast tract called "the Northern Circars." The final struggle was postponed*~~

~~until 1760, when Colonel (after- wards Sir Eyre) Coote won the decisive victory of Wandewash over the French general Lally, and proceeded to invest Pondicherri, which was starved into capitulation in January 1761, A few months later the hill-fortress of Gingee (Chenji) also surrendered. In the words of Orme, "That day terminated the long hostilities between the two rival European powers in Coromandel, and left not a single ensign of the French nation avowed by the authority of its Government in any part of India,"~~

~~Meanwhile the interest of history shifts with Clive to Bengal. The first English settlement in that part of India was Pippli in Orissa, to which the East India Company was permitted to trade in 1633, six years before the foundatio1 of Madras, The river on which Pippli stood has since silted wp, and the very site of the English settlement is now unknown and undiscoverable. In 1642 factories were opened at Balasore and Hugli (Hooglily), and in 1681 Bengal was erected into a presidency, as yet subject to Madras. The name of Calcutta is not heard of till 1686, Calcutta. when Job Charnock, the chief at Hooghly, was expelled by the deputy of Aurangzeb, and settled lower down the river on the opposite bank. There he acquired a grant of the three petty villages of Sutanati, Gobindpur, and Kalighat (Calcutta), and founded the original Fort William in 1696.~~

~~At the time of Aurangzeb's death in 1707 the nawdb or Bengal governor of Bengal was Murshid Kuli Khan, known also nawébs.~~

~~HISTORY. |~~

~~in European history as Jafar Khan. By birth « Brahman, and brought up as a slave in Persia, he united the adminis- trative ability of a Hindu to the fanaticism of a renegade, Hitherto the capital of Bengal had been at Dacca on the eastern frontier of the empire, whence the piratical attacks of the Portuguese and of the Arakanese or Maghs could be most easily checked. Murshid Kuli Khdn transferred his residence to Murshidabad (Moorshedabad), in the neighbour- hood of Kasimbazar (Cossimbazar), the river port of all the Ganges trade. The English, the French, and the Dutch had each factories at Kasimbdzdr, as well as at Dacca, Patnd4, and Maldah. But Calcutta was the headquarters of the English, Chandarnagar of the French, and Chinsurah of the Dutch, all three towns being situated~~

~~*close to each other in the lower reaches of the Hooghly, where the river is navigable for large ships. Murshid Kuli Khan ruled over Bengal prosperously for twenty-one years, and left his power to a son-in-law and a grandson. The hereditary succession was broken in 1740 by Alt Vardi Khan, who was the last of the great nawdbs of Bengal. In his days the Marhatt4 horsemen began to ravage the country, and the English at Calcutta obtained permission to erect an earth-work, which is known to the present day as the Marhatté ditch. Al Vardi Khan died in 17 56, and was succeeded by his grandson, Sirdj-ud-Daulé (Surajah Dowlah), a youth of only eighteen years, whose ungovern- able temper led to a rupture with the English within two months after his accession. In pursuit of one of his own family who had escaped from his vengeance, he marched upon Calcutta with a large army. Many of the English fled down the river in their ships. The remainder sur- rendered after a feeble resistance, and were thrown as prisoners into the "black hole" or military jail of Fort William, a room about 18 feet square, with only two small windows barred with iron. It was the month of June, in which the tropical heat of Calcutta is most oppres- sive. When the door of the prison was opened in the morning, only twenty-three persons out of one hundred and forty-six were found alive.*~~

~~*The news of this disaster fortunately found Clive returned to Madras, where also was a squadron of king's ships under Admiral Watson. Clive and Watson promptly sailed to the mouth of the Ganges with all the troops that could be got together. Calcutta was recovered with little fight- ing, and the nawdb consented to a peace which restored to the Company all their privileges, and gave them com- pensation for their losses of property. It is possible that matters might have ended here if a fresh cause of hostilities had not suddenly arisen. War had just been declared between the English and French in Europe, and Clive, following the traditions of his early warfare in the Carnatic, attacked and captured Chandarnagar. Sirdj-ud-Daulé, exasperated by that breach of neutrality within his own dominions, took the side of the French. But Clive, again acting upon the policy he had learned from Dupleix, had provided himself with a rival candidate to the throne.*~~

~~*Battle of Undaunted, he marched out to the battlefield of Plassey Plassey. (Paldsi), at the head of about 1000 Europeans and 2100*~~

~~Sepoys, with 9 pieces of artillery. The Mahometan army is said to have consisted of 50,000 foot, 18,000 horse, and 50 pieces of cannon. But there was a traitor in the Mahometan camp in the person of Mir Jafar, who had married a sister of the late nawab, Ali Vardi Khan. The battle was short but decisive. After a few rounds of artillery fire, Surdj-ud-Daula fled, and the road to Murshid- Abad was left open.~~

~~The battle of Plassey was fought on June 23, 1757, an anniversary afterwards remembered when the mutiny was at its height in 1857. History has agreed to adopt this date as the beginning of the British empire in the~~

~~hyp i 2 801~~

~~East; but the immediate results of the victory were comparatively small, and several more hard-won fights were fought before even the Bengalis would admit the superi- ority of the British arms, For the moment, however, all Opposition was at an end. Clive, again following in the steps of Dupleix, placed his nominee, Mir Jafar, upon the masnad at Murshidabad, being careful to obtain a patent of investiture from the Mughal court. Enormous sunis were exacted from Mir Jafar as the price of his elevation. The Company claimed 10,000,000 rupees as compensation for losses; for the English, the Indian, and the Armenian inhabitants of Calcutta there were demanded the sums of 5,000,000, 2,000,000, and 700,000 rupees ; for the squad- ron 2,500,000 rupees, and an equal sum forthe army. The members of the council received the following amounts : —Mr Drake, the governor, and Colonel Clive 280,000 rupees each ; and Mr Becker, Mr Watts, and Major Kilpatrick 240,000 rupees each. The whole amounted to £2,697,750. The English, deluded by their avarice, still cherished extravagant ideas of Indian wealth ; nor would they listen to the ungrateful truth. But it was found that there were no funds in the treasury to satisfy their inordinate demands, and they were obliged to be contented with one- half the stipulated sums, which, after many difficulties, Were paid in specie and in jewels, with the exception of 584,905 rupees. The shares of the council were, however, paid in full, At the same time the naw4b made a grant to the Company of the zamindéri rights over an extensive tract of country round Calcutta, now known as the district of the Twenty-four Parganas. The area of this tract was about 882 square miles, and it paid a permanent revenue~~

~~*or quit rent of about £23,000. The gross rental at first payable to the Company was £53,000, but within a period of ten years it had risen to £146,000, Originally the Com- pany possessed only the zamindéri rights, ie, revenue jurisdiction. The superior lordship, or right to receive the quit rent, remained with the nawab; but in 1759 this also was parted with by the Delhi emperor, the nominal suzerain of the naw4b, in favour of Clive, who thus became the landlord of his own masters, the Company. At that time also Clive was enrolled among the nobility of the Mughal empire, with the rank of commander of 6000 foot and 5000 horse. Clive's jagir, as it was called, subsequently became a matter of inquiry in England, and on his death it passed to the Company, thus merging the zaminddrt in the pro- prietary rights.*~~

~~*In 1758 Clive was appointed by the court of directors the first governor of all the Company's settlements in Bengal. From two quarters troubles threatened, which perhaps Clive alone was capable of overcoming. On the west the shdhzéda or imperial prince, known afterwards as the emperor Shah Alam, with a mixed army of Afghans and Marhattas, and supported by the nawdéb wazir of Oudh, was advancing his own claims to the province of Bengal. In the south the influence of the French under Lally and Bussy was overshadowing the British at Madras. But the name of Clive exercised a decisive effect in both directions. Mir Jafar was anxious to buy off the shahzdda, who had already invested Patna. But Clive in person marched to the rescue, with an army of only 450 Europeans and 2500 sepoys, and the Mughal army dispersed without striking a blow. In the same year Clive despatched a force southwards under Colonel Forde, which recaptured Masuli- patam from the French, and permanently established British influence throughout the Northern Circars, and at the court of Hyderabad. He next attacked the Dutch, the sole European nation that might yet be a formidable rival to the English. He defeated them both by land and water ; and from that time their settlement at Chinsurah existed*~~

~~*only on sufferance. XII.—101*~~

~~*Influence of E.I.C.*~~

~~*Massacre of Patna.*~~

~~From 1760 to 1765, while Clive was at home, the history of the English in Bengal contains little that is creditable. Clive had left behind him no system of government, but merely the tradition that unlimited sums of money might be extracted from the natives by the mere terror of the English name. In 1761 it was found expedient and profitable to dethrone Mir Jafar, the English nawab of Murshiddbad, and substitute his son-in-law, Mir Kaésim, in his place. On that occasion, besides private donations, the English received a grant of the three districts of Bardwan, Midnapur, and Chittagong, estimated to yield a net revenue of halfa million sterling. But Mir Kasim proved to possess a will of his own, and to cherish dreams of independence. He retired from Murshidabad to Monghyr, a strong position on the Ganges, which commanded the only means of communication with the west. There he proceeded to organize an army, drilled and equipped after European models, and to carry on intrigues with the nawdb wazir of Oudh. The actual outbreak of hostilities with the English happened on this wise. The Company's servants claimed the privilege of carrying on private trade throughout Bengal, free from inland dues and all other imposts. The assertion of this claim caused frequent affrays between the customs' officers of the nawab and those traders who, whether falsely or not, represented that they were acting on behalf of the servants of the Company. The nawdballeged that his civil authority was everywhere being set at nought. The majority of the council at Calcutta would not listen to his statements. The governor, Mr Vansittart, and Warren Hastings, then a junior member of council, attempted to effect some compromise. But the controversy had become too hot. The nawab's officers fired upon an English boat, and forthwith all Bengal was in a blaze. A force of 2000 sepoys men in various parts of the province fell into the hands of the Mahometans, and were subsequently massacred. But as soon as regular warfare commenced Mir Kasim met with no more successes. His trained regiments were defeated in two pitched battles by Major Adams, at Gheriah and at Udha-nal4, and he himself took refuge with the nawdb wazir of Oudh, who refused to deliver himup. Thisled to a prolongation of the war. Shah Alam, who had uow succeeded his father as emperor, and Shuja-ud-Dauld, the nawdb wazir of Oudh, united their forces, and threatened Patna, which the English had recovered. A more formid- able danger appeared in the English camp, in~~

~~*the form of the first sepoy mutiny. This was quelled by Major (afterwards Sir Hector) Munro, who ordered twenty-four of the ring- leaders to be blown from guns, an old Mughal punishment. In 1764 Major Munro won the decisive battle of Baxar, which laid Oudh at the feet of the conquerors, and brought the Mughal emperor as a suppliant to the English camp.*~~

~~*Meanwhile the council at Calcutta had twice found the opportunity they desired of selling the government of Bengal to a new nawdb. But in 1765 Clive (now Baron Clive of Plassey, in the peerage of Ireland) arrived at Calcutta, as governor of Bengal for the second time, to settle the entire system of relations with the native powers. Two objects stand out conspicuously in his policy. First, he sought to acquire the substance, though not the name, of territorial power, by using the authority of the Mughal emperor for so much as he wished, and for no more; and, secondly, he desired to purify the Company's service by prohibiting illicit gains, and at the same time guaranteeing a reasonable remuneration from honest sources, In neither respect were the details of his plans carried out by his successors. But the beginning of our Indian administration dates from this second governor- ship of Clive, just as the origin of our Indian empire dates from his victory at Plassey. Clive's first step was to hurry*~~

~~*INDTA*~~

~~*up from Calcutta to Allahabad, and there settle in person the fate of nearly half India.*~~

~~*was cut to pieces at Patna, and about 200 English—*~~

~~*[HisTORY.*~~

~~*Oudh was given back to the nawaéb wazir, ou condition of his paying half a million sterling towards the expenses of the war. The provinces of Allahabad and Kora, forming the greater part of the Dodb, were handed over to Shah Alam himself, who in his turn granted to the Company the diwént or financial administration of Bengal, Behar, and Orissa, and also the territorial jurisdiction of the Northern Circars. A puppet nawdb was still maintained at Murshidaébad, who received an annual allowance of about half a million sterling ; and half that amount was paid to the emperor*~~

~~*as tribute from Bengal. Thus was constituted the dual system of government, by which the English received all the revenues and undertook to maintain an army for the defence of the frontier, while the criminal jurisdiction vested in the nawab. In Indian phraseology, the Company was diwdn and the nawdb was nizim. As a matter of general administration, the actual collection of the revenues still remained for some years in the hands of native officials. In attempting to reorganize and purify the Company's service, Clive undertook a task yet more difficult than to partition the valley of the Ganges. The officers, civil and military alike, were all tainted with the common corruption. Their legal salaries were absolutely insignificant, but they had been permitted to augment them ten and a hundredfold by means of private trade and gifts from the native powers. Despite the united resistance of the civil servants, and an actual mutiny of two hundred military officers, Clive carried through his reforms. Both private trade and the receipt of presents were absolutely prohibited for the future, while a sub- stantial increase of pay was provided out of the monopoly of salt, .*~~

~~*Lord Clive quitted India for the third and last time in Warren 1767. Between that date and the arrival of Warren Hastings Hastings in 1772 nothing of importance occurred in Bengal beyond the terrible famine of 1770, which is officially reported to have swept away one-third of the inhabitants. The dual system of government, however, established by Clive, had proved a failure. Warren Hastings, a tried servant of the Company, distinguished alike for intelligence, for probity, and for knowledge of Oriental manners, was nominated governor by the court of directors, with express instructions to carry out a predeter- mined series of reforms. In their own words, the court had resolved to "stand forth as diwdn, and to take upon themselves, by the agency of their own servants, the entire care and administration of the revenues." In the execu- tion of this plan, Hastings removed the exchequer from Murshidabad to Calcutta, and for the first time appointed European officers, under the now familiar title of collectors, to superintend the revenue collections and preside in the civil courts. The urgency of foreign affairs, and subse- quently internal strife at the council table, hindered Hastings from developing further the system of civil administration, a task finally accomplished by Lord Corn- wallis, e. Though Hastings always prided himself specially upon that reform, as well as upon the improvements he in- troduced into the collection of the revenues from salt and opium, his*~~

~~name will be remembered in history for the boldness and success of his foreign policy. From 1772 to 1774 he was governor of Bengal; from 1774 to 1785 he was the first titular governor-general of India, presiding over a council nominated, like himself, not by the Company, but by an Act of Parliament, known as the Regulating Act. In his domestic policy he was greatly hampered by the opposition of Francis ; but, so far ag regards external relations with Oudh, with the~~

~~Cessions to the Com- pany.~~

~~First Marhat- ta war,~~

~~First Mysore war.~~

~~HISTORY. |~~

~~Marhattds, and with Hyder Ali, compel assent to his own measures.~~

~~Oudh may here be passed over as not the general history of India,~~

~~(vol. xi. p. 512).~~

~~history of that people.~~

~~Sivaji the Great, as already mentioned, died in 1680, while Aurangzeb was still on the throne. Sivaji produced no great names, either among those who continued to be the nominal chiefs of the Marhattd con- federacy, with their capital at Satara, of Kolhapur and Tanjore. hands of the peshw4, or Brahman minister, who founded in his turn an hereditary dynasty at Poona, dating from the beginning of the 18th century. Next rose several Marhatté generals, who, of the peshwd, carved out for themselves independent kingdoms in different parts of India, sometimes far from the original home of the Marhatt4 race. Chief among these generals were the g4ikwdr in Guzerat, Sindhia, and Holkar in Malwa, and the Bhonsla r4jé of Berar and N: dgpur. At one time it seemed probable that the Marhatt4 confederacy would expel the Mahometans even from northern India , but the decisive battle of Panipat, won by the Afghans in 1761, gave a respite to the Delhi empire. The Marhatté chiefs never again united heartily for a common~~

~~*purpose, though they still continued to be the most formidable military power in India, In especial, they dominated over the British settlement of Bombay on the western coast,*~~

~~*which was the last of the three presidencies to feel the lust*~~

~~*of territorial ambition. For more than a hundred years, from its acquisition in 1661 to the outbreak of the first Marhatt4 war in 1775, the English on the west coast possessed no territory outside the island of Bombay and their fortified factory at Surat.*~~

~~*The Bombay Government was naturally emulous to follow the example of Madras and Bengal, and to estab- lish its influence at the court of Poona by placing its own nominee upon the throne. The attempt took form in 1775 in the treaty of Surat, by which Raghunath Rao, one of the claimants to the throne of the peshwa, agreed to cede Salsette and Bassein to the English, in consideration of being himself restored to Poona. 'The military operations that followed are known as the first Marhatté war. Warren Hastings, who in his capacity of governor-general claimed a right of control over the decisions of the Bombay Government, strongly disapproved of the treaty of Surat, but, when war once broke out, he threw the whole force of the Bengal army into the scale. One of his favourite officers, General Goddard, marched across the 'peninsula from sea to sea, and con- quered the rich province of Guzerat almost without a blow. Another, Captain Popham, stormed the rock-fortress of Gwalior, which was regarded as the key of Hindustan. Those brilliant successes atoned for the disgrace of the convention of Wargaum in 1779, when the Marhattds dictated terms to a British force, but the war was protracted until 1782. It was then closed by the treaty of Salbye, which practically restored the status quo. Raghunath Réo, the English claimant, was set aside; Guzerat was restored, and only Salsette and some other small islands were retained by the English.*~~

~~*Meanwhile Warren Hastings had to deal with a more formidable enemy than the Marhattd confederacy. The reckless conduct of the Madras Government had roused the hostility both of Hyder Ali of Mysore and of the nizim of the Deccan, the two strongest Musalman powers in India, who attempted to draw the Marhattds into an*~~

~~*INDIA*~~

~~*he was generally able to His treatment of being material to while the personal aspects of his rule have been fully discussed in a Separate article To explain his Marhatt4 policy, it will be necessary to give a short retrospective sketch of the*~~

~~*The family of*~~

~~*or among the rdjas All real power passed into the*~~

~~*though recognizing the suzerainty*~~

~~*British possessions in the Carnatic. under Colonel Baillie*~~

~~*the walls of Madras.*~~

~~*honour of the English of Wandewash, was*~~

~~*name,*~~

~~*marched south overland to overawe Coote was now an old man, and the by Hyder and his son Tipu (Tippoo). 1782, and peace was finally concluded with Tipt in 1784, on the basis of a mutual restitution of all conquests.*~~

~~*It was Warren Hastings's*~~

~~*for thirteen years, a longer period than any of his successors,*~~

~~*During that time the English lost the American colonies, but in India their reputation steadily rose to its highest was succeeded by Lord Corn-*~~

~~*pitch, Within a year Hastings*~~

~~*803*~~

~~*alliance against the English. The diplomacy of Hastings won over the nizim and the Marhatta rj4 of Nagpur, but the army of Hyder Ali fell like a thunderbolt upon the A strong detachment was cut to pieces at Pollilore,*~~

~~*and the Mysore cavalry ravaged the country unchecked up to For the second time the Bengal army, stimulated by the energy of Hastings, saved the Sir Eyre Coote, the victor sent by sea to relieve Madras with all the men and money available, while Colonel Pearse the r4j4 of Berar and the nizim. The war was hotly contested, for Sir Eyre Mysore army was well-disciplined and equipped, and also skilfully handled Hyder died in*~~

~~*merit to organize the empire which Clive founded. He was governor or governor-general*~~

~~*Cornwallis, the first English nobleman of rank who under. Wallis.*~~

~~*took the office of governor-general. His rule lasted from 1786 to 1793, and is celebrated for two events—the intro- permanent settlement into Bengal, and the If the foundations of the system of civil administration were laid by Hastings, the superstruc- It was he who first en- trusted criminal jurisdiction to Europeans, and established the Nizimat Sadr Adalat, or supreme court of criminal judicature, at Calcutta; and it was he who separated the functions of collector and judge. The system thus organized*~~

~~*duction of the second Mysore war.*~~

~~*ture was erected by Cornwallis.*~~

~~*in Bengal was afterwards transferred to Madrasand Bombay, when those presidencies also acquired territorial sovereignty. But the achievement most familiarly associated with the name of Cornwallis is the permanent settlement of the land revenue of Bengal. Up to his time the revenue had been collected pretty much according to the old Mughal system. Zamindérs, or Government farmers, whose office always tended to become hereditary, were recognized as having a right of some sort to collect the revenue from the actual cultivators. But no principle of assessment existed, and the amount actually realized varied greatly from year to year. Hastings had the reputation of bearing hard upon the zaminddrs, and was absorbed in other critical affairs of state or of war. On the whole he seems to have looked to experience, as acquired from a succession of quinquennial settlements, to furnish the standard rate of the future. Francis, on the other hand, Hastings's great rival, deserves the credit of being among the first to*~~

~~advocate a limitation of the state demand in perpetuity. The same view recom- mended itself to the authorities at home, partly because it would place their finances on a more stable basis, partly because it seemed to identify the zaminddér with the more familiar landlord. Accordingly, Cornwallis took out with him in 1787 instructions to introduce a permanent settle- ment. The process of assessment began in 1789 and terminated in 1791. No attempt was made to measure the fields or calculate the out-turn as had been done by Akbar, and is now done when occasion requires in the British provinces ; but the amount payable was fixed by reference to what had been paid in the past. At first the settlement was called decennial, but in 1793 it was declared perma- nent for ever. The total assessment amounted to sikka Rs.26,800,989, or about 22 millions sterling. Though Lord Cornwallis carried the scheme into execution, all praise or blame, so far as details are concerned, must~~

~~Perma- nent settle- ment,~~

~~Second Mysore war.~~

~~Welles- ley.~~

~~Third Mysore war,~~

~~804~~

~~belong to Sir John Shore, afterwards Lord Teignmouth, whose knowledge of the country was unsurpassed by that of any civilian of his time. Shore would have proceeded more cautiously than Cornwallis's preconccived idea of a proprietary body and the court of directors' haste after fixity permitted.~~

~~The second Mysore war of 1790-92 is noteworthy on two accounts: Lord Cornwallis, the governor-general, led the British army in person, with a pomp and lavishness of supplies that recalled the campaigns of Aurangzeb ; and the two great native powers, the niz4m of the Deccan and the Marhatt& confederacy, co-operated as allies of the British. In the result, Tip Sult4n submitted when Lord Cornwallis had commenced to beleaguer his capital. He agreed to yield one-half of his dominions to be divided among the allies, and to pay three millions sterling towards the costof the war. Those~~

~~*conditions he fulfilled, but ever afterwards he burned to be revenged upon his English conquerors.*~~

~~*The period of Sir John Shore's rule as governor-general, from 1793 to 1798, was uneventful. In 1798 Lord Mornington, better known as the marquis of Wellesley, arrived in India, already inspired with imperial projects that were destined to change the map of the country. Mornington was the friend and favourite of Pitt, from whom he is thought to have derived the comprehensiveness of his political vision and his antipathy to the French name. From the first he laid down as his guiding principle that the English must be the one paramount power in the peninsula, and that native princes could only retain the insignia of sovereignty by surrendering the substance of independence. The subsequent political history of India has been but the gradual development of this policy, which received its finishing touch when Queen Victoria was proclaimed empress of India in 1877.*~~

~~*To frustrate the possibility of a French invasion of India, led by Napoleon in person, was the governing idea of Wellesley's foreign policy; for France at this time, and for many years later, filled the place afterwards occupied by Russia in the imagination of English statesmen. Nor was the possibility so remote as might now be thought. French regiments guarded and overawed the nizdm of Hyderabad. The soldiers of Sindhia, the military head of the Marhatta confederacy, were disciplined and led by French adventurers. Tipai Sultan carried on a secret correspondence with the French directorate, and allowed a tree of liberty to be planted in his dominions, The islands of Mauritius and Bourbon afforded a convenient half-way house both for French intrigue and for the assembling of a hostile expedition. Above all, Napoleon Buonaparte was then in Egypt, dreaming of the conquests of Alexander; and no man knew in what direction he might turn his hitherto unconquered legions. Wellesley first addressed himself to the nizim, where his policy prevailed without serious opposition. The French battalions at Hyderabad were disbanded, and the niz4m bound himself by treaty not to take any European into his service without the consent of the English Government,—a clause since inserted in every engagement entered into with native powers. Next, the whole weight of Wellesley's resources was turned against Tipt, whom Cornwallis had scotched but not killed. His intrigues with the French were laid bare, and he*~~

~~was given an opportunity of adhering to the new subsidiary system. Ou his refusal war was declared, and Wellesley came down in state to Madras to organize the expedition in person, and watch over the course of events. One English army marched into Mysore from Madras, accompanied by a contingent from the nizdin. Another advanced from the western coast. Tipu, after offering but a feeble resistance in the field, retired into Seringapatam, and, when his capital~~

~~was stormed, died fighting bravely in the breach. Since the battle of Plassey no event so greatly impressed the native imagination as the capture of Seringapatam, which won for General Harris a peerage and for Wellesley an Irish marquisate. In dealing with the territories of Tipu, Wellesley acted with unusual moderation. The central portion, forming the old state of Mysore, was restored to an infant representative of the Hindu rdjas, whom Hyder Ali had dethroned, while the rest was partitioned between the nizim, the Marhattds, and the English. At about the same time the province of the Carnatic, or all that large portion of southern India ruled by the nawdb of Arcot, and also the principality of Tanjore, were placed under direct British administration, thus constituting the Madras presidency almost as it has existed to the present day.~~

~~The Marhattds had been the nominal allies of the English Marhatta in both their wars with Tipu, but they had never given con- active assistance, nor were they secured to the English 7~~

~~side as the nizim now was. The Marhatt4 powers at this time were five in number. The recognized head of the confederacy was the peshw4 of Poona, who ruled the hill country of the Western Ghats, the cradle of the Marhatta race. Thefertile province of Guzerat was annually harried by the horsemen of the gaikwar of Baroda. In Central India two military leaders, Sindhia of Gwalior and Holkar of India, alternately held the pre-eminency. Towards the east the Bhonsl4 raj4 of Ndgpur, sprung from the same stock as Sivaji, reigned from Berar to the coast of Orissa. Wellesley tried assiduously to bring these several Marhatta powers within the net of his subsidiary system.~~

~~At last, in 1802, the necessities of the peshwa, who had been defeated by Holkar, and driven as a fugitive into British territory, induced him to sign the treaty of Bassein, by which he pledged himself to hold communications with no other power, European or native, and ceded territory for the maintenance of a subsidiary force. This greatly ex- tended the English territorial influence in the Bombay presidency, but led directly to the second Marhatta war, for neither Sindhia nor the r4j4 of Nagpur would tolerate this abandonment of Marhatté independence. campaigns that followed are perhaps the most glorious in the history of the British arms in India. The general plan and the adequate provision of resources were due to~~

~~the marquis of Wellesley, as also the indomitable spirit of Nagpur~~

~~that could not anticipate defeat. The armies were led by Sir Arthur Wellesley (afterwards duke of Wellington) and General (afterwards Lord) Lake. Wellesley operated iu the Deccan, where, in a few short months, he won the decisive victories of Assaye and Argaum, and captured Ahmadnagar. Lake's campaign in Hindustan was no less brilliant, though it has received less notice from historians. He won pitched battles at Aligarh and Laswari, and captured the cities of Delhi and Agra, thus scattering the French troops of Sindhia, and at the same time coming forward as the champion of the Mughal emperor in his hereditary capitals. Before the year 1803 was out, both Sindhia and the Bhonsla raj& were glad to sue for peace. Sindhia ceded all claims to the territory north of the Jumma, and left the blind old emperor Shah Alam once more under British protection. The Bhonslé forfeited Orissa to the English, who had already occupied it with a flying column, and Berar to the nizim, who gained a fresh addition by every act of complaisance to the British Government. The freebooter, Jaswant Rao Holkar, alone remained in the field, supporting his troops by ravages through Malwa and Rajputana. The concluding years of Wellesley's rule were occupied with a series of operations against Holkar, which brought no credit on the British name. The disastrous retreat of Colonel Monson through Central India recalled memories of the convention of Wargaum, and of the destruction of Colonel~~

~~The Wars~~

~~a~~

~~*Burlow.*~~

~~*Minto.*~~

~~*Marquis of Hast- ings.*~~

~~*Gurkha war*~~,

~~*HISTORY.*~~ |

~~*Baillie's force by Hyder Ali. The repulse of Lake in person at the siege of Bhartpur (Bhurtpore) is memorable as an instance of a British army in India having to turn back with its object uuaccomplished.*~~

~~*The ambitious policy and the continuous wars of Lord*~~

~~*Wellesley exhausted the patience of the court of directors*~~

~~*at home. In 1804 Lord Cornwallis was sent out as governor-*~~

~~*general a second tiine, with instructions to bring about peace at any price, while Holkar was still unsubdued, and Sindhia was threatening a fresh war. But Cornwallis*~~

~~*was now an old man and broken down in health. Travel-*~~

~~*ling up to the north-west during the rainy season, he sank aud died at Ghazi{pur, before he had been ten weeks in the country. His immediate successor was Sir George Barlow, a civil servant of the Company, who, as a locum tenens, had no alternative but to carry out faithfully the orders of his employers. He is charged with being, under these orders, the only governor-general who diminished the area of British territory, and with violating engage- ments by abandoning the Rajput chiefs to the tender mercies of Holkar and Sindhia. During his administra- tion also occurred the mutiny of the Madras sepoys at Vellore, which, though promptly suppressed, sent a shock of insecurity throughout the empire.*~~

~~*Lord Minto, governor-general from 1807 to 1813, con-*~~

solidated the conquests which Wellesley had acquired. HIs only military exploits were the occupation of the

island of Mauritius, and the conquest of Java by an ex-

pedition which he accompanied in person. The condition of Central India continued to be disturbed, but Minto suc-

ceeded in preventing any violent outbreaks without himself

having recourse to the sword. The Company had ordered him to follow a policy of non-intervention, and he managed to obey his orders without injuring the prestige of the British name. In his time the Indian Government first opened relations with a new set of foreign powers, by sending embassies to the Punjab, to Afghanistan, and to Persia. The ambassadors were all trained in the scliool of Wellesley, and formed perhaps the most illustrious trio of 'politicals" that the Indian service has produced. Metcalfe was the envoy to the court of Ranjit Sinh at Lahore ; Elphinstone met the shéh of Afghanistan at Peshawar ; and Malcolm was despatched to Persia. If it cannot be said that any of these missions were fruitful in permanent results, at least they introduced the English to a new set of diplomatic relations, and widened the sphere of their influence.

The successor of Lord Minto was Lord Moira, better known as the marquis of Hastings, who governed India for the long period of nine years, from 1814 to 1823. This period was marked by two wars of the first magnitude, the campaigns against the Gurkhas (Goorkhas) of Nepal, and the third and last Marhatt4 war. The Gurkhas, the present ruling race in Nepal, are HIndu immigrants who claim a Rajput origin. The indigenous inhabitants, called Newars, belong to the Indo-Tibetan stock, and profess Buddhism. The sovereignty of the Gurkhas dates only from 1767, in which year they overran the valley of Khatmandu, and gradually extended their power over all the hills and valleys of Nepal. Organized upon a sort of military and feudal basis, they soon became a terror to all their neighbours, marching east into Sikkim, west into Kumdun, and south into the Gangetic plains. In the last quarter their victims were British subjects, and at last it became imperatively neces- sary to check their advance. Sir George Barlow and Lord Minto had remonstrated in vain, and nothing was left to Lord Moira

~~but to take up arms. The campaign of 1814 was little short of disastrous. After overcoming the.natural difficulties of a malarious climate and precipitous hills, the sepoys were on several occasions fairly worsted by the~~

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~~unexpected bravery of the little Gurkhas, whose heavy knives or kukris dealt terrible execution, But in 1815 General Ochterlony, who commanded the army operating by way of the Sutlej, stormed one by one the hill forts which still stud the Himalayan states, now under the Punjab government, and compelled the Nepal darbar to sue for peace. In the following year the same general advanced frum Patna into the valley of Khatmandu, and finally dictated the terms which had before been rejected, within a few miles of the capital. By the treaty of Segauli, which defines the English relations with N epal to the present day, the Gurkhas withdrew on the one hand from Sikkim, and on the other from those lower ranges of the western Himalayas which have supplied the health-giving stations of Naini Tal, Massuri, and Simla. Meanwhile the condition of Central India was every year becoming more unsatisfac- tory. Though the great Marhatta chiefs were learning to live rather as peaceful princes than as leaders of predatory bands, the example of lawlessuess they had set was being followed, and bettered in the following, by a new set of Pind- freebooters, known as the Pindhdris, As opposed to the haris. Marhattas, wlio were at least a nationality bound by some traditions of a united government, the Pindharis were merely irregular soldiers, corresponding most nearly to the free companies of medizval Europe. Of no common race and of no common religion, they welcomed to their ranks the outlaws and broken tribes of all India,—Afglans, Marhattds, or Jats. Their headquarters were in Mdlwé, but their depredations were not confined to Central India. In bands, sometimes numbering a few hundreds, sometimes many thousands, they rode out on their forays as far as Malabar and the Coromandel coast. The most powerful of the Pindhari captains, Amir Khan, had an organized army of many regiments, and several batteries of cannon. Two other leaders, known as Chitu and Karim, at one time paid a ransom to Sindhia of £100,000. To suppress the Pindhari hordes, who were supported by the sympathy, more~~

~~*or less open, of all the Marhatta chiefs, Lord Hastings (1817) collected the strongest British army that had been seen in India, numbering nearly 120,000 men, half to operate from the north, half from the south. Sindhia was overawed, and remained quiet. Amir Khdn consented to disband his army, on condition of being guaranteed the possession of what is now the principality of Tank. The remaining bodies of Pindharfs were attacked in their homes, sur- rounded, and cut to pieces. Karim threw himself upon the mercy of the conquerors. Chitu fled to the jungles, and was killed by a tiger. In the same year (1817) as Third that in which the Pindharis were crushed, and almost in the Marhatta same month (November), the three great Marhatté powers at "4" Poona, Nagpur, and Indore rose against the English. The peshwa, Baji Rao, had long been chafing under the terms imposed by the treaty of Bassein (1802), and the subsequent treaty of Poona (1817), which riveted yet closer the chains of dependence upon the paramount power. Elphin- stone, then resident at his court, foresaw what was coming and withdrew to Kirkee, whither he had ordered up a European regiment. The next day the residency was burned down, and Kirkee was attacked by the whole army of the peshwa. The attack was bravely repulsed, and the peshwa immediately fled from his capital. Almost the same plot was enacted at Nagpur, where the honour of the British name was saved by the sepoys, who defended the hill of Sitabaldi against enormous odds. The army of Holkar was defeated in the following month at the pitched battle of Mehidpur. All open resistance was now at an end. Nothing remained but to follow up the fugitives, and deter- mine the conditions of the general pacification. In both these duties Sir John Malcolm played a prominent part. The dominions of the peshwA were annexed to the Bombay*~~

~~*Annexa- tion of peshwa's*~~

~~*minions.*~~

~~*Amherst.*~~

~~*First Burmese war,*~~

~~presidency, and the nucleus of the present Central Pro- vinces was formed out of the territory saved from thie Pindharis. The peshw4 himself surrendered, and was per- mitted to reside at Bithur, near Cawnpur, on a pension of £80,000 year. His adopted son was the infamous Nand Sahib. To fill the peshwa's place to some extent at the head of the Marhatt4 confederacy, the lineal descendant of Sivaji was brought forth from obscurity, and placed upon the throne of Satar'. An infant was recognized as the heir of Holkar, and a second infant was proclaimed raja of Nagpur under British guardianship. At the same time the several states of Rajputana accepted the position of feudatories of the paramount power. The map of India, as thus drawn by Lord Hastings, remained substantially unchanged until the time of Lord Dalhousie. But the proudest boast of Lord Hastings and Sir John Malcolm was, not that they had ndvanced the pomerium, but that they had conferred the blessings of peace and good government upon millions who~~

~~had suffered unutterable things from Marhatté and Pindhari~~

~~tyranny.~~

~~The marquis of Hastings was succeeded by Lord Amherst, after the interval of a few months, during which Mr Adain, a civil servant, acted as governor-general. Lord Amherst's administration lasted for five years, from 1823 to 1828. It is known in history by two prominent events, the first Burmese war and the capture of Bhartpur. For some years past the north-east frontier had been disturbed by the restlessness of the Burmese. The country that fringes the western shore of the Bay of Bengal and runs up the valley of the Irawadi, with a people of Tibeto-Chinese origin, has a history of its own, parallel to, but not altogether independent of, that of Indie. Tradition asserts that its early civilization was introduced from the oppo- site coast of Coromandel, by a people who still preserve a trace of their origin in their name of Talaing (cf Telinga and Telugu). However this may be, the Buddhist religion, professed by the Burmese at the present day, certainly came direct from India at a very early date. Many waves of invasion from Siam in the south and from the wild mountains in the north have passed over the land.~~

~~These conquests were marked by that wanton and wholesale barbarity which seems to characterize the Tibeto-Chinese race, but the civilization of Buddhism survived every shock, and flourished around the ancient pagodas. European travellers in the 15th century visited Pegu and Tenasserim, which they describe as flourishing marts of maritime trade. During the period of Portuguese predominance in the East, Arakan became the resort of loose European adventurers. With their help the Arakanese extended their power inland, occupied Chittagong, and (under the name of the Maghs) became the terror of the entire delta of the Ganges. About 1750 a new dynasty arose, founded by Alaungphaya or Alompra, with its capital at Ava, which still rules over Inde- pendent Burmah. The successors of Alompra, after having subjugated all Burmah, and overrun Assam, which was then an independent kingdom, began a series of encroachments upon British territory in India. As all peaceful proposals were contumeliously rejected, Lord Amherst was compelled to declare war in 1824. Little military glory could be gained by beating the Burmese, who were formidable only from the pestilential character of their country. One expe- dition with gunboats proceeded up the Brahmaputra intc Assain ; another marched by land through Chittagong into Arakan, for the Bengal sepoys refused to go by sea ; a third, and the strongest, sailed from Madras direct to the mouth of the Irawadi. The war was protracted over two years. At last, after the loss of about 20,000 lives and an expenditure of £14,000,000, the king of Ava consented to sign the treaty of Yandabu, by which he abandoned all claim to Assam, and ceded the provinces of Arakan and Tenasserim,~~

~~which were already in the military occupation of the British. He retained all the valley of the Irawadi, down to the sea at Rangoon. The capture of Bhartpur in Central India by Lord Combermere in 1827 wiped out the repulse which Lake had received before that city in January 1805. disputed succession necessitated British intervention. Ar- tillery could make little impression upon the massive walls of inud, but at last a breach was effected by mining, and the city was taken by storm, thus losing its general repu-~~

~~*tation throughout India for impregnability, which had threatened to become a political danger.*~~

~~*The next governor-general was Lord William Bentinck, who had been governor of Madras twenty years earlier at the time of the mutiny of Vellore. His seven years' rule (from 1828 to 1835) is not signalized by any of those victories or extensions of territory by which chroniclers delight to measure the growth ofempire. But it forms an epoch in administrative reform, and in the slow process by which the hearts of a subject population are won over to venerate as well as dread their alien rulers. The modern history of the British in India, as benevolent administrators ruling the country with a single eye to the good of the natives, may be said to begin with Lord William Bentinck. According to the inscription upon his statue at Calcutta, from the pen of Macaulay, "He abolished cruel rites ; he effaced humiliating distinctions; he gave liberty to the expression of public opinion ; his constant study it was to elevate the intellectual and moral character of the nations committed to his charge." His first care on arrival in India was to restore equilibrium to the finances, which were tottering under the burden imposed upon them by the Burmese war. This he effected by reductions in per- manent expenditure, amounting in the aggregate to 14 millions sterling, as well as by augmenting the revenue from land that had escaped assessment and from the opium of MAlwé. He also widened the gates by which educated natives could enter the service of the Company. Some of these reforms were distasteful to the covenanted service and to the officers of the army, but Lord William was always staunchly supported by the court of directors and by the Whig ministry at home. .*~~

~~*His two most memorable acts are the abolition of sate (suttee) and the suppression of the Thags (Thugs). At this distance of time it is difficult to realize the degree to which these two barbarous practices had corrupted the social system of the Hindus. European research has clearly proved that the text in the Vedas adduced to authorize the immolation of widows was a wilful mistranslation. But the practice had been engrained in Hindu opinion by the authority of centuries, and had acquired the sanctity of a religious rite. The emperor Akbar is said to have prohibited it by law, pnt the early English rulers did not dare so far to violate the traditions of religious toleration. In the year 1817 no less than seven hundred widows are said to*~~

~~*have been burned alive in the Bengal presidency alone. To this day the most holy spots of HIndu pilgrimage are thickly dotted with little white pillars, each commemorating @ sati, In the teeth of strenuous opposition, both from Europeans and natives, Lord William carried the regulation in council on December 4, 1829, by which all who abetted satt were declared guilty of "culpable homicide." The honour of suppressing Zhagi must be shared between Lord William and Captain Sleeman. Z'hagi was an abnormal excrescence upon HInduism, in so far as the bands of secret assassins were sworn together by an oath based on the rites of the bloody goddess Kali. Between 1826 and 1835 as many as 1562 Thags were apprehended in different parts of British India, and by the evidence of approvers the moral plague spot was gradually stamped out.*~~

~~*Two other historical events are connected with the*~~

~~*A pu.*~~

~~*Capture of Bhart-*~~

~~*Bentinck.*~~

~~*Sati (suttee).*~~

~~*Thagi (Thugg- ism).*~~

~~*i i*~~

~~*Métcalfe.*~~

~~*Auck- land.*~~

~~*Afghan affairs.*~~

~~*HISTORY. |*~~

~~*administration of Lord William Bentinck. In 1833 the charter of the East India Company was renewed for twenty years, but only upon the ternis that it should abandon its trade and permit Europeans to settle freely in the country. At the same time a legal or fourth member was added to the*~~

~~governor-general's council, who might not be a servant of the Company, and a commission was appointed to revise and codify the law. Macaulay was the first legal member of council, and the first president of the law com-~~

~~mission. In 1830 it was found necessary to take the state of~~

~~Mysore under British administration, where it has continued to the present year (1881), and in 1834 the frantic misrule of the raja of Coorg brought on a short and sharp war. The raj4 was permitted to retire to Benares, and the brave and proud inhabitants of that mountainous little territory decided to place themselves under the rule of the Company; so that the only annexation effected by Lord William~~

~~Bentinck was 'in consideration of the unanimous wish of~~

~~the people." Sir Charles (afterwards Lord) Metcalfe succeeded Lord William as senior member of council.~~

~~had initiated, but which he willingly carried into execution, for giving entire liberty to the press. Public opinion in India, as well as the express wish of the court of directors at home, pointed to Metcalfe as the most fit person to carry out the policy of Bentinck, not provisionally, but as~~

~~governor-general for a full term. Party exigencies, how-~~

~~ever, led to the appointment of Lord Auckland. From that date commences a new era of war and conquest, which may be said to have lasted for twenty years. All looked peaceful until Lord Auckland, prompted by his evil genius, attempted to place Shah Shujé upon the throne of Cabul, an attempt which ended in the gross mismanagement and annihilation of the garrison placed in that city. The disaster in Afghdnistan was quickly followed by the con-quest of Sind, the two wars in the Punjab, the second Burmese war, and last of all the Mutiny. Names like~~

~~Gough and Napier and Colin Campbell take the places of~~

~~Malcolm and Metcalfe and Elphinstone.~~

~~*For the first time since the days of the sultans of Ghaznt and Ghor, Afghdnistan had obtained a national king in 1747 in the person of the Ahmad Shah Durani, who found his opportunity in the confusion that followed on the death of the Persian conqueror, Nadir Shéh. Before his death in 1773 Ahmad Shéh had conquered a wide empire, from Herat to Pesh4war and from Kashmir to Sind. His intervention on the field of Panipat (1761) turned back the tide of Marhatté conquest, and replaced a Mughal eniperor on the throne of Delhi. But Ahmad Shah never cared to settle down in India, and kept alternate state at his two national capitals of Cabul and Kandahar. The Durdni kings were prolific in children, who fought with one another for the succession to the death. At last, in 1826, Dost Muhammad, head of the powerful Barakzdi family, succeeded in establishing himself as ruler of Cabul, with the subordinate title of amir (ameer), while two fugi- tive brothers of the Durdni line were living under British protection at Ludhiana, on the frontier of the Punjab.*~~

~~*The attention of the English Government had been directed to Afghan affairs ever since the time of Lord Wellesley, who feared that Zaman Shah, then holding his court at Lahore, might follow in the path of Nadir Shah, and overrun Hindustén, The growth of the powerful Sikh kingdom of Ranjit Sinh effectually dispelled any such alarms for the future. Subsequently, in 1809, while a French invasion of India was still a possibility to be guarded against, Elphinstone was sent by Lord Minto on @ mission to Shah Shujé to form a defensive alliance. Before the year was out, Shah Shuj& had been driven*~~

~~*INDPSA*~~

~~*His short term of office is memorable for the measure which his predecessor*~~

~~*into exile, and a third brother, Mahmud Shéh, was on the throne. In 1837, when the curtain rises upon the drama of English interference in Afghanistan, the usurper Dost Muhammad Barakz4i was firmly established at Cabul. His great ambition was to recover Peshawar from the Sikhs ; and when Captain Alexander Burnes arrived on a mission from Lord Auckland, with the ostensible object of Opening trade, the Dost was willing to promise*~~

~~*everything, if only he could get Peshawar. But Lord Auckland had another and more important object in view. At this time the Russians were advancing rapidly in Central Asia, and a Persian army, not without Russian support, was besieging Herat, the traditional bulwark of Afghanistan on the east. A Russian envoy was at Cabul at the same time as Burnes, The latter was unable to satisfy the demands of Dost Muhammad in the matter of Peshawar, and returned to India unsuccessful. Lord Auckland forthwith resolved upon the hazardous plan of placing a more subservient ruler upon the throne of Cabul. Shah Shuja, one of the two exiles at Ludhiana, was selected for the purpose, At this time both the Punjab and Sind were independent kingdoms. Sind was the less powerful of the two, and First therefore a British army escorting Shah Shujé made itg Afghan Way by that route to enter Afghanistan through the Bolan VW" Pass. Kandahar surrendered, Ghazni was taken by storm, Dost Muhammad fled across the Hindu Kush, and Shah Shuj4 was triumphantly led into the Bala Hissar at Cabul in August 1839, During the two years that followed Afghanistan remained in the military occupation of the British. The catastrophe occurred in November 1841, When Sir Alexander Burnes was assassinated in the city of Cabul. The troops in the cantonments were then under the command of General Elphinstone (not to be confounded with the civilian Mountstuart Elphinstone), with Sir William Macnaghten as chief political adviser. Elphinstone was an old man, unequal to the responsibilities of the position. Macnaghten was treacherously murdered at an interview with the Afghéu chief, Akbar Khan, eldest son of Dost Muhammad. After lingering in their cantonments for two months, the British army set off in the depth of winter to find its way back to India through the passes, When they started they numbered 4000 fighting men, with 12,000 camp followers. A single survivor, Dr Brydon, reached the friendly walls of Jalalabad, where Sale was gallantly holding out. The rest perished in the defiles of Khurd, Cabul, and Jagdalak, either from the knives and matchlocks of the Afghans or from the effects of cold. A few prisoners, mostly women, children, and officers, were considerately treated by the orders of Akbar Khan.*~~

~~*Within a month after the news reached Calcutta, Lord Ellen- Auckland had been superseded by Lord Elleuborough, borough. whose first impulse was to be satisfied with drawing off in safety the garrisons from Kandahar and Jalalabad. But bolder counsels prevailed. Pollock, who was marching*~~

~~*straight through the Punjab to relieve Sale, was ordered to penetrate to Cabul, while Nott was only too glad not to be forbidden to retire from' Kandahar through Cabul, After a good deal of fighting, the two English forces met at their common destination in September 1842. The great bdzdr at Cabul was blown up with gunpowder, to fix a stigma upon the city; the prisoners were recovered ; and all marched back to India, leaving Dost Muhammad to take undisputed possession of his throne. The drama closed with a bombastic proclamation from Lord Ellen- borough, who had caused the gates from the tomb of Mahmud of Ghazni to be carried back as a memorial of "Somnath revenged."*~~

~~*Lord Ellenborough, who loved military display, had his tastes gratified by two more wars. In 1843 the Mahometan rulers of Sind, known as the " meers " or amirs, whose only*~~

~~*Con-*~~

~~*quest of were crushed by Sir Charles Napier.*~~

~~*Sind.*~~

~~*Uard- Inge.*~~

~~*Rise of Sikhs.*~~

~~*Sikh cam- paign.*~~

~~*Dal- housie.*~~

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~~*fault was that they would not surrender their independence, The victory of Miani, in which 3000 British troops defeated 20,000 Baluchts, is perhaps the most prilliaut feat of arms in Indian history ; but an honest excuse can scarcely be found for the annex- ation of the country. Inthe same year a disputed succes- sion at Gwalior, fomented by feminine intrigue, resulted in an outbreak of the overgrown army which the Sindhia family had been*~~

~~allowed to maintain. Peace was restored by the battles of Maharajpur and Punneah, at the former of which Lord Ellenborough was present in person.~~

~~In 1844 Lord Ellenborough was recalled by the court of directors, who differed from him on many points of administration, and distrusted his erratic genius. He was succeeded by Sir Henry (afterwards Lord) Hardinge, who had served through the Peninsular War and liad lost a hand at Ligny. It was felt on all sides that a trial of strength between the British and the Siklis was at hand.~~

~~The Sikhs were not a nationality like the Marhattas, but a religious sect bound together by the additional tie of military dis- eipline. They trace their origin to one Nanak, an excellent and successful preacher, who was born in the neighbourhood of Lahore in the latter half of the 15th century, before the arrival of either Mughals or Portuguese in India. Nanak was a religious reformer, like others that arose in the country about that time, who preached the abolition of caste, the unity of the Godhead, and the obligation of leading a pure life. From Nanak ten gurus or apostles are traced down to Govind Sinh in 1708, with whom the succession stopped. Suffering continual persecution from the roling Mahomet- ans, which culminated in the reign of Aurangzeb, the Sikh religion inaintained itself with extraordimary tenacity. At last the down- fall of the Mughal empire transformed it into a territorial power, which possessed the only organization reinaining in the Punjab. ven before the rise of Ranjit Sinh, offshoots from the Sikh misls or confederacies, each led by its elected sardd7, had carved out for themselves feudal principalities along the banks of the Sutlej, some of which have endured to the present day. Ranjit Sinh, tho founder of the Sikh kingdom, was born in 1780. In his twentieth year he obtained the appointment of governor of Lahore from the 'Afghan emperor, and froin that time he sct himself to the task of basing a personal despotism upon the religious fanaticism of the Sikhs. The khdlsd or " the liberated" were organized into an army under European officers, which for steadiness and religious fervour has had no parallel since the "'ironsides " of Cromwell. From Lahore as his capital he extended his conquests south to Multan, west to Peshawar, and north to Kashniir. On the east side alone he was hemmed in by the Sutlej, up to which river the authority of the British Government was advanced in 1804. Till his death in 1839 Ranjit Sinh was~~

~~ever loyal to the engagements which he had entered into with Metealfe in 1809. But he left no son capable of wielding his sceptre. Laliore was torn by dissensions between rival generals, ministers, and queens. The only strong power was the army of the khdlsd, which since the disaster in Afghanistan burned to measure its strength with the British sepoys. The French generals, Avitable and Court, were foolishly ousted, and the supreme inilitary command was vested in a series of panchdyuts or elective committees of five.~~

~~In 1845 the Sikh army, numbering 60,000 men with 150 guns, crossed the Sutlej and invaded British territory. Sir Hugh Gough, the commander-in-chief, together with the governor-general, hurried up to the frontier. Within three weeks four pitched battles were fought, at Moodkee, Ferozshali, Aliwal, and Sobraon. The British loss on each occasion was heavy ; but by the last victory the Sikhs were fairly driven into and across the Sutlej, and Lahore surrendered to the British. By the terms of peace then dictated the infant son of Ranjit, Dhulip Sinh, was recog- nized as raja; the Jalandhar Doab, or tract between the Sutlej and the Ravi, was annexed; the Sikh army was limited to a specified number; Major Henry Lawrence was appointed to be resident at Lahore ; and a British force was detailed to garrison the Punjab for a period of eight years. Sir H. Hardinge received a peerage, and returned to England in 1848.~~

~~Lord Dalhousie succeeded, whose eight years' adminis- tration (from 1848 to 1856) was more pregnant of results than that of any governor-general since Clive. Though~~

~~professedly a man of peace, he was compelled to fight two wars, in the Punjab and in Burmah. These both ended in~~

~~telegraph. benefits are too often forgotten in the vivid recollections of~~

~~the second Sikh war broke out.~~

~~*large acquisitions of territory, while Nagpur, Oudh, and several minor states also came under British rule. Dalhousie's own special interest lay in the advancement of the moral and material condition of the country. The system of administration Punjab by the two Lawrences and their assistants is probably the nuost successful piece of difficult work ever accomplished by spered under their rule scarcely less than the Punjab. In both cases Lord Dalhousie deserves a large share of the credit. reforming hand. He founded the public works department, to pay special attention to roads and canals. the Ganges Canal, still the largest work of the kind in the country, and he turned the sod of the first Indian railway.*~~

~~*But*~~

~~*carried out in the conquered*~~

~~*Englishmen. British Burmah has pro-*~~

~~*No branch of the administration escaped his*~~

~~*He opened*~~

~~*He promoted steam communication with England via the Red Sea, and introduced cheap postage and the electric It is Lord Dalhousie's misfortune that these*~~

~~*the Mutiny, which avenged his policy of annexation.*~~

~~*Lord Dalhousie had not been s1x months in India before Second Two British officers were Sikh Unfortunately ¥"*~~

~~*ae Annexa- The British tion of*~~

~~*treacherously assassinated at Multan. Henry Lawrence was at home on sick leave.*~~

~~*army was not ready to act in the hot weather, and, despite Punjab.*~~

~~*the single-handed exertions of Lieutenant (afterwards Sir Herbert) Edwardes, this outbreak of fanaticism led to a general rising. The &hdlséd*~~

~~*army again came together, and once more fought on even terms with the British. On the fatal field of Chilianwala, which patriotism prefers to calla drawn battle, the British lost 2400 officers and men, besides four guns and the colours of three regiments. Before reinforcements could come out from England, with Sir Charles Napier as commander-in-chief, Lord Gough had restored his own reputation by the crowning victory of Guzerat, which absolutely destroyed the Sikh army. Multan had previously fallen ; and the Afghan horse under Dost Muhammad, who had forgotten their hereditary anti- pathy to the Sikhs in their greater hatred of the British name, were chased back with ignominy to their native hills. The*~~

~~*Punjab henceforth became a British province, supplying @*~~

~~*virgin field for the administrative talents of Dalhousie*~~

~~*and the two Lawrences. Raj4 Dhulip Sinh received an allowance of £50,000 a year, on which he retired as a country gentleman to Norfolk in England. The first step*~~

~~*in the pacification of the Punjab was a general disarmament,*~~

~~*wliich resulted in the delivery of no less than 120,000 weapons of various kinds. Then followed a settlement of*~~

~~*the land tax, village by village, at an assessment much*~~

~~*below that to which it had been raised by Sikh exactions,*~~

~~*and the introduction of a loose but equitable code of civil*~~

~~*and criminal procedure. Roads and canals were laid out by*~~

~~*Colonel Robert Napier (afterwards Lord N apier of Magdala) ;*~~

~~*and the security of British peace and the personal influence*~~

~~*of British officers were felt to the furthest corners of the ‘ province. Thus it happened that, when the Mutiny broke*~~

~~out in 1857, the Punjab remained not only quiet but loyal,~~

~~after only eight years' experience of English rule; while the ; North-Western Provinces, which had been British territory | for more than half a century, rose in rebellion. 'The second second | Burmese war of 1852 was caused by the ill-treatment of Burmese | European merchants at Rangoon, and the insolence offered ¥*™~~

~~to the captain of a frigate who had been sent to remonstrate.~~

~~The whole valley of the Irawadi, from Rangoon to Prome,~~

~~was occupied in a few months, and, as the king of Ava~~

~~refused to treat, it was annexed, under the name of Pegu,~~

~~to the provinces of Arakan and Tenasserim, which had been . acquired in 1826. Since annexation the inhabitants of~~

~~Annexa- tion of Oudh,~~

~~HISTORY. |~~

~~Rangoon have increased tenfold in number, and that port now ranks third in British India, being surpassed only by Calcutta and Madras. Lord Dalhousie's dealings with the feudatory states of India can only be rightly appreciated as part of his general policy. That rulers only exist for the good of the ruled was his supreme axiom of govern- ment, of which he gave the most conspicuous example by the practice of his own daily life. That British adminis- tration was better for the people than native rule followed from this axiom as a necessary corollary. He was thus led to regard native chiefs from somewhat the same point of view as the Scotch regarded the hereditary jurisdictions after 1745, as mischievous anomalies, to be abolished by every means practicable. Good faith must be kept with rulers on the throne and with their legitimate heirs, but no false sentiment should preserve dynasties that had for- feited all consideration by years of accumulated misrule, or~~

~~*prolong those that had no natural successor. The "doctrine of lapse" was merely a special application of these principles, though complicated by the theory of adoption. It has never been doubted that, according to Hindu private law, an adopted son entirely fills the place of a natural son, whether to perform the religious obsequies of his father or to inherit his property, In all respects he continues the persona of the deceased. But it was argued that the succession to a throne stood upon a different foot- ing. The paramount power could not recognize such a right, which might be used as a fraud to hand over the happiness of millions to a base-born impostor. Here came in the maxim of " the good of the governed." 'The material benefits to be conferred through British administration surely weighed heavier in the scale than a superstitious and frequently fraudulent fiction of inheritance. The first state to escheat to the British Government in accordance with these principles was Satdéra, which had been reconsti- tuted by Lord Hastings on the downfall of the peshwaé in 1818. The last direct representative of Sivaji died without a male heir in 1848, and his deathbed adoption was set aside. In the same year the Rajput state of Karauli was saved by the interposition of the court of directors, who drew a fine distinction between a dependent principality and a protected ally. In 1833 Jhansi suffered the same fate as Satard. But the most conspicuous application of the doctrine of lapse was the case of Nagpur. 'The last of the Bhonslas,a dynasty older than the British Government itself, died without a son, natural or adopted, in 1853. That year also saw British administration extended to the Berars, or the assigned districts which the nizim of Hyderabad was induced to cede as a territorial guarantee for the subsidies which he perpetually kept inarrear. Three more distinguished names likewise passed away in 1853, though without any attendant accretion to British territory. In the extreme south the titular nawdb of the Carnatic and the titular r4j4 of Tanjore both died without heirs. Their rank and their pensions died with them, though compassionate allowances were continued to their families. In the north of India, Baji Rado, the ex-peshw4 who had been dethroned in 1818, lived on till 1853 in the enjoy- ment of his annual pension of £80,000. His adopted son, Nana Sahib, inherited his accumulated savings, but could obtain no further recognition.*~~

~~*The annexation of the province of Oudh is to be de- fended on very different grounds. Ever since the nawéb wazir, Shujd4-ud-Daul4, received back his*~~

~~*forfeited terri- tories from the hands of Lord Clive in 1765, the very existence of Oudh as an independent state had depended only upon the protection of British bayonets. Thus, pre- served alike from foreign invasion and from domestic rebellion, the long line of subsequent naw&bs had given way to that neglect of public affairs and those private vices*~~

~~*which naturally flow from irresponsible power. Their only redeeming virtue was steady loyalty to the British Govern- ment. Oudh has been called "the Garden of India " by an author! who endeavours to show that the evils of native rule were never so black as they have been painted. But at any rate that fair corner of the Gangetic basin, which now supports a denser population than any equal area on the surface of the globe, had been groaning for generations under anarchy for which each successive governor-general admitted that he was partly responsible. Warning after warning had been given to the nawabs (who had assumed the title of shah or king since 1819) that they must put their house in order. What the benevolent Bentinck and the soldierly HIardinge had only threatened was re- served for Lord Dalhousie, who united honesty of purpose with decision of character. In this determination he had the full support of the court of directors at home. In 1856, the last year of his rule, he issued orders to General (afterwards Sir James) Outram, then resident at the court of Lucknow, to assume the direct administration of Oudh, on the ground that "the British Government would be guilty in the sight of God and man, if it were any longer to aid in sustaining by its countenance an administration fraught with suffering to millions." The king, Wajid Ali, bowed to irresistible force, though he ever refused to recognize the justice of his deposition. After a mission to England, by way of protest and appeal, he settled down in the pleasant suburb of Garden Reach near Calcutta, where he lived in the enjoyment of a pension of £120,000 a year. Oudh was thus annexed without a blow ; but it may be doubted whether the one measure of Lord Dalhousie upon which he looked back himself with the clearest conscience was not the very one that most alarmed native public opinion.*~~

~~*The marquis of Dalhousie resigned office in March 1856, being then only forty-four years of age; but he carried home with him the seeds of a lingering illness which resulted in his death in 1860. Excepting Cornwallis, he was the first, though by no means the last, of English statesmen who have fallen victims to their devotion to India's needs.*~~

~~*He was succeeded by his friend, Lord Canning, who, at Canning.*~~

~~*the farewell banquet in England given to him by the court -of directors, uttered these prophetic words: "I wish for a peaceful term of office. But I cannot forget that in the sky of India, serene as it is, a small cloud may arise, no larger than a man's hand, but which, growing larger and larger, may at last threaten to burst and overwhelm us with ruin." In the following year the sepoys of the Bengal army mutinied, and all the valley of the Ganges from Patna to Delhi rose in open rebellion.*~~

~~*The various motives assigned for the Mutiny appear Mutiny.*~~

~~*inadequate to the European mind. 'The truth seems to be that native opinion throughout India was in a ferment, predisposing men to believe the wildest stories, and to act precipitately upon their fears. 'The influence of panic in an Oriental population is greater than might be readily believed. In the first place, the policy of Lord Dalhousie, exactly in proportion as it had been dictated by the most honourable considerations, was utterly distasteful to the native mind. Repeated annexations, the spread of educa- tion, the appearance of the steam engine and the telegraph wire, all alike revealed a consistent determination to sub- stitute an English for an Indian civilization. The Bengal sepoys, especially, thought that they could see into the future farther than the rest of their countrymen. Nearly all men of high caste, and many of them recruited from Oudh, they dreaded tendencies which they deemed to be de- nationalizing, and they knew at first hand what annexation*~~

~~*1 The Garden of India, or Chapters on Oudh History and Affairs, by H. C. Irwin, London, 1880,*~~

~~meant. They believed it was by their prowess that the Punjab had been conquered, and all India was held quiet. The numerous dethroned princes, their heirs and their widows, were the first to learn and take advantage of the spirit of disaffection that was abroad. They had heard of the Crimean war, and were told that Russia was the per- petual enemy of England. They had money in abundance with which they could buy the assistance of skilful intriguers. They had everything to gain, and nothing to lose, by a revolution.~~

~~Tn this critical state of affairs, of which the Government had no official knowledge, a rumour ran through the can- tonments of the Bengal army that cartridges had been served out greased with the fat of animals unclean alike to HIndu and Mahometan. After this, nothing could quiet the minds of the sepoys. Fires occurred nightly in the native lines; officers were insulted by their men; all con- fidence was gone, and only the form of discipline remained. On the afternoon of Sunday, May 10, 1857, the sepoys at Meerut (Mirath) broke into open mutiny, Their first mad frenzy marked by its excess the change from their usually quiet manners and orderly habits. 'They broke into the jail, and then ran through the cantonments, cutting down every European they met. At last they streamed off to the neighbouring city of Delhi, to stir up the native garrison and the criminal population of that great city, and to place themselves under the authority of the discrowned Mughal emperor. Meerut was tho largest military station in India, with a strong European garrison of foot, horse, and guns, suf- ficient to overwhelm the mutineers before ever they reached Delhi. But just as the sepoys acted in irrational panic, so did British officers in but too many cases act with equally irrational indecision. The news of the outbreak was telegraphed to Delhi, and nothing more was done that night. The next morning the Mahometans of Delhi rose, and all that the Europeans there could do was to blow up the magazine. A rallying centre and a traditional name was thus given to the revolt, which forthwith spread like wild- fire through all the North-Western Provinces and Oudh down into Lower Bengal. The same narrative must suffice for all, though each episode has its own peculiar~~

~~*story of sadness and devotion. 'The sepoys rose on their officers, without warning, and sometimes after protestations of fidelity. The Europeans, or persons of Christian faith, were massacred, sometimes also women and children. The jail was broken open, the treasure plundered, and then all marched off to some centre of revolt, to join in what had now become anational war. Only in the Punjab were the sepoys anticipated by the stern measures of repression and disarmament adopted by Sir John Lawrence and his lieutenants, among whom Edwardes and Nicholson were conspicuous. The Sikh population never wavered. Crowds of willing recruits came down from the Afghan hills. And thus the Punjab, instead of being itself a source of danger, was able to furnish a portion of its own garrison for the siege of Delhi. In Lower Bengal most of the sepoys mutinied, and then dispersed in different directions. The native armies of Madras and Bombay remained true to their colours. In Central India the contingents of many of the great chiefs sooner or later joined the rebels, but the Mahometan state of Hyderabad was kept loyal by the authority of its able minister Sir Sdlar Jang.*~~

~~*The main interest of the sepoy war gathers round the three cities of Cawnpur, Lucknow, and Delhi. The can- tonments at Cawnpur contained the largest native garrison in India ; and in the immediate neighbourhood, at Bithur, was the palace of Dandhu Panth, the disinherited heir of aa sis mae bg familiar appellation of Nana re ver be handed down to the infamy of history.*~~

~~*rst the Nana was profuse in his professions of loyalty,*~~

~~*LNDES*~~

~~*[HISTORY.*~~

~~*but as soon as the sepoys mutinied he put himself at their head, and was proclaimed peshwa of the Marhattas. The Europeans at Cawnpur, who numbered more women and children than fighting men, shut themselves up in improvised entrenchments, where they sustained a siege for nineteen days under the sun of a tropical June. At last, trusting to a safe conduct from the Nana as far as Allahabad, they surrendered their position, and to the number of four hundred and fifty individuals embarked in boats on the*~~

~~*Ganges. Forthwith a murderous fire was opened upon them from the river bank. Only a single boat escaped, and but four men, who swam across to the protection of a friendly rdj4, ultimately survived to tell the tale. The rest of the men were massacred on the spot; the women and children, numbering one hundred and twenty-five, were reserved for the same fate a few days later, when the avenging army of Havelock was at hand, Sir Henry Lawrence, the chief commissioner of Oudh, had foreseen the coming storm with a prophetic eye. He had fortified and provisioned the residency at Lucknow in good time, and thither he retired with all the European inhabitants and a weak British regiment on July 2. Two days later he was mortally wounded by a shell. But his example inspired the little garrison to hold out under unparalleled hardships and against enormous odds, until relieved by Havelock and Outram on September 25. But the relieving force was itself invested by fresh swarms of rebels, and it was not till November that Sir Colin Campbell, afterwards Lord Clyde, cut his way into Lucknow, and effected the final deliverance of the garrison. The siege of Delhi began on June 8, just one month after the original outbreak at Meerut. Siege in the proper sense of the word it was not, for the British army, encamped on the historic ridge, never exceeded 8000 men, while the rebels within the walls were more than 30,000 strong. In the middle of August Nicholson arrived with a reinforcement from the Punjab, but his own encouraging presence was more valuable than the reinforcement he brought. On September 14 the assault was delivered, and after six days' desperate fighting in the streets Delhi was again won. Nicholson fell at the head of the storming party. Hodson, the intrepid leader of a corps of irregular horse, hunted down and brought in as prisoner the old Mughal emperor, Bahadur Shah, and then in cold blood shot down the emperor's sons with his own hand. After the fall of Delhi and the final relief of Lucknow the war loses its dramatic interest, though fighting went on in various parts of the country for eighteen months longer. The population of Oudh and Rohilkhand, stimulated by the presence of the begum of Oudh, the nawab of Bareilly, and Nana Sahib himself, had joined the mutinous sepoys en masse. In this quarter of India alone, it was the revolt of a people rather than the mutiny of an army that had to be quelled. Sir Colin Campbell in person conducted the campaign in Oudh, which lasted through two cold seasons. Valuable assistance was lent by Sir Jang Bahddur of Nepal, at the head of a numerous army of Gurkhas. Town after town was occupied, fort after fort was stormed, until at length the last*~~

~~gun had been recaptured and the last. fugitive had fled across the frontier by January 1859, In the meanwhile Sir HIugh Rose (afterwards Lord Strathnairn),with another army froin Bombay, was conducting an equally brilliant campaign in Central India. HIs most formidable antagonists were the disinherited rani of Jhansi, and Tantia Topi, whose military talent had previously inspired Nana Sahib with all the capacity for ,resistance that he ever displayed. The rant died fighting bravely at the head of her troops in June 1858 ; Tantid Topi, after doubling backwards and forwards through Central India, was at last betrayed and run down in April 1859.~~

~~Cawn- pur mas- sacre,~~

~~Siege of Luck- now.~~

~~Storm of Delhi.~~

~~Suppres- sion of mutiny.~~

~~Com- pany's charters.~~

~~Transfer to crown.~~

~~HISTORY. |~~

~~The Mutiny sealed the fate of the East India Company, after a life of more than two and a half centuries,~~

~~The Company received its original charter of incorpora- tion from Elizabeth in 1600. Its political powers, and the constitution of the Indian Government, were derived from the Regulating Act of 1773, passed by the ministry of Lord North. By that statute the governor of Bengal was raised to the rank of governor-general 3 and, in conjunction with his council of four other members, he was entrusted with the duty of superintending and controlling the governments of Madras and Bombay so far as regarded questions of peace and war ; asupreme court of judicature was appointed at Calcutta, to which the judges were appointed by the crown ; and a power of making rules, ordinances, and regulations was conferred upon the governor-general and his council. Next came the India Bill of Pitt (1784),~~

which founded the board of control, strengthened the supremacy of Bengal over the other presidencies, and first authorized the historic phrase "governor-general-in-council." The Act which abolished the Company's monopoly of trade (1833) also introduced several reforms into the constitution of the Indian Government, and added to the council an additional member, who might not be chosen from among the Company's servants, and was entitled to be present only at meetings for making laws and regulations ; it gave the authority of Acts of Parliament to the laws and regulations so made, subject to the disallowance of the court of directors e it appointed a law commission ; and it gave the governer- general-in-council a control over the other presidencies in all points relating to the civil or military administration. The charter of the Company was renewed for the last time in 1853, not for a definite period of years, but only for so long as parliament should ordain. 'On this occasion the number of directors was reduced, and their patronage as regards appointments to the civil service was taken away, to make room for the principle of open competition.

The Act for the better government of India (1858), which finally transferred the entire administration from the Company to the crown, was not passed without an eloquent protest from the directors, nor without acrimonious party discussion in parliament, It enacts that India shall be governed by, and in the name of, the sovereign of England through one of the principal secretaries of State, assisted by a council of fifteen members, The governor-general received the new title of viceroy. The European troops of the Company, numbering about 24,000 officers and men, were amalgamated with the royal service, and the Indian nay was abolished, By the Indian Councils Act (1861) the governor-general's council and also the councils at Madras and Bombay were augmented by the addition of non-official members, either natives or Europeans, for legislative purposes only ; and by another Act passed in the same year high courts of judicature were constituted out of the existing supreme courts at the presidency towns.

It fell to the lot of Lord Canning both to suppress the Mutiny and to introduce the peaceful revolution that followed. As regards his execution of the former part of his duties, it is sufficient to say that he preserved his equanimity undisturbed in the darkest hours of peril, and that the strict impartiality of his conduct incurred alternate praise and blame from the

~~fanatics on either side, The epithet then scornfully applied to him of "Clemency " Canning is now remembered only to his honour. On November 1, 1858, ata grand darbdr held at Allahabad the royal proclamation was published which announced that the queen had assumed the government of India. This document, which has been called the Magna Charta of the Indian people, went on to explain the policy of political Justice and religious toleration which it was her royal pleasure to pursue, and granted an amnesty to all except~~

~~those who had directly taken part in the murder of British subjects. Peace was proclaimed throughout India on J uly 8, 1859 ; and in the following cold weather Lord Canning made a viceregal progress through the upper provinces, to Teceive the homage of loyal princes and chiefs, and to guarantee to them the right of adoption. The suppression of the Mutiny increased the debt of India by about 40 millions sterling, and the military changes that ensued augmented the annual expenditure by about 10 millions, To grapple with this deficit, Mr James Wilson was sent out from the treasury as financial member of council, He reorganized the customs system, imposed an income tax and licence duty, and created a state paper currency. The penal code, originally drawn up by Macaulay in 1837, passed into law in 1860, together with a code of civil and criminal procedure.~~

~~Lord Canning left India in March 1862, and died before Recent~~

~~: F ' successor, Lord adminis- Elgin, only lived till November 1863, when he too fell a tration.~~

~~he had been a month in England. His victim to the excessive work of the goveruor-generalship, dying at the Himalayan station of Dharmsdld, where he lies buried. He was succeeded by Sir John Lawrence, the saviour of the Punjab. The chief incidents of his ad- ministration were the Bhutén war and the terrible Orissa famine. Lord Mayo, who succeeded him in 1869, carried on the permanent British policy of moral and material progress with a special degree of personal energy. The Ambal4 (Umballa) darbdr, at which~~

~~*Shere Alj was recognized as amir of Afghdnistan, though in one sense merely the completion of what Lord Lawrence had begun, owed much of its success to the personal influence of Lord Mayo himself. The same quality, combined with sympathy and firmness, stood him in good stead in all his dealings both with native chiefs and European officials. HIs example of hard work stimulated all to their best. While engaged in exploring with his own eyes the furthest corners of the empire, he fell by the hand of an assassin in the convict settlement of the Andaman Islands in 1872. HIs successor was Lord Northbrook, whose ability showed itself chiefly in the depart- ment of finance. During the time of his administration a famine in Lower Bengal in 1874 was successfully obviated by Government relief and public works, though at an enormous cost; the gdikwdr of Baroda was dethroned in 1875 for misgovernment and disloyalty, while his dominions were continued to a nominated child of the family ; and the Prince of Wales made a tour through the country in the cold weather of 1875-76. Lord Lytton followed Lord Northbrook in 1876. On J anuary 1, 1877, Queen Victoria was proclaimed Empress of India at a dérbar of unequalled magnificence, held on the historic "ridge " overlooking the Mughal capital of Delhi. But, while the princes and high officials of the country were flocking to this gorgeous scene, the shadow of famine was already darkening over the south of India,*~~

~~*season of 1877 was little better. The consequences of this prolonged drought, which extended from the Deccan to Cape Comorin, and subsequently invaded northern India, were more disastrous than any similar calamity since the introduction of British rule. Despite unparalleled importa- tions of grain by sea and rail, despite the most strenuous exertions of the Government, which incurred a total expenditure on this account of 11 millions sterling, the loss of life from actual starvation and its attendant train of diseases was lamentable. The total number of deaths from disease and want in the distressed tracts in excess of the normal mortality for the two years 1876-78 is estimated to have raised the death-rate by 40 per cent., or 5} millions. Tn the autumn of 1878 the affairs of Afghanistan again forced themselves into notice. Shere Ali, the amir, who*~~

~~*Both the monsoons of Famine 1876 had failed to bring their due supply of rain, and the 1876-78.*~~

~~Afghan cam- paigns,~~

~~1878-80.~~

~~had been hospitably entertained by Lord Mayo, was found to be favouring Russian intrigues. A British enr- bassy was refused admittance to the country, while a Russian mission was received with honour. 'This led to a declaration of war. British armies advanced by three routes,—the Klaibar (Khyber), the Kuram, and the Bolan, and without much opposition occupied. the inner entrances of the passes. Shere Ali fled to Afghan Turkestan, and there died. A treaty was entered into with his son, Yakub Khan, at Gandamak, by which the British frontier was advanced to the crests or further sides of the passes, and a British officer was admitted to reside at Cabul. Within a few months the British resident, Sir Louis Cavagnari, was treacherously attacked and massacred, together with his escort, and a second war became necessary. Yakub Khan abdicated, and was deported to India ; Cabul was occupied in force, and an Afghan chief of the Durdni line was placed in the government of Kandabar with the title of wali. At that crisis of affairs a geeral election in England resulted in a defeat of the ministry. Lord Lytton resigned with tlre Conservative ministry, and the marquis of Ripon was nominated as his successor in 1880, Since then, a British brigade received a defeat between Kandahar and the Helmand river from the Herdti army of Ayub Khan, a defeat promptly and completely retrieved by the brilliant march of General Sir Frederick Roberts from Cabul to Kandahar, and by the total rout of Ayub Khan's arnry on September 1, 1880. Abdurrahman Khan, the eldest male representative of the stock of Dost Muhammad, has now been recognized as amir of Cabul.~~

~~Governors-General of India under the East India Company,~~

~~1765-1858.~~

~~1806. Earl of Minto. 1818. Earl of Moira (Marquis of Hastings).~~

~~1765. Lord Clive. 1767. Harry Verelst. 1769. John Cartier.~~

~~1772. Warren Hastings. 786. Lord (afterwards Mar- uis) Cornwallis. 793. Sir John Shore (Lord Teignmouth). 1798. Sir Alured Clarke (pro tem.). 1798. Lord Mornington (Mar- quis Wellesley). 1805. Lord Cornwallis again. 1805. Sir George Barlow (pro tem.).~~

~~1828. John Adam (pro tem.). 1823. Lord Amherst. 1828. Lord William Cavendish~~

~~Bentinck. 1835. Sir Charles Metcalfe (Lord Metcalfe).~~

~~1836. Lord Auckland.~~

~~1842. Earl of Ellenborough.~~

~~1844, Viscount Hardinge.~~

~~1848. Earl (afterwards Mar- quis) of Dalhousie.~~

~~1856. Earl Canning.~~

~~Viceroys of India under the Crown, 1858-1881.~~

~~1858, Earl Canning. 1862. Earl of Elgin. 1864. Sir John Lawrence (Lord~~

~~1869, Earl of Mayo. 1872. Lord Northbrook. 1876. Lord Lytton.~~

~~Lawrence). 1880. Marquis of Ripon.~~

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~~position with reference to the great tract of which it treats. But in these departments also the process of subdivision has taken place, and different periods or aspects are now treated elaborately by specialists. (2) Aitchison's Treaties and Engage- ments, 7 vols., require a place by themselves. (8) The following are the leading works on the various periods, provinces, and races : —M'Crindle's Ancient India of Megasthenes and Arrian, and his Navigation of the Erythrecan Sea; Dr J. Muir's Originat Sanskrit Texts, 5 invaluable vols., [868-72 ; Weber's Listory of Indian Literature, 1878; Professor Max Miiller's J/istory of Sanskrit Literature, and various works and essays; Professor Dowson's Classical Dictionary of TTindu Mythology, 1879 ; Sherring's Ilindu Tribes and Castes; Fergusson's Zree and Serpent Worship, Indian Architecture, Cave Temples, &c.; the Reports of the Archzologieal Survey, by General Cunningham and Mr Burgess; Beame's edition of Sir H. Elliot's Races of India; Ward's Hindus; Abbé Dubois's Manners and ee of India; Bishop Heber's Journey ; Mrs Manning's Ancient and Medieval~~

~~ndia; Rajendra Ldla Mitra's Orissa, and series of valuable antiquarian works; General Cunningham's Ancient Geography of India, I87I; B. Ii, Hodgson''s Lssays 4 Indian Sulyects, 2 vols., 1880, and other works, specially on Nepd] and Tibet; ishop Caldwell's Comparative Grammar of the Dravidian Languages, the es authority on southern India; Colonel Dalton's Ethnology of Bengal; R. gusts Linguistic and Oriental Essays, 1880; 1. 1. Wilson's great series of works; 7 Sage Summer Maine's Village Communities; Birdwood's Indian Arts. (4) orks of a more local character : —Zhe Statistical Account of Bengal and Assam,~~

~~INDOVA~~

~~with the Gazetteers or District Manuals for the Central Provinces, Rdjputdna, Colonel Malleson's and princes; Mr Lepel Griffin's Punjab Rajds, TWooker's Himdlayan Jour?~~

~~provinces ;~~

~~and Afghanistan; Ferrier,~~

~~India; Sir Alexander Burnes's Cabool;~~

~~*nals; Vigne's 7rav Ilistory of the Afghans; Dr Bellew's reports;*~~

~~*Mysore,*~~

~~*in the Olden Time, and his other valuable works;*~~

~~*French in India; Wunter's Annals of Rurat*~~

~~*mans. (5) Among Affairs of the East*~~

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~~*India on the Eve of the*~~

~~*and Sir Herbert*~~

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~~*(7) Biographies of Clive, Warren Malcolm, Miuto, Metealfe, Com-Edwardes; also the Wellington*~~

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~~*Kaye's admirable Indian bi*~~

~~*Light of Asia stands first. Pandurang Hart;*~~

~~*well-known examples of the Anglo-Indian novel.*~~

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~~*ographies.*~~

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~~*of,*~~

~~*Plate VII.*~~

~~*END) AN A*~~

~~*INDIANA*~~

~~*Copyright, 1880, by Charles Scribner's Sons.*~~

~~*NDIANA, one of the Central States of the American Union, lies between 37° 47' and 41° 50' N. lat., and 84° 49' and 88° 2' W. long. It is bounded on the E, by the State of Ohio, from which it is separated by a line drawn due north from the mouth of the Great Miami river; on the S. by the Ohio river, separating it from Kentucky, between the mouths of the Great Miami and the Wabash ; on the W. by Ilinois, from which it is separated by the Wabash river from its mouth to a point where a line drawn due north from Vincennes last touches the western bank of that stream, thence north on that line to a point 10 miles north of the southern extreme of Lake Michi- gan ; on the N. by a line drawn from that point due east until it intersects the eastern boundary, separating the State from Michigan. A small portion of Lake Michigan is included within the northern boundary. The coast-line is about 60 miles in length. Michigan City is the only lake harbour in the State. The extreme length of the State is 276 miles, with an average breadth of 145 miles; and the area is 33,809 square miles. Topography.—Indiana occupies a broad table-land, for the most part level or gently undulating, except along the Ohio, where the plain has been deeply grooved by the affluent streams into hills and valleys. There are no eleva- tions that could properly*~~

~~*be termed mountains or mountain ranges. With the exception of a small portion which drains into the great lakes, the whole State inclines gently towards the south-west. The highest point (except a knob in Brown county) is found in the southern portion of Ran- dolph county, and is 1253 feet above the sea; the lowest, at the mouth of the Wabash, is 370 feet. From careful surveys the mean altitude of the State is estimated at 735 feet above sea-level. It is well watered by numerous streams and rivers, but, with the exception of the Ohio and Wabash, few of them are navigable. The Wabash is the largest river that has its course mainly within the State ; and, together with its branches, it drains three-fourths of the entire surface. It rises in the west of Ohio, and flows first in a north-west direction, and then south-west till it meets the boundary of Illinois, which it follows southward for more than 100 miles, till it falls into the Ohio, after a course of upwards of 500 miles. The Ohio forms the entire southern boundary of the State. The other principal rivers of Indiana are tributaries of the Wabash. The White River, the most important of these, is formed by the W. and E. Forks,—two rivers respectively about 300 and 200 miles long,—which unite about 100 miles above its confluence with the Wabash. The Maumee is formed by the St Joseph and St Mary in the north-east, and falls into Lake Erie. The Upper St Joseph, with its tributaries, passes through the northern counties, and falls into Lake Michigan. That portion south of the Wabash was originally covered with heavy forests of oak, beech, maple, walnut, ash, and other hard woods; north of that river was principally prairie, interspersed with small lakes.*~~

~~*813*~~

~~*Geology and Minerals.—Lower Silurian strata are well developed in the south-eastern part of the State, with a thickness of 800 feet. Next, to the west and north, in succes- sion occur rocks of the Upper Silurian, with a thickness of 200 feet, and those of Devonian age, 180 feet thick. The last two formations spread over all the northern third of the State, deeply covered with glacial drift, and at points deeply eroded by ice and water flow of that age. The Coal- measures occupy over 7000 square miles in the western and south-western parts, furnishing seven workabie seams, at a depth of 50 to 220 feet, and averaging 80 feet below the surface ; the seams vary in thickness from 24 to 11 feet, averaging 4) feet; the quality is from*~~

~~fair to good ; an area of 600 square miles in this field yields a superior "block" or splint coal. This, being free from sulphur and phosphorus, is used in blast furnaces as it comes from the mine, without coking, and is well adapted for the preparation of Bessemer steel. The Sub-Carboniferous or Mountain Limestone borders the Coal-measures on the south and east; it yields giant bands of choice limestone for build- ing purposes, 30 to 50 feet thick, unlimited in extent, homogeneous, elastic to compensate for inequalities of tem- perature, and with endurance to bear the climatic changes. Near Leavenworth, in the southern part of the State, there is a remarkable calcareous cavern, the Wyandotte Cave. One of its chambers is 350 feet long and 245 in height. It abounds with stalactites and stalagmites of great variety and size.~~

~~Inexhaustible beds of fire clay, potter's clay, kaolin, and lime, as well as paving and building stone, are found in the southern parts of the State.~~

~~Agriculture is the chief branch of industry, the climate and soil being suited to the growth of cereals, fruits, and grasses. The following table, compiled from the report of the Bureau of Statistics, shows the production of the chief grain crops for 1880 :—~~

~~ren~~

~~Acres, Bushels, RIVALS A Ge iceeise NR. cas: < Se eo 3,109,845 47,130,684 Iinclianicormeene- occas: 3,130,327 87,335,014 EUS aaccicicicers Raters nieve eer cere ee Terre cat 686,901 15,563, 430 PANG) 1)~~

~~687,911~~

~~The meadow land amounted to 778,691 acres, and the hay produced was 1,221,164 tons. The same year the domestic animals numbered — horses 494,809, cattle 1,150,559, sheep 1,508,242, and hogs 4,253,586. There were 145,826 stands of bees, yielding 1,114,883 wb of honey.~~

~~Climate.—The climate is equable and healthy. In 1865 a United States signal station was established at Indianapolis, and the following meteorological tables have been compiled from the daily reports of this~~

~~*office. They indicate the temperature (in degrees Fahrenheit) and rain- fall in inches during a period of fourteen years. The meart height of the barometer for the same period was 30:010 inches. The prevailing winds are from the south and west in summer, veering round to the north in winter.*~~

~~*Mean Monthly Temperature and Rainfall for Fourteen Years.*~~

~~*January. | February.| March. April, May. Temperature …... 313° 36°7° 41°8° 54-1° 64 "4° Rainfall (inches)..| 3°75 3°00 4°50 3°66 4°47*~~

~~*October. |November.} December.*~~

~~*54°7° 2°37*~~

~~*September.*~~

~~*67°9° 3°68*~~

~~*July.*~~

~~*ok he 4°57*~~

~~*June.*~~

~~*74°3° 4°36*~~

~~*August.*~~

~~*75°6° 3°17*~~

~~*41°6° 2°94*~~

~~*3°51*~~

~~*30°5" |*~~

~~*Annual Mean Temperature and Rainfall.*~~

~~*1867. 1868.*~~

~~56°46° | 56°38° 52°44 | 48-54~~

~~1865. 1866.~~

~~55°56° 45°05~~

~~56°32° 50°69~~

~~Temperature Rainfall (inches).~~

~~1871. | 1872, | 1878. | 1874 | 1875. 1877, | 1878, §5°89° | 52°75° "B215° | 55-04° 50°46° 54°60° | 55°40° 36°05 | 87°95 | 52°32 | 43°60 | 54°58 39°08 | 38°62~~

~~814~~

~~Manufactures, Communication, &c.—The manufacturing interests have increased rapidly during the last decade. The Bureau of Statistics reported the value of manufactured products for 1878 at $185,050,220, and the mercantile trade sales at $300,323,256. The increase of wealth is shown as follows by the appraisement for taxation :—~~

~~oT aS, $202, 650,264 haa ot oes eee 411,042, 424 Te ee ee 663,455,044 ee ee oe, ees 767,887,172~~

~~On April 1, 1880, there were sixty-three railway cor- porations, working 4963 miles uf railway in the State, tra- versing eighty-five counties, and appraised for taxation at $38,442,941. So completely does the railway system cover the State that one can go from the capital to almost any county and return the same day. The geographical position of the State is such that all the main railroad through-lines between the east and west have to cross Indiana.~~

~~Administration.—The State is divided into ninety-two counties, containing about 400 square miles each, The governor is elected for four years. The legislature, which meets twice a year, consists of a senate of fifty, elected for four years, and a house of representatives of one hundred, elected for two years. The judges (five) of the supreme court are elected for six years. The~~

~~*State has thirteen representatives and two senators in Congress. All popular elections are by ballot. All elections by the legislature are viva voce. The State has no permanent debt. The con- stitution declares that no debts shall be incurred by the State except to meet casual deficits in the revenue, or to provide for the public defence, repel invasion, and suppress insurrection. tory in 1800, Vincennes was made the capital ; when the State Government was formed in 1816, the capital was fixed temporarily at Corydon, until provision could be made for the permanent seat at Indianapolis, to which it was removed in 1824.*~~

~~*Education.—The foundation of the free school system was laid by Congress when, in admitting the State into the Union, the Government presented a section of land in each township to the inhabitants for free schools. A great advance was made in 1851, when in framing the new con- stitution it was provided that certain funds then belonging to the State, with all penal fines and forfeitures accruing, should constitute a common school fund, the principal to remain a perpetual fund, to be increased, but never di- minished, and the annual income used for tuition only. This fund in 1880 amounted to $9,220,708, and is in- creasing. In the samo year there were 9647 schoolhouses in the State, valued at $11,817,954. Of the children of school age (six to twenty-one) there were—males, white 354,761, coloured 7162; females, white 334,249, coloured 7386. Of these 511,283 attended the schools. The tuition revenue expended for the year ending June 30, 1880, was*~~

~~*Amount derived from State tax ……..ccccsssssseeeeneeses $1,519,791 °69 Interest on common school fund held by countics……. 204,145°30 State's interest on non-negotiable bonds ……..s0s0c000 234,187:00 Amount derived from unclaimed fees .. .,……..ceseeeeeeees 895°22 Compressional TOM MSMID BEVCMUC,., 0.00.00. .sesanmeaveerasece 198,247 66 AmountiofToeallitunityeM Wax nceesice sss cine seeeeenieni ener 589,093°21 Proceeds ofmig ier Teen Gee iiissec1s. canner anasicen ee teanest 193,512°15*~~

~~*INOW os ic comeaieesnaiinetnees ceseauearige wneaiet $2,939,872°23*~~

~~*The State university is at Bloomington, and the State normal school at Terre Haute. The function of the latter is to fit its pupils to become teachers in the*~~

~~*common schools. Perdue University, at Lafayette, is the State agricultural college. There are also a number of colleges, mainly under the control of religious societies, chief among which are Asbury University (Methodist) at Greencastle, Wabash College (Presbyterian) at Crawfordsville, Butler University (Christian) at Irvington (near Indianapolis), Notre Dame*~~

~~*On the organization of Indiana as a terri-*~~

~~*IN D—IND*~~

~~*(Catholic) at South Bend, and Earlham College (Friend) at Richmond.*~~

~~*Population.—In point of population Indiana ranks as fifth State in the Union. The white inhabitants in 1765 are stated to have consisted of a few French families along the Wabash. The following table shows the popula- tion at decennial periods during this century :—*~~

~~*Year, White. Coloured, Total.*~~

~~*1800 4,577 298 4,875 1810 23,890 630 24,520 1820 145,758 1,420 147,178 1830 389,399 8,632 343,031 1840 678,698 7,168 685,866 1850 977,154 11,262 988,416 1860 1,338,710 11,428 1,350, 428 1870 1,655,837 24,560 1,680,637 1880 1,976,261*~~

~~*The return for 1880 shows a density of population of 57°8 persons per square mile.*~~

~~*The following are the chief towns, with population in 1880 :—Indianapolis, 75,074; Evansville, 29,280; Fort Wayne, 26,880; Terre Haute, 26,040; New Albany, 16,422; Lafayette, 14,860; South Bend, 13,279; Rich- mond, 12,473; Logansport, 11,198; Jeffersonville, 10,422.*~~

~~*History.—Indiana originally constituted a part of New France. It was visited by the Jesuits as early as 1672. At the beginning of the 18th century the French opened a line of communication between the lakes and the Mississippi by way of the Maumee, Wa- bash, and Ohio rivers, Trading posts for barter with the natives were established at the head of the Maumee, where is now the city of Fort Wayne; at Ouantenon, on the Wea*~~

~~*Prairie, near the city of Lafayette; and at Vincennes on the Wabash. Missionary stations were also established by the Jesuit fathers, in their endeavour to convert the Indians. At the close of the French war in 1763-4, the territory east of the Mississippi and north of the Ohio passed under British dominion. Pending the war between Great Britain and the American colonies, Colonel George Rogers Clark of Virginia, with an armed force, took possession of the territory, raising the American flag at Vincennes in 1778. By the treaty of 1783 between England and the United States this territory was recognized as belonging to the latter ; inasmuch as Virginia had fitted out Clark's expedition, she was entitled by the law of conquest to claim this vast dominion. During the colonial war Congress recommended the several States to cede their claims to un- appropriated lands in the western country to the general government for the common benefit of the Union. Virginia, in pursuance of this request, yielded up her claims to the territory north-west of the Ohio. The deed of cession, executed on March 1, 1784, was signed by Thomas Jefferson, James Monroe, Arthur Lee, and Samuel Hardy. In 1787 Congress passed an ordinance for the government of the north-west territory, which provided, among other things, that not more than five States should ever be formed thereof, prohibiting slavery, and declaring that "religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall for ever be encouraged." This territory was subsequently divided into the States of Ohio, Indiana, Illinois, Michigan, and Wisconsin. Indiana was admitted into the Union as a State by Congress on April 19, 1816, being the sixth State received after the formation of the government by the thirteen original States and the adoption in 1787 of the present constitution. (A. C. H.)*~~

~~*INDIANAPOLIS, the capital of Indiana, is situated at almost the exact geographical centre of the State, in 39° 47' N. lat., 86° 6' W. long., 824 miles W. of New York by rail, and 194 miles S.E. of Chicago. It stands 721 feet above the sea-level, and 148 above Lake Erie.*~~

~~*On the admission of Indiana as a State into the Federal Union in 1816, Congress presented 4 square miles of public lands for its seat of government, to be selected by the State. The location was made in 1820 at the confluence of Fall Creek and White River. The site chosen was in the*~~

~~*midst of the unbroken forest, 60 miles distant from the borders of civilization, and only reached by Indian trails. The name Indianapolis was given by an act of the Legislature on January 6, 1821; and Alexander Ralston was appointed to lay out the city. Selecting a slight mound near the*~~

~~*iN D=IW B*~~

~~*middle of the ground as the centre of the Proposed capital, Ralston laid out the town after the manner of Washington city, which he had helped to survey.*~~

~~*Four avenues radiate from the centre to the four corners of the city. The streets and avenues are 90 feet wide, except Washington, the main street, which is 120. The city has now outgrown its original limits, and extends 4 miles in length and 3 in width. It is built upon a level plain and surrounded by a fertile country. It was in- corporated in 1836, and received a city charter in 1847, Its growth is shown by the following table :—*~~

~~*Year, Population. Assessed Value of Property.*~~

~~*1850 8,090 $2,326,185 1860 18,113 10,700,000 1870 48,244 25,981, 267*~~

~~*75,121 50,254,934*~~

~~*In 1847 the first railway entered the city. Within a few years thereafter other lines were constructed, until now twelve main lines converge in the Union Depot. About one hundred passenger trains, connected with every part of the country, enter and depart daily. The numerous tracks being on a level with the surface of the streets, the obstruction and danger at the numerous crossings became very great on account of the increase of railway traffic, so that in 1877 a loop ling, called the " Belt," had to be made passing round the city, to connect the various railroads. By means of it the "through freight cars" are conveyed past the city without blocking the traffic.*~~

~~*Indianapolis is in the centre of*~~

~~*the city. The number packed in 1877 was 420,000 head; in 1878, 766,000 ; in 1879, 677,809. It is also largely engaged in the grain trade. greatest*~~

~~service to Indianapolis, compensating for its want of water transit. The manufacturing and mercantile interests, which are large and increasing, are the natural result of the city's extensive railroad connexions.~~

~~A system of graded free schools is maintained all the year. The city school property is valued at $1,041,000.~~

~~In 1871 a public library was established, and is supported by taxation, which now contains 36,461 volumes, and is rapidly increasing. The masonic temple, oddfellows' hall, post-office, U. S. arsenal, and chamber of commerce are handsome buildings. The Marion county court-house, standing on a public square in the heart of the city, was completed in 1877 at a cost of $1,411,524. The exterior is of Indiana limestone, the interior of iron and marble, with frescoed walls and ceilings. Its dimensions are 150 by 256 feet, and 240 feet to the top of the dome. The prin- cipal benevolent institutions of the State, viz., the institu- tion for the education of the blind, that for the deaf and dumb, and the hospital for the insane, are located here ; they are handsome and commodious buildings, the last having accommodation for 1313 patients. The State reformatory for women and girls, where all female offend- ers are imprisoned, adjoins the city. The institution is under the management of a board of control, composed of women chosen by the governor of the State. In 1877 the State began the erection of a new State house, to be com- pleted in 1888, at a cost of $2,000,000. This will be one of the most imposing capital buildings in the United States.~~

~~By law the power to incur permanent debt is limited to a sum not exceeding 2 per cent. upon the assessed value of the property within the city; and the rate of taxation is limited to 90 cents per $100 for municipal purposes, 20 cents for public schools, aud 2 cents for free libraries, (A. C. H.)~~

~~the swine-producing region, and pork packing is one of the chief industries of~~

~~The railways have been of~~

~~*INDIAN ARCHIPELAGO. The Fast Indian Archi- pelago or Malay Archipelago, the largest island cluster in the world, lies to the sonth-sast of Asia and to the north and north-west of Australia, and bears the impress in many of its most important characteristics, both natural and his: torical, of this twofold relation,*~~

~~*_As the archipelago does not form a political unity, Position different writers assign it very different limits, according as and they are influenced by one set of considerations or another, °*te2t New Guinea to the east and the Philippines to the north are sometimes included and sometimes excluded ; Sumatra 1s Sometimes regarded as the most western member of the group, and sometimes that position is given to the Nicobar or the Andaman Islands. From the following survey of the extent of the archipelago the Malay Peninsula and New Guinea are excluded, but the Andaman Islands are admitted as having at least an ethnographical claim. 'The Balintong Strait, about the 20th parallel of N. lat., may be taken as the northern limit; and but for a small portion of the islands Timor and Sumba (Sandalwood Island), with their insignificant adjacencies, the southern limit might be stated as the 10th of S. lat. The Andaman Islands take us as far west as 93° E. Jong., the Aru Islands as far east as 135°. The equator passes through the middle of the archipelago ; it successively cuts Sumatra, Borneo, Celebes, and Jilolo, four of the most important islands. To adopt Mr Wallace's graphic sentences (noting that he embraces New Guinea and the Solomon Islands), the archipelago "includes two islands larger than Great Britain; and in one of them, Borneo, the whole of the British Isles might be set down, and would be surrounded by a sea of forests. Sumatra is about equal in extent to Great Britain ; Java, Luzon, and Celebes are each about the size of Ireland. Kighteen more islands are on the average as large as Jamaica ; and more than a hundred are as large as the Isle of Wight."*~~

~~*The statistics of the area and population of the several islands can only be given approximately. The following table is based on statements contained in the sixth num. ber of Behm and Wagner's Die Bevilkerung der Erde (Gotha,*~~

~~*1880) :-— 9 tee at*~~

~~*Area, Population.*~~

~~*Sq. miles.*~~

~~*3,192 20,000*~~

~~*655,720 | 27,343,000*~~

~~*I, Andaman and Nicobar Islands…. IJ. Sunda and Molueca Islands2…….*~~

~~*(1) Borneo group…..295,007 sq. m. (2) Sumatra group…..... 179,458, as (3) Java group……..seccee. 50,849 ,, toe*~~

~~*(4) Lesser Sunda group… 35,152 ,, (5) South-Western group. 2,021 ,, (6) Tenimber, Aru, and*~~

~~*We! islands! «as. c¢ees. 5,856, (7) Moluccas….. 021.001 20,549 ,, eee ses (8) Celebes group……c00 (i200, oon eon III. Philippine Islands …….00: 114,096 7,450,000 TOR 2 ssanproeme ss cencanie|) 4 uy OD 34,813,000*~~

~~*The total area is thus rather less than that of British India, and the population rather more than that of Great Britain and Ireland.*~~

~~*The islands of the archipelago nearly all present bold General and picturesque profiles against the horizon, and at the appear-*~~

~~*ance.*~~

~~*1 For more detailed information respecting the several islands aud groups of the archipelago the reader is referred to the separate articles BORNEO, JAVA, SUMATRA, PHILIPPINE IsLanps, &c.*~~

- ~~*Various subdivisions have been suggested of the great Sunda and Molucca groups, which may be described as the Indian Archipelago par excellence. Mr Wallace arranges them thus:—The Indo-Malay Islands—Borneo, Java, and Sumatra; the Timor group—Timor, Flores, Sumbawa, and Lombok ; Celebes, with the Sulu Islands and Buton ; the Moluccan group—Buru, Ceram, Batchian, Jilolo, and Morty, with the smaller islands of Ternate, Tidore, Makian, Kaisa, Amboyna,*~~

~~Banda, Goram, and Matabello. The Ke and the Aru Islands he treats along with New Guinea.~~

~~. short ridges and clusters from the plain, like islands from~~

~~Geology.~~

~~rocks, the latter represented by Oolites in Timor, by a coralline limestone in Celebes. Cretaceous rocks occur in both these islands and in Celebes. Throughout the whole archipelago the Tertiary formations have a wide develop- ment both in their Eocene and their Miocene divisions. The latter is represented by foraminiferous limestone, and the former by nummulitic limestone. Lignite is freely distributed throughout the Tertiary strata of Java, Sumatra, and Nias. Among the rocks of economic importance may be mentioned granite of numerous kinds, syenite, serpentine, porphyry, marble (at least in southern Java), sandstones, and marls. Coal is worked successfully in Sumatra, Borneo, and Labuan. Diamonds are obtained in Borneo, garnets in Sumatra, Batchian, and Timor, aud topazes in Batchian ; antimony in Borneo and the Philippines ; lead in Sumatra, Banka, Flores, and the Philippines; and copper and malachite in the Philippines, Timor, Borneo, and Sumatra. Iron is pretty frequent in various forms, and in some places might be successfully worked. Gold is not uncommon in the older ranges of Sumatra, Banka, Celebes, Batchian, Timor, and Borneo. Manganese could be readily worked in Timor, where it lies in the carboniferous limestone. Platinum is found in Landak and other parts of Borneo, and mercury in small quantities in Java.~~

~~The meteorology of the archipelago has hitherto been studied only in a very vague manner. For Batavia, in- deed, there exists a mass of observations ; and the observa- tory there is extending the region of its investigations. At the close of 1879 it had one hundred and twenty-five rainfall stations. A magnetic survey of the islands has been made by E. Van Rijckevorsel, whose report is pub- lished by the Academy of Sciences of Amsterdam. The most striking general fact is that, wherever that part of the south-east monsoon which has passed over Australia strikes, the climate is comparatively dry, and the vegeta- tion is less luxuriant and luscious. The~~

~~*east end of Java, e.g., has a less rainfall than the west; the distribution of the rain ou the north coast is quite different from that on the south, and a similar difference is observed between the east and the west of Celebes. According to Dr Bergsma's Rainfall of the East Indian Archipelago, Furst Year, 1879 (which, like other publications of the Batavian meteorological office, is printed in English), at thirty-three stations out of fifty-nine the annual rainfall exceeded 100 inches, and at five stations 200 inches, The highest regis- tration was 282 inches, at Padang Pandjang (Sumatra). The north-west monsoon, beginning in October and lasting till March, brings the principal rain season in the archi- pelago. The midday heat of the sun, it need hardly be said, makes itself powerfully felt. Exposure to its direct rays in Timor, for example, "at any time between 9 A.M. and 3 p.M.," says Mr Wallace (Tropical Nature), " would blister the skin in a few minutes almost as effectually as the application of scalding water," and Mr Moseley men- tions that on wading into the sea at the Aru Islands he found the heat of the water actually greater than was at all pleasant. But at the same time the general climate cannot be said to be oppressive or unhealthy.*~~

~~*Most of the islands of the archipelago belong to that great forest-belt which, in the words of Mr Wallace, "girdles the earth at the equator, clothing hill, plain, and mountain with an evergreen mantle." In islands aud districts where human civilization has been at work for centuries, the natural covering has in large measure given place to artificial tilth ; and in Timor and several of the south-eastern islands the characteristics of New Guinea —luxuriant herbage and open park-like wood- lands—are more or less strikingly predominant. The*~~

~~*ee eS*~~

~~*same time the character of the scenery varies from island to island and even from district to district. The mountains arrange themselves for the most part in lines running either from north-west to south-east or from west to east. In Sumatra and in the islands between Sumatra aud Borneo the former direction is very distinctly marked, and the latter is equally noticeable in Java and the other southern islands, 'The mountains of Borneo rise rather in*~~

~~*the sea; the arrangement represented on even what are considered authoritative maps being, like much else in the cartography of the archipelago, the product of imagination. Nothing in the general physiognomy of the islands is more remarkable than the number and distribution of the volcanoes, active or extinct.1 Running south-east through Sumatra, east through Java and the southern islands to Timor, curving north through the Moluccas, and again north from the end of Celebes through the whole line of the Philippines, they form as it were the rim of a great atoll (to use Dr Schneider's phraseology), rudely resembling a horseshoe narrowed towards the point. The loftiest mountain in the archipelago would appear to be the fanious Kina Balu in Borneo ; the loftiest of the volcanic peaks are Indrapura in Sumatra (12,255 feet), Semeru in Java (12,238), Gunong Agong in Ball (11,726), and Tamboro in Sumbawa (9324 feet).*~~

~~*An important fact in the physical geography of the archipelago is that Java, Bali, Sumatra, and Borneo, and the lesser islands between them and the Asiatic mainland, all rest on a great submerged bank, nowhere more than 100 fathoms below the surface of the sea, which may be considered a continuation of the continent; while to the east the depth of the sea has been found at various places to be from 1000 to 2500 fathoms. As the value of this fact has been particularly emphasized by Mr Wallace, the limit of the shallow water, which passes through between Bali and Lombok, and strikes north to the east of Borneo, has rightly received the name of Wallace's line. The Philippines, on the other hand, "are almost surrounded by deep sea, but are connected with Borneo by means of two narrow submarine banks." ?*~~

~~*The geology of the archipelago has not been investigated even with the completeness attained in regard to the zoology and botany ; but there is a very considerable collection of material in the publications of the mining engineers of the Dutch Government (Jaarboek Majnwezen Ned. O. Ind.); and for the Philippines a valuable " Memoria geologico- minera " has been printed in the Boletino of the Commission of the Geological Map of Spain (Madrid, 1876), The results obtained by the Dutch engineers have beeu summarized by Dr Schneider, " Geologische Uebersicht iiber den hollind.-ostind. Archipel," in Jahrbuch d. K.K. Geolog. Reichsanstalt,*~~

~~*Vienna, 1876, Bd. xxvi. There is a wide and varied representation of the azoic formations—gneiss, mica-schist, hornblende, &c., in Timor (which it may be remarked is geologically one of the best known of the islands), Ceram, Billiton, Banka, &c. Silurian rocks are found in Banka (where they contain the famous tin-mines), Billiton, and the Linga and Riouw archipelago; car- boniferous limestone occurs in the north of Timor; the coal of Batcbian is apparently similar to that of the English Carboniferous measures ; and the Coal-measures of Borneo are thought by Van Dyk to be also Paleozoic. The Sumatran coal is of unascertained age. Permian rocks are present in Timor, Celebes, Pulo-Laut, and Sumatra. Of Secondary formations we find both Triassic and Jurassic*~~

~~*1 & valuable list of these will be found in Junghuhn's Java, a work*~~

~~*ben contains many details in regard to various parts of the archi-*~~

~~*2*~~

~~*Wallace, Island Life, 1880. 8 Wallace, Malay Archipelago, p. 8.*~~

~~*Meteoro-*~~

~~*logy.*~~

~~*Vegeta-*~~

~~*tion,*~~

~~*Zoology.*~~

~~*fNDUAN ARCHIPELAGO*~~

~~*field for botanical research in the archipelago is still vast and alluring. Among the very giants of the forest the unregistered species must be numerous; and, if we descend to the minor forms, it is a very poor collection that does not yield something absolutely new to science. The ferns, the pitcher plants, and the orchids are especially numerous, and have attracted particular attention. "The volcano of Pangerango in Java is said to have, for example, yielded three hundred species of ferns ;' and Mr*~~

~~*Burbidge, in a short excursion in Borneo in 1879, found upwards of fifty species that had not been previously obtained in the island.*~~

~~*For detailed information in regard to the flora, the reader may consult C. G. le Reinwardt, Ueber den Character der Vi egetation auf*~~

~~*den Inseln des Ind. Archipels, Berlin, 1828 ; Belanger, Botanique du Voyage awe Indes Orientales, 1825-1829, Paris, 1832 ; the various works of C. L. Blume(A/usewm botaniewm Lugd. Bat., Leyden, 1849 51; Colleetion des orchidées, Amster., 1858, &c.); W. H. de Vriese,*~~

~~*Vowvelles Recherches sur la flore des possessions Neerland. aux Indes*~~

~~*Or., Amst., 1845; Hasskarl, Catalogus plantarum in horto botanteo Bogoriensi cultarum, Berl., 1844; F. Dozy and J. H. Molkenboer, Bryologia Javanica seu descriptio muscorum frondosorum Arch, Ind., Leyden, 1844-58; H. Zollinger, System. Verzetehniss der im Ind. Areh. 1842-1848 gesammelten. . . . Pflanzen, Zurich, 1854;*~~

~~*Miquel, Flora van Nederlandsch Indié, Amst., 1855, Annales Muset*~~

~~*Botaniei Lugduno-Batavi, 1869, and Illustrations de la flore de VAr- chipel Indien, 1871 (continued by Suringar).*~~

~~*If we turn to the economical aspect of the vegetation, whether natural or cultivated, we cannot fail to be impressed by its varied resources. The list of fruits is a very exten- sive one; though unfortunately it is only with a very few of them that the untravelled European can have any practical acquaintance. Besides the orange, the mango, the mangosteen, the pomato or shaddock, the guava, the papaw, and the jack fruit, we have the rambutan, the tarippe or trap, the jintawan, the tampu, the bilimbing, the mamhangan, the langsat, the rambi, and the jambosa, The name at least of the durian is now well known (see Durtay), and nearly as strange is the bawangutan (Scor- doprasum borneense), of which the fruit, the leaves, and the branches have all a strong odour and flavour of onions.! Of what more distinctively deserve the name of food-plants the variety is equally notable. Not only are rice and maize (usually called djagong in the archipelago), sugar and coffee, among the widely cultivated crops, but the cocoa-nut, the*~~

~~bread fruit, the banana and plantain (usually called pisang in the archipelago), the sugar-palm (Arenga saccharifera), the tea-plant, the sago-palm, thecocoa- tree (which curiously yields the favourite beverage of the Sulu archipelago), theground-nut, the Caladium esculentum, the yam, the cassava, and others besides, are of practical importance. The cultivation of sugar and coffee owes its development mainly to the Dutch; and to them also is due the introduction of tea. They have greatly encouraged the cultivation of the cocoa-nut among the natives, and it now flourishes, especially in the coast districts, in almost every island in their territory. The oil is very largely employed in native cookery. The sago-palm is most abundant in the island of Ceram, but is also found growing wild in Borneo, Celebes, Timor, and other islands of the Moluccas, in the Linga archipelago, and in parts of Sumatra. The product is mainly prepared for export. Pepper, nutmegs, and cloves were long the objects of the most important branch of Dutch commerce ; and camphor, dammar, benzoin, and other products of a similar kind have a place among the exports. India-rubber and gutta percha are no longer ob- tained to the same extent as formerly."~~

~~To the naturalist the Indian archipelago is a region of the highest interest; and from an early period it has attracted the attention of explorers of the first rank. And~~

~~1 See Burbidge's interesting chapter in his Gardens of the Sun, 1880. 2 Compare Musschenbroek, Alededeelingen omirent grondstofien uit het oost. gedeelte van onzen Ind. Archipel, Briel, 1880.~~

~~yet the list of its living forms is far from being completely ascertained. The best known district is western Java, and Timor, the Moluccas, and the Papuan Islands have for the most part been well explored. Only parts of Sumatra, Borneo, and Celebes have been worked, and most of the other islands have yet to be dealt with. Zoologically the archipelago belongs to two distinct regions—the eastern or Papuan, and the western or Malay or Indian. 'This latter region, according to August von Pelzeln (Ueber die Malayische Sdugethiere-Fauna " in Festschrift zur Feier des Piinfundzwanzigjihrigen Bestehens der K.K. Zool.Bot. Gesellschaft un~~

~~*Wren, Vienna, 1876), comprises southern China, Tibet, the Himalaya, and Further India, as well as the islands of the archipelago up to Wallace's line. He finds six genera of the Quadrumana, fourteen of the Chiro ptera, five of the Znsectivora, fourteen of the Carnivora, six of the Rodentia, of the Hdentata one only (Jfanis), five of Ruminants, and three of Pachyderms. Sumatra indicates @ connexion with the Malacca peninsula by Nemorhedus, the elephant, Gymnura, and the tapir. Pithecus, Tarsius, and Ptilocereus seem peculiar to the Sunda Islands. The Philippines have Semnopithecus, Macacus, Cynopithecus, Galeopithecus, Pteropus, Taphozous, Vespertilis, Viverra, Paradoxurus, Pteromys, Mus, Rusa, and Cervulus.*~~

~~*In his various works Mr Wallace has made the English reader familiar with the most striking features of zoological distribution in the archipelago; and in his Island Life, especially, the ornitho- logy receives particular attention. For details in regard to the mam- mals and birds, see Horsfield, Zoological Researches in Java and the Neighbowring Islands, 1834 ; Van Temminck, Monographies de Mam motogie, 1827-1829 and 1835-1841; Verhandelingen over de natuurs lijke geschiedenis der Nederlandsche overzeesche bezittingen, contain- ing papers by S. Muller and H. Schlegel; zoological appendix to Beleher's Voyage of H. M. Ship "Samarang," Lond., 1850; H. Schlegel, Muséwm d'hist. naturelle des Pays-Bas.: Revue méth. et ertt. des Colleetions, Leyden, 1863-76; Id., Mfém. sur les quadrumanes et les chetroptéres de Varehtpel indien, Amst., 1864; Id., De Vogels van Nederlandsch Indié beschreven en afgebceld, Leyden, 1876 ; Von Rosenberg, " Overzichtstabellen voor de Ornithologie van den Indischen Archipel" in Acta Seient. Ind. Neerland., part v.; T. Salvadori, " Catalogo sistematico degli uccelli di Borneo," in Annali di Genova. To the eam of the archipelago valu- able contributions have been made by P. Bleeker, A.C. J. Edeling, and A. B. Meyer. Like so much else of value, their papers are mainly to be found in the Nat. Tijds. van Ned. Ind. For the fishes the great modern authority is Bleeker, whose principal work, however, was left unfinished (Adlas tehthyologique des Indes orien- tales Neerlandatises), and whose snialler contributions are scattered through more than a dozen periodicals.*~~

~~*The ethnology of the Indian archipelago does not lack Ethno- its difficult problems; but some outstanding features are logy. easily described. 'There are at least two main native races, the brown long-haired Malay and the darker-skinned frizzly-haired Papuan. And to these more recent explora- tions make it almost certain that a third and probably more thoroughly aboriginal race—the Negrito—must be added, though even specialists who have had opportunities of direct observation are not unanimous in regard to this noteworthy element. The Malays are subdivided Into an immense number of tribes and peoples in the most various stages of civilization, and broadly differenced from each other by physical and linguistic characteristics. Of chief note are the Malays proper, the Javanese, the Bugis, the Tagalas, and Bisayas, the people of the Moluccas, the Dayaks (mainly in Borneo), the Battaks of Sumatra, the Sulu islanders (closely similar to the tribes of northern Borneo). The Papuan race is chiefly to be found in the eastern section of the archipelago. Besides these three races, whose first connexion with the archipelago dates from before the dawn of history, we have a variety of intrusive clements, traceable by more or less strictly listorical*~~

~~*3 See Professor Veth's valuable monograph, Overzicht van hetgeen, in het bijzonder door Nederland, gedaan is voor de Kennis der Fauna van Nederlandse Indi#, Leyden, 1879.*~~

~~*XII — 103*~~

~~*Lan- guages.*~~

~~*Popula- tion.*~~

~~*Politieal divisions.*~~

~~*818*~~

~~*documents, A HIndu strain is evident in Java and others of the western islands; Moors and Arabs (that is, as the names are used in the archipelago, Mahometans from yarious countries between Arabia and India) are found more or less amalgamated with many of the Malay peoples ; and the Chinese form, in an economical point of view, one of the most*~~

~~*important sections of the community in many of the more civilized districts. Chinese have been estab- lished in the archipelago from a very early date: the first Dutch invaders found them settled at Jacatra ; and many of them, as, for instance, the colony of Ternate, have taken so kindly to their new home that they have acquired Malay to the disuse of their native tongue. Chinese tombs are among the objects that strike the traveller's attention at Amboyna and other ancient settlements.*~~

~~*For the ethnology of the archipelago, see Meinicke, " Ueber die Vilkerstiimme des Ind. Archipelagus," in Annalen der Erdkunde, 1837; Spencer St John, " The Population of the Ind. Arch.," in Jour- nal of the Ind. Archipelago, the Ind. Arch.: Papuans, Lond., 1858; Logan, " On the Ethnology of the Ind. Arch.," in Jour. of Ind. Arch., 1847, 1850, 1851, 1853, 1854; and the rich collections in the Tijdschrift v. Ind. T. L. on V. Runde An excellent summary of the subject by A. H. Keane will be found as an appendix to Wallace's Australasia (Stan- ford's Compendium of Geography and Travel), Lond., 1879. See also the same writer's papers in Nature, 1881.*~~

~~*There is a vast field for philological explorations in the archipelago. Of the very great number of distinct lan- guages known to exist, few have been studied scientifically. The most widely distributed is the Malay, which has not only been diffused by the Malays themselves throughout tho coast regions of the various islands, but, owing partly to tho readiness with which it can be learned, has become the common medium between the Europeans and the natives. The most cultivated of the native tongues is the Javanese, and it is spoken by a greater number of people than any of the others. To it Sundanese stands in the relation that Low German holds to High German, and the Madurese in the relation of a strongly individualized dialect. Among the other languages which have been reduced to writing and grammatically analysed are the Balinese, closely connected with the Javanese, the Battak (with its dialect the Toba), the Dayak, and the Macassarese (see the writings of R. van Eck, H. N. van der Tuuk, A. Harde- land, aud B. F. Matthes). Alfurese, a vague term mean- ing in the mouths of the natives little else than pagan, is more particularly applied by the Dutch philologists to the native speech of certain tribes in Celebes. The com-*~~

~~*inercial activity of the Buginese causes their language to be pretty widely spoken,—little, however, by Europeans.*~~

~~*A general sketch of the languages of the archipelago will be found in De Gids, 1864, from the pen of Professor Veth. See also Robert Cust, Sketch of the Modern Languages of the Hast Indies, 1878, A bibliography of this department will be found in Bocle van Neusbroek, De beoefening der oostersche talen in Nederland en xijne overzeesche bexittingen 1800-74 (Leyden, 1875).*~~

~~*The statistics of the population are, with the exception of those for a few limited areas, such as Java, of the most uusatisfactory character The estimate of Behm and Wagner in 1880 has been already stated,—34,813,000. This gives the comparatively sparse proportion of 45 to the square mile. The distribution, too, is extremely unequal. In Java we have as much as 364 to the square mile, and in the Philippines about 65, so that for the remaining islands the average is only about 15, It would appear that when left in their natural savage or semi-savage con- dition the natives increase very slowly in numbers, and in some cases hardly maintain their ground,*~~

~~*_Politically the Indian archipelago is subject to a sixfold division :—the independent native states and tribal terri- tories, the Spanish possessions, the Portuguese possessions, the Dutch possessions, the English possessions, and the*~~

~~*1849; G. W. Earl, The Native Raees of*~~

~~*INDIAN ARCHIPELAGO*~~

~~*state of Sarawak. The Dutch are by far the most influen- tial power in the archipelago. The Spanish authority is confined to the Philippines and the Sulu archipelago,—the latter rendered tributary to them by the native sultan in August 1878 in return for an annual subsidy of 2400 dollars. The English, if the island of Singapore be con- sidered as belonging rather to the Malacca Peninsula, possess only the island of Labuan (19,350 acres), acquired in 1847,—though the establishment of the British Bornean Company in the north of the island may prove the begin- ning of a new*~~

~~acquisition. To the Portuguese are subject part of Timor and the island of Kambing, in all 6192 square miles. The Dutch on the other hand claim, besides an area of 149,820 square miles in western New Guinea, a total territory in the archipelago of 566,383 square miles, or forty-four times as much as the governing country. Of the really independent native states the largest is that be- longing to the sultan of Brunei (Borneo) ; it is estimated to have an area of about 88,000 square miles~~

~~The Dutch divide their territory into two great divisions—(1) The~~

~~Java and Madura, and (2) the Outer Possessions. The former,~~

~~which comprises also Bali and Lombok, is administratively divided territory~~

~~into twenty-three residencies, which are subdivided into depart- ments or assistant residencies. The Outer Possessions are organized in a similar manner, but several portions of them—the West Coast of Sumatra, Celebes and its dependencies, and Achin or Atjh—con- stitute governments with residencies under them. Of the other residencies the principal are those of the Hast and South-East coasts of Sumatra, Riouw and its dependencies, the island of Banka, Western Borneo, Southern and Eastern Borneo, Menado in the north of Celebes, Timor, Amboyna, and Ternate, the last being nominally the most extensive of all, from including an unusually large proportion of native territory.~~

~~The accusation frequently made against the Dutch that they fur- nished little information about their East Indian possessions has long ceased to have any foundation in fact. The Government pub- lish at Batavia a large annual Regerings Almanak voor Nederlandsch Indié (that of 1880 contains upwards of 1200 pages) ; and every year there is presented to the Dutch parliament a voluminous Koloniaal Versiag, coutaining elaborate details on all departments of the administration. The Z%jdschrift voor Nederlandsch Indié of Dr W. BR. Baron van Hoévell, continued by a society of statesmen and scholars (Zaltbommel), the Bijdragen tot de Taal- Land- en Volkenkunde van Nederlandsch Indie of the Royal Institute at the Hague, the Indische Gids (Amsterdam), and the Indische Merewur (Haarlem), a monthly organ of trade, show the interest taken in Holland in the East Indian possessions. Of the numerous periodi- cals published at Batavia it is~~

~~enough to mention the Statistick van den Handel, the Verslag van's lands plantentuin te Buitenzorg, the Tijdschrift van het Kon. Institwut voor Ingenieurs; the Verhand- lingcn of the Batavian Society of Arts and Sciences, and the same society's Tijdschrift voor Ind. Taal- Land- cn Volkenkunde; the Ind. Militair Tijdschrift, the Natuurkundig Tijdsch., the Geneeskundig Tijdsch., and Tijdseh. voor Nijverheid en Landbouw. Another Tijdschrift of the Ind. Agricult. Soc. is published at Samarang.~~

~~The population subject to the Dutch is partially indicated in the following table :—~~

~~Males in~~

~~1877,~~

~~1877, 1878~~

~~Java and Madura.~~

~~EV POO ys fi sges uyesiaine ese ens 28,672 15,586 29,998 (Climbayeets! Baqnonp ocossoooppsoocono: 198,238 103,269 200,303 IAMPOMOS, « setereie s ocersteetsinte ocevsis ce sistent 9,379 iy, lel 8,839 Other Eastern foreigners … 3,961 2,077 4,115 INGIGIVIES Miss. Ge ae sents saan 18,567,075 | 8,987,999 |18, 824,574~~

~~118,807,820 | 9,114,046 |19,067,829~~

~~Outer Possessions. †~~

~~Europeans ……..00—eeeesseecee 7,688 3,988 8,028 (O\trhn hc Omememtinneoeeeaese ceeops 126,710 96,448 119,534 eiucnedsieie: aea 4,634 2,299 4,708~~

~~†~~

~~5,681 9,150~~

~~How rapidly the Chinese element is increasing is shown by the fact that in the five years 1874-78 permission to reside within Dutch territory was~~

granted to 18,302 Chinese ; while similar per- iii in: a ae ee

1 No accurate data are known for the native tribes of the Outer Possessions.

Govern- ment.

Finance.

Army and navy,

INDIAN ARCHIPELAGO

mission was obtained by only 749 « Europeans "1 (including Arme- nians and Persians) and 1421 Arabs. Slavery was abolished in the strictly Dutch portions of the Indies on the 1st of J anuary 1860, and under Dutch influence it is being abandoned by the native states.

The functions of the governor-general of tho Dutch possessions may briefly be described as those of a viceroy. He has command over the land and sea forces, and supreme supervision of all parts of the general administration. His also is the right of declaring war and peace, and of concluding treaties with the native princes and peoples. No sentence of death can be executed in time of peace withont his authority, and he enjoys the right of mercy and amnesty within certain definite limits,

The governor-general is assisted by a council (Raad van Neder- landseh Indic), consisting of a vice-president and four members (all named by the king), assisted by a secretary. In relation to the executive the council is an advising body ; but in the exercise of the legislative functions, and in certain definite cases, if the governor- general disagrees with his council, he must appeal to the king for direction. The council has itsseatat Batavia, and meets every Friday.

*The governor-general has besides a cabinet called the ** general secretariat," the head of which is the general secretary (assisted by two*

~~*Government secretaries), who acts as referee and adviser of the administration. Besides his strictly secretarial duties he com- piles the Staatsblad van Nederlandsch Indig and the Regerings Almanak voor Nederlandsch Indié (published since 1816). A general chamber of accounts for the Dutch East Indies, consisting of a president and six members, has its seat in Batavia.*~~

~~*The administrative departments have undergone considerable changes from time to time. At present there are five directors—(1) of inland administration, (2) of education, religion, and industry, (3) of public civil works, (4) of finances, and(5)of justice, the lastadded in 1869. To the department of justice belong, not only the supervision of the courts and law business, but that of the weeskamers and boedel- kamers or chambers of wardship and legacies, the granting of right of residence, the control of the press, and the right of public meeting. The supreme conrt has its seat at Batavia, and there is an elaborate and intricate system of subordinate courts of justice, Kuropean and native. Itis only the chief officials that are Europeans, in accordance with the dominant policy in the whole constitution of the departments of inland administration and justice, that the relations of native with native should be left as much as possible in the hands of native courts. In all about two hundred native princes are tributary to the Dutch authorities,*~~

~~*To the department of finance belong (1) the taxes and resources of the colony, farmed or unfarmed, so far as they do not depend on some other department ; (2) the control of public auctions ; (3) the mint ; and (4) various duties connected with the colonial budg«t and the colonial treasury. The custom of farming a large part of the revenue has long been in vogue, and despite the theoretical objections to the system, it has one great advantage, it pays. The sale of opium is one of the principal Government " farins." he cultivation of the poppy is absolutely forbidden in the archipelago, and the demand is satisfied by imports from British India and the Levant. From the Government supply so obtained the contractor is obliged to take a certain definite quantity at a high fixed price; beyond this he may purchase at ordinary cost price what he finds requisite. The total gain from this monopoly was £1,259,212 in 1879, though the local authorities are instructed to do all in their power to prevent the spread of*~~

~~opium-eating. The whole of what are called 'the lesser resources" of the Government, consisting of a curious miscellany of taxes, do not yield a third of the opium revenue. Of the branches of the revenue not farmed, the chief are the customs or import and export duties. 'The average these yielded for the five years 1874-78 was £720,378. Two important taxes, known as the personal tax and the income tax, both levied on Europeans, were introduced in 1879.~~

~~The most striking feature in the administration of the Dutch East Indies is undoubtedly this that, instead of being a drain on the resources of Holland, the colony pays annually a most im- portant contribution into the national exchequer. When these pos- sessions were taken over by the mother country they were burdened with a large debt, and the financial state of the colony remained very unsatisfactory for many years ; but on the introduction of the culture system in 1830 the aspect of affairs was speedily changed, and in thefourteen years from 1865 to 1878 there was a clear gain of about £18,000,000 from the colonial administration. :~~

~~On December 31, 1878, the strength of the military forces in the East Indies was 38,106 men, of whom nearly one half were Europeans. This, however, does not include the militia corps, which were estab- lished in certain places. At the same date the East Indian navy comprised 27 ships and 154 cannon. The strength of the military marine was 2934 Europeans and 969 natives, while the vessels were manned by 2630 Europeans and 1012 natives. ' P ;~~

~~There is an elaborate department of education, public worship,~~

~~1 The technical use of this name extends it to all except Arabs, Moors, Chinese, and generally all Mahometans and pagans, who are collectively classed as natives.~~

~~and industry; but it is astonishing how little has hitherto been~~

~~oe in the European instruction and Christianizing of the natives.~~

~~_The educational organization consists of two departments—a Educa- European and a native ; but it is only within recent years that tion.~~

~~the latter has begun to attract the active interest of the Govern- ment. For secondary European education the great institution is the Gymnasium Willem III. at Batavia. In 1878 there were 68 Government primary schools for Europeans in Java and Madura, and 28 in the Outer Possessions, with a total attendance of 7223 children. With the exception of certain medical colleges, all the Institutions in the native department are for primary instruction. At the end of 1878 these schools numbered 376 ; 214 of them were in the Outer Possessions. In Java and Madura there is a grand total of 28,000 native children receiving vernacular education, and if the Outer Possessions are included the number must be more than doubled. There are nine training schools for native teachers, most of them established since 1870 ; and in 1879 four schools were opened for sons of the native princes and aristocracy.~~

~~The Protestant churches of the Dutch Indies compose a church union, administered very much according to Presbyterian usage. The number of preachers and assistant preachers is limited by Government, the former to 35 and the latter to 21, by a royal decree of 1863. The Roman Catholics are under a vicar-apostolic, who is also bishop of Batavia, and 20 of their ecclesiastics are paid by the state. Christianity has not as yet made much progress among the natives, the returns for 1878 showing only 174,462 native Christians, of whom 225 were Chinese, In Java and Madura the Christians do not number so much as 1 in 2300 of the popula- tion. Mahometanism is tho religion of a large proportion of the natives, and is at present making more advances in relation to the heathen population than Christianity. The Dutch Government grauts passes for about a shilling each to those who wish to make the pilgrimage to Mecca; and the numbers who set out in 1877,~~

~~1878, and 1879 respectively were 6893, 5632, and 5488, besides~~

~~about 1500 from the native states.~~

~~Religion,~~

~~*The administration of the department of public works shows Public*~~

~~*”*~~

~~*that the Dutch have uot belied their E engineering and industrial activity in their Indian colony. roads and bridges, canals aud irrigation works, which they have executed in their central island win the admiration of visitants, of a railway system, but considerable progress has been made there; and the postal and telegraph services are being rapidly developed.*~~

~~*The total imports of private trade (including specie) amounted in 1876 to 116,392,762 florins (1 florin =1s. 8d.), and in 1877 to 126,066,462; and at the same time 5,118,988 florins and 27,637,954 florins respectively were imported in name of the Government. Of the 109,177,424 florins of general imports (exclud- ing specie) in 1876, 47,694,270 florins were from Holland, 38,042, 854 from other countries outside of the archipelago, and no less than 27,632,294 from Singapore alone ; and of the Government imports 2,207,611 florins were from Holland and 2,033,910 from Singapore. In 1877 cotton manufactures figure among the general imports for 43,566,127 florins, and yarns for 3,325,328 ; rice for 7,798,348 ; petroleum, 5,430,103 ; cigars, 2,892,369 ; tea, 2,405,511 ; coals, 2,268,520; and iron and iron goods 2,362,525. The opium is the most extensive of the Government imports.*~~

~~*The general exports (specie excluded) were 154,229, 384 florins for 1876 and 161,863,449 for 1877; thosc of the Government, 51,168,108 and 57,116,672. In 1876 the more important articles showed as follows :— coffee (private trade) 84,347,870 florins, (Government) 54,208,868 florins; sugar, 62,583,164 florins; tobacco for the European market, 27,794,755 florins; gambir, 2,036,592 ; gutta percha, 1,651,292 ; benzoin, 582,581; dammar, 1,025,737 ; india- rubber, 83,171; gum copal, 128,075; indigo for the European market, 3,636,942 ; nutmegs, 2,815,787 ; cocoa-nut oil, 1,220,682 ; pepper, 1,883,349 ; rice, 2,292,907 florins. i.*~~

~~*The Portuguese were the first Enropeans to visit the Indian archipelago, Prior to their appearance off Sumatra in 1509 under Diogo Lopez la Sequiera, a Hindu civilization, having its chief seat in Java, had flourished and waned, and Mahometanisin had sneceeded to a considerable share of*~~

~~its inheritance. In 1521, when the Portuguese name had become familiar in the islands, the Spaniards under Magellan made their appearance from the east. Hostilities ensued, which continued till the treaty of 1529, by which the boundary between Spaniards and Portuguese was fixed at 17° E. of the Moluccas,—a line which afterwards proved matter of dispute. 'he two powers were undisturbed except by an un- important French expedition till 1596, when the Dutch reached what was destined to Be the scene of their greatest colonial achieve- ments. In that year Cornelis Houtman appeared before Bantam, the chief town of a powerful kingdom in Java, and his expedition was but the precursor of many others from Holland. The com- mercial success of these enterprises led in 1602 to the establishment of the Dutch East Indian Company, which obtained by Government~~

~~foreign Java is the only island which has even the beginning~~

~~wuropean reputation for civil works, The~~

~~Imports.~~

~~Exports.~~

~~History.~~

~~820~~

~~eharter the monopoly of the Dutch trade of the countries between the Straits of Magellan and the Cape of Good Hope, with the right of concluding treaties, appointing governors, &e. The first fleet sent out by the new Company under Van der Hagen was instru- mental in eapturing the Portuguese fort of Amboyna, and the peace of Treves in 1609 set the Dutch free from interference on the part of the Spaniards. In the same year the states-general appointed a governor-general of the East Indies, giving the Company the right of appointing his suceessor, subject to their approval.~~

~~'he instructions given to Pieter Both, the first governor, struck the key-note of that policy which has brought so much~~

~~obloquy on the Dutch name, and prevented the better features of~~

their colonial administration from being appreciated. He was to '« give all endeavour in order that the commerce of the Moluccas, Amboyna, and Banda should belong to the Company, and that no other nation in the world should have the least part." When he came into power there were already Dutch forts at Jilolo, Teruate, and Batchian, and the people of Banda had granted the Dutch the monopoly of nutmegs. It was to the fourth governor (J. P. Coen, 1619-23 and 1627-29) that the Company were most indebted for their territorial aggrandizement. He was the founder of Batavia (1620), and the first to introduce a regular system of accounts in the affairs of the Company. During his rule a treaty was concluded between the English and Dutel: companies, but unfortunately the goodwill which might have resulted from it was not of long dura- tion. Specx (1629-32) gave a start to the trade with Japan, which afterwards grew to vast and various issues. The governor- ship of Van Diemen (1636-45) was signalized by a series of suc- cesses over the Portuguese, and the introduction of the first code of laws. The Dutch power in the archipelago extended rapidly during the latter part of the century. Peace was made with the Portuguese (1661), and various native kingdoms acquired. In the beginning of the 18th century the expense of the necessary military operations and general administration, with other causes, brought the colony into financial difficulties, and in the latter part of the century it was greatly damaged by the rapidly grow- ing predominance of the English in India and Ceylon. The loss of their possessions in India, however, caused the Dutch to give more attention to the archipelago, and they continued to increase their territory. At the same time the state of the finances grew worse and worse, leading to the complete abolition of the Company's authority in 1800, when their possessions and liabilities were both appropriated by the nation. During the term of office of H. W. Daendels (1808-11), the English, who some years before had threatened Batavia and captured Ternate, made themselves masters of the Moluccas, and his successor Janssens was obliged in 1811 to surrender the colony and its capital to Lord M into.! The British occupation lasted for five years, and during most of this time the post of governor-general was held by Sir Stamford Raffles, who acted perhaps too much on the supposition that the English occu- pation would be permanent, and was undoubtedly biased by strong prejudice against the Dutch, but at the same time did not forget Lord Minto's advice "to do as much good as he could." To the Dutch themselves this temporary government by the English did ultimate service.

~~*The example set by Rafiles, when he showed so keen an interest in all that related to the country and the people, proved a stimulus to his Dutch sueeessors ; and the whole relation of the Government to scholarship and investigation has been placed on a more liberal and European footing. The restoration of the East Indian possessions to the Dutch was decided by the treaty of 1814, but was not carried out till 1816, when Baron van der Capellan beeame governor-general.? A varicty of loeal disturbanees followed the change of government, and a more serious war in Java (1825-30) required a special expedition from Holland. The year 1880 saw the beginning of that famous " culture " system, under Van den Boseh, to which so much of the financial suceess and peaceful administration of the modern Dutch government must be aseribed. In 1846 anew eode of laws was introdueed. The recent history of the colony may be briefly deseribed as a gradual but steady extension of the autho- rity of the Dutch Government, marked by a succession of revolts, disturbanees, expeditions, skirmishes, and subjugations ; a gradual but steady endeavour to develop the resourees of the country ; and, it may happily be added, an endeavour growing ever stronger and 2 The following ts a list of the D s a list o e Dutch oa*~~

~~*P. Baron van der Capellan (19th pent yer ee eereve den Bo 4 nie (lieut.-gov.-gen., 1826 to 16th January 1830) ; Count Johannes van 1836); Domi Poi Ne 'uly 1833) ; Jean Chrétien Baud (1853 to 20th February Count yan Mmetto i — e i oe (1836 to 1840, died 30th May); Carel S. W. 1th Hebrnegg 18 ay oe et to 6th January 1841); Pieter Merkus (1841 to (th Awgnat 1844 , gen. till 1844, died 24 August); Joan Cornelis Reijnst May 1851): Ge to 30th September 1845); Jan Jacob Rochussen (1845 to 12th Teel aoa Bes ad lftesis (died before his departure); Albertus Jacob Qa September 1861): Arij Pr 51 to 22d May 1856); Charles F, Pahud (1856 to Baek ne See , ; Arij Prins (2d September 1861); Ludolf Anne Jan Wilt,*~~

~~*eele (19th October 1860 to 25th October 1866); Arij Prins 2d*~~

~~*October 1866); Pieter Mijer : : jer (28th December 1866); James Loudon (ls 1872 to 26th March 1875); J. W. van Lursberge (26th March 1875), Chae*~~

~~*IND—IND*~~

~~*The literature connected with the East Indian archipelago is a vast and rapidly increasing one. For general information we have—J. Crawfurd, /istory of the Indian Archipelago, Edin., 1820, 3 _vols.; J. H. Moor, Notices of the Indian Archipelago, Singapore, 1837; P. P. Roorda van Eysingsa, Mandboek der Land- en Volkenkunde van Nederl, Indié, 1841; A. J. van der Aa, Nederlandsch Qost-Indié, Amsterdam, 1845-57, 4 vols.; and the Aardrijkskundig en statistisch Woordenboek van Nederlandsch Indié, Amsterdam, 1869, to which Professor Veth, Jonkheer yan Alphen, and other specialists were important contributors. Of works which contain the results of recent individual explorations, the most important are—Wallace, The Malay Archipelago, 3d ed., London, 1873; Rosenberg, Die Indische Archipel, Leipsic, 1878; Backer, Larchipel indien, Paris, 1874. Early notices of the archipelago are found in several Ayabie writers. The first European to give any details is the Italian traveller Lodovico di Varthema, but little confidence can be placed in his narrative. Navarrete's Coleccion de documentos; Castan- heda's IJistoria de descobrimento, Lisbon, 1833; Gaspar Correa's Lendas or Le- genda ; De Barros, Asia ; Faria y Sousa, Asia Portuguesa, Lisbon, 1666; and A. de Morga, The Philippine Islands, Moluccas, d&c., at the close of the 16th century, translated from the Spanish, Hakluyt Society, 1868, may be consulted for the early history ; a critical resumé of which, from the pen of P. A. Tiele, is to be found in Bijdragen tot de Taal- 'Land- en Volkenkunde van N. 1, The Hague, 1878. Facile princeps among older Dutch works is Valentijn's voluminous and well-known Oud en Nieuw Oost Indie, Amsterdam, 1724-26, Dealing more restrictedly with the Dutch colony are G. Laut's Geschiedenis van de vestiging, &c., in Indie, Gron., 1852-60; Saalfeld, Geschichte des Lolland., Colonialwesens in O. Ind., Gött., 1812; Gerlach, Fastes militaires des In. Or., Zaltbommel, 1859 ; Du Bois, Vies des gouverneurs-géeneraucr, llague, 1763, with some good plans and views; Elout, Bijdragen tot de Kennis van het Koloniaal beheer, 1851, and other volumes of Bijdragen from his papers, published in 1863 and 1874; P. Myer, Verzameling van instructien, ordonnanciien, &c., voor de regering v. Ned. Ind., Bat., 1848; Boudewijnse and Van Goest, De Indo-Nederlandsche Wetgeving, 1816-57, Llaarlem and Batavia, 1876-79; E. de Waal, Nederlandsch Indté en de Staten- Generaal sed. de grondwet v. 1814, Hague, 1860-61. A bibliography of the Dutch Indics was compiled by J. A. van der Chijs, Proeve eener Nederlandsch Indische bibliograjie, 1659-1870, Batavia, 1875. (H. A. W.)*~~

~~*INDIAN CORN. See Maizz.*~~

~~*INDIAN OCEAN. This designation is given to the portion of the oceanic area which extends northwards from the great southern water-zone, between the eastern coast of South Africa and the western boundary of the partially submerged Malayo-Australian continent. But whilst the Atlantic and Pacific extensions from the southern water- yone—the one dividing South Africa from South America, and the other forming the wide expanse of ocean between the western coast of South America and the eastern side of the Malayo-Australian continent—are prolonged into the land hemisphere as far as the north polar area, the Indian Ocean does not extend itself northwards beyond the Tropic of Cancer, where it is abruptly closed in by the great land mass of the Asiatic continent. The north-western boundary of its basin is formed by the south-eastern coast of Arabia, its north-eastern by the western coast of Burmah. But, between these two parts of its border, its basin is encroached on by the southward projection of the Indian peninsula, and is thus divided into two deep gulfs, of which the western is distinguished as the Arabian Sea, and the eastern as the Bay of Bengal. Now, looking to the fact that these gulfs must have been united, at no remote period, by a transverse band of sea, covering what is now the con- tinuous alluvial plain of Northern India, we may consider the real northern border of this basin to be the great HImalaya range, the southern slope of which must have once formed its shore-line. It is remarkable that nearly the whole of its land-border is of considerable elevation,—being formed on the west by the mountainous ridge that flanks the great table-land of South Africa, on the north-west by the corresponding ridge which forms the south-eastern border of the elevated plateau of Arabia, whilst near its eastern margin there is a nearly continuous mountain range, that extends southwards from Assam to the extremity of the Malay Penin- sula, and is thence prolonged through Sumatra and Java.*~~

~~*The Indian Ocean has no definite southern limit, but is considered to terminate at the parallel (about 38° 8.) which stretches between the southernmost points of the African and Australian continents,—near which, about midway between these two extremes, lie the volcanic islands of St Paul and Amsterdam. And this seems the natural border of its basin, the sea-bed (as will presently appear) showing a distinct rise to the south of*~~

~~*this parallel along a consider- able part of it. The Indian Ocean is often spoken of as divided by the equator into a northern and a southern portion ; and this division it will be convenient to adopt in the description of its current-system.*~~

~~*INDIAN*~~

~~*Depth and Islands.—The main basin of the Indian Ocean has an average depth of about 2500 fathoms, increasing to 3000 fathoms in the angle between Java and north-western Australia, which is the deepest part of it yet sounded. Its southern border is formed by a submarine plateau, which rises in some parts to within 1500 fathoms of the surface, and which forms the common foundation, not only of the islands already mentioned, but also of the Crozets, the Kerguelen group, Prince Edward's Islands, and the Heard Islands, all of which seem to have had a volcanic origin, This plateau, however, does not shut in the south-eastern portion of the basin ; for a southward extension of the depression already described follows the trend of the western and southern coasts of Australia and the western coast of Tasmania, and is continuous with the deep channel (in some parts exceed- ing 2500 fathoms) between Australia and New Zealand. The western and north-western parts of the basin, on the other hand—as the number of their island-groups would lead us to anticipate—have a much less uniform depth. In the first place, the western border of the basin is encroached on by the great island of Madagascar, which must be considered as an outlying extension of the conti- nental platform of South Africa, the Mozambique channel being comparatively shallow ; and, although the bottom, at*~~

~~*Plan showing Depths of the Indian Ocean.*~~

~~*To 1000 fathoms, white ; 1000 to 2000 fathoms, light shading, more than 2000 fathoms, dark shading.*~~

~~*no great distance from its eastern coast, rapidly deepens to 2000 fathoms or more, yet this is only in a channel that separates Madagascar from a platform of about half that depth, on which are based the volcanic Mascarene Islands (Mauritius, Bourbon, and Rodriguez), and of which a northern extension forms the base of the Seychelles group. This platform*~~

~~then curves to the south-west, so as to pass round the north of Madagascar, forming the base of several coral islands, and thus comes into continuity with the bed of the Mozambique Channel, from which the Comoro group arises. To the north of this platform, the 2500 fathom line follows the trend of the African coast as far as Cape Gardafui, keeping outside the island of Socotra; and a bottom of more than 2000 fathoms (crossed by the tele-graph-cable between Aden and Bombay) extends into the Arabian Sea as far as 15° N. lat. On the eastern side of that gulf, however, the declivity from the Indian coast-line to the deepest part of the basin is much more gradual ; the Maldive and Laccadive groups of coral islands rising from a comparative shallow, which extends itself a little to the south of the equator. And about half way between this platform and that of the Seychelles the bottom rises into the bank which bears the Chagos archipelago, and which divides the communication between the deeper portion of~~

~~the general basin and that of the Arabian Sea into two channels of no great width. Thongh the 2500 fathom line does not enter. the Bay of Bengal, a considerable portion of it has a depth exceeding 2000 fathoms. HIere, again, the declivity is more gradual along the eastern margin of the gulf; and the Andaman and Nicobar Islands anise from a comparatively shallow platform that stretches~~

~~between the delta of the Jrawadi and the north end of Sumatra.~~

~~Surface and Bottom Temperature.—The surface-temperature of the Indian Ocean is higher than that of either the Atlantic or the Pacifie ; and this difference shows itself especially in its northern division, on which the proximity of tropical land exerts an import- ant thermal influence. For the mean annual temperature of the portion which lies between the equator and the Tropic of Cancer, including the Arabian Sea and the Bay of Bengal, is considerably above 80°, whilst that of the corresponding part of the southern division—lying between the equator and the Tropic of Capricorn — ranges from 80° to 70°, the average maxiinum temperature in the centre of the Arabian Sea being 87°. In July the thermal equator moves considerably to the north, and the surface-tem perature sometimes rises in the Arabian Gulf and the Bay of Bengal to above 90°. In January, when the~~

~~*thermal equator lies to the south of the geographical, the temperature of these two gulfs falls below 80°, while that of the vast expanse which lies between the parallel of 10° N, and 25°S., hasa temperature of 80° or upwards. In the southern — hemisphere the January (summer) isotherm of 70° and the July (winter) isotherm of 60° correspond pretty closely with the border of the Indian Ocean,—the range of its temperature being thus very moderate,*~~

~~*The bathymetrical isotherms of the Indian Ocean have not yet been systematically worked out by temperature-soundings; but there is adequate evidence of the extension of the Autaretic underflow over the deeper portion of its sea-bed, even to the north of the equator. For the " Hydra" line of soundings between Aden and Bombay gave a bottom-temperature of 36°°5 at a depth of 1800 fathoms, the surface-temperature being 75°, while in the deep depression on the eastern side of the basin, almost immediately beneath the equator, Commander Chimmo met with a bottom-temperature but little above 32°,*~~

~~*Surface-Level.—A very remarkable effect is produced upon the coast-level of part of the northern division of the Indian Ocean, by the attraction of the great mountain-masses and high table-lands of Central Asia, uncompensated by that of any elevated land-mass to the southward, nearer than that which may lie behind the Antaretic ice-barrier. From the results of the great geodetical survey of India Archdeacon Pratt was able to deduce the very remarkable fact that the level of the sea at the mouth of the Indus is no less than 515 feet higher than at Cape Comorin.!*~~

~~*Currents.—The current-system of the Indian Ocean is clearly dependent upon the winds which prevail over its several parts, —the seasonal reversal of the monsoons in the northern part of its area producing a corresponding modification in the direction of the surface-movement of its water, whilst in the southern division the constancy of the south-east trade-wind keeps up through the whole year a strong westerly equatorial current. The north-east monsoon has, of course, while it lasts, the same effect as a north-east trade-wind would exert, in producing a general south-westerly drift over the northern division of the Indian Ocean, which manifests itself in a southerly flow along all the shores it meets, viz., the south- east coast of the Indian*~~

~~*peninsula, the sonth-east coast of Arabia, and the east coast of Central Africa. Besides this, a special enrrent- movement is produced by the action of the north-east monsoon on the surface-water of the China Sea, by the drift of which to the south-west it is foreed into the channel between the Malay Penin- sula and Sumatra, whence it issues into the Indian Ocean, through the Strait of Malaccea, as a current that crosses the Bay of Bengal and impinges against the Coromandel coast of India. By this it is deflected southwards, along with the general drift already mentioned, and then courses round the southern angle of the great peninsula,— partly between Ceylon and the mainland, and partly along the outer coast-line of Ceylon,— into the Arabian Sea, where it merges into the general drift of the surface-water towards the African coast. The average rate of this current, as it issues from the Strait of Malaccea, is 30 miles per day ; along the south-east coast of India, 24 miles; on the east coast of Ceylon, 40 miles; and along the Arabian coast, 18 miles. But when the north-east gives place to the south-west monsoon, about the vernal equinox, the whole of this movement is reversed. The drift then commences from the African and Arabian coasts, and sets across the Arabian Sea, at the rate of about 24 miles a day, to the Malabar coast of India, along which a current flows in a southerly direction at the rate of abou*~~

~~*re a ee) Philosophical Transactions, 1859, p. 795.*~~

~~*822*~~

~~*30 miles a day. This current rounds Cape Comorin and the southern coast of Ceylon, where it sometimes attains the rate of 45 miles a day, and passes into the Bay of Bengal, reinforcing the eneral north-east movement of its own water, cirenlating round the head of this gulf, and then undergving a deflexion by the coast- line towards the entrance of the Strait of Malaccea, into which it flows at the rate of from 20 to 24 miles per day. When the sun crosses the equator towards the south at the autumnal equinox, so that its heating power is exerted on South Africa, the indraught of air towards that continent reproduces the north-east monsoon ; and this restores the westerly drift, which extends over the Indian Ocean as far as 5°S. lat., giving place at about that parallel to the equatorial counter-current. The surface of the southern Indiau Ocean, between the parallel*~~

~~of 10°. and the Tropic of Capricorn (the precise limits varying with the season), is pretty constantly traversed by the south-east~~

~~trade-wind, which gives a steady westward movement to its water, known as the south equatorial current, whose average rate is about 14 miles per day. This meets the eastern coast of Madagascar, and that of continental Africa to the north and south of it; and, its onward flow being thus checked and deflected southwards by the trend of the laud, it forms a strong current which sets along the Natal coast towards Cape Colony. The strength of this current varies according as the north-east or the south-west monsoon is blowing ; for the movement produced by the former reinforces it, while that pro- duced by the latter weakens it, by deflecting northwards a portion of the water which the southern equatorial current brings to the coast of Africa, and drifting it towards the Indian peninsula. When flowing with its greatest force and velocity, the Natal current! is scarcely, if at all, inferior to the Gulf Stream where it issues from the Florida Strait. When passing Cape Corrientes, at the southern extremity of the Mozambique Channel, it is said to havearate of 80 miles per day, and has been even said to rush, under a rare combination of impelling forces, with a velocity of 140 miles~~

~~er day. Its rate gradually diminishes, however, until, off Cape~~

~~'olony (where it is known as the Aguthas current), it has a velocity of about 50 miles per day. The warmth it carries has a very import- ant influence in ameliorating the climate of Cape Colony ; for this would otherwise suffer from the importation of the low temperature brought by the Antarctic current which there meets it? When the Agulhas current is at its strongest, it carries a temperature of 79° as far west as the meridian of 15°. Bnt when the drift of the~~

~~inonsoon wind countervails that of the sonth-cast trade, instead of~~

~~yeinforcing it, the temperature of the Agulhas current is lower and its force less. Whilst a portion of this current rounds the Cape and becomes a tributary of the South African current of the Atlantic (thus carrying away the excess brought into the basin of the Indian Ocean by the Malacca current), the principal part of it is deflected to the south and cast, partly by the agency of the Antarctic current, but chiefly under the influence of the~~

~~*westerly winds or "anti- trades," that prevail throughout the southern water-zone which almost continuonsly girdles the globe between the parallels of 40° and 60°. 'Thus there is here a pretty constant retrograde set of surface-water (corresponding with the southern connecting current of the South Atlantic), at the rate of about 24 miles a day, towards the western coast of Australia; and since, notwithstanding the re- duction of its temperature, the water which has circulated in the Indian Ocean is still inuch warmer than that which forms the general mass of the easterly drift, it is probably through this excess (imparting a corresponding excess of vapour to the atmosphere above, which is condensed again by contact with the colder land) that the fogs are generated, for which the islands that lie in the course of this flow are notorious, On arriving at the shores of Australia, this drift is divided by the south-west projection of its coast-line into two streams, one of which continues its eastward course along the southern coast, whilst the other, turning north- wards, forms the West Anstralian current, of which the greater part, when it reaches the head-water of the southern equatorial current, is drawn into it, and thus completes the circulation of the southern Indian Ocean.*~~

~~*Between the parallel of 5°, to which the influeuce of the monsoon winds extends, and that of 10° S., which is the usual northern Himit of that of the southern trade, there is a " belt of calms," wherein there runs an equatorial counter current, which corresponds to that of the Atlantic, and is, like it, to be considered as a back-water flowing towards the source from which the currents to the north and south of it derive their supplies. (W. B. C.)*~~

~~*1 This is commonly termed the Mozambique current; but, as the usual southerly direction of the surface flow in the Mozambique Channel is liable to reversal with the change from the north-east to the south-west monsoon, or even under the influence of local winds, the pica il current (suggested by Mr Laughton) seems decidedly pre-*~~

~~*7 Some very curicus temperature phenomena are produced on the Aguthas bank by the splitting up of the cold and warm currents, which form distinct bands and strata that do not mix for some time.*~~

~~*IN D—IND*~~

~~*INDIANS, American. The application of the name Indians to the native peoples and tribes of the New World ig an erroneous usage, originating in the belief of the Spanish discoverers of America that they had reached the eastern shores of Asiatic countries already partially known. As it happens, the name is now, even apart from the addition of American, customarily applied to the abori- gines of tho western hemisphere, while it is used with far less frequency as a collective name for the inhabitants of the great country of the East known from the remotest times as India.*~~

~~*Various questions in regard to the American Indians have been discussed in the article Amurica. It is here intended to treat more particularly their ethnographical position, and to give what may be called a working classification of the races. This is followed by a separate notice of the present distribution and condition of the North American Indians.*~~

~~*It may be asserted with some confidence that there is nothing in the physical and mental condition of the aboriginal Americans which requires us to postulate for them a foreign origin. If man was evolved originally from several centres, America assuredly included one at least ; if he sprang from a single pair, then we can even conceive that pair to have been first established in the New World, and the arguments brought forward in support of an Asiatic origin of the American would not lose their point if adduced in favour of an American origin of the Asiatic peoples.*~~

~~*Andreas Retzius, the founder of scientific craniology, arguing on insufficient materials, grouped all the American aborigines in two great divisions—(1) a western or high- land, occupying the main ranges of the Rocky Mountains and Andes, with the intervening lands thence to the Pacific ; and (2) an eastern, mainly lowland, whose domain stretchec from the western uplands to the Atlantic seaboard. The former, being characterized by brachycephalous or round heads, he felt disposed to connect with the brachycephalous Mongolians and Malays of Asia and Australasia. The latter, being of a decided dolichocephalous or long- headed type, he traced to possible Berber and Guanche migrations from north-west Africa and the Canary Islahds, doubtless because the historical arrival of the dolichocephalous Norsemen in the New World was of too recent date to serve his purpose. But Virchow ("Anthropologie Amerika's," in*~~

~~*Verhandlungen der Gesell. fiir Anthropologte, 1877, p. 144-56) has amply shown that this classification is unten- able, and it will be seen further on that there are long and round-headed types often intermingled in every part of the continent. Virchow himself, while denying the claim of the American race to be considered autochthonous, declines to commit himself as to the probable regions whence they may have reached their present habitat. The theory of an Asiatic immigration wa Behring Strait has been somewhat revived since ethnologists have, so to say, rediscovered the lost Tchuktchis of the north-east coast, of Siberia through Nordenskjéld's Swedish polar expedition of 1878-9. These Tchuktclis are supposed to form the connecting link between the races of the two worlds, and the supposition is strengthened by the invention of an American branch of the tribe. Professor Nordenskjéld himself remarks that "this race, settled on the primeval route between the Old and the New World, bears an unmistakable stamp of the Mongols of Asia and Eskimo and Indians of America" (Petermann's Mittheilungen, 1879,p. 330). But Lieutenant Palander of the same expedition says that " they undoubt- edly descend from the Greenland Eskimo" (cb.), which would at once deprive them of all value as a connecting link, while Peschel (Races of dfan, p. 391) much more probably allies them to the Itelmes (Kamtchadales), the*~~

~~*two languages being "as closely related as is Spanish to Portuguese." W. H. Dall (Contributions to American Fithnology, vol. i., Washington, 1877) further points out that the Innuit (Eskimo) tongue, said to be spoken by the Tchuktchis, is merely a tradmg jargon, a mixture of Koriak, Tchuktchi, Innuit, English, Hawaiian, and others, It is also to be noted that the Samoyedes and other Asiatic Arctic peoples, assumed by many to be the pro- genitors of the Eskimo, are of Mongoloid stock and dis- tinctly brachycephalous, while the Eskimo are the most dolichocephalous race on the globe next to the Kai Colos of Fiji (Flower). Thus the Eskimo, instead of being a connecting link, form an anthropological barrier between the populations of the two hemispheres at the very point geographically most convenient for effecting the transition.*~~

~~*Nor would the question be much furthered by allow- ing the arrival of a few barbarous tribes via Behring Strait in prehistoric times. Their presence would leave the Aztec, Mayan, Peruvian, and other local cultures unex- plained, except as independent developments. And more recent historic migrations of Chinese, J apanese, and other civilized peoples, otherwise involved in tremendous difficul- ties, would leave equally unexplained the primeval mound- building races of the Ohio valley and the still more ancient Brazilian races of the Santa Catharina and Santos shell. heaps. Because a stray vessel has been east ashore on the western seaboard since the discovery of America, Virchow suggests the possibility of similar arrivals in remoter times. But if the Chinese arrived so recently as even 8000 years ago (an extreme supposition) in sufficient numbers to build up a civilization in Central America, the Chinese origin of such a civilization would to this day be as self-evident as is the Chinese origin of the neighbouring Japanese civiliza- tion. The foreign founders of these communities would necessarily have brought with them their arts, their domestic animals, their more useful plants und cereals, without which they must have themselves speedily perished or been absorbed in the surrounding native populations. But no trace of these things was found in the New World on its discovery. There was neither the rice of the Chinese, nor the wheat; barley, oats, or rye of the Western nations, nor the iron now proved to have been known to the ancient Assyrians and Egyptians, nor the horse, camel, ox, sheep, pig, dog, or poultry of the eastern hemisphere, these, there was little beyond one cereal (maize), one esculent root (potato), one feeble beast of burden (llama), limited to*~~

~~*the uplands of the southern Cordilleras, one species of dog*~~

~~*elsewhere unknown. Most of the useful plants and animals of the East have since been introduced, and flourish vigorously even in the wild state, a suflicient proof that they would have been propagated had they been introduced at an earlier epoch. The knowledge of metals was limited to copper, both wrought and, in Wisconsin, apparently east (J. S. Butler), bronze, lead, gold, and silver. Otherwise most of the nations were at the discovery still in the Stone Age; and, although Virchow's assertion may be true that the most practised archeologist will fail to detect any material difference between the stone implements of the two hemispheres, this merely*~~

~~*implies that the arts of Paleo- lithic and Neolithic man were pretty much the same every- where.*~~

~~*Nor is there anything in the religions, systems of govern- ment, architecture, and other arts of the native Americans, by which they can be connected with the corresponding systems of the East. That the Toltec builders of the low obtruneated Mexican pyramids were a different people from the pyramid builders of the Nile valley, and that the mummies of the Ancon necropolis and other parts of Peru were of a different stock from the Egyptian mummies, is*~~

~~*Sir Ethnologie, 1879, p. 209).*~~

~~*Instead of*~~

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~~*sufficiently evident from the texture of the hair alone. The hair of the old cultured races of America was the same as that of all the later American races, uniformly lank, because cylindrical in section. The hair of the old Egyptians, like that of the modern Fellahin, is, on the contrary, uniformly Wavy, because more or less oval in section. The religions, again, of the Red Man, we are told by Carl Schultz-Sellack, Oscar Loew, .and other good observers, are "essentially astrological, based on star, sun, and moon worship," with which was often associated an intricate method of measuring time built on a series of twenty constellations" (Zectschr. "The sun," says Loew, "is the god of most Indian tribes. 'He diffuses warmth and nourishment for us and our animals ; why shall we not worship him?' observed to me on one occasion Masa- yamtiba, a Moqui Indian (New Mexico)" (2b. p. 265). This Masayamtiba was a better philosopher than thoso ethnologists who seek for the origin of such a simple cult in the remote corners of the globe, rather than in the beneficial influence of the heavenly bodies which shine alike for all mankind. The four great gods of the Mayas, the "props of the heavens," answered to the four great Mexican gods of the four quarters of the compass, all being associated with the four elements of wind, water, fire, and earth. But to what does either System answer in the polytheistic creeds of the HIndus, Assyrians, Babylonians, or other nations of antiquity? There is something similar in the Neo-Buddhistic*~~

~~teachings ; but Buddhism, even of the oldest type, is much too recent to explain anything in the religious worlds of Mexico or Yucatan, The hare is associated in America, in Asia, and even amongst the Bushmen of South Africa with the moon, But this association was obviously suggested independently by the spots which, especially in the first quarter of the moon seem to present the outlines of a hare on its form, Waitz (Anthropology, p. 255) well observes that a common belief in a universal flood, or in the periodical destruction of the world, whether by fire, water, storms, or earthquakes, and analogous or parallel lines of thought—taken indi. vidually—afford no proof whatever in favour of affinity, and even resemblances in several points possess only a secondary importance; for they may partly, under like conditions, arise spontaneously among peoples who have always lived in a state of separation, or may have partly resulted from periods of short intercourse between two different peoples. |~~

~~In any case, these slight coincidences are of little account when weighed against the argument based on diversity of speech. The tremendous force of this argument, as applied to the American aborigines, is scarcely realized by anthro- pologists such as Waitz or Virchow, who have not culti- vated philological studies, and it is significant that, in the already quoted paper by Virchow on the " Anthropology of America," the linguistic element is not even referred to. On the other hand, it has been greatly depreciated and even brought into contempt by the vagaries of certain etymologists, who discover affinities where there is nothing but the vaguest verbal resemblance.! Science has demon- strated beyond all cavil that, while differing widely among themselves, the American languages not only betray no~~

~~Se oe~~

~~1 It may be sufficient to refer to the series of papers by Mr John Campbell of Montreal on the " Hittites in America," which have recently appeared in the Canadian Quarterly Journal of Science, and which on the most fanciful grounds connect the native idioms not only with each other but with most of the known languages of the universe, Thus Iroquois and Peruvian are declared to be radically one, while the former is connected with Basque, Dakotan with Circassian, Accad with Japanese, and a general Khita~~

~~*linguistic family is made to in- clude, besides all these, Choctaw, Cherokee, Aleutian, Fuegian, Aino, Kamtchadale, Tehuktchi, Haussa, Barabra, and many others in every part of the world.*~~

~~*affinity to any other tongues, but belong to an absolutely dis- tinct order of speech. They are neither isolating or mono- syllabic like the Indo-Chinese group, agglutinating like the Ural-Altaic, Bantu, or Dravidian, nor inflexional like the Semitic and Aryan. They come nearest in structure to the Basque, which is the only incorporating language of the Old World, but differ from it essentially inasmuch as their capacity of incorporating words in the sentence is not restricted to the verb and a few pronominal elements, but extends in principle to all the parts of speech. This faculty, which, with one or two doubtful exceptions, seems to be characteristic of every American idiom from Behring Strait to Cape Horn, has received the name of polysyn- thesis, literally "a much putting together."! Hence, in a comprehensive classification of articulate speech according to its inner mechanism, a special place must be reserved for the American group; and, if we assume as the most probable theory that all speech has slowly evolved from a few simple beginnings, passing successively from the state of crude roots to the isolating condition, and so onwards to the agglutinating and other orders, then in such a scheme the American will stand apart in some such position as under :—*~~

~~*Inflexion.*~~

~~*a (Semitic, Aryan.) "hy woh*~~

~~*Isolation. Agglutination. (Chinese, Anamese, >, (Bantu, Berber, &c.)*~~

~~*Siamese, &c.) ' 7 ON*~~

~~*Incorporation. (Basque alone.)*~~

~~*Crude roots.*~~

~~*Polysynthesis. (American alone.)*~~

~~*Here it is not intended to imply that American derives from Malayan or Dravidian, but only from some now extinct agglutinating forms of speech of which Malayan or Dravidian may be taken as still surviving typical instances. The disappearance in America of all such assumed forms, unless the Otomi of Mexico is to be accepted as a solitary lingering specimen, argues both a very great antiquity and an independent evolution of the American languages. And as the course this evolution has taken differs entirely from that pursued by the idioms of the Old World, it follows that the first peopling of America, if from the Old World, must be thrown back to a time when all speech itself was in its infancy, to a time when slow diffusion might be conceived as equally probable from an eastern or a western starting-point. It is this feature of polysynthesis that gives the American race its first and greatest cluim to be regarded as truly autochthonous, in the same sense that we regard the Mongolian and Caucasian races as truly autochthonous in Asia.*~~

~~*There is a general consensus amongst anthropologists that on the western continent we are in presence of two distinct original types, the brachycephalous and dolicho- cephalous. But these are no longer confined to separate geographical areas, as Retzius supposed. The very general practice of artificially flattening or otherwise deforming the skull has naturally caused less value to be attached to the craniological test in America than elsewhere. The practice has been traced back even to prehistoric times, and a clay figure recently found associated with*~~

~~*1 Abel Hovelacque (Linguistique, Paris, 1877) has endeavoured to confound polysynthesis with agglutination; but A. H. Keane (Appendix to Stanford's Central and South America, 1878) has shown that the difference between the two is fundamental, and Prof. Sayce (Science of Language, 1880) has finally adopted this view.*~~

~~*INDIANS*~~

~~*the remains of a child by Reiss and Stiibel in a grave in Ancon puts in a clear light the method adopted by the ancient Peravians (The Necropolis of Ancon, Berlin and London, 1881, plate 90). Still, careful investigations have placed it beyond doubt that the normal skull both in North and in South America is now mesaticephalous, or of a type intermediate between*~~

~~*the two extremes, a fact sup- posed to imply a general intermingling of the two primeval stocks. On the other hand, Virchow (loc. cif., passim) shows perfectly normal ancient and recent crania from both sides of Greenland, from El Carmen on the Rio Negro, Patagonia, from the Botocudo tribe, East Brazil, from a tumulus of Santa Fé de Bogota, and even a Peruvian mummy exhumed at Pancatambo, all of which are distinctly, i some-cases extremely, dolichocephalic. In the same way he produces brachycephalic skulls from the Brazilian shell-emounds of Santos and Santa Catharina, from the barrows of the Ohio valley mound-builders, from the Carib and Araucanian tribes, and from the Pampas of La Plata, the last mentioned of an extreme type, in close proximity to the extreme dolichocephalous specimens from Patagonia. Were it safe to argue from the analogy of Britain, where the dolichocephalic builders of the long barrows seem to have preceded and afterwards become intermingled with the brachycephalic builders of the round barrows (Dr Thurnam), the western continent might be supposed to have been successively occupied first by a long-headed and then by a round-headed race, which kept aloof in a few places, while more generally becoming fused in a normally mesaticephalic type. But we have in America no guide to the relative priority of the two forms of head, nor are there now any long-headed races on the eastern Asiatio seaboard whose ancestors might be taken as the precursors of the corresponding element in the West. The obvious alternative also remains, that the two forms may have become differentiated on the American continent, just as similar differentiations must, by those who do not accept the doctrine of fixity of species, be assumed to have taken place in Asia. For such an evolution America offered a more ample field even than Asia, for it is not confined to the northern hemisphere, but stretches from the Arctic nearly to the Antarctic Circle, presenting in this wide range alinost every conceivable variety of climate, atmo- sphere, soil, and temperature.*~~

~~*We thus see that the two cranial forms do not necessarily militate against the possible primordial unity of the homo Americanus. This unity seems on the other hand implied in certain physical and mental features, common to all the native races. Of the physical traits the most im- portant and uniform are—(1) the hair, which is always black, coarse, glossy, and long, like a horse's mane, round ↑n transverse section and persistent to extreme old age fa (2) slight beard, but always straight, never wavy ;° (3) eyes small, black,*~~

~~*somewhat deep-set, always horizontal ;4 (4) eye- brows narrow, very arched, and black ; (5) prominent cheek bones and nose, the latter often very long and aquiline.®*~~

~~*The native American being popularly spoken ofas “ The Red Man,” it might be supposed that colour should be included in this brief list of common characteristics. But, notwithstanding the general impression, there is perhaps no*~~

~~*2 During the many years that he lived in South America, D’Orbigny assures us that he ‘ never met a bald native of full blood” (L’ Homme Américain, i. p. 128).*~~

~~*3’The only known exeeption are the Guarayos, a Guarani tribe, originally from Paraguay, now in the Moxos missions, altogether a remarkable people, whose quasi-Enropean complexion and appearance are heightened by a very fnll but always perfectly straight beard.*~~

~~*4 Except amongst the Guaranis, the onter angle of whose eyes is generally pointed upwards, giving them a Mongolian east.*~~

~~*5 But this feature is not constant, for the nose of many Pampas and Guarani tribes is often very short, broad, and flat.*~~

~~other region of the globe where so great a, variety of colour | of a deep brown almost approaching a, true black, and of a prevails. The more general tints area copper or cinnamon light or fair hue almost approaching a true white, also occur,~~

~~brown, and olive yellow ; but the subjoined table of tribes, | altogether independently of latitude, climate, or elevation grouped according to their colour, shows that the extremes | of the land :— ;~~

~~Leather Brown, Coppery, Cinnamon. Dark Brown to Blackish, Olive-Brown and Yellowish. Fair to Whitish~~

~~lroquois: New York, Canada, Guaicuri) | < 2 Guarani: Brazil, Par;~~

~~Algonquins: north-east States, U.S. Pericui f: Tones Colifortiie. Coroados (women): Minne Gerace Tok vig Chili, 35° to 40° S.~~

~~Charruas: Uruguay Puris (women): Rio Janciro. Tocomonas: Beni river, Bolivia. WT) — . . << |~~

~~Chiriguanas (settled) : Pileomayo river.) Coast Arawaks: Guiana, Aucas: Chili, east slopes of Andes. liydas: Queen Charlotte Islands.~~

~~Coroados (nen): Minas Geracs, Quichuas: Peru, tanguelcs: Chilian pampas, Cayawas: Rio Branco, river Mamore~~

~~Puris (men): Rio Janeiro. Aymaras: Bolivian uplands. Chiquitos: between Paraguay and Brazil. : _ a ss Se |e cin river Negro. Pammas: Madeira river, Brazil,~~

~~Araucanians: Chili. Payaguas: Paraguay. Otukes: north-east Bolivi~~

~~Fuegians: Tierra del Fuego. Yaros: east side of Uruguay river. | Tupi ae i ee seal \ : Huallaga river.~~

~~*Mataguayas: Gran Chaco. Charruas: Uruguay. | Tupinamba i north-east Brazil, Inland Arawaks: Guiana.*~~

~~*Maropas) M ae Puelches: Pampas, La Plata Mox iri ild):*~~

~~*) "MomosBolivin: ! y Le . OX0s Chiriguanas (wild): Pileomayo river. Apolistas j : Tehuelches: Patagonia. Itonamas i prov. Moxos, Bolivia. Yuracares : Bolivian plains. Vilelas: Vermejo river, La Plata. Changos: coast of Peru. Cayubabas 5 Tacanas: Beni river, Bolivia. Mbocobis ? ; Gran Chaco. Atacamefios: Tarapaca, Peru, Botocudos: Brazilian coast range. Blackfeet: Saskatchewan river. Tobis y ° Pilcomayo river. Quichés: Guatemala lowlands Timucua }, & Mandans: Middle Missouri. Abipones: west bank of upper Parana.) Galibi: Guiana. Seminoles f° Florida. Guarayos: Moxos, Bolivia. Dakotas: Upper Missouri. Minuanes: between rivers Parana Eskimo: Arctic seaboard. Mosetenos: river Beni, Bolivia.*~~

~~*Apaches: North Mexico, Arizona. and Uruguay.*~~

~~*Unalaskans Quichés: Guatemala uplands. Bohanes: Lower Uruguay river.*~~

~~*Aeon \ : Meuten islends. Guarives: Venczuela.*~~

~~*Siriones: Moxos, Bolivia.*~~

~~*Similar tables might easily be drawn up of stature, varying from the dwarfish Eskimo, Fuegian (mean 5 ft. 1 in.), and Peruvian (mean 4 ft, 9 in.) to the gigantic Pata- gonian, the tallest race on the globe.*~~

~~*No less varied are the other physical traits, while the wide divergence of mental capacity is sufficiently indicated on the one hand by the Cherokees of the southern Allegha- nies, who in 1824 invented a complete syllabic writing system, and who can reckon to a million and upwards, and on the other by the Chiquitos of the Bolivian lowlands, who, D'Orbigny assures ns (op. cit., ii, p. 163), "cannot get beyond one (tama), after which they have nothing but terms of comparison." The only real intellectual faculty common to all the American races is that implied by the peculiar polysynthetic mechanism of their speech. But beneath this general morphological structure, the substance of the languages themselves varies*~~

~~*greatly in all that concerns their phonetic systems, vocabularies, relational forms, syntax, and methods of combination. While, for instance, the Thlinkeet of the extreme north-west Pacific seaboard, the Apache of Arizona, the Quichua of Peru, and the Aymara of the Bolivian uplands are amongst the very harshest and most guttural tongues in the world, the Otuke of the Bolivian plains, the Mohave of Arizona, the Chiquito of the upper Paraguay basin, the Samucu on er . the north frontier of Gran Chaco, and many Amazonian | them to belong to different familios of the human race dialects are distinguished by great softness, often rivalling | (Hind's Labrador, i. p. 332). Within comparatively*~~

~~*It thus appears hopeless to look for any unity of details in euphony the most musical languages of the eastern narrow areas occurs occasionally every conceivable element*~~

~~*in the mental and physical faculties of the American abori- gines. What they have in common is reducible to one physical and one mental quality, the universal texture and black colour of the hair, and their polysynthetic speech. These two properties point directly at primordial unity of origin ; the endless varieties of detail argue a prodigious antiquity and an independent development of the race on the American continent. The variety renders the work of classification a labour of extreme difficulty and uncertainty. Amidst all these endless points of diver- gence, it seems impossible to find any common basis round which to group the various tribes and races, and the pro- blem becomes further complicated by the fact that, while many of these tribes differ in speech, though evidently of one racial stock, others belonging to the same linguistic connexion present the widest physical discrepancies. Thus the Chiquitos and the Moxos peoples of Bolivia, obviously of one ethnical type, speak several fundamentally distinct languages. The same is true of the Moqui, Queres, Isletta, Tegua, Zuili, and other New Mexican Pueblos, while the reverse phenomenon is presented by the Montagnais and Nasquapees of Labrador, both of whom speak closely related Cree dialects, yet differ so much in appearance that, "judging from their exterior, one would suppose*~~

~~*hemisphere. The linguistic families differ from each other, | of confusion, as in California and the south-western States, not only in the measure to which*~~

~~their polysynthesis has | occupied by the morally debased and physically degraded been developed, but even in its very character, so that | Pah-Utes, the tall and manly Mohaves, the ferocious while some have scarcely yet arrived at a clear differen- | Apaches, the mild and intellectual Indians of the New tiation of verb and noun, others, like the Iroquois, have | Mexican Pueblos, some fishers and hunters, co rane oP a purely verbal, others again, such as the extinct Timucua | roots and berries, some skilled agriculturists, all speaking of Florida, an exclusively nominal inflexion. In the same fundamentally distinct languages. awe Way some are partial to prefixes, some to suffixes, some It is evidently impossible in i. a oat 0 'i to infixes. Many of the Californian idioms seem to be | throughout to any one method of Se . Si on ' still verging on the agglutinating stage, while the just- | following tentative survey 1s ee si . in ~ . mentioned Timucua, the Aztec, Choctaw, Shoshone, Cree, | the linguistic and partly on the et ae e omen 8, is Matlalzinca, and others of the Anahuac table-land, have | partly also on mere geographical grounds. 3 una reached the very acme of polysynthesis,in which all the parts | there are in all the divisions of the aor H ee of the sentence often become by indefinite composition | families, occupying vast regions, in W . ee = and syncope fused into one interminable " bunch-word" | linguistic elements largely coincide. ee amo gst of from ten to fifteen syllables and upwards. As these | these are the sub-aretic races ee a a = languages also differ entirely in their vocabularies, often pos- | gonquins, and Dakotas in the north, the aya-Quic**

~~sessing not a single root in common, it follows that they can | the centre, and in the south the Caribs, Quichua-Aymaras,~~

~~i i i i ' jointly an area stance the various | and Guaranis. These eight stocks cover jointly meee ork Cxucoans or of not less than 11 millions of square miles, with a total~~

~~agelutinating tongues of the Caucasus or the Soudan. "io~~

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~~aboriginal population of about four millions. But the seven millions of pure and mixed Indians occupying the remainder of the land, 5 millions of square miles in extent, are divided into a multiplicity of tribes, whose racial~~

~~*and linguistic affinities present problems the solution of which must long tax the utmost ingenuity of science. | The total number of distinct languages alone is estimated at about 760, of which 430 are in the noth and 330 in the south. In the northern division Balbi reckons, exclusive of California, thirty-two stock languages, far too low an estimate, while Rivero and Tschudi consider that of the southern idioms as many as four-fifths are radically distinct. But all such calculations are mere vague guesses at the truth; and in the present state of our knowledge it is impossible to form an estimate of the actual number of languages still current in Gran Chaco, Chiquitos, the Amazon valley, Central America, Mexico, California, the Columbia basin, regions where an extraordinary complexity of speech prevails. Nevertheless language forms on the whole perhaps the most convenient basis of classification, and without its aid it would have been impossible to determine the affinities of many wide-spread races, such, for instance, as that of the Arizona Apaches with the Canadian Chippewyans, or on the other hand to separate nations apparently closely related, like the Iroquois from their Algonquin neighbours, or the Araucanians from the Peruvians. The true relations of many tribes are, on the other hand, still doubtful, because of uncertainty re- garding the languages they speak. Such are the Cheyennes, Blackfeet, and Arapahoes, classed by some with the Dakotas, by others more probably with the Algonquins. Such also are the so-called Dieguefios (Kizh, Netela, and Kechi) of South California, oscillating between the Shoshone (Snake) and Yuma connexions, and the Pawnees of Nebraska and Kansas grouped by Bancroft with the Shoshone, but by Morgan regarded as an independent race. So close is the physical resemblance in these and many other cases that the question must ultimately be decided by a more exhaustive study of their languages.*~~

~~*The American races may be conveniently grouped under*~~

~~*the following eighteen divisions :—*~~

~~*I. Hyperborean Races,—This division may on the whole be re- garded as possessing a certain ethnical, linguistic, and geographical unity. Still the Aleutians differ so greatly in language, and in some respects in type, from the Eskimo proper that it seems desir- able to class them separately. The*~~

~~Zskimo (or "Innuits," as they eall themselves) are thus distributed by Dall : —~~

~~Kopagmut, mouth of the Mackenzie; Kangmaligmut, thence to Manning Point; NQwukmut, about Point Barrow and ley Cape; Kowagmut, east end of Hotham Inlet; Salawigmut, at Salawik river; Chuklukmut, Gulf of Anadyr, Asia, often confounded with the I'chuktchis, from whom they are entirely distinct; Okee-ogmut, the islands north of 63° N, lat.; Kikhtogamut, St Lawrence Island ; Kaviagmut, between Kotzebue and Norton Sounds; Mahlemut, neck of Kadiak Peninsula; Unaligmut, from Norton Sound to mouth of the Yukon; Ekogmut,~~

~~kokwim Bay; Nushagagmut, Bristol Bay, west to Cape Newenham; Ogulmut,~~

~~north side of Alaska peninsula; Kaniagmut, south side of Alaska peninsula and | Kadiak Island; Chugachigmut, Prince William's Sound to Atna river; Ugalakmut, ;~~

~~from Atnariver to Mount St Elias.~~

~~The last-named, the Ugalenzes of the Russians, call themselves |~~

~~Chilkhatmut, and are undoubtedly true Eskimo, althongh fre- quently confounded with the Thlinkeets, on whose domain they converge. 'The few Innuit tribes east of the Mackenzie have not been classified, but two of them, the Netchillik and Uquisiksillik, were met by Lieut. Schwatka in 1879, who received from them some particulars regarding the remains of the Franklin expedition. ' Of the Aleuts, whose collective name is '¢ Ungungun," or People," there are two divisions :— 1. Unalashkans, who eall themselves Kagataya Kung'n ("Men of the East"'), oceupying the extremity of the Alaska Peninsula, as far as 160° W., and the Una- lashka or Fox Islands, 2. Atkhas, occupying all the other Aleutian Islands,~~

~~Il. Tihlinkects:—These form a distinct etlnieal and linguistic group, oceupying a compact geographical area along the Pacific coast from about Mount St Elias to the Simpson river, and includ- ing Sitka and the other~~

~~adjacent islands. They are often called J Koloshes, a term of doubtful origin, but the national name is~~

~~T'linket," man," or ' T'linketantikwan," "men belonging to all villages." The tribal divisions are :— te~~

~~Yakutat, between Mounts St Elias and Fairweather ; Chill i P » betw } e : kahtkwan, Chilkhaht cM Sitkakwan, Sitka Islands and part of Prince of Walcs Islands; inkwan, lower course of Stikine river ; Takukwan and Skatkwan, Taku Inlet:~~

~~Alaska ; , F 5 ; Bison ao Hood's Bay and Huehinu Rapids; Miknu and Tungass, about~~

~~LNDLa ss~~

~~The Thlinkect language seems to be completely isolated, showing nothing beyond the faintest verbal resemblance to the Aleut and more southern Hydah. It has a plural in &, and an instrumental form in ¢ch or ésh, the combination of which produces a heaping up of final consonants, which none but the natives eau pronounce. Thus ass, tree; asstsh, by a tree; tsk, trees; assktsh, by trees. (See " Notes on the Sitkakwan Dialect," by J. Furnhelm, in Con- tributions to American Ethnology, vol. i.)~~

~~IIL. Columbian Raees.—Vhe general grouping of these is purely geographical, the main divisions largely ethnieal and linguistic ; the arca, British Columbia, Queen Charlotte and Vancouver Islands, Washington, aud Oregon. Here are five stoek races speaking an immense nuinber of dialects, which, owing to their extremely evan- escent character, it is very difficult to classify. The Puget Sound district, in the north-west of Washington, is in this respect speci- ally remarkable. But great light las recently been thrown on this Babel of tongues by the labours of G. Gibbs, published by Dall, in North American Ethnology, vol. i. p. 240. The five stock races with their chief tribal subdivisions are as follows :-—~~

~~1. Hydahs—tThe Kaigani of Prinee of Wales Islands and north eoast of Queen Charlotte Islands; the Klue, Kiddan, Ninstenee, Skid-a-gate, Skid-a-gatee, Cum- she-was, and Chut-sin-nl of Queen Charlotte Islands ; and the~~

~~*Tsimsians, including the Kispachlolit of Fort Simpson, the KI'kuskamoluk of river Naas, and tlie Kittistzu, Wailtzukh, Bilikfila, and Kwa-Kiftl of Milbank Sound. 2, Nutkas.— The Ahts, ineluding Pachinaht, Nitinaht, Ohyaht, Howehuklisaht, Klah-oh-quaht, Manohsaht, Nishquayaht, Ayhuttisaht, and Khahosaht, on the west coast of Van- couver Island, in their order going no1thwards ; the Maka or Klasset, about Cape Flattery ; and the Quoquoulth, Komux, Kowitehan, Klallum, Ukletas, Sokes, Paehina, and Sankaulutuch, of the east coast of Vancouver Island. 3. Selish or Flat Meads.—The Kwantlum and Haitlin or Tait, Fraser river below Fort Yale; the Kalispelm, Quarlpi, Spokane, Pisquouse, Soaiatlpi, of middle Columbia basin ; the Nisqualli (including the Skokomish, S'hotlmamish, Sawamish, Segwallitsu, Puyallupahmish, Dwainish, Snohomish, Snokwalmu, Yakama, Skagit, Lummi, and S'klallam) of Puget Sound; the Chihalis or Tsihalis, Grey Harbour; and the Shushwaps (ineluding Shewhapmueh, Kutenais, and Okanagan) of Upper Columbia. 4. Sahaptins or Nez Percés.—The Taitinapam, right bank of Columbia to Adam's Mount; the Klikatat, about Mount St Helens; the Yakima, Yakima Valley; the Walla Walla, Palouse, Tairtla, Cayuse, and Mollale of upper Clear Water and Snake rivers; and the Kamai and Lapwai of Idaho reserve. 5. Chinuks.—The Watlala, Skillit, Kathlamet, Wakiakum, Klatsop, Klakama, Kalapuya, Yamkally, and KillamQk of lower Columbia basin, mostly extinet. Speech radically distinct, but now represented only by the Chinuk jargon,*~~

~~*The names of Nos. land 2 are purely conventional. Hydah or Haida was originally applied by Francis Poole to the Queen Charlotte tribes, and was afterwards extended to all the menibers of that family. Mutka, from Nutka Sound, west coast of Vancouver Island, eame gradually into use as the collective name of the eastern Van- eouver tribes, and of some peoples on the opposite mainland ethni- eally related to them. But the languages differ so widely that they eannot be reduced to a common root. Though possessing great intelligence and even considerable artistic skill, shown especially in their wood and bone carvings and plastic works, these north-western | nations betray an absolute incapacity for adapting themselves to civilized institutions. Sproat tells us that many of those who have been settled, under the most favourable cireumstances, in different parts of Vancouver, simply die out through inanition, or from sudden change of life.*~~

~~*IV. Californian Races.—This is mainly a geographical grouping, but with tlirce large ethnical and linguistic families—the Klamath, Pomo, and Runsien. Many of the others belong to the Shoshone, Athabascan, and Yuma connexions. But the rest form a chaos of tribes, generally of a debased physical and moral type, and speaking rude dialects which baffle all attempts at classification. -They aie all rapidly disappearing into the "reserves," or off the face of the land. The Alamath family, in the Klamath river basin,*~~

~~*| and thence eastwards to Nevada, comprises the Lutuami or Yukon Delta; Magemut, from Yukon to Kuskokwim river; Kuskwogmut, Kus- i to N ee "*~~

~~*Klamaths proper, the Cahroes and Euroes ("' Upper and Lower Roes "), the Modoes, Yacons, Shastas, Weitspeks, Wishosks, Wallies, Yukas, and others stretching south to the Humboldt river. South of them are the Pomos, or " People," mainly in the Potter valley, including the Kahto, Choam, Chadela, Kalamet, Shebalne, Lama, Comacho, Socoa, Sanel, and the Gallinomero of the Russian River. Stillfurther south are the Runsiens of Monterey Bay, witli linguistie affinities stretching all along the coast northwards to San Franciseo, and southwards beyond Cape Concepcion to the islands of Sau Miguel and Sta Cruz. The chief members of the group are the Eslenes, Olhones, Mipaemaes, Yolos, Talluches, Waches, Powells, and others about Lake Tulare. In the Napa valley is a small family including the Ulukas, Suskols, Kalayomanes, Myacomas, and Caymus ; and in the Sacramento valley are the Seeumue, Kosumne, Yasumne, Ocheeumne, Chupumne, and some twenty others, whose tribal names all end in wmne, and who may perhaps be regarded as forming a distinet linguistic group. But they will have vanished before the point can be settled.1*~~

~~*1 In the eyes of certain ethnologists California has always been a favourite harbour of refuge for distressed Chinese or Japanese junks, whose crews are to be regarded as the founders of the arts, cultures, and empires of the New World. A reeent attempt to revive this theory has been made by Lieutenant Wheeler (Expedition through South California, 1875), who found some apparently archaie Chinese hieroglyphies eut into the basalt rocks near Benton, South California. These have been published in Petermann's Mitthetlungen (vol. xxiii. part 4, 1877) by Osear Loew, who*~~

~~*fancies he ean deeipher the Chinese symbol for éo, t.¢., earth, and thenee draws an argument in fayour of the wild theory seriously adyoeated*~~

~~*INDIANS*~~

~~*V. Shoshone and Pawnee Fumilies.—These form one ethnieal, but apparently two linguistie groups, for L. H. Morgan regards the Pawnee as distinct not only from the Shoshone but from all other languages,*~~

~~*The Shoshone or Snake family oceupies a wide domain, ineluding most of Idaho, Utah, and Wyoming, besides parts of Oregon, Nevada, West Montana, Arizona, North Texas, South California, and New Mexico. There are six distinct groups :—*~~

~~*1, Wininasht, or Western Shoshones, Oregon and Idaho. 2. Bannacks, Oregon, Idaho, Nevada. 38. Uéahs or UVies, with numerous subdivisions (Utes proper, Washoes, Pah-Utes, Gosh-Utes, Pi-Edes, &c.), Colorado, Utah, Nevada, Arizona, and South California. 4. Comanches or Yetans, three branches (Paducas, Yamparaks, and Tenawas), North Texas, New Mexico, North Mexico, 5. Moqui, New Mexico; all the seven Moqul pueblos except the Oreibe (Haro), in which the Tegua language is current. 6. DiegueRo (Kizh, Kechi, and Netela), about S, Diego, the south-west corner of California; but by Gatschet these are now affiliated to the Yuma stock (Zeitschr. fiir Ethnologte, 1877, p. 365). The Benemé and Cobaji of south-east California are also ineluded by Gatschet in the Shoshone family.*~~

~~*The Pawnee (Pani) area is confined to Kansas and Texas, besides the Pawnee reserve, Indian territory, with three main divisions :—*~~

~~*1. Pawnees proper, Including the Chiiné, Kitkd, Skldi and Petiihiinerot, Kansas and Pawnee reserve, Indian Territory. 2. Artkarees or hikarees, formerly In the Missouri Valley, 47° N. 3. Wichitas, upper course of Red and Canadian Rivers, Texas, with whom should be gronped the Kichal, Waccoe, and perhaps the Towiak, Towakoni, Wacho, and Caddo of Texas and Louisiana. To the same connexion pro- bably belonged the extinct Adaize, Nachitoch, Chetimach, Attacapa, and others of 'anisiens, figuring in Gallatin's synopsis as stock languages (Schoolcraft, iii. p. 401),*~~

~~*VI. New Mexican Pueblos.—This is a strictly ethnical family occupying a compact area in New Mexico, but according to W. C. Lane (Schooleraft, v. p. 689) speaking six distinet languages sprung of one original stock, as under :—*~~

~~*1. Queres, current in the Acoma, Coehitimi, Klwomi, Laguna, and four other pueblos, 2. Zegua or Taywaugh, current in the N ambe, Tesugne, San Juan, and three other pueblos, besides the Tlaro, a Moqui pueblo. 3, Picori or Enaghmagh, current in the Picori, Isletta, Taos, and five other pueblos, 4. Jemez, current in Jemez and Pecos only. 5, Zufi, current in Zufii only, and said to be a radically distinct language. 6, Afogut, a Shoshone dialect (see V. above), current in all the Moqui pueblos except Haro,*~~

~~*One of the most remarkable of existing linguistic phenomena is the number of widely diverging languages spoken in these twenty- six New Mexican pueblos, where the uniformity of institutions, agricultural habits, town life, and social intercourse might be sup- posed to establish a community of speech.*~~

~~*VII. Yuma Stock. —This linguistie and etlnical group in South Arizona and South California is named from the typical Yuma tribe formerly at the junction of the Gilaand Colorado rivers. The family has been learnedly treated by A. 8. Gatschet (Zeitsch. f. Lthnologie, 1877, pp. 841 and 366), who regards the Yuma as funda- mentally distinct from all the surrounding forms of speech. The tribes are uow mostly gathered in the three reserves of the Colorado river (right bank, 34° N.), San Carlos, Gila river, south-east Arizona, and Pinia and Maricopa, South Arizona, with a joint population of 5249, to which must be added about 750 for those who are still independent, making 6000 for the whole race. Chief tribes :—*~~

~~*1, Yavipai or Yampat, formerly west and north-west of the Aztee Mountains. 2. Konino or Casnino, San Francisco Mountains; said to be extinct. 3, Zontoor Tonto- Apache, between the Green River and Aztee Mouutains, distinct from the Tonto-Apaches of Athabascan stock, 4. Maricopa or Cocomaricopa, middie course of the Gila, 5, Hualapai or Wallapai, between the Colorado and Black Mountains. 6. Mohave or Mojave, properly Hamukh-habi ("' Three Hills"), largest of all the Yuma tribes, both sides of the middle and lower Colorado, 7, Yuma or Kutchan, at*~~

~~*junction of Colorado and Gila rivers. 8. Cocopa or Cucapa, at mouth of the Colorado. 9. Comoyed or Quemeya, collective name of all the Yuma tribes between the lower Colorado and the Pacific, including (according to Gat- schet) the Dieguefios (see V., No. 6), and the Kiliwi near San Tomas mission, 10, Cochimi, Pertcui, and Guaicurt of lower California. Probably to the same family belonged the extinct Cajuenches, Cucapas, Jalchedums, Noches, Cawinas, Niforas, and others of South and East Arizona,*~~

~~*VIII. Athabascan or Tinney Family.—This is the most wide- spread ethnical and linguistic group in North America, comprising most of Alaska and the Canadian Dominion from the Eskimo domain to the Churchill river north and south, and from the Rocky Moun- tains to Hudson Bay west and east, besides isolated enclaves in Oregon, Arizona, New Mexico, Colorado, and North Mexico. The term Athabascan is geographical, from Lake Athabasca, a great rallying point of the northern tribes, while Tinney, suggested by Petitot, variously pronounced Tinné, Thynné, Déné, Tena, Itynai, Tanai, Dtinné, &c., and meaning "People," is the general tribal name. About the spelling, sound, and identification of the indi- vidual tribal names, the greatest confusion prevails, Thus Kenai, used by Francis Miiller as the collective name of a distinct group, is supposed to be an Innuit word by Dall, who says that it should consequently be applied to no tribes of Tinney race. Kolchaina or Kolshane, figuring in most tables as a special tribe, appears to be a term vaguely applied by the Russians to all the interior Tinneys of Alaska, about whom they knew little or nothing. The Chippewyans of Lake Athabasea are constantly confused with the Algonquin iece oe ee eee ee ee*~~

~~*in Charles Leland's Fusang; or the Discovery of America by Chinese Buddhist Priests in the Fifth Century. Healsocompares words from various Californian idloms with Japanese and Chinese, forgetting that these two languages them- Selves belong to two entirely different orders of speech, and haye nothing In cominon beyond eoineldences and borrowings*~~

~~*- Shawnees, Pennsylvania, Kentucky,*~~

~~*Chippewas of Upper Canada, just as the Tonto-Apaches of Yuma stock are with the Tonto-Apaches of Athabascan stock, The Alaska divisiow especially was in a ehaotie state until Dall (op. eit.) surveyed*~~

~~*the field anew, and supplied the subjoined corrected and apparently complete list :— '*~~

~~*The other members of the Tinney family may be grouped in four geographical divisions as under :—*~~

~~*1. Mackenzie Basin: Sawessaw Tinney (Chippewyans), Lake Athabasca; Tant- sawhoots of the Coppermine; Beavers, Dog-ribs, Strongbows, Red Knives, Hares, Sheep, Brushwood, and others enumerated by Petitot, whose theories are wild*~~

~~*IX, Algonquin Family.—This ethnical and linguistic group, next in extent to the Tinneys, but far more important Eiatatiaglly and numerieally, stretches from the Tinney domain southwards to the latitude of South Carolina, and from the Atlantie to the Rocky Mountains. Most of the tribes on the Atlantie seaboard have either disappeared, migrated westwards, or been collected into the reserves, But many have acquired such celebrity in the stirring records of Indian warfare that the more noted with their original geographical domain will be included in the subjoined list of all the Algonquin races,*~~

~~*1. Northern Branch: Chippewas or Ojlbways, Upper Canada and Michigan ; Ottawas, Ottawa river valley (some now in Manitoulin Island, Lake Huron, others in Indian Territory) ; Nasquapees, interior of Labrador; Montagnais, south coast of Labrador; Crees or Knisteneaux, between Lakes Winnipeg and Atha- busca north and south, and from Rocky Mountains to Hudson's Bay, west and east, 2. Eastern Branch: Abenakis, Maine, New Hlampshire (later on, Lower Canada); Milkmaks, Nova Scotia, New Brunswick, and Lower Canada ; Tarratines, New Brunswiek; Etchemins or Milicetes, New Brunswick and Maine; Penob- scots, Penobscot river, Maine ; Passamaquoddies, East Maine; Amariscoggins, New Hampshire; Mohicans or Mohegans, Connecticut and New York ; Natics, Massachusetts (speech survives in Eliot's Bible); Pequods, Massachusetts, west of Cape Cod; Adirondacks, New York highlands; Manhattans, Manhattan Island,*~~

~~*site of present city of New York; Leni-Lennappes or Delawares, Delaware, now in Indian Territory. 8. Southern Branch: Powhattans, Virginia and Maryland; Accomacs, Accomae river, East Virginia; Rappahannocks, Rappahannock river, Virginia; Panticocs, North Carolina, southernmost of all the Algonquin tribes ; and Ohio, now in Indian Territory. 4. Western Branch : Iilinois, Mlinois river basin ; Miamis, Great Miami river basin; Pottawattamies, Michigan ; Kaskaskias, Kaskaskia river, Illinois, now in Indian Territory; Michigamies, south shore of Lake Michigan, named from them; Sacs or Sawkee and Foxes or Outtagaumi, middle course of Mississippi, now in Indian Territory and Nebraska reserves ; Cheyennes, Lake Winnipeg (later on, Missouri and Platte rivers); Arapahoes, upper Arkansas and Platte rivers; Blackfeet, Saskatchewan forks, south to Maria's river; Ahahnelins, Milk river, Montana,*~~

~~*The linguistic affinities of the four last named are somewhat doubtful, but Albert Gallatin shows good grounds for conneeting them with the Algonquin group. 7 ae |*~~

~~*X. Wyandot-Iroquois Family.—This is a distinct and historically famous group, allied ethnically to the Algonquins, and linguistically, Morgan thinks, remotely to the Dakotas. Their area is Upper Canada, about the great lakes, New York, and the Virginian high- ands ; they nowhere reach the Atlantic coast, and are everywhere surrounded by tribes of Algonquin stock. There are three main divisions :—*~~

~~*1, Wyandots or ITurons, including the Eries or Erigas, Ahrendahronons, and Attiwandoronk 'or '"' Neutral Nation," Canada. 2. froquois, or "Six Nations, ehiefly in New York, a famons political confedcracy collectively known as the Ongwehonwe, or "Superior Men," and comprising the Mohawks, Oneidas, Onon- dagas, Senecas, and Cayugas, besides the Tuscaroras, who joined the league from North Carolina in 1712. 3. Monacans or Monahoacs of Virginia, including the Nottoways, Meherries (Tutclos), and others, who later on jolnced the Iroquois eonfederacy.*~~

~~*XI. Dakota or Sioux Family.—This is an independent and wide- spread ethnical and linguistic group, whose proper domain is the western prairies between the Mississippi and Rocky Mountains cast and west, and stretching*~~

from the Saskatchewan southwards to the Red River of Texas. The chief divisions are :—

roper, of the Missouri basin. This term means "Allies," and i rs Seevesies Yantons, Teetons, and Sissetons, each with —— mr 4 divlsions. 2. Assiniboines or Stone Indians, known to the 'heer as We " — or " Rebels," because they withdrew from the confederacy about 1600, an: a6 t e in the Assiniboine river basin. 8. Winnebagoes (" Puans" of the Canadians),

1 Apache, t.e., "tle men" (root apa, man), is a Yuma word, applied. to the goutthinte Tinneys, whose true name is Shés Inday, or "men of the woods, ere the ending che, an attempt has been made by eertain etymologists to pa ep these people with the Puelche, Iuilliche, and other Patagono-Chilian tribes whose names end in the same syllable. But here che is the Araucanian ae, whereas in Yuma che is the definite article suffixed. Of the Apaches the chief tribes are the Coyoteros, Tontos, Lipans, Mescaleros, Pinalefios, Llaneros, and Gilefios, so named by the Spanlards; the real tribal names are undetermined.

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f s or Arkansas, and Osages of hale or C6 Cis es ees or rae. of the Yellowsiéne valley. 5. Minneiarees, Ilidatsa, and Afandans, of the upper Missouri, of doubt- ful linguistic affinities, but by Morgan regarded as intermediate between the Dakotas and Appalachians. W. W. Matthews also affiliates the Hidatsa language to the Dakota family.

XII. Appalachian Races.—These form an ethnical and geo- graphical grouping, including four distinct languages, which, how- ever, according to Morgan, are remotely related to the Dakota ; area, the south-east corner of the United States, westwards to Arkansas and Louisiana, northwards to Tennessee and South Carolina, all inclusive; name purely conventional, from the Appalachian or southern spurs of the Alleghanies. Here was a large Hnguistic family forming a powerful confederacy, of which the Afuscogees or Creeks of Alabama were the centre. The other members were the — Seminoles of South Alabama and Florida ; the Chickasaws of Mis- sissippi ; the Mobiles of Florida West ; the Choctaws of the lower Mississippi; the Colusas or Coosadas, Alibamous, Appalaches, Uches, and

~~*Timucuas (?) of South Carolina and Georgia. Of distinct speech were the Natchez of the lower Mississippi, who were said to have spoken three languages ; the Cherokees or Chelekees, of the Appalachian slopes, and the Catawbas of South Carolina, supposed by some to be the Eries, or the neutral nation who disappeared from the lake region about 1656. All these races are either extinct, or have been removed to the reserves of Indian Territory, where two of the stock languages (Cherokee and_ Creek) are still current. Natchez and Catawba are extinct. Special interest attaches to the extinct Timucua language, formerly current along the east coast of Georgia and Florida southwards to and beyond Cape Caiaveral. Tithas highly synthetic form of speech, regarded by Gatschet (" Volk und Sprache der Timucua," in Zeitsch. f. Ethnologie, 1877, p. 245) as a stock language, and possessing in the grammar, dictionary, and catechisms of Pareja, published in 1612-18 in Mexico, the oldest written records of any native tongue east of the Rocky Mountains, Gatschet gives a full account of its structure, which philologists will find extremely interesting.*~~

~~*XII. Mexican' Races. —This is a geographical grouping, the region comprising an exceptional number of radically distinct languages, and apparently three or four ethnical types, There is one large and important linguistic family, the Aztec-Sonora, which stretches southwards to Nicaragua, and for which Buschmann has sought affinities as far north as the Shoshone group. Its chief members are :—*~~

~~*1, Aztec or Mexican proper, widely diffused throughout the Nahua empire, overthrown by Cortez. 2. Cora, in the state Jalisco. 3. Tarahumara, in Chihua- hua and Sonora. 4. Cahtta,in Sinaloa and Sonora. 5, Nigquiran, of Nicaragua. 6. Tlascaltec, of San Salvador. With these are probably related the Pima and Opata of Sonora and Sinaloa, the Acaxee of Durango, and the Zubar of Chi- huahua,*~~

~~*The other chief stock or at least not yet classified Mexican tongues are the Miztec and Zapotee of Oajaca, Z'arasco current in the old kingdom of Michoacan, Matlalzinca north of Anahuac, Ceres and Cochita of Sonora, Tepecano of Jalisco, Zacatec of Zacatecas, Tamu- lipec of Tamaulipas, and Otomi, an interesting form of speech still almost in the monosyllabic state, current in the mountains enclos- ing the Anahuac table-land. This is the*~~

~~more remarkable that most of the other Mexican languages are highly polysynthetic ; but the attempt made to connect Otomi with Chinese has merely served to place their fundamental difference in a clearer light.~~

~~XIV. Central American Races.—Like the foregoing, this is a geo- graphical grouping, with one wide-spread linguistic and ethnical family, the Maya-Quiché of Yucatan and Guatemala with an outlying branch in Vera Cruz and Tamaulipas. Of this family the chief members are the Maya, still generally current in Yucatan ; Zendal and Zotzil of Chiapas; Jfam and Pokomam of Vera Paz, Guatemala ; Huastee of Vera Cruz and Tamaulipas; Yotonae of Vera Cruz; Quiché, Chol, and Zutugil of Guatemala. The Mayas, like the Aztecs, possessed a writing system, of which three documents still survive,—the Dresden Codex, published in Lord Kingsborough's collection as an Aztec MS., the Mexican MS., No. 2 of the Paris National Library, and the Troano MS. in Madrid. Bishop Landa even credited them with the invention of an alphabet; but all~~

~~attempts to interpret these documents by the key left by him have~~

~~hitherto failed.~~

~~In Nicaragua and Honduras, besides the Aztec Niquiran, Squier (Nicaragua, ii. p. 808) reckons three distinct linguistic groups :—~~

~~1. Melchora, including the Walwa, Rama, Toaca, Poya, and Waikna or Mosco (Mosquito), collectively known as Bravos, probably of Carib stock, but witha mixture of Negro plood. 2. Chorontega, including the Dirian, between Lake Niear- agua and the Pacifie; Nagrandan, north of the Dirian; Orotinan, about the Gulf of Nicoya. 3. Chondal, Chondales highlands, north and east side of Lake Nicaragua.~~

~~In Costa Riea and the peninsula of Panama there are a multi- plicity of unclassified tribes, amongst whom are current at least five stock languages :—~~

~~(1) Doracho of Veraguas ; (2) Savaneric; (8) Bayano, Rio Cha i st;~~

~~/ 8 : po, Paeifie coast © Manzanillo (San Bias), Atlantic coast, Costa Rica; (5) Bribri, a Costa Rica oma been compared, but on slender grounds, with some West African ; XV. New Granada and Guiana Raccs.—The confusion of tribes 1s continued southwards into the Colombian and Venezuelan Cor-~~

~~INDIANS~~

~~dilleras ; but, as we proceed eastwards along the Orinoco plains and through the Guianas, greater order seems to revail. In New Granada itself there is at least one marked ethnical and linguistic group, the Chibcha or Muisca of Bogota, a civilized people, noted for their remarkable taste and skill in the execution of gold orna- ments. Some of these works recently discovered and exhibited by Mr Powles at a meeting of the Anthropological Institute, London, excited universal surprise and admiration. This little known but extremely interesting people formed an important link in the chain of civilized and agricultural nations stretching along the western up- lands from the New Mexican Pueblos, through the Aztecs of Mexico, Mayas of Yucatan, Dorachos of Veraguas, Chibchas of Bogota, and Peruvian Quichuas, to the Aymaras of Bolivia. Elsewhere in New Granada the tribes are almost past counting. In the southern pro- vince of Popayan alone ninety-four distinct languages were reckoned at the time of the conquest ; and, although most of these are ex- tinct, the unclassified races both here and in the north are still very numerous. The only large linguistic group is that of the Sulivi, including the Betois, Eles, Yaruras, Atures (extinct), Quaquas, Macos, and others about the western head-streams of the Orinoco and in the Popayan highlands. Further east is the Barré family, including the Maypuri, Baniwa, Achegua, and many others in Venezuela and Guiana, besides some tribes as far south as Moxos in~~

~~3olivia. From the recent ethnological researches of Everard F. im Thurn (British Guiana Musewm, Georgetown, 1878), there appear to be at least four independent linguistic groups in the Guianas :— Waraw and Arawack in the eoast region, Wapiana or Wapisana, with Atorais, in the savannah region, and Caribeverywhere. At the time of the discovery the Caribs represented the conquering elc- ment in the West Indies, whence they have since disappeared, unless a few survive in Dominica (Vivien de Saint, Martin). But they are still numerous, either pure or mixed with Negroes and~~

~~*others, from Honduras round the coast to the Amazon delta. They are repre- sented in French Guiana chiefly by the Galibi, Oyapok, Emerillon, Nuragwe, and Rucwyennes, the last-mentioned on both sides of the Tumac-Humac range (Dr J. Crevaux in Tour du Monde, June 28, 1879). In British Guiana the Carib tribes are the Ackauais and Caribisi of the coast and forest regions, the Arecumas and Macusis of the savannah region. On the upper Orinoco are the Carinas or Calinas; in Dutch Guiana the Kirtkiricots, Acuria, Saramacea, Aukan, and Mataarie; in Brazilian Guiana the Pianghottos, Parecht, Daurais (extinct ?), Mandaucas, Masacas; in Venezuela the 7iveri- gotes, Guaraunos, Guayanos, Tamanacs, Avarigotes, Acherigotes, Piritus, Palencas, Chacopatas, and many others. On the affinities of the Carib race great uncertainty prevails, some regarding them as an independent stock, some tracing them across the islands to the Allighewis or Alleghans, who are supposed to have been driven by the Algonquins from the Mississippi regions in the 10th century, while others, with D'Orbigny (L'honume Americain, vol. ii.), affiliate them with some show of probability to the Guaranis of Brazil. XVI. Peruvian and Bolivian Races.—Here the grouping is strictly ethnieal and linguistic in the Cordilleras and upland plateaus, which are mainly occupied by one great historical and civilized race, with two well-defined branches—Quichua of Peru and Aymara of Bolivia. Underthe Incas Quichua, one of the most highly cultivated but also one of the harshest of American tongues, was current along both sides of the Cordilleras, from Quito on the equator southwards to the Araucanian domain about 30°S., but in- terrupted between 18° and 20° S. by the Aymara, which, like the northern Quitefio, seems to be an older and rnder form of the com- mon stock language. Still more primitive forms were probably the extinct Cara and Puruha of Ecnador. But in this northern pro- vince, which was the last added to the empire (under the twelfth Inca Iluaina-capac), there were said to be at the conquest forty other nations, speaking as many distinct languages, with three hundred different dialects. Of these a considerable number still people the banks of the Yapura, Pulumayo, Pastassa, Napo, and other north-western head-streams of the Amazons, the most noteworthy being the Jivaros of the Pastassa, the Zapdros of the upper Napo, the Anguteras and Orejones of the lower Napo, the Colorados and Capayas of the uplands east of Quito, and the Copanes of the upper Aguarico. The secret language of the Incas was apparently the Aymara of Lake Titicaca, the cradle of their*~~

~~*race ; and remotely con- nected with the same branch are probably the Olipe or Atacamefio, between 19° and 22° S., and the Chango, between 22° and 24° S., al- though R. A. Philippi (Reise durch die Wiste Atacama, Halle, 1860) regards this latter as fundamentally distinct both from the Quichua and the Aymara.*~~

~~*Antisuyo, the eastern division of the old empire, stretching alon the eastern slopes of the Peruvian and Bolivian Andes between 10 and 19°S., is ocenpied by five nations, the Yuracares, Mocetenes, Ta- canas, Maropas,and Apolistas, whom D'Orbigny (op. cit., vol. i.) col- lectively calls Antisians, affiliating them to the Quichua-Aymara family, from which, however, they differ in speech and physique as profoundly as they do from each other. Hence the so-called Antis or Antisians of more recent anthropological works have no ethnical or linguistic unity, and, like Chinchasuyo, Candisuyo, and*~~

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~~*Collaswyo, t.c., northern, western, and southern province, the term Antisuyo itself is purely geographical.*~~

~~*As we descend to the Bolivian lowlands, the confusion of races reaches its climax in the provinces of Moxos, Chiquitos, and Gran Chaco. Notwithstanding the disappearance of many tribes in recent years, KE. D. Matthews (Up the Amazon and Madeira, 1879) still found in the Beni Missions, Moxos, besides the above-mentioned Maropas, six distinct tribes —Cayubabas, Mobimas, Mojeitos, Cani- chanas, Itonamas, and Baures—' each having a language of its own." But the Baures would seem to be a branch of thie Mojefios, who are again affiliated to the Maypuri of the Barre family (sec XYV.). Other nations in Moxos with distinct speech are the Chapa- eras in the south-east, and the Pacaguaras and Itenes in the north.*~~

~~*Chiquitos is occupied by eleven distinct nations, all speaking radi- cally different languages, but presenting a uniforin physical type:— Chiquitos in the centre; Samucus, Curaves, Tapiits, and Corabecas originally in the south-east ; Saraveeas, Otukes, Curuminacas, Covarecas, Curucanecas, in the north-east; and Pateonecas in the north-west. The langnage of the*~~

~~*Chiquitos, of whom there are endless subdivisions, is one of the richest and most widely diffused in South Ainerica, serving, like the Tupi in the east, as a sort of lingua franca in the Bolivian lowlands and the northern parts of Grau Chaco. The numerous tribes of this latter region seem to form an ethnical group related to the Chiquitos peoples, and like them speaking a great variety of distinct langnages. The greatest confusion still prevails as to their mutual relations; but the main linguistic groups seem to be the Afocobi-J'oba of the Salado and Vermejo rivers; the Mataguaya, ineluding the Vilelu, Lule, and Chanes between the Pileomayo and Vermejo; the Abipone, on the right bank of the Parana, between 28°-30° S.; and the so-called Lengua (properly Jwiaje) in the centre of Gran Chaco, surrounded by Mocobi tribes. Here were also the extinct Guwayeurus (probably akin to the Tobas), noted for their skill in horsemanship. Hence the term Guaycurn came to be apphed generally to all the mounted Indians of Gran Chaco, and, thongh no longer the name of any particular tribe, it eontinues to figure in ethnographie works as a racial designation, increasing the confusion in a region already overburdened with obsolete or erroneous ethnieal nomenclature.*~~

~~*XVII. Brazilian Races.—Here the grouping, with one great ex- ception, is still mainly geographical. The exception is the wide- spread Z'upi-Guarani ethnical and linguistic family, rivalling in extent the Athabasean and Algonquin of the northern continent, and including, besides a great part of Brazil, all Paraguay, about half of Uruguay, large enclaves in Bolivia, and, if the Carib is to be regarded asa branch, nearly all the Guianas and Venezuela. Of this race the two main divisions are the Guarani, from about the neighbourhood of Monte Video to Goyaz sonth and north, and stretching west and east from the Paraguay to the Atlantic, and the Tupi thence northwards to the Amazon and Rio Negro. The southern division may be regarded as nearly compact, but the nor- thern everywhere eneloses a number of races apparently of different stocks, while along the Amazon and its great tributaries the tribes are as numerous as they are diverse in speech and often in physique. Over 15 distinct peoples are mentioned on the Xinga river alone, 20 on the Tapajoz, as many on the Ucayali, 50 on the Japura. R. S. Clough (The Amazons, 1872) gives lists of 33 on the Purns, and of 37 on the Naupes, a tributary of the Rio Negro ; over 100 differ- ent dialects are current on the Rio Negro itself (Martius), and as many as 234 tribal*~~

~~*names occur in Milliet de Saint-Adolphe's Diccionario Geographico do Imperio de Brazil (Paris, 1863). Here the only means of communication is afforded by the Lingoa Geral, or " general language," which is based on the Tupi, and which has gradnally become current throughout the empire.*~~

~~*Of the Guarani-Tupi stock the most representative races are the Lupinambas, formerly dominant on the coast of Para; the Tupint- quins of Espirito Santo; the Petiguares of the Paraiba; the Lupuwias of Bahia; the Tobajares of Maranhao ; the Caetes of Ceara; the Obacatuaras of the Rio S. Francisco; the Afundrucus, Apiacas, and Mauhés of the Tapajos; the Tappés, Patos, and Minuanos of Rio Grande do Sul; the Piturwnas of the river Curitiba ; the Guan- hanaris of the Parana; the Guarayos and Chiriguanos of the upper Memoré, Bolivia; the Omaquas of the Yapura; the Manaos, Juris, Lereeumas, Caripunas, and nine others in the Rio ee basin.*~~

~~*The Non-Guarani element in Brazil, often collectively known to the Tupis as Tapuyas, ¢.e., "strangers " or ' enemies," has hitherto baffled all attempts at classification. The best known groups, mostly linguistic, are the Aimore or Botocudo of the Aimore coast range ; the Pamacan, widely diffused in Bahia and Minas-Geraes ; the Curys, with many subdivisions in Rio Janeiro, Espirito Santo, and Minas-Geraes ; the Canecran, with five branches in Para and Goyaz; the Cairiri or Kiriri, a large nation in the Borborema moun- tains, with two branches (Velhos and Novos) in Pernambuco, Para- hiba, and Ceara, grouped by Martins with the Moxos of Bolivia, the Cunamares of the Jurua, the Majurunas of the J avary, the Manaos of the Rio Negro, and many others under the evllective name of Guck or Coco; the Gé with diverse prefixes (Au-Gé, Canacata-Ge, Cran-Gé, Payeo-Gt, Pontaea-Gt, &e.) in Maranhio and Para, with*~~

~~*whom must be grouped the Timbiras of Goyaz ("' fallavaéo o idioma dos Gamelleiros ou Timbiras, " M. de Saint-Adolphe, i. p. 384); the Vouvé of Matto Grosso, now united with the Choco, Pipian, and Umuan, all of like speech ; the Carijos, formerly very powerful in provinee Sao Panto, now mostly fused with others; the Carajas and Chambioas of rivers Araguaya and lower Tocantins, Goyaz, and Para; the Goya, very numerous in Goyaz, to which province they give their nane; the Charruas, formerly very*~~

~~*powerful in the extreme south and in Uruguay, grouped by D'Orbigny with the Painpas Indians, and described by him as ' peut-étre la nation Americaine que l'in- tensite de la couleur rapproche le plus du noir" (ii. p. 85); the Bororos, formerly dontinant over a vast region in Matto Grosso.*~~

~~*XVII. Austral Races. —These oecupy four geographical areas, to which correspond four distinct ethnieal and linguistic groups :—*~~

~~*1. duca or Araucanian, Chilian and Patagonian Cordilleras; type . very uniform, and by D'Orbigny affiliated to the Peruvian ; Speech entirely distinct from all others, and spoken with little dialectic variety throughout the whole area, The numerous branches are generally indicated by a geographical terminology, as Pieunche, "northern people," Puelche, 'eastern people," Huzlliehe, '* south- ern people," &c., the final syllable ehe signifying " people." But the official Chilian divisions are +—(a) Moluche, or Arribanos, t.¢., " highlanders," and -Abajinos or '*lowlanders,"' between rivers Malleco and Cautin; (b) Lavgquenehe or Costinos, ¢.c., 'coast people," between rivers Lebu and Imperial; (¢) Huilliche, or '" southerners," in two divisions, sonth of rivers Cautin and Tolten. Total population, 24,360 unmixed Araucanians (Edouard Séve, Le Chilt tel qwil est, Valparaiso, 1876).*~~

~~*2. Puelehe, oceupying the Pampas region from the Saladillo to the Rio Negro ; hence known to the Spaniards as the Pampas Indians. Pueclehc or eastern people is their Araneanian name, answering to the Patagonian Yonec and Penek. There is great uniformity of type and speech, the latter, like Araucanian, being distinct from all others. No well-recognized tribal divisions exist. The race is dying out or becoming absorbed in the general mass of the Argentine population,*~~

~~*3. Patagonian, the Tehuclehe, Chuelehe, or Huilliche (t.¢.. "southerners ") of the Arancanians ; national name Tsoneca; area,*~~

~~*Patagonia from the Rio Negro to Magellan Strait, and from the Cor- dilleras to the Atlantic. his is the tallest race on the globe, with mean height 5 feet 11 inches (Topinard, Anthropology, p. 320), and otherwise differing widely from all the American types, with which they have nothing in common except the structure of the hair and the polysynthetie form of their*~~

~~speech. The present race again seems distinct from the prehistorie in this region as represented by the skulls recently found by Moreno at El Carmen on the Rio Negro, These are highly dolichocephalous, whilst Dr.A. Weissbach (Zeitschr. Jiir Ethnologie, 1877, p. 8) represents the modern Tehuelches as amongst the most brachycephalons on the globe, approaching in this respect nearest to the chimpanzee type.~~

~~4. Fuegians, the Peseherais of some writers, Tierra del Fuego ; no recognized collective national or tribal names ; one ethnical type, entirely different from the Patagonian, and by D'Orbigny allied to the Araucanian ; two apparently distinct langnages, a northernand a sonthern variety, vith no known affinities to any on the mainland or elsewhere. They probably ocenpy the lowest scale of eulture in the American division of mankind,—in this respcet eorresponding to the Negritos and Bushmen of the eastern hemisphere.~~

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MopERN HisTorRY AND PRESENT DISTRIBUTION OF Nortu AMERICAN INDIANS.

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It is only very recently that the number of Indians on the North American continent has come to be known with any degree of accuracy. The best estimates at present ac- cessible, based on the reports of Indian agents and on the United States census for 1880, give the total number in the United States as 303,248. The number in British North America is estimated, more roughly, at 103,969, making a total for the continent, north of Mexico, of 407,217. The following table, which is compiled from the census returns for 1880, and from the reports for 1879 of the superintend- euts of Indian affairs for the United States and for the British Possessions, may be relied on as approximately cor- rect :—

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~~*The popular idea has always been that these races are fast disappearing, and that their total extinction is merely a question of time. This conclusion has recently been called in question by Colonel Garrick Mallory, of the United States army, in a paper read before the American Association for the Advancement of Science, From the evidence he presents it appears that,*~~

~~*while many tribes have decreased in number, and some have even become extinct, others have increased very decidedly, leading to the probable conclusion that the Indian population of North America as a whole has not decreased greatly since the earliest occupation of the country by Europeans, It is at least certain that the Indians have been brought under various influences which tend to prolong and preserve life. The murderous inter-tribal wars have ceased ; the people are now better housed, clothed, and fed; many of them have*~~

~~*regular avocations; and they have medical attendance when sick.*~~

~~*INDIANS*~~

~~*The general policy of the United States Government, in its management of the Indian tribes within its borders, has been to treat with them as separate but subject princi- palities, It thus makes treaties with the different tribes, purchases land from them, &c. Its policy further is to place all the tribes upon reservations, whence they are prohibited from wandering, and which are forbidden ground to whites, thus isolating them from the rest of mankind. In return for land ceded by them to the United States most of the tribes receive yearly grants, which are paid in the form of supplies of food, clothing, arms, and ammuni- tion. Under such conditions, the experiment of civilizing them is being attempted,—in the case of some tribes with success, in others, thus far, with utter failure. As, how- ever, all stimulus to self support is wanting, it seems surprising that any tribe should have made perceptible advance at all, and the progress attained is therefore encouraging for future effort. The policy of the Domi- nion Government is almost precisely similar to that of the United States, but the results are very different in the two countries. While the United States have had almost continual trouble with their aboriginal inhabitants, Canada has had no Indian difficulties of importance. This is due in part to a difference in the practical working out of the policy, but more to differences in environment. The Indian service of the Dominion Government is composed of a trained body of men, who remain in it through life, who thoroughly understand the Indian character, and who become known and trusted by their charges. The members of the United States Indian service, on the other hand, are appointed by political or church influence, and are in many cases unfit for*~~

~~*the work; they are changed also as the balance of political power passes from one party to another. The Dominion has always fulfilled the conditions of its treaties, and has always administered punishment promptly and'severely when the necessity arose. The United States have broken treaty after treaty, or have neglected to fulfil their obligations to such an extent that most tribes no longer have confidence in the promises of the Government. In cases of outrages by Indians, it has, asa rule, been very slow and dilatory in punishment.*~~

~~*But undoubtedly the principal reason for the immunity the British Possessions have hitherto enjoyed from Indian wars lies in the fact that the Indians have not yet been crowded by the whites. While the area is larger than that of the United States, the Indian population is but about two-fifths as great, and the whites are but one-tenth. The Indians still hold their favourite hunting and fishing grounds; the game and fish have not yet sensibly de- creased ; and the whites do not yet so press upon them as to arouse their jealousy and suspicion. The history of the Indian tribes in the United States, from the time of the first occupation of the country by the whites, has been one of forced migrations, always westward, to make way for the repeated encroachments of civilization, As the result of a succession of disastrous wars and forced treaties, nearly all the aboriginal population formerly living east of the Mississippi has either been destroyed or removed beyond that river. In the British Possessions they have been more fortunate. The first settlements in the provinces were made by the French, who associated freely with the natives, intermarrying to a large extent. This produced a bond of union between them, the effects of which, in both peoples, are to be seen to the present day. The country being still but thinly peopled, the necessity for removing the Indians, in large numbers, has not yet arisen ; and their treatment by the Dominion Government has been more humane and just than in the United States. In consequence of all this, most of them remain in or near their original homes. Excepting those tribes whicli have*~~

~~*moved across the border from the United States, few, if any, have engaged in war against the whites. As long as the western country was the domain of*~~

~~*the Hudson's Bay Company the interests of the traders were, to a large extent, identical with those of the natives. Tho Company furnished a ready market for furs and pelts, of which the Indians were quick to avail themselves ; Indeed, although it supported a large number of French trappers, by far its principal business was done with the natives,*~~

~~*INDIANS IN THE DOMINION OF CANADA.—The general distribu- tion of the tribes of the British Possessions is as follows. In the provinec of Ontario are found parts of the Six Nations, Wyandots, Chippewas, Minsees, Mississauguas, and others of Algonquin stock. In the province of Quebec are another part of the famous Six Nations, besides Abenakis, Montagnais, Milieetes, Miemaes, and other smaller tribes. In Nova Scotia and Prince Edward's Island are Miemaes, in New Brunswick a part of the same tribe and a few of the Milieetes. In Manitoba and North-West Terri- tory, the Chippewas, Crees, Blackfeet, and Dakotas make up the aboriginal population. The Athabasea district is peopled by tlre Crees, Assiniboines, Chippewyans, and Beavers; while British Columbia and Rupert's Land contain a great number of sinall tribes, too numerons to be inentioned here.*~~

~~*INDIANS OF THE Unirep Srates.—Of the numerous and power- ful tribes which inhabited New England at the time of its first settlement, but few fragments remain.*~~

~~*A remnant of the onee powerful Penobseot tribe is settled at Old- town on the Penobscot river, in Maine, aud in other parts of that State and in Massachusetts, and fragments of other tribes still exist.*~~

~~*The Pequod and Mohegan tribes were amongst the largest and most*~~

~~*owerful. Their range was central Massachusetts and Connecticut.*~~

~~*uring the settlement of those States, these Indians were removed to western New York, where they rapidly became civilizod and pro- sperous. But in 1857, their land being wanted, they were removed to Wisconsin, ani placed on a poor reservation there. They now number barely one hundred men, women, and children,*~~

~~*The Delawares, when first diseovered by the whites, were living on the banks of the Delaware river. Early in the 17th century the Dutch commenced trading with them, under friendly relations. Subsequently William Penn bouglit large tracts of land from them, moving the Indians iuland. A war followed this purchase, the Delawares alleging they had been defranded, but, with the assistance of the Six Nations, the whites forced them back west of the Alleghanies. In 1789 they were placed ona reservation in Oltio, aud subsequently, in 1818, were moved to Missouri. Various removals followed, until, in 1866, they accepted lands in severalty, in the Indian Territory, and gave up the tribal relation. They are now living in civilized fashion, and have become useful and prosper- ous citizens. Their number is now between 1000 and 1100.*~~

~~*Iroquois, or Six Nations.—This powerful and celebrated confede- ration was composed originally of five tribes known as Mohawks, Oneidas, Onondagas, Senecas, and Cayngas. Later, the 'l'uscaroras were admitted into the league, which was then called the 'Six Nations." At that time their total nnmber was estimated at 11,650; including 2150 warriors. They were unquestionably the most powerful confederation of Indians on the continent. 'Their home was the central and western parts of New York State. In the war of the Ameriean Revolution they fonglit on the side of the English, and in the repeated battles their power was nearly destroyed. They are now scattered about on various reservations in New York State, Indian Territory, Wisconsin, and Canada. In 1870 they numbered altogether 13,669, having increased decidedly sinco the close of the Revolution.*~~

~~*The Wyandots or Hurons were an Iroquois tribe which lived origin- ally on the shore of Lake Huron. They served as a shuttleeock between the Six Nations and the Sioux, being driven alternately east and west by them, until the end of tlic last century. In 1832 they removed to a reservation in Kansas. In 1855 many became citizens, while the small remaining fragment of this once powerful tribe removed to Indian Territory.*~~

~~*Chippewas or Ojibways.—This tribe, of the Algonquin family, formerly ranged over most of Michigan, Wiseonsin, and Minnesota.*~~

~~*They were constantly at war with the Dakotas and with their other*~~

~~*neighbours. They sided with the English in the Revolution and in the war of 1812. At present the tribe is divided upon thirteen reservations in the above States, and is making gratifying progress in civilization. Their number is now above 20,000. ;*~~

~~*The Mcnominees, on the Menominee river, in Wisconsin, have never been moved from their original habitat. They served with the French in the war against the Foxes in 1712, and against the English up to 1763. During the Revolntion and the war of 1812 they sided with the English. They are now living in a civilized manner, and are engaged very largely inlumbering. Their number is now about 1445, and is said to be diminishing rapidly.*~~

~~*831*~~

~~*The Miamts were first found in castern Wisconsin, and were esti- mated at 8000 in number. They were a warlike race, continually engaged in broils with their neighbours, the Iroquois, Sioux, and French, in Which they lost heavily. In the Revolution and the war of 1812, like inost of the Indian tribes, they sided with the: English. After the latter war they fought among themselves, reducing their numbers greatly. The tribe has now almost en- tirely disappeared, a few fainilies only remaining, seattered over Indian Territory and Kansas. me 3*~~

~~*The Ottawas lived originally on the northern shore of the upper peninsula of Michigan. In 1650 they were driven by the lroquois beyond the Mississippi, only to be forced back by the Dakotas. Then they settled at Mackinaw, and joined the French in their operations against the English. During the Revolution they sided with the English. Most of them were finally moved to the Indian Territory, where they uow 'are, reduced to a mere handful.*~~

~~*The Pottawatiamies occupied a part of the lower peninsula of Michigan, whenee they were driven into Wiseonsin by the more powerful Troquois. They were allied with the French in their wars against the Iroquois, and took part in Pontiac's conspiracy. In the wars between the colonists and the mother country they took the part of the latter. In 1888 most of them were renioved to a reser- vation in Kansas. Of these the larger proportion have abandoned the tribal relation, aud become citizens. Of the others, some are*~~

~~*in Kansas, upwards of 300 are in Indian Territory, while the remainder are wanderers,*~~

~~*The Seminoles are a tribe of the Muskogee family ; they origin- ally inliabited the peninsula of Florida. About 1842, after a very disastrous war with the whites, lasting seven years, nearly all of them were removed to the Indian Territory, where they are now settled, are civilized, and are succeeding in the cultivation of the soil. They number about 2500.*~~

~~*The Creeks or Afuskogees formed the most powerful tribe of thre Muskogee family ; they originally occupied a large part of Georgia, Alabama, and Florida. During the Revolution they fought against the colonists. A few years later they broke out again, but received a severe chastisement. Subsequently nearly all of them were re- moved to the Indian Territory, where they have inade great pro- gress in civilization and material prosperity. During the late civil war they were divided, part adhering to the Union and part join- ing the Coufederaey. At present they number about 14,000.*~~

~~*The Dakota or Sioux nation is at present the most powerful of the Indian tribes in North America. Its warriors possess fine phy- sique, great personal courage, and great skill in warfare. T hough bavkward in adopting civilization, their intellectual powers contrast very favourably with those of most other tribes. The nation num- bers 30,000 to 35,000 souls, divided into twenty-one bands or snb- tribes more or less independent of one another. At present they range over most of the unsettled portion of Dakota, eastern Montana, and north-eastern Wyoming, their reservations amounting altogether to 108,450 square miles. Until within a very reeent period inost of the bands of this tribe have resisted all efforts for civilizing them. At present, however, several of the bands are settling down to agricultural labour. Their history has, from the first, been one of war, their name a terror to their Indian neigh- bours as well as to the whites. Originally their range extended as far east as the State of Wiseonsin, aud thence west to the Recky Mountains, its present limit. On the east they eneountered the Chippewas, who at that time formed a powerful tribe, fully able to cope with them. By them the Sioux were driven back into Min- nesota, after long continued warfare. In 1862 the bands inhabiting Minnesota fell upon the*~~

~~white settlers, and a terrible massacre ensued. The result of this was the removal of these bands from the State to Dakota, where they were placed upon reservations. The bands inhabiting the country farther west have been to a greater or less extent almost continually at war with the whites until 1877; and for many years the protection of the border settle- ments required the constant presence of large bodies of troops. In 1875 and 1876 the chief, Sitting Bull, at the head of alarge body of warriors, maintained a sueeessful resistance against all the troops which could be brought against him, and finally escaped across the boundary line into the British Possessions, with the bulk of his followers. ;~~

~~The Arapahoes originally ranged over the central portion of the plains between the Platte and Arkansas. This is a brave, warlike, predatory tribe. With the Sionx and Cheyennes, with whom they have ever been on terms of friendship, they have waged unremitting warfare upon the Utes. From time to time, also, the border settle- nients have received hostile attentions from them. The southern bands of the tribe have a large reservation in the western part of Indian Territory, while the northern bands have been placed on the reservation of the Shoshones in western Wyoming. ' o~~

~~The Cheyennes are a tribe of the Algonquin family, which origin- ally lived on the Clreyenne river, a branch of the Red River of the North, in Dakota. Driven westward by the Dakotas, they were found by early explorers at the eastern base of the Black Hills, in Dakota. Subsequently part of them moved south, and allied~~

~~themselves with the Arapahoes. beon collected ona reservation in the western part of the Tndian Territory. Their whole history has been a series of wars against their red neighbours and the whites. They are a large, powerful, athletic race, mentally superior to most of the other tribes. Their occupations are war and hunting. Thus far they have nade little or no progress in civilization. They number about 8600.~~

~~The Artkarees, Gros Ventres, and Mandans are three tribes which inhabit @ permanent village at Fort Berthold, Dakota, on the Mis- souri. They have a partial civilization of their own, not acquired from intercourse with whites.~~

~~*'They live in houses made of wood, covered and thatched with earth and straw. For sustenance they depend largely upon the produce of agricultural labour, Their total number is probably about 2000, the Arikarees being the largest tribe, and the Mandans the smallest. The Arikarees, Arikaras, or Rees, ag the naime is variously rendered, originally lived in the Platte valley, in Nebraska, with the Pawnees, to whom thcy are related. Within the present century they have made their way northward to their present location. 'The Mandans were first found living on the Missouri, at the mouth of Heart river, while the Gros Ventres, or Minnetarees, occupied three small villages at the mouth of Knife river, 'These three tribes were decimated by the small-pox in 1887, shortly after which event they joined together in one village at their present location.*~~

~~*The Sacs and Foxes, now one tribe, located in Indian Territory, wero originally separate, living near Green Bay, Wisconsin. Driven on before the westward march of civilization, they moved first to Iowa, then to Missouri, and finally to their present location. A few still remain in Iowa, Nebraska, and Kansas.*~~

~~*The Shawnees or Shawanoes, supposed to have been primarily a*~~

~~*part of the Kickapoo tribe, were first foundin Wisconsin. Moving eastward, they came in contact with the Iroquois, by whom they were driven south into Tennessee. Thence they crossed the moun- tains into South Carolina, aud spread northward as far as New York and southward to Florida. Subsequently they drifted northward, again came in contact with the Iroquois, and were driven over into Ohio. They joined in Pontiac's conspiracy, and during the Revolution fought under the English flag. After the latter war they commenced migrating westward, and finally accepted homes in Indian Territory, where they now are. Iu 1854 most of them abandoued tribal relations, and divided their lands in severalty. They are now in a civilized and prosperous condition.*~~

~~*The Crows or Upsarokas are a branch of the Dakota family occu- pying at preseut a large reservation in southern Montana, south and east of the Yellowstone river. Their original range included this reservation, and extended eastward and southward, while from their forays no part of the country for many hundreds of miles around was safe. A cowardly tribe, they*~~

have ever been noted as marauders and horse stealers. Though they have generally been crafty enough to avoid open war with the whites, they have uot scrupled to rob them whenever opportunity offered. Physically they are tall and athletic, with very dark complexions. Their number is about 4200. They have made little if any progress in civilization, preferring to be supported by the Government.

The Osages were first found on the lower Missouri, whence they moved south to the Arkansas, and shortly after became allies of the French. After the usual succession of treaties and removals, they finally found themselves in Indian Territory, where they are now an reaching a condition of self-support. They number about 2100 souls.

The Kaw or Kansas tribe was originally an offshoot from the Osages. Their original home was in Missouri, whence they were driven to Kansas by the Dakotas. They were moved from one re- servation to another, until finally they were placed in Indian Terri- tory, where they are rapidly becoming civilized. They numbered 360 souls in 1879.

_ The Winnebagoes are a branch of the Dakota family. At the time of the advent of the whites they formed the vanguard of the eastward migration of the Dakotas, and were living about Winne- bago Lake and Green Bay in Wisconsin. They took up arms on the side of the French in the Franco-English wars, on the side of the English in the Revolution and the war of 1812. In 1820 they numbered about 4500, and inhabited their original home. A series of treaties followed, by which they were moved no less than six times, occupying reservations in various parts of Minnesota and Dakota. At present they are on the Omaha reservation in eastern Nebraska, and are prospering.

The Otoes and Missouries, which now form one tribe, under the former naine, are a branch of the great Dakota family. They were ae a of ie eae They now inhabit a small reservation

ebraska, where the ing ifvi : ae ee y are making gratifying progress. They deat ound ee se St Peter's river, in Minnesota, whiere rye sgricultural life, supporting theinselves from the soil. : era fatal visitation of the small-pox,

~~*which reduced their num- oe ie ee eaiiies alma their village, and wandered westward raska. After a succession of treaties*~~

~~*Within a few years they have all |*~~

~~*IN DIANE*~~

~~*and removals, they are now located on a reservation in eastern Nebraska, where they are rapidly improving in civilization and pecuniary resources. 'They numbered 1100 in 1878.*~~

~~*The Poncas were originally part of the Omaha tribe, with whom they lived near the Red River of the North. They shared the eom- mon fate of the weaker tribes in this part of the country, being driven westward by the Dakotas. They halted on the Ponea river in Dakota, and there held their ground, but suffered severely from their hereditary enemies. After a succession of treaties and removals, they were placed on a reservation at the mouth of the Niobrara, where they took lands in severalty, and were prospering greatly, when they were forced to give up their lands and improve- ments and remove to Indian Territory. Naturally they were extreinely dissatisfied with this change, and in 1878 a number of them left tho reservation in Indian Territory and made their way back to the Omahas, their former neighbours. They were arrested for leaving the reservation, aud were about to be returned to Indian 'Territory, wheu the case was taken up by able lawyers, and after a long trial the Indiaus were set free, it having been decided that they were United States citizens, and therefore not to be confined on reservations. The whole history of the Poncas is a tale of oppression by red men and white.*~~

~~*The Pawnees were formerly a brave, warlike tribe, living on the Platte river in Nebraska. 'Their history, until a recent date, is one of almost constant warfare with the Dakotas. In 1828 their village was burned by the Delawares, and shortly after the tribe lost heavily by the small-pox. In 1874 they moved to a reservation in Indian Territory, where they are making gratifying progress. They number 1440, i*~~

~~*The Caddos, now located on a small reservation in Indian Terri- tory, are but the remnant of a large tribe that formerly ranged over the Red River*~~

~~*country, in Arkansas, northern Texas, and Indian Territory. They have well-managed farms, and are noted for in- dustry and intelligence. Their number is 543.*~~

~~*The Shoshones or Snakes are a tribe inhabiting the country about the head of the Snake, Green, and Bighorn rivers, in Wyoming, Idaho, and northern Nevada, and distributed mainly on four re- servations. They number about 6000. They are a mild, peaceful tribe, but until within a recent period have been involved in alinost constant defensive warfare with their neighbours, the Crows and Blackfeet on the north, and the Cheyennes and Arapahoes on the south. The history of their relations with the whites has been one of almost unbroken peace.*~~

~~*The Bannacks are a small tribe of the Shoshoue family, in the southern portion of Idaho. Their number is about 1000, divided between the Fort Hall and the Lemhi reservations. They have generally been friendly with the whites, although in 1866, and again in 1878, they broke out into hostilities. Very little progress has been made by the tribe.*~~

~~*The Kiowas are another tribe of the Shoshone family, a wild, roving people, ranging over the country about the Arkansas and Canadian rivers, in Indian Territory, Colorado, and New Mexico. Formerly their range was very much less restricted, extending from the Platte to the Rio Grande. 'They have the reputation of being brave warriors, but cruel and treacherous. In recent years they have made repeated raids upon the settlers in western Texas, which have been stopped by the imprisonment of their chief, Satanta. In 1869 they were placed on a reservation in the Indian Territory, which they appear to use only as headquarters for raids into the adjoining country. Their number is given as 1188, but this is undoubtedly too small.*~~

~~*The Ute or Utah tribe, which is composed of several bands, all*~~

~~*acknowledging the authority of one head chief, iuhabits reservations in the western part of Colorado and eastern Utah. They number about 4200. Averse to civilization, they have made little or no progress. They originally inhabited the whole mountain region of Colorado and northern New Mexico, whence they made inroads on the plains in pursuit of buffalo, and*~~

~~*of their hereditary enemies the Sioux, the Cheyennes, and the Arapahoes. Their intercourse with the whites has been, almost without exception, characterized by friendship. The recent outbreak of the White River band, in 1879, is almost the only case on record. The rapid settlement of the State has driven them westward, and has deprived them of the fairest portion of their domain. The Apaches are a branch of the Athabasca family which has wandered far from the parent region, and now range over large parts of New Mexico and Arizona. It isa powerful, warlike tribe, at war with the whites almost continually since the latter entered the country. A large part of the tribe is on the Fort Stanton reservation iu eastern New Mexico, while another portion, under the chief Victoria, has for a long time been devastating the border settlements of New Mexico. The Tonto-Apaches, collected in large numbers on the San Carlos reservation iu Arizona, where they are doing something at farming, are of Yuma stock. Besides these, there are several bands of Apaches scattered about on other reservations, or roaming without a fixed habitat, swelling the total to about 10,600 souls.*~~

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~~*The Nuvajoes are another tribe of the Athabascan group which is far removed from the body of the family. They inhabit the northern part of Arizona and New Mexico, where they have a fine reservation. They have considerable native civilization, not a few of them engaging in agriculture, and in raising horses, Sheep, and goats. 'They weave blankets, which are prized highly throughout the south-west. They are a fine athletic race, and excellent horse- men. While not an aggressive tribe, they have frequently been at war with the whites. 'I'hey number now 11,850.*~~

~~*The Nez Percés, with the exception of a smal] portion in Indian Territory, inhabit a reservation in northern Idaho, which includes a part of their ancestral home. They area fine race, physically and mentally. Until 1877 they had been at peacc with the whites. In 1875, a portion of their reservation having been taken from them ; owing to the alleged fact that they had not carried out the treaty stipulations, difficulties arose which, two years later, brought on a rupture, and the famous '"' Nez Percés" war. The disaffected por- tion of the tribe, numbering some 400 or 500, held out for several months against all the force the Government could bring against*~~

~~*then, but were finally captured on the Sweet Grass Hills, in north- ern Montana. The malcontents were then placed on a reservation in the Indian Territory.*~~

~~*The AModocs are a small tribe, which lived in southern Oregon. They are known mainly from their stubborn resistance to the United States Government in 1872 and 1873, known as the Modoc war. This was caused by an attempt to place them upon a reservation, After some preliminary fighting, the Modocs retreated to the ‘ Lava Beds,” a basaltic region, seamed and crevassed, and abounding in caves. Here they made a stand for several months before they were finally subduced. During the war General Canby, commanding the troops, and Dr Thomas, a peace commissioner, were treacherously massacred by them while under a flag of truce. The leaders of this revolt were hanged, and the remainder removed to Indian Terri- tory.*~~

~~*The Pimas, Papagoes, and Maricopas form a semi-vivilized com-*~~

~~*munity, living on a reservation on the Gila and Santa Cruz rivers in Arizona. Originally they were distributed over the whole south-western portion of that territory. Missions were established among them at an early date by the Spanish Jesuits, and with very good success. At present they are mainly self-supporting, while a large proportion of them wear citizens’ dress and liye in houses. The three tribes now nuinber 10,500.*~~

~~*Pacific Coast Indians.—The Indians upon and near the Pacific coast are divided into a great number of small tribes. Speaking generally, they are lower in the scale of humanity, both physically and mentally, than those of the interior. In northern California, Oregon, and Washington, their principal subsistence was, before the Government undertook their support, the salmon, which in spring crowded the rivers. They are mostly of a mild, peaceful disposi- tion. The Indians of southern California were early taken in charge by the Jesuit missionaries, who Christianized and partly civilized them. Since the settlement of the State by Americans, they have, through neglect, to a large extent relapsed and become worthless members of society.*~~

~~*The name Pueblo (city) is used to designate a number of tribes of town-building Indians in New Mexico. They resemble one another very closely in their surroundings, and in their manners and cus- toms ; and their history has been the same. Subdued by Coronado in 1540, they made a successful revolt two years later, but were sub- dued again in 1586. In 1680 they made another unsuccessful revolt. When the country was ceded to the United States in 1848, these Indians were recognized as citizens, and have since remained so. Their houses are communal, generally but one structure for the whole village. They are sometimes built of stone, but oftener of adobe, several stories high, each story receding from the one below. The common plan is a hollow square, or curved figure, though in some cases the form of a pyramid is followed. Some of the towns are built upon high mesas, almost inaccessible, obviously for purposes ofdefencc. Thesc Indians retain their primitive form of government, each village electing a governor and council. They cultivate the soil, raising grain and vegetables for their own consumption, and keep large tlocks of sheep and goats. Their number is about 9000.*~~

~~*The Moguts are a semi-civilized people living in seven towns on the plateau in northern Arizona. Our first accounts of them date from the expedition of Coronadoin 1540. Their history is similar to that of the town-building Indians of New Mexico, except that after a successful revolt against the Spaniards, in 1680, they have re- mained independent. They are kind-hearted and hospitable, culti- vate the soil, raising grain and vegetables, and possessing large flocks of sheep and goats. They weave very fine blankets, an art which they have taught several neighbouring tribes. The houses are built of stone, set in mortar, and for security are perched upon the summits of almost inaccessible mesas. The Moquis numbered 1780 in 1878.*~~

~~*Inpian ANtTIQUITIES.—The ancient remains of the Indians are coextensive with their occupancy of the country,*~~

~~*but in general they teach but little concerning their life in prehistoric times, The Atlantic and Gulf coasts are lined with shell-heaps, indicating the sites*~~

~~*of ancient villages, Spear or arrow heads are often ploughed up all over the country, relics, it may be, from some well-fought field.*~~

~~*At the copper mines on the northern peninsula of Michigan, there are many evidences that the Indians had been working. Excavations, some of considerable depth, have been found, and in them stone hammers, evidently used in extracting the native copper. Indeed, it is well known that this metal was a common article of commerce among them.*~~

~~*In the south-western territories, however, are found the most Interesting remains of this people, in the furm of towns, some of great magnitude and extent, built of stone set in mortar. These towns, which were evidently inhabited by a people closely resembling the Moquis and Pueblos, are found in south-western Colorado on the San Juan river and its branches, in north-western New Mexico, in south- eastern Utah, and over the greater part of Arizona. Cer- tain regions appear to have been very densely populated. The largest towns are built in exposed situations, without special precautions for defence, and were plainly inhabited by a mild agricultural race, who were enjoying a period of peace. Others are perched upon high inaccessible mesas, with strong towers for defence and observation, while others, "cave dwellings," are merely walled-in niches in the cliffs of the cafions,—evidently the last refuge of a hunted, desperate people. Everywhere in the neighbourhood of these ruins are vast quantities of fragments of pottery, some of which is painted in the most elaborate designs. Wicker work and arrow and spear heads are also found in abund- ance. These extensive ruins, scattered over a large area of country, show that at some time in the past this region, now arid and desert, supported a large population of a degree of civilization fully equal to that of the Pueblos and Moquis of the present day, and in all probability their ancestors. (H. G.*)*~~

~~*INDIAN TERRITORY*~~

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~~*NDIAN TERRITORY is a tract of land in the southern central portion of the United States, which has been set apart as a reservation for the use of various tribes of Indians. It lies between the parallels of 33° and 37° N. lat,*~~

~~*and the meridians of 17° and 23° W. long. of Washing- ton (94° and 100° W. of Greenwich). It is bounded N. by Kansas, E. by Missouri and Arkansas, and §S. and W. by Texas. The area is estimated approximately at 69,000 square miles, The eastern portion is fertile and well watered, having an annual rainfall of 40 to 50 inches, and a mean annual temperature of about 60° Fahr. The surface is mainly rolling prairie, with broad stretches of rich land along the streams, and an abundance of timber. This section of the territory is separated from the western part, which presents a different aspect, by a broad belt of forest, known as the "Cross Timbers," which extends nearly across the territory in a north and south direction, marking the outcrop of the Carboniferous formation. Its breadth ranges from 40 to 60 miles.*~~

~~*West of this singular strip of forest the country assumes the appearance of the '"'Great Plains,"—that long incline which stretches eastward from the base of the Rocky Mountains. The surface is a monotonous, rolling, treeless expanse, The valleys are shallow, and the dividing ridges are broad and slightly marked. The climate is compara- tively dry, the average annual rainfall being but 20 to 25 inches ; and irrigation is needed for the successful cultiva- tion of most crops. 'The mean annual temperature Is some-*~~

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~~*what lower than in the cast, while the contrast in this regard between summer and winter, day and night, becomes much more marked. Timber is found only in the river valleys, on the faces of bluffs, and among the hills, The generally level surface of prairies and plains is broken in the southern and south-eastern parts of the territory by ranges and groups of hills, which rise from a few hundred to 1500 feet above the surrounding country. These hills, known as the San Bois Hills, Shawnee Hills, Wichita Mountains, &c., form a part of the Ozark Mountains, which extend eastward over into Missouri and Arkansas. The principal rivers of the territory are the Arkansas with its branches, the Neosho, the Salt and Red Forks, and the Canadian, with its North Fork, and, in the south- ern part of the territory,*~~

~~*the Red River, which forms the boundary with Texas, and its branch, the Washita. All*~~

~~*these are of little or no importance as regards navigation. The eastern part of the territory is well watered, but the western part, except at times of flood, in late spring and early summer, has few flowing streams.*~~

~~*Gp CHIEVENNES & ARRAPAYOES | H : hs p Yo,*~~

~~*Kd f Sees*~~

~~*) i : H PAGHES\ |*~~

~~*Seale ___, S10 2 30 4 Go Miles*~~

~~*919*~~

~~*)*~~

~~*Map of Indian Territory.*~~

~~*The geology of the region is very imperfectly known, as no survey has been made, with the exception of two or three hasty reconnaissances, The general outline of the distribution of geological formations is as follows. The eastern third of the territory is occupied by the Carboni- ferous formation. In the south-eastern corner, near Red River, it is covered by the Cretaceous. In the eastern portion there are several outcrops of granite, marking the location of groups of the Ozark Hills. The western two-thirds of the territory are covered by Triassic and Jurassic beds, with the exception of the granite mass of the Wichita mountains. The mineral resources are almost totally unknown. It is highly probable that the terri- tory contains extensive deposits of coal, and it is very pos- pi that the precious metals may be found in the Ozark*~~

~~*ills.*~~

~~*The fauna and flora partake of the double character of the surface and climate. In the eastern part they tend toward subtropical types, while the western portion presents forms more or less peculiar to the arid plains. In*~~

~~*the eastern part deer, and brown and black bears, are quite abundant, except in the neighbourhood of settlements ; and wild turkeys are plentiful. In the western part antelopes and bison are the principal large game ; wild horses are still occasionally met with ; and various species of grouse, sage hens, owls, rattlesnakes, gophers, and prairie dogs are abundant. The vegetation of the eastern part is profuse, especially in the bottom lands. The forests present a great variety of species very similar to those found throughout*~~

~~*4 the national government.*~~

~~*INDIAN TERRITORY*~~

~~*the lower Mississippi valley ; among them are several species of oak and pine, cypress, red cedar, black walnut, gum tree, &c. Among the wild fruits, which also present much variety, are plums, persimmons, grapes, &c. On the plains of the western part of the territory the principal natural productions are the grasses which, growing in tufts or bunches, are known collectively as bunch or buffalo grass. While this is the prevailing growth, in the more desert localities its place is usurped more or less by artemisia, cactus, and yucca.*~~

~~*Inhabitants.—Besides the Indians who originally inhabited this territory, the United States Government has from time to time moved thither entire tribes or parts of tribes, from more or less distant portions of the country, assigning to each tribe a definite area or "' reservation." The immigrants now outnumber very largely the original occupants of the soil. The reservation is, to a certain extent, a prison-house. An Indian is not allowed to leave it without a pass from the agent; nor are whites allowed to settle on it, or even to visit it. Exception is made, however, in the case of white men who marry Indian woinen. In the case of most of the tribes, the Government holds in trust funds belonging to them derived from the sale of their original land. The income from these funds*~~

~~*"|is paid in the form of subsistence and clothing, live*~~

~~*stock, and tools. An agent is appointed for each tribe*~~

~~4 or group of tribes, for the purpose of regulating its rela- i ¢ tions with the Government, and of providing and issuing 4 these supplies.~~

~~With few exceptions, the Indians still~~

~~"DE A: he "2, retain the tribal organization, although, with their progress |WICHITAST i FY ee ma~~

~~4~~

~~*4 corresponds in many respects to the legislature of a State.~~

~~in civilization, their forms of self-government have under- gone some changes. The five civilized tribes have, besides the principal and the subordinate chiefs, a council, which~~

~~They also have simple codes of laws, and courts to enforce them. The territory has no representation in For the enforcement of United States laws it is attached to the western judicial district of Arkansas.~~

~~It is difficult to obtain correct estimates of the number of Indians in the territory, as many of them lead a wander- ing life. No accurate census has been taken, and the only data available are the estimates made by the Indian agents. The report of Indian affairs for 1879 contains the esti- mates given in the following table, which also shows the areas of the different reservations :—~~

~~Tribes. | Pop. — ye ' Tribes, Pop. ' Ries " Cheyenne…..| 3593 hintaan song LOR 6715 KuOWai. cess: 1138 Comanche….} 1552 Apache…....| 315 aici Wichita…..... 209 1 aes ere 360 Osage 2135 | > 2447 || Sae and Fox. Quapaw…..... 188 Kickapoo Pawnee…..... 1440 442 || Pottawat- } Ponea …..... 530 301 tamie .. § Nez Pereé….| 870 Cherokee 20,000 WAC Os atomuarcc: 49 Creek…....| 14,500 Towaeonie…. 155 ~· Choetaw 16,500 Keeehie…..... 75 … || Chickasaw …| 7000 Caddo <2, sc. 543 ed Seminole…...} 2500 Delaware….. 81~~

~~The total number, according to these estimates, is 78,142. The white population living in the territory is very small, consisting almost exclusively~~

~~of the agents and their dependants, the garrisons at a few military posts, and the employees of the Missouri, Kansas, and Texas Railway, which crosses the eastern portion of the territory.~~

~~Several of the tribes, notably the Cherokees, Crecks,~~

~~1 a PP NSD~~

~~Choctaws, Chickasaws, and Seminoles, have made consider. able advance in civilization. All the members of the above tribes wear the ordinary dress, live in houses, and are engaged in civilized pursuits. Their occupations are almost entirely farming and stock-raising, principally the former, They support schools, which are attended by a large pro- portion of the children of the tribes.~~

~~The following tables, taken from the report on Indian affairs for 1879, illustrate the progress made by these five tribes :—~~

~~Amount spent on edueation, LST~~

~~Number | Number of houses | attending oeeupied, | school.~~

~~Cherokees Choctaws~~

~~74,000 30,000 28,356 22,000~~

~~2,500~~

~~4800 4500 4300 1900~~

~~750~~

~~3200 1400 800 650 200~~

~~Chickasaws….. Seminoles~~

~~Oats and Barley, bushels.~~

~~Indian Corn, bushels,~~

~~*Vege- tables, bushels.*~~

~~*Wheat, bushels.*~~

~~*700,000 |150,000 600,000 | 85,000 95,000 | 60,000 |5 420,000 | 40,000 200,000} 1,700] 1,500*~~

~~*In 1878 there were 263,000 acres in the territory under cultivation by Indian labour; 503,000 bushels of wheat were produced, 3,038,000 of Indian corn, 220,000 of oats and barley, 339,000 of vegetables, and 120,000 tons of hay. The live stock consisted of 59,200 horses, 249,000 cattle, 189,400 swine, and 22,500 sheep.*~~

~~*The population of the five civilized tribes is almost entirely rural. There are no large towns. The principal settlements are Tahlequah, the capital of the Cherokee nation; Caddo in the Choctaw, Muscogee in the Creek, and Tishomingo in the Chickasaw country; and Vinita, a railroad town on the Missouri, Kansas, and Texas line. (a, G*)*~~

~~*INDIA-RUBBER, or CaoutcHovc, consists of the dried*~~

~~*coagulated milky juice of various trees and shrubs, belong- ing chiefly to the natural orders Luphorbiacew, Moraceae, Artocarpacee, and Apocynacee. Although a milky juice is found in plants of many other families, it does not in all cases yield caoutchouc, nor do different species of the same genus yield an equal quantity or quality of that substance. On the other hand, there are many plants which afford a good rubber, but have not yet been sought out for com- mercial purposes. The milky juice of plants furnishing caoutchouc is contained chiefly in the middle layer of the bark, in a network of minute tubes known to botanists as laticiferous vessels. In the Apocynacew these vessels are found also in the inner bark, or bast layer. The milky juice above mentioned possesses the properties of a vegetable emulsion, the caoutchouc being suspended in it in the form of minute transparent globules, averaging, according to Adriani, y$sy inch in diameter. Like other emulsions, it is easily coagulated by the addition of an acid or saline solution,—alum or salt water being commonly used for this purpose ; but it is said by Mr Bruce Warren not to be coagulated by alcohol. 'The caoutchouc appears to be kept in suspension in the juice by*~~

~~means of ammonia ; at least in some cases the fresh milk exhales an ammoniacal odour. Probably it is on this account that the addition of liquid ammonia prevents the juice from coagulating for a con- siderable length of time ; and the ammonia is in certain districts added when the milk has to be carried some distance from the place of collection. The addition of~~

~~salt water to the jnice is to be deprecated, as it renders the caoutchouc very hygroscopic. The best rubber known is obtained by careful evaporation of the recently strained Juice at a moderate heat. Trees are known to contain caoutchouc by the bark on incision yielding a milk that when rubbed between the fingers coagulates into an elastic fibre. The dried bark of such plants when broken shows between the two fractured surfaces of bark a number of silky fibres which can be stretched for some distance without breaking.~~

~~— Caoutchouc differs from other vegetable products of like origin by possessing considerable elasticity, by being insoluble in water or alcohol, alkalies, and acids (with the exception of concentrated nitric and sulphuric acids). Although apparently simple in constitution, it contains, not only the elastic substance to which its commercial value is due, but a small quantity of an oxidized viscid resinous body soluble in alcohol. This latter substance varies in quantity in different kinds of rubber, those containing the smallest amount, such as the Par4 and Ceara, being considered the most valuable, while those in which it is present in greatest proportion, such as the Guatemala and African rubbers, are the least esteemed. Rapid evapor. ation of the juice, or any means which prevents oxidation, tends to prevent the formation of this viscid resin.~~

~~The first notice of india-rubber on record was given nearly five hundred years ago by Herrera, who, in the second voyage of Columbus, observed that the inhabitants of Hayti played a game with balls made "of the gum of a tree," and that the balls, although large, were lighter and bounced better than the wind-balls of Castile (Herrera, Historia, dec. i. lib. iii. cap. iv.). Torquemada, however, seems to have been the first to mention by name the tree yielding it. In his De la Monarquia Indiana, published at Madrid in 1615, tom. ii., cap. xliii, p. 663, he says, "There is a tree which the~~

~~*[Mexican] Indians call Ulequa- huitl; it is held in great estimation and grows in the hot country. It is not a very high tree; the leaves are round and of an ashy colour. This tree yields a white milky substance, thick and gummy, and in great abundance." He further states tliat the juice was collected and allowed to settle in calabashes, and was afterwards softened in hot water, or the juice smeared over the body and rubbed off when sufficiently dry. The tree mentioned byTorquemada has usually been identified as Castilloa elastica, Cerv., but the above account cannot apply to it, as that tree is de- scribed by Cervantes as one of the loftiest forest trees of the north-east coast of Mexico, and its leaves are not round but oblong-lanceolate. Torquemada mentions also that an oil was extracted from the "ulli," or rubber, by heat, pos- sessing soft and lubricous properties, and of especial effect in removing tightness of the chest. It was also drunk with cocoa to stop hemorrhage. Even at that early date the Spaniards used the juice of the ulé tree to waterproof their cloaks. This fact, however, apparently did not attract attention in the Old World, and no rubber seems to have reached Europe until long afterwards. The first accurate information concerning any of the caoutchouc trees was furnished by La Condamine, who was sent in 1735 by the French Government to measure an arc of the meridian near Quito.*~~

~~*In 1751 the researches of M. Fresnau, an engineer re- siding in Guiana, were published by the French Academy, and in 1755 :°M. Aublet described the species yielding caoutchouc in Frencli Guiana. Nevertheless india-rubber remained for some time unknown in England except as a curiosity, for Dr Priestley, in the preface to his work on perspective, called public attention to it asa novelty for erasing pencil marks, and states that it was sold in cubical pieces of 4 inch for 3s. each, India-rubber was not known*~~

~~*as a product of Asia until 1798, when a plant, afterwards named Urceola elastica, Roxb., was discovered to yield it by Mr J. Howison, a surgeon of Prince of Wales Island, and soon afterwards Assam rubber was traced by Dr Roxburgh to Ficus elastica, Roxb. It was not, however, until the beginning of the 18th century that the india- rubber industry really commenced. The rapid progress which this has made during the last twenty*~~

~~years may be perceived by a glance at the following table Imported into England in the year 1830,~~

~~" 0,~~

~~1850,~~

~~464 cwts.~~

~~6,640 7,616 1870, 152,118~~

~~' 1879, 150,601 It has been computed that in 1870 there were in Europe and America more than 150 manufactories, each employ- ing from 400 to 500 operatives, and consuming more than 10,000,000 tb of caoutchouc. The imports into the United States have largely increased during the last few years. Botanical Sources, Modes of Preparation, &c.~~

~~Notwithstanding the fact that caoutchouc-yielding trees are found in a large belt of countries around the globe, in- cluding at least 500 miles on each side of the equator, yet the demand for the best qualities of india-rubber is in excess of the supply. The varieties which are almost exclusively used when great elasticity and durability are required are the Para, Ceara, and Madagascar rubbers.~~

~~The principal forms of caoutchouc which are imported into Great Britain may be grouped under four heads, the order in which they are here placed indicating their respective values :—South American—Para, Ceara, Per- nambuco, Maranhio, Cartagena, Guayaquil ; Central American—West Indian, Guatemala; African—Mada- gascar, Mozambique, West African ; Asiatic—Assam, Borneo, Rangoon, Singapore, Penang, and Java. Of all these, the most important is the Pard4, the imports of which, according to Messrs Hecht, Levis, & Kahn, have increased from 1670 tons in 1857 to 8000 tons in 1879. For this rubber and the Mozambique variety the demand in- increases every year,—an unerring indication of their value.~~

~~99 99 9?~~

~~" 99 9~~

~~*” 29 23*~~

~~*9 ”*~~

~~*Fie. 1.—Hevea brasiliensis. I. Sourn AmrERICAN.—Pard rubber is obtained chiefly from*~~

~~*Hevea brasiliensis, Mill. Ar i nsds, ill, g., a largo enphorbiaceous tree upwards of 60 feet in height, branching from he: base, and having*~~

~~*INDIA-RUBBER*~~

~~*trifoliate leaves, the leaflets being lanccolate and tapering at both ends (figs. 1, 2). Other species of Hevea, as well as Mierandra siphonoides and MM. minor, Benth., all of which grow abundantly in the moist steamy valleys of the Amazon and its tributaries, are also used indiscriminately by the natives to furnish Para rubber. These trees are found in different districts, but all flourish best on rich alluvial clay slopes by the side of rivers, where there is a certain amount of drainage, and the temperature reaches from 89° to 94° at noon and is never cooler than 73° at night, while rain is rarely absent for ten days together. The genus Hevea was for- merly called Siphonia, and the tree named Pao de Xerringa by the Portuguese, from the use by the Omaqua Indians of squirts or syringes made froma piece of pipe inserted in a hollow flask-shaped ball of rubber.*~~

~~*The caoutchouc is collected in the so-called dry season between August and February. The trees are tapped in the evening, and the juice is collected on the following morning. ‘To obtain the juice a deep horizontal incision is made near the base of the tree, and then from it a vertical one, extending up the trunk, with others at short distances in an oblique direction. Small shallow cups made from the clayey soil and dried in the sun are placed below the in- cisions to receive the milk, each cup being attached by sticking a piece of soft clay to the tree and pressing the cup against it. The juice, of which each tree yields only about 6 ounces in three days, has a strong ammoniacal odour, which rapidly goes off, and in consequence of the loss of ammonia it will not keep longer than a day unchanged, hence when it has to be carried to a distance from the place of col- lection 3 percent. of liquid am- monia is added. The juice is said by Bruce Warren to*~~

~~yield half its weight of caout- f choue, but 32 per } cent. appears to be the usual quantity. To ob- tain the rubber the juice is heated in the following man- ner.~~

~~the mould roun see Miata es nye ee i 1G. 2.—Hevea brasiliensis. a, male flower, and 6, female eet round in a flower (both enlarged, and with the floral envelope re- yr 1 ay handles moved); ¢, ripe fruit, and d, seed (both natural size). ined by hea~~

~~certain oily palm nuts, those of Attalea excelsa pane much pre- ferred, and the vapour being confined within certain limits by tho narrowness of the neck of the pot in which the nuts are heated. Each layer of rubber is allowed to become firm before adding an- other; a practised hand can make 5 or 6 tbinan hour. From what- ever cause, the rubber thus prepared is the finest that can be obtained. The cakes when completed are, in order to remove them from the mould, slit open with a sharp knife, which is kept wet, and are hung up todry. The flat rounded cakes of rubber made in this manner are known in the London market as " biscuits." They rarely con- tain more than 15 per cent. of moisture. The scrapings from the tree, which contain fragments of wood, are mixed with the residues of the collecting pots and the refuse of the vessels employed, and are made up into large rounded balls, which form the inferior com- mercial quality called " negrohead," and often contain 25 to 35 per cent. of impurity. An intermediate quality is known as "entre- fine." Parad rubber is said to be sometimes adulterated with the juice of the Magandaruba tree (Mimusops elata), which might ac- count for the great differences that have been occasionally o served in the behaviour of Para rubber in certain stages of manufacture, the coagulated juice of the Mimusops genus resembling gutta percha rather than caoutchoue.~~

~~Previous to 1860 Parad rubber was exported only in small quan- tities, and then chiefly in the form of shoes; this variety ceased to be sent over in 1852. Occasionally "negrohead " has been im- ported in grotesque forms of animals, &c., and the better qualities in the shape of small bottles moulded in soft clay which has been afterwards washed out by water.~~

~~INDIA-RUBBER~~

~~*In British Guiana rubber is obtained from Hevea pauctfolia. Mii Arg.; in French Guiana from ZZ. Guayanensis, 'Sab ote a known as " heve," " siringa," or " cahoutchou,"—the last being the probable origin of the name caontchouc; and in Venezuela trom AZ. brasiliensis, there called dapi or dapiche. None is exported to England from any of these localities, Small quantities of rubber intermediate in character between that of Par4 and Pernambueo are oceasionally imported from Marauhao. On aecount of its great value as a source of eaoutchoue, the cultivation of the Para rubber tree has been attempted in India; but it has been found to be too tropical a plant for cultivation in northern and eentral India, alvhouph snit- able for Ceylon, Malabar, and South Burmah, aceording to recent reports, The seeds, which are about the size of a damson (fig. 2, d) soon lose their vitality, and euttings do not thrive unless taken from the young wood.*~~

~~*Ceara rubber is eonsidered ahnost next to the Pard in value, as it is a "dry" rubber, very elastie and free from stickiness; but it often eontains a wv of wood and*~~

~~*oreign matter aris- ing from the mode of collecting it, the loss in washing pre- vious to imauufae- tureamountingsome- ™ times to 25 per cent. It is the produce of Manthot Glaztovii, Mill. Arg., a euph- orbiaeeous tree eoin- mon in the province of Rio Janeiro, about 30 feet high, with a rounded head of foli- age, and greyish. green 8- to 7-lobed palmate leaves, some- what resembling the leaves of the castor- oil plant in shape and size (figs. 8, 4, 5). 'The trees are tapped, aceording to Mr R. Cross, when the trunk attains a diameter of 4 to 5 Fie. 3—Manihot Glaziovii. (After H. Trimen, Journ. inches, te, when Bot., Noy. 1880.)*~~

~~*they are about two yearsold. The mode of collecting the rubber is as follows. After brushing away the loose stones and dirt from the root of the tree by means of a handful of twigs, the eolleetor lays down large leaves for the milk to dropupon. He then slices off the outer layer of the bark to the height of 4 or 5 feet. The milk, which exudes in many tortuous courses, some of it ultimately falling on the ground, is allowed to remain on the tree for several days, until it becomes dry and solid, when it is pulled offin strings, which are either rolled up into balls or put into bags in loose masses, in which form it enters eommerce under the name of Ceara '*~~

scrap.”” The amount of Ceara rubber imported in 1879 amounted to 500 ewt. The attempts which have been reeently made to cultivate this rubber plant in India have been attended with signal success. In Rio Janeiro it grows in a rocky or stony arid region, where a short under- scrub is the only vegetation, and the atmosphere is hot and dry, the temperature ranging from 82° to 90° Fahr. It is, therefore, suited for cultivation where the Hevea will not grow. In Ceylon it has been found to thrive at an altitude of from 200 feet to 3000 feet above the sea level. At Zanzibar and Caleutta also it succeeds well, The seeds (fig. 5, c), which have a hard thick eoat, take a year in germinating, unless the edges near the end bearing the ear- uncular projection are rasped off. Cuttings, provided they have a single bud, strike readily.

Pernambuco or Mangabeira rubber is obtained from Hancornia speciosa, Gom., an apoeynaceous tree common on the South American plateau in Brazil from Pernambuco to Rio Janeiro, at a height of 3000 to 5000 feet above the sea. It is about the size of an ordinary apple tree, with small leaves like the willow, and a drooping habit like a weeping bireh, and has an edible fruit ealled “‘mangaba,” for which, rather than for the rubber, the tree is culti- vated in some districts. Only a small quantity of this rubber comes to England, and it is not much valued, being a “ wet” rubber. It occurs in ‘“‘ biseuits” or “sheets.” The caoutehoue is eolleeted in the following manner. About eight oblique euts are made all round the trunk, but only through the bark, and a tin eup is fastened at the bottom of each incision by means of a piece of soft clay. The eups when full are poured into a larger vessel, and solu- tion of alum is added to coagulate the juice. . In two or three minutes eoagniation takes place, and the rubber is then exposed to the air on sticks, and allowed to drain for eight days. About thirty

es >

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days afterwards it is sent to market. Pernambueo rubber, as is the case with most rubbers eoagulated by saline solutions, eontains a large quantity of water.

~~/~~

~~we ANY) ag Ds 3)~~

~~Fic. 4—Manithot Glaziovii, Young leaf (half natural size); inflorescence (about half natural size); half-ripe capsule (real size),~~

~~Cartagena rubber eomes from New Granada in the form of black sheets § inch thick, having a somewhat rough or “ chewed” appear- anee, and is more or less “tarry” or sticky. It also occurs in the form of strips or small pieces pressed together in bags. Its~~

~~Fig, 5.—Jfanihot Glaztovtt. a, male flower; 5, female flower ; ¢, seed ; d, seetion of seed, (All natural size.)~~

~~botanieal source is not known, but is thought to e a pinnate-leaved tree, a portion at least being derived, it is supposed, from Castilloa elastica. It loses 35 per cent. of moisture when dried. The importa- tion of Cartagena abba into Great Britain has declined from 3518 ewts. in 1875 to 1679 ewts. in 1879. .~~

~~Guayaquil rubber is imported from Ecuador in large flakes or lumps, of a whitish eolour in the best kinds, the inferior sorts being porous and filled with a fetid blaek liquid, having an odour of eow- dung, and staining the knife and hands. It 1s believed to be obtained from Castilloa elastiea. The amount imported into Britain has diminished from 8815 ewts. in 1875 to 482 ewts. in 1879. In washing for manufaeture it sometimes loses up to 40 per eent. of its weight. The bulk of the two last-mentioned rubbers is ex- ported to the United States.~~

~~II. CENTRAL AMERICAN.—The source of all the principal rubbers. exported from Central Ameriea is Castilloa elastiea, Cerv., 5 lofty~~

~~838~~

~~artocarpaceous tree, with a trunk 3 feet or more in diameter, and large hairy oblong lanceolate leaves often 18 inches long and 7 inches wide, those subtending the young branches being much smaller and more ovate~~

~~(fig. 6). The tree grows most abundantly in a sporadic manner in the dense moist forests of the basin of the Rio Sau Juan, where the rain falls for nine months in the year. It prefers rich fertile soil on the banks of watercourses, but does not flourish in swamps. It is found also in Costa Rica, Guatemala, Honduras, Mexico, Cuba, and Hayti, and in Panama in company with another species, C. Mark- hamiana, Collins, and on the west coast of South America down to the slopes of Chimborazo, the Cordilleras of the Andes separating the Castillo from the Hevee of Brazil, according to Mr R. Spruce.~~

~~Nicaragua rubber.—In Nicaragua the juice is collected in April, when the old leaves begin to fall and the new ones are appearing, during which time the milk is richest. The tree is tapped either in the same manner as the Hevea, or by encircling the tree with a simple~~

~~Fra, 6.—Castilloa elastica. a, young leaf (quarter real size); }, seeds (natural~~

~~ei 54 'i margin of leaf (enlarged) ; d, female flower and section of it (enarged),~~

~~spiral cut at an inclination of 45°, or by two spirals in opposite directions if the tree be large. At the bottom of the spiral an iron spout about 4 inches long is driven into the tree, and the inilk is received in iron pails. A tree 20 to 80 feet high to its first branches, and about 4 feet in diameter, is expected to yield 20 gallons of milk, each gallon giving about 2 tb of rubber. In the evening the milk is strained through a wire sieve and transferred to barrels. The milk is coagulated by the addition of the juice of the "acheté" plant (Jpomea bona-nox, L.) or of another plant called '"'coasso." The strained juice of either of these plants, obtained by bruising the moistened herb and subsequent expression, is added to the milk in the proportion of abont 1 pint to the gallon. 1f these plants are not procurable, two parts of water are added to one of the milk, and themixture allowed to stand for twelve hours. The coagulum is next flattened out by a wooden or iron roller to get rid of the cavities con- taining watery liquid, and the sheets are then hung up for fourteen days to dry, when they weigh about 2 tb, the sheets being usually 4 to {th inch thick and 20 inches in diameter. When coagulated by water, the mass is placed in vats in the ground and allowed to dry, this taking — in~~

~~*about a fortnight. It is then rolled into balls. That which dries on the incisions in the tree is called bola or burucha, and is said to be highly prized in New York. The loss of Nicaragua rubber in drying is estimated at 15 per cent. It is exported chiefly from San Juan del Norte, or Grey Town, and the*~~

~~*larger proportion goes to the United States. The Castilloa appears to be suitable for cultivation only in districts where the Para rubber would growequally well. The deciduous lateral shoots if planted will never grow erect.*~~

~~*West Indian rubber is the variety usually imported into England, but in comparatively small quantity only. It occurs in the form of blocks, the finest quality consisting of thin separable sheets, and the second of " scraps," usually conglomerated and containing frag- ments of bark. It is the best description of Central American rubber known. It is not, as its name seems to imply, produced in the West Indies, but derives its appellation from being brought over in West Indian steamers.*~~

~~*Honduras rubber rarely comes over to England; it is of good quality, and free from " tarry" matter.*~~

~~*Mexican rubber is imported into Liverpool in small quantity only. The imports of Mexican caoutchouc decreased from 1292 cwts. in 1875 to 158 cwts. in 1879.*~~

~~*Guatemala rubber is a very inferior kind and very unequal in quality ; the best varieties are whitish, and the "lower" are black with a "tarry" appearance. It occurs in the form of sheets com- ere together, from between which when pressed a thick resinous fluid exudes. This when evaporated leaves a hard resinous sub- stance unaffected by hot water or steam. 'The rubber is collected from the trees as in Nicaragua, but it is poured on mats to dry, and the thin sheets are subsequently peeled off, folded into squares, and subjected to pressure to remove as much as possible of the contained moisture. The imports of india-rubber into England from the whole of Central America amounted only to 2080 cwts. in 1879, having decreased*~~

~~*from 5809 cwts. in 1875. The greater proportion of Central American rubber is exported to New York, especially that from Nicaragua and Panama.*~~

~~*Siphocampylus Caoutchoue, Don., and S. Jamesonianus, D. C., Central American plants belonging to the natural order Lobeliacce,*~~

~~*| are also stated to yield rubber of good quality ; and at the Phil-*~~

~~*adelphia exhibition a rubber called Durango caoutchouc, obtained from a composite plant, was exhibited.*~~

~~*III, AFRicAN.—India-rubber is produced throughout equatorial Africa, the chief districts of export being the Gaboon, Congo, and Benguela on the west coast, and Madagascar, Mozambique, and Mauritius on the east. The Madagascar, Mauritius, and Gaboon rubbers are, it is believed, chiefly exported to France. Those which enter into British commerce are known as Mozambique, Madagascar, and African, although the imports are described as coming from the following districts in the blue books :—Senegambia and Sierra Leone 3808 ewts., West Coast 11,307 cwts., East Africa 7621 ewts., Cape of Good Hope 4241 ewts., Mauritius 570 ewts., Gold Coast 12 ewts. The above imports, which are for 1879, show an increase during the past five years, except in the case of Mauritius, Mada- gascar, and the Gold Coast. Africa, in respect of the large amount exported, may now be considered as taking the second place as an india-rubber producing continent.*~~

~~*Mozambique rubber, which is one of the most important varieties, occurs in the form of balls about the size of an orange, and " sausages," or spindle-shaped pieces, made up of slender strings of rubber wound around a piece of wood, which is eventually removed ; or sometimes it occurs in smooth pieces of irregular size known as "cake" or "liver." Madagascar rubber consists of two qualities, the best of a pink and the inferior or "lower" of a black colour, and occurs in shapeless pieces.*~~

~~*The other kinds included under the general name of African are amorphous lumps called " knuckles" from Congo ; small "negro- heads" or "balls" of scrap, and smooth cakes from Sierra Leone ; small square pieces like dice*~~

*~~called "thimbles," and others more irregular in shape called "nuts," and "small negroheads"' from the Portuguese colonies; "tongues," consistin of flat pieces, usually wet and sticky, from the Gaboon ; and *' belle " from Liberia African rubber as a rule possesses more adhesiveness and less elas- ticity than Pard rubber, and is inferior in value. Comparatively little is known of the plants yielding caoutchouc in Africa or of the mode of collection. In Angola, according to Dr Welwitsch, the natives either cut off a piece of bark, and allow the milky juice to run into a hole in the ground, or placing the hand against the trunk of the tree permit the milk to trickle down their arms, going from tree to tree until the arm is covered, when the rubber is rolled back towards the hand in the form ofa ring. The wood of some of the trees, according to Mr Collins, contains a gum which, if the incision penetrates below the bark, mixes with the rubber and deteriorates it. In Madagascar, according to M. Coignet, rubber is obtained from the "Voa-héré" or '" Voa-canja," Vahea madagascariensis, Boj., the 'Voa-hiné, V. comorensis, Boj., and from V. gummifera, Lam. In Senegambia it is obtained from the " Anjouan," Vahea sene- galensis, A. D.C. In Mauritius Willughbeia edulis, Roxb. (which is found also in Madagascar, and in Chittagong and Silhet in India), appears to be the chief source of rubber. All the above are climb- ing shrubs with opposite entire leaves and fleshy fruits.~~*

~~In Central Africa, from Liberia on the one side to Zanzibar on the other, caoutchouc is collected from plants of genera nearly allied~~

~~INDIA-BUDE SB HR~~

~~to Vahea, a few only of the species being known to botanists. In Angola, under the name of " Licomguc," in Golungo Alto and Cazengo, it is collected from Landolphia owarensis, Pal. de Beauv. ; from L. florida, Benth., in Angola and Liberia, and from L. Hendelotii, D. C.,in Senegal. At Kew there also exists a speci- men of india-rubber from the west coast of Africa obtained from an undescribed species of Carpodinus with hairy leaves and stems, In the basin of the Gaboon and Congo it is obtained, according to Du Chailln, from a climbing plant called W'dambo, which gives its name to dambonite, a peculiar substance contained in this kind of rubber (see p. 840). That some African caoutchouc is yielded by species of~~

~~*Ficus there can be no doubt. In Sierra Leone it is collected from Ficus Brasti, R. Br. Iu Liberia, according to Mr Thomas Christy, the finest rubber is obtained from Urostigma Vogelii, Migq., a tall tree with large handsome leaves, and lower qualities of rubber from other species, and from Landolphia florida, Benth. In Angola on the west, and at Inhambane on the east coast, rubber is also obtained from species of Fiews. In the island of Réunion caoutchouce is said to be obtained from Periploca greea, L.*~~

~~*IV. Astatio.—The rubbers which enter English commerce from Asia include the Assam, Borneo, Rangoon, Singapore, Penang, aud Java kinds.*~~

~~*Assam rubber is imported chiefly from Calcutta in baskets made*~~

~~*of split rattans, weighing about 3 cwt. each, and covered with a |*~~

~~*gunny bag. The rubber is glossy, of a bright pink colour and niottled appearance, and occurs in the form either of small balls pressed together or of irregular masses called "slabs" or "loaf" rubber. The former, being more liable to adulteration, are less in demand by manufacturers. The imports into Liverpool in 1879 were 7000 cwts. Assam rubber is obtained from Ficus elastica, Roxb., a plant too well known as a window ornament to need de. scription. A portion also is collected from Urostigma laccifera, Miq. Ficus elastiea grows in the tropical rocky valleys of the HImalayas, between 70° and 80° E. long., where there is always a lot moist atmosphere, the temperature rising to 98° F, in the shade. The trees are tapped in the most careless manner. In the lower portion of the tree and in the large aerial roots, diagonal cuts pene- trating to the wood are made, from 6 to 18 inches long, and in an elliptical form so as to be about 3 inches across the ceutre. The milk is received either in holes made in the ground or in leaves folded in the form of a funnel, that from the smaller cuts on the branches (for the collectors scarify every portion within reach) being allowed to dry on the tree. About 50 oz. of the milk collected in August gives 15 oz. of caoutchouc, but the percentage sometimes falls as low as 10 per cent. From February nore scanty, but richer in caoutchouc, and is lected at that time. The milk is coagulated ing water and stirring it until it is sufficiently firm to be carried about without being clammy; sometimes it is pressed, again boiled, and dried in the sun. In this way the "loaf" rubber in irregular*~~

~~*masses is formed. The small " balls" arc formed of the strings of rubber which have been allowed to dry on the tree.*~~

~~*Assam rubber, although fairly elastic, is much depreciated in valuc by the careless mode of collection, and often loses, by washing at the manufactory, as much as 35 per cent. of dirt, consisting of clay, sand, or bark. The exportation of caoutchouc from British India, exclu- sive of the Straits Settlements and Ceylon, in 1879 amounted to 9973 cwts., of which 7000 are estimated to have been produced in Assam. About three-fourths of the rubber exported from India goes to Great Britain, and the remainder to the United States.*~~

~~*In consequence of the reckless destruction of the trees, the culti- vation of Ficus elastica has been commenced in Assam. It is caleu- lated that the trees can be tapped at the age of twenty-five years, and that after fifty years they will yield 40 tb of caoutchoue each (worth £3, 4s.) every three years, it being injurious to their health to tap them more frequently.*~~

~~*Palay rubber is the product of Cryptostegia grandifiora, R. Br., an asclepiadaceous plant common on the coast of India; and from Willughbeia edulis, Roxb., and IV. martabanica, D. C., a rubber is obtained in Chittagong ; neither of these, however, is known in Britain as a commercial variety.*~~

~~*Borneo rubber comes to the Liverpool market in the form of balls or shapeless masses, internally ofa white or pinkish colour, and very porous and spongy, the pores being usually filled with salt water, in consequence of which it often loses 20 to 50 per cent. of its weight in drying. The imports into Great Britain amounted in 1879 to 5000 cwts. Although Borneo rubber was first made known in 1798, it was not imported into England as an article of trade till 1864, when it appeared under the name of gutta susu, 7.c., in Malayan, milk-gum. The plant which yields Borneo rubber was identified by Roxburgh as Ureeola clastica, Roxb., an apocynaceous climbing plant witha trunk as thick asa man's body, and having a soft thick bark. Mr F. W. Burbidge, who recently visited the island, states that there are three varieties of the rubber plant, known to the natives as "petabo," which yields the finest caoutchouc ; ""menoongan," which yields the*~~

~~*largest quantity; and "serapit, from which the commonest rubber is obtained. The petabo variety,*~~

~~*by pouring it into boil-*~~

~~*to April the milk is | consequently best col- |*~~

~~*839*~~

~~*muk is coagulated 1 plant is probably one of the : repay cultivation, as it grows rapidly, yields a opey of sap in three years, and after planting requires no atten- ion.*~~

~~*_ In Sumatra, caoutchoue is obtained from Willughbeta Jivia, and 18 exported to Holland, but this variety is not known in England. Malacca rubber, which is not met with in English commerce, is said to be obtained from Urecola elastica, Roxb.*~~

~~*Rangoon rubber, and those of Penang and Java, are imported into England in small quantities only, and are irregular in appearance. Froin its physical characters, a portion at least of Rangoon rubber is believed to be the produce of a species of Ficus, probably F. hispida, L. Another caoutchouc-yielding plant, Ureeola (Chavan- nesia) esculenta, Benth., belonging to the Apocynacce, has, how- ever, been recently discovered in Burmah, some specimens of which at the age of five years have stems 6 inches in diameter, while the crown covers an area of 200 square feet. It has been recommended for plantations as an available source of rubber, the cost of cultiva- tion being very slight after the first year, and the profit commenc- ing in seven years, at which age the yield is calewlated to be 3% Ib.*~~

~~*Penang rubber in character resembles the Assam, and may be also supposed to be obtained froma species of Fieus. Dy Wallich, how- ever, has stated that its source is an asclepiadaceous plant, Cynau- . chum ovalifolium, Wright.*~~

~~*Java rubber is stated by Dr De Vrij to _be obtained from Fieus clastica. Like the Assam rubber it is dark and glossy, but it is of a deeper tint, and has occasional reddish streaks. It is said to be prepared by allowing the*~~

~~*juice to dry on the incisions made in tho tree. Singapore, Java, aud Penang rubbers are much alike in char- acter, and may be classed with the Assam rubber, having a firm texture, mottled appearance, and bright polished surface, but vary- ing in colour in a single sample froni light yellowish-white to dark brown. Java rubber is also exported to France.*~~

~~*Caoutchouc is obtained in the Malay archipelago from Alstonia costilata, Miq.; and Alstonia scholaris, R. Br., is likewise reported to yield it. In Fiji it has been obtained from Alstonia plumosa, Labill. In North Australia caoutchoue has been prepared from Ficus macrophylla, Desf., and F. rubiginosa, Desf.; the last-named plant has been recommended by Baron Miiller as suitable for cul- tivation, being a hardy species, None of the above rubbers are as yet known in British commerce as regular articles of trade.*~~

~~*Bibliography.—Collins, in Journal of Botany, 1868 ; Journ. Soe. Aris, vol. xviii. p. 86; Bevan, British Manufacturing Industries, 1877, p. 97-105, and Report on Caoutehoue, 1872; Markham, in Journ. Soc. Arts, p. 475, 1876; L'Iugenicur Universel, vol. ii. p. 187; Bernardin, Classification de 100 Caoutchoucs et Guttaperchas, Ghent, 1872; Christy, New Commercial Plants ; Kurz, Forest Flora of British Burmah, vol. ii. p. 184, (EK. M. H.)*~~

~~*Chemistry, Manufacture, and Industrial Uses.*~~

~~*The remarkable body known as india-rubber is com- posed of carbon and hydrogen alone, but its exact chemical nature is not by any means known with certainty. Tho analyses of Faraday indicate that its ultimate composition is 87°5 per cent. of carbon and 12°5 per cent. of hydrogen ; but there appears to be good ground for regarding the substance as a polymer of the group C,)H,, or as (C,)H,),. There are, however, no data for estimating the value of x in this case. It will be noticed, too, that the formula given requires considerably less hydrogen than the propor- tion indicated by Faraday's analysis; but the difficulties of obtaining such a body as caoutchouc ina fit condition for analysis are so great as to render this discrepancy a matter of comparatively small import. The action of cold and heat on india-rubber presents many points of Interest. When exposed to a temperature approaching 0° C., it gradually loses its softness and ready extensibility, and finally becomes rigid and inelastic; but its normal condi-*~~

~~tion may be restored by submitting it either to a tempera- ture of 35° or 40° C., or to a tension sufficient to stretch it to about twice its natural length. In the latter case it is probable that the change is really due to heat arising from the physical disturbance consequent upon the act of stretching. The effects of heat are more complex and varied than those of cold; and with caoutchouc at an~~

~~840~~

~~ordinary temperature, say 15° C., the primary effect of heat is to increase its flexibility and elasticity. This is well illustrated by the fact that a strip of rubber stretched by a weight contracts when it is heated to a temperature of abont 40° C. This diminution as regards length is, however, accompanied by a more than corresponding 'nereaso in thickness, on account of the expansion iu volume due toan elevated temperature. When caoutchouc is exposed to a temperature ranging between 100° and 120° C., it becomes considerably softened, and almost entirely loses its elasticity; but, if of good quality, it~~

~~slowly recovers its former condition under the influence of When, however, the heat is~~

~~a moderate degree of cold. pushed to 150°, it becomes viscous, and at 200° it fairly 'melts, forming a thick liquid which possesses the same composition as ordinary caoutchouc, but has no tendency to resume its original condition even when exposed to cold for a prolonged period. At a still higher temperature, caoutchouc yields a variety of volatile hydrocarbons ; and, on subjection to dry distillation in a retort,~~

~~'nto these bodies is tolerably complete, only a trifling~~

~~carbonaceous residue remaining behind. Among the most~~

~~notable volatile products resulting from the dry distillation of caoutchouc may be mentioned caoutchin, an oil-like body having a composition and vapour volume corresponding to the formula C,)H,, and boiling at 171° C.; and isoprene, another hydrocarbon oil identical in composition with~~

~~caoutchin and with caoutchouc itself, and boiling at as" €. Other hydrocarbon oils are also formed, as, for example,~~

~~heveene and caoutchene,—these being members of the C,H on~~

~~series. The former boils at 228°, and the latter at 14°°5. The mixed products of the dry distillation of caoutchouc, often described under the name caoutchoucin, form an~~

~~excellent but rather expensive solvent of this body. When caoutchouc gradually oxidizes and~~

~~exposed to the air,~~

~~undergoes deterioration ; the oxidation is often much~~

~~favoured by exposure to sunlight or to alternate conditions~~

~~of dampness and dryness. The deteriorated caoutchouc is either somewhat soft and deficient in tensile strength, or brittle and resinous in its nature. Spiller found 27°3 per cent. of oxygen in a resinous product resulting from the decay of caoutchouc. Ozone rapidly attacks and destroys the substance.~~

~~Dilute acids or alkalies have little or no action on caoutchouc, but strong and hot sulphuric acid chars, and concentrated nitric acid rapidly oxidizes and destroys it. The moderate action of either chlorine, bromine, or iodine hardens or vulcanizes it; but, if allowed toact freely, they completely destroy it. The action of sulphur will be con- sidered below.~~

~~Caoutchouc, when pure, is odourless and nearly white, and possesses a specific gravity of '915. It is porous and cellular in texture, and absorbs from 10 to 25 per cent. by weight of water when long soaked in it. Alcohol is similarly taken up. Up to this point caoutchouc has been referred to as if it consisted of one substance only; but as a matter of fact all ordinary samples contain two distinct modifications, viz. the hard or fibrous and the soft or viscous. These two caoutchoucs are identical in com- position, and similar as regards general properties and reactions. On subjecting a piece of raw caoutchouc, however, to the action of such asolvent as cold benzol,~~

~~*the essential difference between the two forms manifests itself. The fibrous or hard constituent merely swells up to many times its original bulk, but the viscous yields a true solu- tion. Ina high class rnbber, such as that imported from the province of Para, the former modification is the prin- cipal factor ; in a caoutchouc of low quality, such as*~~

~~*African tongue," the latter. Freshly cut surfaces of caoutchouc unite together firmly, and this circumstance is*~~

~~*its conversion*~~

~~*INDIA-RUBBER*~~

~~*duv to the presence of the viscous variety ; vulcanization, by hardening this, destroys the adhesive property.*~~

~~*Certain liquids, such as benzol and its homologues, car- bon disulphide, petroleum, ether, volatile oils, chloroform, and melted naphthalene, dissolve caoutchouc more or less perfectly ; but unless the substance has been subjected to the process of mastication, its fibrous constituent appears, not to dissolve in the strict sense of the term, but rather to swell up, forming a paste analogous to starch which has been acted on by hot water. Carbon disulphide and chloroform, however, exercise a more powerful solvent action on the fibrous parts of india-rubber than benzol or essential oils; and Payen has found that carbon disulphide to which 5 per cent. of absolute alcohol has been added forms one of the best solvents. One part of masticated caoutchouc dissolved in thirty parts of this solvent forms a liquid which can be filtered through paper, and which leaves a film of exquisite tenuity and purity when allowed to dry on a level glass plate.*~~

~~*Most fatty matters exercise a remarkable destructive action on caoutchouc, causing it to become first soft, and afterwards hard and brittle. It has often happened that traces of fatty oils in the liquids employed for dissolving india-rubber, or fatty matters in the textile basis, have led to the destruction of waterproof goods. A like cause has in many cases led to the rapid deterioration vf the caoutchouc threads in clastic webbing.*~~

~~*In the industrial working of india-rubber, the first matter to be attended to is the removal of the various impurities present in the crude material. These are in some cases natural products which have originated with the caoutchouc, while in other cases they owe their presence to careless collection or to adulteration. Among the impurities of the former class may be mentioned various gum-like or mucilaginous matters, and acid products arising from their decay or oxidation, A remarkable volatile body, which is probably of the nature of a polyatomic alcohol, has been discovered by Gerard? inthe crude caoutchouc from the Gaboon. This substance, called by the discoverer dambonite, has a composition corresponding to the formula C,H,O,, is sweetish to the taste and soluble in water, and crystallizes in needles which melt at 190° C. and volatilize between 200° and 210°. The admixtures may range from fragments of bark or wood to stones or large lumps of clay, such as are sometimes introduced into negrohead rubber,—hay or a similar substance being also placed inside to make the mass about equal in specific gravity to the genuine article. Alum and sulphuric acid are often employed to effect the coagulation of the juice ; and traces of the latter remain- ing in the rubber appear, in some instances, to work mischief.*~~

~~*All the above-mentioned impurities are in actnal practice very efficiently removed by the following process. 'The lumps of crude caoutchouc are first softened by the prolonged action of hot water, and then cut into slices by means of a sharp knife,—generally by hand, as thus any large stones or other foreign substances can beremoved. The softened slices are now repeatedly passed between grooved rollers, known as the washing rollers (fig. 7), a supply of hot or cold water being made to flow over them. Sohd impurities speedily become crushed, and are carried away by the water, while the rubber takes the form of an irregular sheet perforated by numerous holes. The washed product contains in its pores a notable proportion of water, which is removed by hanging the rubber for some days in a warm room. It is now ready either for incorporation*~~

~~*1 Compt. Rend., \xvii. p. 820, and Zeitschrift fiir Chem., 1869, p. 66.*~~

~~with sulphur and other solid bodies, or for agglomeration into solid masses by means of the masticating machine, —an apparatus which consists of a strong cylindrical cast- iron casing, inside which there revolves a meta] cylinder with a fluted or corrugated surface. Some of the rub- ber having been placed in the annular Space between the inner cylinder and the outer casing, the former is made to revolve; and the continued kneading action to~~

~~.Fi1e. 7.—Roller of Washing Machine. which the rubber is subjected works it into a solid mass,~~

~~something like a gigantic sausage. Before commencing the mastication it is generally necessary to warm the apparatus by means of steam; but as the operation proceeds the heat produced requires to be moderated by streams of cold water flowing through channels provided for the purpose, The inner cylinder is generally placed somewhat excentric- ally in the outer casing, in order to render the kneading more perfect than would otherwise be the case.~~

~~To convert the masticated rubber into rectangular blocks, it is first softened by heat, and then forced into iron boxes or moulds. The blocks are cut into thin sheets by means of a sharp knife, which is caused to move to and fro about two thousand times per minute, the knife being kept moistened with water, and the block fed up to it by mechanical means. Cut sheets are largely used for the fabrication of certain classes of rubber goods,—these being made by cementing the sheets together with a solution of rubber in coal-naphtha or benzol. Most articles made of cut sheet rubber would, however, be of very limited utility were they not hardened or vulcanized by the action of sulphur or some compound of that element, After vulcanization, rubber is no longer softened by a moderate heat, a temperature of 160° O. scarcely affecting it, nor is it rendered rigid by cold, and the ordinary solvents fail to dissolve it, It must, however, be distinctly understood that it is not the mere admixture but the actual combination of sulphur with india-rubber that causes vulcanization. If an article made of cut sheet be immersed for a few minutes in a bath of melted sulphur, maintained at a temperature of 120° C., the rubber absorbs about one-tenth of its weight of that element, and, although somewhat yellowish in colour from the presence of free sulphur, it is still unvulcanized, and~~

~~unaltered as regards general proper- ties. If, however, it be now subjected for an hour or so to a temperature of 140° C., true combination sets in, and vulcanized caoutchouc is the result. When a manufactured article has been saturated with sulphur in the melted- sulphur bath, the heat necessary for vulcanization may be obtained either by high-pressure steam, by heated glycerin, or by immersion in a sulphur-bath heated to about 140° C. In this last case absorption of the sulphur and its intimate combination with the rubber occur simultaneously. Cut sheets, or articles made from them, may be saturated by being laid in powdered sulphur maintained for some hours at about 110° C. Sheets sulphured in this way can be made up into articles and joined together either by warming the parts to be united, or by means of india-rubber solution ; after which the true vulcanization, or "curing" as it is termed, can be brought about in the usual way. Another inethod of vulcanizing articles made from cut sheet rubber consists in exposing them to the action of chloride of sulphur. Either they are placed in a leaden cupboard into which the vapour is introduced, or they are dipped for a~~

~~seamless tubing~~

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~~few seconds in a mixture of one part of chloride of sulphur and forty parts of carbon disulphide or purified light petroleum. Vulcanization takes place in this instance without the action of heat; but it is usual to subject the goeds for a short time to a temperature of 40° C. after their removal from the solution, in order to drive off the liquid which has been absorbed, and to ensure a sufficient action of the chloride of sulphur. Treatment with a warm alkaline solution is afterwards advisable, in order to remove traces of hydrochloric acid generated during the process. Another very excellent method of vulcanizing cut sheet goods consists in placing them in a solution of the poly- sulphides of calcium at a temperature of 140°C. Rubber employed for the manufacture of cut sheets is often coloured by such pigments as vermilion, oxide of chromium,~~

~~ifs~~

~~Fig, 8.—The Mixing Rollers,~~

ultramarine, orpiment, antimony, lamp black, or oxide of zinc, incorporation being effected either by means of the masticator or by a pair of rollers heated internally by steam, and so geared as to move in contrary directions at unequal speed (fig. 8). Most of the rubber now manufactured is not combined with sulphur when in the form of sheets, but is mechanically incorporated with about one-tenth of its weight of that substance by means of the mixing rollers, — any required pigment or other matter, such as whiting or barium sulphate, being added. The mixed rubber thus obtained is readily softened by heat, and can be very easily worked into any desired form or rolled into sheets by an apparatus known as the calendering machine. Vulcaniza- tion is then ensured by exposure for half an hour or more to a temperature of 135°-150° C., usually in closed iron vessels into which high-pressure steam is admitted (fig. 9). Tubes are gene- rally made up around mand- rels, and allowed throughout the curing to remain imbedded in pul- verized French chalk, which af- fords a useful support for many articles that tend to lose their shape during the © \| process. Of late years a consider- able amount of

Fia. 9.—A Vuleanizer.

‘ has been made, much in the same way as lead piping, by forcing the mixed rubber through a die, and curing as

above. ‘The calendered sheets are generally cured between

folds of wet cloth, the markings of which they retain ; and

hollow articles, such as playing balls or injection bottles,

are vulcanized in iron or brass ee — — and XII. — 10

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very slightly greased. Before it is put in, the article is roughly put together, and the expansion of the included air forces the rubber into contact with the internal sur- face of the mould, or a little carbonate of ammonia is en- closed. Belting intended for driving machinery is built up of canvas which has been thoroughly frictioned with the soft mixed rubber, and is cured by placing it in a kind of press kept by means of steam at a dry heat of about 1 40° C. Packing for the stuffing boxes of steam engines 1s similarly prepared

~~from strips of rubber and frictioned canvas, a8 also are the so-called insertion sheets, in which layers of rubber alternate'with canvas or even wire gauze. India- rubber stereotypes are now extensively made use of as hand stamps, and attempts have been made to introduce them for press and machine printing. A plaster cast of the type is, when dry, saturated with shellac varnish and redried. Rubber mixed in the usual way with about 10 per cent. of sulphur is now softened by heat, forced into the mould, and retained there by pressure during the operation of curing, which is usually effected in an iron box heated over a gas burner to 140° C.~~

~~The ordinary macintosh or waterproof cloth is prepared by spreading on the textile fabric layer after layer of india- rubber paste or solution made with benzol or coal-naphtha. Tf cotton or linen is used, it is usual to incorporate sulphur with the paste, and to effect vulcanization by steam heat ; but, when silk or wool is employed, no sulphur is added to the paste, the dried coating of rubber being merely brought into momentary contact with the mixture of chloride of sulphur and carbon disulphide already mentioned. Double texture goods are made by uniting the rubber surfaces of two pieces of the coated material. Air goods, such as cushions, beds, gas bags, and so forth, are made of textile fabrics which have been coated with mixed rubber either by the spreading process above described, or by means of heated rollers, the curing being then effected by steam heat. The manufacture of overshoes and fishing boots is an analogous process, only the canvas base is more thickly coated with a highly pigmented rubber of low quality. The articles are first fashioned by joining the soft material ; they are then varnished, and afterwards cured in ovens heated to about 135°C. The fine vulcanized " spread sheets" are made by spreading layers of india-rubber solu- tion, already charged with the requisite proportion of sulphur, on a textile base previously prepared with a mixture of paste, glue, and treacle. Vulcanization is then effected by steam heat, and, the preparation on the cloth being softened by water, the sheet of rubber is readily re- moved. The required thickness of the spread sheet is very often secured by the rubber-faced surfaces of two cloths being united before curing. The threads used in making elastic webbing are usually cut from spread sheets. The manufacture of springs, valves, and washers does not re- quire any very special notice, these articles being generally fashioned out of mixed rubber, and vulcanized either in moulds or in powdered French chalk. Rollers are~~

~~made to adhere to their metal spindles by the intervention of a layer of ebonite, and after vulcanization they are turned. In order to make spongy or porous rubber, some material is incorporated which will give off gas or vapour at the vulcanizing temperature,—such as carbonate of ammonia, crystallized alum, and finely ground damp sawdust. Uncombined sulphur is injurious, and often leads to the decay of vulcanized goods; but an excess of sulphur is generally required in order to ensure perfect vulcanization. Sometimes the excess is partially removed by boiling the finished goods with a solution of caustic soda, or some other solvent of sulphur. In other cases the injurious effects of free sulphur are obviated by using instead of it a metallic sulphide,—generally the orange sulphide of~~

~~antimony ; but, for the best results, it is necessary that this should contain from 20 to 30 per cent. of uncombined sulphur.~~

~~When the vulcanization of rubber is carried too far—say~~

~~from the presence of a very large proportion of sulphur and an unduly long action of heat, the caoutchouc becomes~~

~~hard, horn-like, and often black. Rubber hardened by over-vulcanization is Jargely manufactured under the name of ebonite or vulcanite. It is usually made by incorporat- ing about 40 per cent. of sulphur with purified Borneo rubber by means of the usual mixing rollers, shaping the required articles out of the mass thus obtained, and heating for six, eight, or ten hours to from 135° to 150°. Ebonite takes a fine polish, and is valuable to the electrician on account of its insulating properties, and to the chemist and photographer because vessels made of it are unaftected by most chemical reagents. A kind of vulcanite which contains a very large proportion of vermilion is used, under the name of dental rubber, for making artificial ums,~~

~~The following list of works and papers on the rubber industry enumerates the writings which are calculated to be especially useful to the enquirer :—~~

~~Charles Goodyear, Gum Elastic and its Varicties, New Haven, U.S.A., 1853;~~
~~Friedrich Harzer, Gutta-Percha und Kautschuk, thr Vorkommen, &c.,~~

~~*Weimar, 1853; Paulin Desor-: meaux, Nowveau manucl complet du fabricant d'objets en caoutchouc, en gutta-percha, et en gomme factice, 424 pp., Paris, 1855; C. H. Schmidt, Der Fabricant von Kautschuk und Gutta-Percha Waaren, 207 pp., Weimar, 1856; Thomas Hancock, Origin and Progress of the Indian-Rubber Manufacture in England, London, 1857 ; Heinrich Keysserling's edition of Friedrich Harzer's Gutta-Percha und Kaut- schuk, 273 pp. and atlas, Weimar, 1864; Abridgments of Specifica-tions relating to the Preparation of India-Rubber and Gutta-Percha, 1791-1866, 262 pp., printed by order of the Commissioners of Patents, London, 1875; " India-Rubber and Gutta-Percha," a series of articles in the Universal Engineer, vol. ii., Manchester, 1879; Franz Clouth, Die Kautschuk Industrie, 76 pp., Weimar, 1879; T. Bolas, Cantor Lectures on the India-Rubber and Gutta-Percha Industries, London, 1880; M. Maigne, Nowveaw manuel complet du fabricant d'objets en caoutchouc, &c., 2 vols., 506 pp., Paris, 1880. (T. B.)*~~

~~*INDICTMENT, in English law, is a formal accusation in writing, laid before a grand jury, and by them presented on oath to a court of competent jurisdiction. It is thus distinguished from a mere presentment by the grand jury made on information within their own knowledge, and from an INFORMATION (9.v.), by which a prosecution is instituted at the suggestion of a public officer without the intervention of a grand jury. The grand jury hears in private the witnesses in support of the application, and, if it considers that a prima facie case has been made out, it is its duty to find the indictment "a true bill." Otherwise it sends the indictment into court torn up, which is a finding of "no bill." In this case the indictment is said to be ignored. An indictment is said to consist of three parts—the com-mencement or caption, the statement of the facts constitut- ing the crime, and the conclusion. In each part appropriate and highly technical language is still used, but verbal pre- cision is not so essential as it once was, and departure from the ordinary formalities, if it involves no misapprehension or mistake, does not make a flaw in the indictment. The formal commencement of an indictment is after the follow- ing style :—" Middlesex to wit. The jurors for our lady the Queen on their oath present," &c. The name of the county and district in the margin is the " venue," and it should in general be the county in which the offence was committed, or the district over which the jurisdiction of the court extends. An indictment concludes*~~

~~*with the words "against the peace of our lady the Queen, her crown and dignity," if the offence is a crime at common law. If the offence is a crime by statute, the indictment must also use the words "against the form of the statute in such case made and provided." In the "statement" great care must be taken to set forth the facts of the case with certainty*~~

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~~*and precision. It may be mentioned that in the Criminal Code Bill, which has been drafted on behalf of the crown by Mr Justice Stephen, and revised by a judicial commis- sion, it is proposed to substitute for the existing formalities a simple statement of particulars, with a reference to the section of the code defining the offence. An indictment lies " for all treasons and felonies, for misprision of treasons and felonies, and for all misdemeanours of public nature at common law." And if a statute prohibit a matter of public grievance, or command a matter of public conveni- ence, all acts or omissions to the contrary, being mis- demeanours at common law, are punishable by indictment if no other mode of proceeding is pointed out by the statute. The statement of the offence is called a count, and an indictment may consist of several counts. But only one offence ought to be charged in each count, and offences of a different nature, ¢.g., murder and burglary, should not be charged in the same indictment. Until recently it was thought improper to charge theft in one count and receiving in another of the same indictment; but that is now made possible by statute. So a prisoner may be charged as accessory before the fact in one count, and as accessory after the fact in another. At common law an indictment may be preferred at any time after the offence committed ; but various periods of limitation have been fixed by statute in special cases. For example, certain kinds of treason must be prosecuted within three years.*~~

~~*Prosecutions by indictment in the United States gene- rally resemble those of English law, the offence being charged as "against the peace and dignity of the state or commonwealth," unless it is a statutory offence, when tho conclusion "against the statute," d&c., is used.*~~

~~*INDIGO is a well known and exceedingly valuable blue dyeing material. The substance has been known among Western communities from an early period, being mentioned by Dioscorides as "Ivdixdv, and by Pliny as*~~

~~*Indicum ; when it made its appearance in England it was called indico. As ali these names show, the material in its origin and production is closely related to India, among the commer- cial commodities of which it has always occupied a distinc- tive and important place. It was not, however, till after the establishment of the Cape route to India that indigo came to be largely used in the dyeing establishments of Western Europe, woad having in earlier times been utilized for purposes to which indigo was subsequently applied.*~~

~~*As a commercial substance indigo is entirely obtained from the vegetable kingdom, although it may be produced, in minute quantity, from a principle contained in urine, and its synthetical formation has also been accomplished. The number of plants from which indigo may be procured is known to be large, but only from a very few is it pre- pared in practice. These are various species of the leguminous genus Indigofera, especially the four species J. tenctoria, I, Anil, I. disperma, and I. argentea; and it is said that in China Polygonum tinctorium and other non- leguminous plants are used as the source of Jan or Chinese indigo. The woad plant, Jsatis tinctoria, owes its value as a dye to the presence of indigo matter, although indigo is not actually prepared from it. The most important source of indigo, and that most generally cultivated, is J. tinctoria, which is an herbaceous plant growing 3 to 5 feet high, and having bipinnate leaves. It is in the leaves that the indigo-yielding principle chiefly resides, and these are most gorged with it at the period when the flower-buds are about to open. It is then that the plant is cut down ; and in some regions the same stock yields in one year a second and even a third crop of stems.*~~

~~*Two principal methods of preparing indigo are pursued, —dried leaves being operated on in the one, while the fresh green stalks and leaves are used in the other. It will be*~~

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~~*sufficient to describe the latter, the more important process, as it 1s conducted in Bengal, where the most highly esteemed varieties of indigo are made. The cut leaves and stems are tied up into small bundles and conveyed at once to the factory, in which there are two ranges of large tanks or vats, one series being at a lower level than the other. In the upper or fermenting*~~

~~vats the bundles are sub- merged ; and cross-bars are fixed over the vats. A fermen- tation more or less rapid ensues, its completion occupying, according to the temperature, from nine to fourteen homrs. The progress of the operation is judged by the tint assumed by the water, which under favourable conditions should at the end of this stage be of a fine clear yellow colour. In this condition the liquid is run off into the lower vats, in which it is necessary to maintain it in a state of violent agitation. For this purpose a number of men, armed with long bamboos, enter the vats and lash the water incessantly for two or three hours, thus constantly exposing new surfaces to the air. Gradually the liquid assumes a green colour, and indigo appears in broadish flakes, which as it forms begin to sink. After this transformation is complete, the liquid is allowed to settle, and as the indigo sinks the clear liquid is drawn off in a series of discharges by pipes at different heights in the vat. The deposit of ~ indigo is then placed in a boiler, and, to prevent any further fermentation, is raised to the boiling point. After resting for about a day, it is boiled for three or four hours, and then filtered over a thick filtering cloth, and the paste is dried by pressure. The cakes formed during the pressing are then put away to dry gently in the shade, and in a few days are ready for packing.~~

~~Bengal indigo of good quality forms a porous earthy mass, light and easily pulverized; and when newly fractured it has that brilliant purple-blue colour distinctively known as indigo, with a kind of coppery lustre. Experts distin- guish upwards of forty qualities of Bengal indigo, princi- pally characterized by varying shades of colour,—the in- ferior qualities being dull in hue, with greenish or greyish tones, hard, dense, and not readily broken, The varieties of indigo which come into the European markets are classi- fied according to their sources: the classes most frequently met with are Bengal, Oudc, Madras, Manila, Java, Egypt, Guatemala, Caraccas, Mexico, and Brazil. The best qualities are the Bengal, Java, and Guatemala, ,~~

~~The condition in which the indigo-yielding principle exists in the fresh plants has been a subject of some speculation and controversy. Dr Schunck has investi- gated the leaves of the woad (Jsatis tinctoria), the Chinese indigo-plant (Polygonum tinctoriwm), and others, and from all these has isolated a glucoside body indican, which, under the influence of dilute~~

~~mineral acids, is decomposed, forming indigotin or indigo-blue and a variety of glucose which he calls indiglucin. It has been assumed that the same principle resides in Jxdigofera as in these other plants, and is the efficient source of the dye-stufffrom that genus. In the decomposition of indican there are formed—in addition to indigo-blue—indigo-red (indigo-rubin or indigo-purpurin) isomeric with the blue, indigo-brown, and indigo-gluten, all of which, forming part of the precipitate, modify the colour of the product, and render commercial indigo a compound body. Indigo also contains a certain amount of inorganic matter and other non-tinctorial constituents, so that the proportion of indigo-blue may vary from about 72 down to 12 or 14 per cent. of the mass. Pure indigo-blue or indigotin, C,,H,)N,O0, is a neutral body of a deep blue colour, destitute of taste and odour, and insoluble in water, dilute acids, and alkalies, and in cold alcohol and ether. Boiling alcohol, ether, and aniline dissolve it, as do also petroleum, benzene, chloroform, and phenol, melted sperma- ceti and stearic acid, and several oils. It sublimes at~~

~~990°-300° C., giving off violet vapours which condense~~

~~into right rhomboidal prisms possessing a brilliant coppery lustre. By destructive distillation, indigotin yields, among~~

~~other products, aniline,—a circumstance to which that now~~

~~well-known body owes its name (from the Sanskrit nile Treated with and is con-~~

~~through the Portuguese anil, indigo). oxidizing agents, indigotin takes up oxygen, verted into isatin, thus :—~~

~~CygHypN.0, +20 = CroMioN 2 ;~~

~~Indigotin.~~

~~and by further oxidation nitro-salicylic acid and picric~~

~~acid are evolved. The most valuable character, however,~~

~~of indigotin is found in its behaviour under the influence In the presence of nascent hydrogen indigotin absorbs that element and is converted into white indigo, a colourless body which is readily soluble in alkaline or earthy alkaline solutions, and by simple exposure to the air re-oxidizes and reverts to its~~

~~of hydrogenizing or reducing agents.~~

~~original blue condition indigotin. The reduction to white indigo is thus formulated :—~~

~~CjgHigN 05+ 2H = CygH i202.~~

~~Advantage is taken of these properties in dyeing with~~

~~See~~

~~indigo as detailed under DyEING, vol vii. pp. 576-7. also CALICO-PRINTING, vol. iv. pp. 689-90.~~

~~Indigo when dissolved in strong sulphuric acid, forms with it two acid compounds, both of which have limited~~

~~industrial applications. These are (1) sulphindigotic acid,~~

~~C,,H;N,0,(SO,H),, known also as sulphate of indigo or sulphopheenicic acid, sul-~~

~~soluble blue indigo, and (2) phopurpuric acid, or indigo purple, C,,H,N,O, (803;H). These bodies are solution of indigo ; but, as the second is insoluble in weak acids, it precipitates when the solution in which it is formed is largely diluted with water. Both these acids are soluble in water. Saxon-blue on wool and silk, a style now little known ; and the sodium salt of the second is known as red indigo carmine.~~

~~The synthetical preparation of indigo is a subject whicli has long occupied the attention of chemists, as obviously any means by which the substance~~

~~might be artificially obtained on a commercial scale could not fail to be of great industrial value. 'The numerous efforts made in this direction appear at last (1881) to be crowned with success ; and there is now little doubt that artificial indigo will soon become a commercial product. It is to Professor Adolf Baeyer of Munich that the measure of success already attained in manufacturing indigo is due. For many years he has patiently investigated the molecular constitution of indigotin and its derivatives. From isatin, prepared by the oxidation of indigotin, Baeyer and Kuob produced successively di-oxindol, C,,H,,N.O,, oxindol, C,,H,,N,O., and indol, O,,H,,N,. Baeyer at a later period, with the assistance of Emmerling, succeeded in producing indol from cinnamic acid, and as that body can be prepared from coal- tar a new connecting chain was established between indigo at one extreme and coal-tar at the other, meeting in indol just as at a much earlier date they had similarly met in aniline. The task remained of reconverting these deriva- tives of indigotin into that body, and towards that, in 1870, Baeyer and Emmerling, by heating isatin with phosphorus trichloride, acetyl chloride, and phosphorus, succeeded in obtaining a mixture of indigotin and indigo- rubin. In 1878 the further steps necessary to complete the cycle were accomplished by Baeyer, when from pheny]-acetic acid he prepared oxindol. Acting on oxindol by nitrous acid he produced nitrosoxindol, which in its turn, by treatment with nascent hydrogen, was transformed into amidoxindol, a body which on oxidation yielded isatin. Thus the series of transformations was complete; but they~~

~~formed together in the sulphuric acid~~

~~The first was formerly used in dyeing~~

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~~were effected by a process so roundabout and elaborate as to preclude all hope of any commercial issue from the method. Quite recently Baeyer, coming back to the use of cinnamic acid, has devised the much simpler and more direct process which now promises to become, and indeed already is in operation as, a method for the com- mercial preparation of indigo. By treating cinnamic acid with nitric acid, ortho-nitro-cinnamic acid is prepared, which on exposure to bromine vapour readily combines with that body, forming ortho-nitro-dibrom-hydro-cinnamic acid. 'This substance~~

when treated with caustic alkali is converted by the loss of the bromine into ortho-nitro- phenyl-propiolic acid, which, lastly, when heated in an alkaline solution of grape sugar develops into indigotin. The steps in the process are therefore represented thus :— (1) C,H,C,H,COOH + NO,HO=O,H, (NO,)C,H,COOH + H,0 .

Cinnamic acid. Nitric acid. Nitro-cinnamic acid. Water. (2) O,H, (NO,)C,H,COOH + 2Br=C,H,(NO,)C,H_Br,COOH . Nitro-cinnamic acid. Bromine. Nitro-dibrom-cinnamic acid.

(3) Cell y(NO2)CoH2BrgCOOH+2NaOH=Cgll4(NO2)C,CO OH+2NaBr+2H,0. Caustic Nitro-propiolic

soda. acid. (4) 2C HNO, + 2H, = CygHypN.0, + 2CO2 + 2H,0 . sian Sa Indigotin. acid.

The nitro-propiolic acid is now being manufactured by the Badische Anilinfabrik as 2 material for indigo printing. The acid has simply to be printed on the cloth with a thickening containing grape sugar and alkali, and, by steaming, indigo is developed in the fibre. This reaction is in itself a matter of no small importance, seeing that the printing of indigo direct is an extremely troublesome operation. Hitherto indigo in mass has not been produced, but there can be little doubt that the remaining difficulties, among which is the present expensiveness of cinnamic acid, will soon be overcome, and that artificial indigo will take its place among ordinary chemical nianu- factures. (J. PA.)

INDIUM, a metal discovered with the aid of the spectroscope in 1863 by Reich and Richter when testing certain specimens of Freiberg zinc-blende for thallium. Instead of the brilliant green line characteristic of this latter metal, they observed an intense indigo-blue line occupying a position different from that of any known line, and were thus at once led to suspect the presence of a previously unknown element. The name indium was chosen for the metal, when they succeeded in isolating it, onaccount of this circumstance. It has since been detected in blendes from various sources, but always in extremely minute amount, and still remains one of the rarest of the elements. Indium is best prepared from crude zinc made from indium-containing blendes. As it is less positive than zinc, if the crude zinc is

~~*treated with insufficient hydro- chloric acid to dissolve it completely, a residue is obtained containing all the indium together with several other metals also present in small quantity in the zinc. The properties of indium have already been partially described (vol. v. p. 533). Its flame spectrum exhibits, besides the indigo-blue line (w. 1. 4509), a violet line of w. 1. 4101. Lockyer has stated (Royal Society Proceedings, 1878, XXvill. p. 177) that the strongest line in photographs of the spectrum of indium in the electric arc is, as already recorded by Thalén, the h line of hydrogen, the hydrogen line near G being, however, absent. He argues that this is not to be explained by the supposition that the indium contains occluded hydrogen, since none of the hydrogen lines become impressed on the plate when palladium-hydrogen is volatilized in the are. Indium is commonly regarded as closely allied to aluminium, on account of the general resemblance of corresponding compounds of the two metals, and especially on account of the existence of an indium alum isomorphous with ordinary*~~

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~~*alum. Hence indium chloride is usually represented by the formula In,Cl,, the formula of aluminium chloride being Al,Ci, V. and ©. Meyer have recently found, however, that the density of its vapour at a bright red heat corresponds with the formula InCl,, indicating that indium is a ¢riad and not a tetrad like aluminium and iron. Aluminium and iron (ferric) chloride boil readily at a temperature below that at which sulphur or mercury boil, but indium chloride does not volatilize in the vapour of perchlorodiphenyl, which boils considerably above 440° Ge, and only slowly sublimes in the vapour of phosphorus pentasulphide (b.p. 530°). It evaporates by no means rapidly at a dull red heat, but is momentarily converted into vapour at a bright red heat, furnishing a gas which behaves normally. It is noteworthy that aluminium chloride decomposes entirely at a temperature very little above that at which it gasifies. The issue raised by the Meyers' observation is of considerable theoretical interest, and the subject demands further investigation.*~~

~~*INDORE, or the Territories of the Maharaj of Holkar, is one of the principal native states in India, under the Central India Agency. The name of the state is taken from that of the capital Indore, 22° 42' N. lat., 75° 54'*~~

~~*E, long. The territory consists of many isolated tracts ; but since 1861 arrangements have been made to concentrate the state as much as possible, and lands which were formerly held by Holkar in Ahmednagar district and in the Deccan have been exchanged for districts and pdrgdnds bordering on the Nerbudda (Narbad4) river and the tract in which Indore town is situated. The area of the whole of Holkar's territories is estimated at 8075 square miles. Of these districts, those situated to the north are drained by the river Chambal and its feeders, those to the south by the Nerbudda. The tracts are fertile, producing in abundauce excellent wheat and other grains, pulse, sugar-cane, cotton, and opium, The poppy is so generally cultivated that, when in bloom, it gives the country the appearance of a vast garden. Tobacco is also grown to a great extent, and is of admirable quality.*~~

~~*The great Vindhyé range traverses the southern division of Holkar's dominions, in a direction from east to west, a small portion of the territory lying to the north of the mountains, but by much the larger part to the south. Tho latter is a portion of the valley of the Nerbudda, and is bounded on the south by the Sdtpura mountains. Basalt and other volcanic formations predominate in both ranges, although there is also much sandstone. The Nerbudda traverses Indore from east to west; and the valley at Mandlesar, in the central part of the district, is between 600 and 700 feet above the sea, The general appearance of the country is that of an undulating valley intersected by low rocky ranges, in some parts thickly clothed with stunted jungle, which also covers considerable tracts in the plains. The forests of the state form two belts, the southern and the northern. The former, which is con- sidered unhealthy, borders on the Sdtpura range, and the latter, a healthy tract, on the Vindhyd hills. From its inter-tropical position, the climate of Indore is sultry, the thermometer ranging from 60° to 90° Fahr. in the house. For some months from the close of the periodical rains, malaria is so deadly in the jungles that no European ventures into them.*~~

~~*Besides the ruling tribe of Marhattds, the population comprises many other classes of Hindus, a few Mahome- tans, anda considerable number of Gonds and Bhils. The Vindhyd and Satpura ranges are peculiarly the country of the Bhils, who are considered to have been the earliest occupiers of the soil. This race is one of the wildest in India, its people living for the*~~

~~most part on vegetables and game, or on the plunder of their more civilized neighbours.~~

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~~They have, however, of late years been brought into more peaceful habits of life. The population of Holkar's territories was estimated in 1875 at 635,450. The revenue in 1875-76 amounted to £459,800, and the disbursements to £405,100. The number of schools in 1876 was 77, attended by 3235 pupils, costing the state £3000. The principal educational establishment is the Rajkumar college, for the education of the sons of the chiefs and nobles of Central India. The institution is maintained by the British Government, and is located within the grounds assigned for the purposes of the "Residency." The governor-general's agent for Central India has his headquarters at Indore town. A branch line from the Great Indian Peninsula Railway, known as the Holkar State Railway, runs from Khandwa Junction to Indore. The principal engineering works are the ascent of the Vindhya range and the bridge over the Nerbudda river. From Indore the line is taken up by the Neemuch Railway through part of Sindhia's dominions, connecting Indore with Nasirdbad, and finally with Delhi aud Agra, The chief means of communication are the Bombay and Agra Trunk Road, which runs through Indore, with branches at Mhow and Dhar, é&c. ; another road, 80 miles in length, joins Indore with Khandwa, crossing the~~

~~Nerbudda by ferry. j~~

~~There are cotton mills at work in the state, which have proved a regular source of income, as they turn out cloth for which there is a ready market. In 1878 the number of spindles was 10,000. Indore city contains a charitable and leper's hospital, and a dispensary. Cholera frequently prevails,~~

~~History.—The founder of this dynasty was Malhar Rao, the son of a shepherd, who lived in the village of Hol, in the Deccan, whence he derived the surname of Holkar, the adjunct "kae," "kar," or "kur" signifying inhabitant. Disdaining his father's occupation, he enlisted in a troop of horse ; his rise was rapid, and he eventually became one of the most~~

~~distinguished leaders in the first Marhattd in- vasion of northern India, and obtained many possessions north of the Nerbudda and about Indore by grant from the peshw4. At his death he was succeeded by his grand- son Malli Rao, who died shortly after his accession. Alia Bai, the mother of Malli Réo, then took the management of affairs, and appointed as commander of her army Malhar Tukaji Holkar, a chief of the same tribe as, but in no way related to, Malhar Réo. Alia Bai died in 1795, and was not long survived by Tukaji Rao, after whose death the power of the house of Holkar was nearly extinguished by family quarrels and the dissensions which distracted the Marhatta confederacy at the close of the last century. The fortunes of the family were, however, restored by Jeswant Rao, an illegitimate son of Tukaji Holkar, who, after a signal reverse from the army of Sindhia, employed European officers to introduce their discipline into his army, and in 1802 defeated the united forces of Sindhia and the peshwa at the battle of Poona. Twice Holkar attacked British territory, but was totally routed, and finally was forced to sign a treaty on the banks of the Bids, by which he was stripped of many of his conquests. He died insane in 1811, and was succeeded by his son Malhar Rao, during whose minority the state was torn by the most violent dissensions, and overrun by Pindaris. The army mutinied, and British intervention became necessary to restore the government. Malhar Rado dying in 1833 without issue, his wife and mother adopted Martaud Réo Holkar as his successor. He was summarily deposed by Hari Rao, a cousin of Malhar Rao, whose accession was welcomed by the troops. His rule wasa tissue of intrigue and disorder. He died in 1843, and his adopted son, who succeeded him, died in a few months, leaving no heir. The succession was declared to rest with~~

~~the British Government, and Tiikaji Rao (the present mahadrajd), at that time eleven years old, was selected and placed on the gadt. Holkar maintains a military estab- lishment of 3100 regular and 2150 irregular infantry, 2100 regular and 1200 irregular cavalry, and 340 artillery- men, with 24 field guns equipped.~~

~~INDRE, a department of central France, consisting of parts of the old provinces Bas-Berry, Orléanais, and Marche, is bounded N. by the~~

~~*departments of Indre-et-Loire and Loir-et-Cher, E. by Cher, 8. by Creuse, Haute- Vienne, and Vienne, and W. by Vienne and Indre-et-Loire. It lies between 46° 22' and 47° 15' N. lat., and between ce 59' and 2°13' E. long., being 60 miles in length from north to south and 54 miles in breadth from east to west. It derives its name from the river Indre, which flows through it from south-east to north-west. The Creuse, Claise, and Vienne, tributaries, like the Indre, of the Loire, are the other principal streams. The surface forms a vast plateau, sloping from south to north, and divided into three districts, the Bois-Chaud, Champagne, and Brenne, varying with the characteristics of the soil. The Bois-Chaud is a large well-wooded plain, comprising seven-tenths of the entire area, and covered with a sandy and stony soil. In the river valleys, however, the soil is extremely fertile. The Champagne, a bare though fertile district to the north- west, produces abundant cereal crops, and affords excellent pasturage for large numbers of sheep, celebrated for the fineness of their wool. The Brenne isan unhealthy marshy district to the south. Tho climate of Indre is mild and temperate, though moist. On the southern heights the cold is often severe, and throughout the department the crops suffer much from hailstorms. The growth of cereals in Indre exceeds the requirements of the inhabitants ; the pasturage is good and abundant ; and there are numerous valuable forests of oak, clm, beech, and other timber. Fruit-trees are plentiful, and market-gardening is a flourishing industry. The vine is cultivated toa small extent,and yields a mediocre red wine. Chestnuts, potatoes, turnips, beetroot, hemp, and colza are also grown. The rearing of horses and horned cattle is carried on in the Bois-Chaud, and of sheep in the Champagne. The mineral resources of the department include large quantities of iron, besides marl, sandstone, limestone, marble, lithographic and mill-stones, granite, and other stones. The chief industry is the working of the iron; tobacco, paper, parchment, cloth, woollen goods, leather, felt, pottery, porcelain, bonnets, scythes, and tiles are also manufactured. Indre has considerable trade in its natural productions and manufactured articles, and in wool, horses, and oxen. The department is divided into the arrondissements of Chateauroux, Le Blanc, La Chatre, and Issoudun, with 23 cantons and 245 communes. The chief town is Chateau- roux. The total arcais 2624 square miles, and the popula- tion in 1866 was 277,860, and in 1876 281,248.*~~

~~*INDRE-ET-LOIRE, a department of central France, consisting of parts of the old provinces Touraine, Orléanais, Anjou, and Marche, is bounded N. by the departments of Sarthe and Loir-et-Cher, E. by Loir-et-Cher and Indre, S. and §8.W. by Vienne, and W. by Maine-et-Loire. It lies between 46° 45' and 47° 43' N. lat., and between 0° 4' and 1°18' E. long., being 70 miles in length from north to south and 59 in breadth from east to west. It derives its name from the Loire and its tributary the Indre, which flow through it. The other chief affluents of the Loire in the department are the Loir, Cher, and Vienne. Indre-et- Loire is generally level, and conveniently divides itself into the following districts, according to the characteristics of the soil: the Gatine, a flat sterile region to the north of the Loire, with some forests; the Varenne, a rich and fertile district between the Loire and Cher; the Cham-*~~

~~*peigne, a chain of vine-clad slopes, separating the valleys of the Cher and Indre ; the Véron, between the Loire and Vienne, the most highly cultivated district, but subject to inundation by the former river ; the plateaus of Sainte- Maure, a bare hilly region, the most unproductive of the department ; and the Brenne, between the Claise and Creuse, forming part of the marshy territory which extends under the samo name into Indre. The valley of the Loire in this department, from its beauty and fertility, receives the name of the Garden of France. The climate of Indre- et-Loire is singularly agreeable and equable, avoiding extremes of both heat and cold. About two-thirds of the entire area is suited for cultivation, but the south far exceeds the north in fertility. Cereals of all kinds are grown in greater abundance than is required by the inhabitants. Vines are cultivated to a considerable extent, and yield excellent white and red wines, exported chiefly to Holland and Belgium. Vegetables, potatoes, fruits (plums especially being cultivated for the trade in pruneaua de T'ours), hemp, liquorice, coriander, anise, truffles, walnuts, and mulberries are also produced. Owing to the deficiency of well-watered pasture, domestic animals are few. Agri- culture has been for some time in a backward state, from the conservative adherence to old systems and implements by the small peasant proprietors, who hold much of the land. The mineral resources of the department are unimportant. Iron, marble, limestone, millstone,*~~

~~*lithographic stone, and various kinds of marl are worked. Copper, though found, is not worked. The presence of clay, suitable for bricks and pottery, has encouraged the manufacture of these articles. The chief industry is the manufacture of gun- powder at Ripaut near Tours. Silk-weaving, formerly very flourishing, is again beginning to revive. The refining of beetroot sugar and the preserving of fruits occupy many hands. Cloth, carpets, files, woollen goods, paper, and basket work are made in the department ; and there is a consider- ble trade in many of the manufactured articles. Indre-et-Loire is divided into the arrondissements of Tours, Loches, and Chinon, with 24 cantons and 282 communes. The chief town is Tours. The total area is 2360 square miles, and the population in 1866 was 325,193, and in*~~

~~*1876 324,875*~~

~~*INDULGENCE, in Roman Catholic theology, is defined as the remission, in whole or in part, by ecclesiastical authority, to the penitent sinner, of the temporal punish- ment due for sin.) The word (from ixdulgyeo, and perhaps connected with dulcis) in its classical use has the meaning which it still bears in ordinary parlance; but by post- classical writers it is often employed in a more special sense to denote a remission of taxation or of punishment. The Codex Theodosianus has two titles "De indulgentiis debitorum" (lib. xi. tit. 28) and "De indulgentiis criminum " (lib. ix. tit. 38). In this sense it was taken up by ecclesiastical writers ; thus Ambrose says "'nemo recte egerit poenitentiam nisi a Deo per Christum speraverit in- dulgentiam ;" and Augustine (Con. Jul.,i, 3) quotes Reticius of Autun (313 a.p.) to the effect that "baptism is the principal indulgence known to the church." The natural and actual synonyms of the word are "oratia," ' venia," "relaxatio," and " remissio."*~~

~~*The penitential discipline of the ancient church was very severe in its treatment of a large class of scandalous offences ; and in the canonical punishments or penances (which from a very early date began to be determined with considerable precision) time was always a prominent element. But a certain power of showing leniency (firarOpwria) or the*~~

~~*1' Fst autem indulgentia remissio poene temporalis adhue post absolutionem sacramentalem peccatis debits, in foro interno coram Deo*~~

~~*valida, facta per applicationem thesauri ecclesia a superiore legitimo " (Perrone, Prol. Theol., "Tract. de Indulg.,"' procem.).*~~

~~*IND—IND 847*~~

~~*reverse, in the way of shortening or lengthening the prescribed duration of the period during which ecclesiastical penance was to be done, was always left to the discretion*~~

~~*of the bishop. An early and explicit proof of this igs.*~~

~~*found in the fifth canon of the council of Ancyra (314), This discretionary leniency was Sometimes, as appears from the writings of Cyprian, granted by the bishop on the intercession of those who were witnessing for the truth in prison; sometimes also at the instance of the civil magis- trate. The episcopal power was occasionally exercised, not only ina shortening of the canonical duration of the penance, but in some mitigation of the nature of the penalty itself (Syn. Ancyr., can. 2). We find indications at a very early period that some of the minor ecclesiastical offences could be readily and canonically atoned for by almsgiving (Aug., De Mid. et. Op.,c. 19); thus gradually arose, by steps which cau readily be conjectured, a regular system of commutations (redemtiones, commutationes), set forth in "libri penitentiales," offering striking analogies to the provisions made by the various criminal codes by which the Theodosian was supplanted throughout Europe. In the Penitential of the Greek Theodore of Canterbury, for example (690), which is to be found in Migne's Patrologia, a canonical fast of days, weeks, or years may be redeemed by saying a proportionable number of psalms, or by paying au adequate fine. For more than four centuries this work held a position of great authority all over Europe. At the time of the crusades, to go to Palestine and take part in the struggle against the infidel was held to be a work of such extraordinary merit as to render unnecessary any other penitential act on the part of the sinner who engaged in it. Thus at the council of Clermont, held under Urban IT. (1095), it was decreed "iter illud pro omni pcenitentia reputetur." The great schoolmen were the first to reduce to a theory the praxis which had gradually thus sprnng up within the Western Church. That theory may be said to resolve itself into the two positions—(1) that, after the remission of the eternal punishment due for sin, there remains due to the justice of God a certain*~~

~~amount of temporal pain to be undergone, either before death in this world, or after death in purgatory; (2) that this pain may be remitted by the application of the superabundant merits of Christ and of the saints out of the treasury of the church, the administration of which treasury is the prerogative of the hierarchy. A characteristically elaborate statement and defence of these theses will be found in the supplement to the Swmma of Thomas Aquinas (p. 3, qu. 25) and in the Summa of Alexander HIalesius (p. 4, qu. 23, art. 2, membr. 5), In their Tridentine form they occur in sess. 6, can. 30, and sess. 14, can. 12-14. With these passages must be compared the condemnation of the synod of Pistoia by Pius VI. in 1794.~~

~~Indulgences are either general or particular, zc, either open to the whole church or confined to particular localities. The most general of all is that which is proclaimed in the year of jubilee. Indulgences again are either plenary or non-plenary, the former being a total remission of all the temporal punishment which may have been incurred by the recipient. It must carefully be borne in mind that, in~~

~~Roman Catholic orthodoxy, indulgence is never absolutely |~~

~~gratuitous, and that those only can in any circumstances validly receive it who are in full communion with the church, and have resorted to the sacrament of penance, in which alone, after due contrition and confession, provision is made for the remission of the graver penalty of sin. The doctrine of indulgences, however, is singularly open to misunderstanding; and in its practical applications it has too~~

~~1See Bingham, Anét., xviii. 4; and HIefele, Conciliengesch., i. 26, &c.~~

~~often been used to sanction the most flagrant immorality, The scandalous abuses connected with the '* pardoner's " trade, and in particular the reckless conduct of the hawkers of the papal indulgence granted to those who should con- tribute funds for the completion of St Peter's, Rome, were, as 18 well known, very prominent among the proximate causes of the Protestant Reformation. In the 14th article of the Church of England the doctrine of the " thesaurus meritorum" or " thesaurus supererogationis perfectorum " is by implication rejected 3 and in art. 22 "the Romish doctrine concerning purgatory and pardons" is expressly condemned. Itis~~

~~hardly necessary to add that "the power of the keys" is inseparable from the idea of a church, and that in this power is plainly involved a certain discretion as to the time and manner in which discipline shall be administered. This discretion is claimed by every organized body of Christians.~~

~~See Amort, De Origine, Progressu, Valore, et Fructu Indul- gentiarum, Vienna 1735; and Hirscher, Die Lehre vom Ablass Tiibingen, 1844,~~

~~INDUS, one of the three greatest rivers of northern India, rises in unknown regions on the northern slopes of the sacred Kailas Mountain in the Himalayas, Onthe south . of this same hill rises the Sutlej, the great feeder of the Indus, which unites with it after a Separate course of about 1000 miles, The Indus rises in 32° N. lat. and 81° E. long., enters the Punjab in 34° 25' N. lat. and 72° 51' E. long., leaves the Punjab in 28° 27' N, lat. and 69° 47' KE. long., enters Sind in 28° 26' N. lat. and 69° 47' E. long., and finally falls into the Arabian Sea in 23° 58' N. lat, and 67° 30' E. long. The basin of the Indus is estimated at 372,700 square miles, and its total length at a little over 1800 miles,~~

~~The first third of its course lies outside of British territory. It at first flows north-west for about 160 miles under the name of '" Sinh-ka-bab," until it receives the Gar. Shortly after this junction it enters Kashmir. Near Iskardoh in Little Tibet is the wonderful gorge by which the river bursts through the western ranges of the Himalayas, said to be 14,000 feet in depth. For about 120 miles the river passes south-west through the wilds of Kohist4n until it reaches the Punjab frontier near Derbend. A little way above Attock, in Raw4l Pindtf district, it receives the Cabul river, which brings down to if the waters from Afghanistan via Jalalabad and the Khyber Pass. The two rivers have about the same volume ; both are very swift, and are broken up with rocks, Their junction during floods is a scene of wild confusion of waters. At Attock the river has fallen from its elevation of 16,000 feet at its source in Tibet to under 2000 feet. After leaving Attock, the Indus flows almost due south down the western side of the Punjab, parallel to the Sulaiman hills. Just above Mithankot, in the south of the Dera Ghaz{ Khan district, the Indus receives the accumu- lated waters of the Punjab. Between the Indus and the Jumna (Jamun4) flow the five great~~

~~*streams from which the Punjab (Panj-ab, literally “ The land of the five rivers ”) takes its name. These are the Jhelum, the Chendb, the Ravi, the Bids, and the Sutlej. After various junctions these rivers all unite to form the Panjnad, literally “The five rivers.” The Panjnad marks for a short space the boundary between the Punjab and Bah4walpur, and unites with the Indus near Mithankot, about 490 miles from the sea. The breadth of the Indus above the confluence is about 600 yards, its velocity 5 miles an hour, its depth from 12 to 15 feet, and its estimated discharge 91,719 cubic feet per second. The breadth of the Panjnad above the point of junction is 1076 yards, with a depth of 12 to 15 feet, but a velocity of only 2 miles an hour. Its estimated discharge is 68,955 cubic feet per second.*~~

~~*Below the junction the united stream, under the name of the Indus, has a breadth which varies from 2000 yards to several miles, according to the season of the year. The whole course’of the river through the Punjab is broken up by islands and sandbahks, The Indus enters Sind in 28° 26’ N. lat. and 69° 47’ E. long., and empties itself by many mouths into the Arabian Sea, after a generally soutl-westerly course in this province of 580 miles. Its average width during the low season is 680 yards; its depth varies from 4 to 24 feet. Its velocity in the freshes averages 7 knots per hour, at ordinary times 3 knots. The discharge per second varies at the two periods from 446,086 cubic feet to 40,857. The average temperature is 10° lower than that of the air.*~~

~~*The delta of the Indus covers an area of about 3000 square miles, and extends along the coast-line for 125 miles. It is almost a perfect level, and nearly destitute of timber, the tamarisk and mangrove alone supplying fuel. In the marshy portions good pasturage is obtained, and in*~~

~~*the drier rice grows luxuriantly. The climate of the delta is cool and bracing in the “ winter” months, excessively hot in the “summer,” and most healthy during the floods.*~~

~~The Indus begins to rise in March, attains its maximum depth and width in August, and subsides in September. The registered rise at Gidu-Bandar is 15 feet. Fish abound,—at the mouths, the salt-water varieties, notably _ the Olupea neowhit, a species of herring; the chief of the freshwater varieties is the pala. The local consump- tion and export of the dried pala are both very large. The boats of the Indus are the déindhi and zaurak (cargo boats), the kauntdl or ferry-boats, and the dando or fishing boats. The aggregate burthen of the native craft on the river in 1861-62 was as follows :—up-stream to Sukkur 20,232 tons, and beyond that town 16,317; down-stream to Sukkur 7694 tons, and beyond it 11,456. In 1874 the number of steamers plying was fourteen, and of barges forty-three, with an aggregate burthen of 10,641 tons; the receipts amounted to £83,370.~~

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DICTIONARY

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XIII

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ENCYCLOPAIDIA BRITANNICA.

INFANT

NFANT, in law, is a person under full age, and there- fore subject to certain disabilities not affecting persons who have attained full age. The period of full age varies widely in different systems, as do also the disabilities attaching to non-age. In Roman law, the age of puberty, fixed at fourteen for males and twelve for females, was recognized as a dividing line. Under that age a child is under the guardianship of a tutor, but several degrees of infancy are recognized. The first is absolute infancy in the literal sense—speechlessness ; after that, until the age of seven, a child is infantia proximus ; and from the eighth year to puberty he is pubertati proximus. An infant in the last stage could, with the assent of his tutor, act so as to bind himself by stipulations ; in the carlier stages he could not, although binding stipulations could be made to him in the second stage. After puberty, until the age of twenty-five years, a modified infancy was recognized, during which the minor’s acts were not void altogether, but voidable, and a curator was appointed to manage his affairs. The difference between the tutor and the curator in Roman law was marked by the saying that the former was appointed for the care of the person, the latter for the estate of the pupil. These principles of course apply only to children who are sui juris. The patria potestas, so Jong as it lasts, gives to the father the complete control of the son’s actions; and tutorship and curatorship were devices for protecting those who were free from the potestas, but unable by reason of infancy to control their own affairs. The right of the father to appoint tutors to his children by will (testamentarii) was recognized by the Twelve Tables, as was also the tutorship of the agnati (or legal as distinct from natural

relations) in default of such an appointment. Tutors who held office in virtue of a general law were called legitim. Besides and in default of these, tutors datwi were appointed by the magistrates. ‘These terms are still used in much the same sense in modern systems founded on the Roman law, as may be secn in the case of Scotland, noticed below.

By the law of England full age is twenty-one, and all minors alike are subject to ineapacities. The period of twenty-one years is regarded as complete at the beginning of the day before the birthday: for example, an infant born on the first day of January attains his majority at

the first moment of the 31st of December. The incapacity of an infant is designed of course for his own protection, and its general effect is to prevent him from binding him- self absolutely by obligations. In the matter of contracts, the statement has generally passed current that an infant’s contracts, except when they are binding for special reasons, are cither void or voidable, i.¢., null, ab initio, or capable of being nullified by the infant at his choice. Contracts, for example, which cannot be beneficial to the infant are said to be absolutely void. A bond with a penalty is for this reason declared to be void. On the other hand, it is alleged by the more recent text-writers that the words void and voidable have not been carefully distinguished, and that a contract is often described as void when it is only meant that it is not binding. On this theory all the con- tracts of an infant might be described as voidable at his option except those few which are absolutely valid. On his voidable contracts an infant may sue if he chooses to do so, but may not be sued. Of the contracts of an infant which are binding ab initio, the most important are those re- lating to “necessaries.” The word is used in an extended signification to cover “articles fit to maintain the person in the particular state, degree, and station in life in which he is.” Whether a particular thing is necessary or not is a question of fact to be decided by a jury, but it is for the judge to gay whether it is prima facie of a descrip- tion such that it may be a necessary. It has been ruled by judges, without consulting the jury, that the follow- ing articles were not necessary :—expensive dinners sup- plied to an undergraduate in his private rooms; a pair of solitaire studs costing £25, and a goblet costing £15, for a baronet’s son; a chronometer worth £68, for a lieutenant in the navy ; ornaments to the value of £137. On the other hand, an undergraduate has

been allowed a gold watch as a necessary ; and liveries for an officer’s servant, money paid to release an infant from ejectment or distress, and necessaries for an infant’s wife have all bcen held to be necessaries of an infant. An object, in itself of a character to be pronounced a necessary, may in particular cases be declared not necessary, e.g., if the infant is already supplied with things of the kind. A sealskin waistcoat may be a necessary to an infant of good fortune, but not if he has half a dozen such garments in his possession XIII — 1

already.

of their turning out to be unnecessary. lently passing himself off as of full age and contracting on that footing will be held bound in equity. The protection of infants extends sometimes to transactions completed after full age: the relief of heirs who have been induced to barter away their expectations isan example. “‘ Catch- ing bargains,” as they are called, throw on the persons claiming the benefit of them the burden of proving their substantial righteousness ; and, although the youth of the party charged is not an essential point, it is generally one of the facts relied on as showing undue influence.

At common law a bargain made by an infant might be ratified by him after full age, and would then become in all respects binding. Lord Tenterden’s Act required the ratification to be in writing. But now by the Infants Relief Act, 1874, “all contracts entered into by infants for the repayment of money lent or to be lent, or for goods supplied or to be supplied (other than contracts for neces- saries), and all accounts stated, shall be absolutely void,” and ‘no action shall be brought whereby to charge any person upon any promise made after full age to pay any debt contracted: during infancy, or upon any ratification made after full age of any promise or contract made during infancy, whether there shall or shall not be any new con- sideration for such promise or ratification after full age.” Tt has been held in a recent case that this action applies to promises of marriage, so that where an infant had promised marriage, and after attaining full age continued tu recognize the promise, no action arose on the breach. But an actual contract of marriage may be lawfully made by persons under age. Marriageable age is

fourteen in males and twelve in females. So, generally, an infant may bind himself by contract of apprenticeship or service. Since the passing of the Wills Act, an infant is unable to make a will, Infancy is in general a disqualification for public offices and professions, ¢.g., to be a member of parlia- ment or an elector, a mayor or burgess, a priest or deacon, a barrister or solicitor, é&c.

The custody of an infant belongs in the first place, and against all other persons, to the father, who is said to be ‘the guardian of his children by nature and nurture ;” and the father may by deed or will dispose of the custody or tuition of his children until the age of twenty-one. If the father is dead, and has appointed no testamentary guardian, themotheris recognized as “guardian by nature and nurture.” But the children must be brought up in the father’s religion, even when he has given no directions on the subject; and it appears that no agreement between husband and wife to the contrary effect will be sustained. When, however, the father has in his lifetime suffered the children to be educated in their mother’s religion, he may be held to have waived his rights, The Court of Chancery is unwilling to embarrass itself by departing from the strict rule, and an instance is recorded ofa child which had beeneducated from eight to fifteen in the tenets of the Plymouth Brethren being ordered by the court to be educated in the religion of the Church of England, The right of the father to the custody of the child will be enforeed, except where he has been guilty of gross immorality, by writ of habeas corpus, as long as a child is within the age of nurture, which for males at least may be taken to be fourteen years. The infant then acquires a right of election. In two cases a boy over fourteen but under sixteen has been permitted by the court to choose, when the father had sued for the custody under a habeas corpus. In the case of female infants, the courts have held that they do not acquire the right of election till sixteen, following the statute of Philip & Mary which punishes the abduction of maidens under

The person who supplies goods prima facve necessary to an infant must, it would seem, take the risk An infant fraudu-

the infant’s real and personal estate.

that age as a criminal offence. These rules do not apply to illegitimate children, as they are not under the legal guardiauship of the putative father or the mother. The rights of the father or mother may be interfered with by the Court of Chancery under special circumstances, such as cruelty, immorality, &c. A recent Act (386 & 37 Vict. c. 12) gives power to the court to make orders for the mother of an infant under sixteen, to have or retain the custody of such infant, or to have access thereto, &c. The same statute legalizes agreements by the father to give up the custody and control of children to the wife. The Divorce Court has also very extensive powers of regulating the custody and maintenance of children, in exercising which it observes the same limits of age as the courts of law and chancery.

There is not at common law any corresponding obligation on the part of either parent to maintain or educate the children. The legal duties of parents in this respect are only those created by the poor laws and the Elementary Educa- tion Act. In the case, however, of debts contracted by a child for necessaries, the authority of the father would, to use a common phrase, be " easily implied."

Besides the natural guardianship of parents, children may in various other ways come under the authority of guardians. A recent author gives the following as a com- plete list of guardians :—guardian in chivalry, in socage, in nature, by nurture, by election of the infant, by statute (4 Philip & Mary c. 8, 12 Chas. II. ¢. 24), by custom, by appointment of the ecclesiastical courts and of the Court of Chancery, foreign guardians, and guardians ad litem (Simpson's Law of Infants, London, 1875). Some of these have already been noticed, and others are obsolete or nearly so. The Act of Chas. II. enables the father to

appoint a testamentary guardian to his children during

infancy or any less period, who shall have the charge of The Act is not to prejudice any customary guardianship, such as that of the City of London, where, according to ancient but now

disused custom, the goods and lands of the orphans of freemen are in the custody of the lord mayor and aldermen

in their court of orphans. By the custom of Kent, and by the special customs of certain manors,~~the lord has the right of appointing guardians to infant tenants. Guardian~~ ship by socage extends only to lands of socage tenure, and belongs to the next of blood of the infant, other than those who might succeed to the estate when the infant dies. It ends when the infant reaches the age of fourteen; after that age, or before if there was no guardian, infants were formerly allowed to elect a guardian, but that practice is now superseded by the action of the Court of Chancery which appoints guardians in all cases where it is for the benefit of the infants todo so. An infant under a guardian appointed by the Court of Chancery is properly a " ward of court," but the term is also applied to infants brought under the authority of the court although no guardian be appointed. The office and duty of the guardian extend to the custody and control of the infant, to his education, maintenance, and advancement out of any property that may be available therefor, and to the prevention of im- proper and disparaging marriages. The office of guardian is strictly a trust, the ordinary duties and responsibilities of a trustee with respect to property being accompanied by peculiar rights and duties with respect to the person of the cestud que trust. He must act in all cases for the benefit of the infant, and may not put himself into any position in which his interest would be hostile to that of the infant. The Court of Chancery has full jurisdiction over guardians of every kind, whether appointed by itself or not, and if it cannot actually dismiss a testamentary guardian, it may supersede him and entrust the charge of

the infant to some other person on proper cause being shown (see TRUSTEE).

An infant is liable to a civil action for torts and wrongful acts committed by him. But, as it is possible sometimes so to shape the pleadings in an action as to make what is in substance a right arising out of contract take the form of a right arising from civil injury, care is taken that an infant in such a case shall not be held liable. With respect to crime, mere infancy is not a defence, but a child under seven years of age is presumed to be incapable of commit- ting a crime, and between seven and fourteen his capacity requires to be affirmatively proved. After fourteen an infant is dole capax.

The law of Scotland follows the leading principles of the Roman law. The period of minority (which ends at twenty-one) is divided into two stages, that of absolute incapacity (uutil the age of fourteen in males, and twelve in females), during which the minor is in pupilarity, and that of partial incapacity (between fourteen and twenty-one), during which he is under curators. The guardians (or tutors) of the pupil are either tutors-nominate (appointed by the father in his will); tutors-at-law (being the next male agnate of twenty-five years of age), in default of tutors-nominate; or tutors-dative, appointed by royal warrant in default of the other two. No act done by the pupil, or action raised in his name, has any effect without the interpusition of a guardian. After fourteen, all acts done by a minor having curators are void without their concurrence. Every deed in nonage, whether during pupilarity or minority, and whether authorized or not by tutors or curators, is liable to reduc- tion on proof of ‘‘ lesion,” ¢.e., of material injury, due to the fact of nonage, either through the weakness of the minor himself or the imprudence or negligence of his curators. Damage in fact arising on acontract in itself just and reasonable would not be lesion entitling to restitution. Deeds in nonage, other than those which are absolutely null ab initio, must be challenged within the quad- riennium utile, or four years after majority.

In the United States, the principles of the English common law as to infancy prevail, generally the most conspicuous variations being those affecting the age at which women attain majority. In many States this is fixed at eighteen. There is some diversity of practice as to the age at which a person can make a will of real or personal estate. (E. R.)

INFANTICIDE. The history of infanticide as an archaic institution has already been referred to in thie article FounDLING HospirTats (vol. ix. p. 481). Children of both sexes were sacrificed as religious offerings. Indeed, in some cases, ¢.g., in expiations for sacrilege, the boy, as being the nobler child, was preferred. But what may be called the normal infanticide of early society was probably confined to girls. The custom is in certain places and for certain periods explained by the system of exogamy ; but much more generally, as in China at the present day, it is simply an illustration of what Malthus would call a “positive check,” the reckless propagation of children far outrunning the means of subsistence which the energy of the parents can

provide. Infanticide still survives among many savage races; and, where the necessity for strong warriors is felt, a selection is sometimes made of the weaker children for destruction. But this political element seldom enters into the custom. It is because girls cannot provide for themselves that they are killed.

More complex were the leading forms of infanticide in India, now suppressed by the wise action of the British Government. ‘The practice, though forbidden by both the Vedas and the Koran, prevailed among the Rajputs and certain of the aboriginal tribes. Among the aristocra- tic Rajputs, for example, it was thought dishonour- able that a girl should remain unmarried. Moreover, a girl may not marry below lier caste; she ought to marry her superior, or at least her equal. This reasoning was obviously most powerful with the highest castes, in which, accordingly, the disproportion of the sexes was painfully apparent. But, assuming marriage to be possible, it is ruinously expensive to the bride’s father. He has to make gifts of money, clothes, jewels, and sweetmeats to the bride- groom’s relatives ; and when the marriage ceremony comes,

he has, chiefly owing to the exactions of the Brahmans and Bhats or minstrels, to face a lavish expenditure on feasts which in the case of some raj4s has been known to reach more than £100,000. To avoid all this, the Rajput killed a certain proportion of his daughters,—sometimes in a very singular way. A pill of tobacco and bhang might be given to the newborn child to swallow; or it was drowned in milk ; or the mother’s breast was smeared with opium or the juice of the poisonous Datura. A common form was to cover the child’s mouth with a plaster of cow-dung before it drew breath. Infanticide was also practised to a small extent by some sects of the aboriginal Kandhs, and by the poorer hill tribes of the Himalayas. Where infanticide occurs in India, though it really rests on the economic facts stated, there is usually some poetical tradition of its origin. The measures against the practice were begun towards the end of the 18th century by Jonathan Duncan and Major Walker. They were continued by a series of able and earnest officers during the present century. One of its ehief events, representing many minor events, was the Umritsur durbar of 1853, which was arranged by the late Lord Lawrence. At that great meeting the chiefs residing in the Punjab and the trans-Sutlej states signed an agreement

engaging to expel from caste every one who committed infanticide, to adopt fixed and moderate rates of marriage expenses, and to exclude from these ceremonies the minstrels and beggars who had so greatly swollen the expense. According to the present law, if the female children fall below a certain percentage in any tract or among any tribe in northern India where infanticide formerly prevailed, the suspected village is placed under police supervision, the cost being charged to the locality. By these measures, together with a strictly enforced system of reporting births and deaths, infanticide has been almost trampled out; although some of the Rajput clans keep their female offspring suspiciously close to the lowest average which secures them from surveillance.

The modern crime of infanticide shows no symptom of diminution in the leading nations of Europe. In all of them it is closely connected with illegitimacy in the class of farm and domestic servants, The crime is generally committed by the mother for the purpose of completing the concealment of her shame, and in other cases, where shame has not survived, in order to escape the burden of her child's support. The paramour sometimes aids in the crime, which is not confined to unmarried mothers. The ease with which affiliation orders are obtained in Great Britain must save the lives of many children. In France, where the inquiry into paternity is forbidden, a controversy still goes on as to the influence of hospitals for "assisted children," which are said to save life at the expense of morality. It seems certain that the great administrative change involved in closing the "tour" at these hospitals has not perceptibly affected infanticide in France. The laws of the European states differ widely on this subject,—some of them treating infanticide as a special crime, others regarding it merely as a case of murder of unusually difficult proof.

In the law of England, the inexcusable killing of infants is theoretically murder. The infant must of course be a human being in the legal sense; and "a child becomes a human being when it has completely proceeded in a living state from the body of its mother, whether it has breathed or not, and whether it has an independent circulation or not, and whether the navel string is severed or not; and the killing of such a child is homicide when it dies after birth in consequence of injuries received before, during, or after birth.' A child in the womb, or in the act of birth, though it may have

breathed, is therefore not a human being, the killing of which amounts to homicide. The

older law of child murder under a statute of James I. consisted of cruel presumptions against the mother, and it was not till 1803 that trials for that offence were placed under the ordinary rules of evidence. There now is a presumption, said to be based on considerations of humanity, that every newborn child found dead is born dead until the contrary is very clearly shown. It is the opinion of the most eminent of British medical jurists that this presumption has tended to increase infanticide. Apart from this, the technical definition of human life has excited a good deal of comment and some indignation. The definition allows many wicked acts to go unpunished. The experience of assizes in England shows that many children are killed when it is impossible to prove that they were wholly born. The distinction taken by the law has probably by this time reached the minds of the class to which most of the unhappy mothers belong. Partly to meet this complaint, it was suggested to the Royal Com- mission of 1866 that killing during birth, or within seven days thereafter, should be an offence punishable with penal servitude. The second complaint is of an opposite character,—partly that infanticide by mothers is not a fit subject for capital punishment, and partly that, whatever be the intrinsic ,character of the act, juries will not convict or the executive will not carry out the sentence. Earl Russell gave expression to this feeling when he proposed that no capital sentence should be pronounced upon mothers for the killing of children within six months after birth.

It is a statutory offence, under 24 & 25 Vict. c. 100, to administer poison or any noxious thing to a woman with child with intent to procure her miscarriage, or to use any instrument for the same purpose, the maximum punish- ment being penal servitude for life. The previous law had drawn the distinction of “quick with child,” and in such cases had punished capitally. It was a very old con- troversy among the philosophers and physicians of antiquity, when the foetus ceased to be pars viscerum matris and became “vital,” or, as it was afterwards called, “ani- mate.” The law has not yet succeeded in putting down the degraded and wicked trade in abortion.

There can be no doubt from the French and American treatises of Gallard and Storer that the crime prevails extensively, and even in classes of society in which infanticide proper would not be thought of without a shudder.

Under the same statute it is a misdemeanour punishable by two years' imprisonment with hard labour, as a maximum, to endeavour to conceal the birth of a child by any secret disposition of its dead body, whether the child died before, after, or at its birth. This does not apply to very premature births, where it was impossible that the footus should be alive. But itdoes apply to all those numerous cases where the child's body, without being actually hidden, is placed where it is not likely to be found except by accident, or upon search, Lastly, under the same statute it is a misdemeanour punishable by five years' penal servitude, as a maximum, to abandon or expose a child under the age of two years, so as to endanger its life, or to inflict permanent injury, actual or probable, upon its health.

It is difficult to say to what extent infanticide prevails in the United Kingdom. At one time a large number of children were murdered in England for the mere pur- pose of obtaining the burial money from a benefit club. In 1871 the House of Commons found it necessary to appoint a select committee 'to inquire as to the best means of preventing the destruction of the lives of infants put out to nurse for hire by their parents." The trials of

1 See Report on the Sanitary Condition of the Labouring Classes, '"Supplementary Report on Interment in Towns," by Edwin Chad- wick (Parl. Papers, 1848, xii. 395); and The Social Condition and Education of the People, by Joseph Kay, 1850,

Margaret Waters and Mary Hall called attention to the infamous relations between the lying-in houses and the baby-farming houses of London. The form was gone through of paying a ridiculously insufficient sum for the maintenance of the child. 'Improper and insufficient food," said the committee, " opiates, drugs, crowded rooms, bad air, want of cleanliness, and wilful neglect are sure to be followed in a few months' by diarrhcea, convulsions, and wastingaway." These unfortunate children were nearly all illegitimate, and the mere fact of their being hand-nursed, and not breast-

nursed, goes some way (according to the experience of the Foundling Hospital and the Magdalene Home) to explain the great mortality among them, Such children, when nursed by their mothers in the workhouse, generally live. The practical result of the committee of 1871 was the Act of 1872, 35 & 86 Vict. c. 38, which provides for the compulsory registration of all houses in which more than one child under the age of one year are received for a longer period than twenty-four hours. No licence is granted by the justices of the peace, unless the house is suitable for the purpose, and its owner a person of good character and able to maintain the children. Offences against the Act, including wilful neglect of the children even in a suitable house, are punishable by a fine of £5 or six months' imprisonment with or without hard labour.

The law of Scotland also treats the unlawful killing of completely born infants as murder. In such cases a verdict of culpable homicide is usually returned, the punishnent being entirely in the discretion of the court. Still more commonly the charge of concealment of pregnancy is made under the Act 49 Geo. III. c. 14, the maximum punishment being two years' imprisonment. It must be shown that the woman concealed her condition during the whole period of pregnancy, and did not call for help at the birth. Unlawfully procuring abortion, whether by drugs or instruments, is also a crime known to the common lav of Scotland, the punishment being penal servitude or imprisonment according to circumstances. In a variety of cases, which do not admit of general statement, convictions have also been obtained against parents of exposing and deserting children or placing them in danger, and of cruel and unnatural treatment and neglect.

Infanticide will have to be further considered under the heading MepicaL JURISPRUDENCE. For that branch of the subject the works of Tardieu and Taylor are the most important and recent authorities. See also White- head On Abortion and Sterility, and the works of Gallard and Storer already referred to.

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"1868; Tardieu, Hiude méd.-lég. et clinique sur Pavortement, Paris,

1864, and Etude méd.~~lég. sur Vinfanticide, Paris, 1880; Toul~~ mouche, Etudes sur l'infanticide et la grossesse cachée ou simulée Paris, 1875 ; Gallard, De l'avortement au point de vue med.-leg., Paris, 1878. There are several works describing Indian infanticide. The best known is Infanticide, its Origin, Progress,and Suppression, London, 1857, by J. Cave Browne. See also the works of Moore, Cormack, and Wilson. (W. C.8.)

INFANTRY. See Army.

Archi- medes.

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INFINITESIMAL CALCULUS

PirsToRIcAL LNTRODUCTION.

HE mathematical and physical sciences owe their sh present great development to the introduction of the infinitesimal calculus. The power, for example, of that calculus as an instrument of analysis has vastly extended the science of geometry, so that the investigations of the ancient Greeks go but a short way into the field of know- ledge which has been laid

open by the modern method; the discoveries of Archimedes and Apollonius are now easy deductions from its more extended results.

So long as the early geometers confined their speculations to the comparison of the areas of rectilinear figures they encountered little difficulty. They readily showed that the determination of the area of any such figure can be reduced to that of a rectangle, or of a square, and thus be completely effected. This process of finding areas was named the “method of quadratures.” It failed, however, when they attempted to determine the areas bounded by curved lines, or the surfaces of the elementary solids such as the right cone and the sphere. In treating of these the ancients found it necessary to introduce new notions and modes of demonstration into geometry, and the diffi- culty of comparing the areas of curvilinear with those of rectilinear figures gave rise to the ‘method of exhaus- tions.” The fundamental principle of this method con- sists in conceiving the continual approach of two varying magnitudes to a fixed intermediate magnitude, with which they never become identical, though they may approach it to within less than any assignable difference. For example, a polygon may be inscribed in a circle, and another cir- cumscribed to it, each differing from it by less than any assignable area; hence the ancients may have concluded that areas of circles have to each other the same ratio as the similar polygons inscribed in or circumscribed to them, —that is, the ratio of the squares of the radii. But, as this kind of proof was of a different nature from that by which the more elementary doctrines were established, the Greek geometers fortified it by a reductio ad absurdum,—proving, in the above example, that the square of the radius of one circle is to that of another as the area of the former is to a space which is neither less nor greater than the latter, and therefore exactly equal to it.

By the aid of this method Archimedes arrived at his great geometrical discoveries. He determined that the ratio of the circumference to the diameter of a circle lies between 34 and 329, by considering the regular polygons of ninety-six sides which may be inscribed in or circum- scribed to the circle. He proved that the area of a segment of a parabola cut off by any chord equals two- thirds of a parallelogram included between the chord aud the parallel tangent to the curve. He determined the quadrature of theellipse. In the curves named after him the ‘spirals of Archimedes,” he

showed how to draw a tangent at any point, and also determined the area of any portion. .

In space of three dimensions, Archimedes proved that the surface of a sphere equals four times that of one of its great circles, that the surface of a spherical cap is equal to the area of a circle the length of whose radius is the distance from the vertex of the cap to any point on its bounding circle; that a sphere has a volume which is two-thirds of that of a cylinder circumscribed to it, and that their surfaces are in the same ratio, Further, the same method of exhaustions furnished Archimedes with the cubature of conoids and spheroids, as he termed

surfaces generated by the revolution of the parabola, the hyperbola, and the ellipse.

During nearly two thousand years no new method Kepler.

enabled mathematicians to rise to a higher generality than that attained in the works of the great Greek geometers." The celebrated Kepler was the first to extend the results of Archimedes. In his treatise entitled Nova Stereometria Doliorum, accessit stereometrix Archimedex supplementum (1615), he discussed a number of solids of revolution,— for example, those formed by the revolution of a conic section about any ordinate, or a tangent at the vertex, or any line within or without the curve. Thus he con- sidered some ninety new solids, and proposed problems concerning them; of these problems he resolved only a few of the most simple. In this treatise he introduced for the first time the name and notion of "infinity" into the language of geometry. Thus, he considered a circle as composed of an "infinite" number of triangles, having their common vertex at the centre, and forming the circumference by their bases. In like manner he regarded a cone as composed of an infinite number of pyramids, having their vertices at its vertex, and stand- ing on an infinite number of triangular bases, bounded by the circular base of the cone. It may also be noted that Kepler was the first to observe that the increment. of a variable—the ordinate of a curve, for example—is evan- escent for values infinitely near a maximum or Minimum value of the variable. This remark contains the germ of the rule for determining " maxima" and "minima," given by Fermat about twenty years subsequently.

Several years after Kepler had given his method of Cava- determining volumes of revolution, another celebrated lier.

theory, of a similar kind,—the “ geometry of indivisibles ” (1635) of Cavalieri, professor of geometry at Bologna,— marks an epoch in the progress which science has made in modern times. In this work lines were considered as composed of an infinite number of points, surfaces of lines, and solids of surfaces. For example, if the perpendicular of a triangle be divided into an infinite number of equal parts, and through each point of division a line be drawn parallel to the base and terminated by the sides, then, according to Cavalieri, we may consider the area of the triangle as the sum of all these parallel lines, regarded as its elements. Again, as these parallels form a series in arithmetical progression, of which the first term is zero, this sum is represented by half the product of the last term and the number of terms. Now the base is the last term, and the altitude measures the number of terms; thus he deduced the ordinary expression for the area of a triangle. Cavalieri applied his method to a number of problems, such as finding the volumes of pyramids, the areas of certain simple curves of the parabolic species, the determination of centres of gravity, é&c.; and it is remarkable that he was the first who gave an accurate demonstration of the well- known properties of the centre of gravity, originally announced by Pappus, but commonly called Guldin’s theorems. It is accordingly to Cavalieri, and not to Guldin, that the credit is due of having made the first advance beyond Pappus. Cavalieri’s method is analogous to that employed in the integral calculus, the “ indivisible ” being that which has since been styled the “ differential element” of the integral.

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1 This work is enlarged from his earlier Stereometria Doliorum Vinariorum (1605), which originated in a dispute with a seller of wine as to the proper method of gauging the contents of a cask. This accounts for its strange title,

Pascal.

Wallis.

The method of Cavalieri was severely criticized by some of his contemporaries, more especially by Guldin. They alleged that, since a line has no breadth, no number of right lines, however great, when taken together, could make up a plane area. This objection was answered by Cavalieri; but the reply was stated in the clearest form by Pascal, who observed (letter to M. de Carcavi, 1658) that the method of indivisibles possessed all the rigour of that of exhaustions, from which it differed only in the manner of expression, and that, when we con- ceive an area as a sum of a system of parallel ordinates, we mean in reality an indefinite number of rectangles under the several ordinates, and the small equal portions into which we conceive the common perpendicular to these ordinates to be divided. This passage is remarkable—as was well observed by Carnot—as it shows that the notion of mathematical infinity, as now employed, was not strange to the geometers of that time; for it is clear that Pascal employed the word "indefinite" in the same signification as we now attach to the word "infinite," and that he called " small" that which is now called "infinitely small," also that he neglected these small quantities in comparison with finite quantities—thus he regarded as simple rectangles the small portions of the area of the curve comprised between two consecutive ordinates, neglecting the small triangles which have for their bases the differences of these ordinates. Carnot adds that no person attempted to reproach Pascal with want of rigour in his demonstrations.

Pascal applied the method of Cavalieri with eminent success to the investigation of properties of the cycloid, and other problems. His researches, according to D'Alembert, closely approach to the integral calculus, and form the con- nexion between the methods of Archimedes and of Newton.

The most important application, however, of Cavalieri's method was that of Wallis, Savilian professor at Oxford, who, in 1655, gave an admirable specimen of this method in his Arithmetica Infinitorum, sive nova Methodus in- quirendi in Curvilinearum Quadraturam. Pursuing Cava- lieri's views, he reduced the problem of finding the areas of a large number of curves, and the volumes of solids of revolution, to the summation of the powers of the terms of arithmetical series, consisting of an infinite number

of terms,—or rather to the determination of the ratio of the arithmetical mean of all such powers of the terms to the like power of the last term.

For example, in the series of square numbers 0, 1, 4, 9, 16, &c., the ratio of the mean to the last is, for the first

OF1+4 _ O+1+4+49

three terms, ha , 9494949

4444 4+); for the first four

: 0+14+449+16

=F +355 for the first five, A oe, + 33 in like manner the next fraction is $+-35. Hence Wallis noticed that the fractions approach nearer and nearer to 4; and, as the denominators in the fractions 75, 75, sn 39 form an arithmetical series, with a common difference 6, it follows that, when the number of terms is indefinitely increased, the resulting fraction becomes ultimately 3. Wallis applied the same method to the series 0, 1%, 28, 3°, &c., and found without difficulty that the aforesaid ratio is 1 in this case; andso generally. He also introduced into analysis the notation of fractional indices instead of radicals, and extended his method of summation to series proceeding by fractional powers of the natural numbers 1, 2, 3, &c, Wallis was enabled by these principles to obtain the areas of many curves, and the volumes of solids which had not been previously found. He also, by aid of this method, combined with the principles of “interpolation,” arrived at his well-known expression for 7, viz. :— r_24 4:0 6-8

Again, in his treatise De Curv. rectif. (1659), Wallis showed that certain curves were capable of being “ recti- fied,” or that straight lines might be found to which they were exactly equal, a remark which was very soon verified by a young English mathematician William Neil, who, by Wallis’s method, obtained in 1660 the length of any are of a semicubical parabola. This is the first curve that was rectified. The cycloid is the second ; its rectification was effected by Sir C. Wren (Phil. Trans., 1673). The methods we have thus far considered were more especially precursory to the integral calculus, having mainly refer- ence to the quadrature of curves and cubature

of solids. We now propose to consider the question of tangents to curves, in which the differential calculus may be said to have originated.

The great discovery of Descartes in his application of Des- algebra to geometry (1637) imparted to the latter science cartes.

the character of abstraction and generality which distin- guishes modern from ancient geometry. By it the study of curves was brought under the domain of analysis, and in- stead of investigation being restricted to particular properties of a few isolated curves, as it had been hitherto, general views and methods applicable to all curves were introduced.

Hence the general problem of drawing tangents to curved lines started immediately into prominence. It was found necessary to depart from the definition of tan- gents given by the ancient geometers, and to consider them in other points of view. A tangent, accordingly, came to be regarded either (1) as a secant of which the points of intersection became coincident; or (2) as the prolongation of the element of the curve, regarded as a polygon of an infinite number of sides; or (3) as the direc- tion of the resultant motion by which the curve may be described. The first view was that of Descartes and Fermat; the second was introduced by Barrow, who thus simplified the method of Fermat; and the third was that of Roberval.

Descartes’s method of drawing a tangent consisted in supposing a circle (whose centre he placed on the axis of «) to cut the curve in two points; then, if the radius of the circle be supposed to decrease, zs centre remaining fixed, so that the points of section approach nearer and nearer and finally coincide, the circle will touch the curve; thus, by aid of the equation of the curve, the problem was reduced to one of finding the condition of equal roots in an equation. This method is remarkable as being the first general process of applying analysis to the problem of tangents ; at the same time it is only capable of practical application in a small number of simple cases.

Many years subsequently (Act. Hrud. Lips., 1691) John Bernoulli extended Descartes’s method with success to the problem of finding the centre of curvature and the equation of the evolute of an algebraic curve. In his application he supposed the centre of a circle taken on the normal to a curve, and the centre to vary until three of the points of intersection of the

circle with the curve became coincident, z.e., 80 that the resulting equation should have three equal roots. Thus, for example, he showed, without difficulty, that the evolute of a parabola was a semicubical parabola. He also remarked that, when four roots coincide, the centre of curvature becomes a cusp on the evolute.

It should also be noticed that we owe to Descartes the general method of drawing a tangent to a roulette. This was given by him in a letter to Mersenne (Aug. 23, 1638), from which we take the following extracts :—"' I have been very glad to see the questions which you say that the geometers, even M. Roberval, whom you esteem the prin- cipal of them, confess that they cannot solve ; for in investi- gating them I may discover whether my analysis is better than theirs. The first of these questions is that of drawing

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tangents to curves described by a roulette motion, My solution is as follows. If a rectilinear polygon be conceived to roll on a right line, the curve described by any one of its points will be composed of a number of arcs of circles, and the tangent at any point on one of these arcs 18 perpendicular to the line drawn from the point to that in which the polygon is in contact with the base, when describ- ing the are. Consequently, if we consider a rolling curve as a polygon of an infinite number of sides, we see clearly that the roulette traced by any point must possess the same property; that is to say, the tangent at any of its points is perpendicular to the right line connecting 1t with the point of contact of the rolling curve and its base." In this we perceive that Descartes gave a genuine and most important application of the infinitesimal method.

Again, Descartes first introduced the method of indeter- minate coefficients into analysis,—a principle, as was ably shown by Carnot, which is of itself sufficient to establish, by ordinary algebra, the fundamental principles of the in- finitesimal calculus.

The method of Fermat for drawing tangents was based on his method of maxima and minima. This latter was founded, as already observed, on a

principle of Kepler’s, viz., that, whenever a magnitude attains a maximum or mini- mum, its increment or diminution, for a very small change in the variable on which it depends, becomes evanescent.

Accordingly, to determine the maximum or minimum of any function of w, Fermat substituted «+e instead of a, and equated the two consecutive values of the function ; then, removing the common terms, and dividing by e, he made e=0, and obtained an equation for determining the maximum or minimum value.

Thus, adopting the modern notation, let y=/(«), and y,=/(v+e), then f(w+e) —f(x)=0. Dividing by e¢,

flare\—fle)_ 9, é

hence f’(x) =0.

Thus the roots of the derived equation, /’(x)=0, correspond to the maximum or minimum values of /(@). Consequently we see that Fermat’s rule agrees with that of the differential calculus, and in fact is the method of the calculus as applied to such cases.+

In consequence of Fermat’s both having introduced the conception of an infinitely small difference, and also having arrived at the principle of the calculus for determin- ing maxima and minima, it was maintained by Laplace, Lagrange, Fourier, and other eminent French mathema- ticians that Fermat ought to be regarded as the first in- ventor of the differential calculus. In reply to this we need but introduce the remark of their distinguished country- man Poisson, “that this calculus consists in a system of rules proper for finding the differentials of all functions, rather than in the use which may be made of these infinitely small variations in the solution of one or two isolated pro- blems” (Jém. de I’ Acad. des Sct., 1831).

Fermat seems to have given no general demonstration of his method, but contented himself with giving particular applications of it to some pro- blems of maxima and minima, as well as to finding the tan- gents to and the centres of gravity of a few curves.

Fermat applied his method to drawing a tangent, as fol- F lows :—

7: CD ae B Fig. 1.

1 Fermat was in possession of his method in the year 1629, as appears from a statement in one of his letters to Roberval, although it was not made public until this correspondence was printed by M. Herigone in his Cursus Mathematicus (1644).

Suppose CD (fig. 1) the ordinate, and CF the tangent at the point C in a curve, mecting the axis AB in F; from E, a near point on CF, draw an ordinate EG ; then cD_EG ., Ha DF GF GF'

cD — HG DF ~ GF

Hence, in either case, the ratio of the ordinate CD to the sub- tangent DF is a maximum or a minimum relatively to the ratio for a near ordinate HG to GF, the abscissa measured from F, the foot of the tangent.

Accordingly, if CD=y, HG=y,, and DF=¢, we have, by the method of maxima and minima,

if the curve be concave to the axis,

and , if the curve be convex.

It is easily seen that this method furnishes the ordinary value for the subtangent, as obtaincd by infinitesimals ; for, denoting by x, y the coordinates of C, let =FD, DG=da, y,=y+dy, and we have

' ax ac a> from which the subtangent ¢ can be obtained.

The method of Fermat was improved and extended by an Italian, Cardinal Ricci, in his G'eometrica exer- citatio (1666). Ricci was the first who showed that, if (a —a)"a" is a maximum, we must have Na

This he easily established when m and m are integers, from the principle that if a magnitude be divided into r equal parts, their continued product is greater than that obtained by dividing it into r parts in any other manner

The following application, as given by him, to the curve y™=px”, m>n, will help to illustrate this method of drawing tangents. To draw the tangent at C (fig. 1) take AF: AD=m-a:n, and join FC; then FC touches the curve at C.

For the product AF™-“AD*” is a maximum by the preceding lemma; hence the product AF™-“AG* is not a maximum for the line FG; consequently

AF*-“A D” Ay“ 1AG* . (ae n > FD m 7 ED™ Fan =”—* * “VAG FG) ’ but, from the equation of the curve,

AD yal cD me

AG HG] ’ FD CD CD CD : 767 ha” a7 Ea’ “EG > GH; z.¢., the point E falls outside the curve. In like manner it can be shown that any other point on CF lies outside the curve, and con- sequently CF touches the curve at C,

also

Barrow, Newton’s predecessor in the Lucasian chair of Barrow.

mathematics at Cambridge, simplified and extended the method of Fermat, and advanced a step further in the development of the infinitesimal method, by the introduc- tion of two infinitesimals instead of one in the problem of drawing a tangent. His method was as follows :—Let a, y be the coordinates of a point P on a curve (fig. 2), and take Q an adjacent point; let e=PR=MN be the incre- ment of w, and a=QR the increment of y; then, sub- stituting «+e for x,and y+a for y, in the equation of the curve, subtracting the equation of the curve for the original

Fig. 2.

values, and rejecting all terms of the second and higher degrees in a and ¢, he obtained the limiting value of a:e, or of PM:MT, thus determining the value of the sub-

tangent. The triangle PQR, which has for its sides the elements of the curve, of the abscissa, and of the ordinate, has been called Barrow’s differential

triangle.

The elements which. Barrow represented by a and e Leibnitz subsequently styled dy and dz, the differentials of the ordinate and abscissa of the point on the curve. Thus

Roberval.

Newton and Leibnitz.

8

Barrow anticipated the methods of Leibnitz and Newton of drawing tangents, so far as rational algebraic curves were concerned. Barrow's researches were delivered in his professorial lectures in 1664, 1665, and 1666, and were pub- lished in 1670, under the title of Lectiones Mathematice.

The method of tangents of Roberval is based on the conception of the composition of motions, recently intro- duced by Galileo into mechanics, and depends on finding, from the properties of the curve, the different components of the motion of the point at which the tangent is required. The direction of the resultant of these motions determines that of the tangent. This method bears an analogy to Newton's method of " fluxions," but is very limited in its application on account of the impossibility of applying it except in a few cases. Roberval applied it successfully to the following curves—the parabola, hyperbola, ellipse, conchoid of Nicomedes, limagon of Pascal, spiral of Archi- medes, quadratrix, cissoid, cycloid, companion to the cycloid, and the parabola of Descartes.

We thus see that both in England and on the Continent the principles of the infinitesimal calculus were being gradually developed. Their importance was seen and understood, and they were employed in extending the dominion of geometry. Nothing more was required but an appropriate notation to form them into asystem. This was accomplished by Newton and Leibnitz, who appeared nearly at the same time in the field of discovery. In ascribing to each of these great men the full honour due to the merit of the invention of the calculus, it is proper to add that this is a question which at

one time divided the opinions of the scientific world, and gave rise to a controversy which was agitated with great keenness for almost a whole century. There never could be any doubt as to Newton being the inventor of the calculusof fluxions ; but the question strongly contested has been, whether Leibnitz invented his calculus independently, or borrowed it from the fluxional calculus, with which at bottom it is identical.

Leibnitz, born in 1646, four years after Newton, was also later than Newton in beginning his career of dis- covery in mathematics. In 1673, being in London, he communicated to some members of the Royal Society what he supposed to be discoveries relative to the differences of numbers. It was, however, shown to him that the same subject had been previously discussed by Mouton, a French geometer. He then appears for the first time to have turned his attention to infinite series, On his return to Germany in 1674 he announced to Mr Oldenburg, secretary to the Royal Society, that he possessed very general analytical methods, depending on infinite series, by which he had found theorems of great importance relating to the quadrature of the circle. In reply Oldenburg informed him that Newton and Gregory had discovered similar methods for the quadrature of curves, which extended to the circle.

On June 138, 1676, Newton addressed a letter to Olden- burg, for transmission to Leibnitz. It contained his bi- nomial theorem, the now well-known expressions for the expansion of an arc in terms of its sine, and the converse, that of the sine in terms of the arc. Contrary to modern procedure, he deduced the latter from the former, by the method of reversion of series, —a method called by Newton the “extraction of roots.” This letter also contained an expression in an infinite series for the are of an ellipse, and various other results, accompanied, however, only by brief indications of his method of demonstration.

On the 27th of the following August, Leibnitz sent a reply through Oldenburg, in which he requested fuller ex- planation from Newton of his theorems and method of demonstration. . Leibnitz added that he possessed another method of extensive application in geometry and mechanics, of which he gave some examples.

INFINITHEIMAL CATOCULUS

To this communication Newton replied on October 24, 1676, in a letter which occupies thirty pages in Newton's Opuscula (ed. Cast.). As this letter probably gives a more complete account of the order and dates of Newton's dis- coveries than is to be obtained elsewhere, it appears desir- able to give a brief abstract of it here. He commences by commending the very elegant method of Leibnitz for the treatment of series. He goes on to state that he him- self had three methods of such treatment. His first was arrived at from the study of the method of interpolation of series by which Wallis had arrived at expressions for the area of the circle and hyperbola. Thus, by considering the series of expressions (1—2%)?, (1 —«2)2, (1 ~ 22)%, (1 — a)3, (1 ~ #2), d&sc., he deduced from the known values of the alternate expressions, by the method of interpolations, the law which connects the successive coefficients in the expansions of the intermediate terms (1 — a2)8, (1 — 0?)%, (1-.«2)?, &c. Newton thus determined the area of the circle and hyperbola, in infinite series. He adds that this method would have completely escaped his memory if he had not a few weeks previously found the notes he had formerly made on the subject.

By following out the idea thus suggested, he was led to the discovery of his binomial expansion. This he tested in the case of (1-a2)2 by the algebraic process of extracting the square root,—as also, in other cases, by direct multipli- cation. Having established this result, he was enabled to discard the method of interpolation, and to employ his binomial theorem as the most direct method of obtaining the areas aud arcs of curves. Newton styled this his second method. He states that he had discovered it be- fore the plague (in 1665-66) had compelled him to leave Cambridge, when he turned his attention to other subjects. He goes on to say that he had ceased to pursue these ideas as he suspected that Nicholas Mercator had employed some of them in his Logarithmotechnia (1668) ; and this led him to think that the remainder would have been found out before he himself was of sufficiently ripe age to publish! his discoveries (priusquam ego extatis essem mature ad scriben- dum).

Newton proceeds to state that about 1669 he communi- cated through Barrow to Collins a compendium of his method subsequently called the " method of fluxions," with applications to areas, rectification, cubature, &c. In his letter, however, he gave no explanation of this method, carefully

concealing its nature in an anagram of trans- posed letters, thus—Ga cc d x 18e ff 71 31 In 40 4g rr 4s 9¢ 120 &.*

At the end of his letter Newton alludes to the solution of the “inverse problem of tangents,” a subject referred to in Leibnitz’s letter. For the solution of such problems he says he has two methods, which also he disguises under an anagram. ‘The meaning of this anagram is given in his Opuscula, and, as it throws light on Newton’s method of discovery, it is introduced here:—“ Una methodus consistit in extractione fluentis quantitatis ex aquatione simul involvente fluxionem ejus. Altera tantum in assumptione seriei pro quantitate qualibet incognita ex qua cetera commode derivari possunt, et in collatione

1 Newton also states in this letter that, in consequence of the various objections, &c., which were raised to his theory of light and colour, he felt that he had been imprudent in having published it, because by catching at the shadow he had lost the substance, namely, his own quiet and repose. This probably may have been the reason why Newton refrained for so long a time from making public his discovery of the method of fluxions, notwithstanding the earnest solicitation of his friends.

2 Itmeans Data xquatione quotcunque fluentes quantitates involvente, Jluxiones invenire ; et vice versa.

terminorum homologorum equationis resultantis, ad eru- endos terminos assumpte seriei.”

On June 21, 1677, Leibnitz sent a reply to Newton, through Oldenburg. In this he explained his method of drawing tangents to curves, introducing his notation, dx and dy, for the infinitely small differences of the successive coordinates of a point on the curve, and showed that his method could be readily applied if the equation contained irrational functions. Further on he gave one or two examples of the inverse method of tangents, such as to find the curve whose subtangent isb+cy+dy?—#. This, which is a problem involving the integration of a differential equation of the first order, shows that Leibnitz was then in possession of the principles of the integral

calculus. The sign of integration has been found to have been employed by him in a manuscript of 29th October 1675, preserved in the royal library of Hanover (Gerhardt, Die ntdeckung der héheren Analysis, 1855). This date is of importance, as it proves conclusively that Leibnitz was in possession of his method before he had received through Oldenburg any account of Newton's method of fluxions, and thus shows how unfounded was the statement made in the Commercium Epistolicum that Leibnitz had borrowed his calculus from Newton.

The death of Oldenburg, which took place shortly after- wards, put an end to this correspondence. In the year 1684 Leibnitz, for the first time, made his method public, in the Acta Hruditorum of Leipsic, under the following title, " Nova methodus pro maximis et minimis, itemque tangentibus, que nec fractas nec irrationales quantitates moratur, et singulare pro illis calculi genus." Newton's method did not appear until 1687, when he published it, in a geometrical form, as the method of prime and ultimate ratios, in his great work Philosophix Naturalis Principia Mathematica ; consequently, while Newton's claim to the priority of discovery is now admitted by all, it is no less certain that Leibnitz was the first to publish his method. It is also certain that Leibnitz enjoyed unchallenged for fifteen years the honour of being the inventor of his calculus ; even Newton himself rendered him that justice in the first two editions of his Principia.

Subsequently, however, a foreigner, Fatio de Duillier, piqued, as is abundantly manifested in his tract, at having been omitted in an enumeration by Leibnitz of eminent geometers alone capable of solving John Bernoulli's cele- brated problem of the line of quickest descent, published in 1699, at London, a memoir on the problem. In this he declared that he was obliged by the undeniable evidence of things to acknowledge Newton, not only as the first, but as by many years the first inventor of the calculus, from whom, whether Leibnitz, the second inventor, borrowed anything or not, he would rather they who had seen Newton's letters and other manuscripts should judge than himself.

This insinuation drew forth an animated reply from Leibnitz, in the Acta Hruditorum, May 1700, in which he cited Newton's letters, as also the testimony which Newton had rendered to himin the Principia, as proof of

his claim to an independent authorship of his method. A reply was sent by Duillier, which the editors of the Acta Hruditorum refused to publish (quasi lites aversati). Here the dispute rested for a time. It was revived in the year 1705, when, on the publication of Newton's T'ractatus de Quadratura Curvarum, an unfavourable review of the work,—written by Leibnitz, as has since been established,—appeared in the Acta Eruditorwm. In this review, among other obser- vations, 1t was stated that Newton employed and had always employed fluxions instead of the differences of Leibnitz, just as Fabri had substituted, in his synopsis of

mathematicians, one of whom—Keill, Savilian professor of astronomy at Oxford—in a letter printed in the Philo- sophical Transactions of 1708, affirmed that Newton was, without doubt, the first inventor of the calculus, and that Leibnitz, in the Acta Hruditorum, had merely changed the name and the notation. Leibnitz, thus directly charged with having taken his calculus from Newton, addressed a letter, March 1711, to Mr (afterwards Sir Hans) Sloane, the secretary of the Royal Society, in which he reminded him that, a similar accusation having been made some years previously by M. Fatio de Duillier, the Society and Newton himself had disapproved of it, and he requested the Society to require that Keill should retract his accusation. This Keill refused to do, and in answer addressed a letter of great length to Sloane, in which he professed to show, not only that Newton had preceded Leibnitz in the invention, but that he had given Leibnitz so many indications of his calculus that its nature might have been easily understood by any man of ordinary intelligence. That this was in substance the statement of Newton himself appears from the minutes of the Royal Society (of which he was presi- dent), April 5, 1711, in which it is stated " that the presi- dent gave a short account of the matter, referring to some letters, published by Dr Wallis, upon which Mr Keill was desired to draw up an account of the matter under dispute and set it ina just light." Keill accordingly wrote a letter which was submitted to the Society on May 24.

This letter was forwarded to Leibnitz, who, on December 29, 1711, addressed a second letter to Sloane, requiring the Society to stop these unjust attacks of Keill, and saying that Keill was too young a man to know what had passed between Newton and himself. In conclusion, he submitted the matter to the equity of the Royal Society, and stated that he was

persuaded that Newton himself would do him justice. The Society, thus appealed to, appointed a com- mittee on 6th of March 1712, to examine the old letters aud other documents which had passed between mathe- maticians on the subject and to furnish a report to the Society. The members of the committee, as originally appointed, were Arbuthnot, Hill, Halley, Jones, Machin, and Burnet. To these Robarts, a contributor to the Transactions, was added on the 20th; Bonet, the Prussian minister, on the 27th; and De Moivre, Aston, and Brook Taylor on the 17th of April. The complete list of the committee was not made public until the question was investigated by the late Professor De Morgan, in 1852.

Their report, made on April 24, 1712, concluded as follows :—‘‘The differential method is one and the same with the method of fluxions, excepting the name and mode of notation; Mr Leibnitz calling those quantities differences which Mr Newton calls moments or fluxions, and marking them with the letter d,a mark not used by Mr Newton. And therefore we take the proper question to be, not who invented this or that method, but who was the first inventor of the method ; and we believe that those who have reputed Mr Leibnitz the first inventor, knew little or nothing of his correspondence with Mr Collins and Mr Oldenburg long before; nor of Mr Newton’s having that method above fifteen years before Mr Leibnitz began to publish it in the Acta Eruditorum of Leipsic. For which reasons, we reckon Mr Newton the first inventor, and are of opinion that Mr Keill, in asserting the same, has been no ways injurious to Mr Leibnitz.” On the same day the Society ordered the collection of letters and manuscripts, together with the report of the committee, to be printed, along with any other matter which would throw light on the question. This was accordingly done in the course of that year, under the title Commercium Epistolicum D. Johannis Collins et

geometry, motion instead of the indivisibles of Cavalieri. | aliorum de analysi promota, jussu Societatis Regus m This statement excited great indignation among British | lucem editum, but not at first for general publication. the

few copies printed being distributed as presents. In 1715 an elaborate account of the contents of this report was published by order of the Royal Society in their Zransac- tions. The manuscript of almost the whole of this account has in recent years been found in Newton's own handwrit- ing. (Brewster's Life of Newton, vol. ii. p. 75.)

In 1722 what is usually considered the second edition

was published. The latest and most important edition is that of M. Biot and M. Lefort, published in Paris in 1856, in which many additional letters and documents necessary for an impartial appreciation of the question are added. . It would occupy too large a share of our space to detail the long and bitter controversy to which the Commercium Epistolicum gave rise. It suffices to state that from the time of its publication until long after the death of Leibnitz* (November 14, 1716), and of Newton (March 28, 1727), this controversy was carried on, first between Newton and Leibnitz, and afterwards by their respective admirers. The feeling which induces men to exalt their own nation at the expense of their neighbours contributed im- mensely to increase the bitterness of the dispute. It. is the less necessary nowadays to enter into the merits of this great quarrel, inasmuch as it has long been agreed on, by all mathematicians who have examined into the controversy, that Newton and Leibnitz are both justly entitled to be regarded as independent discoverers of the principles of the calculus, and that, while Newton was certainly master of the method of fluxions before Leibnitz discovered his method, yet Leibnitz had several years priority of publication.

The dispute seems, however, to have had a very injurious effect on the progress of mathematics in England ; for, partly owing to the natural veneration for the lofty genius of Newton, but mainly, it would appear, in consequence of the strong national prejudice produced by the bitterness of the above-mentioned controversy, British mathematicians, for considerably more than a century, failed to perceive the great superiority of the notation originated by Leibnitz to that which Newton introduced. And thus, while the Bernoullis, Euler, D'Alembert, Clairaut, Lagrange, Laplace, Legendre, and a number of other eminent Contin- ental mathematicians were rapidly extending knowledge, by employing the infinitesimal calculus in all

branches of mathematics, pure and applied, and producing a number of great treatises in every department, in England com- paratively little progress was made.

In fact it was not until 1815—when three Cambridge graduates, who each afterwards rose to great distinction, Sir John Herschel, Babbage, and Peacock, published a trans- lation of Lacroix's smaller treatise on the calculus—that the algorithm universally adopted by Continental writers was introduced into the studies of the British universities. The great superiority of Leibnitz's system of notation was soon acknowledged, and thus an immense impetus given to the study of mathematics, in all its branches, Ever since that time the method of fluxions,? as a distinct method, has become almost obsolete ; and it is now strange to read Newton's own assertion in the preface to the Commerciwm Epistolicum, in which he claims that the method of fluxions

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1 That Leibnitz at the time of his death was occupied with a reply justifying his title to an independent discovery of the calculus, has been brought to light in recent years by Dr Gerhardt's publication (1846) of the manuscript entitled Historia et Origo Caleult Diferentialis a G. G. Leibnitio. In his letter from Vienna, 25th August 1714, to Chamber- layne, Leibnitz expressed his purpose, on his return to Hanover, to pub- lish an impartial Commerciwm Epistolicum. This, however, remained for others to accomplish.

2 That the fluxional notation in combination with that of differen- tials has its advantages is exhibited in many physical works; we may instance Thomson and Tait's Treatise on Natural Philosophy.

INFINITESIMAL CALCULUS

is more elegant, more natural, more geometrical, more useful, more certain, and incomparably more universal, than that of Leibnitz.

We next proceed to give a brief account of the notation

and principles of the method of fluxions, as that which was | first discovered.

The idea of a fluxion, as its name indicates, originated

from that of motion, and all geometrical magnitudes were considered by Newton as capable of generation by con- tinuous motion. the motion of points, surfaces by that of lines, solids by surfaces, &c. Again, if we conceive a moving point as describing a curve, and the curve referred to coordinate axes, then the velocity of the moving point can be decom- posed into two others, other to that of y; these velocities are called the “ fluxions ” of x and y respectively, and the velocity of the point is the fluxion of the are.

Thus lines are conceived as generated by

one parallel to the axis of , the

Reciprocally, the arc is called the “fluent” of the velocity with which it is described ; and the ordinates # and y are the fluents of their velocities re- spectively. Again, if the velocity of the moving point be regarded as constant, the fluxions of the abscissa and ordi- nate of any point on the curve (except in the case of a right line) will be variable ; and their ratio at each instant will depend on the nature of the curve, z.¢., on the relation between the coordinates. Reciprocally, the relation be- tween the coordinates depends necessarily on that which exists at each instant between their fluxions. Hence we may seek to determine the relation between the fluxions, when we know that which exists between the coordinates, i.¢., the equation of the curve ; and reciprocally we may seek to discover the relation between the coordinates when we know that between their fluxions, either alone or com- bined with the coordinates themselves. ‘The first part of the problem is called the “ method of fluxions,” and the second the ‘inverse method of fluxions.”

Again, in the same case, not only do the coordinates # and y change, but also the subtangent, normal, radius of curva- ture, &c.; that is to say, each of these quantities increases or decreases more or less rapidly, as well as the coordinates themselves. All these quantities, accordingly, have fluxions,

whose ratios are also determined by the motion of the point. Consequently these quantities may in like manner be regarded as “ fluents.” Similar remarks apply to areas and surfaces regarded as fluents. Newton observes that he does not consider the time formally (formaliter), but supposes that one of the proposed quantities increases equably (aguabili flwau), to which the others are refecred (tanquam ad tempus). This fluent may be chosen at pleasure, and is what we now are accustomed to call the independent variable.

Again, if any quantities, regarded as fluents, be represented by letters, such as u, 2, y, 2 d&e., the corre- sponding fluxions are represented by w, % ¥, 4, c., respectively. Next, if a, %, y, @ be regarded as variable or fluent quantities, their fluxions are represented by «, #, gj, %, and are the fluxions of the fluxions of u, 2, ¥, Be, 2.¢., the second fluxions. If one of these, w for instance, be taken as the “ principal fluxion,” then # is a constant, and consequently #=0, In like manner we may have third fluxions, as well as those of higher orders.

Again, w, #, y, &c., may be regarded as themselves the fluxions of other quantities called their fluents. ‘These quantities were represented by Newton, sometimes by w’, a’, y’, &e., in other places by [], |v], &c. ; and from them it may be desired to proceed to the fluents.

Newton remarks that this second general problem in- volves three cases :— (1) when the equation contains the fluxions of two quantities and but one of their fluents ; (2) when the equation involves both the fluents as well as both

Peete sheet CALCULUS

the fluxions ; (3) when the equation contains the fluents and the fluxions of three or more quantities.

The problem of finding the fluent when the fluxion is known is the simplest case of the first class, and is the same as the method of integration of Leibnitz. It was usually styled in Newton’s time the method of quad- ratures, for it is reducible to the problem of finding the area of @ curve, since it can be easily seen that the fluxion of an area is the ordinate, when

the abscissa is taken as the principal fluent. The second class comes under what is now called the solution of differential equations ; this was styled in Newton’s time the “inverse method of tangents.” Newton’s third class is now treated of under the solution of “partial differential equations.”

The infinitely small parts by which the variable quantities increase in an indefinitely small time were called by Newton the “moments” of the fluent quantities; thus, he represented an infinitely small portion of time, called a moment, by o ; then the moments or infinitely small increments of w, 2, y, &c., are represented by wo, do, yo, dc. ; so that if u, 2, y, é&c., denote the values of the fluents at any instant, their values at the end of an indefinitely small interval of time are represented by w+20, «+o, &e.

For instance, let the fluents x, y, be connected by the equation

8 — ax? + any —y>=0 ; then, substituting «+o for x, and y+yo for y, subtracting the original equation, and dividing by 0, we get 82a — Qaccd + ayd + acy — By? + 8×00 + &e.

Hence, regarding o as an evanescent quantity, we obtain, neglect-

ing the powers of 0, 8a°t — 2awe + aye +axcy — By? =0; consequently vs y= dy? — ax : 8x? —- 2ax+ay.

This, as Newton observes, furnishes a ready method of drawing the tangent at any point ona curve. In fact, it is, changing the notation, equivalent to Barrow’s method already considered. Newton adds, that in like manner we may neglect, in all cases, the terms multiplied by the second and higher powers of 0, and thus find an equation between x, y and their fluxions #, 7.

A good deal of confusion has arisen from the word fluxion having been commonly employed by the early English writers in the sense of an infinitely small increment. Thus, as is abundantly shown by Professor De Morgan in his tract on the early history of infinitesimals in England (Phil. Mag., 1852), all the early writers on fluxions, up to 1704, except Newton and Cheyne, employed the notation # to represent an infinitely small increment, calling it a fluxion. It is even remarkable that, in the extract from the Commercium LEpistolicum which we have given, the words moment

and fluxion seem to have been employed as synonymous. It should also be observed that in Newton's earliest papers his method is strictly infinitesimal; and in the first edition of his Principia (1687) the description of fluxions is founded on infinitely small increments ; so that the original conception of the calculus in England, as well as on the Continent, was based on infinitesimal principles.

Objection has frequently been made to Newton's method of fluxions, that it introduced a foreign idea, namely, that of motion, into geometry and analysis. This objection is scarcely well founded, and was indeed answered by Newton when he stated that all his method contemplates is that one of the variables should increase uniformly (equabile jluxu) as we conceive time to do.

Leibnitz, like Newton, supposed any variable magnitude as continually increasing or diminishing, by momentary increments or decrements. These instantaneous changes he regarded as infinitely small differences. Thus the in- finitely small difference of a variable « was represented by du, His calculus also, like Newton's, had two parts :—(1)

it

the differential calculus, which investigated the rules for deducing the relation between these infinitely small differ- ences of quantities from the relation which exists between the quantities themselves ; (2) the ¢ntegral calculus, which treated of the inverse problem, viz., the determination of the relation of the quantities when that of their differences is known. This corresponds to Newton's inverse method of fluxions, as the differential calculus does to his direct method. It is not necessary to go into further detail here on Leibnitz's method, as it will be more fully considered subsequently; in fact, all our treatment of the calculus will be merely a development of this method.

The infinitesimal calculus had in the outset Cartesian, who declared in his Logzsteque Universelle, et Méthode pour les Tangentes (1694), that it would be better to extend the principles of the Cartesian geometry than to seek for new methods ; and this was said in the preface of a book composed on the principles, somewhat disguised, of the very calculus of which he was

an opponent. It had another adversary in Nieuwentijt, a man who had written some tolerable works on morality and religion, but who had slight pretensions to be regarded as a geometer. Catelan was satisfactorily answered by De 1'Hépital, as was Nieuwentijt by Leibnitz, and afterwards by Bernoulli and Hermann, who proved that this adversary of the cal- culus really did not know what he opposed. For instance, Nieuwentijt, while admitting differentials of the first order, rejected all those of higher orders. For such a difference of treatment there is no foundation, for, if we imagine in a circle an infinitely small chord of the first order, the versine is an infinitely small line of the second order.

The calculus had a more formidable enemy in Rolle, a skilful algebraist, but a man full of confidence in his own notions, rash in forming his opinions, and jealous of the inventions of others. He attacked the certainty of its principles, and attempted to show that its conclusions were at variance with those obtained by methods previously known, which were acknowledged to be correct. His attack was repelled by Varignon, who completely obviated the objections to the truth of the principles. These dis- putes occupied the French Academy a considerable part of the year 1701. Themembers were chiefly mathematicians advanced in years, who had been long accustomed to other methods, and were therefore not much disposed to receive new doctrines. Some took no part in the dispute, yet were not sorry to perceive a storm raised against a theory for which they had no great liking; others, more under the influence of their passions and prejudices, declared open war against it. Rolle brought forward objection upon objection ; and, although Varignon answered them in suc- cession, yet the former always claimed the victory. In the end the dispute degenerated into a quarrel, ard com- missioners were appointed to decide on it. These were Gouye, Cassini, and De la Hire. They, however, pro- nounced no judgment; but the public opinion, or at least the opinion of geometers, was in favour of Varignon. The first controversy thus ended, or rather was suspended for want of a decision from the commission ; but Rolle soon renewed hostilities. The defence was next taken up by Saurin. The ground of attack was the indefinite form which the calculus gives for the subtangent of a curve at a point where two branches intersect each other, and which in this case is expressed by the fraction 9, Saurin's auswer was satisfactory ; but Rolle, intrenched in masses of calculation, obstinately maintained the

combat. The Academy was again appealed toin 1705. The Abbé Bignon, who con- ducted its affairs, undertook to decide the controversy, with the assistance of Gallois and De la Hire, two judges by no means favourable to Saurin. They gave no absolute

its Objee- opponents, such as the Abbé de Catelan, a zealous ‘“s-

La- grange,

judgment, but recommended Rolle to conform more strictly to the rules of the Academy, and Saurin to forgive the proceedings of his adversary. Rolle afterwards did justice to the calculus by acknowledging his error in op- posing it, and admitted that he had been urged forward by malevolent persons, one of whom was the Abbé Gallois.

Mathematicians have differed as to the best way of expounding the principles of the calculus. Newton, as has already been stated, employed the theory of motion as the means of connecting its doctrines with the principles of ordinary analysis. Leibnitz, again, with the same view, conceived quantity as passing from one degree of magni- tude to another by the continual addition of infinitely small parts. The mind finds no great difficulty in dis- tinctly apprehending the subject in either way. Objec- tions have, however, been taken to both, and attempts made to substitute a better. Euler considered the infinitely small quantities of Leibnitz as absolutely zeros, that have to each other ratios derived from those of the vanishing quantities which they replace. D’Alembert proposed to make the basis of the calculus the consideration of the ratios of the limits of quantities. This method, as was indeed stated by D’Alembert, does not differ in any material respect from Newton’s prime and ultimate ratios. An English mathematician, Landen, substituted for the Newtonian method of fluxions another purely algebraical. His views are contained in a work entitled The Residual Analysis, a new branch of the Algebraic Art (1764). Lagrange, too, in the Memours of the Berlin Academy for 1772, proposed to base the calculus alto- gether on the expansion of functions, and thus to establish it on algebraical principles merely. He subsequently developed his method in his Théorie des Fonctions Analytiques (1797), and in his Legons sur le

Calcul des Fonctions (1806). Lagrange, however, adopted the infini- tesimal method as the basis of his most important work, viz., the Mécanique Analytique. He states in his preface to its second edition (1811) that “ when we havo properly conceived the spirit of the infinitesimal method, and are convinced of the exactness of its results by the geometrical method of prime and ultimate ratios, or by the analytical method of derived functions, we may employ infinitely small quantities as a sure and valuable means of abridging and simplifying our demonstrations.”

We shall close this introduction with a list of works on the subject.

Principal Works bearing on the Infinitesimal Method before the Invention of the Calcwlus.—Kepler, Nova Stereometria Doliorwm Vinariorwm, 1615; Cavalieri, Geometria Indivisibiliwm, 1635 ; ilog Evercttationes Geometrice Scx, 1647; Descartes, Géométric, 1637 ; Torricelli, De Sphwra et Solidis Spheralibus, 1644 ; Grégoire St Vincent, De Quadratura Circuli, 1647; Huygens, Theoremata de Quadratura, 1647; Id, Horologiwm Oscillatoriwm, 1678 ; Wallis, Arithmetica Infinitorum, 1655; Id., Opera Mathematica, 3 vols., 1693-99; Fermat, Opera Varia Mathematica, 1679; Mer- cator, Logarithmotechnia, 1668; James Gregory, Vera Circuli et Ilyperbole Quadratura, 1668; Barrow, Lectiones Geometricx, 1670; Slusius, ‘‘ Tangents to all Geometrical Curves,” Phil. Trans.,

1672; Wren, ‘Rectification of the Cycloid,” Phil. Trans., 1678 ; Bullialdus, Arithmetica Infinitorum, 1682.

List of some of the Prineipal Works on the Caleulus.—Newton, –

De Analysi per Aquationes numero terminorum infinitas, circulated in MS. in1669 (extracts from this memoir appeared in the 2d vol. of Wallis’s works, 1693, which comprehends the first publication to the world of the method of fluxions); Id., Principia, 1687; Id., Tractatus de Quadratura Curvarum, published with his Optics, 1704; Id., Methodus Differcntialis, 1711; Leibnitz, ‘“‘Nova Methodus pro maximis et minimis, itemque tangentibus,” Acta Erud., 1684; Leibnitz et Bernoulli, Commer. Epis. Ph. et Math., 1745; John Bernoulli, ““Inventio Linee Brachistochrone,” Acta Erud., 1696; Id. Analysis Problematis Isoperimetrict, 1697; Id., Opera Omnia, 1742; James Bernoulli, Opera, 1744; De Hépital, Analyse des

injiniment Petits, 1696; Cheyne, Fluxionum Methodus Inversa, 17083; Hayes, Treatise on Fluxions, 1704; Manfredi, De Construc.

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Equat. Diff.’ Comm. Pctrop., 1726; Fontenelle, Elémens de la Giéo- métric de U Infini, 1727; Clairaut, ‘‘ Determinatio Curve ejusdem Diff.,” Acta Hrud., 1730; Hodgson, Fluxions, 1736; Simpson, Flusxions, 1737; Mac- laurin, Fluxtons, 1742 ;

1748; Euler, Meth. inven. 1744; Id., Introd. Analy. Infin., 2 vols., 1748; Id., Institut. Cal. Diff., 2 vols., 1755; Id., Institut. Cal. Intcg., 8 vols., (the titles of Euler’s numerous memoirs on the Differential and Integral Calculus are given in the edition of his Differential Cal- culus published at Pavia in 1787); Walmesly, Analyse des Mésures, des Rapports, et des Angles, 1750; Stirling, Methodus Differentialis, 1753; Bougainville, Mathematical Lucubrations, 1755; Id., Residual Analysis, 1764 ; Id., Mathematical Memoirs, 1780; Saunderson, Method of Fluxions, 1756; Kistner, Separatio D’Alembert, Opuscules Mathématiques, 1761-80; Robins, Mathe- matical Tracts, 1761; Waring, Miscellanea Analytica, 1762; Id., Meditationes Analytiew, 1776; 1765; Le Scur et Jacquier, Llémens du Calcul Intégral, 1768 ; Lexell, ‘‘Methodus integrandi Aq. Diff.,” Comm. Petrop., 1769; Fontaine, Traité du Calcul Diff. Fluxionibus et earwm Usu, 1771; Cousin, entiel et Intégral, 1776; Laplace, ‘‘ L’Usage part.,” Mém. de ? Acad.,

1729; De Moivre, Miscellanca Analytica,

Donna Agnesi, Instituziont Analitiche, Lin. Curv. max. vel min. prop. gaud.,

1768-70

Traité du Calcul Intégral, 1754; Landen,

Indeterminat. in Aiquat. Diff., 1756 ;

Condoreet, Du Calcul Intégral,

et Intégral, 1770; Gianella, De Traité du Calcul Différ- du Calcul. aux Diff. 1777; Condorcet, ‘‘ De Integ. cujusdam Mquationis,”’ Comm. de Bonon., 1788; Paoli, Memoria sul? equaztone a differenze finite e parziali, 1784; Monge, “Sur le Cal. Int. des Equat. aux Diff. part.,” Mém. deT Acad., 1784; Charles, ‘‘Recherches sur le Calcul Intégral,” Afém. de T Acad., 1784 ; L’Huillier, Exposi- tion des Principes des Calcwls Supériewrs, 1786; ld., Princip. Caleuli Diff. ct Integ., 1795; Mascheroni, Annotationes ad Cal. Intcg. Euleri, 1790; Tabiescen, Principia atque Historia Calculi Diff. et Integ. necnon Methodi Fluxionum, 1793 ; Lagrange, ‘‘Calcul des Variations,” Misc. Taur., vols. ii. and iv., 1760-69; Id., Théorie des Fonettons Analytiques, 1797; 1d., Legons sur le Calcul des Foncetions, 2d ed. , 1806; Id., separate Memoirs, edited under the care of Serret, 7 vols., 1867-77 (the remainder of his works are in course of republication in the same series) ; Vince, Principles of Fluxions, 1797; Carnot, Réflexions sur la Métaphysique du Calicut Infinitésimal, 1797; Lacroix, Traité dw Calcul Différentiel et du Caleul Intégral, 1797; Arbogast, Calcul des Dérivations, 1800; Legendre, Ewxercices de Calcul Intégral, 3 vols., 1811-19; Id., Treité des Fonetions Elliptiques, 8 vols., 1825-28; Cauchy, Cours ’ Analyse, 1821; Id., Appl. Géom. du Cal. Injin., 1823; Id., Além. sur les int. déf. prises entre des limites imag., 1825; Id., Legons sur le Calcul Différentiel, 1829; Ohm, M., System der Mathematik, 9 vols., 1822-52; Id., Lehrbuch f. d. gesammtc Hoh. Math., 2 vols., 1839; Magnus, Sammlung von Aufgaben d. Analyt. Geom., 1833; Navier, Lccons d’ Analyse de VEc. Polyt., 1840; Moigno, Lecons de Cal. Diff. et de Cal. Int., 2 vols., 1840-44; Id., Calcul des Variations, 1861; Duhamel, Cours d’ Analyse de ?Ec. Polyt., 2 vols., 1840-41; 3d ed. by Bertrand, 2 vols., 1874-75; Cournot, Théorie des Fonctions et du Calcul Infinitésimal, 1841; Gregory, Examples on the Diff. and Int. Calewlus, 1841; De Morgan, Differential and Integral Calculus, 1842; Hymers, Integral Cal- culus, 1844; Schlémilch, Handbuch der Differenzial- und Integral- rechnung, 1847; 1d., Compendium der Hoheren Analysis, 2 vols., 1874; Minding, Sammlung ‘von Intcyraltafeln, 1849; Meyer, Exposé Elém. de la Théorie des Int. Déf., 1851; Todhunter, Difer- ential and Integral Calculus, 2 vols., 1852; Id., On Functions of Laplace, Lamé, and Bessel, 1875, Price, Injfinitesimal Caleulus, 2 vols.,

1854; Bierens De Haan, Tables intégrales définies, 1858; Id., Exposé de la théorie des intégrales définies, 1862; Boole, Differ- ential Equations, 1859; Id., Calewlus of Finite Differences, 1860; Grassmann, Die Ausdchnungslehre, 1862; Bertrand, Traité de Cal. Diff. et de Cal. Int., 2 vols., 1864-70; Meyer, G. F., Vorles. it. d. Theorte d. bestimmten Integrale, 1871; Williamson, Differential and Integral Caleulus, 1872-74; Hermite, Cours d' Analyse, 1873; Durége, Theorie d. Funktionen einer complexen veriinderl. Gréssc, 2d ed., 1873; Folkierski, Principles of Diff. and Int. Cale. (Polish), Paris, 2 vols., 1873; Rubini, Elementi di Calcolo infinitestmale, 2 vols., 1874-75; Serret, Cours de Cale. Diff. et Int., 2d ed., 2 vols., 1878-79 (the 8th edition of Lacroix's Traité Elémentairc, by Scrret and Hermite, contains in the notes many valuable additions) ; Riemann, Gesam. Math. Werke, 2d ed., 1876; Id., Partielle Differ- entialgleichungen, 2d ed., 1876; Lipschitz, Lehrbuch der Analysis, 2 vols., 1877-80; Hoiiel, Cowrs de Calcul Infinitésimal, 3 vols. , 1878-79; Boucharlat, EU. de Calc. Diff. et Int., 8th ed. by Laurent, ae Stegemann, Differential- und Integralrechnung, 2 vols., 3d ed., 1880.

The preceding list contains the names of some of the most im- portant existiug treatises on the calculus. It makes no pretence to completeness; in fact, many of the most valuable contributions to the subject are published in the numerous mathematical journals, and in the transactions of learned societies. In treating of elliptic and hyperelliptic functions we shall give a short list of the chief works on that great branch of the calculus.

SP rNniTrresiMAL CALCULUS

PART I. DIFFERENTIAL CALCULUS.

1. In the application of algebra to the theory of curves and sur- faces some of the quantities under consideration are conceived as having always the same magnitude, such as the radius of a given circle or of agiven sphere, or the axes ofa given ellipse or hyperbola ; others again are indefinite, and may have any number of particular values, such as the coordinates of any pomt on a curve. This difference naturally suggests the division of the quantities involved in any question into two kinds, one called constants, the other

fables. a usual in analysis to denote constants by the first letters of the alphabet, a, 6, ¢, &c.; variables by the last, w, v, w, x, ¥, 2%, &e.

2. One quantity is said to be a function of another when they are so related that any change made in the one causes a corresponding variation in the other. This relation may subsist whether there exist an expression for the function by which its value is determined for cach value of its argument; or the relation may sometimes be defined by certain characteristics of continuity and discontinuity. When an expression is presupposed the relation is usually repre- sented by the letters F, 7, , &c. Thus the equations

u=F(x), v=f(z), w=9(2),

denote that w, v, ware regarded as functions of x, whose values are determined for any particular value of x when the forms of the functions are known.]

In each of these expressions the argument 2 is regarded as the independent variable, to which any value may be assigned at

leasure ; and w, v, w are called dependent variables, as their values

me on that of x, and are determined when it is known.

For example, in each of the equations

at 2

Y= ——

y = 10%, Moy

y=tan &, the value of y is known when that of « is given.

Such functions are called explicit. ”

3, In many cases a variable y, instead of being given explicitiy in terms of x, is connected with it by an equation of a more com- plicated character. For instance, suppose them connected by the relations

x log y=y log a, siny=xsin (at+y), +2? + 3axy=0 ; in these cases the value or values of y may be supposed known when x is given, and y is said to be an implicit function of x Such cases are comprehended in the form

P(%,Y) =0.

In such a form y may be regarded as an implicit function of 2, or # as an implicit function of y, at pleasure. — .

4, Againa quantity may bea function of two or more independent variables. Thus in the cquation w=sin (ax+by), x and y may be regarded as independent variables, and w as a function of them. Such functions are in general denoted by

G(x, ¥), P(x, Y, 2), &e.

5. A function ¢(x) is said to be continuous between any limiting

values of x, such as @ and b, when to each value of x between those limits there corresponds a finite value of the function, and when an indefinitely small change in the value of x produces only an indefinitely small change in the function. In such cases the func- tion in its passage from any one value to any other between the limits receives every intermediate value, and does not become in- finite. This continuity can be readily illustrated by taking $(x) as the ordinate of a curve, whose equation may then be written y= (a). : 6. lf the variable x be supposed to receive any change, such change is called an increment ; this increment of a is usually repre- sented by the notation Az. A decrement is regarded as a negative increment. When the increment, or difference, is supposed to be indefinitely small, it is called a differential, and is represented by dx; i.¢., an infinitely small difference is called a differential.

In like manner if w be a function of x, and a become z+ Az, the corresponding value of wu is denoted by w+ Aw; t.¢., the increment of wis represented by Aw. For finite increments of x it is obvious that the ratio of the increment of w to the corresponding increment of x has, in general, a finite value. Also when the increment of x is regarded as being indefinitely small we find that the above men-

4 Ba el ; ; eg 2 tioned ratio, 7.¢., et has in general in each case a definite dimeting

value ; and the first study of the differential calculus necessarily in- volves the investigation of such limiting ratios for the different forms of functions of a.

In fact we have seen that the differential calculus took its rise from the investigation of the limiting value of the ratio of the increment of the ordinate y to that of the abscissa 2, so as to find the position of the tangent at any point on a curve.

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Thus if the equation of a curve, referred to rectangular axes, be denoted by /(z,y)=0, then = ,»%¢., the limiting value of mA for any we

point on the curve, represents the tangent of the angle which the tangent at the point makes with the axis of z.

7. Again, if we suppose x to become «+h (where h represents Ax, the increinent of x) in the equation w=/(x), then the inerement of

w is represented by f(x+h)—f(x), and a= Len), hence

te represents the limit to which

S(e+h) -f(2) h

approaches indefinitely, when / is diminished without limit.

There are two methods in general of finding this value of = : a

The first consists in dctermining the limiting value oo!

by decreasing h indefinitely. The second eonsists in expanding fix+h) in a series of ascending powers of h, and taking the cocffi- cient of % in the expansion. This is the method introduced by Lagrange when he proposed to

make the calculus a branch of ordinary algebra, and altogether independent of the consideration of infinitely small magnitudes, or of limits.

It is easily seen, as was shown by Lagrange, that the result obtained by the latter method is the same as that arrived at by the former ; for, since f(v+h) becomes f(x) when h=0, f(z) is the first term in the expansion, and we may assume

SJ (e@+h)=f (x) +ph+qh? + &c., in which p, g, &c., represent functions of x, independent of h, then

Let “iO _ p+ qh+ ke,

If now we supposc h=0, the left hand side reduces to p ; and, accord- ingly the coefficient of 2 in the expansion of f(#+h) is the limiting value of the expression +2) “/t2) : D This coefficient of h was called by Lagrange the first derived func- tion of the original function f(z), and he represented it by the nota-

tion 7’(a). Git) AFA) ey] SEs : Hence we have a ae (a)

In this case f(x)dx is called the differential of f(x), and f’(«) is called its differential coefficient.

8. We have already seen that the principles of the calculus may be regarded either from the consideration of limits, or from that of infinitesimals or differentials ; the former was the method adopted by Newton, in his later investigations at least ; the latter was that adopted by Leibnitz.

The limit of a variable magnitude may be defined as follows. JZf a variable magnitude tends continually to equality with a certain Jixed magnitude, and approaches nearer to it than any assignable difference, however small, this fixed magnitude ts ealled the limit of the variable magnitude.

For example, if we suppose a polygon inscribed in or circumscribed to any closed curve, and afterwards imagine each side indefinitely diminished, then the closed curve is said to be the limit of cither polygon. By this means

the whole length of the curve is the limit of the perimeter of either polygon, and the area of the cnrve is the limit to the area of either polygon.

9. The following principles concerning limits are of frequent application. (1) The limit of the product of two quantitics, which vary togethicr, is the product of their limits. (2) The limit of the quotient of two quantitics is the quotient of their limits. These are nearly self-evident propositions; they may, however, be formally proved as follows. ‘

Let P, Q represent the variable quantities, and p, q their limits ; then, if P=p+a, and Q=q+ 8, a, B denote quantitics which diminish indefinitely as P and Q approach their limits, and become evanescent in the limit.

Again, PQ=pq4+pB + Gat af.

Accordingly in the limit, PQ=pq9.

The corresponding theorem for the quotients is established easily jn like manner.

10. Again, if we conceive any finite number or magnitude to be divided into a very great number of equal parts, each part is very small in comparison with the original magnitude. By supposing the number of parts to be increased indefinitely, ¢.c., so as to exceed any assigned number, however great, then each part may be regarded as indefinitely small in comparison with the proposed magnitude, and may be called an infinitesimal with regard to it.

By an infinitesimal, or an indefinitely small magnitude, we under- stand a magnitude which is less than any assigned magnitude

however small, and which can be diminished indefinitely, so as to approach as near as we please to zero, without ever absolutely attaining to it. For instance, the difference between the area of a circle and that of an inscribed regular polygon can, by increasing the number of sides of the polygon, be made less than any assigned area, however small ; but, no matter how large

the number of sides may be, this difference can never become absolutely zero. It would be easy to give other illustrations of the sense in which the word infinitesimal is employed in analysis.

11. Again, if a be regarded as an infinitesimal of the first order, a”, being infinitely small in comparison with a, is regarded as an infinitesimal of the second order. In like manner a3, a‘,.. . a”, may be regarded as representing infinitesimals of the third, fourth . . . nth orders, respectively.

Again, two infinitesimals a, 8 are said to be of the same order if the fraction & tends to a finite limit. If £ tends to a finite limit,

a a B is called an infinitesimal of the nth order in comparison with a.

12. To avoid misconception, it should be borne in mind that infinitesimals are not regarded as being actual quantitics in the ordinary acceptation of the words, or as capable of exact representa- tion. They are introduced for the purpose of abridgment and simplification of our reasonings, and are an ultimate phase of mag- nitude when it is conceived by the mind as capable of diminution below any assigned quantity, however small. Such magnitudes are in all cases, as styled by Carnot, auwiliary quantities, introduced for the purpose of facilitating our investigations, but they should disappear from our final results.

We shall illustrate this statement by the example of drawing a tangent to a curve,—in which problem the method of infinitesimals may be said to have originated. We introduce the infinitesimals dx and dy, for the purpose of finding their ultimate ratio, ¢.¢., in

order to determine the limit of oy. Now this limit is in all cases

a function of x and y, the coordinates of the point of contact, and cannot contain in it either dx or dy, since they must be taken as evanescent quantities when we proceed to the limit.

Likewise in all other applications of infinitesimals in the differen- tial calculus, we endeavour to find the ultimate ratio of two indefinitely small quantities, or infinitesimals ; and it is unnecessary to attach any precise

meaning to such infinitesimals during the course of our investigations, further than to regard them as variable Port which become evanescent when we proceed to our final results.

In employing infinitesimals in such cases, we proceed on the principle that the limit of the ratio of two infinitesimals, a and 8,

is the same as that of a’ and 9’, provided the limit of *.=1, and limit a

This is evident since, in all cases, we have So oe a a result which must hold in the limit. In consequence of this principle, before proceeding to the limit, we may neglect an infinitesimal of any order in comparison with one of a lower order. For instance, in seeking the ultimate ratio of vy to 5, where y= Ajat Aga? + Aga’? + &c. + Ana” + &., 5=B,6 + B, 6? + B363+ &c. + Bap” + &e.,

in which A,, Ay, Ag… By, By, &c., are finite, and independent of the infinitesimals a aud 8, we may neglect a”, a®, 67, 63… in com-

B a

parison with a and g, and we get the limit of F B. x limit of 2.

1

In general, if a, 8 be infinitesimals of the same order, their ratio has a finite magnitude; and if y=/,(a, 6), 5=/,(a,8), then in finding the limiting valuc of 4 . we take the terms of the lowest

order in a and g in f, and f,, ueglecting all infinitesimals of higher orders; substituting in the result the limiting value of 4 ,

we obtain the required limit fort F

138. Again, if a;+a,... +n represents the sum of a number of infinitely small quautities which approaches a finite limit when m is indefinitely increased, and if B,, B,. . . Bn, be another system of infinitely small quantities, such that

By

Bn —=I1+€, ay Oy On

= 1 se Ex, 6 6 where €), €,. . . én become evanescent in the limit, then, when 2 is indefinitely increased, the limit of the sum of B,, By. . . Bn is equal to that of a,,@,...a,. Thisis evident from the elementary algebraic

principle that the ratio Bi + By--- + Bn ties hetween the greatest and Oj +a,... +a

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the least values of the fractions 21 : Bo | | Brand itaccordingly

a a Gn

has unity for its limit, under the supposed conditions. For example, suppose any magnitude divided into a number of parts, and that each is capable of subdivision into two parts, one of which can be simply found, and the other not so. Let A+qa be the first part, of which A is of the former species, and a of the latter. In like manner let B+0, C+e, &c., be the other parts. Then the re- quired magnitude is represented by A+B+C+ &. +a+b+e+ &c. Now suppose that when a sufficiently great number of parts is taken we can make a, 8, ¢, &c., as small as we please in comparison with A, B, C, &c., then a+b+e+ &c., can be made as small as we please with respect to A+ B+C+ &c. ; consequently by continuing the process indefinitely, the limit of the sum of A+B+C+ &c., is equal to the required magnitude, without the necessity of paying any attention to the remaining parts. This latter may be regarded as the fundamental principle of the integral calculus, and the former, given in § 12, as that of the differential.

14. In consequence of metaphysical objections to the employment of infinitesimals, many writers on the calculus have confined then- selves exclusively to the method of limits or limiting ratios, and by so doing have in many cases involved themselves in long and cum- brous demonstrations of theorems which follow with great facility by the adoption of infinitesimals. In reality the difference between the method of infinitesimals

and that of limits (when exclusively adopted) is, that in the latter method it is usual to retain evanescent quantities of higher orders until the end of the calculation, and then to neglect them. On the other hand, such quantities are neglected from the commencement in the infinitesimal method, from the con- viction that they cannot affect the final result, as they must neces- sarily disappear when we proceed to the limit. A very little re- flexion will show that the result obtained in both cases must be the same. Morcover such quantities are neglected, not, as Leibnitz stated, because they are infinitely small in comparison with those that are retained, which would produce an infinitely small error, but because they must be neglected to obtain a rigorous result; since such result must be definite and determinate, and consequently in- dependent of these variable indefinitely small quantities. It may be added that the precise principles of the infinitesimal calculus, like those of any other science, cannot be thoroughly apprehended except by those who have already studied the science, and made some progress in the application of its principles.

15. The preceding statements may also be regarded in connexion with the different meanings of the terms ‘‘ zero” and ‘‘an evanes- cent quantity.” There is but one process in arithmetic which yields an absolute zero, namely subtraction, thus a-a=0. But from no other arithmetical process does zero arise, except by the same train of ideas as leads us to the use of the word infinite. We cannot, for example, obtain the quotient zero by dividing one finite magnitude by another. We can make the result as small as we please, but not absolutely zero. When, therefore, we consider an equation made by addition or subtraction of terms, the absolute zero may be used without reservation, thus 2x+a=6, and 2x+a—b=0 may be substituted for each other without any particular examina- tion of the symbol 0. But in any other case we consider zero or 0 as the limit towards which we approach by a series of diminutions, none of which is final. Thus when we see that we can nearly arrive at a eertain conclusion by attributing a small value to a particular magnitude, that we can more nearly attain this con- clusion by attributing to it a smaller value, and so on without limit, ¢.¢., that we can approximate to this conclusion as nearly as we please by the use of a value as small as we please, but that we never attain it as long as the magnitude has any finite amount, then such conclusion is said, for abbreviation, to be absolutely true when the magnitude is nothing or zero. These considera-

tions will help to explain the sense in which Euler was correct when he stated that dz and dy in the calculus must be regarded each as zero.

16. We now return to the consideration of the method of finding the derived functions or differential coefficients of the different forms of functions of x. Before doing so, however, it will be necessary to establish two or threc general principles.

We commence with the differentiation of a product.

Let y=wv, where u and v are functions of # ; then

Ay =(w+Au)(v + Av) — wo =UAV+(V+ AV)AU ;

ere ae ; Ax Ax Ax proceeding to the limit, this becomes d(wv) dv du “da da” dx’ In like manner, if y=wvw, we get dy du dv dw , da! dg te ae tae

and, in general, if y= yoy – - – Yn We have

1 dy_1 dh, 1 Mm a es y dz Y, dk& Yo dx Yn dx Again, if Sma we have w=vy, consequently v du dy av , dz dnt Y dx’ dy 1 du udv__ dx da dz vax v® dx ye :

17. Next, to differentiate a function of a function of x; let y= f(x), and w= $y), to find oe. Suppose y,, w#, to be the values which

y and u assume when x becomes 2, then (AT aR i a i —- ti-Yy m-z’ Ax Ay Ax Hence, sinee, as proved already, the limit of the product of two variable quantities is the product of their limits, we have wee die a5 dz dy da’

Consequently, the derived function of « with respect to xis the pro- duet of its derived with respect to y and of the derived of y with respeet to x Again, if we suppose w=, our equations become y=f(x), and z=¢(y). In the former y is regarded as a function of x, and in the latter x as the corresponding function of y.

Sueli funetions are said to be inverse to each other; and in this ease we have — ‘

dx dy | du_,.dy let dx? * dy 1 de

18. There exist in analysis a small number of simple or elemen- tary funetions, each. of which requires a special investigation in order to find the eorresponding derived funetion. When these have been established the differentiation of functions composed of these ele- mentary functions ean be readily obtained, by applying one or more of the prineiples just established.

19. We commence with the equation y=”, in which 1 is a constant.

(1) Let be an integer, and y, the value which y assumes when x becomes 2, ; then

Ce ee ~2 a PS ee. Now the limit of the right hand side when «=a, is nx”-1; accord- ingly we have in this case ‘ ; dic” = 7″ -1 i j (2) Let y=2”, where m and w are integers. Here y”=a™, and ‘ dy dy m =-1 accordingly ay”-1°4 — ma™-1; h ee ae a cordingly my*-t =a”; hence we get’ =a —-m 1 _ (3) Let ue es ; then, from § 16, we get a = — Me Consequently we get the following rule, applicable in all cases, for the differentiation of a power of «:— Diminish the index by unity, and multiply the power of «x thus obtained by the original index. 20. We shall next consider the elementary circular and trigono- metrical funetions. Let y=sin x Then y,=sin(@+h) ;

m-1

Y-y_sin(@th)-snz 2. A h ——_ = Sil > cos e+). But 2 sin S becomes unity in the limit, and consequently dy AES =COS x. In like manner it is easily seen that Wom sin x cos Sin _ en CORR Again, dtanz_ ad sin x – dx = dae HD de | cos x eos’a coset sine 1 Saat eos eos Similarly Zeote _ 1 dseca _ es aes a5 sec x tan x.

_ Corresponding to these trigonometrical functions we have the circular functions, sin-!z, cos-!”, tan-la, &e.

if y=sin~1z, we have w=sin y, and hence

—=C0S ¥ , OF i as ° dx cosy A/j—g2’ dsin-1e _ 1 In like manner dcos~4a _ d tan~1y 1

21. Next, let y=logax. Here y,=loga(x-+h) ; ow ot) =<. (1+4) a =F loge(Pa bee Th Let Ln then a

a h_1 age eee ; loge(14+2 = loga Cer Oa (1-+1)%.

a The limiting value of (1+ wu)” when w=0, t.¢., of (ee ty when z

inereases indefinitely, is represented by the letter ¢ (see ALGEBRA, vol. i. p. 558), and is the base of the natural or Naperian system

of logarithms. Hence we have d loge 1 l “de «2 Gone If ¢ be taken as the base of our system of logarithms, we have oe. i de x

In our subsequent investigations we shall suppose all logarithms, unless otherwise specified, referred to this base, and omit the suffix.

22, The method of differentiation of an exponential function follows immediately from the preeeding.

For let y=a*, then log y=« log a,

: aU _ log a@,or aU at log a.

We add a few examples for the purpose of showing the appli- cation of the preceding results to the differentiation of more com- plex functions.

(1) y=a*.

W el Here log y=a log x; Zz se =log “+1,

7)

Hence (1 +log x)a*. 2) y=log —-2 i) dine Vo? + 002 Here y=log x-4 log (a? +2?) ; a de «2 atta xa?+2%)° 83) y=log VitatV/l-% By i i — vise) 14+V1-z3 Here Y= lo a (a ey =] gS aet (ye A “ya =4 log (14+/T—24) — 4 log (1-V1) ; Oi eee 2 de an/i—at(14+Vi-2x) 2V1—22(1—-V1-24)

-1

— wN/T =

(4) Prove that sints (sin”x sin nx) =n sin”+1y sin (n +1). x

Cee > : : F Here aia (sin”x sinnz)=n sin”~!z (cos x sin vz -+siN & cos 22) x

=nsin”-lzy sin (n+1l)e; .*. &e. 1 V1 +a24+V 1-22 J1 +02 -V1 = 22 2 A /) D2 Here Vite+Vi-2 Gu ee J/14+2-V1—2 @=sin 2y 5 dy xe x

dx cos 2y /] ae

(5) y= tan

=tan y; from this we get

(6) If y=log sin x, prove tliat oy cot a.

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(7) If y=e* , prove that = = of at(+log a). (8) If yor prove that dy, de Vityt V1+a4 —— ps dy 9)Ify =log (V. 5), prove that 20 (9)Ity=log(Ve-+a+ Na+ dh P daz 2/(x+a)(x+b) 23. We shall conclude this section with the consideration of the differential of the area ABPM (fig. 8) of a plane curve, comprised between the curve, the axis of x, and two ordinates, of which one BA is fixed and the other ~~y PM is variable, x, y represent~~ ing the coordinates of P. This area, when the equation of the curve is given, is an «implicit function of x If it be repre- sented by wu, we proceed to find its differential coefficient, or du dx” definitely small increment repre- sented by MM’, the correspond-

0.

Suppose « to receive an in-

Fig. 3. ing increment of the area is represented by PMM’P’, z.c., by the sum of the rectangle PMM’R and the elementary area PPR. Now

the latter area becomes evanescent in the limit in comparison with PMM’R.

Consequently in proceeding to the limit we have a PM=y,

or = = (x), where y=¢(z) is the equation of the curve.

From this we can make an important inference, viz., that in all cases there exists a function whose differential coefficient is any given function of x, suppose ¢(z). To find such a function it is sufficient to consider the curve whose equation in rectangular coordinates is y=¢(x) ; then the area comprised between any fixed ordinate and the ordinate whose abscissa is z is a determinate function,—which, by the preceding, has (x) for its derived function.

Suceessive Differentiation.

24. We have seen that from any function of a variable we can obtain by differentiation a new function, called its differential co- efficient, or, after Lagrange, its derived function.

If the primitive function be represented by f(x), then, as already stated, its first derived function is denoted by f(x). If this new function, f(x), be treated in the same manner, its derived function is called the second derived of the original function f(x), and is denoted by f(z). In like manner, the derived function of F(x) is the third derived of f(z), and represented by f(x), &c. In accordance with this notation, the successive derived functions of J(x) are represented by

S’(&) SH) s FH) 5 oo SMB)

each of which is the derived function of the preceding.

25. In like manner, if y=/(x), then ay LS’ (x) «

Hence

. (a) = _ =f”(x).

dy q\ aa a The function —\—~+ is written oy , and is called the second dz da?

differential coefficient of y with regard to a. go

2 ;

Likewise = is written “4 ; and so on;

and the series of functions dy d?y dy d”y dx’ dx?’ dai’ °° da® are called the first, second, third, . .. nth differential coefficients of the function represented by y. It is sometimes convenient to adopt a notation analogous to that of fluxions, and to represent the series of differential coefficients of

y by

Ps Ul Ys oo in order to abbreviate the labour of writing down the system of successive differential coefficients.

26. It is plain that the determination of the series of successive derived functions of any function of x does not require any new principles, as it is accomplished by successive applications of the methods already considered.

For example, if y=z”, we have

dy _ Fl °

hence OY nw 1)-2, LY _n(n-1) (n—2)a*-3, &e.

Again, if y=e*, we have

2,

a ie 2 Tn aten, He. : dy “4 and in general qa

27. We next proceed to a fundamental theorem due to Leibnitz, and first published in Mis. Berol., 1710, viz., to find the nth de- rived function of the

product of two functions.

Let y=uv; then, if we write 7/, w’, v’, y”, u”, &e., for

dy du dv diy da’ de® de” da” we have y/ =u’ + ew’.

The next differentiation gives

yf! =u” + ule +0’u’ + ou” =u0″ + Que’ + 0u”, The third differentiation gives yf” =w ae” Quy” + Que! + 0’u” + ou”

=wl” + Buu” + Bur’ +0”,

in 1% the coefficients are the same as those in the expansion of (a+b).

et? that the same law holds for the nth differential coefficient, and that

yl) = Uh) + nau’y-D 4 =? w’‘yr-2)+4 &e.,

&e.,

: ea + num-Ny! + uy ; then, differentiating again, we get

YD) = ul) + w+ n(u/e™ + wy -Y 7″ ant) (alm) + ae” -2)) + Be… Ut Dy

= UVet) + (n+ 1)u’h) + — w’hr-N4 &e wee

in which the coefficients follow the law of the Binomial Expansion. Accordingly, if this law hold for any integer value of n, it holds for the next higher integer ; but it holds when n=, therefore it holds for n=4, &c. In the ordinary notation the preceding result is written

d”(uv) dy dud™-ly n(n—1) d?u d*-2y d™u ae “gata ge* 1.9 dearest FP ga”

(1) If y=e* sin ba, to find of ;

IIcre AY est (a sin ba+b cos bz). Now let b=a tan ¢, and we have av (+ b?)t e%* (sin bz cos P+ cos bx sin ¢) = (a? + b?)t ec sin (bx+ ¢).

Similarly we get Ua? +?) ce sin (bx +2¢) ;

2 dy © and, in general, a (a? + b2) e%% sin (bu +n).

dq” (2) If y=cot-1x, to find — i

Here Z=cot y, «% wv. —sin’y, d*y d ; 3 dy d/_. hence aa” oe (sin*y) = — a’s (sin?y) =sin*y < (sin®’y)=sin?y sin2y . Again yg (sin?y sindy) = a (sin? y sin2y)

= —sin*’y col (sin’y sin2y) dy

=-1. 2 sin’y sindy. (Ex. 4, § 22.)

In like manner,

4

oy . 2.8 sinty sin 4y. é dy 5 ; And, in general, = (-1)” . |n~-1 sin*y sinny.

—e

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d™ \n -1 (3) If y=2”-1 log, prove that —— (4) If y=cos (@ sin-1x), prove that Py Ly Gee 4m

(5) If y=a cos na+b sin nx, prove that ‘au aat® y=0. (6) If w=ay, prove that

—= = 7 —

dat ~ da™

Partial Differentiation.

28, We have hitherto treated of functions of a single independent variable solely. The prineiples established so far apply equally to the ease of functions of two or more independent variables.

For example, in the equation

w= ax? + Way + ey, the variables « and y may be eapable of change independently of each other; and if we suppose x to vary, y remaining constant, the eorresponding differential coefficient of a is represented by a , and we have dx

dt _ once + 2by c a

In the same case if we suppose y to vary, 2 being unchanged, the eorresponding differential coefficient is represented by a , and we have is = 2bu + 2ecy.

In general, if «bea funetion of two variables, x and y, represented by the equation

u=(®, Y)s we have two differential coefficients

du d a oe and os or ae

These are called the partial differential coefficients of the function, with regard to « and y respectively. They are usually written ceand , and are plainly determined in the same manner as in the ease of a single variable.

29. These new funetions eed ” a

or dp(x , ¥)

a dmit of being treated in like

manner. Thus the partial differential coefficient of = , taken with

10)

gi

respect to x, y being supposed unchanged, is represented by es

10)

2,

or bys ;

likewise its differential coefficient with respect to y is au adydx 30. It can be scen without diffieulty that ax dy dy dx i aoe

ee approaches as Ay

represented by ; and so on.

a dxdy dydx’? “°”

In fact

du dydx Aw and Ay diminish beyond limit. Au _o(z+Ax, y)- (2, 9) Az Az :

signifies the limit to which

Again In like manner, Ade G@tAx, ytdy)-¢utdu,y) o@, y+dy)-$(@, ¥)

_ Aa < Ax Ax Ay Ay Per dz , ytAy)~P(e+Ax, y)- oe, y+ Ay) +G(z, ¥) AxAy , Au It is easily seen that = has the same value. Accordingly the limits of the two expressions must be equal, and hence we infer uy du

dydx dady *

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31. In general, if « be a funetion of several independent variables

%4, Lg, + + + ®n, We obtain m partial differential coefficients of the first order, denoted by

can a = da

ax, Ait,’ dt,’”” * dity”

In like manner, the partial differential coeffieients of the second order are represented by

a ee dx,*’ dada,’ dx?’ ; We have, as in the former case, between each pair of variables i ae dxdt, dxty_dx,’ 82. In the equation w=¢(z,y), if we consider x and y to increase

simultaneously, then, if Aw represents the total increment of w, we have

Au=$(xtAz, yt dy)~-o(@, y) =$(zt+Ax, ytAy)~o(u, yt Ay) +o(x, yt Ay)—Gz, y)

_ ot ba, yt dy) —- ov, y+ dy) g(x, yt Ay) — o(@, y) Ax Ay

&c., and so on.

Ax + Ay. If now we suppose Aw and Ay to diminish indefinitely, and repre-

sent the corresponding differentials by du, dw, dy, we have in the

limit

du au

This is called the total differential of u, and it is readily seen that it is equal to the sum of the partial differentials arising from the separate increments in xand y. The same prineiple plainly holds in a funetion of any number of variables.

33. If w=¢ (v, w), where v and w are both functions of x, then by the preceding it is readily seen that

du du dv, du dw,

dx dv de ae dx’ and similarly for any number of functions.

34. The principles of total and partial differentiation admit of simple illustration in plane and in spherical trigonometry. For, in either a plane or a spherical triangle, we may regard any three! of the parts a, b, c, A, B, C as

being independent variables, and each of the others as a function of the three so eliosen.

For instance, in a plane triangle, if the sides a and 6 and the contained angle C be taken as the independent variables, we have

e?=a? +b2-2ab cos C; de_a-b cos C

du=

hence = ,

e ae : cos B; ; . de de :

likewise 75 °° ie one ain B,

de=cosBda+cosAdb+a sinBdC.

Again, to fina 94 , we have } sin A=a@ sin B=a sin (A+C);

hence, regarding a and 0 as constant, we have dA dA da b A = sea) ae = = es cos A TG a cos (A+C) (1+) a cos B a eos BG ; dA *aeosB dC € In like manncr we have, in the same case, dA sn B dA_* sin A a Bg -32 An cos B ic.

6. ¢ C Again, in a spherical triangle,

da Cc

cos c=cos a cos b+ sin a sin b cos C.

From this we obtain

& cos BY, G cos A, @ =sin asinB,

de=cosBda+cosAdb+sin a sin BdC.

This, and the preceeding, also admit of a simple geometrical demonstration, by drawing the triangle and comparing the small increments in each case.

35. Again, since from any equation in spherical trigonometry another ean be deduced by aid of the polar triangle, we get from the preceding

dC= -cosbdA-cosadB+sin A sin bde.

Corresponding formule are obtained by an interehange of letters. BY Se a, eee

1 The ease of the three angles of a plane triangle is excepted, as they are equivalent to but two independent data. – ;

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Again, the infinitcsimals da, dd, dA, dB are connected by the equation aa dB dA db

tan a a B tan a tan b This follows immediately from the equation sin a sin B=sin A sin 0.

36. These and the analogous formule, when we adopt small differ- enees instead of differentials, are of importance in astronomy in determining the errors in a eomputed distance arising from small errors in observation. They also enable us to determine the cir- cumstances under which the most favourable observations are made, viz., those for which small errors in observation produee the least error in the required result.

The relations between the variations in the sides and angles of plane and spherical triaugles were first treated of by Cotes, in his Estimatio Errorum in mixta Mathest (1722).

(1) The values of ou and e, when 2, y, are eonnected by two

equations of the form /(x,y,2)=0, 9(x,y,2)=0, are found to be

af ap _ af db af dp _ af dp dy _dudz dzdx dz _dy dx dx dy dx afdp afdd’ dx af dd df dp-

dz dy dy dz

dz dy dy dz

(2) If f(w)=¢(v), where w and v are each functions of x and y, it is easily shown that

du dv dwdv_

dxdy dy dx

sin © be constant, and equal tox, sin ¢

(3) In a spherical triangle, if

the relations ; da d dc cos A cos B* cos CG and _cosA da +cos Bdb+cosCde=x’d (sin a sin 0 sin ¢)

ean be readily established. (4) More generally, it may be shown that, if « also be supposed

0

to vary, ” ; ; eS i cos A‘ eos Bt cosG tan A tan B tau ca(—), and cos A da +cosBdb+cos Cde=xd(x sin a sin b sine).

(5) If w be a function of &7,¢, and ¢ yi F naet—,

(=2% a , show that y

du du du du du du ae y mr? an ae ac

Taylors Theorem and Development of Functions.

37. We have already noticed that the development of functions by infinite series was a branch of analysis that rose into prontinence during the latter portion of the 17th century.

The first series thus published were—that of Nicholas Mercator in his Logarithntechnia (1668) for the expansion of log (1+2), or what was then styled the area of an hyperbola (this he arrived at by the aid of Wallis's method of quadratures}; and that of James Gregory, in a letter to J. Collins, 1671, for the expansion of an arc in terms of its tangent. About the same time the first efforts of Newton's genius were directed to this subject ; and, as we have already seen, he thus arrived at his binomial theorem, and other general expansions, such as those of sin x, cos a, ¢*, &e.

It was not, however, until many years after these discoveries that it was found that all such expansions may be'regarded as particular eases of one general theorem. This theorem was discovered by Dr Brook Taylor, and published by him in 1715 in his Ilethodus Incrementorwm.

38. Before proceeding to a consideration of this important series it should be observed that, in 1694, John Bernoulli published, in the Acta Eruditorwm, his well-known expansion under the title Additamentum effeetionis omnium quadraturarum ct reetificationum eurvarum per seriem quandam generalissimam.

This series may be written as follows, slightly altering Bernoulli's

notation :— ne we ay wa ay SJ yie= 4 – de ence

Bernoulli obtained this result immediately by differentiation, by which process it can be casily verified.

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This is the first general theorem on series that was discovered ;

and it was easily shown by its author that the ordinary series, such as the expansions of log (1+), of siu x, aud others, can be deduced from it.

This theorem of Bernoulli, however, is but a particular case of

Taylor's, as will be shown subsequently.

39. Taylor arrived at his theorem as a particular case of another

in finite differenees,—a branch of the calculus treated of for the first time in his Afeth. Inerem. : Taylor’s proof, with some modifications, is as follows.

Introducing the modern notation,

Let f (x) be any function of a, and suppose x changed successively

into

L+AL, 2+2Az, r+3Acz, and let the functions

F(x), flat Am), f(e+2hn), be represented by

2+ NAL ; 2. f(u+ndx)

Ys Ws Yar os Yn- Then we have Yy—Y=AY, Yo—Yr=AYr so + + Yn Yn-1= AYn—1, Ay, — Ay=A2y, Ayo—Ayy=A%Yy, AYn- AYn-1= AP Yn-1, A*y, — A®?y = A3y, &e. The final result consists in expressing yn in terms of y, Ay, My,... Arty. We have Yn= Yn-1+ AYn-1=Yn-2 + 2AYn-2+ A*Yn-2 . In like manner, substituting yn-3+ Ayn-3 for yn-2, we get Yn=Yn-3+ BAYn-3+ 8A7Yn-3 + A*Yn-s, the coefficients being the same as those in the expansion of (a+). Now, if we assume that the same law holds for any value n, it is readily seen by the method of mathematical induction, of which we have given an example in § 27, that it holds for the value immedi- ately superior ; and we thus get

=) pay 4

una y + nay +e n. (nm — eae)

3,

ie et

40. This result can be readily established also by the principles of the symbolic calculus, a branch of the subject to which a short space will be devoted subsequently. We shall anticipate the con- sideration of that method by giving an application of it to the de- termination of the preceding result.

Regarding Aas a symbol of operation, the equation yn= Yn-1+ AYn-1 may be written y:=(1+A)Yyn-1-

In like manner, Yyn-1=(1+A)yn-2

yn= (1+ A)(1+A)yn-2=(1+A)%Yn-2

+A’y.

also Yn=(1+A)%yn-3 ; and in general yn=(1+d)“y = (1+ na ae ae +an\y =y + nay Vary + .. oy

41. If we suppose ‘ nag. OF is

the equation becomes

Ay : Ma ay ges

If now, # being regarded as constant, we suppose 7 to increase, and consequently Ax to diminish, indefinitely, we obtain, on pro- eeeding to the limit,

eneyante ae S(athj=yths +75 dap + &e , ni? ud 3 LA =f (a) + hf”) + pa”) + pagal”) + he

This is called Taylor’s series.

42. In order to complete the investigation, it will be necessary to examine into the convergency or divergency of the series, and to obtain an expression for the remainder in it after any number of terms ; this we shall immediately proceed to consider.

43. It may be observed that Taylor docs not seem to have been aware of the great importance of his theorem, nor did he give any examples of its application. This probably accounts for the fact that so long a time elapsed before its real value was dis- covered ; and, although Stirling introduced a particular case of it in his Methodus Differentialis (1717), it was not noticed in any of the English treatises on the calculus—such as Simpson’s P’luaions (1737), Emerson’s Flwaions (1743), Landen’s Residual Analysis (1764),—

nor is it mentioned in the first edition of Montucla's Hist. des Math., 1758. The theorem is to be found in Euler's Cal. Daf. (1755) ; but, although Euler makes extensive use of it, be made no reference to Taylor's name in connexion with the series, and would appear to have given the theorem as his own, or rather perhaps to have connected it with Bernoulli's series,

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44, We may observe that Taylor also introdueed into his Methodus Incrementorum, in the fluxional notation, a series whieh is the same as that of Bernoulli, already noticed. This led to a long and bitter controversy between them, in whieh Bernoulli's son Nieholas and others also took part. In this Taylor was aceused of plagiarism both with respect to this theorem and to other theorems relative to the general theory of the centre of oseillation of bodies. It is re- markable that in this dispute no reference was made to Taylor's own theorem, nor do the disputants seem to have been aware of its vast superiority to that around which the angry controversy was raised.

45. Taylor's theorcin nenee until its great

seems never to have risen into due promi- value was pointed out by the illustrious Lagrange, in the Berlin memoirs for 1772. Lagrange demonstrated the theorem by the principles of ordinary algebra. He made it the foundation of the method of series, and also of the differential ealeulus. He thus proposed to make the ealculus a branch of ordinary algebra, and independent of all considerations of infinitely small quantities, and so to give it all the formal rigour of demon- stration of the method of the aneients.

46. Lagrange also was the first to place Taylor's theorem on a satisfactory basis by finding an expression for the remainder of the series after any number of terms.

The following demonstration of this theorem of Lagrange depends on a single lemma, which may be thus stated. If a continuous function f(x) vanish when x=a, and also when x =b, then its derived

‘function f(x), of also continuous, must also vanish for some value of

x between a and db.

This is easily proved ; for if f’(a) does not vanish for some value of x between @ and 8, it must have always the same sign between these limits, and consequently,(x) must eonstantly increase or eonstantly diminish as x passes by small inerements from the value a to the yalue 6; but this is impossible, since f () vanishes for both limits. Now let R, represent the remainder after terms in Taylor’s expan- sion, then writing X for x+y in that series, we have

Pape) + FE8) pe aD prays. (a),

in which f(x), /() f@- We) are os oot finite and con- tinuous for all values of the variable between X and #.

From the form of the terms included in Rn it evidently may be written in the shape

ae tein,

oe.

Re (X-2)“p v1

where P is some function of X and x. Consequently we have

ys) = {pay + Fa + fou 4 Ra ayret pea (2)

| a—-1 Xam 12 ie AW)

(8).

a Now, let z be substituted for x in every term in the preceding, with the exception of P, and let F(z) represent the resulting expres- sion, we shall have -z SIE

B@)=7(8)- | te) S ror. .- a (hs

in which P has the same value as before. — Again, the right-hand side in this equation vanishes when z=X,

F(X)=0. Also, from (f), the right-hand side vanishes when z=2; .. F(v)=0.

Aceordingly, since the function F(z) vanishes when z= X, and also when z=2, it follows from the preceding lemma that its derived function F(z) also vanishes for some value of z between the limits X and «.

Proceeding to obtain F'(z) by differentiation, it can be casily seen from equation (y) that we have

—zg)r-1 —g)r-1 P@= – Spo) oe

mes ye ald for some value of z between x and X we must have MN a)=D. Again, if 6 be a positive quantity less than unity, the expression x+6(X-2x), by assigning a suitable value to 6, can be made

equal to any number intermediate between x and X. Hence

ie

P=fM{x+oX-z2)}, where @ is some quantity >0 and <1.

Consequently, the remainder after n terms of Taylor's series can be represented by id (X – 2)"

c f{a+0(X -2)} 6

19

This is Lagrange's form for the remainder. Substituting this

value for Ry in (a), it becomes f®@=f@+ Sys F 2 pres eo ae) fa0-+ OX - z)}.

Again, if h be substituted for X-z, the series becomes

n-] n

Slath)=f (x) +hf’(x) + &e. + AS fr-War) + Ci (2 + 6h) . In this expression 2 may be any positive integer.

47, The last equation may be regarded as the most gencral form of Taylor’sthcorem. We infer from it that the essential conditions for the applieation of Taylor’s theorem to the expansion of any function in a series are—that none of its derived functions should

hr become infinite, and that -> (a+ 6h) should become infinitely

small when becomes sufficiently large. 48, The remainder in Taylor’s series admits, as was shown by Cauchy, of being written in the form

(1 — 0-1 an = f@(e+ Oh) .

Another form was given by Dr Schlomilch, viz.

hr (1 = (a (n) 7 x + 0h).

In some cases one or other of these latter values is preferable to Lagrange’s form.

49, Another remarkable mode of determining the remainder in Taylor’s theorem was also given by Cauchy. It is based on the following lemma, that if F(x) and f(x) be two funetions whieh re- main continuous, as also their derived functions, between the values x, and 2 +h of z, and if also /’(x) does not become zero for any value of x between these limits, then

F(x, +h) — F(a) _ F(a + 6h) F(a +h)— f(a) F(x, + 9) ’ where @ is less than unity. 50. If in Taylor’s series we make x+h=0, or h= —a, we get

HO)=f () –2f'(e) +f") - Be. 5 and hence . S)=F (0) +2f (a) – Fa f”@) + 8e.,

a result which can be readily identified with Bernoulli’s series, given in § 38. 51. Again, if=0, Taylor’s serics becomes / I? ie Sh) =f (0) hf’(0)=GS”(0) + &e.5

1.2

or, as it may be written,

2

S(@)=f (0) +P 0) +g SO) + kee,

in which /(0), (0), 7”(0), &c., represent the values of /(x), f(x), S’(x), &e., when z=0.

This result is usually called Maclaurin’s series, having been given in his Fluwions (1742). It had, however, been previously published by Stirling in his Meth, Diff. (1717); but neither Stirling nor Maclaurin laid anyelaim to the theorem as being original, both referring it to Taylor.

By substituting for f(x) any of the elementary funetions, such as sin 2, cos 2, log (1+), we readily obtain their well-known expan- sions. It is to be noted that it is necessary in eaeh ease, for the validity of the series, to show that the remainder after 7 terms be- comes indefinitely small when n is taken sufficiently large.

52. The application of Taylor’s or of Maelaurin’s theorem becomes extremely troublesome in many eases, owing to the complexity of the successive derived funetions. For example, if we seck to expand tan x by Maclaurin’s theorem, we have f(x)=tan a, f(z) =sec’a, f(x) =2 sec’ tana, f’”’(x)=2 sectx+ 4 see’ Gane’; and the subsequent derived functions inerease in complexity. Similarly in the case of other elementary functions, such as sec 2, cot %, &e.

53. The development of tan z, see 2, and many other functions is much facilitated by the aid of a system of numbers, introdueed by James Bernoulli. These numbers are usually arrived at as fol-

x er — powers of x, coutains no odd power of 2 after the

lows.

It is easily seen that the expansion of “p in ascending

first, and that

the two first terms of the expansion are 1 and — 5 . Accordingly we may assume 4 a Gua 2 pty Bae _ Ee ee |6~

20

in which B,, B,, Bs, &c., are constants, These constants are called Bernoulli's numbers, and it can be shown without much difficulty that

Bi=t; Bo=s0 > By=¢s ? By=-s5, Bs=és ? Be=a78 B,=$, &e. The complete investigation of the method of their determination is due to Euler. See his Cale. Diff, lib. ii. cap. 5. In order to develop tan @ by aid of them, we write it in the form

1

tan @=—(1 —- a

d –), where 7=4/—], Hence we find

1 + et

tan 6 = 27(2? — We + 24(24- i + 28/28 — Tors Parks 9 observing that rs i — 1 aL 2

In like manner we get 1 2°B,e 24B,68 2°B,¢5

Also, since cosec =cot + tan oo we get

1 2(2°-1)B,@ 2(23-1)B,63 22° – 1)B,6* COshe Oe + [2 oa [- ae iG are

For the completion of this investigation it would be necessary to consider the convergence or divergence of these series. This ques- tion would occupy too much space for treatment here.

54. The numbers B,, B,, ... were arrived at by James Bernoulli (Ars conjectandi, 1718, p. 97) instudying the summation of series of powers of the natura] numbers 1, 2,3… .

Thus, if Sx? represent the sum of the series

1e+2°+3P … P Bernoulli proved that on 2 # P(p—1)(p- 2) wee 2 ae te Bynp-3 .,

The numbers, B,, B,, B;... were defined by Bernoulli as being the coefficients of the first power of 2 in the expressions for Sx%, Sn4, Sn8, &c., respectively.

This series of Bernoulli may be established as follows

If each side of the identical equation

ent — 1 oa 4 Be -Ie= Le +e oF

be differentiated » times with respect to 2, and we make x=0 in the result, we get

1e+2P43P… +(n-1p=De(Z—*) , when z=0,

a where D stands for a & dx

This may be written Sne= D»(=) z

0)

e—] Again =| – ea). x -1 ¢f e-1- f we! mara. =. 1.. © 2 Woe If g@)———, and f(w)— = 1- F 4h at de,

we get by Leibnitz's theorem § 27, SP = f(0)p%0) + pf'(0) 9-0) 4 BP~ DV pr(oygie-240) +...

Now it is easily seen that

and hence Bernoulli's series follows immediately. From the preceding we have

m{1e-1 + Qe-14 gm-2 | 4 (z—1)m-1}

-1

=Am_ gm —1 ai) Byem-2 _

The function at the right hand side of this equation has been re- presented by ¢ (z, m), and called Bernoulli's function of the mth order, by Professor Raabe (Credie, xlii.).

Raabe has arrived at many remarkable properties of these func- tions, of which a few of the most elementary are here added.

p(l —4, m) =(- 1)“9(z, Mm).

nen —1 $(4, 2n)=(-1) “Dina 1 B,.

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$2, 2n)=2np(z, 2n-1) , where n>1. d aq P% 2n+1)=(2n +1) {z, 2n} + (~~1)”~~!By. Q\2n—-1 sin 2rz. sin 4rz_ sin 6rrz (2, 2n-1)=(-1)/ a opn-1 qen-i ~Gu-1 ae as ,

where z>0 and <1, and m>1.

For their demonstration the reader is referred to Raabe's memoir, as also to Schlomilch's Compendiwm der Hohern Analysis.

It may be noted that the first fifteen of Bernoulli's numbers were given by Euler in his Jnst. Cale. Dif. P. 2, ch. 5. The next sixteen were calculated by Professor Rothe of Erlangen, and published by Ohm in Credle, vol. xxii. ; and thirty-one additional numbers have been recently calculated by Professor Adams, and published in the Proceedings of the British Association for 1877.

The fractional part in each of these numbers was calculated by Professor Adams, by aid of Von Staudt's theorem (Credle, xxi.). This remarkable theorem is as follows. If 1, 2, a, a'... 2n, be all divisors of 2n, and if unity be added to each so as to form the series 2, 8, a+1,.. . 2n+1, and of these the prime numbers 2, 8, p, p'. . . be selected, the fractional part of By will be

yrs ee (~1) stetpty cS

55. Several methods have been given for facilitating expansions by series, of which one of the most general and remarkable is that given by Arbogast in his Caleul des Dérivations (1800).

This is a method for expanding a function of

ae #

xv 3 a+b + Crag td ogt ke.

in a series of ascending powers of x.

Let ; ; « e ee w=atbs he cT3 oF dra3 +&e. and suppose o(w) represents the required function. Also, let e _@

x ou) =f (2)-A+B7+C 1 o+Drggtke.

=7(0)+ 2 7”(0) + 27”) +&e.5 A=/(0)=9(0).

Also, writing w’, wv”, w’”, &c. instead of du du du dx’ dx®’ dx’? we obtain, by successive differentiation of the equation (x)= (1), Tf! (@)=9’(w).w, tS” (w)=$’(u).u”” +9”u).(w’?, St” (w=9’(u).w” +36”(u).w’.u’ +o” (u)(u’y, SF (x) =9’(u). wl¥ +.6”(w)[4u’ w” + 8(as”)7] + 66’”(w). (ww + pl¥(w).(w’)4 obviously become a, b, ¢, d,...

then we have

&e.,

mt

Now, ‘#, W, @”, UW”, 2s. spectively, when z=0. Accordingly

B=/”(0)=b¢’(a), C=/”(0) =cp’(a) + B°G”(a), D=f”(0)=a¢’(a) + 8be¢”(a) + Bo’”(a), &e.

From the mode of formation of these terms, they are seen to be each deduced from the preceding by an analogous law to that by which derived functions are deduced one from the other ; and, as f(x), f(x). . . are deduced

from f(x) by successive differenti- ation, so in like manner B, C, D,... are deduced from ¢(w) by successive derivation ; where, after differentiation, a, b, c, &c., are substituted for

du du

9 dz’ “dx? ere If this process of derivation be denoted by the letter 8, then B=3.A, C=3.B, D=6.C, &e. From the preceding, we see that in forming the term 5. ¢(a) we

&e.

take the derived function ¢’(a), and multiply it by the next letter ; b, and similarly in other cases. Thus 5.5 =c, o.¢ =@,... 5.b%=mb*-l¢, 3. c*=mc”-ld…. Also 3.9 (a)b=¢’(a)le+p”(a)b% ;

This gives the same value for C as that found before; D is de- rived from C in accordance with the same Jaw; and soon. As an

illustration of this method, we shall apply it to find a few terms in the expansion of

sin (a+ 5+ scl

re Cs -gt47-9-3 yey +80.) Here A=sin a, B=5. sin a=) eos a, C=8. beosa=c cos a-0? sina, D=5. C=d cos a— 8be sin a—b? eos a, E=8. D=e eos a—-(40d 8c*) sin a — 6c cos a U4 sin a. Arbogast’s theorem has been treated somewhat differently by Pro- fessor De Morgan. Thus, suppose P(A A, e At? .. +000″ + Ke.) = Ay t+ Aye+ Age, ..+ Anw™+ &e. ; then, if we differentiate with respeet to dn, we have Ag dA, dAn

=a… $—— 2″ 4+ Ke. ibn

P’ (dy tae . . «+ nt” + &e.)a* = a 7

Henee we infer that, if m be less than , we have . 0,

dAm wy dAm-1 bas dim ~ Am -1 ia dAmtn dan el, OO ditm day?

The values of A,, A… . Anean be hence ealeulated (see De Morgan’s Differential and Integral Calculus, arts. 214-220).

56. Lagrange, in addition to having been the first to place Taylor’s series on a satisfaetory basis, also enlarged the powers of analysis by a remarkable theorem which contains Taylor’s as a partienlar ease, This, which is commonly ealled Lagrange’s Formula, first appeared in 1768 in the Berlin memoirs, and may be stated as follows :—

If 2 be conneeted with # and y by the equation

z=x+yop(z), then the expansion, in aseending powers of y, of any function F(z) may be thus written :—

F@=Fe)+ 4 o@OrPO +5 Z| lowPra}

me +i (zy 4 [oayP Fe) } –

This result can be dedueed from Maelaurin’s theorem, as was shown by Laplace, thus :— Let w=F (x), and we may write

= ae i snl) Fs OB) EC whero (5), ; (Fa), . . . represent the values of a ; oa : when we make y=0 after differentiation. We plainly have wu) = F(z). Also, it is easily seen by differentiation that dz dz du 7

dy ‘dx’ dy dx’ writing Z for $(z).

5 (Ga (24% ge ae dy \dy/ dy dx} dz dy] dx dx

Henee we ean deduee in like manner au dad \? du | i= ; GP D\ ck dx

aa-(se mh pnt dy” \dz (=)

If now we suppose y=0, since Z reduces to #(2), and ~ to F(x), ie we get

(Gj) ,-9@F@ , (F),-z} [Haye ret…

from which the series immediately follows.

also

and

Again

and in gencral

For example, let z=2+ = (22-1); then the expansion of z beeomes

peepee?” (apie Le ae & ao (3? N+7-5 (4) ag (1°...

ae (sy (Ey @-ay. –

Again, from our equation we get LAE y y

dz Tg (1 – Pays y’)-}.

a=

Hence

21

Consequently we have 2-} ¥y d (1 — 2ay +?) SEF Spe ae (g—-1)...

BCE) (em

If we write this expansion in the form (1 ~~— Quy + y?)~~#= 14 Xyt+ Koy? 2. + Xny”..- PG pg any a \n 2″) ee ee

The elass of funetions represented by X» was extensively studied by Legendre, to whose works the reader is referred for further de- velopment.

An expression for the remainder in Lagrange’s series in the form of a definito integral will be given further on.

57. Taylor’s series admits of ready extension to two or more variables ; thus, if we change x intox+/ in the equation w=¢(z,y), we get, by Taylor’s theorem,

du Vt Gu he du oath, yy=uth aa de 1.2.3 a t &° If now we change y into y+,

we have!

du, k* dw awl. ee. ; w or (x, y) becomes w+k a ee. 7 ;

du . du Pu ke Bu rs h i becomes h- +hk aay iL.3 dandy t cu

and accordingly we have

du du oath, yt+k)=uth ag dy Rh? d®u d?u ke du a ee eee eee, Le AEC to age + gee io ae

By aid of Lagrange’s theorem in § 46 we ean obtain an expres- sion for the remainder of the series. In like manner, if w= (2,y,z), we get

du du du, h? du (eth, ytkh, e+l)=uth ae dy +e tT3 qa Po Gia CF dy au du au a —_ = ae He; ae ee” ap” pee eae

The method can be readily extended to a funetion of any number of variables.

1. As an example of Maclaurin’s theorem, the first three terms , , eC . OF in the expansion of tan « are x + 3 1B . (2) Prove that tan-! (e+h)=tan-la+h sin z – (h sin ppan

+(hsin 2 SEE |, be,

where z=cot~1z. dy dy by the method of indeterminate coefficients. (4) By similar methods the first four term in the expansion of

1

+y=0, y may be easily expanded in terms of «

(1 +2)” in aseending powers of x are found to be (1 _ = + 11? = T208 é

2 24 16

(5) Find the development of at ll : . sin % sin 2% x, the coefficients being expressed in Bernoulli’s numbers. (6) Prove that Legendre’s function X» satisfies the differential

in ascending powers of

equation BOK aXn . (1 — 2”) a rs +n2(n+1)Xn=0; also that aXn4+1

Ge (Amt UY) Xnt (20 -3)Xn-2+(2n-7)Xn-at. ++

Indeterminate Forms. 58. Another important applieation of the infinitesimal method is

to the determination of the true or limiting values of indeterminate expressions.

For example, if the fraction Le} beeomes of the form a or—, ee 00

when x2=a, the fraction is said to beeome indeterminate for that value of x.

In fact, the method of the evaluation of indeterminate forms may be regarded as the foundation of the differential calenlus, since the determination of the derived funetion of any expression /(x) reduces

to finding the limiting value of ——— when 2=0.

1 This remarkable expression for X, is due to Jaeobi (Crelle, ii. p. 223).

We shall first consider the case where f(a) =0, and ¢(a)=0. Here

the true value of L® ig that of Hat” 1G) (ath)

S(at+h)_ fla)+ hf’(a+6h) _ Sat bh) g(ath) P(a)t+he’(at+6h) ¢o(a+6,h) f(a) when h=0. ?’(@) a the limiting value of the fraetion is in this case represented pal 2) $’(a)

Again, if £ 8 be also of the form + , its true value is that of a

whenh isevanescent.

But

cali ; and soon. (a)

In general, if the order of the lowest derived functions which do not

both vanish is , then the true value of A) is that of PM) : ne 9a) gra)

is of the form ry

xe sin ay —y* sin ax tan ay —tan ax

when z=y, to find its true value. Here f(x)=x* sin ay—y* sin ax, @(x)=tan ay – tan az,

f’(&) =ax*-1 sin ay —ay* cos ax, $’(x)= —a secax , accordingly the required value is represented by SY)

?(y) 59. Again, to find the true value oft if flaj=0, d(a)=o. a

1

Ao) _9(）g() 1 J@) Hence, by the former case, its limiting value is that of $x) S(e) , Se) (9(@)

Suppose A to represent the limitiug valuc in question and we have

For example, the fraction

=y*-\(y cos ay — sin ay) cos*ay.

0

, Which is of the form > , when z=a.

Aa ae Ra. Ome Accordingly the true value of the indeterminate form = is found

0

in the same manner as that of the form —.

In the preceding, in dividing both sides of our equation by A, we have assumed that A is neither zero nor infinite. It can, however, be easily shown that the true value in either of these cases is still that of Ae :

60. Again, the expression f(x) x ¢(x) becomes indeterminate for any value of x which makes one of its faetors zero and the other infinite. The expression, however, is readily reduced to the form

- ; for, if f(a)=0, and ¢(a)=, we have

1

a) X P(a)=f(a)- ——

Fa) x a) =fla)+ a

Also, if the true value of as be unity when $(a)=00, then

J (a)-9()= ae = p(a)= ne -1 a5″

This is of the form % and its true value can in general be found

, Which is of the form + :

asabove. By this means the true value of f(x) — $(x) when f(z) =0, and ¢ (x)=0 can be found.

61. The expression wu” becomes indeterminate in some cases ; for suppose y=w”, then log y=v log u. This latter product becomes indeterminate whenever onc of its factors is zero and the other infinite.

(1) Let v=0, and log w=+0 ; the latter equation requires either w=oo , or w=0. Consequently w* becomes indeterminate for either of the forms 0° or 0,

(2) Let v=-boo, log w=0; the latter equation gives w=1, and the corresponding indeterminate forms are 1° or 1-°.

62. In many eases the true value of an indeterminate form can be best determined by ordinary algebra or trigonometry. Thus, for example, the expression

Je + an+a—- Na? — ax —2? Vat2e —- Na-a@

is of the form & when z=0. To find its true value we multiply

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by the complementary surds, when the expression becomes J/a+2 AP /a—x an + 2 x Vai+ac+22+Var-ax—-2” 2

>!

the true value of which is plainly »/a, when 7=0.

63. The differential caleulus was applied for the first time to find- ing the true value of an indeterminate form by John Bernoulli, in the Acta Eruditorum, 1704, when studying the problem of drawing the tangents ata multiple point on acurve. This problem, as stated already in the Introduction, was started by Rolle, as a erux for the advocates of the differential calculus. It may be here remarked that the determination of the tangents at a multiple point is gene- rally much simpler by Cartesian coordinate geometry than by the method of the differential calculus.

A few elementary examples are added of the different classes of indeterminate forms here given.

(1) uU= epi , when =a. Here S(x) =e — e™* , h(x) =(x@—-a)” »

oe f’(x)=men , p’(x)=7(e-a)rl- Accordingly, when r>1, w=0 ; when r=1, w=me”* ; when r<1,u=0

(2)

Os —= CO _ an ae when 2=”. (1? – x?)

6 sin né@ ,

For r>1, w=0; forr=1, w= – ;and for 7<1, w=0.

“ x?4+2 cos 2-2 tan4z

(3)

, when 2=0.

9 ap Since tan

== when x=0, the true value of w, in this case, is

the same as that of ae

, and is easily seen to be 7.

(4)

at ties when =o,

Here w= = : ; but the true value of ae , when w= 00, is easily en en seen to be zero, consequently the true value of % is also zero.

(5)

The true values are (1) w=13; (2) w=c%. (6) Jo? + a0 —/x?+ bx, when w= 00. This is of the form co — oo; its true value, however, is that of (a — bx a- ee

b faa 2 ~~ oo – N/a + ae + N/a? + ba va me eS A ne

w={1+ +). (1) when z=0, and (2) when z=.

; In2 2 5 (7) PB) when x=y. True value, sin?6, am — ae — oo (8) —_ woen z=0. True value, 35.

1

(9) x(1-a*), when v=o,

1-a’

This is equivalent to when z=0, and accordingly its true

value is — log a.

(10) Trai when 2=0.

2

True value, 345.

Maxima and Minima.

64. We have scen in the Introduction that the question of finding the greatest and least values of an expression was, in the hands of Fermat, one of the first applications of the method of infinitesimals. We have also seen that the principle of his method had been pre- viously stated correctly by Kepler, and is the same as that obtained by the differential calculus. We now proceed to a more general in- vestigation on maxima and minima.

Let w represent the function, and x the variable, and suppose we have uw=/(x).

Let a be a value of x corresponding to a maximwm or a minimum value of w, then for a maximum we must have

Sia) >flath), and fla)>fia-h), for smal] values of h; and for a minimum, S(a) < flath), and f(a) < fla—h) .

Accordingly, in cither case, f(a+h)—f(a) and f(a —h) — f(a) must have the same sign, # being small.

But we have already seen that Zs Slath) -~fla=If’(a)+ ~—a “(a+ oh),

fa~h)—fla)= – f(a) + 5 F”(a- oh),

where is >Oand <1. f Now, when /”(a) is finite, it is plain that f(a+h)–f(a) and J(a—-h) – f(a) eannot have both the same sign, when h is very small, unless f(a) =0. ‘ ve Accordingly, the roots of the equation /’(x)=0 furnish in general the values of x for which f(x) has a maximum or a minimum value. Also we have in this ease—

fla+h)-—fa)= “a+ on),

fla-h)-fla= 75 f”(a- 6h).

Consequently, when /’(a) is negative, the corresponding value of f(a) is a maximum; and when f”(a) is positive, f(a) is a minimum.

If, however, f(a) vanishes, along with /(q), it is readily seen that the correspouding value of w is neithera maximum nor a minimum unless f(a) also vanish.

In general, let (a) be the first derived function that does not vanish; then, if be odd, the corresponding value of w is neither a maximum nor a minimum ; but if 2 be even, the corresponding value isa maximum when /(a) is negative and a minimum when it is positive.

These rules for distinguishing between maxima and minima were first given correetly by Maclaurin, in his Fluaions, ch. ix.

If the equation f(x)=0 has no real solution, then /(x) has no maximum or minimum value, and eonsequently is capable of having all possible values

from +o to —o.

We shall illustrate the preeeding theory by applying it to a few simple cases.

1 u=x+ae+b.

du a Here —=2+a=0,.°. w=-—,. dx , 2 2 4 Le md ° ° aq Again a= Since this is a positive quantity, the function is a

=

a car , . me minimum when «= — 9° Its minimum value jis b- Ti asis also

0 a 2 a? evident beeause u = (« He) 2 i zx

tere e+ 2’e+¢° ax? + 2be+e=u(a’e?+2d’e+c’),

du : 7 id for a maximum or a By

(2) u Here Differentiate both sides, and, since

minimum, we have axz+b=(a’e+0’\u. Hence the roots of the quadratic (ab’ — ba’ \a? + (ae! — ea’)x + be – eb’ =0 give the required solutions. –

The corresponding values of w are given by the quadratic

u>(b‘2 — a/c) + u(ac + ca’ — 2bb’) +62 -ae=0.

If the roots of the quadratic in 2 be imaginary, the proposed fraction has no maximum or minimum value. When the roots are real, the fraction has one maximum and one minimum value. These ean be easily distinguished in any particular ease. It is easily seen that to the greater root corresponds a minimum, and to the lesser a maximum value of the fraction, in general.

(3) w=tan x—x. eg Here a eee uy ie sec7 tan x, au

Te? sectx — 4 sec’ tan2x. Hence, for a maximum or a minimum we have sec 2z=1,

P 3 tan x=0 ; consequently = 0, and =2.

ingly the proposed has neither a maximum nor a minimum value.

4 =

(4) u=T

The fraction i422 ‘8 @ Maximum or a minimum according as

1l+2*. See — yz 82 minimum or a maximum, as is evident from the principle

: P -; that, when wis a maximum, 7 8 & minimum. But z+ = is a x

: Pe 1 maximum or a minimum when —;=1, ora=+41. x

Again, it is easily seen that the upper sign corresponds to a mini- mum and the lower toa maximum. We accordingly conclude that

° . xz : oie 4 is the maximum value of at and — 4 its minimum valne. a

(5) The expression w=2* has its critical value when x = oe é

65. Again, to find the maximum or minimum values of w, if u=f(z), where z= (2).

du 7 1 Here : =f’(2)9’(), and consequently the solutions of the problem are —(1) those given by ¢’(x)=0, ¢.¢., the maximum and minimum of z; (2) those given by 7’(z)=0. : ws

In many cases the values of 2 are restricted by the conditions of the problem to lie between given limits ; accordingly in such cases no root of /’(z)=0 can furnish a real solution unless it lies between the given limiting values. This result will be illustrated in the following examples.

1. To find the maximum and minimum perpendicular from the focus on the tangent to an ellipse, the perpendicular p being capressed in terms of the radius vector Yr. 7

The expression for the perpendicular p, in terms of the radius vector, is

dp ab? Par ~ @a—r?*

Accordingly 2 = 0 gives r= +c ; but these values are inadmissible,

since 7 is restricted to lie between the values a(1+¢) and a(1—-¢).

Consequently the only maximum and minimum values of p are those which correspond to the maximum and minimum values of 7; t.¢., a(1+e) and a(1-e).

2. To find in an ellipse the conjugate diameters whose sum ts a maximum or a minimum.

If 7 and 7 be two conjugate diameters, we have 7? +7?=a? + b?,

. w=rtVvere—P.

The solutions aeeordingly are given,—(1) by the maximum and

minimum values of 7, and (2) by the equation r 1 Se 0. Va? + 52-72

The latter gives the equieconjugate diameters, the former the axes of the ellipse. It is easily seen that the former solution gives a maximum, the latter a minimum ; as is also readily shown other- wise,

3. To find the position of a planet when brightest, its orbit and that of the earth being supposed circular, and to lie in the same plane,

Let S, E, P (fig. 4) be the positions of the centres of the sun, earth, and planet respectively. Let ACBD represent the section of the planet made by the plane SEP. Draw AB perpendicular to SP, and CD perpendicular to PE. Then ADB represents the illuminated half of the planet, and CBD the half visible from the earth. Accordingly the portion of the illuminated surface turned towards the earth 4 is contained between two planes ; drawn respeetively through AB Pig. 4. and CD perpendicular to SPE. This surface is projected into a ereseent, the breadth of which is proportional to the versine of BPD, or to 1+e0s EPS.

Again, the brightness, depending on its distance from the earth and its position respecting the sun conjointly, will vary as

Ss

1+eos EPS PE? Leta=ES, b=PS, 2x=PE; then cos EPS oo S « eo —— Po hh n 5 — ax Henee, neglecting a constant multiplier, we have OP: PS I ble 2 ee

Accordingly, the solutions of the problem correspond to— (1) The maximum and minimum valuesof x, t.¢c.,a+b aud a-) ;

d (2) The roots of the equation <. =—()), 01 -Of a? + 4ba — 3(a? -b?)=0 ;

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whence we get a =\/3a? +0? — 2b ; neglecting the negative root, which is inadmissible.

If b>a, \/3a?+ b* — 20 is negative, and accordingly this gives no solution in the case of an exterior planet.

For an interior planet we have a>b; and it remains to dcter-

mine whether «/3a?+ 62-20 lies between the maximum and mini- mum values of 2, 7.¢., between a+b and a—b.

Since a>b, it is immediately seen that ,/3a?+0?~~20 is >a—b~~ The remaining condition requires atb>NV3a2+0?-2b, or a+3b>V302+8?, 2.¢., a2 + 6ab+9b?>3a?+b?, or 4027+38ab>a?. Hence we easily find) > ra

. We accordingly infer that this gives

uo real solution for a planet nearer to the sun than one-fourth of the earth’s distance. When this condition is fulfilled it is readily shown that the corresponding solution is a maimwm, and that the solutions corresponding to z=a+6 and =a -b are both minimum solutions.

66. Many problems of maxima and minima contain two variables, which are connected by an equation of condition. Thus, to find the maximum or

minimum values of 9(z, y), where x and y are connected by the relation

I (x, y)=0. Here we have F af af a dp , dp dy _ oo aie eo ae ae

Aecordingly the maximum and minimum solutions are obtained from the simultaneous equations

dp df dp df _g d =e

ae dy ay az » an é (x, y) ° More gencrally, if »+1 variables, z, 7, %,..- by ” equations

%n, be connected

F,=0, F,=0, eee F,r=0,

and it be proposed to find the maximum or minimum value of a given funetion f(x, 2, %... %xn) of these variables, we have, by differentiation, the equations

of de + Y ae + Lo. +X din=0,

dx ax, din dF,, dF, Mis) 5 al ee cee a i n ? dF, , , dF s oe ze saigdt = daj+.. « 7, n=O, which give, on elimination, the determinant equation

af of af

da da, °° din

a, dF, aF,|_4

da da. me)

a ee Gee

This joined with the given equations determines the system of values of 2, @,, 2%... %n for whieh the funetion may have a maxi- mum or a minimum value.

Maxima and Minima for Functions of two or more Independent Variables.
67. Let w=¢(x, y), then, as in § 64, if # and y are inde- pendent, the maximum or minimum value of w must satisfy the

equations r P u u ae = 0, and dy =0, Suppose % and y, to be values of x and y which satisfy these equations; then, in order that they should correspond to a real maximum or minimum value of w, the expression P(x +h, Yotk) – H(@os Yo) must have the same sign for all small values of 2 and &, as in the

former casc. : Again let A, B, C be the values of a ; Seay ; va respectively, when z=2, and y=y. Then, by § 57, P(x +h; Yo+h)- (eos Yo)= $(Ah? + 2Bk + Ch*) + &e. But, when / and & are very small, the remainder of the expansion is, in general, very small in comparison with Ah?2Bhk Ch? ; and eonsequently the sign of p(a)+h, Yot+)— $(%o» Yo) depends on

that of ie AN+ 2Bhk-+ CH, te, of Abt BEM EAC” BD |

Now, in order that the latter should have the same sign for all small values of 2 and &, AC—B? must not be negative; 7.¢., fd : Ee pg must not be negative. When this eondition dx? “dy? \dxdy

holds, the resulting value of u is a maximum when A is negative, and a minimum when A is positive. The necessity for this eon- dition was first established by Lagrange.

In the particular case where A=0, B=0, C=0, then for a real maximum or minimum it is necessary that all the terms of the third degree in & and & in the expansion of $(x%+h, Yo +k) should also vanish, and that the quantity of the fourth degree should pre- serve the same sign for all values of A and &.

The preceding discussion admits of a simple geometrical inter- pretation by considering the surface represented by the equation z=(2, y); since it reduees to finding the points on the surface of maximum or minimum distance from the plane of xy.

68. Next let w=¢(a, y, 2), where x, y, zare independent variables. Here, as before, if x), yy, % correspond to a maximum or a mini- mum value of « they must satisfy the equations

du_y du_ du de “ty az Accordingly we have (ayo ths Yoth, %+1)— P(x, Yos o) = }(Ah? + BR? + C? + 2FKI+ 2Gh1 + 2HAK) + &e., where A, B, C, F, G, H represent the values of iu du du du du dw dat’? dy?’ dzt’ dydz” dzdx’ dady respectively, when x=2), Y=Yo, 2=%

. . 0 ; ° Now, as in the former ease, in order that « should have a maxi- mum or a minimum value, it is neeessary that

Ah? + Bk? + Cl? + 2F Ki + 2Glh + 2HAL

should preserve the same sign for all small values of h, %, and Z. If we multiply by A, this expression may be written

(Ah+ Hk + Gl)?+(AB -— Hk? + 2(AF – GH)xI + (AC – G?)??. Consequently the sum of the last three terms must be always positive.

Hence, in order that the expression in question should be positive for all small values of A, %, and 1, we must have

ay a, & – * H, G H, B A, B, ¥ >0. G,F, ©

This result is also due to Lagrange.

The corresponding eonditions for the case of four or more inde- pendent variables can be likewise determined, and are readily ex- pressed in the form of a series of determinants. See Quarterly Journal of Mathematics, 1872, p. 48.

(1) To find the maximum or minimum value of the funetion

an? + Qhay + by? + Aga + 2fy + ¢.

It is easily seen that when h?>ab, there is neither a maximum nor a minimum value. When ab>h*, and a>c, we obtain, as the minimum value,

a, h, g h,b, fi + Ff, ¢ | (2) Similarly it can be shown that the maxima or minima values of ax? + by? + Qhay + 2ga + 2fy +e ux? + b’y? + Qh’cy + 26 a+ Uflyte are the roots of the cubic equation

a, h h, b

a-a’u h—-h’u g-g/u h-h’u b-b’u S-fu |=0. g-gu f-fu e-eu

(3) Of all triangular Se ag standing on a given triangular base, and of given altitude, find that whose surface is the least.

Tangents and Normals to Curves.

69. The infinitesimal calculus furnishes, as we have scen, a gene- ral method of find- ing the tangentat any P Q point in a curve whose equation isgiven. For example, let y=/(x) be the cquation, in Cartesian eoordinates, g T A Nn M to any eurve; and Suppose (a, Y)s (1 1) to be the coordinates of two points P,Q in the curve (fig. 5), and

Fig. 5.

INFINITESIMAL CALCULUS

(X, Y) those of any point on the line passing through these points, then the equation of the line is _ Y-y=(K-2) BE. ‘eC If now the point Q be supposed to approach P, and ultimately to coincide with it, the line becomes the tangent PT at the point P, and its equation becomes

a Y-y=(X-2) S :

For example, in the curve represented by am ay”, we have en P and the equation of the tangent > the point x, y is x

m—-n2 —=mM-Nn, z

This furnishes a simple construction for the tangent at any point on a parabolic curve. (Compare Ricci’s construction given in the Introduction, p. 7.)

If the equation of the curve be given in the form w=/(x,y)=0, du du dy

we have da ay ans and the equation of the tangent is du du (X- 2) dat (© ~y) a:

70. Again, the normal at the point (x, y), being perpendicular to the tangent, has for its equation du Fy 2) (Y-y), the curve being referred to rectangular axes of coordinates. 71. The line TM in fig. 6 is usually called the subtangent and RM the subnormal. It is easily seen that yLY my Y MR= z , TM dy dx as it may otherwise be

written. Again, if the angle PTM=9¢, o T A M R

Fig. 6.

dar P rr

we have tan on ; and

the length of the normal PR=y sec oars), ax) also that of the tangent da? yr

PT=y cosec ? 7 tap 72. In general, if the equation of a eurve be given in terms of any two variable coordinates, the position of the tangent at any point ean be determined by finding the ultimate ratio of the corre- sponding elementary variations of the coordinates at the point. Newton gave, in his Opuseula, several applications of such systems of coordinates. In particular, it may be noticed that he considered the ease of what are now called bifocal curves, t.e., where the equa- tion is expressed in terms of the distances from two fixed points. Newton illustrated his method by finding the tangent to a Car- tesian oval, styled by him an ellipse of the second order. ‘The same problem, ina more general case, was studied by Leibnitz (4c. Hrud., 1693), who gave a method of drawing tangents to curves given in terms of the distances from any number of fixed points. 73. At a double point ona eurve (see CURVE, vol. vi. p. 719),

we have 6 and oe ; and 2Y at such a point becomes inde- dx dy dx

du ‘ : oO . dy dat t »—b f th —- eae gee, a Bae e erminate eing of the form he since ya du dy

du

Applying the method of § 58, the true value of = becomes in this case that of

dy

Pu, Pu dy

dx? dxdy dx

du du dy ; dady* dy? dx Bw, du dy

taba dy _ _ ke daly dae : dz au du dy dady * dy dx

25

du

H ube ence iat

d*u dy , du dy\? 0 dedy dx’ dy \dz} ~~°

The roots of this equation in – give the tangents to the two

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branches of the eurve at the double point. Double points are distinguished into three classes, according as the roots of this equation are (1) real and unequal, (2) real and

i : ; @u\? du dw. equal, or (3) imaginary, 7.¢., as(a) 35 oi is >, =, or <0. Of these the first are called nodes, the second cusps, and the third conjugate points. They are frequently also styled by Professor =’ nomenclature as crunodes, spinodes, and acnodes. See vol. vi. p. 723.

74, In the general discussion of curves it is usually more con- venient to refer them to a system of trilinear coordinates (see vol. vi. p. 719), in which the position of a point is determined by its distances from three fixed lines. The equations of curves in system are homogeneous.

Again, if (x, y, z), (x, y’, 2) denote two points in such a sys- tem, the coordinates of any point on the line joining these points may be represented by

aAwt a’, AY+KY’, AZ+ Kz’. Hence, to determine the points in which the line joining 2, y, 2 to a’, y’, # intersects a curve of the nth degree, we substitute Ax+ Kx’, Ay+ny, Az+nz fora, y, 2 in the equation of the curve, w=0; then by Taylor’s theorem (§ 57) the result may be written du

du n. n-l , I APU +A” Lee (dat Y — +2 =)

An-22 (| d d d\? i ea ¥ (« amt Y =e i) w+ &e,

rn 242 or ANU +A” leAw + Tre A?w+ &e.,

where A stands for the symbol of operation ie ie d (« dat ¥ a** 5) p The roots of this equation in >. determine the coordinates of the K

points of intersection of the line and the eurve. If the point x, y, z lie on the curve, we have uw=0; if in addi- tion we have , ; uw uw du e+ ed ws or Au=0, then a second point of interseetion of the line with the curve will be consecutive to x, y,z; and Aw=0 is the equation to the tangent at the point x, y, 2.

Again, if the latter expression Aw vanish identically, the point x, y, zis a double point on the curve ; or, in other words, every line passing through it meets two branches of the eurve there. The equation A*7=0 is in this ease that of the pair of tangent lines at this point to these two branches.

This method is evidently suseeptible of much extension.

Asymptotes.

75. The method of the calculus furnishes a ready mode of deter- mining the asymptotes to algebraic curves. By an asymptote we understand a tangent whose point of contaet is situated at an in- finite distance.

To find the asymptotes to a curve of the nth degree, we suppose its equation written in the form

Unt Un-1+Un-2+ o ae + Ug + Uy + Uy=0,

where wn, is a homogeneous expression of the nth degree in x and y, &e.

Again, writing u,=2”f, (4) » Un-y=a”-If, (4) » aCe, the equation becomes ae =i a -2. gia => wf, (L)+a lf, (L) +e of (4) +6 Or. Let y=xx+yv be the equation of any right line; then, to find its points of intersection with the curve, we substitute «+ – for £ in

the preceding equation, and, after expansion by Taylor’s theorem, we arrange according to powers of x; this gives

ar folee) + ar-14 f® + of’) 5 $a-2S fle) + of y(n) + Pa S dw +hee.—0.

Now if the line y=xx+v be an asymptote, two of the roots of this equation in x must be infinite, and consequently we have Fo(e)=0, and f(x) +uf”o(x)=0. XITl. — 4

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If x’ be a root of f)(«)=0, the corresponding value of y is

and the cquation y=

represents an asymptote.

If fy(x’)=0, 2.¢., if wa-1 and wn have a common factor y—x’x, the line y=x’x is an asymptote.

To each root of f(«)=0 corresponds an asymptote, and accord- ingly every curve of the nth degree has in general 2 asymptotes, real or imaginary. If the

equation of the curve contains no terms of the degree »—1, the » asymptotes are represented by the equa- tion un=0.

In the case when f,(«) has a pair of roots each equal to x’, then f’(«’)=0, and the corresponding value of y is, in general, infinite. In such cases the corresponding asymptote is situated at infinity. The parabola is the simplest case of this, having the line at in- finity for its asymptote. Branches of this class belonging to a curve are called parabolic, while a branch having an asymptote within a measurable distance is called hyperbolic,

It is easy to establish an analogous method for finding asymptotes to curves whose equations are given in polar coordinates.

The equations to the real asymptotes in the following curves are casily found by the above method.

(1) a2%y2—a%(a?+ 92) +04

(2) a2y? = a(x? – y®)+b%(x+y).

(8) a3 —a2’y—(a+c)e?+any+2a*y+d=0,

Ans. c=+a, y=-ka. » yta=0, y-a=0. », e+a=0,x%-2a=0 x-y—-—c=0. (4) Prove that the asymptotes to a curve of the third degree meet the curve in points which lie on a right line. (5) Show that the curve z*?-azy+aby=0 has a parabolic asymptote, and find its equation.

Curvature, Evolutes, Points of Inflexion.

76. The word curvature indicates deviation from a right line, the curvature at any point on a curve being greater or less accord- ing as it deviates more or less rapidly from the tangent at the

oint.

a The curvature at any point on a curve is obtained by determining the circle which has the same curvature as that of the curve at the point. Let ds be an indefinitely small element of the curve, and dd the angle between the tangents at its extremities, then

oy represents the radius of the circle which has the same curvature.

= is accordingly called the radius of curvature of the curve at the

point. The circle is called the circle of curvature, and its centre the centre of curvature, corresponding to the point on the curve. Denoting the radius of the circle of curvature by p, we have ds pie

Again, if x, y be the coordinates of the point, and ¢ be measured from the axis of x, then, since ds is the limit of the hypothenuse of a right-angled triangle of which dx, dy are the limits of the sides, we have

dy dy do dp ds_ seckd Oe = Fes qa SOP a= sec? Gs – a ae.” dy\?) $ »_ {2+ (z) | Hence p wn BECNP i Ne, ay ay ax? da

This expression for the radius of curvature was given by John Bernoulli (Acta Eruditarum, 1701). The radius of curvature becomes infinite at a point for which

2,

370. Such points are styled points of inflexion on the curve,

and the tangent at a point of inflexion is called a stationary tangent (vol. vi. p. 719). Other expressions for the radius of curva- ture can be readily obtained. For instance, since

da ; dy ce and sing =F” 4 if the arc be taken as the independent variable, we have do _ ay

cos @=

ds ds?’

A *do* (3) (3) p ae ast) t\ase) °

Again, if p be the length of the perpendicular drawn from the origin on the tangent at a point whose distance from the origin is r, the radius of curvature at the point is given by the equation dr = >. p dp

This value of p can be readily established from geometrical con- siderations, and is frequently useful, more especially in applications of the calculus to physical astronomy.

77. If the centre of curvature for each point on a plane curve be taken, we get a new curve Called its evolute. Also, with respect to the evolute, the original curve is called an involute, and may be described from its evolute by the unrolling a stretched string sup- posed wound round the evolute. In this motion each point on the string describes an involute to the curve. The curves of the system thus described are said to be parallel. Again, from its definition, it is plain that the evolute of a curve is the locus of the points of iu- tersection of the normals drawn at consecutive points on the curve.

78. Contact of Curves.—Suppose two curves, represented by the equations y=/(x) and y=¢(z), to have a point (x, y) in common, then f(x) = (2).

Let 2+h be substituted for xin both equations, and suppose y, and y, to be the corresponding ordinates, then

h?

n—Noth)=f@) +f)+ as") +8. Y= G(e+h)= $e) +O) 47% ge) + he.

, h3 Yah \7’@) — ¢’(2) +55) \7”@) ~ ¢”(a) }4-&, Now, if f’(xz)=9(x), we have

h? n3

n-w=p5 \r”@)-e’@) | +755 |” – 9”) bee, and the curves have a common tangent. In this case the curves have a contact of the first order, and when / is small the difference between the ordinates y, and y, is a small quantity of the second

order. If in addition /”’(x)=”(x), we have

h3 th Ya= 5-9-3 | Se) – 9a) [+ Ee. In this case the difference of the ordinates is a small quantity of the third order ; and the curves arc said to have a

contact of the second order, and approach indefinitely nearer to each other at the point of contact than in the former case.

Also, since y;— Y_ changes its sign with that of h, the curves intersect, as well as touch, at the point of contact.

t moreover, f’’(x)= (x), the curves have a contact of the third order.

In general, if f(z)=$(x), f(a)=¢’(), S(a)=9"()…. J (x) = p(x), the curves arc said to have a contact of the uth order at the point.

It is plain from what precedes that, if two curves have a contact of the 2th order, no curve having with cither a contact of a lower order can pass between them.

We shall illustrate this theory of the contact of curves by finding the circle which has a contact of the sccond order with the curve y=f(x) at the point (a, y).

Suppose (x— a)?+(y—-p)/’=R? to be the equation of the circle, then, by the preceding, a and oa must be the same for the circle and for the curve at the point.

Differentiating twice successively the equation of the circle we get

dy \? d?y d =— — —_—, = an 1 +($) + – aes

Hence

ao)

This agrees with the value for the radius of curvature found in § 76, and shows, asis indeed evident, that the circle of curvature is the circle having a contact of the second order at the point in which it touches the curve.

Again, if x, y be eliminated between the preceding differential equations and that of the curve, the resulting equation in a, B is that of the evolute of the curve.

From what has been shown above, if the equation of a curve con- tain » arbitrary coefficients, we can in general determine their values so that the curve shall have a contact of the order »-1 with a given oe at Pi point ; for the cocfficients can be determined

y dy an ly so that y, feel? Gane two curves at the point.

The curve thus determined having a contact of the highest order with a given curve at any point is called an osculating curve. For instance, as the equation of a right line contains but two indepen- dent constants, it adinits in general of a contact of the first degree only. Again, the equation of a circle has three independent con-

shall have the same values for the

stants, and accordingly the cirele admits in general of a contact of the second degree with a curve at any point. The parabola has four independent constants, and consequently admits of a contact of the third order; and so on. ‘ah

Again, introdueing the additional condition | Sz) = PZ), a finite number of points is seen to exist at which the osculating eurve has a contact one degree higher; thus a tangent may have contaet of the second order, an osculating eirele contaet of the third order, and so on.

In the ease of a right line, we have

P(x)=f(z), P(a=f’(x), o’(@)=f”(2), ; where o(z)=aet+b, .*. ¢(w)=0. This agrces with the eondition found for a point of inflexion in § 76. The problem of eontaet admits of being considered also from a geometrieal point of view, i.c., from the consideration of the number of consecutive points of interseetion of two curves, em. ;

79. The discussion of evolutes and involutes originated with Huygens, in his celebrated work, Horologium Oscillatorium (1673), published before the invention of the calculus. Huygens’’s investi- gation is purely

geometrieal. The definition of the osculating eirele was first given by Leibnitz, in the Acta Eruditorwm, 1686, where he pointed out its great ae a in the study of eurves. Newton, in his Principia, makes frequent use of the theory of the radius of curvature, and of its connexion with evolutes.

Newton also observed that the radius of curvature beeomes infinite at a point of inflexion, and vanishes at a cusp—called by him punctwm rectitudinis, and punctum curvature infinite, respee- tively. See Opusc., i. pp. 121, 122, ed. Cast. :

It is worthy of remark that Sluze, in his Afesolabum scu dux medixz proportionales, &c. (1659), pointed out a general method for the determination of points of infiexion (puncta flceus contrarit), by reducing it to a question of maxima and minima, viz., to finding when the intercept made by the tangent, measured along any axis from a fixed point on it, is a maximum or a minimum. This method he applied suecessfully to the conehoid of Nicomedes.

(1) It is easily found as above that the radius of curvature at (a4 + x4) 2ate
(2) The following expression for the radius of eurvature in polar

coordinates, — ar\?) 4 Ce enid (3)

any point on the eurve 3a*y=2‘ is equal to p=

ean be easily dedueed. (8) If was, this beeomes

t+ (aie) b

as au U-+ ae? (4) Henee at a point of inflexion we have w+ ey 0. de?

(5) The origin is a point of inflexion on the eurve represented by the equation w,+w,=0.

(6) The length of the radius of eurvature at the origin in the eurve r= sin 26 is 4na.

(7) If on the tangent to a eurve a eonstant length be measured from the point of eontaet, the normal to the loeus of the points thus taken passes through

the corresponding eentre of curvature of the proposed curve. ,

j hi

(8) In the ellipse = +5 the coordinates a, 6 of the centre of curvature of any point are given by the equations a? — B

a

=1, if we take x=a cos ¢, y=d sin ¢,

eos? 6; B= aia d.

(9) At a cusp (eompare § 73) the radius of eurvature is zero for both branehes.

(10) In some eases two branehes of the same curve may have a eontaet of the second or of a higher order. For instance, it is easy to show that at the origin two branches of the eurve

Y? — 28y +34 – z= 0 have equal finite radii of curvature.

a=

Envoclopes. 80. If we suppose a series of different values given to a in the

equation

S(@, Y, a)=0 ? then for each value we get a distinct curve, and the above equation may be regarded as representing an indefinite number of curves, a single determinate curve corresponding to each distinct value of a, provided a enters into the equation in a rational form only.

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If now we regard the parameter a as varying eontinuously, and consider the two eurves : S(@, y, a)=0, F(®, y, at Aa)=0, then the eoordinates of their points of intersection satisfy each of these equations, and therefore also satisfy the cquation Se, Y, a+ Aa) — F(x, Y, a)

=0,

Aa Now, in the limit, when Aa is infinitely small, the latter equa-

tion beeomes df (x, Y; a) 6 da : Hence the loeus of the points of wltimate interseetion for the

entire system of curves represented by f(x, y, a)=0 is obtaincd by eliminating a between the equations

J(, y, «)=0 and its thse) a

This loeus is ealled the envelope of the system, and it can be easily scen that it is touched by every curve of the system.

For instance, suppose L, M, N to be given functions of x and y, and a a paraimetcr, to find the envelope of the system of curves represented by the equation

La?+2Ma+N=0.

Here Sa, y, «)=La?+2Ma+N ; GO ®) _ og 4 OM. da Consequently the envelope is the curve represented by the equation

LN=M?.

For example, if L, M, N represent right lines, the envelope of the moving line

is the eonic LN = M?, In general, if the equation of the moving curve be of the form Poa” + Pya”-1+ Poa®-2+ 2… Pr=0, where Poy, P,, P,... Pn are given functions of « and y, the envelope is obtained by the elimination of a between the proposed equation and its derived cquation 2Poa”-1- (2 — 1)Pya”-2+&c. =0.

It is accordingly represented by the condition that the equation in a should have cqual roots ; this condition is called the discriminant

of the equation. For examples see Salmon’s Higher Plane Curves, Arts. 85, 86.

81. In many eases the equation of the moving eurve is of the form S(%; Y, % B)=0, where the parameters a, 8 are connected by an equation g(a, B)=0. In this ease we regard Bas a function of a, and thus we get by differentiation dp do dB

Ee

da dp da ;

La?+2Ma+N=0,

cousequently, if we make

v age , we got F — and the required envelope is obtained by the elimination of a, 8, a between these and the two given equations.

For example, let it be proposed to find the envelope of a line of given length (a), whose extremities move along two fixed rect- angular axes.

Here, taking the fixed lines for eoordinate axes, and denoting the intercepts by a and f, we have

See ei , and «7+ p?=a? . a 8B

x 4 Hence ges pe from whieh we get

Ne? *. B=ae, Pay ’

and the equation of the envelope is a8 + y3= al, This envelope was discussed by John Bernoulli in the Acta Erud.,

1692.

Again, to find the equation to the evolute of an ellipse, regarded as the envelope of its normals. Here we have the equations

2 ge eons = a -b?, and oteel, where a, 8 are the coordinates of a point on the ellipse. Henee ann a by B eo. 2 fe

and we easily obtain as the required equation (aax)8 + (by)# = (a? – 0)8.

28

The preceding method can be readily extended to the general case in which the equation of the moving curve contains any number nm of variable parameters, which are connected by n—1 equations of condition.

82. The theory of envelopes, or of ultimate intersections, may be said to have originated with the investigations of Huygens on evolutes, already referred to, and those of Tschirnhausen on caustics (Acta Eruditorum, 1682). These authors, however, merely treated geometrically a few cases of moving right lines, and did not give any general method fer the investigation of such problems. Leibnitz was the first who gave a general process for the solution of this elass of questions (Acta Hruditorwm, 1692,

1694). His method does not differ in any material respect from that here given.

(1) To find the envelope of the parabolas deseribed by a pro- jectile discharged from a given point with a given velocity, but at different angles of elevation.

If ¢ be the angle of elevation, and h the height due to the initial velocity, the equation of the parabolic path is

2

ae 4h cos*e Let tan e=a, and the equation becomes

a=y tan e-

2 2

nay 1 (1+e), or ta-ayt @ =O,

Consequently the equation to the required envelope is y* =4h(h—2), which represents a parabola.

This problem is the first that was brought forward on the locus of the ultimate intersection of curved lines. It was proposed by Duillier to John Bernoulli, who solved it, but not by any general method (Commer. Epist. Leib. et Bern., vol. i. p. 17).

(2) To find the envelope of the system of conics represented by the equation

where a is a variable parameter. Proceeding as before we get as the equation to the envelope (xta/n)?+y?=0. Hence we infer that a system of confocal conies may be regarded as inscribed in the same imaginary quadrilateral.

(3) Find the envelope of the plane

in which the parameters 7, m, m are connected by the equation lnn=a’, Ans. 27xyz=a’.

(4) A right line revolves with a uniform angular velocity, while one of its points moves uniformly along a fixed right line, prove that its envelope is a cycloid.

Symbolic Methods.

83. The analogy between successive differentiation and ordinary exponentials was pereeived by Leibnitz and the early writers on the caleulus, and afterwards more especially by Lagrange (Mém. Acad. Berlin, 1772). Arbogast was, however, the first to separate the symbol of operation from that of quantity in a differential equation (Calcal des Dérivations, 1800). The first writers who appear to have given eorreet rules on the subject of operations were Frangois, Ann. des Math., 1812, and Servois, in the same journal, in 1814. Servois more especially exhibited the principles on which the legitimacy of the separation of the symbols of operation from those of quantity depends; and, making a separate ealeulus of functions out of those properties, he succeeded in proving that differences, differentiations, and multiplications by any factors which are independent of the variable, may be employed as if the symbols of operation were ordinary algebraic quantities. Hence has arisen a new method of considering the principles and processes of the calculus, called the symbolic method, or the calculus of operations.

In this method a is written in the form (a) and the symbol ro £ is regarded in the light of an operation, supposed to be made on the

function u according to the established principles of differentiation:

: d d ad Again aa (w+v)= (=) w+ (Za) : (1). d \™ d\n d m+n Aes; (a) (x) ie (x) ¥ (2). And, if « be a function of a and y, ad d d ad la) eee

Hence we observe that the symbols = elie: operate and are com- ‘ a

dy

bined according to the same laws as ordinary algebraic symbols of quantity, such as @ and 0; and we can readily infer that the theorems in ordinary algebra (compare ALGEBRA, Vol. i. p. 519, § 8, 9) which depend solely on such laws of combination arc capable of being d

>

extended to similar theorems depending on the symbols £ and i

lx or on the symbol – and any constanta. Such results are in general ec

capable of extension to any symbols that are subject to the same laws of eombination.

The law embodied in equation (1) is called the distributive law; the sccond, in (2), is ealled the index or exponential law ; and’the third, in (8), the commutative law.

It is convenient to denote the preceding symbols by single letters.

Accordingly we may suppose the symbol – to be represented by D, and by D’, &e. In general, if 7, p denote two symbols of operation such that mU+Y) =TU+ Tv, p(u+v)= put pv, mpu=pru , rn UL = amin, , then the symbols 7, p possess the distributive, commutative, and exponential properties. For example, suppose Ea represent the operation of changing x

into +h in any function of x, 7.¢., suppose Exg(x) = h(x + h). Then

Ep | (x) + ¥(x) | =ple@t+h)+ Yat h)= Eng(x) + Eny(@). ai E, denoting the operation of changing x into x+k, we 1ave

Exg(x)=$(a+k), In like manner

ExEn g(a) =G(@th+k)=Enzip(a), .*. ExExgp(x)= Ex Engp(x). Hence the symbols Ey, Ex are commutative.

Also the equation ExpEi¢(x) = Ei4nh(@) may be written, symbolically, thus :— E,E,= Ente 5 This shows that the symbol Ey is of the nature of an

exponential ; and may be written in the form E’. 84. This symbol can also be eonneeted with Taylor’s expansion.

Thus, if we separate the symbols of operation from those of quantity in Taylor’s’theorem, it may be written

ot) En. Exp(x)=En(at+ kh) =p(et+h+hk).

S(e+h) “(1 7D +e. Fa) =? f(@)

Accordingly, although we can give no direct meaning to the symbol e*D, except as the representative of the symbolic expansion

h? ‘ hr ‘ 1+h4D+ 7 gD? + 5a 6 bs ae

we may from the preceding section regard it as equivalent to the symbol FE, In like manner we may write

oP (a, y= (ath, y).

If now we suppose both sides operated on by the symbol e*®’, we have

cD’ AD, g(x, y= PM O(x +h, y)=P(uth, y+k). Hence p(x ap h, yt k) — ghee? iy y) = {14+ (AD+kD)+4(AD+kD’P +. . . } O(a, y)

- dp a (105 PH , 20%

od (2, y)th ie 7 +42 met te ae) (Compare § 57 ; also Arbogast, Cal. des Dér., pp. 343-352.)

85. Another proof, by the method of operations, of the foregoing symbolie expression for Taylor’s theorem may be added.

It has already been shown that when h is infinitely small we may write

p(a+h) — $(2)=h¢’(x) =hD¢d (x),

In like manner

(1+AD)*¢(z)=(1+AD) o(u+h)= (e+ 2h), &e. And in general

*, p(a+h)=(14+AD) g(x).

p(% +nh)=(14+hD)*p(2). Now suppose nh=a, and we get

pla-+a)=(1+4D)*¢(a) .

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But when & is infinitely small, we may, by analogy (sce § 21), assume 1 a / (144D)”**u=ePu, ..** (1+4D)*u=e2Pu. Hence o(x+a)—etDe(x), as before. 86. Again, as in § 84, representing the symbol eD by E, we may

write ef (x)= Ef (x). Also, if A prefixed to any function of x denote the operation of taking the increment of that function when « reccives the incre- ment unity, we have f(+1) -f()=Af(a) –

Accordingly Ef()=(1+ 4) f (2). And, by the index law, we have

Ef(z)=(1+a)” f(a) »

on fetn)=(14na+ as ie . . fee) = f(a) masta) + MY payin) + be

Adopting the notation ¢(z)=1z, ¢(a@+h)=Uztn, &e., this leads to the following fundamental theorem of the calculus of finite dif- ferences

-1

Uctn=Ug t+ NAUg + —— A262 + pao Again, since A=E-1, we have A”u,=(E—-1)“2z. Hence, in like manner,

Abe = Uzdn— Miztn-1+ +(-1)“z.

n(n—-1 Te) Uz+n-2 SPoO

For example, Ae = (2 -+n)”—n(a+n—-1)™+...+(—1)”™, Again, if A”0™ represent the value of A*x™ whcn x=0, we have

A0™ =n” — (0 — yn 4 2 Dn 2) —...+(-1)“ln. The numbers represented by the symbol A”0”, called the differences of the powers of zero, are of frequent occurrence in analysis, and

their values can be readily tabulated from this scries. 87. Again, since

d d d D(uv)=G, (ur) =! + Ue v=(D,+D,)ur, in which we suppose D, to operate on w only, and D, on v only,

we infer that D(wv) =(D, + D,)” uv = { Dyr+nDy-1D, +E) UB) Us eee } we dv d™-lu n(n-1) dv d*-2u dy “de dai * 1 ast da a” This is Leibnitz’s theorem, given in § 27.

This result can be extended to the nth differential of the product of any number of functions.

88. More generally, if y(~) represent any function of x, and if f(x) beany rational function, and we suppose D, operates ou w only, and D, on (x) only, we have

J(D)Ha)u= f(Di + Do)y(x)e = {f(Dy)+Dyf(D,) +... yaa

= Uo) f(D)u + W (a) f’(D)u + YA) yD) at Re

{n like manner the equation b F(x) y(D)es = W(D)f(x)u – VD) Pau E Op ‘(aje-..

can be established.

These expansions form the basis of Hargreave’s well-known memoir on the ‘‘Solution of Differential Equations” (Philosophical Transactions, 1848). Hargreave observes that on mere inspection of these results it is apparent thatif D be substituted for x, and —~ for D, the former equation transforms into the latter. Hence, in any differential cquation and in its symbolical solution, if the foregoing substitutions be made we shall obtain another form, accompanied with its symbolical solution. This principle was applied by Hargreave to the solution of several classes of differential equations.

89. Again, if in Leibnitz’s theorem we make v=e* , we get

Dr(otu) =o D*u + naD*-lu + oat aD. +... .) =et(D”4 naD-1 + ak Page @D-24 ., a oe =e(D+a)u.

29

Accordingly (D +a)“u=e-*D%(e%u) . Hence we readily infer that, if f(a) represent any function involy- ing only positive integral powers of a, we shall have S(D+a)u=e-*f(D)e%*u.

Again, if this be transformed by assuming e*=y, we have UZ Y;

adit 2 eM, 2 Vig 8 \, _ a ty (a) wd (a)”- (vay) i

Hence the foregoing result may be exhibited as follows :— S(yD’ +a)u=y-*f(yD ye . This may be written KaD + aju=a~*f(aD)xru.

90. The interpretation of negative and fractional powers of a symbol of operation is a subject necessarily suggested by the intro- duction of such symbols. We pass over all allusion to the case of fractional powers, as no satisfactory theory for their interpretation has as yet been arrived at. The interpretation of an integer negative power of a symbol is easily established, and is in all cases of the nature of an inverse problem.

For instance let r be a symbol of operation such that

TU=V, then, if v be given and wu unknown, we may write : u=t-lo,

and the problem contained in the inverse symbol of operation will be answered when, by any process, we have determined w so as to satisfy the equation rw=v, or mm-4v=v. In other words, we define the inverse symbol w~-! to be that which the direct operation m simply annuls; and this is in accordance with the analogy of ordinary algebra.

For example, since D/(x)=/(x), we write D-1/(x)=f(x), and the symbol D-! is equivalent to an integration. In like manner D-* is equivalent to 7 successive integrations.

Similarly the symbol (D+a)-” is regarded as the inverse of the symbol (D+a)”, 7.¢., such that

(D+a)”(D+a)-*w=u. We now proceed to investigate how far the equation JF (D t+ a)u=e-*f(D)e*u holds for inverse symbols. ~ We have already scen that when 2 is a positive integer (D+a)“u=e-*D”e%u=v, suppose; .*. w= (D+a)-. Moreover from the equation e~ Dery, = y Deu = 0% , or w= e-~A])~ Nery , Consequently (D+a)-“v=e-“D-“e*v, Hence we infer that the symbolic equation also holds for negative powers of D. 91. In gencral, since

D.Oy =) {D + $’(x)t Uy

we get

we have {D +¢’(x) bee =e POP ehMy, ,

Again {D+ g(a) } ume HD He MDH,

= e— PX) Pp2eb(2 oy, : and in general

{D + ¢’(x) bu =e PO)agh™y, ,

where 7 is an integer. LL From this we conclude that in all interpretable cases we have 4

ii { D+ ¢(2) } uae f(D) Py, .

The results here given have becn generalized and extensively em- ployed in the integration of differential equations by Boole. See Philosophical Transactions, 1844 ; also Boole’s Differential Equa- tions, chapter xvii.

92. We conclude this short account of symbolic methods by applying them to establish one or two well-known formule.

It has been shown alrcady (§ 84) that we may write

(BP — 1) (se) =o (a +h) – (2). G(x) =(AP -1)-1 {p(w h)- oa).

Hence

Multiplying by h, and operating on both sides with the symbol of differentiation D, we get i hD hdl(a)=(ap—z) | H+ m)—9@) }

But, by analogy from § 53, we may write

(az)(#e+”) -9@)) =(1— “2 BP BEDE . -)(o@)-9@)) = He B)— Ha) – 54 porn) —o(@) b+ Te Sg”e+n)— 9a}

B,h4 iv — Aiv(> = give +h)- ol @)} + he,

Hence

h2 (at h)=$(x)+ 4 Joe +h) + way Te Joe +h)- wrk

hs iv iv +755 49 (w+h)-9 (a) phe

B,h2 Hit Tae sae amon e+ h)-mwh + &e.

This result is due to Stirling, and has important applications.

To complete this proof it is necessary to consider the question of the convergency or divergency of this series. On this investiga- tion see Bertrand, Caleul Intégral, Art. 374.

93. Again, in the calculus of finite differences, if we consider the finite symbol of summation = as the inverse to that of finite differ- ences A, we have

1

39(2) =A-14(z) = y—79(@) =1 B,D B,D? -(p ~84+7 3 -feeat:: . ota) =f Heder 39 2) + Fae) – P85 9”a) + be.

— $(z) 1 G Liam 1 vi

C+ [ade 2 4 pa) — 5 Oa) +e OND) « This theorem is due to Euler; the foregoing demonstration was given by Gregory (Camb. Math. Journal, 1837).

On the limits of the remainder after » terms in this series, see Boole’s Finite Differences, pp. 91-93; also Mr J. W. L. Glaisher, in Quarterly Journal of Mathematies, 1872.

In concluding this brief account of symbolic methods we may observe that the general principles of the theory of operations have been studied in a comprehensive manner by Grassmann, and by Hankel, who applied them to the general theory of complex vari- ables and of quaternions. See Grassmann’s Ausdehnungslehre (1862), and Hankel’s Vorlesungen iiber die Complexen Zahlen, 1867. The reader will find Grassmann’s method fully discussed in Hoiiel’s Caleul Infinitésimal, vol. i.

We add a few miscellaneous examples of these methods.

(1) Prove the symbolic equation

x”D’u=2D(aD—-1)(xD-2)... (eD-n+1)u.

(2) Prove that

D*(e% 2”) = (2) Dree) – (8) Prove the symbolic equation in finite differences (E-a)“X=a”ttarg-“X,

wheré E is the symbol ¢? (Gregory, Camb. Math. Jowr., 1837).

(4) If w and p be symbols of operation such that

TP—pT=P,, TPi—PiT=P2, Tp. pot =ps-. prove the following symbolic equation Flm)p= pf (a) + pf (n) + PEI) + +

See Donkin, Camb. and Dub. Math. Jour., 1850. (5) From the preceding the following symbolic equations can be readily deduced.

f (D+)=/D)4+¥ SO)

LX? on mx rMt…

$(D) 1p 2D) , Pz) ‘(D) i(2+ Roy) Se +/OgD TS gD) (Donkin, 7bid.)

(6) Every differcntial equation of the form

{(a+ bart ca? + ...)D*+ (V7 0’a...)D™-14.. nek

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can be transformed into the shape {foaD) +f(@D)a+fa(eD)a?+ .. .bu=X.

(7) Apply the method of opcrations to the proof of Herschel’s expansion for F(e*) (Philosophical Transactions, 1816). If we make @=0 in the equation

Der =e (Oi, we have

J (t)=f(D)e”, where D represents the symbol = : If now f(t) =F(e*), we get Fre’) =F(e?). = F(1+ A)e™

02.22

=F(1+A) bg Ot as

(Boole.)

=F(1) +4F(1+a).0 + GFA a).08 &e. (Gregory, Camb. Math. Jour., 1838.) (8) Prove the equation I(D)p(e*)e* = (E) f®er*, d

where D represents £, and E represents er.

f(g tr)o@) = 0(F + 2)\f0).

(Bronwin, Camb. and Dub. Math. Jour., 1848.) (3) Prove the symbolic equation

(gp)SD)K=/D) oe – AX,

where # is to be regarded as a variable independent of the opera- tion D, but which, after the operations, is to be replaced by 2. (Crofton, Quar. Math. Jour., 1879; also Donkin, Camb. and Dub. Math. Jour., 1850.)

Also

Change of Independent Variable.

94. In the application of the calculus it is often necessary to adopt in our equations new independent variables instead of those originally selected.

Thus, suppose it be required to transform a function of y, x,

dy @ : : dy da : oe ; os , &c., into a function of y, ¢, Pt , ot , « being supposed a function of ¢. Let the functions a : = , &c., be represented by 2’, x”, &c., then we have in all cases du idu |. dy 4 dy dx «x dt’ dx x dt’ dy df1ldy\ 14/1 dy\ 1 dy dy] (alg la a go a ae 0 aa ae Z) a dt € +) ale de wt) dy fly ay ay fips Miedl <= rend te ol ate ie oy_a(® ae a) _4 a(? ae” i) 8 das da zs “a dt zs 5, |e – » ay BY lacy ala tep!” . gee ap 3a'x! 7B ta (a0'”)? — acla!’an ;

and so on for differentials of higher order. If y be taken as the independent variable, we have dy vy

at qe 9» &e.

dy __1 @& dx? da 3° dy?’ dy

dy_ 1 de dx’ dy

Hence

By__1_ | 4 (@e\t_de dhe) dx /da\® dy?} ~ dy dy> ’ dy The formule for the change of the independent variable were given for the first time in the Traité des infiniment petites of L’ Hopital. The general theory of transformation was discussed at considerable extent by Euler in his Cale. Diff. In the case of two independent variables, suppose we are given a= (7, 8), y=V(7, 9). dv_do dex, dv dy , dr dx dr’ dy dr’ dv dudz. dv dy

do dx do‘ dy do-

Then

PyPINTPeESsSIMAL CALCULUS

dv dy dv dy

dv dé dr drdé, dz da dy

Hence

=

Q sS

dy diz_dv da dv de dr dr de. dr do dr de dy © can be deduced, but thcir general values de? dye are too complicated for insertion here. — : A case which commonly arises is in the transformation from rectangular to polar coordinates. ; In this case, we have x=r cos @, y=r sin 6, and

In like manner

aw ge? sin dv a 6s a Ff ’ dv 2? cos dy Ge ar Fae dy d sind d dy sin () 3) Hence F2— (cos 7 rs 55) (cs ao a d’*y 2sincos 6/1 dv dv) = 2, —— po | A ae ont r (¢ de drde sin?@ dy sin?@ d?y

r ar r de

The corresponding value of a is got by substituting = —@ instead

of 6 in the last equation. Hence we easily find du dy dv 1 dv, 1 dv dx dy? drt” r dr’ Pde” 95. Another important casc, which is of extensive application in

geometry, is that of linear transformations. . Let us consider the case of three variables, and suppose

e=aX+bY+ceZ, y=aX+UY+eZ, z=a”X+d”Y+e’Z, dv dv dv __ av then x a7 ta a me’ dv dv, ,,dv, ,,dv ee ee” ag ae’ dv _ dv, ,dv,_ dv az a ¢c dy? c a dy Ce alt ie re (de® ok dy dy dy dy ape 1 Oy eee 2 tion Oe 0% Fovty + 20 acta + 20 Ota ae ngv dy dz

Again, if we ‘suppose zt, yf ; “# to be transformed ‘by a similar sub stitution, 7.¢., xe =aX’+bY’+cZ, y’=a’X’+0’Y’+cZ, &e.,

then, if any function w=¢(z, y, z) transform into ¢,(X, Y, Z), we shall have

Pathe’, ytky, 2+k?)=$(X+kX’’, Y+kY’, Z+kZ’). If these be expanded, and like powers of k at both sides be equated, we have

dd \ fy Fiywt i G (# Ets +¢5)u= (XR tY tz a)

BO a ME, OO (“tvetls S| Same a +o ae du du du

or tat ie &c., are unaltered

by linear transformation. These functions have important geo- metrical relations with the original function. Many applications of these principles will be found in Salmon’s Higher Plane Curves, as also in his Geometry of Threc Dimensions.

A few additional examples are added for illustration. (1) If «=tan 9,

Consequently the functions 2’

EUs Yat ; dx? 1+27 dx” (1+a%)? ~ transforms into d*y qe y=.

(2) If z be a function of x and y, and U=px+qy—-z, prove that when p and q are taken as independent variables we have du au r

ol where p, g, r, s, ¢ denote the partial differential coefficients of z with respect to x and y, of the first and second orders.

(3) In the linear transformations in § 95 the determinant (ad’c”) is called the modulus of transformation, and the transformation is said to be orthogonal when

9? +22 = X24 V2 4 72, In this case the determinant

du Pu du da dady dadz dady dy* dydz dxdz dydz dz is unaltered by the transformation. Jacobians.

96. We now proceed to a short treatment of a remarkable class of determinants first studied by Jacobi (De determinantibus fwne- tionalibus,

Crelle, 1841), in developing important generalizations of the fundamental principles of the differential and integral calculus.

If tH, Uo, Ug, »»- Un be functions of independent variables

X, Vy, Xz… Xn, then the following determinant du, du, ad, duty dary? dai,’ dieg’””* dain dur du, du, Abe dat’ ity? ditg’ dn An dn Un dun da, ? dit, ’ dics ? ditn

was called a functional determinant by Jacobi. Such determinants are now more usually known as Jacobians, a designation introduced by Professor Sylvester, who largely developed their properties, and gave numerous applications of them in higher algebra, as also in curves and surfaces. The preceding determinant is frequently represented by the

abridged notation

CO, Ge 3. «Ald

OG, , “ty… Tp)

The following discussion, for brevity, is limited for the most part to the case of three variables, but it can be readily extended to any number.

97. Altering the notation, we suppose w, v, w to represent func- tions of three independent variables, x, y, 2; then (Bertrand, Liowville’s Jowrnal, 1851), if we attribute to each variable an in- finitely small increment, there will result a corresponding increment for each of the functions. If now we choose arbitrarily a number of different systems of increments, there will result a corresponding number of systems of increments for the functions.

Accordingly, representing the increments of a by dx, dx, dx , and similarly for the other variables, we shall have

du

a ad dyu= aa + z ay + ot 9 du du du Age == 5 chase + ay (+ ag du du du dye dyx + dy dgy + ae dz.

Consequently, by the fundamental rule for the multiplication of determinants, we shall have

du du du du, dy, dw dz, dy, d,z we ay ae daw, dy, dyw|—| dy, day, dyz|x|%% 2% & dx dy dz dw dw dw dyt, dgv, dw dzx, Agy, daz ea ee

Let the first determinant be represented by (A), the second by (B), and the third, or Jacobian, by J, and we get J = That is to say, the Jacobian is the ratio of the determinant of the system of infinitesimal increments of the functions to that of the incre- ments of the variables.

This may be regarded as a generalization of the definition of the derived function in the case of a single variable.

98. Again, when the functions u, v, w are connected by any rela- tion their Jacobian vantshes.

For suppose %, v, w to be connected by an equation

F(u, v, w)=0,

32

for all values of x, y, 2; then, since in this case

a¥F aF dF he a ete we have dF du ,d¥ do ,a¥ dw_, du dx dv dx dwdzx 3 dF du *d¥ dv dF dw* da dg de Ee te ye aF du dF dv d¥ dw_y du dz dv dz dwdz : Consequently, climinating dF dF dF du’ dv’ dw’ we get du du au in Gy” ae dv dv adv Fe dy ? dz =), dw dw dw dz’ dy’ dz

This is an extension of the theorem that when a function of a single variable is constant its derived function is zero. :

The converse of the preceding theorem can be established, viz., if J=0, then the functions w, v, w are no longer independent of each other.

These results are readily extended to any number of variables ; thus, whenever the functions 2%, %, . . . %m are connected by a re- ee = __— Un) 9; and conversely.

H) a9″ ? n

99. Again, if uw, v, w, instead of being given explicitly in terms of x, y, 2 be given implicitly, 7.¢., if they are connected with them by three equations of the form

Fy (2, Ys % Uy w)=0, F(x, y, 2%, 2% w)=0, Fy(x, y, 2, , w)=09, we have, adopting the same notation as before,

lation,

Bia, s Maes Maus Bae + Tay de tt dy dy +, att Gy dyu + Fp + awe 0, or | OT eee ee ee Ta ai yo a =- Tu at ~ ‘ae dy dw 3?

and similar equations for the increments dyv… dyv, &c….,

as also others derived from the functions F,, F;... Hence, as before, – al, dF, petit | daw dy dy Ez ae dF, dF, dF d d. os a) ae © oy OSX ay @ dF, dF, dF; dg ay de) | dy de dF, d¥, dF, du ay dw ae ‘ae Gw F, dF, dF, = — du dv dw x ‘aa rn a . aF, dFy dFy dau dav dyw “au adv dw This result, when generalized, may be written as follows:— diy din du, °°” din A(Uy, Uy + – stn) (1p dFy — aly| , | alg als GP), Cs +. &y) dat, °°” dat, |” \du,”** dim} * ar,’ ae,| lar,” a, da,°*° dit, du,” °° dun

100. We shall next consider the generalization of the element- d¥(u) dF(u) du

du dx

If we suppose ¢,, ¢., $3 to represent functions of w, v, w, while u,v, w are functions of z, y, 2, then, adopting the same notation as before, and representing the determinant

dip, dyde Ayb3 dap, Agha, ahs dsp, Ash, adsh3

ary theorem

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by C, we have by § 97

dp, db, dy

dx dy dz

dp, db, Abs|_C,

de dy dz a

dps dps dbs

de dy dz

and similarly

dp, Ady aby

du dv dw

Tp, dy Ups |_ ©

du dv dw| A’

dps dbs dbs

du dv dw Hence doy db, dby| | db, db, doy) | du du du dx dy dz du dv dw dx dy dz dy dby aby |_| db, Uy dby| | dv do dv dz dy dz du dv dw dx dy dz |” do, dh, Udy) | thy “tts, See ee ee oe dx dy dz du dv dw dc dy dz

Consequently, the Jacobian of ¢), $9, ¢3 with respect to 2, y, z is equal to their Jacobian with respect to u, v, w multiplied by the Jacobian of w, v, w with respect to x, y, 2

This is the required generalization in the case of three variables.

101. Again, if w, v, w be functions of x, y, 2, we may regard x, y, 2 as functions of wu, v, w; and it follows immediately that the Jacobian of w, v, w with respect to x, y, z is the reciprocal of the

| Jacobian of x, y, 2 with respect to w, v, w; 1.6.

du du du dx dx dx de dy dz||du dv dw dv dv dv) | dy ay a|_, dx dy dz du dv dw| °- dw dw dw dz de de We ay ae | |“da ee ae

This, when extended to » variables, is the generalization of the theorem that the derived function of y with respect to x is the inverse of that of x with respect to y.

The preceding demonstrations are readily extended to any num- ber of variables. When generalized for m variables, the results are written in abridged notation thus—

Udy» Pay» ++ Pn) _ Udi» bas +++ bn), Athy y Uy s+ » Un) A(t,» Lqy++ + An) Ally, Ug,~~ + Un) A(t, 5 Ly +++ Bn) ” iy 5 Me so tin) Cy, Gass ax Mn) and 19 Uy hs a> =o Dat, , Lass > Hn) Althy, Uys. . Un) :

102. Again, the Jacobian of any system ean be expressed as & mono- mial. This result can be established as follows :—

Reverting to our original discussion, it is readily seen that of Qn quantities, % , %_, %y.- + Wn, Uy, Uy, Ug, s+ + Un, connected by ” equations, when any are chosen at pleasure the others are capable of determination. Consequently, if ~»-1 of them be supposed to remain invariable, all the others may be regarded as changing simultaneously, and the ratios of their infinitely small increments are determined. Hence we may suppose our ” systems of simultaneous increments attributed as in the following table :—

Gt, dy, ... yen du, 0 O° BO O Gay, ..%s Oe Ag, dt, O 0 0 OO dgtz. ad3ln dg, Age AgUlg 0 @ eS ee a an Ce

The first line indicates that the first system of increments attri- buted to 2, , %... #n are such that w., v3… %n do not change; in the second line we suppose that increments of the second system are such that 2 , wg… Undo not change; and so on.

Again, since for these values the determinants A, B, reduce to their diagonal terms, we have, in this case, by § 97,

Ayu, Age gly Anln oe oe ee ee Also, by what has been stated above, the ratios yy dytlg Agi Antn G12,’ Aghy* Aeit,’ °° Cait”

can cach be determined in this case from the given equations.

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Consequently the Jacobian of our system is the continued pro-

du, diy Attn duet of = oe

In order to calculate oa it is necessary to express 2, as a func- Be

tion of 2 , Uz,-- %n3; and similarly for uw, , 3, &c. ; 103. For example, Ict it be required to find the Jacobian of the system X)=7 cos 0, , X_=P sin 0, COS A, %3=P7 Sin 6, Sin 6, cos 63,

%n-1=7 Sit 0, Sin @,.. . COS On-1; Xn=P sin 0, sin 0)... SiN On-1. Here, squaring and adding, we get ete t .. Fe F =r? We shall employ this instead of the last equation of the system. Hence, adopting the conditions laid down in § 102, we gct

ie -r sin 6,, te —7 sid, om 6, . .. &c., one ; Accordingly, the Jacobian of the system is (-1p-1 7 sin®-19, sin®-29,.. . SiN On-1 Xn = (—1)*-1 7”~~1 gin”~~ 29, sin*-36,.. . . sin @n-a. 104. Again, suppose w,, U2, -.. Un to be the partial derived i of a given function of the variables 7, %, +... nj 1.6, e er a 2, mae The Jacobian becomes aft af af 1 eee af wf af dada, dit, declan af _af af Gatrla, datyllit, «at

Such a determinant is called the Hessian of the function f(a, Xa, ...» Xn), after Hessc, who first introduced such determin- ants into analysis, applying them in many investigations of funda- niental importance in the theory of curves and surfaces.

105. Again, in the Jacobian

UY, Yor ++ Yn) Wei) Ly.

ea” if the functions y,, y.,... are fractions with the samc dcno- minator, ¢.e., such that

oe me aes yy 2 » Ye 2 ? + Yn u ’ we have Axz diy — daz’ 2 BY, Muy du W dan dee? Tay’ Hence , ; uw, OF OF dy) | Uy, % DD Li poet ay a pe ee ae, dey din? Cty (2 » Wy. a) Qn U a ae (aw ae i ee ae es From this, by clemcntary properties of determinants, we get uw, ee uw aa TG dan ant1 HY1 » Yor +» Yn)_| rm , wv 7“ fee! UW a Ea ae 1 E ax. GU), Ty. . . Ln) ae Qin » U = uw lat tee ae, Hence Ww wy . Up ot, CO ee) ea agg “7 a(x, , Lanes Ln) wrt Ct . Akn Axn dtp,

oo

This latter determinant has been denoted La Ca A It possesses interesting properties. For example, if uw, 2,, ... Wn are connected by any homogeneous relation, then

K(u, uy, ... un)=0. This follows from § 98, since the quantities y,, y,,.. this case connectcd by an equation.

It is seen without difficulty that Jacobians and Hessians are covariants. That is, if the functions be transformed by linear sub- stitution ($ 95), the Jacobian of the transformed functions is equal to the original Jacobian multiplied by the modulus of transforma- tion ; and similarly the Hessian of the transformed function is equal to that of the original function multiplied by the square of the modu- lus, It can also be seen that, wlien the transformation is orthogonal, the Jacobian and Hessian are unaltered by the transformation.

- Yn are in

hee lee INTEGRAL CALCULUS.

106. The integral calculus may be said to have taken its origin from the methods employed by Cavalieri, Wallis, and others, for the determination of the quadrature of curves and the cubature of surfaces. These methods, as we have seen, consisted in the division of the required area, or volume, into an indefinite number of thin slices, or ‘‘elements”; and then from the law

connecting their suc- cessive values the sum of all the elements was dctermined—or rather the ‘‘limit” to which that sum approached when the number of elements was indefinitely increased. The processes thus employed were devcloped and reduced to a suitable notation by Newtou and Leibnitz. Thus, adopting the more modern nomenclature, if ¢(x) be a function of 2 which is finite for all values of x between the limits zp and X, and if we suppose the interval X — zy dividcd into n ee Ly —- Ly, Ly- My Xy—Xy,... X—An-1, then, multiplying each element by the corresponding value of the function, 7.e., 2X1 — 2% by P(%), &c., the sum

S = (a — Xp) P(X) + (2-2)O(%,) .- . +(X—ar-1)G(cer-1) has, by elementary algebra, a finite value, which may be repre- sented by (X — x»)p(é), where ¢(£) lies between the greatest and the least value ¢(x) admits of betwcen the limits.

If, now, we suppose the number of elements increased beyond limit, so that 2-2, —2, &c., may be regarded as each becoming indcfinitely small, then ultimately thc value of S attains to a certain limit, which depends only on the form of the function (x), and on the extreme valucs X and a. In this stage, introducing the sym-

bol of integration if and adopting the notation / ¢(x)dz, instead oa)

of S, we write f{ *pla)de—lim. [(a —29)b(a) + (2-2) 62) + –

+ (X= 2n-1) $(an-1) |-=(X -ap)p Say + 0(X – ay)

in which @ lies between 0 and 1. For greater simplicity, it is usual to suppose that the increments L — Xp, %_y— A… X—A%m-1arcallequal. In this case their common

value h is equal to the fraction Medi ; and S becomes

Alita) +Al@y+h) +f (eo +2) +... +f(X- MW) +f(K-h}. Again f fay + 6 (X-2%) represents the mean value of f(z), as x

proceeds by equal infinitesimal increments from the value z, to X. The application of the integral calculus to the solution of questions on mean or

average values is founded on the result here given. Thus, denoting the meau value of ¢(x), between the limits X and

2, by M¢(a), we have = me * pla)dex x a Xo X i

Moz) = 107. If in the definite integral ff * p(ae)dox the upper limit X be x

0

conceived to vary, 2%) remaining constant, the integral itself will vary ; and if we replace X, regarded as variable, by x, the integral may be regarded as a new function, F(x), of 2, determined by the

equation

Ka)— f(x) da= (ex) [a+ em)]

This function vanishes when =z); .*. F(x) =0. Also, by the differential calculus ($ 46) we have

F(x) =(2- x)F | a + O(a — x») | : Consequently $| 2% + 6(%— x) | = F[2 +6(“ – xo) |: Again, making «=a», we get

(2) =F (a) 5 = eh, Se

.

and, since #% may have any value, we have in general

g(2)=F(@).

Accordingly we may write if *F’(a)de= F(X) – F(a) « x

Hence the process of integration is reduced to the determination of a function F(x”) when its derived function F(z) is known. We shall illustrate these preliminary remarks by one or two

examples. Ex. 1. Find the liniit of the sum of the series n n a n+ a ON +o –

when 7 is indefinitely increased.

Let d= > , and the limit of the scries is easily seen to be re-

presented by : oi te d Te Te [ite or is 7 since dn (tan Tae’ Ex, 2. Find the limit of the sum 1 1 i 1

4 ee tH OO …. et Vnt-12 Vn®-2? Vn? -3? when 1 is indefinitely increased.

Vn? = (n= 1)?’

: fee 1 dz T Here the required limit” = =5 c 0 Vi-a 2

108. We might have started from the preceding result as the definition of the integral calculus, and regarded this calculus as the inverse of the differential. Thus, as in the differential calculus we investigate the rules for proceeding from any primitive function F(x) to its derived function F(x), so in the integral calculus our object is the converse, viz., to determine F(x) when F’(z) is given ; or, in the language of Newton, ‘‘to find the fluent of a given fluxion.”

It may be here remarked that it has been shown from geo- metrical considerations, in § 23, that such a function always exists.

In the differential calculus rules have been laid down for the method of determining the differential of any function. There are, however, no direct rules for the inverse process, except by retracing the steps by which the derived has been deduced from the original function.

Accordingly, the integral calculus is based on the differential, and to each result in the differential calculus corresponds another in the integral. Moreover, as F(a) and F(z)+C (where C is any arbitrary quantity that does not vary with x) have the same differential, it follows that to find the general integral of F(x)dx we must add an arbitrary constant to F(z).

109. The following elementary integrals {omitting arbitrary con- stants) are easily arrived at, and are called fundamental integrals, to which all others

that admit of integration in finite terms are ultimately reducible—excluding higher transcendental func- tions :—

x J xdx=-cos2z, f[eoseda=sin a, de =tan @ nd = -cotz cos2x , sin a

dx 2 9 2 dx —— laa”™ =: FS (a+ A/a? +27), dx i a ae e+e a eller [tan log a’ 110. A number of integrals can readily be reduced to one or other

of the above forms. A few elementary cases, such as frequently occur in practice, are here given. We commence with the integral

dx m darae B)~

Hae — See (st:-s (w—a)(zx-B) a-B\2-a == Hf

te dx seth log ra (w-a)(x—-B) a-B x—B (2) More generally, the integral dz a+ bx + cx may be written in the form

vA cdx (cz +b)? + ae —b*’

or, substituting z for cx+0,

dz irs ,

The form of this integral depends on the sign of ac— 0%, If ac—b? >0, we have

f dx rn ib _— cx+b a+ 2bat+ce r/ae—pe Vac — 62°

If ac-B?=0, Ii dx sal ~~1 a+2be~~+ca ca+b°

If ac —b?<0, the integral comes under (1), and we have J- daz a a i ex+b -N B= ac a+2be+ex® 2NVb%-aeE cat+b+V/b —ac-

(3) Again, since

l+ma m b+cx le—mb 1 a+2but+ca® c at+2bu+cx? ¢ a@+2be+cx* we have (l+ma)de _m f(b+cx)dx | le-—mb da a+2ba+ea? ¢ J a+2bu+ cx? ¢ Jat+2ba+

cx” The integral of ee is § log (a+ 2bx +-cx?), and the latter integral has been obtained in (2). (4) Next, to find =. ‘ sin x cos &

Here Ieee 2 -[d(tan®) _ tog (tan 2). sin x cos x / tan x cos2x tan x7

In like manner,

det ge x (5) ion Yo > ce (tan =| : sin oO cos 2

dx. ear Hence we get i =log. tan ($+3) : (6) Again /tan*xde=/sec*a dx —/dxe=tan «-2,

111. The number of independent fundamental formule must ultimately be the samc as the number of independent kinds of functions in analysis. The ordinary clementary functions may be briefly classed as follows :—(1) algebraic functions, powers and roots, such as x”, for fixed numerical values of m, &c. ; (2) trigonometrical functions, sin x, tan w, &c., and their inverse func- tions, circular functions, sin-17, tan-1a, &c. ; (8) exponentials a*, &c., and their inverse functions, logarithms.

Several other transcendental functions have been introduced into analysis, such as elliptic and hyper-elliptic functions, gamma- functions, and others. We propose subsequently to give a short account of the elementary properties of some of these functions.

112. The reduction of an integration to one or more of the pre- ceding elementary forms is usually effected by one or other of the following methods :—(1) transformation to a new variable; (2) integration by parts; (3) decomposition into partial fractions ; (4) successive reduction; (5) rationalization. Examples of these methods will appear in succeeding paragraphs.

113. The method of integration by substitution corresponds to a change of the independent variable. We shall pepe 1% it by a few simple cases.

Ex. 1. Let t= fe , m being a positive integer.

a+ bx)” Assume @+6x=2, and the integral transforms into 1 (2- a)™dz bmtl fo ge *

If (g—a)™ be expanded by the binomial theorem, each term can be separately integrated.

dae Ex. 2 5 7 Reece er Let nta=— , and the integral transforms into _f- dz Val +2242’

where @ =c, b’=b-ca, ¢ =a—2batcer.

Ex, 3. u=f—2 P

(a+ cas*)#

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Let z= – , and we get Se 2 Ves +c)? alaz®+e)* a(a+cx)3 dx

a ® u= ff + 2ba: + ea)t , clda

tHe — 6? 4-(ea+b)?}3 j

Let cx+b=2, and it transforms into the preceding integral ; hence

Here

oe (ac — b?)(a+ Qba+ ca) Jd7B Bie i ; (a! +c’a2)(a + ca2)3 Let (a-+ca?)t=xz, then da dz

(+cat e— 2’

and the integral transforms into

dz (we—ea)—-a’e”

Uw (= .

MV (a-x)(a= B) Let 2=a sin*@+ 6 cos?@, and we get a! \/ (a x)(« = B) dx

ae ean), /2—8 SFR — / 28. da a? — x2

unf% ,/%. a2dx _ xdx @A/ (a? — aP)(a?— 6?) (a? — 2?) (a? — B) ”

If we make at in the former, and x?=y in the latter, they

Ex. 6.

2d0 ,

Ex. 7.

Here du=

each reduce to the preceding example. Ex, 8.

Here uU=

ee, (a + b) cos” + (a – b) sin’

uf sce dur -sf, dk a+b+(a—b) tane® Setht+(a—det

2

where z=tan = : This integral is a circular or a logarithmic function, according as

a@ >, or, < 8, (1) Let a > b, and suppose b=a cos a, then we have

pas. Se = Z tan-1(ton $ tan >) ‘ is cos? 5 + 2 sin’ asi 4 2

(2) If a

cose sin, tan =

d aime hr ei u log 2 2 a : a sin * cos? -2 sin? % cos eo — f= dan 2

2 2

a-2 _ cos —— bsina at+x% 08 — (3) If a=, the value of the integral is i tan es – a 2

_ 114. The substitution of an imaginary expression for a constant in an integral is often useful in evaluating integrals. For example,

if in the equation Jf iene a

we substitute! a+78 for a, it becomes

TO ee ey } We shall throughout represent the imaginary symbol “ —1 by #, according to

the usual notation.

do

{= (cos Be + isin Br)dxae (008 Be +? sin Ax) a+27p a? + p? . Hence, equating the real and also the imaginary parts, we get

AX, 7 [8 008 Be di 8 (a cos mek sin 62) ao 62

J” sin Br dxal (2 Sin Bx — B cos Br) a’ +p? These results can be easily veri-

?

omitting the arbitrary constants. fied

ed. 115. The method of integration by parts depends on the follow- ing equation, whieh is deduced immediately from the relation ad(urv) =udv + vdu — Judv=wv— frdu. Hence the determination of the former integral is reduced to that of the latter, and vice versa. #zx, 1. To find JS tan ta dz. Here

fran dx=2 tant — [BE ma tan ~1¢—4 log (1+2°). Ex. 2. Next, to find

Ja” log x da. Let ” =] = 3 w= log a, v ele then

n Sig eg! fe (aide J log ae kee pan n+1 lage m+1/)° Ex. 3. Again, to find J log (at Nit 0*)dx. — se Of ie Jove (2 Va2 + a)da =a: sinniail V2 + a?) Vig =a log (2+ Va? +a) — Vat +a®. Jog x)‘da . Slog x)rda=a(log x) – nfllog «)”-3 da =a(log x)” — naflog a)”-1 + n(n 1)/(log a)”? dx.

Accordingly, by successive applications of this formula, tlie in- tegral can be found whenever x is a positive integer. If n be a

Ex, 4

negative integer, the intcgral finally depends on Sei , a form to be subsequently considered. ? Bz. 5. JSemlog x)“da. This is at once reduccd to the preceding by making z=a”11, in © fone*dee. This is immediately reducible to Ex. 4 by makingc*=z. It can also be deduced directly, since freien mf eaxym-ldy, a a Ex. 7. ede = a. 7. (I+ap x Ans, 116. In general, if _, dy du d*-lv du d™-%v nun, On te de dat aad dant + TOW we have

ou ae Sayed dntly |= dx=@-+(—1)” foe :

This result is readily proved by successive applications of the method of integration by parts, or can at once be verified by differentiation. As an example, let us consider the integral

JS F(x)c*da ,

where F(z) represents a rational integer algcbraic function of x, of the degree 7.

ax qnti Let u=F(x), ana v= , then

36

This result can be also readily obtained by aid of the symbolic theorem of § 90, thus,

D-1. e%F(x)=e%(D +a) “1 F(z) eat Dez

D”

- +(-I ee FO, the remaining terms being neglected since D”t1F(z)=0. This result plainly coincides with that previously found.

More generally, if F(x, e%, ¢**, . . e®) represents a rational integer function of a, ¢%, c&*,... the integral of

Bia, ee, . . . Bde

can be determined. For, this function, being composed of products of integer positive powers of x, c%*, &c., will consist of a number of terms of the form Aa™claten= . . . or Agmellatnbt+ .- -)*, each of which can be integrated by the preceding method.

Again the form

SJ F@, log «dex,

S¥F@, edz,

by making x=c*, and consequently, when F represents an integer

algebraic function, is integrable by the method considered above. 117. We next proceed to give a brief account of the treat-

ment of the integral /L\ ae, in which f(z) and $(«) are rational ax

algebraic functions of x.

This class of integrals early engaged the attention of mathema- ticlans. For example, Leibnitz and John Bernoulli, in the Acta Eruditorum (1702 and 1703), showed that such integrals depended on the method of partial Egos et The processes there given were simplificd and generalized by Euler (Zntroductio in Analysin Infint- toruwm, 1748).

When the degree of f(x) is not less than that of ¢(x), the ex-

pression ae, can by division be reduced to an integer along with

is reducible to

a fractional part ; we may, therefore, suppose that we have reduced the degree of f(x) to less than that of p(x). Then, a being a simple root of # (x)=0, we may assume (x) =(x— @)x(x), where x(x) is not

divisible by «—a. Iftwe now make Se)__A 4A) gz) x-a x(x)’ Se) _Ax(a)+@- A(z) p(x) (w-a)x(~)” Sle)= ome Ria x) -— Ax(a Si()= __ In order that the second member should be an integer expression, f(x) - Ax(x) must be divisible by x-a; hence we get Fe) _F | x(a) (a) In like manner, if 2 be a second simple root of ¢(x)=0, and consequently a root of x(a)=0, we may makc x(x)=(a%— 6)}(a). Hence

we have

This gives

we get fe _ B_, fla) , x(x) 2-6 * able) * from which it follows that pe. ¢’(b)

Finally if a, 0,... 7 represent all the roots of ¢(z)=0, no two of

which are equal, we shall have PO tet teat vie Aga)? P80 iO fee sae (w —a) +2 Hose Bien +f log (e 1).

In the general case of multiple roots, we may suppose

p(x) =(«—a)*(e- bP… (@-D, and assume

A Fb Bins As .. +—

g(@) w-a (w-ayP ” (x —«a)* Joa By Be +L + aa Meo (ae Oye (a — b)8 L L, Ly fea eee) esta gp age

by ordinary

imaginary roots.

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The constants A,, A,... B,, Ba…

tegrable.

Le+M (x —a)?+ p?

Also, for 2 pairs of equal imaginary roots, we have additional terms of the form

L,z+M, L3v+M, Lyet+Mn [eoeep’ [e-aprey’ ” Te-aeay

Each of these expressions consists of two parts, one of which can be

immediately integrated. For example, (Ine+Mn)de _ Lnlx—a)dx (Lna+ M)dx

{(@—a)+p7}” {(x —a)?+ py {(x —a)?+ pay” ;

the former can be at once found ; the consideration of the latter

class of expressions is postponed for the present.

Many integrals of the form here considered may be determined by a transformation, without the employment of the method of

partial fractions. For example,

ar~lele 102″ + Dhar” + €

is at once reduced to an elementary form by making «=z.

dx Sg —a)™(a — 6)”

(1 = pe Se

gm

dx JS @-1′

then z°da=4zdz, and we get

5 202 xe JE fF 4z+4 log (z-1)=-3 +4 log (x3—1).

de Jes

Again

is reduced to depend on

x-a x—b Ex. 1. To find

by making z=

assume 7=2? ;

Ex. 2. To find

Let me. then de 1 as

2 ie n 8 dx 1 dz 1 aie = = —_§l i. _ Ae = x(a + ba”) uJ a2+b na °6 (; + i ax

0. 8. oe, Eee

= ae ba)

Let 2 ==, and we get

dae edz z b = – 4 f= – a tS +b Jem 5 az+b Bat Bat beget +2)

1 b at bx ee Baa Bal og (o)

A ax J = 2x? cos 0+21°

dx -f. dic I— 2x? cos 0+ J (1+ 2x cos 464)(1 — 2x cos 4042”)

Ex, 4. To find

Here

a (x+2 cos $6)dx 1 (2-2 cos 40)dx ~Fcos 40) 142xcos$0+a* 4 cos 40/1
~~2xcosh0+2” a! 1+ 2x cos $0+2? ~ 8 cos 40 log [95 cos 460+ iL x+cos $6 x~~

~~— cos $0 ss 4 sin 40 Le sin 10 oe sin 10 1 1422 cos $0427 1 _, 2x sin 46 = og : : tan~~! ——= . 8 cos 40° 1-2QxcossO+a2* 4 sin 36 1-2 Ex. 5. Find the integral of dx a + 2bas? + cat when ac>b?. It is easily secn from the last that its value may be written 1 Na+ Qua + 02Vle 1 OaN/b + 2

eo — — = ee ft ~~1 — _ _~~ ; 8xVa °8 n/a — 2no +326 4N/a(b + 1) an NaN

L, . . -Ly, can be determined

algebraic methods, and each term is immediately in- The preceding is called the method of integration by decomposition into partial fractions.

The method herc given applies also to the case where $(x)=0 has In that case it is usually, however, simpler to employ a somewhat different treatment. Thus, to a pair of imagin- ary roots at7f corresponds a partial fraction of the form

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118. Several general classes of integrals can be easily redueed by a transformation to depend on those of the preceeding article. For example, the integral

S fler*da

reduces to fe) = , by making e**=2; and, accordingly, it can

where

be integrated whenever f(z) is a rational algebraic fnnetion of z. Again, if we take tan }xz=z, we get

p Qn _1-# _ 2dz eee tre ie

and, the expression f(sin x, eos x)dz,

f 22 1-2%\ 2dz l+2° 142] 1420

Consequently, whenever f(sin , eos x) is a rational function, the integration of /(sin x, eos x)dz is reducible by the method of partial fractions.

119. Functions of this latter elass are, however, usually more readily integrated by other processes. Thus, when (sin xz, cos x) is a rational and integer function, its integration depends on that of the sum of a number of expressions of the form sins cos” dz. As a nnmber of other forms are readily reducible to this type, it 1s proposed to devote a short space to its discussion here.

In the first place it should be observed that whenever m or is an odd integer, the expression sin™z cos”x dx can be immediately integrated. For, if we suppose n=2r+1, the integral transforms into

transforms into

Jemi-#yrdz ,

by making z=sinz. Hence, as r is by hypothesis a positive integer, (1—22)r ean be expanded in a finite number of terms, and the integral thus immediately obtained.

Again, if m+n be an even negative integer, the expression can be readily integrated ; for, by assuming z=tan 2, we get

men _ 1 favre cos”xdz =f il +23) Bethe

This integral ean be readily obtained by expansion.

120. When neither of these methods is applicable it is usual to find the integral of sin’x eos”xdx by the method of successive re- duetion.

The formule of reduction ean be easily obtained by the method of integration by parts ; thus

5 C c 2-1 ; favre eos”xdar =i. cos”-ly sin™axd(sin x) -[a d(sin™+1z) m+

eos*-ly sinmtle =n—1 ‘ =f sin™ 2 COR Pode. m+1 m+1

Again, fsin™+2z cos*-%adx = fsin™x(1— cos x) eos”-2ada =fsin™z cos”-’adx — fsinx eos”ada .

Substituting in the former equation, and transposing the latter integral to the other side of the equation, we get

Pa sin™x eos”adx = sinm riz cost te w—1 m+n M+, Henee, when 7 is positive, the integral of sin™x eos”zdx depends on that of sin eos”-22dx. The corresponding formule in which the degree of sin « is redueed ean be immediately found. It should be noted that these formule of reduetion are perfectly general, and hold whether m and v be positive or negative, integer or fractional. Accordingly, ehanging the sign of m, onr first

sin”z eos” -2xda.

equation may be written thus :— eos” Osta Gua COs” = 22 sinx (m —-1)sm™—2 m-1 Singer

121. These formule of reduction, as well as many others, ean be readily established by differentiation. For example, sinee

O) pa ‘ as (sin™x eos”) =m sin”~lz ecos?+1z —n sin™ tz cost-ly

=nv sin™-1z eos”-1z— (m+) sin” ax eos*-1x,

the integration of the expression sin”+!x cos”-ladz depends on that of sin™-1x eos”-lzdz ; and similarly in other eases. It may be noted that the integral (§ 118)

ve dx {(x- a? + B?}”

is at oncereduced to the elass here considered by makingz—-a=ftané, |

when it beeomes

eos’”-2ed9 ,

1

pen-l

od

To find © JS tan de . Here (f tan”xdx—=/ tan*-%x(sece%x — 1)dx = ee – tan ~2ardoe nm—1 _tan”-lx _ tan”-z ke ~ m-1 n-38 . Next, let us consider the integral dx (acosx+bsin x)” Let tan a= , and we get

b a cos +b sin x=(a? 0?) sin (2). Hence, making 2+a=2, the integral transforms into

(a2402) ®

122. In many applications the results depend on integrals of

the form here discussed when taken between the limits 0 and 7 ° Such definite integrals are easily found when the indices m and n are positive integers,

T Commencing with the simple case of 2 sin”adxz, we have,

0

since sin x cos*-1z vanishes for both limits,

= ee 2 costadaa —— 2 eos*-2xdx. 0 nm Jo

By successive applications of this formula the definite integral in question ean be always found when » is a positive integer; its form, however, depends on whether the index 7 is even or odd.

(1) Suppose 2 even, and equal to 27,

Tv 2 eos**xdx= 2r-1 0 2r Jo

and, accordingly, by successive applications, we get Tv La comedic 2 «jets alien 1) er

0

TT then 2 eos**-2xdax ,

ge te hc be | eG 2 * (2) If m be odd, and equal to 2r+1, we get in like manner

T = 2.4.6 2r 7 Qr-+1 = . 8310518. y lee jer cae

It is evident that in all eases

acy aE, y 2 sin”adz = wf 2 eosada –

0 0

(8) In like manner, we have T

T ae 5 lo TO sae 2 sin’”x eos”xda = mai 2 sin™z cos”-2xdax – 0 ae 0

+n

As in the former ease, the value of this definite integral depends on whether the indices are odd or even. First suppose 2 odd, and equal 27 +1,

Tv Tv

as 2Qr re then 2 sins cos’? Hadz =—~—— 2 sin™x cos*”-lxzdz.

0 m+2r+1 fo pete Hence gf 2 sin™x eos*tadx

0

Qr(2r-2)... 2

T a O° + (2r+m+1)(2r+m—-1)... maa sin™® cos xa

a ek ee ~(m+1)(m+8).. .(m+2r+1)” Next let » be even, and equal to 27, then

T

us yy 2 sin2x eos**zdz = 2 2 sin? cos?” -2axdz . 0 2m+r) Jo Henee, as before, ; ees wee), FS 2 os om 2, = een ee 2 sin?™xdx i Onn Cm)... (iia Ob) 0/6 et SM (nl 8. 5S alfm—1), ee ee ni oe (Qm+2r)° 2

When m and n are both fractional these definite integrals are

38

reducible to Eulerian integrals,—funetions of which a short diseus- sion will be subsequently given.

The following examples are given for the purpose of illustrating the preceding results.

1

Ex, 1. J (1 – x?)“da , where m is an integer. 9.4.6… (2m) ae ee Ge wv ar Oe Ex. 2. JA 2 costa sintade . ane. 44 44 A pay

° de iin, 3. i (@+a2yr’ where 7 is au integer.

0

We Bo Bo oo (Psd) ii : 8: oopn-1° 2.4.6… (Qn—2)

Tv Ex. 4. Ve 2 cos”+2”x cos nx dx .

0

(n+ 2r)(n+2r-1)..-(n+r+1) Le PA 8 aes T 3

Ex. 5. To deduce Wallis’s valuc for by aid of the definite integrals considered in this article.

wv Ans. indir

When 1 is positive, we have, for all values of x between 0 and

sin2”-ly> sin’ > sin?”+1z ; accordingly,

Tv ‘. ris Tv re 2 gin2-lyeda > vi. 2 sinadz > x ca

0 0 0

1.3.5…(Qm-1) rj… 2.4.6… (Ym—2) a i oe 2 a. . ae Ob, Ae Ghat Monee 3.5.7… (2m+1)’

but when m is indefinitely increased the latter fractions tend to oe oat and, consequently, we have the well-known formula of

Wallis, viz. :— en ee ee ae a mee tr | 123. As a further example of the method of successive reduction, we shall consider the integral

wh em=1(1 —a)”-Tdas .

Here, integrating by parts, we have

ye pit epsiggeeea! = 2) tid ff m(1 —a)”- 2dr, m mM

and

Again, Sf (1 — aya f m1 — 22)” 2d -f: 2-11 — a)”,

Substituting, and transposing, we get

fr OF ine a

mt+tn-1

n—-1

a aa m-1/1 — @)\n-2 m+n—i1f ~ (aan ar:

By successive applications of this relation the proposed integral can be found whenever 1 is a positive integer. It can be determined in like manner when #m is a positive integer. x™(a+bx)“dx readily admits of similar treatment.

The preceding is a simple case of the integration of what are styled

The integral of

P binomial differentials, z.c., differcntials of the form ae™(au + bas) dx, — in which m, 7, p, q represent any numbers, positive or negative. We propose to determine in what cascs such differentials can be immediately integrated by a transformation.

2-4

b pt

1

Assume a+ ba” =2%, then n—(Ji , and we get m-ntl

P ees -1 eo Ti xa tba) tde= a z (at-a) ™ dz.

The latter can be immedately integrated when mere

is an integer. n

P Again, substituting a for x, the expression «(a +ba”)% dz be-

P Be comes—z “4 * (aug +b)%dz. This can be integrated whenever m+1 ra It can be shown that when neither of these conditions is fulfilled the integral of the binomial differential cannot be expressed except by infinite series.

P is an integer.

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124. Irrational Functions.—We shall next briefly consider the method of proceeding in the case of irrational expressions.

Suppose F(z, \/X)dzx to represent the expression whose integration is sought, where F is a rational algebraic function, and X is a rational integer polynomial of any degree in 2. Here, since even powers of 4/X are rational, and odd powers contain 4/X as a factor, it is plain that F(z, \/X) can be always reduced to the form

P+QVX

P+ Q’VX’ where P, Q, 1”, Q’ are rational algebraic functions of zw Again, if this be multiplied by P’— Q’VX, it is reducible to the form

MENVX, ortom 2% ,

VX where M and N are rational functions. Consequently integrals of the proposed form are reducible in general to two parts, of which one is rational, and the other is of the form Sz) dx p(x) VX It can be shown that, when X contains powers of x beyond the second, such integrals cannot be reduced to any of the elementary forms given at the commencement; and, accordingly, they depend on higher transcendental functions. When X is a cubic or a bi- quadratic, such integrals are reducible to elliptic functions, of which a short account shall be given below. When X is a polynomial of higher degree, the integrals are usually styled hyper-clliptic integrals. ‘They were first treated of in a gencral manner by Abel. 125. We shall at present consider only the case where X is a qua- dratic, of the form a+2bx+cx*%, The integral

J(@) die P(X) a+ Qba + cx?

can be rendered rational in diffcrent ways. (1) First, let the roots of a+2ba+cx?=0 be real, and suppose a+2bx+ cx? =c(x— a) (x- B).

a— B2?

If c be positive, we assume #-a=(x—f)2*, or w= a) then VX=(a- B)Ne p= , and dz= aad ? dx 2 dz Ne Hence the transformed expression is a rational function of z. If c be negative, we make nuit 2 , and the transfornied ex-

pression is rational, in like manner.

When the roots a and are imaginary this method of trans- formation introduces imaginary forms into our results. In such cases it is usually more advantageous to adopt a different treat: ment.

For instance, if we assuine

a+ be +cxt=2-2Ve,

we get a+ Qba= 2? —Qu2V/e, H = a enee a 2(d + A/c) : dx dz

an d ——————— a Na+ 2Qba+ca? b+2N/c. This substitution consequently furnishes a rational function in z.

Again, when c is negative the expression becomes rational by the assumption

Jat 2bx + cx =/a+az. A+ 2uz+ v2″

N+ Qy’e + v’e? u,v, v’ satisfy the equations we— Ay = a, Nv + Av! — Quy! = QW, w’2—a’y’=c, it can be shown without difficulty that dx =] 2d Na+ 2x + ca A +2Qple+v’e” aud accordingly the function

F(@) de P(%) Na+ hx + ca?

becomes rational by this transformation.

This last is a particular case of the general method adopted by Jacobi (Fundamenta nova theoriz functionwm cllipticarum) for the transformation of elliptic integrals.

126. The class of infegrals here discussed admits also of another mode of treatment.

In general, if we substitute for x, where A, A’, pn,

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Thus it can be shown that, if F(z) is an integer rational function of the degree , then F(a)dax = f- da Nat2atcn® S Na+ 2betca in which a is a constant, and ¢() is at most of the degree 2 —1 in x. For, if we differentiate the expression am/a + Qbar + exe? with respect to x, we readily obtain, after the integration of both sides, and the substitution of X for a+ 2bx +2, em teas Audet Hi

Henee, making m=0, 1, 2,3… Im a it is easily seen a

that / ae is expressible in terms of ae and of an algebraic

fi p(a)Nat 2be +cx*,

expression of the form 9(@) /X, where ¢(x) is of the degree n—-1 at highest. ‘ Again, by the method of partial fractions the integral Je) dee P(x) Na+ he + cx reduces to terms such as the preceding, along with terms of the form da:

(x – a)“Vat Oba + cx? If in this latter we substitute = for e—a, it reduces to the form

an-ldz JK 2B24 C2’ in which A=c, B= —b-ca, C=a+ 2ba+ ca’.

127. Integrals of the form here diseussed may also be treated by the method of indeterminate coefficients. Thus, writing X for a+2ba+cx2, and differentiating the equation at the commencement of §126, we get F(z) a (x) (b + cx)

—_ = —_— + fi Xe 4+——_—>—_ 3

cee VX or F(x) =at¢’(x)(a+ 26a + cx) + p(a)(b + cx). Hence, by equating coefficients of like powers of x, the value of a and of the coefficients in $(x) ean be determined.

Yor example, let it be proposed to find

eda MV a + 2ba + ca” :

Writing A+ 2ua + vx? for p(x), we get a8 = a+ 2(a + Qbx + cxt?)(w+ ve) + (A+ Qpee + va*)(b + cx),

from which we deduce

i 5b 5b? 2a v=o? etry od =a ta’ 128. Again, if F denote a rational funetion, the integral S¥(a, Nax+b, Va’e+0)dx

is reducible to the preceding type, by making Vax+d=y. For this gives

b 5 a= 5-(Ba0 – 50”).

dant, Jxeqve , [UP wo, & a a and the proposed becomes of the form

Sty, NY dy, in which Y is of the second degree in y.

129, Having given a sketch of the various methods of reduction of integrals to the forms usually regarded as elementary, we proceed to introduce further transcendental integrals by considering the

integral “5 oro Dae , in which f(z) and ¢(z) are rational algebraic.

functions of x. By the method of partial fractions we may write

Sz) _ a a FO -Fe) + 325 + apts

or, making a slight ehange in the eonstants,

J) _ Fa) + 3A(x2-a)-} $3Ay2(0—a)-1+ : + 8da(EY @-a)

an

G +2Q ay ’

$(2) da =F(x)+3(A4+A,D+A,D?+ ... +AnD*)(x2-a)-}, d ae The method of integrating F(x)c”*da has been already considered (§$ 116). The integral of the remainder depends on that of the ex-

pression e@da(A+A,D+A,D?..

where D stands for the symbol

. + AnD”\(a@-a)-}.

Tix. 4)

oo

If the symbolie expression A+A,D+A,D*... +AnD” be repre- omni by /(D), this integral, in symbolic notation, is represented Nf

or, by §89,

D-lerzf(D)(x – a)-},

D-AD-n)—— .

Again if f(—), or A~ Ayn +Ayn?— ... + Ann”, be represented by N, we have

dN aan

fD-n)=N- 7G, Dt ged? – ee ee AnDs

dN dN

Hence, observing that N, a

.. are independent of 2,

we have F 1 N ~lenz ae bh)! fe — n D aD), D N aD * sag Ge AND)

re le ane ot e-a dn x-a dn dx\x-a al

ad n-1 ent ee) ee)! Consequently, the class of integrals here considered depends ulti-

mately on the integral BEE 2a

If we make x—a=log z, this integral reduces to the form (§ 115,

te log 2°

It is impossible to represent this latter integral, in a finite form, in terms of z. It is accordingly regarded as a function swt generis, and is usually styled the logarithmic integral, and sometimes Sold- ner’s integral. Its expression in the form of a series will be de- duced in a subsequent section.

130. Next, if we replace » by 72, where 7 stands for V -1,

enx

xr—-—a

cn fe) becomes (cos nx+7 sin 2x) f@) ;

(2) (2)

and by an analogons treatinent it cam be preved that integrals of the forms

cos Nx f(x) dx and / sin nx Se) dat

(2) (2)

depend on the forms

os 2 dz i Fs fe ade ong [= 20. z z

Finally, denoting by F(sin x, cos x) an integer polynomial in sin 2 and cos 2, it ean be shown that the integral

A) Hj VE. mie) F(sin x, cos x)dx

can be reduced to the same fundamental forms. For the poly- nomial F(sim a, eos z) ean be transformed into a linear function of

sines and cosines of multiples of 2 Again, decomposing oe ; : : re by the method of partial fractions, the integral in question can be made to depend on integrals of the form sin ma dx cos mx dx (a — antl (@—a)r*)’

and consequently on

J dx sin mx (< a) i and dx cos ma al a ; dx] (w-ay dz] (x-«@)

These integrals, by the method of §116, depend on

(a) sim mae (4) e0s Me ar ae. ae v-a GMs A

and, consequently, on the forms

{= 2 dz f= 2 dz — and / ——— – z z

131. These latter integrals also are now regarded as primary fanctions in analysis, and are incapable of representation in terms of z except by infinite series.

These functions have been largely treated of by mathematicians, more especially by Schlémileh (Cree, vol. xxxiii.), by whom they were styled the sinc-integral and the cosine-integral. Also, intro- ducing a slight madification, the logarithmic integral can be written

in the form We e~%dz

40

In this latter shape it is called the exponential integral. Hence, adopting Schlomilch's notation, we write

Si wmf SE af clea A 0 z 0 U Ci ef s oe a= f poo (a) du, oO & loa) U mie — dz

-2% -1i . ig e7 ue Kie=/ -[ithe [oe] & [os] Ww

a

pare: . x dz Again, if Liz=/ ——, we have 0 log z& Li e*=EKiz.

An interesting and valuable historical account of these tran- sceudental functions is given by Mr J. W. L. Glaisher in the Trans- actions of the Royal Society, 1870, of which want of spaee prevents our giving a fuller account. Mr Glaisher has also, in the same memoir, given tables of the numerical values of these transcen- dental functions for a number of different arguments.

It may be added that the logarithmic integral was discussed, and tabulated by Soldner in 1809.

Nunierous integrals have been reduced to depend on the fore- going transcendents. For example, in the great tables of Bierens de Haan (Nowvelles tables d'intégrales définies, Leyden, 1867) nearly 450 forms are shown to be reducible to one or other of the functions considered. in this section.

What has been said here will help to exhibit the way in which the necessity for the introduction of new transcendental functions arises as the calculus is developed, and to show that around each new transcendent, whole classes of integrals are grouped.

132. 'The very limited number of differentials which can be inte- grated in a finite form by aid of the ordinary functions makes it an interesting and inrportant question to find whether the integral of any proposed differential expression is capable of being represented by such functions or not. This problem appears to have been first discussed in a general manner by Abcl. Our limits admit only of a statement of one or two of the gencral results thus arrived at. The reader will find a tolerably full account of the treatment of the question in Bertrand's Calewl Intégral, pp. 89-110.

'Abel's fundamental theorem may be stated as follows. Suppose y to be an algebraic function of the variable x, that is, a function defined by a rational cquation F(x, y)=0, which is of the nth de- gree in y ; then, if the integral fydx be also an algebraic function of x, it must be of the form

Syde =Pyt+ Py + re + &c. + Peas" -1, in which P,, P,, Pz. – - Pn-1 are rational functions of x. The functions Po, P}. . . . can be investigated by the method of in- determinate coefficients, which, in the great majority of cases, will show the impossibility of an algebraic mtegral.

In the particular case where y= @/X, X denoting a rational func- tion of x, it has been shown by Liouville, as a consequence of Abel's

theorem, that, if the integral Je dx "/X be algebraic, it must be of the form P,"s/X, in which P, is a rational algebraic function of «. Again, denoting X by a and substituting T for M"~3N, if the

integral Mdz

it is of the form , where © is another polynomial.

WF If the cquation ee Nt WT be differentiated, we see that the highest degree of x in © must be one greater than that in M. Hence, by the method of indeterminate coefficients the integral, if it is algebraic, can be found ; or elsc it can be shown to be impossible under such a form. — if t, wu, v,.- . be algebraic functions of x, the differential

19)

t+A log w+ B log v+&c., where A, B, Care constants, is evidently algebraic. The converse theorem was investigated by Abel, viz., when y is algebraic, to find when /ydx can be expressed by algebraic and logarithmic functions. He showed that if

Syde=t+ A log ut B log v+C log w+k&e.,

then the functions ¢, w, v,... are capable of being expressed as integer functions of y. Abel's theorem was extended by Liouville, who started from sup- posing Syda=F (x, et, c7, ae Ge. . =);

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where w, %, w, &c., are algebraic functions of x. He proved that, when y is algebraic, the expression for its integral cannot contain an exponential, such as ¢. Also that a logarithmic function, such as log w, cannot enter into the integral except in a linear form with a constant coefficient.

Pd. In particular, it is shown by Abel that whenever TE is ex-

pressible explicitly, it must be of the form

Pda at B/R y+ 5\/R a A OO ea t+ _+&e., VR NVR 8 a- BVR 7-5/R

in which P and R arc integral polynomial functions of 2.

2 +B log

Definite Integrals.

133. The investigations have thus far been chiefly limited to what are styled indefinite integrals. It is plain from §107 that, when- ever the expression (a) remains finite between the limits of inte- gration, its definite integral, taken between those limits, can be de-

terinined whenever its indefinite integral is known.

For instance, since x+COS a tan-1 (————_ ’ sin a

of ax

1+ 2%

cosat+z? sina we have

Je da pS! ge ot _ gage CET aa 9 1+2ecosatx sina sin a ~ sinal 2sing Also (Ex. 8, § 118), dx 2 a ie ——$<——____— = € =e! a = . a acosx sina = (tan 2 — z | Accordingly & nee 3 9 l+cosacos% sina da 7 or ; ictus Sie , when £<1.

From this we readily get

A = da _ = | @ cosa +O? sin’e 2ab 134. As definite integrals have frequently to be considered in

which we regard one or both of the limits as infinite, it is necessary to determine whether the equation

x Zz F’(a)dx = F(X) — F(x)

holds for infinite limits. Suppose when X becomes infinitely great that F(x) approaches a finite limit, represented by F(o), then

fm, [eden xis, | FB) – Fle) | =Fo)—Fla).

Conscqueutly the formula holds in this case. In like manner if, when x becomes—o, F(x tends to value F(— 0), we have

a finite

Te *P’(a)de= F(X) SE (=),

$0

Also y F’(x)dz=F(o)-F(- ©).

Hence, when F’(x) remains finite between the limits, and F(a) has determinate values for both limits, the equation

x Pi F’(a)da = F(x) — F(x») always holds. For cxample, in the integral

dx 1 ee LTS ool ff +a? a me (4), when z=, tan-! (=) has for its limit = , and when v= – ©,

tau-1 = has for limit -F ; hence

ve (e.) dx 0 i

Also, from the integrals given in § 114, we get

y= ete ff eee – e-* cos 0% AX= Ca as i A= a 0 aun = e+e

de a+a2 Qa’

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Again, in Ex. 4, § 118, we have : Ve F (0)

ac—b2 ’

b a er , F(o)= 2 dx aod m4 (a+2bu+cx?)? act+bat In like manner, from Ex. 5, § 117, we get

SD ae WS , where h=2(a/ac+b) . 0 4 a

It may be noted that if F(x) approaches a finite value F(oo) as x approaches oo the derived function F’(x) must vanish at the same time.

135. As a further cxample, let us consider the definite integral

1

Ke (x) X nile,

where ¢(x) is an arbitrary polynomial of the degree n-1 in, and Xn is the coefficient of a” in the expansion of (1— 2az+a”)}. It has been shown (§ 56) that il d

n ae a a (z) eT). Again, by the method of § 116, we have

| i‘ ase) (%)et-1p-0+(-19/ daa? 1)” (3) 9@):

morcover, (zy ¢(x)=0 by hypothesis, and when the limits

+1 and-1 are substituted each term in © vanishes separately ;

hence we have m i o(x)Xpdx=0. i

From this it is readily seen that so long as m and n are unequal

we have

+1

4 KeenmO ,

~1

136. There are many integrals which are capable of being deter- mined between certain definite limits without any previous know- ledge of the corresponding indefinite integral, and even in cases where the consideration of the indefinite integral would lead to the introduction ofa higher transcendental function. Examples of this class will be met with further on.

137. Next, reverting to our original definition (§ 106), we have

Je Heer bir {24 ~ 2) fe) + (24 23) Hem). + (K ~ 2-2) fln-a)f

in which f(x) is supposed to be continuous between the limits 2, and X. If now A represents the least and B the greatest value of F(x) between these limits, it is plain that

(3% — Xo) Jaq) + (%q – 4) flay) + . – . +(X-an-1) f(en-1) is greater than (X —«,)A, and less than (X —2)B.

54

Hence Ie Ja)da=(X -a)M,

0

where M>A and

_ Again, when f(x) is a continuous function, in passing from one limit to the other it varies so as always to lie between the values A and B. Consequently for some value é, of x, we must have /(¢)=M, where é lies between 2, and X, i.c., & is of the form 2) +6(X —2,), where 6 is positive and less than unity. Hence, whenever f(x) is finite and continuous between the limits x) and X, we have

x Jy, Fe)da= (Xm) f {04+ 0X ~m)}

In like manner it is shown that

J, Kewaydamt {a+ 9X -a)} J” gaye,

provided f(x) and ¢(x) are finite and continuous between the limits % and X, and (x) has always the same sign between these limits.

For example, let ¢(x) = : , and write /(~) instead of JX) then x-a

“—-a X~a ’

x J,, Fevda=(§—a) f(¢) log ==”

in which we suppose that X~a, x —a have the same sign, and & lies between x and X.

In particular, if a=0, we have

a x J, flerda = Efe) tog * Xo xX 138. Taylors Theorem.—The method of definite integrals fur- nishes us with a simple demonstration of Taylor’s series. For, if in the equation

WE+D) {OY faa

41

we substitute X+~z for x, we get h AX+h)-f(X) ah f’(X+h-2)de.

0

Integrating by parts, we have

fre +h-2da=af”(X+h—2) +fa”& +h-2)dz; hence he, f(X +h) -f(X) =hf”(X) 7 f”(X+h-a)ede.

0 :

Again,

“P(X +h ayeda = p(x) 4 f pe th—2 ff Kt hase Te IO +f Rta) and so on.

Hence we get finally

a re ums…

a 3s | | + | Fen | i P (X) Le an ldz

() .

sf PK h-aT Accordingly the remainder, R», after x terms, in Taylor’s series, is represented by the definite integral

q h arf, SR +h 2eerde

This value of R, can be identificd with that given in § 46, for by § 137 we have U . hn

=> gn-) a — foley oe’ where U lies between the greatest and least values of f(“X +h —2) between the limits 0 and A for z.

Hence, since any value of z between 0 and h may be represented by (1- 6)k, where 6> 0 and <1, we have

hn Rn= cial 6h) .

139. Thus far the function f(x) under the sign of integration has been supposed to have a finite value for all values of « between the limits of integration.

Let the indefinite integral of /(x)dx be denoted by F(x), and sup- pose f(x)=0o when «=a, where a lies between the limits X aud x; then, decomposing the integral into two parts, we have

Sade = 2M. [fades 2 [Hee

= [lim. (2) : Fe) | ne Eo F(x) | ;

Accordingly, whenever F(a) has a finite and determinate value, we have “ I (x)dae = F(X) — F(a).

%

This result also holds if f(x) becomes infinite at one of the limits, provided F(x) is finite and determinate at the same time.

For example, the expression becomes infinite

a— x)(e— when x=a, and also when x=8; but (Ex. 6, § 118) F(a)=q,

F(p)=0, Oar , ——_” B /(a-«)(x-B)

140, The complete discussion of the exceptional cascs in definite integrals is due to Cauchy. We purpose here to give a bricf account of his method.

Suppose that the function /(x) becomes infinite for the particular values of x represented by x}, %,... %n, lying between the limits of integration ; then we have

ay Fader [Aevlew. ref fade

en of | a OU eit: Sh see, . Xo Ly+vy

age:

where e denotes an infinitely small quantity, and py, 71, Ma, Yor + + Yn, are positive constants, but arbitrary. In addition, if the limits X and x become +o and—o, we

write ONO ES 6

[i fevte=tio. | [Ppa fT.

Be A +f” sacl, In-+vne in which p, v are new positive arbitrary constants. In all eases, the general values of the definite integrals

frie f Te flee,

deduced from the preeeding equations, depend on the form of the funetion f(x), and may be finite and determinate, or infinite, or in- determinate, depending on the values attributed to the arbitrary constants pf, ¥, My Vins + + May Yn

Whenever the integrals become indeterminate, if each of the eon- stants p, ¥).+ + Hn Yn, be made unity, the corresponding values of

A * ade and ih ae become : a

Him. [71″ Hae) dee + ee wee We i f(a)ae: | Xo Xy+e awn+e

and

i [fy teres [fee aM fi goa :

These are called, by Cauchy, the principal values of the definite integrals : 7 Z “f(x)dx and ff pe S(x)dz , a) —oO

in the ease in question. Again, the definite integral

of “fade,

if f(x) be finite when #=a, is infinitely small if the difference between the limits @ and 0 is an evaneseent quantity.

But, if, f(z) become infinitely great at the same time, the value of the definite integral may be finite, or even infinite. In the latter eases the integral is ealled a singular definite integral.

For instanee, if f(a,)=00, the integral

vi mf ae)de ’ @y4—€

where e is an infinitesimal, is of this class. Its value may be represented by the method of § 137 ; for, if f; denote the limit of (x —2,) f(a) when x=2, we have

Uy — hye

i Sade=f, log wy –

1-4

Ute all

f(x)da=f, log—.

H+} Lal

Again, if the limits a and 6 each beeome infinite, while preserving

the same sign, we have another class of singular definite integrals, such as

Similarly

(“pede f° fede, G mie

in which e is eonsidered evanescent as before. In this, as in the former ease, if a(x) tend to a limiting value /, when « is infinitely great, we shall have

(jedan log (+), vr: en ~ pe

v €

141. We shall illustrate the preceding by a few simple examples commeneing with the definite integral

WA 2, ©

Here the funetion = beeomes infinite when x=0, and we have % dx -[” dx +f xX dau —%y & —29 xz 0 x SJ —Xo x ye az x a: ta) eva vo S = logs,» f oof te tog (HE) 5 ee ve Jz, © Sa #* Xx

but

general value is log ES + log tg

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F —pe dx xX dx OX (£) . — “1 = log— + 1 Je hha lim. |i af 4! cons og .

, x 3 ; Aecordingly, the principal value of vie & is log (}) , and its —X 0

The latter is perfectly arbitrary

and indeterminate. ar Again, each of the singular definite integrals

1

ae a. ae sas wes i #

is equal to log cs v

x = X d Next vA oti, ie a ef =| . —Xo x J —Xo x ve x —K im ae ital ey eZ © He ® “yee

Consequently, the prineipal value and the general value of the de- finite integral are both infinite in this case. In like manuer

Xide 4. 1 al il i he ae t(Ja-gatzaom):

Accordingly, the general value of the integral is infinite, while its principal value is 4

wh XP)” Next let us consider the singular definite integral

ss | ae i

€

(x — a)de (@—aP +e

oped log {(e-a)?+ 2} .

If we substitute the proposed limits, and afterwards make e=0,

Here

we readily find the value of the proposed to be log 1_-an inde- : Vv

terminate quantity, as v is by hypothesis supposed to be arbitrary. Likewise

+> (~—a)de _}; ve (x—a)de bt f,, eay RO) BA ee log a when e=0. Be

oO

Accordingly the general value of

+0

Shes

(x-a)dx (w-a)? +2?

| is perfectly arbitrary, while its prineipal value is zero.

In like manner, sinee

dx 1 _1/“2-a ean ee i 3)>

we find the general and also the principal value of

Saori oo (e-ayte® BC

Again, it readily follows from the last result that, when ac>b?, the value of the definite integral

Je, da a rid Le O+ 2b +c? S ae Re 142. Next let us consider the definite integral eo af C= a, v wv

“tim, (# $a2) = B02) ap uw im. S Fa

Here

aie ae: But Pi, He P42) gop a4 we (2)d2 | making aw=z. a z

ve ave

1 b ve b(ba) gy — f ve Pl2)dz x x vs a)

w=lim. f a! Held? tim, p(z)dz : b Zz 2

— ave pe

where e is infinitely small.

Also

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The limit of the latter integral, as already seen, is 4(0) log ($) 3

Algo, whencver $(z) tends to a definite limiting value o(co) when z is infinite, we have

fit to = $1) 106 (4).

pe ; ° p(ax)— (bz) 7, foo) — & ove He ae a) $(0)} log (i) ’

in this case. a Again, whenever SI, we Oe is zero, we have z BE i. Blac) — H{bet) (755 (0) log (+) 0 x a

In the latter form this result is called Frullani’s theorem, having been communicated by Frullani to Plana in 1821, and subsequently published in Mem. del. Soc. Ital., 1828. ; e

These results, though limited as to their generality, contain many particular integrals under them.

For example, since e-** becomes 0 when 2=oo, and 1 when

x2=0, we have GE pete pek vA ia eg log 2. 0 x a

Again, when x= 0, tan-!(ax) becomes 0; and when x=, Consequently we have

- tan“lax—tan~le, F146 & 0 “<

tm-le7 = .

2

x 2 Also, from the periodic character of cos 2, it is readily seen

that a Hh HE COSZ 4,

8. %

BE

vanishes wlieu «=0.

© cos ax —cos ba a AAS dl pee rc ah | = lo re ae a lal

Hence

In like manner we have

i log (m +ne-*) — log (m + ne~ >) ae =log(1 : =) log a 0 x n b

Frullani's theorem has attracted considerable attention recently, and many remarkable applications, both in single and multiple in- tegrals, have been given by Mr Elliott, Mr Leudesdorf, and others, a a the Proceedings of the London Mathematical Society 1876,

1877, 1878.

143, The consideration of singular definite integrals furnishes a method for the calculation of the general value of a definite integral when its principal value is known.

Thus, if A be the general value and B the principal value of

».¢ J J\x)dx, where f(x) is supposed to become infinite for the values S xy

%, Ug… Xn Ofw, then the difference A-B, from the preceding investigation, will consist of the sum of the singular definite inte-

grals Ty — pe a +6 eo "Aa)de, ee. . @—€ +3 Consequently if A, fo… fn a8 before, denote the limiting values of

(w-ay)f(x), (e-a%)f(z), . .

when w=2,, 2=2,..

» (%- en) f(x),

. L=Xn, respectively, we shall have

a= Deef, log 24 flog M24… +fp lop &. Vy Vo Yn

DG Accordingly, in order that the definite integral ‘valk J(x)dz should

. . . e a have a finite and determinate value it is necessary that the quantities}, fo. . + Jn should each be evanescent. hen the limits X and Y are +0 and —o, to the value of

A-B here given we must add the term / log * , provided a(x), as Vv x becomes infinitely great, tends to a definite limiting value /.

144. For example, if Fay be a rational algebraic function, then

‘ gia Ce ; : the integral ay,ace has a finite and determinate value. pro- ~~o F(z) : vided (1) the equation F(x)=0 has uo real roots, and (2) the de~~

gree of x in the denominator F(x) excecds that of the numerator

J(z) by two at least. For the former condition implies that a does not become infinite for any real finite value of x, and it follows

from the latter condition that af(z) becomes evanescent when x

F(z)

becomes infinite. ee In order to find the value of fe + —\da in this case, we sup- —o F(z)

pose

A(x-a)+B

(2 – a)? +B? to represent the partial fraction corresponding to a pair of conjugate roots a7 of the equation F(z)=0; then, as we have shown that the general and the principal values of the definite intcgral arc the sanie in this case, we may write

Le Fpeenin J

po € A(a—-a)+B a xf, e— aah

But we have already seen that

ae eo ye © (e-alde _ ana /” _—_— a _1 (#%-a)?+0? 4 (c-a)?+b2 6 €

=

Consequently + © f(a) tag

2 (ie, Bay, a piegit ss BD)

where B,, 0,, By, 02… Ba, bn represcnt the constants corre- sponding to the 7 pairs of imaginary roots in the equation F(a) =0. As an example, let us consider the definite integral

+0 grmda ri o io’ where m and 7 are positive integers, of which 7 is the greater.

By aid of the theory of equations it can be shown without difficulty that

are respectively equal to

sin `sin 36 sin (2n – 1)` ale | ai n a where — Migr | T

27

Consequently we have

72 = [sin 6 sin30+ ... + sin(2n-1)@] n

1

oo oe eT alle 2d

‘ +a 2m dan v Accordingly Rf « i+en™ n sin 2t1 ; 2n

” Sl

Hence it follows immediately that

[Zs T

| ih. oes a aa . 9 ie On sin “+1,

2

By a corresponding investigation it can be shown that Pads oe 2nm+1 5 «1 a ae a a These results are readily transformed into

On,a-1 Cn ee ee ae 7 ea — 1d PA =——— , and dt =r cot an, 0 l+a sinaw 0 1l-z

where a is less than unity, A few simple examples are added.

GO 1x us 1) To show that f _—” ___; Eyal Sto uf (l= 28)(a2 + gar) emmal to Dorp)’

44

(2) If 2 be less than unity, the equations

Mane ip 2

0 247 2 a2 ‘1 n -n%

a” —2x ut

J 2ni dx =— tan a?

can be readily established. (3) Ifa<-, by a simple transformation it can be shown that

RO 6,

us Ka

(4) Ifa+b<-, we can prove the equation

Ls

(5) To find the valuc of

2.cos 5 cos =

cos a+ cosb ~

0 (e% 4 ¢— 9%) (0? 4 c— 2) ”

Assume

log (1-a8)= -log (1+ y‘), aide yPdy . » a oan oF

1-# i+ (as)

‘ a da eo dy

0

(l—a)t Jy I+y ‘L (6) In like manner ri

0

ut

ci 3°

da

wv

I (e gam)yan

sider some of the general methods of It is obvious that the value of the

A ‘ S(x)dxc

is independent of the variable x, and is a function of the limits a and }, as also of any constant parameters contained in the function f(x). We proceed

to show that a definite integral may be differen- tiated, and also integrated, with respect to any such parameter.

. 7g 5 on sin’ — Qn

145. We now propose to con evaluating definite integrals. definite integral

Differentiation wnder the Sign of Integration.

146. Suppose the function f(z) to contain a constant parameter a; t.¢., let f(w)=$(a, a); then, denoting the definite integral by 2,

we have u- f° p(x, ade. a

Also, let the limits a and b be independent of a; then, if Aw de- note the change in w arising from the change Aa in a, we get

6

au= { b(z, a+ Aa) — $(2, a) de, uf” p(x, a+ Aa) — o(x, a) dx. Aa Ja Aa
Hence, passing to the limit,

du_ dpe, a) da, -f da =

This principle is called differentiation under the sign of inte- gration, and, by aid of it, from any known integral a number of others can in general be determined by differentiation with respect to the constants contained in the integral.

For example, if we differentiate the equation

Be U 7 e-%e=— , 0 a ad 1 y c~*eda=—z 5 0 a

and, by ” successive differentiations, fo cedan 2.3….2)

0

qrH Again, if the equation

ih – —o

we get

dx

vin at+2bet+ce r/ace—B®

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be differentiated with respect to a, b, c respectively, we have

y dx TC —o y; <

—o

(a+ 2be+ cx)? 2(ac— 02/2 i pie xdx ra

y™ (a+ 2bx+ ca)? 2(ac — b?)3 .

xdx ae (a+2be+cx*)? 2(ae— B28’

Hence i (a! + 2b’x + c’s”) dae _ aac’ +a’e — 2bb’) ee)

(a+2be+cx*)? —=—«—& ae — B®) 8

A number of other definite integrals can be immediately deduced from these by successive differentiation.

Again, since ia on ~ 2 ‘ 0 (a+ 2ba-+ cx)? hat’

where h=Vac+b, we get, by differentiation,

2 de __ah=d

pa (a+ 2ba + cx2)8 ~ neat’ a ada <_. e

yj. (a+ 2ba+ cxt?)i ~ Bhat’ 2 ada 1

0 (a+2be+cx)t Bh?

In like manner, if the equation dx 7

us

2

A @ cose+ pf? sina 2a be differentiated with respect to a and B respectively, we get

gs 4 2 costada

=

— —=— a2 cos’x + 8? sin*x)?

aes 4032p’

ay eA 2 sin2xdx at 0 (a? cos’a+ B* sin*x)? 4ap?

Hence, by addition, dx a(a2 + B*)

sm

2

A (a? cos’x-+ B® sin?x)? — 4a8p ; From these other definite integrals can be readily found by further differentiation.

147, When the limits are functions of the parameter a, a de- finite integral admits of differentiation in like manner. For, let Aa, Ab be the changes in the limits corresponding to the increment Aain a, then

b+Ab

AU -f, atAa

b =f° {ple a+ 0) O(a, a} de fr” $e, a aaa a-+-Aa = p(x, a+Aa)da.

Hence, proceeding to the limit, we get

d ’ dd(a, db di Bef? BO) diet $0, 0) Fg — OH 8)

(x, a+ Aa)dx ~ [$e ade

Integration under the Sign of Integration.

148, We shall next consider the corresponding process called in- tegration wnder the sign of inicgration.

Suppose ° p(x, a)dx to be represented by wu, then a 3 b ys [Soe, a)da Jef (x, a)da=u , b Pb [[occ ada |dw= fuda,

the same limits for a being taken in both integrals. Suppose a, and ay to represent the limiting values of a, then the preceding result may be written

LLL ve sialon [fot oti]

or

or, adopting the usual notation,

x Loe a)dadae =, C a p(x, a)deeda .

Sueh expressions are called double integrals, and the result just es- tablished is equivalent to the statement that in a double integration, when the limits are independent one of the other, we may effect the integrations in either order without altering the result. ‘ It is easily seen that the preceeding statement does not hold if

iition dla), a a =e pees infinttocwiiliin he assigned limits of integration. : ; ‘

By aid of this principle, from a definite integral involving constant parameters we ean often obtain others by the method of integration with respeet to one of its parameters.

(1) For example, if the integral

—ax b & 0 = —__ rj é cos bx dx 2452

be integrated with respect to a between the limits a and B, we get Oo yn at _ Ba 24. 2 } “9s iyi ee one

P+ a> (2) If the same equation be integrated with respect to b between the limits a and 0, we get

re , eae SO te —tan-1& , 0 x a On making a=0 in this, it becomes

»” gin ax T ——_ d#=—, 0 × 2

provided a is positive. (3) Again, if the definite integral (§ 183) | OC ee: i l+xeosx /[—72 be integrated with respect to «, between the limits 0 and sin a, we get ™ log (1+sin a cos 2) 0 Cos x (4) Next, if the equation

i 1 yo 0″ 3 = ——— 0 n+1 be integrated with respect to x between the limits a and B, we get

1 Be 1 a = 0″ e=loe Lt8 cA log x Gees l+a°

(5) To find the value of the integral

ee) 2 uf é dz.

0

If zx be substituted for x, we have, since the value of the integral plainly remains unaltered,

ey un ze” * da ,

0

ie.) ° — 2 4 —22 ff € Ee Tp aie ris

Hence, integrating with respect to z between the limits 0 and 0,

we have of? — 2 1+22) © a e cate =uff e ° dz=uv,

0 /0 0

v2) = 22(1-++-22) al 1 hh? a= 8 ea 2 dz T = ae | ee w af lpe@? ul ra — we 2 — Consequently w=4,/z ; ie, ff e* da=4n/n.

149. In many eases an unknown integral can be reduced to an elementary form by differentiation under the sign of integration.

For example, let om “ft | Eee), . 0 we/l—-2

du a: da da Jo (1+0°x®)/1 — a

un-5f = ae qua w= 5 Var 2 og (@++/1+4?).

dx=a.

Again,

——s J1+a?’

eat ne

(Ex. 5, § 118).

No eonstant is added, since «~=0 when a=0. _ 150. A modification of this method of determining definite integrals is founded on the transformation of a simple integral into a double integral, and the inversion of the order of integration.

(1) For example, when z is positive, we have

1 ie 2)

x

wae cD fea} aie ¥ a= fl sin ax anf e~tydy 0 × 0 /0 = & = ° = 2 ady a =f dy [e-7¥sin ax dv= f e+e 3? (2) Next, to find the value of a > i a+bsin@\ do u=f 8 \ a-bsine /sind’ Here, from the elementary equation

l Omndx —,—s5» Wherem>n, m? — nx

e-mudy ,

(§ 148).

Mm +2 lee ——_ = m-n Jo

\ at+bsing\ /t 2absinedz’ . “8\ a-bsind) Jy ax? sin®6 ’

s/t dade – 1 ee a u=2ad iy a? — bx? sin?@ °

Hence, inverting the order of integration, we get ($ 133)

1 dx ‘ b u= af a sin ~~1 | 5 0 A/a? —~~ bx a Similarly we get

us en — e = = 2 vt ius (see sin dom AE

we get

a—bsin 6 Ex. 3. Again, by aid of the equation

the Daeg -{ absin Oda _ a Jo @+0%? sin26 ’

it is readily seen that wT “2 2 pe i, 2 ‘tan -1 Ping 6 jsin Ee PN i lad 4 0 a 2 b

151. Lagrange’s Theorem.—That Lagrange’s series ($ 56) can be established by the integral caleulus, and its remainder after any number of terms exhibited in the form of a definite integral, was shown by M. Popoff (Comptes rendus, 1861). His demonstration has been transformed into a simple shape by M. Zolotareff, in the following manner.

Let z=x+y¢(z), and suppose the definite integral

a {yp(a) + 2% – u}” F(u)du x represented by sy, then we get by differentiation dsn & n- , if a nf fyp(u) +a—w} TE ‘(u)dw— y” { p(x) } F(z)

ain — 9 { G@)}“F( ). If we make n=1, we have

89 = YP(K)E (se) + o ;

8

but $9 = F(z) — F(x) ;

F)=F(2) +yH(e)P@) +B .

In like manner, if n=2, we get

25 = { oa) Fe) 4S, ds — y ad 277 a as a er [o(a)PI’(a) +5 Consequently ” y oa 7 i ds, F(2)= Fa) 99@)P@) 25 S| {o@PP@)]+>5 GP-

3

ern = 2 {6 @)}PP(o)+ 5S

alg f= (2) Lt $(x)} F(z) | ee ,

and so on. Hence we deduee finally

A6 F@)=Fe)+ Lo@r@) +25 Z(e@preo]

ees ale) f { yp(w) +2- u}rk(w)du 5

This is Lagrange’s series,—in which the remainder after » terms is exhibited in the form

ie = Jee {yo(u)+a-u }nF (udu .

Diseontinuous Integrals.

152. The intcgral calculus furnishes many examples of discon- tinuous functions. For cxample

Dot 20 4% Dot a Je sin ax cos bx a af sin (a+ b) 1, = af sin (a b)e ae : 0 a& 0 × 0 oe When a+b anda} are both positive, each of the latter integrals

Hence we have—

~ sin ax cos bx ee % Ness EG ae 0 × 2 :

OCs : and when a

0

(§ 148) is equal to = :

when a> 6,

x

If a=, the value of the integral becomes is 9%

Here we have an example of a function of two variables a and 8, changing its value suddenly when 6, varying in a continuous manner, becomes equal to or greater than a. This singularity has been in- geniously utilized for the purpose of obtaining the values of certain definite integrals. For example, let

0 a; sin @& ene n a cos bry, . 0 ax

then, since «=0 when a is less than }, and u=t when a>b, we

fo a) eo whe we-edam = ff e- “da =—~e-*, 0 2 Sb 2

fe.) ie) G e~@sin or a penny Ces ae et 0 JSo x 2

But Of erasin ot dtm Fs ($ 184) ;

eos bx oe =e”. as

Again, considering 6 as variable,

Ue A i 0 0 /S0 × 0 x

Hence, if b

ee ee : if b>a, we have _ sin ax sin CB a He, 0 ae 2

have

ai : Consequently Se dz is equal to multiplied by the

0

smaller of the numbers a and 0. Again, let us consider the definite integral

ve (a—6 cos x)dx «a — 2ab cos 2+ 07° of (a—bcosxjde 1 1 a? — 6% a?— 2ab cos x+ 0? 2a + G2—2ab =| dz

“21S. ae 2a 2a / a®—2ab cosxt+b?

Again (Ex. 8, § 118),

Ti ax ee ee”); a?—2abcosx+l? a?— B an a—b mG}?

a?— b? dx ey 2a J w—2abcosxt+h? a Accordingly, if a? >6?,

Here we have

a? 2 dex – 2a Jy a®—2abcosx+b? 2a”

If a?

“I dx T 3a Jy a-2ab cos a+0? ~ 2a

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Consequently, when a? – 0? >0, ff Ge (fy a-Qabcoset+h a when a? ~~0?<0, . j~~ (a—b cos x)da – «a? —2ad cos x+ 0? i and when a=8,

ei ™ a(1—cos x)dx_ 1 a 9 2a%(1-cosx) 2a/o 2a

The comparison of these three cases shows that if b be supposed to vary in a continuous manner from a value less than a to a value greater than a, the integral

Ve (a —b cos x)dx 0 a? —2ab cos «+ 0?

will assume for b=a—h, a, a+h the valucs = ‘ eS » 0.

It is accordingly a discontinuous function.

Eulerian Integrals. 153. The following definite integrals,

1 o i gm-1l(1—2)”~~ldx , ra e~~*er-lda ,

0 0

were first studied, under a modified form, by Euler, who devoted several memoirs to the investigation of their propertics. They were afterwards fully discussed by Legendre, by whom they were styled Eulerian integrals of the first and second species respectively. The latter integral is now regarded as the fundamental one, to which the other is reducible, as shall be presently shown.

In the case where 7 is an integer we plainly have

fe 2] J e-*am-lde=1.2.38… m=|n. A a The integral is in all cases a function of 2; and, when 7 is frac- tional, it is os as a distinct transcendental function. It was distinguished by the symbol I by Legendre, thus :—

fee) Tn=f a

0

This is now usually called the Gamma-Funetion, but sometimes, however, the Factorial Junction, a nae suggested by Arbogast, and subsequently adopted by Kramp and others.

Moreover, since (Ex. 6, § 115),

a oO y e-tutda= nf e-%a”-lda ,

0 0

we have I’(n+1)=2I’(n).

This may be taken as the fundamental property of gamma- functions, and by aid of it the calculation of all such functions is reduced to the case where the parameter n is comprised between any two consecutive integers. The values of I’(n), or rather of log T(n), were tabulated to twelve decimal places by Legendre in his Traité des fonetions elliptiques, tome 2, ch. 16, corresponding to values of » increasing by intervals of ‘001 between the integers 1 and 2.

It may be remarked that 1(1)=1, T(0)=0, I(-n) =o, x being an integer. For negative values of , not being integers, the function has a finite value.

The first Eulerian integral,

1

y xm-W1 —x)”-lda,

0

is evidently a function of its two parameters, m and x. Following Binet we shall represent the integral by the notation B(m, 7). It is readily seen that

nl 1 A am-1(1— zyldenf er 1 — 2)™-1dae ,

Bim, 2)= B(n, m).

Its value, when either sm or 7 is a positive integer, can be immedi- =i found. For, suppose » a positive integer, then (§ 128) we ave

; m —1/ 1 m—-1 = nol : f® (1-2) dem enn ft am-1(1 — x)”~2dar.

By successive applications we get 1 (2 —1)(m – 2) ul 1 le oll ee eee – 1 an“ — 2) ig (m+n—-1)\(m+n—-2)... aay, i = W2.3…(2=7) m(m+1)\(m+2)... (m+n—1)~

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The corresponding result when m is an integer is obtained by interchanging the letters m and n. ;

We now proceed to show that B(m, 2) can in all cases be expressed in gamma-functions. For if we substitute zx for x in the equation

ie.) rin)=f Ca eas,

0

io 2) T(n)=f e-Fzhget lax , we rae

lee) T(njertem tn e-Alta)jymtn-lyn-ldy ,

0

ie.) a ea rim) f taeda ff e~Alta)gmtn-lyn-Idadz .

0 0 /0 –

Let 2(1+x)=y, and we get

ce 1 ——_ T(m+n) sallta)yomtn-ldy— = Yym+n—-Wdyy — —\ re ee, Oe

we get

Hence

T(m)I(n)_ f° _a—lde

a Pmen Th Oar

x Next let ery oa gal | dé

and ; Trapp / u”-1(1— 2)”-1du= Bim, n),

e T(m)T (2) ae T(m+n) °

This fundamental relation is due to Euler. Again, if m=1-7, we get from the preecding © »n-1 T(n)T(1 -2)= Os ge ie tabard -[Tee gin a’

If »=4, this becomes I(4)=V7. This result agrees with § 148, for, if we write 2? for 2,

a i) ra) etn -tdem of” e7**dz,

0 0

(154. Many definite integrals are reducible to gamma-funetions, of which a few elementary cases are here given. (1) To express the definite integral

T

He sin”-19 cos”-1led@

in gamma-funetions. et z=sin?@, and the integral transforms into

a fat (1 a)? dnt r(a)r(4) s

(2) To find the value of

1

Xf x1 —an)\rdax.

0

Let =z, and the transformed integral is

m+1 le aieel | 1) Tet) oA gn) (1-2)“dem——”* 2 ___, n J P(r+1+™3)

(§ 144).

(8) If in the last r= ~ 4, we get _ p{m pate (8) n

(4) uf (a — x)m(a — B)ndax. Let z=6+(a-)z, and we readily find

fn — Ayetnet Lm 1a 1) U=(a—pyeterl Teena)

(5) To prove the equations

[oe] . e- %%ym-1 aos ba: ge EO) €0s 20 5 0 (a? +b?) fe.2) % e~ ety —Isin be da= alee sin 70 ; 0 (a? + b?)2

where @=tan-1 (+) : a

In the equation

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let a— ib be substituted for a, and we get ee — T(n) T(n)(a+ib) – ax ~~i] = = . j e~~ (cos ba +7 sin bax)a—ldx Gi (+e) If b=a tan @, we have

a b : (P+ BRI OS ap 8ne foo) 3 7. e-%(eos bu +7 sin bax)x”-Ida= re (a? + b%)3

Hence the proposed equations are obtained by equating the real and imaginary parts respeetively.

co (6) e eos bx an ldn —™) eos ;

~/0

(eos nO+7 sin 78).

on 2 [oa] it sin bx og Tdar ae E() sin ica 0 bn 2}

These follow from the preeeding by making »=0. ; A more rigorous demonstration of this and of the preceding example will be found in Serret’s Calewl intégral, pp. 194-198. (7) Find the value of i (=) n

v=n(2)e(2)r(2)-

Here, since

sin— it is easily seen that r-1 w= : Lr ace 2m . (n-1)r sin — sin —... sin ——————- n n n

But it can be shown, by trigonometry, that in ~ sin a sin Gs he ek aS a ca

2-1

1 2 wa ex) Tey ley ae (8) Prove that Tv

je eos”@ cos m6 dd =—~ T(n+1)

0

n+1 gn r (™e”41)r jo)

155. We next proceed to show that I’(7) admits of being exhibited as the limit of the product of an infinite number of faetors, a form whieh was adopted by Gauss as the definition of the function.

If in the equation

[oo T(x) ~~f e~~%yn-ldxr

we make e-*=z, we get

T(2) -{(log =e : 0 z

i But (§ 68, Ex. 9) log = is the limit of w(1 – 2) when # increases beyond limit.

hence

1 1

T(n)=lim. nf 1-2”)”-laz (n)=lim. 4 ( )

=lim. p” ye —y)”~~\dy, making z~~=y”.

0

‘ eater Oe” .sie

T(n)=lim. py”. =

at nr. (m+1)... (n+p) when p is inereased indefinitely. As an application of this definition of I’(m) suppose »+/ and n—lrespectively substituted for m, and we readily obtain

» (§ 123),

” .. ix =7- sin +

by a well-known trigonometrical relation. If we make x»=1, this gives

L ee mee «COE ate

156. Again, if we make x=az, we get

a 1 Jf, Kan ayidnm amen ff gm-l(] —2)”-ldz

T(m)T(2) T’(m +2) °

, as before.

= qmtn -1

48

This result cau be readily represented as a theorem in double integration, as follows. If the double integral S fem 1y\deedy as be taken for all positive values of z and y subject to the condition x+y<4a, its value is represented by T(m)0'(n)

I’(m+n+1) For, considering x as constant, and integrating with respect to y between the limits 0 and a—2, the value of the double integral becomes

gntn,

1 ” nl in, — m — bas ee (a -2)“dx, or —; qmtn _Tm)I(n) és

I(m+n+1)

157. The preceding result, first given by Euler, was generalized by Dirichlet (Liowvtlle’s Jowrnal, 1839), and extended to a large class of multiple integrals by the following’ theorem. ©

Let v= fff . ..al-lym-in-1,, , dxdydz…,

in which the variables x, y, 2, &c., are always positive, and subject only to the condition atyte…

: Va ffir dad: ;

subject to the foregoing conditions. Integrating with respect to z, considering x and y constants,

we get . v= +f fea -a—y)“dxdy ,

in which x and y are positive, and subject to the condition x+y<1. If we next integrate with respect to y, between the limits 0 and 1-2, we have

1% Tm) I(n + 1) m~1/] — ww —y"dy = (1 — g)rtr sah v Re Aan ee Ta +2+1) °

ts,

Accordingly _— Tim)’(a) 1 ~Mintn+1i/o (ma) TDM a+n+1) _ DT n)0(n)

“Tim+n+1) Vd+mtnt+1 Tl+m+n+1)”

158, The preceding theorem when extendcd to variables can be stated somewhat more generally, viz., if

v-/fj … a-lym-ign-1, . , dxdydz…

where x, y, 2 are always positive and subject to the condition

(5) +B) (Ye

.. 2, %7,++. being positive quantities, then we shall

1 m n TY — (=) (2)... yaub”y” set a) qd ie é He M1+s+2+5…) ie aie Tu

This readily follows from the preceding by making

eee ap eee e pe (soe. (Boy. (Sere

In the case of three variables this theorem contains a large num- ber of results relative to volumes, centres of gravity, moments of inertia, &c.

The remarkable clegance and generality of Dirichlet’s theorem immediately attracted notice, and his results were speedily extended by Liouville, Catalan, Leslie Ellis, and other matheimaticians of distinction. Of the results thus established we shall content our- selves with giving Liouville’s extension of Dirichlet’s theorem (Liowville’s Journal, 1839).

x-1(1 — x) tde

a, B, ¥, – have

If Ve ff. ct-ryp tae… f (Z)+(4y ae dadydz…, –

where 2, /, z are always positive and subject to the condition

Caeee)

Uh o

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a, B, p, 9, being always positive, as before, then will

yawn. ane TPS 4

elle Lym

ee og ail wp 4 Tujdu . r(f45… PrP ¢

This follows without difficulty from the preceding by assuming

(2) =2 : (E)‘H, ..., and then making 2’+7/+2’.... =u.‘ a A few examples are added for illustration. : (1) The value of f/f da, dity daz… den; where 2%... am are subject to the condition : er+ arta… tan

n R Te

(2) The value of

NW detyCltty. . . Oitm ie. ee

extended to all positive values of the variables for which the expression is real, is.

n+1 Ue

a(t : r(**5**) 7 ak-Vy -kextydady

extended to all positive values for which x+y

(3) The value of

Ee oe >

1-2? – y?\4 dady| —— 2 Lol are)

for all real values of the expression, x and y being positive, is a fay al a= 1)
,

St oP -1y9-1z”- ded ydz extended to all positive values of x, y, z contained within the ellipsoid

(4) The value of

(5) The value of

a 2 22

mt petal £ ve oS | wre ™(5)2(4)”(5) 1s —_~? i ZZ <<..\

(6) Prove that Ly + AyWy . . » +$An%n P iz ee — “dar dey. . « Aan 1 as

when extended to all values subject 10 the condition

oan

2 2 2

Hales Cog a artay dk,

& zi “~ is equal to WS. S(ka)(l — 22)? “dae , (g) A

whcre ken/apt+azt+...+aa- 159. We shall next give a short account of Legendre’s formula

- for the calculation of log I’(1+ 7).

Adopting Gauss’s definition, substituting «+1 for n, and taking the logarithms of both sides of the equation of § 155, we get

log I’(@+1)

O { x Ko e x =lim. je log p — log (+4) — log (1 +3). re —log(1 +=)] If now 2 lie between +1 and ~~1, we may substitute their well~~ . 2 x known expansions for log (1 + 7 » log { pe 5) soni

Hence, representing the indefinite series Le Rg all

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by sa, we shall have Also e>l+u, **.. d=uwetsl-y, i log T(a+1)= — yet $8ya? — 58,03 + Gere. . RE, hence 1-(1-w)¥e<1-(1-w\y + &e. oo J Se a V(l+a) _ {T(1+2)}? 7 [rd +2))? sin am vanishes at the same time. ae T(i-a) xl(«)rd—2) om – - eye Sere. ony Sepie Hence we have – ele 7 ae a log I(1+a)=4 log aT = (ye + doje” is0...). Again ; Sin er thay =i 1 a2 a i**

Again, by “ae 7 7 unf (x – Ca i du & log 5 pet eet far + &e. 2 a ” ; a =e —-4— 4 §____-_ &e Consequently @ 4 27 31,9,3 * an 1+2z 3 3 log T(1-+2)=} 108 sin ag 2 Hoe (7) A YoU Da9—Heg— Da… Li(e-*)=y loge-a+4 —, – 3,3 the. = a ee ee =e “~ a = log Sa ae 4 log Tog tert — eg? = 650? oo. , eit: Li(e)=f” C — – -[a where ¢,=1-—-y, ¢3=4(83—1), ¢s=4(ss-1)... 2% a? It is easily seen that the constants ¢s, ¢;, &c., form a rapidly de- = —e etd aaa ereasing series, in which each term ean be calculated to any required ee |S eee . i a number of places of decimals. Accordingly, when the value of | when ¢ vanishes. Kuler’s constant y has been determined, a series of values of co oe xc log I(1+) ean be computed from the foregoing equation, and thus | But i -[+f : tabulated. € x €

© O 3 a/t : 5 Ha —€,=—2Z = 2 me-% Again, since [($)-E , the value of y may be calculated by , = me, [vs e~*dz +f of =] -[< es : =f Cj x

making x=4 in the preceding formula; by this means its valuc is a é found to ke 0°5772156649 to ten decimal places.

Loz . en? Wy-z oe -[dz -f —dz. On the Integrals Lix, Hix, Six, and Cix. 0 i ©

160. Having thus arrived at a determination of Euler’s constant, ieee aad we shall return to the consideration of the logarithmic integral Life) = sl ee ‘Cay and other transeendents introduced into § 181. i(e*) = u a 7 ? Adopting the notation of that article, we have

- **: 1jxu _ p-xu Lp ~~2 Slee — o Sie é mes 2 Li(e*)~~=/” a= f ——du, writing ew for z ; Ss Taleo +f u ae «0 20 hence a ae hal at dale Si . Ong 104 ~~) — Li(e#)~~=/. ——_——_ Li(e) = —— + J __ite. Li(e) Life y) ~~/ uy du i(e) Py sty log e+e + $s 4p a7.9,9°° C ye em fa ——~~ ” This and the preceding can be represented by the single formula a ————du. ’ , : w 0 Hin=Li(et)=y+ log (a!) +a+4s%, + 4-35 80. Wee ec 3 But ($ 142), : a — © g-yu g-ae : The expansion for the sine-integral can be readily obtained, for y ————-du=log ck we have by definition : : ; 1y ¢-yu 1] ¢- 2 sien fn 3 .. Li(e-*) -Li(e-¥)=log x ~ log y a ete Sf = du. o = F : ’ ; 0 hence, substituting the ordinary expansion for sin z, and integrat- dein th l—e-w ‘du ~~ł~~(1- UY an -[e-m—(1- Uy ry ing between the limits proposed, we**

get : > ie ‘ 7 Sieme-$55-5 + bape & . 1 ae _ 1 7 “4 eo hte ome ote
But uy Patou =f Teel al el Again, if, in the equation already proved
0 u 5 t=(1=)

: 1 ~~m te ge Li(~~e*)= f/ “du=y+d log (38) 24 45 – bo thes we substitute zz for x, it becomes =—Ueyigt… +2 = i (Ed wo

7 du=y+ log (af) ~ ta — 35-3 + sz og tke,

1

~~[(14+(1~~ w)+(1-u)2+ ae +(1= w)y-1 du

0

If now we suppose y to increase beyond limit, observing that in

1

that case Lie~y=0, and that y=limit of 14+44+4+.. toa logy oe Me when y=0o, we get ; ”

cos xw—7% sin wu a

% y+} log (x*) ~~ix~~&e.

Hence, equating the real parts on both sides, we get

A ie —xUu Ve 2 i ie) =) Jor = Geary e~m—(1l-uyy, 1 2 4 (e-*)=y+log x i F dw — lim. = dw. ri cos ey +3 log (at) – 4 4a eee we 0 5 uw 1.2 1.2.3.4 We next proceed to show that

Consequently Li 2 2 vs e-¥— (1—x)y Ciz= eae ac ee ye _ oe ee ew ae

vanishes when y becomes infinitely ercat The scveral series here arrived at are readily seen to be con- To prove this, we observe tl Sie Tc = vergent for all real values of x, and by aid of them the values of : : = enna ee) “cage ie between 0 and 1, Eig, Siz, Ciz for different Salamon

the argument x can be tabulated. q*> lad, <<. Coeeee a)... Such tables have been constructed by Soldner, Bidone, Bret-

a —

50

schneider, Schlémileh, and others. The most recent and complete tables are those of Mr J. W. L. Glaisher, already referred to (§ 181).

161, The values of some definite integrals ean be best determined by transforming them into-infinite series. This statement will be illustrated by one or two examples.

llog a

1) To find we,©

(1) To fin . aw

Here, when is less than unity,

8 2 log al+ata?+...a” &e.);

1

but x” log xda=— (tay ; eonsequently

llog x r ee 1 == . 4 i EAT ET Lg 6

(2) In like manner it can be shown that

ri yt-l—m-@ ‘ 9 (1+2) loge Replacing . by its development, we get

(8) Again, to find

ganl- 2-6

1+2

Consequently (Ex. 4, § 148)

f SE tase tap 0 (1+2) loga ~ Sita aie a(a+2)(at+4)...(2-a)(4—-a)... * 08 (1 —a)(1+a\(3—a)3+a)... Cae a*)(4?— a). . “(17 — a(S? =a”)... by a known formula in trigonometry. 162. Conversely, an infinite series ean in many cases be trans-

formed into a definite integral, and thus evaluated. For example, suppose

S=14+$-$-7+ $+ – &e.

=n -l—g-e— (x —gl-@) 4 atl — g2-a = (at+2 — a:3-«) ba

= lo * = log tan > ;

1

Here, since a: x°ndx, we have a2n+1 So

1 1

1+2? rT S=/ da(1t+a®-at-2+4+.,.)=/ =~ dt=— 4 (df ae 72. Tn like manner we get 1] — 26 1+V2 L-44h-aetiy— of a, ipsa eT A b dan ae LS Bg ; ie = Again, the serjes

= : +) mene +&c ppt)... (ptn) (ptm)\(pt+mtl1)...(ptmt+n) ean be represented by a definite integral.

8

Here

eee eee ppl). . .(ptn) T(nt+p+1) P(n+) A (1 — x) “2? -1dex (§ 158) ;

1 1

ny S-aan (L—a)”(ap-l+amte-14,., dee

2 1 1(1-2)ngP-1 5 LZio ss 3 VG 1l-a™

We now proceed to give a few applications of the calculus to geometrieal problems.

Areas of Plane Curves.

163. If a plane curve be referred to rectangular axes of coordinates, the area between the eurve, the axis of X, and two ordinates eorre- sponding to the abscisse a and 0 is represented by the definite

integral b ri yd.

Hence if y= (x) be the equation of the curve, the area in question

is denoted by ‘ yA o(x)dx .

From this result it follows that every definite integral may be

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represented by an area. And itis seen at once that all the examples hitherto considered admit of geometrical interpretation.

In the above formula the ordinate is supposed positive for all points of the eurve between the limiting abscisse. The moditica- tion when the curve cuts the axis of ~ can be readily supplied.

Ex. 1. Let the curve be an ellipse, represented by the equation

es 2 P ee ee Here y=— a? — x; and, if x, y be 4, A

the coordinates of the point P (fig. 7), the area APN is represented by the integral

b é: = if Je Pde . a x Let x=a eos ¢, and the integral transforms into ab $ sintgdpa (p— sin ¢ cos ¢) et «BES = : 0 2 2 @ Hence, the area of the elliptic sector APCD is equal to

B, Fig 7.

x ab eos-i— . a

If the sectorial area APCP, be represented by 8, the preceding result gives

- **= cos a z =tin ; @. Gh? ar” wae a Lum mi or OH » b =sing, where ¢ = Ex. 2. The equation of a hyperbola referred to its axes is m2 yf? gett: b re we**

y= NO =a ;

Accordingly, if x, y be the coordinates of the point P on the eurve (fig. 8), the area APN is represented by it Ye 2 et ee et+r/x?- a? oe Jak = aPdarm ge enl® — a — “5 log Se

ae See ra 9 og (4)

Consequently the area of the hyperbolic sector ACP is repre- sented by

x yy ‘

This relation has given rise to a elass of expressions ealled hyperbolic funetions, Thus, if S denote the area of the hyperbolic seetor APCP,, we have

§ = ab log (+4) ,

b s 2 Zt om a ¥ b : Hence, from the equa- tion el a , a = Pe = Fig. 8.

8

we get a a, F ae Let = be represented by v, and we have : a Ee: Tie i ae Die In analogy with the formule for the ellipse the expressions GF aie c=s * a 2

are called the hyperbolic cosine aud hyperbolic sine of v respec- tively, and are usually written cosh v, sinh »; and we have

x 9 : a 7oosh ev, JY _sinh v.

Again, for simplicity, the hyperbola may be assumed equilateral, and a=b=1;; in this case the equations become

x=coshv, y=sinh v,

‘

aoe PhS Ii MAL CALCULUS

where v represents the area of the corresponding hyperbolic sector, represented by APCP). Also, by analogy, we write smkhy ¢-¢-* 1 coshv e*+e-” e411’ Again, we obviously have eos 2=cosh 7, isin «=sinh iz.

&e.

tanh v=

Between hyperbolic functions many relations exist analogous to those between ordinary trigonometrical functions. For example, it is casily seen that we have cosh2z —sinh®v=1, cosh (v+y)=eosh x cosh y+sinh x sinh y, sinh (v+y)=sinh # cosh y+cosh x sinh y, cosh 8v=4 cosh*x—3 cosh x, sinh 8e=4 sinh’x+8 sinh w.

Again z oy =cosh x , — cosh #=sinh xz, dx dx d a ‘ il Ga tanh w= Geeta: ay Corb C= = ink Henee

feos edxe=sinh x, Jain adx=cosh x,

dee dx J = = -coth z. de cosh*x ee sinh*a oa 4

The analogy between hyperbolic and trigonometrical functions will also appear as follows. If we make w=sec ¢ in the equation of the equilateral hyperbola x?- y?=1, we get y=tan ¢. Conse- quently sec p=cosh v, tang=sinhv. —

Morcover the equation v=log(x+y), gives

eS ton ($42)

In this ease ¢ is called the hyperbolic amplitude of v; ahd, by analogy, we write é=amh v, Also when w=cosh 2, we have v=log (x+V«?—1). Again, when y=sinh v, we have v=log (y+ Vy? +1). Moreover, since v is the sector whose corresponding hyperbolic cosine is x, the connexion between v and x may be represented by the relation v=seet cosh «. Hence we have

sect cosh w=log (2+ V2?-1). In like manner we get seet sinh a=log (w+ Vx? +1), Ite | ee This notation exhibits the analogy between the elementary integrals

in aremarkable manner, and even more strikingly when we intro- duce the Continental notation, are sin x, instead of sin-12, &c.

sect tanh x=} log

Thus SIN w= are sin 2 5 V1 – a2 jf da hie P ia 18 (e+V1+27)=sect sinh x; jaa tan “te=are tan x; ax l+z ee ‘eartaedc tanh 2.

Hx. 3. To find the area ineluded between the cissoid of Diocles and its asymptote. The equation of this curve is

Y?(2a — a) = a ? and that of its asymptote is x= 2a. Hence the area in question is represented by

ime 0 (2a—x)t Let =2a sin6, and the integral becomes Bal” 2 sintede=3na?.

0

Hz. 4, To find the whole area of the curve

(=) (Po

Le are pe. es, et 7808 6; then; sin”@.

Gr

=

Hencc the whole area is represented by

Tr _ 2 sin +19 cos”-led@.

0

i the method of determining this integral has been exhibited in 164. In the preceeding examples the area of any portion of a plane may be conceived as divided into a system of infinitesimal rectan gles, dady, by lines drawn parallel to the axes of coordinates. Accord. ingly any plane area may be represented by JSfdxdy, taken be- tween limits determined by the boundary of the area.

Again, as in polar coordinates, the plane may be divided by a system of circles having the origin as centre, and also by a system of radii vectores drawn through the origin. In such coordinates the element of area bounded by two cireles of radii r and r+dr and by the radii vectores corresponding to the angles 6 and 9+d6 is plainly represented by rdrd@. Accordingly, any plane area may be represented by

Sfrarda

taken between the limits determined by its boundary. Hence, if the cquation of a curve be given in polar coordinates, the sectorial area S bounded by two radii, and the curve is repre-

sented by B = f rde , a

bar a and B are the values of @ corresponding to the limiting radii, (1) For example, in the class of spirals represented by r=ag™, we have pane ~ 2 Im+1 If the arca be bounded by the prime vector 0=0, this gives aq? 92m-+1 “2 Qm+1″ Thus for the spiral of Archimedes, whose equation is *=a8, a iB . 6 ; B In the spiral, 7?=«a6, we have

a262 2 2

_ 4 -(5):

+ const.

.In the reeiproeal to this spiral, viz., 72@=a?, we have

Be ear log 6=a? log (+) ;

in which the sector is reckoned from §@=1. (2) To find the arca of a loop of the curve

7 =a? cos 0. Herc r=0 when 26= Oy , and r=a@ when n§=0. Consequently the area of a loop is represented by Tv

ofan of “cos 20 dé,

ets 2 ‘ . a . ‘ ‘ ‘ and, accordingly, is Fa It is easily seen that when 7 is a posi-

tive integer, the curve consists of 2 loops; accordingly the entire area of the curve is a.

(8) To find the area of the loop of the folium of Deseartes, the equation of the curve being 2+ ¥3= Baay.

Transforming to polar coordinates, we get

Tv ge (2 sin% costade 2/, (sin®6+cos?6)2 * Let tan 6=w, and this becomes 9a? f° wdu _ 3a 2/o (stp 2”

165. If from any point a perpendicular be drawn to any tangent to a curve, the locus of the foot of the perpendicular is called the pedal of the curve with respect to the assumed origin. ;

If » and w be the polar coordinates of the foot of the perpendi- cular, the sectorial area of the pedal curve is plainly represented by

afi ‘pde taken between proper limits.

The following remarkable eonnexion between the pedal areas with respect to the same closed curve, for different internal origins, is due to

Steiner. Let A be the area of tho pedal with respect to the origin O, A' the area for origin O', and p, p' the corresponding perpendiculars, then we have

Qa Qa = A yo pide, A'= fe pride.

0 0

52

If, now, x, y be the coordinates of O' with respect to a pair of rectan-

gular axes drawn through O, we shall have p=p-xcosw—ysinw;

therefore

Qn ; Qn 2r A Aah (vcore tysin a)'dw-2f peosada—y / psin wd.

0 0 0

But

Qr oT. Qr ' "¢ costa dam, / sinte da=m, sin w cos wdw=0;

0 0 0

A'- A= 3+?) – ga-hy,

Qn Qa 9-f- p cos w dw, haf psinwda.

0 0 :

Hence we infer that, if O be fixed, the locus of O', when the corre-sponding pedal area A' is constant, is a circle.

All the circles obtained by varying the pedal area are concentric. Also the common centre is the point for which the pedal area is a minimum, and the pedal area with respect to any origin excecds the minimum pedal area by half the arca of the circle whose radius is the distance

between the pedal origins. Many interesting results may be deduced from this theorem. When the curve is not closed, it is easy to prove, as was shown by Prof. Raabe (Crelle, vol. 1.), that the locus of the origin for pedals of cqual areas is an ellipse. The corresponding theorems for the volumes of the pedals of surfaces were investigated by Dr Hirst (Transactions of the Royal Socicty, 1863). In addition to other important generalizations, Dr Hirst has here proved, when the surface is closed, that the locus of the origin for equal pedal volumes is a surface of the second degree.

Another remarkable theorem of Steiner's, on the connexion be- tween the areas of pedals and of roulettes, may be stated here. When a closed curve rolls on a right line, the arca between the right line and the roulet'e gencrated by any point invariably con- nected with the rolling curve, in a complete revolution, is double the area of the pedal of the rolling curve, taken with respect to the gene- rating point as origin. Hence it follows that there is one point in a closed curve for which the entire area of the roulette, described in acomplete revolution, isaminimum. Also, the area of the roulette deseribed by any other point exeeeds that of the minimum roulette

by the area of the circle whose radius is the distance between the points.

consequently

where

Rectification of Curves.

166. The rectification of curves is based on the principle that the length of an arc of any curve is the limit to which the perimeter of an inscribed polygon approaches when each of its sides is conceived to diminish indefinitely.

Hence, if the curve be referred to rectangular axes of coordinates, and if ds denote the element of the are of the curve at the point (x, y), we shall have

ds? = da? + dy? , and accordingly

f Yoo (2) Ye af 1+ (SY a

taken between the limiting points, 7.c., the extremities of the arc.

In like manner if the curve be referred to polar coordinates we shall have

sf S14 (SP) Lar, or s=f {24 (Fe) bao.

We shall illustrate these formule by a few simple cases. Kx. 1. In the ordinary parabola x?=2py we have

ae dx pp' ' —f 2 2 ws ga f (x? +2°)idx DP _@+p)), p 1, ctv Pre ay +5 log r '

Ex, 2. In the more general parabolic curve represented by a" = py we have

This expression is capable of integration in a finite algebraical form ($ 123) for the following values of 2n-2,

1

a a 1, $, 4; Frees oy be,

i.c., when n is

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167. In illustration of the method of rectification in polar coor- dinates, we commence with the spiral of Archimedes, r=aé.

Here sa f (r+ ahr ;

This shows that the length of any are of this spiral is equal to that of a corresponding arc of a parabola.

This relation between the spiral of Archimedes and the parabola was discovered, according to Str John Leslie, by Gregoire St Vin- cent, before the middle of the 17th century (see Leshie's Geometri- cal Analysis, p. 424). That a corresponding relation connected the

parabola y*=px and the spiral mot 2 * pé was established by

John Bernoulli (Acta Erud., 1691).

These results were extended by Lardner (Algebraic Geometry, p. 355), and in their general form may be stated thus :—

If from the equation to any curve in rectangular coordinates another curve in polar coordinates be formed, by making dy =dr and dx=rd6, then the length of any arc of the second curve will be equal to that of the corresponding arc of the first curve. Also the sec- torial area of the second curve will be half the area bounded by the corresponding y ordinates in the first curve.

These relations can be immediately established.

As an example, the right line y=mz gives by this transforma- tion the logarithmic spiral r=e"'. Hence we can always obtain a portion of a right line equal in length to any arc of this spiral,— a result which is obvious otherwise.

Again, from the ellipse

2 2 a —— + 3-1 we get = = VP-P,

2

dm 2

DP Hence the differential equation of the transformed curve is a dr

de= Se b /P-r } from whieh we get r= bcos 6 . where @ is measured from the line which corresponds to the major axis of the ellipse.

Accordingly, the rectification and quadrature of this latter curve is the same as for the ellipse. This can also be shown imme- diately otherwise.

168. Whenever the pedal cquation of a curve (§ 165) can be found, there is an- other general formula for its rectifica- tion, which may be proved thus.

In fig. 9 let ON be the perpendicular let fall on the tangent at any point P

on a curve, and ON' the perpendicular ga"

on the tangent at a consccutive point Q; Fig. 9.

and suppose ON=p, angle AON =o, and PN=?.

Then PQ=As, angleSON=Aw, At=QN'-PN.

ds .. PT+TQ adi ,... QN'-PN

H pes cee a ee ence = lim. a6 a lim. ao

But PT+TQ+PN-QN'=TN-TN';

1 ds dt ,.. TN-TN' SN

rence — = ——= Ii

io Sa ns ~= lim. 2 =ON=p.

Accordingly, if w, and wy be the values of w corresponding to the extremitics of the arc s, and ¢,, ¢) the corresponding values of t, we have

@) smth tyt pdw. coli)

This theorem is due to Legendre.

In its application it is well to observe, that

,

DP tim, SS’ Vim. TH’=t. For example, in the parabola we have a@ , dp asin» PP cos w? dw cos*w

Hence, if s be measured from the vertex of the parabola, we have ° dw sin a raf cosa “cose log tan (F+5) :

2 2 ;

Similarly in the ellipse, ae a =1, we have p=/a* cos*w + b’sin 2w.

a sine cos*w

s=

Accordingly, the rectification of the ellipse depends on the integral —

J V/a?cos’w + bsin®w dw . Likewise the rectification of the hyperbola depends on the integral F Vacos*w — Psin®e de.

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Further considerations on the rectification of these curves will be found under the head of elliptic integrals.

169. Steiner’s theorem connecting the rectification of pedals and roulettes, analogous to that which connects their areas (§ 165), may be here stated. It is as follows :—

Tf a curve roll on a right line, the length of the roulette described by any point connected with the rolling eurve ts equal to the corre- sponding are of the pedal of the rolling eurve, taken with respect to

ibing point as origin. ee ie is Bray seen that the length of any are of a cycloid is equal to that of a corresponding portion of a cardioid, and the length of a trochoid to an arc of alimagon. Again, if an cllipse be supposed to roll on a right line, the length of the roulette de- scribed by either of its foci is equal to the length of the eorrespond-

ing arc of the auxiliary circle.

Rectification of Curves of Double Curvature. 170, lf the points in a curve be not in the same plane, the curve is said to be one of double ewrvature.

Formule for the rectification of curves of double curvature are easily obtained. Thus, if the curve be referred to a system of rect- angular axes in space, we shall have

ds? =dx? + dy? +dz*. Hence, if w be taken as the independent variable, we have

2 de2\h s=/(1 + $3) ae

daa ae

and similar formule when either yor z is taken as the independent

variable. . f The equations of the curve are usually written in the form

Se; y)=0, p(2, z)=0 ; that is, the curve is determined by the intersection of two

cylinders. The values of “and = deduced from these equations have to be substituted in the foregoing integral. It is not difficult to determine a relation between the functions f and ¢ in order that the are of the curve of intcrsection may admit of easy determination. au _ 9%.

The simplest class is where (Z I

dz {dz*\% = sete (| = d ’ on f(re+(a)) ; dz =f\ 1 + —- jdv=x+2+ const. dx

For example, in tlic parabolic cylinder x? = 2py + const.,

for in this case

we have dy @ Gan : : e Accordingly, let i, ay Ghe WO aivrr Py and we get Z= PE +const.,

hence the length of the curve of intersection of the eylindrical surfaces e=QWwyt+e, v= 6p%e+e

is immediately determined. In general, when y=/(z) is the equa- tion of the first cylinder, and that of the second is represented by the equation

z=h Lf: { S'(2) \ 2dr +constant,

the arc is determined by the above formula. 171. If we transform to polar coordinates by the relations x=rcos Osin d, y=rsin @sing, z=rcos¢, ds? = dr? + rd? +r? sin*pdé? ; hence, for the rectification of a curve of double curvature we have

2 2\2 oof (140 "59? Sint Tn) :

We 5 29, 00″ Vi og) (Gas agit" sin oy dd.

The latter gives for the length of the are of a curve on a sphere, |

of radius a, + 9 6″ \3 Seal 2h" "dd. of + sin org) p

If be const. =a, the curve lies on a right conc ; and we have

: ade? \3 s= alt 2 Qa . of| +r* sin ra) di

we get

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Cubature of Solids.

172. The method usually adopted, in secking tle volume of any solid, consists in supposing it divided by parallel planes into an in- definite number of thin slices. Then in finding the volume we may in the limit consider cach slice as an infinitely thin cylindrical plate ; and, consequently, represent its volume by the product of the arca of tlie

corresponding section into the indefinitely small distance between the parallel planes which bound it.

Thus, if the points in the body be referred to a system of rectangular axes of coordinates, and the system of parallel planes be perpendicular to the axis of x, then, representing the area of the section at the distance x from the origin by Az, the volume of the solid will be represented by

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Sarde taken between proper limits. Adopting a similar notation, the volume of a solid may be repre- sented by SA,fly, or fA,dz.

In the case of a surface of revolution, the sections are drawn per- pendicular to the axis of revolution. Thus, if any curve, situated in the plane zy, turnround the axis of x, a plane perpendicular to the axis cuts the surface in a circle. The area of this circle is ry? ; consequently the volume between two scetions, corresponding to the abscissee a and 6, is represented by

b of yd . a

ae gy . (1) Suppose the ellipse a a £ =1 to revolve round its axis of x,

then the entire volume of the generated solid is

+a xe a 2 T 62(1 -— -— |dx =270b? 1 — —)de=4nalb?. 4 a 0 a?

(2) If the parabola y=az”” revolve round the axis of x, the volume cut off by a plane at the distance X from the origin is

See raeX2ntl XyYy2 rf ara dx=— -=7——~ , 0 2n+1 2v+1

(8) To find the volume of the ellipsoid ~ ge? gt -1

@’ eR

iTere the scction at the distance z from the origin is the cllipse oe f y? as 22 Ge 102 ce

The area of this section A, is

a2 (1 = Sab

(4

accordingly the volume of the ellipsoid is represented by

c anatf (a –

0

(4) To find the volume of the surface gencrated by the revolution of a cycloid round its base.

It is easily seen that the coordinates of any point ona cycloid, of radius a, are capable of being represented by

x=a(pt+Sin d), y=a(1+cos ¢). Ilence the volume V generated is given by the equation

rie vin 7 naif (14 cos d)*do= 16m” cost Sdp— Smut.

0 0

(5) To find the volume of the portion of the paraboloid

2

. jae =$mrabe.

2

cut off by a planc drawn perpendicular to the axis of z. Here, the area of the section at the distance z from the origin is

2xzV/im. Hence, if ¢ be the distance of the bounding plane, € V= ani edz=neNim .

0

Consequently the volume is half that of the cireumscribing cylinder.

173. Again, since any solid can be supposed divided into an in- definite number of elementary parallelepipeds, the volume enclosed within any bonudary may be represented by

Sf [txdyde ,

the limits being determined in each case by the nature of the pro- blem.

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For example, cubature of the ellipsoid volume of the solid bounded by the surface z=/(x, y), by the plane eae eet i of zy, and by the eylinder having as its base the ellipse at et at oy 2n 4 is equivalent to the determination of the triple integral i ; Sf [xdyde, For instance, suppose the bounding surface to be the paraboloid for all values of x, y, 2 subject to the relation > +t Qe, a yp 2 ptpte

To integrate this, assume «=2a sin?@, and we get

PS) 72 v=24// = Me Faas ° = ae a eo w= oo = cos2¢ sin'ed@ + "or f " sint¢ costede

0 0

2 2

x? y? ~~F(F+a)~~

=<. 8 tm 175. Again, the double integral

This integral is easily determined by making

5 xX -Y Y eee x, y)dad a/ 1 S sings Jf, Repeat,

b a when the limits X, 2, Y, Yo are constants, represents the volume then dy=b af 1- ia o dp, bounded by the plane ay, the surface rie and the planes we x=X,x=%, y=Y,y=Y. Also, in the determination of this double and Va 2bof/((a – a) cost ad , | integral the order of integration may, in general, be changed = (s 148) ; and this eliange in the uae ape no alteration in the ‘ — i 7 imits. The latter statement no longer holds when the limits of where the limits for are =z and ey ee integration with respect to the first vaninbls are funetions of the seeond. or P * In this latter case it is of importance to be able to determine in But of cos olga ‘ each case what are the new limits when the order of integration is “7 reversed. This ean generally be best effeeted from geometrical eon- al 7 siderations ; thus, for instanee, in the example of the preeeding hence Vande f € ra ae 4mabc, as before. article, we readily find, when the order is reversed, the new limits a a 2 a : : of x to beat+a afi – 7 anda-a af 1 ~ ©, and that the sub- The geometrical interpretation of each step in the preceding a b° be demonstration can be readily supplied by the reader. sequent limits for y are 0 and db. f It may be observed that, in consequence of the symmetry of tho | As another example, let us consider the double integral ellipsoid, the preceding integrations might have been limited to b positive values of x, y, z,—thus determining the eighth part of the cue a Al fle, y)dedy entire volume. A similar remark applies to any symmetrical sur- fate vane

_— It will also be observed that the determination of the volume

of an ellipsoid is a simple ease of the theorem given in § 157. °

Similarly the volume ineluded within the surface axis of y, OB=8, and eomplete the rectangle OACB, it is plain from Y

(=) +(a +(& \e al the equation that the point (a, 7) is

If we take on the axis of x a portion OA=a (fig. 10), and on tha

a b ¢ limited to the triangleOAC. is reducible to the determination of the triple integral Accordingly, if the order of in- tegration be reversed, we must Lf dadyde suppose the area, instead of being | divided into

infinitesimal strips parallel to the axis of y, to be divided into strips parallel to the

¢\2 lee ce (=): +(4) . (=): = axis of x. Henee, the limits for 2, Fig. 10. Hence, by § 157, we get when y is constant, are a and $3 and the subsequent limits for

l mm n r(>)r()r($) y are b and 0.

extended to all positive values of x, y, 2, subject to the condition

V=lmnabe / ath Consequently, ae « gis 5 om Thus, for instance, the volume enclosed by the surface FA Jt fe, y)diady =f te Se, y)dacdy.

6

2 z\% ,. 4mabe (=)¥+ (4)8+ (<)§—1 1s z “ : As an exemplification of the advantage of an interehange in the : : : : order of integration it will suffice to take the double integral

In like manner the volume enclosed within the surface

(2) (1) (hate ee ee

a b $.:7.11.18° and so on. | Here, interchanging the order, we have by the preceding 174. From the preceding it will be apparent that every double ara + integral may, in general, be represented by a volume. uw - [vs Oe a : As an example, let us eonsider the double integral ovy V(a-2)\(a=y) Pere a pa pag Ee But (§ 189), i Sf a ae fle, ydeedy . Sy Na=aye=y) 0 0 a ; bs “. us : os —f(0) Here, since y> 0 and <7 V tan — 2, and the limits of x are : ws of Pyldy= a) A) } ‘ 0 and 2a, it is readily seen that the integral represents half the | Tt may be observed that in many cases, when the order of integra-

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tion is reversed, we get two or more double integrals instead of the

iginal integral. “r is frequently found necessary to transform a double

176: Kt 1s STi; ydecdy ,

integral referred to rectangular coordinates, to another referred to polar

oordinates. : . / In this case, as in § 164, we substitute rdrdé instead of dady, and

the integral becomes Sir cos §, 7 sin 6)rdrdé

The limits in the latter integral are determined from the equa- tions which give the limits in the former. _

For example, to find the volume comprised between the planc of ay, the hyperbolic paraboloid cz=ay, and the right cylinder

(a — a)? (y — bP? =k. v= ff aya

Here extended to all values of x, y, subject to the condition (x-a)?+(y-b)?

1! klar . vi ff (a+7 cos 0)(b+7 sin 6)rdrdé =

070

since

Q0 Qi Qa : ra sinode—0,/ cos 9d0=0, / sin 0cos6de=0,

0 0 0

177. The triple integral

SLi, y, Odacdydz

can be transformed in like manner, For, first, take

nabk? C

>

x=p cos $, y=psin and the integral transforms into SL fie cos p, p sin , 2)pdpdzdo . Again, assume z=r cos 6, p=r sin 6, and the multiple integral becomes Sp fir sin 6 cos p, 7 sin sin ¢, 7 cos)r? sin 6 drded@ .

With respect to the limits in the new integral, it may be ob- served that, in this and all other cases, the new limits must be taken in such a manner that the transformed multiple integral shall comprise every element which enters into the original integral, and no more.

In particular the volume of any solid is represented by

Sf fr? sin 0 drdéd¢ , taken between limits determined by the boundary of the solid. If this expression be integrated with respect to 7, we have

V=14//” sin 6 dodg,

_ in which we must substitute for 7 its value determined by the equation of the bounding surface, For example, let us investigate the volume within the surface

(ar? +: y? + 27)5 = (a3x? + b3y? + c827)?, Here we get =a’ sin®6 cos’ + b* sin?6 sin*¢ + c* cos’9 , and, as the equation is symmetrical, we have

us T v~i/ if 2 (a? sin2@ cos’# +b sin®6 sin? +c? cos’@) sin 6 ded¢ 0 JS0 ‘ er

= vA 2 (208 cos +283 sin®h +.8)dp — 47

0

9

Again, the expression for the volume of the ellipsoid ay? ete

(a3 +0403).

¢

is represented by the integral sin 6 déd@ : sin?@ sin’ cos?6 $

2 +3

¢

a Tv yh”

3

0 0 sin?6 costo a? b Hence, since the volume of the ellipsoid is $rabc, we get T Te el

0 0

a result which admits of a direct demonstration.

sin 6 déd@ _ mabe sin?@ cos*@ , sin?@ sin’@ . cos*9)% 2 ” a id b? ; Cc

2

+5=1 |

oO

178. The multiple integral

UL ff Vie de,dx,da,

admits of a like transformation.., For, let 2=p, cos $, %,=p, sin ¢, and it becomes

SLT Vip dp,dpdaxsdar, ,

where V, represents the transformed value of V.

In like manner, if z3=p, cos ¥, %,=p, sin w, the transformed integral may be written

SLL Vepwkerdp,dgody .

Again, if p,=7 cos 0, p.=7 sin 6, the integral assumes the form

SU Vor? sin 0 cos 6 drded¢dy ,

where V; represents the final form of V._ In this case the values of Hy, Ly, Xz, L4, in terms of the new variables, are

%=7r cos 0 cos ¢, X3=7 sin 6 cos y, =r cos @sin gd, ®=7r sin 6 sin yp.

Quadrature of Surfaces.

179. It is readily shown that the area of any cylindrical surface, bounded by two planes perpendicular to its axis, is equal to the rectangle under the height of the cylinder and the perimeter of its base; also that the surface of a truncated right cone is equal to the rectangle under its mean section and the length of the portion of any edge of the cone intercepted between the bounding sections.

In the evaluation of the superficial area of a solid of revolution, we proceed, as in § 172, by supposing the surface divided by planes perpendicular to the axis of revolution (fig. 11). Then the Lg elementary portion of surface between two indefinitely near planes may be regarded as a portion of the surface of a right cone, generated by the revolu- tion of the corresponding ele- ment of the curve round the axis. Hence, denoting the ele- ment PQ by ds, and PM by y, Fig. 11. the area generated by PQ in a complete revolution round the axis of xis represented in the limit by 2ryds. Consequently, if S be the surface generated by the curve AB, we have

8=2nfyds ,

taken between limits corresponding to the points A and B. (1) Thus for the sphere, generated by the revolution of the circle x? +y?—a? round

the axis of 7, we have

(dy\? + 3 ms ds— j1+ (40) a= ( ) om de Hence 8=2n/ada=2na(X — a»), if X, x be the limits for a. Accordingly, the whole surface is 47a, i.c., four times the area of one of the great circles of the sphere. Also the surface bounded by any two parallel planes is equal to the corresponding surface cut out of the circumscribed cylinder, whose axis is perpendicular to the bounding planes. (2) If the ellipse

B

fed Rete eS y

eR revolve round the axis of x, we have

4

ds=(1 = zy de : af y? b

where ¢ is the eccentricity of the ellipse. Hence, the whole surface of this ellipsoid is

b a a, tr fe (a? — ea) dee =Irb? + Qme—sin Ae

In like manner, if S be the surface generated-by the revolution of the ellipse round its axis minor, we get S=2n/ xds= lars (b4 + atety?)* dy. Consequently its entire surface is represented by

lig l+e Qra?+ r— eer Cie ae log (4)

180. In connexion with surfaces of revolution, the following general propositions, usually called Guldin's theorems, may be here stated.

(1) If a plane curve revolve round any external axis situated in its plane, the area of the surface generated in a complete revolution

equals the product of the length of the generating curve into the path described by its centre of gravity.

(2) In like manner, the volume of the solid generated is equal to the product of the gencrating area into the path described by the centre of gravity of the area.

The former of these theorems is easily shown ; for if y, be the distance of the centre of gravity of the curve from the axis of re- volution, taken as that of x, we have

ys—=/yds ; Qry\s=2n/yds=S ,

which proves the theorem. Next, if y, be the ordinate of the centre of gravity of the area

A, we have Ay,=xydA=//ydady =} fy°de , Qry,A= nfyrda ;

whence the latter theorem follows.

181. In the general case of the determination of the quadraturo of a surface we regard it as the limit of a number of indefinitely small elements, each of which is considered a portion of a plane that is ultimately a tangent plane to the surface. Now let ds denote such an element at any point of the surface, and da its pro- jection on a fixed plane, which makes the angle @ with the tangent plane at the point, then we have

do=dS cos 6, or dS=sec 6 de. S=/see do, taken between proper limits. If now the surface be referred to a rectangular system of coor-

dinate axes, we may take da=dxdy; also, from an elementary theorem in surfaces,

Hence

22s d: ad sec @=A4/1+p? +9”, where p=5- ’ “7 a

Hence we have S=//(1+p?+¢?)idady,

in which the values of p and q are to be determined from the equa- tion of the surface.

(1) For example, let it be proposed to find the portion of the sur- face of a sphere detereptedl by a cone of the second order, whose vertex is on the surface of the sphere, and whose internal axis passes through the eentre of the sphere.

Let O the vertex of the cone be taken as the origin (fig. 12), and the line join- ing it to the centre of the sphere as axis of z, then the equation of the sphere may be written

e+ y+ =2az.

Hence ey oe de a—2z' dy a-z' Vise sh 5 Fig. 12. consequently S=a/) ___ teedy N/a? = gt — y? 4

in which the limits are determined from the equation of the bound- ing cone. Let the equation of this cone be

a= A®y? + By? ;

then, eliminating 2, the limiting values of % and y are connected by the cquation

(1+ A2)a? + (1+ B2)y?=2aV/ A2a? + By? Next, transform to polar coordinates by making

zx=r cos 6, y=r sin 6,

ge rdrd@ taken for all points within the curve

r{(1+.A2) cos' + (1 +B?) sin?@} =2a./A?cos'6 + B'sin20. Hence, since the curve is symmetrical, we get

Tr 2 rdrdo N 0 Na-r'

5 2a A2c0826 + B?sin?@ 1+ A'cos?0 + B'sin2@ *

and we get

where R

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, R rdr re 2a Agai pee ee A ASP — A ie — ts Jat — 72 vi 1+ A?%cos”6 + B*sin?6 ? Tv iz dé 4ra? S=8a2

0 (1+ A?) cos’e + (1+ BY sin” V(1+A2(14B%) This result admits of a simple geometrical representation ; for let D, E (fig. 12) be the points in which the edges of the cone lying in the planes y=0 and x=0 cut the surface of the sphere, and we plainly have soa etn tte ce V14A2? 1+ B Consequently the area of the intercepted portion of the sphere is equal to that of the ellipse which has CD and CE as its semi-axes. (2) If, instead of the cone, we had taken the paraboloid

z= Ax? + By?,

the area of the portion intercepted on the sphere is given, as in the precoding, by the equation

ce 7 S= sof (a- /a?—R2)de, where, from the equation of the bounding curve, we have 2a(A cos*é+B sin?4) —1 (A cos?6+B sin?@)? * v a dé _ Q@na 0 Acose+Bsin2?@ JAB’

_ This result admits of a geometrical interpretation similar to that in example (1).

R?=

Hence S=4a

Multiple Integrals.

182. The general form of a multiple integral may be represented by the expression

= v1 U sig V4 xf yf du A CEB a Uy, b);

in which f(x, y, ... %, t) is supposed continuous for all. systems of values of the independent variables x, y,...w, ¢ included within the limits. Moreover the limits of each variable must be independent of the following variables, but may depend on the preceding variables.

In calculating the integral, the expression f(z, y, .. . w, t)dt is integrated between the limits T and ¢), regarding x, y, ... w as constants. Thus we obtain a function of x, y,... u. This fune-

tion is integrated with respect to w between the limits U and 1), treating vz, y … as constant. We thus obtain a function of x, y, ... independent of uw, ¢; and so on for the subsequent integrations.

If the limits for each variable be constant, the integrations may be taken in any order, subject to such limitations as those given in § 148 for two variables. In the more general case, when the order of integration is altered it is necessary to determine, from the con- ditions of the Lge the new limiting valucs. This is usually a matter of much difficulty.

183. Continuing from § 178, the general problem of the ¢truns- formation of a multiple integral by a change of variables may be stated as follows.

Suppose the multiple integral represented by

SS + \ SRyy By . Cyl Oy 2: Th,

and it be proposed to transform it into another, depending on new variables w@, %%,,...+ Un, Which are related with the original variables by a system of » given equations, This transforma- tion implies three parts in general:—(1) the determination of (a, Lg)... Xn) in terms of w%, U%,...%n3 (2) the determination of the new system of limits; (3) the finding the substitution for dat, dit, . . . Ain.

The solution of the first two questions is an algebraical problem, of which we have already considered one or two elementary cases. We

now address ourselves to the third question, and write the integral in the form

fli, flit, . f Uttar f dnGl,, Sy or. Va In the integration with respect to %p, as stated in § 182, 2, 2,

+ + + @m-1 are regarded as constants, Accordingly, in order to replace 2 by Um, it is sufficient to express x, in terms of tn, %,; A din ; Hy, » . » m-1, and then to substitute Tu, tn for dv,. Again, ‘

to transform the next integration, relative to dzn-1, we suppose n-1 expressed in terms of tn-1, Un, 2, oy.» ~ Ln-2, and we re-

place dxn-1 by “ae ‘dun-1. By continuing this process the integral n-1

finally becomes of the form

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axtn C27 -1 day J itn Aitm-1°** diy

where ¢, represents the value of $(2,, , . into a function of 2, Up, .. – Un Moreover, by § 102, the product On Sei dun An-1°*

OU, . . . Attn,

. . n) When transformed

cal “du,

is, in this case, the Jacobian of the original system of variables 2, ... % regarded as functions of the new variables.

- .

“Accordingly, for dx, dx, ... dx, we substitute

Sg, a |

au, UUs, : aun

dit, dit, dx,

di, arty ‘ey, MO, . . « Blin. ey iin ew

du, Ay dun

For instance, if ay Vdady be transformed to new variables dU, V, denoting by V, the value which V assumes, the double integral becomes

LT Viet ut’ o— Yu oddly,

dy _ ax _ dy

du? ay Yer ay

Again, if the coordinates of each point on a surface be given in terms of two independent variables w, v, to find the transformed expression for the superficial area

dz\? [{dz\? MS +() +($) dady . Here dady becomes (uf ~ Y’uX’») dudv as before.

Also, since, from the cquation to the surface, z may be regarded as a function of x and y, we have

dx

,

ors = 9% = where u du’ Yu

az ig OF cag tyme tt ug ey=Ly

ae +Yy “dy ? dz = Zulf’» —Yub» dz i uy — 2 uit» de Uf y— Yul y? dy uty — Yule Accordingly the transformed expression is LY (tetfe- Yate? + (Y tle — 2a o)? + (Lat ~ Haale) VAdud. For example, the coordinates of any point on the ellipsoid an ae atpt gl may be represented by the

equations . x=a sin cos, y=b sin sing, z=c cos 8; hence it can be shown that its total surface 8 is represented by

Ta SB Seta sues sinte cost S=abef / sin 6 dod oe _— @ , sin 6 cos Eas Os 0

a? in which the integration with respect to @ can be immediately effected.

Again, the coordinates of any point on a sphere of radius a can be represented by the equations v=a sin 0/1 — 2 sin'¢, y=a sin ¢V1—-k? sin', 2=a cos 6 cos ¢, where k?+k%2=1.

This is obvious, since the sum of the squares of these expressions sa', Accordingly 2 2 agg? 2 aod @ YY' gH g= — 2208 8 cos P(k? cos' +k? cos*6) – ' V1—k? sin*¢ V/1—k? sin%9 , 2 sind (k? cos*p +k'? cos?¢) Date ~Paafn — 2 sind (aiiedd i=? sin® 2 sj 2 eos? 2 anc 7 ge a 9D OLE" cos' +k" cos*e) fe fs Si =k sin?¢ Hence we get

dS

ak? cos' +k'? cos?) = = ; — 6d. Vi-#? sin' /1—7? sin26 Consequently, since the entire surface of the sphere is 41a, we lave

Tr T ¥ a? (K? cos +h cos*@)dodp ow 0 So V1-M sin' VI-%? sin%9 2"

O7

The well-known general formula of Legendre, connecting com-

plete elliptic functions of the first and second species, follows at once from this last result.

184. In the case of three variables,

adopting a similar notation, the integral

SL V dedydz transforms into

LLL V Xe ol 20 rtf» i, Oise)’ Se Oot = are) + L(Y uz as 2 uy’) \dudwdn,

For example, in the general transformation from rectangular to polar coordinates we find, as already observed, that r’sin édrdedp is to be substituted for the element of volume dadydz. This is but a particular case of the general transformation given in § 103.

The preceding formula of transformation for three variables was given by Euler in 1769, and afterwards generalized by Lagrange in 1778. Jacobi appears, however, to have been the first to have cs- tablished the general transformation, in his memoir referred to in

§ 96. The method of proof here adopted is that given by Bertrand. Ee, 1. In the case of linear transformations, viz., when Hy HAW + Agta t … +Anlln, Hy =, + Dgllg +... +Dnitn, Bn = 1th + Lytig + xeeues) + Titln»

we get Aydt, . . ditn=Adiu,dit,. . . din, + ae whcre A Ber ee ih iL ee ihe at a U UUs cs en ee) eae Uy Uy Us the Jacobian is —Upllg Ug Up ur Uy Uy Uy —Ujllg UW ct L baa ; Up Us Uy Uy Uy, = Uy U3 Ug U5

The value of this determinant is easily seen to be 4; hence

SU V da decgdxg transforms into 4//f Vda diigdity .

Ez, 3. As an additional example we shall take Jacobi’s method of establishing the fundamental formula of Eulerian integrals (§ 153).

Since se) roa r= e~*x!-ldar, 1(m)= em ¥ym-dy.

0 0

eo oO T(DT(m) ~~/ is e~~ 8m! Lym—ldandy

0 0

If now we transform by making a=wv, y=1(1-), the limits for ware 0 and , and those for v are 0 and 1;

dx dy

dv du

we have

de dy.

also = du dv :

wo rl hence T(DI(m) -[bs e~Myltm-lyl-1] — y)m-Idydy a)

1

=r0+m/ v- 1 —v)™-‘dv,

0

T’(2)0(m)

1

e 1/3 _)m-1dy— AUP Js v-l4 —v)™-Idy ecm)

185. In the more general case, where 2, 2. . explicitly in terms of 24, uw… by 2 equations of the form

. &» are not given . Un, but are connected with them

Fy (Xj, Ha. «+ Way Uy, Uys. . Un)=0, Fo(ay, XQ… ny Uy Ug… Un) =0,

BaiGegry:. #. Ly Uy, Ug- + » Un) =O, Fr(ay, 2g.» « Ln, Uyy Uys» Un)=0, we get, by § 99,

dx, dx, dit,

duty duty cc! dun

dat, Axe ax, Ay diy ditty °° dttn |”? dn, du,’ * ditm

where du, duy * din ax, dk, Gen, Ai=| du, dil ” din |» 42e=| dx, dx, din Wy An dEn | | dn En aE du, dit, °° dun ie, dt, | dita Accordingly the multiple integral wy ao [Veet Ls ity

transforms into

A Wi

The limits in the transformed integral are determined by aid of the equations which give the limits in the original.

186. We conclude this short account of multiple integrals with a notice of the very general and remarkable theorems relative to integrals extended through a closed surface first given by Green (Essay on the Application of Mathematics to Electricity and Magnet- ism, Nottingham, 1828).

Let U, V denote two functions of the rectangular coordinatcs x, y, 2 Which are finite, and have their first differential coefficients finite, for all points within a closed surface; then, since

d aad _ aU dV av dx\ ~ dx) dx dx dx’ we have

wif ap dU dV PY pee —_ Z2= SS 4 fd i! 3 Wij $(u =) dedya : MY ie > laa hi fe 7 acdyda

the integrals being extended to all points within the surfacc. __ Also, since the bounding surface is closed, any right line which meets the bounding surface, must cut it in an even number of

points ; hence the integral : ze)

d [av Wi Je U gy)antde— VE aydex(U, a

where 2, 2%, U,, U,, &c., are the values of x, &c., for two corre- sponding points of intersection with the boundary by the infinitely thin cylinder standing on dydz, and by & is denoted the summation taken for all such values. Again, if dS,, dS, be the corresponding clements of surface, and a, a, the angles which the exterior normal to the surface at

each of these points makes with the positive direction of the axis of x, we have

dydz=C0s a, dS,= — cos a, AS, ; hence it is readily seen that the integral

dV,

H dydzz, (UF I U, wa) is equal to vA U & cos ads,

taken for every element of the boundary, whether it consist of one dU dV

closed surface or of several. adv We de dadydz – [oz ads,

Accordingly, we get av Wi U iB dadydz + Wi in which the former integrals are taken for every point within any space, and the latter integral taken for each point on the boundary

of that space. This may be written

du dv dv PV HW dedydz= Mf U cosa dS Hf U Ty dedyde.

ws Ge Taking the corresponding equations relative to y and 2, we have by addition,

dU dV aU dV , av av aE pice eam —— \dadyd: be da * dy dy * dz Te eye dV dV aV – [f= cos a+ dy cos B+ a cos 17)aS CV PV av = NE i a el ery ere MD ae + pt Ge ee

Again, if dn be the element of the normal, measured outwards, at the element dS, we readily get

_ _ wy cos _ s COS Os cos B= ae am wv av. IV gee 2 OV ae cos a+ dy cos B + re i a

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Hence

dU dv dU av , dU a¥

pecieeteielTe pee ieee Mae NEY

WS de ‘ ay a ae =) wee dV eV @V a&v

- ff F as- fff U (Gar + ae ¢ os) oa dU eu U

“Ve dS MS + 7D + 7a andy.

The latter equation is obtained by an interchange of U and V. This is Green’s fundamental theorem, in the case where U and V are continuous functions. 187. The modification when one of the functions, U for example, becomes infinite for a point within the surface was also investigated by Green. Suppose this to happen at one point, P, only; moreover,

infinitely near to P let U be sensibly = = , 7 being the distance from

P. Next suppose an indefinitely small sphere, of radius a, described with Pas centre. Then it is clear that Green’s equation holds for all the space exterior to this sphere. Also, since

CF ed ya

= + apt ae ie as

the triple integrals may be extended throughout the entire space. Moreover, the part of ff U Das due to the surface of the sphere

is plainly infinitely small of the order ofa. It only remains to con- sider the value of ff Vv = dS taken over the surface of the sphere.

But, since 4 1

of V at the point P. Hence, denoting

rb this becomes — 42 V,, where V, is the value

Poe

de * op

Wij dedyda00.V – ff eS dS dv 3 MY dudyd:Vo 0 — Aft i agin,

where, as before, the double integrals are extended over the boun- ding surface or surfaces, and the triple integrals taken through- out the entire space enclosed.

These theorems of Green have been generalized by Sir W. Thomson ; thus, if a be another continuous function of 2, y, 2, we gct, by a similar treatment, instead of Green's first equations,

ad?

+ aa by Va,

we have

(a dv , dU dv , av dv Wee a wits oe aude dU ad aU ad aU _ ang ie = Reef py eee Ly Le fo OM \ Hee) al? a)

+4,(2) | days

az dz

7 dV dav -[feu Fas – fifo\ F(a) +

af dV dy* 'dy df ,aV

with a corresponding modification when one of the functions becomes infinite at one or more interior points.

In the case of many-valued functions, another modification of Green's theorem was established by Helmholtz (" Ueber Integrale der Hydrodynamischen Gleichungen welche den Wirbelbewegungen entsprechen," Credle, 1858).

Elliptic Integrals.

188. Attention has hitherto been restricted to integrations of rational algebraic functions, of logarithmic or circular functions, or of such functions as could be transformed to depend on these ; or, if irrationalities were introduced, they were such as involved the variable under the radical in no higher than the second degree. But the founders of the infinitesimal calculus early perceived that many integrals did not admit of expression by means of these ele- mentary functions with which they were familiar. Apparently it was the geometrical interest attached to such integrations which first attracted notice. Thus James Bernoulli published, in the Acta Hru- ditorum for 1691, a paper on the helicoidal parabola, in which we meet with the idea of comparing arcs of one and the same curve, which cannot be superposed.

This spiral is the locus of the extremities of the ordinates of a parabola when its axis is rolled as a tangent to a fixed circle, the ordinates being measured towards the centre. The polar

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7 equation of the locus is (a—7)?=2abw (see fig. 13). Hence the

r(a-—7r)?

lie as

are ds=dr ; so that, if s, be the are contained be-

B

Fig. 13.

tween the values $a and 4a+¢ (=AG) of 7, and s, the are between the values 4a – ¢ (= AN) and 4a, we have

a a a te ie rar? 3 r(a—r) anf 1+—age a7, anf? 1+—ap ar.

2 2

Now, putting in the former r=4a+2, and in the latter r=4a—-z,

we fin 7 “i ~~.. art nannf nf +39 #~~ 2) dz;

whence we conclude, as Bernoulli did, that even in curves whose rectification has not yet been effected, parts may be assigned which are equal though dissimilar ; such as BG =AN, and GI=NI, where

Al=$a., John Bernoulli, following up this discovery of his brother, pro- osed to find for a given curve another, such that the sum or the D aersnon of two ares, one on each curve, may be expressed by arcs of circles. In the case of the cubical parabola he noticed that the two curves reduce to one curve, in which, without effecting the recti- fication, pairs of arcs could be found whose difference is rectifiable. 189. The Count Fagnani next proposed in 1714 the problem, “given a portion of the parabola whose equation is x*=y, to find another portion of it such that the difference of these two parts may be rectifiable.” In the following year, not having received a solu- tion, Fagnani published his own, with greater generality, Aakcilornis

m+2

” m+2 Taking @ constant, and m any real number, let “7 = – a 2 the equation of a parabolic curve (compare Ex. 2, § 166). Let ¢ be the portion of the tangent be- tween any point (ay) of the curve and the axis of abscissa. Then by the equation of the curve,

_ ee 2 " tad i+(2) ’

and the are of the curve

be

Integration by parts gives (see R Ry S 1S; fig. 14) Fig. 14. m a daz m+2 a FS = are PP, – (P|R, – PR),

a if P, P, have the abscisse XL 3 also

naa fl Voy QQ, – (Q;8, – QS),

if Q, Q, have Zo 4, as abscissee.

Now if the former integral can be transformed by introducing a variable z so that the function under the sign of integration may Temain unaltered, and thus the former integral may pass into the latter, we may equate arc PP, —(P,R,- PR) =are QQ, — (Q,S, — QS).

o9

Thus the question is to determine an integral of the differential equation

or of

Es + See. = 0 A ah as a) \ ee Fagnani gave the following solutions. For m-=4 the curve is the

cubical parabola, and the relation between x and zis az=a?, For m=8 the equation is satisfied by the relation

(1 +2) +2)=3.

For m=6 the curve is as in the problem proposed, and the relation is

Gikomnon

190. Passing over Fagnani's investigations relative to the lem- niscate, —such as his discoveries of the method of doubling or halv- ing any arc, of dividing the quadrant into equal parts in number 2.2™, 3.2", or 5.2™, discoveries which prompted to their author the wish, since executed, that on his tomb a lemniscate should be in- scribed in memoriam, —we must mention his well-known geometrical theorem, that on the circumference of an ellipse, in innumerable ways, pairs of arcs can be determined having their difference ex- ee by a right lino (first published 1716). His method is as ollows. If we have h, J, f, g constants, and (/fha)* + (flx?) + (fle?) + (gl)*=0, then, first, the sum**

daha +l, fda ,_ tating sy (1); Vfe+g JS Nf@+g NV-fl i , eh

and, secondly, the same sum = @ + <— when s=—1. g

In the former case the relation gives WV — fla? — gl VJ fhat+fl Introducing this into the first integral, and the corresponding valuo of x into the second, the sum of the integrals becomes

fee =t., de -1 af anf – But differentiating the relation, and dividing by 2fxz, we find

had heedz +t 41 E m0 ;

whence, substituting, the sum is found to be as stated. A liko treatment yields the formula eae

when s=-—1. This theorem F

is applied in its former part to

elliptic arcs. Let us call the

axis major 2a, the parameter p, @ {

and the abscissa x; then, if h=p—2a, the element of the arc AB (fig. 15) corresponding

to the abscissa CD=2 can be _H shown to be Fig. 15. daN ha? + 2a8 / 203 = Qa ©

If now /=2a3, f= — 2a, and g=2a, this becomes the former differ- ential in (1); and it appears that, taking' another abscissa oS 2 Chara TV 20 = Bact J ha® + 203

we have are AB+are AF= -S5+K if

To determine the value of the constant K, letz=0; then AF becomes the entire arc AG, hence are AB-are GF= whee : 2a

The second part of the theorem is applied to the hyperbola (fig. 16). Calling HA= 2a, the parameter p, and x the variable abscissa CD, and

putting A=p+2a, the element of the are AB is easily found to be expressed by

dec ha? — 208 | NV 2aa? — 205 ”

60

whence, identifying, we have /=- 2a*, f=2a, g=-2a3, and, aN hx® — 208 V ha? — har’

assuming another abscissa CE=2= the theorem gives

arc AB+are AF={”” VY” 4X,

Taking another pair of abscisse ¢, wu, similarly related, we have twVh kK

aN2a

and by subtraction the arbitrary K is eliminated. : .¥

191. In order to be able to state the results more concisely, it is desirable here to explain in anticipation the notation introduced by Legendre, which has since generally prevailed,

If the position of a point on an cllipse be expressed by the co- ordinates x=asing, y=) cos¢, it can easily be found that, denot- ing the cecentricity of the ellipse by «, the arc reckoned from the extremity of the axis minor A to the point B determined by ¢ is expressed by

are Ab+are Af=

> A =f NTH# Sat GMp

0

This Legendre writes are AB 19).

If it were desired to indicate also the quantity x, which is called the modulus of this elliptic integral, he writes it E(x, ¢), and calls this an elliptic integral of the second kind, for reasons which will soon appear. The quantity ¢ is called the amplitude of the ellip- tic integral, and its geometrical meaning is the eccentric angle measured from the axis minor of the point for which E(x, ¢) measures the arc. For brevity also he adopted the notation

/1— sin'? = A(x, @), or=A() when it is unnecessary to mention x. 192. Legendre, proceeding to rectify the hyperbola & = a =1,

first assumes x=a sec 6, and this gives the element of the arc = Sv B?+a2 sin?@ ; but to have a radical similar to that of the arc of the ellipse he had recourso to another notation. ing ¢ by the equation

p?

c

Determin-

aV 1-2 sin' : cos @

in which a=ckx. The are of the hyperbola is in this way found to be

p° dp

"e J cos*pdd *

Again d(tangA¢) __Kdp __ "dg

e Cos*gAg Ad

Hence the hyperbolic arc AB of which the extreme ordinate is BD,

or cx" tan ¢, is AB =cA¢ tan ¢ -f Apdo +n" A ae 0 qo Ad

The geometrical meaning of ¢ is easily determined by taking the circle on the transverse axis, and. joining its intersection with the tangent at

B to the centre ; ¢ is the angle the joining line makes with the perpendicular on the tangent. It is seen thus that the are of a hyperbola depends, not only on the integral which gives the

y=— tan ¢, where c?=a?+ p?, we get z=

.+Agddd, wnere k?+K2=1.

are of an ellipse, but also on ra , which is called an elliptic in-

0

tegral of the first kind, and denoted by F(x, ¢), @ and « being called amplitude and modulus as before.

193. When this is applied to the formule of Fagnani they become for the cllipse, calling p the value which ¢ has for the point F, sin ye , are AB-— are GF =an? sin ¢ sin p=ax? opeee ; and it is easily found that the expression on the right is the length on the tangent at either B or F intercepted between the curve and

the foot of the central perpendicular let fall upon it. In application to the hyperbola, similarly,

cAg sin ¢ cos Now the length of the tangent betwcen the point of contact ¢ and the foot of the central perpendicular upon it is c tan Ag; hence denoting by E and F the complete functions E(x, $m), F(x, 42), the value of the constant can be determined ; arc AB+are AF _ Ad c sin ¢ cos ¢ and this value of the constant is the difference between the entire hyperbolic quadrant and the length of the corresponding asymptote. 194. Landen, continuing these investigations in 1775, considers

the hyperbola whose semi-axes are a=m -n and b=2\/mn; then,

sin y= ve , and arc AB+are AF= + const.

+n?F-E;

writing CP= {mn ~ ¢?}# (fig. 17), he notices that eee a

pp-ap=/ | @=2-” } hae.

m+n —t Then he says it is well known that, in the edl/ipse whose semi-axes are m, 7, the are z from the conjugate axis to the point whose abscissa is x is

and therefore in the ellipse whose semi-axcs are m+” P

and 2Vmn, for an ab-

Rig: 17, ; + Tan — 0 ; sclssa -<——t, the are= [| (24-6 : \tat . But further, in the

m=n —t? ellipse m, n, the length ¢ of the tangent at the point whose abscissa is x, to the foot of the central perpendicular on it, is m? a Aya 4 tool os =a) whence 292? = gm? +02 —/(m? =)? — 2(m? + n?)\t? + é4. Differentiating this, since

te a _~? =” £2 eof OP, mnt (hata (a, ha m—n — min —t

which is a relation between the hyperbolic arc, the two elliptic arcs, and a portion of a right line. Landen remarks on his dis- covery, “Thus beyond my expectation I find that the hyperbola may in eye be rectified by means of two ellipses,”—a result apparently of secondary importance compared with the method it is attained by, which involves the principle of what after Legendre is known as Landen’s transformation,

195. But, simultaneously with the geometrical interest thus developed in these integrals, they also attracted attention to their more algebraic relationships. James Bernoulli (1694) devoted par- ticular attention to, the “elastic curve,” which is defined by the equation dxv== + tea , with a view to construct it by the quad- a — rature or rectification of a

conic. Maclaurin (1742) gave such a construction, depending on the rectification of the equilateral hyper- bola ; and in like manner constructed by the aid of arcs of conies the integrals of expressions such as

dx da as 2 ? Jax/l+a (1Fe2)

and others like them, which can be reduced to elliptic differentials. D'Alembert (1746) extended these results. His paper in the History of the Berlin Academy treats a number of differentials, whose in- tegrals are of the same forms as those by which the arc of an ellipse or hyperbola is expressed. When a differential expression can be reduced to the differential element of the arc of onc of these curves, D'Alembert calls this the integration of it by means of an ellipse or hyperbola. This paper is of a purely analytic character, and is penetrated by a tendency to classification of elliptic differentials similar to that which has effected in the works of Legendre such important services in the development of analysis.

196. In the works of Euler, of which from 350 to 400 quarto pages are concerned with this department of our subject, the geo- metrical and analytical aspects alternate. His first investigations

are in the St Petersburg Commentaries (1761), on the integration of the differential equation

mde __ dy | Vi-wt V1-y'

and it is remarked that the differential equation of a more general

form ...— —— VA+2Bx2+Cat VWA+2By?4 Cyt can be completely integrated by an algebraic equation, provided the numbers m and n are rational. He extends the same method of integrating to the apparently more general equation maz a nay JA+2Ba+C2?+2Da+Ext VA+2By+C0y?2Dy3 Ey In the next paper in the same volume Euler determines on the quadrant of an ellipse two arcs whose sum can be expressed geo- metrically, reproducing many of Fagnani's formule. 197.

Euler's most important investigations are collected in his Institutiones Cale. Int., vol. i. sec. 2, cap. vi. His method, being

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essentially as follows, has much analogy with Fagnani's, given in § 190. Let the equation (c1s0? + Qav'e + 0" ey? + 2(a0? + 2b'a + by

+92 +2¢u+e"=Ly?+2My+N=0 . (1), or (ay? + Qby +0)u? + 2(a'y? + 20'y +c') + aly? + 2b"y +c" = Pa? +2Qz+R=0 . (2), subsist between x and y. Differentiating either, we get (Px+Q)dx+(Ly+M)dy=0 . (3). Further, by (1, 2) (Pa+Q)?=Q?-PR, (Ly+M)?=M?-LN, . (4);

taking the roots positive, (3) becomes ee, /M?-LN VQ?~~PR in which the radicals are respectively functions of x and of y ex~~ pressible from (1) and (2).

If the functions under the radicals are to be severally the same functions of z and y, the following conditions result :—

B—ac=a*-aa", 2b! — ac' -—a'c=2a'0′ — ab" — 0b, bb" =a'e, 2b'b" = a'c" = ae = 9b' Jia bc' pie b"c, O/2 S ac! =¢'2 —_ ce", The values of ¢ and c' being substituted from the first and third

equations, in the second we get a'=0, Whence first and third give a' =¢, b'=c'; and the others are identical, (1) thus becomes

(6).

aay? + Qbay(a + y) + 6(x? + y?) + 4d'xy + 2c(x+y)+c's0 Hence (5) takes the form ad a dy = JA+2Bx+Cx?+2D23+Ext VA+2By+Cy?+2Dy+Ey ' or more briefly

im. OR

dx . dy —=t+—==0 Vi Ny'

of which the obvious transcendental integral is

dx dy

a — == ¢ nst. SF Va A=c?—cc’, B=20’c’ — be” — ce’,

C=4b? — ac’ — 0? — 2be’, D = 2bb’ – ac’ — be, E=0? ~ ac. Further, from (4) VY =(ay? + Qby + cc + by? + 2’y +e, SX = (a0? + Qha-+c)y + ba2 + 20a +e.

VENTE cay uty) + 28’=c

Squaring, we get, by (6), &c., the algebraic integral

ve vy \3 (a=) = Ee y)? 2D(a+y) + (20 —¢)®- ae”.**

The constant on the right, involving an arbitrary quantity, if a B, C, D, E are known, inay be taken as the constant of integra- ion.

198. In Euler’s first paper in vol. vii. of the St Petersburg Commen- taries, he uses the “‘equatio canonica” 0 = a+ (a? + y?) + 2dxy + eazy? as a starting point for establishing his theorem of addition, and, Introducing the notation

where

Hence

xz A! 4+ Bly? + O’at

TI = ——————— ny =), KGa 4 Eat

>

establishes the equation

Thx) +N(y) – 1 =H | – 1_@+Pt+e a me (2) +My) – (2) vEL7B Poe go’], where pn DV AA Cy + Ey) + VA F CaP Ea) | A — Easy?

Now, when B’=0, C’=0, these equations represent the theorem of addition for Legendre’s first kind of elliptic integrals, and when #1, C=

—(1 444), E=x2, A’ 1, B’= -—x?, C’=0, they become the theorem of addition for his second kind. Thus it appears that already in 1761 Euler was acquainted with this fundamental theorem, of which he gave many applications to the comparison of elliptic arcs,

199. Butit Scems to have been Euler’s paper “De reductioneformu- pean Integralium ad rectificationem ellipsis ac hyperbole” (Novi t nile x. p.38-50, St Petersburg, 1766), which impelled Legendre

: Sinvestigations. With special eases of the general relation, § 197 (1), between and y, Euler transforms integrals contained in the

form af St ga h+he

dx , and distinguishes whether the integral has one

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of the five significations, arc of ellipse, are of hyperbola, or either or both of these along with an algebraic part,—collecting in one general investigation the results of Maclaurin and D’Alembert on the recti- fication of conics. Here we find the words,—regarding the desir- ability of a suitable notation by which elliptic arcs may be as conveniently expressed in calculation as logarithms and circular arcs are at present, “such signs,” he says, “ will afford a new sort of calculus, of which I have here attempted the exposition of the first elements,”—which Legendre cites in the preface to his great work in 1825 as having remained unfulfilled but for his own labours continued till that date from his first publications on the subject in 1786.

200. In vol. iv. of the Afiscellanca Taurinensia, Lagrange deals with the integration which had been given by Euler, remarking that it was due only to a kind of lucky accident. This indecd Euler himself admitted when he stated that he had not obtained this result by a regular method, but “ potius tentando, vel divin- ando,”’ and recommended mathematicians to scek a direct method. Lagrange here lays down the principle that, when the integral of a differential equation of the first degrce cannot be found, the equation should be differentiated ; and,

combining the result with the given equation, an integral equation of the first degree different from the yepored may be found. Then by means of these two the first differentials may be eliminated, and the result is the required inte- gral. If this fail we may differentiate once more, and try to get a new equation of the second order, and so on. This enabled him to give a deduction of Euler's equation, which Euler received with the greatest admiration, and gives nearly as follows in his Institut. Cale. Int., iv. p. 466.

Writing for brevit y A+Bz+Cx?+ Dx? 4 Ext=X (1) A+By+Cy? +Dy+Eyt=Y , , suppose the differential equation between « and y to be dx dy —=+-== 0 ‘ ° . Og (2). Vie NY

Regard « and y as functions of a variable ¢, and replace (2) by the following

oe, he Ne 3 pANK, Be-VF. 1 8) Assuming ery—wp,e@=y=q…... .« (4), a_i _ ape 6 = d4p_ X'+Y' we get 7 Va VY, ies +VY, Ge 2 ? (5), which last is, by (1), EP _B+Olwty)+4D(a? +4") + 288 +97) ‘ (6). dp d V = fox We also get, from (5), a a X-Y =(x— y) {B+Cluty)+ De? +ay+y%)+E(at+y(e+y)}, which, combined with (6), gives, by (4), ap _ dp dq _ sy . 2 "A> dp \ _ t ae ai ieee Dey) 0) at q oe =D+2Ep.

Multiplying by a, this gives on integration, with F a constant,

1 dp\? _ Rt B- whence, replacing values, a fer \ia ("EF) =D(z+y)+EHa+y)+F,

which is the same result as Euler's (§ 197).

_A principal advantage of this method consists in its admitting of generalization, which Euler's method, depending on the solution of a quadratic equation, excludes. But Lagrange fails to apply it to the case of X and Y being arbitrary polynomials respectively in x and y; all assumptions lead back to the forms of X and Y in (1).

201. Ina paper of Euler's in the St Petersburg Transactions for 1771, an angle is introduced as the variable into the integral for the are of an

ellipse. In another paper, in the Novi Commentarti, 1767, he had also remarked that, in a differential such as

dz

VA + Ba + Ca + Dat + Ext" Meta nz+b : the radical can be abolished ; and by a like substitution, removing the odd powers of y, Euler treats, without any loss of generality, the differential equation in the form az dy

VA+Ce+Ex* VA+Cy? + ky

by a substitution of the form «= the odd powers of z under

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This furnishes an essential simplification of the process of calcula- tion, and leads to the results of his important and remarkable '*Plenior Explicatio" in the St Petersburg Transaetions for 1781, This contaius in fact a proposition which includes the theorem of addition for all three kinds of elliptic integrals of Legendre.

z Ldz Ii(z) = =e @) ne V1 4+me2+ne'

where Z is an even function of z, M(x) +M(y)— M(z) can be exhibited as an algebraic function of x, y, and z, provided a certain algebraic relation holds between x, y,andz. '*But now," observes Euler, "I have noticed that the same comparisons may be instituted if for Z be assumed any rational function of z*, as suppose one of the form F+G22+ Het+ 128+ K28+ | Stgethet+i+ka+ ' in this casc, however, the difference between the sum of two such formule and a third is no longer found to be an algebraic quantity, but can always be expressed by logarithms and circular arcs, so that the investigation is much more extensive than I hitherto conceived." To establish this, assume

202. Putting

a2 + 2 — 2+ QayN/ 1 + me + ne — nady?22=0 « « (2); or, writing /T+me2+ n= : . Qy <u>a? — 22</u> Qay A — nary2*=0 . > CF

Solving in turn for a and y, this gives a(1 —ny?z) + yA=2V1 4+ my+ny! (4) y(l — noe) + oA =2V/1 + ma? + nxt —-

But, by differentiation, we know that i “ Ji + ma +nat V1i+mypP+nyt i

which may be written thus

dx dy . (6).

W1— na) +e2d a1 —ny‘22)+yd- For x=0, the relation (3) gives y=z; whence (5) nae rg gives the known theorem of addition for integrals of the first kind. Now let X,Y be the same functions of x, y? as Z is of 27; then Xdx af Ydy (7) Vitmetnet Vit-my+ny ae the quantity V may be found as follows. We can eliminate by (5) either dz or dy trom (7) ; but, as there is

no reason to consider V as a function of x or of y speeially, intro- duce a new independent variable w=ay. Then we may replace (6) by

writing

| me

da=[y(1—nx2*)+xA]sdu, dy= —[x(1- ny%z*)+yA]sdu Ps)

1

where we take s=—— > y — x dx dy ad Thus SS SSS SS eee ee V1 + mx? +n JS1+my?+ny* ya”

which give dV=- il pe Sem rs 37 (9).

But now hs ; isa function of xy and x? + y?, or of u, since by (3)

yx

2 + yr =a? — Qua +nwe2,

=U, we havedV = — Udu. Substituting this

Thus, putting z

yo in (7), and integrating, we have u I(x) +M(y)-M(z)=-/ Udu,

0

since, for ~=0, y=z and u=0. As an example,

ef VL hk 7 a'b —ab! ;

: a Ue? yee? aad (x? + y) +O ary? ' i Be

that is, U (absalle

gt aU + 2a'b' Au + (02+ abn)? * Thus, if we take

ne=/ F552 dz g VEO? MT matt nad '

we have "4 (ab! — a'b)zdu T(z) + (y) — H(z) Sf a? + a/b? + 2a'b' Aut (62 +a'b'n2?)u>'

in which after integration wu is to be put =xy. By assigning special values to the constants this equation can be applied to each kind of elliptic integral.

203. In the Théorie des Fonctions Analytiques of Lagrange there is found the remark on the rclation between the summation of ellip-

[INE PR PTUESTMAT CALCULUS

tic integrals and spherical triangles which is involved in the formule of § 200, and of which we have given the essential formule in §§ 34-36. But Lagrange's paper " On a new method of the Intcgral Calculus for Differentials affected with the square root of a poly- nomial of not more than the fourth degree" (Mémotre de 1 Acad. des sctenecs, 1784-5, 2d

part, Turin, 1786), contains additions of much greater importance to our subject. Taking

PapINPRg. =P -SP ee p” =p +N p?= 92, g’ =p’ -V p= 9”, pl” =p” 4A [y‘“2 =a q ; gi” =p” = V9? ee qi? ? Further, writing for brevity, R=Vi1EPY\ILPy), R=V ik p?y)\(1£97y%) , R’=Vlep?y leq y”) 5

and oR _ Te gy’ we have the equations 9 ta? — 148! £22’ tq” oi +R” peat a Ee ee y’ oe 2p’? ’ Si qf yf”? —1e8 R” ; Ey

WE ni

y’R’ WT VTE

yf”?

d oe an Re

Now, assuming g

g>q>q’, &c., without limit.

Lagrange gives another system of pat of reduction following from the above series when continued backwards, so that the series are

+++ Day Pry Ps Bs BP”...

; +66 Gy Oy & TT ++ The equations

P= t+Vp2-G”?, G=P-NPP-H?, Di = Dat NP ~ 92”, G1=P2- VP? 92″ »

give conversely ee A=kPtq, H=-VP; Po=BAtH), Q=VPN and the terms 7, „ ~.... decrease, while 7, %, 2. . . increase. Now, putting = WR, = YoRs a Ttopy?? 9 T£9,7y,?’ R=Vi sey AIEnW), Re= VI Evy PITER YI) 5. +. we get

vy

ory – ia Se ee BY 8Y1 _ PY 2 _ Yy Lope? &c., and J as

The former series are essentially the transformation known by Landen's name; the latter, indirectly, are (§ 214) the transformation which Gauss published in 1818, and on which his theory of the arithmetico-geometric mcan is based.

204. We have thus glanced at the most important contributions to this branch of our subject previous to Legendre. His "Memoire sur les intégrations par dares d'ellipse" (Histotre de 1 Aead., 1786) appeared a few years after Euler's death (1783). The geometric basis is here almost abandoned. Establishing with ease and ele- gance the theorems of Fagnani, Landen, and Euler, there are per- ceptible traces of a coming theory of transformation in the analytical conception of these theorems. Legendre's Mémoire sur les Trans- cendantes Elliptiques (Paris, 1793) contains the division of elliptic integrals into their different kinds, the reduction of integrals of each kind to the simplest normal forms, and the calculation of elliptic integrals by most accurate modes of approximation. All these in- vestigations are collected in Legendre's Exereiees (Paris, 1811-19), and later in his Zraité des Fonetions elliptiques et des Intégrales Eulériennes (Paris, 1825-6, 2 vols., suppl. vol., 1828).

205. '*It is Legendre's undying glory," said Lejeune Dirichlet of this great work, "to have recognized in the discoveries we have just mentioned (of Fagnani, Euler, Landen, and Lagrange) the bud-

'no of a mighty branch of analysis, aud by thie toil of half a life to og a oss bases an independent theory which embraces all integrals containing no other irrationality but a square root under which the variable rises only to the fourth degree. Euler had already noticed with what modifications his theorem can be extended to such integrals ; Legendre, starting from the happy thought of reducing all these integrals to fixed canonical forms, attained the knowledge, so important for the development of the theory, that they group into three essentially different kinds. Submitting then each kind to a careful investigation, he discovered many of their most important properties, of which chiefly those which belong to the third kind were very obscure

and inaccessible. Only for the most persistent tenacity, which ever anew led the great-mathema- tician to his subject, did the victory at last declare itself over diffi- culties apparently insurmountable by the weapons at his disposal.”

206. Having shown that the integral _! , Where P is a

rational function of wz, and R=(a+ Bu+ yx? + du3+ ext), can be dx axdx ard reduced to the fixed fundamental forms Fr? ae =

taak dist R’ Legendre removes, by aid of the linear transforma-

+ na

tion x Serer , the odd powers of the variable from the poly- t]

nomial R2, and shows, by enumeration of cases, that = can always

q add duced to the form ——°? = V1 sin?¢ A

than unity. Thus he reduces the general elliptic integral

a’ J/1—e sin’

three normal forms of “ elliptic functions or transccndents ”—

Jie fe fermaaa-™

A being an abbreviation for the radical /1- ¢ sin?¢.

With this reduction to fixed normal forms the foundation of the theory of elliptic integrals is laid, and the essentially irreducible integrals found which belong to a square root of a biquadratic func- tion. The same reduction subsequently led to the division of the general Abelian integrals into those of the first, second, and third kinds, in accordance with the properties of these three classes of integrals, either of remaining always finite, or of becoming infinite, algebraically only at infinity, or logarithmically at two different

oints. _ It will be perceived that the epithet “clliptic” applied to these integrals is purely conventional, arising from the connexion of one of them with the are of an ellipse ; but even at this stage it is apparent that we are concerned with matters of much greater gene- rality than the name indicates. It may also be noticed that, though Legendre calls by the name elliptic functions what are now called elliptic integrals, this is a change introduced by Jacobi, which Legendre long resisted. The change consists in regarding the superior limit of the integral of the first kind as a function of the integral, the latter being now considered as the independent vari- able. Expressed in symbols the change is that, in Legendre’s equa-

where ¢ is a quantity less

with abstraction from an algebraic part, to the

tion F(«, p) = rae =u, Jacobi calls ¢=am(2,«), and sin ¢, 9 A(x)

cos ¢, or Ad, &c. (or, in this notation, sin am w, cos am u, Aam 2, &c.), are his elliptic functions.

207. Legendre proceeds, after classifying the integrals, to the com- parison of his elliptic functions of the first kind. All geometers, he says, are acquainted with the complete algebraic integral given by Kuler of the differential equation

dat mn dy =e (a+ Bu+ ya? + du + ext)!” (at pyt+yytoyptreyyt —’ the discovery of which, in the introduction, he too ascribes to a combination of good fortune ‘*quoique ces hazards n’ arrivent qu’h ceux qui savent les faire naitre.” Our reductions show that this equation can, without loss of generality, be put under the form – -_ ae Vi-e sin V1-2 simpy and then its integral is

F(¢)+F@)=F),

1. **being an arbitrary constant. But the integral found by Euler’s method is thus written zs :**

cos ¢ cos y—sin ¢ sin WV1—-2 sin?u=Ccos p, which he then verifies a posteriori.

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The expressions sin p— S12 COS AY+siny cos p AP

1—c? sing sin2p 3 cos p= £98 ¢ cosW—sin ¢ sinW Ad AW 1~c? sin®¢ sin2y ;

Ap APA ¢ sin ¢ ging cosip.coeiy 1-¢ sin'¢ sin'y i

are at once derived from this form of the integral; and the corre- sponding formule for the amplitude of the difference between two functions follow by replacing py by —y.

Legendre next proceeds to the formule for finding algebraically a multiple function of a given one, connecting the angles gn-1, gn, ¢nti, by the relations equivalent to F(¢n41)=F(¢n)+F(¢), F(¢n-1) =F (¢,) — F(¢), which he writes

. ' 2A cos @.sin dn

see Le — casi iaaaanps * _ 2608 G. COS py

en eee aa 1—c? sin' sin?¢n

These can be applied in succession. Investigating the division of a function into " equal parts the equation is found to rise in general to the degree n?; but for the complete function the equation is only of the degree $(n?—1) when n is odd.

208. Proceeding to generalization of Euler's addition theorem, Legendre admits that, denoting the radical by R(z), &c., the equa- meee nay " paz R(x) Rly) | Rie) always be expressed in the form F(u)=mF(¢)+nF(y)+ &c., and so will always have a complete algebraic integral, for nothing pre- vents the supposition that 2 and the following variables are given algebraic functions of ~ and y, Perhaps, he says, this is the

only ae of generalizing Euler's result concerning the equation dx Yy 5 . pratp-x=0. For, though Lagrange tried to find cases of integra-

be de , dy : , : bility of al V¥? without supposing the two polynomials X

tion 0=

+ &c., can for integer values of m, n, p

and Y entirely similar, it does not scem that he arrived at any any other result; the cquation he gives (Mém. de Turin, iv. 119) is immediately reducible to Euler's. Thus, as has been remarked, Legendre was at this time very far from anticipating the very general transformations, sincc discovered, or the celebrated theorem of Abel which so marvellously extended this subject.

209. Having illustrated the functions F by the lemniscate and other curves, algebraic and transcendent, whose arcs are expressed by functions of the first kind, as well as by the expression for the time in the motion of a simple pendulum, Legendre enters, in chapter ix., on the comparison of elliptic functions of the second kind. Corresponding to the relation F(¢)+F(w) — F(uz)=0, these functions are related by

E(¢) + E(y) — E(u) =c? sin yp sin ¢ sin yp.

This includes Fagnani's as a particular case, and of course there is a similar relation for comparison of the arcs of hyperbola. In chap. xii. the well-known relation of Legendre is established between complete integrals of the first two kinds with complementary moduli; dand c being moduli are said to be complementary when

b?+c?=1. Denoting by F, E the values of F (F: c), E ar e), and by F', E' those of ¥(Z, (i)\ – ($2) , this relation, which has been already demonstrated, § 183, is

FE'+FE-FF' =~.

These complete functions satisfy differential equations of the second order, viz., F satisfies

2 ae al (i-o) S44 Ze an -P=0, and the complete E @E 1-c? dE ye oo +} Ee0 ee det —¢ deo :

with corresponding cquations when 6 is taken as the independent variable. The complete integrals of these differential equations are assigned in terms of both sets of complete functions, and the differential equations are utilized to show the law of the develop- ment of these functions in series of powers of the complement of the modulus, since when the modulus is near unity the ordinary series in powers of the modulus do not sufficiently converge.

210. In treating integrals of the third kind, the presence of a third determining magnitude, the parameter n, besides the ampli- tude ¢ and modulus ¢, which are common to the first two kinds, is

an additional eomplication. Legendre first establishes the relation

a = — Va tan mn) + n) F+ a tan-1 le ee ? am(1+m)(14+<) ;

by means of which any function M1 having a parameter greater than c is redueed to depend on one having a parameter less than c, but with the same amplitude and modulus. The quantity a, however, may have different values, and thus the following eases are to be distinguished.

When a is positive (either positive, or if negative its value is between —1 and —c*)the function introduced is circular, as written above. :

When a is negative, » is negative, and either greater than —1 or less than —c?, and the function is logarithmic. In this ease

where

writing a= — 8, the comparison written above is tis 1 A+B tan 2) I(n)+1(—) =F + —= log (——j=———- m ©, + OB een a ae ‘

When a=0 the integrals are expressed, by the first and second kinds.

Omitting the case of »= — eosee”@, which ean be reduced to that of 2 = —c? sin6, this ease and those of m=cot?@ and n= —1-+6?sin?9 remain, the first being the logarithmic parameter. The other two cases are easily shown to be connected by the relation

= 2

Te ee il 1 Fi gecanye en op il n am mn

veaie } /mn.sin pcos /mn A

provided (1+) (1—m)=8?, and so constitute really but one case. Functions with imaginary parameters always reduce to others with real parameters of the above two distinct kinds.

211. Coniparison of integrals of the third kind by means of the addition theorem leads to the formula

il na sin p sin ? sin p TI(?) + M(y) — Mu) = —— tan} iibeialnte | iinitenhis Mage) *

i Va 1+”—7 cos wu cos ¢ cos p)’ and thus the difference, which is zero in the first kind, and is algebraic in the second, is here expressed by the are of a circle; which becomes a logarithm if a be negative. Thus finally Legendre remarks that if =

He

dh taf = —_— (7) V (a+ Bat ya? + 8×3 + exc4) , where P is a rational function of x, there ean always be found an algebraie equation between a, y, z, &c., such that the quantity

tZ(s) +kZ(y) 1Z(z)&e.,

where t, &, 1, &e., are integers, may be determinable by ares of circles and by logarithnis.

212. Legendre next proceeds to the diseovery of Landen, having so far been employed mainly with those of Euler. He expresses astonishment that among the many analytic transformations em- ployed by Maclaurin and D'Alembert they had uot fallen in with the transformation which brings to light the numerous properties of the ehain of moduli, and that this discovery was reserved for Lan- den, who, however, made but a poor usc of it, not even seeing that it furnished a very simple method for approximate ealeulation of the arcs of conies. It is lessastonishing that Euler missed this discovery considering that the beautiful integration which is due to him led him to compare together the different values of thesame transcendent, just as arcs of the same curve are compared. But nowhere in his Mémoires do we find him varying the constants or parameters of the functions, and thus passing from one curve to another, as is done in eomparisons which depend on the scale of moduli. From the fact that Euler has written nothing about the memoir of Landen, Legendre eoueludes he had never been acquainted with it.

213. The formula given in § 194, by introducing the eccentric angles from the axes minor in the two ellipses, easily gives rise

to the equation sin ¢°=(1+3) el

n , Where 6=— , and so m

c= of that article. ¢° belongs to another ellipse, and for it the value of the corresponding modulus is evidently ma . Legendre

sees through the simple proposition of Landen, expressing the arc of a hyperbola by two arcs of ellipses, to the infinite series of moduli which can be produced by repeated application of this sub- stitution. Commeneing with functions of the first kind, he shows

that F(c,p) and F(c’,¢’), when ¢ ~, and ¢’ is determined by sin (29’ ¢)=c sin @, are related by the equation

Fé, #)=”*” Fe, ¢).

Thus, as 2¢’-¢@ is always contained between+6 “and — 6, @ being the least are having c for its sine, there is no ambiguity in deter-

mining the values of ¢’ and ¢. The relation for eomplete functions is F1(c’)=(1+c)F’(c). Now conceive an infinite scries of inereasing

moduli _ mn owe , Ie « Mee Cpe, ag! = 5, C= Ces 1A l+e le

it will soon attain the limit unity. Forming the complements 0’, ”, &c., of these moduli, the series decreases continually, and each term is, according to the law, 1-¢ „el-¢ 1-c” ~1+¢? l+¢”’ The series of amplitudes is deduced in succession by the formule sin (29’—@)=c sin ¢, sin (29”-— ¢’)=¢ sin ¢’, sin (29’” — @”)=c” sin $”, &c. ; and so a series of integrals of the first kind is got, rclated as follows

K(¢, ?’)= ai F(e, ?) ?

b” = &e.

1 1l+¢ il 1l+¢ Ke’, “==” F¢, ¢’) =-F* S” Fc, 9), &c., any two of the functions being always in a ratio independent of the values of the corresponding amplitudes. Similarly for the com plete functions

Fl¢/)=(1+¢)F©, F(e”)=(1+c)FU©=(1+c)(1+¢)FUc), &e. But the series ¢, c’, c’, inereasing in one direction, can be pro-

longed indefinitely in the opposite or decreasing sense to the limit zero. Here the law of terms is

ave® aN aN /c000 ¢———— =_—a =o, &e.; 1+0°’ 1+¢%? 1+”? ; and similarly 1-6 1-0° 1-0 1+ oY

with the series of relations of amplitudes derived from sin (2¢- $°) = sin ¢°, &c., which may be written tan (¢°- ¢)=6 tan ¢, &c.,

and of integrals F(c, ¢)= = F(c°, $°), &c.;

2 13% 9

F(o°, 9°)=(1+4)F(c, 9), ; Fic, 6%) =(1+D)F(o%, H°)=(1+8)(1+0)E(C, p), &e., and, for the complete integrals,

or, reversing, since 1+c°=

P=” Fe),

0 0

Fc) =, — F1(¢°) = —2 2He Fic) ; &e.,

for the decreasing scale of moduli. 214. Now if this be applied to the second kind of integrals we

find BE (c, $)=2E(c, 6)-2(1+c)H(c, ¢’)+2c sin 4,

showing that an integral of the first kind ean be expressed by the aid of two arcs of ellipses, E(c, ¢) and E(c’, ¢’). Whence by the formula of § 192 it follows that an are of a hyperbola can always he expressed by two elliptie arcs, the theorem Landen enriched geometry by. Also, by eliminating the integral of the first kind by means of two consecutive equations in the series, the relation between the ares of three consecutive ellipses in the series ean be found; so that by the indefinite rectifieation of two ellipses in the series ... EC’, 6”), EC’, $+), E(c,), E(c®, 6°), E(c%, 6), ...

of which the extremes are the ellipse having an eceentricity 1, which is a portion of the axis major, and that having an eecentricity 0, which is a cirele, the rectification of all the rest is obtained.

The transformations of Lagrange, or of Gauss (§ 203), may be seen to be essentially the same as this of Landen (or Legendre), for by (1+4) sin

y.

ale Sate in F(c, @) we get

dd (l+k)dy VINA

—— —— , where c=—-—_ , Vi-e sine V1-# sin*y 1+k

Henec F(c, ¢)=(1+ 0)F(c°,W).

Now with F(0°,y) =4F(0°,°), F(c, 6) = atl F(c®,$®) , and by elimi-

. = : : F (1+ c°)siny

fay “4 = 2 eee nating the quantity y between the equations sin ¢= [+o sin ? tan £¢6° = tan W/1— ¢% sin®y, we obtain the relation given above

sin(2¢ — $°)=c° sin ¢°.

215. This principle of transformation is next applied to the approximate calculation of the three kinds of integrals. Required, for instance, an approximate value of F(c, @): the decreasing moduli

taking sin ¢=

or k=0°.

PaPINITESIMAL CALCULUS

c°, o9, -00, ,. . must be calculated, and the increasing amplitudes ¢°, Sage”, ... thus

ats

y 1+e° 14+ Fe = FC, °) =

eB, p) = &e. ;

but, when the modulus has become very small, A=1, and ae ;

if then ® be the limit of the angles 49°, 46, $69, &c., we have F(e,)=8(1+0%)(1+c%)... When ¢=47 the limit @ will be equally 47; so that the complete function is a F1© =4mr(1 + 0°) (1 +61 + 9%) . ,

The continued product which multiplies 47, or ¢, may also be written in a form suited to logarithmic calculation, as

=...

The moduli are best got by taking auxiliary angles: let sin p=c, *, ®=tan*4u, similarly if c =sin p°, c%=tan?hy°, &c. ; and when a very small c has been arrived at, we can get the next by Cmte t+h. sett h. g.8c8+ ... sles f°, 6, are best found by tan (¢°- ¢)=0d tan ¢,— ee a hed always the least rail a Pe tables but that which is nearest ¢. ae

216. Combining the cquation t= ns

rived from it by differentiation with regard to », and using a to

2

denote (1 +2) (if +2), as in § 210, it is easily found that

2/a m= Asin ¢ cos gf ——“"____- ~—_= ~ (F-E)/—.. ; (1+ sin®'?)/a n/a nr/a Applying this to the case n = cot@, and writing for brevity cot? ¢=7', the following relation is found :— A(?,6) A(c, 9) sin cos gains %) + Sin cos =}r+tan 0A(b,)E(c, p)+tan A(c, $)F(, 8) +F(c, p)F(b, 0)— F(c, PE, 0)-E(e, $)F(, @) . Making ¢=47, this gives for the complete function of the third kind, with positive parameter, the following expression :—

A(5, 60) 1 o : BIRD diaio (n, a) =tr +tan 6A(d, 6)F ©

+F\(c)F(d, 0) — FY©E(d, 6) -E\(c) FQ, 6).

A similar relation is established for the other cases of the para- meter, and in each the complete integral is likewise expressed by integrals of lower kinds.

There now follow the general reduction of integrals with imaginary parameter, and the reduction to elliptic integrals of integrals not included in the general type, as for instance

dz ho) do ke Jem Sa — ¢? sin'g)t Se —¢2 sintg)t?

217. In his preface, however, Legendre had directed attention to the discovery of a new scale of moduli, different from that hitherto known, as the most novel of the results distinguishing this work from his Exerciccs. This transformation starts from the assumption

sin o(m+h sin?) ,

l+ksin®*@ " and by the conditions that w and ¢ reach 47 together, and, moreover, that cos w does not contain any other irrational factor in sin ¢ but cos d, we get _cos (1 —h sin?¢) 1+é sin'¢ _ do(m—k sin?) 1 m+

—-ihens r) hence tan (wt+o)= 2

But in order that w should increase gradually from 0 to 47, as ? does, / must be less than 1, and m less than 3.

Again, if ¢ and a are two moduli, so related that

('=msnte einer ca nticin? ee 1—a? sin'w =(1 —¢? sin'¢) Ten aiee | °

it will be found possible in eneral to satisfy the ab ti and thus we get 1D g isly the above equation, gee (—1lm+3) en 2 (m— 1)3(m +8) , 16m 16%

whence m must be between 3 and 1 in order that a and c¢ may both be real proper fractions.

with that de-

on dn 'dn

TI(n', b, @)

sin w

COS w » With k=}(m-1)\(m+3), h=}(m-1)%

Now tan ¢.

65

Hence ae 1+é sin’?

and this, combined with the above differential relation, gives

dw _ mag A(a, w) A(c, $) ‘ or, integrating, F(a, w)=mF(c, @),—a relation between two functions of the first kind, whoso moduli depend in general on the quantity m, which may be taken at will between the limits 1 aud 3. The modulus a is always greater than c, for we have ¢ m-m

a m+3 which is always positive. We havo seen that a and ¢ are detcr-mined by means of tho regulator m when it is known; it can be found from either of them by solving a biquadratic.

Again, the complements of the moduli are found by

prea (m+1)(3 – m)? yen (Me +1)(3 — m) 16m3 : 16m a

whence follows the simple relation Vac+V/B=1.

Application of this transformation to integrals of the second and third kinds gives rise to the remark that the trisection of an indefinite function of the first kind may he reduced to depend on the solution of two cubic equations.

218. Now, starting with a given modulus ¢, an infinite series of moduli increasing towards the limit 1, and an infinite series decreas- ing towards the limit 0, may be formed, and we may denote the latter by a notation analogous to the former. Let them bc in the increasing order ¢, ¢, cy, ¢,, &e., and in the decreasing order €, Cy, Co, &C.; and similarly for the complements, the regulators, and the amplitudes. Thus, by the

first scale, any integral of the first kind, having a given modulus and amplitude, can be trans- formed into another with any modulus in the series. . . , 0%, c, c',c'... and from this by the second to any in the other series formed from the same c by a different law, depending on extrac- tions of square and cube roots.

Legendre arranges the moduli in a sort of infinite chess-board, having c in the centre, and the moduli derived according to each scale in rectangular directions, and notices how remarkable is this infinite multitude of transformations which the same function F(c, @) may be submitted to, without changing its nature while

reserving the same ratio between the new function and the old

far all valucs of the amplitude ; in vain, he adds, might a second example be sought of a function which should be reproduced under so many different forms, and to which, more justly than to the logarithinic spiral, might be applied James Bernoulli's device, " adem mutata resurgit."

219. The first volume of the 7'raité also contains the reduction to elliptics of a great number of integrals, the development of elliptic integrals in series proceeding by sines and cosines of multiples of the amplitude, and calculations of some definite integrals, single and double, which can be expressed by elliptic integrals. The applications are, in geometry to the surface of an oblique cone, to that of an ellipsoid, and to a geodesic on a spheroid; and in mechanics, to the rotation of a solid, to the motion of a body under the attraction of two fixed centres, to the attraction of homogeneous ellipsoids, and to the orbit described under a given central force.

The second volume contains details of the calculation of the integrals, and such tables of them as have to be constructed in order that the use of theso functions may be introduced into analysis just as circular and logarithmic functions are employed. Here, Legendre excludes the thought of reducing to tables functions of the third kind, sinco they contain besides the principal variable two arbitrary quantities ; and so the tables should be of triple entry, a thing altogether unmanageable.

Besides these, this volume contains a treatise on Eulerian integrals, and an appendix on spherical functions and on quadratures.

The third volume of the 7raité contains three supplements to the theory of elliptic functions, dated 1828, 1829, 1832, enlbodying Legendre's aceeptance of the discoveries made by Jacobi and Abel since the publication of the 7'raité.

220. It was owing to the strangeness of his subject that Legendre for more than twenty years found no fellow-worker in it. " After having employed myself for a great number of years," he says in the preface to the first supplement of the Zraité, "with the theory of elliptic functions, of which the immortal Euler had laid the foundations, I thought I should colleet the results of this long work in a treatise, and this I published in the month of January 1827. Up to that geometers had taken almost no part in this kind of researches; but hardly had my work seen the light, its name could hardly have become known to scientific foreigners,

Mi — 9

and m+3—(m?—m)=(1+m)(3-m),

66

when I learned with cqual surprise and satisfaction that two young geometers, MM. Jacobi of Konigsberg and Abel of Christiania, had succeeded by their own studies in perfecting considerably the theory of elliptic functious in its highest parts."

Abel and Jacobi have found not only points of connexion for their works with Legendre's investigations, but have been able to adopt a set of methods and points of view from his T'raité, on the basis of which they have constructed the mighty edifice of the theory of elliptic trauscendents. This Jaeobi himself subsequently fully recognized. On May 27, 1832, he writes to Legendre :—" In a note at the end of the eighth volume of M. Crelle, I have sought to extol the imperishable merits of the geometer who, besides the numerous and important

discoveries with which he has enriched science, has effectually laid the foundations by the glorious labours of his life of two great aud extended disciplines which shall henceforth form the a and the w of every mathematical study. I have at the same time made use of this opportunity to speak of Abel and of his great theorem, which you again have the merit of having first penetrated, and of having shown to posterity that its development js the great task remaining for it to fulfil.”

221. Before entering into the developments due to these two celebrated mathematicians we should make some mention of Gauss’s labours in the same field. These were mostly found in incom- plete sketches at the beginnings of different treatises, or as indi- vidual formule scattered among his other works.

the third volume, and states that there is evidence that Gauss was acquainted with the relations between the arithmetic geometric mean and the series proceeding by square powers in the year 1794. This arithmetic geometric mean is defined in the paper “ Deter- minatio attractionis” published in 1818, where he speaks of it as a peculiar and most expeditious algorithm which he had for many years employed, and intended yet to treat of more fully. ora

Let m, x betwo positive quantities, and putm’ =4(m+7),n’=/mn, so that m’ and n’ may be their arithmetic and geometric mean, taking the latter always positive. Now take

mm!’ =4(m’ +n’), n= Vin’ »

mom” = $(m” + n”), nl” — mn” ; and soon. It may be seen that the scries m, m’, m”, m’”, and n, n’, n’, nv”, &e., rapidly converge to a common limit, which we shall denote by #, and simply call the arithmetic geometric mean between

mand 2. Now we shall demonstrate that i is the value of the B& integral adr : Sx /m? cos*t +n? sin?r taken r=0 to r=360”.

For suppose that the variable 7 is expressed by another 7’, so that —— 2m sin +’ (m+n) cos?7’+2m sin®r”

it will casily be seen that as 7’ increases from 0 to 90°, 180°, 270°, 360°, r also, though not uniformly, increases through the same range. But, effecting the substitution, at a’ :

n/m? cos +? sin?r) — \/(m’” cos*x’ +n sin?7’) ’

accordingly the values of the integrals | as SN Tee TD) Qaa/(m? cos? +n? sin?r) ?/ Qara/(m cos*s’ +n’ sin?r’) 4

each taken from 0 to 860° are equal ; and, since this may be carried

on as far as we please, plainly they are also equal to the value of the integral

Si A)

2aa/(u2cos?@ + #2 sin?) ’

from @=0 to ©=360°, which is plainly – B

222. N. H. Abel (1802-29) started in the summer of 1825 to pursue his studies abroad, chiefly at Paris. On lis way he made the acquaintance in Berlin of A. L. Crelle, who had long conceived the project of founding a mathematical journal, but was decided to put this into execution by the importance of the numerous memoirs already prepared by Abel (as also by Steiner), who consented to their publication in it. The first number of the journal appeared during Abel’s stay in Berlin, and each copy in the first four volumes contained papers by him. These and other published papers are reprinted in the first volume of his collected works (Christiania, 1839). The second volume contains mostly papers found after his death, neatly all in this volume having been written before Abel began his travels. These, therefore, first claim our attention after Legendre’s independent investigations.

tion determined by the equation

Fy being any function of y which does not become zero or infinite

The editor of his collected works has brought them together in the latter part of

223. Elliptic integrals have hitherto occupied us. We have men- tioned ($ 207) the problem of inversion which leads to clliptic func- tions, viz., that if w=F(x, 4), then ¢—am u, and if

o dx é un Va 2d 2 ea) , we have 2=sin am wu. fs a =

Paper viii. (vol. ii.), is headed ‘Remarkable properties of the func-

fy, dy- def (a~y)a,~yNag—y) « – - (am— 9) b=,

when Y=@, Q), Gp, -.. &m: In it this problem of inversion of the more general (hyperelliptic) integral in which the square root contains a function of the degree m+1is attempted ; and, though it has since been shown by Jacobi (Credle, xiii.) that the inversion of hyperelliptic integrals is a different problem from what is here proposed, Abel at any rate in this short paper had established the existence of two periods for elliptic functions.

224. We saw in § 216 that Legendre, in comparing two elliptic integrals of the third kind, found a certain relation connecting with integrals of the first and second kinds two such integrals of the third kind, in which the argument and parameter are interchanged. This relation recurs to us in an extended form in the paper of Abel (ix., vol. ii.) “On a remarkable property of a very extended class of transcendent functions.” Defining y or yx by the differen-

tial equation y fort , gu=0, where pv=atajw+agw*+ ..., and fu=B+A,c+B,77+... , he gets

Y Ye. We, gauf- da

ya J “-a (a-x)pa. wa

= 2((n ty 2)Omtnte on Saints) [oo . frye

the integrals in x being taken from a value of x which makes yo. $x vanish, and those in a from a value of @ which destroys

i When we put yo= a in this, it becomes the theorem for the px interchange of argument and parameter for hyperelliptic integrals.

295. **The first works of Abel which attracted attention,” writes his editor, “were his memoirs on the impossibility of the general resolution of algebraic equations higher than the fourth degree, and his researches on elliptic functions. Simultaneously with Abel, and without being acquainted with his works, M. Jacobi of Konigsberg began to treat the theory of elliptic functions. Thusa rivalry exists between these two men of exalted genius in their treatises on these functions. Abel told me that during his stay at Paris in 1826 he had already completed the essential part of the principles he sub- sequently enunciated regarding these functions, and that he would have much wished to postpone the publication of his discoveries until he could compose a complete theory of them, had not in the meanwhile M. Jacobi entcred the lists.”

226. On October 24, 1826, Abel wrote from Paris:—“I have just finished a large treatise on a certain class of transcendent functions for presentation to the Institute, and that will take place next Monday, I dare without ostentation say it is a treatise which will give satisfaction. I am curious to hear the opinion of the Institute about it.” He had not deceived himself in the significanee and reach of this fundamental theorem ; yet in the Academy judgment upon the work was deferred, so that Abel two years later (Jan. 6, 1829), felt himself called upon to send to Crelle the following, which appeared in the fourth volume of the Journal (Works, ip. 394),

227, ‘* Demonstration of a general property of a certain class of transcendent functions.

“‘ Theorem.—Let y be a function of z which satisfies any irreducible equation of the form

O= py try Py? t... tPn-yrtty™ « . « O) where >, Py,» «+ Pn-1 are integer functions of the variable w In like manner let 9, 91). – - Qn-1 be integer functions of w, and

O=Htnytgayt… +g-yr?. . . . @

a similar equation, and let us suppose the coefficients of the different

powers of x in these functions variable. Let these be denoted by

a, a’, a’... , By reason of the two equations (1) and (2), # will

be a function of a, a’, a”, &c.; and we shall detcrmine its values by eliminating y. Let us denote by

p=0. . 2 eo «

the result of climination, so that p will contain only the variables

z, a, a’, &. Let m be the degree of this equation in x, and let its

p roots be

DyiWlg «as ey pene (4),

which will be so many functions of a, a’, a”, &ec.

“Now, if /(z, y) denote any rational function of x and y, and we

make yaa ffx, ydu. . 1. 1 « + OH

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then the transcendent function ¥(z) will possess the general property expressed by the following equation—

fa tg t Wy =Utk logy, +hylogy +... +knlogvn… (6),

Uy Vyy Vay 0 > > Uns being rational functions of a, a’, a”, ... and 1» ky + + » Rn, constants. –

“ Demonstration. —To prove this theorem it is enough to express the first member of equation (6) as a function of a, a’, a”, &c. ; for thereby it will reduce to a rational differential, as we shall see.

‘First, the two equations (1) and (2) will give y as a rational func- tion of z, a, av’, a”. . . Similarly the equation (3) will give for dx an expression of *he form

dx=ada+a’da’ + ada” + &e.,

wherea, a’, w’. . . are rational functions of 2, a, a’, a’, &c. Thence it follows that the differential (x, y)dw can be put under the form flx,y)du=puda+t p,xda’ + pada” &c., where $x, git, .. . are rational functions of 2, a, w, a”, &c. Integrating, we get y= f (oxda,xda’+...); and from this we conclude, since this equation holds when we put for « its « values,

\ = keds

Yay tnt… += f(pr + haat… +ha,)da +f (bit + b%2+ SgCNOumeLS pit,)da + &e.

‘In this equation the coefficients of the differentials da, da’, &e., are rational functions of a, a’, Oot CONOR, By. . 0 Mes but they are besides symmetrical in %, 2, . . . 2; therefore, by a well-known theorem, they can be expressed rationally in terms of a, a’, a… and the coefficients of the equation p=0; but these latter are themselves rational functions of the variables a, a’, w’... so that finally the coefficients of da, da’, da”, &c., of equation (7) will be so too. Therefore, integrating, we have an equation of the form (6). ; am!

‘J propose on another occasion to develop numerous applications of this theorem, which will throw a great light on the nature of the

transcendental functions it deals with.”

228. Abel died of consumption, April 6, 1829, having been con- fined to bed nearly three months ; and of the pen promised nothing appeared or has since been found in his remains, More- over, except the note that he had presented the memoir to the Academy, which appears in the paper “On some general properties of a certain sort of transcendental functions” (Works, i. p. 288), Abel hardly seems to have expressly referred to it, though he mentioned the theorem (November 25, 1828, Works, ii. p. 258) to Legendre, adding that on this general property he had in fact founded the whole theory of elliptic functions.

229. But notwithstanding, his contemporaries were not slow to estimate the value of his analysis. The statement in Orelle’s Journal revealed to Jacobi the entire significance of this “ funda- mental theorem of analysis,” and his admiration breaks forth to Legendre on the 14th March 1829 :—“ What a discovery of Abel’s is that generalization of Euler’s integral? But how does it happen that this discovery, perhaps the most important our century has made in mathematics, though communicated two years since to the Academy, has been able to escape the attention both of you and your fellow members?” To this question Legendre answers (April 8, 1829) :—“I shall not close this letter without answering yours relative to M. Abel’s beautiful paper, which was printed in the last number of Crelle’s Journal, and which had been presented to the Academy by its author in the last months of 1826. M. Poisson was then president of the Academy. The committee named to examine the memoir were M. Cauchy and myself. We perceived that the memoir was almost illegible; it was written with very faint ink, the characters badly formed ; it was agreed on that we should ask the author for a better copy, and one easier to be read. So things remained. M. Cauchy kept the manuscript up to this without doing anything further about it. The author, M. Abel, appears to have gone away without caring what became of his memoir. He furnished no copy, and no report was made. However, I have asked M. Cauchy to give me the manuscript, which never was in my hands, and I shall see what there is to be done, to make up, if possible, for the little attention he bestowed on a production which no doubt deserved a better fate.”

230. The third and last supplement of Legendre to his great work is dated March 4, 1832, and concludes as follows :—“ Here we shall terminate the additions we proposed to make to our work, taking advantage of the recent discoveries of MM. Abel and Jacobi in the theory of elliptic functions. It will be remarked that the most important of these additions consists in the new branch of analysis we have deduced from the theorem of M. Abel, and which had hitherto remained quite unknown to geometers. This branch of analysis, to which we have given the name ‘theory of ultra-ellip- tie functions,’ is of infinitely greater extent than that of elliptic functions, with which it has very intimate relations ; it is composed of an indefinite number of classes, each of which divides into three kinds, as do elliptic functions, having besides a great number of Properties. We have only been able to glance at this matter, but

no doubt it will be gradually enriched by the labours of geometers, and at length will form one of the finest parts of the analysis of transcendents.” At nearly the same time Legendre wrote to Crelle— ““The work, so far as J am concerned, has given me the profound satisfaction of rendering conspicuous homage to the genius of M. Abel, in making felt all the merit of the beautiful theorem which was his discovery, and which may be characterized as Monumentum ere perennius.” In his remarks on this third supplement of Legendre (Crelle, viii.) occur the notable words of Jacobi :— We hold it (the Abelian theorem) to be the greatest mathematical dis- covery of our time, although it remains for a future, perhaps long distant, work to manifest its whole significance.”**

231. The name which Jacobi thus applied, the Abelian theorem, has since adhered, and the functions to which it refers have been called Abelian functions, the term hyper- or ultra-clliptic having been restricted to that particular class in which the square root of a polynomial is the only irrational quantity introduced ; while Abelian functions may depend on any irrationality. The neglected paper of Abel appeared in the Memoirs of the Institute in 1841.

232. But, though the Abelian theorem was thus published during its author's stay in Paris, his labours in other departments of the theory of transccndents suffered no intermission. In December 1826 he writes —"I have written a large memoir on elliptic functions which contains much that is curious, and which I flatter myself will not fail to fix the attention of the literary world. Amongst other things it treats of the division of the arc of the lemniscate. I have found that with rule and compass the lemniscate can be divided into 2"+1 equal parts, when this number 2"+1 is prime. The division depends on an equation of the degree (2"+1)?-1, but I have found its complete solution by means of square roots. This has revealed to me at the same time the mystery in which Mr Gauss's theory of the division of the circumference of the circle has been wrapped up. I see clearly how he arrived at it," referring to the last section of the Disquisitiones Arithmetice of Gauss, published in 1801.

233. C. G. J. Jacobi (born Dec. 10, 1804, died Feb. 18, 1851) appeared first as a discoverer in connexion with our subject in the '* Extracts of two letters to the editor," published in September 1827 in the Astronomische Nachrichten of Schumacher, and re- printed at the beginning of the collected Works, 1881. We have seen that Legendre discerned the vast importance of the relations which he called Landen's transformation, and discovered with increased wonder the further transformation of the third order, which became public in January of this same year 1827 in the Traité. But in his first letter Jacobi states: "The integrals of

the form f- a — for different moduli c, belong to different V1-¢ sin'

transcendents. Only one system of moduli is known for which they reduce into one another, and M. Legendre in his Fzercices says even that there is only this one. But in fact there are as many of these systems as there are prime numbers, that is to say, there is an infinite number of these systems, all independent, each answering to a prime number ; the system heretofore known answers to the prime number 2."

This is already, without proof, a statement of the general theorem of transformation of elliptic integrals of the first kind. If U be a certain odd function of sin y of any degree n, and V a certain even

function of sin y of degree n—1, then, putting sin gL , the co-

efficients of these functions may be determined so as to satisfy

ad ad : STsam on fas ; and each of these substitu- tions gives a new system of moduli.

Further, Jacobi notices that sin y can be in an almost analogous manner expressed by sin @, so as by composition of the two integral equations to satisfy the relation

I a= ba nf a V/1-¢? sin'? /1— sin?"

Thus the substitution which serves to give m times the tran- scendent can be divided into two of a simpler nature, and this substitution gives sin `expressed by a fraction whose numerator contains the odd powers of sin` **up to 7, and its denominator the even powers of it up to 2?—-1.**

Without giving the general proof, the transformations of the third and of the fifth degrees are here actually effected, and connected with multiplication and division for the numbers 3 and 5 ; and thus for the first time the algebraic solution of the equation of the ninth degree which trisects the transcendent is given.

234. Legendre could not at first believe in the existence of an alge- braic transformation belonging to any arbitrary degree, and thought Jacobi trusted to mere induction. But he soon admitted the pro- fundity and rigour of Jacobi's analysis on receiving from him a letter, dated Aug. 5, 1827, in which it is stated that, if» be any odd num- ber, we can by a rational substitution,

ea ilA A’2P . B+ B+ arrive at the equation

ae) ... poet

,

ee (1 =a) Pa) (1 AL = 228) Moreover, this substitution can be replaced by two in succession, _yatayit … a”y?—}) aata’ze ... +a%%P—}) en eee ag Ro ae ee b+b y+... b’yP-} B+Bet… +R”zP-} the first substitution transforming the elliptic function into another of different modulus, so that da Mdy V (i= a8\(1 02a?) V1) — ay?) ” and the second returning to the original dy 2 dz V(1=y)(1— a7?) MV(1- (1 = 02”)

Now, giving p different values, we sce that each given modulus is one in an infinite scale of moduli into which it may be transformed by an algebraic and even rational substitution. This letter, moreover, contained the two theorems giving the general formula in a trigono-metrie form.

235. Subsequently Jacobi, on January 12, 1828, brought under the notice of Legendre the works of Abel on elliptic functions, which Crelle had published,—but in his own notation. Abel, he says, begins with the analytic expression of all the roots of the equations of higher degrees on which the division of elliptic func- tions depends. Taking sin ¢=7 tan y, where 7=/-—1, and

lasts! Vi-esinte

we have, if «’ be the compleinent of x, dp _ Ji-«sin Vi-«?sin’y’ whence sin am (zz, «)=7 tan am (é, «’), which is a “fundamental theorem of M. Abel.”

Further, we have in general sin am (+ 4mK + 4m’cK’)=sin am &, where m and 7’ are positive or negative integers, and K is the com-

plete function OM —— 2s 0 Vin sint¢ ’

and K’ the complete function corresponding to x’.

We sce then that the roots of this higher equation for dividing the elliptic function & into parts will be of the form E+4mK + 4m'K7 ,

n 3 a formula which involves as many as "? roots, if we make m, m' successively take the values 0, 1, 2,...-—1.

Abel next reduces the division of any elliptie function é to the division of the complete function K. In fact, ifa, B be any roots E+ 4mK 4+ 4m'iK'" giv eee

x 4

sin am

of x"=1, the expression (3a"“8"' sin am

n ing m, m' all the values 0, 1,2… 2-1, will not change if we put |

Th bet ad fe = ue ; it will thus be symmetrical in these roots, and may therefore be expressed by sin am é, and by constant but irrational quantities of the form

4mK + 4m'7tK'

oo Now giving a, B all possible values produces »? combinations, and thereby the values of all the roots. The division of the com- plete function, which depends in general on an equation of the 4(n2—1) degree, is reduced to one of the n+1 degree, m being a Lat Pel sey For if og —teK + Au Kt

n

instead of sin am £ any other root, sinam n

sin a

prime number. , and g be a primitive root

of the congruence w”-1==1(mod n), also ¢ (w) any trigonometric function of the amplitude of w, and a a root of x”-!=1, we attain this by considering the expression

[p(w) +ap(gw) + a*p(grw) + . « which is symmetrical in

Hw), H(ge), P(g?) .. . P(g”-2w).

But symmetric functions of these quantities can only have x+1

different valucs, answering to 1=0, w’=1; p=1, w=0; w=l, p=

, 2, 8,.. . 2-1. So they will be determined by an algebraic equation of the degree » +1.

In conclusion, Jacobi mentions researches of his own, which led

him to the conclusion that if a modulus « can be transformed into

another A, they are connected by an algebraic equation of the degree

» ann 2g(gr- Fo) }-?

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+1, if the transformation be of the order of the number n, supposed prime. These symmetric equations are, for 7=8 and 5,

ut — vt Que(1 — uv?) =0, u8— v8 + 5u?v(u? — v?) + 4ur(1 — u*v4)=0, a= Ale, v= AA.

These equations he names modular equations, and notices as remarkable that they have their simplest forms when expressed in the fourth roots of the moduli. He also gives the differential equation of the third degree which all these algebraic cquaticns satisfy, viz.,

3(du2d?a? — da2d?x?) — 2duda(dnd3a — dard x)

+ antans| (Tee) dt : € a x) ax | =) KK A-A

Moreover, in some cases the same modulus reappears, and the trans- formation becomes multiplication. This takes place in all cases when 1 is the sum of two squares, 7 =a? + 40, « being /. 4, and the elliptic function becomes multiplied by a42067. Similarly with all moduli which are connected by any scale with «=4/4, a kind of multiplication not having an analogue in cireular arcs.

236. In answer to a request of Legendre that he would furnish him with the elue to his discoveries, Jacobi wrote, April 12, 1828:—“ Having found (March 1827) the equation

eee:

M da dx I recognized that for any number, 1, transformation was adeterminate problem of algebraic analysis, the number of arbitrary constants being always equal to that of conditions. By indeterminate coefficients I formed the transformations for the numbers 3 and 5. The biquadratic equation to which the former led me having nearly the same form as that which serves for trisection, I began to sus- pect somerelation. Fortunately I happened to remark in these two cases the other transformation complementary to multiplication. At this stage I wrote my first letter to M. Schumacher, the method being general and verified by examples. Subsequently, examining ay + by? ae +- bia

l+cy?’? %° 1+éa under the form presented in my first letter, I saw that when we

2

ut e=sin am—— , z must vanish, and, as in the said form La was 3 ? ? a

positive, I thence concluded that y must vanish also. In this manner I found by induction the resolution into factors, which being confirmed by examples, I gave the general theorem in my second letter. Having remarked the equation sin am (dé, «)=7 tan am (é, x’), I next drew from it the transformation from x’ toa’. I had then two different transformations, one from « to a smaller modu- lus A, the other from x’ to a larger one A’. Thence | conjectured that exchanging inter se x’ and

A, « and 2’, the analytic expression of the complementary transformation would be got. The demon- strations were found only subsequently.”

287. Equally interesting is Legendre’s reply (June 16, 1828):— ** As to what you told me of the train of ideas which led you to your beautiful discoveries on elliptic functions, I see that we have both run some risks, —you in announcing discoveries not yet in-

putting,

more closely the two substitutions z=

| vested with the seal of a rigorous demonstration, and I in publicly and | unrestrictedly giving them my fulland entire approbation. We have

neither of us to repent of what we have done…. I saw very clearly that results such as those you had obtained could be no effect of chance or of a faulty induction, but only of a profound theory based upon the nature of things.”

238. Of Gauss’s investigations in this branch of mathematics Jacobi makes mention in his first letter to Legendre (August 5, 1827). These researches “are not the only ones which have been undertaken in Germany in the same subject. M. Gauss having heard of them let me know that he had developed as far back as 1808 the cases of division into 8, 5, and 7 parts, and found at the same time the new scales of moduli referring to them.” Again, April 12, 1828:—“ As to M. Gauss, he has not yet published anything in elliptic functions, but it is certain he has made beautiful discoveries. If he has been anticipated and perhaps surpassed, it is a penalty due to the veil of mystery he has spread over his works. Iam not personally acquainted with him, as I studied philology at Berlin, where there are no distinguished geometers.” Legendre, however, cannot believe that discoveries of such reach can be left unpublished, as was actually the case with Gauss. “If M. Gauss,” Legendre writes to Jacobi, April 14, 1828, “ had fallen upon such discoveries, which in my eyes surpass all hitherto done in

analysis, most assuredly he would have lost no time in publishing them.”

239. Simultaneously with the announcements of Jacobi just men- tioned there appeared in September 1827, in Crelle, the first part of Abel’s “ Recherches sur les fonctions elliptiques,” and accom- panying the second part (Feb. 12, 1828) a statement that, “ having finished the preceding memoir on elliptic functions, a note on the same functions by Mr C. G. J. Jacobi, inserted in No. 128 of M. Schumacher’s Nachrichten, has reached me. M. Jacobi gives the

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following theorem… . This elegant theorem, which M. Jacobi gives without demonstration, is contained as a particular case in formula 227 of the foregoing memoir (which is the formula of of § 246 infra), and is fundamentally the same as that-of formula 970.” This he proceeds to show.

940. The “ Recherches” present a great and complete theory of elliptic transcendents. Starting with the inverse function ¢(a) as

dé é : that determined by a=. leat and sin @=¢a=x, which by

——_— : dx ‘ced do/1—sin?0=d¢a= dz givesa= és Jaa) oa)’ Abel notice

hat the formule become simpler by supposing c? negative = —c?, a for symmetry writes 1—c°x? instead of 1 ×2, so that the func- tion ¢a=z will be given by the equation

=f da

4= ——————_—___———— 3»

9 V(1— ctx?) (1 + 2”)

or by ga=NV(1-e¢‘a)(1+ 97a),

and for brevity two other functions fa = V1- ga, Fa= Vi+e¢ra introduced. : =

© ier establishing the double periodicity, and determining the

zero and infinite values of these functions, Abel proceeds to the

development of the formule of multiplication to determine ¢(na),

fina), F(na) in rational functions of (a), f(a), F(a).

He next enters on the solution of the more difficult problem of the division of elliptic functions, which is the principal object of the memoir, Abel proves the algebraie expressibility of the fune-

. a a FE a cia Cs : t(s*5) ‘ (seri f(a), F(a) in the form

1

al! 2 Qn 2n-F1 #18), 47 4) M18) + (a, +V0F=D} 7) eens

1

+ (m+ Jou a aa ;

yas functions of ¢$(a),

in which

— il se 1 A? 2 Ben $B g(2n+1)B+ 5 (At JA} BY)

1 : ih (Ay Na cae a + (Am + J a a t.

and the quantities C, D are rational functions of ¢,(8), while the quantities A, B are similar functions of $(2n+ 1)8. Thus these equations give (8) algebraically expressed by ¢,(8), and then ¢,(8) algebraically by #(2n+1)8. So, replacing B Lo aad » We get o msi) as an algebraic function of ¢a; and similarly for f and F. : ,

241. The priority of this beautiful discovery Jacobi ascribes unconditionally to Abel. To Legendre he writes (March 14, 1829):— "You suppose I have found means of expressing algebraically trigo- nometric functions of the amplitudes you denote by am, adding that without that my formula would contain coefficients I could not determine. But that is gwite impossible in the general case, and is done only for special values of the modulus. My formula, which gives the algebraic expression for sin am uw by means of sin am nu, supposes known the section of the complete function. In this manner, for more than a century, the division of an arc of a circle could be solved algebraically, supposing known that of the complete circumference, this latter having been given generally only in these later times by the works of M. Gauss…. You see then that M. Abel has proved this important theorem, as you call it, in his first memoir on elliptic functions, although he has not dealt in it with transfor- mation, aud does not appear even to have thought when he wrote that his formule and theorems would find such an application. The transformed modulus, or, which amounts to the same thing, the regulator, being supposed known, it is still necessary to resolve an equation of degree 4(m—1) to arrive at the quantities sin'am(2pw), or at the section of the complete function. Thus you had only to solve a quadratic in the case of m=5. M. Abel proved that M. Gauss's method applies nearly word for word to the solution of these equations, so that it is only the modular equations that we are unable to solve algebraically."

242. Starting from the solution of the problem of multiplication and division, ¢(2n+1)8 is exhibited by Abel as the quotient of two double products, the factors of which depend linearly on $(8). Thence napa —

(mnt In+1? verse function ¢(a) is derived in double products and double sums, the factors of which are linear in a; accordingly a unique analytic expression is found for the function heretofore defined only by its propertics. The reduction of the double products and double sums

and n=, the development of the in-

to simple products and simple sums, the product development and breaking up into partial fractions of the elliptic functions, follow then without further difficulties.

243. With the publication of the “ Recherches” Abel clears at one bound the limits of the investigations of Jacobi hitherto published, though the first part devotes no attention to the problem of trans- formation of elliptic integrals. Moreover, this work drew from Gauss the remark:—“ M. Abel has anticipated me at least in a third part. He has just trodden preeisely the same path I went along in 1798. And so I am not at all astonished at his arriving, for the most part, at the same results. Besides, as in his deduction he has displayed so much sagacity, penetration, and elegance, I feel myself by it relieved from the publication of my own researches.”

244. The same volume of Crelle eontains, besides the first part of of the “ Recherches,” indications in the paper “ Problems and Theorems” that Abel was at the time in possession, not only of the theory of rational transformation which Jacobi treated, but of the general algebraic transformation, as has been nade manifest subse- quently in his collected works.

245. Before Jacobi had read the “ Recherches’ he published a proof of the general theorem of rational transformation in No. 127 of Schumacher’s Nachrichicn, December 1827. It is based on enumeration of the constants available, and fixing the conditions

in order that the substitution y= U may satisfy the differential equation ae

dx

MV(1— Bx)(1 — f’2)(1 — B’x)(1— Bx) He introduces the unique inverse function which he calls sine of the amplitude, sin am, and gives the value of

2 2

eC. ——_ oan ee ee _ sin coam sin coam* 2Qn+1 2n-+1

l-y= : 1— x? x?sin’am Se @ ~ 2% sin’am 2% 2n+1 2n +1 as satisfying the differential equation (M being constant) da dy

eee = WM V (1 = a8)(1 = a) V1 (1 – 9”) The value of y is derived from this, and Jacobi remarks that this theorem holds generally, but does not embrace all the solutions of the problem. 246. The second part of the “ Recherches ” was finished by Abel February 12, 1828, and appeared immediately in Credle. The first

problem treated is the algebraic expressibility of the function o(=),

when certain relations, as for the lemniscate, hold between e and c. The principal application of this is the expression of the function by square roots whenever x is of the form 2” or 1+2”, the latter being prime. He then proceeds to deal with the general treatment of rational transformation, which he presents in the following form.

Tf a be (tHe ia aet , Where at least one of the integers

m and pw is prime to 2n+1, we shall have

dy da Iii =o + ey) . fe — oa®)(1 + c?a*) }t ’

where y=f.x (2a — x?)(p?2a — a)... (p?na — x”)

(1+ 0%?pa . o)(1 + e?p?2a x)... (140%? p2na. 2)’

1 t[e($ee)-9(Sem)- (Sem) e-F[o(F +a) . o(S420) or o(S+na) |,

a=f(pa.¢2a. 68a… gna)’,

f being an indeterminate, so that there only exists a single relation between the quantities c,, ¢, c, ¢. The section concludes with the words —“To have a complete theory of the transformation of elliptic functions, it would be necessary to know all the transformations possible ; now I have succeeded in demonstrating that they are all got by combining that of M. Legendre with those contained in the above

formula, even when we are looking for the most general relation between any number of elliptic functions. This theorem, the consequences of which embrace nearly the whole theory of elliptic functions, has led me to a very great number of fine properties of them."

247. The same number of Credle contained, in an extract from a letter by Jacobi, " Note sur les fonctions elliptiques," the exhibi- tion of sin am as the quotient of two series © and H, or as they

were subsequently called the 6 and 6, functions; also appended to —_——rK'

this, the development of = by powers ofg=e K , the expon- v

ents of which are the squares of the natural numbers ; as also the very important development of /« as quotient of two series pro- ceeding by square powers of g and gt—results whose importance was at once accepted by Legendre. Regarding the result in this paper, that to a given modulus for a prime degree of transformation a there always correspond n+1 other transformed moduli got by y&£ 4 .a"~~lg" for g, where a*=1, Jacobi re~~ will see that imaginary transformations

putting 9g", g", ag",.. marks, "Thus M. Abel had not escaped me."

248. Jacobi's well-known construction for the addition and multiplication of elliptic functions by the arcs determined on a cirele by the vertices of an inscribed polygon, whose sides touch other circles coaxal with i (or, as he entitled it, application of elliptic transcendents to a known problem of elementary geometry—to find the relation between the distance of the centres and the radii of two circles, one inscribed in, and the other circumscryibed to, an irregular polygon), is of about the same date, April 1, 1828.

Immediately afterwards, Jacobi, still ignorant of the second part of Abel's " Recherches," communicates to Legendre (April 12, 1828), the

forms of development detailed in the work we have just spoken of for the sin am, for the modulus of the integral, and for the period K, and notices that these formule will not be without interest for the celebrated geometers who are engaged with the motion of heat,—numerators and denominators of the fractions by which the trigonometric functions of the amplitude have been expressed being often met with in that question.

249. Abel sought to pe the problem of transformation, in the publication of which he was anticipated by Jacobi.

‘*We may regard this theory ” he says (May 27, 1828), “froma much more general point of view, proposing as a problem of indeter- minate analysis to find all possible transformations of an elliptic function which can be effected in a certain manner. I have attained the complete resolution of a great number of problems of this kind,—among them the following:—To find all possible cases in which we can satisfy the differential equation

dy La da

V/(1 = ¢,2y*)(1 — €,2y?) V(1 = c8x®)(1 — ex) * by putting for y an algebraic function of x, rational or irrational. This problem may be reduced to the case that yis rational. For we can show that, if (1) holds for an irrational value of y, we can always deduce from it another of the same form in which y is rational by suitably changing the coefficient a, —the quantities ¢,, ¢,, ¢, ¢ remaining the same. The first method which presents itself for resolving this problem when y is rational is that of undetermined coefficients. But this is a very fatiguing process. The following, I believe, deserves the attention of geometers, leading as it does to a complete solution in the simplest manner.”

The theorem of the reducibility of the general problem of trans- formation to the rational is, however, stated without proof in this paper, but the problem of rational transformation, based on con- siderations of periods for the original and transformed elliptic func- tion, is airiatly treated. It is shown to resolve into simpler analogous problems whenever the number characteristic of the transformation is a

compound one, and the equation of transfor- mation itself is stated to be algebraically soluble. Lastly, Abel enters more closely into the case of equality of the transformed moduli of the integrals (viz., ¢,=e, cy=c), which has subsequently constituted the theory of the complex multiplication of elliptic functions. The multiplier of the transformation is found in the necessary form p'+/-p, where p' and pu signify two rational num- bers, of which the latter must be essentially positive ; and Abel adds—''If we attribute to such a value, we can find an infinity of different values of e and c which render the problem possible. All these values are expressible by radicals." Regarding the subject of this paper, Jacobi remarks to Legendre (June 14, 1829), '* Abel's principal merit in the theory of transformation consists in his demonstration that our formulwe embrace all possible algebraic substitutions, and this gives a high degree of perfection to this theory."

250. In the " Suite des notices sur les fonctions elliptiques," dated July 21, 1828 (Crelle, vol. iii.), Jacobi introduces his functions © and H as independent fundamental functions on which to base the theory of elliptic transcendents ; a conception to which also Abel was simultaneously led, and which he gave utterance to in writing to Legendre, Nov. 25, 1828:—" The theory of elliptic functions has led me to consider two new functions which enjoy several remarkable properties." Abel desired, quite in analogy with Jacobi's principle, to treat of the properties of these new trans- cendents apart from the inverse function of the elliptic integral, but the priority of publication of this discovery is Jacobi's, since the completion of the second part of the " Précis d'une théorie des

(1).

fonctions elliptiques," which was to contain all these investiga. tions, was interrupted by Abel's unexpected death.

The above-mentioned work by Jacobi next contains the theorems expressing elliptic integrals of second and third kinds by 6 functions,

Regarding the formula of reduction of the integral of the third kind by aid of the @ functions, Jacobi remarks a characteristic property to Legendre (September 9, 1828):—“ Moreover it shows that elliptie functions of the third kind into which three variables enter reduce to other.transcendents which contain only two,”’—a discovery which Legendre was greatly interested in, though he found difficulties in the distinction of real and imaginary parameters, expecting that the introduction of an imaginary parameter involved three independent quantities in the integral, and so there should be four kinds of elliptic functions instead of three.

acobi, however, repeats. the above assertion in his demonstration

of the relation M(w,a)=wZ(a)+4 log ou) (Crelle, iv.):—“ This latter formula shows that elliptic functions of the third kind which depend on three elements can be reduced to other transcendents which contain only two.” Later, Jacobi wrote to Legendre (May 238, 1829):—“ As regards elliptic integrals of the third kind with circular parameter, they do not admit of a reduction analogous to that of the logarithmic kind. In a general analytical sense not distinguishing between real and imaginary values, a formula embraces all cases ; but in ‘applying to numerical calculation cases must be distin- guished.” And again, “as to the numerical calculation of elliptic integrals of the third kind with circular parameter, I do not think you should too much regret the inconvenience that they cannot be reduced to tables of double entry.”

251. The collected statement of his investigations, published by Jacobi as his Fundamenta nova Theorixw Functionum Ellipticarum in 1829, contains two main divisions, the first on the transformation of elliptic functions, the second on their evolution. We have already indicated many of the principles contained in this work, the most important of all being that of the double periodicity of these functions. As Jacobi says (Works, i. p. 262)—“Elliptic functions differ essentially from ordinary transcendents. They have, so to say, an absolute manner of existence. Their principal character is to embrace all there is in analysis that is periodical. In fact, trigono- metric functions having a real period, exponentials an imaginary period, elliptic functions embrace the two

cases, since we have at the same time sin am (w+4K)=sin am w, sin am (w+ 2/K')=sin amu. Moreover it is easily demonstrated that an analytic function cannot have more than two periods, one real and the other imaginary, or both

imaginary (complex) if the modulus k be so too, The quotient of

the periods of a proposed function determines the modulus of the elliptic functions by which it must be expressed by means of the

relations /*k=0 =, ak -H(4); v 2 T 2

(the expansions for which in terms of g follow by § 258). Perhaps

it will be convenient to introduce this quotient into analysis as

2k'K Re: = @(0),

modulus in piace of &." On these principles Jacobi subsequently

founded a theory of hyperelliptic functions.

252. Jacobi's first evolution of elliptic functions is into infinite products, and is derived from the transformation from A to &, which is expressed by sin am(nw, /)

rw". wb ns wu ,4tA'\ .. wu , Sta' = J sin am Mw sin am (et) sin am (ears) : UU 4(n—1)A' 5 edt A th 3 8) gto and equivalent forms, by writing in the dade eel – equations of transformation, for wu, =f and allowing n to take an

infinitely great value. When this is done, am (Fr P a) becomes

uw wu ; : —,A)=— =2, and he arrives at the equations a (4 : ed q

. 2Kx Qt . (1-29? cos 2x+94)(1 — 2¢4 cos 2u4+4¢9)... See NI (= 2g Cos Ban-+g4)(T = 248 cos 20-+9%)... " Ke i (1 + 2¢?cos2a + q4)(1 + 2¢4cos2u + 9°)... €0s am—— =2¢ 8 * (7 = 29 coda +9°\(1 — 29% co son

+¢5).. 2Kxe —_z,(1+2¢ cos 2a + q*)(1 + 29% cos 2a +-9°)... a 7 a hed — 2g cos 2x + g*) (1 — 293 cos 22 +98)...”

from which are easily derived such series as 2Ke 4/7 sin x , 4/9 sin 8x , 4a/g° sin 525 ge T 1-q 1-48 l-¢

Val +4) 1 – 2¢ cos 2a+47

/q(1 + 93)

Siar 124 cos 22-498

+ &e. 2

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The series for powers of these functions are then peesianes f a it is found, ¢.g., that the square may be written (=) sin’am = 4K(K — E}) 4 2q cos 2x , 4¢° cos 4z_ 6g? cos 6a — Le tae olan

258. This enables the second kind of elliptic integral to be evolved in a series. The form introduced being called Z is related to Legendre’s E by the equations

K FLE — EX F(¢ amu, p=am tu, Z(u) = ao ;

and the expansion is found

¢ ; ey (=)- aes 2S) = ear sintam> “Ae, – (B) qv

i) vid vid wT wT

gsin 2x q’sin 4a 93 sin 6x i. ~4] 1-¢7 oF 1-q 1-4 Ks

254. Before proceeding to the serial development of the third kind

of integrals, the theorems concerning their reduction to depend on

functions containing only two variables are given. It is shown first assuming two angles o, 8, such that F(¢)+F(a)=F© and ¥(¢) — F(a) = F(8) that ¢ k* sina cosa Aa. siu'd dp vA {1-# sina . sin*¢ }A(P)

4/7 Holds, , (? Bowas Fre) Ba) af" Sea f°

(C) ; ~ A(d)

so that the third kind of elliptic integrals, which involves threc elements, the modulus &, the amplitude ¢, and the parameter a (the quantity —X*sin*a is what Legendre called 2 the parameter, § 206)

is reduced to integrals of the first and second kind, and to the new '

> B45 | transcendent A eens, each of these depending only on two

0

elements. This new transcendent we see from the above equation, by letting F(ag)=2F(a), and so o=a,, 3=0, for =a, satisfies the equation

"k* sin a cos a Aa. sin*¢d¢ *2 E(g)do . D, Serene Fone yf" Sees,

that is to say, for the new transcendent we may substitute the definite integral of the third kind in which the amplitude is equal to the parameter ; another statcment of the reducibility to functions depending on two elements only.

he above equation © may be transformed by the identity derived from the formule of § 207, 4 sina cosa Aa sing cos Ad (1-?sin2a sin?p)? which gives, on introducing am w for ¢, am'a for a, and consequently am (w+) for o and am (wa) for 5, and integrating,

Uu d dw { sin?am(w + a) – sin2am(u—a)}

_.2 sin ama cos am @ A am a. sin'am w 1-#*sin?am a. sin'?am w 255. Jacobi accordingly accepts as canonical for an integral of the third kind the form written above. He defines it by

sin?¢ — sin?§ =

,

“2sinama.cosama.Aama. sintam u. du 1—-k?sin’am a, sin?am %

S”Xuyaa Again, denoting by (x) the expression (xu)=(0)° the integration of the series for Z(u) (§ 258) gives

2K £7, /2Kx cos2z g*cos4z gq? cos 6x 2K (A ata — 9) 20082 | a e , 9° cos 6a 4 | oe a1 — 98)” (1 — 9) ine a = 2¢ cos 2x + 9)(1 — 29% cos 2a + 9°) (1 ~ 2g5cos 2a+q!)... (o) a ner rere rear orenee-e . RO =g)(l—a\(1-9).. .}? ?

?

+&e. + const.

whence G) m /} (1-29 cos 2x +9?)(1—293 cos 2u-+98)... @(0) {(L-g)(1-941-5)... }? i 256. This is the first introduction in the Fundamenta of these

functions, which have been called theta functions from the original notation adopted for them by Jacobi, and by many writers havc been named after him Jacobian functions.

The connexion of the integral of the third kind with these func- tions follows at once from §254. In fact, calling oe =@’(u), it is u

71

M1(u, a) =uZ(a)+4 log X%-%) _,, M4 pen nliks) + blog |e gg) alee But, since @ is an even function in x, ©(u) =O(– x),

N(a, u)=aZ(u)+4 log ore = 4 3

whence

Hence, subtracting, T(u, a)— (a, u)=uZ(a) -aZ(u), which is in this notation the theorem that an integral of the third kind can always be reduced to another in which its parameter and amplitude are interchanged, as was noticed by Legendre (§ 216). Tho development of M(z) in a series is found by aid of the series for sin?am w and of the last equation in § 254. It is

n(2K sd ed (=) ut "us us us _ Fie sin 2A sin 2x g*sin4Asin 4a g3sin 6A sin 6x Ke va (1 — g*) 3(1 — 9°) al 257. Returning from the integrals to the elliptic functions, the expressions in infinite products (A, § 252)are resumed. The occur-

rence of the function © is apparent in each of the denominators. Introducing the definition of a function H,

p(2Kz \ *mw* / 2¢sin wx(1 — 29? cos 2a +q4)(1 — 2¢4 cos 22-+98)... ; @(0) Vo weg)... f" and replacing"k" by wu, it is easily seen that the expressions arc wv aj 1) oe sin am se ou cos amu= ce aoe ;

Aamu=a/x/

(u+ K) (w) ~ Again, it is easilyscen that (u+2K)=©(u) and H(w+ 2K) =~ H(w). Also as by substituting iw for u (§ 235) we get tZ(iu, k)=Z(u, k') +

SKK' ~ tan am(w, k')Aam(u, k');

whence, integrating,

, mu? O(tu, k) _ AKK' cos am(u, pry Olrs k')

(0, &) (0, k')' a(K'— iu) it follows that Out WK')=-e K eu); 1(K'— 2iu) as also that Q(w+iK')=%e 4K @(u). Vesinamw. a(K'—2iu) whence =te 4K H(u);

and by successively replacing w by w+iK' it is hence scen that

(u) and H(2) have one real period 4K common with the elliptic TU TU functions, and that e4KK'(w) and e4KK'H(u) have another imagin- ary period 47K' in common with them. 258. The expansion of

the @and H functions in series of cosines and sines of multiple arcs by the method of indeterminate coeftici- ents determines

o(=e) = 1-29 cos 2u+ 294 cos 4x — 29° cos 6x + 2q‘6 cos 8x, wv

2K (7) —298 sin x — 29% sin 8a 29 sin 5x -29¥ sin 7z;

and hence a new development of elliptic functions as well as of the integrals arises,

The developments of the numerators of the cos am and Aam may be written down from the above—in the notation subsequently used by Jacobi—

62 =1 — 2q cos 2x + 294 cos 4x -2q%cos6a+...

6,2 = 2gt sin x— 29% sin 82-429 sin 52- . 6,0 =2q+ cos x +294 cos 8x 29¥ cos Ba...

632 = 1+ 2g cos 2% + 294 cos 4a+2q%cos 6r+ ...

as, for instance, in his lectures, in which, without any pre- supposition from the theory of elliptic transcendents, he cstablished the relations which these series fulfil, and from them a theorem of addition for the quoticnts of the series, and from this the differ- ential formule which lead immediately to the elliptic integrals. All these formule consist of series of exponential quantities, extending in both directions to infinity, in which the ordering element in the exponent riscs to the second degrce. Their general form may therefore be written Xe2v?+2bv+c, whcre » takes all positive and negative integer values.

259. The Hundamenta Nova appeared almost at the date of tho death of Abel. Of Abel’s works, besides those which we have men-

tioned, the chief is the unfinished “Précis d’unc théorie des fonctions elliptiqucs,” which appeared in Crelle, iv., in 1829. “The whole of my researches will form a work of some extent which I cannot yet publish,

therefore I give here a ‘ Précis’ of the method I followed, and its general results.” The fragment of this work which has been published deals only with the integrals.

260. The consideration of the indetcrminateness of the integral

sf da Us Wir Vries 0 V (1 — 22)(1 — Ba?

which gives rise to periodicity in the inverse function z=sin am u, has led to the consideration of the whole subject from a new point of view. The introduction of the complex variable into analysis by Cauchy in his Mémoire sur les intégrales définies priscs entre des limites imaginaires (1825), and by Gauss in the second part of his Theoria Residuorum Biquadratieorum (1831), has been followed by the works of Puiseux (“ Recherches sur les fonctions algébriques,” Liouville, xv. 1850), of Riemann (Inaugural Disser- tation, 1851, and “Thcorie der Abelschen Functionen,” Credle, 1857), and of Weierstrass (“ Theorie der Abelschen Functionen,” Crelle, 1856)—which develop the subject in this more extended ficld, perfecting the conception which the term function covers in analysis, and pointing out the essential distinctions in the different modes of dependence of two quantitics,—such distinctions, for instance, as when a function is defined by a differential equation, whether it is one-valued or not, and, if it be, whether it is integer or frac- tional.

261. Inclose connexion with this is another department to which the theory of transeendents has with great success been applied, —the investigation of the geometrical propertics of curves. The points on a curve are expressed as functions of a parameter, and on the nature of these functions the nature of the curve depends,—the “deficiency” or “Geschlecht” of the curve (sce CURVE, vol vi., p. 725) determines the nature of the function, and any curve into which another can be rationally transformed depends on the same function.

We shall conclude with a bricf application to the case of elliptic functions and plane curves of the third degree. It is well known iat the equation of any non-singular cubie can be reduced to the orm

y? = x(a —y)(x—- ky) ,

where y=0 is the tangent at the point of inflexion in which the curve meets x=0, and «=0, x=y, x=—k*y are the tangents from that point to the curve, their points of contact lying on z=0.

This equation is satisfied identically by assuming the equations px— =sin am u, py=sin'am w, pz=Aam ww cos amu, which determine any point on the curve by a parameter wu. To each value of w corresponds a perfectly definite point of the curve. But on the other hand, to any point of the curve corresponds an infinite number of valucs of the argument all related to one of them, u,—differing from it only by a multiple sum of the periods.

The occurrence of the elliptic integral w here in this normal form results from the coordinates chosen ; but, whatever they be, we see that the points of the curve can be expressed by a parameter depending on no higher irrationality than that we have intro- duced. When the cubic has a double point, the coordinates of any point on the curve can be expresscd by a parameter without intro- ducing any irrationality.

262. To investigate the intersections of the cubie with a right line we procced to derive in a simple manner a slight extension of Euler's integral (§ 207). Written in Jacobi's notation it is

cosam(2, + %,) = cos am U4 cosam W, — Sinam 2, sinam w,Aam(2, + Ug), which is easily thrown into the form k2 k? cos am wu, cos am w, cos am(2y Uy) =Aam wu, Aam u, Aam(uU,+ Ug) .

This may be extended to three arguments as follows. Denoting sin am wy briefly by s,, also cos am uw, by cr, Aam wy by Ar, tan am w, by ¢,, and cot am wu, by ct,, the formula may be written

Ki? +h? cycgc(uy + Uy) = AA,A(Uy + Ue) 5 putting for uw, w2+w3, and expressing, by § 207, c(w)+%3) and A(u,+Us) by functions of onc argument, we get ke? + keycyc3c(uy + We + Ug) — AyAgAgA(t + Uy + Ug) = Ks983 { e!?9483 + Cy gAge(Uy + Ug + Ug) — Aylol3A(%y + Ug + Us)} » Now the former expression is symmetrical; denoting it by

£7s,s2839, we can determine 6 as follows. Writing for brevity C(t + Uy t+ug)= C, and A(w+U_+U3)=A ,

the equation is £s,s3-+¢,A,A3C — Aycoc3A — 65;=0. Hence writing down the three equations, which must hold from symmetry,

0 = e505 SF C)A,AgC = Aye2034 = 681 3

0 =K‘2s,5, + CoAgA,C — Agcge)A — 05, ,

0 SHROGS, + Cg, A.C oot A3C)C,4 a O83 ?

INFINITESIMAL CALCULUS

we obtain C and A as quotients of determinants of single argu.

ments. For A we get SC os Pees 1s 4 | A) Sel. 1 382 SoA, | A=| 1 &? a AjA,A; ,

2

SxC: 1s,” S5egA, 1 3s? 33 | A3 and for C 1 5,7 8,c,Ay 1 ese Aaa 1 &* s¢,4, | C= I 95)? Re, ei 1 3/ sca 1 @? Ag

But in this, increasing each argument by 7K’, since then we get,

1 —tA : 4 for $7 » for ce; wae? for A,, —tct,, for ¢t,, > ie r r

and thus

iA , for C, is? where S stands for sin am(w)+ w,+ 23), this formula gives 1 8? Ajcty 1 2a Ay vi _ OE S = I Be Ayes => 1 5,2 2 ; Siem As 515953 CaS I 3,2 Aycts P ig = As wheucc 81 on Ay} a i 83 8; Asé. sin am(t + Ug +3) = — 3 s 303 1 5, SCalay 1 83? SgCgAg

and the value for @ thus found gives Ky? + heyCyCg0(aty + Uy + Ug) — AyAnAgA(uy + Uy + Ug) + K2Ke’?5,89535(Uy + Uy + Ug) = 0.

263. The formula thus obtained for sin am(w,w. 3) vanishes when 14,+U,+U3=0, or differs from 0 only by an integer com- bination of the periods. But the determinant

8 3 Ay

82 8:2 Aste

83 83° Azts vanishes if its coustituents be the coordinates of three collinear points. But these are, as we have just seen, the coordinates of three points on the cubic y2?=x(x—y)(a— k*y), § 261.

This result may therefore be stated thus :—J/ the points of a cubic be capressed as clliptic functions of a parameter, then for the tnter- sections with a right line the swm of the arguments differs from zero only by some integer combination of the periods.

This enables us to solve many problems. For instance, the argu- ments of the points of contact of the four tangents which can be drawn to the curve from a point w on it are

= eee _Utea' — Utwto!

2 2 2 2

Conversely the tangential point w of a given point v of the curve is determined by w= — 2v (mod @, w').

The problem of determination of points of inflexion when one point of inflexion is known is identical with the problem of the special trisection of elliptic functions, z.¢., of the detcrmination of

the values for wae to the same moduli.

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INFLUENZA (syn. Epidemic Catarrh) is a term applied to an infectious febrile disorder of short duration, char- acterized specially by catarrh of the respiratory passages and alimentary canal, and occurring mostly as an epidemic.

The symptoms of this disease develop suddenly, with all tle phenomena attending a severe cold or catarrh, At first there are chills or rigors,

which are soon accompanied with distressing headache and tightness across the forehead, tenderness and watering of the eyes, and sneezing and dis- charge from the nostrils. To these succeed heat and soreness of the throat, hoarseness, cough, and, it may be, some difficulty of breathing. The temperature is elevated, the pulse quick and feeble, and the skin, which at first was dry, becomes moist, and is said to exhale a peculiar musty odour. The digestive system participates in the disturbance, and there is loss of appetite, with thirst, vomiting, and occasionally diarrheea.

Rapid loss of strength and remarkable depression of spirits accompany these various symptoms, and are among the most characteristic features of the disease. After lasting for two or three days, the symptoms abate and convalescence begins, but there may remain, particularly in severe cases, and in persons at the extremes of life, great debility fora length of time, or the attack may be com- plicated with inflammatory affections of the chest, whicli may prove a source of danger far exceeding that of the original disease. Apart from this, influenza is not usually a very fatal malady, although some epidemics such as that of 1762 have been characterized by a severe type of the disease and considerable loss of life. The mortality is generally reckoned at about 2 per cent., but when an extensive epidemic prevails, even this proportion is sufficient to swell the death-ratc largely.

This disease is referred to in the works of the ancient physicians, but accurate descriptions of it have been given by numerous medical writers during the last three centuries, in connexion with epidemics which have occurred from time to time. Thcse various accounts agree substantially in their narration of the phenomena and course of the disease, and influenza has in all times been regarded as fulfilling all the conditions of an epidemic in its sudden invasion, rapid and extensive spread, and speedy and complete disappearance. Among the chief cpidemics of influenza are those of 1762, 1782, 1787, 1803, 1833, 1837, and 1847. In several of these the disease appeared to originate in some parts of Asia, and to travel west- ward through Europe and on to America, resembling in this respect certain cholera epidemics, although the two classes of disease have nothing in common. In some of the

epidemics influenza has spread through the whole of Europe in the course of six weeks. Wherever it appears the whole community suffers to a greater or less extent, irrespective of age or condition of life. It has occasionally appeared in fleets at sca away from all communication with land, and to such an extent as to disable them temporarily for service. This happened in 1782 in the case of the squadron of Admiral Kempenfelt, which had to return to England from the coast of France in consequence of a Severe epidemic of influenza attacking his crews, while at the same time the squadron of Lord Anson, off the coast of Holland, suffered extensively from a similar outbreak. Many instances of a like kind have been recorded.

Much speculation and some amount of scientific inquiry have been expended in endeavours to ascertain the cause of this remarkable ailment. The Italians in the 17th century ascribed it to the influence of the stars, and hence the name “influenza,” by which the disease has subsequently been known. By some it has been held to depend on certain telluric, and by others on certain climatic conditions ; but the occurrence of the disease in all sorts of climates and

localities is sufficient to negative these theories. The view which refers it to some morbific principle present in the atmosphere during an epidemic is that which has gained widest acceptance, but the nature of this infecting agent is unknown. Various hypotheses have been advanced on the subject, such as some change in the electrical condition of the air, or the over-abundance of ozone, but these have not been confirmed by observation. More probable, and more in harmony with observed facts, is the thcory that in influenza, as in other epidemic diseases, there is present in the atmosphere some minute organism of specific nature, which is not only distributed over wide areas, but which when introduced into the bodies of those attacked multiplies there indefinitely, and becomes a source of infection by the breath, &c., and in tliis way a further cause of the spread of the disease. The contagiousness of influenza appears to be unquestionable. The treatment of this disorder is similar to that recommended in Catarru

(¢.v.), but special regard must be had to its weakening effects, and every effort made throughout the illness to maintain the strength by light but nutritious diet. (J.%09 &.)

INFORMATION, in English law, is a formal accusation of a crime committed, preferred ex officio by the attorney- general or solicitor-general in the Queen's Bench without the intervention of a grand jury. It lies only for misdemeanour and not for treason, felonies, or misprision of treason (see INDICTMENT); and it is properly employed against such ""enormous misdemeanours" as peculiarly tend to disturb or endanger the Qucen's government, e¢g., seditions, obstructing the Queen's officers in the execution of their duties, &c. In the form of the proccedings the attorney- general is said to "come into the court of our lady the Queen before the Queen herself at Westminster, and gives the court there to understand and be informed that, dc." Then follows the statement of the offence as in an indict- ment. The information is filed in the crown office without the leave of the court. An information may also be filed at the instance of a private prosecutor for misdemeanours not affecting the government, but being peculiarly flagrant and pernicious, Thus criminal informations have been granted for bribing or attempting to bribe public fune- tionaries, and for aggravated libels on public or private persons. Leave to file an information is obtained after an application to show cause, founded on a sworn statement of the material facts of the case.

INFUSORIA. See Protozoa.

INGELHEIM. Oberingelheim and Niederingelheim, two contiguous market-towns of Germany, in the Hessian province of Rhine Hesse, circle of Bingen, are situated on the Hessian Ludwig Railway and on the Salz near its con- fluence with the Rhine, 9 miles west-north-west of Mainz. Oberingelheim, formerly an imperial village, has an old Evangelical church with painted windows representing scenes in the life of Charlemagne, a Catholic church, and a synagogue. Its industries are the manufacture of wine and papermaking. The population of Oberingelheim in 1875 was 2846, and of Niederingelheim 2474.

Niedcringelheim is, according to onc tradition, the birthplace of Charlemagne, and it possesses the ruins of an old palace built by that emperor between 768 and 774. The building contained one hundred marble pillars, and was adorned with sculptures and mosaics from Italy. It was extended by Frederick Barbarossa, and continued to be a favourite residence of the empcrors till 1356, when Charles IV. resigned it to the Palatinate. The building suffered much damage during the Bavarian feud of 1504, the Thirty Years' War, and the French invasion in 1689. Only few remains of it are now standing, but some of the pillars are still to be found in different parts of Germany. Inside the boundaries there is an old church, apparently dating from the time of Frederick I. See Hilz, Der Reichspalast zu Ingelheim, Oberingclheim, 1868.

INGEMANN, BernynarDd SEVERIN (1789-1862), a Danish poet and novelist, was born . aig in the

island of Falster, on the 28th of May 1789. He lost his father in early childhood, was educated at the grammar school at Slagelse, and entered the university of Copenhagen in 1806. His studies were interrupted by the English invasion, and on the first night of the bombardment of the

city Ingemann stood with the young poet Blicher on the –

walls, while the shells whistled past them, and comrades were killed on either side. All his early and unpublished writings were destroyed by the English when they burned the town. In1811 he published his first volume of poems, and in 1812 his second, followed in 1813 by a book of lyrics entitled Procne. These three volumes were extremely well received, and so was his cycle of romances in verse, called The Black Knight, 1814. With these books he attained at once the leading position in Denmark as a lyrist, and he then turned his attention to the drama. In 1815 he published two tragedies, Masaniello and Blanca, followed by

The Voice in the Desert, I'he Shepherd of Tolosa, and other romantic plays. After a variety of publications, all enormously successful, he travelled in 1818 to Italy. At Rome he wrote Zhe Liberation of Tasso, and returned in 1819 to Copenhagen. In 1820 he began to display his real power in a volume of delightful tales. In 1821 his dramatic career closed with the production of an unsuccess- ful comedy, Magnetism in a Barber's Shop. In 1822 the poet was nominated lector in Danish language and litera- ture at Séré College, and he now married. Valdemar the Great and his Men, an historical epic, appeared in 1824. The next few years were occupied with his best and most durable work, his four great historical novels of Valdemar Seier, 1826; Hrik Menved's Childhood, 1828 ; King Erith, 1833; and Prince Otto of Denmark, 1835. He then returned to epic poetry in Queen Margaret, 1836, and Holger Danske, 1837. The number of his later writings is too great to permit us to chronicle them. They consist of religious and sentimental lyrics, epic poems, novels, short stories in prose, and fairy tales. His last publication was The Apple of Gold, 1856. In 1846 Ingemann was nominated director of Séré College, a post from which he retired in 1849. He died peacefully and happily on the evening of the 24th of February 1862. Ingemann enjoyed during his lifetime a popularity which was unapproached even by that of Oehlenschliiger, and in fact it may be said that no Danish poet has ever been nearly so popular as he. But criticism has been busy since his death in reversing this decision of the public, and Ingemann now takes a place in Danish literature below four or five of his immediate con- temporaries. His boundless facility and fecundity, his sentimentality, his religious melancholy, his direct appeal to the domestic affections, gave him instant access to the ear of the public. His novels are better than his poems ; of the former the best are those which are directly modelled on the manner of Sir Walter Scott. As a dramatist he has entirely outlived his reputation, and his unwieldy epics are now little read. Ingemann was a purely sentimental writer, and his reputation has proved no less ephemeral than the fashion for sentiment.

INGOLSTADT, a fortified town in the government dis- trict of Upper Bavaria, is situated on the left bank of the Danube at its junction with the Schutter, 50 miles north of Munich by rail. As the chief town of the

district it is the seat of the usual authorities. The town is well built, The principal buildings are the old castle of the dukes of Bavaria-Ingolstadt, now used as.an arsenal ; the remains of the earliest Jesuits' college in Germany, founded in 1555 ; the former university buildings, now a school; the theatre ; the large Gothic church of Our Lady, founded in 1425, with two massive towers, and the grave of Dr Eick, Luther's opponent; the Franciscan convent and nunnery; and several other churcles and hospitals. Ingolstadt possesses

several technical and other schools. In 1472 a university was founded in the town by Duke Louis the Rich, which at the end of the 16th century was attended by 4000 students. In 1800 it was removed to Landshut, whence it was finally transferred to Munich in 1826. The industries of Ingolstadt comprise brewing, wax-bleaching, and potash- boiling; there is also trade in vegetables. The station, an important junction 14 miles distant, is connected with the town by tramway. 'The population in 1875 was 14,485,

Ingolstadt, known as Aureatum or Chrysopolis, was a royal villa in the beginning of the 9th century, and only received its city charter about 1312, from the emperor Louis of Bavaria. After that date it gradually grew in importance, and became the capital of a medieval dukedom which merged finally in that of Bavaria- Munich. The fortifications, erected in 1539, were put to the test during the contests of the Smalkaldian League, and in the Thirty Years' War. Gustavus Adolphus besieged Ingolstadt in 1632, when Tilly, to whom there is a monument in the church, lay mortally wounded within the walls. In the war of the Spanish succession it was besieged by the margrave of Baden in 1704. In 1743 it was surrendered by the French to the Austrians, and in 1800, after a three months' siege, the French under General Moreau took the town, aud destroyed the fortifications. These, however, were rebuilt on a much larger scale under King Louis I. ; and since 1834 Ingolstadt has ranked as a fortress of the first class. In 1872 even more important fortifications were begun, which include tétes-de-pont with round

towers of massive masonry, and the Réduit Tilly on the right bank of the river.

INGRES, Jean Avcuste Dominique (1780-1867), whose name represents one of the most important among the conflicting tendencies of modern art, was born at Montauban August 29, 1780. His father, for whom he always enter- tained the most tender and respectful affection, has described himself as scwlpteur en pldtre; he was, however, equally ready to execute every other kind of decorative work, and now and again eked out his living by taking portraits, or obtained an engagemeut as a violin player. He brought up his son to command the same varied resources, but in con- sequence of certain early successes—the lad's performance of a concerto of Viotti's was applauded at the theatre of Toulouse—his attention was directed chiefly to the study of music. At Toulouse, to which place his father had removed from Montauban in 1792, Ingres had, however, received lessons from Joseph Roques, a painter, whom he quitted at the end of a few months to become a pupil of M. Vigan, professor at the academy of fine arts in the same town. From M. Vigan, Ingres, whose vocation became day by day more distinctly evident, passed to M. Briant, a landscape-painter who insisted that his pupil was specially gifted by nature to follow the same line as himself. For a while Ingres obeyed, but he had been thoroughly aroused and enlightened as to his own objects and desires by the sight of a copy of Raphael's Madonna della Sedia, and, having decisively ended his connexion with Briant, he started for Paris, where he arrived about the close of 1796. He was then admitted to the studio of David, for whose lofty standard and severe principles he always retained a profound appreciation. David recognized the merit of one who soon ranked amongst his most promising pupils, and Ingres, after four years of devoted study, in the course of which (1800) he obtained the second place in the yearly competition, finally carried off the Grand Prix (1801). The work thus rewarded—the Ambassadors of Agamemnon in the Tent of Achilles (Ecole des Beaux Arts)-—was admired by Flaxman so much as to give umbrage to David, and was succeeded in the following year (1802) by the execu- tion of a Girl after Bathing, and a woman's portrait ; in 1804 Ingres exhibited Portrait of the First Consul (Musée de Lidge), and portraits of his father and himself; these were

followed in 1806 by Portrait of the Emperor (Invalides), and portraits of M., Mme., and Mdlle. Riviere (the first two now in the Louvre). All these and various minor works were executed in Paris, for it was not until

1809 that the state of public affairs admitted of the re- establishment of the Academy of France at Rome, and we find from the journals of the day that they produced a dis- turbing impression on the public. It was clear that the artist was some one who must be counted with ; his talent, the purity of his line, and his power of literal rendering were generally acknowledged ; but he was reproached with a desire to be singular and extraordinary. “ Ingres,” writes Frau v. Hastfer (Leben und Kunst ix Paris, 1806) “ wird nach Italien gehen, und dort wird er vielleicht vergessen dass er zu etwas Grossem geboren ist, und wird eben darum cin hohes Ziel erreichen.” In this spirit, also, Chaussard violently attacked his Portrait of the Emperor (Pausanias Frangats, 1806), nor did the portraits of the Rivitre family escape. The points on which Chaussard justly lays stress are the strange discordances of colour,—such as the blue of the cushion against which Mme. Riviére leans, and the want of the relief and warmth of life, but he omits to touch on that grasp of his subject as a whole, shown in the portraits of both husband and wife, which already evidences the strength and sincerity of the passionless point of view which marks all Ingres’s best productions. The very year after his arrival in Rome (1808) Ingres produced Cidipus and the Sphinx (Louvre ; lithographed by Sudre, engraved by Gaillard), a work which proved him in the full possession of his mature powers, and began the Venus Anadyomene (Collection Rieset ; engraving begun by Pollet), completed forty years later, and exhibited in 1855. These works were followed by some of his best portraits, that of M. Bochet (Louvre), and that of Mme. la Comtesse de Tournon, mother of the prefect of the department of the Tiber; in 1811 he finished Jupiter and Thetis, an immense canvas now in the Musée of Aix; in 1812 Romulus and Acron (Beole des Beaux Arts), and Virgil reading the Aneid—a composition very different from the version of it which has become widely popular through the engraving executed by

Pradier in 1832. The original work, executed for a bed- chamber in the Villa Aldobrandini-Miollis, contained neither the figures of Mzecenas and Agrippa nor the statue of Marcellus ; and Ingres, who had obtained possession of it during his second stay in Rome, intended to complete it with the additions made for engraving. But he never got beyond the stage of preparation, and the picture left by him, together with various other studies and sketches, to the Musée of his native town, remains half destroyed by the process meant for its regeneration, The Virgil was followed by the Betrothal of Raphael, a small painting, now lost, executed for Queen Caroline of Naples; Don Pedro of Toledo Kissing the Sword of Henry IV. (Collection Deymié; Montauban), exhibited at the Salon of 1814, together with the Chapelle Sistine (Collection Legentil ; lithographed by Sudre), and the Grande Odalisque (Collection Seilliére; lithographed by Sudre). In 1815 Ingres executed Raphael and the Fornarina (Collection Mme. N. de Rothschild; engraved by Pradier); in 1816 Aretin and the Envoy of Charles V. (Collection Schroth), and Aretin and Tintoret (Collection Schroth) ; in 1817 the Death of Leonardo (engraved by Richomme) and Henry IY. Playing with his Children (engraved by Richomme), both of which works were commissions from M. le Comte de Blacas, then ambassador of France at the Vatican. Roger and Angelique (Louvre; lithographed by Sudre), and Francesca di Rimini (Musée of Angers ; lithographed by Aubry Lecomte), were completed in 1819, and followed in 1820 by Christ giving the Keys to Peter (Louvre). In 1815, also, Ingres had made many projects for treating a subject from the life of the celebrated duke of Alva, a com- mission from the family, but a loathing for "cet horrible homme" grew upon him, and finally he abandoned the task and entered in his diary —" J'étais foreé par la nécessité

de peindre un pareil tableau ; Dieu a voulu qu'il restat en ébauche." During all these years Ingres's reputation in France did not increase. The interest which his Chapelle Sistine had aroused at the Salon of 1814 soon died away ; not only was the public indifferent, but amongst his brother artists Ingres found scant recognition. The strict classicists looked upon him as a renegade, and strangely enough Delacroix and other pupils of Guérin—the very leaders of that romantic movement

for which Ingres, throughout his long life, always expressed the deepest abhorrence— alone seem to have been sensible of his merits. The weight of poverty too was hard to bear. In 1813 Ingres had married; his marriage had been arranged for him with a young woman who came in a business-like way from Montauban, on the strength of the representations of her friends in Rome to whom the painter was well known. Mme. Ingres speedily acquired a faith in her husband which enabled her to combat with heroic courage and patience the difficulties which beset their common existence, and which were increased by their removal to Florence. There Bartolini, an old friend, had hoped that Ingres might have materially bettered his position, and that he might have aroused the Florentine school—a weak offshoot from that of David—to a sense of its own shortcomings. These expectations were disappointed. The good offices of Bartolini, and of one or two persons who felt a friendly interest in the painter, could only alleviate the miseries of this stay in a town where Ingres was all but wholly deprived of the means of at least gaining daily bread by the making of those small portraits for the execution of which, in Rome, his pencil had been constantly in request. Before his'departure he had, however, been commissioned to paint for M. de Pastoret the Entry of Charles V. into Paris, and M. de Pastoret now obtained an order for Ingres from the Administration of Fine Arts; he was directed to treat the Voeu de Louis XIII. for the cathedral of Mon- tauban. This work, which was exhibited at the Salon of 1824, met with universal approbation: even those sworn to observe the unadulterated precepts of David found only admiration for the Voeu de Louis XIII. On his return Ingres was received at Montauban with enthusiastic homage, and found himself celebrated throughout France. In the following year (1825) he was elected to the Institute, and his fame was further extended in 1826 by the publication of Sudre's lithograph of the Grande Odalisque, which, having been scorned by artists and critics alike in 1819, now became widely popular. A second commission from the Government called forth the Apotheosis of Homer, which, replaced by a copy in the decoration of the ceiling for which it was designed, now hangs in the galleries of the second story of the Louvre. From this date up till 1834 the studio of Ingres was thronged, as once had been thronged the studio of David, and he was a recognized chef décole. Whilst he taught with despotic authority, and

admirable wisdom, he steadily worked; and when in 1834 he produced his great canvas of the Martyrdom of Saint Symphorien (cathedral of Autun ; lithographed by Trichot-Garneri), it was with angry disgust and resentment that he found his work received with the same doubt and indifference, if not the same hostility, as had met his earlier ventures. The suffrages of his pupils, and of one or two men—like Decamps—of undoubted ability, could not soften the sense of injury. Ingres resolved to work no longer for the public, and gladly availed himself of the opportunity to return to Rome, as director of the Ecole de France, in the room of Horace Vernet. There he executed La Vierge 4 l'Hostie (Imperial collections, St Petersburg), Stratonice (Duc d'Aumale), Portrait of Cherubini (Louvre), and the Petite Odalisque for M. Marcotte, the faithful admirer for whom, in 1814, Ingres had painted the Chapelle Sistine,

The Stratonice, executed for the duke of Orleans, had been exhibited at the Palais Royal for several days after its arrival in France, and the beauty of the composition produced so favourable an impression that, on his return to Paris in 1841, Ingres found himself received with all the deference that he felt to be his due. A portrait of the purchaser of Stratonice was one of the first works executed after this return ; and Ingres shortly afterwards began the decorations of the great hall in the Chateau de Dampierre, which, unfortunately for the reputation of the painter, were begun with an ardour which gradually slackened, until in 1849 Ingres, having been further discouraged by the irreparable loss of his faithful and courageous wife, abandoned all hope of their completion, and the contract with the Duc de Luynes was finally cancelled. A minor work, Jupiter and Antiope, marks the year 1851, but Ingres's next considerable undertaking (1853) was the Apotheosis of Napoleon I., painted for the ceiling of a hall in the Hdtel de Ville; Jeanne d'Arc (Louvre) appeared in 1854; and in 1855 Ingres consented to rescind the resolution more or less strictly kept since 1834, in favour of the International Exhibition, where a room was wholly reserved for his works. In consequence of the effect which they produced, Prince Napoleon, president of the jury, proposed an exceptional recom- pense

for their author, and obtained from the emperor Ingres's nomination as grand officer of the Legion of Honour. With renewed confidence Ingres now took up and completed one of his most charming productions—La Source (Louvre), a figure of which he had painted the torso in 1823, and which seen with other works in London (1862) there renewed the general sentiment of admiration, and procured him, from the imperial government, the dignity of senator. After the completion of La Source, the principal works produced by Ingres were with one or two exceptions (Moliére and Louis XIV., presented to the Thédtre Frangais, 1858; Le Bain Ture, 1859), of a religious character ; La Vierge de Adoption, 1858 (painted for Mdlle. Roland-Gosselin), was followed by La Vierge Couronnée (painted for Mme. la Baronne de Larinthie) and La Vierge aux Enfans (Collection Blanc) ; in 1859 these were followed by repetitions of La Vierge & l'Hostie ; and in 1862 Ingres completed Christ and the Doctors (Musée Montauban), a work commissioned many years before by Queen Marie Amélie for the chapel of Bizy. On the 14th January 1867 Ingres died, in his eighty-eighth year, having preserved his faculties in wonderful perfection to the last. Jor a moment only—at the time of the execu- tion of the Bain Ture, which Prince Napoleon was fain to exchange for an early portrait of the master by himself— Ingres's powers had seemed to fail, but he recovered, and showed in his last years the vigour which marked his early maturity. It is, however, to be noted that the Saint Symphorien exhibited in 1834 closes the list of the works on which his reputation will chiefly rest ; for La Source, which at first sight seems to be an exception, was painted, all but the head and the extremities, in 1821 ; and from those who knew the work well in its incomplete state we learn that the after-painting, necessary to fuse new and old, lacked the vigour, the precision, and the something like touch which distinguished the original execution of the torso. Touch was not, indeed, at any time a means of expression on which Ingres seriously calculated : his con- stant employment of local tint, in mass but faintly modelled in light by half tones, forbade recourse to the shifting effects of colour and light on which the Romantic school depended in indicating those fleeting aspects of things which they rejoiced to put on canvas ;—their methods would have dis- turbed the calculations of an art wholly based on form and line. Except in his Sistine Chapel, and one or two slighter

pieces, Ingres kept himself free from any preoccupation as to depth and force of colour and tone; driven, probably by the excesses of the Romantic movement into an attitude of stricter protest, “ce que l’on sait” he would repeat, “il faut le savoir Pépée & la main.” Ingres left himself, there. fore, in dealing with crowded compositions, such as the Apotheosis of Homer and the Martyrdom of Saint Symphoricn, without the means of producing the neces- sary unity of effect which had actually been employed in due measure—as the Stanze of the Vatican bear witness— by the very master whom he most deeply reverenced. Thus it came to pass that in subjects of one or two figures Ingres showed to the greatest advantage: in Cidipus, in the Girl after Bathing, the Odalisque, and La Source—subjects only animated by the consciousness of perfect physical well- being—we find Ingres at his best. One hesitates to put Roger and Angelique upon this list, for though the female figure shows the finest qualities of Ingres’s work,—deep study of nature in her purest forms, perfect sincerity of inten- tion and power of mastering an ideal conception,—yet side by side with these the efligy of Roger on his hippogriff bears witness that from the passionless point of view, which, as before said, was Ingres’s birthright, the weird creatures of the fancy cannot be secn. A graphic account of “ Ingres, sa vie et ses travaux,” and a complete catalogue of his works, were published by M. Delaborde in 1870, and dedicated to Mme. Ingres née Ramel, Ingres’s devoted second wife, whom he married in 1852. Allusions to the painter’s early days will be found in Delécluze’s Lowis David; and amongst many less important notices may be cited that by Théophile Silvestre in his series of living artists. Most of Ingres’s important works are engraved in the collection brought out by Magimel. (E. F. 8, P.)

INGULPHUS [Incutr], abbot of Crowland, for a long period believed to be the author of the Hvstorta Monasterit Croylandensis, was born of English parents. The account of him given at the conclusionof the //istoria has been shown to be incorrect in several particulars, but accord- ing to the authority of Ordericus Vitalis, who visited Crowland three years after the death of Ingulf, he became secretary to William,

duke of Normandy, and after taking part in a pilgrimage to Jerusalem, lived as a monk in Normandy, where he rose to the rank of prior. After the accession of William to the throne of England, he in 1085 received the abbatial stall of Crowland, Lincolnshire, where he remained till his death, December 16, 1109. Through his influence with the Conqueror he secured for the abbey many valuable privileges and immunities, besides the reconstruction and enlargement of the building itself, which had been greatly damaged by the Danes in 870. The only manuscript of the History of Ingulf now known to exist is the Arundel manuscript, No. 178, in the British Museum, which breaks off at the same point as that published by Sir Henry Savile in the Scriptores Rerum Anglicarum post Bedam, London, 1596. Other four manuscripts are known to have been at one time in ex- istence ; and a more complete copy with a continuation by Peter de Blois was printed by Fulman in vol. i. of the Rerum Anglicarum Scriptores veteres, Oxford, 1684. The authenticity of this work was, however, disputed by Sir Francis Palgrave in the Quarterly Review for Septem- ber 1826, and the errors which it contains show beyond doubt that it must have been written by a later author, and entirely destroy its value as an historical authority. The work, edited by H. 8. Riley, forms vol. xxix. of Bohn's Antiquarian Library. Two elaborate papers by Mr Riley in opposition to its authenticity are contained in the Archxological Journal, March and June 1862. A full account of it is also given in Hardy's Rerum Britan- nicarum Medi Aim Scriptores, vol. i1., 1865.

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INUERITANCE. In English law, inheritance, heir, and other kindred words have a meaning very different from that of the Latin Aires, from which they are derived. In Roman law the heir or heirs represented the entire legal personality of the deceased—his wniversum jus. In English law the heir is simply the person on whom the real property of the deceased devolves by operation of law if he dies intestate. He has nothing to do as heir with the personal property ; he is not appointed by will ; and except in the case of coparceners he is a single individual. The Roman heres takes the whole estate ; his appointment may or may

not be by testament ; and more persons than one may be associated together as heirs.

The devolution of an inheritance in England is now regulated by the rules of descent, as altered by the Inheri- tance Act (3 & 4 Will. IV. ce. 106), amended by 22 & 23 Vict. c. 35. 1. The first rule is that inheritance shall de- scend to the issue of the last "purchaser." A purchaser in law means one who acquires an estate otherwise than by descent, ¢.g., by will, by gratuitous gift, or by purchase in the ordinary meaning of the word. This rule is oneof the changes introduced by the Inheritance Act, which further provides that "the person last entitled to the land shall be considered the purchaser thereof unless it be proved that he inherited the same." Under the earlier law descent was traced from the last person who had "seisin" or feudal possession, and it was occasionally a troublesome question whether the heir or person entitled had ever, in fact, acquired such possession. Now the only inquiry is into title, and each person entitled is presumed to be in by purchase unless he is proved to be in by descent, so that the stock of descent is the last person entitled who cannot be shown to have inherited. 2. The male is admitted before the female. 3. Among males of equal degree in consanguinity to the purchaser, the eldest excludes the younger ; but females of the same degree take together as "coparceners." 4. Lineal descendants take the place of their ancestor. Thus an eldest son dying and leaving issue would be represented by such issuc, who would exclude their father's brothers and sisters. 5. If there are no lineal descendants of the purchaser, the next to inherit is his nearest lineal ancestor. 'This is a new rule introduced by the Inheritance Act. Under the former law inheritance never went to an ancestor,—collaterals, however remote, of the person last seized being preferred even to his father. Various explanations have been given of this seemingly anomalous rule,—Bracton and Blackstone being content to say that it rests on the law of nature, by which heavy bodies gravitate downwards. Another explanation is that estates were granted to be descendible in the same way as an ancient inheritance, which having passed from father to son ex necessitate went to collaterals on failure of issue of the person last seized. 6. The sixth rule is thus ex- pressed by Mr Joshua Williams in his excellent treatise on The Law of Real Property: 'The

father and all the male paternal ancestors of the purchaser and their descend- ants shall be admitted before any of the female paternal ancestors or their heirs; all the female paternal ancestors and their heirs before the mother or any of the maternal ancestors or her or their descendants; and the mother and all the male maternal ancestors and her and their de- scendants before any of the female maternal ancestors or their heirs.” 7. A kinsman of the whole blood shall come before the same degree of the half blood. The admission of kinsmen of the half blood into the chain of descent is one of the alterations made by the Inheritance Act. Formerly a relative, however nearly connected in blood with the purchaser through one only and not both parents, could never inherit—a half-brother for example ; while relatives of the whole blood, however distant, might inherit to the

@ exclusion of nearcr relatives of the half blood. §& In the admission of female paternal ancestors, the mother of the more remote male paternal ancestor and her heirs shall be preferred to the mother of the less remote male paternal and her heirs; and, in the case of female maternal ancestors, the mother of the more remote male maternal ancestor shall be preferred to the mothcr of a less remote male maternal ancestor. This rule, following the opinion of Blackstone, settles a point which has been much dis- puted by text-writers, although its importance was little more than theoretical. 9. When there shall be a total failure of heirs of the purchaser, or when any lands shall be descendible as if an ancestor had been the purchaser thereof, and there shall be a total failure of the heirs of such ancestor, then and in every such case the descent shall be traced from the person last entitled to the land as if he had been the purchaser thereof. This rule is enacted by 22 & 23 Vict. c. 35. It would apply to such a case as the following :— Purchaser dies intestate, leaving a son and no other relations, and the son in turn dies intestate; the son’s relations through his mother are now admitted by this rule. If the purchaser is illegitimate, his only relations must necessarily be his own issue. Failing heirs of all kinds, the lands of an intestate purchaser, not alienated by him, would revert by “escheat” to the next im- mediate lord of the fee, who would generally be the crown. If an intermediate lordship could be proved to exist between the crown and the tenant in fee simple, such intermediate

lord would have the escheat. But escheat in any case is a matter of rare occurrence.

The descent of an estate in tail would be ascertained by such of the foregoing rules as are not inapplicable to it by the necessity of the case. By the form of the entail the estate descends to the "issue" of the person to whom the estate was given in tail,—in other words, the last purchaser. The preceding rules after the fourth, being intended for the ascertainment of heirs other than those by lineal descent, would therefore not apply; and a special limitation in the entail, such as to heirs male or female only, would render unnecessary some of the others. When the entail has been barred, the estate of course descends according to these rules. In copyhold estates descent, like other incidents thereof, is regulated by the custom of each particular manor; ¢g., the youngest son may exclude the elder sons. How far the Inheritance Act applies to such estates has been seriously disputed. It has been held in one case (Muggleton v. Barnett) that the Inheritance Act, which orders descent to be traced from the last purchaser, does not override a manorial custom to trace descent from the person last seized, but this position has been controverted on the ground that the Act itself includes the case of customary holdings.

Husband and wife do not stand in the rank of heir to each other. Their interests in each other's real property are secured by curtesy and dower. See HusBAND AND WIFE.

The personal property. of a person dying intestate devolves according to an entirely different set of rules, which will be found under the head of InTEsTacy.

In the law of Scotland the rules of deseent differ from the above in several partieulars. Descent is traeed, as in England before the Inheritance Act, to the person last seized. The first to sueceed are the lineal descendants of the deceased, and the rules of primogeni- ture, preference of males to females, equal suecession of females (heirs-portioners), and representation of ancestors, are generally the same as in English law. Next to the lineal descendants, and failing them, come the brothers and sisters, and their issne as collaterals. Failing

collaterals, the inhcritance ascends to the father and his relations, to the entire exclusion of the mother and her relations. Even when the estate has descended from mother to son, it ean never again revert to the maternal line. As to suceession of brothers, a distinetion must be taken between an estate of heritage and an estate of conquest. Conquest 1s where

the deccased has acquired the land otherwisc than as heir, and corresponds to the English term purchase in the techuical sensc explained above. Heritage is land acquired by deceascd as heir. The distinction is important only in the case when the heir of the deceased is to be sought among his brothers; when the descent is lineal, conquest and heritage go to the same person. And when the brothers are younger than the deceased, both conguest and heritage go to the brother (or his issue) next in order of age. But when the deccascd leaves an elder and a younger brother (or their issues), the clder brother takes the conquest, the younger takes the heritage. Again, when there arc several elder brothcrs, the one next in age to the deccased takes the conquest before the more remote ; and when there are several younger brothers, the onc next to the dcccased takes the heritage before the more remote. When heri- tage of the deceased gocs to an clder brother (as might happen in certain eventualities), the younger of the.elder brothers is preferred. The position of the father, after the brothcrs and sisters of the deceased, will be noticed as an important point of difference from the English axioins ; so also is the total exclusion of the mother and the maternal linc. After brothers and sisters and their issue have been exhausted, the heir is sought among the relations of the father ; but even when these are exhausted, the estate, although it should have deseended ex parte materna, can never revert to the maternal line. As betwcen brothers and sisters the half-blood only succeeds after the full blood. Half-blood is eithcr consanguinean, as between children by the same father, or uterinc, as between children having the same mother. The half-blood uterine is excluded altogether. Half-blood consanguinean succeeds thus: if the issuc is by a former marriage, the youngest brother (being nearest to the deccased of the

consanguinean) succeeds first ; if by a later marriage than that from which the deccased has sprung, the cldest succecds first.

In the United States the English law of inheritance has been more completely repudiated than any other portion of our system. Each State has established rules of descent for itself, and the observation of Chicf Justice Reeve that the nation "has no gene- ral law of descents, which probably has not fallen to the lot of any other country," is to some extent justified by the great dif- ferences in detail betwecn the rules obtaining in the different States. The following are the rules of most general application, as stated in Kent's Commentaries on American Law, twelfth edition, edited by O. W. Holmes, jun. 1. Real estate shall descend to the lawful descendants of the owner, in the direct line of lineal descent; and if there be but one person, then to him or her alone; and if more than onc person, and all of equal degrees of consanguinity to the ancestor, then to the several persons or tenants in common in cqual parts, however remote from the in- testate the common degrecs of consanguinity may be. 2, When the lawful issue are of uncqual degrees of consanguinity to the in- testate, the inheritance shall descend to the children and grand- children, if any be living, and to the issue of such as shall be dead, as tenants in common; but such grandchildren and their descend- ants inherit only such shares as their parents respectively would have taken if living. 'These two rules are stated to prevail in all the United States, with some important variations, however, in the- case of the first rule. 3. In the absence of descendants the inherit- anee gocs to the parents, cither first to the father and next to the mother, or jointly undcr certain conditions. 'This canon is de- scribed as prévailing "to a considerable extent." 4. If the in- testate dies without issue or parents the estate gocs to his brothers and sisters and their representatives. If the relatives are of equal dcgrees of consanguinity they take in cqual parts; but if, of the same degrce, somo be dead, leaving issue, and others living, the descendants of those who are dead take only their parents' share. Collaterals under this rule would be preferred to ascendants—after parents. "It is perhaps universally the rule that brothers and sisters are preferred to grandparents, though the latter stand in an equal degree of kindred" (Kent, vol. iv. p. 401). In some States there is no essential distinetion left

between the whole and the half-blood, in others the half-blood is postponed, but nowhere is it totally excluded. 5. In default of the foregoing, the inheritance generally goes to grandparents, but in some States (New York, New Jersey, and North Carolina) grandparents are excluded, and in othcrs postponed. 6. Next come uncles and aunts and their descendants, taking per capita if of equal degrec, and per stirpes if not. 7. If the inheritance came to the deceased on the part of his father, the father's brothers and sisters would cxclude the mother's brothers and sisters, and the mother's brothers and sisters would have a similar preference in respect of property com- ing to the deceased ex parte materna. A similar distinction is observed in some States in applying the fourth rule. 8. On failure of hcirs under the preccding rules, recourse is had to the "ncxt-of- kin" as ascertained by the English statute of distributions. In many of the States the harshness of the English rule that natural children have no inheritable blood is greatly mitigated. In Louisi- ana, if duly acknowledged, they may inlierit from both father and mother in the absence of lawful issue,

A full summary of the rules of dcscent prescribed by the statute law of the various States of the Union, will be found in a note appended to the first chapter of Washburn's American Law of Real Property, vol. iii., Boston, 1868.

INJUNCTION, in English law, is a judicial process whereby a party is required to refrain from doing a parti- cular thing according to the exigency of the writ (Daniel's Chancery Practice). Formerly it was a remedy peculiar to the Court of Chancery, and was one of the instruments by which the jurisdiction of that court was established in cases over which the courts of common law were entitled to exercise control. The Court of Chancery did not presume to interfere with the action of the courts, but, by directing an injunction to the person whom it wished to restrain from following a particular remedy at common law, it effected the same purpose indirectly. Under the present constitution of the judicature, the peculiar features of the injunction have been considerably altered. It is now equally available in all the

divisions of the high court of justice, and it can no longer be used to prevent an action in any of them from proceeding in the ordinary course.

From the definition given above it is apparent that an injunction is properly a restraining order, although there are instances in which, under the form of a prohibition, a positive order to do something is virtually expressed. Thus in a case of nuisance an injunction was obtained to re- strain the defendant from preventing water from flowing in such regular quantities as it had ordinarily done before the day on which the nuisance commenced. But generally, if the relief prayed for is to compel something to be done, it cannot be obtained by injunction, although it may be expressed in the form of a prohibition— as in the case in which it was sought to prevent a person from discontinuing to keep a house as an inn, which is the same thing as ordering him to keep an inn. The injunction was used to stay proceedings in other courts "wherever a party by fraud, accident, mistake, or otherwise had obtained an advantage in proceeding in a court of ordinary jurisdiction, which must necessarily make that court an instrument of injustice." As the injunction operates personally on the defendant, it may be used to prevent applications to foreign judicatures ; but it is not used to prevent applications to parliament, or to the legislature of any foreign country, unless such applications be in breach of some agreement, and relate to matters of private interest. In so far as an injunction is used to prohibit acts, it may be founded either on an alleged contract or on aright independent of contract. The jurisdiction of the court to prevent breaches of contract has been described as supplemental to its power of com- pelling specific performance ; 2.¢., if the court has power to compel a person to perform a contract, it will interfere to prevent him from doing anything in violation of it. In the case of contracts to abstain from doing, injunction is in fact a means of compelling specific performance. But even when it is not within the power of the court to compel specific performance, it may interfere by injunction ; thus, é.g., In the case of an agreement of a singer to perform at the plaintiff's theatre and at no other, the court, although it could not compel her to sing, could by injunction prevent her from singing elsewhere in breach of her

agreement. In other matters, an injunction may as a general rule be obtained to prevent acts which are violations of legal rights, except when the same may be adequately remedied by an action for damages at law. Thus the court will interfere by injunction to prevent waste, or the destruction by a limited owner, such as a tenant for life, of things forming part of the inheritance. Injunctions may also be obtained to prevent the continuance of nuisances, public or private, the infringement of patents, copyrights, and trade marks. Trespass might also be prevented by injunction, in certain cases, alluded to below. Under the Common Law Pro-

cedure Act of 1854, and by other statutes in special cases, a limited power of injunction was conferred on the courts of common law. But the Judicature Act, by which all the superior courts of common law and chancery are con- solidated, enacts that an injunction may be granted by an interlocutory order of the court in all cases in which it shall appear to be just or convenient; .... and, if an in- junction is asked either before or at or after the hearing of any cause or matter, to prevent any threatened or appre- hended waste or trespass, such injunction may be granted whether the person against whom it is sought is or is not in possession under any claim of "title or otherwise, or if not in possession does or does not claim to do the act sought to be restrained under colour of any title, and whether the estates claimed are legal or equitable.

An injunction obtained on interlocutory application during the progress of an action is superseded by the trial. It may be continued either provisionally or permanently. In the latter case the injunction is said to be perpetual. The distinction between "special" and "common " injunc- tions—the latter being obtained as of course—is now abolished in English law. The practice as to injunctions obtains in the United States of America. 'In the courts of the United States, as injunctions are grantable only on notice to the adverse party, all interlocutory injunctions are regarded as within the class of special injunction ; and this is believed to be also the practice of the State courts generally "

(Abbott's Law Dictionary). For the analogous Scotch practice see INTERDICT.

INK (French, encre; German, Zinte), in its widest signification, is the medium employed for producing graphic tracings, inscriptions, or impressions on paper or similar materials. The term includes two distiuct conditions of pigment or colouring matter :—the one fluid, and prepared for use with a pen or brush, as writing ink; the other a glutinous adhesive mass, priuting ink, used for transferring to paper impressions from types, engraved plates, and other like surfaces. The latter class may be more properly dealt with under LITHOGRAPHY and PRINTING (q.v.).

Writing inks are fluid substances which contain colouring matter either in solution or in suspension, and very com- monly partly in both conditions. They may be prepared in all shades of colour, and contain in their composition almost every pigment which can be dissolved or suspended ina suitable medium; but by far the most important of all varieties is black ink, after which red and blue are the colours most commonly employed. Other colours are only occasionally employed; but apart from colour there are special qualities which recommend certain inks for limited applications, such as marking inks, ineradicable ink, sym- pathetic ink, &e.

Black Ink.—Among the qualities which should char- acterize a good black ink for ordinary purposes, the follow- ing are important. It should continue limpid, ard flow freely and uniformly from the pen; it should not throw down a thick sludgy deposit on exposure to the air ; nor should a coating of mould form on its surface. It should yield distinctly legible characters immediately on writing, which ought to become a deep blue-black, not fading or decaying with age; and the fluid ought to penetrate into the paper without spreading, so that the characters will neither wash out nor be readily removed by erasure. Further, it is desirable that ink should be non-poisonous, that it should as little as possible corrode steel pens, that characters traced in it should dry readily on the applica- tion of blotting paper without smearing, and that the Writing should not present a glossy varnished

appearance. To obtain these characteristics is the chief object of the ink manufacturer ; and upon the whole they have hitherto been found best combined in ink prepared from galls, or

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other sources of tannin, and a salt of iron, with the addition of some colouring matter. Such a compound indeed forms the staple black ink of commerce, which is essentially a ferroso-ferric gallate in extremely fine division held in sus- pension 1n water.

The essential ingredients of this ordinary black ink are— first, tannin-yielding bodies, for which Aleppo or Chinese galls are the only eligible materials ; second, a salt of iron, the ferrous sulphate (green vitriol) being alone employed ; and third, a gummy or mucilaginous agent to keep in suspension the insoluble tinctorial matter of the ink. For ink-making the tannin, from whatever source obtained, has first to be transformed into gallic acid; and, as has been shown by Viedt, in the case of Aleppo galls that change takes place by fermentation when the solution of the galls is exposed to the air, the tannin splitting up into gallic acid and sugar (see Gaiic Acrp, vol. x. p. 41). Chinese galls, which formerly were considered unsuitable for the manufacture of ink, do not contain the ferment necessary for inducing this change; and therefore to induce the process yeast must be added to their solution. To prepare a solution of Aleppo galls for ink-making, the galls are coarsely powdered, and intimately mixed with chopped straw. This mixture is thrown into a narrow deep oak vat, provided with a perforated false bottom, and having a tap at the bottom for drawing off liquid. Over the mixture is poured lukewarm water, which, percolating down, extracts and carries with it the tannin of the galls. The solution is drawn off and repeatedly run through the mixture to extract the whole of the tannin, the quantity of water used being in such proportion to the galls as will produce as nearly as possible a solution having 5 per eent. of tannin. The object of using straw in the extraction process is to maintain the porosity of the mixture, as powdered galls treated alone become so slimy with mucilaginous extract that liquid fails to percolate the mass. For each litre of the 5 per cent. solution about 45 grammes of the iron

salt are used, or about 100 parts of taunin for 90 parts of crystallized green vitriol. These ingredients when first mixed form a clear solution, but on their exposure to the air oxidation occurs, and an insoluble blue-black ferroso- ferric gallate in extremely fine division, suspended in a coloured solution of ferrous gallate, is formed. 'To keep the insoluble portion suspended, a mucilaginous agent is employed, and that most available is gum senegal. An ink so prepared develops its intensity of colour only after some exposure; and after it has partly sunk into the paper it becomes oxidized there, and so mordanted into the fibre. But, as the first faintness of the characters is a dis- advantage, it is acommon practice to.add some adventitious colouring matter to give immediate distinctness, and for that purpose either extract of logwood or a solution of indigo is used. When logwood extract is employed, a smaller proportion of extract of galls is required, from the fact that logwood itself contains a large percentage of tannin. Black ink in which the pravisional colouring matter is indigo was introduced about the year 1856, under the name alizarin ink, although the substance alizarin has nothing whatever to do with the preparation. The indigo for this ink is dissolved in strong sulphuric acid, and the ferrous sulphate, instead of being used direct, is prepared by placing in this indigo solution a proper quantity of scrap iron, In order to free the solution from excess of uncom- bined acid, chalk or powdered limestone is added, whereby the free acid is fixed and a deposit of sulphate of lime formed. A solution so prepared, mixed with a tannin solution, yields a very limpid sea-green writing fluid, and as all the constituents remain in solution, no gum or other suspending medium is necessary. In consequence the ink flows freely, is easily dried, and is free from the glossy

appearance which arises through the use of gum. C. H. Vicdt of Brunswick, who has written very exhaustively on all kinds of ink, gives the following as the standard in- vredients of these three varieties of ink:—

Galls-logwood

Galls Ink. Galls-indigo

Ink. Ink,

Tanninextract,5percent.| 1 litre % litre “1 Hitre Ferrons sulphate….. .... 45 grammes | 45 grammes Gatim Senemal ener casa 20-30 „ 20-30 „. Logwood solution, 8) slides

DAE CEM. ws vossss eves \ eee MMC tellC TOM ease esc ee ee 9 grammes INN. ..°\0) St Aes ee ae 6t 5 Concentrated sulphuric } 25

RVC CS ectan ceamnebera ache cal i. ui OMe era skcees cst ae

On long exposure to air, as in inkstands, or otherwise, all these varieties of ink gradually become thick and ropy, depositing a slimy sediment. This change on exposure is inevitable, resulting as it does from the gradual and at the sainc time essential oxidation of the ferrous compound, and it can only be retarded by permitting access of air to as small surfaccs as possible. The inks also have a tend- ency to become mouldy, an evil which may be obviated by the use of a minute proportion of carbolic acid ; or, should that body be objectionable on account of its smell, salicylic acid may be used.

Under the name of chrome ink a black ink was discovered and prepared by the chemist Runge, which held out the promise of cheapness combined with many excellent quali- ties. It is prepared by dissolving 15 parts of extract of logwood in 900 parts of water, to which 4 parts of crystal- lized sodic carbonate are added, A further solution of 1 part of chromate (not bichromate) of potassium in 100 parts of water is prepared, and is added very gradually to the other solution with constant agitation. Thereby is obtained an ink which possesses an intense blue-black colour, which flows freely and dries readily, which being neutral in reac- tion docs not corrode steel pens, and which so adheres to and sinks into paper that manuseripts written with it may be freely washed with a sponge without danger of smearing or spreading. It forms a good copying ink, and in short it possesses all the qualities essential to the best ink; but unfortunately on exposure to air it very readily undergoes decomposition, the colouring matter separating in broad flakes, which swim in a clear menstruum, It is

affirmed by Viedt that this drawback may be overcome by the use of soda, a method first suggested by Bottger.

Logwood forms the principal ingredient in various other black inks which are now much used, especially as copying ink. A very strong decoction of logwood or a strong solu- tion of the extract with ammonia-alum yields a violet ink which darkens slowly on exposure. Such an ink is costly, however, on account of the concentrated condition in which the logwood must be used. If, however, a metallic salt is introduced, a serviceable ink is obtained with the expendi- ture of much less logwood. Either sulphate of copper or sulphate of iron may be used, but the former, which pro- duces a pleasing blue-black colour, is to be preferred. The following is the formula most highly recommended for this ink. A clear solution of 20 kilos of extract of logwood in 200 litres of water is obtained, to which is added, with agitation, 10 kilos of ammonia-alum dissolved in 20 litres of boiling water. The solution is acidified with 0°2 kilo of sulphuric acid, which has the effect of preventing any deposit, and finally there is added a solution of 1°5 kilos of sulphate of copper dissolved in 20 litres of water. This compound is exposed to the air for a few days to allow the

colour to develop by oxidation, after which it is stored in

well-corked bottles, The acid condition of this ink has a

corrosive influence on steel pens; but in all other respects it is a most valuable writing fluid.

A black ink under the name of nigrosin is prepared from a soluble aniline colour, which, although not producing a black so intense as common ink, is possessed of various advantages, Being perfectly neutral, it does not attack pens; it can easily be kept of a proper consistency by making up with water; and its colour is not injuriously affected by the action of acids.

Copying Ink.—Ink which yields by means of pressure an im- pression, on a sheet of damped tissue paper, of characters written in it is ealled copying ink. Any ink soluble in water, or which retains a certain degree of solubility, may be used as eopying ink. Runge's chrome ink, being a soluble compound, is, therefore, so available ; and the other logwood inks as well ag the ordinary ferrous gallate inks contain also soluble constituents, and indeed are essentially solnblo till they are oxidized in and on the paper after exposure to the air. To render tliese available as copying inks it is only necessary to add to them a substance which will retard the oxidizing eflect of the air for some time, For this purpose the bodies most servieeable are gum arabic or senegal, with glycerin, dextrin, or sugar, which last, however, has the disadvantage of rendering the ink sticky. These substances aet by forming a kind of glaze or varnish ovcr the surfaee of the ink whieh excludes the air. At the same time when the damp sheet of tissue paper is applied to the writing they dissolve and allow a portion of the yet soluble ink to be absorbed by the moistened tissue. As copying ink has to yield two or more impressions, it is necessary that it should be made stronger, 7.c., that it should contain more pig- ment or body than common ink. It, therefore, is prepared with from 30 to 40 per cent. less of water than non-copying kinds ; but otherwise, exeept in the presenee of the ingredients above alluded to, the inks are quite the same.

Red Ink.—The pigment most eommonly employed as the basis of red ink is Brazil-wood, a dye-stuff which yields a good durable ink. Such an ink is prepared by adding toa strong decoetion of the wood a proportion of stannous ehloride (tin spirits), and thickening the resulting fluid with gum arabic. In some instances alum and cream of tartar are used instead of the stannons chloride. Cochineal is also employed as the tinctorial basis of red ink; but, while the re- sulting ilnid is mueh more brilliant than that obtained from Brazil- wood, it is not quite so permanent. A very brilliant red ink may be prepared by ee in a solution of caustic animonia, but it is necessary to keep this preparation in closely stoppered bottles. A useful red ink may also be made by dissolving the rosein of Brooke, Simpson, and Spiller in water, in the proportion of 1 to from 150 to 200 parts.

Blue Ink.—For the production of blue ink the pigment princi- pally used is Prussian blue. To render this colour solnble in water it is first digested for two or three days with either strong hydro- chlorie acid, sulphurie acid, or nitric acid, the digested mass is next very largely diluted with water, and after settling the supernatant liqnid is siphoned away from the sediment. This sediment is repeatedly washed, till all traces of iron and free acid disappear from the water uscd, after which itis dried and mixed with oxalic acid in the proportion of 8 parts of Prussian blne to 1 of the aeid, and in this condition the material is ready for dissolving in water to the degree of colour intensity necessary. An aniline bluo ink may be prepared by dissolving 1 part of bleu de Paris in from 200 to 250 parts of water.

China ink or Indian ink is the form in which ink was earliest prepared, and in which it is still made and used in China and Japan for writing with small brnshes instead of pens. It is exten- sivcly used by architects, engineers, and artists generally, and_for various special uses. China ink is prepared in the form of sticks and cakes, which are rubbed down in water for use. It consists essentially of lamp-black in very fine condition, baked up with a glutinous substance ; and the finer Oriental kinds are delicately per- fumed. The following description of the manufacture as conducted in Japan is from a native souree :—"The body of the ink is soot obtained from pine wood or rosin, and Jamp-black from sesamum oil for the finest sort. This is mixed with liquid glne made of ox skin. This operation is effected in a large round coppcr bow], formed of two spherical calottes, placed 1 inch apart, so that the space be- tween can be filled up with hot water to prevent the glue from hardening during the time it is being mixed by hand with the lamp-black. The cakes are formed in wooden moulds, and dried betwecn paper and ashes. Camphor, or a peeuliar mixture of scents which comes from China, and a small quantity of carthamine (the red colouring substanee of safflower), are added to the best kinds for improving the colour as well as for scenting the ink. There is 4 great difference both in price and in quality of the varicus kinds of ink, the finest article being rather costly." It is said that the size used in Chinese kinds is of vegetable origin.

niind Ink.—The ink so called, used principally for marking re sive of a salt of silver, usually the nitrate, dissolved in water and ammonia, with a little provisional colouring matter and gum for thickening. The colour resulting from the silver salt is developed by heat and light ; and the stain it makes, although exceedingly obstinate, gradually becomes a faint brownish-yellow. The following yields a good marking ink. _ Equal parts of nitrate of silver and dry tartaric acid are triturated in a mortar, and treated with water, when a reaction takes place, resulting in the formation of tartrate of silver and the liberation of nitric acid. The acid is neutralized, and at the same time the silver tartrate is dissolved by the addition of ammonia, and this solution with colouring matter and gum forms the ink, which may be used with an ordinary steel

Gold and silver inks are writing fluids in which gold and silver, orimitations of these metals, are suspeided in a state of fine division. In place of gold, Dutch leaf or mosaic gold is frequently substi- tuted, and bronze powders are also used for preparing a similar kind of ink. The metallic foil is first carefully triturated into a fine

aste with honey, after which it is boiled in water containing a little

alkali, and then repeatedly washed in hot water and dried at a |

gentle heat. A solution is prepared consisting of 1 part of pure sum arabic and 1 part of soluble potash glass in 4 parts of dis- tilled water, into which the requisite quantity of the metallic powder prepared as above is introduced. Owing to the superior covering nature of pure gold, less of the metal is reqnired than is neeessary in the case of silver and other foils; but the proportion varies according to the colour and condition of the surface upon which the ink is to be used. In general 1 part of foil to3 or 4 parts of solution is sufficient. The metallic lustre of writing done with this solution may be greatly heightened by gently polishing with a burnishing point.

Indelible or incorrodible ink is the name given to various coimbi- nations of lamp-black or other carbonaceous material with resinous substances used for writing which is exposed to the weather or to the action of strong acids or alkaline solutions. An ink having great resisting powers may be conveniently prepared by rubbing

down Indian ink in common ink till the mixture flows easily from —

the pen. Other combinations have more the character of coloured varnishes.

Sympathetic inks are preparations used for forming characters which only become visible on the application of heat or of some ehemical reagent. Many chemicals which form in themselves colourless solutions, but which devclop colour under the influence of yeagents, may be used as sympathetic ink, but they are all of little practical utility. Characters written in a weak solution of galls de- velop a dark colour on being treated with a solution of copperas ; or,

vice versa, the writing may be done in copperas and developed by the |

gallssolution. Writing done in various preparations develops colour on heating which fades as the paper cools. Among such substances are solutions of the acetate and the chloride of cobalt and of the chloride of nickel. Very dilute solutions of the mineral acids and

of cominon salt and a solution of equal parts of sulphate of copper — Characters traced in a weak solu- |

and sal-ammoniac act similarly. tion of nitrate of silver darken on exposure to light, and tcrchloride of gold solution develops a purple colour on exposure. (J. PA.)

INLAYING is a method of ornamentation, by incrusting or otherwise inserting in one material a substance or sub- stances differing therefrom in colour or nature. The art is practised in the fabrication of furniture and artistic objects in all varieties of wood, metal, shell, ivory, and coloured and hard stone, and in compound substances ; and the

possible combinations, styles, and varieties of effect are exceedingly numerous. There are several special classes of inlaying, long established and well recognized, which may be here enumerated and defined, details regarding most of which will be found under their separate headings. In the ornamental treatment of metal surfaces Viello decoration, applied to silver and gold, isan ancient and much practised species of inlaying. It consists in filling up engraved designs with a composition of silver, copper, lead, and sulphur incorporated by heat. The composition is black, and the finished work has the appearance of a drawing in black on a metallic plate. An art, analogous in effect, called Bidri, from Bider in the Deccan, is practised in India. In bidri work the ground is an alloy of zinc, with small proportions of copper and lead, in which shal- low patterns and devices are traced, and filled up with thin plates of silver. When the surface has been evened and smoothed, the bidri ground is stained a permanent

Sl black by means of a paste the chief ingredients of which are sal-ammoniac and nitre, leaving a pleasing contrast of bright metallic silver in a dead black ground. The inlaying of gold wire in iron or steel is known as DAMASKEENING (9.0. vol. vi. p. 793). It has been very largely practised in Persia and India for the ornamentation of arms and armour, being known in the latter country as Kuft work or Kuftgari. In Kashmir, vessels of copper and brass are very effectively inlaid with tin,—an art which, like many other decorative arts, appears to have originated in Persia. In the ornamental inlaying of metal surfaces the Japanese display the most extraordinary skill and perfection of work- manship. In the inlaying of their fine bronzes they use principally gold and silver, but for large articles and also for common cast hollow ware (for with them inlaying is common and profuse) commoner metals and alloys are employed. In inlaying bronzes they generally hollow out and somewhat undercut the design, into which the ornameuting metal, usually in the form of wire, is laid and hammered over so as to be firmly inserted. Frequently the famous lacquer work of the Japanese is inlaid with mother-of-pearl and other substances, in the same manner as is practised in ornamenting lacquered papier-maché among Western communities. The Japanese also practise the various methods of inlaying alluded to under DAmas-

KEENING. The term Mosaic (see Mosaic) is generally applied to inlaid work in hard stones, marble, and glass, but the most important class of mosaics—those which consist of innumerable small separate pieces—do not pro- perly come under the head of inlaying. Inlaid mosaics are those in which coloured designs are inserted in spaces cut in asolid ground or basis, such, for example, as the modern Florentine mosaic, which consists of thin vencers of precious coloured stones set in slabs of marble. The famous Taj Mahal at Agra is an example of inlaid mosaic in white marble, aud the art, carried to that city by a French artist, is still practised by native workmen. /%etra Dura is a fine variety of inlaid mosaic in which hard and expensive stones—agate, carnelian, amethyst, and the like—are used in relief in marble. Under the head Buyt Work (vol. iv. p. 446) will be found a description of the kind of inlaying, principally brass and tortoiseshell, which was introduced and carried to great perfection by André Charles Boule, who gave his name to this particular style of inlaying. Closely allied to buhl work is the more ancient Z'arsia work or Marquetry, which consists of inlaid woods alone. It has been practised from remote times, but came into prominence, for the decoration of furniture, in Italy during the Renaissance epoch, and has continued to be a favourite decorative art, varying with changing tastes and styles, to the present day. From India, under the name of Bombay boxes, comes a variety of minute and elaborate work, inlaid in geometrical patterns on wood. The inlaying materials consist of tin wire, sandal wood, sapan wood, ebony, ivory, and stag's horns, and the effect produced by the combination of minute pieces of these various substances is altogether peculiar and distinctive. Certain kinds of Enamet (vol. viii. p. 182) might also be included among the varieties of inlaying.

INNKEEPERS, Law retatine To. By the common law of England innkeepers are under certain peculiar obligations, the most important of which are the duty of supplying accommodation to such travellers as may desire it, and their responsibility for the safety of the goods belonging to persons staying in their inns. An inn is a place "instituted for passengers and wayfaring men," and in a recent case, in which the proprietor of a restaurant was prosecuted for refusing refreshment on

demand, it was held that a tavern, or shop for the retail of spirits across the counter, is not within the ii ane that a person XITi. — 11

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resident in the neighbourhood of the inn is not a traveller. An innkeeper may be indicted for refusing accommodation to a traveller, who may also of course have a remedy by civil action. To render an innkeeper liable for loss of goods at common law, the following are stated by Chitty (Law of Contracts) to be necessary conditions :—(1) that the inn be a "common" inn; (2) that the guest be a traveller or passonger; (3) that the goods or chattels must be in the inn, or at all events under the protection of the innkeeper as such; (4) that there be default on the part of the innkeeper, which is, however, implied in all cases not arising from the negligence of the guest, the act of God, or of the queen's enemies. An innkeeper re- ceiving goods in any other capacity, ¢g., as a warehouse- man or generally as bailee, or allowing the guest exclusive possession of a room for special purposes, is not liable for loss. Nor is the innkeeper liable for loss of goods by the theft of the guest's servant or companion, or by the negligence of the guest himself. A recent Act, 26 & 27 Vict. c. 4, limits the liability of the innkeeper by the following provisions :—No innkeeper shall be liable to make good loss or injury to goods or property (not being a horse, or other live animal, or gear appertaining thereto, or a carriage) to a greater sum than £30, ex- cept in the following cases—(1) when the loss has been caused by the default or neglect of the innkeeper or his servants, (2) when such goods have been deposited expressly for safe custody with the innkeeper, who may require them to be deposited in a safe or other recep- tacle and sealed by the person depositing the same. Innkeepers are not entitled to the benefit of the Act if they refuse to receive goods for safe custody, or otherwise prevent their deposit as before provided for, or if they fail to have one copy at least of the first section of the Act exhibited in a conspicuous place in the inn. The liability of innkeepers was recognized in the civil law. On the other hand, the innkeeper has a lien on the goods of his guest for the amount of his bill. It does not extend to the clothes of the guest or justify his personal detention, but it includes articles in the possession of the guest

belonging to third persons, at least when they are of a kind that travellers might ordinarily be expected to have. When a professional artist living at an inn had a piano on hire, the innkeeper, who knew it did not belong to her, was held to have no lien thereon. In a recent case the lien has been held to cover a hired piano in the possession of a family staying at an inn. In some American cases it lias been held that the possession of a licence does not produce, nor does the absence of a licence prevent, the liabilities of an innkeeper at common law. An inn is dis- tinguished from a boarding-house in this, that in the latter the guest is under an express contract for a certain time at a certain rate, in the former under an implied contract from day to day. Even if a boarding-house keeper entertains guests in the capacity of an innkeeper, he is not liable as such to his boarding-house guests.

INNOCENT L, pope from 402 to 417, was, according to his biographer in the Liber Pontificalis, the son of a man called Innocent of Albano; but, according to the more trustworthy Jerome, his father was Pope Anastasius ilps, whom he was called by the unanimous voice of the clergy and laity to succeed. It was during his papacy that the siege of Rome by Alaric (408) took place, when, according to a doubtful anecdote of Zosimus, the ravages of plague and famine were so frightful, and divine help seemed so far off, that papal permission was granted to sacrifice and pray to the heathen deities; the pope happened, however, to be absent from the city ona mission to Honorius at Ravenna at the time of the sack in 410. He lost no op- portunity of maintaining and extending the authority of the

Roman see as the ultimate resort for the settlement of all disputes; and his still extant communications to Victricius of Rouen, Exuperius of Toulouse, Alexander of Antioch, and others, as well as hisaction on the appeal made to him by Chrysostom against Theophilus of Alexandria, show that opportunities of the kind were numerous and varied. He took a decided view on the Pelagian controversy, confirming the decisions of the synod of the province of proconsular Africa held in Carthage in 416, which had been sent to him, and also writing in the same year in a

similar sense to the fathers of the Numidian synod of Mileve who, Augustine being one of their number, had addressed him. Among his letters are one to Jerome and another to John, bishop of Jerusalem, regarding annoyances to which the first-named had been subjected by the Pelagians at Beth- lehem.

He died March 12, 417, and in the Romish Church is commemorated as a confessor along with Saints Nazarius, Celsus, and Victor, martyrs, on July 28. His successor was Zosimus.

INNOCENTIL., pope from 1130 to 1148, whose family name was Paparesci, his own baptismal name being Gregory, was probably one of the clergy in personal attendance on the antipope Clement IIL (Guibert of Ravenna). By Pas- chal IL, he was created cardinal-deacon. In this capacity he accompanied Pope Gelasius II, when driven into France ; and by Calixtus II. he was employed on various important missions, such as on that to Worms for concluding the peace concordat with the emperor in 1122, and on that to France in 1123. On February 14, 1130, he was hurriedly chosen to succeed Honorius II.; soon afterwards an opposition asserted itself which issued in the counter-elec- tion of Pietro Pierleoni as Pope Anacletus II. Unable to maintain his position in Rome, Innocent took ship for Pisa, and thence sailed by Genoa to France, where the influence of Bernard of Clairvaux readily secured his cordial recogni- tion by the clergy and the court; in October of the same year he was duly acknowledged by Lothaire of Germany and his bishops at the synod of Wiirzburg. In January 1131 he had also afavourable interview with Henry II. of England; and in August 1132 Lothaire undertook an expedition to Italy for the double purpose of being crowned by the pope, and of setting aside the antipope. The coronation ultimately took place in the Lateran church (June 4, 1133), but otherwise the expedition proved abor- tive. A second expedition by Lothaire in 1136 was not more decisive in its results, and the protracted struggle between the rival pontiffs was terminated only by the death of Anacletus on January 25, 1138. By the Lateran council of 1139, at which Roger of Sicily, Innocent's most uncompromising foe, was excommunicated, peace was at last restored to the church, The remaining years of this pope's life were almost as barren of permanent

results as the first had been; his efforts to undo the mischief wrought in Rome by the long schism were almost entirely neutralized by a struggle with the town of Tivoli in which he became involved, and by a quarrel with Louis VII. of France, in the course of which that kingdom was laid under an interdict. Innocent died September 23, 1143, and was succeeded by Celestine II. The doctrinal questions in which he was called on to interfere were those connected with the names of Abelard and Arnold of Brescia.

INNOCENT IIL, pope from 1198 to 1216, by far the most remarkable of the popes who have reigned under this name, and, if Gregory VII. is excepted, perhaps the greatest of all who have occupied the see of St Peter, was born at Anagni about 1160. His father, Count Trasimundo of Segni, was a member of the famous house of Conti, from which nine popes, including Gregory IX., Alexander IV., and Innocent XIII., have sprung; his mother, Claricta,

INNOCENT

belonged to the noble Roman family of Scotti. His own baptismal name was Lothario. After receiving the rudiments of his education in Rome, he studied theology under Peter of Corbeil at Paris, and canon law at Bologna. On his return to Rome in 1181 he became a canon of St Peter's; and through family influence, combined with the increasing evidence he gave of remarkable ability, his subsequent promotion was rapid. By Gregory VIII. he was appointed one of the subdeacons, and in 1190 (while barely thirty) he was, at the instance of his maternal uncle Clement ITI., made cardinal-deacon of St Sergius and St Bacchus. On the death of Clement (1191), who was succeeded by Celestine III., a member of the rival house of Orsini, Cardinal Lothario was but little employed in church affairs; the unsought leisure which he now possessed he devoted to the composition of three works, two of which have come down to our times. Of these the most remark- able by far is that entitled De Contemptu Mundi, sive de Miseria Humane Conditionis, written "in not inelegant Latin," full of the best learning of that age, and everywhere manifesting the moral depth, earnestness, and insight, if also the somewhat gloomy and severe temperament, of its

author! On the death of Celestine III. (January 8, 1198), Lothario was without a day's delay unanimously chosen to succeed him ; his ordination to the priesthood (hitherto he had held only deacon's orders), his episcopal consecration, and his coronation as pope (February 22, 1198), followed one another inrapid succession. The state of Europe and of the known world at that juncture was such as might have suggested even to a less able and energetic man than Innocent the ambition of once more seeking to obtain for the papacy that absolute supremacy, both spiritual and temporal, in the struggle for which his great predecessor Gregory, more than a century before him, had lost his throne, and, one might almost say, his life. The owner of the crown of Naples (Frederick IT., born 1197) was an infant, incapable of protecting his dominions from the numerous adventurers by whom they were overrun; the Lombard republics were at deadly feud with one another, or rent by increasing domestic faction; the empire was convulsed by the struggles of the rival claimants to the throne rendered vacant by the death of Henry VI.; in France Philip Augustus since 1180 had been disgusting his subjects with his tyranny and scandalous vice; at Constantinople the cruel and wicked Alexius III., after dethroning his elder brother Isaac Angelus, was struggling to maintain his precarious grasp of the sceptre, while the kingdom of Jerusalem, which half a century before had extended along nearly the whole coast of Syria, was now almost entirely confined to the city of Acre. Innocent's first care was to deliver Rome itself from the claims to Supreme authority asserted by the prefect, who for many years had been nominated by the emperor, but whom now he compelled to swear allegiance to himself, thus for the first time practically establishing the temporal sovereignty of the bishop of Rome over his own city. In another direction the popular rights in connexion with the choice of a "senator" were curtailed. Measures were next taken to free the so-called patrimony of St Peter from the various German adventurers who, professing to hold of the empire, had divided it amongst them. Markwald of Anweiler, duke of Ravenna, was by a papal army driven from the March of Ancona, with which he had been invested, and compelled to withdraw to the south of Italy; Conrad of Lutzenberg, duke of Spoleto, was driven into Germany ; Innocent personally visited Reate, Spoleto, Perugia, Todi, – eee

1 The other extant work belonging to this period of Innoeent's life

ig the Mysteriorum Evangelicw Legis et Sacramenti Eucharistiz Iibri VI. The De Quadripartita Specie Nuptiarum has not survived,

and everywhere was welcomed as sovereign and deliverer. His claim to the sovereignty of the duchy of Tuscany as heir of the countess Matilda, Hildebrand's friend, was successfully asserted next ; and on the death of Constantia, widow of Henry VI. of Germany, Innocent, who had been acknowledged by her as liege lord, became, as guardian of the young Frederick II., master of the kingdom of Naples and Sicily. By the help of Walter of Brienne, Diephold of Accrra was compelled to relax his hold of Apulia; and in 1202 the death of Markwald at Palermo removed one of the most vigorous of the many troublers of Italian peace, The rivalry between Philip of Swabia, brother of Henry VI, and the Guelph Otto of Brunswick, for the imperial crown, in the next place offered a favourable opportunity for intervention in German politics after the more immediately pressing affairs of Rome and Italy had been settled. The tardy (but not reluctant) decision finally given (March 1201) by Innocent in favour of the Guelph did not indecd avert protracted civil war, resulting in humiliation and disaster both to emperor and pope; yet ultimately the murder of Philip (June 21, 1208) paved the way for the peaceful coronation of Otto in the following year, and the long-continued efforts of Innocent seemed to have met with an absolute success when the new emperor not only ratified previously exacted promises faithfully to maintain the territories, fiefs, and rights of the sce of Rome as these had been defined by the see itself, but also renounced even the small share in episcopal elections which had been reserved tothe empire in the concordat of Worms. The triumph, it is true, proved a hollow one; Otto soon broke his oath, claiming the kingdom of Apulia as a fief of the empire, and losing no time in commencing a war for the subjugation of Naples. Nor did his excommunication in 1211 result greatly to the advantage of the papacy, except in so far as it strikingly showed how dangerous to the individual was a collision with the supreme spiritual power. The battle of Bouvines

(July 27, 1214) finally disposed of the last hopes of Otto, but by it there was left master of the field one who was destined to prove still more formidable in his opposition to ecclesiastical ascendency. The immense influence which the energy, persistence, and political skill of Innocent enabled him to wield throughout the whole duration of his pontificate in the affairs of the empire was equally exemplified in his relations with almost every other state of Christendom. 'Thus onc of his first acts after his accession was to signify his disapproval of the conduct of Philip Augustus of France in dismissing his lawful wife Ingeburga of Denmark. By a rigorous interdict laid upon the kingdom from December 1199 to September 1200, the headstrong and refractory king was at last compelled to take her back with all the honour due to the queen of France. So, when in England King John began to persecute the clergy in consequence of their adherence to the cause of Stephen Langton, the papal nominee to the archbishopric of Canterbury (1207), his own excommunication followed forthwith; the kingdom was laid under an interdict (March 24, 1208), his subjects released from their allegiance, and his throne offered to any con- queror, with effects which again were far from being such as Innocent had anticipated, but which could not fail to impress the minds of the men of that time with a new and deep scnse of the vigour and far-reaching power of the vicars of Christ. In Castile, in Portugal, in Leon, in Navarre, in Denmark, Bohemia, Poland, Hungary, the same story repeats itself, with equal distinctness, if with less pro- minent results. Another outlet of the zeal and ambition of Innocent was found in the fifth crusade, the leading events of which, including the pact with Venice and the fall of Constantinople, have been elsewhere related (vol. vi. p. 628-9). In the west also, a new crusade against here-

tics was sct on foot with relentless energy, which has been described in the article AuBicENsus. The principles upon which such enterprises ought to be conducted were formu- lated under the presidency of Innocent at the fourth Lateran council (1215). It was there decreed that all rulers should promise to tolerate no heretics within their dominions, and that any prince who should refuse to comply with an injunction of

the church to purge his dominions of heresy was to be punished with excommunication, and in case of contumacy to be deposed,—if necessary, by force of arms. To those who should take part in such application of armed force when declared necessary, immunities similar to those enjoyed by the Eastern crusaders were guaranteed. At the same time very stringent laws were made with reference to the Jews. Their disability to hold any public appointment of trust was declared, and they werc prohibited froni at any time wearing Christian apparel, and also from appearing in public at all during Holy Week. This council was held by Innocent in the full consciousness of his approaching dis- solution, which took place at Perugia on July 16, 1216. He was succeeded by Honorious II. Apart from his other claims to fame as a sovereign and statesman of remarkable breadth of view, unity of purpose, and boldness of action, Innocent deserves notico as a canonist and as a preacher. His decisions in canon law are characterized by a learning and an acuteness whicli have made him an im- portant authority. The decretals of the first three years of his pontificate were collected by Rainer of Pomposi, and afterwards Bernardus Compostellanus undertook the editing of those of the first nine years, which appeared in a collection known as the Compilatio Romana. This, how- ever, contained some spurious documents, which were eliminated from the Compilatio tertia, brought down by Petrus Callivacinus to the twelfth year, and sent to the university of Bologna. The Compilatio quarta, published shortly after his death, contains the bulls and briefs of the closing six years. Sonie indication of Innocent's power as a preacher, which is kuown to have been great, can still be found in his extant sermons; while fully partaking of the curious artificiality and mannerism of the period, they abound in passages of fervid eloquence, and are every- where characterized by deep religious and moral feeling.

For the works of Innocent III., see Migne, Patrol. Curs. Compl., vols. 214-217. For his life and pontificate, vol. v. of Milman's Latin Christianity may be consulted; also Jorry, Histoire dw Pape Innocent ITI., Paris, 1858; Deutsch, Papst Innocenz III. uw. sein Einfluss auf die Kirche, 1876; Wattenbach, Gesch. d. rim. Papst- thums, 1876.

INNOCENT IV., Sinibaldo de Fieschi, pope from 1243 to 1254, belonged to one of the first families of Genoa, and, educated at Parma and Bologna, passed for one of the best canonists of his time. He had for his immediate pre- decessor Celestine IV., who, however, was pope for eighteen days only, and therefore the events of Innocent's pontificate practically link themselves on to those of the reign of Gregory IX. It was on occasion of Innocent's election (June 28, 1243) that Frederick H. is said to have remarked that he had lost the friendship of a cardinal and gained the enmity of a pope; the letter which he wrote, however, expressed in respectful terms the hope that an amicablo settlement of the differences between the empire and the papal see might be reached. The negotiation which shortly afterwards began with this object speedily proved abortive, Frederick being unable to make the absolute submission to the pope's demands which was required of him. Finding his position in Rome insecure, Innocent secretly withdrew in the summer of 1244 to Genoa, and thence to Lyons, where he summoned a general council which met in 1245 and deposed Frederick. The agitation caused by this act throughout Europe terminated only with Frederick's death in 1250, which permitted the pope to return, first to Perugia,

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and afterwards in 1253 to Rome. The remainder of his life was largely devoted to schemes for compassing the overthrow of Manfred, the natural son of Frederick IL, whom the towns and the nobility had for the most part received as his father's successor. It was on a sick bed at Naples that Innocent heard of Manfred's victory at Foggia, and the tidings are said to have precipitated his death (December 7, 1254). His learning gave to the world an Apparatus in quingue libros decretalium, which is highly spoken of ; but essentially Innocent IV. was a small-

souled man, whose avarice, cowardice, cunning, and vindictiveness suggest a striking contrast with Innocent II1., whose character and career, if his selection of a name may be taken as an indication, he seems to have admired and sought to follow. He was succecded by Alexander IV. INNOCENT V., pope from January 20 to June 22, 1276, was a native of Tarantasia in Burgundy, where he was born in 1225. In early life he joined the Dominican order, in which he acquired great fame as a preacher. The only noteworthy feature of his bricf and uneventful pontificate was the practical form assumed by his desire for union with the Eastern Church. He was proceeding to send legates to the Greek emperor in connexion with the recent decisions of the council of Lyons when he died. He was the author of several works in philosophy, theology, and canon law, including commentaries on the Pauline epistles and on the Sentences of Peter of Lombardy, and is some- times referred to as "famosissimus doctor." His pre- decessor was Gregory X., and he was succeeded by Hadrian

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INNOCENT VI., Stephen Aubert, pope at Avignon from 1352 to 1362, the successor of Clement VI., was a native of the diocese of Limoges, and, after having taught civil law at Toulouse, became bishop successively of Noyon and of Clermont. In 1342 he was raised to the dignity of cardinal. On the death of Clement VI., after the cardinals had each bound himself by a solemn agreement as to a particular line of policy should he be elected, Aubert was chosen (December 18, 1352); one of the first acts of his pontificate was to declare the paction to have been illegal and null. Hissubsequcnt policy compares favourably with that of the other Avignon popes. He brought about many needed reforms in the administration of church affairs, and by his legate, Cardinal Albornoz, who was accompanied by Rienzi, he sought to restore order in Rome, where in 1395 Charles IV. was with his permission crowned, after having previously come under an oath that he would quit the city ou the day of the ceremony. It was largely through the exertions of Innocent that the peace of Bretigny (1360) between France and England was brought about. During this pontificate also John Paleologus offered to submit the Greek Church to

the Roman see on condition of assistance being rendered him against John Cantacuzenus. The resources at the disposal of the pope, however, were all required for exigencies nearer home, and the offer was declined. Innocent was a liberal patron of letters, and, if the extreme severity of his measures against the Fraticelli be kept out of account, had a deservedly high reputation for justice and mercy. He died September 12, 1362, and luis successor was Urban V.

INNOCENT VIL, Cosimo de Migliorati, pope from 1404 to 1406, was a native of Solmona in the Abruzai, and early distinguished himself by his learning both in civiland in canonlaw. By Urban VI. he was called to the papal court, and entrusted with various responsible offices, being finally promoted to the archbishopric of Ravenna, and afterwards to the bishopric of Bologna. Boniface IX. made him cardinal, and employed him as legate in several delicate and important missions. On the death of Boniface, Migliorati was unanimously chosen (October 17;

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1404) to succeed him, after each of the cardinals had pound himself by a solemn obligation to employ all lawful means for the restoration of the church's unity in the event of his election, and even to resign the papal dignity should that be considered necessary to this end. 'The election was resisted at Rome by the Ghibelline party, but peace was maintained by the aid of Ladislaus of Naples, who thus laid Innocent under embarrassing obligations, from which he freed himself at the earliest possible moment. The assassination of some leading members of the city party by Ludovico Migliorati (a nephew of Innocent) and his friends compelled the pope to take refuge, in August 1405, at Viterbo, whence he did uot return until January of the following year. These troubles furnished him with a pretext, of which he was not unwilling to avail himself, for postponing the meeting of a general council which was urged by Charles of France, the university of Paris, Rupert of Germany, and John of Castile, as the only means of healing the schism which had prevailed so long. It is hardly necessary to say that he showed no favour to the proposal that he as well asthe antipope Benedict XIII. should resign in the interests of peace. He died

somewhat suddenly at Rome on November 6, 1406; there is no evidence for the truth of the allegation that his death was not due tonatural causes. His successor was Gregory XII.

INNOCENT VIIL, Giovanni Battista Cibo, pope from 1484 to 1492, was born at Genoa (1432), and was the son of a mau of senatorial rank. His early years were spent at the Neapolitan court, and subsequently he went to Padua and Rome forhiseducation. In the latter city the influence of his friends procured for him, from Paul II., the bishopric of Savona, and in 1473 he was made cardinal by Sixtus IV., whom he succeeded on August 29, 1484. Shortly after his coronation he addressed a fruitless summons to Christendom to unite in a crusade against the infidels ; the amount of his own zeal may in some degree be esti- mated from the fact that in 1489, in consideration of a yearly sum of 40,000 ducats and a gift of the spear- head which had pierced the Saviour's side, he consented to favour the sultan Bajazet II. by detaining his fugi- tive brother in close confinement in the Vatican. In 1486 Henry VII. of England was declared to be the lawful holder of the English crown by the threefold right of conquest, inheritance, and popular choice. Innocent, in his bull "Summis desiderantes" (5th December 1484), instigated very severe measures against magicians and witches in Germany; the principles enun- ciated by him were afterwards embodied in the Afalleus maleficarum (1487). He it wasalso who in 1487 appointed Torquemada to be grand inquisitor of Spain ; he also urged a crusade against the Waldensians, offering plenary indulgence to all who should engage in it. In 1486 he prohibited, on pain of severe ecclesiastical censures, the reading of the uine hundred propositions of Pico Mirandola. An important event of his pontificate was the fall of Granada (January 1492), which was celebrated in the Vatican with great rejoicings. He died July 25, 1492, leaving behind him numerous children ("Octo Nocens pueros genuit, totidemque puellas; Hunc merito poterit dicere Roma patrem"), towards whom his nepotism had been as lavish as it was shaineless. His successor was Alexander VI.

INNOCENT IX. succeeded Gregory XIV. on October 29,1591, and died on December 30 of the same year. His pontificate was unimportant.

Clement VIII. was his successor.

INNOCENT X., Giovanni Battista Pamphili, pope from 1644 to 1655, was born at Rome in 1574, attained the dignity of cardinal in 1629, and through French influence Was chosen to succeed Urban VIII. on September 15, 1644.

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Throughout his reign the influence exercised over him by Olympia Maidalchina, his deceased brother's wife, was very great, and such as to give rise to gross scandal, for which, however, there appears to have been no adequate ground. He naturally cnough objected to the conclusion of the peace of Westplialia, against which his nuncio in his name vainly protested, and against whicli lic issued the bull "Zelo domus Dei" in November 1648. The most important cf his doctrinal decisions was his condemnation of the five Jansenist propositions in 1653. The avarice of his female counsellor gave to his reign a tone of oppression and sordid greed which probably it would not otherwise have shown, for personally he was not without noble and reforming impulses. He died January 5, 1655, and was succeeded by Alexander VII.

INNOCENT XI, Benedetto Odescalcli, pope from 1676 to 1689, was born at Como in 1611, studied law at Rome and Naples, held successively the offices of protono- tary, president of the apostolic chamber, commissary of the Marca di Roma, and governor of Macerata; in 1647 Innocent X. made him cardinal, and he afterwards succes- sively became legate to Ferrara and bishop of Novara. In all these capacities tle simplicity and purity of character which he displayed had combined with his unselfish and openhanded benevolence to secure for him a high place in the popular affection and esteem; and two months after the death of Clement X. he was (September 21, 1676), in spite of French opposition, chosen his successor. He lost no time in declaring and practically manifesting his zeal as a reformer of manners and a corrector of administrative abuses. He sought to abolish sinecures and to put the papal finances otherwise on a sound footing; beginning with the clergy, he sought to raise the

laity also to a higher moral standard of living. Some of his regulations with the latter object, however, may raise a smile as showing more zeal than judgment. In 1679 he publicly condemned sixty-five propositions, taken chiefly from the writings of Escobar, Suarez, and the like, as " propositiones laxorum moralistarum," and forbade any one to teach them under penalty of excommunication. Personally not unfriendly to Molinos, he neverthcless so far yielded to the enormous pressure brought to bear upon him as to confirm in 1687 the judgment of the inquisitors by which sixty-eight Molinist propositions were condemned as blasphemous and heretical, His pontificate was marked by the prolonged struggle with Louis XIV. of France on the subject of tlic so-called "Gallican Liberties," and also about certain immunities claimed by ambassadors to the papal court. He died after a long period of feeble health on August 12, 1689. Hitherto repeated attempts at his canonization have invariably failed, the reason popularly assigned being the influence of France. The fine moral character of Innocent has been sketched with much artistic power as well as with historical fidelity by Mr Robert Browning in The Ring and the Book, Innocent XI. was suceceded by Alexander VIII.

INNOCENT XIL, Antonio Pignatelli, pope from 1691 to 1700, was the successor of Alexander VIII. He came of a distinguished Neapolitan family, and was born March 18, 1615. Educated at the Jesuit college in Rome, he in his twentieth year became an official of the court of Urban VIII. ; under successive popes he served as nuncio at Florence and Vienna and in Poland; and by Iunocent XL he was made cardinal (1681) and archbishop of Naples. Immediately after his election (July 12, 1691) he declared against the nepotism which had too much and too long been one of the greatest scandals of the papacy; the bull "Romanum decet Pontificem," issued in 1692, prohibited popes in all times coming from bestowing estates, offices, or revenues on any relative; at the same time he sought

to check the simoniacal practices of the apostolic chamber, and in connexion witli this to introduce a simpler and more economical

manner of life into his court. He introduced *. various much-needéd reforms into the States of the Church, and for the better administration of justice erected thie Forum Innocentianum. In 1693 he compelled the French bishops to retract the four propositions. relating to the "Gallican Liberties" which had been formulated by the assembly of 1682. In 1699 he decided in favour of Bossuet in his controversy with Fénelon about the Kaplication-des Maximes des Saints sur la Vie Intérieure of the latter. His pontificate contrasted with that of a series of predecessors in having marked leanings towards France instead of Germany. This benevolent, self-abnegating, and pious pope died on September 27, 1700, and was succeeded by Clement XI.

INNOCENT XIIL, Michael Angelo Conti, pope from 1721 to 1724, was born in 1655, and became cardinal under Clement XI. in 1706. From 1697 to 1710 he acted as papal nuncio to the kingdom of Portugal, where he is believed to have formed those unfavourable impressions of the Jesuits which afterwards influenced his conduct towards them. In 1721 his high reputation for ability, learning, purity, and a kindly disposition secured his election to succeed Clement XI. His pontificate was prosperous, but comparatively uneventful. He prohibited the Jesuits from prosecuting their mission in China, and ordered that no new members should be received into the order. This indication of his sympathies encouraged some French bishops to approach him with a petition for the recall of the bull "' Unigenitus" by which Jansenism had been con- demned; the request, however, was peremptorily denied. Innocent XIIL, like his predecessor, showed much favour to the English Pretender " James IIL," and liberally sup- ported him. He died March 7, 1724, and was succeeded by Benedict XIII.

INNSBRUCK, or Innspruck (18,000), the chief town of Tyrol, Austria, is situated on the right bank of the Inn, not far from its junction with the Sill, in a beautiful valley surrounded by lofty mountains, which seem to overhang the town. It is connected with its suburbs on the left bank of the stream by three bridges.) The old wooden bridge, which was the scene of a fierce struggle between the Tyrolese and the Bavarians in 1809, was replaced in 1871-72 by a handsome iron structure, and the banks of the Inn have, during the last few years,

been widened and planted with trees. Innsbruck is the seat of the law courts and the usual administrative offices for the district of Tyrol and Vorarlberg. The town has broad streets, with four open places. The houses are handsome; many of those in the old town date from the 17th and 18th centuries, and are built in the Italian style, adorned with frescoes, and having arcades beneath used as shops. The Franciscan or court church (1553-1563), in the Renaissance style, con- tains several works of art, of which the chief is the imposing cenotaph of the emperor Maximilian I. This monument of art, ono of the most important on the Continent, represents the emperor kneeling in prayer on a marble sarcophagus, surrounded by twenty-eight colossal bronze statues of his ancestors ; while on the sides of the sarcophagus there are twenty-four reliefs, depicting the chief events in. Maximilian's life. Alexander Colin executed most of tha reliefs (see vol. vi. p. 141); and Gilg Sesselschreiber, court-painter, had the general superintend- ence of the work, and designed many of the statues. In the same church are the monuments of the patriots Hofer, Haspinger, and Speckbacher, and one in memory of the Tyrolese who fell in defence of their country between 1796 and 1809. The silver chapel of the church contains a silver Madonna and altarpiece, and the graves of Archduke

Ferdinand IL and his wife Philippa. In this church Christina of Sweden, daughter of Gustavus Adolphus, publicly adopted the Roman Catholic faith in 1654. Other churches worthy of note are the Pfarr-church, the Jesuits' church, the Serviten church, and St John's of Nepomuk.

There are numerous monastic institutions, including a

Jesuits' college, and a Capuchin convent, begun in 1593 a8 the first of the order in Germany. The university, founded in 1672 and, after being twice suspended, finally reinstituted in 1826, had in 1880-81 a teaching-staff of 76, and (1879-80) 607 students. It possesses a fine library, and exhibitions to the annual value of £1200. The Ferdinand- eum, an interesting national museum, was founded in 1845, and is maintained by private enterprise. The other chief buildings are the palace,

completed in 1771, the theatre, the post-office, the landhaus, town-house, and other official buildings, and several schools and benevolent institutions,

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Plan of Innsbruck. 6. Franciscan or Court |] 11. Museum.

. National Theatre.

. Town-house, Custom- Church. 12. Landhaus. 7, University. 13. Post-Office. 8. Jesuits' Church. 14, Serviten Church.

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house. 8. Pfarr Church. 4. Burg or Palace. 5. Goldne Dachl,

The Golden Roof (Goldne Dachl) is prominent on the front of a mansion built in 1425 at great expense by Frederick of the Empty Pockets, as a practical refutation of his nickname. Among the several monuments in the town are St Anna's pillar, erected in 1706 to commemorate' the repulse of the French and Bavarians in 1703; the fountain, with a bronze statute of Duke Rudolf IV., raised in 1863~77 in memory of the five hundredth anniversary of the union of Tyrol with Austria; statues of the archduke Leopold V. and of Walter von der Vogelweide; and the triumphal arch erected in 1765, on the occasion of the marriage of the emperor Leopold IL to the infanta Maria Ludovica. The manufactures of Innsbruck comprise woollen and cotton goods, stained glass, leather, and machinery ; and there is considerable transit trade between Italy and Austria. The population in 1869 was 16,324 ; but in 1879 it was estimated at about 18,000, with a garrison of 2000 men.

The ancient name of the town was (Eni Pons or Ginipontum, of which Innsbruck (Bridge of Inn) is the German equivalent. ; received town privileges in 1234 from Duke Otto I. of Meran ; from that date till about 1665 it was the capital of the Tyrolese counts; and after the union of Tyrol with Austria in 1368, it became a favourite residence of the emperors. In 1552 Maurice

9, Jesuits' College, 15. Triumphal Arch, 10, Capuchin Monastery.

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and took Innsbruck, oe capturing the

Charles V., to whom a mutiny among aurice's troops ateele time for a hasty flight. In the war of the Spanish succes- sion, and again in the patriotic Tyrolese wars at the beginning of the 19th century, Innsbruck suffered severely. During the com-

of Saxony surprised

motions of 1848, it was the temporary refuge of the emperor Fer-

dinand. :

INNS OF COURT. The Inns of Court and Chancery are voluntary mon-corporate legal societies seated in London, having their origin about the end of the 13th and the commencement of the 14th century.

Dugdale (Origines Juridiciales) states that the learned in our laws were anciently persons in holy orders, the justices of the king's court being bishops, abbots, and the like. But in 1207 the clergy were prohibited by canon from acting in the temporal courts. The result proving prejudicial to the interests of the community, a commission of inquiry was issued by Edward I. (1290), and this was followed up (1292) by a second commission, which among other things directed that students 'apt and eager" should be brought from the provinces and placed in proximity to the courts of law now fixed by Magna Charta at West-minster. 'These students were accordingly located in what became

known as the Inns of Court and Chancery, the latter designated by Fortescue (De Laudibus) as "the ear- liest settled places for students of the law," the germ of what Sir Edward Coke subsequently spoke of as our English juridical university. In these Inns of Court and Chancery, thus constituted, and corresponding to the ordinary college, the students, according to Fortescue, not only studied the laws and divinity, but further learned to dance, sing, and play instrumental music, "so that these hostels, being nurseries or seminaries of the court, were therefore called Inns of Court."

Stow in his Survey (1598) says: "There is in and about this city a whole university, as it were, of students, practisers or pleaders, and judges of the laws of this realm ;" and he goes on to cnumerate the several societies, fourteen in nunber, then existing, corresponding nearly with those recognized in the present day, of which the Inns of Court, properly so-called, are and always have been four, namely, Lancoln's Inn, with the subordinate Inns of Chancery, Furnival's Inn and Thavie's Inn; the Jnner Temple, with Clifford's Inn and Clement's Inn; the Jfiddle Temple, with New Inn; and Gray's Jnn, with Staple's Inn and Barnard's Inn. In addition to these may be specified Serjeant's Inn, a socicty composed solcly of serjeants-at-law, which, however, ceased to exist in 1877. Besides the Inns of Chancery above enumerated, there were others, such as Lyon's Inn, which was pulled down as recently as 1868, and Scrope's Inn and Chester or Strand Inn, spoken of by Stow, which have long been removed, and the societies to which they belonged have disappeared. The four Inns of Court stand on a footing of complete equality, no priority being conceded to or claimed by one inn over another. Their jurisdictions and privileges are equal, and upon affairs of common interest the benchers of the four inns meet in conference. From the earliest times there has been an interchange of fellowship between the four houses ; nevertheless the Middle Temple and Lincoln's Inn, and the Inner Temple and Gray's Inn, have main- tained a closer alliance.

The members of an Inn of Court consist of benchers, barristers, and students. The benchers are the governing bodies of the inns, and are composed of the senior mem- bers, designated also more formally

‘masters of the bench.” They are self-elected, and unrestricted as to numbers ; usually, but not invariably, a member of an inn, on attaining the rank of queen’s counsel, is invited to the bench. Other members of long standing are also occasionally chosen, but no member by becoming a queen’s

counsel or by seniority of standing acquires the right of being nominated a bencher. The benchers thus clected vary in number from twenty in Gray’s Inn to seventy and upwards in Lincoln’s Inn and the Inner Temple. The powers of the benchers are practically without limit within their respective societies ; their duties, how- ever, are restricted to the superintendence and manage- ment of the concerns of the inn, the admission of candi- dates as students, the calling of them to the bar, and the exercise of discipline generally over the members. The judges of the superior courts are the visitors of the inns, and to them alone can an appeal be had when either of the societies refuses to call a member to the bar, or to reinstate in his privileges a barrister who has been’ dis- barred for professional or other misconduct. The mcctings of the benchers are variously denominated a “ parliament ” in the Inner and Middle Temples, a “pension” in Gray’s Inn, and a “council” in Lincoln’s Inn. The presiding or chief officer is the treasurer, one of the benchers, who is elected annually to that dignity. Other benchers fulfil the duties of master of the library, master of the walks or gardens, dean of the chapel, and so forth, while others are readers, whose functions are referred to below. Under the term barrister are included generally all those members of an Inn of Court who, after due probation, and being at least twenty-one years of age, have been called to that rank by the benchers of the inn of which they have been students. For a notice of these the reader is referred to the article Barristers (vol. iii. p. 394), but some further details respecting their connexion with these societies may be fitly given here. Each inn confers this status or degree on its own members only. The grade of barrister comprehends the attorney- general and solicitor- general (appointed by and holding office solely at the will of the Government of the day), who rank as the heads of the profession, queen’s counsel, and ordinary practitioners, sometimes

technically known as “utter barristers.” There is also the practitioner ‘ below the bar,” the lowest in the ranks of the forensic hierarchy, who limits his practice to those special branches of the law designated pleading and conveyancing, and is precluded by the fact of his not having been “called” from appearing in court.

The usages of the different inns varied somewhat for- merly in regard both to the term of probationary student- ship enforced and to the procedure involved in a call to tlie bar. In the present day complete uniformity is observed in all respects, the entrance examination, the course of study, and the examinations required to be passed on the completion of the curriculum being identical and common to all the inns alike. When once called to the bar, the barrister is left to follow his own will in regard to entering into active practice or with respect to the special branch of the law he may elect to pursue, no hindrance beyond pro- fessional etiquette limiting his freedom of action in any way; so also members may on application to the benchers, and on payment of arrears of dues (if any), leave the society to which they belong, and thus cease altogether to be members of the bar likewise. Barristers rank as esquires, and are privileged from arrest whilst in attend- ance on the superior courts and on circuit, and also from serving on juries. They enjoy unfettered freedom of speech, though this confers no right to utter slander. On the other hand, a barrister has no legal remedy for the recovery of his fees, and it is not competent for him to enter into any contract for payment by his client with respect to litigation. A member of an Inn of Court re- tains his name on the lists of his inn for life by means of a small annual payment varying from £1 to £5, which at one or two of the inns is now compounded for by a fixed sum taken at the call to the bar. A distinctive dress is

worn by barristers when attending the courts, consisting of a stuff-gown, exchanged for one of silk when the wearer has attained the rank of queen’s counsel, both classes also having wigs dating in pattern and material from the 18th ceutury. Those who practise below the bar as pleaders or conveyancers are under the necessity of taking out a cer-

tificate, which is granted for one year only, but is renew- able, and is subject to a small payment. This certificate is issued by the benchers of the Inn of Court of which the practitioner is a member, and is given to those only who are qualified to be called to the bar.

During the reign of Edward III. the Inns of Court and Chancery, based on the collegiate principle, prospered under the supervision and protection of the crown. In 1381 Wat Tyler invaded the Temple, and in the succeed- ing century (1450) Jack Cade meditated pulling down the Inns of Court and killing the lawyers. It would appear, inoreover, that the inmates of the inns were themselves at times disorderly and in conflict with the citizens. Fortescue (circa, 1464) describing these societies thus speaks of them: "There belong to the law ten lesser inns, which are called the Inns of Chanccry, in each of which there are one hundred students at least, and in some a far greater number, though not constantly residing. After the students have made some progress here they are admitted to the Inns of Court. Of these there are four, in the least frequented of which there are about two hundred studeuts. The discipline is excellent, and the mode of study well adapted for proficiency." This curriculum had probably existed for two centurics before Fortescue wrote, and continued to be enforced certainly down to the time of Sir Thomas More (1498) and of Chief Justice Dyer (1537), and yet later to that of Sir Edward Coke (1571). From this time, however, the attorneys were gradually closing tlie doors of the Inns of Chancery against students for the bar; and these preparatory schools of law, once the stepping stones to the Inns of Court (who directed their studies), have long since severed their relations with the bar and with legal education, and are now of no account whatever in connexion with the law, their members being chiefly, though not entirely, solicitors meeting solely for convivial purposes. By the time of Sir Matthew Hale (1629) the custom for law students to be first entered to an Inn of Chancery before being admitted to an Inn of Court had become obsolete, and thenceforth the Inns of Chancery have been entirely abandoned to the attorneys, Stow in his Survey succinctly points out the course of reading enforced at the end of the 16th century. He says that the Inns of Court were replenished partly by students coming from the Inns of Chancery, who went thither from the univer- sities aud

sometimes immediately from grammar scliools ; and, having spent some time in studying the first elements of the law, and having performed the excrcises called “bolts,” “moots,” and “ putting of cases,” they proceeded to be admitted to, and become students in, one of the Inns of Court. Here continuing for the space of seven years or thereabouts, they frequented readings and other learned exercises, whereby, growing ripe in the knowlcdge of the laws, they were, by the general consent cither of the benchers or of the readers (who down to 1664 enjoyed a special privilege in this respect), called to the degrec of barrister, and so enabled to practise in chambers and at the bar. There is thus abundant evidence that ample provision for legal study was formerly made, and that this continued with more or less vigour down to nearly the commencement of the 18th century. A languor similar to

that which affected the church and the universities then’

gradually supervencd, until the fulfilment of the merest forms sufficed to confer the dignity of advocate and pleadcr. This was maintained until recent ycars, when (from 1845)

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the necessity for suitable training of young men aspiring to forensic honours has again become recognized, and steps have been taken for reviving and extending the ancient discipline and course of study, bringing them into harmony with modern ideas and requirements.

In the present day the four Inns of Court have combined in framing and enforcing regulations having for their end a preliminary or matriculation examination prior to admission to an inn, the keeping of terms, the attendance at lectures and private classes, and finally an examination preparatory to the call to the bar, which, as at the universities, is divided into an honour and a simple pass examination, the former carrying with it certain studentships of some pecuniary value and certificates of honour. The scope of the examinations is tolerably wide, and includes juris- prudence (with international law,

public and private), the Roman civil law, constitutional law and legal history, common law, equity, the law of real and personal property, and criminal law. ‘These studies, and the examinations consequent upon them, are superintended and controlled by a council of legal education consisting of twenty benchers nominated in equal numbers by each inn, and by a per- manent committee of education and examination consisting of eight members, appointed by and taken from the council itself, A body of examiners has been likewise constituted, whose payment, together with the attcndant expenses of the council, is provided for by annual contributions, in certain fixed proportions, made by the four inns. The arrangements in force would appear, however, to be regarded as tentative only, several attempts laving been made to carry out a more systematic scheme of cducation, to be developed eventually into a regular legal university. The assistance of the legislature to this end has even been sought, but as yet without result, in the shape of a statutory enactment. ‘The fees payable at the different inns vary from £136, 11s, 10d. at Gray’s Inn to £154, Is. 3d. at the Middle Temple. ‘These sums cover all expenses from admission to an inn to the call to the bar, but the addition of tutorial and other expenses may augment the cost of a barrister’s legal education to £400 or £500. The period of study prior to call has now become limited to twelve terms, cquivalent to about three years. In the case of solicitors, however, the regulations have been altered in 1881 so as to enable them to be called after the lapse of one year.

It has been seen that the studics pursued in ancient times were conducted by means of “readings,” ‘“ moots,” and “bolts.” The readings were from tlic very first deemed of vital importance, and were delivered in the halls with much ceremony ; they were frequently regarded as authori ties and cited as such at Westminster in argument. Some statute or section of a statute was selected for analysis and explanation, and its relation to the common law pointed out. Many of these readings, dating back to Edward I, are extant, and well illustrate the importance of the subjects and the exhaustive and learned manner in which they were treated by the able, experienced men upon whom this duty was cast. The function of “reader” involved the holder in very weighty expenses, chiefly by reason of the profuse hospitality

dispenscd,—a constant and splendid table being kept during the three weeks and three days over which the readings extended, to which were invited the nobility, judges, bishops, the officers of state, and sometimes the king himself. In 1688 the readers were paid £200 for their reading, but by that time the office had become 4 sinecure. In the present day the readership is purely honorary and without duties. The privilege formerly assnined by the reader of calling to the bar was taken away in 1664 by an order of the lord chancellor and the judges. Afoots were exerciscs of the nature of formal argu-

ments on poults of law raised by the students and conducted with much care under the supervision of a bencher and two barristers sitting as judges in the halls of the inns. Bolts were of an analogous character, though deemed inferior to moots. Both had fallen into complete desuetude until lately, when the society of Gray's Inn has revived mootings, it is understood with some success.

In the early history of the inns discrimination was exer- cised in regard to the social status of candidates for ad- mission to them. Ferne, a writer of the 16th century, referred to by Dugdale, states than none were admitted into the houses of court except they were gentlemen of blood. So also Pliny, writing in the Ist century of the Christian era (Letters, ii. 14), says that before his day young men even of the highest families of Rome were not ad- mitted to practice except upon the introduction of some man of consular rank. But he goes on to add that all barriers were then broken down, everything being open to everybody,—a remark quite applicable to the bar of England and elsewhere in the present day. It may here be noted that no dignity or title confers any rank at the bar. A privy councillor, a peer's son, a baronet, the speaker of the House of Commons, or a knight,—all rank at the bar merely according to their legal precedence. Formerly orders were frequently issued both by tle benchers and by the crown on the subject of the dress, manners, niorals, and religious observances of students and members. No such interference with the liberty of the subject is now recognized in the inns of court ; and, although there is

some semblance of a collegiate discipline maintained, this is re- stricted to the dining in hall, where many ancient usages survive, and to the closing of the gates of the inns at night.

‘Each inn maintains a chapel, with the accompaniment of preachers and other clergy, the services being those of the Church of England. The Inner and the Middle Temple have joint use of the Temple church, a fabric of high antiquity and much dignity. The chapels of Lincoln’s Inn and Gray’s Inn are also very interesting. The office of preacher is usually filled by an ecclesiastic of learning and repute chosen by the benchers. The principal functionary of this rank in connexion with the Temple church is, however, constituted by letters patent by the crown without episcopal institution or induction, enjoying, nevertheless, no authority independently of the benchers. He bears the title of Master of the Temple.

It has already been stated, on the authority of Fortescue, that the students of the Inns of Court learned to dance, sing, and play instrumental music; and those accomplish- nents found expression no doubt in the “masques” and “revels” for which the societies formerly distinguished themselves, especially the Inner Temple and Gray’s Inn. These entertainments were of great antiquity and much magnificence, involving very considerable expense. Evelyn (Diary) speaks of the revels at the Middle Temple as an old and riotous custom, having relation neither to virtue nor to policy. The last revel appears to have been held at the Inner Temple in 1734, to mark the occasion of the elevation of Lord Chancellor Talbot to the woolsack. The plays and masques performed were sometimes repeated elsewhere than in the hall of the inn, especially before the sovereign at court, A master of the revels was appointed, commonly designated Lord of Misrule, whose authority in making the necessary arrangements was paramount, Abundant infor- mation as to the scope and nature of these entertainments has come down to us: one of the festivals is minutely described by Gerard Leigh in his Accedence of Armorie, 1612; and a tradition ascribes the first performance of Shakespeare’s Z’welfth Night to a revel held in the Middle Temple hall in February 1601. At the present day no

entertainments are given; excepting on very rare occasions, the hospitality of the inns has ceased to find expression save in the " Grand Day" held once in each of the four terms, when it 1s customary for the judges and other dis- tinguished visitors to dine with the benchers (who sit apart from the barristers and students on a dais in some state), and "Readers' Feasts," on both which occasions extra com- mons and wine are served to the members attending.

The Jnner and the Middle Temple, so far as their history can be traced hack, have always been separate societies. Fortescue, writing between 1461 and 1470, makes no allusion toa previous junction of the two inns. Dugdale (1671) speaks of the Temple as one society, and states that the students so increased in number that at length they divided into two bodies, becoming the Inncr and Middle Temple respectively. He does not, however, give any authority for this statement, or furnish the date of the division. The first reliable mention of the Temple as an inn of court is to be found in the Paston Letters, where, under date November 1440, the Inner Temple is spoken of as a college, as is also subsequently the Middle Temple. The Temple, as the name would serve to indicate, was the seat in England of the famous monastic order kuown as the Knights Templars, on whose suppression in 1312 it passed with other of their possessions to the crown, and after an interval of some ycars to the Knights Hospitallers of St John of Jerusalem, who in the reign of Edward II. demiscd the mansion and its surroundings to certain professors of the common law who came from Thavic's Inn. Notwithstanding the destruction of the muniments of the Temple by fire or by popular commotion, sufficient testimony is attainable to show that in the rcigns of Edward III. and Richard Il. the Temple had become the residence of the legal communities which have since maintained there a permanent footing. The two societics continued as tenants to the Knights Hospitallers of St John until the dissolution of the order in 1539 ; they then became the lessecs of the crown, and so remained until 1609, when James J. made a grant by letters patent of the premises in perpetuity to the benchers of the respective societies on a yearly payment by cach of £10, a payment which has long ceased to

be made, having becn bought up in the reign of Charles II. In this grant the two inns are described as ‘the Inncr and the Middle Temple or New Temple,” and as ‘* being two out of those four colleges the most famous of all Europe” for the study of the law. Excepting the church, nothing now remains of the cdifices belonging to the Knights Templars, the present buildings having been almost wholly erected since the reign of Quecn Elizabeth or since the Great Fire, in which the major part of the Inner Temple perished. The church, a noble structurc, has been in the joint occupation of the Inner and Middle Temple from time immemorial,—the former taking the southern and the latter the northern half. Theround portion of the church was consecrated in 1185, the nave or choir in1240. It is the largest and most com- plete of the four remaining round churches in England, and is built on the plan of the church of the Holy Sepulchre at Jerusalem. Narrowly cscaping the ravages of the fire of 1666, this beautiful building remains to this day one of the most perfect specimens of early Gothic architecture in England, and is maintained in the highest order in respect not merely to the edifice itself but to the services conducted within its walls. In former times the lawyers awaited their clients for consultation in the Round Church, as similarly the serjeants-at-law were accustomed to resort to St Paul’s Cathedral, where each serjeant liad a pillar assigned him.

The Inner Temple, comprchending a hall, parliament chamber, library, and other buildings, occupies the site of the ancient mansion of the Knights Templars, built about the ycar 1240, and has from time to time been more or less re-erccted and extended, the most recent changes in this direction dating from 1870, when the present handsome range of buildings, including a new dining hall, was com- pleted. The hbrary owes its cxistence to William Vetyt, kceper of the Tower Records in the time of Qucen Anne, who was also a benefactor to the library of the Middle Temple. The greatest addition by gift was made by the Baron Maseres in 1825. Tho number of volumes now in the library is 30,000, arranged in suit- able rooms adjoining the hall. Of the Inns of Chancery belonging to the Inner Temple Clifford’s Inn was anciently the town residence of the Barons Clifford, and was demiscd in 1345 to a body of students of the law. Clement’s Inn was an Inn of Chancery

beforo the reign of Edward IV., taking its name from the parish church of St Clement Danes, to which it had formerly belonged.

The Middle Temple posscsscs in its hall one of the most stately and interesting of existing Elizabethan structures. Commenced in 1562, under the auspices of the learned Plowden, then treasurer, it was not completed until 1572, the richly carved screen at the east

-end in the style of the Renaissance being put up three years later,

in 1575. The idea long commonly received that the screen was constructed of timber taken from ships of the Spanish Armada (1 588) is therefore bascless. The noble edifice, which through many vViciss1- tudes of fire and popular tumult has been preserved unaltered to

the present day, has been the scene of numerous historic incidents, notably the entertainments given within its walls to regal and other personages from Queen Elizabeth downwards. The library, whieh now contains 28,000 volumes, dates its origin from 1641, when Robert Ashley, a member of the society, bequeathed his colleetion of books in all classes of literature to the inn, together with a large sum of money; other benefactors were Ashmole (the antiquary), William Petyt (a benefaetor of the Inner Temple), and Lord Stowell, From 1711 to 1826 the library was greatly neglected ; few works were added either by presentation or purehase, and many of the most searce and valuable were lost. The present handsome library building, whieh stands apart from the hall, was eompleted in 1861, the Prinee of Wales attending the inauguration eeremony on Oetober 31st of that year, and becoming a member and bencher of the soeiety on the oceasion, The MSS. in the collection are few in number, and of no special value. In eivil, eanon, and inter- national law, as also in divinity and ceelesiastieal history, the library is very rich ; it eontains also some curious works on witeh- craft anddemonology. There is but one Inn of Chancery eonnected with the Middle Temple, that of New Inn, which, aeeording to Dugdale, was

formed by a soeiety of students previously settled at St George's Inn, situated near St Sepulehre's Chureh without New- gate ; but the date of this transfer is not known. ;

Lincoln's Inn stands on the site partly of an episcopal palace erected in the time of Henry III. by Ralph Nevill, bishop of Cli- ehester and chaneellor of England, and partly of a religious house, ealled Blaek Friars House, in Holborn. In the reign of Edward II, Henry Laey, earl of Lincoln, possessed the place, which from him aequired the name of Lineoln's Inn, probably beeoming an Inn ot Court soon after his death (in 1810), though of its existenee as a place of legal study there is little authentie reeord until the time of Henry VI. (1424), to which date the existing muniments reach back. The fee simple of the inn would appear, however, to have remained vested in i see of Chichester ; and it was not until 1580 that the society which for eenturies had oeeupied the inn as tenants acquired the absolute ownership of it. The old hall, built about 1506, still remains (and is temporarily used as one of the eourts of the High Court of Justiee), but has given place to a modern strueture designed by Philip Hardwick, R.A., which, along with the buildings containing the library, was completed in 1845, the Queen attending the inauguration eeremony (Oetober 13). The ehapel, built after the designs of Inigo Jones, was eonseerated in 1623. The library—as a collection of law books the most eomplete in the country—owes its foundation to a bequest of John Nethersale, a member of the society, in 1497, and is the oldest of the existing libraries in the metropolis. Various entries in the records of the inn relate to the library, and notably in 1608, when an effort was made to extend the collection, and the first appoint- ment of a master of the library (an office now held in annual rota- tion by each beneher) was made. The library has been niuehi enriched by donations and by the acquisition by pureliase of collee- tions of books on speeial subjeets. It ineludes also an extensive and valuable series of MSS., the whole comprehending 43,000 volumes. The Inns of Chaneery affiliated to Lincoln's Inn are Thavie's Inn and Furnival's Inn, Thavie's Inn was a residence of students of the law in the time of Edward III., and is mentioned by Fortescue as having been one of the lesser houses of Lincoln's Inn for some eenturies. It thus continued down to 1769, when the inn was sold by the benchers, and

thenceforth it ceased to have any character as a place of legal edueation. Furnival's Inn beeame the resort of students about the year 1406, and was purehased by the soeiety of Lincoln's Inn in 1547. In 1817 the inn was rebuilt, but from that date it has eeased to exist as a legal community.

There is no reason to suppose that Gray's Inn is of less anti- quity than the other Inns of Court. The exaet date of its be- eoming the residence of lawyers is not known, though it was so oeeupied before the year 1370, and there is abundant evidenee of its existenee as an Inn of Court after that date. The inn stands upon the site of the manor of Portpoole, belonging in ancient times to the dean and chapter of St Paul's, but subsequently the property of the noble family of Grey de Wilton and eventually of the erown, from whieh a grant of the manor or inn was obtained, many years sinee discliarged from any rent or payment. The hall of the inn is of handsome design, similar to the Middle Temple hall in its general character and arrangements, and was completed about the year 1560. 'The ehapel, of much earlier date than the hall, has, notwithstanding its antiquity, but little now to recommend it to notice, being small and insignifieant, and laeking architeetural features of any kind. The library, including about 13,000 volumes, eontains a small but important eolleetion of MSS. and missals, and also some valuable works on divinity. Little is known of the origin or early history of the library, though mention is ineidentally made of it in the soeiety's records in the 16th and 17th eenturies. The gardens, laid out about 1597, it is believed under the auspices of the lord ehancellor Bacon, at that time treasurer of the society, coutinue to this day as then planned, though with some curtailment owing to the erection of additional buildings in recent years,

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Among many eurious eustoms maintained in this inn is that of drinking a toast on grand days '"'to the glorious, pious, and immortal memory of Queen Elizabeth." Of the speeial eireum. stanees originating this display of loyalty there is no reeord. The Inns of Chancery eonneeted with Gray's Inn are Staple's and Barnard's Inns. Staple's Jnn was an

Inn of Chancery in the reign of Henry V., and is probably of yet earlier date, Readings and moots were observed here with regularity. Sir Simonds d'Eweg mentions attending a moot in Febrnary 1624. Barnard's Inn, aneiently designated Maekworth Inn, was an Inn of Chaneery in the reign of Henry VI. It was then and still is held of the dean and ehapter of Lincoln, to whom a fine of £1400 is payable every fourteen years.

The King's Inns, Dublin, the legal school in Ireland, corresponds closely to the English Inns of Court, and is in many respects in unison with them in its regulations with regard tothe admission of students into the society, and to the degree of barrister-at-law, as also in the scope of the examinations enforced, though no final examination is now required for call to the bar. Of the twelve terms required to be kept, however, by a student, four must be spent at an Inn of Court in London, admission to which is obtained in the usual manner, but exempt from stamp duty, on the certificate of the under treasurer that such duty has been paid in Ireland. Until lately two years were required to be thus passed in London,—the stipulation dating as far back as 1542 (83 Henry VIII. c. 3). Down to 1866 the course of education pursued at the King's Inns differed from the English Inns of Court in that candidates for admission to the legal profession as attorneys and solicitors carried on their studies with those aspiring to the higher grade of the bar in the same building under a professor specially appointed for this purpose,—herein following the usage anciently prevailing in the Inns of Chancery in London, which, as has already been stated, has long since fallen into desuetude. This arrangement was put an end to by the statute 29 & 30 Vict. c. 84. The origin of the King's Inns may be traced back to the reign of Edward I, when a legal society designated Collett's Inn was established ; but, being situated without the walls of the city, the inn was destroyed by an insurrectionary band. In the reign of Edward III. Sir Robert Preston, chief baron of the exchequer, gave up his residence within the city to the legal body, which then took the name of Preston's Inn, where for two centuries the study of the law was pursued and a collegiate discipline maintained. In 1542 the land and buildings known as Preston's Inn were restored to the family of the original donor, and in the same year Henry VIII. granted

the monastery of Friars Preachers for the use of the professors of the law in Ireland. In consequence of this grant the legal body removed to the new site, and thenceforward were known by the name of the King's Inns. Possession of this property having been resumed by the Government in the middle of the last century (1742), and the present Four Courts erected thereon, a large space of ground at the top of Henrietta Street was purchased by the society, and the existing hall built in the year 1800. The library, numbering over 50,000 volumes, with a few MSS., is housed in buildings specially provided in the year 1831, and is open, not only to the members of the society, but also to strangers upon proper introduction. The collection is not entirely legal, but comprises all kinds of literature. It is based principally upon a purchase made in 1787 of the large and valuable library of Mr Justice Robinson, and is maintained chiefly by an annual payment made from the Consolidated Fund to the society in lieu of the right to receive copyright works which was conferred by the Act of 1801 (41 George III. c. 107), but abrogated in 1836 (6 & 7 Will. IV. c. 107). In discipline and professional etiquette the members of the bar in Ireland differ but little from their English brethren. The same style of costume is enforced, the same gradations of rank—

attorney-general, solicitor-general, queen's counsel, and ordi- nary barristers—being found. There are also serjeants-at- Jaw limited, however, to three in number, and designated Ist, 2d, and 3d serjeant; and, unlike their English brethren, these are not as yet in course of extinction. The King's Inns do not provide chambers for business purposes ; there is consequently no aggregation of counsel in certain locali- ties, as is the case in London in the Inns of Court and their immediate vicinity.

The corporation known as the aculty of Advocates in Edinburgh corresponds with the Inns of Court in London and the King's Inns in Dublin (see Apvocatz, vol. i, p. 178). The constitution of the faculty differs in many respects, however, from the English and Irish societies. There is no resemblance to the quasi-collegiate discipline and the

usages and customs prevailing in an Inn of Court. There is no governing body similar to the benchers. The president is elected by general vote of the whole body of the advocates, and is designated dean of faculty. Until a recent date no precedence excepting that of the lord advocate (who performs many of the duties of the attorney-general in England), the dean of faculty, and the solicitor-general was recognized. Now these officers and the ex-law-officers of the crown obtain patents as queen's counsel. The faculty is possessed of a hall and extensive library build- ings situated beneath and adjoining the Parliament House, which have been much added to in the present century. The body regulates all matters connected with admission to its ranks.

Advocates are not required to pass any portion of their studentship in London, as is the case with members of the Trish inn. On the other hand, advocates of the Scottish bar desiring to change the scene of their professional labours to the English metropolis derive no advantage as such (excepting when pleading in appeals at the bar of the House of Lords and in cases before the judicial committee of the privy council), but have to pass through the ordinary curriculum of the English student before acquiring the necessary status ; and in like manner an English or Irish barrister seeking admission to the Scottish bar must go through the course prescribed by the faculty.

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INOCULATION. See Sxatz-Pox.

INOWRAZLAW, anciently J ung-Breslau, thechief town of a circle in the government district of Bromberg, is situated on an eminence in the most fertile part of the Prussian province of Posen, 25 miles south-east of the town of Bromberg. It is the seat of a local court, and has seve- ral churches, a synagogue, anda gymnasium. Iron-founding, the manufacture of machinery, and an active trade in cattle and country produce are carried on. In the vicinity are Important salt works and a sulphur mine, and since 1876 there has been a brine bath establishment within the town. Tnowrazlaw is mentioned as early as 1185, and appears seve- ral times in the medieval history of the Teutonic knightly order. The population in 1875, including the garrison-and the neighbouring Grostnow, was 9147.

INQUEST. See Coroner.

INQUISITION, Tux, is the name usually given to that organization which was established in Spain in the 15th century for the detection and suppression of heresy. The " Holy Office," as it was styled, was, however, only the development of a system which, in the hands of the preaching orders, had existed from the beginning of the 13th century ; and this in turn did but enforce anew the old view that the church is bound to correct all immorality or misbelief. The subject has therefore three distinct periods :—(1) the treatment of heresy and vice before the 13th century ; (2) the Dominican Inquisition, dating from the council of Toulouse in 1229 ; (3) the Spanish Inquisi- tion, which began in 1480. 'The second and third periods express a different principle from that which guided the first ; for the earlier inquiry into heresy or vice was a part of the episcopal functions, while the second period sprang out of the anti-episcopal and anti-feudal revival of the preaching orders, and the third went with the establish- ment of a centralized monarchy in Spain, and its claims to a political-religious supremacy in Europe. The first was not directed against any special heresy; the second was called forth by the Albigensian movement, and the literary and artistic independence of southern France; the third expressed the views of

Spanish orthodoxy in its struggle with Jew and Moor, and, when that contest was done, it attacked Protestantism, becoming, in union with the Jesuits, the fighting power of the Catholic reaction of the 16th century. The original episcopal Inquisition never forgave its more vigorous and better organized successor ; the Spanish Office was nowhere introduced without a struggle, but the Reformation left episcopacy almost powerless in northern Europe, while in the south the renewed and autocratic papacy discouraged the independ- ence of bishops, and trusted itself mainly to the order of Jesus and the Holy Office.

The Inquisition was an outcome of that desire for safety in the truth which distinguishes Christianity from most other forms of faith, If men feel safe, they charitably wish others to be also safe,—hence missionary heroisms ; they fear whatever may endanger their safety, and long to clear it away,—hence persecution ; they argue that if they make a convert they save a soul, and if not that the stiff unbeliever is too dangerous to be left,—whence come imprisonments and the stake. So long as church and state were distinct, the heretic simply forfeited his privileges as a member of a religious body; but when state and church became, in theory at least, conterminous, this process availed no longer, and the heretic had to be put away by the state, while the church became ever more industrious in seeking out error. Now, in religious matters, men have always tried to make things easier by multiplying difficulties ; they secure safety by exact state- ment and minute definition, Creeds and formularies cease to be symbols of a general consent, and become, instead, tests of orthodoxy. And though, in theory, the church was as anxious for the moral purity as for the right faith of her members, the moral questions were presently eclipsed by the dogmatic ; church discipline judged conduct lightly, while it controlled opinion with an iron hand.

1. The germ of the Inquisition lies in the duty of search- ing out and correcting error entrusted to the deacons in the early churches. The promise in the Anglican Ordinal that the priest will be “ready with all faithful diligence to banish and drive away all erroneous and strange doctrines contrary to God’s word” is a pale reflexion of this ancient

charge. The episcopacy thus providing the instruments, the temporal power soon offered to enforce the sentences of the church: the edicts of Constantine and his successors now began that double system which, by ordaining that heretics should be dealt with 3 ris €wHev

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éfovotas, by the secular arm, enabled the church to achieve her object without dipping her own hands in blood. Thus, about 316, Constantine issued an edict condemning the Donatists to lose their goods; and in 382 Theodosius declared the Manicheeans guilty of death, and confiscated their goods. Later on, in 769, we learn in the capitularies of Charles the Great that each bishop must visit all his " Parcechia," or diocese, teach truth, correct morals, see that the clergy hold the right faith, and, on the Saxon border, stop the uso of any pagan rites. Charles the Bald in 844 orders the bishops to preach and confirm the people, and to inquire into and correct their errors, "ut populi errata inguirant et corrigant." In this inquisition, as in other matters, the church long felt the impress of the organizing power of Charles the Great; it helped forwards the episcopal dominance in the 9th and 10th centuries. Still, it claimed no special authority, and its action was very partial, and dependent on the temper and energy of each particular bishop. Sometimes it was raised into activity by some bolder movement of independence, as when in Italy in the 11th century' the bishops attacked the Patarines, under the impulse of Hildebrand, or as when it was used as an implement for the reduction of the archbishopric of Milan under the papal authority.

2. But when a time of new life came to Europe early in the 13th century, and orthodoxy was threatened by the brilliant speculations of southern France, a great revival in the church met the independent movement outside, and the rise of the Preaching Friars gave a new direction to the relations between religion and the world. Then, asin later days, the " Renaissance shook off many restraints, the good with the bad"; andart went with religious speculation and moral licence. The action of the new orders, as a develop- ment of the inquisitorial system, was directed almost entirely against opinions, and moral questions were left on one side. To this period we owe the technical use of the terms Inquisitor and

Inquisition. Hitherto they had signified, specially in France, officers inquiring into matters of taxation ; henceforth they are applicd to the more ominous inquiry into orthodoxy. At the council of Tours in 1163, in the time of Alexander III., the title of Inquisitor was first applied in this sense; and, at the council of Toulouse in 1229, the apostolical legate "mandavit ingucsetconem fieri contra heereticos suspectos de heeretica pravitate." But the thing was far older than the name. In 1184 the synod of Verona cursed all heretics and their shelterers, ordered relapsed persons to be handed over to the secular arm for capital punisliment, confiscated their property, and clearly indicated that the new Inquisition would go far beyond the older episcopal function. The synod did not hesitate to threaten easy-going bishops, urging them to more frequent and more searching visita- tions, standing over them as a superior power. And hence- forward Inquisition becomes more systematized, with papal not episcopal authority ; it was developed by those three masterful pontiffs, Innocent ITI. (1198-1216), Gregory IX. (1227-1241), and: Innocent IV. (1243-1254), who all, re- garding the supremacy of Rome as the keystone of society, claimed authority over men's souls and bodies, above the authority of prince or bishop. Thus, soon after his accession, Innocent III. sent two Cistercians, Guy and Regnier, to visit the dioceses of southern France and Spain, "to catch and kill the little foxes," the Waldensians, Cathari, and Patarines, to whose tails were fastened fire- brands to burn up the good corn of the faithful. The bishops and lay authorities were instructed to give all help ; & new power, with special papal authorization, had come in, and would interfere with every bishop in his diocese, rouse new activity in the old system, and also act inde- pendently as a new engine of inquiry.

Similarly, in 1203, Innocent III. sent Peter of Castelnau and Ralph, two Cistercians of }'ontevrault, to preach down the Albigensian heresy ; and when persuasion availed little he added to them Arnauld, abbot of Fontevrault, and named the three his apostolical legates, ordering them to deal more sharply with the heretics. The murder of Peter (hencefor- ward styled St Peter Martyr) in 1209 led to the outbreak of that cruel and disastrous war, the crusade of Simon of Montfort against the Albigensians. But little success attended the effort of these earlier Inquisitors till they were joined by the too famous Castilian Dominic,

who, having in 1215 accompanied the bishop of Toulouse to Rome, laid before the pope a scheme for a new order of preaching friars, whose special function should be the overthrow of heresy; Innocent III. approved the order in 1215, and Honorius III. confirmed it in 1216. It spread swiftly through Europe, and the charge of the Inquisition was soon entrusted almost entirely to it, Hitherto there had been no regular tribunal; now, as the war in southern France went on and the strife became more fierce, a stricter organization was introduced. While the strong current of independent opinion was being stemmed in Italy, Provence, France, and Spain, the resistance gave compactness to the new system. St Dominic established three orders— (1) his friars, (2) a female order, and (3) the " Militia of Christ," an order of laymen, married chiefly and noble, who became the working force of the inquisitorial system ; they were also styled "the Familiars of the Holy Office."

It is, however, to Gregory IX. that the Inquisition owes its definite form. In the synod of Toulouse in 1229 it was agreed that each bishop should appoint one priest, and one, two, three, or even more laymen, to inquire, under oath and with much secrecy, into heresy. In 1234 the Dominicans were specially entrusted with the inquisitorial office in Toulouse. From their tribunal there was no appeal to the bishop, who fell into the background, all appeals being directed to Rome alone. To this end Urban IV. appointed, in 1263, an inquisitor-general to be the medium of com- munication between the papacy and the local inquisitors, in hopes of stopping the delay of business caused by the absence of officials in Rome on appeal questions. This office, however, fell into abeyance till revived by Paul III. in the person of Caraffa in 1542.

From Provence the organization of the Inquisition soon passed into France, where, in 1255, Alexander IV. named the provincial of the Dominicans and the head of the Francisians at Paris his inquisitors-general for France at the urgent request of Saint Louis, whose piety was of the narrowest crusading type. The Gallican Church stoutly resisted this ultramontane interference; the bishops gave it no help; churches and abbeys became asylums for the victims of the Holy

Office; and the new movement had consequently but very partial success. It was more effectively used by Philip the Fair to crush the Templars, though that greedy prince quickly interfered when he found the Inquisition laying hands on his special preserve, the wealthy Jews, Charles V., moved to new efforts by Gregory XI., imprisoned large crowds of Frenchmen for heresy, and to meet the pressure erected several new prisons, among them the ill-omened Bastille. After this the Inquisition was quiet in France till the Reformation once more aroused it in the time of Francis I, In Spain it was introduced by Pope Gregory IX. in 1232, and had a far more active and con- tinuous life; we have a minute account of its system and procedure in the Directorium Inquisitorum of N. Eymerich, inquisitor-general for Castile in 1356. This work, based entirely on the writer's personal knowledge and experience, gives us full insight into the way in which cases were got up and handled: we see the spy system, the delation, the mysterious secrecy, the scandal of the "question"; the

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shameless uniou in one person of accuser and judge, the unscrupulous hindrances put in the way of the victim's defence, the direct interest of the tribunal in condemning, — for condemnation affirmed vigilance and orthodoxy, while it secured to the Holy Office the wealth of the accused, and the accused were usually among the wealthiest in the land. Wecan trace the absolute injustice of the institution on every page, and must only wonder that even in those days men could endure its existence. In Italy the Inquisi- tion was established under Dominican supervision as early as 1224; Simone Memmi's famous fresco of the " Domini Canes" in 8. Maria Novella at Florence, with its black and white hounds chasing off the wolves from the holy fold, bears living witness to the power of the institution and +43 influence over the Italian imagination. If Eymerich's book gives us a view of the rules of procedure, the MS. Liber Sententiarwm, or Book of Judgments, printed in part by Limborch, and containing the acts of the Toulouse Office from 1308 to 1322, gives us a full account of those rules reduced to practice in the earliest tribunal of the reconstructed Office. Between the two we can create for ourselves a complete image of the institution,

and judge of its power over the intellects, souls, and bodies of the quick- witted southerners. Inquisitors were at a later time brought into England to combat the Wickliffite opinions.

3. Though it succeeded, with help of the terrible lay- crusade, in southern France, the Inquisition seemed unequal to the problem laid before it in Spain, where, instead of simple-hearted Albigensians, it had to deal with rich and crafty Jews and highly-trained Moors, Forced to profess a Christianity which they hated, they loathed the worship of virgin or saint, the pictured or graven effigy of the Christ, the thousand objects of medizval worship, all which to their eyes were mere idolatries ; their allegiance to such a faith was that of compulsion, which fostered the bitterest sense of wrong. Between them and the old Catholic Spaniards smouldered a perpetual grudge; the Inquisition seemed unable to overcome the evil. When, however, Castile and Aragon were united by Ferdinand and Isabella, political aims as well as religious fanaticism demanded more stringent measures against independent thought; the war of Louis XIV. against freedom of opinion was not more distinctly political than that of the two monarchs, although his machincry was more civil and military than theirs,

Three chief motives led to the reorganization of the Inquisition in Spain ;—(1) the suspicions and ill-feeling against the new Christians ; (2) the wish of Ferdinand and Isabella to strengthen the compactness of their union, threatened by the separatist tendencies of the wealthy Jews and Moors ; and (3) above all, the hope of a rich booty from confiscations, a characteristic which specially marks the history of the Spanish Inquisition. The motive of strictly religious fanaticism influenced, not the monarchs, but the Dominican instruments of the Holy Office. And so when in 1477 Friar Philip de Barberi, inquisitor for Sicily, came to Seville for the confirmation of his office, and pressed on Ferdinand the great advantages of a revived system on the Sicilian plan, the king, led by his hunger for gold, and the queen, guided by her piety, were easily persuaded, and sent to Rome to solicit the establishment of such a tribunal as Barberi suggested. Sixtus IV. in 1478 acceded to their request ; his bull for this purpose is, however, lost, But as Isabella wished first to try gentler measures, and as both monarchs were rather

alarmed by the independence the Proposed tribunal claimed, the papal permission was not made known or acted on till 1480. The monarchs bar- gained that they should nominate the Inquisitors, hoping thereby to secure a control over the institution; but the teal centre of authority was inevitably Rome, and from its

outset the Holy Office was ultramontane. Nor indeed is there good ground for Hefele's contention, in which he is followed by the Benedictine Gams of Ratisbon, that the Inquisition was entirely a state institution ; the state did take part in it, and tried to draw its own selfish advantages from it, and it was also in name a royal tribunal ; but its spirit was completély Dominican, and the impulsc of it papal; nor can the church be relieved from the just odium which presses on the memory of the institution.

The first inquisitors named in 1480 were Dominicans; their tribunal was established at Seville, where they were but sullenly received, Early in 1481 they began work, and before that year was out had burnt 298 victims in Seville alone, besides many effigies of those who had happily escaped. The Jesuit historian Mariana assures us that in this year full 2000 were burnt in the arclibishopric of Seville and the bishoprie of Cadiz; the Quemadero, or cremation-place, built at this time by the prefect of Seville, not far from that city, a square platform of stone, was a grim altar on which the lives of almost daily victims ascended in clouds ofsmokc to heaven. 'This new blessing, however, was but unwillingly welcomed by the Spaniards ; the capital of Castile remembered its ancient learning and splendour, and the wealth and intelligence of its old Moorish inhabitants ; complaints and protests poured in on Sixtus IV., especially from the bishops; and in 1483, in one of his briefs the pope actually ordered a softening of the rigours of tle Holy Office; he also named the arch- bishop of Seville, D, Inigo Manriquez, his sole judge of appeals in matters of faith, hoping thereby to still the strong jealonsy of the episcopate. He was also somewhat offended because Ferdinand and Isabclla held back the papal share of the spoils.

Shortly afterwards, October 1483, the Dominican father Thomas of Torquemada (de Turrecremata) was named by Sixtus IV. inquisitor-general for Castile and Leon. From him the institution received its full organization. He became its president ; by his side werc two lawyers as asses- sors, and three royal counsellors. This scheme was not large enough for the work; it was shortly amended, and there was now a central court styled the Consejo de la Suprema, composed of the grand inquisitor-general, six apostolical counsellors, a fiscal procurator, three secretarics, an alguazil (or head policeman), a treasurer, four servants of the tribunal, two reporters or informers, and as many consultors as might be needful. Under this central tribunal four local tribunals were also appointed. All the officials were well paid from the confiscation-fund ; it was the interest of all that that stream of wealth should never run dry ; Torque- mada was to the full as eager as Ferdinand for profit from this unholy source : the chief spoils of the institution fell to the crown ; the true accession of strength was at Rome.

This royal council of the Inquisition, as it was now styled, proceeded next to draw up its rules. Torquemada in 1484 summoned to Seville all heads of local tribunals, who presently published a code of: thirty-nine articles. The dreary list regulates the procedure of the Holy Office. The articles were originally twenty-eight ; of these 1 to 10 deal with the summons to heretics to come forward and confess, and with the penalties to the submissive ; 11 to 13 with penitents in the prisons of the Office ; 14 to 19 treat of the procedure of trial, including torture; 20 and 21 extend the jurisdiction of the tribunal to dead heretics and the vassals of living nobles; the remainder are on points of detail in the management. Afterwards eleven more rules were added, on points of less interest: they deal with the organization of the smaller tribunals, guard against bribery of officials, establish an agent at Rome, and make fresh and minute directions as to confiscations and the payment of inquisitors' salaries ; the money ques-

tion comes up perpctually. Inno part of Spain was the system well received ; the resistance in Aragon passed into revolt and assassination,

which were only overcome by the united efforts of the Dominicans, the papacy, and the sovereign, aided to some extent by the “ Old Christians” (z.e., those not of Jewish origin), whose jealousy towards the new Christians and the Moors led them to favour a system which repressed their rivals.

The Holy Office had now free scope for its work, and its procedure, arranged by Torquemada, will explain how thoroughly it succeeded in terrifying all who came within its reach. When an accused or suspected person was first delated to the Inquisition, a preliminary inquiry was held, aud the results of it laid before the tribunal. If the tribunal thought it a case for interference, aud it usually did so, the informers and witnesses were re-examined, and. their evidence, with all suspicious circumstances which zeal could rake together, drawn out and submitted to a body of monastic theologians called “the Qualifiers of the Ioly Office.” The character of these officials was at stake, and their honour involved ; they could hardly be expected to report well of the accused, or there might be a suspicion as to their own orthodoxy. When they had given in their opinion against the accused, he was at once removed to the secret prison of the Office, where all communication with the outer world was entirely cut off from him. Then followed three “ first audiences,” in which the officials did their utmost to wring a confession out of him, so that he night be made to rank as a penitent, and enjoy the charity of his persecutors. If, however, he was stiff, the charges against him were re-formed, and the fiscal in charge of the case demanded torture to extort confession. This in the earlier times of the institution followed frequently, and had many forms of ingenious cruelty, as to which Llorente, who had good means of judging, declares that ‘none of the descriptions of them can be accused of exaggeration. ” After torture, the shattered victim was carried to the audicnce chamber, and called on to make his answer to the charges, which were now read to him for the first time, He was next asked whether he desired to make any defence, If so, he had to choose a lawyer from a list of those employed by his accusers, and the defence was little but, a mockery. After this process, which sometimes lasted for months, the qualifiers were again called in, and gave thoir final opinion, which was almost always adverse, on the whole case. Then followed the sentence,

with opportunity of an appeal either to the “Suprema ”—which was useless, as being an appeal to the tribunal again—or to Rome, The papal treasury by these appeals obtained a large income; for money was the only valid argument. Thus the Inquisition got the victim’s property by confiscation, and the papacy the wealth of his friends in the appeal. If the sentence was, as did sometimes occur, an acquittal, the poor wretch might slink home without redress or recom- pense for imprisonment, and the agony of the trial and the torture; if it was a condemnation, the victim was made the centre of an auto-da-fé, dressed in a sanbenito, or con- demned man’s robe, and eventually, at the open place of execution, informed as to his fate. He might be either “reconciled,” and then, as a penitent, had to undergo penalties almost worse than death, or “relaxed,” that is, handed over to the sccular arm for burning,—for the Holy Office shed no blood.

This then was the instrument by which the purity of Christendom was to be assisted and defended, “ misericordia et justitia,” as the motto of the institution runs, by the most flagrant injustice, and by the infliction of those cruel “tender mercies ” of which the Book of Proverbs speaks.

In 1492 the great work began with the persecution and expulsion of the Jews; they were ejectcd, and their wealth

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confiscated. There was an enormous crowd of exiles, who wandered to different shores of the Mediterranean, carrying misery and plague in their train. A few years later, under supervision of Cardinal Ximenes, the Moors were also ordered to be converted or to go; the Morescoes, or Christianized Moors, suffered constant persecution through- out the 16th century, until finally they too were expelled by Philip III. in 1609. Jews, Moors, and Morescoes made up over three millions of the wealthiest and most intelligent inhabitants of Spain; the loss in trade, agriculture, and manufactures was incalculable ; in seventy years the popul- ation fell from ten to six millions. ;

Ximenes was the greatest organizer, after Torquemada, of the Office; he divided the whole Inquisition into ten tribunals,—Seville asthe

capital, Jaen, Toledo, Estremadura, Murcia, Valladolid, Majorca, Pampeluna, Sardinia, and Sicily ; and, though the bishops still resisted his authority, he carried his will through witha high hand, The Inquisi- tion was set up in all the colonies and dependencies of Spain ; it established itself, as a theological quarantine, at all the harbours, and greatly checked the development of Spanish trade. The horror of the English at the institu- tion was much due to the collision of the English traders and adventurers of Queen Elizabeth's day with the Inquisi- tion on the Spanish main, and to its interference with that freedom of traffic which they desired. The new Inquisition was set up in the Netherlands by Charles V. in 1522; it was exceedingly severe, and greatly hated by the people (see HotLanp) under Philip II. and Alva. In Portugal the Holy Office established itself in its sharpest form, and continued there in full foreec even when the Jesuits were suppressed. It was introduced into France under Henry II, (1557), though its hold on that country was small, In Italy it had free course during the 16th century and vigorously supported the Catholic reaction, especially when the very soul of the Inquisition, Michele Ghislieri, had ascended the pontifical throne as Pius V. Its organization was also strengthened by Sixtus V., who secured it at Rome.

The hand of the Holy Office was outstretched against all ; no lofty dignity in church or state, no eminence in art or scicnce, no purity of life, could defend from its attacks. It is said to have threatened Charles V. and Philip IL; it persecuted Archbishop Carranza, head of the church in Spain; destroyed De Dominis, archbishop of Spalatro ; it smote Galileo, murdered Giordano Bruno, attacked Pico di Mirandola, and even is said to have threatened Cesar Borgia. With equal vigour, in combination with the Jesuits, the Inquisition made war on books and learning, religious or secular alike ; we have seen how baleful was its effect in earlier days on literature and art in Provence, and in the time of the Catholic sovereigns on the material well-being of Spain. 'In the love of Christ and his maid- mother," says Queen Isabella, " I have caused great misery, and have depopulated towns and districts, provinces and kingdoms."

The statistics of death at the hands of the Inquisition in Spain given by Llorente show how the institution gradu- ally lost force ; the average number in each year steadily diminished after the beginning of the 17th century ; and in the 18th torture was abandoned, and the deaths dropped to two or three or even less in the year. In Italy it was abolished in Parma and Tuscany about 1769, in Sicily in 1782 ; the spirit of the 18th century was all against the Office, though it lingered on. In the Revolution wars Napoleon sternly crushed it wherever he came across 1t, in Spain in 1808, and in Rome in 1809. Down to 1809 Llorente gives as the figures for Spain alone—burnt alive 31,912, in effigy 17,659, and imprisoned, é&c., as penitents, 291,450—a total of 341,021, After the hand of Napoleon was taken off, the institution revived again at Rome and at

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Madrid ; but its teeth were gone ; and it could do little but show a murderous will. The last capital punishments were those of a Jew who was burnt, and a Quaker school- master hanged, in Spain in 1826. _ Still, its voice is sometimes heard; in 1856 Pius IX. issued an. encyclical against somnambulism and clairvoyance, calling on all bishops to inquire into and suppress the scandal, and in 1865 he uttered an anathema against freemasons, the secular foes of the Inquisition.

The occupation of Rome in 1870 (see Iraty) drove the papacy and the Inquisition into the Vatican, and there at last John Bunyan's vision seems to have found fulfilment. Yet, though powerless, the institution is not hopeless ; the Catholic writers on the subject, after long silence or uneasy apology, now acknowledge the facts, and seek to justify them. In the early times of the Holy Office its friends gave it high honour; Paramo, the inquisitor, declares that it began with Adam and Eve ere they left Paradise; Paul IV. announced that the Spanish Inquisition was founded by the inspiration of the Holy Spirit; Muzarelli calls it "an indispensable substitute to the church for the original gift of miracles exercised by the apostles." And now again, from 1875 to this day, a crowd of defenders has risen up :

Father Wieser and the Innsbruck Jesuits in their journal (1877) yearn for its re-establishment; Orti y Lara in Spain, the Benedictine Gams in Germany, and ©. Poullet: in Belgium take the same tone ; it is a remarkable phenome- non, due partly to despair at the progress of society, partly to the fanaticism of the late pope, Pius TX. It is hardly credible that any one can really hope and expect to see in the future the irresponsible judgments of clerical intolerance again humbly carried out, even to the death, by the seculat arm.

In the mass of literature on the subjeet, the most important works are —N, Eymerich, Directorium Inquisitorum, Rome, 1587; F. Valdes, Ediet establishing Procedure, &c., Madrid, 1561; L. de Paramo (a Sicilian inquisitor), De origine et progressu Officti Sanctex Inquisitionis, ejusque dignitate et utilitate, Madrid, 1598; Philip van Limborch, Historia Inquisitionts, cut subjungitur Liber Sententiarwm inquisitionts Tholosanz, Amsterdam, 1692; and the Abbé Marsollier's Histoire de UInquisition et de son Origine, Cologne, 1693, a work based on Limboreh; J. A. Llorente, Historia critica de la inqwisicion de Espatia, Madrid, 1812, 1813; Gams, Kirchengesehichte von Spanien, vol. iii. pt. 2, Ratisbon, 1876; F. Hoffman, Geschichte der Inquisition, 2 vols., Bonn, 1878 ; Molinier, Z' Inquisition dans le midi de la France au treizxieme et au quatorzieme Siécle, 1880, The modern defenders of the Inquisition are F. J. G. Rodrigo, Historia verdadera de la Inquisicion, 8 vols., Madrid, 1876, 1877 ; and J. M. Orti y Lara, La Inquisicion, Madrid, 1877. (G. W. K.)

INSANITY

NSANITY is a generic term applied to certain morbid mental conditions produced by defect or disease of the brain. The synonyms in more or less frequent use are mental disease, alienation, derangement or aberration, mad- ness, unsoundness of mind. There are many diseases of the general system productive of disturbance of the mental faculties which, either on account of their transient nature, from their being associated with the course of a particular disease, or from their slight intensity, are not included under the head of insanity proper. From a strictly scientific point of view it cannot be doubted that the

fever patient in his delirium, or the drunkard in his excitement or stupor, is insane—that, the brain of either being under the influence of a morbific agent or of a poison, the mental faculties are deranged ; yet such derangements are regarded as functional disturbances, 7.e., disturbances produced by agencies which experience tells will, in the majority of cases, pass off within a given period without permanent results on the tissues of the organ. The comprehensive scientific view of the position is, that all diseases of the nervous system, whether primary or secondary, congenital or acquired, shonld, in the words of Griesinger, be regarded as one inseparable whole, of which the so-called meutal diseases comprise only a moderate proportion. However important it may be for the physician to keep this principle before him, it may be freely admitted that it cannot be carried out fully in practice, and that social considerations compel the medical profession and the public at large to draw an arbitrary line between such functional diseases of the nervous system as hysteria, hypochondriasis, and delirium on the one hand, and such conditions as mania, melancholia, and dementia on the other.

All attempts at a short definition of the term insanity have proved unsatisfactory ; perhaps the nearest approach to accuracy is attained by the rough statement that it is a chronic disease of the brain inducing chronic disordered mental symptoms—the term disease being used in its widest acceptation. But even this definition is at once too comprehensive, as, under it might be included certain of the functional disturbances alluded to, and too exclusive, as it does not comprehend certain rare transitory forms. Still, taken over all, this may be accepted as the least defective short definition; and moreover it possesses the

great practical advantage of keeping before the student the primary fact that insanity is the result of disease of the brain, that it is not a mere immaterial disorder of the intellect. In the earliest epochs of medicine the corporeal character of insanity was generally admitted, and it was not until the superstitious ignorance of the Middle Ages had obliterated the scientific, though by no means always accurate, deductions of the early writers that any theory of its purely psychical character arose. At the present day it is unnecessary to combat such a

theory, as it is universally accepted that the brain is the organ through which mental phenomena are manifested, and therefore that it is im- possible to conceive of the existence of an insane mind in a healthy brain. On this basis insanity may be de- fined as consisting in morbid conditions of the brain, the results of defective formation or altered nutrition of tts substance induced by local or general morbid processes, and characterized especially by non-development, obliteration, impairment, or perversion of one or more of its psychical functions. Thus insanity is not a simple condition ; it comprises a large number of diseased states of the brain, which have been gathered under one popular term on account of mental defect or aberration being the predomi- nant symptom.

The insanities are sharply divided into two great classes —the Congenital and the Acquired. Under the head of Congenital Insanity fall to be considered all cases in which, from whatever cause, brain development has been arrested, with consequent impotentiality of development of the mental faculties ; under that of Acquired Insanity all those in which the brain has been born healthy, but has suffered from morbid processes affecting it primarily, or from diseased states of the general system implicating it secondarily. In studying the causation of these two great classes, it will be found that certain remote influences exist which are believed to be commonly predisposing ; these will be considered as such, leaving the proximate or excit- ing causes until each class with its genera comes under review.

In most treatises on the subject will be found discussed the bearing which civilization, nationality, occupation, education, &e., have, or are supposed to have, on the production of insanity. Such discussions are generally

cminently unsatisfactory, founded as they are on common observation, broad generalizations, and very imperfect statistics. As they are for the most part negative in result, at the best almost entirely irrelevant to the present purpose, it is proposed merely to shortly summarize the general outcome of what has been arrived at by those authorities who have

sought to assess the value to be attached to the influence exercised by such factors, without entering in any detail on the theories involved. (1) Civilization.—Although iusanity is by no means unknown amongst savage races, there can be no reasonable doubt that it is much more frequently developed in civilized communities; also that, as the former come under the influence of civilization, the percentage of lunacy 1s increased, This is in consonance with the observation of disease of whatever nature, and is dependent in the case of insanity on the wear and tear of nerve tissue involved in the struggle for existence, the pliysically depressing effects of pauperism, and on the abuse of alcoholic stimulants ; each of which morbid factors falls to be considered separately as a proximate cause. (2) Vatéonality.—In the face of the imperfect social statistics afforded by most European and American nations, and in their total absence or inacces- sibility amongst the rest of mankind, it is impossible to adduce any trustworthy statement under this head. (3) Occupation.—There is nothing to prove that insanity is in any way connected with the prosecution of any trade or profession per se. Even if statistics existed (which they do not) showing the proportion of lunatics belonging to different occupations to the 1000 of the population, it is obvious that no accurate deduction guoad the influence of occupation could be drawn. (4) Mducation.—There is no evidence to show that education has any influence over either the production or the prevention of insanity. The general result of discussions on the above subjects has been the production of a series of arithmetical statements, which have either a misleading bearing or no bearing at all on the question. In the study of insanity statistics are of slight value from the scientific point of view, and are only valuable in its financial aspects.

Of much greater importance is the question of hereditary predisposition to nervous disease. There is a general and warrantable position taken up by the medical profession, founded on the observation of ages, that a constitutional condition may be generated in a family, which, although it may never manifest itself in a concrete form of disease, may materially influence development, or may make itself felt in a more subtle manner by a mere tendency to degenerative changes. In this wise hereditary predisposi- tion may be regarded as a

common factor in all insanities —in the congenital class as an arrester of brain develop- ment, in the acquired as the producer of the nervous diathesis. How the constitutional condition is generated, and in what its pathological nature consists, is beyond the ken of science; it may in fact be freely admitted that the proof of its existence hangs more on popular observation than on scientific evidence. The observation is not con- fined to the nervous system ; it extends itself to others, as is shown by hereditary predisposition to gout, consumption, cancer, and other diseases.

It has been strongly asserted that consanguineous marriage is a prolific source of nervous instability. There is considerable diversity of opinion on this subject; the general outcome of the investigations of many careful inquirers appears to be that the offspring of healthy cousins of a healthy stock is not more liable to nervous disease than that of unrelated parents, but that where there is a family history of diathesis of any kind there is a strong tendency in the children of cousins to degeneration, not only in the direction of the original diathesis, but also

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towards instability of the nervous system.1 The objection to the marriage of blood relations does not rise from the bare fact of their relationship, but has its ground in the fear of their having similar vitiations in their constitution, which, in their children, are prone to beconie intensified, There is sufficient evidence adducible to prove that close breeding is productive of degeneration; and when the multiform functions of the nervous system are taken into account, it may almost be assumed not only that it suffers concomitantly with other organs, but that it may also be the first to suffer independently.

Of the other causes affecting the parents which appear to have an influence in engendering a predisposition to insanity in the offspring, the abuse of alcoholic stimulants and opiates, over-exertion of the mental faculties, ad- vanced age, aud weak health may be cited. Great stress has been laid on the influence exercised by the first of these conditions, and many extreme statements have been made regarding it. Such must be accepted with reserve, for, although there is reason for

attaching considerable weight to the history of ancestral intemperance as a probable causating influence, it has been generally assumed as the proved cause by those who have treated of the subject, without reference to other agencies which may have acted in common with it, or quite independently of it. The question has not as yet been fairly worked out. However unsatisfactory from a scientific point of view it may appear, the general statement must stand—that whatever tends to lower the nervous energy of a parent may modify the development of the progeny. It is merely a matter of probabilities in a given case.

Constitutional tendency to nervous instability once established in a family may make itself felt in various directions,—-epilepsy, hysteria, hypochondriasis, neuralgia, certain forms of paralysis, insanity, eccentricity. It is asserted that exceptional genius in an individual member is a phenomenal indication.

Confined to the question of insanity, this morbid inherit- ance may manifest itself in two directions,—in defective brain organization manifest from birth, or from the age at which its faculties are potential, ¢.e., congenital insanity ; or in the neurotic diathesis, which may be present in a brain to all appearance congenitally perfect, and may present itself merely by a tendency to break down under circumstances which would not affect a person of originally healthy constitution.

In systematic works and in asylum reports, it has been too much the fashion to accept the evidence of the existence of insanity in a relative as a proof of hereditary predisposi- tion ina given case. In estimating the value to be attached to such histories, two things must be taken into account,— first, the amount and quality of proved ancestral nervous disease, and, secondly, the period of life at which it appeared in the alleged insane ancestor. Take, for instance, tlie case of a lunatic whose father or mother is reported to have died insane; this may be true in fact, but may still have no bearing on the causation of the patient's insanity; for the parent may have been the subject of mental disease at a period subsequent to the birth of the child, he may have drunk himself into alcoholic mania late in life, or disease of the cerebral

arteries in old age may have produced senile insanity. It is difficult to limit the remote-

1 See Report of Committee appointed by New York State Medical Society, in American Journal of Insanity, 1870; G. H. Darwin, Statistical Society's Journal, June 1875; Dr Langdon Down, "On Marriages of Consanguinity," London Hospital Clinical Lectures and Reports, 1866 ; Dr Arthur Mitchell, " On Consanguineous Marriages," in Zdin. Med. Journ., 1865 ; Maudsley, 'On Hereditary Tendency,' Journal of Mental Science, Jan. 1868 and Jan. 1864; Trousseau, Clinique Médicale de Hétel de Dieu de Paris, 1868, vol. ii. pp. 129- 137; Alfred Henry Huth, The Marriage qf Near Kin, 1875.

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ness of relationship in tracing hereditary predisposition, mainly from the fact that it frequently skips a generation. As a rule it does not confine itself to a single individual of a family, but makes itself felt in one form or another in several members. According to Esquirol and Baillarger, it is more frequently transmitted through the female than through the male branch, but this opinion is called in question by Koch of Wiirtemberg, whose statistics show that hereditary tendency to insanity acts more strongly through the father than through the mother.

CoNGENITAL INSANITY.

The morbid mental conditions which fall to be considered under this head are Jdiocy (with its modification J: mbecility) and Cretinism.

Idiocy.—In treating of idiocy it must be carefully borne in mind that we are dealing with mental phenomena dis- associated from active bodily disease, and that, in whatever degree it may exist, we have to deal with a brain condition fixed by the pathological circumstances under which its possessor came into the world, or by such as had been present before full cerebral activity could be developed, and the symptoms of which

are not dependent on the interven- tion of any subsequent morbid process. From the earliest ages the term Amentia has been applied to this condition, in contradistinction to Dementia, the mental weakness following on acquired insanity.

The causes of congenital idiocy may be divided into four classes :—(1) hereditary predisposition, (2) constitutional conditions of one or both parents affecting the constitution of the infant, (3) injuries of the infant head prior to or at birth, and (4) injuries or diseases affecting the infant head during infancy. All these classes of causes may act in two directions: they may produce either non-development or abnormal development of the cranial bones, as evidenced by microcephalism, or by deformity of the head ; or they may induce a more subtle morbid condition of the con- stituent elements of the brain. As a rule, the patho- logical process is more easily traceable in the case of the last three classes than in the first. For instance, in the case of constitutional conditions of the parents we may have a history of syphilis, a disease which often leaves its traces on the bones of the skull; and in the third case con- genital malformation of the brain may be produced by mechanical causes acting on the child in utero, such as attempts to procure abortion, and deformities of the ma- ternal pelvis rendering labour difficult and instrumental interference necessary. In such cases_ the bones of the skull may be injured; it is only fair, however, to say that more brains are saved than injured by instrumental inter- ference. With regard to the fourth class, it is evident that the term congenital is not strictly applicable ; but, as the period of life implicated is that prior to the potentiality of the manifestation of the intellectual powers, and as the result is identical with that of the other classes of causes, it is warrantable to connect it with them, on pathological principles more than as a mere matter of convenience.

Dr Ireland, in his work On Idiocy and Imbecility, classi- fies idiots from the standpoint of pathology as follows :— (1) Genetous idiocy: in this form, which he holds to be complete before birth, he believes the presumption of here- dity to be stronger than in other forms ; the vitality of the general system is stated to be lower than normal; the palate is vaulted and narrow, the teeth misshapen, wrongly placed, and

prone to decay, and the patient dwarfish in appear- ance; the head is generally unsymmetrical, and the com- missures occasionally atrophied ; (2) Microcephalic idiocy, a term which explains itself; (3) Eclampsic idiocy, due to the effects of infantile convulsions ; (4) Epileptic idiocy ;

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(5) Hydrocephalic idiocy, due to water on the brain; (6) Paralytic idiocy, a rare form, due to the brain injury causing the paralysis; (7) Traumatic idiocy, a form pro- duced by the third class of causes above mentioned ; (8) Inflammatory idiocy ; (9) Idiocy by deprivation of one or more of the special senses. Dr Ireland's wide experience has enabled him to differentiate these groups further by describing the general characteristics, mental and physical, of each.

The general conformation of the idiot is often very imper- fect ; he is sometimes deformed, but more frequently the frame is merely awkwardly put together, and he is generally of short stature, Only about one-fourth of all idiots have heads smaller than common. Many cases are on record in which the cranial measurements exceed the average. It is the irregularity of development of the bones of the skull, especially at the base, which marks the condition. Cases, however, often present themselves in which the skull is perfect in form and size. In such the mischief has begun in the brain matter. The palate is very often highly arched, in some cleft; hare-lip is not uncommon ; in fact congenital defect or malformation of other organs than the brain is more commonly met with amongst idiots than in the general community. Of the special senses, hearing is most frequently absent. Sight is good, although coordina- tion may be defective. Many are mute. On account of the mental dulness it is difficult to determine whether the senses of touch, taste, and smell suffer impairment ; but the impression is that their acuteness is below the average. It is needless to attempt a description of the mental phenomena of idiots, which range between utter want of intelligence and mere weakness of intellect.

The term Imbecility has been conventionally employed to indicate the less profound degrees of idiocy, but in point of fact no distinct line of

demarcation can be drawn; the application of either term to a given case depends more on the opinion of the observer than on the condition of the observed. As the scale of imbeciles ascends, it is found that the condition is evidenced not so much by low obtuse- ness as by irregularity of intellectual development. This serves to mark the difference between the extreme stupidity of the lowest of the healthy and the highest form of the morbidly deprived type. The two conditions do not merge gradually one into the other. Extreme stupidity and sottish- ness mark many cases of idiocy, but only in the lowest types, where no dubiety of opinion can exist as to their nature, and in a manner which can never be mistaken for the dulness of the man who is less talented than the average of mankind. Where in theory the morbid (morbid in the sense of deprivation) and the healthy types might be supposed to approach each other, in practice we find that, in fact, no debatable ground exists. The uniformity of dulness of the former stands in marked opposition to the irregularity of mental conformation in the latter. Com- paratively speaking, there are few idiots or imbeciles who are unifornily deprived of mental power; some may be utterly sottish, living amere vegetable existence, but every one must at least have heard of the quaint and crafty sayings of manifest idiots indicating the presence of no mean power of applied observation. In institutions for the treatment of idiots and imbeciles, children are found not only able to read and write, but even capable of applying the simpler rules of arithmetic. A man may possess a very considerable mced of receptive faculty and yet be idiotic in respect of the power of application ; he may be physically disabled from relation, and so be manifestly a deprived person, unfit to take a position in the world on the same platform as his fellows. ;

DrIreland subdivides idiots, for the purposes of education,

into five grades,—the first comprising those who can neither XIII — 13

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speak nor understand speech, the second those who can understand a few easy words, the third those who can speak and can be taught to work, the fourth those who can be taught to read and write, and the

fifth those who can read books for themselves, The treatment of idiocy and imbecility consists almost entirely of attention to hygiene, and the building up of the enfeebled constitution, along with endeavours to develop what small amount of faculty exists by patiently applied educational influences. The success which has attended this line of treatment in many of our public and private institutions has been very con- siderable. It may be safely stated that all idiotic or 1m- becile children have a far better chance of amelioration in asylums devoted to them than by any amount of care and teaching lavished upon them at home.

In the class of idiots just spoken of imperfect develop- ment of the intellectual faculties is the prominent feature, —so prominent that it masks the arrest of potentiality of development of the moral sense, the absence of which, even if noticed, is regarded as relatively unimportant ; but, in conducting the practical study of congenital idiots, a class presents itself in which the moral sense 1s wanting or deficient, whilst the intellectual powers are appareutly up to the average. It is the custom of writers on the subject to speak of " intellectual" and "moral" idiots. The terms are convenient for clinical purposes, but the two con- ditions cannot be disassociated, and the terms therefore seve- rally only imply a specially marked deprivation of intellect or moral sense ina given case. The everyday observer has no difficulty in recognizing as a fact that deficiency in re- ceptive capacity is evidence of imperfect cerebral develop- ment; but it is not so patent to him that the perception of right and wrong can be compromised through the same cause, or to comprehend that loss of moral sense may result from disease. The same difficulty does not present itself to the pathologist ; for, in the case of a child born under circumstances adverse to brain development, and in whom no process of education can develop an appreciation of what is right or wrong, although the intellectual faculties appear to be but slightly blunted or not blunted at all, he cannot avoid connecting the psychical peculiarity with the pathological evidence. The world is apt enough to refer any fault in intellectual development, manifested by imper- fect receptivity, to a definite physical cause, and is willing to base opinion on comparatively slight data; but it is not so ready to accept the theory of a pathological

implication of the intellectual attributes concerned in the perception of the difference between right and wrong. Were, however, two cases pitted one against another—the first, one of so- called intellectual, the second, one of so-called moral idiocy —it would be found that, except as regards the psychical manifestations, the cases might be identical. In both there might be a family history of tendency to degeneration of the nervous system, a peculiar cranial conformation, a history of nervous symptoms during infancy, and of a series of indications of mental incapacities during adoles- cence, differing only in this, that in the first the promi- nent indication of mental weakness was inability to add two and two together, in the second the prominent feature was incapacity to distinguish right from wrong. What complicates the question of moral idiocy is, that many of its subjects can, when an abstract proposition is placed be- fore them, answer according to the dictates of morality, which they may have learnt by memory. If asked whether it is right or wrong to lie or steal they will say it is wrong; still, when they themselves are detected in either offence, there is an evident non-recognition of its concrete nature. The question of moral idiocy will always be a moot one between the casuist and the pathologist; but, when the whole natural history of such.cases is compared, there are

points of differentiation between them and mere moral depravity which must appeal to even biased observers. Family history, individual peculiarities, the manifest im- becility of the acts committed, the general bizarre nature of the phenomena, remove such cases from the ordinary category of crime.

Statistics. —According to tlie census returns of 1871 the total] number of persons described as Idiots and Imbeciles in England and Wales was 29,452, the equality of the sexes being remarkable— namely, 14,728 males and 14,724 females. Compared with the entire population, the ratio is one-idiot or imbecile to 771 persons, or 18 per 10,000 persons living. Whether the returns are defec. tive, owing to the natural sensitivcness of persons who would desire to conceal the occurrence of idiocy in their families, we have no means of knowing; but such a feeling is no doubt likely to exist among those who look upon mental infirmity as humiliating, rather than as one of the many physical evils

which afflict humanity, According to Ireland, this number (29,452) is 25 per cent. below the mark. The following table shows the number of idiots accord- ing to official returns of the various countries ; probably they are subject to the same criticism as the census returns for England.

Proportion to 100,000

Males, Females. Total.

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ee 29,452 | 180

bE RID 2,317 | 4,621 134

TOOT OC One eR ORT ON pot 8,151 150

France (including Cretins) 14,677 | 35,183 97 Germany (1871)..... 14,395 | 38,739 82 Sweden (1870).....-066 ome 1,682 38 INOTWaRVAl es .cneusieieet oc ontns oa ae 2,039 116 United States (1870)..... ‘ 9,209 | 22,428 58

The relative frequency of congenital and acquired insanity in various countries is shown in the following table, taken from Koch’s statistics of insanity in Wiirtemberg, which gives the num- ber of idiots to 100 lunatics :—

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It is difficult to understand the wide divergence of these figures, except it be that in certain ‘states, such as Prussia and Bavaria, dements have been taken along with aments, and in others eretins. This cannot, however, apply to the case of France, which is stated to have only 66 idiots to every 100 lunatics. In many districts of France cretinism is very common; it is practically unknown in England, where the proportion of idiots is stated as higher than in France ; and it is rare in Prussia, which stands at 158 idiots to 100 lunatics. Manifestly imperfect as this table is, it shows how im- portant an element idiocy is in social statistics ; few are aware that the number of idiots and that of lunatics approach so nearly.

Oretinism.—Orétin probably comes from Chrétien, either from the idea that the person was innocent in the sense in which that word is employed occasionally to imply a person who cannot sin, or from the religious respect in which cretins were held. Cretinism is a form of congenital insanity in- asmuch as the cretino-genetic miasma acts before birth ; it is endemic in many mountainous conntries, and is said to occur most frequently on magnesian limestone formations, but never at an elevation above 3000 feet. Although all cretins have not goitre, and all goitrous persons are not cretins, there is a very intimate relationship between the two conditions. The districts in Europe in which it is most common are the departments of Hautes-Pyrénées, Haute-Savoie, and Hautes-Alpes; Styria, Upper Austria, the province of Aosta, and Sardinia. It is found more sparsely in other parts of Europe, and also among the Himalayas and Andes. It occasionally presents itself in flat countries,—a remarkable instance being the island of Niederwerth below Coblentz, where out of 750 inhabitants there are 131 cretins (Dr Ireland). Notwithstanding the circumscribed area in which this disease exists, affording, it might be supposed, data founded on the conditions of

life common to their inhabitants for arriving at conclusions as to its cause, nothing has been definitely determined. Cretinism has occupied the attention of many eminent observers, but the various theories they

have advanced have been in succession overturned. It has been suggested that the condition is due to the constant use of snow water, or to the presence of sulphate of iron or of lime in water, but none of these theories admit of universal application. That the disease is due to some geological or climatic cause appears certain from the fact, stated by Baillarger, that it disappears from a family in one or two generations after removal to a healthy climate, and may even be prevented by the gravid mother leaving a valley where it is rife for localities where cretinism is unknown. The physical and mental symptoms of cretinism are so closely allied in essentials to those of congenital idiocy as not to demand a separate description. The marked features of the disease are its endemic nature and its intimate connexion with goitre. See CRETINISM.

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ACQUIRED INSANITY. Pathology.

It is predicated in treating of Acquired Insanity that we have to deal with brains congenitally perfect, the exercise of whose functions has been normal until the incidence of disease. A full description of the tissues of the healthy brain will be found in the article ANATomy (vol. i. pp. 869- 880),.a careful perusal of which will very materially assist the reader in following the present remarks on pathology. A short recapitulation of certain anatomical facts is, how- ever, necessary. The purely nervous structures of the brain consist of very delicate fibres and cells, the latter occurring only in the grey matter. It is richly supplied with blood vessels, the supply being six times greater to the grey matter than to the white. These tissues are supported and separated one from the other by a connective tissue, or interstitial matter, the newroglia; the whole organ is enveloped in membranes which separate it from the skull. By one system of independent fibres (the expansion system) communication is maintained between the spinal cord, the central ganglia, and the cortical grey matter ; by a second system of fibres (the commissural), corresponding and identical regions of the grey matter of the two opposite hemispheres are united ; and by a third system (the hori- zontal) communication is maintained between parts of the same hemisphere. The cells communicate one with the other by means of processes or poles, fine projections from the body of the cell. The observations of Cleland and Boll show that the apical processes become connected with the fibres as they go to the periphery ; the basal processes loop with the horizontal fibres, and also, by means of their recurrent poles, with those of the expansion series. But it is of great importance to observe that we have no

evidence of fibre communicating directly with fibre, or no certain proof that one series of fibres communicates directly with others ; in fact, all anatomical demonstration goes to prove the individuality and isolation of fibre, the processes of the cells being the connecting link. It is universally accepted that the cerebral cells possess the vital property of generating, receiving, and transmitting nervous influences, and that the fibres are the organs by means of which these influences are received and communicated. In the words of Herman, “in a part of the central

organs (the cortical cells) certain material processes are accompanied in an inexplicable manner with wholly undefinable phenomena which characterize what we term consciousness." The term mind may be applied to the combination of all the actual and possible states of consciousness of the organism. 'Wo have aright to presuppose that in the brain, as in other organs of the body, the normal exercise of function is dependent on a perfect maintenance of the anatomical relations of the component structures, and conversely that morbid conditions of these structures must affect the whole economy more or less seriously" (Bucknill and Tuke). In studying brain pathology it must be kept in view that the brain cannot, like the lungs, liver, and kidneys, cast any of its functions on other organs ; it must do its own work, rid itself of its effete matter, and of the products of injury or disease, and provide within itself for the resump- tion of functions, the exercise of which has become im- paired from whatever cause.

Solutions of continuity, preventing perfect maintenance of the component cerebral tissues, may arise from—(1) idiopathic causes, 7.e., causes originating primarily in the brain ; (2) traumatic causes (injury to the head); (3) the effects of other neuroses (morbid nerve conditions); (4) ad- ventitious products (tumours, &c.) ; (5) morbid conditions of the general system secondarily implicating the brain ; (6) evolutional conditions of the system concurrently affecting the brain; (7) toxic agents (poisons). In the case of insanity the results of morbid action are confined to the convolutions of the superior surface of the brain, and to the upper part of its lateral aspects; for the most part its base and inferior lateral aspects and the cerebellum are un- affected. It is true that in old standing cases the central ganglia present lesions, but these are for the most part secondary, and are due to the action of disease in the superior convolutions.

1. Idiopathic changes occur from disease affecting the tissues, the cause of which it may be impossible to trace, —as, for instance, acute inflammation, which, however, is not a frequent cause of insanity. Diffused subacute inflammation is held to be a much more fruitful cause, producing increase (sclerosis) of the neuroglia, degeneration of

the cells, destruction (atrophy) and dis- placement of fibres, and aneurism, distortion, and oblitera- tion of vessels.

A large and important class of causes of idiopathic morbid action is due to over-excitation of the brain. The causes of over-excitation of the brain functions are those which, in most works on insanity, are spoken of as "moral" (grief, anxiety, domestic complications, dis- appointment, terror, sorrow or joy, religious or political excitement, the exercise of the mental faculties by study unduly prolonged or conducted under adverse circumstances) in contradistinction to "physical" causes,—a distinction which implies some material difference in their method of operation. To the most superficial observer, the deformed head of the idiot, and the paralysis of mind and body which follows on the rupture of a cerebral vessel, are coarsely material conditions; but when mental aberration follows on mental excitement, men are prone to regard it more asa derangement of function than as an evidence of deteriora-

tion of brain structure. If, however, we give due weight to the results of physiological research, the matter is not quite so obscure. Arguing from the analogies of other organs and from direct observation, there is reason to believe that when the brain functions are being actively exerted there is a dilatation of the vessels and an increased blood supply (hyperemia) to its superior and lateral surfaces. 'This functional hyperemia is caused by the direct action of the cerebral cells, which, along with the sympathetic system of nerves, exercise control over the muscular coats of the arteries, the immediate regulators of blood supply to any given part. Control over muscular tissue implies, of course, control in two directions, dilatation and contraction, Functional hyperemia is in every respect a healthy condition, one necessary for the provision of temporary nutriment during temporary action, ceasing with the withdrawal of stimulus, when the calibre of the vessels is reduced to its original dimensions through the contracting influence of the cells. But if the excitement is unduly prolonged a new result appears; the cells themselves become exhausted, and therefore, even if the stimulus is withdrawn, they are unable to assert their ordinary

control over the arterial muscular coats in the direction of contraction, so that the increased blood supply continues although the stimulus which caused it has been removed. Instead of functional hyperemia we have a hypersmia caused, not by functional excitement, but by exhaustion of the controlling organs. In a minor degree the results of this condition are matters of everyday observation ; overtaxation of the brain functions, by study for instance, is very generally followed by sensations of fulness and aching of the head, loss of sleep, and general exhaustion,—a condition which is recovered from when the primary irritation is withdrawn, 7.e., when the arteries reacquire healthy tone. But if relief from the causes of irritation is not obtained, a sequence of events ensues tending to deterioration of tissue, In the first place, sleep, the condi- tion necessary for rest and recuperation of the cells, becomes unattainable. Physiological research has shown that during sleep the supply of blood to the brain is diminished (aneemia), that anzemia is necessary for, and hyperemia is inimical to, its production. Further deterioration of cell activity follows on non-recuperation, and concomitant diminished contro] over the vessels tends to the establish- ment of morbid hypersemia and more or less blood stagna- tion (stasis). It would be far beyond the compass of this article to follow out in detail the various pathological processes which ensue on paralysis of vaso-motor action ; two only need be alluded to—(1) ,the various changes which take place in the behaviour of the constituents of the blood, producing congestion and greater or less obstruction to its normal distribution, and (2) the effects which congestion produces on the lymphatic system of the brain, the system by which effete matter is largely removed from it. It is now generally recognized that the lymphatics of the brain are perivascular, z.¢., that they are tubes sur- rounding the arteries, patent under ordinary conditions ; when, however, the arteries are distended, it is easy to comprehend that the lymphatic system becomes occluded by the artery filling up the space provided for it, and therefore that the removal of waste products becomes difficult or impossible. It is a pathological axiom that the structural integrity of a part is dependent on the maintenance of its vascular unity, in other words, on the regular supply and withdrawal of blood by its regular channels. This if impaired or

destroyed is necessarily followed by histological changes and by disturbance of function.

By this exposition of a probable sequence of pathological events it is desired to indicate that disturbance of function directly referable to over-excitation of the brain is not a

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mere functional derangement, not a mere morbid increase of a normal emotion, but that it is the manifestation of a pathological condition,—that, in effect, so-called moral causes may be the producers of physical cerebral disease, This meets with support from the clinical observation that, with very rare exceptions, a considerable period of time elapses between the incidence of the moral cause and the first indication of mental alienation,—an interval during which sleep has been absent in consequence of continued hyperemia. Instances of melancholy or mania being suddenly produced by mental shock must be searched for in works of fiction. Sudden fright, more especially, is stated to produce immediate convulsion, epilepsy, aud catalepsy, but not insanity; except in certain comparatively rare instances, in which it appears to induce with great rapidity a cataleptic mental state, presently to be spoken of as acute primary dementia. Over-exercise of the intellectual function is not by any means such a prolific cause of brain disease a8 undue emotion. It is not work but worry that kills the brain. When both are combined the result ig often rapid.

On the removal or persistence of congestion depends the issue of acase—recovery, or further and permanent solution of continuity. Unless relief is soon obtained, the changes in the cells are followed by lesions of other brain structures which are productive of important pathological conditions affecting the general system; these in their turn render recovery more difficult or impossible, or may even cause death. (For a full account of the various lesions found in the brains of the insane, consult Bucknill and Tuke, Jfanual of Psychological Medicine, 4th ed., cap. vi.; Fox's Patho- logical Anatomy of the Nervous Centres, London, 1874; J. Batty Tuke, " On the Morbid Histology of the Brain and Spinal

Cord as observed in the Insane," Brit. and For. Medico-Chirurgical Review, 1873-74.)

2. The second class comprises all accidents and injuries affecting the brain, and is most conveniently termed traumatic. Violence to the head may produce fracture of the skull with or without depression, extravasation of blood in or on the brain, or concussion. 'There is no relation between the apparent extent of the injury and the results in insanity ; extensive fractures of the frontal, lateral, and superior surfaces of the skull, even when complicated with rupture of the envelopes and loss of brain matter, are not, taken over all, more productive of insanity, if so much so, as the apparently less serious condition of concussion. The reason of this is not far to seek; by the open wound free egress is afforded for extravasated blood and the products of inflammation, whereas in concussion, which may also involve extravasation of blood in or on the brain, foreign substances have no means of escape, and so may set up morbid action of a grave nature. Occasionally insanity follows rapidly on the injury, but much more frequently weeks or even months elapse before development of mental symptoms amounting to insanity. During this period morbid action is proceeding on the inner surface of the skull, in the membranes, or in the brain itself. On the inner table of the skull bony growths may be in process of formation, subacute inflammation of the membranes may be going on, and from the same cause the brain may be undergoing progressive changes generally in the direction of sclerosis, 2.e., increase of connective tissue.

3. The nervous diseases in the train of which insanity occasionally follows are Epilepsy, Hysteria, and Locomotor Ataxy. In the case of Epilepsy the brain lesions are doubt- less the result of the frequently asphyxiated condition of the patient and of the blood poisoning due to the retention of carbonic acid gas (see Epinupsy). As might be expected, lesions of the arteries in the form of hypertrophy of their coats is frequently observed. The canals in the brain

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matter through which the vessels pass are very frequently found dilated to from two to six times their normal dimensions. If the richness of the blood supply to the grey matter is considered, this condition of dilatation must imply an immense loss of brain tissue; moreover, the cells are frequently found suffering degeneration. In dealing with the subject of Hysteria, we have, as stated in the article especially bearing on the subject (Hysteria), to do with a disease which, although marked by very prominent symptoms, possesses no anatomical seat, and thus when the disease amounts to insanity we are equally in the dark as to the cerebral con- ditions. The insanity followiug or accompanying hysteria is nota fatal one in its earlier stages, and there is no report extant of an autopsy on a recent case of this disease. Locomotor Ataxy is a disease of the spinal cord, sclerosis of its posterior columns (see Araxy). It implicates other parts of the nervous system,—for instance, the optic tracts and nerves. Insanity occasionally is concurrent with, and probably, if not certainly, is produced by an extension of the sclerosis to the cerebral convolutions. This theory meets support from the fact that the mental symptoms associated with locomotor ataxy resemble very closely those of general paralysis, in which hypertrophy of the connective tissue of the superior convolutions has been demonstrated.

4, By the term adventitious products it is meant to indicate all forms of tumours of the brain, skull-cap, and membranes. Such foreign bodies have tliree distinct effects on the brain structure :—‘ 1st, They create an irritation tending to ramollissement in the nerve substance, with which they are in contact from their first appearance, 2d, They cause pressure on distant parts, which in its turn causes an alteration of the structure and nutrition. 3d, They set up progressive disease and degeneration of certain parts of the nerve structure, the true naturo of which is as yet not very well known; but it seems to be in some way directly connected with the essential nature and constitution of all sorts of nerve substance, whether cells or fibres. Its results pathologically are an increase of the connective tissue in the form of granules, and enlargement and thicken- ing of the coats of the blood-vessels ; but all these seem to be secondary changes” (Clouston, “On Tumours of the

Brain," Journal of Mental Science, vol. xviii.). Apoplectic clots are practically tumours.

5. Morbid conditions of the general system secondarily implicating the brain. It is of great interest from an etiological point of view to note that insanity is seldom if ever the immediate result of diseases of individual organs, but that it is more or less intimately associated with those forms of disease which result from a general constitutional instability, such as tuberculosis, rheumatism, gout, ard syphilis. There are many diseases painful in character and very depressing to the nervous system, such as stone, fistula (in fact all the so-called surgical diseases of the rectum and bladder), cancer of the uterus, &c., which might be presupposed to be probable causes of insanity, yet in point of fact are not inimical to mental health. They may be so indirectly, inasmuch as they prevent sleep, but even in this wise their effect is very slight. Nor does there appear sufficient reason to connect diseases of the heart, liver, kidneys, directly with insanity. Much stress has been laid on diseases of the uterus and ovaries, and more especially on tumours of these organs, being the primary factors in the production of insanity. Skae laid down as a special form ovario- or utero-mania ; and Wergt of Illnau has described the various morbid conditions of the female organs of generation found on post-mortem examination, and has connected with them mental symptoms. But authors on gyusecology make no mention of insanity being a sequela of uterine disease, except in so far as the mental

depression which in most women follows on the knowledge that they are affected by serious, perhaps fatal, disease, and the pain and anxiety inseparable therefrom, may produce sleeplessness, and consequent melancholy ; and there is no proof of such tumours exercising an extensive influence on causation by peripheral] irritation. The fallacy has in the great majority of instances probably arisen from the observation often made in asylums that insanity arising from whatever cause is conditioned by the presence of uterine growths, and that delusions of a sexual character may arise from the sensations thereby

produced. Of the very few instances on record in which a direct connexion between uterine disease and insanity has been traced may be cited a case reported by Van der Kolk, in which deep melancholy and prolapsus uteri coexisted; the mental symptoms were at once relieved by the organ being restored to its normal position. Such cases are very rare.

It is still a moot point whether a true tubercular or phthisical insanity exists ; if it does, it certainly does not arise from tubercular deposits in the brain—a very rare condition in the insane. Those authorities who deny the existence of phthisical insanity hold that, although mental symptoms do frequently present themselves in cases of con- sumption, and although consumption is very frequent amongst the iusane, the insanity is not directly dependent on the diathesis, but more probably results from the general lowering of the system, and at most is only conditioned by the primary disease. In the case of rheumatism and gout there are strong reasons for believing that an actual trans- lation (metastasis) of the materies morbi occasionally takes place from affected joints to the connective tissue of the brain and cord,—the evidence being choreic movements of the limbs (St Vitus's Dance) accompanied by acute mental symptoms, both of which disappear contemporane- ously with the return of inflammatory swellings of the joints. Syphilis may act on the brain by the production of tumours (which, however, do not differ in their effects from those of other adventitious products), and by specific changes in the coats of the arteries, which become thickened and even occluded. As a consequence the tissues in their neighbourhood suffer deterioration. . .

The pathological relation between sun-stroke (insolation) and brain disease has not been ascertained. A certain amount of brain congestion has been observed, but not invariably. The cerebral lesion is more probably due to the extreme depression of the whole nervous system; but the modus operandi is unknown.

The morbid condition of the general system which most frequently implicates the brain is anzemia, not itself a disease, but the result of many diseases, such as fever, and of such drains on the constitution as

lactation (suckling) and imperfect nourishment. The operativeness of these drains may be assisted by over-work under unhealthy conditions. As a typical example may be cited the dress- maker, poorly paid, poorly fed, working for many hours daily inan ill-ventilated room, and sleeping in an unhealthy garret. The term anzmia is not used here to indicate a condition antithetical to hyperseemia—it does not imply any mechanical deprivation of blood supply; on the contrary, the amount of blood, such as it is, is not reduced in quantity. The temporary mechanical anemia which results from extreme cold produces its effects rapidly,—short delirium and profound sleep. But it is qualitative anzemia, an impoverished state of the blood, which produces more or less permanent results on cerebral health. 'Inanition acts rapidly on the brain: in the case of those cast away at sea on rafts or in boats the general story is that of short delirious mania, suicide, or death from nervous exhaustion, beforo emaciation (¢.¢., beforothe reserve food of the system is consumed) takes place. So in cases where inanition is

more slowly produced, the nervous system is first depressed. And here the position becomes somewhat complicated ; for not only is, under such circumstances, the relative amount of the blood constituents different from the normal standard, but its corpuscular elements change in quality ; they acquire a degree of viscidity which tends to cause the red corpuscles to coalesce and hang together, and the white to lag and wander into surrounding tissues; and further, this unphysiological behaviour of the corpuscles is apt to become aggravated in regions whose nervous energy is depressed. Anemia thus acts and reacts in procuring a condition of stasis.

6. The effects of evolutional periods concurrently affect- ing the brain: puberty, adolescence, utero-gestation, the climacteric period, and oldage. ' Although from the time when the human being comes into the world to the final cessation of his corporeal existence the various functional operations of organic life are carried on with ceaseless activity, whilst those of animal life are only suspended by the intervals of repose which are needed for the renovation of their organs, yet there

are very marked differences, not only in the degree of their united activity, but also in the relative degrees of energy which they severally manifest at different epochs" (Carpenter's Principles of Human Physiology, chap. xviii.). These differences in degree imply physiological modifications of nutrition, and the observation of ages has caused it to be accepted as a fact in the etiology of disease that numerous and various degenerations occur contemporaneously with such modifications, more especially in the subjects of diathetic conditions. The development of phthisis during adolescence, and of cancer amongst persons at the climacteric period, may be cited as instances. It may be freely admitted that the nexus between the physiological and the pathological position is, as regards certain of the periods, obscure, and that it is dependent more on induction than on demonstration; but it may be pleaded that it is not more obscure in respect of insanity than of other diseases. The pathological difficulty obtains mostly in the relation of the earlier evolutional periods, puberty and adolescence, to insanity; in the others a physiologico-pathological nexus may be traced; but in regard to the former there is nothing to take hold of except the purely physiological process of development of the sexual function, the expansion of the intellectual powers, and rapid increase of the bulk of the body. Although in thoroughly stable subjects due provision is made for these evolutional processes, it is not difficult to conceive that in the nervously unstable a considerable risk is run by the brain in consequence of the strain laid on it. Other adju- vant influences may be at work tending to excite the system which will be spoken of when the insanity occurring at these periods is described. Between the adolescent and climacteric periods the constitution of the nervous, as of the other systems, becomes established, and disturbance is not liable to occur, except from some accidental circumstance apart from evolution. In the most healthily constituted individuals the "change of life" expresses itself by some loss of vigour. The nourishing (trophesial) function becomes less active, and either various degrees of wasting occur, or there is a tendency towards restitution in bulk of tissues by a less highly organized material. The most important instance of the latter tendency is fatty degenera- tion of muscle, to which the muscle of the arterial system is very liable. In the mass of mankind those changes assume no pathological importance : the man

or woman of middle life passes into advanced age without serious con- stitutional disturbance ; on the other hand, there may be a break down of the system due to climacteric disease of special organs, as, for instance, fatty degeneration of the heart. In all probability the insanity of the climacteric

period may be referred to two pathological conditions : it may depend on structural changes in the brain due to fatty degeneration of its arteries and cells, or it may be a secondary result of general systemic disturbance, due to cessation of menstruation in the female, and, possibly, to some analogous modification of the sexual function in men, The senile period brings with it further reduction of formative activity; all the tissues waste, and are liable to fatty and calcareous degeneration. Here again the arteries of the brain are very generally implicated: atheroma in some degree is almost always present, but is by no means always followed by insanity. Whewell retained his faculties to the last, notwithstanding that his cerebral arteries were much diseased. Still this condition must be taken into account in studying the causation of senile insanity, as it necessarily implicates the nutrition of the brain. It must assist in preventing recuperation of the cells ; it may in cer- tain instances diminish suddenly the blood supply to a par- ticular area; but the stronger probability isthat senile mental decay lies at the door of senile degeneration of the cells.

The various and profound modifications of the system which attend the periods of utero-gestation, pregnancy, and child-bearing do not leave the nervous centres unaffected. Most women are liable to slight changes of disposition and temper, morbid longings, strange likes and dislikes during pregnancy, more especially during the earlier months; but these are universally accepted as accompaniments of the condition not involving any doubt as to sanity. But there are various factors at work in the system during pregnancy which have grave influence on the nervous system, more especially in those hereditarily predisposed, and in those gravid for the first time. There is modification of direction of the blood towards a new focus, and its quality is changed, as is shown

by an increase of fibrin and water and a decrease of albumen. How much these changes structurally affect the encephalon may be deduced from the fact of the presence of bony plates (osteophyte) on the surface of the dura mater and the inner table of the skull, and how much functionally, by constant congestions and flushings. To such physical influences are superadded the discomfort and uneasiness of the situation, mental anxiety and anticipation of danger, and in the unmarried the horror of disgrace. In the puerperal (recently delivered) woman there are to be taken into pathological account the various depressing influences of child-bed, its various accidents reducing vitality, the sudden return to ordinary physio- logical conditions, the cessation of the occasional physio- logical condition, the rapid call for anew focus of nutrition, the translation as it were of the blood supply from the uterus to the mamme,—all physical influences liable to affect the brain. These influences may act independently of moral shock; but, where this is coincident, tlrere is a condition of the nervous system unprepared to resist, or, it may rather be said, prepared to succumb.

7. Among the toxic agents which affect the brain, alcohol holds the foremost place. On the action of this poison the article DRUNKENNESS supplies full information. Consider- able difficulty exists as to the estimation of the importance to be attached to alcohol in the production of brain disease from the fact that excess in the use of stimulants is very frequently a symptom of incipient insanity, and that the symptom is often mistaken for the cause. The habitual use of opium and Indian hemp (Cannabis indica), which first stimulate and then paralyse the action of the cerebral cells, is a frequent cause of lesion.

Difficulties may arise in individual cases in establishing a theory of causation from the presence of what are generally spoken of in systematic works on insanity as “mixed” causes, 7.¢., the presence of two morbid factors in one individual. So long as these consist in variety in

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character of excited psychical action, such as grief and anxiety of business, over-prolonged study and domestic affliction, the combination

does not affect the position ; but when we have a history of one or more of such psychical influences being associated with a depraved condition of the general system, with poverty, with excess in alcoholic stimulants, or with hereditary predisposition, it appears at the first glance difficult to assess the value to be attached to each in the production of brain disease. This complica- tion is, however, more apparent than real; weakness of the system, whether produced by disease or by malnutrition, only implies a condition in which cerebral degeneration is more likely to occur, but where there is no reason to believe it would have occurred if the brain, weakened along with the other organs of the body, had not been subjected to over-excitation. It may be argued that the brain excitation would not have produced the lesion if the tone of the general system had not been lowered : that is as it may be, —it is a proposition which cannot be accepted or denied positively in the absence of positive data, But negative data obtain which warrant its refusal. These are twofold : —a depraved condition of the general system is a frequent result of over-excitation of the brain, the result being liable to be mistaken for the efficient cause ; and the history and symptoms of insanity resulting from special morbid con- ditions of the system differ materially from those produced by over-excitation.

The action of all these varied morbid factors is in the direction of solution of continuity of cerebral elements, and consequently of perversion of psychical function. And here a wide gap opens itself in the study of brain pathology in its relation to morbid psychology. No adequate theory has been advanced to account for the. sequence of a parti- cular type or train of morbid mental symptoms on a parti- cular morbid condition of the brain. In the most definite forms of insanity, those of which the morbid anatomy is pretty definitely determined, there is not the slightest suggestion afforded of the causation of the peculiar type of mental symptoms which symptomatize them, or for the alternation of symptoms in an individual case, or for diversity of symptoms apparently starting from the same cause. All that is known is that when the hemispherical ganglia are diseased we may have excitement or depression of feeling, delusion, or obfuscation of the intellectual and moral qualities ; but why in one case excitement, in another delusion, and in a third both, is an utter mystery.

Classification.

The mental symptoms of acquired insanity have been classified from the time of Pinel—it might, save from some slight difference in the application of the terms, be said from the time of Hippocrates—as mania, melancholia, and dementia, according as exaltation or depression of feel- ing or weakness of intellect presents itself most prominently In a given case. To these has been added delusional Insanity, spoken of by certain authors as monomania. Numberless classifications founded on psychological con- siderations have been advanced, involving, however, more variety in terminology than in principle ; all such, when analysed, are reducible to the primitive mania, melancholia, and dementia. Pritchard asserted that mental symptoms Were divisible into two great classes, according as the intellectual and moral faculties were implicated. This principle falls to the ground from the simple but most important fact that the primary symptom in all insanities 18 perversion of the moral sense, and that this perversion pervades all cases of mental disease to their termination. This change of morale amounts to various degrees of per- version of the ordinary character and disposition of the Individual, He becomes indifferent to social considerations,

apathetic and neglectful of the personal and family duties, evinces dislike and suspicion of friends and relatives, and may betake himself to excess in alcoholic stimulants and other forms of dissipation. There isa general concentration of his ideas on himself, which is often spoken of as the selfishness of the insane. According to the direction in action in which perversion of the moral sense is manifested such so-called forms of insanity have been constructed as dipsomania, kleptomania, erotomania, &c., which, however, are to be regarded as merely accidental phenomena. Moral insanity may appear to exist alone at certain times in certain cases, but it is greatly to be doubted whether it really ever exists apart from intellectual perversion. The mere fact that a person cannot appreciate the change in himself, can- not, as it were, disapprove of his own actions, is evidence that the moral faculties are

not alone implicated. The converse proposition may be stated even more strongly— intellectual insanity never exists without moral perversion. Moral perversion is, however, only one of the initial symptoms, In most insanities a “ period of incubation” is observed, generally spoken of as the prodromal or initial period. Sudden and violent outbursts of insanity are occa- sionally reported, but, when these are carefully examined into, a train of prodromal symptoms, physical as well as psychical, can almost invariably be traced. These symptoms are for the most part insidious in character. Founding on the statements of patients suffering from premonitory symptoms, on those made by others, who, having recovered, are able to carry back their recollection to the incidence of the prodromal stage, and on the direct observation of the physician, physical indications are the first to present them- selves. ‘These consist in a feeling of fulness in the head, throbbing of the forehead and eyeballs, flashes of light before the eyes, and general malaise. The mental symptoms follow closely, and consist, in addition to the change in morale already spoken of, in restlessness, irritability, inability to apply the mind to the everyday affairs of life, and sleeplessness, In certain forms this description of the prodromal symptoms requires some slight modification. They are very generally accompanied by impairment of general health. – The classification of the insanities according to the predominant mental symptom is adopted in almost all treatises on the subject; but there is a growing convic- tion that this basis is neither so scientific nor so con- venient as a classification based on pathology. Mania, melancholia, and dementia are merely symptoms of brain disease. If these symptoms were constant in even a considerable majority of all cases, there would be better warrant for employing them as a basis of nosology; but they vary so widely in kind and degree, they run so closely one into the other, they may all appear in an individual case within so very short a space of time, that their use is generally misleading, even as indicating the mental condi- tion of a patient. In many cases of insanity mania may present itself to-day, melancholia to-morrow, and dementia the day after, being, in fact, indications of the course of the complaint. It is undoubtedly true that ina proportion of the insane there is a general predominance of one or other of these conditions, but it is equally true that there is an equal proportion in which the application of any one of

these terms is open to question. ‘Thus we may have a melancholic mania or a maniacal melancholia. Moreover, there are many forms of insanity of which the connexion with the causation is so intimate that even those authors who adhere to the archaic classification cannot refuse to acknowledge them as pathological classes, and are coni- pelled to treat of them under their pathological designa- tions ; puerperal insanity, epileptic insanity, senile insanity, and general paralysis may be cited as prominent examples.

To say of aman that he is maniacal is not saying more than to say of one who has lost power over his limbs that he suffers from palsy, adiagnosis which no scientific physician of the present day would be content with, as it conveys no definite idea as to the pathological character or cause of impairment of mobility. It may be freely admitted that medical science is not yet able to base a nosology of the in- sanities on the highest pathological platform, that of morbid anatomy. Considerable advances have been made in this direction, but the observations of pathologists, with the exception of those bearing on three or four classes of brain disease, are vague and quite insufficient for the purpose. Clinical observation, however, has served to relate symptoms with cause to such an extent as to enable the observer of mental disease to fall back on the second pathological position—etiology, and has enabled him to assert, in a very large proportion of cases, causation as a scientific and con- venient standpoint for classification. After all, classifica- tions are matters of convenience. It is not asserted that the classification adopted in this article is more than provisional ; but it is asserted that it is more convenient to study the insanities in connexion with the bodily conditions of their subjects than to rely on a general description of mental symptoms which are inconstant in kind and degree, and often so complex as to render analysis impossible. When Esquirol’s definition of the mental conditions is quoted, little more need be added, for further descrip- tion would merely involve an amplified account of psycho- logical peculiarities, Esquirol thus describes the con- ditions :—-(1) Melancholia, or, as he terms it, Lypemania, disorder of the faculties with respect to one or a small number of objects, with

predominance of a sorrowful and depressing passion ; (2) Monomania, in which the disorder of the faculties is limited to one or a small number of objects, with excitement, and predominance of a gay and expansive passion; (3) Mania, in which the insanity extends to all kinds of objects, and is accompanied by excitement ; (4) Dementia, in which the insensate utter folly, because the organs of thought have lost their energy and the strength requisite for their functions. In 1852 Schroeder van der Kolk and in 1860 Morel laid the foundation of a classification more in accordance with pathological science. The former included the different forms of the disease under two great classes :——" idiopathic insanity," comprising all cases produced by primary affec- tions of the brain; and "sympathetic insanity," including those due to morbid conditions of the general system. Morel divided the insanities into six groups :—(1) heredi- tary insanity; (2) toxic insanity; (3) insanity produced by the transformation of other diseases ; (4) idiopathic insanity; (5) sympathetic insanity; (6) dementia, a terminative stage. Notwithstanding faults of detail, it may be fairly said that these propositions marked a great advance in the study of insanity, and that all later classifi- cations based on the same principles have been derived from study of them. The following system admittedly is so.

insani-

II. Traumatic insanity. {II. The insanities asso-

Idiopathic mania, melancholia, and dementia. General paralysis of the insane.

I. Idiopathic ties.

Epileptic insanity. Hysterical insanity. Hypochondriacal insanity.

ciated with other neuroses.

IV. Insanity resulting from the prescnce of adventitious pro- ducts.

(Phthisical insanity.

V. Insanities resulting | Rheumatic insanity.

from morbid condi- } Gouty insanity.

tions of the general Syphilitic insanity.

system. Insanity from sunstroke,

\ Anemic insanity.

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INSANITY

VI. Insanities occur- | Climacteric insanity. ring at cvolutional 4 Senile insanity. periods. eae of pregnancy.

Pucrperal insanity.

[Glinack of pubescence and adolescence,

VII. Toxic insanity.

I. Ipiopatuic Manta aND MeELancuoria.—It is pro- posed to consider under the head of idiopathic mania and melancholia the large and important class of cases which re- sult from over-excitation of the brain due to so-called moral causes. In considering this form of insanity, a difficulty arises in reconciling the dependence of two such apparently widely divergent morbid psychical states as mania and melancholia ou one common pathological condition. That they are so is maintained by the following clinical observa- tions—Ist, that during the prodromal period, 7.e., the period during which over-excitation is using its influence on the brain tissues, the symptoms of excitement and depression geuerally alternate; 2d, that in certain acute cases mania and melancholia coexist, that is to say, it is impossible for the observer to say whether they are cases of maniacal melancholia or melancholic mania; 3d, that, as many cases run their course towards recovery, the symptoms are con- secutively mania, melancholia, and dementia ; 4th, that the effects of irritating poisons applied to the brain, alcohol

markedly, produce these symptoms in some individuals in a very short space of time, These observations point, not to a difference of pathological causation, but to variation in symptoms in conformity with the progress of pathological processes. It must be borne in mind that congestion is not a condition constant in quality or in quantity, and, further, that it is an inconstant condition acting on an inconstant subject, and therefore productive of cumulative inconstant results. Brain congestion, due to over-excita- tion, produces functional excitement of that organ. It must be remembered that although mania is accompanied by exaltation, and melancholia by depression of feeling, they are both manifestations of excitement of feeling. Given this common psychological condition of excitement, areason must be sought for the variety of its manifestation either in some peculiarity of the irritating cause or in some idiosyncracy of the affected individual. In either case no material assistance is gained from psychological considera- tions, for there is no necessary connexion between depress- ing emotions and melancholia ; intense grief often produces acute mania, and the insanity of the man of saturnine mind is as often as not characterized by mania. The peculiarity of the irritating cause appears to be, not its psychological characteristic, but its intensity. The more rapidly excitement of feeling is produced, the more likely is mania to be the symptom of the insanity. That melancholia often supervenes on depressing emotions gradual in their incidence does not imply a psychological nexus, but that, as their irritating influence is slowly applied, so the results of the irritation are slowly produced, and (as in the case of every tissue of the body) there is variety of degree of symptoms in conformity with the rapidity of the progress of pathological events. There are also various underlying conditions difficult to treat of in the mass, any one of which may have considerable bearing on an individual case. Constitutional predisposition (diathesis) may render a person more prone to the sub-acute forms of disease, and the condition of the body at the time of irrita- tion may influence the nature of the symptoms in either direction, In the absence of the possibility of applying to the brain the mechanical aids which have given the physician an insight into the sequence of pathological events occurring in other organs, the pathologist has nothing to depend on save clinical observation. He has presented to him a diseased organ,

complex in function, of the physiology of which he is, as regards its psychical action, profoundly

ignorant; all he can say is that, when its histological integrity is impaired, he has reason to believe that "some functions become torpid and oppressed, while others are excited into preternatural activity" (Bucknill and Tuke). It must be stated, however, that in a considerable propor- tion of cases the nature of the ultimate condition is fore-shadowed from the very commencement by the character of theinitial symptoms. Simple depression of feeling may be the first and last symptom of insanity, or it may gradu- ally increase in intensity till it attains the extreme and most complicated form of melancholia, In like manner simple excitement and exaltation of feeling may characterize a case from beginning to end, or it may culminate more or less rapidly in active mania, without the intervention of other psychical symptoms.

As to the duration of the prodromal period, in the mass of cases nothing can be stated with certainty; it can only be said that, as a general rule, the incidence of melancholia is more slow than that of mania. Putting aside exceptional cases, it may be stated that, whereas the former is a matter of months or weeks, the latter is a matter of weeks or days.

The initial mental symptoms having been already de- scribed, it remains only to say that the general system becomes coincidentally affected ; functional disturbances of the digestive organs soon manifest themselves, and the nutrition of the body becomes defective. To this implica- tion of other systems consequent on impairment of the trophesial (nourishment-regulating) function of the brain can be traced a large amount of the errors which exist as to the causation of idiopathic melancholia and mania. Very frequently this secondary condition is set down as the primary cause; the insanity is referred to derangements of the stomach or bowels, when in fact these are, concomitantly with the mental disturbance, results of the cerebral mischief. Doubtless these functional derangements exercise consider- able influence on the progress of the case by assisting to deprave the

general economy, and by producing depressing sensations in the region of the stomach. To them may probably be attributed, together with the apprehension of impending insanity, that phase of the disease spoken of by the older writers as the stadzwm melancholicum, which so frequently presents itself in incipient idiopathic cases.

During the earlier stages of the prodromal period it is impossible, in the majority of cases, for the physician to predict, with anything like certainty, whether the case may culminate in acute melancholia or acute mania. But as it progresses the irritability and restlessness which ushered in the malady become intensified ; sleep is either irregular or may be lost for nights together ; further degeneration of the brain constituents necessarily follows, and the loss of controlling power over ideas is manifested in excitement in one of two ways—(1) by the domination of one set of ideas, which are for the most part of a depressed character, or (2) by a tendency to follow lines of thought suggested by accidental external circumstances. Although in the one case there isa concentration and in the other a diffusion of ideas, there is the common result of occlusion of the individual from anormal process of thought, in consequence of his inability to review external circumstances correctly.

1. Acute Idiopathic Melancholia presents itself in three degrees of intensity :—(1) simple depression of feeling, (2) depression of feeling with delusion, (3) depression of feeling with mania or delirium. The second and third of these conditions may supervene on the first, or any one of them may singly characterize the case.

_ Simple Depression of Feeling.—In no form of insanity 1s the sane mind more prone to project a psychological scheme of causation than in that of which simple depression of feeling is the predominant symptom. The restlessness and irritability which accompany anxiety, grief, and worry,

and the consequent exhaustion and depression, suggest a psychological continuity. ‘There is, however, a very dis- tinct difference between depression of feeling within the limits of health and the depression of feeling resulting from morbid processes going on in the brain, and in

symptoms there is a distinct line of demarcation. A mere fit of depression, from whatever cause, does not prevent a man from using his intellectual faculties ; circumstances influence him, and he can review his position ; but where the limit of health is passed the normal influence of external circum- stances is lost. This indication is accompanied by a gloomy apathy ; the memory of the past is misery, the present is unendurable, and there is no hope in the future; every-thing is black within and without, every incident feeds the melancholy, every suggestion of hope is parried, and every appeal to the reason falls dead on the ear of the sufferer. This latter symptom—the inoperativeness of appeals to the reason—is a feature of all forms of insanity, and it is therefore well to notice it particularly when treating of the simplest. What to the sane mind is the simplest proposi- tion, to the insane appears either utterly false in itself, or to have no bearing on the position. The power of comparing idea with idea, the faculty of discriminating their differences, or the perception of agreement in the midst of difference is lost—in a word, the judgment is impaired or utterly in abeyance. The common everyday expression "out of his judgment,' employed to indicate that a man is Insane, is psychologically accurate, and logically applicable in all forms of insanity. A strong tendency to suicide frequently presents itself; the utmost ingenuity is exercised to accomplish this object, the whole mental energies being concentrated upon it. It is impos- sible to render in terms the general as well as facial expression of the melancholic ; it cannot be simulated with success before any one conversant with the condition. Depression of Feeling with Delusion.—Idiopathic melan-cholia symptomatized by simple depression of feeling may become gradually complicated with delusion and hallucination, or this complicated condition may follow immediately on the initial symptoms. The delusions and hallucinations of idiopathic melancholia may be divided into three classes :—(1) those traceable to perverted sensation produced by implication of the functions of the general system ; (2) those apparently dependent on the nature of the primary causating train of emotion; and (3) those which it is impossible to connect with any particular influ- ence, either psychical or somatic. The first class contains the delusional symptoms resultant on atony of the alimentary canal, which, by producing obstinate constipation, catarrhal affections

of the stomach and bowels, and dyspepsia, cause sensations which are referred by the insane mind to supernatural influences: he believes that he has serpents or worms inside him, that his gullet is closed, or that his bowels are so obstructed as to render relief by the natural passage impossible. Asa direct result of this delusion food is systematically refused, and it often becomes necessary to resort to artificial feeding by the stomach-pump or some allied apparatus. Hallucinations and illusions of smell and taste may be referred to the same causes as the delusions just spoken of: the foetor of the breath due to dyspepsia may suggest to the melancholic that he is surrounded by a poisonous atmosphere, and that everything near him stinks; and the foul tongue of the same condition may be productive of hallucinations of taste, and may even lead up to the very common delusion that his food is poisoned. Such distinct objective starting points, however, do not suggest themselves for hallucinations of vision and hearing; these can only be regarded as incidental results of the morbid cerebral con- dition of which the process of production is unknown. Hallucinations of sight are comparatively rare ; when they XIIT. — 14

do occur it is generally in the form of spectres, which prompt to suicide, self-mutilation, or homicide. Hallu- cinations of hearing are more common, and are believed to be of graver import. form of words emanating from a something or some one of whose personality the patient has no eonception. That an apparent connexion can often be traced between the ‘character of the delusion and that of the primary causating emotion is particularly true of the melancholic delusions which follow on religious emotionalism, so much so that many writers regard religious melaneholiaas a distinct form of insanity. This is a term, however, very loosely employed, and it is, in fact, by no means easy to ascertain what it im- plies ; by one section of authors it is regarded as that form of melancholia in which the insanity eentres upon religious ideas, by another as the form of insanity produced by depressing religious emotion. The latter position 1s tenable on purely clinical considerations, if the insanity retains the character of the causating emotion, which it very frequently does not; the former is

open to the objection that the delusions may be mere accidents in a case, and may bear no relation whatever to the exciting psychical cause. One reason why the term is so strongly impressed on the mind of the public is, that it may appear as pseudo-epidemic. The waves of religious emotionalism, which almost periodi- cally disturb society in the form of "revivals," are apt to produce explosion of psychical action in those members of the community predisposed to nervous degradation. The public never considers, in fact does not know, that any other equally potent cause of emotion might be as effectual, and therefore sets down such accidental congeries of cases as "religious melancholia," accepting that term as representing all the abnormal psychical conditions which may result from "revivals." It is better to consider religious influences in the common category of emotions producing over-excitation of the brain. The deep despondency which follows on religious emotionalism may be productive of such pre- dominating ideas as that the soul is irretrievably lost, that the unpardonable sin has been committed, and that there is no hope of salvation. Although in the abstract it is open to question whether such predominating ideas are strictly delusions, inasmuch as they may be considered as morbid exacerbations of fears and anxieties suggested by certain schools of religious thought, still in the concrete they amount to delusion; for, even supposing they have been arrived at by a normal process of reasoning—which in most cases is extremely doubtful—they are maintained at the expense of all other religious considerations, and by the exclusion of all arguments founded on the experience of others.

The delusions which it is impossible to connect with any particular physical or psychical influence arc for the most part characterized by suspicion and fear, and take such forms in the mind of the patient as that spies surround him, that all his actions are watched, that all connected with him are plotting against him, that conspiracies are being organized with a view to deprive him of his estate, procure his ruin, or do him some evil of which he can give no definite explanation. Occasionally delusions of fear and suspicion are connected with persons whom the patient has never seen, or with sections of society, such as political partics or religious communions. erime is a frequent result of delusion. This idea of crime may be entirely unsubstantial, or

it may possess some very slight foundation in fact, one which has no rational bearing on the existing position. When insane self-accusations are critically examined, it is found that remorse is very rarely connected with the real or imaginary crimes, from the consequenzes of which others have or might have suffered. The poetic stories of insanity produced by remorse of con-

Asa rule the hallucination takes the –

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science for crimes involving the ruin or disgrace of others than the actual offenders may be set down as in the main apocryphal.

The delusions of the melancholic are often fearfully intense, and produce very serious results in action; they are apt to extend beyond himself. By a process of reason- ing which the sane mind cannot appreciate, he may argue himself into the belief that his misery is also the misery of liis friends and family, that his relatives are cognizant of or implicated in his imaginary crimes, and that they must suffer the consequences along with him. As death offers to him the only chance of relief, so he believes it best that those nearest and dearest to him should die also. From this state of feeling follow those fearful acts of homicide which occasionally startle society—a parent destroys several of his ehildren, a lover his mistress, or a husband his wife, before committing self-destruction. It is as well to attract attention here to the appearance of a tendency to homicide and suicide as an incident in a case, as the subject will have to be recurred to when adverting to the question of homicidal and suicidal insanity.

Depression of Feeling associated with Delirium or Mania—In this class of eases it is impossible to say whether they should be called melancholic mania or maniacal melaneholia. The wildest delirious excitement coexists with the deepest depression of feeling ; delusions of fear and horror are given expression to in the most extravagant manner, and relief from them is sought in frantic attempts at suicide;

the patient dashes his head against the floor or wall, tries to cast himself down stairs, holds his breathin the hope that he may suffocate. In this condition there is a strong tendency towards death, which not unfrequently occurs within a few days of the develop- ment of the graver symptoms, and whieh is generally produced by congestion of the lungs as a direct result of the eerebral condition, ze, by a true eerebral pneumonia.

2. Acute Idiopathic Manta presents itself in three forms —/(1) simple exaltation of feeling, (2) exaltation of feeling with delusion, (3) acute delirious mania. The second and third of these psychical conditions may supervene on the first, or any one of them may singly characterize a case; in all, the period of transition from the prodromal stage is much more rapid than in acute idiopathic melancholia.

Simple exaltation of feeling manifests itself in all de- grees of intensity between mild general excitement and the extreme forms of maniacal furor; in kind it may not amount to more than a decided increase of the initial symptoms of restlessness, irritability, and change of dis- position ; in degree it is eharacterized by greater or less excitement of thought, word, and action. The general vague restlessness and irritability of the prodromal period not only become exacerbated, but manifest a tendency to produce results in action. Excited action may show itself cither in a general exaltation or in the suspension of normal trains of thought. A prominent example of the first psychical condition is found in the naturally devout mind under certain conditions of excitement: the habitually religious man may have meditated on schemes for self-eonduct, the good of mankind, or the spread of religion, schemes which, so long as mental action was

| under control, were mere projects, things to be hoped Self-accusation of serious

for, but which under morbid excitement assert themselves so powerfully as to be regarded by the unbalanced mind as immediate necessities, to be procured at the expense of all considerations. The real distinction of religious mania from religious enthusiastic excitement consists, not in the form of the ideas, for which parallel cases might be

found in sanity and insanity, but in the per saltwm manner in which it is sought to carry them into action, in the leaving out of those links which the sane mind uses to decide on the

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adoption or rejection of a scheme, but the omission of which transfers the scheme suddenly from the region of imagina- tion and hope to one of present reality. There is an absence of religious totality; the patient is bound up in

some scheme for the advancement of religious knowledge, |

in some project for the building of a church, the founding of a school, the establishing of a mission, or, more probably, for all at once; for this he neglects his family, all social considerations, and those duties which are the precepts of his faith. Whether the apparently efficient cause be religion, politics, or the prominent social question of the day, the results are identical, being only conditioned by the nature of the original idea. The ordinary behaviour of the man is changed ; he is ever on the move ; his gestures, loud tone of voice, volubility of talk, and general manner are such as to cause his friends distinctly to mark the change. proportion of such cases recover under appropriate treat- ment, but they not unfrequently pass into acute delirious mania. When the disease is manifested by the suspension of the ordinary trains of thought, the symptoms consist, for the most part, in recklessness of action and conversation ; there is a sort of exalted joyousness, a strong teudency to dissipation, loud and wild though not necessarily incoherent talk, extreme restlessness, and utter want of respect for all conventionalities. Such patients (reputable members of society, be it remembered, a month or a week before) outrage all sense of decency ; they may walk the street with strumpets, and appear drunk in public, forcing their be- haviour on the notice of the police. They care nothing for the feelings of friends or the prospects of their families. The intellectual faculties may be active; thus wit.and humour, uncontrolled by any feelings of cousideration for others, may stand out all the more prominently. The condition, taken over all, is very closely allied to that stage of intoxi- cation in which the poison of alcohol sets free all

controlling influences. When the restraining power of association is lost, there is no difficulty in comprehending that the uncon- trolled brain may act in any direction. This class of cases is specially emphasized, because they are apt to be mistaken by the public for instances of mere moral obliquity.

The relation of amount of mental disturbance to the degree of excitement is not definable; mania may be extreme, and the disturbance of ideas apparently slight, and viceversa, It isof great importance that the two following facts should be insisted on—(1) that mania of an extreme description can exist without delusion ; and (2) that mania of a dangerous nature may exist without furious excitement. It is in this class of mania that cases of so-called folie raisonnante are for the most part met with—a class strongly insisted on by many Continental authorities as of great pathological importance. By one section of foreign writers it is spoken of as folie raisonnante, by another under the original name suggested by Pinel mania sine delirio, while by a third both are used promiscuously to indicate a class of cases in which, although considerable disturbance and excitement may exist, the sufferer is able to justify his course of action by a line of reasoning not illogical in itself, although founded on false premises.

Hixaltation of feeling with delusion or delusional mania, whether it follows on a period of simple exaltation of feel- ing, or is coexistent with the first symptoms of excitement, 1s not to be connected with the originating psychical cause ; indeed the intellectual confusion is so great aud of such a kind as to render any analysis impossible. It is well to mark here the psychological difference between maniacal and melancholic delusions; the latter are persistent in character and appear to proceed from within, the former are changeful and are readily acted on from without. The general expansiveness of ideas, the rapidity with which they are produced and influenced by external objects, along

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with the inability to correlate idea with idea, are productive of incoherence in thought, word, and action. For instance, a man may imagine and state that he is the king of the universe, at the same time that he enters no remonstrance against herding and eating with his fellow paupers ; he may assert his superiority, but may not object to obey the behests of a common keeper.

Acute delirious mania is a condition often rapidly produced and not unfrequently fatal. It may be the culmination of a case which has passed through the stages of simple exaltation of feeling and mania with delusion— the latter rarely ; or it may appear in a few days or even a few hours as the result of some severe mental shock. It may persist for only a short time, and is then spoken of as acute transitory mania. The symptoms are very definite,— the wildest yells and screams, a frenzied rushing to and fro, a reckless casting of the body on the ground or against the walls and furniture, smashing everything that comes in the way without any definite purpose save smashing, flushed features, clammy sweat, and a high bounding rapid pulse ; nothing can control the patient but physical force, for his fury renders him blind to all influences.

3. Acute Primary Dementia.—This disease is of rapid incidence. It may result from sudden psychical disturbance, especially fright ; occasionally no cause can be traced. After a few days or hours, during which the patient is somewhat stupid and apathetic, these symptoms increase to such a degree as to cause him to be, to all outward appearance, utterly demented; he sits unaffected by any- thing that goes on around him; he is completely helpless, cannot take off or put ou his clothes nor feed himself, and passes urine and feeces where he sits or stands; he is speechless, and cannot be roused to action by any appeal ; his movements are slow, when he ean be got to move at all; but the chief motor symptom is a degree of catalepsy. It may be said with truth that the condition is one of mental and bodily catalepsy. Such cases to the ordinary observer appear utterly hopeless. There is a strong tendency towards death; but, when this is overcome, it often happens that the sufferer gradually emerges from the condi- tion, and can give an account of the sensations experienced during his illness. It

may terminate in dementia of a very low type. Post-mortem examination of recent cases fre- quently reveals dropsy of the brain, or changes in inter- stitial tissues producing pressure. (See Blandford, Jnsanity and tts Freatment; Bucknill and Tuke, Psychological Medicine; Griesinger, On AfLental Diseases.)

4, General Paralysis of the Insane.—General paresis, progressive paralytic dementia, or, as it is more frequently spoken of, general paralysis, is a disease of the superior

and lateral convolutions of the brain, which gradually

extends over the whole nervous system, producing a peculiar impairment of motor power, and invariably accompanied by insanity. It is marked by well-defined series of physical and psychical symptoms, and terminates in a peculiar manner within a definite period.

General paralysis was first recognized as a special disease in France; it was indicated by Esquirol, and its history was fairly elucidated by Bayle, Delaye, and Calmeil, the latter giving it the name of paralysie générale des aliénés. General paralysis is a common disease, and is generally spoken of as “softening of the brain,” a term diametrically opposed to its pathological anatomy. The condition is essentially a chronic diffuse subinflammatory overgrowth of the connective tissue of the cerebral hemispheres, leading to destruction of the true nerve elements, and principally affecting that region of the brain in which recent observers have localized the cortical motor centres. General paralysis is said to be a disease of middle life; this is’ to a certain extent true, for, in the large majority of cases, its incidence

occurs betwecn the ages of thirty-five and fifty; it is, however, met with prior to the first-mentioned age, less frequently after the latter period of life. Statistics show that the decade between forty and fifty is the one during which the disease is most likely to occur. Men are more subject to it than women, in the proportion of, at least, eight to one; in women the symptoms are less strongly pronounced, and the disease runs its

course more slowly. Although the relative frequency of the disease appears to be equal inthe higher and lower classes of society, statistics show that the town artisan is more liable to it than the agricultural labourer. In the lower grades of society general paralysis is much more common in England than in Scotland or Ireland; in certain English asylums general paralytics constitute from a sixth to an eighth of the inmates, whilst in Scotch and Irish district asylums the proportion does not amount to more then 2 or 3 per cent. The progressive character of the disease 1s marked by three stages, termed the prodromal, the acute, and the ter- minative. The prodromal stage is marked by a somewhat incongruous congeries of mental symptoms, consisting of total change in the habits and disposition, general restless- ness and irritability, impairment of memory, extravagance in thought and action, and a peculiar facility closely followed by, or intercurrent with, the bodily symptoms of impaired mobility of the face and tongue. For the purposes of diagnosis the physical are more important than the mental phenomena. As a rule the bowleversement of disposition is peculiarly well marked; the impairment of memory consists, not only in the blurring and confusion of past events, but in the forgetting of the occurrence of one minute in the next,—purposes formed and intentions expressed are forgotten almost as soon as formed and expressed. This want of fixity is also shown by the non- recognition of tho lapse of time, and by the manner in which violent passion is suddenly changed into amiability. To the samo cause may probably be traced the peculiar facility of disposition of the general paralytic ; even at this early stago there are indications of the optimism which, as the case progresses, affords the characteristic psychical symptom. In the prodromal period it is manifested by a degree of morbid vanity, general exaltation, and a tendency to regard all things in the brightest possible light. The physical symptoms consist in a finely fibrillar action of the muscles of the tongue, twitching of the upper lip, hesitancy of speech, and a loss of facial expression; the tongue symptom consists of a rapid agitation of its surface, the voluntary movements of the whole organ not being entirely under control, ¢.g., it is protruded with a jerk; the upper lip hangs and trembles before utterance like that of one struggling against weeping; the hesitancy of speech can best be illustrated by saying that it is identical with the slurring of words in the first stage of

intoxication,—the patient “speaks thick;” the face assumes a mask-like want of expression—the muscular power being impaired to such a degree as to cause change of expression to be a compara- tively slow process. As the disease advances there is greater excitability, and the general exaltation of ideas becomes so great as to lead the patient to the commission of insanely extravagant actions, such as purchases of large numbers of useless articles, or of lands and houses far beyond his means, numerous indiscriminate proposals of marriage, the suggestion of utterly absurd commercial schemes, or attempts at feats utterly beyond his physical powers. Not unfrequently he is found committing theftuous acts. The acute percod is frequently ushered in by maniacal symptoms which generally assume the type of what is termed by French writers délire ambitieux. Delu- sion of the wildest character may now present itself; the patient may believe himself to be in possession of millions

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of money, to be unsurpassed in strength and agility, to be a great and overruling genius, and the recipient of the highest honours. Every idea is expanded and exalted, whether it relates to time, space, or personal attributes, Although grandiose and extravagant delusion is ver frequent, existing as it does in about one-half of all cases, it is by no means such a persistent symptom as the bien étre, which condition is the diagnostic of the disease in that it is invariably present. This is shown by perfect contentment with himself and all things around him, by the constant use of superlatives and such expressions ag ‘all right,” “splendid,” “first rate”; he speaks of his health as robust, “never better in my life,” even when there is grave constitutional disturbance; he is unaffected by the death of child, or wife, or nearest friend. He is utterly unsuspicious, lost to all appreciation of social relations, and facile in the extreme. Synchronously with this condition, the physical symptoms become exacerbated ; the tongue and facial symptoms already spoken of increase in intensity, and in addition impairments of the motor powers of the extremities present themselves, consisting in a loss of co-ordinating power, not in a loss of muscular strength. Thus the gait becomes straddled and uncertain ; there is a widening of the basis of

support ; he has to pick his steps as he goes up and down stairs, and is apt to trip over small obstacles; the action of walking resembles that of a half-drunk man, Later on the arms become involved. The pupils are often irregular, The third or ¢erminative stage is marked by "epileptiform" or more properly apoplectiform attacks, the general condition becoming more and more degraded. By this time the patient is almost bedridden ; actual palsy often occurs. Towards the end certain of the semivoluntary muscles are affected ; bed-sores may form ; and he may die slowly of exhaustion or suddenly during an apoplectiform attack. General paralysis runs its course in from one to four years; more rapid and more protracted cases are on record, but, taken over all, eighteen months may be stated as its average duration, The disease is incurable.

IL. Traumatic Insanrry.—Generally speaking, insanity is not developed for some months or even years after receipt of the injury, but in the interval the patient suffers from headache, more especially after mental effort, irascibility of temper, confusion of thought, and consequent inaptitude for business, weakened memory, and a constant feeling of fatigue. If this condition is not overcome, a progressive dementia sets in, of which the special character is violence of temper, and a tendency to impulsive action. This dementia is generally complicated with maniacal attacks intervening at uncertain periods and marked by furor or violence. Dipsomania or insane drinking is a not very uncommon result, apart from all other indications of aberration. Prognosis is unfavourable.

III. INSANITY ASSOCIATED WITH OTHER NEUROSES.—Epileptic Insanity.—In the intervals between the fits the patient is generally stupid and dull of apprehension. Im- mediately before or after fits, or, as some believe, occasionally taking their place, mania of a violent and furious, of a subacute, or of an ecstatic character presents itself. All authorities recognize epileptic insanity as the form most dangerous to the public. Prognosis is unfavourable. Hysterical Insanity.—The symptoms described in the article HysTeR1A may become so exacerbated as to amount to insanity. Superadded to these may be delusions of a sexual nature. The most extreme form of mental dis-

turbance supervening on hysteria is acute mania of a very violent character ; it is generally of a delirious nature, but does not usually continue for any great length of time. Tt is open to question whether the “fasting girls” and women with “stigmata” should not be included among the

hysterically iusane. Men, although very rarely, are liable to this form of insanity. In a_ sense the prognosis is favourable, inasmuch as prolonged treatment procures

reat abatement of symptoms, if not actual recovery. Insanity occurring with locomotor ataxy strongly resembles general paralysis. Taken over all, it may be stated that the symptoms differ more in degree than in kind, not being so intense. ‘Thereis not thc same extravagance of delusion or violence of mania.

IV. INSANITY FROM THE PRESENCE OF ADVENTITIOUS Propucts is marked by progressive dementia of a dull heavy character and the absence of delusion. Prognosis is unfavourable.

V, INSANITIES ASSOCIATED WITH Morgip ConDITIONS of THE GENERAL SystEM.—Lhthisical insanity is stated to pecharacterized by a short period of mania, melancholia, or delusion, which soon passes into a mixture of subacute maniaanddementia. ‘The symptom, according to Clouston, ig a tendency to be suspicious. (Consult Clouston, ‘¢Tuberculosis and Insanity,” Journ. of Mental Science, April 1863.) Rheumatic insanity is characterized by hallucinations of sight, touch, and taste, loss of memory, acute delirium succeeded by confusion of ideas and slug- gishness of mind, accompanied by choreic movements of the limbs, deadening of reflex action, and even paralysis. These symptoms appear as the articular affection diminishes or disappears; they are, as it were, one vicarious of the other. Prognosis is favourable. (See Griesinger On Jfental Diseases, p. 189; Clouston, Journ. of Mental Science, July 1870; Sibson, in Reynold’s System of Medicine, vol. iv. p. 286.) In gouty insanity the alternation of the joint and head symptoms is also well marked. The latter are general mania with delusions of suspicion. Prognosis favourable. (Vide Berthicr, Annales Medico-Psychologiques, 1869. Sydenham also alludes to the condition.) Syphilitic insanity frequently commences with acutely maniacal symptoms, shortly followed by hypochondriasis of marked character, paralysis of energy, and rapid progressive dementia.

Extravagant delusions often present themselves so strongly as to render the diagnosis between this condition and general paralysis difficult. Prognosis unfavourable. (The most important paper on this form of insanity is by Mickle, Brit. and For. Medico-Chirurgical Review, July and October 1876.) In anemic insanity, however produced, the general train of symptoms is violent mania of short continuance followed by melancholic dementia. Prognosis favourable.

VI. INSANITIES occURRING AT EVoLUTIONAL PERIODS or Lirz. —ZInsanity of pubescence and adolescence is mani- fested by various trainsof symptoms. Acute mania is on the whole the most common: it is characterized by motor restlessness ; the patient walks, talks, smokes, drinks, must ever be on themove. Where self-abuse comes in as a factor, the sufferer is melancholic and suspicious, self-accusing. Dipsomania is a not unfrequent symptom, But whatever may be the general symptoms of these three sets of patients, they have one common symptom, a perversion or increase of the sexual instinct. Prognosis is favourable as regards the attack present, unfavourable as to the probability of recurrence, Climacteric 'insanity, which is nearly as common in men as in women, is marked by pretty constant symptoms of a melancholic character. Prognosis generally favourable, Senile irsanity is symptomatized by dementia with frequent intercurrent attacks of mania. Prognosis unfavourable. The most frequent symptoms of the insanity of pregnancy are melancholy and moral perversion, the latter taking the form of dipsomania. Puerperal insanity shows itself during the first seventcen days after labour, and is of sudden incidence; the mental symptom is acute delirious mania. Prognosis is favourable in this, as in the

insauity of pregnancy. (Vide J. Batty Tuke, "On Pucer- peral Insanity," Hdin. Med. Journ., May 1865 and June

1867.)

VII. Toxic INsaniry.—Jnsanity of alcoholism in tlic acute form may be marked by acute maniaof a transient naturc, mania a potu; by

melancholia, frequently accom- panied by delusions and hallucinations of a frightful character ; in the chronic, by a type of dementia frequently simulating general paralysis. Prognosis of the acute form favourable, in the chronic the reverse.

In employing the above classification it must be clearly borne in mind that the term of the symptom should, whenever possible, be appended to the pathogenetic term ; thus, puerperal mania, climacteric melancholia, senile dementia, acute idiopathic mania, epileptic mania, &c, If the terms are combined, the nature of the disease and its general psychical characteristics are expressed in terse language.

It will be noted that no separate notice has been taken of such popular terms as homicidal or suicidal insanity. They in no wise indicate a class of the insane; they are symptoms common to many insanities, especially to epi- leptic, traumatic, puerperal, and idiopathic insanity, and as such must be regarded as incidents in a given case-

Terminations of Acquired Insanity.

Insanity terminates in recovery, in death, or in clironic mania or chronic dementia. Accurate statistics of the two first-named terminations are unattainable, as a large number of patients are treated at home; and asylum statistics do not therefore show the result overhead, only that of the more aggravated cases. The result of treatment in lunatic hospitals gives about 40 per cent., calculated on the admis- sions, which, however, include idiocy, chronic terminative insanity, and such acknowledged incurable forms of the disease as general paralysis. This figure does not of course represent the results of treatment of all the insanities, which, although there are no figures at command to support the assertion, may be fairly estimated at not less than 70 per cent., excluding idiocy. There is a general tendehcy of all insanities to shorten life; as already noted, some are in themselves fatal, or render their subjects less able to withstand diseasc, Asylum statistics show from 7 to 8 per cent. per annum as the average mortality calculated on the numbers resident.

It is necdless to attempt a description of the various phases of chronic terminative dementia and mania. De- lusion may continue, or the patient may become more or less sottish and degraded in habits; or, on the other hand, he may retain a considerable amount of mental power, still not sufficient to render him a responsible member of society. The great mass of the inmates of asylums belong to this class of lunatics, mostly harmless, yet precluded from mixing with the world as much for the convenience and safety of society as for their own benefit. A small proportion are detained on account of their liability to suffer from recurrence of attacks of insanity, although they are not actually insane during the intervals. To this condition foreign authoritics have applied the term folie circulaire, and some have asserted that it is the characteristic of certain cases ab initio. It is mostly confined to persons strongly hereditarily predisposed. The term explains itself: after intervals of comparative sanity, the patient manifests symptoms which run their course through the prodromal, the acute, and the demented stages, on again to recovery, in manner similar to a recent case.

Treatment.

In speaking of the treatment of the insanities, it will simplify matters to eliminate, in the first place, those forms

of the disease which are not amenable to remedial agents in the present state of inedical knowledge. Medicine, whether hygienic or therapeutic, cannot touch general paralysis, the insanity produced by adventitious products, or senile insanity, except in the reduction of intensity of symptoms. Traumatic insanity is for the most part hope- less; it is probable that sufficient attention has not been directed to surgical measures in such cases.

In the insanities due to morbid conditions of the general system, in those associated with other neuroses, and in toxic insanity, the physician attacks the head symptoms through treatment of the causating factor. It is true that in these forms symptoms have to be attacked directly, but ultimate cure is to be looked for through

treatment of the diathetic condition. Itis rare, and then only in the earlier stages of the initial symptoms, that the progress of these diseases is cut short by therapeutic measures, inasmuch as

they seldom come under the cognizance of the physician at.

that period. The exception to this statement is to be found in the case of puerperal insanity, where the patient is very generally under immediate medical supervision; in her case, therefore, the prodromal indications are often observed, and the disease arrested by the timely administration of drugs. But in the great mass of cases the last idea which occurs to the minds of friends is the possibility of impend- ing insanity, and it is not till the disease has considerably advanced that the fact is recognized and the physician called in. When he has the opportunity of applying his art during the initial stages, he directs his attention to the procuring of sleep by means of opium and other narcotics, the bromides of potash and ammonium and chloral hydrate, and by rectifying the disorders of the digestive system. But when the disease has reached the congestive stage the treat- ment becomes for the most part expectant, as it does in analogous complaiuts of other systems. ‘ Change of scene ” is often adopted, and properly so in the very earliest stages ; but when the disease is confirmed it is much more apt to aggravate the condition, fatigue and excitement only fan- uing the flame; it is much the same as if a man with a congested lung were asked to walk a mile uphill, in the hope that he would breathe more freely at the top. Tull within the last few years treatment by bleeding, cupping, and blistering, shaving the head, and cold applications, was much in vogue. In asylums of the present day a shaved head is never seen. It was likewise the custom to administer large doses of sedatives. ‘The system of treat- ment which now generally obtains is almost purely hygienic. Opiates are much less used, and are to be deprecated in those forms characterized by excitement; in idiopathic and climacteric melancholia, lowever, they often produce good results. General constitutional treatment is what is usually adopted. In such forms as idiopathic mania and melan- cholia, the mania of adolescence, puerperal mania, and climacteric melancholia, the disease, like many others, runs its course, not very materially affected by remedial agents

apart from those applied to the maintenance of the system, and its cure is similarly dependent on rest and nursing, And the main question concerning treatment is, Where are these best to be obtained? In the case of the poor there is no alternative, even in comparatively mild cases, but to send the patient to an asylum. In the case of the rich it resolves itself very much into a question of convenience, for, with plenty of money at command, the physician can convert any house into an asylum. But under ordinary circumstances, when the patient is violent, noisy, suicidal, homicidal, or offensive to society, it becomes necessary to seclude him, both for the purposes of cure and for the safety and comfort of the family. Except amongst the very affluent, treatment at home is for the most part unsatisfactory ; it is very generally tried, but breaks down

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uuder the constant strain to which the friends are sub- jected. In a well-ordered hospital for the insane there is every possible appliance for treatment, with trained nurses who are under constant supervision; and it therefore affords the best chance of recovery.

History.—The history of the treatment of insanity has been stated to be divisible into three epochs—the barbaric, the humane, aud the remedial. But this does not take into account the very highly humane and probably highly remedial system of treatment which obtained in very ancient times. In Egypt the temples of Saturn, and in Greece the Asclepia, were resorted to by lunatics, and the treatinent there adopted was identical in principle with that of the present day. The directions given by all the classical medical authors, and especially Hippocrates and Galen, are of the soundest character. How long their influence existed it is difficult to say, but in the Middle Ages, and up to the middle of the last century, little atteution was paid to the care or cure of the insane. A small proportion were received into monastic houses or immured incommon jails. In 1537 a house in Bishopsgate Street, London, fell into the possession of the corporation, and was appropriated for the reception of fifty lunatics, This, the first Bethlehem Hospital or Bedlam, was removed in 1675 to Moorfields,

and in 1814 the present hospital in St George's Fields was erected, St Luke's was instituted in 1751. Bedlams or houses of detention for lunatics appear to have existed in other cities, but, with these ex- ceptions, no provision was made for the insane, who were allowed to wander at large. There is good reason for believing that many were executed as criminals or witches. Abont 1750 the condition of the insane at- tracted some amount of public attention, and the incar- ceration in madhouses of a considerably larger number than formerly followed, not on account of any philanthropic sympathy with their condition, but as a measure demanded for the public safety and comfort. But this measure by no means brought about the termination of the barbarie period. The houses, misnamed asylums, were in the hands of private parties, under little or no supervision, and were in fact merely prisons of the very worst description. The unhappy inmates were immured in cells, chained to the walls, flogged, starved, and not unfrequently killed. It is almost impossible to believe that this condition of matters existed far on into the present century. According to Conolly, "there is clear proof of the continued existence of these abuses in 1827; and it cannot be denied that not a few of them survived in some public and private asylums in 1850." Matters were no better in France when Pinel was appointed in 1792 to the charge of the Bicétre, the great hospital of Paris for male lunatics. In that establisli- ment, and in the Salpetriére, the condition of the inmates was as degraded as in the British madhouses. This great philanthropist adopted the bold step of striking off the chains and other engines of restraint from those under his care. About the same time, the most gross abuses having been brought to light in connexion with the management of the city of York asylum, William Tuke, a member of the Society of Friends, was mainly active in instituting the York Retreat for the care and cure of insane members of that sect. This real asylum was conducted on non-restraint principles. The names of Pinel and Tuke are indissolubly connected with the history of the humane treatment of the insane, and to their efforts must be ascribed the awakening not only of the public but of the medical profession to the true principles of management. It took, however, many years before the principles laid down by these men were universally adopted. In 1815 a committee of the House of Commons

brought to light many gross abuses in Bethlehem Hospital, and it was not till 1836 that mechanical restraint

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tirely abolished in an English public asylum. This Bassiscs 2 Lincoln, where Dr Gardiner Hill did away with all engines of restraint. Shortly afterwards Conolly adopted the same line of treatment at Hanwell, near London, and through the influence of his example and precept the measure extended over the whole of Great Britain. Experience has shown that, as restraint of all forms is abandoned, the management of lunatics becomes easier. Walled-in airing-courts, barred windows, and strong dark rooms have almost entirely disappeared, and in some Scotch asylums it is found practicable to discontinue the use of lock and key. It has been said that the type of insanity has changed within the last forty years; 1t would be more true to say that the type of treatment has changed. It is much less common nowadays to meet with those extremely violent forms of madness which entered into the descriptions of many authors. With the reduction of restraint a higher order of supervision on the part of attendants is demanded, and as they are trained to rely more and more on the moral influence they can exercise over their charges, and less on mechanical apparatus, the patient is not so apt to resent control, and therefore a greater calm and contentment pervades the atmosphere of our asylum wards. This has been mistaken for a change jn the type of the disease.

Statistics. The statistics of lunacy are merely of intcrest from a sociological point of view ; for under that term are comprised all forms of insanity. It is needless to produce tables illustrative of the relative numbers of lunatics in the various countries of Europe, the systems of registration being so unequal in their working as to afford no trustworthy basis of comparison. Even in Great Britain, where the systems are more perfect than in any other country, the tables published in the Blue Books of the three countries can only be regarded as approximately correct, the difficulty of registering all cases of lunacy being insuperable.

On the 1st January 1880, according to the returns made to the offices of the Commissioners in Lunacy, the numbers of lunatics stood thus on the registers :-—

England and Wales,....,..... Scotland …., BEI AEE vicina.» Oe 6 Tre ieues use ses eee GE oii

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These figures show the ratio of lunatics to 100,000 of the popula- tion to be 279 in England and Wales, 217 in Scotland, and 236 in Ireland.

The next table is of interest as bearing on the question of the

alleged increase of lunacy as a disease. Similar returns are not

available for Ireland.

Numbers of Lunatics on the 1st January of the Years 1858-80, tinelusive, according to Retwrns made to the Offices of the Commis: stoners in Lunacy for England and Wales and Scotland.

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abe 5,823 1870 54,713 7,5r1

86,762 6,072 1871 56,755 7,729 38,058 6,273 1872 58,640 7,849 39,647 6,327 1873 60,296 7,982 41,129 6,398 1874 62,027 8,069 43,118 6,386 1875 63,793 8,225 44,795 6,422 1876 64,916 8,509 45,950 6,533 1877 66,636 8,862 47,648 6,710 1878 68,538 9,097 49,086 6,860 1879 69,885 9,386 51,000 7,055 1880 71,191 9,624 52,177 7,310

There is thus an increased ratio in England and Wales of lunatics to the population (which in 1859 was 19,686,701, and in 1880 was estimated at 25,480,000) of 186°7 per 100,000 as against 279°4, and in Scotland of 157 as against 217 per 100,000. The publication of these figures has naturally given rise to the question whether lunacy has actually become more prevalent during the last twenty years, whether there is real increase of the discase.

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gencral consent of all authorities that if there has been an increaes it is but very slight, and that the apparent increase is due, first to the improved. systems of registration instituted by the boards of lunacy, which have brought under their cognizance a mass of eases which were formerly neglected, “who would not have been dealt with as paupers in 1858, but who are now dealt with as such, so as to obtain for them the advantage of accommodation in pauper asylums.” Secondly, a further and far more powerful reason is to be found in the increasing tendency among all classes, and especially among the poorer class, to recognize the less pronounced forms of mental disorder as being of the nature of insanity, and requiring to be dealt with assuch. Thirdly, the grant of four shillings per week which in 1876 was made by parliament from imperial sources for the maintenance of pauper lunatics has induced parochial authori- ties to regard as lunatics a large number of weak-minded paupers, and to force them into asylums in order to obtain the benetit of the grant and to relieve the rates. These views receive support from the fact that the increase of private patients, ¢.¢., patients who are provided for out of their own funds or those of the family, has advanced in a vastly smaller ratio. In their case the increase, small as it is, can be accounted for by the growing disinclination on the part of the community to tolerate irregularities of conduct due to mental disease, and the consequent relegation of its victims to asylums for the sake of family convenience. And again, careful inquiry has failed to showa proportional increase of admissions into asylums of such well-marked forms as general paralysis, puerperal mania, &c. The main cause of the registered increase of lunatics is thus to be sought for in improved registration, and parochial and family convenience. If there is an actual increase, and there is reason for believing that there is a slight actual increase, it is due to the tendency of the population to gravitate towards towns and cities, where the conditions of health are inferior to those of rural life, and where there is therefore a greater disposition to disease of all kinds,

Bibliography.—The following are systematic works :—Bucknill and Tuke, Psychological Medicine, 4th edition, 1879; Blandford, Insanity

and its Treatment, 1877 ; Griesinger, On Mental Diseases, New Sydenham Society, 1867 ; Maudsley, The Pathology of Mind, 1879. Conolly, On the T'rcatment of the Insane, 1856, bears chiefly onasylum management. Every question connected with lunacy will be found discussed in the Journal of Mental Science, to the first twenty-four volumes of which a general index has been prepared by Dr Fielding Blandford, 1879, The works of Pinel and Esquirol are well worthy of attention. Consult also Krafft-Ebing, Lehrbuch der Psychiatrie, Stuttgart, 1879, and Dr Heinrich Schiile, Hand- buch der Geisteskrankheiten, the latter being the sixteenth volume of Von Ziemssen's Handbuch der speciellen Pathologie und Therapie, Leipsic, 1878. (J. B. T.)

Law.

The effect of insanity upon responsibility and civil capacity has been recognized at an early period in every system of law. In the Roman jurisprudence its con-

| sequences were very fully developed, and the provisions

and terminology of that system have largely affected the subsequent legal treatment of the subject. Its leading principles were simple and well marked. The insane person having no intelligent will, and being thus incapable of consent or voluntary action, could acquire no right and incur no responsibility by his own acts; his person and property were placed after inquiry by the magistrate under the control of a curator. The different terms by which the insane were known, such as demens, furiosus, fatuus, although no doubt signifying different types of insanity, did not infer any difference of legal treatment. They were popular names which were used somewhat indifferently, but which all denoted the complete deprivation of reason. During the Middle Ages the insane were but little protected

or regarded by law. 'Their legal acts were annulled, and

their property placed under control, but little or no attempt was made to supervise their personal treatment. In England the wardship of

idiots and lunatics, which was annexed before the reign of Edward II. to the king's prerogative, had regard chiefly to the control of their lands and estates, and was only gradually elaborated into the systematic control of their person and property now exercised in chancery. Those whose means were insignifi- cant were left to the care of their relations or to charity.

There isa pretty | In criminal law the plea of insanity was unavailing except

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in extreme cases. About the beginning of this century a very considerable change commenced, The public attention was very strongly attracted to the miserable condition of the insane who were incarcerated in asylums without any efficient check or inspection; and at the same time the medical knowledge of insanity entered on a new phase. The possibility and advantages of a better treatment of insanity were illustrated by eminent physicians both in France and England; its physical origin became generally accepted; its mental phenomena were more carefully observed, and its relation was established to other mental conditions which had not hitherto been regarded as insane in the proper sense of the word. From this period we date the commencement of legislation such as that known in England as the Lunacy Acts, which aimed at the regulation and control of all constraint applied to the insane. And at the same time we find the commencement of a new state of matters inthe courts. Hitherto, the criteria of insanity had been very rude, and the evidence was generally of a loose and popular character; but, whenever it was fully recognized that insanity was a disease with which physicians who had studied the subject were peculiarly conversant, expert evidence obtained increased importance, and from this time became prominent in every case. The newer medical views of insanity were thus brought into contact with the old narrow conception of the law courts, and a controversy 'arose in the field of criminal law which in England, at least, is not yet settled.

The fact of insanity may operate in law—(1) by exclud- ing responsibility for crime ; (2) by invalidating legal acts ; (3) by affording

ground for depriving the insane person by a legal process of the control of his person and property ; or (4) by affording ground for putting him under restraint.

1. Responsibility for crime may be destroyed by insanity. The theory of the limitations under which this plea is recognized by English law is first clearly stated by Hale (Pleas of the Crown, i. c. 2) in these terms: " When tliere is no will to commit an offence there can be no transgression, and, because the choice of the will presupposes an act of the understanding, it follows that when there is a total defect of the understanding there is no free act of the will in the choice of things or actions." This doctrine was closely followed by the courts, and in the subsequent cases we find nothing admitted in defence short of a total defect of the understanding. In later times, however, frequent attempts were made on the part of the defence to break through this stringent rule, and in 1843 the case of Macnaughton, which resulted in an acquittal, attracted so much public attention, and seemed to cast so much doubt on the law as previously understood, that a series of questions were put by the House of Lords to the judges with the view of determining conclusively how the law really stood. These answers practically affirmed the old law. They decided that, in order to establish a defence on the ground of insanity, "it must be clearly proved that at the time of the committing of the act the party accused was labouring under such a defect of reason from disease of the mind as not to know the nature and quality of the act he was doing, or if he did know it he did not know that he was doing wrong." These answers are now the ruling authority both in England and Scotland, although there have been undoubtedly many instances in which the defence of insanity has been sustained either through the judge abstaining from pressing the law very strictly or from the jury taking a wider view of the case. Frequently, also, a more lenient view has practically been given effect to by the intervention of the home secretary, many of the most puzzling cases having been disposed of in this way. When the prisoner is unable to plead or has been acquitted on the ground of insanity, the jury are obliged to state whether they find the prisoner

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to be insane, and in that case he is ordered to be detained during her majesty's pleasure ; and the home secretary has power to order him to be detained at such place as he may direct. Prisoners who become insane while in prison upon any form of legal process may also be removed by warrant of the home secretary to whatever asylum he thinks fit, All these are known technically as criminal lunatics, and an asylum has been provided for their detention at Broad. moor, from which they can only be discharged by warrant of the home secretary. (39 & 40 Geo. IIL c. 94; 3&4 Vict. c. 54; 23 & 24 Vict. c. 65; 27 & 28 Vict. c. 29% 30 & 31 Viet. c 18

The law thus clearly laid down by the courts has been strongly condemned by most medical authorities, who maintain that it is founded upon an ignorant and imperfect view of insanity. There can be no doubt that insanity does not wholly or even chiefly affect the will through the intellectual faculties. The disturbance of emotion and fecling is at least of equal consequence. We have cases where a criminal act seems to spring entirely from this source, and very many others where we have a complex of morbid intelligence and feeling which it is impossible to disentangle. In cases like those it is impossible by any analysis to separate the intellectual from the emotional phenomena, and to assess the amount of intelligence which, although morbid or defective, ought to be sufficient to restrain the equally morbid emotional condition. It seems clear that in judging of responsibility we ought to take the mental condition of the insane as a whole; and the present view of the law seems to have originated partly from ignorance of the more obscure phenomena of insanity, and partly from the metaphysical conception of a will whose freedom is only limited by its intelligence. It must, however, be remembered, on the other hand, that the courts have had serious difficulties to encounter. The views of insanity and consequent irresponsibility presented to them in medical evidence were often so vague that they seemed capable of indefinite extension, and there is no subject on which the experts have appeared so much at variance with each other. But these difficulties, however much they may call for the watchfulness of the courts, seem no sufficient ground for limiting the effect of insanity in relation to responsibility to the intellectual faculties. Such a limitation seems

opposed, not merely to our present knowledge of insanity, but to the experience of ordinary psychology. These controversies are not confined to England. In the United States the law may generally be said to be the same as that of England, but, as the judges have been by no means so tightly bound down as the English judges have been by the opinions in Macnaughton's case, a considerable tendency has been shown in many (or indeed most) States to take a more liberal view of the question. In France the provision of the Code N apoléon, "il n'y a ni crime ni délit lorsque le prévenu était en état de démence," depends for its effect upon the interpretation given to the word démence, and for some time the tribunals were inclined to interpret it in such a manner as to make the law very much the same as that of England; but the view of the physicians is now generally prevalent. In Germany the matter is dealt with ina section ($51, 2.@.B) of the criminal code, which was the result of very careful discussion both by physicians and lawyers. It runs thus: "There is no criminal act when the actor at the time of the offence is in a state of unconsciousness or morbid dis- turbance of the mind, through which the free determination of his will is excluded."

2, In the case of all civil acts, the general rule is that capacity must be measured in relation to the act. The mere fact of insanity will not in itself make void a will, for example, if it appears that the testator had a fairly clear

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conception of the nature of his property and the objects of his bounty. But it is needless to say that the least appearance of insanity in the deed itself, or any appearance of fraud or undue persuasion on the part of any one, is immediately fatal to the deed. In the case of contracts an additional element is knowledge of the insanity by the other party. When the contract was entered into bona de, and the insanity of the one party was not known to the other, the contract may not be set aside unless the parties can be exactly restored to their previous condition.

3, Both the property and person of the insane may be placed under control by a legal process. In England this right was early annexed to the prerogative of the crown, and is even yet in consequence not

exercised by the ordinary courts, but by the lord chancellor and such other judges as may be entrusted with it by the sign manual. The

rocedure is now governed by the Lunacy Regulation Acts (16 & 17 Vict. c. 70; 18 Vict. c. 13; 25 & 26 Vict. c. 86). The question of insanity is tried before one of the masters in lunacy, either with or without a jury, according to circumstances. 'The terms of the inquiry are—whether the party is of unsound mind and incapable of managing himself and his affairs ; and on this being found his person and property are placed in charge of one or more persons called committees, whose administration is subject to the masters in lunacy, and through them to the chancellor. Persons thus found insane (technically known from the old form of procedure as lunatics so found by inquisition) are under the inspection of the board of chancery visitors, consisting of two medical men and a, barrister, who are appointed to visit them at intervals. They are not subject to the provisions of the Lunacy Acts.

In Scotland the old procedure is by a brieve or writ from chancery, formerly tried before the judge ordinary and now before the lord president of the court of session, The nearest niale agnate of twenty-five years of age is appointed tutor, but, latterly at least, is not entrusted with the per- sonal custody, the court, if necessary, selecting some one for the purpose, generally the nearest cognate. The procedure by brieves is now becoming infrequent. More generally application is made to the court of session to appoint a curator bonis to take charge of the estate, This procedure is in many ways simpler and more convenient, especially in the numerous cases which are unopposed, as the court when they are satisfied that every person con- cerned has had due notice will grant the application on the certificate of two medical men. In America and on the Continent similar forms of procedure exist, which cannot be-gone into in detail. In the United States the law is mostly, as is natural, derived from the English sources, but the procedure is regulated by statute in the different States. In many other countries, where the common law is based on Roman jurisprudence, the procedure seems to differ in many points from the English forms, but in substance the law on the subject has in nearly all countries reached very much the same results.

_ 4. Insane persons (although not lunatics so found by Inquisition) may be placed under personal restraint. At common law this power is limited to cases where the insane person is dangerous to himself or others, but in practice it used frequently to be exercised with little discretion and often with great barbarity. The care and restraint of the Insane (other than that exercised by their friends and relatives in their own homes) is now strictly controlled by the Lunacy Acts (8 & 9 Vict. c. 100; 16& 17 Vict. c. 96 ; 16 & 17 Vict. c. 97; 25 & 26 Vict. «. 111), the general nature of whose provisions may be thus briefly described. The chief supervision of the insane is vested in a body called the Commissioners of Lunacy. No insane person can be received for profit, or detained in any house or

asylum except upon an order by a person who becomes responsible for his detention, accompanied by certificates of two qualified medical practitioners that he is insane, and a proper person to be taken charge of and detained under care and treatment. Every such case must at once be reported to the commissioners, who must also be informed of the patient's death, discharge, change of residence, and similar circumstances. Not more than one insane person can be received into a house unless a licence has been previously obtained. In the metropolitan districts such licences are granted after due examination by the commis. sioners, and in the provinces by the justices of peace in quarter sessions, Every house thus licensed, together with public hospitals and asylums (which are not under licence), and every patient under private treatment, are subjected to a more or less frequent inspection by the commissioners, as well as by visitors appointed in their respective districts by the quarter sessions, The private licensed houses are under especially frequent inspection; their regulations and arrangements are subject to the approval of the commis. sioners, and especial precautions are taken that the patients shall have full opportunity of having their cases examined and of communicating with the commissioners. Patients may be discharged as cured, or on the direction of the person who ordered their detention, or on the order of the commissioners, all these modes of discharge, however, being

guarded by various conditions. The order for detention of a lunatic may be given by any person having an interest in him, and he is liable in damages if there prove to have been no sufficient ground for the order, his position differ- ing in this respect from that of the physicians and keeper of the asylum, who are only liable in the event of negli- gence or mala fides.

In Scotland the equivalent Acts are 20 & 21 Vict. eT1, 25 & 26° Vict ce 54, andg29 & 30 Vict. « 51. The system is in its main features the same as that of England, the leading differences being that the Commis- sioners of Lunacy are the only licensing body, and that an order granted on application by the sheriff takes the place of the order by a private person.

The regulations applicable to pauper lunatics differ in some respects from the ordinary case. The provisions applicable to them are for the most part to be found in 16r& 17 Vict @ 97;and'in 20 & 21) Viet) c. 71:

The nature of the evidence, and the manner in which it is to be presented to the court, is an important question in every department of the legal treatment of insanity. In England the courts, although giving increasing prominence to expert evidence, have gone a good deal on the theory that the medical evidence is merely a part of the general evidence inthe case. In most Continental countries, on the other hand, the whole evidence is presented in the shape of reports by medical men (in most instances officials) who have previously examined the case; and in this way every piece of evidence as to the state of mind of the insane person is commented on by an expert who is presumably better acquainted with its true import than an ordinary court or jury.

Literatwre.—The most recent book on the general law and pro- cedure in insanity is A Treatise on the Law and Practice of Lunacy, by H. M. R, Pope (London, 1877) ; Archibald's Statutes relating to Lunacy (2d ed., London, 1877) contains the statutory law on all branches ; Bertrand, Zot sw les Aliénés (Paris, 1872), presents a comparative view of English and foreign legislations. In forensie medicine the works of Taylor (Medical Jurisprudence, 2d ed., Lon- don, 1878) and of Wharton and Stillé (A Treatise on Medical Jurisprudence,

Philadelphia, 1873) are probably the English authorities in most common use. See also Casper and Liman, Practisches Handbuch der Gerichtlichen Medien, Berlin, 6th ed.,1876; Tardieu, Btude médico-légale sur la Folie, Paris, 1872; Legrand du Saulle, La Folie devant les Tribunaux, Paris, 1864; and especially Krafft-Ebing, Lehrbuch der gerichtlichen Psychopathologie, Stutt- gart, 1875. KUL — 15 (A, GI.)

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I. CUNEIFORM.

Plate I. eee in characters sometimes termed cunei- form or wedge-shaped, sometimes arrow-headed, have been found throughout a large part of western Asia,—in Persia and Babylonia, Assyria and Media, Armenia and Mesopotamia. The names given to the characters are derived from their form, as some of them resemble the points of arrows, though most have the appearance of wedges, thicker at one end than at the other. This appear- ance is due to the fact that the characters were originally impressed upon moist clay by a metal stylus, and the form consequently assumed by them was subsequently imitated by the engraver upon stone and metal. The characters were primarily pictorial, but in course of time the outlines of the primitive pictures came to be alone preserved, while the nature of the writing materials caused curves to become angles, and rounded lines straight ones. Varieties of Cuneiform Writing.—The original home of the cuneiform system of writing was either Elam or Babylonia, the inventors of the hieroglyphics in which it originated being the ancient Accadian population of Chaldea. It passed from the latter to a number of other nations, undergoing at the same time a variety of modifi- cations, It was first borrowed by the Semitic settlers in Babylonia and Assyria, and from them it was handed on to the Turanian tribes of India, the Alarodians of ancient Armenia, and the Aryans of Persia, while the Turanian inhabitants of Elam or Susiania preserved the system as it had been in use among the Accadians of Chaldea. In Babylonia, Assyria, Susiania, and Media the forms of the characters underwent several changes at succes- sive periods, the tendency in each case being

to simplify the characters by dropping superfluous wedges. In Babylonia we have to distinguish between the archaic, the linear, the hieratic, and the later forms of the characters. The archaic forms are principally found on bricks and cylinders of the Accadian epoch (before 2000 B.c.), and are the oldest forms of the characters of which we have contemporary specimens. The linear forms were in use at the same time, and are marked off from the archaic forms by being written in continuous lines instead of a series of wedges, and sometimes also by a closer resemblance to the original pictures from which they were derived. The hieratic forms were mainly employed between the overthrow of the Accadian power (about 1700 B.c.) and the 8th century B.c., more especially for contracts and similar docu- ments. The later forms may be seen on the monuments of Nebuchadnezzar and his successors, a further modification of them being used for the Babylonian transcripts of the Persian cuneiform inscriptions. In Assyria also we may classify the characters as archaic, hieratic, and later (or Ninevite), though the forms they assumed in Assyria were not identical with those used in Babylonia which we have

1 Description of Plate I.

1-4, Cuneiform inscriptions on clay; 5, Pisistratus inscription, on marble, from Athens (Athenaion, vi. p. 149); 6, 7, inscriptions from Dodona, bronze (Carapanos, Dodone, pl. xxvii., fig. 1, and pl. xxiii, fig. 5); 8, archaic inscription on brown sandstone, from Olympia (Arch. Zeitung, 1879, p. 153); 9, inscription on bronze spear-head, from Olympia (Jbid., p. 149); 10, boustrophedon inscrip- tion on base at Athens (C. J. Gr. Aftt., i. No. 463); 11, treaty be- tween Elis and Herma, on bronze tablet, found at Olympia in 1813, now in British Museum (C. 7. Gr., No. 11); 12, archaic inseription on base at Athens (C. 7. Gr. Att., i. No. 480); 13, Latin inscription from Pompeii (Zangemeister, Inscript. Pariet. Pomp., pl. xxiv., fig. 7); 14, Latin inscription (Ritschl, Prisc. Lat. Mon. Hpig., pl. xxxviii., fig. d); 15, Latin inscription, tessera (Zbid., pl. ii., fig. 7).

called by similar names. employed in Assyria for ornamental or religious purposes, and may be compared with our own black letter. In

Susi- ania the archaic forms of the characters lingered to the last, though in the northern part of the country simpli- fied forms were in use. ence may be observed between the peculiar forms of many characters in the older inscriptions of Mal-Amir and the forms borne by them in the Protomedic transcripts of the Persian monuments. were the same as those of Assyria, except that where one line or wedge had to be drawn across another, it was broken

The hieratic forms were mainly

In Media a considerable differ.

The Armenian or Vannic characters

into two. But this was to prevent the stone from breaking

at the point of section.

It will be noticed that the cuneiform characters were employed to express very different languages. The Accadian, like the allied dialects of Susiania and primitive Media, was agglutinative, and probably belonged to the Ural-Altaic family of speech; Assyrian and later Baby- lonian were Semitic; Persian was East Aryan ; while the Armenian of Van seems to claim affinity with that Alarodian group of tongues of which Georgian may be regarded as the modern representative.

The Origin and Development of the Cuneiform System of Writing. —- As already stated, the cuneiform characters were in their origin pictorial. In many cases it is possible to restore the primitive hieroglyphics or ideographs by the help of the archaic and linear Babylonian forms, and a fragment of a clay tablet has been discovered on which the pictorial originals of a few characters are given. In order to restore the primitive pictures, it is frequently necessary to turn a character upon its side, from which we may infer that the ideographs were once written vertically like

Chinese. Thus <\-, the ideograph of “an eye,” is

plainly a representation of the eye in a vertical position.

The primitive pictures denoted either objects or ideas, the latter being represented metaphorically by the picture of one or more objects. “Life,” for example, was expressed by the picture of a growing flower, ‘a month” by placing the numeral xxx. within the circle of the sun, which symbolized the day. But the same picture might denote more than one idea or object. Thus the circle of the sun represented not only “the sun” and “the day,” but also “light,” “brilliance,” and the like; and a pair of legs represented the ideas of “going,” “ walking,” and “running.” By combining two or more ideographs together, fresh ideas might be symbolized to an almost infinite extent ; “ drink- ing,” for example, is denoted by placing the three drops which denoted water within the picture of the mouth, “language” by substituting the tongue for the three drops of water, and “a tear” by setting the ideograph of water before that of the eye.

Out of this early picture-writing there soon grew a syllabary. Accadian was an agglutinative language, which was already largely affected by phonetic decay, the result being that on the one hand the same word might be used indifferently for noun, verb, and adverb, as in English, while on the other hand the loss of final sounds had reduced a great part of the vocabulary to the condition of mono- syllables. Ideographs consequently came to be associated with the sounds of the words which they primarily or most usually represented, and these words were mostly mono- syllabic. Thus the ideograph of “ month” (7té#) was known as id or it, that of “going” (dun) as du, that of “ drinking” as nak, that of a “tear” as ir.

CUNEIFORM. |

But the same object or idea was frequently expressed by more than one name, while each of the ideas represented by a single sign was naturally denoted by a different word. Hence the saine ideograph, or character, as we may now term it, had varying pronunciations assigned to it according to its meaning and use; the ideograph of the “sun,” for instance, was called, not only wé or ud (for uéu), but also par (for para), tam, lakh, and khis. Thus the ideographs, as soon as they came

to appeal to the ear as well as to the eye, were necessarily polyphonous. ae

A further step in advance was now taken. An ideograph continued to represent the pronunciation of the word for which it originally stood even when it no longer represented the word itself; that is to say, the pronunciation of the word it denoted became attached to it as a mere phonetic value. This important innovation, which amounted to a change of the old picture-writing into a syllabary, must have taken place at an early period in its history. Though native proper names, which were always significant, could be written ideographically, it was necessary to find some other way of denoting foreign proper names, which had no meaning in Accadian, The pronouns, moreover, must have been a difficulty from the first, and the fact that these are invariably represented in Accadian, not by ideographs, but by characters used phonetically, indicates a very early date for the cmployment of the characters to represent syllabic sounds as wellas ideas. 'This is borne out by the existence of several compound characters, in which the second element denotes only the pronunciation of the words for which they stand. The picture of a corpse, for example, had the phonetic value of bat, since bat, meant "corpse" and "death" in Accadian; but, as bat also signified "a fortress," the ideograph of "' corpse" was inserted within the ideograph of "enclosure," not because there was any relationship between the ideas of '"' death" and "fortress," but to indicate that the character which meant an enclosure was to be interpreted as siguifying "a fortress," and to be pronounced bat. So, too, the usual word for "going" was dun or du; but there was another word ara or ra with the same meaning, and when the latter was intended to be read the fact was pointed out by attaching the character which had the phonetic value of 7a to the ideograph which expressed the idea of "' going."

While the characters could thus be used as mere phonetic symbols, some few of them could be employed, on the other hand, for the language of the eye only. These were the determinative prefixes and affixes, such as the eight-rayed star, Which represented a deity, or the shaded circle, which denoted a country or place. Their original use

seems to have been to mark out those groups of characters which had to be read phonetically, and not as ideographs.

Like the lexicographers of China, the lexicographers of Acead attempted to classify and arrange the characters of their syllabary. Every character received a name of its own, so that literary works could be copied from dictation. A list of primary characters was first drawn up, each of which was named from the object it originally represented. The remaining characters were regarded as compounds, and divided into two classes. The first class consisted of characters which differed from the primary ones in having extra wedges, the second class of those that were really com- pounds. 'This classification of the syllabary must have been completed at a very remote date, since the analysis of many of the compound characters can only be explained by the forms they bear in archaic Babylonian, and in some cases even the archaic Babylonian forms are not sufficiently Primitive. We may gather from this some idea of the epoch to which the invention of the cuneiform system of writing reaches back,

The Transmission of the Cuneiform Characters.—As far

back as the second millennium p.c, Semitic tribes were in possession of a part of Chaldea. Duigi, the son and suc- cessor of the first Accadian monarch of whom we have contemporaneous record, has left us an inscription in which the cuneiform system of writing is adapted to the expression of a Semitic language. By the 17th century Bc. the Accadian language seems to have been wholly superseded by Semitic Babylonian and its northern dialect Assyrian. Along with other elements of civilization, the Semites received the cuneiform system of writing from their pre- decessors, and in the process of transmission the transfor- mation of the old picture-writing into a syllabary was com- pleted. The Accadian words represented by the characters when used as ideographs became phonetic values, and, since the same ideograph usually represented several differcnt words, almost every character was

polyphonous. It is true that some of these Accadian words, and even some of the phonetic values borne by the characters in Accadian, were rejected by the Semites, but on the other hand new pho- netic values attached themselves to a few of the characters derived from the Semitic pronunciation of the latter when employed ideographically. For the Semites continued to use the characters on occasions ideographically as well as syllabically.

A greater extension was also given to the employment of determinative prefixes; the name of an individual, for instance, is always preceded by an upright wedge, the names of a country and a city by the ideographs which stand for these two ideas. The reader was assisted towards knowing when a character was used as an ideograph by the employment of phonetic complements, that is to say, characters which denoted the last syllable of the word

intended to be read. Thus, when the ideograph a, to

conquer," is followed by the syllable wd, we may infer that it must be pronounced acsud, " I conquered," or some other person of the past tense of the same verb.

The real difficulty the cuneiform syllabary offers to the decipherer is not the polyphony of the characters, but one which would not have been felt by the Assyrians them- selves. Accadian and Assyrian phonology did not always agree, and in borrowing the Accadian system of writing the Assyrians had to adapt the sounds of their own language, as best they could, to the phonetic symbols of another. Consequently no distinction in writing is made between final 6 and p; g, c, and &; and d, dh, and t. Teth is inadequately represented sometimes by d, sometimes by ¢; and there is but one character for za (xr) and tsa (sy). No difference could be drawn between w and yz, and 7 aud y, while the representative of the consonantal ayu has to stand also for the diphthong é.

The Assyrians continued to follow the example of the Babylonians in writing on clay, but they also made use of papyrus and stone. This literature on clay is very exten- sive, and embraces every branch of

study known at the time. For an account of it see BaByLoniA, vol. iii. p. 191.

The learned court of Assur-bani-pal in the 7th century B.C, amused itself with essays in Accadian composition, the extinct language of primitive Babylonia standing in much the same relation to the Assyrians that Latin does to us. But literary Assyrian itself was fast becoming an artificial dialect. The Aramean alphabet was introduced into Nineveh at least as early as the Sth century B.c., and, though Nebuchadnezzar and his successors continued to employ the cuneiform syllabary, the conquest of Babylon by Cyrus was a blow from which the old mode of writing never recovered. The literary dialect and the characters in which it was inscribed were more and more disused, and finally disappeared altogether. Commercial tablets, how- ever, dated in the reigns of the earlier Arsacid princes,

have been found written in cuneiform, and if M. Oppert's identification is correct, a deed of sale, now in the Zurich museum, and written in cuneiform characters, is dated in the fifth year of Pacorus, the contemporary of Domitian.

The Assyrian syllabary was borrowed by the Armenians and Minnians of Lake Van in the reign of a certain king named Lutipri in the 9th century p.c. The characters both in form and use are identical with those of Nineveh, except that the Armenians rejected the polyphony of the Assyrian syllabary, and with one or two exceptions used each sign with one phonetic value only.

After the occupation of Armenia by the Aryans, the use of the cuneiform character seems to have been discontinued, aud no * Vannic " or Armenian cuneiform inscriptions are kuown to exist of later date than the 7th century B.c.

The example set by the Armenians seems to have been soon followed by their Turanian neighbours iu Media. The earliest specimens of the so-called Protomedic (or Amardian) syllabary are to be found in the

inscriptions of Mal-Amir and Sherif Khan. ‘The syllabary of Nineveh appears to have been again the source from which the new script was borrowed. As among the Armenians, polyphony was rejected, a few ideographs only were used, and a selected number of characters employed. The Protomedic tran- scripts of the Persian inscriptions are written in this syllabary. In Susiania or Elam the archaic Babylonian form of cuneiform continued in use up tv the last.

It was reserved for the Aryans of Persia to discover the ultimate capabilities of the cuneiform system of writing by reducing its characters to an alphabet of forty letters. These were divided into two classes, those with an inherent vowel a, and those which were followed by wandz At the same time all superfluous wedges were thrown away, and the forms of the characters thus simplified as much as their pronunciation. Dr Oppert has pointed out the prin- ciple upon which the formation of this new alphabet was carried out. Some one meaning was selected among those a character might bear when used as an ideograph, and this was rendered by its Persian equivalent. The initial sound of the latter was the alphabetic value henceforth

represented by the character. Thus amats “time of

life,” “Zaya in Persian, was contracted into ak and made to represent 2 (a, wv). A few ideographs were retained along with the alphabetic characters. The Persian cuneiform alphabet, called ‘ Assyrian letters” by Herodotus, seems to have been invented in the early part of the reign of Darius, and, being confined to monumental purposes, soon fell into disuse.

Possibly the reduction of the cuneiform syllabary into an alphabet was suggested by a previous acquaintance with alphabetic writing. In the Persian inscriptions the words are divided from one another by an oblique wedge. A similar division of words is found in one or two Assyrian inscriptions.

See Ménant, Le Syllabaire Assyrien, 1861-78 ; Sayce, Lectures upon the Assyrian Language and Syllabary, 1877. (A. H. 8.)

II. Semitic.

An account has already been given (see ALPHABET) of the derivation of the Phcenician alphabet from the hieratic alphabet of the Egyptian papyri of the middle empire. No early monuments written in it have as yet been found; the first known examples belong to a time when the alphabet had been widely spread and a literature had long existed. At this time we find the alphabet divided into two branches, the Pheenician and the Aramzean, the first being again subdivided into archaic and Sidonian. The last two are chiefly distinguished by the form of the wy, which is angular in the first and rounded in the second.

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The earliest inscription in the Phcenician alphabet known to us is the stele of Mesha, king of Moab, found at Dhiban and belonging to the 9th century B.c. In this Mesha relates that after the death of Ahab his god Chemogh enabled him to shake off the yoke of Israel, to drive the Gadites out of Ataroth, and to fortify Kir-hareseth, Aroer, ¥loronaim, Dibon, and other places, The language of the inscription differs only dialectically from Hebrew.

To the same form of the alphabet belong most of the Phoenician inscriptions on the engraved gems brought of late years from Assyria and Babylonia, among which may be mentioned a cone with the image of a " golden calf" and the names Shemaiah and Azariah (yn™ry }3 iynw), The Aramaic legends on the bilingual lion-weights of Nimrud, which date from the reign of Tiglath-Pileser IT, (745-727 B.c.) downwards, also belong to the same form of the alphabet. With these inscriptions may be classed the Pheenician inscription on a bow! lately restored by M, Clermont Ganneau, which mentions a King Hiram, and had been brought with other merchandise from Pheenicia to Cyprus, where it was found. Of later date are the graffiti scratched on the legs of the colossi at Abu-Simbel in Nubia by Pheenician travellers or mercenaries.

The most important monument of the Sidonian period of the Pheenician alphabet is the sarcophagus of Eshmun'azar, son of Tabnith

(?Tennes), “ king of the Sidonians,” which is probably of the 6th century B.c. It may, however, be later. The inscription upon it states that Eshmun’azar had restored the ruined temples of Sidon, and prays the gods to preserve to that city the possession of “ Dor, Joppa, and the rich corulands in the plain of Sharon.” Other note- worthy monuments of the same period are the so-called “Second Sidonian Inscription,” which records the installa- tion of a subordinate ‘king of Sidon” by a “ king of the Sidonians” of Phoenicia ; the inscriptions from Citium in Cyprus of King Pumyathon and his father Melecyathon in the 4th century B.c., as well as the bilingual Phcenician- Greek and Pheenician-Cypriote inscriptions from the same island, the Pheenician-Cypriote inscription of Melecyathon having furnished Mr George Smith with the key to the Cy- priote syllabary; together with six inscriptions from Athens and two from Malta; and the three inscriptions found by M. Renan at Umm’-el-Aw4mid on the Pheenician coast.

The numerous dedicatory inscriptions found on the site of Carthage are written in what is termed the Punic development of the Sidonian alphabet; all apparently belong to the Greek period. The most important Punic inscription is the tariff of sacrifices found at Marseilles in 1845, an abridged edition of which was discovered on the site of Carthage by Mr Davis in 1860. The regulations contained in it have a striking analogy to many of those of Leviticus. Its date, however, cannot be very early, since it makes no mention of human sacrifices. The Punic alphabet was the source of those of Numidia and Beetica, where inscriptions have been found.

The series of Aramean inscriptions begins with the dockets on Assyrian contract-tablets of the age of Tiglath- Pileser IL. and his successors, when Nineveh and Carchemish became the chief centres of tradein western Asia. To the same period may be assigned an interesting gem from Babylonia inscribed masay na nwpad, as well as the cylinder of the eunuch Achadban, son of Gebrod, from Babylonia, and the cone of HadrakiA, son of Hurbad, from Nineveh. As already observed, the inscriptions on the Assyrian lion-weights, though in the archaic Phoenician form of the alphabet, are Aramaic in language. Passing over the engraved stones of the Achemenian epoch, we may notice the

famous bronze lion of Abydos, belonging probably to the 5th century B.c,, on which an Aramaic legend is written. Of considerably later date is the inscrip-

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tion on an altar found by M. Mariette in the Serapeum, in characters which resemble those of the Aramzan papyri of Ptolemaic Egypt. 'The alphabet of the latter, however, is still more closely represented by certain f unereal monuments found in Egypt with Aramzan inscriptions, the best known of which is the inscription of Carpentras, which records the death of a priestess of Osiris.

Starting from the Ist century B.c., the ruins of Palmyra and Taiba have furnished us with a large number of inscrip- tions in the Aramaic dialect of the locality. MM. de Voeué and Waddington alone have discovered more than a hundred of them. Most of them are written in what may be termed uncial characters, but there are a few ina cursive hand. Among the persons mentioned in them is Odeinath (Odenatus), the husband of Zenobia. Palmyrene inscrip- tions have been met with in Africa and Rome, and a bilingual one (in Palmyrene and Latin) has lately been found at South Shields.

Professor Sachau has recently discovered two inscriptions in Old Syriac characters, one at Zebed, near Palmyra, accompanied by Greek and archaic Arabic transcripts, and the other among the early Christian tombs of Edessa,}

Passing over an Aramaic legend found by M. de Saulcy on a sarcophagus of the tombs of the kings at Jerusalem, and the coins of the kings of Edessa, we may notice the Mendaite inscription of twenty lines discovered in a tomb at Abu-Shadr in southern Babylonia, and first explained by Dietrich. It probably belongs to the 4th or 5th century. Inscriptions in Western Aramaic have been found in the Hauran. Among these is one ona tomb at Sueydeh, raised by Odeinath to his wife Hamrath in the time of Herod the Great, accompanied by a

Greek transcript. Six other inscriptions of the same period come from the temple of Siah; one of them is dedicated to the god Katsiu, the Zeus Kasios of the Greeks.

The Hauran, more particularly the neighbourhood of Bozra, bas also yielded a number of Nabathean inscriptions, written in a sort of Aramaic running hand. Nabathean inscriptions have further been found at Umm)' er-Russas in Moab, and at Petra, as well as on the coins of Aretas and other Nabathean princes. But they are specially numerous on the rocks of Sinai, where they were scratched by pilgrims in the 3d and 4th centuries of our era, and were first deciphered by Beer. They consist for the most part of proper names, preceded or followed by the word shdlom, "peace." The Aramaic dialect of these inscriptions is tinctured by Arabisms, among which may be mentioned the use of the article el. Two Nabathean inscriptions have been discovered at Pozzuoli, where, as we learn from the Acts, there was a Jewish colony.

The Nestorian Syrians carried their language and letters as far even as China, The celebrated inscription of Si- gan-fu is written in good Estrangelo of the 8th century. A Hebrew inscription has also been found at Khai-fong-fu.

Ancient Hebrew epigraphy is poorly represented. The earliest Hebrew inscriptions are three from Siloam, one of which is addressed to "Baal of the temple," a fragment found in the streets of Jerusalem by M. Vernes, and a boundary stone discovered by M. Ganneau near Gezer. The royal names on the pottery found near the foundations of Solomon's temple are not Hebrew, but Pheenician. The Maccabean period has left us several inscribed monuments and coins. "The oldest are the epitaph of eight members of the priestly family of Hezir (1 Chr. xxiv. 15) on the Doric tomb of St James at J erusalem, the beginning of an eae cme meas

} The inscription at Zebed was first noticed by Dr Bischoff. The letters seem to be derived from an Aramaic alphabet. Some of them resemble the enigmatical characters on gems from Diarbekir and the

neighbouring district, published by D : xxxi. 4 (1877), » published by Dr Mordtmann in the Z. D. M. G.,

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inscription on a monument to the north-west of Jerusalem, and an inscription on the sarcophagus found by De Saulcy in the tomb of the kings, which probably belongs to a female relative of Helen, queen of Adiabene, in the 1st century of our era. Other early inscriptions have been copied in Galilee, especially in the synagogues of Kefr- Bereim as well as in the Jewish catacombs on the Via Portuensis at Rome. From the 10th century onwards the Jewish cemeteries in Spain, Italy, the south of France, Turkey, and Egypt enable us to trace the history of Hebrew writing up to the close of the Middle Ages; and Professor Ascoli has lately drawn attention to the inscrip- tions in the Jewish cemetery of Venosa, which enable us to fill up the gap that had previously existed between the memorials of the 10th century and those of the 4th. We must not forget also the exorcisms, written in a dialect allied to that of the Mishna on bronze bowls found at Babylon by Sir A. H. Layard, or the sepulchral inscriptions collected by Firkowitz in a Karaite cemetery of the Crimea, dated sometimes from the creation, sometimes from the capture of Samaria. The latter belong to the 9th and following centuries, though the discoverer falsified the dates of many of them in order to assign them to an earlier period (sec Strack in the Z. D. M. G., xxxiv. 1, 1880). Hebrew inscriptions in ancient characters have further been met with from Tiflis to Derbend.

Arabic epigraphy begins with the rise of Islam. Two systems of writing were used concomitantly, the Cufic or uncial, and the Neski or running hand, neither of which, however, can be derived from the other. The earliest inscriptions yet known are two sepulchral ones, the first of which has been published by Wetzstein, Waddington, and De Vogué, while the other has lately been discovered by Sachau at Zebed. A Cufic inscription, dated 693 a.p., has been copied by De Vogué, at Jerusalem, and the old cemetery near Assuan contains a large number of similar inscriptions, some of which, as deciphered by Count Amari, contain the

names of the companions of the prophet. Unfortunately this cemetery has never been thoroughly examined. Mention may also be made of Cufic inscrip- tions at Bozra, in Sicily, and elsewhere. Inscriptions in Greek and Neski Arabic have been found at Damascus, Tiberias, and other places, one of which is dated 696 a.D., while others are even older.

Passing to the north, we find the rocks of the desert of Safa (south-east of Damascus) covered with graffiti written in peculiar characters which long defied decipherment. About six hundred and eighty of them have been copied. M. Halévy, however, has now succeeded in reading them (see Journal Asiatique, Jan.—Feb., 1877,and Z. D. M.G., xxxii. 1, 1878), and showing that they are mostly the productions of Thamudite soldiers in the Roman army. The alphabet turns out to be intermediate between the Phoenician and the Himyaritic. The Himyaritic is the name usually given to the form of the Phoenician alphabet used in southern Arabia. Here a considerable number of pre-Islamitic inscriptions have been found, belonging partly to the kingdom of Saba, partly to that of Ma'n or the Mineans, where a dialect allied to that of Hadramaut was spoken. Many of them contain the names of kings, while most make us acquainted with various deities, among others 'Athtar, the equivalent of Ashtoreth. The Him- yaritic alphabet was carried to Abyssinia, where it became the Ghe'ez or Ethiopic syllabary. The earliest specimens of Ethiopic writing are two inscriptions of King Tazéna copied by Riippell on the monuments of Axum, which belong to the 5th century.

Inscriptions in still undeciphered characters, some of which resemble those of the Himyaritic alphabet, though the larger number is more closely related to the demotic

and hieratic characters of Egypt, have been copied (in 1880) by Professor Robertson Smith on the rocks of Tuaif near Jeddah. (Compare the inscription from the neigh- bourhood of El-Wijh given by Wellsted, ii. 189.) Captain Burton has also found an inscription in characters not unlike the Himyaritic, in the Wady Intaysh, with which he compares two semi-Nabathean inscriptions from Wady Unayyid

copied by Dr Wallin, and an inscription at Mecca given by Dozy (The Gold Mines of Midian, 1878).

The inscriptions of the Semitic Babylonians and As- syrians are separately treated above. The curious Hittite hieroglyphics found of late years at Carchemish, Aleppo, Hamath, and various places in Ayia Minor do not seem to conceal a Semitic language.

See Fr. Lenormant, Essai sur la Propagation de VAlphabet phé- nicien dans Vancien Monde, 1872-75; KE. Renan, Histotre générale ct Systeme ecomparé des Langues Sémitiques, 1863 ; Gesenius, Scripture, Lingueque Pheniciz Monumenta, 1837; Schroder, Dic phinizische Sprache, 1869; De Vogué, Meélanges ad' Archéologie orientale, 1868. Clermont-Ganneau's work on the Aoabite Stone will supersede previous monographs. (A. H. 8.)

TIL. INDIAN.

The inscriptions of India arc very numerous and of great variety. They are found upon rocks, pillars, and build- ings, in caves, topes, and temples, and on plates of copper. These last are grants of land made by kings for religious purposes, and they are historically valuable because they coutain, not only the name of the grantor, but a more or less complete list of his predecessors. Implicit reliance cannot be placed on these documents. Vanity has some- times led to the invention of an illustrious ancestry. So far back as the old lawgiver Manu, punishments were denounced upon the forgers of grants, and plates that are palpable forgeries have been discovered.

The oldest and most important of the inscriptions are the religious edicts of King Piyadasi, who is styled Devdénam- prya, "the beloved of the gods." 'Their date is clearly proved to be about 250 Bc. This Piyadasi is now by universal consent admitted to be identical with the great, Maurya king Asoka, grandson of Chandra-gupta, whose identification by Sir W. Jones with Sandrakoptos or Sandracottus, the ally of Seleucus Nicator, is the corner- stone of that very tottering structure, Hindu chronology. The first published inscription of Piyadasi was copied from a stone column 42 feet high, and knownas the dt or

pillar of Ifroz Shah, a sultan who, about the middle of the 14th century, conveyed it to Delhi from a village in the hills about 250 miles distant, and re-erected it as an ornament to his capital. ‘The same monarch brought from Meerut and re-erected near his palace another similar column, but this was thrown down by an explosion in the year 1719, and, although it has lately been raised again, it is so much mutilated that scarcely half of the inscription remains. A copy of the inscription on the first of these columns was published by Captain Hoare in the Asiatic Researches in 1801. It was a subject of great curiosity and speculation, but it baffled all attempts to decipher it until the year 1837, when the acute sagacity of James Prinsep surmounted the difficulty.! This particular alphabet having been first

‘ He found the key to it by a very happy guess. He was engaged in copying some short inscriptions engraven upon the pillars of a temple at Sanchi, and he observed that, although each inscription was in the main different, all of them terminated with the same two letters. Knowing that devout Buddhists were in the habit of making votive offerings of pillars, rails, and ornaments to their temples, and of inscrib- ing upon them a record of the gift with the name of the donor, Mr Prinsep assumed that the oft repeated two letters represented the word dénam, “ gift,” and this surmise proved to be correct. He thus obtained the consonants d and n, and as the name preceding the word ddnam must necessarily be in the genitive case, this fact made him

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discovered on and translated from a Ld, or pillar inserip. tion, obtained the name of the “ Ldt alphabet,” but the name ‘Indian Pali” is now generally preferred.

The mystery of the alphabet being thus penetrated, the longer and more important rock inscriptions were taken in hand. ‘Two versions were then known, one at Girnar in Kathiawar, the other discovered and copied by Kittoe at Dhauli in Orissa, at the extreme opposite side of India, Dr Wilson of Bombay and Captain Postans furnished Prinsep

with copies of the former, and he collated the two versions. He then transliterated them in modern char- acters, and with the help of a pandit he rendered them

into English. Not long afterwards Prinsep's brilliant dis.

coveries were brought to a close by his untimely death in April 1840.

In the year 1836 M. Court, an officer in the service of Ranjit Singh, the ruler of the Punjab, made known the existence of a rock inscription at Kapur-di-giri, west of the Indus, and not very far from Attock. Subsequent explorations show that the rock is really situated in the village of Shahbdz-garhi. No copy was obtained until October 1838, when the traveller Masson most carefully and perseveringly made a calico stampage and an eye copy. These he presented to the Royal Asiatic Society, whose acute and laborious secretary, Edwin Norris, proceeded to make a reduced copy of the calicostampage. This inscrip- tion was not in the Lat character, but in that now known as the Bactrian Pali or Ariano-Pali, which bears strong indications of a Pheenician origin, The Lat alphabet or Indian Pali is written, like the character of the Sanskrit, from left to right ; the Ariano-Pali runs from right to left. This character had previously been found on the bilingual coins of the Greek kings of Bactria, the obverse of which bore a Greek legend, and the reverse had some letters which proved to be a rendering of the same in Ariano-Péli. Masson first detected the connexion between the two legends, and Prinsep following up his suggestion soon settled the value of several of the Ariano-Pali letters. Similar discoveries were made simultaneously by Lassen in Germany. 'The letters so discovered were available as keys for the interpretation of the Shéhbaz-garhi inscription, but only as keys, for the inscription contained many dubious and unknown characters, and, unlike the alphabet of the Indian Pali, it possessed numerous compound letters. It was in tle process of copying that Norris, like Prinsep, hit upon aclue. He remarked a frequently repeated group of letters, and he came to the conviction that these represented the words Devdénam-piya. He made known this opinion (J. 2. A. S&, viii. 303), and gave a copy ofa short separate part of the inscription to a young student, afterwards

Professor Dowson, who accepted the reading. Knowing that these words were the oft repeated title of Piyadasi in the Girndr inscription, Mr Dowson proceeded to make a comparison of the two and discovered their identity. The whole inscription eventually proved to be a third version of Asoka's edicts. In the year 1850 a fourth version was discovered and copied, though it was not made public, by Mr (now Sir Walter) Elliot, at Jaugada near Ganjam in Orissa, about 50 miles south of Dhauli. Lastly, a fifth copy was discovered by Mr Forrest early in 1860, at Khalsi, west of the Jumna, about 15 miles from Mastiri or Mussooree. The late Captain Chapman (J. 22. A, &., xiii. 176) brought from Ceylon a copy of a small fragment of rock inscription, and in this the words Devdnam-piya are distinct, but the copy was made by eye and is unintelligible. These inscriptions show the extent of Asoka's influence, if not of his direct empire. Their master of the letter s. He used this key with such ardour and success

that in the course of a month he was able to make a transliteration and translation of the whole inscription.

INDIAN. |

positions are Afghanistan, the foot of the Himalayas, the extreme east and west of the centre of India, and presump- tively Ceylon, where it is known from other sources that Asoka ruled. The inscription of Shahbaz-garhi is the only one in the Ariano-Pali character, the others are in the Lat or Indian Pali alphabet. The language of all of them is a Prakrit or a sort of Pali, the immediate descendant of Sanskrit, but bearing marks of a long process of detrition. There are dialectical differences in the different versions, and there are also divergences of spelling, as ldja=rdja, dipt =lipt, &e. The Khalsf inscription differs from the other Indian Pali versions in having two of the three dis- tinct sibilants of the Sanskrit, while the others have only one, The inscriptions at Girndr, Khalsf, and Shahbaz-garhi consist of fourteen distinct edicts; those at Dhauli and Jaugada omit three of them, but add two new ones, which, being written apart, are known as the "detached edicts." When Prinsep and his pandit made their translatious, they had before them only the two versions of Girndr and

Dhauli. On the publication of the Sha4hbaz-garhi version Professor H. H. Wilson made a comparison of the three, and brought out an amended translation which was certainly an improvement upon Prinsep's; but he was far from satisfied with his performance, and declared it ""'open to correction on every page." The learned and critical Burnouf subsequently studied them, and made fresh translations of parts, which again marked an advance, but he declared that 'personne ne peut se flatter d' arriver du premier coup a l'intelligence définitive de ces monumens difficiles." Professor Kern of Leyden has since worked upon them, and his method is turning the language back into Sanskrit and then translating into English. This process only carries out more systematically that of the previous translators. They all interpreted the inscriptions through Sanskrit, making use of such knowledge of Pali and the other Praékrits as they possessed or could acquire. The translations are acknowledged to be imperfect and unsatisfactory, and no great improvement can be expected through Sanskrit alone. The words vary greatly in form from their Sanskrit originals, and some changes of meaning and construction no doubt accompanied their alterations in form. Comparative philology, in tracing back the modern tongues of India through the Prakrits to the Sanskrit, will probably throw fresh light upon the language of the inscriptions, and make more perfect translations possible. All the known inscriptions of Asoka are now accessible to the student. General Cunningham, the Archzological Surveyor of Hindustan, has published the first volume of his Corpus Inscriptionum Indicarum, in which he has given carefully corrected facsimiles, with parallel translitera- tions, of the five versions and all published translations. Mr Burgess also has published an excellent collotype of the Girndr version, with transcriptions and translations, in his Archxological Survey of Kathidwér. Asoka was a convert to Buddhism, but his edicts bear few distinctive marks of that or any formal religion, and they are entirely free from vaunts of his power and dignity. They inculcate a life of morality and temperance, a practical religion, not one of rites and ceremonies. They proscribe the slaughter of animals, and they enjoin obedience to parents, affection for children, friends, and dependants, reverence for elders, Buddhist devotees, and Brahmans, universal benevolence, and unreserved toleration. They would seem to

have been set up at a time when there were few differences between Buddhists and Brahmans, and their apparent object was to unite the people in a bond of peace by a religion of morality and charity free from dogma and ritual. One of the edicts provides for the appointment of missionaries to spread the religion. The thirteenth edict refers to Asoka's foreign relations. It mentions the Greek king Antiochus,

and refers to some connexion through him with four other kings, Ptolemy, Antigonus, Magas, and Alexander, or, to quote the words of the Shahbdz-garhi version, " Antiyoke nama Yona-raja parancha tena Antiyokena chaturo ||| rajane Turamaye nama Antikini nama Maka nama Alikasandare nama." The four strokes are numerals, cqui- valents of the word chaturo (four), and in the Khalsi ver- sion the numerical sign used is+. Prinsep and his pandit gave a confused rendering of this edict, but no one elsc has attempted to translate it. There has becn some difference of opinion as to the identification of these Greek kings, but the most approved names are Antiochus Thcos of Syria, Ptolemy II. of Egypt, Antigonus of Macedonia, Magas of Cyrene, and Alexander II. of Epirus, 253-251 B.c.

Besides the five great inscriptions of Asoka, there are six other rock inscriptions consisting of single edicts, three of which, found at Sahsaram, Rupnath, and Bairat are the same, but the last is imperfect. Dr G. Bihler has trans- lated them. A second and different inscription at Bairat has been translated by Wilson, Burnouf, and Kern. These separate edicts are not found among the fourteen, but they are of similar style and spirit. Two of them have the dis- tinction of being dated thus: '256 [years have elapsed] since the departure of the Teacher," z.e., since the death of Buddha, the time of which has been variously assigned to 544 and 478 z.o, In these two edicts Asoka, after stating that he had been "a hearer of the law" more than thirty-two years and a half, adds, "I did not exert myself strenuously. But it is a yearand more that I have entered tle community of [ascetics]."

The pillars erected by Asoka would appear to have been numerous, but only a few now remain. Six of these, at Delhi (2), Allahabad, Lauriya (2),and Sanchi, are inscribed. Five of them present in a slightly variant form the text of a series of six edicts that were promulgated by Asoka in the twenty-seventh year of his reign, 2368.0. These pillar inscriptions, which are beautifully cut, are not repetitions of those on the rocks, but they are of similar purport. The pillars at Delhi and Allahabad have since been covered, wherever space was lcft, and even between the lincs of Asoka's inscription, with records and scribblings of later dates. The only one of consequence is the inscription of Samudra-gupta on the Allahabad pillar. The "iron pillar" of Delhi belongs to a later age, and its inscription is dated 1052 a.v.

In immediate succession to the rock and pillar inscrip- tions of Asoka come the inscriptions of the caves and rock- cut temples. There are caves in Bihar, Cuttack, and elsewhere with inscriptions showing that they were con- structed by Piyadasi or Asoka. Soon after thesc, about the 2d century A.D., come the caves at Khandagiri in Cuttack, over which there is an important but much defaced inscription. It records the construction of the caves by a king Aira of Kalinga, a convert from Brahman- ism to Buddhism, aud it gives glimpses of his religious and beneficent life that make its defacement a matter of especial regret.!. The letters of the inscriptions in the oldest caves show a slight departure from the forms of the Lat alphabet, and would seem to have been written from about the beginning of the Christian era to the 5th ccn- tury. The caves at Ajanta, Karlen, Kanhari, Nasik, and Junir are Buddhist, and contain many inscriptions, but most of these records are of no historical valuc, as tlicy simply commemorate the dedication of a cave, chamber, cistern, or some other votive gift, coupled with the name of the donor. The same observation applies generally to

1 Babu Rajendra Lal in vol. ii. of his Antiquities of Orissa, just pub- lished, has proposed some emendations of a few lines of Prinsep's ver- sion, but the rock is now in a worse condition than it was in Prinsep's time, and a full translation is hopeless.

the topes at Amardvati, S4nchi, and elsewhere. In the caves of Nasik there are some historical records, and the great cave-temple of Karlen is recorded to have been con- structed for an emperor named Devabhuti, by a foreigner called “ Dhanukakata ” or “ Dhinukakati,” which name is understood to represent Xenocrates. Ina Jain cave-temple at Badami there is an inscription of the Chalukya dynasty, dated in 578 a.p. The caves of Elephanta and Ellora are of a much later date. There have been many explorers of the caves and copyists of the inscriptions. Dr J. Wilson successfully interpreted some of the inscriptions, but Dr Stevenson has been the greatest decipherer. The letters of the inscriptions in the caves are often formed with a want of precision and distinctness, and the copies obtained are not always satisfactory, so the translations are open to some doubt, and are capable of improvement.

Soon after the inscriptions of Asoka we have those of the Turushka or Indo-Scythic kings Kanishka and Huvishka, the Kanerke and Ooerke of the bilingual coins, whose names are linked with a third as ‘“ Hushka, Jushka, and Kanishka” in the Kashmir chronicle called Raja Tarangini. Their inscriptions have been found in Afghanistan, in the Punjab, and in the hills, and as far east as Mathuré. With the exception of those at Mathura, they are in the Ariano- Pali character. They are all short; some consist of only six or seven words. The majority of the inscriptions are dated. The, Macedonian months are used, but there is no certainty as to the era, The word used is “ Samvatsara,” and, as there is an era so called, some maintain that they are dated iu that era, but as the word “samvatsara” means also year, it may imply a year of some unknown era or of a king’s reign. Their period is about the beginning of the Christian era. ‘The first inscription discovered was on a stone slab found by General Court in a large tope at Manikydla in the Punjab; the longest is one punched on a brass vase extracted by Masson from a tope at Wardak in Afghanistan. The former was discovered just before Prinsep’s death, but he did no more with it than picking out the king’s name as “ Kaneshm,” and conjecturing that the date figured xx9 signified cxx. General Cunningham subsequently interpreted the date as 446, and the title of the king correctly as “ Kanishka, maharaja of the Gushang tribe.” No further discoveries of

importance were made until the year 1862, when Mr Roberts obtained, at Hasan Abdal in the Punjab, a copper plate with five lines of inscription, which he sent to the Royal Asiatic Society. The letters on this plate were clearly written, and, when read by Professor Dowson, the record furnished the long desired key to the numeral system, for the date was given both in words and figures. The forms of the numerals had made Prinsep and others suspect a Roman influence, but the figure ? proved to be 10 and the x equivalent to 4. The inscription was a record made by a satrap named Liako Kusuluko of his having deposited a relic of Sakyamuni (Buddha) in an institution near Taxila. Before the pub- lication of the translation copies of this inscription were sent to India with the explanation of the date, and with a call for independent translations of the text. General Cunningham made a translation which was revised by Babi Rajendra Lal, and when brouglit together the versions were found to be in close agreement.

Professor Dowson succeeded in making out considerable portions of the Manikyala, Wardak, and other inscriptions, and found that all had reference to the deposit of relics. No progress has since been made in the interpretation of these inscriptions, although there is ample scope for further study. The Maniky4la inscription is dated in the year 18, and was made in the reign of Kanishka; the Wardak urn is dated in the year 51, and was inscribed in the reign of his successor Huvishka. There are other inscriptions, in

which the names of these kings appear, and the names of King Moga or Moa and of Gondophares have also been found. Several short inscriptions in this character owe their discovery to General Cunningham, who has been most persevering in his search and constant in his endeavours to interpret them. Another series of inscrip- tions of these Indo-Scythian rulers was obtained b General Cunningham from the ruins of the Buddhist temples and other buildings at old Mathura. These inscriptions are in the Indian Pali character and the Sanskrit language, and have been translated by

Professor Dowson. Several of them are dated “ Sam,” the common abbreviated form of Samvatsara. The earliest certain date is 44, and as one of the dates is as high as 280, it is clear that some era is intended. If it be the Samvatsara era, the dates range from 13 B.c, to 337 A.D. These inscrip- tions have two peculiarities in which they agree with the practice of the inscriptions in western India: instead of months they use the triple series of seasons, and the numerals are arbitrary symbols having little or no arith- metical relation to each other. The explanation of these figures has occupied the attention of Prinsep, Dr Steven- son, General Cunningham, Dr Bhau Daji, and Mr E, Thomas, and may be said to be accomplished. Some further inscriptions have since been found at Mathurd and translated by General Cunningham. The whole series furnishes the names of Kanishka, Huvishka, and Vasu- deva [BazoaHo of the coins], all of whom bear the arro- gant title Devaputra, “son of God.” One of the last discovered inscriptions is dated as early as the year 5.

About the period of the Indo-Scythians there was in Surdshtra, on the western coast of India, a dynasty of rulers who called themselves Kshatrapas or satraps, and-are known as the Sah or more properly Sinha kings. These have left someinscriptions commencing with their founder Nahapdna, but they are better represented by their coins, the legends on which are in the Indian Pali character. On some of the earlier ones the distinctive name of the king is given also in Ariano-Péli, An inscription in a cave at Nasik records its construction and dedication by Nahapéna. The most important of their inscriptions is that of Rudra Dama, the seventh king of the dynasty, dated in the year 72, but of what era is undetermined. This is engraven on the famous rock of Girndr near Jundgarh, the same as that on which the edicts of Piyadasi are inscribed. It is in Indian Pali, and was first deciphered by Prinusep. Since then the trans- lation has been revised by Professor Wilson, Dr Bhau Daji, and Professor Eggeling. It commemorates the repair of adam or embankment of the river Paldsini. Its most interesting passage records the fact that the same dam had been formerly repaired by “the Maurya raja Chandra- gupta,” the classical Sandrakoptos, and it is the only monumental mention known of that king. It also names Asoka specifically as “ Asoka Maurya,” not as

Piyadasi. Mr Burgess has published a fine collotype of this inscription in his Archeological Survey.

After the S4hs come the Guptas of Kanauj, a dynasty which must not be confounded with the Maurya dynasty of which Chandragupta (Sandrakoptos) was a member. The inscriptions of the Guptas are in a slightly advanced form of the Indian Pali. One, the first known, translated by Dr Mill, was inscribed by Samudra-Gupta on the old Asoka column at Allahabad, another is inscribed on the Asoka rock at Girndr, being the third on that rock. It records another repair of the Palasini dam by Skanda-Gupta, and a copy with a translation by Bhau Daji is published in Burgess's Survey. All the Gupta inscriptions are dated in the Gupta-kdla, the Gupta era, the epoch of which has long been and still remains a subject of dispute. Other inscrip- tions of this dynasty have been found at Mathura, on a

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GREEK. |

jillar at Bhitari in Ghaz{pur, at Sanchi, Eran, and other After the Guptas come the inscriptions of

laces. 1 who seeis to have succeeded them in Central

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dia. are Guptas were overthrown by the Vallabhi or Ballabhi

kings, the founders of Vallabli-pura in Kathidwar, who established themselves in the latter half of the 5th century ap. No monumental inscriptions of this dynasty have been discovered, but their copper grants are numerous, and fresh discoveries are constantly being made. Far down in the south the Kongu kings have left grants of the 4th century, and one of questionable authenticity corresponds in date to 188 a.p. In the Deccan reigned the great family of the Chalukyas, which in course of time divided into two branches. They reigned from the 5th to the 19th century A.D., and their inscriptions, especially their copper

grants, are very numerous. Sir Walter Elliot made the history of this dynasty his especial pursuit, and suc- ceeded in collecting and epitomizing some hundreds of inscriptions. Mr Burgess, the archeological surveyor of western India, and other explorers are constantly making fresh discoveries of inscriptions relating to the Chalukyas and other dynasties of the west and south; and these are quickly translated by the indefatigable Mr Fleet, Mr Rice, Dr Burnell, and other busy translators. Many other dynasties have left copper plate inscriptions which cannot be here described, and a mere list would be of greater length than value. The inscriptions are found in all parts of the country, and date from the early periods above stated until the establishment of the Mahometan rule. They are almost all in Sanskrit, but in the south inscriptions are found in Tamil and Old Canarese. Through all of them the gradual change of the letters from the old Indian Pali to the modern forms is distinctly traceable. Mr Rice has published a thick volume of inscriptions discovered in Mysore, and the pages of the Jndian Antiquary add every month to the store. A very handsome volume of photo- graphs of inscriptions has been prepared by Mr Fleet at the expense of the Government, but only ten copies have been made.

The inscriptions of the Mahometans in India are also numerous. They are either in Arabic or in Persian, and are often engraved witli exquisite skill and grace. Some celebrate victories, but most of them record the erection of mosques, palaces, tombs, and other edifices. These inscrip- tions are occasionally valuable in settling dates, but as the Mahometans are good historians their inscriptions are of less importance than those of their Hindu predecessors, who did not write history. GB”)

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_ Etymologically the term inscription (érvypag¢y) would include much more than is commonly meant by it. It would include words engraved on rings, or stamped on coins,} vases, lamps, wine-jar handles,2 &c. But Boeckh was clearly right in excluding this varia supellex from his Corpus Inscriptionum Grecarum, or only admitting it by way of

appendix. Giving the term inscription a somewhat narrower sense, we still include within it a vast store of documents of the greatest value to the student of Greek civilization, It happens, moreover, that Greek inscriptions yield the historian a richer harvest than those of Rome.

1 The legends on coins form part of numismatics, though closely connected with inscriptions.

The amphore which conveyed the wine and other products of vari- ous localities have imprinted on their handles the name of the magis- trate and other marks of the place and date. Large collections have been made of them, and they repayinquiry. See Dumont, Inscriptions

Céramiques, 1872: Paul Beck Henkelinschrift Leipsi ted 1862, 14 Hs ede ecker, lZenkelinschriften, Leipsic, pt. i,

PHSB CRIP TIONS

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Partly from fashion, but partly from the greater abundance of the material, the Romans engraved their public documents (treaties, laws, &c.) to a large extent on bronze. These bronze tablets, chiefly set up in the Capitol, were melted in the various conflagrations, or were carried off to feed the mint of the conqueror.

marble, and made it the natural material for inscriptions. Some Greek inscribed tablets of bronze have come down to us,? and many more must have perished in the sack of cities and burning of temples. A few inscriptions on small thin plates of lead, rolled up, have survived; these are chiefly imprecations on enemies* or questions asked of oracles.©> Butas a rule the material employed was marble. These marble monuments are often found zz situ; and, though more often they were used up as convenient stones for building purposes, yet they have thus survived in a more or less perfect condition.®

Inscriptions were usually set up in temples, theatres, at Place of

the side of streets and roads, in rewévy or temple-precincts, and near public buildings generally. At Delphi and Olympia were immense numbers of inscriptions,—-not only those engraved upon the gifts of victorious kings and cities, but also many of amore publio character, At Delphi were inscribed the decrees of the Amphictyonic assembly, at Olympia international documents concerning the Felopon- uesian cities; the Parthenon and Acropolis were crowded with treaties, laws, and decrees concerning the Athenian confederation ; the Hereum at Samos, the Artemisium at Ephesus, and indeed every important sanctuary, abounded with inscriptions. It is a common thing for decrees (Ynpicpara) to contain a clause specifying where they are to be set up, and what department of the state is to defray the cost of inscribing and erecting them, Sometimes dup- licates are ordered to be set up in various places; and, in cases of treaties, arbitrations, and other international documents, copies were always set up by each city con- cerned. Accordingly documents like the Marmor Ancy- ranum and the Edict of Diocletian have been restored by a comparison of the various fragments of copies set up in diverse quarters of the empire.

Greek inscribed marbles varied considerably in their Forms of

external appearance. The usual form was the or7An, the normal type of which was a plain slab, from 3 to 4 or even 5 feet high,' 3 or 4 inches thick, tapering slightly upwards from about 2 feet wide at bottom to about 18 inches at the top, where it was either left plain or often had a slight moulding, or still more commonly was adorned with a more or less elaborate pediment; the slab was otherwise usually plain. Another form was the Buwpds or altar, sometimes square, oftener circular, and varying widely in size. Tombstones were either orjAax (often enriched beneath the pediment with simple groups in relief, com- rnemorative of the deceased), or xdoves, pillars, of different size and design, or sarcophagi plain and ornamental. To these must be added statue-bases of every kind, often inscribed, not only with the names and honours of

8 H.g., treaty between Elis and the Herzans, about 500 B.c., from Olympia (Boeckh, C. 7. G., 11); a similar bronze from Olympia, recently discovered (Archdol. Zeitung, 1877, p. 196); a similar bronze

treaty from the Locri Ozole (Rangabé, Ant. Hellén., 3566); bronze plate from Dodona, recording the victory of Athens over the Lacede-monians in a sea-fight, probably 459 B.c. (Archdol. Zeitung, 1878, Bh MY)

4 See Franz, Elem. Epigr. Gr., p. 168, &e.

> See Karapanos, Dodone et ses ruines. ‘

8 What was done by Themistocles under stress of public necessity (Thucyd., i. 93) was done by others with less justification elsewhere 5 and from Byzantine times onward Greek temples and inscriptions were found convenient quarries. 4

7 It appears from Cicero, De Legibus, ii. 26, 27, that the size of Athenian gravestones was limited by law. XII G

In Greece, on the contrary, the Materials mountains everywhere afforded an inexhaustible supply of for them.

individuals, but also with decrees and other documents.

All these forms were intended to stand by themselves in

the open air. But it was also common to inscribe state documents upon the surface of the walls of a temple, or

other public building. Thus the cella-walls of the temple

of Athena Polias at Priene were covered with copies of the

awards made concerning the lands disputed between Samos

and Priene (C. J. G., 2905, and infra) ; similarly the

walls of the Artemisium at Ephesus contained a number of decrees (Wood’s Lphesus, appendix), and the proscenwm of

the Odeum was lined with crustx, or “‘ marble-vencering,”

under 1 inch thick, inscribed with copies of letters from Hadrian, Antoninus, and other emperors to the Ephesian

people (Wood, bed, p. 44). The workmanship and appearance of inscriptions varied considerably according to

the period of artistic development. The letters incised

with the chisel upon the wall or the or7An were painted

in with red or blue pigment, which is often traceable

upon newly unearthed inscriptions. When Thucydides, in quoting the epigram of Pisistratus the younger (vi. 54),

says, “it may still be read dpvdpois ypdppact,” he must

refer to the fading of the colour; for the inscription was brought to light in 1877 with the letters as fresh as when

they were first chiselled (see Kumanudes in ’A@yvator, vi,

149; Corpus Inscr, Att., suppl. to vol. i. p. 41). The Greeks found no inconvenience, as we should, in thie bulkiness of inscriptions as a means of keeping public records. On the contrary they made every temple a muniment room; and while the innumerable o77Aa, Hermex, bases, and altars served to adorn the city, it must

also have encouraged and educated the sense of patriotism

for the citizen to move continually among the records of

the past. The history of a Greek city was literally written

upon her stones.

Value of inscrip- tions.

The primary value of an inscription lay in its documen- tary evidence (so Euripides, Suppl. 1202, foli.). In this way they are continually cited and put in evidence by the orators (e.g.,see Demosth., als. Leg., 428 ; Alschin., In Ctes., § 75). But the Greek historians also were not slow to recognize their importance. Herodotus often cites them (iv. 88, 90, 91; v. 58 sg.; vii. 228); and in his account of the victory of Platea he had his eye upon the tripod-inscription (ix. 81; cf Thuc, i. 182). Thucydides's use of inscriptions is illustrated by v. 18 foll., 23, 47, 77; vi. 54, 59. Polybius used them still more. In later Greece, when men's thoughts were thrown back upon the past, regular collections of inscriptions began to be made by such writers as Philochorus (300 3.c.), Polemo (2d century B.c., called ornAoxdéras for his devotion to inscriptions), Aristodemus, Craterus of Macedon, and many others. At the revival of learning, the study of inscriptions revived with the renewed interest in Greek literature. Cyriac of Ancona, early in the 15th century, copied a vast number of inscriptions during his travels in Greece and

Modern collec- tors and editors,

Asia Minor; his MSS. collections were deposited in the |

Barberini library at Rome, and have been used by other scholars. at Athens, vol. i.) Succeeding generations of travellers and scholars continued to collect and edit, and Englishmen in both capacities did much for this study.

Thus early in this century the store of known Greek in- scriptions had so far accumulated that the time had come for a comprehensive survey of the whole subject. And it was the work of one great scholar, Augustus Boeckh, to raise Greek epigraphy into a science. At the request of the Academy of Berlin he undertook to arrange and edit all the known inscriptions in one systematic work, and vol. i. of the Corpus Inscriptionum Grecarum was published in 1828, vol. ii, in 1833. He lived to see the work completed, al-

Py eCBRLeETLORs

though other scholars were called in to help him to execute his great design ; vol. iv., by Kirchhoff, in 1856." sa of lucid arrangement, profound learning, untiring industry, and brilliant generalization. Corpus there grew upa new school of students, who devoted themselves to discovering and editing new texts, and working up epigraphical results into monographs upon the many-sided history of Greece. settled for ever the methods of Greek epigraphy; and in his Staatshaushaltung der Athener (well known to English readers from Sir G. C. Lewis's translation, Zhe Public Economy of Athens, 2d ed., 1842) he had given a palmary specimen of the application of epigraphy to historical studies. introduction to the study of inscriptions in his Hlementa

(See Bulletin of the French archeological school |

[GREEK,

vol, iii, by Franz, appeared in 1853; The work is a masterpiece

Out of the publication of the

In the Corpus Boeckh had

At the same time Franz drew up a valuable

Epigraphices Grace (1840).

Meanwhile the liberation of Greece and increasing facilities for visiting the Levant combined to encourage the growth of the subject, which has been advanced by the labours of many scholars, and chiefly Ludwig Ross, Leake, Pittakys, Rangabé, Le Bas, and later by Meier, Sauppe, Kirchhoff, Kumanudes, Waddington, Together with the development of this school of writers, there has gone ona systematic exploration of some of the most famous sites of antiquity, with the result of exhuming vast numbers of inscriptions, Cyrene, Halicarnassus, Cnidus, Priene, Rhodes, and Ephesus have been explored by the English ; Athens, Eleusis, and Dodona by the English and the Greeks; Olympia by the Greeks and Germans; Cyprus by General Cesnola; Delphi and Delos by the French; and Pergamos by the Germans. A German and a

French institute have been established at Athens, chiefly engaged in the study of inscriptions, And still the work proceeds at a rapid rate. For indeed the yield of inscriptions is practically inexhaustible: each island, every city, was a separate centre of corporate life, and it is significant to note that in the island of Calymnos alone Mr Newton collected over one hundred inscriptions, many of them of considerable interest.

The result of this has been that Boeckh's great work, though it never can be superseded, yet has ceased to be what its name implies. The four volumes of the C. J. @. contain about 10,000 inscriptions. But the number of Greek inscriptions now known has been estimated at 20,000 or 30,000. Many of these are only to be found published in the scattered literature of dissertations, or in Greek, German, and other periodicals. But several comprehensive collec- tions have been attempted, among which may be named— Rangabé, Antiquités Helléniques, 2 vols., 1842-1855; Keil, Sylloge Inscriptionum Booticarum, 1847; Kumanudes, 'Arrixhs errypaal erirdBro1, 1871; Le Bas, VoyageArchéo- logique, vols, i.—iii., in course of continuation by M.Wad- | dington ; Greek Inscriptions in the British Musewm, edited by C. T. Newton, pt. i, " Attika," by E. L. Hicks, 1874; and above all the Corpus Inscriptionum Atticarwm, under- taken by the Berlin Academy, of which there have already appeared. vol. i, by Kirchhoff, 1873 (with supplement, by the same, 1877); vol. ii. pt. 1, by Kohler, 1877 ; vol. ii. pt. 1, by Dittenberger, 1878,

The oldest extant Greek inscriptions appear to date from the olde middle of the 7th century B.c. During the recent excavations at Gree Olympia a number of fragments of very ancient inscriptions have insct! ! been found, which have been published in the recent numbers of tions. the Archtiologische Zeitung (1878-1880). But what is wanted is a if sufficient number of very carly inseriptions of fixed date. One such exists upon the leg of a colossal Egyptian statue at Abu-Simbel on the upper Nile, where certain Greek mercenaries in the service a f

1 An index to the four volumes was long wanting ; it was at length completed and appeared in 1877.

river up to the second cataract (C. I. G., 5126). Even if Psam- inetichus II. is meant, the inscription dates between 594 and 589 .c, Documents earlier than the Persian war are not very frequent ; but after that period the stream of Greek inscriptions gocs on, gene- rally increasing in volume, down to late Byzantine times.

Greek inscriptions may most convenicntly be classified under the

following heads :—(1) those which illustrate political history ; (2)

those connected with religion ; (3) those of a private character. 1. Foremost among the inscriptions which illustrate Greek history

. and politics are the decrecs of senate and people (Wydicnara Bovis,

2 tae. &c.) Upon every subject which could concern the interests ee otaie. thew ae em every part of Greece. Itis true that a large number of them are honorary, 4. €., merely decrees granting public honours (crowns, statues, citizenship, and othcr privileges) to strangers who have done service to the particular city. But the importance of an honorary decree depends upon the individual and the services to which it refers. And even the mere headings and datings of the decrecs from various states afford curious and yaluable information upon the names and titles of the local magis- trates, the names of months, and other details. Droysen in his Hellenismus (1877-78) has shown how the history of Alexander and his successors is illustrated by contemporary yypiouara. And whicn the student of Athenian politics of the 5th and 4th centuries turns to the 2d volume of the C. J. 4., he may wonder at the abundance of material before him ; it is like turning over the minutcs of the Athenian parliament. One example out of many must suffice :—No. 17in C. I. A., ii. pt. 1, is the famous decree of the archonship of Nausinicus (378 B.C.) concerning the reconstruction of the Athenian confederacy. The terms of admission to the league occupy the face of the marble; at the bottom and on the left edge are inscribed the names of states which had already joined.

Inscribed laws (vduor) occur with tolerable frequency. The following are examples :—A citation of a law of Draco's from the mparos kw of

Solon's laws (. LAs, d, O1 5 of. Eicriees, ii. p. 27); a reassessment of the tribute payable by the Athenian allies in 425 zo. (0. Z. A, i. 87; Kohler, Urkunden wnd Untersuchungen zur Geschichte des Delisch-attischen Bundes, 1870, p. 63); a law passed by the Amphictyonic council at Delphi, 380 B.c. (Boeckh, C. I. G., 1688; 0. f. A., ii. 545); law concerning Athenian weights and measures (Boeckh, Staatshaushaltung, vol. il. p. 3856; C. I. G., 128); the futile sumptuary law of Diocletian concerning the maximum prices for all articles sold throughout the empire (Waddington, Ldit de Diocléticn, 1864; Mommsen, C. J. Lat., vol. iii. pt. 2, 801 sq.).

Besides the inscribed treatics previously referred to, we may in- stance the following :—Between Athens and Chalcis in Eubcea, 445 zc. (C, J, A., suppl. to vol. i., 27a); between Athens and Rhegium, 433 B.c. (C. L. A., i. 83, and suppl. zbid., p. 138); between Atlicns and Leontini, dated the same day as the preceding (C. J. A., suppl. to vol. i., 88a); between Athens and Beotia, 395 B.c. (C. I. A., ii. 6); between Athens and Chalcis, 378 B.c. (ibid., p. 398); between Athens and Sparta, 271 3.o. (C. ZL. A., ii. No. 332); between Hermias of Atarneus and the Ionian Erythre, about 350 B.c. (Le Basand Waddington, Voyage Arch., iti. 1536a) ; treaties in the local dialect between various cities of Crete, 3d century B.c. (C.J. G., 2554-6; Rangabé, Ant. Hellén., 2478 ; Hermes, iv. 266). Egger's Etudes historiques sur les traités publics chez les Grees et chez les Romains (Paris, 1866) embraces a good many of these documents.

The international relation of Greek cities is further illustrated by awards of disputed lands, delivered bya third city called in (Zexantos wéds) to arbitrate between the contending states, ¢g., Rhodian award as between Samos and Priene (C. J. G., 2905; Le Bas and Wadd., Voy. Arch., iii. No. 189 sq.) ; Milesian between Messenians and Spartans, recently discovered at Olympia (Arch. Zeit., 1876, p. 128; see Tac., Ann. iv. 48); and many others. Akin to these are decrees in honour of judges called in from a neutral city (fevndy Sixaorhptov): to try suits between citizens which were complicated by political partisanship (see C. 7. G., No. 2349, and Bocckh's remarks).

Letters from kings are frequent; as from Lysimachus to the Samians (C. J. G., 2254); from Antigonus I. directing the transfer of the population of Lebedus to Teos (Le Bas-Wadd., Voy. Arch., iii.

0. 86). Letters from Roman emperors are commoner still; such as C, I. G., 3175, 3176, 3178, 3834.

The internal administration of Greek towns is illustrated by the minute and complete lists of the treasures in the Parthenon of the time of the Peloponnesian war (Boeckh, Staatshaush., vol. ii.); public accounts of Athenian expenditure (ibid.) ; records of the Athenian navy in the 4th century, forming vol. iii. of the same work. The management of public lands and mines is specially illustrated from inscriptions (ibid. , vol. i. passim) ; and the political constitution of

ferent cities often receives light from inscriptions which cannot be gained elsewhere (¢.g., see the document from Cyzicus, C. I. G. 3665, and Boeckh's note).

Inscriptions in honour of kings and emperors are very common. The Marmor Ancyranum has already been mentioned; but an Fra example is the Monwmentum Adulitanum (from Abyssinia,

- 1. G., 5127) reciting the achicvements of Ptolemy Euergctes I.

Offerings in temples (4va@fuara) are often of great historical value, e.g., the helmet of Hiero, now in the British Museum, dedicated at Olympia after his victory over the Etruscans, 474 B.c. (C. Z. G., 16) ; and the bronze base of the golden tripod dedicated at Delphi after the victory of Plata, and carried off to Constantinople by Constan- tine (Dethier und Mordtmann, Epigraphik von Byzantion, 1874).

2. The religion of Greece in its external aspects is the subject of Reli-

a great number of inscriptions. The following are a few specimens. gious (1) Institution of festivals, with elaborate ritual directions—see jnscrip- Sauppe, Die Mysterieninschrift aus Andania, 1860, and the singular tions. document from the Ephesian theatre, in Wood's

Ephesus, appendix vi. 1; the following also relate to festivals—C. J. G., 1845, 2360, 2715, 3059, 3599, 3641b. (2) Laws defining the appointment, duties, or perquisites of the pricsthood—C. £. G., 2656; Staats- haush., ii. p. 121 sq. (8) Curious calendar of sacrifices from Myconus, "AOhvatov, li. p. 237. (4) Fragment of augury rules, Ephesus, 6th century B.c., C. I. G., 2958. (5) Leases of rewevy and sacred lands—CO. I. G., 108, 104, 2693d, 2694; Le Basand Wadd., Voy. Arch, ili. No. 415, &c. (6) Imprecations written on lead, and placed in tombs or in temples—Franz, El. Epigr. Gr., p. 168; Newton, Cnidus, Halicarnassus, and Branchidx, pl. 7,18. (7) Oracles are referred to—C. I. G@., li. p. 1091 (Ross, Archdol. Aufs., p. 495); C. I. G., 2717. (8) Among the inscriptions from Delphi few are more curious than those relating to the enfranchisemeut of slaves under the form of sale to a god (see Foucart, Sur U'affranchissement des esclaves par forme de vente, &e., Paris, 1857). This catalogue might be enlarged indefinitely.

3. There remain a large number of inscriptions of a more strictly Private

private character. The famous Parian marble (C. I. G., 2874) falls inscrip- under this head ; it was a system of chronology drawn up, perhaps tions. by a schoolmastcr, in the 3d century B.c. The excessive devotion of the later Greeks to athletic and other competitions at festivals is revealed by the numerous dedications made by victorious competi- tors who record thieir successes (see C. I. G., passim). The dedica- tious and honorary inscriptions relating to the Ephebi of later Athens (which occupy half of C. 7. A., iii. pt. 1), dreary as they seem, have yet thrown a curious light upon the academic life of Roman Athens (see A. Dumont, Essai sur U'Ephébie Attique); and from these and similar late inscriptions the attempt has been made to construct Fasti of the later archons (Dumont, Essai sur la chronologie des Archontes Athéniens, 1870; R. Neubauer, Commeniationes Epi-graphicx, 1869 ; Westermann in Pauly's Real-Encyclopéidie, vol. i., new ed., s.v. Archontes). The sepulchral monuments have been beautifully illustrated in Stackelberg's Gitiber der Hellenen (cf. Pervanoglu, Die Grabstcine d. alt. Griechen, Leipsic, 1863). Some of the most interesting cpitaphs in the C. Z. G@. are from Aphro- disias and

Smyrna. Kumanudes's collection of Attic epitaphs has been mentioned above; they yielda good deal of information about the Attic demes, and some of them are of high importance, e.g., the epitaph on the slain in the year 458 B.c. (C. J. G., 165), and on those who fell before Potideea(C. I. A., i. 442). Closely connected with sepulchral inscriptions is the famous " Will of Epicteta" (C. I. G., 2448). It was also customary at Athens for lands mort- gaged to be indicated by boundary-stones inscribed with the names of mortgager and mortgagee, and the amount (Franz, £7, Epigr. Gr., p. 168, 388) ; other 8po: are common enough.

The names of sculptors inscribed on the bases of statues were col- lected in 1871 by G. Hirschfeld (Zitwli Statwariorum Seulptorum- que); but since then the number has been greatly increased by excavations at Olympia and elsewhere. In most cases the artists are unknown to fame. Among the exceptions are the names of Pythagoras of Rhegium, whom we now know to have been a native of Samos (Arch. Zeit., 1878, p. 82), Polyclitus the younger (Arch. Zcit., 1878, p. 12), and Peonius of Mende, who sculptured the marble Nike at Olympia (Arch. Zeit., 1875, p. 178). ;

The bearing of inscriptions upon the study of dialects is very Study of obvious. A handy collection has been made by Cauer (Delectus dialects. Inscr. Gr., Leipsic, 1877) of the pene inscriptions illustrating this subject ; and the dialect of the Athenian dramatists has been illustrated from inscriptions by Wecklein (Cura# Epigr. ad Gram- maticam Greecam ct Poctas scenicos pertinentes, Leipsic, 1869).

The date of inscriptions is determined partly by the internal evi- Date of dence of the subject, persons, and events treated of, and the charac- inscrip- ter of the dialect and language. But the most important evidence tions. is the form of the letters and style of execution. Much of this evi- dence is of a kind difficult to appreciate from a mere description. Yet—besides the Boverpopniddv writing of many early documents- we may mention the contrast between the stiff, angular characters which prevailed before 500 or 450 B.c, and the graceful yet simple forms of the Periclean age. This development was part of the general movement of the time. Inscriptions of this period are usually

written croxnddr, t.c., the letters are in line vertically as well as horizontally. From the archonship of Euclides (4038 3.c.) onwards, the Athenians adopted the fuller alphabet which had obtained in Ionia since the 6th century. Before 403 B.c. ¢ and y were expressed in Attic inscriptions by XS and #2, while E did duty for 7, «, and sometimes et, O foro, ov, and w,—H being used only for the aspirate.

Collee- tions of marbles,

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The documents of Lycurgus's administration are recognized by their small, neat characters, very carefully inscribed. The Macedonian period betrays a falling off in neatness and firmness of execution, — the letters being usually small and scratchy, excepting in inscrip- tions relating to great personages, when the characters are often very large and handsome. At this time came in the use of apices as an ornament of letters. These tendencies increased during the period of Roman dominion in Greece, and gradually, especially in 'Asia Minor, the dota adscriptwin was dropped. The Greek characters of the Augustan age indicate a period of restoration ; they are uniformly clear, handsome, and adorned with apices. Under the empire the characters fast degenerated, combining increased orna- ment with less delicacy of execution. In the 2d or 8d ceutury, if not earlier, the circular and square sigma (C, [) occur, together with the circular epsilon (€). There are a good many pretty in- scriptions under the Antonines ; but later the writing grows more coarse and elumsy until Byzantine times, when the forms appear barbarous indeed beside an inscription of the Augustan or even

Antonine age.

The finest collections of inscribed Greek marbles are of course at Athens. There are also good collections, public and private, at Smyrna and Constantinople. The British Museum contains the best collection out of Athens (now being edited) ; the Louvre contains a good many (edited by Frohner, Les inscriptions Grecques du muséc du Louvre,

1865); the Oxford collection is very valuable, and fairly large ; and there are some valuable inscriptions also at Cambridge.

The following essays give good outlines of the whole subject :—Boeckh, C.J. G., preface to vol. i.; Westermannin Pauly's Real-Encyel., 8, v. Inscriptiones ; Egger, " Des collections d' inscriptions Grecques " in Journal des Savants, 1871; C. T. New- ton, Essays on Art and Archeology. 1880, p. 95, 209. Besides the works already quoted, the following should be mentioned :—Boeckh's Kleine Schriften ; Wescher-Foucart, Jnscriptions recuetllies & Delphes, 1863 ; Miehaelis, Der Parthenon ; Wad- dington, Fastrs des Provinces Asiatiques, part i., 1872. and Ifémoire sur la chron- ologie de la vie du rhéteur Aristide; Kirchhoff, Studien zur Geschichte der griechischen Alphabets, 1867; Keil, Specimen Onomatologi Greci, 1840, and Analecta Epigraphica et Onomatologica, 1842 ; C. Curtius, Studien und Urkunden zur Geschichte von Samos, Liibeck, 1877; Meier, De proxenia, 1843, and Die Pri- vatschiedsrichter und die dffentlichen Dititeten Athens, Halle, 1846; Bétant, An fuerint apud Gracos judices certi litibus inter ctvitates componendis, diss. inaug , Berl., 1862; Foucart, Des Associations Religieuses chez les Grecs, Paris, 1873 ; Liiders, Die Dionysischen Kunstler, Berl,, 1873, (E. L. H.)

V. Roman.

I. Roman Inscriptions (by which general name are de- signated, in classical archeology, all non-literary remains of the Latin language, with the exception of coins, letters and journals) fall into two distinct classes, viz. (1) those which were written upon other objects of various kinds, to denote their peculiar purpose, and in this way have been preserved along with them; and (2) those which them- selves are the objects, written, to be durable, as a rule, on metal or stone. The first class is that of inscriptions in the stricter sense of the word (styled by the Romans éztulz, by the Germans Aufschriften) ; the second is that of instru- ments or charters, public and private (styled by the Romans first leges, afterwards instrumenta or tabule, and by the Germans Urkunden).

No ancient Latin authors have professedly collected and explained or handed down to us Roman inscriptions. Some of the orators and historians, such as Cicero, Livy, Pliny the elder, and Suetonius among the Latins, and Polybius, Dionysius of Halicarnassus, and Josephus among the Greeks, occasionally mention inscriptions of high historical interest. A few grammarians, as for example, Varro, Verrius Flaccus, and Valerius Probus of Berytus, quote ancient words or formule from them, or explain the abbreviations used in them. Juridical instruments, laws, constitutions of emperors, senatus consulta, and the like appear here and there in the various collections of Roman jurisprudence.

Inscriptions (in the wider sense, as we shall henceforth call them without regard to the distinction which has been drawn) have been found in nearly every centre of ancient Roman life, but, like many other remains of antiquity, only seldom in their original sites. The great mass of them has to be sought for in the large European museums of ancient art, and in the smaller local collections of ancient remains which occur nearly everywhere in the European provinces of the former Roman empire, as well

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as in the north of Africa, and also here and there in Asia Minor.

Only those copies of inscriptions are to be received with full confidence which are furnished by experienced and well-equipped scholars, or which have been made with the help of mechanical methods (casts, photographs, moist and dry rubbings), not always applicable with equal success but depending on the position and the state of preserva. tion of the monuments.! From the first revival of classical] learning in the Carolingian age, attention was paid anew by pilgrims to Rome and other places worth visiting, fp epigraphic monuments also. In the time of the Renaissance from the end of the 14th century downwards, some a the leading Italian scholars, like Poggio and Signorili, and the antiquarian traveller Cyriacus of Ancona, collected inscriptions, Greek and Latin.? In the 15th century large collections of the inscriptions of all countries, or of limited districts, were made by Giovanni Marcanova, Fra Felice Feliciano, Fra Michele Ferrarino, Fra Giocondo the archi- tect of Verona, Marino Sanudo the Venetian polyhistor, and others. At the end of the 15th and the beginning of the 16th, the first printed collections can be recorded (Spreti's for Ravenna, 1489; Peutinger's for Augsburg, 1508 ; Huttich's for Mainz, 1520; Francesco degli Alber- tini's for Rome, printed in 1521 by Jacopo Mazochi), while during the same century, a long list of epigraphic travellers, like Pighius, Rambertus, and Accursius, or antiquarian collectors, like Sigonius, Panvinius, Antonius Augustinus with his collaborators

Ursinus and Metellus, and many others, were busy in augmenting the stock of epigraphic monuments. The series of printed epigraphic Corpora begins with that of Apianus (Ingolstadt, 1534), the only one arranged in geographical order, and is con- tinued in those of Smetius (1558, but edited only after the author's death by Justus Lipsius, 1588), Gruter (with Joseph Scaliger's Zndices, 1603, and re-edited by Gravius, 1707), Gudius (about 1660, edited by Hessel, 1731), Reinesius (1682), Fabretti (1699), Gori (1726), Doni (1731), Muratori (1739), Maffei (1749), Donati (1765-75). These collections, manuscript and printed, will never altogether lose their value, as great numbers of inscriptions known to the ancient collectors have since been lost or destroyed. But, inasmuch as even towards the beginning of the 15th century, as well as afterwards, especially from the 16th down to a very recent period, all sorts of inaccu- racies, interpolations, and even downright falsifications, found their way into the Corpora, these can be employed only with the greatest caution. Modern critical research in the field of epigraphy began with the detection of those forgeries (especially of the very extensive and skilful ones of Pirro Ligorio, the architect to the house of Este) by Maffei, Olivieri, and Marini. The last-named scholar opens a new era of truly critical and scientific handling of Roman inscriptions (especially in his standard work on the Att? dei Fratelli Arvali, Rome, 1795); his disciple and successor, Count Bartolomeo Borghesi (who died at San Marino in 1860), may be rightly called the founder of the modern science of Roman epigraphy.' Orelli's handy collection of Roman inscriptions (2 vols., Zurich, 1828) is a first attempt to make accessible to a larger scientific public the results of the researches of Marini and his successors ; but it was not completed (and thoroughly corrected) until nearly thirty years later, by Henzen (Orelli, vol. iii., with the indispensable Jndices, Zurich, 1856), who,

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1 See E. Hitbner, Ueber mechanische Copieen von Inschriften, Berlin, 1881.

2 Compare De Rossi, Bullettino dell' Instituto archcologico, 1871,

aliases

3 Of his works, published by the French Government, nine volumes Ato (Paris, 1862-80) have already appeared.

ROMAN. |

with Mommsen and De Rossi, carried out the plan of a universal Corpus Inscriptionwm Latinarum, previously pro- Maffei (1732), by Kellermann and Sarti (1832), jected by with Borghesi's help, and by Letronne and Egger (1843). After the appearance of Mommsen's Inscriptiones regne Neapolitani Latine (Leipsic, 1852) and his Inscriptiones Confaderationis Helvetice Latine (vol. x. of the publica- tions of the Zurich Antiquarian Society, 1854), the publica- tion of the C. /. L., following the similar work on the Greek inscriptions, was undertaken by the Royal Academy of Sciences of Berlin. This work, in which the previous literature is fully described and utilized, consists of the following parts :-—vol.i., Inscriptiones Antiquissime ad C. Cxsaris mortem, by Mommsen (Berlin, 1863), with the Fasti Consulares by Henzen, and the Zndices by Hiibner ; Ritschl's Prisce Latinitatis monumenta epigraphica (Berlin, 1862, fol.) form the graphic illustration to vol. i., giving all extant monuments of the republican epoch (with five Supplementa, Bonn, 1862-65 ; R. Garrucci's Sylloge In- scriptionum Latinarum xu Romane reipublice usque ad GC. Iulium Cesarem plenissima, 2 vols., Turin, 1875-77, must be used with caution); vol. ii, Znscr, Hispanize by Hiibner (1869) ; vol. iii, Znser, Asix, provinciarum Europe Grecarum, Illyrice, by Mommsen ; vol. iv., Znscr. parietarix Pompeiane Herculanenses Stabiane (the scratched and ainted inscriptions chiefly of Pompeii) by Zangemeister (1871); vol. v., Znscr. Galliw cisalpine, that is, regionis Italie decime and undecime et none (1872-77) ; vol. vi., part i, Znser. urbis Rome, by Henzen (part ii, in the press) ; vol. vil., Znscr. Britanmzx, by Hiibner (1878) ; vol. vili., Inscr. Africe, by Wilmanns and Mommsen (to be published in 1881; here Renier's Inscriptions Romaines de P Algérie, Paris 1855-1860, though not finished, may be consulted) ; vols. ix. and x., Inscr. Italie inferioris, by Mommsen (to be published in 1881 or 1882); vol. xi., Inser. Italie superioris, by Bormann, vol. xii., Inscr. Gallizx, by Hirschfeld (a subject partly treated in W. Brambacli's Corpus Inscriptionum Rhenanarum, &c., Elberfeld, 1866), vol. xiii., Jnser.

Italix medizx, by Dessau, and a concluding volume of general indexes are either in the press or in preparation. The arrangement observed in the Corpus is the geographical (as in Apianus) ; within the single towns the order of subjects (t¢tule sacri, magistratuum, privatorum, &c., as in Smetius) is followed, with some few exceptions, where the monuments are so numerous (as in the forum of Rome—see H. Jordan, "'Sylloge iuser. fori Romani," Zphem. epigr., iii. p. 237 sq.—and at Pompeii and Lambesis) that they can be assigned to their original places. Run- ning supplements to the C.Z. Z. are given in the Ephe- meres epigraphica, Corporis Inscr. Latinarum Supplementum (4 vols., Berlin, 1872-80). The inscriptions in the other Italian dialects have been published by Aufrecht and Kirchhoff (Die wmbrischen Sprachdenkmiler, 2 vols, Berlin, 1849-51), Mommsen (Die wnteritalischen Dialecte, Leipsic, 1850), Fabretti (Corpus Inscriptionum Italicarum antiquioris evi, Turin, 1867, with three supplements, ¢bid., 1872-77), Corssen (Ueber die Sprache der Etrusker, 2 vols., Leipsic, 1874-75 ; see also Deecke, Htruskische Forschung- en, 1 toiv., Stuttgart, 1875-80); for farther particulars on the Italian dialects see Hiibner's Grundriss zu Vorlesungen tiber die lateinische Grammatik, 2d ed., Berlin, 1880; pO). For the Christian inscriptions of Rome, and of Gaul, Spain, and Britain, see De Rossi's Znscr. Christiane urbis Rome septimo seculo antiquiores, vol. i. (Rome, 1857), and the same author's Roma sotterranea (3 vols, Rome, 1861-77), with the Bullettino di Archeologia cristiana (Rome, 1873- 80), the Inscriptions Chrétiennes de la Gaule of Le Blant (2 vols., Paris, 1857-65), and the Znser. Hispanix Chris- vane and Inscr, Britannix Christiane of Hiibner (Berlin, 1871, 1876). As splendidly illustrated works on the Latin

inscriptions of some districts, Alphonse de Boissieu's Jn- scriptions antiques de Lyon (Lyons, 1846-54), Ch. Robert's LEpigraphie romaine de la Moselle (Paris, 1875), and J. ©. Bruce's Lapidarium septentrionale (London and Newcastle, 1875) can be recommended. Besides the above-mentioned Orelli-Henzen collection, G. Wilmanns's Exempla Inscrip- tionum Latinarum (2 vols., Berlin, 1873, with copious indexes) gives a general synopsis of the materials.

Ii. The alphabet used by the Romans is identical with that of the Chalcidian colonies in southern Italy and Sicily (viz., Cyme, Neapolis, Rhegium, Zancle, Naxos, and Himera), except the three aspirates 6, ¢, x; these, being of no use in ancient Latin, which had no such aspirates, were employed as numerals. The old Z, which occupied the seventh place in the alphabet, being of rare employ- ment, was replaced, as early as the 4th ceutury a.v.c., by G, a letter formed by the addition of a stroke out of the old gamma C, which became identical in sound with K, though remaining in use as an abbreviation for Gaius and Gnexus. To that standard alphabet of twenty-one letters were appended, in Cicero's time, the Greek letters vand @ In this alphabet (ABCDEFGHIKLMNOPQ RSTVXY Z, in this form found written on the walls of Pompeii, on tiles and other monuments) the forms of the single letters vary not inconsiderably, according to the material of the monuments, their age, and their origin. Carefully cut letters, especially when on a large scale, naturally differ from those scratched or painted on walls

by non-professional hands, or hewn on rocks by soldiers; |

and small incised (or dotted) letters on metal or ivory and boue, and those painted on earthenware, or impressed on it or on glass before burning, are also necessarily of a different character. The letters, ordinarily drawn with miniwm on the monument before being cut (and also often painted, after having been cut, with the same colour), sometimes have been painted with a brush, and thence receive a peculiar form. A, in tlhe most ancient period (before the Second Punic War), appears in these forms, AA A; L, in the same epoch, is acute-angled (as in the Chalcidian alphabet), ; P is rectilineal, [; Q has a perpendicular stroke, 9; B, D, R, § are often not rounded, but acute-angled CB D R 4); O and appear sometimes not closed (0, Q). Besides E and F (which usually have their horizontal strokes of equal length and not as in modern printing), there were in use some quasi-cursive forms, |! and Il; and besides M (which, at the best periods, has its two exterior strokes inclined, not perpendicular, and the middle point extended to the foot of the line), a cursive Il is to be found. In later periods, F is sometimes elevated above the other letters (and

afterwards not F only), G assumes the form G, H appears as h, and Las k ,—to mention only some promi- nent diversities, for a complete history of the palseographic changes of the Roman alphabet has not yet been written. In general, the old quadrate forms of the letters, with equal breadth of strokes above and below, become, by degrees, more slender and elegant, the tops and angles being slightly curved, &c. Additions to the Roman alphabet were made, but without permanent success, by the emperor Claudius (4 for V the consonant, to distinguish it from V the vowel, 5 for the Greek y, + for the sound between 2 and u, as in bybliotheca; he wrote also ai for ae). To distinguish, after the later Greek usage, long from short vowels, in the course of the 7th century a.v.c. the plan of doubling them was introduced for a, e, and 0 (not U)s while the long ¢ was written ¢, and afterwards indicated by the prolonged form |. At the end of the republic these distinctions disappear, and long vowels are distinguished, when at all, by an apex (a stroke or a curved line upon

them —” ,not an accent), down to the epoch of the emperor Marcus Aurelius. In some very rare instances the doubling of consonants is indicated by a scilzcus, a hook (’) upon them. The double 2 indicates, in some examples, from Cesar down to Domitian, the consonantal j (as in cutis, ciius). To save space, on coins first and afterwards iu inscriptions also, two or three or even more letters were joined, especially at the end of the lines, to a nexusor a ligatura. This system of compendious writing, very rare in the republican epoch, and slowly extending itself during the 1st century, became rather frequent in the 2d and 34d, especially in Spain and Africa. There is no constant system in these nevus Litterarum, but generally the rule is observed that no substantial element of a single letter is to be counted for twice (thus, ¢.g., ‘T+ is 2 or td, not Z’tz). In the republican period, the numbers from one to nine are mostly written in the additive form (1 II III Hil V VI VIL VII Vill), and similarly in combination with x, Xx, and so on (XXXX, LXXXX); V, for five, seems to be a graphic division of X. The x of the Chalcidian alphabet, y, is the numeral for fifty (afterwards L and L, which has originally nothing to do with the letter L); the 3, ©, is that for a

hundred (replaced early by the initial of the word centum, C); the ?, , is that for a thousand (afterwards M, the initial of mle), of which (00 are only slight graphic alterations. The multiples of a thousand by 10 are written thus 7 (10,000), (100,000). From © came, by graphic division, T) (not D the letter) for 500 (with fy 5000, 50,000). A peculiar mark (Q»5) appears rarely for 500,000 (Hermes, iii, 1868, p. 467). Numerals are usually dis- tinguished from letters in the ancient period, down to the end of the republic, by a stroke drawn through them, as in HVIR, duo(m) vir(om) 8 duo semis (sestertius), B 500 ; it was afterwards put above them, as in TIVIR, XVIR; limlVIR, duovir, decemvir, sevir.

The direction of the writing is, even in the oldest in- scriptions, from left to right; there exists only one very ancient example of an inscription, found at the lake Fucinus, written in a kind of Bovorpopyddv arrangement (H. Jordan, Hermes, vol. xv., 1880, p. 5), while in the Sabellic inscriptions similar arrangements are not in- frequent. Each word is separated from the other by a sign of interpunction, which is not wanted, therefore, at the end of lines or of the whole text. Exceptions to this rule occur only in the later period (from the 2d century downwards), and sometimes under special conditions, as when abridged words form the end of the line. Here and there even the different syllables of each word are separated by interpunction. The interpunction is formed by a single dot (except in some very ancient inscriptions, such as those of Pisaurum, where, as in Greek and other Italian monu- ments, three dots : are used), which, according to the technical skill of the different periods in stone-cutting, is in some very ancient inscriptions quadrangular, or similar to an oblique cross (x), or oblong (as a bold stroke), but, as a rule, triangular, and never circular. This triangular dot changes, by ornamentation, into a hook (7) ora leaf (¥); the ivy-leaf-shaped dot is especially frequent in in- scriptions from about the 2d century downwards. The dot is always placed at the middle height of the letters, not, as now, at the foot of the line. In large texts of in- struments the interpunction is often omitted ; in the later period it is often entirely wanting ; and in short texts, in the disposition of the lines, in the varying sizes of the letters employed, in the division of words at the end of the lines, &c., certain rules are

observed, which cannot be detailed here. In some instances older inscriptions have

1 For other details of numerical notation, fractions, &c., see the manuals of metrology.

been cancelled and more recent ones substituted (e9., on milestones), especially in the case of the damnatio me. moriz (in cases of high treason), in consequence of which the names of consuls and emperors are often cancelled ; but in modern times also inscriptions have been delibe- rately destroyed or lost ones restored.

For understanding the texts of the inscriptions an accu- rate knowledge of the system of abbreviations used in them is necessary. These are almost invariably litter smgulares; that is to say, the initial letter is employed for the entire word (in all its grammatical forms), or, if one initial, as belonging to more than one word, is not sufficiently clear, the first two or even the first three letters are employed; rarely more than three. Abbreviations in the true sense of the word (by dropping some letters at the end) are to be found, in the older period, only at the end of lines, and not frequently. In the later period some instances of them have been observed. The Jitterx singulares, as Valerius Probus taught, are either generally employed (usus generalis) in all classes of written documents (and so in literature also), as, for instance, those of the indi- vidual names (the prenomina), the names of days and feasts (Lal. for kalendz), and those of the chief magistrates (cos. for consul) and the like; or they belong chiefly (but not exclusively) to certain classes of documents, such as those used in juridical acts (/. for lea, h. for heres, s. d. m. for sine dolo malo, and so on), in sepulchral inscriptions (h. 8. ¢., hic situs est) or in dedicatory inscriptions (vs. l.m., votum soluit libens merito), &c.?

It may be observed here that the pranomzna are, as & rule, always written in the universally known abbrevia- tions (in the few instances

where they are written in full, it is aconsequence of Greek influence or of peculiar cir- cumstances). The gentilicia in ~ius are abridged, in the republican period, in -i (in the nominative, perhaps for -s), In the always abbreviated indications of ancestors or patrons (in the case of slaves and freedmen), as C. f., Gat filius, M. 1., Marci libertus (s. for servus is not frequent), the feminine gender is sometimes indicated by inversion of the letters. Thus 0. /. (or lib.) or W (an inverted M) 7. designates a mulieris libertus; 4 and are used for fila, pupilla. On the tribus and their abbreviations, and on the so-called military ¢7ibws (which are names of colonies collocated, for the sake of symmetry, at the place usually occupied, in the nomenclature, by the érzbws), and on the other indications of origin used in the designation of in- dividuals, the indexes to the abuve-named works give sufficient information ; on the geographical distribution of the tribus, see Grotefend's Imperium Romanum tributum de scriptum (Hanover, 1863). For the abbreviations of official charges, urban and municipal, and, in the imperial period, civil and military (to which, beginning with the 4th cen- tury, some Christian designations are to be added), see also the explanations given in the indexes. Among these abbre- viations the first instances are to be found of the indication of the plural number by doubling the last letter; thus Augg., Caess., coss., dd. nn. (domini nostri), are used from the 3d century downwards (see De Rossi's preface to the Inscriptiones Christ. urbis Rome) to distinguish them from Aug., Caes., as designating the singular. In the later period, a dot or a stroke over the abridged word, like that upon numerals, here and there indicates the abbreviation.

2 On the system of Roman nomenclature and the abbreviations em- ployed in it, see Orelli, cap. viii. (with Wilmanns's Analecta, il. Pp. 197), and especially Mommsen in Rémische Forschungen, Vol. 1. P. it sq., and in Hermes, iii., 1869, p. 70; on the cognomina (but only those occurring in ancient literature), Ellendt (De cognomine et agnomine Romano, Kénigsberg, 1853), and on the local cognomina of the Roman patriciate, Mommsen, Rim. Forsch., ii. p. 290 sg.; on the nomina gen- tilicia, Hiibner (Ephem. epigr., ti. p. 25 sg.). The indexes to Orelli, Wilmanns, and the volumes of the Corpus may also be consulted.

wees] LwscRi

[J.—1. Among the inscriptions in the strieter sense (the ¢ctwlz),

erhaps the oldest, and certainly the most frequent, are the seprdl- ae inseriptions (tituld sepulerales) Of the different forms of Roman tombs, partly depending upon the differenee between burial and eremation, which were in use side by side, the latest and a very complete account is given in Marquardt's Handbueh der rimischen Alterthiimer (vol. vii. part i., Leipsic, 1879, p, 330 sq.). The most ancient examples are those of a sepuleretwm at Preeneste (Cor L., i. 74, 165, 1501 a-d; Ephem. epigr., i. 25-181, Wil. 153); the oldest of these contain nothing but the name of the deceased in the nominative ; those of more recent date give it in the genitive. The oldest and simplest form remained always in use down to Christian times ; it is that used on the large teetonie monuments of the Augustan age (¢.g., that of Cecilia Metella, C. L. L., vi.1274) and in the mausolea of most of the emperors, and is still frequent-~ in the tituli of the large columbaria of the same age (C. J. L., vi, part ii.). It was early sueceeded by the lists of names, given also in the nominative, when more than one individual, either dead or alive, were to be indicated as sharcrs of a tonib. To distinguish the members still alive, a v (vivit, vivos, vivi) was prefixed to their names (¢9., C. 1 L., 1 1020, 1195, 1271) ; the deceased were sometimes marked by the Ojra nigrum (0. £ L., i. 1082; Wil. 158; see also C. Z. L., vi, 10251 sq.). Only the names in the nominative are shown, too, on the sarcophagt of the Zurpleti and Fowrti at Tusculum (C. 2 L., i. 65-725 Wil. 152), and in the oldest inscriptions on those of the Scipiones, painted with miniwm (C. I. L., i. 29; Wil. 537), to which were added afterwards the insignia of the magistratus curules (CL. L., i. 31; Wil., 538) and the poetical elogia. Of a somewhat different kind are the inscriptions scratched without mueh care on very simple earthen vessels which belonged to a sepulcretwm of the lower class, situated outside the porta Capena at Rome, on the Appian road, near the old church of San Cesario (12 L., i. 882-1005, 1589, 1539 a-d=C. J. L,, vi, 8211-8397; Wil. 176); they can be ascribed to the period of the Graechi. On these olle, besides the name of the deceased, also for the most part in the nominative, but on the more recent in the genitive, the date of a day,

probably that of the death, is noted; here and there obit (or 0.) isadded, About the same epoch, at the beginning of the 6th century, along with the growing taste for tectonie ornamen- tation of the tombs in the Greek style, poetical epigrams were added to the simple sepulchral ¢itwlus, especially amongst the half-Greeck middle elass rapidly increasing in Rome and Italy; Saturnian (C. £ LZ., i. 1006), iambic (1007-1010), and dactylic (1011, compare Annali dell' Instituto Areheologico, vol. xxxvii.,

». 808) verses become more and more frequent in epitaphs (see Wil. 548 sqg.). In prose also short designations of the mental qualities of the deceased (homo bonws, misericors, amans pauperwn, or uxor frugi bona pudiea, and the like), short dialogues with the passer-by (originally borrowed from Greek poetry), as vale-salve, salvus ire, vale et tu, &e. (Wil, 180), then indications of his con- dition in his lifetime, chiefly among the Greek tradesmen and workmen, ¢,9., lanius de colle Viminale (C. I. £., i. 1011), mar- garitarius de saera via, 1027, and the like), and some formule, such as ossa hic sita sunt, fete cubat, heie situs est (in republican times mostly written in full, not abridged) were added. The habit of recording the measurement of the sepulehre, on the sepulchral cippus, by such formyle as locus patet in fronte pedes tut, in agro (or in via, or retro) pedes tot, seems not to be older than the Augustan age (C. J. L,, i, 1021, with Mommsen's note; Wil. 188). About the same time also the epitaphs more frequently state how long the deceased lived, which was formerly added only on certain occasions (¢.g., in the case of a premature death), and mostly in poetical form, The worship of the dei Mancs, though undoubtedly very aneient, is not alluded to in the sepulchral inscriptions themselves until the close of the republie. Here and there, in this period, the tomb is designated as a (loews) dewm Maanium (¢.g,, at Hispellum, C. Z. L., i. 1410); or it is said, as ona eippus from Corduba in Spain (C. I. L., ii, 2255; Wil. 218),

C. Sentio Sat(wrnino) co(n)s(ule)—that is, in the year 19 n.c.—ded Manes reeeperunt Abulliam N(umerit) Uibertam) Nigellam. In the Augustan age the titulus sepuleralis begins to be confounded with the titulus sacer, it adopts the form of a dedication dets Manibus, offered to the det Manes (or det infert Manes, the det parentum being the Afancs

of the parents) of the deecased (see Orel, 4351; Wil. 217-228). This formula, afterwards so eommon, 1s still very rare at the end of the republie, and is usually written in full, while in later times it is employed, both simply and in many varied forms (as dis manibus saerwm, or d. m. et memoria, d. m. et genio, or memorize wterne, pact et quiett, quicti xterne, somno xternali, and so on; Wil. 246), in thousands of monuments. By similar degrees the tctulus sepuleralis adopts many of the elements of the titulus honorarius (the indication of the cursus honorum., of the military charges, &e., as, ¢.g,, in the inscription of Cn. Calpurnius Piso, C. Z L., i. 598=vi. 1276, Wil. 1105, on the pyramid of Cestius, C. J. L., vi. 1374, and on the monument at Ponte Lueano of Ti. Plautius Silvanus Alianus. consul 74 A.D.,

Orel. 750, Wil. 1145, and many others), of the é¢tuli operum publi- corum (€.9., monumentum feeit, sibi et suis, &e.), and of the ¢nstru- menta, ‘Testaments (like those of Dasumius of the year 109 A.D, — C. I. L,, vi. 10229, Wil. 314, and T. Flavius Syntrophus—C. J. L., vi, 10289, Henz. 7321, Wil. 313), or parts of them (like that on the tomb of a Gaul of the tribe of the Lingones, belonging to Ves- pasian’s time, Wil. 315), funeral orations (as those on Turia, the wife of Q. Lueretius Vespillo, consul 19 3.c.—C.Z.L., vi. 1527, in Orel. 4859 incomplete ; on Murdia —C. J. L., vi. 10230, Orel. 4860, Rudorff, dbhandlungen der Kinigl. Akadenvie der Wissenschaften zw Berlin, 1868, p. 217 sq.; and that of Hadrian on the elder Matidia, found at Tivoli—Mommsen in the same Abhandlungen, 1863, p. 483 sq.), numerous statements relating to the conservation and the employment of the monuments (C. J. L., vi. 10249; Wil. 287-290), to their remaining withiu the family of the deecased,—from which came the frequent formula “ h(oc) m(onwmentwm) h(credem) n(on) s(equetur)” and the like (Wil. 280),— and relating to the annual celebration of parentalia (Wil. 305 sq.), down to the not un- eomion prohibition of violation or profanation of the monument (compare, for instance, C. J. Z., i. 1241, Wil. 267, from Naples, ““dets inferum parentun sacrum, ni violate ;” C. I. L., iii, 3955, from Siseia, “ne quis in hac arfela porcos agi faccre velit ;” C.LL., ii. 2708, from Portugal, in a distich, “ quisquis honorem agitas, tta te tua

gloria servet, precipias puero ne linat hune lapidem;” C. I. L., vi. 2357, “hospes ad hune twmulum ne metas ossa precantur,”’ &c.; and Wil, 271-278), and the addition of the naine of the stone-eutter (C. J. Z., v. 7670; Wil. 2490; Orel.~~Henz. 6344) and of the writer of the ¢itwlus (De Rossi, Inscr. Christ., i. p~~ 9, 5; Wil. 1285, 2490), with many other particulars (on which the index of Wil. p. 678 sg., may be consulted), form the text of the sepulehral inseriptions of the later epoch from Augustus down- wards. To these are to be added many local peculiarities of provinces (as Spain and Africa), districts (as the much-disputed sub aseta dedieare of the stoncs of Lyons and other parts of Gaul), and towns, of which a full aeeount cannot be given here.

2, Of the dedieatory inscriptions (or tituli saeri), the oldest known are the short indications painted (along with representations of winged genii, in the latest style of Greeco-Italian vase painting), with white colour on black carthen vessels, by which those vessels (poeula) are declared to be destined for the worship, public or private, of a eertain divinity (C. Z L., i. 48-50; Ephem. epigr. i. 5-6 ; Wil. 2827 a-z); thcy give the name of the god, as that of the possessor, in the genitive (¢.g., Saeturni pocolom, Lavernat poeolom), The proper form of the dedication, the simple dative of the name of a divinity aud often nothing elsc (as Apolene?, Fide, Junonc, &e., which are all datives), is shown on the very primitive altars found in a sacred wood near Pisaurum (C. £ L., i. 167-180; Wil. 1-14); but also the name of the dedicants (matrona, matrona Pisawrese, which are nomin. plur.) and the formule of the offering (dono dedrot or dedro, donu dat, where dono and donuw are accus.) are already added to them. This most simple form (the verb in the perfect or in the present) never disappeared entirely; it occurs not infrequently also in the later periods. Nor did the dative alone, without any verb or formula, go entirely out of use (see C. L L., i. 680; Wil. 86; OC. J. £.,i. 814=vi. 96; Orel. 1850; Wil. 32; C.£ Z., 1.11538; Henz. 5789; Wil. 1775). But at an early date the verb donwm dare and some synonyms (like donwm portare, ferre, maneupto dare, parare) were felt to be insufficient to express the dedicator’s good will and his sense of the justice of the dedieation, which aecordingly were indicated in the expanded formula dono dedet lub(e)s mereto (C. I. L., i. 188, ef. p. 555; Wil. 21; C2. L., i.

190; Wil. 22), or, with omission of the verb, dono mere(to) lib(e)s (C. L. £., i. 182). The dative case and this formula, completely or partially employed (for merito alone is also used, as C. I. £., 1. 562, cf. Ephem. epigr., ii. 358, Wil. 29), remained in solemn use. To lubens (or libens) was added le&tus (so in Catullus, 31, 4), and, if a-vow preceded the dedication, votwm solvit (or voto condemnatus dedit; see C. I. £., 1. 1175; Henz. 5733; Wil. 142; and C. I. L., ii. 1044); so, but not before the time of Augustus (see C. J. L., i, 1462=iii. 1772), the solemn formula of the dediea- tory inseriptions of the later period, v. s. 1. m. or us. 11 m™., arose. To the same cffcet, and of equally ancient origin with the solemn words dare and donwm dare, the word saerwm (or other forms of it, as saera[ara]), conjoined with the name of a divinity in the dative, indicates a gift to it (ag., OZ Z., i. 814; Wil. 32; C. J. L., i. 1200-1201; Wil. 33 a b); the same form is to be found also in the later period (¢.9., C. Z. Z., i. 1124 ; Henz. 5624-5687), and gave the model for the numerous sepulchral inscriptions with dis Manibus saerwm mentioned before. Saerwm combined with a genitive very seldom oeeurs (Orel. 1824; Wil. 34); ara is found more frequently (as ara Neptwni and ara Ventorwm, Orel. 1840). Dedications were frequently the results of vows; so victorious soldicrs (such as L. Muimmius, the conqueror of Corinth—C. L. L., i, 541 sqg.; Orel. 563; Wil. 27), and prosperous merchants (¢.g., the brothers Vertuleii—c. 2 L., i. 1175; Henz. 5783; Wil. 142) vow a tenth part of their booty (de pracdad, as is said on the basis erected by one of the Fourii of Tusculum—C. I L., i. 68, 64 ;:

YIenz. 5674; Wil. 18) or gain, and out of this dedicate a gift to Hereulus or other divinities (sce also C. £. Z., i. 1503; Wil. 24; C. I. L., 1118; Wil. 48). Again, what one man had vowed, and had begun to erect, is, by lus will, executed after his death by others (as the propylwm Cereris et Proserpine on the Eleusinian temple, which Appius Claudius Pulcher, Cicero's well-known pre- decessor in the Cilician proconsulate, began —C. I. L., i. 619=iii. 347; Wil. 81); or the statue that an e&dilis vowed is erected by himself as duovir (C. I. L., iii. 500; Henz. 5684) ; what slaves had promised, they fulfil as freedmen (C. J. L., 1238, servos vovit liber solvit ; C. I. L., 816, W. 51, "ser(vos) vov(it) lecbert(us) solv(it)"),

and soon. The different acts into which an offering, according to the circumstantially detailed Roman ritual, is to be divided (the consecratio being fulfilled only by the solemn dedteatio) are also specified on dedicatory inscriptions (see, for instance, consaerare or consecrare, Orel. 2508, and Henz. 6124, 6128; for dedicare, C. I. L., i. 1159, Henz. 7024, Wil. 1782, and compare Catullus's hune luewm tibi dedico eonsecroque Priape, fragm. 2 ap. Lachmann and Miller ; tor dieare, see the aara leege Albana dicata to Vediovis by the genteiles Iulici, C. I. L., i. 807, Orel. 1287, Wil. 101). Not exactly dedicatory, but only mentioning the origin of the gift, are the in- scriptions on the pedestals of offerings (ava@juara, donaria) out of the booty, like those of M. Claudius Marcellus from Enna (C. J. L., i. 580; Wil. 25, '* Hinnad cepit") or of M. Fulvius Nobilior, the friend of the poet Ennius, from Atolia (C. I. L., i. 584; Orel. 562; Wil. 26a, and Budlettino dell Instituto, 1869, p. 8 ; (Oh Ih, Jbag vi. 1307; Wil. 26), " tolia cepit" aud " Ambracia cepit "\ ; they contain only the name of the dedicator, not that of the divinity. Of the similar offerings of L. Mummius, already mentioned, two only are preserved in their original poetical form, the Roman in Saturnian verses of a carmen triumphale (C. I. L., 1.5415 Orel. 563; Wil. 27a) and that found at Reate in dactylic hexameters (C. I. L., i. 5423 Wil. 276); the rest. of them contain only the name of the dedicant and the dative of the community to which they were destined (C. J. L., i. and Wil. /.c.). Of a peculiar form is the very ancient inscription on a bronze tablet, now at Munich, probably from Rome, where two atdiles, whose names are given at the beginning as in the other donaria, "ayicesma(m) parti(m) or [vx] vicesma parti Apolones (that is, Apollinis) dederi (that is, dedere)" (C. I. L., i. 187 ; Orel. 1483), Many, but not substantial, varieties arise, when old offerings are restored (¢g., C.J. L., i. 638, 632=Orel. 2135, and Wil. 48; C1 L., i. 803; Henz. 5669, 6122); or the source of the offering (¢.g., de stipe, C. I. L., i. 1105 ; Henz. 5633a; ex reditu pecunia, ex patrimonto suo, ex ludis, de munere gladiatorio, and so on); or the motive (ex jusso, ex imperio, ex visu, ex oraculo, monitu, viso moniti, somnio admonitus, and the like), or the person or object, for which the offering was made (C. 1. L., i. 188, pro poplod ; Ephem. epigr., ii. p. 808, pro trebibos ; pro se, pro salute, in honorem domus diving, &c.), are indicated ; or, as in the ¢étuli operwm publicorwm, the order of a magistrate (de senati

sententia, C. I. L., i. 560=vi. 1806; Orel. 5351 ; i. 6832= vi. 110; Orel. 2185; Wil. 48; decurtonwm decreto, &c.), and the magistrates or private persons executing or controlling the work, the place where and the time when it was erected, are added. On all these details the indexes, especially that of Wil. (ii. p. 675), give further information. The objects themselves which are offered or erected begin to be named only in the later period just as in the tituli operum publicorum ("basim donum dant," C. I. L., i. 1167; "signum basim," C. I. L., i. 1154; "Saram," C.L L., i, 1468; Orel. 1466; Wil. 52; C. 1Z.,i.1109; Wil. 54); in the later period this custom becomes more frequent. It is hardly necessary to observe that all kinds of offerings have very frequently also been adorned with poetry ; some of these carmina dedieatoria are given by Wil. 142-151.

3. Statues to mortals, whether living or after their death (but not on their tombs), with honorary inscriptions (titulc honorarit), were introduced into the Roman republic aftcr the Greek model, and only at a comparatively late date. Onc of the oldest inscrip- tious of this class comes from Greck soil and is itself Greek in form (C. J L., i. 583; Wil. 649), "Ztaliced L. Cornelium Scipionem (i.e., Astagenum) honoris eaussa," lost and of not quite ccrtain reading, belonging to 561 A.v.c. (193 B.C.) ; the same form (in the accusative) appears in other (Latin or Latin and Greek) inscrip- tions from Greece (C. F. L., i. 596=iii. 532; Wil. 1108; C. J. L., iii. 865; Hphem. epigr., iv. 77; compare also C. I. L., i. 587, 588 ; Orel. 3036). The same Greek form occurs also, curiously enough, in an honorary inscription of the age of Constantine (C. / L., i. 1708; Wil. 1227). But at an earlier date, at the end of the 5th century A.U.C., the noble house of the Scipios had already intro- duced the use of poetical elogia, in the ancient form of the earmina triumphalia in Saturnian verses (from the 6th century in clegiac distichs). As has been stated above, they were added to the short tituli, painted only with méniwm on the sarcophagi, giving the name of the deceased (in the nominative) and his curulian offices (exclusively), which were copied perhaps from the well-known imagines preserved in the atriwm of the house (C. Z. Z., i. 29 sq.; Orel. 550 sg.; Wil. 587 sq.; and elsewhere). They hold, by their

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contents, an intermediate place between the sepulchral inscriptions, to which they belong properly, and the honorary ones, and there. fore are rightly styled elogia. for themselves was in other cases done publicly at a period nearly as early. The first instance preserved of such a usage, of which Pliny the clder speaks (Hist. Nat., xxxiv. § 17 sq.), is the celebrated columna rostrata of C. Duilius, of which only a copy exists, made in the time of the emperor Claudius (CZ. Z., 1.

What the Scipios did thus privately

=vi, 1300; Orel. 549; Wil. 609). Then follow the elogia in-

scribed at the base of public works like the Arcus Fabianus (C. I. L., i. 606, 607, and p. 278, elog. i.-iii. = vi. 1303, 1804;

Wil. 610), or of statnes by their descendants, as those belonging to a sacrarium domus Auguste (C0. I. L., i. elog. iv.vi=C. 2. L.,

vi. 1310, 1311) and others belonging to men celebrated in politics

or in letters, as Scipio, Hortensius, Cicero, &., and found in Rome either on marble tablets (C. Z. L., i, vii—xil = C. LZ. L., vi. 1812, 1279, 1288, 1271, 1273; Wil. 611-613) or on busts (12. L,, i, xv.-xix.= CO. T. L., vi. 1827, 1295, 13820, 1309, 1825, 1826; Wil. 618-621; seealso C.J. L., i. 40=vi. 1280; Wil. 1101; and C.Z.Z., i, 68l=vi. 1278; i. 640=vi. 1828; vi. 1321, 13822, where 7, Quinctt seems to be the nominative), and in divers other places (C. I. L., i, xiii, xiv.; Wil. 614, 615). This custom scems to have been resumed by Augustus with a political and patriotic aim, praised by the poet Horace (Od., iv. 8, 18, “¢ncisa notis marmora

publicis, per quex sptritus et vita redit bonis post mortem ducibus”) ;

for he adorned his forwm with the statues of celebrated men from Aueas and Romulus downwards (C. J. Z., i., xxiv., XXvV., XxXvil., xxxil — C. I. L., vi. 1272, 1308, 1315, 1818 ; Wil. 625, 626, 627, 632), and other towns followed his example (so Pompeii, C. LZ L., i, xx., xxii = Wil. 622, 623; Lavinium, C. f. L., i., xxi., Wil. 617; Arretium, C. 1 L., i, xxiii, xxviii, xxix., XXxX., XXXL, XXXii., xxxiv.=Wil. 624, 625, 629-633). All these elogia are written in the nominative. In the same way in the colonies statues seem to have been erected to their founders or other eminent men, as in Aquilcia (C. J. L., i. 588=v. 873, Wil. 650; compare also ©. I. L., v. 862; Orel. 3827) and Luna (CL L,, i. 589 = Wil. 651).

But along with this primitive and genuine form of the titulus honorarius another form of it, equivalent to the dedicatory inseription, with the name of the person honoured in the dative, begins to prevail from the age of Sulla onwards. For the oldest examples of this form seem to be the inscriptions on statues dedicated to the dictator at Rome (C. L. L., i. 584=vi. 1297; Orel. 567; Wil 1102a) and at other places (Caieta and Clusium, C. J. L., i. 585, 586; Wil. 11020, c), in which the whole set of honours and offices is not enumerated as in the elogia, but only the honores preesentes ; compare also the inscription belonging to about the same date, of a questor urbanus, C. I. L., i. 636). Within the Greek provinces also, at the same period, this form is adopted (C. J. L., i, 595= iii, 581; Henz. 5294; Wil. 1104). Similar dedications were offered to Pompey the Great (at Auximum and Clusiumn, @C. Z L., i. 615, 616; Orel. 574; Wil. 1107) and to his legate L. Afranius (at Bologna, but erected by the citizens of the Spanish colony Valentia, GO. I. L., i. 601; Henz. 5127; Wil. 1106). They are succeeded by the statues raised to Cesar (at Bovianum, C. I. £L., YG20% Orel. 582; Wil. 1108), and, after his death, cussu populi Romani, in virtue of a special law, at Rome (C. I. L., i. 626=vi. 872; Orel. 586; Wil. 877). With him, as is well known, divine honours begin to be paid to the princeps, even during life. In this same form other historical persons of high merit also begin to be honoured by posterity, as, for cxample, Scipio the elder at Saguntum (C. 7. L., ii, 3836; Wil. 658), Marcellus, Romanorwm ensis, at Nola (Momm- sen, Inser. Neap., 1984; Henz. 5847), Marius at Cereate Mariane, the place which bears

his name (Mommsen, Inscr. Neap., 4487 ; Wil. 654). Of statues erected by the community of a municipium to a private person, that of L. Popillius Flaccus at Ferentinum scems to be the oldest example (C. J. L., i. 1164; Wil. 655, and his note). In Rome, Augustus and his successors in this way permitted the erection of statues, especially to triwmphatores, 0 the new fora, including that of Augustus (C. J. L., vi. 1886; Orel. 3187; Wil. 684; C. I. L., vi. 1444; Henz. 5448; Wil. 685) and that of Trajan (C. £ L., vi. 1877; Henz. 5478; Wil. 636 ; Vi. 1549; Henz. 5477; Wil. 639; iv. 1549; Orel. 1386 ; Wil. 687; C. I. L., 1565, 1566; Wil. 640); and this custom lasted to a late period (G. Z. L., vi. 1599 ; Henz. 3574 ; Wil. 638), as is shown by the statues of Symmachus the orator (C. I. L., vi. 1698, 1699 ; Orel. 1186, 1187; Wil. 641), Claudian the poet (C. 1. L., Vi 1710; Orel. 1182; Wil. 642), Nicomachus Flavianus (C. f. L., vi. 1782, 1788; Orel. 1188; Henz. 5593; Wil. 645, 645a), and many other eminent men down to Stilicho ((. L, vi. 1780, 1731; Orel. 1138, 1134; Wil. 648, 648a), who died in the year 408. In similar forms are conceived the exceedingly numerous dedications to the emperors and their families, in which the names and titles, according to the different historical periods, are exhibited, in the main with the greatest regularity. They are specified in detailed indexes by Henzen and Wilmanns, as well as mM each volume of the Corpus, In the provinces, of course, the usages ©

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apital were speedily imitated. Perhaps the oldest example of es perdi in Ne form of an elog?wm (but in the dative), with the full cursus honorum of the person honoured, is a bélinguwis from Athens, of the Augustan age (C. J. Z., iii. 551; Henz. 6456a; Wil. 1122); the honours are here enumerated in chronological order, beginning with the lowest; in other instances the highest is placed first, and the others follow in order.} In the older examples the formula “‘honoris eausa,”’ or virtutis ergo (Hermes, yol. vi, 1871, p. 6), is added at the end, as in an inscription of Mytilene belonging to the consul of the year 723 a.v.c., 7.4, mice. (C. J. 7, tii, 455; Orel. 4111; Wil. 11040); tho same, abbreviated (h.c.), occurs on an inscription of about the same age from Cirta in Africa (C. I. Z., viii. 7099; Wil. 2384). Shortly afterwards the

honour of a statue became as common in the Roman munietpia as it was in Athens and other Greek citics in the later period. Each province furnishes numerous examples, partly with peculiar formule, on which the indexes of Wilmanns (p. 678, 696 sg.) may be consulted. Special mention may be made of the numerous honorary inscriptions belonging to aurige, histriones, and gladiatores ; for those found in Rome sce C. J. L., vi. 10044-10210. ' He who erects a temple or a public building, or constructs a road, a bridge, an aqueduct, or the like, by inscribing his name on the work, honours himself, and, as permission to do so has to be given by the public authoritics, is also honoured by the community. Therefore the titawli operum publicorwm, though in form only short official statements (at least in the older pcriod) of the origin of the work, without ny further indications as to its character and urpose, partake of the style of the oldcr honorary inscriptions. f the ancient and almost universally employed mcthod of ereeting public buildings by means of the Joeatio ccnsoria one monument has preserved some traces (Ephem. epigr., ii. 199). The oldest instance of this class is that commemorating tho restoration of the temple of the Capitoline Jupiter, begun, after its destruction by fire in the year 671 (83 B.c.), by Sulla and continued five years later by the well- known orator and poet Q. Lutatius Catulus, but completed only about twenty years afterwards. Here, after the name of Catulus in the nominative and the indication of the single parts of the build- ing (as, for example, sudstructionem ct tabularium) follows the eum formula de s(enati) s(ententia) factundum cocravit etdemque robavit (C. I. L., 1. 592—vi. 1314; Orel. 81, 3267; Wil. 700). Vith the samo formula the pretor M. Calpurnius Piso Frugi (of about the same period) dedicated an unknown building (C. J. L., i. 594=vi. 1275), restored afterwards by Trajan. Ona work executed by the collegium tribunorum plebis (C. I. L., i. 5938=vi. 1299; Wil. 787), perhaps tho public streets within the town, tho sum employed for itis also inscribed. Precisely similar is the oldest inscription of one of the bridges of Rome, the ponte det quattro capt, still preserved, though partly restored, on its original site, which com- memorates its builder, the tribune of the year 692 (62 3B.c.), L. Fabrieius (C. Z. Z., 1. 600=vi. 1805; Orel. 50; Wil. 788); it was restored by the cousuls of the ycar 733 (21 B.c.).2 On privately erected buildings the founder after his name puts a simple /ecit (as also on sepulchral inscriptions) ; so, possibly, did

Pompey, when he dititatod his theatre as a temple of Venus Victrix and, on Cicero's clever advice, as Varro and iro had it from Cicero himself, in- scribed on it Cos-TERT (not tertiwm or tertio) (see Gellius, Noct. Att., x. 1), So Agrippa, when he dedicated his Pantheon in the year 727 (27 B.c.), inscribed on it only the words If Agrippa L. f. cos. tertium feeit (C. I. L., vi. 896; Orel. 84; Wil. 731), as all who visit the Eternal City know. Of municipal examples it will be sufficient to name those of the majestic temple of Cora (C. I. L., i. 1149-1150 ; Wil. 722, 723), of Ferentinum, with the measurements of the foundation (C. Z Z., i, 1161-1163; Wil. 708), of the walls and towers at Aclanum (C. J. Z., i. 1280; Orel. 566; Henz. 6583; Wil. 699), of the theatre, amphitheatre, baths, and other structures at Pompeii (C. 7. Z., i. 1246, 1247, 1251, 1252; Orel. 2416, 3294; Henz. 6158; Wil. 730, 1899-1901), At Alatrium a munificent eltizen gives an enumeration of a number of works executed by him in the period of the Gracchi, in his native town ("hwe qua infera serypa sunt de senatu sententia facienda coiravit," C. I. L., i. 1166; Orel. 8892; Wil. 706); and, more than a century later, the same is done at Cartima, a small Spanish town near Malaga, by a rich woman (C. J. L., ii, 1956; Wil. 746). Military works, oxecuted by soldicrs, especially frequent in the Danubian provinces, Africa, Germany, and Britain, give, in this way, manifold and circum- stantial information as to the military administration of the Romans. On a column found near the bridge over the Minho at

1 This observation, applied to a large number of monuments, gave rise to many of the splendid epigraphical labours of Borghesi (see e.g., his dissertation pe the inscription of the consul L. Burbuleius, uvres, iv. p. 103 sq.).

The character of an elogium is assumed ina speeial way by the inscriptions on Peach arches, such as that of Augustus on the areh of Susa in Piedmont, ating from the year 745 (9 B.c.) (C.1.Z., v. 7281; Orel. 626), and the similar one oie tropra Augusté (la Turbia) (C. I. L., v. 7817) of the year 747 (7 3.c.), which iny also (Hist. Nat., iii. § 136) records, and those of the other emperors at Rome, of which only that of Claudius, the conqueror of Britain (CZ. L., vi. 920, 921;

Orel. 715; Wil. 899), with th i i i mentioned, 899), e statues of himsclf and his family, necd be

Aque at layie, the modern Chaves in northern Portugal, ten communities inseribed their names, probably as contributors to the work, with those of the emperors (Vespasian and his sons), the imperial legate of the province, the legate of the legion stationed in Spain, the imperial procurator, and the name of the legion itself (G, i L., ii. 2477; Wil. 803); and similarly, with the name of Trajan, on the famous bridge over the Tagus at Alcdntara, in Spanish Estremadura, the names of the municipia provinctse Lusi- taniz stipe conlata gus opus pontis perfecerwnt are inscribed (C. J. L. ii, 759-762; Orel. 161, 162; Wil. 804). : As in soine of the already-mentioned inscriptions of publie works the measurements of the work to which they refer (especially, as ~ be supposed, in the case of works of great extent, such as walls of towns or lines of fortification, liko the walls of Hadrian and Antoninus Pius in Britain) are indicated, so it early became a custom in the Roman republic to note on mdlestones the name of

. the founder of the road and, especially at the extremities of it and

near large towns, the distances. So in the val di Diana in Lucania P. Popilius Leenas, the consul of the year 622 (182 B.c.), at the end of a road built by him, set up the milariwm Popilianum (C. I. L., i. 551; Orel. 3308; Wil. 797), which is a general elogiwm to himself, in which he speaks in the first person (viam fecei ab Regio ad Capuam, &c.). One of the single mzléaria set up by him is also preserved (C. J. L., i. 550; Henz. 7174d; Wil. 808), which contains only his name and the number of miles. In the same brief style are conceived the other not very frequent republican miliaria found in Italy (C. Z. Z., i. 585-587; Henz. 5348; Wil. 567; C122, i. 540; Henz. 5850, 6226; Wil. 807; C. I. L., i. 568, 559; Henz, 5353; Wil, 808; C. 7. Z., i. 561; Henz, 5180; Wil. 811; CZ Z., i. 633; Wil. 812) down to the time of Augustus (Mommsen, J. V., 6244; Wil. 813), and also the even more rare specimens from the

provinces (from Asia—C. J. L., i. 557= iii. 479, Wil. 826, C. 2. Z., i, 622 — iii. 462, Wil. 827; from Spain—C. ZT. Z., i. 1484-1486 sii. 4920~ 4925, 4956, Wil. 828, 829). Augustus inscribed on each milestone on his road aeross Spain "a Bete et Jano Augusto ad Oceanum" (cg., OC. I. L., ii. 4701; Wil. 832), Claudius on those of a road in Upper Italy founded by his father Drusus "viam Claudiam Augustam quam Drusus pater Alpibus bello patefactis dercuserat muntt ab Altino (or a flumine Pado) ad flumen Danuvium" (C. £. L., v. 8002, 8008; Orel. 648, 708; Henz. 5400; Wil. 818). Tho lator milestoncs vary greatly in form, but all contain most precious and not yet nearly exhausted materials for ancient geo- graphy and topography; in the volumes of the Corpus they are taken together under the special head viv publiew (and here and there privatx) at the end of each chapter.

A similar character, resulting from the combination of a mere authentic record with the peculiar form of the honorary inscrip- tion, belongs to the indeed classes of inscriptions of the aqueducts and of the different bowndary-stoncs. The aqueduets of Rome are known to have their origin in remote antiquity ; but no inscriptions belonging to them, so far as has been as yet discovered, go farther back than to the age of Augustus.? The large dedicatory inscrip- tions of the celebrated aqueducts of Romo (as the Aque Marcia,

.Tepula, and Julia, C. 7. Z., vi. 1244-1246, Orel. 51-538, Wil. 765;

the Virgo, C. J. Z., vi. 1252, Orel. 708, Wil. 768; the Claudia, etc., OC. 0. £., vi. 1256-1258, Orel. 54-56, Wil. 764) have quite the character of honorary inscriptions, while the various cipp7 ter- minales, which mark the ground belonging to the aqueduct, show the greatest analogy to the milestones (¢g., C. J. £., vi. 1248a-g; Henz. 6685, 6686; Wil. 775-779), The other Italian and pro- vincial varieties cannot be specified here. Of boundary-stones, or eippt terminales, some very ancient specimens have been preserved. To the age preceding the Second Punic War belong two, found at Venusia and erected by municipal magistrates (C. I. L., i. 185, 186; Orel. 3527, 3528; Wil. 863); they give a short relation of a decree, by which certain localities were Ectined to be sacred or public ('aut saerom aut powblicom locom ese"). Then follow

the cippt Gracehani, by which Gaius Gracchus and his two colleagues, as tres viri agris tudicandis adsignandis, measured the ager Campanus, for its division among the plebs) They contain the names of the tres virt in the nominative, and in addition, on the top, tle lines and angles of the cardo and decwmanus, according to the rules of the agrimensores, or the boundary lines between the ager publiews and privatus (C. I. L., i, 552-556; Henz. 6464; Wil. 859-861). From the age of Sulla we still have various boundary-stones giving the line of demarcation between different communities (between Fanum and Pisaurum—C. J. Z., i. 588, Orel. 570, Wil. 861; between Ateste, Vicetia, and Patavium—C. 7. Z., i. 547-549, Orel. 3110, Henz. 5114, 5115, Wil. 865, 866). To the town of Rome belong the termini ripe Tiberis (C. IL. L., i. 608-614=V1. 1234a-1), beginning in the Augustan age, and the termini of the pomertum of Claudius and Vespasian as censors, and of the col- legium augurum under Hadrian (C. I. L., vi. 1231-1238; Orel. 710, 811; Wil. 848, 844), while others, of the consuls of the year 4 ad. (C0. L., vi. 1268; Orel. 3260; Wil. 856), of Augustus EE PD eee lest) lila I cll A

3 See the reeent important work of R. Laneiani, Commentari di Frontino tntorna le acque e gli acquedotti, &c., Rome, 1880. XIII 17

(C. Z. L., vi. 1265; Henz. 6455; Wil. 852), &c., show the boundary between the ager publicus and privatus. With similar objects boundary-stones were erected by the emperors, or, under their authority, by magistrates, mostly military, in the rest of Italy also (as in Capua—Mommsen, Jf. NV. 3590, Orol. 3688, Wil. 858; at Pompeii—Z. NV. 2314, Wil. 864) and in the provinees (as in Syria— C.1. L., tii. 183; in Macedonia—C. JF. Z., 111. 594 ; in Dalmatia— CO. f. L., iii. 2883 ; in Africa—C. J. L., viii. 7084-90, 8211, 8268, 10808, 10888, Wil. 869, 870; in Spain—C. J. L., ii, 2349, 2916, Wil. 871—where the pratwm of a legion is divided from the territory of a mwnieipiwm ; in Gaul—Wil. 867 ; in Germany, in the column lately found at Miltenberg on the Main, Bonner Jahrbiieher, vol. lxiv., 1878, p. 46, &c.). The recent attempt to combino under some boundary system the numerous stones found in Britain on military buildings, as on the wall of Hadrian and in

divers castra, which indieate the centuri# of legions and cohorts employed in the work and its measurements as exeeuted by them, has been finally refuted by Mr Clayton (in the Archwologia liana, 1880). Private

ounds (pedaturx) were unfrequently marked off by terminal etppt, fo this class of ¢ctuli must be added also the curious inserip- tions incised upon the steps of Roman circuses, theatres, and amphi- theatres (see Hiibner, Annali dell' Instituto archeologico, vol. xxviii., 1856, p. 52 sg., and vol. xxxi., 1859, p. 122 sq.), as, for instance, upon those of the Coliseo at Rome (C.J. Z., vi. 1796, 1-37; eompare R. Lanciani, Bulicttino archeologico municipale, 1881).

4, We now eome to the last elass of titi, viz., those whieh in the Corpus are arranged, at the end of each volume, under the head of Jnstrumentum. By this very eomprehensive term are designated objects which vary greatly among themselves, but which are of such a character as not to fall within any of the classes of ¢itwli deseribed before, or the elass of the instrwmenta in the proper sense of that word, —the laws, &e. — The ¢vtwii of the instra- mentum embracé movable objects, destined for public and private use, and illustrate almost every side of the life of the ancient Romans. As systematio treatment of them is hardly possible, a simple enn- meratien only of their different classes ean be given, without cit- ing special examples. The first species of them is metrological, eomprehending the inscriptions on measures and weights. The gold and silver plate used in the best Roman houses was also always marked with a note of its weight,—as is seen, for instance, on the different objects belonging to the Hildesheim find (see Hermes, iii, 1868, p. 469 sq. ; Philologus, xxviii., 1869, p. 369), the Corbridge lanx in Northumberland House (C. J. Z., vii. 1268), and many others. A second species is formed by the tessere, tokens, or marks, mostly in bronze, bone, and ivory, but also earthen, of which the most interesting are the so-called tesserx gladiatoriz, little staves of bone with holes at the top, and with names of slaves or freed- men and consular dates upon them, the relation of whieh to the munera gladiatoria is by no means certain (see C. J. L., i. 717 sq, and Hiibner, Monatsberichte der Berl. Akad. der Wissenschaften, 1867, p. 747 sq., Revue archéologique,

vol. xvi., 1868, p. 469 sq., and Ephemnv,, iii. 203). The other eircular tessere of ivory or bone, with emblems and short inscriptions, partly Greek and Latin, may with more confidence be attributed to the dud? scxwnict (see Henzen, Annali del? Instituto areheologico, vol. xx., 1848, p. 278 sq., and vol. xxii., 1850, p. 357 sq.) and to other Judi; but the uses of many of them remain very uncertain. A third species is that of inscriptions carved, inscribed, painted, or stamped upon various materials, raw or manufaetured, for trade or household use. Such are, to begin with the most solid and heavy, the inseriptions carved or painted on masses of stone, mostly columns, in the quar- ries, and preserved either on the rocks themselves in the quarries or on tho roughly hewn bloeks transported to the Roman emporium on the Tiber bank. Curious specimens of the first kind are pre- served in Lebanon, and in the north of England, near Hadlrian's Wall and elsewhere; on the second may be consulted a learned treatise by Padre L. Bruzza ("Iserizioni dei marmi grezzi," in the Annali dell?' Instituto archeologtco, vol. xlii,, 1870, p. 106=204). Of a kindred character are the inscriptions, mostly stamped or engraved in the mould, of pigs of silver, bronze, and lead (and

ewter), found in the Roman mines in Spain and England (see

iibner, "Rémische Bleigruben in Britannien," in Rheindsches Museum fiir Philologie, vol. xi., 1857, p. 347sq., and C. £. L,, vii. p. 220 s7.; A. Way, Archexlogieal Journal, vol. xvi., 1859, p. 23, and vol. xxili., 1866, p. 63). A fourth species of sted of this elass is strictly related to the military institutions of the Roman empire. Many of the weapons are marked with the names of the bearer and of the military corps to which he belonged,—so, for example, the buckles of their shields (see Hiibner, ** Romische Schildbuckel," in Arehdologisch-epigraphische Mittheilungen aus Oesterreich, vol. ii., 1878, p. 105 sq. ; by far the best extant specimen is the umbo of a legionary soldier of the eighth legion found in the Tyne near South Shields, C. Z Z., vii. 495), aud sometimes the swords, as that of Tiberius from Mainz (now: in the British Museum, see Bonner Winckelmannsprogramm of 1848). The leaden glandes used by the funditores, the slingcrs, in the Roman army bear curious historical inscriptions (see C, L., i, 642 sq., and, on the question

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of the authenticity of many of them, much discussed of late, Bergk, Bonner Jahrbiicher, vols. lv., lvi., 1875, p. 1 sq., and Zangemeister, Monatsberichte der Berliner Akademie der Wissenschaften, 1875, p. 465, 1876, p. 65 sq. ; Bullettino dell' Instituto archeologico, 1877, p. 172, 1879, p. 190 sg.). Speeial mention must be made also of the leaden seals or marks, evidently of military origin (perhaps to be borne by the soldiers as a countersign), which have been found in many parts of England, but nowhere else as yet (C. L. L., vii, 1269; Ephem. epigr., iii. p. 144, 318, iv. p. 209). Of the highest interest are tho manifold produetions of tho Roman tile and brick kilns. Next to the tiles with consular dates made at Veleia (C. 1. L., i. 777 foll.), those signed with the name of legions or other military corps, and employed in the various military build- ings of these, are especially worthy of mention ; they form an im- portant chapter in every geographieal part of the Corpus. But private persons, too, especially the rich landed proprietors, and afterwards the emperors and their kinsmen, kept large jfiguling, and their manufactures—tiles of every description and other earthenware—were spread over the Roman empire. The different sorts of earthen vessels and lamps, the fragments of which are found in great quantities wherever Roman settlements occurred, are arranged at the end of each volume of the Corpus. But a scientific inquiry into their origin, age, and employment, diffieult on account of the enormous and always inereasing mass of the extant remains, has not yet been undertaken, the small works of Froehner (Inserip- tiones terre cocte vasorum, Gottingen, 1858) and Sehuermans (Sigics figulins, Brussels, 1867) being by no means satisfactory. On Roman lamps and their inscriptions the accurate catalogue of the Vienna collection by Kenner { Die antiken Thonlampen deg K. K. Miinz- und Antiken-Cabinctes und der K. K, Ambraser Sammlung," in the Arehiv fiir Kunde dsterreichischer Gesehichts- quellen, vol. xx., Vienna, 1858) may be consulted with advantage, But a good beginning to a thorough

treatment of the question has been made by an accurate exploration of the chief deposit of those fragments, the Monte testaccio at Rome, by Dressel (“ Ricerehe sul Monte testaceio,” in the Annali dell’ Instituto archeologico, vol. i, 1878, p. 118-192). Inseriptions are found on various elasses of vessels, painted (as the consular dates on the large dolia for wine oil, &e., see Schone C. J. L., iv. p. 171 sq,, and Ephem. cpigr., i. p. 160 sq.), stamped on the clay when still wet or in the mould, and seratched in the clay when dry, like those on the walls of ancient buildings in Pompeii, Rome, and other places of anti- quity. Like the corresponding Greek ware, they eontain chiefly names of the makers or the merchants or the owners, and can be treated in a satisfactory manner only when brought together in one large collection, inasmuch as, besides being made in many local potteries, they were exported principally from some places in Italy (e.g., Arezzo) and Spain, in nearly every direction throughout northern and western Europe, the countries outside the Roman frontiers not excluded. Vessels and utensils of glass and of metal (gold, silver, and especially bronze) were also exported from Italy on a large scale, as is being more and more readily recognized even by those eh who formerly were wont to assume a loeal origin for all bronze finds made in the north of Europe. These utensils, ornaments, and other objects made of precious metals (such as cups, spoons, mirrors, fibule, rings, gems), not unfrequently bear Latin inseriptions. On the very ancient silver and bronze caskets, for holding valuable articles of the female toilet, which have been found at Preneste, are inscribed, in addition to the naines of the artist and of the donor, oecurring once, the names of the persons in the mythical representations engraved upon them (C. I. L., i, 54-60, 1500, 1501; Jordan, Kritische Beitrage cur Geschichte der lateinischen Sprache, Berlin, 1879, p. 8 sq.). In the ancient well of the Aqua Apollinares, near Viearello in Tuscany, three silver cups have been found with cireumstantial itineraries “a Gades (sic) wsgue Romam” engraved upon them, evidently gifts to the divinity of the bath for recovered health presented by travellers from the remote city named (Henzen 5210). Similar is the Rudge Cup, found in Wiltshire and preserved at Alnwick Castle, whieh contains, engraved in bronze, an itinerary along some Roman sta- tions in the north of England (C. Z. Z., vii. 1291). The inscriptions of the Hildesheim silver find and others of a similar

eharacter have been already mentioned; and many examples might be enume- rated besides, On the ancient glass ware and the inscriptions on it the splendid works of Deville (Histoire de Vart de la verrerre dans Vantiquité, Paris, 1878) and Froehner (La verrerie antique, description de la collection Charvet, Paris, 1879) may be consulted ; on the Christian glasses that of Garrucei (Vetri ornati di figure im oro trovati net cimitert det cristiani primitivi di Roma, Rome, 1858). The last species of ¢ituli is formed by the stamps them- selves with which the inscriptions on many of the objects already named are produced. They are mostly of bronze, and contain names; but it is not easy to say what sort of objects were marked with them, as scarcely any article stamped with a still existing stamp has been found. Amongst the materials stamped leather also is to be mentioned. One class only of stamps differs widely from the rest,—the oculists' stamps, engraved mostly on steatite

(or similar stones), and eontaining remedies against diseases of the eyes, to be stamped on the glass bowls in whieh sueh remedies were sold, or on the medieaments themselves (see Grotefend, Die Stempel der rimischen Augenarate gesammelt und erklirt, Gottingen, 1867 ; since its publieation many new examples have come to light).

IV. The other great elass of inseriptions above referred to, tho instrumenta or leges, the laws, deeds, &¢c., preserved generally on metal and stone, from tho nature of the case have to be considered ehiefly with regard to their eontents; their form is not regulated by such constant rules as that of the ¢ituli, so far as may be inferred from the state of completeness in which they have been preserved. The rules for eaeh speeial class therefore, though, generally speaking, maintained —as was to be expected of Roman institutions—with remarkable steadiness from the earliest times down to a late period, must be based upon a eomprehensive view of all the examples, ineluding those preserved by aneient writers, and not in the monumental form. These documents are, as a rule, incised on bronze plates (only some private acts are preserved on wood and lead), and therefore have their peculiar

form of writing, abbreviation, interpunction, &e., as has been already explained. A complete collection of these monuments, although projeeted by many workers in the field of Roman jurisprudence from Antonius Augustinus downwards, has not yet been made. The older Roman Jaws are now collected, in trustworthy texts, in the Corpus, vol. i.; of the documents belonging to the later period a very comprehensive though not quite eomplete sydloge is given in the late lamented C. G. Brnns's Fontes juris Romani antiqui (Tibingen, 4th ed., 1879).

il pas the earliest occasions for committing to writing agrec- ments, which may be supposed to have been originally verbal only, must certainly be reekoned international transaetions (leges faderis or federa), At tho head of the prose records written in the Latin language we find the treaties of allianee of Tullus Hostilius with the Sabini (Dionysius Halie., iii. 38), of Servius Tullius with the Latini (Dionysius, iv. 26; Festus, p. 169; this was, partly, at the same time, as will afterwards appear, the oldest document of thio sacred class), of the seeond Tarquinius with Gabii (Dionysius, iv. 58; Festus, epit., p. 56). They are followed, in the oldest re- publican period, by the eelebrated fadera with Carthage, so much discussed of late; by the pacts of Sp. Cassius Vecellinus with the atini of the year 261 (493 B.c.), which Cicero seems to have seen still in the forwm behind the rostra, written on a bronze column (P10 Balbo, 23, 53; sce also Livy, ii. 88; Festus, p. 166; and Momm- sen's Rémische Forschungen, ii. p. 153 sq.); and by the fadus Ardeatinum of 310 (444 B.c.) mentioned by Livy (iv. 7). Of all these documents nothing has been preserved in an authentic form, save some few words quoted from them by the aneient grammarians, Of one fedus only is there a fragment still in existence, relating to the Oscan civitas libera Bantia (C. I. L., i. 197); it was drawn up between 621 and 631 (133 and 123 B.c.), and contains the clausula of the fedus, which was written in Latin and in Oscan. On account of this peculiar circumstance, the doeument gave occasion to Kleuze, and afterwards to Mommsen, to resume (for the sake of Roman jurisprudence, in the first instance) inquiry into the Oscan and other Italian dialects. Some other Roman federa are preserved only in Greek, ¢.g., that with the Jews of the year 594 (160 B.c.) (Josephus, Andé., xii. 6, 10). Some others, made with the same uation between 610 and 615 (144 and 189 z.c.) (Jos., Ant.,

xiii. 5, 6, and 7, 8), are mentioned in an abridged form only (see Mendelssohn, “Senati consulta Romanorum que sunt in Josephi antiquitatibus,” &e.,in the Acta Societ. Philol. Lips., vol. v., 1875, p. 87 sg., and compare Rheinisches Museum fiir Philologie, vol. xxx., 1875, p. 118 sg., xxxii., 1877, p. 249; Ritschl’s Opuscula, vol. v. p. 99 sg.; Mommsen, Hermes, vol. ix., 1874, p. 281 sq; Niese, Hermes, vol. xi., 1876, p. 466 sq.), or given in that of a senatus consuitwm, to whieh they must formally be ascribed. Amongst the federa may be reckoned also the curious oath, sworn, perhaps, according to a general rule obtaining for all civitates federate, by the citizens of a Lusitanian oppidum, Aritium, to Gaius Cesar on his accession to the throne in A.D. 37 (Cis ii. 172; Wil. 2839).

Closely related to the federa are the pacts between communities and private individuals, respecting patronatus or hospitium (tabulx patronatus et hospitii, also, when in small portablo form, tesserz hospitales), of which many specimens from the end of the republic down to a late period of the empire have been preserved (sce Gazzera, Memorie dell’ Academia di Torino, vol. xxxv., 1831, p. 1 sq.,and Mommsen, Rémische Forschungen, i. p. 841 sg.). There is at present no complete collection of these; for since Gazzera’s timo many new ones have been found. Of the numerous examples scattered through the different volumes of the Corpus may be quoted the tessera Fundana, containing the paet of hospitality be- tween the community of Fundi and a certain Ti. Claudius (who cannot, with eertainty, be identified), the oldest hitherto known, in the form of a bronze fish (C. I. £., i. 582; Henz. 7000; Wil. 2849); the tabula of the pagus Gurzensium in Africa, delivering the patronate to L. Domitius Ahenobarbus, Nero’s

grandfather, in 742 (12 B.c.), in the afterwards solemn form of a tabella fastigata, to bo fixed in the atrium of the person honoured (Orel. 3693 ; Wil. 2850) ; that of the civitas Palantina with a pere- grinus named Acces Licirni of the year 752 (2 B.c.) (Ephem. epigr., 1, 141; Hermes, v., 1871, p. 371 sg.); that of Lacilbula, in Spain, with one Q. Marius

Balbus, of 5 a.p. (C. Z. L., ii. 1398) ; that of the Bocchoritani on the island of Majorea, of 6 a.v. (C. i L., ii. 3695; Wil. 2851); the four relating to C. Silius Aviola, datin

from 27 to 28 A.D., all found at Brescia (C. J. Lv. 4919-4922) ; that of the colonia Julia Aug. legionis vii. Tupusuetu, in Afriea, with the imperial legate Q. Julius Seeundus, of 55 a.p. (CE is vili. 8887; Wil. 2851); that of two gentilitates, the Desonci and Tridiavi, of the gens of the Zelx, in Spain, now in the Museum of Berlin, whieh contains an older aet of the year 27, and another more reeent of the year 127 a.p. (C. J. L., ii. 2633; Orel. 156); that of the respublica Pompelonensis (Pampluna in Spain) of 185 A.D. (C. I. L., HW. 2960; Wil. 2854); that of the Segisamonenses, in Spain, of 239 a.p., now in the museum at Burgos (Ephem. epigr., ii, 822); that of the fabri subidiani (7.¢., subediani, qui sub ede consistunt) of Cordova, of 348 a.p. (C. I. Z., ii. 2211; Wil. 2861); and, in addition to many others, those found together at Rome, ou the site of the palace of Q. Aradius Valerius Proeulus, and belonging to him and other members of his family, from divers African eities, and executed in 821 and 322 a.v. (CO. L L., vi. 1684 -88; Orel. 1079, 3058).

2. Hardly inferior in antiquity, and of superior value, are the remains of laws in the strieter sense of the word (leges and plebt- scita), preserved to us in the originals, although unfortunately only in fragments more or less extensive. Of thoso laws the oldest and most important are the lex Acilia (for so it is in all probability to be styled) repetundarum of the year 631 (C. I. L., i. 198), whieh is incised on a bronze table about 2 metres broad, in 90 lines of about 200 to 240 letters each, and therefore extremely inconvenient to read, and the lex agraria of 648 (111 3.c.), written on the reverse of the table of the Acilia, abrogated shortly afterwards (C. J. L., i. 200); this is the third of the eelebrated laws of C. Gracehus bear- ing upon the division of publie lands. Then follow the lex Cornelia de viginti questortbus, a fragment of Sulla's legislation, the eighth table only, of the whole set, being preserved (C. J. L., i. 202); the plebiscitum de Thermcnsibus, on the autonomy of Ter- messus in Pisidia, proposed by the tribuni plebis, in 682 (72 B.C.), one of four or five large bronze plates (C. I. Z., i. 204); the lex Rubria de civitate Galliw cisalpine of 705 (49 B.c.), written in a

new and more eonvenient form (belonging as it does to Cexsar's legislation), in two columns, with numbered divisions, being the fourth out of an unknown number of plates (C. Z Z., i. 205); the lex Julia municipalis, or, from tho place whero it was fonnd, thie tabulee Heracleenses of 709 (45 B.c.), written on the reverse of the much older Greek law of that community, preserved partly at Naples, partly in the British Museum (C. 7. Z., i. 206), also a fragment of Cesar's general municipal institutions; it contains a curious passage relating to the publie promulgation of laws (v. 15). These are tho laws of tho Roman republie preserved in important fragments; some minor ones (brought together in C. 7. L., i. 207-211) inay be left out of aecount here. In the imperial age, laws in general were replaced by scnatus consulta, or by imperial decrees. It was also in the form of a senatus consultwm that the legcs de imperio, on the accession of the emperors, seem to have been promulgated. An example of such a law, preserved in part on a bronze tablet found at Rome, is the lex de imperio Vespasiant (C. I. L., vi. 980; Orel. vol. i. p. 567). There is, besides, one special category of imperial constitutions which continued to be named Jeges, viz., the constitutions given by the emperors to the divers classes of civitates, based upon the ancient traditional rules of government applied to Rome itself as well as to the coloniw and municipia. Of this sort of lcges some very valuable speeimens have come from Spanish soil, viz., the lex coloniw Juliz Genetives Urbanorum sive Ursonis (now Osuna), given to that colony by Cesar in 710 (44 B.c.), but incised, with some alterations, in the time of Vespasian, of which three bronze tables out of a much larger number remain (Hiibner and Mommsen, Ephem. epigr., ii. p. 150 sg. and 221 sq.); the lex Salpensana and the lex Malacitana, given to these two municipia by Domitian, between 81 and 84 A.D., each on a large bronze plate, written respectively in two and in five columns, with the single ehapters numbered and_ rubricated (C. L. L,, ii. 1968, 1964, compare Mommsen, " Die Stadtrechte der ateinischen Gemeinden Salpensa und Malacca in der Provinz Betica," in tho Abhandlungen der sdchsischen Gesellschaft der Wissenschaften, philol.-histor. Classe, vol. iii., 1857, p. 368 sq.) ; the lex metalli Vipascensis, given, with all probability, by one of the three Flavii, as a constitution to a mining district of southern Portugal, one bronze plate numbered iii.—three or more, therefore, being lost (seo Hiibner, Ephem. cpigr., iii. p. 165 sq.

and, for a popular account, the Deutsche Rundschau, August 1877, p. 196 sqg.). The so-ealled military diplomas, although in certain respects nearly related to the deges of the later period, aro better placed along with the imperial decrees,

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3. A tliird species of official documents is formed by dccrees of the scnate of Rome, of the analogous eorporations in the colonix and municipia, and of the divers collegia and sodalicia, consti- tuted, as a rule, after a similar fashion and debating in nearly the same way as the Roman and the municipal senates. The oldest Roman senatus consulta are those translated into the Greck lan- guage and containing treaties of alliance, as already mentioned. They are preserved either on monuments or by ancient authors, as Josephus :—e.g., the fragment found at Delphi, from the year 568 (186 B.o.), and the sc. Thisbeum, from Thisbe in Beeotia, 584 (170 B.C.) (Ephem. epigr., i. p. 278 sq., ii. p. 102, and Joh. Schmidt, Zeit- schrift der Savigny-Stiftwng, vol. iii, 1881), those of 616, 619, 621, 649 (138-105 B.c.) (C. L Grec., 2905, 2908, ii. 2485, 2737; Le Bas and Waddington, vol. iii. p. 195-198; Annali dell Instituto, vol. xix., 1847, p. 113; Ephem. epigr., iv. p. 218 sq.), and those relating to the Jews, dating from 615, 621, and 710 (139, 188, and 44 B.C.) (Josephus, Ant., xili. 9,2, xiv. 8, 5and10, 9). The two oldest senatus consulta written in Latin are also preserved in a more or less complete form only by ancicut authors; they are the se. de philosophis et rhetort- bus of 598 (161 b.c.) (Gellius, Noct. Att., xv. 11, 1) and that de hastis Martiis of 655 (99 B.c.) (Gellius, iv. 6, 2). The only one belong- ing to the oldest period preserved in the original Latin form, of which only a part exists, together with the Greck translation, is the sc. Luiatianum, relating to Asclepiades of Clazomene and his companions, dating from 676 (77 B. o)(C. T. £., 1. 903). "Therese, belonging to the later epoch from Cieero downwards, about twenty in number, are mostly preserved only in an abridged form by anoient writers,—such as Cicero, Frontinus, Maerobius,—or in Justinian's Digesta (see Hiibner, De senatus populique Romani actis, Leipsic, 1859, p. 66 3g.); a few exist, however, in a monumental form, complete or in fragments—as the two sc. on the ludi sacu- lares, dating from 173B.c. and 47 A.D., preserved

on a marble slab found at Rome (C. Z Z., vi. 877); the fragments of two sc. in honour of Germanicus and the younger Drusus, from Rome, on bronze tablets (C. 7. Z., vi. 911-912; Henz. 5881-5282); the two se. Hosidianwm and Volusianwm, containing regulations for the demolition and rebuilding of houses in Rome, incised on the same bronze plate, found at 'Herculaneum, dating from Nero's time, between 41 and 46 and from 56 a.p. (Orel. 3115; Mommsen, Berichte der sdchs. Gesellschaft der Wissenschaften, philol.~~histor. Classe, 1852, p. 272 sq.); and, of a later period, the sc. Cassianwm or Nonianum of 188 A.D., containing a market regulation for the saltus Bequensis in Africa, where it has been found prescrved in two examples on stone slabs (Zphem. epigr., ii. p. 271 sq., not com~~ plete in Wil. 2838), and the fragment of that for Cyzicus, belong- ing to the reign of Antoninus Pius (Ephem. epigr., iii. p. 156 sg.). There exists, poutine! a chapter of a sc., relating to the collegia, inserted in the decree of a collegiwm at Lanuvium, to be mentioned below. Of the municipal decrecs, of which a greater number is preserved (see Hiibner, De sen. populique Rom. actis, p. 71 sq.)): only a few of the more important may be mentioned here: —the lea Putcolana de parieti faciundo of 649 (105 B.o.) (C. J. Z., i. 577; Orel, 3697; Wil. 697); the two decreta (or so-called cenotaphia) Pisana in honour of Lucius and Gaius Cesar, the grandsons of Augustus, of 8 A.p. (Orel, 642, 643; Wil. 883); the decretwm Lanu- vinum of 183 A.D., containing the regulations of a collegiwm funeraticium, styled collegium salutare Diane et Antinot (Or. 6086 ; Wil. 319); and the deeretuwm Tergestinum, belonging to the time of Antoninus Pius (0. Z. Z., v. 5382; Henz. 7167; Wil. 693). There are, however, more than thirty others preserved, some of them, such as those from Naples, written in the Greek language. Of the third speciality, the decreta collegiorwm, only the lex collegii aqux of the first century (Marini, Atti de' fratelli Arvali, p. 70; Rudorff and Mommsen, Zeitschrift fiir Rechtsgeschichte, vol. xXv., 1850, p. 203, 345 sq.), and the lex collegii isculapti et Hygix, of 158 (C. J. Z., vi. 10234; Orel. 2417; Wil. 320) need be mentioned here; many more exist. One of them, the lex collegit Jovis Cerneni, dating from 167 a.p., found at Alburnum major in Dacia, is pre- served on the original tabella cerata on which it was written (C. I. L., iit. p. 924; Henz. 6087; Wil. 321).

4, The fourth species of instruwmenta are the decrees, sometimes in the form of letters, of Roman and municipal magistrates, and of the emperors and their functionaries, incised, as a rule, on bronze tablets. The oldest decree in the Latin language which has been

reserved is that of L. Amilius Paulus, when pretor in Hispania

etica, dating from 189 b.c., for the Turris Lascutana in southern Spain (C. I. Z., ii. 5041; Wil. 2887); of the same date is a Greek one of Cn. Manlius, consul of the year 565, for the Heracleenses Carie (Le Bas and Waddington, n. 588). Then follow the famous epistula consulum (falsely styled commonly senatws consultwnr) ad Teuranos de bacchanalibus, dated 568 (186 B.c.) (C. LZ. Z., i. 196) ; the sentence of the two Minucii, the delegates of the scnate, on a dispute concerning the boundaries between the Genuates and Viturii, 117 3.c. (C4. £ LZ., i. 199; Orel. 3121; Wil. 872); and the cpistula of the pretor L. Cornelius (perhaps Sisenna), the preetor of 676 (78 B.c.) ad Tiburtes (C.L£L., i. 201). These belong to the republican age. From the imperial period a great many morc have

come down to us of varying quality. Some of them are decrees or constitutions of the emperors themselves. Such are the decree of Augustus on the aqueduct of Venafrum (Henz. 6428, Wil. 784); that of Claudius, found in the Val di Nona, belonging to 46 a.p. (C. 2. L., v. 5050; Wil. 2842); of Vespasian for Sabora in Spain (C.LL., ii. 1428), and for the Vanacini in Corsica (Orel. 4031); of Domitian for Falerii (Orel. 3118) ; the epistles of Hadrian relating to Aizani in Phrygia, added to a Greek decree of Avidius Quietus (C.J. Z., Thi. 365.5. Wenz. 6955), and relating to Smyrna, in Greek, with a short one of Antoninus Pius, in Latin (C. I. Z., iii. 411 ; Orel, 3119); the decrees of Commodus relating to the saltus Buruni- tanus in Africa (Mommsen, Hermes, vol. xv., 1880, p. 358 sg.); of Severus and Caracalla for Tyra (Akerman in Meesia), Latin and Greek (C. I. L., iii. 781; Henz. 6429); of Valerian and Gallienus for Smyrna, also Latin and Greek (C.L.Z., ili. 412); of

Diocletian de preliis rerum venaliwm, containing a long list of prices for all kinds of merchandise, preserved in divers copies more or less com- plete, in Latin and Greek (C.L.L., iii. p. 801 sg. ; compare Ephem, epigr., iv. p. 180, and, as similar monuments, the lex portus of Cirta, of 202 A.p., Wil. 2738, and the fragment of a regulation for the importation of wines into Rome, Henz. 5089, Wil. 2739) ; and some of the age of Constantine, as that relating to Hispellum in Umbria (Henz. 5580; Wil. 2843), that of Julian found at Amorgos (Henz. 6431), and some others, of whieh copies exist also in the juridical collections. Of two imperial rescripts of a still later age (413 A.D.), fragments of the originals, written on papyri, have becn found in Egypt (see Mommsen and Jaflé, Jahrbuch des gemeinen deutschen Rechts, vol. vi., 1861, p. 898 ; Hanel, Corpus legum, p. 281). Imperial decrees, granting divers privileges to soldiers, are the diplomata militaria also, mentioned above, incised on two com- bined bronze tablets in the form of diptycha, of which about seventy examples have been brought together in the Corpus (vol. iil. p. 842 sq.) ; some specimens are given in Wil. 2862-2869, and in the Ephem. epigr. (vol. ii. p. 452, and vol. iv. p. 181 sq.), belonging to nearly all emperors from Claudius down to Diocletian. Though not adecree, yet as a publication going back directly to the emperor, and as being preserved in the monumental form, the speech of the emperor Claudius, delivered in the senate, relating to the Roman citizenship of the Gauls, of which Tacitus gives an abstract (Ann. xi. 28), ought also to be mentioned here ; it was engraved on large bronze slabs by the public authority of Lugudunum (Lyons), where a large fragment of it is still preserved (Boissieu, Inscriptions antiques de Lyon, p. 182 sq.). Another sort of deerees, relating to a great variety of subjects, has to be mentioned, emanating, not directly from the emperors, but from their functionaries. Such are the decree of the proconsul L. Helvius Agrippa, of the year 68 4.D., on the boundaries of some tribes on the island of Sardinia (Wil. 872a); that of the prefect of Egypt, Tiberius Julius Alexander, written in Greek, of the same year (C. J. Grec., 4957); that of C. Helvidius Priscus, on-a similar question relating to Histonium, belonging perhaps to the end of the first century (Wil. 873); that of the legate of Trajan, C. Avidius Quietus, one of the friends of Plutareh, found at Delphi, in Greek and Latin (C. L L., iti. 567; Orel. 3671; Wil. 874); a rescript of Claudius Quartinus,

perhaps the imperial legate of the Tarraconensis, of the year 119 a.p., found at Pampluna (C.I.L., ii. 2959; Orel. 4032) ; the epistle of the pre- fecti pretorio to the magistrates of Sepinum, of about 166-169 A.D. (Mommsen, J..V., 4916; Wil. 2841) ; the decree of L. Novius Rufus, another legate of the Tarraconensis, who ex tilia recitavit, of 198 AD. (C.J. Z., ii, 4125; Orel. 897; Wil. 876); the sentence of Alfenius Senecio, then subprefeet of the classis pretoria Misenensis, belonging to the beginning of the third century, formerly existing at Naples (Mommsen, J. V., 2646) ; and some others of the fourth and fifth centuries, not requiring specific mention here. Quite a collection of epistles of high Roman functionaries is found in the eclebrated'*inscription of Thorigny (Mommsen, Berichte der sdchs, Gesellschaft der Wissenschaften, 1852, p. 235 sg.). The letter of a provineial functionary, a priest of Gallia Narbonnensis, to the fabri subediant of Narbonne, of the year 149, may also be mentioned (Henz. 7215; Wil. 696a). To these must be added the tabulz ali- mentariz, relating to the well-known provision made by Trajan for the relief of distress among his subjects, such as that of the Ligures Bebiani (Mommsen, J.V., 1854, Wil. 2844) and that of Veleia near Parma (Wil. 2845); while evidence of similar institutions is fur- nished by inscriptions at Tarracina, at Sicca in Africa, and at Hispalis in Spain (Wil. 2846-48; C.Z.Z., ii. 1174). At the close of this long list of official documents may be mentioned the libelius of the procurator operum publicorum a eolumna divi Marci of the year 193 (C. I. L., vi. 1585; Orel. 39; Wil. 2840) and the interloeutiones of the prefecti vigilum on a lawsuit of the fullones of Rome, of 244 a.D., inseribed on an altar of Hercules (CL L., vi. 266; Wil. 100). These documents form a most instructive class of instrumenta. 4 5. Many doeuments, as may be supposed, were connected with religious worship, public and private. The oldest lex templi, which continued in force until a comparatively late period, was the regu- lation given by Servius Tullius to the temple of Diana on the

Aventine, after the conclusion of tho federal pact with the Latini, noticed above. Mention is made of this ancient law as still in foree in two later documents of a similar character, viz., the dedi- eation of an

altar to Augustus by the plebs of Narbo in southern France, of 764 A.D., but existing only, at Narbonne, in a copy, made perhaps in the 2d century (Orel. 2489 ; Wil. 104), and that of an altar of Jupiter, dedicated at Salone in Dalmatia in 187 a.p., still existing in part at Padua (C. J. L., iii. 1983 ; Orel. 2490 ; Wil. 163). Another lex fant still existing is that of a temple of Jupiter Liber at Furfo, a vicus of southeru Italy, of the year 696 (58 B.c.), but copied, in vernacular language, from an older original (C. 7. L., i, 603; Orel. 2488; Wil. 105 ; compare Jordan in Hermes, vol. vil., 1872, p. 201sq.). The lists of objects belonging to some sanctuaries or to the ornaments of statues are eurious, sucli as those of the Diana Nemorensis at Nemi (Henz., Hermes, vol. vi., 1871, p. 8 sq.), and of a statue of Isis in Spain (Htibner, Hermes, vol. i., 1866, p. 345 sq. ; compare C.J. L., ii. 2060, 3386, Orel. 2510, Wil. 210), and two synopses from a temple at Cirta in Africa (Wil. 2736, 2737). The sortes given by divinities may also be mentioned (see C. I. L., i. p. 267 sg.; Wil. 2822). Toa temple also, though in itself of a secular character, belonged a monument of the highest historical importance, viz., the Index rerum a se gestarum, incised on bronze slabs, copies of which Augustus ordered to be placed, in Latin and Greek, where required, in the numerous Augustea erected to himself in company with the Dea Roma. This is known as the Jfonu- mentum Ancyranum, because it is at Angora in Asia Minor that the best preserved copy of it, in Greek and Latin, exists ; but frag- ments remain of other aipe from other localities (see C. ZT. L., iii.

. 779 sq., and the special editions of Mommsen, Berlin, 1865, and femk, Gottingen, 1873). Among the inscriptions relating to sacred buildings must also be reckoned the numcrous fragments of Roman calendars, or fastd anni Juliani, found at Rome and other places, which have been arranged and fully explained by Mommsen (0. f. £., 1. p. 293 sg.; compare Hphem. epigr., i. p. 88, ii. p. 98, iii, p. 5, 85, iv. p. 1 sg., and for those found in Rome, C. J. L., vi. 2294-2306). Local, provincial, or municipal kalendaria have like- wise been found (as the feriale Cumanwm, C. I. L., i. p. 810, and the Capuanum, Mommsen, J. N., 3571). Many other large monu- mental inscriptions bear some relation, more or less strict, to sacred or public buildings. Along with the official calendar exhibited on the walls of the residence of the pontifex

mamimus, the list of the eponymous magistrates, inscribed by the order of Augustus on large marble slabs, was publicly shown,—the fasti consulares, the recon- struetion and illustration of which formed the life-work of Borghesi. These have been collected, down to the death of Augustus, by Henzen, and compared with the additional written testimonies, by Mommsen, in the Corpus (vol. i. p. 298 sg.; see also Ephem. epigr., i. p. 154, ii p. 210, 285, iii. p. 11 sg.; compare Hirschfeld and Mommsen in Hermes, vol. iii., 1874, pp. 98, 267 sq.), along with the acta triumphorwm and other minor fragments of fasti found in various Italian communities (C. I. L., i. p. 458 sq.; Ephem. epigr., i, p. 157, iii. p. 16), while the fasti sacerdotwm publicorum populi Romani, together with the tabula feriarwm Latinarum, are given in the volume devoted exclusively to the monuments of Rome (vol. vi., p. 441 sg. ; compare Hermes, vol. v., 1870, p. 879, and Ephem. epigr., ii, p. 93, iii. pp. 74, 205 sq.). Documents of the same kind, as, for example, the albwm ordinis Thamugadensis from Africa (Ephem. epigr., iii. p. 77 sq.),.and a considerable mass of military lists (Zatercula, of which those belonging to the garrison of the metropolis are brought together in C. Z. L., vi. p. 651 sq.), are given on many dedicatory and honorary monuments, chiefly from Lambesis in Africa (C. I. L., viii.). As. those documents, though having only a partial claim to be ranked with tho sacred ones, derive, like many other dedicatory monuments, their origin and form from that class, so also the protocols (acta), which, from Augustus downwards, seem to have been preserved in the case of all important collegia magistratuum, now survive only from one of the largest and most distinguished collegia sacerdotum, in the acta collegit fratrum Arvaliwm, to which Marini first drew the attention of _epigraphists ; they form one of the most important masses of epigraphic monuments preserved to us in the Latin language (see C. I. L., vi. p. 459 sq., Ephem. epigr., ii. p. 211 sg., and Henzeun's Acta fratrum Arvalium, Berlin, 1874),

6. Another species of instruments is formed by private documents. They have been incidentally preserved (inserted, for instanee, into sepulchral and honorary inscriptions), in the later period not un- frequently in monumental form, as the testaments, given partly or in full, mentioned above (viz., that of Dasumius and the Gaul, CE L., vi.

10229, Wil. 314, 315, and some capita testamentorum or codieiili, as that of M. Meconius Leo found at Petelia—Mom- msen, J. V., 78, 79; Orel. 3677, 3678 ; Wil. 696), and the dona- tions, such as those of T, Flavius Syntrophus (C. J. L., vi. 10239 ; wae 318), of T. Flavius Artemidorus (Wil. 310), of Statia Irene and

ulia Monime (C. I, L., vi. 10231, 10247; Wil. 311, 318). Of a peculiar description is the pactwm Jiduciz, found in Spain, engraved on a bronze tablet, and belonging, in all robability, to the 1st century (C. J. L., ii. 5042), which seems to be a formulary. Other

documents relating to private affairs exist in their original form, written on tabellxz ceratz. Those found together in a mining dis- trict of Dacia have been arranged and explained by Mommscn and Zangemeister (C. J. L., iii, p. 291 sq., with facsimiles) ; those found at Pompeii in 1875, containing receipts of the banker L, Cwcilius Jucundus, have been published by De Petra (‘Le tavo- lette ecrate di Pompei,” Atti del?’ Academia de’ Lineet, vol. iii., 1876) and explained by Mommsen (Hermes, vol. xii., 1877, p. 88 sq.). These documents are written in cursive letters ; and so mostly, too, are some other curious private monuments, belonging partly to the sacred inscriptions,—tho defixiones, imprecations dirccted against persons suspected of theft or other offences, who, aceording to a very ancient superstition, were in this way believed to be delivered to punishment through the god to whom the defixio was directed. The numerous Greek and Latin (and even Oscan) examples of this usage have been brought together by Wachsmuth (Ltheinisches Museum, vol. xviii., 1868, p. 559 sg.; Henz., Baillet- tino dell’ Instituto, 1866, p. 252; compare C. L. L., i. 818-820, C. I. L., vii. 140). Only a few of them are incised on stone (as that to the Dea Atwcina from Spain, C. I. L., ii. 462); for the most part they are written, in cursive lettcrs, or in very debased capitals, on small bronze or lead tablets (so C. J. L., i. 818, 819; Henz. 6114, 6115 ; Wil. 2747, 2748), to be laid in the tombs of the “defixi,” or deposited in the sanctuaries of some divinity. Some new specimens of this class have

been latcly added from Pavia and Arezzo in Italy (Mommscn, Hermes, vol. iii., 1868, p. 802, and vol. iv., 1869, p. 282 sq.; Wil. 2749, 2753, 2754); one was lately found at Bath (Zangemeister, Hermes, vol. xv., 1880, p. 588 sq.).

7. Many of the privato documents just alluded to have not a monumental charaeter similar to that of the othcr inscriptions in the wider sense of the word, as they are written on materials not very durable, such as wood and lead,—in the majority of cases, in cursive characters ; but, nevertheless, they cannot be classed as literature. As a last species, therefore, of instrwmenta, there remain some documents, public and private, which similarly lack the strict monumental character, but still are to be reckoned among inscriptions. These are the inscriptions painted or scratehcd on the walls of the buildings of ancient towns, like Pompeii, where, as was to be expected, most of them have been pre- served, those from other ancieut cities buried by the eruptions of Vesuvius and from Rome being very small in number. All the various classes of these inscriptions—publie and private advertise- ments, citations for tle municipal elections, and private scribblings of the most diverse (and sometimes most indecent) character, once partly collected by Chr. Wordsworth (Inscriptiones Pompeiane, &e., London, 1837, 1846)—are now arranged by Zangemeistcr in the Corpus, vol. iv. (see also Ephem. epigr., i. pp. 49, 177 sq., and some specimens in Wil. 1951 sg.), whence their peculiar paleographic and oo rules inay be learned. And, lastly, as related to some of these advertisements, though widely differing from them in age and character, may be mentioned the soceallled diptycha consularia, monuments, in the first instance, of the still very respectable skill in this branch of sculpture to be found at this late period. They are, as is generally known, carved-ivory tablets, in the form of pugillaria, and seem to have been invitations to the solemnities connected with the accession of high magistrates, especially to the spectacles of the circus and amphithcatre ; for they contain, along with representations of such spectacles, the names, and often the portraits, of high functionaries, mostly of the 5th and 6th cen- turies. Since Gori's well-known work on this class of monuments (Thesaurus veterum diptychorum, &c., 8 vols., Florence, 1759) no comprehensive collection

of them has been published ; as speci- mens see C. J. L., ii. 2699, and v. 8120, 1-9.

Bibliography.—There is no '*Textbook" of Roman epigraphy which can be recommended to the student. Brissonius, in his work De formulis et solemnibus populi Romani verbis librt VILLI. (first published at Paris, 1588 ; edited, with additions by Conradi and Bach, at Frankfort and Leipsic, 1754), gives some useful information about the instrwmenta; Maffei, in his Ars critica lapidaria (published, after his death, in Donati's Supplement to Muratori, 1765), goes too far in his suspicions about forgeries ; Morcelli's Lexicon epigraphicum (in his Opera epigraphica, 5 vols., Padua, 1819) is made for use in tho composition of modern Latin inscriptions. Zaccaria's Instituzione antiquario-lapidaria osia in- troduzione allo studio delle antiche latine tscrizioni (Rome, 1770, and Venice, 1793) has its merits, though it is somewhat anti- quated, and is, besides, a rather scarce book. But students must be warned against Zell's Handbuch der rimischen Epigraphik (2 vols., Heidelberg, 1850-1852), which is a work in every respect thoroughly unsatisfactory. For Christian inscriptions Le Blant's Manuel d'épigraphie chrétienne d'aprés les marbres de la Gaule (Paris, 1869), on which the article in Martigny's Dictionnaire des antiquités chrétiennes (2d ed., Paris, 1877, p. 357 sq.) is based, and that in Smith and Cheetham's Dictionary of Christian Antiquities (vol. i., London, 1875, p. 841 sg.), may be consulted with advan- tage. (E. HU.)

INSECTIVOROUS PLANTS. Insectivorous or, as

they are sometimes more correctly termed, carnivorous plants are, like the parasites, the climbers, or the succulents, a physiological assemblage belonging to a number of distinct natural orders. They agree in the extraordinary habit of adding to the supplies of nitrogenous material afforded them in common with other plants by the soil and atmosphere, by the capture and consumption of insects and other small animals. The curious and varied mechanical arrangements by which these supplies of animal food are obtained, the ways and degrees in which they are utilized, and the remarkable chemical,

histological, and electrical phenomena which accompany these processes of prehension and utilization, can only be understood by a separate and somewhat detailed examination of the leading orders and genera. It is convenient to follow the order adopted by Mr Darwin in his work on Jnsectivorous Plants (Lond., 1875), to which our knowledge of the subject is mainly due, incorporating, however, as far as possible the leading observations of other writers on the subject. We must preface this, however, by a brief summary of the facts of taxonomy and distribution.

Taxonomy.—The best known and most important order —the Droseracee— is placed among the calycifloral exogens, and has obvious affinities with the Saxifragacex. It includes six genera—Byblis, Roridula, Drosera, Droso- phyllum, Aldrovanda, and Dionwxa, of which the last three are monotypic, @e., include only one species. The curious pitcher-plant, Cephalotus follicularis, is usually raised to the dignity of a separate natural order Cephalotex, though Bentham and Hooker (Gen. Plant.) place it among the Ribesiacex, The Sarraceniacee are thalamiflorals, and contain the genera Sarracenia, Darlingtonia, Heliam- phora, while the true pitcher plants or Wepenthacez, consisting of the single large genus MWepenthes, are placed near the Aristolochiacee among the Apetale. Finally the genera Pinguicula, Utricularia, Genlisea, and Polypom- pholix belong to the gamopetalous order Utricularie. Thus all the four leading divisions of the exogenous plants are represented by apparently unrelated orders; certain affinities, however, are alleged between Droseracex, Sarraceniacex, and Nepenthacex.

Distribution.—While the large genus Drosera has an all but world-wide distribution, its congeners are restricted to well-defined and , usually compara- tively small areas. Thus Drosophyllum occurs only in Portugal and Mo- rocco, Lyblis in tropical Australia, © and, although Al- © drovanda is found in Queensland, in Bengal, and in Europe, a wide dis- tribution explained by its aquatic habit, Dionezais restricted to a few localities in North and South Carolina, mainly around Wilming- ton. Cephalotus = wey occurs only near ey Albany in Western Fig. 1.—Leaf of Sundew (Drosera rotundifolia). x4, Australia, Helvam-

(After Darwin.) phora on the Roraima Mountains in Venezuela, Darling- tonta on the Sierra Nevada of California, and these three

INSECTIVOROUS PLANTS

genera too are as yet monotypic; of Sarracenia, however, there are six or eight known species scattered over the eastern States of North America. The 386 species of Nepenthes are mostly natives of the hotter parts of the Indian Archipelago, but a few range into Ceylon, Bengal, Cochin China, and some even occur in tropical Australia on the one hand, and in the Seychelles and Madagascar on the other. Pinguicula is abundant in the north temperate zone, and ranges down the Andes as far as Patagonia; the 150 species of Utricularia are mostly aquatic, and some are found in all save polar regions; their unimportant congeners, Genlisea and Polypompholix, occur in tropical America and south-western Australia respectively. It is remarkable that all the insectivorous plants agree in inhabiting damp heaths, bogs, marshes, and similar situations where water is abundant,—a peculiarity perhaps due to their habit of copious secretion and conse- quent need of water. \ Drosera. —The Common & Sundew (D. rotundifolia) has X& extremely small roots, and bears five or six radical leaves horizontally extended in a rosette around the flowerstalk. The upper surface of each leaf is covered with gland-bearing filaments or "tentacles," of which there are on an average about two hundred. Each ria. 2—Leaf of Sundew, enlarged, gland is surrounded by a lange ith, tentacles on, due sid fs dew-like drop of a viscid but the disk. (After Darwin.) transparent and glittering secretion, and the popular names (Sundew, French Rossolis, German Sonnenthau) as well as the Linnean (from dpdcos, dew) have been thus suggested, The stalk of the tentacle has the essential structure of a leaf. A small fibro-vascular bundle, consisting mainly of spiral vessels, runs up through the stalk and is surrounded by a

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Fia. 3.—Glands of Sundew magnified. (After Dodel-Port.) A, external aspect with drop of secretion; B, internal structure. layer of elongated parenchyma cells lined by a thin layer of colourless circulating protoplasm, and filled with a homo- geneous fluid, tinted purple by a modification of chlorophyll (erythrophyll, Sorby). The epidermis bears small multi- cellular prominences. The glandular head of the tentacle contains a central mass of spirally thickened cells in im- mediate contact with the upper end of the fibro-vascular bundle. Around these (but separated from them by @

layer of much elongated cells, Warming) there is a layer of cells filled with purple fluid, and outside these lies a similar series of cells, whose contents differ slightly in tinge, and in behaviour when treated with reagents.

Insects seem to be attracted by the leaves of Drosera, put whether by their colour, their glittering secretion, their odour, or by all three, remains as yet unsettled. A fly alighting on the disk, or even only touching one or two of the exterior tentacles, is immediately entangled by the viscid secretion; the tentacles to which it is adhering begin to bend, and thus pass on their prey to the tentacles next succeeding them inwards, and the insect is thus carried by a curious rolling movement to the centre of the leaf. The tentacles on all sides become similarly inflected ; the blade or the leaf may even become almost cup-shaped; and the insect, bathed in the abundant secretion which soon closes up its trachee, is drowned in about a quarter of an hour. The leaves clasp also, but for a much shorter time, over inorganic bodies.

The bending of the tentacle takes place near its base, and may be excited (1) by repeated touches, although not by gusts of wind or drops of rain, thus saving the plant from much useless movement; (2) by contact with any solid, even though insoluble and of far greater minuteness than could be appreciated by our sense of touch,—a morsel of human hair weighing only zs7z of a grain, and this largely supported too by the viscid secretion, sufficing to induce movement; (3) by the absorption of a trace of certain fluids, mostly nitrogenous, During the

inflexion of the tentacle, and even before it touches the stimulating object, the secretion of the gland increases in quantity, and, instead of remaining neutral, becomes acid.

The stalk of a tentacle whose gland has been stimulated by repeated shocks, continuous pressure, or the absorp- tion of any nitrogenous fluid, particularly a solution of ammonic carbonate, shows a mottled appearance; and, when examined under the microscope the formerly homogeneous fluid contents of its constituent cells are seen to have separated into purple masses of constantly varying num- ber, shape, and size, suspended in a colourless fluid, and the layer of colourless circulating protoplasm which lines the cells thus becomes much more distinctly visible. This process, which is termed by Darwin "aggregation of the protoplasm," commences in the glands and gradually travels down the tentacles, being temporarily arrested at each cell-wall, The process of redissolution of the proto- plasm commences at the base of the tentacles and proceeds upwards, Aggregation is a vital process: the cells must

Fic. 4—Diagram of the same cell of a tentacle of D. rotundifolia, showing the vartous forms successively assumed by the aggregated masscs of protoplasm.

(After Darwin.) be alive, uninjured, and oxygenated ; if they are crushed or treated with carbonic acid the phenomenon does not take place. It is not necessarily related to inflexion, for one may be induced without the other ; it is totally unlike the " plas- molysis," or shrinking away of the protoplasm from the cell-wall, which takes place on treating a portion of vege- table tissue with any dense fluid, and which is simply due to exosmose; and it does not depend upon increased Secretion. Darwin has also observed aggregation in the Sensitive hairs of Dionza, and in the roots of various plants ; 1t seems indeed to be of wide distribution and _—* importance in the physiology of the vegetable

Liffects of Heat.—Sachs asserts that plants are killed by immersion for ten minutes in water at 45° to 46° C., and that their protoplasm coagulates at 50° or 60°. Darwin, however, found that the immersion of leaves of Drosera for ten minutes in water at 50°, instead of killing the leaves, excited the tentacles into quick movement, that a tem- perature of 54°-4 paralysed the leaves without killing them, and that some even survived a tempcrature of 62°C. Some of the lowest plants have frequently been described as living in hot springs, but that so highly organized a native of temperate and even almost arctic regions should withstand so high a temperature is very remarkable.

Action of Ammonia Salts.—All the salts of ammonia produce in- flexion, the carbonate strongly, the nitrate even more so, and the phosphate most of all. The immersion of a leaf in a solution of the last- mentioued salt, so weak that each gland could only absorb about

‘soos Of a grain, is sufficient to produce complete inflexion of the tentacles. ‘Though the particles of solid matter which stimulate the olfactory nerves, and so produce the sensation of odour in ani- mals, must be infinitcly smaller than this, as Mr Darwin remarks, the fact remains truly wonderful that the absorption of so minute a quantity bya gland should induce some change in it, which leads to the transmission of a motor impulse down the entire length of the tentacle, causing the whole mass to bend, often through an angle of more than 180°, and this too in the absence of any specialized nervous system.

Action of various Salts and Acids.—In the case of salts the nature of the base seems to be of much more importance than that of the acid, a conclusion already arrived at by auimal physiologists. Thus nine salts of sodium caused inflexion, and were not poisonous; seven of the corresponding salts of potassium did not cause inflexion, and some were poisonous. This is interesting in connexion with the fact that large doses of sodium salts may be introduced into the circulation of mammals with impunity, whereas small doses of potassium salts speedily cause death. Of twenty-four acids tried, ninetecn caused inflexion, and the majority, even including most of the organic acids, were poisonous, which is the more remarkable since

juice of many plants scems much more strongly acid than the

solutions which were ws patty The poisonous action, however, is not improbably connected with the negative osmose which is known to be induced by dilute acids.

Action of Alkaloid Poisons, of other Substances, and of Vapours. — Acetate and sulphate of quinine, citrate of strychnine, nicotine, digitaline, act more or less strongly on the glands and kill them; on the other hand, nitrate of quinine, atropine, veratrine, colchicine, theine, are quite harmless. Curare is not poisonous, and cobra poison, which kills animals by paralysing their nerve centres, causes "* strong and rapid inflexion of the tentacles, and soon discharges all colour from the glands," stimulating also the movements of their protoplasm. Since alkaloids which act strongly on the nervous system of animals are without effect on Droscra, it seems probable that the sensibility of its glands, and their power of transnuitting a stimulus to other parts of the leaf, are not duc to clements analo- gous to nerve. Camphor in solution acts as a stimulant; the vapours however, of camphor, chloroform, alcohol, ether, and car- bonic acid have a narcotic or anesthetic action, and kill the plants after a time.

Effects of Organic Fluids.— Digestive Power of Sceretion.—Darwin treated sixty-one leaves of Drosera with non-nitrogenous solutions (gum-arabic, sugar, starch, dilute alcohol, olive-oil, tea). The ten- tacles were not in a single case inflected. Hethen applied to sixty- four other leaves various nitrogenous fluids (milk, urine, albumen, infusion of meat, mucus, saliva, isinglass), and sixty-thrce had the tentacles and often the blades well inflected. Finally, taking twenty-three of the leaves which had served for the first experiment and treating them with bits of meat or drops of nitrogenous fluids, all save a few, apparently injured by exosmose caused by the density of the former solution of gum, sugar, &c., were distinctly in- flected.

We are thus led to inquire whether the leaves have only the power of absorbing matter already in solution or whether they can render nitrogenous matter soluble, that is, whether they have the power of true digestion. 'The digestion of albuminous bodics by animals is effected by

means of a ferment, pepsin, acting in presence of weak hydrochloric acid,—neither the acid nor the ferment having the power of digesting in the absence of the other, though almost any other acid may " substituted for hydrochloric. When the stomach is mechanieally excited, acid is secreted, but not pepsin ; this requires for its production the absorption of a minute quantity of already soluble animal matter (peptogene of Schiff). These pro- positions all hold good of Drosera. Frankland analysed the sccre- tion obtained by stimulating four hundred and forty-five leaves with particles of glass, and came to the conclusion that its acidity was due to some aeid of the acetic series, apparently either propionic or a mixture of accticand butyric aeids. Analysis of larger quantities enabled Will to show that the secretion contained formic as well as probably butyric and propionic acid, and Recs and Will prepared a glycerin extract which when acidulated rapidly digested fibrin,

Lawson Tait also separated a substance possessing the property of a digestive ferment.

Darwin fed numerous plants with roast meat and minute cubes of boiled white of egg, and placed other cubes in wet moss as a check. Solution soon took place in the former cases ; and, just as in animal digestion, the edges of the cubes of egg were first rounded off, and the striation of muscle was replaced by dark points, while the bits of egg left in moss putrefied. On neutralization of the acid by alkali, digestion stops ; on reacidification, it goes on again. Neither the watery nor the glycerin extract of leaves stimulated by fragments of glass was able to digest, showing that the ferment is not secreted until the glands have absorbed a trace of animal matter. The leaves digested fibriu, connective tissue, cartilage, bone, enamel, and dentine, gelatin, chondrine, casein of milk, &c., but could not digest epidermic productions (nails, hairs, feathers), fibro-elastic tissue, mucin, pepsin, urea, chitin, chlorophyll, cellu- lose, gun-cotton, oil, fat, and starch, thus completing the analogy with the gastric digestion of animals.

Pollen-grains had their pro- toplasmic contents dissolved, and seeds were usually killed.

Trritability and Movements.—Cutting and pricking the leaf does not induce movement ; the petiole is quite insensible, nor do the pedicels of the glands bend when rubbed or stimulated by contact with food. Only the eos remain, and these at once respond to stimuli, yet their irritability seems to extend for a very slight dis- tance below them, since when the glands are cut ff their pedicels often become inflected. When a tentacle receives an impulse either from its own gland or from the central tentacles, it bends towards the middle of the leaf, the short tentacles on which do not bend at all ; in all other cases all the tentacles, even those of the centre, bend towards the point whence the stimulus comes. Thus all the tentacles of a leaf may be made to converge into two symmetrical groups by placing a fragment of phosphate of ammonia in the middle of each "half of the blade. Contrary to the opinion of Ziegler, vivisection shows that the motor impulse is not transmitted through the fibro-vascular bundles, but through the cellular tissue. An impulse thus travels more rapidly along than across the leaf, since, from the clongated shape and the position of the cells, fewer cell-walls have to be crossed in a given distance. Thus, when the central glands are excited, they send centrifugally some influence to the exterior glands, where aggregation of the protoplasm is set up, which may be watched descending their tentacles, and the whole process is not without analogy to a reflex action, The motor im-

_ pulse seems to be allied to the aggregating process, and it has been attempted to explain the bending which takes place at the base of the tentacles by assuming either (1) a rapid passage of fluid out of the cells in that region, which would thus contract, at least if we suppose them to be previously in a state of high tension and to possess great elasticity, (2) a contraction of the protoplasm of these cells, (3) the contraction of the cell-walls as wales the protoplasm, or (4) a shrinkage of the fluid contents of the cells, owing to a change in their molecular state with the subsequent closing in of the walls.

Absorption.—Bennett has described what he terms absorptive glands beneath the epidermis, consisting of two nearly hemi- spherical cells, filled with brownish protoplasm and bearing papille, which sometimes rise above the surface of the leaf, or the P aie of the tentacles. He finds similar organs in Dionwa and Nepenthes, but in no plants other than carnivorous, except Callitriche. Clark fed Drosera with flies soaked in chloride of lithium, and after several days found that all parts of the plant when burned showed the characteristic spectrum of lithium ; and Tait, by cultivating plants with roots cut off and leaves buried in pure sand watered with an ammoniacal solution, showed that the sundew can not only absorb nutriment from its leaves, but can actually live and thrive by their aid alone, if supplicd with small quantities of nitrogenous material.

Dionea Muscipula, L.—This plant, the well-known Venus's Fly-trap, was first described in 1768 by Ellis in a remarkable letter to Linnzeus, in which he gave a substan- tially correct account of the structure and functions of its leaves, and even suggested the probability of their carni- vorism. lLinneus declared it the most wonderful of plants (miraculum nature), yet only admitted that it showed an extreme case of sensitiveness, supposing that the insects were only accidentally captured and subsequently allowed to escape. Two American botanists, Curtis and Canby, successively advanced our knowledge of the mode of capture and digestion, which has also been investigated by Mrs Treat, T. A. G. Balfour, and others, and most fully by Darwin.

The leaves are all radical, with broad foliaceous foot- stalks. Each leaf has two lobes, standing at rather less than a right angle to each other, their edges being produced

two plants.

into spike-like processes. The upper surface of each lobe is covered with minute circular sessile glands, each consist- ing of from 20 to 30 cells filled with purplish fluid. If bears also three fine-pointed sensitive filaments arranged

Fic. 5.—Leaf of Venus's Fly-trap (Dionwa muscipula), viewed laterally in its expanded state. (After Darwin.)

ina triangle. These contain no fibro-vascular bundles, but present an articulation near their bases, which enables them to bend parallel to the surface of the leaf when the lobes close, When the filaments are touched by an insect, the lobes close very sharply upon the hinge-like mid- rib, the spikes inter- lock, and the insect is imprisoned. If very minute, and so not worth digesting, it is able to escape between the inter-

locked spines > More Fra, 6.—Leaf of D. muscipula closed over insect, usually, however, it A, viewed from the side; B, from above. is retained between the lobes, which gradually but firmly compress it, until its form is distinguishable from without. The leaf thus forms itself into a temporary stomach, and the glands, hitherto dry, commence, as soon as excited by the absorption of a trace of nitrogenous matter, to pour out an acid secretion contain- ing a ferment, which rapidly dissolves the soft parts of the insect. This is produced in such abundance that, when Darwin made a small opening at the base of one lobe of a leaf which had closed over a large crushed fly, the secre- tion continued to run down the footstalk during the whole time — nine days— during which the plant was kept under observation. Aggre- gation may be observed in 4 the glands, and, at least on treatment with carbonate of ammonia, the aggregative pro- cess may be watched ascend- =& ing the sensitive hairs. Though the filaments are exquisitely sensitive to the YF ate fee with solid "G; alee nig ae bodies, yet they are far less ~ 80? sensitive than those of Drosera to prolonged pressure, @ singular difference in evident relation to the habits of the Like the leaves of Drosera, however, those

of Dionxa are completely indifferent to wind and rain. The surface of the blade is very slightly sensitive ; it may be roughly handled or scratched without causing movement, but closes when its surface or midrib is deeply pricked or cut. Irritation of the triangular area on each lobe enclosed by the sensitive filaments causes closure. The

footstalk is quite insensitive. Inorganic or non-nitrogenous bodies, placed on the leaves without touching the sensitive fila- ments, do not excite movement, but nitrogenous bodies, if in the least degree damp, cause after several hours tlie lobes to close slowly. So too the leaf which has closed over a digestible body applies a gradual pressure, which serves to bring the glands: on both sides into contact with the body, and may also, as Balfour suggests, aid in absorp- tion. 'Thus we see that there are two kinds of movement, adapted for different purposes, one rapid, excited mechani- cally, the other slow, excited chemically. Leaves made to close over insoluble bodies reopen in less than twenty-four hours, and are ready, even before being fully expanded, to shut again. But if they have closed over nitrogen-yielding bodies, they remain closely shut for many days, and after re-expanding are torpid, and never act again, or only after a considerable time. ven in a state of nature, the most vigorous leaves are very rarely able to digest more than twice, or at most thrice, during their life. The secretion is a true gastric juice containing formic acid, and like gastric juice has remarkable antiseptic powers. Lindsay fed leaves with such quantities of meat as to kill them with indigestion, yet showed that the meat inside the leaf remained perfectly fresh while portions hanging outside putrefied.

While evidence is thus afforded of the absorption of the products of digestion by the complete disappearance of fibrin, albumen, &c., placed upon the leaf of Dzioneza, Fraustadt was able, by feeding leaves with albumen dyed with aniline-red, to colour the contents and nuclei of the gland-cells.

The motor impulse, as in Drosera, is transmitted through the cellular tissue. Burdon Sanderson has demonstrated the existence of a normal electric current in the leaf of Dionzxa, and the negative variation under- gone by that current at the mo- ment of closure of the leaf due to the conversion of electromotive, force into mechanical work. This discovery, which is of the highest importance as showing the pro- found resemblance between the closure of the leaf of Dionxa and the contraction of a muscle, has been followed up and extend- edbyMunk. ©. £ de Candolle a- fé scribes the clos- BE ure of the valves = to

variations in Re the turgescence ¥ of the paren- chyma of their upper surface.

Aldrovanda vesiculosa. — This aquatic Dionxa” floats freely, and is destitute of roots. Its whorled leaves have two lobes, with slightly inflected margins, which open only about as much as the valves of a living mussel-shell, and thus capture the more easily the

Fic. 8.—Aldrovanda vesiculosa.—A, whorl of leaves; B, leaf pressed open and enlarged, showing glands, sensitive 66 minute filaments, and quadrifid hairs. (After Darwin.)

small crustaceans and mollusks which may get between them. Part of the upper surface of each lobe next the midrib bears colourless glands (like those of Dionzxa, but stalked), together with numerous long sensitive filaments which have both median and basal articulations ; the outer thinner portion bears small quadrifid hairs, Darwin holds that the glands secrete and digest, while the quadrifids are destined to the absorption of decaying animal matter,

the two regions of the leaf thus serving for very different

purposes.

Drosophyllum lusitantcum.—This plant catches such vast numbers of flies in a state of nature that the Portuguese cottagers call it the fly-catcher, and hang up branches of it in their houses for this purpose. Its linear leaves are thickly covered with stalked glands which resemble in the main the tentacles of Drosera, save in that they are incapable of movement, and that their secretion is acid before excitement. The secretion too is less viscid, and freely leaves the gland to wet the insect, which, creeping ouward, soon clogs its wings and dies. There are, moreover, many minute colourless sessile glands which only begin to secrete when stimulated by the absorption of nitrogenous matter, with which they seem to be mainly concerned.

Roridula and Byblis resemble Droso- Pe alia AO phyllum, but their glands are of simpler ¢urtace. (After structure than those of the latter, scarcely D2”) differing appreciably from the glandular hairs of other plants. Mr Darwin has thrown considerable light upon the question of how far the glands of plants not adapted. for capturing insects share the power of absorption exhibited by those of the Droseracex. Choosing a number of plants at hazard, he found that the glands of two species of Saxifraga, a genus distantly allied to Drosera, of a Primula, and of Pelargonium have the power of rapid absorption, and exhibit movements of aggregation in their protoplasm, whereas those of rica, Mirabilis, and Nicotiana appear to have no such power. Heckel has made similar observations on the floral glands of Parnassia palustris, and on the leaf-glands of Geraniwm sparmannia, &e. The glandular hairs of at least some plants are known to be capable of absorbing ammonia, both in solu- tion. and in vapour, and probably some obtain animal matter from the insects which are occasionally entangled in the viscid secretion.

Fie.9.—Part of leaf of Drosophyllum lusitanicum. x 7.

Fic. 10.—A, leaf of Butterwort (Pinguicula vulgaris), with left margin infleeted over a row of small flies. (After Darwin.) B, glands from surface of leaf (x 800).

Pingwcula or Butterwort.—The large thick radical leaves of this genus have a very viscous surface and a pale colour, and bear two sets of glands, the larger borne on usually unicelluiar pedicels, the smaller almost sessile. When a fly is captured, the viscous secretion becomes strongly acid, the naturally sinsiad “gull = the leaf

are excited to curve still farther inwards, and in short all the phenomena of secretion, aggregation, digestion, absorp- tion, &c., may be observed which have been described in Drosera. . Utricularva.—The aquatic species of this plant are found floating in foul and stagnant

water. Their much divided filamentous leaves bear bladders (fig. 11, A), averaging about 41, of an inch in length, each of which bears six or seven long bristles around the mouth, which is fitted with a thin transparent valve, that opens inwards and is covered with peculiar glands. The interior of the bladder is lined by quadrifid hairs (fig. 11, B), like those described in Aldrovanda. Aquatic crustaceans, worms, insect larvae, and other small animals easily enter by pushing inwards the posterior free edge of the valve, which is highly elastic.

Fic, 11.—A, bladder of Utricularia neglecta (after Darwin), showing at c collar

indistinctly seen through walls.

of U. vulgaris (x 300), This instantly shuts against an interior thickened collar or projection around the mouth, and so renders escape impossible. The means by which the plant attracts its victims are unknown, but their success is very remarkable. Few bladders fail altogether, and many are found quite filled with crustaceans, as many as ten having been counted by Darwin within a single bladder. These bladders, however, have no secretion, and are quite unable to digest; they merely absorb the products of decomposition by means of their quadrifid hairs,

The terrestrial species (¢g., U. montana), as also those of Polypompholiv, bear numerous minute bladders of essentially similar structure along their creeping subter- ranean rhizomes, and these usually contain the decomposed remains of small terrestrial articulate animals. enlisea has curious long-necked pitchers, lined with long downward directed hairs, which at once aid an animal in its entrance and prevent its retreat.

Sarracenia.—Long supposed to be reservoirs of water for the birds, as was suggested by Linnzeus, or refuges for insects from their pursuers, as was supposed by Catesby, the true function of the leaves of this curious plant has only been elucidated of recent years, mainly by the labours of Mellichamp and Hooker. The mouths of the long radical trumpet-shaped leaves are protected by a large spreading lid, the inner

surface of which is abundantly smeared with nectar, and often gaily coloured. Into one form of pitcher rain enters easily, into the other with difficulty. This with the mouth of the pitcher is furnished with numerous honey-secreting glands, and furnishes the attractive surface (fig. 12, A). A pathway too leads up- wards from the ground along the broad wing of the pitcher, and is at least in some species also honey-baited ; along this creeping insects are lured to their destruction. Below it is the conducting surface (B) of glassy epidermic cells, with short downward-directed points, which like those of Genlisea facilitate the descent, but impede the ascent of an insect. Then come the glandular surface ©, which is formed of smooth polished epidermis with numerous glands, that secrete the fluid contents of the pitcher, and finally the detentive surface (D), of which the cells are produced

B, quadrifid hairs from interior of bladder

into long and strong bristles which point downwards and: meet in the centre of the diminishing cavity so ag to render escape impossible. The secretion wets an insect very rapidly, and appears to have remarkable anesthetic effects. It seems to be completely destitute of digestive power, indeed rather to accelerate decomposition. The pitchers accumulate vast quantities of insects in the course

Fie. 12.—Leaves of Sarracenia purpurea.

A, attractive surface of lid; B, con- ducting, C, glandular, and D, detentive surface; magnified. A and D are taken from S. flava.

of a season, and must thus abundantly manure the surrounding soil when they die. Moreover, the feast is largely shared by unbidden guests (commensals). Not to speak of insects which feed upon the pitcher itself, some drop their eggs into the putrescent mass, where their larve find abundant nourishment, while birds often slit open the pitchers with their beaks and devour the maggots in their turn.

Darlingtonia.—Of the two forms of pitcher in this genus the larger and ordinary form, that of the adult plant, is somewhat twisted, and instead of a lid has a large inflated hood overarching the small mouth.

Nepenthes.—The pitchers of this genus are borne at the ends of long tendril-like prolongations of the leaves, and are of considerable size, varying from an inch to a foot or more in depth. Again we have two varieties of pitchers, one belonging to the young state of the plant, short, broad, and provided with broad external wings, adapted for the capture of ground game, while the adult form, intended for winged game, is long, narrow, and often destitute of lateral appendages. The mouth of the pitcher is strength- ened and kept open by a thickened rim, which, like the under surface of the lid, secretes honey, and is frequently produced inwards and downwards into a short funnel-shaped tube which prevents the escape of insects, or into a row of incurved hooks sometimes strong enough to retain a small bird. The younger form of pitcher has its whole interior lined by secreting glands ; the other and more common form

has an attractive, a conductive, and a secreting surface analogous to those of Sarracenia, but wholly different in histological details. The detentive surface is represented by the fluid secretion which is invariably present. This is developed before the pitcher opens, and has generally a

Fie. 13.—Darlinglonia californica.

faintly acid reaction ; it contains, as shown by Voelcker, malic and citric acids, together with chloride of potassium, and carbonates of soda, magnesia, and lime. Hooker proved the digestive powers of the fluid, even on substances

Neat 3

Fic, 14—Pitcher of Nepenthes distillatoria. A, honey-gland from attractive Surface of lid; B, digestive gland from interior of pitcher, in

pocket-like depression of epidermis, opening downwards; ©, transverse section of the same. A, B, and C magnified about 100 diameters.

80 resisting as cartilage ; Rees and Will found that fibrin was

dissolved even more rapidly by the secretion of the excited

pitchers than in a test experiment with pepsin from the Ss 29) . .

pigs stomach ; and Lawson Tait, Vines, and others have

obtained the ferment in a separate state. Tait indeed

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finds two substances, both possessing great antiseptic powers, and both being apparently, together with acid, essential to digestion—one a greyish-white precipitate with alkalies, which he terms '"droserin," and which seems the analogue of pepsin; the other, "azerin," a transparent straw-coloured substance precipitated by alcohol, he com- pares to ptyalin, the ferment of saliva. Droserin seems to be present in the secretion of all those insectivorous plants which possess the power of digestion, azerin perhaps in all without exception. The latter substance has the property of rapid deliquescence, so that it can only be preserved in hermetically sealed tubes, and its solution, like glycerin, quickly wets any body with which it comes in contact. A fly thrown into water never gets completely wetted, while one which falls into the secretion of any insectivorous plant is rapidly soaked and drowned by the fluid entering its trachex.

Cephalotus.—This plant bears ordinary leaves as well as pitchers. The latter somewhat resemble in general form those of Wepenthes, but are more complicated in histological details. Tait has proved the digestive action of their secretion.

Morphology of Pitchers.—Baillon, and indeed first of all Linnzus, have pointed out how by exaggerating the con- cavity of a peltate leaf like that of Mymphzxa we obtain a pitcher of the type of Sarracenia.

Intermediate forms are frequently shown by a variety of Piperomia arifolia. Hooker has given reason to believe that the pitcher of Nepenthes is not a transformed leaf, but a mere leaf- appendage answering to the water-secreting gland found at the end of many leaves, The apex of the leaf, instead of forming the lid as in Sarracenia, is represented by a filiform appendage (see fig. 16, F). Finally, Dickson has

Fya

Fic. 16.—Morphology of Pitchers. _— after Dickson.) A, ordinary leaf of Cephalotus; B, monstrous leaf with spoon-shaped depression; C and D, other abnormal forms more deeply pouched, showing f ormation of pitcher; E, ordinary pitcher of Cephalotus; I, pitcher of Nepenthes; G, pitcher of Sarracenia; a, apex of leaf,

proved by comparison with monstrous forms that the

pitcher of Cephalotus arises in a third and totally distinct

way, by a calceolate pouching from the upper surface of the ordinary spathulate leaves, the lid here arising from the proximal side of the pitcher-orifice. ie

Other Insectivorous Plants.—Dischidia, an Asiatic genus

of Asclepiadacex, and Martynia, one of the Pedalines, have also been described as insectivorous, as well as Caltha dionxfolia and several Aroids. Even Anomoclada, a South American liverwort, and a fern (Llaphoglossum glutinosum) have been described by Spruce as capturing numerous insects. All these cases, however, require much further investigation. The counate leaves of Dzipsacus frequently enclose water in which insects are drowned, and Francis Darwin has discovered protoplasmic filaments which are emitted by the cells of certain glands within these cups, and which appear to absorb the

products of decomposition. A similar process has recently also been shown by Ludwig to occur in Si/phiwm, an allied genus.

Oonelusion.—When Mr Darwin's work appeared, nume- rous objections were made to accepting his conclusions, on the a priort ground that digestion was too purely an animal function to be conceivable of plants. Morren demolished these by showing that digestion—the conversion of insoluble and indiffusible proteids, fats, and amyloids into soluble and diffusible compounds by means of appropriate ferments—is not confined either to animals or to carnivorous plants, but is a universal property of living beings, in fact the necessary preliminary of all assimilation. Not only are all the important animal digestive ferments represented among plants, but vegetable physiologists have made us acquainted with several ferments —synaptase, erythrozyme, myrosine, &c.-which have no known analogues in the animal kingdom. It is merely the exudation, not the existence, of the ferment, then, which is remarkable in carnivorous plants, and this Darwin suggests might begin by an exosmose accompanying the absorption of animal matter by any plant possessing viscid glandular hairs, and, once set up, would be perfected by natural selection. Insectivorous plants too are not the only ones which exhibit peculiarities of nutrition. The true parasites absorb the juices of the plants which they infest, and, not to mention the fungi, many of which subsist partly or wholly on animal matter, the phanerogamous saprophytes (Veottza, Monotropa, &c.) live by absorbing the partially decomposed materials of other plants; and from the absorption of vegetable to that of animal matter the transition is easy. The reciprocal case too occurs in the animal kingdom ; animals possessing chlorophyll have been shown to nourish themselves like plants, without feeding, by decomposition of carbonic acid and the formation of starch in sunlight, and thus carnivorous plants—trespassers into the animal kingdom—are paralleled by vegetating animals. Thus, then, we have only to change our standpoint, and look, not at the anomalous plant or animal, but at the essentially similar cells, and the yet more essentially similar protoplasm of which both are composed, to see that their apparent anomalies are but additional proofs of the unity of nature.

But a more serious criticism affected the completeness of Darwin's work. Though Knight in 1818 had thought plants of Dionza on which he placed morsels of beef grew more luxuriantly than others not so treated, many observers have since failed to see any improvement on insectivorous plants when regularly fed, or any disadvantage when prevented from obtaining animal food altogether ; while others have even asserted that animal food was hurtful, having injured or killed their plants by feeding. In the latter case the explanation was of course that the feeding was excessive, but to meet the objections of the former a very careful research was undertaken by Francis Darwin. Te took six plates full of thriving plants of sundew, and divided off each by a transverse bar. Then, choosing the least flourishing side of each, he placed, on June 12, 1877, roast meat, in morsels of about =4, of a grain on the leaves, and renewed the dose occasionally. The plants on the fed sides were soon clearly greener than those on the starved sides, and

their leaves contained more chlorophyll and starch, In less than two months the number of flowerstalks was half as numerous again on the fed as on the unfed sides, while the number and diameter of the leaves and the colour of the flowerstalks all showed a great superiority. The flowerstalks were all cut at the end of August, when their numbers were as 165 to 100, their total weight as 230 to

- 100, and the average weight per stem as 140 to 100 for

the fed and unfed sides respectively. The total numbers of seed capsules were as 194 to 100, or nearly double, and the average number of seeds in each capsule as 12 to 10 respectively. The superiority of the fed plants over the unfed was even more clearly shown by comparing their seeds, the average weights per seed being as 157 to 100, their total calculated number as 240 to 100, and their total weight as 380 to 100. The fed plants, though at the commencement of the experiment in a slight minority, at the end of the season exceeded the unfed by more than 20 per cent., while the following spring the young plants which sprang up on the fed side exceeded those on the other by 18 per cent. in number and by 150 per cent. in total weight, so that, in spite of the

relatively enormous quantity of flowerstalk produced by the fed plants during the previous summer, they had still been able to lay upa far greater store of reserve material.

It is to be remarked that the beneficial effect of feeding, although distinct in the vegetative system, is much more remarkable in the reproductive, a fact which explains the unfavourable opinion of previous observers.

These results were also independently arrived at by three German observers, Rees, Kellerman, and Von Raiumer, who used aphides instead of roast meat. The question of the utility of the carnivorous habit may thus be considered as no less indisputable than its existence.

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INSECTS

HE Insecta, or Insects, form the largest class of that i division of the animal kingdom formerly called Articu- lata, but for which the more expressive term Arthropoda (joint-footed) is now more generally employed. This term includes, besides Znsecta, the classes Crustacea, Arachnida, and Myriopoda.

The chief diagnostic characters of an Insect, as com- binedly distinguishing it from a Crustacean, an Arachnid, or a Myriopod, are as follows:—Legs usually (never more than) six in number ; two antennv ; ordinarily two pairs of more or less membranous wings; head, thorax, and abdomen distinctly separated; respiration effected by means of internal trachez, which communicate with the air by lateral openings termed spiracles or stigmata, or by external plates or filaments (these ordinarily only in the preparatory conditions of aquatic forms), which absorb air and convey it to the trachez. A reference to the articles on the other classes of Arthropoda will indicate in what way these diaguostic points are modified in them.

As in all organized beings, the limits of the class are not strongly defined, for, although it is not difficult to indicate an insect, speaking broadly, there are certain small groups that do not satisfactorily fall into the class as limited by strongly marked lines of demarcation. These will be especially alluded to hereafter.

Number of Species of Insects.—At the head of this article it is stated that the Znsecta form the largest group of the Arthropoda ; it might probably be said with justice that they far outnumber all the other members of the animal kingdom combiued. It is certain that at the present time 80,000 presumably distinct species of beetles have been described, and it is safe to assume that the number of known species of other orders is greater, thus giving a total of about 200,000. And yet we are only on the threshold of a knowledge of the forms that actually exist in nature, many enormous groups of minute forms being still only very

partially studied. In fact, it may be confidently anticipated that some day the number of known forms will not fall far short of 1,000,000.

Antiquity of Insects. —Fossil indications have been dis- covered in the Devonian series, and in the Carboniferous they become rather more numerous; but, with few exceptions, these all belong to those orders in which the metamorphoses are incomplete, and there is no evidence that any antho- philous insects (such as Lepidoptera or Hymenoptera) were then in existence. Ascending the geological scale to the Mesozoic age, the representatives of the older groups become very numerous, and often of gigantic size. Coleoptera are fairly well indicated; and the flower-loving Lepidoptera and Hymenoptera make their appearance, but in very small numbers. In the Tertiary rocks remains become sometimes very abundant, and of all orders ; and in the post-Tertiary or Quaternary period these remains consist largely of those of species now existing. One of the most interesting features in fossil entomology is the well-known occurrence of myriads of insects entombed in the fossil resin known as amber, preserved in the most beautiful manner, and belonging for the most part to genera now existing, but differing spécifically. In alluding to this it is well to mention that the insects found in gum copal and other recent resins are, on the contrary, of existing species. As in other animals, and also plants, the fossil remains prove that the distribution of heat and cold on the earth was once very different from what it now is: a fossil beetle of rather large size was discovered by our last Arctic Expedition almost at the highest northern point attained,

Geographical Distribution.—It may be asserted that no part of the earth's surface is without insects, They have been discovered in the Arctic and Antarctic regions at the highest point reached, and even showy butterflies of several species enliven the dreary solitudes of almost everlasting ice, as was abundantly proved by the naturalists of the "Alert" and "Discovery," who found them almost up to 83° N. lat. But, as a rule, the larger and more brilliant forms occur within the tropics. Yet it must not be assumed, as is sometimes erroneously done, that the majority of tropical insects are large and brilliant, and the smaller and more obscure forms comparatively less numerous. Recent

investigations by competent observers show that the latter are at least as abundant in the tropics as in temperate regions, and that it is the wealth of large forms that has caused the others to be overlooked.

The attempts at subdivision of the globe into zoological regions, so successful with regard to mammals, and in a smaller degree with birds, have not been so entirely satis- factory with regard to insects, more especially as concerns the separation of the Palearctic and Nearctic regions (see DistrisutTion) ; still there is often a very marked local- ization in particular groups, which divide themselves specifically to an infinite extent within very circumscribed areas, and are found nowhere else. The results obtained from minute investigation of insular faune have derived much of their value from insects, and have occasioned much valuable philosophical speculation on the origin both of the islands themselves and of their faunz and flore. Space will not permit of detailed allusion to the apparent affinity shown by the insect inhabitants of regions now very widely separated, such, for instance, as that of Western Europe with Western (rather than Eastern) North America, of Australia and New Zealand with Chili, of Chili and the southern extremity of South America with the Palzearctic region, &c.

As special points of distribution may be mentioned the occurrence of insects in hot springs, in brine, in the deepest caves (these are usually blind), below low-water mark, and even on the surface of the ocean (the genus Halobates in the Memiptera) very far from land.

The power of many insects to acclimatize themselves rapidly when accidentally introduced into new regions is very marked, and adds to the difficulty often experienced in considering what species are really endemic and what introduced, especially in islands. Someof the common and noxious British species thrive enormously when introduced into Australiaand New Zealand; and there is every reason to believe that the grape-vine pest (Phyllowera) was origin- ally an importation from America.

Duration of Iife.-— The maximum duration of the life of a perfect insect is probably attained in bees and ants, the females or queens of which are known to live at least seven years; the minimum is found in

some species of May-flies (Zphemeride), in which twenty-four hours is perhaps the limit. But the length of life of a perfect insect is sometimes in direct opposition to that of the same insect in its preparatory stages, and some of the Hphemeride that live at most but a few days in their aerial form have taken three years to complete their growth in their sub- aquatic stages. Temperature also has a marked effect on some species. The common house-fly, for instance, will complete its whole life cycle from embryo to fly in a few days in the heat of summer, but requires very much longer in cold weather.

Economic Entomology.—Within the limits of an encyclo-

predia article it is impossible to give even a skétch of this subject. Those who desire an cxhaustive résumé cannot do better than consult Kirby and Spence's delightful Introduction, even although it may be now somewhat out of datc. Some especially noxious species—such, for instance, as the grape-vine pest, the Colorado beetle, and the Rocky Mountain locust—had not then been alluded to as occasion- ing damage, or were evén altogether unknown. Asconcerns American species, Riley's Leports on the Noxious, &c., Insects of Missourt are mines of information. Amongst insects that are of direct benefit to man the hive-bee and the silk-worm moth stand pre-eminent, and the cochineal and lac insects are scarcely of less importance. No sub- stitutes for silk, honey, and beeswax have been or are likely to be discovered; but, on the other hand, chemical discoveries have now occasioned the disuse of some insect products that were formerly valuable articles of commerce, and in this category nothing is more remarkable than the manner in which the oak-gall of commerce has given way to inorganic substances in the manufacture of ink. As food for man, insects play a very unimportant pait, and they can scarcely be said now to form part of the diet of the more highly civilized races, notwithstanding an attempt lately made in America so to utilize the masses of the destructive Rocky Mountain locust. Yet locusts themselves (with other large insects) are eaten raw or cooked by the inhabi- tants of more than one part of the globe, and the large fleshy

grubs or larvee of beetles and other insects are as much esteemed as delicacies by the natives of some countries as the Cossus (the precise identity of which appears involved in some uncertainty) was by the luxurious Romans. The aborigines of Australia make a cake of the

pounded bodies of a night-flying moth (Noctua spini),

termed the Bugong moth; the natives of the Lake region of Central Africa make a kind of bread of the multitudes of small dead insects (chiefly Hphemeride and Diptera) that collect on the shores; in Central America the eggs of a large water bug supply materials for a kind of bread.

Noxious insects are legion, and cannot here be alluded to even in the most general manner. The number of those that cause injury to man by direct attacks is comparatively small; it is by their attacks on the produce of our fields and gardens that insects assert their importance. But it should not be overlooked that the especial province of insects is to act as scavengers, and very frequently they are not the initiating cause of damage, which is rather to be sought in a previously unhealthy condition of the trees or plants; they simply step in to complete the work of destruction commenced by disease or by a low state of the vital functions.

Insects and the Fertilization of Plants.—Such is the importance of insects in the economy of nature, and as conferring indirect benefit on man, in this particular, that this subject might have been alluded to under the preceding heading. That the action of insects in fertilizing plants was often necessary had long been known. But it is owing to the patient and laborious researches of living naturalists (amongst whom the names of Darwin, Hermann Miiller, and Lubbock stand prominently forward) that the vast im- portance of the subject has come to be understood. They have proved incontestably that in a multitude of plants the condition of the: reproductive organs is such that self- fertilization is impossible ; but what is of greater import- ance is the proof afforded that, although many plants are per- fectly capable of self-fertilization, the weight and number of tlie seeds or fruit are often vastly increased when cross- fertilization is effected, and that this

is mainly done by the action of insects, the wind and other causes playing only a minor réle. It may be truly said that such is the correlation between plants and insects that the majority of the former

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would more or less gradually disappear from the carth's surface were the latter to be destroyed. In New Zealand the red clover has been introduced and flourishes, but all hopes of spreading it there have to be abandoned; the plant never perfects its seeds, owing to the absence of humble bees, which appear absolutely necessary for its fertilization.

Parasitism.—Among the varied relations of insects to other classes of the animal kingdom and their mutual relations, no subject is more interesting than is that of parasitism. It occurs in almost all the orders, but in very different degrees. Whole groups are naturally epizoic, others entozoic, while a few (such as fleas and bed bugs) can scarcely be arranged in either of these divisions, inas- much as, although in one sense epizoic, it appears probable that they may occasionally be able to go through the whole of their life cycle without contact with the animals to which they otherwise appear especially attached. As true epizoa the whole group of true lice, Anoplura (which are probably degraded /Zemuptera), and bird lice (Mallophaga, a group of uncertain affinities) are especially familiar. 'These cannot exist without their hosts, and their whole life is passed on them, each mammal or bird having its especial parasite (or more than one), which affects it only, or is at any rate confined to it and allied species. Such also are certain degraded forms of Diptera, including the bat para- sites (Vycteribia), the bird flies (Ornithomyia), and others. Such also is a curious creature (Platypsylla) parasitic upon the beaver, the affinities of which are so little marked that it has been formed into a distinct order (Achrevoptera) by Westwood, placed in the Lemiptera by Ritsema, and declared to be a true beetle by Leconte. Such also isa curious little moth (Zpipyrops, Westwood), an external parasite upon certain homopterous insects ; another moth (Tinea vastella) lives in its larval state on the horns of living animals ; and many others might be cited.

As entozoic insects, the large dipterous family Wstridz is especially characteristic, all its members living at the expense of Jfamma/ia in very varied manners, the stomach, throat, frontal air passages, the subcutaneous system, and even the genital organs being attacked by various species, but only as larvee, the perfect insects being winged and strong flyers. Furthermore, a genus of Dzptera (Batrachomyia) belonging to quite another family (Mw cidx) is said to attack frogs. It is scarcely just, how- ever, to class as true parasites certain insects whose larve have been discharged (still living) from the nostrils, intes- tines, or urethra of man. Many such cases have been perfectly authenticated, but the insects have been such as certainly do not of necessity require such conditions, and these latter are not natural habitats. Accident introduced them, and they were fitted to exist, at any rate for short periods, in the interior of the human body. But the largest class of insect parasitism is that which exists between insects themselves, as exhibited in an enormous number of certain families (Ichnewmonide, Evaniide, Proc-. totrypide, Chalcidide, &c.) of Hymenoptera, &c. These are essentially parasitic in their preparatory stages, and the parasitism is of the class that may be termed entozoic. The eggs are laid either in or on the bodies of the larve (chiefly) of other insects, and even in the eggs, the young larvee of the parasites feeding mostly on the adipose tissue of their hosts, often enabling the latter to undergo most of their transformations (but very rarely that to the perfect insect). To such a class belong also many dipterous insects, chiefly belonging to the Yachinide. Hyper-parasitism exists in many minute species of Chaleididx, which do not directly affect the hosts themselves, but which feed in the bodies of other parasites.

Luminosity.—This is another subject that should have

more than passing notice bestowed upon it. Modern scientific travellers have not succeeded in confirming Madame Merian's well-known statements with regard to the luminosity of the so-called lantern-flies (ulgora), hence these have to be eliminated from the category of luminous insects. It is among the Coleoptera that the phenomenon

cspecially occurs, and in them is almost confined to certain skip jack beetles (the genus Pyrophorus), and probably the entire family of glow-worms (Lampyridx). The luminosity is confined to certain dis- tinct patches, differing in position and number according to the species and also according to sex,—usually most observ- able in the female, although this does not appear to be always the case. The property is distinctly under the control of the insect, and is often exercised in an inter- mittent manner at stated intervals, wheu the insects are not under the influence of extraordinary excitement. It is probable that luminosity exists in some Diptera, and also in the larvee of certain exotic Lepidoptera, a recent traveller having assured us that in South America a larva of this order has luminous patches along either side, so that when in motion it has been compared to a lighted-up railway train. Some occasional instances of luminosity appear to be accidental, probably owing to the insects having been feeding upon, or otherwise in contact with, decaying phosphorescent matter. With regard to the uature of the luminous substance no very precise results have been arrived at by investigators. That it is phos- phorus in some form or other appears certain, and the latest experimenter (Jousset de Bellesme) asserts as his belief that it is no other than phosphoretted hydrogen gas stored up in the cellular tissue, and in direct communica: tion with tle nervous and respiratory systems.

Galls.—These well-known insect-productions are alluded to chiefly in order to call attention to the mystery that surrounds their growth, Galls are occasioned by the presence of the larvee of certain species in nearly all orders of true insects, though it is amongst the Cynipidx in Hymenoptera and the Cecidomytidx in Diptera that they are most cliaracteristic. And they may be in almost any position on a plant, according to the species of gall-maker. The most striking, however, are clearly modified leaf or flower-buds.

The mystery surrounding galls is their cause. The in- direct cause is the puncture of the insect, and the presence of its eggs or larvae, but no explanation has been offered of the reason why this presence sets up the growth termed a gall Two insects of differing species will deposit their eggs in the same position: in the one case no abnormal growth follows ;

in the other some peculiar irritation sets up a tumour, often enormous in size. Two insects, also of different species, but both gall-makers, do the same: in both cases a tumour ensues, but its form is totally different in the two. A most noticeable recent discovery is that by Dr Adler (since confirmed by others) to the effect that in certain European Cynipidx dimorphism to a remarkable exteut occurs, and that certain genera are only conditions of others, the two forms of insects, and the totally different galls occasioned by them, being alternate in appearance.

_Lxternal Structure.—Taking any large insect, we recog- hize in it three more or less distinctly separated divisions, the head, thorax, and abdomen. Taking the majority of lusects, and especially of their larve, we recognize thirteen Segments or somites, counting the head as one, the thorax as consisting of three, and the abdomen as nine. From a classificatory point of view, it is probably convenient to retain this idea, though in the abdomen of a dragon-fly (for instance) there are 10 quite distinct segments. But, seen in the light of embryology and morphology, a different aspect Is put on, The abdomen in the embryo of some

insects cleatly consists of 11 segmeuts. Moreover if each appendage.of the head be considered as a modified limb, we get In some insects as many as 7 segments in this portion of the body alone. Thus although 13 segments is a usual and convenient number as regards the structure of an insect, this number must be vastly increased if we consider the animal in regard to other divisions of the Arthropod series. In the abdomen the actual number js sometimes very much reduced, owing to several of the segments becoming obsolescent, coalescent, or retracted.

The exoskeleton, or outer covering, is.more or less horn: like in its nature. But its elements are by no means similar to those of either horns or bones. It is composed to a varying extent of phosphate of lime, with the addition of a peculiar substance termed chitine, especially character- istic of, though not strictly confined to, the Insecta. According to recent analysis, the constituents of chitine are said to be as follows :—

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The head, or anterior of the three main divisions of the body, ofa perfect insect is of very varying form and structure, both as regards outline, the condition of its attachment to the trunk, and the details of its special appendages. No account of these variations can be given here; they will be briefly alluded to in the classificatory portion of this article. The various organs and appendages may be stated as follows. On each side of the anterior portion are inserted two long and usually multi-articulate processes termed “ antennz,” which are tubes containing nerve-prolongations and trachee, and undoubtedly associated in a high degree with the special senses; but, notwithstanding all the controversy on tle subject that has existed and still exists, we do not yet know clearly what is their special function. They have been considered organs of touch, of hearing, of smell, or simply as balancers assisting and directing flight. No one who has watched the proceedings of many insects (and especially of ants), when meeting others of their kind, can doubt that they act in some way (but perhaps not in all insects) as means of intercommunication, and thus take a high rank as important structures. They are, as a rule, much less developed in those insects having very large eyes ; and in the larvee of those that undergo a complete metamorphosis they are usually rudimentary ouly, notwith- standing their often enormous development in the perfect insects produced from the same larvee.

The compound eyes are two in number (though cach is occasionally divided into’two portions), usually of large, sometimes of enormous size, and each consisting of very uumerous facets, which but indicate the faces of so many independent angular tubes separated by layers of pigment. In the larval state the eyes are ordinarily simple, and each eye is usually a congregation of separate eye-spots. Besides the compound eyes, there are two or three (or no) small simple eyes, “‘ocelli” or “‘stemmata,” each with a simple nerve, and never present iu the larvee or (probably) pupe.

The organs of tlie lower surface of the head are of a most complicated nature, and are excessively modified according as the insect takes

nutriment by biting or by sucking. Below the eyes is the “front”; this is succeeded by a piece termed the “clypeus”(or ‘“‘epistome” or “nasus”), which is followed by the “labrum” or upper lip. On either side are the “mandibles” (usually dentate within) articu- lated to the cheeks, and below these a second pair of jaws, compound in structure, and consisting of a hinged base, afterwards frequently dividing into two portions, the “‘maxillee” and maxillary lobes, and provided externally with articulated appendages known as the maxillary palpi. Below the mouth is the “labium” with its labial palpi, articulated to the “mentum” or chin-piece ; lying within this lower

mouth-covering is the “lingua” or tongue. The same general arrangement is present throughout all insects, and also in the larval and pupal stages ; but the differing conditions of the food cause extreme modification, not only between differing groups or orders of the perfect insects, but also in the metamorphic stages of the one and the same species. In some insects there are additional small structures, such as the “ paraglosse.”

The “ thorax” is the next main division. It is composed of three distinct portions, the prothorax, mesothorax, and metathorax, all subject to excessive modifications ; but the last is, on an average, the smallest ; at any rate it seldom exceeds the intermediate, and is usually very much smaller. According to surface, each portion receives two different names; thus the upper side consists of the pronotum, mesonotum, and metanotum, the lower of the prosternum, mesosternum, and metasternum. It will be noticed also that each subdivision is again subdivided by more or less distinct grooves, especially above and on the sides, indicat- ing its compound nature, and each of these has its special term, so that some authors go so far as to say that each thoracic division is formed of nine separate pieces (a text book on entomology, which this article cannot be, should be consulted as to these). In those insects in which the wing-power is great, the attachmeuts of the muscles are strongly indicated externally.

The appendages of the thorax are the legs and wings. The legs are articulated members, of which one pair is attached to the sides of each subdivision. All true insects have but six actual legs, but in the larve of some orders there are simple fleshy prolegs on the abdominal segments, considered as representing the homologues of those abdominal legs so conspicuous in the Myriopoda. Of the true legs the anterior (or prothoracic) pair are directed forward, the two other pairs backward. Each leg consists of a basal joint or coxa (frequently not movable) inserted in sockets termed the acetabula; this is followed by a small joint termed the trochanter placed between the coxa and femur or thigh, which is ordinarily the largest joint, and is enormously developed in saltatorial insects. To this succeeds the tibia, followed again by the tarsus, which is ordinarily compound, but may consist of any num- ber of joints from one to five. The tarsus is terminated by a pair (seldom one only) of claws, between which arc more or less membranous arolia or plantule (much marked in the feet of Diptera, which climb polished surfaces, &c., by means of them), and also a pulvillus or cushion.

Wings are appendages of the mesothorax and metathorax (never of the prothorax), and, viewed simply as organs of locomotion, may be considered as expansions ofthe integu- ment, though some morphologists object to this simple definition, and one at least (I. Plateau) regards them as tracheal extensions. Although in all orders there are cases in which they are never developed, the exceptions being so few as abundantly to prove the rule, yet the posterior (or "hind" or 'under ") pair may be absent, and tle anterior (or "fore" or "upper") ample. So strongly are they attributes of a perfect insect, that in some cases in which neither pair is developed the creatures strongly incline to retain their larval form. Normally the first external indications may be said to appear in the pupal stage (but we will show that in insects with imperfect metamorphoses the line of demarcation between larva and pupa is not marked), and they only attain their full development some little time after the exclusion of the perfect insect. A wing consists of an upper and lower membrane (readily separable in a recently excluded insect, or afterwards by maceration), strengthened by more or less

numerous strong ribs, more or less connected transversely, termed nervures or veins (neither term being very appropriate), which are

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chitinous tubes (containing special trachez), through which the blood circulates. The varying condition of the wings will be alluded to in the systematic portion of this article, as also to some extent the scheme of neuration, one of the most important factors in systematic entomology, but rendered unsatisfactory in consequence of the utterly different nomenclature employed by writers on special orders, though doubtless the general scheme is capable of being homologized.

The last of the three great divisions of the body is the abdomen, which consists of a number of segments (nor- mally nine), having an upper (dorsum) and lower (venter) chitinous surface, which two surfaces (in the most char- acteristic condition) are connected by a membranous lateral line, with lateral stigmata or spiracles. But almost every conceivable modification is presented both in its attachment to the thorax, its general outline,and the number of segments present. Of the appendages of the abdomen it is necessary to say but little. In a perfect insect there are no abdom- inal legs, and rarely any indications of breathing plates (so usual in some groups of aquatic larvae). The appendages are therefore almost entirely connected with the sexual apparatus, which vary enormously, and occasionally there are terminal articulated thread-like tails, strongly simulat- ing antennz both in form and structure.

Nervous System.—This may be said to consist of a more or less double cord lying along the ventral portion of the body, connected at intervals by thickened masses termed ganglia. But the large mass in the head is termed the brain, in contradistinction to the others. The brain usually consists of a bilobed mass giving off nerve masses to the eyes, and threads to the other cephalic appendages or organs ; recent researches prove that, at any rate in some cases, the brain has convolutions analogous to those of the higher animals. Immediately below the brain is a large ganglion, usually termed the infra-cesophagal, con- nected with the mouth organs and digestive functions. Then follow, in the

thorax and abdomen, a series of ganglia, each of which gives off numerous lateral threads. But the number of these ganglia varies very greatly, not only in insects of different orders, or in species of the same order, but also in the larvae, pupze, and perfect insects of the same species; and it is impossible to enter here into the most rudimentary analysis of these variations. It has been said that normally there should be a ganglion for each segment (or for each movable segment) of the body, and to some extent this would appear to hold good, for, in those insects in which some of the segments coalesce, a similar arrange- ment is seen in the system of ganglia, but this would not appear to be a universal law, and in some the abdominal ganglia are virtually obsolete. Similar variations exist in the extent to which the double central column becomes united or remains divided. In addition to this column, a simple sympathetic nerve is also distinguished, without ganglia, but giving off threads to the respiratory and other systems. This lies above the main ganglionic chain, In minute structure tle nervous cord of the Znsecta is analo- gous to that of higher animals. The simplicity of the nervous system has caused it to be believed that insects do not suffer pain in the sense of that experienced by higher animals, and their behaviour when subjected to treatment that should cause intense pain, in the ordinary sense of the word, appears to warrant such an opinion; but the existence of such a condition cannot be held to justify wanton cruelty. Those who desire minute informa- tion on the nervous system should especially consult New- port's article "Insecta" in Todd's Cyclopedia of Anatomy and Physiology, and a series of articles by E. Brandt, now appearing in the publication of the Russian Entomological Society.

INSECTS

Respiratory Systent.—Respiration by trachez is one of the main characteristics of an insect. Trachea are tubes ramifying in the interior of the body, the walls of which are composed of two membranes with a spiral thread between, and extending into the wings and other append- ages; but in the perfect insect the main trachee are subject to modification, and arc more or less expanded into vesicles to suit the requirements of creatures with great powers of flight, or of strong

movement in other ways. The manner in which air is communicated to these trachez, in order that the necessary oxygen may be obtained from it, is twofold in its nature. In insects that live in free air the latter is received through lateral openings termed spiracles or stigmata, which vary in number in different insects, but there is usually one on each side of most of the segments. A spiracle usually consists of a longitudinal slit ina membrane, protected by delicate mechanism, and also by special muscles, which can close it hermetically if necessary. Many aquatic insects also breathe through spiracles, and in these cases a quantity of air is collected (or entangled) in delicate pubescence on the surface of the body, the insect coming to the surface to obtain a fresh supply at intervals. But in the majority of aquatic insects, and especially of their larvee or pupz, air is obtained by means of external threads or plates, expansions of the integument, the function of which is to absorb air from water and convey it to the trachee by means of delicate ramifications of the tracheal system in their substance. The number and position of these external appendages (or branchiz) is as varied as are the conditions under which the insects live ; in some only a single elastic tube is present, which can be protruded to the surface of the water, and its length adapted to the varying depth of that element; in some (as in many dragon-flies) the plates are in the rectum, and the air is obtaincd by the forcible taking in and expulsion of water by means of powerful anal valves (which serve also for locomotion). Itis obvious that those larvee that exist parasitically in the substance of the body of other larve, d&e., must still obtain air, and it is presumed that this is sometimes effected at the expense of the respira- tory system of their hosts. It has long been known that rudimentary branchiz exist in aerial insects, and, though this was at one time supposed to be an attribute of one or two forms only, it is now known to occur frequently. According to the researches of Gegenbaur and Palmén, those branchize exist side by side with the ordinary spiracles; hence they conclude that there is no direct connexion be- tween the branchial system of the larva and the spiracles of the imago. It is still perhapsan open question whether these branchiz in the imago serve any functional purpose.

Alimentary and Digestive Systems.—The food of insects is either solid or liquid, and the parts of the mouth are modified, according to

requirements, into two main condi- tions, termed mandibulate aud haustellate ; but the latter term is somewhat vague, inasmuch as the modifications arc by no means homologous in all haustellate insects, although the structure is subservient to the same function. Again, in both divisions the food may be either vegetable or animal in its nature, and according as this may be the parts of the digestive system are modified. The most simple digestive system consists merely of a tube extending from mouth to anus, with no very distinct division into parts. But in insects the arrangement is considerably more complex, yet varying enormously. The most complete system consists of cesophagus, with the salivary glands (modified into silk-producing glands in Lepidoptera, &c.), crop or proventriculus, gizzard, stomach, small and large Intestines, and an arrangement of small canals termed the Malpighian tubes. Some authors distinguish also other divisions of the intestines answering to those of higher

animals. By some the term proventriculus, is applied to the crop, by others to the gizzard. The gizzard ig usually absent in haustellate insects; but, as most of these are truly mandibulate in their larval stage, much modification is undergone during metamorphosis. The digestive secretion of all parts of the system appears to be essentially alkaline, aud assimilation goes on from all (excepting perhaps the lower intestine) pari passu with digestion, the latter being commenced in the crop. The Malpighian tubes are a set of long slender vessels (varying much in number) situated in the lower portion of the system at the junction of the small and large intestines. Their function has been warmly contested amongst physiologists, many considering them biliary organs, while probably an equal number maintain they are solely urinary, and a few hold that both these functions may be attributed to them. The recent researches of Plateau and others are in favour of their being solely urinary. Von Siebold has asserted that the biliary system consists of certain cells in the walls of the stomach. It is possible the whole intcstinal canal is at times called upon to play a réle quite independent of digestion and assimilation ; it may be made subservient to metamorphosis through being distended with air, thus

assisting the rupture of the integuments for the escape of the imago; but this cau probably only obtain in insects with incomplete metamorphoses.

Circulatory System.—Almost as much uncertainty exists, or has existed, as to the true nature of this system as in other points of internal structure and physiology. Originally it was believed that no circulatory system existed, an idea that was speedily dissipated. If we examine a larva of which the integuments arc tolerably transparent, we perceive, even without dissection, a large vessel running along the dorsal portion of the creature just beneath the integument, and we perceive also that it dis- tinctly pulsates. This is the 'dorsal vessel" or " heart," and it terminates anteriorly ina cephalic aorta. Examined more minutely by dissection, it is seen to consist of a number of chambers and constrictions, each chamber having a lateral valvular opening on either side, through which the blood is received into the vessel by regular currents and conveyed to the cephalic aorta, whence it escapes into the body in currents which have no vascular walls, and is again received into the dorsal vessel from lateral currents, —such, at least, is the most generally received opinion. Certain it is that the blood (which is ordinarily a colourless liquid) circulates through all parts of the body, even to the antenne, legs, and wings, and the circulation can be well observed in the wings of some insects in which these organs are unusually transparent, in that case distinctly fol- lowing the course of the nervures. But many physiologists have belicved that the blood is conveyed over the body by means of the trachex, some distinguishing certain trachez to which this function alone, and not that of respiration, is proper. The majority of these, however, state that the blood simply flows between the two integuments of which the walls of a trachea are composed, and to this system the term " peritracheal" has been given. According to the results obtained from the experiments of the most recent observers, we prefer to doubt the existence of this peritra- cheal circulation. The relative frequency of pulsations varies much according to the insect and its state of activity or excitement. They disappear almost entirely in insects in a state of hibernation, and are much reduced in the pupe of those that undergo complete metamorphoses.

Muscular System.—The muscles are attached to the inner side of the chitinous integument, and lie just beneath it. They are composed of numerous parallel fibres without any tendinous sheaths, but the fibres are apparently sometimes united at their extremity into a kind alm which has wi iets I9

been considered as only an extension of the chitinons integument. According to their position and function, they act variously, as do those of higher animals, and have received similar names. Their number is often enormous, and when we consider the great powers of flight, or of locomotion by other means, possessed by many insects, it is not difficult to understand that their strength must be proportionately great. Lyonet's celebrated treatise on the anatomy of Cossus remains a masterpiece of research on this subject, and in England Lubbock's recent memoir on the subcutaneous muscles of Pygzra bucephala is equally remarkable, and should be studied by those desiring minute information on the complex muscular system.

Generative System.—In all insects the sexes are separate, True hermaphrodites do not exist, though individual mon- strosities, in which the form, coloration, and even internal organization of both sexes are combined, are not rare. The extcrnal organs are placed at or near the extremity of the abdomen, and are usually accompanied by secondary or accessory appendages often of most complex structure, serving to ensure complete contact during the sexual act, and probably also to some extent excitatory. In the dragon-flies, however, the intromittent organ of the male is in the under side of the second abdominal segment, which explains the extraordinary position of the sexes when coupled. In the male tle testes are very varied in form, ordinarily separated, but sometimes united into one mass, each of the two halves of which has its special duct. But the separate form is by far the most usual. As in higher animals, there are the usual parts, the ductus ejaculatorius, thevesicule seminales, and the vasa deferentia, the conditions of which vary infinitely in different insects. Whether the intromittent organ is always traversed by an inner canal or not is a

little doubtful. Ordinarily such is no doubt the case, but in others it would appear probable that the ductus ejaculatorius does not end absolutely in the organ, and that a groove on the surface of the latter receives the sperm, Some such arrangement must certainly exist in dragon-flies, in which the testes and the opening of the duct have no direct connexion with the intromittent organ. In the female the ovaries oceupy much of the abdomen tlat is not taken up by the intestinal canal. Each consists of a very varying number of tubes, branching off externally, in which the eggs are contained ; these eggs are conveyed by oviducts, and before extrusion receive the fertilizing fluid stored in the spermatheca, which latter may be simple or compound; they pass out by the vagina. In close connexion with these parts in the female is the poison gland and sting found in some insects. In the gravid female of Lermes the ovaries become enormously distended, so that the entire insect may be said to consist of little else than eggs. The rudiments of the sexual organs may be detected in the larva when in a very young state, and the sex of the future perfect insect determined,—a sufficient answer to those who assume that sex can be controlled by the nutriment furnished to the larva. It was formerly con- sidered that, pairing once effected, the male died almost immediately, and the female followed after having deposited her eggs. Recent observations go to prove that this is to a large extent erroneous, that pairing may be effected several times by both sexes (the female laying her eggs intermittently), in effect that polygamy and polyandry exist.

There are certain anomalous conditions of the generative system that may be conveniently noticed here, under different headings.

Neuters or Workers.—In bees, wasps, and ants, and also in Termes (or white ants), the majority of the members of a colony is made up of individuals which as a rule have no reproductive powers. In the first three, these are

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aborted females, and it has been proved (at any rate for ants) that occasionally these workers lay eggs, which, how. ever, always produce males, the production of a queen depending apparently upon special

feeding in the larya] stage. In Yermes the conditions are different. There are both workers and soldiers, both incapable of reproduction, but not exclusively consisting of aborted females, since bot} sexes are represented. Also in Zermes there are what have been termed complementary males and females, distinet from the pair that were once supposed to be the exely. sive founders of a new colony; of these the females ly comparatively few eggs, their ovaries not acquiring the extraordinary development of those of the true queen.

Viviparous Insectsx—Oviparous generation is the rule in insects ; but there are certain departures from the rule, In the Aphides it is well known that both the oviparous and viviparous exist in the same species. In Lepidoptera there is a well-authenticated instance of an Australian insect closely allied to the clotles-moth bringing forth larva already hatched, A similar condition is asserted to exist in a species of cockroach. In Coleoptera, Schiddte has noticed that two species of Staphylinidz, living in the nests of white ants in Brazil are viviparous, as is like. wise Oremna in Chrysomelide; so also are the Strepsi- ptera. In Deptera flesh-flies of the genus Sarcophaga are known to be viviparous. But the most extraordinary instance is in certain minute flies, to be noticed below, of which the larve produce living larvae.

Alternation of Generations, Parthenogenesis or Agamo- genesis.—In the bee, ant, many gall-flies, some Lepedoptera and (as is now known) also some Coleoptera, and inseets of other orders, females are capable of producing fertile eggs without any contact with the male, and the produce of these eggs is frequently male. This property varies considerably in details. In the case of the bee or the ant, it would appear that one impregnation suffices for the life of the queen (which may last for seven or eight years), but the power of producing females does not probably extend beyond the immediate influence of the impregnation. In some hymenopterous gall-flies a true alternation probably sometimes occurs, combined with dimorphism; but absolute parthenogensis, in which females are produced generation after gencration, is the common condition in many lepidopterous insects. This process is cffected by internal budding. In the Aphides the conditions are still more remarkable, owing to the existence of both

winged and apterous forms of both sexes, and of both oviparous and viviparous generation ; but it is not proved that the same individual insect is capable of producing both forms. In the case of the minute fly (Jfastor metroloas) mentioned above, the production of larvee from larvee is continued throughout the winter and spring, until in June the brood goes through its ordinary metamorphosis, and results in mature males and females, and so the cycle recommences. Of all the marvels in the history of insects, this is the most astonishing ; no wonder that the assertions of R. Wagner (the discoverer) were met with incredulity from the best physiologists until abundantly confirmed by others, and in other species.

Metamorpheses.—Hundreds of volumes have been written on this fascinating subject, one or more of which are in almost every library; hence there is no_ necessity for giving more than a rudimentary outline here. All true insects may be said to undergo a metamorphosis. Such a condition is absent in the small groups known as Thysanura and Collembola; and, although these are here retained amongst Jnsecta as a matter of con- venience, the writer is disposed to agree with Lubbock that they are outside the pale of true insects. Metamor- phosis may be broadly grouped into two main divisions—

(1) that in which the larva changes into a pupa which, as a rule, is inactive, and which never eats, and (2) that in which there is no true pupa state, the animal continning active, and eating, from the egg to the perfect insect. In the former the larva changes its skin, or moults, several (often many) times before it changes to the pupa, the last moult (or ecdysis) happening when it is in what may be called the pseudo-pupal condition (which may last from a few hours to several months) immediately before the pupa state is assumed ; this division is usually characterized as "metabolic." In the latter ecdysis goes on continuously at intervals from the egg to the winged-insect, and the form of the larval condition much resembles that of the perfect, the wings budding out gradually as the creature approaches maturity ; the term " hemimetabolic " is applied to this division. In the first division the

conditions are rather more varied than in the second. In the pupa of some Diptera the larval skin hardens, and within this the true pupa is formed (such a pupa is termed “coarctate ”) ; in other Diptera the pupa is not contained within the larval skin (which much resembles a true cocoon), but is free and even sometimes active, the various appendages not being connected with the body, as is usually the case in that of a lepidopterous insect. The pupze of /ymenoptera and Coleoptera are also much in the same condition, but they are not strictly active. Many writers have attempted to draw a broad distinction between such a pupa as that of a moth and that of an ant-lion or caddis-fly, cited here as extremes, because in the latter the members are free, and the pupa is really active shortly before the change into the perfect state, and thus the metamorphosis is supposed to be in some respects intermediate between that of true Metabola and true LHemimetabola, But such distinctions are more apparent than real. In many of the small moths the limbs and other appendages are scarcely consolidated. with the body, but simply concealed in sheaths of which the ends at any rate are free. Also in the second (or hemimetabolic) division distinction has been drawn between the larva of a May-fly and that of a bug (as instances), because the changes from an absolutely apterous condition to one in which the wings are rudimentary and from this to the perfect state are more marked in the latter. This is probably due to the number of moults being less; the form with rudimentary wings is in no way a true pupa.

The metamorphosis of the internal organs, and even of the mouth parts, is much more marked in the Metabola than in the Hemimetabola. Respiration is maintained by means of spiracles or branchie, as in larvee.

“Hypermetamorphism” is a term applied to certain con- ditions in which the larva at one period of its life assumes a very different form and habit from those of another period. Such a condition exists in several Coleoptera, such as Ifeloe and Cantharis, in which the larva is at first very active, with long legs, slender form, and anal seta, and attaches itself to the bodies of bees, afterwards becoming almost apodal, short, and stout, and living in the bees’-nests. Other

Cantharide live in the egg-tubes of Orthoptera. In Sttaris a still more remarkable intermediate condition has been observed: the larva after having attained its second con- dition assumes that of the coarctate pupa of a fly, from which it changes again to a state more analogous to the second condition before finally transforming to a pupa. This kind of metamorphosis has been closely observed by Newport, Fabre, Lichtenstein, Riley, and others. Brauer has recorded a somewhat similar condition in the larva of Mantispa (Neuroptera), which is at first free and very active, and afterwards becomes nearly apodal and obese, and lives parasitically in the nests of spiders. Advanced evolutionists hold the idea that larv are only acquired conditions,

Classification.

It is necessary to reduce what may be termed the systematic portion of this article to the smallest possible limits, The various orders are noticed under separate articles, and similar articles are devoted to the con- sideration of many of the more prominent, interesting, and familiar insects. All we can do here is to allude briefly to classification as a whole, with indications of the higher groups under each order. We also have nothing to do here with Crustacea, Arachnida, and Myriopoda, now considered as distinct classes, although American writers have recently again included the last two in /nsecta as orders, placing the more subordinate groups (or orders in the general acceptation of the term) as suborders. Still more impossible is it for us to enter into an examination of the history of classification; those of our readers who are specially interested in this subject cannot do better than consult vol. iv. of Kirby and Spence's Jntroduction to Entomology, where a most full and painstaking "history of entomology" is to be found up to the date (1826) at which it was published; or they may consult with equal advantage Westwood's Jntroduction to Modern Classification, and Burmeister's Manual of Entomology (Shuckard's English translation). The different classifications proposed by authors mainly resolve themselves under three headings,— the "metamorphotic" (of which Swammerdam may be considered the founder), the "alary" (or wing-system, due to Linnzeus), and the " cibarian" (or mouth-system, originating with, or at any rate elaborated by, Fabricius). The meta- miorphotic system divides insects into those that undergo complete and incomplete metamorphoses ; the alary is based upon the presence of two or four wings, or their absence altogether ; the cibarian depended upon the conditions of the mouth organs, and more especially as to their being fitted for biting or sucking (mandibulate or haustellate). But experience proved that each of these systems had its defects; there were always some groups, of more or less importance and extent, that would never fit satisfactorily into any of the proposed systems. To remedy this varying means were adopted,

such as 4 combination of the several systems into what has been termed the “eclectic” system, the erection of numerous orders for certain aberrant groups, and that most ingenious idea of MacLeay, the author of what is termed the “circular” system. We are disposed to consider that of all systems the one that combines the greatest amount of convenience with the nearest approach to being natural is the metamorphotic, and this we shall accordingly follow here. It is not intended to acknowledge the subsidiary orders, excepting the Collembola and Thysanura, which are probably scarcely true insects, but which it is necessary to place here, were it only to avoid the risk of their being overlooked alto- gether, inasmuch as the writers on the otlier classes of Arthropoda are not likely to recognize them as coming within their scope.

The stumbling-block of all systems has been the Linnean order Neuroptera, inasmuch as its members combine the characters of most of the other orders, and ingenious American writers have attempted to overcome this difficulty by considering it a collection of “synthetic types.” In adopting metamorphosis as the basis of classification, we prefer to take another course, and to follow Erichson, who (in 1839) boldly transferred all those Vewroptera with in- complete metamorphoses to the Orthoptera as a suborder, although, in dealing with the Newroptera in the light of a specialist, division into several orders appears the more natural course. :

The sequence of orders we propose to follow 1s as under :—

HYMENOPTERA. CoLEOPTERA. Genwina. Metamorphoses complete | Diprrra. Pupipara. (Afetabola). Aphaniptera. LEPIDOPTERA. Nevrorrera. } 27tchoptera. Planipennia. Pseudo-Neuroptera. Metamorphoses incomplete Ones Genuina.

(Hemimetabola). Heteroptera.

x RRA. HEMIPTER Homoptera. No metamorphoses CoLLEMBOLA.

(Aberrant Insecta). THYSANURA.

The obvious innovation in this arrangement is the position assigned to the Diptera, rendered necessary by the intimate relationship of Lepidoptera and Zrichoptera, but in a meta- morphotic sense no particular outrage on more generally adopted systems is occasioned, and we see no alternative other than that of widely separating the two subdivisions of Neuroptera.

HyMmEnoprera.—In accordance with the system adopted by many modern writers, this order heads the scale as containing amongst its members those insects that appear to be endowed with the highest intellectual faculties. But at the same time it must be remembered that if the economy of the Zermitide in the Pseudo-Neuroptera had been as fully investigated as has that of bees, wasps, and ants, it is probable that the importance of this idea might be considerably weakened. The main characteristics are as follows :— .

Wings four (frequently absent altogether in ants, &c.), membranous, naked, transparent, with open reticulation and very few transverse nervules. Mouth mandibulate. Metamorphosis complete, but the pupa has its members free. Larva mostly apodal, but in the saw-flies much re- sembling that of Lepidoptera.

A convenient subdivision into three great groups is generally adopted, viz, Aculeata, Hntomophaga (or Pupwora), and Phytophaga.

The Aculeata may be again divided into four :—Afellifera (or Bees), Fossores (Wasps, &e.), Heterogyna (Ants and allies), and Tubwli- era (Ruby-tailed Flies), but the last is perhaps more generally con- sidered as forming a special division. In these the females (and workers, when present) are provided with a sting at the apex of the abdomen, connected with a poison gland. The abdomen is petiolate. The antenne are mostly thirteen-jointed in the males and twelve- jointed in the females. In the bees the mouth parts are greatly modified, so as to form a suctorial apparatus, by the elongation of the maxillz, labium, and lingua, the small palpi being borue at its end. The neuration of the wings is tolerably complete. The legs arc much modified, aecording to

requirements, such as pollen-gathering, burrowing, &c. The larve are apodal, hatehed in cells constructed by the parent insects, the food usually provided by them being either honey or other insects. The habits of the group are frequently social (in this case neuters or workers are present); many are parasitic on insects of their own group (in the broad sense), and in many instanees the parasites strikingly resemble those species in the nests of whicli they live (as in the familiar instance of Bombus and Apathus). Each division includes several families (to which we cannot allude here), and the group as a whole includes some of the most familiar insects, such as bees, wasps, and ants.

The Entomophaga are invariably true parasites in the larval stage (excepting the Cyntpidz), the perfect insects depositing their eggs in or on the larve or eggs of other insects, and their larvee living upon the adipose tissue or contents of the eggs. There are no true sting and poison gland, but the female usually has the end of the abdomen provided with a long slender ovipositor, with which she can (in some cases) pierce the skin if roughly handled (but no inflammatory symptoms follow). The antenne are usually long, slender, and multiarticulate. The abdomen is strongly petiolate. The neuration of the wings is variable (often almost absent). The main divisions are [ehnewmonidx, Proetotrypide, Chaleididx, and Cyniptde, chicfly founded on the neuration, which in Chaleididz (and in a lesser degree in Proetotrypidx) is almost absent. Many members of this group are of extreme interest in consequence of their economy, aud especially some extremely minute species (in Proctotrypidx) that infest theeggs of other insects, someof which can swim by means of the wings in search of the egas of aquatic insects. The Cynipide, although agreeing in main points of structure with

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the other divisions, are totally different in habits, and tho term Entomophaga as applied to them is erroneous (a few, however, are parasitic upon aphides). They lay their eggs in the tissues op buds of

plants, and there results therefrom a swelling termed a gall, inside which the larva feeds, either solitarily, or many in ong gall in separate cells.

True Phytophagous Hymenoptera (or Terebrantia) comprise the two divisions known as Tenthredinide and Sirteidex. In these the abdomen, instead of being petiolate, is sessile ; the female is pro- vided with a double saw in the Tenthredinide, and with a borer jn Sirieide. The antennex have seldom more than ten joints. Tho neuration of the wings is complete. The larve differ from those of all other Hymenoptera in possessing well-developed thoracic legs, and in addition (excepting in the Sirveidx) a varying number of abdominal prolegs, and are so like those of Lepidoptera as often to require a practised eye to distinguish them therefrom. All are phytophagous, but their habits are very varied ; in fact, all the cop. ditions known in Lepidoptera are probably here present also. Some species cause galls. Some (sueli as the Turnip Saw-Fly) occasion great damage. The Sirietdx are wood or stem borers ; the familiar Sirex gigas often appears in the midst of large towns, through the larvee or pupe having been brought in with pine timber.

CoLEoprERA.—This is probably the largest, and cer. tainly the best studied, of all the orders.

Four-winged insects, but the upper pair of wings are modified, hard and horny in texture, and are termed “elytra,” lying longitudinally over the meso- and meta thorax and abdomen, and when closed divided by a line or suture (occasionally the elytra are united, and in this case the second pair of wings is usually absent, and the insects are incapable of flight; more rarely the wings are absent altogether, both the elytra and hind-wings). Mouth mandibulate. Antenne seldom more than 11-jointed (often much less). Metamorphosis complete; the pupa having its members free. Larva extremely variable as to form ; usually with thoracic legs, sometimes apodal.

Latreille divided the enormous amount of materials comprised in this order into four great groups according to the number of joints in the tarsi. Thus the Pentamera have five joints in all the tarsi; the Z/eteromera have five in the anterior and intermediate tarsi, and four

in the pos- terior; the Z'etramera have four in all the tarsi, the Trimera three in all. More minute investigation and better know- ledge have proved, however, that this system is essentially artificial, and in part founded on misappreliension ; and it is the custom amongst many modern entomologists to ignore these great divisions, and to consider the order as composed of about 75 families, without collecting them into larger groups. It would be impossible to notice here each of these families in detail, and the old system, still regarded with favour by some of our most intelligent coleop- tcrists as the most useful, will be followed.

The general structure is so marked that but little con- troversy has been occasioned. A beetle is recognized as such universally, notwithstanding the great diversity of details that exists. The only disputed elements are the Strepsiptera (Bee-parasites) and Platypsylla (an epizoic parasite on the beaver). The diversity in the larval con- dition is much greater, and as extremes may be cited the larvee of the Staphylinide (in which there is little difference in form and structure from those of the imago, excepting the absence of wings) and the apodal maggots of the Curculionide. In the pupal condition this divergence mainly disappears.

The Pentamera are usually considcred to comprise the following superior subdivisions. ~~Adephaga alone possess an inner palpiform lobe to each maxilla; the larve are predaceous, and feed on other insects and on flesh generally: they include the Cieindelide (Tiger~~ Beetles) and Oarabide (these two groups often termed Geodephaga), whieh are terrestrial, and the Dytiseide and Gyrinidg, familiar aquatic groups, with the addition of Amphizoa,an anomalous Ameri- can genus, reeently referred to Dytiseide. Palpicornia have short clavate antenne, and comprise a number of small and mostly aquatic genera. Brachelytra (including Staphylinide, known as Rove-Beetles or Devil's Coach Horses) are known by the very short elytra (usually much shorter than the abdomen), and form an exceedingly numerous

roup of often minute insects, of which the larve are predaceous, and differ but little in form from the imago ; with these the curious and aberrant Pselaphidw are usually united. Clavicornia have clavate antenne, aud are sometimes termed Necrophaga, from the habit many of the species have of feeding upon dead and deeaying animal matter; the forms are very numerous, and inelude the well-known Burying Beetles (Neerophorus) and the destructive Dermestide (in which is the Baeon-Bectle) Parnide are aquatic ; Paussidew are wonderfully curious creatures with singularly formed antenne, living in ants' nests: in this division are now placed the almost microscopie Zrichopterygide, most of which are not larger than small grains of sand, and remarkable for their narrow ciliated hind wings, and also other groups sometimes placed in the Trimera. Lamellicornia have the apex of the antenne pectinate or provided with lamelliform plates: they include the Stag-Beetles and the very numerous Dung-Beetles, amongst which is the Scarabwus of the Egyptians, together with the numerous Chafers. __Sternoxt have the prosternum produced and pointed, and mostly filiform antenna, with ordinarily an elongate oval form : in this division are the beautiful Buprestide and the familiar Hlateridx, the latter known as Click-Beetles, and able to spring by means of the process of the prosternum acting ona peculiar structure of the mesosternum: the larve are all vegetable feeders, and have the legs only slightly de-veloped; thoseof lateridx are known as Wire-Worms,and are often very destruetive; some of the exotie Hlatcridw are brilliantly luminous. JMalacodermi are a group of mostly soft-bodied insects very variable in form and habits ; the prosternum is not produced, and the antenna are usually pectinate or serrate: included in it are the Zelephoride (Soldier-Beetles), Lampyridx (Glow-Worms), Cleride (often parasitic in the nests of bees), the wood-eating Piinidz (in which is Anobiwm, or the Death-Wateh), and Bosirychidex.

The Heteromera are a large group of forms conneeted together by the tarsal structure, but otherwise of the most diversified nature ; in fact it may be said that, so far as outward appearance is concerned, there are forms in it that might be readily mistaken as belonging to almost all the other principal groups, so protean are they both in structure and in habits. Two principal points of structure have been used for separating

them into two great divisions. In one of these they have been divided into Globicoxw and Conicore, aceord- ing to the form of the anterior cox; in the other the two divisions are termed Atrachelia, in which the head does not forma neck, and Trachelida, in which the head is narrowed into aneck. To some extent both these points of structure are eorrelated ; we adopt the latter; but it must be remarked that the protean nature of the group as a whole is equally exemplified in its primary subdivisions, They appear to be invariably terrestrial, and for the most part phytophagous. The

Tetramera,—Although the beetles of this great division have apparently only four-jointed tarsi, it was long ago demonstrated by Westwood that there is actually a very minute joint between the lobes of the third joint, so that they are actually pentamerous, but the concealed joint is probably functionless; thus the terms Pscudo-Tetramera and Crypto-Tetramera haye been proposed in lieu

of Leramera, The ehief groups are the Rhyncophora, Xylophaga, Longicornta, Phytophaga, and Clavipalpi. All are vegetable feeders. The Lhyncophora (or Weevils) have the head produced into a ros- trum, varying enormously in length, and in its lowest eondition searcely appreciable. The larve are footless grubs, feeding almostuni- versally in the interior of the stems or seeds of plauts,and occasion ally causing galls. Some exotie members of this group are amongst the most beautiful of insects. A peculiarity exists in the antennz

which are attached to the rostrum, and usually elbowed, the basal joint being ordinarily very long (and termed the "'seape") and the rest shorter, the terminal joints usually forming a club (the portion between the scape and the elub is termed the "funieulus"), Rhyn- cophora have been very variously subdivided. Schénherr separated them into Orthoceriand Gonatocert, according to the absenee or pre- senee of an elbow to the antenne ; Westwood has three families, Bruchide, Aticlabidex,and Curculionide,founded on the antenne and palpi; Lacordaire's groups are Adelognathes and Phanerognathes, founded on the eovered or uncovered mentum. Adopting Westwood's system, we have three families. Druchidx have onlya short flattened snout,

unelbowed antenne, and filiform palpi ; they are probably universally seed or nut feeders in the larval stage. DBruchus gra- narius eauses great destruction to grain; species of the genus Caryo- borus affect palm-nuts, some even living in the so-ealled vegetable- ivory nuts; Anthribidx, which form a subfamily of Bruchidx aecord- ing to Westwood, livein dead wood.

Much diversity in the elassification of Phytophaga exists, and as to the number of families and the value of their characters. By Latreille they were divided into Eupoda (Paramcea, Westwood) anil Cyclica, of which the most prominent character is in the extcrnal form, the Eupoda having the head and thorax narrower than the abdomen, whereas in the Cyeliea the base of the elytra is not broader than the hinder part of the thorax, henee the form 1s more rounded. Another grouping is according to the insertion of the anteune at the sides, or on the middle, of the front. The number of families varies from four to nine aceording to different authors. A glance at the prominent forms, aceording to later ideas, 1s here given. Crioccridx (by some divided into Crioceridx, Doua-

ciadx, and Sagridx) belong to the Eupoda, and include the well- known Asparagus Beetle (Crioccris asparagi), the genus Donacia (and allies), which is aquatic in its earlier stages, and the brilliant exotic genus Sagra (remarkable for its enormously thickened hind femora), the larva of which forms galls on the stems of plants and lives therein. Cryptocephalide (including Clythridz) are remark- able for the habits of the Jarve, which form hard cases of excrement (?)in which they live. _Chrysomelidew are a group of often beautiful insects, mostly remarkable for their nearly hemispherical form; they include, inter alia, Timarcha (the Bloody-nosed Beetle), the well- known genus Chrysomcla,and the Colorado Potato-Beetle(Doryphora or Longitarsus); most of them distil an acrid fluid; the larve: are short and obese, feeding exposed and the pupe often have the remarkable peculiarity of being suspended by the tail. JZalticidw are noted for their thickened hind femora and their jumping powers ; though small

in size, some of the members (¢.g., the Turnip-Flea) are most destructive. Cassididx (or Tortoise-Beetles) usually have the sides of the elytra expanded ; the larve have the very singular habit of concealing themselves under a covering formed of their own excre- ment, which is sustained by means of a forked appendage at the ex- tremity of the body. Other families (such as Hispida and Galcru- cid) must be passed over. The last division of the 7'ctramera is the Clavipalpi, often placed with the Z'rimera, and forming a con- necting link therewith. They are a small group, with the last three joints of the antenue forming a compressed club, and the last joint of the maxillary palpi also broadly clavate. The family Lrotylidx mainly constitutes the gronp ; the larve probably all live upon fungi. In proof of the wide divergence of opinion as to the re- lationship of special groups, it may be mentioned that one author places certain gencra of this group amongst the Clavicornia of tho Pentamerous division.

The last of the great divisions of Colcoptera forms the Trimera, Asin the Z'ctramera, it was discovered that the term is not strictly applicable, and that a minute joint is concealed between the lobes of the second joint of the tarsi, hence they have been called Psewdo- Trimera and Crypto-Trimcra. Some authors have made this group a place-of refuge for many almost isolated forms, the natural position of which it is difficult to suggest. At present, however, only a small number of more lomogceneous materials are usually located here, and these are divided into Aphidiphaga and Fungicola. The A phidiphagacom prise the familiar Lady- Birds (Coccinclla) and allies; these have the last joint of the maxillary palpi hatehet-shaped, have short-clubbed antenne, and have the body remarkably hemi- spherical, They appear to feed chiefly on other small insects in both larval and perfect stages, and aphides are especial articles of diet with them ; but the writcr has seen a larva of Coccinclla with its head deeply immersed in the juicy body of a recently formed pupa of its own species. /ungicola have the last joint of the maxillary palpi filiform, with longer antenne, and, as a rule, less hemi-spherical body. They contain a number of mostly small and little familiar forms, and, as their name indicates, are often found in fungi, on which they no doubt principally subsist.

DipreraA.—Only the anterior (mesothoracic) wings pre- sent, membranous, usually naked, with varying longitudinal nervures and but few transverse nervules. Posterior wings replaced by knobbed filaments termed “ halteres.” Mouth consisting of a rostrum formed chiefly by the extended labium, forming a canal in which tle other usual organs, inodified into lancet-shaped pieces, are contained, the whole forming a sucker; only the maxillary palpi developed. Thorax consisting almost entirely of the greatly enlarged mesothorax, the two other divisions very small, and scarcely separable from the mesothorax. Tarsi 5-jointed; the end joint with a pair of more or less disciform pulvilli. Meta- morphosis complete.

Although it is the generally received opinion that the halteres are the representatives of the posterior wings, there have been those who regard them rather as connected with respiration or hearing,and by some they have even been considered as belonging to the base of the abdomen rathier than to the thorax ; this latter idea results from the diffi- culty of defining the true limits of the metathorax. At the base of each anterior wing is a small membranous portion termed an ““‘alulet,” not absolutely connected with the wing itself, but which must be considered an adjunct, and certainly not representing a posterior wing.

Diptera form one of the most extensive orders. The Genuina are commonly divided into two great groups, according to the structure of the antenne, and termed Nemocera and Brachycera respectively ; but it has long

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been seen that these divisions are not natural, especially with regard to metamorphoses, and Brauer proposed division according to whether the larval skin at the last moult opens by a slit down the back or in a curvilinear manner, a proposal he has since extended by demonstrating that those two divisions—Orthorhapha and Cyclorhapha— are rendered the more natural by the pupal condition being correlated with

differences in the larva and perfect insect, and eventually it is probable his views will be generally adopted. Another basis for division is according to whether the pupa is free (sometimes active, but not takin nutriment) or enclosed within the hardened skin of the larva ("'obtected" or "coarctate"). The division into Nemocera and Brachycera is here followed,

In the Nemocera the antennz are long and slender,and composed of a considerable number of small joints, which are often verticillate or plumose. They include the families Culicidz, Chironomide, Psychodidx, Cecidomyiide, Mycctophilidy, Tipulide, and Bibio. nide, but some authors make a more minute subdivision. All these, and a multitude of others, fall into Brauer's suborder Orthorhapha,and the pupais obtected. Here come some of the most familiar and bloodthirsty members of the order, such as Gnats(orMos- quitos), Midges, Gall-Midges, " Daddy Long Legs," &c., and some of them cause incalculable mischief to the agriculturist. In those species in which the earlier stages are aquatic, the pupa fs active.

The Brachycera have the antenne short and thick, not more than three-jointed, but the terminal joint has a bristle (arista) which is sometimes articulate. These again have been divided into Hera. chetx#, Tetrachetx, and Dichetx, according to the number of sete conccaled in the mouth. They are "cyclorhaphous," and the pupais coarctate. Itis not possible to cnumerate here all the families, nor to allude to the extreme diversity of habit and structure that exists, House-Flies, Blow-Flies, Flesh-Flies, Bot-Flies, and Gad-Flies, the beautiful Syrphide (many of which devour aphides in the larval state), the parasitic Tachine, the plant-eating Phytomyze, &c., all belong to this division.

The Pupipara are a small group distinguished especially by the fact that the larve and pupe are developed in the body of the mother, and the head is sunk in the thorax ; they have even been considered a distinct order termed Homaloptera. All are parasitic. They include Ornithomyia (Bird-Flies), Aclophagus (the Sheep- Tick), the extraordinary wingless genus Myctcribia, parasitic upon bats, and the

perhaps still more extraordinary genus Braula, a minute creature known as the Bee-Louse. Brauer terms them Cyclorhapha pupipara,

With the Diptera (as a distinet section) it is now the all but universal practice to include the Aphaniptera or Fleas, at one time considered as forming a distinct order. They differ from true Diptcra in their laterally compressed form, well-detined thoracic divisions, absence of wings (which are represented only by scales), aborted antenn, developed labial palpi, &c. The mouth of the imago is (as is too well known) formed for suction, and its parts can be homologized with those of the true Diptera. The larva is slender and worm-like, and is mandibulate, in all probability feeding on the scaly debris or scurf froin the skins of the animals attacked; it is not found on the animals themselves, but in their beds or other resting-places. .The pupa is inactive. For all practical purposes the Aphaniptcra include only two genera—Pulex and Sarcopsylla, the Flea and the Chigoe or Jigger. Many mammals and some birds have each its own peculiar species of flea, or more than one, and the size of the tormentor is often in an inverse proportion to that of the tormented, the flea of the mouse being of gigantic pro- portions. The chigoe is notorious in tropical America for its habit of penetrating the skin of man, especially on the feet, the abdomen of the insect swelling and causing troublesome ulcers. Formerly it was believed that the egos were deposited in the ulcers and that the larve fed therein, but more recent observations tend to prove that the habits are much those of ordinary fleas.

LEPIDOPTERA.—Four membranous wings (frequently rudimentary, or sometimes wanting, in the female) clothed with flattened striated scales ; neuration open ; transverse nervules few; at the base of the anterior margin of the posterior pair is frequently a bristle used for connecting the two pairs in flight. Mouth haustellate, the maxille being much elongated and very slender, forming two closely- applied pieces, which together make the suctorial apparatus by means of which the nectar of flowers is pumped up for food; in some groups this apparatus is rudimentary. Labial palpi strongly developed, the maxillary ordinarily rudimentary (but more developed than the other pair in @

few small groups). Prothorax very narrow, with a pair of lateral organs termed patagia. Legs slender; tibiz spurred. Metamorphosis complete, all the appendages of the pupa enclosed in common covering with the body, but leaving the parts visible (occasionally, in some of the lower groups, the extremities of the appendages are free). Larva (termed a caterpillar) with six thoracic legs, and with a varying number (never more than 4 pairs) of fleshy abdominal and two anal prolegs (rarely the larva is apodal), With few exceptions, they are phytophagous.

These insects are familiarly known as Butterflies and Moths, and the order contains the most beautiful insects that exist, and forms the most popular and attractive of all for collectors. The scales of the wings (and other parts of the insect) are really modified hairs. Each is a flattened sac, striated on one side, containing variously coloured pigments, the arrangement of scales of different colours causing the beautiful markings and patterns so universal ; but metallic colours are due also to interference caused by minute inequalities of the surface, combined with the contained pigment.

The classification of Lepidoptera is still in a state of much uncertainty. By collectors they are fancifully divided into Jfacro- and JMicro-Lepidoptera. A more familiar division is into Butterflies and Moths,—the former being termed Lhopalocera (or Diurni), the latter Hetero-cera (or Mocturnt).

The Rhopalocera are especially distinguished by their clubbed antenne. The following great groups are tolcrably well marked (but each has been much subdivided) :—viz., Papilionide, Nym- phalide, Hrycinidx, Lycenidx, and Hesperiide. Some split the division into two, according as the pupa is suspended by the tail only, or has a thread round the body as well (these groups are termed Suspensi and Succineti respectively) ; the Nymphalidx are espeeially characteristic of the first of these. In the Nymphalide the anterior legs are not fully developed in either sex; in the Eryeinide and Lycenide this occurs only in the malcs. The Hesperiidz have the club of the antenne terminatcd by a hook, and the position of the wings in repose differs ordinarily from that in the other

groups; the pupa is enclosed in a rudimentary cocoon, and inay even be snbterranean.

The Heterocera are subdivided roughly into Sphingidx, Bomby- eid, Noctuide, Geometride, Pyralide, Tortricidew, Tineidx, and Pterophorid# ; but much more minute subdivision is adopted by specialists. In these the form of the antennm is very variable (as the name implies), and the bristle on the posterior wings is usually (not always) present. The Sphingide# (which comprise some of the largest and most robust moths) usually have the antenne fusiform towards the tips. Bombycidw generally have the antennez of the male strongly pectinate, and those of the female simple or nearly so; the larve with four pairs of abdominal prolcgs (and the anal pair); but this is a group of extremely heterogeneous materials, if taken in its widest sense; it includes the Silk-Worm Moths as familiar examples, and many extraordinary forms, amongst which may be mentioned the curious Psyehide, in which the larve: manu- facture portable cases whercin they live, and in which the females are apterous. Perhapsallied to this group, or intermediate between it and the Sphingidx, is the curious and abnormal collection of pretty insects termed Castniadx, at one time considered to be butterflies, and even yet included with them by some authors, The haustellum is rudimentary in the true Bombycide. The Noctwide are stout-bodied moths, mostly (but by no means always) of nocturnal habits ; the antenne greatly varying, but not thickened ; the bristle on the posterior wings present; the hau- stellum present (in one genus, Ophideres, it isstrong enough to pierce the skinof oranges). Theyare mostly divided into two groups accord- Ing to the number of the prolegs in the larve: (four, or only three, abdominal pairs), and the neuration of the posterior wings. The larve are usually nearly smooth (those groups with hairy larve are by some transferred to the Bombyeide), and the pupe subter- Tanean. Geometride are especially distinguished by the presence of usually only one pair of abdominal prolegs, occasioning a peculiar form of locomotion, termed “looping” ; antenne varying ; bristle of posterior wings present ; the wings usually expanded when at rest. With apparent relations to these is the small group Urantide, consisting of beautiful papilioniform insects, still by some placed with the butterflies. Pyralidw form a special group of

varying, and for the most part rather small, insects, with simple (or nearly simple) antenne ; long slender legs; the bristle of the posterior wings present ; long palpi ; larve with three to five pairs

of abdominal prolegs, and mostly smooth and glossy in appcarance. Lortricide# are small insects of nocturniform mien when at rest (the wings being horizontal and not expanded) ; antenne simple ; bristle of posterior wings absent ; haustellum short ; palpi short; larva with four pairs of abdominal prolegs. Many of the spccies of this group do immense damage to trees and garden plants. The Lincide is an immense group of mostly small (often very minute) insects, with extremely varying structure and habits. They may always be distinguished from the Tortricidx by the long palpi (the maxillary pair being sometimes strongly developed and exceeding the labial) ; the fringes of the wings are usually very long. Some of these minute forms are excessively beautiful. 'lhe group asa whole is made up of very incongruous materials. Pterophoridx are a small group at once distinguished by the wings being split up into linear divisious, hence they have been termed " plumes." By some they are not considered distinct from the Pyralide, with which there is considerable structural affinity.

Nevroprera.—Four meinbranous and for the most part densely reticulate wings, more or less clothed with hairs, but without true scales; very frequently the hairs are on the neuration only. Mouth mandibulate. Metamor- phosis complete, but the pupa has its members free.

In the outline of classification (at p. 147) proposed to be adopted in this article, it is stated that the Veuwroptera as there indicated are considered as forming a single order, more as a matter of convenience than from any conviction of the homogeneity of the two divisions.

The Trichoptera (or Caddis-Flics) form a very natural and sharply defined group distinguished by their rudimentary mouth-parts, with the exception of the two pairs of palpi, which are strongly developed, the maxillary pair being the longer, and with often the greater number of joints ; the antenne setaceous; wings with com- paratively simple

nenration and but few transverse nervules, ordi- narily covered with hair (which sometimes simulates scales) ; larvee (known as Caddis-Worms) with well-developed thoracie legs, and anal crotchets, but without prolegs, living in tubes covered with extraneous materials ; pupa lying free in the case, or occasionally in a special cocoon, only active just before its metamorphosis ; habits (with one or two exccptions) aquatic.

It is considered by the writcr that there is direct relationship of the Trichoptera with the Lepidoptera, and this idea acts as the key to the scheme of classification adoptéd. Thcy are divided into seven families, viz., Phrygancide, Limnophilidx, Sericostomatide, Leptoceridx, Hydropsychidx, Rhyacophilide, and Hydroptilide, chiefly according to the structure of the maxillary palpi. In the Lthyacophilide and Hydropsyehide the larve inhabit fixcd cases, in the others the cases are free, and caricd about by the inmates ; in the Rhyacophilide the pupa is enveloped in a special cocoon. The neuration shows strongly-marked homology with that of Lepidoptera.

The Planipennia (or true Vewroptera according to modern ideas) have strongly-developed mandibulate mouths; for the most part moniliform or filiform (often clavate) antenne; the wings ordinarily densely reticulate, with very numerous transverse nervules, the meinbrane hairless or nearly so. The larva is more divergent from the Lepidopterous type. The pupa is ordinarily in a cocoon; it is active just before its transformation, A conycnient subdivision is into Panorpidy, Sialidx, and Aegaloptera.

The Panorpide (Scorpion-Flies, &c.) are remarkable for the mandibles, &c., being situated at the cnd of a long beak, formed by the much-clongated clypeus above and the lower lip beneath. The wings have open reticulation, and the larva is more vermiform than in the succeeding groups, so that the relationship to the Z'icho- ptera is close. They are carnivorous both in imago and larva, and the latter is subterranean. Panorpa is remarkable for the cheliform termination of the abdomen, Bittaeus for its tipuliform aspect, Boreus for its nearly apterous condition.

The Stalide form a heterogeneous group of small subdivisions with setaceous antenne (which are sometimes pectinate); strongly developed prothorax; the third or fourth joints of the tarsi cordate. They are again divided into two sections (or families), of which Lhaphidia and Sialis may be taken as the types. The former (Snake-Flies) are espccially remarkable for the enormously elou- gated prothorax (the anterior legs at its posterior extremity); the larve sub-cortical. 'The latter comprise mostly large insects with strong (but not greatly elongated) prothorax and ample wings, the larvee of which are aquatic, and provided with lateral branchial plates; the genus Corydalis is remarkable for the enormously elongated mandibles of the male (but not in all specics). an

Mcgaloptera contain many groups of insects, with mostly monili- form (or clavate) antenne; densely reticulate broad wings; varying prothorax ; tarsal joints uot dilated. The number of subfamilics is large. The most prominent forms are the Afantispidx, with their long prothorax (the antcrior legs at its anterior end), the larve of

which livo in the nests of spiders (and also tree wasps), and in Mantispa undergo a kind of hypermetamorphosis; the Nemo- pteride, with their lincar posterior wings; the Ant-Lions, with their clavate antcnne and trap-forming larve ; the Chrysopidx and Hemerobiidw, known to feed on aphides in their larval stage, — the former often emitting a disgusting odour; aud the very curi- ous little Coniopterygidx, covered with a whitish waxy seeretion, and differing from all others in the extremely simple neuration, In Osmylus and Sisyra the larve are aquatic; and those of the latter have been found in the interior of the freshwater sponge.

OrTuoPpTeRA.—Typically with four densely reticulate unequal wings (or apterous), whereof the anterior are more or less coriaceous, the posterior folded under them, and membranous ; in the most typical groups they are deflexed, and closely applied to the body longitudinally in repose. Mouth mandibulate. Metamorphosis incomplete.

Having adopted metamorphosis as a basis for classifica- tion, it became necessary to view this order after the manner universal amongst German systematists, and to include in it many groups that are ordinarily accepted as neuropterous, the only plan possible without the erection of independent orders for their accommodation. The result is that more absolute homogeneity from a general point of view is attained, and we have to deal with an order made up of otherwise most incongruous clements, but somewhat relieved by the sharpness with which the great groups are defined. Regarding the two great divisions, Pseado-Neuroptera and Orthoptera genuina, as a whole, the main distinction really consists in the fact that in the former the four wings are equally membranous, whereas in the latter the anterior pair are more or less coriaceous; another difference is in the head, which in the former is horizontal, whereas in the latter it may be described as vertical ; but this distinction only applies to the typical groups. Thus there is really little more difference than exists between the two great divisions of Hemiptera, now almost universally placed in one order.

Naturally allowing the Pseudo-Neuroptera the first place as following on froin the true Newroptera (though some would say the Dragon-flies are really the typical Newroptera of Linneus), these must be first considered. Adopting the descending scale, the main groups may be glanced at as follows :—

The Odonata (Dragon-flies ; constituted an order by Fabricius) may be considered the most highly organized, with regard to their powerfully mandibulate mouth, strong, densely reticulate wings, &c. The special peculiarities of this group (including the extra- ordinary structure of the mouth in the preparatory stages, and the anomalous position of the genital organs in the male) have been fully discussed in the artiele DRaAGon-FLy (q.v.).

The Ephemeride (see EPHEMERID#) follow. After these come the Perlidw, aquatie insects in their preparatory conditions, remarkable for the comparatively weak development of the mouth parts (shared with the Zphemeridz) in the perfeet state, the four wings longitudinally horizontal and overlapping, the stout quadrate or oblong prothorax,

the frequent presence of two articu- lated tails, the long setaceous antenne, &e. This group is also re- markable as being the first in whieh the persistence of extcrnal branchie in the imago was detected (a peculiarity since found to be of frequent occurrence in them, and extending to other orders). They are known familiarly as Stone-Flies, and forma large portion of the stock-in-trade of an angler.

The Lmbide constitute a very small group, which in gencral form much resemble Perlide, but have, on the other hand, affinities with the white ants. The larve live habitually under stones in little galleries, and a recent discovery appears to prove that they feed on roots.

Lermitidez (or White Ants, placed by some authors in the true Orthoptera) are social insects living in immense communities, and forming nests on the ground or on trees. In some respects there is analogy between these and social Hymenoptera, and the diversity of condition in a single specics is even greater. Winged forms of both male and female exist (the wings being shed at a eertain time), and there are also commonly apterous forms known as workers and soldiers, whose office it is to build the dwellings and protect the inmates, the soldiers having the head provided with a powerful horn or elongated mandibles. Each condition has its own special immatnre form, so that it is probable no more specially polymorphic inseets exist. The wings are carried horizontally and overlapping in repose; the prothorax is well developed, and the

tarsi are four-jointed. Reeent observations tend to show that speci. ally prepared food (comminuted wood) is provided for the larva,

Psocidz are a small group of small insects. remarkable for their swollen face, setiform antenne, narrow prothorax, aud large meso. thorax, four-jointed maxillary palpi, and rudimentary labial palpi, two- or three-jointed tarsi. The wings are deflexed (often absent), with ordinarily very open neuration. These insects live on fungi and débris and also occasionally on dry animal substances, as in the ease of the Book-

Louse, ordinarily so abundant in neglected collections of insects, and crroneously supposed to occasion a ticking like that of Anobiwm.

There remain two groups the position of which has occasioned much controversy, but which are now often placed here, not, per- haps, because tlie affinities are very marked, but more to accommo- date them with a rcsting-place in a division of Znsecta the characters of which are so very elastic.

The first of these are the Thysanoptera, considered a distinct order by Haliday, the founder of the name, and by Burmeister placed in his order Gymnognatha as a distinct group termed Physopoda ; by some authors they are placed in the Hemiptera. It is true that the inouth forms a short rostrum with only bristle-like mandibles, but the presence of distinct palpi would appear definitely to invalidate the position in Hemiptera. The wings are four in number, lying horizontally on the back and crossing at the tips; they are very slender, membranous, without nervures or ncarly so, and strongly ciliated, or they may be wanting in some species, even in the perfect Statc. These insects are familiarly known as Thrips, and sometimes occasion much damage to various kinds of plants by sucking the juices, which the almost haustellate nature of the mouth enables them to do. 'They are mostly very minute insects, and have been divided into many scctions and genera on_ structural eharacters.

The second of the above-mentioned groups is the Afallophaga (or Rird-Lice), which it is convenient to separate from the Anoplura (or true Lice) on account of the structure of the mouth, which is man- dibulate and also carries palpi. On account of the absenee of meta- morphoses, some place them (with the Anoplura) as outside the pale of the Insecta, but they may be regarded as degraded Pseudo-Neuro- ptera. They for the most part live on the feathers of birds (each bird having its particular parasites), but a few also on mammals.

What may be termed Orthoptera genuina consist of groups forthe most part very sharply defined.

The Llattide (or Cockroaches) form the order Dictyoptera of Leach. These are insects of flattened form, with four horizontal wings (or apterous), of which the anterior pair are eonsiderably cori- aceous, but with distinct neuration ; the head small ; tarsi five- jointed. The eggs are not laid separately, but are contained in a common eapsule which is earried about by the female at the extremity of her abdomen. There are many genera and species, of which latter the abundant Pertplaneta orientalis is the most familiar.

Forficulide (or Earwigs) form the order Euplexoptera of West- wood and the group Dermatoptera of Burmeister. Externally they much resemble Coleoptera of the family Staphylinide in form (but with pincer-like appendages at the extremity of the abdomen), the anterior wings being abbreviated and coriaceous, separated by a suture, and concealing the ample but folded posterior wings (but some forms are apterous); the tarsi three-jointed. The eggs are deposited in cavities in the earth, and are guarded (at any rate in some) by the mother.

Mantide are mostly large elongate insects with strongly de- veloped raptorial anterior legs (hence the insects are carnivorous). The prothorax very long; tarsi five-jointed ; wings often ample ot frequently wanting, all reticulate, but the anterior pair slightly more coriaccous, ‘Ihe earlicr states greatly resemble the perfect insect without wings. The eggs are contained in a kind of case formed of a secretion voided with them, in which they are arranged in rows, the whole mass being attached to twigs, &¢.

Phasmidz (Spectres, or Walking-Sticks) have considerable exter- nal resemblance to the former, but the anterior legs are not rapto- rial, and the insects are phytophagous. The wings (when present) are usually much shorter than the abdomen. Most of the species mimie (as do those of the last family) leaves or twigs, often to such a degree that it is hard to imagine one is regarding an insect.

Gryllide form the first of a division termed Saltatoria (as opposed to Cursoria or Gressoria), from the structure of the hind legs fitting them for jumping. The antenne are long and setaccous ; tarsi three-jointed ; anterior wings lying horizontally over the folded posterior. The males

mostly produce sound by a special structure at the base of each antcrior wing acting on the posterior. This family is made up of materials presenting considerable diversity, but may be grouped roughly in two, according as the anterior legs are formed for digging (Mole-Crickets) or for running (Crickets).

Locustidex have the antenne very long and slender; the tarsi four-jointed ; the anterior wings longitudinally deflexed. The female ordinarily has a broad curyed ovipositor suitable for forming

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grooves in bark, or earth, in which the eggs are deposited. They are mostly phytophagous, but in some cases carnivorous also. The males are usually very noisy,—with special sound-producing organs ase of the anterior wing.

oes differ from the last chiefly in the antenne, which are shorter and thick, and in the three-jointed tarsi. The female has no produced ovipositor. They are phytophagous, and the eggs are nostly laid in earthen tubes. This family includes (according to modern classification) the true Locusts, notwithstanding the appli- cation of the term to the last-mentioned. Sound is produced by friction of the hind thighs against the nervures of the anterior the Orthoptera have here been treated in a somewhat more de- tailed manner than other orders, on account of the bearing of the materials on the classification of insects in general, and thesharply differentiated nature of these materials in particular.

HemipTeRA.—This order consists of insects of very vary- ing structure. Primarily there are two great divisions, known as L/eteroptera and Homoptera, by some considered distinct orders. The points in which they agree consist especially in an imperfect metamorphosis, and the structure of the mouth, which latter is of a very simple nature, consisting of an elongated articulate tube formed by an extension of the labium into a suctorial organ, concealed in which are bristle-like mandibles and maxills, and probably rudiments of maxillary palpi. The tarsi have from one to three joints.

Inthe Heteroptera (or true Bugs) the anterior wings are horizontal, and composed of two distinct parts, the basal portion (or corium) being coriaccous, and the apical portion (or membrane, often unde- veloped) being membranous with distinct longitudinal neuration, which latter is only faintly indicated in the coriaceous portion. In repose the membranous portion of onc wing overlaps that on the other. The posterior wings are concealed under the anterior, folded, membranous, and with only few nervures. Apterous forms are not uncommon, and sometimes the posterior wings are wanting. This division is again divided into two, Gymnoccrata and Cryptoccrata, in the former of which the antennz are composed of few elongate slender joints, while in the latter the joints are still fewer, short and thick, and ordinarily concealed under the head. Modern writers have erected a multitude of small subdivisions which ecaunot be enumerated here. The Gynunoccrata are broadly divided into the fol- lowing families, viz., Scwtcllcridx, Pentoatomidex, Corcidex, Berytide, Lygeide, Capsidx, Tingidide, Reduriide, Emeside, and Saldide, founded on different points in the structure of the antenne, rostrum scutellum of mesothorax, tarsi, &c. They are terrestrial, and suck the juices of plants or animals. The entire family Rcduvitde are probably blood-suekers, and members of other fainilies as above given are notorious for a similar habit, amongst which may be par- ticularly noticed the genus Acanthia (including the Bed Bug); but the greater part are plant bugs. Most of them are remarkable for emitting a peculiar and often disgusting odour. The Cryptoccrata areentirely water bugs, often of extraordinary form, and sometimes gigantic in size. They include the families Hydrometridz, Gerridzx, Galgulidx, Nepide, and Notonectide. They prey upon aninials. One genus (Halobates) is remarkable for its pelagic habits, being found on the surface of the ocean very far from land. Many others, such as Notonecta (Water Boatmen or Toe-Biters), Nepa, Ranatra, &c., are very familiar insects.

Tho Homoptera have the wings for the most part deflexed, and th anterior pair not separated into two parts. Often all the wings are membranous, with strong nervures ; in others the anterior pair is coriaceous. The division regarded as a whole is very polymorphic. The true Homoptera have threc-jointed tarsi. They may be divided into

Cicadide (remarkable for the sound-producing organs at the base of the abdomen of the male), Fulgoride (known as Lantorn- Flies, but now known to produce no light ; having the head greatly prolonged in front), Lystridx, Cixiidx (comprising many little plant- hoppers), Issidx, Derbidx, Flatidex, Tettigometride, Mcmbracide (often of most extraordinary forms), Cercopid (included iu which is the Cuckoo-Spit Insect), Lcdride, and Jassidx,—all vegetable feeders. The more aberrant Homoptera include well-marked groups. The Psyllidz are small plant-sucking saltatorial insects with four membranous wings which lic longitudinally deflexed in repose, and with very narrow prothorax, and eight- to ten-jointed antenne ; they often occasion much damage; the larve are frequently covered with a cottony secretion. The Aphide are the familiar Plant-Lice, the winged forms of which have those organs mem- branous, and often extended in repose. The antenne are five- to seveu-jointed. The diversity in form and habits is enormous, and, as is well-known, there are winged and apterous forms in the same Species, and parthenogenctic generation of the most extraordinary nature; and the same species may be both oviparous and viviparous.

Most of them void a sweet secretion from abdominal tubes, known as honey-dew, for which they are " milked" by ants. The destruc- tion they occasion to plants is very great; as a now too familiar instanee of this, the Phylloxcra vastatrix of the grape-vine may be cited. Coccidx (or Seale Insects) have the male two-winged, the female apterous, and living all her life asa fixed "scale" on plants the organs being of the most rudimentary nature ; the eggs lying under the scale in great numbers ; the tarsi with only one joint ; parthenogenesis occurs also in this group ; the male in its earlier stages lives under a special scale. 'lhe Cochincal Insect is one of the best known in this group. The little family Alewrodidz con- sists of minute insects covered with a white waxy secretion. They have four almost nerveless wings in both sexes, two-jointed tarsi, the abdomen without socreting tubes, and do not live under scales,

In the Hemiptera it is now the fashion to include the Anoplura, or true Lice (some also place here the Aallophaga or Bird-Licc), a degraded form of this order, without metamorphosis. Here it is preferred to let them rest in this article, even althongh some writers do not eonsider them true insects. The mouth parts certainly have indications of a rostrum, and there are no palpi, and, but for the absence of inetamorphosis, there would be little difficulty in fixing the position here as without doubt. All, as is well-known, are epizoie parasites on man and other Mammalia, each species being eonfined to a special host, while attempts have been made to prove that the Head-Louse (Pediculus capitis) varies according to the races of men to which it is attached. Perhaps the Crab-Louse (Phthirius pubis) is regarded with greater disgust than is bestowed upon any other living creature.

CoLLEMBOLA and THYysaANuRA.—In the introductory notes to this article (p. 141) it is stated that "although it is not difficult to define an insect, speaking broadly, there are certain small groups that do not satisfactorily fall into the class as limited by strongly-defined lines of demarcation." The writer there had especially in view those lice known as Mallophaga and Anoplura, and the two groups indicated in the leading of this section, groups in which metamor- phosis, the key of his ideas as to classification, and embody- ing an essential requisite in an insect according to common acceptance, is wanting. In the time of Linnzus, when we were only outside the threshold of knowledge, it may have been sufficient (and perhaps prudent) to include these groups in an order Aptera, But accumulation af knowledge soon dispersed that incongruous order. Such of its elements as could with justice be considered insects have been distributed amongst the various orders, We have not hesitated here to regard the Jfallophaga as degraded Pseudo-Neuroptera, nor the Anoplura as equally degraded Hemiptera, notwithstanding that some veterans in entomo- logical science may still dispute their position as true insects, There is a breaking-point to elasticity even in ideas of classification, and with regard to the Collembola and Thysanura we gladly avail ourselves of the assertion of Lubbock to the effect that they are scarcely within the pale of the true Jnsecta, notwithstauding the efforts made to locate them in that convenient refuge for the destitute, the Pseudo-Neuroptera. It is certain

that the writers in the present work on other classes of Arthropoda will not accept them, and it becomes necessary that they should not be forgotten. If insects at all, they have in the process of evolution lost the chief attributes of insects, or have never acquired them. Generally both groups are accepted as Thysanura, or as forming two families—Poduridx (= Col- lembola) and Lepismatide (= Thysanura).

In the Collembola the antenne are short, thick, and few-jointed ; the eyes are composed of groups of simple "eye-spots"" (much as in the larve of true insects) varying in number; the mouth organs mandibulate, subject to modifications of a haustellate nature; the palpi quite rudimentary ; the abdomen consisting of six segments, and ordinarily provided beneath with a saltatory apparatus (which may, however, be rndimentary) ; no caudalsete. The body is often clothed with prismatic scales, not unlike those of Lepidoptera. Ordinarily they are minute animals, living in damp places, and sometimes found gregariously. An elongate form is the most general, but Smynthurus and Papirius are short and obese. Lubbock recognizes six familics. :

The true Thysanura are elongate creatures, not unlike the larvee of Ephemeridx in form. The antenne are long, slender, and multi-

articulate; the cyes large, compound, and contiguous (or absent) ; XIIL — 20

the mouth mandibulate ; the palpi well developed ; the abdomen consisting of ten segments, with long caudal appendages. Lubbock forms three families. In some of the genera the scales form beau- tiful microscopic objects; in others they are replaced by hairs. Lepisma saccharina—sometimes termed the "Silver Fish "—is a familiar example of Zhysanura. The genus Campodea is especially interesting as being considered by some as the representative of the primitive form of insect, whence all others have been evolved.

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INSPIRATION is the Latin equivalent of beorvevoria, and is used to express the fact that holy men of old spake as they were moved by the Spirit of God. The idea is not exclusively Christian or Jewish; pagans have had their inspired speakers and writers and their ideas of inspiration, and these earlier pagan notions have had their effect on some of the forms which the Christian doctrine has assumed.

The classical languages contain many words and phrases expressive of this idea, e.g. Peopdpor (Aisch., Agam. 1150), Georvevorot (Plut., ii. 904 sq.; of. 2 Tim. iii. 15), Oeompdrer (Iliad and Odyssey, passim), &vOeo. (Plato, Phadr. 244), pawopevor, divino numine afflati, divino spiritu instincti, inspirati, furentes. Artistic powers and poetic talents, gifts of prediction, the warmth of love, and the battle frenzy were all ascribed to the power of the god pos- sessing the man inspired. And these words were taken over into Christian theological writing, and used to describe

what Jewish and Christian divines have called inspiration. This transference of terms, which was unavoidable, pro- duced, however, a certain confusion of thought; for pagans and Christians meant by inspiration two different things, When a pagan described inspiration, he did so by stating the marks of the state into which the inspired person fell when thc fit seized him; a Christian theologian on the other hand was chiefly concerned with the result of inspira- tion. What the inspired person said or did or commanded was of less moment to the pagan philosopher than the fact that he was possessed, that he was passive in the hands of the inspiring deity, that he was no longer himself but the god who for the moment dwelt in him and used him as he might an inanimate instrument. But in Christian theology inspiration always has to do with the belief that God has "wholly committed to writing" His reve- lation, and the psychological character of the state of inspiration is of small account compared with the fact that inspiration, whatever it may be, has for its result that God's revelation has so been committed to writing that men have it permanently, fully, and in an infallibly trust- worthy way. In pagan literature Oedavevoros is applied primarily to men who have been possessed; in Biblical and ecclesiastical language its primary use is to denote the writings which are the result of inspiration. 'The words in the mouth of a pagan mean primarily the psychological state, in the mouth of a Christian they mean the charac- teristics of a book or set of writings.

The doctrine of inspiration in Christian theology contains very little reference to the psychological state of the persons inspired, and when it does enter into such details we may

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generally trace their presence back to the influence of pagan ideas or words; it has to do with the characteristics of the writings which have been inspired. In short, the problem of inspiration in Christian theology very much comes to this:—In the Bible we have God's

revelation wholly committed to writing; what are we to infer from this about the Bible? And the varying answers given to this question form the history of the doctrine. Theology distinguishes between revelation, inspiration, and the canon of Scripture. Revelation is the objective approach of God to man, God entering into human life and history for man's salvation ; Scripture is the record of this revelation, and inspiration provides that the record is complete and trustworthy ; while the canon of Scripture gives the list of inspired writings.

It does not belong to an historical article like this to describe more minutely the doctrine of inspiration or its basis in Scripture and in the Christian experience ; all that can be done here is to state as concisely as possible various answers made to the main problem involved.

1, Jewish Theologians.—Our knowledge of the opinions of ancient Jewish thinkers about inspiration comes chiefly from the Apocrypha, from Josephus, and from Philo Judzus. The writers of the Apocrypha do not give us any theory or doctrine of inspiration, but it may be easily gathered from what they say that they regarded the Scriptures of the Old Testament as the word of God, and therefore worthy of all reverence. It is in 1 Mace. xii. 9 that the expression ra BiBA'a ra ayia is first used of Old Testament books ; and it is evident that the Pentateuch or the books of the law were held in special reverence, but beyond this we do not find a doctrine of inspiration. Nor does Josephus formally state or discuss the dogma in his writings, but his language shows that he and his contem- poraries believed that the Old Testament Scriptures were the word of God. The Old Testament he calls prophecy, and he declares that down to the time of Artaxerxes there was a regular succession of prophets which since then has ceased (Contra Apion., lib. i. ¢. 8.). It is Philo who first seeks to give a theory of inspiration, and he does so by bringing the reflexions of Plato upon the pagan inspiration or pavia. to explain the Jewish doctrine. Following Plato, Philo says that inspiration is a kind of "ecstasy," and he seems to imply that the degree of inspiration is greater in proportion to the unconsciousness or at least to the passivity of the man inspired. The prophet, he says, does not speak any words of his own, he is only the instrument of God, who inspires and who speaks through him (De

a means of information, and not so much a means of grace. and were of importance because they gave information not otherwise attainable ; and so inspiration, whatever else it was, came to be regarded as the means whereby that information was kept correct. that the divine agent in inspiration was the Holy Spirit, but the precise function of the Spirit was not clearly defined. The early theologians, when discussing the inspiration of the apostles, forgot the writing in describing the writers, and enlarged: on the powers communicated to them by the Spirit of God to guide the church, to work miracles, and to foretell the future. The promise of the Spirit, however, was not confined to the apostles ; all believers were to share in it. Justin Martyr speaks of the miraculous powers of the apostles, and of the spiritual gifts of all Christians, as if the

Specialibus Legibus, § 8); but he says that there are degrees of inspiration, and that all portions of Scripture are not equally inspired, or at least have not the same depth of inspiration. Moses has the first place in the scale of inspired writers ; he is épyerpopyrys, While others are Movoéws €ératpot, pabyrat, GracGrat, Powrytal, yvapyror ; but this idea of degrees of inspiration, a conception borrowed from Plato, does not seem to prevent Philo from thinking that the very words of the Old Testament were all inspired of God (Vit. Mos., 2, § 7). Tt was also a common opinion among the Rabbins of the early Middle Ages that the inspiration of the Old Testament required that, not merely the thoughts and words of Scripture, put even the vowel points and accents were themselves of divine origin; but this idea seems to have been compatible with the theory that there were three degrees of inspiration, the highest being the inspiration of the Penta- tench and the lowest that of the Hagiographa.

9, The Church Fathers.—The early Christian church seems to have simply taken over the Jewish views about the inspiration of the Old Testament; and, when the New Testament canon was complete, they transferred the same characteristics to the New Testament writings also. It is evident that the early fathers of the church wished to teach

that the complete knowledge of the salvation of God revealed in Christ was to be found in the Holy Scriptures because they were the book of God, but it is difficult to gather any consistent doctrine of inspiration from their writings, and when they do speak of inspiration it seems as if they were thinking more of the psychological process going on in the mind of the inspired man than of the result in the character of an inspired book. It was perhaps dificult for men educated in the principles of heathen philosophy to avoid applying their early belief about the pagan pavia to explain or define the Christian idea of inspiration. At all events we find the doctrine of inspira- tion described under such metaphors as the Platonists were accustomed to use: the inspired writer was the lyre, and the Holy Spirit the plectrum ; the writer was the vase, and the Spirit filled it; aud Montanus could appeal to the almost unanimous idea of the church that prophecy implied both passivity and ecstasy. This view of inspira- tion was strengthened by the Apologists, who were accus- tomed to plead for the credibility of the inspiration of the Scriptures by appealing to the oracle of Dodona, to the supernatural character of the Sibylline books, and to the universally accepted fact of pavia. Origen, whi so fre- quently anticipates later criticism, was one of the earliest theologians who really attempted to construct a theory of inspiration. He said that the Scriptures contain the plenitude of the Holy Spirit, and that there was nothing in the law nor in the gospel which had not come down to us from the fulness of the Divine Majesty. Inspiration, he declared, preserved the writers from any faults of memory, and made it impossible to say that there was anything superfluous in Scripture. He got over difficulties either by allegorical interpretations, or by declaring that God, like a teacher, accommodates Himself to the degree of civilization in various ages. But the church of the early centuries was hindered from considering the doc trine of inspiration on all its sides by two influences. Throughout the early church the common opinion pre- vailed that the Scriptures were of great practical import- ance and promoted the edification of believers. But the church scarcely set itself seriously to ask how the Scriptures edified believers and in what their practical importance consisted; yet these questions bore upon a right understanding of theirinspiration. It seems evident, however, that ever

since the early conflicts with Gnosticism the church was tempted to look upon Scripture as primarily

intimations of what was to come. looked on as altogether or even chiefly a means of know-

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The Scriptures edified because they instructed,

It had been always held

two were the same; and Tertullian, while he does draw a

distinction between the inspiration of the apostles and that common to all believers, declares that the difference is one of degree, the inspiration of believers being only partial inspiration.

Out of these conflicting tendencies there emerged in due time a double doctrine of inspiration. The Scriptures were inspired to teach infallible truth, and believers were inspired also with something of tle same

kind of inspiration to interpret this infallible truth. For

though it was not distinctly stated, yet still there were Whenever the Bible is

ledge, and not as a means of grace also, the intellectual

aspect overcomes or drives into the background the concep-

tion of the Bible as a grace-giving power, and there is need of infallible interpretation as well as of infallible

delivery of the propositions which convey the knowledge.

In short, the doctrine was in such a state that at any moment it might crystallize into a theory that would practically deny to the ordinary

believer the saving use of Scripture asa means of grace. The oceasion was furnished

by Montanism, which revived within the Christian church

the old pagan idea of pavia, and applied it not to the original Scriptures but to the infallible interpretation of Scripture. The Montanist prophets claimed to be possessed of thé Spirit as the Old Testament prophets had been, but this inspiration they used, not so much to give additional Scriptures, as to give authoritative exposition of the Scriptures already delivered to the church. Theologians rejected the Montanist pavia, denied that passivity and ecstasy were marks of inspiration, but none the less did the real essence of Montanist prophecy find its way into the church, for the' result was a double doctrine of inspiration, ~-the inspiration of Scripture, which insured that the knowledge they communicated was correct, and the official inspiration of the church, which insured that the knowledge infallibly communicated was infallibly understood. This brings us to the scholastic period.

3. The Schoolmen accepted the doctrine of inspiration as it came to them from the fathers, and methodized it. They held that the Bible, which was the word of God and there- fore inspired, was the source of doctrinal truth; and so this inspiration of the Bible came out in the fact that the doctrinal truths contained in it were infallibly true. The Schoolmen also recognized that a revelation which is primarily doctrinal, and that only, requires infallibility in interpretation as well as infallibility in delivery; and so the inspiration of the church was as important as the infallibility of Scripture. As time went on the infallible interpretations were collected, and side by side with an infallible Scripture was the infallible tradition or the official interpretation of Scripture The logical Schoolmen, however, perceived, what was not so distinct to the fathers of the church, who were accustomed to think in pictures

rather than in propositions, that if the Bible was altogether a communication of doctrinal truth there was much in the Scriptures which had notat first sight that appearance. The long histories, the tables of genealogy, did not contain doctrinal statements, or give rules of holy living. Were these portions inspired? The question does not require to be raised if we believe that inspiration implies simply that God has fully committed His revelation to writing, and that revelation is above all things God entering into human life and history for the salvation of His people; for then the whole course of the history, with all the facts as well as the doctrines, contains the revelation. But if we take revelation to be only the delivery of doctrines, the question arises and disturbs our theory of inspiration. The fathers solved every difficulty here by appealing to allegorical interpretation, for allegory will turn the driest statistical details into a moral or doctrinal code; but the Schoolmen were too dryly logical to be quite content with this explanation. They accepted the allegorical senses of Scripture, but many of them held, like Thomas Aquinas (Summa ii, 2, qu. 1, art. 6; qu. 2, art. 2), that there were two kinds of inspiration in Scripture, the ddrect, which is to be found where doctrinal and moral truths are directly taught, and the endirect, which appears in historical pas- sages, whence the doctrinal and moral can only be in- directly evolved by the use of allegorical interpretation. Many different: opinions, however, were held about the details of the doctrine. Gregory the Great called the writers of Scripture the calami of the Holy Spirit, to denote how entirely the Bible was the work of God; while Agobard of Lyons asserted that the inspiration of Scripture did not exclude the presence of grammatical errors. Thomas Aquinas was content to say simply that God is the author of Scripture (Summa 1, qu. 1, art. 10); but elsewhere he discusses at some length the psychological aspects of the inspiration of tle prophets.

4, The Reformers placed the authority of Scripture above the decrees of popes and councils, above the opinions of the fathers, above the whole digest. of official interpreta- tions of Scripture which made tradition. They regarded Scripture as the judge in all controversies in matters of faith and doctrine, and as the source whence came every article of belief; but besides this they held that Scripture was a means of grace, a

principle of salvation, a means of awakening the new life in the hearts of God's people. This was the real gist of the Reformation doctrine of Scripture ; this was tle main part in the contribution which the Reformers made to the doctrine of the word of God. The fathers had spoken of the practical importance of Scripture and its power for edification, but they had placed these qualities in a secondary position, and in the scholastic period Scripture came to be regarded as little more than a quarry for doctrines. The Reformers insisted that all doctrines must come from Scripture; they held that the Scripture was the book of the all-wise God, and was therefore the touchstone in matters of religious controversy, but they also held that above all the Scripture was the sword of the Spirit, and that its main use was to pierce the heart and conscience. According to the Reformers, the revelation of God was fully committed to writing in the Scriptures, and the inspiration of Scripture lay in this fact ; but they held that the special nature of inspiration must be derived from the purpose of God in this matter. God fully committed His revelation to writing, they argued, not merely to impart new knowledge to men, but also and principally to awaken His people to a new life; and this purpose must appear in the statement of the doctrine of inspiration. Thus the Reformation doctrine of inspiration, while capable of statement in terms somewhat similar, was really different from the patristic and medizval theories,

and it became more closely allied with the written Scrip. tures, and paid less attention to the writers. It taught that Scripture as a whole, and the parts of Scripture looked at as parts of the one whole, were designed to be a means of grace, to awaken a new life in God's people, through the work of the Spirit, and thus the doctrine of inspiration was at once brought into connexion with and yet clearly separated from the spiritual illumination shared by all believers. It is allied because both the inspiration of Scripture and the enlightening work of the Spirit in the hearts of believers are parts of the plan of God whercby by His

means of grace through the work of the Spirit He gathers believers into His kingdom; it is quite distinct, for by it God wholly commits His revelation to writing, and so makes the Scripture able to appeal with the very power of God to the hearts and consciences of men, In this way the doctrine of inspiration was advanced a stage beyond what it had before reaclied, and indeed was raised to a higher platform. It was now seen that inspiration secured that the Scriptures should be iustinct with God's power for salvation, as well as full of the knowledge which God has pleased to communicate to man. And thus in the hands of Luther, Calvin, and Zwingli the doctrine of inspiration had for its corrclative the doctrine of the Testimonium Spiritus Sancti ; the two doctrines supported aud explained each other. The second raised the first out of the region of mechanical dictation, the first prevented the second degenerating into a mystical enthusiasm. The Reformers were content to leave the doctrine of inspiration without much further definition, but they took the full advantage of the spiritual form of the doctrine to use great freedom with the letter of Scripture. Their successors acted otherwise.

5. The Protestant Scholastic for tlhe most part treated the Reformers' doctrine of inspiration very much in the same way as the Schoolmen had treated the doctrine of the fathers, They did not deny the spiritual side of the doctrine ; they maintained that Scripture was a means of grace, a power of God to salvation ; but they did not bring this side forward much in their discussions about inspiration. They dwelt on the fact that inspiration secured accuracy, rather than on the fact that it brought with it spiritual power. They asked, When Scripture is the word of the all-wise God, what does this imply? And the answers were various. Gerhard held that it implied that the writers were the "pens," the "hands," the "amanuenses" of the Holy Ghost. We may with propriety, he says, call the prophets and the apostles "amanuenses Dei, Christi, manus et Spiritus sive tabel- liones sive notarios." Calovius and Quenstedt say the game. Quenstedt holds that everything in Scripture comes from the infallible divine assistance and direction, from a special suggestion and dictation of the Holy Spirit ; and he says that because Scripture is inspired it is of infallible truth and free from every error; canonical Scripture con- tains no lie, no falsehood, not the very slightest

error either in fact or in word; whatever things it relates, all and every one of them, are of the very highest truth, whether they be ethical or historical, chronological, topographical, or verbal ; there is no ignorance, no want of knowledge, no forgetfulness, no lapse of memory in Scripture. The framers of the Formula Consensus Helvetica went further, and declared that the Old Testament was ‘“‘ tum quoad con- sonas, tum quoad vocalia, sive puncta ipsa, sive punctorum saltem potestatem, et tum quoad res, tum quoad verba Gedrvevoros.” On the other hand, Cappellus, led by his investigations into the antiquity of the Hebrew points, maintained that the inspiration of Scripture did not neces- sarily demand perfect accuracy in details; and he declared that such accuracy not only did not exist in such editions as we have now, but never did exist, for manuscripts

show discrepancies which cannot be explained on the theory of wilful or involuntary mistakes of copyists.

The Socinians and certain Arminians, such as Episcopius, who started with the idea that the Bible is simply a com- munication of knowledge, and so revived the medizeval idea, also resuscitated the scholastic doctrine of partial inspira- tion. They did not admit the allegorical method of inter- pretation, and were therefore compelled to reject the ‘indirect inspiration” of Thomas Aquinas; but they held that inspiration was only required to communicate know- ledge which the writer could not otherwise obtain, and they usually asserted that only the doctrinal parts of the Bible were inspired while the historical were not. Calixtus in the Lutheran Church held a somewhat similar opinion.

6. In more recent times the doctrine of inspiration has assumed various forms, many of which have but slight connexion with either the Reformation or the medieval theories. All admit that the inspiration of Scripture implies that the revelation of God has been cominitted to writing. Those who hold naturalistic views of revelation reduce inspiration to a peculiar aptitude for and sympathy with religious and moral truth. Others, although believing in the supernatural character of revelation, hold that there is no warrant to suppose anything

specially supernatural about the committal of the revelation to writing, and believe that God left His revelation to be recorded in the natural course of providence by men who had perhaps a larger share than their fellows of the spiritual enlightenment common to all believers. Others again have revived the old Thomist doctrine that parts of the Bible are inspired and that parts are not. To meet such theories, orthodox theologians have invented the terms plenary inspiration and verbal inspiration, but the phrases are neither very exact nor very enlightening. Meanwhile it is interesting to observe that a number of modcrn theologians, among whom may be named the late Adolphe Monod of Paris, have sought to revive the old simple Reformation form of the doctrine divested of its 17th century subtilties,

See Sonntag, Doetrina Inspirationis ejusque ratio, &c., Heidelberg, 1810; Hagenbach, History of Doctrines; Baur, Vorlesungen iiber die Christliche Dogmengeschichte ; Sehaff, History of the Creeds of Christendom ; Bannerman, Inspiration; Gaussen, Théopneustie ; Lee, The Inspiration of the ILoly Bible, &e. (T. M. L.)

INSTERBURG (16,303), the chief town of a circle in government district of Gumbinnen, East Prussia, is situated at the point where the Angerap and Inster join to form the Pregel, about 55 miles east of Kénigsberg. It is the seat of an appeal and other courts, and of a reformatory for the district, and has a chamber of commerce, a hospital, a gymnasium, a real-school of the first class, and several other schools. Insterburg is an active manufacturing town, and, besides flax-spinning and iron-founding, carries on the manufacture of machinery, shocs, cement, leather, and furs, along with a considerable tradc in cereals, vegetables, flax, linseed, and wood. Close to the town is a large stud-farm, and about 2 miles off is the old castle of Georgenburg. Including the garrison, the population in 1875 was 16,303.

Insterburg was founded in the 14th eentury as a castle and eom-mandery of the knights of the Teutonic order. The commandery was removed in 1525, but the village which had sprung up round the eastle reeeived town privileges in 1583 from the margrave of Brandenburg. During the next century it made rapid advanees in prosperity, owing to

the settlement in it of several Scotch trading families. In 1679 it was besieged by the Swedes, in 1690 it suffered severely from a fire, and in 1710-11 from a pestilenee.

INSTINCT is a term which does not admit of rigid de- finition, because, as ordinarily used, the meanin g of the term is not rigidly fixed. But for the purposes of scientific expo- sition from a biological point of view the nearest approach we can make to such a definition is perhaps the following : —Instinct is a generic term comprising all those faculties of mind which lead to the conscious performance of actions

that are adaptive in character, but pursued without neces. sary knowledge of the relation between the means employed and the ends attained. We must, however, remember that instinctive actions are very commonly tempered with what Pierre Huber calls "a little dose of judgment or reason." But although reason may thus in varying degrees be blended with instinct, the distinction between the two is sufficiently precise ; for reason, in whatever degree present, only acts upon a definite and often laboriously acquired knowledge of the relation between means and ends, Morcover, adjustive actions due to instinct are similarly performed by all individuals of a species under the stimulus supplied by the same appropriate circumstances, whereas adjustive actions due to reason are variously performed by different individuals. Lastly, instinctive actions are only performed under particular circumstances which have been frequently experienced during the life history of the species, whercas rational actions are performed under varied cir- cumstances, and serve to meet novel exigencies which may never before have occurred even in the life history of the individual.

All instincts probably arose in one or other of two ways. Origin of

(1) By the effects of habit in successive generations, mental activities which were originally intelligent become, as it were, stercotyped into permanent instincts. Just as in the life-time of the individual adaptive actions which were originally intelligent may by frequent repetition

become automatic, so in the life-time of the species actions originally intelligent may, by frequent repetition and heredity, so write their effects on the nervous system that the latter is prepared, even before individual experience, to perform adaptive actions mechanically which in previous generations were perforined intelligently. This mode of origin of instincts has been appropriately called the "'Japsing of intelligence." (2) The other mode of origin consists in natural selection, or survival of the fittest, con- tinuously preserving actions which, although never intelli- gent, yet happen to have becn of benefit to the animals which first chanced to perform them. Thus, for instance, take the instinct of incubation. It is quite impossible that any animal can ever have kept its eggs warm with the intelligent purpose of hatching out their contents, so we can only suppose that the incubating instinct began by warm-blooded animals showing that kind of attention to their eggs which we find to be frequently shown by cold- blooded animals. Thus crabs and spiders carry about their eggs for the purpose of protecting them ; and if, as animals gradually became warm-blooded, some species for this or for any other purpose adopted a similar habit, the impart- ing of heat would have become incidental to the carrying about of the eggs. Consequently, as the imparting of heat promoted the process of hatching, those individuals which most constantly cuddled or brooded over their eggs would, other things equal, have been most successful in rearing progeny ; and so the incubating instinct would be developed without there having been any intelligence in the matter. That many instincts must have been developed in this way is rendered evident by the following considerations. (1) Many instinctive actions are performed by animals too low in the scale to admit of our supposing that the adjustments which are now instinctive can ever have been intelligent. (2):Among the higher animals instinctive actions are performed at an age before intelligence, or power of learning by individual experience, has begun to assert itself. (3) Considering the great importance of instincts to species, we are prepared to expect that they must be in large part subject to the influence of natural selection. As Mr Darwin observes, "it will be universally admitted that instincts are as important as corporeal structures for the welfare of each species under its present

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conditions of life. Under changed conditions of life it is at least possible that slight modifications of instinct might be profitable to a species; and if it can be shown that instincts do vary ever so little, then I can see no diffi- culty in natural selection preserving and continually accumulating variations of instinct to any extent that was profitable. It is thus, I believe, that all the most complex and wonderful instincts have originated."

But here it is of importance to note that there is no reason why instincts should be restricted to one or other of these two modes of origin. On the contrary, there seems to be every reason to suppose that many instincts may have had, as it were, a double root—intelligent adjustment and natural selection blending their influences to a joint production. For example, the grouse of North America display the curious instinct of burrowing a tunnel just below tho surface of the snow. In the end of this tunnel they sleep securely; for, when any four-footed enemy approaches the mouth of the tunnel, the bird, in order to escape, has only to fly up through the thin covering of snow. Now in this case the grouse probably began to burrow for the sake of protection, or concealment, or both, and if so, thus far the burrowing was probably an act of intelligence. But the longer the tunnel the better would it have served the purposes of escape, and therefore natural selection would almost certainly have tended to preserve the birds which made the longest tunnels, until the utmost benefit that length of tunnel could give had been attained. And similarly the origin of many other instincts may be satisfactorily explained by thus supposing the combined operation of two causes—intelligent adjustment and natural selection—where there is a difficulty in explaining their origin as due to either cause alone. And if even in fully formed instincts we often find "a little dose of judgment or reason," we can have no cause to doubt that in thie formation of instincts by natural selection such small admixtures of judgment or reason may often greatly assist the process, while, conversely, it is even more evident that

“an instinct which is developing from the habitual perform-

ance of an intelligent action might be greatly assisted by natural selection favouring the individuals which most frequently or most promptly performed that action.

It is necessary to the above interpretation of the origin of instincts that the latter should not be immutably fixed. A few words may therefore be added to show that the view commonly entertained as to the unalterable character of instincts is erroneous. As a matter of fact, instincts are eminently variable, and therefore admit of being modified as modifying circumstances may require; their variability gives them plasticity whereby they may be moulded always to fit an environment, however continuously the latter may be subject to gradual change.

For the sake of brevity we may confine our attention to a single instinct, and for the sake of procuring a good test we may again take as our example the instinct of incuba- tion. This affords a good test because it must be regarded, not merely as one of the most important, but also as one of the oldest of instincts, and therefore one which for both these reasons we should deem least likely to exhibit variability. Yet we find it to exhibit variability in every imaginable direction. Thus the complicated effects of domestication and artificial selection on some of our breeds of poultry appear to have almost completely destroyed this instinct, while in other breeds it remains intact, if indeed it has not even been intensified. Among tlie latter breeds experiment shows that the natural period of incubation may be indefinitely prolonged by substituting “ dummies” for eggs, while the following experiment, which we owe to Mr Spalding, shows “how far the time of sitting may be interfered with in the opposite directiou. Two hens,” he

says, “became broody on the same day, and I set them on dummies, On the third day, I put two chicks a day old to one of these two hens; she pecked at them once or twice, sceined rather fidgety, then took to them, called them to her, aud entered on all the cares of a mother. The other hen was | similarly tried, but with a very different result ; she pecked

at the chickens viciously, and both that dayand the next stub-

bornly refuscd to have anything to do with them.” Similarly . the period of maternal supervision after the chickens have | been hatched admits of being greatly modified, as is proved

by some experiments made and published several years ago by the present writer. In one of these experiments there was given to a Brahma hen a pea-fowl’s egg to hatch ; the hen was an old one, and had previously reared several broods of ordinary chickens. A pea-chicken requires a much longer period of maternal care than does an ordinary chicken, and for the wonderfully long period of eighteen months the old Brahma hen continued to pay unremitting attention to her supposed offspring. Through all this time she never laid any eggs, and eventually the separation

/ seemed to take place from the side of the peacock. In other cases, however, where the conditions of the experi-

ment were exactly parallel, the pea-chickens were abandoned by their Brahma mothers at the time when the latter ordi- narily abandon their chickens. But not only will a hen thus take to a brood of birds so unlike her natural chickens as are pea-fowl, and adapt her instincts to their peculiar needs ; she may even take to young animals belonging toa different class, and adapt her instincts to their still more peculiar needs. Thus the writer gave to a hen, which for several weeks had been sitting on dummies, three newly- born ferrets ; she took to them almost immediately, and remained with them for more than a fortnight, when they were taken away from her. During the whole of this time she had to sit upon the nest, for of course the young ferrets were not able to follow her about as young chickens would have done. Two or three times a day she would fly off her nest, calling upon her brood to follow ; but, on hearing their cries of distress from cold, she always returned im- mediately, and sat with patience for six or seven hours morc. She only took one day to learn the meaning of these cries, and after that she would always run in an agitated manner to any place where the crying ferrets were concealed. Yet it would not be possible to conceive a greater contrast than that between the shrill piping note of a young chicken and the hoarse growling noise of a young ferret. It is of

importance to add that the hen very soon learnt to accommodate herself to the entirely novel mode of feeding that her young ones required ; for, although at first she showed much uneasiness when the ferrets were taken from her to be fed, before long she used to cluck when she saw the milk brought, and surveyed the feeding with satisfaction. But she never became accustomed to

| the attempt of the ferrets at sucking, and to the last used

now and then to fly off the nest with a cackle when nipped by the young mammals in their search for the teats.

Enough then has been said on the variability of instinct Heredi- to show that there is supplied to natural selection abundant ty

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opportunity for the development of new and more highly |, wrought instincts from previously formed and less elabor- ated instincts. But in order to show that this opportunity has been utilized it is not enough to show that hereditary instinct may be modified by individual experience ; it must also be shown that such a modification when successively repeated through a number of generations itself becomes inherited. Now, although the evidence on this point is necessarily scanty, it is sufficient for the purpose here required. The evidence is scanty because there are only a very few cases in which human observation has, as it were, the opportunity of watching the continuance of effects of

Special ‘difficul- ties.

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recently acquired or altered experiences over a number of generations ; but in the few cases in which we have this opportunity we find good evidence that new or changed experience, when continued over a number of generations, is bequeathed to future generations as a legacy of intuitive knowledge, and that any newly acquired adjustive actions may in time be similarly transmitted as instinctive actions which no

longer require to be separately learnt by each individual. Perhaps the best instance that can be quoted is that of the many species of birds, and some mammals, which when first found by man on oceanic islands were perfectly tame, but whose descendants now show a dread of man which is, in the most rigorous sense of the word, instinctive.

The only other instances in which we have an oppor- tunity of actually observing the transmission of newly acquired mental habits are those in which such habits have been artificially taught to domesticated animals. It so happens that these instances are very few in number, but it is not too much to say that, in all the cases where such habits have been taught for a long series of generations, some tokens of their hereditary transmission may now be observed. Thus, to quote Mr Darwin, whose accuracy on such a subject is not likely to be disputed by any one, "it cannot be doubted that young pointers—lI have myself seen a striking instance—will sometimes point and even back other dogs the very first time they are taken out; retriev- ing is certainly in some degree inherited by retrievers ; and a tendency to run round instead of at a flock of sheep by shepherd dogs. If we were to behold one kind of wolf when young and without any training, as soon as it scented its prey, stand motionless like a statue, and then slowly crawl forward with a peculiar gait, and another kind of wolf rushing round instead of at a herd of deer, and driv- ing them to a distant point, we should assuredly call these actions instinctive. Domestic instincts, as they may be called, are certainly much less fixed than natural instincts, but they have been acted on by far less rigorous selection, and have been transmitted for an incomparably shorter period, under less fixed conditions."

Now these three habits, or mental attainments, are the only ones that have been systematically taught to any animals for anumber of generations, and the fact that they all show a marked tendency to become intuitive may be taken as lending a greater amount of confirmation to the present theory of the origin of instincts than we miglit on a priort grounds be led to expect. The only other facts bearing upon this point are those which are thus tersely rendered by Mr Darwin. " How strongly these domestic instincts, habits, and

dispositions are inherited, and how curiously they become mingled, is well shown when different breeds of dogs are crossed. Thus it is well known. that a cross with a bull-dog has affected for many generations the courage and obstinacy of greyhounds, and a cross with a greyhound has given to a whole family of shepherd dogs a tendency to hunt hares. These domestic instincts resemble natural instincts, which in like manner become curiously blended together, and for a long time exhibit traces of the instincts of either parent."

_ The above doctrine as to the nature, origin, and development of instincts serves very satisfactorily to explain nearly all the enor- mous number of instincts with which we are acquainted. There are, however, several special cases where there is still some difficulty in applying the above doctrine asa full and satisfactory explanation

of the observed facts. This article may therefore fitly conclude with a brief enumeration of these cases.

_ 1. Theso-called "migratory instinct" is one that is still shrouded in much obscurity. The main difficulty with regard to it is to account for the "sense of direetion," whereby the animals are guided to their destinations. 'Thus, for instance, many migratory birds fly at night, when it would seem impossible that they ean be guided on their way by the sight and memory of landmarks. More- over, it is asserted on good authority that among some species it is the habit for the young brood to fly separately by themselves, or

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apart from the older birds, and therefore to travel over enormous tracts of land and sea without either guidance or previous experi- ence of the way ; such is unquestionably the ease with the young of the cuckow. Lastly, it is certain that several species fly across immense tracts of oeean, where it is impossible that they can be guided on their way by landmarks. Several theories have been pro- pounded to account for these facts ; but, as none of them are satis- tactory, we need not here occupy space with their enumeration.

2. Closely allied to, if not identical with, this so-called “sense of direction” as manifested in migration, is the faculty whereby various species of animals which may not be migratory in their habits are enabled to find their way over greater or less distances. This has been called the “ homing” faeulty, and is chiefly mani- fested by various species of domesticated mammals. It is very generally believed that it is also manifested by earrier-pigeons ; as a matter of fact, however, there is no trustworthy instance on record of one of these birds having found its way back over a tract of country with which it was previously unacquainted. In order that a carrier-pigeon should find its way home, it is neccssary first to teach the animal, by flying it at a series of points along the route, the landmarks of the country which it is afterwards to traverse. But, although the “sense of direction ” may be a figment as regards the carrier-pigeon, there can be no doubt that it is a fact as regards many species of our domesticated mammals. Thus the evidence is unequivocal with regard at least to dogs, cats, horses, sheep, pigs, and cattle. Judging from hitherto unpublished correspondence received from Australia and South America, there seems to be practically no limit to the distance over which these animals may be able to return ; and, what is of more importance, there can be no doubt that these animals, when finding their way home, do not require to traverse the exact routes by which they eame; on the contrary, they generally scem to select the shortest or the straightest eourse, however circuitous the way may have been by which they were taken ; or, if their outward journey is over two sides of a tri- angle, their homeward journey will probably be taken over the third side. The sense by which they are guided therefore eannot be, as has been suggested by more than one eminent naturalist, the sense of smell ; and for the same reasons it cannot be either the sense of sight or that of hearing. More plausible is the hypothesis that the faculty consists in an automatic process of “brain registration,” every change of direction in the outgoing journey leaving behind it a record in the cerebral nervous system, and therefore in the mind of the animal, so that asa total result the general direction of the starting place is retaincd in the memory,—Just as we are ourselves able in a smaller degree to preserve our general sense of direction when winding through the strects of a town. One great difficulty attaching to this view appears to be that the animals in

question are able to find their way home over land even when they have made their outward journey by sea, for it is evident that the difficultics of " brain registration " must in such cases be indefinitely increased, not only by the many meaningless movements of a vessel at sea, but still more by the fact that the changes of direction made by the vessel, being made in long and easy eurves, and without muscular effort on the part of the animals, are movements which we can scarcely suppose to be appreciated by the eerebral organization of the animals. On the whole, therefore, with regard to the faculty of "homing," as with regard to the analogous if not identical faculty exhibited in migration, it can only be said that further investigation is required in order to explain that which, in the present state of our knowledge, must properly be regarded as inexplicable.

3. Mr Darwin has pointed outa serious difficulty lying against his theory of the origin of instincts by natural selection, and one which, as he justly remarks, it is surprising that no one should have hitherto advanced against the well-known doctrine of inherited habit, as taught by Lamarck. The difficulty is that among various specics of social insects, such as bees and ants, there occur " nenter"' or asexual individuals, which manifest entirely different instincts from the other or sexual individuals, and as the neuters cannot breed it is difficult to understand how their peculiar and distinctive instincts can be formed by natural selection, which, as we have seen, requires for its operation the transmission of mental faculties by heredity. The only possible way in whieh this difficulty can be met is the way in which it has been met by Mr Darwin, viz., by supposing "that selection may be applied to the family as to the individual." 'Such faith may be placed in the power of selection that a breed of cattle always yielding oxen with extraordinarily long horns could, it is probable, be formed hy carefully watching which individual bulls and cows, when matched, produced oxen with the longest horns; and yet no one ox would ever have propa-gated its kind"; and similarly, of eourse, with regard to the instincts of ncuters. As Mr Darwin has argued out this difficulty at length, it seems unnecessary to say more with regard to it than that he has shown it to be not so forinidable as to exclude his doc- trine as fully explanatory of

such eases, when we have already accepted his doctrine as explanatory of other cases. ae

4. There are two or three other special instincts of minor import-

ance the explanation of which is not as yet eompletely clear. Thus it is not yet asccrtaincd what hereditary influenee it is that Icads the Norwegian lemming periodically to migrate westwards, with the result that enormous numbers of tho species are destroyed by drowning. But there can be little doubt that this influence, what- ever it was, was originally of bencfit to the species, for it would bo a case standing out of all analogy if this instinct should from _its first origin have bcen, as it now appcars to be, detrimental. The only other instance that could be pointed to as wearing any such appearance is that which has been alleged, but on very doubtful evidence, with regard to the scorpion committing suicide by stinging itself to death when surrounded by a ring of fire. It may be here incidentally observed that the fact of all the innumcr- able multitude of animal instincts, with the cxception of the two dubious cases just mentioned, being of obvious use to the species which manifest them, may properly be taken as the strongest possible evidence of the theory that ascribes all instincts to the operation of natural selection. ; ;

5. Lastly, we have an instinct which is pointed to by Mr Mivart as one that cannot beexplained by tho influence of natural selection, or, as he would appear to suggest, by the operation of any other natural cause. This instinct is manifested by a certain wasp-like animal, and consists in this animal stinging spiders in the particular part of the cephalo-thorax which contains the principal nervous centre. The effect of stinging this nervous centre is that of paralys- ing the spider without killing it, and the spider in this maimed condition is then stored up with the larve of the fly, to serve as their food when they quit the egg. It will be observed that there is here no question as to the utility of the instinet to the spccies which manifests it, and the difficulty to whieh Mr Mivart points consists merely in understanding how the inseet was in the first instance led to sting the spiders in precisely the right spot to pro- duce

the particular -results rcquired. The answer to this single remaining difficulty is that as yet the case has uot becn sufficiently observed with a vicw to a possible solution of the difficulty. I seems, for instance, not at all improbable that the striking of the spider's ganglion by the sting of the wasp is, as it were, wholly accidental, being determined only by the circumstanee that both the ganglion and the sting are organs which occur in the mcdian linc of their respcetive possessors. Whether or not this is the explanation of the supposed difficulty, it at least seems clcar that the latter is not one of any considerable magnitude, (G. J. R.)

INSTITUTE OF FRANCE, an association constituted under the name of the Jnsfitut National by the French Republican Convention, in October 1795, to occupya similar position to that of the old academies suppressed by an Act of the Convention, 8th April 1793 (see AcapEmy), The affix to the word "Institut" has undergone a variety of changes corresponding to changes in the form of the government of France. The Institute owed its existence chiefly to the efforts of three persons, Lakanal, Daunou, and Carnot, and, according to the terms of the law by which it was founded, its purpose was to "advance the sciences and arts of research by the publication of discoveries and by correspondence with other learned societies, and to pro- secute those scientific and literary labours which shall have for their end general utility and the glory of the republic." It was composed of three classes —the first for sciences physiques et mathématiques, the second for sciences morales et politiques, and the third for littérature et beaux-arts. Originally it consisted of 144 members (the 48 nominated by the Convention electing 96 others), an equal number of associates in the provinces, and 24 foreigners of distinction who held the position of corre- spondents. Each class was divided into several sections, 6 members and 6 associates being assigned to each section. The first class was composed of ten sections, viz, (1) inathématiques, (2) arts mécaniques, (3) astronomie, (4) physique expérimentale, (5) chymie, (6) histoire naturelle et minéralogie, (7) botanique et physique générale, (8) annatomie et zovlogie, (9) médecine et chirurgie, (10) économie rurale et art vétérinaire. The second class was composed of six sections, namely, (1) analyse des sensations et des idées, (2) morale, (3) science sociale et législation, (4) économie politique, (5) histoire, (6) géographie.

The third class consisted of eight sections, viz., (1) grammaire, (2) langues anciennes, (3) poésie, (4) antiquités et monu- ments, (5) peinture, (6) sculpture, (7) architecture, (8)

musique et déclamation. To the first class were thus assigned 60 members and as many associates, to the second 36, and to the third 48, the foreign correspondents being divided equally among the classes. No member was per- mitted to belong to more than one class ; but any one might be present at the meetings and assist in the labours of the other classes. The Institute was installed at the Louvre in the building formerly occupied by the Académie Frangaise, but in 1806 its locality was changed to the College des Quatre-Nations. The First Consul on the 23d January 1803 decreed for it a new constitution, the leading featnres of which were—that the approval of the head of the Government was essential in the election of members; the suppression of the second class; and a redivision into the four classes of (1) sciences physiques et mathématiques, (2) la langue et la littérature Frangaises, and (3) histoire et littérature anciennes, (4) beaux-arts. The first class was composed of the ten sections of the old first class, and an additional scction of geography and navigation with 3 members, with power to nominate 100 correspondents, The second class was composed of 40 members not separated into sections. The third class was composed of 40 members and of 8 foreign associates, and had the power to nominate 60 correspondents. The fourth class, which was composed of 28 members and of 8 foreign associates, was divided into five sections :—peinture with 10 mem- bers, sculpture with 6, architecture with 6, gravure with 3, and musique (composition) with 3 members. It had the power to nominate 36 correspondents. All classes had power to elect a stipulated number of members from the other classes. After the Restoration Louis XVIII. on the 21st March 1816 decreed the revival of the names of the old academies to the four classes of the Institute :—(1) L'Académie Francaise, corresponding to the old second class; (2) L'Académie royale des inscriptions et belles lettres, corresponding to the third class; (3) L'Académie royale des sciences, corresponding to the first class; and (4) L'Académie royale des beaux-arts,

corresponding to the fourth class, On the 5th March 1833 a fifth academy was added to the Institute.—L'Académie des sciences morales: et politiques, corresponding to the second class suppressed by Napoleon. As restored, it was composed of 30 members, with a minimum of 30 and a maximum of 40 correspondents. It was divided into five sections, viz., (1) philosophie, (2) morale, (3) législation, droit public, et jurisprudence, (4) économie politique et statistique, (5) histoire générale et philosophique.

Each academy has its own special jurisdiction and work, with special funds and one or more perpetual secre- taries, in addition to which there is a general fund and common library, which, as well as other matters connected with the Institute as a whole, are managed by a committee chosen in equal numbers from each of the academies. Matters of common interest to all the academies are dis- cussed at a general meeting of the institute, and a séance publique annuelle takes place on the 25th October, the anniversary of the organization of the Institute. All the expenscs of the Institute and the academies are defrayed by an annual sum voted by Government. Each member of the Institute receives an annual allowance of 1200 francs, and each secretary of an academy a salary of 6000 francs. A notice of the several academies is given in the article AcapemMy. See also France, vol. ix. p. 514.

See Annuaire de UV Institut ; Mémoires de Institut; J. P. A. Lucas, Quw'est-ce que Institut, Paris, 1845; Roget de Belloguet, Pétition adressée & Vopinion publique pour la réforme des élections de UInstitut, Paris, 1862; L'Empereur a U Institut, Paris, 1865; Alfred Franklin, Les Origincs du palais de UV Institut, Paris, 1862; Alfred Potiquet, Z'Institut national de France, 187/15 Renan, "'TInstitut," in Questions Contemporaines, Paris, 1865 ; Franeisque Bouillier, Z' Institut ct les Acadé.ries de province, Paris, 1879.

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INSURANCE

NSURANCE is the system or machinery by which it is sought to guard against the pecuniary consequences of certain accidents to which men are liable, such as the loss of property by fire or shipwreck, or the loss of future carnings through disablement or premature death. Insurance does not attempt to prevent these accidents, nor even to protect men against all the consequences of them. It deals only with the main pecuniary loss which such acci- dents are fitted to occasion, provides for it beforehand, practically distributes it among the persons who are more or less exposed to the same risk; and so, when the accident does light on any one of them, its pecuniary effects are neutralized or greatly mitigated.

The three chief devclopments of this system—Fire, Life, and Marine Insurance—are separately treated in the follow- ing articles. A very important application of the principle has been treated under the heading FrienDLY SocrETIEs.

Besides the above branches of insurance, which have attained immense proportions in almost all civilized countries, there are many other applications of the principle which have been tried with greater or less success. The conditions which seem necessary to success (in addition to good administration) are chiefly these :—there must be a risk of real loss which it ought to be beyond the power of either the insurer or the insured to avert or to hasten; a large number of persons must be liable to the like risk ; the accident contemplated must be likely to fall on a com- paratively small number of the persons exposed to the risk of it; the probabilities of its occurrence must be capable of being estimated beforehand with some approximation to certainty; the loss apprehended must be so considerable when it does occur as to be worth providing against; and the cost of that provision must be comparatively so small as not to be prohibitive,

Accident Insurance.—Ordinary life assurance protects against the pecuniary loss arising to a man's family or creditors or others by his death, whether that arise' from accident or disease; but it has been found that a separate insurance against the consequences of accident meets the requirements of a large class of persons. A company was

established in London in 1849 for insuring against the consequences of railway accidents,—the Railway Passengers Assurance Company. In return for a payment of 3d., 2d., or ld. made by first, second, or third class passengers respectively, for insurance during a single journey, it under- took to pay £1000, £500, or £200 in case of death by such an accident, or a certain weekly allowance in respect of personal injury not resulting in death. In 1856 the business was extended to embrace accidents of all kinds, and there came into use a system of yearly payments pro- portioned to the degree of risk supposed to attach to various occupations or other conditions of life. Many other similar companies have since been established, and at the present time (1881) there appear to be about eleven such offices in the United Kingdom. The amount insured by them is estimated at nearly £100,000,000 sterling, and their yearly income is between £400,000 and £500,000. The claims absorb about 50 per cent. of the premiums, the remainder, after paying expenses necessarily large, being the profit. Various schemes are at present being organized, in conse- quence of recent legislation, to enable employers to insure against risk from injuries suffered by their work-pcople.

The business of insuring against accidents has been developed in Canada, Victoria, and New South Wales, as well as in France, Germany, Switzerland, and the United States. In the country last mentioned the premium in-

come of the principal office engaged in this business was in 1879 close on a million of dollars.

fidelity Guarantee.—The guarantee of employers against the fraud or insolvency of their servants has of late years become a considerable and useful department of insurance business. Private suretyship is attended by many evils, and a bond of indemnity by a joint-stock company, although it has to be purchased by a yearly payment, is now generally preferred. Such a bond is not granted without previous inquiry as to the character of the applicant and the checks which the employer is to use. Seven institu- tions in the United Kingdom undertake this description of business ; some of them insure ouly against loss arising

from embezzlement, while others protect the employer against any failure to make good the sums entrusted to an employé. The yearly premiums required range from 10s. to 60s. per cent. of the sum guaranteed.

Various Minor Forms of Insurance.—In those parts of the British Isles which are exposed to violent hail-storms offices have been established successfully for insurance against the loss which these often occasion. Efforts have been made also, not always with equal success, to protect farmers and other owners of horses aud cattle against the loss arising from accident or disease among these animals. It has been attempted also to insure traders against loss from bad debts, and house-owners against loss of rent and against defective titles. No fewer than thirtecn offices, mostly local in their operation, insure against loss from the break- age of plate glass, and three against the loss from explosion of boilers. In former times, when men were liable to be drawn to serve in the militia but might purchase a substi- tute, a system of insurance was established to provide them with the necessary funds, These developments of insur- ance, however, are of an importance quite insignificant com- pared with the three grcat departments now to be dealt with.

I. Fire INsSuRANCE.

Fire insurance is a matter of practical interest to a far larger number of persons than either of the other two great departments of insurance—life or marine. There are few persons to whom, in the absence of insurance, the destruction of their dwellings or of their household goods would not be a serious calamity, while to the merchant or manufacturer the burning of his premises or stock or machinery might be ruinous. No age or country has been exempt from such fatalities, and no watchfulness has been able to prevent them. Some protection against the pecu- niary consequences seems an essential condition of any extended system of manufactures or commerce.

Fire insurance, however, as an organized system, has had an origin comparatively recent. ‘I’here are traces, indeed, in earlier times of enforced or voluntary contributions towards the relief of sufferers by

fire, but it is only about the beginning of the 17th century that we hear of proposals being made for a more systematic provision, and it was not till after the great fire of London in 1666 that these proposals took practical shape. This seems at first to have been in the form of underwriting by individuals or by clubs, and some attempts were made to engage the corporation of London in a scheme of fire insurance; but in 1681 the first regular office for insuring against loss by fire was opened by a combination of persons "at the back-side cf the Royal Exchange," and it was followed shortly after- wards by another. Of the insurance offices that still survive, only one, the aero ecel e from the 17th

century (1696) ; five date from the first half of the 18th century, the Sun (1710), Union (1714), Westminster (1717), London (1720), and Royal Exchange (1720) ; while only three date from the second half of that century, the Salop (1780), Phoenix (1782), and Norwich Union (1797). The first fire office in Scotland was established in 1720, the first in Germany in 1750, and the first pro- prietary company in that country in 1779; the first office in the United States was established at Philadelphia in 1752, one of its early directors having been Benjamin Franklin; the first in France dates from 1816, and the first in Russia from 1827. es The growth of fire insurance business in Britain did not receive much assistance from Government. At a very early period, in 1694 under William & Mary, a stamp duty was imposed on fire policies (now reduced to the nominal rate of one penny), and in 1782, during the administration of Lord North, fire insurances were made liable to an annual duty at the rate of 1s. 6d. for each £100 insured. This tax, which was collected by the offices along with their premiums and accounted for by them to the exchequer, was increased in 1797 to 2s. per cent., in 1805 to 2s. 6d., aud in 1816 to 3s., at which rate it continued for about fifty years. It was strongly objected to as a discouragement to prudence, and as disproportionate in rate to the cost of insurance which it was tacked to; but as it was easily 'collected, and

yielded nearly two millions a year (£1,714,622 in 1863), it naturally died hard, In 1864 it was partially remitted, and it expired finally in 1869. The returns of the duty enable us to measure in some degree the progress of fire insurance in the United Kingdom during the eighty-five years of its incidence. Some descriptions of property, such as agricultural produce, were exempt from duty and do not appear in the returns, nor do the sums insured on property situated out of the United Kingdom; but the amount insured by British offices on which duty was paid was In 1783 about £135,000,000 In 1840 about £645,000,000 », 1800: „ 200,000,000 | „ 1860 „ 1,000,000,000 LOZUn ay 427,000,000 », 1868 „ 1,4380,000,000 At the present time (1881) there appear to be about sixty offices established in the United Kingdom for insur- ing against loss by fire either alone or in conjunction with life or marine insurance. A few of these are of very recent origin. The number does not include several foreign companies doing business in Great Britain. Excepting by the imposition of the duty now repealed, the British legislature has not interfered with the busi- ness of fire insurance. Any number of persons may at the present time engage in this business with or without capital, nor is there a necessity even for the publication of their accounts. By the Life Assurance Companies Act of 1870, a deposit of £20,000 is required on the establish- ment of a life office ; certain returns also must be made to the Board of Trade for presentation to parliament, and these regulations apply to offices which conduct fire in conjunction with life insurance, as well as to purely life offices. One consequence is that, while the results of the fire insurance business of these compound offices are pub- lished regularly, those of purely fire offices need not be published, and several of the oldest and most important fire companies do in fact keep their accounts strictly private, There is no reason to suppose, however, that their experi- ence differs materially from that of the compound offices whose figures are open to us, From the returns of thirty of these it appears that their aggregate income from fire premiums in the seven years 1870-76 was as follows : —

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The increase in six years was therefore nearly two millions and a half of yearly income, the premiums in 1876 being about 63 per cent. more than in 1870, There are no means of ascertaining how far this increase arises from the insurance of property abroad, which is no doubt a considerable item, or from an increase in the quantity of insurable property within the United Kingdom, or in the proportion of it which is insured, or in the average rates charged for insurance, but no doubt all of these causes were at work. It may be mentioned here that the thirty offices to which the above returns relate have a subscribed capital of about 40 millions, and cash assets available for fire losses, not including their life assurance funds, amounting to 20 millions. They have therefore funds in hand equal to more than three years' income from premiums. Another return gives the premium income of forty-five British offices in the year 1879 as £8,271,000, their losses as £4,349,000, their expenses as £2,426,000, and their net profits irrespective of interest as about £1,500,000, or 18 per cent. of the premiums. The whole premium income of British fire offices is probably nearly 10 millions sterling, and the amount insured may be taken at from four to five thousand millions.

The returns of the London Fire Brigade enable us to approximate to the amount of insurances effected on pro- perty within the metropolitan area. In 1866 the sum insured was about 316 millions; in 1871, 440 millions ; in 1878, 605 millions ; and in 1879, 624 millions.

The essential principle of fire insurance is the distribution of loss. It does not aim, directly at least, at the prevention and only in a secondary way even at the minimizing of loss ; but what it seeks to accomplish is that such losses as do occur shall not fall exclusively, and possibly with overwhelming effect, on the owner of the property de- stroyed, but shall be borne in easy proportions by a large number of persons, who are all alike exposed to the risk of a similar catastrophe. This work of distribution is capable of being effected in more ways than one. It might be undertaken by the state or by a municipality, and

this plan has been tried in several countries, notably in the canton of Zurich. There it applies to buildings only, not to their contents. ‘The Government insures, and raises the necessary funds for meeting losses bya ratable tax on the owners. Where, as in this case, the exact sum needed is raised and no more, the system is practically one of mutual insurance administered by the cantonal authorities. Such a system yields this collateral benefit that the authorities, and indeed all house owners, become interested in the prevention and extinction of fires, and in Zurich accordingly the construction of build- ings is carefully watched and regulated; but the results do not indicate any remarkablo measure of success. The rate of assessment in 1870 was nearly equal to 2s. 6d. sterling per cent. The diffieulties of carrying out such a system with equity, especially in a great community, seem almost insuperable. ‘To assess the cost fairly it would be necessary, not merely to value each individual building, but to measure the degree of risk it was exposed to from its construction, its surroundings, its uses, and its contents. To place in the hands of public functionaries the power to do this, as well as to adjust the amount of compensation to be paid in the event of a fire, would be a course attended with manifest evils, Still greater would be the difficulty of applying the same principle to household goods, mer- chandise, and machinery ; and, if these must be insured on some other plan, there seems little to be gained by setting up a different system for the insurance of buildings alone.

There is, however, a natural temptation presented to particular classes or communities to speculate in the insurance of their own property, in the hope of making a

profit, or at all events of saving for themselves what would go as profits to the companies which would otherwise insure them. Sometimes this temptation seizes the inhabitants of a particular town, sometimes the persons interested in some particular trade, sometimes an ecclesiastical body. A community which has taken out of the hands of joint-stock companies the supply of its own gas or water, and finds itself as well served as before, perhaps better served and more cheaply, is apt to

think that it may insure itself against fire as well. But, besides the complications in the problem which have been already alluded to, and which require technical skill and extended experience for their equitable solution, there are few bodies or communities which possess a sufficiently wide area to make insurance profitable or even safe. If there had been such a system at Boston or Chicago or St John's when these considerable cities were ravaged by fire, the effects would have been still more disastrous to them than they were. Certain classes of property again seem liable alinost to epidemic fires, from causes which are often not far to seek; and if, for example, the owners of any particular class of mills were to combine in a scheme of mutual insurance, they might find that, besides the great difficulty of agreeing on how each mill was to be rated, or on the compensation to be awarded on the occurrence of a fire, they were exposed to exceptionally numerous claims just when their own trade was most depressed, or when their relations with their work-people already loaded them with sufficient anxiety. Schemes of so-called mutual insurance are tried from time to time, but scarcely ever without being based on a subscribed or paid- up capital (the contributors to which have to be remune- rated), or without looking for outside business to give breadth and ballast to the enterprise.

Accordingly the system of fire insurance which has virtually superseded all others, and has contributed most to the public benefit, is that which is conducted by joint- stock companies, offering to the insured the guarantee of their capital and other funds, and looking to make a profit by the business. It is a department of commercial activity eminently suited for joint-stock enterprise, requiring for its success, and indeed almost for its safety, that its transac- tions should be various in character and spread over wide areas of space and time, and be invested with a certain amount of publicity, and enjoy that prolonged existence which attaches more to corporate than to individual effort.

Fire insurance as a business consists in undertaking a certain risk more or less considerable in amount, in return for a comparatively small sum, received beforehand, called the premium. While the amount of risk undertaken is strictly limited to the sum insured, the degree of risk

is an element extremely difficult to measure, and liable to much fluctuation. Whether of ten thousand houses or shops, or stores, or factories, ten will be more or less injured every year by fire or a hundred is a matter partly of experience, but partly also of conjecture and, as we say, of chance. Assuming that the proportion would always be the same under precisely the same circumstances, not perhaps every year but on an average of years, the questions remain whether the circumstances will always be the same, and whether if they be the one thousand cases on which we have made our own calculations are a sufficient basis for dealing with ten thousand cases. The slightest observation reveals an endless diversity in the risks undertaken, and, even if an absolute law could be reckoned on, the risks would require careful and accurate classification before the law could be deduced. But, in point of fact, the risks are always changing. If we take what from an insurance point of view is the simplest and safest "risk," a private dwelling honse in a large town, the question suggests itself, How has this risk been affected by the age of the building,

the character of the occupants, tle introduction of gas or paraffin or lucifer matches, by the proximity of more dangerous property, and by the improvement or deteriora- tion in the public supply of water and the public arrange- ments for extinguishing fires? Infinitely greater changes take place in the degree of risk attending warehouses and manufactories, and many of these developments are of an unexpected character. The great fire in Tooley Street, London, in 1861, was aggravated by a prodigious escape of burning tallow, which literally set the Thames on fire, and long defied all efforts to extinguish it. More lately at Leith a highly inflammable spirit recently introduced into trade exhibited similar characteristics. At Newcastle a fusion of nitrates of soda or potash mixed with burning timbers caused a prodigious aggravation of a fire; and at Glasgow and elsewhere the fine flour dust of a corn mill, when mixed with a certain quantity of atmospheric air, was unexpectedly found to be as explosive as gunpowder.

But the speculative hazard of fire insurance as a com- mercial enterprise is limited by a very important circum- stance. The contracts, in the United Kingdom at least, are seldom made for a longer period than one year, and often for less, and need not be renewed on either side unless their safety and reasonableness are confirmed by experience, so that from day to day the insurance company is able in a measure to revise its terms, and to correct the errors arising from imperfect data or a too sanguine generalization. The business on the whole has been a profitable one. There have been comparatively few absolute failures of fire insurance offices in Great Britain, and none of any magnitude; nor do British companies regard it as any distinction that "they have always paid their losses in full.' The returns of those companies whose accounts are published indicate general prosperity, and the quotations of the share market and other circumstances show that the companies whose accounts are not made public have had at least equal success. The thirty companies whose experience has been already quoted received in fire premiums during the seven years 1870-76 about 37} millions sterling, and paid away for losses by fire about 22 millions, or 58°7 per cent. of the premiums received. After providing for expenses, tliere must have been a satisfactory balance of profit in proportion to the capital at risk.

The conditions of the contract between a fire office and the insured are regulated partly by the terms of the document known as the policy, which embodies them, and partly by law outside these terms, resulting from custom, from statute, or from legal decisions. We will endeavour to set forth as succinctly as possible some of these con- ditions, having regard chiefly to British contracts.

It is in the first place a contract of indemnity. The in- sured is guaranteed against loss by fire to the extent of the sum agreed on, but he is in no event to receive more than he has lost, or to make any profit by the occurrence of a fire. The sum named in the policy is not the measure but the limit of what he can recover. Nor does his policy cover all the loss he may sustain, for it will not in any case protect him against consequential damage, such as the loss of trade or of prospective profit ; and if he desire to recover, not merely the value of a

building, but the loss he will sustain through its being temporarily untenantable, he must insure specially against that risk. He must have some substantial interest in the property he insures, but it need not be that of ownership, for, if he might lose as tenant or mortgagee or in any other capacity, he may insure against that loss; and he may insure against the loss which others would sustain for whom he holds the property in any fiduciary character. It is loss by fire only that is insured against, not loss by a fall in the market value of property or by natural tear and wear. If property

which was worth £1000 has come to be worth only £700, and is then destroyed by fire, it is £700 and not £1000 that is recoverable under the policy. In some cases loss by lightning and by explosions of gas are insured against, even where there has been no fire in the ordinary sense. It is the value at the time of the fire, or rather the difference in value which the fire has occasioned, that becomes the sum payable, provided it do not exceed the sum insured. It has been sometimes tried to have "valued policies" by which the sum to be paid in the event of the property being destroyed is fixed definitely beforehand; but the system has been felt to be open to grave objections; for, apart from the labour and cost of valuing a thousand properties in preparation for the total destruction of four or five, it is obvious that, if the value fixed is less than the real value, there is no advantage to the insured, but the contrary ; and if it is greater than the real value, then no doubt the insured might make a profit by a fire, but this would offer an inducement to carelessness, if not to incendiarism. In the United States, however, several State legislatures have been so imprudent as to enforce the issue of "valued policies."

According to the general practice of insurance in Great Britain, the insured recovers his loss up to the amount of the policy, although the property may not have been insured to its full value. A different rule prevails on the Continent and clsewhere, and even in England under exceptional circumstances, and wherever several uncou- nected properties or parcels of goods are insured under one sum. In these

cases the rule of “ average” is applied, by which the insured recovers only such proportion of his loss as the total sum insured bears to the total value of the property covered. The effect of this rule is virtually to compel persons to insure their property to the full amount of its value, unless they are willing when any loss occurs to bear a share of the loss. Under either system, if property is not fully covered, the owner is to the extent of the deficiency his own insurer; but under the one plan his liability to loss begins only after that of the insurance company has been exhausted, under the other his liability and that of the company run parallel from the first. The difference is most material where the loss is only partial, aud practically the English rule is equivalent to a con- siderable reduction of rate. There are weighty reasons for believing that it might be for the advantage both of the insurance offices and the public to introduce more widely the pro rata principle, with a corresponding reduc- tion of the nominal scale of premiums, or even to enforce a participation of risk on the part of the insured.

The contract of insurance is one of good faith. The insured is bound to disclose all special circumstances of risk attaching to his property, and ought to have them described in the policy, otherwise its validity may be endangered. He is bound, moreover, to communicate any change of circumstances which may affect the degree of risk, Special hazards affecting particular kinds of property are often specially warranted against,

Companies do not insure against the loss occasioned by invasion, foreign enemy, civil commotion, riot, or any military or usurped power; and there are some kinds of property which they will not insure,— ready money, books of accounts (their value as documents), bank notes, stamps, bills, bonds, and other written securities.

The almost universal practice in England is to insure a separate sum on each distinct kind of property insured, as on a building and on its contents, on mercantile stock, and on. furniture in private use. The same rule prevails with respect to all properties not involved directly in the risk of one fire. Thus two contiguous buildings or their contents may be insured for one sum if the buildings com-

inunicate with each other internally or have a common roof, but otherwise they must be separately insured.

Very important questions arise out of the circumstance that the same building or goods may be insured by different persons, with various offices, and under dissimilar con- ditions. Thus a house may be insured by the landlord, the tenant, and the mortgagee; goods may be insured by the owner, by a creditor holding a lien over them, and by the warehouseman or other person who may be responsible for their custody. Where the owner alone has effected insurances, these may be so varied in their character as to give rise to perplexing questions. A merchant may have insured with one office wines in a specified warehouse A; with another, wines and spirits in the same warehouse for onc lump sum ; and with a third, wines only, but in all or any of the warehouses A, B, and C, subject to the con- ditions of average. The questions that arise under such circumstances owe their solution as much perhaps to the honour and fair dealing of the several offices interested as to any settled rules of law, but the general practice may be shortly stated. As between a policy covering a specific parcel of goods or goods in a specified place and another embracing a wider range subject to average, the former is exhausted before liability attaches to the latter. As between a policy covering goods in A and B and another covering goods in A, B, and C, if a fire occurs in A or B liability attaches first to the more restricted policy, pro- vided the more extended liability of the other is not merely nominal. On the other hand, if one policy insures stock and machinery together (but without the condition of average), and another insures one or both of these separately, liability attaches to both policies part passu ; but the former is placed at some disadvantage in being obliged to contribute ratably to its whole amount with certain limitations, as against each of the separate items of the other. Where the same property is insured under similar conditions with more than one office, it has been the aim of the companies to provide that the loss shall be borne by each in proportion

to the sum insured, whether the several insurances may be in favour of the same person or of several persons having different interests. It is plain that if it were in the power of two persons, having each some sort of insurable interest in the same parcel of goods, so to insure them as that each might recover their full value, the goods might come to be paid for by the offices twice over, and it might become the interest of one or both of the persons that they should be burned, The "contribution clause " of policies is intended to guard against this. It has lately received an unexpected interpretation which limits its application to insurances in which the interests insured are identical, while protection against double payments is afforded by another principle, namely, that each person insures only his own special interest. The utmost possible interest which M, N, and P can have in any given property cannot exceed the present value of the property ; each may recover what he himself has lost by its destruction, whether he be owner, or mort- gagee, or depositary, but he deals separately with the office that insures him, without reference to what other insurances may have been effected by other persons having a different kind of interest in the same property. The application, however, of these principles is often matter of extreme difficulty, and has scarcely yet been definitely settled.

The adjustment of a loss when a fire occurs is not unattended with difficulty, even where there are no such complications as those just referred to. To ascertain the quantity, the quality, and the value of property injured, and the degree of injury, is often a work of no little anxiety. Its destruction has swept away the readiest proof which could have been given; or, where partial damage only has been sustained, it is often scarcely capable

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of exact measurement. ‘The insured is naturally bound to state and prove his claim; and tlie office, while exposed on the one hand to exaggerated and even to fraudulent demands, may on the other endeavour to exact from an honest claimant details and evidence which

it is scarcely possible for him to give. Fortunately for both parties to the contract, there are strong motives on either side tending towards a reasonable adjustment. In most cases the office is guided by the advice of an independent professional valuer, who, while attending to the interests of his employers, has a natural desire, even apart from his instructions, to conciliate the claimant, and to avoid landing the company he represents in troublesome controversies. Claims which cannot be adjusted in this way are usually submitted to arbitration, and it is a condition of most policies that both sides must refer the quantum of loss to an arbiter or arbiters. Jew claims find their way into the courts of law, and those only where some principle is in- volved, or where the claim is thought to be fraudulently overstated, or where the still more serious objection is taken that the fire has been the wilful act of the insured.

Many troublesome questions are rendered more easy of solution by the condition that it is in the power of the company to reinstate property rather tlian to pay the value of it The insured has not the option of requiring rein- statement. In general an office prefers to settle a claim by payment in cash, but an offer to reinstate may be a convenient as it is a perfectly fair reply to an exaggerated demand, and may adjust the pretensions of competing claimants. The insured is not entitled to "abandon" his property, and the company is not bound to take on itself the care or risk of damaged property ; it is for the insured to make the most of the "salvage," and to deduct the value of it from his claim, but in practice it is sometimes found desirable to relieve him of this duty.

A part of the insurance system which has developed into great magnitude is the practice of reinsurance. No one company, however large its resources, deems it prudent to undertake a risk to an unlimited amount in connexion with any one set of goods or one locality. An office might restrict its liabilities by refusing' to insure to a larger amount than what it pleased to run the risk of, but the convenience of the insured and the interest of its own agents, to say nothing of other considerations, make it difficult for any office-so to limit its responsibilities, It therefore issues a policy for the amount proposed to it, but reinsures @ part with some other office or offices.

Business to a very large amount is exchanged in this way, and there are some offices which professedly, and some which practically, live by the premiums paid over to them by otlier offices. The principal British offices have established a code of laws for the regulation of these transactions, and a court of arbitration for the decision of such questions as may arise among themselves in connexion with them. They are often also matter of special contract between office and office. The system is of some benefit to the public. In the earlier periods of fire insurance, when a large sum had to be insured, a higher rate was charged ; but this has long ceased to be the rule. A man who wishes now to insure a large amount has not only no extra rate to pay, but has not to take the trouble of arranging with numerous offices, or, if a fire occurs, of adjusting his loss with numerous offices. He can usually, if he pleases, obtain a policy from one company for the full sum he needs to Insure, and the company takes all the trouble and risk of distributing the liability, a distribution with which he has nothing to do. He may even benefit in another way, for when a loss occurs he has on the whole, perhaps, a better chance of being liberally dealt with than if he had to make a direct claim on many offices.

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What las been said hitherto has had reference chiefly to one side of the fire insurance contract—the obligations undertaken by the company. The consideration they receive in return is the payment made by the insured called the "premium." The premium is calculated at so much per cent. of the sum insured, and is usually paid once a year, at one or other of four quarter days; but many insurances are effected on mercantile property and on ships for periods less than a year—ten days, one, three, or six months—the rate in such a case being higher than an aliquot part of the yearly rate; and insurances may be effected for seven years by a payment of six times the yearly rate, and for other periods at a proportionate discount. 'Insurances effected for a year, and stated to be renewable, practically remain in force for fourteen or fifteen days after the expiry of the year; that is, they may be renewed

by payment of the premium within these “days of grace,” and if a fire occurs in the meantime the company will be liable. This will not happen, however, if an intention not to renew has been manifested on either side.

The rate of premium varies with the supposed risk, and in Great Britain runs from Is. 6d. per cent. yearly, the rate for first-class dwelling-houses and ordinary private furniture, to six or seven guineas per cent. The highest British rates are what are charged for some descriptions of corn-mills and sugar refineries, and for Turkey-red dyc-works. Large classes of property are insured at the ordi- nary “hazardous” rate of 2s. 6d., or “extra hazardous ” rate of 4s. 6d., but certain descriptions of property arc specially and more elaborately rated. This has becn donc to a considerable extent by common agreemcut amongst the offices, and the arrangements are known as the “ tariff system,” which requires here a few words of explanation.

We may suppose the question to arise, What ought to be paid for insuring a cotton-mill, or a flax or woollen mill, or a weaving factory, or a wharf or warehouse in some large city? The experience of any one office scarcely affords adequate data, and a rate based on the combined experience of many offices has a greater chance of being at once safe and fair. The problem, indeed, is a more complicated one than what has been already said would indicate. The property to be insured may consist of several distinct buildings and the contents of them: one building may be devoted to operations involving in a high degree the risk of fire; in another the processes carried on may be more simple and safc; a third may be used only for the storage of materials having little tendency to burn. These several buildings may be more or less connected with each other—under the same roof, under different roofs but with internal communications, contiguous but with- out any communications, detached but still within reach of fire. Of two mills one may work on fine materials, the other on coarse; in one the machinery may be driven twice as fast as in the other; in one the most hazardons processes may be carried on in the heart of the building, in the other they may be so treated and so guarded as to involve the rest of the property in no peculiar danger. Fairly to measure these various

hazards it has been found necessary that tle experience and skill at the command of many companies shall be combined, and that the rates shall be the result of consultation and a common understanding.

Now it is clear that no office will contribute its skill and experience to such a common stock if the effect is to be that other offices may avail themselves of the information in order to undersell it. Consultation about rates and a common understanding necessarily involve a reciprocal obligation to charge not less than the rates thus agreed on ; in other words, a tariff of rates is developed to which each office binds itself to adhere. The system tends to restrain and moderate the competition for business which inevitably

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and to some extent properly exists among the companies, and its value to them is manifest. But it is also of service to the insuring public. At first sight it might seem that free competition would suit the public best, and that a combination among the offices must tend to keep up rates, and to secure for the companies excessive profits, but a little consideration will show that this is a mistake.

It is an unquestionable truth, though one often lost sight of, that all losses by fire must ultimately be borne by the public. The insurance companies are the machinery for distributing thesc losses, nothing more. If the losses fell on them, their funds, large as they are, would speedily be exhausted, and the service which they render to the public would come.to an end. To those who require insurance against loss by fire it must be a manifest advan- tage that they should have many sound and prosperous offices ready to accept their business, and no less able than desirous to earn or to retain the public favour by fair and liberal conduct. A necessary condition of this state of things is that the rates of premium paid for insurance should be remunerative to the

offices, and the main object of the tariff system is to secure such remunerative rates,

This it endeavours to do by two methods,—by an agreement as to what rates are to be charged, and by affixing such a penalty to dangerous constructions, sub- stances, and processes as to induce, if possible, a lessening of the danger. In other words, and reversing the order, it seeks to diminish the risk of fire, and to secure adequate payment for what risk remains, There can be no doubt as to the benefit the public derive from the former of these, in having pointed out to them, not on the authority of one office, still less on hesitating and contradictory authority, but with all the weight arising from the combined experi- ence of numerous companies, that this or that method of construction, this or that combination of materials, this or that mode of conducting a-manufacturing process, is attended by imminent hazard of fire, and in having the lesson enforced by a heavy pecuniary penalty. On the supposition that the offices are correct in their estimate of risks, the effect, and indeed the intention, of their rule is not so much to put money into their own coffers as to lessen the danger, and to save themselves in the first instance, and the owners of property ultimately, from the consequences of preventible fires.

These rules, as will readily be seen, must have powerful influences on trade and manufactures. Many individual warehouses and mills are, with their contents, insured for very large sums, £10,000, £20,000, £50,000, £100,000, and more. An additional charge of 5s, or 10s. per cent. in respect of a supposed increase of risk may mean a payment by the owner of several hundred pounds a year, aud may operate as a complete veto on some arrangement or some machine which it might otherwise be desirable to resort to. The occurrence of a few severe fires in one town, followed by an increase of insurance rates, may have, and indeed has had, the effect of driving some branch of trade away to another locality, the seat of greater caution or better fortune. It is therefore obviously desirable that so important an influence should be exercised, not precari- ously or capriciously, but according to the combined wisdom and experience of those associations which may be supposed to understand the subject best, and which obtain their

experience in the way that makes it perhaps of most value, by paying for it.

It is equally for the public benefit that rates of insur- ance should be fixed on some common scale. Suppose the system of unrestricted competition to be tried, the first effect will be a general and great reduction in rates. But it may be said, "So much the better for the insured; if the offices can afford this reduction of rate, it will only be

a fair result of competition ; if they cannot afford it, they will be the losers, but the public will gain ; will the effect not be simply to reduce the rates to the paying point, and no further?" This would be all very well if the paying point could be absolutely ascertained or determined in any way beforehand, but the rate comes first and the losses come afterwards. In other businesses prices are based on some certaiuty as to the cost of production, but in selling fire insurance the cost is not known till after it has been sold. In a free competition it is the sanguine man's views which regulate the market price, and the rates therefore cease to be remunerative. The consequences are that some

offices disappear altogether, others take fright in time to

avoid ruin, though not to escape serious loss, persons who might establish new offices are deterred from doing so, the business gets the character of being a highly speculative and hazardous one, requiring extravagant profits to induce men to carry it on at all, and the public have to bear the cost. Unrestricted competition therefore is not for their

advantage.

The combination we are considering has another bene- ficial effect; it serves to distribute the burden of losses fairly. If it is a just thing that cotton-spinners should bear all the losses that arise in cotton-mills, and not leave them to be borne by the owners of private dwelling-houses, or vice versa, it is well that the loss by each class of risks should be measured fairly. But, while the experience of any one office, taken by itself, furnishes a very imperfect criterion, each contributes its quota of knowledge and experience to the common stock, and tle public get the

benefit both of broad and trustwortliy data and of that peculiar and intimate acquaintance with each different class of property or process which the conductors of one company or another are sure to possess.

On the other hand, it is beyond question that no association of the kind will ever hold together a large body of independent socicties, except under the pressure of some necessity. No conventional or excessive rates can be maintained for any length of time. Some member of the union is sure to perceive that popularity and profit may be gained by introducing a lower rate, if a lower rate is manifestly sufficient, or a new company starts into exist- ence to remedy the grievance. It is to be remembered, too, that the directors and shareholders who control the offices are likewise insurers, quick to raise the question of how far the rates they have to pay as individuals are justified by the risks run; and if it cannot be shown that these rates are a true measure of the risk, offices are soon constrained by a sense of justice or by self-interest or by pressure from without to mitigate them. In short, the association is a union bound together by necessity and tempered by conipetition.

Adequately to measure the risk of loss by fire demands not merely reference to.an extended experience but a watchful regard to current changes. While the profits of fire insurance business fluctuate considerably from year to year, and seem even to follow cycles of elevation and depression, the tendency on the whole appears to be towards a growth of risk, although excessive competition among offices prevents the rates from rising in proportion, Among the causes are the prodigious increase in the use of lucifer matches; the introduction into commerce of such articles as jute and esparto grass and mineral oils, which are either highly inflammable, or have by themselves, or in combination with other substances, a tendency to generate combustion ; the great speed of machinery ; and the vast accumulation of property exposed to the risk of one con- flagration, owing to the larger size of mills and warehouses and their concentration in particular localities. The very development of the insurance system may conduce to

heighten the risk by lessening the motives to carefulness. It is difficult to form an estimate of the average rate of premium paid for property in the United Kingdom, but it is probably not much above or below 4s. or ‘2 per t. yearly. kon PA itance companies were first established, and for a long time afterwards, they undertook not only to reimburse the insured for losses, but to extinguish fires. In one of the earliest prospectuses put forth (in 1684), there is the promise that “ watermen and other labourers

are to be employed at the charge of the undertakers to

assist at the quenching of fires.” A writer in 1690, describing the ingenious and useful invention of a fire insurance office, says, ‘They have a great many servants in livery with badges, who are watermen, and other lusty persons dwelling in several parts of the city, who are always to be ready when any sudden fires happen, which they are very laborious in and dexterous at quenching ”; and De Foe, in an essay published in 1697, refers to the same subject. In 1708 when the Sun Fire Office was first projected, it was proposed that all persons insured with it should have a mark representing the sun nailed up against their houses, that the men whom it employed to extinguish fires and save property might direct their efforts specially for the benefit of the houses so distinguished. Marks of this sort were afterwards generally adopted by the offices, and are often to be seen even at the present day, though they no longer serve their original purpose. [or more than a century and a half the insurance offices provided and kept up fire-engines at their own expense, not only in London but in many provincial towns, where frequently no other means of extinguishing fires were available. At ‘first each office provided its own engine, and much rivalry prevailed among the several brigades; but in London ultimately the offices combined to support in common a very effective and very costly fire brigade. This arrange- ment, however, came to be regarded as objectionable from public points of view, as it had long been distasteful to the offices themselves; and in 1866 the offices handed over their whole establishment to the Metropolitan Board of Works, by whom it has been greatly enlarged and extended, the cost

being provided for partly by a contribu- tion from the offices, partly out of the Consolidated Fund, and partly by the rates.

The views of the insurance offices on this subject have undergone a material change, aud they have ceased to regard it as any part of their duty to extinguish fires, or to bear the cost of extinguishing them. That ought to be undertaken by the public through municipal or other local authorities, and it is understood that the law regards it as their duty todo so. Parliament is always ready to confer the necessary power of assessment ; but there is a disposi- tion on the part of municipal bodies to exact from the insurance offices, directly or indirectly, as much of the expense as they can. Considerable contributions are in this way levied in Liverpool, Manchester, Glasgow, and other towns, but the system is eminently to the disadvan- tage of the public. Whatever the offices are compelled to pay forms a portion of their general expenditure, which they must recover from the public, at least the insuring part of it, in the form of premiums. The amount would be more equitably levied by means of a general assessment, and would be more likely to be advantageously expended. The business of fire insurance is to meet the losses which happen by fire, not to prevent them ; if losses are heavy, the rates of premium must follow; if by care and well- organized appliances losses are diminished, the competition among the offices will inevitably reduce the rates of premium. In other words, if the public themselves bear the cost of these appliances, they obtain the benefit of it

in a reduced cost of insurance ; if they transfer the burden to the offices, they have in the end to bear it themselves in the form of increased insurance rates. If there Were, as there ought to be, an efficient fire brigade in every town and village, it is obvious that the insurance offices could neither bear the cost nor undertake the care of them, and the best arrangement would be that they should be wholly under local management and wholly at local expense.

But, while it is the business of the public authorities to extinguish fires, the insurance offices regard it as within their province to promote in other ways the safety of the property endangered, and accordingly in London, Liver- pool, Glasgow, and other cities they have established at their own expense salvage corps, which act in alliance with the fire brigades, but whose special duty it is, not so much to quench a fire, as to diminish as far as they can the damage which may be occasioned to the property whether by the fire or by the water used to extinguish it.

It only remains to add, with reference to fire insurance in the United Kingdom, that public attention has from time to time been directed to the serious question of how far the crime of arson may be regarded as a consequence of the in- surance system, and what can be done to prevent it. There can be no doubt that wilful fire-raising, with a view to de-fraud insurance offices, is not only a very common offence, but is probably on the increase, In 1867 the subject was inquired into by a committee of the House of Commons, and evidence was submitted to show that between 1852 and 1866 the proportion of fires which were suspicious, doubtful, and unaccounted for had gradually increased from 344 to 523 per cent., while well-informed persons testified that the number of fires in insured property is greater in proportion than in uninsured. 'There is a general agreement that in the interests of the public the origin of all fires should be made the subject of organized inquiry, but there is a difference of opinion as to the proper machinery and as t» the incidence of the expense. Of existing functionaries the coroner in England and the procurator-fiscal in Scotland seem the natural persons to conduct the needful investigations, but in neither case is the subject free from difficulties, which in England are enhanced by the want of a public prosecutor. Several attempts have been made to legislate on the subject, but hitherto without success, nor is the public feeling suffi- ciently strong to give the required impulse. Other crimes than arson thrust themselves on public notice, and all men see the necessity for inquiry and detection. This crime, when successful, too often destroys, not merely the evidence which would go to prove it, but the very circumstances which would indicate that a crime has been committed. The immediate sufferer, too, is probably some wealthy insurance company, whose case naturally excites little sympathy; it is

seldom prudent and sometimes scarcely safe for the sufferer to insist on exceptional inquiries, and there is a general disposition rather to put up with a loss than to raise disagreeable questions likely to lead to nothing. But, as the honest portion of the community pay for all dishonest claims, it may be hoped that a due inquiry into the causes of fires will some day come to be regarded as a matter of grave public interest.

The general principles and practice of fire insurance are, in their main features, the same in most parts of the world. In the United States the business has been pursued with cliaracteristic energy, and with some peculiarities of law and practice. As already stated, the earliest American fire insurance company was organized in 1752, and its policies during the first year covered a sum of $108,360 at an average rate of 1:17 per cent. At the present timc there are within the State of New York alone upwards of eighty fire offices, having assets amounting to about 54 millions

of dollars, and in the Znsurance Year-Book for 1880 there is a Jist given of about four hundred different native offices in the various States, but this docs not include a large number of local offices of small dimensions, mostly estab- lished on the mutual principle. The number of fire insur- ance offices in the United States is probably about nine hundred. Of these a large proportion have a merely nominal existence, but on the other hand important foreign offices—British, French, German, Swiss, and Canadian— transact business in the States.

If sixty offices suffice to transact the insurance business of the United Kingdom and a great deal of foreign business besides, the existence of more than four hundred offices in the States indicates of itself that a large number of them must have very limited resources, quite unfit to cope with the disastrous fires which sometimes occur in the rapidly developed cities of America. The failure of an insurance office is therefore a more familiar event than in England, and it is this perhaps partly which has led to a system of Govern- ment supervision intended to guard the public against such misfortunes. Each State of the Union has its own regula- tions about insurance companies, its insurance

department, its insurance commissioner, superintendent, or auditor, its system of accounts and checks and public notices, its fees, taxes, and requirements as to deposits. The trouble and expense to which offices arc thus exposed, especially where they do business in many States, is very great indeed, while the resulting benefits are problematical. All at- tempts of this sort are attended with these disadvantages, that they interfere injuriously with honest and _ well- conducted companies, and afford but a feeble protection against those of a different class; that they involve the Government in the odium of failures which it is supposed to be their duty to prevent; that they lessen the sense of responsibility among those who control the offices, and the spirit of prudence and watchfulness among the public; and that they place in the hands of public officials a power and influence which are apt to be abused, and are always open to suspicion. More to be admired and imitated are the State regulations in America with respect to building operations, the extinguishing of fires, and the inquiring into their origin. The business of an insurance agent in America is more recognized than in England as a distinct profession, and the agent is entrusted with greater powers. More lias been done to facilitate the working of insurance by the surveying and mapping of large cities, and there has been a greater development of periodical literature devoted to the subject.

Since 1866 a national board of fire underwriters of the Unitcd States has existed, and has proved of great service to the insurance offices and to the public. At the present time it is unfortunately suffering from disorganization, and there has been a consequent "shrinkage" of rates. It ap- pears from the reports of the superintendent of the fire department in the State of New York that in the year 1879 the sums insured in the United States by the com- panics reporting to him amounted to 6767 millions of dollars, and the relative premiums to nearly 61 millions of dollars, so that the average rate of premium was '9 per cent., or 90 cents for each hundred dollars insured. Four- teen British fire offices doing business in the States received in the year 1879 premiums to the amount of 11 millions of dollars, and paid losses of 7 millions. Their losses that year were 63 per cent. of their premium, and their expenses in America 31 per cent.

In Canada twenty-seven companies—Canadian, British, and American —made returns, which showed that in 1879 they had insured in Canada, including the maritime pro- vinces, sums amounting to 385 millions of dollars. In the eleven years ending in 1879, the premiums received

had amounted to nearly 33 millions of dollars, and the losses to 274 millions, and the ratio of loss had been 84°16 per cent. ‘his included the loss arising from the great fire at St John’s, New Brunswick, in June 1877, which cost the insurance offices 64 millions of dollars,

In France there were at a recent date thirty-two pro- prietary and about twenty mutual fire insurance offices. Of the thirty-two offices founded on capital three are pro- vincial offices, and the others are established in Paris. Two confine themselves to reinsurance. From the returns made by twenty-three of these offices, including all the more important, it appears that in 1879 their income from premiums was about 92 millions of francs, and their losses 47 millions. The average loss during eleven years was 50 per cent. of the premiums. Many of the French offices have been extremely successful; and recently there has been a remarkable increase of new offices in that country.

The Insurance Cyclopedia of Mr Cornelius Walford, a work now in progress, and of prodigious industry and completeness, is the best and almost the only available literary authority which covers the

whole subject of this article. The Law of Fire Insurance, by Mr C. J. Bunyon, is also of value. (J. M. M‘C.)

II. Lire Insurance.

The system of life insurance embraces a variety of con- tracts by which the insurers engage to pay capital sums ou the decease of policyholders or nominees, in consideration of other sums received during their lifetime. These contracts may be divided into two classes,—(1) those in which the sum insured is certain to become payable, provided only the insurance is duly kept in force, and (2) those which are of a temporary or contingent character, so that the sum in- sured may or may not become payable according to circum- stances.

To the first of those classes belong the great bulk of the transactions of life insurance offices, namely :—

1. Whole-Term Assurances on Single Lives.—These are simply contracts on the part of the insurance office to pay a certain sum (with or without "bonus additions," as the case may be) on the death of the person named in the policy, whenever that may occur. The premium, or con- sideration for the insurance, is in most cases an annual sum payable during the whole continuance of the policy. It may, however, be arranged in various other ways,—as, for example, by asingle payment at the commencement of the transaction ; or by a limited number of contributions, each larger in amount than the annual premium for the whole of life; or by payment of a modified rate during a limited period and a correspondingly higher rate thereafter. Insurances for tlie whole term of life are more common than any other kind,

2. Hndowment-Assurances.—Next to insurances for the whole term of life, these constitute the most numerous class of insurances on single lives. The sum insured is payable to the person named in the policy, if he should survive a certain period or attain a specified age, or to his represen- tatives at his death, if that should occur before the time has expired,

3. Insurances on Joint Lives.—In these transactions two or more lives are included in the policy, and the sum in- sured is payable when either or any one of them fails.

4, Longest-Life Insurances, or Insurances on Last Sur- vivor.—These also are effected on two or more lives, but, instcad of falling in by the death of any one of the partics, they do not mature until both or all are dead.

The second class of insurances described above consists principally of two kinds :-—

1. Temporary or Short-Period Insurances.—These are effected for limited periods to cover special contingencies,

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Varieties of life in- surance,

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the sum insured becoming payable only if death should occur within the time specified in the policy. Such ‘nsurances may be effected on single lives or on two or more lives, and (in the latter case) may be payable either if one life or all the lives should fail within the period, or only if one life should fail before another, as in the case to be next mentioned.

9. Survivorship Insurances, or Insurances on one Life against Another. —In these the sum insured is payable at the death of A if that should happen in the lifetime of B, put not otherwise. Should B predecease A, the transaction falls to the ground.

Besides these there are transactions of other kinds dealt in by life insurance offices—such as deferred insurances, where the risk does not commence until the expiry of an assigned period ; deferred and survivorship annuities ; insurances against issue, for the benefit of expectant heirs ; and the like. The system is indeed adapted to nearly every contingency of a pecuniary nature connected with human life.

It may be observed that, while life insurance has much in common with fire and marine insurance, there are some essential differences between it and them. The insurance of houses and goods against fire, or of ships and merchandise against the casualties of the sea, is a contract of indemnity against loss, and in like manner an insurance on human life may be regarded as indemnifying a man’s family or his creditors or others interested against the loss of future income by his premature death. But it does not necessarily take the value of such income into account, nor does it relate to any intrinsic value of the subject of the insurance __the life of the insured party. Again, in fire and marine insurance loss may be either total or partial. In life insurance the event

insured against cannot take place in any limited degree, and there is thus no partial loss. And again (in the first and larger of the two classes into which life insurances are divided) the event is certain to occur, and the time of its happening is the only contingent element. In the other kinds of insurance the events are wholly of a contingent character.

The idea of distinguishing in terms between contracts which differ so widely in reality appears to have early suggested itself. Mr Babbage in his Comparative View of the various Institutions for the Assurance of Lies, published in 1826, says—"The terms isuwrance and assurance have been used indiscriminately for contracts relative to life, fire, and shipping. As custom has rather more frequently employed the latter term for those relative to life, I have in this volume entirely restricted the word assurance to that sense. If this distinction be admitted, assurance will signify a contract dependent on the duration of life, which must either happen or fail, and zxswrance will mean a contract relating to any other uncertain event, which may partly happen or partly fail. Thus, in adjusting the price for insurance on houses and ships, regard is always had to the chance of salvage arising from partial destruction."

The distinction proposed by Mr Babbage has not always been observed. Some writers appear to prefer the term insurance where life is concerned as well as in other cases ; some continue to use the terms indiscriminately ; while other recent writers have sought to establish distinctions of a novel character between them. One of these is that a person inswres his life, his house, or his ships, and the office assures to him in each of these cases a sum of money pay- able in certain contingencies. Another is that asswrance represents the principle and inswrance the practice. Of these two suggestions we prefer the former; but, as the more conventional distinction of Mr Babbage is still very widely recognized, we shall adhere to it throughout the remainder of this article.

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registers kept in the parish of All Saints, Northampton, for

Calculation of Premiums.—The general principles of life

contingency calculations are explained in the article ANNUITIES, and it is there shown that such calculations are made by means of mortality tables, which exhibit the Mor- numbers of persons who out of a given number born or tality living at a particular age live to attain successive higher ages, and the numbers of those who die in the intervals.

tables.

A full account of the numerous tables of this kind which

have been framed from time to time does not fall within the scope of the present article, but, before passing on to show the application of mortality tables in the various calculations relating to assurances upon lives, it may be useful to mention those tables which have been chiefly

employed by assurance offices. Passing over the earlier tables of Halley, De Parcieux,

and others, which for all purposes of calculation have long been obsolete,—and which, however much they contributed in their day to the development of assurance, possess now onlyan historical interest, — we pause first at the Northampton

North- Table. ‘This was constructed by Dr Thomas Price from the ge able. the forty-six years 1735 to 1780. Owing to certain faults in its construction, the table gives the chances of death too high at the younger ages, and consequently requires large premiums for assurances; while at the more ad- vanced ages the chances of death are disproportionately low. Fora long time, however, this table occupied the

foremost place as a basis for life contingency calculations of

all kinds, and even after the introduction of other tables, which are now recognized as more accurate, it continued to receive a large share of

popularity. The rates of many assurance offices of high standing were calculated from it,

and until a comparatively recent date it remained in use

by not a few of them. The Carlisle Table was constructed by Mr Joshua Milne Carlisle

from materials furnished by the labours of Dr John Table.

Heysham. ‘hese materials comprised two enumerations

of the population of the parishes of St Mary and St Cuth- bert, Carlisle, in 1780 and 1787 (the numbers in the former year having been 7677 and in the latter 8677), and the

abridged bills of mortality of those two parishes for the

nine years 1779 to 1787, during which period the total

number of deaths was 1840, These were very limited data upon which to found a mortality table, but they were manipulated with great care and fidelity. The close agreement of the Carlisle Table with other observations, and especially its agreement in a general sense with the experience of assurance companies, won for it a large degree of favour. No other mortality table has been so extensively employed in the construction of auxiliary tables of all kinds for computing the values of benefits depending upcen human life. Besides those furnished by Mr Milne, elaborate and useful tables based upon the Carlisle data have been constructed by David Jones, W. T. Thomson, Chisholm, Sang, and others. The graduation of the Car- lisle Table is, however, very faulty, and anomalous results appear in the death-rates at certain ages.

The mortality experience of the Equitable Assurance Equit- Society, the pioneer of the modern system of assurance, able ex- hag formed the basis of several tables. Of these two in Peeves particular have been used to a considerable extent by assurance companies. The first was atable constructed by Mr Griffith Davies and published by him in 1825, It was

deduced from accounts given by Mr W. Morgan, the actuary of the society, of the ratio which the death-rates among the members bore to those indicated by certain well-known tables at different ages. The other table was constructed by Mr Arthur Morgan from the statistics of membership of the society from its commencement 1n 1762 down to 1829. This table was ce in 1834.

XIII. — 22

170 INSURANCE [LIMR, z Shortly afterwards a desire began to be pretty generally | 26,721 had died, 45,376 had discontinued their policies, Scven y ote | elias y i fiat] teen felt for a table of observations more extended than the | and 88,329 remained on the books o the several offices at oflices' gtatistics of any single office could supply, and accordingly | 31st December 1863, the date to which, as a rule, the exper a movement was set on foot in 1838 by a number of | observations were brought down. es aetuaries and others for collecting the experience of | from these statistics several distinet mortality tables were con- various offices '" to afford the means of determining the law | structed, viz:—

. : at eh 7 Table HMF, comprising all the healthy lives, male and female, of mortality which prevails among assured lives. : e — included in the observations,—the word "healthy" being used teen offices agreed to contribute their statistics, whic were | +5 denote those lives which had been considered eligible for assur- found to embrace in all 83,905 policies, of which 44,877 | ance at the ordinary rates of premium, were in existence at the time of giving in the returns ; Table H™, comprising the healthy male lives only. 25.947 had b " discontinued ": and 13,781 had fallen Table H™©), comprising healthy male lives, but excluding from =e ee : e * Its. ok tl observation the first five years of assurance in every case. by the death of the persons assured, The results of the Table HF, comprising the healthy female lives. inquiry were in due time published, and upon them was Other tables of a subsidiary character were constructed, but they founded a mortality table known as the Seventeen Offices' | do not appear to have been put to any practical use.

E ieice Table. Which cathe to ‘he weedetor acomeiler- The coinpleted tables were published in 1872, together with an xperlence) Z A liarity of this | ¢Xtemsive series of monetary values dedueed from them, and able extent by assumance Companies. Pe ae explanations by Mr W. 8S. B. Woolhouse and Mr Peter Gray respee- table is that it is based upon the experience of the offices | tively, as to the method of graduation employed in the formation in regard to the number of policies which existed and | of the tables, and as to the construction and application of the became claims, and not the number of persons who were | monetary values. In 1873 Mr R. P. Hardy published a series of 2 : : Valuation Tables based upon these data. assured and died. There having been in many cases two cis or more policies issued on one life, the results are not | | It appeared to the two bodies in Scotland already men- geotch necessarily the same as those which would have been | tioned that considerable advantage might result if the ex- offices’ obtained had each life been reckoned only once. The | perience of the Scotch offices were separately ascertained, — general agreement of the results with those derived from besides being merged in the general inquiry. This was “”“° other data referring to persons, and not to policies, seems to | accordingly done, and the results, arranged and tabulated show, however, that the peculiarity referred to does not | by Mr James Meikle, were published in a report (1869) by niaterially affect the accuracy of the table as an exponent | the joint committee appointed to collect the information, of the value of assured life. The investigation embraced 115,254 policies on 94,749 English Three English Life Tables have been constructed by Dr | lives, of whom 12,443 had died, 19,284 had discontinued Life William Farr from the official records of the registrar- | their policies, and 63,022 remained on the books of the Tables. general for England and Wales. The first, contained | ten offices at 31st December 1863. These separate Scotch in the Jifth Report of the Registrar-General (1843), was | Statistics were intended more particularly to illustrate the founded on the census returns of 1841, and the deaths | effects of the selection of lives for assurance. They have recorded in that year. The second table, contained in the | not been commonly employ ed as a basis for the calculations Registrar-General’s Twelfth Report, was based on the | of offices. In 1872 Mr Meikle published Observations on same census and the deaths of the seven

years 1838 to | the Mate of Mortality of Assured Laves,in which the materials 1844. Thethird table had a much wider basis than either | furnished by these statistics are exhaustively treated. This of the others. It embraced the census returns of 184] | work forms a most valuable contribution to our knowledge and 1851 and the deaths of seventeen years (1838-1854). | of the subjects with which it deals. This table, with an extensive series of monetary and other The following tables will serve as a means of general comparison Ni §. ‘ 8} mp tables deduced from it, was published as a separate work | betwcen the various mortality tables that have been mentioned. in 1864, I.—TABLE showing the Number of Persons who, out of 1000 living Institute The next set of tables demands more special notice at the age of 10, will live to attain the ages of 20, 80, 40, Gf Actu- jneammanenelesiiles tire present, as being #ie SeaGst important de., according to the undermentioned Mortality Tables. Tables, Collection of observations yet made in regard to the mor- North-| stale, {Equitable Equitable} Seventeen | English, | Institute tality of assured lives. “ Nearly a, quarter of a century Age. onan 1815, Paxton gegen, Experience! (Meles),| (sae having elapsed since the period to which the combined a, | 18) experience of seventeen life assurance offices was collected, 10 | 1000 | 1000 | 1000 | 1000 1000 | 1000 | 1000 | it began to be felt amongst actuaries and the managers of 20 9041 943] 951 928 933 945 962 companies that a large mass of valuable materials had 30 773 | 873 | 879 861 863 863 | 899 accumulated which, if combined, would tend to throw 40 | 641 | 786 | 786 | 784 787 | 771 | 828 further light on the law of mortality amongst assured lives, a a oes c oan oe he ia and on other points affecting the interest and prosperity of 70 217 | 372] 361 360 358 324 381 assurance companies.” Accordingly steps were taken by 80 83 | 148} 169 | 140 183 | 116 | 189 the council of the Institute of Actuaries, in co-operation 90 8 22 | 23 13 13 14 15

with committees of the Association of Managers of Scottish

j ‘oa 7 | LL—TABLE showing the “ Hxpeetation of Life” or “ Mean After-Life- Life Assurance Offices and of the Faculty of Actuaries i time” of persons aged 10, 20, 30, ce., according to the wnder- Scotland, to collect and combine, as far as possible, the mentioned Mortality

Tables. experience of the life assurance companies of the United Kingdom to the present time." This movement was begun ro Icarlisle, Sti Cees Se eS ee in 1862, and in 1869 the results of the inquiry were pub- 1615. |" is95. ||" 1684, | Papetence (Mila), a lished in a volume containing 282 pages of tabular matter, | |__| | S| S| S| with a preface (from which the above quotations are taken) 10 48°82 | 48°83 | 48°32 | 48°36 | 47-05 | 50°29 by Mr Samuel Brown, then president of the Institute of 20 41°46 | 41-06 | 41°37 | 41-49 | 39°48 | 42°06 Actuaries. The preface details the processes employed in i a ea ae a ae cate ey collecting and arranging the statistics, and indicates the 50 21°11 | 20°83 | 20°36 | 20°18 | 19°54 | 20°31 more important conclusions to be drawn from them. 60 14°34 | 15-06 | 13°91 | 13°77 | 18°53 | 13°88

The experience collected on this occasion embraced the a 918) 9°84 | 8°70| 854 | 8°45 yes returns = j : — 5°51} 5°38 4°75 4°78 4°93 4°

eturns of twenty offices—ten English and ten Scotch—the 90 358 '| 9:68 one | ei 9-34 | 9:36

total number of lives assured being 160,426, of whom

Lire. | rao. PAN OC B 171

Having given this table for the purpose of comparing in a general | assurances of £1 each on as man lives, of the same age 2 cord- way the Fe efaseenisties of the several mortality tables to which it | ing to the H™ mortality table, rookie ine ate ae relates, it is right we should say, in order to avoid misconception, follows that, if all these persons are to contribute at the samc rate that the "expectation of life" docs not enter into calculations for | for their several assurances, the share payable by each—or the single determining the value of sums dependent on human life, or for | premium for anagsurance of £1 on cach life—will be £31,644-+96, 223 ascertaining the eee required for life assurances. The nature | or £'32886. If twice the number of persohs were ca be assured, of these latter calculations will be explained presently. _ there would be just double the number of claims to satisfy at the

As a specimen of a mortality table deduced from actual observa- | close of each year, and the contribution payable by each person tion of assured lives, we give in full the last of the tables from which | would remain the same; and so in proportion for any smaller or

the foregoing particulars are deduced, viz. :— larger pee of Beene. ae pepslidey therefore, that the single ; ; premium at age or a whole-term assurance of .£1« according Il1.—The H™ Table of the Institute of Actuaries. to the HM Pe table, reckoning interest at 3 ve pe | Number Number £‘32886, or 6s. 7d. ; é ‘ Tee. rite, GC! wanes | aieet Passing from numerical illustration to general symbols, the pro- fe x ie ae cess displayed above may be stated as follows. The number of = eae = persons living at any given age (x) is represented! by the symbol J,, 100,000 82,284 70 | 88,124 | 2371 and the number dying in the next year (that is, between the ages 99,510 81,436 71 | 35,758 | 2433 of x and %+1) by dz, which is the equivalent of 2,~Je11. Hence 99,113 80,582 72, | 38,320 | 2497 the number of claims to be made at the end of successive years in 98,784 79,717 73 | 80,823 | 2554 respect of 7, assurances of 1 cach, effocted at the age of x, is repre- 98,496 78,830 74 | 28,269 | 2578 | | sented by the series ‘ 98,224 77,919 75 25,691 2527 hey. Gens Ant Geet sor “0 datz y ead sane is cate ak where z is the difference between x and the highcst age completed 97 245 74,932 78 18,326 258 by any of the lives in the mortality table. The sum of all the terms 96.779 73,850 79 | 16068 | 2138 in this serics is of course 7,, since every person living at age x must 96 293 72.726 80 | 13-930 | 2015 die at one time or another within the period embraced in the table. 95 614 71,566 81 |11.915 | 1888 If money made no interest, 2, would be the present value of all the 94971 70,378 82 | 10.0321 1719 assurances, and the premium payable by each person would be pee 69,138 83 8, 313 | 1545 ly+1z, or 1. To allow for the operation of interest, it is necessary 93 683 67,852 84 | 6.768 | 1346 to discount the several yearly payments for the periods during 93.061 66, 513 ar – 499 | 113g | | Which they are respectively deferred. The scries representing the 92, 444 65,114 86 | 4,984] 941 present value of all the assurances thus becomes 91,826 é 68,652 87 | 3,a43)| 9738 Mn+ Vda Vdria «6. . +012, 91,192 62,125 88 | 2,570] 615 es 90,538 60,538 89 | 1,955| 495 | | where ee? being the interest of 1 for a year. Hence the ed oe ane a re pad premium payable by each of the 7,

individuals is 88,465 55,289 92| °793| 254 Udat Pde teat .. .. +e dere 87,748 58,374 93 | 469] 195 le | 87,021 51,378 _ 274 139 | | which is usually represented by the symbol A, 86,281 | 40,297 95 185} 86 The same result may be arrived at bya process of reasoning based 85,524 47,156 96 49) 40 | | on the doctrine of probabilities. Since out of 7, persons alive at the 84,745 44,960 97 9 9 | | age of , and all (as we must suppose) equally exposed to the risk 88,943 42,717 98 0 of death, dz, will die before completing another year of age, the

83,122 40,448 | chance that any one in particular of those 7, persons will die within

the first year is as d, to l,, Similarly the chance of any particular Prin- In order to show the method of calculating assurance premiums, | person dying within the second year is as dz4 to l,; within the | eiples of we shall first suppose the premiums to be payable in one sum, and | third year as dz,» to 7z; and within the mth year as de4n-1 to le calcula. shall employ an illustration founded on the above table. We | In any particular case, therefore, the probabilities of the sum tion, learn from the table that, of 96,223 persons living at the age of 20, | assured becoming payable at the end of the first, second, third, nth 609 will die before reaching the age of 21; of the 95,614 persons GCL IE Chao remaining alive at the latter age, 648 will dic before reaching the he ge ae age of 22; and so on. Let it be supposed that 96,228 persons of | value of the expectation of receiving 1 at the end of any year, the age of 20 are desirous to have their lives assured, each for the re 3 sum of £1 to be paid at the end of the year in which he shall happen | 28 the xth, is a a Hence the value of 1 to be paid at the to die; and let it be further assumed that the H™ table represents correetly the number of deaths that will occur among these 96,228 persons in each successive year, until the last of them dies between d a a the ages of 97 and 98. According to the hypothesis, 609 payments a pe oe… eee of £1 each will fall to be madc at the end of the first ycar, 648 at le le le de the end of the second, 650 at the end of the third, and so on until | an expression which is identical with that given above. finally 9 payments fall to be made at the end of the seventy-eighth Reverting to the previous expression, it will be seen that by Commu- year. Inorder, therefore, to

ascertain the ‘“ present value” of the | multiplying both numerator and denominator by the same quantity tation meee cag payments to ie made after the decease of the oo v* we obtain, without altering the value of the formula, method. whose lives are to be assured, we inust find the value of £609 due one Pes 2 4-3 eee year hence, £648 due two ycars hence, £650 due three years hence, ala SCAR a sie a and so on to the last payments. The sum of all these values will be ls the total value required. Suppose the interest of money to be8 per | In this new expression the denominator is the product known as Dz | cent. perannum. Then (as explained in the article ANNuITIES) the | in the commutation method (see again the article ANNUITIES) ; and | value of 1 to be paid at the end of one ycar is aS ; of 1 to be paid the successive terms in the numerator are of the general form v”!dp.

years, are » respectively ; and the present

me end of the year in which death occurs is the sum of all the terms in the series

ae

1:03 This latter product is called Cp ; so that the whole expression may be writt at the end of two years a andsoon. Consequently the total rane Cerra… . POR value of the supposed assurances will be the sum of the following Dz terms :— In a commutation table the sum of Cy, Cui, Crtoa, . . . – Cute

Value of first year’s payments £609 x — = £59126 is placed in a column headed Mz; so that the single premium for

an assurance payable after the death of a person aged 2 is Ae ¢

L x secon Sh oa ae : : : ; : » . > se oto The single premium: for an assurance on the same life “ deferred I ; = third 650 X=——s= 594°84 | i a oi 1088 1 The notation employed in this article is that recommended by the Tnstivate of ; &e. = &e. Actuaries in an appendix to their tables, published “i 1872. i – es i i jes] and x/z, to express the number living at age a-rn, W re d The sum of all the terms in this series is £31 ,644,

fomuat ae voit 0K liable. to ereate confusion when used in connexion with

We have thus found that £31,644 is the present value of 96,223 | other symbols.

Formu- le in terms of annuity- values,

Annual pre- miums.

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for m years —that is, to bé payable only if death should occur after

that period—is ae ; which is cquivalent to

x

Crim + Cx4m41+ 5 oo 0 +Cx+z Dz , and hence to Udy tm + mt? dee oe oe +otteHd ys, le By subtraction, the single premium for a “ temporary” assurance for m years on the same life is Mz = La-tm , Which is equivalent to fd

CetCeyit 2s

x

al Oxim—1 ;

and hence to Vet Vdetit + +s Ly A column BR is sometimes inserted in commutation tables to facilitate calculations relating to “increasing” assurances. Ry is the

. . Metre; so that Re is the value

: +0″ tm —1 F

sum of the terms Mz, Mzti, – -

of an assurance the amount of which shall be 1 if the life fails during the first year, 2 if during the second year, 8 if during the third year, and so on.

When the value of any immediate annuity, calculated at a given rate of interest, is known, the value of a sum payable one year after the last instalment of the annuity may be readily deduced from it. The value of any deferred payment is the difference between the sum to be ultimately paid and the discount for the period during which it is deferred. Let a be the value of an annuity of 1 at tle rate of interest 7, and Ict it be required to find the value of 1 due at the end of the year following the last pay- ment of the annuity. The discount of 1 for one year at the rate of interest 7 is a v; and the present value of such annual discount (payable in advance) for the whole period eovered by the annuity and one year more is (1—v) (1+a). Hence the value of the deferred payment of 1 is1-—(1-v%) (1+a). Putting az for the value of an annuity on a life aged x, we have for the present value of a whole-term assurance on a life of that age 1- (1-1) (1+4z).

The agreement of this result with those formerly deduced from the numbers dying in each year may be seen by substituting for dz, dai, &e., their equivalents (lz —lz+41), (le4i- x42), &¢., when the foregoing expression

VdetVdetit 1… +7 tld 45 ioe ae i. becomes Ade — Ugtr) + V%(leg1 — lope) +» + v2+1(1 1.2 — 0) lx @let+Vlerrt … . tly, fe eel a _ UUgp it Vlepe + 5 + Vlzte ly

=2(1+dz)—@z3 as will be seen from the article ANNUITIES. By a simple transposition this expression takes the form v —(1—)dz ; which in its turn becomes 1 (1)(1+

Assurances, as formerly mentioned, are usually paid for by annwal contributions or premiums, continuing either during the whole subsistence of the assurance or during a limited period only. The annual premium for an assurance is deduced as follows. Since the

present value of all the annual payments must be equal to the single premium, and since premiums are always payable in advance, we have (putting P for the annual premium required) P(1+a)=A;

whonce rien . In this expression A may represent the single premium for any benefit whatsoever, whether depending on single or joint lives, or on any other deseription of status ; and (1+) may represent the value, in any such case, of an annuity payable in advance during the period over which the payment of premiums is toextend. 'The annual premium, payable during the whole of life, for a whole-term assurance on a life aged x is 1-(1-»)(l+a)_ 1

i =i or OL d2)— Oe a 14, Was ok

or it may be expressed in a variety of other ways by substituting different equivalents of the single premium and the annuity. When the premium is to be payable for m years only, its amount

is expressed by where the symbol |m-1@ represents the

14m – 1

rRSeEUR Awe

[LIFE value of a temporary annuity for m—1 years; and 1+|m-1@ is there- fore the value of an annuity for m years payable in advance.

When the premium for the first m years is to be th of that for the remainder of life, the ultimate annual payment is found by

—_-——— where »-1\a is the value of an (1 ae \m-10) + m-1|0

the expression –

a

7

annuity deferred for m— 1 years, and therefore of an annuity deferred for m years, but payable in advance,

By the commutation method the annual whole-life premium is Mz, Ne-1_ Me . The premium limited to m annual payments, Mz Ny-1-
Whatton :

able after mv years, when the payment during that period is sth ve

for a whole-term assurance, is The premium pay-

of the ultimate annual payment, is ae ’

—(Ne-1- Neetw—1) + Nesow-1

or ae. ; Nz-1t+ (r—L)Netm-1

We do not propose to enter further on the investigation of for- mules for the calculation of premiums for the various descriptions of life assurances. These will be found in the works of Milne, Baily, Jones, and other authors who have treated of the subject of life contingencies, The student will find a very clear exposition of the nature and modes of calculation of the more ordinary kinds of premiums in a paper by Mr James Meikle, The Rationale of Life Assurance Premiums, reprinted by the Actuarial Society of Edin- burgh in 1879.

In the practical calculation of life assurance premiums various Prag. devices have been suggested for shortening labour and ensuring tica} accuracy. Mr Peter Gray’s method of ealculation, by means of me. logarithmic tables on the plan originated by Gauss, may be specially thods, mentioned. His Tables and Formule, in which this method is explained, is a work of great value to the student of life contin- gencies,

When the requisite annuity-values are available, the tables of assurance premiums constructed by Mr William Orehard afford great facilities, either in forming scales of premiums or in isolated calculations. The foregoing expressions for the single premium in terms of the corresponding values of annuities are of such a character as to be

applicable to a great variety of eases—to nearly every case, in fact, where the risk of the assurance is to be entered on imme- diately, and the sum assured is to be payable at the end of the year following the last payment of the annuity embraced in the formule.

In like manner the formule for the annual premium, -(1-»),

and its equivalents are ele in all such cases, but only when

the premium is to be payable during the whole continuance of the

1-(1-v)(1+a) 1+4a

value a in the denominator corresponds with that in the nume- rator. Mr Orchard has tabulated the values of v-(1-v)a and

—(1~—v) for all probable values of a, and for the several values

assurance, so that in the expression the annuity-

1+a@ of v corresponding to eight different rates of interest. By means of these tables, when the aunuity-value corresponding to any required single or annual premium is known, the premium itself may be obtained by mere inspection. The tables may be employed with annuities derived from any table of mortality, and, as the various eases to which they apply are by far the most frequent in practice, they are found extremely useful by computers.

We have throughout supposed that the payment of the sum assured is to be made at the end of the year in which death occurs. This supposition accords with the theory of annual mortality and annual conversion of interest into capital, upon which the usual system of calculation is based. It also agrees very nearly with fact when the sums assured are payable six months after death ; for, if it be supposed that the deaths occurring within each year of age take place at equal intervals of time, or that they occur in equal numbers in the first and second halves of cach year respectively, the persons insured will, one with another, complete about half a year of age in the year when they

die. When it is thought desirable to make allowance, in the ealculation of premiums, for the circumstance of the sums assured being payable earlier than at the end of the year of death, that may be done by a simple modification of the usual formule. For example, A(1+7)t is an approximation suffi- ciently near for most purposes to the value of au assurance payable as soon as death oecurs.

The more scientific methods of calculation developed by Mr Wool- house and others, and referred to in the article ANNUITIES, eliinin-

iNe URAN CE

LIFE. | 173 con- ate eth a eee esis at LS ea ae – Le aha lie ali i sl to eover the expenses of management. ‘ a at of a unifor. U ” . $ eee of eich te strictly admissible. The lives assured, instcad of being i eee he a Sl oe at “ia b : reaarded as subject to successive yearly decrements, are considered : Lema ‘ e “loading” should be to be diminishing in number continuously ; and in like manner adjusted so as to give due weight to the faet that by far interest, instead of being payable annually, is supposed to be grow- | the larger proportion of expense is usually connected with ing due ae oe ee ods nite pe ae the first year’s premium; but most of the scales of pre- Ree approximately, or with extreme iow, by the usual ob miums now in use by assuranee offices have been an ived of computation, but they are not employed in the ordinary caleu- at by one or other of the methods of loading mentioned lations of assurance offices, above. ‘Net The premiums obtained by caleulation from the funda- The rates of the Northampton Table, at 3 per cent. pre- mental data of interest and mortality are ealled “net” | interest, furnish an example of a scale of net rates used as miums” or “pyre” premiums. In calculating the premiums to be | offiee premiums, without any specific addition by way of on charged by an assuranee office, it is to be borne in mind | “loading.” ‘These are shown in the following table. As

contract between the office and the assured. such as to render impractieable its successful prosecution ance

To secure llices.

Few if any of the older assurance offices eontiuue to base their estimates of liability on the tables which were originally employed in the construction of their scales of premium ; but many of them still charge the same rates as formerly, or at all events rates which have not been con- structed from the tables of mortality now in use. Hence the terms “loading” and “margin” have eome to bear a somewhat extended meaning. They are now used to designate the difference between the premiums payable by the assured and the net premiums deduced from any table that may be employed for the time,

There have been various theories as to the proper method of loading premiums. The plan most commonly employed at first was that of adding a constant percentage of the net premiums at all ages. Some actuaries objected to this method, holding it to be inequitable as between old and young lives, and proposed in its stead the addition of an equal sum for every age (that is, in effect, a constant per- centage of the sum assured) as more in accordance with the object in view. By others a combination. of these two plans was preferred. The premiums were loaded by a per- centage for “profit” and contingencies, and a constant

as a matter of individual or private enterprise. a sufficiently uniform operation of the laws of average, the transaetions must be earried out ona scale quite incom- patible with the sufficieney of private eredit for their ful- filment ; while the indefinite and lengthened periods over which the engagements extend also mark them out as beyond the reacli of individual responsibility.

Aecordingly, with the limited exception of the insurance scheme of the Government, the business in the United Kingdom may be said to be entirely in the hands of public companies or societies. ‘These bodies have been of three

kinds—(1) the purely mutual offices, in which the assured Mutual. themselves constitute the society ; (2) proprietary offices, Proprie- as they once existed, being joint-stock companies which ty.

carried on the business of assurance for the benefit of the shareholders, among whom were divided the whole “profits” or “surplus” arising from the contributions of the assured ;

and (8) the mixed offices, possessed of a share capital, but Mixcd.

dividing among their assured a proportion (generally from two-thirds to nine-tenths) of the “profits” realized. In the present day there are but two kinds of offices, muteal and mixed, the proprietary companies either having dis-

>

Selection of lives.

Means of selection. algo well known.

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appeared or having adopted the plan of sharing profits with the policyholders.

Into the relative merits of the two elasses of offices it is not our purpose to enter. The mutual offices take their stand on the advantage to the assured of sharing the whole profits among themselves, while the mixed offices point to certain features of their system which tend to neutralize the apparent disadvantage of the shareholders taking a portion of the surplus. We believe it will be found that the fact of an office belonging to one class or the other does not of itself afford a presumption either for or against its being an advantageous office to assure in. The comparative ad- vantages of different companies must be sought out by a closer scrutiny than a mere reference to this distinction in the nature of their constitution.

Most assurances are effected on the plan of participating in profits. In both mutual and mixed offices, however, there is generally a elass of policyholders who do not share in the profits, but who, requiring only a guarantee of a fixed sum on the happening of the contingency men-

tioned in their policies, effect their assurances at a re- duced rate of premium calculated to eover fully the risk and expenses of business.

Selection of Lives.—It is well known that assurance com- panies exercise a selection among the lives proposed for assurance, admitting some on the ordinary terms and sur- charging or rejecting others whose prospects of longevity appear to be below the average. The necessity for this has been sometimes called in question. Why, it has been asked, should the offices inquire so scrupulously into the state of health of those who offer themselves, if the mor- tality tables on which the premiums are based exhibit the death-rate among a number of persons in all the degrees of health and sickness? The answer is that without such selection on their part the offices eould not reekon on the lives assured being as a body equal to those represented in the tables. It must be remembered that the inducement to become assured is not so great to the healthy and vigorous as it is to the wenk and delicate, and if the offices were to open their doors' to all comers, or were even to relax their vigilance in scrutinizing the applications made to them, they would inevitably admit an undue proportion of the latter class, and thus expose themselves to greater hazards than those provided for in their tables. Moreover, since the assured have a direct interest in the surplus remaining of their premiums, after providing the cost of the assurances, the admission of all lives on equal terms would be an in- justice to those possessing a full measure of health. They would practically be ealled upon to contribute more than their own eases required, in order to provide a fund suf- ficient to pay the sums assured on lives having inferior prospects of longevity.

The means of selection employed by assurance offices are Each applicant is required to furnish information as to his own health and habits of life, and some particulars as to his family history, and he under- goes an examination by a medical man named by the office. Informer days this examination was not always required, nor docs it appear that the same attention was paid as now to the question of hereditary tendencies to disease ; and yet, judging from the experience of the older offices, the precautions observed in those days seem to have been not without considerable effect. Unquestion- ably, however, the

improvements which growing experience and the advance of medical science have brought to bear upon the means of selection have had au important influ- ence in increasing its efficacy, although possibly they may have done little more than to defend the offices against a ereater risk of the introduction of questionable lives. It is now well understood that hereditary tendencies have a

marked effect in determining the chances of longevity of individuals; the degree of importance to be attached to particular deviations from health is better known than formerly ; while the increased prevalence of assurance has led to a better appreciation among medical men of the duties required of them in the examination of proposers, In some of the medical schools special attention is now directed to the subject. Several excellent works on medi- eal selection have appeared, one of the most recent in England being that of Dr Sieveking of London.

It may readily be supposed that selection has an import: Its

ant influence in determining the rates of mortality among “fects,

assured lives. The extent and nature of this influence have formed a very fruitful and interesting subject of inquiry. So early as 1776 an investigation of the affairs of the Equitable Society revealed that the death-rate among the members had been much lower than that anticipated in the tables on which the premiums were based. Similar results appeared at the subsequent investigations of W. Morgan and A. Morgan, who were successively aetuaries of the society ; and in many other collections of the statistics of individual offices—those by Galloway of the Amicable (1841), Jellicoe of the Eagle (1854), Spens of the Scottish Amicable (1862), for example—the mortality among as- sured lives has been exhibited in comparison with the death- rates shown by the mortality tables in common use. Com- parisons of this kind may be drawn from the tables on a preceding page. ‘These do not, however, afford the means of observing what is a very marked

peculiarity of the mortality experience of assurance companies, namely, the varying death-rates at different periods in the duration of assurances. Mr Spens devoted considerable attention to this subject, but it had been previously investigated in connexion with the statistics of the seventeen offices to 1843 already referred to. These statistics were analysed with this object by Mr E. J. Farren, who pointed out the extremely light mortality experienced during the first year of cach assurance. A more exhaustive analysis is given by Mr Higham, in a paper "On the Value of Selection as exercised by the Policyholder," contributed to the Asswrance Magazine (vol. i. p. 179). Mr Higham traces the lives from their first year of assurance down to the time of their passing from observation, by death or otherwise, and shows — that the mortality, light at first in consequence of the initial selection exercised by the offices, gradually increases until it becomes greater than that prevailing among the general population. which the assured exercise against the companies by drop- ping policies on healthy lives and retaining those on lives which have become bad or doubtful. A still more com- plete investigation of the subject of selection has been made by Mr Sprague (Assur. Afag., xiv. 328), who shows that the deterioration noticed by Mr Higham attains its maximum some time before the lives pass from observation, and is ultimately reversed after the full effect produced by the withdrawal of good lives has exhausted itself. Mr Sprague's statistics are taken from the T'wenty Offices' Experience to 1863. In the collection of that experience the effects of the two kinds of selection that have now been referred to—selection by the assurance offices and selection against the offices—were kept in view as a subject to be investigated; and in the preface to the tables published in

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1The Assurance Magazine—or, as it is now called, the Journal of the Institute of Actuaries—continues to be, as it has been for many years, the principal medium of publication for what is new and im- portant in actuarial science. Under the auspices of the Institute of _ Actuaries, a text-book is in preparation which, when eompleted, will no doubt bring within a convenient compass much that is now scattered "throughout

the Jowrnal and other works. In the meantime the student will find it indispensable to make himself acqnainted with many of the valuable papers contained in the Assurance Magazine.

This latter result he attributes to the selection Counter

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1869 the subject is considered at some length, and several interesting tables are devoted to its illustration. The fol- lowing figures, extracted from one of those tables, show the rates of mortality at different quinquennial periods of life among the “healthy lives, male and female,”—divid- ing the lives into groups according to the duration of their

assurances.

Annual Mortality per cent. in periods of Assurance.

Five : Age. Under j Under ‘ 5 : years and sars, | Years and Total ate ee Upwards. i tea Upwards. Q) (2) (3) 20 to 24

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assumptions are reasonably safe, an assurance office pro- ceeding upon them may be confidently regarded as solvent so long as there is no conspicuously unfavourable deviation from what has been anticipated and provided for, and go long as the funds are not impaired by imprudent invest- ments or otherwise. The ascertainment and division of profits, however, require that the affairs should be looked into periodically ; but the fluctuations to which the surplus funds are liable within limited periods of time, from varia- tions of the death-rate and other causes, are generally ro- garded as furnishing a sufficient reason why such investiga- tions should not take place too frequently. Accordingly in most offices the division of profits takes place only at stated intervals of years,—usually five or seven years,—when a

complete survey is taken of the whole engagements present and future, and of the funds available to meet these. The mode in which the liability of an office under its current policies is estimated requires explanation.

All statistical observations on the duration of human life Nature point to the conclusion that, after the period of extreme of ea youth is past, the death-rate among any given body of Ves

Valua- tion of liabili- ties,

et OU OU bO Or

ore obh ©

A prominent feature of this table is the divergence of the figures in column 3 from those in column 2, and on the other hand the comparatively close agreement of the figures in column 3 with those in column 5. This seems to indicate that among lives which have been less than five years assured the rate of mortality is materially lower than that prevailing among lives of similar ages who have been assured for longer periods, but that after the first five years the causes which bring about this lessen-

ing of the rate of mortality have in great measure ceased

to operate. It was this peculiarity of the statistics that led to the construction of the H™®) table,—the first five years of assurance being regarded as marking, although not in any strict or absolute sense, a distinct period in the value of assured life, after which 'for all practical purposes the benefit of selection may perhaps be said to be lost." Mr Sprague has since pointed out that this distinction is not altogether satisfactory, and he has sought by the con- struction of a series of 'Select Mortality Tables" for separate ages at entry (Ass. Mag. xx. 95 and xxi. 229) to supply a more exact basis of calculation than the H™ and H™©) tables afford.

Besides its influence upon the rates of mortality, selec- tion has also a very noticeable effect in regard to the causes of death,among the assured. Diseases to which a predis- position may be inferred from family or personal history, or which admit of detection in an early stage by careful medical scrutiny, are less frequent among this selected class of lives than among the general population, while, on the other hand, assured persons seem to be more liable than others to particular forms of disease, This interesting subject is dealt with by Mr Meikle in his Observations, formerly referred to; and it is also illustrated in numerous reports on the experience of different assurance companies by their medical officers. '

Valuations.—The business of life assurance being founded on well-asvertained natural laws, and on principles of finance which in their broad aspect are of the simplest description, there exists no necessity for frequent close scrutiny of the affairs of an assurance office, in so far as the maintenance of a mere standard of solvency is con- cerned. We have seen that the premiums charged for assurances are based on certain assumptions in regard to (1) the rate of mortality to be experienced, (2) the rate of interest to be earned by the office on its funds, and (3) the proportion of the premiums to be absorbed in expenses and In providing against unforeseen contingencies. If these

persons increases gradually with advancing age. If, there- fore, assurance premiums were annually adjusted accord- ing to the chances of death corresponding to the current age of the assured, their amount would be at first smaller, but ultimately larger, than the uniform annual payment required to assure a given sum whenever death may occur. This is illustrated by the following figures, calculated from the H™ mortality table at 3 per cent. interest. In column 2 is the uniform annual premium at age thirty for a whole-term assurance of £100. In column 3 are shown the premiums which would be required at the successive ages stated in column 1 to assure £100 in the event of death taking place within a year. Column 4 shows the differences between the figures in column 2 and those in column 3.

(4)

£°750 £

+£1°130

769 + 1111 787 + 1:093

1°806 + Od

1916 ~ 036 2-042 ~ 162

61°848

~ 59-968 79265 ~ 77385 97-087 ~ 95-207

From this table it appears that if a number of persons effect, at the age of thirty, whole-term assurances on their lives by annual premiums which are to remain of uniform amount during the subsistence of the assurances, each of them pays for the first year £1:130 more than is required for the risk of that year. The second year the premiums are each £1°111 in excess of that year's risk. The third year the excess is only £1:093, and so it diminishes from year to year. By the time the individuals who survive have reached the age of fifty-four, their uniform annual premiums are no longer sufficient for the risk of the follow- ing year; and this annual deficiency goes on increasing until at the extreme age in the table it amounts to £95-207, the difference between the uniformannual premium (£1 880) dnd the present value (£97°087) of £100 certain to be paid at the end of a year. Now, since the uniform annual premiums are just sufficient to provide for the ultimate

Net lia- bility.

Provision for ex- 'penses &e.

payment of the sums assured, it is obvious that the deficiencies of later years must be made up by the excess of the earlier payments ; and, in

order that the assurance office may be in a position to meet its engagements, these surplus payments must be kept in hand and accumulated at interest until they are required for the purpose indicated. It is, in effect, the accumulated excess here spoken of which constitutes the measure of the company's liability under its policies, or the sum which it ought to have in hand to be able to mect its engagements. In the individual case this sum is usually called the "reserve value" of a policy.

In another view the reserve value of a policy is the difference between the present value of the engagement undertaken by the office and the present value of the premiums to be paid in future by the assured. This view may be regarded as the counterpart of the other. For practical purposes it is to be preferred, as it is independent of the variations of past experience, and requires only that a rate of mortality and a rate of interest be assumed for the future.

According to it, the reserve valuc (nVz) of a policy for the sum of 1, effected at age w, and which has been in force for years—the (n+1)th premium being just due and unpaid—may be expressed thus, in symbols with which we have already become familiar.

(1).

nVa= Anin = (1 oF a) If we substitute for-Azin its equivalent Pz4n(1+4z+4n) this expres-

sion becomes nVa2=(Prtn— IP + Qztn) . . . . . (2);

whence we sec that the sum to be reserved under a policy after any number of years arises from the difference between the premium

actually payable and the premium which would be required to assure the life afresh at theincreased age attained. By substituting for Prin i ' 1 1 and P, their equivalents —(1-v) and — (1-v), we and P, their equiva Tea (1-2) eam (1—v), obtain another useful form of the expression, l+a Vy ee 8 _ Ce =f Axtn 4 1+ a, (4).

The preceding formule indicate clearly the nature of the calculations by which an assurance office is able to ascertain the amount of funds which ought to be kept in hand to provide for the liabilities to the assured. In cases other than whole-term assurances by uniform annual premiums, the formule are subject to appropriate modifications. When there are bonus additions to the sums assured, the value of these must be added, so that by the foregoing formula (1), for example, the value of a policy for 1 with bonus additions B is (1+B)A,4,—P(1 +44.) But the general principles of calculation are the same in all cases. The present value of the whole sums undertaken to be paid by the office is ascertained on the one hand, and on the other hand the present value of the premiums to be received in future from the assured. The difference between these (due provision being made for expenses and contingencies, as afterwards explained) represents the "net liability " of the office. Otherwise, the net liability is arrived at by calculating separately the value of each policy by an adapta- tion of one or other of the above formule. In either case, an adjustment of the annuity-values is made, in order to adapt these to the actual conditions of a valuation, when the next premiums on the various policies are not actually due, but are to become due at various intervals throughout the succeeding year.

So far in regard to the provision for payment of the sums contained in the policies, with their additions. We now come to the provision for future expenses, and for contingencies not embraced in the ordinary calculations. In what is called the "net-premium" method of valuation, this provision is made by throwing off the whole " loading"

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in estimating the value of the premiums to be received.

That is to say, the premiums valued, in order to be set off Net-pre.

against the value of the sums engaged to be paid by the office, are not the whole premiums actually receivable, but the net or pure premiums

derived from the table employed in the valuation. ‘The practical effect of this is that the amount brought out as the net liability of the office is sufficient, together with the net-premium portion of its future receipts from policyholders, to meet the sums assured under its policies as they mature, thus leaving free the remaining portion—the margin or loading—of each year’s premium income to meet expenses and any extra demands. When the margin thus left proves more than sufficient for those purposes, as under ordinary circum- stances it always ought to do, the excess falls year by year into the surplus funds of the office, to be dealt with as profit at the next periodical investigation.

There appears to be a decided preference among assurance companies for the net-premium method as that which on the whole is best suited for valuing the liabilities of an office transacting a profitable business at a moderate rate of expense, and making investigations with a view to ascertaining the amount of surplus divisible among its con- stituents. Under certain circumstances it may be advis- able to depart from a strict application of the characteristic feature of that method, but it must always be borne in mind that any encroachment made upon the “ margin” in valuing the premiums is, so far, an anticipation of future profits. Any such encroachment is indeed inadmissible, unless the margin is at least more than sufficient to provide for future expenses, and in any case care must be taken to

arise when the valuation of the future premiums is greater than the valuation of the sums engaged to be paid by the office, or when in the expression (P,,, — P,) (1+ pin) the value of P, is increased so as to be greater than that of Prine It is evident that any valuation which includes “negative values” must be misleading, as policies are thereby treated as assets instead of liabilities, and such fictitious assets may at any time be cut off by the assured electing to drop their policies.

In recognition of the fact that a large proportion of the first year’s premiums is in most offices absorbed by the expense of obtaining new business, it has been proposed by some actuaries to treat the first premium in each case as applicable entirely to the risk and expenses of the first year. Ata period of valuation the policies are to be dealt with as

if effected a year after their actual date, and at the increased age then attained.

Another modification of the net-premium method has been advocated for valuing policies entitled to bonus addi- tions. It consists in estimating the value of futwre bonuses (at an assumed rate) in addition to that of the sum assured and existing bonuses, and valuing on the other hand so much of the office premiums as would have been required to provide the sum assured and bonuses at the time of effecting the assurance. his tends to secure, to some ex- tent, the maintenance of a tolerably steady rate of bonus.

An essentially different method is employed by some offices, and is not without the support of actuaries whose judgment is entitled to every respect. It has been called the "hypothetical method." By it the office premiums are made the basis of valuation. Hypothetical annuity-values, sma'ler than those which would be employed in the net-premium method, are deduced from the office premiums by means

. 1

of the relation P' =——- ie

a

(1-v), and the policies are

valued according to the formula nee = (Bin – flee) cll ar Ceties) ' where PY and P,,,, are the office premiums at ages x and

minum method.

guard against what are called "negative values." These Negative

values,

Hypo- thetical method.

Effectsof : Fao : different and interest, and the resulting net liability will be greater

data,

— mies zs

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a+n respectively, and a’... is the hypothetical annuity- value at the latter age. Mr Sprague has shown (Ass. d/ag., xi, 90) that the policy-values obtained by this method will be greater or less than, or equal to, those of the net-premium method according as the “loading” isa constant percentage of the net premium or an equal addition to it at all ages, or of an intermediate character, its elements being so ad-

justed as to balance each other.

When the net-premium method is employed, it is im- portant that the office premiums be not altogether left out of view, otherwise an imperfect idea will be formed as to the results of the valuation. Suppose two offices, in cir- cumstances as nearly as possible similar, estimate their liabilities by the net-premium method upon the same data, but office A charges premiums which contain a margin of 20 per cent. above the net premiums, and office B charges premiums with a margin of 830 per cent. Then, in so far as regards their net liabilities (always supposing the sum seb aside in each case to be that required by the valuation), the reserves of those offices will be of equal strength, and if nothing further were taken into account they might be supposed to stand in the same financial position. But it ‘3 obvious that office B, which has a margin of income 50 per cent. greater than that of office A, is so much better able to bear any unusual strain in addition to the ordinary expenditure, and is likely to realize a larger surplus on its transactions. Hence it appears that in order to obtain an adequate view of the financial position of any office it is necessary to consider, not only the basis upon which its reserves are calculated, but also the proportion of “loading” or “margin” contained in its premiums, and set aside for future expenses and. profits.

Valuations may be made on different data as to mortality

or less according to the nature of these. Under any given table of mortality a valuation at a low rate of interest will produce a larger net liability—will require, that is to say, a higher reserve to be made by the office against its future engagements to the assured—than a valuation at a higher rate. The effect of different assumptions in regard to the rates of mortality cannot be expressed in similar terms. A table of mortality showing a high death-rate, and requiring, consequently, large assurance premiums, does not necessarily produce large reserve values. The contrary indeed may be the case, as with the Northampton Table, which requires larger premiums than the more modern tables, but gives on the whole smaller reserve values. The amount of the net liability depends, not on the absolute magnitude of the rates of mortality indicated by the table, but on the ratio in which these increase from age to age.

If the values deduced by the net-premium method from any two tables be compared, it will be seen that

Vi >, =, 0r < aVz

according as

,

eet! >, =, or < 1 1+ Gatn

1+a, l+daz 4.0.4 aS ee ec (1) i ecw: 7 ? teas mi 2

, ,

or as Le >, =, or < 1+ etn (205 14+az 1L+z4n

where the accented symbols throughout refer to one table and the unaccented symbols to the other.

We have thus the means of ascertaining whether the policy-values of any table will be greater or less than, or equal to, those of another,

either (1) by calculating for each table separately the ratios of the annuity-values at successive ages, and comparing the results, or (2) by cal- culating at successive ages the ratios of the aunuity-values

rweeranet Lr

ei of one table to those of another, and observing whether these ratios decrease or increase with advancing age, or remain stationary throughout. The above relations will subsist whatever may be the differences in the data employed, and whether or not the annuity-values by the different tables are calculated at the same rate of interest. When the same rate of interest is employed, any divergence in the ratios of the annuity-values will of necessity be due to differences in the rates of mortality. This interesting subject is investigated by Mr Meikle in a paper on Policy Life-Lines, one of the Actuarial Society's publications, and by Mr Sprague in the Assurance Magazine, vol. xxi. p. 77.

The following table gives examples of the reserve values of policies for £100, calculated on the net-premium method by three different mortality tables, at a uniform rate of interest, 3 per cent.

: Table . The Institute of Northampton. pate: Actuaries 1, reserve values,

Duration of policy five years.

20 £4°196 £4°534 £4°360 30 5°490 5464 67135 40 7°294 7053 8°708 50 9°571 12:374 127100 60 13 °668 13°698 16°180 Duration of policy ten years.

20 8 '738 9422 9°440 30 1572 11°746 12°897 40 15°220 15°655 18°045 50 19°790 24°904 24°573

29°310 31°857

60 28 °236

Duration of policy twenty years.

Something may be said here as to the data on which Dataem- assurance companies make their valuations. The rates ployed of interest assumed by different offices may be said to range between 3 and 4 per cent., being in most cases. lower than 4. It is, however, in regard to the tables of mortality that the greatest diversity exists. The N orth- ampton Table has, for valuation purposes, been all but discarded. 'The Carlisle Table has so far lost its ground, since the introduction of the more recent Experience Tables,

as to be now used by only a minority of the offices as the chief basis of their calculations. The different tables based

on the experience of the Equitable Society, the Seventeen Offices' Experience, and the English Life Tables have still some adherents, and (besides those offices which value by the 'hypothetical method") a few companies employ tables constructed specially for their own use. But there

is an evident tendency towards the general adoption of the Institute of Actuaries (twenty offices) Tables, which have been used by a large proportion of the companies in their latest valuations. Of these, the tables chiefly employed are H™ and H™, the latter being used by some offices in combination with the H™ pure premiums, in order to eliminate as far as possible the effects of selec- tion. Mr King (Ass. Mag., xix. 381 and xx. 233) and Mr Sprague (Ass. Mag., xxi. 229 and xxii. 391) have shown the construction of tables which would give in a more direct and scientific way the result that is aimed at by using the combined H™ and H™® tables. Mr King, to illustrate the results of his method, constructs a "model office," assuming a uniform annual influx of new business and

a rate of discontinuance of policies based on the experience XIII. — 23

Sources of profit.

Bonuses.

of the twenty offices which contributed their statistics to the formation of the Institute of Actuaries Tables, and he shows the comparative reserves required by such an office at the end of successive quinquennial periods, according to various mortality tables and at different rates of interest. As these illustrative tables afford an admirable means of comparing the results of valuing by different mortality tables, we give the following extracts. it must be borne in mind, however, in seeking to apply the figures in these tables to estimate the strength of the reserves maintained by particular offices, that the soundness of the estimate may be a good deal affected by circumstances. In particular the rates at which new businciss has come in and policies have been discontinued must be taken into account, and, as before stated, the amount of “ margin re contained in the premiums must not be lost sight of. Moreover, the supposed liabilities do not include bonus additions, and the presence of these will of course modify any conclusions drawn from the tables.

Comparative Reserve, 1000 being assumed for the Reserve by the eombined H™ and H™() Tables at 34 per eent. Interest.

Table of Mortality and Rate of Interest.

Age of Office.

Twenty | Thirty | Forty years, | years. | years.

Analysed mortality

(Mr King)... ts aae8 | oe | eee Do. do. 3h 1014 | 999 | 998 Do. do. 40 961 952 950 Combined “H™ 1059 | 1052 | 1047 1000 | 1000 | 1000

945 951 955

1016 | 1023 | 1024

ce eG ea O58”) 971 | O77

BUR acarthiesaimeaes 904 922 933

1009 | 1017 | 1019

Do. do. 951 965 | 972 Do. do. ... 4 898 917 928 Davies's Equitable. 3 917 | 923 | 927 Do. a us 862 | 874] 882 Do, do. 4 811 827 839 Celioley… stariatnian' aa 3 938 | 952] 959 Bh sccmey oy seeds 3h 881 | 901| 912 WO a ws atectees MBoopee 4 829 853 868 English, No. 3…... 3 988 | 995 | 997 Do. do; aes 933 | 945) 952 SAC ae 881 898 | 909

877 | 887 | 895

872 | 898; 914

Division of Surplus.—There are various sources from which a surplus of funds may arise in an assurance com- pany :—(1) from the rate of interest actually earned being higher than that anticipated in the calculations; (2) from the death-rate among the assured being lower than that provided for by the mortality tables; (3) from the ex- penses and contingent outlay being less than the "load- ing" provided to meet them ; and (4) from miscellaneous sources, such as profitable investments, the cancelment of policies, &c.

Supposing a valuation to have been made on sound data and by a proper method, and to have resulted in showing that the funds in hand exceed the liabilities, the surplus thus ascertained may be regarded as profit, and either its amount may be withdrawn from the assets of the office or the liabilities may be increased in a corresponding degree.

Various methods are employed by assurance companies in distributing their surplus funds among the assured. In some offices the share or "' bonus" falling to each policy- holder is paid to him in cash; in others it is applied in providing a reversionary sum which is added to the amount assured by the policy ; in others it goes to reduce

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the annual contributions payable by the policyholder. A method of more recent introduction is to apply the earlier bonuses on a policy to limit the term for which premiums may be payable, thus relieving the policyholder of his annual payments after a certain period. Another method is to apply the bonuses towards making the sum assured payable in the lifetime of the policyholder. The plan of reversionary bonus additions is most common, and when it

‘is followed the option is usually given of exchanging the

bonuses for their value in cash or of having them applied in the reduction of premiums.

Not only are there different modes of applying surplus, but the basis on which it is divided among the assured also varies in different offices. In some the reversionary bonus is calculated as an equal percentage per annum of the sum assured, reckoning back either to the commence- ment of the policy in every case, or (more commonly) to the preceding division of profits. In others the rate is calculated, not only on the original sums assured, but also on previous bonus additions. In others the ratio of dis- tribution is applied to the cash surplus, and the share allotted to each policy is dealt with in one or other of the ways above indicated. The following are some of the ratios employed by different offices in the allocation of profits:—(1) in proportion to the amount of premiums paid (with or without accumulated interest) since the last preceding valuation ; (2) in proportion to the accumulated “loading ” of the premiums so paid; (3) in proportion to the reserve values of the policies ; (4) in proportion to the difference between the accumulated premiums and the re- serve value of the policy in each case.

Some offices have a special system of dealing with surplus, reserving it for those policyholders who survive the ordinary “expectation of life,” or whose premiums paid, with accumulated interest, amount to the sums assured by their policies. This system is usually connected with specially low rates of premium.

The various bonus systems which have been mentioned yield different results to policyholders of different ages, and whose assurances have

been in force for longer or shorter periods. A person seeking to effect an assurance may exercise a wise discretion in selecting that office whose bonus system appears most advantageous, considering his own age and circumstances.

From a paper by Mr A. Hewat in the Asswrance Maga- zine (xxii. 286) it appears that the average amount of surplus annually divided among the assured by seventy- seven offices which have rendered valuation accounts to the Board of Trade since the passing of the " Life Assur- ance Companies Act, 1870," has been £2,285,000, or 23 per cent, of the annual premium income of the offices. The following average specimens of reversionary bonuses are taken from the returns of forty- one of those offices, whose average rate of annual premium is shown in the second column.

ee Average Specimens of Reversionary Bonuses, per cent. per annum.

Age at Entry.

Average Premium.

Years in Force.

o

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Surrender Values.—In those branches of

remaining the same from ycar to year—and where the consent of both parties, insurer and insured, is required at each periodical renewal—no question of allowance in respect

insurance Surrender where the contract is one of indemnity against loss, the risk V4".

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of past payments can arisé when one party or tho other determines to drop the contract. It is quite recognized that the premiums are simply an equivalent for the risk undertaken during the period to which they apply, with a certain margin for expenses and for profit to the insurer, and that therefore a favourable issue of the particular contract supplies no argument for a return of any part of the sums paid. In life assurance, however, we have

to assurances effected by premiums payable during longer fixed periods, and ultimately, by some offices, to assurances bearing annual premiums during the whole of life. The methods of fixing the amount of paid-up policy in the last-mentioned class of cases vary in different offices, but the principle underlying them all is that of applying the resetve value to the purchase of a new assurance of reduced amount.

shown that the premiums contain a third element, namely, the portion that is set aside and accumulated to meet the risk of the assurance when the premium payable is no

Conditions of Assurance.—An office, in entering on a Dis- contract of life assurance, does so in the faith that all closure circumstances material to be known in order to a proper of facts.

longer sufficient of itself for that purpose.

When a policyholder withdraws from his contract with a life assurance office, the provision made for the future in respect of his particular assurance is no longer required, and out of it a surrender value may be allowed him for giving up his right to the policy. If there were no reasons to the contrary, the office might hand over the whole of this provision, which, as we have seen, is in fact the reserve value of the policy. No more could be given without encroaching upon the provision necessary for the remaining policies. But the policyholder in withdrawing is exercising a power which circumstances give to him

only and not to the other party in the contract. The office is bound by the policy so long as the premiums are duly paid and the other conditions of assurance are not infringed. It has no opportunity of reviewing its position and withdrawing from the bargain should that appear likely to be a losing one. The policy- holder, on the other hand, is free to continue or to drop the assurance as he pleases, and it may fairly be presumed that he will take whichever course will best serve his own interest. If he is in failing health he is the more likely to make an effort to keep the assurance on foot ; if he has also fallen into adverse circumstances, his friends may aid him to maintain his policy for the benefit of those dependent on him, or he may dispose of it to some one who, knowing the circumstances, may be willing to give a high price for it, speculating on the chance of its becoming an early claim. All these things do happen, and the tendency obviously is

estimate of the risk have been disclosed. These circum- stances are beyond its own knowledge, and as the office for the most part (except as regards the result of the medical examination, which may reveal features of the case un- known to the proposer himself) is dependent on the infor- mation furnished by the party seeking to effect the assur- ance, it is proper that the latter be made responsible for the correctness of such information. Accordingly it is made a stipulation, preliminary to the issue of every policy, that all the required information bearing upon the risk shall have been truly and fairly stated, and that in case of any misrepresentation, or any concealment of material facts, the assurance shall be forfeited. In practice, however, this forfeiture is rarely insisted on unless there has been an evident intention to deceive. The other usual conditions of life assurance policies may be shortly noticed.

1, As to Payment of Premiums.—aA certain period of grace is Days of allowed, most commonly thirty days, after each premium falls due. grace.

If payment is not made within that time, the presumption is that the policyholder intends to drop the contract, and the risk of the office comes toan end. It may, however, be revived on certain con- ditions,

usually the production of evidence of health and payment of a fine in addition to the premium. An impression used to prevail among the public that the offices were interested in encouraging the forfciture of policies. If any such impression was ever sharec by the offices themselves it must have long since passed away, as it will be found that every reasonable effort is now made on their part, not only to secure assurances but to retain them, and to afford all the facilities that can be extended to policyholders with that object.

2. As to Foreign Travel and Residence,and as to Hazardous Occu- Foreign pations.—When Mr Babbage wrote his Comparative View of Assur- limits, anee Institutions in 1826, voyaging abroad was scarcely permitted &c,

that policies on deteriorated and unhealthy lives are kept in force, while those on lives having good prospects of

Non-

longevity are more readily given up. Again, the retiring policyholder, by withdrawing his annual contribution, not only diminishes the fund from which expenses are met, but lessens the area over which these are spread, and so increases the burden for those whoremain, Considerations like these point to the conclusion that, in fairness to the remaining constituents of the office, the surrender value to be allowed for a policy which is to be given up should be less than the reserve value. The common practice is to allow a proportion only of the reserve value. Some offices have adopted the plan of allowing a specified proportion of the amount of premiums paid. This plan is not defended on any ground of principle, but is followed for its simplicity and as a concession to a popular demand for fixed surrender values, :

Another mode of securing to retiring policyholders the

- benefit of the reserve values of their assurances is that syse™- known as the non-forfeiture system. This system was first

introduced in America, whence it found its way to the United Kingdom, where it was gradually adopted by a large proportion of the assurance companies. In its origi- nal form it was known as the "ten years nou-forfeiture plan." The policies were effected by premiums payable during ten years only, the rates being of eourse correspond- ingly high. If during those ten years the policyholder wished to discontinue his payments, he was entitled to a free 'paid-up policy" for as many tenth parts of the original sum assured as he had paid premiums, The system, once introduced was gradually extended first

under a life poliey. The Elbe and the Garonne, Texel and Havre, Texel and Brest, the Elbe and Brest, were the limits prescribed by most of the English offices. Even at a much later period the extra premiums charged for lcave to travel or reside abroad were very heavy. But improved means of conveyancc—in some places better sanitary appliances, and habits of living morc suited to the elimatie eonditions—and, more than all perhaps, the knowledge that has been gained by experience as to the extent of the extra risks in- volved and the relative salubrity of foreign climates—have enabled the offices to modify their terms very considerably. The limits of free residence and travel have been greatly widened, and where extra premiums are still required these arc, as a rule, much lower than formerly. The assured are now commonly permitted to reside any- where within such limits as north of 35° N. lat. (except in Asia) or south of 30°S. lat., and to travel to and from any places within those limits, without extra premium.

Military men (when on active service) and seafaring men are of course charged cxtra rates, as are also persons following spccially dangerous or unhealthy occupations at home.

3. As to Suieide.—The policies of mosf companies contain a Suicide.

proviso that the assurance shall be void in ease the person whose life is assured dies by his own hand. This proviso is analogous to that which renders void a fire policy if the insured becomes guilty of arson, or a poliey of marine insurance if the vessel is wrecked intentionally by the owner. The event contcmplated in the policy being brought about by the voluntary act of the assured, and not in the natural course of

events, is a contingency not included in the scheme of insurance. In the case of life policics the gencral rule of law appears to be (see The Law of Life Assurance, by C. J. Bunyon) that the contract will be avoided unless the suicide takes place when the assured is insane and not accountable for his acts. Sometimes the proviso " whether insane or not" is inserted in policies, In the ease of policies bona fide assigned, or otherwise held by a third party for an onerous cause, it 1s usual to exempt the assurance from forfeiture to the extent of the interest of such third party, The practice of assurance offices, however, in regard to

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suicides, is more liberal than a strict application of legal priuciple, or of the conditions attached to life policics, would require. A few offices have abolished the suicide clause from their policies. A number of others, acting, we think, on a sounder principle, now limit its operation to a fixed period, the extent of which varies in diffcrent offices from six months to seven years from the date of issue of the policy. In cases happening within those periods, or when there is no express exemption from forfeiture, officcs are usually ready to grant any relief which circumstances may seem to warrant, such as an allowance of the surrender value or a return of the premiums paid under the policy.

Indis- The practice of rendcring policies ¢rdisputable and frec from re-

putable striction as to foreign travel or residence, aftcr a ccrtain period, has

policies. tended greatly to simplify the contract between the office and the assured, by setting at rest many points on which difficulty might arise. A declaration of indisputability covers any 1naccuracies 1n the original documeuts on which a policy was granted, unless these inaccuracies amount to fraud, which the law will not condone under any circumstances.

Begin- History.—It does not appear that the principles of nings of insurance were applied in any definite form to transactions ees

depending on human life until about the 16th century. nmane" At that time, and for long afterwards in England, the private underwriters who carried on the business of insurance sometimes undertook risks upon lives for short periods, to cover contingencies of a temporary character. The premiums were very high, but this was in part necessary for two reasons—first, the insurers had no sufficient data upon which to estimate the risk they incurred; and secondly, the transactions were probably not numerous enough to 'secure anything like a regular average in the occurrence of claims. About the end of the 17th century several "annuity" schemes were formed, notably that of the Mercers Company of London, for the benefit of the widows and orphans of subscribers. These schemes, however, and numerous others of similar character promoted in the succeeding century, failed for lack of correct data and sufficient knowledge of the principles which should have guided their operations, But the idea of uniting the contributions of a number of persons in order to make a provision available on the death of each had taken some hold on the public mind. Its first practi- cal embodiment in the direction of life assurance, but still far short of that system as it is now understood, was the The foundation in 1706 by royal charter of 'The Amicable Amicable Society for a perpetual Assurance Office." The scheme Society. was simply to raise a fixed contribution from each member, and from the proceeds to distribute a certain sum each year among the representatives of those who died during the year. Noone was to be admitted under the age of twelve nor above fifty-five (afterwards altered to forty-five), but all were to pay the same rate of contribution. In 1734 the society made arrangements for guaranteeing that the dividend for each deceased member should not be less than £100. This was the first approach to an "assurance" of a definite sum at death, whenever that might occur. The minimum dividend was afterwards increased, but still the society adhered to the plan of rating all members alike, irrespective of age. It was not until 1807 that the Ami- cable, under a fresh charter, began the practice of rating new members "according to the age and other circum- stances." But that essential step in the development of assurance had been taken long before in another quarter. The theory of life contingencies had made considerable progress, chiefly through the labours of Halley, De Moivre, Simpson, De Parcieux, and Dodson, when in 1756 was

The projected “The Socicty for Equitable Assurances on Lives bla ie and Survivorships.” Mr Dodson, wishing to have his life ociety.

assured, found himself excluded from the Amicable on account of his being more than forty-five years old. This led him to the determination ‘to form a new society upon a plan of assurance on more equitable terms than those of the Amicable, which takes the samc premium for all ages,”

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and he secured the support of various persons who were willing to join him if the intended society could be estab- lished by charter. He did not live to see his purpose accomplished. ‘The petition for a charter of incorporation was presented in 1757, and after a delay of four years it was finally refused, whereupon a remnant of the original subscribers set about constituting the society under a deed of settlement, and business was commenced in 1762. The Equitable possessed from the outset all the essential features of a life assurance office. It was to issue policies for the assurance of fixed sums on single or joint lives, or on survivorships, and for any term. Premiums were to be regulated according to age. Lives were to be admitted with due regard to their state of health and other circumstances. Provision was made for the investment and accumulation of the funds, and also (although imper- fectly) for the disposal of any surplus that might arise. As may be supposed, the original scheme was defective in many points of detail, but under the teachings of experience there was soon initiated that course of improvement in the system of assurance which has continued to the present day.

More than forty years before the foundation of the Other

Equitable, charters of incorporation had been granted to early

two companies which have ever since held an honourable ices.

position among assurance institutions, the Royal Exchange and the London Assurance. These included life assurance in their schemes, but appear to have at first transacted it only to a limited extent and in the form of temporary risks such as were taken by the private underwriters.

Before the close of last century the labours of Price and Morgan had developed in an important degree the theory of life contingencies ; the Northampton Table had supplied what was then esteemed a sound basis for such calculations; and the career of the Equitable Society had demon- strated the practicability of conducting life assurance business on a large scale. Within the period mentioned other four life offices were established, one of which, the Pelican, founded in 1797, is nowin existence. The present century thus cominenced with eight offices transacting, in a more or less complete form, the business of life assurance in Great Britain and Ireland. But the success which attended those older societies, particularly the Equitable, soon led to the formation of other offices, and as these increased in number and activity public attention became more and more attracted to assurance, both as a means of employing capital and as an advantageous form of co-operation for mutual benefit. |

Up to the year 1844 over one hundred and forty Joint-

companies and societies had been established on a more Stock or less solid footing for the purpose of transacting life Com-

: a c : ° anies business, either alone or in connexion with other forms ie

of insurance, and of these offices upwards of one hundred 1844.

remained in existence. But abuses had taken place in connexion with all kinds of joint-stock enterprises, and this led to a parliamentary inquiry which resulted in the Joint-Stock Companies Act of 1844. This Act provided specially for the regulation of insurance companies, and among other things imposed upon them the duty of giving in annual statements of their affairs to be placed upon public record. Not many years passed, however, before the attention of parliament was again

called to life assurance in consequence of the exposure of certain unwise and fraudulent schemes.

actuaries of the day. They found that the law as it then stood was very dcfective, that it did not afford the security which was contemplated by the Act of 1844, and that the provisions of that Act had been very imperfectly carried

A select committee was appointed to Select make inquiries and they reported to the House in 1853, committee,

having examined several public officials and many leading 15°?

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out. In particular the financial returns had not been satis- factorily made. No special form of accounts had been pre- seribed by the Act, nor was there even any authority pro- vided by it to compel the returns to be made. As a matter of fact, the Act had been followed by the promotion of a large number of bubble insurance schemes of various kinds.

The committee had very fully before them the whole question as to the policy of Government interference in matters relating to life assurance. Their conclusion was that assurance differed so much from ordinary business as to call for separate and special legislation; and in that view they made certain recommendations—(1) as to pre- cautions to be taken in regard to the formation of new associations, and (2) as to requiring the publication of valuation returns and accounts giving information on specified particulars. Assurance companies were excepted from the next Government bill relating to joint-stock com-

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effect. It is now no longer practicable to commence a life assurance company without a substantial guarantee for the good faith of those

engaged in it; and the possibility of ruinous amalgamations, such as those which aided so materially in bringing about the collapse of the famous Albert and European offices, may be regarded as a thing of the past. Unfortunately the provisions of the Act in regard to winding-up have more than once been brought into requisition, but it is safe to say that since it came into effect no one who had sought competent advice need have been involved in loss by joining any of the offices which have thus passed under its operation,

On the whole, the Life Assurance Companies Act of 1870, although not without its defects, may be regarded as in many respects a satisfactory measure. In some un- important particulars it has been amended by two subse- quent Acts in 1871 and 1872.

panies, but nothing was done in the shape of legislation,

The year 1870 witnessed the passing of another Married such as that proposed by the committee, until the passing

Act which has an important bearing on life assurance, Women's

companies transacting other kinds of business) the receipts under assurance and annuity contracts to be kept separate from other receipts, in order to form a security for the policyholders and annuitants ; prescribes forms for annual accounts and for periodical valuation reports and statements, to be rendered to the Board of Trade and to be annually laid before parliament; forbids the transfer or amal- gamation of companies without judicial authority, which is not to be given until the policyholders concerned have been fully informed as to the nature and terms of the arrangement, nor if policyholders representing one-tenth or more of the total sums assured dissent; and provides for the winding-up of any company (1) in case of default in complying with the requirements of the Act, or (2) on its being proved to the satisfaction of the court, in view of the contingent or prospective liabilities, that the company is insolvent. In the latter case the court may, if it thinks fit, reduce the amount of the contracts of the company in place of making a winding-up order.

It will be seen that the principle upon which the Act proceeds, in so far as it regulates the management of existing offices, is to require full particulars to be furnished as to their financial condition, and to leave all concerned to form their own judgment upon these. The Government attempts no supervision of the com- panies further than to see that they comply with the requirements of the Act. But the very publicity now given to their affairs exercises a most wholesome influence, wherever that is needed, on institutions which are peculiarly dependent for their success on the estimation in which they are held by the public, It cannot be pretended that the

material furnished by the returns under the Act for –

forming an estimate of the condition of offices is such as to be wholly intelligible to the mass of those interested in it. Nor was this to be expected. The principles of life assurance, which we have endeavoured in some measure to explain in the present article, are such as to require considerable study, and even special training, for their full appreciation. But the material required by the Act is there, to be interpreted by those who have made themselves familiar with its import and bearing, and the public have themselves to blame in great measure if they remain in ignorance as to the real con- dition of any offices in which they may be interested. The provisions of the Act in regard to amalgamations and to the formation of new companies have also had their

Life As- of the Life Assurance Companies Act, 1870, in the framing | Under clause 10 of the Married Women's Property Act, Property 5 G q Act,

surance of which the assurance companies took a considerable share. | 1870, assurances may be effected by married women on 1870.

cs This Act requires a deposit of £20,000 to be made in | their own lives or the lives of their husbands, for their

ae, the Court of Chancery by every new company proposing to | separate use, and by married men on their own lives for

1870. transact life assurance business; requires (in the case of | the benefit of wife, or wife and children, free from the

claims of creditors. In 1880 the Scottish life offices pre-

pared a short bill containing similar provisions in regard Scotch to assurances, but with certain improvements on thie Act.

English Act, and it was passed into law as the Married Women's Policies of Assurance (Scotland) Act, 1880.

The Blue-Books containing the returns made under the Statistics Life Assurance Companies Act afford a vast amount of of 1880.

information as to the financial condition of British life offices, From an abstract in Mr White's Znsurance Register for 1881 we gather the following particulars in regard to one hundred and seven companies which furnished returns during the year 1880. The premiums received in one year by those companies amounted to £18,174,848, and the interest and dividends on investments to £5,342,988. The sums paid in claims during the same period were £11,149,730 ; for surrenders of policies £720,406; and as cash bonus or in reduction of premiums £763,704. The total amount of funds held by the companies(including, how- ever, £6,151,479 of fire insurance funds) was £143,813,793. Of this sum £120,131,541 represented the life assurance and annuity funds. The amount of paid-up share capital cmbarked in these enterprises was £10,961,744, in addi- tion to which (but also included in the above sum of £143,813,793) there were reserve and other funds amount- ing to £6,569,029. These statistics include the business of "industrial assurance," transacted by a few offices—a systenl by which small sums are secured on the lives of persons in the humbler ranks of life by the payment of weekly or monthly contributions. The premium income from this source was upwards of £1,600,000 ; the claims reached fully £600,000 ; and the funds in hand in con- nexion with this description of business amounted to up- wards of £1,100,000.

The Act does not require an annual statement of the existing business of assurance companies, nor does it render compulsory the publication

of the amount of new assur- ances annually effected with them ; and, as the companies do not all give those details in their published reports, it is impossible to state with accuracy the amount of assur- ance business transacted by the British offices. Of the 107 companies whose accounts are summarized above, 63 reported in the year 1880 new assurances amounting to £22,551,626, including however, in many cases, sums reassured with other offices. It is roughly estimated that the total assnrances in force with al] the companies amounted in 1880 to £420,000,000.

Govern- ment

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Besides the business transacted by British assurance companics there is a scheme of Government life insurance

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A subject of special interest in connexion with life Legisla. assurance in America is the legislation by which it is tion.

ae authorized by the Act 27 & 28 Vict. cap. 43, and worked | regulated. While the national Government, under the ’ in connexion with the Post-Office. Bya recent parliamen- | constitution of the United States, has supreme control

tary return it appears that from the commencement of the | over all commerce between the States, the courts hold that

scheme in 1864 to 3lst December 1878 there had been | insurance in its various forms is not commerce, and that

issued 5844. policies insuring in all £460,000, and there had | corporations created by a State have no corporate powers

been paid on the death of nominees about £25,000. beyond the limits of that State, and can transact no

Ameri- In the United States of America, life assurance has | business beyond those limits, except on sufferance of the

can assur- ance,

attained a greater relative importance among financial institutions than in any other country. Its history there extends back to an early period, but the system has received its main development in coniparatively recent times. During the years which immediately followed the close of the civil war it grew with unparalleled rapidity. The social disorders of the period excited anxiety for the future, and directed earnest attention to institutions which promised exceptional security. The general Government, by its financial administration, and especially by its issues of paper money, furnished a powerful stimulus to the specu- lative tendency in this as in every branch of business. New companies were established in great numbers; new plans and features of assurance contracts were devised ; thousands of energetic agents canvassed the community with their solicitations ; and the published reports of the assurance companies reflected, in a high degree, the fictitious prosperity of the period of inflation. The financial crisis of 1873 applied to the companies a test of great severity. The mushroom institutions of recent growth fell rapidly ; and, while the standard societies, which were administered with wise conservatism, and which had always held the greater part of the business, were unshaken, their growth was seriously checked,

The following figures (for which we are indebted to the Insurance Year Book, Chicago, 1880) give in outline the history of this period. They represent the aggregate business of the companies reporting to the New York insurance department. The figures for 1879 include ‘industrial assurance,” a branch of business but recently developed in America. :

local Government. Hence the life assurance companies are the creatures of State law, and are controlled by the legislatures of the States in which they operate. The first systematic attempt to regulate

the business by Government supervision was made by the State of Massachusetts under a statute passed in 1858 establishing an "insurance department." New York adopted a similar law in 1859, and the example has since been followed in nearly all the States, even in those which have no important assurance companies of their own. Each State has its own peculiar laws, and these undergo frequent changes in detail as successive legislatures attempt to improve or to reform the business, but the general character of the supervision exercised is the same in the different States, and is as follows. A company may be organized at any time for the business of assuring lives and granting annuities, by obtaining from the proper officers of the State the approval of its name and fundamental law or charter, and by depositing with the insurance department a stated sum, usually $100,000, in prescribed securities, as a guaranty of good faith. Since no charters are now granted except under this general law, it is no longer possible to establish a company except by the deposit of a considerable sum in advance,—so that purely mutual companies cannot now be founded ; but it is customary to limit the amount of profit upon the capital to a reasonable rate of interest, and all surplus beyond goes to the policy-holders. In some instances, the capital stock of these "mixed companies " has been redeemed, after their successful establishment, leaving them purely mutual.

In New York and some other States the insurance Regis- department may receive further deposits, representing the tered Basin tnewationies reserve or present value of policies, and hold them accu- Policies.

Amount of Assurance,

Amount of Assurance.

Number.

$ 395,703,058 1,161,729,776 2,023,884, 955 2,086, 027,178 1,735,995, 190 1,457,255,513

$ 155,803,897 471,611,744 587,863,236 465,614,001 232, 665,489 168,633,035

146,729 401,140 747,807 817,081 706,179 653,905

199,050 99,036 112,025

From 1873 to 1879 the number of companies and the aggregate amount at risk steadily decreased. Since then, although no new companies have been organized, there have been no failures, and a healthy and natural increase has beeu observed in the business of the existing offices. The following table shows the aggregates of the principal items in the business of the forty-two most important com- panies in the United States for the years 1879 and 1880, as compiled by the New York Spectator :-—

Total asscts, December 81 ……..sssssercosesscees »5 Jiabilities og (including reserve) Premiums received during the year…….....

$442, 055,862 361,452, 788 54,939,987 79,216,202 22,297,107 8,462,768 10,247,024 13,263,592 62,038,066 194,166,890 1,554, 093,611

$414,271,442 353,684,927 50,753,970 79,437,280 20,665,045 9,646,598

Total income ; Death claims paid

13,815,491 13,470,639 71,483,351

177,891,719 1,515,378,042

4 dividends to policyholders Total disbursements during the year Assurances written

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mulating in trust, for the security of those particular policies, which are "registered" in the State treasury. This scheme was pressed with vigour a few years ago, as offering peculiar protection, but several companies which adopted it have failed, and the settlement of the claims of creditors upon the funds held by the State has been the cause of much delay and costly litigation.

In each State there is a superintendent or commissioner of Superin- insurance whose powers and duties towards the companies tendent The companies must return toto

are varied and important. him under oath every year full statistics of their business in all departments, showing the precise investments of their funds, the amount and sources of their income, the expendi- ture for every purpose, and a schedule of policies with the ele- ments for valuing them. It is the superintendent's duty to see that the investments are made in accordance with the laws, which limit the companies to securities popularly re- garded as the safest ; to make every inquiry which he deems it "desirable for the public interest " to have answered ; to make a valuation of the policies of each company by the legal standard ;! and to report to the legislature every year in full the results of his inquiries and calculations. It is his duty, " whenever he shall deem it expedient so to do," and in particular whenever he shall suspect any statement

1 Each State has its own official standard of valuation. In New York, for example, the American Experience Table of Mortality, com- bined with 43 per cent. interest, is the standard. In Massachusetts it

| is the Seventeon Offices' Experience (British) Table, and 4 per cent.

made by the officers, to "investigate" the affairs of each life assurance company,—that is, to overhaul its books and accounts, examine its muniments of title, and test and scrutinize every part of its administration, No company chartered by any other State or government can do any business within the State, except under his licence and certificate that it has complied with all the laws; and exclusion from the State is the penalty for neglect to answer any question concerning its business which he may ask. In several States he is required to exclude any company which shall take an appeal from the courts of the State to a court of the United States, in a case arising between it and a citizen.

The most important duty imposed on the superintendent is the administration of the legal test of solvency. In New York and most of the other States, his valuation, according to the legal standard, must be made by the net-

premium method, and if any company is unable to meet

Winding up.

Non-for- feiture laws,

Ameri- ean mor- tality tables.

this test by actual possession of the requisite amount of funds, he must commence legal proceedings for its dis- solution, and the distribution of its assets as in bankruptcy. The Act making this course imperative in New York was passed in 1879, but many years earlier the practice had become fixed of requiring a company to meet a net valua- tion of its obligations, or be deemed insolvent. The fair- ness of this unbending application of the net-premium mode of valuation as a test of mere solvency, and the efficiency of the check supplied by a too exclusive reliance on such a test, have often been called in question.

When an insolvent assurance company is wound up, the rule commonly followed by the courts of equity in dis- tributing the proceeds is to recognize each policyholder as a creditor for the amount of reserve corresponding to his assurance at the time of the declared insolvency. The representatives of a policyholder who dies before the actual distribution may claim for the amount of the policy, dis- counted back to the date of insolvency. The whole process of winding up would be much less unsatisfactory than it has proved, if the courts and the departments could make a prompt and inexpensive distribution. But in practice there is too much danger of the distribution being delayed until the.available assets have been largely dissipated in receivership and legal expenses.

In New York, and several other States, the legislature has interfered to prevent the forfeiture of assurances by the failure to pay a premium,

and has undertaken to regu- late the payment of surrender values and the grant of paid-up policies in such cases. There is not, however, any general agreement among the different States as to the basis on which such allowances are to be computed. It is too soon to judge finally of the effect of these non-forfeiture laws upon the business ; but the impression is believed to be growing among thoughtful policyholders that they are too favourable to withdrawing members, and tend to weaken the companies, by encouraging the retirement of the most healthy and profitable lives. Laws of this kind usually proceed upon the theory (which we venture to think an erroneous one) that the reserve for each particular assur- ance is to be looked upon as in some sense the property of the individual policyholder.

The American Experience Table adopted by New York State as the official standard of valuation was constructed by Mr Sheppard Homans from the statistics of the Mutual Life Insurance Company of New York City. Other valuable tables of American experience have been pub- lished, such as that given by Mr W. 8. Nichols (Ass. Mag., xix. 28) from the experience of the Mutual Benefit Insurance Company of New Jersey, and a later collection of the experience of the Mutual Life, more extensive than the first, to which Professor Bartlett has devoted great

attention. Some years ago the Chamber of Life Insurance in America (an association formed among the American assurance Offices) undertook the collection and arrangement of the experience of a number of the companies in the States. Their labours when completed will no doubt throw much additional light on the value of assured life in America. Meantime Professor Bartlett brings out in his tables a longer duration of life than that indicated by experience in England, and Mr Nichols points out a higher relative mortality among young lives in America. If the latter peculiarity be well established, it will follow that the reserves required by American offices may be smaller than those required by English offices, even if the same rate of interest be employed in the calculations.

An interesting feature in the practice of many American Bonus offices is their dividing profits on the “ contribution system.

method,” so called because it aims at returning to eacli class of policyholders a share of the surplus proportionate to the amount contributed to its formation, An explana- tion of this method by Mr Homans, by whom it was originated, will be found in the Assurance Magazine, vol. Xi. p. 121. Bonuses, or “dividends,” as they are called in America, are largely taken in cash, but they may be applied in augmentation of the sums assured.

The “ Tontine” system of assurance has come into pro- Tontine minence of late years. The policyholders under this plan system.

agree that no dividend, return-premium or surrender value shall be received for a term of years called the “ tontine period”; but that the entire surplus from all sources, in- cluding lapses, shall be accumulated to the end of that period, and then divided among all who have maintained their assurances in force. The tontine companies usually offer this plan as an alternative with the ordinary mode of assurance, and large numbers of applicants select it.

In Canada the course of legislation with regard to assur- Canada.

ance has brought about a state of the law very much resembling that in the United States. After the passing of the latest Act in 1877,—-which, among other things, requires all companies to keep separate assets in Canada against their liabilities there,—several British and American offices withdrew from transacting new business in tho Dominion. From the report of the superintendent of insurance for the year 1879 it appears that the number of companies licensed for the transaction of life assurance business in Canada for that year was thirty-six. Of these thirteen did not transact new business, The following are the Canadian statistics for the year referred to.

Assurances in force at end of Year.

Assurances effected during the Year.

Com- Amount Com- Amount panies. Assured. panies. Assured.

nee a ——

$ $

Canadian Companies.} 7 6,112,706 7 | 83,246,543 British Companies….} 11 1,877,918 18 19,410,829 American Companies. 3,363,600 | 11 | 38,616,330 Macaca 36 | 86,273,702

In Australia and New Zealand there were in 1879 Austral- (including the New Zealand Government Insurance Depart- 4s!

ment) ten institutions for life assurance business. The total amount of new assurances granted by them was between £3,000,000 and £4,000,000, upwards of £2,000,000 of which was transacted by one office, the Australian Mutual. The ten offices had in force at the close of the year nearly 70,000 policies, assuring upwards of £23,000,000.

In India, at the Cape of Good Hope, and in the West India, Indies there are native assurance offices, but the business &e.

in those places is largely transacted by companies whose headquarters are in Great Britain.

France.

Germany.

Defini- tion.

The

policy.

Stamp Act.

184 rNSU RA NCL [MARINE.

On the continent of Europe the practice of life assur- ance has not as yet become so widespread as in English- speaking countries. There are assurance companies in various Continental countries, but it is chiefly in France and Germany that any extensive development of the system has taken place.

In France life assurance was later in taking root than in Great Britain, and its development has been much slower. 'There are, however, several large and solid life offices in that country dating back for a considerable period, besides a number of more recent growth, and the business 1s now making remarkable progress. The oldest French company, La Campagnie d'Assurances Générales, founded in 1819, issued in the year 1880 policies to the amount of 81,000,000 francs,—a year's business unequalled in magnitude in the experience of any British office. The following figures, taken from the Mondteur des Assurances, shows the rapid increase of business among the French life offices in recent years. They represent the total amount of new assurances effected in each year :—

Frances, Frances. DRY Seaete cee 254,000, 000 SHAS «vise 315,000,000 1876…....284,000, 000 JRA nanos 337,000,000 SHE es cmscee 278,000,000 ISSO) uo ooasto 435,000,000

There are now twenty companies in France, the aggregate of whose existing assurances must considcrably exceed 2,000,000,000 francs.

In Germany (including German Austria and German Switzerland) there are fifty companies transacting life assurance business, whose aggregate new assurances in the year 1879 amounted to 275,787,828 marks. At the end of that year the number of lives assured was 797,343, for sums amounting to 2,534,764,076 marks. There is now in progress an extensive investigation as to the mortality of assured lives in Germany, to which upwards of twenty Ger- man offices have contributed their expcriencc. (G. M. L.)

TIT. Marine INSURANCE,

Marinc insurance is a contract by which one party, the "insurer" or "underwriter," engages for a stipulated pre- mium to protect another party, the "assured," against loss arising from certain perils, or sca risks, to which his ship, goods, or other interest may be exposed during a specified voyage or period of time.

The policy of insurance, or instrument which contains the contract, is a printed form, with spaces left blank for the insertion in writing of the particulars of the agree- ment. The form in general use appears to have been introduced with the earliest practice of British marine insurance. Although worded in a confused and ambigu- ous manner, its meaning has been clearly defined by a series of legal decisions on the debatable points; and in all cases the written conditions overrule any of the printed clauses that might seem inconsistent with them.

The stamping of policies is at present regulated chiefly by the Customs aud Inland Revenue Act, 1867, 30 Vict. c. 23. This Act provides that no contract or agreement for sea insurance shall be valid unless expressed in a policy ; that all policies must be stamped before signature; that no policy shall be pleaded or admitted as evidence in any court, unless duly stamped; and that no policy can be made for any tinie exceeding twelve months, The stamp duties are—

On Voyage Policies.—For every £100 insured and for any fractional part of £100, 3d.

On Time Policies.—For every £100 insured, and for any fractional part of £100, where the time does not exceed six months, 3d.; where the time exceeds six months, and does not cxceed twelve months, 6d.

If the separate interests of two or more persons be in: sured in one policy the stamp must cover each fractional part of £100, in the amounts of such separate interests, as if it were a full sum of £100. Where insurance is made for a voyage, and also for time, or to cover any time beyond twenty-four hours after the ship's arrival at her destination, the policy is chargeable with duty as a voyage policy, and also with duty as a time policy. The penalty exigible from any person

engaged in effecting or sub- scribing policies which have not been duly stamped is £100.

By the Act 33 & 34 Vict. c. 97, § 117, it is provided that policies made abroad, but in any manner enforceable within the United Kingdom, are liable to the duty, and may be stamped at any time within two months after they have first been received in the United Kingdom. Further, by the Act 39 Vict. c. 6, § 2, it is now provided that, for the purpose of being given in evidence, any policy may be stamped after execution, on payment of the penalty of £100.

In practice it is usually desirable to conclude an agrec- The slip.

ment for insurance at once, lest some subsequent intelligence should induce either party to recede; and it is customary for the underwriter to sign a "slip," or short memorandum of the insurance, until the stamped policy can be completed. But such memorandums, however obligatory in good faith, are not legally binding. The assured, however, is under no obligation to communicate to the underwriter a material fact coming to his knowledge between the date of the slip and that of the policy. And, when a valid policy exists, the slip is admissible in evidence to throw light on the circumstances under which the risk was offered and accepted.

In order to give validity to the contract, it is necessary Policy that the assured have a right of property, or "interest," without in the thing assured, A policy without interest is held to ™*e"s- be a wager ; and it is declared by the 19th Geo. II. c. 37 that policies bearing the words "interest or no interest," or "without further proof of interest than the policy," or "without benefit of salvage to the insurer," or any policics made by way of gambling or wagering, shall be null aud void. 'The expected profits of a sea adventure may be included in the value of the property for insurance ; but an unwarrantable or fraudulent over-valuation might render the policy void even in respect of the value actually proved.

By the Act 31 & 32 Vict. c, 86 it is provided that, Assign- 'whenever a policy of insurance on any ship, or on any ment of goods in a ship, or

on any freight, has been assigned so as Policies. to pass the beneficial interest in such policy to any person entitled to the property thereby insured, the assignee of such policy shall be entitled to sue thereon in his own name, aud the defendant in any action shall be entitled to make any defence which he would have been entitled to make if the said action had been brought in the name of the person by whom, or on whose account, the policy had been effected.”

A valued policy is one which contains a specific valuation Valued of the interest insured. This valuation forms an essential Policies. element in the adjustment of all claims under the policy, and cannot be set aside except on the ground of fraud.

The burden of proof, in any averment of fraudulent over- valuation, lies on the underwriter.

An open policy is one in which the value of the interest Open insured is not specified. In claims under such policies the Policies. assured must prove the value of the thing insured. The value of a ship for insurance is what she is actually worth at the commencement of the voyage, including all her stores, provisions, and outfit, money advanced for seamen’s wages, and costs of insurance. ‘The difficulty of proving a

Over-in- surance.

Short interest.

Double insur- ance.

Reinsur- ance.

Duration

of risk,

MARINE. |

precise value in the case of ships is sufficiently obvious ; and, to avoid disputes, policies on them ought always to be valued, as is the usual

practice. The value to be proved under an open policy on goods is their first cost, including the expenses of shipment, with any portion of the freight that may have been prepaid, and the costs of insurance. The value to be proved in open policies on freight is the amount of the manifest or freight list, excluding such freight as may have been paid in advance.

When the value proved under an open policy falls skort of the sum originally insured, the difference, which is technically termed an Over-insurance, is treated as a deduction to be made from the amount of the policy. On this footing a proportionate part of the premium is return-able to the assured, who, on his part, can make no claim on the underwriter for loss or damage beyond the value of his interest as actually proved. If, on the other hand, the value proved exceed the amount of the policy, the assured is regarded as "his own underwriter " to the extent of such excess; and the amount of loss or damage, if such has arisen, is apportioned on this footing between the parties relatively to their several proportions of the total value.

A "short interest " arises when only a part of the interest insured has been exposed to risk, as when some portion of the goods specified in the policy have not been loaded on board of the ship. This case is treated in the same manner as that of over-insurance, from which indeed it does not essentially differ.

Double insurance takes place when the same interest has been insured twice or oftener. This frequently occurs, either through mere inadvertence, or from the want of definite information ou the part of the respec- tive persons concerned in the transaction. In such cases, the usual practice is that all the underwriters make a return of premium, in proportion to the amounts of their respective subscriptions, for the excess of the sum insured above the actual value of the interest,—the liabilities of the several underwriters under the different policies being of course proportionally diminished. To this rule, however, there are two important exceptions. One of these occurs when two or more persons insure the same thing, in order to protect the distinct interests which they may individually have in it; the other, when the

circumstances are such that a claim for loss might have been brought against one set of underwriters before the other set had become liable at all.

Reinsurance was formerly illegal in England except in the event of the death, insolvency, or bankruptcy of the original insurer. This Jaw subsisted for about one hundred and sixty years, but it was repealed by the 27 & 28 Vict. c. 65, and the subject of reinsurance was further regulated by the 30 & 31 Vict. c. 23. Reinsurance is now recognized by these statutes as a perfectly legal contract.

The risk on the ship, in voyage policies, commences 'at and from" the place specified in the policy, and continues till she arrive at the destination specified, and have been there moored twenty-four hours in good safety. On goods the risk begins with their loading and ends with their dis- charge at the specified ports. On freight the risk usually commences with the shipment, and terminates with the landing of the goods ; but if there be a contract of affreight- ment, under which the goods have been provided for ship- ment, the risk is held to commence as soon as the ship is in readiness to take them on board. After the risk has once commenced, the whole premium is earned, even although the voyage should not be prosecuted, and the actual risk of the insurers be thereby confined to the mere lying of the ship at the port where the insurance was to commence. But if the risk should not commence at all, or, in technical phrase, if the "policy should not attach," the premium must be returned to the assured.

If the ship should deviate from the regular and usual Devia- course of the specific voyage insured without necessity or tion.

reasonable cause, the underwriter is thenceforth discharged from all liability under the policy. The insurance becomes void as soon as such deviation begins ; and consequently it is quite immaterial whether a subsequent loss of the ship should happen during the actual deviation

or after the ship had returned to her course, the insurer being no longer concerned. It is also immaterial whether the assured was or was not cognizant of the deviation. A mere intention to deviate will not vitiate the policy; but if the ship have sailed on a different voyage from that specified, the insurer is discharged, although the loss should happen before reaching the point of divergence in the two voyages. An unjustifiable delay in the prosecution of tlie voyage operates as a deviation, The causes which justify deviation are such as to refit the ship after she has been disabled, to avoid an enemy or an impending storm, or to save the lives of seamen in distress.

In all voyage policies it is an implied condition of the Sea- contract that the ship shall be seaworthy at the commence- worthi- By this is meant that the ship shall be °°*

ment of the risk. in a fit state, as to repairs, equipments, crew, and all other respects, for encountering the ordinary perils of the voyage insured, at the time of sailing on it. Seaworthiness is a condition precedent to the contract ; and, therefore, where the ship is originally unseaworthy, the underwriter is dis- charged even although the loss should result from causes independent of the particular deficiencies constituting the unseaworthiness, It is not material whether the assured is or is not cognizant of the defects rendering the ship unseaworthy ; and this rule applies indiscriminately to the owners of the ship and the proprietors of the goods on board. There is no engagement that the vessel shall continue to be seaworthy after the voyage has been com- menced ; but it is the owner's duty to take all reasonable means to keep her so. The burden of proof in any aver- ment of unseaworthiness lies on the underwriter, unless where the ship, without adequate cause, becomes leaky soon after sailing. It is now settled law that in time policies there is no implied warranty of seaworthiness at any period of the risk. This was decided in the cases of Gibson v, Small (June 1853), and Fawcus ». Sarsfield (March 1856), and more recently by the House of Lords in Dudgeon v, Pembroke (March 1877).

The contract of insurance being pre-eminently one based Misrepre- on the assumption of perfect good faith between the sentation.

parties, it is the duty of the party wishing to effect the policy to make a true disclosure of every circumstance likely to affect the underwriter's estimate of the risk. The concealment or misrepresentation of material facts, or the representation of anything not consistent with the facts, will render the policy void, This rule holds good even where the concealment or misrepresentation may have resulted from a mistake, without the intention to deceive. If the underwriter has actually been deceived, whether wilfully or by mistake, the risk is different from that understood and intended to be run; and on this ground he is discharged. The materiality of a concealment or misrepresentation depends, not on its eventual influence on the result of the risk, but on its immediate influence on the judgment of the underwriter at the time of effecting the insurance. The loss may arise from causes totally uncon- nected with the facts concealed or misrepresented, but the policy may nevertheless be void, because a true disclosure of the facts at the time of effecting it might have led the underwriter to decline the insurance altogether, or to accept it only at a higher premium. If an agent be employed to effect the insurance, he is bound to communicate to the underwriter, not only all the material facts disclosed to XIII. — 24

Perils insured against,

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himself by his principal, but also any other material facts which may have come to his knowledge from other sources. If either the principal or the agent fail to communicate such facts, the policy will be void. Should any material fact come to the knowledge of the parties wishing to effect the insurance after they have sent away an order to have it effected, they are bound to intimate such fact without delay, so that the underwriter may be informed of it (if there should still be time) before he has accepted the risk. The suppression of information tending to show that the ship was overdue, or that there were rumours current as to her having met with some accident (even though it afterwards appeared that these rumours were unfounded), is concealment fatal to the validity of the contract. It has also been held that a policy was void

because the agents employed to effect it failed to inform the under- writers that their principal had instructed them to wait the arrival of the ship for a certain number of days before acting on the order to insure. Misrepresentations of the terms on which other underwriters have agreed to accept the insurance will be fatal to the validity of the contract, as well as misrepresentation of the risk itself. It may be observed generally that every circumstance repre- sented to the underwriter ought to be at least substantially true. A mere expression of opinion or expectation does not of course amount to a positive representation of facts ; but the opinion or expectation expressed must itself be genuine, since, if it: appeared that it had been ouly a pre- tence, or inconsistent with anything within the actual know- ledge of the assured at the time, the policy might be viti- ated. When an express "warranty" is given, its terms must be literally complied with, otherwise the policy will be void. The chief distinction between a warranty and a representation is that the former is always inserted in the policy, while the latter is never so inserted ; and the effect of this is that, while a representation affects the contract only in so far as it may be found to have been material to the risk, a warranty precludes all questions as to materiality, its express terms superseding any such in- quiry.

The perils insured against are described in the printed form as the "adventures and pcrils of the seas, men-of-war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and counter-mart, surprisals, takings at sea, arrests, restraints, and detainments of all kings, princes, and people, of what nation, condition, or quality soever, barratry of the master and mariners, and all other perils, losses, and misfortunes that have or shall come to the hurt, detriment, or damage of the said goods, merchandises, and ship, &c., or any part thereof." It may be observed that, as a general rule, the underwriters are liable only for such losses as are proximately caused by the perils insured against, For the remote consequences of these perils, such, for instance, as the loss of markets through delay, they are not responsible. But, on the other hand, if a loss has been proximately caused by a peril insured against, the underwriters are not relieved from liability, although such loss may have been remotely occasioned by the acts or negligence of the assured

or his agents. The reason for this rule, as given by Lord Bacon, is that "it were infinite for the law to consider the causes of causes, and their impulsions one on another; therefore it contenteth itself with the immediate cause."

Losses resulting from breaches of the revenue laws or of the law of nations, or from illegal voyages generally, are not covered by the policy. The risk of "thieves" applies only to plunder committed by open violence, and does not cover losses by secret theft. The illegal acts of the master and erew, if committed without the privity of the owners, will amount to barratry, so as to render the underwriters

responsible for them, but if the master be also owner of the ship, none of his acts will be held as barratrous. A shipmaster, however, who is only part owner may commit barratry as against his co-owners and their underwriters. If the assured be the subject of a foreign state, British underwriters will not be liable for the acts of that state, unless it appear from the form of the policy or from the circumstances of the case that the intention was to insure against such risk. Losses by the ordinary wear and tear of the ship, or by the natural deterioration or decay of perishable goods, are not chargeable to the underwriters.

The printed form of the policy declares that "in case of Duty of

any loss or misfortune it shall be lawful to the assured, their factors, servants, and assigns, to sue, labour, and travel for, in, or about the defence, safeguard, and recovery of the said goods and merchandises, or ship, or any part thereof, without prejudice to this insurance: to the charges wliereof, we, the assurers, will contribute, each one according to the rate and quantity of his sum herein insured." The object of this clause is to permit the assured to take measures for the recovery of the property without losing any right of abandonment he might have in the circumstances, Although the language of tlie clause is only permissive, it is a settled rule that the assured is bound so to labour for the

recovery of the property. The best practical rule for the assured to follow in cases of partial loss or damage is to act in the circumstances as a prudent man would do if uninsured.

An important clause in the printed policy is what is called the "memorandum," which is as follows :—" Corn, fish, salt, fruit, flower, and seed are warranted free from average, unless general, or the ship be stranded. Sugar, tobacco, hemp, flax, hides, and skins are warranted free from average under 5 per cent. And all other goods, also the ship and freight, are warranted free of average under 3 per cent., unless general, or the ship be stranded." The effect of this clause, as interpreted by legal decisions, is to free the underwriter from claims for particular average (or partial damage), or from such claims if under the rates specified, unless the ship be stranded. But if the ship be stranded, he is liable for such claims, whether caused by the stranding or not. For losses of the nature of general average the underwriter is liable whether the ship be stranded or not, and whether the amount be over or under the rates mentioned in the memorandum.

It is frequently a matter of some difficulty to determine whether a ship has been stranded within the meaning of the memorandum.

assured in case of damage,

The memo- randuni.

When an absolute total loss occurs, the assured is entitled Total

to recover the amount of the policy, without giving notice of abandonment. When the subject insured, without being wholly destroyed, is so seriously injured, through the perils insured against, that its recovery might involve greater expenses than its eventual value would cover, it forms a 'constructive total loss," and the assured is entitled to give notice of abandonment to the insurers, and to claim the amount of the policy. (See ABANDON-

loss and

abandon: ment.

Particu- lar average.

MARINE. |

MENT.) It is only, however, when the circumstances seem to involve a virtual loss, as distinguished from a deteriora- tion of the property, that notice of abandonment can be competently given; and, unless the abandonment be accepted, the ultimate state of the facts will alone deter- mine the question whether it can be insisted on. The principle upon which losses are settled, when abandonment is validly made, is that the underwriter becomes the pro- prietor of the subjects abandoned on payment of the sum insured. The effect of an abandonment of the ship is to transfer the ownership to the underwriters, so that what- ever freight she may thereafter earn belongs to them; and, although such freight is thereby lost to the original owners, the insurers of the freight are not liable to them for loss in respect of it, because it is lost only by their own act of abandonment, and not by the perils insured against. When goods are so damaged by the perils insured against that they are necessarily sold at any place other than the original destination, they are constructively lost, and the underwriter is liable for their insured value, under deduc- tion of the net proceeds of the sale. But this rule is not applied to goods warranted "free from average unless stranded," if there has been no stranding of the ship,—it being only in that event that the underwriter is responsible for damage to such goods. A constructive loss of freight occurs when the ship is prevented by any peril insured against from completing her voyage, or when the goods on which the freight is to be earned have received such damage that they cannot be conveyed to their destination ; but if the ship can proceed with other goods, the freight, earned for theso must be deducted from the claim for loss.

Partial loss or damage, arising from the perils insured against, is usually, though somewhat loosely, designated by the term " particular average." Under this head are included the damages suffered from the accidental or voluntary stranding of the ship, or by her getting into collision with another vessel, by lightning, fire, hostile attacks, or the

violence of the sea under any extraordinary circumstances. Damages to the ship's upper works, sails, spars, and rigging are included under particular average if occasioned by the direct force of the sea; but if caused merely by the force of the wind they are treated as wear and tear, and are not chargeable to the insurers. of anchors and cables parted from by the vessel riding hard, or by the anchor hooking to any object at the bottom, is regarded as wear and tear ; and the same rule applies to the repairs of the ship consequent on her becoming leaky through working and straining in a heavy sea. The general principle upon which damages of the nature of particular average are distinguished from those falling under the class of wear and tear is that the former must be caused by the immediate operation of some extra-ordinary accident, while the latter are only the ordinary incidents of navigation, and as such are not within the scope of the underwriter's contract. But the practical application of this principle is a matter of much nicety, and must usually be left to the judgment of a professional average stater.

In adjusting elaims for particular average on sbips, certain deductions are made for the difference between "new and old," unless the ship be on her first voyage, either outward or homeward, or the repairs be only tem- porary. On this footing one-third is deducted from the costs of the materials and labour required for the ship's repairs, excluding, however, the charges for dock dues, surveyor's fees, or similar accessories, which are allowed in full. No deduction is made for anchors (unless in so far as they may be fitted with wood), and the deduction for chain cables is only one-sixth. When a ship has to be recoppered at the expense of the underwriters, the practice

The loss |

is to allow in full the difference of price between old and new metal, to the extent of the weight of the old copper stript off; and if any sheets have been lost by being rubbed off, the cost of replacing these is further

allowed, under deduction of one-third. If the ship has not been stranded, the underwriters are not liable for claims for particular average amounting to less than 3 per cent. on her insured value, independently of the accessory expenses, such as survey fees, &c., which are not taken into account in making up the 3 per cent. Two or more averages occurring in the course of a voyage may, however, be taken together to make up 3 per cent. on the value of the ship, so as to render the insurers liable.

Particular average on goods occurs when they arrive at their port of destination damaged by sea-water, or by its effects in heating or otherwise deteriorating them, although in actual contact only with other portions of the cargo. The amount of compensation recoverable from the insurers for such damage is regulated by comparing the " gross" market price, which the goods would have produced if landed in sound condition, with the actual gross price obtained for them in their damaged state, and by charging to the insurers the same rate of deterioration on the value insured, with the addition of the extra charges specially occasioned by the damage, such as surveys, &c. By this inode of adjustment the assured recovers either more or less than the actual depreciation of the goods, according as the insured value may exceed or fall below the sound market value at the port of destination ; but as the latter value generally includes freights, duties, and other charges, besides profits, it is in most cases in excess of the insured value, and to the extent of such excess the indemnity of the assured is incomplete. The equity, however, of this mode of adjustment is obvious, when it is considered that the insurer receives his premium only on the value insured, and ought therefore to be liable only in respect of that value, while at the same time the gross market values of the goods in their sound and damaged condition furnish the only true criterion of the actual depreciation, because these are the only values with reference to which, ulti- mately at least, purchasers could be influenced. It is, however, customary to adjust particular average on a com- parison of bonded instead of duty-paid prices in claims for damage to tea, tobacco, coffee, wine, and spirits imported into the United Kingdom.

As already indicated, claims for particular average on goods must amount to 3 per cent. or upwards, or in the case of the goods specified in the second clause of the memorandum to 5 per cent. or upwards, otherwise the underwriters will not be liable unless the ship has been stranded ; and it is only when there has been a stranding of the ship that the insurers are liable for any such claims on the goods specified in the first clause of the memor- andum, or on other goods specially warranted "free of particular average."

The subject of general average has been treated under general But it may here be remarked average.

the heading AVERAGE (¢.v.). that, in the very recent case of Attwood v. Sellar (March 1880), it has been decided, contrary to the usage of seventy or eighty years, that the expenses of warehousing and reshipping the cargo ata port of refuge, and of the ship in quitting that port, are the subject of general average contribution.

On the general subject of marine insurance the best book of re- ference is Arnould's Preatise (5th edition), which embraces the lead- ing cases decided in the law courts down to a very recent period. Amongst the minor works bearing on the subject nay be mentioned Mr M. Hopkins's Manual of Marine Insuranee, and Mr Charles M'Arthur's Policy of Marine Insurance Popularly Explained, and especially Mr R. Lowndes's Practical Treatise on the Law of Marine Insuranee (1881). (J. WA.)

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INTERDICT (interdictum sc. officiorum divinorum), in its full technical sense as an ecclesiastical term, means a sentence by a competent ecclesiastical authority (popes, councils, bishops with chapters) forbidding all administra- tion of the sacraments, celebration of public worship, and use of the burial service. An interdict may be either local, personal, or mixed, according as it applies to a locality, to a particular person or class of persons, or to a particular locality as long as it shall be the residence of a particular person or class of persons. Local interdicts again may be either general or particular; in the latter

instance they refer only to particular buildings set apart for religious services. In the writings of Augustine (Zpp., 250) there is an indication that something of the nature of an interdict had been attempted in his diocese by a certain bishop Auxilius ; the attempt is strongly condemned by Augustine, who disapproved of the plan, as making the innocent suffer along with the guilty. In 869 Hinemar of Laon laid his entire diocese under an interdict, a proceeding for which he was severely censured by Hincmar of Rheims. In the Chronicle of Ademar of Limoges (ad ann. 994) it is stated that Bishop Alduin introduced there 'a new plan for punishing the wickedness of his people; he ordered the churches and monasteries to cease from divine worship and the people to abstain from divine praise, and this he called excommunication" (see Gieseler, Kirchengesch. iti, 342,

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where also the text is given of a proposal to a similar effect made by Odolric, abbot of St Martial, at the council of Limoges in 1031). It was not until the 11th century that the use of the interdict obtained a recognized place among the means of discipline at the disposal of the Roman hierarchy. Important historical instances of the use of the interdict occur, in the cases of Scotland under Pope Alexander III. in 1181, of France under Innocent ITI. in 1200, and of England under the same pope in 1209. So far as the interdict is " personal," that is to say, applied to a particular individual, it may be regarded as synonymous with EXcoMMUNICATION (q.v.), an ecclesiastical punishment

'known in one form or another in all churches ; the local

interdict is quite peculiar to the Church of Rome. It is removed by what is termed “ reconciliation.”

INTERDICT, in Scotch law, is an order of court pro- nounced on cause shown for stopping any proceedings com- plained of as illegal or wrongful. It may be resorted to as a remedy against all encroachments either on property or possession, Jor the analogous English practice see INJUNCTION,

INTERDICTION, in Scotch law, is a process of restraint applied to prodigals and others who, “from weakness, facility, or profusion, are liable to imposition.” It is either voluntary or judicial. Voluntary interdiction is effected by the act of the prodigal himself, who executes a bond oblig-

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Environs of Interlaken.

ing himself to do no deed which may affect his estate with- out the assent of certain persons called the “ interdictors.” This may be removed by the court of session, by the joint act of the interdictors and the interdicted, and by the number of interdictors being reduced below the number constituting a quorum. Judicial interdiction is imposed by order of the court itself, either moved by an interested

party or acting in the exercise of its nobile oficium, and can |

only be removed by a similar order. After interdiction duly completed according to law, all deeds done by the interdicted person, so far as they affect or purport to affect his heritable estate, are reducible, unless

they have been done with the consent of the interdictors. Interdiction has no efiect, however, on movable property.

INTEREST, At English common law an agreement to pay interest is not implied unless in the case of negotiable instruments, when it is supported by mercantile usage. Asa general rule therefore debts certain, payable at a specified time, do not carry interest from that time unless there has been an express agreement that they should do so. But when it has been the constant practice of a trade or business to charge interest, or where as between the parties interest has been always charged and paid, a con- tract to pay interest is implied. It is now provided by 3 & 4 Will. IV. c. 42 that, "upon all debts or sums certain payable at a certain time or otherwise, the jury on the trial of any issue or in any inquisition of damages may if

they shall think fit allow interest to the creditor at a rate not exceeding the current rate of interest, from the time when such debts or sums certain were payable, if such debts or sums be payable by virtue of some written instru- ment at a certain time; or if payable otherwise, then from the time when demand of payment shall have been made in writing, so as such demand shall give notice to the debtor that interest will be claimed from the date of such demand until the term of payment: provided that interest shall be payable in all cases in which it is now payable by law." Since the abolition of the usury laws by the 17 & 18 Vict. c. 90, a contract stipulating for higher interest than the legal rate of 5 per cent. is no longer illegal. This Act, however, does not affeet contracts with pawnbrokers. Compound interest requires to be supported by positive proof that it was agreed to by the parties; an established practice to account in this manner will be evidence of such an agreement. In short, under the present law, any con- tract that the parties choose to make as to the amount of interest, or the time or manner of payment, will be enforced like any other agreement. When interest is awarded by a court it is generally at the rate of 4 per cent.; under special circumstances 5 per cent. has been allowed.
INTERLAKEN, or InTERLACHEN, a Swiss village in the canton and 26 miles south-east of the town of Bern, is situated on the left bank of

the Aare in the low-lying district named the Bodeli, between the lakes of Thun and

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Brienz. The name is strictly applied to the few buildings which occupy the site of the religious houses founded in 11380 and abolished in 1528, but is generally used as including also the Héheweg, a handsome avenue shaded with walnut trees and flanked by hotels and shops, and the village of Aarmitihle at its western extremity. The houses are mostly of timber, but the village is lighted with gas, and has an excellent water-supply. The east wing of the Augustinian monastery has been used since 1836 as a hospital for the poor ; and the rest of the building together with the castle, added in 1750, is now occupied by Covern-ment offices. The nunnery, which was suppressed in 1484, has been converted into a prison. The Kursaal, on the . Hoheweg, was opened by the hotelkeepers in 1869. Between 150,000 and 200,000 strangers visit Interlaken annually, being attracted by its beautiful situation and fine climate, as well as by its goat's-whey cure. Interlaken is a convenient centre from which to visit the Bernese Ober- land, with the Grindelwald and Lauterbrunnen valleys and the Giessbach and Staubbach falls. Population of Inuter- laken, Aarmiihle, and the adjacent Unterseen, in 1880, 4080.

INTERNATIONAL. The International Working Men's Association, commonly called the ' International," was formed at London in 1864. It was a society of working men of all nations, somewhat like a cosmopolitan trades union, but bearing a still closer resemblance to an international social science association for discussing and furthering the rights of labour. At first moderate in its tone, it soon began to endorse advanced views respecting property and industrial organization. Shortly after it had attained to the height of its power about 1869, it became more and more allied with the most destructive socialism of western Europe. Weakened by internal disunion, and discredited by its approval of the commune at Paris and its alliance with the communal risings in southern Spain, the International died a natural death before it was quite ten years old,

The occasion of the formation of the International was the visit of some French workmen to the London Exhibi- tion of 1862. This visit had the approval and even the pecuniary support of the emperor, and was warmly com- mended by some of the leading Parisian organs as a means, not only of acquainting them with the industrial treasures of the exhibition, but of removing from the relations of the two countries the old leaven of international discord and jealousy. Inthe course of their visit the French delegates were cordially welcomed at an entertainment at the Free- masons' Tavern, where the labour question was discussed, and a desire for the further interchange of ideas expressed. Nothing decisive, however, was done till 1864, when a great public meeting of working men of all nations was held at St Martin's Hall, at which Professor Beesly pre- sided. Here a provisional committee was appointed to draft the constitution of the new association. In this con- stitution, which was approved at the first congress held at Geneva in 1866, and in a remarkable address issued by the committee the aim of the International is defined in clear and able terms. It was set forth that, notwithstand- ing the vast development of industry and the enormous accumulation of national wealth, the lot of the working class was as hard as cver, All the recent revolutions and political reforms had been achieved only in the interest of the middle classes, leaving the position of the working man unimproved. The emancipation of the working men must be the task of the working men themselves. With this view the International was founded, which, while recogniz- ing truth, justice, and morality as the basis of its action, without distinction of creed, nationality, and colour, would Serve as 2 common centre for the efforts of working men towards their complete deliverance from the tyranny of

capital. A general council having its seat at London was appointed, which was to hold annual congresses and exer- cise a general control over the affairs of the association, while local societies were allowed free play in all local questions. The working men of a district or trade were to form a section, several sections formed a fedcration, and all the societies of each nation were if possible to form a national association;

but all were to be in communication with the International headquarters.

The first four congresses of the International, held at Geneva (September 1866), Lausanne (1867), Brussels (1868), and Basel (1869), marked the rapid. development of the association. It gained its first triumph in the effectual support of the bronze-workers at Paris during their lock-out in 1867; and it repeatedly gave real help to the English unionists by preventing the importation of cheap labour from the Continent. In the beginning of 1868 one hundred and twenty-two societies of South Germany assembled at Nuremberg declared their adhesion to the International. In 1870 Cameron announced him- self as the representative of 800,000 Amcrican workmen who had adopted its principles. It soon spread as far east as Poland and Hungary, and it had affiliated societies with journals devoted to its cause in every country of western Europe. The leading organs of the European press became more than interested in its movements; the Z%mes published four leaders on the Brussels congress. It was supposed to be concerned in all the revolutionary move- ments and agitations of Europe, gaining a world historic notoriety as the rallying point of social overthrow and ruin. Its prestige, however, was always based more on the vast possibilities of the cause it represented than on its actual power. Its organization was loose, its financial resources insignificant ; the Continental unionists joined it more in the hope of borrowing than of contributing support. At the successive congresses its socialistic tendencies became more and more pronounced; it declared its opposition to private property not only in railways but in mines and the soil, holding that these should revert to the community. Even the principle of inheritance was saved only by a narrow majority. In 1869 Bakunin the Russian socialist or nihilist with his party joincd the association, and at once asserted his character as the "apostle of universal destruction."

In 1870 the International resolved to establish itself at the very hearth of the revolutionary movement by holding its annual congress at Paris. This plan was rendered abortive by the Franco-German conflict. That war, how- ever, helped to bring the principles of the association more

decidedly before the world. On general grounds, and during the Austro-Prussian struggle of 1866, it had declared its emphatic condemnation of war; and now the societies of France and Germany as well as the general council at London uttered a solemn protest against this renewal of the scourge. Some of its German adherents likewise incurred the wrath of the authorities by venturing to pro- test against the annexation of Alsace and Lorraine. In this way the International appeared as the champion of a wider principle against the abuse of the principle of nationality.

The relation of the association to the communal rising at Paris in the spring of 1871 has been the subject of much dispute. It is now agreed that the International as such had no part either in originating or conducting it ; some of its French members joined it, but only on their individual responsibility. Its complicity after the event is equally clear, After the fall of the commune the general council of London, Karl Marx included, issued a long and trenchant manifesto, approving its action and extolling the "glorious vanquished." From this point the decline and

fall of the association is to be dated. The English unionists, intent on more practical concerns at home, never took a deep interest in its proceedings; the German socialists were hindered by law from corporate action ; America was too remote. But it found its worst enemies amongst its own friends; the views of Marx and his school were too moderate for the universally subversive principles of Bakunin, and the radical Swiss federation of the Jura led by Guillaume. It came to a rupture at the congress of 1872, held at the Hague, when Bakunin, being outvoted and "excommunicated" by the Marx party, formed a rival International, which found its chief support in Spain and Italy. Wearied of its European contentions and desirous to form a basis of operation in America, the Marx Inter- national now transferred the seat of its general council to New York; but it survived just long enough to hold another congress at Geneva in 1874, and then quietly expired. The party of destruction styling themselves " autonomists " had a

bloodier history. The programme of this party was to overturn all existing institutions, with the view to reconstructing them on some vague communal basis such as had been tried at Paris in 1871. It endeavoured to realize this in the great communal risings in southern Spain in 1873, when its adherents set up their peculiar form of government at Barcelona, Seville, Cadiz, and Cartagena,— at the last-mentioned place also seizing on part of the iron- clad fleet of Spain. As at Paris, they failed in leadership and organization, and were suppressed, though not without difficulty, by the national troops. The " autonomists" lingered on till 1879. At present there is no society that has any claim to the name and prestige of the International. The collapse has thus been complete of an association which once extended from Hungary to San Francisco, and alarmed the minds of men with visions of universal ruin.

See Villetard, Histoire de U' Internationale, Paris, 1871 ; Testut, L' Internationale, Paris, 1871; Onslow Yorke, Seeret History of the International, London, 1871; Emile de Laveleye, Revue des Dewa Mondes, April 1880; Professor Beesly, Fortnightly Review, 1870. (T. K.)

INTERNATIONAL LAW is the name now generally given to the rules of conduct accepted as binding «ter se by the nations—or at.all events the civilized nations—of the world. International law as a whole is capable of being very differently interpreted according to the point of view from which it is regarded, and its rules vary infinitely in point of certainty and acceptance. According to the ideas of the leading English school of jurists it is an impropriety to speak of these rules as being laws; they are merely moral principles,—positive, it is true, in the sense that they are recognized in fact, but destitute of the sanctioning force which is the distinguishing quality of law. There is not a word to be said against this criticism con- sidered merely as a verbal criticism, but it may be so used as unduly to depreciate the actual force and effect of the system as a whole. On the other hand, the vast majority of writers on international law have preferred to derive its principles from some transcendental source, such as nature, reason, the Divine will, &c. ; and these accordingly have no hesitation in attributing to its rules an intrinsic authority over all the nations of the world. The usage of

nations according to this theory is evidence of, but not the origin of, the law. It merely expresses, as Sir R. Phillimore puts it, “the consent of nations to things which are naturally, that is, by the law of God, binding upon them.” The true position is this—that we find as a fact a number of rules accepted by civilized nations as obligatory in their mutual dealings. These rules no doubt in many cases owe their existence to the prevalence of theories of natural and divine law, but their authority no longer depends on the truth of such theories. The rules are in themselves just and reasonable. Some of them are so precise, so certain, and

so universally accepted that they cannot be distinguished from positive law except by the absence of a determinate legislative source. Many of them are taken up by the municipal laws of different countries, and in so far as they are thus incorporated with positive systems they are in every sense positive laws. But many of the rules of international law are vague, uncertain, and of disputed authority. Some of the rules, for example, relating to capture in war, the law of blockade, and the privileges of ambassadors are so well ascertained and settled that it is hardly conceivable that they should be broken by any civilized state. On other points—e.g., as to what articles should be contraband of war, when a state should interfere with the domestic policy of another—no universally admitted principles can be said to have been established. The substance of international law has been for this reason divided into various sections, according to the degree of certainty which the rules have obtained. Thus one of the most recent writers on this subject, Dr Woolsey, distin- guishes the rights and duties known to the science as (1) those which are deducible from natural jus, which no action of a state can begin or terminate, (2) those deducible from the idea of a state, and (3) those which can be created or destroyed by compact, express or tacit. This and similar divisions do not really explain why some of the rules com- posing what is known as international law are as fixed and certain as rules of conduct can well be, while others are pure matter of controversy. It is simpler to state the fact and to take note that the area of certainty in international law is constantly increasing.

For example, the rights of embassies were disputed by England till a recent period ; and the rules prohibiting the slave-trado and making privateering illegal are comparatively recent additions to the certainties of international law. To say that such rules as the last, being founded on contract, are therefore of inferior authority to the imperishable principles which pronounce all sovereigns to be equal and independent, and distinguish between just and unjust wars, is absurd.}

The theory of international law contemplates the world as divided into independent states. That states are sovereign within their own territories, independent of other states, and equal as between themselves is a fundamental axiom of the science. Not that all states are regarded as lying within the domain of this law. In modern times at least it has included all the states of the Christian world ; but at one time it excluded non-Christian states, and at this moment it would be difficult to say to what extent it covers the relations of such states inter se and with the Christian states of Europe and America. There is little doubt, however, that in course of time all the civilized communities of the world will observe substantially the same system of international law.

In the next place international law regards the states of the world as being either in a state of war or in a state of peace. It prescribes rules of conduct to be observed in the mutual dealings of nations which are at peace with each other, and of nations that are at war with each other ; and it fixes the rights and duties of belligerent and neutral nations. If peace is the normal state of nations, as jurists sometimes assert, war is the state which has made the largest demands on the science. The rules of international law with regard to war are more voluminous and more certain than those which govern nations in time of peace.

International law, as we now know it, is substantially the creation of civilized Europe in the last three hun- dred years, but rules of some kind, however meagre,

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1The name “ international law” has generally taken the place of the “law of nations,” the “law of war and peace,” Jus iter gentes, &c., used by earlier writers. Bentham suggested international law as the most suitable title.

must accompany any state of society in which intercourse, hostile or peaceful, between different communities is common. The great nations of antiquity which have contributed most to the civilization of modern Europe have given least to this branch of that civilization. The history of the Jews furnishes nothing but examples of the total absence of a sense of duty in relation to other nations. The division of the Greek world into a large number of independent communities favoured the existence of an Hellenic law of nations, presenting in many points— such as the recognition of common Hellenic customs, religious and political, and of the principle of a balance of power— a parallel to modern international law. The coherence of the Greek communities, however, only intensified the difference between them and all other peoples, and left their relations with them unregulated by any general principles. The jus fectale of the earlier Roman law— regulating the formal intercourse between Rome and other nations—is indeed the germ of what might have been a system of pure international law. But the rise of the Roman commonwealth to the mastery of the world rendered a jus inter gentes unnecessary and impossible. The fecial law with its college of interpreting priests dwindled into an obsolete collection of formalities no longer supported by the religious feelings of the people. The jus gentium of the Romans does indeed play an important part in the history of international law, but as conceived of by the Roman lawyers it was not international, but a body of positive law composed of the elements common_to the nations known to them, including Rome itself. Positive international law does not in fact come into existence until the era of Grotius, although usages of international intercourse must at all times have existed. The sanctity attributed to ambassadors, the importance of formal declarations of war, and the good faith to be observed in promises or treaties would probably be found to be the points of most general recognition.

The connexion between Roman and modern international law, through the conceptions of jus gentiwm and jus nature, has been lucidly traced by Sir Henry Maine in his treatise on Ancient Law, and may be briefly noticed here. The postulates of the law of nations—that there is a determinate law of nature, that it is binding on states inter se, and that such states are equal—are founded on well-known general principles of the Roman jurists. The ambiguity of the phrase jus gentiwm enabled the early founders of international law to apply the principles of the jus nature to the conduct of states inter se in a way of which there is no example in the Roman law-books. Further, in the Middle Ages the state systems of Europe had arranged themselves on a territorial basis, so that sovereigns were regarded as being the absolute masters of the territory _ occupied by their people, instead of the chiefs of the people "irrespective of territory. They could thus be coneeived as "members of a group of Roman proprietors," and the Roman law of property supplied the fundamental principles on which their occupation was in international law under- stood to be based. 'The appearance of jurists, dominated by the conceptions of the Roman law, at a time when European arrangements made their application possible, is the true beginning of modern international law. The greatest name is that of Grotius, whose work De jure Belli et Pacis was published in 1624. In the first sentence of the prolegomena he defines his subject as the law which obtains between nations or their rulers, whether founded on native or divine ordinance, or custom and tacit consent, which he adds wniversim ac certo ordine tractavit hactenus nemo. 'There had been earlier workers in the same field. Among these were Francis de Victoria of Salamanca, Suarez, Ayala, and Albericus Gentilis, all of whom

flourished in the 16th century. The work of Grotius definitely laid the foundation of the science, which he shaped in imitation of the institutional treatises of Roman law. Among the jurists who followed Grotius, the classical names are those of Puffendorf, Wolff, Vattel, and Bynkers- hoek. In England Sir Leoline Jenkins and Lord Stowell are the most illustrious of those who have made impor- tant contributions to international law. In America Wheaton stands at the head of a school

of distinguished jurists, and his Hlements of International Law is the standard modern treatise on the subject.

Several of the more important heads of international law will have to be noticed separately, and it is only proposed in the present article to state shortly and in outline its leading principles so far as they can be gathered from the most authoritative modern writers. It will be convenient to discuss first the general rules obtaining between nation and nation, and, secondly, the modifications and special rules which are brought into existence by a state of war.

It may be necessary to distinguish here between public international law and what is known as private international law. The latter phrase is applied to those principles which in the ordinary tribunals of a country are used to harmonize the conflict of laws. Where the subject of a foreign state has a claim against the queen or any of the queen's subjects, for which he seeks redress in our courts of law, it may become necessary to recognize and enforce the law of the foreign state and not the law of England. The best illustration of this class of questions is the case of domicile. For many purposes the place in which a man is domiciled, as distinguished both from that in which he lives and the country of which he is a subject, supplies the law applicable to his case. A French subject, domiciled iu Scotland, dies in England leaving personal property in England ; in such a case the property would be distributed according to the law of Scotland, and not of England or of France. All nations have to provide for such cases, in which the principles of a foreign jurisprudence must be enforced, and have to determine under what conditions and to what extent the tribunal will be required to enforce them. As it happens there is a general agreement among nations on these points; the rule, for example, which makes real property administrable according to the law of the land, and personal property according to the law of the owner's domicile, is universally recognized. So far as this agreement extends, there may be said to be a private international law corresponding to the international system of public law. But in the former we have to deal with true positive law, deriving its authority from the legislature, having no reference to the opinions and practice of nations, and dealing with the rights of individuals. Public international law is of a totally different character, recognizing nations as the only parties, and depending on the agreement of nations as evinced by their opinions and practice. It is with the latter only that we have now to deal.

Independent sovereign states are then the units of international law, and whether a given community is such a state is a question of fact. A community having definite territorial limits within which its own government exercises absolute authority, free from all external control, is the proper type of a state in international law. But the world is not

parcelled out among states thus accurately defined. Where a number of states have been united in a permanent confederation, it may be a question whether the group alone is in international law an independent state, or whether each individual member has retained its inter- national independence. The United States of America are an example of the former case; the German confederation until the recent changes was an example of the other. Again, when one state has placed itself under the protection

of another, it may be a question whether it has lost or retained its independent status in international law. The proper test, according to Phillimore, is its capacity de facto to deal with other states in peace or war, withont reference to the protecting state. States which have lost this capacity have been called semi-sovercign states, They have the organization of an independent nation, but are in practice subject to the rule of another state. The Ionian Islands under the English protectorate were in that position, and in the treaty of 1815 they are described as a single free and independent state, under the exclusive protection of Great Britain. A similar character attaches to some of the dependencies of Turkey. On the other hand, a large portion of the surface of the earth is occupied by com- munities having neither the permanent territorial occupation nor the social coherence of civilized states, yet entering into such relations with them as require the recognition of some system of rules. A further question of the highest importance may arise when a portion of an existing state rises in rebellion and sets up a claim to independence. Here again the question is one of fact. If the rebels have succeeded in establishing a government, it is the right and duty of the nations to recognize the fact, and each nation must judge for itself whether the time for recognition has come. Premature recognition would be regarded as an aid to rebcllion inconsistent with the rules of international law. The criterion suggested by practice and authority is whether the old government had ceased to contend in fact against the revolutionary state. But other nations are not bound to wait until the old government has itself recognized the independence of the new. Similar questions arise when the form of

government in any country is changed by revolution, or when portions of one state are transferred by conquest to the dominion of another. When the new state of things is established in fact, no matter whether justly or unjustly, it must be recognized by other nations. With the question of recognition is intimately connected that of non-interference. Premature recognition of a strug- gling rebellion would be regarded as a breach of the prin- ciple of non-intervention, but to recognize the independence of an independent state is part of the same duty as to abstain from interfering with it when it has been established. Writers on international law lay it down as one of the fundamental principles of the science that one state has no right to interfere with the domestic affairs of another. In the formal arrangement of topics it generally appears as one of the necessary consequences flowing from the in- dependence of nations, and Phillimore considers it a self- evident proposition for which it is unnecessary to cite authorities. Nevertheless the practice of nations forbids the doctrine to be stated without limitation. Interference has been sanctioned, according to Phillimore, either in the purely domestic concerns of a nation, or with respect to its foreign relations and territorial acquisitions. The first kind of interference has been justified on the plea of self- defence, as when the decree of the French Convention of 1792, promising aid to all peoples who wished to recover their liberty, was treated as a declaration of war on all existing constitutions. Interference to prevent effusion of blood, or put an end to a state of anarchy from which the interests of other nations necessarily suffer, has also been justified, as when England, France, and Russia interfered between Turkey and its rebellious subjects in 1827. Onthe whole, the right of intervention has been discredited in international law, and the anomalous con- dition of the Turkish empire has almost alone in recent times given occasion for its exercise. The ground that reversion- ary rights of a particular family to the throne of a country justify foreign interference with legislative changes of the succession can no longer be maintained. Nor is it necessary

to discuss any such pretended right as that of putting down

-new Governments which have established themselves by

revolution. The same kind of interference is illustrated by the principle of the balance of power which is thus enunciated by Dr Woolsey—that any European state may be restrained from pursuing plans of acquisitions or making preparations looking toward future acquisitions which are judged to be hazardous to the independence and national existence of its neighbours. According to the same authority, it applics only to European states and their acquisitions in Europe, and does not extend to predominant power on the sea. It is not so much a rule of inter- national law as a maxim of policy which has from time to time united European nations against the dangerous ambitions of one of their number. The " Monroe doctrine" of the United States is of a similar character, being dirccted against the interference of European states in the affairs of the American continent. The declaration that no European power can be permitted to acquire territory on the American continent is, according to Woolsey, not a princip!e of tha national policy of the United States.

Independent states are said to be equal in international law, because, says Phillimore, it is contrary to the nature of an independent state to be in servitude to another. The proposition negatives any claim of precedence on the part of one or more states in international rank, and asserts that all states equally are entitled to the benefit of inter- national rules. No difference in constitution affects this equality, a republic being the equal of a kingdom, and a kingdom of an empire. Beyond this it can hardly be stretched. It is consistent with conventional inequalities in the reciprocal treatment of nations, and with the habitual recognition in Europe at least of the predominance of the Great Powers. Phillimore deduces from the principle of equality the following rights—(1) the right to protect subjects resident in other countries, (2) the right to recog- nition, (3) the right to external marks of honour, and (4) the right to enter into treaties. As to the first of these, it may be laid down that a state has cause of complaint if its subjects in foreign countries are denied ordinary justice.

States in relation to the territories occupied by them are treated on the footing of proprietors in law. As between nations each is the absolute owner of its dominions, and the principles applicable to their ownership are taken, as already said, from the Roman law of things. For example, the modes of acquiring territory in international law are said to be four. (1) The first is occupation of land not already occupied (7s nullius). Mere discovery unaccompanied by beneficial use and occupation will not givea title. (2) The second is prescription or mere possession for a considerable length of time. Jurists on the whole are agreed in admitting this title, although they refrain from attempting to fix a period of prescription. These have been called original modes of acquisition, while secondary or derivative modes are (3) gift, purchase, or treaty, and (4) conquest in war. With reference to these distinctions it may be observed that the overruling consideration is actual possession as a matter of fact. Sovereignty exercised de facto over any territory makes it the territory of the sovereign state. This is a deduction of what has already been said on the subject of recognition, and the modes of acquisition here described would only be appealed to in defanlt of such unequivocal possession. In former times a bull of the pope has been set up as a title, eg., the famous bull of Alexander VI. granting to Spain all lands west of a north and south line drawn a hundred leagues west of the Azores. No such mode of acquisition would now be recognized even by Catholic states. In modern times the acquisition of territory is tv some extent governed by the wishes of the inhabitants. As an abstract principle of international

justice, the transfer of territory from one sovercignty to ‘another should be with the consent of the people. But this is not yet a recognized rule of international law, although in many recent cases of acquisition of new terri- tory a certain amount of deference has been paid toit. In the treaty of Prague (1866), in the union of the Neapolitan provinces to the kingdom of Italy, and in the union of Savoy and Nice to France, the rights of the inhabitants to decide on the proposed transfers are expressly reserved. A recent and more painful instance is the annexation of the Transvaal by England under an order in council

which authorized the measure if it should appear to be agreeable to the legislature or a sufficient portion of the inhabitants. It is now clear that no such assent was given by the people, while the acting Government of the republic firmly protested against the annexation.

The territory of a state includes all the lands and inland waters within its boundaries, the mouths of rivers, bays, and estuaries, and the sea to the distance of a marine league along the coast. By a fiction vessels on the high seas, and public vessels everywhere, are treated as part of the territory of the state to which they belong. The high seas are no nation's property,—although in the earlier stages of international law exclusive pretensions lave been set up to particular seas, as by Spain to the Pacific, England to the seas around Great. Britain, and Russia to the North Pacific.

Formal intercourse between natious is carried on under well-ascertained rules. Omitting mere ceremonial regula- tions, we may notice specially the position assigued by the law of natious to ambassadors. These are the highest class of diplomatic agents, and according to the universal modern practice they are permanently attached to the foreign court to which they arc accredited. The earlier practice (e.7., before the Reformation) favoured the appointment of special ambassadors for particular business. The office of ambassador, whether permanent or temporary, has at all times been clothed with a character of peculiar sanctity. His privileges during residence at a foreign court may be summed up in the statement that himself, his house, his property, and his household are exempt from the foreign jurisdiction. Like a ship of war in foreign waters, the embassy is exterritorial—supposed by fiction of law to be part of the sovereign's dominions. The ambassador there- fore is not liable to prosecution in the eriminal nor to suit in the civil courts. His official residence is free from the local jurisdiction; but it is no longer an asylum, and a criminal taking refuge there may be seized by the local authority if not delivered up by the ambassador. Ambassadors are further relieved from taxation on goods imported for their own use, a privilege which has not unfrequently been abused. An ambassador is entitled to freedom of worship, whether his religion be tolerated by the local

government or not. The suite of an ambassador down to his domestic servants are also exempt from the local jurisdiction. The household may in some respects be likened to a separate community under the sovereignty of the ambassador. But it is only in minor affairs that his power to actually execute criminal justice on his own servants would now be recognized. The proper course for him to adopt in a serious charge would be to send the accused home to be tried. The privileges of an ambassador and his suite, it should be added, apply only so far as they do not act beyond the limits of their legatorial character, —e.g., aS merchants, trustees, and so on. Exceptional crimes committed by an ambassador do not destroy his character or rights,—at least according to the general con- sensus of modern authorities, although English lawyers have argued that a crime contra jus genttum destroyed the ambassadorial character. Besides ambassadors, two inferior

‘and assisting them in obtaining their legal riglits.

grades of foreign ministers are recognized, viz., (1) envoys, ministers, or others accredited to sovereigns, and (2) chargés d’affaires accredited to ministers charged with foreign affairs. These three grades of diplomatic rank were settled by the congress of Vienna (1815) to avoid the embarrass- ment arising from claims of precedence. Consuls are merely local agents of a foreign Government, for certain limited purposes, such as facilitating and recording legal transactions affecting the subjects of the state they represent, The are appointed with the permission (exeqguatur) of ike country in which they are to act. They have no immunity from local jurisdiction except under special arrangenients, In non-Christian countries the consuls representing Christian states have more extensive functions. In Turkey and the Mahometan countries of the Levant they exercise generally an exclusive criminal and civil jurisdic- tion over their countrymen.

The contracts made by states with each other are in international law treated according to the general principles of the law of contracts (see TREATIES). Under the modern practice rules of private law affecting

foreigners arc in many cases settled by treaty on the basis of reciprocity, eg., extradition, cdpyright, &c.

Hitherto we have considered nations as in a state of peace. War introduces an entirely new order of rules, applying either between the belligerents themselves or between the belligerents and neutral states. To the ques- tion whether a given war be just or unjust international law has no answer to give, or only a formal one. Any war undertaken in defence of the rights which have been already described might be called a just, and any war under- taken in violation of them might be called an unjust war. The justice or injustice of any war is really a question of morality, and in proportion as international law has escaped from the merely ethical region it has abandoued the attempt to decide this question. It figures largely in Grotius, as compared with later writers, and niore largely in the specu- lative than in the positive jurists. One condition of the legality of a war, that of a formal declaration, borrowed from Roman practice by Grotius and some of his followers has ceased to be of any importance, although some publica- tion of the fact of war is considered neccssary in fairness to neutrals. But all wars are legal in international law— that is, they are governed by the rules of the law of war— except wars levied by pirates or piratical communities. The part played by international law has been not to prevent but to regulate warfare. Nations have arrived at a tolerable degree of unanimity as to how wars ought tu be conducted, and the result is a certain and progressive law of war. They are far from having arrived at any un- derstanding as to the conditions under which war ought to be allowed; when they are within sight of any such under- standing, it will be time enough to talk about a war being just or unjust in international law.

The absence of any legal standard of the justice of a war only adds to the importance of the moral question. There being no law of nations to restrain the warlike ambition of nations, as there is to restrain their passions when war has begun, the purely moral restraints become all- important. Among these it might not be worth while to reckon the kind of selfishness which counts the cost of a campaign against a powerful enemy. But a generous horror of war for its own sake may safely be

pronounced to be, in spite of recent events, a growing public sentiment, particularly in the English-speaking people of both worlds. There 1s no English or American statesman who would not at least do lip-service to the principle that an avoidable war 1s a public crime. Some of them have done more. The great experiment in international arbitration between England

and America in 1871 was more glorious to its promoters, and will be more fruitful of bencfit to mankind, than fifty victorious campaigns. It is through the establishment of the principle of arbitration that we may ultimately hope to see the question of justice or injustice in war take its place among the topics of international law.

Short of war, certain preliminary measures of hostility are recognized. These are—"embargo," or the seizure in port of vessels belonging to a foreign nation with which we have a difference, in order to bring it to justice ; "retorsion," or retaliating on the foreign nation or its subjects, by similar injuries to those inflicted on us; and "reprisals," or the seizure of foreign property in retaliation for wrongs done to us. hese are now of little importance. The right of "pacific blockade," ¢.¢., the blockade of ports belonging to a nation with which we profess not to be at war, has been asserted in a few doubtful instances, but such interference ought to be treated as an act of war.

A state of war transforms the nations engaged into two hostile camps, every man in either being the enemy of all in the other, and entitled to slay and capture as best he can. Such at least is the "natural" theory of war, which international law has reduced to much smaller proportions. First, hostile acts are strictly reserved for the soldiers or others acting under direct public authority ; non-combat- ants are to be regarded as neutrals so far as actual warfare is concerned ; they must abstain from hostile acts, and they must be left unharnied by the enemy. Property taken in war belongs to the state, not to the individual captor ; and, on the other hand, subject to modifications to be pointed out hereafter,

only the property of the state and not private property should be liable to capture. War is thus reduced to an open armed strife between two states carried on by means of a definite and unmistakable set of agents, viz., the fleets and armies. That the non-combatant por- tions of the two communities should remain as though they were in a state of peace is the principle towards which international law appears to be tending. The movement against privateering is an illustration of this tendency. In wars carried on by land, non-combatants are as far as possible kept out of the sphere of operations,—persons only under public military command being regarded as combat- ants. In naval warfare it has long been recognized as a valid mode of conducting hostilities to grant "letters of marque" to private vessels, owned, manned, and officered by private persons. Its analogy on land would be a roving commission to private gangs of freebooters. These letters commission the privateers to prey upon tlie commerce of the hostile nation, the reward for their services being the plunder they may chance to gain. The privateer may belong to a neutral nation or to the nation granting the commission, The practice is defended on the ground that it enables a power having weak naval resources to cope with a great naval power on sudden emergencies. On the other hand tlie loose discipline of privateer crews, and the fact that their object is simply plunder, are serious evils, The treaty of Paris of 1856 contains the famous declaration that "privateering is and remains abolished," and the adhesion of the United States to this principle would go far to make the practice illegal by the law of nations. Hitherto they have declined, preferring the more compre- hensive policy of prohibiting the seizure of private property of all kinds by ships of war. This point conceded, the United States would assent to the abolition of privateering.

Contracts entered into between the subjects of hostile states are void. Rights already created by contracts entered into before the war are not destroyed, but the remedy is suspended, an alien enemy having no redress in courts of law. All commercial intercourse between the two peoples is interdicted, according to the maxim that

there caunot be at the same time “a war for arms anda peace for commerce.” Partnerships between a citizen and an alien enemy existing before the war are tpso facto extinguished by the war. All nations, in fact, are agreed in pronouncing illegal during a time of war the ordinary commercial intercourse which prevails between them in time of peace. The principle extends to giving one of two allies a right to prohibit intercourse carried on with or without licence by the subjects of the other with the common enemy. Contracts for the ransom of captured property are valid by the law of nations, but may be and sometimes are restricted by the provisions of a municipal law. Anda state may of course grant special licences to its own subjects to trade with the enemy.

The effect of war on the persons and property of alien enemies within the dominions of the state, and on debts due to them by the state or its subjects before the war, has been greatly softened in modern practice. In strict theory the debts and property would be liable to confiscation, and the persons themselves to detention as prisoners of war. Such is the rule laid down by Bynkershoek, but later writers have held that the guarantees to a contrary effect coutained in commercial treaties and even in voluntary declarations by belligerent powers have altered the law of nations on this point. This question was expressly decided inan important American case (Brown v. the United States), in which the supreme court held that the ancient rule still remained unimpaired as a right recognized by the law of natious, however much it might have been mitigated in practice. In that case, however, its exercise was held to require a special Act of Congress. The confiscation of debts and the confiscation of property seem to stand on the same footing, and in both cases it may be said that the law of nations has not yet formally recognized the rule established by universal practice. The Act of the Con- federate Congress in 1861, confiscating all property and debts (except public debts) due to an alien enemy, may be taken as the exception which proves the rule. It has been unequivocally condemned, and was vigorously pro- tested against at the time by Earl Russell as a violation of the spirit of modern law. Even the Confederate Act did not profess to confiscate public debts, and it may be taken as the settled

rule of law that no state is justified in repudiating its own public obligations to the subjects of a state with which it may be at war.

The Jaws and usages of actual war exhibit the same tendency to substitute a milder and more humane code for the unrestrained licence of earlier times. The inspiring idea of Grotius was in fact to introduce the spirit of law into the conduct of hostilities, to enforce the principle that there was a lawful as well as an unlawful way of waging war. Between the time of Grotius and our own the splicre of law in war has greatly widened. Nonation claiming to be civilized would now venture to conduct a campaign otherwise than according to the rules of civilized warfare, unless against savages from whom no reciprocal treatment is to be expected, or rebels to whom they refuse the status of belligerents. Besides the influence of international law systematically studied as a science, and the general growtli of humaner modes of life and action, a specific cause of this improvement in the law of war is the fact that battle is now for the most part the business of professional soldiers scientifically equipped, and accustomed to stringent disci- pline. For the best historical view of this interesting subject we may refer to Mr Mountague Bernard's paper "*On the Growth of Laws and Usages of War," in the volume of Oxford Essays for 1856.

The actual laws and usages of civilized warfare can scarcely be brought within the scope of the present article, but we may refer to a summary of them contained in the

project of an international declaration submitted to the Brussels conference of 1874. The conference did not result in any international convention, and England firmly repu- diated portions of the declaration which appeared to be calculated to "facilitate aggressive wars, aud to paralyse the patriotic efforts of an invaded people." But on the whole this document, although not accepted into the legis- lation of nations, expresses their general sense on most of the points with which it deals. It lays down rules with regard to (1) the occupation of a hostile country by military force, (2) the distinction between combatants and non- combatants, (3) the means of injuring an enemy,

(4) sieges and bombardments, (5) spies, (6) prisoners of war, (7) sick and wounded, (8) private individuals and private property, (9) contributions and requisitions, (10) flags of truce, (11) capitulations, (12) armistices, (13) belligerents interned or wounded treated in neutral territory. Under the first, second, eighth, and ninth heads the effects of war are restricted to the property of the state and its recognized army, although the necessity of military organization in order to entitle combatants to the rights of war is laid down too stringently. Private property must be respected, and pillage is expressly forbidden, but on the other hand an army of occupation has a right to seize all the personal property of the state which is likely to be of use in war, including any kind of munitions of war although belonging to private individuals or companies. The occupying state is to consider itself in the light of an administrator and usufructuary of the public buildings, &c., of the hostile state. Contributions and requisitions may be imposed on the inhabitants, for which receipts must be given. Under the third head there are forbidden the use of poison or poisoned weapons, murder by treachery or murder of a dis- armed enemy, declaration of "no quarter," projectiles caus- ing unnecessary suffering or prohibited by the declaration of St Petersburg 1818, abuse of the flag of truce, and unneces- sary destruction of enemy's property ; but ruses de guerre are permitted. Spies (who collect information on false pretences or secretly in territory occupied by the enemy) shall when captured be tried and treated according to the law of the army which captures them. The bearer of a flag of truce is inviolable unless he abuse his position, but a commander is not bound to receive a flag of truce. Treat- ment of the wounded is regulated by the Geneva Conven- tion of 1864, and such modifications thereof as may from time to time be made. The English reader will find a copy of the Brussels project in Boyd's edition of Wheaton's International Law. The Geneva Convention, to which reference is here made, was an international compact between the European states, establishing the neutrality of ambulances and military hospitals, and of all persons engaged in the service thereof, as well as of inhabitants of the country bringing help to the wounded. The hospitals, &c., shall bear a distinctive flag (red cross on white ground), and badges similarly distinguished shall be allowed for individuals entitled to the benefits of neutrality. The St Petersburg declaration renounces

for the contracting parties in case of war among themselves the use of "any projectile of a weight below 400 grammes, which is either explosive or charged with fulminating or inflammable substances." War by land is necessarily carried on within the territory of one or other of the belligerents, and generally in the midst of surroundings devoted to the permanent works of civilization and peace. Naval warfare is a duel between two sets of "floating fortresses," on an element which is no nation's exclusive property, and in no nation's continuous possession. 'This is the principal reason for the superior humanity characterizing the rule of war on land, where the licence of primitive warfare would be infinitely more disastrous than it would be at sea, Another reason why

the law of the sea retains so much of its original severity is that its rules have been developed under the influence of a regular court anda professional bar, and have acquired the fixed and inelastic character peculiar to positive law. The toleration of privateering already noticed is an example of the difference between the two systems, and the practice of bombarding seaports to enforce contributions is another. The liability of private property to capture is, however, the most important point of difference. The public vessels of the enemy are of course the natural prey of our own. The private property of the enemy may be contained either in private vessels of his own or in the ships of neutral powers, and we may add for the sake of convenience a third case, where the private vessels of the enemy carry goods belong- ing to neutral owners, In the last case, when the hostile vessel has been captured, the neutral property is not affected thereby—enemy ship does not make enemy goods. In the second case the treaty of Paris has promulgated the rule that free ship makes free goods, which may now be regarded as the established modern rule, In the first case ship and cargo alike are the prey of our vessels of war. In the result, therefore, we may capture the enemy's ships and the enemy's property on board his own ships, but we must spare neutral vessels and all the goods therein, whether belonging to enemies or neutrals, and neutral goods when found on board the enemy's vessels. There is, however, a manifest tendency in international opinion to withdraw private vessels and private property lawfully used altogether from the sphere of warlike

operations. The law of capture by sea is further considered under the heading Prizz.

It remains to speak of the right of neutrals, and their obligations to the belligerents. The neutral nation is to be regarded as the friend of both belligerents, and is bound to treat both of them alike. Jurists distinguish between “strict” or “ordinary ” neutrality, and ‘ imperfect ” neutrality, in which certain advantages are allowed to both belligerents, or in which advantages are granted to one of the belligcrents only under a prior treaty, which the other belligerent does not choose to consider a casus bellz. The “perpetual” neutrality of Belgium and Switzerland secured by treaties binds those states to abstain from taking part in any war arising between their neighbours. The combination of several northern powers to enforce by arms certain alleged rights of neutrals against the claims of belligerents in 1780 and 1800 has been termed an “ armed neutrality.”

Neutral states are entitled to prohibit all belligerent operations within their territory,—using that phrase in the enlarged sense it bears in international law. They may prevent the passage of fleets or armies through those por- tions of the sea or land over which their jurisdiction extends, Hostilities carried on within neutral territory are unlawful, and captures effected thereby are void. The rule is indis- putable, but its application to warfare by sea has not been free from controversy. A capture made outside the neutral territory by the boats of a ship lying within the neutral territory has been held to imply an illegal use of that terri- tory for purposes of war. On the other hand, a capture begun outside but consummated within the neutral territory, is also, notwithstanding the theory set up by Bynkershoek, entirely illegal, It is in fact as much the duty as the right of the neutral state to insist on these prohibitions, as the omission to do so in any case might give an advantage to one belligerent over the other inconsistent with true neutrality. The exemption of neutral property everywhere from the operation of war has been already noticed. The impartiality which it is the duty of the neutral to observe towards the belligerents has been summed up by Vattel in two propositions cited with approval by

Wheaton :—(1) that no assistance should be given to either party in matters relating to war unless under some pre-existing

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stipulation ;1 (2) that in matters not relating to war the neutral should not refuse to one belligerent '* merely because he is at war with the other what she grants to that other." The obligation of impartiality extends to prohibiting the use of the neutral territory for the purpose of fitting out warlike expeditions, equipping vessels, and enlisting men. The right and duty of neutral nations in this respect were first recognized and enforced by the United States, long the chief representative and champion of neutral rights. An Act of Congress passed in 1794, re- enacted 1818, makes it a misdemeanour for "any person within the jurisdiction of the United States to augment the force of any armed vessel belonging to one foreign power at war with another power with whom they are at peace, or to prepare any military expedition against the territories of any foreign nations with whom they are at peace, or to hire or enlist troops or seamen for foreign military or naval service, or to be concerned in fitting out any vessel to cruise or commit hostilities in foreign service, &c." The same principles inspire the English Foreign En- listment Acts which have been pronounced by the well- known writer " Historicus"? to be a transcript of the American law. The 59 Geo. III. c. 69 was the first Act known by this title; the statute now in force is the Foreign Enlistment Act, 1870 (33 & 34 Vict. ¢. 90). These Acts are correctly described as municipal statutes, based indced on international law, but intended for the protection of the neutral state rather than the belli- gerents.2 The purely international obligations of the belligerent have been recently the subject of protracted discussions between England and America, arising out of the depredations committed by Confederate cruisers on American commerce. The treaty of Washington, 1871, by which all these questions were referred to arbitration, directed the arbitrator to apply to them not only the rules of the law of nations but three new rules, which England at least could not admit as being in force when

the claims arose, but which she acceded to as an evidence of her desire to strengtlicn friendly relations with the United States. Both parties agreed to abide by these principles in future, and to invite other nations to accede to them. The rules were that a neutral government is bound —(1) to use due diligence to prevent the fitting out, arming, or equipping within its jurisdiction of any vessel which it has reasonable ground to believe is intended to cruise or to carry on war against a power with which it is at peace, and also to use like diligence to prevent the departure from its jurisdiction of any vessel intended to cruise or carry on war as above, such vessel having been adapted in whole or in part within such jurisdiction to warlike use; (2) not to permit or suffer either belligerent to make use of its ports or waters as the base of naval operations against the other, or for the purpose of renewal or augmentation of military supplies or arms or the recruitment of men ; and (3) to exercise due diligence in its own ports and waters and as to all persons within its jurisdiction, to prevent any violation of the foregoing obligations and duties.

These rules, which we believe to be substantially just, have been unduly discredited in England, partly by the result of the arbitration, which was in favour of the United States, partly by the fact that they were from the point of view of English opinion ex post facto rules, and that the words defining liability ("due diligence") were vague and open to unforeseen constructions,—for

1 Phillimore considers that such stipulations made in time of peace are wrongful and incompatible with sound neutrality. The fulfilment of them would be an attempt to do the act of a belligerent and yet claim the immunity of a neutral,

2 Sir William Vernon Harcourt.

3 Letters on some Questions of International Law, by Historicus, '* On belligerent violations of neutral rights."

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example, the construction actually adopted by the Geneva tribunal that due diligence ought to be exercised in propor- tion to the belligerent's risk of suffering from any failure of the neutral to fulfil his obligations. One important principle, to some extent challenged in these controversies, is established beyond dispute. Whatever the obligations of a neutral in any given case may be, failure to fulfil them is not excused either by defects of the municipal law or by successful evasions of that law. The neutral state ought to make its laws conformable to its international duties, and to compel its subjects to obey them. If it fails in either respect, and injury to belligerents is the consequence, it is answerable under the law of nations.

So far we have been dealing with the rights and duties of neutral states. Neutral commerce in times of war is subject to restrictions which affect individuals rather than states, such as the rules relating to blockade and contra- band of war.

Pirates and savages or uncivilized tribes have been men- tioned as excluded from the benefits of international law. The municipal law of most countries assumes jurisdiction over the former wherever they may be found (see Piracy). With regard to the latter, it cannot be said that civilized nations have observed any rule of law or morality whatso- ever in their dealings with them. The overflowing popula- tion of European nations has been compelled to seek an outlet in regions occupied by men in a low state of civili- zation, neither capable nor desirous of making a beneficial use of them. It is not to be pretended for a moment that the Europeans were bound to leave the continent of America to its original Indians, for even civilized communitics are not permitted to claim dominion over territory which they do not really occupy. But the early European settlers founded their claims on some authority, generally that of thcir own sovereigns, which recognized no right whatever in the original occupants. They were described in patent deeds as "heathens and infidels," and a colour of religious duty was thus imparted to the most barefaced schemes of spoliation. Wheaton cites the authority given by Henry VII. to Cabot and by Queen Elizabeth to Sir Humphrey Gilbert to seek out foreign and barbarous lands "not actually possessed of any Christian prince or people," and to

hold, occupy, and enjoy the same. Vattel, who strongly insists upon the right of civilized people to reduce the ineffective occupation of savages to the narrowest possible limits, warmly commends the conduct of William Penn and the English Quakers in purchasing from its savage occupants the country they wished to inhabit. The colonizing nations, says Wheaton, were agreed in one thing, viz., in "almost entirely disregarding the right of the native inhabitants." Settlements of this kind are not now made from European countries, and public opinion would no longer sanction the pretensions on whieh they were based. But between the European settlements already established and the native tribes by which they are surrounded the same disregard of the rights of the weaker party is only too common. So faras England is concerned, the temptations of her colonists to commit injustice in their dealings with inferior races are counterbalanced by an active public opinion at home. In the conduct of hostili- ties against savages, civilized troops would not be regarded as bound by the international law of war ; and it is difficult to conceive of any restraint other than that of their own sense of decency and humanity. In conflicts between civilized communities the employment of savages on either side is condemned for this very reason. In self-defence the troops opposed to them must resort to practices con- demned by the opinion of the civilized world.

4 Seo Mountague Bernard's British Neutrality.

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The main object of this article has been to exhibit the law of nations as much as possible in the form of a positive system of rules binding on states znter se, to assimilate the treatment of the subject to a statement of the ordinary rules of positive law. Many topics have therefore been omitted which are discussed at length in treatises on international law. It is not always possible to say where international law begins and international morality ends, but it is of the highest importance to mark the distinction. Thc former, taken broadly, means the rules of conduct that the nations of the civilized world admit and insist upon as a matter of course, and the fact that there are such rules is the central fact of the whole subject. Every addition to them is a positive good to the whole

world, and such additions are for the most part to be traced to the reasonings of private thinkers. But to treat principles supported only by the authority of jurists, how- ever distinguished, as of equal validity with those which have been adopted by the universal practice of nations is to weaken the one without strengthening the other. It should be said, moreover, that the systematic study of international law witha view to its improvement by jurists of all countries organized in societies like the Institut de Droit International at once tends to mature opinion and to give it an immediate hold on the practice of nations.

Among the purely speculative questions connected with international law two deserve special notice on' account of the extent to which they have engaged the sympathies at least of the best minds in every age. One is the project for a perpetual peace, the other is the more immediately practical proposal to reduce the law of nations to a written code. With the former the names of Bentham and of Kant are associated. Bentham's plan is a congress of deputies, two from each state, which should determine international disputes, and the decrees of which should be enforced against any state that might resist them by the combined power of the rest. As a preliminary condition he requires the reduction of military establishments and the abandonment by European nations of their colonies. Kant proposes a confederation of states, all under a republican constitution, and acting in international affairs through congresses to be held from time to time. An account of these and other projects of the same kind will be found in Wheaton's History of the Law of Nations. Codification would effect for the law of nations, as a whole, what has already been done for portions of it by the St Petersburg and Geneva conventions, and even by the treaties of Paris and Washington. All states are alike interested in ascertaining the rules to which they have assented in general terms. The work has already been to a great extent performed by private associations, and what is wanted is the formal ratification of their labours by the Governments of the world.

The following are the most authoritative modern works on In- ternational Law :—Henry Wheaton's lements of International Law (8th American edition published in 1866 with notes by Rk. H. Dana,

jun.; an English edition appeared in 1880); Sir Robert Phillimore's Commentaries on International Law, in 4 vols. (a very complete and elaborate work); Sir Travers Twiss's Law of Nations, 2 vols.; and Heffter's Das Huropdische Volkerrecht der Gegenwart. To these may be added the less important treatises of Richard Wildman, William Oke Manning, and H. W. Halleck (American). Useful elementary works are Chancellor Kent's Commentary, which has been edited in England by Dr J. T. Abdy ; T. D. Woolsey's Introduction to the Study of International Law; and W. E. Hall's International Law. The history

of the law of nations has been treated by Wheaton, Ward, K. von Mohl, and F. Laurent. (E. BR.)

INTERPLEADER, in English law, is the form of action used when a person is sued at law for the recovery of money

or goods wherein he has no interest, and which are also claimed of him by some third party. Originally the only

relief available to the possessor against such adverse claims was by means of a bill of interpleader in equity. The Interpleader Act, 1 & 2 Will. IV. ec. 58, enabled the defendant in such cases, on application to the court, to have the original action stayed and converted into a trial between the two claimants. The Common Law Procedure Act of 1860 further extended the power of the common law courts in interpleader ; and the Judicature Act, 1875, enacts that the practice and procedure under these two statutes shall apply to all divisions of the high court of justice. The Judicature Act also extends the remedy of interpleader to a debtor or other person liable in respect of a debt alleged to be assigned, when the assignment is disputed. Inter- pleader is the equivalent of multiplepoinding in Scotch law.

INTESTACY. In dealing with the property of a person who dies without making a will, the law of England dis- tinguishes sharply between his real and his personal estate. The devolution of the former is regulated by the rules of INHERITANCE (g.v.). The destination of

the latter is marked out by the Statute of Distributions. The proper conditions of a testamentary disposition of property will be found under the heading WILL.

The distribution of an intestate's personal estate is carried out under the authority of administrators, whose duties are generally the same as those of executors under a will. Administration was until quite recently a matter cognizable by the ecclesiastical courts, and the ordinary was in fact the administrator until the passing of the 31 Edw. III. st. i. c. 11, An earlier statute (Westminster 2) directed against the abuses of the system required the ordinary, instead of applying the residue of the estate to "pious uses," to pay the debts of the intestate. The Act of Edward III. went further in providing that "in case where aman dieth intestate, the ordinaries shall depute of the next and most lawful friends of the dead person intestate to administer his goods," with power to sue for debts due to the deceased, and under obligation to pay debts due by him, and to answer to the ordinary like executors in the case of testament. Administrators remained on this foot- ing of deputies appointed by the ordinary until the Probate Act transferred the jurisdiction in administration of the ecclesiastical courts to the new court of probate.

The courts of law having held that by the grant of administration the authority of the ecclesiastical courts was exhausted, the administrator became entitled to the privilege, similar to that formerly enjoyed by the ordinary, of dealing as he pleased with residue of the estate. The next of kin of the same degree of relationship with the deceased were thus aggrieved by the preference of the administrator, and it was to remedy this grievance that the Statute of Distributions (22 and 23 Charles IT. c. 10) was passed. It empowered the ordinary to take a bond from the administrator binding him to make a fair and complete distribution of the estates among the next of kin. Such distribution is to be in the following manner : —one-third to the wife of the intestate, and all the residue by equal portions to and amongst the children, and their representatives if any of such children be dead, exclusive of children who shall have any estate by the settlement of the intestate, or shall be advanced by the intestate in his lifetime by portions equal to the shares

allotted to the other children under the distribution. If such advancement should be less than the share of the other children in distribution, then it shall be made equal thereto. But the "heir-at-law, notwithstanding any land that he shall have by descent or otherwise from the intestate, is to have an equal part in distribution with the rest of the children" (§ 5). By § 6, if there be no children nor any legal representatives of children, one moicty of the estate

is to be allotted to the wife of the intestate, the residue "to be distributed equally to any of the next of kindred of the intestate who are equal in degree and those who legally represent them." By § 7 there shall "be no representation admitted among collaterals after brothers' and sisters' chil- dren; and in case there be no wife, then all the said estate to be distributed equally to and among the children ; and in case there be no child, then to the next of kindred in equal degree of or unto the intestate and their legal representa- tives as aforesaid, and in no other manner whatsoever." For the protection of creditors it is enacted that there shall be no distribution till a full year after the intestate's death, and if any debts should be discovered after distribution, the persons sharing the estate shall refund the amount of the same ratably. Finally, by § 4 it is provided that nothing in the Act shall prejudice the customs of London, York, and other places having customable rules of succes- sion; but these have been since abolished. ; With reference to the above rules the following points may be observed :—(1) The husband's absolute right to administer his wife's estate is not affected by the Act. This was made clear by a later Act of the same reign (29 Charles II. ¢. 3). Administration is now granted to the representatives of the husband, where he has died without taking out administration to his wife, unless it can be shown that the wife's next of kin are beneficially interested. (2) The widow, in the event of there being no children or next'of kin, takes only her half. The other half goes to the crown. (3) The child or chil- dren take equally two-thirds if the widow be alive, and the whole if she be dead. If the children of the intestate be

all dead, the grandchildren will take equally amongst themselves as next of kin; if there be neither child nor grandchild alive the great-grandchildren would likewise take equally as a class (per capita). But if some of the children be alive, some dead leaving issue, the children of a deceased child take their father's share (per stirpes). Thus, for example, the ten children of a deceased son would only take between them their father's share if any brother or sister of their father were alive ; if not, they would share equally with the other grandchildren. (4) The next of kin must be ascertained according to the rules of consanguinity, which are the same in English as in the civil law. Degree is calculated from the intestate, through the common ancestor if any, to the kindred. Thus from son to father is one degree, to grandfather two degrees, to brother two degrees, to uncle three degrees, and so on. The statute ordains distribution to be made "to the next of kindred in equal degrees pro suo cuique jure, according to the laws in such cases and the rules and limitations hereafter set down." Equality in degree is therefore not in all cases accompanied by equality in rights of succession. Neglecting the cases of wife and children already noticed, the father excludes all other next of kin. So would a mother, in default of a father surviving, but the Act 1 James II. c. 17 enacted that in such a case the brothers and sisters of the intestate should share equally with the mother. The language both of this and of the principal statute is very inapt, and has given rise to complicated questions of interpretation. In the absence of brothers or sisters and their representatives, the mother in the case supposed would take the whole. Mothers-in-law and stepmothers are not within the rules of consanguinity. As between a brother and a grandfather who are both in the second degree, preference is given to the brother; but a grandfather, being in the second degree, will exclude an uncle, who is in the third. An uncle and a nephew, both being in the third degree, take together. Brothers or sisters of the half blood take equally with brothers and sisters of the whole blood. The rule which prohibits

representations after brothers' and sisters' children would, in a case where the next of kin were uncles or nephews, wholly exclude the children of a deceased uncle or nephew. Also, as between the son of a brother and the grandson of a brother, the latter would not be admitted

by representa- tion. Where a brother and the children of a deceased brother are the next of kin, they will take per stirpes, .e., the brother will take one half, and the children of the other brother will take the other half between them. When the next of kin are all children of the deceased brothers or sisters, they will take equally per capita. Subject to these modifications, the personal estate will be divided equally among the next of kin of equal degree, «g., great-grand- fathers would share with uncles or aunts, as being in the third degree. Failing next of kin, under these rules, the estate goes to the crown as ultimus heres, a result which is more likely to happen in the case of illegitimate persons than in any other.

Personal or movable property takes its legal character from the domicile of the owner, and the distribution of an intestate's goods is therefore regulated by the law of the country in which the intestate was domiciled. A domiciled Scotchman, for example, dies intestate in England, leaving personal property in England; the administrator appointed by the court of probate will be bound to distribute the estate according to the Scotch rules of succession.

In the law of Scotland the free movable estate of the intestate is divided amongst the nearest of kin, the full blood excluding the half blood, and neither mother normaternal relations being originally admitted. The heir of the heritable property if one of the next of kin must collate with the next of kin if he wishes to share in the movables. Proximity of kin is reckoned in the same order as in the case of inheritance. The Intestate Movable Suceession Act, 1855, among other changes, allows the issue of a predeceasing next of kin to come in the place of their parent in succession to an intestate, gives the father of an intestate dying without issue onc- half of the movable estate in preference to brothers and. sisters, and to the mother if the father be dead a similar preference to the extent of one-third, and admits brothers and sisters uterine in the absence of brothers and sisters german or consanguinean.

In the United States the English Statute of Distribution has been taken as the basis of the law for the distribution of personal property in intestacy, and its principles have been applied to real property also. "In

a majority of the States the descent of real and personal property is to the same persons and in the same pro- portions, and the regulation is the same in substance as the English Statute of Distribution. In Georgia the real and personal estate of the intestate is considered as altogether of the same nature and upon the same footing. The English Statute of Distribu- tion, being founded on justice and on the wisdom of ages, was well selected as the most suitable and judicious basis on which to establish our American law of descent and distribution." See INHERITANCE. (E. RB.)

INVERARAY, a royal, parliamentary, and municipal burgh of Scotland, the county town of Argyllshire, is situated at the lower end of a small bay, where the river Aray falls into the north-western waters of Loch Fyne, 40 miles north-west of Glasgow. The town is small, consist- ing of one street running east and west, and a row of houses facing the bay. The county buildings and court- house are handsome edifices. Near the church stands a small obelisk in memory of certain members of the clan Campbell who were executed on the spot in 1685 for preaching against Popery. The ancient market-cross, supposed to have been brought from Iona, is a fine speci- men of the Scottish sculptured stones. The chief industry of Inveraray is the herring-fishery, the herring of Loch Fyne being celebrated for their excellence. To the fishing 'district " of Inveraray there belonged in 1879 690 boats, 1647 fishermen and boys, and fishing-gear to the value of £31,592. In the district, or in boats fishing off its coast, 33,837 barrels of herring and 86 cwt. of cod and ling were cured in 1879. The town originally stood on the north side of the bay, clustering round the ancient baronial hold, attributed to Colin the Singular, who flourished

at the end of the 14th century, but it was removed to its present site in the middle of the 18th century. In- veraray was erected into a burgh of barony in 1472; and Charles I., while a prisoner in Carisbrook Castle, raised it to a royal burgh in 1648. It is governed by a provost and council, Much has been done for Inveraray by the ducal house of Argyll, whose seat, Inveraray Castle, is a quarter of a mile to the north.

This hand- some square edifice, built between 1744 and 1761 and restored 1879-80, consists of two stories and a sunk floor, with round overtopping towers at the four corners, Many interesting and valuable relics were destroyed by a fire in 1877. The population of the royal burgh in 1871 was 984, and in 1881 it was 939.

INVERNESS, a maritime county of Scotland, is situ- ated as to its mainland portion between 56° 38’ and 57° 36’ N. lat. and 3° 27’ and 5° 54’ W. long., and is bounded on the N. by Ross, N.E. by Nairn and Elgin, E. by Banff and Aberdeen, 8.E. by Perthshire, 8. by Argyll, and W. by the Atlantic. It measures 85 miles from north-west to south-east and 55 miles from north-east to south-west. The total area is 2,723,840 acres or 4256 square miles. The mainland portion has an area of 1,947,520 imperial acres or 3043 square miles, of which 86,400 acres or 135 square miles are under water. The area of the islands is 776,320 acres or 1213 square miles, of which the area under water is 39,040 acres or 61 square miles,

The surface of the county is very varied, consisting of ranges of lofty mountains alternating with deep narrow valleys, the beds of numerous lakes and rivers, Its exterior outline is very irregular. On the north-east a narrow tract runs out between Nairnshire and the Moray Firth. Further to the south-east a portion of it was detached till 1870, when by Act 33 & 34 Vict. c. 16 this and a similarly detached portion of Elgin were inter- changed. Argyllshire penetrates it from the south-west, and Ross-shire from the north-west, while the western coast is indented by Lochs Moidart, Aylort, Nevis, Hourn, and other arms of the sea. Both the mainland and island portions abound in grand and picturesque scenery. The islands in the county are those of the Outer Hebrides (excluding Lewis, which belongs to Ross-shire, but includ- ing Harris), and Skye, Raasay, Rona, Scalpa, Eigg, &e. (see HesripEs). The mainland portion is divided into two nearly equal parts by the valley of Glenmore, or the Great Glen, which crosses it from the south-west to the north-east. This glen is now traversed by the Caledonian Canal, which, begun in 1803 and finally completed in 1847, at a total cost of £1,300,000, forms a line of in- land navigation between the east and west seas, from the Moray Firth on the north-east to Loch Linnhe on

the south-west. It has a length of 603 miles, including about 37 miles of lakes, namely, Loch Ness with a length of 23 miles, Loch Oich of 4, and Loch Lochy of 10. On each side of this valley there are numerous glens and straths, separated by mountain ridges, and displaying, with their lakes and rivers, a great variety of beautiful scenery. The western half of the county is the more wild and moun- tainous. Its principal divisions are Moidart, Arisaig, Morar, Knoidart, and Glenelg, with the glens or valleys of Glengarry, Glenmoriston, Glenurquhart, and Strath-glass. Among the numerous lakes in this portion of the county are Loch Shiel bordering on Argyll, Loch Arkaig, Loch Morar, Loch Quoich, and Loch Garry. The eastern half of the county comprises the extensive district of Badenoch, south-west of which lies Lochaber, and to the north the Aird. The principal valleys are Glenroy, Glen Spean, Strathspey, Stratherrick, Strathdearn, and Strath- nairn; and Loch Ericht on the borders of Perthshire, Loch

Treig, Loch Laggan, Loch Inch, and Loch Ouchan are among the largest lakes. The greater part of the county is occupied by mountains, many of which are over 3000 feet in height, the highest summits being Ben Nevis, 4406 feet, and Cairngorm, which is partly in Banffshire, 4095 feet. The principal rivers are the Spey, the Find- horn, and the Nairn, which flow in a north-easterly direction into the Moray Firth ; the Ness, which issuing from Loch Ness flows north-eastwards, passing through the town of Inverness, and falls into the Moray Firth after a course of 6 miles; the Lochy, which flows south- westwards from Loch Lochy, and after a course of 10 miles falls into Loch Eil near Fort William; and the Beauly in the north of the county, which, after being joined by the Glass and two smaller streams, falls into the Beauly Firth. The small river Foyers, which flows north- wards into Loch Ness, forms near the loch two beautiful falls, the one 30 and the other 90 feet in height.

Like the greater part of the Highlands of Scotland, Inver- ness-shire rests on the Old Laurentian gneiss. The Old Red conglomerate is found in Glenmore and along the sea-coast. Granite, gneiss, limestone, slate,

marble, and brick-clay abound in many parts. The general direction of the rocks is from south-west to north-east. The upper part of Ben Nevis is composed of beautiful porphyry. Lead has been found on Ben Nevis and in Glengarry, but is not worked. Silver and iron ore have also been met with in small quantities. The want of coal renders the limestone of little value. On account of the irregular surface the climate of Inverness-shire is very diversified, and in many parts it is very unfavourable for the prosecution of agriculture,

According to the agricultural returns for 1880, the total area of arable land was 126,306 acres, or 4°6 per cent. (4:2 in 1870), of which 39,584, or 1:5 per cent. (1‘4 in 1870), were under corn crops, 19,513, or 0°7 per cent. (0°7 also in 1870), under green crops, 27,155, or 1:0 per cent. (0°‘9 in 1870), under rotation grasses, 39,140, or 1:4 per cent. (1‘2 in 1870), under permanent pasture, and 914 fallow. There were 160,656 acres under wood. Within the last twenty-five years great progress has been made in the reclamation of waste land, the arable land in 1855 extending only to 42,030 acres. There are nearly 300,000 acres of deer forests, and about 1,700,000 of heath land, one half of which affords pasturage for sheep, the other half being of no value except for grouse shooting. From the trees found in great numbers in the peat-bogs of the county it would appear to have been at an early period thickly covered with wood. Strathspey is still celebrated for its great forests; and the natural woods on Loch Arkaig, in Glengarry, Glenmoriston, Strathglass, Strath- farrar, and at the head of Loch Shiel are also very extensive. The forests consist chiefly of oak, fir, birch, ash, mountain ash, holly, elm, hazel, and Scotch poplar. There are also extensive plantations of larch, spruce, silver fir, beech, and plane. Part of the great Caledonian forest extends for several miles near the Perthshire boundary. The most unproductive portion of the county is that to the north-west of the Caledonian Canal, although it in- cludes several patches of highly cultivated land. In the low districts surrounding the county town the soil and climate are both excellent, and good crops of all kinds are caised, which are not much later in reaching maturity than in the earlier districts of Scotland. The soil of the Badenoch and Laggan districts is generally good, but the climate is very uncertain, and much injury is often caused by early frosts. In many districts the

grain in late seasons never reaches full maturity. In the whole of the Western Isles the soil is generally poor, and the moist climate renders it very difficult to secure the crops in good condition.

The number of holdings in June 1880 was 6142. Of these there were 5616 of 50 acres and undcr, with a total extent of 47,772 acres; 248 were between 50 and 100 acres, total 17,407 acres ; 237 between 100 and 800 acres, total 39,746 acres; 30 between 300 and 500 acres, total 11,408 acres; 9 between 500 and 1000 acres, total 6029 acres; and 2 above 1000 acres, total extent 4057 acres. Considerable enterprise has been shown in many districts in the im- provement of land, and on the larger farms the best modern imple- inents of husbandry are in use. The crofter system las very much decreased on the mainland, and some of the crofters now have lcases of five, ten, or fourteen years, and have largely increased their cul- tivated holdings by reclamation. On the larger farms a nineteon years' lease is almost universal, and a five-shift course of cropping is the most common. Large numbers of admirable farm steadings have been erected within late years, and considerable progress has been made in the construction of suitable cottages for married ser- vants. The acreage under wheat has been decreasing very much within late years; the area sown in 1878 was 352 acres, 1n 1879 only 82, and in 1880 146, while in 1855 it was 1539 acres. The best quality raised has always been that of the Aird and Beauly districts. Barley and bere were grown on 7855 acres in 1880 instead of 2220 in 1855. Much good barley is produced in the middle districts, such as Strathspey, Strathnairn, Strathglass, and Glenurquhart. Bere is grown mostly in the late districts and in the Western Isles. Most of the barley is manufactured into whisky in the county. Oats occupy more than three-fourths of the area under grain, —30,714 acres in 1880, instead of 18,704 in 1855. A considerable portion of this crop is of a light and inferior quality, the best being that pro- duced on heavy clay land. There isa considerable area undcr ryc, 814 acres in 1880 as compared with 125 in 1855. It is grown chiefly on the sandy hills south and east of Inverness, Under beans and pease there were in 1880 only 18 and 35 acres respectively. The extent under turnips and Swedes in 1880 was

11,084 acres, the proportion under Swedes heing about one-sixth. Artificial manure is exten-

sively used for the turnip crop, and on many soils the yield is very .

heavy. Potatoes were grown on 8252 aeres in 1880. The dry soil in many parts of the country is well adapted for this crop, and on the more extensive farms they often. constitute a large item in the farmer's profits.

The number of cattle in 1880 was 51,287 (24,061 in 1855), or an average of 40°5 to every hundred acres under cultivation, the aver- age for Scotland being 23:2, and that for the United Kingdom 20°7. Of these the number of cows and heifers in milk or in ealf was 22,208, and the nuinber under two years of age 21,673. The prin- cipal breed is the Highland, the largest and best herds of which are in the Western Isles, There are a few of the polled and shorthorn breeds, and Ayrshire cows have in many places been introduced for dairy purposes. Crosses of an indefinite description are numerous in the lowlands, but in many places their quality has beeu improved by the use of polled or shorthorn bulls. The number of horses in 1880 was 8938 (8485 in 1855), or 7-0 to every hundred acres under cultivation, the proportion for Scotland and also for the United Kingdom being 4*1, Large nuinbers of Highland ponies are raised on the hillfarms. The breed of agricultural horses, which in 1880 numbered 6758, has been much improved by the introduction of Clydesdale stallions. The sheepnumbered 711,910 in 1880 (567,694 in 1855), or 563°7 to every hundred acres under cultivation, the proportion for Scotland being 149°3 and for the United Kingdom 63°5. The majority are either Cheviots or blackfaced, ot which the numbers are about equal, Cheviots having been for some time on the inercasc. Leicesters and half-breeds are kept in several of the lower districts of the country. The number of pigsin 1880 was 2897 (1667 in 1855), an average of 2°3 to every hundred acres under cultivation, the average for Scotland being 2°6 and that for the United Kingdom 6'0. Not much attention is paid to the character of the breed, especially by the crofters, who rear this stock chiefly for domestic consumption.

According to the Returns of Owners of Lands and Heritages, 1872-78, the land was divided among 1867 proprietors; its gross, annual value was £361,848, 5s, and the average value of the whole 2s. 94d. per acre. Of the owners 83% per cent. possessed less than lacre. There were no fewer than thirty proprietors owning more than 20,000 acres, while uineteen possessed upwards of 50,000 acres each, and an ageregate of nearly 1,900,000 acres—viz., Lord Lovat, 161,574; Earl of Seafield, 160,224; Macleod of Macleod, 141,679 ; Evan Baillie, 141,148; Lord Macdonald, 129,919; The Mackintosh, 124,181; Donald Cameron of Lochiel, 109,574; Sir G. Macpherson Grant, 103,372; Edward Ellice, 99,545 ; The Chisholm, 94,328 ; John Gordon of Cluny, 84,404; Sir John P. Orde, 81,099; Trustees of J. M. Grant, 74,646; Mrs Campbell, 74,000; Colonel George G. Walker, 70,940; Sir John W. Ramsden, 60,400; Earl of Dunmore, 60,000; James Baird, 60,000 ; Edward H. Scott, 59,128.

Salmon yield a considerable rent on the rivers Lochy, Beauly, and Ness, and are found also in other streams and in several of the lochs. Red and roe deer, the alpine and

common hare, black game and ptarmigan, grouse, partridges,

and pheasants tenant the moors and woodlands. Foxes and wild cats are found, and otters are to be met with in the lakes and rivers. There are also eagles, hawks, and owls, and great numbers of waterfowl, particularly swans, resort to Loch Inch and the other lakes of Badenoch.

The manufactures of the county are unimportant. At Inverness there are two woollen manufactories, two breweries, and a distillery. The principal distilleries are Ben Nevis distillery near Fort William, Ord distillery near Beauly, Carbost distillery in Skye, and two in the neighbour- hood of Kingussie. There are flour mills in various parts of the county, and artificial manure is manufactured at Kirkton near Inverness. .

The Highland Railway traverses the eastern corner of the county, and enters it again near Campbeltown, skirting its northern shore by Inverness and Beauly.

The only royal burgh is Inverness, the county town. The principal villages are Beauly (population 995), with some shipping trade ; Campbeltown (831), frequented as a bathing-place, and possessing a chalybeate spring; Fort William (1562), near Ben Nevis, with herring and salmon fisheries ; Kingussie (645) ; and Portree (893), in the Isle of Skye, having considerable export trade in cattle, sheep, and fish. The population of the county, which was 88,261 in 1861, and 87,531 in 1871, was found in 1881 to be 90,414 (43,785 males and 46,629 females). The maximum population was reached in 1841, when it was 97,799. In 1801 it was 72,672. The county returns one member of parliament ; and the burgh of Inverness unites with three others in returning a second.

At an early period Inverness was included in the kingdom of the Northern Picts, its mainland portion forming part of the provinces of Moravia and Arguthecla. The latter province with the islands subsequently became the possession of the Norwegians, but was afterwards known as Ergadia, and was divided into three poe Ergadia Borealis, Ergadia quae ad Moravian pertinet, and

Ergadia que ad Scotiam pertinet. For same time the capital of the Pictish kings was at Inverness in Moravia. The province was for a considerable period ruled by the mormaers of Moray, one of whom was the well-known Macbeth, The last of these mormaers was defeated by David J. Early in the 13th century the province, which up to that time had been included under one sheriffdom, was divided into the sheriffdoms of Inverness, Elgin, and Nairn.

Among the antiquarian remains of Inverness-shire are a large number of the so-called Druidical circles, especially in the northern part of the county. At Inshes, 2 miles from Inverness, there are remarkable eromlechs ; and at Clava near Culloden there are large remains of old chambered sepulchres. Numerous traces exist of ancient pit dwellings similar to those of the Picts but of inferior masonry, and there are remains of crannogs or old lake dwellings at the Loch ef the Clans and

Loch Beauly. Two examples of the old Pictish towers still exist at Glenelg in a state of almost perfect pre- servation, and there are others in Glenmore and elsewhere. Among the vitrified forts the principal are those on the hill of Craig Phad- raig, with ten others stretching into the interior; Dundbhairdghall on Ben Nevis; and Dun Fhion or Fingal's fort on the top of a conical hill near the river Beauly. The principal examples of other ancient fortresses are Castle Spynie, an extensive ruin on a hill about 700 feet above the plain and 2 miles east from the church of Beauly, and the remains of massive fortifications on the summit of a steep hill in the parish of Laggan. Among the old castles may be mentioned Urquhart castle, besieged and taken by the officers of Edward I. in 13808, and Inverlochy castle near Fort William. The county formerly eontained three military forts. Of these Fort George, on the Moray Firth, 12 miles east of Inverness, built in 1747-67, at a cost of £160,000 is now used only as barracks; Fort Augustus, at the west end of Loch Ness, originally erected in 1730, and rebuilt after having been demolished by the rebels in 1745, is now almost obliterated, a palatial Benedictine monastery having been erected on its site; Fort William, on Loch Eil, built in the reign.of William III., remains in good preservation, but is inhabited by civilians. On Culloden Moor to the eastward of Inverness was neath the battle (April 10, 1746) which closed the rebellion of

4 es 6.

INVERNESS, a royal, parliamentary, and municipal burgh of Scotland, the capital of the above county, is finely situated at the northern end of Glenmore, on both sides of the river Ness, about half a mile from its mouth, and

on the Highland Railway, 144 miles north-north-west of Perth, and 109 west-north-west from Aberdeen. It is built principally on the right bank of the river, which is crossed by a suspension bridge, a wooden bridge, and a railway bridge of stone. Though very ancient, the town presents quite a modern appearance, and possesses wide and handsome streets, and beautiful suburbs with numerous fine villas. Lately great

improvements have taken place, several new streets having been laid out within a recent period. Onan eminence to the south-west of the town stood an ancient castle in which Macbeth is said to have murdered Duncan. This was razed to the ground by Malcolm Canmore, who erected another on an eminence overhanging the town on the south. The original castle was a royal fortress, and that erected by Malcolm continued to be so till its destruction in 1746. Its site is now occupied by a castellated structure erected in 1835, and comprising the court-house, county buildings, and jail. At the northern extremity of the town Cromwell erected a fort capable of accommodating a thousand men ; this was demolished at the Restoration, but a considerable part of the ramparts still remains. In the centre of the town is the town-hall, completed in 1880, in front of which is a fountain so constructed as to contain the lozenge-shaped stone called Clach-na-Cudain, or " Stone of the Tub," from its having served as a resting-place for women in carrying water from the river. It was regarded as the palladium of the town, and is said to have been carefully preserved after the town was burned by Donald of the Isles. The spire of the old jail, which is of fine proportions, now serves asa belfry for the town clock. In the tower there is a slight twist caused by a shock of earthquakein 1816, The other principal buildings are the episcopal cathedral of St Andrew in the Decorated Gothic style, erected in 1866, and comprising nave, side aisles, transepts, and apsidal chancel ; the academy, incorporated by royal charter in 1792, endowed originally with £20,000, to which in 1803 was added £25,000 left by Captain W. Mackintosh for the edueation of boys of certain familics of that name; the collegiate school, the high school, the school of science and art, the new market buildings, erected in 1871 at a cost of £3100, the northern infirmary, and (outside the burgh) the new depét for soldiers at Millburn. The ceme- tery is finely situated on a hill south-west of the town, and about a mile and a half west of the town is the lunatic asylum, erected in 1864. On Craig Phadraig hill, about a mile west of the town, there is a vitrified fort supposed to have been the residence of the Pictish kings. The manufacturing industries are not extensive; but there are iron-works, breweries, tanneries, woollen factories, and saw-mills. The harbour affords good accommodation for vessels, and there is considerable trade with Aberdeen, Leith, and London on the east

coast, and by means of the Caledonian Canal with Liverpool, Glasgow, and Ireland. Shipbuilding is also carried on. The exports are chiefly sheep, wool, and agricultural produce, and the imports coal and provisions. In 1879 the number of vessels that entered the harbour was 2859, with a total burthen of 309,121 tons, while 2788 cleared, of 304,302 tons burthen. The population of the parliamentary burgh in the 'ten years 1861-71 increased from 12,509 to 14,466, and in 1881 it numbered 17,366. Inverness unites with the burghs of Forres, Fortrose, and Nairn in returning a member to Parliament.

Inverness is of great antiquity, but the exact date of its origin is unknown. At an early period it was incorporated as a town, and it was one of the Pictish capitals. In 1233 an abbey of the Domi- hicans was founded there by Alexander III. Froin William the Lion the town received four charters, one of which created it a royal

burgh. In 1411 it was burned by Donald of the Isles on his way to the battle of Harlaw. The town was visited in 1427 by James

I., whohelda parliament within its walls, and in 1562 it was visited by Queen Mary, who, being refused admission into the castle, caused it to be taken and the governor hanged. During the civil wars the

. castle was repeatedly taken and occupied by the rival forces ; and

in 1746 it was blown up by the troops of Prince Charles Stuart. See Jnvernessiana, by Charles Fraser Mackintosh, 1875.

INVESTITURE, in feudal phraseology, means the act of giving corporal possession of a manor or office,—an act which was usually conjoined with some significant cere- monial, such as the delivery of a branch, a banner, or some other appropriate symbol of the thing conveyed. Investi- ture with staff and ring was during and after the 11th century the name given to the ceremony by which eccle- siastical dignitaries were admitted by the civil power to possession of the temporalities of their office. The word investiture (from '" vestire,' to

put in possession; see Ducange) is later than the 9th century ; the thing itself is an outcome of the feudal system. Under the Frankish monarchy the idea came very early into vogue that the right of nominating bishops lay with the sovereign,—au idea that gained currency all the more widely, especially in Germany, as the territorial and temporal character of the bishoprics and abbacies, with their various immunities and privileges of coinage, toll, market, and the like, gradually came into prominence, and their spiritual nature and functions were proportionally obscured. It was indeed but logical that ecclesiastics, so far as they were the holders of lands, should not be exempted from the ordinary obliga- tions of feudatorics to their suzerain; nor was this view seriously disputed until after the middle of the 11th century, when the views of Hildebrand (afterwards Pope Gregory VII.), who aimed at asserting the absolute freedom of the church from all secular control, began to prevail at Rome. Thus a Roman synod in 1063 forbade all clergy- men from accepting churches at the hands of laymen ; and in 1068 a direct collision took place at Milan between the German court, which had invested a bishop in the usual way, and the populace, who under papal influence insisted on the appointment of one who had been canonically elected in accordance with the views of the reforming church party. In 1075 (the second year of his pontificate) Gregory VII. in a council held at Rome (Labbé, Conc., vol. xii, ed, 1730) in the most stringent terms deposed every bishop, abbot, or inferior ecclesiastic who should receive investiture from any lay person, interdicted any one who should be guilty of rebellion from all communion in the favour of St Peter and from all fellowship with the church, aud imposed a similar sentence on any emperor, duke, marquis, count, or other secular person who should presume to grant such. investiture of bishopric or inferior dignity. The conflict between the empire and the Roman See, which began with this decree, was carried on with varying success throughout the whole of that pontificate, and was continued by Gregory's successors, with more than one unsuccessful effort at an adjustment, until in the concordat of Worms (1122) it was agreed between Henry V. and Calixtus II., on the one hand, that the emperor should surrender to the church the right of investiture by the ring and the pastoral staff, grant to the clergy throughout the empire the right of free election, and restore the possessions and feudal sovereignties which had been seized

during the wars in his father's time and his own; while, on the other hand, it was conceded by the pope that all elections of bishops and abbots should take place in the presence of the emperor or his commissioners, and that every bishop elect in Germany should receive, by the touch of the sceptre, all the temporal rights, principalities, and possessions of the see, excepting those which were held immediately of Rome. It was also stipulated that in all other parts of the empire (Italy and Burgundy) the royalties should be granted to the freely elected bishop within six months after aaa Later,

the imperial control over the election of bishops in Ger- many came to be in practice much curtailed, partly by the tacitly changed relations between the empire and its feuda- tories, partly by explicit concessions wrung at various times from individual emperors (Otto IV. in 1209, Frederick II. in 1213); but the principles of the concordat of Worms continued theoretically to regulate the tenure of bishoprics and abbacies until the dissolution of the empire in 1806.

The question of investitures never assumed an aspect of first rate importance in France, partly because the bishoprics there partook less than in Germany of the nature of secular principalities, partly because at an early period in the dispute the sovereigns voluntarily yielded the leading claims of the church party. In England an arrangement was come to as early as 1105 between Pascal II. and Henry I., in virtue of which the king gave up the right to invest with staff and ring, but retained the right to nominate his bishops and to exact from them the oath of allegiance. A certain freedom of election, somewhat similar to that which still exists (but see BrsHop), was first conceded under Stephen, and confirmed by John in 1215.

IO is the heroine of a legend associated with the cultus of Hera, both in Argos andin Eubcea. In Argos the great temple of Hera was situated ona hill called Eubcea, on the road from Mycene to the city of Argos ; while in Eubcea the legend was associated with the town of Argoura.

The identity of names shows that the legend dates from a very ancient period of the worship ; and as, in accordance with the universal rule in such legends, Io is only a form of the goddess, it is highly probable that she represents an older stage of the cultus than the better known Hera. Her transformation into a cow is clearly a relic of the primitive time when the goddess was actually worshipped under the symbol of a cow, the fertile mother, united with the male deity in the iepss yéuos which was annually celebrated at Argos (see Hera).

Even in the simplest form in which we know it, the legend has been much transformed by poetic fancy. As a heroine united with the country from immemorial time, Io is called daughter of Inachus, the river of Argos and its oldest king, or of Iasus, from whom comes the epithet "Iacov "Apyos. As associated with the oldest worship of Hera, she is called the daughter of Peiras, who made the first image of the goddess out of a pear tree at Tiryns; and Io Callithyia is, by a common device in such legends, the first priestess of the goddess. Zeus fell in love with her, and she was transformed into a white cow either by Zeus, to hide her from the rage of Hera, or by the jealous goddess herself. When Io and Hera had once been made into dis- tinct personalities, such tales easily arose to explain the relation between them. Hera then insisted on getting this cow from Zeus, and set Argus Panoptes with his thousand eyes to watch her. Io is almost universally understood to be the moon, and Argus the star-studded nightly heaven. Argus tied the cow to the olive tree shown in the sacred grove on Mount Eubcea, or according to the poets pastured her in the fertile meadows of Lerna or Nemea. Zeus now sends his messenger Hermes, who lulls Argos to sleep with his magic wand, and slays him with the same curved sword, harpe, with which afterwards Perseus, the light-hero, slew the Gorgon, the power of darkness. According to another aecount Argus, the darkness, is slain by a stone thrown by Hermes, z.c., by the rising sun, whose sudden appearance is frequently spoken of as the throwing of a stone (Kuhn, Enturekl. d. Mythol.). Maddened by a gadfly, Jo wanders over many lands till at last she comes to Egypt, where she regains human form and becomes the mother of Epaphus. Opinions differ much as to the interpretation of this part of the tale. It is not probable that both Zeus and Hermes figured in the original legend ; and the end has

certainly been adapted so as to bring Greece and Egypt into con-nexion, and dates therefore from the time when intercourse

between them became frequent and much influence was exerted by Egyptian religion on Greek thought, 7.¢., the 7th century B.c. How far Oriental influence had affected the cultus at the period to which the origin of the legend belongs is doubtful; Preller compares the Phoenician conception of Astarte as a wandering cow. In later time Isis, who was conceived as horned (Herod. ii. 41), was connected with To. The legend of Jo was a favourite subject among Greek painters, and many representations are preserved on vases and in wall paintings (see Overbeck, Kunstmyth. d. Zeus,

465).

Sce the works quoted under Hermes; and against the explanation of Io as the moon see Plew in NV. Jahrbb., 1870 and 1873.

IODINE, thus named on account of the violet colour of its vapour (ioedys, violet-coloured), one of the so-called halogen elements, has already been partially described (see CHEMISTRY, vol. v. pp. 490-498).

Todides occur in minute quantity in most mineral waters and in sea water. The ashes of many marine alge are rich in them; and formerly iodine was chiefly extracted from kelp or varec, the ashes of sea-weed, by distilling the mother liquor remaining after the separation of the less soluble salts by crystallization with manganese dioxide and sulphuric acid. Of late years, however, large quan- tities of iodine have been obtained from crude Chili saltpetre by a similar process.

The chief use of iodine is in the preparation of methy]- iodide, a substance employed inthe manufacture of certain of the so-called aniline dyes. In medicine it is frequently applied externally as an irritant. Potassium iodide is also an important medicinal agent; and iodoform, CHI,, a substance prepared by acting on alcohol with iodine

in presence of alkali, has latterly been introduced as an agent for external application in certain diseases. Several iodides, especially ammonium, cadmium, and potassium iodide, are largely employed in photography.

Recent investigations have disclosed a number of most remarkable facts regarding the behaviour of iodine, and the allied elements bromine and chlorine, which merit a brief description here. Free chlorine, bromine, and iodine are respectively represented by the formule Cl,, Br,, and 1,5 that is to say, their molecules are " diatomic," each eonsisting of two atoms (comp, vol. v. pp. 467-472). On the other hand, the molecules of which sulphur vapour at a temperature of about 500° C. consists are hexatomic, as expressed by the formula §,; but on raising the tempera- ture these molecules undergo simplification, so that at temperatures above 800° the vapour appears to consist entirely of diatomic molecules such as are indicated by the formula §,. It would seem that the halogens undergo a similar molecular simplification when heated.

Having devised a method of extreme simplicity for the determination of vapour density, V. Meyer was led in the summer of 1879 to determine the density of a number of elementary bodies at much higher temperatures than had previously been employed, and among others chlorine was examined. He was then led (in conjunction with C. Meyer) to the discovery that at high temperatures this gas has a very much lower density than corresponds to the formula Cl, (Berichte der deutschen chemischen Gesellschaft zu Berlin, 1879, p. 1430; comp. dbid., 1880, p. 1172). Subsequently he extended his observations to bromine and iodine (ibid., 1880, p. 394), and with similar results. Meier and Crafts took up the subject with the object of verifying V. Meyer's statements (zbid., 1880, p. 851); they introduced several refinements in the method of operating, and determined the temperatures at which the experiments were made more accurately; in the main, however, their observations with iodine were confirmatory of V. Meyer's. V. Meyer's original results, and those of Meier and Crafts,

are arranged in the following table, where the numbers in

the column headed = indicate the ratio between the ob-

served density and the theoretical density on the air scale corresponding to the formula I, (8°79).

V. Meyer.

Meier and Crafts.

Temperature. Temperature.

8°70, 8‘78, 8-75

8-06, 8:58

953°—450° 445° 586° 677°, 682° T5T°, 770°, 765° 31°, 878°

668, 680, 680 ’ B75, 5°74 ‘1039°, 1059°, 1030″ 7° 0°, 1280°

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5:67, 5°60, 5°71, 5°81 | °65 1390°

842° 1027°

1570°

Meier and Crafts were of opinion that the highest tempera- ture they employed was probably as high as that estimated by V. Meyer at 1570°, and the latter chemist subsequently acknowledged the justice of their criticism of his deter- minations of temperature, which were conducted by a calorimetric method, whereas Meier and Crafts employed an air thermometer. V. Meyer has since extended his observations to a still higher temperature, and has obtained the values 4°53, 4°55, 4°57, which are not far removed from the theoretical value 4°39, corresponding to the formula I for the iodine molecule (op. czt., 1880, p. 1010).

An important series of observations by Meier and Crafts (Comptes Rendus, xcii. 39) on the density of iodine at various temperatures under various pressures show that at temperature below 700° and pressures below atmo- spheric pressure the density is constant, and corresponds to the formula I,, and that the density diminishes more rapidly with rise of temperature.

From the earlier results obtained by Meier and Crafts, A. Naumann has calculated the rate of dissociation of iodine, on the assumption that the decomposition is expressed by the equation I,=I+I, and has shown that it is in accord- ance with the general law of dissociation deduced from the dynamical theory of gases. He points out as especially remarkable that dissociation probably extends over 1200", since it is only half completed at a temperature of about 1270°, and commences at least 600° lower.

The observations of Meier and Crafts indicate that the density of iodine begins to be abnormal at a temperature between 600° and 700°. The dissociation of bromine appa- rently does not commence at so low a temperature, and at a temperature at which the ratio of the observed to the theoretical density is '66 for iodine, it is '8 for bromine. Chlorine is much less readily dissociated than bromine. These results are in accordance with the general chemical behaviour of the halogens. It has yet to be proved, however, that the dissociation is of the character indicated above, and that the molecules of the halogens do not undergo a less simple decomposition such as is contem- plated in Sir Benjamin Brodie's calculus of chemical operations. (H. E. A.)

ION, of Chios, one of the five Greek tragic poets of the canon, was born in Chios, probably in the 74th Olympiad, —485-480 B.c. Although he seems to have lived much in his native island, where he met Sophocles in 441 3.c., he paid frequent visits to Athens, making the acquaintance of Aischylus, and becoming a warm admirer of Cimon and a severe critic of the rival statesman Pericles. His first tragedy dates from the 82d Ol., between 452 and 449 B.c. ; and he is mentioned as third to Euripides and Iophon in the tragic contest of 429 B.c. In a subsequent year he gained both the tragic and dithyrambic prizes, and in honour

of his victory gave a jar of Chian wine to every Athenian citizen,—a gift which would imply an ample fortune. From a passage in the Peace of Aristophanes

(830 seg.), which was produced in 421 Bc, it is gene- rally concluded that Ion died before that year. The names and a few fragments of eleven of Ion's plays remain; the latter give him a place only inferior to the three great tragic masters of Greece. He is credited by the scholiast on Aristophanes (/oc. ect.) with having composed comedies, dithyrambs, epigrams, pseans, hymns, scholia, encomia, and elegies ; and he is the reputed author of a philosophical treatise on the mystic number three. His historical or biographical works were five in number, and included an account of the antiquities of Chios.

See Mure's Language and Literature of Antient Greece, iv.; Ma- haffy's History of Classical Greck Literature, i.,1880; Welcker's Griechischen Tragédien, iii.; and Kayser's Historia Tragicorum Grecorum.

IONA, or IcoLMKILt, a small island of the Hebrides, on the west coast of Scotland, in the county of Argyll, is situated about 8 miles south of Staffa and 14 miles west of the south-western promontory of Mull, from which it is separated by the shallow Sound of Iona. Its Jength is about 34 and its breadth 14 miles. The total area is about 2000 imperial acres, of which about 600 are under cul- tivation. Along the north-western shore patches of green pasture alternate with small irregular rocky elevations, cul- minating in the north of the island in Dunii, which has an elevation of about 330 feet. From the base of Dunii to the shore there is a stretch of low land consisting of shelly sand covered partly with grass, but towards the east ex- hibiting a surface of unbroken and dazzling whiteness. The southern part of the island consists of a combination of rocky elevations and grassy ravines, the rocks in the south-west corner presenting a bold and precipitous front to the sea. Geologically Iona is composed of Laurentian gneiss of great variety of character and very contorted stratification. Its deficiency in natural features of special interest is compensated for by the striking and various views obtained of the surrounding archipelago of islands,

including the neighbouring Mull and Jura, and the distant mountains of Skye. Fronting the sound is the small village of Iona or Buile Mor, consisting of about fifty cottages. There are two churches (Established and Free) and a school. Oats, barley, and potatoes are grown on the island, and it affords sustenance for about 300 cattle, 600 sheep, 20 horses, and 60 pigs; but the inhabitants are dependent for support as much on fishing as on agriculture. Population in 1861, 264; in 1871, 236; in 1881, 243.

The relics of antiquity still remaining consist of part of the cathedral church of St Mary, the nunnery, some small chapels, a building called the bishop's house, anda number of ancient tombs or crosses. The cathedral, dating from the 13th century, is built in the usual form of a cross, and consists of nave, transept, and choir, with a sacristy on the north side and chapels on the south. A great portion of the walls and the central tower, about 75 feet in height, are still standing. It contains a number of old tombs. To the north are the remains of the conventual buildings which from a Norman arcade still standing appear to have been of an older date than the cathedral. The chapel of St Oran or Odhrain situated in the cemetery, on the south side of the monastery, dates probably from the 11th century, and its western doorway presents a Norman arch with the beak-head ornament. The cemetery, called in Gaelic Relig Otran, the burial-place of kings, and said to contain the remains of forty-eight Scottish, four Irish, and eight Danish or Norwegian monarchs, possesses a large number of monumental stones. The remains of the nunnery exhibit traces of Norman architecture. Of the numerous crosses erected in the island the finest are Maclean's cross and St Martin's cross, which are still almost entire. Both

are richly carved with Runic knots and various emblematic devices and fanciful scrolls.

The original form of the name Iona was Hy, Hii, or I, the Irish for island. By Adamnan in his Life of St Columba it is called Loua insula, and the present name Iona originated in some transcriber mistaking the w in Jowa for an. It also received the name of Hu-colum-kill

(Icolmkill), that is, the island of Columba of the Cell, while by the Highlanders it has been known as Innis nan Druidhneah, the island of the Druids. It was in the year 563 that Columba, after leaving the shores of Ireland, entered the creck of Iona now known as Lort-a-churraich, the port of the coracle, and, having satisfied himself of the suitability of the island for his purpose, foundcd there his famous monastery. The island was then inhabited by a Pictish population, but it has been disputed whether Columba obtained the grant of it from Conall, king-of Dalriada, or from Brude, king of the Picts. Columba was buried in Iona, but between 802 and 807 his remains were transferred from it to the church of St Patrick in the county Down, Ireland. For a long time the mona- stery of Iona held the supremacy among all the monasteries and churches founded by Columba and his disciples. It was several times plundered and burned by the Norsemen, and its inmates on more than one occasion put to death. The Western Isles having come into the possession of Scotland in 1072, the monastery ot Iona was rebuilt and endowed by Queen Margaret. In 1092 they were, however, ceded to Magnus Barefoot of Norway, who after the re- newal of the cession by Edgar in 1097 visited Jona and allowed the people to retain their possessions. The diocese of the Isles, founded about 838, of which Iona was the seat, was united by Magnus to the bishopric of Man, and made subject to the archbishopric of Drontheim in Norway. A newmonastery as well as a nunnery was founded by the Benedictines in 1203, and the Benedictine order either absorbed or expelled the Celtic community. About 1507 the island again became the seat of the bishopric of the Isles. The monastery was demolished in accordance with the Act passed by the Convention of Estates in 1561. For many centuries it was much fre- quented on account of its facilities for learning, and, as may be sup- posed, became after the death of Columba a great resort of pilgrims, many of whom came in order to die on the island that their remains might be interred in its sacred soil ; while the remains of persons illustrious in rank or in piety were brought to it for burial from all parts of northern Europe. The site of the old monastery was about a quarter of a mile north from the present ruins.

See, in addition to the article CorumBa, and the old authorities therein cited,

Montalembert's Afonks of the West, vol. iii.; The Cathedral or Abbey Church of Iona, by Bishop Ewing, 1866; Jona, by the Duke of Argyll, 1870; Skene's Celtic Scotland, vol. ii., 1877 ; and Sculptured Monuments in Jona and the West Iigh- zands, by James Drummond, 1881.

IONIA, in ancient geography, was the name given to a portion of the west coast of Asia Minor, adjoining the Jagean Sea, and bounded by Lydia towards the east. Like the adjoining districts of AZolis on the north and Doris on the south, it was not a country or region marked out by any natural boundaries, but merely consisted of a strip of land near the coast, of comparatively small breadth, which, together with the adjacent islands, was occupied by Greeks of the Ionic race, and was thus permanently distinguished from the interior district, which was inhabited by the Lydians.

According to the tradition universally received among the Greeks, the cities of Ionia were founded by emigrants from Greece on the other side of the Agean, and their settlement was connected with the legendary history of the Tonic race in Attica and other parts of European Greece, by the statement that the colonists were led by Neleus and Androclus, the two sons of Codrus, the last king of Athens. In accordance with this view a definite date was assigned to the Ionic migration, as it was called by later chronologers, who placed it one hundred and forty years after the Trojan war, or sixty years after the return of the Heraclide into the Peloponnese. It is hardly necessary to remark that no reliance can be placed upon this chronological state- ment; and it is altogether improbable that the colonization of the whole of this important district took place at the same period. All analogy would lead us to suppose that the foundation of the different cities which ultimately constituted the Ionic League took place at different times, and was perhaps spread over a long period of time. It is, however, not improbable that the great Dorian invasion of the Peloponnese, which gave rise to such extensive

changes in the population of European Greece, may have given the first impulse to the migration of a large part of the Ionian inhabitants to the opposite shores of the Augean. Nor is there anything unlikely in the fact that a body so composed should have put themselves under the command of a leader or cckist from Athens, which was generally looked upon as the special representative of the Ionian race! But Herodotus himself tells us (i. 146) that they were very far from being of unmixed Ionic descent, and comprised settlers from many different tribes and cities of Greece (a fact indicated also by the local traditions of the different cities), as well as by intermarriage with the native races whom they found in possession of the country. A striking proof of this was to be found in the fact that so late as the time of the historian several distinct dialects were spoken by the inhabitants of different cities within the limits of so restricted an area.

Some modern critics have supposed that the population of this part of Asia was originally of Ionic race, and that the settlers from Greece found the country in the possession of a kindred people. But no trace is found in any ancient writers of such a fact, or of the distinction established by these modern scholars between the so-called Old Ionians and New Ionians. All that we know upon anything like historical evidence is that at the earliest period when we hear of any Greek population as existing on the east coasts of the Aigean we find there a large group of cities, distinct in dialect and institutions from those to the north and south of them, and generally regarded both by themselves and their neighbours as derived by direct immigration from the people who bore the name of [onians in European Greece. Of the period of their settlement in Asia we have no trustworthy evidence; but it appears to have been anterior to the rise of the Lydian monarchy, which gradu- ally became their most formidable neighbour.

The cities comprised under this name in historical times were twelve in number,—an arrangement copied as it was supposed from the constitution of the Ionian cities in Greece, which had originally occupied the territory in the north of the Peloponnese subsequently held by the Achaians. These were (proceeding from south to north)—Miletus, Myus, Priene, Ephesus, Colophon, Lebedus, Teos, Erythre,

Clazomenz, and Phocea, together with the two important islands of Samos and Chios. Smyrna, which subsequently assumed so prominent a position among the cities of this part of Asia, was originally an Kolic colony, but was afterwards occupied by a band of Ionians from Colophon, and became thenceforth an Ionian city,—an event which had taken place before the time of Herodotus. But at what period it was admitted as a member of the Ionian League we have no information.

The cities above enumerated unquestionably formed a kind of league or confederacy among themselves, of which their participation in the Pan-Ionic festival was the distin- guishing characteristic. But, like the Amphictyonic League in Greece itself, this was rather of a sacred than a political character ; every city, as usual among the Greeks, enjoyed absolute autonomy, and, though common interests often united them for a common political object, they never formed a real confederacy like that of the Achaians or Beeotians ; and the advice of Thales of Miletus to combine in @ more intimate political union found no approval among them.

The territory thus occupied was of small extent, not exceeding 90 geographical miles in direct length from north to south, with a breadth varying from 20 to 30 miles, but to this must be added the remarkable peninsular promon- tory of Mimas, together with the two large islands. So

1 Concerning the Ionian race in Greece, the reader is referred to the article GREECE, vol. xi. p. 90.

intricate indeed is the coast-line that the periplus or voyage along its shores was estimated at 340 geographical miles, or nearly four times the direct distance. A great part of this area was, moreover, occupied by mountains, none of them attaining to any great elevation, but filling up a con- siderable space. Of these the most loftyand striking were—Mounts Mimas and Corycus, in the peninsula which stands out to the west, facing the island of Chios ; Mount Sipylos, to the north of Smyrna; Mount Corax, extending to the south-west from the Gulf of

Smyrna, and descending to the sea between Lebedus and Teos; and the strongly marked range of Mount Mycale, which is in fact a kind of continua- tion of the chain known as Mount Messogis in the interior, and forms the bold headland of Trogilium or Mycale, op- posite to the island of Samos. None of these mountains attain a height of more than from 3000 to 4000 feet ; but they for the most part form abrupt and detached ranges, intersecting the country in different directions. Confined as it thus was, the narrow district in question had the advantage of comprising three broad valleys, formed by the outflow of three rivers, among the most considerable in Asia Minor:—the Hermus in the north, flowing into the Gulf of Smyrna, though at a considerable distance from the city of that name; the Cayster, which flowed under the walls of Ephesus; and the Meander, which in ancient times discharged its waters into the deep gulf that bathed the walls of Miletus, which has been gradually filled up by its continued action. These valleys were all of them extremely fertile, and besides them many smaller tracts were to be found between the mountains and the sea, of great fertility, and enjoying the advantage of a peculiarly fine climate, for which this part of Asia Minor has been famous in all ages. The consequence is that Ionia enjoyed the reputation in ancient times of being the most fertile of all the rich provinces of Asia Minor; and even in modern times, though very imperfectly cultivated, it produces abun- dance of fruit of all kinds, and the raisins and figs of Smyrna supply almost all the markets of Europe.

The colonies founded in such a favoured land speedily rose to opulence and prosperity. Miletus especially was at an early period one of the most important commercial cities of Greece, and in its turn became the parent of numerous other colonies, which extended all around the shores of the Euxine and the Propontis, from Abydus and Cyzicus to Trapezus and Panticapeum. Phocea also was one of the first Greek cities whose mariners explored the distant shores of the western Mediterranean, where they founded on the coast of Gaul the important colony of Massilia. Ephesus also, though it did not send out any colonies of importance, from an early period became a flourishing and opulent city, and gradually attained to a position in this part of Asia corresponding in some measure to that of Smyrna at the present day.

The first event in the history of these Ionian cities of which we have any trustworthy account is the invasion, or rather inroad, of the Cimmerians, a nomad people from beyond the Euxine, who ravaged a great part of Asia Minor, including the neighbouring Lydia, and even sacked Magnesia on the Meander, but were foiled in their attack upon Ephesus. This event may be referred to the middle of the 7th century B.c. A more formidable danger soon threatened the Ionian Greeks from the rising power of the Lydian monarchy. Gyges, the first king of the Mermnad dynasty (about 700 B.c.), already invaded the territories of Smyrna and Miletus, and 1s even said to have taken Colophon, as his son Ardys did Priene. But neither conquest was durable, and it was not till the reign of Croesus (560-545 B.c.) that the cities of Ionia successively fell under the dominion of the Lydian monarch. The defeat of Creesus by Cyrus was followed by the conquest of all the Ionian cities by the Persian general Harpagus, and they henceforth became subject to the Per- slan monarchy, in common with all the other Greck cities of Asia. In this position they enjoyed a considerable amount of autonomy, but were for the most part subject to the rule of local despots. It

was at the instigation of one of these, Histiseus of Miletus, that in about 500 B.c. the principal cities broke out into insurrection

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against Persia, in which they were at first assisted by the Athenians, with whose aid they even penetrated into the interior, and burnt the important city of Sardis, an event which ultimately led to the Persian invasion of Greece. But this first success was of little avail; the fleet of the Ionians was defeated in a great battle off the little island of Lade, and the capture and destruction of Miletus, after a long protracted siege, was followed by the reconquest of all the Asiatic Greeks, insular as well as continental (494 B.o. Mb

The victories of the Greeks during the great Persian war had the effect of enfranchising their kinsmen on the other side of the Aigean ; and the battle of Mycale (479 B.c.), in which the defeat of the Persians was in great measure owing to the revolt of the Jonians, secured their

emancipation from the Persian yoke. They hence- forth became, like most of the inhabitants of the islands, the de- pendent allies of Athens, though still retaining their autonomy, which they preserved until the peace of Antalcidas in 388 B.c. once more placed them, as well as the other Greek cities in Asia, under the nominal dominion of Persia. They appear, however, to have retained a considerable amount of freedom until the invasion of Asia Minor by Alexander the Great brought about a fresh change. After the battle of the Granicus most of the Ionian cities submitted at once to the conqueror; Miletus alone held out, and was not reduced till after a long siege, 834 B.c. From this time they passed successively undcr the dominion of the Macedonian rulers of Asia, but continued to enjoy a state of great prosperity, both under these Greek dynasties and after they had been united as a part of the province of Asia with the all-absorbing empire of Rome.

There was indeed one striking exception to this prosperity. Mi- letus, so long one of the chief cities of Ionia, gradually sank into complete decay, a circumstance owing not so much to political as to physical causes, the mass of alluvial matter brought down by the river Meander having gradually filled up the Latmian Gulf, on which it was situated, so that the island of Lade was ultimately joined to the mainland, and Miletus itself altogetlier ceased to be a seaport. The same cause has at a later period produced the same effect, though in a less degree, with the city of Ephesus ; while the continually advancing deposits of the Hermus threaten, at no dis- tant period, unless prevented by the skill of modern engineers, to close up the still more extensive Gulf of Smyrna.

It has been mentioned that the Ionian cities were accustomed to celebrate in common a festival called the Pan-Ionia; the sanctuary at which this was celebrated, and which was also called the Pan- Ionium, was situated on the northern slope of Mount Mycale, in the territory of Priene. But, besides this common religious centre, Ionia contained also two of the most cclebrated shrines in all Asia, the temple of Artemis at Ephesus, and that of Apollo at Branchide ucar Miletus. It is probable that both sites were connected with local centres of more ancient religious worship, and were adoptcd by the Ionian Greeks when they first settled in Asia. (E. H. B.)

IONIAN ISLANDS, the ordinary collective name of Corfu (Képxvpa), Cephalonia (KefadAnvia), Zante (Zdxvv- 6os), Santa Maura (Aeuxds), Ithaca, Cerigo (K¥@ypa), and Paxo, with their minor dependencies. As the islands are seven in number they are often called the Heptanesus (‘Emrévyoos) in Greek, and Heptanesian or Septinsular is the corresponding adjective. The history of the use of Ionian as the distinctive epithet of the islands is sufficiently obscure; but it is probable that, like the application of the name Ionian Sea to this part of the Mediterranean, it is due to the settling of Ionian colonists on the coasts and islands. The islands have no real geographical unity beyond that involved in the fact that, with the exception of Cerigo, situated off the south coast, they are all within a little distance of the west coast of Greece or Albania. Corfu is separated from the mainland by not more than 2 miles, while the passage from it to Santa Maura, the nearest of the larger islands, is no less than 46. Since 1863 the whole Heptanesian territory has been incorporated with the kingdom of Greece, and the several islands have been assigned to different administrative divisions. Corfu, Cephalonia, and Zante each gives its name to one of the thirteen nomarchies of the kingdom; Cerigo is part of the nomarchy of Argolis and Corinth. The area of the seven islands is computed at 1041 square miles. The popula- tion shows a steady increase: in 1836 it was 204,242 (110,496 males, 93,746 females); in1854, 228,981 (123,254 males, 105,727 females); in 1870, 229,516; and in 1879, 244,433. The following table shows the details of the last census :—

Nomarchy. Males. Females. ry acon Conta… 18,402 | 18,292] 26,694| 25,729 Corfu f Messe…... 12,697 | 11,681! 24,828] 21,754 (Kerkyra), [1 108-0… 14,191} 12,811] 27,002] 24,983 crsyt@); |) Loucas….| 12,185| 10,898| 23,083] 20,892 Paxo…....., 2,651] 2,351] 5,002| 3,582 55,126 | 50,983 | 106,109 | 96,940 Crancia…| 15,698 | 16,505 ae ape ‘ Palle …... 9,651| 9,352} 19,00 k Cephalonia | 5 aime… 7‘995| 9,190| 17,115] 16,774 Ithaca… 6,305| 6,917] 12,222] 9,873 39,579 | 40,964] 80,543] 77,882 Zante 44,522 | 44,557 ae ee t Zante — 23,935 | 20,587| 44, Part of :

Argolis and ee) 6,750| 6,509] 18,259] 10,637 Corinth. y ; Total …} 125,390 | 119,043 | 244,433 | 229,516

Corfu has a denser population than any other part of Greece, more than 350 inhabitants to the square mile; and Zante ranks next with about 300. The city of Corfu, with its 25,000 inhabitants, is the third in size of the Greek towns, being exceeded only by -Patras (Patrai) and Athens.

As the Ionian Islands have no geographical unity, their political unity is of comparatively modern date. A Septin- sular or Heptanesian history, as distinguished from the in- dividual histories of the seven islands, is consequently in its earlier chapters a mere conventional composition produced by gathering together a variety of scarcely connected facts. To a certain extent indeed the various islands have passed under the same succession of influences ; they have been subjected to the same invasions, and have received accessions to their populations from the same currents of migration or conquest ; but in the degree in which even what may be considered as common experiences have affected the indi- vidual islands there has been no small diversity. In the matter of population, for instance, the island of Corfu has undergone much more important modifications than the island of Ithaca. For such facts as the establishment of Ulysses in Ithaca, the settlement of a Corinthian colony in Corfu, and the origin of the Peloponnesian War in a dispute between the colony and the " metropolis," the reader will consult the separate articles Corru, ITHaca, &c.

The beginning of Heptanesian history may be said to date from the 15th century. Though it is true that Leo the Philosopher (about 890 A.D.) formed all or most of the islands into a distinct pro- vince under the title of the Tema of Cephallenia, and that in this condition they belonged to the Eastern empire after Italy had been divided into various states, this political or administrative unity could not last long in the case of islands situated, as they were, in the very meeting place of opposite currents of conquest. Robert Guiscard, having captured Corfu (1081) and Cephalonia, might have become the founder of a Norman dynasty in the islands but for his early death at Cassopo. Amid the

struggles between Greek em- perors and Western crusaders that continued to fill the 12th century, Corfu, Cephalonia, Zante, &c., emerge from time to time; but it was not till the Latin empire was established at Constantinople that the Venetians, who were destincd to give the Ionian Islands their place in history, obtained possession of Corfu. They were afterwards robbed of the island by Leon Vetrano, a famous Genoese corsair; but he was soon defcated and put to death, and the senate, to secure their position, granted fiefs in Corfu to ten noble families in order that they might colonize it (1206). The conquest of Cephalonia and Zante followed, and we find five counts of the family of Tocco holding certainly the former island, and probably the latter as well as Santa Maura, as tributary to the republic. But the footing thus gained by the Venetians was afterwards lost, and through the closing part of the 13th and most of the 14th century the islands were a prey by turns to corsairs and to Greek and Nea- politan claimants. In 1386, however, the people of Corfu made voluntary submission to the republic which had nowrisen to be the first maritime power in the Mediterranean, and in 1401 (August 16th)

the senate, with mercantile caution, secured thcir possession of the island from any elaim which might be asserted by the kings of Naples through the duchy of Taranto by obtaining a ratification of their title from Ladislaus for the sum of 30,000 ducats. In 1485 Zante was purchased from the Turks in a very depopulated condi- tion ; and in 1499 Cephalonia was captured from the same masters; but Santa Maura, though frequently occupied for a time, was not finally attached to Venice till 1684, and Cerigo was taken only in Tele.

On the fall of the Venetian republic in 1797, the treaty of Campo Formio, which gave Venice to Austria, annexed the Ionian Islands to France; and in 1798 the French Governmeut ratified the arrange- ment, and their division into three departments. But a Russo- Turkish force came to drive out the French at the close of that year; and in the spring of 1799 Corfu capitulated. By treaty with the Porte in 1800, the emperor Paul erected the Republic of the Seven United Islands, which,

with various modifications, was but another name for anarchy and confusion, till a secret article in the treaty of Tilsit, in 1807, declared the Ionian Islands an integral part of the French empire. They were incorporated with the province of Illyria, and in this condition they remained till the decline of the French power. The British forces, under General Oswald, took Zante, Cephalonia, and Cerigo in 1809, and Santa Maura in 1810; Colonel Church reduced Paxo in 1814 ; and after the abdication of Napoleon, Corfu, which had been well defended by General Donzelot, was, by order of Louis XVIII., ceded to Sir James Campbell. By the treaty of Paris (9th November 1815) the contracting powers— Great Britain, Russia, Austria, and Prussia—agrecd to place the 'United States of the Ionian Islands" under the exclusive protection of Great Britain, and to give Austria the right of equal commercial advantage with the protecting country, a plan strongly approved by Count Capodistrias, the famous Corfiot noble who afterwards became president of the new republic of Greece.

The terms of the treaty were unfortunately not only of indefinite import, but, if not actually self-contradictory, at least susceptible of contradictory interpretation. And, still more unfortunately, instead of interpreting the other articles in harmony with the first, which declared the islands one "sole free and independent state," the protecting powcr availed itself of all that they contained in support of the extension of its authority. The first lord high commissioner, Sir Thomas Maitland, who as governor of Malta had acquired the sobriquet of " King Tom," was not the man to foster the constitu- tional liberty of an infant state. The treaty required, with ques- tionable wisdom, that a constitution should be established, and this was accordingly done ; but its practical value may be judged of from the fact that the budget presented to the assembly of repre- sentatives in 1840, without risk of discovery, consisted of so much blank paper,—duly bound, it is true, in purple velvet. The con- stitution, which came into force in January 1818, placed the ad- ministration in the hands of a senate of six members and a legisla- tive assembly of forty members; but the real authority was vested in the commissioner, who was able directly to prevent anything, and indirectly to effect almost anything. Sir Thomas Maitland was not slow to exercise the control thus permitted him,

though on the whole he did so for the benefit of theislands. The construction of roads, the abolition of direct taxes and of the system of farming the church lands, the securing of impartial administration of justice, and the establishment of educational institutions are among the services ascribed to his efforts. These, however, made less impres- sion on the Heptanesians than his despotic character and the measures which he took to prevent them giving assistance in the Greek war of independence in 1821. He was succeeded in 1828 by General Sir Frederick Adams, who in the main carried out the same policy, though he showed more favour to the aristocracy. It was under his government that the new fortifications of Corfu began to be constructed, and that some of the most important public works which still do honour to the English protectorate were undertaken. In Cephalonia the credit belongs, however, to Colonel Napier, one of the most able and arbitrary Englishmen who had to do with the islands. Lord Nugent, who became commissioner in 1882, began by allowing the parliament greater freedom, but was afterwards compelled to revert to the previous method of management. Sir Howard Douglas, his successor (1835-1841), had a stormy reign. He ruled with a firm, too often with a high hand; and he was met by continual intrigues, contentions, and calumnies. The parliament was prorogued in 1831, 1841, and 1842, the principal exponent of the opposition being the famous Mustoxidi (who died in 1861). A complete change of policy was inaugurated by Mr Mackenzie (1841-43), but his relations to the home Government, rendered more embarrassing by a bold act of his own, led to his speedy resig- nation. Lord Seaton (1848-49) was induced by the European dis- turbances of 1848 to propose and urge on a number of important reforms in the constitution ; and in 1848 liberty of the press was granted by statute. Freedom of election, both parliamentary and municipal, a large extension of the franchise, and the restoration of voting by ballot were among the concessions of 1849. The assembly (the ninth) first elected under the extended franchise had

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to be twice prorogued by Sir Henry Ward (1849-1855), and was finally dissolved in 1851; and the growing hostility to the Govern- ment was vainly met by banishment of members of assembly and editors of papers. The party which wished for union with Greece was rapidly growing in vigour and voice. Serious insurrections of the peasantry, especially in Cephalonia, had to be put down by military force both by Lord Seaton and Sir Henry Ward, Sir John Young (1855-1859) found the tenth parliament of the same temper as the ninth: in its first session it passed a resolu- tion in favour of immediate union with Greece. The hostility of the unionist party to the commissioner himself was increased by the publication (1858) of one of his despatches (stolen from the colonial office), in which he recommended that " Corfu and Paxo should, with the consent of their inhabitants, be converted into English colonies, and that only the southern islands should be handed over to Greece." About the same time, however, the hopes of the unionists were roused by the appointment of Mr Gladstone as high commissioner extraordinary to investigate into the con- dition of the islands. From hiseminence in Greek scholarship, and his known sympathy with Greek independence, it was their expec- tation that he would support if he did not satisfy their pretensions. But after a tour through the principal islands Mr Gladstone came to the conclusion that the abolition of the protectorate was not the wish of the mass of the people, and the cordial reception which he owed to his own reputation and character was too much ascribed by him to the general goodwill of the Ionians to the English Govern- ment. For a few days in 1859 he held office as lord high com- missioner, and in that capacity he proposed for the consideration of the assembly a series of reforms. These reforms were, however, de- elarcd inadmissible by the assembly; and Sir Henry Storks (Feb- ruary 16, 1859), who succeeded to the difficult post which Mr Glad- stone resigned, began his rule by a prorogation. The contest con- tinued in the same style between the assembly and the protectorate. The English Government was slow to realize the true position of affairs : as late as May 1861 Mr Gladstone spoke of the cession of the islands as "a crime against the safety of Europe," and Sir Henry Storks continued to report of tranquillity and contentment. The assembly of 1862 accused the commissioner of violation of the constitution and of the treaty of Paris, and complained that England

remained in ignorance of what took place in the islands. During this time there had been considerable agitation in Greece owing to the disfavour in which King Otto (of Bavaria) was held. On the abdication of that prince in 1862 the Greck people by universal suffrage voted Prince Alfred of England to the throne, and when he declined to accept the crown England was asked to name a suc- cessor. The prince proposed was William, brother of the Princess of Wales ; and the English Government declared to the provisional Government of Grecce that if they accepted him (which they did) his power would be strengthened by the long-refused cession of the Ionian Islands. In 1863 the commissioner laid before the parliament (the thirteenth) the conditions on which the cession would be carried out. The rejection of one of those conditions— the demolition of the fortifications of Corfu— led to a new proroga- tion ; but none the less (on November 14, 1863) the plenipoten- tiaries of the five great powers signed the protocol by which the protectorate was brought to a close. The neutrality which they attributed to the whole of the islands was afterwards (January 1864) confined to Corfu and Paxo. On May 30 of that year the lord high commissioner handed over the archives of the state to General Zaimis, the Greek plenipoteutiary; and on the following day he left Corfu with the English troops and men-of-war. King George (Prince Williain of Schleswig-Holstein) made his entry into the eapital on June 6th, The eighty representatives of the Ionian Islands took their places in the national parliament in July. Bibliography. Bondelmonte, Liber insularum Archipelagi (written about 1500; published by Sinner, 1824); Bencdetto Bordone, Jsolarto, Venice, 1528-84-62 ; T. Poreacchi da Castiglione, L'isole piu famose del mondo, Venice, 1590; Rul- hitres, Essai sur les iles de Zante, de Cerigo, &c., Paris, 1799; Castellan, Lettres sur la Morée et les tles de Cerigo, Idra, et Zante, Paris, 1808; Holland, Travels in the I. 1, &c,, London, 1815; Vandoncourt, Mémoires sur les tiles Joniennes, English translation, London, 1820; De Bosset, Parga and the I. I., London, 1822; C. J. Napier, Zhe Colonies, London, 1833; Gifford, Visit to the I. J., London, 1837; Sir George Bowen, The 1. I. under British Protection, London, 1850; Dr Davy, J. J., London, 1842, containing many physical observations ; H. Cook, Zhe J. J., Lon- don, 1851; Liebetrut, Reise nach den Ionischen Inseln, Hamburg, 1850; Lunzi, Della republica settinsulare, and various other

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the linguistic peculiarities of the islands reference may be made to Tsitselis, TAwooapiov KepaddAnvias, Athens, 1876.

IOWA, one of the north-western States of the American Union. Its boundary lines are—on the 8. and N. the parallels 40° 36' and 43° 30' of N. lat., on the E. the Mississippi river, aud on the W. the Missouri and Big

20%

Sioux rivers. The south-eastern corner projects slightly below the parallel of 40° 36', the boundary following the Des Moines river down to its mouth. The neighbouring States are—Minnesota on the north, Wisconsin and Illinois on the east, Missouri on the south, and Nebraska and Dakota on the west. The length of the State from north to south is about 200 miles, and its greatest breadth from east to west 300 miles. Its area is 35,228,800 acres, or 55,045 square miles.

The State lies entirely within the prairie region of the Mississippi valley, and has a level or undulating surface. Its mean height above the sea is 925 feet,—ranging from 500 in the south-east to 1700 in the north-west. About 24,600 square miles of the area rise less than 1000 feet above sea-level.

The surface presents very little relief. A broad ecleva- tion (1700 feet at the north boundary, and decreasing gradually southwards) separates the waters of the Missis- sippi from those of the Missouri. The position

of this “divide” is, for the most part, near the western border of the State, giving to the branches of the Mississippi long courses and an easy fall, while those of the Missouri have comparatively short courses and a rapid fall. Near their sources, these branches, both of the Mississippi and Missouri, flow in broad, shallow valleys. Farther down their courses, however, bluffs develop, and _ increase gradually in height, while the valleys in general become narrower. ‘The bluffs bordering the valley of the Missis- sippi range in height from 200 to 400 feet, the valley between them being usually from 4 to 8 miles in width, although in a few places, as at Dubuque, they close in upon the river on both sides. On the Missouri, the bluffs range from 200 to 300 feet in height, enclosing a bottom land 5 to 12 miles in width.

Rivers and Lakes.—The Mississippi and Missouri are the only navigable rivers. They have ample depth of water for all purposes of inland navigation. At two points upon the former river, indeed (at Rock Island and near Keokuk), there are rapids which at low water form partial obstruc- tions to navigation ; but at high water steamers can run them in either direction. A canal is now being made to facilitate the passage of the lower or Des Moines rapids, and works are projected for the improvement of the upper or Rock Island rapids. The other rivers are the Upper Iowa, Turkey, Maquoqueta, Wapsipinicon, Iowa, Cedar, Skunk, or Checauqua, and Des Moines, flowing into the Mississippi, and the Chariton, Nodaway, Grand, Nishna- botany, and Little and Big Sioux, flowing into the Missouri. None of these streams are navigable. A few small lakes are found in the north-west, on or near the divide between the two great rivers. The area of swamp and marsh sur- face is proportionally small, and is rapidly diminishing.

forests.—As in most of the prairie region of the Missis- sippi valley, there is in this State but little forest, the timber being confined to the bottom lands of the streams and the faces of the bluffs. The commonest trees are the oak, elm, cottonwood, black walnut, hickory, maple, and linden. Upon the bluffs is found a sparse growth of pines and red cedar.

Geology.—The geology of the State is remarkably simple ; excepting in the north-western quarter, where the formations are so covered with

Quaternary drift as to be unrecognizable, there is from north-east to south-west a succession of belts, from the Lower Silurian to the top of the Carboniferous, varying in breadth and extending north- west and south-east. The Silurian occupies but a com- paratively small area in the north-eastern corner. A strip of Devonian follows, 40 to 50 miles in width, ex- tending from Davenport on the Mississippi north-west- ward to the northern boundary. The south-western

half of the State is overlaid by the different members of the Carboniferous formation, with here and there frag- ments of Cretaceous beds, which have survived the enor- mous eresion to which the surface has everywhere been subjected.

Minerals. —It is estimated that about 7000 square miles are underlaid by the Coal-measures. Within this area coal beds of workable thickuess and quality have been found at Fort Dodge, Moingona, Des Moines, and Oskaloosa, where they are being extensively worked. The coal is bituminous, no anthracite having been found in the State. The north-eastern part of Iowa is included within the great lead region of the Upper Mississipp! ; and, although the palmy days of the mines of that region are over, the product is yet very important. The ore, which is galena, is found in pockety deposits in the limestones of the Silurian formation. These deposits vary immensely in size, and in general extend to no great depth, and therefore cannot be relied upon for permanence.

Climate.—The climate resembles in its essential features that of the rest of the prairie States, excepting that to- wards the west the aridity of the atmosphere and the decreased rainfall characteristic of the great plains begin to be perceptible. The annual rainfall ranges from 24 to 44 inches, with an average of about 36 inches, the south- eastern portion receiving the greatest amount, and the western part the least. The mean annual temperature ranges from 42° to 52° Fahr., the summer mean from 66° to 79° and the winter mean from 14° to 27° showing a difference between the summer and winter temperatures of 52°. The highest single observed temperatures have been 95° to 105°, and the

lowest 18° to 33° below zero, an extreme range of about 125°. The south-eastern por- tion has the mildest and most equable temperature, as well as the greatest rainfall. Northward and westward the temperature becomes lower and extremes greater.

Soil.—The soil is extremely fertile, whether drift, bluff, or alluvial. The drift, whose name explains its origin, covers the greater part of the State. It is a dark loam, 1

to 2 feet in depth, and of almost inexhaustible fertility. The bluff soil or loess occupies the country bordering upon It is supposed to be a subaerial rly winds from the

the valley of the Missouri. deposit, brought by the prevalent weste

Greatest Average Average 7 Number number of day's day's | Total amount Industries, 1 of Estab- Capital. liands em- | wages for| W@8°5 | paid in wages Materials. Products, 1880. lishments. ployed at any} g Skilled | fo 8″ lauring the Year. ; one time dur-| yechanic, | Ordinary ing the Year. Labourer.

Agricultural implements $1,085,530 1075

SOOTSHIMUNSHOCS! nor ceitec scsi: sem eae 477,077 1025 Brickstantd tiles… cc.s.scc0seeeer ess 474,614 2760 Carpentering and building… ..... 531,660 2664 Cheese and butter …….....-.0ccers. 742,633 897 Flouring and grist mill products,, 7,950,560 3025 Lumber, sawn and planed …..... 5,035,440 5886

Printing and publishing 1,150,786 1384

Communication.—For means of communication and transportation Iowa is dependent almost entirely upon its

railroads and its two bounding rivers. It has no canals, if we except the short one around the Des Moines rapids.

In 1880 there were forty-five railroads, working 4779 miles of track, with a total capital stock of $60,000,000, and a funded debt of $44,400,000. The total amount invested in railroads exceeded $100,000,000. The total gross earnings of the companies from passengers, freight, and mails was $5,218,000, of which $1,415,000 or 27 per cent. were net earnings. This is but 25, per cent. on the capital stock.

Banks.—According to the report for 1880 of the con- troller of the currency, there were in operation in Towa

I[OWA

plains of Nebraska and Dakota, and deposited here near the borders of the humid region. It has a great depth, reaching 200 feet in some instances, and is everywhere extremely rich. The alluvial soil, found in the valleys and bottom-lands, is the deposit of the streams, aud varies in composition with the country which the streams have traversed above. Much of it on the Missouri and its branches is composed of loess, while that on the Mississippi is mainly altered drift deposits.

Agriculture.—The agricultural interest is by far the largest and most important of the State. In the produc- tion of Indian corn it ranks second, and of wheat fifth, among the States of the Union. The following table, taken from the report of the department of agriculture, shows the amount of the agricultural products for 1879 :—

Number of

aeres under each Crop.

Average yield per acre.

Bushels. 388°0 10°2 15°6

36 22 18 86

Tons.

1°54

32,786, 880 |30, 163,930

365,040 37,256,400 4,290,000 144, 000

8,568,972

1,930,500

99,360

9,090,200 | 2,908,864 Tons.

8,564,000 [16,180,560

Barley Buckwheat ……. Potatoes

105,700 2,314,286

The numbers of different classes of live stock were— horses, 778,400; mules, 44,700; milch cows, 724,500 ; other cattle, 1,370,400 ; sheep, 454,400 ; hogs, 2,778,400. In number of horses Iowa ranks as the fifth, of milch cows and other cattle third, and of hogs second, among the States. 'The average value of cleared farming land in the State in 1879 was $27°30 per acre; of timber land, $39-36. The increased value of the latter is due to the scarcity of forests. The average monthly wages paid to agricultural labourers during the same year was $23:26 ; average daily wages, on transient employment, $2°01.

Manufactures.—The manufacturing industries have not yet reached a high degree of development. Those branches connected with agriculture have naturally made most ad- vance. The following statistics, from the results of the tenth census (1880), show the condition of these industries.

$235,335 $559,861 | $1,148,872 253,681 445,443 | 1,179,811

370,929 227,687 935,507

536,994 | 1,197,845 | 2,175,346 127,430 | 1,087,645 | 1,555,188 845,714 | 16,567,552 | 21,062,744 1,399,779 | 3,808,696 | 6,401,940 509, 529 525,586 | 1,431,589

75 national banks, having a capital of $5,837,000, and an outstanding circulation of $4,697,314; 60 State banks and trust companies, with a capital of $2,521,985, holding $6,100,367 of deposits; 245 private bankers, represent- ing a capital of $2,583,754, with deposits amounting to $7,017,806; and 4 savings banks, with a capital of $48,167, having deposits amounting to $208,018. Administration.—As in the other States, the govern- mental power is divided among three departments, known as the executive, legislative, and judicial. _ The officers of the executive department are the governor, lieutenant-governor, secretary of state, auditor, treasurer, superintendent of public instruction, and register of the State land office. All these officers are elected by the

people, the term of office being in cach case two years. No one is eligible for the office of governor or lieutenant- governor who is less than thirty years of age, or has not been a citizen of the United States and of the State for at least two years. The governor is commander-in-chief of the militia. He has the power of filling vacancies in oftice in cases for which the law does not otherwise provide, of calling the general assembly to meet in extra session, of vetoing laws passed by the general assembly, and of pardoning persons convicted of any crime excepting treason. The lieutenant-governor is ex officio president of the State senate; and, in the event of the death, resignation, or removal of the governor, he assumes his office.

The legislative department is vested in the general assembly, which consists of a senate and house of repre- sentatives. The former consists of not more than 50 senators, who are elected for terms of four years. Each senator must be at least twenty-five years of age, and must be a citizen of the State. The house of representa- tives consists of not more than 100 representatives. Their term of office is two years. A representative must have attained the age of twenty-one years. The

general as- sembly meets at Des Moines (which since 1857 has been the capital), and holds a regular session once in two years.

The judicial department comprises a supreme court and district and circuit courts. Its officers are the judges of the several courts, clerk and reporter of the supreme court, attorney-general and district attorneys, all of whom are elected by the people. The supreme court consists of four judges, whose term of office is six years. The senior in office is the chief justice. The State is divided into a certain number of judicial districts, in each of which are elected every four years a judge of the district and of the cireuit court and a district attorney. The latter is the prosecuting attorney for his district.

The representation of the State in the national congress consists of two senators, chosen by joint ballot of the two houses of the general assembly, and of nine representatives, elected directly by the people of the congressional districts.

The State is divided into ninety-nine counties. Their officers are all elected by the people, and the tenure of office is two years. They are—three, five, or seven super- visors (who collectively form a " board of supervisors"), an auditor, a clerk of the district and circuit courts, a sheriff, treasurer, recorder, superintendent of schools, coroner, and surveyor. 'The board of supervisors have authority over the property of the county, levy State and county taxes, and keep in repair roads and bridges. Each county is divided into civil townships, which are in most cases 6 miles square, corresponding with the congressional or survey townships of the general land system. Each town- ship is under a civil government, administered by three trustees, a clerk, anassessor of taxes, and twoor more justices of the peace and constables. All these officers are elected by the people, and all, with the exception of the justices of the peace, whose term is two years, serve for one year only. 'The trustees are the general managers of the affairs of the township. They are the judges of election, and have charge of fences and roads, and the care of the poor. Cities and towns, when incorporated, are not removed from the jurisdiction of the township officers.

Value of Property.—The preliminary results of the tenth

census (1880) show the following figures regarding the wealth, debt, and taxation of the State :—

Assessed valuation of real estate ….....0. $296, 254,342

19 ap personal property …... 101,268,422 Total assessed valuation….....cc.eccseecsevess 897,522, 764 PEMOUUEAOETS AEC 5 (ccc.

a3 COMMMUV DAR ertte trans enies sie ont san 4,280,091 StaternclebtermellS7Ome me ete. ese vc cscssenessceeee 545,435 Bonded debt of counties… .....0….c.cccceeeene QeOU/Aaeiell All other debt Re Re os fss ews 325,165

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Judging from returns of true valuation of real estate from a few countics, scattered over the State, the true valuation of real estate must be not far from $900,000,000. Itis impossible to make an estimate of the true valuation of personal property.

Education.—The State is divided into school districts, each civil township constituting one, with such incorporated cities and towns as may so elect. The support of the educational system is derived from the proceeds from all sales of State lands, 5 per cent. of all proceeds from sales of land belonging to the general Government within the State, a county tax of not less than 1 mill nor moro than 24 mills on the dollar, and a district tax of not more than 14 per cent. upon the assessed valuation of the property within the school district. Besides these, there are several other minor sources of revenue. The amount of the school district tax for 1880 was $3,704,465, and the county tax for schools, $409,110, giving a total taxation for support of schools of $4,113,575. The total valuation of school property is estimated at $12,197,396. The total school district debt, all which is bonded, is $1,125,138. The schools are graded, and classified as primary, intcrmediate, grammar, and high schools. The law permits a high school in each county.

The State supports one university, located at Iowa City. It com- prises academical, normal, medical, and law departments. Thc State also supports a school of agriculture and the mechanical arts, located near Ames, in Story county. There are also several colleges supported by religious denominations, the greatcr number of them belonging to the Mcthodists, theological seminaries, and a college under the direction of the Norwegian Luther Synod.

Population. —The inhabitants of the State in 1880 numbered 1,624,620, a gain of 86 per cent. on the number of 1870. The fol- lowing tables show the growth of the population since 1840, and give details of its distribution in 1870 and 1880 :—

Increase

White, Total. per cent,

Coloured.

188 333 1069 5813

43,112 192,214 674,913

1,194,020

1,624,620

42,924

191,881 673,779 1,188,207 1,614,510

1880, Percentage, 1870. Percentage.

1: EC

848,234 52 625,917 52h

Females……... 776,386 48 568,103 474 INiaitiveS) = ...006 1,363,132 84 989,328 83 ak. 261,488 204,692 ily

The density of the population is 30 inhabitants per square milc. Excluding the cities of 10,000 inhabitants and upwards (the urban population), this density is reduced to 27.

The principal cities of the State, with their population in 1880, are as follows :—

Des Moines… 0.1.0. 0c PE ys) TK Glo) salle Ganeemepeetesoeece soc mal MO TEU gino: 50952 «ever 22,254 | Cedar Rapids ……. 10,104 DAWEH VOR E:.....0s0recne ee 21, SOL |TMATON ....escscvseeeseees 9,052 [Byehe) bbave40}1 ooameReBannOnGe HOSA DO MOLtUMIGV aN.) ...0-

History.—Iowa was originally a part of the Louisiana purchase. In 1834 all that part of the United States lying west of the Mississippi river and north of Missouri, including the present area of Iowa, was placed under the jurisdiction of the Territory of Michigan, and two years later the Territory of Wisconsin was created, including what is now Iowa. In 1838 Iowa itself was made a Territory, and on December 28, 1846, it was admitted to the Union asa State. At the time of the Louisiana purchase, this region was occupied by the Sioux, Sac and Fox, and Iowa tribes of Indians. The first white settlements within the State were made along the Mississippi in 18383,—Fort Madison, Burlington, and Dubuque being the first points occupied. From these points set- tlement spread westward, and the growth of the Territory and State has from that time been rapid and steady. (Hy G.*).

IOWA CITY, the capital of Johnson County, Iowa, and till 1857 the seat of the State Government, is situated on the Iowa river, and on the Chicago, Rock Island, and Pacific Railroad, 130 miles east of Des Moines. It is the seat of the State university, which since 1857 has been open to both sexes, and holds a high position among western colleges, both as regards methods of study and the number of students in attendance. The population,

which in 1870 was 5914, numbered 7123 in 1880, XI. — 27

IPECACUANHA. The root used in medicine under this name is obtained from Cephaelis Ipecacuanha, A. Rich., a small shrubby plant of the natural order Cincho- naceex. It is a native of Brazil, growing in clumps or patches in moist shady forests from 8° to 22° S. lat., and is believed to extend to the Bolivian province of Chiquitos, and the valley of Cauca in New Granada. The drug of commerce is procured chiefly from the region lying between the towns of Cuyaba, Villa Bella, Villa Maria, and Diamantina in the province of Matto Grosso, and near the German colony of Philadelphia, north of Rio Janeiro. Ipecacuanha, although in common use in Brazil, was not

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Ipecacuanha Plant.

employed in Europe previous to 1672. In France within a few years after that date it formed the chief ingredient in a remedy for dysentery, the secret of the composition of which was purchased by the French Government for 1000 louis d’or, and made public in 1688. The botanical source of ipecacuanha was not accurately known until 1800.

The mode of obtaining the root is thus described by Weddell. The collector or poayero grasps the whole of the stems of the poaya or ipecacuanha plant in one hand, and loosens the roots by inserting a stick obliquely under them, to which is given a see-saw motion; the adhering soil is then shaken off, and the root placed in a bag.

TPECALCUANHA

The root is gathered during the whole-of the year, but in less quantity during the rainy season on account of the difficulty of drying the root. As imported, about three packages out of four are damaged by sea-water or damp. The root appears to be possessed of very great vitality, for in 1869 M‘Nab, the late curator of the Botanical Gardens of Edinburgh, discovered that so small a portion as 4’g of an inch of the annulated root, placed in suitable soil, would throw out a leaf-bud and develop into a fresh plant, while Lindsay, a gardener in the same establishment, proved that even the leaf-stalk is capable of producing roots and buds ; hence there is but little probability of the plant being destroyed in its native habitat. The great value of the drug in dysentery, and its rapid increase in price from an average of 2s. 94d. per Ib in 1850 to about 8s. 9d. per Ib in 1870, led to attempts to acclimatize the plant in India, which, however, have not hitherto proved to be a commercial success, owing to the difficulty of finding suitable spots for its cultivation, and to its slowness of growth. Like other dimorphic plants, ipecacuanha ripens seeds best when cross- fertilized, and presents various forms. Two of these have been described by Professor Balfour of Edinburgh, one distinguished by having a woody stem, firm elliptic or oval leaves, with wavy margins and few hairs, and the other by an herbaceous stem, and leaves less coriaceous in texture, more hairy, and not wavy at the margins. This diversity of form is most apparent in young plants, and tends to dis- appear with age. ,

Ipecacuanha root occurs in pieces about 2 or 3 lines in thickness, of a greyish-brown or reddish-brown tint externally, having a ringed or annulated surface, and ex- hibiting a white or greyish interior and a hard wiry centre. It has a faint rather musty odour, and a bitterish taste. It is usually mixed with more or less of the slender subter- ranean

stem, which has a very thin bark, and is thus easily distinguished from the root. The activity of the drug resides chiefly in the cortical portion, and hence the presence of the stem diminishes its value. The variety imported from New Granada and known as Car- tagena ipecacuanha differs only in its larger size and in being less conspicuously annulated. Ipecacuanha owes its properties to the presence of rather less than 1 per cent. of the alkaloid emetine, which, with the exception of traces, occurs only in the cortical portion of the root. The formula assigned to emetine has been variously stated by different chemists, that published by Lefort and Wurtz in 1877 is C.sH, N,O; Emetine is a white powder, turning brown on exposure to light, and softening at 70° C. (158° Fahr.). It is precipitated from its solution by tannin and nitrate of potassium, and is soluble in chloroform, but only slightly so in ether. A solution containing only gy55 part of emetine has been shown by Power to become of an intense and permanent yellow colour when treated with a solution of chlorinated lime and a little acctic acid. Emetine exists in the root in combination with ipecacuanhic acid, which according to Reich is a glucoside. It is amorphous, bitter, and very hygroscopic. 'The root contains also about 37 per cent. of starch, a large quantity of pectin, and small proportions of resin, fat, albumen, and ferment- able and crystallizable sugar.

Ipecacuanha is one of the safest and most valuable emetics, being more suitable for administering to children than any other. The amount required to produce its effect varies considerably, children as a rule being more tolerant than adults: according to Ringer, thirty grains is the average dose for an adult, twenty grains for young children. Its action is rather slow, taking place in from 20 minutes to half an hour after ingestion. Minute quantities of the drag, on the contrary, such as drop doses of ipecacuanha wine every hour or three times a day,

according to the urgency of the case, have the effect of checking vomiting arising from natural causes. The nauseating and emetic properties of ipecacuanha are believed to be due to its influencing the peripheral ter- minations of the pneumogastric nerve, since it produces

vomiting even if injected into the blood. In nauseating doses it acts both as a diaphoretic and antispasmodic. It is also a stimulant or irritant of the mucous membranes, and is hence classed as an expectorant, and used success- fully in cough, bronchitis, gastric catarrh, and diarrhcea. Some individuals are so sensitive to the action of ipecacuanha as to suffer, even on smelling the drug on entering a room where it is kept, all the symptoms of coryza, hay fever, or bronchitis. In large doses of from 60 to 90 grains, repeated if required in 10 or 12 hours,— the patient lying on his back to prevent sickness or nausea, —it is found to be one of the most valuable remedies in dysentery, especially in the epidemic and sporadic forms met with in tropical and malarious countries. Externally applied in the form of ointment, ipecacuanha causes con- siderable irritation, followed by the appearance of pustules and ulceration. In doses of one-eighth to one-sixth of a grain it acts as a stomachic, and probably increases the gastric secretions.

Other plants to which the name of ipeeacuanha has been popularly applied are American Ipeeacuanha (Gidlenia stipulacca, Spreng.), Wild Ipecacuanha (Luphordia ILpecacuanha, L.), Bastard Ipe- cacuanha (Asclepias curassavica, L.), Guiana Ipeeacuanha (Bocr- havia decumbens, Vahl), Venezuela Ipecacuanha (Sarcostemna glauceum, TH. B.), and Ipeeacuanha des Allemands (Vincctoxicum officinale, Moench.), All these possess emetic properties toa greater or less degree.

The term poaya is applied in Brazil to emetic roots of several genera belonging to the natural orders Cinchonacexw, Violacce, and Polygalacex, and henee several different roots have from time to time been scent over to England as ipccacuanha; but none of them possesses the ringed or annulated appearance of the true drug. Of these the roots of Jonidium Ipcecacuanha, Vent., Richardsovia scabra, St. Hil, and Psychotria emetica, Mutis, arc those which have most frequently been exported from Brazil or New Granada,

See Pharmacographia, 2d ed., pp. 870-376; Bentley and Trimen, Afcdicinal Plants, 20; Martius, Systema Materixw Mcdicx

Brasiliensis, 3 91-94; Ringer, Handbook of Therapeutics, 8th ed., p. 406; Bartholow, Materia Medica and Therapeutics, pp. 423-428, (EB.

M. H.)

IPEK (112,000) (Slavonic, Petcha; Albanian, Peja ; Latin, Pesciwm), a town of Upper Albania, in the Turkish eyalet of Uskub, situated in the upper valley of the Drin between the mountains Peklen and Koprionik. A siall stream, bearing like several others in the Balkan peninsula the name of Bistritza (the bright or clear), flows through the town. On one of the neighbouring heights is situated the monastery of Ipek, founded by Archbishop Arsenius in the 13th century, and famous as the ancient seat of the patriarch of the Servian Church. The buildings are surrounded by thick walls, and comprise a large central church (Our Lady's), and two side chapels (the Martyrs and St Demetrius), each surmounted by a leaden cupola. The church dates from the 16th and 17th centuries, Among its numerous objects of interest are the body of Archbishop Nicodemus, the white marble tombs of Ar- senius and other chiefs of the Servian Church, and the white marble throne on which the patriarchs were crowned. The side chapels have stained glass windows. According to some authorities, Ipek occupies the site of Dioclea, destroyed by the Bulgarians in the 11th century. In the Turkish administration it is the seat of a pasha with two tails, and at one time the pashalik had become almost an hereditary government. The population of the town was calculated by Boué (1838, 1845) at 8000 and by Dr Miiller (1844) at 12,000. Jourishitch, the Servian author, states the number of houses at 4000. In the recent troubles of Turkey Ipek has suffered, and in 1876 the Turkish officials closed the monastery.

See Boué, Ltinéraire de la Turquic; Irby, The Slavonic Provinces of Turkey, 1867 ; Barth, Reise durch das Innere der Huropiischen

Turket, Berlin, 1864.

IPHICRATES, an Athenian general who flourished in the earlier half of the 4th century B.c., owes his fame as much to the improvements which he made in the accoutre- ments of the peltasts or light-armed troops as to his numerous victories gained by their aid. Increasing the length of their javelins and swords, substituting linen corselets for their

heavy coats-of-mail, and introducing the use of light shoes, called after him Zphzcratides, he increased greatly the rapidity with which these troops could make the sudden forays that were so common in the military tactics of the time. With his peltasts Iphicrates seriously injured the allies of the Lacedemonians in the Corinthian war, aud in 392 succeeded in dealing a heavy blow at once to the vanity and the prestige of the Spartans, by almost annihilating a body of their famous hoplites. Following up his success, he took city after city for the Athenians ; but his arrogance procured his transfer from Corinth to the Hellespont, whither, however, his success followed him. About 378 he accepted a command under the Persians in Egypt, and on his return thence to Athens commanded an expedition in 373 for the relief of Corcyra, which was menaced by the Lacedemonians. On the peace of 371, Iphicrates seems to have returned to Thrace, and some- what tarnished his fame by siding with his father-in-law, King Cotys, in a war against Athens for the possession of the entire Chersonese. The Athenians, however, soon pardoned him and gave him a joint command in the social war. For his conduct in this position he was impeached; after his acquittal he lived quietly at Athens. The date of his death is unknown.

See Rehdantz, Vitzw Iphicratis, Chabriv, et Timothei.

IPHIGENETA is the heroine of several famous Greek legends. She is generally said to be the daughter of Agamemnon, and is also called Iphianassa, though the two are distinguished by Sophocles and by the writer of the Cyprva. Agamemnon had offended Artemis, who there- fore prevented the Greek fleet from sailing for Troy, and could be appeased only by the sacrifice of his daughter. According to some accounts the sacrifice was completed, according to others Artemis carried away the maiden to be her priestess in the Tauric Chersonese, and substituted for her a hind. In this new country it was her duty to sacrifice to the goddess all strangers ; and as Orestes came in search of her she was about to sacrifice him, when a happy recognition took place. These legends show how closely the heroine is associated with the cultus of Artemis, and with the human sacrifices which accompanied it in older times before the Hellenic spirit had modified the barbarism of

this borrowed religion. They bring into connexion the different places in which this goddess was worshipped ; and, as Attica was one of her chief seats, Iphigeneia is sometimes called a daughter of Theseus. At Comana in Cappadocia, one of the chief homes of the goddess in her more barbaric form, there was a priestly family Orestiade ; and Iphigeneia and Orestes are named as the founders of Artemis worship in Sparta and Attica, as well as in many parts of Asia Minor and Italy (see Preller, Griech. Mythol., 3d ed., i. 250). At Hermione Artemis was worshipped with the epithet Iphigeneia, —this showing the heroine to be in the last resort a form of that goddess. Iphigeneia isa favourite subject in Greek literature and art. She is the heroine of two plays of Euripides; but none of the many other tragedies founded on her story have been preserved. In vase paintings she frequently occurs ; and the picture by Timanthes represent- ing Agamemnon hiding his face at her sacrifice was one of the famous works of antiquity.

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IPSWICH (50,000), Old Eng. Gippeswic, the county town of Suffolk, 68 miles north-east of London by rail, stands on,a gentle ascent above the left bank of the Gipping, which widens here into the Orwell estuary. Its lower and older portion, irregularly built, retains some curious speci- mens of ancient domestic architecture, as Sparrowe’s House (1567), with quaint emblematic mouldings of Charles IT.’s reign, Archdeacon’s Place (1471), and Wolsey’s Gateway (1528), sole relic this of one of those “twins of learning,” the colleges of Christ Church and Ipswich. The public buildings, however, are one and all of them modern. The town-hall (1868) is an imposing edifice in the Venetian style, surmounted by a clock-tower 120 feet high, and beautified with statues and medallions. Close by, and

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Plan of Ipswich,

similar in style, are the post-office (1880) and tho new corn-exchange (1880-81), and a second good group is formed by the new museum and fine art gallery (1880-81), the former of which, founded in 1847, has a splendid collection of red crag fossils. Other buildings are the Kast Suffolk Hospital (1836-69), militia artillery barracks (1855), custom-house (1845), mechanics’ institute (1824 ; greatly enlarged 1877), working men’s college (1862), public hall (1868), and a little theatre, where Garrick made his début in 1740. The grammar school, dating from at least 1477, was last refounded by Queen Eliza- beth in 1565, and was rebuilt in 1851 on the northern outskirts of the town, the Prince Consort laying the foundation stone. It is a red brick Tudor pile, with a

IPSWICH

pretty chapel, has 6 masters and 85 boys, and is endowed with 11 scholarships of an aggregate yearly value of £302. Fourteen board schools had an average attendance of 2426 in May 1880, when there were twenty-two other elementary schools, attended by 3130 children. The older of the sixteen churches are all of them towered flint-work struc- tures, wholly or mainly Perpendicular in style, with the exception of St Peter's (restored and enlarged in 1877), which is Decorated. They include St Margaret's (restored 1846-74), with a beautiful oak Tudor roof, elaborately painted temp. William and Mary; St Matthews (restored 1860), St Lawrence (1431; restored 1858); and St. Clement's (restored 1860-80), containing the tomb of Eldred, an early circumnavigator. St Michael's (1880) is a wholly new erection in Early English style, and three other churches have practically been rebuilt—St Mary-le-Tower (1863-66), rich in oak carving and painted glass, with a tower and spire 176 feet high, and a peal of twelve bells; St Helen's (1877-78), also with a spire; and St Mary (1871) at Stoke, a suburb south of the Gipping. Of non- established places of worship the Roman Catholie church of St Pancras (1863) is the most noticeable, a late First Pointed edifice with a richly carved reredos and a lofty fléche. Ipswich has two finely planted arboretums, the upper one of which is public; alongside stretches Christ Church park, with its picturesque Tudor mansion (1549). There are shady walks too, between the river and a wet dock, which, formed in 1842 at a cost of £130,000, covers 32 acres, and admitted vessels drawing 14 feet. Under an Act obtained in 1877 the commissioners have expended £80,000 more in making a new entrance lock, to admit vessels drawing 18 feet, in erecting public ware- houses, and in deepening and improving the river.

In 1879, 264 vessels of 54,353 tons entered from, and 89 of 11,406 tons cleared to, foreign countries and British possessions ; eoastwise there entered 2405 of 152,161, and cleared 1792 of 118,624 tons. There were 125 vessels of 9779 tons, besides 23 fishing boats, registered as belonging to the port on 31st December of that ycar, in which the customs revenue amounted to £20,828, the chief im- ports being coal (51,720 tons), linseed, cotton seed, maize, barley, 1ron, and iron pyrites; the exports, wheat, malt, flour, artificial manures, and agricultural implements. The last are manufactured at the Orwell Works (1785) of

Ransomes, Sims, & Head, the greatest in the world, covering 13 acres, and employing over 1400 hands. Shipbuilding (27 vessels of 1965 tons during 1875-79), brewing, tanning, and the manufacture of manure from coprolites, and of silk, flax, ropes, and artificial stone, are the leading industries. Ipswich returns two members to parliament. The borough has an area of 8192 acres. The population, which in 1871 was 42,947, had inereased in 1881 to 50,2138.

A pavement found in Castle Field in 1854 establishes the pre- sence of the Romans, but Ipswich is first mentioned in history as having been plundered by Northmen in 991 and 1000. Lying out of the eourse of events, it has played no conspicuous part, and the chief incidents in its history are the granting of its earliest charter by John (1199); the visits of Edward I. (1297), Edward III. (1350), Elizabeth (1561, 1565, and 1578), and George II. (1737) ; the meet- ing of the British Association (1851) and of the British Archeo- logical Association (1864). Thomas Wolsey (1471-1530), William Butler (1535-1618), Bishop Ralph Brownrigg (1592-1659), Clara Reeve (1738-1803), and Mrs Trimmer (1741-1810) were natives ; and Gainsborough, a resident from 1747 to 1759, has given his name to a beautiful lane above the " princely" Orwell. See G. R. Clarke's History of Ipswich, Ipswich, 18380.

IPSWICH (7734), the second most important town of Queensland, Australia, is built on the south side of the river Bremer at the head of navigation, about 24 miles in a westerly direction from Brisbane, in 27° 35' S. lat. and 152° 50' E. long. It is the centre of a rich pastoral and agricultural district, the principal product being maize. Coal is worked on the banks of the Bremer and the Bris- bane, and there is a woollen factory in the town. A court- house, a hospital, a lunatic asylum, a grammar school, opened in 1863, and a school of arts are among the public buildings. The first sale of crownlands took place on October 11, 1843; and the first steamer between Brisbane

and Ipswich was run June 29,1846. It was in 1860 that the town was incorporated as a municipality, and in the same year was held the first session of the supreme court. The railway to Brisbane was opened in

1875. The value of ratable property is estimated at about £350,000. In 1871 the population of Ipswich was 4820; in 1876, in- cluding the suburbs, it was 7734.

IQUIQUE, a seaport town of Peru, in the department of Tarapaca, in 20° 12’S. lat. In the twenty-five years from 1850 to 1875 it rose from a mere fishing village to be a place of from 18,000 to 20,000 inhabitants. This rapid growth was solely the result of the trade in the nitrate of soda which is found in exhaustless abundance in the neighbouring country, and of which during the five years 1874 to 1878 there was annually exported from the pro- vince, by way of Iquique, Mejillones, Junin, and Pisagua, an average of 276,811 tons. About 60 or 70 tons of iodine are also manufactured in the nitrate of soda factories, vary- ing in proof from 95 to 98 per cent. There entered and cleared in 1877 253 vessels, of which 142 were English, the total burden being 138,054 tons. As there is no cultivable land in the vicinity, all provisions have to be imported. In 1875 the town was laid waste by a conflag- ration; and it had hardly begun to recover from this disaster when it was visited in 1877 by a series of earth- quakes. The wooden houses which fell at the first shock

took fire, and while the firemen were endeavouring to.

extinguish the flames a huge wave rushed in and carried off their engines. The people suffered severely both from hunger and thirst, as the principal store and the water condensers were both destroyed. The total damage was estimated at £800,000. In 1878 there were only 7000 or 8000 people in the town, which, however, has been rebuilt with greater attention to solidity of architecture and regularity of plan.

IRAK ADJEMI (@e., Persian Irak), also called JEBAL (Arabic, mountains) and Konistan (Hindustani, moun- tain-land), is the most important of the eleven provinces of Persia, comprising the larger part of the western half of the country, or upwards of 138,280 square miles. To the north lie Azerbijan, Ghilan, and Mazanderan, to the east Khorasan, to the south Farsistan and Khuzistan, and to the west Ardilan and Luristan. The mountains for the most part run west and east, or north-west and south-east. Among the important valleys are

those of Hamadan, Ispahan, and Yezdikhast. The principal river—though it only belongs to Irak Adjemi in the middle part of its course—is the Kizil Uezen or Sefid Rud, which drains about 25,000 square miles of country, rising between Hamadan and Tabriz, in that part of the Kurdistan highlands which bears the name of Besch Parmak or Pentchangusht (Five-Finger Mountain), flowing north-north-east and then east to its junction with the Hasht Rud, and finally breaking through the Elburz range and finding its way to the Caspian. 'The rest of the rivers for tlie most part flow towards the Great Salt Descrt, which forms part of the wide eastern plain that stretches eastward into Khorasan. The following are points whose position has been fixed. Teheran, the capital, 35° 40' 30" N. lat., 51° 24' 54" E. long.; Kum, 34° 39' N. lat., 50° 53' 54" E. long. ; Kushan, 34° N. lat., 51° 26' 39" E. long; Ispahan, 32° 37' 30" N. lat., and 51° 39' E. long. The name Irak Adjemi is a modern one, and Reynaud confesses that he knows no other origin of its use than the fact that the Seljukids who reigned over Irak and bore the title of Sultan el Irak were also rulers of the Jebal. The country corresponds in large part to the ancient Media.

IRAK ARABI, or Inax ex Arast, to which the name Trak is more properly applied, is the district betwecn the Tigris and Euphrates, and from the Euphrates west to the desert, its northern limit being from Anah on the Euphrates

to Tekrit on the Tigris. It corresponds to the land of Chaldsea or Lower Mesopotamia. There is a town Irak in the district, about 20 miles east of the Euphrates.

IRAWADI, or Inrawanpy, the principal river in the province of British Burmah, traversing the Pegu division from north to south. The Irawadi is formed by the junction of two streams whose source is as yet unknown, in about 26° N. lat. The chief tributaries are the Mogoung, from the westward, which throws its water into the main stream (here 600 yards wide), in 24° 50' N. lat., and the Shwe-lf and Kyeng-dweng. Shortly after leaving the mouth of the Mogoung it enters the first or upper defile. Here the current is very rapid, and the return waters

occasion violent eddies and whirlpools). When the river is at its lowest, no bottom is found even at 40 fathoms. After receiving the Ta-peng from the east, it enters the second defile, which is exceedingly picturesque, the stream winding in perfect stillness under high bare rocks rising sheer out of the water. Farther down the Irawadi, and not far from Mandalay, is the third or lowest defile. The banks are covered at this point with dense vegetation, and slope down to the water's edge; at places appear almost perpendicular but wooded heights. The course of the Irawadi after receiving the waters of the Myit-uge and Tsagaing, as far as 17° N. lat., is exceedingly tortuous ; the British frontier is crossed in 19° 29' 3" N. lat., 95° 15' E. long., the breadth of the river here being # mile; about 11 miles lower down it is nearly 3 miles broad, At Akouk-toung, where a spur of the Arakan hills ends in a precipice 300 feet high, the river enters the delta, the hills giving place to low alluvial plains, now protected on the west by embankments. From 17° N. Jat. the Irawadi divides and subdivides, converting the lower portion of its valley into a network of intercommunicating tidal creeks. It reaches the sea in 15° 50' N. lat. and 95° 8' E. long., by nine principal mouths. The only ones used by sea-going ships are the Bassein and Rangoon mouths. The area of the catchment basin of the Irawadi is 158,000 square miles ; its total length from its known source to the sea is about 900 miles, the last 240 of which are in British territory, As fardown as Akouk-toung in Henzada district its bed is rocky, but below this sandy and muddy. It is full of islands and sandbanks; its waters are extremcly muddy, and the mud is carried far out to sea. The river commences to rise in March ; about June it rises rapidly, and attains its maximum height about September. The total flood discharge for 1877 was 466,120,288,940 metre tons of 37 cubic feet. The river is navigable at all seasons by steamers of light draught as high as the first defile, and during the dry season for steamers drawing 6 feet as far as the frontier. The chief tributaries of the Irawadi in British territory are the Tha-htun (or Theng-dun), the Tha-de, and Thai-lai-dan from the west ; and the Kye-ni, Bhwotlay, and Na-weng from the east. Below Akouk-toung on the west and Prome on the east the Irawadi receives no tributaries of any importance.

The broad channel of the Irawadi has always been the sole means of communication between the interior and the seaboard. From time immemorial the precious stoncs, minerals, &c., of Upper Burmah, Siam, and the Chinese frontier provinces have been brought down by this route. At the present day the great bulk of the trade is in the hands of the " Irrawaddy Flotilla Company," an important English carrying firm; but native boats still maintain a strenuous competition. The flotilla of the company con- sists of about sixty vessels, including both steamers and flats. They employ about 1770 hands, European and native, and distribute in wages upwards of £50,000 a year. Their headquarters are at Rangoon, whence steamers run twicc a week to Bassein, and also to Mandalay.

The latter service is continued twice a month to Bhamo, about 1000 miles from the sea. The principal articles carried up stream are Manchester piece goods, rice, salt, hardware, and silk. The articles carried down stream are raw cotton, cutch, india-rubber, jade, spices, precious stones, timber, earth-oil, and dry crops, such as wheat and pease. 'The value of the trade either way is roughly esti- mated at about 14 millions sterling. The tota] number of native boats on the Irawadi is returned at about 8000. They carry a large proportion of the heavy articles of commerce, especially cutch and earth-oil.

IRBIT, a town of European Russia in the government of Perm, 70 miles north-east of Ekaterinburg, at the conflu- ence of the Irbit with the Nitza, a sub-tributary of the Obi. Though the St Petersburg Calendar for 1878 gives the permanent population as only 4212 (in 1860 the number was 3408), it is oue of the most important trade centres of northern Russia, and during its great fair (February 1-13 to March 1~13) it is visited by upwards of 20,000 people, Among its public buildings are a theatre, au exchango, a bank (established in 1849, with a capital of 30,000 roubles), and a district school, Irbit was originally founded by Tartars in 1638, but the discovery of iron ore in the neighbourhood soon attracted Russian settlers. The

assistance which the inhabitants rendered iu the suppres- sion of the Pugatcheff rebellion was rewarded by Catherine granting Irbit the rank of a town in 1775. In 1781 it was made a district town of Perm. The right of holding the fair was bestowed by Michael Theodorovitch as early as 16438, and from 1695 the customs which had previously beeu collected at Verkhoturya were taken at Irbit itself. In 1829 the value of the wares brought to market amounted to 10,888,155 roubles (£1,723, 916), and these were sold to tlic value of 7,537,489. In 1861 the corresponding figures were 51,204,000 roubles and 39,397,500. In 1859 the principal items were (a) of Russian goods: leather and skins, 6,780,000 roubles ; furs, 4,750,000; copper and iron, 1,252,000; grain, salt, meat, and fish, 1,207,000; fruit and groccries, 1,115,000 ; wooden wares, 1,040,000; (b) of European wares; cotton, woollen, and silk, 12,087,000; sugar, 2,650,000 ; groceries 860,000 ; (c) of Asiatic goods: tea, 29,500,000. In 1880 the fur trade was espccially active, no fewer than 3,550,000 Siberian furs and 110,100 Russian furs being brought to market. The tea, on the other hand, did not go beyond the value of 54 million roubles. There is a horse fair at Irbit, October 28th (September 10th), when old horses are disposed of by Tobolsk and Tyumen Tartars. The Irbit iron-works are situated 40 miles from the town, on the banks of the river Irbit, below the confluence of the Shaitanka, which flows out of Irbit lake, a sheet of water nearly 4 miles long and 24 miles broad. The inhabitants of the spot numbered 1822 in 1869 (861 men and 961 women). In 1878 the output of pig iron was about 2900 tons. The Irbit post-road leaves the great Siberian road at Kamnishloff, 73 miles from the town.

IRELAND

PART L—GEOGRAPHY AND STATISTICS.

RELAND, a large island ta the west of Great Britain, | and along with it forming the United Kingdom, extends from 51° 26’ to 55° 21’N. lat., and from 5° 25’ to 10° 30’ W. long. It is encircled by the Atlantic Ocean, and on the east is separated from Great Britain towards the uorth by the North Chanuel, whose width at the narrowest part, between the Mull of Cantyre and Torr Head, is only 1334 miles; in the

centre by the Irish Sea, whose width is 130 miles; and in the south by St George's Channel, which has a width of 69 miles between Dublin and Holyhead, and of 47 miles at its southern extremity. The island has the form of an irregular rhomboid, the largest diagonal of which, from Torr Head inthe north-east to Mizen Head in the south-west, measures 302 miles. The greatest breadth of the island is 174 miles, and the average breadth about 110 miles. The total area comprises 32,535 square miles, or 20,822,494 acres. 'Territorially it is divided into 4 provinces—Leinster, Munster, Ulster, and Connaught— and 32 counties, the number of counties included in the different provinces being 12, 6, 9, and 5 respectively. These 32 counties are divided into 316 baronies, comprising 2532 parishes, which are further divided into townlands or ploughlands numbering about 60,760, with an average size of over 300 acres each. 'Table I. shows the area and distribution of land by provinces and counties in 1880.

Geology.—The central part of Ireland is occupied by a great undulating plain, whose highest elevation is 300 and average elevation about 200 feet. In the centre of the country, from Dublin Bay on the east to Galway Bay on the west, this plain stretches from shore to shore, but towards the south and north it is enclosed by an irregular semicircular belt of mountainous country. The surface of the plain is broken occasionally by isolated hills. Through- out nearly the whole of its extent it rests on the Carboni- ferous Limestone, and in several places there are remains of the Upper Carboniferous strata or Coal-measures, by which the Carboniferous Limestone was at one time overlaid, and which have been carried away during a vast period of denudation chiefly by the action of subaerial agents. The strata of limestone are nearly horizontal, except where they

are contorted by local disturbances, In the central plain it is only occasionally that the limestone crops to the surface, as it is generally overlaid by boulder clay, the result of glacial action, by the middle sands and gravels formed on the bed of the shallow sea by which the plain was at one time occupied, or by the peat bogs resting on the beds of previous lakes. At one period the Carboni- ferous beds must have extended widely beyond their present limits, and have formed the

surface strata of the uplands to the north-west and south-east. In the north-western highlands of Sligo, Leitrim, and Fermanagh they still form a lofty table-land, which occasionally rises into peaks about 2000 feet in height.

The mountain masses of Ireland are generally traversed by deep and narrow valleys running both north and south and east and west, and frequently giving rise to high and isolated peaks. The districts of Donegal and Derry in the north-west, and those of Galway and Mayo in the west, consist chiefly of metamorphosed Lower Silurian rocks, and are believed to form part of the same geological system as that of the Highlands of Scotland. Those of Donegal and Derry, lying between Donegal Bay and Lough Foyle, consist of granite, gneiss, and hornblendic and other schists, with crystalline limestones and quartzites. Their principal peaks are the isolated summit of Errigal (2466 feet) and Blue Stack (2219 feet). In West Galway and Mayo the rocks consist chiefly of quartzite, or of alternating beds of quartzite and granite or gneiss schist. They include the Twelve Pins of Connemara (2395 feet), Croagh Patrick on the shores of Clew Bay (2510 feet), the Nephin Beg mountains, and the Ox mountains. The range of hills between Killary Harbour and Lough Mask—the highest summit of which, Muilrea, has an elevation of 2688 feet—belongs to the Upper Silurian formation. The fact that these rocks do not share in the metamorphism of the Lower Silurian beds shows that the alteration must have taken place at some time between the Lower Silurian and Upper Silurian periods. Rocksof Cambrian age occur in Wexford, Wicklow, and Dublin. The principal elevations of these districts are formed of granite, and belong to an earlier epoch than

that of the Old Red Sandstone. The highest summit is Lugnaquilla (3039 feet), composed of altered Silurian rocks lying on the granite. In the south-western districts of Kerry, Cork, and Waterford, the mountains are composed of broad. bands of Old Red Sandstone, the valleys being formed of narrow bands of Carboniferous rocks. The lie of the strata is nearly east and west, since they have been plicated by

forces acting in a transverse direction, the time of disturbance being some unknown date between the Carboniferous and the Permian periods. This district includes the rugged range of Macgillicuddy's Reeks, which rise abruptly from the Carboniferous Limestone surround- ing the Killarney lakes, and, occupying the greater part of the peninsula between Dingle Bay and Kenmare River, attain at Carntual a height of 3414 feet above sea-level. Many of the most conspicuous mountain groups in the southern half of the island consist of central cores of Silurian strata wrapped round with thick folds of Old Red Sandstone. Such are Slieve Aughty, Slieve Bernagh, the Silver Mine mountains, and Slievenaman in Clare and Tipperary, Galtymore in Limerick, which has an elevation of 3015 feet, and the Slieve Bloom mountains in Queen's county. The principal mountain groups in the north-east

are the Carlingford mountains, composed of felspathic and pyroxenic rocks, and attaining in Slieve Foy a height of nearly 2000 feet ; the Mourne mountains to the north of Carlingford Lough, composed of granite, with veins of basalt, felstone, mica trap, and porphyry, the highest summit being Slieve Donard (2796 feet); and the Slieve Croob mountains, to the north of the Mourne range, composed of granite of a much earlier origin. Both the Mourne and Carlingford mountains are of intrusive origin, and probably belong to the Permian period. A considerable extent of low country in Down, Armagh, and Cavan is occupied by Silurian rocks in the form of grits and slates. The estuary of Belfast Lough lies in Triassic rocks, containing beds of rock salt. Rocks of similar age extend west of Lough Neagh, and thence north to Lough Foyle. They are overlaid by Jurassic and Cretaceous strata, which, however, are almost wholly concealed under the great basalt flood of the north- eastern counties. The greater part of Antrim and the eastern portion of Derry are occupied by basalt rock forming an elevated plateau, for the most part bounded towards the sea by precipitous escarpments, consisting of Upper Green- sand and Chalk,

surmounted by the black basalt which, often crowning their summits, stands in striking contrast

Taste I.—Area and Distribution of Land in 1880, and Population in 1881.

Area in Statute Aeres.

Distribution of Land in Aeres. i

| Large Lakes, Towns, Bogs, {Population 1881, Land, Rivers, and Total. Under Tillage. Pasture. Plantations. | Mountains, and Tideways. Roads, Tie ii pretties asewritiaioenans | 20,327,764 494,73 20,822,494 5,096,490 | 10,259,108 339,858 4,632,308″ | 5,159,839 Leinster. WOON ov..s-.csceececceu ces 221,298 50 221,348 77,916 116,383 8,400 23,594 46,508 ADMIT So. cee eedae ae seve 226,895 ce 226,895 88, 808 104,300 4,192 29,595 418,152 HSiare) ge si.ieeaelesiee vcnen 418,497 it 418,497 117,832 239,406 7,382 53,927 76,102 BGM KOMINY: asic iaiste oo oaieariss 507,254 2,478 509,732 157,281 293,252 10,799 45,922 99,064 King's County …... ..... 493,019 966 493,985 114,648 238,677 8,551 131,143 72,668 MRCMOLOT 66. overs : 2oi,221 12,188 269,409 72,876 131,321 3,823 | 49,201 60,790 IL QU) cag epeco dan eeeeenenas : 201,618 506 202,124 97,954 74,944 4,585 24,135 78,228 IMEC AG econ cece «es a 578,247 1,614 579,861 138,916 395,159 10,839 33,3383 86,301 Queen's County….. 0. 424,854 as 424,854 186,523 216,851 11,634 59,846 72,598 WY@SUMICHTN .....—.ceners 433,769 19,700 453,469 93,695 271,891 8,688 59,495 71,513 WYRERLOLG siete se ccscee ne, ae 575,700 3,388 579,088 207,074 304,706 10,886 53,0384 123,587 IWICKIOW®... cieiesec see saeees 499,894 284 500,178 105,307 261,393 20,826 112,368 73,679 Total for Leinster ….) 4,838,261 41,174 4,879,435 1,408,830 2,648,283 105,555 675,593 1,279,190 Munster. CYATON «Reese 768,265 59,729 827,994 141,362 481,536 8,500 136,867 141,210 (Clo ie ceuepaernencenporie. 1,838,921 10,764 1,849,685 412,029 1,001,822 32,957 392,613 492,810 IK (GTO Sere ennenee seen 1,159,358 26,562 1,185,920 160,326 586,600 18,348 394,084 200,448 MEITCTIOK cesses sijsiee oars 662,973 17,869 680, 842 176,994 415,107 8,407 62,465 177,208 WNW WeTALY ….. .…. ..| 1,048,969 12,762 1,061,731 266, 550 598,326 28,412 155,681 199,004 \) Veni (oy nee 456,198 5,354 461,552

85,169 239,515 19,771 111,743 113,235 Total for Munster ….| 5,934,684 133,040 6,067,724 1,242,430 3,322,406 116,395 1,253,453 1,323,910 Ulster AN OU STU 0 AO eee 711,276 50,804 762,080 244,685 349,172 7,420 109,999 423,171 PAUIVAGIM I ccses.. sede sees 313,036 15,051 328,087 163,473 115,871 4,665 29,027 162,823 (Clasii Jono coogoct: cee 466,261 11,134 477,895 145,326 254,347 5,448 61,145 129,008 Donegal…... 1,190,269 6,885 1,197,154 230,152 356, 809 7,275 596,033 205,448 [Dio Wyitlwdeouang Rebenceeeameeee 611,936 473 612,409 298,441 225,349 14,086 74,060 269,927 CTIA MAN ee. cee eee 417,665 39,705 457,370 104,717 243,066 6,286 63,596 84,633 Londonderry …..... 513,388 8,927 522,315 181,588 206,044 5,305 120,451 164,714 MONAGHAN eee… ..e sss 318,806 935 319,741 131,506 152,474 4,688 30,138 102,590 HAVOC Msisaaaitiiietisinaiines ves 778,943 27,714 806,657 249,334 307,026 9,736 212,847 197,238 Total for Ulster …..... 5,321,580 161,628 5,483,208 1,749,222 2,210,158 64,904 1,297,296 1,789,542 Connanght. BA. bus csiss ss sues. 1,502,362 67,142 | 1,569,504 211,986 7625787 24,282 513,407 241,662 JEGHUINI em ere os: 376,212 16,151 392,363 82,011 | 212,374 3,497 78,330 89,795 ENO oa eesrercase a ane 1,318,129 42,601 1,360,730 181,528 542,853 11,1238 582,625 243,030 Roscommon, ..ce.,. wir.. 585,407 22,284 607,691 133,090 $39,922 7,163 105,232 131,755 LEO areas. aaa 451,129 10,710 461,839 87,443 230,375 6,939 126,372 110, 955 Total for Connaught 158,888 | 4,392,127 696,008 | 2,078,261 | 53,004 | 1,405, 966 817,197

4,233,239

- **Including 133,085 acres under the smaller streams and Jakes.**

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with the light-coloured strata below. In some places, liowever, as at the Giant's Causeway, the Cretaceous rocks disappear, and the basalt slopes gradually to the sea, displaying a series of terraces formed of hexagonal pillars, and occasionally separated by bands of volcanic asl.

Coast-Line.—Along the present coast-line there are to be seen in several places traces of ancient sea margins, the most continuous being those on the northern and eastern coasts, especially in county Antrim.

Of still more ancient sea margins there are evidences in the terraces at the base or on the flanks of the mountains. The present coast-line, especially on the west and south, is very much indented by bays and inlets, which Hull, in his Geology of Ireland, attributes in many cases to the chemical action of the sea-water on the limestone rocks. On the south coast they most commonly run in a northerly direction with a westerly inclination at the upper end, and on the west coast the direction of the larger inlets is easterly, although several of the smaller ones run north, south, and north-east. Their troughs have mostly been excavated in the synclinal folds of the rocks, which therefore frequently project far into the sea in the form of high and bold headlands. On the northern coast the inlets generally run in a southerly or south-westerly direction. Most of those on the east coast have by the accumulation of sand been either wholly or partly formed into lagoons; and on the southi-east coast the sea has made considerable encroachments on the land.

The principal inlets are—on the east coast Belfast Lough, Strangford Lough, Carlingford Lough, Dundalk Bay, Dublin Bay, and Wexford Harbour; on the south coast Waterford Harbour, Dungarvan Harbour, Youghal Bay, and Cork Harbour; ou the south-west coast Roaring Water Bay, Dunmanus Bay, Bantry Bay, Kenmare River, and Dingle Bay; on the west coast Tralee Bay, the mouth of the Shannon, Galway Bay, Clew Bay, Blacksod Bay, Killala Bay, Sligo Bay, and Donegal Bay ; and on the north coast Sheep Haven, Lough Swilly, and Lough Foyle. In all, Ireland possesses fourteen harbours suitable for the largest ships, seventeen for frigates, and over thirty for coasters, besides an immense number suitable for fishing boats.

The islands of Ireland are small in size, and are situated near the mainland, most of them being formed of rocks from which, according to Hull, the adjoining Carboniferous strata had been denuded by the action of the sea-water. They are most numcrous on the west coast, especially opposite Galway, Mayo, and Donegal. Off the Donegal coast the largest is Neish Aran. Separated from the mainland of Mayo by a narrow isthmus is Achill, the largest island of Ireland, and in Clew Bay there are an immense number of islets all formed of drift. An

archipelago of granite rocks off the coast of Galway is formed of continua- tions of the mountains, and at the mouth of Galway Bay are the three islands of Aran, composed of Carboniferous Limestone. Among the picturesque stacks of rocks off the coast of Kerry the most notable are the Skellings. The largest islands opposite Cork are Dursey Island, Bear Island, and Clear Island, south of which is a picturesque rock called the Fastnet, on which there is a lighthouse. On the east coast the principal are Lambay Island, Innis- patrick, and Ireland's Kye off county Dublin, and Copeland Island at the mouth of Belfast Lough. On the northern coast the principal are Rathlin Island off Antrim, and Tory Island off Donegal.

Ivers and Canals.—Several of the rivers of Ireland, including the largest of them, have had their channels determined by a previous physical condition of the land surface, and must have been formed during a long period of denudation. Many of the valleys are dried-up river beds, and along various of the present river valleys traces of old river terraces may still be seen. In some cases tho

alterations of the courses by breaks and dislocations of the strata are of very recent occurrence. In the districts of Sligo and Fermanagh, as well as of Galway, Clare, Kerry, and Cork, the rivers and streams have frequently cut out sub- terraneous passages through the limestone, in some cases altogether disappearing ; and along their courses turloughs or blind lakes, and abrupt deep holes called sluggas are frequently formed.

Owing to the moistness of the climate and the lie of the surface of the country, Ireland is more intersected by large rivers than England or Scotland, and it is a remarkable circumstance that in several cases there are groups of rivers with closely contiguous sources, which, however, flow in widely different directions. The largest river is the Shannon, which has its source in the Carboniferous mountains of Fermanagh and Leitrim, and flows southward through Lough Allen,

Lough Ree, and Lough Dearg to Limerick, where it opens out into a wide estuary and takes a westerly course to the ocean. Up to Limerick, where it becomes tidal, it is navigable for large vessels, and for vessels of small tonnage it is navigable within 5 miles of Lough Allen. Its course above Lough Dearg is very sluggish, but from that lake to Limerick its descent is very rapid. Its total length is 240 miles, and it drains an area of 4544 square miles, The Suir, the Nore, and the Barrow, which have their sources not far from each other in the Slieve Bloom mountains, and unite at Waterford, drain together an area of 3400 square miles. The Suir is navigable for boats as far as to Clonmel, and the Nore to Innistioge. The Barrow, by means of a branch of the Grand Canal, forms a line of 120 miles of inland navigation between Dublin and Waterford. The other principal rivers, all of which are to some extent navigable, are—debouching on the west coast the Erne, the Moy, and the Corrib; on the south coast the Blackwater and the Lee; on the east coast the Lagan, the Boyne, the Liffey, and the Slaney ; and on the north coast the Bann and the Foyle.

The Grand Canal, which with its various branches has a length of 165 miles, connects Dublin with the Shannon at Shannon Harbour; and the Royal Canal, with a length of 76 miles, connects Dublin with the Shannon at Cloondora. Lines of inland navigation, partly natural and partly arti- ficial, connect Lough Neagh with Belfast, Newry,and Lough Erne, From the sea at Galway there is communication by Lough Mask and Lough Corrib to Lough Carra. Since the introduction of railways the passenger traffic on the canals has wholly ceased, but the goods traffic is still considerable.

Lakes.—Many lakes of considerable extent exist both in the mountainous and lowland districts of Ireland, and the number of small lakes is very great. Altogether the area covered by lakes amounts to 711 square miles, of which 287 are in Ulster, 305 in Connaught, 69 in Munster, and 50 in Leinster. Lough Neagh in Ulster is the largest inland lake in the United Kingdom, and has an area of 153 square miles, with a general depth of from 20 to 46 feet. Lough Erne in Fermanagh has a length of upwards of 40 miles, but a breadth of only 8 miles. Properly speaking, it consists of two lakes 5 miles apart and con-

nected by a river, the upper lake being 13 miles in length with an area of 9278 acres, and the lower 24 miles in length with an area of 28,000 acres. Both lakes are dotted with numerous islets, and the lower one is famed for its picturesque beauty. Lough Corrib and Lough Mask have respectively an area of 43,484 and 22,219 acres. The country to the west of Lough Corrib contains about 130 lakes, 25 of which are more than a mile in length. The lakes of Killarney in Kerry, which are three in number and closely adjoin each other, are situated in the midst of wild and picturesque mountain scenery. The area of the lower lake is 5001 acres, of the middle one 680,

MINERALS. |

and of the upper one 430, Lough Dearg, a small lake in the south of Donegal, has been resorted to from time immemorial as a place of penance by Roman Catholics.

The other lake of the same name in the course of the |

Shannon has an area of 29,570 acres. The other principal lake districts are Sligo, Cavan, Westmeath, and Longford. Hull, in his Geology of Ireland, makes a classification of the lakes, according to their modes of formation, under the three heads of—(1) lakes of mechanical origin, (2) lakes of glacial origin, and (3) lakes of chemical solution. Of the first group, which are those whose formation is due chiefly to faults or dislocation of the strata, he mentions as special examples Lough Neagh and Lough Allen, both of which originated before the Glacial period, and probably between the Miocene and Pliocene periods. 'Those of glacial origin occur in the mountainous districts, and are due either to the scooping out of the rocks by the passage of ice over their surface, or to the accumulation of embank- ments at the end of the valleys or hollows. Those due to chemical solution are situated either on the limestone plain or in districts where the limestone formation has penetrated, and have been produced by the solution of the limestone through the action of water containing carbonic acid gas,

Coal.—Of the Upper Carboniferous beds which at one time overspread the central plain of Ireland, only small patches remain in isolated spots,

serving chiefly as an indica- tion of the immense loss that has been sustained in an important element of material prosperity. The principal coal-fields are the Leinster, the Munster, the Connaught, and the Tyrone. .

The Leinster or Castlecomer field, situated between the Nore and Barrow, consists of a range of hills varying from 800 to 1000 fcet high, and extending over portions of Kilkenny, Queen's county, and Carlow. It lies in the form of a basin, its most productive beds occupying the centre. These are the Middle Measures, but in the field both the Middle and Lower are represented. The coal is anthracite. The most common fossils are either terrestrial or freshwater, marine fossils being found chiefly in some of the upper beds. Above the Barrow coal in county Kilkenny several remarkable reptilian remains have been found. The Lower Measures consist of gannister beds resting upon Carlow flags, and contain some beds of shale and a few thin seanis of coal, with several beds of marine fossils. This field is the most important in Ireland, and yields a larger weight of coal than all the others together.

The West Munster coal-field ocenpies portions of Clare, Limerick, Kerry, and Cork, and consists of a series of low hills extending from near Galway Bay in the north to Killarney in the south. All the three measures are repre- sented, but there are only a very few workable seams, as most of the coal is very thin, and the strata very much inverted. The principal collieries are at Dunhallow in Cork, and the coal, which is anthracite, is used chiefly for lime-burning. Many of the Lower Measures are very rich both in terrestrial and in marine fossils.

The East Munster coal-field consists of a low range of hills in Tipperary, closely adjoining the Carboniferous hills in Leinster, from which they are separated by the river Nore. Thence it extends to near Cashel, a distance of about 20 miles, and its average breadth is about 5 miles. All the measures are represented. The productive portion of the field is at Killenaule, and consists of two thin seams in the Upper Measure. In the Lower Measures the principal fossils are marine ; and plant impressions, especi- ally those of ferns, are very numerous.

The Connaught coal-field embraces the mountainous district round Lough Allen, and includes portions of Sligo, Roscommon, and Leitrim in Connaught, and of Fermanagh and Cavan in Ulster. Both the Middle and Lower Measures

are represented. They are composed chiefly of yellow sand- stone and shale, and are overlaid by beds of grit. The coal is bituminous, and a large portion of it is workable.

The Tyrone coal-field includes the district between Dungannon and Lough Neagh, having a length of 6 and a breadth of 1 to 2 miles, and the small basin of Annaghone a little tothe north. All the measures are represented, The coals have been worked only near the surface, but it is believed that very extensive and valuable seams:of workable coal exist at lower depths. .

The average quantity of coal raised in Ireland annually is about 130,000 tons, of which about 80,000 are raised in Leinster, 30,000 in Munster, 16,000 in Antrim and Tyrone, and 6000 in Leitrim and Roscommon. As the annual im- portation of coal exceeds 2,000,000 tons, it is evident that the coal supply obtained from Ireland's own mines is quite a minor element in its prosperity; but the industry might be much more largely developed, the total available amount of coal being estimated at 180,000,000 tons.

Peat.—For the absence of coal the country is to some

extent compensated by the supply of peat fuel obtained

from the red bogs situated in the central plain, and occupying a large tract included within two lines drawn across the island, the one from the Hill of Howth to Sligo, and the other from Wicklow to Galway. Originally this district was occupied by a forest, principally of oak trees, which after being gradually killed by the growth of mosses and

other peat-producing plants, were succeeded by a forest of firs, these also in turn perishing. The average depth of the bog is 25 feet, but in some cases it is over 40 feet. According to its depth it varies in colour, from whitish brown to a brown-black closely resembling coal. The brown or red turf in the centre forms the best fuel. The lower strata sometimes pass into lignite. Lignite of an immense thickness is found around the southern shores of Lough Neagh. In the mountain districts the bogs usually consist of brown turf of only about 12 inches thickness. Preglacial or interglacial peat has been found in Queen's county, county Galway, and county Tipperary, and submarine bogs with remains of an ancient pine forest have been discovered off the south-west coast. 'The bogs of the central plain contain in a state of good preservation animal and human skeletons, tree canoes, gold and silver coins and ornaments, crannogs or lake dwellings, log houses, and wooden roadways. 'The total area occupied by bog is 2,830,000 acres, or about one- seventh of the surface of the island, mountain bog occupy: ing 1,254,000 acres, and flat red bog 1,576,000 acres, Iron.— The deficiency in coal supply is the more to be regretted in the case of Ireland on account of its immense stores of iron, which for want of proper fuel remain unutilized. Red hematitic iron of a very rich kind is found associated with the coal-fields in the districts of Tyrone, and in Cork and Waterford. Valuable pisolitic ore occurs between the sheets of basalt in Antrim. Iron is met with in great quantities in the bogs, and is easily fusible, but the quality is not nearly so good as that of the clay iron which occurs in great abundance in the coal districts of Connaught. Some centuries ago the manufacture of iron was one of the most important industries of Ireland, the surface of the country being dotted over with small iron- works, in which the ore was smelted by wood charcoal; but as the supply of wood became exhausted the industry was wholly discontinued, the last of the old furnaces having been put out more than a hundred years ago. On the discovery of coal at the Arigna river near Lough Allen, iron-works were established there in 1788 which were carried on until 1808, and again revived in 1825, when the undertaking failed on account of the insufficiency of

capital with which the company started. Of late years XIII. — 28

iron-mining has been prosecuted with some briskness in Antrim, as well as in Down and Londonderry. The quantity produced in the country has risen from 106 tons in 1860 to 77,600 in 1870 and 155,833 in 1879; but for the proper development of the industry the available supply of coke is wholly insufficient, and until other methods or materials of smelting have been discovered, the valuable iron ores of the country will contribute a very small modicum to its prosperity.

Gold.—From the gold ornaments and crucible ladles and other implements used in the purifying of gold that have been discovered in a bog on the borders of Limerick and Tipperary, it would appcar that that metal was manu- factured there at a very early period; and there 1s a tradition that gold was smelted for King Tighearnmas about 1620 (or 915) B.c. in one of the valleys of the Liffey. About the end of last century a nugget of gold 22 oz. in weight was found in a tributary of the Ovoca, and, the Government having shortly afterwards taken up the enterprise, placer mining was carried on for some years. The gold was from 21% to 21 carats fine, the alloy being silver. The total value of the gold obtained at the Government works was £3675, while gold to the value of over: £10,000 was obtained by private en- terprise. All the gold has been found in shallow places. Very little gold is found in the iron or quartz veins, although pieces of iron are always found with the gold, and quartz is sometimes attached to the nuggets. The gold usually occurs in small grains, but nuggets of con- siderable weight are sometimes found.

Silver and Lead.—In very ancient times there were silver mines at Argetros, county Kilkenny, and near Toomavara, county Tipperary. ‘The metal occurs both as native silver and in the lead ore, which sometimes yields as much as 80 oz. of silver to the ton. Lead is found in a greater number of localities than any other metal. Its most usual form is galenite, which occurs sometimes alone, but generally with sulphide of zinc, sometimes with the sulphides of iron and copper, and occasionally with sulphate of baryta and sulphate of strontium. In 1854 the lead mines of Ireland were wrought by ten companies, and the

amount of ore raised was 3069 tons 15 cwts., yielding 2210 tons 15 cwts. lead and 18,096 oz. silver. Since that period the industry has gradually declined, until in 1875 it was prosecuted by only one company, that of Luganure in Wicklow; but since 1877 two mines have also been wrought at Carahan in Clare, Table II. gives returns from 1876 to 1879,

Copper,—The principal copper-mines are at Knock- mahon in Waterford, at Cronebane and Connary in Wicklow, and at Bearhaven, Ballycommisk, and Cosheen

TABLE I].—Produce of Lead and Silver, 1876-79.

Companies. Lead Ore, Lead.

Tons. Cwts. |Tons. Cwts. Luganure (1)} 1825 4 /|1368 18 Luganure (1)) 1655 18 |1241 0 Luganure (1)) 1526 1 |1130 0 Carahan (2)! 178 0 133 10) Luganure (1)| 1124 9 800 0, Carahan (2)) 148 0 111 0

TABLE III.—Produce of Copper,

i Number of Mines. corremere,

Value.

1874 1875 1876 1877 1878 1879

Tons.

9773 7019 6186 4949 1821 2096

Tons.

802 600 452 281 140 179

eS

54,339 42,020 82,342 19,664

9662 13,062

C1 Sd Sd S32 CO CO

Li i a ee ah oD

[MINERALS.

in Cork. Chalcopyrite or yellow copper is the most common, but melaconite or black copper is found at Crone- bane and Connary, and tetrahedrite or grey ore in the small beds to the south of Bearhaven. Native copper is common in most of the districts where the ore is found, and in many places large quantities of copper are collected from the streams by precipitation on irou. In 1854 the quantity of copper raised in Ireland was 12,171 tons, value £104,882. Since 1874 the industry has been on the decline, as may be seen from Table IT].

Other Minerals.—There is a large lode of pyrites asso- ciated with the iron ore at Ovoca, county Wicklow, and native sulphur is found in the limestone in various dis- tricts as well as in some of the copper-mines, The pro- duce of the sulphur mines of Wicklow amounted in 1860 to 99,259 tons, in 1870 to 38,634 tons, and in 1879 to only 8262 tons. Tin stone has been found in a leaden lode at Dalkey, county Dublin, and also in the auri- ferous soil of Wicklow, but no lodes or workable de- posits have been discovered. Salt is found at Carrick- fergus and Larne in Antrim, and gypsum suitable for manure in the same districts. Molybdenite is found in a vein of granite near Roundstone in county Galway. Antimony, arsenic, sulphate of barytes, cobalt, magnesia, alum, and steatite, all occur in several districts. Clays suitable for porcelain, as well as those used for coarse pottery, are not uncommon, and there are a great many quarries for building stone, flags, and slate, and also some for granite and marble, Lime is of course plentiful almost everywhere. Mineral springs, chiefly chalybeate, exist in the Upper Limestone in many parts of the country, the principal being Mallow in Cork, Ballynahinch in Down, Swanlinbar in Cavan, Castleconnel near Limerick, and Lucan near Dublin.

Climate.—The climate of Ireland is more equable than that of Great Britain, both as regards temperature and rainfall. No district in Ireland has a rainfall rising so high as that of large portions of the Highlands of

Scot- land, or falling so low as that of several large districts in the east of Great Britain. In January the mean tempera- ture rises but little above 37° over the larger portion of the eastern slope of Great Britain, whereas in the same month it scarcely falls below 40° in any part of Ireland ; and in July, whilst in Great Britain the extremes in the mean temperature are 64° in the London district and 54° in Shetland, the extremes in Ireland are 59° in the north and 62° in Kilkenny. Latitude accounts only for a part

| of these differences, which are mainly occasioned by the

physical configuration of the surface in its relations to the prevailing moist W.S.W. winds. Ireland presents to these winds no unbroken mountain ridge running north and south, which would result in two climates as distinct as those of the east and the west of Ross-shire ; but it presents instead only a series of isolated groups, with the result that it is only a few limited districts which enjoy climates approach- ing in dryness the climates of the whole of the eastern side of Great Britain.

Agriculture.—In wet years the excessive moisture is very prejudicial to cereal crops, especially in the southern and western parts of the island. Probably the returns either of corn or of green crop would in exceptional cases be very deficient under any mode of culturc, and they might on the average, in the south-western district, be less remunerative than those of grass; but. undoubtedly, if tillage were more practised on pasturage farms, the rearing and fceding of cattle would be more satisfac- torily performed. Moreover, the soil in many cases is such that most kinds of crops thrive in the moist climate, and much might be done by drainage to procure a drier atmosphere and to mitigate the prejudicial influences of

rainfall at the period of ripening. In regard to the natural fertility of the soil, and the ease with which it can be cultivated, Ireland as a whole has great advantages over Great Britain. Strong retentive clay soils, sandy soils, chalky and gravelly soils, are almost wholly absent, and the mixture of soils resulting from the great variety of stratification, as well

as from the detritus carried down to the plains, has created many extensive districts of remark- able richness. The most fertile part: of the country is the tract in Munster known as the "Golden Vein," stretching from Cashel in Tipperary to near Limerick. Along the banks of the Shannon there are long stretches of flat lands formed by deposits chiefly of calcareous and peaty matter carried down by floods, and at the estuary of the river this matter has been largely mixed with blue silt deposited by the sea. Extensive districts of similar formation are connected with the Suir, Nore, and Barrow, and with the Bann. In other parts of the limestone plain a rich soil has been formed by the decomposition of drift accumulated by the Esker Sea, mingled in some cases with the remains of granite; and a mixture of a variety of rocks has also greatly benefited many of the other limestone soils. The red bogs contain underneath them abundant marl admirably adapted for use in reclaiming the land. In many of the mountain districts the soil above the hard rocks consists of a thin stratum of vegetable matter. On the clay slate formations in Louth, Down, Wicklow, Wexford, Waterford, Cork, and Kerry, the soil is generally poor, except in the hollows, where rich patches have frequently been formed by rocky deposits. Similar remarks apply to the soils above mica slate. In the dis- tricts of the Old and New Red Sandstone, including the greater part of Cork, and portions of Kerry, Waterford, Tyrone, Fermanagh, Monaghan, Mayo, and Tipperary, the soil in the hollows is generally of remarkable fertility. Where gneiss and schist rocks prevail a finely productive soil frequently occurs, resting on inliers of limestone and other calcareous rocks. Indeed, Ireland contains compara- tively little irreclaimable land, and even in the mountainous districts which are unsuitable for tillage there is often soil sufficient, with the aid of the moist climate, to yield pasturage of superior quality in great abundance; and more than two-thirds of the surface of the country, being less than 500 feet above sea-level, possesses a temperature well adapted to all the usual kinds of crop.

But, although enjoying such favourable natural condi- tions, Ireland as a whole lags far behind most other por- tions of the United Kingdom in agricultural progress, both as regards the circumstances of the peasantry and the development of the capabilities of the soil for pro-

ducing food. The causes of this state of things are some- what complex; and, having their chief connexion either directly or indirectly with the procedure of the legislature, they have been in operation for several centuries, during which, instead of diminishing in influence, they have apparently gained strength by intermixing and entangling with each other. Until a comparatively recent period the system of landholding in Ireland was the tanistry or communal, governed by the ancient Brehon code. Accord- ing to this code the land belonged primarily to the tribe or commune, and was vested in the chief or tanist, who, from his rank as a noble, held a portion of it as his own property, had a life interest in a second portion from the office to which he had been elected, and possessed juris- diction over a third portion, the commonal land, which was divided annually. The nobles from among whom the tanist was chosen had the right of ownership of land, and another class had the right of ownership of chattels, which went to their sons by gavelkind. Only certain classes of the tribe—the Saer Céili or "free tenants," and Daer

Céili or "base tenants "—could obtain security of tenure for life, the others being either yearly tenants, free labourers, or slaves. The interests even of the yearly tenant were preserved by stringent regulations, and in the course of generations it was possible to rise from the lowest social grade to the rank of a 'free tenant." The lands of the tenants went to their male descendants by gavel: kind. Even the free labourers and the slaves, with the exception of those who were convicts or prisoners, had the right of sustenance and shelter on the estate of their lord. Unlike those of Great Britain, the ancient laws of Ireland remained uninfluenced by Roman legislation ; and, although the Danish invasions caused some disturbance of the old order of things, the regulations so far as the possession and tenure of land were concerned remained practically unmodified until the invasion of Henry IJ. The natural consequence was that the pastoral mode of life associated from the beginning with the Brehon code should also remain

unchanged, the more especially as soil and climate alike were favourable to the growth of luxuriant pasturage ; but, as pastoral employment is that which is least able to support a dense population, a large proportion of the servant class gradually sank into a condition of idleness and wretched poverty. Unhappily the result of the Anglo-Norman invasion was not to improve this state of things by the gradual influence of other laws and customs, but to introduce into the social system disturbing

| and irritating elements, which kept alive all the old evils

in a more aggravated form. Henry I]. nominally bestowed the entire land of Ireland wpon ten of his followers, but practically, with the exception of the small district of the Pale, it remained in the possession of its ancient lords. Confiscations became more frequent as the power of the English increased, and within that portion of the territory over which English rule did not extend the tenants and labourers, in the unsettled condition of society, suffered severely from the irresponsible authority of the nobles. Henry VIII., the first English sovereign who really held sway over the whole island, induced the nobles to aecknow-ledge him on condition that their ancient rights and privi- leges were left intact ; but this arrangement was set aside by Elizabeth, whose reign was signalized by the great wars, resulting in the composition of Connaught and the planting of Munster. By the former of these; while possession was secured to the nobles in their estates, the lands in the province were alienated from the clan to the chief, and the free tenants became virtually proprietors of their farms; and by the latter 574,628 acres, the estate of the earl of Desmond, were parcelled out to be peopled according to a plan founded wholly on English customs. Soon after the accession of James IJ. in 1603, tanistry and gavelkind were abolished by decision of Queen's Beneh, and the estates of the Ulster nobles—511,465 acres in extent—were forfeited to the crown, to make way for the great plantation of Ulster. The custom of gavelkind was, however, revived by the Act of Queen Anne against the Catholics, and the statute was not repealed till the reign of George ITI. The confiscations were repeated on a larger scale during the Stuart and Cromwellian periods, from which time may be dated the complete

practical overthrow of the Brehon system except in Ulster and a few isolated districts where the shadow of it still lingers in the custom known as tenant- right. Even, however, after the subjugation of Ireland by Cromwell, Sir William Petty, in his Political Anatomy, written in 1672, estimated the value of the tenant's claims for improvements and benefit of leases at one-third of his annual rental. The same writer calculated that, whereas in 1641 about two-thirds of the good land belonged to the Irish or Catholics, at the time he was writing the proportion was as nearly as possible reversed, the figures

being as follows :—Purchased by the Protestants of Con- naught of the transplanters 80,000 acres, possessed by the English and Protestants and Church 5,140,000, possessed by the Irish 2,280,000. Of the 1,100,000 inhabitants, the proportion of Irish to English was as 9 to 3; and 6 out of every 8 of the Irish lived in a "brutish nasty condition." After the confiscations which followed the wars of William IIL., the Catholics did not possess more than onc-seventh of the soil, 'The penal laws by which the Catholics were disabled from holding freehold property tended to effect a still further transference of proprietorship to the Protes- tants. The functions of the proprietor were generally per- formed by the large Protestant tenant, to whom a long lease of the property was granted, and who sublet to the Irish farmer. Frequently the farms were subdivided and sublet to the third, fourth, or fifth degree, and, as the Catholics were disabled from holding leases for more than thirty-one years, and at less than two-thirds of a rack- rent, they necessarily occupied the lowest step in this peculiar social scale. Instead of an industrious and thriv- ing class of peasant proprietors, which the Brehon system left to itself would in all probability have gradually de- veloped, a race of wretched cottiers sprang up, whose only inheritance now guaranteed to them by the remains of the old Brehon system was their deep-seated conviction as to their inalienable rights to the soil; the custom which, without now recognizing these rights, threw upon them the expense not only of fencing, draining, and other improvements, but of the erection of all the dwellings on the farm; and their dependence on the proprietor, one, however, who was

now generally an alien, and from whom they held their small patches of soil on payment in labour according to conditions strung to the utmost degree of severity by the process of subletting and an un- limited competition. Support by any other form of industry than agriculture was rendered impossible by laws which practically paralysed the commerce and manufactures of the country, and agriculture itself was additionally hampered by the enactments passed in the reign of Charles II. against the exportation to England of cattle, sheep, and pigs, of salt beef and bacon, and even of butter and cheese. These enactments, combined with that final one by which the prohibition formerly passed against the exportation of woollen manufactures to England or the colonies was ex- tended also to foreign countries, caused the " middle men" to turn their attention to woollen smuggling ; and, finding it a more lucrative means of livelihood than that of squeezing money from impoverished tenants, they in many instances drove the cottiers from their farms, which they changed into sheep walks.

The Acts of 1771, 1778, and 1782, which removed the Roman Catholic disabilities in regard to the holding of leases and property, and the Act of 1793, which ex- tended to the Catholics the forty shillings franchise, had, on account of the peculiar social condition created by former legislation, practically as disastrous effects as even the penal laws which they superseded. The landlords for election purposes created an immense number of the lowest kind of freeholds, which they let at exorbitant rents owing

to the high price of provisions during the great war. These prices indeed gave a temporary stimulus to agri- culture, and led to the conversion of a considerable amount of pasturage into tillage, but practically the position of the frecholder was more servile than that of the previous tenant-at-will, and when prices sank to their normal rate at the close of the war he found himself in a condition of absolute ruin. At the same time, by this minute subdi- vision of leaseholds, an immense increase had taken place in the agricultural population, whose

numbers could perhaps scarcely have found support under any system of agricul- ture, although undoubtedly under a system of peasant proprietorship support would have been possible toa much larger number, inasmuch as the principal profits of tillage would have fallen into the hands of the tillers of the soil instead of those of absentee proprietors. To aid the land- lords in freeing themselves from the incubus of impo- verished tenants an eviction Act was passed in 1816, and further protection was afforded them by the Subletting Act of 1826, but it was not until after the abolition of the forty shilling leasehold suffrage in 1829 that any important diminution took place in the leaseholds. Under tenancy-at- will, which was then generally substituted, the subdivision of holdings was not materially diminished, although for some years previous to the occurrence of the potato blight and the repeal of the Corn Laws more than one-fourth of the population stood in need generally of relief, and the land- lord, in order to escape the burdensome taxation consequent upon the Poor Law Act of 1838, had begun the transforma- tion of small holdings into large farms. Table IV., compiled from special parliamentary returns givingthe number of free- holds by counties, will illustrate the influence of various acts of legislation on the growth of freeholds, and especially their rapid increase after 1793 and their rapid decline after 1829.

The potato blight and the repeal of the Corn Laws, occurring nearly simultaneously, caused an immediate and almost complete sweep to be made of the smaller class of holdings. The consequence was an enormously rapid dimi- nution of the population, which made whole districts of the country almost tenantless, but which, great as it was, only removed the abnormal strain of hardship under which the peasant was suffering, and brought him no permanent relief from his burdens by an increase of wages or more favour- able terms of occupancy. Indeed, tenancy-at-will was still further increased by the Parliamentary Votes Act of 1850, which granted the suffrage to those who for twelve months were rated as occupiers of land valued at £12 a year.

The change which has taken place in the size of the holdings since 1841 is sufficiently indicated in Tables V., VI. and VII.

TABLE IV.—Frecholds, 1795-1830.

344

1796 3,195 73,056 1803 7,009 174,264 1821 11,068 210,431 1828 18,369 216,907

1830 iy 39,704

TABLE V,—Holdings of various sizes in 1841, 1851, 1861, 1871, 1876, and 1880.

Not excceding 1 Acre.

Above I and not exceeding 5 Acres.

Per Per

Number. conn Number. rage Number. 1841 135,314 6°3 310,436 37°4 252,799 1851 37,728 6‘2 88,083 14°5 191,854 1861 40,080 6°5 85,469 14°71 183,931 1871 48,448 8°2 74,809 12°6 171,383 1876 52,433 9°0 67,524 11°6 164,810 1880 50,613 8°8 64,292 11:2 | 161,335

Above 5 and not exceeding 15 Acres.

Above 15 and not excceding 30 Aeres,

Above 380 Aeres. Total.

Souk Number. ea. Number. 4 Number. 3047 79,342 9°7 48,625 59 826,516 31°6 141,311 Dou 149,090 24°5 608,066 380°2 141,251 232 157,833 26°0 608,564 28°9 138,647 23°3 159,303 27°0 592,590 28°3 eS 7a 23°6 159,872 27°5 581,753

‘ 136,518 BBN) 161,464 28°1 574,222

AGRICULTURE. | IRELAND Za.

TABLE VI.—Showing the amount of Inerease (+) or Deerease (—) between 1841 and 1880 in the various classes of Holdings above 1 aere in extent in the different Provinees and for all Ireland, with the proportion per cent. of that amount.

Classes of Holdings. Leinster. Munster, Ulster. Connaught. Treland Above 1 and not emecomime & | Niumiber….....c..cccetiee — 31,277 = | — 47,087 — 81,829 — 86,001 — 246,144 Bk8709 nd. ano soaobr conPonbeg Sontag obe POCORN. 6.0 cian .. bogenobotn ongene 62°4 81°3 80°1 85°8 79:3 ‘Above 5 and not exeeeding | Number….....s0sceve — 20,228 — 42,767 — 91,464 1S BORD So deendeendtbo cpaeeeeanead IBCTACEMs rey cee ractseetas consteosices 43°9 69°3 36:2 Above 15 and not excecding | Number….....sscccsssrvees + 1,893 — 3,018 + 57,176 DURLOUOG esi acrecscsvors onesies IROTI COMP rain cicisisatevsctueareeys ’ 9°2 109 79° ANIGUUDON yas comytciss cece viewisae scene + 21,724 +40,122 +112,839 Na cc EET eee BR say tesco uzinue’ “19141 ”240°8 “939‘1 ae Number…... ee Babee ooo nceret — 27,883 — 52,700 — 167,593 Pea ERED siscsiscrnnssaane NHIMPROOENG Sc Uihitiin se cr ciaeescoaone ee “20°7 24°2

Classes of Holdings, 4 b Increase, Above 30 and not exeeeding 50 acres 2,830 Above 50 and not exeeeding 100 acres…..... g 6,289 Above 100 and not exceeding 200 acres.. 2,660 Above 200 and not exceéding 500 acres 493 Above 500 aeres 102

Taste VIII.—Percentages of Acreage of different sizes of Holdings, with percentages of Crops.

Up to Up to Up to Up to Up to Up to Up to Up to Above 1 eos 5 eo 15 ion 380 Toran: 50 ig 100 erent 200 Rowe: 500 poner. 500 Acres, Bowe Pereentage of acreage (1854 6°5 13°8 30°3 23°3 12°0 89 3°6 1:3 0°83 100 in each class of < 1861 6°8 14°0 30°1 23'1 11°9 89 3°5 1°4 0°3 100 1 Bp it alteiy/al 8:2 12°6 28°9 23°4 12°3 9°3 3'6 1°4 0:3 100 1854 | 86°8 65°0 48°3 40°6 34°7 28°9 Pe 12°6 3°8 27°6 Under crops…..... 1861 | 85°8 64°8 49°0 41°8 36°7 30°1 22°0 13°1 3°8 29°0 1871 | 85°1 63°5 47°4 40°6 85°3 28°9 21°3 127 3°2 277 1854 67 28°0 43°8 48°1 50°4 51°6 §2°5 47°3 29°5 47‘1 COS Saas scetrwwiawanmares 1861 5‘8 26°1 41°1 45°6

48°3 50°8 52°9 50°1 34°0 46°9 1871 5°5 275 42°9 48°1 ~ iil 54°8 pie. 52°5 33°2 49°6 1854 07 0°5 0°4 0°4 0°6 0°6 0°5 0°4 0’°0 Or4 121) os geet EEG 1861 0:3 0°2 0°2 0‘2 0°3 0°3 0‘2 0°2 0‘1 0°2 1871 0°2 0‘1 Ol Ol 01 01 01 Ol 0°0 Ol 1854 0°8 07 0°5 0°5 07 1:0 2°0 31 31 95) sg and aa 1861 | 1-0 0-9 0°5 0-5 0-7 12 21 3°2 3-1 16 ee 1871 | 0°8 1°0 06 05 07 11 2°0 3°3 3°3 16 1854 5‘0 5°8 7°0 10°4 13°6 1729 23°8 36°6 63°6 23°4 Bogs and waste……. 1861 ol 8:0 9°2 11°9 14:0 17°6 22°8 33°4 59:0 OO 1871 8°4 79 9°0 10°7 28 ull 19°4 31°4 60°3 21°0 ac, ro, po. | ac. ro. po. | ac, ro. pO.| ac, YO, po.| ac. TO, pO.] ac. ro, po.| ac. YO. po.) ac. Yo. po.| ac. TO. po.) ac. z po. 1854 |0 2 2313 1 386/10 1 0/22 oO 32,40 1 82/74 6 21158 O 513855 0 2511241 1 32/838 1 6 Average extenitver…5 lool 0 2 228 1 sso 1 Zee 1 240 1 1173 118/149 3 4/840 1 Oj1244 2 27138 1 9 1871 |/0 2% 4138 210/10 1 39/22 1 6/40 119/73 2 6,150 0 39)341 3 33)13820 0 39,34 1 O TABLE IX.—Areas (in Aeres) of Land under different Crops in 1847, 1851, 1861, 1871, 1879, and 1880. (The figures for 1880 are taken from the Agricultural Abstract, and differ slightly from those in the complete return.) } Other | Total Meadow Total ” Mang. Wheat.| Oats, | Barley.| Bere.| Rye. |Beans.|Pease. (Ceca! Potatoes.|Turnips, Ware, on Chon, Flax. Seen Total. 564,711) 98,555 |23,899 7 975,583 109,857 205,731 451,339 614,535] 97,750 |27,642 5 960,883 104,069 339,077 481,564 Leinster 482,546/120,328 | 1,988 | 1,489 | 6, 746,663 102,886 |11, 350,855 547,122 nehelenehges 390,551/156,140 | 1,182 i 623,742 A 105,531 ‘ 855,932 621,765 278,290/174,146 232 | 1,¢ . 502,509 99,660 F 298,074 606,924 307,389)152,186 1,124 531,244 102,051 |15, . 292,397 597,566 884,159)106,116 |11,815 | 2,086 1,779 823,022 114,838 | 4, ‘ 230,874 315,848 399,534/131,991 | 5,577 | 2,838 | 8,927,| 8,158| 732,294 125,493 397,982 872,072 Munster 881,545] 54,060 293 1,885 597,435 110,298 ‘ 429,660 448,171) 1, aos arisen 298,246) 46,611 320 | 2,206 439,991 89,434 f i 390,786 525,266 222,390} 60,616 140| 1,831 348,927 81,113 |20, 316,383 568,790) 1, 249,811) 49,576 1,389 858,946 77,863 A 310,190 569,714) 1 957,307| 41,718 |11,049 | 4,436 1,116,511 : 107,261 k 216,601 263,149 888,419] 27,483 15,441 | 6,942 |18,498 | 4,446 |1,046,417 108,216 ‘ 420,026:125,407 | 260,145 Ulster ; 838,492| 14,241] 672 | 2,872 942,804 81,978 | 3, 494,172‘143,206 | 372,801 ! mae 720,437| 9,066 298 | 2,107 | 3, 800,397 90,479 5 491,336)147,065 | 465,687 649,675} 9,699] 133 | 1,782] 4, 5 708,369 102,297 A 450,997|124,630 | 499,446 641,361} 7,688 Oe 693,780 93,158 422,986/152,996 | 474,483

294,693] 37,198} 2,805 | 2,482 3 398,463 88,398 74,532| 1,811] 108,610 287 ,287| 25,893 | 4,687 | 5,977 i 359,807 45,770 ‘ 215,521} 4,249] 132,627 Connaught ; 296,577| 10,331 338,055 39,452 382 | 296,729, 2,088) 178,112 eit. a 226,902) 9,162 259,904. 41,591 273,635| 3,451 216,326 179,906} 9,831 slé 202,062 31,627 : 229,236} 1,315 262,095 7,067 | 183,382) 8,569 ‘ 78 202,454 ” 29,696 221,786 743,871 |2,200,870| 288,587 |49,068 |12,415 23,768 3,318,579 ; 370,344 504,248 |2,189,775| 282,617 |53,347 |19,697 |28,535 |21,182 |3,099,401 i 383,548 i Ch ce 401,248 |1,999,160)198,955 | 8,052 | 8,530 12,451} 1,566 |2,624,957|1,133,504 | 334,104

244,451 |1,636,136/220,979 | 1,855 | 9,700| 9,521 | 1,392 |2,124,034‘1,058,434 | 327,035 157,511 |1,330,261)254,292 | 553| 9,099} 9,297| 854 1,761,867) 842,671 | 314,697 148,636 |1,381,943 218,019 7,668 10,158 —|1,766,424| 820,728 | 802,768 |41,510

222

The number of holdings of less than one acre is not given in the census returns of 1841, but the number of persons occupying the holdings is given in Kennedy’s Digest of the Evidence of the Devon Commission. Reckon- ing that no one possessed more than one holding, the total diminution in the number of holdings between 1841 and 1880 would thus be 252,294, or, not including holdings under 1 acre, 167,593. The number of occupiers in 1880 was 527,444, or 46,778 fewer than the number of holdings. The diminution in holdings took place chiefly between 1841 aud 1851, that is, practically between 1846 and 1851, this decline being 218,450. It was confined to farms not ex- ceeding 15 acres in extent, which between these years de- clined as much as 380,884, and between 1851 and 1880 have declined by only 41,425. Those not exceeding 1 acre, prin- cipally the potato gardens of the cottiers, between 1841 and 1851 declined by 97,586, or nearly three-fourths; since 1851 they have increased by more than one-fourth. Farms above 1 and not exceeding 5 acres declined between 1841 and 1851 by 222,353, or nearly three-fourths; and those above 5 and not exceeding 15 acres by 60,945, or nearly one-fourth. Between 1851 and 1880 the decline in farms of the former class has been 23,791 and of the latter class 30,519,

there having been a slight increase in this class in the province of Counaught. The largest increase in the number of holdings took place in those exceeding 30 acres, the additions be- tween 1841 and 1851 being 100,465, and between 1851 and 1880 only amounting to 12,374, the greatest proportional increase between 1841 and 1880 being in the provinces of Connaught and Ulster. The increase between 1841 and1851 in farms above 15 and not exceeding 30 acres was 61,969, and between 1851 and 1880 there has been a decrease of 4793, there having been a slight increase in Connaught. In farms above 30 acres in extent, the increase between 1851 and 1880 has been greatest, both in numbers and in pro- portion, in those above 50: and not exceeding 100 acres. Since 1861 the decrease in the total number of holdings has been gradual but continuous; and the slight increase between 1851 and 1861 is more than accounted for by an increase in the gardens of the cottiers. The largest pro- portional decrease in the number of holdings, 8 per cent. above that for Ireland, has been in Munster, where, as will be seen from subsequent statistics, the increase of the acreage under pasture has also been greatest.

The relation which the decrease in the number of holdings has had to the decrease in tillage may be to some extent understood from Table VIII., which gives the percentages of acreage in the various classes of holdings for 1854, 1861, and 1871, with the percentage of land in each class under crops, grass, fallow, woods, and bog or waste respectively. The registrar-general's returns do not supply materials for such a table for 1851. It will be seen that there is an uninterrupted decline in the proportion of land under crops according to the increase in the size of the holdings, it being over 80 per cent. in those less than 1 acre, over 60 per cent. in those above 1 and not exceeding 5 acres,

and only a little over 3 per cent. in those above 500 acres, On the other hand, the acreage under grass is in farms between 1 and 5 acres only about 28 per cent., and reaches its maximum, nearly 60 per cent., in farms above 200 and under 500 acres; and, while the extent of bog and

waste is scarcely 8 per cent. in farms between 1 and 5 acres, it gradually increases with the increase in the size

-of the farm until it is over 60 per cent. in those above 500

acres. Theacreage under crops remained nearly stationary between 1854 and 1871 in all the classes of farms, but the acreage under grass increased 2‘5 per cent., the increase being wholly in farms of above 30 acres, while there was a decrease of about 1 per cent. in the case of all classes of farms below 15 acres in extent. The increase may almost be accounted for by reclamations, the decline in the acreage under bog and waste being between the same periods about 2°4 per cent., which occurs principally in farms above 50 acres in extent, there being a consider- able increase in the case of some of the other classes of farms. The nature of the change in regard to cropping and tillage which has taken place since 1847 is shown more distinctly in Table IX., which gives the acreage under the different kinds of crop in 1847, 1851, 1861, 1871, 1879, and 1880. Table X. gives the acreage under crops, grass, fallow, woods, and waste for 1851 and 1880, and Table XI. shows in detail the proportions per cent.

The general result of Table IX. is to show a total decline between 1847 and 1880 in the area under crops amounting to 157,351 acres, the decrease having taken place after 1861, up to which year there was from 1847 an increase of 651,961, the decline between 1861 and 1880 being 809,312, or more than one-seventh. The stated area under crop in 4847 conveys, however, a misleading impression, as the area under potatoes was only 284,116 acres, whereas in 1846 it was estimated at 1,237,441, the difference being undoubtedly due to the fact that in 1847 a great portion of this area was left out of cultivation. Thus, if 1846 had been substituted for 1847 it would have been found that in the area under crops there was a decrease between 1846 and 1851 probably as great as that which occurred between 1851 and 1880. This latter decrease amounted to 777,727 acres or 3°8 per cent. of the area of the country, the decrease in Leinster being 383,143 or 7°6 per cent., in Munster 268,351 or 4°5 per cent., in Ulster 107,750 or 2 per cent., and in Connaught 18,623 or ‘4 percent. Unfortunately the TABLE X.—

Areas (in Acres) wnder Crops, dc., im 1851 and 1880. Fallow.| Woods.| Waste.

698,212

Grass.

2,177,441 2648,283 2:749,660 3,322,406 2,111,736 2,210,158

Crops.

1851) 1,786,413

1880} 1,

Total.

73,863 |101,776 4,837,705 5,560 |105,555 52,458 |103,665 2,442 |116,395 |1, 30,528 | 58,611 4.977 | 64,904 |1, 38,209 | 40,854 |1,732, 2,497 | 53,004 195,053 |304,906 |5,209, 316, 15,406 |889,858 |4,632,3081 20,327,764?

Leinster’,..... {

Munster

ISHELssdeecss { 5

1,709,740 2,078,261 8,748,577

Connaught .. 1880

Treland

1 Including more than 130,000 acres under water. 2 Exclusive of nearly 500,000 acres under the larger rivers, lakes, and tideways.

TaBLe XI.—Percentage of Area under the principal Crops, and under Grass, Fallow, Woods, and Waste, in 1851 and 1880.

Total Barley. | Cereals.

et et

Connaught

=

AGCPAN AK DEb

wm~Td oOo S~WH~WAT

Total, Ireland,

He SOOCONnNwDN NRO AKEPAONNS

4°2 0°9 8°0

0‘9 17

0°7 0°7 Ol 2°4

0‘7

. | Fallow. | Woods, | Waste.

He HR OO OT On GO RD OO SYK AVHRR EES ADAIR ONMaAaN AI SdSdRASS SCHococoococoor Sersradcddoau Pt et et et et Pb ED DOD NAN SNE ONEE

AGRICULTURE. |

commissioners’ reports do not give the acreage in 1847 under grass, and the census returns of 1841, though they give the acreage of arable land, do not distinguish between that under grass and that under crop. If, however, we deduct the amount under crop in 1847 from the total arable area in 1841, which is stated at 13,464,000 acres, we have only 8,225,425 acres under grass, the increase of grass land be- tween 1841 and 1851 being, according to this calculation, 523,152 acres, while if we

add the acreage left out of crop in 1847 it is probably 1,000,000 acres more. Since 1851 the acreage under grass has been gradually but uninter- ruptedly increasing, the increase between that year and 1880 being 1,510,531 acres or 7°5 per cent. of the whole country, there being thus in all probability about 2,500,000 more acres under grass in 1880 than in 1841. In Leinster the increase has been 470,842 acres or 9°7 per cent., in Munster 572,746 or 9°6 per cent., in Ulster 98,422 or 1°7 per cent., and in Connaught 368,521 or 8°8 percent. The largest percentage under grass is in Munster, and the smallest in Ulster, the proportionate difference between the two being 14:5 per cent. But in addition to this stated increase of acreage under grass, it is to be remem- bered that a large proportion of the acreage under meadow and clover comes properly under this category, being really untilled land, and that this has increased between 1847 and 1880 by 770,961 acres, the increase in Leinster being 146,227, in Munster 253,866, in Ulster 211,334, and in Connaught 159,534. Thus if we deduct the area under meadow, the decrease in the area under crops between 1847 and 1880 would, even according to this table, be 928,312 acres, there being a decrease in cereals of 1,547,145, and an apparent increase in the area of green crops of 519,611 acres, and in flax of 99,222. As, however, about 1,000,000 acres formerly under potatoes were in 1847 left out of cultivation, it is probable that between 1846 and 1880 there was a decrease in the acreage under green crops as large as the apparent increase between 1847 and 1851. If, on the other hand, the acreage under meadow and clover be added to that under grass, the in- crease between 1851 and 1880 of the two combined is 2,175,552 acres, and between 1841 and 1880 it is pro- bably nearly 3,500,000,

Sir William Petty estimated the area of Ireland in 1641 at 10,500,000 Irish acres, or 17,008,264 English acres, of which he classed 1,500,000 Irish acres, or 2,429,752 English acres, as rivers, highways, bogs; an area of similar extent as very coarse land ; and 7,500,000 Irish acres, or 12,148,760 English acres, as good meadow, arable, and pasture. According to the returns of the Census Commis- sioners of 1841, the area of arable land comprehended 13,464,000 acres, plantations 374,482, water 630,825, and uncultivated land 6,295,735. Between 1841 and 1851, owing to works undertaken both by Government and private

proprietors in order to give relief at the period of famine, the area of arable land showed the large increase of 1,338,581 acres, there being a decrease in the extent of waste land amounting to 1,086,493 acres, and in the area under woods amounting to 69,476, while the area under waste includes a large acreage under water. The returns of 1841 are, however, much less accurate than those from 1847. Between 1851 and 1880 the arable lands increased

from 14,802,581 to 15,355,598 acres, or by 553,017, there being a decrease in the waste land of 577,184 acres, and an increase of the area under woods of 34,952 acres, while the total acreage of the country is stated in somewhat larger figures, 'The percentage of decline in waste land for the whole acreage of the country was 2°9, there being a decline of °6 in Leinster, and of 4°5 in Munster, an increase, strange to say, of '7 in Ulster, and a decline of 7:8 in Connaught, where there is still the large percentage of 33°2. Of the 4,632,308 acres returned for Ireland under the head of waste land in 1880, 1,718,386 acres were returned as bog and marsh, viz. 325,864 in Leinster, 324,826 in Munster, 372,387 in Ulster, and 695,309 in Connaught; and 2,064,361 acres as barren mountain land, 157,618 being in Leinster, 699,732 in Munster, 679,285 in Ulster, and 527,726 in Connaught. According to the report of Sir Richard Griffith, the total number of acres improvable in 1844 was 3,755,000, of which 1,425,000 were improvable for cultivation and 2,330,000 for pasturage. The reclamations of waste be- tween 1841 and 1851 nearly all took place after 1844, and the total acreage of reclamations between 1841 and 1880 is 1,663,427, leaving therefore an acreage in 1880 of waste but reclaimable land amounting to 2,091,573. The term

waste land is, however, used in a rather vague sense, and

might without much exaggeration be made to include a con- siderable portion of the area now classed as arable. The sig- nificance of the change which has taken place in the acreage of the principal crops will

be better understood if the tables already given are compared with Tables XII and XIII. The area under cereals has declined between 1847 and 1880 by 1,547,145 acres, or nearly one-half ; while in 1847 the produce of cereals reached 2,548,723 tons, in 1878 it amounted to only 1,226,655 tons, and in 1880 to 1,275,678 tons, the difference between 1847 and 1878 amounting to 1,322,068, and between 1847 and 1880 to 1,273,045. Allowance must, however, be made for the fact that since 1855 the estimates of produce, having been corrected by the Poor Law Guardians, have generally been lowered ; and of course the weather introduces a very variable element. In any case it would appear that generally there has been a decline in productive power from 1856 until 1871. For the five years up to and including 1860 there is a much lower average than for the five previous years, and the decline still continues for the ten years up to and includ- ing 1870 ; but, except in the case of potatoes and cabbage, there is an increase for the ten years following, due to the high averages of 1874 and the two subsequent years. The decline in the productive power may doubtless in a considerable degree be accounted for by the fact that the increase in the acreage under pasturage took place chiefly in the richer districts of the country, but it is also attributable, as is the low average still attained, to inadequate manuring, insufficient draining, inattention to the destruction of weeds, over-cropping, or in a word, to general ignorance in regard to the proper methods of cul- ture. In some isolated instances the system of agriculture practised is quite on a par with that on the best farms of England and Scotland, and within recent years consider- able progress has been made; but as a whole an approach to a satisfactory state of things exists only in Ulster, where

TaBLe XII.—Zstimated Produce in Tons of the principal Crops for all Ireland in 1847, 1851, 1861, 1871, 1878, and 1880.

Oats. Barley. 1847 | 614,575 | 1,612,921 | 248,933 12,784 17,112 1851 | 313,620 1,507,876 | 248,299 19,692 31,123 1861 | 178,881 | 1,126,324 119,470 4,582 | 8,093 1871 | 148,121 | 1,035,529 167,927 5,253 | 8,958 1878 | 115,384 907,232 | 195,885 7,659 | 7,885 1880} 111,385 | 977,923 | 172,229 8,648 | 9,694

736 879 560 399

Potatoes. Turnips. Mangel. | Cabbage. Flax. Hay.

2,048,195 | 5,760,616 | 247,269| ... 17,499 | 2,190,317 4,441,022 | 6,081,326 | 466,235 | 401,622 | 38,861 | 2,518,977 1,858,433 | 3,392,884 546,545 22,568 | 2,810,352 2,793,641 | 4,246,332 761,863 12,919 | 3,815,525 2,526,504 | 4,686,226 1,090,200 22,175 4,417,344 2,985,859 | 4,339,688 | 604,421 | 360,036 25,532 | 3,795,003

agriculture has the stimulus both of tenant-right and of manufactures. In Ulster the average produce per acre is now equal to the average of Ireland, although in 1642 it was rated to the " adventurers" as worth only 4s. an acre, while land in Leinster was rated at 12s., in Munster at 9s., and in Connaught at 6s, The southern and western dis- tricts of the country lag farthest behind, and generally proxi- mity to Great Britain seems to exercise an advantageous influence. Griffith's valuation, apart from other objections, of course supplies no test as to the agricultural value of the land at the present time, and has the disadvantage that the southern and. western districts were valued imme- diately after the famine. By it the total annual value of Ireland was given as £11,439,575, that of Ulster being £2,533,265, of Munster £3,247,177, of Leinster £4,305,413, and Connaught £1,353,720.

An increase in the average produce of wheat per acre might naturally be expected from the fact that its area is now restricted to those districts where soil and climate are specially suitable. The decline in the area under wheat between 1847 and 1880 has been 595,235 acres, or more than four-fifths. It has been specially large in Leinster and Munster, but the fact that it has also been considerable in Ulster and Connaught shows that it must be attributed to other causes besides a real or supposed unsuitability of climate. In 1878 the amount of wheat produce was less by 499,191 tons than in 1847, and in 1880 it was less by 503,190 tons. The decrease in the acreage under oats has not been proportionally so great; but, inasmuch as oats are the staple crop of the country, it is perhaps even more significant. Between 1847 and 1880 the

decrease in area was 818,927 acres; and the decline in amount of produce in 1878 as compared with 1847 was 705,689 tons, and in 1880 it was 634,998 tons. The decrease in

the acreage under cereals has by some been accounted for by an increase in that under potatoes, but although between 1851 and 1861 this increased by 265,008 acres, it has since gradually diminished, being 47,773 less in 1880 than in 1851. The increased productiveness of the potato in 1880 is attributed both to the favourable season and the importation of new varieties, especially the "Champion." The report of the special potato inquiry of 1880 shows that " Champions " were grown on 220,934 acres, " White Rocks" on 194,778, "Skerry Blues" on 116,959, and 'Scotch Downs" on 98,342. Between 1851 and 1880 there has been a diminution in the total area under green crops of 125,247 acres. It is certainly remarkable that, while the number of cattle has so largely increased, not only the area but until recent years the average produce per acre of turnips and mangolds, the staple winter food of cattle, has been diminishing. The aggregate produce of turnips was less by 1,395,100 tons in 1878 than in 1851, in 1879 by 4,023,522 tons, and in 1880 by 1,741,638.

The nature of the increase which has taken place in live stock since 1841 is brought out in Tables XIV.-XVII.

The returns for 1851 give no information as to the number of horses used for agricultural purposes, but Table XV. supplies this information for 1861, 1871, 1879, and 1880. Table XVI. gives the total value of each kind of live stock for 1841, 1851, and 1871 on hold- ings above one acre, and the average value of the same on each holding, the valuation given agreeing with the rate originally fixed by the commissioners, according to which horses were estimated at £8 each, asses at £1, cattle £6, 10s. sheep £1, 28, pigs £1, 5s., goats 7s., and poultry 6d. The value of all classes of live stock has of course greatly increased within recent years, but although

TaBiE XITI.—Estimated Average Produce per Statute Acre in 1847, 1851, 1861, 1871, 1878, and 1880, and also for certain periods of years.

Wheat. | Oats. | Barley.| Bere

I TELL cc | manent | ew | ens | rs | ns | | mr ns | een | wens | pe | ign | pagent | eres

ewts. ewts, ewts,

15:2} 18:2 | 178

1851 | 12:0 | Toa | 176 | e744 Z , 1861 8°8 | 114/132 | 13re Leinster QHOONOOTHOHHO onooNAanbonOSan 1871 11°8 13°7 15°3 155 1878 } 16:0 |) 14:1) 62 1) Tere C1880 | Hs To | bes ses 1847 | 15°0 | 14:7 | 17:0 | 16°6 (+351 TOL easier | alk | bes 1861 8:0 | 10°0 | 10°8 | 11°4 Munster Lrieiereialeiesrejeiele aieislptigsies eteieitreretn 1871 12°3 13‘8 154 13°0 T8738 | W387 |) a2 be Ges TSSO|) Woe We TSG coelelions 1847 | 17:0 | 14:5 | 16°8 | 17:0 1851 | 14:5 | 13:0 | 17°6 | 15°8 T8610″ | AS) | asso est LOD S025), sees a Gee et ie 1871 12°7 11°7 13°1 12:3 Sate LORON |) a8c5 ellen malGe ny 1880 | 15°0 | 138°4 | 161] 13°9 1847 | 16°0 | 14:2 | 18:4 | 17:2 1861 12:0 | 13-7 | 18-2 | 16°8 86 6°8 | 11:0 | 12:2 | 10°6 COHMAWE Mi cciviscessssciaeanees gous 1871 | 10°6 | 19°6 | 14°6 | 133 1878 | 15°9 | 14:0} 18:0 | 14:9 1880 | 12*1 | 138°1 | 14:2 | 19°5 (1847 | 16:5 | 14:7 | 17-4] 17-2 a 1255 18585) 1766) 16k6 861 O20) dale Zed ot 1Oe8 JoyeV ENG) Wepeerenoncmscener steemrstanse 1871 | 121 | 12-7 | 15-21] 14-5 1878 | 15:0 | 18:5 | 16-1} 16:9

14:2; 15°38 | 14:7

Ireland, average for five years1851-55 | 14:0

142! 181 | 16-5

1856-60 | 12°3

39 a9 9

ten years 1861-70 | 11:8

1871-80

29 3? a9

ewts. ewts. ewts. tons, tons. tons, tons. | stones. | tons. 22.°0 14°4 Woes 15°1 | 19°0 ae 48:0 | 1°9 PADS || ASS) FE aVahs) |) ba988} NG:5) | U7aoe| 1450) | SSebm ly eal PASS | alakeee | lakers) | 58) TO) LORS) | meOel a R2AcOn | ite Seo ele Oi) BES HER alse) TY OeS |] Qype | oy 16°1 | 19°0 9°4 | 3-1 O27 aes? | TOS a eleoe! Beco 13°5 20°38 | 17°5 4°0 15°7 | 14:9 | 10°0 | 28-1 1°9 18°5 138°8 6°9 -| 15°4 | 17°3 aan 48:0 | 2:0 PALO isis | lage || Bsa Way tey || alee alBere || Bids || ae

85 8:0 91! 1°4 82 8°8 8°5 | 19°3 | 1°8 1O°09| P59 |) Sea eee 12°0 | 18°4 9°3 | 24°8 | 1:9 TS! |) Sela Oe aie 12°8 | 14°7 S29) |) Bcd) | 28 TOG) | 74s | Seb) eae ssn || ache 89 | 31:8 | 2:0 20°5 14°2 7°4 GEO 7, ad 48:0 | 1°9 HONG) 44 TS aes 15°6 | 19°6 | 14+] | 38°6 } 2-9 TLRS | 15985) 8:3} 1:9 Mea J) aba 8)j) alas} | deel) || 0) THEO!) 2OR2 A SiR OM) Bae2 13°1 | 18°9 OFS 1) TEST Meg 15°0 | 16°3 9°5 | 3°6 14°6 | 15:2 9°8 | 31:8 | 2:2 10°3 | 20°5 | 12:9 | 3:8 14:0 | 14:2 9°6 | 25°9 | 1:9 20°5 13°6 75 TAGE alors ace 48°0 1:9 T9°S j) 1LSsO ale? oe VERO | 0777 || 13°67 94087 | 920

9°8 | 11:2 51) 1:3 Sal | Ges | Tae 2A 10°8 | 138°4 9:9 | 2:8 12°0 | 18°5 | 11°6 | 18°7 | 1:9 13°7 | 12°4 | 1575 | 3:0 13:6 | 14:6 | 184 1) 27-25) B38

OF St | MESES Oke ames 0273 | 13:0 | 12:2”) we ar 20°5 14°2 (a2 15°5 | 18°0 ee 48:0; 1:9 20°0 | 13°9 ; 11°6 |] 5:1 15°9 | 18°0 | 138°9 | 88°6 | 2°0 NOR also) 9°4 | 16 102) | WOK | WO4) B44) Wes 10°8 | 18°8 | 14:1 2°6 T3507 |) Sb) BU0sO7 Vee | aes) Pel 74 9°8 3°0 14:2 | 15:2 | 10°2 | 31:7 || 2°38 10°3 | 20°38 | 13°5 3°6 14°3 | 14°6 9-9 | 25°9 2°0 ZOLON | 142) | ees 5°5 To” Ife Ze). | lssyp |) 3h8)33 2°0

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Ryc. | Beans. | Pease. ‘Potatoes’Turnips. Mangel. |\Cabbage) Flax.

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a table representing the actual increase of value in live stock would throw an important light on certain aspects of Irish agriculture, these considerations cannot be entered into here, and as the increase is due almost entirely to other causes than increased merits in the live stock, a table at a fixed rate more exactly represents the change in value so far as it depends upon the agriculturist.

As horses and mules are classed together in the returns of 1841, no comparison can be made as to the difference in the number of horses between that year and 1880; besides, the returns of 1841 are much more inaccurate than those since 1847. Between 1851 and 1880 horses increased by 35,447, but between 1861 and 1880 they decreased by 57,079, agricultural horses diminishing by 66,853, undoubtedly an indication of a diminution in tillage, but not a criterion as to its amount, both because the horses are not fully occupied, especially on small farms,

and because a considerable amount of farm work is done by bullocks, which are much better suited for this work than the small and weak horses kept on most farms. Asses have more than doubled in numbers since 1841, and have increased between 1851 and 1880 by 49,264, a sign both of poverty and of lazy and inefficient' work.

Cattle have increased between 1841 and 1880 by 2,080,471, or have more than doubled in numbers, and between 1851 and 1880 by 953,565, or scarcely so much as between 1841 and 1851. The only pure native breed of cattle now in Ireland is the "Kerry," a light handsome animal, black or red in colour, with upturned horns. It is easily kept, and in quality both its flesh and its milk re- semble those of the finer West Highlands. The variety known as the "Dexter," a cross between the "Kerry" and some unknown breed, is shorter and plumper than the pure "Kerry," and has none of its finer points; and

TaBLE XIV .—Nuwmber of the various kinds of Live Stock in Ireland and tts Jour Provinees for 1841, 1851, 1861, 1871, and 1880. (The figures for 1880 in Tables XIV. and XV, are taken from the Agricultural Abstract, and differ slightly from those in the complete return,)

Leinster. Munster,

Two years and upwardsg…..... mpiivisiesteucmennaupeseess HOYSGS.....%0.000c0008 4 ONE ANG UNCC tWOssecessccccese Wane sWNen tives és suasleadaens ica Under On€,....csssses. nonodasdoonednodS SOCHSrioddonocanddndd apn MGta lL tosearenectuaneeearecs: /sisrtetisccrsleswsiy iiss caies Reseduvancvssuunaenteeses mel Ss BORON Ernie se etmeneess ccc ics assesecesevsraegaveusiss se Useaeuseenensmaseses 6 ;

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(Two years and upwards… Cattle ….....0….. 4 Under two years….. 00 (Under OMCs rreesccesperseresvecssceses nagoOeaD saaeetconseens

Hievetiletis| BOGS

vB Sa coesguamuaiacess05svsak vane eloiusiatiieniasidisvecvs

1841, | 1851. | 1861. | 1871. | 1880, | 1841,

170,514) 191,330; 167,325} 173,288] 160,878) 181,279] 155,930 189,802

435,975; 594,448) 595,951] 597,444)... 558,655) 748,891] 759,423

1851. | 1s61.’| 1871. | 1880, 143,636] 150,293 133,932| 130,904)... | 115,278/ 1274131 112,469 12,139] 24/437| 18/681] 95)170| ... 6,966] 16494, 14/169 14,739| 16,600, 14712] I7jot4| <2. 9.035] 12,023] 13,164

7,827| 7,795) 7,102) 8170) ... 7,956] 6,723] 6,477]. 39,983] 48,124} 48,719 49,873] 23,970] 34,081] 46,516| 48,731

140,599] 148,926} 190,466] 231.870! ... 142,890] 151,114] 202,846 125,555! 128,192) 162,039] 163,569]... 155,001} 151,269] 268,830

702,129] 866,566] 948,456] 997,883) 530,273| 851,546|1,051,274‘1,231,099

One year and UPWATdS……..cscscessssesessecosersstsces + SNCCPwererssscrsrsorn {onan eM EE. Bc sccsvsetteummeiivicaiomh — ase

“HB sages eencoqconéconncoocodiocsocbo DogoOo cob) PLLC RE RER OPERA OCPEGERL 657,118

542,750} 818,083} 895,960} 834,059]... 380,954} 580,202] 639,137 207,089] 414,800; 470,995 436,900)... 160,214 313,646) 382,040

749,789 |1,232,883)1,366,955 1,270,959| 695,622) 541,168 893,848‘1,021,177

Pigs One year and upwards ……..seeseseeeee ee uasancaee = WieTOMe RV CATS. ..::ctecvccereceescecsse

Tig) SsereocaccicoocacHer bocncech CeDco COLCA EEEREEC Co aeE eer rico 866,772

CRGAUS Mes scsiecwsssccas Teatan siisseenaeten vec sa’ Sele slenenenemenenerntocens; sucess teremans er

Ulster.

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2,024) 2,098] 1,865

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MIO GA rctesiassssssuss

One & upwards Under one year

EDGUi ce sscalasesese

MLOUAll ans vsessaiwns

Leinster.

Munster.

1861, | 1871. | 1880,

1861. | 1871. } 1880. Horses used for agvicul- tural purposes…....e..0. WIT CHVGO WS) <-essests crocs ssces BIOS reser een een reson ssc:

314,958) 280,590) 395,812) 222,925] 522,895] 408,419] 482,259 570,784

Poultry… eR icc Lemme “5h cia ea a wes |2206,941 2,101,438, ee ee ee le ee

1851. 1861. 1871. 1880. 18-41. 1851. 1861. 1871. 1880. 1841.

2 (Two & upwards 147,663} 166,205] 150,815] 152,479]... 45,212| 58,066] 47,764] 46,844]... 451,789} 601,977, 444,980] 435,63(% 4 Under two years 6,815} 11,598] 7.524) 12388] |.. 4,402 10,035] 6,570} 10,464, 30,322| 62,564] 46,944) 67.46: = (Under one …... 9,500; 12,669] 10,427/ 11,617|__… 6,321| 8,399] 7,868; 9,723| 39,595, 49,691) 46,171] 54,06

163,978, 190,472] 168,766] 176,477} 68,013) 55,935 76,500) 62,202; 67,031] 552,569| 521,706] 614,232 538,095; 557,153

Dono, |... 4,299] 3,580) 4,373] 45,6931… 23,486/ 26,001) 24,706; 22,518) 29,409] 39,431] 53,070} 58,217/ 58,016] 90,815) 136,981] 173,711 180,873 186.245

940,998 ‘ 1,028,059 1,161,088 1,052,494 295,840| 472,793, 530,809, 636,529 580,387/1,840,555 2,967,461] 8,471,688| 3,977,172) 8,991,026

182,996; 248,872] 334,310] 241,941]... 437,520) 745,773] 888,046] 714,493]... 70,137) 143,609] 207,791} 158,214| ... 140,518| 296,065) 415,156] 339,419]... 577,908] 1,168,120) 1,475,982) 1,256,263

253,183) 387,481) 542,101) 400,155) 525,788) 578,038 1,041,838)1,303,202 1,053,912 2,091,199 2,122,128) 3,556,050| 4,933,435] 3,561,861

Z §One & upwards 75,733] 86,771| 56,150| 26,348]. 44,587} 34,246] 32,650] 15,459). 391,698] 230,049) 232,996) 115,309 & (Under one year 171,098) 206,638] 365,314] 147,911, ... 70,062) 111,538] 200,718] 102,508) ... 693,159} 871,993) 1,389,197] 733,737

246,831) 243,409) 421,464) 174,259/ 170,922) 114,649) 145,784] 233,363] 117,967/1,853,101,1,084,857| 1,102,042| 1,621,423

ee ee 51,716| 38,679] 57,586, 73,010] ___… 33,581! 24,380] 34114] 37,1091. 235,813] 189,842| 231,373] 965,688 POULETY sssreeeseesseee|],895,678|2,886,637 2,947,873 3,596,204 4,240, 861 1,397,056 1,156,269 1,858,426 2,090,561 2,491 ,647|8, 334,497 ,7,470,604 10,871,175 (11,717,182 18 426,729

861. | 1871. | 1880,

128,167| 105,536 103,896) 113,649] 98,732) 92,755) 155,735] 198,881] 139,608

267,136] 251,265) 231,440) 562,023] 584,967 549,384) 504,186] 492.992] 499,018, 211,823] 216,438 -| 489,056] 535,740) 505,093! 420,806] 464,786 861,531) 186,132) 245,400) 177,611) 432

99,460| 49,633, 51,087} 26,344; ... | 171,918/ 109,399} 92,389 215,498] 230,957; 344,775} 196,581}... 936,501 322,860] 478,395

64,471] 52,186] 58,508) 67,474). 85,545] 74,597| 81,165 2,756,237 8,087,375 3,367,677]2, 834, 752 1,826,350 2,808,639 2,949,052

Connaught. Treland.

1851. 1861. 1871, 1880,

21,606 20,146 19,817 24,900

2 (Two & upwards 580,701) 675,486 647,145) 576,902)... | 277,886 872,935| 386,280| 346,027| ... [1,847,717] 2,391,760, 2,388,799] 2,261,302 = 4 Under two years 191,435]. 171,355} 924.834| 295.960; 7. 113,420] 87,108] 128,450] 126,699; .. 588,344} 558,508) 746,596] 818.704 & (Under one'..... 168,857, 176,198} 289,109| 249,632; ... 81,987| 70,766 121,799] 107,611]... 581,400| 521,425} 841,777| 841,020

1,544,220] 2,387,980) 2,757,453) 2.305.098

Ulster. Treland.

1861. 1871, 1879, 1880.

52,063 42,3091 ial 444,614′ 385,471) 378,757) 377,761

186,991 1 ,545,168|1,545,662|1,464,818 1,396,833

405,211 1,528,251)1,751,958 1,624,846/1 449,446

XIII. — 29g

257

506,032

226

in Connaught there is another breed of cattle which is also a coarse variety of the "Kerry." In some parts of the country the Scotch West Highland breed has been intro- duced. The "old Irish" breed which existed in the central parts of the country has now been all but eradicated by crossing. The English Longhorn was at first the animal principally used to improve the breed of the Trish cattle, but it was ultimately supplanted by the Shorthorn, and the greater number of Irish cattle are now crosses with that breed. Polled Scotch cattle have also been largely introduced into the mountain districts, and in Ulster and Cork the Ayrshire or a cross between it and the Shorthorn is the breed chiefly used for dairy purposes. Milch cows in 1880 exceeded a third of the total number of cattle,—the numbers of the three classes of other cattle (those under one year, those above one and under two years, and those above two years) being pretty nearly equal. The propor- tion of milch cows to the total number of cattle in Leinster was less than one-fourth, in Munster nearly one-half, in Ulster above nine-twentieths, and in Connaught about three-eighths. Since 1861 the number of milch cows has decreased by 148,335, the decrease having nearly all taken place since 1871. Dairy farming is carried on chiefly in the south, more especially in Cork, where the methods practised are generally greatly superior to those of the other districts. In Cork the cows are generally wintered partly on turnips or cabbage, and to some extent also on artificial feeding stuffs, but in other districts they are often not housed even in winter, and what they gather from the winter pastures is supplemented only by an allowance of hay. The milk is used chiefly in the manufacture of butter, the buttermilk being employed for feeding pigs, and forming also along with potatoes or stirabout an important element of family diet. On account of the bad household arrangements of the small farms, the butter manufactured is often dirty and unwholesome ; and it is also frequently oversalted. Cheese is not manufactured except by some of the Scotch or English farmers for their own use. The proportion of calves kept may be gathered from the number of cattle under one year old, which in 1880 was less than the number of cows by 555,813. On the best farms the cow calves are generally kept. Only a very small number of calves are fattened for the butcher, but many are killed

Tiorses. Asses.

£ £ £ £ £ £ : 1841 | 4,215,768} 66,542 | 11,446,916 159,270 | 19,399,850 Total value on holdings 1851 128,317 19.153.023 178,143 27,326,150 BBOVE INACHEl «ce. seseees waa 1871 7A MOL 279,416

Average value on “3 Des

: 1851

holding above 1 acre… } j974

exceeding 30 Acres.

er a a | | ene | eee | teat

£8 ad. Average value per holding 5 5 8

IREDAND

Cattle.

25,798, 605

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when ouly a few days old. Those that are kept scarcely ever receive warm milk after the first week, but are fed chicfly on buttermilk, hay-tea, and similar substitutes. This early process of half starvation, joined to imperfect winter housing and feeding, leaves effects on the constitution of the animals which greatly lessen their value for the butcher; and, although the breed of cattle in Ireland is one which fattens quickly on good pasturage, the animals, besides being smaller than they would otherwise have been, are always deficient in “tallow,” and generally weigh about 2 stones less than those of apparently similar dimen- sions reared in England or Scotland. Scientific cattle- feeding is only practised in exceptional cases.

Sheep have increased between 1851 and 1880 by 1,439,233, there having been very little increase between 1841 and 1851. The number is smallest in Ulster, which possesses only about one-eighth of the whole. The old native breed has been greatly improved by the introduction of Leicesters, and within recent years Border Leicesters have been largely introduced, as well as Shropshire Downs. In the mountain western districts there are large flocks of Cheviots and Scotch Blackfaced. The sheep possessed by the small farmer are generally of a very mongrel character.

Pigs between 1841 and 1851 decreased by 268,244, but between 1851 and 1861 increased by 17,185, and between 1861 and 1871 by 519,381, while between 1871 and 1880 they declined by 772,377. They constitute a very important item in the economy of the small farmer, and their carcases are largely sold to supply the English market. The old Irish "'grey-hound" pigs, which were very nearly allied in race to the wild boar, are now almost extinct, their place having been taken chiefly by Berkshires, although Yorkshire and Cumberland breeds are not uncommon.

Table XVIII. shows the progress of the cattle export trade to the United Kingdom since 1790.

Between 1841 and 1851 poultry diminished by 863,733, much less than might have been expected from the decrease in small farms; and between 1851 and 1880 their numbers have nearly doubled, the larger portion of the small farmers' returns being now often obtained from the rearing of geese and turkeys and the produce of eggs. The breed of domestic fowls is somewhat mixed, but Dorking and Spanish fowls are becoming more common.

Taste XVI.—Value of Live Stock on Holdings above 1 acre, and Average Value peor Holding, in 1841, 1851, and 1871.

Poultry. Total.

37,147,468

Not excceding 100 Acres.

Not exceeding 200 Acres.

Not Above

exceeding a0 aaied, 500 Acres.

exceeding 50 Acres.

ane | rn | | |

£ : . D °

204 11 10/865 18 6/588 4 5

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An approximation to a proper estimate of the deficiencies of the chief branch of Irish agriculture, the rearing of cattle, may be obtained by a computation founded on a comparison of its statistics with those of Great Britain. In 1880 the average number of cattle to every 100 acres under cultivation was 25°5, the average of England being 16:9, of Wales 23°7, of Scotland 23:2, and of Great Britain 18°4. Horses in the same year had an average in Ireland of 3°3, that of England being 4°4, of Wales 4°9, of Scotland 4°1, and of Great Britain 4:4. The average of sheep was for Ireland only 23:2, while for England it was 68°4, for Wales 98:2, for Scotland 149°3, and for Great Britain 82:9. Of pigs the average in Ireland was 5°5, in England 6:9, in Wales 6°6, in Scotland 2°6, and in Great Britain 6:2, While in Great Britain, with a permanent pasturage of 14,426,959 acres, the num- ber of cattle amounted to 5,912,046, in Ireland, with a per- manent pasturage of 10,259,108 acres, they amounted to 3,921,026, the number of cattle in England to every 100 acres under grass being 41-0, while in Ireland it was 38:2. But in addition to this the pasturage of Great Britain sup- ported 26,619,050 sheep, while that of Ireland supported only 3,561,361, or rather fewer sheep than cattle, and less than one-seventh of the number of sbeep supported in Great Britain ; and if we regard six sheep as equal to one

of the cattle, which is less than the estimated value, the number of cattle supported on every 100 acres in Great Britain would be 71°7, the number in Ireland being only 44°6. It would certainly not be exaggeration to estimate the cattle of Great Britain as on an average one-fourth better than those of Ireland, and if this be so it follows that compared with Ireland at least double the value of cattle and sheep are supported on the same amount of pasturage in Great Britain. (Thom's Almanac gives the value of cattle, sheep, and pigs of Ireland in 1880 as £60,904,429, and those of Great Britain as £138,559,045, reckoning those of each country as individually of equal value.) In Great Britain, however, the combined area under rotation grasses and under green crops, excluding potatoes, is 7,360,060 acres, as against only 2,326,538 in Ireland, the area devoted chiefly to the rearing of cattle and sheep being in Great Britain 21,787,019 acres, while in Ireland it is only 12,585,646, the average, reckoning six sheep as equal to one of the cattle, being thus 47°5 animals to every 100 acres devoted to rearing them in Great Britain as against 35:9 in Ireland; or, reckoning the animals in Eng- land as one-fourth better, the proportions are 59°3 to 35:9.

If, moreover, it be remembered that in Ireland pasturage occupies nearly all the richer districts of the country, and that where tillage is carried on the first principles of scientific agriculture are generally unknown, we cannot be underestimating the food produce of Ireland in stating it as about two-fifths less for the acreage than that of Great Britain ; and since 1847 there has, owing to the increase of pasturage, been a great decline in the production of

Taste XVIII.—Number of Cattle, Sheep, and Pigs Exported from Ireland to the United Kingdom.

1957, | 1874. | AveT#BC | 1880,

1876-188

15,737,171 | 1877 | 18,562,107

14,437,018 | 1878 | 23,502,383 17,521,860 | 1879 | 23,913,907 24,123,560 | 1880 | 17,876,338

9,368,516 | 1873 13,761,931 | 1874 14,356,996 | 1875 18,803,251 | 1876

food. From the inadequacy of the information given by the Board of Trade it cannot be determined with accuracy to what extent Ireland is dependent on other countries for supplies of corn and meal. From special parliamentary returns we learn that the total foreign imports of grain in 1850 were 1,683,687 qrs., and of meal and flour 220,107 ewts., and that the exports to Great Britain from Ireland exceeded the imports from it in the case of grain by 242,287 qrs., and of flour by 708,008 cwts. In 1855 the exports of corn and meal to Great Britain exceeded the imports from Great Britain and foreign countries together by 451,627 qrs. In the yearly returns of imports of foreign corn and meal into the United Kingdom no separate column is given for Ireland; and, in addition to this, since 1867 no return has been given of the trade in corn and meal between Ireland and Great Britain. Weekly returns of the imports of foreign grain into Ireland are, however, published in the London Gazette, and Table XIX., founded on a special parliamentary return and on the Gazette returns, gives the total amount of foreign imports of grain and meal in 1865, and in each year from 1870.

Notwithstanding that much of the land now under pas- turage is well adapted for turnips or mangolds, the amount of green crop grown is generally quite insufficient for scientific cattle-rearing. In many cases also the grass is laid down after the soil has been exhausted by over-crop- ping, and little pains generally are taken to improve the soil by draining or manures, The increase in pastoral farming has indeed been largely due to the desire to save trouble, one of the principal difficulties of the large farmer being to obtain, notwithstanding a low general average of wages, the worth of his expenditure in hired labour. The indolent habits of the peasantry, due to long ill fortune, constitute also a principal obstacle to the introduction of spade culture, which has been advocated as well suited for the climate and soil of Ireland, and as affording employment to the largest possible agricultural population.

As it is, the small farmer, living in a wretched hovel which he shares with a considerable proportion of his live stock, is able, on account of the fewness and simplicity of his wants, to succeed, though making use of very primitive methods of culture, where the larger farmer wholly dependent on hired labour would fail if he attempted a system of tillage even according to the most approved methods.

For the promotion of the agricultural progress of the country grants of various kinds are bestowed by Govern- ment. Since 1847 an Act for granting land improvement loans has been in operation, and since the passing of the Act up to the 31st March 1881 the total number of loans issued has been 7328, amounting to £3,278,762,—the applications for the year 1880-81 bejng 638, amounting to £161,575. The quantity of land drained since the commencement in 1847 until the 31st March 1881, has been 274,827 acres, at an average cost of £7 per acre. The number of loans for farm buildings sanctioned since the passing of the Act 13 & 14 Vict., c. 31, until the 31st March 1881, has been 1528, amounting to £771,360, —the number of loans sanctioned during the year ending 31st March 1881 being 133, amounting to £53,670. Under 23 Vict., c. 19, the number of loans sanctioned for dwellings for agricultural labourers has been 462, amount- ing to £263,465,—the cases for the year up to 31st March 1881 being 16, amounting to £11,155. The whole expen- diture charged againstthe different undertakingscommenced under the Arterial Drainage Acts (prior to 1863), including £70,201 for rent chargeable to counties, amounted at the close of the operations to £2,390,612, 12s. 4d., of which £2,249,540 was advanced on loan, and £141,073 by way of free grant, and the repayments in respect thereof, including interest, amounted on 31st of March 1881 to

£1,413,944. The loans sanctioned since the passing of the Acts in 1863 amouut to £553,295. The advances on account thereof, including interest charged during the operations of the works, amount to £411,116, and repay- ments, including interest, to £103,448. The total area of land drained and improved is 55,311 acres, at a cost of £325,705.

In view of the prevalent agricultural distress, the Government on 29th November 1879 offered to land- lords within the radius of distressed districts certain facili- ties of obtaining loans under the Lands Improvement Acts, and on 12th January 1880 offered additional inducements. Of the sum of £1,500,000 borrowed from the Church Temporalities Commissioners for relief works, £1,166,385 had up to March 1881 been sanctioned as loans to land- lords, and of this sum £702,857 had been issued. The amount issued as Seeds Loans, under the Seed Supply Act of 1880, was for year ending 3lst March 1881 £494,317, making a total of £647,490 since the passing of the Act. One of the chief obstacles to agricultural improvement in Ireland has been the unsatisfactory relations between landlord and tenant. 'The legislation bearing on the sub- ject has been of a very various and contradictory character. An immense number of holdings was created by the Free- hold Votes Act of 1793; but in 1816 an Act was passed to facilitate the working of the Ejectment Act first passed in the reign of Queen Anne. In 1851 an Act was passed to facilitate ejectments in cases of implied tenancies from year to year under £50 rental, and in 1860 these facilities were increased and extended to all tenancies. There are no records of evictions earlier than 1849. A special return presented to the House of Commons in April 1881 gives by provinces and counties the number of evictions for each year from 1849 to 1880, as ascertained by the police. The numbers are of course only approxi- mately correct, but err by defect, not by excess. The total number of families evicted during that period was 90,107, comprising 460,570 persons; but of these, 21,340 families, comprising 115,859 persons, were readmitted. Deducting readmissions, the numbers in 1849 were 13,384 families, 72,065 persons; in 1850 they were 14,546 families, 74,171 persons; in 1851 they declined to 8815 families, 43,449 persons; and they gradually diminished until 1856, from which year until 1862 the numbers though fluctu- ating fell short in each year of 1000 families. There was a considerable diminution from 1865 till 1878, when they rose to 834 families, or 3916 persons, while in 1879 the numbers were 1098 families, or 5576 persons, and in 1880 they were 1893, or 9036 persons. During the half year ending 30th June 1881 the numbers evicted were 1433 families or 6557 persons. In 1865 it was enacted that no evictions should take place without the intervention of the sheriff; but, although

a means was thus supplied of obtaining records absolutely correct, the sheriffs in some instances neglect to seud in returns. In Table XX. the figures for 1870-79 are taken from the judicial statistics, and those for 1880 from a special return. These ejectments do not include those of cottiers and weekly tenants in towns whose cases are decided by petty sessions. The large increase of ejectments since 1870 shows that the Landlord and Tenant Act of that year has failed in ordinary circumstances to improve the relations between landlord and tenant ; and, while some of its pro- visions have had in certain respects a beneficial effect, it

has also exercised a variety of prejudicial influences, and not only broke completely down under the strain of the famine of 1879, but in many cases led to the almost unavoidable infliction of great hardship on the tenant. The salient prin- ciple of the Act was the abandonment of the position assumed in the Act of 1860, which endeavoured to place the relation of landlord and tenant on the simple basis of con- tract. Stated positively, its leading features were the legal confirmation of the Ulster tenant-right and other ancient customs, the provision made for compensation for loss on quitting and for improvements, and the sanctioning of grauts on loan and other facilities to tenants to aid in the pur- chase of their holdings. Since the passing of the Act the average sum adjudged annually in cases between landlord and tenant has been over £18,000, of which more than a third has been for Ulster tenant-right. The amount adjudged annually has varied considerably but irregularly, and of late years there has been a diminution in the number of cases. The judicial statistics give information, in reference to the several counties aud provinces, as to the number of cases, the amount charged where decrees were made, the amount reduced or added on appeal, and the amount adjudged, distinguishing also between compensation for loss ou quitting holdings and improvements together, for loss on quitting holdings alone, and for improvements alone. In1877 and 1878 an additional column was added, giving also the

total sum claimed. The sum claimed in 1877 was £225,225 for the 598 cases, an average of £425, the gross sum adjudged being only £15,401, or an average of £25, 10s. ; in 1878 the sum claimed was £176,954, an average of £344 for the 514 cases, the gross sum adjudged being £17,063, or an average of £33; in 1879 the gross sum adjudged was £12,654. The total number of loans made to aid tenants in purchasing their holdings up to 31st March 1881 was only 849, and the gross sum granted £492,370. Table XXI. gives various details. According to a special return made to the House of Commons in April 1881, the number of holdings sold by the Church Temporalities Commission up to 30th December 1880 was 2444 to the public, and 6195 to tenants. Of the 411 pur- chasers who had fallen in arrears, 332 were purchasing ten- ants, arrears £4619, and 79 other purchasers, arrears £3813.

To remedy the defects of the Act of 1870, a new Act was passed in 1881, Practically it secures to the tenant a uear approximation to the " three F's "—" free sale," " fair rent," and " fixity of tenure." 'Free sale" is granted so far as is compatible with a due regard to the rights of the proprietor. The "fairness" of a rent may be decided by the "intervention of court," and, while on certain condi- tions a "fixed tenancy" may be agreed upon between landlord and tenant, an approximation to this is obtained in other cases by provisions in regard to rent and " com- pensation." Additional facilities have also been given to tenants to purchase their holdings, and provision has been made for grants of money to aid in the reclamation of land and in emigration, A feature of the Act is the creation of a land commission as a supreme court of appeal, except in special cases, in questions between landlord and tenant, and with the power of sanctioning loans.

Leases are not held by so many as one-tenth of the total number of farmers, tenancy-at-will being preferred, partly for the freedom it allows, and partly because it is thought to involve a tacit consent to permanent occupancy.

TABLE XX.—Ejectment Deerees exeeuted from 1870-80.

1870. 1871. 1872. 1873,

Total ejectments ….....10000% 1301 1288 1173 1777 Hjectments for non-pay- 813 800 1256

THAVEPOUE, (OVE THOU Fonapenosoonncoe

1874, 1876, 1877. 1880. 2170 1839 57 2888 1567 1032 2447

1521

AGRICULTURE. |

One of the chief hindrances to agricultural progress in Ireland has been absentecism. According to Sir William Petty, who wrote in 1672, one-fourth of the real and personal property of Ireland was possessed by abseutees. Prior, in his List of Absentees, published in 1729, divides them into three classes—those who are seldom or never seen in Ireland, those who visit Ireland for a month or two, and those who are occasionally absent. The money spent out of Ireland by the first class he estimated at £204,200, by the second at £91,800, and by the third at £54,000. According to another account, published in 1769, tle income of the first class is placed at £371,900, of the second at £117,800, and of the third at £92,000. Arthur Young gives the rental of absentees in his time as £732,200, about one-seventh of the whole estimated rental, and Swift declared that one-third of the rental of Ireland was spent in England. Absentecism continued to increase until the close of the great war in 1816, and although it diminished from that time, a substitute for many of its evils was supplied by the rapid impoverishment of a large number of idle and extravagant squireens. 'To help in freeing the country from this incubus, an Act was passed in 1848 to facilitate the sale of encumbered estates in Ireland, which however proved wholly ineffectual, and was superseded by another in the following year appointing a commission of three persons to constitute a court for the purpose. This court commenced its sittings in October 1849, and, from that period until it closed its sittings in August 1859, 3547 sales were effected, the gross amount of which was £25,190,839. In 1859 the court was recon- stituted on a permanent footing under the title of the "Landed Estates Court," power being conferred on it to | deal with unencumbered as well as encumbered estates. Up to January 1880 the

sales in this court amounted to £27,277,140, so that probably about one-sixth of the whole | area has changed hands through the action of the two courts. The average price for the five years ending 1867 was 174 years' purchase; in 1870, the year of the passing of the Land Act, it fell to 164 years' purchase, but in 1873 it had risen to 20 years' purchase, and for the six years ending 1877 it was 19-4, while for 1878 it was 18:9,

TabLE XXI.—Purchase Loans to Tenants up to March 31, 1880.

as ae Number of} Annual Value of

TanGed. Acres. Rent. icin

£ 8. d. £ ac. ro.po; £ &, a.| ES Mees

Leinster…..] 125 |223,09516 5, 129,487 (10,122 3 19) 9,645 7 65) 8,531 0 2 Munster…...| 169 |202,064 8 5) 113,604 13,769 0 3) 9,261 6 5) 9,640 9 6 Connaught.) 27 | 47,327 0 2) 30,173 | 3,652 0 6/| 2,369 5 9 1,791 16 8 Ulster…....| 528 (850,635 1 9) 219,106 |23,151 8 213,913 1110 18,708 4 8 Treland…... 849 |823,122 6 9) 492,370 50,695 2 30‘35,189 11 5 30,971 11 0

TRELAWN D

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and for 1879 only 17:7. The action of the Encumbered Estates Court was of a somewhat arbitrary kind, and in the beginning of its operations it forced the sale of estates at a time when their market value was much below the average. In addition to this it introduced a large number of proprietors who looked at their purchase entirely from a business point of view, and who, though quite alive to the importance of agricultural progress, had little regard for the feelings of their tenants; having bought the improve- ments which the tenant had effected, they naturally had no scruples in raising the rents so as to make them represent the value of these. It is not probable that the land sales have increased very much the number of proprietors ; for,

although they caused a subdivision of many large estates, a number of small estates have been consolidated, and in many cases more than one estate has been purchased by the same person. On the whole, however, the result has been to increase the estates of a medium size, aud also probably to lessen the number of absentees.. From a return presented to the House of Commons in 1872, it would appear that the number of proprietors resident on their estates in 1870 was 5589, possessing 8,880,549 acres, with an annual value of £4,718,497, while there were 4842 proprietors resident either usually or constantly elsewhere in Ireland, who possessed 5,215,264 acres, with an annual value of £2,499,343 ; 2973 rarely or not usually or never resident in Ireland, who possessed 5,129,169 acres, with an annual value of £2,470,816 ; and 5982 unclassed, who possessed each less than 100 acres, aud together 236,872 acres, with an annual value of £257,100, 25°5 per cent. of the soil is thus owned by absentee proprietors, and 26 per cent. by proprietors who though resident in Ireland are not resident on their properties.

According to the classified summary return of owners of land in Ireland laid before the House of Commons in 1876, the land in 1873 was divided among 68,716 pro- prietors, who together possessed 20,157,557 acres, with a rateable annual value of £13,418,357, or, according to the corrected statement of 1878, 68,755 proprietors, possess- ing 20,162,050 acres, with a rateable value of £13,420,022. Table XXII. gives a classification of proprietors according to the area of their estates, and their numbers in the several provinces and in all Ireland, with the acreage possessed by each class collectively, and its rateable valuation, —the result of the corrected statement of 1878 being also added.

According to the returns presented to the House of Com- inons in 1872, which have the advantage of omitting cities and towns, the total number of rural proprietors in 1870 was only 19,547, possessing a total area of 20,046,182 acres, with a rateable value of £10,180,434, A return obtained

TasLE XXII.—Classification of Landowners, with Extent and Valuation of their Estates.

Provinee of Leinster. Provinee of Munster.

Classes of Owners.

–

Provinee of Ulster. Province of Connaught.

Total of Ireland.

No, of Valua- | No. of Valua- j No, of | 7 Valua- | No. of Valua- | No. of Valua- Owners Extent. tion. ; Owners Extent. tion. {Owners Extent. tion. |Owners Exkenns tion. |Owners Extent. tion. ac. £ ac. £ ac. £ ac. £ ac. £

15,684 3,119) 607,816) 8,101 2,511! 266,212) 10,036 8,010) 468,516) 2,323 425) 29,904 36,144 9,065) 1,966,448

2,604 10,362] 213,661) 1,250 4,697| 46,763) 2,706 12,504} 220,671 332 1,405) 17,821) 6,892 28,963; 498,916 LO 55 éG 50 | 1,893 47,248] 200,785| 1,118 29,357| 68,278} 4,426 | 110,962; 207,251 809 7,958] 13,868) 7,746 195,525} 480,182 50g, 1) 100 982 71,356| 116,810 819 59,907| 61,467| 1,487 | 104,563) 123,960 191 14,821! 11,137) 8,479 250,147} 313,374 100.~—C*g, “ 500 | 2,665 | 666,844) 740,571) 2,394 | 601,603 453,007| 2,008 | 447,955} 453,520 927 | 239,335 125,473, 7,989 | 1,955,537! 1,772,571 876 | 615,530) 517,080 901 | 638,950) 404.628 520 | 361,568) 281,275 419 | 299,480} 129,502 2,716 | 1,915,525 1,332,435 559 | 777,594) 540,687 578 | 807,874) 432,282) 327 | 454,218 294,821 839 | 475,057 184,994! 1,803 | 2,514,743) 1,452,984) 816 | 973,403] 663,097 875 1,132,578) 596,713 253 | 783,715) 484,517 254 | 785,573| 252,883; 1,198 3,675,269 1,997,210} 89 | 623,927) 403,851 131 | 911,161) 405,062 129 | 894,931) 565,805 103 | 724,609) 208,756 452 | 3,154,628) 1,583,474 86 | 484,316) 278,402 51 | 688,433] 273,133 56 | 742,185) 390,260 42 | 563,559) 171,878 185 | 2,478,493} 1,113,67 14 | 379,288) 184,351 23 | 670,728] 253,283 33 | 931,629] 428,127 20 | 577,205| 205,845 90 |

2,558,850) 1,071,616 50,000 __,, < 2) 157,118) 93,016 4 | 349,194) 66,4385 5 |} 292,056) 191,582 3] 225,309) 46,797 14 | 1,028,677) 397,829) 100,000 and upwards,..... Ea i Pa Ai Pr ee 1 | 122,300] 15,167 Q | 274,780| 22,478 3 | (397,080) 37,645) No valuation …....0066 : 4 aa Fy i 5 ‘i a ne +s an irs 5 47 tee Total .evesesssesseesesesee | 25,724 {4,810,147 4,560,277] 15,746 |5,896,998,3,311,272| 21,982 [5,261,596 4,125,472] 5,264 [4,188,816 1,421,336) 68,716 20,157,557)13,418,357 Corrected statement, 1878… | 25,727 [4,812,412 4,560,342| 15,780 |5,898,370,3.811,085) 21.982 5a pa Bb a 5,266 '4,190, 999 1,422,650 68,755 |20,162,050|13,420,022

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by the Irish Government in 1870, and ordered by the House of Commons to be printed in 1876, gives the number of rural proprietors as 19,288. It also shows that only 2377 possessed less than 25 acres, so that nearly all the pro- prieturs of less than 1 acre must be in towns. ‘The classified returns of 1876 show that nearly one-half of the whole acreage of the country is possessed by 749 proprietors holding each npwards of 5000 acres, and that more than four-fifths of the land is possessed by 3750 proprietors hold- ing upwards of 1000 acres. Compared with Great Britain, the number of proprietors is strikingly small, Scotland having twice as many, and England nearly fourteen times as many. The proportion of landowners possessing less than 1 acreis very much smaller, and that of those possess- ing less than 500 acres is also smaller. Further details of comparison with England and Scotland will be found in the article ENGLAND, vol. viii. p. 223-225.

Woollen Manufacture.—Though Ireland is without the stimulus to industry produced by an abundant supply of coal, yet with its great command of water power it might have widely developed its manufactures before the intro- duction of steam, had not special causes been in operation to check their progress. The unsatisfactory political and social relations of the country, and the unhappy legislation which had blighted its agriculture, would necessarily in any case have indirectly stunted its manufactures also; but, in addition to this, they were specially discouraged by various restrictive and repressive Acts.

For a considerable period after the Anglo-Norman invasion Ireland was, how- ever, in this respect placed on an entire equality with England, and in Acts passed in the reigns of Edward I, Edward IIL., and Edward IV. is specially exempted from the duties or prohibitions imposed on foreign manufactures.

At an early period the woollen manufactures of Ireland were exported in considerable quantities to foreign countries. In a posthumous poem, Dita Mundi (two copies of which are in the British Museum, of dates 1474 and 1501), by Bonifazio Uberti, who died about 1367, mention is made of "the noble serge " which Ireland sent to Italy; and Irish frieze is specially excepted by name in an English statute of 1376. Five mantles made of Irish frieze are mentioned in a list of goods exported duty free from England to Pope Urban VI. Considerable impulse was given to the manu- facture in the reign of James I. by the establishineut of a colony from the Palatinate, in Germany, at Carrick-on-Suir, but in the reign of Charles I. the clothing trade was dis- couraged by the earl of Strafford, lord-deputy, who to prevent it interfering with that of England endeavoured to foster the linen manufacture instead. The Act of the 12th of Charles II., which prohibited the export of raw wool both from Ireland and England to foreign countries, was in the case of Ireland not only harmless but ineffectual ; but, in addition to this, Ireland was virtually debarred from the English market by the heavy duties imposed on her woollen manufactures, and, being left out in the Naviga-

tion Act of 1663, she was also debarred from the colonial.

market. The foreign market was, however, left open to her ; and after the prohibition of the export of Irish cattle to England the Irish farmer was led to turn his attention to the breeding of sheep, when not only did the woollen manufacture increase with great rapidity, but, owing to the superiority of the wool, the materials manufactured were of such a quality as to awaken the alarm of the English manufacturer, at whose instance both Houses of Parliament petitioned William III. to come to the rescue. In accord- ance with his wishes, the Irish parliament in 1698 imposed additional heavy duties on all woollen clothing with the

exception of friezes exported out of Ireland, and in the following year an Act was passed by the British Government prohibiting the export from Ireland of all woollen goods to

any country save England, to any port in England save six, and from any town in Ireland save six. Sir William Petty in 1641 estimated the number of woollen workers and their wives at 30,000, but the result of these Acts was sv disastrous as practically to annihilate the manufacture, to reduce large districts and towns to the last verge of poverty, and seriously to cripple the revenues of the king- dom. Notwithstanding, however, that Ireland ceased to make even for her home supply any but the coarser articles, and was forced to import her finer goods from England, the Acts were almost as injurious to the English as to the Irish manufacturer; for not only did many of the skilled Irish workmen settle in France, Spain, and the Netherlands, but by means of smuggled Irish wool, to the extent of four-fifths of the Irish fleeces annually, the foreign manufacturer was able at a much smaller cost to fabricate materials quite equal to those of England, and for a time almost to swallow up her Turkey wool trade. According to the tables given by Newenham, the annual average of new drapery exported from Ireland for three years ending 25th March 1702 was only twenty pieces, and that of old drapery 4 yards, while the export of woollen yarn, worsted yarn, and wool, which to England was free, amounted to 349,410 stones. The annual average export for the three years ending 1722 had risen to 5494 yards for new drapery and 364 yards for old drapery, while that of yarn, worsted, and wool, owing doubtless to smuggling, had fallen to 188,450 stones, and for the three years ending in March 1732 fell as low as 96,953 stones, but for the three years ending in 1772 had risen to 129,191 stones, of which wool amounted only to 2247 stones, The returns as to the exports of new and old draperies from 1722 to 1777 are incomplete. Arthur Dobbs, in his Lssay on the T’rade of Ireland, published in 1729, estimated the medium exports of wool, worsted, and woollen yarn at 227,049 stones,

which he valued at £117,554, 15s. 10d.,— the other exports of manufactures made from sheep, such as friezes, flannel, gloves, &c., being estimated at £2353, 5s. On the other hand, the annual average of new drapery imported for three years ending in 1702 was 29,329 yards, and of old drapery 15,787 yards; and the averages gradually rose till they were 84,631 yards and 18,726 re- spectively for the tlree years ending in 1722; 379,766 and 206,875 for the three years ending in 1772; and, according to Arthur Young, 485,609 and 259,466 for the seven years ending in 1777. Between 1779 and 1782 the various Acts which had hampered the woollen trade of Ireland were repealed or greatly modified; but, although a temporary impulse was thus given to the manufacture, the imprudent manner in which it was prosecuted and the influence of the remaining statutes led in the majority of cases to disappointment, and after a short period of deceptive prosperity, followed by failure and distress, the expansion of the trade was limited to the supply of the home market. Thus, while the annual average of new drapery exported for the three years ending in 1792 had risen to 352,309 yards and of old drapery to 10,688 yards, the averages fell for the three years ending in January 1802 to 18,028 and 2007 respectively ; while the average imports of new drapery for three years rose from 379,989 in 1782 to 1,077,471 in 1802, and of old drapery from 251,251 to 1,474,000. In 1823 the imports of new draperies into Ireland had risen since 180] from 967,225 yards, valued at £120,903 in Irish currency, to 1,437,652 yards, valued at £179,706 ; while the import of old draperies had risen from 911,082 yards, valued in Irish currency at £637,757, to 1,188,366 yards, valued at £831,856. Since 1825, owing to the cessation of duties, returns of the exports and imports of Ireland to and from Great Britain have ceased to be issued, According to the evidence laid before the House of Commons

in 1822, one-third of the quantity of woollen cloth used in Ireland was imported from England, the value being about one-half. The number of persons employed in the manu- facture was 6500, while worsted stuffs and flannels employed each about 3000 more, in addition to which probably other 35,000 were dependent on these workers for their liveli-

hood. According to a return presented to parliament in 1837, the number of woollen or worsted factories in Ireland was 46, all situated in Dublin or in the southern counties of Ireland, the number of workers employed being 1321 ; and. in a special return relating to factories for 1839 the number of woollen mills is stated as 31, employing 5 steam engines with a horse-power of 58, and 39 water- wheels with a horse-power of 523, the number of workers being 1231. Table XXIII. gives the number of factories, spindles, power-looms, and persons employed in the woollen and worsted manufacture at various periods from 1850. In addition to this, a large number of persons are employed in handloom weaving,—farming in many cases also occupying part of their time.

Linen Manufacture.—The linen manufacture of Ireland has suffered from legislation chiefly indirectly—from the trade restrictions which hampered the commerce of the country generally, and from the depressing influence of an unsatis- factory socialsystem and unfavourable agricultural relations. At a very early period flax was to some extent cultivated in Treland, and was both spun into thread, which was exported to foreign countries, and manufactured into cloth, which was made use of for cloaks, for the headdresses of women, and for shrouds. But although the manufacture was so well known in the beginning of the 15th century as to be noticed in an English poem of that period, and is mentioned in a statute of Henry VIII. as constituting along with that of wool one of the principal branches of the trade of Ireland, there is no probability that it would have rivalled that of wool unless it had been artificially fostered and the latter artificially all but annihilated. The earl of Strafford, lord- deputy in the reign of Charles I, with a view both to dis- courage the woollen manufacture of Ireland and to obtain for England a cheaper supply of linen than was to be had from France or Holland, as well as probably to benefit himself, invested as much as £30,000 of his fortune in the promotion of the linen trade, and not only imported flax- seed in large quantities from Holland, but offered premiums to induce skilled workmen from France and the Netherlands to settle in Ireland. A similar policy was vigorously prosecuted by his successor the duke of Ormond, who in 1665 procured the passing of an Act by the Irish parliament to encourage the growth

of flax and the manufacture of linen, In addition to this he despatched persons to the Netherlands to obtain a knowledge of the best mode of

manufacture, and he brought over a number of families from Brabant and others from France and Jersey whom he settled at Carrick and at Chapelizod near Dublin, in both which places he established flourishing factories. Follow- ing the same line of policy, an Act was passed by the English parliament inviting foreign workmen to settle in Ireland, and admitting all articles made of flax or hemp into England duty free, a privilege which, according to the report of the Irish House of Commons in 1774, gave Ireland an advantage over foreign nations of 25 per cent. In 1698 the Irish parliament, in answer to the representa- tions of England, promised that they would "heartily endeavour to establish a linen and hempen manufacture," but this promise was at first only fulfilled by levying prohibitory duties on the exports of woollens, and the linen trade in 1701 had made such comparatively small pro- gress that the value of the exports of cloth was only £14,112, and of the exports of linen thread £39,106, 18s. 4d. In 1705 the Irish were, however, permitted to export their white and brown linens to the British colonies, but not their striped and dyed linens, which were also excluded from England by a prolibitory duty of 30 per cent. In 1710, in accordance with an arrangement entered into between the two king- doms, a board of trustees was appointed to whom a con- siderable sum was granted annually for the promotion of the manufacture ; but the jealousy of England nevertheless interposed to check the manufacture whenever it threatened to interfere with her own trade, and by an Act of the 23d of George II, which imposed a tax on Irish sailcloth imported into England, the hempen manufacture was virtually annihilated. From 1700 to 1777 the sum expended by the Board of Trustees on the promotion of the linen trade, according to tables given by Arthur Young, amounted to £847,504, the annual average amount for the fifteen years up to 1772 being £14,100. In addi- tion to this bounties were granted for the import of flax- seed, which during seven years up

to 1777 averaged £15,094 annually; and a special parliamentary bounty was also paid annually, which in 1777 amounted to £4000, and from 1700 to that date to £192,540. At first the total sum applied to the encouragement of the trade was very small, being in 1700 only £100, and in 1703 £430; but the grants increased rapidly from 1716, and altogether between 1700 and 1777 they amounted to £1,295,560, the total annual average grant for the seven years ending 1777 being £33,540. The linen manufacture of England was, however, also encouraged by bounties, which according to the statistics of M. César Moreau amounted in 1824 to £73,392, those of Ireland amount- ing only to £17,528. Table XXIV., compiled from

TABLE XXIII.—Woollen and Worsted Factories in Ireland, 1850-1879.

Number of Factories. Spinning Spindles.

1850.| 1861.| 1870,| 1879. 1870.

Woollen factories….) 9 | 39 | 61 | 74 [14,458 18,574

Worsted factories…) 2] 8] 3] 2 | 1,552] 4,700] 1,768

See reneeee eee

1879,

28,348 |40,205

288

— | ——— | ———— | | — | | EE | EE

Doubling Spindles. Power Looms. Persons Employed.

1850.) 1861,| 1870, 1879.| 1850.| 1861.] 1870,| 1879.] 1850.| 1861. | 1870.

. {1547/4942} 22 | 123| 241/ 411/553) 862/1490| 1975 i |ivee 10] . 72) 175) 75

1879,

oe

1,688,574 | 4,136,203 |11,200,460 |20,560,754 |87,446,133 |35,890,050 |87,165,089 |87,464,279 |46, 464,363

£105,537 | £206,810

10,088

£55,485

£134,238 | £200,502 | £189,437

12,201

£73,207

5,558

£33,320

4,583

31,572

£27,502

13,701

£82,206

232

statistics supplied by Arthur Young and M. Moreau, shows the increase of the linen manufacture so far as this can be judged from a comparison of the exports of linen cloth and yarn to all parts of the world at various periods from 1710 to 1823. Arthur Dobbs estimated

that in 1727 the value of the whole linen manufacture, including both that exported and that used for home consumption, was about £1,000,000 sterling.

The Linen Board ceased to act in 1830, the trade having since 1825 been in a very depressed condition owing to the importation of English and Scotch yarns made by machinery, which undersold the home-made article. A flax-spinning factory had indeed been erected at Cork in 1805, but appears to have been unsuccessful, and no further attempt to introduce machinery seems to have been made until after the discontinuance of the Linen Board, when an experiment ona large scale was made on the Bann near Belfast, from which period may be dated the rise of the great linen trade of Ulster, where, with the gradual dis-appearance of the hand spinning in the other provinces, nearly the whole linen manufacture of Ireland became concentrated. Statistics as to the acreage and produce of flax will be found under ‘ Agriculture,” supra. It is in the province of Ulster that flax is chiefly grown, but the soil has in many instances been much deteriorated by a too frequent rotation of the crop. The flax of Irish pro- duction in 1880 was estimated at 24,508 tons, of British production at 1398, while the foreign imports of flax into the United Kingdom amounted to 94,812 tons. The cessa- tion of the duties on exports from Ireland to Great Britain deprives us of the means of tracing the progress of the modern development of the linen industry. It was calcu- lated that in 1855 the total exports of linen from Treland to Great Britain and foreign countries was 106,000,000 yards, valued at £4,400,000, and undoubtedly since that period it has more than doubled. According to the report of the Flax Supply Association of Belfast for 1876, it was esti-mated that in 1875 the consumption of fibre in all the mills of Ireland was about 45,897 tons, or about one-seventh of that consumed by all the flax mills in existence. It was also estimated that the total quantity of yarns produced per annum was 21,373,700 bundles, of which 10,479,040 were supposed to be manufactured into cloth by power-looms, and 5,850,000 by hand-looms, in addition to which about 2,000,000 bundles were supposed to be imported from Great Britain and the Continent, leaving for export 7,044,660 bundles,—fully two-thirds of the production and imports into Ireland of yarn being

converted into linen fabrics in Ireland. According to the report made to parlia- ment in 1837, the number of workers employed in the flax factories of Ireland was 7810, and according to the returns relating to factories for 1839 the number of mills engaged in the manufacture was 40, employing 32 steam engines with a horse-power of 928, and 37 water-wheels with a horse-power of 1052, the total number of persons em- ployed being 9017. Table XXV. gives returns at various periods from 1850. In the report of the Flax Supply Association for 1881 the number of spindles is estimated in 1881 at 927,295 and of power-looms at 21,177.

In 1880 there were 1182 scutching mills, a decrease of 317 as compared with 1871. The number of persons employed in the jute and hemp factories is over 1000.

Cotton Manufacture.—The cotton manufacture was

TaBLe XXV.—Linen Factories in Ireland, 1850-79.

ik co & WD

| MANUFACTURES.

introduced into Ireland in 1777, and a mill for spinning twist with water-power was erected in 1784. Under the protection of high import duties and bounties the manu- facture increased with such rapidity that in 1800 it gave employment to 13,500 workers, chiefly in the neighbour- hood of Belfast. At the Union it was arranged that the duties, which then stood at 68 per cent. ad valorem, should remain unchanged for eight years, when they were gradually lowered by eight annual reductions, until in 1816 they stood at 8 per cent., and were shortly afterwards abolished. According to the statistics given by M. César Moreau, the manufacture between 1804 and 1820 had more than doubled, the cotton, cotton yarn, and twist imported into Ireland for the three years ending in 1804 amounting to 2,244,582 ib, whereas for the three years ending in 1820 it was 4,787,071 ib. The value of cotton goods exported from Ireland to Great Britain rose from £708 in 1814 to £347,606 in 1823, and between 1814 and 1826 the value of those

exported to other parts of the world rose from £37,569 to £201,196. According to a statement made to the House of Commons in 1817, the number of hands employed in the manufacture was 12,091; and in 1822 they had increased to 17,756. It is evident that the in- troduction of machinery had prejudicial effects on this industry as well as on the linen trade, for, according to the returns relating to factories for 1839, the number of cotton mills is given as 24, employing 19 steam engines with a horse-power of 517, and 22 water-wheels with a horse- power of 572, the number of persons engaged being only 4622. Tho manufacture of course suffered greatly during the famine of 1846, and in 1850 the number of factories was only 11, employing 2937 persons. In 1861 the number had declined to 9, employing 2734 persons, and, although in 1870 it had risen to 14, employing 4157 persons, the check experienced during the American war has never been surmounted, the number of factories in 1874 being ouly 8, employing 3075 persons, and in 1879 declining to 6, employing 1620 persons.

For some time a large manufacture of lace and sewed muslin has been carried on in Ulster and some parts of Munster and Connaught—the sewed muslin trade being much the more extensive of the two. More than 300,000 persons, chiefly females, are employed in it, many of them being girls in the convent schools. Of late the trade has, however, been declining,

Silk Manufacture.—This was introduced into Ireland about the end of the 17th century by French Huguenots, who aftcr the revocation of the edict of Nantes settled in Dublin, where great perfection was attained in the fabrication of a mixture of silk and wool called tabinet or Irish poplin. According to Lord Sheffield, who wrote in 1785, 1500 persons were employed in the manufacture. M. Moreau gives the quantity of raw silk imported into Ireland in 1803 as 27,384 1b, and that of thrown silk as 59,441 tb, while in 1823 the quantities were 27,869 and 21,195 respectively. He also inferred that in 1823 be- tween 3000 and 4000 persons were employed in the manu- facture. In 1825 a company was formed in the south of Ireland for the purpose of obtaining a supply of the raw material by rearing the silk-worm, but after considerable expense had been incurred the scheme was abandoned as

impracticable. With the abolition of the protective duties in 1826 the manufacture gradually declined. In 1874 the

Factories. Spindles. Power Looms. Persons Employed. 1850, 1861, } 1870. | 1879. 1850, ~ 1861, 1870, 1879. 1850, 1861, 1870. 1879, 1850. 1861. 1870. 1879. 69 | 100 | 154 | 144 | 396,838 | 592,981 | 916,660 | 826,743 | 58 | 4,666 | 14,834 | 19,611 | 21,121 | 33,525 | 55,089 | 56‘342

number of factories was only 2, employing 400 persons, and in 1879 it was represented by 1 factory, which employed 152 persons.

Miscellaneous Manufactures.—There is 1 hosiery factory employing 119 persons, and 2 hair factories employing 38 persons. There is aconsiderable paper manufacture, which since the repeal of the paper duties in 1860 has been in- creasing. For most other articles in common use, such as glass, hardware, soap, candles, and many clothing materials, Treland is nearly altogether dependent on England.

Distillation.—For several centuries Ireland has rivalled Scotland in the manufacture of whisky, the spirit of each country having its own special excellences. Camden states that in Ireland usquebagh was much used to stop the fluxes and catarrhs caused by the excessive moisture of the climate, and that the Irish spirit was much “less heating and more drying” than that of England. An excise duty was first imposed on the manufacture in 1661, the rate charged being 4d. per gallon. This was raised in 1715 to 7d., and in 1717 to 8d. In 1719, when a new method of reckoning by the size and number of stills was introduced, the revenue realized was £5785, 9s, 4d. In 1791 the amount produced by a rate of 1s. 2d. was £204,648. Various alterations were subsequently made in the methods of reckoning, and a system of survey was also combined with the old method, but the few capitalists who judged it advantageous to engage in the trade succeeded in baffling all the efforts of the Government to stop the issue of spirits which had not paid duty. The amount of spirits produced by distillation avowedly illicit vastly exceeded that produced by the licensed distilleries. According to Wakefield, stills werc erected even in the kitchens of baronets and in

the stables of clergymen. More commonly they were placed in retired districts on louse stones, so as to be easily removable on the approach of the revenue officers. In 1685 the number of stills seized was 2974, of heads 2656, and of worms 2378. The duty was gradually raised till it stood at 4s., and, after being reduced in 1811 to 2s, 6d., it was raised in 1814 to 5s. 6d. This addition to the duties added very little to the revenue, while of course it greatly increased the temptations to illicit manufacture. According to M. Moreau, it was the opinion of competent judges that in 1822 the amount produced by the licenscd and unlicensed stills was not less than 10,000,000 gallons, while the amount brought to charge in the same year was only 2,950,647. For the six years ending 1818 the number of stills seized was 7233, of heads 5291, and of worms 5109, and for the six years ending 1826 the numbers were 13,017, 9475, and 8014 respectively, the number of pro- secutions being nearly 18,000. Since that period illicit distillation has been largely practised up till the present time, the number of cases in 1880 being 685. Table XXVI. gives the amount of Irish spirits brought to charge in various years from 1821.

Breweries.—There are breweries in most of the large towns of Ireland, and Dublin is celebrated for its porter. In 1880 the number of common breweries was 53, and of licensed victuallers 16,686, the malt consumed by the former being 3,965,887 and by the latter 1864 bushels.

Fisherves.—An account of the fisheries of Ireland will be found under the headings FisHErrEs, vol. ix. p. 262 sq., and SauMon FISHERIES.

1821. –

Gallons, imperial measure

Net amount of revenue…..... 912,288

between 11,000 and 12,000 persons. ‘The deep sea and coast fisheries now employ only about 6000 boats and 20,000 persons, whereas the numbers in 1860 were 13,483 and 55,630 respectively. A reproductive loan fund for fishery purposes was constituted by the 12th section of the Act 37 & 38 Vict. c. 86, and the loans advanced up to 31st December 1880 amounted to £31,079, of which £20,675 has been repaid. The average annual produce of the oyster fisheries is about £50,000.

Commerce and Shipping.—So far as natural advantages for commerce and shipping are concerned, Ireland is scarcely rivalled by any other country. Her coast is not only surrounded by safe anchorages, but the land is so deeply indented by bays and inlets, and so intersected by a network of internal navigation, that no part is more than 24 miles from water communication with the sea. In regard also to situation, it is difficult if not impossible to fix on a country whose circumstances are more favourable. Lying contiguous to the coast of Great Britain, and at some points almost touching it, she is nearer than that country to the West Indies, the continent of America, the west coasts of France, the coasts of Spain and Portugal, and the ports of the Mediterranean, There is abundant evidence to show that Ireland was prepared to make use of these advantages, and that only impolitic trade restric- tions have prevented her from developing a commerce which would undoubtedly have vied with that of Great Britain, but from which Great Britain would have gained more than she was in dread of losing. These restrictions, however, imposed when the great manufacturing industries of modern times were in their early infancy, not onlysnatched from her the possibility of commercial greatness, but, operat- ing along with other legislation, doomed her to agricultural stagnation and centuries of poverty and distress; so that in fact contiguity to Great Britain has proved to be to her a bane rather than a blessing, and America instead of affording her the means of enrichment, has only supplied her with an asylum for her poverty-stricken sons.

From allusions in Strabo, Ptolemy, the northern sagas, Richard of Cirencester, and other old writings, it would appear that Ireland early

in the present era had consider- able commercial intercourse with various parts of Europe. At the time of the Anglo-Norman invasion, the merchants of Dublin having fled from the city, it was given by Henry II. to merchants from Bristol, to whom free trade with other portions of the kingdom was granted, as well as other commercial advantages. During the reigns of the Edwards, Irish ships were frequently employed in supplying the English armies with provisions, and in the Staple Act of Edward III. Dublin, Waterford, Cork, and Drogheda are mentioned as among the towns where staple goods could be purchased by foreign merchants. The trade of these and other towns had increased in the 15th century with con- siderable rapidity, and Sir John Davies, writing in 1612, speaks in commendation of the encouragement then given by the Government to the commerce of the maritime towns and cities. The first restriction on the trade of Ireland was an Act passed in 1637 imposing duties on the chief commodities to foreign nations not in league with England. 'Though included in the Navigation Act of 1660, she was, however, left out in that of 1663, and in the same year was prohibited from exporting her cattle

The salmon fisheries employ | to England in any month previous to July. Gerard TABLE XXVI.—Jrish Spirits charged with Excise Duty, 1821-80.

1830. 1840. 4850. 1860. 1875. 1880.

3,811,462 "9,004,639 | 10,815,709 6,073,383 | 6,598,448 ~ 6,094,688 | 6,927,871 1,409,128 929,778 2,615,379 | 3,047,019 | 3,826,732

1,261,833

XIII. — 30

23-4

Boate, writing in 1652, gives a description of the various havens of Ireland. Sir William Petty estimated that between 1657 and 1672 her foreign trade had doubled, and that before the statute of 1663 " three-fourths of the Ireland foreign trade was with England, but now not

one-fourth part of the same." 'The value of exports he computes at £500,000 per annum. About the time he was writing, the inhibition against exports to Great Britain was extended to include both dead meat and also butter and cheese. A trade was, however, carried on at this time with France, Spain, and Italy, not only in cattle and agricultural produce, but in salmon and herrings as well as various kinds of manufacture; but Arthur Dobbs was of opinion that from the Restora- tion until 1688 the exports of Ireland never exceeded £600,000 per annum. In 1681 the exports amounted to £582,814, and the imports to £433,040. On account of previous wars the exports in 1695 amounted to only £295,592, the imports exceeding them by £95,932 ; but owing chiefly to the prosperity of the woollen trade they had risen in 1698 to £996,305, the imports amounting to £576,863. Upon the prohibition of the exports of woollen manufactures to foreign countries, a rapid fall took place in the exports, which, although the value of those to Great Britain remained much the same, did not reach to the amount of 1698 until 1714, the recovery being due in part to the gradual increase of the linen manufacture, the value of whose exports rose between 1700 and 1714 from £14,112 to £313,329. Table XXVII., compiled from statistics given by Newenham, Arthur Young, and M. César Moreau, gives the annual value for 1698, and the average annual value for various periods from 1701 to 1823 of Irish exports and imports from and to all parts of the world, and from and to Great Britain.

A better idea of the commercial progress of the country would have been obtained if space had been available for tables of the different articles of export and import, for, besides giving more detailed information, it would have afforded a more accurate basis for an estimate, since Table XXVII. is so far vitiated by being given in Irish currency, which was altered at various periods, and by the fact that the method of rating at the custom

TABLE XXVII.—Average Annual Value (in Irish Currency) of Exports and Inporis, 1698-1823.

Average Annual Exports. Average Annual Imports.

eg ee Great Britain. ear Great Britain, £ £ £ £

1698 996,305 293,813 576,863 33,968 1701-1710 553,023 242,811 513,657 242,811

1711-1720 | 1,126,670 348 352 852,905 361,921 1721-1730 | 1,019,809 489,546 856,936 329,078 1731-1740 | 1,190,253 667,505 885,044 378,588 1741-1750 | 1,485,110 8725259 | 1,193,378 611,999 1751-1760 | 2,002,354 | 1,068,988 | 1,594,164 734,548 1761-1770 | 2,865,080 | 1,818,594 | 1,877,468 1,032,431 1771-1773 | 3,020,062 | 1,955,469 | 2,136,173 1,291,616 1774-1783 | 3,035,560 | 2,380,899 2,702,978 | 1,984,811 1784-1793 | 4,373,094 | 3,358,962 | 3,723,295 2,508,250 1794-1803 | 4,310,610 | 3,667,474 | 4,572,443 3,404,798 | 1804-1813 | 5,380,876 | 4,689,922 | 6,618,613 4,646,873 1814-1823 | 6,963,451 | 5,675,673 | 6,626,409 4,921,879

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house has also varied. On the latter account it was reported to the House of Commons in 1811 that the augmentation of trade during the 18th century appeared from such valuations to be greater than it really was. The increase has, however, been considerable, for we find that between 1710 and 1777 the quantity of linen exported had risen from 1,688,574 to 19,714,638 yards, while the export of oats, wheat, and barley had been nearly quadrupled, and there was also a large increase in the exports of live cattle, and of beef, butter, and pork. The table shows a large increase, especially in the value of exports, after the peace in 1748, and, while there is a diminution shortly before the passing of the Acts granting free trade, there is a rapid revival after that period; and there are also very evident signs of the prosperity Ireland was experiencing during the wars with France. Since the cessation of the shipping duties on the cross channel trade in 1825, there are no data for obtaining accurate details regarding the trade with Great Britain; and, in addition to this, the Board of Trade has ceased since 1870 to give returns of the foreign and colonial trade for each of the separate kingdoms of England, Scotland, and Ireland. Returns are given,

however, for the principal ports of each kingdom. Table XXVIII. gives the value of the foreign and colonial trade of Ireland at various periods down to 1870, and of its principal ports for 1875 and 1879.

Another means of estimating the commercial progress of Ireland during this period is supplied by the returns of shipping. Priorin his Observations on the Trade of Ireland gives an estimate of the tonnage of the shipping engaged in the trade of Ireland from 1721 to 1727, according to which the number of ships in the former year was 3499 with a burthen of 158,422 tons, while Arthur Dobbs gives their number for the same year as 3334 with a tonnage of 158,414, and their number in 1714 as 3081 with a ton- nage of 161,115. The tonnage of the ships belonging to the ports of Ireland in 1727 is given by Prior as 40,469, the total number of ships trading with Ireland being 3494, with a tonnage of 173,193. According to the statistics of M. Moreau the number of Irish ships in 1788 was 1016, the tonnage being 60,776, or a third more than in 1727 ; and in 1826 they had increased to 1391, with a tonnage of 90,768. Table XXIX. gives the number and tonnage of vessels registered in the ports of Ireland in 1840, 1850, 1860, 1870, and 1880.

According to the statistics of M. Moreau, the number of ships that entered the ports of Ireland in 1795 was 7086, with a tonnage of 630,506, and in 1801 they had increased to 7690, with a tonnage of 711,242. Returns of the trade and navigation of Ireland have since the Union been annually presented to parliament. Table XXX. gives the number of British and Irish and foreign vessels engaged in the foreign and colonial trade that entered and cleared at the ports of Ireland at various periods from 1802 ; Table XX XI. the number of ships that entered and cleared coastways in various years during the same period; and Table XXXII. the number of ships engaged in intercourse between Great Britain and Ireland that entered and cleared British and Irish ports at various periods from 1835, the figures in this table of course repre- senting about double the number of ships actually engaged in the trade.

TABLE XXVITI.—Foreign and Colonial Trade of Ireland, 1828-79.

Anrual average for 1828-30,

Te mr —_—_—.

Imports. | Exports. | Imports. | Exports. | Imports. | Exports. | Imports.

Exports,

Imports. | Exports. Imports. Imports. | Exports,

Exports.

& £ £ £ £ £ £ £0 £ & B £ £ £ 1,573,545) 839,014 |1,659,934 472 537 |6,081,569| 268,611 |7,122,237| 284,362 8,725,211] 238,452 (11,828,511) 326,095 |10,994,359| 830,878 a eee ;

REVENUE. |

Details as to the several articles of foreign trade will be , found in the Board of Trade returns of the principal ports ; but without information as to the trade with Great Britain it is impossible to estimate their significance. The returns of the foreign trade are unsatisfactory, inasmuch as they show a great excess of imports over exports. The principal export trade to foreign countries is in Jinen, spirits, and malt liquors ; while the imports embrace large quantities of wheat, wheaten flour, Indian corn, and oat- meal. On the other hand the country is dependent chiefly on Creat Britain and foreign countries for its manufac- tured goods. Much: of its trade is, however, an indication rather of poverty than prosperity, for it is the absence of manufactures that causes such large imports of textile fabrics, and the large exports of cattle, dead meat, and butter, which would otherwise be consumed by her town population, while at the same time the large imports of corn and wheat into a country chiefly rural are un- doubtedly due to wrong or insufficiently advanced methods of agriculture.

Shipbuilding.—About nine-tenths of the total shipping of Irish construction is built in Belfast, and the whole amount is very small. Next to Belfast come Dundalk, Dublin, Cork, Drogheda, and Galway,—muuch in the order named. The number of vessels built in Ireland in 1850 was 25 of 1929 tous burthen; in 1860, 42 of 11,582 tons ; in 1875,

16 sailing vessels of 18,655 tons, and 5 steam vessels of 3613 tons. In 1880 they numbered respect- ively 3 of 1873 tons, and 10 with 7131 tons burthen.

Revenue and Expenditure.—Until the time of Henry VIII. the

English rule in Ireland was only nominal, except within a very ‘small district ; and, while statistics as to the revenue would thus

Tapnu XXIX.—Vessels Registered in the Ports of Ireland, 1840-80.

Sailing Vessels. Steam Vessels.

50 Tons and upwards.

50 Tons and upwards.

Under 50

Under 50 Tons.

Ton.

17,378 27,281 40,796 45,192 58,245

Ton,

148,591 204,183 181,435 148,967 153,266

19,173 | 788

PR EG AN’ D

235

be of little advantage for comparison with later times, they are not obtainable except in a very fragmentary manner. Henry VIII. levied a subsidy of 18s, 4d. on every ploughland ; and, besides reviving the tax upon absentees first enacted by Richard II., he also obtained a

considerable sum from the suppression of several of the monasteries. During the first fifteen years of the reign of Elizabeth the expenses of Ireland, on account chiefly of the wars, amounted, according to Sir James Ware, to £490,779, 1s. 6d., while the revenue is estimated by some writers at £8000 per annum and by others at only £6000. In the reign of James Me the customs gradually increased from £50 to £9700 ; but, although he obtained from wardships and other feudal rights about £10,000 per annum, and a considerable sum also accrued from the planta- tion of Ulster, the revenue is supposed to have fallen short of the expenditure by about £16,000 per annum, the cost of maintaining the troops in Ireland amounting alone to about £50,000. During the reign of Charles I. the proceeds of the customs were nearly quadrupled, but it was found necessary to raise £120,000 by yearly subsidies of £40,000. According to the report of the committee appointed by Cromwell to inquire into the financial condition of Ireland, the revenue in 1654 was £197,304 and the expenditure £680,814, 9s. 8d. At the Restoration the Irish parliament granted an hereditary revenue to the king, an excise for the main- tenance of the army, a subsidy of tonnage and poundage for the navy, and a tax on hearths in lieu of feudal burdens. " Additional duties" were granted shortly after the Revolution. ' Appropriate duties" were imposed at different periods ; stamp duties were first granted in 1778, and the post-office first became a source of revenue 1783. In 1706 the hereditary revenue with additional duties produced £394,324, 11s. 3d., and for the two years ending in 1729 the amount was £889,851, 4s. 11?d. Returns of the ordinary revenue were first presented to the Irish parliament in 1730. Table XXXIII., compiled from the statistics of M. Moreau, gives the annual average amount in Irish currency of net and gross pro- duce of the revenue during every ten years up to 1789, the amount for 1790, and the annual average for the ten years 1792-1801. Table XX XIV., compiled from special and other returns presented to the House of Commins, gives the net produce of the excise and customs at intervals from 1720, and of the other branches of ordi- nary revenue at intervals from the time when they were first imposed. A special return in Accounts and Papers, 1868-69, gives in British currency the annual net public income and expenditure of Ireland from the Revolution to the Union, and Table DXOXOXOV compiled from this return, gives its

amount at various intervals between these periods. Table XXXVI, compiled from certain special returns presented to the House of Commons at different periods, gives the net annual income aud expenditure at certain intervals from the Union up to 1868.

Returns of the produce of the revenue were annually presented to parliament up to 1870, and, although they have been discontinued since that period, a special return from 1871 to 1875 was presented in 1876, and special returns were also presented in 1878 and 1879, the latter returns, however, not including the produce of the

Tapte XXX.—Vessels in the Foreign and Colonial Trade Entering and Clearing at the Ports of Ireland, 1802-80.

Entered. Cleared. a SS a a (ae British and Irish. Foreign. British and Irish. Foreign. Total.

Number. Tonnage. Number. Tonnage. Number. Tonnage. Number.; Tonnage. Tonnage. | Number. Tonnage.

1802 648 87,869 363 57,964 1,011 145,833 508 71,420 58,423 831 129, 848 1816 565 70,106 318 67,538 883 137,644 522 74,255 69,703 8438 143,958 1826 860 154,380 290 50,194 1,150 204,574 569 117,032 57,004 850 174,366 1841 881 176,977 197 26,441 1,078 208,418 604 146,859 20,9538 757 167,812

1850 | 1,884 245,012 886 166,417 2,220 411,429 681 165,123 146,670 | 1,442 311,798 1860 | 1,089 | 289,603 | 1,288 | 277,240 | 2,322 566,843 | 349 | 189,625 70,152 604 | 209,777 1870 |} 1,112 389,526 927 323,095 2,039 712,621 394 147,822 67,687 603 215,509 1880 958 572,647 age 388,173 er 960,820 547 313,190 271,862 | 1,086 585,052

Table XXXI.—Vessels Entering and Clearing Coastways.

Entered. Cleared.

Sailing Vessels. | Steam Vessels. | Sailing Vessels. | Steam Vessels.

No. | Tonnage.| No. | Tonnage.| No. | Tonnage.| No, | Tonnage. 1802 | 6,589 546,647 6,032 521,151 1817 |10,142 845,260 9,200 773,783 1826 }11,5144 1,037,299 |... ane 6,388 632,972 eee nOG 1840 |16,654 | 1,211,942)10,263 637,801 | 2,427 571,064 | 2,900 655,928 1850 |16,403| 1,191,243 } 7,360| 488,532 | 4,340} 1,303,489 | 4,534 | 1,838,732 1860 |19,244 | 1,488,635 | 7,036! 1,983.165 7,476 454,482 | 7,039 | 1,996,738 1870 |18,972| 1,660,942 | 5,688) 425,632 | 8,132) 2,527,845 | 7,851 | 2,571,656 1880 |15,835 | 1,411,132 |15,408 | 4,768,322 14,611] 1,499,314 15,416 | 4,850,858

TABLE XXXII. —Vessels engaged in Trade between Great

Britain and Ireland.

Cleared.

a a

Entered.

No. Tonnage. No Tonnage.

10,026 1,100,389 14,560 4,440,617

9,183 1,411,130 19,124 2,211,496

8,569 1,585,057 18,268 2,355,166 34,693 5,578,436 34,387 5,512,116 36,167 6,868,545 35,528 6,684,547 54,742 12,145,116 52,803 11,588,074

income tax from the income of officials. According to these returns the net produce of the revenue was in 1870 £7,287,127, in 1871 (not including that of the post-office) £7,291,393, 15s. 4d., in 1875 £7,970,050, 13s. 7d., and in 1879 £6,616,455. The revenue of England in 1879 amounted to £54,456,718, and of Scotland to £7,719, 500.

No separate post-office returns have been published since 1870. In 1860 the gross produce of the sale of crown lands amounted to £15,537, and

the annual income of land revenue to £48,358 ; in 1870 they were respectively £1283 and £45,000, and in 1880 £3506 and £41,589. The items of the expenditure of the ex- chequer of Ireland for 1868 (the last year for which returns are given) are—interest of public funded debt payable in Ireland, £1,188,654 ; other payments in connexion with the eonsolidated fund services, £278,015 ; army, £3,560,000; miscellaneous civil services, £1,594,525. Since 1817 the public debt of Ireland on account of the consolidation of the British and Irish exchequer lias ceased to form a separate item in the national account. Table XXXVII. shows its progress from 1716 till that period. ;

Banking.—A notice of the banks of Treland will be found in the article BANKING, vol. iii. p. 386. The deposits in joint-stock banks amounted in 1840 to £5,567,851, in 1850 to £8,268,838, in 1860 to £15,609,237, in 1870 to £24,366,478, and in 1880 to £29,350,000. The deposits in trustees' savings banks in 1846 amounted to £2,855,827, but in 1850 had declined to £1,291,798 ; in 1860 the amount was £2,148,282, in 1870 £2,054,907, and in 1880 £2,100,165. The deposits in post-office savings banks in 1862, the year in which they were founded, were £78,696, in 1870 £583,165, and in 1880 £1,229,000. The amount of Govern- ment and India stock held in Ireland amounted in 1870 to £36,549,000, and in 1880 to £33,113,000.

National Wealth. — From a variety of circumstances it is difficult to arrive at an approximate estimate of the wealth of Ireland ; and there is no proper basis for a comparison with the other portions of the Tnited Kingdom—among other reasons from the fact that by far the largest part of the wealth of Ireland is derived from agriculture. The Tenement Valuation Act, passed in 1846 and amended in 1852,

TABLE XXXIII.—Average Annual Produce of Revenwe, 1780-1801.

Gross Net Gross Net Produce, Produce. Produce. Produce. £ £ £ £

1730-39 651,751 472,308 1770-79 971,041 749,507 1740-49 569,920 487,389 1780-89 1,835,097 950,511 1750-59 729,482 – 632,757 1,695,398 1,147,967

1790 1760-69 892,071 1792-1801 2,161,939 1,801,901

747,194

IRDLAN D

according to which the property of Ireland is rated for purposes of local and imperial taxation, has the disadvantage of having been applied in different parts of the country at different periods, and in the southern and western counties at a time when the value of property on account of the famine had very much deteriorated.

[NATIONAL WEALTH,

No provision except of an optional kind has been made for a revaluation of property other than buildings and similar external additions to the value of the soil. It is probable therefore that the present valuation, which is a little short of £14,000,000, is deficient by about £5,000,000. The case of Ireland is also excep- tional from the large amount of wealth that immediately after it is produced is removed to be spent elsewhere, and of capital invested in Irish undertakings which is held by persons who do not reside in Ireland. The value of the agricultural produce and stock, the chief item of the wealth, is of course variable, and the rise in value is due solely to increase of price and to increase in the number of live stock, which of course represents the produce of more than one year. It is also a fallacious method of calculating its value to add that of produce and live stock together, as a great part of the produce is employed in feeding the live stock. In Ireland a con- siderable amount of money is probably hoarded privately, and the increase of deposits in banks can scarcely be regarded as altogether a symptom of prosperity, as the money thus deposited might in most cases be more advantageously employed by the farmer in improving his land. On the other hand, since the passing of the Land Act of 1870, indebtedness has largely increased among the farmers, A method of estimating the capital of Ireland has been employed by Dr Hancock from the amount of capital passing annually under probate of wills and letters of administration, calcu- lating this capital as 2°66 per cent. of the whole. Table XXXVIIL, formed

according to this method, shows the annual average amount of capital from 1826 at various periods of five years, and the amount of capital possessed by each head of the population, this being reckoned according to the year most nearly corresponding with those for which the average is given.

Railways.—The railway from Dublin to Kingston, which was opened in the end of 1834, was the first and for several years the only railway in Ireland. The progress of the railway system from that period is shown in Table XXXIX. For a comparison with England and Scotland see ENGLAND, vol. viii. p. 287 ; it will be observed that the proportion of traffic in relation to popula- tion is very much sins in Ireland.

Vital Statistics.—In the Z'ransactions of the Royal Irish Academy for 1865, part iii., will be found an account by W. H. Hardinge of a copy which he accidentally discovered of a manuscript census survey of Ireland arranged in counties, baronies, parishes, and townlands, and in cities, parishes, and streets, and belonging in

TABLE XXXIV.—Revenue from Excise, Customs, d&e., 1720-1880.

1820.

£

1,907,335 1,730,837

449,846

188,105

1790.

£ £ 9,422,746 | 1,650,104 a 1,788,380 165,121 | 634,706

76,260

178,965

£ £ £ EXCIS€ .,ccseeesseeveeeee| 440,536 | 646,624 | 1,238,721 COBtOT8 65 sccssacueacae od6 ase are Stamps 54,812

Post-Offic…...-ssceseee

44,156

Income-tax …cocsreee

TABLE XXXV.—Annual Income and Expenditure, 1689-1800.

Net Income. |Net Expenditure. Net Income. |Net Expenditure.

Bi Meh Bo wa | £8. a. £. sh 152,809 17 11] 190,715 11 38 600,236 12 1) 626,738 10 38 411,819 3 9| 415,083 5 1 571,942 7 8) 778,940 2 10 298,194 16 11] 800,182 19 0 707,996 3 6] 808,546 7 5 408,066 16 4| 42291716 8 789,850 4 8) 1,015,266 12 6 405,178 1 7| 407,758 18 1 1,313,476 12 3) 1,384,087 18 . 2 441,236 911] 441,736 2 10 8,017,757 18 10| 6,615,959 2 5

TABLE XXXVII.— Public Debt of Ireland, 1716-1817.

Capital passing Estimated According to under Probates. Capital. Population in

-—-eeooo | OO | |

£& £

1826-30 8,448,443 129,641,000 1831 1836-40 3,755,758 141,194,000 1841 1846-50 2,534,611 95,286,000 1851 1856-60 4,220,395 158,661,000 1861 1871-75 6,815,866 256,236,000 1871 1876-79 7,390,612 277,843,000 1881

1830. 1840. 1880.

£ ‘£ £ £ £ 1,754,215 | 1,956,445 | 1,885,258 | 1,494,747 | 2,790,970 | 3,597.519 | 4,068,335 1,976,498 | 1,555,600 | 2,132,731 | 2,064,998 | 2.268.962 | 2049,374 470,757 | 478,638 | 453,209 | 479,684 | 524,116 | ‘580,288 | 648,067 197,907 | 229,994 | 97,156 | 170,061 | 261,550 | 381,116 728,887 | 613,113

470,808

TABLE XXXVI.—Annual Income and Expenditure, 1801-68.

Net Income, |Net Expenditure. Net Income. |Net Expenditure

CaS Mears ee es owe 1801 |2,645,736 0 0 | 4,922,524 0 0 | 1850 [4,882,459 16 0} 4,120,841 11 0) 1817 |4,561,353 0 0 |17,677,649 0 0 | 1860 |7,851,612 12 11] 6,331,223 12 7 1834 |3,814,401 3 83) 3,489,895 5 14] 1868 |6,176,390 7 8] 6,621,193 17 11

Miles.) Passengers.| Receipts. £

35,421 36,590 119,398 514,035 999,832

£

1,368,447 1,710,506 2,072,995 2,671,154 2,658,136

1,237,800 1,358,761 3,481,797 5,495,796 7,212,286

9,991,118 13,186,055 14,339,444 16,894,398 17,185,338

VITAL STATISTICS. |

all probability to the year 1659. The population of Leinster is there given as 155,534, of Ulster as 103,928, of Munster as 153,282, of Connaught as 87,352, making a total for Ireland of 500,091. This is the only census return made by Government previous to 1821. Table XL. gives the different parliamentary returns and also various estimates or returns for previous years, to some extent reliable, but either inferential or made in such a manner as to render a very near approach to accuracy impossible. The Govern- ment returns are also deficient in accuracy until 1841, but from the table a fairly correct idea may be formed of the growth of the population up to 1841, while it affords a very accurate representa- tion of its decline from that period. Table XLI. exhibits the population of cach province for the years in which Government returns have been made; and Table XLII. shows the number of each sex from 1841.

The great increase of population which began towards the close of last century, and continued during the first forty years of the present one, was due in various degrees to improvements in the political condition of the country, to the creation of leaseholds after the abolition of the forty shillings franchise, and to the prosperity caused by the productiveness of the potato and the high prices of produce during the war with France. that period began at first with great rapidity owing to the pressure of famine, and has been continuous up to the present time, chiefly owing to the creation of large pasturage farms. Table XLIII. gives the rate of increase or decrease per cent. in the various decades from 1821 to 1881. Table XLIV. gives the proportion of population to the square mile for each county from 1841.

The figures for 1841 indicate a density of population which is unparalleled, considering that it is so largely rural. Table XLV. gives the numbers of the rural and urban population, including the military, for 1841, 1851, 1861, and 1871. The collective population in the parliamentary boroughs was 804,705 in 1841, 878,430 in 1851, 788,866 in 1861, 856,788 in 1871, and 892,505 in 1881. The increase of the urban population between 1841 and 1851, while there was a large decrease in the population generally, was apparently owing to a temporary influx of the rural population into the towns, as in 1861 a large diminution had taken place, the increase of manufactures, however, causing the loss to be nearly recovered in 1871. Excluding the Dublin suburban townships of Rathmines (24,245) and Pembroke (23,184), there were only six

TABLE XL,—Population of Ircland, 1659-1881.

Population Aceording to Population Aecording to : 1659 500,091 | Census return. 1792 | 4,088,226 | Beaufort. 1672 | 1,320,000 | Sir William Petty. || 1805 | 5,395,456 | Thomas Newenham. 1695 | 1,034,102 | Captain South, 1814 | 5,937,856 | Parl. returns. 1725 | 1,669,644 | Arthur Dobbs. } 1821} 6,801,827 Census eommis- 1731 | 2,010,221 | Established clergy, ae 4 sioners. 1754 | 2,372,634 | 'Tax colleetors. — 1831 | 7,767,401 Do. 1760 | 2,317,384 | De Burgo, 1841 | 8,196,597 Do. 1767 | 2,544,276 | Tax collectors. 1851 | 6,574,278 Do. 1777 | 2,690,556

Do. 1861 | 5,798,564 Do. 1785 | 2,845,932 Do. 1871 | 5,412.377 Do. 1788 | 4,040,000 | Gervaise P. Buslie, || 1881 | 5,159,839 Do, 1791 | 4,206,612 | Tax eollectors,

TABLE XLI.—Population of the Different Provinces, 1821-81.

1821, 1831, 1841, 1851, 1861, 1871. 1881,

Leinster …..... 1,757,492 1,909,713/1,982,169 1,682,320/1,457,635 1,339,451!1,279,190 Munster …..... 1,935,612) 2,227,152|2,404,460)1,865,600)1,513,558 1,393,485 1,323,910

RUISGOD: dsecs0055 1,998,494|2,286,622|2,389,263) 2,013,879|1,914,236

1,833,228 /1,739,542

1821-81. | 1831-41. | 1841-51. | 1851-61.

Decrease. 12°86 18°53

4°85 9°59

Decrease. 15°25 22°47 15°69 28°81

Inerease, 3°85 7°59 4°36

Increase. 8°66

15:06

14°42 21°05

Leinster …. Munster Ulster

8-11

7°93 4°23 7°33

19°85

14°19 11°50 6°67

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The decrease from >

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towns whose population in 1881 was over 20,000; Table XLVI. gives their population in the census years from 1841 to 1881. The most noticeable features of the table are the rapid rise of Bel- fast owing to its prosperous linen trade; the steady progress of Londonderry, also situated in the thriving province of Ulster ; the almost stagnant position of Dublin ; and the decline of Cork and Limerick, both situated in Munster, the province in which both trade and agriculture are in the most backward condition. Table XLVII. gives a classification of the population according to occu- ation. . The population of Ireland has at various periods been consider- ably diminished by outbreaks of pestilence and by faminc, but its decrease is chiefly attributable to emigration. Since 1847 this has been annually so great as to cause a continuous diminution of the population. The census commissioners estimated the emigration between 1821 and 1831 at 70,000. The total number who emi- grated between 1831 and 1841, according to information collected at the various ports, and corrected by comparison with other statistics, was 403,459 (with an addition of 10 per cent. on account of imperfect returns), the number who emigrated from Irish ports being 214,047, and from Liverpool 152,738. Information as to the destination of the emigrants for these years is available only in regard to those emigrating from Irish ports, the numbers who left for British America being 189,225, for the United States 19,775, for the Australian colonies 4553, and for other destinations 494, The census commissioners of 1851 obtained information from the different ports of the United Kingdom regarding the numbers and destination of Irish emigrants from 1841 to 1855. The

TABLE XLIV.—Persons per Square Mile.

1841, 1851, 1861. 1871. 1881

Leinster—

IC APIOW cis nccansareanesctseas ‘expastas 249 197 165 147 135 MAREE coh cos czh ciauacaragtdnctanteets 1054 1145 1159 1147 1185 MEMABYG: jccacpacciveiincs kdccecapeeede 175 146 139 128 117 Kilkenny ..,..... 254 199 156 136 123 BUR a cavies wi vginavaukeutahvolaeaah 190 145 117 96 92 EPCOS face courcsacsaraeceuses opine 274 196 170 154 144 TOURER cick acaudneavcscscvavnyencavesciy 393 828 274 266 248 IPO RELL ersced, sdavcachass cba bus ess chet 208 160 126 106 96 Queen’s …. 232 168 137 121 109 West Meath 199 157 128 110 101 Wexford 224 200 160 147 137 Wicklow…. 161 127 111 lol 94

Kerry

Ulster— Armagh DONO GG ppipejnessencvcaccsedsasaseores BID pactersgerkesesvssntecs -adekeness Fermanagh.. Londonderry Monaghan TYTONE jeeeeee oie PAGAL ES wiisacp teeth cctak, Gee 235 224 214 203 Connaught— ne ——_——— ———_ Galway o.r.cscees satpanobadeceasaaees 180 131 111 102 99 Leitrim …. 253 183 171 156 150 DHRU Sis fssaccuccsvsavanvestsccegutdaes 182 129 119 115 114 RROSCOTATION) si, cccenesacsucaduarcers 267 183 167 148 139 BUG iactuddovarcdavctessevstacscice 251 178 173 160 154 Total: ccvieccrsesscsesst) 90T 147 133 123 | 119 General Total …..... eeeaniers j

TABLE XLV.—Rural and Urban Population.

1841.

1851. 1861.

Urban. Rural. | Urban.

7,052,928) 1,143,674] 5,347,617| 1,226,661| 4,658,196) 1,140,368] 4,211,033/ 1,201,344

Urban.

Rural. Rural. | Urban. | Rural.

Years.| Dublin. Belfast. Cork. Limeriek. | Waterford. derry 1841 | 235,864 76,441 82,748 49,205 23,506 15,196 1851 | 261,700 100,945 87,758 53,782 25.643 20,187 1861 | 254,808 121,602 80,121 44,476 23,293 20,875 1871 | 246,326 174,412 78,642 39,353 23,349 25,242 1881 | 249,486 207,671 78,361 38,600 22,401 28,947

| a ee el

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returns of cmigration and immigration from and into the United Kingdom give full information regarding the destination of emi- grants of Irish birth from 1853. Table XLVIII., compiled from the statisties of the census commissioners, and from the emigration returns, will show the character of the emigration movement, both ag to the number of persons of Irish birth emigrating from the United Kingdom at different periods and as to their destination.

The influence of the great famine is very evident in the numbers emigrating between 1846 and 1852, the average being three times that of the preceding period, and more than double that of the period from 1858 to 1860. Although also the impulse towards emigration had begun even before 1846, and must be regarded as part of a general tendency towards emigration then prevalent in Europe, and especially in the United Kingdom, it was doubtless strengthened .in Ireland by special eireumstaneces whieh are still operating so as to cause an annual diminution of the population. The number who emigrated in 1841 was only 16,376, and in 1847 it rose to 215,444, more than double that of 1846. The highest number in any year was 249,721 in 1852, and the smallest sinee 1852 was 22,831 in 1877, the numbers increasing in 1879 to 41,296, and in 1880 to 93,641. 'This table, however, gives the number of emigrants not from Ireland but from the United King- dom, and of course ineludes many of Irish birth who had been for some time living in Great Britain.

The Irish emigration returns, whieh commence from the Ist May 1851, give the numbers of natives of Ireland who emigrated direct from the country—whether by Irish or British ports—but inelude those also who emigrated to settle in Britain, and until 1876 gave no information as to the several destinatious of the emigrants. Table XLIX. shows the amount of general emigration from Ireland and from its various provinces from 1st May 1851 to 31st December 1879. The number of emigrants in 1852 was 190,822, the annual average for the three years 1852-1854 being over 170,000, from 1855 to 1862 the average was about 80,000, but it rose to 110,000 for 1863-65. From 1865 to 1874 it was about 70,000, in 1876 it was only 37,587, in 1879 it was 47,065, and in 1880 it increased to 95,517. There are no direct means of obtaining information as to the numbers who emigrated to settle in Britain before 1876, but a comparison between the numbers who emigrated from Ireland both to Britain and to foreign countries with those who emigrated from the United Kingdom to foreign countries shows that the number who settled in Great Britain between 1852 and 1880 was about 300,000. The percentage of those who have settled in Britain between 1876 and 1880 was 38. Apparently, however, for several years, the deaths of Irish-born persons and their emigration from Great Britain have more than counterbalanced the influx into it of Irish intending to settle, for, while the number

Lodging,, Trade Miseel- Food. Clothing. Furniture, | Health.|Charjty., Jugtice. | Educatjon.| Religion. and laneous Banking. and Machines. Travelling. 1841 | 1,904,071 | 901,324 | 164,866 |6,871| 253} 19,541 78,524 | 8,495 | 409,409 1851 1,531,914 606,532 146,469 | 7,148 | 1,898 | 26,862 98,213 | 2,674 | 394,208}... 1861 1,053,045 490,492 463,562 | 6,735 983 | 55,085 68,791 757 | 507,827 | 2,840 1871 1,051,430 413,213 487,918 | 6,948 | 2,532 | 66,638 56,764 381,454 | 3,347

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TaBLe XLVII.—Classtflcation of the Population according to Oceupation.

[VITAL STATISTICS.

of Irish resident in Great Britain, which in 1841 was 419,256, had inereased by 1851 to 733,866, and by 1861 to 811,251, it had diminished by 1871 to 778,638. On the other hand, there has been a gradual inerease in the number of British-born immigrants to Ireland, as is seen from Table L.

More than two-thirds of those leaving Ireland for foreign coun- tries emigrate direet to the United States, but to these must be added the large numbers who sail to Canadian ports, and journey thenee by rail. From May 5th 1847 to June 1880, aecording to reeords of the city, the arrivals of natives of Ireland direet to New York were 2,042,046, the arrivals from all countries being 5,857,025. The total number of Irish-born persons registered, whether in Ireland or foreign countries, about 1871 was 8,506,511,—that is, a larger number than the population of Ireland in 1841, and exeeed- ing the population of 1871 by more than 3,000,000. The pro- portion of emigrants from Ireland who were labourers was 52°6 per cent. in 1877, 60°4 per cent. in 1878, 66°1 per cent. in 1879, and 72°1 per cent. in 1880, Until 1864, when the Act for the registra- tion of births and deaths came into operation, no reliable informa- tion was obtainable as to the exeess of the one over the other, and of course the large amount of emigration to some extent renders comparison with other countries impossible, as to the inferences to be drawn from the proportion of births and deaths to the popula- tion. Table LI. gives the yearly average of marriages, births, deaths, and emigrants for the ten years 1870-79, the numbers for 1880, and the rate per 1000 of estimated population.

The usual theory that the poverty of the Irish is due to early marriages, or to the fact that a larger number marry than in Seotland or England, can be proved by statisties to be ,wholly unfounded. The average annual number for the ten years ending in 1879 of male minors married was only 2°65 per event. of the total males married, and in the case of females the pereentage was only 12°26, a much smaller proportion than in Great Peitein: and in 1871 the proportion per cent, of the unmarried population above fifteen years was in Ireland—males 47°85, females 42°38, the proportion in England and Wales being 38°40 and 36°14 respectively, and in Seotland 44°41 and 42°23, In proportion

to the number of married women between seventeen and fifty-five years of age, the number of births is very similar to that in Great Britain. The number of illegitimate births ig very small, the yearly average for the last ten years being about 2°5 per cent. The proportion of the sexes born is about 106 males to 100 females,

Table LII. gives the average annual number of deaths from eaeh of the principal zymotic diseases and from all causes for 1870-79, and also the number for 1880. Table LIII. gives the number of deaths from all causes for four deeades, and the number from zymotic diseases, with the pereentage from these diseases to the

1 Including commercial clerks, who jn 1861 were reckoned under Literature and Education.

TaBLE XLVIL—Lfmigrants fram the United Kingdom of Irish Birth, 1841-80.

1841-52. 1841-46,

Destination.

United States

British North America…... AlistrBelianwe2….dcevasade. All other places ….....-s000

1,265,541

370,105 | 30,842 | 133,860 | 22,310 30,254 | 2,521] 5,083| 845 | 25,171

126 10 99 16 97

1,666,026

TABLE XLIX.—Total Native Emigrants from Ireland from May 1, 1851, to December 31, 1880.

Con- naught.

Not

Ulster. specifie

Leinster.| Munster. a Treland.

Me sdulssiecessesesiacss 257,968 | 476,306 | 441,510 | 168,926
prnedgnguoLANnGnen 236,203 | 441,084 | 337,038 | 167,534

61,766 | 1,406,476

2,637,187

Ssevaysvastsse-sees 494,171 | 917,340 | 778,548 | 336,460 |110,668

100 of population in 1861

See rccccccsccres

Emigrants to every 33°9 |

1847-52.

105,462 | 239,749 | 39,961 |1,025,772) 170,962 | 574,848 936,245} 39,373

4,196

138,835 | 378,811 | 63,132 |1,287,215| 214,535 | 736,728

48,902 | 1,230,711 | .

1861-70. 1871-80.

Total, Total, _ sd | | | | 1858-80. | 1841-80. 71,856 90,840 69,084 | 449,553 | 44,955 | 1,715,241 | 2,980,782 64,680 8,085 | 40,080 4,008 | 25,782
130,542 500,647 92,184 | 11,523 | 82,920 8,292 | 61,947 237,051 267,305

4 5,016 627 4,740 474 5,426 15,182 15,308

92,091 | 818,580 54,270 | 2,098,016 | 3,764,042

Tasie L.—Persons not of Irish Birth in Ireland at Census Periods.

Where Born. | 1841. 1851. 1861. 1841. | 1851. } 1861. | 1871.

England and } | 91 559 | 34,454 | 50,761 . 53. |: °88

1:25

16,861 k . . 29 | °38 10,379 i : . 18 | 32

Wales…cee Scotland. Abroad…

8,585 4,471

12,312 9,961

TaBie LI.— Yearly Average of Marriages, Births, Deaths, and Emigrants.

Emi- grants.

Marriages,| Births.!Deaths.

142,404] 95,430! 60,827 128,010]102,955 | 95,517

25,847 20,390

1870-79 1880

GOVERNMENT. |

total number of deaths; and Table LIV. shows the number suffer- ing from the various kinds of serious bodily or mental infirmities in 1851, 1861, and 1871. The total number of deaths in the decade ending in 1881 was 969,110. _ ,

The mortality of Ireland is considerably under that of Great Britain, and at the time of the census of 1871 a larger percentage of the population were over sixty years of age. The rate of mortality is no doubt affected by emigration, but its smallness in Ireland is perhaps due to the large proportion of the rural popula- tion. At various periods the mortality has been largely increased by famine, and it is also influenced by the insufficient diet and clothing of many of the inhabitants.

Government.—The executive government is vested in a lord-lieutenant, assisted by a privy council, and by a chief secretary, who is a member of the House of Commons and frequently also a member of the cabinet. In the absence of the lord-lieutenant his functions are discharged by lord-justices, those generally appointed being the lord-chancellor and the commander of the forces. Each county is in charge of a lieutenant, a number of unpaid deputy- lieutenants and magistzates, and one or morc resident paid magistrates, all appointed by the crown. The counties of cities and towns and the boroughs are governed by their own magi- strates. The judicial establishment consists of the high court of chancery, the courts of Qucen's bench, common pleas, and exchequer, the landed estates court, and tho probate and matri- inonial court, which since 1877 constitute the high court of justice ; the court of appeal; the high court of admiralty, which is to be abolished after the death of the present judgc; and the court of bankruptcy and insolvency. The decisions of the court of appeal are subject to an appeal to the House of Lords. Assize courts are held in each county by two judges, for which purpose the country is divided into six circuits.

Ireland is represented in the imperial parliament by 28 temporal peers elected for life and 103 commoners,—the counties being represented by 64 members, the small borouglis by 25, Dublin, Cork, Limerick, Waterford, Belfast, and Galway by 2 each, and the university of Dublin by 2. In 1850 the franchiso in county elections was extended to occupiers of any tenement assessed for poor rates at a net annual value of £12 and upwards, and also to owners of certain estates of the rated net annual value of £5. In 1868 the franchise in boroughs was extended

to occupiers rated at and above £4, and a lodger franchise was also introduced, grant- ing votes to occupiers of lodgings of a clear yearly value, if let unfurnished, of £10 and upwards.

In Ireland there are four military districts, the headquarters of these being Dublin, Cork, Curragh, and Belfast respectively, and eight military subdistricts, with depéts at Downpatrick, Omagh, Armagh, Naas, Birr, Galway, Clonmel, and Tralee. The Irish militia consists of 12 regiments of artillery, 21 regiments of

infantry, and 14 rifle corps, numbering when embodied over

81,000 men and officers,

The parish constables of Ireland were in 1814 superseded in pro- claimed districts by a peace preservation force, and in 1822 an Act was passcd authorizing the formation of a constabulary force of 5000 men, under an inspector-general for each provinee. In 1836 the entire force was analgamated under one inspector-general. In all, it numbers between 10,000 and 12,000 men. In addition to the usual duties of policemen, the police are entrusted with the collec- tion of statistics, the preservation of fish and game, and a variety of services connected with the local government. The average annual expense is a little over £1,000,000. In addition to this force there is the Dublin metropolitan police, consisting of about 1100 officers and men, who are maintained at an annual cost of over £130,000, the expense borne by the Consolidated Fund being over £80,000.

Crime.—Table LY. gives the number of persons in Ireland sent for trial by jury, and the numbers convicted and acquitted, for every fifth year from 1845 to 1875, and also for 1878 and 1880,

These figures show a very rapid decrease of crime between 1850 and 1855, and a gradual and considerable decrease since that period, partly

but not altogether attributable to the decrease in the number of the population. The large number of committals in 1850 and previous years was chiefly owing to the distress then prevailing in the country.

In regard to the more serious crimes, the proportion of offences against thé person as compared with that in England is very large, and of offences against property and against the currency very small, the latter fact being doubtless owing to the small proportion of the town population. The proportion for all Ireland of indictable offences not disposed of summarily was 15 in 10,000 of the population in 1879, while in Dublin it was 110 in 10,000.

Table LVI. gives the number of offences in Ireland for 1879 according to three classes, and the corresponding numbers for 1878 in England and Scotland for an equal population.

Of the minor offences in Ireland over 99,000 were cases of drunkenness, considerably more than. double the number of cases in England or Scotland, which were pretty nearly equal. Table LVII. gives the number of agrarian offences from 1870,

Poor Law Authorities.—The legislation connected with making provision for the poor of Ireland dates from 1771, when an Act was passed by the Irish parliament under which 11 houses of industry were erected, 8 in Munster, and 3 in Leinster. The amount of expenditure sanctioned by the Act was £14,400 a year, and probably it always came short of this by at least £10,000. Addi- tional powers were conferred on county authorities in 1806 and 1818, but according to the select report of the House of Commons in 1830 no addition had been made to the houses of industry up to that period. An Act was, however, passed in 1838, which contained

TABLE LII.—Annual Average of Deaths from the eight principal Zymotie Diseases and from all causes.

Scarlet Smallpox. |Measles. Fever,

Annual average for 1870—79 … Number for 1880

328 289

719 369

1,104 979

2,362 2,350

Diphtheria.

1,738

Hooping- Cough.

Percentage of eight Zymotics. 11°7 11°4

Fever. | Diarrhoea. |Cholera.} Total. {All causes,

1,798 76 2,518 60

3,000 2,986

11,125 11,750

95,430

2,199 102, 955

Taste LITI].—TZotal Deaths, with Numbers and Proportions from Zymotic Diseases, in decades ending 1841, 1851, 1861, and 1871.

Deeade ending 1851.

Decade ending 1841.

Zymotic Diseases, Zymotic Diseases.

Total Deaths. Total Deaths.

Taste LIV.—Sufferers from various Infirmities, 1851-71.

Deaf Lunatic Sick in |Sick in Sick i Inmates} Ordi-

and |Blind.| and Work- | Hos- Pri a MO nary

Dumb. pitals.|“7”5°”| Asylums| Sick. 1851 | 5,180 | 5,787 | 9,980 4,545 | 1,072 | 2,271 | 48,291 | 1861 | 5,653 | 6,879 14,098 2,993 461) 2,087 46,141 1871 | 5,554 | 6,347 | 16,505 3,625 85 | 3,129 | 39,754 |

- | 1860. | 1865. } 1870. | 1875. | 187°,

FOPMDTIAls…..03 Convicted …... Acquitted

16,696 (31,326

7,101 |17,108 9,595 |14,218

5,386 2.979 2,407

4,657 | 4,956 2,661} 3,048 1,996 | 1,908

4,248 | 4,183 9,484 | 2.293 1,764} 1,890

Total Deaths.

Number. Per Cent, Number. | Per Cent. 1,181,374 381,249 SZ 1,361,051 558,801 40°7

Decade ending 1871.

Zymotic Discases.

Decade cnding 1861.

Zymotic Discases. Total Deaths,

Number, Per Cent. Number, | Per Cent.

767,909

819,768 | 189,660 | 23-1 140,289 | 18:2

TABLE LVI.— Offences in Ireland for 1879, with Equivalent Numbers for Great Britain for 1878.

More Serious Offences. Less Serious Offenecs. Minor Offences

Irc-

land, |England trina Treland. |England |Scotland| Ireland. |England |Scotland

3,842 | 4,767

6,487 55,398 119,742 | 203,199 | 107,354 | 84,598

TasLe LVII.—Agrarian Offences in Ireland, 1870-80.

Years. Number. Number. Years. Number.

1870 1329 212 1878 280 1871 368 136 1879 810 1872 256 201 1880 2578

1873

240.

the important provision that if the local authority failed to carry the law into effect they might be superseded by paid vice-guardians. The Act came into operation in 1840, and an Outdoor Relief Act was passed in 1847. Full details regarding subsequent additions to the Act, as well as in reference to the whole subject of Irish local government, will be found in the paper by Dr Hancock contributed to Cobden Club Essays, 1875. Table LVIII. gives the number of unions for every ten years from 1840 to 1870, and for 1878 and 1879, with the number of outdoor and indoor pmo and the total expenditure. The figures show a much smaller proportion of paupers compared with population than the corresponding statistics of England and Scotland,—Scotland notwithstanding its smaller population having nearly one-third more paupers, while England has actually about twelve times as many. The

difference is to be accounted for by the smaller town population of Ireland, the simpler habits of the Irish, and the prevalence of mendieancy. It is only indeed in years of exceptional famine that there is any great demand on the public purse for the support of the poor: the duchess of Marl- borough's relief fund, 1879-80, amounted to £135,000, and the Mansion House fund to £180,000, probably over £400,000 being spent directly on relief, in addition to the sums advanced on loan for relief works. By the Medical Charities Act, passed in 1851, boards of guardians were empowered to form the poor law unions into dispensary districts subject to the control of the poor law eommissioners. The number of dispensary districts is 720, with nearly 1100 dispensaries and about 800 medical officers. Each district is placed under a committee of management, consisting of the guardians of the unions, the ex ofieio guardians who reside and have property in the district, and a number of ratepayers elected by the board of guardians, the number of each committee being fixed by the commissioners. The average annual expenditure under this Act during the five years ending 1880 was over £140,000, and the average number of cases very nearly 700,000. The average number of insane in Ireland during the same five years was over 19,000, of which number the average in asylums was over 8000, and in workhouses over 3000. For further information regarding the whole subject of Irish pauperism and lunacy the reader is referred to the Report of the Poor Law Union and Lunacy Com- missioners in vol. xxii. of Aecownts and Papers, 1878-79.

County Authorities. —For purposes of local taxation Ireland is placed under the authority of baronial presentment sessions and juries. The former are for baronies or half-baronies, baronies corresponding to the ancient territories inhabited by distinct tribes or families, The number of these sessions is 326, and they are composed partly of justices of the peace and partly of rate- payers, the number of whom is fixed by the mind jury of each county. Since 1836 they have had the primary decision of all questions as to roads and bridges. 'The power of iniposing county rates is, except in the case of the county of Dublin, exercised by the grand juries either at the assizes in the several counties at large, or at the assizes in the several counties of cities and towns. In

the county of Dublin this authority is vested in the Easter term grand jury in the court of Queen's bench, and in the case of the cities of Dublin, Cork, and Limeriek it has since 1850 been vested in the town councils. The tax levied under the vote of the grand juries is called grand jury cess, and is employed for the mainten- ance of roads, and the detrayment of the expenses incurred by the

TABLE LVIII.—Poor Law Unions and Paupers, 1840-80.

maintenance of laws and the administration of justice. Infirmaries and hospitals are supported by grand jury presentments, aided by treasury grants, and by subscriptions, donations, and bequests. The origin of the grand jury cess dates from the time of Charles I., when the justices were directed to tax the inhabitants for the maintenance of bridges, with the assent of the grand juries. At the beginning of the reign of George III. power was granted to the grand juries to make presentments also for roads. At first the rate was applied only to the maintenance of cross roads, but in 1857 the turnpike system applicable to main roads was abolished. This early accidental legislation in- reference to roads has given Ireland at least one solitary advantage over Great Britain which it still retains.

Authorities for Groups of Cownties.—These consist of governors of district lunatic asylums and the trustees of inland navigation and arterial drainage. The asylums number 22 in all, and the governors are nominated by the lord-lieutenant. The navigation works in Ireland were cxecuted at the tiie of the famine of 1846, and their management is placed under aboard of trustees originallynamed by Act of Parliament, the vacancies being filled up by the grand juries.

Town Authorities.—The towns of Ireland were under the govern- ment of close corporations until 1829, when they were allowed to adopt popular constitutions. By the Municipal Act of 3d & 4th Viet., the towns containing upwards of 12,000 inhabitants are divided into wards,

and are governed by a council consisting of a chief magistrate called mayor, that of Dublin being styled lord mayor, and a certain number of aldermen and councillors for each ward. Eighteen towns are governed according to the Act of 9th George IV., and more than 80 have adopted the Towns Improve- ment Act of 1854. Additional powers were conferred on town authorities by the Local Improvement (Ireland) Act of 1871.

Harbour Authorities are distinct from the town authorities, and consist of a board chosen in accordance with certain special acts.

The town authoritics, or in counties the poor law guardians, have the power to constitute themselves a burial board for the purpose of levying rates, to be used in the maintenance of old burial grounds or the purchase of new ones.

By an Act passed in 1872 the functions previously performed by the lord-lieutenant, the privy council, and the chief secretary in reference to local government were transferred to a local govern- ment board, formed out of the poor law board which it superseded.

Taxation.—The local taxation of Ireland amounted in 1866, the first year for which returns are available, to £2,538,280, in 1870 to £2,728,327, and in 1879 £3,368,113. The following are the separate items for 1879 :—grand jury cess, £1,128,192; fees of the clerks of the peace (exclusive of salary), £11,585; fees of the clerks of the crown, £2884; petty session stamps and crown fines, £65,086; dog licence duty, £35,945 ; Dublin metropolitan police taxes, £44,965 ; court leet prescntments, £293 ; harbour taxation, £380,350; inland navigation, £5679 ; town taxation under town authorities, £622,871; burial board taxes, £3185; poor rate and local receipts, £1,031,992; light dues and fees, under Merchant Shipping Act, and bridge and ferry tolls, £35,086. The amount of rates on real property was £2,619,188, or 77°8 per cent. of the whole ; tolls, fees, stamps, &c., £539,174, or 16°0 per cent.; and other receipts, £209,756 or 6‘2 percent. The amount granted from the imperial revenue in aid of local taxation in 1880-81 was £1,856,748, in addition to which an annual sum, £1,189,461 in 1880, is advanced on

loan by the Commissioners of Public Works froin the Consolidated Fund, while £883,116 was advanced in 1880

Unions. | Indoor P: ol Onidoor IE Fae 3ky from the Irish Church fund. — Se wr Pie hand coc) we 0 Religion.—According to the census returns of the commissioners 1840 4 10,910 ~at £37,057 of public instruction in 1834, out of a total population of 7,943,940 1850 163 805,702 368,565 1,430,108 inhabitants 852,064 belonged to the Established Church, the 1860 163 170,549 8,965 454,531 nuinber of Roman Catholics being 6,427,712, of Presbyterians 1870 163 230,971 53,885 668,202 642,356, and of persons of other denominations 21,808. Table 1878 163 248,810 75,290 845,608 LIX. gives returns for 1861 and 1881. 1880 163 367,354 181,778 929, 967 The annual average number of marriages according to the forms of the Episcopalian Church for the ten years 1869-78 was 4208, Tas_E LIX.—Classifieation of Population according to Religious Profession, 1861 and 1881. Roman Catholics. Seer es. Presbyterians, Methodists. dee tos — Number. | Per Cent.) Number. | Per Cent.| Number. | Per Cent.) Number. | Per Cent.| Number. | Per Cent. FRAUEN err ceecsevres 1861 | 1,252,553 | 85°9 | 180,587] 12:4 | 12355] 0-9 6,290 0°4 5,850 0°4 "1,457,655 1881 | 1,095,459 | 85°6 | 157,622; 12°3 | 12633! 1-0 6,712 0°5 6,764 0°6 | 1,279,190 Mundtes >... 1861 | 1,420,076 | 93°8 | 80,860] 5:3 4,018} 0-8 | 4,486 | 0° 4,173 | 0-3 | 1,513,558 1881 | 1,244,876 | 98:0 | 68,352| 5-2 3,794 | 0°3 4,421 0°38 2,467 0°2 | 1,828,910 Pista de. } 1861 966,613 50°5 391,315 | 20°4 | 508,835} 26°38 32,030 irs 20,4438 11 | 1,914,236 1881 | 831,784 | 47°38 | 377,986 | 21:7 | 466,107| 26°8 | 34,494 | 1-9 | 29,991 | 1-8 | 1,739,542 Conaaeet .2e….. 1861 | 866,023 | 94°38 | 40,595) 4°5 8,088} 03 | 2,643 | 03 766) Or 913,135 © 1881 779,769 | 95°4 | 81,760] 38°9 2,969] 0°4 2,042 02 657 01 817,197 Reid ke… } 1861 | 4,505,265 | 77:7 | 693,357] 11°9 | 523,291| 9:0 | 45,399 0°8 | 31,655! | 0°6 | 5,798,967 1881 | 3,951,888 | 76°6 | 635,670| 12:3 | 485,508} 9:4 | 47,669 09 | 89,1097} 0°8 } 5,159,839

1 Including seamen at sca on census night.

® Ineluding 453 Jews and 1144 who refused information.

¥

and for 1879 it was 3646,—the numbers according to the Presby- terian form being 2556 and 2214 respectively, in other registered buildings 308 and 338, and according to the rites of the Roman Catholic Church 18,567 and 16,578.

The Anglican Episcopal Church of Ireland constituted until 1871 an integral portion of one church, known as the Church of England and Ireland, and established by law in the two countries; but the Irish branch was disestablished and disendowed by an Act which received the royal assent on July 26, 1869. Aceording to this Act, which came into execution on January 1, 1871, all church property became vested in a body of commissioners. All the state grants were to be resumed by the state, provision being made for vested interests, but the church was to receive possession of all endowments obtained from private sources since 1660. To all in- cumbents the income they formerly possessed was secured for life, minus the amount they might have paid for curates ; and compen- sation was also grantcd to curates, parish clerks, and sextons, to Maynooth Roman Catholic College in lieu of the continuance of the annual parliamentary grant, and to the Presbyterians in lieu of the continuance of the grant called " Regium Donum."

According to the report of the commission appointed to inquire into the revenues of the Established Church, Accounts and Papers, 1867-68, the net annual produce and value of the entire property was found to be £616,840, of which the value of the houses of residence and the lands in possession of the clergy was £32,152. The total sum paid or payable by the commissioners of church temporalities as compensation in connexion with the operation of the Irish Church Act is estimated at £11,666,518. To meet the demands upon them the commissioners borrowed £9,000,000 from the National Debt Commissioners, The total sum obtainable by sales of church property is £9,794,790, of which £3,362,648 has been reccived in cash, the balance, except £797,766, which is secured by mortgage, being payable in terminable annuities, In addition to this there is a permanent income consisting of tithe rent-

charges and perpetual rents estimated at £293,455. The work of the commissioners has now been practically completed, and according to their report for 1869-80 the estimated value of the estate is now £12,189,728, exclusive of £200,000, the value of uncommuted glebes and uncollected arrears. The annual income at present is £574,219, but by the termination of annuities it will gradually diminish until 1932, when there will still be the per- mauent income of £293,455. But for additional burdens laid upon the estate its entire debt would at the end of 1880 have been £5,900,000, leaving a surplus of £6,500,000. These burdens are a sum of £1,000,000 for intermediate education, £1,300,000 to form a pension fund for national school teachers, and the interest at 34 per cent. of £1,500,000 advanced on loan for the purposes of the Relief of Distress (Ireland) Acts, 1880, and involving a loss to the estate of £543,345.

Before its disestablishment the Church of Ireland consisted of 2 archbishoprics, 10 bishoprics, 30 corporations of deans and chapters, 12 minor corporations, 32 deaneries, 33 archdeaconries, 1509 incumbencies, with 500 stipendiary curates. A general con- vention of the clergy to reorganize the church and to choose a representative body to manage its secular affairs met in February 1870, and the church is now constituted as the Church of Ireland. The amount received from the commissioners for commutation of life interests up to 31st December 1879 was £7,577,477, 6s. 8d., chargeable with annuities amounting to £592,075, 5s. 8d., and of this sum there remained at the end of 1879 £2,783,871, 11s, 8d., chargeable with annuities amounting to £201,824, 8s. 9d., the annuities extinguished by composition and advances amounting to £294,054, 9s. 4d. The sums invested by the church in securities amounted to £6,362,433, 17s. 5d., yielding an income of £281,577, 11s. 8d., in addition to which £109,162, 10s. has been advanced to the clergy on policies of insurance. The balance of the general

Taste LX.—Contributions to Stipend Fund, &c., 1876-79.

1876. 1877, 1878. 1879.

Stipend | AN | Stipend | an | stipena| an | stipena Fund. | Sources.| Fund. |Sources.| Fund. Sources.| Fund.

£124,424 |£212,095 £118,478 |£197,739| £115,558 | £159,403

£108,272 (£165,007

Taste LXI.—Classification of Population according to Education—Percentages for 1841, 1851, 1861, and 1871.

Could Read and Write.

1851. 1861.

ban oe 49

ic meee 40

Rte ene 42 Connaught …..... 28 Treland . ..cc.sscor0s all

IRELAND 24]

sustentation fund amounted to £194,125, 12s. 8d., yielding an interest of £7753, 7s. 9d., the unappropriated balance of which was £963,7s. 9d. ‘The sum expended on the purchase of glebes has been £499,589, 16s. 10d., of which £214,900, 10s. 8d. has been subscribed; and the net amount received from the sale of glebes was £45,588, 10s. 3d. The contributions to the stipend fund, and the total contributions from all sources from 1876 to 1879, are shown in Table LX. For fuller financial details the reader is referred to the annual report of the representative body and to the Irish Church Directory.

The Roman Catholic Church is governed by 4 archbishops aud 27 bishops, the number of parish priests being nearly 1000, and of administrative curates about 1750. The ecclesiastical parishes amount to 1084, and the churches and chapels number near y 2500. The Maynooth Roman Catholic College, which was founded in 1795, originally received an annual vote from Government of £8000, but

latterly a grant from the consolidated fund of £26,360, which was commuted by the payment of £372, 331.

The Presbyterian Church, which has its prineipal adherents in Ulster, was originally formed in 1642, and-in 1840 a union took place of two divisions of the church which had formerly separated. Previous to the disestablishment of the Church of Ireland, the Presbyterians received for the support of their ministers an aunual sum, first granted in 1672, of about £40,000, known as 'Regium Donum," which was commuted by the Church Disestablishment Act. The church embraces 36 presbyteries and nearly 600 congrega- tions, the nuinber of families connected with the church in 1880 being 79,214, and of communicants 104,769. The total sum at the disposal of the church in 1880 was £139,840, the sum paid to ministers being £44,922, Candidates for the miuistry are trained at Magee College, Londonderry, and at the Presbyterian College, Belfast.

The Methodist Church of Ireland was tormed in 1878 by the union of the Wesleyan Methodists with the Primitive Wesleyan Methodists. The number of ministers counected with the Con- ference in June 1880 was 240, of whom 40 were supernumeraries, The number of principal stations under the charge of ministers was 135, embracing 373 chapels, The number of attendants on publie worship was stated to be 60,541, and the membership 24,463. The home mission fund, with an augmentation from the English Confer- ence, amounted to £13,241, and the sum raised for forcign missions to £5533. There is a Methodist college at Belfast for the training of students who have been accepted as candidates for the ministry.

The number of persons connected with the other denominations of Ireland is inconsiderable, amounting in 1881 to only 0°8 per cent.

Lducation.—Table LXI. shows the proportion per cent. of per- sons in Ireland who could read and write, who could read only, and who could neither read nor write at the various census periods. The number of persons in 1871 who could speak Irish only was 103,562, the number in 1841 being 319,602, and the number who could speak both Irish and English was 714,813 in 1871 and 1,204,684 in 1841.

According to the census of 1871 the number of schools for primary instruction was 9495 with 615,785 pupils, of superior sehools 574 with 21,225 pupils, of universities and colleges 13 with 2945 students. The oldest university is that of Dublin, established in 1591 by a charter of Quecn Elizabeth. The course of study includes mathematics, classics, modern languages, English, logic, ethics, astronomy, experimental science, and natural science. The Catholic University, Pronded in 1854, has in operation faculties of medicine, philosophy and letters, and science. Quecn's University, established in 1850, with colleges at Belfast, Cork, and Galway, has faculties of law, arts, medicine, and engineering. Qucen's University will be shortly superseded by the Royal University, for which a charter was granted in 1880. A royal college of science was established in 1867, with departments of mining, agriculture, engineering, and manufactures. The higher education of women is represented by Alexandra College, Dublin, founded in 1866, the Governess Association, the Ladies' Institution of Belfast, and the Queen's Institute for the instruction of women. A list of colleges and intermediate schools will be found in the Intermediate Educa- tion Year Book and Directory. By the provisions of the Inter- mediate Education (Ireland) Act, 1878, a sum of £1,000,000 of the Irish Church surplus was set apart for the encouragement of inter- mediate education in Ireland, the money being expended partly in

Could Read only. Could neither Read nor Write.

1861. 1851, 1861. 20 14 28 15 20

exhibitions and prizes to students, and partly in the payment of results fees. The total number of pupils examined in 1880 was 5561—4114 boys and 1447 girls, the number who passed being 2899 boys and 1111 girls. Exhibitions of the value of £20 a year for three years were awarded to 96 boys and 40 girls in the junior grade; in the middle grade 32 boys and 183 girls received exhibitions of £30 annually for two years; and in the senior grade 16 boys and 4 girls received exhibitions of £50 for one year. In addition to this 558 boys and 726 girls received prizes in books.

In 1811 a society was formed in Ireland for the education of the poor, which from 1819 received the assistance of a grant of public money. This, however, was withdrawn in 1830 on account of the Roman Catholics refusing from religious objections to allow their pupils to enter the schools of the society. In 1833 the money formerly given to the society was vested in eommissioners of public education, who in 1845 were incorporated under the name of the "' Commissioners of National Education of Ireland." a

Table LXII. will show the progress of national education in Ireland from 1833 to 1880; and Table LXIII. gives particulars as to sehool attendance for 1880. ;

able LX1V. shows the Protestant and Roman Catholic attend- ance at the 4175 mixed schools from which returns were received.

The unmixed schools numbered 3331, of which those taught by Roman Catholic teachers numbered 2779, the number of pupils being 441,612, while those taught by Protestant teachers numbered 552, the total number of pupils being 63,983, of whom 26,283 belonged to the Chureh of Ireland, 34,348 to the Presbyterian Chureh, and 3352 to other denominations. Table LXV. shows the attendance at the various classes in the national schools in 1880.

The number of district and minor model schools in 1880— exclusive of those of the metropolitan district—was 26, the number of pupils on the roll 16,997, and the average attendance 8971. Table LXVI. shows the relative proportion of attendance at the various classes.

The workhouse schools under the superintendence of the National Board in 1880 numbered 158, the pupils on the roll being 16,945, and the average attendance 8880. There were 52 industrial schools in 1879, the number of inmates being 4979, and the expenditure

Tas_rn LXII.—National Sehools in Ireland, 1833-80.

ifeiawn D

£117,888. The nunther of school farms connected with the national schools in 1880 was 94, and of school gardens 19, in addition to which there are a large number of agricultural schools under local management, and a large number of pupils were also taught agriculture in the national schools, the total number of pupils who presented themselves for examination in agriculture in 1880 being 33,648, of whom 15,652 passed. The number of pupils who presented them- selves at the results examination in the national schools in 1880 was 461,574, of whom 340,871, or 738 per cent.,passed. Table LXVII. shows the various classes of teachers underthe National Boardin 1880.

In addition there were 85 junior assistants, 227 work mistresses and industrial teachers, 90 temporary assistants, and 8 temporary work mistresses. The payment to the teaching staff for the year ending 3lst March 1881 was £737,631, 4s. 3d. The amount of money raised by school fees was £91,300, 5s. 8d., by subscription £40,516, 6s. 10d., by local rates £8,324, 6s. 7d. The whole amount received from the Board was £597,490, 5s. 2d. The amount of sub- scriptions other than local for the four years ending 1880 was £151,698, 16s. 6d., which was devoted to building purposes. The total amount of the parliamentary grant for the promotion of edu- cation, science, and art in Ireland for the year ending 31st March 1880 was £795,351.

For particulars regarding the endowments, funds, and actual condition of the endowed schools of Ireland, including the royal free schools, diocesan free schools, grammar schools, Erasmus Smith schools, and schools connected with the Church of Ireland, the Roman Catholic Church, and the various other denominations, the reader is referred to the Report of the Endowed Schools (Ireland) Commission, vols. i. aud it., 1881.

Antiquities.—The principal objects in Ireland of antiquarian and architectural interest are noticed under the various counties.

BIBLICGRAPHY.

Geology.—The Government geologieal survey of Ireland, begun in 1832, was completed in 1881, and maps of separate portions have becn publislied,accompanied with explanatory memoirs. Among the geological maps of the whole country may be mentioned that by E. Hull, London, 1878. The chief works on the geology of the country as a whole are Sir Richard Griffith's Physical Geology of Ireland, 2d edition, 1888; Hull's Physical Geology and Geography of Ireland, London, 1878; and Kinahan's Manual of the Geology of Jreland, London, 1878. An interesting notice of the principal features of Irish geology will be found in Aws Jriand, by Dr Arnold von Lasaulx, Bonn, 1877. A list of the more important papers on the special points of Irish geology is given in the work of Hull.

Parlia- Parlia- Agriculture.—For information regarding the character of the land systems of Schools.| Pupils, | mentary Schools.) Pupils. | mentary Ireland the reader may consult Godkin's Land War in Ireland, 1870; Sigerson's Grant. Grant. History of Land Tenure in Ireland, 1871; O'Curry's Ancient Manners and a —— a Customs of Ireland, 3 vols. 1873; the paper on " The Tenure of Land in Ire- Ni Zag | | MR hs nee rata ns sist MMe Rl of aa 1833 789 | 107,042 25,000 6,806 950,999 | 394,20 and with additions in @ new ection, Sirs USNS) CTU GU dela 1840 | 1,978 | 232560 | 60/000 7433 | 1 086742 | 59°837 Holding in Ireland, 1877 ; O'Brien's IJistory of the Irish Land Question, 1880 ; 1850 | 4,547 | 511,239 | 140,000 7,522 170317995 | 681.829 Richey's Jrish Land Laws, 1880. The political-cconomy relations of the sub- 1860 | 5.632 | 804.000 | 270.722 59 083, 6 ject have been treated, among other writers, by John Stuart Mill, T. E. Cliffe ' ; ' 7,590 | 1,083,020 | 722,366 ; Leslie, and Professor Cairnes, For general information a first place must be TABLE LXIII.— Aéttendanee in National Schools, 1880. Pupils on Roll who made at least '5 ha re — one attendance. Religious Denominations. Total Schools.} sending in Returns. : Roman Episcopalian Presby- , ' Males. Females, Total. Canidiics: Church. hee Othert. WIS t citer reac: coetenate nen oeree te 2,867 2,846 200,293 183,528 383,821 | 185,462 76,684 113, 028 8,647 MUMSHED.....sccseessorrereenee IOs 1,885 140, 492 147,941 288,433 | 279,774 7,481 595 583 WGN ECT rene. sscseraes vs ceases 1,595 1,576 107,123 112,189 219,312 | 204,786 12,576 1,397 553 (Croymite HiME

cooehincenoncasbSee IL Pails) 1,202 98,393 93,061 191,454 | 185,035 5,477 609 333 melanin! sen vectra ens 7,590 7,509 546,301 536,719 1,083,020 | 855,057 102,218 115,629 10,116 Mericentin..sceneee sums 50°4 49°6 79°0 9°4 10°7 09 TABLE LXIV.—Attendanee in Mixed Schools, 1880, TaBLE LXVI.—Percentages in Model Sehools, 1880. Per cent Class | Class | Class Class Class Class Roman D Infants. 5 Teachers. Schools.| Catholic "a y – oe Sd el | a Pe iad : an ab Pupils, 3 oman rotest- A ; : : q ; : ip Catholics. aes 12°9 10°0 ily 14°0 13°3 91 14-1 Roman Catholic …... 2,804 | 377,677 | 24,011 940 | 6-0 ad we wae Se NeqOoNN na 1,273 25,183 127,868 16°4 83°6 oman Catholic ? . 0 ea one. 98 10,580 11,923 47-0 53:0 TABLE LXVII.— Teachers in Service of the National Board, 1880. ibaa 3 4,175 163,802 | 716 | 284 Class a amet Males. | Females.| Males. | Females, 1,—Ist Division …... 129 102 13 23 Tas_e LXV.—Pereentages in National Schools, 1880. i ae B99 802 23 64 a ee ye 867 7h 318 per: : : 47 187 n- Class Class Class Class Class 3.—Ist ' foe |e Clee i, | tv. | vr. | wa. | VI. ae 376 197 1308 Ircland..| 26°5 | 21°8 151 12°9 10:0 65 34 3°8 Tan Ss ——<—<—— = 3 26°5 49°8 23°7

keep in memory the deeds of their ancestors.

TISTORY. |

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PART IL—HISTORY.

Legendary History of arly Races.—Circumstances were favourable in Ireland to the growth and preserva- tion of ethnic legends. Among these favourable circum- stances were the long continuance of tribal government, and the existence of a special class whose duty it was to preserve the genealogies of the ruling wg hoe

ong pedigrees and stories of forays and battles were pre- served, but under the necessary condition of undergoing gradual phonetic change according as the popular language altered. During many centuries there had been no con- quest by foreign races to destroy these traditions ; internal conquests and displacements of tribes confuse but do not eradicate traditions and pedigrees. When the Irish were converted to Christianity and became acquainted with the story of the deluge, the confusion of tongues, and the unity of the human race, the stiide (sages) naturally endeavoured to fill up the gap between their eponyms and Noah. The pedigrees now began to be committed to writing, and, as they could for the first time be compared with one another, a wide field was opened to the inventive faculties of the scribes. 'The result has been the construction of a most extraordinary legendary history, which under the constant care of official suide acquired a completeness, fulness, and a certain degree of consistency which is wonderful. In the 11th and 12th centuries this legendary history was fitted with a chronology, and synchronized with the annals

of historical nations. We may assume with confidence that a history of a group of tribes admittedly of diverse origins, consisting mainly of names of persons and battles transmitted by memory, must necessarily lack all proportion, not alone as regards absolute, but even as regards relative time ; that personages and events may appear in the back-ground that should be in the foreground, and the converse ; nay, even that the same personages and events may figure at times and places far apart. Keeping these things in view, the Lebar Gabhala, or "Book of Invasions," a curious compilation, or rather compilations, for there are several editions of it, of the ethnic legends of Ireland, will help us to give the main facts of the early peopling of Ireland. Our guide records the coming of five principal peoples, namely, the followers of Partholan or Bartholomew, those of Nemed, the Firbolgs, the Tuatha Dé Danann, and the Scots or Milesians.

Partholan and his people came from Middle Greece, and landed at Inber Sceine, believed to have been the estuary

of Kenmare. After occupying Ireland for three hundred years, they died of a plague, and were buried at Tamlecht Muintire Partholain, the plague Lecht or grave of Par- tholan's people, now Tallaght near Dublin. 'This race divided the coast into four parts, their leader having had four sons. Thirty years after the destruction of Partho- lan's people, a race arrived from Scythia under a leader called Nemed, in thirty ships, each containing thirty warriors. We are not told where he landed, but like Partholan's people Nemed died of a plague at the hill upon which Queenstown in Cork Harbour is situated, aud which has on that account been called Ard Nemeid. At this time another people appear on the scene, the Fomo- rians. It is probable, however, that Fomorian was merely a name for all sea-coming enemies, and that they were not always the same race. The descendants of Nemed's people suffered much hardship from them, we are told, but at length succeeded in destroying the fortress of their leader Conan at Tor Inis, now Tory Island, off the coast of Donegal, and killing himself and his children; but Morc, another leader, having arrived soon after from Africa with sixty ships, a second battle was fought, in which both parties were nearly exterminated. Morc, how- ever, escaped, and took

possession of the country, while of the Nemedians only the crew of one ship, having the usual number of thirty warriors—among whom were three descen- dants of Nemed himself—escaped. Each of the three descendants of Nemed went to a different country, and became the eponym of an important race. ‘The five chiefs of the Firbolgs, the next colonizing race, appear to have landed at different places: one party, that of the Fir Galeons, landed at Inber Slangi, so called from their leader Slangi, whose name is still preserved in the river Slaney ; another tribe, the Firbolgs, who gave their name to the collective tribes, arrived at what is now Erris in Mayo ; and a third section, the Fir Domnand, landed at Tracht Rudraide in Ulster, so called from their leader Rudraide, or rather Rud. All these tribes seem to have been British, a view which is confirmed by their chief fort being Dind Rig, the dun or fort of the kings on the Barrow in Carlow, afterwards the seat of the kings of Leinster, a province which appears to have always had a close relationship with Britain. The Firbolgs had only effected settlements in the country, but had not brought the whole of it into subjec- tion before the arrival of a new tribe called the Tuatha Dé Danann. According to the Nemedian legend, this new

tribe was the race of Ibath, grandson of Iarbonel the prophet, son of Nemed. The new-comers under a king called Niadu demand the sovereignty of the country from the Firbolg king Eochaid Mac Erca, who refuses, and there- upon they fight a battle at Mag Tuired Conga, now Moytura near Cong in the county Mayo, the site of which is still traditionally remembered, and many graves belong- ing to the period of cremation have been found there. The Firbolgs were worsted in this battle, and, as in all ethnic legends, almost annihilated, and the remainder driven out of the country. Thirty years after the conquest of the Firbolgs, the Tuatha Dé Danann fought a great battle with the Fomorians at another Mag Tuired, which is dis- tinguished from that of Cong by being called the Northern. Its site is placed by tradition near Lough Arrow on the borders of Sligo and Roscommon, at a place where many graves and pillar-stones still exist.

The last of the prehistoric races of Ireland are the so- called Milesians or Scots. The immediate eponym of the new race was Galam from Gal, "valour," a name which might be cxpressed by the Latin miles, a "knight," whence came the names Milesius and Milesians. Among the names which appear in the pedigree, which is of course carried back without .a break to Noah, are several worthy of the attention of archzeologists,—namely, Breogan or Bregan, Eber Scot, Géedal Glas, Fenius Farsaid, Allait, Niuadu, Sru, and Esru. Breogdn, according to the legend, was the grandfather of Galam or Milesius, who founded Brigantia in Spain.

With all their drawbacks, the Irish ethnic legends, when stript of their elaborate details and Biblical and classical loans, express the broad facts of the peopling of Ireland, and are in accordance with the results of archeological in- vestigation. At the earliest period the country was well wooded, and the interior full of marshes and lakes ; it was occupied by a sparse population, who appear in later times as 'forest tribes" (Tuatha Feda), and were doubtless of the aboriginal (Iberic) race of western and southern Europe. The story of Partholan represents the incoming of the first bronze-armed Celts, who were a Goidelic tribe akin to the later Scots that settled on the sea-coast, and built the for- tresses occupying the principal headlands. They formed with the forest tribes the basis of the population in the Early Bronze age. Afterwards came the various tribes known by the general name of Firbolgs. It is not neces- sary to suppose that all the tribes included under this name came at the same time, or even that they were closely akin, The legend names several tribes, and tells us that they came into Ireland at different places from Britain. The effect of their immigrations now appears to have been that in the north the people were Cruithni, or Picts of the Goidelic branch of the Celts; in the east and centre, British and Belgic tribes ; and in Munster, when not distinctly Iberic, of a southern or Gaulish type.

The fertile plain lying between the Wicklow and Carling- ford mountains, and cspecially the part of it south of the Boyne (Mag Breg), was open to tribes coming from the oppo- site coast, and has accordingly been at all times a landing place of invading tribes. This

region was occupied by the tribe of Nemed before the arrival of the Firbolgs, if we be- lieve the legend; but the event certainly belongs to a later period, though still to the time of the movements and displacement of peoples which led to the immigration of those tribes. The Fomorians, with whom the Nemedians fought, may have been merely some of those incoming

. ? They were, however, only subdued, for long after there were Firbolg kings of Olnegmacht (the ancient name of Connaught), and the people were very numerous in Ireland in St Patrick's time; indeed, it is probable that they then formed the largest element of the population.

tribes. The Irish legend brings the Nemedians from the east of Europe, which of course only means that they came from a distance, perhaps from Armorica or some other part of Gaul. Nemed's tribes were probably the builders of the tumuli of Meath, and the introducers of the worship of Dia and Ana, in other words, they were the mysterious Tuatha Dé Danann ("tribes of Dia and Ana"). Nemed was probably only another name for Dia, and his wife was Macha, an appellative of Ana. The name Nemed itself is of great interest, for it is evidently connected with nem, heaven, used also in the secondary sense of a sacred object upon which oaths were sworn.

The Milesian legend seems to consist of two or perhaps of three events. Eber and Erimon, two sons of Galam, or Milesius, the leaders of the invading forces, fight a battle at Sliab Mis in western Kerry with Eriu, the queen of Ceitheoir or Mac Gréne, "the son of the Sun," one of the three joint kings of the Tuatha Dé Danann, whom they defeat. Eber or Heber then marches to Tailti in Meath, while his brother Erimon or Heremon sails round to the mouth of the Boyne, where hie lands and marches to mect his brother advancing from the south. This skilful strate- gic movement betrays the late invention of the legend. The first fact that underlies the story is the incoming of some powerful and well-armed tribe who seized upon the plain between the Liffey and the

Boyne, and made it the centre of an encroaching power. The eponym of this tribe was Erimon, a name foreign to the pantheon of the tribes of Diaand Ana.? The new tribes arrived in Ireland towards the close of the prehistoric period, and not long before the beginning of the Christian era, or possibly as late as the first century of it. They were Goidelic, and were related to the dominant clans of Munster, and the Clanna Rudraide or Ulster clans, though perhaps not so closely to the latter as to the former. When the sons of Galam had defeated the kings of the tribes of Dia and Ana, they partitioned Ireland between themselves and their kinsmen. Erimon got Leinster and Connaught; Eber Find, his brother, North Munster; Lugaid, son of Ith, brother of Galam, South Munster; and Eber, son of Ir, son of Galam, the pro-genitor of Rud or the Rudraide, the immediate eponym of the Ultonians, Ulster. Eber Find, the leader of the north Munster tribes, and Lugaid of the South Munster ones, were grandsons of Breogdn, the stem-father of all the new tribes. A long struggle took place between their descend- ants, in which those of Eber Find ultimately gained the upper hand, and the descendants of Lugaid were gradually – pressed into a corner of the county of Cork. This struggle and the position of the tribes of Eber in the plain of Munster seem to show that the latter were, what the legend pretends, a part of the incoming tribes which we shall henceforward call Scots, and which landed, not in Kerry, but in Meath. The places supposed to have derived their names from the forty captains of the invading Scots, such as the plain of Brega, Sliab Cualand, &c., are all in that part of Ireland already spoken of as the landing place of invading tribes, or in the great central plain stretching west and south-west from it. There seems little doubt that these clans of Breog4n or Scots were closely related to the Brigantes, perhaps they were even tribes of that great clan. The Brigantes who occupied the basin of the Barrow and Nore, and ultimately the county Waterford, according to Ptolemy,

2 Herr Mannhardt connects Erimon with Irinc or Trmin, a god or divine hero of the Germans, and both with Aryamo (Aryaman), the deified ancestral king of the Hindus, who ruled Elysium, and whose path was the Milky Way. He also thinks that these words as well as Eriu contain the same stem as Aryan, and that consequently Aryamo

may have been at one time the national god of all Aryans. Some curious particulars might be added here respecting Donn, the brother e Eber and Erimon, which appear to give great interest to this hypo-.

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support this view. The clan of Lugaid, grandson of Breo- gan, is almost certainly that which used the Ogam inscribed stones, the last that came into the country, and with which originated the story of the migration from Spain.

The Scott.—The opening of the historic period was marked by a great struggle of tribes, which took place about the begiuning of the Christian era, and of which Trish annalists have left us but very scanty information, and that confused aud misleading. This struggle was brought about by the arrival from abroad of a new tribe, or the rise of an old one. The former view seems the more probable, for at that time great displacements of the Celts were taking place everywhere consequent on the con- quests of the Romans, and some of the displaced tribes may have migrated toIreland. The victors in the struggle appear afterwards as Scots; the conquered tribes are called Aithech Tuatha, that is, vassal tribes, because they paid daer or base rent. The names of the free and servile clans have been preserved, and were first published by the pre- sent writer! The former consisted of forty-six tribes, among them being the Scotraige or Scotraide. This tribe probably took a foremost place in the subsequent invasions of Britain ; and, it having thus acquired the leadership of the free clans, the latter became all known to foreigners as the Scoti, a name which was subsequently extended to the whole people. That this was the way in which the name was first given is shown by its not having been used in Irish, but only in Latin documents. The ending -raige or -raide is a patronymic.

In the struggle between the free and servile tribes the latter appear to have succeeded in throwing off the yoke of the free clans or Scots, but after some time the latter, under the leadership of Tuathal, called Zechtmar or “ the Legitimate ” (ob. c’r. 160 a.p.), recovered their

power and took effective measures to preserve it by making some kind of redistribution of the servile tribes, or more probably making a plantation of Scots among them, and building fortresses capable of affording mutual aid. The duns and raths on the great central plain of Ireland to which Tuathal's measure was probably confined appear to have been erected on some strategic plan of this kind, intended to keep up a chain of communication, and prevent the combination of the servile classes. Tuathal in fact founded a kind of feudal system which ruled Ireland while the Scotic power endured.?

Another measure of Tuathal was the formation of the kingdom of Meath to serve as mensal land of the Ard Ri or over-king. Before his time there was, according to legend, a district about the sacred hill of Usnech called Mide, that is, "the middle," the religious centre of the Trish ; this Tuathal enlarged by taking from each of the four provinces —the two Munsters being reckoned as one —a tract of land. In the Munster portion he built his Dun of Tlachtga, a sacred place of the Druids, now called the Hill of Ward, near Athboy. Usnech was considered to be in Olnegmacht (Connaught). Tailti (gen. Tailtenn, now Teltown) was his Ulster residence, and Temair or Tara the Leinster one. Tuathal made each of those places

2 In O'Curry's Manners and Customs of the Ancient Irish, Introduction, vol. i. p. xxvii.

2 The Aithech Tuatha, or servile tribes, have been identified by some antiquarians with the British tribes known as Atticotti. The ground of this surmise is the resemblance of the names. Although the explanation we have given of the name is satisfactory, it is right to state that among the servile tribes there was one called the Tuath Aithechta, which might have given its name to the whole of the ser- vile tribes, as the Scotraige gave theirs to the "'free clans." This tribe was seated on the sea-coast near the Liffey, and there is nothing improbable in the notion that when beaten they may have crossed over to Britain, where they became known as Atticotti, and were

associated with the Scots in their devastations of the Roman provinces,

a religious centre for the province from which it had been taken.? He was thus not only the founder of the central monarchy, but also it would seem the organizer of the reli- gious system of the people, which he used as a means of securing the allegiance of their princes by holding their chief shrines in his power, while leaving them the rents derived from them. Aun act of Tuathal, which marks his power, and the firm grasp which he had secured over the country, was the infliction of a heavy fine on the province of Leinster, a legend tells us, for an insult offered to him by one of its kings. This fine, called the Boroim Laigen or Cow-tribute of Leinster, was levied uutil the 6th cen- tury, when at the instance of St Moling it was remitted by the monarch Finachta. It was a constant source of op- pression and war while it lasted, and helped to cripple the power of Leinster. Several attempts were made to reim- pose it, among others by the celebrated Brian, who, accord- ing to some, derived his surname of Boruma from this circumstance. To carry out his measures of conquest and subjugation, Tuathal is credited with having established a kind of permanent military force which afterwards became so celebrated in legendary story as the Fiann or Fenians. He may have seen Roman troops, and attempted as far as his circumstances would permit to form a military tribe organized somewhat after the manner of a legion. Among the other measures attributed to Tuathal was the regulation of the various professions and handicrafts. The former he must necessarily have done as part of his religious organi- zation, for the various professions were merely the grades of the Druidical hierarchy.

The Rival Kingdom of Munster.—If we accept the story of the plantation of the broken Aithech Tuatha, Tuathal's power must have extended over the whole country ; but it was practically confined to Meath and Leinster, and perhaps Olnegmacht. Ulaid was independent, In Munster the clan of Degaid had conquered a large tract of country in the middle of the province, and forced the clan of Dergtind or descendants of Eber into the south-west of Cork and Kerry. The origin of the clan of Degaid is obscure ; one story makes it Ultonian, and the other Erimonian. The latter is probably the true one, for among the

free clans associated with the Scotraige in the war of the Aithech Tuatha was a tribe called Corco Dega, which seems to be the one we are now discussing. The clan of Degaid, having dispossessed a non-Scotic tribe called the Ernaans, were themselves afterwards known by that name. From their peculiar position in the south they must have acknowledged the supremacy of Tuathal and his successors. In the reign of Cond, surnamed "of thie Hundred Battles," grandson of Tuathal, the clan of Degaid had succeeded in getting the upper hand of the clans both of Eber and Lugaid ; and Munster, now divided into three

3 Thus the great Druidical festival of Samuin (now Allhallowtide), on which occasion all the hearths in Munster should be rekindled from the sacred fire, and for which a tax was due to the king, was cele- brated at Tlachtga. At Usnech, now the hill of Usnagh in West- meath, the festival of Beltaine was celebrated in the month of May. The horse and garments of every chief who came to the festival formed part of the toll of the king of Olnegmacht. At Tailti a great Oenach or fair was held at certain intervals on the first of August, at which was celebrated the Lugnasad, the games supposed to have been estab- lished by Lugaid of the Long Arm, one of the gods of Dia and Ana, in honour of his foster mother Tailti. Here for the first time Tuathal erected a dun, thus securing possession of the shrine of the Ulaid, to the king or which the rents of the fair belonged. These consisted chiefly in a fine due for each marriage celebrated there. At Tara, the principal residence, he established the Feis Temrach or Feast of Tara, which was a general assembly of the provincial and other subreguli of Ireland who came to do homage to the ard ri or over-king. This feast' continued to be held from Tuathal's time to 554 a.p., when the last was held by Diarmait, son of Cerball. The establishment of this feast is also attributed to the prehistoric king Eochaid Ollam Fotla, which implies that Tuathal merely re-established it.

petty kingdoms, was ruled over by three princes of that family. A chief of the Eberians named Kogan, better known as Mug Nuadat,! by the

aid of his foster-father the king of Leinster, succeeded in defeating the Degaidian princes and driving them out of Munster. The latter asked the aid of Cond the over-king, who took up their cause, and a fierce war arose, in which Cond was beaten and compelled to divide Ireland with his rival. The boundary line ran from the Bay of Galway to Dublin along the great ridge of gravel which stretches across Ireland. The northern part was Leth Cuind or Cond's Half, and the southern part Leth Moga or Mug's Half. By this arrangement the present county of Clare, which had hitherto belonged to Olnegmacht, was transferred to Munster, to which it has ever since belonged. It was about this time too that the former province received the name Connacht, now Connaught, from the name of King Cond. In the wars between Mug Nuadat and Cond a considerable number of foreigners are said to have been in the army of the former, among whom are specially named Spaniards. Perhaps these foreigners represent the tribe of Lugaid, and this was really the period of the arrival of that tribe in Ireland out of which grew the Milesian story. The earliest of the Ogam inscriptions are perhaps of this date, and support the view just stated.

Mug Ntadat must have been an able man, for he established his race so firmly that his descendants ruled Munster for a thousand years. He seems to have been as politic as warlike, for we are told he stored corn to save his people from famine. He was also enabled to give some to many chieftains who in a tribal community had no such forethought, and thus made them his vassals. His success, liowever, created a rivalry which lasted down to the final overthrow of the native government, and led to constant war and devastation, and maiuly contributed to the final overthrow of the central monarchy. Although Munster remained nominally in subjection to that power, it was thenceforward in reality an independent kingdom, or rather federation of clans under the king of Cashel.

Scotic Conquest of Ulster.—If the Scots failed to subdue the south thoroughly, they succeeded in crushing the Ultonians, and driving them ultimately into the south- eastern corner of the province. One of Cond's successors, Fiacha Srabtine, was slain by his nephews, known as the three Collas, one of whom, called Colla Uas, "the noble," became king

about 327; but after a reign of four years he and his brothers were driven out of Ireland. They took military service with their maternal grandfather, a certain Ugari, called king of Alba. After three years in this position they returned to Ireland, and succeeded in making peace with their cousin Muiredach Tirech, who became king after the banishment of Colla Uas. The Ard Ri, in order to give them employment, recommended them to carve out territories for themselves among the Ulaid. Finding an excuse in an insult offered to their grandfather, King Cormac, son of Art, they invaded Ulster, plundered and burned Emain Macha, the ancient seat of the kings of the Ultonians, and made "sword-land ? of a large part of the kingdom, which was afterwards known as Airgéill or Oriel. Afterwards the sons of the celebrated Niall of the Nine Hostages, the most powerful monarch of the Scotic dynasty after Tuathal, also carved out principalities for themselves in Ulster which bore their names for centuries :—Tir Conaill, or as it was called in English Tyrconnel, the land of Conall, and Tir Eogain, the land of Kogan, from which has come the name of one of the Ulster counties, Tyrone.

1 That is, the slave or servant of Nuadu, one of the chief gods of the Géedel.

Tnwasions of Britain by the Irish.—Constant allusions are nade in the legends of the prehistoric kings to warlike expeditions to Alba. In the legends of the heroic period an expedition to the Isle of Man forms the subject of one ot the tales, in which Curui Mac Dairi, of the clan of Degaid, king of West Munster, accompanied by Cuchulaind, carries off Blathnat, daughter of the king of Man. Crimthand, surnamed Nar's Hero, a prehistoric king just preceding the Aithech Tuatha war, brought back many trophies from abroad which are celebrated in legend. The Annals of the Four Masters, quoting the Annals of Tigernach, tell us at the year 240 that Cormac, son of Art, and grandson of Cond, sailed across the sea and obtained the sovereignty of Alba. This Cormac was a noteworthy king, who ruled with much state

at Tara from about 254 to 277 A.D. He is said to have introduced water-mills into Ireland, and to have established schools for the study of law, military matters, and the annals of the country. Laws attributed to him continued in force all through the Middle Ages. A book of moral precepts for the guidance of princes, called Z'ecosc na Righ, is attributed to him, a copy of which occurs in the Book of Leinster, a MS. of the 12th century. Another work compiled under his direction, and containing what may be called the history and geography of Ireland, has unfortunately not survived. He was the enemy of the Filid, owing it is said to his having learned something of Christianity in his expeditions. It was, however, during the reign of Crimthand son of Fidach (866-379) and of his successor Niall of the Nine Hostages (879-405) that the Irish invasions of Britain acquired for the first time historic importance. The former was a Munster prince, the most powerful of his race, and the only Eberian prince who was king of Ireland until Brian Boruma (1002). His successor Niall was also the most powerful of the rival race of the Erimonian Scots.

There appear to have been three distinct settlements of Irish tribes in Britain :—(1) of Munster tribes in South Wales, Devon- shire, and Cornwall ; (2) of Erimonian Scots in the Isle of Man, Anglesey, and other parts of Gwynedd or North Wales ; and (8) of the Erimonian Scots, called the Dal-Riada. The Cruithni or Picts of Galloway seem to have been a fourth settlement, but definite evi- dence on this point is wanting. The first invasion and the extent of the settlement of the Irish in south-west Britain are established by the Ogam inscriptions, and there is other proof besides. The most important picce of Irish evidence is the article " Mug-Eime" in Cormac's Glossary, which gives a legend of the introduction of the first lap-dog into Ireland. "Mug-Hime, that is the name of the first lap-dog that was in Ireland. Cairpre Musc, son of Conaire, brought it from the east from Britain; ... . for when great was the power of the Gael on Britain, they divided Alba between them into districts, and cach knew the residence of his friend, and not less did the Gael dwell on the east side of the sea quam in Scotica, and their habitations and royal forts were built there. Inde dicitur Din Tradui, ¢. ¢., triple-fossed fort of Crimthand the Great, son of Fidach, king of Ireland and Alba to the Ictian Sea, et inde est Glastonbury of the Gael,

¢.¢., a church on the border of the Ictian Sea (the English Channel)..... And it is in that part is Dinn map Lethain in the lands of the Cornish Britains, 7.¢., the fort of Mac Liathain, for Jfac is the same as Map in the British. Thus every tribe divided on that side for its property to the east was equal [to that on the west], and they continued in this power till long after the coming of Patrick." The Cairpre Musc here mentioned was son of Conaire, son of Mug Lama, of the Degaidian race of Munster, and his visit to Britain took place during the reign of Cormac, son of Art, and when Ailill Fland Beg was king of Munster. As the latter began his reign about 260 A.p., and the former died about 277, the visit lies between those datcs. It appears therefore that the occupation of south-west Britain by the Munster Goedel began at least a century earlier than Crimthand's time. The reference to the occupation of Cornwall is curiously corroborated by the story of Tristan and Ysculte, in which Morault is sent by the king of Ireland to collect tribute from the king of Cornwall. British and Welsh records are equally explicit about this occupa- tion. The earliest edition of the Historia Britonwm (represented by the Paris MS.) dates from 675, according to the Rev. D. Haigh, who attributes its authorship to Gildas, and gives the date of its composition as 471. If we were certain that we had Gildas's work we should have almost contemporaneous evidence, but, whoever wrote the work in question, the actual MSS. are of such antiquity that their authority on the point we are discussing is of great value. The passage referring to South Wales is as follows :—" But the sons of Licthan possessed the country of the Demetians (Dyfed), and other provinces Guoher (Gower) and Cetgueli (Kidweli), until they were expelled by Cuneda and his sons from all British territories." This statement bears out that taken from Cormac respecting the name of the leaders of the Géedel in South Wales. The name Lia- than is of great interest, because it is the eponym of an important Munster clan, the Hui Liathain, whose territory Crich Liathain in- eluded the barony of Barrymore in the county Cork. The Historia Britonum further tells us that Cuneda and his eight sons came from a region in the north called Manau Guotodin, probably about the end of the 5th century. The Welsh traditions referring to the

Goidelic occupation of Britain, though contradictory and irreconcil-able in their chronology, confirm all that we have said.

Camden, Edward Lihyd, and others pointed out a Goidelic element in the topographical nomenclature of west Britain, and concluded that the country was once oceupied by the Géedel, whence they were driven into Ireland by the advancing Cymri. This was a natural and reasonable conclusion at the time. But our present knowledge compels us to adopt a different view, namely, that, without prejudice to the existence at an anterior period of Goidelic tribes in west Britain, the numerous traces of Goidelicnames found there are derived from an Irish occupation in historic times. The Rev. W. Basil Jones (now bishop of St Davids), who by his valuable book, Vestiges of the Gael in Gwynedd (North Wales), has so largely contributed to our knowledge of this subject, came to the conclusion that the Irish occupied the whole of Anglesey, Carnarvon, Merioneth, and Cardiganshire, with a portion at least of Denbighshire, Montgomery- shire, and Radnorshire. The same tribes who occupied Anglesey and Gwynedd also occupied the Isle of Man, which, as is well known, was an Irish possession before the Norse invasion. Its colonization is attributed to Manandan, son of Lér, a sea-god of the tribes of Dia and Ana, and who is associated in the Mabinogion! with Gwydion ap Donn aud other deities. It would appear that the first occupation of Man, Mona, and Gwynedd took place before the dominance of the Scots, or was the work of Ultonians. But the subsequent importance of Gwydion ap Donn and Arianrod shows that the Erimonian Scots were afterwards the dominant element. South Wales was undoubtedly occupied by South Munster tribes, so that we have the curious historical phenomenon presented in Walcs as in Ireland of Mug's Half and Cond's Half. The explanation of this as well as of the occupation itself is no doubt the pressure of the clan of Degaid aud other Scotic tribes upon the tribes of Lugaid," causing the greater part to emigrate. By the aid of thesc emigrants, who had become better armed, Mug Nuadat and his successors on the Munster throne were enabled to recover their possessions in Munster again. It was no doubt by their help that Lugaid Mac Cuind of the South Munster clan succeeded in defeating Art, the son of Cond of the Hundred Battles,

and becoming king of Ireland. The occupation of North Wales was probably due to a similar pressure of the Scots upon the Ultonians.

We have said that there was probably a fourth settlement of Irish in Britain, but that we had no definite information on the subject. The position of the Goidelic population in Galloway is, however, so peculiar that we have no hesitation in saying that it is‘ derived from an emigration of Irish Cruithni or Picts in the first half of the 4th century, consequent on the Scotic invasion of Ulster. Before that period small settlements of Scots had already taken place, one of which is of very great historical importance. Conaire, son of Mug Lama, the successor of Cond of the Hundred Battles as king of lreland from about 212 to 220 a.p., had three sons, who, like the later Collas, carved out principalities for themselves in different parts of Ireland. These were—Cairpre Musc, from whom six territories in Munster were called Muscraige, which has been Anglicized Muskerry ; Cairpre Baiscinn, who is said to have been the stem of the tribe of Corco Baisvinn in the west of the county Clare; and Cairpre Riata, who acquired a territory in the north- east of the county Antrim, called Dal Riata or Dal Riada (which is to be distinguished from Dal Araide, the country of the Cruithni or Ultonians), a name which still survives in the local name “the Route.” It is probable that Cairpre Riata or some of his immediate successors passed over into Alba, and acquired territory also there. Bede is the earliest anthority for such a migration. Speaking of the inhabitants of Britain, he says :—“In process of time Britain, besides the Britons and the Picts, received a third nation, the Scots, who migrating from Ireland under their lcader Reuda, either by fair means or by force of arms sccured to them- selves those settlements among the Picts which they still possess. From the name of their commander, they are to this day called Dalreudins ; for in their language dal signifies a part.” Bede derived his information from some of the Columban clergy, and knew nothing of Wales, and thercforc of any previous settlements of the Irish. About three hundred years after the first settlement a body of the Irish Dalriads of Antrim went to Alba, under the leadership of Fergus Mér, son of Ere, and his brothers, and founded on the basis of the previous colony a new Dal Riata, which became known as Airer Gdedel or region of the Gael, a name now pro- nounced Argyle. This

petty kingdom ultimately developed into the kingdom of Scotland, and appropriated to itself the name of the mother country, or at least that which was its Latin name.

The Roman historians are usually assumed to represent that the Scots taking part in the attacks on Roman Britain all came like een ee

1 On the Goidelie character of the Mabinogion see Centric Lirera-TURE, vol. v. pp. 821, 322.

? Lugaid, the eponym of the South Munster tribes, which oecupied South Wales and Cornwall, appears to be the Loueetio, a war god, who 18 associated with a local goddess Nemetona on an inseription found in Cornwall (cf., Nemon, the Irish goddess of war, wife of Néit).

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the Picts from the north. But Ammianus expressly states that the Picts, Atticotti, and Scots arrived by different ways (per diversa vagantes). The basis of the Scotic attacks was their settlements in Wales and south-west Britain, which afforded protection to the invading forces arriving from Ireland in their hide-covered wicker boats. Argyle may also have served as a point from which to send out piratical expeditions. ‘he Irish Picts or Ultonians who had settled in Galloway, and who with their kinsmen in Ireland were the Gwyddel ffichti of the Welsh, must have also joined in the fray,— their position near the Solway giving them unusual facilities, Conversion of the Scots to Christianity.—In the beginuing of the 4th century there was an organized Christian church in Britain, for there were British bishops at the council of Arles in 314 A.p., one of whom was probably from Wales. At that time the Irish had possession of many places in west and south Britain, and must have come in contact with Christians. These were more numerous and the church better organized in South Wales and south-west Britain, where the Munster or southern Irish were, than in North Wales, held by the Scots proper. Christianity may have therefore found its way into Munster some time in the 4th century. This would

account for the existence of several Christian Scots before St Patrick, such as Pelagius the heresiarch and his disciple Ccelestius, one of whom was certainly a Scot, and Celius Sedulius (in Irish Siadal or Siudal) the Christian poet, who flourished in Italy about the cnd of the 4th and beginning of the 5th century. There is a story of four bishops who, with several priests and anchorites, lived in Munster before the mission of St Patrick, which was credited by such high authorities as Colgan and Ussher, but later inquiries have shown that most if not all these cither were contemporaries of St Patrick or belonged to a later time. But, although it is almost certain that no organized church existed in Ireland before the mission of St Patrick, there may have been several scattered communities in the south of Ireland. This might ee the words of St Prosper of Aquitaine in recording the mission of St Palladius in his chronicle for the year 431 :—" Palladius was ordained by Pope Celestine and sent as first bishop to the Scots believing in Christ." This mission arose out of tle visit of St Germanus of Auxerre to Britain. According to Constantius of Lyons, the contemporary and biographer of Germanus, the British bishops, alarmed at tlie rapid progress of Pelagianism in Britain, sought the aid of the Gaulish Church ; a numerous synod summoned for the occasion commissioned Germanus and Lupus to go to Britain, which they accordingly did in 429, according to the usual reckoning. Prosper of Aquitaine on the other hand attributes the mission of Germanus to the pope, and makes no mention of the action of the Gaulish bishops; but he adds that it was done through the action of the deacon Palladius. There is nothing inconsistent in the two accounts, for the acts of the council were probably sent to the pope by a special messenger, who was Palladius. 'The latter was probably a Briton, but of the Gaulish family of the Palladii. Ammianus Marcellinus mentions a Palladius holding high office in Britain in the middle of the 4th century. Palladius was probably the envoy of the British bishops both to Gaul and to the pope. If he was a Briton, he would naturally have been anxious for the conversion of the Irish as the most effectual way of stopping the Scotic incursions, and was therefore a fitting person to be selected for sucli a mission. Our information about Palladius is derived from the various lives of St Patrick, of which seven have been printed by Colgan. The earliest of these are the two in the Book of Armagh, a MS. of about the

year 800 a.p.; one is by Murchi Maccumachtein, the latter part of the name being the equivalent of the "son of Cogitosus," and was compiled at the suggestion of Aed, bishop of Sletty, who died about the year 698; and the other is known as the Annotations of Tirechan. According

to Murchw's account, Palladius failed in his mission, and on his way back died in the country of the Britons. Tirechan says that Palladius, who was also known by the name Patricius, suffered martyrdom among theScots. The second life in Colgan's collection and the fifth of the same series, which is by Probus, agree with Murcht's, except that they make him die in the country of the Picts. The other lives give more details, as is usual in all the later acts of saints. 'The general statement that he died in Pictland is changed into the special one that he went to Mearnes and died, or, as some say, was martyred in Mag Gerginn at a place called Fordun in the east of Scotland. This of course is alate invention, and may have arisen from a confusion of the names of places in Ireland with similar ones in Britain. There was a Pictland in Ireland, namely, Dal-Araide, and, as we learn from the story of a prince Cano, a place named from a certain Gergind (genitive form) somewhere in it. This may be the place referred to. There was also the Pictland of Galloway, which would be on his way from the north of Ireland to the Roman Britons.

The death of Palladius is assumed to have taken place in 431 and the mission of St Patrick to have begun in the following year. Our knowledge of the Irish apostle is, however, so contradictory and unsatisfactory that no reliance can be placed on any dates connected with him. In any case, when we remember tle time and the state of Europe, it is not at all likely that the place of Palladius could be so rapidly supplied as the above dates make out. While there are many lives of the saint, these are rather legendary than historical biographies (see PATRICK). But although there is much obscurity and confusion in the Acts of St Patrick, there cannot be the slightest doubt of his real existence. He was thoroughly acquainted with the people of Ireland, and consequently knew that he should secure the chief in order to

succeed with the clan, and this is what he did. At first the conversion was only apparent, but, although the mass of the people still continued practically pagans, the apostle was enabled to found churches and schools, and educate a priesthood, and thus provide the most effective and certain means of converting the whole people. He was undoubtedly a great missionary, full of zeal but withal prudent, and guided by much good sense. The learned Tillemont, judging Patrick by the writings attributed to him, truly says that he had much of the character of St Paul, and was well read in Scripture. It would be a mistake to suppose that his success was as rapid or as complete as is generally assumed. On the contrary, it is fully apparent that he had much hard work, and ran much danger, that many chiefs refused to hear him, and that much paganism still existed at his death, That this should be so was no doubt an inherent defect of his system; but on the other hand by no other system could so much real work have been done in so short a time, and that too, so far as we can niake out, almost by his own unaided efforts.

The Karly Irish Church.—The church founded by St Patrick was identical in doctrine with the churches of Britain and Gaul, and other branches of the Western Church. There is no evidence that the Pelagian heresy found an entrance there, and least of all is there the slightest foundation for the supposition that it had any connexion with the Eastern Church. Its organization was, however, peculiar ; and, as countries in the tribal state of society are very tenacious of their custonis, the Irish Church preserved these peculiarities for a long time, and carried them into other countries, by which the Irish were brought into direct collision with a different and more advanced church organization. Wherever the Roman law and municipal institutions had been in force, the church society was modelled on the civil one. The bishops

governed ecclesiastical districts coordinate with the civil divisions. In Ireland there were no cities and no municipal institutions ; the nation consisted of gronps of tribes con- nected by kinship and loosely held

together under a graduated system of tribal government. The church which erew up under such a system was organized exactly like the lay society. When a chief became a Christian and bestowed his dun and his lands upon the church, he at the same time transferred all his rights as a chief. But though by his gift the chief divested himself of his rights, these still remained with his sept or clan, though subordinate to the uses of the church; at first all church offices were exclusively confined to members of the sept or of the clan according as the gift emanated from the head of the one or the other. In this new sept or clan there was conse- quently a twofold succession. The religious sept or family consisted, in the first instance, not only of the ecclesiastical persons to whom the gift was made, but of all the Céli, or vassals, tenants, and slaves, connected with the land bestowed. The head was the comarba, that is, the co-heir, or inheritor both of the spiritual and temporal rights and privileges of the founder; he in his temporal capacity exacted rent and tribute like other chiefs, and made war not on temporal chiefs only,—the spectacle of two comarpi making war on each other being not unusual. The ecclesiastical colonies that went forth from a parent family generally remained in subordination to it in the same way that the spreading branches of a secular clan remained in general subordinate to it. The heads of the secondary families were also called the comarpi of the original founder of the religious clan. Thus there were comarpi of Columcille at Hi, Kells, Durrow, Derry, and other places. – The comarba of the chief family of a great spiritual clan was called the ard-comarba or high comarba. The comarba might be a bishop or only an abbot, but in either case all the ecclesiastics of the family were subject to him; in this way it frequently happened that bishops, though their superior functions were recognized, were in subjection to abbots, who were only priests, nay, even to a woman, as in the instance of St Brigit. This singular association of lay and spiritual powers was liable to the abuse of having the whole succession fall into lay hands, as happened to a large extent in later times. This has led to many misconceptions of the true character and dis- cipline of the Irish medizeval church. The temporal chief had his steward who superintended the collection of his rents and tributes; in like manner the comarba of a religious sept had his airchinnech (usually written in Anglo-Irish documents Erenach and Herenach), an office which has

given rise to many erroneous views. The name was supposed to be a corruption of Archidiaconus, but this is not so. The office of airchinnech or steward of church lands was generally but not necessarily hereditary; it embodied in a certain sense the lay succession in the family.

From the beginning the church of St Patrick was monastic, as is proved by a passage in his Confessio, where, speaking of the success of his mission, he says: “The sons of Scots and daughters of chiefs appear now as monks and virgins of Christ, especially one blessed Scottish lady of noble birth and of great beauty who was adult, and whom I baptized.” But the early [rish monasticism was unlike that known at a later period. An Irish ccenobium of the earliest type was simply an ordinary sept or family whose chief had become Christian, and making a gift of his land either retired leaving it in the hands of a comarba, or remained as the religious head himself. The family went on with their usual avocations, but some of the men and women, and in some cases all, practised celibacy, and all joined in fasting and prayer. These communities offer many striking analogies with the Shaker communities of the

United States of America. A severer and more exclusive system of monasticism succeeded this primitive one, but its general character never entirely changed.

As all notions of diocesan jurisdiction as understood in countries under Roman law were unknown, there was not that limitation of the number of bishops which territorial jurisdiction renders necessary, and consequently bishops were very numerous. If we were to believe some of the legends of the early church, the bishops were nearly as numerous as the priests. St Mochta, abbot of Lugmad, or Louth, and said to have been a disciple of St Patrick, had one hundred bishops in his monastic family. All the bishops in a ccenobium were, as we have said above, sub- ject to the abbot. Besides the bishops in the monastic families, every tuath or tribe had its own bishop. The church in Ireland having been evolved out of the monastic nuclei above described, the tribe-

bishop was an episcopal development of a somewhat later period. He was an important personage, having a right to the same retinue as the ri or chief, and though we cannot define exactly the character of his jurisdiction, which extended over the tuath, his power was considerable, as we can judge by the con- flicts which took place between them and the kings on that fertile source of dissension, the right of sanctuary. The tuath bishop corresponded to the diocesan bishop as closely as it was possible in two systems so different as tribal and municipal government. When diocesan juris- diction grew up in Ireland in the 12th and subsequent centuries, the tuath became a diocese. Many of the old dioceses represent ancient tuatha, and even enlarged modern dioceses coincide with the territories of ancient clans. Thus the diocese of Kilmacduagh (Cell-Macc-n Duach) was the territory of the Hui Fiachrach Aidhne; that of Kilfenora (Cell Find abrach) was the tribe-land of Corco Modruaidh or Corcomroe. Many deaneries also represent tribe territories ; thus the deanery of Musgrylin in the county Cork was the ancient Muscraige Mitaine, and no doubt had its tribe-bishop in ancient times. It should be added that bishops without dioceses and monastic bishops were not unknown elsewhere in the church in early times, but had disappeared with very rare exceptions in the 6th century, when the Irish reintroduced the monastic bishops and the monastic church into Britain and the Continent.

In the 8th and 9th centuries, when the great emigration of Trish scholars and ecclesiastics took place, the number of wandering bishops without dioceses became a reproach to the Irish Church ; and there can be no doubt that it led to much inconvenience and abuse, and was subversive of the stricter discipline that the popes had succeeded in establishing in the Western Church. They were also accused of ordaining serfs without the consent of their lord, consecrating bishops per saltwm, that is, making persons bishops who had not previously received the orders of priests, and of permitting bishops to be consecrated by a single bishop. The latter could hardly be a reproach to the Irish Church, as the practice was never held to be invalid ; and, besides, the Nicene canons of discipline were perhaps not known in Ireland until comparatively late times. The isolated position of Ireland,

and the existence of tribal organization in full vigour, explain fully the anomalies of Irish discipline, many of which were also survivals of the early Christian practices before the com- plete organization of the church.

From the nature of the organization of the Irish Church as established by Saint Patrick, it was to be expected that on his death the bond between the numerous church families which his great authority supplied would be greatly relaxed. The Druidic orders too, which there is reason to believe remained still to a large extent pagan, and undoubtedly practised many of their arts even in the 7th century,

must have regained much of their old power. A tradition exists that at the instance of St Patrick the laws were purified by a commission of which he himself was a member, and collected into a body called the Senchas Mor. Nevertheless the pagan marriage customs were practised long after St Patrick's time. Sir Henry 8. Maine has well observed that the Christian church did not succeed in substituting its ideas of morality and the canon law for the old natural customs of the Celts, Germans, and Slavs so easily or at so early a period as is usually assumed. It is known, for instance, that traces of sister-marriage still lingered among the south Germans of Bavaria in the 7th century. The transition period which follows the loosening of the faith of a people in its old religion, and before the authority of the new is universally accepted, is always a time of confusion and relaxation of morals, Such a period appears to have followed in the first half of the 6th century the fervour of St Patrick's time. Another cause, too, powerfully helped to produce and foster disorder. We have seen that from the 2d century, if not earlier, to the middle of the 5th century, the Irish youth betook them- selves to piracy, and, like the later Scandinavian vikings, ravaged the coasts of Britain, and perhaps North Gaul, and made permanent settlements in the former. Christianity weakened the warlike and adventurous spirit of the Scots, and led to their expulsion from Wales about the end of the 5th century. The energy which the fierce Scotic

youth expended in plundering expeditions when not engaged in intertribal feuds, having no outlet, helped, with the causes just stated, to produce internal disorders and relaxation of morals, This period of reaction after warlike and religious excitement has been magnified into an entire corruption of faith and morals, for which, however, there is no real evidence, and which is incompatible with subsequent events. That the survival of the Druids under the name of the grades or orders of Ecna and Filidecht, which we may describe conventionally as bards, had much to do with the state of disorder we are discussing, is proved by the pro- posal of the king Aed, son of Ainmire, to get rid of them on account of their numbers and unreasonable and exorbitant demands. St Columcille, however, advocated a reform of the body, a diminution of their number, and the curtailment of their privileges ; these proposals were adopted at the convention of Druimceta in the north of Treland, called together for this among other purposes. The encroachments of the Saxons which forced the Cymri of the north into Wales, and the consequent driv- ing out of the Irish from their possessions in Wales and south-west Britain, and the desolation and anarchy of the whole country, appear to have caused many British ecclesiastics to seek a refuge in Ireland, among whom was Gildas, who is said to have been invited over by King Ainmire. But, whether as an invited guest or as a refugee, Gildas certainly helped to reform the Irish Church, at least of Leth Cuind, or Cond's Half. The chief reform due to the influence of Gildas and the British Church seems to have been that effected in the monastic life, or rather we should say the introduction of monastic life in the strict sense of the word, that is, of communities entirely separated from the laity, with complete separation of the sexes. To this reformed church of the second half of the 6th century and early part of the 7th belong Columcille, Comgall, and many other saints of renown, who established the schools from which went forth the missionaries and scholars who made the name of Scot and of Ireland so well known throughout Europe. During this period the energy of the youth of Ireland seems to have concentrated itself on religious asceticism and missionary work. St Columcille converted the Picts, and from his monastery of Hi went forth the illustrious Aed4n to plant another Iona at XIII. — 32

Lindisfarne, which, as Mr Hill Burton, the historian of Scotland, says, “long after the poor parent brotherhood had fallen to decay, expanded itself into the bishopric of Durham, or as some will have it the archbishopric of York itself ; for of all the Christian missions to England that of Aidan seems to have taken the firmest root.”! This was also the period of the great missionaries of the Continent, Columbanus, Gall, Killian, and many others. Nor had the old daring on the sea, which distinguished the Scotic adventurers who had ravaged the coasts of Britain, and which still characterizes the Celtic fishermen of the west of Scotland, the Isle of Man, Cornwall, and Brittany, and the colony of Newfoundland, died out among the Gael of South Munster, for besides St Brendan, whose voyages have given rise to a widespread myth, there was another navigator, Cormac, a disciple of St Columcille, who visited the Orkneys, and discovered the Faroe Islands and Iceland, long before the Northmen set foot on them. Other Irish- men seeking remote places to lead there the lives of anchorites followed in their tracks, and when the Northmen first discovered Iceland they found there books and other traces of the Irish of the early church.

The peculiarities which, owing to Ireland’s isolation, had survived were, as we’ have said, brought into prominence when the Irish missionaries came into contact with Roman ecclesiastics. Those peculiarities, though only survivals of customs once general in the Christian church, shocked the ecclesiastics of the Roman school accustomed to the order and discipline which were everywhere being introduced into the Western Church. On the Easter question especially a contest arose which waxed hottest in England, and as the Irish monks stubbornly adhered to their tradi- tions they were vehemently attacked by their opponents. This controversy occupies much space in the history of the Western Church, and led to an unequal struggle between the Roman and Scotic clergy in Scotland, England, the east of France, Switzerland, and a considerable part of Germany, which naturally ended in the Irish system giving way before the Roman. The monasteries following the Irish rule were supplanted by or converted into Benedictine ones. Owing to this struggle the real work of the early

Irish missionaries in converting the pagans of Britain and central Europe, and sowing the seeds of culture there, has been overlooked when not wilfully misrepresented. Thus, while the real work of the conversion of the pagan Germans was the work of Irishmen, Winifred or, as he is better known, St Boniface, a man of great political ability, reaped the field they had sown, and is called the apostle of Germany, though it is very doubtful if he ever preached to the heathen. The southern Irish, who had been more in contact with the South British and Gauls, were the first to accept the Roman method of reckoning Easter, which they did in 633 a.p. In the north of Ireland, which was in connexion with the Columban church, it was adopted fully only on the community of Iona yielding in 716, one hundred and fifty years after the commence- ment of the controversy, while Wales only conformed, according to the Welsh annals, in 768.

The Dynasty of the Hut Néill.—Niall of the Nine Hostages had many sons, of whom cight became stem-fathers of important clans. Four—Loegaire, Conall Crimthand, Fiacc, and Maine—settled in Meath and adjoining territories, and their posterity were called the southern Hui or Hy Néill. The other four—KHogan, Enna Find, Cairpre, and Conall Gulban—like the three Collas before mentioned, went into Ulster and made sword-land of a large part of it. Their descendants were the northern Hui Néill. The territory of Hogan was known as Tir Eogain, which has survived in the county of Tyrone ; that of Conall Gulban was called Tir Conaill (Tyr Connell) corresponding nearly to the present county of Donegal. The pos-

terity of Eogan were the O'Neills and their numerous kindred septs ; the posterity of Conall Gulban were the O'Douncllls and their

1 History of Scotland, i. 333.

kindred septs. Locgaire the son of Niall was succeeded by Ailill Molt, the son of Niall's predecessor Dathi. After a reign of twenty years (463-

483) he was slain in the battle of Ocha by Lugaid, son of Loegaire. This battle marks an epoch in Irish history, for it made the posterity of Niall the dominant race in Ireland for five hundred years, during which the Hui Néill held the kingship with- out a break. ‘The power of the Hui Néill over Munster, or indeed over any part of Mug’s Half, which included Leinster, was, however, often only nominal. At this period the king of the southern half of Ireland was Oengus son of Natfraech, who is said to have been baptized by St Patrick. Whatever may have been the character of Oengus’s religious belief, his wife Ethne “ the Terrible’ was a pagan. She was the daughter of a Druid, and nsed Druidical in- cantations in the battle in which she was slain with her husband. Yet this was the age of St Brigit, St Ailbe, and other saints, who were then laying the foundation of that monasticism which in the following centuries absorbed the intellect and the energy of the nation.

The first king of the southern Hui Néill was Diarmait, son of Fergus Mac Cerbaill (538-558). He uudoubtedly professed Chris- tianity, but still clung to many pagan practices, such as a plurality of wives and the use of Druidical incantations in battle. He as with the church about the right of sanctuary, with

isastrous results for the country. The king held an assembly (feis or fess) of the kings and princes of Ireland at Tara in 554, at which Curnan, son of the king of Connaught, slew a nobleman. By ancient usage homicide and certain other offences committed at such assemblies were punishable with death without the privilege of compounding for the crime. Curnan, knowing his fate, fled for sanctuary to Columcille ; but Diarmait pursued him, and, dis- regarding the opposition of the saint, seized Curnan and hanged him. The kinsmen of Columcille, the northern Hui Néill, took up his quarrel, and attacked and defeated the king in a battle in 555. It is probable that the part taken by Columcille in this affair had much to do with his leaving Ireland for his great mission to the Picts two years after. So ardent, energetic, and imperious a spirit must have chafed at any impediment in the way of his work, and, as many of his establishments were under the king’s hand, he must have decided to seek another field. This was not the only quarrel about the right of sanctuary which

Diarmait had with the church. The chief of Hui Maine, having slaiu the herald of the king, took sanctuary with St Ruadan of Lothra in Lower Ormond. Diarmait, despite the remonstrances of St Ruadan, seized him by force. The saint, accompanied by St Brendan of Birr, followed the king to Tara, and solemnly cursed it. After the death of Diarmait, who was slain in 558, Tara was deserted, and no assembly was again held there. Subsequent kings resided at their hereditary duns-—the northern Hui Néill at Ailech, near Derry, those of the southern branch in Westmeath. The desertion of Tara was one of the chief causcs which disintegrated the Irish nation, in which the idea of a central government had taken firm root, and might under favourable circumstances have acquired suf- ficient force to evolve a higher political state out of the tribal system.

The reign of Aed, son of Ainmire, of the race of Conall Gulban of the northern Hui Néill (572-599), marks another important epoch in Irish history. The jiJéd, whom we shall conventionally call bards, and who were part of the transformed Druidic order, had increased in number to such an extent that they are said to have iucluded one-third of the freemen. An ollam fili, the highest grade of the order, was entitled to a large retinue of pupils, with their horses and dogs, with free quarters wherever he went. There was thus quite an army of impudent swaggering idlers roaming about the country and quartering themselves on the chiefs and nobles during the winter and spring, story-telling, and lampooning those who dared to refuse, or cven to hesitate, to comply with their demands. Aed determined to banish them from Ireland ; and, as this could only be done with the consent and cooperation of all the kings and chiefs, he summoned a convention (fets or fess), such as formerly met at Tara, to assemble at Druimceta, in the north of Ireland. 'The political geography of the country at the time may be understood from the princes who attended. Besides Aed him- self, the " Ard Ri" or over-king, there came there the over-king of Munster, the king of West Munster or Desmond, the king of Leinster, the king of Ossory, the chiefs of which had then begun to acquire that power and independence which gave them promi- nence in the Dano-Irish wars, the kings of the three principalities into which Connaught was then divided, the chief of the Cinel Eogain branch of the northern

Hui Néill (Aed, the over-king, re- presented the Tir Conaill branch), two kings of the Airgéill, the king of Dal-Araide, the representative of the once powerful kings of the Ulaid, before the conquests of the Scots, and Aedan, son of Gabran king of the Dalriata of Alba. Two other causes were also to be discussed at the assembly, one of which is of considerable his- toric interest, namely, Aed's proposal to impose a tribute payable to the over-king upon the Dalriadic kingdom in Alba, which had hitherto paid no rent, though bound to assist the Irish king in his

wars both by soa and laud, and to pay him érics or blood fines. In other words, Aed proposed to make the Dalriadic colony an integral part of the Irish kingdom. St Columcille came thither from his island home attended by a large retinue of monks, many of whom were bishops, to plead the cause of the bards and of his kinsman Aedan. His influence seems to have becn decisive ; the bards were not banished, but were reformed, and the Dalriadic colony was made independent. The decision about the bards was no doubt a reasonable compromise at the time. The schools which the re- formed order were obliged to keep mainly contributed to make Ire- land a refuge of learning in the 7th and 8th centuries, and created a native literature, such as it was, several centuries before those of the other barbarian nations of Europe. But, on the other hand, professional poets, whose duty it was to sound the praises of chiefs and clans in rhymes of the most complex and artificial metres and inflated language could not produce a really healthy vigorous litera- ture. Soinc notion of what that literature might have been if pro- duced in the favourable atmosphere of a growing political and social life may perhaps be formed from works, written it is true in Latin, but yet the genuine outcome of Irish culture, such as those of St Columbanus ; the poems of Hibernicus exul, as the unknown exile is called who wrote in the second half of the 8th century the earliest epic of the Middle Ages!; the poems of Sedulius Scotus, now brought to light more fully ; Adamnan's life of St Columba, or Columcille, which Pinkerton considered to be "the most complete piece of such biography that all Europe can boast of, not only at so early a

period, but even through the whole Middle Ages"; and above alt the writings of John Scotus Erigena, undoubtedly the greatest philosopher of the Middle Ages. We are, however, now in a better position to judge of the injurious action of the bardic institution as a whole. Scveral causes—among others, geogra- phical position—helped to arrest the political and social growth of the Irish people, and crystallize their culture in the tribal stage, but the most powerful of those causes was the existence of the or- ganized professions of the sede, who kept up elaborate systems of pedigrees, and of the filid or bards, whose business it was to flatter the vanity of their patrons and pander to their vices. These kept the clan spirit alive, shut out the influx of new opinions, and sieve the growth of national political ideas. The ephemeral lustre of the Irish medieval schools could never compensate for such losses.

The intensity of the tribal spirit even among churchmen is illus- trated by an event which took place in the reign of Domnall, son of Aed (628-642). St Carthach, or as he was also called St Mochuda, a West Munster man, wandered into what is now the King's county, and built a monastery at Raithin, now Rahin, near Tullamore. The clergy of Leth Cuind—that is, of the Hui Néill—were jealous of the intrusion of the Munster monk into their territory, and accordingly insisted ou Mochuda's expulsion, who sought a refuge among the Dési in Munster, and there founded the monastery of Less Mor, now Lismore, in Waterford, which became a famous school. Another event of this reign, of great importance, was the battle of Mag Rath, now Moira, in the county Down. Congal Claen, the king of Dal-Araide, who had been in exile, invaded Ireland with an army of foreign adventurers, and aided by Domnall Bree, king of the Albanian Scots, endeavoured to recover the ancient supremacy of the Rudrician race, or Ulaid, but was signally de- feated. This wanton attack of Domnall Brec weakened the power of the Scots in Alba for a long time, and thus influenced largely the course of events in North Britain.

Joint kingship was one of the most curious features of the Irish system ; it frequently occurred in the course of the Hui Néill rule. The reign of the joint kings Diarmait and Blathmac of the northern Hui Neill (658-665) is interesting on account of the glimpse which Bede gives us of

Irish society in the 7th century. After mention- ing the sudden appearance of a great pestilence which depopulated the southern coasts of Britain, and afterwards extended into the province of the Northumbrians, Bede adds (Hecl. Hist., iii. 26), “ This pestilence did no less harm in the island of Ireland. Many of the nobility and of the lower ranks of the English nation were there at that time, who in the days of the bishops Finan and Colman, forsaking their native island, retired thither, either for the sake of divine studies or of a more continent life ; and some of them presently devoted themselves to a monastical life, others chose rather to apply themselves to study, going about from one master’s cell to another. The Scots willingly received them all, and took care to supply them with food, as also to furnish them with books to read and their teaching gratis.” Later on in the same century (681) the cow-tribute or borotm of Leinster was abolished at the instance of St Moling by the over-king Finnachta; and at the end of it (697) St Adamnan, abbot of Hi, who had come to Ireland in connexion with the still unsettled question of the time of keeping Easter, succeeded in excmpting women from military service. The necessity for such a law, which has been called from its author the Cain Adamnain, shows how little affected the tribal system of Ireland was by Roman civilization, even at this period. In the

1 « Hibernici exulis versus ad Karolum imperatorem,” in Mai, Classicorum Auctorum e Vaticanis Codd. editorum, y. 405 sq.

reign of the over-king Aed Alaind (733-7 42), an attempt scems to have been made for the first time to create a national church organi- zation. King Aed and his rival, the king of Munster, Cathal, entered into an agreement regulating the tribute due to the church according to the rules and customs of the see of Armagh, Some time elapsed, however, before the regulation was generally accepted over the whole of Ireland. In the year 803 the over-king Aed Ordnigthe mustered an army composed of “ both laity and clergy,” but the latter complained of the hardship of being foreed to take part in warlike expeditions. King Aed

agreed to abide by the advice of a learned priest called Fothud of the Canons, who re- commended the exemption of the clergy from the obligation of fighting. This law was called the Cain Patraicc or law of Patrick, probably from having been obtained by the comarbaor successor of St Patrick, that is, the archbishop of Armagh at the time. The exemption may have, however, formed part of the regulations, called also Cain Patraicc, which formed the subject of the agree- ment between Aed Alaind and Cathal above referred to.

Invasions of the Northmen.—The first incursion of the Northmen took place in 795 a.p., when they plundered and burnt the church of Rechrann, now Lambey, an island north of Dublin Bay. When this event occurred, the power of the over-king had become a shadow ; the provincial kingdoms had split up into more or less in- dcpendent principalities, almost constantly at war with cach other. Even Mag Breg, which was only part of Meath, was able to rebel against the chief of the latter. 'The oscillation of the centre of power between Meath and Derry, according as the over-king was of the southern or northern Hui Néill, which followed the desertion of Tara, produced corresponding perturbations in the balance of parties among the minor kings. 'The army consisted of a number of clans, each commanded by its own chief, and acting as so many independent units without cohesion. The clansmen owed fealty only to their chiefs, who in turn owed a kind of conditional allegiauce to the over-king, depending a good deal upon the ability of the latter to enforce it. A chicf might through pique, or from other causes, withdraw his clan even on the eve of a battle, without such defce- tion being deemed dishonourable. What the clan was to the nation or the province, the fine or sept was to the clan itself. The chief- tains or heads of septs had a voice, not only in the question of war or peace, for that was determined by the whole clan, but in all sub- sequent operations. However brave the individual soldiers of such an army might be, the army itself was unreliable against a well organized and disciplined enemy. Again, such clan armics were only levies gathered together for a few weeks at most, unprovided with military stores or the means of transport, and consequently generally unprepared to attack fortifications of any kind, and liable to melt away as quickly as they were gathered together. Admirably adapted for a

sudden attack, such an army was wholly unfit to carry on a regular campaign or take advantage of a victory. These defects of the Irish military system were abundantly shown through- out the Dano-Irish wars, and also in Anglo-Norman times.

The first invaders were Norwegians, who sought only plunder and captives. They confined thcir attacks to the sea-coast, or placcs at easy distances from it. After some time they erected rude earthen or stockaded forts, which served as magazines and places of retreat. Some served a temporary purpose, while others became in time trading stations, or grew into towns. During the first half of the 9th century the attacks were incessant upon almost every part of the coast. The small bodies who came at first having met with considerable resistance, large fleets commanded by powerful vikings followed. Their well-armed crews—the principal men at least being mail-clad—were able to penetrate into the country, and even to put fleets of boats upon the lakes. An Irish work on the invasions of the Northmen gives an account of one of those vikings named Turges or Turgesius, of whose cruelties any stories are told. Gir- aldus Cambrensis and the monk Jocelin repeated these stories, —the Irish book being, however, the original source from which the stories came. But Cambrensis goes beyond his source, and makes Turgesius king of Ireland. The Norse saga and chronicles make no mention of Turges, and niuch speculation has been indulged in as to the Norse equivalent of thename. It has been suggested that he was Thorgils, son of Harold Fair Hair, but this is an anachron- ism. According to another view, he was the shadowy king Ragnar Lodbrok or "Hairy Breeches," but this, besides being also an anachronism, is mere groundless guesswork. Dr Todd has sug- gested that the Celtic form Turges represents the Norse Trygve, but is more likely Thorgcir. The actual story of Turges is a fable, which has grown up by the fusion of the stories of several vikings of the name, helped out by some invention. That there were at least two of the name is proved by an elegy on the death of Eignechan, prince of Tir Conaill, who died about 902, written by Fland Mac Lonain, a poet who lived within fifty years of the supposed histori- cal chief. The poet tells a curious story of three vikings, one of whom was Turgeis and another Tor, who were married to three daughters of the prince. The Turges of history is

supposed to have come to Ireland in 815, and to have been made prisoner and drowned by Maelsechlainn, or Malachy, the first king of the name

in 845. Garmmundus, another king of Ireland spoken of by Cambrensis and Jocelin, is most probably the mythical Garman or Carman of prehistoric times, a view which bears out a sagacious remark of Worsaae, that the Irish accounts of the Northmen frequently bear the stamp of being derived from carly poetical legends.

But, cven admitting that the story of Turges is a fable, the vik- ing inroads in the first half of the 9th century inflicted untold woes ou the country, one of the greatest being the breaking up of the Irish schools, just when they were at their best. Those who escaped fled to other countries ; among these we may assume were Sedulius Scotus and John Scotus Erigena. But, whatever may have been the cruelty of the vikings, the work of disorder and ruin was not all theirs. 'The condition of the country afforded full scope for the jealousy, hatred, cupidity, and vanity which characterize the tribal stage of political society. Fedlimid, king of Munster and archbishop of Cashel, took the opportunity of the misfortunes of the country to revive the claims of the Munster dynasty to be kings of Ireland. 'Io enforce this claim he ravaged and plundered a large part of the country, took hostages from Niall Caille, the over-king (833-845), drove out the comarba of St Patrick, or. archbishop of Armagh, and for a whole year occupied his place as bishop. On his return he plundered the termon lands of Clonmacnoise "up to the church door,"—an exploit he repeated the following year. There is no mention of his having helped to drive out the foreigners. It is indeed possible that much of the devastation attributed to Turges may havo been the work of Fedlimid, yet he is praised by the bards and annalists.

About 852 the Dub-gaill or black foreigners, that is, the Danes as distinguished from the Find-gaill or fair foreigners or Nor- wegians, arrived. They quarrclled with each other at first, but ultimately made common cause. The Scandinavians at this time had effected permanent settlements, and trade had brought the natives and foreigners into

friendly contact and intermarriage. Much intermingling of blood had already taken place in conse- quence of the number of captive women who had been carried away by the invaders. A mixed race grew up, recruited by many Irish of pure blood, whom a love of adventure and a lawless spirit led away. This heterogeneous population were called Gallgéedel or forcign Irish, and like their northern kinsmen betook themselves to the sea and practised piracy, and so were known to the Northmen as Vikingr Scotar. The Christian element in this mixed society soon lapsed to a large extent, if not entirely, into paganism. The Scandinavian scttlements were almost wholly confined to the sea- port. towns, and, except Dublin, included none of the surround- ing territory. Owing to its position, and the character of the country about it, especially the coast land to the north of the Liffey, which formed a kind of border land between the territories of the kings of Meath and Leinster, a considerable tract passed into the possession of so powerful a city as Dublin. We have evidence of this occupation in the topographical nomenclature of the district, while there are very few traces to be found elsewhere. The social and political condition of Ireland, and the pastoral occupation of the inhabitants, were unfavourable to the development of foreign commerce, and the absence of coined money among them shows that it did not exist. The foreign articles of dress or ornament they required appear to have been brought to the great oenachs or fairs held periodically in various parts of the country. A flourishing commerce soon grew up in the Scandinavian towns—Dublin, Waterford, Limerick, &c.; mints were established there, and many foreign traders—Flemings, Italians, and others—settled there. It was through these Scandinavian trading communities that Ireland came into contact with the rest of Europe in the 11th and 12th cen- turies, of which the present forms of the names of three of the Irish provinces affords evidence. They are formed from the Irish names by the addition of the ending sta¥r, ster. The settlers in the Scandinavian towns soon came to be looked upon by the native Irish as so many septs of aclan added to the system of petty states form- ing the Irish political system. They soon mixed themselves up in the domestic quarrels of neighbouring tribes, at first selling their protection, a method largely followed afterwards by the Anglo-Normans, but afterwards as vassals, sometimes as allies, like the septs

and clans of the Goedcl aniong themselves. The latter in turn acted in similar capacities with the powerful Dano-Irish chiefs, Irish clans often forming part of the Scandinavian armies in Britain. This intercouse led to frequent intermarriage between the chiefs and nobility of the two peoples. One of the earliest and most interest- ing examples of this is the case of Cerball, king of Osraige or Ossory, from about 858 to 887 or 888. Eyvindr, surnamed Aust- inadr, "the east-man," 1 son of Bjorn, agreed to defend Cerball's territory, which from its position stood much in need of it, on condi- tion of getting his daughter Raforta in marriage. Among the chil- dren of this marriage were Helgi Magri, or "the Lean," one of the early settlers in Iceland, and Thurida, wife of Thorstein " the Red," gon of the celebrated Olaf, "the White," king of Dublin. Three other

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1 In Anglo-Norman times the Dano-Irish of Dublin and other cities are always called Ostmen (Aust-menn) or East Men; hence the name Ostmanstown, now Oxmanstown, a part of the city of Dublin.

daughters of Cerball married foreigners: Gormflaith, called in Norse Kormls®, married Griinolf, who also settled in Iceland ; Fridgerda, married Thoris Hyrna; and Ethne or Edna, married Hlé%ver, whose son was Karl Sigurd Digri ("'the Fat"). Cerball's sou Domnall, in Norse Dufnialr, was the founder of an Icelandic family; while the names Raudi and Baugr, the son and grandson of another son of Cerball, Cellach, in Norse Kjallakr, show how com- pletely Norse they had become, Many others of the Icelandic settlers were Irish of pure or mixed blood, such as Thormdér, Ketil Bufa, &c. Among the descendants of Reginald (Rognvald) of Waterford we find such distinctly Irish names as Gillepatraicc, and Donddubhan or Donavan. This intimate conncxion of the two peoples explains the occurrence among the Icelanders and Nor- wegians of Konall, Kjaran, Njall, Kormakr, Brigit, KaSlin, and many other Celtic names.

After the arrival of the Dubgaill or Danes about 851, there was a severe struggle between them and the Norwegians, but all ulti- mately acknowledged Olaf "the White" (the Olafr hinn Hvite of the Norse saga and the Amhlaebh of the Irish) as king. The over- king of Ireland at this time was Maelsechlainn, or Malachy, the first of the name, a brave soldier who had reduced the Scandinavian possessions in Ircland previous to the coming of Olaf to a few strong- holds on the sea; but owing to the character of the Irish armies, which has been dwelt upon above, he was unable to retain the forts he took (among them Dublin). After Olaf came lvar " Beinlauss," '*the Boneless," who was afterwards king of the Northumbrians, a circumstance which accounts for the close connexion which after- wards subsisted between the Northumbrian dynasty and the Danish kings of Dublin. On the death of Ivar, Cerball, king of Ossory— the Cerball above mentioned—an Irishman of Goidelic blood, suc- ceeded him, and was acknowledged as Danish king of Dublin until his death in 888. Cerball in alliance with another Ivar made his neighbours feel his power, and practically made Ossory independent. It is curious that, while the Irish annals do not recognize Cerball as king of Dublin, Kjarvalr of Dyflin is enumerated among the principal sovereigns of Europe in the Icelandic Landnéma- bék. From about the beginning of the reign of Cerball to about 915, corre- sponding to the reigns of the over-kings Aed Find Liath and Fland Sinna (nephew of Cerball), there were no fresh invasions of the Danes or Northmen. During this period Ireland enjoyed compara- tive rest, and was regarded elsewhere as a place of comparative safety, notwithstanding the many feuds between the Trish clans in which the Dano-Irish shared, including the campaigns of Cormac, son of Cuilennan, king-bishop of Cashel. After this forty years' rest the invasions recommenced. Niall Glundub (" Blackknee"'), who became over-king in 910, gallantly opposed the invaders, and attempted to get possession of Dublin, but was defeated with great slaughter in the battle of Kilmashoge (Cell-Mosamhog) near Dublin in 919, and himself and twelve chiefs slain. From this time until Maelsechlainn, son of Domnall, or Malachy II. became over-king of Ireland in 980, the country was plundered and desolated by natives and foreigners alike. The most prominent figures of this period were Muircertach, son of Niall " Bluckknee," commonly known as Muircertach "of the Leather

Cloaks," Cellachan or Callaghan of Cashel, and Olaf Ciaran. Muircertach Mac Neill was the most formidable opponent the Scandinavians had yet met. In his famous circuit of Ireland he took all the provincial kings, as well as the Danish king of Dublin, as hostages, and, after keeping them for some time at Ailech, he handed them over to the titular king of Ireland, the weak and inefficient Domnall, showing that his loyalty was greater than hisambition. Callaghan of Cashel, thougli the hero of a late romance, had in reality no claim to fame. Olaf Ciaran, or Olaf "of the Sandal," was the son of Sigtryggr, or Sitric, who was king of Dublin about 917. Sigtryggr was expelled from Dublin (about 920), and went to England, where he took advantage of the death of Rognvald (about 924) to make himself king of the Scandinavian kingdom of Northumbria. On the accession of Athelstan he went to Tamiworth (926) and made homage to him, and married Athelstan's sister, but died the following year. Athelstan then expelled his sons Olaf and Guérodr or Gudred. This Olaf appears to have been the one who married the daughter of Constantine, king of Scotland, and with another Olaf, son of the cruel Gudred, king of Dublin, who went away from that city in 834, took part in Constantine's wars with Athelstan, ending in the bloody battle of Brunanburgh (938 4.D.). Olaf, son of GuGred, returned to Ireland, but on the death of Athelstan becameking of the Northumbrian king- dom, and on becoming a Christian was acknowledged by Eadmund. Olaf Ciaran, who appears to have been also baptized (844), suc- ceeded to the Northumbrian kingdom for a short time in the reign of Eadred, on the expulsion of Eric Bloody Axe, but on being in turn expelled he appears to have gone to Ireland, where he became king of Dublin, and apparently of Man and the Isles. The Isle of Man belonged to the Goidelic kingdom of Ireland in early times, and was conquered in 588 by Aidan, son of Gabran, king of the Scotic kingdom of Alba, and passed away from the Irish connexion after the convention of Druimceta. During the independence of the Dano-Irish kingdom of Dublin it seems to have formed part of it,

Olaf Ciaran slew Congalach, king of Ireland, in 956. In 973 Domnall, the son of this Congalach, in alliance with Olaf, defeated Domnall O'Neill, king of Ireland, at Cell Mona (Kilmoon near Dun- Shaughlin, county Meath). Domnall O'Neill was the son of "Leather Cloaks," son of King Niall, from whoin he took the sur- name O'Neill, that is, grandson of Niall, and was the first who used it. The tanists or heirs of the northern and southern Hui Néill having died, the throne fell to Maelsechlainn or Malachy II. of the Clann Colmain, the last of the Hui Néill who was undisputed king of Ireland. Malachy, who became king in 980, had already distin- guished himself as king of Meath in war with the Dano-Irish. In the first year of his reign as over-king, he defeated them in a bloody battle at Tara, in which fell Rognvald, son of Olaf Cuaran. This victory, won over the combined forces of the Scandinavians of Dublin, Man, and the Isles, compelled Olaf to deliver up all his captives and hostages, among whom were Domnall Claen, king of Leinster, and several notables, to forego the tribute which he "had imposed upon the southern Hui Néill, and to pay a large contribu- tion of cattle and money. Olaf's spirit was so broken by this defeat that he went on a pilgrimage to Hi, where he died the same year. The Dal-Cais Dynasty. —Like the Hui Néill, the rival family of Ailill Olum of Munster had split into two branches. The descend- ants of Ailill's son Eogan were called the Eoganacht or Eugenians, and those of his son Cormac Cas the Dal-Cais. Ailill is said to have ordained that the succession to the throne of Munster should be alternately in the races of Eogan and Cormac Cas. This rule was observed with tolerable regularity for some generations, like the corresponding alternation between the northern and southern Hui Néill. The Eugenian clans, however, being the more powerful, suc- ceeded in excluding to a great extent the rival race from the throne. The Dal-Cais, who were seated in North Munster, had necessarily to bear the brunt of the attacks upon Munster, which impoverished and weakened them. A few of them succeeded, however, in assert- ing their claims to the throne, among whom were Cenneidig or Kennedy (in 954), and his sons Mathgamain or Mahon (slain 976), aud Brian, surnamed Boruma, who reigned from 976 to 1002, when he became over-king. Properly speaking, the Dal-Cais derived their name not directly from Cormac Cas but from Cas MacTail, king of Thomond, one of his descendants. The grandson, of'

this Cas, Carthann Find, was the first Christian chieftain of the race. The family was seated near Bel na Boruma or the Pass of the Cow-Tribute, and Ath na Borumaor Ford of the Tribute, which suggests that the Dal-Cais were in the habit of " lifting" preys of cattle. It was most probably from this arsed that Brian was called Boruma, and not, as is usually assumed, from having reimposed the ancient cow-tribute upon Leinster. Kennedy and his sons offered a stubborn resistance tothe Dano-Northmen. While king of Thomond, Mahon after a harassing warfare made a truce with the latter, but Brian roused the whole people to war. Mahon crossed the Shannon, and got possession of Cashel on the death of the Eugenian king of Munster, Dunchad. Ivar, Dano-Norse king of Limerick, in con- junction with Maelmuad, or Molloy, king of Desmond, and Donnaban, king of the Hui Fidgeinte and Hui Cairpri, who were in alliance with Ivar, perhaps even his vassals, determined to carry the war into Thomond, but were met by Mahén at Sulcoit, ncar the site of the present town of Tipperary, and totally defeated. This decisive victory gave the Dal-Cais Limerick, which they sacked and burnt. Mah6n then took hostages of all the chiefs of Munster. Ivar escaped to Britain, but returned after a year with a Lord of the Isles whose name is unknown, but who was called Maccus, son of Harold, probably a misunderstanding of the Irish Mac Arailt, that is, son of Harold. This chieftain had conquered Anglesey, which, however, he was only able to hold for a short time. He was one of the eight kings of Britain who paid homage to Eadgar at Chester in 973, and rowed his boat to and from church. Ivar and MacHarold entrenched themselves at Inis Cathaig, now Scattery Island in the lower Shannon, which they held for three years. In the meantime a conspiracy was formed between Ivar and his son Dubcenn and the two Eoganacht chieftains, Donoban and Maelmuad, before mentioned. Donoban was married to the daughter of a Danish king of Waterford, and his own daughter was married to Ivar of Waterford. Theson of the latter was called Donaban, after his maternal grandfather. The descendants of the Irish prince in the male line were the O'Donovans, those of the Danish prince the O'Donavans. Inis Cathaig, where the Dano-Northmen had entrenched themselves, was attacked in 976 by the Dal-Cais and plundered, and the garrison, including Ivar and his son Dubcenn, slain. According to the Norse saga, MacHarold and his two sons per- ished there, while Ivar

was defeated and put to flight elsewhere. Irish accounts tell us that Ivar's surviving son Harold was recognized as king of the foreigners of Munster, and that he took refuge with Donoban. This Harold was probably not the son of Ivar, but the above mentioned MacHarold, Lord of the Isles. Brian, now the head of the Dal-Cais, invaded the territories of Donoban, took his fort, Cathir Cuain, and slew himself and Harold. He next attacked the other conspirator, Maelmuad, who by the death of Mahon had become king of Munster, and defeated andslew him. By this event

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Brian became undisputed king of Munster. He reduced the Dési, who were in alliance with the Dano-Northmen of Waterford and Limerick, and banished their king. In 984 Brian subdued Ossory, and took hostages from the kings of East and West Leinster, for that province, like the others, had now become divided into two principalities, and thus made himself king of Leth Moga, or "*Mug's Half" of Ireland. Brian then appears to have allied him- self with the Dano-Northmen of Waterford, or made them his vassals, for they seem to have joined him in his invasion of West- meath in 989.

This last exploit of Brian brought him into contact with Malachy, who after his great victory at Tara had gained otlier successes. In 983, in alliance with his half brother Gluniarind or " Iron-Knee," son of his former foe Olaf Cuaran, he defeated Domnall Claen, king of Leinster, whoin he had released from hostageship by his victory at Tara, and who was now in league with Ivar of Waterford. In 985 he slew the chicftains of Connaught, and plundered the country. In 989 he took Dublin, and imposed an annual tribute upon the city. Malachy thought it high time to check Brian, so he invaded Thomond, and defeated the latter. In 992 Brian, who evidently aimed at the over-kingship, invaded Meath, and advanced as far as Loch Ainind (Lough Ennel), at which was one of the residences of the southern Hui Néill, whereupon Malachy invaded Connaught and then compelled Brian to retire. In 996 Malachy advanced into Munster, plundered Nenagh, and defeated

Brian. He next attacked Dublin, and carried off the ring or chain of Tomar! and the sword of '*Carlus," two heirlooms much prized by the Danes of Dublin.

In 998 Brian ascended the Shannon with a large force, intending to attack Connaught. Malachy, who received no support froin the northern Hii Néill, came to terms with Brian. All hostages held by the over-king from the Danes and Irish of Leth Moga were to be given up to Brian, which was a virtual surrender of all his rights over the southern half of Ireland. Brian on his part recognized Malachy as sole king of Leth Cuind, or Cond's half, " without war or trespass from Brian." This treaty was thus the exact counter- part of that made centuries before by their ancestors Cond and Mug Nuadat. In 1000 Leinster revolted against Brian, and entered into alliance with the Danes of Dublin. Brian advanced towards the latter place with the intention of blockading it, but halted on the way at a place called Glenn-Mama or Glen of the Gap, near Dunlavin, the ancient fortress of the kings of Leinster, in the county of Wicklow. It is said, though there is not sufficient ground for the opinion, that Malachy joined him here. The Dano- Irish allies attacked him, but were defcated with a loss of 4000 slain, including Aralt or Harold, son of OlafCuarin. Brian entered Dublin with his victorious army, where he found immense booty, and made captives and slaves of a great number of women and boys and girls. Making Dublin his headquarters, he then easily reduced the greater part of Leinster.

After his defeat at Glen Mama, Sigtryger or Sitric fled for protee- tion to the northern Hui Néill at Ailech, but, failing to induce them or the kings of the Ulaid to enter into an alliance with him, he submitted to Brian three months aftcr his defeat. The latter, seeing the advantage the Dane would be to himself, not only restored him to powcr in Dublin, but gave him his daughtcr in marriage, and took the mother of Sigtryggr as his wife or concubine. Gorm- flaith or Gormlaith was the sister of Maelmorda, the king of Leinster, whom Brian had defeated at Glen Mama. She was married first to Olaf Ciaran, by whom she had Sigtryggr, and then to Malachy, by whom she was divorced or repudiated, after she had borne him a son Conchobar. It is probable

that her connexion with Brian dates before this, for her son Donnchad by Brian was grown up at the time of the battle of Clontarf."

Sigtryger's confederate Maelmorda, brother of Gormflaith, was also taken into favour by Brian and restored to the kingship of Leinster. Brian then returned to his residence, Cenn Coradh, and there matured his plan for deposing Malachy, and making himself over- king. When everything was ready he entered Bregia (Mag Breg) with an army consisting of his own troops, those of Ossory, his South Connaught vassals, and the Dano-Irish of Munster. His allies the Dublin Danes appear to have advanced into Meath before him, but their cavalry was defeated by Malachy. The latter, feeling himself unequal to the contest with Brian, endeavoured to gain time for the purpose of seeking allies, for he had evidently been taken by

1 It is to this ring that Moore alludes in the line

'When Malaehy wore the eollar of gold."

2In the Njdla Gormflaith is described as "the fairest of all women, and the best gifted in everything that was not in her own power ;" but, it is said, "she did all things ill over which she had any power;" that is, though a beautiful she was a bad woman. The elose relations whieh her story shows to have subsisted between the {Scandinavians and Géedel at this period may be illustrated by other similar storics. Donnflaith was the daughter or grand- daughter of "' Leather Cloaks," and was in the first instance the wife of the king of Ireland, Domnal, son of Donnehad, and after his death of Olaf Ciardn, king of Dublin, by whom she had Gluniarind, " Iron Knee," afterwards Dano-Irish king of Dublin. When Olaf Cuardn died his other wife Gormflaith went to Malaehy as before stated, who repudiated her after some time. Malachy then married Maclmaire, sister of Sigtryggr or Sitric, Olaf Ciiardn's son by Gormflaith. From her name Maelmaire, 'Servant of Mary," this daugliter of Olaf Ciiardn was probably a Christian,

surprise. With this view he concluded an armistice, during which he was to decide whether he would give Brian hostages (that is, abdicate) or not. He applied to the northern Hui Néill to come to his assistance, and even offered to abdicate in favour of Aed O'Neill, chief of the Cinel Eogain ; but the latter clan refused unless Malachy undertook to cede half the territory of his own clan—the Clann

Colmain—to them. The attempt to unite the whole of the.

Heremonian race against the Eberian race, and preserve a dynasty that had ruled Ircland for six hundred years, having failed, Malachy submitted to Brian, and without any formal act of cession the latter became over-king, for the annalist Tigernach, who was himself of the Hui Néill, records at the end of the year 1001, "' Brian regnat. The Four Masters, also of the northern Hui Néill, begin his reign in 1002. During a reign of twelve years (1002-1014) he is said to have effected much improvement in the country by the erection and repair of churches, the construction of bridges, causeways, and roads, and the strengthening of the royal forts and "crannogs" or island fortresses. We are also told that he administered rigid and impartial justice, and dispensed royal hospitality, and, as he was liberal to the bards, they have not forgotten his merits. ; Towards the end of Brian's reign a conspiracy was entered into between Maclmorda, king of Leinster, and his nephew, Sitrie of Dublin, who was married to Brian's daughter. This conspiracy was instigated by Gormflaith, Maelmorda's sister, and Brian's wife or concubine, who seems to have used all her arts to secure allies. In the spring of 1014 they had collected a considerable army in Dublin, composed of Maelmorda's own Leinster troops and Welsh allies, the Danes of Dublin, and considerable contingents from Man, the Isles, Orkney, and in fact from all the Scandinavians of the west. Some Saxons and Flemings interested in the trade of Dublin seem to have also joined theexpedition. Its leader was Sigurd, earl of Orkney and Caithness, son of Earl Hlodver or Lewis, by an Irish princess (Ethne or Edna, daughter of Cerball, king of Ossory), whom he succeeded in 980. Sigurd, who aimed at the supreme command of all the Scandinavian settlements of the west, suc- ceeded in the course of a few years in conquering the Sudreys, and even Sutherland, Ross, Moray, and

Argyll. He had acci- dentally fallen into the power of Olaf Tryggvason, when the latter was on his way from Dublin to be king of Norway, who only sct him free on condition of his becoming a Christian and swearing fealty to him. Another leader of the Dano-Hibernian army was an

apostate deacon called Brodir, who, according to Maurer's conjecture, ~

was the Danish viking Gutring. To mect this formidable force, Brian, who was then an old man, unable to lead his troops in person, mustered all the forces of Munster and Connaught, and was joined by the forecs of Meath under Malachy the deposed king. The northern Hui Néill and the Ulaid took no part in the struggle. Brian advanced into the plain of the Fine-gaill, north of Dublin, where a council of war was held. It is said that Malachy differed with Brian on the plan of battle, and did not join his troops with Brian's. He is further accused of treachery and of being in league with the enemy. This is, however, a calumny of the Munster bards, The probability is that his troops had not yet come up when the battle began, and that he held them in reserve. There is no doubt, however, that he mainly contributed to the victory by keeping the strong garrison under Sitric, which held Dublin, in check, and at a critical moment falling upon the Leinster wing of the enemy, which he crushed, and preventing the Danes from rallying, by which num- bers were forced back to the shore and drowned by the advancing tide. The battle, which in the Norse saga is called Brian's Battle, and in Irish history the battle of Clontarf, though the chief fighting took place close to Dublin, about the small river Tolka, was fought on Good Friday 1014. In it fell most of the leaders on both sides, and also Brian himself, who was slain in his tent by Brodir when a fugitive from the field of battle.

_ The Irish as usual did not follow up their victory by taking Dublin, which remained a Danish city until the advent of the Nor- mans. This probably arose from the dissensions which immediately broke out among the Munster men about the kingship of Munster, each party hastening home as quickly as possible in order to get possession of the

prize. On the way the Dal-Cais were opposed by the men of Ossory, but no battle took place owing to the heroic conduct of the wounded. This unpatriotic conduct of the king of Ossory has been made much of ; but nationality in the modern sense had nothing whatever to do with the affair. In the following year, 1015, Malachy, who was again recognized as king of Ircland, with the aid this time of the northern Hui Néill, burned Dublin and harried the Leinster clan the Hui Cennselaig. But the effects of Brian's revolution were permanent; the prescriptive rights of the Hui Néill were disputed, and after Clontarf, until the coming of the Normans, the history of Ireland consisted of a struggle for ascendency between the O'Brians of Munster, the O'Neills of Ulster, and the O'Connors of Connaught. The power of the western Scandinavians was broken at Clontarf; no new invasion took place, chiefly no doubt because of their conversion to Christianity. They continued to hold their strongholds on the coasts, and occasional conflicts took place between them and their neighbours. Gradually,

however, they assumed the position of native tribes; but, owing to the distinction of language, they did not readily fuse with the Géedel, though intcrmarriages were frequent. They fused much niore readily with the Normans and English, not so much from any affinity of language, as from their civic life and commercial spirit being alike. The next generation saw Christianity the recognized faith of the Dano-Jrish, who founded bishoprics, at first in con- . nexion with the church in Norway, but wholly unconnected with the Irish elan-bishops until a short time before the Anglo-Norman invasion.

From the Battle of Clontarf to the Anglo-Norman Invasion.—The death of Malachy, the last over-king acknowledged by the whole country, afforded an opportunity for an able and ambitious man to subdue Ireland, establish a strong central government, break up the tribal system, and assist the gradual fusion of factions into a homo-geneous nation. Such a man did not, however, arisc ; those who afterwards claimed to be ard ri lacked the qualities of founders of

strong dynasties, and, though sometimes acknowledged by the greater part of the country, were never accepted as the legitimate rulers of the whole of Ireland. Even the Scandinavian towns of Ireland ceased to cooperate as one people. 'heir native chiefs were sometimes expelled and replaced by Irish ones, and the fusion of the two races went rapidly on. In 1052, Diarmait (called Mae Macl na mBo), king of Leinster, defeated the Dano-Irish king of Dublin, Echmargach (Marga%r in the Sagas), son of Régnvaldr (Reginald), and became king of Dublin, and was succeeded by his son Murchad, who defeated Sigtryggr, son of Rognvaldr, king of Man, and made that island tributary to Dublin, a relation it generally stood in under Scandinavian rulers. After an ineffectual attempt of Donnchad, son of Brian, king of Munster, to become ard ri, Diarmait, king of Leinster, gained the upper hand. At the com- mencement of Donnchad's reign great lawlessness prevailed in Munster, which was further intensified by a dearth. The king held an assembly of the chiefs and clergy at Killaloe in 1050, to devise measures for its repression, and appears to have succeeded, for Munster was peaceable for a long time, and many Saxon and Welsh nobles found refuge there. Much intercourse appears to have existed between the southern Irish and the Anglo-Saxons, and many Trish nobles were mixed up with English feuds. Intermarriages were also frequent, the king himself being married to Driella, sister of Editha, queen of Edward the Confessor. In the rebellion of Earl Godwine, Harold took refuge with his brother-in-law, who gave him nine ships on his return to England. Tordelbach (Torlough), in revenge for thedeath of his father Tadg, whom his uncle Donnchad had slain, attacked the latter and defeated him in 1063.

On the death of Diarmait Mac Mael na mBo, who was killed in a battle with the king of Meath in 1072, the Tordelbach just men- tioned was generally recognized as ard ri, but he did not succeed in gaining the allegiance of the northern Hui Néill. He appears to have appointed his son Muircertach (Murtough) lord of Dublin ; but the latter must have only had precarious possession of it from about 1075 or 1076 to 1079; for, immediately after the death of Diarmait, Godred, son of Sigtryger (Sitric), was king. This Godred requested Lanfranc, archbishop of Canterbury, to consecrate a cer- tain Gillepatrick bishop of Dublin, in

succession to Duncan, a fact which shows that at this period the Danish cities acknowledged the supremacy of the see of Canterbury. Lanfranc in his answer calls Godred " Rex Hibernie," a title which healso gave to Tordelbach. On the death of the latter, Muircertach succeeded him as king of Munster, and while he was establishing himself on the throne, Godred Mananach (i.¢e., of Man) got possession of Dublin, which he ruled till 1094, when he was defeated by Muircertach. This is the Godred usually called Crovan, a name which, however, properly belongs to an earlier king of Man. A fierce war broke out between Muircertach and Domnall O'Loughlin, king of Ailech (of the northern Hui Néill). Godred took the side of Domnall with ninety ships, and Muircertach was defeated ; but in the end he succeeded, and in 1094 he drove Godred out of Dublin. It is probable that Muircertach had received assistance to do this from Magnus "' Bare- leg," who made his first expedition to the west about this time. As the Isle of Man was always an apanage to the Scandinavian king- dom of Dublin, the Manxmen on the defeat of Godred Crovan natu- rally applied to Muircertach for a governor; he sent them his kinsman Domnall, who was, however, expelled some time after for his tyranny. The struggle for the sovereignty between the rivals Muircertach and Domnall O'Loughlin continued, with intervals of truce negotiated by the clergy, without any decisive advantage on either side. In 1102 Maguus " Bare-leg" made his third and last expedition to the west, with the express design of conquering Ireland. His former ally Muircertach had meanwhile joined in a league against the king of England. The Norman lords, Robert of Belesme and Arnulph, brothers of Earl Hugh Montgomery, who had been killed by Magnus in his attack on Anglesey, on the occasion of his first expedition to the west, having espoused the cause of Robert, duke of Normandy, against his brother Henry Beauclerc, leagued with some Welsh princes against the king. Arnulph entered into alliance with Muircertach, who gave him his daughter

in marriage, and even, it is said, promised to make him his suc- Feet The league was unsuccessful, and Arnulph betook himself to the court

of Muircertach, who so far from being able to give his son-in-law assistance, expected help from him against Magnus, who appears to have threatened Muircertach with war, probably on account of his relations with Dublin. There is a story of Magnus sending his shoes to Muircertach, and of the latter submitting un- conditionally, which is, however, a mere fable ; but the latter in his desire to crush his rival Domnall may have done homage to Magnus as suzerain of the kingdom of Dublin. Magnus and Muircertach came, however, to terms; they exchanged hostages, and Sigurd the son of the king of Norway was betrothed to Biadhmuin, the daughter of the Irish king. Magnus then became the cuest of the latter at Cenncoradh in the winter of 1102; and in the iomng spring they invaded Ulster, but were signally defeated by Domnall O'Loughlin, and Magnus was killed shortly after in a foraging expedition in the present county of Down. Muircertach then courted the friendship of Henry, king of England, took back his daughter from Arnulph, and gave her to another man ; and, faithless, like most of the princes and nobles of that time, he even plotted against the life of Arnulph. St Anselm nevertheless coni- pliments him upon his good government, and passes a high eulogium on some of the Munster bishops. Ideas of a higher political life and church organization appear at this time to have made consider- able progress in Ireland, and to have had an appreciable influence on the policy of Muireertach himself.

After the death of Muircertach the power of the O'Briens was for a time broken by Tordelbach (Turlough) O'Connor, king of Connaught, and a pretender to the over-kingship,—a man whom no tie or obligation bound. Conchobar (Connor) O'Brien, grandson of Muircertach, succecded however in defeating O'Connor ; and his brother Tordelbach, who succeeded him, carried on the war until the whole country was reduced to that state so graphically described by the Four Masters as "a trembling sod." In the midst of this al- most continuous war and devastation morals became rclaxed, and the practice of religion almost ceased. The church property had passed into the hands of the lay successors, and no provision was made for the service of the churches, most of which were in ruins, A true reformer, however, appeared in Maclmaedog Ua Morgair, or St Malachy, who

was appointed legate by Innocent II. Through his exertions a great synod was held at Kells under Cardinal Paparo (Malachy having died at Clairvaux in 1148) in 1152, at which true diocesan jurisdiction was established, Dublin being brought into connexion with the Irish Church, and raised to the rank of an archiepiscopal city ; another archbishopric was founded at Tuam, to the great discontent of the northern and southern ase represent; ing "'Cond's Half" and "Mug's Half" in the church,—the cardinal, as papal legate, having pune the palliums for the four arch- bishops. 'Tithes were also ordained to be levied for the support of the clergy, and many reforms decreed. Many churches and monas- teries were built, and great advance took place in architecture and artistic metal work, which were not mere imitations of foreign art, but the true outcome of the earlier period of Celtic art.

Between 1148 and 1150 Muircertach (Maurice or Murtough) O'Loughlin was acknowledged as over-king in three out of the four provinces, Tordelbach O'Brien, however, renewed the struggle between the north and south, but after he had received the homage of the Dano-Irish of Dublin, a truce was arranged between the rivals. In 1151 the Munster king was deposed by his brother Tadg, who was supported by Tordelbach O'Connor, king of Connaught, with the assistance of Diarmait MacMurchada (Dermot MacMurrough). O'Loughlin took np the cause of his former rival, but was defeated by O'Connor. The latter died in 1156 after a long reign, and O'Loughlin remained undisputed over-king. Ruadri (Roderick) O'Connor succeeded his father Tordelbach, and signalized the beginning of his reign by blinding one brotherand imprisoning two others. Muircertach O'Loughlin, having blinded the chief of Dal- Araide, a savage mode of mutilation very much in fashion at the time, a league was formed against him, and he was defeatcd and slain, whereupon Ruadri claimed to be over-king, and, there being no serious opposition, he was inaugurated with great pomp at Dublin, which already began to have considerable weight in Irish affairs, and had now for the first time assumed somewhat of the charaeter of a metropolis.

The Diarmait MacMurchada above mentioned was the great- grandson of Diarmait Mac Mael na mBo, and was consequently both by descent

and position much mixed up with foreigners, and generally in a state of latent if not of open hostility with the over- Kings of the Hui Néill and Dal-Cais dynasties. He was a tyrant, and a man of bad character. In 1152 Tigernan O'Rourke, prince of Brefni, had been dispossessed of his territory by Tordelbach 0'Connor aided by Diarmait, and the latter is accused of also carrying off Derbforgaill (Dervorgilla), O'Rourke's wife. It is pro- bable, however, that the latter event has been entirely misrepre- sented, and that the lady had merely thrown herself, in accordance with Irish law, upon the protection of the Leinster king. However this may have been, the accession of Ruadri to the chief kingship

warned Diarmait of his danger ; and accordingly, on learning that O'Rourke was leading an army against him with the support of the over-king, he burnt his castle of Ferns, and went to Henry II. to ask his assistance. The results which followed belong to the next section, but here we may point out that many Irish princes before Diarmait had souglit the aid of foreigners, and that at that time, and especially in a tribal society, this was not regarded in the same light as in modern times.

Political and Social State of Ireland in the early Middle Ages.— To complete our account of pre-Norman Ireland, we shall give hero a bricf account of the social life of the Irish at the end of the 8th and beginning of the 9th century, which indeed substantially repre- sents the state of things during the whole period from the 7th to the 12th century.

In the Middle Ages there were considerable forests in Ireland encompassing broad expanses of upland pastures and marshy meadows, unbroken up to the 7th century by ditch or dyke. There were no cities or large towns at the mouths of the rivers ; no stone bridges spanned the latter; stepping stones or hurdle bridges at the fords or shallows offered the only mode of crossing the broadest rivers and connecting the unpaved roads or bridle paths which crossed the

country over hill and dale from the principal kingly duine (sing. dun). The forests abounded in game—the red deer and wild boar were common ; and wolves ravaged the flocks, for the most part unprotected by fences even in comparatively later times. Scattered over the country were numerous small hamlets, composed mainly of wicker cabins, among which were some which might be called houses; other hamlets were composed of huts of the rudest kind. Here and there were some large hamlets or villages that had grown up about groups of houses surrounded by an earthen mound or rampart ; similar groups of houses enclosed in this manner were also to be found without any annexed hamlet. Sometimes the rampart was double, with a deep ditch between. The simple rampart and ditch enclosed a lcs or cattleyard and the groups of houses of the owners, for every room was a separate house. The enclosed houses (ratha, sing. rath) belonged to the free men called airig (sing. aire). The sizes of the houses and of the enclos- ing mound and ditch marked the rank (that is, the wealth) of the aire. If his wealth consisted of chattels only, he was a b6-aire, or cow-aire. When he possessed ancestral land, which was no doubt one of the consequences of the Scotic conquest, he was a flaith or lord, and was 'entitled to let his lands for grazing, to have a hamlet in which lived labourers, and to keep slaves. The larger fort with two or more ditches and ramparts was a dun, where the chieftain or rf lived, and kept his hostages if he had subreguli. The houses of all elasses were of wood, chiefly wattles and wicker-work enclos- ing clay, and cylindrical in shape, with conical roofs thatched with rushes. The oratories were of the same form and material, but the larger churches aud kingly banqueting halls were made of sawn boards. Bede, speaking of a church built by Finan at Lindesfarne, says, "'nevertheless, after the manner of the Scots, he made it not of stone but of hewn oak and covered it with reeds." When St Malachy, who lived in the first half of the 12th century, thought of building a stone oratory at Bangor, it was deemed a novelty by the people, saying, "we are Scoti, not Galli." Long before this, however, stone churches had been built in other parts of Ireland, and many round towers. In some of the cathraig (sing. cathir), or stone forts, of the south-west of Ireland, the houses within the ramparts were made of stone in the form of a bechive, and similar

“cloghans,” as they are called, are found in the western islands of Scotland.

Here aud there in the neighbourhood of the hamlets were patches of eorn grown upon allotments that were annually exchangeable among the inhabitants. Around the ditine and ratha the cultivation was better, for the corn land was the fixed property of the lord, and began to be enclosed by fences in the 7th and succeeding centuries. Oats was the chief corn crop, but wheat and barley were also grown, —chiefly, however, by the higher classes. The onion and the parsnip also were cultivated, and mark the first stage in kitchen gardening, which, as well as bee-keeping, was introduced by the church. Flax and the dye-plants (woad for blue and rz, a kind of madder, for red) were the chief industrial plants. Portions of the pasture lands were reserved as meadows. ‘Tillage was rude, the spade and fork being of wood, though sometimes shod withiron. There are native names for the different parts of the plough, so we may assume that some form of that implement worked by oxen yoked together by a simple straight yoke was in use in the very carly times. Wheeled carts were also known ; the wheels were often probably only solid disks, though wheels formed of a hub, spokes, and felloes were used for chariots. The tilled land was manured. Droves of swine under the charge of swineherds wandered through the forests ; some be-

longed to the chiefs, others to flatha or lords, and others again to

village communities. The house-fed pig was also an important object of domestic economy ; its flesh—fresh, pickled, or in baeon— was much prized. Indeed, fresh pork was one of the indueements held out to visitors to Tir Tairngire or Elysium. Horned cattle constituted the chief wealth of the country, and were the standard

for estimating the worth of anything ; for the Irish had no coined money, and carried on all commerce by barter. The unit of value was called a sét (pl. séwét), which appears to mean literally a jewel or precious object of any kind. here were several kinds of séuti, differing

somewhat in value. The king sét was a full-grown cow after her third calf; the normal sét was an average milch cow. Gold, silver, bronze, tin, clothes, and all other kinds of property were estimated in séuti, referred to the milch-cow as the standard. Three séuti, that is, three cows, were equal to a cumal, a word signifying a female slave, which reveals an important feature of Irish society to which we shall revert. Sheep formed an important element of wealth in some parts of the country, and goats were numerous. The old laws draw a distinction between the working horse and the riding horse; both kinds appear to have been numerous and of good breed. Bee-cultivation was carefully attended to, the honey being used both for a kind of confectionery and for making metheglin or mead. So important a place did bee-culture hold in the rural economy of the ancient Irish that the laws regarding bees still extant would fill a goodly volume.

The ancient Irish were a pastoral people, and therefore had certain nomadic habits. When they had sown their corn, they drove their herds and flocks to the mountains, where such existed, and spent the summer there, returning in autumn to reap their corn and take up their residence in their sheltered winter residences. Where the tribe had Iand on the sea-coast they also appear to have migrated thither in summer. These habits explain the presence of duine, cathraig, and other forts on mountains and headlands. The chase in the summer occupied the freemen, not only as a source of enjoyment, but also as a matter of necessity, for wolves were very nuinerous. For this purpose they bred dogs of great swiftness, strength, and sagacity, which seem to have been much admired by the Romans.?

We have said that the residences within enclosing ramparts did not consist of one house with several apartments, but every room was a scparate house. Thus, to take the residence of an aire, he had the living house, in which he slept as well as took his meals, the women's house, in which spinning and other domestic work was carried on, the kitchen, the barn, the calf-house, the pigsty, and the sheep-house. In the residence of chiefs and flatha a sun- chamber or grianan was also provided for the mistress of the house, which in the large duine appears to have been put on the rampart, so as to escape the shadow of the

latter. The round houses were made by making two basket-like cylinders, one within the other, and separated by an annular space of about a foot, by inserting upright posts in the ground and interweaving hazel wattles betwcen, the annular space being filled with clay. ain this cylinder was placed a conical cap, thatched with reeds or straw. The kreel houses of many Highland gentlemen in the last century were made in this way, except that they were not round. The early Irish houses had no chimney; the fire was made in the centre of the house, and the smoke made its exit through the door or through a hole in the roof, as in the corresponding Gaulish and German houses. The introduction of chimneys probably led to the change in the form of the houses from round to oblong. Near the fire, fixed in a kind of candlestick, was a candle of tallow or raw bees-wax, which gave a lurid smoky flame ; this marked a notable advance upon the use of a piece of bog-deal. Around the wall in the houses of the wealthy and higher classes were arranged the bedsteads, or rather compartments, with testers and fronts, which were sometimes of carved yew. The beds were made of skin stuffed with feathers. Wooden platters, drinking horns, and vessels of yew and bronze were displayed on dressers. Of pottery there was none. Large chests and cupboards for holding clothes, meal, and other things were placed in convenient places. In the halls of the kings, of whom there were several grades, the position of each person's bed and seat, and the joint of meat which he was entitled to receive from the ranaire, or distributor, were regulated according to a rigid rule of jrecedence. The arms and horse trappings of the master of the house were also displayed on the walls; and in the king's house each person who had a seat in it had his shield suspended over him. Every king had hostages for the fealty of his vassals, who sat unarmed in the liall, and those who had beéome forfeited by a breach of treaty or allegiance were placed along the wall in fetters. The position of a hostage in ancient times was at best unpleasant, but when those who gave him in hostageship broke their engagements his lot was truly a hard one; he was fettcred and his life was forfeited. There were places in the king's hall for the judge, the jili or poet, the harper, the various craftsmen, the juggler, and fool. The king had his bodyguard of four men always around him ; these were freed men whom the king had delivered from slavery inherited from birth, or to which they had been

condemned for crime or debt, for an insolvent debtor became in Ireland, as in Rome and indeed in most ancient societies, the property of his creditor. In an age of perpetual warfare and violence, the gratitude of a slave was esteemed a greater safeguard

1 Symmachus, Zpist., ii. 77.

than even the ties of blood,—a fact which suggests some curious reflexions concerning the origin of offices at the courts of kings.

There were also numerous attendants about a king's house and a flaith's house ; these were a very miscellaneous body ; among them were many Saxon slaves and the descendants of former slaves, for after the cessation of the Irish incursions a regular slave trade grew up, which was only abolished by the action of the church not long before the Norman invasion. These attendants slept on the ground, in the kitehen, or in cabins outside the fort. It was only the higher classes who were provided with beds, and in early times not even these. In the Pfalz MS. of Chunrat's Song of Kaiser Karl there is a picture of the emperor sleeping on the floor, so that the habit of the whole family sleeping in the hall in which they ate and drank was rathcr the rule than the exception among all the northern nations. The living room or hall we have been describing also served in part as a kitchen, for joints were roasted at the fire in winter, the soup boiler was suspended over it, the brewing vat was in it. The house we have called the kitchen was rather a room for grinding meal in hand-mills, a work done by females (who were slaves in the houses of flatha and kings), the making of bread, cheese, &c.

The children of the upper classes in Ireland were not reared at home, but were sent to some one clse to be fostered. The children of the greater kings were generally fostered by minor kings, and even by kings of their own rank. The ollam filt, or chief poet, ranked in some respects with a tribe king, sent his sons to be fostered by the king of his

own territory. The fosterage might be done for friendship or for some special advantage, but it was generally a matter of profit, and there are numerous laws extant fixing the cost, and regulating the food and dress of the foster child according to his sis It was customary to educate together a number of youths of very different ranks, and the laws laid down regulations for the clothing, food, and other expenses of each grade. In like manner a number of maidens were fostered together, those of inferior rank serving as companions for the daughter of a king. The cost of the fosterage of boys seems to have been borne by the mothcr's pro- perty, that of the daughters by the father's. The ties created by fosterage were nearly as close and as binding on the children as those of blood. Fosterage was apparently the consequence of the marriage customs.

It has been stated above that pagan marriage customs survived the introduction of Christianity. Of this there is ample evidence. As among all tribal: communities, the wealth of the contracting parties constituted the primary element of a legitimate marriage. The bride and bridegroom should be provided with a joint fortune proportionate to their rank. When the bride and bridegroom were of equal rank, and the scpt of each contributed an equal sharc to the marriage portion, the marriage was legal in the full sense, and the wife was a wife of equal rank. If the bride were noble and the bridegroom not, the former had to contribute one-third of the marriage portion to fulfil the condition of equality. If the bride- groom was the son of a flaith, and the bride the daughter of a cow- aire, the former contributed one-third and the latter two-thirds. In this kind of marriage the husband and wife had equal rights over the joint property. The wife of equal rank was the chief wife in pagan times, and where the conditions were not fulfilled the woman occupied an inferior position, and might have another woman placed over her as principal wife. The church endeavoured to make the wife of a first marriage, that is, the wife according to canon law, the only true wife according to Irish law, but in this it is clear it did not at once succeed. The struggle between the marriage laws of the church and the ancient customs is curiously illustrated by the continuance of what according to canon and feudal law was concubinage, as a recognized condition of things according to Irish law. These marriages may be

called contract marriages, and were of various kinds, depending mainly on questions of property, and were entered into with the cognizance of the man's chief wife and of his sept. When a woman had sons her position was greatly altered, and her position did not niaterially differ in some respects from that of a chief wife. As the tie of the sept was blood, all the acknowledged children of a man, whether legitimate or illegitimate according to canon and feudal law, belonged equally to his sept. Even adulterine bastardy was no bar toa man becoming chief or ri of his ¢wath, or tribe, as was shown in the case of Hugh O'Neill, earl of Tyrone. As all the children of a chief of household, of what- ever rank, had equal rights in the scpt, notwithstanding the efforts of the church to restrict those rights to the children of marriages according to canon law, it was necessary to commit their rearing and education to some,one outside their own sept; hence the system of fosterage, which at one time prevailed in all Aryan comniunities, as did also no doubt the whole of the Irish marriage customs, which are a survival in a singularly complete and archaic form of customs which had died out elsewhere under the influence of Roman and canon law.

The food of the ancient Irish was very simple, and their table service equally so. The former consisted mainly of cakes of oaten bread, cheese, curds, milk, butter, and the flesh of all the domestic

animals fresh and salted. In the 8th century at all events wheat and barley meal were also used by the better elasses. The legendary food of the Land of Promise consisted of fresh pork, new milk, and ale. Of eourse fish, especially the salmon, and game are also to be added to the list. The opsonia were very limited—onions and watereresses. The food of the monks was ehiefly oaten bread, milk, and curd-cheese. The ehief drink was ale, the right to brew it being apparently confined to flatha, as was the ease in many parts of Germany down to the end of the Middle Ages. It seems to have been expected that a flaith should be generous to his vassals, retainers, and all those about him ; the word for open-handedness in Irish, flaitheamhuil, is derived from his name ; an aphorism fixes the time at which he was expected to be bountiful, "

for he is not a lawful flaith who does not distribute ale on a Sunday." All the business of the sept and tribe was conducted in the ale-house or cuirmtcch, as the chief men of the tribe were called its props,— sabaid cuirmtig?. The bards chanted poems, and songs were sung to the music of a kind of harp, called a crwot, or of a bowed instru- nient called a timpan; stories were also told, and the guests of the ale-house were content to hear the same story over and over again. The ollam fili, who only told his story to kings, was, however, expeeted to know more than seven times fifty great and small stories. The amusements were also varied by the jokes of the fool and the tricks of the juggler, as in the baronial halls of the Normans at a later period.

The dress of the upper classes was similar to that of a Scottish Highlander before it degenerated into the present conventional garb of a Highland regiment. It consistcd first of the denn, a kind of loose shirt generally of woollen eloth (but linen ones are mentioned), reaching a little below the knees of men, and forming what is now ealled the kilt. This garment was of different colours, some being spotted, eheckered, and variegated, each tribe or clan having apparently speeial eolours. It would also secm that the number of eolours in the dress indicated the rank of the wearer. The lenna of kings and the wealthy flatha were embroidered, furnished with borders, and even fringe of gold is mentioned. Over the leun eame the tnar, a kind of closely fitting tunic reaching to the hips, and bound around the waist by the criss, a girdle or scarf often of some rieh colour, especially purple, and frequently, in the case of the men's, the gift of a woman. The inar or jacket appears to have been oven at the breast so as to show off the embroidery of the lenn. Over the left shoulder, and fastened with a brooch, hung the brat, a shawl or plaid like the modern Scottish one. This garment replaced the skin or fur of a wild beast of earlier times, and the brooch the thorn with whieh it was fastened. The brooches were often of beautiful workmanship, as is shown by the numerous examples exhibiting endless variety of design whieh are now pre- served in museums. The legs were bare or covered with a kind of legging or hose fastened by thongs; the feet were entirely naked or encased in shoes of raw-hide also fastened with thongs. The only differenee between the dress of men and women was that the lenn of the latter reached nearly to the ankles

and formed a petti- eoat instead of a kilt. The freemen wore their hair long and prided themselves on its eurling into ringlets. They sometimes confined it at the back of the head in a conieal spiral of bronze, silver, or gold. The women also wore their hair long, and braided it into tresses, which they confined with a pin. The beard was worn long, and was earefully cultivated, being often plaited into tresses. The men as well as women, like all ancient and semi-barbarous people, were fond of ornaments. They tatooed figures with woad on their bodies like the Britons and Picts, as we learn from a gloss in a MS, of St Gall,‘ and also from Isidore. They eovered their fingers with rings, their arms with bracelets ; they wore torques or twisted rings of gold about the neek, such as we see on the celebrated antique sculpture of the Gaul, known as the ‘* Dying Gladiator.” The richer and more powerful kings wore a similar torque about the waist, and a golden mind or diadem on state occasions. Every woman of rank wore finger rings, bracelets, earrings, and a Jann or crescent-shaped blade of gold on the front of the head, from which hung behind a veil. ‘ The queens also wore a golden mind or diadem on state occasions. ‘The mind was so attached to a veil or some kind of headdress that it seems to have formed a complete covering for the head. Ladies also had carved combs, and ornamental work boxes ; they used oil for the hair, and dyed their eyelashes black with the Juice of a berry, and their nails erimson with a dye like archil. The lenn or kilt seems to have been the garb of freemen only ; the men of the servile classes wore braccx or tight-fitting breeches reaching to near the ankles, the upper part of the body being either left altogether naked, or eovered by a short eloak without sleeves. In winter all classes appear to have worn a long coat or eloak with a cochwii or hood. ‘The Gauls used a similar kind of hooded eloak, which became fashionable in Rome. Coats er cloaks

1 “Sticmata: pictura in corpor© quales Scotti pingunt.’”—Gloss in a St Gall MS. in Hattemar’s Denkmale, 1. 227, 233. 2 “Scoti propria lingua nomen habent a picto corpore, eo quod aculeis ferreis

cum atramento variarum figurarum stigmatc annotcntur.”—Isidore of Seville, Orig., lib. ix, c. 2.

of this kind made of a brown frieze were regarded in the 7th and 8th centuries as peculiarly Irish, owing no doubt to the great number of niissionaries and seholars from Ireland who wandered over Enrope clothed in such long eloaks, with a book wallet and a kind of leather bottle*® slung on their shoulders, and a thiek knotted staff in the hand. It is from them the Benedictine monks bor- rowed the dress whieh has since beeome the charaeteristic habit of religious orders. The naime eowl in English, and all the eognate forms in other languages, are no doubt from the Gaulish word corresponding to the Irish cochull. The two Irishmen who aeceom- panied the Icelander, Thorfinn Karlsefnisson, in his voyage from Greenland when he discovered Ameriea in the 9th eentury, wore coats which are called by the same name which the Northmen gave the monk's cowl.

The principal weapon of the Irish soldiers was a pike or lanee with a very long handle ; some were also armed with a short sword suspended by a belt across the shoulder, and a shield. It is pro- bable that bronze lance-heads and swords were used down to early Christian times, and even later, thougli the use of iron weapons must have been known from the period of the Scotic invasions of Britain. The shields were of two kinds:—one a light round or slightly oval wooden target covered with hide, and in earlier times in the case of rich warriors a bronze disk with numerous bosses, backed with wood; and the other the sciath or oblong bulged shield of wicker work covered with hide. Some carried stone hammers or war axes, and in the 9th and succoeding centurics an iron one, the use of which was learned from the Northmen. War-hats, cuirasses, and other defensive armour were very little if at all used before the Danish wars. In Irish legendary tales some of the heroes are equipped in leather cuirasses, and wear crested helmets and war-hats, but these are no doubt interpolations in the narrative of later times.

The twath or territory of a7t or king was divided among the septs. The lands of a sept (fine) eonsisted of the estates in severalty of the lords (jflatha), and of the ferand duthaig or com- mon lands of the sept. The dwellers on each of these kinds of land differed materially from each other. On the former lived a motley population of slaves, horse boys, and mereenaries composed of broken men of other clans, many of

whom were fugitives from justice (macea bais, literally "sons of death"'), &c., possessing no rights either in the sept or tribe, and entirely dependent on the bounty of the lord, and consequently living about his fortified resi- denee. The poorer servile classes, or cottiers, wood cutters, swine herds, &c., who had right of domieile (acquired after three genera- tions), lived here and there in small hamlets on the mountains and poorer lands of the estate. The good lands were let to a elass of tenants called fuwidirs, of whom there were several kinds, some grazing the land with their own eattle, others reeeiving both land and cattle from the lord. Fuidirs had no rights in the clan or sept ; some were true serfs, others tenants-at-will ; they lived in scattered homesteads like the farmers of the present time. The lord was responsible before the law for the aets of all the servile classes on his estates, both new comers and senehleithe, 7.¢., descendants of fuidirs, slaves, &c., whose families had lived on the estate during the time of three lords. He paid their blood-fines, &c., and received compensation for their slaughter, maiming, or plunder. The fuidirs were the chief source of a lord's wealth, and he was consequently always anxious to increase them.

As every mau in a fine or sept had a right to build a house on the ferand duthaig or common land, the size of the house and ex- tent of land which might be permanently enelosed as a yard or lawn depending upon the rank of the man, that is, upon his wealth, the clansmen occupied chiefly isolated homesteads and cabins ; some of the latter being occasionally grouped in hamlets. Clansmen who possessed twenty-one cows and upwards were airig (sing. azre), oras we should say had the franchise, and might fulfil the funetions of bail, witness, &c. When an aire died his family did not always divide the inheritance, but formed "a joint and undivided family " the head of which was an aire, and thns kept up the rank of the family. Three or four poor clansmen might combine their pro- perty and agree to form a " joint family," one of whom as the liead would be an aire. In consequence of this organization the home- steads of airig included several families—those of his brothers, sons, &c.

3 “ Ascopam, 7.¢., flasconem similem utri de coriis factam, sicut solent Scot- tones habere.’—Gloss of a St Gall MS. of the 9th century in Hattcmar’s Denk-

mate, 1, 237, XIII. — 33

Hadrian’s bull.

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and pay rent in kind. Such men, whose position was, however, thereby much altered, were called biathachs(from biad, food). Aman might with the consent of lis sept enter into a similar contract with the flaith of another sept, so that the biathachs or victuallers in- cluded also some of those called fuidirs. A lord might receive his biad or food at his own residence, or go to the house of his biathach accompanied by a retinue and cat it there, or send his mercenaries, horses, dogs, &c., there, to be supported, which was the usual way. The biathachs were consequeutly liable to suffer great oppression,

The professions accounted noble, such as those of cena (wisdom), which included law and medicine, and /ididceht or divination, which in Christian times was that of the bards or rhymesters, formed a number of schools each under an ol/am or doctor, who was provided with mensal land for the support of himself and his scholars. He was also entitled to free quarters for himself and a retinue, in- cluding dogs and horses, so that when he travelled he had a kind of ambulatory school with him. The ollam bretheman or chief of @ law school was the chief brithem (brehon or judge) of his tuath, The Jéag or leech had also his apprentices, and treated his surgical patients in his own house. The harper, the cerd or artist in metals, and the smith were also provided with mensal land, and gave their skill and the product of their labour as their bés tigi or customary tribute in return for the gifts bestowed by their chief.

Popular assemblies, which were held in the open air, were of various kinds; thus the methel flatha was a gathering of the vassals of a lord to reap his corn, clear his roads, &c. The fine or sept had its special

meeting, summoned by the aire fine or chief of the sept for many purposes, such as the assessment of blood-fines due from the sept, and the distribution of those due to it. The clan had also its gathering to deliberate on important questions, such as peace and war, in which every aire or fully qualified clansman had a voice. The most important of all popular assemblies was, however, the oenach or fair, summoned by a king, those summoned by the kings of provinces having the character of national assemblies. The oenach had a fourfold object:— (1) the promulgation of laws, and the rchearsal of pedigrees upon which depended the succession of the ——* ; (2) the recitation of poetry and tales, musical contests, exhi-

ition of works of artists in metals, &c., and the award of prizes to the professional classes ; (8) popular sports, such as horsc-racing, wrestling, &c.; and (4) the barter of all kinds of wares. The oenach in pagan times was an essentially religious festival celebrated in the great cemoterics, each clan, and in the minor fairs each sept, hold- ing its assembly on the grave mound of their ancestors. Nor did it entirely lose its religious character in Christian times, for the oenach opened and closed with religious ceremonies. The women and nien assembled in separate aireehta or gatherings, and no man durst enter the women's airecht under pain of death. The brithem (brehon) or jndge seated on a stone chair raised above the heads of the people delivered his judgment, the side recounted the pedigrecs of the chiefs, the jidid sounded their praises and told the deeds or the clans in verse, the cerda or artists in metal exhibited their work. Forcign traders came thither with their wares, which they exchanged for native produce, especially for the coarse woollen fabrics which even in the 8th century were celebrated on the continent. Every one was expected to appear at the oenach or fair in his or her best clothes and ornaments, and carcful provision was made by the law to prevent creditors from unjustly withholding ornaments pledged with them on the occasion of a fair. Crimes committed at an oenach or other solemn assembly could not be commuted by pay- ment of fines. The inauguration of a king took place at some sacred place where there was an ancient tree or grove, the nemet of the clan, the cutting down of which was the greatest insult a conqueror could offer to the conquered. (W. K. 8.)

INistory from the Anglo-Norman Invasion.

Nicholas Breakspeare, known in history as Hadrian IV., was the only Englishman who ever filled the papal chair. Urged by the ambition proper to his office, and perhaps by an Englishman's natural pride in being able to confer favours on a king of England, he granted a bull to Henry II. in 1155 which contains this passage :— "There is no doubt, and your nobility acknowledges, that Ireland and all islands upon which Christ the Sun of righteousness has shone, and which have received the teachings of the Christian faith, rightfully belong .to the blessed Peter and the most holy Roman Church." Believ- ing that Henry was likely to use his power for the good of religion and of the church, he granted Ireland to him, reserving all ecclesiastical rights, and making one penny from each house payable yearly to St Peter.

In 116 Dermod MacMurrough, deposed for his tyranny

from the kingdom of Leinster, repaired to Henry in Aquitaine. The king was busy with the French, but gladly seized the opportunity of asserting his claim, and gave Dermod a letter authorizing him to raise forces in England. Thus armed, and provided with gold extorted from his former subjects in Leinster, Dermod went to Bristol and sought the acquaintance of Richard de Clare, a Norman noble of great ability but broken fortunes,

to reconquer Dermod's kingdom for him. The stipulated consideration was the hand of Eva his only child, and according to feudal law his sole heiress, to whose issue lands and kingdoms would naturally pass. But Irish customs admitted no estates of inheritance, and Eva had no more right to the reversion of Leinster than she had to that of Japan. It is likely that Strongbow had no con- ception of this, and that his first collision with the tribal system was an unpleasant surprise. Passing through Wales, Dermod agreed with Robert Fitzstephen and Maurice Fitzgerald to invade Ireland in the ensuing spring.

Earl Strong- Richard, whom later usage has named Strongbow, agreed bow.

About the 1st of May 1169 Fitzstephen landed on the Landing Wexford shore with a small force carefully chosen from °f Anglo-

among the Welsh youth, and next day Maurice de Prender- gast brought another band nearly to the same spot. Dermod joined them, and the Danes of Wexford soon submitted. According to agreement Dermod granted the territory of Wexford, which had never belonged to him, to Robert and Maurice and their heirs for ever. And here begins the conflict between feudal and tribal law, which was destined to deluge Ireland in blood. Maurice Fitzgerald soon followed with a fresh detachment. About a year after the first landing Raymond Le Gros was sent over by Karl Richard with his advanced guard, and Strongbow himself landed near Waterford on the 23d August 1170 with 200 knights and about 1000 other troops.

The natives did not understand that this invasion was quite different from those of the Danes. They made alliances with the strangers to aid them in their intestine wars, and the annalist writing in later years (Annals of Lough Cé) describes with pathetic brevity the change wrought in Ireland :—‘ Karl Strongbow came into Erin with Dermod M‘Murrough to avenge his expulsion by Roderick, son of Turlough O’Connor; and Derinod gave him his own daughter and a part of his patrimony, and Saxon foreigners have been in Erin since then.”

Most of the Norman leaders were near relations, many being descended from Nesta, daughter of Rhys Ap Tudor, prince of South Wales, the most beautiful woman of her time, and mistress of Henry I. Her children by that king were called Fitzhenry. She afterwards married Gerald de Windsor, by whom she had three sons:—Maurice, ancestor of all the Geraldines; William, from whom sprang the families of Fitzmaurice, Carew, Grace, and Gerard; and David, who became bishop of St David’s. Nesta’s daughter Angareth, married to William de Barri, bore Giraldus Cambrensis, and was ancestress of the Irish Barries. Rayniond Le Gros, Hervey de Montmorency, and the Cogans were also descendants of Nesta, who, by her second husband Stephen

the Castellan, was mother of Robert Fitzstephen. Further details must be sought in Giraldus. His prejudices and credulity make him an unsafe guide about Irish customs, but there is no valid reason to reject his statements as to his own kinsmen.

While waiting for Strongbow's arrival, Raymond and Hervey were attacked by the Waterford Danes, whom they overthrew. Seventy prisoners were thrown over a cliff into the sea. Strongbow himself took Waterford and Dublin, and the Danish inhabitants of both readily combined with their French-speaking kiusfolk, and became firm supporters of the Anglo-Normans against the native Irish.

Normans,

HISTORY. | IRELAND 259 flenry II. Alarmed at the principality forming near him, Henry] making his vassal almost independent. De Lacy sublet in Ire- jnvaded Ireland in person, having first had Hadrian's grant | the land among kinsmen and retainers, and to his grants land.

Irish Synod. Christian O'Conarchy, bishop of Lismore and|in England. He thwarted or encouraged the Anglo- Church papal legate, presided, and the archbishops of Dublin, | Normans as best suited him, but on the whole they submits. Cashel, and Tuam attended with their suffragans, as did | increased their possessions. In 1210 the excommunicated King | many abbots and other dignitaries. The primate of | king visited Ireland again, and being joined by Cathal aes a Armagh, the saintly Gelasius, was absent, and presumably | Crovderg O'Connor, king of Connaught, marched almost 7°" his suffragans also, but Giraldus says he afterwards came | unchallenged by De Lacy from Waterford by Dublin to to the king at Dublin, and favoured him in all things. | Carrickfergus. Thus, with the aid of Irish allies, did Henry's sovereignty was acknowledged, and constitutions | Henry II.'s son chastise the sons of those who had given made which drew Ireland closer to Rome. In spite of | Ireland to the crown. John did not venture farther west the "enormities and filthinesses," which Giraldus says | than Trim, but most of the Anglo-Norman lords swore defiled the Irish Church, nothing worse could be found to | fealty to him, and he divided

the partially obedient dis- condemn than marriages within the prohibited degrees, | tricts into twelve counties—Dublin (with Wicklow), Meath and trifling irregularities about baptism. Most of the | (with Westmeath), Louth, Carlow, Kilkenny, Wexford, details rest on the authority of Giraldus only, but the main | Waterford, Cork, Limerick, Kerry, and Tipperary. John's facts are clear. The synod is not mentioned by the Irish | resignation of his kingdom to the pope in 1213 included annalists, nor by Regan, but it is by Hoveden and Ralph | Ireland, and thus for the second time was the papal claim de Diceto. The latter says it was held at Lismore, an | to Ireland formally recorded. error arising from the president having been bishop of During Henry IIT.'s long reign the Anglo-Norman power Henry Lismore. Tradition says the members met in Cormac's | increased, but underwent great modifications. Richard, IIT. chapel. earl marshal, grandson of Strongbow, and to a great 1B), Roderick Henry at first tried to be suzerain without displacing | extent heir of his power, was foully murdered by his own" submits. the natives, and received the homage of Roderick O'Connor, | feudatories—men of his own race; and the colony never hitherto considered head king. But the adventurers were | quite recovered this blow. On the other hand the De uncontrollable, and he had to let them conquer what they | Burghs, partly by alliance with the Irish, partly by sheer could, exercising a precarious authority over the Normans | hard fighting, made good their claims to the lordship of only through a viceroy. Fitzadelm and other early | Connaught, and the western O'Connors henceforth play a governors seemingly had orders to deal as fairly as possible | very subordinate part in Irish history. Tallage was first with the natives, and this involved them in quarrels with | imposed on the colony in the first year of this reign, but the "conquerors," whose object was to carve out principali- | yielded little, and tithes were not much better paid. ties for themselves, and who only nominally respected On the 14th January 1217 the king wrote from Oxford Objec- the sovereign's wishes. One is forcibly reminded of the | to his justiciary, Geoffrey de Marisco, directing that no "en ha squabbles of the crusaders. The mail-clad knights were not | Irishman should be elected or preferred in any cathedral a uniformly successful against the natives, but they generally | in Ireland, "since by that means our land might be dis- managed to

occupy the open plains and fertile valleys. | turbed, which is to be deprecated.” This order was Geographical configuration preserved centres of resistance, | annulled in 1224 by Honorius IIL, who declared it —the O’Neills in Tyrone and Armagh, the O’Donnells in | “destitute of all colour of right and honesty.” The pope’s Donegal, and the Macarthies in Cork being the largest | efforts failed, for in the 14th century several Cistercian tribes that remained practically unbroken. On the coast | abbeys excluded mere Irishmen, and as late as 1436 the from Bray to Dundalk, and by the navigable rivers of the | monks of Abington complained bitterly that an Irish abbot east and south coasts, the Norman put his iron foot firmly | had been imposed on them by lay violence. Parliament down. was not more liberal, for the statute of Kilkenny, passed Jobn, Prince John landed at Waterford in 1185, and the neigh- | in 1366, ordained that ‘no Irishman be admitted into any aie houring chiefs hastened to pay their respects to the king’s | cathedral or collegiate church, nor to any benefice among

confirmed by Alexander ITI., so as to gain the support of the Irish clergy. He landed near Waterford 18th October 1172. Giraldus says he had 500 knights and many other soldiers; Regan, the metrical chronicler, says he had 4000 men, of whom 400 were knights ; the Annals of Lough Cé that he had 240 ships. The Irish writers tell little about these great events, except that the king of the Saxons took the hostages of Munster at Waterford, and of Leinster, Ulster, Thomond, and Meath at Dublin. They did not takein the grave significance of doing homage to a Norman king, and becoming his “ man.”

Henry’s farthest point westward was Cashel, where he received the homage of Donald O’Brien, king of Thomond, but does not appear to have been present at the famous

son, Prince and followers alike soon earned hatred, the former showing the incurable vices of his character, the latter pulling the beards of the chieftains. After eight dis- graceful months he left the government to De Courcy, but retained the title “Dominus Hibernix.” It was even in- tended to crown him; and Urban III. sent a licence and a crown of

peacock's feathers, which was never placed on his head. Had Richard I. had children Ireland might have

the families of Nugent, Tyrell, Nangle, Tuyt, Fleming, and others owe their importance in Irish history. It is not surprising that the Irish bordering on Meath should have thought De Lacy the real king of Ireland ; the follow- ing passage from the Annals of Lough Cé is worth quoting : —" The son of the king of the Saxons went across after- wards to complain of Hugo de Lacy to his father; for it was Hugo de Lacy that was king of Erin when the son of the king of the Saxons came, and he permitted not the men of Erin to give tribute or hostages to him."

During his brother's reign John's viceroy was William Richard Marshal, earl of Pembroke, who married Strongbow's I. (1189-

daughter by Eva, and thus succeeded to his claims in Leinster. John's reputation was no better in Ireland than

the English of the land," and also "that no religious house situated among the English shall henceforth receive an Irishman to their profession." This was solemnly con- firmed by the English parliament in 1416, and an Irish Act of Richard III. enabled the archbishop of Dublin to collate Irish clerks for two years, an exception proving the rule. Many Irish monasteries admitted no Englishmen, and at least one attempt was made, in 1250, to apply the

Le

: Separa- become a separate kingdom.

Henry granted Meath, about 800,000 acres, to Hugo de Lacy, reserving scarcely any prerogative to the crown, and

same rule to cathedrals. The races remained nearly sion of separate, the Irish simply staying outside the feudal the two system. Ifan Englishman slew an Irishman (except one races.

Edward

1.(1272- 1

Edward

(1307-

260

of the five regal and privileged bloods) he was not to be tried for murder, for Irish law admitted composition (erick) for murder. In Magna Charta there is a proviso that foreign merchants shall be treated as English merchants are treated in the country whence the travellers came. When Henry III. sent the letter against Irish clerks, Gualo the papal legate was chief minister, and the king a child of eleven years. Yet some enlightened men strove to fuse the two nations together, and the native Irish, or that section which bordered on the settlements and suffered great oppression, offered 8000 marks to Edward I. for the privilege of living under English law. The justiciary supported their petition, but the prelates and nobles refused to consent.

There is a vague tradition that Edward I. visited Ireland about 1256, when his father ordained that the prince's seal should have regal authority in that country. A vast number of documents remain to prove that he did not neglect Irish business. Yet this great king cannot be credited with any specially enlightened views as to Ireland. Hearing with anger of enormities committed in his name, he summoned the viceroy D'Ufford to explain, who coolly said that he thought it expedient to wink at one knave cutting off another, "whereat the king smiled and bade him return into Ireland." 'The colonists were strong enough to send large forces to the king in his Scotch wars, but as there was no corresponding immigration this really weakened the English, whose best hopes lay in agriculture and the arts of peace, while the Celtic race waxed propor- tionally numerous. Outwardly all seemed fair. The De Burghs were supreme in Connaught, and English families occupied eastern Ulster. The fertile southern and central lands were dominated by strong castles. But Tyrone and Tyrconnel, and the

mountains everywhere, sheltered the Celtic race, which, having reached its lowest point under Edward I., began to recover under his son.

In 1315, the year after Bannockburn, Edward Bruce landed near Larne with 6000 men, including some of the best knights in Scotland. Supported by O'Neill and other chiefs, and for a time assisted by his famous brother, Bruce gained many victories. The Scots ranged at will over great part of Ireland, but the brothers never took Dublin, though they came as near it as Castleknock. There was no general effort of the natives in their favour ; perhaps the Irish thought one Norman no better than another, and their total incapacity for national organization forbade the idea of a native sovereign. The family quarrels of the O'Connors at this time, and their alliances with the Burkes, or De Burghs, and the Birminghams, may be traced in great detail in the annalists,—the general result being fatal to the royal tribe of Connaught, which is said to have lost 10,000 warriors in the battle of Templetogher. In other places the English were less successful, the Butlers being beaten by the O'Carrolls in 1318, and Richard de Clare falling about the same time in the decisive battle of Dysert O'Dea. The O'Briens re-established their sway in Thomond and the illustrious name of De Clare disappears from Irish history. Edward Bruce fell in battle near Dundalk, most of his army recrossing the channel, and leaving behind a reputation for cruelty and rapacity. Indeed the invaders were generally hated, and have had little thanks either from Irish or colonial chroniclers. The colonists were victorious, but their organization was undermined, and the authority of the crown, which had never been able to keep the peace, grew rapidly weaker. Within twenty years after the great victory of Dundalk, the quarrels of the barons allowed the Irish to recover much of the land they had lost.

John de Birmingham, earl of Louth, the conqueror of Bruce, was murdered in 1329 by the Gernons, Cusacks, Everards, and other English of that county, who disliked

his firm government. They were never brought to justice. Talbot of Malahide and two hundred of Birmingham's rela- tions and adherents were massacred at the same time. In 1333 the young earl of Ulster was murdered by the Mande- villes and others; in this case signal vengeance was taken, but the feudal dominion never recovered the blow, and on the north-east coast the English laws and language were soon confined to Drogheda and Dundalk. The earl left one daughter, Elizabeth, who wasof course a royal ward. She married Lionel, duke of Clarence, and from her springs the royal line of England from Edward IV., as well as James V. of Scotland and his descendants.

The two chief men among the De Burghs were loth to hold their lands of a little absentee girl. Having no grounds for opposing the royal title to the wardship of the heiress, they abjured English law and became Irish chieftains. As such they were obeyed, for the king's arm was short in Ireland. Sir William appropriated Mayo as the Lower (Oughter) M'William, and the earldom of Mayo perpetuates the memory of the event. Sir Edmund as the Upper (Highter) M'William took Galway, and from him the earls of Clanricarde afterwards sprung.

Edward III. being busy with foreign wars had little time to spare for Ireland, and the native chiefs every- where seized their opportunity. Dublin was forced to pay blackmail to M'Murrough, and the northern settlements fared no better. In 1848 O'Kennedy drove the Cogans and Cantwells from their lands in North Tipperary, and burned Nenagh to the castle walls under the eyes of Ormonde's governor. In 1318 Brian O'Brien left Clare, and established himself in Tipperary, founding the family of M'Brien Arra. Perhaps the most remarkable of these aggressive chiefs was Lysaght O'More, who reconquered Leix. Clyn the Franciscan annalist, whose Latinity is so far above the medizval level as almost to recall Tacitus, sums up Lysaght's career epigrammatically : —"He was a slave, he became a master; he was a subject, he became a prince (de servo dominus, de subjecto princeps effectus)."

The two great earldoms whose contests form a large The part of the history of the south of Ireland were created by three Edward III. James Butler, eldest son of Edmund, earl of oe Carrick, became earl of

Ormonde and palatine of Tipperary . in 1828. Next year Maurice Fitzthomas Fitzgerald was made earl of Desmond, and from his three brethren descended the historic houses of the White Knight, the knight of Glyn, and the knight of Kerry. The earldom of Kildare dates from 1316. In this reign too was passed the statute of Kilkenny, a confession by the crown that obedient subjects were the minority. The enactments against Irish dress and customs, and against marriage and fostering proved a dead letter.

In two expeditions to Ireland Richard II. at first over- Richard came all opposition, but neither had any permanent effect. ae Art M'Murrough, the great hero of the Leinster Celts, i practically had the best of the contest. The king in his despatches divided the population into Irish enemies, Irish rebels, and English subjects. As he found them so he left them, lingering in Dublin long enough to lose his own crown. But for M'Murrough and his allies the house of Lancaster might never have reigned. No English king again visited Ireland until James II., declared by his English subjects to have abdicated, and by the more out- spoken Scots to have forfeited the crown, appealed to the loyalty or piety of the Catholic Irish.

Henry IV. had a bad title, and his necessities were Henry conducive to the growth of the English constitution, but ae fatal to the Anglo-Irish. His son Thomas was viceroy in 473) 1401, but did very little. 'Your son," wrote the Irish council to Henry, "is so destitute of money that he has not @ penny in the world, nor can borrow a single penny,

HISTORY. |

because all his jewels and his plate that he can spare, and those which he must of necessity keep, are pledged to lie in pawn." The nobles waged private war unrestrained, and the game of playing off one chieftain against another was carried on with varying success. The provisions of the statute of Kilkenny against trading with the Irish failed, for markets cannot exist without buyers.

ITRELAND

others. The rebellion of Jack Cade, claiming to be a Mortimer and cousin to the duke of York, took place at this time. This adventurer, at once ludicrous and formid- able, was a native of Ireland, and was thought to be put forward by Richard to test the popularity of the Yorkist cause. Returning suddenly to England in 1450, Richard left the government to James, earl of Ormonde and

HenryV. The brilliant reign of Henry V. was a time of extreme | Wiltshire, who had married Lady Eleanor Beaufort, and a misery to the colony in Ireland. Half the English-speak- | was deeply engaged on the Lancastrian side. This earl

ing people fled to England, where they were not welcome. The Act of 1 Henry V.c. 8 ordered all 'Irishmen and Trish clerks, beggars, called chamber deacons, to depart before the feast of All Souls, for quietness and peace in this realm of England." Soldiers were drawn by high pay to Henry's French wars, and a contemporary writer, Robert Redman, recounts how they " with very sharp and missile balls (catapultariis pilis) wounded their enemies severely, easily avoiding their onset by their own swift- ness of foot. Their valour in that siege (of Rouen) was remarkable…..... They showed very great animosity to the French, whom they plundered of their goods, and

begun the deadly feud with the house of Kildare which lasted for generations. After Blore Heath Richard was attainted by the Lancastrian parliament, and returned to Dublin, where the colonial parliament acknowledged him and assumed virtual independence. A separate coinage was established, and the authority of the English parlia- ment was repudiated. William Overy, a bold squire of Ormonde's, offered to arrest Richard as an attainted traitor, but was seized, tried before the man whom he had come to take, and hanged, drawn, and quartered. The duke only maintained his separate kingdom about a year. His party triumphed in England, but he himself fell at Wakefield.

whose children they seized by force as slaves to the English, after the price had been fixed by bargaining." The Irish wars had not been a good school of humanity,

Among the few prisoners taken on the bloody field of Edward Towton was Ormonde, whose head long adorned London IV. Bridge. He and his brothers were attainted in England (1461-

Henry The disastrous reign of the third Lancastrian completed | and by the Yorkist parliament in Ireland, but the import- ~"" oo the discomfiture of the original colony in Ireland. Quarrels | ance of the family was hardly diminished by this. For By ~ between the Ormonde and Talbot parties paralysed the | the first six years of Edward's reign the two Geraldine

Government, and a "':Pale" of 30 miles by 20 was all that remained. Even the walled towns, Kilkenny, Ross, Wex- ford, Kinsale, Youghal, Clonmel, Kilmallock, Thomastown, Fethard, and Cashel, were almost starved out ; Waterford itself was half ruined and half deserted. Only one par- liament was held for thirty years, but taxation was not remitted on that account. No viceroy even pretended to reside continuously. The north and west were still worse off than the south. Some thoughtful men saw clearly the danger of leaving Ireland to be seized by the first chance comer and the Libel of English Policy, written about 1436, contains a long and interesting passage declaring England's interests in protecting Ireland as "a boterasse and a poste" of her own power. Sir John Talbot, immortalized by

earls engrossed official power. The influence of Queen Elizabeth Woodville, whom Desmond had offended, then made itself felt. Tiptoft, earl of Worcester, became deputy. He was an accomplished Oxonian, who made a speech at Rome in such good Latin as to draw tears from the eyes of that great patron of letters Pope Pius II. (Aineas Sylvius). But his Latinity did not soften his manners, and he was thought cruel even in that age. Desmond was beheaded, ostensibly for using Irish exactions, really, as the partisans of his family hold, to please Queen Elizabeth. The remark- able lawlessness of this reign was increased by

the practice of coining. Several mints had been established since Richard of York's time; the standards varied, and imitation was easy.

Shakespeare, was several times viceroy; he was almost uniformly successful in the field, but feeble in council. He held a parliament at Trim which made one law against men of English race wearing moustaches, lest they should be mistaken for Irishmen, and another obliging the sons of

During Richard IIL's short reign the earl of Kildare, Richard head of the Irish Yorkists, was the strongest man in Ireland. 1. He espoused the cause of Lambert Simnel (1487), whom Henry the Irish in general seem always to have thought a true V!I.

Plantagenet. The Italian primate, Octavian de Palatio, rae

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agricultural labourers to follow their father's vocation under pain of fine and imprisonment. The earls of Shrewsbury are still earls of Waterford, and retain the right to carry the white staff as hereditary stewards, but the palatinate jurisdiction over Wexford was taken away by Henry VIII. The Ulster annalists estimate the great Talbot very differently from Shakespeare :—"A son of curses for his venom and a devil for his evils; and the learned say of him that there came not from the time of Herod, by whom Christ was crucified, any one so wicked in evil deeds" (O'Donovan's Four Masters).

knew better, and incurred the wrath of Kildare by refusing to officiate at the impostor's coronation. The local magnates and several distinguished visitors attended, and Lambert was shown to the people borne aloft on "great D'Arcy of Platten's" shoulders. His enterprise ended in the battle of Stoke,where the flower of the Anglo-Irish soldiery fell. " The Irish," says Bacon, "did not fail in courage or fierce- ness, but, being almost naked men, only armed with darts and skeins, it was rather an execution than a fight upon them." Conspicuous among Henry's adherents in Ireland were the citizens of Waterford, who, with the meu of

Richard In 1449 Richard, duke of York, right heir by blood to | Clonmel, Callan, Fethard, and the Butler connexion gene- of York the throne of Edward III., was forced to yield the regency | rally, were prepared to take the field in his favour. Water- a . of France to his rival Somerset, and to accept the Irish | ford was equally conspicuous some years later in resisting ™— viceroyalty. He landed at Howth with his wife Cicely | Perkin Warbeck, who besieged it unsuccessfully, and was Neville, the beautiful Rose of Raby, and Margaret of | chased by the citizens, who fitted out a fleet at their own

Anjou hoped thus to get rid of one who was too great for | charge. The king conferred honour and rewards on the

a "subject. The Irish government was given to him for | loyal city, to which he gave the proud title of urbs intacta.

ten years on unusually liberal terms. He ingratiated himself with both races, taking care to avoid identification with any particular family. At the baptism of his son— "false, fleeting, perjured Clarence"-—who was born in Dublin Castle, Desmond and Ormonde stood sponsors together. In legislation Richard fared no better than

Many doubtless believed that Perkin was really the duke of York ; but it is now certain that he was an impostor, Mr Gairdner's researches having quite dispelled the " historic doubts" with which Horace Walpole and many smaller mystery-mongers amused their excessive leisure. Other events of this reign were the parliament of Drogheda, held

Henry VIII.

(1509- 47).

The Trish Church.

by Sir Edward Poyning, which gave the control of Irish legislation to the English council (the great bone of con- tention in the later days of Flood and Grattan), and the battle of Knocktow, in which the earl of Kildare used the viceregal authority to avenge a private quarrel.

Occupied in pleasure or foreign enterprise, Henry VIII. at first paid little attention to Ireland. The royal power was practically confined to what in the previous century had become known as the "Pale," that is Dublin, Louth, Kildare, and a part of Meath, and within this narrow limit the earls of Kildare were really more powerful than the crown. Waterford, Drogheda, Dundalk, Cork, Limerick, and Galway were not Irish, but rather free cities than an integral part of the kingdom ; and many inland towns were in the same position. The house of Ormonde had created a sort of small Pale about Kilkenny, and part of Wexford had been colonized by men of English race. The Desmonds were Irish in all but pride of blood. The Barretts, Condons, Courcies, Savages, Arundels, Carews, and others had dis- appeared or merged in the Celtic mass. Anglo-Norman nobles became chiefs of pseudo-tribes, which acknowledged only the Brehon law, and paid dues and services in kind. These pseudo-tribes were often called " nations," and a vast number of exactions were practised by the chiefs. 'Coyne and livery "—the right of free-quarters for man and beast— arose among the Anglo-Normans, and became more oppres- sive than any native custom. When Henry took to business, he laid the foundation of reconquest. The house of Kildare, which had actually besieged Dublin (1534), was overthrown, and the Pale saved from a standing danger. But the Pale scarcely extended 20 miles from Dublin, a march of uncertain width intervening between it and the Irish districts, Elsewhere, says an elaborate report, all the English folk were of " Irish language and Irish condition," except in the cities and walled towns. Down and Louth paid black rent to O'Neill, Meath and Kildare to O'Connor, Wexford to the Kavanaghs, Kilkenny and Tipperary to O'Carroll, Limerick to the O'Briens, and Cork to the M'Carthies. M'Murrough Kavanagh, in Irish eyes the representative of king Dermod, received an annual pension from the exchequer. Henry set steadily to work to reassert the royal title. He assumed the style of king of Ireland, so as to get rid of the notion that he held the island of the

pope. The Irish chiefs acknowledged his authority and his ecclesiastical supremacy, abjuring at the same time that of the Holy See. The lands of the earl of Shrewsbury and other absentees, who had performed no duties, were resumed; and both Celtic and feudal nobles were encouraged to come to court. Here begins the long line of official deputies, often men of moderate birth and fortune. Butler and Geraldine, O'Neill and O'Donnell, continued to spill each other's blood, but the feudal and tribal systems were alike doomed. In the names of these Tudor deputies and other officers we see the origin of many great Irish families— Skeffington, Brabazon, St Leger, Fitzwilliam, Wingfield, Bellingham, Carew, Bingham, Loftus, and others. Nor were the Celts overlooked. O'Neill and O'Brien went to London to be invested as earls of Tyrone and Thomond

of Tyrconnel, went to court and was well received. The pseudo-chief M'William became earl of Clanricarde, and others reached lower steps in the peerage, or were knighted by the king's own hand. All were encouraged to look to the crown for redress of grievances, and thus the old order slowly gave place to the new.

The moment when Protestantism and Ultramontanism are about to begin their still unfinished struggle is a fit time to notice the chief points in Irish church history. Less than two years before Strongbow's arrival Pope Eugenius had established an ecclesiastical constitution in

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Ireland depending on Rome, but the annexation was very imperfectly carried out, and the hope of fully asserting the Petrine claims was a main cause of Hadrian's gift to Henry IJ. Hitherto the Scandinavian section of the church in Ireland had been most decidedly inclined to receive the hierarchical and diocesan as distinguished from the monastic and quasi-tribal system. The bishops or abbots of Dublin derived their suecession from Canterbury from 1038 to 1162, and the bishops of Waterford and Limerick also sought consecration there. But both Celt and Northman acknowledged the polity of Eugenius, and it was chiefly in the matters of tithe, Peter's pence, canonical degrees, and the observance of festivals that Rome had still victories to gain.

Between churchmen of Irish and English race there was bitter rivalry ; but the theory that the ancient Patrician Church remained independent, and as it were Protestant, while the English colony submitted to the Vatican, is a mere controversial figment. The crown was weak and papal aggression made rapid progress. It was in the Irish Church, about the middle of the 13th century, that the system of giving jurisdiction to the bishops "in temporalibus" was adopted by Innocent IV. The vigour of Edward I. obtained a renunciation in particular cases, but the practice continued unabated. The system of pro- visions was soon introduced at the expense of free election, and was acknowledged by the Statute of Kilkenny. In the more remote districts it must have been almost a matter of necessity. Many Irish parishes grew out of primitive monasteries, but other early settlements remained monastic, and were compelled by the popes to adopt the rule of authorized orders, generally that of the Augustinian canons. That order became much the most numerous in Ireland, having not less than three hundred houses. Allemand, who wrote in the 17th century for the benefit of the Stuart family, remarks with French flippancy that an Irishman who wished to be a bishop first became a canon regular. Of other sedentary orders the Cistercians were the most important, and the mendicants were very numerous. Both Celtic chiefs and Norman nobles founded convents after Henry II.'s time, but the latter being wealthier were most distinguished in this way. Religious houses were useful as abodes of peace in a turbulent country, and the lands attached were better cultivated than those of lay proprietors. It is a reproach to England that after four centuries Ireland was still without a university. Attempts to found one at Dublin (1311) or Drogheda (1465) failed for want of funds. The work was partially done by the great abbeys, boys of good family being brought up by the Cistercians of Dublin and Jerpoint, and by the Augustinians of Dublin, Kells, and Conall, and girls by the canonesses of Gracedieu. A strong effort was made to gave these six houses, but Henry VIII. would not hear of it, and there was no Irish Wolsey partially to supply the king's omissions.

Ample evidence exists that the Irish Church was full of abuses before the movement under Henry VIII. We have detailed accounts of three sees—Clonmacnoise,

1 | Enaghdune, and Ardagh. Ross, also in a wild district, respectively. O'Donnell, whose descendants became earls |

was in rather better case. But even in Dublin strange things happened; thus the archiepiscopal crozier was in pawn for eighty years from 1449. The morals of the

| clergy were no better than in other countries, and we have | evidence of many scandalous irregularities.

But perhaps the most severe condemnation is that of the report to Henry VIII. in 1515. "There is," says the document, 'no archbishop, ne bishop, abbot, ne prior, parson, ne vicar, ne any other person of the church, high or low, great or small, English or Irish, that useth to preach the word of God, saving the poor friars beggars…... the church of this land use not to learn any other science, but the

law of canon, for covetise of lucre transitory." Where his hand reached Henry had little difficulty in suppressing the monasteries or taking their lands, which Irish chiefs swallowed as greedily as men of English blood. But the friars, though pretty generally turned out of doors, were themselves beyond Henry's power, and continued to preach everywhere among the people. Their devotion and energy may be freely admitted ; but the mendicant orders, especi- ally the Carmelites, were not uniformly distinguished for morality. Monasticism was monientarily suppressed under Oliver Cromwell, but the Restoration brought them back to their old haunts. The Jesuits, placed by Paul IIL under the protection of Con O'Neill, " prince of the Irish of Ulster," came to Ireland towards the end of Henry's reign, and helped to keep alive the Roman tradition. It is not surprising that Anglicanism—the gospel light that dawned from Boleyn's eyes—recommended by such prelates as Browne and Bale, should have been regarded as a symbol of conquest and intrusion, The Four Masters thus describe the Reformation :—"A heresy and new error arising in England, through pride, vain glory, avarice, and lust, and through many strange sciences,

so that the men of England went into opposition to the pope and to Rome.”

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have hairs of your head and I advise you for Christ’s sake not to preach at the Navan.” Staples answered that preaching was his duty, and that he would not fail ; but he feared for his life. On the same prelate fell the task of conducting a public controversy with Primate Dowdall, which of course ended in the conversion of neither. Dow- dall fled; his see was treated as vacant, and Cranmer cast about for a Protestant to fill St Patrick’s chair. His first nominee, Dr Turner, resolutely declined the honour, declaring that he would be unintelligible to the people; and Cranmer could only answer that English was spoken in Ireland, though he did indeed doubt whether it was spoken in the diocese of Armagh. John Bale, a man of great learning and ability, became bishop of Ossory. There is no reason to doubt his sincerity, but he was coarse and intemperate,—Mr Froude roundly calls him a foul-mouthed ruffian,—without the wisdom of the serpent or the harmless- ness of the dove. His choice rhetoric stigmatized the dean of St Patrick’s as ass-headed, a blockhead who cared only for his kitchen and his belly. Archbishop Browne was gluttonous and a great epicure. If Staples was gene- rally hated, what feelings must Bale have excited ?

The Reformation having made no real progress, Mary Mary found it easy to recover the old ways. Dowdall was re- (1553- stored ; Browne, Staples, and others were deprived. Bale °”””

The destruction of relics and images and the establishment of a schismatic hierarchy is thus recorded :—“ Though

great was the persecution of the Roman emperors against the church, scarcely had there ever come so great a perse- cution from Rome as this.” Such was Roman Catholic opinion in Ireland in the 16th century,

and such it is still. In vulgar Irish the word “ Sassenagh” denotes a Protestant as well as an Englishman.

fled for bare life, and his see was treated as vacant. Yet the queen found it impossible to restore the monastic lands, though she showed some disposition to scrutinize the titles of grantees, She was Tudor enough to declare her inten- tion of maintaining the old prerogatives of the crown against the Holy See, and assumed the royal title without

Edward The able opportunist St Leger, who was accused by one | papal sanction, Paul IV. was fain to curb his fiery VI, party of opposing the Reformation and by the other of | temper, and to confer graciously what he could not with- Sa lampooning the Real Presence, continued to rule during | hold. English Protestants fled to Ireland to escape the ’ the early days of the protectorate. To him succeeded Sir | Marian persecution; but respectable evidence exists to Edward Bellingham, a puritan soldier whose hand was | show that, had the reign continued a little longer, Dublin heavy on all who disobeyed his dear young master, as he | would have been no safe place of refuge. affectionately called the king. He bridled Connaught by Mary scarcely varied the civil policy of her brother’s a castle at Athlone, and Munster by a garrison at Leighlin | ministers. Gerald of Kildare was restored to his earldom. Bridge. The O’Mores and O’Connors were brought low, | The plan of settling Leix and Offaly by dividing the country and forts erected where Maryborough and Philipstown now | between colonists and natives holding by English tenure stand, Both chiefs and nobles were forced to respect the | failed, owing to the unconquerable love of the people for king’s representative, but Bellingham was not wont to | their own customs, But resistance gradually grew fainter, flatter those in power, and his administration found little | and we hear little of the O’Connors after this. The favour in England, Sir F, Bryan, Henry VIII,’s favourite, | O’Mores, reduced almost to brigandage, gave trouble till succeeded him, and on his death St Leger was again | the end of Elizabeth’s reign, and a member of the clan was appointed. Neither St Leger nor his successor Crofts | chief contriver of the rebellion of 1641. Maryborough could do anything with Ulster, where the papal primate | and Philipstown, King’s county and Queen’s

county, Wauchop, a Scot by birth, stirred up rebellion among the | commemorate Mary's ill-starred marriage. natives and among the Hebridean invaders. But little Anne Boleyn's daughter succeeded quietly, and Sir Elizabeth was done under Edward VI. to advance the power of the | Henry Sidney was sworn lord-justice with the full Catholic crown, and that little was done by Bellingham. ritual, When Sussex superseded him as lord-lieutenant, The Re- The English Government long hesitated about the official | the litany was chanted in English, both cathedrals having Fa establishment of Protestantism, and the royal order to that | been painted, and Scripture texts substituted for '" pictures

effect was withheld until 1551. Copies of the new liturgy were sent over, and St Leger had the communion service translated into Latin, for the use of priests and others who could read, but not in English. The popular feeling was strong against innovation, as Staples, bishop of Meath, found to his cost. The opinions of Staples, like those of Cranmer, advanced gradually until at last he went to Dublin and preached boldly against the mass. He saw men shrink from him on all sides. 'My lord," said a beneficed priest, whom he had himself promoted, and who wept as he spoke, "before ye went last to Dublin ye were the best beloved man in your diocese that ever came in it, now ye are the worst beloved…..... Ye have preached against the sacrament of the altar and the saints, and will make us worse than Jews…..... The country folk mould eat "you… . ... . Ye have more curses than ye

and popish fancies." At the beginning of 1560 a parlia- ment was held which restored the ecclesiastical legislation of Henry and Edward. In two important points the Irish Church was made more dependent on the state than in England : congés d'élire were abolished, and heretics made amenable to royal commissioners or to parliament without reference to any synod or convocation. According to a contemporary list, this parliament consisted of 3 arch- bishops, 17 bishops, 23 temporal peers, and members returned by 10 counties and 28 cities and boroughs. We know not whether all were present, and therefore the list throws no light on the dispute as to the conformity of Irish bishops in possession at Elizabeth's accession. A careful scrutiny shows that

Curwen of Dublin and O'Filily of Leighlin actually conformed. Bodkin of Tuam, De Burgh of Clonfert, and perhaps some others took the oath

Rebellion of Shane O'Neill.

First Desmond rebellion,

1574

of supremacy ; but the English convocation under Henry VIII. had done no less, and it involved no doctrinal changes. Walsh of Meath, Leverous of Kildare, and probably Thonory of Ossory were deprived. In other cases Elizabeth connived at what she could not prevent, and hardly pretended to enforce uniformity except in the Pale and in the large towns.

Ulster demanded the immediate attention of Elizabeth. Her father had conferred the earldom of Tyrone on Con Bacagh O'Neill, with remainder to his supposed son Matthew, the offspring of a smith's wife at Dundalk, who in her husband's lifetime brought the child to Con as his own. When the chief's legitimate son Shane grew up he declined to be bound by this arrangement, which the king may have made in partial ignorance of the facts. " Being a gentleman," he said, " my father never refusid uo child that any woman namyd to be his." When Tyrone died, Matthew, already created baron of Dungannon, claimed his earldom under the patent. Shane being chosen O'Neill by his tribe claimed to be chief by election and earl as Con's lawful son. Thus the English Government was com- mitted to the cause of one who was at best an adulterine bastard, while Shane appeared as champion of hereditary right. To secure his position he murdered the baron of Dungannon, whose prowess in the field he had reason to dread, aud the eldest of two surviving sons became official candidate for the earldom. Shane maintained a contest which had begun under Mary until 1567, with great ability and a total absence of morality, in which Sussex had no advantage over him. The lord-lieutenant twice tried to have Shane murdered; once he proposed to break his safe- conduct ; and he held

out hopes of his sister's hand as a snare. Shane was induced to visit London, where his strange appearance and followers caused much amusement, and where he spent his time intriguing with the Spanish ambassador and making himself agreeable to Lord Robert Dudley. The Government detained him rather unfairly, and the young baron of Dungannon suffered his father's fate, leaving a brother who at last gained the coveted earldom, and became a more dangerous enemy to England than even Shane had been. Sussex was outmatched both in war and diplomacy ; the loyal chiefs were crushed one by one ; and the English suffered checks of which the moral effect was ruinous. Shane always fully acknowledged Elizabeth as his sovereign, and sometimes played the part of a loyal subject, wreaking his private vengeance under colour of expelling the Scots from Ulster. At last, in 1566, the queen placed the sword of state in Sidney's strong grasp. Shane was driven helplessly from point to point, and perished miserably at the hands of the M'Don- nells, whom he had so often oppressed aud insulted.

Peace was soon broken by disturbances in the south. The earl of Desmond having shown rebellious tendencies was detained for six years in London. Treated leniently, but grievously pressed for mouey, he tried to escape, and, the attempt being judged treasonable, he was persuaded to surrender his estates,—to receive them back or not at the queen's discretion. Seizing the opportunity, English adventurers proposed to plant a military colony in the western half of Munster, holding the coast from the Shannon to Cork harbour. Some who held obsolete title deeds were encouraged to go to work at once by the example of Sir Peter Carew, who had established his claims in Carlow. Carew's title had been in abeyance for a century and a half, yet most of the Kavanaghs attorned to him, Falling foul of Ormonde's brothers, seizing their property and using great cruelty and violence, Sir Peter drove the Butlers, the only one among the great families really loyal, into rebellion. Ormonde, who was in London,

could alone restore peace ; all his disputes with Desmond

were at once settled in his favour, and he was even allowed to resume the exaction of coyne and livery, the abolition of which had been the darling wish of statesmen. The Butlers returned to their allegiance, but continued to oppose Carew, and great atrocities were committed on both sides. Sir Peter had great but undefined claims in Munster also, and the people there took warning. His imitators in Cork were swept away. Sidney first, and after him Humphrey Gilbert, could only circumscribe the rebellion. The presidency of Munster, an office the creation of which had long been contemplated, was then conferred on Sir John Perrott, who drove Fitzmaurice into the mountains, reduced castles everywhere, and destroyed a Scottish con- tingent which had come from Ulster to help the rebels. Fitzmaurice came in and knelt in the mud at the president's feet, confessing his sins; but he remained the real victor. The colonizing scheme was dropped, and the first pre- sidency of Munster left the Desmonds and their allies in possession. Similar plans were tried unsuccessfully in Ulster, first by a son of Sir Thomas Smith, afterwards by Walter, earl of Essex, a knight-errant rather than a states- man, who was unfortunately guilty of many bloody deeds. He treacherously captured Sir Brian O'Neill and mas- sacred his followers. The Scots in Rathlin were slaughtered wholesale. Essex struggled on for more than three years, seeing his friends gradually drop away, and dying ruined and unsuccessful. Towards the end of 1575 Sidney was again persuaded to become viceroy. The Irish recognized his great qualities, and he went everywhere without interrup- tion. Henceforth presidencies became permanent institu- tions. Drury in Munster hanged four hundred persons in one year, Malby in reducing the Connaught Burkes spared neither young nor old, and burned all corn and houses. The Desmonds determined on a great effort. A holy war was declared. Fitzmaurice landed in Kerry with a few followers, and accompanied by the famous Nicholas Sanders, who was armed with a legate's commission and a banner blessed by the pope. Fitzmaurice fell soon after in an encounter with Malby, but Sanders and Desmond's brothers still kept the field. When it was too late to act with effect, Desmond himself, a vain man, neither frankly loyal nor a bold rebel, took the field. He surprised Youghal,

then an English town, by night, sacked it, and murdered the people. Roused at last, Elizabeth sent over Ormonde as general of Munster, and after long delay gave him the means of conducting a campaign. “TI will merely,” wrote Burghley, “say Butler Aboo against all that cry in anew language Papa Aboo.” It was in fact as much a war of Butlers against Geraldines as of loyal subjects against rebels, and Ormonde did his work only too well. Lord Baltinglass raised a hopeless subsidiary revolt in Wicklow (1580), which was signalized by a crushing defeat of Lord-Deputy Grey (Arthegal) in Glenmalure. A force of Italians and Spaniards landing at Smerwick in Kerry, Grey hurried thither, and the foreigners, who had no commission, surrendered at discretion, and were put to the sword. Neither Grey nor the Spanish ambassador seem to have seen anything extraordinary in thus disposing of incon- venient prisoners. Spenser and Raleigh were present. Sanders perished obscurely in 1581, and in 1583 Desmond himself was hunted down and killed in the Kerry mountains. More than 500,000 Irish acres were forfeited to the crown. The horrors of this war it is impossible to exaggerate. The Four Masters say that the lowing of a cow or the voice of a ploughman could scarcely be heard from Cashel to the furthest point of Kerry ; Ormonde, who, with all his severity, was honourably distinguished by good faith, claimed to have killed 5000 men in a few months. Spenser, an eye-witness, says famine slew far more than the sword. The survivors were unable to walk, but crawled

out of the woods and glens. “ They looked like anatomies | pardon on his knees, renouncing his Celtic chiefry, and

of death ; they did eat the dead carrion and one another | abjuring all foreign powers, but still retaining his earldom,

soon after, insomuch as the very carcasses they spared not | and power almost too great for a subject. Scarcely was

to scrape out of their graves; ... . to a plot of water- | the ink dry when he was told of the great queen's death.

cresses or shamrocks they flocked as to a feast." He burst into tears, not of grief; but of vexation at not

In 1584 Sir John Perrott, the ablest man available after | having held out for still better terms.

Sidney's retirement, became lord-deputy. Sir John Norris, In reviewing the Irish governnient of Elizabeth we shall Eliza- famed in the Netherland wars, was president of Munster, | find much to blame, a want of truth in her dealings and bethan and so finpressed the Irish that they averred him to be in | of steadiness in her policy. Violent efforts of coercion C21est

league with the devil. Perrott held a parliament in 1585 | were succeeded by fits of clemency, of parsimony, or of cee

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in which the number of members was considerably increased. He made a strenuous effort to found a university in Dublin, and proposed to endow it with the revenues of St Patrick's, reasonably arguing that one cathedral was enough for any city. Here he was opposed by Loftus, archbishop of Dublin and chancellor, who had expressed his anxiety for a college, but had no idea of endowing it at his own expense. 'The colonization of the Munster forfeitures was undertaken at this time. It failed chiefly from the grants to individuals who neglected to plant English farmers, and were often absentees themselves. Raleigh obtained 42,000 acres. The quit rents reserved to the crown were less than one penny per acre. Racked with the stone, hated by the official clique, thwarted on all sides, poor Perrott was goaded into using words capable of a treasonable interpre- tation. Archbishop Loftus pursued

him to the end. He died in the Tower under sentence for treason, and we may charitably hope that Elizabeth would have pardoned him. In his will, written after sentence, he emphatically repu- diates any treasonable intention—“ I deny my Lord God if ever I proposed the same.”

In 1584 Hugh O’Neill, if O’Neill he was, became chief of part of Tyrone ; in 1587 he obtained the coveted earldom, and in 1593 was the admitted head of the whole tribe. A quarrel with the Government was inevitable, and, Hugh Roe O’Donnell having joined him, Ulster was united against the crown. In 1598 James Fitzthomas Fitzgerald assumed the title of Desmond, to which he had some claims by blood, and which he pretended to hold as Tyrone’s gift.

Tyrone had received a crown of peacock’s feathers from |

the pope, who was regarded by many as king of Ireland. The title of Sugan or straw-rope earl has been generally given to the Desmond pretender. Both ends of the island

apathy. Yet it is fair to remember that she was surrounded by enemies, that her best energies were expended in the death struggle with Spain, and that she was rarely able to give undivided attention to the Irish problem. After all she conquered Ireland, which her predecessors had failed to do, though many of them were as crooked in action and

less upright inintention. Considering the times, Elizabeth Religious cannot be called a persecutor. “Do not,” she said to the Pelicy.

elder Essex, “‘seek too hastily to bring people that have been trained in another religion from that in which they have been brought up.” Such things as the torture of Archbishop O’Hurley cannot and need not be defended, but tle statesmen of that day regarded the royal supremacy as a political doctrine, and its active opponents as traitors. And Catholics should not. be too ready to remember the tyranny which their forefathers felt, and to forget the plots against Elizabeth’s life, the night of St Bartholomew, and the Spanish Inquisition. Elizabeth saw that the Irish could only be reached through their own language. But

for that harvest the labourers were necessarily few. The fate of Bishop Daly of Kildare, who preached in Irish, and who thrice had his house' burned over his head, was not likely to encourage missionaries. Neither the best nor the worst of the episcopal body, Adam Loftus must be regarded as a representative man. Topreach what he thought true when he could do it safely, to testify against toleration, and in the meantime to make a fortune, was too often the sum and substance of an Anglican prelate's work in Ireland. Iu all wild parts divine service was neglected, and wander- ing friars or subtle Jesuits, supported by every patriotic or religious feeling of the people, kept Ireland faithful to Rome. Against her many shortcomings we must set the queen's foundation of that university which has been the

Last were soon in a blaze, and the Four Masters say that in | one successful English institution in Ireland, and which = seventeen days there was not one son of a Saxon left alive | has continually borne the fairest fruit. Tebeion.

in the Desmond territories. Edmund Spenser lost his all, escaping only to die of misery in a London garret. Tyrone more than held his own in 'the north, completely defeated

Sir H. Bagenal in the battle of the Yellow Ford (1598),

invaded Munster, aud ravaged the lands of Lord Barry- more, who had remained true to his allegiance. Tyrone's ally, Hugh Roe O'Donnell, overthrew the president of Connaught. 'The Irish of Connaught," say the Four Masters, "' were not pleased at Clifford's death; .... he had never told them a falsehood." Essex came over in 1599 with a great army, but did nothing of moment, was outgeneralled and outwitted by Tyrone, and threw up his command to enter on the mad and criminal career which led to the scaffold. In 1600 Sir George Carew became president of Munster, and, as always happened when the crown was well served, the rebellion was quickly put down. Mountjoy, who succeeded Essex, joined Carew, and a Spanish force which landed at Kinsale surrendered. The destruction of their crops starved the people into submis-

‘ sion, and the contest was only less terrible than the first

Desmond war because it was much shorter. In Ulster Mountjoy was assisted by Sir Henry Doewra, who founded the second settlement at Derry, the first, under Randolph having been abandoned. Hugh O’Donnell sought help in Spain, where he died. Tyrone submitted at last, craving

‘ Great things were expected of James I. He was Mary James I. Stuart’s son, and there was a curious antiquarian notion (1603-

afloat that, because the Irish were the original “Scoti,” a Scottish king would sympathize with Ireland. Corporate towns set up the mass, and Mountjoy, who could argue as well as fight, had to teach them a sharp lesson. Finding Ireland conquered and in no condition to rise again, James established circuits and a complete system of shires. Sir John Davies was sent over as solicitor-general. ‘The famous book in which he glorifies his own and the king’s exploits gives far too much credit to the latter, and far too little to his great predecessor. When she was still alive to confer favours, Davies in very creditable verse had lavished praises upon Elizabeth which must have seemed exaggerated even

to her.

Two legal decisions swept away the customs of tanistry and of Irish gavelkind, and the English land system was violently substituted. ‘Tyrone was harassed by sheriffs and other officers, and the Government, learning that he was engaged in an insurrectionary design, prepared to seize him. The information was probably false, but Tyrone was grow- ing old and nervous, and perhaps despaired of making good his defence. By leaving Ireland he played into his enemies’ hands. Rory O’Donnell, created earl of Tyrconnel, accompanied him. Cuconnaught Maguire had already gone.

Set ;

The “flight of the earls,” as it is called, completed the ruin of the Celtic cause. Reasons or pretexts for declaring for- feitures against O’Cahan and O’Reilly were easily found. O’Dogherty, chief of Innishowen, and foreman of the grand jury which found a bill for treason against the earls, received a blow from Paulet the governor of Derry. O’Dogherty rose, Derry was sacked, and Paulet murdered. O’Dogherty having been killed arid O’Hanlon and others being impli- cated, the whole of northern Ulster was at the disposal of the Government. Tyrone, Donegal, Armagh, Cavan, Fermanagh, and Derry were parcelled out among English and Scotch colonists, portions being reserved to the natives. The site of Derry was granted to the citizens of London, who fortified and armed it, and Londonderry became the chief bulwark of the colonists in two great wars. If we look at its morality we shall find little to praise, but in a political point of view the plantation of Ulster was success- ful. The northern province, which so severely taxed the energies of Elizabeth, has since been the most prosperous and loyal part of Ireland. But the conquered people remained side by side with the settlers; and Sir George Carew, who reported on the plantation in 1611, clearly foresaw that they would rebel again “under the veil of religion and liberty, than which nothing is esteemed so precious in the hearts of men.” Those natives who retained land were often oppressed by their stronger neighbours, and sometimes actually swindled out of their property. It is probable that in the neglect of the grantees to give proper leases to their tenants arose the Ulster tenant-right custom

to carry out his policy. He told those who remonstrated to mind their own business. ‘ What is it to you if I had created 40 noblemen and 400 boroughs? The more thie merrier, the fewer the better cheer.” In 1639 the House of Commons had 274 members, a number which was further increased to 300 at the Revolution, and so it remained until

the Union.

Steeped in absolutist ideas, James was not likely to Religions tolerate religious dissent. He thought he could “mak policy of A proclamation for James L

what liked him law and gospel.” banishing Romish priests issued in 1605, and was followed by anactive and general persecution, which was so far from succeeding that they continued to flock in from abroad, Lord-Deputy Chichester admitting that every house and hamlet was to them a sanctuary. The most severe English statutes against the Catholic laity had never been re-enacted in Ireland, and, in the absence of law, illegal means were taken to enforce uniformity. Privy seals addressed to men of wealth and position commanded their attendance at church before the deputy or the provincial president, on pain of unlimited fine and imprisonment by the Irish Star Chamber. The Catholic gentry and lawyers, headed by Sir Patrick Barnewall, succeeded in proving the flagrant illegality of these mandates, and the Government had to yield. On the whole Protestantism made little progress, though the number of Protestant settlers increased. As late as 1622, when Lord Falkland was installed as deputy, the illustrious Ussher, then bishop of Meath, preached from the text ‘he beareth not the sword in vain,” and descanted

which has attracted so much notice of late years.

It may be convenient to notice here the parliamentary history of the English colony in Ireland, which corresponds pretty closely to that of the mother country, First there are informal meetings of eminent persons; then, in 1295, there is a parliament of which some acts remain, and to which only knights.of the shire were summoned to represent the Commons. Burgesses were added as early as 1310. The famous parliament of Kilkenny in 1367 was largely attended, but the details of its composition are not known. That there was substantial identity in the character of original and copy may be inferred from the fact that the well-known tract called Modus Tenendi Parliamentum was exemplified under the Great Seal of Ireland in 6 Hen. V.

on the over-indulgence shown to recusants. Primate Hampton, in a letter which is a model of Christian eloquence, mildly rebuked his

eminent suffragan.

The necessities of Charles I. induced his ministers to Charles]. propose that a great part of Connaught should be declared (1625- forfeited owing to mere technical flaws in title, and planted "*" like Ulster. Such was the general outcry that the scheme had to be given up; and, on receiving a large grant from the Irish parliament, the king promised certain graces, of which the chief were security for titles, a free trade, and the substitution of an oath of allegiance for that of supremacy. Having got the money, Charles as usual broke Adminis- his word; and in 1635 Lord-Deputy Strafford began a tration of general system of extortion, The Connaught and Munster Strato

The Trish *parlia- ment.

The most ancient Irish parliament remaining on record was held in 1374, twenty members in all being summoned to the House of Commons, from the counties of Dublin, Louth, Kildare, and Carlow, the liberties and crosses of Meath, the city of Dublin, and the towns of Drogheda and Dundalk. The liberties were those: districts in which the great vassals of the crown exercised palatinate jurisdic- tion, and the crosses were the church lands, where alone the royal writ usually ran. Writs for another parliament in the same year were addressed in addition to the counties of Waterford, Cork, and Limerick ; the liberties and crosses of Ulster, Wexford, Tipperary, and Kerry; the cities of Waterford, Cork, and Limerick ; and the towns of Youghal, Kinsale, Ross, Wexford, and Kilkenny. The counties of Clare and Longford, and the towns of Galway and Athenry, were afterwards added, and the number of popular repre- sentatives does not appear to have much exceeded sixty during the later Middle Ages. In the House of Lords the temporal peers wére largely outnumbered by the bishops and mitred abbots. In the parliament which conferred the royal title on Henry VIII. it was finally decided that the proctors of the clergy had no voice or votes. Elizabeth's first parliament, held in 1559, was attended by 76 members of the Lower House, which increased to 122 in 1585. In 1613 James I. by a wholesale creation of new boroughs, generally of the

last insignificance, increased the House of Commons to 232, and thus.secured an Anglican majority

landowners were shamelessly forced to pay large fines for the confirmation of even recent titles. The Irish woollen manufacture was discouraged as hurtful to England ; and, if linen was encouraged, it was only because no linen was made in the greater kingdom. The money obtained by oppressing the Irish nation was employed to create an army for the oppression of the Scotch and English nations. The Roman Catholics were neither awed nor conciliated. Twelve bishops, headed by Primate Ussher, solemnly pro- tested that 'to tolerate popery is a grievous sin." The Ulster Presbyterians were rigorously treated. Of the prelates employed by Strafford in this insane persecution the ablest was Bramhall of Derry, who not only oppressed the ministers but insulted them by coarse language. The "black oath," which bound those who took it never to oppose Charles in anything, was enforced on all ministers, and those who refused it were driven from their manses and often stripped of their goods.

Strafford was recalled to expiate his career on the scaffold; the army was disbanded; and the helm of the state remained in the hands of a landjobber and of a superan- nuated soldier. Disbanded troops are the ready weapons of conspiracy, and the opportunity was not lost.

but quickly became masters of nearly the whole country. That there was no definite design of massacring the Pro- testants is likely, but it was intended to turn them out.

The Rebellion Catholic insurgents of 1641 just failed to seize Dublin, of 1641.

Cromwell.

ILISTORY. |

Great numbors were killed, often in cold blood and with circumstances of great barbarity. The English under Coote and others retaliated. In 1642 a Scottish army under Monro landed in Ulster, and formed a

rallying point for the colonists. Londonderry, Enniskillen, Coleraine,Carrick- fergus, and some other places defied Sir Phelim O'N eill's tumultuary host. O'Neill gradually formed a powerful army among the Ulster Irish, and it is impossible to overestimate his skill and patience. But like other O'Neills, he did little out of Ulster, and his great victory over Monro (1645) had no last- ing results. The old English of the Pale were forced into rebellion, but could never get on with the native Irish, who hated them only less than the new colonists. Ormonde throughout maintained the position of a loyal subject, and, as the king's representative, played a great but hopeless part. The Celts cared nothing for the king except as a weapon against the Protestants; the old Anglo-Irish Catholics cared much, but the nearer Charles approached them the more completely he alienated the Protestants. In 1645 Rinuccini reached Ireland as papal legate. He could never cooperate with the Catholic confederacy at Kilkenny, which was under old English influence, and by throwing in his lot with the Celts only widened the gulf between the two sections. The Royalist confederates were not willing to decide the question of investitures in favour of the pope, still less to restore the abbey lands of which they were the chief holders. Whatever may be thought of Mr Carlyle's judgments on Ireland generally, he has thoroughly mastered the state of parties during the turmoil

which followed 1641 :—' There are," he says, " Catholics.

of the Pale, demanding freedom of religion, under my lord this and my lord that. There are Old-Irish Catholics, under pope's nuncios, under Abba O'Teague of the excom- munications, and Owen Roe O'Neill, demanding not reli- gious freedom only, but what we now call 'repeal of the union,' and unable to agree with Catholics of the English Pale. Then there are Ormonde Royalists, of the Episco- palian and mixed creeds, strong for king without covenant ; Ulster and other Presbyterians strong for king and cove- nant; lastly, Michael Jones and the Commonwealth of England, who want neither king nor covenant."

In all their negotiations with Ormonde and Glamorgan, Henrietta Maria and Digby, the pope and [inuccini stood out for an arrangement

which would have destroyed the royal supremacy and established Romanism in Ireland, leaving to the Anglicans bare toleration, and to the Pres- byterians not even that. Charles behaved after his kind, showing, not only his falseness, but also his total want of real dignity. Ormonde was forced to surrender Dublin to the Parliamentarians (1646), and the inextricable knot awaited Cromwell's sword. The total inability of the Irish Catholics to form anything like a working government during their nine years of power proves that her history, and the discordant ingredients of her population, must ever prevent Ireland from achieving a separate political existence.

Cromwell's campaign (1649-50) showed how easily a good general with an efficient army might conquer Ireland. Resistance in the field was soon at an end; the starving- out policy of Carew and Mountjoy was employed against the guerillas, and the soldiers were furnished with scythes to cut down the green corn. Bibles were also regularly served out to them. Oliver's severe conduct at Drogheda and elsewhere is not morally defensible, but much may be urged in his favour. Strict discipline was maintained—he hanged soldiers for stealing chickens; faith was always kept; and short, sharp action was more merciful in the long run than a milder but less effective policy. The character and designs of this great man offer a most difficult problem.

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Trained in foreign wars, Owen Roe.

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For a time Lord Clarendon had it all his own way; in due course came a reaction so violent that the Protector has been almost deified in some quarters. Ireton was in many respects a copy of his father-in-law. Cromwell's civil policy, to use Macaulay's words, was "able, straightforward, and cruel." He thinned the disaffected population by allowing foreign enlistment, and 40,000 are said to have been thus got rid of. Already Irish Catholics of good family had learned to offer their swords to foreign princes. In Spain, France, and the empire they often rose to the distinction which they were denied at home. About 9000

persons were sent tothe West Indies, practically into slavery. Thus, and by the long war, the population was reduced to some 850,000, of whom 150,000 were English and Scots; the marvel is that so many were left. Then came the trans- plantation beyond the Shannon. The Irish Catholic gentry were removed bodily with their servants and such tenants as consented to follow them, and with what remained of their cattle. They suffered dreadful hardships. To excludo foreign influences, a belt of one mile was reserved to soldiers on the coast from Sligo to the Shannon, but the idea was not fully carried out. The derelict property in the other provinces was divided between adventurers who had advanced money and soldiers who had fought in Ireland. Many of the latter sold their claims to officers or specu- lators, who were thus enabled to form estates. The majority of Irish labourers stayed to work under the settlers, and the country became peaceful and prosperous. Some fighting Catholics haunted woods and hills under the name of 'Tories, afterwards given in derision to a great party, and were hunted down with as little compunction as the wolves to which they were compared. Measures of great severity were taken against Catholic priests ; but it is said that Cromwell had great numbers in his pay, and that they kept him well informed. All classes of Protestants were tolerated, and Jeremy Taylor preached unmolested. Com- mercial equality being given to Ireland, the woollen trade at once revived, and a shipping interest sprang up. Were it worth while to prove Cromwell a greater statesman than Strafford, his religious and commercial policy in Ireland would supply ample evidence. A legislative union was also effected, and Irish members attended at Westminster. The following brief record of a debate is worth quoting :—

¢*Mr Bamfield and Mr Robinson—all that serve for Ireland

should be on this committee. Sir Gilbert Pickering, Mr Hyland—against any such distinction of members; it is an ill precedent and looks not like an union ; name as many as you will, but let them not be exclusively added. Mr Ashe—as they sit in Parliament, they are not Irishmen, but mere Englishmen. Resolved—that all who serve for Ireland be of the committee." For further particulars

Mr Prendergast's Cromwellian Settlement and Tory War

of Ulster should be consulted.

Charles II. was bound in honour to do something for Charles

such Trish Catholics as were innocent of the massacres of II.

1641, and the claims were not scrutinized too severely. I was found impossible to displace the Cromwellians, but they were shorn of about one-third of their lands. When the Caroline settlement was complete it was found that the great rebellion had resulted in reducing the Catholic share of the fertile parts of Ireland from two-thirds to one-third. Ormonde, whose wife had been allowed by Croniwell's clemency to make him some remittances from the wreck of his estate, was largely and deservedly rewarded: A revenue of £30,000 was settled on the king, in considera tion of which Ireland was in 1663 excluded from the benefit of the Navigation Act, and her nascent shipping interest ruined. In 1666 the importation of Irish cattle and horses into England was forbidden, the value of the former at once falling five-fold, of the latter twenty-fold.

(1660-

U5),

James IT.

(1685— 89).

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Among other arguments in favour of this atrocious law was that used by Ashley, who said that if the bill did not pass the duke of Ormonde would have a greater estate than the earl of Northumberland. '" Achitophel" must have laughed in his sleeve. Buckingham said every opponent of the bill must have "an Irish' estate or an Irish under-standing," which nearly cost him a duel with Ossory, and much

damaged his reputation for courage. That sucha man as Buckingham should have so taunted such a man as Ormonde is characteristic of the most shameless reign in our history. Dead meat, butter, and cheese were also excluded, yet peace brought a certain prosperity. The woollen manufacture grew and flourished, and Macaulay is probably warranted in saying that under Charles II Ireland was a pleasanter place of residence than it has been before or since. But it was pleasant only for those who conformed to the state religion. Catholicism was tolerated, or rather connived at; but its professors were subject to frequent alarms, and to great severities during the reign of Titus Oates. Bramhall became primate, and his hand was heavy against the Ulster Presbyterians. It is humiliating to record that Jeremy Taylor began a perse- cution: which stopped the influx of Scots into Ireland. Deprived of the means of teaching, the Independents and other sectaries soon disappeared. In a military colony women werescarce, and the "Ironsides" had married natives. To use their own language, they saw the daughters of Moab: that they were fair. Women are more religious than men, travelling missionaries more zealous than endowed clerks; and Catholicism held its own. The Quakers became numerous during this reign, and their peaceful industry was most useful. They venerate as their founder Thomas Edmundson, a Westmoreland man who had borne arms for the Parliament, and who settled in Antrim in 1652.

The duke of Ormonde was lord-lieutenant at the death of Charles II. At seventy-five his brain was as clear as ever, and James saw that he was no fit tool for his purpose. "See, gentlemen," said the old chief, lifting his glass at a military dinner party, "they say at court I am old and doting. But my hand is steady, nor doth my heart To the king's health." loyal subservience, James appointed his brother-in-law, Lord Clarendon, to succeed Ormonde. Monmouth's enter- prise made no stir, but gave an excuse for disarming the Protestant militia. The Tories at once emerged from their hiding-places, and Clarendon found Ireland in a ferment, It was now the turn of the Protestants to feel what perse- cution means. Richard Talbot, one of the few survivors of Drogheda, governed the king's Irish policy, while the lord-licutenant was kept in the dark. Finally Talbot, created earl of Tyrconnel, himself received the sword of state. Protestants were weeded out of the army,

Protestant officers in particular being superseded hy idle Catholics of gentle blood, where they could be found, and in any case by Catholics. Bigotry rather than religion was Tyrconnel's ruling passion, and he filled up offices with Catholics inde- pendently of character. Fitton, a man convicted of forgery, became chancellor, and but three Protestant judges were left on the bench. The outlawries growing out of the affairs of 1641 were reversed as quickly as possible. Pro- testant corporations were dissolved by "quo warrantos " ; but James was still Englishman enough to refuse an Irish parliament, which might repeal Poyning's Act and the Act of Settlement. In 1687 the Church of England discovered

that there were limits to passive obedience, and at the close |

of the following year James was a fugitive in France. By this time Londonderry and Enniskillen: had closed their gates, and the final strnggle had begun. In March 1689 James reached Ireland with some French troops, and

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Calculating on his |

[IISTORY.

summoned a parliament which repealed the Act of Settle- ment. The estates of absentees were vested in the crown, and, as only two months law was given, this was nearly equivalent to confiscating the property of all Protestants. Between 2000 and 8000 Protestants were attainted by name, and moreover the Act was not published. The appalling list may be read in the State of the Protestants by Archbishop King, one of many divines converted by the logic of events to believe in the lawfulness of resistance. Interesting details may be gleaned in Thomas Edmundson's Diary. The dispossessed Protestants escaped by sea or flocked into Ulster, where a gallant.stand was made. The glories of Londonderry and Enniskillen will live as long as the English language. The Irish cause produced one great achievement—the defence of Limerick, and one great leader—Patrick Sarsfield. The Catholic Celts aided by France were entirely beaten, the Protestant colonists aided

by England were entirely victorious (battle of the Boyne, William Ist July 1690; battle of Aughrim, 12th July 1691), HI.

Even the siege of Limerick showed the irreconcilable divisions which had nullified the efforts of 1641. Hugh Baldearg O'Donnell, last of Irish chiefs, sold his services to William for £500 a year. But it was their king that condemned the Irish to hopeless failure. He called them cowards; whereas the cowardice was really his own, and: he deserted them in their utmost need. They repaid him with the opprobrious nickname of " Sheemas-a-Cacagh," or Dirty James.

Irish rhetoric commonly styles Limerick "the city of the violated treaty." The articles of capitulation (3d October 1691) may be read in Leland or Plowden ; from the first their interpretation was disputed. Hopes of religious liberty were held out, but were not fulfilled. Lords Jus- tices Porter and Coningsby promised to do their utmost to obtain a parliamentary ratification, but the Irish parlia- ment would not be persuaded. There was a paragraph in the original draft which would have protected the property of the great majority of Catholics, but this was left out in the articles actually signed. William thought the omission accidental, but this is hardly possible. At all events he ratified the treaty' in the sense most favourable to the Catholics, while the Irish parliament adhered to the letter of the document. Perhaps no breach of faith was intended, but the sorrowful fact remains that the modern settlement of Ireland has the appearance of resting on a broken pro- mise. More than 1,000,000 Irish acres were forfeited, and, though some part returned to Catholic owners, the Catholic interest in the land was further diminished. William ITI. was the most liberally minded man in his dominions ; but the necessities of his position, such is the awful penalty of

_ gteatness, forced him into intolerance against his will, and he

promised to discourage the Irish woollen trade. His manner of disposing of the Irish forfeitures was inexcusable. Grants to Bentinck, Ruvigny, and Ginckell may be defended, but not that to Elizabeth Villiers, countess of Orkney, the king's former mistress. The lands were resumed by the English parliament, less perhaps from a sense of justice

than from a desire to humiliate the deliverer of England, and were resold to the highest bidder. Nevertheless it became the fashion to reward nameless English services at the expense of Ireland. Pensions and sinecures which would not bear the light in England were charged on the Irish establish- _ ment, and even bishoprics were given away on the same principle. The tremendous uproar raised by Swift about Wood's halfpence was heightened by the fact that Wood shared his profits with the duchess of Kendal.

From the first the victorious colonists determined to make another 1641 impossible, and the English Government failed to moderate their severity (principal Penal Act, 2 Anne, c. 3). In 1708 Swift declared that the Papists were politi-

Penal laws.

Commer- cial re- straints,

cally as inconsiderable as the women and children, In despair of effecting anything at home, the young and strong enlisted in foreign armies, and the almost incredible num- ber of 450,000 are said to have emigrated for this purpose between 1691 and 1745. This and the hatred felt towards James II. prevented any rising in 1715 or 1745. The panic-stricken severity of minorities is proverbial, but it is not to be forgotten that the Irish Protestants had been turned out of house and home twice within fifty years. The restric- tions on Irish commerce provoked Locke's friend Molyneux to write his famous plea for legislative independence (1698). Much of the learning contained in it now seems obsolete, but the question is less an antiquarian one than he supposed. Later events have shown that the mother country must have supreme authority, or must relax the tie with self- governing colonies merely into a close alliance. In the case of Ireland the latter plan has always been impossible. In 1708 the Irish parliament begged hard for a legislative union, but as that would have involved at least partial free trade the English monopolists prevented it. By Poyning's law England had a vote on all Irish legislation, and was therefore an accomplice in the penal

laws. [or details on this disagreeable subject the reader is referred to Denys Scully's Statement of the Penal Laws. No Papist might teach a school or any child but his own, or send children abroad,—the burden of proof lying on the accused, and the dccision being left to magistrates without a jury. Mixed marriages were forbidden between persons of property, and the children might be forcibly brought up Protestants. A Papist could not be a guardian, and all wards in chancery were brought up Protestants. The Protestant eldest son of a landed proprietor might make his father tenant for life and secure his own inheritance. Among Papist children land went in compulsory gavelkind. Papists could not take longer leases than thirty-one years at two-thirds of a rack rent; they were even required to conform within six months of an inheritance accruing, on pain of being ousted by the next Protestant heir. Priests from abroad were banished, and their return declared treason. All priests were required to register and to remain in their own parishes, and informers were to be rewarded at the expense of the Popish inhabitants. No Papist was allowed arms, two justiccs being empowered to search; and if he had a good horse any Protestant might claim it on tendering £5. These laws were of course systematically evaded. The property of Roman Catholics was often preserved through Protestant trustees, and it ig understood that faith was generally kept. Yet the attrition if slow was sure, and by the end of the century the proportion of land belonging to Roman Catholics was probably not more than one-tenth of the whole. We can see now that if the remaining Roman Catholic landlords had been encouraged they would have done much to reconcile the masses to the settlement. Individuals are seldom as bad as corporations, and the very men who made the laws against priests practically shielded them. Nothing was so odious as a priest-hunter, even among Protcstauts, and this form of delation has doubtless done much to create the Irish horror of informing, or indeed of giving any evidence. The penal laws put a premium on hypocrisy, and many conformed only to preserve their property or to enable them to take office. Proselytizing schools, though supported by public grants, entirely failed.

The restraints placed by English commercial jealousy on Irish trade destroyed manufacturing industry in the south and west, Driven by the

Caroline legislation against cattle into breeding sheep, Irish graziers produced the best wool in Europe. Forbidden to export it, or to work it up profitably at home, they took to smuggling, for which the indented coast gave great facilities. The enormous profits of the contraband trade with France enabled Ireland to

purchase English goods to an extent greater than her whole lawful traffic. The moral effect was disastrous, The religious penal code it was thought meritorious to evade ; the commercial penal code was ostentatiously defied ; and both tended to make Ireland the least law-abiding country in Europe. The account of the smugglers is the most interesting and perhaps the imost valuable part of Mr Froude's work on Ireland, and should be compared with Mr Lecky's Irish and Scotch chapters.

When William III promised to depress the Irish Ulster woollen trade, he promised to do all he conld for Irish prosper-

linen. the Ulster weavers were not crushed, and their industry flourished. Some Huguenot refugees, headed by Louis Crommelin, were established by William ITJ. at Lisburn, and fuunded the manufacturing prosperity of Ulster. Other Huguenots attempted other industries, but com- mercial restraints brought them to nought. The peculiar character of the flax business has prevented it from crossing the mountains which bound the northern province. Wool was the natural staple of the south.

England did not fulfil the second promise; still] °"

The Scottish Presbyterians who defended Londonderry Dis- were treatcd little better than the Irish Catholics who be- Senters.

sieged it,—the sacramental test of 1704 being the work of the English council rather than of the Irish parliament. In 1715 the Irish House of

Commons resolved that any one who should prosecute a Presbyterian for accepting a com- mission in the army without taking the test was an enemy to the king and to the Protestant interest. Acts of indemnity were regularly passed throughout. the reign of George IL., and until 1780, when the Test Act was repealed. A bare toleration had been granted in 1720. Various abuses, especially forced labour on roads which were often private jobs, caused the Oakboy insurrection in 1764. Eight years later the Steelboys rose against the exactions of absentee landlords, who often turned out Protestant yeomeu to get a higher rent from Roman Catholic cottiers. The dispossessed men carried to America an undying hatred of England which had much to say to the American revolution, and that again reacted on Ireland, Lawless Protestant associations, called Peep o' Day Boys, terrorized the north and were the progenitors of the Orangemen (1789). Out of the rival "' defenders " Ribbonism in part sprung, The United Irishmen drew from both sources el): '

Bul the Ulster peasants were never as badly off as those of the south and west. Writers the most unlike each other—Swift and Boultcr, Berkeley and Stone, Arthur Young and Dr Thomas Campbell—all tell the same tale. Towards the end of the 17th century Raleigh's fatal gift had already become the food of the people. When Chief

| Baron Rice went to London in 1688 to urge the Catholic

claims on James II., the hostile populace escorted him in mock state with potatoes stuck on poles. Had manufac- tures been given fair play in Ireland, population might have preserved some relation to capital. As it was, land became almost the only property, and the necessity of pro- ducing wool for smuggling kept the country in grass. The poor squatted where they could, receiving starvation wages, and paying exorbitant rents for their cabins, partly with their own labour. Unable to rise, the wretched peoplc multiplied on their potato plots with perfect recklessness. During the famine which began in the winter of 1739 one-fifth of the population is supposed to have perished ; yet it is hardly noticed in literature, and seems not to have touched the conscience of that English public which in 1755 subscribed £100,000 for

the sufferers by the Lisbon earthquake. As might be expected where men were allowed to smuggle and forbidden to work, redress was sought in illegal combinations and secret sucieties. The

Poverty of the peas-

antry.

Struggle for inde- pend. ence,

dreaded name of Whiteboy was first heard in 1761, and agrarian crime has never since been long absent. Since tle Union we have had the Threshers, the Terry Alts, the Molly Maguires, the Rockites, and many others. Poverty has been the real cause of all these disturbances, which were often aggravated by the existence of factions profoundly indicative of barbarism. Communism, cupidity, scoundrel- ism of all kinds have contributed to every disturbance. The tendency shown to screen the worst criminals is some- times the result of sympathy, but more often of fear. The cruelties which have generally accompanied Whiteboyism is common to servile insurrections all over the world. No wonder if Irish landlords were formerly tyrannical, for they were in the position of slave-owners. The steady application of modern principles, by extending legal pro- tection to all, has altered the slavish character of the oppressed Irish. The cruelty has not quite died out, but it is much rarer than formerly; and, generally speaking, the worst agrarianism has of late years been seen in the districts which retain most of the old features.

The medieval colony in Ireland was profoundly modified by the pressure of the surrounding tribes. While partially adopting their laws and customs, the descendants of the conquerors often spoke the language of the natives, and in so doing nearly lost their own. The Book of Howth and many documents composed in the Pale during the 16th century show this clearly. Those who settled in Ireland after 1641 were in avery different mood. They hated, feared, and despised the Irish, and took pride in preserving their pure English speech. Molyneux and

Petty, who founded the Royal Society of Dublin in 1683, were equally Englishmen, though the former was born in Ireland. Swift and Berkeley did not consider themselves Irishmen at all.

3urke and Goldsmith, coming later, though they might not call themselves Englishmen, were not less free from provincialism. It would be hard to name other four men, who, within the same period, used Shakespeare's language with equal grace and force. They were all educated at Trinity College, Dublin. The Sheridans were men of Irish race, but with the religion they adopted the literary tone of the dominant caste, which was small and exclusive, with the virtues and the vices of an aristocracy. Systematic infringement of English copyright was discreditable in itself, but sure evidence of an appetite for reading. '" The bookseller's property," says Gibbon of his first volume, "was twice invaded by the pirates of Dublin." The oratory of the day was of a high order, and incursions into the wide field of pamphlet literature often repay the student. Handel was appreciated in Dublin at a time when it was still the fashion to decry him in London. The public buildings of the Irish capital have always been allowed great architectural merit, and private houses still preserve much evidence of a refined taste. Angelica Kauffmann worked long in Ireland; Barry and Shee were of Irish birth; and on the whole, considering the small number of educated inhabitants, it must be admitted that the Ireland of Flood and Grattan was intellectually fertile.

The volunteers extorted partial free trade (1779), but manufacturing traditions had perished, and common experi- ence shows how hard these are to recover. The demand for union was succeeded by a craving for independence. Poyning's law was repealed, and in 1782, in Mr Grattan's opinion, Ireland was at last a nation, The ensuing period of eighteen years is the best known in Irish history. The quarrel and reconciliation of Flood and Grattan, the kindly patriotism of Charlemont, the eloquence, the devotion, the corruption, are household words. In 1784 out of 300 members 82 formed the regular opposition, of whom 30 were the nominees of Whig potentates and 52 were really elected. The majority contained 29 members

considered independent, 44 who expected to be bought, 44 placemen, 12 sitting for regular Government boroughs, and 12 who were supposed to support the Government on public grounds. and were let to Government for valuable consideration. The House of Lords, composed largely of borough-mongers and controlled by political bishops, was even less inde- pendent. Only Protestant freeholders had votes, which encouraged leases for lives, about the worst kind of tenure, and the object of each proprietor was to control as many votes as possible. The necessity of finding Protestants checked subdivision for a time, but in 1793 the Roman Catholics received the franchise, and it became usual to make leases in common, so that each lessee should have a freehold interest of 40s. The landlord indeed had little choice, for his importance depended on the poll book. Salaries, sinecures, even commissions in the army were reserved for those who contributed to the return of some local magnate.

The remaining seats were proprietary, ©

But no political cause swelled the population as much Depend.

as the potato. Introduced by Raleigh in 1610, the culti- vation of this dangerous tuber developed with extraordinary rapidity. The Elizabethan wars were most injurious to industry, for men will not sow unless they hope to reap, and the very essence of military policy had been to deprive a recalcitrant people of the means of living. The Mantuan peasant was grieved at the notion of his harvest being gathered by barbarian soldiers, and the Irishman could not be better pleased to see his destroyed. There was no security for any one, and every one was tempted to live from hand to mouth. The decade of anarchy which followed 1641 stimulated this tendency fearfully. The labour of one man could plant potatoes enough to feed forty, and they could neither be destroyed nor carried away easily. When Petty wrote, early in Charles IJ.’s reign, this demoralizing esculent was already the national food. Potatoes canuot

be kept very long, but there was no attempt to keep them

at all; they were left in the ground, and dug as required. A. frost which penetrated deep caused the famine of 1739. Even with the modern system of storing in pits the potato does not last through the summer, and the “meal months ” —June, July, and August—always brought great hardship. The danger increased as the growing population pressed ever harder upon the available land. Between 1831 and 1842 there were six seasons of dearth, approaching in some places to famine.

The population increased from 2,845,932 in 1785 to 5,356,594 in 1803. They married and were given in marriage. Wise men foresaw the deluge, but people who were already half-starved every summer did not think their case could well be worse. In 1845 the population had swelled to 8,295,061, the greater part of whom de- pended on the potato only. There was no margin, and when the “ precarious exotic” failed an awful famine was the result.

Great public and private efforts were made to meet the case, and relief works were undertaken, on which, in March 1847, 734,000 persons, representing a family aggregate of not less than 3,000,000, were employed. It was found that labour and exposure were not good for half-starved men. The jobbing was frightful, and is probably insepar- able from wholesale operations of this kind. The policy of the Government was accordingly changed, and the task of feeding a whole people was undertaken. More than 3,000,000 rations, generally cooked, were at one time distributed, but no exertions could altogether avert death in a country where the usual machinery for carrying, distri- buting, and preparing food was almost entirely wanting. From 200,000 to 300,000 perished of starvation or of fever caused by insufficient food. An exodus followed

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F HISTORY. |

which, necessary as it was, caused dreadful hardship, and among the Catholic Irish in America Fenianism took its rise. One good result of the famine was thoroughly to awaken Englishmen to their duty towards Ireland. Since then, purse-strings have been even too readily untied at the call of Irish distress.

Great brutalities disgraced the rebellion of 1798, but the people had suffered much and had French examples before them. ‘The real originator of the movement was Theobald Wolfe Tone, whose proffered services were rejected by Pitt, and who founded the United Irishmen. His Parisian adventures detailed by himself are most interesting, and his tomb is still the object of an annual pilgrimage. Tone was a Protestant, but he had imbibed socialist ideas, and hated the priests whose influence counteracted his own. In Wexford, where the insurrection went farthest, the ablest leaders were priests, but they acted against the policy of their church.

The inevitable Union followed (1st January 1801). Pitt.

had long before (1785) offered a commercial partnership which had been rejected on the ground that it involved the ultimate right of England to tax Ireland. He was not less liberally inclined in – religious matters, but George III. stood in the way, and like William IIT. the minister would not risk his imperial designs. Carried in great measure by the same corrupt means as the constitution of ’82 had been worked by, the Union earned no gratitude. But it was a political necessity, and

Grattan never gave his countrymen worse advice than when he urged them to "keep knocking at the Union." The advice has, how- ever, been taken. Emmet's insurrection (1803) was the first emphatic protest. Then came the struggle for eman- cipation. It was proposed to couple the boon with a veto on the appointment of Roman Catholic bishops. It was the ghost of the old question of investitures. The remnant of the Catholic aristocracy would have granted it; even Pius VII. was not invincibly opposed to it; but Daniel O'Connell took the lead against it. Under his guidance the Catholic association became a formidable body. At last the priests gained control of the elections; the victor of Waterloo was obliged to confess that the king's govern- ment could no longer be carried on, and Catholic emanci- pation had to be granted (1829). The tithe war followed, and this most oppressive of all taxes was unfortunately commuted (1838) only in deference to clamour and violence. The repeal agitation was unsuccessful, but let us not be extreme to mark the faults of O'Connell's later years. He doubtless believed in repeal at first; probably he ceased to believe in it, but he was already deeply committed, and had abandoned a lucrative profes- sion for politics. With some help from Father Mathew he kept the monster meetings in order, and his constant denunciations of lawless violence distinguish him from his imitators, His trial took place in 1844. There is a sympathetic sketch of O'Connell's career in Lecky's Leaders of Opinion; Wyse's History of the Catholic Associa- tion gives the best account of the religious struggle, and much may be learned from Fitzpatrick's Life of Bishop Doyle.

The national system of education introduced in 1833 was the real recantation of intolerant opinions, but the economic state of Ireland was fearful. The famine, emigration, and the new poor law have nearly got rid of Starvation, but the people have not become frankly loyal, for they feel that they owe more to their own importunity, to their own misfortunes, than to the wisdom of their rulers. The literary efforts of young Ireland eventuated in another rebellion (1848) ; a revolutionary wave could not roll over Europe without, touching the unlucky island. After the failure of that wretched outbreak there was

peace until the close of the American war released a number of adventurers trained to the use of arms and filled with hatred to England.

Already in 1858 the discovery of the Phoenix conspi i i pirac ; had shown that the policy of Mitchel and his ate otis on

was not forgotten. John O'Mahony, one of the men of "48, organized a formidable secret society in America, which his historical studies led him to call the Fenian brotherhood. The money raised in the United States was perhaps not less than £80,000, but it is due to O'Mahony to say that he died poor. In Ireland the chief direction of the con- spiracy was assumed by James Stephens, who had been implicated in the Phoenix affair, and who never cordially agreed with O'Mahony. Stephens was very despotic—a true revolutionary leader. As in all Irish political con- spiracies there were traitors in the camp, who. kept the authorities well informed, and in September 1865 the Zrish People newspaper, which had been the organ of the move- ment, was suddenly suppressed by the Government. 'The arrests of Luby, O'Leary, and O'Donovan Rossa followed, all of whom, with many others, were afterwards prosecuted to conviction, Stephens for a time eluded the police, living with little concealment in a villa near Dublin, and apparently occupied in gardening. But in November he was identified and captured, much evidence being found in his house. Ten days afterwards he escaped from Richmond prison, and it is now known that some of the warders were Fenians. Another conspirator, sometimes called O'Brien and some- times Osborne, afterwards escaped from Clonmel jail. American papers stated that Stephens was in actual want in New York in the winter of 1880, but he has since been heard of at Paris. The promptitude of the Government perhaps prevented a general insurrection, but there was a partial outbreak in February and March 1867, chiefly in Kerry, Limerick, and Tipperary. There was an affray, if it deserves the name, at Tallaght near Dublin, and a plot to seize Chester Castle was discovered and frustrated. The police, who behaved extremely well, were often attacked, but the Fenians abstained from plunder or from any acts which might estrange the rural population. The peasants, however, though for the most part

nationalists, did not care to risk their lives in such a wild enterprise, and the young men of the towns furnished the only real force. Weather of extraordinary severity, which will long be remembered as the ‘ Fenian winter,” completed their discomfiture, and they suffered fearful hardships. There was enough sympathy with the movement to procure the election of O’Donovan Rossa for Tipperary in 1867, when he was actually undergoing penal servitude. John Mitchel, whose old sentence was unreversed, was chosen by the same con- stituency as late as 1875, but in neither case was the vote a large one. It became the fashion in Ireland to celebrate annually the obsequies of the “ Manchester martyrs,” as the three Fenians were called who suffered death for the murder of police-serjeant Brett. The Roman Catholic Church has always opposed secret societies, and some priests had the firmness to discountenance these political funerals, but strong popular excitement in Ireland has generally been beyond clerical control. Even now the Fenian spirit is not extinct, and one of the brotherhood, named Devoy, announced a new departure in January 1879. Devoy and his friends have certainly had considerable influence upon the recent agrarian agitation, which they have from motives of policy placed in the front, while keeping a separatist movement in reserve.

The Fenian movement disclosed much discontent, and was attended by criminal outrages in England. The abolition of the Irish Church Establishment, which had long been condemned by public opinion, was then decreed (1869). The land question was next taken in hand (1870), and

many of those who opposed the changes made now think they have done good. These reforms did not, however, put an end to Irish agitation, The Home Rule party, which demanded the restoration of a separate Irish Parliament, showed increased activity, and the general election of 1874 gave it a strong representation at Westminster, where one

Bad seasons and distress among the peasantry (187 8-1880) added force to the Land League, and agrarian outrages increased to an alarming extent on the expiration of the Peace Preservation Act and the rejection by the Lords of a bill temporarily limiting evictions, In 188] a Coercion Act was passed, and was immediately followed by a new

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IRELAND, Samus. Wittiam Henry (1777-1835),

of the following article, in the publication of the supposed Shakespearian papers, was born in London, where he was originally a mechanic in Spitalfields. He afterwards became a dealer in old books and prints and similar articles; and, turning his knowledge of drawing and engraving to account, he published several books of travel, with illustrations in aquatinta. On December 24, 1796, Ireland published the Jfiscellaneous Papers and Legal Instruments under the Hand and Seal of William Shakspeare ; including the Tragedy of King Lear and a small fragment of Hamlet, dated 1797, and purporting to he copies of originals furnished him by his son. Al- though, on the exposure of the fraud, the latter asserted his father’s complete innocence, Samuel Ireland felt the disgrace very bitterly, and the occurrence is said to have hastened his death, which took place in J uly 1800.

His works, which at one time were in considerable request, include A Picturesque Tour through Holland, Brabant, and part of France, 2vols., 1790 ; Picturesque Views on the River Lhames, 2 vols., 1792, on the River Medway, 1793, on the Warwickshire Avon, 1795, on the River Wye, 1797, and on the River Severn, 1824; Graphic Illustrations of Hogarth, 2 vols., 1794; and_A Picturesque View, with an Historical Account of the Inns of Court, 1800. On the forgeries question he published 4 Vindication of his Conduct, 1797, and An Investigation of Mr Malone’s Claim to the character of a Scholar or Critic, 1797.

generally known as William Henry Ireland, who at the age of seventeen produced the notorious Shakespeare for- geries, was the son of the subject of last notice, and was born in London in 1777, After spending four years at school in France, he was apprenticed in 1794 to a con- veyancer in London. The enthusiasm of his father for everything connected with Shakespeare suggested to young Ireland the idea of delighting him with a forged autograph of the poet. He carefully drew up a copy of an old deed, purporting to be a lease from Shakespeare to certain other parties, and presented it as a genuine document to his unsuspecting father. The complete success of this first attempt and the eager solicitations of his friends to ransack the papers among which he pretended to have found the lease were the incitements to a more ambitious career of literary forgery. He invented a story of a gentleman, acci- dentally met with, among whose old papers the documents were found, but who, for various reasons, refused to permit his name to be disclosed. A large collection of the most interesting relics was brought to light. A. profession of faith, a love-letter, enclosing a lock of the poet's hair, to Anne Hathaway, private letters to and from Shakespeare, theatrical memoranda, notes of hand and receipts, agree- ments between Shakespeare and actors, pictures, annotated

books and tracts—all were produced and received with delighted credulity. Dr Parr, Dr Wharton, Sir Isaac Heard, James Boswell, and others came to register their belief in the authenticity of the papers. The assurance with which the imposture was conducted may be judged from the fact that a deed was brought forward, in which it was set forth that the papers and books had been bequeathed by Shakespeare to a certain contemporary William-Henrye Irelaunde, who had rescued him from drowning in the Thames, and who, there was evidence to show, was the direct ancestor of the Ircland whom chance had thrown in the way of the possessor of the relics. At last a whole new play, named Vortigern, was announced as having been discovered. Sheridan purchased it for Drury Lane Theatre, and au overflowing house assembled to sit in judgment upon it. But away from the glamour of crabbed handwriting and yellow paper, the feeble dialogue and crude

conceptions of the tragedy could not stand the test, and one representation sufficed to prove it a complete failure. Its fate prevented the composition of a series of historical plays, of which Henry JJ. had already been produced by the impudent Ireland. Samuel Ireland the elder had published the miscellaneous papers in what he asserts to have been the fullest belief in their authen- ticity, but the hostile criticism of Malone and others, and the unsatisfactory account of the source of the papers, com- bined to compel him to demand a full disclosure from his son. Harassed by the success of his own deceit, which had carried him far beyond his first intention, Ireland at last confessed his fraud, and published a tract with a full account in 1796. In 1805 he published more elaborate Confessions, in which he cannot conceal his satisfied vanity. After the exposure, Ireland was forced to abandon both his home and his profession. He wrote several novels of no value, and gradually sank to the condition of a book- seller's hack. He died in great penury in April 1835.

The more interesting publications on the Ireland forgeries are :—

Inquiry into the authenticity of certain Papers, de., attributed to Shakespeare, by Edmond Malone, 1796 ; An Apology for the Believers in the Shakespeare Papers, 1797, and a Supplemental Apology, 1799, both by George Chalmers ; and pamphlets by Boaden, Waldron, Wyatt, Webb, and Oulton. Vortigern was republished in 1832.

IRENAIUS, bishop of Lyons in the end of the 2d century, was one of the most distinguished of the theo- logians of the ante-Nicene church. Very little is known of his early history, and the accounts given in various biographies are for the most part conjectural. He himself has informed us that in his youth he was acquainted with Polycarp, the disciple of John (Eusebius, Hist. Zccl., v. 20), and from this fact, together with his Greek name, his early and thorough Christian training, and his great acquaintance with Greek literature, it has been conjectured that he belonged to the neighbourhood of Smyrna in Asia Minor, and that he was the child of Christian parents. Itis most probable that he died in the year 202, but the date of his birth is quite uncertain; tlhe best authorities place it between 120 and 140. How he,

born and educated in Asia Minor, came to spend his life in Gaul is also unknown. Eusebius tells us that he was a presbyter of Pothinus, bishop of Lyons, and it has been inferred from that passage that he was ordained by that bishop. In 177 the persecu- tion under Marcus Aurelius reached Gaul, and the members of the churches of Lyons and Vienne suffered severely (see the letter of these churches to the brethren in Asia Minor and Phrygia, quoted by Eusebius, /fist. Eccl., v. 1). Pothinus the bishop was one of the first martyrs. Trenzeus was called to succeed him and to fill the honourable but dangerous post in the following year (178). Gregory of Tours has recorded his wonderful success in the city of Lyons, which in a short time became almost wholly Christian (fist. Heel. Franc., i. 27), and tradition tells us

of many scholars of Irenseus who were notable missionaries among the Pagan Gauls. Irenzus, however, was best known by his endeavours to counteract the teachings of the Gnostics, and his attempts to mediate between the bishops of Rome and the churches of Asia Minor in their disputes about the proper time at which to keep Easter. The Gnostic teacher whose views spread to Gaul was Valentinus. [He had come to Rome some time about the middle of the. 2d century, and disciples had tried to pro- pagate his opinions among the Christians in Gaul. It is said that the efforts of Irenzus resulted in a council held at Lyons, where the opinions of these Gnostics were con- demned ; but, as the evidence for this statement is not pro- bably older than the 9th century, it may be considered doubtful. The Easter controversy, which lasted on to the council of Niczea in 325, and assumed various forms, had a very simple origin,—the question whether, in reckoning the days on which our Lord died and rose again, Christians should keep by the day of the month simply, or so arrange it that the day to be observed in commemoration of our Lord's resurrection should always bea Sunday. The sacrament of the Lord's Supper was instituted on the 14th day of the Jewish month Nisan, and it was the opinion of the churches of Asia Minor that that day should always be observed ; on the other hand, our Lord was crucificd on a Friday and rose again on a Sunday, and the churches of Alexandria and Nome held that the two events should always be com- memorated on a Friday and a Sunday respectively. In the time of Irenzus, Victor, bishop of Rome, made strenuous

endeavours to bring about uniformity of celebration ; and, when he failed to convince the churches of Asia Minor that the Western usage was right, he proposed to declare these churches heterodox, and to cut them off from ecclesiastical fellowship. The interference of Irenzeus was intended to dissuade the pope from this hasty action, and his letter is interesting, not merely for its peace-loving sentiments, but because of the valuable information it gives upon the usages of the churches of the East and of the West (of Eusebius, Hist. Ecel., v. 24). Gregory of Tours is our authority for saying that Irenzeus died a martyr in the persecution under Severus ; but, as this fact is not mentioned by Tertullian, Augustine, Eusebius, Theodoret, and other early writers, it is considered doubtful by most modern scholars. His death, whether crowned with the houour of martyrdom or not, must have taken place near the beginning of the 3d century. Gregory tells us that the bones of Irenseus were buried under the altar of the church at Lyons. The story that they were dug up and thrown into the street by the Calvinists in 1562 has been abundantly refuted. Irenzus holds the same relation to the theology of the Greek fathers that Tertullian does to the doctrinal system of the Church of the West. In tracing back the history of a doctrine, it is common to find it first taking shape in the writings of one or both of these early theologians. Hence the great value of his writings. It is from Irenaeus also that we get the earliest form of the creed which after- wards, through the labour of councils and theologians, became what we now know as the Niceno-Constantinopolitan creed (Lumby's History of the Creeds, p. 14, cf Schaft, The Creeds of the Latin and Greck Churches, p. 40). The only writing of Irenzeus which has come down to us, with the exception of fragments, is his work Against Heresies, and for this reason his opinions are all expressed by way of controversy. The treatise is divided into five books : of these the first two contain a minute description and criticism of the tenets of various heretical sects, both Gnostic and Ebionite; the other three set forth the true doctrines of Christianity, and it is from them that we find out the theological opinions of the author. Irenzus as a Christian theologian lays great stress on the existence of XT. — 35

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the Christian church, and on the necessity of life within the church. Christianity does not consist merely in the possession of knowledge, but in partaking in a life which is to be lived in the world and beyond it. Believers have a common religious experience, and this rests both upon facts outside them and upon their association together within the church, while it implies a community of know- ledge. The church rests upon the common facts contained in the gospel history ; her historical succession of pastors places her in direct and outward relation to Christ, to whom her pastors ought to be inwardly related also by spiritual consanguinity. Her common knowledge—the true Gnosis, and not the false of the Gnostic—comes from the Holy Scriptures, which in Old Testament and New are inspired by the Holy Spirit and contain the truth of God. The church has also got, coming to her from apostolic times, and giving authoritatively the interpretation of the Scripture, certain forms of sound words or rules of faith which keep her from heresy. In speaking of God Irenzus is careful to insist that the God of the Christian church is the maker of heaven and earth, aud the God of Abraham, Isaac, and Jacob; for it was a Gnostic inference from the supposed sinfulness of matter that the good God could not defile Himself with matter in a work of creation, and some carried their antipathy to the Old Testament so far as to make the Hebrew Jehovah a malignant deity whom Christ had come to destroy. Ireneus is at pains to explain that Christ, the Logos of God, the Saviour, is true man and true God, in opposition to the Gnostic Docetee who taught that our Lord’s body was only an assumed phantasm, and in contradiction to the Ebionites, who acknowledged Christ to be the last of the prophets, and looked upon Christianity as Judaism with a new prophet, but refused to confess him true God of true God. Ireneus also lays great stress upon the doctrine of the Trinity. His exposition is by no means either so full or so precise as that of theologians who write after the council of Nicza, but he insists on the equality in divinity of the three persons, Father, Son, and Holy Ghost. The plan or method of salvation is commonly represented under the idea of a covenant, which word is used more in the sense of promise than of bargain. Sometimes the covenant is represented as twofold,—that given to the favoured nation

and symbolized in the Mosaic economy, and that given to those who are not the descendants of Abraham and promised in the gospel; sometimes it is fourfold, and Irenzus speaks of a covenant given to Noah, and renewed through Abraham and Moses, and lastly in the gospel of our Lord. It is difficult to state with any precision what Irenzus holds about the nature of the effect of Christ's work of reconcilia- tion upon man. He makes great use of metaphor, and evidently had not learnt to express himself otherwise. The doctrine was still in its pictorial state in his mind. Still, traces appear of that tendency afterwards common in the Greek Church to make the incarnation rather than the crucifixion and ascension of our Lord the most important part of his work, and to look upon the effect of that work as a transfusion of the incarnation through redeemed humanity. The doctrine of the sacraments is also too metaphorically expressed to admit of precise statement ; but Irenzeus seems to believe that in the sacrament of the Lord's Supper it is the heavenly body of Christ which is actually partaken of in the elements, and that sucli parti- cipation gives immortality.

Our knowledge of the writings of Ireneeus comes principally from Eusebius. That church historian tells us that Irenzus wrote a Lettcr to Florinus, and atract On the Valentinian Octave (of Mons), both against Gnostie theories ; a Letter to Pope Victor, and another to Blastus, also at Rome, both on the Easter controversy ; a work, probably on apologetie, called Mpbs"EAAnvas Adyos . . . wep) émt- orhuns envyeypaypévos; a Picture of Apostolie Preaching; aud a book

first edition was published by Erasmus in 1526.

of aphorisms. According to Photius, Ireneus wrote also on the Substance of the World. Fragments from these lost works and perhaps from others have been recovered from Eusebius, from

Maximus of Turin, from Leontius of Byzantium, from John of Damascus, and from several eollections of fragments, some of which were diseovered in European libraries, and others eame to the

British Museum among Syriac MSS. from the Nitrian convents.

The only work of Ireneus whieh has come to us entire is the

treatise Against Heresies. The original Greek text, except the

greater part of the first book, which has been preserved in quota- tions in Hippolytus and Epiph

anius, has been lost, and the treatisc has been preserved in a somewhat barbarous Latin version. The He used three MSS. which have since been lost. In 1570 Gallasius, a Calvinist pro- fessor in Geneva, published a new edition. He had before him the Greek text as far as given in the quotations in Epiphanius. The next important edition was that of Feuardent in 1596, and frequently reprinted. Feuardent used a Vatican MS. In 1702 Grabe pub- lished at Oxford a new edition, greatly better than preceding ones. He used the Arundel codex. In 1710 the Benedictine Massuet published at Paris another edition, in which three new MSS. were used. It long continued the standard, and forms the 5th volume of the Abbé Migne's Patrologia Greea, Paris, 1857. A valuable edition was published in 1849-58 by Adolph Stieren, which really superseded the others, The fragments discovered among the Syriae MSS., however, are only to be found in the Cambridge edition of 1857, edited by the Rev. Wigan Harvey. The extant writings of Ircneus, including the fragments, have been translatedand published in Clark's Ante-Nicene Library. The faets of Irenzeus's life and his dogmatic teaching and ecclesiastical position may be learnt from the prefaces of Feuardent, Massuet, and Stieren, as well as from such church historians as Tillemont, Schrock, Neander, and Fr. Chr. Baur. There is a very valuable monograph upon Ireneus in Erseh and Gruber's Encyelopddie, Il. section, vol. xxiii, written by Stieren, the editor of the German edition. This was written, how- evcr, before the Syriac versions were discovered. (T. M. L.) IRENE (752-803) was the wife of Leo IV., emperor of the East. A poor but beautiful Athenian orphan, she speedily added the confidence to the love of her feeble husband, and at his death in 780 was left by him sole guardian of the empire, and of their young son Con- stantine VI. Seizing the supreme power in the name of the latter, Irene's first endeavours were to revive the orthodox

image-worship, which she had secretly cherished, although compelled solemnly to abjure it in the life-time of her iconoclastic father-in-law and husband. In 784 she obtained the elevation of Tarasius, a partisan of her own, to the patriarchate; and, at first suffering the laws against image-worshippers to fall into disuse, she assembled a council of clergy at Nicsea in 787 to discuss the whole question anew. An attempt to hold the council at Constantinople in the preceding year had been frustrated by the iconoclastic zeal of the soldiers. Under the auspices of a ruler whose wishes were so clearly known, the decision of this second council of Nice could take only one direction, and the Icono- clasts were hurled from their supremacy (vol. xii. p. 713). So long as Constantine remained a child, Irene was able to combine his interests and her own, and to rule wisely and faithfully ; but asthe prince approached maturity he began to grow restive under her autocratic sway. An attempt to free himself by force was met and crushed by the empress, who in her first indignation demanded that the oath of fidelity should thenceforward be taken to her name alone. The discontent which this occasioned swelled in 790 into open resistance, and the soldiers, headed by the Armenian guard, formally proclaimed Constantine VI. as the sole ruler. A hollow semblance of friendship was maintained between Constantine and Irene, whose title of empress be confirmed in 792; but the court, the army, and the capital were divided between rival factions, and that which sup- ported the mother against her son grew daily in number and strength. Constantine perceived his danger too late to avert it ; and when he saw tle conspiracy ripe for action he could only flee for aid to the provinces. But even there he was surrounded by those who were already too deeply implicated in treason to refuse to complete their perfidy. Seized by his attendants on the Asiatic shore of the

Bosphorus, the emperor was carried a captive back to the palace at Constantinople ; and there, by the orders of his inhuman mother, in the very porphyry chamber where he first saw the light, his eyes were stabbed out by fierce blows of a murderous dagger. An eclipse of the sun and an obscurity of seventeen days were attributed by the common superstition to the horror of heaven at this crime. Irene, having thus

removed her rival, reigned in prosperity and splendour for five years. She is said to have endeavoured to negotiate a marriage between herself and Charlemagne ; but according to the Greek writers, who alone mention it, the scheme was frustrated by Aetius, one of her favourites. In 802 the patricians, upon whom she had lavished every honour and favour, conspired against her, and placed the avaricious Nicephorus on the throne. The haughty and unscrupulous princess, ‘ who never lost sight of political power in the height of her religious zeal,” who, hailed by the church as a second Helena, the mother of another great Constantine, had revealed herself to the world as a second Athaliah, was forced in her exile in Lesbos to support herself by the daily toil of her distaff. She died the following year. Her religious zeal has given her a place among the saints of the Greek Church.

See V. Mignot’s Histovre de UV’ Imperatrice Iréne, 1762; Gibbon’s Decline and Fall; Milman’s Latin Christianity ; Le Beau’s Bas-

Empire; and Schlosser’s Geschichte der bilderstiirmenden Kaiser des ostrénuschen Reichs, 1812.

IRETON, Henry (1610-1651), Parliamentary general, was the eldest son of German Ireton of Attenton in Nottinghamshire, and was bornin 1610. After graduating B.A. at Oxford, he entered the Middle Temple, London, as a student of law; but on the outbreak of the civil war he joined the Parliamentary army, in which his technical mastery of the military art gave him rapid promotion and helped him to obtain the special favour of Cromwell. On the formation of the “new model” lie was appointed captain in Sir Robert Pye’s regiment. Shortly before the battle of Naseby, in June 1645, he was promoted to a colonelcy, and on the eve of the battle he was on the suggestion of Cromwell made commissary-general and appointed to the command of the left wing, Cromwell himself commanding the right. The wing under Ireton was completely broken by the impetuous charge of Rupert, and Ireton was taken prisoner, but after the rout of the enemy which ensued on the successful charge of Cromwell he regained his freedom. He was present at the siege of Bristol in the September following, and he took an active part in the subsequent victorious campaign which resulted in the

overthrow of the royal cause. While occupied with the siege of Oxford he was, in June 15, 1646, married at Holton House, 5 miles distant from the city—and at that time probably the headquarters of Fairfax—to Bridget, daughter of Oliver Cromwell. In the negotiations of the army with the Parliament, and in the conferences with the king, he took a leading part, being the person chiefly entrusted with the drawing up of the army papers, including the heads of proposals from the army to the king, a task for which he possessed the special qualifications of "a subtle-working brain" and a complete legal training. He is said to have been one of the principal instigators of the trial of the king, and was one of the most zealous supporters of his execution. The regiment of Ireton having been chosen by lot to accompany Cromwell in his Irish campaign, Ireton was appointed major-general; and on the recall of his chief to take the command in Scotland he remained with the title and powers of lord-deputy to complete the work of reduction. This he proceeded to do with his usual energy, and as much by the severity of his methods of punishment as by his military skill was rapidly bringing his task to a close, when during the siege of Limerick he died, November

26, 1651, of an inflammatory fever, the result in all pro- bability of exhaustion and exposure. His loss "struck a great sadness into Cromwell," and perhaps there was no one of the Parliamentary leaders who could have been less spared. He is said to have been of " melancholic, reserved, dark temperament ;" and, while he possessed very high abilities as a soldier and great political penetration and insight, he resembled in stern unflinchingness of purpose the Protector himself.

IRIARTE, or Yrrarre, Tomas DE (1750-1791), Spanish poet of the age of Charles TIL, was born September 18, 1750, at Orotava in the island of Teneriffe, and received his literary education at Madrid under the care of his uncle, Juan de Iriarte, a scholar who for forty years was head of the royal library, and whose name as a collector of proverbs still finds a place in the literary annals of his country. In his eighteenth year the nephew began his literary career by translating French plays for the royal theatre, and in 1770, under the anagram of Tirso Imarete,

he published an original comedy entitled Hacer que hacemos. In the following year he received an appointment as official translator in the foreign office, and in 1776 he became a keeper of the records in the war department. Jor a short time he now edited a journal entitled the Mercurio Politico, and during this period of his life he added to the number of his original dramas (the best of these being La Seftorita mal criada), and also composed various minor poems. In 1780 appeared his didactic poem La Miésica, the outcome of his proficiency in music, which attracted some attention in Italy and France as well as at home. It is composed in those masses of irregular lines known nationally as silvas, and consists of five books which severally treat of the elements of music, the various kinds of musical expression, the music of the theatre, of society, and of solitude. Its poetical merit is very small. In 1782 appeared the Fdbulas Literarias, with which his name is most intimately associated. The work is of interest to the student of Spanish literature as being the first original attempt at fable-writing in that language ; the stories, which numbered in the first edition about sixty and afterwards increased to eighty, are composed in a great variety of metres, and show in many cases considerable ingenuity (sometimes, it must be confessed, very far-fetched) and careful execution. As their name is intended to imply, they all relate to the follies and weaknesses of literary men. They have been translated into several European languages. An English version by Rockliffe reached a third edition in 1866. During his later years, partly in consequence of the /débulas, he became involved in troubles with several of his literary contem- poraries ; and in 1786 he was charged before the Inquisi- tion with having manifested leanings towards the new French philosophy. He died September 17, 1791.

The first collected edition of his works (Obras), prepared by him- self, appeared at Madrid in six volumes in 1787 ; another, more complete, in eight volumes, in 1805. They include, besides those already mentioned, translations of the 7s Poctica of Horace and of the first four books of the Ancid, and also some metrical epistles.

IRIDIUM, one of the metals of the platinum group (see vol. v. p. 536), has recently acquired increased importance from its employment in

alloy with platinum in the construc- tion of the international standards of length and weight. Its separation from the associated metals is a matter of very considerable difficulty, and involves a long series of opera- tions. These have been fully described by Deville and Debray (Comptes Rendus, lxxxi. 839) and by Mr G. Matthey (Roy. Soc. Proc., 1879, xxviii. 463). In practice, even when prepared with the utmost care, it still contains a minute though almost inappreciable amount of oxygen, rhodium, ruthenium, and possibly iron (Matthey). tun

Seubert has redetermined the atomic weight of iridium

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by reducing ammonium iridichloride, (NH,),IrCl, and potassium iridichloride, K,IrCl,, by heating in a current of hydrogen, and finds as the mean of fifteen accordant experiments Ir=192°74 (Berichte d. deut. chem. Gesellsch. gu Berlin, 1878, 1767). This result justifies the placing of iridium before platinum in the table in vol. v. p. 543. The alloy used in the construction of the international geodesic standard was prepared by fusing together pla- tinum and iridium in a lime crucible by a powerful blast of oxygen and coal gas ; it has the following composition :

Analysis 1,

Analysis 2,

It is almost indestructible, and has extreme rigidity, especi- ally in the tube form; its coefficient of elasticity is very great; it has a high density, and a most beautifully polished surface can be obtained upon it (comp. Deville, Ann. Chim. Phys. 1879 [5] xvi. 506). An iridio-platinum alloy containing about 20 per cent. of iridium has also a very high coefficient of elasticity (22:20), whilst its malleability and ductility are almost without limit. A 25 per cent. alloy can only with great difficulty be worked into sheet and wire when heated at a low temperature, 30 and 40 per cent. with great difficulty only at a temperature little below melting; it is brittle when cold, but has a grain of great beauty and fineness (Matthey).

IRIS, the rainbow, was personified as one of the second- ary deities of Olympus, and occurs very frequently both in art and in literature. As the rainbow unites earth and heaven, Iris is the messenger of the gods to men; in this capacity she is mentioned frequently in the J/zad, but never in the Odyssey, where Hermes takes her place. According to Hesiod (Z'heog. 260) she is the daughter of Thaumas and Electra and sister of the Harpies, the stormwinds. With the swiftness of the wind (déAXomos, zodjvenos) she pene- trates everywhere, bearing the messages of heaven. She often carries the caduceus, the herald's staff of Hermes. An epithet frequently applied to her is " golden-winged " (xpvodrrepos), and in painting and sculpture she is always represented with wings. In the absence of other criteria, it is sometimes difficult to distinguish her from Nike. The latter is more frequently attendant on Atliene, while Iris oftener accompanies Hera.

IRIS. The iris flower belongs to the natural family Iridacex, of the class monocotyledons, and to the petaloid division with inferior ovary and only three stamens (the outer series), being thus distinguished from the Amaryllis family, which has six stamens. They are handsome showy-flowered plants, the Greek name iris having been applied on account of the hues of the flowers. Two of the species are British,—J/. Pseudacorus, or yellow flag, and the J. fotrdissima, the foetid iris or roast-beef plant, with blue- purple rarely yellow flowers. The former species is widely distributed ; the latter is English, although naturalized in Scotland and Ireland. The roasted seeds of 7. Pseud- acorus have been used as a substitute for coffee. Iris florentina, with white or pale blue flowers, is a native of the south of Europe, and is the source of the violet-scented orris root used in perfumery. ris versicolor, or blue flag, is indigenous to North America, and yields "iridin," a powerful hepatic stimulant. Jris germanica of central Europe, "the most common purple Fleur de Luce" of Ray, is the large common blue iris of gardens, the bearded iris or fleur de luce. From the flowers of ris florentina a

1 Quite recently (Liebig's Annalen, cevii. 1), Seubert has corrected the atomic weight of platinum also, which he finds to be 194°34.

pigment—the “ verdelis,” “ vert d’iris,” or iris-green, formerly used by miniature painters—was prepared by maceration, the fluid being left to putrefy, when chalk or alum was added. The garden plants known as the Spanish iris and the English iris are both of Spanish origin, and have very showy flowers. Along with some other species, as I. reticulata and I. persica, both of which are fragrant, they form great favourites with florists. All these just mentioned differ from those formerly named in the nature of the underground stem, which is tuberous and not a rhizome as in I. Pseudacorus, florentina, &c. Modern botanists separate these bulbous irises from the genus J7%s, and place them apart in the genus Xiphium, the Spanish iris,—J. Xiphium of the older botanists being now known as Xiphium vulgare. As defined by Baker, X¢phiwm includes 15 species, all from the Mediterranean region and the East, and Jris 81 species, mostly from the northern temperate region. Remains of three species of Jrzs have been met with in a fossil state, in rocks of Tertiary age.

IRISH MOSS, or CarraceeEn (Irish carraigeen, “ moss’ of the rock”), is a sea-weed (Chondrus crispus) which grows abundantly along the rocky parts of the Atlantic coast of Europe and North America. It is collected for commercial purposes on the west and north-west of Ireland, and in very large quantities on the coast of Plymouth county, Massachusetts, United States. In its fresh con- dition the plant is soft and cartilaginous, varying in colour from a greenish-yellow to a dark purple or purplish- brown ; but when washed and sun-dried for preservation it has a yellowish translucent horn-like aspect and consistency. The principal constituent of Irish moss is a mucilaginous body, of which it contains about 55 per cent. ; and with that it has nearly 10 per cent. of albuminoids and about 15 per cent. of mineral matter rich in iodine and sulphur. When softened in water it has a sea-like odour, and from the abundance of its mucilage it will form a jelly on boiling with from 20 to 30 times its weight of water. The jelly of Irish moss is used as an occasional article of food, and is a popular remedy in cases of chest disease. It may also be used as a thickener in calico-printing, and in America it is used for fining beer. In the neigltbourliood where it is obtained it is utilized for feeding cattle. As found in commerce, Irish moss is fre- quently mixed with Gigartina

mammillosa, G. acicularis, and other sea-weeds with which it is associated in growth.

IRKUTSK, a government of Asiatic Russia, extending over an area of 272,140 square miles of eastern Siberia, and bounded by the Yenissei and Yakutsk governments, the Trans-Baikal region, and the Chinese frontier. It is divided into the districts of Kirensk, Nizhne-Udinsk, Irkutsk, Verkholensk, and Balagansk.

The surface of the government is mountainous, espe- cially in the south-west. While the greater part lies at a level of from 1200 feet to nearly 3000 feet above the sea, the range of the Sayanski mountains reaches from 6000 feet to between 7000 and 8000 feet (the highest point, Mungu Sarduik, is in Chinese territory). Other mountains of note are the Gurbi Daban and Tunkinski Byelki ranges and the massif of the Khamar Daban. All the rivers of the government belong either to the system of the Yenissei (as the Angara and the two Tunguskas) or to that of the Lena (as the Kirenga, the Tchaya, the Tchuya, the Kuta, the Ilga). Of the geological features of the country the most remarkable is the wide distribution of volcanic products—basalts, dolerites, tuffs, obsidians even, and pumice. The mountain chains consist in the main of crystalline rocks. Iron is obtained in considerable quan- tities; coal-beds exist in various parts, especially in the basin of the Angara ; graphite is wrought in several places; and salt-springs form the object of a considerable exploitation.

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In 1879 the number of factorics and public works in the govern- ment was 117, with 3322 workmen and a production amounting to 3 647,045 roubles, besides 57 workshops with upwards of 250 work- men and a production of nearly 280,000 roubles. The distilleries ranked first with 1,897,500 roubles. In the iron-works of N icolaieff 795 workmen were employed, and the production was valued at 449,110 roubles. The salt-works were credited with 298,852 roubles, the cloth factories with 115, 365, and the oligo potteries with 85,962. The principal pottery is situated in the okrug or circle of Irkutsk, and employs about 1500 workmen ; and its wares are widely known throughout all Siberia. The

chief cloth factory is at Telininsk, about 40 miles from Irkutsk. Cigars are manu- factured to the value of 115,000 roubles. Sce the Pamyatnaya Knizhka of the Stat. Com. of the Irkutsk Government, 1881.

The population, which in 1862 was 363,375, was 383,578 in 1879 (199,344 males). At the latter date the native tribes numbered 115,783 souls (59,979 males) ; the Buriats are the most numerous, these amounting to about 116,000 in 1862. The Yakuts and Tun- guses are comparatively few. Of the European population a large proportion are exiles or descendants of exiles, most of them being of Polish blood. Shamanism was in 1879 the religion of 66, 422, and Lamaism that of 12,491; 1837 were Mahometans, and 2878 Jews. Of the Christian population (319,919), the Orthodox Greek Church claims 296,521, and 2427 are Roman Catholics. In 1862 the Jews were under 900 and the Roman Catholics about 1200. The native tribes are being rapidly incorporated by the Orthodox Church.

According to observations taken at the town of Irkutsk, which is one of the regular meteorological stations of Russia (1536 feet_above the sea), the temperature ranged in 1879 from 99° Fahr. in July to 34° below zero in January. In 1876 the minimum was 40° below zero. The mean temperature in summer is 56°, and in winter i

Irkutsk, the chief town of the government of the same name, is under various aspects the most important place in all Siberia, being not only the greatest centre of

Plan of Irkutsk.

1, Cathedral. 10, Gymnasium. 19. Garden of Church of 2, Archiepiscopal Palace. | 11. Kindergarten. our Saviour.

3. Seminary. 12, Orphanage. 20. Custom House.

4, Vladimir's Church. 13. Juvenile Asylum, 21, Ch. of Thaumaturge. 5. Retail Bazaar. 14, Town Buildings. 22. Asylum.

6. Ch. of Annunciation. 15. Museum. 23. Sisters of Mercy.

7. Synagogue. 16, Tikhvin Church. 24, Church of Trinity.

8. Female Gymnasium. 17. Merchants' Hall. 25 Church of Gregory of
9. Mining Commission. 18. New Cathedral. Nyssa.

population and principal commercial depdt to the north of Tashkend, but the residence of the governor-general, a fortified military post, an archbishopric, and the seat of several learned societies. It is situated in 52° 17' N. lat. and 104° 12' E. long., 3780 miles from St Petersburg. The town proper lies on the right bank of the Angara, a tributary of the Yenissei, and on the opposite bank is the Glaskovsk suburb. The river, which has a breadth of

1890 feet, is crossed bya flying bridge. The Irkut, from which the town takes its name, is a small river which rises in Lake Ilchin and joins the Angara directly opposite the present town, the main portion of which is separated from the monastery, the castle, the port, and the suburbs by another confluent the Ida or Ushakovka. Irkutsk has long been reputed a remarkably fine city for such an outlying situation—its streets being straight, broad, well paved, and well lighted; but in 1879, on the 22d and 24th June (4th and 6th July), the greater proportion of its houses being of wood, the central and most important part fell a prey to a great conflagration. In the accompanying plan the area laid waste is indicated by the lighter shade, The palace of the governor-general, the principal administrative and municipal offices, and many of the other public build- ings were destroyed; and the government archives, the admirable library (10,000 vols.) and museum of the Siberian section of the Geographical Society, with minor collections of the same kind, were utterly ruined. The total loss was estimated at 30,000,000 roubles. Full details will be found in D. D. Larionoff's Gub. gorod Irkutsk (Irkutsk, 1880). A cathedral (built of wood in 1693 and rebuilt of stone in 1718) and other twenty-three Orthodox churches, a fine gymnasium, a school of medicine, a museum, a theatre, a town's hospital and a military hospital, an orphan asylum, an infirmary, the penitentiary, and the crown factories are among the public institutions and buildings.

The origin of Irkutsk is to be found in the winter-quarters estab- lished by Ivan Pokhaboff for the collection of the fur tax from the Buriats. Its existence as a town dates from 1686. The first church, that of our Saviour, and the monastery of the Ascension, 34 miles from the town, were built in 1672, and that of the Apparition of the Virgin in 1693. It was in 1731 that the town was made the administrative centre of the Irkutsk province, and its position as chief town of the government dates from 1764. Its population, which was about 6500 at the time of Gmelin's visit (1740), had in- creased to 16,569 by 1838, and to 24,779 in 1862 (12,639 males). An elaborate census taken in 1875 gave 18,076 males and 14,436 females, a total of 32,512. This increase is wholly produced by immigration ; for the death-rate always considerably exceeds the birth-rate, a fact easily explained by the vast proportion of the un- married classes, —public employés, soldiers, ecclesiastics, prisoners, and domestics amounting to 12,876 in 1875.

IRNERIUS, a distinguished jurist, sometimes referred to as "lucerna juris," who taught the "free arts" at Bologna, his native city, during the earlier decades of the 12th century. Other forms of the name are Ymerius, Hirnerius, Hyrnerius, Warnerius, Wernerius, Guarnerius, Gernerius, some of which have been held to be suggestive of a German origin. Of his personal history nothing is known, except that it was at the instance of the Countess Matilda, Hildebrand's friend, who died in 1115, that he directed his attention and that of his students to the Institutes and Code of Justinian; that after 1116 he appears to have held some office under the emperor Henry V.; and that he died, perhaps during the reign of the emperor Lothair IL, but certainly before 1140. He was the first of the Glossators (see GLoss), and according to ancient opinion (which, however, has been much contro- verted in later times) was the author of the epitome of the Novells of Justinian, called the Authentica, arranged according to the titles of the Code. His Formulariwm Tabellionum (a directory for notaries) and Questiones (a book of decisions) are no longer extant. His position as the founder of all learned investigation into the laws of Jus- tinian is an important one; and he and his school are generally held to present an almost brilliant contrast, not only with the law writers of the preceding, but also with the jurists of the latter part of the following century.

See Savigny, Gesch d. Rim. Rechts im Mittclalter, iii. 88 ; Vecchio,

Notizie di Irncrio e della sua scuola, Pisa, 1869 ; and Ficker, Forsch. 2. Reichs-u. Rechtsgesch. Italicns, vol. iii., Innsbruck, 1879.

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IRON

N the short space that can be allotted to the wide subjects of Iron and STEEL, it is impossible to do more than briefly describe the main facts in connexion with the general properties and relationships of iron and steel, and their modes of manufacture. These points will be considered under the following general heads.

I. General characters of iron; its relationships to other ele- ments. 1. Properties of iron. : ‘ 2. Chemical and physical relationships of iron. | : 8. Relationships between iron and stccls of various kinds. II. Natural sowrees of tron. 4. Meteoric iron. 5. Iron ores. at 6. Methods of analysis of iron ores, metallic iron, and steel. Ill. Eetraction of tron from its ores. 7. General history of the manufacture of iron and stcel. 8. Classification of methods of manufacture. IV. Manufacture of cast iron » tron smelting. 9. Preliminary treatment of orcs. 10. Fuel. 11. Fluxes. 12. Construction of blast furnaces. 18. Subsidiary appliances ; hoists and lifts. 14, a a blowing cngiues. * a apparatus for superhcating the blast, and for determining its temperature ; tuyeres, 16. Collection of pig iron and cinder, and their composition. 17. Utilization of cinder. 18. Collection of waste gases, and their composition. 19. Chemical changes taking place in the blast furnace. 20. Development and appropriation of heat in blast furnaces. 21. Conditions regulating economy of fuel in blast furnaces. V. Conversion of pig iron into malleable iron and stcel by decarbonization processes. 22. Malleable cast iron. , 23. Refining, fining, and puddling of pig iron. 24. Machine puddling. 25. Machinery and appliances for working malleable iron. 26. Puddled stcel and natural stecl. 27. Bessemer’s original process (pneumatic process). 28. Heaton’s process. VI. Production of malleable iron and steel from the

ore at one operation without passing through the stage of east iron. 29. Catalan forge and analogous appliances. 30. Spongy iron processes. 31. Siemens's precipitation process. VII. Conversion of malleable iron into steel by direct carboniza- tion. 32. Cementation process and subsequent operations. 338. Cast stcel. 34. Case hardening, 35. Crucible steel ; Wootz; Mushct and Heath's processes. VIII. Methods of steel production essentially involving eombina- tions of the preceding processes. 36. The Bessemer-Mushct process and its precursors. 37. The "basic" process. 38. The Uchatius process. 39. Siemens-Martin processes ; open-hearth stecls. 40. The Pernot and Ponsard furnaces. 41. Manufacture of spicgeleisen and ferro-manganese. TX. mci qualities of tror. and steel in their practical relation- ships. 42, Hardening, tempering, and annealing. 43. Tenacity and strength of iron and steel. 44, Foundry operations ; casting under pressure. 45. Protection of iron from rust. X. Statisties of the iron trade.

I. GENERAL CHARACTERS OF TRON AND ITs RELATIONSHIPS TO OTHER ELEMENTS.

1. Properties of Iron.—The peculiar physical characters of iron, more especially when in the form of steel or slightly carbonized iron, have rendered this element one of special importance since the earliest ages for the fabrication of cutting instruments, weapons, and tools of various kinds,

In the form of moderately-pure malleabie or wrought iron, the metal is a substance possessed of considerable lustre and hardness, and of a bluish-white or bluish-grey colour ; it takes a high polish, and when bright does not readily oxidize in dry air, although moist air, especially in presence of traces of acids, even of carbonic acid, readily effects its tarnishing and the subsequent formation of rust. It hasa specific gravity near to 7°75, and requires a very high tem-

perature to effect its fusion, the melting point being the

more elevated the purer the substance ; its most valuable and characteristic property is its power of becoming soft and pasty before undergoing complete fusion, so that two hot masses may be pressed or

squeezed together into one by the process of welding, and so that by forging, rolling, hammering, or other analogous operations it can readily be fashioned into shapes which its rigidity and strength when cold enable it to maintain. Its strength and tena- city are very high, as also are its powers of being drawn into wire and rolled or hammered into sheets (ductility andmalleability); these properties, however, are very largely influenced by the presence of impurities. In magnetic characters it is superior to all other substances, nickel and cobalt coming next to it in these respects, but being much lower in power; when it is almost pure, the magnetic influ- ence produced, owing to induction, by the proximity of a per- manent magnet or of an electric current disappears entirely on removal of the magnet or current; if, on the other hand, carbon be present (as is usually the case to some extent even in the softest malleable iron), there remains after removal of the magnet or current a greater or less amount of permanent magnetism according to circumstances, hard steel exhibiting the greatest power of becoming permanently magnetized under given conditions, and substances inter- mediate between pure iron and hard steel (soft steels and hard irons) possessing this power to a lesser extent. Other elements besides carbon, e.g., oxygen and sulphur, can com- municate to iron the power of becoming permanently mag- netized, as in the case of the minerals loadstone (magnetic oxide of iron) and magnetic pyrites. The effect of a magnet on iron at high temperatures is far below that exhibited at ordinary temperatures ; according to Matteucci the action of a given magnet on a molten globule of iron is only 0-0015 per cent. of that on the same globule when cold, so that the attractive action is wholly insensible in the case of molten iron except when a powerful electromagnet is employed. In electrical conductivity and power of conducting heat (which are always approximately in the same ratio), iron stands about midway amongst metals ; Matthiessen's experiments give the specific resistance (C. G. S. system) of annealed iron as 9827 at 0° C., that of annealed silver being 1521 and that of mercury 96,190 at the same temperature. As with the other physical properties, the presence of small amounts of impurity largely affects the numerical value of the specific resist- ance, which is decreased some 35 per cent. by a rise in temperature from 0° tv 100° C.

The specific heat of iron at the ordinary temperature is 0°11379 (Regnault), 0110 (Dulong and Petit). Pouillet gives the melting point when in a state of high purity as between 1500° and 1600° (probably somewhat too low), Scheerer as 2100°, Deville as near to that of platinum, which is not far from 1900°-2000°. The presence of minute quantities of carbon, sulphur, é&c., sensibly lowers the fusing point, whilst 1 per cent. of the former furnishes a steel melt- ing at several hundred degrees lower than pure iron (at near

| 1600°),—cast iron containing some 3 per cent. of carbon

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melting at near 1500°, and being rendered still more fusible by the presence of small quantities of sulphur and silicon ; whence sulphurized pig irons are often blended with purer varieties in order to produce good casting metal for various purposes. At the ordinary temperature the linear coeffi- cient of expansion of wrought iron is near to 0:0000125 (values between 0:0000115 and 0°0000144 having been obtained by Borda, Smeaton, Lavoisier and Laplace, Trough- ton, and Dulong and Petit), so that 1 unit of length at 0° will become on an average 1°00125 units in length at 100°. Slightly lower values have been obtained with steel of different qualities by various of these observers, averaging 00000115 ; whilst cast iron expands less still, averaging 0:0000111 as linear coefficient of expansion; the precise numbers obtainable vary with the conditions, according as the metal has been hammered, rolled, hardened, annealed, dc. At somewhat elevated temperatures the rate of expan- sion is higher; thus Dulong and Petit find that the mean rate of expansion of iron between 0° and 100° is to that between 0° and 300° nearly in the ratio of 4 to 5. The force exerted during expansion is very great, being equal to that requisite to produce an elongation of the bar examined to the extent through which its length increases by heat ; thus, according to Barlow, a weight of 1 ton suspended to an iron bar a square inch in section will extend its length by 0:0001 times the original length, so that 1 inch of length will become 1:0001 inches ; this increase in length would be brought about by a rise in temperature of about 9° C. ; hence for an increase of 36°, or less than

the average differ- ence between a cold and warm day in winter and summer respectively, a girder of iron of 20 square inches in section would exert a thrusting strain upon two walls, &c., built firmly up to its ends when coldest, equal to about 20 x % or 80 tons for each inch of its length, were it not that the pressure is more or less relieved by the giving of the walls long before this strain is reached. In conse- quence it is indispensable to allow a space for expansion in all constructions in which iron is employed, e.g., ordinary buildings, railways, furnaces braced together with tie-rods, &c.

With large masses of ironwork exposed to the weather, very great strains may be produced through unequal expansion in differently heated parts, e¢.g., in the portions exposed to sunshine and in the shade respectively ; as just indicated, a difference of temperature of 9° between two portions rigidly connected will produce a strain of about 1 ton per square inch, Edwin Clark has calculated that half an hour's sunshine produces more effect in the way of developing strain on the tubes of the Britannia bridge over the Menai Straits than the heaviest rolling loads or the most violent storms. Variations of temperature also exert some effect upon the strength and tenacity of iron ; the numerical values are largely variable with the quality of the metal. At temperatures below a red heat the strength is considerably lessened, and at high temperatures approximating to the welding temperature the tenacity becomes comparatively small (see § 43).

A peculiar suspension of the chemical activity of iron in refer- ence to nitric acid (passive condition) appears to be connected with its electrical relationships ; when placed in nitric acid very slightly diluted (specific gravity about 1°4), iron is ordinarily violently attacked ; but if whilst in the acid it be touched with certain sub- stances, ¢.g., gold, platinum, plumbago, &c., the action stops (at least under certain conditions, especially when not heated above some particular temperature varying with the strength of the acid —Ordway) ; the iron thus rendered passive will induce the same condition in a second piece immersed in the acid by contact; on exposure to air the passive iron loses its power of remaining un- attacked. Concentrated nitric acid, of specific gravity 1°45, pro- duces the passive condition at once, so that a

piece of bright metal may be kept for months immersed in the acid without any action

being set up; acid of strength below specific gravity 1°35, on the other hand, is usually incapable of permitting iron to become or

remain passive in contact with it. If, whilst passive and immersed in nitric acid, iron be made the positive pole for a voltaic current sent through the acid, oxygen is evolved from its surface without any oxidation being visible ; if on the other hand it be made the negative pole, it immediatcly loses its passivity, and is attacked by the acid. In consequence of the production of the passive state by contact with concentrated nitric acid, iron is sometimes sub- stituted for carbon or for platinum in the forms of voltaic battery known as Bunsen's and Grove's cells. Passivity may also be brought about in iron by heating the bright metal in the flame of a ae lamp, &c., so as to coat it superficially with a film of oxide.

Preparation of Pure Iron.—In order to prepare pure iron, special chemical operations must be gone through, of increasing complexity the greater the purity desired. Berzelius obtaincd a nearly pure fused substance by mixing filings of the purest soft iron of commerce obtainable with about 20 per cent. of puro ferric oxide and some glass powder (frec from lead) as a flux, and exposing for an hour to the highest heat of a smith's forge in a covered crucible; in this way the small a of carbon and other impuritics still retained by the filings are oxidized, and a button of silvery lustre results, of specific gravity 7'844, more tough but softer than ordinary iron. Matthiessen and Szczepanowski found the greatest diffi- culty in obtaining iron absolutely free from sulphur by means of the ordinary methods for preparing oxide of iron subsequently reduced by pure hydrogen, but ultimatcly succeeded in obtain- ing moderately large quantities of mctal not containing more than 0°00025 to 0°0007 per cent. of- sulphur by the employ- ment of a specially prepared ferric oxide made by heating together pure ferrous sulphate and sodium sulphate (Brit. Assoc. Reports, 1868, 1869), and thoroughly washing out the sodium sulphato

from the fluxed product. After reduction in platinum vessels by pure hydrogen, and fusion in lime crucibles by the oxyhydrogen flame fed with purified gases, buttons of metal were obtained absolutely free from phosphorus, silicon, and calcium, and practically free from sulphur. By the electrolysis of as nearly as possible neutral solutions of ferrous chloride, or better of double magnesium ferrous sulphate, iron is thrown down in hard brittle films containing a considerable amount of occluded hydrogen (usually about twenty times its volume); on annealing, the metal becomes soft, malleable, and silvery white, cee considcrably in density, the specific gravity when first deposited being about 7°67, and rising to 7°81 after annealing ; Lenz finds that the amount of hydrogen occluded is greater the thinner the film of metal, the amount rising in the case of a very thin film to upwards of 180 volumes ; the metal deprived of the occluded gas by heating in vacuo decomposes water at ordinary temperatures and rusts, par- tially reabsorbing hydrogen in so doing (Pogg. Annalen, v. 242, 1870); whereas before the expulsion of the hydrogen by heating in vacuo the iron is highly brittle and of a fine granular texture, showing no crystalline structure under the qs (being deposited from solutions containing no free acid), after the expul- sion of the hydrogen the metal becomes highly tenacious and capable of resisting repeated bending backwards and forwards without rup- ture; the hardness is lowered from 5°5 to 4°5 on the mincralogical scale, #.¢., from something between the hardness of fclspar and apatite to something between that of apatite and fluorspar. Under eertain conditions iron can be obtained in a crystallized state, the crystalline charactcr being far more readily assumed when small quantities of other substances, notably carbon, are present; by reducing ferrous chloride by hydrogen ata red heat, Peligot obtained the metal in brilliant crystals belonging to the cubic system ; by reduction with zinc vapour Poumarcde transformed ferrous chloride into hollow tetrahedra of specific gravity 7°84. Bessemer iron has been obtained in distinct cubic crystals, whilst Percy has observed solid and skeleton octahedra in cast iron. Malleable iron that has been much rolled and forged during its manufacture exhibits on etching with acids a fibrous structure; when pulled asunder by a slowly acting force, this structure is also well seen ; if, however, it be transversely ruptured by a suddenly applied force (e.g., the impact of a heavy shot on an

armour plate), a crystalline fracture usually results. Iron exhibiting fibrous structure on etching is usually considerably more tough and tenacious than that which is crystalline. A change from the former kind of molecular struc- ture to the latter, producing comparative brittleness, is believed by many to occur with crank-shafts, axles, &c., exposed to continuous vibration and jolting; in some cases the acquisition of a high degree of permanent magnetism (e.g., in pump rods) is said to have been observed as occurring just before rupture of the metal took place.

2. Chemical and Physical Relationships of Tron.—Iron unites with oxygen in several proportions, forming definite oxides, the best marked of which are those indicated by the formule FeO, Fe,O,, and Fe,0,, O standing for 16 parts of oxygen, and Fe for 56 of iron, the value 56 being

chosen rather than the older combining number 28 in accordance with Dulong and Petit's law. Besides these, however, indications of the existence of a lower oxide Fe,O have been obtained by Lowthian Bell (Chemical Phenomena of Iron Smelting, p. 85); for by partially reducing the higher oxides by carbon oxide at temperatures near to 420° ., a mixture of metallic iron, unreduced oxide, and free carbon results, from which the iron can be dissolved out by digestion with water and iodine in closed vessels, after which the relationship between the undissolved iron and the oxygen present is very close to that indicated by the formula Fe,O. On the other hand, derivatives of an oxide higher than Fe,O, exist, compounds known as ferrates being formed by heating iron with nitre, and in other ways, the composition of which may be expressed by regarding them as containing iron trioxide united to other metallic oxides, ¢g., potassium ferrate, K,O, FeO, (just as potassium sulphate may be regarded as an analogous compound con- taining sulphur trioxide, K,0, SO;). Neither the hypothe- tical ferric anhydride (or iron trioxide, 'eO,;) nor any other oxide intermediate between it and Fe,O, has as yet been isolated, although iron disulphide, FeS,, is well known.

Of these oxides, two, viz., FeO and Fe,O,, correspond to stable well-defined classes of salts conveniently referred to as the ferrous and ferric salts respectively, 56 parts of iron replacing 2 parts of hydrogen in an acid to form the cor- responding ferrous salt, and replacing 3 parts to form a ferric salt. The heat of formation of all oxides up to FeO, appears to be about uniform, viz. near to 66,000 gramme degrees per 16 grammes of oxygen combined; but that of the formation of Fe,O, is sensibly less, so that when the latter oxide is reduced the rate of reduction is much more rapid prior to the removal of one-ninth of the oxygen present and consequent formation of Fe,O, than it is subsequently, in accordance with the general law which appears to exist connecting the rate at which reduction goes on with the development of heat during the chemical change (Alder Wright and Rennie, Chem. Soc. Journal, 1880 [Zransactions|, p. 757). Probably it is in consequence of this that Fe,O, breaks up at an intense white heat into oxygen and Fe,O,, and that when iron is burnt in oxygen so that the temperature is very high Fe,O, is formed and not Fe,O,; just as higher oxides of manganese than the corresponding Mn,O, break up on strong ignition into oxygen and Mn,O,. On the other hand, just as oxides of manganese lower than Mn,O,, and also that oxide itself, take up oxygen forming higher oxides on heating in the air to moderate temperatures, so Fe,O, can be oxidized to Fe,O, by direct addition of oxygen taken up in the same way ; it is noticeable, however, that, whilst Fe,O,, possess- ing a certain kind of physical structure, will thus oxidize to Fe,O, on being exposed to ordinary atmospheric influences, yet when other kinds of physical structure are possessed (producible by special modes of formation) its tendency

to oxidize further even in moist city air becomes inappreci- able.

It is remarkable that, whilst iron ores which mainly contain the oxide Fe,O, are highly magnetic in character (the loadstone being one variety of this class of minerals, and the generic names “ magnetic iron ore” and “ magnetic oxide of iron” being derived from this fact), the other iron compounds found in nature are far less marked in regard of their possession of this quality, one particular sulphide of iron excepted, termed magnetic pyrites in consequence, and indi- cated by the formula

Fe,S,, or possibly Fe,S,. Thus the following values were found by Pliicker as the relative effects of equal vol- umes of suft iron, loadstone, specular iron ore, and brown hematite on a given magnet under similar conditions :—

SofGMrOn .cceseeccs. 100

Desc titeosscr Oly MPCCUIAT OLClvisessssseseseseseess1 0 DBS Native magnetic oxide …..... 40°227

Brown hematite. .....c0000..0°071

Oxides of iron of all classes are readily acted upon by reducing agents (especially hydrogen, carbon, oxide, and free carbon and

[RO WN

silicon) in such a fashion as to cause the transference of the oxygen of the oxide to the reducing agent, a lower oxide of iron and finally metallic iron being set free. In accordance with the general rules obtaining in such cases (Alder Wright and Rennie, loc. cit.), the rate of reduction of ferric oxide of given physical character is less, ceteris paribus, when a reducing agent is employed which evolves less heat in uniting with oxygen than when one is used evolving more heat; so that a reduction by hydrogen with formation of water vapour goes on more slowly under constant conditions than reduction by carbon oxide forming carbon dioxide, whilst the temperature requisite to cause reduction to be brought about to a just measurable extent (temperature of initial action) is. lower with carbon oxide than with hydrogen, and lower with hydrogen than with free carbon (Alder Wright and Luff, Chem. Soc. Journal, 1878 [Transactions], pp. 1, 504). The precise rate of reduction and temperature of initial action observed in any given case vary with the conditions of the experiment and also with the physical char- acter of the iron oxide (see also Lowthian Bell, Chemical Phenomena of Iron Smelting).

When ferric oxide is reduced by carbon oxide, a peculiar seeond- ary change is brought about under certain conditions, which has been

investigated by Lowthian Bell with the present writer's co- operation (oc. cit.) ; this consists in the reaction of a lower oxide of iron (Fe,O ?) formed at a certain stage of the reduction ou the carbon oxide forming a higher oxide of iron and setting free car- bon ;} the higher oxide of iron is then again reduced by a fresh portion of carbon oxide, and so on in a cycle, so that after some time the quantity of free carbon deposited largely exceeds the total iron present. This peculiar action is also exhibited by oxides of nickel and cobalt, but apparently by those of no other metals; it has a most remarkable influence upon the nature of the ~~chemical changes ensuing in the process of smelting iron by the blast furnace (§ 19), and is doubtless the chief source of the carbon con~~ tained in pig iron thus produced; it is also the main reaction taking place during the conversion of iron into steel by cementation (§ 32).

Ferrous carbonate differs from most of the other compounds of iron found in nature in being soluble in water, especially when excess of carbonic acid is also present, an "acid carbonate" being formed. Such water on exposure to air forms a rusty deposit of hydrated ferric oxide produced by the combination of the oxygen of the air with the ferrous oxide contained in the ferrous carbonate, the carbon dioxide originally combined therewith being set free. In certain localities large deposits of more or less pure hydrated ferric oxide are thus formed, constituting " bog iron ores."

The sulphides of iron partly correspond to the oxides. Thus the sulphides Fe,S, FeS, and Fe,S, exist ; besides these, the compound Fe,S has been described, whilst magnetic pyrites, Fe,S, (or FeSo), and ordinary pyrites, FeS,, and its allotropic or metameric modification mar- casite, constitute minerals of widespread occurrence, and of considerable value, mainly as sources of sulphur, secondarily on account of the iron they contain, and more especially with certain kinds of pyrites on account of the copper, silver, and gold sulphides intermixed therewith. It is to be noticed in connexion with pyrites that, by the action of reducing agents on solutions of iron compounds in presence of sulphates, a slow formation of crystalline FeS, often results; thus many fossil plants and animals occur in various strata in which the deposition of pyrites by this means has produced a perfect cast or

pseudomorph, so to speak, of the organisin; it is probable that the pyritous deposits of large magnitude which exist in various localities have been formed by these agencies, the soluble iron salt having been originally the carbonate.

The chlorides of iron correspond to the ferrous and ferric series of salts, ze, are indicated by the formule FeCl, and FeCl, (or preferably Fe,Cl, and Fe,Cl,) respectively ; chlorides corresponding to Fe,O, Fe,O,, FeS,, &e., have not as yet been formed. The same remark applies to the salts of iron formed by the substitution of iron for hydrogen in all the acids of common occurrence. For the use of iron salts and other ferruginous compounds in the arts

1 Aceording to Griiner (Comptes Rendus, 1871, 28), the reaction is oFeO + CO= Fe,0,+ C, some metallic iron being always formed in addition to the ferrous oxide

produced by the subsequent reduction of the Fe,0,, so that a fer- ruginous carbon always results.

[ih ON

generally see separate articles. Its therapeutic uses are noticed at p. 359.

3. Relationships between Iron (Malleable and Cast).and Steel.—Iron possesses the power of uniting with a number of elements, forming products which either are highly intimate mixtures of more than one substance presenting apparent homogeneity, or else are compounds of an in- definite character, 7.¢., in which the constituents are com- bined in proportions which do not come under the usual chemical laws .of invariableness of composition and of combination in multiple proportions; in short, these iron compounds are substances belonging to the same category as alloys generally and solutions, the placing of which inside or outside the class of true chemical compounds depends on the particular definition of a chemical compound adopted. Probably the most accurate view of the constitu- tion of such substances is that which regards them as being “solidified solutions” of one substance in

another (Mat- thiessen), ¢.¢., when the bodies in question have been fused : the most uscful commercial forms of iron are of this class. Thus, for example, iron sulphide and metallic iron fused together in such proportions that the latter greatly pre- dominates form a homogeneous mixture (or solution of iron sulphide in molten iron), which on cooling solidifies as a whole, not exhibiting any tendency to separation of the iron and iron sulphide; a product similar but melting more readily is formed if iron sulphide and sulphur be fused together, forming one of the varieties of the so-called "Spence's metal" recently patented ; so that between the extremes of pure iron on the one hand and pure sulphur on the other an apparently homogeneous mass can be obtained containing iron or sulphur in any assignable pro- portions, the compound being a solidified solution of iron sulphide in either iron or sulphur, according as the former or the latter is in excess. Silicon and phosphorus can be similarly incorporated with excess of iron, forming analogous solidified solutions; the same remark is true for nitrogen and other non-metallic elements, as well as for manganese and many other metals, notably nickel, gold, tin, platinum, rhodium, aluminium, zinc, titanium, tungsten, and chromium. With arsenic and tin definite compounds can be produced expressible by simple formule, e.g., FeAs (Gehlen) and FeSn (Deville and Caron), When carbon is thus incorporated with iron a peculiar phenomenon is (under certain circumstances) observable which has no parallel with the other compounds, except perhaps to some extent in the case of silicon; this is that, whereas the car- bon is in the amorphous condition when first dissolved, yet on long-continued maintenance in the molten state, but more especially on cooling (whilst the substance is still liquid or semisolid), a more or less complete separation of carbon in the crystallized graphitoidal state often ensues ; so that the cooled mass is no longer visibly homogeneous, but consists of granules and crystals, partly of graphite and partly of solidified solution of amorphous carbon (and such other elements as were originally present) in iron. This pheno- menon may be compared with a somewhat analogous change undergone by phosphorus: when this element is dissolved in carbon disulphide or certain organic bodies, eg., ethyl iodide, the phosphorus gradually changes more or less completely into the red variety, which, being insoluble in the menstruum, precipitates in flakes.

The amount of carbon which changes during solidification from the amor- phous into the graphitoidal variety depends largely on the nature and amount of the substances present along with it dissolved in the iron, and also on the absolute amount of

1Snelus has shown (Journal Iron and Steel Institute, 1871, i. 28) that it is practicable to remove mechanically from a highly crystalline pig iron graphitoidal scales, which consist so entirely of carbon as to leave little or no appreciable residue on combustion.

carbon present and on the rate of cooling; it appears to be promoted by the presence of silicon, the greyest irons (ceteris paribus) being usually the richest in silicon. On remelting graphitoidal cast iron, the graphite is again dis- solved, so that by rapidly chilling the fused mass " white " iron results. Under certain conditions silicon appears to extrude from highly silicious irons in cooling, but not in a difficultly oxidizable form, so that the outside of the pigs becomes covered with silica of a peculiar physical aspect (Lowthian Bell, Journal Iron and Steel Institute, 1871, i. 44) ; under other conditions several parts per cent. of silicon can be permanently retained by the pig without extrusion on cooling, forming a peculiar metal known as " glazy iron," bearing to the silicious pig from which silicon does separate much the same relations as highly carbonized white iron bears to grey pig.

When foreign substances are present in but small quan- tity (manganese excepted), and the amount of total carbon does not exceed 1°5 to 2°0 per cent. of the iron, little or no separation of graphitoidal carbon takes place, and the resultant product is tolerably homogeneous, and possesses the properties of steel more or less soft in proportion as thie carbon percentage is minute or otherwise.

When the carbon amounts to some 2°5 or upwards per cent. of the iron, and especially when the fused substance is rapidly cooled, the metal often solidifies as an almost homogeneous mass, possessing somewhat different properties from those of good steel; it is then known as white cast tron (from its colour after fracturc) ; under other conditions,

especially when a longer time is allowed for solidification, a more or less complete separation of graphite and conse- quent production of a coarse-grained crystalline structure results, the product being then termed grey cast cron, which consequently stands to white cast iron in much the same relation as devitrified glass (Réaumur's porcelain) to ordinary glass. When the amount of manganese present is relatively large (constituting several parts per cent. of the iron present), this separation of graphitoidal carbon takes place to but a small or even inappreciable extent; the cooled mass is homogeneous and highly crystalline, the fractured surface exhibiting great brilliancy, whence the term spiegelersen applied to such substances. As a rule cast irons, whether white or grey, contain more than traces of impurities, such as sulphur, phosphorus, and silicon; but otherwise no absolute line of demarcation between malleable iron and steel on the one hand, and between steel and white iron on the other, can be drawn, based on the chemical com- position; so that it cannot besaid that a substance contain- ing so much carbon is malleable iron, and so much more carbon stcel, and so much more still cast iron ; the definition is purely arbitrary ; moreover, the physical qnalities of a steel containing a given amount of carbon often differ much, according as the proportion of other substances present varies.

The ordinary practical test applied todistinguish iron from steel is the ascertaining whether the substance hardens on heating and quenching in cold water, becoming again softened on reheating and cooling slowly : a substance which does this may fairly be regarded as steel (possibly of very bad quality, but still steel), whilst one which does not may be fairly regarded as a soft iron. With certain specimens it is difficult thus to classify the substances under either head satisfactorily, whilst such a classification would not be accepted by many who would define a steel as being either the product of the cementation of malleable iron or as a substance that has been fused during manufacture, and who consequently would not admit that a very hard puddled metal was steel, even though it did harden distinctly on heating and quenching in cold water. —_

Although it is impossible to draw a sharp line distin- XIII. — 36

guishing between malleable iron when hard and steel when Akermann classifies commercial iron and steel as follows :—

soft, there is no difficulty in tabulating the essential Not Malleable. differences between good malleable iron, well-marked steel, | one Preht- 4 ig and cast iron. Thus the following table may be drawn Malleable cast iron, made by decarbonizing pig iron by cementation with oxide

up — of iron.

Cementation steel (blister steel), made by carbonizing piled bloom or ingot iron

Malleable Iron.

Cast Iron.

by cementation with carbon. Designated as ‘ Bessemer,”

Made ie —— earn &e., ac- ——= cording as iS made. Martin .| traces to 0°3 or 0°4) 2-0 and upwards Ingot metal ead aaah pon. and crucible steel can also be 0 to 0-2 0°1 to 8:0 (Got metall). heat, or Ingot steel made from malleable cast iron, 0 to 0-1 traces to °5 molten, * | blister steel, ingot, bloom, or ? ? > piled iron or steel, or a mixture 0 to 0°5 – traces to 20 with or without pig iron. . 0 to in cementation Made in miles ere id the —— here steel. : oom iron. | 0 atalan,” ‘* cashire,” traces | odio andupwaniain |r Mmeest070 | | loam mets) } open nears “ Franche Colnté” ey aceon Bessemer’s metal, &c. or pig iron Bloom steel. | ing to the description of hearth $9°0 to 99°5 97:0 to 99°5 90°0 to 97°0 ’ in Bag it is made. ———— an be made by welding the Almost pure| More or less pure iron,| Usually consid- . pact iad Piled iron, | SPonsy iron redneed f — iron, containing | containing from 0-4 to erably impure Piled metal together of * J} ore, or, as is more often the case, very fittle if any | 1°8 per cent. of carbon, |iron, containing (Garf metal). aniieltad Piled steel by puddling pig iron, when it has impurity other | and as a rule not more | upwards of 20 per articles * | the extra

name of ‘ puddled than carbon, this | than traces of other sub- | cent. of carbon, Pp : iron” or “‘puddled steel.”

Essential composi- GION) oascree

Physical character- istics ……

| cent.

not exceeding a tenths per Sometimes contains percep- tible amounts of imperfectly _re- meved slag, vary- ing from 0-1 to 3°0 per cent.

few

Welds readily; is comparatively soft and very diffi- eultly fusible ; will not harden; of fibrous texture; when well made yery tough and tenacious. ‘The limit at which the capability of har- dening is first noticeable as re- gards carbon per- centage is near to

stances (manganese ex- cepted, and in certain special qualities plios- phorus and silicon), manganese being pre- sent only quantity in cementation steel, in larger amounts in the products of Bes- semer’s process and cer- tain other methods,

Can be welded with

more or less difficulty, according to the amount of earbon present ; less infusible than malleable iron, the melting point being lower the more earbon is present; can be hardened and anneal- ed and will bear a cut- ting edge ; is very tough and elastic when of good quality, much more so than malleable iron. Texture granular, fine granular, or slightly fib-

in minute.

and varying but notable amounts of sul- phur, silicon, phosphorus, &c.

usually

Will not weld;

is comparatively readily — fusible and casily cast; will not harden like steel; far more brittle than tempered steel or malleable iron, but still possessed of considerable strength, cspe- cially as regards erushing strain ; crystalline or granular texture.

0°35 per cent. rous, according to quality and mode of preparation.

The following tables express the results of Karsten, Eggertz, and Siemens as regards the limiting amounts of carbon present in soft iron, stecl, and cast iron respectively :—

Karsten.

Character of Metal,

‘ ene ‘ Physical properties. Malleable iron. Steely iron,

Not capable of being perceptibly hardened by sudden cooling.

Just capable of being slightly hardened.

Will harden, and give sparks with a filnt when hardened.

Best proportion for tenacity and hardness.

Limit of power of welding properly.

Very hard cast steel; cannot be forged easily.

Not malleable at all when hot.

Brittle ; will not bear hammering.

Highest percentage of carbon obtainable in white irons and spiegeleisens, &c.

0°25

2°0 and upwards, 5:0 to 6°0

Do. {

Eggertz.

Carbon percentage. Nature of Metal.

0-08

0°75 1°4 to 15 0°99 to 2°44 0°5 to 1°9 0°86 to 1°94

Softest Swedish Bessemer iron.

Soft steel.

Best kinds of cast steel.

Forge steel.

Cement steel.

Cast steel.

Hardest cast steel that can be welded. Malleable cast iron.

Draw plate steel.

1°80 0°88 to 1°52 3°30

Stemens.

Carbon percentage. » Character of Metal.

Up to 0°3 When cast is homogeneous melted iron rather than true

Above 1°4 {

stecl, being no longer capable of being hardened. No longer capable of taking a temper, and consequently rather approaching to cast iron in character than to steel.

The following recommendations as to the nomenclature of iron and steel were made by an international committee appointed at Philadelphia in the year 1876 by the American Institute of Mining Engineers, consisting of I. L. Bell, Dr H. Wedding, Professors Tiinner and Akermann, L. Griiner, A. L. Holley, and T. Egleston :—

1. That all malleable compounds of iron, with its ordinary ingredients, which are aggregated from pasty masses or from piles or from any form of iron not in a fiuid state,and which will not sensibly harden and temper, and which generally resemble what is called wrought iron, shall be called weld iron (Ger- man, Schweisseisen ; French, fer soudé).

2. That such compounds, when they will from any cause harden and temper, and which resemble what is now called "puddled steel," shall be culled weld steel (German, Schweissstahl ; French, acier soudé).

8. That all compounds of iron, with its ordinary ingredients, which have been cast from a fluid state into malleable masses, and which will not sensibly harden by being quenched with water while at a red heat, shall be called ingot iron (German, Flusseisen; French, fer fondu).

4, That all such compounds, when they shall from any cause so harden, shall be called ingot steel (German, Plussstahl ; French, acier fondu).

Siemens (Lecture to Chemical Society, Journal Chem. Soc., 1868, p. 284) lays down the aphorism that "no method of producing steel can be considered admissible at the present day which does not pass the metal through the condition of entire liquefaction, for it is only by fusion that foreign admixtures can be thoroughly separated, and that flaws and fissures can be avoided ;" which appears to imply that no substance that has not been completely fused should be termed a true steel even though it be susceptible of hardening. Nine years later (Presidential Address to the Iron and Steel Institute, 1877), in discussing the above proposed de- finitions of the international committee, he remarks that practical difficulties would be introduced by these definitions ; for instance, railway bars, which ordinarily contain from 0°2 to 0°6 per cent. of carbon, would sometimes be stamped as ingot iron and sometimes as ingot steel ; and he further objects that, unless the precise

tem- perature to which the metal is to be heated in order to harden it is specified, and also the cooling medium into which it is plunged, discrepancies will be introduced between the results of tests of the same metal by different experimenters, certain conditions of tempera- ture and cooling material enabling particular classes of metal to take a slight temper, the whicli substances would not be hardened by the use of lower temperatures or different cooling materials, ¢.g,, oil in lieu of water or mercury.

In view of the difficulty experienced in defining precisely what is meant at the present day by the terms iron and steel, and the practical inconveniences and litigation thereby bronght about, it has been proposed by Sir Joseph Whitworth and others to disuse the terms "iron" and "steel" as distinctive marks of quality, and instead to define the metal in terms of its tensile strength and ductility (percentage elongation before rupture). The following table illustrates such a "scale" of qualities, being one employed at Seraing! for " steels" prepared by fusion processes :—

a

2 Recently a slightly different classification of the Seraing steels (Socleté John Cockerill) has been adopted (Annales Industrielles, August, 1879), viz. :—

Content of} Tensile |Extension) wejging and Tempering

Properties.

Welds, but does not temper. Welds but badly, but may be very slightly tempered.

20 to 27

15 ,, 20

(| Does not weld, but will

15 ,, 20< 5 ,, 10

temper. Unweldable, but may be

Extra hard (0°50 ,, 0°65) 46 ,, 51 strongly tempered.

IR

Tensile strength in |, Elongation kilos per per cent. sq. millim.

Approximate percentage of carbon.

General Characters.

(Welds, but does not ‘+ harden; used for boiler iG antea: rivets, &c. Welds but badly, and | hardens slightly, but |; notto any great extent; used for tires, axles, rails, pistons, &c. Hardens well, but | | does not weld readily ; , 0°55 ,, 0°65 |{ used for springs, cut- ting tools, saws, drills, &e.

5 ,, 10

IL

20 to 25 0:25 to 0°35

0°35 ,, 0°45

10 20 4] O45” O55

Hardens, but does above 0°65

springs and tools, spin- dles, &c.

Ie weld; used for fine

A tensile strength of 1 kilogramme per square millimetre is about equal to 0°63 tons per square inch, so that on this scale extra soft, soft and semihard, and hard steels have average tensile strengths of about 32,

39, and 55 tons per square inch respectively. Stcels of the (a) class can be bent U shape without breaking, and will generally allow the two ends of the U to be hamimered together without fracture ; steels of the (¢) class break when the angle of bend reaches to 1380°-140°; and the other classes are intermediate between these limits.

Hackney has proposed a: classification of iron and steel practi- eally identical with this "Seraing scale"; the main objections to such scales are that, as even the softest completely fused metals are thus designated "steel," the time-honoured definition of steel as being a substance that can be hardened and tempered is wholly done away with; and the circumstance that the numerical values ex- pressing the ductility and tensile strength are variable with the dimensions of the piece of metal tested (§ 43). Much confusion and litigation would be avoided were some name other than 'steel " applied to the modern metals of low carbon percentage obtained by fusion processes, and destitute of the power of taking any consider- able amount of temper by heating red hot and rapidly cooling.

In practically testing a sample of steel, the difference between a specimen that has been prepared by a fusion process and by a process of puddling is usually very mani- fest when the specimens are slightly etched by dilute nitric acid or other agent that will gradually attack the metal: the fusion product exhibits a regular more or less granular structure, whilst the other exhibits more or less of a fibroid character. On dissolving the metal in cupric chloride (§ 6), a small amount of silicious cinder is left undissolved in the latter case, but practically none with a properly fused steel.

The presence of sulphur and phosphorus in true steels in other than the most minute proportions exercises a marked deteriorating effect upon the strength and tenacity of the metal, the former substance rendering the steel more or less brittle when hot (red-short or hot-short), the latter causing it to be liable to crack and break when cold (cold- short). 'The presence of manganese, however, and to some extent of carbon and silicon, modifies the exact amount of effect produced by a given quantity of phosphorus or sulphur ; as a general rule it may be said

that a steel con- taining 0°5 per cent. of carbon and upwards, and also con- taining more than 0-1 per cent. of sutphur, will be objection- ably red-short, and that, if it contain more than 0:1 per cent. of phosphorus, it will be too cold-short for most applications; whilst a much smaller quantity, as little as 0-03 per cent., renders the steel almost useless for tools and cutting instruments, &c., in which a fine temper is essential. These figures, however, are subject to notable corrections: the presence of manganese to an extent of several times the amount of sulphur present considerably mitigates the evil effect of that substance, whilst, provided the carbon be very low (i.e., that the metal is really not steel at all but only fused iron), much larger quantities of phosphorus than 0-1 per cent. may be present without deteriorating the properties of the substance to so great an extent as would be occasioned by the presence of much smaller quantities of phosphorus simultaneously with |

several tenths per cent. of carbon. Thus years ago the practical experience acquired at the Terre Noire works proved that good rails could be made from steel containing about 1 per cent. of manganese and as much as 0°3 per cent. of phosphorus, provided the carbon did not exceed half that amount ; subsequently, good serviceable rails have been rolled not only in England but also in Saxony, Austria, America, and elsewhere, containing 0°3 to nearly 0:4 per cent. of phosphorus and about half as much of carbon, or less. These “phosphoric steels” (more correctly “homo- geneous irons,” fused irons, or “ingot irons ”), however, are wholly unsuitable for all purposes requiring the metal to be tempered, on account of the impossibility of having so much phosphorus present together with more than minute amounts of carbon without producing brittleness and utter inability to be worked.

The effect of si/icon on the physical qualities of steel is far less marked than that of sulphur and phosphorus. Like that of the latter it is modified by the amount of carbon present: thus Riley has found 2 per cent. of silicon in rails of good quality; Gautier states that a siliconeisen con- taining upwards of 7 per cent. of silicon, but almost desti- tute of carbon, could be forged perfectly, whilst a steel containing 1°5 per cent.

of silicon and slightly less than 0-2 per cent. of carbon (with 0°76 of manganese) rolled perfectly and was very strong. The presence of silicon, moreover, conjointly with that of manganese, exerts a remarkable action in diminishing the extrusion of gases from molten steel in the act of solidifying, thereby pro- ducing honeycombing ; so that when very soft steels are cast into ingots much sounder masses are obtained by the ordinary casting processes (ie, not under hydraulic or other powerful pressure) when a little siliciuretted metal is added to the steel just before casting than when ordinary rich spiegeleisen or ferro-manganese is employed. On the other hand, when carbon and silicon are simultaneously present to the extent of 0-5 to 1-0 per eent. or thereabouts, both hot and cold shortness are brought about to a greater or lesser extent.

Nitrogen has been supposed by many chemists and especi- ally by Fremy to be an essential constituent of steel ; and in favour of this view it is to be noticed that in the prepara-

tion of steel by cementation the addition of nitrogenous

organic matter (scraps of leather, horn, ferrocyanide of potassium, &c.) is found to facilitate the conversion of bar iron into blister steel. On the other hand this may be due simply to the formation and absorption of cyanogen, which carbonizes the iron without necessarily communicat- ing nitrogen to it. The actual quantity of nitrogen found in steel by various experimenters is always extremely small,* whilst it is possible to produce steel from iron free from nitrogen by cementation in pure carbon oxide, or in an atmosphere of coal gas (Macintosh's patent),—so that nitrogen is clearly not an essential constituent in these cases. Moreover, nitrogen has been found both in wrought and in cast iron in even larger quantity than in steel, so that the peculiar properties of steel as regards hardening eee Se Oe,

1} From 0°011 to 0°18 per cent. of nitrogen was found by Bouis in various specimens of malleable iron, cast iron, and steel ; from 0°007 to 0°057 per cent. in various steels and wrought irons was found by

Boussingault. By heating metallic iron in ammonia gas much more highly nitrogenized substances can be produced, Fremy having thus obtained substances containing as much as 9°8 per cent. of nitrogen. In these and other analogous experiments by others, various methods of analysis were adopted, the most conclusive ones being solution of the metal in pure hydrochlorie acid, and determination ot the ammonia freed by the combination of the nascent hydrogen with the nitrogen. Recently A. H. Allen has repeated these experiments, and also made others by passing steani over the red-hot metal, and determining the ammonia produced. The quantity of nitrogen thus obtainable varied from 0°0041 per cent. in spiegeleisen to 0°0172 per cent. in steel niade from Dannemora iron.

and tempering cannot be markedly influenced by the pre- sence of this constituent. No connexion between the amount of nitrogen present and the physical properties of the metal, or the amount of carbon or other foreign ele- ments present therein, has as yet been thus established by any experimenter.

As regards the presence of oxygen in iron and steel, and its effect on their qualities, little evidence as yet exists. It is well known that certain metals, e.g., copper, will dis- solve small proportions of oxide, the presence of which renders the metal much less tenacious than it otherwise would be, so that certain operations are usually gone through in the final stages of the extraction of these metals for the purpose of again reducing the oxide disseminated through the mass, e.g., "poling" melted copper. The tena- city exhibited by " phosphor-bronze" is largely due to the complete reduction of copper and tin oxides by the phos- phorus. This solution of oxide in the metal also takes place with iron, especially when tolerably free from silicon; this element is capable of reducing iron oxide when heated therewith, so that when present the silicon is oxidized in preference to the iron.

Overblown Bessemer metal is comparatively unforgeable and brittle, so that probably the presence of oxygen affects iron in the same way as sulphur. When iron and steel are overheated for a long time, they

become “burnt” and brittle ; this is supposed by some to be due to the forma- tion of oxide disseminated through the mass of the metal, but many others consider that a more or less crystalline structure set up under the influence of a softening heat is the sole cause of the diminution in strength and tenacity (§ 43).

lron and steel usually give off, on heating under diminished pres- sure, carbon oxide and more or less hydrogen, and the formier gas is largely extruded from steel in the act of solidifying (Besseimer), there- by giving rise to honeycombing of the casting. This is usually attributed to the same cause as the “spitting ” of silver, 7.¢., to a physical inability on the part of the metal to retain in solution at a lower temperature the same amount of gas that it can dissolve when more highly heated; the presence or silicon diminishes this evolu- tion of gas, probably by the decomposition of the carbon oxide with formation of non-gaseous silica. A nutaber of observations and de- terminations of the gases occluded by and otherwise present in iron and steel have been made by Parry, Troost and Hautefeuille, Miller, and others, but without leading to any definite correlations between the physical properties of the metals and the gases occluded. More- over, it does not seem to be absolutely established whether the carbon oxide obtained by heating in an exhausted tube really exists as dis- solved gas or as a mixture of oxide and carbide (or solution of car- bon); the writer has found that by varying the mode of heating and the tempcrature variable proportions of carbon oxide and di- oxide may be obtained from spongy iron (prepared by heating to a bright red heat ferric oxide in an atmosphere of carbon oxide) when itis heated in connexion with a Sprengel pump ; which seems to sug- gest that a mixture of oxide and carbide is present rather than simply oceluded gases.

Hydrogen when present in iron to a considerable extent appears very considerably to diminish the tenacity and strength ; thus electro-deposited iron containing much hydrogen is brittle, but becomes soft and flexible on heating under diminished pressure so as to extract the hydrogen. When iron or steel wires are immersed in dilute sulphuric acid, especially in contact with zinc, so as to evolve hydrogen copiously from the surface of the iron, the wires take up about twenty times their

volume of hydrogen, and become so brittle that they break on attempting to bend them.

Copper is often present in minute quantity in pig iron. When steel contains a few tenths per cent. of copper it is distinctly red-short, more so when the proportion is increased (Eggertz). Malleable iron does not seem to be so much affected by copper, 0°5 per cent. giving but little red- shortness; the welding power is, however, considerably diminished. On the other hand, addition of iron to bronze and similar copper alloys increases their strength and tenacity, as in Aich's gun-metal and Gedge's metal. Antimony acts as injuriously upon iron as sulphur and phosphorus conjointly, a few tenths per cent. rendering

bar iron highly cold-short and also hot-short. Chromium, tungsten, vanadium, and titanium are all apparently capable of increasing the strength of iron more or less after the fashion of carbon, and accordingly have been regarded as valuable constituents in special kinds of iron and steel, ¢.g., the so-called chromium steel and tungsten steel, and the iron containing traces of vanadium employed on the Swiss wire bridges at Freiburg. Faraday and Stodart found that about 1 per cent. of platinum or certain of its congeners (e.g., palladium and rhodium) improved the toughness of steel, and communicated to it a fine grain. Nickel is largely present in meteoric iron (vide infra), from which knife blades, &c., are readily beaten out, so that the presence of nickel does not appear to diminish materially the malleability of iron.

The question as to whether the carbon which does not separate in the graphitoidal state on cooling molten cast iron or steel is truly combined or not (in the sense in which oxygen is combined in ferric oxide, and not in the sense in which silicate of cobalt may be said to be combined in blue glass to which it gives the colour, or in which sugar is combined with water in syrup) is one about which great divergence of opinion exists. 1t is usual to speak of this carbon as * combined carbon," because when the iron or steel is dissolved in an acid (e.g., hydrochloric acid), this carbon combines with the evolved hydrogen and escapes as carburetted hydrogen of some kind, whereas the graphitoidal carbon

remains behind unaffected ; just in the same way the sulphur escapes as sulphuretted hydrogen. 1t is by no means apparent, however, that carbon if set free in the amor- phous condition in a state of excessively fine division and in pre- sence of nascent hydrogen would not forthwith combine with the hydrogen, even though its condition in the iron were only that of a dissolved body ; the probability is indced rather the other way, for such carbon when free and warm is known to be often pyrophorie in the air, whilst the mixture of carbon and partially reduced iron and iron oxide, formed when carbon oxide is allowed to act on ferric oxide for some time at a low red heat, evolves hydrogen containing much carburetted hydrogen on treatment with an ak 6.g., hydro- chloric acid. It isto beremembered alsothat, whilst definite sulphides ofiron are known and are easily obtainable, the same can hardly be said of carbides of iron ; it is true that spiegeleisen (manganese- iron alloy) contains a larger amount of so-called combined carbon than ordinary steel, amounts up to 6 per cent. having been found therein; but it hardly follows from this that spiegeleisen and steel, &c., contain a definite carbide, such as Fe,C, or Fe,C, which has sometimes been considered as present therein, ¢g., by Karsten, Gurlt, Mattieu Williams, and others. A compound the con- stituents of which separate on cvoling would be a very unusual sort of substance, whereas it is well established that by fusing and very rapidly chilling certain kinds of grey cast iron they are more or less converted into white or mottled iron, the amount of "combined" car- bon largely increasing, and that of graphite correspondingly decreas- ing; whilst the converse change can be brought about iu some kinds of white iron by fusing and very slowly cooling them, a notable separation of graphite and diminution in the quantity of "com- bined" carbon present being thus brought about. According to Akermann fusion is not indispensable, long continued maintenance at a yellow heat sufficing to change white iron into grey.

In practice the quality of pig iron is to a considerable extent decided by the degree of crystallinity exhibited by it, ¢.e., by the extent to which graphite has separated out during solidification, and the size of the crystals of this substance and of the solidified partly decarbonized pig iron, the crystallization of which is promoted by the particles of

graphite acting as nuclei. Pigs with the largest crystals are known as No. 1; those made up of somewhat smaller but still moderately large crystals, as No. 2; smaller-grained pigs, but still crystalline and grey, are known as Nos. 3and 4. The finest grained No. 4 pigs, being usually unsuitable for making castings, and only serviceable for the puddling forge, are designated " forge 4," the higher kinds being known generically as " foundry iron." Some- times a pig will solidify partly as white iron partly as grey, the crystallization having commenced in patches, but not having spread throughout the whole mass before it solidified ; such iron is known as "mottled pig." The price of market pig iron is regulated by these numbers and the locality of the furnace, 7.¢., the nature of the ore from which it is smelted; those brands which are specially free from phosphorus, and are consequently applicable to the pre- paration of " Bessemer metal " (stecl made by the Bessemer-Mushet process—§ 36), are usually designated " Bessemer pig." Special qualities of white iron free from sulphur and phosphorus and con- taining several parts per cent. of manganese smelted from spathose and other highly manganiferous ores are known as spiegeleisen, from their mirror-like fracture. Ferro-manganese is a similar pro- duct containing a much larger amount of manganese (§ 41).

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4. Meteoric Iron.—Metallic iron in a more or less pure condition is occasionally met with in nature, but the supply of metal from this source is wholly inconsiderable. Pro- bably nearly all such substances are of meteoric origin, with the exception of ferruginous metallic platinum. Cer- tain masses of oxidized iron with unoxidized metal in the interior have been found in Saxony and elsewhere; but great doubt exists as to whether these substances are not artificially prepared metal which has rusted exteriorly in the course of time. Near Nery (France), at a spot where a seam of coal had been burning for some time, Mossier found a mass of a very hard steely iron weighing upwards of 16 ib, together with smaller lumps, evidently formed by the reducing action of the burning coal on ferruginous matter in the soil and rock. True

meteoric iron usually if not invariably contains nickel to the extent of from 1 or 2 parts per 100 of iron (as in meteorites analysed by Prout) up to considerably larger amounts. The following analyses of various specimens of meteoric iron consisting wholly or almost entirely of unoxidized substances may be taken as representing the general composition of the substance :—

Krasnojarsk, B : :

athe ohumi- | Cosby's | Cape of

Souree….. i Lenarto. 'Pallas litz, Creek, Good Meteorite) Bohemia. |Tennessee.| Ilope.

Analyst…... H. Miiller.) Wehrle.| Berzelius. | Berzelius. |Bergemann|Uricoechea

Specifie gra- ;

Wilitvirere sons. 7°78 to 7°84 |7:14 to 7-71

726 6°63 to 7°94

TOW ene. .ss+00 90°91 90°883 88°27 Nickel,...:... 5°65 8°450 10°82 Cobalt…..... 0°42 0665 0°46 Manganese., Feo bec 0°13 Copper…....| trace 0:002 0:07 Magnesium.} trace mae) 0:10 Phosphorus. 0°23 O11 Carbon…..... cee E Sulphur…...

Mess: ise sce

Silica, &e….

100°50 =| 100-000 | 100-00

Many meteorites consist of nickcliferous iron intcrmixed with larger or smaller amounts of oxidized minerals, in particular olivine, augite, labradorite, and other silicates, together with chrome iron- stone, magnetic pyrites, magnetic oxide of iron, and schreibersite (phosphide of nickel and iron), &c. On solution in acids many of fhese substances

are left undissolved, cspecially schreibersite ; in consequence metcorites of mainly metallic character often exhibit peculiar crystalline figures (something like the “moirée metallique” produced by pouring acids on tinplate) when etched by acids (Wiedmanstidt’s figures). Nordenskjéld has recently shown that many meteorites that have fallen at different times exhibit great uniformity in composition, so that it is highly probable that they all had a common extra-terrestrial origin. Graham found (Proceed- ings of Royal Society, xv. 502, 1867) that the Lenarto iron yielded on heating in vacuo 2°85 times its volume of gas, containing

UROL OMsy.). aeeuietassascnsessesssoeeeens 85°68 per cent. WE ORVOMIUCS . .crossloaeiieajcide nf +24. alas 4°46 4, 45, RNIN cots nitihis veces onnensananes S236), aeenrn

whilst ordinary malleable iron (horse-shoe nails) yielded a rather smaller amount of gas, of which carbon oxide and dioxide consti- tuted the majority; from the fact that he was unable to impregnate ordinary metallic malleable iron with more than about its own vol- ume of hydrogen, whilst this meteoric metal contained upwards of two anda half times its volume of that gas, Graham concluded that the ineteorite was derived from a cosmical body possessing a densc atmosphere of hydrogen, such as spectrum analysis indicates as ex- isting in various fixed stars, of which a Lyre may be taken as a type.

5. Ores of Iron.—Cutting instruments of a rough charac- ter have been fashioned by savage and semi-savage nations from meteoric iron ; but the sources from which the metal is practically extracted are those ores in which the metallic properties of the element are masked by its combination with non-metallic substances. These ores are essentially divisible into three classes, viz., those respectively in which the iron exists as sulphide, as carbonate, and as oxide. The

duced from ores of this class, although the impure ferric oxide obtained from the residue left in the vitriol works after combustion of pyrites and extraction of copper from the residue, known as “purple ore” or

“blue billy,” is utilized as “‘fettling” in the puddling operation, and has sometimes been employed on the spot where it is produced as a source of finely divided metallic iron for the precipita- tion of the more valuable copper, the reduction being simply effected by heating together the iron oxide and small coal, or by passing over the heated oxide reducing gases prepared by the partial combustion of coal or other fuel, &c. It may be noticed in passing that the ferrum redactum of pharmacy, or spongy metallic iron, is produced in much the same way, purer materials being employed, ordinarily a pure ferric oxide or hydrated ferric oxide and hydrogen gas; and that several methods for the reduction of iron on a manufacturing scale from various ores based on the same principle have been attempted hitherto without much commercial success (§ 30). The ores in which iron exists as carbonate, FeCO,, are essentially of two kinds, viz., those in which the ferrous carbonate is crystalline and but little admixed with earthy matters, and those in which a larger or smaller amount of clayey matter is intimately intermixed with the ferruginous com- pound: the former class is generally termed spathic tron ore (sparry ore, siderite, spathose), and often contains a notable amount of magnesium or of manganese carbonate ; the latter class is from its texture and appearance generally spoken of as clay ironstone or argillaceous tron ore. Large deposits of a variety of clay ironstone exist in the Coal Measures, frequently alternating with layers of carbonaceous matter, whence the term blackband is applied to this variety. In many cases deposits of spathose and of clay ironstone have become more or less altered by the action of air and moisture, the effect of which is to convert ferrous carbonate into ferric oxide; in other instances by the action of heat derived from the underlying strata by conduction, or due to trap dykes and analogous volcanic agency, the ferrous carbonate is more or less completely converted into an iron oxide akin to magnetic oxide,—so that the deposits of spathose ore or clay ironstone shade off in places into deposits of the iron oxide class.

The third class of iron ores in which the iron exists as oxide may be divided into three subclasses, viz., those in which the iron respectively exists as anhydrous ferric oxide, Fe,O,, as hydrated ferric oxide, Fe,O;,H,O, or other hydrate, and as ferrous and ferric oxides

combined, of which magnetic oxide of iron Fe,O, is the type. To the first division belong the red hematite and specular ores, to the second brown hematite and bog tron ore, and to the third the magnetic iron ore properly so called, or loadstone, and various modifications of this found in different locali- ties, and usually also designated as magnetic ore, although frequently not possessed of strongly marked magnetic pro- perties, and also the tronsands of India, New Zealand, St Lawrence, and elsewhere. These latter are usually almost pure Fe,O,, intermixed with more or less silicious matter (often titaniferous), and are distinguished by their remark- able freedom from tendency to take up oxygen and pass into the state of ferric oxide, the which property is not by any means possessed to an equal extent by all so-called magnetic ores ; just as deposits of ferrous carbonate by the action of heat, air, and moisture become changed, so beds of ore exhibiting in the main a composition akin to that of magnetic oxide of iron often contain portions which have become converted by similar agencies into ores more re- sembling red or brown hematite. Owing also to the variable intermixture of gangue of various kinds with the

first class of ore is best exemplified by pyrites or iron | veins of iron ore, the physical properties of the substances disulphide, FeS, ; comparatively little iron is directly pro- | become more or less altered, so that it is often difficult to

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classify a particular ore otherwise than in broad general terms.

According to the nature and amount of the admixed substances, the value of the ore varies largely. The pre- sence of certain impurities, notably of phosphorus, in more than minute quantity prevents the use of certain ores for particular purposes, and thus reduces their value; the admixture of particular kinds of gangue in other cases renders the ores unsuitable for working in the same kind of way that would otherwise be advantageous; in smelting such ores by means of a blast furnace different kinds and amounts of flux for the earthy impurities are requisite in different cases, thus affecting the cost of production, — so that in fine the value of an ore is by no means necessarily

proportionate to the amount of actual iron present therein. The following table gives a rough idea of the general composition and characters of the leading classes of iron ores, such as are in actual use as sources of metal :—

Oxide of Iron Class. Ferrous Carbonate Class.

. Brown Iron | Magnetie . Clay Heematite. One, Ge Spathic Ore, Tronetone. Ferrie oxide] 60 to 95 50 to 90 30 to 70 Oto 5 0 to 10 F y (| usually ab- d oe ae Oi: sent or |>15 ,, 55 20,,60 | 30,, 45 idles… 20% P' nearly so. |f 'ater f O» 2 | ot? | 0,2 | 1,2 | 0, 2 Magnesia…) 0,, 1 0,, 2 0,, 2 0 ,, 10 1 ,, 10 Alumina….. OL ne 1,, 10 OF, 20 ea & 1,20 mie eececseet| 2OR;; uo Oro a On, 25 as 2) Siliehiiess.ccesf. 1) 3820 Y,, 1380 0 ,, 25 On, 8 2,, 25 ae aul O,, 2 0,, 5 0, 5 Hl 35,,40 | 20,, 35 usually a Phosphorie } sent, or only auhydride |(Oe rae Oy 2 present in 0, 3 traces. SIphurs.‡ ~~"O 5, ae We Ot OW55. ditto. OF, 2 Water ……. Oey bs 5 ,, 20 0, 5 Oto 5 0, 4 Anbydrous Hydrated} Ferric and || Crystalline | Ferrousear~~ ferrie _ox-| ferrieoxide, | ferrous ox-|| ferrous ear-| bonate dis- ide, with aj'with more}ides, more Donate, with |seminated greater orjor less ad-}or less ap-j|moreorless}through a less admix-|m i x e d/proaehing]| magnesium | clayey mass, (sure of sili-| earthy and | to the ratio || and manga-|the former Maineom-}|cious or] clayey mat-| Fe,03, FeO, || nese earbo- predominat- position] | quartzose| ter. and more |/nates,andajing in the matter, and or less ad-||little gan-|richer ores sometimesa mixed with |) gue. of the kind little elay or elayey mat- usually other alu- ter and gan- worked, minous gan-| | gue, (| gue.

Lied hematite ores (including specular ore or fer oligiste and mica-ceous ore) vary considerably in their external appearance; the variety known as " kidney ore" is well exemplified by the Cumberland de-posits, and constitutes dark brownish-red botryoidal and reniform concretions, occasionally with a considerable amount of smoothness and lustre externally, and of crystalline frequently radiating struc- ture ; softer varieties are known as 'red ochre" and 'puddlers' ore," owing to their use for ' fettling" puddling furnaces and as pigments, and are of unctuous consistency almost earthy in character. " Specular ore " is a hard well-crystallized form, deriv- ing its name from the brightness of

the surface of its crystals, which appear dark grey or black by reflected light ; this variety is well exemplified by the Elba ore ; its. specific gravity is near 5:0, the crystalline system being the hexagonal. “ ‘Titaniferous iron ore ” or “ilmenite ” resembles specular ore in appearance and crystalline form; it is more strictly a variety of magnetic ore, however, inasmuch as it usually contains a considerable amount of ferrous oxide ; the ferrous titanate present may on the other hand be re- garded as FeTiO,, or Fe,O,, in which half of the iron is replaced by titanium ; whilst some of the ferrous iron is frequently replaced by magnesium. “ Micaceous iron ore” is a crystalline scaly substance which, when of sufficient brilliancy, forms a good pigment for iron- work, known as “minium de fer.” Asa rule hematites are consider-

ably free from phosphorus and sulphur; various hematitic deposits .

in Spain, however, have been found by the writer and others to contain large amounts of phosphorus, sometimes to the extent of several parts per cent. of that element in relation to the iron; whilst occasionally pyrites veins are found in hematite beds. The chief hematitic ores worked are those from Cumberland and North Lan- cashire (Ulverston, Furness, Whitchaven, &c.); from Sweden and Norway (Dalkarlsberg, Uté, &c.); from Liége, Saxony, the Harz, Silesia, and Austria; from Elba and Brazil (specular ore); and from Missouri (Iron Mountain, Pilot Knob), Lake Superior, Ohio, Ten-

-Diatomacex.

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nessee, and Alabama; many other deposits, however, exist, this class of orc being very widely spread; thus it is found in some quantity in Cornwall (Restormel), Brixham, Ayrshire, Glamorgan- shire, North Wales, the Isle of Man, the Erzgebirge, Russia, Spain, &. Hematitic ores are usually found in the older Lapis formations, especially the Huronian, Cambrian, Silurian, evonian, and Carboniferous rocks; in many cases they are distinctly of sedi- mentary character, 7.¢., they have obviously been deposited by aqueous agency. Some deposits have

probably been originally thrown down either as ferric oxide detritus from the abrasion of rocks, &c., containing ferruginous matter, or as hydrated oxide from the oxidation of water containing ferrous carbonate in solution, the ochreous deposits thus formed having been rendered more or less completely anhydrous and indurated by the long-continued effect of pressure and the conduction of the internal heat of the earth to them. The Cumberland hematite largely oceurs in pockets in Carboniferous Limestone, and has doubtless been produced by the latter kind of agency, the cavities of the limestone rock becoming gradually filled up by the deposition of iron oxide. Red sandstones, on the other hand, represent deposits of ferric oxide thrown down simultaneously with much sand ; whilst the earthy varieties of hematite have probably been less indurated by heat and pressure, and were doubtless formed by deposition from water containing clayey matters in suspension to a greater or lesser extent. The Alabama deposits exhibit distinct stratification, forming a bed be- tween the Coal Measures and the Devonian Limestone upwards of 100 feet in thickness, and several square miles in extent. In Corn- wall, North Wales, and especially in the Lake Superior and Missouri districts, the hematitic deposits form large veins and lodes. The specular ores of Elba, Sweden, Missouri, and elsewhere usually occur as massive deposits ; portions of the latter occasionally show the passage of spathose ore into specular ore (Snelus), suggesting the effect of heat accompanied by oxidizing action. Oceasionally brown hematite is found passing into red, indicating gradual dehydration more complete in one portion of the deposit than in another. The following analyses illustrate the composition of some hematites :—

Ore and Re

Character ofj Uvenieae Loeality…. (| Hematite.

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Analyst …....000008

Ferrie oxide …... Ferrous ,, Manganese oxide- Alumina…..... Melee Werwacesccsrcces. Magnesia. ..... Phosphorie ; anhydride f°

Sulphurie do…..... INCH.

eeerse

aeid, volatile matters, &e. Sulphur… .ccce-s

absent

a | a fr | a |

100-00

Total metallic ATOM res scecessess

43°40

Brown hxmatite (including géthite, limonite, bog tron ore, lake ore, &c.) varies even more in appearance and character than red hematite, and is found of the most varied degrees of purity. Many deposits have been apparently formed by the alteration of argillaceous ferrous carbonate ; others form superficial sandy beds produced by the deposition of ochreous matters from solution either by purely chemical action, such as the oxidation of dissolved ferrous carbonate, or by the action of organized beings, especially As a rule much earthy matters are contained in this class of ores, together with considerable amounts of sulphur and phosphorus ; certain deposits found in Spain and Africa (Bilbao and Marbella ores, &c.) are, however, often considerably free from these objectionable ingredients. Usually brown hematites are distinctly of sedimentary character, forming beds ; but they often occur also as: veins, especially in the older formations, doubtless deposited (often along with other minerals, ¢.g., copper ores) from water flowing through the cracks and crevices of the rocks. Sometimes the brown colouris much lightened, the tint being almost red and some- times even yellow. In texture these ores usually differ considerably from the more compaet kinds of red hematite, being cindery, earthy, or sandy in character, and only comparatively rarely massive, save when they have been subjected to indurating and compressing influ- ences sincc their deposition, in which case they have usually lost water and become

partially converted into something more like red hematite. Sometimes a definitely crystallized hydrate, Fe,03,H,0 (gothite), is found; scaly minerals of the same composition have also been described under the names of lepidocrocite, &. The larger deposits of brown hematite are found in the Secondary and

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more recent formations as a rule, but some considerablo ones occur among the Coal Measures and Carboniferous Limestone; the Oolite, Lias, Jurassic, Greensand, and Wealden formations of England especially Northamptonshire and adjaccnt counties), and of France (Boulogne and the Ardéche), Luxembourg, Bavaria, and Wiirtemberg, contain deposits often of considerable magnitude and extent, which occasionally show distinct passage into red hematite, and often pass- age of clay ironstone into brown hematite. Bog and lake ores are considered by Ehrenberg to be mostly formed by infusorial agency ; on the dredging up of deposits of this kind (occurring in nodules and granular concretions), a new formation of lumps is often found to occur after the lapse of some years. In some cases these deposits are of large magnitude, e.g., those of Finland, Sweden, Norway, and Three Rivers (Canada). Pisolitic concretionary masses of a variety of brown hematite are found sometimes in large quantity in the Ger- man Oolites, and elsewhere in the cavities and crevices of limestones; these have been probably formed by deposition from water percolat- ing through the rock, and the aggregation together of the ferric oxide thus thrown down, and the earthy matters also in suspen- sion. The following table gives the composition of various kinds of ores belonging to the brown hematite class :—

Character of deve 2 y; Ore Ore and ae Kentucky.| Nova’ | Flaten,

: isoliti London- | Bog Iron iad Scotia. | Sweden.

Ferric oxide Manganese do…. Alumina …..008 JGIPTUS oBtigeonce eoang Magnesia …...00 RlGifecereeasccssss Phosphoric \ anhydrides °° Sulphuric do. .., Solphur …...s10.0. \7E (a2. enoepEceeeBee Carbonic \ anhydrides **’

Total metallic DROW cosessscees

Magnetic Iron Ores,—The substances most nearly approaching to the composition Fe,0, sometimes occur well-crystallized in forms belonging to the cubic system, and possessing a semi-metallic lustre; in the mineral franklinite (found in large quantities in New Jersey) the ferrous oxide present is largely replaced by zinc and manganese oxides without altering the crystalline shape (usually octahedral). The purest magnetites are strongly magnetic, and often show polarity, then constituting loadstone; they differ from hematites in the colour of the streak, magnetic ore yielding a black, red hema- tite and specular iron a red, and brown hematite a brown streak ; the specific gravity is about the same as that of compact red hema- tite, viz., near to 50, while brown hematites are usually consider- ably less dense, their specific gravity being near to 4:2. Massive deposits are found in the older formations in Sweden and Norway (crystalline limestones, talcose schists, and diorites), North America (Laurentian series), the Ural mountains (doleritic rphyry), and Mexico (Cerro Mercado—felspathic porphyry) ; whilst considerable amounts are also found in somewhat more recent formations, e.g., in Piedmont (Traversella—talcose schists and dolomites), Spain, northern India, and Saxony (Berggieshiibel); in England only com- paratively small quantitiesare found, notably at Rosedale (Yorkshire) and Brent and Dartmoor (Devonshire). The mines of Dannemora (southern Sweden) and Gellivara (Swedish Lapland) are of great antiquity, the iron produced from the ore thence raised being of the finest quality (partly owing to the use of charcoal in smelting); the Indian mines have also been a source of wootz for some two thousand years at least, whilst the Traversclla deposits have been worked from time immemorial. Notable amounts of magnetic ore also occur in various parts of France, Germany, Spain, Portugal, North Africa, Greece, Australia, and Brazil; whilst in New Zealand (Taranaki), as also in the Bay of N aples, and especially along the

north-east coast of British America and Labrador, enormous quantities of “iron sand” occur along the beach, derived from the disintegration of rocks containing crystalline magnetic oxide of iron (usually more or less titaniferous); this variety of magnetic oxide is capable of resisting indefinitely the oxidizing effect of air and water, and from its hardness and density becomes mechanically separated. from the felspathic and silicious particles of matrix simultaneously formed during the erosion of the rocks ; owing to its great freedom from sulphur and phosphorus, it is practicable to obtain from it (by the aid of charcoal) the finest qualities of iron. It has been sup- posed by some that the presence of titanium in the ore communi- cates special qualities to the steel thence prepared; but evidence in proof of this is requisite, inasmuch as it seems that the titanium

present in the pig iron smelted from titaniferous ores, to the extent of some tenths per cent. or more, becomes eliminated during the transformation into malleable iron and steel just as silicon is similarly oxidized and removed. The following analyses illustrate the composition of various kinds of magnetic ore :— ,

Dabgiietie Titani- Lake

_ jiron Sand,| ferous New |Champlain

eee ae Moisie “| Iron Ore, | Jersey Gn Locality …. Sweden.|_ River, St Chug Mag- | Moriah,

Lawrence,| Valley, | netitc. | “No. 21” Canada. | Wyoming. Bed.

Carson. |Bertolet.] Chandlcr.

Analyst …...0cc0005

**Ferric oxide …... 45°03 63°18 **

Ferrous ,, 1796 | 26B25| 95°99 Manganese oxide 1:53 0°12 0°10 Alumina 3°98 3°28 2°00 1-11 0°38 0°52 1°56 a0 0°60 cies 0°76 6°68 0°64 osphoric é i anhydride [trace 0°054 0°10 Sulphuric do ove ooo Carbonic do. ..... nee "09 200 1-44 0°012 0°10 3°49 200 oan Chromium do. .... 2°45 500 500 ANC' GOs: sesecesscces 0°47 a8 aa

| | ef |

99°78 100°226 | 100-05 Totar metallic

fran 45°49 64:86 69°51

Spathose Iron Ores.—Ferrous carbonate, being isomorphous with magnesium, manganese, and calcium carbonates, frequently occurs crystallized either by itself as siderite or with large intermixture of one or the other of these salts; when manganese is present to any considerable extent, the ores are more especially suitable for the production of spiegeleisen and ferro-manganese, especially when they contain little or no phosphorus. In Great Britain the chief deposits are those of Weardale (Carboniferous Limestone), Alston Moor (Cumberland), Brendon hills (Somerset), and Exmoor (Devon- shire) ; these el) show passage of the mineral into brown hematite by oxidation through access of air and moisture. Large massive deposits are found in Germany (Stahlberg near Miisen, Westphalia), Styria (Eisenerz), Thuringia, and Carinthia, mostly in rocks of the Devonian period or thereabouts, and sometimes consti- tuting almost entire mountains ; also in the Basque provinces, the Pyrenees, South Spain, and Nova Scotia. These ores are as a rule extremely free from phosphorus and sulphur, whence they are largely employed for the manufacture of malleable iron, steel, and spiegeleiscn of high qualities; they are of notably less density than compact hematite or magnetite, usually possessing a specific gravity of near 3°8. The following analyses represent the com- position of certain kinds of spathosc ore :—

Brendon

Miisen, | Allevard Fictou

; Wear- | Hills, | Eisenerz ? | County, TOCALEY: ccccscccescses dale. | Sevier: Styria, ’ oe pone Novae setshire P ¢ * | Scotia. Analyst …..... ++..e04| Tookey.| Spiller. |Haidinger.| Peters.| Jordan. | Thorpe Ferric oxide …..... 0°81 081 aa 2°75 one “a CTROUS 55 scszees | 49°77 43°84 53°42 48°51 48°15 54:99 Manganese oxide…| 1°93 12°64 3°08 0-63 3:02 2°85 ATUMNG sc o5ss00s20205 =| eee 0°01 os 163 ose ae WUC oe cersscesescor=sea|| OD 0°28 ie 1:75 2°50 1:53 Magnesia …..... 2°83 3°63 5°00 2°29 0°57 0°55 Dll Geeeenceysrs-cseusse| O72 0:07 0:06 1:62 4°85 2°70 Phosphoric 5 4 : anhydride f ”””” traco see aa 0-54 nil ret Carbonic do. ..... 37-20 88°86 33°10 39°92 40°49 33°60 WWibC Ti ensssccceecesscces -| 0°30 018 wan 0-45 50 ae Zine oxide …....66 660 see ads 0-04 206 es DULPDUI. scesesaseaseae 0°04 ono AGE 0°22 0°16 noe Calcium sulphate… aie ane 3°48 99°96 | 100-32 99°66 | 100°55 99°73 99-70

Total metallic iron 38:95 |234°67 41°51 42°59 37°45 42°76

Clay Ironstone.—When ferrous carbonate occurs largely mixed with clayey matter, the crystalline structure is usually non-apparent; frequently so much calcium carbonate is also present as to make the ores useless for smelting purposes except when intermixed with others, the calcareous matter then serving as flux; nodules of this poor or “ lean” ironstone found in the London clay and elsewhere are, however, largely used in the manufacture of cements, and hence are often known as cement stones. The largest deposits of clay iron- stone are found in the Coal Measures, and often exhibit distinct stratification, fossils being not unfrequently met with, especially in the nodular varieties; blackband ores (layers of ironstone and clay alternating with coaly matter) are largely found in Staffordshire, Wales, and Scotland, and to some extent in the Rhenish and West-

phalian coalfields and in Ohio. When carbonaceous matier is not present in any considerable quantity, clay ironstone forms a dark biashcarey or greyish-yellow mass, sometimes forming layers of nodules, sometimes distinetly bedded deposits of large area, ¢.g., the Cleveland beds of North Yorkshire, the ores of Glamorganshire,

Shropshire, Derbyshire, France, Westphalia, and various parts of the United States, notably Alabama, Tennessee, Kentucky, Ohio, and Pennsylvania. Curiously, although an ordinary con- comitant of coalfields, clay ironstone is almost entirely absent from the Coal Measures of Durham and Northumberland. In many localities clay ironstone has become so changed by oxidizing and hydrating influences as to contain but little ferrous carbonate, the iron being converted into a hydrate, giving to the ore the character of a brown hematite ; this is specially noticeable in the Northamp- tonshire deposits, most of which are usually classed as brown hematite, although containing some amount of carbonate, whilst occasionally ferrous carbonate is found in them having undergone but little alteration, and forming a clay ironstone closely resembling that of Cleveland. As a rule Coal-Measure ironstones are somewhat highly phosphorized ; this is especially noticeable with the Cleve- land ore, which usually yields on smelting a pig iron containing between 1 and 2 parts of phosphorus per 100 of iron. The following table illustrates the composition of some of the more important clay ironstone deposits :—

Character of (| Average gene Cleyeland |Dowlais, ee Feegug Ore and Scotch biseeend: Ore, North South Black. , Locality…. ({Blackband. hire. Yorkshire.| Wales. Teel

ANA Bhisrescsscssacs Colquhoun; Dick. | Pattinson.| Riley. |Ratcliffe.

Ferric oxide Ferrous ,, Manganese oxide | AVUNIING) scccsececes ERTHC a scesee Magnesia . Silica…..... – Phosphoric anhydride f * Carbonic do. ..... SHIPRUL'.....:0s000s INGHECT cosestersaceone Organic matter… Potash and soda**

aeneee

100°51 | 100-28

31°42 34°72 36°40 41°89

Total al EVOM Gre eces-. |

Pyrites.—As already stated, pyrites is never used directly by the smelter as a source of iron; but the residue left after burning pyrites to make vitriol and extracting copper from the residue by Henderson's process consists almost entirely of ferric oxide, and from its physical characters is valuable as fettling for puddling furnaces ; so that the iron contained in the pyrites ultimately becomes largely reduced to the metallic state, either in the puddling furnace itself, or subsequently from the tap cinder produced therein on its being smelted in combination with other ores. The cupreous pyrites of Spain and Portugal (Huelva and Tharsis ores), and certain other analogous substances from other countries, containing but little silicious matter or other ingredients besides iron, sulphur, and copper, are in consequence largely used by vitriol makers. The fol- lowing tableillustrates the average composition of Huelva and Tharsis ores before burning and. subsequently, and also of the " purple ore" or " blue billy" left when the copper has been almost entirely extracted (together with quantities of silver and gold, relatively small, but absolutely sufficiently great to be a distinct source of profit) by conversion into chloride by heating in contact with air with sodium chloride and lixiviation of the product, the " purple ore" remaining undissolved :—

After pass-

Raw Ores. ing through aw Ores 'tie pytitas Dry Purple Ore. kilns. 5 Alder Alder J. A, PAMIOIVSbinc cesecscesss00- Clapham Wright. | Wright. Philips. Snelus. | j Average. | Average. ; 44°28 Age maa eae 49°07 3-0 0°36 0°32 2°75 30 0-20 0°30 0°38 af eae ae . i oles oe Sear adel ae Silica, quartz, and substances in- 3°40 2°34 3°0 2-11 4:02 soluble in acids…. : POrvielOXIGC sassces-0s: 90:0 96°00 94°51 Phosphorus…….....6 see ae absent absent Lime, soda, &c. ..... 1:18 10 0°50 0°10 100-00 | 100-00 | 1000 99°92 100-00

i

IRON

A valuable report on the character of various British iron ores ig to be found in the Journal of the Iron and Steel Institute, 1871, whilst

numerous analyses and descriptions of ores from almost all

arts of the world are given in the volumes published during the loss ten years or so.

6. Analysis of Iron Ores and of Metallic Iron and Steel. —tThe analysis of iron ores by the "dry method" (fusing with reducing agents, such as powdered charcoal, and suit- able fluxes, and weighing the button of cast iron produced) has the advantage of giving in a comparatively short time a notion both of the amount of iron contained in the ore and of the presence or absence of phosphorus, manganese, &c. (judged of by the physical characters of the button), but has little to recommend it on the score of minute accuracy. The results are usually in excess of the iron actually present by 31, to 73,5, on account of the button containing carbon, &c.; whilst it does not by any means necessarily follow that the reduction of a given ore on the small scale ina crucible and on the large scale in a furnace will produce a metal of the same characters in each case.

Accordingly the "wet method" of analysis (solution in

appropriate solvents and separation of the various constitu- ents from one another or other treatment equivalent there- to) is ordinarily preferred.

The ore, after being finely pulverized and sifted, &c., and repre- senting a fair average sample of the material operated on, is dissolved in hydrochloric acid (if this fails by itself to produce ready solu- tion, the ore may be heated to a low red heat in hydrogen so as to reduce to the metallic state, and then dissolved in hydrochloric acid) ; the ferric salt present is then reduced to the ferrous state by nascent hydrogen (evolved by adding fragments of pure zinc or other reduc- ing agents, sucli as sulphur dioxide), and the amount of iron con- tained in the fluid determined either by adding a standard solution of potassium permanganate to the diluted fluid until a pink tint just appears (Marguerite), or by adding standard potassium dichromate solution until a drop of fluid just ceases to form a blue precipitate or greenish colour with potassium ferricyanide (Penny) ; the oxygen communicated

by the test fluid being known from the volume of liquid consumed, the amount of iron peroxidized is known. When the ores contain iron in both the ferrous and ferric states, and the amount of each is required to be determined, the ore is boiled with hydrochloric acid, and the ferrous salt determined in one part of the solution, and the total iron in another portion. If the iron exist wholly or partially as carbonate, the amount of carbon dioxide may be determined by treating the finely pulverized ore with sulphuric acid in a suitably constructed apparatus, and weighing the appar- atus after the (completcly dried) gas hasbeen wholly removed, or by absorbing the evolved gas in ammonia, boiling with calcium chloride, and weighing the precipitated calcium carbonate, a correction being made by means of a blank experiment for any ammonium carbonate originally present in the ammonia solution, or formed by absorption of carbonic acid from the air during the operation. Janganese is conveniently determined by dissolving the ore, peroxidizing if necessary, rendering nearly neutral, and boiling with sodium or ammonium acetate, whereby all iron and alumina present are thrown down as basic acetates, carrying with them all the phosphoric acid which is in solution; to this filtrate bromine is added (or it is saturated with chlorine), and the whole allowed to stand in not: too cold a place for some hours, when the manganese is precip as a hydrated dioxide, or oxide approaching in composition thereto, which is collected, washed, ignited, and weighed as Mn,O, ; when more than a trace of manganese is present it may be determined volumetrically by several methods, ¢.g., Pattinson's, consisting of addition of ferric chloride if the iron present is not already present in larger quantity than the manganese, of bromine water or calcium hypochlorite, and finally of freshly precipitated calcium carbonate, the liquid being at a temperature of 60°- 70° C. ; the precipitate thrown down contains all the manganese as MnQ, (Pattinson, Chem. Soe, Journal, 1879 [Transactions], p. 865), which may be estimated by dissolving with dilute sulphuric acid and a known amount of stand- ard ferrous sulphate solution, and determining the iron which remains unoxidized by the MnO,. Kessler (Zeitseh. Anal. Chemie, 1879, 18, part i.) employs an analogous method for manganese determination, adding zinc chloride and bromine, boiling for a long time to ensure that all the manganese is precipitated as MnO,, and finally dissolving in solution of

antimonious chloride in hydrochloric acid, and titrating the non-perchlorinated antimony by perman- ganate. Alder Wright and Menke (Chem. Soe. Journal, 1880 [Transactions], p. 22) find that Pattinson's process gives more satis- factory results if zinc is present as well as iron in the precipitation of the manganese as MnO,, the formation of oxides of manganese lower than MnO, and of permanganate (which may sometimcs otherwise

1k N

occur and cause error) being thus avoided; whilst they also find that a modification of a method originally due to Guyard (precipita- tion of manganese as MnO, by the addition of permanganate) will

ive good results provided that a zine salt be added to ensure the Teeion of MnO, only, and that the amount of free acid be not too great. When it is required to determine the alumina dissolved by the acid employed to act on the original ore, the phosphoric acid in the total precipitate thrown down by the acetate treatment for the estima- tion of manganese gravimetrically may be determined ; subtracting this and the Fe,0, from the weight of the precipitate, the Al,0, is approximately known ; or the alumina may be separated by other precesses, ¢.g., use of caustic soda, &c. Sulphuric acid, if present in the ore, is precipitated as barium sulphate from the hydrochloric acid solution of the ore ; sulphur in tho form of pyritcs is deter- mined by fusing the ore with sodium carbonate and nitrate in a gold crucible, and determining the total sulphate formed, the sul- phate existing as such in the ore being subtracted. Phosphorus may be determined by dissolving the ore in aqua regia (usually the phosphorus exists as phosphate, and is wholly dissolved by hydrochloric acid), precipitating the phosphoric acid (best after separation of dissolved silica by evaporation to dryness and re-solu- tion in dilute acid) in combination with part of the iron, by reduc-ing most but not all the iron to the ferrous state, and then precipitating the ferric iron and phosphoric acid by boiling with an acetate ; the precipitate is finally converted into magnesium pyrophosphate by solution in hydrochloric acid, addition of citric acid (less conveniently tartaric acid), ammonia, and magnesia liquor, and ignition of the

precipitate collected after standing twenty-four hours ; Eggertz's method of determining phosphoric acid is, however, more suitable for the estimation of minute quantities, this depending on the precipitation by molybdicacid ofa peculiar yellow crystalline phosphomolybdate of ammonium on bringing together the phosphoric acid solution (from which dissolved silica has been removed by evaporation to dryness) and excess of molybdate of ammonium solu- tion supersaturated with nitric acid. Calciwm and magnesium are conveniently determined in the filtrate from the basic acetate and phosphate of iron and alumina thrown down in the separation of manganese gravimetrically, the filtrate from the precipitated man- ganese dioxide being employed, the calcium being first precipitated as oxalate, and then the magnesium as ammonio-phosphate ; or the ferric oxide and alumina may be thrown down by ammonia free from carbonate, and the filtrate employed. ygroscopic water and ordi- nary moisture are determined by drying at 100°, and noting the loss of weight ; whilst combined water is subsequently determined by heating to redness in a tube through which dry air is aspirated, the issuing gases passing through a drying tube to absorb the water evolved ; if nothing but water is lost on ignition, the weight so lost may be directly determined without collecting the water. Titanic oxide, chrome ironstone, complex silicates, &c., are often contained in the substance left undissolved by acid ; for the modes of determination and analysis of these, and for the precautions in the determination of the soluble constituents should titanium be present and partly dissolved by the acid, &c., the reader is referred to larger treatises, in which also are to be found numerous methods of analysis other than those briefly indicated above.

The analysis of iron and steel is carried out on much the same lines as that of iron ores. The metal being dissolved in nitric acid or a regia, phosphoric acid is separated as above described, usually by Eggertz's process, the acid solution being previously evaporated to dryness and treated with dilute hydrochloric acid, which leaves behind silica formed from the silicon present, graphite, and slag; after ignition to burn off graphite, the silica is dissolved out by sodium carbonate solution and the residual slag weighed ; in this way, however, more silica is generally obtained than repre- sents the silicon originally present, as the silicates

of the slag are apt to be more or less attacked by the acid; a better method for the determination of the slag is to dissolve the iron in bromine or iodine water, or by means of copper chloride (or mixed copper sul- phate and ammonium chloride solution), which gives rise to cuprous chloride, dissolved out by heating; the slag is thus left undissolved, and may be weighed after boiling with sodium carbonate; the silica in the united sodium carbonate and bromine solutions being deter- mined, the silicon is readily calculable. Afangancse is determined just as in the case of ores. Sulphur is conveniently determined by treating with hydrochloric acid, and leading the evolved gases through a solution of lead or silver or some analogous metal, and finally converting the precipitated sulphide into bariuin sulphate ; or by dissolving in aqua regia, evaporating, and converting the sulphuric acid found into barium sulphate : this method usually gives lower values than the others, barium sulphate not precipi- tating readily from very dilute highly acid solutions. The s0- called “combined” carbon is found by determining the graphite left undissolved during the treatment of the metal with hydro- chloric acid (by collection and burning to CO, in oxygen, and absorption in caustic potash), and subtracting the amount from the total carbon found by digesting with copper sulphate or chloride, or with bromine water, collection of the undissolved mass on an

asbestos filter, and burning in oxygen, preferably with lead chromate in the front of the tube, to prevent chlorine or bromine vapours, &c., passing over, should the precipitate contain (through insuflicient washing, &c.) substances which may evolve chlorine or bromine. Copper sulphate leaves behind an amount of copper equivalent to the iron dissolved ; this covers up the finely divided particles of carbon, and diminishes the chance of pyrophoric oxidation and con- sequent loss of carbon during drying, which may otherwise occa- sionally take place, especially when the filter is dried by the aid of heat ; but the solution of the iron is less rapid, and it is difficult to see or fee] with a glass rod when all the iron is dissolved. Weyl dissolves the iron by making it the positive pole of a weak galvanic current passing through

hydrochlorie acid. Fresenius determines the “combined” carbon directly by dissolving in hydrochloric acid, passing the evolved hydrogen and carburetted hydrogen over red-hot copper oxide, and determining the carbon dioxide formed by absorption in potash as usual; if much sulphur is present, lead chromate should be employed to avoid crrors due to formation of sulphur dioxide ; if the amount of “combined” carbon is large, liquid non-volatile hydrocarbons are apt to be formed, which causes the method to yield too low a result. Ullgren determines the total carbon by oxidation to CO, in the wet way with chromic and sul- phuric acids of the residue eft after treatment with copper chloride or bromine ; the results are apt to be too low, owing to incomplete oxidation of the graphite. Regnault determines the total carbon by heating the finely powdered metal with copper oxide or lead chromate, and absorbing the CO, produced by potash ; by passing air over tho finely divided inetal at a low red heat, and when the oxidation is nearly complete finishing the operation in oxygen at a somewhat higher temperature, the use of copper oxide or lead chromate is rendered unnecessary ; if too high a temperature and oxygen be employed at first, there is risk of forming fusible Fe,0, and of enclosing portions of carbonized unoxidized metal within a coating of that substance, which more or less protects it from the action of the oxygen, and tends to decrease the amount of CO, collected. Eggertz determines the “combined” carbon in steel by solution of a known amount of borings or filings in a known amount of nitric acid, and comparison of the fluid as regards its colour with a simi- lar solution prepared from steel of x known carbon percentage, or with a series of solutions of caramel made s0 as to exhibit the same tints as those yielded by steels of known carbon percentage when treated in this way. The principle of the method depends on the formation of soluble humus-like carbon compounds by the action of the nitric acid, probably analogous to the vegetable colouring matter of peaty water. Opinions differ widely amongst chemists as to tho absolute accuracy of the method for general analytical operations, especially where nothing is known of the precise details of the mode of manufacture of the stecl; but for a works laboratory, where speed is essential, and where it is only required to compare one specimen of steel with another one prepared in the same way but harder (the hardest steels being taken for the preparation of

the standards, and the solutions representing the lower carbon percentages being obtained by diluting the fluid proportionately), the mcthod is invaluable. For the sake of saving time under analogous circum- stances, Eggertz somewhat modifies the above-described methods for the determination of sulphur and phosphorus, the amount of sulphur present being estimated by noting the discoloration produced on a plate of silver exposed to the gases evolved on solution in hydro- chloric acid, or digestion with sulphuric acid, and comparing it with that produced under the same conditions from a metal of a known degree of sulphurization, and the amount of phosphorus being esti- mated by transferring the phospho-molybdic precipitate into a narrow measuring tube, and observing the volume occupied byit com- paratively with that occupied by the precipitate similarly produced from metal containing a known amount of phosphorus. Sir J. Alleyne has described a method of determining approximately tho quantity of phosphorus present in iron and steel by means of tho spectroscope (Journal J. and S. Inst., 1875, 62). Nétrogen is deter- mined by solution in hydrochloric acid free from ammonia, and titration by Nessler's test of the ammonia formed (A. H. Allen, Chemical News, xli. 231, 1880). The less commonly occurring substances, copper, chromium, arsenic, cobalt, nickel, zinc, alumi- nium, vanadium, titanium, tungsten, molybdenum, &c., are sought for and separated by special methods for which the larger text-books must be consulted.!

III. Extraction oF Iron FRoM ITS ORES.

7. History of the Manufacture of Iron and Steel,—Neither the period when malleable iron was first prepared from its ores nor the precise mode of manipulation then adopted is known with certainty, although the remains of iron

1 Parry and Tucker have employed the spectroscope successfully in this direction, see Journal I. and 8, Inst., 1880, 163. Rill. — 3;

implements manufactured in prehistoric times are so numerous as to leave no room for doubt as to the extreme antiquity of the use of that

metal instead of the yet earlier stone implements of primeval man. There is every reason to believe that the earliest methods of iron smelting essentially consisted in placing lumps of ore in a fire of wood or char- coal, and, after the lapse of a sufficient length of time to permit of their more or less complete reduction, hammer- ing the mass of spongy metal thus formed; so that what is known as the "Catalan forge" of modern times is but a comparatively slight modification of and improvement upon the oldest metallurgical appliances for the extraction of iron, the main difference being in the size of the apparatus and the use of an artificial air blast, Tradition assigns a very remote period to the first discovery of the possibility of extracting iron or crude steel from its ores, Tubal Cain (who has been compared with Vulcan) being the first name mentioned in connexion with the metallurgy of this substance. In the time of the Assyrians iron appears to have been in somewhat extensive use, saws, knives, and other analogous tools having been found by Layard at Nineveh, many of which are very siniilar to those in use at the present day. Both Homer and Hesiod refer to the forging of iron, whilst the hardening and tempering of steel also appear to have been operations in common use amongst the early Greeks; indeed the employment of a rough kind of bellows for the forging of tools (probably of iron) is figured in Egyptian sculpture of 1500 years and upwards B.¢.,—the inflation being accomplished by the aid of cords worked by the hand, whilst the pressure of the foot caused the expulsion of the air thus drawn in, much in the same way as is still practised by some almost savage Eastern nations, ¢.g., the Burmese. In the time of Pliny (about 50 a.p.) the existence of large masses of iron ore in Spain, Elba, Styria, and elsewhere was well known, these minerals being described by him as largely employed in the manufacture of iron and steel; whilst evidently the conditions requisite to produce the best temper of the latter had been carefully examined at that epoch, as he states that the quality of the steel depends on the nature of the water used to harden it, and that oil is preferable for small articles. Prior to this the discovery of cast iron or cast steel appears to have been made, for Aristotle (about 350 B.C.) describes the preparation of the fused or fritted steely iron still prepared in India and known as wootz, whilst Galen refers to cutting knives made of this steel, and mentions that they are apt to be brittle

through excessive hardness, Through the agency of the Romans the manu- facture of iron was introduced almost all over the then known world, and into those regions where it had not been previously practised ; this, however, does not appear to have béen the case with Britain, as the use of iron was probably known there before the Roman invasion; the knowledge, however, may very possibly have been originally derived from the Romans through the Gauls,

The earliest kind of iron forge or bloomery was probably simply an oxcavation on the windward side of a hill; the application of an artificial stream of air doubtless soon followed, the blast being either produced by the alternate dilatation and compression of a bladder or goat skins, &c. (as still practised in India and elsewhere), or by means of a fan propelling air through a hollow tube, the fan developing into a kind of loosely fitting piston as still employed in Orissa, Borneo, Madagascar, and elsewhere; so that the modern bellows and cylinder blowing machine are merely advanced and improved forms of these crude contrivances. The construction of a clay chamber to contain the fuel and ore, with the employment of a tuyere at the base, so as to be independent of the direction of the wind and of the nature of the ground, was doubtless an early improvement, and probably was the kind of forge used by the Romans, as it still is substantially that used by various Eastern races.1 The use of valved single bellows is attributed to the

1 For a description of the different kinds of rude furnace in use in Borneo and other Eastern districts, see Percy's Metallurgy.

Romans in the 4th century by Franquoy ; when these developed into double-acting bellows is uncertain, although it is known that such blowing machines were in use in the Harz and elsewhere about the beginning of the 17th century. The date of the invention of the trompe (or air blast, due to the fall of water and the carrying down of air with it) isalso uncertain, but was probably a little later, near 1640 (Frangois) ; its use was probably almost confined to the Pyrenees and similar districts where the requisite fall of water was readily obtainable from

natural rivulets and torrents, Cylinder blowing machines were introduced at the Carron iron-works about 1760, water-power being usually employed when practicable at that period ; some twenty or thirty years later, when the steam engine came into use, a great impetus was thereby given to the iron industry, as to most other trades, owing to the increased facilities in all directions given by the increased command of power thus obtained. The precise date of the introduction of cast iron ig unknown ; probably it was an accidentally formed product in the first instance, due to the employment of larger furnaces and increased blowing power ; in the 14th and 15th centuries it appears to havo been known, castings of this period made in Sussex (especially of the later date) being said to be still extant, whilst in the 16th century cannon of some 8 tons weight each were cast by Johnson. About the end of the century the iron-works of Sussex and neighbouring counties had attained to such dimensions that their consumption of timber for fuel became a serious matter, so that an Act was passed in Elizabeth's reign prohibiting their further extension. Probably this restriction was the cause of attempts being made to utilize coal as fuelin iron smelting, a patent for this purpose being granted in 1611 to Simon Sturtevant, who, however, does not seem to have been successful. Somewhat later Dud Dudley succeeded in producing both cast iron and malleable iron by the aid of coke, but met with so much opposition from the charcoal smelters that he abandoned the process ; a similar result befell Strada in Hainault about the same time; a century later, however, about 1735, Abraham Darby of Colebrookdale reintroduced coke as fuel with complete success. About 1766-1784 great improvements in the mode of working malleable iron and of transforming cast iron into wrought iron werc introduced, partly by Thomas Cranage of Cole- brookdale, and Peter Onions, but more particularly by Henry Cort, who patented the use of grooved rolls so as to supersede hammerin in 1783, and of the puddling forge in 1784, Since the invention o puddling, and its improvement by Rogers by the introduction of iron instead of sand bottoms, the main improvements in the iron manufacture are the use of the hot blast instead of cold air, due to Neilson, and patented in 1828 ; the employment of the waste gases from blast furnaces for raising steam, &c. (and subsequently for superheating the blast), first patented by Aubertot in France in 1811, and subsequently largely employed in

most iron-producing districts, Scotland and Staffordshire excepted ; the invention of the steam! hammer by Nasmyth, patented in 1842; and the introduction of the Bessemer-Mushct process for steel making (1856) by blowing air through molten cast iron so as to burn out the carbon, and then adding spiegeleisen so as to produce a metal of any required degree of carbonization. In every department of the iron industry, how- ever, Numerous improvements have been made, amongst which must be specially mentioned the Siemens regenerative furnace and gas producer, and the improved processes for making steel thence resulting ; the use of machinery in lieu of hand labour for puddling, introduced at first unsuccessfully by Tooth and Menelaus, and several others, but brought to a considerable degree of practical suc- cess by Danks, Crampton, and others; the casting of steel under great pressure, due to Sir Joseph Whitworth ; the application of waste gases and the Siemens regenerative principle to the super- heating of tho blast by the Cowper-Siemens and Whitwell stoves ; and the recently introduced improvements in Bessemcrizing due to Snelus and to Thomas and Gilchrist, whereby even highly phos- phorized pig is rendered capable of furnishing a fairly good quality of steel.?

8. General Classification of Methods employed for the Extraction of Iron from its Ores.—The various modern developments of the earliest methods of iron extraction, consisting of the heating of iron ores with fuel until more or less complete reduction was brought about, and hammer- ing the mass, may be conveniently divided into four classes, viz.:—(1) those in which cast iron is produced by a smelting process (S§ 9-21), and subsequently transformed into steel or wrought iron by decarbonizing the resulting pig iron (S§ 22-28) ; (2) those in which malleable iron or steel is obtained direct from the ore at one operation without

? A lengthy series of papers on the “ History of Modern Invention in the Manufacture of Iron” has appeared in Jron, 1876 and follow- ing years, from which much detailed information on the subject may be obtained.

passing through the stage of cast iron (§§ 29-31); (3) those in which steel is formed from wrought iron by directly carbonizing, it (§§ 32-35) ; and (4) those in which steel is finally prepared by intermixture of carbonized and wrought iron in the fluid state (§§ 36-41). The methods of class 1 include the preparation of pig iron; its purification by refining, and conversion into wrought iron by fining and puddling (both by hand and by machinery) and by inverse cementation (heating in contact with iron oxide) ; and the preparation of puddled steel and pneumatic steel and iron, a.é., steel prepared by Bessemer's original process, viz., decarbonization more or less complete by blowing air through molten pig iron, and also of Heaton's steel (pig iron decarbonized by nitrate of sodium), &c. Class 2 includes the Catalan forge and allied processes, and the "direct " methods of Clay, Chenot, Yates, Blair, Snelus, Du Puy, Siemens, aud others. The processes: ineluded in class 3 are those of steel manufacture by cementation and partial acieration by case hardening, together with various other allied methods of producing steel from soft iron; whilst class 4 includes the Bessemer-Mushet steel process, in which blown Bessemer metal is made into what is usually known as "Bessemer steel" by incorporating with it spiegeleisen ; and the allied open hearth steel processes, in which wrought and cast iron are melted up together, or iron is decarbonized in a Siemens hearth and then mixed with ferro-manganese, &c. ; together with various modifica- tions of these processes, such as the Snelus-Thomas-Gilchrist method of blowing phosphorized pig, the Uchatius process, the Ponsard process, &ec.

IV. MANUFACTURE oF Cast JRon.—IRoN SMELTING.

9. Preliminary Treatment of Ores.—Many kinds of ore are unsuitable for use in the blast furnace without some preliminary treatment,—consisting either of washing with water and dressing in the ordinary way adopted with heavy minerals to wash out clay, &c.; weathering by exposure to air and moisture for considerable periods of time so as to oxidize pyrites, &c., and wash out the soluble matters formed ; roasting, so as to expel carbon dioxide and water and burn off organic matter, peroxidizing the iron in so doing ; or a combination of some or all of these processes. Even with such ores as magnetic ironstone

calcination is usually found to increase the ease with which the ores are subsequently smelted, the lumps being rendered somewhat porous, and hence more readily acted upon; indeed, with compact Swedish magnetites previous calcination is indis- pensable, otherwise great waste of fuel is occasioned. In the case of franklinite, 2 mangano-zinciferous magnetite, the mineral is first roasted with lime and anthracite so as to distil off the zinc, and the residue then smelted for Spiegeleisen. Certain Westphalian and other ores are deprived of sulphur existing as pyrites by roasting in a kiln, into which superheated steam is admitted at intervals, whereby sulphuretted hydrogen is first formed and subse- quently burnt to sulphur dioxide, whilst the iron of the pyrites is converted into oxide; by using a mixture of highly carbonaceous blackband and other ores, the roasting is effected without the use of any fuel other than that con- tained in the blackband. Where fuel is not an object, calcination of iron stone is frequently effected in heaps analogous to those produced in the burning of "ballast " (clayey soit) for foundations of houses, roads, &c.; a fire of slack being made, shovelfuls of ironstone are thrown on to it, and then more slack and more ironstone alternately, until a sufficiently large heap is prepared; or the heap is first built up and subsequently fired, the spots where the fire comes visibly out of the heap being, when requisite, dampered over with moist small ore so as to prevent too

rapid combustion, which might otherwise cause the ore to frit. Blackband usually requires only lighting with a little coal, &c., when properly heaped, furnishing its own fuel. When economy in fuel is desirable, a calcining kiln is employed, generally resembling a lime kiln in construction. Fig. 1 repre- sents a kind of kiln (Gjers's) used extensively in the Cleveland district; it is usually built of firebrick cased with iron plates, circular in section, wider in the middle than at top, and tapering down- wards from the middle slightly more rapidly than upwards. An iron double cone AA sgur- mounts an orifice in the base connected with radiating flues B, B, whereby airisintroduced into the interior. The whole superstructure rests on an annular cast iron entablature CO, supported on stout iron pillars D, D; the cal-

cined ore is raked out === between these pillars, K

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BSE SPP SPs FR eee re Bee PE A ee

eucesoe™

PDD POCO A VOLTA 4 Ue te

Fig. 2.—Westmann's Kiln.

upwards of 5000 cubic feet ; but considerably larger kilns are cften used ; the consumption of slack is from 4 to 5 per cent. of the ore (Cleveland ironstone) calcined. Siemens has patented a somewhat analogous calcining furnace, combustible gas and air being led into the centre and distributed by a cone; Rachette's calciner 1s oval,

with three firing grates, two on one side and one on the other. The magnetic ores and quartzose hematites of Sweden, Russia, America, and elsewhere are often calcined in Westmann's kiln (fig. 2). This is a nearly tubular vertical kiln slightly diminishing in diameter upwards, and fed at the base with waste gases from the blast furnace, together with air for their combustion ; the ore is thus rendered somewhat less dense than at first, whilst pyrites, when present, is decomposed ; analogous arrangements are employed in many Continental iron-works. Many attempts have been made to smelt clay ironstoné without previous calcination, but as a general rule but little saving appears to be effected, if indeed any at all is brought about ; the value of the small coal and slack saved in the roasting barely, if at all, compensates for various practical disadvan- tages attending the use of raw ore as compared with calcined ores. Much the same remarks apply to brown ores, especially when earthy. Several methods have been proposed to remove phosphorus com- pounds from ores containing that constituent

before smelting them, so as to produce a purer metal; the success of these as manufacturing operations, however, has been mostly indifferent, the cost and labour involved not being adequately repaid by the results. Amongst these processes may be noticed those of Jacobi and Velge; the former places the broken-up ores in tanks, and lixiviates them with aqueous solution of sulphurous acid obtained by burning pyrites ; in this way phosphates are dissolved out, from which manures may be made ; the latter impregnates the ores (previously calcined) with brine, and after drying calcines again, subsequently washing out the phosphate of sodium produced by water, or preferably water containing a little hydrochloric acid. Jacobi's side has been tried on a considerable scale, and apparently could be worked com- mercially were it not that, to extract the phosphates thoroughly, the ore requires crushing to coarse powder, or at least to lumps so small as very materially to interfere with its employment in the blast furnace; moreover, whilst calcium phosphate is readily soluble in solution of sulphurous acid, ferrous phosphate is not soluble in that menstruum, and hence is not removed from ores containing phos- phorus in this form.

The ores being ready for smelting, the next stage in their treat- ment consists in subjecting them to the reducing action of carbon oxide (and also of aber, at a temperature gradually increasing as the reduction goes on, until finally the reduced metal melts; in order to promote the separation of the earthy impurities of the ore from the metal, and to facilitate their fusion, it is requisite either to mix various classes of ores together in such a fashion that the silicious admixtures of the one and the calcareous and aluminous impurities of the others may jointly be in suitable proportions relatively to one another ; or, which is usually more convenient, to add calcareous or other matters (in the form of limestone, ferruginous clay, aluminous poor iron ores, &c.) to serve as a flux. To carry out this operation the blast furnace is employed, the ore, flux, and fuel being charged in at the top of the erection, and air being blown in at the base, so that a mixture of carbon oxide and nitrogen is formed at the lower levels, which, passing upwards, effects the deoxidation of the ore ; the heat prorlneed at the base fuses the reduced iron and the earthy matters, &c., which accumu- late in two layers (the

former being the heavier), and are drawn off from time to time, the one as cast or pig iron, into moulds for

the market, the other as cinder or slag, usually of little or no-

value. Fresh materials are added at the top, so that the furnace works continuously.

10. Fuel.—The fuel employed in iron smelting by means of the blast furnace is substantially always one of three kinds, viz., raw coal (anthracitic, or more or less bitu- minous), coke, or charcoal ;} inasmuch, however, as raw coal inserted into the mouth of a blast furnace speedily becomes coked, the combustible matter reaching the tuyere level is invariably carbon in a greater or less state of purity. The effect of using raw coal instead of coke in the first instance is chiefly marked as regards the alteration thereby produced in the character of the gases in the upper part of the furnace, and the consequent alteration in the chemical changes taking place, chiefly owing to the presence of hydrogen and hydrocarbons in much larger proportion, For numerous other operations in connexion with the metal- lurgy of iron, other kinds of fuel are often employed, lignites, turf, wood, &c. The following analyses will give

ae ee

1 Peat has been used successfully as fuel in some Austrian furnaces, especially in the Vordernberg district, in open-topped furnaces about 80 feet high. The peat was made into compressed balls and dried in the air; these descended to the tuyere without losing their shape, but of course wholly carbonized. The iron produced was white, but of as good quality as that obtained with charcoal. lLignites and brown coal have similarly been employed in districts where better coals are scarce.

an idea of the general character of the fuels usually employed. In the north of England a very hard variety of coke, often known as “Durham coke,” is made specially for iron smelters; during the production of

this, on an average about one half of the sulphur originally present in the raw coal is expelled, the yield of coke being about two-thirds of the coal employed. ;

Alais,

Franee, Anthra-

Lanea-

Coal and< – cite shire Locality …. Ga Swansea.| Coals3 Admiralty

Regnault., Regnault. Reports.

89°27. 92°56 17°53

Re cossceee 4857 3°33 5°32

ite Mecccee 9°53

Gen eee. 1) wal “ : 447 2°53 1°30 . . 1°44

Sneoroccennioncce” 1-41 158 4°88 q 10000 | 100-00 | 100-00

Sulphur in ash….

1“ Busty” and ‘* Brockwell” seams, largely used for making blast furnace coke. 2 Yields a good blast furnace coke. 3 Average of 28 samples of various kinds.

Highly Burnt Black Alder Char- coal.@

Character of

Fuel and Oak

Wood.}

Loeality…..

Lowthian Bell.

1 Exclusive of 2°04 per cent. of ash.

2 Heated to an intense white heat to expel as much yolatile matters as possible; similar charcoal prepared at somewhat lower temperatures retained 10 to 15 per eent, of oxygen and hydrogen jointly.

3 Average coke from " Busty " and "' Brockwell" seams of coal, specially pre- pared for blast furnaces.

It is somewhat difficult to fix on an average value for the heat of combustion of coal, great variations being observ- able with different classes. The following values of Scheurer Kestner and Meunier (Annales de Chim. et Phys. [4], 21, 436, and 26, 80) are calculated after allowing for ash, and on the supposition that the carbon dioxide and water

produced were formed at the ordinary temperature, near 20°:—

Pereentage Composition. Character of Coal. Nitrogen,

28°84 23°99

4:97 711

8°26 3°98 11°58 18°45 6°72

Lignites from Basses-Alpes…

Non-caking coal, Creusot Caking do. do.

: Blanzy Anthracite } Grameen Saarbriick coals

Ronchamp coal, averago…....

Hence average true coal may be taken to have a heat of combustion of 9000 when ash free ; assuming it to con- tain 5 per cent. of ash, 8550 will be the heat produced. If aqueous vapour at 20° were formed

instead of liquid Water, assuming average coal to yield 40 per cent. of aqueous vapour on complete combustion, 0°4 × 593 = 237 heat units less would be evolvéd, 593 being the latent heat of water at 20° (Regnault) ; so that 8300 may be taken as an approximation to the heat of combustion of ordinary

IRON

coal burnt to carbon dioxide and water vapour at 20°. The heat of combustion of coke and charcoal is somewhat less than this: 1 part by weight of carbon gives out about 8000 units of heat, so that, if the coke contained 7‘5 per cent. of ash and no appreciable amount of hydrogen, the heat of combustion (burnt to carbon dioxide) would be about 7400 (see § 20).

For certain purposes, and more especially for use in the blast:

furnace, the physical properties of the coke used are important ; when caking coal is coked in furnaces so constructed as to permit of the collection of the products of the decomposition of the coal by heat, a larger yield of coke is obtained than is got when the coking is effected at a higher temperature brought about by the combustion of the volatile matters as fast as they are generated ; but the softer coke obtained in the former way is less suited for smelting iron in the blast furnace than the harder variety obtained by the latter pro- cess ; where lofty furnaces are in use, a hard coke that will stand the crushing action of the weight of the superincumbent materials answers better than a softer coke which is disintegrated by the pressure. Moreover, the hard compact form is less readily acted upon by carbon dioxide so as to produce carbon oxide (the carbon of the coke being gasefied) than is the case with the softer form of coke; accordingly it results that when soft coke is employed in the blast furnace a larger amount of it is requisite per given weight of iron made than would be required were hard coke used instead ; so that the greater yield of soft coke from the coal used in the first instance is counterbalanced, and even more than counterbalanced, by the increased quantity required to do the work of the furnace. Crampton’s Furnaces.—¥or various purposes for which fuel is employed, whether for raising steam or producing a more or less

oxidizing or reducing flame (e.g., in puddling), a form of flame-producer is available obtained by blowing into the furnace a jet of air carrying with it finely ground coal; for this purpose Crampton employs a mill like an ordinary flour mill with Derbyshire grit stones. The ground coal is placed in a hopper A (fig. 3) con-

Fic. 3.—Crampton's Mill.

taining a sieve B, two agitators C and D stirring up the fine coal under the sieve, and urging it outwards through an opening E, the size of which is controlled by a sliding door F ; from this opening it passes between rollers H and IJ, the distance between which can be regulated by a screw L acting on a lever MN, which adjusts the position of the bearings of the upper and smaller roller ; in this way the feed is perfectly under sombrel : the agitators cannot force out the coal- dust from the hopper at a greater speed than that regulated by the rollers. The stream of issuing coal-dust falls down a shoot K, a scraper O being provided to prevent adherence to the rollers ; at the bottom of the shoot it is blown away continuously by an air blast, the shoot delivering the dust into the blast pipe continuously ; the blast remaining the same, the amount of fuel is regulated by the screw and levers ; or, the coal-dust supply being constant, the air blast. can be varied. The flame thus produced on kindling the jet of air and coal (suitably proportioned to one another) is smoke- less, and perfect combustion is effected with an intensely high tem- perature ; for puddling and reheating furnaces, for heat-generating purposes generally, and for steam raising, the arrangement answers ieee (Journ. I. and S. Inst., 1873, 91, and 1874, 384; sce

Besides coal, coke, and charcoal, various other forms of com- bustible matter are used as sources of heat in certain of the opera- tions involved in the extraction of iron from its ores. Among these may be mentioned the following.

Coal Tar.—At the Wyandotte Rolling Mills, Michigan, coal tar has been employed as fuel, being injected into the puddling furnace to be heated

by means of a jet of superheated steam, which carries with it a certain amount of atmospheric air, the principle being much the same as that of firing tar-stills with waste naphtha. The steam at a pressure of four atmospheres (60 fb per inch) is super- heated by forcing through a coil in the exit flue of the furnace whereby it is raised to a red heat, and issues from a #5 or #5 inch nozzle into an opening at the level of what would be the bridge were the ordinary firehole employed, the tar dripping down into the opening, and the air drawn in thereat being impelled onwards by the jet so as to fill the whole furnace with flame.

Petrolewm.—Raw petroleum and the lighter benzoline obtained as a bye product in the manufacture of illuminating and lubricat- ing oils have been used in America as fuel applied in much the same way as the above-described. Experiments at Pittsbur indicated that for puddling and steel melting furnaces this fuel answered well, a consumption of a gallon of benzoline used in this way producing the heating effect of several times its weight of coal burnt in the ordinary fire-place.

Crude petroleum contains, according to Plagge,

OOP DO, vcecesecsiscscsvsscsvesdevecsenentaseesagseas OLOO Per Cents BEV ARO Ol sos cane ses sn ssn osressarsenacssneasass' © 13°7 * DY PGi cewrcciessnlaviowwyesseteteaanserisanasmaiis ayass! 2°25 7

Hence its calculated heat of combustion is about 11,300 per unit weight of substance burnt (z.¢., 1 part by weight, on combustion to carbon dioxide and water, will give out heat enough to raise the temperature of 11,300 parts of water 1° C.), or considerably in excess of that of charcoal and coke ; if burnt to carbon dioxido and steam, the heat evolved by petroleum will be some 6 per cent. less, or 10,600, that of coal being 8300 on an average, as stated above. At the Eames Iron-Works, Titusville, Pennsylvania, petroleum is allowed to trickle over a series of shelves in a cham- ber through which highly superheated steam passes; the current of combustiblo vapour produced is used for reheating and puddling furnaces, with the result of ne ge thirty barrels of petroleum daily for an output of iron that would otherwise require 40 tons of coal.

Natural Gas.—In Pennsylvania the gas evolved from petroleum wells and springs into a subterranean stratum (some 1600 feet below the surface) is largely utilized as fuel. One of the largest of these, the Delamater Well, some 30 miles from Pittsburg, was described in 1877 by Professor Laurence Smith as having at first yielded considerable amounts of petroleum, but then giving off nothing but gas coming up with a velocity of 1700 feet per second at the rate of about a million cubic feet per hour, or upwards of 1400 tons daily. In a 53 pipe at the well the pressure was 100 tb per squaro inch, so that large engines were worked by the gas current pressure alone. The illuminating power was about 7% candles, or less than half that of good coal gas; the calorific effect was considerably superior to that of the most bituminous coal (weight for weight) on account of the much larger percentage of hydrogen (free and combined). Puddling and reheating furnaces fired with this fuel fed in through pipes in the rear of the fire bridge answer well, but emit some smoke ; when it is used with a more plentiful supply of air under steam boilers, no smoke at all is produced. The composition of the gas from some of these wells is indicated by the following analyses by Sadtler :—

Burns, Leehburg,

Butler Co.

Harvey, |Cherrytree,

Westmore-| putler Co. \Indiana Co. land Co.

4°39 0°56 89°65 4°79 0°26 0°35

18°12 572 | 6°80 60°27 29°50

80°12 13°50

75°44 6°10 trace sare 0°34 22) ms 7°39 0°83

Carbon dioxide… 0°66

INIGFORE, «3 «=...

100°00 | 100700 | 100°00 | 100-00

Gaseous Fuel.—Various forms of arrangement for pro- ducing combustible gases in one place and leading them by means of tubes elsewhere to be burnt as fuel have been devised by numerous inventors. The object arrived at being essentially cheapness of production, the combustible substances have usually been coal, slack, lignites, shales, and the like, more or less submitted to distillation by the heat developed by the combustion of a part of the mass, the ultimate product of this combustion being largely carbon oxide formed by the action of the heated carbonaceous

matter on the carbon dioxide first formed. One of the most successful of these is the Scemens gas producer, which is applicable to the production of heat by means of gaseous fuel generated from all kinds of waste materials, such as shale and combustible rubbish of all sorts, and is repre- sented in fig. 4; the air, being admitted only through the

Fig. 4.—Siemens Gas Producer.

bars C, is converted into nitrogen and carbon oxide in its passage through the incandescent mass, whilst hydrocarbons and hydrogen are also evolved in the upper portion by the action of the heat on the organic substances used as fuel, passing off by the gas flue B. A is the charging hole for the introduction of fresh fuel; the ashes are stoked out from time to time from between the bars, which may with advantage be made capable of rotation about their own axes when shale is burnt, so as to facilitate the extrac- tion of the burnt residue. E is a pipe which allows water to drip down into the ash pit D, and so to keep it always wet. The following analyses will give an idea of the com- position by volume of the gas from such producers :—

Siemens. Snelus. Mixture of 3 parts caking

POHACHIS Ne cncviaaat coteusnsesesesevietnssvac coal and 1

Dowlais.

Hydrogen Combustible _)Carbon oxide

gases. Marsh gas

Other hydrocarbons..

Incombustible gases.

Carbon dioxide…..... Nitrogen

IRON

When steam is allowed to pass into the producer along with the air, it reacts on the hot carbon of the fuel, producing “ water gas” in virtue of the reaction

H,0 +C=H,+C0.

The extent to which this can be safely done depends on the fuel burnt, the decomposition being attended by an absorption of heat ; if more steam be admitted than can be decomposed, the surplus passes on unchanged and dilutes the gases, serving no useful pur- pose, but rather the contrary. Usually the small amount of steam requisite is produced by placing a water-tank underneath the grate, supplied continually with water as indicated in fig. 4, so that evaporation is set up by the radiating effect of the fire; only a relatively small volume is thus drawn in with the air used for combustion, but enough to give several parts per cent. of additional hydrogen and carbon oxide in the gas, and sensibly to increase the heating power. Roughly speaking, the calorific value of a unit of weight of gas from a Siemens producer is about 650; for one part by weight of carbon oxide will develop 2400 units of heat, and average gas contains about 25 per cent. by weight of carbon oxide with a little hydrogen (some 0°5 percent. by weight), and hydrocarbons equivalent to some few parts per cent. more of carbon

oxide. The mean specific heat of the gases being about 0°24, an alteration in temperature of 300° would represent about 72 units of heat, or 11 per cent. of the heating power ; so that by conveying the hot gases from a Siemens producer such a distance that their temperature is reduced by 300°, a considerable loss of effective heating power is experienced, amount- ing to about one-ninth of the actual heat developed by combustion. Partly owing to this cause, and partly owing to radiation, absorption of heat by fhe brickwork of the fireplace, &c., it has been calcu- lated that the heat actually producible by means of gaseous fuel is only about two-thirds of that due to the fuel actually employed ; but manifestly the latter sources of loss apply to solid fuel burnt in an ordinary firegrate just as much as to a gas producer. Experi- ence shows that when the producers are near to the furnaces fed by them the fuel consumption is perceptibly lessened.

Siemens Regenerative Furnace,—The peculiar feature of this furnace is that the waste heat is employed to heat up

| both the gaseous fuel and the air requisite to burn it before

they are introduced into the furnace or chamber in which they undergo combustion. This is effected by making the exit gases pass through " regenerators," consisting of piles of firebricks stacked loosely together so as to ex- pose as much surface as possible. Figs. 5 and 6 represent such a regenerative furnace as arranged for melting steel on an open hearth (Journal of Chemical Society, 1873, p. 661).

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Fig. 5.—Open-Hearth Furnace—Longitudinal Section.

Four such piles are employed, two being heated up by the waste gases escaping from the melting furnace, whilst the other two are in use, the one for heating the gaseous fuel on poe from a Siemens gas producer, or from a gas main fed by several such producers, the other for heating he air requisite for the combustion of the gas. By suitable valves the waste gases are shunted from the first to the second pair of regenerators, whilst simultaneously the gas and air are changed from the second to the first pair; as the temperature at which the gas and air enter is close to that at which the products of combustion leave the furnace, whilst the regenerators are being heated up, the temperature of the combustion chamber continually rises (when not reduced by the introduction of cold substances) with each reversal of the currents through the regenerators ; so that ultimately the only limit to the temperature attainableis the refrac- toriness of the materials of which the furnace is constructed. Even Welsh Dinas brick, which perfectly resists the ordinary steel melting

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IRON

temperatures of coke-fired furnaces, even when the least fusible mildest steels are being prepared, can be easily melted when the furnace is pushed; these bricks are made from a silicious clay (con- taining 98°31 per cent. ofsilica, 0°72 of alumina, 0°18 of ferrous oxide, 0°22 of lime, 0°14 of potash and soda, and 0°35 of combined water), mixed with 1 per cent. of lime, and are usually considered the most refractory in ordinary use. A specially prepared brick made from a mixture of crushed pure quartz and 2 per cent. of lime answers much better. Bauxite bricks are somewhat less refractory, and have the further objectionable quality of shrinking much when highly heated, whilst fresh bauxite introduced for repairing cavities caused by wear and tear will not adhere properly to them ; where

FAT VATY

| WELL

Fia. 6.—Open-Hearth Furnaee—Cross Seetion through Regenerators, Air and Gas Flues.

ores requiring lime as flux are employed, however, they are less readily corroded than silica bricks. The hot air and gas currents and the waste gases are reversed through the regenerators at con- venient intervals by means of a cast iron valve on the principle of a four-way cock ; when the regenerators are placed verccolizand heated from the top, their action is more uniform than when the draught is in any other direction ; they should be at a lower level than the heating chamber, and may be worked either with a gas pressure just about atmospheric, or preferably with a slightly increased pressure so as to avoid possible chilling of the furnace by the drawing in of cold air, the pressure being regulated by the chimney damper and the valves governing the gas and air supplies.

Since the composition of the gas from a Siemens gas producer is,

roughly speaking, somewhat less than one-third carbon oxideor gases equivalent thereto, and somewhat more than two-thirds nitrogen and carbon dioxide, and as carbon oxide requires half its volume of oxygen and hence about two and a half times its volume of air for i Saag combustion, the volumes of gas and air equivalent to one another are roughly equal ; but, since an excess of air is usually requisite, and is indispensable when an oxidizing atmosphere is desired, the regenerators by which the air is heated are made some- what larger than those used for heating the gas; by suitably adjusting the speed of the air current by the valve, the atmosphere can then be rendered neutral, reducing, or oxidizing at will. This point is of less importance for other applications of the regenerative furnace such as glass making or tack melting in crucibles than it is for puddling and reheating furnaces, For every pound of coal burnt per hour-about 6 square feet of surface is requisite in the regenerators to take up the heat; whilst about 60 tb weight of brickwork is Tequisite to expose the surface to the best advantage, i.e., between three or four times the weight of brickwork which would have the same capacity for heat as the waste gases (equal to about 17 tb). ._ Lundin's furnace (or gas producer), employed in

Sweden for the production of gas from moist sawdust, is constructed on much the same principles as Siemens's gas producer, saving that the air is driven in bya blast; as the sawdust contains upwards of 40 per cent. of moisture, the steam and hot gases passing off from the furnace are cooled down, and the former condensed, by jets of water-spray and a kind of scrubber consisting of piles of iron pigs over which water flows. Peat and turf can be used with the same arrangement, if not too wet. The gas evolved from sawdust has about the following composition after condensation of steam, ex- clusive of about 3 volumes per cent. of aqueous vapour :—

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By Weight.

By Volume.

Wacbon GiOMIAE….2c520060.000.. as bavesonsea Carbon oxide….

Marsh gas…. Nitrogen.. — .

brook & Wilson's Producer (fig. 7) consists of a solid hearth with no fircbars: the coal is fed in at the top by means of a hopper-shaped – conical tube closed by a "bell and cone" arrangement; the air requisite for combustion is supplied by means of a steam jet, and blows into a bell-mouthed pipe outside, communicating with a box- shaped cast iron chamber in the middle of the base of the producer; this chamber, being perforated, distributes air and steam uniformly throughout the mass of fuel, and so prevents unchanged steam and excess of air from passing away in the gases, which are led away by a tube communicating with the annular upper part of the producer between the hopper and the outer wall. Siemens has recently in- troduced a modification of his gas producer differing chiefly from

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Fia, 7.—Brook and Wilson’s Gas Producer—Sectional elevation. this one in details of construction, being more simple. The Tessié du Motay generator is in form like a small close-topped blast furnace fed by means of a cup and cone with coal dust or other low-class fuel ; the hearth is cylindrical, with a brick bottom, on which are formed four channels, each communicating at its ends by passages with cast iron mouthpieces or windboxes, connected with an annular blast main through which blast is supplied at a pressure of about 8 inches of water. Doors are provided at the mouthpieces for the removal of ashes from time to time (see Engineering, April 23, 1880). Several other gas producers have been introduced by various in- ventors, and are employed to a greater or lesser extent; the limits of the present article forbid these being discussed.

Peat and peat charcoal have been proposed by Kidd as sources of gascous fuel. Steam at a pressuro of 20 Ib being injected, together with a considerable volumo of air carried along with it, into a mass of incandescent peat charcoal in a suitable chamber produces a fuel of much the same composition as that obtained from a Sic- mens gas producer, but absolutely free from sulphur dioxide. Keates gives the following analysis of gas thus produced :—

Carbon oxide.. ses seerssessceee 28°C

Hydrogen…. wee 146 Nitrogen …. ... 68°0 Carbon dioxide . 4:0

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the figures representing the volume in cubic feet of gas formed from 1 fb of peat charcoal, so that upwards of 200,000 cubic feet of gas are yielded by a ton of charcoal.

1]. Fluxes and Cinder.—When a very pure iron ore is smelted, such as Cumberland hematite or Swedish mag- netite, the amount of silicious and earthy matter present relatively to the iron oxide is but small, and in conse- quence the amount of flux requisite to be added is also small. By proper combination of ores of different kinds the necessity for the addition of flux may be almost or altogether avoided; thus a highly aluminous ferric oxide known as bauxite (valuable as a source of aluminium and its compounds, as well as serviceable as a source of iron and flux in the blast furnace) and silicious hematite smelted

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together, with the addition of a little limestone or quick- lime, furnish a cinder consisting mainly of calcareous aluminium silicate which readily melts and separates from the pig iron; similarly aluminous shales from the Coal Measures may be used instead of bauxite, whilst certain Swedish ores naturally containing as gangue fusible silicates of lime and magnesia, together with limestone, can be smelted without any additional flux of any kind, and will even serve to take up the silicious gangue from other ores when smelted with them if the latter are not in too large a proportion. On the other hand, clay ironstone and clayey ores generally usually require a considerable admixture of limestone or quicklime in order to yield a sufficiently fusible cinder, the presence of a sufficiently large amount of basic matter (lime and magnesia, or manganese oxide) in the cinder being essential in order to prevent the pig iron from taking up too much sulphur from the coke or coal when these fuels are employed. Phosphorus, however, when present in either

the ore, the flux, or the fuel, is almost entirely taken up by the pig iron, as was shown in 1838 by Berthier, and subsequently confirmed by other observers; thus Lowthian Bell found that ina furnace smelting Cleveland ironstone, with a con- sumption per 100 parts of pig of

Ironstone containing 6°522 per cent. of phosphorus=240 parts
Limestone – 0°011 5 35 = 60 „ Coke an 0°265 3 % =120 „

and a formation of 150 parts of cinder containing 0:098 per cent. of phosphorus, the amounts of phosphorus leaving the furnace in the slag and pig iron respectively were almost exactly 10 and 90 per cent. of the total phosphorus present ; whilst in the same series of experiments the sul- phur retained by the iron and that passing out in the slag were respectively between 2 and 2°5 and between 97°5 and 98 per cent. of the total sulphur present (which amounted to upwards of 4 parts per 100 of pig).

According to Riley the amount of phosphorus retained in the slag is greater the more iron is present. When the reduction of the metal is all but complete, and the furnace consequently is working well, the pig contains practically all the phosphorus pre- sent, whether it be white or grey; but if the slag becomes more or less of a "scouring" character through ineomplete reduction of considerable amounts of iron, notable quantities of phosphorus are also present therein. Witherbce finds that a certain small amount of phosphorus contained in the charge fails to appear in the pig iron, this amount being greater the higher the temperature of the hearth, z.¢., being greater when Bessemer pig is being run than with iron smelted ata lower temperature. This he explains by supposing that phosphorus is volatilized in the furnace, a view apparently cor- roborated by direct experiments made by Akermann.

Some of the Lincolnshire ores are imbedded in a caleareous matrix or gangue; in order to smelt these an admixture of silicious ore is necessary. For this purpose the more or less silicated forge mill cinders from the manufacture of malleable iron are frequently used, these substances virtually constituting rich iron ores, the only draw- back of which is that their texture is compact, and they generally are in small

pieces, so that they could not be smelted advantageously alone ; moreover, they usually contain considerable quantities of phosphorus, if that constituent was present to any extent in the original pig used for puddling, mill cinder (the scale formed and detached during rolling) being much purer in this respect than furge cinder (the molten slag squirted out during hammering).

When any notable amount of manganese oxide is present in the cinder, it is generally very fluid and easily fusible; aceordingly, when a furnace shows a tendency to "seaffold" (by the fritting together of lumps which form a comparatively solid skeleton mass inside the furnace, preventing the charge from descending properly), a mangani- ferous ore is sometimes employed asa sort of flux to assist in remov- ing the obstruction by melting itdown. In Sweden, when sulphur is present in the ores to an undue amount (through imperfect cal- cination, &e.), it is usual to add some titaniferous ore to the charge (some 10 percent. or so); the pigis thereby prevented from taking up the sulphur, possibly through the formation of titanium sulpho- cyanide. In the anthracite furnaces at Cedar Point, U.S., it was found that a much more fluid cinder was produced when a magnesian limestone, containing 67 per cent. carbonate of lime and 27 per cent. earbonate of magnesia, was used than with ordinary limestone of 95 per eent. carbonate of lime, other things being the same.

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As a general rule it may be said that the composition of the cinder from a blast furnace working satisfactorily varies between that of an orthosilicate, 2RO,SiO, or 2R,0,,3Si0,, in which the oxygen of the bases present is equal to that of the silicon dioxide, and that of a metasili- cate, RO,SiO, or R,O3,38i0,, in which the oxygen of the bases is one half of that of the silicon dioxide,—the dyad metals being essentially calcium and magnesium, and with certain ores manganese, whilst the triad metals are usually only represented by aluminium. More or less ferrous oxide is, however, invariably present ; cxteris paribus, the darker the colour of the slag the more iron it contains. When the furnace is working properly the amount of ferrous oxide is small, not

exceeding 1 or 2 per cent. of the cinder; but when the reduction of the iron is imperfect, and a “ scour- ing cinder” is being produced, the quantity of ferrous oxide present may amount to one-fifth or more of the cinder, representing a very large loss of metal. The follow- ing analyses represent the composition of various kinds of limestones and other fluxes employed :—

Caleareous Fluxes.

Oyster Shells from Chesa- peake Bay.

Crystal – line Lime- stone, Spring- field.

Durham Lime- stone, Wear-

dale.

‘Undried Surrey Chalk,

Character of Flux and Locality…

Scotia.

Clap- | Lowthian Chap-—

ASIBIVSE)..cossssscescsesecoe Haley, Bell. a

Calcium carbonate…. 78-00 94°48 51°24 Magnesium _,, BOC trace 0°94 23°28 Ferrous oh oe eae 24°46 Manganese _,, c|| 015 a6 0°98 SANE ccoss.SOWA ccsssasesessscscsconee 0 ; 0162 0°65

10014 | 100°00 | 10050 | 100°62

1 Used in Baltimore furnaces as flux. 2 As sodium chloride.

Aluminous and Magnesian Fluxes.

Pisolitic | Coal- Bg Fog

Character of Flux Bauxites |pauxite,|Aminous/ measure! “iende 1 hdeedke from Baux, Belfast. | 2f00 Ore, | Shale, usenlin

and Locality…... Fientics elfast. | Red Bay, | Lanca- ac Antrim, | shire. rine

Frank- Jand.

PATIALY Sts sestiacscccasWereres Deville. [Ritchie.| Crossley.

ATWMING: <<<. scccceareses-csl DOU. || gOcS | 4aeS0 20°37 21°73 Memictoxide? s..cs..0cc.-cs8 3°0 | 34:9 | 28°74 71°63 oat Ferrotts:,, ..ceree ate ive 0°78 0°68 4:73 Manganese oxide. re eee 2o0 trace a0 sx WING) os ciseeaccascete Pee eee 1:70 trace 0:09 Magnesia aan . 0°23 trace 0:59 HICH ..ccceas eam legal, 14:05 6°00 61-91 Phosphoric anhydride…} ... eee 0°01 eae 206 Sulphuric “s cee) one non 0°01 as 35 ea organic} | 140 | 221] 1385 | 115 | 743 MAUVE ceeenicassscaiees TrbanicOxXider….:..cecces|) VOD ees 03 Calcium carbonate …... LeBye m0 ain Potash and soda…..... Sad 341

100-00

100°0 | 100°0 | 100-97 100°58

99 89

Effects of Caleination of Limestone.—When quicklime, or cal- cined limestone, is employed instead of raw limestone, a certain diminution in the amount of fuel requisite to run a given quality of pig with a given furnace is noticed, arising from the circum- stance that in calcining limestone heat is absorbed, so that when quicklime is used there is a less demand on the heat developed in the furnace than with raw limestone. The saving in this way, however, is rarely equal to the amount of fuel used in the limekiln itself, probably because in the top portion of the furnace thie quick- lime becomes partially Fooathanatel by the eseaping gases. When the amonnt of limestone used is large, the carbon dioxide intro- duced into the furnace in that form is a large fraction of the total carbon dioxide expelled in the escaping gases, and

consequently the carbon of the fuel cannot be burnt to so great an advantage as it

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would be were less carbon dioxide introduced in the form of flux, since the total amount of dioxide in the escaping gases is limited (see § 20) ; accordingly, a further saving in fuel might be expected to accrue by calcining the limestone previously, when large amounts of limestone flux are employed. The two sources of saving jointly sometimes considerably exceed the fuel expenditure in the limekiln during the process of burning the lime ; thus at Ougrée, near Liége, comparative trials lasting over some three and a half years indi- cated not only increased production but also a notable saving in fuel when lime was used. T'wo similar furnaces gave the following results per unit of iron run (A), the results (B) being obtained with the same furnace throughout :—

Furnace with Furnace with Quicklime. Raw Limestone.

(A) Coke consumed 1:465 j 1:4725

Analogous results, but not so strongly marked, were obtained by Eck at the Royal Smelting Works, Upper Silesia :—

Furnacewith| Furnace with Quicklime. | Raw Limestone.

Saving.

1st Furnace—Coke per unit of iron… 2°230 2280 0:050 ea Do: do. do. see} 2°1825 2°2725 0:090

1st Furnace—Increase of make by using quicklime, 3°3 per cent. 2a =— ~Do. ° do. do. Zale,

From these results as well as others described by Percy (Metal- lurgy), and by Griiner (Annales des Mines [vi.], xx. 525) and others, it would seem that, with certain ores at any rate, a distinct practical advantage

attends the use of quicklime instead of raw limestone. On the other hand, Lowthian Bell regards the advantage with Cleveland ores as at least doubtful, his own experiments un- mistakably indicating "that the expense of calcining the limestone was unaccompanied by any advantage whatever in the operation" (Journ. I. and S. Institute, 1875, 406) ; similar results have also been observed by others.

As regards the quantity of flux requisite to produce good results, no general statements can be made, the proportion being highly variable with circumstances, and especially with the nature of the ore. Thus, with Cleveland ironstone containing after calcination some 40 per cent. of iron, about 11 ewts. of limestone are usually requisite per ton of pig iron, or about 22 per cent. of the weight of "mine" used. Much larger quantities have becn employed at various Continental works using poor ores with much earthy matter, up to 20 ewt. and more per ton of iron ; on the other hand, some of the Swedish ores require no flux at all, and Lake Superior ores often do not require more than some 2 cwts. of limestone per ton. When it is practicable to mix aluminous, calcareous, and silicious ores together, the amount of flux otherwise requisite may be largely reduced ; but the conditions governing the amount and nature of flux to be used are too variable to be briefly generalized.

12. Construction of Blast Furnaces.—Intermediately between the comparatively open hearths of the Catalan forge and analogous early arrangements for the direct pro- duction of iron from its ores (§ 29) and the completely closed- in blast furnaces of gigantic dimensions in use at the present day, may be classed the smaller closed-in blast furnaces used amongst various nations, the products of which were either something approaching to malleable iron, more or less carbonized and imperfectly fused, a fused or semi-fused steel, or a completely melted more highly car- bonized cast iron, according to circumstances. Of this intermediate class of furnace the "'Stiickofen," or high bloomery furnace, formerly considerably used on the Con- tinent, may be taken asa type. By increasing the amount of fuel relatively to the ore smelted, a completely fluxed cast iron resulted, run out as in the ordinary modern blast furnace through a tapping hole; with less fuel, 2.e., increased "burden," the product approximated more

to the pasty mass produced in the Catalan forge, being extracted as a ball through a much larger opening in the hearth than was necessary for simple tapping; in this latter mode of working the cinder was usually allowed to escape pare passu with its formation so as not to allow the mass of reduced metal to be covered and protected from the oxidizing action of the blast, otherwise a too highly carbonized metal resulted, Essentially the Stiickofen was a brickwork tower of some 10 to 15 feet in height, the inner cavity being shaped like

two truncated cones placed base to base; in short differing from the ordinary blast furnaces for producing cast iron in little but dimensions. As far back as 1841 these appliances were stated by Karsten to have been entirely abandoned in Carinthia, Carniola, and Styria (where formerly they were largely employed), on account of their large consumption of fuel; at that period they were still in use to a small extent in Hungary and near Henneberg in Germany. The "Osmund" furnace, formerly in use in Sweden for converting bog iron ores into malleable iron, was essentially a Catalan forge with the sides built up to a height of several feet so as to constitute a small blast furnace entirely closed in save at the top.

The modern blast furnaces for pig iron production in use in different districts vary considerably in the details of their construction. The changes that have been intro- duced during the last half century are mainly in the direc- tion of increased size, which up to a certain point has been found advantageous so far as the consumption of fuel is concerned, at any rate with certain classes of ore. Thus about 1830 the largest furnaces in use in Great Britain were usually but little upwards of 40 feet in height, with a capacity of 4000 to 5000 cubic feet, and were often much smaller; about 1864 Vaughan of Middlesborough built a much larger one, 75 feet high; atthe present day furnaces of 80, 90, and even upwards of 100 feet in height and of 20,000 to 40,000 cubic feet capacity are in use in certain localities, some of the largest being those at Ferryhill and Ormesby in the Middlesborough district, furnaces of 1034 feet in height and 33,000 cubic feet capacity, and of 90 feet in height and 40,000 cubic feet capacity, having been built at these places respectively. The researches of Lowthian Bell on blast furnaces

smelting Cleveland iron- stone, and the practical experience of iron smelters using this ore alone, or mixed with hematite, coincide in indicating that, whilst a considerable saving in fuel consumed (several cwt.) per ton of iron of given quality made at a given rate of working from a given class of ore and flux accompanies the increase in dimensions from 40 or 50 feet in height and 5000 or 6000 cubic feet capacity up to about 80 feet in height and some 12,000 cubic feet capacity, the economical effect of in- creasing the dimensions beyond these limits is not marked, although, according to Bell, a further increase in capacity up to some 15,000 or 16,000 cubic feet (without increase of height beyond 80 feet) appears on the whole to tend to

increase of regularity during working. On the other hand,-

when avery hard coke (such as that specially made in Durham and Northumberland for the purpose) is not obtainable as fuel, or when very friable ores are employed, the extra weight of material in a very high furnace so crushes and pulverizes the ore and fuel as seriously to interfere with the working; so that with charcoal or soft anthracite or other coal as fuel, or with ores which either at first or when partially reduced have but little coherence, the disadvantages of increasing the size of the furnace beyond certain limits outweigh the benefit derived from the saving of fuel Accordingly the 80 feet furnaces and upwards of the Cleveland district are but little used out of England ; the furnaces employed in the North Lanca- shire and Whitehaven districts, where hematite mainly is smelted, are usually 60 to 70 feet in height, and those in use in the United States for similar ores rarely exceed 59 to 65 or 70 feet in height, with a maximum width of 15 or 16 feet at the boshes, and are often only from 40 to 50 feet in height; whilst furnaces very much smaller than these are in use both in America and on the Continent where charcoal iron is made; thus at Vordernberg in Styria furnaces of only some 28 feet in height, 6 feet greatest n- ternal diameter, and 450 cubic feet capacity were in use a few years ago and probably are still, whilst in various places XII, — 38

in Sweden, Norway, and Lapland furnaces of 30 to 40 feet in height and 1000 to 2000 cubic feet capacity are em- ployed. Of late years, however, large furnaces have been

built in Sweden of 50 to 60 feet in height, especially for Bessemer pig smelting.

The internal shape of the blast furnaces in general use is some- what variable. Those of the older construction may be described as being made up of two truncated cones placed base to base, the greatest diameter (the boshes) being about one-third way up ; those of more recent construction exhibit much less angle at the boshes, and are internally shaped more like a barrel, or like an inverted soda water bottle with most of the neck and the conical bottom eut off. Fig. 8 illustrates the alterations in size and shape that have

taken place in the blast furnaces of the Cleveland district during the last thirty years or so (abridged from a paper by J. Gjers, Journal Iron and Steet Institute, 1871, ii. 202). Similar alterations in dimensions and shape of furnaces have taken place in other localities. ‘The smaller furnaces of 30 to 35 or 40 feet in height have mostly been replaced (when worn out) by larger and higher ones, the angles of the internal cavities of the older shapes being rounded

Fig. 9 illustrates the section and ground plan of one of the older form of open-mouthed furnaces used at Dowlais (Truran), consisting of a heavy mass of masonry, square at base, strongly braced together with iron tie-rods, rising in the shape of a truncated pyramid to the height of the boshes, and then surmounted with a conical top surrounded at the throat by a gallery for the introduction

15050 V VY Y Z Y y CUB. FEET. Y), Y Y y Frye Y] j : te 1ssoo 7 Y Y j CUBFEET. Y Y Y ZZ] / y/ Y Z Yy Z Y Y) Y i J yy Y, 25940 j BY 2 Y |]] j} j CUBIFEET. 7 y Y g CUB.|FEET Y, y 7 7 7 y Yy YU Y i 7 J 22-

0] DIA. y 24.0| DIA. 7 Z y Yj Y | h BG GY i Y Yy Ly L, 20 DIA Y 7 16.0] DIA. G Z r| y 7) i y Dn = Y Y | » 3 lj 7-1 /), “a l, j Gy °c Yj Y Y Yy —TY] bn & Y Z| DIA Yj n Y tUijyy “es YA CMMC@M@@]@]@|]Mu- YY YUE. WU

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Fic. 8.—Different Forms of Blast Furnaces.

of the charging materials. In the square base were four arched re- cesses or tuyere houses, one on each side, F, F, for the introduction of the blast through blowing holes by means of tuyeres, the front recess G also serving for the removal of cinder and the tapping of the fnr- nace for the running of the pig. The lowest portion of the hearth or erucible, A, was constructed of refractory sandstone, grit, or con- glomerate, or of difficultly fusible firebrick, the inner portion of the upper part of the furnace being also built of firebrick set in fireclay with an air course between the double lining thus constructed; ex- teriorly the furnace was built of less expensive and refractory materials, usually of stone, strongly bound round with iron hoops. Above the charging gallery Da slighter brickwork continuation of the internal cavity arose, E, termed the ¢wnnel head, in which door-holes, closed with movable iron doors, were perforated for the introduction of the charge. At the level of the boshes BB or thereabouts, the

pyramidal base was finished off exteriorly with a cap or coping, the conical shaft C rising upwards therefrom. Fig. 10 represents a somewhat later form, chiefly differing from the former in that the base is circular instead of square, the whole forming a truncated cone into which the tuyere houses A,A,A,B are sunk, the cinder notch and tapping hole for the outflow respectively of the cinder and pig iron being in the tuyere house B, towards which the walls of the hearth and crucible are cut away ; the outer portion of this form of furnace consisted of a shell of boiler plate rivetted together, and the masonry

was considerably less massive than that of the older form. The more modern furnaces (such as fig. 11) are con- structed like this, but the masonry at the base is still Jess massive, so that, instead of there being four distinct tuyere houses, the separat- ing walls of the houses are wholly cut away and replaced by a number of stout iron pillars on which rests the greater portion of

the weight of the superstructure ; through the walls of the hearth are pierced conical arched openings for the tuyeres ; the throat is fitted with a valve for introducing materials from time to time, such as the cup and cone arrange- ment (see § 18). Just below the cup a perforation through the fur- nace wall allows the gases to pass out into a down flue of rivetted boiler plate through which the gases pass (when the cone is in its normal raised position) to the boiler fires, blast superheaters, &c. ; in order to prevent the fire being i tigenimned when the cone is lowered, a small coal fire is kept burning under the boilers, &c., unless the temperature of the fire- place is sufficiently high to relight the gases when the cone is again raised. Even at the present day, however, many furnaces are in use of the open-mouthed class, the escaping gases simply passing into the air through the tunnel head as a mass of roaring flame, unless the = temperature is too low to enable them to ignite spontaneously, in which case they escape without flame — when accidentally or intentionally lit.

The precise angle made at the boshes between the lower and upper portions of the inner furnace wall is a matter of some mo- ment. If the hearth slopes too gently, the fall of the materials downwards as the reduced metal and cinder melt is apt to be re tarded, and “ scaffolding” to be produced. Modern furnaces usu- ally have the walls of the hearth Fig. 9. more nearly vertical than the é older ones, whilst the shaft instead of being conical from the boshes upwards is often cylindrical for some considerable distance, then gradually closing in SS barrel- wise towards the throat; the tuy- eres also are often more than four, cspe- cially in the larger furnaces. In some of the furnaces in use some

twenty years ago and upwards, the hearth was originally built square in plan, like the still older

ones of half a century

back and more; but po + 4 observation of the fact Fie ES Ce Be, that the hearth of OSS) SN SY a al SS blown-out furnaces 2 Ba ie Bee i a

was always corroded or fused away to an irregular circular out- line, and that the same kind of effect was also

roduced in the inner ining of the boshes ed shaft where an angle originally exist- ed, led sy the : adual substitution of inner cavities shaped in the first instance as much as possible like the ultimate shape to which the furnace be- came corroded.

In building a blast furnace, the “ stack ” or upper portion is usually constructed first on its supporting columns, the hearth Fig. 10. and its outer casing being built in subsequently. The firebrick used for the purpose should be as frec as possible from iron, otherwise it is

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apt to be disintegrated by the reducing action of carbon oxide on the ferruginous matter, a continual reduction of iron and reoxidation of the metal with deposition of carbon being produced in virtue of the reactions described in § 19, equations (3) and (4); according to Pattinson’s observations (Journ. I. and 8. Inst., 1876, 101) this ac- tion has in several instanccs caused considerable injury when iron was present to a notable extent (3 or 4 per cent.). In Austria and Hun- gary steatite is often used for lining the charcoal furnaces in use there ; serpentine hasalso been employed, but is not so advantageous on account of the difficulty in obtaining it of uniform texture and sufficient compactness; it does not wearso wellas good firebrick. The

hearth and foundations frequently require to be specially prepared, consisting of a ee mass of concrete, broken stone, &c., with air courses interspersed; above this is the hearth bottom, formerly made of one or more large slabs of sandstone or grit, but with the modern large furnaces of masses of firebrick or sandstone laid inverted dome- wise, or like the under portion of a barrel drain, to diminish the tendency to undermining and forcing upwards by the molten metal

and slag. The crucible and hearth are then constructed of as great thickness and as infusible material as convenient, so as to increase the time requisite before renewal is necessary, owing to the solvent action continually being exerted by the cinder, especially when the furnace is working irregularly and forming a slag containing much unreduced iron (scouring cinder) which attacks the hearth lining powerfully. The tuyere holes are built in as conical perforations through the hearth wall at a level of some few feet above the bottom, —the front tuyere hole being made into an arched recess (like the old *‘ tuyere house,” but on a smaller scale) reaching from the bottom to a level of 2 or 3 feet above the other tuyeres; the tymp arch usually projects a little forward from the earth wall, constituting the ‘fore hearth,” at the base of the front of which is the dam, a block of stone or mass of firebrick pierced by a vertical cavity (tapping hole), the bottom of which is on a level with the base of the hearth, and through which the molten pig iron is drawn off from time to time, the liquid metal being dammed back by ramming a mixture of clay and sand or small coal into the hole when the furnace is not being tapped, and the stopping being withdrawn by hammering with a pointed crowbar when all is ready for tapping. The top of the dam

is nearly on a level with the tuyeres, and has a groove (cinder notch) cut in it forming a channel through which the cinder continuously flows out when the iron and cinder have risen toa level with the top of the dam since the last tapping ; occasionally the top of the dam is raised to a somewhat higher level than the tuyeres, when it consequently results that the blast is blown in through and not over the liquid cinder. The

space between the dam and the top of the tymp arch is filled up with brickwork, or with clay and sand, &c., with the exception of the cinder channel terminating in the cinder notch ; when the furnace has been tapped and the level of the cinder has sunk below the notch, this cavity is temporarily stopped until the cinder level riscs again, to prevent the blast issuing from the hole. In order to prevent wearing away of the dam, water cooling arrangements are sometimes applied analogous to those used for the hot-blast tuyere (§ 15); various arrangements of this kind are in use, notably Liirman's. On the Continent the older massive round or square-based class of furnace (of variable dimensions in different localities) is still em- ployed to a considerable extent. In some of the smaller-sized fur- naces, external masonry is replaced b 2 i by a jacket of earth and rock between it and the furnace casing proper. When the furnaces are only in blast at certain seasons bein Sie of moisture from the interior brickwork or stonework on relighting are usually provided. The hearth is constructed of a mixture of fireclay and crushed quartz or old used fireclay moulded whilst soft into shape by being rammed in between the outer casing

and a wooden internal mould and carefully dried gradually before –

use. Rachette's furnace (fig. 12),! adopted at Nijne Tagilsk and

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Fic. 12.—Rachette's Furnace. I. Cross seetion. section. III. Plan at tuyere level. the hearth.

elsewhere in the Urals, at Mulheim on the Rhine, and in a modified form in certain copper smelting works, differs considerably in shape from the ordinary English form ; the shaft A is an inverted four- sided pyramid, the throat being the widest part of all, about 7 feet wide and

18 long ; towards the hearth D the width diminishes to 2°75 feet, the total height being about 30 feet. At each end of the oblong hearth is a slaghole and a tapping hole, C, C. ‘The tuyeres B, B are some dozen in number, arranged in two ranks opposite to one another, each tuyere on one side being midway between the axes of two adjacent tuyeres of the opposite side. In order to keep the walls cool air courses E,E are ‘built under the hearth and others O,0,0 in the walls of the shaft, all communicating with one another; when the furnace is being blown in these also serve to heat up the walls and dry them, fuel being placed in the lowest and largest air space E and fired. The chief advantages claimed for this form of furnace are that its small height and comparatively slight construc- tion render it far less costly to build than more massive furnaces ; that the ascending current of gases must slacken in vertical

II. Longitudinal IV. Plan of air courses below

1 Taken from Bolley’s Handbuch der Chemischen Technologie vol. ii, part ii, by Dr C. Stolzel.

such as those in use in Sweden and Finland, the heavy . a log casing, prevented from heating °

blown out during the rest of the year), holes for the –

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speed as it reaches the wider ——— portion, and must conse- quently be more efficaceous in reducing the ore than in furnaces the shafts of which taper the other way at top, so that the yield of iron relatively to the cubic capacity is larger; and that when first built it can be blown in much sooner than ordinary furnaces owing to the air courses. The yield of one of the Ural furnaces, when smelt- ing a rich magnetic ore furnishing 67 per cent. of grey pig with charcoal and cold blast, was from three to three and a half times that of the old type of furnace (measured for equal cubic capacity), the consumption of fuel being from 10 to 15 per cent. less (Stélzel).

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A peculiar furnace, known as Ferrie's self-coking furnace, after the name of its inventor, in which raw coal is employed, has been used at the Monkland Iron Works and elsewhere during the last few years. On the top of an ordinary furnace of about 53 feet in height and 7000 cubic feet capacity were erected four chambers or retorts about 20 feet in depth, each having a capacity of 500 cubic feet; external flues, in which a portion of the waste gases were burnt, served to heat these chambers in such a way as to coke the raw coal, the temperature of the flues being about 800° to 900° C. Fig. 13, taken from the Journal Iron

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and Steel Institute, 1871, i. p. 433, illustrates the arrange- ment. That part of the gas not consumed in the coking re- tort flues is led off by the usual bell and cone arrangement.

Before these chambers were erected the quantity of raw eoal requisite to make a ton of pig from the Lanarkshire ironstone averaged about 52°5 ewt.; the addition of the coking chambers reduced the amount of coal to 33°5 ewt., producing a saving of 19 ewt. of raw coal, equivalent to upwards of 12 ewt. of coke per ton of iron. Aceording te Lowthian Bell this result is largely due to the increase in the height of the furnace produced by the addi- tion of the eoking chambers ; 7, ¢., a large proportion of the saving (estimated by Bell at about one half) would have been brought about by an inerease in furnace height, even though the upper part were not specially heated by the combustion of waste gases, the balance being due, first, to the avoidance of a large portion of the heat absorption during the eoking of the coal that would other- wise have taken place at the expense of the heat developed by ehemical changes in the upper part of the furnace, owing to the supply of heat from the combustion of waste gases in the external flues, and, secondly, to the modifying action of the hydrocarbons developed on the chemieal changes themselves, the direction of the modification being that of increased rate of reduction of iron oxide. In any ease, the consumption

of fuel is by no means inferior to that which with the most advantageous conditions will suffice to smelt a given iron ore (§ 21). For further details see Jowrnal Iron and Steel Institute, loc. cit., and 1871, ii. 228. A modification of this furnace has been tried, in which the coking chambers at the top are connected with condensers for collection of tar and am- moniaeal liquor; the fuel only is placed in these chambers, the mine and flux being introduced at their base.

Double Rows of Tuwyeres.—Experiments have been made, notably at Pittsburg, U.S., on furnaces with two sets of tuyeres, one row at a lesser height above the sole than that of the other row, both rows used simultaneously; the general effect has been found to be the reverse of advantageous. It is, however, frequently convenient to have two or more tuyeres symmetrically disposed round the furnace at a somewhat higher level than those ordinarily used, the higher series being employed, not in the ordinary working of the furnace, but only in ease of certain derangements of working such as seaffold- ing, &e.; accordingly several furnaces of recent construction, especially in America, have been thus fitted with 'auxiliary tuyeres," at 16 to 18 inches level above the others, ready for use when oceasion needs. In certain eases when seaffolding liad taken place to such an extent that the furnace did not give any fused matter at all at the hearth, and it was probable that it would have to be put out of blast and partly unbuilt, proper working has been brought about and the obstruction removed by what was thought when first practised to be a desperate remedy, viz., cutting holes in the shaft at some elevation (15-20 feet) above the tuyeres and intro- ducing by means of temporary tuyeres blast at the orifices thus formed, so as to flux away the obstructing matter. In certain American works seaffolds have been melted away by introducing a little above the tuyere a pipe communicating with a barrel of petro- leum, so as to create an intense local heat by the combustion of the petroleum allowed to run in in a gentle stream.

13. oists and Lifts—Except when the natural varia- tions in the level of the ground permit of the materials being drawn in waggons or trucks to the top of the furnace directly, lifts of various kinds are employed to raise them.

“Water lifts” consist of a pair of chambers or cages | working in guides suspended to the two ends of a chain

passing over a pulley, and provided with water boxes, so that a stream of water from a tank or reservoir at a higher elevation can be directed into the uppermost waterbox, rendering that heavier than the other, when the weighted cage descends with the empty trucks drawing up the other one with the trucks laden with materials, the rate of descent being regulated by a brake. In frosty weather lifts of this kind are apt to become impracticable. Hydraulic lifts are sometimes used, consisting of a similar chamber suspended from a chain passing over multiplying pulley blocks and attached to the piston of a hydraulic ram, so that when the ram makes a stroke the chain draws up the cage; if the blocks multiply tenfold a stroke of 7 feet of the ram draws up the cage 70 feet. At the Bethlehem Works, U.S., an hydraulic hoist is employed in which the relatively short stroke of the ram is made to raise the cage through a much greater height by making the ram actuate an axle by means of a rack and pinion, a large wheel being fixed

on the axle over which the cage rope passes. Besides these

lifts, an inclined plane and stationary engine, or a vertical

lift like a colliery winding engine, is sometimes employed. Pneumatic lifts of various kinds are also in use, one consisting of a tall bell immersed in a water tank like an exaggerated thin gasometer; the bell is attached to the cage (underneath it) and also to a chain passing over a pulley to a counterpoise, the weight being so arranged that the bell, when not containing air under pressure, together with the cage and empty trolly, is heavier than the coun- terpoise, and sinks when a valve is opened, so that the internal air pressure becomes atmospheric; whilst on closing the valve and forcing air in, the water inside the bell is partially displaced, and the bell and cage, being relatively lighter, rise like an ordinary gasometer. Gjers’s pneumatic lift is a piston box, such that, the air being exhausted or compressed under the piston which is connected with the cage, a motion up or down as the case may be is

brought about. Fig, 14, taken from a paper by Gjers in the Journal Iron and Steel Institute, 1871, ii. 209, illustrates the mode of action; the cylinder is about 36 inches dia-~ meter, the piston being connected with the travelling plat- form (through the centre of which the cylinder passes freely) by four wire ropes passing over pulleys overhead; the platform runs along guides bolted to the cylinder. The platform and empty barrows being at the top, air at about 2 Ib pressure per square inch is forced into the cylinder underneath the piston, which suffices to make it ascend, and consequently to cause the table to descend; when barrows full of mine, coke, &c., are wheeled on to the platform, the air is sucked out from underneath the piston so as to make a vacuum of about 4 Ib (7.e, the pressure is reduced from 14 to 10 Ib per square inch) with heavy loads, and propor- tionately less with lighter. ones, when the atmospheric pressure now forces the piston down and draws the cage up. The strain on the ropes is thus diminished, whilst the objection to water lifts 'of being unworkable in frosty weather is entirely done away with. For heavier weights two larger cylinders are employed, working conjointly with the cage or platform between them.

14. Production of Blast.—The earliest blowing machines were made of goats' skins, inflated by hand by pulling cords, and compressed either by standing on them or by a weight or a bent bamboo acting asa spring, dec. ; such rude arrange- ments are still in use amongst certain Eastern nations; a kind of rudimentary cylinder blowing machine is also employed in certain districts, consisting of a hollowed log with a piston packed with feathers, leaves, dc. About the middle of the 17th century the trompe appears to have been first invented, probably in Italy. The action of this arrangement depends on the suction of air into a stream of falling water running from a tank by an orifice not too far from the surface of the water, just as occurs on pulling out the plug of an ordinary lavatory basin so as to discharge the water therein; the air carried down by the water is discharged into a chamber with an outlet at bottom for the water and one at top for the air, so that as long as the

stream of water is kept up a continuous air current passes

out of the air hole, the force of which is regulated by a plug-valve attached to a lever and cord, so that the furnace- man can at will diminish or increase the amount of falling water. In practice the trompe only utilizes a small frac- tion of the power of the descending water. It is of course inapplicable in cold climates during frost; a serious dis- advantage too is the fact that much fine spray accompanies the blast and interferes with the production of heat thereby. With a fall of 20 to 30 feet a well-proportioned trompe will deliver a sufficient air supply for a Catalan forge at a pressure of about 9 or 10 centimetres of mercury (about § atmosphere = nearly 2 ib per square inch).

16), consisting of two parallel tubes L, L running along the

The blowing engines in ordinary use in England are worked by yrs base of the stove above the firebars d, a communicating the

steam, but in other countries, e.g., Sweden, where sHkpws is available, this is frequently utilized. In principle cylinder blowing ma- ehines are precisely like inverted steam engines, the air taking the place of the steam; the single- acting machines are the reciprocal analogues of the atmospheric engine

KIN (saving of course in the means by ge A whilst the double-acting machines

which the return stroke is effected), | verted. In clack valve machines | mM , ta the motion of the piston in one ¢ Hd LAr

are high-pressure steam engines in- direction causes a diminished pres- sure behind it, and consequently air rushes in through the intake valve at that end, whilst the com- pression of the air in front of it opens the outlet valve of the other end and eauses the air to escape; on the return motion this outlet valve is closed and the intake valve of the same end opened, whilst the intake valve of the other end is closed and the outlet valve opened. In “slide valve” machines the moving clack valves are replaced by sliders connected with the piston rod by means of an

eccentric on the shaft driving it, so that, when the piston begins to make its stroke, the appropriate valves are closed or unclosed as the case may be. In order to equalize the intermittent blast thus produced, a regulator is sometimes interposed between the blowing eylinder and the furnace, consistin of a reservoir or chamber of considerable size which acts in much the same way as the air cham- ber of an ordinary force pump, the whole mass of air becoming some- what compressed when air is blown in, and the expansion during the momentary cessation of the supply keeping up a sufficiently equable stream of air issuing from the reservoir until the next eylinder- ful of air is blown in. To econo- mize space, a piston box with a eS loaded with weights, or a oaded gasometer in a water tank, may be substituted for the reservoir; the latter expedient is objectionable, causing the air to be saturated with moisture. If the furnace is at some distance from the blowing engine, the large mass of air in the blast main and superheaters serves to render uniform the eurrent supplied Tr to the furnace without any other FAO)

regulator being requisite.

15. Hotblast Stoves. —The oldest form of blast heating apparatus, applied by Neilson, consisted of a tubular rivetted boiler plate heating vessel (A, h, fig. 15), mounted in a brick chamber OOOO, and heated by a fire underneath fed through the door D, the waste gases from the fire passing out at the far end tothe chimney. Crescent- shaped partitions p, p, p inside the heater caused the current of air from the blowing engine which entered at B to take a serpentine course as indicated by the arrows, finally passing off at S to the furnace. This was speedily superseded by the "Calder pipe stove" (fig.

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Fic. 14.—Gjers's Furnace Hoist. I. Section. II. Elevation. III, and IV. Plans,

one with the other by a series of inverted U or horse-shoe shaped tubes; the blast being introduced into the cold

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main Bé, the air passes over into the hot main S through the curved tubes #, h, becoming heated in so doing, the flames from the fire Dd enveloping the horse-shoe tubes and then passing by the flue f to the chimney C. Many modifications of this stove have been introduced, several of which are still in use: thus in some the air is compelled to pass alternately from a portion of the one main to the other

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Fig. 15,

and vice versa several times so as to be more completely heated, passing through several horse-shoes before emerg- ing; the horse-shoes are sometimes altered into inverted V's, and made rectangular or flatly elliptical in section instead of circular so as to expose greater heating surface. To avoid the liability to fracture through unequal expansion, the U's are sometimes made of two parallel vertical tubes united by

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Fic, 16.—Calder Pipe Stove. I. End Elevation. II. Plan.

@ horizontal connecting tube socketed into each, just as each vertical tube is socketed into the main (fig. 17). The “ pistol pipe ” stove, still largely used (fig. 18), chiefly differs from this in having the limbs of the U tube closely adjacent, 80 as to consist in fact of a single tube with a partition D in the centre, the cold air passing up one side of the partition and down the other so as to become heated in passing ; to accommodate the pipe to an arched roof, the upper end is bent inwards, thus giving the form of a pistol stock and barrel to the double pipe, two ranks of pipes facing one another being built in the same stove. Another modifica- tion of the older tubular superheater consisted of a serpen- tine or coil of piping made of cast iron pipes bent into half circles and socketed together, so as to form a continuous

II. Elevation.

worm tube which was mounted inside a brickwork stove and heated by a fire in much the same way as the Calder pipe stove. The " Wasseralfingen superheater" consists of a kind of serpentine of which the curved parts lie outside

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-Pistol Pipe Stove.

the stove, only straight tubes being exposed to heat. The "'Blaina oven" differs from this chiefly in the serpentine being vertical instead of horizontal, and in the whole of the serpentine (the curved ends inclusive) being exposed to the heating flame.

The substitution of the waste gases from the blast furnaces as fuel for the coal or coke-fired fireplaces originally used for these and various other forms of superheater not only works advantageously in saving the fuel that would otherwise be requisite, but also keeps up a more regular heating effect, and diminishes the liability to breakage through unequal expansion, &c. All these forms of super- heater, however, are open to the same objection, viz., that it is impracticable to heat the blast continuously by means of them to a higher temperature than about 450° C., otherwise the iron pipes get speedily burnt away. In order to obtain a higher temperature, the principle of the Siemens regenerative furnace is employed in the Siemens-Cowper stove, the flame from the

combustion of the waste gases from the blast furnaces being made to traverse piles or stacks of brickwork loosely heaped together or regularly laid so as to heat up the brickwork, the products of combustion finally passing off to the chimney at a comparatively low temperature. After the lapse of a certain time the os is shut off, and the cold air blast made to traverse the heated brickwork in the reverse direction, entering at the cooler chimney end, and leaving at the hottest point near where the furnace gases and the air to burn them originally entered ; two such regenerators are used together alternately, the flame heat- ing up one whilst the blast is being heated in the other, and vice versa, the shifting of the blast and furnace gases from the one to the other being accomplished by opening and shutting suitable valves. Owing to the presence of dust in the blast furnace gases, the cavities between the piled bricks are apt to become filled up with deposit ; to remedy this inconvenience in the " Whitwell stove " the piles of brickwork are replaced by a series of parallel firebrick walls about 9 inches apart, each wall being perforated by arched openings at the top and bottom respectively in cach alternate wall, so that the flame passes alternately up and down between each wall and the adjacent one, thus heating up the surfaces of the walls (figs. 19, 20). By means of manholes at the top and sides scrapers can be introduced from time to time, and the deposit of flue dust scraped off the walls and removed from the stove without rendering it necessary to take down the internal brickwork at all. With regenerative stoves of this description worked in pairs it is easy to obtain a continuous blast at a temperature of 750° to 800° C.

Determination of Temperature of Blast.—A rough and ready method often employed is to take out a plug from the blast main, or " gooseneck," supplying the tuyere, and to hold in the issuing stream of hot air a rod of zine or other test metal for a determinate time, noting how long it takes to melt its end. More accurate methods consist in the use of specially constructed pyrometers. Certain forms containing a compound silver and platinum spiral, working on much the same principle as that of Bregnet's thermo- meter, and others in which the expansion of a bar of metal moves an index by means of multiplying wheels or levers, although useful for comparatively low temperatures

(below 500° C.), are out of the question for intensely heated blasts; in such cases two forms of pyrometer invented by Siemens are applicable. One of these is an adaptation of the method employed by Pouillet for determining

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high temperatures, consisting of a calorimeter into which a heated ball of platinum is dropped ; the rise in temperature of the water being noted, the amount of heat lost by the platinum, and conse- quently its initial temperature, is known. The calorimeter in

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1G. 19.—Whitwell Stove—Vertical Section.

Siemens’s instrument (fig. 21) is a copper cylinder jacketed outside with a double jacket, the inner portion of which is an air space and the outer a concentric layer of hair so as to diminish errors due to radiation and atmo- spheric action ; this is provided with a thermo- meter, the bulb of which is protected by a copper gauze sovgring fixed in a groove in the wall of the innermost vessel ; a sliding scale is attached, so constructed as to indi- cate at sight the tempera- ture of the ball dropped in when the zero of the scale is adjusted to the temperature of the calori- meter before starting as indicated by the

height of the thermometric mer- curial column, and the level of the mercury sub- sequently read off on the scale in that position after the ball has been dropped in,—the size of the ball and the quantity of water in the instrument being duly proportioned to one another. The “ball” is a cylinder of copper with a perforation in the axis, so that it can be lifted up on a pointed rod and introduced through a small opening into the blast main, &., to be examined ; after a few minutes, when the ball has attained to the temperature of the blast, it is quickly withdrawn and dropped into the copper calorimeter previously filled up to a mark with water, which is well stirred up before setting the movable scale and subsequently after the ball is dropped in, so as to equalize the temperature. Usually the calorimeter holds a pint of water, the copper being of such a weight that its thermal capacity is equal to y of a pint of water. With an instrument that has been “calibrated” (7.¢., the error of each scale indication determined by previous experiments at accurately measured temperatures), the writer’s experience is that very concordant and accurate results may be obtained by an expert operator working in precisely the sume way as that employed in the calibration of the instrument, but that very considcrable errors are apt to be introduced if the instruments as sold are employed without such corrections being made, and if the times which elapse during the withdrawal of the heated ball from the blast main and its dropping into the water are at all uncqual, so that different amounts of heat are lost by atmospheric cooling before the ball reaches the water. Morcover, with use the balls become lighter, and the temperature indicated is then too low.

The other Siemens pyrometer depends on the alteration of the electrical resistance of a platinum wire when heated. The current from a suitable battery is divided into two branches, one of which

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passes through the experimental wire and the other through a counterbalancing resistance consisting of another wire which is not heated, the two branches again mecting in one conducting wire which completes the circuit. If the two counterbalancing wires are at the same temperature, equal amounts —,

of current will flow through each branch, the resistance of the conductors, &c., in each branch other than the two wires being equal; but if one wire be hotter, less current will flow through that branch as compared with the other in proportion as the temperature is more elevated. By determining electric- ally the difference between the amounts of current in the two branches, a means is afforded of calculating the temperature to which the hotter wire has been raised. In the newest form of instrument (fig. 22) a pair of ingeniously constructed voltameters is employed as the current-difference mea- surer, onc being in each branch of the com- pound circuit, so that by reading off the 4” volumes of gas evolved in the two, and [| referring to specially constructed tables, the temperature of the heated wire is at once known. In order to apply this to the mea- surement of the temperature of blast mains, furnaces, &c., the wire to be heated is wound spirally upon a porcelain cylinder, which is then enclosed in a protecting iron tube ; | the ends of the platinum wire are connected with thick copper leading wires insulated by kaolin, &¢c., atthe hot part of the tube, and by ordinary gutta percha, &c., at the other end. An equal amount of the same copper wire is included in the second branch, usually by carrying three wires through the hollow iron tube,

—one to convey the current before branching (the division taking place near the heated end), the other to convey the current through the branch containing the heated wire, and the third for the current in the other branch to pass through ; in this way errors through the unequal length and heating of the copper conductors in the two branches aré avoided. Very accurate measurements are obtainable with instruments of this class when newly arranged; but it is not always certain that the resistance of a given platinum wire will remain constant after long-continued heating or interrupted exposure to high tempera- tures, &c.; in consequence it is requisite that the actual resistance after cooling of the heated wire should be verified from time to time, and the numerical values in the instrumental tables suitably adjusted when any alteration has taken place, otherwise serious errors may be introduced.

For temperatures above 800° or 900° C. a peculiar pyrometer has been proposed by Lamy (Comptes Rendus, lxix. 847), based upon the connexion between the amount of dissociation of calcium carbonate and the pressure and temperature to which it is subjected; a glazed porcelain tube closed at one end with some fragments of marble and calespar is filled with carbon dioxide gas and connected with a mercurial manometer ; on placing the end of the tube containing the calcspar on the furnace to be examined, the extra pressure due to the evolved carbon dioxide is read off on the manometer, and the temperature thence deduced by a table ; on cooling, the evolved gas is reabsorbed by the partially causticized lime.

Tuyeres.—The heated blast passes into the furnace through nozzles or ¢wyeres supplied from an annular or horse- shoe shaped tube carried round the lower part of the furnace at an elevation of a few feet above them by means of slant- ing tubes at right angles to the ring known as "swan necks" or "goose necks." Usually the annular tube is carried by the columns supporting the superstructure by means of suitable braces or gibbets, and communicates with the blast main ata point as near to the superheater as possible, slide valves being provided for each goose neck s0 that any one of the tuyeres can, when necessary, be shut off without stopping the supply of blast to the others; when more than one furnace is supplied from the same hot main, a similar valve is provided

in the branch from the main leading to each furnace. In order to adjust the nozzle of the tuyere accurately to the tuyere hole in the hearth wall, a sliding telescope joint is often inserted between the nozzle and the end of the goose neck, the lowest portion of the nearly vertical part of which is provided. with a tubulus closed with a hollow stopper, the hollow of

which is covered with a plate of mica; by looking through

om Tees,

the mica along the axis of the nozzle a view of the furnace | furnace, this effects an equal distribution of blast, and interior is obtained, whilst by removing the stopper a jet of | facilitates regular working. With small-sized faxpacés hot blast rushes out, by means of which the temperature | such as are used in various parts of the Continent (with 4 charcoal as fuel), two tuyeres only are fre- quently used; with larger ones three, four, or five are usually employed, the diameter of the orifice of the nozzle being greater tlie greater the furnace; thus whilst some 2 inches diameter suffices with the smaller SSS N erg 4, 5, 6, and even 8 inch nozzles are S95 Sallie RUE with the larger furnaces, especially in Bala Y America (e.g., at Pittsburg), and sehad "ho number of tuyeres is small. In other cases a larger number of tuyeres, sometimes as many as eight, are substituted for increased dimensions, so as to enable the requisite amount of air to pass into the furnace with- out unduly increasing the pressure of the blast, which varies from 2 to 50 per cent. of au atmosphere (z.¢., from about half an inch to 15 inches of mercury, representing from 4 oz. to 74 tb per square inch), the lightest pressure being employed in small charcoal furnaces, and the heaviest in the English hard coke large furnaces and the American anthracite furnaces, especially the latter, on account of the tendency of the anthracite to disintegrate and so plug up the passages between the lumpsof ore, &c. The pressure of the blast in ordinary large English furnaces, such as those of the Cleve- land district, usually averages about 4 to 4:5 Ib per square inch, equivalent to about one-third of an atmosphere, or some 10 inches of mercury. = When the nozzle of a

tuyere gets injured or = burnt through, the water intended to keep it cool

. Fia. 22.—I. Siemens Electrical Pyrometer. JI. Section of Heated End. is apt to find its way into the furnace. As long as III. Double Voltameter. the quantity of water thus introduced is small, the

can be ascertained by holding rods of zinc, é&c., in the | to the tuyere ce ee haat frosadins on ae onvocsibar ef the jet ; = the ball of a Siemens pyrometer can be introduced | water into steam and the reaction of 7 water vapour on the red hot into the tuyere through the orifice. coke, forming carbou oxide and hydrogen (the presence of extra In the he days es the hot blast it speedily became hydrogen thus formed also modifics to some extent the chemical Sok fit unl h 1 4 ae actions taking place in the upper part of the furnace in a direction manifest that unless the tuyere nozzles were artificially rather the reverse of economical as regards consumption of fuel); if, cooled they became so rapidly eaten away that practically | on the other hand, a large volume of water is suddenly introduced, the hot blast was inapplic- and especially if by a "slip" (or sudden jerky motion downwards able; to remedy this the of a mass of material that had previously more or less " scaffolded ") io. a : it is forced into the mass of molten cinder and pig in the hearth, or,

water tuyere" was In-

: : what amounts to the same thing, if the cinder and molten pig are vented by Condie. This suddenly forced or splashed up by the slip, a sudden explosive simply consists of a nozzle generation of steam (and probably decomposition into pd me and with double walls, the outer hydrogen, or formation of iron oxide and free hydrogen) takes place, one formi or ket" sometimes giving rise to serious accidents. Why contact with

ic. Ball pees vitreous matter (such as cinder, &c.) should cause a more explosive round the inner one or formation of water vapour or gases than contact with metal is nozzle proper, water being unknown, but probably the cause is the same as that in virtue of allowed to

circulatethrough [_— a —< — in “pera “— thing Fog ee tenes ydrogen quickly but not explosively, whereas 11 the sodium touc res ioe between the walls. glass, glazed crockery, &c., and water simultaneously, a violent — of effecting : explosion often occurs, In foundries and during the refining of the cooling is by bending Fig. 23. iron (§ 28), if water be thrown on the surface of the molten or a coil of wrought iron piping into a conical spiral (fig. 23), — SOOM 20 ree an does inside the furnace sometimes occurs with serious consequences; but se loos e tuyeres are genera ly arranged sym- | this isa different thing from (though often combined with) the metrically in a horizontal plane round the base of the | effect of water being carried suddenly into a rp: the cinder,. , oF

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&c. In order to diminish the liability to explosions from this effect of water, Lloyd has patented a peculiar tuyere into which the cool- ing water is injected in the form of spray or fine jets all over the outer surface of an inner conical tube through which the hot air passes, as well as over the inner surface of an outer covering cone, so that in case of the end of the tuyere being burnt away the volume of water injected into the furnace is mueh lessened, as owing to the incline backwards of the lowest part of the cone (the axis being horizontal) most of the water runs out away from the furnace instead of being forced into it by the pressure of the head of water as in the ordinary coil tuyere. When the water supplied is muddy, or is apt to deposit matter on warming or standing, there is a liability to stopping up of the holes through which the fine jets of water pass; to reniedy this Plum modifies the arrangement by mak- ing the water pass through a slit or against a sheet of metal so as to spread it out into fan-shaped jets delivered against the nose of the tuyere and the upper half of the outer shell. For drawings of this “spreader tuyere,” see Journal I. and S. Inst., 1878, 299.1

16. Collection of Cinder and Pig Iron.—As the cinder flows off from the furnace it is usually received in rectangular or cylindrical iron tanks mounted on wheels and running on a railway at a few feet lower level

than the base of the furnace ; the cinder balls thus formed are usually dis- charged on to some vacant piece of ground in the vicinity of the furnace, thus entailing the loss of the value of the ground.? The Kloman machine used in America for the reception of the cinder consists of a series of iron boxes placed in a water tank on a turn-table, the object being to quicken the solidification of the cinder and get it out of the way more rapidly. In order to cast the pig iron into convenient marketable forms, the ground in front of the tapping hole is made into a pigbed, by arranging it at a gentle slope from the tapping hole and covering it with loam or sand. A channel is dug in this with a spade, &c., leading down the slope in a right line from the tapping hole; and at right angles to this side channels are dug, the ground sloping laterally away from the main channel; from each side channel moulds are made to spring, prepared by pressing into the yielding sand wooden blocks some 2 or 3 feet in length, and in section like a capital D, the convex side (on which is embossed or engraved the particular mark or brand of the iron-works) being downwards. When the furnace is tapped the rivulet of molten metal running down the main channel is

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out at the tapping hole. Whilst the castings are still at a dull red heat and the metal is consequently Fig. 24.

brittle, the gags or masses of metal filling the moulds are detached from the sows, or irregular larger pigs from the channels, by means of a crowbar. In some works the tap- ping is performed only once in twelve hours; in others a cast is made every eight hours or even more frequently ; of course the oftener the furnace is tapped the less the size of the pigbed required. Occasionally the molten metal is

first directed into the lowest row of rn | : moulds, and when these are full the {| | NUUUY supplyis shutoff byplunginga spade [fi NNN coated with fireclay into the channel | JH JUUUU at a (fig. 24), so as to fill up the rin Thin second row of moulds, and so on [J Wy | wy successively until only cinder flows aL che =a utd SUSTAIN

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1 A large amount of detailed information as to the dimensions and construction and general working of the blast furnaces and subsidiary plant of a number of the more important American iron-works is to be found in a series of papers on “ American Iron and Steel Works,” by A. L, Holley and Lenox Smith, Engineering, 1877, &e.

2 In the vicinity of Middlesborough they have for some time been largely disposed of by using them to build a retaining wall to keep the sea back from low-lying ground and mud banks covered at high water to a greater or lesser extent, whereby not only is a valueless waste product got rid off, but a recovery of what may hereafter prove to be valuable land from the sea is effected.

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run into waggons lined with firebrick serving as reservoirs supplying with fused pig Bessemer converters conjoined with the smelting furnaces ; so that the molten cast iron is run directly into the converters and finished off without ever solidifying before the completion of the steel-making process, Sometimes the metal is cast into pigs in iron moulds instead of a sand bed.

Composition of Pig Iron.—The following analyses illustrate the

difference in composition of various kinds of pig iron as met with in the market :—

Pig Irons comparatively free from Sulphur and Phosphorus.

| Cumberland and Brown | Lancashire pane Eisenerz| yoy e | Hematite Character of Pig Hematite Pig. Charcoal Charcoal Superior epee oe and Locality… | wnite-|Cleator| 2‘8> | spathte Charcoal Ore, Nova haven, | Gr i 4 aOH Scotia, No. 1, ADVE ccicnesvst teed Abel. a eg ge ay 94°86 | 93:94 |. 95°57 95°68 93°34 ““Combined” carbon | trace x j ¢ 0°38 Graphite… sscccsseees oor |f £18 | 420 | a07 | 4355 BUCO woos scccesoreeeued 2°77 1:92 0:08 0-13 2:28 DHL P BG iacsio.sates ceeses

0-01 0°05 trace 001 0°08 PHOSPHOTUS «...c0nsccees 0:05 008 0-05 trace 0-10 Manganese…….....000+. 0°07 0:02 0°10 0°61 017

10019 | 100-00 | 100-00

| phere Tron- Calder stone, Clarence 5 Glazy Character of Pig Furnaces. Works, Ores mixed] cal Pig,| ron,

and Locality… | with tap- | White. | Cleveland.

No. 1. | Mottled.

Lowthian

ttin- wy

Analyst .eesssunee4 | Pagan" | Pattin Ale WUOMG ssecsecvsweesnsveen), "248 93°59 88°18 "Combined" caibon| 0°32 0:85 0°79 | CORPEPPRE trooper 3°43 2°70 2°59 Boos te conse Seon oe 1-70 0°66 5°18 «i O18 0°35 0°17 Phosphorns …….....| 1°24 1°05 112 Manganese…….....| 0°30 079 077 THANIOM:.....c0ss2-006 0:56 "oh 0°26

ATSe@niC e200: 5 ins mae

Calcium, Magnes.)

ium, Alumin- 0:06 traces 3°28 100°17 100-000 99°29

Composition of Cinder.—Sometimes cinder is highly crystalline ; that from clay ironstone, especially of the Cleveland district, however, is usually amorphous ; the structure in all cases depends much upon the rate of cooling, a cinder which is distinctly erystalline when a large mass is cooled slowly being often vitreous and wholly devoid of crystalline texture when cooled quickly in

Analyses showing Composition of Cinder.

Askam in

{ Loeality an@ |

Particulars…

Lowthian Rammels- » Analyst vss { te 2 a Wehrle. SINGH < .csazseosvence 27°65 55°25 546 Alumina…..... 24°69 5°71 26 TAME .n cccéssectinnened 40°00 27°60 104 Magnesia …..... 3°55 701 13 Potash and soda.. 3°45

100°62

small quantities at a time. Presence of much lime makes the cinder chalky or stony in appearance ; ferrous oxide communicates a dark green or black tint and a ready fusibility to it; manganese oxide often gives an amethystine shade. Ultramarine appears to be sometimes formed, some slags possessing a blue colour easily dis- charged by mineral acids ; the bluc tint is, however, attributed by

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some to different causes, such as compounds of vanadium and titanium. When, in addition to the "mine" or ordinary ores, the substances smelted contain an admixture of the slags from puddling and reheating furnaces, or of " mill cinder " (scales from the rolling mills used in the production of malleable iron), the blast. furnace cinder is apt to contain an undue proportion of iron, these additional substances being usually much more compact in their texture than ores, and at the same time more fusible, so that their complete reduction is often not effected in the time during which they are traversing the furnace. Since these slags are usually highly con- taminated with phosphorus and sulphur, they are only employed as a rule in conjunction with ores yielding the commoner qualities of iron, furnishing " cinder pig," which is often wholly white, and less carbonized and more impure than other kinds ot white iron. The accompanying analyses illustrate the composition of the cinder roduced in furnaces smelting various kinds of ore.

17. Utilization of Cinder.—When the cinder does not contain too much lime orcalcium sulphide, it often forms a material of moderate hardness and durability suitable for road metal ; but frequently it is of but little value for this purpose, owing to its friability and ten- dency to fall to pieces on exposure to air and moisture. By casting the molten cinder (when of the requisite amount of durability) into rectangular blocks, a good substitute for building stone is produccd ; in other cases, by the addition of alkaline silicates, a serviceable coarse bottle glass can be obtained. Vitreous cinders also serve for the preparation of a variety of " mineral wool," a filamentous sub- stance something like spun glass producible by cade: | air or steam through the molten cinder, and useful for packing the jackets of steam pipes, boilers, &., to avoid loss of heat, and superior for this

rpose to organie substances in being not lable to char or burn. Fortain kinds of cinder which approximate to cements in composi-

tion may be utilized in the manufacture of hydraulic mortars, Port-land cement, &c., by heating together with lime or hydraulic lime-stone ; according to J. Huck, if the powdered slag be stirred up in a tank with dilute hydrochloric acid (containing some 17 per cent. of actual acid, HCl), sulphuretted hydrogen is evolved, and a partly gelatinized mass is produced by the decomposition of the silicates ; this when washed, drained, dried, and ground to fine powder, and mixed with finely powdered ordinary slag so as to constitute about 10 per cent. of the mixture, affords a cement capable of use for all sorts of work as well under water as above it, and equal in quality to the best cements in ordinary use. Bricks for building purposes may be made from suitable kinds of cinder by grinding it to a coarse powder, moistening and mixing with a little lime, and strongly compressing in moulds by machinery ; the brick sets in a few days to a hard stone-like mass; some cinders will thus set without addition of lime by merely grinding up fine, moistening, and compressing. In order to facilitate the grinding, C. Wood has patented the following process: the molten slag as it runs from the furnace is received on a slowly revolving horizontal

table and cooled by a jet of water (fig. 25), which causes it to disintegrate into comparatively small fragments which are much more readily pulverized than the compact blocks formed when the molten slag runs into a receptacle and there solidifies ; or it is reduced to a kind of sand by running it into water kept in agitation by a pecu- liar machine, the sand being a moderately useful manure for certain soils. See Journal J. and S. Inst., 1873, 186, and 1877, 448; and Journal Soc. Arts, May 14, 1880 (vol. xxvili. p. 576). At the Sclessin Works, Liége, slag sand is made without any machinery at all by simply making the stream of molten slag run into a con- stant-running jet of water issuing obliquely from behind ; the slag thus disintegrates spontaneously into small fragments, Many

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Fic. 25.—Wood's Slag Machine.

kinds of cinder, however, are of so little value for any of these purposes that they constitute a wholly waste product, the getting rid of which in the cheapest way possible is a desideratum.

18. Collection of Waste Giases.—To M. Aubertot of the department of Cher belongs the credit of having first attempted to utilize the gases escaping from blast furnaces, in 1811; a brick kiln being erected on the top of the furnace, the flame was allowed to pass in and so burn the bricks; the calcination of lime and the heating of the chests containing charcoal and iron bars for steel cementa- tion was effected by him in the same way. In later years steam boilers were heated in much the same way; about 1840, at the Rustrel furnaces (department of Vaucluse), the device was in use of drawing off the gases by means of a tube and burning them underneath the boilers placed, not on the top of the furnace, but in any convenient place even though at some distance. The use of the waste gases for heating the blast on this principle was patented in Eng- land by J. Palmer Budd in 1845. A few years later George Parry of Ebbw Vale adapted an old arrangement for distributing equally the charges introduced into the furnace (by shooting the materials on to a conical surface at the mouth of the shaft)

so as to form a kind of valve, closing the furnace entirely when shut and allowing the

gases to pass out completely into a tube conveying them to the places where they were to be burnt, and at the same time allowing the charge to be

introduced almost instantane- ously when opened. This “cup and cone” arrangement is re- presented in fig. 26.

By simply lowering the cone (counterbalanced) the materials shoot off it into the furnace; by immediately raising it the furnace is again closed ; on account of its simplicity and ease in working it has been very largely adopted, especially as it facilitates the proper distribution of materials inside the furnace by making them glide off the slanting conical surface so as to be deposited at the sides of the shaft and not at its centre; the effect of this is to tend to make the upper surface of the mass concave instead of convex, and in consequence the lighter coke or charcoal tends to roll down the slope towards the centre somewhat more than the heavier ore and flux, so that the central portion of the mass of materials In the shaft is somewhat richer in fucl than the sides; if the furnace is full nearly to the throat and of considerable width, the surface will be erater-shaped,—the heavier ore, &c., accumulating in the circular crater ridge, and the lighter coke rolling down inwards towards the centre, and outwards towards the side of the shaft. As the materials sink the outermost layers are retarded by friction against the sides

of the shaft, so that they have a tendency to fall over inwards during deseent and produce intermixture ; in this way a much more nearly uniform degree of porosity of the whole mass (and conse- quently of action of the ascending gases) is brought about than would be the case were the materials introduced through a narrow funncl so as to form a convex-surfaced heap in which the ore would accumulate in the eentre. Sometimes the eup and eone arrange- ment is modified by making the

cone to rest upon the inner and lower edge of the hollow in the cup, so that the introduction of fuel is accomplished by apr br cone

instead of lowering it, the object of this being to diminish the height of the furnace by the space through which the cone would otherwise sink when lowered. With this arrangement the mate- rials run into the furnace in @ geeees direction sloping towards the

centre instead of away from it, & sliding inwards along the eonverg- ing sides of the cup. To avoid the central aceumulation of fuel and the lateral preponderance of “burden”? (ore and flux) thus promoted, an inverted annular funnel is suspended underneath the lower orifice of the eup, so that the falling substanees im- pinge upon this and slide off

Fia. 27.—Colleeting Top.

again with a motion towards the eircumference of the shaft just as they do from the eone itself in the ordinary arrangement.

- **Prior to the introduetion of the cup and eone, a form of tunnel- head in whieh no valve or cone exists was employed, represented in fig. 27, A hollow annular chamber BB is built in the upper portion**

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Fig. 28.—Langen’s Collector—Vertical Section.

of the stack, communicating by arched cavities A, A, A with the shaft, and also with the exit gas main C; a considerable fraction of the gases then passes out through the arehed cavities when the materials are heaped up to the level of the charging door D. With small furnaces the wall between the shaft and the chamber B is made of

Ar. C

Ga I |

Fic. 29.—Langen's Colleetor—Horizontal Section.

cast or wrought iron ; in some cases the gas has been collected through a central tube in the axis of the shaft supported by groins springing from the shaft, the ore, &c., being charged through the annular opening between this tube and the shaft. Arrangements of this kind are still used in Sweden. In Coingt's gas collector the central tube is combined with a modification of the cup and

cone arrangement. Langen's arrangement (figs. 28, 29) is @ somes what similar combination, the cone being made into a bell with

perforated top, the edges of the perforation being turned over in-

wards bb; the bell rests upon the eup aa, the turned over edge ce

fitting into a water lute surrounding the central tube kkk, so that

whilst the bell is lowered the furnace top is gastight or nearly so. By means of a pair of levers d, d and a connterpoise swung on a horizontal axle at r by means of a winch ¢, the bell can be raised so that the charge in the cup falls into the furnace, sliding down the inclined surface. Two safety valves x and fg are provided, the latter being ordinarily supported by the pressure of the gases, but falling by its own weight when the gas pressure is relieved by raising the bell, so as to close the top of the gas shaft, the turned-down edges of g fitting into the annular groove 00 ; h is a small manhole for the introduction of serapers to clear out flue dust when required.

Composition of Waste Gases.—In general terms the escaping gases may be said to be the nitrogen of the blast mixed with variable proportions of carbon oxide and dioxide, and usually small quantities of free hydrogen ; when raw coal is the fuel, the proportion of hydrogen is greater, and carburetted hydrogens are also present. The main sources of hydrogen when coke and charcoal are used as fuel are probably the hydrogenous matter in the fuel, and the moisture contained in the blast

and in the materials as water of hydration not expelled until they reach a part of the furnace sufficiently high to cause the water vapour to react whilst still nascent on the carbon present, forming carbon oxide and hydrogen (see § 10).

Various solid substanees are mechanieally carried up with the gases, these having in many instances been vaporized at the lower levels, condensing again in the relatively cooler portions of the furnace as finely divided partieles. This especially applies to zinc oxide (formed by the oxidation of zinc vapour generated by the re- duction of zinc compounds in the ores) and to compounds of the alkali metals, and gives rise in the latter ease to a destructive flux- ing action upon the brick-work of the upper portion of the furnaee and to a complication in the chemical changes ensuing in the furnace ; for the solid floating particles are more or less intercepted and filtered out, as it were, from the ascending stream of gases by the materials in the upper part of the furnace, and are thus brought baek again to the lower level, so that an accumulation in the furnaee of alkali metals is produeed which ultimately causes the actual quantity of alkaline compounds in the furnace to bear a very eon- siderable | pre to the iron present, although the amount of potash and soda in the ore flux and fluel is originally only trifling as compared with the iron. Those portions of the suspended solid matters which are not thus retained in the furnace by condensation on the materials are more or less deposited in the gas flues, and the heating stoves, &c., in which the gas is burnt, sometimes causing considerable inconvenience, and rendering it necessary to clean out the deposits from time to time. To avoid this clogging, the fume is sometimes washed out of the gases by jets of water in the form of spray before they pass on from the downeast pipe to the stoves ; an arrangement of this description applied to the Luey fur- nace (Pittsburg, U. S.) has worked well. The following analyses represent the composition of the fume deposited in the gas flues of various furnaces : —

Furnaces of Furnaces |Pheenix Iron at Stenay |Co., Pheenix-

Clarence. H. Brivet.

Source of Fume { Dowlals. is Tnsol- (Meuse). | ville, Penn- and Analyst… Riley. 5 “pe wala sylv. iasihe. in Blodgett Water. | water. Britton. BUNS cies czeectscaenl? OOOO 1:37 11:00 | 86:00 AlumIin@ ....-cccc 8°43, 12-20 |) 10°76 657 Ferric oxide …...| 47°05 ces NO 21:72 Bime: ise 2°30 | traces 2°06 3°98 Magnesia … 1:13 | traces | traces 0°69 ZANC OXIAG .2 0000-0 we 4°58 13°28 2°84 Sulphuric anhy-) v ? i Grldle. ssscuaes- oor = Chlotine..:....<<<3 ais 0°57 Ban 0:03 Potash and soda ' ‘ , . HANG wresseasesesan ; _ =“ os die — ORIG s..2022. ae arbonic anhy- ; Arte sealecuc toss ~~— _ Water and mat~~ ters lostonigni-| + 0°93 * GIOM i Scbsveceeanss Manganese oxide} 1°77 1°66 Calcium sulphate} 4°42 Bs 0:38 — Do, phosphate! 0°75 (Phosphoric acid.)

52°67 47°17 100 00

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- Amongst the alkaline salts thus deposited are considerable amounts (under certain circumstances) of potassium and sodium cyanides ($ 19); this circumstance appears to have misled Pro- fessors Bunsen and Playfair into the belief that cyanogen gas is occasionally one of the uormal constituents of blast furnace gases as they eseape at the top, the cyanides being more or less deposited in the collecting tube employed, and decomposed by the carbon dioxide and moisture present, with the production of hydrocyanic vapour, which on analysis gives the same numbers as the same bulk of a mixture of hydrogen and cyanogen in equal volumes ; it is noteworthy that cyanogen has never been found by any other analyst. The following analyses indicate the general character of the waste gases escaping at the top of blast furnaces smelting various ores:—

Lowthian Bell.

NitTOZen…..e..s-+ ° 7 : : 60°93 Carbon oxide…...

Carbon dioxide… Hydrogen oes Marsh gas Olefines (express- ed as CoH) coors

J, Alfreton furnaces using raw coal, caleined clay ironstone, and limestone: blast at 330° C,

- **9, Seraing furnace using coke, brown hematite with a little mill cinder, and limestone: blast about 180° C.**

3, Wrbna furnaee using spathic ore and charcoal; blast at 400° C.

4, Askam-in-Furness furnace using Askam hematite, Fisher's Red Bay aluminous ore, and coke: blast at 500° C.; exit gases at 380° C.

5. Average of a number of analyses of gas from an 80 foot furnacc using cal- cined Cleveland ore, limestone, and hard coke; blast at 485° (average), and exit gases at 332° C.

6. Coltness furnace using raw coal.

The precise rclative amounts of carbon oxide and dioxide that accompany the proper working of any particular furnace are governed by a variety of circumstances, many of which have been carefully investigated by Percy, Bunsen and Playfair, Vathaire, Tiinner, Ebelmen, Scheerer, and others, and more especially by Lowthian Bell, with the present writer's cooperation (Chemical Phenomena of Iron Smelting), with the general result that the amount of heat produced in the furnace by the conversion of the fuel (coke or charcoal) into carbon oxide and dioxide, together with that introduced by the blast, is cqual to the sensible heat carried out by the escaping gases and the molten pig and cinder, together with an amount constant for given conditions, but otherwise variable within certain limits, representing the sum of the heat absorptions during the various physical and chemical changes going on in the furnace, and the loss of heat from the furnace walls by radiation and conduction ; so that for given sizes and shapes of furnace, given ores aud fluxes, and production ot given kinds of pig iron and cinder, the amount of carbon oxide relatively to the carbon dioxide in the escaping gascs is regulated ouly by the proportion of fuel burnt, and the temperature of the issuing gases ; this latter being also constant, the greater the amount of coke burnt per ton of iron run the more carbon oxide exists in the waste gases and the less carbon dioxide,

and vice versa. There is always a natural limit, however, to the extent to which the quantity of carbon mopoxido can be reduced and that of carbon dioxide increased jn any given furnace under any given conditions (as to nature of ore, &c.) by diminishing the amount of fuel relatively to the burden ; as this limit is being approached and passed, the pig iron begins to deteriorate in quality, first being less graphitoidal or "grey"' in character, then becoming entirely white iron of a less carbonized character than good pig of the kind; finally a large fraction of the iron is wholly unreduced, and passes into the cinder as ferrons oxide (silicate), producing a strongly marked "scouring cinder," and greatly diminishing the yield. The reason for this is simply the natural character of the complex chemical changes and _reac- tions involved in the working of the blast furnace (dealt with in detail in § 19).

Poisonous Effects of Blast-Furnace Gases.—Carbon oxide being, as is well known, a poisonous gas, rapidly producing death when inhaled even in small quantity (as when badly ventilated rooms are warmed by charcoal brazicrs, &c., or when a considerable escape of coal gas—containing usually a few parts per cent. of carbon oxide—takes place into the air of the room), it results that unless care be taken serious effects may be produced by the inhala- tion of the waste gases from the blast furnace. Several fatal occurrences due to this cause have taken place, one of the most remarkable of which was the death of Mr Truran, manager of the Dowlais iron-works, through the escape into his office of the gases from the gas main, which was of brickwork, and newly constructed underground, Besides carbon oxide, the waste gases often contain perceptible quantities of potassium cyanide disseminated through

them as dust ; the cffect of moisture and carbon dioxide upon such air is to impregnate it with vapour of hydroeyanic acid (prussic acid) ; in some of the cases of poisoning by waste gases the cyanide was believed to be the chicf deleterious agent.

19. Chemical Changes taking place in the Blast Furnace. —At the level of the tuyeres, the entering blast comes in contact with a mass of incandescent coke through and over which molten cinder and pig iron

are dropping and running ; the almost instantaneous effect upon the air con- sequently is to transform the oxygen into carbon oxide either at once or through the two well-known reactions :—

Cre ere. « 4 fA), ROprOreeCD «ow wt sw (2) If a hole be drilled through the walls of a furnace at the tuyere level, and the issuing gases collected (or, what is much the same thing, if the blast be shut off from one goose neck and the plug taken out so that the pressure of gases inside the furnace forces gas out at the orifice), it is invariably found that the amount of carbon dioxide present in the gases is inconsiderable or nil,—the composition of the gases being essentially a mixture of carbon and nitrogen with a little hydrogen (either derived from the moisture in the blast being converted into hydrogen and carbon oxide, or from the hydrogen of the coke first burnt to water vapour and then immediately reconverted into hydrogen and carbon oxide), Besides the carbon oxide due to these causes, there is also a small amount of that gas arising from the molten iron and cinder accu- mulated in the hearth, owing to the reaction of. the dis- solved carbon on the last traces of iron oxide disseminated through the pig and dissolved in the cinder ; so that at the tuyere level there naturally is a little more oxygen relatively to the nitrogen than that corresponding to the oxygen of the original air and moisture in the blast, viz., a mixture of about 35 volumes of carbon oxide and 65 of nitrogen, Jn passing through the mass of materials in the Feats the carbon oxide becomes more or less con- verted into carbon dioxide, reducing the iron ore in virtue of the change expressed in general terms by the equation 2CO+Fe,Oy=2zCO,+Fe,0,-. . . – + (3); so that, were this the sole action taking place, at successive levels upwards the amount of carbon in the gases would remain constant relatively to the nitrogen, whilst the oxygen therein would increase. The actual changes, however, are far more complex than this. Thus, commencing with the top of the furnace, and proceeding downwards, when raw limestone is used as flux, it gives off carbon dioxide as it gets heated, thereby increasing both carbon and oxygen in the gases; during the passage downwards of the ore in the blast furnace it finds itself continually exposed to a heated atmosphere containing carbon oxide and dioxide ; the first effect of the gases upon the newly introduced ore is simply to heat it up, but as soon as the outer

portions of the lumps have attained a temperature of something like 200° C. (dependent on the physical character of the ore), which practically is almost immediately after intro- duction, reduction of the ferric oxide present commences, the carbon oxide of the gases becoming converted into car- bon dioxide in accordance with equation 3. Simultane- ously, however, the fuel introduced is more or less acted upon: if raw coal be not used, but coke or charcoal, as is most frequently the case, the effect of exposing this to an atmosphere containing carbon dioxide is to cause (when the temperature is sufficiently high) the occurrence of the reaction between the carbon dioxide and the carbon of the fuel expressed by equation 2. The temperature at which this change begins to take place to any considerable extent depends on the physical condition of the carbon, as does also the rate at which it goes on, which is also modified by the amount of carbon dioxide present in the gases relatively

to the other constituents, the reaction is not sensible with hard coke at temperatures lower than 300°, whilst at 400° and somewhat upwards it is not marked; at 500° and 600°, however, it goes on pretty rapidly, the more so the less hard and dense the coke, charcoal acting much more readily under similar conditions than coke. Accordingly as the iron ore and the fuel gradually sink in the furnace and become hotter, they tend to affect the composition of the gas in opposite ways, the former decreasing the carbon oxide and increasing the carbon dioxide, and vice versa with the latter. The rate of reduc- tion of iron oxide under constant circumstances is, however, a diminishing one, inasmuch as the reduced particles cover up the unreduced ones and prevent their being so readily acted on; so that, whilst on descending into a hotter region the rate of reduction of the ore is at first increased owing to increase of temperature, by and by the rate of removal of oxygen as it sinks ceases to increase and ultimately diminishes. Long before anything like complete reduction is brought about, however, other changes are brought into play which greatly modify the actions. As soon as the iron ore is partially reduced, it begins to react on the carbon oxide in the way indicated by the equation Fc,0,+CO=C + Fe,0y41 ees me CO

setting free finely divided amorphous carbon in contact with it! Again, as soon as metallic iron in a spongy form is pro- duced, it reacts on the carbon dioxide, thus— xFe+yCO,=Fe,0,+yCO . (5); whilst very probably a parallel reaction takes place with lower oxides of iron not completely reduced to the metallic state, these actions being practically reciprocal to those in virtue of which carbon oxide reduces to ferric oxide, first to a lower oxide and then to metal. Yet again, when carbon and iron oxides are heated togcther, there takes place a change virtually reciprocal to that in virtue of which carbon is deposited from carbon oxide (equation 4),—carbon oxide and dioxide gases being formed, and the iron oxide being more or less reduced in virtue of the reactions C+Fe,0y= CO+Fe0,~~1 (6), C+2F,0,=CO,~~+2Fe,Oy-1 = The ultimate result then is that before the ore and fuel have descended far they are subjected to a number of oppos- ing forces: so far as the ore is concerned, the carbon oxide in the gases surrounding it and the deposited carbon in con- tact with it tend to remove oxygen by reactions 3, 6, and 7, whilst the carbon dioxide in the gases and the reaction causing deposition of carbon from carbon oxide tend to re-oxidize it by reactions 4 and 5: the fuel and carbon oxides in the gases on the other hand are analogously affected ; the reaction of the carbon dioxide on the fuel, 2, tends to gasify the latter (the action being more rapid with charcoal than with coke—Lowthian Bell, also Akermann), and that of the carbon oxide on the partly reduced iron ore setting free carbon, 4, to reverse this action. The actions of the iron and its oxide on carbon, and on carbon oxide and dioxide, also are opposed, some tending to increase the carbon oxide, 5 and 6, and some to decrease it, 4, and others to affect similarly the carbon dioxide, viz., 3 and 7 to increase it, and 5 to decrease it. In consequence, at any given level of the furnace a sort of compromise is arrived at amongst all these varied oxidizing and reducing influences, the net or resultant chemical action being that, whilst a portion of the hard coke of the fuel is gasified, and reciprocally a portion of finely divided amorphous carbon precipitated from the gases, the iron is partially but not wholly reduced. On the whole, then, as the ore sinks in the furnace, it

1 According to Griiner (Comptes Rendus, 1871, 28) this reaction is 3FeO + CO=C+ Fe30,, and does not commence until the iron ore is

deoxidized to some con- siderable extent, at least on the outer surface of the lumps of ore.

IRON

becomes hotter and hotter and more and more deoxidized, but owing to the oxidizing influences at work it does not part with all its oxygen until it has descended some considerable distance to a point where the temperature is about sufficient to fuse it; at this stage the last portions of oxygen are removed, partly by the precipitated amorphous carbon, partly by the alkaline cyanides accumulating in the furnace, and the almost completely reduced metal melts, dissolving as much of the amorphous carbon in contact with it as it can take up under the circumstances; simultaneously the silicious and earthy matters present also fuse, forming cinder, The reducing influences at work here also cause the deoxidation of some of the silica present, whilst man- ganese, phosphorus, and sulphur compounds, &c., are also more or less reduced and taken up by the fusing iron. When the proportion of fuel relatively to the burden is diminished, a larger amount of incompletely deoxidized ore reaches the hearth, the result of which is that, as the silicious and earthy matters fuse, they dissolve some of the iron oxide before it has time to become reduced by the deposited carbon, giving a ferruginous cinder, whilst this carbon is used up in completing the reduction more rapidly than would otherwise be the case; the pig iron formed is less highly carbonized than before, becoming white instead of grey, partly owing to the diminution in the quantity of dissolved carbon, and partly because the temperature of the hearth is lowered, and there is less time for graphite to separate in cooling,

The formation of alkaline cyanides and their reaction on the imperfectly reduced iron oxide is brought about as follows: in the upper part of the furnace a crust of alkaline carbonates, &c., carried up as fume by the escaping gases (§ 18), is deposited on the surface of the materials, and so is brought down again to the hearth, where the nitrogen of the blast and carbon act on it conjointly, forming (for potassium carbonatc) potassium cyanide, thus

The exact nature of the reaction of potassium cyanide on the imperfectly reduced iron oxide with which it finds itself in contact is not known, but jit is probable that potassium oxide and iron cyanide are formed, the latter becoming decomposed into iron, car- bon, and free nitrogen, and the former being carried away by the escaping gases and deposited as potassium carbonate in the upper part of the furnace, so that where the cyanide is formed (mainly at or near the tuyere level) there is an evolution of carbon oxide anda disappearance of nitrogen, whilst a little higher up there is a re- evolution of nitrogen ; that is, whilst at the tuyere level and there- abouts the carbon and oxygen in the gases are raised, relatively to the nitrogen, considerably above the amount due simply to the blast becoming transformed into carbon oxide and nitrogen, a little higher up the amounts of carbon and oxygen appear to diminish relatively to the nitrogen ; not that they actually do diminish in quantity, but that the evolution of nitrogen from the cyanide decomposition causes their amounts to be lessened relatively to the total nitrogen. Thus the following numbers are calculated from some of Lowthian Bell's observations with an 80 foot furnace using coke and calcined Cleveland ironstone, the gases being obtained by drilling holes through the furnace wall at the different levels, and collecting the issuing gas ; the amount of carbon in the gases is manifestly greater at the tuyere than that due to the blast ; tor some feet it apparently diminishes owing to the cyanide reaction, and then remains almost constant till near the top, where it increases from the expulsion of carbon dioxide from the flux. The oxygen again is considerably in excess of that due to the blast at the tuyeres, but at a somewhat higher level it apparently decreases, whilst higher up still it increases again owing to the reduction of the ferric oxide and the evolution of carbon dioxide from the limestone.

Composition by Weight of Gases at different Furnaee Levels.

Blast if wholly

Height above tuyere|) ' burnt in feet peer | © ee ——_ | To CO. | To CO». Carbon dioxide ……. 1-2 trace] 0°8| 1:2| 16 ae | 29°2 Carbon oxide …….../37°6 | 37:1 |35°9 |34-9 /34°8 344 ime Nitrogen sseeseseeresee f 12

62-9 |63°3 |63°9 |63°6 65°6 70°8 Carbon and Oxygen calculated per 100 of Nitrogen. (CEAADGT G5coeenaaaceceend 267s II) DED) l24°6 23°9 ‘24-1 123-8 ‘2140 1e7-5{| 99:5 113 ORV PON ces .scccassestee 36°5 | 33-7 83°3 32°6 |33°1 |82°4 33° 416| 300 80:0

IRON

Precisely similar results are calculable from the analyses of Tiinner, Ebelmen, and others who have cxamined the composition of the gases at different levels of the blast furnace ; the variations in the amounts of carbon and oxygen relatively to the nitrogen at the lower levels in all cases are of such a nature as to indicate that the amount of decomposition of iron cyanide with evolution of nitrogen is very considerable, ¢.¢., that the reduction of iron oxide by alkaline cyanides takes place to an extent constituting a very considerable fraction indeed of the total amount of reduction.

The amount of alkaline cyanides disseminated through the gases of a furnace at different levels varies inversely with the height above the tuyere ; thus, in the course of Lowthian Bell’s experiments, the following analyses were made by the present writer of the sub- stances dissolved by water through which known large volumes of the gases were aspirated, being drawn from the different levels into a large gasometer,—the weights being given in grammes per cubic metre of gas (at 0° and 760 mm.), and the experiments being all made within a short time of one another (all on the same day) :—

Exit pipe after leaving furnace.

Height above tuyere fect

Total constituents of ee : fume soluble in water 223°07

The amounts of alkaline cyanides were found to be considerably variable from day to day when the gases from any given perforation were examined ; thus, for example, the following amounts of com-

bined cyanogen were obtained in two other serics of observations with the first and last of these perforations :—

Eight ft. above tuyere} 19-00 Exit pipe …... Barecsoests eee

In the furnace examined the quantity of gases at a few feet above the tuyere level per unit weight of pig iron made would be about 6 parts by weight, so that per 100 grammes of pig the gases would weigh about 600 grammes, occupying about 0°45 cubic metre. When the amount of cyanogen combined as cyanides disscininated through the gases was 20 grammes (equivalent to 50 grammes of potassium cyanide) per cubic metre (a quantity often exceeded), the potassium cyanide per 100 grammes of pig would consequently be about 22°5 gramines, or about % of the weight of the pig iron, and consequently about $x $=4 roughly of the oxygen in the form of ferric oxide in the ore originally used ; hence evidently the influence exerted by the combined cyanogen upon the removal of the last portions of oxygen must have been very considerable indeed, especially as the cyanides that escape in the gases from the hearth probably represent con- siderably less than the total amount generated there, a considerable proportion being used up in deoxidizing the iron oxide part passu with its formation. That this is so has indeed been urged long ago by Bunsen and Playfair, who found that the gases drawn from a per- foration 2 feet 9 inches above the tuyere of the Alfreton furnace contained cyanogen compounds equivalent to from 8 to 10 grammes of potassium cyanide pcr cubic metre of gas, much smaller amounts than those above mentioned, but greater than those found on some other occasions when the alkaline substances contained in the fume consisted chiefly of carbonates.

The chief source of the alkalies which form the cyanides is the coke used as fuel, but the ore and flux also usually contain small quantities ; when a furnace is newly blown in, the amount of cyanides is necessarily very small ; but a very few weeks' use suffices to cause an accumulation of a quantity sufficient to exert a marked influence on the chemical actions taking place, whilst a somewhat longer period brings the accumulation up to the final working average attained when the alkaline compounds mechanically carried off in the fume, and escaping

altogether from the furnace through not being inter- cepted and filtered out by the substances in the upper part, together with those in the cinder, just equal the alkalies brought in by the fuel and burden jointly. ‘It is highly probable, although not abso- lutely demonstrated, that when charcoal is used as fuel the forma- tion of alkaline cyanides is promoted, owing to the increased quan- tity of potassium carbonate in the ash of the charcoal as compared with coke ; and that this is one of the reasons why the consumption of carbon in the form of charcoal in the Styrian, American, and Swedish furnaces is often less per ton of iron made than that of coke in even the best of the large English furnaces, —the greater ease with which the ores are reduced as compared with English ones being, at any rate in certain cases, another circumstance diminishing the quantity of fuel requisite.

large number of direct observations as to the progressive changes undergone by the minerals in descending through the fur- nace have been made, morc especially by Ebclmen, Tiinner, and

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Lowthian Bell, with the general result of showing that the changes as a whole are substantially those above described ; as the iron ore sinks, it becomes deoxidized at a rate which at first gradually in- creases, the tenrperature rising ; but by and by the reduction ceases to increase in rate, and would probably almost stop were the inner ponen of the lumps as much reduced as the outer portions.

either direct experiments on the ores in the furnace, nor laboratory experiments, nor the results deducible from the examination of the composition of the gases at different levels indicate that under the conditions of the blast furnace interior complete deoxidation of the ore ensues until the level of the hearth is reached and the iron begins to fuse,—the agents completing the deoxidation being partly the carbonaccous matter of the solid fuel, but to a much greater extent the finely divided carbon precipitated from the carbon oxide in the upper part of the furnace, and the alkaline cyanides.

20. Development and Appropriation of Heat in the Blast Furnace.— The sources of heat in the blast furnace are two in number, viz, the heat brought in by the hot blast, and that generated by the combustion of the fuel. The former of course varies considerably with the nature of the heating arrangement and with the actual weight of blast employed per unit weight of iron smelted ; thus, if the weight of air used be 5:5 times that of the pig iron made (110 ewts. of blast per ton of pig), if its temperature be 500° C., and the average specific heat of its components 0-23, the heat brought in per unit weight of pig made will be 55 × 500 × 0-23 = 6325 heat units, the weight of the pig iron being the unit of weight ; and similarly in other cases. The heat generated by the combustion of the fuel, again, depends, first, on the amount of fuel burnt and the pro- portion of inert matters (ash) in it and other circumstances modifying its heat of combustion, and, secondly, on the relative amounts of carbon oxide and dioxide formed.

In transforming 1 part of amorphous carbon into carbon dioxide, the heat evolution (the materials and products being all at the

ordinary temperature) is close to 8000, the following values having been found by different observers :—

Fayrevaid! Silberiianiniss.cs.sis..0csccessssceesseads 8080 Wood charcoa

DOL) a4 Seer eeeeee PP 2 Do.

JATIGIGWS jo ceo ceccoscres ss Do.

Favre and Silbermam Gas carbon. 0. 0. Graphite.

If, again, carbon oxide be burnt to dioxide, the amount of heat is

AN MENA DOMS AEN TIA: 5

Hence the heat given out in burning one part by weight of carbon to carbon oxide must be 8000-4 × 2400=2400, since 3 parts of carbon yield 7 of carbon oxide. If then a given quantity of coke containing 95 per

cent. of carbon be burnt, two-thirds to carbon oxide and one- third to carbon dioxide, the heat produced will be

***Q ° 75? x 8000 +9 99%? 5 9400= 4058 5**

that is, the heat developed by this combustion of one part by weight of fuel would suffice to raise the temperature of 4058 parts by weight

™" of the carbon be m+n

of water through 1" C.; or generally, if

nN

+n centage of carbon in the coke (the trifling amount of hydrogen being neglected), the heat development per 100 parts by weight of coke F m eis, (a furnishes about 34,000 heat units when burnt to liquid water, between 28,000 and 29,000 if burnt to vaporous stcam ; so that, if q be the percentage of hydrogen, the total heat devclopment per

Las de 80) +9 × 2855 if

men nt B q is less than 0°5 (as is usually the case) the error caused by neglecting the term involving q altogether is not greater than that due to the uncertainty about the precise valucs of the heat evolved in burning carbon to carbon oxide and to carbon dioxide (taken above approximately as 2400 and 8000 respectively).

Knowing the quantity of fuel (coke) burnt and the average composition of the waste gases, together with the amount of flux (limestone) employed, the quantity of carbon dioxide and oxide formed by the combustion of the coke and the amount of blast employed to burn it can be readily calculated ; for example, in one out of many series of observations made by Lowthian Bell with the present writer's co-operation, it was found that the average composition by weight of the issuing gases was

burnt to carbon oxide and to carbon dioxide, p being the per-

x 2400 — = x 8000) – One part by weight of hydrogen

one part of fuel is close to p

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arbonioxlde, .o.-.veccssssectesos Racateeeeesenessceses CD IED PEL CUNlte Caubom GiOxiNe, ..-<co--.cc-seccertecest ercereresccceee eM EOU MENS) 35 FAV OROONS. cs ccaccecnie rece ereee eee eee LO sys INSEL OBGiiceeresarencesccentcodteesacccectcocacvessteceets 57°40 4, 45

and that per wnit weight of pig made the amount of coke used was 1°116, of which 0°096 was ash and moisture, leaving 1°020 of actual carbon, whilst the limestone and niine (caleined Cleveland ore) eon-tained 0°082 carbon and 0°219 oxygen in the form of earbon dioxide, the iron being contained wholly as ferric oxide. ‘The pig containcd 3 per eent. of earbon, so that 0°080 of the total carbon entering the furnace did not escape in the gases ; consequently the weight that did escape was 1:020+0°082 -0°030=1°072, whence the gases (leaving the hydrogen out of consideration) were made up of the following amounts :—

1

Containing | Containing Carbon. | Oxygen.

0-995

0°869

0-746 0-326

Carbon Oxide ……00- ; Carbon dioxide ……....0ccsseressee sees

1-072

The coke, however, contained a small amount of moisture (some 2°5 per cent.), which would eseape as aqueous vapour 1n the gases ; this,

together with the hydrogen, would make the weight of the escaping gases a little more, about 6°93. The blast introduced cou- taining 3°965 parts of nitrogen (which must have been associated with 1°185 of oxygen forming air) must consequently have weighed 5°150, or making allowance for the moisture contained in it about 5:20 parts ; the total oxygen introduced into the furnace, therefore, inust have been 17185 in the air of the blast and 0°219 from the car- bon dioxide of the flux ; whilst, as the pig contained about 95 per cent. of iron, $x °95=0°407 is the corresponding oxygen, making a total of 1°185+0°219 +0°407 =1°811, to which must be added the oxygen in the moisture of the blast, and that contained in the silica and other impurities reduced in the pig iron, which consequently will give a total very near to the 1‘864 parts calculated from the composition of the gases, and consequently to some extent checking the accuracy of the determination.

The total development of heat inside the furnace is then as follows. The carbon contained in the pig, being produced by the reduction of carbon oxide, is formed in virtue of a reaction which absorbs heat ; the total fuel added being in the first instance burnt to earbon oxide will develop 1020 × 2400=2448 ; of this a certain portion is further converted into carbon dioxide in the upper part of the furnace, the amount so converted containing of carbon 0°326 —0°082=0‘244, and consequently yiving a further heat evolution of 0:244 x (8000—2400) = 1366! (the 0082 being originally contained in the flux as carbon dioxidc) ; whence the total heat evolution is

2448 + 1366= 3814.

The heat brought in by the blast is 5°20 × 485 × 0°237 = 597, 485° being the average temperature of the blast and 0287 the specific heat of air; whilst that taken out of the furnace by the waste gases is 6°93 × 332 × 0°24=558, 382° being their average temperature, aud 0°24 their average specific heat ; hence finally the total amount of heat used up in doing the work of the furnace, and lost by radiation, &e., is 38144597 — 553=3858.

In a similar way in a number of other instances the quantities of heat used up in the various furnace require- ments were measured, with the

general result that, with large furnaces of the construction employed in the Cleveland and Durham districts (48 to 80 feet in height), smelting calcined Cleveland ironstone either alone or mixed with hematite, a certain amount of heat is required for purposes practically constant and not varying with the richness of the ore and the amount of flux consequently requisite ; whilst another portion of the heat is used up for purposes which are much more variable. Including the heat absorbed in the reduction from the gases of the carbon in the pig, the comparatively constant requirements of such furnaces are close to 2600, so that in the instance taken for example above, the non-constant requirements amounted to about 1258, the two sets being made up as follows :-—

1 Lowthian Bell calculates the total earbon in the carbon dioxide of the gases as being formed from carbon oxide, considering that the carbon dioxide of the flux is converted into earbon oxide by the hot earbon of the fuel part passu with its formation; and hence introduces an additional item into the table of furnace requirements, viz., the heat absorbed in this conversion, and an additional complication into the caleulation owing to the subtraction of the carbon of the fuel thus supposed to be consumed in the upper part of the furnace from that burut by the blast at the bottom.

LRON

Approximate

Comparatively constant heat requirements. average amount

” 72

: a phosphorus, silicon, and sulphur 209 Heat carried away by water uscd to eool tuycres cesses IL 5 5 MOIEN Pig ..0..000—cereeeeeee ” radiation and conduction .

39

More variable heat requirements.2

Yleat absorption during eausticizing limestone flUX ….....seeceersscesceee deeomposition of moisture of blast …..... Ss evaporation of water in Coke: .....0:.0000..ssecseecee Heat carried away by molten slag (onc part of slag earrying away 550) WIMLESIOL OAL) ec en cteecceesccsseet soca stvevcutecassercertectecrecseasenchet etre eses en =

”? ”

3858

Similar results were obtained in several other analogous series of observations, the variable heat requirements differ- ing somewhat in some instances on account of the use of poorer or richer ores, different amounts of flux, &c.; for the details of the methods used in the determination of the various items of furnace requirements see Bell’s Chemical Phenomena of Iron Smelting, and also the earlier experi- ments of Vathaire (Htude sur les Hauts Fourneaux). Various publications of Griiner, and also an essay by Habets (abstracted in the Journ. I. and S. Inst., 1877, 225) may also be consulted with advantage; the numerical values of certain of the items deduced by Griiner from his observa- tions differ somewhat from those of Vathaire and Bell, but not to auy very material extent. The general result of these observations is that, with the large English furnaces used in smelting Cleveland ironstone with coke and lime- stone, about 3850 is the amount of heat required on an average per unit of weight of pig iron made for the various furnace requirements, and that in even the most economi- cally working furnaces the quantity of carbon contained in the issuing gases in the form of carbon dioxide does not exceed one-third of the total quantity of carbon, and rarely exceeds 30 per cent. of that amount, the remainder passing out as carbon oxide. Some of the carbon that does escape as dioxide, about one-fourth, is originally introduced as carbon dioxide contained in the flux (in the illustrative example, given above, 0-082 was contained in the flux out of 0°326 escaping as dioxide), so that only about three-fourths is derived from the fuel; whence it results that even under the most favourable conditions, rarely met with in practice with this class of ores, not more than } x 2, or 25 per cent., of

the carbon of the fuel is ultimately burnt to dioxide, the remaining 75 per cent. being burnt to carbon oxide, thus giving an effective heat development of 0°25 × 8000 + 0°75 x 2400 = 3800 instead of 8000 ; ae, the "duty " actually performed by the fuel is only 38°, or 47°5 per cent. of the possible maximum amount; so that if the amounts of heat brought in by the hot blast, and carried out in the waste gases, are approximately equal (which is the case when ordi- nary cast iron stoves are used, delivering blast at tempera- tures near 450°), it finally results that, to produce the heat requisite for the various furnace requirements (amounting on an average to 3850), an amount of carbon must be burnt equal to 385° or 1:013 times the weight of the pig iron made. 'Taking average coke to contain 7 per cent. of moisture and ash, and, consequently 93 per cent. of carbon, this represents 1°28 = 1-089 parts of coke per unit weight

of pig iron, or 212 cwts. per ton as the minimum prac- ticable consumption of fuel attainable with calcined Cleve- land ironstone, under the condition that the blast brings in as much heat as the waste gases carry out.

It docs not by any means follow, however, that only this minimum practicable consumption of coke will be requisite in any given fur- naee. When the dimensions are not such as to cause the most

economical employment of the fuel, a considerably larger quantity of fuel may be requisite to cnable the whole of the iron in the ore

2 Exclusive of that due (according to Bell's mode of calculation) to absorption of heat by the carbon dioxide of the flux in being converted into carbon oxide. '

to be satisfactorily extracted and a saleable pig produced ; in this case the actual heat consumption remains about the same, but a less amount of carbon dioxide and a larger quantity of carbon oxide escape in the waste gases; this is particularly noticeable when anthracite is used as fuel instead of coke, as in many Amcrican fur- naces. Thus, in aseries of

observations parallel with those detailed above, but made with a smaller furnace (using coke and calcined Cleveland ironstone), the size of which was insufficient to cause the most economical action possible (48 feet in height instead of 80), the average composition of the gases by weight was

WHE OPM scrvercsresrrevsrvsverseresrercevclesererceveesre 57°67 per cent. Carbon OXiGC…....cccccceecerereceeessecceeccsenseenees 80°58 4, 4, Carbon di0Xide…....ssescsesceecesssessesecseseeennes o RLTO! G5. 53

i.¢., they contained much less carbon dioxide relatively to the car- bon oxide than those escaping from the larger furnace, whilst tho amount of carbon burnt in the form of coke was increased from 1-020 parts to 1°318 parts per unit of weight of pig (or from about 223 to 28°8 ewts. of coke per ton of pig, the eoke containing about 91°5 per cent. of carbon and 8°5 per cent. of moisture and ash, &c.). Of this extra fuel consumption part only was expended to generate the heat requisite for the furnace requirements, owing to the for- mation of less carbon dioxide and moro carbon oxide; the re- mainder produced the effect of sensibly raising the tempcrature of the exit gases, which escaped at the average temperature of 452° C, instead of 332° C., thus carrying out of the furnace much more heat than was brought in by the blast.

If by the use of a hotter blast more heat is brought into the furnace by,this mcans than will supply the loss of heat in the waste

ses experienced with the less highly heated blast, one of threo iilogs must result: either less coke will be requisite to produce the heat necessary for the various furnace requirements ; or the surplus heat will be carried out in the waste gases, they being at a higher temperature; or the fuel will be burnt to less advantage, a smaller proportion of carbon dioxide being formed and a larger one of car- bon oxide. As to what does actually take place in such a case, opinions are somewhat divided ; for, whilst most iron masters main- tain that a sensible diminution in fuel requisite per ton of iron is always occasioned by employing a hotter blast, others (especially Bell) consider that their experience proves that in certain cases, e.g., with Cleveland

ore, no actual saving in fuel accompanies the use of blast at temperaturcs above about 500° (see § 21).

The results obtained by Bell with blast-furnaces using Cleveland ironstone and coke are applicable, with appropriate modifications, to furnaces employing different ores and fuel. For instance, Crossley found (Journal Iron and Steel Inst., 1871, ii. 157) that a furnace 67 feet in height, 19 wide (boshes), and 18,124 cubic fect capacity, smelting Askam hematite and Red Bay ore at Askam-in-Furness,

roduced grey Bessemer pis with 223 ewt. of coke to the ton of

iron (1‘1375 per unit of weight of pig), the heat requirements during the process being as follows (the mode of representation adopted above being employed, and the heat viewed by Bell as consumed during the reaction of carbon on the carbon dioxide of the flux being left out of account) :—

Comparatively constant heat requirements.

PC Ue OTMO MEETING OXI) <2… - cocaerdassssscscoseesesvensssasesessescsesasssearccnecees 1655

AS GeEDOMMLORMCREDON OXLUC. scssoccsessccrescescsscessessesscosessessesss 96

i silicon (phosphorus and sulphur practically absent)..... 120

Heat carried away by tuyere Water….....secscsssscsscccsesscsscccccesees sos TO

” 9 molten pig…... 330

“5 a THARALIOM) GC. coves sccesccescsscacsnes COacOnHeURcOLeoeHUrodD 268 ——2560

More variable heat requirements.

Heat absorbed during causticizing of lime ….0….sssseceseers 171

a aS decomposition of moisture of blast eos ees

” * evaporation of water in Coke ….s0.- ees 3

” ” ” r) OTE... 27

HIGATIGATICO OULIDY NOMEN SIA, <2… .a0e0+cesesesesesesosarssscseccsteesccenccceecees 413 — 865

3425

This amount of heat was supplied as follows:

Total carbon of coke burnt to carbon OX{de ….....ssscecseeesreeeee 1:0625 × 2400=2550 Portion of ditto further burnt to carbon dioxide — 0162 ×5600= 907 PRC HMED APE LTIMI MD VADERGUL .c eetcceecests

4034

ICGOSIIGREICATTICANOUL INGWASECTZASES) ..+0cscsccsococccvesesecerscansessvasevscsretncaccenss 609

3425

In this case the carbon carried out as dioxide in the escaping gases was only 20°2 per cent. of the total carbon therein contained; so that here the fuel was burnt to less advantage than in the most economically worked Cleveland iron furnaces. This, however, was partly due to the fact that in order to make very grey Bessemer pig a larger quantity of coke was employed than would suffice to make forge iron, viz., about 2 cwts. per ton extra ; so that forge iron could be run in the same furnace with an expenditure of about 212 cwts., or 1:0825 parts of coke per unit weight of pig. Other things remaining the same, this would ropresent an amount of total carbon burnt equal to about 0°97 per unit weight of pig, which must,

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therefore, be burnt in the following way to givo tho same heat as before, viz., 2550+907=38457 due to the fuel :-—

nisi 0-97 × 2400 = 2328 veoe0°2016 X 5600=1129

3457

Since the carbon in the carbon dioxide of the limestone was 0°0555, the total carbon as dioxide in the gases would thus be 0°2016 + 0°0555 =0°257, whilst the total carbon as oxide and dioxide would be 0°97 + 0°0555 — 0°040=0°9855 (0:040 being tho carbon in the pig iron, which contained 4 per cent. of carbon); so that the escaping gases would contain, when forge iron was being made, about 26 per cent. of the total carbon present thercin as carbon dioxide and 74 per cent. as carbon oxide,—still indicating a fuel expendi- ture less economical than in the most favourably arranged Cleve- land furnaces in which 30 to 33 per cent. of the total carbon in the escaping gases is contained as dioxide ; presumably this is duc either to the smaller height of the furnace (67 feet only) or to the more difficult reducibility of the ore used.

On the other hand, the Wrbna (Hisenerz) charcoal furnaces smelting spathic ore (which is somewhat more readily reducible than calcined Cleveland ironstone) were found to give the following values, reduced as before to a unit of weight of pig (white iron) (Tiinner, Journ. L. and S. Inst., 1873, p. 4383):—

Comparatively constant requirements,

Reduction of ore and of carbon in Pig …....s.ccscsecsscsveeveees 1620

on illg@eiinareseasuaessaveerscerttssassreasravectsccseresasessse 50

Heat carriod away by tuyere water and radiation, &c…..... 192

ay A VUPIOT ee seccessennsssroses cncmuenoosroggenan 340 —— 2202

More variable requirements.

Evaporation of watcr in charcoal…....,sscssssoscvscssecsgscnsevces 20 Decomposition of moisture of Dlast…....cccccscsoercesee coors 80 Heat carried out by slag, 1 part carrying out 440 units of 308 heat (Rinman)..... eeeeeas Generar neceancnecnrucnerLenennn o EhaK — 408 , F 2610 This heat was furnished as follows :— Heat due to combustion of fuel …....s0cecsssssceseenes soca da », brought in by hot blast …..... occaconessanneonsgncenacd 218

2940

9, Carried out in Cscaping Gases …....ccrrerscscersssecere 330

2610

The fuel burnt was charcoai containing about 0°63 parts of carbon per unit weight of pig, which in order to produce 2727 heat units must have been burnt as follows :—

Heat due to burning of 0°63 carbon to carbon OX{de …....eecceeeee 0°68 × 2400 =1512 op further combustion of 0-217 carbon to carbon dioxide 0°217 × 5600=1215

—

2727

Of this 0°63 parts of carbon burnt 0°045 was taken up again by the iron, leaving 0°585 as the total quantity of carbon escaping in the waste gases. Hence $222 or 37°1 per cent. of the carbon was burnt to dioxide, and 62°9 per cent. to carbon oxide, which represents a more econoniical use of the fuel than in the Cleveland furnaces, not-withstanding the smaller size of the Wrbna furnace. Bell has also calculated (Chemical Phenomena, p. 420) for the same furnace very much the same numbers, the furnace requirements being estimated by him as slightly in excess of Tiinner's valuation.

Calculations as to the development and appropriation of heat in the Cedar Point anthracite furnace, U.S., Taunded on the same principles

as the above cited examples have been made by Wither- bee (Transactions Am. Inst. Mining Engineers); the consumption of anthracite as compared with charcoal in American furnaces is always greater, indicating a smaller proportion of carbon dioxide ultimately formed.

As far as the data at present extant go, it does not appear that in any furnace yet constructed burning coke, charcoal, anthracite, or coal, upwards of 40 per cent. of the carbon in the issuing gases is, on an average, contained as dioxide, the remainder being oxide, although somewhat larger amounts are occasionally found as exceptional occur- rences. Admitting that 2 of the carbon of the fuel is burnt to dioxide and 3 to oxide, the heat evolution per unit of carbon burnt would be 2 × 8000+ 2 × 2400 = 4640 instead of 8000, which would be developed were all burnt to dioxide; that is, the " duty" actually per- formed by the fuel would be 58 per cent. of the possible maximum amount ; so that even in such a furnace the con- sumption of fuel would be at least $999= 1-72 times the =» ~eneenee

1 This item is somewhat larger than Bell's figure, as the temperature of the charcoal furnace hearth is somewhat higher (Riuman).

amount that would be requisite could perfect combustion be effected. If, however, the issuing gases be so burnt in heating the blast that more heat is brought into the furnace than is carried out by the waste gases, the excess is virtually obtained by more perfect combustion, though not actually so burnt inside the furnace; whilst, if the gases are also employed to raise steam for the blowing engines and lifts, &c., the fuel thus saved virtually is equi- valent to a diminution in the blast furnace consumption ; for, were perfect combustion obtainable in the furnace, extra fuel would have to be burnt outside for these

purposes. ie of ; :

These remarks apply a fortiort to furnaces in which coal is employed as fuel instead of coke or charcoal. The heat of combus- tion of average coal (after allowing for ash and supposing it to be burnt to carbon dioxide and water vapour) may be taken as about 8300 (see § 10); hence to afford sufficient heat for the requirements of a furnace smelting average Cleveland ironstone, viz., 3850, only 2859=~0°464 parts of coal would be requisite, could complete combustion be ensured, or 94 cwts. per ton of pig (assuming the sensible heat carried out by the waste gases and brought in by the blast to be equal). The actual con- sumption in furnaces using raw coal is, however, several times this amount,—80 ewts. being a low estimate in such cases, whilst 40 and even 50 ewts. of coal per ton of pig made is not an infrequent consumption: thus even with Ferrie's self-coking furnace (§ 12), which reduced the consumption of coal from 52°5 to 33°5 cwts. per ton of pig, the consumption was upwards of three times the theo- retical amount ; with anthracite-consuming furnaces, such as those used in America, the consumption of fuel varies from 25 cwts. per ton of pig in the largest and best constructed furnaces to 40 cwts. or so in the older and smaller furnaces, the consumption being as a rule, however, somewhat less than that of more bituminous raw coal in the English open-topped furnaces. The reason for the extra fuel consumption in raw coal furnaces is simply that the nature of the chemical reactions taking place in the upper part of the furnace, especially the action of heat alone upon the coal, necessarily causes the evolution of much free hydrogen, carburctted hydrogen, and carbon oxide, which escape unburnt, thus prevent- ing the consumption of the fuel to the maximum advantage : where the gascs are collected and burnt, this loss would not be material were it not that ordinarily the heat obtainable from the gases is far in excess of that requisite to raise steam for blowing and lifting the burden to the furnace top, &c. These reasons are also to a great extent operative with anthracite as compared with coke. On the other hand, the smaller weight of charcoal ordinarily requisite to smelt a given ore is partly due to the more ready action of carbon dioxide on chareoal than on coke forming carbon oxide, so that virtually the ore is partly reduced by the carbon of the charcoal (this being converted into carbon oxide, which

deoxidizes the ore) to a greater extent with charcoal than with coke ; t. ¢., the charcoal is more completely oxidized, and the ore |

is more deoxidized at the top of the furnace and less at the bottom than is the case (cwteris paribus) with coke, so that a smaller weight of charcoal ultimately performs the same work as a larger quantity of coke. The larger amount of alkalies in charcoal, producing more cyanides, probably also aids in the more rapid reduction relatively to the weight of fuel used.

In a prize essay, Professor Habets has given formule for calculat- ing the value of a given weight of iron ore of given composition, the price of the pig iron made from it, and the quantities of ore and limestone requisite to produce a unit of weight of pig, &c. (see abstraet in Journ. I. and S. Inst., 1877, 225), and has also arranged formule for caleulating the amount of fuel that ought to be required for the smelting of such ores, &c., assuming that the duty actually performed by the fuel is 48 per cent. of the possible maximum amount. In these calculations slightly different values are taken for certain of the heat requirements from those given above; thus for the reduction of pig iron (containing carbon, silicon, &c.) the total heat consumption is taken as 1984, the amounts assumed by Bell, Crossley, and Tiinner as above described being respectively 1931, 1871, and 1670 ; that carried out by the molten pig is taken at 260 for cold working, 270 for medium, and 285 for hot, Bell's figure (and Vathaire's) being 330, whilst Tiinner takes 340 from Rinman's observations ; and the loss by radiation (presumably in- cluding the tuycre water) is taken as 400 (Bell=349—deduced by the present writer froma round general average result by difference; Crossley = 359; Tiinner= 192, the furnace being a much smaller onein this latter case), and so on throughout ; but on the whole Habets's formule are based on much the same valuations as those above cited. The instances given above, however, indicate that the results obtainable with one class of ores, fuels, &c., are only applicable to another class with considerable latitude of variation, and that it is im- practicable to fix a hard and fast line as the limit of economy of fuel

universally applicablo. Where, however, the fuel is burnt differ- ently (to less advantage, for instance, so that, instead of one part of carbon giving 0°48 of the total heat production as “ duty,” it only gives say 0°40), the formule of Habets will still be applicable, only requiring the application of a coefficient (°=1°2 in the case supposed).**

Temperature of Blast Furnace at Various Levels.—Many observations of the rate of increase of temperature from the mouth of the furnace have been made by Tiinner, Ebelmen, and Lowthian Bell. When fresh materials have been just introduced cool into the furnace, of course they intercept heat from the escaping gases, acting precisely like the brick- work stacks of a Siemens regenerative furnace ; this effect, however, cannot be carried so far as to prevent the escaping gases from passing out at an average temperature which, if not elevated, is at least sensible,—the actual temperature varying with the conditions obtaining. Since heat is gene- rated by the reduction of ferric oxide by carbon oxide, more heat being evolved by the oxidation of the carbon than is absorbed in the reduction of the iron oxide, roughly in the ratio of 3 to 2, it results that there is always a source of heat in the upper part of the furnace; and, unless fresh materials can be supplied sufficiently rapidly to keep the escaping gases always at a given low temperature by their direct cooling effect, the temperature must rise by the reduction of the ore. A condition of equilibrium as to temperature is consequently finally arrived at when the sums of the generations of heat by chemical action at each and every particular level, and of the absorptions of heat by direct communication to the fresh charges added from time to time, balance one another; when this condition of things is arrived at the temperatures of the escaping gas, and of the substances generally at each level, become constant, or rather would do so were the fresh materials added continuously instead of intermittently, and were the action of the furnace absolutely uniform. The circumstances which regulate the most advantageous way in which fuel can be burnt, z.e., the economy of fuel in the furnace, consequently regulate the temperature of the escaping gases, which accordingly is variable with the quantity of fuel burnt per unit of iron smelted, with the size and shape of the furnace, the character of the ore employed, &c. Under particular conditions, especially when a large mass of fresh materials

has been added, the escap- ing gases may be so cool that the aqueous vapour present is condensed into mist, whilst the hand may be placed in the gases without being burnt; ordinarily, however, the temperature at the mouth averages 200° or 300° C., and with small furnaces and difficultly reducible ore requiring a large fuel consumption may be much higher. One great effect of increasing the height of furnaces smelting clay ironstone (e.g., Cleveland ore) is the reduction of the amount of fuel requisite owing to the cooling influence exerted upon the temperature of the escaping gases which pass off, there- by leaving in the furnace heat which otherwise would have to be provided by burning more fuel. Of the numerous particular determinations that have been made of the tem- peratures at different levels in different cases, the following may be cited as examples :—

Wrbna Furnace (Eisenerz); height 36 feet; using soft chareoal with a burden of spathie ore, cast tron scrap, and grawwacke-schist (as flux), in the proportion of 388, 8, and 20 respeetively (Tiinner and Richter).

Distance from top

Distance from top

Temperature. Temperature,

in Feet. in Feet. 0 320° ag 340° ll 850° 640°

680°

The temperature values were deduced by introducing alloys of known melting points, and noticing which were fused.

IFRON

Clarence Furnaces; using hard coke and calcined Cleveland tron- stone with limestone as flue (Lowthian Bell).

Distance from top

fn Reet Eighty foot Furnace. in Feet.

Forty-eight foot Furnace.

0 (exit gases). 452° C. 332° C. 4°25

Not visibly red hot. 9°75 Dull red heat. 15°50 Bright red heat, 21°25 Very bright red heat. 26°75 Do. (9)

Not visibly red hot. Do. do.

Dull red heat. Bright red heat. Very bright red heat.

A paper on the " Thermic Curves of Blast Furnaces," discussing a number of results of this class, and the conclusions to be drawn from them, by H. M. Howe, is given in the Trans. Amer. Inst. Mining Engincers, 1876 ; see also Jron, vol. x. p. 826 sq.

21, Conditions Regulating Economy of Fuel and Cost of Production.— It is evident from the data given in the pre- ceding section that, when the amount of cinder formed is less, a smaller quantity of fuel will do the work of iron smelting, the amount of heat absorption for the variable requirements being lessened the less limestone is causticized and the less hot cinder flows out of the furnace. Evidently also, the hotter the blast and the cooler the issuing gases, the less fuel must be burnt to generate the particular amount of heat requisite for a given furnace working under given conditions as to quality of ore, &c.; whilst the more carbon is burnt to carbon dioxide and the less to carbon oxide the less total carbon is requisite for the same end. As regards the possibility of diminishing fuel con- sumption by the use of richer ores and less flux, this is largely a matter of local circumstances; when there is a choice possible between two deposits of ore, one richer than the other, and each equally good in other respects, the cost of smelting the richer ore will evidently be somewhat less than that of working the other; as regards the other circumstances, it is by no means a matter of indifference in reference to cost of production whether the more econo- mical conditions be attended to or not; thus, in the case of the 48 and 80 foot furnaces referred to in the last sec- tion, the difference between 22°3 and 28°8 ewts. of coke consumed per ton of iron involves a very considerable difference in cost of production. It is calculated that the

increased size of furnaces used in England at the present day, as compared with those in use some thirty or forty years ago, represents an average saving of fuel equivalent to about 50 per cent. of the weight of the pig iron made in coal, 2.¢., a saving of 10 ewts. of coal per ton of iron. The saving effected by the use of waste gases for heating the blast, although less than this, still represents an enor- mous aggregate; in the Cleveland district alone the saving in coal from this cause is calculated to amount to upwards of 1,000,000 tons annually.

‘To some little extent the amount of fuel consumed is variable with the rate at which the furnace is driven ; that is, if a given quality of pig is produced when the furnacc is making 300 tons per week with a given coke consumption (the fuel being burnt under the most favourable conditions practicable), and the furnace be then driven ata higher speed so as to make 400 tons, either a little more coke must be added relatively to the burden, or else there will be a tendency to make a less strongly marked crystalline pig ; Instead of producing the coarsest crystallized iron (No. 1 grey pig), this quality will sink to the less largely crystalline numbers (Nos. 2, 3, or 4), or even to mottled or white iron. If, however, the fuel is not burnt to the maximum possible advantage in the first Instance, increasing the rate of production may under certain circumstances not only not cause an increase in the fuel consump- tion, but may even slightly diminish it, by lessening the amount of heat lost by radiation, &c., relatively to the metal produced. Everything remaining the same, decreasing the fuel relatively to the burden decreases the quality of the iron run, and vice versa ; with Cleveland ironstone an extra consumption of half a cwt. or less of coke per ton of pig suffices to raise the quality of iron rnn one number in the scale, ¢.¢., from No. 4 to 8, from 8 to 2, or from 2 to 1. According to Crossley (Joc. cit.) about 2 cwts. of coke per ton of pig corresponds to the difference between running white iron and grey Bessemer pig, the ore smelted being Askam hematite and Fisher Red Bay ore. ‘Tiinner states (oc. cit.) that at Neuberg,

with a blast at 200°, from 15-4 to 15°6, ewts. of charcoal were uscd per ton of white iron, but 23 to 24 cwts. per ton of grey iron, making a difference of some 8 cwts. per ton, or four times the amount given by Crossley ; at Heft, with a blast at 200°, 12°6 to 14 cwts. of charcoal were formerly required per ton of white iron, and 20 cwts. and upwards per ton of grey iron, making a difference of more than 6 cwts. per ton, or upwards of three times Crossley's figure. Although a variation in the amount of fuel burnt under constant conditions denotes a correlative variation in the tempera- ture of the hearth (No. 1 iron being actually hotter as it flows from a furnace in regular work than No. 4, for instance), yet the infinence thereby produced on the chemical composition is, accord- ing to Lowthian Bell's experiments, not marked, at any rate so far as Cleveland pig is concerned, the differences between various

specimens of different numbers not being greater than those

between various specimens of the same numbers,—the difference in the crystallinity of the pig being in fact more probably ascrib- able to the circumstance that the hotter the iron the longer is the time taken to solidify, and the more completely is the exfoliation of the graphite and the crystallization upon it of the remaining iron, &c., effected, than to differences of actual constitution. On the other hand, it is a matter of usual opinion, if not of invariable experience, that highly crystalline grey Bessemer pigs are richer in silicon than others, and that this is due to the higher temperature of the hearth facilitating reduction of silicon ; again, it is usually considered that white irons are apt to contain more sulphur than grey irons made from the same ore ; this circumstance, however, is possibly rather due to differences in the average composition of ore smelted and amount of flux added than simply to variations in amount of fuel consumed ; thus diminishing the amount of lime added asa flux below a certain point often increases the sulphur in the pig, so that upwards of 1 per cent. may be present, when with more lime the quantity would be only one or two tenths per cent., the iron being white in the first case and grey when moro lime is employed.

As regards the temperature of the blast, the fact that heating the blast enabled iron to be made with much less fuel consumption than was requisite with cold blast was recognized immediately after Neilson's discovery or inven- tion ; but it soon became also manifest that a deteriorating effect was often produced upon the iron smelted from certain kinds of ore by the use of the hot blast, due to the higher temperature attained in the hearth facilitating the reduction of phosphorus, sulphur, and especially of silicon. The advocates of the very highly heated blast obtainable by means of the Whitwell stove consider that, as the heat is obtained from the waste gases at a comparatively nominal cost, the more heat can be thus introduced into the furnace the better, the saving in fuel being directly proportionate to the increase in blast temperature ; it would seem from Bell's observations, however, that the advantages thus obtainable are not always quite so great as appears at first sight to be the case. If less fuel be burnt in the furnace, a less absolute weight of blast per given amount of pig run will be requisite, and consequently a higher propor- tionate temperature must be given to the blast to enable it to introduce the heat equivalent to the fuel thus saved ; for each successive diminution of fuel to the extent say of 1 per cent. an increase in temperature of blast will be requi- site, the rate of increase not being constant, but accelerating at a rapid rate; so that finally an increase in blast tem- perature of 100° from 1100° to 1200° only represents about half the amount of heat introduced into the furnace that would be introduced by raising the blast from 300° to 400°. The advantage of highly heating the blast then is not directly proportionate to the temperature attained as re- gards saving of fuel, but something less; according to Bell, practical experience shows that with certain ores, ¢.g., Cleveland ironstone, the effect of highly superheating the blast to temperatures much above 500° is not to render any considerable saving of coke practicable, but mainly only to raise the temperature of the issuing waste gases. Other iron masters, however, dissent from this view, and consider that by the use of a blast heated to 700° and upwards by a Whitwell stove, instead of to 450° or 500° by the older iron stoves, a distinct saving in the amount of coke requisite to produce a ton of pig iron from Cleveland ironstone 1s

effected ; so that, instead of requiring an amount of coke to be consumed equal in weight to about 1:09 times that of the pig iron made (nearly 213 cwts. per ton), which as stated in the previous section is the minimum practical average consumption possible when the amount of heat brought in by the blast about equals that carried out by the waste gases, a smaller amount of fuel will suffice, from 0°95 to 0-90 parts of coke (19 and 18 cwts. per ton) only being necessary with blast heated to 700° and upwards by a Whitwell stove, the heat carried out by the waste gases being less than that brought in by the blast by an amount equal to that which would otherwise have been generated by the fuel saved. With ores other than Cleveland iron- stone the same kind of result is obtained; not only in England and Wales, but also in France, Germany, Switzer- land, America, and elsewhere, the Siemens-Cowper and Whitwell stoves have been extensively adopted on account first of the saving of fuel effected by them, and secondly of the greater regularity and efficiency in working.

On the other hand there is no doubt that increasing the height of a furnace smelting calcined Cleveland ironstone from 48 to 80 feet causes a considerable saving in fuel ; as shown in the previous section, the increased height acts partly by permitting the gases to escape at a lower temperature, and partly by enabling the fucl to be burnt with the formation of a smaller relative proportion of carbon oxide and a larger one of carbon dioxide than is the case with the smaller furnace. When, however, a still greater height is given to the furnace, a further saving in fuel and larger relative production of carbon dioxide do not seem to occur, furnaces of 90 and 100 feet in height not exhibiting any marked advantages over 80-foot furnaces working under the same conditions, so far as con- sumption of fuel is concerned. Even if Bell’s views as regards the non-apparent advantage of increasing the blast temperature above 500° C. with the furnaces smelting Cleveland ore experimented on by him be admitted to apply in all cases where this ore is used, it does not follow that they are applicable to other furnaces smelting different kinds of ore, nor does it follow that 80 feet in height is the limit beyond which no visible saving is effected in all cases; thus

for instance with a furnace smelting (at Consett) a mixture of Cleveland ore and hematite in such proportions that about half the iron made came from each ore, a distinct saving of coke was found to accompany the substitution of Whitwell stoves giving blast at about 720° for iron stoves giving blast at about 450°; whereas with the less heated blast the coke consumption was 22°75 cwts. per ton of iron, with the hotter blast it was only 18 ewts., the conditions, character of ore and flux used and pig produced, &c., being pretty nearly the same, the furnace being 55 feet in height in each case. Again, on rebuilding such a furnace (for the purpose of using the same mixture of ores) toa height of about 70 feet, it was found that the increased dimensions, so far from pro- ducing the beneficial effects which such a change would have given had Cleveland ore only been used, introduced such irregularities in working that the height had to be reduced to the former amount, 55 feet or so. Similar results have also been found with furnaces using Lancashire hematite only ; thus a Barrow furnace built to the height of 75 feet, and using Cowper stoves, worked so badly that it was reduced to 61 feet, when it worked well. Analogous results were also obtained at Workington, a 70-foot furnace work- ing much better when cut down to 55 feet ; in America also it has been found that charcoal furnaces, increased materially above the original height, worked irregularly until the height was reduced again, when the working again became good. With easily reducible Belgian ores furnaces of 50 to 60 feet in height are found to give the best results both as to quantity of iron run and as to economy of fuel. On the other hand, an increasein height from 45 to 60 feet in furnaces smelting Staffordshire ores was found to cause an average saving of upwards of 10 cwts. of coal per ton of iron (Plum, Journal I. and S. Inst., 1871, ii. 227), whilst two furnaces at Stanhope (New Jersey) using magnetic ore, one 80 feet high and of 16,400 cubic feet capacity, the other 55 feet high and of 9200 cubic feet capacity, differed by several cwts. in the amount of coal re-

uisite to produce a ton of pig, the difference being in favour of the larger furnace ; similarly at Glendon, U.S., two furnaces, 72 and 50 feet in height and 11,900 and 4800 cubic feet capacity respectively, differed by 3 to 4 cwts. of coal per ton of pig, the taller furnace requiring the least fuel (F. Firmstone, Trans. Am. Journ. Mining Engineers).

With charcoal furnaces smelting grey iron, increasing the blast temperature from about 200° to 400° or 500° C. causes a marked saving of fuel; but the utility of heating the blast above 300° or even a somewhat lower limit for such furnaces when making white iron is regarded by Tiinner as extremely doubtful: thus he states

[Ih OR

(Journal I. and S. Inst., 1878, 442) that charcoal furnaces at Neu- berg which used 28 to 24 ewts. of charcoal per ton of grey Bessemer pig (and only about 154 for whitc iron) when the blast was at 200°, only required 19 to 20 cwts. per ton of grey pig when the blast was heated to 500°, representing a saving of some 4 ewts. per ton of charcoal ; similarly at Heft the charcoal consumption was 20 ewts, and upwards per ton of first class grey Bessemer pig with blast at 200°, and only 17 to 18 cwts. with blast at 350° to 400° C., repre- senting a saving of at least 24 cwts. of charcoal per ton of pig. – Analogous results have also been recorded as obtained with Carin- thian furnaces, a saving of 25 to 80 percent. in the charcoal used accompanying the heating of the blast to 500° or 600° instead of the much lower temperature formerly employed ; similarly with Swedish charcoal furnaces smelting bog ores, the use of hot blast at 350° instead of cold blast producing a saving in fuel estimated as averaging one-third, or 83 per cent. of the larger amount, and the employment of blast at 200° effecting a saving of one-fifth, or 20 per cent., with mountain orcs (Jern-Kontorets Annaler, 1859, p- 273). The much smaller consumption of fuel in the Wrbna charcoal furnaces and others using certain Austrian ores as com- pared with English coke furnaces appears, from the results of Tiinner, quoted in the last section, to be mainly due to the smaller amount of slag produced, and the consequently diminished furnace requirements, a portion of the diminution being due to the some- what larger formation of carbon dioxide relatively to the carbon oxide in the escaping gases; with other ores producing more cinder, the quantity of charcoal used per ton of iron run does not secm to be materially less than the amount of coke cmployed with English furnaces, so far as comparisons can be instituted.

On the whole, the precise details as regards the dimen- sions of furnace, temperature of blast, &c., the use of which will enable iron to be smelted from a given kind of ore with a minimum expenditure of fuel, cannot always be distinctly stated, the requisite data not existing: evi- dently the data available for one class of ore and fuel and iron produced are not applicable without material correction to other classes. All existing experience, how- ever, goes to show that the blast furnace is an instrument in which it is impossible completely to utilize the calorific power of the fuel burnt. Owing to the nature of the com. plex reactions regulating the resultant chemical changes taking place in the furnace, a considerable proportion of the fuel inevitably must escape as carbon oxide, and it is not practicable to restore to the furnace the whole of the heat thus not utilized by employing the waste gases to heat up the blast, although a portion of this heat may thus be saved. Thus, in the case of average Cleveland ironstone, the 3850 units of heat per unit of weight of pig requisite for the various items of furnace consumption would be obtained by the combustion of less than 0°5 part by weight of carbon (representing 10 ewts. of carbon or less per-ton of pig, ze, about 10°5 ewts. of average coke per ton of pig), could all the carbon be burnt to carbon dioxide; whilst for ores containing less earthy matter, and hence requiring less flux and producing less cinder, considerably smaller amounts would be required, insome cases not more than 7 or 8 ewts. per ton. In practice, even with the most economical arrangements at present known, the consumption of fuel is largely in excess of the minimum quantity thus theoretically requisite, the coke used varying from 18 or 19 cwts. in the most favourable cases to 25 and even 30 ewts. per ton of pig under less economical conditions.

A portion of the excess of fuel thus burnt may be utilized in generating steam by burning the waste gases under the boilers. Bell calculates that somewhat upwards of 1400 heat units per unit weight of pig iron were thus utilized in the works serving as the chief basis of his inquiries,

1 An instructive essay by J. Walters on the best-known means of increasing the production of blast furnaces without at the same time interfering with the quality of their products, discussing the dimensions

as regards height, diameter of both size and throat, &c., and other conditions best suited for certain classes of ores, is to be found in the Revue Universelle, 1877, and in abstract in the Journal I. and S. Inst., 1877 (Foreign Report), p. 125. See also papers by T. Whitwell (Iron, 1878) " On the Construction, Dimensions, and Management of Blast Furnaces,"

IRON

the total amount of water required for steam purposes being 2°55 times the weight of the pig iron made (in- cluding the steam used for blast engine, pumps, &e., and allowing 15 per cent. for waste by priming, cleaning boilers, &c.), this water being raised to 100° in a hot well (by the waste steam) and simply converted into steam at 45 tb pressure (non-condensing engines used). Adding this to 3850, a total of 5250 is obtained as heat actually accounted for in smelting average Cleveland ore when the steam power is obtained solely from waste gases as fuel, representing consequently about $$3>=0°656 parts of carbon, say 0°7 parts of coke, or 14 ewts. per ton. Hence even when the consumption of coke is 18 cwts. per ton of pig (below which even with the most highly heated blast continuous production never seems to have been effected, whilst usually a considerably greater amount is used), a large waste of heat through imperfect combustion below the boilers, and radiation, &c., therefrom, is occasioned. A fortiori the same argument applies to a blast furnace using raw coal, even when close-topped.

When compared with other modes of burning fuel in metallurgical operations, &c., however, the blast furnace does not seem to be so wasteful as many of these appliances ; thus Griiner calculates the following values as approximately the percentages utilized of the total heat capacity of the fuel employed in various kinds of furnaces :-—

Air furnaces ; steel melted in crucibles……. 17 Reverberatory furnaces, oe re 2 Sientens's crucible furnace …….-.s0sensscesees 8 to 3°5

5 PERE TUITIACE «200.6050. 00scccnennns savers veeces Sion, Well arranged Siemens and Ponsard's furnaces …. 15 „ 20 Old cupola

melting furnaces …….:.seeeeeeeeee ees 29 „ 30 Modern _„ ee ees Ma selec coins 50 and upwards. Large blast furnaces for iron smelting (exclusive

of the heat obtained by combustion of the? 384 to 36

waste Zascs) ..... CE ee eaaeenrasisas retis eiceee

The rate of production in a blast furnace is, up to a certain extent, variable with its dimensions; but no well marked correlative increase appears to have been effected in the make of furnaces of considerably upwards of 15,000 or 20,000 cubic feet capacity above that of furnaces of these dimensions. The quality of the ore smelted also largely affects the rate, the furnace being of such dimensions as to give the maximum saving of fuel practicable, and the least crushing of the ore by its own weight, together with the minimum tendency to scaffolding, slips, and other practical inconveniences; thus, whilst from furnaces smelting Cum- berland and North Lancashire hematite an output of 600 and even 800 tons per week has been accomplished, from 400 to 500 tons per week is the usual result with large furnaces smelting clay ironstone, such as that of the Cleveland district. Somewhat smaller yields than these are obtainable from furnaces of less capacity.

Charcoal furnaces usually make more pig fora given amount of cubic capacity than when coke, anthracite, or raw coal is employed as fuel: thus, whilst some Styrian charcoal furnaces have been made to produce for every 1000 cubic feet capacity from 110 to 130 tons weekly (the capacity being only 500 to 1200 cubic fcet), and whilst the Swedish and Norwegian and some American charcoal furnaces of 1000 to 3000 cubic feet capacity produce per 1000 cubic feet 50 to 70 tons weekly, the large English coke blast furnaces of 15,000 to 20,000 cubic fect and upwards usually produce only 15 to 30 tons weekly per 1000 cubic feet. Those of the coke, anthracite, and coal burning furnaces of Europe and America of somewhat less capacity than these largest sizes usually produce somewhat more than 20 to 30 tons weekly per 1000 cubic feet ; but in many cases this is done at the expenditure of a greater amount of fuel than that employed in the larger furnaces (7.¢., after making allowance for the difference in the amount of flux added, and cinder produced,

&c.). This is not the case with the Europcan charcoal furnaces, for in some of these the consumption of fuel is not greater, and in other cases is notably less, per ton of iron made than in the largest Eng- lish coke-employing furnaces, even after making these allowances. In many American charcoal furnaces, however, notwithstanding that a purer ore is smclted than that used in some of the European charcoal furnaces, the consumption of charcoal appears to be not-

ably higher, approaching 18 and 19 and even 20 ewts. of charcoal per ton of iron instead of 15 to 17 ewts.; still, as compared with coke, these charcoal furnaces ordinarily consume a smaller amount of fuel. According to Akermann the charcoal used in America is usually very much more dense than that employed in the Swedish charcoal furnaces, so that a bushel sometimes represents some 30 per cent. more of weight of fuel. With charcoal as fuel it does not appear that an increased rate of driving the furnace (by putting on more blast) necessarily causes an increase in the fuel consumption ; indeed, the opposite result has been observed in certain cases, at least to a certain extent, the cause being the relatively smaller loss of heat by radiation, &c., from the furnace. Forany given furnace and ore, &c., there is a particular rate of driving which gives the minimum fuc] consumption : a more rapid rate requires more fuel because the gascs havo not time to effect their full action on the ores, and less carbon dioxide is formed ; a slower rate causes more loss by radiation, &c., relatively to the output. Up to a certain extent it is often advantageons to use a little extra fuel, and increase the rate of production beyond the rate that would correspond to the minimum fuel consuniption ; which is probably the reason why in many instances the fuel employed per ton of iron is somewhiat larger than that found to be requisite in other analogous cases, where the rate of production is somewhat lower ; the exact point at which the advantages of increased rate of production are counter- balanced by extra cost for fucl, and extra wear and tear, &c., necessarily varies in each particular case.

Cold Blast as compared with Hot.—In reference to the employ- ment of cold blast for the production of iron, the saving in fuel occasioned by the use of heated air has been practically proved to be so great that excepting for certain special brands of iron the use of hot blast has almost entirely superseded that of cold; the evi- dence in support of the alleged dcterioration in quality thereby caused is, however, not so conclusive as that in behalf of the economy produced. Witha cold blast the mass of fuel in front of the tuyeres is visibly much less brightly incandescent than that in a hot blast furnace, being com anaively black, indicating considerable local refrigeration, and hence probably differences in the amount of silicon, eae, phosphorus, &c., reduced in the hearth; but analyses of hot and cold blast pig irons made from the same ore do not always show such marked differences as might be anticipated ; opinions are in fact somewhat divided even at the present day on this point, but such of these opinions as admit of being checked by figures usually incline to the non-existence of any material differ- ence between the English pig irons produced from a given ore, flux, and fuel by cold and hot blast respectively. On the other hand, it was for many years after Neilson's patent was taken out a matter of belief, especially in Wales, that the increased impurity of the pig made with hot test necessitated so much more labour and expendi- ture of fuel in puddling, to give a wrought iron equally good with that made by cold blast, as to render the actual saving doubtful ; whilst with certain Swedish charcoal irons of the highest brands, e.g. , Dannemora iron from magnetite, cold blast is still adopted on the ground that experience has shown a marked deterioration in the character of the iron produced when the blast was heated. With other similar Swedish and Norwegian brands, on the other hand, a heated blast is in use, it being considered that no perceptible deterioration in quality is thereby occasioned ; this remark equally applies to the Styrian and Carinthian furnaces employing Eisenerz and Lélling spathic ores, and to those at Fullonica where the Elba specular ore is smelted ; Tiinner states that the use of hot blast for Eisenerz charcoal iron production in no way necessarily produces any deterioration in quality ; and Bell is of thc same opinion so far as English irons made with hot blast up to 500° C. are concerned. In many cases the superiority of cold blast over hot blast iron alleged to exist, as shown by chemical analyses, and more

especially by mechanical tests, is really due to the fact that the ores used for the two are not identical, the cold blast metal being made from a purer quality. In fact, the notion that cold blast iron is vastly superior to hot seems to have been originally to a considcrable extent the result of a trade manceuvre ; thus the ironstone of the Scotch coal-fields near Glasgow being of a refractory nature required the consumption of a much larger amount of fuel with cold blast than did the more easily reducible South Wales ores; but with hot blast a much

eater saving in fucl was produced with the Scotch than with the

elsh ore; as early as 1884 Dufrenoy (director-general of mincs, France) specially investigated the relative advantages of hot and cold blast with these two ores, and found that, whilst with the Scotch ore the saving produced at the Clyde works by heating the blast to about 320° by an expenditure of 8 cwts. of coal per ton of iron was (after allowing for this 8 cwts., and taking into account the coal used for the blowing engines) equivalent on the whole to a diminution of coal consumed from 153 to 59 ewts. of coal per ton of iron,' or ee en ee

1 Dr Clark read before the Royal Society of Edinburgh in 1835 a paper 'On the Application of the Hot Blast in the Manufacture of Iron," in which he stated that at the Clyde works, prior to the end of 1829, the average consumption of coke (45 parts of which were

from 7°65 to 2°95 per unit of pig iron made, the saving with the Welsh ore similarly represented a reduction in consumption at the Plymouth Works, Merthyr Tydvil, of from 53 to 36 ewts., or from 2°65 to 1°80 per unit of pig iron ; so that if the Scotch iron master could compete on equal terms with the Welsh one when cold blast was used, he would have a decided advantage over the latter when hot blast was employed. Accordingly it became a matter of advan- tage to the Welsh smelter to decry hot blast metal, because its manufacture gave him less profit relatively to smelters in other dis- tricts than that of cold blast metal.

Even at this early period, consequently, it was manifest that the advantages derived froin a given modification of plant and processes attainable with one class of ore were not necessarily producible with another class; Dufrenoy found that the furnaces of La Guerche, smelting an impure ore containing 42 pcr cent. of iron, derived little or no benefit by the substitution of hot air for cold ; the fuel used in each case amounted to some 25 ewts. per ton, and the only dis- cernible advantage derived from the hot blast was that the resulting iron became grey instcad of white, doubtless from the higher tem- perature of the issuing pig enabling the graphite to separate more readily whilst cooling and solidifying. Iron masters, however, have often failed to appreciate the truth of the proposition that what is advantageous for one ore may not necessarily be so for another ; and in consequence very different estimates of the value of new pro- ecsses and improvements have frequently been made, some condemn- ing them wholly, because under the circumstances of their own particular experience no remarkable advantages accrued ; others regarding them as universally beneficial, because under the different conditions of their experience a distinct advantage was gained. The early history of the Bessemer process for producing malleable iron and semi-steel dircet from pig by decarbonizing it by blowing air through it affords a good illustration of this point, the process being at first considered by some a complete success, and universally appli- cable, good metal having been made by them from certain kinds of pig iron (naturally almost free from sulphur and phosphorus) ; whilst others regarded it as a failure because the less pure pig experimented on by them yielded only an inferior product.

V. Conversion or Cast Iron Into MALLEABLE [RON AND STEEL BY DECARBONIZATION.

22. Production of " Malleable Cast Iron."—It has been known for upwards of a century and a half that when articles of cast iron of not too great thickness are imbedded in powdered iron oxide (a pure red hematite as free as possible from earthy matters, smithy scales, or some

obtained from 100 of raw coal) was equivalent to 8 tons 1$ cwt. per ton of pig (8°06 per unit of pig iron) when cold blast was nsed; in 1830,

when hot blast was used with the same coke as fuel, the con- sumption was reduced to an amount equivalent to 5 tons 3} cwts. (5°16 per unit of pig); and in 1833, when a hotter blast and actual raw coal were employed, the consumption was only 2 tons 5} cwts. per ton of pig (2°26 per unit of pig), this being exclusive of 8 cwts. of coal used in heating up the blast, making a total of 2 tons 1384 cwts. (2°66 per unit of pig), — figures substantially the same as those of Dufrenoy, represent- ing a reduction in fuel consumption nearly in the ratio of one to three parts of Scotch coal used (as coke) with cold blast and Scotch ore. Much the same figures have also been given by Mushet: thus he states that in 1797 with cold blast the consumption of coal at the Clyde works was 7 tons 3 cwts. per ton of pig (7°15 per unit), whereas in 1839 with hot blast it was only 2 tons 34 cwts. (2°175 per unit). Ou the other hand during the course of a lawsuit entered apon by Neilson to enforce his patent rights, attempts were made to show that the alleged saving in fuel due to the hot blast was really owing to other causes; and subsequently similar views have been urged, perhaps with not wholly disinterested motives; thus Truran states in his work that at Dowlais the coal consumption per ton of iron was reduced to the following extent between 1791 and 1831 by improvements other than the use of hot blast, cold blast being used throughout, with the follow- ing consumption per ton of iron :—

e 2 tons 10 ewt. engines and calcining…... 1 f

” 15 3 Se lve ”

Tome…) 8 5 1 „

Very probably the increased dimensions of furnaces and various other causes all contributed to this large diminution; but it does not there- fore follow that substituting hot blast for cold did not diminish the consumption still further. That such a substitution did actually save fuel with ores and coal from South Wales is shown by Dufrenoy’s figures.

ik O WN

analogous substance) and then kept at a red heat for some days (three or more according to the thickness), a diminu- tion is produced inthe amount of carbon contained, so that the cast iron becomes more or less converted into soft iron. When the action is pushed to the extreme all or almost all of the carbon is removed, that in the outer layers disappear- ing first, but no material diminution in the amount of phos- phorus, silicon, sulphur, or manganese is produced;?! if the heating is not continued long enough to remove all the carbon, that which remains is found in the innermost layers which constitute a core of more or less decarbonized cast iron, with an outer skin of malleable iron. Owing to the non-removal of constituents other than carbon, it is essential to the production of a good malleable metal that a tolerably pure cast iron should be employed in the first instance: unless the articles are thin, so that there is no considerable inner core of cast iron, they will not bear forging so as to weld them, the concussion fracturing the brittle core; on the other hand, the removal of the carbon from the outer skin renders this so much less readily fusible than cast iron that articles so treated (e¢.g., melting pots and crucibles) will bear a very much higher temperature than cast iron vessels, especially if the core is almost wholly decarbonized ; whilst a much greater degree of toughness and power of resisting fracturing influences is communi- cated. Accordingly this method of preparing cheap small malleable iron articles by casting and subsequently decar- bonizing is largely employed, the goods produced being known as "run steel"; whilst even with much larger castings, such as the propellers of screw steamers, the method is often adopted, especially in combination with "case hardening" or conversion of the outermost layer of all into steel by a subsequent process (wide infra). Although the process was described in 1722 by Réaumur, patents for it have been subsequently taken out, ¢.g., by Lucas in 1804, and Brown and Lennox some half century later.

In order to carry out the conversion of cast iron into malleable iron in this way, the articles to be treated are packed in cast or ba iron chests in iron oxide powder ; the chests are then stacked one above another in a kind of reverberatory furnace, and gradually heated up to a red heat, which is maintained for the requisite time, after which they are

annealed by slow cooling; with charcoal pig pretty free from silicon, sulphur, and phosphorus, and with fuel in

the furnace free from any large quantity of sulphur, a soft but tough, tenacious, and readily malleable skin is produced ; if, how-

1 Analyses by W.A. Miller, quoted in Percy's Metallurgy (" Iron and Steel," p. 111), seem to indicate entire removal of sulphur and partial purification from silicon ; thus :—

Before 'Treatment. | After Treatment.

227 0-434

0°583° 0-446 0-951 0°409 trace trace | 0°015 nil. Phosphorus é trace trace SEMI Me cwnc secs sera cerkasccescess-arertoeneeersas 0°502 50

Probably the cast iron contained irregularly distributed intermixed cinder, the silica of which was counted as silicon. When cast iron plates are slowly oxidized by hot air, according to Tiinner, the silicon diminishes, as it does during refining and in the first stage of the Bessemer process; but recent analyses of " malleable cast iron"' articles made on the large scale by cementation in hematite powder show that substantially no change whatever occurs in the phosphorus and silicon, and that what alteration there is in the sulphur is rather in the direction of increase (from the presence of sulphur in the fuel) than otherwise. For instance—

Malleable Malleable

Original Cast Iron Original Cast Iron

Iron. after two Cast Iron. after two Annealings. Annealings.

3°43 lessthan 0°10 0°614

Silicont.. <.scsceec 0°445 449 Sulphur …| 0°059 0°162 0-083 Phosphorus ….....| O°315 0°295 0°315 Manganese ….....00+ 0°529 0°575 0°525

ever, the heating is continued for some time after the whole of the carbon originally present has been removed, the articles become brittle, owing to the formation of oxide of iron disseminated through the mass, just as copper, bronze, and analogous substances are rendered brittle through a similar cause. This circumstance, together with the known character of the chemical actions of carbon dioxide on iron and carbon at a red heat, indicates the nature of the processes taking place during the decarbonization : the ferric oxide and the heated air in contact with it first oxidize the carbon in the outermost film to carbon dioxide ; this then passes inwards by the process of "occlusion" (gradual solution of gases in solids), and reacts upon the carbon of the next layers in accordance with the

tion ode 00, +C=200,

the carbon oxide thus formed first becoming dissolved in the iron, and subsequently when the iron is saturated therewith gradually diffusing outwards, becoming converted into carbon dioxide as soon as it comes in contact with either the ferric oxide of the packing or the partially oxidized iron of the outer film, which, when free from carbon, reacts on the carbon dioxide, thus

yCO, +vFe = Fe,0,+yC0.

In the outermost layers, accordingly, there is always a tendency to the formation of iron oxide in virtue of this reaction, and simul- taneously a tendency to the reduction of this oxide by the agency of the carbon oxide which is being formed in the interior layers and travelling outwards ; as long as this latter action keeps the former in check, the accumulation of iron oxide in the outer layers docs not take place to such an extent as to deteriorate matcrially the tenacity of the malleable iron skin ; but, when the carbon of the core has been so completely removed that the supply of carbon oxide from the interior almost ceases, the formation and accumulation of iron oxide in the outer layers goes on, rendering them more or less brittle. In the inner layers the removal of carbon by the penetration of the dis- solved carbon dioxide

and its reaction on the carbon is continually progressing, the decarbonization gradually creeping inwards, as it were, until finally the innermost central part becomes decarbonized also. The non-removal of silicon, sulphur, and phosphorus during the process is due simply to the fact that these elements are not Siok upon by the occluded carbon dioxide as the carbon is, and consequently not being oxidized cannot be eliminated. The iron oxide used becomes partially reduced during the operation ; in order to make it fit for use over again, it is moistened with a solution of sal-ammoniac and exposed to the air in order to rust and so re- oxidizeit. The whole process is in effect an exact inversion of the chemical changes taking place during the manufacture of blister steel from malleable iron by the process of cementation (see § 32), and differs from the ordinary puddling method for the purification of cast iron in this salient respect that in the latter case the for- mation of oxide of iron by the effect of heated air, and its direct addition in the form of ‘“‘fettling,” give rise to the production of a fluxed mass, in which is incorporated a notably larger amount of oxide of iron, which reacts on the carbon, sulphur, silicon, and phosphorus, oxidizing them and converting them into products which are either gaseous and escape (carbon and sulphur dioxides), or are non-metallic and fusible, and hence separate from the iron as a fused slag or cinder.

23. Refining, Fining, and Puddling of Cast Iron.—In order to convert large masses of pig iron into wrought iron, a large variety of methods have been and to some extent are still employed, differing from oné another in certain details ; they may, however, be classified under two chief heads, viz., those in which the iron is more or less completely fluxed by heat in contact with the solid fuel used, by means of a blast of air on much the same principle as an ordinary smith’s forge, and those in which the treat- ment of the iron is effected in a chamber separate from that in which the fuel is burnt when solid fuel is employed, or in which gaseous fuel is used in the first instance.

Charcoal Finery.—Prior to the invention of puddling, the conversion of cast into wrought iron was uniformly effected by a process which, though differing markedly in certain details in different countries, yet in all cases essen- tially consisted of exposure to an oxidizing

atmosphere and agitation until practically all the carbon and silicon, &c., isremoved, As the iron becomes purer its fusibility lessens, so that ultimately it collects into pasty semi-solid masses which when united together form a “ball,” which is taken out and forged into a “ bloom.”

Of the different kinds of finery in use some fourteen principal modifications have been enumerated by Tiinner, divisible into the

three classes of ‘ Einmalschmelzerei ” (single fusion process), “ Wallonschmiede ” (Walloon process), and ‘* Aufbrechschmiede ” or ‘* Deutscheschmiede” (breaking up process, or German process), Of these most have been virtually out of date for years past ; afew, however, are still in use, but like the puddling process are rapidly giving way to modern soft steel or ingot iron making processes, the use of malleable weld iron being on the whole rapidly decreasing, at least relatively to that of “steel” and fused iron. A single illustration of one of these processes (termed by Tiinner the English Walloon process) will suffice: as carried out in Sweden in what is somewhat inappropriately termed the Lancashire hearth, this differs slightly from the method as used in South Wales, the chief difference being that in the former case the pigs are melted down and the whole operation finished in the same furnace (saving that the rough blooms produced are reheated in a second furnace for further hammering), whilst in the latter the pig is melted in a separate hearth, in fact is passed through a sort of “ running out” fire or refinery before it reaches the finery proper ; the bed of this latter is “ brasqued” or lined with charcoal powder moistened and rammed in, and so forcibly compressed. The tuycres are directed downwards, so that the blast impinges more or less directly upon the fused metal. The effect of the last upon the metal broken up and stirred amongst charcoal heaped over it is gradually to cause the formation of iron oxide and silica, with oxidation of the carbon and other impurities, so that finally the metal used becomes changed into two separate substances, viz., a pasty mass of spongy residual purified metal, and a bath of fluid cinder mainly composed of fer- rous silicate; the former is ultimately removed as a ball and hammered into rough slabs, and

finally after reheating forged into bars, &c.; in the production of " charcoal plates" (for tinplate making), the first rough forged slabs are cut into picces termed "stamps," which are then reheated in a reheating furnace termed a " hollow fire" on a mass of the same kind of metal forged into a shovel shape, the blades of the shovel and the mass of stamps piled on it being then forged into a slab, which is virtually a much bigger blade ; this is doubled upon itself to ensure equality of the two sides, welded, cut off from the shank, and rolled into bars and plates, &c. In Sweden the metal is usually forged by hammering throughout and not rolled at all. For inferior iron plates this pro- cess has been used with the substitution of coke for charcoal and of less pure pig for the better qualities used for the finer plates ; but paddled iron has for the most part long superseded that made in a coke-fired finery for general purposes.

The following analyses illustrate the character of Swedish irons produced in the charcoal finery :—

WOOHOO caicaveroucas Sscnes Hoop L. {Hoop C. L. ADVE cceiaccaceeseed Henry. |H. 8. Bell.) Schafhiutl. | Pattinson and Stead. seecsecsscdnssenscnee 99-660 99-298

0-220

eeeeree

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eeeecesesese

| es al

| Fic, 30.— Refinery—Elevation. , is in practice restricted to one particular operation practised as a preliminary stage in the puddling process, viz., melting pig iron ona hearth such as that shown in figs. 30, 31 (taken

from Bolley's Technology), on which the fuel (coke or char- coal) is piled, the combustion being urged by a blast of air, which also par- tially oxidizesthe iron, both as it melts and sub- sequently ; the molten mass when the opera- tion is complete is either run out into moulds, chilled by throw- See ES

ing water on to Fic. 31.—Plan of fig. 30.

it (the solidified upper surface being removed as a rough cake), or tapped into a separate similar open furnace or into a puddling furnace, in which the conversion into malleable iron is finished. }

The effect of this first treatment is materially to reduce the percentage of total carbon, and almost entirely to remove the silicon present, the latter forming a slag with the oxidized iron together with more or less of the ash of the fuel; when the metal from the refinery is cast, it solidifies as "white iron" destitute or nearly so of graphi- toidal carbon. Sometimes the removal of carbon and silicon is accelerated by adding to the fluxing pig mill scales or other tolerably pure readily fusible iron oxide; lime is also sometimes added, with the intention of either partially removing sulphur present in the pig or preventing its further absorption from the fuel.

A modification of the refinery has been introduced by Parry os applicable to the direct treatment of the molten metal from the blast furnace ; the molten pig being tapped straight into the refinery hearth, a jet of superheated steam is made to play upon its surface (the temperature being maintained BY an air blast in addi- tion) ; the oxidation of the iron is then rapidly effected, with evolu- tion of hydrogen from the decomposition of the steam ; in this way a notable saving in fuel is said to be effected. In South Wales a coke refinery has been largely employed to partially purify the iron subsequently finished in an ordinary puddling furnace ; this refinery or running-out fire is a rectangular hearth with two or more tuyeres delivering blast slanting-wise downwards upon the surface of the fused metal, which is simply introduced as pig piled up on the hearth alternately with layers of coke, melted down, and kept fused with the blast playing on its surface for some time. Owing tothe partial removal of silicon, &c., in this previous treatment, the subsequent puddling develops less cinder, and accordingly is sometimes distin- guished as dry puddling ; whilst puddling proper (consisting of the fusion in a more or less modified Cort's furnace of the pig, and its complete treatment therein at one operation) is spoken of as pig- boiling, the term "boiling" being derived

from the rapid effer- vescent evolution of carbon oxide from the fused mass at a certain stage, when the iron oxide reacts vigorously on the dissolved carbon.

The following analyses by Rocholl illustrate the changes pro- duced during the refining of Bowling cold blast pig :—

Just

Melted, Metal.

Fusion.

95°521 3°644

0-273 0-032

0°530

Fusion.

96-013

3°342

0-130 0-025 0-490

TLON .....cc00e0sssc00e Carbon (total) .... Silicon. ..... 0.000 SUpPHUrY s.s.0s.s500 Phosphorus …....

a | | a ee |

100°000 100-000 100:000 | 100-000

Puddling.—In the “dry puddling” process (which, as compared with the “pigboiling” process, is so little used that the generic term “ puddling ” is much more frequently employed to indicate the latter operation than the former), the iron which has passed through the refinery is placed on the bed of a reverberatory furnace together with a

certain amount of mill cinder or other fettling, and melted down in a somewhat oxidizing atmosphere, the result of which is the formation of a fluxed mixture of pig iron and iron oxide; this is well stirred, whilst the flame keeps it fluid,

so that the iron oxide gradually reacts on the carbon, silicon, phosphorus, and sulphur present, oxidizing them and converting them either into gases which escape, or oxides which by uniting with ferrous oxide form a readily fusible slag. As this process goes on, just asin the charcoal finery, the consistency of the mass alters, the whole thickening firstly to a porridge-like substance and finally to a mixture of pasty solid lumps partly of coherent spongy malleable iron and partly of fluxed slag, mechanically adherent thereto, and dripping from the spongy mass when this is lifted. When the proper consistency is reached the iron is said to "come to nature"; the spongy mass is then raked together with the iron rabble or stirring rod employed, and formed into a rough loosely coherent "ball," which is worked as described in § 25. The use of the refinery conjoined with the dry puddling process has almost ceased in England; certain brands of Yorkshire iron, however, of high reputation, are still prepared in this way. The superiority of the metal is largely due to tho carefulness with which the plates and bars finally prepared are made; the puddled bars are broken into fragments, and each piece carefully examined as to its fracture, the crystalline portions being worked up separately from the fibroid portions which yield the better plates; by piling, reheating, and rolling, d&c., the fragments are worked into bars, which are again piled and rolled into plates, Cold blast pig is preferred for certain of these brands.

In the " pigboiling" process, or puddling par excellence as now understood, the main differences as compared with the preceding are that raw pig iron is used in the first instance instead of refined pig, so that the purification takes longer owing to the greater amount of impurity to be removed, and, in consequence of this and of the larger amount of fettling used, a much larger amount of slag or 'tap cinder" is

formed; in other respects the operation is much the same. The furnace is usually lined in the first instance by melting down and partially oxidizing scrap iron on the bed so as to make a firm foundation ; “ bull. dog” or roasted tap cinder, mainly consisting of ferric oxide and silica, also forms a material largely used, the upper surface being finished off with a layer of a smooth unctuous variety of hematite or with “ blue billy ” (§ 5) or some other variety of ferric oxide.

In order to facilitate the removal of phosphorus and sulphur in the puddling forge, numerous chemical reagents have been em loyed incorporated with the mass by stirring. Thus common salt and manganese dioxide have been recommended by Schafhautl, chlorides of phosphorus, arsenic, and sulphur being said to be formed and volatilized, whilst manganese is communicated to the iron, and by its oxidizing action whilst becoming oxidized itself promotes the purification ; moreover it renders the slag more fusible. Henderson employs a mixture of titaniferous iron ore and fluor spar, whereby fluorides of phosphorus, silicon, &¢., are said to be evolved. Good results are said to be produced by the employment of fluorides (cryolite or fluor spar) as a flux in puddling. Sherman recommends iodide of potassium ; according to Siemens, who carefully tried the Sherman process at the Landore works, no appreciable diminution is produced in the amount of sulphur and phosphorus by the addition of the iodide even in some considerable quantity both during the ordinary “ape of puddling and in a steck converting furnace, and the same kind of negative result has also been testified to by others, notably Snelus (Journal I. and S. Inst., 1871, ii. 181), and also by Euverte after full trial at Terre Noire. On the other hand, trials of the Henderson process appear to indicate that it causes a more rapid purification than ordinary puddling ; thus in experiments made at Blochairn Works, Glasgow, the following percentages of phosphorus were obtained :—

Original pig iron

Partly refined iron 30 minutes after fusion …... 0°23 A . =) 40 * There ore 0°15 ‘ A = 50 Pe ee este 0°12 fs Final wrought iron ….....sscossseessenees eneeeerwees 0°07 qb

The resulting cinder contained considerably less phosphorus than that in the pig employed, so that apparently some notable amount was Volatilized.

IRON

has proposed after puddling in the ordinary way to recar- rey oe fe aaeee if along oa coke and a little lime, &e. {to avoid sulphuration as much as possible), in a cupola furnace, and then to puddle a second time ; the phosphorus being eonsidered by him to be reduced in each puddling operation to about one-fifth of the original amount, the double puddling would convert even a moderately phosphorized pig into a tolerably pure bar iron. Very good iron has thus been made from highly phosphorized pig on a moderately large scale (some 80 tons).

Appliances for Puddling. The Puddling Forge.—The puddling furnace introduced by Cort in 1784 differs from those in use at the present day only in one essential par ticular, viz., that whereas Cort used a bed of sand on which to run the metal fused previously in a running-out fireplace, the modern furnace as improved by Rogers some half century ago has a bed of iron plates cooled by air spaces underneath and covered with roasted scrap iron or with "bulldog," on to which the metal is heaped, having been previously refined or not according as the dry puddling or pig boiling process is used. The substitution of iron bottoms and a firm bed for the loose sand effects a great saving in iron through the formation of much less silicious cinder, and a great saving in time on account of repairs to the bed being much less frequently required ; moreover, a much greater degree of purification from phosphorus is at the same time brought about.

Fig, 32 represents the general arrangement of a puddling furnace ; a is the charging door for the fuel, d@ the bridge with an air course to cool it, ¢ the bed se on iron plates with air courses under them, f the exit flue leading to the chininey stack, which is sur- mounted with a damper & worked by a chain 7 from within the shed in which the forge is placed ; 0 is the ashpit, g the slag-hole, and ¢

WG

h

ll

Middl

S

WY

QIK K W(

SS

_ mG ot ee | ee

K GG GQ GG]|||

KK cc

Fig. 82.—Puddling Furnace.

the working door suspended by a chain from a lever with a counter-oise attached h, resting on the front side of the furnace roof. A arge number of patterns of puddling furnaces differing one from the other in details have been constructed by various inventors ; the limits of the present article as to length forbid that these should be minutely discussed.

Instead of using solid coal or coke as fuel for the puddling forge, gas 1s equally applicable, ¢.e., such as is described in § 10. In order to apply at will an oxidizing or a reducing atmosphere, it 1s only requisite to regulate the supply of air (usually hot blast) to the reverberatory furnace in which the gas is used. In Silesia gas padsting furnaces have been long in use, consisting of producers in which coal is burnt by means of a number of small jets of air forced in at the base of a square brick chamber some 5 feet in height, the top of the chamber being level with the bridge of an ordinary reverberatory furnace, the producer taking the place of the firegrate. In this way a mixture of nitrogen and

earbon oxide with more or less hydrogen and earburetted hydrogens from the distilla- tion of the coal results, the eombustion of which in the reverberatory is effected by blowing a serics of jets of heated air from a row of tuyeres arranged horizontally, or from a long narrow horizontal slit-

shaped tuyere, across the issuing gases so as to form something like a gigantic blow-pipe, or series of parallel blow-pipe flames, which are somewhat inelined downwards so as to impinge on the substances in the bed of the furnace. Similar arrangements have been adopted elsewhere; thus in Carinthia gas-fired puddling furnaces are in use where wood is the fuel, the producer and furnace proper adjoining one another, and the combustion of the gas being completed in the furnace by a jet of blast from a tuyere inclining somewhat downwards ; the blast is inoderately heated by being made to circulate through flues under the furnace bed, thus also cooling the brickwork ; the pigs to be puddled are previously heated up to near their fusing point by the waste gases from a previous operation, being placed ina chamber just beyond the hearth. The waste gases have also been employed to heat the air blast by placing a pistol- pipe or other equivalent kind of stove between the furnace and the chimney. Several furnaces for thus utilizing the waste heat have been introduced, in England in particular; J. Head deseribes under the name of the “ Newport furnace” a somewhat analogous arrangement, a dry steam jet being used in connexion with the air blast ; a great diminution in consumption of fuel is thus said to be produced (Journal I. and S. Inst., 1872, p. 220).

The Siemens regenerative furnace as applied to puddling consists essentially of a furnace fired by the gases from a Siemens gas producer heated (along with the air requisite to burn them) by means of Siemens regenerators (§ 10). The chief difference between this form of furnace, represented by fig. 38, and the Carinthian

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Fig. 338.—Siemens Regenerative Puddling Furnace.

gas furnaces is that the flame does not enter at one end and issue at the other, but leaves the furnace at the same end as that at which it enters, circulating in the furnace, and thereby leaving the other end free for access by means of an ordinary door. Accord- ing to Siemens the loss of weight between pig and puddled bar did not exceed 2 per cent. on an

average of six months' continuous working, whilst the consumption of coal (including the reheating furnace) was 30 ewts. 3 qrs. 8 Ib per ton of finished wire rod (8 cwts. of ordinary fettling being used per ton of iron). Modifications of the Siemens furnace have been adopted in various iron-works differ- ing more or less in detail, but not greatly in on principle ; thus the Ponsard furnace (§ 40) and the Swindell furnace mainly differ in having the producer placed elose to the furnace so that the gases are used directly without passing through the regenerators, which are only used to heat the air. The total fuel used in a Swindell puddling furnace in a large American works on a four months' average was 2024} Ib of slack per ton of yield in iron (2240 Ib), or 0°904 per unit of iron ; the furnace, however, was not at work at night, so that a greater consumption of fuel was occasioned than would have been with double shifts of workmen. Kosmann has made a careful comparison (Preussieher Zeitschr. f. Berg-, Hiitten-, und Salinenwesen, 1870, 145) between the effeets and relative economy of puddling in the ordinary manner and in a Siemens regenerative gas puddling furnace, arriving at the eonclusion that the latter is preferable in all cases where an extremely high heat is required, and where the fuel is of bad quality and unsuited for use in the ordinary way, or when a fixed temperature and particular constant quality of flame are required for any length of time. if, however, these conditions are not required, there is little ad- vantage in the Siemens furnace over the ordinary one, whilst the latter admits of waste heat being utilized for heating boilers, &c. The waste of iron is nearly cqual in the two eases, the ordi- nary furnace being slightly at a disadvantage ; thus the cinder

contained XIII. — At

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Ordinary Furnace. | Siemens Furnace.

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11°98 15°36 BGrrous GRIMS 5.022 ate gomigeae oe 68°69 66°33 Phosphoric anhydride ……..... 14°43 14°28 SOLO? 0 teie rp ncweemasrpaee eee 0°24 0°28

Descriptions of the cost and working of Siemens puddling furnaces in several iron-works are given by the Puddling Committee of the Iron and Steel Institute (Journal, 1872, p. 123). :

Besides the gases generated from coal, various other kinds of fuel for puddling furnaces are sometimes employed ; thus petroleum and

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Fia. 34.—Witham's Mechanical Rabble.

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vances have been introduced from time to time, mostly consisting of an ordinary rabble or some similar stirrer to which motion is communicated by machinery, in such a way as to move it (with some amount of guidance on the part of a workman) more or less in the same way as the puddler would use it. Fig. 34 represents one of this class of mechanical rabbles known as Witham's machine rabble applied to a double puddling furnace. Dormoy's rabble (figs, 35, 36) differs from others of this class in being worked by rotation like a hair-brushing machine ; the tool being made to revolve very rapidly (300 to 500 turns per minute for white iron and 800 to 1000 for grey pig) gives the metal such an impulse that it gyrates _ horizontally round the bed, continually renewing the surface in contact with the atmosphere; this is further aided by making the end of the rabble to carry a disk, which is replaced by a short twisted point when the metal comes to nature; only for the final balling is a hand-worked rabble re- quisite. According to

Paget (Journal I. and S. Inst., 1872, 338) one fettling serves for forty charges worked in this way ; an in- crease of 30 per cent. -in the yield is effected, – with an expenditure of only 0°552 parts of coal perunit of wrought

coal tar have been used in American works, as also has the natural | iron made (11°4 cwts. per ton); the puddler is but little as from the eiinceen thing. oil wells, and that produced by partially | fatigued, although charges are worked off much more

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ust (see § 10).

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yy Y= : «= 24. Machinery for Saving Labour in Puddling.—In

\ \ Fic. 35.—Dormoy's Rabble —Transverse Section. order to diminish the amount of laborious and exhausting work performed by the puddler, various mechanical contri-

rapidly, whilst sulphur and phosphorus are so well elimi- nated that inferior brands of pig produce iron equal to good charcoal iron. Numerous other mechanical rabbles and analogous appliances have been introduced by various

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Fic. 36.—Dormoy's Rabble—Details of Puddling Tool.

inventors; reports on the working of several of these (Witham's, Griffith's, Stoker's, Wilson's, éc.), and on the construction and performance of several kinds of puddling furnace, are given by the Puddling Committee of the Iron and Steel Institute in the Journal, 1872; also of the rom Thats furnace and mechanical rabble, did., 1876,

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Many attempts were made prior to 1869, chiefly by Walker and Warren, Maudsley, Yates, Tooth, and Menelaus, to effect puddling by a revolving furnace rotated by machinery so as to cause the requisite intermixture of

IRON

and slag mechanically ; Bessemer proposed to employ an ovoid oscillating chamber fired by flame pass- ing in through a hollow-trunnion on one side and. escap- ing similarly on the other side, whilst Oestlund (of Sweden) invented a rotating globular vessel into which the flame was directed from the front. Practically none of these machines ever came much into use. A considerable measure of success, however, has attended the improved form of rotary puddling furnace invented by Danks of Cincinnati, and represented in fig. 37.

pig, fettling,

The fuel is burnt in an ordinary fireplace, a blast B being admitted under the bars and. another over them A, level with the firing hole, so that by regulating the two streams of air the atmosphere can be kept reducing or oxidizing at will. A circular chamber or drum C is supported on massive friction rollers and arranged so that its axis is about level with the top of the bridge; at the other end is a movable terminal shaped like the frustum of a cone D, supported by chains or rods from a crane so that it can be swung on one side if required, thus serving as a door ; this is

connected by a lateral tube with the flue; a small orifice E closed by a stopper allows the interior of the furnace to .be viewed when at work. The movable end being swung on one side and the blast turned off, the pigs are introduced at the end, and the terminal replaced ; on turning on the blast and causing the drum to rotate slowly the pig is melted and incorporated with the fettling, &c., by the rotation; motion is communicated by means of a large external cog wheel F gearing intoa pinion. Through a small cinder hole G the fluid slag is drawn off. The main difficulty experienced by

revious inventors was to obtain a furnace lining that would last or any length of time, silicious bricks and analogous substances being used by them ; this difficulty was overcome by Danks in the following way. ‘The iron external drum is cased inside with fire- brick, or preferably a cement composed of crushed ore and lime ; a fusible iron ore such as hammer slag or mill scaleis then introduced and melted down, the drum being slowly rotated; the rotation being stopped, the melted mass collects as a pool at the lowest level ; large irregular lumps of an infusible ore (American iron mountain ore in preference, or Marbella lumps when this is not attainable) are then thrown into the pool ; the cooling effect of these soon sets the liquid mass, which thon acts as a cement, binding the lumps to the lining. This operation is repeated several times, so that finally

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Fria. 87.—Danks Rotary Puddling Furnace.

the whole inside is lined, the pool being formed in a new place each time. The performance of the Danks puddler was very fully in- vestigated a few years ago by a special commission of the Iron and Steel Institute, whose various reports are given in the Journal of the I. and 8. Inst. for 1872 (see also 2bid., 1871, i. 258); the general results of the experiments being that the production from the rotator is several times that from a hand furnace using the same pig, and that a larger yield of iron is obtained, more being in fact taken out of the furnace than is put in as pig, the surplus arising from the reduction of the fettling; moreover, with suitable fettling the quality of iron produced is always at least equal to that yielded by the hand furnace, and is usually much superior owiug to the more complete elimination of phosphorus due to the less “ acid” nature of the slag ; the consumption of fuel per ton of iron made is much about the same, but usually somewhat less with the rotator than with the hand furnace; thus whilst something like 214 ewts. of pig were required to give a ton of wrought iron by the hand process, slightly less than 182 sufficed with the Danks furnace ; 7.¢., 100 parts of wrought iron were obtained from 107°5 and from 93°6 parts of pig in the two processes respectively. It is to be noticed, how- ever, that further practical experience has not altogether confirmed the results of the commission, and that so far as England is con- cerned the advantages derived from mechanical puddling by the

Danks machine (and also by others subsequently introduced) have not proved as great in actual practice as the success of the machine in America at first seemed to indicate would be the case in other countries.

In order to avoid the damage done to the lining by introducing solid pigs, Wood proposes to granulate the iron by means of a machine somewhat analogous to his slag granulator (§ 17), whilst fusion of the pigs in a separate furnace or cupola has also been often employed, the molten metal being then tapped into the rotary puddler.

A large number of modifications of Danks's furnace and many other more or less analogous rotating arrangements for puddling have been subsequently constructed by various inventors; thus Williams (Pittsburg, United States) makes the rotating chamber of the Danks furnace to be separated from the combustion chamber a little way, the flame being led in through a movable flue analo- gous to that at the chimney end, so that access to both ends of the rotator is possible.1 Amongst other rotating puddling furnaces may be noticed the following.

Seller's Furnace.—In this arrangement the flame does not pass through the chamber to the chimney, but turns back on itself as

1 See Iron, vol. x. p. 456, 1877, from the Metallurgical. Review.

in the Siemens puddling furnace (fig. 33). The far end is cooled by water or steam; the fuel employed is gaseous, the generator being immediately in front of the furnace; mechanical arrange- ments of special eharacter are also applied for the purpose of eharging and diseharging thefurnaees. The rotating chamber rests on friction wheels which are made to turn by an engine instead of having an external cog wheel affixed to the drum itself as in Danks's machine. For drawings of the machine and further details see Jron, vol. x.

. 738.

‘ Spencer’s rotating furnace (fig. 38) is shaped like a rhombus reversing on a horizontal axis, supported at the end by disks per- pendicular to the axis of rotation ; the transverse vertical section is square, two sides being parallel to the axis, the other two, though parallel to each other, being pitched slightly diagonal, so that in revolving a throw is communieated to the charge from bridge to flue during one half of the revolution, and vice versa during the other half, The flat sides allow the rotator to be readily fettled ;

they are made of troughs filled with molten tap cinder, the ends being made up of bricks also of cast tap cinder, the whole put together and cemented with molten tap; in one side is the door The pig is

for removing the ball when it has come to nature.

Fic. 38.—Speneer’s Revolving Puddling Furnace.

thence to the drain. The wearing joints 0, O of the furnace and flue which rub together are iron rings, direetly in contact with the water (forming the ends of the jackets); these are renewable when required. In fettling the furnace either oxide of iron bricks moulded to fit the furnace are built in and then baked in situ, and fettled in much the same way as Danks’s furnace (viz., melting fusible ores or cinder, and throwing in irregular lumps of ore, splashing the cinder over the far end in so doing so as to eover it); or hammer slag, &c., is melted on the bare iron casing, and lumps of ore are thrown into the fused substance so as to be thereby eemented to the casing; or a thin firebriek lining may be built in and the fettling then put on. Owing to the cooling aetion of the water-jacket when the furnace is in use, the bricks are never melted down, and even a fluid cinder nae directly to the iron plates in the first instance without bricks of any kind is completely prevented from fluxing ; in the same way the far end gets spontancously fettled by the consolidation of the cinder splashed against it. According to Crampton’s deseription of the furnace (from which the above account is abridged—Journal L. and S. Inst., 1874, 384), in puddling 130 ewts. of pig 147% ewts. of hammered irou were ultimately produced, with an expenditure of 70 ewts. of coal, 7.¢., the wrought iron was 113°5 per eent. of the pig used, and the coal employed was 47°3 per cent. of the

wrought iron made (or 9°46 cwts. per ton); in another case, with smaller charges, the eoal consumption was 70°1 per cent. of the wrought iron (14°02 ewts. per ton), which amounted to 114°5 of the pig used. Pig

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melted in a cupola before running in; in about five minutes the boil eommenees, and it lasts about ten minutes, the operation being finished in other ten, when the ball is extracted, and quickly re- moved on a bogie to the hammer and rolls.

Crampton's furnace has a similar construction, with the addi- tional modification that the flame is produced by coal dust and air ($ 10) instead of solid fuel (fig. 39). A is the revolving ehamber supported on frietion rollers C, C ; B is the refraetory lining, and D a movable flue piece, supported upon a pivot D' so as to wheel round when required into the position indicated by the dotted lines ; it is kept in place against the furnace by the screws d, d when the operation is proceeding. By means of the injecting pipe G a jet of mixed air aud small coal is blown into the furnace ; this pipe is adjustable so that the flame can be directed into the furnaee in different ways as required ; when a number of furnaces are worked together from one central air and coal reservoir, each one is fed bya pipe G' radiating from the reservoir. By means of little doors f, f different parts of the opening F in the flue piece through which the jet enters can be elosed at will. A water jacket surrounds the rotator fed through the two-way cock H with a stream of water cir- culating as indieated by the arrows entering by the pipe I, and passing through the jacket JJKLL to the exit pipe N, after which it passes to the flue piece D (by means of a flexible tube), and there cireulates through another analogous jacket, finally emerging by a pipe and running into a chamber d' at the base of the pivot and

I, Plan on line A B.

containing nearly one per cent. of phosphorus yielded wrought iron containing only traces.

Howson and Thomas's Rotary Machine. —The chamber is made up of two cones of wrought iron fixed base to base, lined with brieks made of ferric oxide and previously well-baked, ilmenite or hema- tite or any refraetory ore being suitable. The fireplace eommuni- cates with an annular space surrounding the neck of the ehamber nearest to it by a tube, so that any air which would otherwise be drawn in by the draught at the opening between the grate bridge and revolver is drawn over to the fire and not into the ehamber. In order to withdraw the ball, and introduce a new charge, the revolver is mounted on & carriage (supporting the friction rollers), so that by running the carriage backwards or forwards, in a direction te? gesagt to the axis, access is had to the interior through the ends, or the chamber is again put into position.

Riley and Henleys Furnace.—This furnace has a bowl-shaped bed which revolves on a vertical axis by machinery, the sides and roof being fixed ; when the pig is tntrodnced and melted down, the workman inserts his rabble at the working door, and has simply to hold it in position to stir up the molten mass, this being facilitated by a projecting stud being fixed to the rabble and fitting into a eavity in the doorplate. Whenthe metal begins to come to nature, it is worked with a differently shaped tool somcthing like a plough- share in shape ; this, being pressed against the bottom, causes the plastic mass to roll over the plough like a small cascade ; finally the

iron is balled up, the quantity worked at once being sufficient to form several balls. Zhrenwerth's and Alleyne's furnaces are very similar in construction and mode of use ; in the latter the axis is hollow, containing a water pipe by means of which jets of water are made to play on the under surface of the upper bottom (the bottom being double), the water flowing away again through the hollow shaft; in a later modification, a mechanical rabble capable of rotary or reciprocating motion is also attached. ;

Pernot Puddling Furnace.—This furnace essentially differs from the preceding ones only in that, while the revolving hearth rotates on an

axis not perfectly vertical (as also previously used by Maudes-

ley), the axis is mounted on a carriage, so that when required for repairs the whole hearth can be withdrawn. Fig. 62 represents the furnace with this modification that, instead of an ordinary fireplace being employed, a Siemens regenerator and Siemens gas producer are used in connexion with the Pernot hearth, the arrangement being intended for steel melting by the Siemens-Martin process rather than for puddling (see § 40). According to Petin (Journ. I. and S. Inst., 1874, 148) the fuel consumption with the Pernot hearth as compared with the ordinary puddling furnace is cousiderably less (the fuel being burnt in the same kind of fireplace in each case), whilst the loss in puddling is also less; thus per unit of wrought

Fia 39.—Crampton's Revolving Puddling Furnace—Cross Section and Sectional Plan.

iron the following figures were obtained during the puddling of nearly 300 tons of fine iron and 50 tons of ordinary iron (leaving out of account the saving of labour) :—

~ Pernot Hearth. a 7 Pmas: A igused = 1021 : to 1:070 IRC UPAR Bsa) savetenii tis insunsoeces Coal 5 rae 1-279 1770 sa

: g =" a0e2 1120 to 1°160 Ordinary Pigs Ore eneerceceesoee ** Coal > = 0:726 1°170

Further experience has confirmed these results to a consider- able extent ; thus the results of a year's working at Ougrée in- dicates that a yield of 1 part of puddle bars is obtained with a consumption of between 1°09 and 1°10 of the white Ougrée pig and 0°75 to 0°80 parts of coal, or 0°04 less of pig and 0°20 less of coal than is consumed with the ordinary puddling furnaces in use there.

The Godfrey and Howson Puddling Furnace.—Like the Pernot furnace, this has a pan-shaped hearth rotating upon an oblique axis ;

the obliquity of this can be adjusted to any required angle within certain limits, so as to admit of the ball being tilted out when the operation is over, the furnace bed having both a rotary and a tiltin movement. The source of heat is like that of a Crampton's urnace, with this difference that instead of using coal dust a gas and air jet like a compound blowpipe of enormous inag- nitude is employed. Details of the construction and working are given in the Journal I. and S. Inst., 1877, p. 416; when the pig Iron 1s previously melted in a cupola, it is said that a consumption of 2500 cubic feet suffices to puddle a ton of metal, this amount representing only about 5 ewts. of coal, the coke of which is not con- sumed, and is consequently available for heating purposes.

It deserves notice that in 1858 Oestlund invented in Sweden a revolving furnace almost identical in principle and mode of work- ing with the Godfrey and Howson furnace of some eighteen years later date ; Jordan gives a description of this and some other Swedish early inventions in the same direction (Revue Universelle des Mines, tom. iii. No. 1; see also ron, 1878, vol. xi. pp. 740 and 772),

The following analyses by Louis illustrate the changes produced during the puddling by hand of Nova Scotia pig :—

cinder produced during puddling, reheating, &c.

40 Mins. Time from Pe- ° riod of com- plete Fusion Pi

13 Mins, Boil In vigorous progress.

98°67 1°10

99°68 0°16

0°23 0-09 trace 0:07

100:00 | 100-00

JYOM pesdes: .qinseweses ‘ Carbon (total) ,... BINGO jaar adeapeses Phosphorus ……. Manganese „.....

100°00

100-00

The following analyses indicate the character of various kinds o

Refinery Cinder,

Tap Cinder, Dowlais.

Hammer- —~|slag Hand- puddling

=

Char- eoal Finery Cinder, Silesia,

Cleveland Particulars….„„+: Bro ——” Crystal- ne

Machine.

ee

| Analyst sitdensagenasaes) \OREIUS Percy. Louis. Riley. | Riley. |Karsten.

48°43

1711 113

1°28 0°47 0°35 29°60

Ferrous oxide…..... Ferrie

eosccese

traces traces 14°69

1°60

Phosphorus ..,.....+. Sulphur, ...055. 5-00 S25 Ferrous sulphide… 1°61

99-42 | 10132 | 99°97 | 99-79

According to the care bestowed by the operator, and the nature

of the fettling and other circumstances, the amount of silicon,

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sulphur, and phosphorus in the puddle bars obtained from a given | kind of pig will vary. Many of the machines for puddling

above mentioned, and of the more or less analogous ones invented | by Menessier Jones, Gidlow and Abbott, Bouvart, and others, are

reported by their inventors to answer far better in this respect than | ordinary hand-puddling furnaces, in particular as regards the re-

moval of phosphorus ; so that with Cleveland pig, for instance, con- | taining 1°5 to 2°0 per cent. of that element, whilst the hand-puddle bars usually contain about 0°5 per cent. of phosphorus, only 0°2 and 01 pe cent. and even less iscontained in the machine-puddled metal.

This result has been traced in some instances to the use of fettling materials containing but little silica; the production of a comparatively non-silicious cinder greatly facilitates the oxidation and removal of phosphorus (as in the “‘ basic ” Bessemer process,— § 37); whilst, conversely, well-puddled iron, if left in contact with a highly silicious cinder, is capable of removing phosphorus there- from and taking it up again. Based on this principle, several pro- cesses have been proposed for more or less completely dephos- phorizing pig iron either during puddling or previously thereto ; among them may be mentioned the following.

Bell’s Processes. —Lowthian Bell has proposed to desili- conize the pig by blowing for a few minutes in a Bessemer converter, and then to

transfer to a puddling furnace and finish the operation therein so as also to eliminate phos- phorus; in case the metal contains so much phosphorus as to come to nature before a sufficient amount of that im- purity is removed, spiegeleisen or other carbonized iron free from phosphorus is added to the partially blown metal, so as to prolong the operation of puddling, and consequently to enable a larger amount of phosphorus to be removed ; or the too rapid expulsion of the carbon may be prevented by blowing into the converter along with the blast carbonaceous matter, such as ground coke or charcoal, &c. Partially refined metal thus prepared charged into the furnace in the fluid state causes much less injury to the lining than ordinary pigs, especially when used solid, and consequently with a good deal of sand adherent to them; and the process has the additional advantage of diminishing the time dur- ing which the furnace is required for each puddling heat, so that the yield per furnace is increased, whilst the quality of the metal is also improved; thus when Cleveland pig was treated by blowing for five minutes in a Bessemer converter, and the fluid metal then puddled, the phosphorus in the final product was reduced to 0°3 per cent., whereas when puddled in the ordinary way it amounted to 0°5 per cent. and upwards.

The same result as regards partial purification of the pig iron can also be produced in a more simple way and to a greater extent by "washing" molten pig iron with iron oxide (ore, cinder, &c.) in a fused state, the two being agitated together at a temperature suffi- ciently low to prevent the iron from being heated much above its fusing point ; under these circumstances the greater portion of the phosphorus present is oxidized and removed, whilst only a fraction of the carbon is oxidized, although at higher temperatures the carbon is rapidly oxidized ; to effect this either a rotating or an oscillating puddling furnace can be employed, or preferably a special arrange- ment consisting of a trough of boiler plate closed at the ends and: covered with a brick arch and lined with purple ore at the bottom and sides ; the trough rests ona horizontal axis, so that it can oscil- late like the beam of an engine ; hence any material placed inside is continually rolled or made to flow from one end to the other and back by the oscillation. The trough is about 12 feet long, 3 wide, and 3 high ; the interior being red hot and

the oxide introduced (either fluid or sufficiently hot to melt when in contact with fused pig iron), the pig is run in, and oscillation kept up for about ten minutes, when the partially purified metal is tapped out and puddled in the ordinary way ; during the oscillation the metal and

oxide travel altogether some 700 to 900 fcet backwards and forwards from one end to the other. In this way a pig containing much phosphorus is almost wholly dephosphorized, as, for example, in the

following instance.

Loss per 100 Refined Metal. |parts of original Non-metal.

Pig before Treatment.

Per cent. | SilkG@M, Wecccaxaenscnn-sc* 0°12 94 OAEDON, gas cse ssi ees econ: 3‘1 11 Phosphorus:... <..+ =: 0°23 84

fkRON

Krupp’s process (Narje’s process) for dephosphorizing iron is in principle very much the same as Bell’s method, the phosphorus being oxidized by fused iron oxide, only at a much higher temperature than that used by Bell. Wedding describes the process as carried out at Essen thus: the pig is melted in a 13 foot cupola with coke (taking an hour and a half), and is then tapped into a modified Pernot hearth (§ 40) covered with a layer of fluxed ore almost a foot thick, melted on at a very high temperature ; before every heat from 1500 to 1700 ib of ore, heated until sintered, are added before the iron is tapped from the cupola. At first the furnace is made to revolve twice only in a minute, but later the speed is increased to five revolutions per minute. In from five to ten minutes the phosphorus is almost completely removed, the point when this is the case being indicated by the formation of jets of carbon oxide ; prior to the formation of these, the carbon percentage is barely altered, although the phosphorus is acted upon rapidly. Finkiner gives the following analyses of various specimens of metal thus treated : —

Sample No. 1. Sample No. 3.

Sample No. 2.

After Treat- ment.

Before Treat- ment.

After Treat- ment.

Before Treat- ment.

Carbon (mean of duplicate deter- minations)

Phosphorus

3°94 | 3°76 | 3°80 | 3°57

do. | 0°631 | 0°182 | 0°448 | 0°107 | 1°221 | 0°302

Manganiferous ores are employed in preference, the presence of manganese being said to increase the rate of removal of phosphorus whilst diminishing that of carbon. Both in Europe and America this method has been employed on the large manufacturing scale with consider- able success, especially for the prepazation and purification of metal for Siemens-Martin steel.

Hamoir's process as carried out at Mauberge (France) essentially consisted in the removal of silicon, &c., by blowing air through the molten pig before puddling it in the ordinary way ; according to Deby an economy of 10 per cent. of fuel was thus occasioned, with an increase of 10 per cent. in daily output (10 heats being worked instead of 9), the quality of the metal being also improved.

Smyth has proposed to refine pig iron by blowing in a Bessemer converter or analogous specially constructed vessel with a blast con- taining petroleum disseminated through it, together with hydro- chloric acid or caustic soda, these chemicals being introduced in a special picce of apparatus or " generator" somewhat analogous to an ordinary spray

producer, and the partially refined metal being subsequently puddled in the usual way. A number of experiments made by Maynard at Gorton (near Manchester) indicated that the advantages of the process were hardly in proportion to the extra cost thereby entailed so far as the purifying action is concerned; but there is an advantage in the use of petroleum as a means of obtain- ing the high tempcrature in the converter or ‘ receiver” used by Smyth requisite to keep the blown metal in fusion and prevent ‘skulls forming when it is run out into a casting ladle, in cases where the iron has not the requisite amount of silicon present to enable it to generate this heat with the use of air alone (see § 27).

Pettitt’s process for dephosphorizing pig iron, strictly speaking, is in no way a modification of the ordinary methods of mechanical puddling, being more akin to the ‘“‘basic” dephosphorization method ($37). Essentially it consists of the use of a blast carrying with itinto the Bessemer converter iron oxide particles, the object being to bring iron oxide into intimate contact with the fused metal, and thus make the slag formed in the body of the iron “ basic ” ab initio, instead of its being mainly silicate, as in the ordinary pro- cess. According to the inventor it is not necessary, in order to produce steel, to employ spiegeleisen, nor to alter the mode of lining with ganister in any way; he gives the following analyses :—

Pig Iron before

dueed. Treatment. Se

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Bilas porate. scores sue | 1:44 0°07 ManeaneSeqis..J..5 aiescinen trace trace

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“Ag yet the process does not seem to have attracted the attention, or to have produced the results, that were expected of it some two or three years back. ; ; ;

Eaton’s Process (Drown’s Process).—In connexion with the history of the dephosphorization of pig iron, and its conversion into steel, the experiments of Eaton (of Brooklyn, N.Y.) are of interest; in 1860 he patented the production of steel by the fusion together of cast iron and alkaline carbonates or by the exposure of the cast iron to the decarbonizing and purifying action of these salts in a fused state. No practical use seems to have been made of the process. Recently the subject has been investigated by Drown, who finds that cast iron plates immersed in melted sodium carbonate for several days become converted into malleable iron to a greater or lesser depth by a pro- cess substantially the same as that occurring when iron oxide is used as the “cementing” agent (§ 22), so far as the removal of carbon is concerned, but differing in that silicon and phosphorus are also largely oxidized and removed. Thus the following analyses represent the purifying effect of a seven days’ treatment of a bar of pig iron :— ‘

After Treatment for seven days.

ps inch | # inch

inch ‘ot deep. (CD00 cree UGS SPMCOML c.cccs sae = Phosphorus…..... WATHOW 5.0.00. cies Oe ee AICO is vceeee cess 0°574 | 0°607 | 1°281 Phosphorus…..... 0‘015 | 0°201 | 0°776

95. Machinery and Appliances employed in the Manu- facture of Malleable Iron.—When a ball has been prepared in the puddling furnace, it consists of a loosely coherent spongy mass of iron of doughy consistency with fluid slag filling up all the interstices and dripping fromit. The first thing to be done with it is to hammer or squeeze it into a somewhat more compact mass or bloom, the fluid slag being thus toa considerable extent removed ; the mass is then further hammered or rolled into rough bars, by which time it has so far cooled down that before it can be further manipulated it must be again heated up to welding heat ; previously to this heating it is cut up into slips which are

“piled” on one another and “ fagoted” together with iron wire, and after being heated up again are hammered into a bloom and rolled or otherwise worked into bars, plates, rods, &c., as required. For very coarse bars piling and reheating is not always necessary; but for the better qualities of “ merchant iron” these operations are carefully gone through, often more than once; the size of the piles, the way in which the separate portions are arranged in them, and the mode of rolling, &c., depending on the form ultimately desired; thus the arrangement is somewhat different when T iron is intended to be made from that adopted for plates, and so on; the pile being made in the former case pyramidal or somewhat | shaped, in the latter of rectangular section.

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ze Formerly the balls were squeezed by an “ alligator” cr “ croco- ile” squeezer such as that represented in fig. 40, and were then

Fig. 40.—Alligator Squeezer.

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‘* shingled” by shingling hammers, such as the “ tilt” hammer (where the hammer forms a lever with the fulcrum in the middle, a cam pressing upon one end serving to depress that end and raise the other which carries the head) and the “ helve ” hammer (where

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II. Plan.

the fulerum is at one end, the lifting cam being at the other, and the hammer head between the two, as near the eam as possible, fig. 41); these arrangements were usually worked by water-power. With the increased ‘use of steam-power more powerful squeezers were employed. Fig. 42 represents Brown’s revolving squeezer, the ball being made to pass between two rotating cams which flatten it out, and subsequently between the second of these and a third which carries the operation further; in more powerful machines of the kind a larger number of cams still is employed. Fig. 43 represents another form of rotary squeezer, in which, by the friction of the revolving inner wheel C (studded with blunt projecting teeth) the ball D is urged onwards from A where it enters to E where it leaves, and is con- sequently flattened out and squeezed by the pressure between C and the outer circle BL. The use of the steam hammer, however, has now largely superseded these arrangements for the produce of hand- puddling furnaces ; for larger masses hydraulic squeezers are often used; thus Siemens employs an hydraulie compressor in which three or more hydraulic rams simultane- ously advance horizontally to the ball in radial directions, the ball being mounted on a turntable, so that when the rams retire it ean be {, shifted round so as to present fresh surface to the rams; after lateral compression, a vertical ram or screw descends upon the ball so as to compress it in a new direction. For the Pi balls obtained in ne Danks furnace, &c., a powerfu : squeezer is used, in Seinalate ana- Fic. 43.—Revolving Squeezer. logous to Brown’s (fig. 42), having two rollers at the base revolv- ing in the same direction, and a large eccentric or cam geared to them and also revolving in the same direction, the end being hammered up by a horizontal steam hammer when the pressure forces the metal outwards. :

Fig. 44 represents a single-acting hammer after Nasmyth’s construction (Cave’s modification), in which the cylinder is fixed and the

Fic. 41.—Helve Hammer. I. Elevation.

Fic. 42.—Brown’s Revolving Squeezer.

piston movable; and fig, 45 indicates a form of Condie's hammer! which has the piston fixed and the cylinder movable ; in each case the movable part works vertically and carries a heavy hammer head at the lower end, underneath which isa massive anvil resting on a solid foundation. In the case of single-acting hammers, the steam pres- sure is only employed to lift the hammer head, the fall being simply that due to gravity ; much greater force of impact is gained in double-acting hammers, where the steam is admitted on each side of the piston alternately, in the one case lifting the head as with the single-acting hammer, in the other adding to the force of gravi- tation by its pressure. By suitably working the valves the blow may be modified or arrested at any desired stage; a cushion of steam being left underneath the piston by closing the exhaust valve before the stroke is complete, the force of the blow is deadened ; so that a

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Fia. 44.—Cave's modification of Nasmyth's Hammer.

variable amount of impact can be imparted, it being possible for an expert hammerman to crack a nut without injuring the kernel, and at the next stroke to exert the full power of the machine. It is this adaptability that renders the steam hammer preferable to the old helve and tilt hammers, the blows from which could not be readily modified during the shingling of a given ball ; whilst the ball is excessively pasty and spongy immediately after taking from the puddling furnace, comparatively light blows suffice to shape it into a bloom, the mass being dexterously turned about on the anvil by means of suitable tongs during the forging ; the force of the blow is then greatly increased so {as to squirt out the fused slag on all sides in a shower at each stroke, and forge the bloom into a compact

1 Taken from Bolley's Handbuch, vol. vii., part 2, by Dr C. Stélzel.

mass; in this way the steam hammer acts as both squcezer and helve hammer combined. Hammer blocksor " tups" of from 1 to 3 tons weight usually suffice for ordinary puddling furnace work, and lighter ones still for various kinds of smelting and forging work ; but when large masses have to be forged for special purposes, e.g., thick armour plates, large crankshafts, coils for large guns, &e., much heavier tups are used, weighing many tons ; thus in Krupp's works a 50-ton hammer is in use with a 10-foot stroke, the anvil weighing upwards of 180 tons, whilst at Creusot an 80-ton hammer with a fall of 5 metres (about 16 feet) is employed. The striking faces of both anvil and tup are usually removable, sliding sideways by dovetails into the body of the tup and the anvil block respectively. For certain classes of work curved faces are employed instead of plain ones; so that a roughly cylindrical bar can be forged by appropriate manipulation.

A duplex horizontal modification of the vertical steam hammer is sometimes used (Ramsbottom's hammer), consisting of two opposed hammer blocks running on wheels or rollers and meeting one another ; the forging being placed between the two is struck by both simultaneously. In one form of this double horizontal hammer the two tups are actuated by the same piston, each being

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Fia. 45.—Condie's Hammer,

attached thereto by a link rod so that both necessarily approach and recede at equal ratio; in another form two pistons are employed, the steam valves of each being worked simultaneously by the con- trolling lever. For forging small articles such as bolts, screws, &c., special machines are in use, striking a large number of blows per minute, the hammer heads and anvil locks being moulded or curved into the appropriate forms so as virtually to form dies ; the blows are usually struck by means of cams lifting the hammers and bending strong springs which force the hammer back when the cams rélease them. See also HAMMER, vol. xi. p. 425.

For bending into shape large masses of metal such as thick armour plates that have to be curved to the ship's side, powerful hydraulic presses are employed ; by means of the same appliances large weldings of metal that cannot readily be hammered on account of the shape can be readily made; thus, for welding the spokes and tyres of iron and steel wheels and the like operations, hydraulic forging, squeezing, welding, and bending machines are found to be eminently satisfactory. Crank axles thus bent are said to be stronger than ordinary forged ones,

Rolling Mills.—After the bloom has been forged more or less into shape by the steam hammers, it is passed between

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a pair of stout cast iron rollers, usually with roughened surfaces, which are made to revolve synchronously but in opposite directions by suitable gearing ; the opposed faces of the rolls which meet the bloom between them are con- sequently moving in the same direction; by

these “roughing rolls” the bloom is squeezed out into a rough irregular long plate or slab, much as a lump of dough is by a cook’s rolling pin; this is passed through another pair of rolls with smoother surfaces, which draw the mass out into a thinner barorslab. Instead of having the two sets of rolls arranged one in front of the other, they are often placed one above the other; the bar after passing in one direction between one pair is returned again through the other pair. Instead of four rollers, only three are generally used (forming a “three-high train”), the bar passing above the middle one whilst travelling in one direction and below it when passing the reverse way. The “puddle bar” or “muck bar” thus ob- tained in the form of elongated slabs of from 4 to 18 inches wide, and half an inch to 2 inches thick, according to the size to which it has been reduced, is then cut up into lengths of some few feet, several of which are piled one on the other, reheated, and rolled down again into another bar or slab of superior quality (No. 2).

For thick plates the pile is made much heavier than for thinner bars; two puddle bar wide slabs are used for the top and bottom of the pile, between which are arranged thinner bars, either of puddle bar or No, 2; the pile being heated to a welding heat 1s first

passed between roughed rolls to consolidate it, then through other pairs of smooth rolls in succession, the space between each pair

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Fie. 46,—Two-high Trains.

being successively less and less so as to elongate the bar and diminish its section at each passage, much as wire is in wire draw- ing ; this is usually effected by grooving the rollers used for the last few rolling stages so that the rolls are almost in contact with one another saving where grooved. Fig. 46 illustrates two kinds of successions of grooves used for rectangular bars in a “ two-

high” train, and fig. 47 those for rails in a “three-high” train on A. Thomas’s system. The bars are turned one quarter round at each passage, so that the pressure may be exerted alternately compressing and extending each component layer of bars in the pile, and thus developing a more uniform texture. Sometimes, in reducing the pile to the larger-sized bar which is ultimately sent through the finish-

Fic. 47.—Three-high Train.

ing train” of grooved rolls, a combination set of rolls is employed, consisting of one horizontal pair of rolls and one vertical pair just behind it, so that the mass is compressed both laterally and verti- cally simultaneously (fig. 48). The “ housings,” or stout cast-iron supports for the rollers, are arranged with a slot so that the gun- metal bearings for the axles of the rollers can be raised or lowered by means of a powerful adjusting screw, and in this way the distance between the rolls is regulated, and conscquently the thickness of the bar rolled out. In order to facilitate this adjustment the bear- ings of the upper roller are sometimes attached to a frame with a counterpoise, and connected with a hydraulic ram so as at will to bring the movable roll nearer to or further from the other ; in this way one pair of rollers can be made to do the work of several

Fria 48.—Universal Rolls.

rectangular grooves. Sometimes two pairs of horizontal rolls are arranged one just in front of the other, so that the size of the bar passing from the hinder pair is still further reduced by passing through the front pair, which are a little closer together and revolve more rapidly. When very thick plates are rolled, the direction of rotation of the rolls is reversed instead of returning the plate back again, special “ reversing engines”’ being used for the purpose. For

| special kinds of work, such as rolling taper iron (¢.g., the movable

tongues of railway “points”), a peculiar lifting arrangement is applied to the upper roll, so that as the metal passes between the distance apart is varied. When an hydraulic ram is employed to vary the distance

apart of the rollers, this is simply effected by adjusting the ram so that the distance apart of the rolls is the minimum requisite, and opening a small discharge valve for the water when the bar is introduced; as the bar passcs through, the water 1s ejected in a regular stream through the discharge valve, the rate being so adjusted that as the bar travels through the distance apart of the rolls gradually increases ; by closing the valve the distance apart remains constant, so that after rolling a taper end the rest of the bar can be rolled of uniform section. With a "two-high XIIL — 42

train not reversed at each successive passage, the bar is lifted by hand or otherwise to the top of the top roller, which then guides it back to the side from which it started, after which it is put through the next groove, and so on ; this causes loss of time, and prevents the bar being rolled so many times before it cools ; accordingly for thin

lates or rods of small section the three-high train is always used cs some more complex analogous combination of rollers). As a rule the speed of rotation of the rolls is less the heavier the plate, &c., rolled ; for very thick armour plates (of which sizes up to 20 and 30 tons are sometimes rolled) a comparatively small number of re- volutions per minute suffices ; for thin rod a much larger number up to several hundreds ; from 80 to 100 revolutions is about the usual speed for rolling rails and similar heavy bars, 50 or 60 being employed for very thick ones, 120 to 150 for lighter bars, and con- siderably more rapid speeds for very thin bars, rods, and wire. nee will not permit of descriptions of the details of various kinds of rolling-mill plant, &c., introduced in different works, and more especially of numerous American improvements in this direction, particularly those of Messrs Fritz; for descriptions of these, the technological journals, &c., of the last few years must be consulted.

For rolling tires a peculiar arrangement of comparatively small rolls is employed ; the ingot after having a hole punched through it (or cast in a thick ring if of molten " ingot metal ") is subjected to a kind of rolling action between two surfaces, one inside the ring and the other outside,

so that the circumference of the ring is gradually extended and its thickness diminished, whilst the flange is simultaneously formed.

When thin rods of rectangular section are required (¢.g., nail rod), they are often made by rolling out a bar into a long wide thin plate, which is then passed through a “slitting mill” consisting of a pair of steel rollers with deep grooves, the projecting portions of the one fitting into the grooves of the other, but not reaching to the bottom of the grooves. These projecting portions act as revolving shears, so that the plate is “slit” as it passes into thin rods, the width of which is regulated by the width of the grooves ; after pass- ing through the machine these are straightened by hand.

In order to cut puddle bars into lengths for piling, powerful shears are employed. Fig. 49 represents one form of double shears

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Fig. 49.

worked by a reciprocating lever actuated by an eccentric; fig. 50 represents a much more powerful form of gnillotine shears. A massive plate B with a terminal shearing edge AA works slowly up

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and down in guides by means of eccentrics C, C, C on the shaft D ; this cutting edge passes just in front of a similar one permanently fixed to the guide poe The plate to be sheared is supported on a table aa in front of the shears, running backward and forward upon

alittle railway; whilst the upper cutting edge is elevated, the plate. is quickly run into position, and as. the cutting edge descends is sheared across, the cut-off portion dropping down ; as the cutter ascends again the plate is turned round or pushed forward, so as to bring under the cutter the portion to be sheared at the next down stroke. The same kind of machine serves for cutting boiler plate to any required dimensions, and for shearing purposes generally. Substituting a solid steel: plunger for the cutting edge, the machine becomes a punching machine, the plate to be punched being sup- ported on a travelling table, and the spot where the rivet-hole, &c., are to be pierced being brought under the end of the punch whilst the latter is raised. A powerful fly-wheel is requisite whenever the plate to be sheared or punched is massive. For cutting " crop ends"' off hot or cold railway bars after rolling so as to reduce them to a

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LTA Fig. 51.

uniform length, an arrangement analogous to a travelling table is used, urged forward by an eccentric, a toothed wheel and screw, or a chain and axle,-&c , fig. 51; on this the bar FF is placed against stops B, B, and the table then moved forward (as represented in the figure by means of the handle G actuating an eccentric on the axis AA) so as to bring the bar gradually against the ia of rapidly. revolving circular (usually toothless) saws C, C worked by a band and. pulley E, and thrown out of gear by shifting the band to the "'idle pulley" D when

required; to prevent the saws from becoming overheated, the lower portions dip into water troughs as they revolve.

| A single circular saw revolving 5000 times a minute (with. a cir-

cumfereutial velocity of about 300 miles per hour) has been used for this purpose. For obliterating file marks, reducing to roughly plane surfaces, cutting slots, smoothing, and many other purposes for which grindstones, &c., were formerly employed, emery wheels made of pulverized emery cemented together with calcium silicate are often used with great advantage.

Cold Rolling.—In the ordinary processes of rolling iron plates and rods, é&c., the metal is at a high temperature so as to be softened by the heat; when cold iron is similarly rolled the compression thereby produced gives a much greater stiffness and elasticity: thus Fairbairn found that an increase in strength in bars from 60,746 Ib per square inch before rolling to 88,230 after was thus effected. Whipple (of the U. S. navy) finds that in sheet iron the tenacity is thus increased by 60 and even 100 per cent. of the original value, and Thurston has recently found analogous results both as to increase in tenacity and power to resist strains and in the modulus of elasticity. The process is largely in use in America, being carried out by rolling the bars, &c., out to a little larger dimensions than the finished metal is intended to have; they are then "pickled" in dilute hydrochloric acid to dissolve off the film of oxide from the surface, passed through limewater to neutralize the adherent acid, and finally rolled many times in succession between grooves of great smoothness, so cut as only to compress portions and not the whole of the circumference at each passage through the rolls. For a description of the appliances used in cold rolling as carried out at the works of Jones & Laughling, U. S., who make a speciality of this business, see Hngineering, vol. xxvi. p. 347 (1878).

_ For straightening and planishing circular stec] bars such as shaft- ing rods, &c., a peculiar machine is sometimes used, consisting of a pair of revolving disks with bevelled faces, which compress the rod slightly between them, at the same time rotating it and traversing it forwards (and, by reversal, backwards) by one continuous move- ment, so that

all parts of the surface are equally operated on, and the bar leaves the machine circular, straight and bright-surfaced.

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Numerous other machiries? are in use for various special purposes, such as wire-drawing, drilling, screw-tapping, &c.; the description of these would take up more space than can be given here.

A marked feature in most American iron-works is the general handy, compact, and efficient nature of the machinery of all kinds, and the use of various physical-exertion-saving contrivances and arrangements for ventilation and cooling of workshops, &c., many of which appliances are not so frequently to be met with on the eastern side of the Atlantic, more especially in England. The general arrangement and planning out of works, moreover, is usually far superior to that of the older British works, which have gradually grown to their present dimensions, and consequently have not been systematically laid out as a whole. In consequence of attention to such details as these, the output of finished material from a given amount of plant is frequently considerably greater in America than would be attained in other countries, whilst the labour required is not proportionately increased ; thus the largest makes of Bessemer metal from a given converter ever registered have been attained in American works; and so in other instances. To a considerable extent the same remarks apply to Continental establishments, at any rate to many of those of more modern arrangement ; of late years, however, the spirit of competition and other influences have rendered it imperative upon the British ironmaster to pay more re- gard to such matters than was formerly the case, and to adopt many American and Continental improvements in details,—experience

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to be non-oxidizing, thus avoiding waste by “cutting”

- (i.e. oxidizing) the piles; independently of which, more-

over, a saving in cost of fuel consumed is effected ; thus Holley states that, in reheating Bessemer ingots or ordinary blooms in Siemens furnaces, 350 to 400 16 of coal are used. to the ton, whilst the ordinary fires would consume 800 to 1000 ib. On the other hand, if the waste heat from the reheating furnace is used to generate steam, the saving in fuel that would otherwise have to be burnt for the purpose just about equals the difference in fuel consumption between the Siemens and the ordinary reheating furnaces.

Price's retort reheating and puddling furnace (fig. 52) is a sort of combination of a gas producer and an ordinary puddling furnace ; the firegrate is supplied with fuel which has been heated in a low tower surmounting the grate by the waste gases circulating in a flue round the tower ; in this way the coal is coked, the gases passing to the fireplace ; a blast is introduced under the fire bars so as to burn the coke and produce a large body of flame of reducing character owing to the admixture of hydrocarbons from the coking process in the tower ; the blast is heated by passing through a chamber surrounded by the waste-gas flue ; by regulating it the atmosphere can be made more or less reducing at pleasure. The saving of fuel effected is said to amount to about one-third of that which would be required in an ordinary puddling furnace, whilst when arranged as a reheating furnace a still greater saving is produced.

- **During several years past a series of papers on " American Iron and Steel Works," by A. L, Holley and Lenox Smith, have appeared in Engineering, from which much detailed information may be gained**

a3 to modern American improvements in various directions,

having opened his eyes to the fact that it is possible for other nations, though less naturally favoured as to ores and fuel, to compete successfully with him, and undersell him, not only as to foreign trade, but even in the case of English contracts for iron work for home use.

The reheating furnaces employed to heat up to a welding temperature the piles intended to be rolled are essentially low reverberatories, much resembling puddling furnaces, in which the atmosphere is kept as little oxidizing as possible ; notwithstanding, a certain amount of slag is formed from the fusion of the oxide of iron coating the bars and its union with silica from the furnace bed when of sand, as is often the case; ferric oxide ores ("dry bottoms") are preferable, yielding less cinder and causing less waste in consequence, whence the name. To avoid introduction of air, the doors for introducing and withdrawing the piles are banked up with small coal, &c. Gas forms a most suitable fuel, and various forms of gas-fired reheating furnaces have been introduced: thus in Sweden Eckman's gas reheating furnace has been in use many years, con- sisting of a chamber in which charcoal is partially burnt by an air blast so as to form impure carbon oxide, which passes by a tube into the reheating furnace and is there burnt. Siemens regenerators applied to re- heating furnaces have also been frequently employed, and with good results, either with his gas producers or with other forms of gas generator; at Munkfors the Lundin gas producer (using damp sawdust, § 10) is employed. Another form of reheating gas furnace is the Ponsard furnace (see § 40). The chief advan- tage of gaseous fuel for reheating furnaces is that the atmosphere can be much more exactly regulated s0 as

Fig. 52.

Utilization of Waste Heat.—In all iron-works the amount of heat escaping from the puddling and reheating furnaces (except when regenerative) is enormously in excess of the amount actually utilized; to economize this waste heat to some extent, it is usual to employ the exit gases for raising steam, or for heating the air blast, or both. The actual amount of fuel employed in the operations of puddling and reheating (apart from that corresponding to the motive power) varies within wide limits according to the quality of the pig iron used in the first instance and the mode of operating adopted. When the coke refinery is employed a consumption of coke to the extent of 15 to 30 per cent. of the weight of the pig iron used usually suffices to produce a refined metal, which is then convertible into puddle bar with an expenditure of

coal about equal to or somewhat exceeding that of the puddle bar made; where particular manipulation requiring the working of only small batches at a time is practised, e.g., in some of the West Yorkshire iron-works, the consumption of fuel is often much larger, amounting in some cases to nearly double the weight of pig iron treated originally. In the ordinary pig boiling process, according to the purity of the metal, something between 100 and 150 parts of coal per 100 of puddle bar, and sometimes even more, are usually requisite, but con- siderably smaller amounts are said to be used with some of the more recently invented kinds of furnaces. Analogous

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results are obtained when lignite, wood, peat, or other fuel |

is employed, due allowance being made for its different calorific power. Tor reheating furnaces in which coal is burnt, the consumption of fuel is usually in excess of 50 per cent. of the metal ultimately rolled for each time it is reheated. The yield of puddle bars from a given quantity of pig varies somewhat with the quality : in spite of some of the iron oxide of the fettling being reduced, the weight of malleable iron (cinder being deducted) finally obtained in hand furnaces is always somewhat less than that con- tained in the pig iron used; the latter averaging say 94 or 95 per cent. of iron, the yield of puddle bar may be said to run from 88 to 92, averaging about 90 per cent. Before an ordinary class of iron ore is converted into good bar iron there is in practice requisite a consumption of coal (or of its equivalent in coke, taking say 3 parts of coke to represent 5 of coal) to about the following extent per 100 parts of malleable iron finally obtained, that is, when each operation is conducted about as economically as is practicable on the large scale :—

Smelting, to pig irons(1 40) parts ofppic)) sc21.ce-cessecasestecneeeeeees 250 Puddling to puddle bar (140 pig becoming 125 puddle bar) ... 140 Reheating for final rolling, &c. (125 puddlc bar used)..... 60

Totales.:: cscs… ame ane 450

In reference to this last item the consumption of puddle bar varies much with circumstances ; a considerable fraction of the final iron is obtained in the form of mill scale, which is not lost, being utilized in the puddling forge, or for smelting, &c.; the rest is obtained in the form of cuttings, “crop euds,” and “scrap” of various kinds, often not very largely inferior in value to the bar iron.

26. Puddled Steel and Natural Steel—lIf in the opera- tion of converting pig iron into malleable iron by puddling in a reverberatory furnace the process be stopped before the decarbonization is complete (the temperature of the furnace being a little lower, so that the partial solidification of the mass on decarbonization—“ coming to nature ”—takes place more easily), the resulting metal is a more or less carbonized iron, which, when prepared from pig free from any large quantity of sulphur and phosphorus, is susceptible of many of the applications to which steel is put. Considerable skill in manipulation is necessary in order to obtain anything at all approaching to a uniform product, the tendency being towards the production of a mass with lumps of soft wholly decarbonized iron, and sometimes of but little decarbonized pig irregularly distri- buted through it. This is best overcome by conducting the decarbonization more slowly and at a somewhat lower temperature than is usually done in ordinary puddling, and using less fettling and a less oxidizing atmosphere. A manganiferous pig is almost essential to the obtaining of a good product, first because the oxidation of the manganese gives a more fluid slag, and secondly because the small quantity retained by the product decreases the injurious effects of sulphur, phosphorus, é&c., on the physical proper- ties of the metal.

The manufacture of puddled steel in England is now but small, the Bessemer and Siemens-Martin processes having largely supcer- sededit. Occasionally, however, substances apparently consisting of badly puddled iron, and possessing some degree of hardening power, are sold under the name of steel; but, not having been fused so as to give uniformity of composition, these products are incapable of being used advantageously for purposes for which the elasticity and capability of resisting wear and tear possessed by good steels are essential. The want

of a definite understanding as to whether the term “steel” is nowadays to be understood as implying that the product has been completely fused (as maintained by some, see § 3) or not leads occasionally to disputes and lawsuits, when inferior kinds of “puddled steel,” or badly decarbonized puddled iron, are supplied under the terms of a contract which simply mentions “steel” as the character of the metal to be supplied, without pre- cisely ‘stating its nature, quality, or properties, or the mode of its production,

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On the Continent, puddled steelsmade from pig of pure qualities so far as sulphur and phosphorus are concerned are more extensively employed. Schilling has examined the relative rates at which carbon, silicon, phosphorus, and sulphur are eliminated from the pig irons of Gittelde and Zorge in a charcoal steel-puddling forge at Zorge (Hanover), obtaining the results given in the following table:—

66 mins. Com- mence- ment of Boil.

111 mins. 120 Beginning| mins. to come to} Final

Nature. | Stcel.

80 mins. During Boil.

So-called com- bined carbon

Graphite

Phosphorus

2°360 2°260 1:330

0-071

trace

0°110

0-310

98°179

0°110 0°012

0-110

0°470

97-038

0°170

0:027 0-160

0°470

96°613

Manganese : Iron (by differ-

eecees

100-000 100°000 100-000 | 100-000 Slightly malicable white pig, ecllular.

Malleable yery hard steel.

Character

product Steel.

Stecl.

Similar results have becn obtaincd by other observers; thus Parry gives the following analyses of British puddled steel (Ebbw Vale) and of the original pig employed :—

Pig Iron used. Puddled Steel.

2°680 0°501

Qe 0°106

Sulphur 0°426 0:002 Phosphorus 0°125 0°096 Manganese…..... 1230 0°144 Iron (by difference) 93°327 99-151

100000 100000

Natural steel is to refined pig iron (§ 23) in the inverse relation that puddled iron is to puddled steel: the last is derived from pig iron by stopping the decarbonization ata stage before it is complete ; the first is obtained by carry- ing the refining process somewhat further than the stage usually attained in the refinery. The forge or hearth used for natural steel making is substantially like that employed for refining, a brasqued bottom of charcoal dust being put on, and the pig iron melted down and gradually decar- bonized by the conjoined action of an inclined blast blowing downwards upon it and of the cinder floating above it; if the decarbonization is carried too far a little fresh pig is added to recarbonize the whole. The details of the mani- pulation (upon the mode of performance of which the character of the resulting product depends) vary in different localities; thus Tiinner describes five distinct modifications practised in Siegen, Tyrol, Carinthia, and Styria ; save in these districts the manufacture of this class of steel is but small. The bars ultimately formed from the blooms are usually hammered out by hand entirely, and not machine rolled at all. For further details see Percy's Metallurgy.

27. Bessemer's (Original) Process.—The method usually known in this country as " Bessemer's process" of steel making does not, strictly speaking, belong to the class of methods now under discussion, being a combination-process consisting of two parts :—one the Bessemer process proper, of which the essential feature is the conversion of cast iron into wrought iron by the method (due to Bessemer) of forcing air through the molten mass so as to burn out the carbon ; the other (due to Mushet) consisting of the con- version of the molten wrought iron

thus obtained into steel by mixing with it a suitable proportion of fused carbonized iron containing manganese, in the form of spiegeleisen or ferro-manganese ; this combination process is discussed more fully in § 36.

IR

The decarbonizing and desiliconizing of iron by the action of an oxidizing atmosphere is the essential feature of the proeesses of re- fining pig iron (§ 23) and of making natural steel (§ 26) ; but prior to 1855 these processes had only been applied to the partial purifi- eation and decarbonization of pig iron, the air being blown over the surface of the fused metal ; and, in consequenee of the eompara- tively slow rate of oxidation of carbon and silieon thus brought about, the use of fuel to melt the iron and to keep it in fusion was

fal,

Be ek pteniber 15, 1855, an English patent was granted to Gilbert Martien of Newark, New Jersey, U.S., for the purpose of partially purifying cast iron by passing streams of air or steam " through and amongst the melted metal as it flows from a blast furnace" or the remelting furnaee, the object being apparently, not to con- vert pig iron into wrought iron and to supersede the puddling furnaee, but simply to act as an adjunct to the refinery. Shortly after, Parry made experiments at Ebbw Vale on a process substan- tially the same as this. On October 17, 1855, Bessemer took out his first patent for " foreing currents of air or of steam, or of air and steam, into and among the particles of molten crude iron or of remelted pig or refined iron, until the metal so treated is thereby rendered malleable and has acquired other properties eommon to east steel, and still retaining the fluid state of sueh metal, and pouring or running the same into suitable moulds, "—7.e., for eonverting east iron into east steel. A succession of patents for various improvements was taken out during the next few months, in the course of which the use of steam was dropped, certain parti- eular appliances deseribed, and the production of malleable iron as well as stcc] elaimed. It was speedily found, however, that the produetion of steel of uniform quality from English pig irons was iinpraetieable, owing to the

difficulty in stopping the blowing operation at exaetly the right moment to produce the desired degreo of earbonization, and that the produetion of malleable iron was equally an unsuceessful manufacturing operation, because if the “blow” eontinued a little too long, the produet was “ burnt iron,” eontaining oxide disseminated through it which rendered it brittle ; whilst if the metal were underblown it was hard and steely. Again, contrary to expectation in view of the knownaction of the puddling process, the oxidation of the copper, sulphur, and phosphorus con- tained in the pig iron was found to be so faintly marked that practieally the resulting “‘ semi-steel” contained the whole of these impurities originally present in the pig iron employed. Accord- ingly the value of the new process, of which the highest expeeta- tions were at first formed, was speedily found to be really but small, notwithstanding the various sueeessive improvements patented by the inventor during 1855 and 1856 ; towards the end of the latter year, however, the difficulty was solved and the whole process ren- dered praetieal and readily controllable by Mushet, who patented the improvement in use to the present day of decarbonizing the iron by eompletely blowing it, and then adding melted spiegeleisen in known quantity so as to carbonize the total mass to any definite required extent, and also to introduce manganese into the com- position, thereby diminishing the injurious effects of sulphur, phos- pats, &e., on its physieal qualities,—the character of the metal

eing further regulated by ehoosing for the operation hematite pig, or some other kind, eontaining only minute amounts of sulphur, copper, and phosphorus. Mushet’s patent right, however, was allowed to lapse through neglect to pay the requisite fees in the third year ; and in consequenee his name is all but forgotten in eonnexion with his improvement on Bessemer’s own proeess, the eombination being ordinarily termed “ Bessemerizing.” Details as a? practical working of the combination process are given in

It is to be here remarked in connexion with the Bessemer pro- cess proper (the blowing) that, whilst the difficulties in the way of preparing uniform products with English irons have led to the entire abandonment of the production of iron or steel thereby in England, the

method is still in use to some extent in Sweden, at Seraing, and elsewhere, the proper moment when the blow should cease being determined by rapidly sampling and testing the metal, or by the eolour of the slag. In Sweden the eharges of metal blown at one operation are occasionally much smaller than thosc usually employed elsewhere where the combination-process is adopted, whilst the converters in use are sometimes of the fixed pattern adopted by Bessemer in his earlier experiments, now mostly super- seded "for the spiegeleisen process by the movable converters swinging on trunnions described in § 36 ; in the newer Bessemer works, however, the most improved methods and arrangeinents are in use.

In the John Cockerill Works (Seraing) it has been found practi- eable to ensure the eontinuous production of pig in the blast furnaces of sensibly eonstant composition, Algerian and Spanish ores being employed. From these, pig of the annexed composition 1s smelted and run direet into the eonverters without solidifying ; 235 parts of limestone per 100 of ore are employed together with coke (containing 8 to 10 per cent, of ash) in the proportion of 22 ewts. per ton of pig.

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Average Composi- tion of Ores used.

ULIGONMs.scsccsren Carbon…. Sulphur Phosphorus Manganese ….

Magnesia Tron

Ferrie oxide Manganous oxide Sulphur

Pkosphorie anhydride

Owing to the considerable amount of manganese present in the pig, suffieient of that metal remains unoxidized in the blown pro- duct to render it unneeessary to add spiegeleisen thereto; on this depends the praetieability of the process ; the blowing is eontinued until a speeiien of the slag (obtained during a brief intermission of the blast for the purpose) exhibits a particular eolour dependent upon the amount of

residual carbon required, whilst the physical characters of the globules of metal interspersed throughout the sainple are also noted ; the metal is then tipped into the easting ladle, and run into ingots whieh are reheated when solid enough to be withdrawn from the moulds and rolled without ever cooling below ared heat. The colour scale and the corresponding carbon percentages are as follows —

Colour Percentage of Carbon of Slag. in Steel. Lemon yellow… 0°75 or upwards. Orange yeilow .. close to 6°60 Light brown… . 0°45 Dark brown…. ‘a 0°30

Bluish blaek…..... 000.006

As regards the general character of the blowing operation, it is noticeable that the generation of heat by the oxidation of silicon and carbon is so large that without the use of any fuel at all the mctal is not only kept melted but inereascs eonsiderably in tempera- ture, so that it remains fluid whilst the decarbonization goes on, instead of becoming pasty and almost solid as it does in tho puddling forge when “coming to nature.” The nature of the gaseous products on blowing a considerable mass of metal, say 5 tons, is somewhat different during the different stages of the pro- cess, At first when the metal is at a relatively lower temperature, a considerable amount of carbon dioxide is formed, together with carbon oxide, but later on, when the temperature is mueh higher, little but earbon oxide is produced. During the early stages, more- over, the amount of oxygen (combined as oxides of earbon) is much less relatively to the nitrogen than in ordinary air, showing that much of the silicon and manganese present are being oxidized ; whilst in the latter half of the blow, when the silieon and manganese have largely beeome oxidized, the amount of oxygen in the issuing gases is mueh larger, nearly equal to that present in air. Thus the following series of analyses were made by Snelus during an eighteen minutes blow (Journal Iron and Steel Institute, 1871, ii. p. 247), the specimens being collected respectively after two, four, six, ten, twelve, and fourteen minutes from the commencement. Similar results have also been subsequently obtained? by other cheniists, notably Adolf Tamm

(Jern-Kontorets Annaler, xxx. 257 ; also Iron, 1879), with the iron made at Westanfors from charcoal pig.

Time from Commeneement, expressed as a Fraetion of Total Duration of Blow.

| $ | a | 8 Carbon oxide …..... 4-60 19°59 29°44 3111 », dioxido . 815 3°58 2°39 1°34 Oxygen… 9 on ae ; cer ae Nitrogen 5°25 A H 5 Hydrogen… 2°00 _ t 2165 as

100-00 | 10000 |

From these analyses Snelus caleulates that 48 per eent. of the total carbon oxidized in this blow was converted into CO,, and 57 per cent. into CO. It hence results that a considerable development of heat attends the operation, espeeially with irons moderately rieh in silieon'as well as carbon. Taking the heat of combustion of earbon to CO as 2400, of carbon to CO, as 8000 (§ 20), and of silieon to SiO, as 7800 (Troost and Hautefeuille give 7830), and assuming that these are also the values of the combustion heats of these elements when dissolved in (or united with) iron,—which is not the case, the values being really somewhat lessencd by the amounts of heat evolution during the solution in (or eombination with) the iron,— it results that, on blowing an iron containing for instanee 2 per eent. of silicon and 8 per cent. of carbon, there will be a heat development to the following extent :—

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ie x roo x 8000 =103 2 due to the formation of CO,

TeX 190% 41 0 7 9 O

Toe x 7800 =156°0 9 93 Si0, or an evolution of 300°2 per unit weight of metal blown. Analogous but somewhat different values are calculable with irons of different composition, or with blows so conducted that less carbon dioxide is formed. The mean specific heat of the resulting fused metal and slag is probably somewhere near to 0°20 (at the ordinary tempera- ture the specific heat of iron is 0°1138, Regnault ; the specific

heat is probably greater as the temperature rises, and, judging by analogy with water, greater in the fluid state than in the solid ; the specific heat of the slag at the ordinary temperature is higher than that of iron, but its mass is much less); hence, pursuing the above calcula- tion, the heat evolution would suffice to raise the temperature of the mctal ote = about 1500° C. above its initial temperature, were all the heat applied to that purpose. This is not the case, however, for the containing vessel or converter has also to be heated up, and the waste gases carry off a notable amount of heat with them, whilst radiation and the cooling effects of the air on the converter also take up a considerable fraction of the heat ; on the other hand, however, a certain amount of iron becomes oxidized, thus increasing the heat development ; if 5 per cent. of metal be thus oxidized, the heat of oxidation being taken as somewhere near to 1200 per unit of weight of metal oxidized, the heat evolution due to this will be 73,5 × 1200 =60°0, or about 4 of that due to the joint oxidation of the carbon and silicon. Similarly manganese, if present, becomes oxidized with evolution of heat; on the whole it is calenlated by Jordan, Akermann, Snelus, and others who have specially examined this subject, that with the kinds of pig iron usually employed at the present day, and with the size of converters used (holding 5 tons and upwards of metal), the net amount of heat actually employed in heating up the metal is sufficient to raise its temperature by at least 600°; so that if the initial temperature of the fused pig is about 1400°, that of the blown metal is at least 2000°, being above thie melting point of platinum ; with highly silicious pig the temperature attained is notably higher than with metal containing less silicon.

When the blowing has gone on for a short period, so that the iron has become perceptibly raised above its initial temperature, a reaction commences between the iron oxide or silicate already formed and the as yet unoxidized carbon, giving rise to the evolution of gas with a sort of efferves- cence; this stage is technically termed the “boil.” The precise period at which it is marked varies with circum- stances, a longer time elapsing from the commencement of the blow when the iron is relatively cooler at first, and also when it is richer in silicon, —in the former case because the temperature requisite to produce the

effervescent action is not reached until a longer time has elapsed, and in the second because the more oxidizable silicon is chiefly affected first, and the effervescent action of iron oxide, &c., on the dissolved carbon only commences when the silicon is to a considerable extent oxidized.1 During the earlier part of the boil, whilst the silicon and manganese still present are being oxidized, a greyish or whitish kind of smoke issues from the converter, consisting of minute particles of slag, manganese oxide, &c., mechanically diffused through the gases. When practically all the silicon, carbon, and manganese have been oxidized, and the oxidizing action of the blast is concentrated on the iron, the colour of the smoke emitted changes to brown, and the iron becomes "burnt" or "overblown" ; if to such metal containing much iron oxide diffused throughout it molten spiegeleisen be added, as in the after part of the Bessemer- Mushet process (§ 36), the effervescence or "boil" due

1 In all probability the reason why the silicon is first affected is simply because more heat is evolved in the formation of silicon dioxide than of carbon oxide, so that if carbon were burnt to carbon oxide silicon would probably react wpon it, thus—

2CO + Si=2C + Si0,. Since the heat of combustion of a unit of weight of carbon to CO is abont 2400, and that of silicon to SiO, 7800, the transformation 2×12 × 2400

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= 5743 units of heat per unit of weight of silicon,—a tolerably high value, indicating a considerably strong tendency towards the occurrence of this transformation. :

indicated by the above equation would evolve 7800—

ik © W

to the reaction of this iron oxide on the carbon of the spiegeleisen takes place with almost explosive violence.

The following analyses by Snelus (Journ. I. and S. Inst., 1871, i. 39) illustrate the gradual diminution in carbon, silicon, and manganese, and the non-removal of phosphorus during the process of blowing :—

Period since Com- 0.

13. Final Steel after

i 6. End of addition of mencemcnt of |Original| Boil just Blowing Spiegeleisen. Blow, in Min- Pig com- before: |= ae TORS co ocse cece peeves used. | mencing. adding | Ingot | Rail Crop

Spiegel. |Borings.| Ends, So-called com- ’ ‘i ‘ . 4

ee t 1-200 | 2-170 0007 | 0-566} O19

Graphite ….0…..... 2°070 SAD neo aoe oon Silicon …..... oes] = L952 0°795 0-020 0-030 0°033 SMIPWOT ..0..ccsc¢ccsss 0-014 trace trace trace trace Phosphorus …....| 0°048 0051 0°067 0°055 0:053 Mangancse…....0..-| 0°086 trace trace 0:309 0°309 Copper’... ceacswesess. a0 600 neo 0:039 0°039 Iron (by difference)} 94630 | 96984 99816 | 99°001 | 99-047 100:000 100-000 | 100°000 | 100-000

Analogous figures have been obtained by various other observers ; the results as a whole show that during the first few minutes of the blow the silicon and manganese mainly are oxidized, raising the temperature ; during this period the carbon is also being oxidized, but not so rapidly as during the next interval whilst the boil is proceeding, a result also indicated by the analyses of the gases evolved (supra). The oxidation of the silicon, however, may not be complete even when the whole of the carbon has been burnt out, especially if highly silicious pig was used in the first instance ; thus steels containing 0°5 and upwards of unoxidized silicon have been found to be formed ; when excessively soft steel is required, so that but little spiegeleisen (or preferably ferro-manganese) is added to the blown metal, the presence of this silicon is not only not injurious, but is desirable as it diminishes “ honeycomb-ing”; but with ordinary ‘Bessemer steel” containing several tenths per cent. of carbon, the presence of this amount of silicon is almost fatal to

its value, silicon con- jointly with carbon producing brittleness to a marked extent. Accordingly it is of importance to blend a highly silicious pig with another kind containing less silicon, or to add to the highly silicious pig crop ends and scrap metal, so as to avoid the presence of too much silicon in the steel ultimately produced; this intermixture when judiciously performed also avoids certain practical diffi- culties attending the use of pig containing too high or too low an amount of oxidizable matter other than iron; in the former case the temperature attained during the blow is excessive, so that on casting the final steel (after adding spiegeleisen, see § 36) in iron moulds these are partly fused and destroyed ; in the former case the temperature attained is not high enough to keep the metal fluid whilst pouring into the moulds, in which case it more or less solidifies in the casting ladle, forming a "skull," whilst the slag partially solidifies in the converter and gradually chokes it. In practice it is usually found desirable to have not less than 2 and not more than 3 per cent. of silicon in the metal before blowing, so as to avoid these difficulties ; when the pig is melted in a cupola there is always a liability to loss of silicon and carbon during the fusion through oxida- tion, thus impoverishing the iron in combustible matter and risking the formation of skulls, owing to the metal not becoming hot enough during the blowing to remain fluid whilst casting; on the other hand, when the metal is run in from the blast furnace direct (by means of an intermediate ladle) there is a liability to variation from time to time in the quality of the pig; this difficulty can be overcome by carefully regulating the working of the furnace. Durfee has proposed to tap the blast furnace into large gas-fired heaters in which the metal is kept melted for a sufficiently long time to determine its charao-

ter, pig rich or poor in silicon and carbon as the case may be being then added to give the requisite composition. | According to Stead the rate at which silicon is oxidized in the converter relatively to carbon is somewhat different according as the temperature attained is extremely high or comparatively low. In the latter case the silicon is wholly

eliminated before the carbon disappears, even when the original amount was large, say 3 per cent. silicon and 3°5 of carbon; in the former case, however, the relative rate of oxidation of the silicon is less rapid, so that the carbon becomes oxidized before the last traces of silicon have dis- appeared. 'Thus the curves illustrated in fig. 53 indicate the

Fig. 53.

percentages of carbon and silicon contained in the metal in different stages of the blowing, the dotted lines representing the former and the continuous lines the latter, the abscissa representing times and the ordinates percentages. Just at first the carbon percentage slightly increases owing to oxidation of metal and silicon and their removal as slag ; but by and by the rate of carbon removal becomes rapid, whilst the rate of silicon removal is a maximum at first and gradually diminishes, more rapidly at the higher temperature.

Attempts have been frequently made to use the spectro- scope as a means of determining the moment when the last portions of silicon and carbon have become oxidized ; but it is very doubtful whether the indications of the character of the flame as seen by the unaided eye are not asa general rule practically at least equally valuable with those of the spectroscope, and much more readily attainable. At any rate, the spectroscope is but little used in actual manufac- turing practice in England ; on the Continent, however, its use is somewhat more frequent.! The more smoky the flame the less distinct are the spectroscopic indications, so that with highly manganized pig (e.g., pig from Austrian spathose ores) the instrument is all but useless. With certain kinds of pig the progress of the decarbonization can be readily judged by the colour of the slag; the peculiar roar of the blast alters slightly in character when the decarbonization is complete, so that an experienced hand can judge by the sound alone when the operation is about finished. For details of apparatus, d&c., see § 36.

The slag formed during the blowing usually approximates in composition to the metasilicate formula R,O, SiO,, where R, is either iron or manganese,—in this respect differing from the tap cinder of the

ordinary puddling forge, which 1s much more basic. This arises from the highly silicious nature of the lining of the converter (see § 36).

It has been proposed by ‘Snelus to utilize the gases discharged from the converter, especially during the latter half or so of the blow, in the same way that blast furnace gases (which they closely

resemble in general composition, § 18) are utilized ; the practical difficulties are, however, considerably greater than. in the case of i ee

At lower temperature.

PA report of a lecture on the use of the spectroscope in Besse- merizing, given by Roscoe to the Iron and Steel Institute, is to be found in the Journal I. and S. Inst., 1871, ii. p. 38. Alleyne has attempted to utilize the spectroscope for the determination of phos- phorus in steel, idid., 1875, i. p. 62.

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the blast furnace, chiefly on account of the much higher tempera- ture of the converter gases and the intermittent character of their generation during a series of blows; but stoves for heating the blast for the cupolas used in melting the spiegeleisen, &c., have been successfully heated in this way, the flame being applied in much the same way as that obtained from blast furnace gases. For the descrip- tion of a method used for this purpose in Sheffield, sce a paper by C. B. Holland, Journal I. and 8. Inst., 1878, p. 104.

28. Heaton’s Process.—The chemistry of this process is closely allied to that of Bessemer’s, the oxidizing gases used to decarbonize the pig iron being blown through the fused mass so as to produce either a semi-steel, a harder steel, or something approaching malleable iron, according to the amount of carbon oxi- dation effected,—the gases employed being, not ordin- ary air, but the mixture of nitrogen, nitrogen oxides, and oxygen evolved by the action of heat upon sodium

nitrate. This salt is packed at the bottom of the con- verting vessel (usually a vertical cylinder of iron lined with firebrick) to the extent of about 10 per cent. of the weight of the pig to be treated, and covered over with a perforated cast iron plate ; the pig, previously melted in a separate furnace, is run into the converter; the heat melts the sodium nitrate and causes an evolution of gas, at first comparatively slow, but gradually increasing in violence as the perforated iron plate melts, until a rapid ebullition of the whole mass takes place ; after a few minutes the reaction is over ; the partly decarbonized fluid mass is then run into ingot moulds (if the mass operated upon is sufficiently large to render the product fluid enough) or otherwise removed from the con- verter, conveniently by detaching the bottom portion, which is made removable purposely ; the masses of "crude steel" are then reheated and rolled, or melted in crucibles, so as to produce either bar or crucible steel as required.

Unlike the Bessemer process, Heaton's method brings about a sensible diminution in the quantity of phosphorus present. In all robability this is due to the alkalinity oft the cinder owing to the soda rom the nitrate, this acting like the lime lining to the converter in Thomas and Gilchrist's modification of the Bessemer process (§ 37); it is evident, however, that the character of the resulting product depends on the uniformity of the pig iron used, and the amount of nitrate of sodaemployed. The practical difficulties in the way of carrying out the process on the large scale, and of securing uniformity of bape aud the non-entire removal of phosphorus, have prevented this method from seriously competing with the other leading steel-making processes; but a number of experimental trials made on a moderately large scale have demonstrated the possibility of obtaining a good class of useful steel by its means. According to Griiner the elimination of phosphorus becomes almost imperceptible if the cinder formed contains upwards of 30 per cent. of silica produced by the oxidation of the silicon in the pig.

At higher temperature.

VI. METHODS INVOLVING THE PRoDUCTION oF STEEL oR MALLEABLE [RON DIRECT FROM THE ORE WITHOUT

PASSING THROUGH THE STAGE oF FUSED Pic Iron.

29. Catalan Forge.—This variety of bloomery may be taken as being a typical development of the earliest crude apparatus for extracting iron from its ores, represented in almost its simplest form by the rough clay furnace used for the first stage of wootz making (§ 35), and by the analogous small furnaces in use in Burmah, Madagascar, Borneo, é&c.; with various modifications it is still in use in different localities, e.g., the Pyrenees, Corsica, and especially in some parts of America and Canada. In principle all these forges may be considered as a more or less enlarged black- smith's or ordinary rivetting forge, in the bed of which are

placed together the ore to be reduced and the'fuel; the blast being applied, partly by the direct action of the carbon, partly by the carbon oxide generated, the iron ore is gradually reduced to a spongy mass of metal which by stirring is gradually agglutinated into a ball which is re- moved and worked into bars, &c. The Pyrenean forge essentially consists of a silicious stone bottom (covered over with a "'brasque " of charcoal powder rammed down), with a tuyere inclining downwards, as indicated in fig. 54 ; the front part of the forge is filled up with the ore to be reduced, and the hinder part with charcoal, and the whole coated over with a layer of moist mixed fine ore and charcoal dust (greii- lade) to moderate the combustion.

In various places where the Romans smelted or reduced iron from different kinds of ore by processes substantially the same as this, large accumulations of highly ferruginous cinders exist, ¢.g., in the Forest of Dean, Elba, Spain, &c.; many of these contain suffi- cient iron to be capable of being profitably smelted in the blast furnace either alone or admixed with other ores, being frequently quite as rich as average Cleveland clay ironstone after roasting ; they usually approximate in composition to the orthosilicate type, 2R,0,Si0,.

The Catalan forges of the south of Europe are usually of such dimensions as hold from 3 to 10 cwts. of ore; those formerly in use in

Austria, and to some extent still in America (¢.g., the Champlain forge), have the blast heated to a greater or lesser extent by the waste flames from the forge, which are made to heat a ‘serpentine through which the blast is blown, thcreby causing a considerable saving in the amount of charcoal required, sometimes Amounting to

about 20 per cent. of the quantity requisite with cold blast when the blast temperature averages about 300° (Sterry Hunt). The titaniferous iron sand smelted at Moisie in similar forges is much less easily reducible than most other ores, and consequently con- sumes a much larger amount of fucl in proportion ; owing to the almost complete absence of sulphur and phosphorus, a very fine quality of iron can be produced therefrom. The American bloom- ery processes, whilst resembling in general principles the old European Catalan forge methods, differ considerably therefrom in working details, mode of construction of hearth, dimensions, &c. An account of them and the ores worked by them, abridged from Sterry Hunt’s Reports to the Canadian Geological Survey, is to be found in the Journal Iron and Steel Inst., 1871, ii. 103 and 126.

30. Spongy Metal Processes.—The essential chemical: reaction taking place in the Catalan forge being the reduction of oxide of iron to the metallic state by carbon and carbon oxide, it has been attempted by many inven- tors to effect this reduction on a larger scale and in separate apparatus, the spongy metal thus obtained being employed either to form malleable iron by heating to a welding heat and hammering, &c., or to produce steel by fusion in crucibles with carbonaceous matter or intermixture with fused cast iron (free from any considerable quantity of sulphur and phosphorus) so as to reduce the per- centage of carbon to any required limits in proportion as more or less spongy non-carbonized metal is employed. This latter application comes rather into the category of processes described later on (§ 36 e¢ seg.) than into the class at present under discussion ; its employment has met with some considerable degree of success in one

form or another,—which can hardly be said of the former methods of working up the spongy metal, at least from a commercial point of view.

Some of the earliest experiments in this direction were made about 1837 and 1840 by Clay,! whilst since then and even quite recently several attempts have been made to prepare either iron or steel by operations substantially of the same description by Gurllt, Larkin (who reduces very pure fine magnetic ore by pene with charcoal powder, separates the spongy metal by a magnet, and fuses it with spiegeleisen in crucibles), Renton (of Cincinnati and Newark), Henderson (of Glasgow), Yates, and Snelus, who utilizes the "Gherstonofer" furnace used for burning pyrites smalls in vitriol making, substituting powdered iron ore for the pyrites, and a reducing atmosphere for the hot air employed to oxidize the pyrites and burn off the sulphur. Moderately large scale experi- mental trials in this direction have been made by Chenot, and sub- sequently by Siemens and by Blair of Pittsburg. Chenot's reducing furnace was essentially a series of vertical conical retorts heated externally, the ore (Bilbao, Sommorostro, or other ores containing but little sulphur and phosphorus) being either mixed with car- bonaceous matter and the mixture heated in the retorts, or else being placed therein alone whilst a mixture of carbon oxide and nitrogen (prepared by blowing air through incandescent charcoal) was passed through them ; from time to time the reduced spongy metal was drawn off at the base of the retorts into covered iron boxes, so as to prevent reoxidation as much as possible, and then heated in a charcoal hearth and made into a ball when pasty. It is mainly in this last stage that the practical difficulties of the pro- cess are encountered : if the sponge be not powerfully compressed into comparatively solid blocks, an enormous waste by oxidation during the balling is produced; in any case, as it is practically impossible to continue the reduction of the ore in the first stage sufficiently long to remove all oxygen from it (the time requisite and the cost of fuel being then excessive), a great waste of iron ensues. These difficulties have hitherto proved fatal to the com- mercial success of the process; but it has been shown conclusively that a very good iron may be produced by its means, provided sufficiently pure ore be used. .

The same causes of failure for the most part apply to the earlier methods of Clay, and the subsequent ones of Gurllt, Renton, Yates, Snelus, and Blair, which in principle are all much the same, the nature of the apparatus employed in producing the spongy iron being the main difference in the various processes respectively. Chenot's attempts to produce steel from the reduced spongy iron answered no better, commercially speaking, than the malleable iron manu- facture from that source ; the sponge was simply compressed into small blocks after being mixed with charcoal powder, or aftcr being moistened with melted resin, tar, or fatty matters, and heated to char the organic matters, and then melted up in crucibles. The

1 For details of these experiments, seé Percy's Metallurgy.

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difficulties in the way of regulating the degree of carbonization, the cost, and the impurity of the resulting steel (unless excessively

ure ores were used) rendered the process practically a failure.

ig. 55 indicates the sppemits nsed by Blair for the production of spongy iron. A is the reducing chamber into which the ore is placed along with about 5 per cent. of lime, which is found to accelerate the reduction considerably, so that a charge can be worked off in about a fifth of the time that would otherwise be requisite. Through this chamber a current of carbon oxide and nitrogen is led,

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Fig. 55.

produced in the gas generator B ; ore and fuel are supplicd from time to time through the respective hoppers g,g. The escaping gases pass away through the flue deh, a valve f being applied so that part of the gas can be passed back again through the producer so as to keep the action from going on too quickly. From time to time the reduced metal is withdrawn by the slide m from the cooling-box kk, which is surrounded by a water jacket to facilitate the cooling of the spongy iron.

Siemens has attempted to apply a modification of the spongy iron process to the manufacture of stecl, the spongy metal from a mixture of ore and carbonaceous matter heated in a revolving furnace being dropped into a bath of melted pig metal ; this method, however, was found to give unsatisfactory results, first because the spongy iron would not readily dissolve in the molten pig but floated on its surface, and secondly because sulphur wastaken up by it from the gases during its reduction ; accordingly the precipitation method deseribed below was adopted in its place.

Dupuy has recently proposed a direct process worked as follows: the ore to be reduced is mixed with carbon, and the mixture placed in an annular vertical cylinder of shect iron some 8 feet high, the outer diameter of the cylinder being about 20 inches, and the inner diameter 7 or 8 inches; a number of these masses are arranged on the coke floor of a reverbcratory furnace ; after heating for some hours the redueed metal and the sheet iron coatings cake together so that the masses can be removed and hammered and squeezed to muck bar, cut up, piled, and reheated and rolled into plates, bars, &c.; or they may be fused down on the open hearth into steel. It is claimed that by this treatment the metal takes up not more than one-fourth of the phosphorus contained in the ore instead of practi- cally the whole as when smelted in the blast furnace ; thus the ore of the Republic Mine of the Lake Superior district and the metal made from it by Dupuy's process gave the following numbers (Dupuy, Journal Franklin Institute, December 1877 ; see Jron, vol. x. p. 803) :—

Dupuy's Metal made therefioin.

THOM cssescveice < 99-704

Carbon OOM

Sulphur 0-032

Slag 07185 100-000 ind

0-016

The inventor considers that the phosphorus compounds do not become largely reduced in the process owing to the incomplete fusion of the metal during the reduction, the phosphates remaining blended with the cinder ; as he states that the process works much better when alkalics, in quantity and kind determined by analysis of the ore, are added to the mixture before reduction, presumably the non-reduction of phosphorus is due to the " basic" nature of the cinder.

_ 31, Stemens Precipitation Process—About the most successful of the methods for producing iron or steel direct from the ore at one operation is that designated by Siemens the " precipitation process" (Chem. Soc. Journal, 1873, p. 661); although it is doubtful whether this can yet be said to have completely emerged from the conditions of experi- mental trial as to the best conditions for competing with other methods in regard of cheapness of production, yet its practical success is demonstrated by its having been worked commercially not only in England but also in America. The principle of the process is essentially the fusion by means of an intensely heated "regenerative" furnace of the ore to be reduced with a suitable flux (lime, aluminous ore, &c.), and the reaction upon the fused substance of heated anthracite or hard coke forming the covering of a lower bed in the furnace (fig. 56), on to which the fused ore

N AV \ Fia. 56.—Cascade Furnace—Longitudinal Section.

is allowed to flow from the upper bed. Under these cir-’ cumstances the solid carbon precipitates iron from the fluid in the same way that iron precipitates copper from copper sulphate solution (saving that in the latter case no gases are evolved as complementary products) ; the iron agglu- tinates together into a pasty ball immersed in a fluid bath of cinder ; when the operation is sufficiently advanced the ball is removed and shingled into blooms or made into steel by dropping it into a mass of fused pig iron, in which it rapidly dissolves. The cinder thus produced contains much iron,—usually at least 15 per cent., and sometimes upwards of 40 per cent. In an improved form of process, the double bed is dispensed with and a rotary furnace substituted (figs. 57,58), much resembling Siemens’s puddling furnace, save that the combustion chamber is rotative ; the ore and flux are introduced and melted ; small coal of the size of nuts is then shovelled in, when a rapid evolution of carbon oxide results, so that it is un- necessary to introduce more than a little gas from the gas regenerative heater, but mainly only heated air to burn the evolved carbon oxide; when the reduction is nearly com- plete, the fiuid cinder is drawn off and the spongy metal balled by quick rotation for a short time. In this way,

according to Siemens, a ton of iron may be reduced with XII. — 43

a consumption of not more than 25 ewts, of coal, and a ton of cast steel made with about 40 cwts. of coal ; whilst even though the ore and fuel may contain considerable amounts

of sulphur and phosphorus, the “precipitated ” iron is almost chemically pure. The temperature requisite in this process being excessive, the bricks of which the furnace is con-

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VY MMMM

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Fra, 57,—Siemens Rotator—Longitudinal Section.

structed must be of the most infusible material possible ; | and about 2 per cent. of lime mixed together and moulded a particular kind of silica brick consisting of crushed quartz | into bricks answers better than alumina (bauxite) bricks.

LE TLM Yj

Za

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Cd LLL | ZZ VM

Fia, 58,—Siemens Rotator—Sectional Plan.

On comparing the actual consumption of fuel in this process with that used in the smelting of iron by the blast furnace and its puri- fication by puddling, it is at once evident that a much less amount

of heat is lost by radiation, conduction, and escape of hot gases and of only partially oxidized carbon (in the state of carbon oxide) in thé regenerative direct process than in the blast and puddling furnaces”

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conjointly. When coal is completely burnt by cold air to carbon dioxide and water vapour (not liquid water), the products of com- bustion escaping at a temperature of say 300°, the actual heat de- velopmentisvariablewith the character of the coal, butmay be taken as approximately near to 7600, the unit of weight being the weight of coal burnt ; for the heat of combustion of ash-free average coal may be taken as near to 9000, or about 8550, allowing 5 per cent. of ash ($10), when tho resulting carbon dioxide and liquid water are at about 20° C.; a lessamount of heat, however, is gencrated if the products of combustion escape at a higher temperature, say 300° C., the dif- ference being 0°4× 593+ (0°4 × 0°484+3°0 ×0 216) (300 — 20) =462 when the coal is considered to yield 3:0 times its weight of carbon dioxide and 0°4 times its weight of water on complete combustion, 593 being the latent heat of water vapour at 20°, and 0°48 and 0°216 the specific heats of water vapour and carbon dioxide respectively. The nitrogen of the air used for combustion, however, is also heated to 300°, starting originally say at 20°; making allowance for the oxygen supplied by the ore, suppose that in the Siemens process the nitrogen escaping is 6°0 times the weight of the coal uscd, its specific heat being 0°24; then the heat carried away by the nitro- gen is about 6-0 × 0°24 x (300 — 20)=408. On the whole, therefore, the effective calorific value of the coal will be 8550 — (462 + 403) = 7685, or 7600 in round numbers.

In order to reduce ferric oxide to metal, the heat consumption per nnit weight of iron may be taken as about 1700 (contrast § 20); the heat carried out from a Siemens furnace hearth by a ball of iron will be somewhat greatcr than that by an equal weiglit 0. fused pigiron from a blast furnace on account of the higher temperature, say 850 instead of 330 ; the same will apply to the cinder, but this increase will be more than counterbalanced by the smaller quantity thereof, so that, assuming 600 heat units to be carricd out by one part of slag by weight, and the cinder to amount to 50 per cent. of the iron, the heat thus carried ont per unit weight of iron will be 0°5×600=3800. Altogether, therefore, 1700 +350 +300 =2350 units of heat would be requisite per unit weight of iron were it possible to reduce the ores in the Siemens

rotator without loss by radiation, &c., and imperfect combustion, the gases leaving the regencrators at 300°; this would correspond to about 7§$$=0°309 parts of coal, or somewhat less than 6} ewts. per tou of iron. If then 25 per cent. of the total heat generated by the fuel be utilized, 75 per cent. being wasted through incomplete combus- tion, gases leaving at a higher temperature than 300°, and radiation, &e., still reduction would be accomplished by an expenditure of only 25 cwts. of coal per ton of iron. By a somewhat different mode of calculation Siemens arrives at much the same result (Chem. Soc. Journal, 1873, p. 677), viz., that about 6°4 ewts. of carbon- aceous matter should theoretically suffice to reduce a ton of iron in the precipitation furnace; and hence that about 25 per cent. of the heat actually capable of being generated is actually utilized. This high "duty" (as compared with other operations of the iron industry, especially with the blast and puddling furnaces con- jointly) arises from the cirenmstance that whilst the reaction is proceeding carbon oxide is copiously evolved from the materials, and this is burnt in the furnace itself by admitting air and very little other gas so as to keep up the temperature almost without extraneous fuel; the carbon dioxide produced by the combustion, being above and not in contact with the reacting substances, does not in any way interfere with their action, in which respect the process of reduction in the precipitation furnace markedly differs from that in the blast furnace.

The following table, prepared by L. Gordon for Siemens (Journ. I. and §. Inst., 1873, p. 57), is of interest as representing the rela- tive consumption of fuel during the production of one part by weight of iron by various of the processes largely used at different epochs up to the present date.

Charcoal: Ancient Direct Processes.

Equivalent in

Average. Wood.!

| 50 to 816 . 21: 2°75 „ 2°98 ;

2°85 „ 3°07

2°66 yy 2°90

. East Indian forges ….....

Chenot’s process lJ. Siemens rotator process .

Blast Furnace.

Puddling Forge.

Equivalent

Total. | in Wood.!

Average. | Average.

0:71 0‘90

Rhine

0°95

1-00 1:00

{ee and Carinthia …... lV.

Sweden

1 100 paris of wood reckoned to yield 30 of charcoal.

Coak: Blast Furnace and Puddling Fire.

Blast Furnaee. ee Bee Total Coal. Average. Average.

Plume ccc teecace. Westie sca estecs 2°75 1°00 3°75 USUI svecsscxxesssaresose- se 2°38 0 90 3 28 EMCO tats coves tccecces cewis devs 2°39 0°90 3°29

WARS COMMMA! ocrevcscsecs0+e0 00055505 2-712 1:40 3°72 | Cleveland. csccsssscccssoscecs 199 1:00 2°99

Staffordshire ….0…c..0000. 3-02 1:25 407 |

S. Wales (Vowlais) ..... 1-48 0-85 233 | VII. Siemens rotator process … sac 1:25

Details of the manufacture of iron by this method, of its conver- sion into steel by further treatment with pig, &c., in the rotator itself, analyses of the mctal and cinder produced, &c., are to be found in the Journ. I. and S. Inst., 1877, p. 345; the total consump- tion of fuel for the production of wrought iron of highest quality is there described as being about 3°0 parts per unit of iron (60 ewts. per ton), of which quantity about one-third is assigned to the rotator, the remainder being nsed in the reheating furnaces.

Withiu the last twelvemonth Holley has communicated to the American Institute of Mining Engineers the results obtained with a large rotating furnace set up at Tyrone, Pennsylvania, to produce material for open hearth steel furnaces by Siemens's direct process. The charges were—ore (containing about 50 per cent. of iron) 2000 Ib; reducing coal 600 to 700 Ib; limestone 250 tb; scale and cinder 800 Ib. The yield of blooms was 1600 to 1700 Ib per charge, or 80 to 85 per cent. of the metal contained in the ore; nineteen operations per weck producing 14 tons of blooms were made, the producer coal being 3800 tb per ton of blooms. The total coal consumption was thus on an average near to 4600 Ib per ton.

Jones's Process.—A peculiar process, in principle some- what analogous to the Siemens precipitation method, has been proposed by F. F. Jones (Journ. I. and S. Inst., 1873, 251), consisting of a cupola furnace into which ironstoue slag and coke or other fuel is charged, an air blast being applied so as to melt the ores by the heat developed by the combustion of the fuel; another blast is then turned on through a second set of tuyeres directed downwards obliquely towards the bottom of the hearth, the jet of gas thus introduced being the mixture of carbon oxide and nitrogen produced by blowing air through a second cupola:

full of coke only after the fashion of the Tessié du Motay gas producer (§ 10); by this means rapid reduction of the iron oxide is brought about, the process being a sort of inverted Bessemer blow, oxygen from fused oxide being burnt out by a stream of carbon oxide instead of carbon being burnt out from fused cast iron by a stream of air. Carbon is taken up by the metal thus produced to the extent of several tenths per cent., but it is remarkable that silicon is not thus reduced. Phosphorus is largely present in the resulting metal if contained in the materials used.

VII. CoNnveERSIoN oF MALLEABLE IRON INTO STEEL BY DIRECT CARBONIZATION.

32. Cementation Process.—It has been known for a long period, some two centuries at least, that when wrought iron is enveloped in powdered charcoal and heated to redness for a long time it gradually becomes carbonized and con- verted into steel, the deposition of carbon commencing at the outside and gradually penetrating inwards in precisely the same way as that in which the decarbonization of iron proceeds in the manufacture of malleable cast iron (§ 22), a longer time being consequently requisite for the car- bonization of thicker than of thinner bars; the name of the inventor of the process, however, has been forgotten. In the middle of the 16th century it was known that when a bar of wrought iron was kept immersed for a long time in molten cast iron it gradually became acierated by taking up carbon from the cast iron; this process is clearly closely allied to cementation in solid carbon, and was pro- bably the forerunner thereof ; very likely it was in the first instance an accidental observation; it was described as being in actual use about that period by various writers, notably Biringuccio in 1540 and Agricola (De Ke Metallica,

1561, p. 841). Early in the 18th century Réaumur inves- tigated the character of the process, and found that under similar conditions a bar of iron of 0°2 inch in thickness was carbonized in six hours to the same extent as another bar of the same metal of 0°45 inch in thickness in about thirty-six hours. The crude “blister steel” produced by the cementation process (so termed from its blistered surface) is often

simply cut into pieces, piled, heated to a welding heat, and forged, when it is converted into " shear steel"; or this process is repeated, when it becomes " double shear steel"; but when a perfectly homogeneous product is required it is melted in crucibles, when it becomes "' cast steel": this process was introduced by Huntsmann about 1740. The nature of the chemical changes taking place during cementation have been often regarded as somewhat uncertain ; but there seems to be little room for doubt that the action in the ordinary cementation process is mainly due to the occlusion of carbon oxide (formed by the action of the air in the pores of the charcoal) in the iron, and its decomposition by the metal into carbon and an iron oxide, which is subsequently again reduced by a second portion of carbon oxide, thus — Fe, -+yCO=C+Fe,0, 'Fe,0, + yCO = Fez + yCO.,

the two changes going on simultaneously. The escaping carbon dioxide, which penetrates through the metal less readily than does carbon oxide, and hence is apt to accumu- late in certain parts, is probably the cause of the blistering of the surface of the steel often observed, especially with pud- dled bars containing small quantities of ferrous silicate dis- seminated through them; Percy has shown that fused homogeneous metal free from interspersed slag does not give rise to blisters on cementation. Certain hydrocarbons, e.g., paraffin vapour and coal gas, will carbonize iron heated therein, and the manufacture of steel by cementation in the latter has been patented by Macintosh (vide infra). Probably in these cases the carbon comes from the direct splitting up of the hydrocarbon, with elimination of hydrogen ; but pos- sibly the acieration is due to carbon oxide present in the coal gas or formed from the paraffin vapour, &c., by the action of iron oxide disseminated through the bars or adherent to their surface. Many cyanogen compounds, especially ferro- cyanide of potassium, when applied to iron in a heated state convert it exteriorly into steel (case hardening), and it has in consequence been supposed that nitrogenous substances are essential to the carbonization of iron by cementation, and that nitrogenis anessential constituent of steel. The evidence in behalf of this is, however, at present unsatisfactory ; on the other hand, charcoal rich in alkalies, or a mixture of char- coal powder with a little lime and soda, will carbonize iron submitted to cementation therein more

rapidly than charcoal more free from alkalies; and, as these conditions are those favourable to the formation of alkaline cyanide from the nitrogen of the air, there is some reason for supposing that the carbon in the steel formed under such circumstances (like that produced in case hardening by means of ferro- cyanide) is more or less derived either from cyanogen separated from the cyanide and occluded by the iron and gradually decomposed with formation of carbon, or from some other reaction of iron upon the cyanide. Accordingly nitrogenous organic matter, such as animal charcoal, leather, horn, &., is often mixed with the charcoal used for cementation with a view to facilitating the conversion into steel by the formation of gaseous carbon compounds with the simultaneous presence of nitrogenous vapours.

The theory that carbon oxide is the source of the carbon eom- munieated to wrought iron during eementation, appears to have been first propounded by Leplay in 1846 (Ann. de Chim. et Phys. [3] xvii. 221), ata time when the properties of metals and other bodies in absorbing gases (7.¢., the phenomena of occlusion) had not been so well studied as they have becn subsequently. Leplay appcars to have

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considered that the carbon oxide splits up déreetly into carbon and carbon dioxide, the latter beeoming again transformed into carbon oxide by the surrounding ehareoal, and to have left out of eonsider- ation the intervention of the iron in beeoming alternately oxidized and redueed. Other ehemists have considered that by direet eon- taet with earbon combination of the iron therewith takes plaee, the earbon thus taken up by the outer layer quitting that and eombin- ing with the next layer, and so gradually travelling inwards, the outer layer reeombining with more earbon as fast as it parts with earbon to the under layer, and so on throughout ; the earbon thus traversing the iron by a proeess somewhat akin to that by whieh a drop of mereury in contact with a pieee of gold (or certain other metals) gradually passes into and permeates the mass,—this being in short a kind of capillary action exerted wpon a solid substanee. Perey's observation (Afetallurgy, 'Iron and Steel," p. 109) that char- eoal after being intensely ignited will not

earbonize iron when air is excluded by means of hydrogen (although it will do so to some extent if still eontaining matters capable of being driven off by heat)

- negatives the possibility of the earbon being taken up by direet con-

tact by this hypothetieal kind of chemical union between solids, or solvent action of one solid on another; it may be that carbon deposited on the outer layer by the chemical action of the iron on carbon oxide, eyanogen eompounds, earburetted hydrogen, &e., permeates inwards by this supposed diffusive proeess; but the known phenomena of the absorption of gases by eolloid bodies, diffusion, dialysis, ocelusion, &c., as elueidated by Graham and his followers, render it wholly unnceessary to suppose that any sueh action takes placc, and do away with all experimental grounds for supposing that it ean take placc. In order to carry out the proeess of eementation, the bars of iron are placed in a firebriek box or chest several feet long, layers of eharcoal and iron being alter- nately piled in until the box is filled, when a luting of fireclay or of the sandy ferruginous mud produeed in grinding and polishing stcel articles after manufaeture, termed " wheel swarf," is applied so as to elose up the upper part of the box and prevent access of air; two or morc such chests are then arranged under the arched roof of a ehamber ereeted over a fireplace in sueh a way that the flames from the fire pass under and lap round the sides of the ehests, and impinge upon the roof, the gases eseaping through orifices in the roof into a eonical chimney built over the whole,—the ehamber constituting in faet a kind of furnace somewhat like a glass house or pottery kiln, the flame passing upwards from the bed instead of laterally from a fireplace at the side as in the ordinary reverberatory furnaecs. Trial bars are arranged in the mass of ehareoal in sueh positions that they ean be withdrawn from time to time, and the progress of the operation examined by fracturing the bars after cooling, and seeing when the eore of malleable iron disappears; from seven to ten days' heating aeeording to the amount of carbonization required (averaging about 1 per cent.) is generally allowed, with a total charge of some 10 to 20 tons of iron in the furnace. When the requisite carbonization is attained the fire is raked out and the chests allowed to cool; the blister steel is then either

melted down into cast steel, or converted into shear steel by piling and forging, &c.

According to Boussingault a material diminution in the amount of sulphur present takes place during eementation; thus he found malle- able iron speeimens containing 0°012 to 0°015 per eent. of sulphur yielded steels containing only 0°005 to 0°006 per eent. of sulphur. Indieations in the same direetion but not to so great an extent have also been observed by others ; no noticeable effeet, however, is pro- dueed on the silieon, phosphorus, or manganese originally present, as far as the irregular way in which traees of einder are always inter- spersed throughout bars of wrought iron will permit eonelusions to be drawn. The following analyses indicate the effeet of cementation on Swedish bar irons :—

Pattinson and Stead. H. S. Bell.

Danne- mora Bar. 99°471 0°352

0:075

0°050 0°027

0:025

Steel.

Phosphorus (Gh) 8) EL? ossangocenenanonn

100-000

100:000 | 100-000 | 100-000 | 100°000 | 100:000

In consequence of the phosphorus originally present remaining unehanged, only the purest brands of iron as free as possible from these ingvedients are converted into cementation steel, often known as "tool steel," eommanding a high price in eonsequenee of its physieal properties, the most valuable of which are enormously deteriorated by minute quantities of sulphur and phosphorus. The proeess of

cementation in an atmosphere of eoal gas as patented by Macintosh of Glasgow consists of exposure of the bars of iron hang- ing vertically in a eylindrieal chamber, the walls of which are kept

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at a high temperature by an annular fireplace surrounding it, a

entle stream of well-desulphurized eoal gas being allowed to pass through the chamber. The expense of the process seems to have been the chief bar to its adoption, as steel of excellent quality can readily be made by it from good malleable iron.

33. Cast Steel.—The crucibles or '" pots" used for steel melting are usually made of refractory fireclay, often with an admixture of graphite, which not only communicates a greater degree of infusibility, but also diminishes the decarbonization which partial access of air unavoidably brings about during melting; they are of such size as to hold from 40 to 60 ib of steel, and occasionally more, even up to nearly a cwt., especially in certain American steel works. As a rule a pot that has served for three successive meltings in a coke-fired furnace is so much damaged as to be unsafe for a fourth; and with inferior kinds of clay two meltings or even one only are allowed ; with superior pots and gas-fired furnaces four, five, and even six heats are attainable with ease and safety. After annealing, the crucibles are heated red hot and then placed

about is due to the reduction of a little silicon from the crucible materials, &c., the presence of that element greatly diminishing the tendency to evolution of gas during solidification (see § 44). When the pots are withdrawn and the casting made (frequently from the contents of many pots combined together), they are replaced in the melting holes before they cool, and used over again, a somewhat smaller quantity of metal being introduced for the second melting (and less still for the third), in order to prevent the surface of the fused scoria being at the

same level as before, the pots being chiefly attacked at that place. About 3-5 parts of coke are required for 1

of mild steel melted, and somewhat less for harder steels, which melt more easily.

The Siemens regencrative furnace ($ 10), fed with gas from a producer, can be very advantageously employed instead of the older eoal or eoke-fired furnaces. In such. a steel melting furnace (fig. 59) the fusion chamber generally contains some two dozen pots, and is

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in the melting furnace on fireclay stands, round which and the pots coke is piled, two pots being usually fixed in the same ‘melting hole,” but sometimes more. When the pots are white hot the steel in small lumps is introduced by lifting up the cover and pouring the pieces down a long iron funnel; the covers being replaced and the fire made up, after some two or three hours the steel is fluid; but if cast immediately it is found that a much larger quantity of gas separates during solidification, rendering the steel porous, than is evolved if the metal is dead-melted, ‘.e., allowed to remain melted for an extra half hour or nore, presumably from the reaction of the iron oxide interspersed throughout the steel upon the carbon evolving carbon oxide during the earlier period, this evolution subsequently ceas- ing, owing partly to the reduction of the oxide and partly to its floating up to the top of the fused mass as scorie. According to Bessemer the chief part cf the “dead melting” effect of the extra time allowed in fusing stecl for the molten metal to stand in the furnace after fusion is brought

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SG. ‘S LAZAVIVA7

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Fig. 59.

constructed in the form of a trench with overhanging sides, which are arched both horizontally and vertically to keep them from sinkin gin whilst in use. The floor is covered with finely ground hard coke, which burns away but slowly and does not flux or indurate, thus giving a firm foundation for the pots, which are set in a double row along the centre of the chamber ; the upper roof of the chamber consists of firebrick tiles or frames filled with firebrick capable of being slid off separately by means of levers or handles attached to each, so as to permit of the introduction and withdrawal of the pots. The inventors state that the lining of a furnace of this description will last from fifteen to twenty weeks without repair, working day and night, whilst four to five weeks is the ordinary life of a eoke- fired furnace ; that the pots will stand four, five, and sometimes even ten successive meltings instead of two or three ; and that, whilst 3 to 4 tons of hard coke are requisite in eoke-fired furnaces per ton of steel melted, 15 to 20 ewts. of much inferior slack burnt in a gas producer will furnish enough fuel to melt a ton of steel on the regenerative principle (Chem. Soc. Journal, 1868, p. 276). The precise amount of fuel used in actual praetice is somewhat ‘tssiabla, but consumptions as low as 0°64 parts of coal per unit of steel melted (nearly 20 tons being melted in all during one week) have been recorded. In other works the consumptions were 1°1 to

1°45 parts of coal per 1 part of steel melted (the heat requisite for drying the pots being included).

34. Case Hardening.—This operation is essentially the reverse of that by which cast iron is converted into malle- able iron (§ 22). In the latter the carbon is gradually removed, the outer portion being first affected; in the former carbon is added to the exterior layer of a malleable iron article so as to give it great hardness, strength, and power of resisting wear and tear by superficial conversion into steel. As applied to larger articles in which the steely coating is required to be of more than just perceptible thickness (0°1 to 0°3 inch), the operation is essentially that of cementation, the iron articles being packed in an iron chest or box in charcoal reduced to very coarse powder (burnt or charred leather, hoofs, bones, &c., answering best), and then heated toa red heat for a sufficient length of time (some four to six hours for a coating of stecl of 0-1 inch or so in thickness) either judged by past experience or by withdrawing trial pieces from time to time, and breaking them so as to ascertain to what depth the acieration has proceeded. When this is effected the chest is withdrawn from the oven or furnace and the articles chilled by taking them out whilst still hot and quenching in water or oil, &c,, so as to harden the exterior coating. Since the steel exterior is thus rendered too hard for working with ordinary tools, the articles to be treated must be as far as possible finished before case hardening, so as only to require clean- ing and pulishing subsequently.

Sometimes a portion only of an iron object is required to be case hardened. In this case a coating of loam or clay, &c., is applied to that part of the object not required to be hardened, and gradually dried on so as to form a jacket; this prevents the ready access of earbon and carbon oxide to the covered-up part, and hence hinders or entirely prevents acieration thereat ; instead of a clay coating moulded on, a roughly made loose iron jacket may be made fron iron tube or sheet iron, &c., and the space between the two surfaces filled in with clay well rammed in. In certain cases the article is case hardened as a whole, those portions required to be of malleable iron being made too large ; after acieration the whole is annealed, and the softened steely coating

filed or lathed off from these portions, and the whole then heated and hardened.

When only a thin coating of stcel is required, it is unnecessary to acierate by packing in charcoal ; the iron to be hardened is heated to redness and then sprinkled with powdered ferrocyanide of potassium either by itself or mixed with other saline substances ; the salt fuses and earbonizes the surface of the metal to such an extent that after hardening the exterior film is usually hard enough

to resist a file. Sometimes goods are cast in the first instance (for cheapness of manufacture) and then heated in hematite, &c., so as

to convert them into malleable iron to a greater or lesser extent, |

the outer film being finally case hardened by ferrocyanide ; so that occasionally cast iron as an inner core, malleable iron as an exterior coating, and steel as an outermost film are met with in the same article. or axles, shafts, and other portions of machinery apt to encounter sudden strains which would snap a solid hard steel mass, but where certain portions (bearings, &c.) are required to be as hard as possible to diminish wear and friction, the local case hardening of the parts required to be hard is frequently practised ; and in this way certain of the advantages of both hard steel and wrought iron are combined.

For case hardening rails Dodd's process has given good results ; as practised some years ago by the North-Eastern Railway Company, charcoal, soda ash, and limestone crushed small were mixed together in the proportion of 1 ewt. of the first to 1 stone of each of the others, aud charged into the case hardening furnace between successive tiers of rails. The rails remained in the furnace sixty hours ; when taken out they were covered with sand till cold. The cost of the process amounts to about 12s. 6d. per ton (Lowthian Bell); but when the rails are of ordinary puddled malleable iron, a certain degree of brittleness is communicated. With rails from Danks's machine puddled iron the carbonization was found to extend inwards for

nearly a quarter of an inch, the percentages of carbon in each suc- cessive x4; inch from the surface being found to be as follows :—

Outer +; inch …0°740 to 1°013 Mean of seven specimens = 0-862 Sueceeding do….0°231 „ 0°696 – = 0°496 Third do. ...0°030 „ 0°468 a = 0°253

35. Cructble Steel.—The term "crucible steel," strictly applicable to the cast steel prepared by fusing cementation steel in crucibles, is often applied to denote various other somewhat different substances (also fused in crucibles), cementation cast steel being often designated ' Hunts- mann's steel," from the name of its inventor. About the beginning of the present century Mushet patented the production of a crucible steel by the direct carbonization of malleable iron by the fusion together in crucibles of bar or scrap iron and "a proper percentage of carbonace- ous matter" ; and also the production of a similar product direct from the ore by substituting the ore for the malleable iron and increasing the amount of reducing matter. This latter process (which is substantially the method of assay- ing iron ores in crucibles by the dry method on a somewhat larger scale, and with less reducing matter) had been previously patented in 1791 by Samuel Lucas, whilst substantially the same process was again patented in 1836 by Hawkins. But little steel, however, was made by this process until 1839, when Heath patented the use of what he termed " carburet of manganese " as an ingredient in making crucible steel, this substance being prepared by heating together manganese dioxide and carbonaceous matter. It being speedily found that the same result was produced whether this heating together of the manganese, dioxide, and carbonaceous matter was previously carried out, or whether these materials were separately added to the contents of the crucible and the whole melted together, the validity of the patent was vigorously contested, the utility of the manganese thus introduced into the resulting mass as a means of partially correcting the deleterious effects of sulphur and phosphorus being speedily apparent, and the possibility of the production of useful qualities of steel from even inferior iron being rapidly recognized as a valuable improvement. This Mushet-Heath process of fluxing together in crucibles malleable iron and steel

scrap, powdered charcoal, and manganese oxide or spiegeleisen is still used to some extent ; the cast steel thus produced is apt to be somewhat vesicular and porous ; to over- come this when bars are required the ingots are reheated and hammered or rolled, either with or without cutting and piling; the character of the cast steel is largely variable with the proportions of malleable iron and iron already carbonized that are used. Siemens or open hearth steels have of late years largely superseded this class of products.

When blister steel is judged to be somewhat deficient in carbon, and is converted into cast steel by fusion, the amount of carbon present in the cast steel can often be increased by adding carbon- aceous matter to the fragments of steel with which the crucibles are filled,—the additional carbon being taken up precisely as in Mushet's process of date 1800. The same effect is produced to a slight extent by employing a considerable quantity of blacklead in the crucible composition, the graphite being then directly dissolved during the fusion. The Chenot process of steel making (by fasion in crucibles of spongy iron and carbonaceous matter) has been — already adverted to (§ 30) ; Parry took out a patent in 1861 for con- verting puddled iron into steel by fusing it with coke and fluxes in a kind of cupola furnace so as to recarbonize the metal ; by modify- ing the blast and proportion of fuel employed it is possible to pro- duce either steel or cast iron containing 2 per cent. and upwards of carbon (§ 23). Apparently the cost of the fuel required for this process and other circumstances have prevented it from materially competing with the Bessemer and Siemens steel-making processes.

Wootz or Indian steel was described in 1807 by Buchanan as being prepared from the steely iron obtained by heating in a rough conical furnace of clay some 2 feet wide at the base and 1 at the top the pure magnetites and other ores of India and charcoal, the ore and

fuel being supplied at the top, and the combustion urged by a rude bellows made of a goat's skin stripped from the carcass without

ed ody)

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ing up the belly, the neck being furnished with a bamboo seals hs Rael in ie tube, forming arough tuyere. After the fire has been urged for some hours the contents of the furnace are removed by partially breaking down the front, in the form of a rough porous ball or bloom of partially melted inetal, which is then cut into pieces and charged into a crucible (made of clay mixed with a small quantity of charred rice husks) together with the wood of Cassia auriculata, chopped into little fragments ; each crucible holds about a pound of metal, and is covered over with a few green leaves, preferably of Asclepias gigantca or Convolvulus

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from the first crucible operation could be fused into one mass of somewhat less hard steel than that produced at first in the more successful operations. The possibility of producing steel by fusing together a malleable and a car- bonized iron is evidently a simple deduction from the pro- cesses whereby a steel is produced by the direct addition of carbon to malleable iron, e.g., those of Mushet and of Heath (§ 35). Accordingly a few years after the latter

laurifolius, a clay cover being made by ramming in soft clay and | patented the use of “ carburet ” of manganese, he proposed

drying gently. A number of these cru- cibles (some twenty or twenty-four) are then piled up in a clay furnace furnished with a bellows something like the ori- ginal smelting furnace, the interstices being filled with charcoal. After some two aed heating the steel is fused ; the erucibles are then removed and allowed to cool, and the melted cakes extracted by breaking away the clay. If the opera- tion has been successful, the cakes are smooth-surfaced, with radiating strie ; such cakes when remelted in larger quan- tities furnish an extremely fine quality of steel ; when the conversion of the iron into highly carbonized steel is inconi- plete, the cakes are imperfectly melted down, and consist

more or less largely of fritted lumps of metal not carbonized sufficiently to fuse ; such cakes yield only aninferior steel when remelted. In order to forge the steel the natives heat the cakes ina charcoal bellows-forge for some hours to a temperature short of fusion, and then hammer them out by hand into bars ; these are welded together by forging to wedge-heads, tying together with wire, sprinkling with borax, and quickly heat- ing and hammering till united ; the long preliminary heating partially decarbonizes the steel, so ag to make the final product less like a steely east iron, When properly pre- pared, the temper which this steel will take is magnificent ; it is said that sabres of such steel with an edge sharp enough to cut gossainer like a razor ean be dashed with the full strength of a man's arm against a stone wall, or used to eut in two a bar of wrought iron, without having the cutting edge injured in the least degree if the swordsman be only sufficiently expert.

According to analyses made by Faraday, wootz contains a small quautity of aluminium ; this probably existed as cinder dissemi- nated through the mass, as subsequent analysts have entirely failed to detect aluminium in wootz free from slag ; thus Henry (Phil. Mag., 1852) and Rammelsberg (Berichte Deut. Chem. Ges., 1870, p. 461) found the following mean numbers, the sulphur being probably overestimated in Henry's analysis :—

| Henry.

—_—— ee

Rammelsberg.

98-986

100°000 100°000

VUE. Mernops or Steet Propuction ESSENTIALLY CONSISTING OF COMBINATIONS OF THE PRECEDING PROCESSES, MORE OR LESS PURE MALLEABLE IRon BEING PRODUCED IN ONE WAY, AND CARBONIZED |

[RON IN ANOTHER, AND THE TWO BEING BLENDED TO FORM STEEL,

36. The Bessemer-Mushet Process and its Precursors.—It has been known since the beginning of the 18th century at least that steel could be prepared by fusing together in crucibles cast and wrought iron; thus the operation was performed in 1722 by Réaumur employing the heat of an ordinary forge ; whilst in the production of wootz it must have been observed centuries ago that by continued heat- ing the badly prepared cakes (consisting partly of fused steel and partially of unfused iron) frequently resulting |

Fig. 60.

(1845) a method for making steel on a larger scale than crucible operations would permit, viz., by fusing ina cupola pig iron, running this into the bed of a steel-making furnace, into the upper part of which the malleable iron was intro- duced in bars so as to be heated up by tle waste heat and gradually pushed forward so as to dissolve, as it were, in the molten pig with formation of steel. This method is described by Siemens as being one which would doubtless have led to complete success had the regenerative principle been known to Heath, so as to enable him to obtain the requisite intensity of heat and absence of cutting draught essential to the proper combination together by fusion of the wrought and carbonized iron without oxidation ; it is substantially one of the forms of steel making by means of the open hearth or regenerative processes now in use, and known collectively as Siemens or Siemens-Martin

| processes (see § 39). Other patents, amounting substan- _ tially to the same combination of wrought and cast iron

by fusion so as to form steel, have been subsequently taken out by Price and Nicholson (1855), Gentle Brown, and Attwood (1862); a particular combination of this class patented by Mushet in 1855 (consisting of the addition to

molten Bessemer blown decarbonized iron of fused spiegel- —

eisen) has proved of the highest practical value (§ 27), notwithstanding that the non-removal of phosphorus and

Sulphur to any marked extent in the ordinary blowing

process render it applicable to certain kinds of pig iron only ; the recently invented " basic" process, however, bids fair to overcome this difficulty (see § 37).

The earliest form of converter patented by Bessemer, October 17, 1855, consisted of a rectangular furnace with firebars at the side instead of at thebottom, so that a number of crucibles could be heated therein, each furnished with a tapping hole at the bottom, and a pipe dipping to the bottom of the fused metal inside, through whieh air was to be blown, or a mixture of air and steam, the former causing the temperature to rise, the steam having a eooling effect. Two months later another patent was taken out, the use of a spherical or egg-shaped vessel of iron lined with firebrick and sup- ported by axes being the main novelty. In May 1856 a fixed vertical cylindrical vessel, with blast pipes at the base anda tapping

hole, was patented ; not till somo time later, however (after the in- troduction of Mushet's improvement of adding spiegcleisen), was the present form of converter arrived at, consisting of a pear-shaped or bottle-shaped vessel with tuyeres at the base, and supported upon axes, one of which being hollowserves as the tube by means of which the blast is communicated to the tuyeres, whilst the vessel ean be rotated into any desired position round the axis (fig. 60) ; the use of hydraulic power to work the converter into position, and to manipu- late the "ladle" into which the finished metal is run so as to be poured from it into moulds, soon followed. Subsequently various improvements in details of arrangenient and construction of the plant have been introduced, notably by Holley in certain American works in the first instance; amongst these may more particularly be noticed the use of somewhat longer converters (fig. 61), with movable bottoms, so that, as the tuyeres wear out (which ovcurs much more rapidly than does the

destruction of the lining), new previously constructed bottoms can be introduced without entailing large loss

Fig. 61.°

of time, whilst the greater length diminishes less by splashing and forcible ejection during the boil ; the effect of these improvements is to increase the possible output from a given plant by at least 50 per cent. At first it was usual to melt the pig iron in a separate reverberatory furnace and then to run it into the converter ; a cupola furnace (saving much fuel) was then substituted, a little lime being added to diminish its tendeney to sulphuration ; in this way scrap of all kinds can be utilized, being melted down with fresh pig in a cupola furnace much more readily than in a reverberatory, and being less decarbonized and desiliconized in so doing, which is somewhat important (§ 27). Where the blast furnaces are not too far from the converters, the molten pig is often run direct from the furnace into the converter without solidifying into pig and remelting, an intermediate ladle running on a railway being employed instead of a long gutter, which would cool the metal too much and be other- wise impracticable. In some few Swedish works the old immovable eylindrical converter is still employed, the metal being tapped out into a ladle from which it is run into the ingot moulds, but in most works, even in Sweden, movable converters are now in use. The spiegeleisen usually added subsequently is melted in another smaller cupola ; in some few works however, ¢.g., in Styria, spiegel is not used, but when the charge is blown some more of the original pig is added ; in others Bessemer's original process is adhered to ($ 27); the use of this method, however, is comparatively limited, the combination process being usually adopted in preferenee. When ferro-manganese is used instead of spiegeleisen, it is usually not melted, but simply heated in a suitable vessel by the waste flame of the converter, and emptied into the casting ladle together with the blown metal so as to intermix the two, the ferro-manganese fusing as soon as it comes in contact with the blown metal.

Converters.—The improved form of converter in use at the present day is indicated by fig. 61. It consists of a vessel in shape resembling a claret

bottle with the neck somewhat shortened and slightly bent over sideways ; this is made of stout boilerplate, lined internally with "ganister," a kind of sandstone possessed of peculiar phy- sical properties, more especially of the power of binding together to a compact non-crumbly excessively infusible mass when ground to powder, moistened, and finally ex- posed to a high temperature. The base of the bottle is

removable, being kept in position by bolts and nuts; this being removed, a core is fitted concentrically within the shell, and the moistened ganister rammed lightly in; sometimes the shell is also made of two parts thus treated separately and afterwards bolted together. The

bottom is double, constituting an air chamber or " blast

box," the top portion of which is a perforated cast iron plate, into which are fitted tuyeres consisting of slightly conical elongated bricks or plugs perforated longitudinally with holes (between 0'15 and 0°3 inch diameter) and fixed in at the thicker end; these are composed of a mixture of fireclay and ganister, the space between them being filled up with ganister, so that the inner bottom is substantially the same as the lining sides of the converter, only perforated by a number of holes. The total numberof orifices through which the blast thus comes is considerable, in order to spread it into numerous streams, the actual number varying with the size of the converter ; fora 5-ton converter a dozen or more tuyere bricks, each perforated with about as many holes, are usually employed. The lower plate of the air chamber is removable for the purpose of examining the tuyeres from time to time without removing the entire bottom.

The different portions of the vessel being put together, and the joints well grouted with ganister slip, the whole is gently dried by lighting a small coke fire inside, and by and by increasing this, the blast being

turned on gently until the whole vessel is thoroughly dry and hot, when it is ready to receive a charge of molten pig. The blast is communicated to the blast-box by a curved tube reaeh- ing thereto from the hollow trunnion box, inside which one of tho trunnions of the converter lies; tho other trunnion has a cogged wheel or pinion attached, by means of which the vessel can be rotated, a toothed rack gearing into the pinion and being worked directly by a hydraulic press or ram; the rack and press were formerly arranged horizontally, but now are usually placed vertically or slantwise to save space. By means of an automatic valve the blast is shut off when the converter is in an inclined position, so that the level of the mouth is not lower than the tuyere hole then lowest ; in this position the molten metal is run in, the elevation of the tuyere holes preventing it from running into them; whilst erecting the converter by means of the rack and pinion before the tuyeres sink below the molten mass, the blast is turned on at a pressure of some 1°5 atmospheres or more (21 Ib per square inch and upwards) ; the pressure due to the column of molten metal being less than this, the air is forced through it without it being possible for the fused matter to run down into the blast-box. A large hood over the mouth of the converter and connected with a chimney or flue prevents the flame and ejected matter from being scattered about and injuring the workmen.

The ganister preferred for lining is a peculiar silicious deposit found under a thin coal-seam near Sheffield, of almost conchoidal fracture, therein differing from ordinary sandstones, and containing a few tenths per cent., or sometimes a little more, of lime and about the same amount of alumina, with small quantities of iron oxide and alkalies, the rest being silica; analogous substances, however, are found in various other localities, ¢e.g., in the Yorkshire, Northumberland, South Wales, and Shropshire Coal Measures. A well-prepared lining carefully repaired every few days will last several months, and even upwards of a year ; the bottoms, however, wear away much more rapidly, the tuyeres either becoming melted or dissolved away by the oxidation of the iron in their vicinity, the oxide produced exerting a marked solvent action on the fireclay and ganister bricks; hencethe advantage of Holley's removable bottoms. A damaged bottom can be removed and a new one put in its place, the joint being made up by ramming in ganister into

the crevice whilst screwing up the bolts, without stopping the action of the converter for any lengthened period ; whilst with the older vessels it was requisite to cool down somewhat, knock out the damaged tuyere bricks, replace them by others, and ram in ganister between them from the inside, and finally to heat up again by an internal fire before use,—the whole process causing much delay and waste of fuel, especially as the renewal of some at least of the tuyere bricks is requisite every few blows. In some American works, e.g., Bethlehem, instead of a rammed ganister lining, one composed of blocks of a peculiar sandstone is employed, set in ganister as mortar for the joints.

Subsidiary Appliances.—The precise mode of arrangement of

Bessemer plant varies in different works, but usually two converters are arranged to be worked together, one casting ladle being used for the pair, worked by a crane. In most of the European works tho two converters are on opposite sides of the casting ladle,.so that a

large portion of the circle covered by it cannot be used for running ingots into moulds, being occupied by the converters ; in most American works the two converters are placed side by side, so as to leave a larger space for the casting bed when the metal is not used direct from the blast furnace. A range of cupolas is fitted up ata convenient distance, some larger for melting the pig, some smaller for the spiegeleisen ; the molten metal is either run out from these direct into oue or other of the converters through a shoot or guttcr of iron lined with fireclay and sand, or is tapped into an interinedi- ate collecting ladle, and when the requisite quantity is collected run rapidly into the converter either by "tipping" the ladle over so that the metal runs out together with some little amount of slag floating on its surface, or by means of a tapping hole at the bottom. This latter arrangement allows the charging of the converter to be more quickly effected ; when the iron is tapped directly from the blast furnace into the converter by means of an intermediate ladle, the cupolas are of course unnecessary, save those for melting the spiegeleisen. The blast is generated by an ordinary blowing engine, but at a considerably greater pressure than

that used for blast fur- naces, 20, 25, and even 30 ib per square inch pressure being employed. The casting ladle into which the contents of the con- verters are emptied by tilting them up sufficiently when the opera- tion is finished is a large iron bucket lined with clay with a hole at the bottom filled up with a perforated firebrick, into which fits a stopper consisting of a stout iron rod covered with a thick fireclay tube to protect the rod from the fused steel ; when the ladle is full of molten metal, and the hole is closed by the stopper, the ladle is swung round by means of a crane over the ingot moulds (of cast iron); the stopper is then lifted, when the fused stecl runs out, the scorie floating on the top of the metal being thus retained and pure steel only poured. Sounder ingots are obtained by running the metal into a cavity communicating by firebrick tubes with the bottoms of the moulds, so as to fill them from below, than by filling them from above directly. Detailed descriptions of the plant employed in various first-class American Bessemer works are given by Holley and Lenox Smith in a series of articles in Engineering, 1877 and following years.

The mode of carrying out the operation is briefly as follows :— the charge of pig iron being run into the converter, this is swung back into the vertical position, the blast being automatically turned on in so doing; when the blowing is at an end, tho converter is turned into a nearly horizontal position, the blast being thereby shut off; a weighed quantity of fused spiegeleisen is then run in, and the total contents of the converter forthwith poured into the cast- ing ladle; formerly the converter was erected for a few seconds and the blast blown through to mix the spiegeleisen and blown metal, but that is now found to be unnecessary. The ingots are finally reheated and passed through the rolling mills after forging so as to reduce them to rails, bars, plates, &c., as required, the machinery for this purpose being identical in character with that employed for malleable iron (§ 25).

The following analyses illustrate the general composition of “Bessemer steel” as made in different European countries, the first two specimens being prepared by Bessemer’s original process (with- out addition of spiegeleisen, § 27), and the others by the Bessemer- Mushet

combination process (from report of E. Brusewitz to the Swedish iron office, Jern-Kontorets Annaler, 1871, 199).

. Westanfors Barrow-in- Neu- Locality wine { | Wgstanfors [Barrow-in-/ Germany. berg. Rails from! Boiler Without addition Rail Working- | Plates: of Spiegeleisen. i = ton Hema-|Pig used Particulars ……+.. 4 For Coarse Pig poor| tte and | direct vo: in Man- oa an = angani- as oe Hard. Banese. | ferous Fur- Pigs. nace. Carbon 0°085 0-950 0-200 07150 0-046 0°250 Silicon 0-008 0°047 0179 0:091 0°634 0°016 Manganese. trace 0°463 0:214 0264 0°638 0°136 Phosphorus .. 0:025 0-032 0-026 0132 0093 ian Sulphur tterecseesseoes] £TACE trace 0-030 0°025 0°045 0°010 Iron by difference..| 99-882 | 99-508 98°351 99-338 98°544 99°588 100-000 | 100-000 | 100°000 {100-000 | 100-000

100-000

ano illustrating the composition of the slag are given 37. The Basie Process.—On attentively examining the history of the puddling process, especially the improve- ment effected by Rogers in substituting bottoms of iron coated with fettling of iron oxide for the sand bottoms originally used by Cort, and also the various experi- ments that have been made during the last dozen years or so both on puddling by machinery and refining and purifying iron, the general conclusion deducible seems to

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be that when phosphorized metal is in presence of iron oxide in a fused state, or of a melted mixture of iron oxide and ferrous silicate containing an amount of the latter not above a certain limit, the tendency of the phosphorus is to become oxidized and converted into phosphate, which separates in the cinder, leaving a purer iron; whilst on the other hand if the cinder is mainly silicate, especially of the metasilicate or “acid” type (R,O, SiO,), the tendency is rather the other way, part of the metallic iron becoming

‘oxidized whilst the phosphate is reduced, thus communi-

cating phosphorus to the remaining iron! Accordingly, in the modern ordinary puddling process, especially when machine puddling and regular mechanical agitation are substituted for hand labour, and when plenty of fettling of ferric oxide (not largely silicious) is employed, and in Bell's and Krupp's purification processes, phosphorus is largely removed from the pig ; whilst on the other hand in the older method of puddling on sand bottoms and in the ordinary Bessemer blowing process the first action of the oxygen of the blast is concentrated rather on the silicon than on the iron (at least so far as the ultimate chemical change is concerned), and in consequence a highly silicious cinder results, so that removal of phosphorus by oxidation becomes impracticable ; this result, moreover, is intensified by the nature of the lining material (ganister) used for the converters ; similarly, in the Heaton process phosphorus is sometimes removed to a considerable extent and sometimes not, according as the soda produced by the decomposition of the nitrate and the iron oxide formed modify the character of the slag produced by the oxidation of the silicon and formation of silicates, rendering it of an "acid " or " basic " silicious character. Again, according to Riley, when the whole of the iron is reduced in the blast furnace, so that the cinder contains none, or practically none, the pig contains all the phosphorus present; but if the cinder contains unreduced iron to any extent, it also retains a proportionate amount of phosphorus, being then much more basic. The temperature also seems somewhat to influence the reaction of iron oxide on phosphorus and of iron on phosphate ; the higher the temperature the more pronounced apparently is the tendency of the metal to retain phosphorus, ¢.e., the less is the tendency of the phosphorus to oxidize and separate from the metal. Guided by these considerations, Snelus took out a patent in 1872? for the use of lime or limestone

1 An instructive experiment on this point has been made by Pourcel. A quantity of metal (3 tons) containing 2°5 per cent. of carbon and 0°5 of phosphorus was melted in a Siemens-Martin hearth, the scorice removed, and the atmosphere made highly oxidizing (hot air alone passing); in fifteen minutes jets of carbon oxide were formed, and some of the silicon and iron was oxidized, forming a cinder containing no

phosphorus. The bath was then heated up again and the cinder removed; and after some silico-manganeisen (10 per cent. silicon, 20 per cent. manganese) had been added, the oxidation by air alone was proceeded with ; at first no carbon oxide was liberated (indicating the preferential oxidation of silicon), but after fifteen minutes more the jets reappeared ; the cinder now was found to contain phosphates, the percentage of phosphorus in the metal having become reduced to 0°35, indicating that the iron and manganese oxides formed, whilst partly reacting on carbon and chiefly on silicon, nevertheless to some extent attacked the phosphorus. The atmosphere was now made much less powerfully oxidizing by turning on the gas supply as usual ; in fifteen minutes the phosphorus had disappeared from the cinder, and was wholly taken up again by the iron, which now contained 0°50 per cent. as at first, showing that prolonged contact with the silicious cinder enabled metallic iron (containing more or less carbon) to reduce the phosphate of this cinder, thus inverting the operation effected during the rapid oxidation of iron set up in the first part of the experiment.

? The idea of employing calcareous and other basic linings to fur- naces used for the purification of iron by methods other than the pneumatic process of Bessemer is of considerably older date than 187 2; thus such substances were used years ago by Siemens and Chatelier in the earliest experiments on the open-hearth process (§ 39), bauxite being extensively employed then, and also in Siemens's subsequent direct precipitation process. The use of lime in puddling has often been tried as an addition to the fettling, whilst in the Siemens ore process limestone is usually added as a flux.

as a lining material for the converter, and found that when a "basic" lining of this description was substituted for ganister a removal of phosphorus to a greater or lesser extent was actually brought about in the converter just as it is in the puddling furnace; for some few years, how- ever, this method was not applied on a commercial scale, but subsequently the subject was again examined by Thomas and Gilchrist,

who finally succeeded in reducing the principles of Snelus's patent to successful practical operation, finding that by the use of a "basic" lining to the converter, and especially the addition of a small amount of lime, or lime mixed with " blue billy " or some other form of iron oxide such as mill scale, to the charge together with the continuance of the blow for some short period after the decarbonization is complete, the elimination of phosphorus (even from highly phosphorized pig, containing 1°5 to 2°0 per cent. of phosphorus) could be very largely effected, some 80 to 90 per cent. at least of the total phosphorus present becoming oxidized and converted into phosphates, this action chiefly taking place during the "after blow"; provided that the cinder is sufficiently basic, the iron does not oxidize during this after blow as it does in the ordinary 'acid lined" converter process. Owing to the success of these operations, the "basic" process has been more frequently spoken of as the "'Thomas-Gilchrist process" than as being what it substantially is, the principle of Snelus's earlier patent in a somewhat but not very largely modified form. Warned probably by the disasters of previous in- ventors, the rival competitors for the honour (and profit) of the practical production of ingot metal of fair quality from phosphorized pig have coalesced and united their forces, instead of opposing one another in costly litigation.

During the oxidation of phosphorus a large amount of heat is evolved, so that the temperature rises during the after blow just as it does during the oxidation of silicon. According to various experimenters the heat of combustion of phosphorus is a little short of 6000, so that, as that of silicon is near to 8000, 4 parts of phosphorus are thermally about equivalent to 3ofsilicon. Hence ifa pig containing 2 per cent. of silicon will furnish sufficient heat to keep the blown metal and slag fluid, the same result will be attained by means of a pig containing about 0°5 per cent. of silicon and 2-0 per cent. of phosphorus, ¢.e., if the radia- tion loss be the same, and also the diminution in heat evolution due to separating the non-metal from the iron," as well as the fusibility of the slag. In actual practice the "basic" method is found to take a little longer time than the ordinary "acid" blow, so that the radiation loss is a

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1 The experiments of Troost and Hautefeuille show that this is not the case, the heat evolution during the union of silicon and iron being much less than that taking place when phosphorus and iron combine together ; so that considerably more than four parts of phosphorus would be requisite to produce the same amount of heat as three of silicon if both non-metals arc séverally combined with iron.

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little greater ; the calcareous cinder too is somewhat less fusible than the ferrous silicate cinder of the ordinary ganister-lined converter ; so that a practical inconvenience is apt to be occasioned owing to the frothy mass of imper- fectly fused cinder formed foaming up to the mouth of the converter and there solidifying, whilst the greater extent of the foaming causes more material to be ejected than is usual with the ordinary converters. 'To remedy this, it has been proposed to add the basic matter in a highly heated or even molten state, and:to make the air used for blowing traverse a chamber filled with coke on to which petroleum is allowed to drop, so that combustible vapours are blown into the converter along with the air, thus raising the tem- perature considerably, and preventing the blocking of the converter-mouth by solidification of cinder, and the pro- duction of metal too little heated to remain fluid during the pouring of the ingots, and consequently solidifying in the ladle forming a "skull." Wilks finds that the action of this arrangement is very satisfactory and effective in preventing "cold blows" from occurring. The same result is also producible by means of coal dust or other freel

divided combustible matter blown in along with the blast.

With silicious pig iron the lining is apt to be attacked by the silica formed during the first part of the blowing operations ; this is partly but not wholly avoided by the addition of heated lime to the charge. Harmet has proposed, and at Witkowitz attempts have been made, to blow phosphorized and siliciuretted pig suc- cessively in two converters, one acid-lined for removing silicon and carbon, and the

other basic-lined to get rid of the phosphorus, the blown metal being transferred from the one to the other; much cooling of the metal was thus produced, and the operation was pro- longed some fifteen minutes, so that the method was speedily abandoned.

According to Tiinner, in order to produce 100 parts of pure ingots of blown metal 122°5 parts of pig are requisite with "basic"? converters, and only 118°7 with the ordinary "acid" ones (waste in remelting being included in each case; when the metal is used direct from the blast furnace, only 112 parts are required with acid converters) ; hence an extra loss of nearly 4 per cent. of metal is experienced in the basic process. The following analyses, by Miiller, of specimens taken during a prolonged investigation at Horde illustrate the non-removal of phosphorus and sulphur during the earlier part of the blow, and indeed their slight increase (in percentage amount) owing to the oxidation of manganese, silicon, and carbon; and also the rapid removal of phosphorus during the after-blow :—

Original Metal.

Time in Minutes…. |

. a a |

4 99531

{100-000 100-000 100°000 100-000

The composition of the slag produced during the basic process differs greatly from that of the ordinary method ; the following analyses illustrate the difference :—

Ordinary Process. Basic Process.

Pattinson

A. Tamm. | Schecrer. Rrdictenal Pink.

Horde Slags: some 15 per cent. of Lime added to Converter.

borough Slag.

Ferrous OXide «.....0 8-90 IETTICH Gcssiauaesatseees= 1°75 Manganese oxide …... 4°40 With We. «cs secseeccsencense! 50°21 eaencncsnosceD08 9°84 aeeccesessacceeses traces

ERE reer eee 11°10 Phosphoric anhydride 12°43

Calcium sulphate…... UIPHUT cerecececesesrocus==

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1c phosphoric anhydride in the basic process slag appears to ay ee seen phosphate, and not as iron phosphate ; for aftcr roasting to peroxidize iron, no soluble phosphate is dissolved out on dieestion with ammonium sulphide, nor is any formed by fusion with sodium chloride, whilst sulphurous acid solution readily dis- solves out phosphate (Pattinson and Stead). ; ; Basie Lining Material.—Some of _the earliest of Bessemer's experiments (made at Dowlais) on his air-blowing process were made with a converter lined with Stourbridge firebrick, and in this vessel a Bessemer metal was made which contained only ininute quantities of carbon and silicon, and much less phosphorus than the batches subsequently prepared from the same phosphorized Welsh pig in other converters lined with ganister, the non-success of which sub- stances as commercial products (owing to their brittleness due to the phosphorus present) ultimately led to the use of hematite and other phosphorus-free pig only for Bessemcrizing. Without doubt the superiority of the earliest samples was due to the less silicious character of the brick lining. The lining materials used by Snelus in his experiments on the subject were lime and limestone, especially magnesian limestone ; those first employed by Thomas and Gilchrist were crushed limestone and sodium silicate solution added so as to moisten the limestone, which was then rammed into the converter like ganister. Bricks made of a limestone containing some aluminous silicate and fircd at a very high temperature were then employed, but were found to be subject to disintegration by moisture when kept in stock ; magnesian limestone bricks containing a little silica and alumina similarly preparcd answered much better. Riley has found that freshly

burnt pretty pure magnesian limestone mixed with about 10 or 15 per cent. of crude petroleum can be rammed into converters or moulded by hydraulic pressure into bricks, the substance in either case becoming compact and hard upon firing, so as to present a very durable lining material. Instead of petroleum, crude shale oil, resin oil, or tar may be used to moisten the lime. The bricks thus prepared do not slake or dis-integrate on keeping, or even if immersed in watcr, provided they have been fired at a high temperature ; in this case they contract slightly, whereas if only comparatively slightly heated they do not materially diminish in volume on firing.?

38. The Uchatius Process.—In the process of puddling (§ 23) the oxidation of the carbon and other impurities of the pig iron is essentially effected by oxide of iron incorporated mechanically with the fluxed mass, and derived either from the oxidation of part of the iron of the pig, or from the fettling, or both. By fusing down in crucibles a mixture of small fragments of pig iron and ferric oxide of tolerable purity in suitable proportions it might therefore be expected that the percentage of carbon of the iron would be reduced so that a steel would result, a portion of the iron oxide added becoming simultaneously reduced to the metallic state; this experiment was actually made by Reaumur upwards of a century ago; the reaction forms the foundation of the Uchatius process, patented in 1855. In order to obtain a usable steel, the iron oxide employed should also contain manganese oxide; the pro- duct of the continued roasting of a manganiferous spathic ore answers well. Independently of the costliness of crucible operations, however, as compared with other modes of production, the method is open to objection on the score of the practical difficulty in exactly regulating the degree of carbonization of the resulting steel, and also

in its requiring a tolerably pure pig iron in the first place,

so that, like the Bessemer process proper, it is unsuited for the production of steel from many classes of iron. The method has, however, been employed on a manufacturing scale in Sweden, the non-phosphorized charcoal smelted from Swedish magnetite being employed along with some of the crushed ore ; whilst a modification of

the process, in which an open hearth heated by a regenerative furnace is employed instead of crucibles, has been employed of late years by Siemens (see § 39), and is usually known as the "ore process" for open hearth steel making, At Wikmans- hytta in Sweden a few years ago various qualities of steel were prepared from the richest Bispberg mine ores stamped fine and intermixed with pig iron granulated by running ee eee

1 For further details respecting the working of the Snelus-Thomas-

Gilchrist process, see various papers in the Journal J. and SX. Inst., 1879 and 1880, and in Tron, &c.

into a rapidly revolving wheel in a water tank. Only hard steel for miners' picks, cutting tools, razors, dies, &c., were thus prepared, containing 0°7 to 1°3 per cent. of carbon, about 50 ib being melted in each crucible at one operation ; the crucibles lasted longer than in ordinary cast steel making, usually for some half dozen heats.

Rostaing effected the granulation of the iron by running the melted pig on to a rapidly revolving horizontal cast iron disk, so that the liquid was scattcred around (by centrifugal action) in globules which solidified into a kind of iron shot; these being sifted into tolerably uniform sizes admitted of the production of a more nearly homogeneous metal than would otherwise have been obtained. The principles of Uchatius and Rostaing's patents, however, were long previously known and even patented; thus in 1761 J. Wood obtained a patent for reducing iron "into small grains (according to art) by pouring it into water upon a wheel or roller turned briskly round," and for decarbonizing the granulated metal by fusing with various fluxes, &c., including iron cinder, scales, and scoris ; whilst Mushet has described, as being in use long ago at Cyfartha, a method of granulating iron by pouring on to a revolving horizoutal stone in a water trough moltcn pig iron, stating that the granulated metal was fused with oxide of iron in the form of bloomery cinders, and thereby rendered less easily fusible and capable of welding,— in short, that it was decarbonized to a greater or lesser extent.

The method of purification or refining of pig iron proposed by Bell (§ 24) is substantially the Uchatius process applicd on a large scale and at a somewhat lowcr temperature, with mechanical agitation and interruption at a certain stage. By stopping the pro- cess when the action has only gone on sufficiently long to oxidize the majority of the silicon and phosphorus without materially affecting the carbon, a refined cast iron is produced; whilst, were somewhat more carbon removed by longer action, a kind of Uchatius stcel would result.

Ellershausen's process consisted in running molten pig iron upon a bed of iron oxide, sprinkling ore on the surface, and running on another layer of pig iron, and so on until a mass of alternate laycrs of pig and oxide is formed; on heating this the pig gradually beconies decarbonized, the reaction being in fact a kind of modifica- tion of the " malleable cast iron" process described in § 22. Finally the mass is forged and rolled. The results obtained were not uniformly satisfactory, whilst the fuel consumption was found to be large ; accordingly the method never becanie anything much more than an experimental process.

39. The Stemens-Martin Process.—As already stated, this process in its original form is substantially the method patented by Heath in 1845, with the addition of the use of a regenerative furnace, and of certain improvements in the working details, &c., the effect of which jointly is just to convert a practically useless process into a most valuable working method. Fig. 5 represents the kind of furnace employed. Since the date of Heath's patent the fusion of steel by means of a fan blast in an open hearth (under a layer of molten glass to protect from the oxidizing action of the flame which was the main cause of failure in Heath's original process) was experimented upon by Sudre and a commission from the French emperor (consisting of Deville, Beaulieu, and Caron) at the Montataire iron- works, with the result of showing that, whilst the operation could be readily effected and a gaod tool steel prepared, the practical difficulties in the way, especially the corrosion of the furnace and the great cost of the requisite fuel, rendered the process commercially of but little value. In 1863, however, Chatelier attempted to prepare cast steel by puddling a good pig iron so as to

form a very mild puddled steel, and then fusing it, not in crucibles, but on the hearth of a furnace containing molten pig and fitted on the regenerative principle. To enable the hearth to resist the high temperature it was composed of a bed of bauxite, a material highly suitable, so far as infusibility and the absence of injurious ingredients are concerned, but open to the objection of not indurating properly, and consequently becoming dislodged and floating up to the surface of the fused mass ; this inconvenience was subsequently remedied by mixing the bauxite with a 1 per cent. solution of calcium chloride, moulding the paste into bricks, and calcining them,

whereby a highly refractory coherent bottom can be

obtained. Siemens, however, prefers (Chem. Soc. Journal.

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1868, 279) to use a silicious sand of a particular degree of fusibility (such as that from Gornal near Birmingham, or Fontainebleau sand with an admixture of about 25 per cent. of common red sand); this, being introduced dry into the furnace in a layer of about an inch in thickness, is fritted by increasing the heat up to a full steel- melting temperature ; another similar layer is then intro- duced and fritted down again, and so on until the hearth is made into a shallow basin sloping towards the tapping ‘hole. The experiments of Chatelier not being attended with the desired success in the first instance, the subject was taken up by E. & P. Martin, who subsequently intro- duced certain improvements in details, such as the use of particular fluxes to cover the surface of the molten metal, the application of a separate furnace for heating the iron before introducing it into the melting chamber, the em- ployment of particular brands of iron, &e.

Under the names of “Siemens process” and “Siemens-Martin process” are usually included several different modifications. In what may be called the older or original process, which was essen- tially the combination of pig iron and malleable iron fused together in a

regenerative furnace hearth, the same kind of difficulty was met with that nearly proved fatal to Bessemer's original process, viz., that it is difficult if not impracticable to make sure of obtain- ing any required degree of carbonization of the resulting steel, so that the finer classes of steels cannot readily be thus made; for rails, however, the process has been largely adopted. Much the same way of overcoming the difficulty was adopted in the Siemens- Martin process as was used by Mushet, thus giving the second modification, viz., making the atmosphere slightly oxidizing, and continuing the heating until the metal is decarbonized, when the required amount of carbon is added in the form of spiegeleisen or ferro-manganese, and the steel forthwith cast. This modification is consequently substantially the refining process formerly adopted as a preliminary stage to puddling (§ 23) carried out a great deal further (so as wholly to decarbonize the metal) at a much higher temperature, and differs from the Bessemer blowing process mainly in this that the oxygen requisite to burn off the carbon and oxidize silicon, &c., is made to play over the surface of the fused mass instead of passing through it. The decarbonization is carried out in precisely the same way (so far as principle is concerned) as that by which the oxidation of lead and base metal is effected in the ordinary process of gold and silver cupellation in an oxidizing atmosphere at a high temperature. These modifications, of which the second is now much the more largely adopted, are generally referred to as the "Siemens-Martin" process, or " Martin process." A third modification is substantially the Uchatius process carried out in a regenerative hearth instead of a crucible; this is known as the '*Sieinens process" or " ore process," and consists in melting hema- tite pig, or other pig iron free from sulphur and phosphorus, and then adding in small quantities at a time an equally pure ore until a sample taken out from time to time does not harden on plunging into water whilst still red hot ; to the fused iron spiegeleisen, &c., is then added as before ; in this way a somewhat larger quantity of steel is obtained from a given amount of pig, the ore becoming partly reduced whilst oxidizing carbon and silicon, &c. ; but this advantage is counterbalanced by the greater wear and tear owing to the larger amount of cinder formed and its corrosive action on the brickwork, and by the necessity for using somewhat more fuel. A fourth modification consists in a sort of combination of the Martin

method and the ore process, the pig and scrap, &c., being fused together and the decarbonization being then effected, not by oxida- tion by the gases alone, but by that together with ore added to the mass.

When Siemens's precipitation process (§ 31) is used, or when the ore isreduced to spongy inetal in a rotating furnace, &c. (§ 30), the resulting iron is readily converted into steel by simply adding it instead of malleable scrap to the fused pig in the above process,— spongy metal when thus employed being made up into a sort of ball by stirring it up with fused magnetite, and the whole added to the fused pig ; another variety of combination of " ore process" and ordinary Siemens-Martin process is thus obtained, the finishing up of the metal by adding spiegeleisen, &c., in known quantity when complete decarbonization has been effected Weing the same in all cases. An analogous modification is that of Blair, who first pre- pares spongy iron by reducing the orc in much the same fashion as in Chenot's process (§ 30), and then fuses it up in a regenerative furnace with more or less pig to give a fluid bath to begin with.

In the ordinary working of the process when ore is not used, the materials employed are pig iron (free from sulphur and phosphorus) and malleable scrap of various kinds, together with scrap and waste Bessemer steel, crop ends of rails, &c. The pig being melted and

the malleable iron raised to nearly a white heat (either in a scparate furnace or by the waste gascs before passing to the regenerator), the latter is gradually added to the former until the whole is liquid; the heating is then continued, the flame being made somewhat oxidizing so as to gradually decarbonize the metal, until a sample of the metal drawn and cooled in water is scarcely hardened thereby ; at this stage the metal is virtually molten decarbonized iron, all silicon, manganese, and carbon having been removed by oxidation. To give the requisite steel character, a definite quantity of spiegel- eisen is added (or of ferro-manganese when a larger relative percentage of manganese is desired, or in certain cases of silico-manganeisen when silicon is wanted to be present), and the whole cast into ingots, Pig iron alone can be used in

the first instance, only then a longer time is requisite to effect decarbonization. The following analyses by A. Willis illustrate the relative rates at which the oxidation of manganese, silicon, and carbon is effected, the quantity of the last not suffering any material diminution until the others have almost disappeared :—

Time in Hours since

Fusion just completed ‘ 0. th 2. 3.

4, j 5. 6.

114 0:20

0°18

1-70

0°58 0°23 1°80

0°08 | nil nil nil 0°05 | nil nil nil 1°65 | 1:60 | 1°10 | 0°60

Manganese per cent…. Silicon | CUSays Carbon sof LEED

When pure ores are used in the ore process, no appreciable altera- tion takes place in the percentage of sulphur in the pig and scrap, but if sulphates (e.g., barium sulphate) be present in the ore, the resulting stecl contains more sulphur than the pig and scrap used to the extent of about 30 per cent. of the sulphur present in the ore (Willis). When ferro-manganese is used to finish the process and prepare a soft steel, the requisite quantity of ferro-manganeseis heated up either on the bed between the hearth proper and the regenerators on which the materials are heated up by waste heat or otherwise without fusion ; when spiegeleisen is used, the requisite quantity may either be added in the same way, or fused in a cupola and then added ; burning out of more or less carbon and manganese is always a possibility where a cupola is used, wherefore when possible the spiegeleisen is fused in the hearth itself or its adjuncts. In order to obtain the best castings at Terre Noire,

the decarbonized metal is treated with siliconeisen, and then allowed to remain for some twenty minutes in as nearlyneutral an atmosphere as possible, so that cinder may completely be separated by gravitation and the reaction of the silicon on the carbon oxide may be complete (§ 44); the ferro-manganese is then added, and the casting proceeded with.

In the Siemens-Martin proccss (where ore is not used) the yield of steel finally obtained is somewhat below the weight of metal originally employed, owing to oxidation ; in the ore process, on the other hand, a larger weight of steel is ultimately obtained than that of the metal used, owing to the reduction of iron from the ore. The consumption of fuel per ton of ingot steel is, however, somewhat higher in the ore process, owing to the larger quantity of slag. According to Gautier a considerable loss of fuel results if the gas producers are not placed close to the steel furnaces, cven to the extent of one-third in some cases ; probably this figure is a little overestimated (see § 10).

In order to avoid the necessity of decarbonizing completely the metal and then recarbonizing by addition of spiegeleisen or ferro- manganese, which is practicallyentailed by the difficulty experienced in finding out the exact Hen se of the partially decarbonized metal at any given stage of the operation, it has been proposed by Ryder to sample the steel and cast the sample into a small ingot of definite size and shape, and then to determine the magnetic qualities developed in the ingot by the influence of a powerful electromagnet, using a particular apparatus devised for the purpose. In this way a fairly correct estimate of the amount of residual carbon is obtained, rendering it unnecessary to prolong the operation of decarbonization further when the test shows that an amount is present sufficient to give a steel of the required quality on addition of a known amount of ferro-manganese. In the inventor's hands the method has been found to work successfully, enabling the open hearth operations to be considerably shortened as to duration. An improved form of apparatus for the purpose has also been described by Wattenhofen.

40. The Pernot and Ponsard Furnaces and Allied Appliances. —The Pernot furnace as applied to steel making differs in no material respect

from the Pernot puddling furnace ; it is substantially a Siemens-Martin furnace with a rotating bed. The hearth is a saucer-shaped cavity supported by an iron frame, mounted on the top of a slightly inclined nearly vertical axis, and running on wheels upon a rail or guide supported on a stout bogie (fig. 62). When in position the hearth is just under a dome or roof, which is perforated with orifices for the entrance and exit of the

gas and blast and exit gases passing to the regenerators ; as the furnace revolves the liquid metal always forms a pool at the lowest portion, but any solid matter is carried round, alternately rising above the pool and being plunged beneath it ; the effect of this is greatly to facilitate melting down and also considerably to shorten the time requisite

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Fig. 62.—Pernot Furnace.

for oxidizing out the carbon. At the required stage of decarbonization the blast and gas supply are shut off, the spiegeleisen or ferro-manganese added, and the bogie with- drawn carrying with it the hearth and metal; or it may be tapped a situ, and removed only for repairs (relining, fettling, d&ec.). | : _Comparing the working of a furnace of this kind with one of similar dimensions but fixed bed, Hackney found that the output of stecl was about double ina given time, and the coal used per unit weight of steel was less than one half,

viz., 0°40 to 0°43 instead of 0°90 (8 to 84 cwts. per ton instead of 18 cwts.). AtSt Chamond an improved Pernot 7-ton furnaee gave during three months working the following results per unit of ingot steel :—

Coal macd for smelting ……00……..seieeccneeeeses 0318 is lighting, repairing, &e. ..... 0°156 BN i isinaorcoshgceue ntecagee 0°474

The metal used per unit of ingot steel was 1°06, the output being

about 21 tons per day of twenty-four hours, the conversion taking about seven hours per charge. In English works where the Siemens process (‘¢ ore process ”) is used with fixed hearths the yield of steel is somewhat in excess of the metal used originally, but the time of working is inferior to that just mentioned, the yield with 5-ton furnaces being only some 14 tons per twenty-four hours.

Holley states that the removable Pernot furnaces set up in America (especially at Springfield, where 20-ton hearths have been recently erected) are highly satisfaetory, especially as regards the ease with which repairs can be made; the hearth ean be run out on Saturday night, and is eool enough to repair on Sunday ; firing up a commeneed on Sunday night, the furnace is ready for the usual charge on Monday forenoon, Krupp’s dephosphorizing pro-

cess is adopted to purify the pig before finishing in the Pernot hearth, the metal being run from the melting cupolas into the Krupp washing furnace, and thence into the steel furnace by means of a ladle. Essentially the Pernot furnace is an ingenious combination of various previously well-known prineiples, the rotat- ing eircular bed having been previously used not only for puddling iron, but also for roasting ores, and the withdrawing carriage having © also been employed previously in the manufacture of armour plates, whilst the inelined axis had also been previously used

The Berard Process.—This method is essentially a sort of combination of the Bessemer converter principle and of the open-hearth method. A

double furnace is employed, heated by gas, and provided with movable tubes dipping into the melted metal, or with a tuyere at the base in the case of the first hearth, in which the metal is blown, and the carbon, &c., oxidized by means of an air-blast ; in the fellow hearth the metal is partially recarbonized by the gases from coal similarly blown into it, the object being to facilitate the removal of sulphur and phosphorus, Finally the purified metal is treated with spiegeleisen or ferro-manganese in the usual way.

Ponsard Furnace or Forno-Convertisseur.—This apparatus is essentially a combination of the Pernot furnace with the Bessemer converter, consisting of a hearth movable about an obliquely vertical axis (figs. 63, 64). Instead of rotating round and round on this axis, the hearth D only moves through half a revolution; when in one position (as in-

| il} sl ——SS== —— : ; Pa Z

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Fic. 63.—Ponsard Forno-Convertisseur—Transverse section.

dicated in fig. 63) the surface of the molten metal is above the level of a series of tuyeres O fed by a blast pipe LMN ; under these circumstances the apparatus performs the functions of a Bessemer converter, the blast passing through the molten metal ; when it is half turned round, the tuyeres are raised above the surface of the metal and the blast is shut off, so that it then becomes an ordinary Siemens open hearth. The air blast is introduced, as in the Bessemer converter, through a hollow axis of rotation ; the hearth is fixed, as in the Pernot furnace, upon a carriage or bogie K, so that it can be withdrawn and the metal tapped out at the tapping hole P. A gas producer A is attached, the gases from which are burnt as they are formed without cooling by passing through a long pipe, &c., or heating by aregenerator; the air used to burn them, how- ever, is heated by a regenerative arrangement consisting of a pair of chambers H filled with brick stacked in a peculiar way ; through one chamber the waste flame passes by the flue EFG, heating it up; through the other one used alter-

nately the air passes reaching the furnace by the flue CC. F is a chamber in the waste gas flue for the deposition of solid suspended matters, dust, &c., from the blowing opera-

tion, and G is a small bed for heating scrap, d&c., before its introduction into the main hearth D. Owing to the regene- rator only heating up the blast, the waste gases escape at a much higher temperature than with a Siemens regene- rator ; accordingly they may be advantageously utilized to produce steam.

According to Perissé (from whose paper—Journ. I. and 8. Inst., 1878, 459—the cuts, figs. 63 and 64 are taken) the average duration of a blow and subsequent operations in a 5-ton furnace is five to six hours when the metal is charged cold, whilst six to eight operations may be made in twenty-four hours when it is previously melted in a spare hearth ; 250 kilos (about 5 ewts.) of Mons coal were consumed per hour, or about 6 tons per twenty-four hours for 20 tons and upwards of produetion (eharged eold), or for 30 to 40 tons (charged with fluid metal), Phosphorus is not materially eliminated, because, as in the ordinary Bessemer and Siemens-Martin hearths, there is a silieious flux always present, owing to the nature of the lining ; this objection, however, is readily remediable by simply using a "basie" lining (§ 37), when more or less eomplete dephosphorization results, just as is the ease with the Pernot hearth when a large amount of fused iron oxide is added, as in Krupp's dephosphorizing process.

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cj i

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Y Do

relatively to the burden, however, the quantity of manganese reduced and obtained in the pig iron is increased ; the hotter the blast the greater the richness in manganese of the pig, at least with the ores used in the Siegen district. At Nijne Tajilsk (Urals) a ferruginous manganese dioxide occurs of the following composition :—

MaWQoneae QiexINe ..00..6.0000000 seveerndsnensd 58:00 per cent. ay SOSG WO RAC Sh cisions «seasons ones 13°86 5,

BGI TOMO jet ats zyeesisie een cies. se nien eae Coes 15°33,

SUIENT crastsoases odelonien dgiecguis sastenninwenauaiediones wap, me er

BVH RUT chess Festa tiermnaiatistustusictnctelecntadn coils sey alg Sate S68 5;

From this a fine brand of spiegeleisen is smelted. At Schisshyttan (Sweden) occurs a mixture of magnetite, manganiferous garnet, and knebelite (silicate of iron and manganese), of which mixed ore the average composition is

a Minissha aie ea vs alamo atusin 25°88 per cent. Deter cht aOR LC es oreo sels oso e’s ole xlesisielo Sareecinee yay aearn Mas QWRGES OTAGG 5 025.5668 te cee en cene dos cceene ea, *

Alumina and calcium carbonate, &..... ABS: « os Of late years this has been extensively used for manu-

facturing spiegeleisen (chiefly used for Swedish Bessemer

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Fic. 64.—Ponsard Forno-Convertisseur—Longitudinal seetion.

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By omitting the movable bed, and substituting the ordinary fixed bed of a reheating furnace, the Ponsard forno-convertisseur becomes changed into the Ponsard reheating furnace ; the ‘advan- tages of this form of arrangement over that of Siemens’s reheater are said to be considerable saving of eost in construction and capa- bility of producing steam by the waste heat.

41. Manufacture of Spiegeleisen and Ferro-manganese and Allied Substances.—In all the above combination pro- cesses which are successfully worked, the final stage is almost invariably the addition to more or less com- pletely decarbonized molten iron of carbonized mangani- ferous iron in definite proportion, so as to communicate a known amount of carbon (and also of manganese) to the mixture ; accordingly the preparation of Manganeisen (as such substances may be conveniently termed) is an im- portant step in the steel making processes. When highly manganiferous iron ores, such as the Styrian spathose ores, are smelted in the ordinary way in a blast furnace, a large fraction of the manganese is not reduced, but passes away in the cinder; by using a larger amount of fuel

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iron) containing about 4 per cent. carbon and upwards of 10 of manganese, sometimes 15 or even more per cent. being present. These higher manganiferous irons show little or no magnetic action. ;

During the early period of the development of the fused steel industry, the richer manganeisens (containing 15 per eent. and upward of manganese) used for erucible steels were themselves pre- pared in crucibles, the term "'ferro-manganese" being applied to these products, "spiegeleisen" indieating the less manganiferous pis eoutaining some 6 or 7 per'cent. of manganese prepared in the

last furnace ; subsequently, however, the blast furnace spiegel- eisens of commerce were prepared much richer in manganese than formerly, whilst ferro-manganese of 30 and upwards per cent. of manganese eame into use prepared by Henderson's method, viz., by redueing upon the open hearth of a Siemens furnace a mixture of manganese carbonate (obtained from bleaching powder residues or '¢still-liquor") and ferric oxide in presence of excess of carbon, a neutral or slight reducing flame being employed. The furnace bottom is made of coke ground up and eonsolidated, so as virtually to form a large earbon shallow crucible or basin,—the finely divided mixture being put in and the temperature raised to a low red heat for some hours. A metallie sponge is obtained which subsequently runs down to a regulus when the temperature is raised to a full white. An important influence in the amount of manganese

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reduccd and contained in the final alloy is exerted by silica ; if much of that substanee be present the product is eomparatively poor in manganese, a green slag (mainly manganese silieate) being formed ; a very high temperature too is essential ; of late years blast furnace manganeisens have almost superseded these open hearth products. Alloys containing 25, 50, 75, and even more per cent. of man- ganese

are usually employed in the manufacture of so-called extra soft steels (or more properly fused irons), the use of spiegeleisen being in such cases inadmissible inasmuch as too high a degree of earbonization would be effected if sufficient spiegeleisen were added to eommunicate as much manganese as is desired to be present ; thus at Terre Noire, whcre the preparation of ferro-manganese has been extensively experimented with and adopted, only about 1°5 parts of 45 per ecnt. manganeisen are added to 100 of the decarbonized product from the Siemens-Martin hearth or Bessemer eonverter, thus communieating some 0°7 per cent. of manganese with lcss than 0°1 per eent. of carbon ; whereas were spiegeleisen used at 8 per cent. manganese only, either the carbon percentage would be far too great, or the manganese would be too low to give the partieular physical qualities required. For the manu- facture of spiegeleisen the franklinite of New Jersey (essentially a compound of ferrie oxide with oxides of zinc and manganese) has been long utilized, being first heated with anthracite so as to reduee and distil off most of the zine (the vapour of which is allowed to oxidize, the resulting oxide being colleeted), and then smelted in small blast furnaees with anthracite and limestone flux with a large excess of fuel (about three times the weight of spiegeleisen run or more).

a to Snelus (Journ. I. and S. Inst., 1874, 68) the best results are obtained when a eertain quantity of manganese remains unreduced and eseapes in the slag, which should have about the following composition to give the best results :—

RE oor c cs etsceiomeraccecenes Abana ee 35 per cent. PRO RAE ratios s vac.sesescscane sec cse eames ecse LO” 55 RDI es onicciivcnessercisnbiesncnnsinncines aceed *) MEIOSIS 2.41. 000recdseceseroncserseres 12-20 „

constituting a green vitreous smooth mass of conchoidal fracture. The composition of the charges introdueed into the furnace must be ealculated out so as to give about this amount of manganese unreduced together with that reduced in relation to the other con- stituents respeetively ; thus from the following average composition of charge the annexed slag and spiegeleisen result :—

Charge. Slag. Spiegeleisen.

Per cent. Per cent.

33

BGO es ese viioadenss 83°08 6 14°6 Manganese…..... 12° Manganese oxide 16°5 16°0

Lime and magnesia 3 32:0 Ferric oxide …... 47 en

Much more richly manganiferous metals than this have been obtained in the blast furnace by W. G. Ward (Cartersville, Georgia) by simply increasing the amount of lime added, and employing a smaller burden ; in this way ferro-manganese of upwards of 50 per eent. has been manufaetured readily, about three-fifths of the man- ganese in the charge being redueed. Analogous metals have been obtained by many other smelters; thus specimens of ferro-manganese eontaining upwards of 80 per cent. of manganese and prepared in the,blast furnace were exhibited in the Paris exhibition. Aceording to Akermann, to produce ferro-manganesc of 85 per cent. in the blast furnace is a matter of no great difficulty, but the eonsumption of eoke is about four times greater than that required for common pig iron, whilst the daily output is only about one-fourth of that of the latter. No advantage attends the production of manganeisen of upwards of about 80 per cent., but rather the contrary, rieher metal being very brittle. It is noteworthy that, notwithstanding the use of much more fuel in a furnace smelting rich manganeisen, the eseap- Ing gases do not contain more earbon oxide than (and often not as much as) those of an ordinary blast furnaee, the extra oxygeu in the carbon dioxide eseaping eoming from the higher oxides of man- ganese employed as manganese ores. A deseription of the older modes of produeing spiegeleisen in Germany is given in a report by Wiborg to the Swedish iron office (Jern-Kontorets Annaler, 1870 ; also in abstraet in Journal I. and S. Inst., 1872, 188).

When lime fluxes are employed, it is indispensable that they should not eontain phosphorus ; thus the spiegeleisen prepared in New Jersey from franklinite was found to eontain phosphorus to a decidedly

prejudicial extent when oyster shells were employed as flux, but eeased to do so when good limestone was used instead. It is noteworthy, however, that when a highly manganiferous iron 1s smelted a considerably larger preparation of phosphorus finds its way into the cinder and less into the pig than is the casc when

|

the resulting pig contains less mangancesc ; and the same remark is also largely true of sulphur.

According to several chemists and metallurgists as the percentage of manganese in manganeisen increases, so, roughly speaking, that of carbon decreases ; so that whilst spiegeleisen of 7 or 8 per cent. manganese usually contains some 4 or 5 per cent. of carbon and sometimes more, ferro- manganese of 20 per cent. manganese contains much less carbon, and when the manganese attains to 30 per cent. and upwards the carbon becomes diminished to something below 1 per cent., being often as low as 0°4 or even 0°25 per cent. (Henderson). Others, however, have obtained diametrically opposite results; thus Riley and Griiner both find that the carbon percentage increases part passu with that of manganese. The peculiar large mirror-like crystals from which the term “spiegeleisen” (mirror iron) is derived are not exhibited by ferro-manganese containing large amounts of manganese.

By mixing finely divided iron (sponge, filings, turnings of cast or wrought iron or steel, &c.) with finely powdered ores of manganese, tungsten, or titanium, or with quartz in suitable quantity, moistening with dilute acid or ammoniacal solution, and compressing into lumps, hard niasses are formed (after stauding a few hours) which can be heated to a red heat without breaking up. By melting these in a small cupola furnace with a crucible or hearth of alumina, magnesia, or lime, or of hard carbon and a tuyere letting in a hot blast just above the top of the hearth, manganeisens and siliconeiseus containing up to 75 per cent. of manganese or 22 per cent. of silicon, or iron-tungsten or iron-

titanium alloys, or ternary alloys can be readily produced (Chronique de (Industrie, 1873, ii. 235).

The following analyscs illustrate the composition of various kinds of spiegeleisen, ferro-manganese, and allied products:—

Titani- ferous Chrom-| Pig. eisen. | Ilmanite and He- matite.

New Jersey English Spiegel- Spiegel-

f cisen, eisen. Frank-

sinite.

Ferro- Miisen man- Spiegel- | ganese. eisen. | Reschitza, Hungary.

Henry. |Fresenius| Sturm.

32860 | 23°46 | 87:28 4°323 6°21 { 282

Analyst ……..0.. Snelus,

1-000 0:28 0:21

Manganese 10°707 69°64 trace Sulphur…..... neancanc i f 0014 trace trace Phosphorus …...-+00 ; : 0°059 0:06 0°12

0‘066 0-14

CBTOMIUM..cccccccccsc| aes 000 nee Titanium an ee 0:006 Nickel and cobalt… aes pon 0-016 Calcium, magne- sium, aluminium, 0°949 arsenic, &c., and) { ‘” a 1083 .eeeeee i

9°57

99°01 | 100:000 99°79

Siliconeisen.—In order to produce highly silicious iron, aceord- ing to Jordan, the main conditions are that the blast shall be extremely hot,

the furnace not driving rapidly, and that the charge whilst containing much silica shall be highly aluminous and not markedly calcareous. An aecident at the Heardt iron-works, Diisseldorf, necessitated the shutting off of the majority of the blast, three tuyeres instead of six being used, and the pressure being reduced from 15-18 to about 10 centimetres of mercury (7.e., from about 3°1 to 1°9 tb per squarc ineh) ; the blast beeame highly heated (from 500° to 600° C.), whilst the burden was increased, the charge containing 124 cwts. ore at 38 per cent. iron, 6 cwts. limestone, and 10 cwts. coke, so that the slag eontained silica 50, lime 33, alumina 16, manganese oxide 1, the coke being 42 cwts. per ton of iron. Under these conditions a pig was run containing silicon 7°9, phosphorus 0°72, and carbon 2°60 per cent. Analogous results as regards increased percentage of silicon on deereasing lime and increasing alumina relatively to the silicon have been observed in various other instances, Troost and Hautefeuille consider that the presence of alkaline silieates in the furnace promotes the silieonizing of the iron,—the alkali metals formed at a high temperature by the reduc- tion of the alkalies reaeting whilst still naseent on the silica, and thus reducing it ; a mixture of potassium earbonate, eharcoal, iron

filings, and silica melted in a wind furnace affords a cast iron containing 15-16 per cent. of silicon and nearly 3 per cent. carbon ; lime or calcium silicate on the other hand removes silicon from silicious iron when the two are melted together. – It is a matter of usual belief that silicon expels sulphur from pig iron ; at any rate the conditions most favourable to production of highly silicious pig are not so favourable to the presence of sulphur, and henee grey silicious pig is much less sulphurized than white pig made from the same materials. According to Riley the greater the percentage of silicon in siliconeisen the smaller is the amount of carbon present, so that when 15 or 20 per cent. of silicon is present the carbon is reduced to a very small amount. Pi;

Silicon-Manganeisen.—Siliciousspiegelcisen (or mangauesesilicide, as it is sometimes termed) is prepared by the ordinary blast furnace methods of making rich spiegeleisens by increasing the amount of silica

present and using large amounts of fuel. For the purpose of preventing "blowholes" in cast soft steels containing but little carbon, an alloy containing about 8 per cent. of silicon, 14-15 of manganese, and about 1°3 per cent. of carbon, has been extensively used at Terre Noire. The steel thus produced gave the following numbers (Euverte, Bulletin Soe. des Ing. Civ., 1877) :—

Hard Metal for Projectiles. Very soft Metal. Percentage of carbon…... 0°550 to 0°635 0°260 to 0°317 fe silicon …..- 0°405 „ 0°550 0:260 „ 0°330 Bs manganese 0°95 „ 1°05 O41 „ 0°48 Crude Tempered Crude Tempered Metal. Metal. Metal Metal Breaking strain in kilogr. 5 r. : y é 76 per 6q. millim. .....+. 52°2 to58 |77-2 to 116 46°8 to 56:8 | 56°5 to 67:7 EON gatiON) ...0c-ccederenrence 2 40, 7 „ CS | 128 5,148 | TIO Ws

Chromium-stecl, or " Chromeisen,"' as it may conveniently be termed, is closely allied to manganeisen ; the capabilities of this substance for the most part yet remain undeveloped, but the effect of the chromium is analogous in some respects to that of manganese, in others to that of carbon, communicating a fine close texture with hardness and brittleness when present in any quantity. Chrom- eisens containing 10 per cent. and upwards of chromium have been prepared by crucible operations, and of somewhat less rich- ness in the blast furnace from ores containing a notable amount of chrome ironstone ; Sergius Kern obtained a very hard chromeisen containing 74 per cent. of chromium and 25 of iron by heating chrome iroustone and charcoal powder in graphite crucibles. The Tasmanian Iron or a produced from Tasmanian ores a pig containing some 6 or 7 per cent. of chromium and 4 of carbon ; according to Riley a mixture of this pig with ordinary hematite pig (half and half) would not puddle well, being incapable of weld- ing and forming a bloom on account of the thick cinder ; with less chromeisen (one-tenth) the puddling period was prolonged ; a little of the chromium rénsese unoxidized in the iron without materially affecting its qualities ; at first the ordinary grey pig melted whilst the chromium pig remained unfused. By melting chromium pig containing upwards of 0°2 per cent. of sulphur with ferro-manganese, the sulphur becomes almost entirely eliminated, the resulting product only containing 0°035 per cent.; on addin it (in a fused state) to blown

Bessemer metal a product was obtaine not at all resembling good manganiferous Bessemer steel, as it crumbled under the hammer at a red heat. The experience of a Sheffield firm as to the tempering qualities of chromium steel has been very unsatisfactory ; and Boussingault states that he was unable to give to iron any of the useful properties of steel by adding chromium unless carbon were also present ; on the other hand, it has been stated that in America mining tools made of chromium steel have been found to be more durable than any others, the tempering being readily managed. Yet again, R. Brown finds that by adding potassium dichromate to blown Bessemer metal or other varieties of steel a certain amount of chromium is reduced and counteracts the evil effects of phosphorus, steel so made being capable of being bent and twisted cold even though containing as much as 1 per cent. of phosphorus; thus samples of steel so pre-

pared gave the following numcrical results (J bik 1879, 855) :— esults (Journ. I. and S. Inst.,

» chromium…... phosphorus …. (tons per BQUATEMACH): s60.ccses<000sc00 Percentage ultimate exten- t BIDB eonexsis osticiscecwoacsessdoa's

"? Tensile strain

Tungsten-steels have been often brought forward as possessing valu-able properties, but do not appear to have been largely manufactured in England. On the Continent they have attracted more attention ; thus Biermann of Hanover has prepared ferro-tungsten containing from 20 to 50 per cent. of tungsten and a few parts per cent. of manganese with the object of using the composition in the same way as ferro-manganese, ¢.¢., intermixing it with larger amounts of decarbonized iron so as to obtain a tungsteniferous steel of known

IRON

composition. Griiner states that the hardness of stcel is increased by addition of tungsten almost indefinitely, but that when more than 2 or 3 per cent. is present the metal becomes brittle from extreme hardness ;

for lathe tools steel up to 8 per cent. tungsten may be used provided they be submitted only to a mild oil temper- ing, for with water they would fly to pieces; thus a hook tool used in a stecl tire shop of the West of France Railway Company contained

PET PSO siavavCAT DOMME ss seaeas «sscveceauscioesrsssebsucussasseseessivchnnvesiecwcins ar x SULCON ..0sccecsessscevevesecceusesses cuvess sevssesenysssessesisens 0°22

In the manufacture of such steels the tungsten is introduced either as a triple manganese alloy (prepared on a Siemens hearth or in the blast furnace like ferro-manganese) or as crude fritted metallic tungsten obtained by reducing wolfram with a mixture of coal and tar, &c.

Levallois has patented in France the use of ternary nickel- tungsten-iron alloys containing

Tungsten

WICK Ol cvsscassicecboow seauene

They are said to be very hard, but can be worked like ordinary cast steel ; they are prepared by putting the tungsten and nickel into a small soft iron sae together with a little flux (composed of 9 parts boric anhydride and 8 each of calcined quartz and washed calcium carbonate), and placing the tube in the midst of the rest . of the iron in a crucible, the surface being covered with some of the flux. When melted up, the whole is poured into moulds in the usual way.

Manganese Bronze.—By melting ferro-manganese and copper together, or preferably mixing the two metals separately fused, all traces of oxide disseminated through the copper are removed by the agency of the readily oxidizable manganese, and a close-grained tough alloy results, capable of very many useful applications. The

ercentage of iron in the alloys usually prepared, however, being but small, the description of these products more properly belongs to the metallurgy of copper and manganese.

IX. Puysicat Quatities oF [Ron AND STEEL IN THEIR PRACTICAL RELATIONSHIPS,

42. Hardening, Tempering, and Annealing of Steel.— It has been already stated (§ 3) that the characteristic property of steel as distinguished from malleable iron is that when heated red hot and suddenly cooled (by plung- ing into cold water, oil, mercury, &c.) it becomes hardened to a greater or lesser extent, and rendered more or less brittle and also elastic; when the steel thus hardened is heated red hot and cooled slowly, on the other hand, it loses this acquired hardness and becomes soft and malleable again; this inverse process is strictly termed " softening " or "annealing." The generic phrase '"' tempering" is usually applied to mean a combination of the hardening and anneal- ing processes practically applied to all steel goods in order to give such a degree of hardness as will best fit them for resisting wear and tear, conjoined with the minimum possible of brittleness,—this being effected by first harden- ing them by heating to a red heat and suddenly cooling, and then heating up again to a somewhat lower tempera- ture and allowing to cool slowly. According to the tem- perature to which the hardened steel has been heated before annealing, so is the diminution in the hardness effected by the process; and the particular resultant combination of hardness with toughness and elasticity is spoken of as the "temper" of the steel. Occasionally, however, this latter phrase is applied in somewhat different senses ; thus steels of different carbon percentages are sometimes said to differ in temper irrespective of whether they have actually been hardened and annealed or not; the term " tempering capacity" or "hardening capacity" would better express the idea. Sometimes again, especially amongst " practical " men and workmen, the phrase "to temper a tool" is under- stood as signifying simply to harden it; whilst on the other

hand the same term is often used to imply the softening or annealing only of the tool.

In the act of hardening, steel becomes specifically lighter to an extent varying with the temperature attained before cooling, the composition

of the steel, and its form and dimensions, and accord- ing as it has been rolled or otherwise worked before treatment ; thus Elsner found a specimen of cast steel had the specific gravity 7-9988 before hardening, and 7°6578 after (both at 11° C.), indicat- ing an expansion in volume of about 3°5 per cent. ; Similarly Rinman found expansions of 2°6 to 3°5 per cent. for blister steel ; and Hausmann found for a very hard steel and for a soft welding steel expansions of 1°7 and 0°8 per cent. respectively. The expan- sion, however, is not uniform in all directions ; thus Caron found that a hammered steel bar 20 centimetres long and 1 centimetre square in section altered after repeated hardenings to the following extent in percentages of the original dimensions :—

Number of Hardenings……..... Decrease in length.. Increase in Width …...+.-+ereeee+e| Decrease in specific gravity …..

whilst with rolled steel there was an increase in length of 2°25 per cent. and no change in the other dimensions.

On thoroughly annealing hardened stecl it recovers the original dimensions possessed before hardening ; evidently therefore when a large steel tool is hardened, since the inner portion cannot possibly become cooled at the same rate as the outer film, a kind of strain must be developed amongst the particles; for, whilst the rapid chilling of the outer portion causes that part to occupy a larger volume than it otherwise would, this is not effected to so large a relative extent with the inner portions. The opposite result is necessarily produced during annealing. Accordingly, in the (eae of tempering steel goods, cracking and splitting or “ buc sling” and otherwise getting out of shape are inconvenient results that are apt to happen, especially when all parts of the surface are not equally and simultaneously heated or chilled, a result difficult to bring about with articles of certain shapes; the hardening process may in such cases be more safely effected by heating the article up gradually in a fluid bath such as melted lead (or in some cases oil) and then chilling in a cool fluid bath, preferably of oil ; whilst the annealing may be performed by allowing the fluid in which the article is slowly heated up to cool down again spontaneonsly when the requisite temperature is attained. For special articles, ¢g., saws, a

particular manipulation is requisite to avoid buckling ; in some cases the annealing of a flat plate, ¢.g., a circular saw, is effected between two solid flat masses of iron, which keep the plates from getting out of shape whilst cooling. In some instances when the point only of an article is required to be tempered, ¢.g., eertain kinds of chisels, the whole mass is heated red hot and the point dipped into water or oil to harden it ; on taking out, the heat from the body of the hot article is rapidly conducted to the point ; as soon as its temperature is sufficiently raised the body is somewhat cooled by a short immersion so as to reduce the tempcra- ture of the whole approximately to uniformity, and then the article is allowed to cool altogether slowly ; so that the hardening and annealing are effected by one heating ouly. For articles the temper of which requires to be somewhat exactly determined, the tempera- ture attained is judged of by the tint of the iridescent film of oxide which forms on the surface (previously brightened) during the heating; the higher the temperature the thicker the film, the colours and temperatures being approximately as follows : —

Approxi- mate Tem- perature.

Class of Tools for which the Temper is best suited.

Colour.

Very pale yellow ……..00s0 SETA WACOLOUL covc,.cc.sccceeseses se COLAO CMOWs.0.50-0000sor0-se00s

Lancets. Surgical instruments and razors. Penknives and common razors. Scissors, cold chisels, shears, &e. Axes, planes, &c.

Table knives, large shears. Springs, watcli springs, swords. Fine saws and augers.

Hand saws and large saws.

MAIUMsRscrsesngcssnescses cae ssssos’ce Bright blue Full blue

Dark blue

For instance, if a saw is to be tempered at a full blue it is heated over a clear fire or a mass of red hot iron or ina sand bath until the tint appears on the brightened surface, when it is allowed to cool. In many cases the tempering of tools is effected with sufficient accuracy without brightening them, by coating them with tallow, oil, or some similar composition, and then heating over a lamp or @ mass of hot metal until the tallow, &c., begins to decompose ; with sufficient experience as to the size of the article, the mode of heating, and the character of the decomposition set up, much the same results are arrived at as when the colour is watched on the brightened surface. In sqme instances the requisite temper is given by one operation only, the point of the article to be hardened (a

drill, say) being coated with tallow and heated in a flame until the tallow decomposes rapidly, and then plunged into a mass of tallow to chill it; the point is thus rendered harder than the body of the drill. By heating the point of a small tool nearly white hot and plunging it into a stick of sealing wax for a second, and then into another part of the wax, and so on till cold, steel may be made so hard as to be readily capable of boring into similar steel hardened in the ordinary way.

Instead of determining the temperature of the object to be annealed by the tint developed on it, various fusible alloys may be used, a series of such being ai in the annealing bath, so that by observing whicli are fluid the temperature is known approxi- mately. Parkes gives the following compositions of lead-tin alloys for this purpose :—

Parts of Lead to Temperature at four parts of Tin. | which Alloy melts.

Parts of Lead to four parts of Tin.

Temperature at which Alloy melts.

215° ©, 19 221° 30 228° 48 232° 100 243° Boiling linseed oi}.

14 254

Melting lead.

Tho first five of these alloys consequently correspond to the various yellow shades ; the next three to brown, brown and purple spots, and purple ; and the last four to the blue shades.

43. Strength and Tenacity of Iron and Steel.—Indepen- dently of the additional strength communicated to iron by the presence of small quantities of carbon, producing steels or so-called steels of various kinds, a considerable increase in this property is brought about by the removal of portions of cindery matter by fusion. Wrought iron that has simply been welded, reheated, and rolled a given number of times is, cxteris paribus, less tenacious than iron from which complete fusion has removed the films of silicate, &c., enveloping the component layers and fibres of the welded material, and preventing their complete union together. Thus the best qualities of weld iron, containing usually about 0:2 to 0°3 per cent. of carbon, possess a tensile strain of from 20 to 30 tons per square inch, whilst mild " steels" and ingot irons are usually considerably higher in this respect, viz., from 30 to 40 tons per square inch; harder steels of higher carbon percentage are proportionately stronger. The following numbers may be quoted, repre- senting tensile strains in tons per square inch.

Weld Irons, or Wrought Irons made without Fusion.

Kirkaldy.

Govan puddled bar
…...cccccceccccsssecsecceccecesssecessesersesesseetessseenesersceeseates esenes 20°9 yy RAMMMELEd DAL
..0….eereeserseeceessesscerseceecereceneresseerseserersesseesessssserie s 28°7

» rolled 3)
_tececneesennscceeneesccecncesecsseescerscosecsoecesenaassenaases 25°4 to 26°6 Blochairn bar, cOld rolled

…....scessssessesscercenenrecsesseseaseseesesessessesessessesssees BOO ae ny ANMCAIEM .....0.0e.seeeceeereneveerees coors Dae stasreeete eecrenasstnsesis 25°2 to 27°8

oc poiler plate, cold rolled, lengthways …...ssccccccecserereseeesesesessceseseens 89°7

= HH 55 CKOSSWAYS ..c..cceccccccscccesccssacoesosee-sssseses 86°0

a aS annealed, lengthways .. 22:7

+ a +s crossways …. aries, gh Lowmoor bars (0°3 per. cent. Of CATDON).....esereeerrrerescrseceresenseeees Metentcstes 28‘9

Styffe.

LOW Or rolled tyT@ DAT .....+-.ceeeececcecnensseeererecsaessecerersssseeaesoeaeertseceseneesee 27°3 Lesjofirs rolled bar (made in Lancashire hearth) .....esssesscsesrceerseerarsenes . 22°5 Fairbairn.

Average of five classes of plates | rte fore nT 380

Ingot Irons, or Mild Steels, made by Fusion Processes. Greiner: Seraing extra mild steels,

33 ae mediuni soft, 5) ” H 5 hard and extra hard, ” 4 Styffe: Hégbd Bessemer iron, i> re ao 3 ; hammered steel, „ ys +4 Krupp’s east steel, e nr OiGanercersessa 109: Kirkaldy: Bessemer soft steels, 65 Hy 0°83 to 04…....83 to 85

Steel wire of as high a breaking strain as 206,170 ib, or 92 tons, per square inch section, has been drawn by Johnson and Nephew (Manchester), whilst wire of tensile strength of 70 to 80 tons per square inch is readily procurable. According to Collingwood, galvanizing increases the strength of freshly drawn wire by about 15 per cent., whilst ungalvanized wire has been found to gain nearly 5 per cent. by

merely being allowed to remain at rest for a week or so; the increase of strength in each case appears

to be simply due to internal adjustment of the strains produced during drawing.

Tt does not necessarily follow that the resistance to per- cussive force exhibited by a given sample of metal will be in the ratio of its tensile strength. Thus phosphorus when present together with only minute quantities of carbon (forming the so-called “ phosphoric steels”) does not very materially decrease the tensile strength, such steels con- taining 0°3 per cent. of phosphorus being often but little inferior to soft non-phosphorized steels in this respect ; but when tested by a “ falling weight ” (a mass of known weight falling once or oftener from a known height upon the centre of the bar or rail firmly gripped in supports a known distance apart) the phosphorized metals generally show themselves considerably inferior to the non-phosphorized ones. The same remark applies to silicon. According to

BEFORE RUPTURE

AFTER RUPTURE

| i

Yyy

Fig. 65. Dudley the effect of phosphorus, silicon, and carbon in hardening iron and making it less capable of resisting percussion are nearly in the proportions of 3, 2, and 1 relatively to one another. The presence of manganese diminishes this deleterious effect of non-metals ; whilst, if more than minute quantities of carbon be present, the tensile strength as well as the resistance to percussion is greatly diminished by the additional presence of phosphorus or silicon in proportions beyond

certain small limiting amounts. Accordingly it is the usual practice to test rails, bars, &c., not only by the determination of the breaking strain for tensile force (measured by pulling asunder,

preferably by hydraulic power, a bar turned to known

definite dimensions, and made into the shape of fig. 65), but also by a falling weight,—a "monkey" (somewhat like a pile driver) being raised to a known height and let drop upon the rail.

The particular tests applied in different instances vary much ; for instance, some little while ago the official falling weight test for Bessemer rails at Gratz (Austrian South Railway Company's Works) was to permit a weight of 1000 kilos (about a ton) to fall from a height of 15 feet upon the centre of the rail supported by two rests 3 feet apart, any amount of bending being allowed, but not fracture, whilst a test for elasticity or resistance to permanent defiexion was applied by placing a weight of 17,500 kilos on the middle of the rail similarly supported. The North-Eastern Railway (England) similarly at one time tested rails by allowing a weight of 1800 tb to fall from 4 feet height, the number of blows requisite to produce rupture and the permanent bending produced by each being noted. In other instances the test applied has becn a ton weight falling a greater height, such as 20 feet or even 30 feet, the rail being required to stand one such blow only, or a succession, the particular details of the test to be applied being usually specified in each particular case; thus the Midland Railway Company has tested steel rails by allowing a weight of 1 ton to fall three times from a height of 12 fect, the supports being 4 feet asunder.

In just the same way as regards the determination of tensile strength, the dimensions of the piece to be tested (6 inches, 8 inches, 10 inches long, &c.) are usually specified, and the strain whieh the metal will just stand without becoming permanently elongated (limit of elasticity) determined, as well as the total strain requisite to produce rupture, together with the " ductility" or amount of permanent extension of the test piece and the diminution in section ofthe bar at the point of rupture. Thus for instance the following numerical data were obtained by Kirkaldy with a particular specimen

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of West Cumberland Bessemer stcel plate, three pieces being tested, each 10 inches long, and respectively 3, 4, and 7 ineh in thickness.

Permanent Extension in

Ultimate |Percentage Percentage of Original Length.

Thick- | Limit of | Breaking |diminution

ness in| Elasticity | Strain | of Section With With ag

Inches.} in Tons. jper Square|at Place of; 50,000 ib | 60,000 ib Rupturing

Inch, Fracture. |per Squarc|per Square] Gtrain, Inch. Inch.

0°25 20°7 29°‘8 54-4 2°60 8°02 23°2 0°49 16°0 Poa | 50°7 5°52 13°9 27°3 0°75 15°0 276 49°6 6°09 15°0 30°2

These numbers illustrate, amongst other things, the effect upon the final values produced by variations in the diameter of the test pieees ; the shorter and thicker the piece the greater in amount is the permanent extension. In calculating the rupturing strain per square inch, the dimensions of the metal as originally employed before permanent alteration was brought about are employed ; by taking the diminished area at the point of fracture as the section, a much higher value is obtained as the tensile strength per unit area of the extended metal. Tempering steel greatly increases its break- ing strain and limit of elasticity, but decreases the permanent extension; thus the following values represent certain results obtained with Creuzot steels of the A class, in tons per square inch (see Engineering, 1875, p. 119).

a

—— Not Tempered. Tempered. Pe Limit of | Breaking |Percentage| Limit of | Breaking |Percentage Elasticity. | Strain. | Extension.) Elasticity.| Strain. | Extension. 1 | 24-72 | 45°64 | 74:16 | 0-2 3 23°07

41°71 66°95 02 5 21°04 35°63 56°17 Med 7 18°25 BOG 43°49 14°6 9 14°26 21°30 35°63 21°0

In making a contract for the supply of steel of a particular quality, the details of the tests of strength to be applied should consequently be duly set forth ; for instance, a short time ago the French Government required certain steel navy tubcs, of which the limit of elasticity and breaking strain tested in a particular way were respectively to be 21 and 38 tons per square inch. Similarly in the construction of the Mississippi great bridge the cast steels used were contracted to be of the following qualities :—"To be of crucible cast steel ; the staves of the tubes to stand a compressive strain of 60,000 and a tensile strain of 40,000 Ib per square inch section without permanent set, and to stand a tensile strain of 100,000 fb per square inch without fracture. Modulus of elasticity to be between 26 and 30 million 1b, preferably nearer the lower limit, and as constant as possible ; bars of the same modulus to be selected for the tubes, so that each side shall have same power of resistance ; each bar to be tested and modulus stamped onit. Steel pins, rods, bolts, eyewashers, rivets, &c., and the 4 inch steel plates for envelop- ing the staves to stand a tensile strain of 40,000 Ib per square inch without permanent set, and an ultimate tensile strain of 100,000 ib without fracture." ~ ;

Practical tests of the capability of metal to stand bending double or through some given angle, or twisting round and round in the cold without fracture are often applied, as are also tests of the capability of being bent hot, forged, welded, &c. A test as to the power of resisting repeated bending strains backward and forward through a given angle is sometimes applied ; a particular mechani- cal arrangement for effecting this has been described by Olrick.

James Price has constructed a machine for testing rails as to durability under rolling wear and tear, consisting of a pair of metal rollers 5 feet in diameter and 16 inehes wide, weighing 45 cwts. each, supporting a frame weighing 6} tons, connected with a centre boss' and vertical axle, so that the rollers are driven round in a circle, one bearing with 5 the other with 6 tons pressure ; the rails to be tested are bent into a circle

or preferably a polygon, to equalize the wear of the rollers, which are driven over them at a speed of 18 or 14 miles per hour until the rails are broken or wear out.

It by no means follows that the rail which possesses the greatest tensile strength will resist wear and tear and rolling friction best, although this might be anticipated if, other things being equal, increased tensile strength corresponds to greater hardness ; on the other hand, experience does not always indicate that the most carbonized rails last the longest, although the superiority of ingot metal (Bessemer steel, &c.) over weld iron (not fused) rails is well demonstrated ; it is probable that the interposed film of einder between the metallic fibres in the latter case greatly facilitates the destruction and wearing away of the upper surface, just as the accumulation of dust and sand on the rail between the passage

of consecutive trains, especially conjoined with moisture, conduces to mechanical abrasion. Price Williams has calculated from the results of various British lines that the average tonnage lives of wrought iron and Lessemer rails (é.¢., the traffic in tons requisite to wear away 8 inch of the head of the rail) are respectively close to 174 and 161 million tons, the latter being thus more than nine times as lasting as the former.

Numerous observations have been made on the effect on the strength of iron and steel of punching and drilling holes, of notch- ing and otherwise removing part of the surface, and of shearing, with the general result of.indicating that the disturbance produced in the relative positions of the constituent particles by forcibly punching and shearing in the cold materially decreases the strength of a bar or plate (apart from the actual removal of substance) ; but that drilling does not effect the strength in the same way (see various papers in the Journal I. and S. Inst., Iron, and Engineer- ing during the last few years), Annealing restores the strength to a considerable extent ; if the plates be punched whilst red hot the annealing takes place spontaneously.

The strengthening effect upon soft steels and ingot irons of hard- ening by heating and plunging into oil is often very marked, the tendency to crystallinity observable in large masses of cast metal being thus largely removed. A valuable paper,on the causes and

effects of hardening iron and steel, by Professor Akermann, is to be

found in the Journal I. and S. Inst., 1879, 504; whilst the Research Committee of the Institution of Mechanical Engineers has recently issued reports containing much information on this subject. :

Ufect of Temperature on the Strength of Iron and Steel. —Many observations on this point have been made by dif- ferent experimenters, with the general result of indicating that at 0° C. and below the tensile strain and resistance to percussion of iron and steel bars, rods, &c., are substan- tially the same as at the average ordinary temperatures of 15° to 20°, but that what difference there is is usually in the direction of diminution in strength; the numerical values obtainable are considerably variable with the com- position of the metal, &c.; thus Webster finds that a severe cold of — 15° C. does not affect the tensile strain of wrought iron and steel, although it slightly increases the ductility by about 1 per cent. with iron and 3 per cent. with steel; the power of resisting transverse strain is, however, some 3 per cent. lower, whilst the flexibility and the resistance to rupture by impact are reduced by the following amounts :—

Reduction in Power Reduction in

of Resisting Impact. Flexibility. Per cent. Per cent. 7S 3°0 18 COE: CVC) 3°5 17 Malleable cast iron…..... ee 4°5 15 (COGt TCT fit eer 21°‘0 aad

A committee of engineers appointed by the Russian Government for the purpose of examining carefully into this question has recently found that, when the amount of phosphorus, silicon, and carbon in Bessemer and Siemens- Martin steel rails exceeds jointly about 0°54 (varying from 0°44 to 0°67) per cent., the rails are decidedly more brittle at temperatures near to — 20° C. than at the ordinary tem- perature (+

10° to 20°); whilst the effect of low tempera- ture in producing brittleness is not marked when the phosphorus, silicon, and carbon jointly amount to only about 0°41 (0°37 to 0°55) per cent. Expressing the amounts of non-metals on the scale proposed by Dudley (3 parts of carbon, 2 of silicon, and 1 of phosphorus being considered as equivalent to one another, so that a rail containing carbon = 0°30, silicon = 0:20, phosphorus = 0°05, would be equivalent to one containing phosphorus = 0°25), these results may be expressed as follows: when the per- centages of carbon, silicon, and phosphorus are jointly equivalent to au average of 0°19 per cent. of phosphorus, the effect of low temperatures is not marked; but when they are equivalent to an average of 0°31 per cent. of phosphorus, the rails are more brittle at temperatures near ~ 20° than at ordinary average temperatures near to + 15°.

Breakages of axles, crankshafts, pumprods, &c., exposed to strains and vibration appear to be more common in frosty weather than at other scasons of the year; it is considered by many that exposure to vibration, &c., and low temperature simultancously tend to diminish tenacity and set up a brittle structure in a way not observed when only one of the two causes alone acts; direct evidence on this point is, however, wanting. It is noticeable that large masses of cast metal (cast iron, true steel, or ingot metal) if cooled too quickly are apt to have the internal portions in a high state of ten- sion or strain; for the outer portion, when solidified, prevents the contraction taking place that would otherwise ensue during the solidification and cooling of the inner portion ; henee the amount of extra strain requisite to produce rupture is much diminished, so that the want of elasticity of bearings, foundations, &c., connected with the almost rigid ground during hard frosts in certain cases causes the strain applied during use to exceed the reduced amount which the metal can then bear without fracture. Chilled castings, case hardened iron, and tempered stecl, moreover, are affected by low temperatures in another way; the outer harder portions do not expand at exactly the same rate as the inner softer parts ; and consequently alteration of temperature produces such variations in the internal strain as in some cases to lead to fracture either spon- taneously or by the superaddition of the strain due to ordinary use. On the whole it appears that no clear evidence is as yet extant proving that

vibration either alone or concurrently with low tem- perature docs actually cause a brittle crystalline structure to be developed ; whilst on the other hand thousands of examples are extant of axles, engine beams, connecting rods, tires, girders, &c., coutinually subjected to vibration, percussive action, and varying strains of all kinds for years, in which no such development of brittleness has taken place; in those cases in which fracture has been thus brought about, the probability is that defective work- mauship and the development of internal strain are the true causes of the rupture, and not a gradual alteration in texture.

At 800° to 850° soft irons and steels become much deteriorated in power to resist percussive action and bending strains, whilst at lower temperatures and at a red heat this peculiar comparative rottenness is notmarked. Phosphorized iron appears to be affected to a greater extent than purer varieties, but mild Bessemer and Siemens-Martin steels are by no means exempt from the detcriorat- ing influence. A railway wheel that has become heated through the grease-box taking fire by friction rapidly fired guns, and tools that become much heated in use, &c., may readily attain to a tem- perature sufficiently high to be much less capable of resisting strain than when cool. A large number of experiments on this and allied points are described by Adamson, Journal I. and S. Inst., 1878, 383, and 1879, 30.

Closely akin to the comparative brittleness developed in iron and steel on the oue hand by interspersed films of cinder, and by the presence of phosphorus, &c., and on the other by temperature, 1s tle phenomenon which gives rise to the production by over-heating of what is termed “ burnt: iron”; according to some the want of strength of burnt iron and stecl is due to the formation of oxide disseminated through the mass as cinder is through weld iron, this oxide coating the constituent particles and preventing their adhesion to one another ; others, however, wholly dissent from this view, Caron (Comptes Rendus, March 4, 1872) has shown that by simply strongly igniting good qualities of malleable iron citherin a smith’s forge, or in porcelain tubes in an atmosphere of hydrogen or of nitrogen, the “ burnt ” crystalline structure canbe developed nnder circuinstances where no oxidation can occur.

Akermann also has been led to the same conclusion, defining “ burnt” iron as “‘ iron which, through too long continued or strong heating, has had the opportunity of assuming a crystalline texture, with the brittleness which accompanies it on account of the diminished cohesion of the crystals.”

44, Foundry Operations.—Occasionally for rough cast- ings, such as tuyere nozzles, &c., the pig iron is used as it comes from the blast furnace, a small side channel leading off a portion of the molten pig flowing to the sand bed containing the pig moulds (§ 16) to some other convenient part of the bed in which the moulds have been prepared ; but much more frequently the iron employed for castings is remelted by the founder in a cupola furnace, various kinds of pig being intermixed together according to circum- stances. A reverberatory furnace is preferable to a cupola, the metal being less altered by oxidation; but a much greater consumption of fuel is thus occasioned. A very coarse grained iron, No. 1, will, on remelting and running into small moulds, give a much finer grain than the original pig; whilst, on the other hand, a large massive casting which takes a long time to solidify would, if of the same

metal, develop a large grain like that of the original pig.

To obtain just the right grain under any given circum- stances requires an amount of special knowledge and experience of a peculiar kind only to be gained in the foundry itself, the mixture of brands that answer well for a certain kind of casting not being necessarily at all suit- able for one of different size; different mixtures, moreover, are apt to differ more or less in the amount of contraction taking place in solidifying and cooling, so that a somewhat different allowance for shrinkage must be made in different cases; asa rule the moulds are made about 1 per cent. larger in each direction than the casting is intended to measure (one-eighth inch to the foot).?

For complex forms, a number of different pieees are required to make up the whole mould, each piece being a metal box or “‘ flask eontaining

sand mixed with eharcoal powder, loam, or similar naterials somewhat varying in their nature aecording to the char- acter of the easting, moistened so as just to eohere together and enable the outline of the easting to be defined by the surface of the mixture. The ‘ pattern” or model being placed in a suitable posi- tion, the flasks are separately moulded to the variously shaped parts, and then set up (being bolted or otherwise fixed together) so as to enelose a spaee shaped precisely to the pattern ; the molten metal being then allowed to run into this spaee, by tapping the cupola and letting the fluid iron pass oe a runner or gutter on the sand bed floor of the casting house, gradually fills it up, the seorie floating on the top ; the air which previously filled the mould passes away through orifiees left for the purpose, along with steam and gascs formed by the action of the hot metal on the materials of the mould, ‘To ensure the casting being free from scorie, and to give sufficient hydrostatic pressure to enable the impression to be sharp, the liquid metal is allowed to rise to some little height above the top of the easting by making the highest part of the cavity of the mould to be some inehes or more below thie surface of the floor, so that the metal fills up the tubular hollow above the mould thus formed, making a projection (“ gate”’ or “git”) above the top of the casting ; this is ultimately detached by a hammer or chisel, as are also the ridges formed where the different flasks meet, and any similar protuberanees at places where a little of the sand has fallen away from the surfaee of the mould, thus increasing the dimensions of the cavity at sueh places.

More simple forms are cast in moulds prepared with a smaller number of flasks, two often sufficing, or for some purposes one only; inachinery is employed for moulding such objeets as gas pipes, railway chairs, &e., required in large quantities. For certain pur- poses metal moulds are used, or eombinations of metal and sand moulds; owing to the greater eondueting power, the iron in contaet with the metallie parts of the mould is rapidly solidified ; a pecu- liar hardness is thus communieated to the casting, whicli is then termed a “ chilled” casting. For the best qualities of chills certain particular elasses of pig are requisite; thus for the east iron car wheels used largely in Ameriea the brands of pig preferred are cer- tain kinds of eold blast charcoal brown hematite or specular iron ; iron smelted from the pure magnetites of Lake

Champlain does not chill in the required way so as to produce an outer film of white iron constituting the ‘ tread” of the wheel, passing into a mottled iron with a soft grey inner centre, thus contbining the maximum of strength with a hard wearing face. The peculiarity of some of the Ameriean east iron in this respect enables maeltinery of certain kinds to be eoustrueted in part of that kind of metal with a strength diffieult if not impraeticable to obtain with the same weight of metal from most British brands. In order to produce the chilling effeet a east iron ring is imbedded in the sand mould so as to em- braee the eircumferenee of the wheel to be east ; the metal is con- sequently rapidly solidified in contact with the iron ring, the *ehill,” or portion solidified as white iron, penetrating inwards some 0°75 ineh. It is found that confining the chill to the middle portion of the outer cireumferenee only, and not eommunicating it to the entire flange and the opposite outer portion of the external surface, gives greater strength without diminishing the resistance to wear; this is effeeted by narrowing the east iron chilling ring.

Casting under Pressure-—During the solidification of iron, and especially of steel, after running into moulds, bubbles of gas are often extruded, causing the substances to become vesicular and honeycombed, especially at the upper portion ; the gas thus evolved from Bessemer metal was found by Bessemer and Henry to be almost entirely

1 Wrightson has reeently made some interesting observations on the variation in the volume oeenpied by a given mass of molten east iron during solidification and subsequeut eooling; see Journal I. and S. Inst., 1879, 418, and 1880.

carbon oxide ;? on casting in a mould from which the air was rapidly pumped out, ebullition was set up, owing tu the rapid evolution of gas, just as ordinary spring water apparently boils under the exhausted receiver of an air pump. Three methods of overcoming this practical diffi- culty of vesicular structure being set up have been used. The first, or “dead melting,” applied to cast crucible steel, is simply to allow the

crucibles to stand for some time in the furnace with the molten metal in them before casting ; in this way the iron oxide disseminated through the mass is acted upon by the carbon, and this source of gases eliminated ; according to Bessemer, silicon is also introduced (by the action of the metal on the pot-material), the presence of which retards or stops altogether the gas evolution (see § 33). The second method is the application of this principle in a more direct way by adding silicious pig, preferably as silicious spiegeleisen (silico-manganeisen), to the fused metal; this process has been long used on the Continent in one form or another by steel-makers who have attained a high reputation for their cast steel pro- ducts, ¢g., in Krupp's works, at Terre Noire, &c. The third method is one which prevents the formation of bubbles of gas by mechanical means, the fluid metal being subjected to powerful compression during its solidification. In 1856 a patent for this was taken out by Bessemer, the mould being closed by a strong cover and hydraulic power employed to force inwards a stout wrought iron plunger ; Whitworth's system of casting 'compressed steel" is a more perfect development of this notion.

Other methods of arriving at the same end have been also suggested, the pressure being derived either from the admission of high pressure steam on the top of the ingot mould, or by the gene- ration of gases by the heat of the metal introduced on some chemi- cal composition in the upper part of the closed mould; thus by employinga mixture of nitre and coal dust, the mould being elosed by a screw plug and strongly bound round to strengthen it, a highe pressure can be exerted, regulated by varying the amount of mix- ture used in the first instance. A deseription of the steam proeess as employed at the Edgar Thomson Works, Pittsburg, is given by H. R. Jones in the Journal J. and 8, Inst., 1879, 477 ; it appears to be simple and inexpensive as compared with the Whitworth hydraulie arrangements, but generates far less pressure, Whitworth steel being compressed by forees up to 6 to 9 tons per square ineh ; increasing the pressure up to 20 tons produces little or no further effect, but, ceteris paribus, the ductility of the compressed metal increases with the pressure used wheu below some 6 tons per square inch. According to Kuverte, no praetieally valuable results were obtained at Terre Noire nor at St Etienne by the application of intense

pressure to the open-hearth steels there made,—indicating probably that the removal of gas bubbles effected by Whitworth's operation in crucible steel is accomplished chemieally in soft so-called steels of low carbonization made with silico-manganeisen.

The modus operandi of pressure in consolidating steel during casting appears from Bessemer's observations as to the more copious evolution of gas on diminishing pressure to be simply the appli- cation of the well-known law of inereased solubility of gas in any given medium with increased pressure; under high pressure the fluid metal retains the gas dissolved just as soda water does the carbon dioxide whilst it remains in bottle; but, just as effervescence is pro- duced in this latter case as soon as the pressure is relieved, so in the case of steel would gas bubbles appear under the ordinary pressure which would not have been developed under high pressure. It is, however, somewhat difficult to understand why steel should retain hydrogen and carbon oxide dissolved when at a high tem- perature and perfeetly fluid, and should extrude it on cooling some- what and when just on the point of solidifying ; but the pheno- menon is not an isolated one, fused silver behaving in precisely the same way towards oxygen, and thus giving rise to the well-known '* spitting " of silver during solidifieation. The funetion of silicon in preventing the extrusion of gas may be ascribed either to its eom- municating the physieal peeuliarity to the steel of dissolving as mueh

2 Miiller has reeently found hydrogen to be the ehief constituent of the gases eontained in the bubbles found in ordinary solid east steels, along with nitrogen, and mueh smaller quantities of earbon oxide than those found by Henry.

3 Recent experiments made in England with Bessemer ingots have indieated that no appreeiable diminution in honeyeombing is brought about by the use of steam at only 40 or 50 ib pressure per square inch.

gas at the solidifying temperature as at the higher temperature, and eonsequently of preventing the separation of gas during solidifi- eation

; or else to its chemical reaction upon the dissolved earbon oxide forming partieles of siliea disseminated through the mass and setting free earbon, so that the metal containing less dissolved earbon oxide ean thus retain more hydrogen ; experimental evi- dence is wanting finally to decide the question, but the latter view seems to be highly probable.

45. Protection of Iron from Oxidation by Surface Appli- ances.—One of the greatest inconveniences in connexion with the use of iron and steel for constructive and general purposes is the tendency of the metal to oxidize and rust in the air under ordinary atmospheric conditions, 7.¢., in presence of free oxygen together with moisture and small quantities of carbon dioxide (and in the case of the air of seaside places of saline spray, and in that of coal-consuming districts of sulphur acids, &c.). Highly polished iron can be kept in perfectly dry air without rusting at all; and in contact with a solution of an alkali, such as caustic soda or ordinary carbonate of soda, the tendency to oxidize is far less than in simple spring water, sea-water, or moist air ; in certain cases this property may be utilized for the pre- servation of bright steel objects kept in stock, a coating of ordinary whitewash (chalk and water, or preferably lime and water) being brushed over them and allowed to dry on; a similar coating of lime or whiting and oil is even more efficacious, especially if the oil be a non-drying one, ae, one that does not spontaneously take up oxygen and become more or less acidified. Protective coatings of paints of various kinds—tar, melted pitch, &c.—are generally applied to the exterior of large iron constructions, such as bridges, pillars, girders, rainwater spouts and conduits, railings, and the like; the function of these is more mechanical than chemical, the coating simply preventing the metal from coming in contact with the oxidizing medium ; but in some of the paints used the basic character of certain of the materials probably also diminishes the tendency to oxidation. In certain cases the corrosion of iron can be diminished by placing a more active metal in contact with it (e.g., zinc), so that by a galvanic action the oxidation is largely limited to the zinc; by causing the surface of the iron to be closely adherent to the protect- ing zinc coating (by dipping the brightened metal in fused zine), a sort of permanent metallic paint coating is obtained, which acts as a

preservative in the threefold manner of mechanically preventing contact with air, of galvanically confining the oxidation to the zinc, and of chemically causing the iron to be coated with a basic film of zinc oxide (when the zinc has become slightly oxidized).

Many other metallie protective coatings can be similarly applied. Of these the most frequently employed is tin, forming ordinary *‘tinplate,” the manufacture of which dates back a cousiderable length of time. Other coatings can also be applied by means of electricity, at least to small articles ; electro-coppered iron goods

and nickelized steel articles thus prepared are now frequently manu-faetured.

It has long been noticed that iron bars, plates, &c., from the forge or rolling mill are coated externally with a film of magnetic oxide formed by the action of the air on the heated metal; during rolling this film becomes somewhat thick and peels off, forming “mill-seale” ; when the film is but thin and is closely adherent, it has long been known that the metal does not rust so readily at the parts thus covered up with a protective coating as at points where this coating is removed. Similarly it has been long known that certain natural forms of magnetic oxide of iron, and in parti- eular the “iron sands” of New Zealand, Canada, and elsewhere possess the power of resisting the rusting action of sea-water and atmospherie air conjoined. The idea o: purposely coating iron articles with a film of magnetic oxide prepared in such a way as to Tesist to the greatest possible extent natural peroxidation, and so elosely adherent to the underlying metal as not to be readily de- taehed by ordinary usage, has aceordingly been successfully carried out in practiee by more than one person. Barff’s process for pro- dueing sueh a coating is based on the reaction oeceurring between iron and steam at moderately elevated temperatures, viz.,

3Fe + 4H,O=Fe,0,+4H,, hydrogen and magnetic oxide being produced ; the articles to be

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protected, having first been worked into shape, are placed inside a large muffle or chamber of brick heated to a suitable temperature {400° to 600° C.), and subjeeted to the aetion of superheated steam for a period of from five to ten hours according to the thickness of the coating required. Bower's process consists in the exposure of the iron artieles to be protected to the action of air and earbon dioxide in a chamber or retort heated externally and eapable of being closed air-tight ; when hot, air is blown in from time to time so as to produce a thin eoating of oxide on the surfaee. A modification of the proeess consists in alternately oxidizing and reducing the sur- face, the fuel being burnt inside the chamber ; heated air, in excess of that requisite for the combustion, is introduced, and the surface oxidized, so that the outer film is peroxide, magnetic oxide under- lying ; by shutting off the air supply for a short time the peroxide is reduced and a uniform film of adherent magnetic oxide produced. Both proeesses can be so worked as to give a highly protective coating to the iron, so that the articles treated will resist ordinary atmospheric influences for long periods of time. The chief weak point in each. case (excluding the question of cost) is that it is impossible to apply any amount of force to the treated articles with- out craeking or stripping off chips of the coating, so that protected iron articles eannot be hammered, rivetted together, bent, or other- wise subjected to mechanical strains, but must be worked to the dimensions and shape (however large) that are ultimately required before treatment ; hence the processes become too costly for large girders, &c.

Tin and Terne Plates.—In order to protect thin iron plates froin oxidation and to enable them to be readily soldered together so as to manufacture the numerous articles in ordinary use made by the '«whitesmith " or "tin-man," they are coated over with a closely adherent layer of metallic tin, forming tinplate; when instead of pure tin an alloy of tin and lead is used as a protective coating, the product is known as terneplate. The charcoal plates (§ 23) prepared from a good gualty of jron used for the tinning process and pro- perly annealed are thoroughly scoured with sand and water and *'piekled" in dilute

sulphurie acid alternately until perfectly clean and bright ; they are then washed and immersed in a pan full of melted grease until all adherent water has boiled away, and dipped into a bath of melted tin (covered with grease to prevent oxidation) which adheres to the surface more or less completely; the first bath is of less pure tin than that contained in a seeond into which the plate is further dipped so as to complete the coating ; the plate is then taken out, and wiped with a hempen rubber to remove super- fluous tin and make sure that the surface is completely covered, and dipped for a third time into another bath, after which it is placed in a grease bath of tallow and palm oil at a moderately high tem- perature, so that the surplus tin may run off, and then intoa cooler grease bath to avoid too sudden chilling, which would impair the face of the coating, and finally taken out and cooledin the air. As the tin in the third bath becomes alloyed with iron from the opera- tion, it is removed jnto the second, fresh pure tin being used instead ; similarly the meta] from No. 2 bath is by and by removed to supply the first one, so that the plate is covered with less and less ferruginous tin sueeessively as it passes through the three baths. For terne plates the process is much the same, only an alloy of about half tin and half lead is used instead of pure tin ; in con- sequence, the surface produeed is not so brilliant.

When tin plates are partially etched by dilute aqua fortis mixed with common salt or sal ammoniac, they acquire a peculiar spangled appearance, owing to the dissolving away of adherent tin, leaving behind a less readily attacked crystalline tin-iron alloy; the "moirée metallique" thus prepared, after varnishing to prevent oxidation, is frequently used for ornamental purposes.

Galvanized Iron,—When perfectly cleansed iron is immersed in melted zinc instead of tin, the zine adheres to the surface just as tin does in the tinplate manufacture, forming " galvanized iron," the name being derived from the cireumstance that the coating is analo- gous to that producible by electrical means. Norwood and Rogers apply a thin coating of metallic tin to the iron before dipping it in the zine bath, by putting in a wooden tank alternately granulated zinc and the eleaned

iron plates, the tank containing a dilute solution of chloride of tin, so that the tin is deposited by a kind of galvanic action.

By the ordinary processes of eleetroplating manufactured iron and steel goods can be covered over with protective coatings of other metals, notably eopper and nickel. Similarly by various processes silver and gold coatings can be laid on, especially by means of the application of mercurial solutions of the precious metals (water gild- ing), the mercury being volatilized by heat and the residual gold or silver made more adherent by burnishing, the proccss being repeated several times if necessary. “ Pyrosilver” goods are prepared by heating the silvered steel whereby the silver sinks, as 1t were, into the inetal ; successive coatings are then applied and ‘* burnt in, until the sinkage ceases; in this way a coating 18 obtained not readily detachable by wear and tear. Protective coatings of various forms of enamel are often employed for various classes of iron goods, more especially advertisement boards, ¢. ¢., sheets of enamelled iron

with the lettering done in some differently coloured enamel. A modification of this elass of eoating has been recently introduced by Dodé, metallic platinum being mixed with the enamelling eom- position so as to “platinize” the metal and thus add to the dura- bility ; aeeording to the inventor, the comparatively high price of platinum does notinterfere with the applieability of the process, one

platinizing application costing no more than three eoats of good paint, and only about a tenth of the expense of nickelizing.

X. Sratistics oF THE [RON AND STEEL MANUFACTURE.

46.-—The following data are abridged frum the Journal of the Iron and Steel Institute, 1880.

Production of Iron Ore in different Countries (in Thousands of Tons).

In 1872. In 1877-79.

a a a a |

14,300 7

Great Britain 1879 United States, estimated ….

Geran yer sivas. ave? areas Franee

Arai tn dorerscchis wags fend P SOO ase. seu eas hed ae Italy

Spain (Bilbao)

Rv sgias..ceare en feat beoverter

Australia, estimated . Japan

Turkey

India

Mexico

87,434

Production of Pig Iron and Steel in different Countries (in Thousands of Tons),

A essemer od, Pig Iron, Steel, eee emsiostanh Y Steels, 1877-79. 4 . 1879. L 1878. 1879. Great Britain…..... 1879…5,995 835 1175 | 35 United States…..... an, cere 929 50 62 BV@BCG cocceteue ons ae A 8. leo 808 Ve 85 Polgituy«,...2—,.5.° 17 + «=494 155 ; hae Germany and Luxembourg… incom Sele #0 6b 1s Austria-Hungary…| „ ... 469 110 25 16 WSSIA fe evats scout 78… 410 54 22 |(1878) 4:0 Sweden sir..2 8s F heat Ce 19 (1878) 3°0 aly eee ea VEF7 6a” 5 ; “5 29 Canada 18707.) ABS M5 a Mexico’s, 2.708. soy ees a) a Australia vos. See 2°6 a8 Japad oss. plies he a 7°4 ; iteiee rece 12°5 WATIVCR S40 vets oh Tose F- 12 MP UDRCY. snes tee te % 4°3 anf Switzerland …..... + 6°5 0°3 14,373°3 | 2,865 | 409 261° Position of Pig Iron Trade. N umber Tons of Pig! Country of Fur-| _ Tons of Pig made per naces in| Iron Produced.

|Furnace at} Blast. Work. Austria 166 400,426 2,412 Belgium 26 425,200 16,3538 270 | 1,217,838 4,510 Germany … 297 | 1,846,345 6,216 Great Britain ….. 498 | 6,381,851 | 12,813 Sweden 224 350,541 1,560 United States …. 257 | 2)577,861 10,028 1,738 | 13,198,762

‘IRON

Position of Bessemer Steel and Open Hearth Steel Trade.

Bessemer, Open Hearth.

Capacity | Number of | Fstimated

| Came Additional (in Thou- Furnaces verters ones being sands of | erected and erected.| _ built Tons), | i course of

erection

(1880).

1461 1500 39

104 24

Great Britain .. United States..

eee cereres

Avasthia sy, tins 350 |(1879) 15 ‘Belgium… ...| 14 380 |(1879) 2 Sweden «.....00 85 80 i:

‘

Bessemer stéel ……. Open hearth steel …..... Crucible and other steels

The following table, abridged from Hunt’s Mineral Statistics of the United Kingdom, illustrates the gradual increase of the pig iron manufacture in Great Britain during the last twenty years or so :—

Average Annual

Make of Pig Make per Furnace

(in Thousands of

Furnaces in Blast.

Tons). (in ps of 3827 6°

4564 7‘4

4970 8°9 5962 9°0 6742 9°6 5991 9°2

6365 101

6506 ita 6609 12°2 6381 12°8

The following table, abridged from the Statzstical Report of the British Iran Trade Association, gives compendiously a synoptical view of the iron and steel trade of the United Kingdom in 1878 and 1879 :—

British output of iron ore (in thousands of tons)... Cleveland a a

From Spain nt ” — : » F yy geria ” Imports of ore “Norway Ps ” Turkey ” » Russia * Exports Of O76 …csascesseees 3 * British production of pig iron a 5,995 5 ES POPES 2biecgecce sere seastearee fr 2,880 “ Home econsumption…..... 5 3,309 Stocks in hand Deeember 31, 1879 __,, 1,028 Blast furnaces existing December 31, 1879…..... 931 Average make per furnace per annum (in “Scat 121 HANGS OF LODS)issress sakes ce aanpaigas Mo dena peddle ae Average coal used per ton Of pig …....scccccssccnsers 44 ewts. tes Aggregate production of Bessemer steel 836 $19 (in thousands of tons) Do. open hearth steel a 175 Number of Bessemer works in operation «.....c0000 20 COMMETLETS Rh WOT. csssgengenss-

520 633

ane sieneeee 30 we ” 273 325 12°5 ae

n as

IRON

In America, which comes next to Great Britain in amount of pig iron production, and slightly exceeds that country in make of steel, the following figures illustrate the production of pig iron during the last twenty-five years (in thousands of tons of 2000 ib each) :—

|

Bituminous. |

| Anthraeite. Chareoal. Total.

342 736 285 704 187 788 333 1350 365 578 309

359

The following list of American iron and steel works is abridged from the Directory of the Iron-Works of the United States, April 15, 1880 :—

: Bituminous ….

Completed blast furnaces, March 1, 1880… < Anthracite …. Charcoal

ANIGAVRBIC! ..o.c.ccce- acces

BitUMINOUsS: ..:..2.0602s000 (CHAN COMI. eckeicsescecscee

Blast furnaces building, ee

Annual capacity of complcted furnaccs (in thousands of tous)..... 6500

Completed rolling mills and steel works, March 1, 1880…. ces 382

POU Me MISUITSUDTLICITIC' .....0snccescnsnveccovvesees covcsececscdeesone 10

Single puddling furnaces (double ones counting as two) 4467

UR BCU OR Ws ete We 09 «006 nalcn se sticasWsjaseessvencdTtoesessMls0segaiy 2419

So os HOGI oeredecocne aes EEEEEREEeOnt CMe Eee aE Re Ey Coe ae ee 1397

Annual capacity of rolling mills (in thousands of tons) s0.e0.0s000 4000

a rail mills “3 sOnaaeareneatrecee 2150

Completed Bessemer steel works, March 1, 1880 (2 morc building) ... ll

4 aa converters „ 10 a ana 32

- **Open hearth steel works F 3 “i 22**

. id furnaces „ 6 – oe 33

a Crucible cast stcel works Ms 3 Bh aes 35

1 Forges for making iron direct from orc, March 1, 1880… 69

A Bloomaires = 53 (1 more building) 59 Annual capacity (in thousands of tons)... peeks as P

— 165

The present position of the iron and steel trade

generally as compared with that at a pericd of some quarter of a century ago, may be put in a few sentences thus. An enormous increase in the production of iron and steel from natural sources has occurred; not only have the older iron-producing countries, as a rule, shared |

Do9

largely in this increase, but further, in many countries aud districts where the amount of iron production was formerly little more than a nominal amount or even absolutely nil, the manufacture has now attained to notable dimensions, whilst there is every prospect of this increase in production continuing, notwithstanding the great fluctuations in trade experienced from time to time in particular districts. This is mainly due to the vastly increased use of iron and steel (or so-called steel =fused iron of a low degree of carbonization) for constructive and other general purposes, and especially to the introduction of the peculiar melted products obtained from pig iron by means of Bessemer's blowing process conjoined with Mushet's spiegeleisen-addition improvement; by Siemens's open- hearth "steel" making process involving the use of gaseous fuel and the regenerative principle ; or by various modifications of these methods, such as the Snelus-Thomas- Gilchrist process, by means of which phosphorus is removed to a large extent from the pig iron whilst undergoing de- carbonization. By this and various other allied devices, the production of useful kinds of so called "steels" from impure ores, which till recently could only be utilized for inferior cast and wrought iron production, has become possible. On the other hand the increasing use of fused "steels," prepared by various of these methods for many purposes for which wrought iron was exclusively used some quarter of a century ago, has stimulated the wrought iron department, and has in consequence caused the inven- tion of numerous machines for diminishing the cost and increasing the output of puddled iron, and for effecting a greater degree of purification than hand puddling ordinarily produces. Notwithstanding these advances, however, it is evident that the weld iron industry is by no means increas- ing in magnitude as rapidly as the ingot metal manufacture. So evident is the disparity that it is believed by many competent judges that puddled metal will in a longer or shorter time become practically a thing of the past, and that ingot metal will almost wholly take its place,—especially when the advantages of the latter as regards physical qualities and cheapness of production have become more extensively appreciated. (Cc. R. A. W.)

IRON, THERAPEUTIC USES oF. The use of iron in the cure of disease dates from a very early period. Pliny speaks of its medicinal effects, and

there is reason for believing that it was administered several centuries before his time. But Sydenham was the first to point out its most important therapeutic property, its blood-restoring power. “To the Worn out and languid blood,” lie says, ‘it gives a spur or fillip whereby the animal spirits which before lay prostrate or sunk under their own weight are roused and excited.”

The blood is composed of a fluid wherein float roundish red bodies, the blood corpuscles, which play a leading part in those tissue changes essential to life. Each corpuscle consists of a stroma permeated by a red fluid, hemoglobin, which has the remarkable property of readily combining with either oxygen or carbonic acid, but so loosely that under slightly altered conditions these gases are as readily Separated from it. In the lungs the corpuscles, through their hemoglobin, take up oxygen which they carry to all parts of the body. But in the presence of the vital pro- cesses of disintegration and repair constantly going on in the tissues, the corpuscles yield up the oxygen they have brought, and supply an element necessary for these pro- cesses. Having got rid of the oxygen, the hemoglobin then unites with the carbonic acid produced by tissue disinte- gration, and the corpuscles thus reladen carry their burden back to the lungs, and discharge there the carbonic acid,

taking up anew a supply of oxygen. If the hemoglobin of the blood fall below a certain standard, the supply of oxygen necessary to healthy tissue changes in brain, nerve, muscle, &c., becomes too limited, and the changes will be imperfectly performed; hence defective vitality, general or local. Now tlie ingestion of iron increases the heemo- globin supply when it is defective; it promotes the pro- duction of blood corpuscles, and causes each corpuscle to carry with it more hemoglobin; hence the health-giving power possessed by this metal The exact method in which the increase in red colouring matter is brought about we do not know, but in the fact that iron forms an essential constituent of hemoglobin we have some clue to its utility.

Anzemia or spanzemia is the name given to that condition in which the red colouring matter of the blood is below the normal amount. It is indicated by pallor of skin and mucous membranes, and by a depressed

condition of brain, of muscle, and of the tissues generally. A beating headache is often present, sustained mental or physical exertion is difficult, palpitation and breathlessness are sources of in- convenience; in the female the uterine functions are often in abeyance. By a chalybeate course we can usually restore to the blood its due supply of hemoglobin, and cause the gradual disappearance of all these symptoms.

It would be impossible here to enumerate all the special forms of spanemia in which iron is preseribed. It will be sufficient to point

out the leading conditions under which it may be given with every hope of advantage, and those in which it usually fails to do good. First of all, it is of marked benefit in the spanemia of young females, which is often accompanied by a faint greenish or yellowish discoloration of the skin. Chlorosis is the naine usually given to this condition. Here iron almost unfailingly though slowly removes the pallor, breathlessness, and palpitation, increases mental and physical vigour, and restores the uterine functions. Where the blood has been impoverished by hemorrhages, want of proper food, or exposure to bad hygienic conditions, iron rarely fails to improve its character, provided the causes of such impoverishment are removed. In convalescence from many illnesses, iron 1s em- ployed with advantage, and it aids recovery from such constitutional diseascs as rickets and scrofula by its restorative effect on the blood, sometimes too in syphilitic cachexia it is of service. On the other hand, in the obscure disease called pernicious anemia, the cause of which is so far unknown, but in which the deficiency of hemoglobin is extreme, iron is rarely even of temporary service. It is generally useless too in the spanzinia attendant on advancing consumption where the temperature is high; some physicians indeed hold that in such cases it is injurious, because it increases temperature. In chronic diseases leading to spaneemia, where the cause of the poverty of blood is continuously present, iron is often of but little service. Such is the case in cancer and most of those emaciating ailments which tend naturally to a lethal termination. But

in valvular disease of the heart, iron though not curative often helps to prolong life and relieve suffering, for by enriching the blood it spares the heart some of its labour, and at the same time strengthens the cardiac walls. In Bright's disease too, which is often accompanied with bloodlessness, iron is a most valuable medicine in prolonging life even though incapable of saving it.

Hitherto we have spoken of iron only in its capacity of a strengthening agent acting through its power of stimulating the production of hemoglobin, but it may be beneficial in other ways. It is supposed to augment the production in the blood of that active oxydizing agent ozone, but of this we have little or no proof ; there is, however, considerable probability that the iron which exists as an albuminate in the blood scrum has some direct tonie effect on the tissues through which it circulates ; and the astringent pre- parations, such as the sulphatc, are most effective in bracing the gastro-intestinal mucous inembrane when it is relaxed.

Iron is of use in some diseases of special organs and systems, geny perhaps from its general tonic effect, but in part too no

oubt from some local nutritive action which it has. In neuralgia, for example, it is sometimes curative, more certainly so, however, if combined with quinine. In chorea, or St Vitus's dance, too, it is of value, especially when combined with arsenic. On the digestive organs chalybeates have at times a good effect, some forms of dys- pepsia and diarrhcea being favourably influenced by them. Iron too is of service often in the nocturnal incontinence of children, and is often given as an cmmenagogue. In gout, plethora, and most febrile ailments, the administration of iron is usually held to be injurious, but in erysipelas the administration of half drachm doses of the tincture of the perchloride of iron every four hours has been highly lauded, and Dr Russell Reynolds advocates the use of similar doses in acute rheumatisms. Iron is valued for the astrin- gent effects of some of its preparations on parts with which they come in contact, as well as for its good effects on the blood and various organs after ingestion.

The tincture of perchloride of iron is used as a styptic to stop bleeding from the gums or from leech bites, or other slight hemor- rhages. Sometimes too it is of service locally applied in bleeding of a more serious character, but it is a strong irritant to the parts with which it comes in contact. One part of the tincture of the perchloride mixed with three of watcr is sometimes injected up the nostril to check persistent nose bleeding. Lint moistened with the tincture is also used as a plug for the same purpose. For stopping hemorrhage after confinement, the plan introduced by Dr Barnes of injecting a solution of perchloride of iron into the uterus is frequently followed with the greatest advantage. The perchloride and sulphate of iron may be given to check hemorrhage from the stomach, and these salts have likewise been used to decrease the discharge in gonorrhcea and leucorrheea. The local application of the tincture of perchloride of iron in diphtheria has been highly recommended, and a very dilute solution is sometimes used as a rectal injection to destroy thread-worms.

As a medicine iron is used in many forms and combinations, and thirty-three of these are described in the British Pharmacopeia. The metal itself, finely divided, is often administered in 1 or 2 grain doses,—ferrum redactum the preparation is valled,—and lozenges are made of it, each containing 1 grain of reduced iron. The vinum ferri or solution of iron in wine is probably tlhe most ancient of all iron preparations. Of the oxides, the peroxide and the magnetic oxide are officinal. The former was in early times known under the name of saffron or crocus of iron, and was much used ; but now more soluble hilar of iron are usually pre- scribed. Reecntly precipitated peroxide in a moist condition is one

of the best antidotes for arsenical poisoning if given in quarter to half ounce doses. The carbonates of iron readily undergo oxidation unless mixed with sugar, which therefore enters into all the phar- macopeial preparations of iron, the saccharated carbonate of iron, the pill of the carbonate of iron, and the compound iron mixture. Perhaps the most commonly used and the best known astringent preparations of iron are

the combinations of this metal with vege- table acids, the ammonia citrate of iron and the tartrate of iron, which are given in 5 to 10 grain doses, the former too in the form of wine (vinum ferri citratis). The combination of citrate of iron and quinine is an exceedingly valuable preparation, and is given in 3 to 5 grain doses. The acetate of iron is somewhat astringent, but, though officinal, is very rarely used. The sulphate and per- chloride of iron are powerful astringents, constricting the tissues with which they come in contact. Several preparations of these salts are officinal. Their use as local applications has been alluded to; internally they are given instead of the non-astringent chaly- beates, when a tissue-bracing as well as a blood-restoring effect is desired. They are more constipating than the non-astringent chaly- beates. The dose of the solution and tincture of perchloride of iron is from 5 to 20 minims. The sulphate is given in 1 to 3 grain doses. Iodide of iron, in the form of pill or syrup, is specially used in cases of struma. The phosphate of iron and its syrup are of the greatest value when given to weakly and rickety children.

All the above-named iron medicines are officinal. Of those not mentioned in the Pharmacopeia, two only need he alluded to—solu- tion of dialysed iron, whicli of all preparations is perhaps the least liable to disagree with the stomach, and solution of the magnetic phosphate of iron in citric acid, commonly known as Lightfoot's steel, one of the most agreeable of the acid solutions of iron.

Many mineral waters contain iron. In most it exists as a car- bonate, but in one of the springs at Harrogate as chloride. Chaly- beate waters are in suitable cases the most effective of blood tonics.

Ingestion of iron in all forms causes the stools to become black. This arises from the fact that, when iron is taken, but little is ab- sorbed ; the rest passing into the intestinal canal is converted into the black sulphide by the sulphuretted hydrogen present there. The discoloration is devoid of all significance. The evil effect of iron preparatious on the teeth has been much exaggerated. The acid ehalybeates, if taken in a concentrated form, may indeed do harm, and all iron medicines tend to

blacken the teeth somewhat, but by washing the mouth out with water after taking them the possibility of injury is readily prevented. (D. J. 1.)

IRON MASK. The Man in the Iron Mask is the name by which a French state prisoner, whose identity has given rise to much curious inquiry, is universally known. The facts established by contemporaneous evidence respecting this mysterious personage, who died in 1703, were, until a modern writer largely added to them, neither numerous nor of very great importance.t Enough indeed is related

1 Dujunea, the chief turnkey of the Bastille, whose register has for- tunately been preserved, gives us this account of the captive: —“ On Thursday, the 18th September 1698, at three o’clock in the after- noon, M. Saint Mars, the governor, arrived at the Bastille for the first time from the islands of Sainte Marguerite and Sainte Honnat. He brought with him in his own litter an ancient prisoner formerly under his eare at Pignerol, and whose name remains untold. This prisoner was always kept masked, and was at first lodged in the Basiniére tower. . . . Icondueted him afterwards to the Bertandiere town, and put him in a room, whieh, by order of M. de Saint Mars, I had fur- nished before his arrival.” A letter of M. de Formanoir, a grand- nephew of Saint Mars, furnishes the following details :—“ In 1698 M. de Saint Mars exchanged the governorship of the islands for that of the Bastille. When he set off to enter on his new office he stayed with his prisoner for a short time at Palteau, his estate. The Mask arrived in a litter which preceded that of M. de Saint Mars; they were aceom- panied by several men on horseback. The peasants went out to meet their seigneur. M. de Saint Mars took his meals with his prisoner, who sat with his back towards the windows of the room, whieh looked into the court-yard. The peasants of whom I made enquiry could not see if he had his mask on when eating ; but they observed that M. de Saint Mars, who sat opposite to him at table, had a pair of pistols beside his plate. They were attended by a single valet only, Antoine Ru, who took away the dishes set down to him in an antechamber, having first carefully shut the door of the dining-room. When the prisoner crossed the eourt-yard a black mask was always on his face.” Dujunca’s journal contains this

entry respecting the death of the se- eluded prisoner, who, it may be added, was named “M. de Marchiel ” in the Bastille register:—“ On Monday, the 19th of November 1703, the unknown prisoner, who had eontinually worn a black velvet mask, and whom M. de Saint Mars had brought with him from the island of Sainte Marguerite, died to-day at about ten o’elock in the evening, having been yesterday taken slightly ill. He had been a long time in M. de Saint Mars’s hands, and his illness was exceedingly trifling.”

to show that even in his lifetime the veiled prisoner had becoine an object of curious mystery. Other instances occur, however, of captivity under like conditions; and nothing in the treatment of the Mask proves that he was a personage of rank and importance. It has been indisput- ably shown that it was no uncommon practice, especially in the reign of Louis XIV., to isolate human beings and keep them immured, their very features being carefully hidden, and that the victims were persons of all conditions. Though one or two efforts had been previously made to find out the name of the unknown prisoner, Voltaire was the first writer of note to give form and life to the vague tradi- tions that had been current about the Mask; and we may probably ascribe to his suggestive account the increased im- portance which since his time the subject has been supposed to possess. In his Age of Lows XJV. the historian hinted that the Mask was a person of high rank; and he graphic- ally described how this mysterious being endeavoured to commune with the outer world by throwing out, on the shore of Sainte Marguerite, from the grated window of his gloomy dungeon, a piece of fine linen, and a silver plate, on which he had traced some strange characters to reveal a horrible tale of misfortune. This work was published in 1751, nearly fifty years after the death of the Mask; and from this time the problem who he was has been investi- gated with no little diligence. The editor of the Philosophic Dictionary suggested that he was an illegitimate son of Anne of Austria, born in 1626; and in 1790 he was identi- fied, in the Memozrs of Cardinal Richelieu with a supposed twin brother of Louis XIV., put out of the way by the great Cardinal to avoid the ills of a disputed succession. As early as 1745 the

Mask was said, by an anonymous writer, to have been the count of Vermandois, one of the bastards of Louis XIV.; in 1759 M. Lagrange-Chaucel endeavoured to prove that he was the duke of Beaufort, a hero of the Fronde ; a few years afterwards M. St Foix con- jectured that he was the duke of Monmouth, the English pretender of 1685 ; and others have laboured to show that he was either a son of the Protector Cromwell, or Fouquet, the minister of Louis XIV., or Avedick, the Armenian patriarch, whose treacherous imprisonment by the am- bassador of Frauce was one of the worst acts of that un- scrnmpulous king. The claim, finally, of Ercolo Mattioli, a diplomatic agent of the duke of Mantua, was put forward in 1770, and since that time has found zealous advocates in MM. Roux-Fazillac, Delort, Topin, and in the late Lord Dover ; indeed, until lately it was generally thought that Mattioli was the mysterious captive.

The claims, however, of none of these can stand the test of the searching inquiry which recent discoverics have made possible. Voltaire docs not inform us who the Mask was ; his hint that he was an exalted personage is at variance with a remark of his on the same subject in a later work ; and as for the tale of tho attempts made by the Mask to divulge his name and fate, these have been traced toa Huguenot pastor, imprisoned in the islands of Sainte Marguerite. There is no evidence that the illegitimate child of Anne of Austria, or the twin brother of Louis XIV. cver existed. Fouquet dicd in 1680, the count of Vermandois in 1683, and the duke of Beaufort in 1689 ; Monmouth fell under the axe of the headsman ; Avedick was not imprisoned until 1706. The case made on behalf of Mattioli also breaks down when carefully sifted. Mattioli was certainly imprisoned at Pignerol, and that for a considerable time ; he was also long under the care of Saint Mars; and he was detained at the Sainte Marguerites, in the custody of the same jailer. But on the other hand the Mask is never named in the numerous documents that refer to him; he was certainly imprisoned at Exiles ; and he was brought from the Sainte Mar- gucrites, and died in the Bastille ; whereas Mattioli's name occurs

uot seldom in the correspondence of Saint Mars; he cannot be traced to Exiles ; and it is almost certain that he died at the Sainte Marguerites

in 1694.

Is it impossible, then, to fix the identity of the unknown Mask ? The latest writer upon the subject is M. Jung, a French staff officer, and his diligent investigations have brought us perhaps very near the solution of the problem. He appcars to have fully proved that

36 | the prisoner of 1698—beyond question the mysterious Mask—had for many years been guarded by St Mars; that he had long been known as "your ancient prisoner," "your prisoner of twenty ycars standing"; and that at the Sainte Marguerites he was jealously watched with precautions nearly of the same kind as those after- wards taken at the Bastille. He has shown, moreover, that this very prisoner was, in 1687, removed to the Sainte Marguerites from Exiles, always under the eye of the same jailer, and that, too, with the care and secreey observed in the joumney to the Bastille ; and, finally, he has traced the captive to Pignerol, still in the hands of the relentless St Mars, where, in 1681, we find him designated as one of the "two prisoners of the Lower Tower," apparently for some years in confincment. This prisoner, too, is never once named, which, as we have secn, was the case with the Mask. On the whole it would scem that M. Jung has estab- lished the identity of the object of our search with this unknown person. He goes, however, a great deal further, and endeavours to find out the name and the history of the prisoner of the Lower Tower of Pignerol. His theory is that he was a criminal who pro- bably played a prominent part in one of the numerous poisoning plots which disgraced the reign of Louis X1V.; and he identifies him with a Lorraine gentleman who scems to have belonged to a murderous band of conspirators against the life of the king, and who, being then arrested at Peronne, was lodged in the Bastille in 1673, and thence taken, he makes out, to Pignerol. His narrative abounds in interest, but he has adduced no valid proof to connect the supposed prisoner captured at Peronne with the prisoner of 1673 ; and he has not given us anything like evidence to associate this last-named person with either of the prisoners of the Lower Tower at Pignerol, or even to show that he reached that fortress. Besides, he has not ascertained the identity of these two prisoners. The mystery of the identity of the Mask thus remains unsolved ; but the field of inquiry

has been greatly narrowed, and further investigation will not improbably discover this strange historical secret. (W. O. M.)

IRONTON, the chief city of Lawrence county, Ohio, is situated on the river Ohio, 142 miles south-east of Cincinnati. Occupying a central position in a productive mineral district, its chief industry, as its name suggests, is connected with iron. There are iron-furnaces, rolling and planing mills, and machine shops in the town ; and stoves, boilers, nails, and other iron goods are manufactured. to a considerable and yearly increasing value. Ironton was founded in June 1849 by the Ohio Iron and Coal Company, and received its city charter sixteen years later. The population in 1880 was 9000.

IRON-WOOD is the name applied to several kinds of timber, the produce of trees from different parts of tlie tropics, and belonging to very different natural families. Usually the wood is extremely hard, dense, and darlk- coloured, and sinks in water. The true iron-wood of the East Indies and Malay archipelago, of which anchors are often made, seems to be the JMfetrosideros vera of Rumphius, a tree belonging to the Jfyrtacce, and formerly extensively used in China, Japan, and the Moluccas. Several species of Stderoxylon (Sapotacex) also yield iron- wood, Stderoxylon cinereum or Bojerianum, D. C., being the bois de fer blanc of Africa and Mauritius.

West Indian iron-wood is the produec of Colubrina reelinata and C. ferrugina, Ad. Br. (Rhamnacex), and of &oiphila mar- tinicensis, Linn. (Verbenacew). Inxora (Siderodendron) triflorwm, Vahl. (Rubiacex), is the bois de fer of Martinique, and Zanthory- lum Pierota, H. B. K. (Rutacex), is the iron-wood of Jamaica, while Robinia Ponacoco, Aubl. (Leguminosex), is described as the iron-wood of Guiana. The iron-wood of Ceylon is the produce of Mesua ferrea, Linn. (Guttifere). The endemic bots de fer of Mauri- tius, once frequent in the primeval woods, but now becoming very scarce, is the Stadtmannia Sideroxylon, D. C. (Sapindacex), while the Cossignya pinnata, Lam., is known as the bots de fer de Judas. Coccoloba grandifolia and C. pubescens (Polygonaeex) yield a kind of West Indian iron-wood. Muba bumifolia, Pers. (Lbenaccex), yields a varicty of iron-wood which is used at Tavoy

in Burmah to make anchors for large boats. Tasmanian iron-wood is the produce of Notelxa ligustrina (Oleacex), and is chiefly used for making ships' blocks. The iron-wood or lever-wood of North America is the timber of the Amcrican hop hornbeam, Ostrya virginica (Cupulifere). In Brazil Apuleia ferrea, Mart., and Cxsalpinia ferrea, Mart., yield a kind of iron-wood, called, however, the Pao ferro or false iron-wood.

IRRAWADDY. See [Rawan!.

IRRIGATION is the systematic application of water to land in order to promote present or prospective vegetation. Water, thus used for the general purpose of growing or increasing the crops on which animals and man have to subsist, is employed in special ways and at special times according to the particular end in view, the individual plant to be grown, and the very divergent conditions of soil and climate which have to be studied in different countries. Sometimes the art of irrigation is practised for the simplest of all reasons, to make up for the absence or irregular seasonal distribution of rain or for a local deficiency of rainfall; sometimes a particular crop 1s irrigated, because the plant is of an aquatic or semi-aquatic nature ; sometimes lands are irrigated for the sake of the eucouragement to early growth afforded by the warmth of the water, or for the sake of the dissolved plant-food which it furnishes ; and sometimes the object is that the land may be enriched and its level raised by means of the deposit from the water used.

In considering the vast importance of water to plant growth, it must be remembered that seeds must absorb a very large quantity of water before germination can begin; that the growth of the young plant, while still dependent upon the seed, involves the employment of a constant supply of water in order that the transference of nutrients from the stores in the seed to the newly developed parts may proceed without interruption; that soils which do not contain more than 5 to 9 per cent.

of moisture will yield none of it to the plant, and that when such low per- centages of moisture are approached there is a constant struggle — often fatal to the plant—between the soil and the plant for water; that during the period of the plant's active growth, the absorption of all mineral matter and all nitrogen compounds from the soil takes place through the niedium of an exceedingly weak aqueous solution of these substances, which solution is indeed absorbed in such quanti- ties that a single plant of barley needs the passage through it during the five months in which it occupies the ground of more than an imperial gallon of water. It should be also remembered that all vegetable produce when in a growing state contains an immense proportion of water, often 70 to $0 per cent., and sometimes as much as 92 to 96 per cent., the latter figures representing the percentage of water in turnips and watercress respectively.

From all this it will be readily understood that artificial supplies of water are needed for vegetation in many dry countries. An illustration of this need presents itself in the district which comprises parts of the south of Spain, Portugal, and Italy, including Sicily and Greece. Along this zone, which includes the Mediterranean coasts north of the rainless region of Africa, with its currents of hot dry air from the Sahara, the annual rainfall may be as high as 30 inches, but the amount during the summer quarter is but 4 per cent. of the whole. All the district suffers from droughts, which are often most severe. Again, in many parts of central and eastern Europe there are table-lands, as in Moravia, Poland, and parts of Russia, where the yearly rainfall is insufficient— from 10 to 15 inches only. There are about twice as many rainy days in western as in eastern Europe. In very many of these rainless or arid countries aud districts there are remains (mostly in ruins) of important ancient irrigation works; Spain, Sicily, and Syria furnish abundant examples of aqueducts and canals for agricultural irrigation. In Egypt, and in some, parts of Persia, India, and China, artificial watering is employed for the reasons given above; while in Peru and many other parts of America the same scarcity or irregular distribution of rain occurs. Special reference will be made further on to the very important irrigation works of India.

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The next point to which reference has been made is the peculiar aquatic or semi-aquatic nature of some of the plants which are grown by means of artificial watering. Rice is the chief example of a plant of this kind; a rice swamp is proverbial, and wherever rice is grown in China, in India, in Japan, in Egypt, or in Italy, the land is under water till the crop is just ready for harvesting.

The third reason for irrigating mentioned above is the determining cause of nearly all the artificial watering of land in temperate climates. It is not performed because the soil is dry and hot, for it is carried out mainly in the wettest and coldest months of the year. Itis not performed because the crop to be raised is of an essentially aquatic nature, for ordinary grasses and meadow herbage only are watered. But it is performed that growth may be stimu- lated and fed, through certain agencies which the water brings to bear upon the vegetation in question. The water- meadows of England afford examples of this kind of irri- These are, in some instances, of immemorial origin, and may, like those of the Avon in Wiltshire and the Churn in Gloucestershire, be traceable back to Roman times. In the early part of the present century the system received further developments, but at present there is some tendency to depreciate the value of this kind of irrigation.

A fourth reason for irrigation is found where the solid matter suspended in the water is valuable and valued for its richness as manure, and for the actual increase which its deposition on the land makes to the height or level of the country. In England this kind of irrigation is practised mainly in the estuary of the Humber. But wherever a decided deposition of fertilizing silt, clay, or mud from water allowed to rest on the land takes place, there “warping,” the name given to this kind of irrigation, may be said to be practised. The waters of the overflowing Nile in Egypt act, partly at least, in this manner, for their dissolved constituents (about 10 grains per gallon) are perfectly insignificant when compared with those which are suspended.

In addition to these various kinds of irrigation with ordinary water, there are several systems in which town sewage is employed. These involve the introduction of many new and complex conditions, and may be more conveniently considered under the heading SEWAGE.

It is the irrigation determined by the third of the fore- going reasons—water-meadow irrigation—that calls for more particular notice here. The subject may be con- veniently treated in the following order :—quantity of water; quality of water; influence of mining refuse on water-meadows; grasses suitable for water – meadows ; changes in irrigated herbage; methods of irrigation, in- cluding (1) bedwork irrigation, (2) catchwork irrigation, (3) upward irrigation, and (4) warping; management and advantages of water-meadows; theory of irrigation of water-meadows. 'The article will close with some account of irrigation in India, and in Italy, France, and Belgium, and of the history of irrigation.

Before the systematic conversion of a tract into water- meadows can be safely determined on, care must be taken to have good drainage, natural or artificial, a sufficient supply of water, and water of good quality. It might indeed have been thought that thorough drainage would be unnecessary, bnt it must be noted that porous subsoils or efficient drains do not act merely by carrying away stagnant water which would otherwise cool the earth, incrust the surface, and retard plant growth. They cause the soil to perform the office of a filter. Thus the earth and the roots of grasses absorb the useful matters not only from the water that passes over it, but from that which passes through it. These fertilizing materials are

. found stored up in the soil ready for the use of the rvots

of the plants. Stagnation of water is inimical to the action of the roots, and does away with the advantageous processes of flowing and percolating currents. Some of the best water-meadows in England have but a thin soil resting on gravel and flints, this constituting a most effectual system of natural drainage. 'The fall of the water supply must

suffice for a fairly rapid current, say 10 inches or 1 foot in from 100 to 200 yards. If possible the water should be taken so far above the meadows as to have sufficient fall without damming up the river. If a dam be abso- lutely necessary, care must be taken so to build it as to secure the fields on both sides from possible inundation ; and it should be constructed substantially, for the cost of repairing accidents to a weak dam is very serious.

Quantity of Water.—Even were the objects of irriga- tion always identical, the conditions under which it is carried on are so variable as to preclude calculations of quantity. Mere making up of necessary water in droughty geasous is one thing, protection against frost is another, while the addition of soil material is a third. Amongst causes of variation in the quantity of water needed will be its quality and temperature and rate of flow, the climate, the season, the soil, the subsoil, the artificial drainage, the slope, the aspect, and the crop. In actual practice the amount of water varies from 300 gallons per acre in the hour to no less than 28,000 gallons. Where water is used, as in dry and hot countries, simply as water, less is generally needed than in cold, damp, and northerly climates, where the higher temperature and the action of the water as manure are of more consequence. But it is necessary to be thoroughly assured of a good supply of water before laying out a water-meadow. Except in a few places where unusual dryness of soil and climate indicate the employment of water, even in small quantity, merely to avoid the eonsequences of drought, irrigation works are not to be commenced upon a large area, if only a part can ever be efficiently watered. The engineer must not decide upon the plan till he has gauged at different seasons the stream which has to supply the water, and has ascertained the rain- collecting area available, and the rainfall of the district, as well as the proportion of storable to percolating and evaporating water. Reservoirs for storage, or for equaliz- ing the flow, are rarely resorted to in England; but they are of absolute necessity in those countries in which it is just when there is least water that itis most wanted. It is by no means an injudicious plan before laying out a system of water-meadows, which is intended to be at all extensive, to prepare a small trial plot, to aid in determin- ing a

number of questions relating to the nature and quantity of the water, the porosity of the soil, &e.

Quality of Water.—The quality of the water employed for any of the purposes of irrigation is of much importance. Its dissolved and its suspended matters must both be taken into account. Clear water is usually preferable for grass land, thick for arable land. If it is to be used for warping, or in any way for adding to the solid material of the irrigated land, then the nature and amount of the suspended material are necessarily of more importance than the character of the dissolved substances, provided the latter are not positively injurious. For use on ordinary water- meadows or on rice-fields, however, not only is very clear water often found to be perfectly efficient, but water having no more than a few grains of dissolved matter per gallon answers the purposes in view satisfactorily. Water from moors and peat-bogs or from gravel or ferru- ginous sandstone is generally of small utility so far as plant food is concerned. River water, especially that which has received town sewage, or the drainage of highly manured land, would naturally be considered most suitable

for irrigation, but excellent results are obtained also with waters which are uncontaminated with manurial matters, and which contain but 8 or 10 grains per gallon of the usual dissolved constituents of spring water. Experienced

English irrigators generally commend as suitable for water-

meadows those streams in which fish and waterweeds abound. But the particular plants present in or near the water-supply afford further indications of quality. Water- cress, sweetflag, flowering rush, several potamogetons, water milfoil, water ranunculus, and the reedy sweet watergrass (Glyceria aquatica) rank amongst the criteria of excellence. Less favourable signs are furnished by such plants as Arundo Donax (in Germany), Cicuta virosa, and T'ypha latifolia, which are found in stagnant and torpid waters. Water when it has been used for irrigation generally be- comes of less value for the same purpose. This occurs with clear water as well as with turbid, and obviously arises mainly from the loss of plant food which occurs when water filters through or trickles

over poor soil. By passing over or through rich soil the water may, however, actually be enriched, just as clear water passed through a charcoal filter which has been long used becomes impure. It has been contended that irrigation water suffers no change in composition by use, since by evaporation of a part of the pure water the dissolved matters in the remainder would be so increased as to make up for any matters removed. But it is forgotten that both the plant and the soil enjoy special powers of selective absorption, which remove and fix the better constituents of the water, and leave the less valuable.

The Influence of Mining and other Refuse.—In some of the districts of Devonshire and of Wales, in which the sloping sides of narrow valleys have been converted into small catchwork irrigated meadows, the injurious effects of water from mines have been most marked. A stranger visiting the district in early spring would notice, along the sides of a valley, a number of small irrigated fields. Some of these, watered directly from little streams behind and above them, would show grass of great luxuriance, especially close to the main and secondary carriers. But where the river-water, contaminated by mining refuse, had been used, the grass bordering the water-courses would show a sickly yellow tint, and be generally less developed than the herbage of the rest of the field. This difference between the fields irrigated by small local brooks and those watered by the river cannot be explained by any inferiority in the river water as river water; for above the entrance of the refuse from the first mine it was every- thing that could be wished. But just below the place of entrance of the mine water the grass on the banks looked as if it had been burnt up with vitriol, while in the stream itself not a vestige of a living waterweed could be detected.

The injurious effects thus caused by the mine water have led to its partial disuse for the purposes of irrigation. Some of the most profitable water-meadows are no longer irrigated : the herbage in these is now of inferior character, and mosses and weeds, suppressed by total immersion, have reappeared, to the detriment of the more valuable grasses. Besides, there is now no early feed. Manure, not before wanted, has now to be applied, and the yield of grass is reduced in annual value

by 30s. to 60s. per acre. To get a fair growth of grass the plant-food which the water formerly brought at little expense has to be furnished by costly farmyard manure; and even with this the crop is late and light.

It is clear in the particular instance to which reference has been made that water pumped from copper mines or used in dressing the ores is: the origin of the mischief. Several changes in the composition of the water have been

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found to occur in its passage through the mine. The original water lost much of its free carbonic acid gas; its carbonates were converted into sulphates; and it con- tained now the metals iron, manganese, cobalt, and alum- inium, all as sulphates,—hardly a trace of any of these metals being present in the uninjured water. And matters in suspension were found to be both more abundant and more injurious than matters in solution. They consisted chiefly of copper pyrites and iron pyrites, in a very fine state of division. According to their degree of fineness the pyritic particles which escape from the settling pits at the mines travel varying distances down the stream, and may even be detected several miles below, both in the mud of the bed of the stream and on the leaves of grass and other occasionally immersed plants. Oxidation of the pyrites into the sulphates of copper and iron was proved to occur all through the course of the stream,—these salts, with their concomitant free sulphuric acid, producing a most injurious effect on vegetable growth. The presence of this acid in the free state has been detected in the waste water from a Welsh lead mine, in sufficient abundance to kill instantly, on several occasions, many salmon in the river into which it was discharged. The evil done by some of the most deleterious materials in mine-waters can be arrested by the interposition of conduits filled with chalk or limestone, which act as chemical filters. The carbonate of lime neutralizes the free sulphuric acid and stops the heavy metals by converting them from soluble sulphates into insoluble carbonates.

Among the most injurious sorts of refuse which can find their way into streams used for irrigating meadows are the chemical wastes from mills and factories in which the processes of dyeing, paper making, metal working, é&c., are carried on. In the majority of such cases the fatal effects on vegetation are obvious, and the rivers polluted in this way, even if their volume of pure water. be very large, cannot be used at all for irrigation.

The Seeds for Water-Meadows.—Of the few leguminous plants which are in any degree suitable for water-meadows, Lotus corniculatus major, Trifolium hybridum, and 1'. pratense are those which generally flourish best: 7'. repens is less successful. Amongst grasses the highest place must be assigned to ryegrass, especially to the Italian variety, commonly called Lolium ttalicum. The mixture of seeds for sowing a water-meadow demands much consideration, and must be modified according to local circumstances of soil, aspect, climate, and drainage. From the peculiar use which is made of the produce of an irrigated meadow, and from the conditions to which it is subjected, it is necessary to include in our mixture of seeds some that produce an early crop, some that give an abundant growth, and some that impart sweetness and good flavour, while all the kinds sown must be capable of flourishing on irrigated soil.

The following mixtures of seeds (stated in pounds per acre) have been recommended for sowing on water-meadows, Messrs Sutton of Reading, after considerable experience, regarding No. I. as the more suitable :—

US 0 I ak Loliwm perenne ……..... 8 12 Festuca pratensis …..... 0 2 Lolium ttalicwm 20.0.0… 0 8 Festuca loliacea …..... 3 2 POOLTUUTOLIS monavie vs so0c.0e 6 3 Anthoxanthumodoratum0 1 Glyceria fluitans …..... 6 2 Phiewn pratense …....4 2 Glyceria aquatica…....4 1 Phalaris arundinacea… 8 2 PAGEORIS OLDE ssn. ovivnsss- OF Al! Lotus corniculatus major 3 2 Agrostis stolonif~era…... (Gh Y Trifolium hybridum…. 0 1 Alopecurus pratensis…. 0 2 Trifolium pratense …... 0 1 HestUees CLUMOT sereceseeees 8

Changes in Irrigated Herbage.—In irrigated meadows,

though in a less degree than on sewaged land, the reduc- tion of the amount or even the actual suppression of certain species of plants is occasionally well-marked. Sometimes

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this action is exerted upon the finer grasses, but happily also upon some of the less profitable constituents of the miscellaneous herbage. Thus Ranunculus bulbosus has been observed to become quite rare after a few years watering of a meadow in which it had been most abundant, kt. acris rather increasing by the same treatment ; Plantago media was extinguished and P. lanceolata reduced 70 per cent. Amongst the grasses which may be spared, Aira cespitosa, Briza media, and Cynosurus cristatus are gene- rally much reduced by irrigation. Useful grasses which are increased are Loliwm perenne and Alopecurus pratensis, and among those of less value Avena favescens, Dactylis glomerata, and Poa pratensis.

Methods of Irrigation.—There are four ways of irrigating land with water practised in England :—(1) bedwork irri- gation, whicli is the most efficient although it is also the most costly method by which currents of water can be applied to level land; (2) catchwork irrigation, in which the same water is caught and used repeatedly ; (3) subter- raneous or rather upward irrigation, in which the water in the drains is sent upwards through the soil towards the surface ; and (4) warping, in which the water is allowed to stand over a level field until it has deposited the mud suspended in it.

There are two things to be attended to most carefully in the construction of a water-meadow on the first or second of these plans. First, no portion of them what- ever should be on a dead level, but every part should belong to one or other of a series of true inclined planes. The second point of primary importance is the size and slope of the main conductor, which brings the water from the river to the meadow. The size of this depends upon the quantity of water required, but whatever its size its bottom at its origin should be as low as the bed of the river, in order that it may carry down as much as possible of the river mud. Its course should be as straight and as near a true inclined

plane as possible. The stuff taken out of the conductor should be employed in making up its banks or correcting inequalities in the meadow.

Bedwork Irrigation.—In this species of irrigation, which is eminently applicable to level ground, the ground is thrown into beds or ridges. Here the conductor should be led along the highest end or side of the meadow in an inclined plane ; should it terminate in the meadow, its end should be made to taper when there are no feeders, or to terminate in a feeder. The tapered end will retard the motion of the water ; and, as this contains, of course, less water, the water will overflow the banks of the conductor. The main drain to carry off the water from the meadow should next be formed. It should be cut in the lowest part of the ground at the lower end or side of the meadow. Its dimensions should be capable of carry- ing off the whole water used so quickly as to prevent the least stag- nation, and discharge it into the river. The stuff taken out of it should be used to fill up irregularities in the meadow. In case the river takes a turn along the lower end or side of the meadow, the turn should be utilized to carry off the water. It might be imagined that, as a portion of the water will be absorbed by the soil, the main drain need not be made so large as the conductor, merely to carry off the water that has been used ; but in practice it will be found that, when the water is muddy, very little of it comparatively will enter the ground, the scdiment acting as an impervious cover- ing. The next process is the forming of the ground intended for a water-meadow into beds or ridges. That portion of the ground which is to be watered by one conductor should be made into beds to suit the circumstances of that conductor ; that is, instead of the beds over the meadow being all reduced to one common level, they should be formed to suit the different swells in the ground, and, should any of these swells be considerable, it will be necessary to give each side of them its respective conductor. The beds should run at or nearly at right angles to the line of the conductor. The breadth of the beds is regulated by the nature of the soil and the supply of water. Tenacious soils and subsoils, with a small supply of water, require beds as narrow as 80 feet. Porous soils and a large supply of water may have beds of 40 feet. The length of the beds is regulated by the supply of water and the fall from the con-

ductor to the main drain. If the beds fall only in one direction longitudinally, their crowns should be made in the middle ; but, should they fall laterally as well as longitudinally, as is usually

the case, then the crowns should be made towards the upper sides, more or less aeeording to the lateral slope of the ground. The erowns should rise a foot above the adjoining furrows. The beds thus formed should slope in an inelined plane from the conductor to the main drain, that the water may flow equably over them.

The beds are watered by " feeders," that is, channels gradually tapering to the lower extremities, and their crowns cut down, wherever these are placed. The depth of the feeders depends on their width, and the width on their length. A bed 200 yards in length requires a fecder of 20 inches in width at its junction with the conductor, and it should taper gradually to the extremity, which should be 1 foot in width. The taper retards the motion of the water, which constantly decreases by overflow as it proceeds, whilst it continues to- fill the feeder to the brim. The stuff which eomes out of the feeders should be carefully and evenly laid along the sides of the beds. The water overflowing from the feeders down the sides of the beds is received into small drains formed in tho furrows between the beds. These small drains diseharge themselves into the maiu drain, and are in every respeet the reverse of the feeders ; that is, their tapering extremities lie up the slope, and their wide ends open into the main drain, to accelerate the motion of the departing water. The depth of the small drain at the junction is made about as great as that of the main drain, and it gradually lessens towards the taper to 6 inches in tenacious and to less in porous soils. The depth of the feeders is the same in relation to the conductor. The stuff obtained from the small drains is employed to fill up inequalities in the meadow. For the more equal distribution of the water over the surface of the beds from the con- ductor and feeders, small masses, such as stones, or solid portions of earth or turf fastened with pins, are placed in them, in order to retard the momentum which the water may havo acquired. These "stops," as they are termed, are generally placed

at regular intervals, or rather they should be left where any inequality of the current is observed. Heaps of stones answer very well for stops in the con- ductor, particularly immediately below the points of junction with the feeders. When tough pieces of turf aro used, care must be taken to keep the tops of the pins below the reach of weeds floating on tho surface of the water. These stops, however, are nothing but expedients to rectify work imperfectly executed. It must be obvious that a perfectly formed water-meadow should require few or no stops. The small or main drains require no stops. The descent of tho water in the feeders will no doubt necessarily increase in rapidity, but the inclination of the beds and the tapering of the feeders should be so adjusted as to counteract the inereasing rapidity. At all events notehes cut into the sides of the feeders to retard the velocity of the water are much more objectionable than stops, although some recommend them. The distribution of the water over the whole meadow is regulated by the sluices, whieh should be placed at the origin of every conductor. By means of theso sluices any portion of the meadow that is desired can be watered, whilst the rest remains dry; and alternate watering must be adopted when there is a searcity of water. All the sluices should be substantially built at first with stones and mortar, to prevent the leakage of water ; for, should water from a leak be permitted to find its way into the meadow, that portion of it will stagnate and produce eoarse grasses, In a well-formed water-meadow it is as necessary to keep it perfectly dry at one time as it is to place it under water at another. A small sluice placed in the side of the eonductor opposite to the meadow, and at the upper end of it, will drain away the leakage that may have eseaped from the head sluice.

To obtain aecomplete water-meadow, the ground will often require to be broken up and remodelled. This will no doubt be attended with cost; but it should be considered that the first cost is tho least, and remodelling the only way of having a complete water- meadow which will continue for years to give satisfaction. To effect a remodelling when the ground is in stubble, let it be ploughed up, harrowed, and cleaned as in a summer fallow, the levelling-box employed when required, the stuff from the conductors and main drains spread abroad, and the beds ploughed into shape,—all operations that can be performed at little

expense. The meadow should be ready by August for sowing with one of the mixtures of grass-seeds already given. But though this plan is ultimately better, it is attended with the ono great disadvantage that the soft ground cannot be irrigated for two or three years after it is sown with grass-seeds. This can only be avoided where the ground is eovered with old turf which will bear to be lifted. On ground in that state a water-meadow may be most perfectly formed. Let the turf be taken off with the spade, and laid carefully aside for relay- ing. Let the stript ground then be neatly formed with the spade and barrow, into beds varying in breadth and shape according to the nature of the soil and the dip of the ground,—the feeders from the conductor and the small drains to the main drain being formed at the same time. Then let the turf be laid down again and beaten firm, when the meadow will be complete at once, and .ready for irrigation. This is the most beautiful and most expeditious method of making a complete water-meadow where the ground is not naturally sufficiently level to begin with.

_ The water should be let on, and trial made of the work, whenever it is finished, and the motion of the water regulated by the introduction of a stop in the conductors and feeders where a change in the motion of the current is observed, beginning at the upper end of the meadow. Should the work be finished as directed by August, a good erop of hay may be reaped in the suceeeding summer. There are few pieces of land where the natural descent of the ground will not admit of the water being eolleeted a second time, and applied to the irrigation of a second and lower meadow. In such a ease the main drain of a watered meadow may form the conductor of the one to be watered, or a new conductor may be formed by a prolongation of the main drain ; but either expedient is only advisable where water is scarce. Where it is plentiful, it is better to supply the second meadow directly from the river, or by a continuation of tho first main conductor. In some instances it may be necessary to carry a conductor over a hollow piece of ground along an aqueduct made for the purpose, called a “ carry- bridge.” Such an aqueduet may be made either of wood, cast-iron, or stone and mortar ; or inverted siphons may be used.

Catchwork Irrigation.—In the ordinary catchwork water-meadow, the water is used over and over again. On the stcep sides of valleys the plan is easily and cheaply earried out, and where the whole course of the water is not long the peculiar properties which give it value, though lessened, are not exhausted when it reaches that part of the meadow which it irrigates last. The design of any piece of catchwork will vary with local conditions, but generally it may be stated that it consists in putting each eonduit save the first to the double use of a feeder or distributor and of a drain or collector. The following description of one of the best ways in which a eatch- work meadow plan may he constructed is condensed from Mr Bickford's account in the Journal of the R. Agric. Soc., 1852. This comparatively eheap system, though at first chiefly used on the sloping sides of Devonshire and Somersetshire valleys, has been successfully applied to level meadows. In one case the fall was but 1 in 528.

"This system has the advantage over the common system of obviating the necessity for large and frequent level gutters; it has the effect of continuing (and even causing) a smooth and uniform surface to the meadow, allowing of the operations of mowing and carting without any sensiblo pereeption of the existence of the gutters ; and also that of accelerating the speed of the water over the land when 'turned on,' and the speedily draining tlie water from the surface when ' turned off.' It becomes a ready instrument in the hands of tho irrigator, and obviates that waste of land occasioned by the usually largo gutters. It is every way better than the old system : it can be done in half the time, and for less than half the expense. The chief features of the system consist in eausing the ground intended to be irrigated to be covered with a network of small gutters, intersecting each other as nearly at right angles as circumstances will permit. These gutters are about 4 inches wide and 1 ineh deep; they are cut with a ' die,' fixed in a sort of plough of simple construction, drawn generally by one horso, This network of gutters is fed at the highest level possible, or thought desirable, by a earriage gutter of sufficient size.

'* Let fig. 1 be a piece of meadow; look first where the water enters the meadow, or where it can best be made to enter. Let this bo ascertained

to beat Al. Then estimate roughly where it may be supposed the water will run,—say, along the dotted line 1… . 2. Next proceed, using a simple level adjusted by means of a plumb-line, to lay down aleyel ..__4.38 ee line made across the meadow, such as BC. Tho arrows marked on the line show the way the B water is to be made to run on in theD gutter line,—to ob- tain which it is neeessary to deviate from precise level- L ling, and allow the plumb-line to drop I a little before the level mark when in-

Fig. 1.

elining down, and a little behind it when inclining up the meadow. This will have the effcet of running the water out of the low places,

and upon the high places. Care must be taken in levelling to follow out the indications of the level, however crooked and curved the line may appear, going down around every elevation, and avoid- ing every disposition to cut the line straighter.

"' Having completed that line, return to the side first begun, say to D, about 10 paces down from B; and by proceeding as in BC the lino DE will very likely be produced. Should C and E be too far asunder, begin again at F, and produce the line FG. Tho middle of the meadow is supposed to be lowest, and the meadow itself to be flat, rising on each side of the middle by two gentlo

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undulations, so that the lines of gutter curve very considerably. From the nature of the ground it may next be necessary to begin at H, and to produee HI. It will now be perceived that D and I are too far asunder, making it necessary to introduce KL, beginning at K. The higher side must be finished in like manner.

'Let now fig. 2 represent a meadow, with all the lines of fig. 1 inarked with the level and ploughed, but not 'turned out.' It will be perceived

that the eurves of the lines form a series of loops, and that the undulations of the meadow are prettily mapped out by the eurves going down round the hills and up round the valleys. It will be at once seen where the water is principally wanted, viz., just above where the 2 eurves form the greatest downward bend, as at A, fig. 2. Next draw the lines which, upon an aver- age, will be at right angles to the level, but in eaeh particular line will deviate from the right angle, more or less, aeeording as the ground is more or less irregular. This may be done by walk-

Fig. 2. ing in advance of a plough, and leaving foot-prints to mark where

the plough must follow. Care must be taken to 0 as nearly through the centre of the downward loops as.possible. In order to do this, first cut the lines 1, 2, 3, 4, 5, and then fill up the intervals by cutting a, b,c. 'The best distance for these seems to be from ten to fifteen paces apart.

'

"The size of the stream is the nextconsideration. If it can water the whole piece at all times, one gutter, of sufficient size, should be made. Stops in a gutter should be avoided. Where the stream is small, make a leading gutter, and take out from it taper gutters, each of a size suited to the stream when at its smallest, so that when the stream inereases (from rain or any other causc), as many taper-gutters may be used as will disperse the whole stream. The leading gutter should continually decrease in size from the place where the first taper-gutter is taken out of it, and finish in a taper- ing water-gutter itself at last. In fig. 3, AB is a carriage-gutter as

—— ———— is : Fig. 3.

far as c, and a watering-gutter from c to B; a and b are watering-gutters taken out of it. When the stream is small, a stop at 1 will eause it to work in a; a stop at 2 will work in 0; without any stop it will work inch. If the stream is too much for cB, it will work } at the same time; amd, should there be water enough, it will also fill @ without any stop

at all. Care should be taken not to make AB larger than just to carry tho full stream wanted; and in every case when the gutter becomes too large by frequent clean- ing out, cut it anew on one side or the other.

****The hedge-trough may be made a carriage-gutter wherever it can be done conveniently, care being always taken to keep the water running init. Covered gutters made with large tiles could also be substituted for the deep open earriage-gutter, where it is necessary to cross the middle of meadows; this obviates the danger of the opon gutter to sheep and lambs, and the tiled gutter does not re- quire the annual ‘ cleaning out.’**

‘s When a small stream insufficient for the whole meadow is used, the water must be confined to ground determined on by stops in the gutters whieh run on the two sides of it, thus :—

‘Fig, 4 isa seetion of the net-work of gutters; AB is the earriage- gutter ; a is a taper watering-gutter, to the extent of which the water is supposed to be determined to be confined ; 0, ¢, d, e, are the fecding gutters (perpendicular to the levels) ; the eross-gutters are the ‘level’ ones; 6 and ¢ serve as the two side gutters of the section to be watered. The water is confined to the ground between them by stops at the crossings, arranged thus :—b and ¢ (fig. 5) are

stops are pieces

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crossings on the feeders ; 1, 2, 3, 4 are stops, the purpose of which

is obvious enough. The arrows show the direction the water is

madetorun. The a B

of the turf taken out of the gutters, which, being eut with a ‘die,’ fit i the gutters with exaetness, and ean be put in opera- tion _ instantly, without trouble or loss of time. “The gutters are not to be cut in the same places two — suceessive years, but on one

Fig. 4.

side, as near as can be conveniently done, say about a foot and a half from the former ones; and the turf of the new gutter is to be used to fill in the old one, the latter not being erammed too full. By this means the gutters are always new, and always the

proper size. 1f cut on the right- hand side and above one year, the next year they should be cut the left-hand side and _ be- low.

‘It will be proper now to call attention to the manner in which the water is carried, with its sus- pended matter, to the extreme

Fig. 5.

end of the meadow, by the plan we are pursuing. It will be observed that the ground is covered by a sort of network of little gutters, one set being, in a sort, parallel to each other, interseeted by another

set at right angles to them and also parallel to each other. This would be strictly true were the surface strictly a plane surface; but, this being very rarely the case, both sets deviate from a strictly parallel condition in order to meet the undulations of the ground,— the deviations compensating each other on the aggregate. Now, instead of carrying the water down to the lower end by means of one large gutter, and then dispersing it by another large gutter (a level one), we do it by twenty or so little gutters which feed the dispensing gutter about every ten or fifteen paces ; being so small, these never fret away, and, being newly cut every year, they never increase in size.

‘These small gutters are sufficient when the little stops are taken out of the perpendicular gutters, and the level gutters are stopped so as to confine the water to the perpendieulars, to carry down the requisite water. The level gutter of a lower section (if a lateral section is to be watered), instead of being fed -by a large stream at the end, is supplied every ten or fifteen paces by one of those littlo gutters, thus giving a uniform supply throughout the length of the level gutter. A larger supply than this will afford is an evil. When the water is shut out from

the ‘leading-in’ gutter it is not neeessary to move any of the little stops; the same per- pendicular gutters that are effectual to run the water on are as effectual to run it off, leaving the surface of the meadow dry and solid. The water is evenly distributed over the surface by these minute gutters, which are made to follow all the undulations of the land (which can never be done by the large gutters); and also, from the draining effect of the perpendicular gutters, the water is never suffered to accumulate in ponds. The water on the meadow is therefore never ‘over-shoe’ anywhere. These gutters are no way dangerous to sheep or lambs, are never in the way of mowing, have an elegant rather than an unsightly appearance, are not pereeived either in raking or carting, and suit the horse-rake or hay-making machine admirably. It may be added that the leading-in gutters can be so arranged as to tend themselves in cases of flood.”

Upward or Subterranean Irrigation.—In this kind of irrigation the water used rises upward through the soil, and is that which under ordinary cireumstances would be carried off by the drains. The system has received considerable development in Germany, where the elaborate method invented by Petersen is recommended by many agricultural authorities. In this system the began earthenware drain-pipes are furnished at intervals with vertica shafts terminating at the surface of the ground in movable caps. Beneath eaeh cap, and near the upper end of the shaft, are a number of vertical slits through which the drainage water which rises passes out into the conduit or trench from which the irrigating streams originate. In the vertical shaft there is first of all a grat- ing which intercepts solid matters, and then, lower down, a central valve which can be opened and elosed at pleasure from the top of the shaft. In the ordinary English system of upward or drainage irrigation, ditches are dug all round the field. They aet the part of eonductors when the land is to be flooded, and of main drains _ when it is to be laid dry. The water flows from the ditches as

conductors into built conduits formed at right angles to them in parallel lines through the fields ; it rises upwards in them as high as the surface of the ground, and again subsides through the soil and the conduits into the ditches as main drains, and thence it

asses at a lower level either into a stream or other suitable outfall. he ditches may be filled in one or other of several different ways. The water may be drainage-water from lands at a higher level ; or it may be water from a neighbouring river ; or it may be drainage- water accumulated from a farm and pumped up to the necessary level. But it may also be the drainage-water of the ficld itself. In this case the mouths of the underground main pipe-drains are stopped up, and the water in them and the secondary drains thus caused to stand back until it has risen sufficiently near the surface. Of course it is necessary to build the mouths of such main drains of very solid masonry, and to construct efficient sluices for the retention of the water in the drains. Irrigation of the kind now under discussion may be practised wherever a command of water ean be secured, but the ground must be level. It has been success- fully employed in recently drained morasses, which are apt to beeome too dry in summer. It is suitable for stiffish soils where the subsoil is fairly open, but is less successful in sand. The water used may be turbid or clear, and it acts, not only for moisten- ing the soil, but as manure. For if, as is commonly the case, the water employed be drainage-water from cultivated lands, it is sure to contain a considerable quantity of nitrates, which, not being subject to retention by the soil, would otherwise escape. These coming into contact with the roots of plants during their season of active growth, are utilized as direct nourishment for the vegetation. It is necessary in upward or subterranean irrigation to send the water on and to take it off very gently, in order to avoid the displacement and loss of the finer particles of the soil whieh a forcible current would cause.

Warping.—In this variety of irrigation the suspended solid matters aro of importance, not merely for any value they may have as manure, but also as a material addition to the ground to be irrigated. The waters of the Nile and the Ganges afford con- spicuous examples of rivers rich in

suspended matter, which oceasionally amonnts to one hundredth of their volume, and fre- quently to more than one part in two hundred parts of water. The warping which is practised in England is almost exclusively con- fined to the overflowing of level ground within tide mark, and is eonducted mostly within the districts commanded by estuaries or tidal rivers. The best notion of the process of warping may be gained by sailing up the Trent from the Humber to Gainsborough. Here the banks of the river were constructed centuries ago to pro- tect the Jand within them from the eneroachments of the tide, A great traet of country was thus laid comparatively dry. But, while the wisdom of one age thus succeeded in restricting within bounds the tidal water of the river, it was left to the greater wisdom of a suc- eeeding age to improve upon this arrangement, by admitting these muddy waters to lay a fresh coat of rich silt on the exhausted soils. The process began more than a century ago, but has become a system in recent times. Large sluices of stone, with strong doors, to be shut when it is wished to exclude the tide, may be seen on both banks of the river, and from these great conduits are carried miles inward through the flat country, to the point previously prepared by embankment, over which the muddy waters are allowed to spread. These main conduits, being very costly, are constructed for the warp- ing of large adjoining distriets, and openings are made at such points as are then undergoing the operation. The niud is deposited, and the waters return with the falling tide to the bed of the river. Spring- tides are preferred, and so great is the quantity of mud in these tivers that from 10 to 15 aeres have been known to be covered with silt from 1 to 3 feet in thickness during one spring of ten or twelvo tides. Peat-moss of the most sterile character has been by this process covered with soil of the greatest fertility, and swamps which used to be resorted to for leeches are now, by the effects of warping, converted into firm and fertile fields. The art is now so well understood that, by careful attention to the currents, the expert warp farmer can temper his soil as he pleases. When the tide is first admitted, the heavier particles, which are pure sand, are first deposited ; the seeond deposit is a mixture of sand and fine mud, which, from its friablo texture, forms the most valuable soil ; while lastly the pure mud subsides, containing the finest particles of all, and forms a rich but very tenacious soil. The great effort, there- fore, of the warp farmer is to get

the second or mixed deposit as equally over the whole surface as he can, and to prevent the deposit of the last. This he does by keeping the water in constant motion, as the last deposit ean only take plaee when the water is suffered to be still. Three years may be said to be spent in the process, one year warping, one year drying and consolidating, and one year growing the tirst crop, which is generally seed hoed in by hand, as the mud at this time is too soft to admit of horse labour.

The immediate effect, which is highly beneficial, is the deposition of silt from the tide. To ensure this deposition, it is neeessary to surround the field to be warped with a strong embankment, in order to retain tho water as the tide recedes. The water is admitted by

valved sluices, which open as the tide flows into the field, and shut by the pressure of the confined water when the tide recedes, These sluices are placed on as low a level as possible, to permit the most turbid water at the bottom of the tide to pass through a ehannel in the base of the embankment. The silt deposited after warping is exceedingly rich, and capable of carrying any species of erop. It may be admitted in so small a quantity as only to act as a manure to arable soil, or in such a large quantity as to form a new soil. This latter acquisition is the principal object of warping, and it excites astonishment to witness how soon anew soil may be formed. From June to September a soil of 3 feet in depth may be formed under the Pradlsbie circumstances of a very dry season and long drought. In winter and in floods warping ceases to be beneficial. In ordinary circumstances, on the Trent and Humber, a soil from 6 to 16 inches in depth may be obtained, and inequalities of 3 feet filled up. But every tide generally leaves only } inch of silt, and the field which has only one sluice can only be warped every other tide. The silt, as deposited in each tide, does not mix into a uniform mass, but remains in distinct layers. The water should be made to run completely off, and the ditches should be- come dry, before the influx of the next tide, otherwise the silt will not incrust, and the tide not have the same effect. Warp soil is of surpassing fertility. The expense of forming canals, embank- ments, and slnices for warping land is from £10 to £20

an aere. A sluice of 6 feet in height and 8 feet wide will warp from 60 to 80 acres, according to the distance of the field from the river. The embankments may be from 8 to 7 feet in height, as the field may stand in regard to the level of the highest tides. After the new land has been left for a year or two in seeds and clover, it produces great crops of wheat mie potatoes.

Warping is practised only in Lincolnshire and Yorkshire, on the estuary of the Humber, and in the neighbourhood of the rivers which flow into it—the Trent, the Ouse, and the Don. The silt and mud brought down by these rivers is rich in clay and organic matter, and sometimes when dry contains as much as one per cent. of nitrogen.

The Management and Advantages of Water-Meadows,— Constant care is required if a water-meadow is to yield quite satisfactory results, The earliness of the feed, its quantity, and its quality will all depend in very great measure upon the proper management of the irriga- tion. The points which require constant attention are —the perfect freedom of all carriers, fecders, and drains from every kind of obstruction, however minute ; the state and amount of water in the river or stream, whether it be sufficient to irrigate the whole area properly or only a part of it; the length of time the water should be allowed to remain on the meadow at different periods of the season ; the regulation of the depth of the water, its quantity, and its rate of flow, in accordance with the temperature and the condition of the herbage; the proper times for the commencing and ending of pasturing and of shutting up for hay; the mechanical condition of the surface of the ground ; the cutting out of any very large and coarse plants, as docks ; and the improvement of the physical and chemical conditions of the soil by additions to it of sand, silt, loam, chalk, &ec.

Whatever may be the command of water, it is unwise to attempt to irrigate too large a surface at once. Even with a river supply fairly constant in level and always abundant, no attempt should be made to force on a larger volume of water than the feeders can properly distribute and the drains adequately remove, or one part of the meadow will be deluged and another stinted. When this inequality of

irrigation once occurs, it is likely to increase, from the consequent derangement of the feeders and drains. And one result on the herbage will be an irregularity of composition and growth, seriously detrimental to its food-value. The adjustment of the water by means of the sluices is a delicate operation when there is little water, and also when there is much ; in the latter case the fine earth may be washed away from some parts of the meadow; in the former case, by attempting too much with a limited water current, one may permit the languid streams to deposit their valuable suspended matters instead of carrying them forward to enrich the soil. The water is not to be allowed to remain too long on the

ground ata time. The soil must get dry at stated intervals in order that the atmospheric air may come in contact with it and penetrate it. In this way as the water sinks down through the porous subsoil, or into the subterranean drains, oxygen enters, and supplies an element which is needed, not only for the oxidation of organic matters in the earth, but also for the direct and indirect nutrition of the roots. Without this occasional drying of the soil the finer grasses and the leguminous plants will infallibly be lost; while a scum of confervee and other alge will collect upon the surface, and choke the higher forms of vegetation. The water should be run off thoroughly, for a little stagnant water lying in places upon the surface does much injury. The practice of irrigating differs in different places with differences in the quality of the water, the soil, the drainage, &c. As a general rule, when the irrigating season begins in November, the water may flow for a fortnight con- tinuously, but subsequent waterings, especially after December, should be shortened gradually in duration till the first week in April, when irrigation should cease. It is necessary to be very careful in irrigating during frosty weather. For, though grass will grow even under ice, yet if ice be formed under and around the roots of the grasses the plants may be thrown out by the expansion of the water at the moment of its conversion into ice. The water should be let off on the morning of a dry day, and thus the land will be dry enough at night not to suffer from the frost; or the water may be taken off in the morning and let on again at night. In spring the newly grown and tender grass will be easily

destroyed by frost if it be not protected by water, or if the ground be not made thoroughly dry.

Several other important matters in the management of water- meadows have to be noticed. Among these the times for depas- turing with sheep and other stock are of considerable moment, not only because one of the main services rendered by a watcr-meadow is the carly and valuable feed which it ought to afford, but for securing the health of the animals, particularly their immunity from shcep-rot. A water-meadow cannot be trusted late in the season, especially in view of what is now known concerning the liver-fluke of sheep. It seems to be judicious to depasture the carly grass on water-meadows with ewes and Jambs at fle end of March and in April, and to have it caten down bare before May with a heavy stock. On good land and in good seasons a sccond and even a third crop of feed may be got before the 1st of May, the water being let on after each feed. After that the grass is allowed to stand for hay, but it should he irrigated for a few days to clean the pasture. Further particulars as to the management of irrigated meadows may be gathered from the two accounts which follow, which embody, though in a very condensed form, the system pur- sued in the district which is perhaps the most noted for its water- meadows, namely, that of the Christchurch Avon. Some of these afford characteristic examples of the usual English system of irri- gation. They consist in the main of alluvial soil, often very shallow, lying upon gravel. Professor Wrightson, of the College of Agriculture at Downton, near Salisbury, gives the following particulars concerning the water-meadows in his own neighbour- hood. They are very valuable as they assist to keep sheep from Lady Day until the end of April, a time when grecn food is scarce ; at that season they never rot sheep. After sheep have been pas- tured on the water-meadows, these are shut up for hay, of which they yicld in fair seasons about 2 tons per acre. The hay is cleared off in July, and the meadows are then fed off by cows until about the first week in October. At this time the work of clearing out the water-carriers and ditches is proceeded with ; banks, stops, sluices, &c., are repaired ; and holes and deep hoofprints filled up or laboriously stamped out. As soon as possible the water is let on, the irrigation being eontinued throughout November, December, January,

aud February. On the Downton College farm the watcr, during the above four months, is shared, on alternate weeks, with the neighbours. The water is caused to flow regularly over all the meadows, and the "mcadman " is almost constantly employed in " watering" and " drowning." In March the water is shut off, and the meadows are ready for sheep during the first week in April. In about four weeks' time the sheep are taken off, and the ineadows are again watered on alternate weeks up to mid-June. At this time the ground is allowed to become dry and firm so as to permit of grass-cutting (with scythes) and of hay-making. The hay is good and of agreeable flavour, but not equal to upland

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hay. The Avon meadows begin at Britford, just below Salisbury ; and here the results of irrigation are as good if not better than anywhere else in England. They continue from Britford to Fordingbridge, but below the lattcr place down to Ringwood and Christchurch they degenerate into mere flooded meadows and marshes abounding in wild duck, and yielding a very coarse and innutritious herbage. The Avon valley waters are derived from the Chalk, the Upper Greensand, and the Upper Oolite.

The late Mr J. Combes gave, in a paper read before the Royal Agricultural Society, some remarkable instances of the value of the grass produced on some of these Avon water-meadows. He mentioned the fact that £7 or £8 per acre had been given for the spring feed when there had been a failure of the turnip crop ; once under such circumstances the spring fecd of 64 acres fetched no less than £80. – He cited an instance of a meadow of 20 acres, depastured by sheep in spring, as keeping eight hundred sheep twenty-five days, and as yielding after this, in the first and second cuttings, no less than 40 tons of hay.

The following directions for the management of water-meadows given by the late J. Combes of Tisbury (whose observation as a practical irrigator was exact, and whose experience was very exten- sive), though

in the first instance applicable to the Wiltshire Avon meadows, are of general value.

Let the meadows be ready to reeeive the water in the first week in November, that the manurial matters present in the first freshet of the river after the autumnal rains have commenced may be caught and utilized. Water as much as possible during November and December. In January let the water on six days out of seven, in February three out of four, in March two out of four, in May and June two out of seven, in July and August one out of six; and shut off the water entirely during September and October. The young grass coming up where shcep have just fed off a portion should not be immersed ; but generally thin watering is bad, and, if there is not enough water for the whole meadow, let one portion be generously treated at a time. Such sections, in Wiltshire called sterns, may be watcred for five days ata time in winter and two days at atime in summer. It is better to water by night than by day, and in shady rather than in sunny weather.

Assuming that the sluices are in working order, and the conductors or carriers, the feeders, and the drains sound and clear of all obstructions, then actual irrigation begins thus. The sluice is drawn up, and if the water be abundant the conductor and feeders will be filled in about half an hour. The motion of the water should first be adjusted in all the conductors, then in the feeders nearest the upper part of the meadow, and then successively in those which are lower. The sluices regulate the water in the conductors, and the position of the ‘stops ” regulates the water in the feeders. The stops should be so placed as to cause the watcr to overflow the sides of the feeders, by so adjusting the stops as to make tlie openings or waterways at either side of them wider or narrower as required. The first general inundation will show any irregularities in the levels and meadow surfaces ; these should be noted for rectification in the ensuing summer. It will in general need three trial adjustments of the sluices and stops before an experienced irrigator can satisfy himself that the meadow is properly irrigated with the requisite depth of 1 inch of water. During each period of irrigation the meadow should be visited and inspected at regular intervals to see that obstructions are removed and accidents repaired. In Scotland

irrigation is generally continued all April, though in reduced amount towards the end of the month.

The average annual repairs of a water-meadow have been estimated at 5s to 6s. an acre ; the greatest expense will be incurred for levelling, &c., in the second year after laying out the ground.

Mention has been made already not only of the general advantages resulting from that variety of irrigation practised in water-meadows, but also of particular examples of profitable results. It would not be difficult to accumulate many further examples of tlic latter sort, but they must always be reeeived as applying to the particular circumstances of the case, and very often to seasons and commercial and agricultural conditions different from those which have ruled. An example or two of favourable results obtained by irrigation of water-meadows may be cited here. The late Mr Pusey, after having converted a field of 2 acres on his Berkshire home farm into a water-meadow, was able to obtain from it five months' keep for seventy-three sheep. The grass of the meadow had previously become hardly worth cutting, from the land having got out of condition ; but by irrigation 2 acres of it had become equal to 5 acres of superior grazing land unwatered. The late Mr Stephens

uoted in his Practical Irrigator a case of the conversion of 5 acres Craberet at 8s. per acre) of a peat bog into a bedwork water- meadow. The expense was £6 per acre, and the crop of hay was 4 tons 114 ewts. per acre, with an aftermath valued at 18s. per acre.

Theory of Irrigation.— Although in many cases it is easy to explain the reasons why water artificially applied to land brings crops or increases their yield, the theory

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of our ordinary water-meadow irrigation is rather obscure. For we are not dealing in these grass lands with a semi- aquatic plant like rice, nor are we supplying any lack of water in the soil, nor are we restoring the moisture which the earth cannot retain under a burning sun. We

irrigate chiefly in the colder and wetter half of the year, and we "saturate" with water the soil in which are growing such plants as are perfectly content with earth not containing more than one-fifth of its weight of moisture. We must look in fact to a number of small advantages, and not to any one striking beneficial process, in explaining the aggre- gate utility of water-meadow irrigation. We attribute the usefulness of water-meadow irrigation, then, to the follow- ing causes :—(1) the temperature of the water being rarely less than 10° Fahr. above freezing, the severity of frosts in winter is thus obviated, and the growth, especially of the roots of grasses, is encouraged; (2) nourishment or plant food is actually brought on to the soil, by which it is absorbed and retained, both for the immediate and for the future use of the vegetation, which also itself ob- tains some nutrient material directly; (3) solution and redistribution of the plant food already present in the soil occur mainly through the solvent action of the carbonic acid gas present in a dissolved state in the irrigation-water; (4) oxidation of any excess of organic matter in the soil, with consequent production of useful carbonic acid and nitrogen compounds, takes place through the dissolved oxygen in the water sent on and through the soil where the drainage is good ; and (5) improvement of the grasses, and especially of the miscellaneous herbage, of the meadow is promoted through the encouragement of some at least of the better species and the extinction or reduction of mosses and of the innutritious weeds.

To the united agency of the above-named causes may safely be attributed the benefits arising from the special form of water-irrigation which is practised in England. Should it be thought that the traces of the more valuable sorts of plant food (such as compounds of nitrogen, phos- phates, and potash salts) existing in ordinary brook or river water can never bring an appreciable amount of manurial matter to the soil, or exert an appreciable effect upon the vegetation, yet the quantity of water used during the season must be taken into account. If but 3000 gallons hourly trickle over and through an acre, and if we assume each gallon to contain no more than one-tenth of a grain of plant food of the three sorts just named taken together, still the total, during a season including ninety days of actual irrigation, will not be

less than 9 ib per acro. It appears, however, that a very large share of the benefits of water-irrigation is attributable to the mere contact of abundance of moving water, of au even temperature, with the roots of the grass. The growth is less checked by early frosts; and whatever advantages to the vegetation may accrue by occasional excessive warmth im the atmo- sphere in the early months of the year are experienced more by the irrigated than by the ordinary meadow grasses by reason of the abundant development of roots which the water has encouraged.

Irrigation in India.—The irrigation works of India may be grouped under five descriptions or classes, as follows :—(1) perennial canals, —works fed by rivers of whieh the discharge at all times of the year suffices, without storage, to supply the canals; (2) mermittent canals,—works fed by rivers having an uncertain and very variable discharge, which is stored and rendered constantly available for the eanals by means of reservoirs formed in the river- basins themselves ; (8) periodical canals,—works fed by rivers having a supply available during the rainy season only ; (4) inun- dation canals,—works fed by rivers having a constant discharge of some magnitude, but fed only when the rivers are in flood ; (5) tanks,—works which either impound a supply from rivers or small catchment areas, or collect a supply by means of embank- ments thrown across valleys or gorges.

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The rainfall of India is not only very irregular in its yearl distribution, but the annual amcuat voice ner from year " pried while the annual average differs in the twenty-two " meteorological tracts into which the empire has been divided. The following table of average annual rainfall, stated in inches, is from the Report for 1879 of the Select Committee on Indian Public Works :-—

1, Sind and Cutch…....secsccesecees 9 | 12. Western Bengal… 2. Punjab plains…....000 ScRCOROnSOREEE 22 | 13. Western Iimalaya 3) 3. Hyderabad and South Deccan…..25 | 14. Lower Ganges plains bey (is) 4. North Deccan plateau…..... ee BLO ODI os ass cscceece ca, .scssess Ee 76 5. Khandeish and Berar….....29 | 16. Assam and

East Denral es -ccccceess 96 6, Rajputana and Gujcrat.. Le, WRYAUSIANGE 8s ossces oocececeee.ce ~~108 7. Carnatic 3 18. Malabar and Ghats,.....ccc6..112 8. Northern Circars 19, Eastern Himalaya…….....cccccccc 144 9. Upper Ganges plains, North~~ 20. Conean and Ghats 145 NWIGST IPTOVINCCS!. .cc.0.cerscceoseont 38 | 21. Tenasserim…..... 173 10. Central India and Nerbudda…... 44 | 22. Arakan…....0. 193 11. Central Provinces (South)..... 49

The following statistics of the irrigated acreage in different Indian cia and provinces belong generally to the years 1877-8, ut are in several directionsimperfect. Averages are in many cases not yetavailable. Of course the figures here given must be received with due reserve, since the areas irrigated vary much, from ycar to year, according to the season ; while, as new worksare brought into action, great additions to the irrigable acreage are suddenly made.

Acres Irrigated.

Annual Rainfall.

MCRLDHSE, scoters cescccesscesececteecconnnes 5,265,320 35 inches. SOM soa sosuswes esstececcceseescteeteeene 20,786 aie MUO bcctcasscssecsecnctecesss aexceemattctmene 1,267,054 oF, SCINA Jocvecusscereicsassccccetseveetesesseses 360,304 oO” OF North-West Provinees and Oudh…. 1,461,429 400 igs GTI errcseeectte sree cere ee 1,320,124 1 ee

The annual average rainfall refers only to that of the irrigable areas, and is a very rough approximation.

Irrigation in Italy, France, and Belgiwm.—In Italy the practice of irrigating meadows and crops has been long followed, and is carried out in some parts by means of a complex and costly system

of canals. The extent of lands irrigated was in 1878 :-— Lombardy…..... 678,000 hectares, milla. evs ceee sees 96,000 hectarcs. Piedmont …....<: 443,000 – Other provinecs 214,000 33 WEMCUIG cssassacesss 74,000 *

Rice is extensively grown in artificially irrigated lands in the basin of the Po. The produce in rough grain oscillates between 30 and 50 times the weight of seed sown ; if official reports may be trusted, a hectolitre and a half of seed rice will yield from 45 to 75 hectolitres, During the four years in which a field is in rice the annual crop, beginning at 70 hectolitres, sinks successively to 65, 50, and 40. About 42 hectolitres of cleaned rice is the general average yield.

In some parts of Italy the system of winter irrigation, with which we are familiar in England, is carried out upon meadows in which the Loliwm talicwm abounds. This is the case in many of the valleys of Lombardy and in the neighbourhood of Padua. The cuttings of grass are about six in the year, but where certain sewage waters from towns are mingled with the natural water supply eight or even nine cuttings are not unusual. The average yield of hay in these meadows when irrigated with clean river water is about 14,000 kilograms annually, or twice the amount obtained from per- manent pasture in the same district. The euttings begin as early as the end of February, the heaviest amount being obtained in the May cutting, and the lightest in that of October.

In France irrigation has met with increasing favour of late years, Since 1875 there have been Government competitions for prizes for the best examples of irrigated farms. In 1879 there were competitors from eight departments of France, two departments, those of the Basses Alpes and Hautes Alpes, in which the areas irrigated amount respectively to 8500 and 20,000 hectares, furnishing no less than seventy-two. There are many canals in these departments. Other a irrigation works are to be found in Provence, Dauphiné, and Languedoc. The valley of the Istre near Grénoble affords a good illustration of how a devastating torrent may be turned into a source of continual fertility, 3000 hectares of useful land having now been conquered from floods and reclaimed. In the Roussillon district the irrigated area has been doubled between 1820 and 1880, and exceeds 25,000 hectares. One farmer, M. Frangois Coste, whose grandfather was ruined by having to pay 2 francs per hectare for a rugged mountain farm, now obtains from 18 hectares of the same land no less than 125,000 kilos of hay, or 6000 to 7000 kilos

per hectare, a fair yield even for the average meadows of the north of France. In the Pyrénées Orientales there are canals which have been constructed since 1850, and which now water over 6000 hectares. It is scarcely necessary to say that in some lands irriga- tion without any application of manure has been unremunerative, but that with manure the natural produce has been raised from 7000 to 16,000 kilos of hay per hectare. ;

There appear to have been some instances where that terrible vine scourge, the Phylloxcra, has been entirely eradicated by autumnal submersion of the roots of the affected plants. Irrigation

has also been employed in the cultivation of lucerne, of green maize | the Spanish Northern Railway. It has a fine Renaissance

fodder, and of asparagus and other market-garden produce. –

The notion that irrigated rice fields are unhealthy has led to the abandonment of rice-growing in France and Portugal. But it is only when the layer of water is exceptionally shallow or discontinu- ous as well as stagnant that bad effects on the health of the district have followed. Itis at the close of the growing season, when during very hot weather the water uo longer covers the soil, and also in the case of badly-planned and badly-managed rice fields, that there is danger from the rapid decomposition of organic matters in the earth.

In Belgium irrigation is extensively practised in the district La Campine, where the whole process is carried out in the most methodical way, and under strict Government supervision. | The following figures, given by Mr E. Laveleye, afford somo notion of the results of Belgian irrigation. An area of 2281 hectares of barren soil (sand dunes, in fact), yielding absolutely nothing, now produces an

average of about 3000 kilos. of hay per hectare, 100 kilos. being worth 10 francs. The value of the aftermath is further estimated at 100 francs per hectare, so that the total yield from one hectare becomes 400 francs, or £16. Full particulars concerning irrigation in Belgium may be learned from the treatise by J. Keelhotf, entitled Trazté Pratique de UIrrigation des Prairies

(Brussels, 1856). M. Keelhoff recommends the following mixture of seeds (stated in kilos. per hectare) for sowing on the Belgian sandy fields which are to be irrigated :—

LOLGWINA PCVENME.. sensrecrccncccccesceeseoee 16 | Pod pratensis …..cececerscereerecceseecees 5 Phleum pratense….cseveseee SRCOOSECOOEEO 6 | Anthoranthum odoratum …... 10 Alopecurus pratensis…. = 25 | Medicago lupultna…cccceeecceereseerere 4 FIOICUS (GRAGUS ....20.ve-cosce-cesencrecnse 25 | Trifolium pratense ..ecesesccecessresseee 4 CYNOSUTUS CESLALUS..0.0eeeeceeeeeeseeens

5

History of Irrigation.—This part of the subject is very exten- sive, not mercly because it deals with a very ancient art, and one very widely practised, but because the materials are very varied, and in many cases very difficult of interpretation. Still we pos- sess not merely a considerable number of allusions to irrigation in ancient Egyptian, Hebrew, and Oriental records, and in Latin and Greek authors, but we have very tangible remains, still extant, of ancient irrigation works in many countries of Kurope and Asia, and in some parts of northern Africa. In Egypt the art can be traced back to a very early period. In that comparatively level couutry an extensive system of artificial ponding reservoirs or lakes, with a network of distributing canals, was in existence at least as early as the time of Sesostris. If the art of ivrigation was tanght to the ancient Egyptians by the natura] overflowing of the Nile, it is probable that Egypt in her turn afforded an example to Assyria and Babylon, to Carthage and Pheenicia, and also to Greece and Italy. The early history of irrigation in Persia and China has received some little elucidation in recent years, but even in

the case of India our exact knowledge of the development of this art remains imperfect. What has been done during the present century in India may, however, be studied in a compact form, though rather from the financial than from the agricultural side, in Mr R. B. Buckley's Trrigation Works of India (1880), a book which has been laid under contribution in preparing the present article. Amongst Latin authors Cato, and more particularly Colu- mella, speak of the formation and management of irrigated mcadows as well as of watered gardens, The Lombard kings, following the Roman practice, encouraged aud extefded irrigation in Italy. From Lombardy the art extended to France ; while the Moors encouraged it in Spain, Sicily, and Algeria. In Great Britain irrigation was not extensively practised until the close of the 18th and beginning of the present century, although one Pallavicino, an Italian of the time of Mary and Elizabeth, introduced the irrigation of fields on a large scale on his estate of Babraham in Cambridgeshire. It has been thought that some of the existing English water-meadows originated in Roman engincering skill. And the extensive tracts of irrigated land in the vicinity of ancient Roman stations, as in the neighbourhood of Cirencester, lend some support to this view.

The irrigation of grass land, laid out in accordance with one or other of the plans to which reference has been made, is in England a localized custom almost confined to a few southern counties ;— Berkshire (watered by the Kennet); Derbyshire (valley of the Dove); Dorset (the Stour in the vale of Blackmore) ; Devonshire (catchmeadows in the valleys of many rivers and brooks) ; Glou- cestershire (valleys of the Churn, Severn, Avon, Lidden, &c.); Hampshire (the Avon, Test, and Itchen); Wiltshire (valley of tlie Avon) ; Worcestershire (certain canals). In Scotland systematic irrigation is praetised to a very limited extent, and was not intro- duced until the early part of the present century. It is, however, ry adapted to many lands lying near rivers, which could

e made most serviceable in fertilizing poor soils and bringing on an early feed of grass for sheep, while at the same time an ampler supply of hay for the winter feeding of stock could thus be secured. (A. H. C.)

IRUN, a frontier town of Spain, in the province of Guiptzcoa, on the left bank of the Bidassoa, opposite the French village of Hendaye. It is the northern terminus of

church, that of Nuestra Sefiora del Juncal ; and its indus- tries (iron-works, tanyards, potteries) are in a flourishing condition. The population in 1877 was 7040.

IRVINE, a royal and parliamentary burgh, market town, and seaport of Ayrshire, Scotland, is situated on the north bank of the estuary of the Irvine river, and on the Glasgow and South-Western Railway, 29 miles south- south-west of Glasgow and 10 north of Ayr. It is con- nected with the suburb of Fullarton on the south side of the river by a fine stone bridge of four arches, originally built in 1746 and widened in 1827. The principal street is wide and spacious; and a number of handsome villas have been erected in the suburbs. Among the public buildings are the new town-hall, erected near the site of the old town-hall and jail, which dated from the end of the 14th century; the academy, erected in 1814; and several elegant churches. The ancient cross was removed in 1694, Two niles distant is Eglinton castle, the seat of the earls of Eglinton. The principal relics of antiquity are the square tower of Stanecastle, and the ancient Seagate castle, which contains some good specimens of Norman architec- ture,—notably a fine arch, A water-supply has lately been introduced at a cost of about £45,000. The in- dustries include engine-making, shipbuilding, iron-founding, brass-founding, the manufacture of chemicals, brewing, and soapmaking. The shipping trade, which had consider- ably declined, has been steadily increasing since about 1865. The exports consist principally of coal, iron, and chemical products, and the imports of grain, timber, lime- stone, ores, and general produce. The population of the royal burgh in 1871 was 4229, and in 1881 it was 4511, that of the parliamentary burgh in the same years being 6866 and 8503.

Mcntion is made by Hoveden of a castle of Irvine or Irwin exist- ing as early as 1184. The town is styled a burgh in a document of Robert Bruce, dated February 1308, and in a later document of the samo reign mention is made of a charter granted to it by Alexander II. Towards

the end of the 17th century it ranked as the third shipping port in Scotland, bate next to Port-Glasgow and Leith. Irvine is the birthplace of James Montgomery and John Galt.

IRVING, Epwarp (1792-1834), a minister of the Scotch church, was born at Annan, Dumfriesshire, 4th August 1792. By his father's side, who followed the occupation of a tanner, he was descended from a family long known in the district, and the purity of whose Scotch lineage had been tinged by alliance with French Protestant refugees ; but it was from his mother's race, the Lowthers, farmers or small proprietors in Annandale, that he seems to have derived the most distinctive features of his personality. The first stage of his education was passed at a school kept by " Peggy Paine," a relation of the well-known author of the Age of Reason, after which he entered the Annan academy, taught by Mr Adam Hope, of whom there is a graphic sketch in the Reminiscences of Thomas Carlyle. Of Irving's career at school there is nothing special to record if we except a slight liking for mathematical study, which afterwards developed itself more decidedly. Even in his early years he had a predilection for what was grave and solemn, but this tendency was also united with genial mirthfulness and a special fond- ness for athletic exercises,

At the age of thirteen Irving entered the university of Edinburgh. In 1809 he graduated M.A. ; and in 1810, on the recommendation of Sir John Leslie, he was chosen master of an academy newly established at Haddington, where lie became the tutor of Jane Welsh, afterwards the wife of Thomas Carlyle. His appointment at Hadding- ton he exchanged for a similar one at Kirkcaldy in 1812. Completing his divinity studies by a series of partial sessions, he was "licensed" to preach in June 1815,

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but continued to discharge his scholastic duties for other three years. Asa teacher he acquired the reputation of being a severe disciplinarian, —apparently rather fron the stern gravity with which he regarded every kind of delinquency than from excessive severity in the actual administration of chastisement ; out of doors he identified himself with

the recreations of his pupils in a degree rare even at the present time, mingling instruction and amuse- ment so as to win their enthusiastic respect. During the latter period of his stay at Kirkcaldy Irving renewed an acquaintanceship with Thomas Carlyle, which ripened into lifelong friendship. While waiting with some impa- ticnce for a permanent opportunity to exercise his gifts in the ministry, he devoted his leisure, not only to mathe- matical and physical science, but to a course of reading in English literature, his bias towards the antique in sentiment and style being strengthened by a perusal of the older classics, among whom Richard Hooker, denominated by him "the venerable companion of my early days," was his favourite author. At the same time his love of the mar- vellous found gratification in the wonders of the Arabzan Wights, and it is further characteristically related of him that he used to carry continually in his waistcoat pocket a miniature copy of Ossian, passages from which he fre- quently recited with "sonorous elocution and vehement gesticulation."

The impression which Irving's early appearances as a preacher produced upon his hearers seems to have been more of a perplexing and bewildering than an edifying character; but he himself never seems to have been troubled with doubts as to whether preaching was his "vocation." In the summer of 1818 he resigned his mastership, and, in order to increase the probability of obtaining a permanent appointment in the church, took up his residence in Edinburgh, where he now resolved to write according to a new system specially adapted to the wants of the age. Yet, although his exceptional method of address seems to have gained him the qualified approval of certain dignitaries of the church, the prospect of his obtaining a settled charge seemed as remote as ever, and he was meditating a missionary tour in Persia when his departure was arrested' by steps taken by Dr Chalmers, which after considerable delay resulted, in October 1819, in Irving being appointed his assistant and missionary in St John's Parish, Glasgow.

among the congregation of Chalmers, Chalmers himself, with no partiality for its bravuras and flourishes, com- paring it to "Italian music appreciated only by con- noisseurs"; but as a missionary among the poorer classes he wielded an influence that was altogether unique.

The benediction “Peace be to this house,’ with which, in accordance with apostolic usage, he greeted every dwell- ing he entered, was not inappropriate to his figure and aspect, and it is said “took the people’s attention won- derfully,” the more especially after the magic of his per- sonality found opportunity to reveal itself in close and homely intercourse. This half-success in a subordinate sphere was, however, so far from coinciding with his aspi- rations that he had again, in the winter of 1821, begun to turn his attention towards missionary labour in the East, when the possibility of fulfilling the dream of his hfe was suddenly revealed to him by an invitation from the Cale- donian church, Hatton Garden, London, to “make trial and proof” of his gifts before the “remnant of the con} gregation which held together.” Over that charge he was ordained in July 1822. Some years previously he had expressed his conviction that “one of the chief needs of the age was to make inroad after the alien, to bring in the votaries of fashion, of literature, of sentiment, of policy,

Except in the case of a) select few, Irving’s preaching awakened little interest

and of rank, who are content in their several idolatrics to do without piety to God and love to Him whom He hath sent;” and, with an abruptness which must have produced on him at first an effect almost astounding, he now had the satisfaction of beholding these various votaries thronging to hear from his lips the words of wisdom which would deliver them from their several idolatries and remodel their lives according to the fashion of apostolic times. This sudden leap into popularity seems to have been occasioned in connexion with a veiled allusion to Irving’s striking eloquence made in the House of Commons by Canning, who had been induced to attend his church from admiration of an expression in oue of his prayers, quoted to him by Sir James Mackintosh. As far as the mere manner of Irving’s eloquence was concerned, it was improbable that any eulogy could err on the side of warmth and enthusiasm, for perhaps there never was any one more highly gifted with what may be called the personal qualifications of an orator. His commanding stature, the admirable symmetry of his form, the dark and melancholy beauty of his coun- tenance, rather rendered

piquant than impaired by an obliquity of vision, produced an imposing impression even before his deep and powerful voice had given utterance to its melodious thunders; and harsh and superficial half-truths enunciated with surpassing ease and grace of gesture, and not only with an air of absolute conviction but with the authority of a proplietic messenger in tones whose magical fascination was inspired by an earnestness beyond allimitation of art, acquired a plausibility and importance which, at least while the orator spoke, made his audience entirely forgetful of their preconceived objections against them. The subject-matter of his orations, and his peculiar treatment of his themes, no doubt also at least at first constituted a considerable part of his attractive influence. He had specially prepared himself, as he thought, for "teaching imaginative men, and political men, and legal men, and scientific men who bear the world in hand"; and he did not attempt to win their attention to abstract and worn-out theological arguments, but discussed the opinions, the poetry, the politics, the manners and customs of the time, and this not with philosophical comprehensiveness, not in terms of warm eulogy or measured blame, but of severe satire varied by fierce denunciation, and with a specific minuteness which was concerned primarily with individuals. Indeed it was the titillation produced by his picturesque unconventionality rather than any contagious emanation from his intense moral energy that formed the principal basis of connexion between him and his audience, with the majority of whom he was so deeply out of sympathy. The pungency of the titillation was sufficiently evidenced by the fire of criticism from pamphlets, newspapers, and reviews which opened on his volume of Orations, published in 1823; but the excitement produced was merely superficial and essentially evanescent. Though cherishing a strong antipathy to the received ecclesiastical formulas, Irving's great aim was to revive the antique style of thought and sentiment which had hardened into these formulas, and by this means to supplant the new influences, the accidental and temporary moral shortcomings of which he detected with instinctive certainty, but whose profound and real tendencies were utterly beyond the reach of his conjecture. Being thus radically at variance with the main current of the thought of his time, the failure of the commission he had undertaken was sooner or later inevitable; and shortly after the opening of his new church in Regent

Square in 1827, he found that “fashion had taken its de- parture,” and the church, “though always well filled,” was “no longer crowded.” By this desertion his sclf-esteem, one of his strongest passions, though curiously united with singular sincerity and humility, was doubtless hurt

to the quick ; but the wound inflicted was of a deeper and deadlier kind, for it confirmed him finally in his despair of the world’s gradual amelioration, and imparted to his tendency towards supernaturalism a supremacy which virtually produced the partial suspension of his intellectual faculties. For years the subject of prophecy had occupied much of his thoughts, and his belief in the near approach of the second advent had received such wonderful corro- boration by the perusal of the work of a Jesuit priest, writing under the assumed Jewish name of Juan Josafat Ben-Ezra, that in 1827 he published a translation of it, accompanied with an eloquent preface. Probably the religious opinions of Irving, originally in some respects more catholic and truer to human natnre than generally prevailed in ecclesiastical circles, had gained breadth | and comprehensiveness from his intercourse with Coleridge, but gradually his chief interest in Coleridge’s philosophy centred round that which was mystical and obscure, and to it in all likelihood may be traced his initiation into the doctrine of millenarianism, although Irving’s imagination laid hold of this doctrine as an indispensable contrast to the dark and hopeless foreground of the present, which his morbid and incurable melancholy had led him to represent as robed in the gloomy draperies of the “reign of Satan.” Towards supernaturalism he was indeed impelled, apart altogether from any accidental association with individuals, both by certain peculiar blemishes in his character and by its noblest excellences ; and it seemed a foregone necessity that he should become the moral victim of the struggle between the old and new faiths. He had so imbibed the spirit of apostolic times, and had accepted the old forms of Scriptural truths in such entire good faith, that he virtu- ally lived in an atmosphere of which the miraculous con- stituted the principal element, and the tendency towards supernaturalism thus associated with a profound

moral sincerity was strengthened as well as tainted by alliance with a love of outward magnificence and splendour, and a restless craving after excitement, the result of misused and over-exerted energy.

The history of the remainder of Irving's career is a striking example of the power of one delusive prepossession partly to stifle aud partly to frustrate the beneficent exercise of noble mental and moral gifts. Impracticable, visionary, deficient in appreciation of a whole side of human nature, and without real depth of humour, he became the compliant tool of almost any one who offered to supply him with the necessary corroboration of his own absorb- ing hallucination. The first stage of his deflexion was associated with the prophetical conferences at Albury, followed by an almost exclusive study of the prophetical books and especially of the Apocalypse, and by several series of sermons on prophecy both in London and the provinces, his apocalyptic lectures in 1828 more than crowding the largest churches of Edinburgh in the early summer mornings. In 1830, however, there was opened up to his ardeut imagination a new vista into spiritual things, a new hope for the age in which he lived, by the seeming actual revival in a remote corner of Scotland of those apostolic gifts of prophecy and healing which he had already in 1828 persuaded himself had only been kept in abeyance by the absence of faith. At once he welcomed the new "power" with an unquestioning evidence whick could be shaken by ncither the remonstrances or desertion of his dearest friends, the recantation of some of the principal agents of the ' gifts," his own declension into a comparatively subordinate position, the meagre and barren results of the manifestations, nor their general rejection both by the church and the world. His excommunication by the presbytery of London, in 1830, for publishing doctrines regarding the humanity of Jesus Christ now generally held by the broad school of theologians, and the condemnation of these opinions by the General Assembly of the Church of Scotland in the following year, were irrelevant and secondary episodes which only affected the main issue of his career in so far as they tended still further to isolate him from the sympathy of the church ; but the "'irregularities" connected with the manifestation of the "gifts" gradually estranged the majority of his own congregation, and on the complaint of the trustees to the presbytery of London,

whose authority they had formerly rejected, he was declared unfit to remain the minister of the National Scotch Church of Regent Square. After he and those who adhered to him had removed to a new building in Newman

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Strect, he was in March 1833 deposed from the ministry of the Church of Scotland by the presbytery of Annan on the original charge of heresy. With the sanction of the " power" he was now after some delay reordained " chief pastor of the church assembled in Newman Street," but unremitting labours and ceaseless spiritual excitement soon completely exhausted thesprings of his vital energy. "Commis- sioned" by the " power" as "a prophet to do a great work in his native land," he, notwithstanding that he was "sinking under a deep consumption," undertook a inission to Glasgow, where, though his " gigantic frame" was now seen to " bear all the marks of age and weakness," and his " tremendous voice" had become " tremulous," he bated no jot of heart or hope; and even when "stretched in utter weakness," and " visibly dying," he, with unfaltering faith in the testimouy of the prophetic voice, waited for the moment when God '*should bring life and strength." He died worn out and wasted with labour and absorbing care while still in the prime of life, 4th December 1834.

The writings of Edward Irving published during his lifctime are For the Oraeles of God, Four Orations, 1823 ; For Judgment to come, 1823; Babylon and Infidelity foredoomed, 1826; Sermons, &c., 3 vols., 1828; Exposition of the Book of Revelation, 1831; an introduc- tion to a translation of Ben Ezra; and an iutroduction to Horne's Commentary on the Psalms. His collected works have becn published in 5 volumes, edited by Gavin Carlyle. The earlier of his writings abound in passages of finely figurative eloquence rising occasionally into a strain of sublime poetic spiritualism, sometimes breaking ont into wild notes of melancholy and touching lamentation, and again hardening into vehement and scornful invective. They manifest, not only a keen sense of the beauties of nature, but a genuinc interest in literature and art, a comprehensive if somewhat vague intellectual grasp, and a moral

discernment penetrating and subtle, but tending towards narrowness of temper and sympathy. The style, however, is so much influenced in its forms by his study of the older writers as to seem stiff and antiquated, in addition to which many of. its finer passages are marred by glaring errors of taste, while there are already signs of that tendency to irrelevancy and diffuseness which imparts such tediousness to his later writings, and along with the exaggeration of his other defects, contributed to deprive them of nearly all literary charm as well as of moral and intellectual worth.

The Life of Edward Irving, by Mrs Oliphant, appeared in 1862 in two vols. Among a large number of biographies published previ- ously, that by Washington Wilks, 1854, has some merit. See also Hazlitt's Spirit of the Age; Coleridge's Notes on English Divines ; Carlyle's Miseellanies; and Carlyle's Reminiscences, vol. i., 1881. (T. F. HL)

IRVING, Wasutneton (1783-1859), the first American who obtained a European reputation merely as a man of letters, was born at New York, April 3, 1783. Both his parents were immigrants from Great Britain, his father, originally an officer in the merchant service, but at the time of Irving's birth a considerable merchant, having come from the Orkneys, and his mother from Falmouth. Irving was intended for the legal profession, but his studies were interrupted by an illness necessitating a voyage to Europe, in the course of which he proceeded as far as Rome, and made the acquaintance of Washington Allston. He was called to the bar upon his return, but made little effort to practise, preferring to amuse himself with literary ventures. The first of these of any importance, a satirical miscellany entitled Salmagundi, written in conjunction with his brother William and J. K. Paulding, gave ample proof of his talents as a humorist. These were still more conspicuously displayed in his next attempt, Anickerbocker"s History of New York (1809). The satire of Salmagundi had been principally local, and the original design of Knickerbocker's History was only to burlesque a pretentious disquisition on the history of the city in a guide-book by Dr Samuel Mitchell. The idea expanded as Irving pro- ceeded, and he ended by not merely satirizing the pedantry of local antiquaries, but by creating a distinct literary type out of the solid Dutch burgher whose

phlegm had long been an object of ridicule to the mercurial Americans. Though far from the most finished of Irving's productions, Knickerbocker manifests the most original power, and is the most genuinely national in its quaintness and drollery. The very tardiness and prolixity of the story are skilfully made to heighten the humorous effect. The next few years

were unproductive. Upon the death of his father, Irving had become a sleeping partner in his brother's commercial house, a branch of which was established at Liverpool. This, combined with the restoration of peace, induced him to visit England in 1815, when he found the stability of the firm seriously compromised. After some years of ineffect- ual struggle it became bankrupt. This misfortune com- pelled Irving to resume his pen as a means of subsistence. His reputation had preceded him to England, and the curiosity naturally excited by the then unwonted apparition of a successful American author procured him admission into the highest literary circles, where his popularity was insured by his amiable temper and polished manners. As an American, moreover, he aroused no jealousy and no competition, and stood aloof from the political and literary disputes which then divided England. Campbell, Jeffrey, Moore, Scott, were counted among his friends, and the last- named zealously recommended him to the publisher Murray, who, after at first refusing, consented (1820) to bring out Geoffrey Crayon's Sketch Book, which was already appearing in America in a periodical form. The most interesting part of this work is the description of an English Cliist- mas, which displays a delicate humour not unworthy of the writer's evident model Addison. Some stories and sketches on American themes contribute to give it variety; of these Rip van Winkle is the most remarkable. It speedily obtained the greatest success on both sides of the Atlantic. Bracebridge Hall, 2 work purely English in subject, followed in 1822, and showed to what account the American observer had turned his experience of English country life. The humour is, nevertheless, much more English than American. Tales of a Traveller appeared in 1824, and Irving, now in comfortable circumstances, determined to enlarge his sphere of

observation by a journey on the Continent. After a long course of travel, he settled down at Madrid in the house of the American consul Rich. His intention at the time was to translate Navarrete's recently published work on Columbus ; finding, however, that this was rather a collection of valuable materials than a systematic biography, he determined to compose a biography of his own by its assistance, supplemented by independent researches in the Spanish archives. His work appeared in 1828, and obtained a merited suc- cess. It is a finished representation of Columbus from the point of view of the 19th century, affecting neither brilliancy nor originality, but a model of tasteful elegance, felicitous in every detail and adequate in every respect. The Companions of Columbus followed ; and a prolonged residence in the south of Spain gave Irving materials for two highly picturesque books, The Conquest of Granada, professedly derived from the MSS. of an imaginary Fray Antonio Agapida, and The Alhambra. Previous to their appearance he had been appointed secretary to the embassy at London, an office as purely complimentary to his literary ability as the legal degree which he about the same time received from the university of Oxford. Returning to the United States in 1832, after seventeen years' absence, he found his name a household word, and himself universally honoured as the first American who had won for his country recognition on equal terms i the literary republic. After the rush of fétes and public compliments had sub- sided, he undertook a tour in the western prairies, and returning to the neighbourhood of New York built for himself a delightful retreat on the Hudson, to which he gave the name of "Sunnyside." His acquaintance with the New York millionaire John Jacob Astor prompted his next important work—Astoria, a history of the fur-trading settlement founded by Astor in Oregon, deduced with singular literary ability from dry commercial records, and, without laboured attempts at word-painting, evincing a

remarkable faculty for bringing scenes and incidents vividly before the eye. Captain Bonneville, based upon the unpublished memoirs of a veteran hunter, was another work of the same class. In 1842 Irving was appointed ambassador to Spain. He spent four years in the ceuntry, without this time turning his residence to literary account ; and it was not until two years after his return that Forster's Life of Goldsmith, by

reminding him of a slight essay of his own which he now thought too imperfect by comparison to be included among his collected writings, stimulated him to the production of his own biography of his favourite author. Without pretensions to original research, the book displays an admirable talent for employing existing material to the best effect. 'The same may be said of The Lives of Mahomet and his Successors, published two years subse- quently. Here as elsewhere Irving has correctly discri- minated the biographer's province from tlie historian's, and, leaving the philosophical investigation of cause and effect to writers of Gibbon's calibre, has applied himself to represent the picturesque features of the age as embodied in the actions and utterances of its most characteristic representatives. His last days were devoted to a biography of Washington, undertaken in an enthusiastic spirit, but which the author found exhausting and his readers tame. His genius required a more poetical theme, and indeed the biographer of Washington must be at least a potential soldier and statesman. Irving just lived to complete this work, dying of heart disease at Sunnyside, on November

28, 1859.

Although one of the chief ornaments of American litera- ture, Irving is not characteristically an American author. Like most of the Transatlantic writers of his generation, he disappointed expectation by a scrupulous conformity to acknowledged European standards. 'The American vine had not then begun to produce the looked-for wild grapes. Irving, however, is one of the few authors of his period who really manifests traces of a vein of national peculiarity which might under other circumstances have been productive. Knickerbocker's Iistory of New York, although the air of mock solemnity which constitutes the staple of its humour is peculiar to no literature, manifests nevertheless a power of reproducing a distinct national type. Had circum- stances taken Irving to the West, and placed him amid a society teeming with quaint and genial eccentricity, he might possibly have been the first Western humorist, and his humour might have gained in depth and richness. In England, on the other hand, everything encouraged his natural fastidiousness ; he became a refined

writer, but by no means a robust one. At the same time he is too essentially the man of his own age to pass for a paler Addison or a more decorous Sterne. He has far more of the poet than any of the writers of the 18th century, and his moralizing, unlike theirs, is unconscious and indirect. The same poetical feeling is shown in his biographies ; his subject is invariably chosen for its picturesqueness, and whatever is unessential to portraiture is thrown into the background. The result is that his biographies, however deficient in research, bear the stamp of genuine artistic intelligence, equally remote from conipilation and disquisi- tion. In execution they are almost faultless ; the narrative is easy, the style pellucid, and the writer's judgment nearly always in accordance with the general verdict of history. They will not, therefore, be easily superseded, and indeed Irving's productions are in general impressed with that signet of classical finish which guarantees the permanency of literary work more surely than direct utility or even intellectual power. This refinement is the more admirable for being in great part the reflection of his own moral nature. Without ostentation or affectation, he was exqui- site in all things, a mirror of loyalty, courtesy and good

taste in all his literary connexions, and exemplary in all the relations of domestic life which he was called upon to assume. He never married, remaining true to the memory ofan early attachment blighted by death.

The principal edition of Irving's works is the " Geoffrey Crayon," published at New York in 1880, in 26 vols. His life, accom- panied by copious extracts from his correspondence, was published by his nephew Pierre (London, 1862-64, 4 vols.).

ISAAC (PRY or PHY, "he laughs"; "Ioadk, "Ioaxos), the only child of Abraham and Sarah, was born when his par- ents were respectively a hundred and ninety years of age (Gen. xvii. 17). Explanations of the name seem to be intended by the sacred writer in more than one reference to the incredulous or joyous laughter of his parents when a son was promised to them (Gen. xxi. 6, xviil. 12, xvii. 17). Like his father, Isaac lived a nomadic pastoral life, but within much narrower

local limits, and with an occasional experiment in agriculture (Gen. xxvi. 12). After the death of his mother, he married Rebekah the daughter of his cousin Bethuel, by whom after twenty years of married life he became the father of Esau and Jacob. He died at the age of one hundred and eighty. The most striking episode of his life as related in the Biblical record is that which took place while he was still young, "in the land of Moriah," when at the last moment he was by angelic interposition released from the altar on which he was about to be sacrificed by his father in obedience to a divinecommand. Other occurrences which have been recorded have striking resemblances to incidents in the life of Abraham. Of a less marked and energetic individuality than his father and sons, Isaac is by general consent of the Christian church taken as a representative of the unobtrusive, restful, piously contemplative type of human character. By later Judaism, which fixed its attention chiefly on the altar scene, he was regarded as the pattern and prototype of all martyrs. The Mahometan legends regarding lim are curious, but trifling. Among the far-fetched attempts of those who prefer a mythological interpretation of the early incidents of the Bible narrative may be mentioned those of Goldziher, who sees in Isaac a personification of the smiling light of the ruddy evening sky, and of Popper, who identifies the name with that of the dragon Azhi dahika of Eranian folklore. See Ewald, Gesch. d. V. Isr., vol. i.; and Herzog-Plitt, Healencyk. vol. vii, art. " Isaak."

ISAAC I., Comnenvus, Roman emperor of the East from 1057 to 1059, was the son of a gallant officer under Basil II., named Manuel Comnenus, who on his deathbed com- mended his two sons Isaac aud John to the emperor's care. Basil caused them to be carefully educated at the monastery of the Studium, and afterwards advanced them to high official positions. During the disturbed reigns of Basil's seven immediate successors, Isaac, serving in the army, acted prudently and cautiously; and, when the insults of Michael, the eighth from Basil, stung the nobles and generals into rebellion, Caracalon, the leader of the con- spiracy, induced the rebels to proclaim Isaac emperor. Michael, conquered in one battle, was forced to assume the monastic habit, and Isaac ascended the throne in August 1057. The first care of the new emperor was to reward his noble partisans with appointments

that removed them from Constantinople, and his next was to repair the beggared finances of the empire. He revoked numerous

peusions and grants conferred by his predecessors upon idle courtiers, and, disregarding the charge of sacrilege, and meeting the insolent menaces of the patriarch of Constan- tinople by a decree of exile, resumed a proportion of the revenues of the wealthy monasteries. Isaac's only military expedition was against the Hungarians and Patzinaks, who began to ravage the northern frontiers in 1059. Shortly after his successful return he was seized with an illness, and believing it mortal appointed as his successor Constantine Ducas, to the exclusion of his own brother John. Although he recovered from his illness, Isaac did not resume the purple, but, retiring to the monastery of the Studium, spent the remaining two years of his life as a humble monk, alter- nating menial offices with literary studies. His Scholia to the Ziad, and other works on the Homeric poems, are still extant in MS. Isaac died in the year 1061. He was a good and just prince, and his reign justified his choice as emperor. He was grave and reserved, and, more affable in deed than in word, offended many by his haughtiness and soldierlike brusqueness ; while the fact that he coined money with the image of a drawn sword was attributed to his arrogauce and impiety. His great aim was to restore and maintain the early splendid organization of the govern- ment, and his reforms, directed to that end, though unpopular with the aristocracy and the clergy, and not understood by the people, certainly contributed to stave off for a little while longer the final ruin of the Byzantine empire.

ISAAC II., Aneetus, Roman emperor of the East from 1185 to 1195, and again in 1203-4, who came to the throne in the manner described under AnpRonicus I. (vol. ii. p. 23), succeeded also to the unfinished Sicilian war. The favourable close of that was counterbalanced by the failure of an attempt to recover Cyprus, where Isaac Com- nenus had established an independent throne. Of the numerous revolts excited during Isaac's reign by his vices and incapacity, the most serious was the rebellion of the Bulgarians and Wallachians between Mount Hemus and the Danube, which, breaking out in 1186, resulted in the independence of a second Bulgarian kingdom. Alexis Branas, the

general sent against the rebels in 1187, after temporarily repulsing them, treacherously turned his arms against his master, and, leading his troops to Constanti- nople, attempted to seize the city. There he met with more resistance than Isaac's vices had. led him to expect, and in the ensuing battle was defeated andslain. After a hastily- arranged truce with the Bulgarians, the emperor's attention was next demanded in the east, where several claimants to the throne successively rose and fell. In 1189 Frederick Barbarossa of Germany sought and obtained leave to lead his troops on the third crusade through the Byzantine territory ; but he had no sooner crossed the border than the wily and treacherous Greek, who had meanwhile sought an alliance with Saladin, threw every impediment in his way, and was only by force of arms compelled to fulfil his engagements. The next five years were disturbed by fresh rebellions of the Wallachians, against whoni Isaac led several expeditions in person. During one of these, in 1195, Alexius, the emperor's brother, taking advantage of the latter's absence from camp on a hunting expedition, proclaimed himself emperor, and was joyfully hailed by the soldiers, who heartily despised the craven vices of their late emperor. Isaac was seized; his eyes were put out, and he was imprisoned in a lonely tower at Constantinople. It has already been related (Crusapss, vol. vi. p. 629) how after eight years Isaac was raised for six months from his dungeon to his throne once more. But both mind and body had been enfeebled by captivity, and his son Alexius IV. was the actual monarch. JIsaac's feeble hold on life was loosened by the turmoil which followed the restoration,

and he died in 1204. He was one of the weakest and most vicious princes that ever occupied the Byzantine throne. His father had been censured as a general for cowardice, and Isaac II. seems to have inherited a full share of the paternal failing, which his connexion on the mother's side with the Comnenian family had not counter- acted. He was vain, superstitious, and sensual; and, while he neglected the duties of his lofty position, he abandoned himself to all the pleasures which it commanded. Surrounded by a crowd of slaves, mistresses, and flatterers, he permitted his empire to be administered by unworthy

favourites, while he squandered the vast sums of money wrung from his unhappy provinces on costly buildings and expensive gifts to the churches of his metropolis. It is little to be wondered at that his cowardice and vice stirred up numerous rivals, who sought to emulate the ease with which a creature so worthless had obtained an empire.

ISABELLA (1451-1504), surnamed la Catolica, "the Catholic," queen of Castile from 1474, was the second child and only daughter of John IT. of Castile by his second wife Isabella, granddaughter of John I. of Portugal (thus being through both parents a descendant of the famous John of Gaunt, duke of Lancaster), and was born at Madrigal on Apri] 22, 1451. On the death of her father, who was succeeded by her brother Henry IV. (1454), she was withdrawn by her mother to Arevalo, where her early education was conducted in the deepest seclusion ; in 1462, however, after the birth of Joanna " Beltraneja," she was, along with her uterine brother Alphonso, removed by Henry to the court, where she showed a remarkable example of staidness and sobriety. Already more than one suitor had made application for her hand, Ferdinand of Aragon, who ultimately became her husband, being among the number ; for some little time she was engaged to his elder brother Carlos, who died in 1461. Whenin her thirteenth year her brother promised her in marriage to Alphonso of Portugal, but to this union she firmly refused to consent ; her resistance seemed less likely to be effectual in the case of the marquis of Villena, the grand master of the order of Calatrava, to whom she was next affianced, when she was delivered from her fears by the sudden death of the bride- groom while on his way to the nuptials (1466). After an offer of the crown of Castile, made by the revolutionary leaders in the civil war, had been declined by ler, she was in 1468 formally recognized by her brother as lawful heir, after himself, to the united crowns of Castile and Leon, New candidates for her hand now appeared in the persons of a brother of Edward IV. of England (probably Richard, duke of Gloucester), and of the duke of Guienne, brother of Louis XI., and heir presumptive of the French monarchy. Finally, however, in face of very great difficulties, she was married to Ferdinand of Aragon at Valladolid on October 19, 1469. Thenceforward the fortunes of the two spouses were inseparably blended (see FERDINAND, vol. viii. p. 81). For some time they hcld a humble court at Duefias, and afterwards they resided at Segovia, where

on the death of Henry she was proclaimed queen of Castile and Leon (December 13, 1474). The first months of her reign were fully employed in coping with domestic disaffection and in repelling invasion from Portugal; but peace was soon secured on a basis of such firmness and permanence as rendered possible that successful policy the main features of which have already been skctched elsewhere. Spain undoubtedly owed to Isabella's clear intellect, resolute euergy, and unselfish patriotism much of that greatness which for the first time it acquired under "the Catholic sovereigns." The moral influence of the queen's personal character over the Castilian court was incalculably great ; from the debasement and degradation of the preceding reign she raised it to being "the nursery of virtue and of

generous ambition." The very sincerity of her piety and strength of her religious convictions led her more than once, however, into great errors of state policy, which have never since been repaired, and into more than one act which offends the moral sense of a more refined age; her efforts for the introduction of the Inquisition into Castile, and for the proscription of the Jews, are outstanding evidences of what can only be called her bigotry. But not even the briefest sketch of the facts of her life can omit to notice that happy instinct or intuition which led her, when all others had heard with incredulity the scheme of Columbus, to recall the wanderer to her presence with the words "I will assume the undertaking for my own crown of Castile, and am ready to pawn my jewels to defray the expenses of it, if the funds in the treasury should be found inadequate." She died at Medina del Campo on November 24, 1504, and was succeeded by her daughter Joanna "la loca" (the " Crazy") with Ferdinand as regent. See Prescott, History of the Reign of Ferdinand and Isabella, where the original authorities are exhaustively enumerated.

ISABEY, Jean Baptiste (1767-1855), was born at Nancy on the 11th April 1767. At nineteen, after some lessons from Dumont, miniature painter to Marie Antoin- ette, he became a pupil of David. Employed at Versailles on portraits of the dukes of Angouléme and Berry, he was

given a commission by the queen, which opens the long list of those which he received, up to the date of his death in 1855, from the successive rulers of France. Patronized by Josephine and Napoleon, he arranged the ceremonies of their coronation and prepared drawings for the publication intended as its official commemoration, a work for which he was paid by Louis XVIII., whose portrait (engraved, Debucourt) he executed in 1814. Although Isabey did homage to Napoleon on his return from Elba, he continued to enjoy the favour of the Restoration, and tvok part in arrangements for the coronation of Charles X. The mon- archy of July conferred on him an important post in connexion with the royal collections, and Napoleon JII. granted him a pension, and the cross of commander of the Legion of Honour. Review of Troops by the First Consul was one of his most important compositions, and Isabey's Boat,—a charming drawing of himself and family—pro- duced at a time when he was much occupied with litho- graphy—had an immense success at the Salon of 1820 (engraved, Landon, Annales, vol. i. p. 125). His portrait of Napoleon at Malmaison is held to be the best ever exe- cuted, and even his tiny head of the king of Rome, painted for a breast-pin, is distinguished by a decision and breadth which evidence the hand of a master.

A biography of Isabey was published by M. E. Taigny in 1859, and M. C. Lenormant's article, written for Michaud's Biog. Univ., is founded on facts furnished by Isabey's family.

ISAUS owes his place in the decade of the Attic orators to his mastery of forensic argument; but his literary significance, in relation to the historical develop- ment of Attic prose, is not inferior to that of any other name in the series. The chronological limits of his ex- tant work fall between the years 390-353 B.c. ; and his birth may with probability be placed about 420 B.c. The Plutarchic life describes him as a Chalcidian; Suidas, whom Dionysius follows, as an Athenian. The accounts have been reconciled by supposing that his family sprang from the settlement (kAypovxia) of Athenian citizens among whom the lands of the Chalcidian hippobote (knights) had been divided about 509 3.c. In 411 3.c. Eubcea (except Oreos) revolted from Athens ; and it would not have been strange if residents of Athenian origin had then

migrated from the hostile island to Attica. Such a connexion with Eubcea would explain the non-Athenian name Diagoras which is borne by the father of Iseeus, while the latter is

said to have been "an Athenian by descent" (A@nvatos 76 yévos). So far as we know, Iseus took no part in the public affairs of Athens. 'I cannot tell," says Dionysius, " what were the politics of Iseeus—or whether he had any politics at all" Those words strikingly attest the profound change which was passing over the life of the Greek cities. It would have been scarcely possible, fifty years earlier, that an eminent Athenian with the powers of Iszeus should have failed to leave on record some proof of his interest in the political concerns of Athens or of Greece. But now, with the decline of personal devotion to the state, the life of an active citizen had ceased to have any necessary contact with political affairs. Professional pursuits, determined by private choice and directed to private ends, could now engross all those energies which would once have been devoted, at least in large measure, to the service of the city. The very fact that almost nothing is known about the life of Iszeus is itself the most suggestive of facts. Already we are at the beginning of that transition which is to lead from the old life of Hellenic citizenship to that Hellenism whose children are citizens of the world.

There is good authority for the tradition that Iszeus was the pupil of Isocrates,—probably about 393 B.c., when Isocrates was beginning his career as a teacher, and while Tseeus was not yet occupied with his special calling. Internal evidence for such intercourse may be found in the method of handling subject-matter which some extant speeches of Iseeus exhibit. Though nota pupil, Iseeus had certainly been a student of Lysias. A passage of Photius has been understood as meaning that personal relations had existed between Iszeus and Plato; but this view appears to rest on an erroneous construction of the pas- sage in question.}

The profession of Iseeus was that of which Antiphon had been the first representative at Athens—that of a Aoyoypapos, who composed

speeches which his clicnts were to deliver in the law-courts. But, while Antiphon had written such speeches chiefly (as Lysias frequently) for public causes, it was with private causes that Iseeus was almost exclusively concerned. The fact marks the progres- sive subdivision of labour in his calling, and the extent to which the smaller interests of private life now absorbed the attention of the citizen.

The most interesting recorded event in the career of Isceus is one which belongs to its middle period—his con- nexion with Demosthenes. Born in 384 3.c., Demosthenes attained his civic majority in 366. At this time he had already resolved to prosecute the fraudulent guardians who had stripped him of his patrimony. In prospect of such a legal contest, he could have found no better ally than Iseeus, a master of Attic law, especially where claims to property were at issue, and one who for upwards of twenty years had been eminently successful as a writer of speeches for the law courts. That the young Demosthenes actually resorted to the aid of Iseeus is beyond reasonable doubt. But the pseudo-Plutarch embellishes the story after his fashion. He says that Demosthenes, on coming of age, took Iszeus into his house, and studied with him for four years—paying him the sum of 10,000 drachmas (about £400), on condition that Isseus should withdraw from a school of rhetoric which he had opened, and devote himself wholly to his new pupil. The real Plutarch gives us a more sober and a more probable version. He simply states that Demosthenes 'employed Iszeus as his master in rhetoric, though Isocrates was then teaching, either (as some say) because he could not pay Isocrates the prescribed

1 On this point (as on some others which can be but briefly noticed here) the reader is referred to the detailed treatment of the subject in SJebb's Attic Orators from Antiphon to Tsxus, vol. ii. p. 264.

fee of ten mine, or because he preferred the style of Isseus for his purpose, as being vigorous and astute" (dpaarnpiov Kal mavovpyov). It may be observed that, except by the pseudo-Plutarch, a school of Iseeus is not mentioned,—for a notice in Plutarch need mean no more than that he had written a text-book, or that his speeches were read in

schools ;2 nor is any other pupil named. As to Demo- sthenes, his own speeches against Aphobos and Onetor (363-62 B.c.) afford the best possible gauge of the sense and the measure in which he was the disciple of Iszeus ; the intercourse between them can scarcely have becn either very close or very long. The date at which Iszeus died can only be conjectured from his work ; it may be placed about 350 B.c.

Tsceus has a double claim on the student of Greek litera- ture. He is the first Greek writer who comes before us as a consummate master of strict forensic controversy. He also holds a most important place in the general develop- ment of practical oratory, and therefore in the history of Attic prose. Antiphon marks the beginning of that development, Demosthenes its consummation. Between them stand Lysias and Iszeus. 'The open, even ostenta- tious, art of Antiphon had been austere and rigid. The concealed art of Lysias had charmed and. persuaded by a versatile semblance of natural grace and simplicity. Iseeus brings us to a final stage of transition, in which the gifts distinctive of Lysias were to be fused into a perfect harmony with that masterly art which receives its most powerful expression in Demosthenes. Here, then, are the two cardinal points by which the place of Iseeus must be determined. We must consider, first, his relation to Lysias ; secondly, his relation to Demosthenes.

A comparison of Iseeus and Lysias must sct out from the distinc- tion between choice of words (Aééts) and mode of putting words together (ctv@eors). In choice of words, diction, Lysias and Iseeus are closely alike. Both are clear, pure, simple, concise ; both have the stamp of persuasive plainness (4@éAera), and both combine it with graphic power (évdpyeta). In mode of putting words together, composition, there is, however, a striking difference. Liysias threw off the stiff restraints of the earlier periodic style, with its wooden monotony ; he is too fond indeed of antithesis always to avoid a rigid cffect ; but, on the whole, his style is easy, flexible, and vari- ous; above all, its subtle art usually succeeds in appearing natural. Now this is just what the art of Iseeus does not achieve. With less love of antithesis than Lysias, and with a diction almost equally pure and plain, he yet habitually conveys the impression of con- scious and confident art. Hence he is least

effective in adapting his style to those characters in which Lysias peculiarly excelled,— the ingenuous youth, the homely and peace-loving citizen. On the other hand, his more open and vigorous art does not interfere with his moral persuasiveness where there is scope for reasoned remon- strance, for kecn argument, or for powerful denunciation. Passing from the formal to the real side of his work, from diction and com- position to the treatment of subject-matter, we find the divergence wider still. Lysias usually adheres to a simple four-fold division— proem, narrative, proof, epilogue. Isseus frequently interweaves the narrative with the proof.3 He shows the most dexterous ingenuity in adapting his manifold tactics to tho case in hand, and often "'out-generals" (karaorparnye?) his adversary by some novel and daring disposition of his forces. Lysias, again, usually contents himself with a merely rhetorical or sketchy proof; Iseus aims at strict logical demonstration, worked out through all its steps. As Sir William Jones well remarks, Iseeus lays close siege to the under- standings of the jury.*

eo alla dae ee a

2 Plut., De glor. Athen., p. 850c, where he mentions robs 'Iao- kpdrets kal AvTipavras kat loalovs among Tobs év Tals cXoAais Ta Heipdxta mpodisdorovTas.

Here he was probably influenced by the teaching of Isocrates. The forensic speech of Isocrates known as the dgineticus (Or. xix.), which belongs to the peculiar province of Iswus, as dealing with a claim to property (ém:d.xacta), affords perhaps the earliest example of narrative and proof thus interwoven. Earlier forensic writers had kept the d:fynots and rferers distinct, as Lysias does.

4 This is what Dionysius means when he says that Iseus differs from Lysias—ro ph nar' evOdunud ti rAéyetv GAAG Kad Kar' emixelpnua (Isx. 16). Here the "enthymeme" means a rhetorical syllogism with one premiss suppressed (" curtum," Juv., vi. 449) ; " epicheireme," such a syllogism stated in full. Gf. Volkmann, Rhetorik der Griechen und Romer, 1872, pp. 153 fF.

ISA—ISA

Such is the general relation of Isceus to Lysias. What, we must next ask, is the relation of Iseus to Demosthenes? The Greek critic wlio had so carefully studied both authors states his own view in broad terms when he declares that "the power of Demosthenes took its seeds and its beginnings from Isecus." A closer examina- tion will show that within certain limits the statement may be allowed. Attic prose expression had been continuously developed as an art; the true link between Iseeus and Demosthenes is techni- cal, depending on their continuity. Isxus had made some original contributions to the resources of the art ; and Demosthenes had not failed to profit by these. The composition of Demosthenes resembles that of Iseeus in blending terse and vigorous periods with passages of more lax and fluent ease, as well asin that dramatic vivacity which is given by rhetorical question and similar devices. In the versatile disposition of subject-matter, the divisions of " narrative' and "proof" being shifted and interwoven according to circum- stances, Demosthenes has clearly been instructed by the example of Iseeus. Still more plainly and strikingly is this so in regard to the elaboration of 'systematic proof; here Demosthenes invites direct and close comparison with Iseeus by his method of drawing out a chain of arguments, or enforcing a proposition by strict legal argument. And, more generally, Demosthenes is the pupil of Iseeus, though here the pupil became even greater than the master, in that faculty of grappling with an adversary's case point by point,

_ in that aptitude for close and strenuous conflict which is expressed

Works.

Classifi- cation.

bythe words-ayév, évayévios.! Thus far Iseus and Demosthenes are related to each other as technical proficients in a progressive art. It might be added that there was some degree of resemblance between the natures of the two men, in so far as the intellectual character of both was marked by a certain vigorous intensity of logic. But it would be as perverse to overstate the debt of Demosthenes to Iszeus as it would be

unjust to rest the significance of Iseus solely or chiefiy on his relation to Demosthenes. As Demosthenes holds his unrivalled place in virtne of qualities which no teacher could have communicated, so, too, the writings of lseus have the independent value of masterpieces in their ow kind,

The pseudo-Plutarch, in his life of Iseus, mentions an Art of Rhetoric and sixty-four speeches, of which fifty were accounted genuine. From a passage of Photius it appears that at least? the fifty speeches of recognized authenticity were extant as late as 850 A.D. Only eleven, with large part of a twelfth, have come down to us; but the titles of forty-two others are known.?

The titles of the lost speeches confirm the statement of Dionysius that tle speeches of Iseeus were exclusively forensic; and only three titles indicate speeches made in public causes. The remainder, concerned with private causes, may be classed under six heads :— (1) kAnptxot— cases of claim to an inheritance ; (2) émimAnpixol— cases of claim to the hand of an heiress ; (8) d:adixacla:—cases of claim to property ; (4) drocracfov—cases of claim to the ownership of a slave; (5) @yyuns— action brought against a surety whose principal had made default; (6) dvtwpoola (as=aapaypaph)— a ee plea; (7) %peois—appeal from one jurisdiction to an- other.

Eleven of the twelve extant speeches belong to class (1), the kAnpixol, or claims to an inheritance. This was probably the branch of practice in which Isseus had done his most important and most characteristic work. And, according to the ancient custom, this class of speeches would therefore stand first in the manuscript col- lections of his writings. The case of Antiphon is parallel: his speeches in cases of homicide (fovxoi) were those on which his ae inainly depended, and stood first in the manuscripts. Their exclusive preservation, like that of the speeches made by Issus in will-cases, is thus primarily an accident of manuscript oo but partly also the result of the writer's special pres-

ige.

Six of the twelve extant speeches are directly concerned with claims toan estate ; five others are connected with legal proceedings arising out of such a claim. They may be classified thus (the name me

1 Cleon's specch in Thuc. iii. 87, 38, works out this image with remarkable force; within a short space we have tuvécews aydv— Tov Todvde &yovwv—d-ywrioths—aywrlecbai—avraywrl (eo bai—aywvobereitv. See Attic Orators, vol. i. 39; ii. 304.

- **For the words of Photius (cod. 263), rodtwy 3 of rb yrhciov Paprupnbévtes v' xaradelwovta: pdvov, might be so rendered as to imply that, besides these fifty, others also were extant. See Att. Orat., ii. 311, note 2.**

® The second of our speeches (the Meneclean) was discovered in the Laurentian Library in 1785, and was edited in that year by Tyrwhit. In editions previous to that date, Oration i. is made to conelude with a few lines which really belong to the end of Orat. ii. (§ 47, &AX' éreid} 7d mparyua… Wyploacde), and this arrangement is followed in the translation of Iseus by Sir William Jones, to whom our second oration was, of course, then (1779) unknown. In Oration i. all that follows the words nh morhoayres in § 22 was first published in 1815 by Mai, from a MS, in the Ambrosian Library at Milan.

given in each case being that of the person whose estate is in dis. pute) : — I, Trials of Claim to an Inheritance (8.a8txaciat).

1, Or. i., Cleonymus. Date between 360 and 353 B.c. 2. Or. iv., Nicostratus. Date uncertain. 3. Or. vii, Apollodorus. 353 B.c. 4. Or, viii., Ciron. 375 B.c. §, Or. ix., Astyphilus. 369 B.c, 6, Or. x., Aristarchus. 377-71 3.c.

II. Actions for False Witness (Sika: pevdonapruprav). 1, Or. ii., Menecles. 354 3B.c. 2. Or. iii., Pyrrhus. Date uncertain, but comparatively late. 3. Or. vi., Philoctemon. 364-63 B.c.

III, Action to Compel the Discharge of a Suretyship (éyyins dixn). Or. v., Dicseogencs. 300 B.c,

LV. se ie of a Guardian for Maltreatment of a Ward (cicayyeda naxdocas

épdavod). Or. xi., Hagnias. 359 3.c. V. Appeal from Arbitration to a Dicastery (épects).

Or. xii., For Euphilctus. (Incomplete.) Date uncertain.

The speeches of Iseeus supply valuable illustrations to the early General

history of testamentary law. ‘They show us the faculty of adoption,

char-

still, indeed, associated with the religious motive in which it acter- originated, as a mode of securing that the sacred rites of the family istics.

shall continue to be discharged by one who can call himself the son of the deceased. But practically the civil aspect of adoption is, for the Athenian citizen, predominant over the religious; he adopts a son in order to bestow property on a person to whom he wishes to bequeath it. The Athenian system, as interpreted by Iseus, is thus intermediate, at least in spirit, between the purely religious stand- point of the Hindu and the maturer form which Roman testamen- tary law had reached before the time of Cicero.4 As to the form of the speeches, it is remarkable for its variety. There are three which, taken together, may be considered as best representing the diversity and range of their author’s power. The fifth, with its simple but lively diction, its graccful and persuasive narrative, recalls the qualitics of Lysias. The eleventh, with its sustained and impetn- ous power, has noslight resemblance to the manner of Deimosthenes. The cighth is, of all, the most characteristic, alike in narrative and in argument. Iseus is here seen at his best. No reader who is interested in the social life of ancient Greece

necd find Iseus dull. If the glimpses of Greek society which he gives us are seldom so gay and picturesque as those which enliven the pages of Lysias, they are certainly not less suggestive. Here, where the innermost rela- tions and central interests of the family are in question, we touch the springs of social life ; we are not merely presented with scenic details of dress and furniture, but are enabled in no small degree to conceive the feelings of the actors.

The best manuscript of Iseeus is in the British Museum,—Crippsianus A (=Burneianus 95), which contains also Antiphon, Andocides, Lycurgus, and Dinarchus, The next best is Bekker's Laurentianus B (Florence), of the 15th century. Besidcs thesc, he used Marcianus L (Venice), sxc. 14, Vratislaviensis Z. see, 14, and two very inferior MSS., Ambrosianus A. 99, P (which he dis- missed after Or, i.), and Ambrosianus D. 42, Q (which contains only Or. i, ii.), Schémann, in his edition of 1831, generally followed Bckker's text; he had no fresh apparatus beyond a collation of a Paris MS. R in part of Or.i.; but he had sifted the Aldine more carefully. Baiter and Sauppe (1850) hada new colla- tion of A, and also used a collation of Burneianus 96, M, given by Dobson in vol. iv. of his edition (1828). C. Scheibe (Teubner, 1860) made it his especial aim to complete the work of his predecessors by restoring the correct Attic forms of words; thus (e.g.) he gives nyyva for éveyda, dé5uev for dediauev, and the like,—following the consent of the MSS., however, in such forms as the accusative of proper names in -yy rather than -y, or (e.g.) the future davjcopar rather than davotua, &c., and on such doubtful points as ppadrepes instead of hparopes, Or EiAnOuias instead of EtAecOvias.

Recent Editions.—In Oratores Attici, by I. Bekker, 1823-8 ; G. E. Dobson, 1828 ; J. G. Baiter and Hermann Sauppe, 1850. Separatcly, by G. F. Schémann, with commentary, 1831. In Teubner scrics, by C. Scheibe, 1860. English translation by Sir William Jones, 1779. R. J

ISAIAH. I. Isaiah is the name of the greatest, and both in life and in death the most influential of the Old Testament prophets. We do not forget Jeremiah, but Jere- miah's literary and religious influence is secondary compared with that of Isaiah. Unfortunately we are reduced

to infer- ence and conjecture with regard both to his life and to the extent of his literary activity. In the heading (i. 1) of what we may call the occasional prophecies of Isaiah (z.e., those which were called forth by passing events), the author is called “the son of Amoz,” and Rabbinical legend identifies this Amoz with a brother of Amaziah, king of Judah ; but this is evidently based on a mere etymo- logical fancy. We know from his works that (unlike Jeremiah) he was married (viii. 3), and that he had at least two sons, whose names he regarded as, together with his own, symbolic by Divine appointment of certain decisive events or religious truths—Isaiah (Yesha’-yahi), meaning

4 Of. Maine’s Ancient Law, ch. vi.; and the Tagore Law Lectures (1870), by Herbert Cowell, lect. ix., “On the Rite of Adoption, pp. 208 f.

Manu- scripts.

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“ Salvation—Jehovah ”; Shear-Yashiib, “a remnant shall return”; and Maher-shalal-hash-baz, “swift (swiftly cometh) spoil, speedy (speedily cometh) prey” (vii. 3, vii 3, 4, 18). He lived at Jerusalem in the “middle” or “lower city” (2 Kings xx. 4), exercised at one time great influence at court (chap. xxxvii.), and could venture to address a king unbidden (vii. 4), and utter the most unpleasant truths, unassailed, in the plainest fashion. Presumably therefore his social rank was far above that of Amos and Micah ; certainly the high degree of rhetorical skill displayed in his discourses implies a long course of literary discipline, not improbably in the school of some older prophet (Amos vii. 14 suggests that “ schools” or companies “of the prophets” existed in the southern kingdom). We know but little of Isaiah’s predecessors and models in the prophetic art (it were fanaticism to exclude the element of human preparation) ; but certainly even the acknowledged prophecies of Isaiah (and much more the disputed ones) could no more have come into existence suddenly and without warning than the master- pieces of our own Shakespeare. In The Prophecies of Isaiah by the Rev. T. K. Cheyne, vol. ii p. 218, a list has been given of the points of contact bothin phraseology and in ideas between Isaiah and the prophets

nearly con- temporary with him ; Isaiah cannot be studied by himself —he gives much to his successors, but he takes something from his less gifted colleagues.

The same heading already referred to gives us our only traditional information as to the period during which Isaiah prophesied ; it refers to Uzziah, Jotham, Ahaz, and Hezekiah as the contemporary kings. It is, however, to say the least, doubtful whether any of the extant prophecies are as early as the reign of Uzziah. Exegesis, the only safe basis of criticism for the prophetic literature, is unfavourable to the view that even chap. i. belongs to the reign of this king, and we must therefore regard it as most probable that the heading in i. 1 is (like those of the Psalms) the work of one or more of the Sdpherim (or students and editors of Scripture) during the Babylonian exile, apparently the same writer (or company of writers) who prefixed the headings of Hosea and Micah, and per- haps of some of the other books.

In fact, the view of Hengstenberg that the prophecies of Isaiah are arranged chronologically, though not without justification, fails to satisfy the requirements of historical interpretation. Let us put it aside and briefly sketch the progress of Isaiah's prophesying on the basis of philological exegesis, and a comparison of the sound results of the study of the inscriptions. Chap. vi., which describes a vision of Isaiah " in the death-year of King Uzziah," may possibly have arisen out of notes put down in the reign of Jotham ; but for several reasous it is not an acceptable view that, in its present form, this striking chapter is earlier than the reign of Ahaz. It seems, in short, to have origin- ally formed the preface to the small group of prophecies which now follows it, viz., vii. l-ix. 7. The portions which may presumably represent discourses of Jotham's reign are chap. ii. and chap. ix. 8-x. 4—stern denuncia- tions which remind us somewhat of Amos. But the allusions in the greater part of chaps. ii—v. correspond to no period so closely as the reign of Ahaz, and the same remark applies still more self-evidently to vii. l-ix. 7. Chap. xvii. 1-11 ought undoubtedly to be read in imme- diate connexion with chap. vii.; it evidently presupposes the alliance of Syria and northern Israel, whose destruction it predicts, though opening a

door of hope for a remnant of Israel. The fatal siege of Samaria seems to have given occasion to chap. xxviil.; but the following prophecies (chaps. xxix.-xxxii.) synchronize rather with the reign of Sargon than with that of Shalmaneser. Sargon is one

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of those kings whose influence upon the fortunes of the chosen people was the strongest, however little we might suspect this from the Old Testament records. The truth is that Sargon as well as Sennacherib invaded Judah ; the date of the invasion of the former appears to be 711. Judah had, in fact, joined that unfortunate coalition, another member of which was the Philistian town Ashdod. The record of the vengeance taken upon Ashdod is preserved in the narrative in chap. xx.; to that upon Judah no distinct reference is made in Isaiah, but no less than five prophecies, or groups of prophecies, are for the first time fully explained when referred to this king’s invasion of Palestine (xiv. 29-32, xxix.-xxxii., x. 5-xi. 16, xxii, and probably i). Sargon was a successful warrior; and his subjugation of Babylonia, revealed to us by the cunei- form monuments, throws a flood of light upon the obscure but striking little prophecy in xxi. 1-10, so often referred, but referred wrongly, to the Babylonian exile. It hag always been a difficulty hitherto to understand the depres- sion with which Isaiah announces his tidings (see xxi. 3). But we can now easily realize the apprehensions of a member of one of the smaller states when their chief bulwark against Assyria had fallen. Merodach-baladan, as we know from xxxix. 1 (2 Kings xx. 12), had shortly before opened negotiations with Hezekiah. Isaiah had been opposed to a Babylonian alliance, and recognized the divine necessity of the tyrant-city’s fall, but he felt a human sympathy for the smaller states of whose ruin this was but the prelude. This view of the origin of xxi. 1-10 had already suggested itself to the late Mr George Smith (Transactions of Soc. of Biblical Archzxology, ii. 329), but was first raised to the rank of a. philological certainty by Professor Kleinert in an important paper in the Theolog- ische Studien und Kritiken for 1877 (pp. 174-79). The oracle on the fall of Babylon was soon followed by pro- phetic warnings to the other neighbouring states, Philistia, Egypt, and Ethiopia, and probably Moab

and Arabia, though it isa growing opinion, for which strong philological reasons may be advanced, that the epilogue in xvi. 13, 14 was attached by Isaiah to an oracle in archaic style by another prophet (Isaiah's hand can, however, be traced in xvi. 46, 5). In fact, no progress can be expected in the accurate study of the prophets until the editorial activity both of the great prophets themselves and of their more reflective and studious successors is fully recognized.

Thus we have already met with two great political events (the Syro-Israelitish invasion under Ahaz, and the first Assyrian invasion under Sargon) which called forth the wonderful spiritual and oratorical faculties of our prophet, and quickened that mysterious power of insight into the future which cannot reasonably be denied (to say the least) to simpler ages and races (see Tholuck, Die Propheten und thre Werssagungen, Gotha, 1861). A third still more remarkable invasion remains—that of Sennacherib, to which four of the extant prophecies must undoubtedly be referred, viz., chap. xviii, chap. xvii. 12-14, chap. xxxili., and chap. xxxvil. 22-35 (or at any rate as far as ver. 32). " The last of these is specially interesting, as it has evidently not been so elaborately worked up as the rest of Isaiah's prophecies, and seems to correspond more nearly to a spoken discourse. Its incisiveness is exactly what we should expect from the stirring circumstances under which it purports to have been delivered.

A special reference seems needed at this point to one of the two oracles on Egypt which, in the light of Oriental discovery, seems to be rightly ascribed to the period of Sargon—chap. xix. The comparative feebleness of the style warrants a hesitating conjecture that, though the basis of the prophecy is Isaianic (the points of contact with the prophet's acknowledged works are opposed to any

other view of its origin), yet in its present form it has undergone the manipulation of a disciple of the prophet. Isaiah's disciples are indeed expressly referred to by the prophet himself as the guardians of one important prophecy (viii. 16) ; and, granting an editorial activity, it is the most conservative and current view open to us to suppose that the

disciples of the prophet were also his first editors. Every one is familiar with the idea of the editorial process through which the historical books of the Old Testament have passed; it would be culpable indolence to neglect the phenomena which record the similar process through which the other books, especially the prophetic, have passed. It should be added, however, that the Isaianic origin of the epilogue in xix. 18-24 (the point of commence- ment of the epilogue is given differently by some) has been frequently called in question. The chief stumbling-blocks are the precise, circumstantial details of the prophecy, which are thought to be not in the manner of Isaiah. In particular the reference to the "city of destruction," "ur ha-héres (v.1., " city of thesun," 'tr ha-khéres), has awakened suspicion. Accepting (which it is not necessary to do) the various reading, it would be plausible to regard ver. 18 as a fictitious prophecy in the interests of Onias, the founder of the rival Egyptian temple to Jehovah at Leontopolis (in the nome of Heliopolis), Josephus, Antig., xii. 9, 7.

II. We are now brought face to face with the question whether the whole of the book which now bears the naine of Isaiah was really written by that prophet. The question relates to xiii. 2-xiv. 23, xxiv.—-xxvil, xxxlv., XXXV., and xL-Ixvi. (xxi. 1-10 must henceforth be excluded, on objective, historical grounds, from the list of doubtful pro-phecies). It is not necessary here to enter into the history of the controversy (the father of which may be said to be the subtle-minded Aben Ezra). Nor will it be necessary to spend much time on the well-worn but inconclusive arguments of the older critics. The existence of a tradi- tion in the last three centuries before Christ as to the authorship of any book is (to those acquainted with the habits of thought of that age) of but little critical moment ; —the Sdpherim or students of Scripture in those times were simply anxious for the authority of the Scriptures, not for the ascertainment of their precise historical origin. It was of the utmost importance to declare that (especially) Isaiah xl-lxvi. was a prophetic work of the highest order ; this was reason sufficient (the Sdpherim may have had other reasons, such as phraseological affinities in xl.—lxvi., but this was sufficient) for ascribing them to the royal prophet Isaiah. When the view had once obtained currency, it would naturally become a tradition. The question

of the Isaianic or non-Isaiauic origin of the dis- puted prophecies (especially xl.—lxvi.) must be decided on grounds of exegesis alone. There dre indications among critics, bred in very different schools, of a growing percep- tion of this truth. We therefore simply chronicle the fact that the older critics appeal to Ezra i. 2 (interpreted by Josephus, Antig., xi. 1, 1-2), to the Septuagint version of the book (produced between 260 and 1380 B.c.), in which the disputed prophecies are already found, and to the Greek translation of the Wisdom of Jesus, the son of Sirach, which distinctly refers to Isaiah as the comforter of those that mourned in Zion (Ecclus. xlviii. 24, 25). It will be remembered that our prophet himself flourished in the 8th century B.c., and that the Babylonian captivity intervened.

The fault of the combatants (for there has been far too much animosity on both sides) in the controversy as to the origin of what we may call, for brevity's sake, II. Isaiah (including all the disputed prophecies) has been that each party has only seen "one side of the shield." It will be admitted by philological students that the exegetical data supplied by (at any rate) Isa. xl.-lxvi. are conflicting, and

therefore susceptible of no simple solution. (In other words, Isa. xl-lxvi. cannot have been written as it stands either by Isaiah or by a prophet at the close of the exile.) This remark applies, it is true, chiefly to the portion which begins at lii. 13. The earlier part of Isa. xl.-lxvi. admits of a perfectly consistent interpretation from first to last. There is nothing in it to indicate that the author's standing-point is earlier than the Babylonian captivity. His object is to warn, stimulate, and console the captive Jews, some full believers, some semi-believers, some unbelievers or idolaters. At lil. 13 new phenomena begin to show themselves, indicative, not indeed of a changed standing-point, but at least of another date and pen. No doubt an author may change his style, writing in a different mood ; we must at all events suppose that the author (whoever he may have been) was in a different tone of mind when he wrote so " hardly, obscurely, and awkwardly " (Delitzsch) as in li, 13-liiii [Ewald is bolder. He traces this passage to an anonymous prophet of the reign of Manasseh, to whom are also due xl. 1, 2 (?) and

lvi. 9-lvii. 11; and it must be owned that the style of the latter is equally harsh with that of lii. 13, &c. |

III. But let us devote a somewhat closer attention to the easier and more intelligible portion of the last twenty-seven chapters. It will amply remunerate us; for there is no more striking specimen of prophetic rhetoric in the Old Testament. More particularly, it will be well to study continuously chaps. xl-xlviii., which evidently forin a section by themselves, introductory to that which begins at chap. xlix. They have one leading idea—the great crisis impending over Babylon and Israel. Babylon and her gods must fall, that Israel may rise again with the glorious function of giving a religion to the world. The develop- ment of this idea is full of contrasts and surprises: the vanity of the idol-gods and the omnipotence of Israel's helper, the sinfulness and infirmity of Israel and her high spiritual destiny, and the selection (so offensive to patriotic Jews, xlv. 9,10) of the heathen Cyrus as thie instrument of Jehovah's purposes, as in fact His Messiah or Anointed One (xlv. 1), are brought successively before us. [The prophet, however, does now and then speak as if Jehovah Himself would interpose to help His people, see xlii. 18, &c.] Hence the semi-dramatic character of the style. Already in the opening passage mysterious voices are heard crying, "Comfort ye, comfort ye my people" ; the plural indicates that there were other prophets among the exiles besides the author of Isa. xl-xlviiii Then the Jews and the Asiatic nations in general are introduced trembling at the imminent downfall of the Babylonian empire. The former are reasoned with and exhorted to believe; the latter are contemptuously silenced by an exhibition of the futility of their religion. Then another mysterious form appears on the scene, bearing the honour- able title of "Servant of Jehovah." Who this personage may be is much disputed, and naturally enough ; for while, according to xlili. 1, he may "in some sense be called" Israel, it is clear from xliii. 8 that in another sense he is perfectly distinct from Israel. This is a paradox to which this, the first book as it may be called of the Prophecy of Israel's Restoration, does not supply the key. All that we learn from this portion is that Jehovah has removed the two chief obstacles to Israel's accomplish- ment of its destiny, the one by a free pardon, the other by raising up Cyrus as the instrument of the national regenera- tion.

The section which begins at chap. xlix. is written (at first, at any rate) in the same delightfully flowing style as its predecessor. We are still among the exiles at the close of the captivity. But the new book has one peculiarity, viz., that Babylon and Cyrus are not mentioned in it at

all. [(True, there was not so much said about Babylon as we should have expected even in the first book ; the paucity of references to the local characteristics of Babylonia is one of the negative arguments urged in favour of the Isaianic origin of the prophecy.] Israel himself, with all his incon- sistent qualities, becomes the absorbing subject of the prophet's meditations. The section opens with a soliloquy of the " Servant of Jehovah," in which the same paradox meets our view which we discovered in the earlier books ; the * Servant of Jehovah" is addressed as Israel, and yet is shortly afterwards distinguished from that people. The immediate prospects of Israel seem now to be overclouded ; but the prophet " bates not heart nor hope." He comforts Zion with the thought of the unchanging love of God : "Can a woman forget her sucking child," &c. (xlix. 1, comp. li. 12, 13). Then his tone rises, Jerusalem can and must be redeemed ; he even seems to see the great divine act in process of accomplishment. Is it possible, one can- not help asking, that the abrupt description of the strange fortunes of the ' Servant '—by this time entirely personal- ized—was written to follow chap. lii. 1-12? ;

The whole difficulty arises from the prevalent assumption that chaps. xl.—lxvi. form a whole in itself. Natural as the feeling against disintegration may be, the difficulties in the way of admitting the unity of chaps. xl.-lxvi. are insurmountable. Even if, by a bold assumption, we grant the unity of authorship, it is plain upon the face of it that the chapters in question cannot have been composed at the same time or under the same circumstances; literary and artistic unity is wholly wanting. But once admit (as it is only reasonable to do) the extension of Jewish editorial activity to the prophetic books, and all becomes clear. Just as the historic records were filled out and adapted to the religious wants of later ages, so too were the prophetic. Orthodoxy loses nothing

by the admission ; for why should not the same Spirit of wisdom which, as the church believes, inspired the prophets, have vouchsafed all needful gifts to the "sons of the prophets"—the prophetically-minded Sépherim? Even the lowest degree of inspiration, as Rudolf Stier remarks, is one of faith's mysteries. But we are not now concerned with orthodoxy, but only with the religious records of the Israelites. The record before us gives no information as to its origin. It is without a heading, and by its abrupt transitions, and honestly pre- served variations of style, invites us to such a theory as we are now indicating.

There are portions of Isa, xl.-lxvi. of Palestinian origin, and some of them composed previously, others subsequently, to the exile. These are partly imbedded in, partly appended to, a work written at the close of the exile by a true though litcrary prophet, well acquainted with the more archaic and less purely literary prophet Isaiah, but not without numerous peculiarities of his own. These insertions and appendices are sevenin number. The first (a) is lil. 13-liii., which, as Ewald (who pointed the way which later eritics have to follow) rightly felt, proceeds from a time of per- secution. It should bo taken in connexion with (0) lvi. 9-lvii., which is in the same harsh but strong style, and has a large num- ber of distinct historical data. "The strikingly Palestinian char- acter of the scenery in lvii. 5, 6, the presumed reference to perse- eution in lvii. 1, and the correspondence of the sins imputed to the people with pre-exile circumstances," secm to favour a reference to the persecution of Manasseh, (So Ewald, Bleck, and even Luzzatto, who ascribes all the rest of the book to Isaiah.) It must be admitted that a religious persecution set on foot by Manasseh is not directly affirmed in the Old Testament; but it is a legitimate inference from a combination of passages, and it were hypercriticism to doubt it. Next comes (e) a short Prppheey. complete in itself (Ivi. 1-8), directed against the Jewish pride of race. The cireum- stances presupposed are manifestly neither those of the age of Isaiah nor yet those of the latter part of the exile :—(1) the temple is in existence, ver. 5 ; (2) a special duty is inculcated (Isa. x]. and the following chapters are entirely taken up with infusing a new spirit into the Jews ; the correction of details is left to the future) ; and (3) this duty is one which was specially enforced in the age of Jeremiah

(xvii. 19-27) and in that of Nchemiah (Neh. xiii. 15-22), If we further cousider the apprehensions of exclusion from religious

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privileges expressed by the eunuchs, we can hardly doubt that the

eriod of Nehemiah (when proselytes began to gather to-J erusalem) is that to which this prophecy belon S—a period specially charac. terized by legal rigour (see Neh. xiii.), Another isolated prophecy (d) is chap. lviii. Its practical, hortatory tone reminds us of lvi, 1-8, and the stress laid upon fasting—the true fasting of the heart-— points equally to the post-exile period. See Zech. vii. 5 (comp. viii. 19); Joc] ii, 12,18. (It is here assumed that the book of Joel is a work of the Persian period. Nothing but the habit of looking at each book of Scripture separately, instead of in connexion with those of similar style and contents, hinders this theory from attain- ing a more general prevalence.) Whether this prophecy comes from the same author, or simply from the same school, as lvi. 1-8, it is neither possible nor of any importance to determine. From the same school, too, if not from the same author, must have proceeded (c) chap. lix. It has no distinct connexion with chap. lviii., but the tone is similar. The first part of the chapter presents affinities with the book of Proverbs (a favourite subject of study during or after the exile, when, as it would seem, the introductory chapters, with their glowing portraiture of life in a metropolis, were prefixed), (f) The prophecy in chap. Ixiii. 1-6 is one of the most obseure in the prophetic literature. 1 would indeed not be hopeless to assign a probable date, but this would depend upon a consideration of other prophecies (notably Joel and Malachi), for which we have not space here. Suffice it to point out the eschatological apocalyptic tone which prevails in it. How unlike it is to the honicd rhetoric of him whom we are accustomed to call the Second Isaiah: "It ig certainly a strange phenomenon, this reference to a great battlefield in Edom, when the grand object of II. Isaiah is to help the Jews to realize their coming deliverance from Babylon. It creates a serious difficulty for those who maintain that II. Isaiah was written at one time and under one set of impressions. The complications of the problems of Biblical criticism are only beginning

to be adequately realized" (The Prophecies of Isaiah, ii. 99). At present Ixiii. 1-6 is an isolated passage, but it has affinities with lix. 15)-20, and with chap. xxxiv., and it is probable that chaps, xxxiv., lix., and Lxiti. 1-6 were occasioned by the same contemporary circumstances, The gorgeousness of the theophany reminds us of Ezckiel and of the Apocalypse.

With regard to the rest of chaps. xl.-Ixvi., one general remark seems necessary. It is only the inveterate habit of reading Ixiii, 7-Ixvi. as a work relating to the close of the exile that prevents us from seeing how inconsistent its tone and details are with this presupposition. J.ooking at it with eyes that strive to be impartial, we cannot resist the impression that it has not only come down from the restoration period, but that it was written at different parts of that period. Let us pursuc the examination of the sections separately.

(9) Chaps. 1xili, 7-lxiv. This consists of " thanksgiving, peni- tence, and supplication in the name of the pious portion of the Jewish nation." The tone is exactly that of the Lamentations ; the desolation of the temple and of the Jewish cities (1xiii. 18, Lxiv. 10, 11) is described with all the emotion of an eye-witness. The style of the section is unusually abrupt.

(4) Chap. lxv, The subject-matter is 'alternate threatening and promise. Most commentators regard this chapter as the answer of Jehovah to the [prayer of the] church [in chaps. lxiii., Lxiv.]." But there are grave objections to this view. "The divine speaker makes not cvena distant allusion to the difficulty stated in the foregoing prayer." Observe, too, that in chap. lxiv. the chureh speaks as representing the nation, whereas in chap. Ixy. the national union is deseribed as broken by open idolatry. The sins referred to in vers. 3-5 and 11 are at least in part characteristic! of Canaan rather than Babylonia ; and so also is the reference to the vintage in ver. 8. On the other hand, there are passages in vers. 11-25 which have been thought to point to the period of the exile,—e.g., 'that forget my holy mountain" (ver. 11), and the entire deserip- tion of the new Jerusalem. We admit that one of the exiles might have written such passages, but it is more probable that they were written by onc of the returned Jews. The actual condition of the

new Judean state was very far from corresponding to the glorious predictions of chap. lx. What more natural than that prophetic voices should have continued to point to the future for the fulfil- ment of those predictions? [Hence we can account for the parallel between Ixvi. 12 and lx. 4. Note in passing that the figure in lx. 16 has received a different application in lxvi. 11; the writer of chap. lxvi. is familiar with the works of his predecessors, and uses them with freedom.] As to the phrase 'that forget my holy moun- tain," a similar one occurs in ver. 5 of Ps. exxxvil., which is gene-

1 See The Prophecies of Isaiah (1880-81), vol. ii. The view main- tained is that the idolatrous practices referred to, so far as they are distinctively Palestinian, were renewed by some of the Jews on their return to Palestine. Weare apt to forget the local character of ancient eults, also the mixed motives of men. The Jews who returned, and

still more the succeeding generations, cannot have been uniformly as pious and believing as Ezra,

rally admitted to belong to the restoration period. A phraseological argument for a post-exile date may at any rate be dednced from the words "the God of Amen" (Ixv. 16), which point to an age in which liturgical forms containing the word Amen were abundant.

(¢) Chap. lxvi.. This chapter has peculiar difficulties, and we must take it in two parts, vers. 1-4 (or 1-5) and 5~24 (or 6-24). (1) Verses 1-4 are highly perplexing. Everywhere else in II. Isaiah the existence of a temple is assumed to be a neccssity for the highest religious life (see liv. 28, Lv. 7, Ux. 7, Ixvi. 20,21), Tn these four verses alone the prophet appears to assume a position of hostility both toit and to the sacrificial system, The temple appears to be unbuilt, and the writer to be opposed on principle to its re- erection. lt is not at all impossible that a religious Jew should have taken up this position. In the central portion of the book of Enoch the second temple is boldly denounced, and the offerings of those who worshipped in it are called "unclean," on the ground that the rebuilding ought to have been postponcd till the kingdom of Israel

had been set up in the ends of the earth (lxxxix. 73, xci. 13). If, therefore, we follow appearances, we are bound to regard vers. 1-4 as a separate fragment, interpolated by the latest editor. The fatal objection to such an hypothesis comes from ver. 5, which unitcs two phrases peculiar—the one to the section vers. 1-4, the other to the section vers. 6-24. It is evidently a designed link between the two parts of the prophecy in chap. lxvi., and as evi- dently is not the work of a mere mauipulating scribe, but of the author. We must therefore interpret vers. 1-4 on the analogy of the famous passage Jer. vii. 22, which seems to discountenance sacrifices altogether, but in reality only condemns them when gone through as mere forms (see Jer. xxxiii. 18). (2) Verses 5-24 con- sist, like chap. lxv., of alternate threatening and promise. The threatening is mainly addressed to the hostile Gentiles, but partly also to the idolatrous Jews ; and the idolatrous practices denounced (ver. 17) are the same as those in lxv. 4, 5 (initiation into heathen mysteries and eating "unclean" food). The temple has been rebuilt, and the sacrificial system in some forin has been restored, — such at least appears the most natural interpretation of the allusions in vers. 6, 20, 21.

On the whole, we seem to be led to the following conclusions with regard to (g), (2), and (¢) :—first, that the passage lxiii. 7-lxiv. is entirely distinct from the prophecies in the midst of which it ocenrs, and that it was probably written early in the exile by one of the Jews left behind in Palestine; and, secondly, that the whole of chaps. lxv. and lxvi. proceed from one author, thongh they were certainly not written continuously. A comparison of ver. 6 with Joel iii. 12-16, and also of the contexts of both passages, snggests that chap. Ixvi. (and consequently Ixv.) was written by a contem- porary of Joel (7.c., well on in the Persian period).

As the result of our digression, we are enabled to do better justice to what may be called the second book of the prophecy of Israel's restoration. Chap. lii. 13-liii. is bascd upon an early work, descrip- tive, however, as it would scem, not of the martyrdom of an Tcl or a Jeremiah, but, even in its original form, of an ideal (or, as orthodoxy holds, ideal and historical) personage, the first sketch as it were (Job, in

the poem which bears his name, is another) of the Servant of Jehovah. But it is proper to speak here with great hesi- tation. No analysis can be skilful enough to bring out a descrip- tion of a mere martyr ; it is simply on linguistic grounds that we assume the existence of this remarkable section in some form or other, but a form not very unlike the present, at a date previous to that of the other portraits of the "Servant." By omitting it, how- ever, we obtain a much improved connexion ; chap. liv. forms the finest of all possible sequels to lii. 9-12. The transition to the next chapter is, it must be confessed, a little abrupt, and indeed the remainder of the book has the appearance of not having becn com- pletely worked up; it was the more natural, therefore, for the Sopherim to insert or append to it prophecies mostly of later origin. But no one can fail to observe how greatly chap, lx. gains by being read in connexion with lv, 12, and especially with liv, 1, &¢,

_in chap. Ixi. the "Servant of Jehovah" appears for the last time (if it be not rather the prophet who is the speaker) ; and chap. 1xii. closes the second book of the prophecy of restoration with the wel- come summons to depart from Babylon.

IV. We have said nothing hitherto, except by way of allusion, of the disputed prophecies scattered up and down the first thirty-nine chapters of the book of Isaiah. It is indeed not absolutely necessary to devote a special survey to them here ; the data which they furnish are found (with important additions) in the second part of the book. There is only one of these prophecies (putting aside xxi. 1-10) which _may, with any real plausibility, be referred on exegetical grounds to the age of Isaiah, and that is chaps. Xxlv.~~xxvli. The apparent grounds are (1) that accord~~ ing to xxv. 6 the author dwells on Mount Zion ; (2) that

Moab is referred to as an enemy (xxv. 10); and (3) that,

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at the close of the prophecy, Assyria and Egypt are men- tioned as the principal foes of Israel (xxvii. 12, 13). But the explanation was long ago seen by Ewald, viz., that the author, being less richly endowed with the

prophetic spirit, has interwoven precious fragments of old propliecies. The tone and spirit of the prophecy as a whole point to the same late apocalyptic period to which chap. xxxiv. and the book of Joel in a faint degree, and much more strikingly the last chapter (at any rate) of the book of Zechariah, may unhesitatingly be referred.

A word or two may perhaps be expected on Isa. xiii., xiv., and xxXiv., xxxv. (a suggestion has already been offered with regard to the latter prophecy). These two oracles agree in the elaborateness of their description of the fearful fate of the enemies of Jehovah (Babylon and Edom are merely representatives of a class), and also in their view of the deliverance and restoration of Israel as an epoch for the whole human race. There is also an unrelieved sternness, which pains us by its contrast with Isa. xl.—lxvi. (except passages of this portion which are probably not homo- geneous with the bulk of the prophecy). They have also close affinities with Jer. 1., li, a prophecy (as Budde has proved on philological grounds) of post-exile origin, but ure apparently earlier than that longest and least striking of all the prophecies.

The literary characteristics of the acknowledged pro- phecies of Isaiah have been thus summed up by Ewald :—

‘* The thing of chief importance is, that we are wholly unable to name a special peculiarity and favourite manner of style in the case of Isaiah. He is not the specially lyric, or the specially elegiac, or the specially rhetorical and monitory prophet, as, ¢.g., J oel, Hosea, Micah, in whose writings a special manner is predominant; but every kind of style and every variation of exposition is at his com- mand to meet the requirements of his subject ; and this it is which in respect of style constitutes his greatness, as well as generally one of his most prominent excellences. His fundamental peculiarity is only the ous majestic repose of style, proceeding froin the full and surecommand of his subject. This repose by no means requires that the language should never be more violently agitated, and not blaze up where the subject demands it ; but even the most extreme agitation is bridled by this repose in the background, and does not pass beyond its proper limits, and soon returns with higher self- mastery to its regular flow, not again to leave

it, ii. 9-iii. 1, xxviii. 11-28, xxix. 9-14.”— The Prophets, Eng. transl,, ii, 10, 11.

This representation has sometimes been misused in the interests of a party to show that Isaiah’s versatility was absolutely unlimited, and that no conceivable prophecy, in which affinities with Isaiah can be traced, may not have proceeded from his pen. But Isaiah, though more versa- tile than his predecessors (sovra gli altrz come aquila vola), was not unmindful of that “ limitation” which, Goethe assures us, is the first sign of mastership. He was nota Proteus, and the characteristics mentioned above by Ewald cannot be transferred without large modifications to the prophecy of Israel’s restoration.

We sink to a lower level when we pass to the disputed prophecies interspersed in chaps. i.~~xxxix., which can~~ not lay claim to a high perfection of style, with, however, one exception, and that such a striking one that it is difficult to believe that the passage always occupied its present position. The ode on the fall of the king of Babylon in chap. xiv. 4-21 is as brilliant with the glow of lyric enthusiasm as the stern prophecy which precedes it is, from the same point of view, deficient ; it is too faint a eulogy which Ewald gives to it in the words, “a poetical and highly finished lyric.” It is in fact worthy to be put by the side of the finest passages of chaps. xl.—lxvi.,—of those passages which irresistibly rise in the memory when we think of “Isaiah.”—But what shall we say—what language is adequate to the divine beauty of such passages as Handel linked to music almost as divine: “ Comfort ye, comfort ye my people, saith your God”; ‘“ He shall feed His flock like a shepherd”; “ He was oppressed, and He

was afflicted, yet He opened not His mouth”? Silver tones of which the ear is never weary; honied rhetoric, which thrills, like a subtle odour, even those who have lost the key to its meaning. It should be remembered, however, that these delightful passages are mostly confined to that part of chaps. xl-xlvi. which has, on the whole, a literary and esthetic unity. Among the passages which we have indicated as of doubtful age and origin there are but two which are

generally remembered. One of these has apparently been adopted and restricted by the great prophet of chap. xl—xlviii, and is therefore not abso- lutely an exception. The other has commended itself not so much to the affections as to the imagination of later readers (we refer to the wonderfully picturesque Vision 1n lxiii. 1-6). ; _—

V. From a religious point of view there is a wide differ- ence, not only between the acknowledged and (taking them altogether) the disputed prophecies of the book of Isaiah, but also between those of the latter which occur in chaps. i.—xxxix., on the one hand, and the greater and more striking part of chaps. xl.~~lxvi., on the other. We may say, upon the whole, with Dr Duhm, that Isaiah represents a synthesis of Amos and Hosea, though not without important additions of his own. Isaiah's "place in the affections of all succeeding generations is due to the fact that he was, perhaps, the first to preach in distinct terms the doctrines of a personal Messiah and of the spiritual brotherhood of all nations. He foresaw that, in the awful 'day of Jehovah' which former prophets had announced, few even of the chosen people should pass the ordeal, and so deep was his conviction of this that he expressed it in the name of one of his sons, Shear Yashub, 'a remnant shall return.' But he was too 'bold,' as St Paul says, to terminate his speculations at so early a point. By com~~ bining the doctrine of the few that should be saved with that of the necessary triumph of Jehovah's kingdom, he was prepared to receive a new and grand revelation. He saw in prophetic vision an exalted personage ascending the throne of David, who should attract the whole world into voluntary submission to his rule… ... And thus to the twofold elementary doctrine of the sole divinity of Jehovah and the awful strictness of the impending judgment a fellow-truth was added, viz., that of the personal Messiah, which developed finally into the crowning doctrine of the spiritual equality of all nations" (Cheyne, The Book of Lsaiah Chronologically Arranged, Introduction, p. xi.).

This very conception, which is, as it were, the blossom of the revelations of the acknowledged portions of Isaiah, is conspicuously wanting in the disputcd prophecies; or rather, this particular form of the conception has disap- peared. Not the ideal king of Israel, but a figure vari- ously described, and susceptible (as experience proves) of different

explanations, is the centre of the longest and grandest of this cognate group. Who is the ‘Servant of Jehovah”? Certainly not, in the proper sense of the word, the Messiah ; certainly not, in all the extant descrip- tions, an individual. Both these explanatious must from the very first be excluded as absolutely opposed to a philo- logical exegesis. The following are, in brief, the leading opinions which have been held :—(1) Hitzig’s, that the Jewish people in exile is referred to, as distinguished from the heathen ; (2) that of Paulus and Maurer, that the Ser- vant is the pious portion of the people; (3) that of Gesenius, that the prophetic order is intended; (4) that of Hofmann, combining (2) and (3), that it means Israel, the prophetic people, suffering on behalf of the heathen world; (4) that of Oehler and Delitzsch, that “the conception of the Servant of Jehovah is, as it were, a pyramid, of which the base is the people of Israel as a whole, the central part Israel ‘according to the

Spirit,’ and the summit the person of the mediator of salvation who arises out of f[srael.” [Delitszch, however, who now traces this historical person, the Christ of the gospels, in the strongly individualizing portrait in chap. liii., formerly considered the subject of that chapter to be the spiritual Israel ; see his article in Zeitschrift fiir lutherische Theologie, 1850, pp. 29-42.] This last theory has been advocated on partly new grounds by the writer of this article in his work called Zhe Pro- phectes of Isaiah, ii. 194-200, where it is further admitted that though the Servant of Jehovah, even in the most individualizing passages, is not properly speaking the Messiah, yet there are features in the description borrowed from the earlier portraits of the Messianic king, features which, regarded strictly, may be inconsistent, but which serve to keep up the historical continuity of the announce- ment of salvation. ‘It was natural and necessary that the die from which the coins with a royal stamp had proceeded should be broken, the royalistic form of the Messianic conception having become antiquated with the hopeless downfall of the kingdom of Judah; but

equally so that fragments of the die should be gathered up and fused with other elements into a new whole.”

Among the other characteristic religious peculiarities of the disputed as opposed to the acknowledged prophecies are—(1) the emphasis laid on the uniqueness, eternity, creatorship, aud predictive power of Jehovah (xl. 18, 25, zli. 4, xliv. 6, xlviii. 12, xlv. 5;6, 18, 22,xlwi. 9, slieas xlv. 18, xli. 26, xhiii. 9, xliv. 7)xlv. 21, alvii. 14)3 ay the ironical descriptions of idolatry (Isaiah in the acknow- ledged prophecies only refers incidentally to idolatry), xl. 19, 20, xli. 7, xliv. 9-17, xlvi. 6; (3) the personality of the Spirit of Jehovah (mentioned no less than seven times, see especially xl. 3, xlviii. 16, xiii. 10, 14); (4) the influ- ence of the angelic powers (xxiv. 21); (5) the resurrection of the body (xxvi. 19); (6) the everlasting punishment of the wicked (Ixvi. 24); (6) vicarious atonement (chap. liii.).

It is unnecessary to do more than chronicle the singular attempts of the Jewish scholar, Dr Kohut, in the Z. D. M. G. for 1876 to prove a Zoroastrian influence on chaps. xl.-lxvi. Were this proved, of course the date of these chapters would be determined. But the baselessness of this hypothesis has been shown by M. de Harlez in the Fevue des questions historiques, and by Dr Matthes in the Theologisch Tijdschrift.

There is, however, an equally striking difference among the disputed prophecies themselves, and one of no small moment as a subsidiary indication of their origin. We have already spoken of the difference of tone between parts of the latter half of the book ; and, when we compare the disputed prophecies of the former half with the Prophecy of Israel’s Restoration,- how inferior (with all reverence be it said) do they appear! Truly “in many parts and many manners did God speak” in this composite book of Isaiah! To the Prophecy of Restoration we may fitly apply the words, too gracious and too subtly chosen to be translated, of M. Renan, “ce second Isaie, dont l’4me lumineuse semble comme imprégnée, six cent ans d’avance, de toutes les rosées, de tous les parfums de l’avenir” (L’Antéchrist, p. 464); though, indeed, the common verdict of sympathetic readers sums up the sentence in a single phrase—“ the Evangelical Prophet.” The freedom and the

inexhaustibleness of the undeserved grace of God is a subject to which this gifted son constantly returns with “a monotony which is never monotonous.”! The defect of the disputed prophecies in the former part of the book (a defect, as long as we regard them in isolation, and

1 The Rev. G. G. Bradley, Master of University College, Oxford, in

coe sermon on the Book of Isaiah, preached February 18,

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not as supplemented by those which come after) is that they emphasize too much to a Christian feeling the stern, destructive side of the series of divine interpositions in the latter days. But we will not attempt to exhaust a subject on which any thoughtful reader is competent to

eak. i How is it, then, that so many Biblical students (especially in Great Britain and America) still adhere to the view, so profoundly opposed to philological exegesis, that one man wrote the whole of the book of Isaiah? Partly no doubt from a fear lest, in giving up the view of Isaiah held in the time of Christ, the orthodox thevlogy should be insensibly undermined. The fear was at one time justified, .¢., in the early stages of the critical controversy ; but the fact that orthodox theologians and men of deep Christian faith do hold the composite origin of Isaiah is a practical proof that the fear is no longer opportune. Another reason is a certain instinctive aversion to the questioning of time-honoured traditions, and an esthetic abhorrence of disintegration —a bad reason, for (1) ancient traditions are seldom entirely wrong, and it is the element of truth which gives them vitality, and (2) disintegration is only a preliminary to reconstruction. A third reason, often operating in combination with the second, is worthy of all respect. It is that in reading the disputed prophecies, especially those which form the latter part of the book, conservative critics (if we may be allowed the phrase) are conscious of a number of peculiarities both of phraseology and (in chaps xl.—Ixvi.) of historical allusion which raise associations of the age of Isaiah. We have already referred to the latter class of peculiarities. They are indeed of more importance than the former, which can obviously be explained by the profound influence

which so great a prophet as Isaiah must have exercised, and demonstrably did exercise, on his successors. The view which has been indicated above as the most just to exegetical facts, and to what we know from other sources of the editorial activity of the Sdpherim, is that the latter part of the book of Isaiah is of an origin as composite as the former. It is, however, of course our duty to mention the prevalent explanation of the conservative school of critics, viz., that the allusions to the scenery of Palestine and to the religious condition of the Jews of a time prior to the exile are Isaiah's involuntary betrayals of his authorship. It is admitted that there are numerous passages which presuppose the fall of Jerusalem and the residence of the exiles in Babylonia. But it is urged that the other class of passages are so many providentially permitted indications of the true date of the author, who was in reality the subject of an extraordinary ecstatic impulse, which almost, but not altogether, effaced his consciousness of the present. To quote from the same able and interesting sermon referred to above, "'The Isaiah of the vexed and stormy times of Ahaz and Hezekiah is supposed in his latter days to have been transported by God's Spirit into a time and a region other than his own. aS ae The voices in his ears are those of men unborn, and he lives a second life among events and persons, sins and suffering, and fears and hopes, photographed sometimes with the minutest accuracy on the sensitive and sympathetic medium of his own spirit." The objection is, first, that this theory is extremely artificial; secondly, that the only allusions greatly worth considering occur in masses in those portions only of the second part of Isaiah which, for a combination of reasons, should most probably be separated from the remainder; and thirdly, that this theory does not do justice to those passages which contain indications at once of a Palestinian locality and of a post- exile date,

But if sufficient account has not yet been taken by many

anti-traditionalist critics of the data which conflict with the Babylonian origin of Isa. xl—lxvi. as a whole, it must in fairness be admitted that conservative critics have not adequately appreciated those which make

distinctly for a Babylonian origin. Take Isa. xl.—xlviii. by itself (it must be allowed to form a whole), abstracting from all considerations of modern controversy, and no one would dream of assigning it to any other time than the close of the exile, any more than he would of ascribing ‘ By the waters of Babylon we sat down and wept” (Ps. exxxvii.) to the authorship of David. There might have been a case for the Isaianic origin of “‘Go ye out from Babylon” (xlviii. 20), if the passage had only run, “ Behold, in days to come my people shall go forth from Babylon.” There might have been a case for such an origin of “Thus saith Jehovah to Cyrus” (xlv. 1), if the passage had but run thus, “ Behold the days come that I will raise up a king, Cyrus by name.” But no one fresh from the perusal of the other great prophetic writings would imagine such a thing as that Isaiah had died to his actual present, and lived again among men still unborn.

A few points of detail have still to be considered.

(a) To the argument from phrascology, on which Knobel in particular has laid great stress in the anti-traditional intcrest, it is impossible to do justice here. A bare list of names would not be luminous, and the lists given by reeent English conservative critics warn us of the difficulty of constructing such catalogues fairly. None of these crities appear quite to understand the object of the appeal to phraseology, or to be aware that the mere peculiarity of a word is not important, unless it points toa different linguistic stage from that of the historical Isaiah, or unless its sense is one that implics a great development of thought. It appears to us indeed that the argument from phrascology is not one of much critical moment ; but on this part of the subject we must refer to more special treatises.

(b) Nor can we satisfy ourselves that the existence of parallels between passages of the disputed prophecies and passages of pre-exile prophets —a chief bulwark of the conservative theory as presented by Delitzsch —is a fact of much greater value. In some respects indeed these parallels are most interesting and instructive. They help us to form a fuller idea of the literary and prophetic

hysiognomy of the — They show us too “ how instinct- ively the prophets formed as it were a canon of prophetic Scrip- tures for themselves, and also how free they were from the morbid craving for originality.” But on which side the originality lies it is not always easy for a candid mind to determine ; one must be on one’s guard against a prejudice in favour of the more brilliant genius, and against thinking that the more strikingly expressed passage is necessarily the more original. For has not a brilliant genius been known to copy word for word from an extremely ordi- nary writer? Having said thus much by way of caution, let usadd some of the more striking parallels to passages of Isa. xl.-lxvi. in prophets earlicr than the elose of the captivity.

Isa. xxxiv. 6, 7; comp. Jer. xlvi. 10. Isa. xl. 13, 14, yy, vel. xxi. 15. Isa. xl, 18, 20,

and parallels, ed a Isa. xli. 14, Teas xisi1. (5; 55> | OO ee, 10, xvi. 27. Isa, xliv. 2,

Isa. li. 15, ys er. axl: Sb:

Isa. lv. 38, » der. xxxii, 40.

Isa. lvi. 9, yy edoteesil, By

fsa. lvii. 9, »» Ezek, xxiii. 40, 41. Isa. lviii. 7, » Ezek. xviii. 7, 16.

Isa. li. 19, – abs ail, 7.

Isa. li. 20, >» Nah. iii. 10.

Tgacvlnie tea7, >» Dealt. a. 15 (Heb. ii. 1). Isa. xlvii. 8, 10, », Zeph. il. 15.

Isa. lxvi. 20, 95 6s Meigs. 10.

(c) With regard to the historical appendix to the first part of the book of Isaiah (chaps. eet a, we must be, as usual, on our guard against admitting too sintplea solution. Knowing, as we do, from 2 Chr. xxxii.

32 (comp. ix. 29) that the prophct wrote one, if not more than one, historical monograph, it would be natural to assume that this appendix is an extract from that monograph. When we examine it more closely, however, we sec that this eannot be the ease. This is shown (1) by the variations with which the

1 For similar arguments of minor importarice, seo ‘Cheyne, The Prophecies of Isaiah, vol. ii. pp. xv., 202.

narrative is repeated in 2 Kings xviii. 13=xx. 19, and which are, generally speaking, very peculiar, and therefore probably more authentie. See especially Isa. xxxviii., noticing the abbreviation of vers. 4and 5, the addition of the Psalm of Hezekiah, and the wrong position given to ver. 21. (2) By the circumstance that the style of Isa, xxxvi. and xxxvii. (2 Kings xviii.—xix. 37) contains nothin, to distinguish it from that of many other portions of the two books o Kings, which are evidently extracted froni the royal chronicles, and that the style of Isa. xxxviii. (excluding the Psalm) and xxxix. closely resembles that of the final editor of the historical books (Genesis~2 Kings)” (The Book of Isaiah Chronologically Arranged, p. 102). To this it may now be added that the first verse of the narrative contains a glaring mistake (which also profoundly affects the sequel), which ean only be accounted for on the supposition that a long period had elapsed since the events referred to. We refer to the substitution of “the fourteenth year (of King Hezekiah)” for “ the twenty- seventh,” and the confusion of the invasion of Sargon with the later one of Sennacherib (see Zhe Prophecies of Isaiah, vol. i. p. 192, &c.). In short, the ease of this appendix appears to be similar to that of the passage vii. 1+ix. 7, which ean be shown to have assumed its present form not till long*after the utterance of the prophecies imbedded in it. That the great prophecy enshrined in our historical appendix is in the highest degree Isaianic we have already pointed out ; it were to be wished that there were equal grounds for assuming that the so-called Psalm of Hezekiah were really the work of that pious and literary king. The probability is that we

have in this Psalm the work of one of those inspired but less original Sopherim of whom we have spoken above. _

(d) Isaiah, it is admitted, was a prophet and an historian ; was he alsoa psalmist ? His twelfth chapter (if really by him) is in fact apsalm; but Hitzig goes further, and conjectures that Psalms xlvi.— xlviii. were composed by our prophet on the successive overthrows of the Syrians, Philistines, and Assyrians (Die Psalmen, i. 255-6). All, however, that can safely be inferred from the parallelisms which Hitzig produces is that tle prophecies of Isaiah exercised a strong influenee on contemporary or later writers, especially those which dealt with the great turning points in the history of the nations. A still larger harvest of affinities may be reaped in the later psalms, as Canon Elliott has well shown (Speaker's Comumen- tary, iv. 506-512), and it will be noticed that only one of them, and that not one of the closest, relates to the acknowledged pro- phecies of Isaiah. Similarity of style is not an infallible proof of unity of authorship.

(c) One of the most important contributions to the right estimate of II. Isaiah (as also of the book of Daniel) has been the discovery of two cuneiform texts relative to the fall of Babylon and the religious policy of Cyrus. The results are not favourable to a mechanical view of prophecy as involving absolute accuracy of state- ment on points not essentially connected with moral and religious truth. Cyrus appears in the unassailably authentic cylinder in- scription "as a complete religious indifferentist, willing to go through any ainount of ecremonies to soothe the preindicas of a sus- ceptible population." He preserves a strange and significant silence with regard to Ormazd, the supreme God of Zoroastrianism, and in fact, as Professor Sayce and M. Halévy have shown, cannot have been a Zoroastrian believer at all. '*Cyrus, on whom the prophet of Jehovah lavislies such honourable titles, Cyrus, who, the pro- phet even appears to hope, may be won over to the true faith, is a polytheist and an idolater." On the historical and religious bearings of these two inscriptions the reader must be referred to the essay on "JI. Isaiah and the Inscriptions" in the work already several times quoted from. It must be carefully remembered that 'the inscription, when rightly understood, is not in conflict with the

prophecy, but only with a gloss upon the prophecy," and that our estimate of prophecy must be brought into harmony with facts, not facts with our preconceived theory of prophecy.

In conclusion, it seems not inopportune to remind the student that the investigation of the critical problems of the Old Testament is not mere guess work, but proceeds on the sure basis of comparison and analogy. We have got beyond the stage at which the books of the Old Testament were regarded as so many isolated phenomena, and reached the conception of a literature, with closely related parts, slowly and very gradually brought into its present shape. The coordination in an historical outline of the results already attained would be the most effectual justification of the critical analysis of the Old Testament. It is worse than idle, however, to meddle with analytical work without a preliminary discipline in the disinterested exegetical study of the texts,

Commentaries, &c.—1. On the entire book :—Calvin, Comm. in Jes., 3d, ed., Geneva, 1570 : Vitringa, Comm. in libr. proph. Jesajex, 2 vols., Leeuwarden, 1714-28, and 1724; Lowth, Isaiah: a new translation, with a preliminary dissertation and notes, London, 1778 ; Gesenius, Der Pr. Jes. iibersetzt, &e., Leipsic, 1821 ; Hitzig, Der Proph. Jes., Heidelberg, 1838 ; Ewald, Die proph. des A. B., 2d. ed., 3 vols., Gottingen, 1867-68 (in course of translation) ; Knobel, Der Pr. Jes., 4thed. (by Diestel), Leipsic, 1872 ; Drechsler, Der Pr. Jes., 8 vols., Stuttgart and Berlin, 1845-57; Delitzsch,

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Der Pr. Jes., 8d. ed., Leipsic, 1879; Nagelsbach, Der Pr. Jes., in Lange's Bibelwerk, Bielefeld and Leipsic, 1877; Alexander, Com- mentary, ed. Eadie, 2 vols., Edinburgh, 1865; Kay, in Speaker's Commentary, vol. v., London, 1875; Cheyne, The Book of Isaiah Chronologically Arranged, London, 1870, and The Prophecies of Isaiah, 2vols., London, 1880-81. 2. On portions of the first part :— Meier, Der Pr. Jes. I. (ou chaps. i,-xxiii.), Pforzheim, 1850; Roerda, " Aunotationes . . . ad vaticinia Jes, i.~~ix. 6" (in Juyn~~ boll's Orientalia, vol. i. p. 67, &c.) ; Stade, De Jes.

vaticintis Aithio- pieis diatribe, Leipsic, 1873. 8. On the second part :—Stier, Jesajas nicht Pseudo-zesajas, Barmen, 1850; Seinecke, Der Evangelist des alten Testamentes, Leipsic, 1870. 4. On the critical question of the second part :—Delitzsch, "Schlussbemerkungen,"in Drechsler's Com- mentar, Theil iii. ; Rutgers, De echtheid van de tweede gedeelte van Jesaja, Leipsic, 1866 ; Klostermann, Zeitschr. fiir lutherische Theo- logic, 1876, p. 1, &c. 5. Monographs and generally illustrative works: —Hengstenberg,Christologie des alten Testaments, vol. ii. (trans- lated in Clark); Strachey, Jewish History and Politics in the Times of Sargon and Sennacherib, 2d. ed., London, 1874, 8vo; Neubater and Driver, The Fifty-third Chapter of Isaiah according to the Jewish Interpreters, 2 vols., Oxford, 1877; Urwick, The Servant of Jehovah, a Commentary, Edinburgh, 1877 ; Caspari, Beitrige zur Kinleitung in das Buch Jes., Berlin, 1848; Payne Smith, The Authenticity and Messianic Interpretation of the Prophecies of Isaiah, Oxford and London, 1862; M'Gill, 'Critical Remarks on Isaiah, xviii. 1, 2," in Journal of Sacred Literature, 1862, pp. 310-324; Cheyne, Notes and Criticisms on the Hebrew Text of Isaiah, London, 1868; Lagarde, Semitica, i., Gottingen, 1878 (pp. 1-82 contain critical notes on Isaiah i.-xvii.), ('T. K. C.)

ISAURIA, in ancient geography, was a district in the interior of Asia Minor, bounded by Mount Taurus and Cilicia on the S., by Lycaonia on the E., by Phrygia on the N., and by Pisidia on the W. Like the neighbouring Lycaonia, it consisted in great part of a cold and barren upland plain, while the southern portions were rugged and mountainous. No mention is found of the Isaurians dur- ing the early periods of the history of Asia ; but they were doubtless, like their neighbours the Pisidians, in all ages a lawless race of freebooters, owing merely a nominal allegi- ance to either the Persian or the Macedonian monarchy. The only occasion on which they come prominently forward in history was during the war of the Cilician and other pirates against Rome, in which they took so active a part that the proconsul P. Servilius deemed it necessary to follow them into their mountain fastnesses, and compelled the whole people to submission, an exploit for which he received the title of Isauricus (75 B.c.). They were after- wards placed for a time under the rule of Amyntas, kin of Galatia; but

it is evident that they always conte to retain their predatory habits and their virtual independ- ence; and under the Roman empire they gave so much trouble that it was ultimately agreed to leave them in the undisturbed possession of their inaccessible mountain homes. In the 4th century they are still described by Ammianus Marcellinus as the scourge of the neighbouring provinces of Asia Minor; but they are said to have been effectually subdued in the reign of Justinian.

From the nature of the country Isauria contained but very few towns, the most important of which bore the name of Isaura, as the capital of the district. It was rebuilt by Amyntas, and extensive remains of it are still visible at a place called Zengi Bor. Carallia, which seems to have been included in the province, and was noted as giving name to the Lake Caralitis, was situated farther north. This lake, now known as the Kereli Gl, is a con- siderable sheet of water; it communicates by the river called Bei Sechr with a lesser lake called by Strabo Trogitis, now known as Soghla Gél; both are perfectly fresh. The boundary of Isauria and Lycaonia seems to have been always unsettled, Strabo indeed speaks of Isauria as a part of Lycaonia, but it is certain that they were separate districts for administrative purposes, though their limits cannot be accurately defined. Of the ethnographical character or origin of the Isaurians we know nothing.

The comparatively obscure tribe of the Isaurians had

the honour on two occasions of giving birth to a Byzantine emperor. The first of these, Zeno, in the 5th century (474-495 A.D.), was not calculated to reflect any lustre on his native country ; but at a later period Leo III., who ascended the throne of Constantinople in 718, and reigned till 741, was a monarch of vigour and capacity, and became the founder of a dynasty which ruled over the empire for three generations.

ISCHIA, the ancient Pithecusa, “naria, or Inarime, and the medizval Jscla, a volcanic island of Italy, is situ- ated at the north entrance to the Bay of Naples, about 15 miles south-west of the Cape of Miseno. The circumference, omitting the irregular indentations of the coast-line, is

about 19 miles, and the superficial area about 26 square miles. Monte Epomeo or San Nicola, the ancient Epomeus or Epopeus, which rises to the height of 2600 feet above sea-level, is the highest point. The principal summit is surrounded by twelve inferior volcanic cones, from one of which the last eruption in the island took place in 1302. The valleys between the mountains and the plain which occupies a part of the interior are remarkable for their luxuriant vegetation and beautiful scenery. The vegetable products of Ischia are very rich and various. Most of the cultivated land is occupied by vines, from which a somewhat acrid white wine is manufactured. Corn, oil, and southern fruits are produced in luxuriant profusion. Oak and chest- nut groves, thickets of myrtle and lentiscus, cotton-trees, mulberries, and arbutus stretch up the mountain sides and along the pastures. Iron and sulphur are found on the island, and bricks, tiles, and pottery are manufactured at Casamicciola. The great sources of wealth to the island are the numerous thermal mineral springs, which are among the strongest and most efficacious in Europe. Casamicciola is the headquarters of the water, hot-air, and sand baths, but Lacco is also popular in the season. Though the nominal bathing season lasts from June to September, the exquisite climate and lovely situation of Ischia allure visi- tors all the year round. The island has suffered heavily from earthquakes. A very severe shock in March 1881 occasioned great loss of life and property. The inhabitants, about 25,000 in number, are distinguished by a peculiar dialect and figure, and are chiefly engaged in tillage and fishing. The chief town is Ischia (6500) on the east coast, the seat of a bishop, with an old castle of the 15th century. Other towns are Forio (6100) on the west coast, Casa- micciola and Lacco on the north, Panza, and Moropano.

Ischia was first colonized by Grecks from Chalcis in Eubcea, but although the colony rose to prosperity it was driven from the island by volcanic outbreaks. Similar convulsions dispersed a second colony established by Hiero of Syracuse. From the Neapolitans, who were the next settlers, the island passed into the hands of Rome, but Suetonius informs us that Augustus again restored it to Naples, in exchange for the inferior Caprese. The name of Ischia docs not

often occur in Roman history, but it seems to have been early in

repute as a resort for invalids. After the fall of Rome, it suffered much and repeatedly at the hands of the successive invaders and rulers of Italy. In 1299 it was captured by Charles II. of Naples, since which time it has had a full share of the vicissitudes that are so characteristic of the history of Italian towns and provinces, ISCHL, a favourite watering-place in the district of Gmunden, Upper Austria, is beautifully situated on the peninsula formed by the junction of the rivers Ischl and Traun, and is surrounded by high mountains, present- mg scenery of the finest description. It has mineral Springs and numerous brine and brine-vapour baths. The brine used at Ischl has in 16 oz. 233 grains of chloride of sodium (common salt) and 15 grains of other solids. The principal buildings include the casino, erected in 1875, the town church, with fine frescoes, the theatre, the official buildings, and the imperial villa surrounded by a beau- tiful park. Ischl first came into repute in 1822, and since that time the yearly advent of the imperial family

and of many of the Austrian nobility has made it one of the most fashionable and prosperous spas of Europe. In the neighbourhood is a very productive salt-mine, which has been worked for more than three hundred years. The place has some trade in wood, gypsum, and chalk. The population in 1869 was 6842.

See Kaan's Ischil e¢ ses Environs, Vienna, 1879.

ISEGHEM, a town of Belgium in the arrondissement of Roulers and the province of West Flanders, is situated on the small river Mandel, about 10 miles north-east of Courtrai. It has manufactures of linen, hats, and sugar. Tobacco is cultivated in the environs. The population in 1876 was 7753.

ISERE, a department of south-eastern France, formed from the southern part of the old province of Dauphiné, is bounded on the N. by the department of Ain, E. by Savoie and Hautes-Alpes, 8. by Hautes-

Alpes and Dréme, and W. by Dréme, Loire, and Rhine. It lies between 44° 43’ and 45° 43’ 19” N. lat, and between 4° 43’ 32” and 7° 6’ 9” E long., being about 100 miles Jong from north- west to south-east and 60 miles broad from nortli-east to south-west. It derives its name from the river Isére, which flows through it from north-east to south-west. The Rhone, with several tributaries, is the other chief stream. Lake Paladuc is the largest of several lakes in the department. The surface is mountainous, especially in the south-east, which is occupied by lofty offshoots of the Alps, some of whose summits are covered with perpetual snow. The Belledonne, the Grandes-Rousses, the Oisans, the Grande Chartreuse, famous for its monastery, the Vercors, the Lans, and the Dévoluy are the chief groups and ranges which are found either wholly or partly within Isére. The highest point is the Aiguille du Midi (9800 feet). Towards the north and west the country gradually slopes down in fertile terraces to the Rhone. The river valleys are remarkable for their extent and fertility ; that of Graisivaudan is reckoned one of the richest in France. The climate of Isére varies according to the irregularity of the surface, but is on the whole colder and ruder than is usual at its latitude. Agriculture occupies about four- fifths of the inhabitants, although less than half the total area is suited for cultivation. Wheat, barley, rye, oats, buckwheat, maize, potatoes, hemp, colza, and fruit, and, on the southern slopes, vines, walnuts, mulberries, and almonds, are the principal crops. Valuable pastures, on which mules and large flocks of sheep are bred, extend up the mountain to meet the large forests stretching down from the snow-line. Silkworms are reared easily and profitably ; fish is exported in considerable quantity to Paris ; and the cheese of the department is much esteemed. Gold and silver are found in small quantities. The chief minerals are coal, lignite, and iron; but copper, lead, mercury, zinc, aud antimony, with marble, gypsum, granite, porphyry, and slate, are also worked. After agriculture the chief industry is the working of the minerals; glove- making occupies about 20,000 persons in and around Grenoble; while the department is the leading district of France for the manufacture of paper. Wine, felt, silk, linen, cloth, beet-root sugar, straw-hats, brandy, glass, and other commodities are also manufactured. There is trade in iron, steel, and other metals, cement, lime, grain, wine, liqueurs, and gloves. Isére is divided into the

arrondisse- ments of Grenoble, Vienne, La Tour-du-Pin, and Saint Marcellin, with 45 cantons and 558 communes. ‘The chief town is Grenoble. ‘The total area is 3200 square miles, and the population in 1866 was 581,386, and in 1876

581,099,

ISERLOHN, chief town of a circle in the government district of Arnsberg and province of Westphalia, Prussia, is situated on the Baar, ina bare and hilly region, 17 miles

west of Arnsberg. Among the principal buildings are the town-church, the synagogue, the hospital, the orphanage, the poorhouse, and the new town-house. There is a real school of the first class, and a commercial school for the province. Iserlohn is one of the most important manu- facturing towns in Westphalia. Its chamber of commerce was founded in 1850. Both in the town and neighbour- hood there are numerous foundries and works for iron, brass, steel, and bronze, while the manufactures include wire, needles and pins, fish-hooks, machinery, umbrella- frames, thimbles, bits, furniture, chemicals, coffee-mills, and pinchbeck and britannia-metal goods. A part of the town has recently been endangered by the calamine mines beneath. Iserlohn is a very old town, its guild of armourers being referred to as “ancient” in 1443. The population in 1875 was 16,838. eae

ISERNIA, a town of Italy, capital of a district in the province of Campobasso, is pleasantly situated among the Apennines, 54 miles north-east of Naples. The town, which is closely built and dirty, consists chiefly of one long narrow street running along the crest of a hill from south-west to north-east, near the middle of which are an ancient arch and a fine old marble fountain. Of the numerous Roman antiquities in and near the town the most considerable is the subterranean aqueduct, which may be traced for the distance of about a mile, and which is still used to supply the fountains and manufactories of Isernia with water.

There is also a fine old Roman bridge just outside the town. On a hill half a mile distant is a chapel, once much frequented, to the saints Cosmas and Damian. Isernia has manufactures of woollens, paper, pottery, and tiles. It is the seat of a bishop, and of a civil and criminal court. Population in 1875, 9066.

Isernia is the ancient Samnite town Alsernia, whieh was eon- quered and colonized by the Romans about 264 B.c. The massive polygonal walls which form the basis of the present walls in nearly their entire circuit are attributed to the Samnites. During the social war Isernia was captured by the allied Italians, and became for a time their headquarters, and at the eonelusion of the war was so severely chastized by the Romans as to be almost deserted. Its fortification in the Middle Ages seems to have been an occasion for destroying many of the Roman remains, a result which numerous earthquakes 'have helped to attain. That of 1805 overthrew the eathedral and did much damage. In 1799 Isernia was stormed by the French, and in 1860 it was sacked and suffered fearful atrocities during a Bourbonist insurreetion.

ISHMAEL (8YQ¥, "God hears"; "Icpad), the son of Abraham by his Egyptian concubine Hagar, was born when his father was eighty-six years old, received circum- cision along with Isaac when thirteen years of age, and some three or four years later (apparently in his sixteenth year) was, on account of the jealousy of Sarah, who had seen him " playing" (Hebrew), turned out of doors along with his mother. It had been foretold to his mother before his birth that he should be "a wild ass among men," and that he should dwell " before the face of" (that is, to the eastward of) his brethren. It is subsequently stated that after leaving his father's roof he " grew, and became an archer, and dwelt in the wilderness of Paran, and his mother took hima wife out of the land of Egypt." It is also related that he was present at the burial of Abraham. His twelve sons are enumerated by their "villages" and "encampments" in Gen xxv., where also (ver. 18) their locality is indicated by the expressions that "they dwelt from Havilah unto Shur that is east of Egypt, and he settled to the eastward of his brethren" (Heb.). Of the twelve names given, only a few have historical associations apart from the Biblical records. Nebajoth and Kedar

suggest the Nabatzi and Cedrei of Pliny (v. 12), the first- mentioned of whom were an important Arab people after the time of Alexander, and for some time both before and after the Christian era formed an independent kingdom

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(Nabatenc). Dumah may perhaps be the same as tho Domata of Pliny (vi. 32) and the AovweGa or Aovpaiéa of Ptolemy (v. 19, 7; viii. 22, 3), and Jetur is obviously the Itursea of classical geographers. The word ‘ Ishmaelite” is sometimes used in Scripture in a wide sense, which includes such families as the Midianites (Judg. viii. 24), who, according to Gen. xxv., are children of Keturah. On the other hand, no connexion is alleged between the Ishmaelites and the Hagarites (1 Chr. v. 10) or Hagarenegs (Ps. Ixxxiii. 7), the “Aypato. of Ptolemy and Strabo. According to the Mahometan Arabs, who recognize Ishmael as their ancestor, he lies buried with his mother in the Kaaba in Mecca.

ISHPEMING, a city and township in Marquette county, Michigan, U.S., is situated in the heart of the Lake Superior iron-fields, about 15 miles west of Lake Superior, and 400 miles north of Chicago, with which it is connected by rail. The export of iron-ore in 1880 was 700,000 tons, valued at $3,500,000, while the lumbering and other industries are proportionately extensive. There are two blast furnaces, with a daily capacity of 60 tons of pig iron. Ishpeming was incorporated as acity in 1873. In 1880 the population of the city was 6,039, and of the township 1,967.

ISIDORUS HISPALENSIS, or IstporE oF SEVILLE, one of the most influential writers of the early portion of the Middle Ages, flourished during the latter part of the 6th and the early part of the 7th century. The exact date of his birth is unknown; he died 636 a.p. Of the particulars of his life, specially of the earlier portion, little is known with certainty. He was the son of a wealthy and distinguished native of Cartagena, named Severiauus, and his elder brother, Leander, was bishop of Seville. Isidore succeeded his brother in his bishopric at the

beginning of the 7th century, and acquired high renown in the church, not only by his conduct of his see, but by his numerous theological, historical, and scientific works. His learning and eloquence are celebrated by his contemporaries, and his reputation was even greater in the succeeding ages. During the latter portion of the period which historians are accustomed to call the Dark Ages, extending from the 7th to the 10th century, the writings of Isidore furnished mental pabulum to all students and scholars; and, though one can find in them little of real value and no originality, they have at least the merit of having served to keep alive, even ina form far from adequate, some remnants of the older culture and learning. The most elaborate of his writings, that entitled Ztymologiarum Libri XX., or some- times Origines, is an encyclopedic work, eclectic in character, and presenting in dry compendious form the sum of the knowledge of the age on all branches of scientific research. Later writers make continual references to the Etymologies, which served for long as the general text-book. The arrangement of materials in the twenty books is unsystematic, and on most matters of scientific experience it is evident that the writer depends on second- hand information. Perhaps the most interesting of the books are the fifth, containing a sketch of universal history, and the ninth, on language. Various sinaller writings of Isidore, such as the two works Diferentiarum, the two books on synonyms, and the short tractate De Natura Rerum, are supplementary tothe Htymologies, and carry out in detail what is there given in epitome. The tract De Natura Rerum is specially interesting as contain- ing the sum of physical philosophy during this period of the Middle Ages. Of Isidore's many writings on theo- logical subjects no detailed account can be given.

The works of Isidore have been published with preface by F. Arevalo,—S. Isidori Hispalensis episc. Opera omnia, 7 vols. 4to, Rome, 1797-1803 (2 vols. of Prolegomena). The De Natura Rerum has been edited separately by G. Beeker, Berlin, 1857. See

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Ebert, Geschichte d. Litteratur d. Mittelalters im Abendlande, i. 555 5. Also Pouchet, Histoire des Sciences Naturelles au Moyen Age, 1845,

and the general histories of Latin literature.

ISINGLASS. See GELATIN.

ISKELIB, or EsxiLup, a town in the province of Kasta- muni, Asiatic Turkey, is situated near the left bank of the Kizil Irmak, at an elevation of 2542 feet above sea- level. The population is estimated by Ritter at 9000. —

ISLA, Jos# Francisco pe (1703-1781), Spanish satirist, was born at Segovia in 1703, and became a member of the Society of Jesus, in which he distinguished himself both as a teacher and as a preacher; on the expul- sion of his order from Spain in 1767 he betook himself to Bologna, where after some years of impaired health he died in 1783. His first literary experiment was the Juventud Triunfante ("Triumph of Youth," Salamanca, 1727), a cleverly disguised satirical account of a festival celebrated in 1727 at Salamanca in honour of two young Jesuits who had recently been canonized by Benedict XIII, in which he was assisted by a brother priest named Losada ; it was followed in 1746 by his Zriunfo del Amor y de la Lealtad: Dia Grande de Navarra, being an account of the extravagant ceremonies with which the accession of Ferdinand VI. of Castile had been celebrated in Pampe- lona. This was written in so delicate a vein of satire that at first the parties chiefly ridiculed felt really flattered, and expressed their gratitude to the author; ultimately, however, its true meaning was discerned, and so strong was the reaction that he had to leave the locality. The work on which Isla's claim to a place in the history of the literature of his country rests, however, is his Historia del Famoso Predicador Fray Gerundio de Campazas, in which in course of an imaginary biography of a preaching friar named Gerundio many of the absurdities that deformed the Spanish pulpit at that time are ably held up to ridicule. The first volume appeared at Madrid in 1758, duly approved by the ecclesiastical authorities, who probably were not unwilling tliat the faults then glaringly prevalent among preachers should be chastized and if possible corrected ; so great was the offence given, however, to the religious orders, and especially to the Dominicans, by the causticity of ray Gerundio, that the royal authority was at last called in to

prohibit the book. Thesecond volume, which therefore could only appear surreptitiously, is dated "Campazas" (i.e, Madrid), 1770, and like the first bears on the title page the name of Don Francisco Lobon de Salazar as its author. An anonymous translation by Thomas Nugent (Zhe History of the fumous preacher Friar Gerund de Campazas, otherwise Gerund Zotes) appeared in London, in two volumes, in 1772. Six volumes of Ser- mones, written between 1729 and 1754, and published in 1792, show that Isla's own high reputation as a preacher was not undeserved ; and his Cartas Familiares (6 vols., Madrid, 1785-86) are written in an easy and attractive style. He is also well known in the Peninsula as the eminently successful translator of Gil Blas (Gil Blas de Santillana vuelto 4 su patria, printed at Madrid in 1787), although his strenuously asserted theory that La Sage had borrowed that popular story wholesale from a Spanish source is now entirely exploded.

ISLAMABAD, a town in Kashmir state, Punjab, lies in 33° 43' N. lat., 75° 17' E. long., on the north bank of the Jhelum (Jhilam), there about 80 yards wide, and crossed by a wooden bridge. The town crowns the summit of a long low ridge, extending from the mountains east- ward. Below isa reservoir containing a spring of clear water called the Anat Nag, slightly sulphurous, from which volumes of gas continually arise. The water swarms with sacred fish, There are large manufactures of Kashmir shawls, also of chintzes, cotton, and woollen goods.

ISLAY, an island on the west coast of Scotland, the most southern of the Hebrides group, is situated in the county of Argyll, between 55° 30' and 55° 58' N. lat. and 6° 2 and 6° 35' W. long., 17 miles west of Cantire and 2 miles south-west of Jura. It has an area of 220 square miles, or more than 140,000 acres, and its rental is nearly £38,000. It is the richest and most productive of the group, and on that account has been called the " Queen of the Hebrides." The surface generally is regular, the highest summits being Ben Varu (1500 feet) and Ben Ronastel (1050 feet). Islay House, the ancient seat of the Campbells of Islay, stands at the head of Loch-in-daal. The island is chiefly possessed by three proprietors :—C. Morrison, 67,000 acres ; J. Ramsay of Kildalton, 54,250 ; and K. Finlay of Dunlossit, 17,676. Formerly it was occupied

by small crofters and tacksmen, but since 1831 it has been gradually rearranged into large sheep and arable farms. About two-thirds of the sheep are black- faced, the others being mostly Cheviots. Dairy farming is largely followed, and oats, barley, and the various green crops are raised. The chief difficulty in the way of reclamation of the land is the large extent occupied by peat, which has an area of 60 square miles, and is caleu- culated at its present rate of consumption to last 1500 years. The island has long been famous for the distilla- tion of whisky, and at present contains seven distilleries, which produce about 400,000 gallons annually. Port Ellen, the principal village, had 974 inhabitants in 1881. While the population of Islay in 1831 was 14,992, it had decreased in 1851 to 12,334, in 1871 to 8143, and in 1881 to 7512.

Islay was the ancicnt seat of the 'Lord of the Isles," the first to adopt that title being John Macdonald of Isle of Islay, who died about 1886. See HEBRIDES.

ISMAIL, a town of Roumania, at the head of a district of the same name, on the left bank of the Kilia branch of the Danube, 30 miles to the east of Galatz, with a river frontage of about 24 miles. It is the seat of a con- siderable trade, mainly in grain, but also in wool, leather, and tallow. The population of the town, inclusive of Tutchkoff, was 16,000 in 1856, 31,779 in 1866, and 21,000 in 1876. In 1872 794 ships with a total burden of 81,445 tons entered, and 790 with 81,711 tons cleared.

Originally a Turkish fortified post, Ismail had by the end of the 18th century grown into a place of about 30,000 inhabitants, having 4000 dwelling-houses inside and 2500 outside the enceinte, and numbering among its public buildings four mosques, two churches for the Moldavians, one for the Armenians, and one for the Greeks (see account by a Russian officer in Bernoulli, Sanunhung kurzer Reisebeschreibungen, Berlin, 1781). The inhabitants were mainly Turks and Tartars, but not far from the town there was a scttlement of Raskolniks, who had fled from the persecution of Peter I, Ismail was occupied by the Russians in 1770, and twenty ycars later its capture was once of the brilliant achievements of the celebrated Suwaroff. On this occasion the garrison was 40,000 strong, and the assault cost the

invaders 10,000 and the defenders 30,000 men. “ Never,” wrote Suwaroff to Potemkin, the Russian minister, “ was a fortress stronger than Ismail, and never was a defence more desperate. But Ismail is taken.” The victory was the theme of one of Derzhavin’s odes. In 1809 the town was again captured by the Russians; and, when in 1812 it was assigned to them by the Bucharest peace, they chose it as the central station for the fleet of the Danube. It was about this time that the town of Tutchkoff, with which it was incorporated in 1830, grew up outside of the fortifications. These were dismantled in accordance with the treaty of Paris (1856), by which that part of Bessarabia in which Ismail was included was made over to Roumania. ‘

On the other side of a small lake not far from the town lies the village of Matrasofka ; and 4 miles to the east is another village, Old Nikrasofka, with the following inscription :— Terminus australis areus meridionalis 25° 20′ quem inde a fluvio Danubio ad Occanwm Arcticwum usque per Rossiam, Sueciam, et Norwegiam, jussw et auspictis imperatorum augustissimorum Alexandri I. atque regis augustissimt Oscaris I., Annis MDCCCVI ad MDCCCLIL continuo labore emensi sunt CCC geometre. Latitudo 45° 20” 28”.

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ISMAILIA, a town of Egypt, nearly in the centre of the isthmus of Suez, on the western shore of Lake Timsah (which is traversed by the canal), and connected with the railway which joins Zagazeg, and consequently Alexandria and Cairo, with Suez. It was laid out in 1863, and for a time had a population of about 3000, mainly engaged in the construction of the canal. The broad macadamized streets and regular squares bordered with trees give it an attractive appearance ; and it has besides the advantage, a rare one in Egypt, of being surrounded on three sides by flourishing gardens. The Quai Mehemet Ali, which lies along the canal for upwards of a mile, contains the chalet long occupied by M. de Lesseps. At the end of the quay are the works for supplying Port Said with water ; and there is a bathing establishment on Lake Timsah. Ismailia is a separate mohafza or governorship, and has a vice-

regal palace anda court of first instance. The population was returned as 3062 in 1872, and as 1897 in 1877. On the other side of the lake are the so-called Quarries of the Hyznas, from which the building material for the town was obtained.

ISMAILIA, or Gonpoxoro, a famous mission-station and market-place in the territory of the Bari negroes on the right bank of the White Nile, about 330 miles, accord- ing to Baker, above the confluence with the Bahr Giraffe, and about 200 miles below the northern end of Lake Albert Nyanza, in 4° 54’ 5” N. lat. and 31° 46’ 9” EK. long. The name Ismailia is mere strictly applicable only to the military post established by Baker in 1871, and Gondo- koro, as it is the more ancient, is still the more ordinary designation. In former times Gondokoro was a great centre of the ivory and slave trade ; and, though the site is now almost forsaken for ten months of the year, there is still a considerable ivory market held in December and January. In connexion with the mission instituted by Pope Gregory XVI. in 1846, the pro-vicar Knoblecher founded a station at Gondokoro in 1851, the principal station being at Khartum. A succession of misfortunes, including the death of Knoblecher in April 1858 and a famine in 1859, led to the final abandonment of the place. An interesting series of meteorological observations taken at Gondokoro will be found in Att? det Lincec, 1860-61.

ISMID, Iskrmrp, or IsNIKMID (2.¢., “Ers Nixopydeay), a town of the Turkish vilayet of Khudavendikiar in Asia Minor, in the sandjak of Seutari, situated at the head of the bay of Ismid (the ancient Sinus Astacenus), an inlet of the Sea of Marmora. It is connected by rail with Scutari, and the line is being continued eastward to Ada Bazar. As the seat not only of a pasha but also of a Greek metropolitan and an Armenian archbishop, Ismid retains somewhat of its ancient dignity, but the material condition of the town is little in keeping with its rank ; and but few traces are left of the magnificence which it possessed as Nicomedia, the capital of Bithynia. The population, estimated at from 10,000 to 15,000, are engaged in silk weaving and in commerce, Ismid being a great out~ let of goods from the interior. See NicoMEDIA.

ISNIK. See Nicma.

ISOCRATES, one of the ten Attic orators, and one of the most remarkable men in the literary history of Greece, was born in 436 B.c., seven years before Plato. His father Theodorus was an Athenian citizen of the deme of Erchia,—the same in which, about 431 zB.c., Xenophon was born,—and was sufficiently wealthy to have served the state as choregus. The fact that he possessed slaves skilled in the trade of flute-making perhaps lends point to a passage in which his son is mentioned by the comic poet Strattis.1 Several popular "sophists" are

1 *Araadyrn, frag. 1, Meineke, p. 292.

named as teachers of the young Isocrates, Like other sons of prosperous parents, he may have been trained in such grammatical subtleties as were taught by Protagoras or Prodicus, and initiated by Theramenes into the florid rhetoric of Gorgias, with whom at a later time (about 390 B.c.) he was in personal intercourse. He tells us that his father had been careful to provide for him the best education which Athens could afford. A fact of greater interest is disclosed by Plato's Phedrus. '"Tsocrates is still young, Phedrus," says the Socrates of that dialogue, "but I do not mind telling you what I prophesy of him, ... It would not surprise me if, as years go on he should make all his predecessors seem like children in the kind of oratory to which he is now addressing himself, or if—supposing this should not content him—some divine impulse should lead him to greater things. My dear Pheedrus, a certain philosophy is inborn in him." This conversation is dramatically supposed to take place about 410 Bc. It is unnecessary to discuss here the date at which the Phedrus was actually composed. From the passage just cited it is at least clear that there had been a time —while Isocrates could still be called " young "—at which Plato had formed a high estimate of his powers.

Isocrates took no active part in the public life of Athens ; he was not fitted, as he tells us, for the contests of the popular assembly or of the law-courts. He lacked strength of voice,—-a fatal defect in the ecclesia,

when an audience of many thousands was to be addressed in the open air; he was also deficient in ‘“ boldness” (7éAyo.). He was, in short, the physical opposite of the successful Athenian demagogue in the generation after that of Pericles ; by temperament as well as taste he was more in sympathy with the sedate decorum (edxoopia) of an older school, Two ancient biographers have, however, preserved a story which, if true, would show that this lack of voice and nerve did not involve any want of moral courage. During the rule of the Thirty Tyrants, Critias denounced Theramenes, who sprang for safety to the sacred hearth of the council chamber. Isocrates alone, it is said, dared at that moment to plead for the life of his friend.2 Whatever may be the worth of the story, it would scarcely have connected itself with the name of a man to whose traditional character it was repugnant. While the Thirty were still in power, Isocrates withdrew from Athens to Chios. He has mentioned that, in the course of the Peloponnesian War — doubtless in the troubles which attended on its close—he lost the whole of that private fortune which had enabled his father to serve the state, and that he then adopted the profession of a teacher. The proscription of the “art of words” by the Thirty would thus have given him a special motive for withdrawing from Athens. He returned thither, apparently, either soon before or soon after the restoration of the democracy in 403 B.c.

For ten years from this date he was occupied—at least — WOTK :

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occasionally—as a writer of speeches for the Athenian law- courts. Six of these speeches are extant. The earliest (Or. xxi.) may be referred to 403 3.c. ; the latest (Or. xix.) to 394-93 B.c. This was a department of his own work which Isocrates afterwards preferred to ignore. Nowhere, indeed, does he say that he had not written forensic speeches. But he frequently uses a tone from which that inference might be drawn. He loves to contrast such petty concerns as engage the forensie writer with those larger

2 [Plut.] Vit. Zsocr., and the anonymous biographer. Dionysius does not mention the story, though he makes Isocrates a pupil of Theramenes.

3 Some would refer the sojourn of Isocrates at Chios to the years 398-395 B.c., others to 393-388 B.c. The reasons which support the view given in the text will be found im Jebb's Attic Orators, vol. il. p. 6, note 3.

B.C.

Scholas- tic and literary life.

School of

ISOCRATES

and nobler themes which are treated by the politician. This helps to explain what would otherwise be startling. Not long after his death it could be asserted—by his adopted son, Aphareus—that he had written nothing for the law-courts. Whether the assertion was due to false shame or merely to ignorance, Dionysius of Halicarnassus decisively disposes of it. Aristotle had, indeed, he says, exaggerated the number of forensic speeches written by Isocrates ; but some of those which bore his name were unquestionably genuine, as was attested by one of the orator's own pupils, Cephisodorus. 'The doubt would not, indeed, have been even plausible, had not Isocrates fre- quently spoken of such work with the aversion of one who would gladly forget, if he could, a distasteful episode of early life,—a mere prelude to those labours of riper age in which he afterwards found his delight and his reward.

The real vocation of Isocrates was discovered from the moment that he devoted himself to the work of a teacher and a writer. The instruction which Isocrates undertook to impart was based on rhetorical composition, but it was by no means merely rhetorical, That "inborn philosophy," of which Plato recognized the germ, still shows itself. In many of his works—notably in the Panegyricus—we see a really remarkable power of grasping a complex subject, of articulating it distinctly, of treating it, not merely with effect, but luminously, at once in its widest bearings and in its most intricate details. Young men could learn more from Isocrates than the graces of style; nor would his

success have been what it was if his skill had been con- fined to the art of expression.

It was about 392 B.c.—when he was forty-four—that

Isocrates. he opened his school at Athens near the Lyceum, and

Political writings,

to the end of his life he continued to teach as well as to write. In 339 B.c. he describes himself as revising the Panathenaicus with some of his pupils; he was then ninety-seven. The celebrity enjoyed by the school of Isocrates is strikingly attested by ancient writers. Cicero describes it as that school in which the eloquence of all Greece was trained and perfected: its disciples were "brilliant in pageant or in battle," foremost among the accomplished writers or powerful debaters of their time. The phrase of Cicero is neither vague nor exaggerated. Among the literary pupils of Isocrates might be named the historians Ephorus and Theopompus, the Attic archeologist Androtion, and Isocrates of Apollonia, who succeeded his master in the school. Among the prac- tical orators we have, in the forensic kind, Iseeus; in the political, Leodamas of Acharne, Lycurgus, and Hyperides. And these are but a few names out of many. Hermippus of Smyrna (mentioned by Athenzeus) wrote a monograph on the "Disciples of Isocrates." And scanty as are now the sources for such a catalogue, a modern scholar? has still been able to recover forty-one names. At the time when the school of Isocrates was in the zenith of its fame, it drew disciples, not only from the shores and islands of the Aigean, but from the cities of Sicily and the distant colonies of the Euxine. As became the image of its master's spirit, it was truly Panhellenic. When Mausolus, prince of Caria, died in 351 3.c., his widow Artemisia instituted a contest of panegyrical eloquence in honour of hismemory. The most accomplished rhetoricians of Greece entered the lists at Halicarnassus ; but among all the com- petitors there was not one—if tradition may be trusted— who had not been the pupil of Isocrates.

Meauwhile the teacher who had won this great reputation had also been active as a public writer. The most interest- ing and most

characteristic works of Isocrates are those in which he deals with the public questions of his own day.

? Partim in pompa, partim in acie illustres.—De Orat., ii., § 94. 2 Sanneg, De Schola Isocratea, Halle, 1867.

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The influence which he thus exercised throughout Hellas might be compared to that of an earnest political essayist gifted with a popular and attractive style. And Isocrates had a dominant idea which gained strength with his years, until its realization had become, we might say, the main purpose of his life. This idea was the invasion of Asia by the united forces of Greece. The Greek cities were at feud with each other, and were severally torn by intestine faction. Political morality was become a rare and a somewhat despised distinction. Men who were notoriously ready to sell their cities for their private gain were, as Demosthenes says, rather admired than otherwise.? The social condition of Greece was becoming very unhappy. The wealth of the country had ceased to grow; the gulf between rich and poor was becoming wider ; party strife was constantly adding to the number of homeless paupers; and Greece was full of men who were ready to take service with any captain of mercenaries, or, failing that, with any leader of desperadoes. Isocrates draws a vivid and terrible picture of these evils. The cure for them, he firmly believed, was to unite the Greeks in a cause which would excite a gencrous enthusiasm. Now was the time, he thought, for that enterprise in which Xenophon's comrades had virtually succeeded, when the headlong rashness of young Cyrus threw away their reward with his own life.* The Persian empire was unsound to the core,—witness the retreat of the Ten Thousand: let united Greece attack it and it must go down at the first onset. Then new wealth would flow into Greece; and the hungry pariahs of Greek society would be drafted into fertile homes beyond the Aigean.

A bright vision ; but where was the power whose spell Asiatic was first to unite discordant Greece, and, having united project.

it, to direct its strength against Asia? That was the problem. The first attempt of Isocrates to solve it is set forth in his splendid Panegyricus (380 B.c.). Let Athens and Sparta lay aside their jealousies. Let them assume, jointly, a leadership which might be difficult for either, but which would be assured to both. That eloquent pleading failed. The next hope was to find some one man equal to the task. Jason of Phere, Dionysius the First of Syracuse, Archidamus III, son of Agesilaus — each in turn rose as a possible leader of Greece before the imagination of the old man who was still young in his enthusiastic hope, and one after another they failed him. But now a greater than any of these was appearing on the Hellenic horizon, and to this new luminary the eyes of Isocrates were turned with eager anticipation. Who could lead united Greece against Asia so fitly as the veritable representative of the Heraclide, the royal descendant of the Argive line,—a king of half-barbarians it is true, but by race, as in spirit, a pure Hellene,—Philip of Macedon? We can still read the words in which this fond faith clothed itself ; the ardent appeal of Isocrates to Philip is extant ; and another letter shows that the belief of Isocrates in Philip lasted at any rate down to the eve of Chzeronea.5 Whether it survived that event is a doubtful point. The popular account of the orator's death ascribed it to the mental shock which he received from the news of Philip's victory. He wasat Athens, in the palestra of Hippocrates, when the tidings came. He repeated three verses in which Euripides names three foreign conquerors of Greece— Dandus, Pelops, Cadmus—and four days later he died of

3 De Fals. Legat., § 265: od Sms dpytCovro 7) odd lew hgtovy Tos tadTta motodbvTas, GAA' &mwéBrerov, eChrwv, eTinwv, &vdpas WyouvTo.

4 éxefvous yap duoroyerTat. . mpaypdtay dia thy Kupov mpowéteray atuxijoeai, § 90; of. Panegyr., § 149.

5 Philippus (Or. v.), 346 B.c. ; Epist. ii., end of 342 B.c. (2)

. Hin eynparets SoxovvrTas efvat TOV Philippus (Or. v.),

The third letter.

Tradi- tion of

suicide.

voluntary starvation. Milton (perhaps thinking of Eli) seems to conceive the death of Isocrates as instantaneous— As that dishonest victory At Cheronea, fatal to liberty, Killed with report that old man eloquent.

Now the third of the letters which bears the name of Tsocrates is addressed to Philip, and appears to congratulate him on his victory at Cheronea, as being an event which will enable him to assume the leadership of Greece in a war against Persia. Is the letter genuine? ‘There is no evidence, external or internal, against its authenticity, except its supposed inconsistency with the views of Isocrates and with the tradition of his suicide, As to his views, those who have studied them in his own writings will be disposed to question whether he would have regarded Philip’s victory at Cheeronea as an irreparable disaster for Greece. Undoubtedly he would have deplored tlie conflict between Philip and Athens; but he would have divided the blame between the combatants. And, with his old belief in Philip, he would probably have hoped, even after Cheronea, that the new position won by Philip would eventually prove compatible with the inde- pendence of the Greek cities, while it would certainly promote the project on which, as he was profoundly con- vinced, the ultimate welfare of Greece depended,—a Panhellenic expedition against Persia.

As to the tradition of his suicide, the only rational mode of reconciling it with that letter is to suppose that Isocrates destroyed himself, not because Philip had conquered, but because, after that event, he saw Athens still resolved to resist, He might have felt that the moment was coming when duty to his native city would be in sharp conflict with his loyalty to one whom he regarded as the destined saviour of Greece; nor would he have been the only man who has deliberately preferred death to the agony of a divided allegiance. We should be rather disposed to ask how much weight is to be given to the tradition itself. The earliest

authority for it—Dionysius of Halicarnassus in the age of Augustus—may have had older sources ; granting, however, that these may have remounted even to the end of the 4th eentury B.¢., that would not prove much. Ancient biography usually contained a large alloy of unsifted popular gossip ; in particular it is strongly marked by a tendency to invent striking coincidences, or to adorn such as had actually occurred. Suppose that Isocrates—being then ninety- eight, and an invalid—had happened to die from natural causes a few days after the battle of Cheronea, Nothing could have originated more easily than a story that he killed himself from intense chagrin. Every one knew that Tsocrates had believed in Philip; and most people would have thought that Chzronea was a crushing refutation of that belief. Once started, the legend would have been sure to live, not merely because it was picturesque, but also because it served to accentuate the contrast between the false prophet and the true,—between Isocrates and Demosthenes; and Demosthenes was very justly the national idol of the age which followed the loss of Greek independence.

Isocrates is said to have taught his Athenian pupils gratuitously, and to have taken money only from aliens ; but, as might have been expected, the fame of his school exposed him to attacks on the ground of his gains, which his enemies studiously exaggerated. After the financial reform of 378 B.c., he was one of those 1200 richest citizens who constituted the twenty unions (cvppopia) for the assessment of the war-tax (ciopopd). He had discharged several public services (Ae:rovpyia:) ; in particular, he had

1 The views of several modern critics on the tradition of the suicide are brought together in the Attic Orators, ii. 82, note 2.

thrice served as trierarch. He married Plathane, the widow of the '"sophist" Hippias of Elis, and then adopted her son Aphareus, afterwards eminent as a rhetorician and a tragic poet. In 355 B.c, he had his first and only lawsuit. | A certain Megaclides challenged him to undertake the trierarchy, or exchange properties. This was the lawsuit | which suggested the form of the discourse which he calls the Antidosis

(“exchange of properties ”—353 B.c.)—his defence of his professional life. |

He was buried on a rising ground near the Cynosarges,

—a temenos of Heracles, with a gymnasion, on the east side of Athens, outside the Diomeian gate. His tomb was sur- mounted by a column some 46 feet high, crowned with the figure of a siren, the symbol of persuasion and of death. A tablet of stone, near the column, represented a group of which Gorgias was the centre; his pupil Isocrates stood at his side. Aphareus erected a statue to his adopted father near the Olympieion. Timotheus, the illustrious son of Conon, dedicated another in the temple of Eleusis.

It was a wonderful century which the life of one man had thus all but spanned,—a century fuller than any other | that could be named of great events both in the political | and in the intellectual life of Greece. Isocrates had reached early manhood when the long struggle of the Peloponnesian War—begun in his childhood—ended with the overthrow of Athens. The middle period of his career was passed under the supremacy of Sparta. His more advanced age saw that brief ascendency which the genius of Epaminondas secured to Thebes. And he lived to urge on Philip of Macedon a greater enterprise than any which the Hellenic world could offer. His early promise had won a glowing tributefrom Plato, and the rhetoric of his maturity furnished matter to the analysis of Aristotle ; he had composed his imaginary picture of that Hellenic host which should move through Asia in a pageant of sacred triumph, just as Xenophon was publishing his plain narrative of the retreat of the Ten Thousand; and, in the next generation, his literary eloquence was still demonstrating the weakness of Persia when Demosthenes was striving to make men feel the deadly peril of Greece. ‘This long life has an element of pathos not unlike that of Greek tragedy ; a power above man was compelling events in a direction which Isocrates could not see; but his own agency was the ally of that power, though in a sense which he knew not; his vision was of Greece triumphant over Asia, while he was the unconscious prophet of

an age in which Asia should be transformed by the diffusion of Hellenism.?

A just estimate of Isocrates demands that his character His_ should be viewed in both its main aspects,—the political political and the literary. 7

With regard to the first, two questions have to be asked : —(1) How far were the political views of Isocrates peculiar to himself, and different from those of the clearest minds contemporary with him? (2) How far were those views which he held—singly, or in common with others—falsified by the event ?

1. In regard to Hellenic politics at large, Isocrates held that they must go from bad to worse, unless the wrangling and demoralized cities could be united by the spell of a national enthusiasm, under the leadership of one strong state or one strong man. 'This national enthusiasm would be, he believed, most certainly evoked by a war against the great Asiatic empire of Persia. Such an expedition might well abolish the miserable squabbles of state with state, if only a captain could be found.

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® Tsocrates, a loyal and genuine Hellene, can yet conceive of Hel- lenic culture as shared by men not of Hellenic blood, Panegyr., § 50. He is thus, as Ernst Curtius has ably shown, a forerunner of Hellenismi—analogous, in the literary province, to Epaminondas and Timotheus in the political (History of Greece, v. 116, 204, tr. Ward).

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The whole tone of Greek thought in that age had taken a bent towards monarchy in some form. This tendency may be traced alike in the practical common sense of Xenophon and in the lofty idealism of Plato. There could be no better instance of it than a well-known passage in the Politics of Aristotle. He is speaking of the gifts which meet in the Greek race,—a race warlike, like the Europeans, but more subtle,—keen, like

the Asiatics, but braver. Here, he says, is a race which "might rule all men, if it were brought under a single government."! It is unnecessary to suppose a special allusion to Alexander; but it is probable that Aristotle had in his mind a possible union of the Greek cities under a strong constitutional monarchy. His advice to Alexander (as reported by Plutarch) was to treat the Greeks in the spirit of a leader (jyewovexds), and the barbarians in the spirit of a master (SeorortkGs).2 Aristotle agreed, then, with Isocrates in holding that, if tlle Greek race was to have a great future, the first requisite was union under a central power. Aristotle conceived this power as political and permanent; Isocrates conceived it as, in the first place, military—having for its immediate aim the conduct of an expedition against Asia. Had Isocrates foreseen that such a command-in-chief was inseparable from a per- manent monarchy, he would undoubtedly have accepted the latter; but he would have insisted, in the spirit of Aristotle's advice, on the constitutional liberty of the Greek subjects. The general views of Isocrates as to the largest good possible for the Greek race were thus substantially the same as those of Aristotle; and they were in accord with the prevailing tendency of the best Greek thought in that age.

2. How far were these views justified by the issue? The vision of the Greek race " brought under one polity" was not, indeed, fulfilled in the sense of Aristotle or of Isocrates. But the invasion of Asia by Alexander, as captain-general of Greece, became the event which actually opened new and larger destinies to the Greek race. The old political life of the Greek cities was worn out; in the new fields which were now opened, the empire of Greek civilization entered on a career of world-wide conquest, until Greece became to East and West more than all that Athens had been to Greece. Athens, Sparta, Thebes, ceased indeed to be the chief centres of Greek life; but the mission of the Greek mind could scarcely have been accomplished with such expansive and penetrating power if its influence had not radiated over the East from Pergamus, Antioch, and Alexandria.

Panhellenic politics had the foremost interest for Isocrates. But in two of his works—the oration On the Peace and the Areopagiticus (both of 355 B.c.)—he deals specially with the politics of Athens. The speech On

the Peace relates chiefly to foreign affairs. It is an eloquent appeal to his fellow-citizens to abandon the dream of supremacy, and to treat their allies as equals, not as sub- jects. The fervid orator personifies that empire, that false mistress which has lured Athens, then Sparta, then Athens once more, to the verge of destruction. 'Is she not worthy of detestation?" Leadership passes into empire; empire begets insolence; insolence brings ruin. The Areopagi- tzcus breathes a kindred spirit in regard to home policy. Athenian life had lost its old tone. Apathy to public mterests, dissolute frivolity, tawdry display and real poverty—these are the features on which Isocrates dwells. With this picture he contrasts the elder democracy of Solon and Clisthenes, and, as a first step towards reform, would restore to the Areopagus its general censor-

1d trav "EAAqvov yévos.. . duvduevov Upxew wdvrwr, mias

tuyxdvoy morrrelas, Polit., iv. [vii.] 7. * De Alex, Virt., i., vi.

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ship of morals. It is here, and here alone—in his com- ments on Athenian affairs at home and abroad—that we can distinctly recognize the man to whom the Athens of Pericles was something more than a tradition. We are carried back to the age in which his long life began. We find it difficult to realize that the voice to which we listen is the same which we hear in the letter to Philip.

Turning from the political to the literary aspect of his His work, we are at once upon ground where the question of literary

his merits will now provoke comparatively little controversy. Perhaps the most serious prejudice with which his reputa- tion has had to contend in modern times has been due to an accident of verbal usage. He repeatedly describes that art which he professed to teach as his durocodia. His use of this word—joined to the fact that in a few passages he appears to allude slightingly to Plato or to the Socratics—has exposed him to a groundless imputation. It cannot be too distinctly understood that, when Isocrates speaks of his ¢Aocodia, he means

simply his theory or method of “culture ”—to use the only modern term which is really equivalent in latitude to the Greek word as then current.?

The diAorodia, or practical culture, of Isocrates was not in conflict, because it had nothing in common, with the Socratic or Platonic philosophy. The personal influence of Socrates may, indeed, be traced in his work. He con- stantly desires to make his teaching bear on the practical life. His maxims of homely moral wisdom frequently recall Xenophon’s Jemorabilia, But there the relation euds. Plato alludes to Isocrates in perhaps three places. The glowing prophecy in the Phedrus has been quoted ; in the Gorgias a phrase of Isocrates is wittily parodied ; and in the Huthydemus Isocrates is probably meant by the person who dwells “on the borderland between philosophy and statesmanship.”* The writings of Isocrates contain a few more or less distinct allusions to Plato’s doctrines or works, to the general effect that they are barren of practical result.5 But Isocrates nowhere assails Plato’s philosophy as such. When he declares “knowledge” (émuorjyn) to be unattainable, he means an exact “knowledge” of the contingencies which may arise in practical life. ‘Since it is impossible for human nature to acquire any science (émuatnunv) by which we should know what to do or to say, in the next resort I deem those wise who, as a rule, cau hit what is best by their opinions” (8d£as).®

Isocrates should be compared with the practical teachers His dis- of his day. In his essay Against the Sophists, and in his tinctive

speech on the Andidosis, which belong respectively to the beginning and the close of his professional career, he has clearly marked the points which distinguish him from “the sophists of the herd” (dyeAatot cogucrat). First, then, he claims, and justly, greater breadth of view. The ordinary ~ teacher confined himself to the narrow scope of local in- terests,—training the young citizen to plead in the Athenian law courts, or to speak on Athenian affairs in the ecclesia. Isocrates sought to enlarge the mental horizon of his dis- ciples by accustoming them to deal with subjects which were not merely Athenian, but, in his own

phrase, Hellenic. Secondly, though he did not claim to have found a philosophical basis for morals, it has been well

3 The word ¢iAocodla seems to have come into Athenian use not much before the time of Socrates ; and, till long after the time of Isocrates, it was commonly used, not in the sense of ‘ philosophy,” but in that of “literary taste and study—culture generally.”’ Aristid., ii. 407, iroKadla tis at diarpiB} wep) Adyous, Kal ox 6 viv tpdros obtos, GAAX moideta Kowas. And so writers of the 4th century B.C. use ¢iAocopety as simply=‘‘to study”; as, g., an invalid “‘ studies” the means of relief from pain, Lys., Or. xxiv. § 10; cf. Isocr., Or. iv. § 6, &c.

4 Plat., Gorg., p. 463; Euthyd., 304-6. p.

5 These allusions are discussed in the Attic Orators, vol. ii. pp. Bf. 6 Tsocr., Or. xv. § 271.

said of him that “he reflects the human spirit always on its nobler side,”! and that, in an age of corrupt and impudent selfishness, he always strove to raise the minds of his hearers into a higher and purer air. ‘Thirdly, his method of teaching was thorough. Technical exposition came first. The learner was then required to apply the rules in actual composition, which the master revised. The ordinary teachers of rhetoric (as Aristotle says) employed their pupils in committing model pieces to memory, but neglected to train the learner’s own faculty through his own efforts. Lastly, Isocrates stands apart from most writers of that day in his steady effort to produce results of permanent value. While rhetorical skill was largely engaged in the intermittent journalism of political pamphlets, Isocrates set a higher ambition before his school. His own essays on contemporary questions received that finished form which has preserved them to this day. The impulse to solid and lasting work, communicated by the example of the master,

was seen in such monuments as the Atthis of Androtion, the Hellenic History of Theopompus, and the Philippica of Ephorus.

Tn one of his letters to Atticus, Cicero says that he has used "all the fragrant essences of Isocrates, and all the little stores of his disciples."2 The phrase has a point of which the writer himself was perhaps scarcely conscious : the style of Isocrates had come to Cicero through the school of Rhodes; and the Rhodian imitators had more of Asiatic splendour than of Attic elegance. But, with this allowance made, the passage may serve to indicate the real place of Isocrates in the history of literary style. The old Greek critics consider him as representing what they call the "smooth" or "florid" mode of composition (yAadvupd, évOnpa dcpyoviac) as distinguished from the "harsh" (atornpd) style of Antiphon and the perfect " mean" (uéon) of Demosthenes. Tried by a modern standard, the language of Isocrates is certainly not "florid." The only sense in which he merits the epithet is that (especially in his earlier work) he delights in elaborate antitheses. Isocrates is an "orator" in the larger sense of the Greek word rhetor; but his real distinction consists in the fact that he was the first Greek who gave an artistic finish to literary rhetoric. The practical oratory of the day had already two clearly separated branches—the forensic, represented by Isceus, and the deliberative, in which Callistratus was the forerunner of Demosthenes. Mean- while Isocrates was giving form and rhythm to a standard literary prose. Through the influence of his school, this normal prose style was transmitted—with the addition of some florid embellishments—to the first generation of Romans who studied rhetoric in the Greek schools. The distinctive feature in the composition of Isocrates is his structure of the periodic sentence. This, with him, is no longer rigid or monotonous, as with Antiphon,—no longer terse and compact, as with Lysias,—but ample, luxuriant, unfolding itself (to use a Greek critic's image) like the soft beauties of a winding river. Isocrates was the first Greek who worked out the idea of a prose rhythm. He saw clearly both its powers and its limits ; poetry has its strict rhythms and precise metres; prose has its metres and rhythms, not bound by a rigid framework, yet capable of being brought under certain general laws which a good ear can recognize, and which a speaker or writer may apply in the most various combinations. This

fundamental idea of prose rhythm, or number, is that which the style of Isocrates has imparted to the style of Cicero. When Quintilian (x. 1, 108) says, somewhat hyperbolically, that Cicero has artistically reproduced (effinxisse) “the force of

1 Cartelier, Le Discours .d’Isocrate sur lwi-méme, p. 1xii. 2 Totum Isocratis pupoOjxiey atque omnes ejus discipulorum arculas, Ad Adz., ii. 1. :

Demosthenes, the wealth of Plato, the charm of Isocrates,”’ he means principally this smooth and harmonious rhythm. Cicero himself expressly recognizes this original and distinc- tive merit of Isocrates.? Thus, through Rome, and especi- ally through Cicero, the influence of Isocrates, as the founder of a literary prose, has passed into the literatures of modern Europe. It is to the eloquence of the preacher that we may perhaps look for the nearest modern analogue of that kind in which Isocrates excelled,—especially, perhaps, to that of the great French preachers. Isocrates was one of the three Greek authors, Demosthenes and Plato being the others, who contributed most to form the style of Bossuet.

The extant works of Isocrates consist of twenty-one speeches or Works, discourses, and nine letters. Among these, the six forensic speeches Forensic.

represent the first period of his literary life,—belonging to the years 408-898 B.c. All six concern private causes. They may be classed as follows. 1. Action for Assault (8ixn aixtas), Or. xx., ‘* Against Lochites,” 894 B.c. 2. Claim to an Inheritance (émid:xacta), Or. xix., Agineticus, end of 394 or early in 898 B.c. 8. Actions to Recover a Deposit :—(1) Or. xxi, ‘“‘ Against Euthynus,” 408 B.c.; (2) Or. xvii., Trapeziticus, eud of 894 or early in 398 B.c. 4. Action for Damage (Stxkn BAdBns), Or. xvi., “ Concerning the Team of Horses,” 397 B.c. 5. Spectal Plea (wapaypaph), Or. xviii., ‘* Against Callimachus,” 402 B.c. Two of these have been regarded as spurious by G. E. Benseler, viz., Or. xxi., on account of the fre- quent hiatus and the short compact

periods, and Or. xvii., on tho first of these grounds. But we are not warranted in applying to the early work of Isocrates those canons which his mature style observed. The genuineness of the speech against Euthynus is recognized by Philostratus; while the Trapcezit¢cus—thrice named without suspicion by Harpocration—is treated by Dionysius, not only as authentic, but as the typical forensic work of its author. The speech against Lochites—where "a man of the people" (rod wAfOous efs) is the speaker—exhibits much rhetorical skill. The specch sep) rod (edyous ('concerning the team of horses'') has a curious interest. An Athenian citizen had complained that Alcibiades had robbed him of a team of four horses, and sues the statesman's son and namesake (who is the speaker) for their value. This is not the only place in which Isocrates has marked his admiration for the genius of Alcibiades ; it appears also in the Philippus and in the Busiris. But, among the forensic speeches, we must, on the whole, give the palm to the Wgincticus—a graphic picture of ordinary Greek life in tho islands of the Hgean. Hcre—especially in the narrative—Isocrates makes a near approach to the best manner of Lysias.

The remaining fifteen orations or discourses do not easily lend themselves to the ordinary classification under the heads of " deliberative" and "epidcictic." Both terms must be strained; and neither is strictly applicable to all the pieces which it is required to cover. The work of Isocrates travelled out of the grooves in which the rhetorical industry of the age had hitherto moved. His position among contemporary writers was determined by ideas peculiar to himself; and his compositions, besides having a style of their own, are in several instances of a new kind. The only adequate principle of classification is one which considers them in respect to their sub- ject-matter. Thus viewed, they form two clearly separated groups —the scholastic and the political.

Scholastic Writings.—Under this head we have, first, three Scholas- (1) The letter to the tic.

letters or essays of a hortatory character. young Demonicus,—once a favourite subject in the schools,—con- tains a series of preccpts neither

below nor much above the average practical morality of Greece. (2) The letter to Nicocles—the young king of the Cyprian Salamis—sets forth the duty of a monarch to his subjects. (8) In the third piecc, it is Nicocles who speaks, and impresses on the Salaminians their duty to their king—a picce re- markable as containing a popular plea for monarchy, composed by a citizen of Athens. These three letters may be referred to the years 874-872 B.c.

Next may be placed four pieces which are " displays" (émideles) in the proper Greek sense. The Busiris (Or. xi., 890-91 B.C.) is an attempt to show how the ill-famed king of Egypt might be praised. The "Encomium on Helen" (Or. x., 870 B.c.), a piece greatly superior to the last, contains the celebrated passage on the power of beauty. These two compositions serve to illustrate their author's view that ' encomia" of the hackneyed type might be elevated by combining the mythical matter with some topic of practical interest,—as, in the case of Busiris, with the institu- tions of Egypt, or, in that of Helen, with the reforms of Theseus. The Evagoras (Or. ix., 865 B.c. 2) is a laudatory epitaph on a really able man,—the Greek king of the Cyprian Salamis. A passage of

3 Idque princeps Isocrates instituisse fertur,. . . ut ineonditam

a dicendi rationem . . . numeris astringeret, De Or., iii

44, 1738.

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Political.

Letters.

sineular interest describes how, under his rule, the influences of Hellenic civilization had prevailed over the surrounding barbarism. The Panathenaicus (Or. xii.), intended for the great Panathenwa of 342.B.¢., but not completed till 339 B.c., contains a recital of the

services rendered by Athens to Greece, but digresses into personal defence against critics ; his last work, written in extreme old age, it bears the plainest marks of failing powers.

The third subdivision of the scholastic writings is formed by two most interesting essays on eduication—that entitled “ Against the Sophists” (Or. xili., 391-90 B.c.), and the “ Antidosis”’ (Or. xv., 355 B.¢.). The first of these isa manifesto put forth by Isocrates at the outset of his professional carecr of teaching, in which he secks to distinguish his aims from those of other “‘sophists.” These « sophists ” are (1) the “ eristics” (of wept Tas €pidas), by whom he seems to intend the minor Socratics, especially Euclides ; (2) the teachers of practical rhetorie, who had made exaggerated claims for the efficacy of mere instruction, independently of natural faculty or experience ; (8) the writers of “arts”’ of rhetoric, who virtually devoted themselves (as Aristotle also complains) to the lowest, or forensic, branch of their subject. As this piece is the prelude to his career, its epilogue is the speech on the “ Antidosis,”—so called be- cause it has the form of a speech made in court in answer to a chal- lenge to undertake the burden of the trierarchy, or else exchange pro-

erties with the challenger. The discourse “ Against the Sophists” al stated what his art was not; this speech defines whatit 7s. His own account of his ¢:Aocopfa—“ the discipline of discourse” (7 ray Adywv maidela)—has been embodied in the sketch of it given above.

Political Writings.—These, again, fall into two classes—those which concern (1) the relations of Greece with Persia, (2) the inter- nal affairs of Greece. The first class consist of the Pancgyricus (Or. iv., 380 3.c.) and the Philippus (Or. v., 8346 B.c.) The Panegyricus takes its name from the fact that it was given to the Greek public at the time of the Olympic festivals—probably by means of copies cir- culated there. The orator urges that Athens and Sparta should unite in leading the Greeks against Persia. The feeling of antiquity that this noble discourse is a masterpiece of careful work finds ex- pression in the tradition that it had occupicd its author for more than ten years. Its excellence is not merely that of language, but also—and perhaps even more

conspicuously—that of lucid arrange- ment. The Philippusis an appeal to the king of Macedon to assume that initiative in the war on Persia which Isocrates had ceased to expect from any Greek city. In tke view of Demosthenes, Philip was the representative barbarian ; in that of Isocrates, he is the first of HelJenes, and the natural champion of their cause.

Of those discourses which concern the internal affairs of Greece, two have already been noticed, —that On the Peacc (Or. viii.), and the Areopagiticus (Or. vi.)—both of 355 B.c.—as dealing respectively with the foreign and the home affairs of Athens. The Plataicus (Or. xiv.) is supposed to be spoken by a Platean before the Athcnian eeclesia in 373 B.c. In that year Plateea had for the second time in its history been destroyed by Thebes. The oration—an appeal to Athens to restore the unhappy town—is remarkable both for the power with which Theban cruelty is denounced, and for the genuine pathos of the peroration. The Archidamus (Or. vi.) isa speech pur- porting to be delivered by Archidamus III., son of Agesilaus, in a debate at Sparta on conditions of peace offered by Thebes in 366 B.€. It was demanded that Sparta should recognize the independ- ence of Messene, which had lately been restored by Epaminondas (370 B.c.). The oration gives brilliant expression to the feeling which such a demand was calculated to excite in Spartans who knew the history of their own city. Xenophon witnesses that the attitude of Sparta on this occasion was actually such as the Archi- damus assumes (Hellen., viii. 4, §§ 8-11).

Letters.—The first letter—to Dionysius I.—is fragmentary ; but a passage in the Philippus leaves no doubt as to its object. Iso- crates was anxious that the ruler of Syracuse should undertake the command of Greece against Persia. The date is probably 368 B.c. Next in chronological order stands the letter ‘To the Children of Jason” (vi.). Jason, tyrant of Phers, had been assassinated in 370 B.c.; and no less than three of his successors had shared the same fate. Isocrates now urges Thebe, the daughter of Jason, and her half-brothers, to set up a popular government. The date is 859 B.c.1 The letter to Archidamus III. (ix.)—the same person who is the imaginary speaker of oration vi. —urges him to execute the writer’s favourite idea,—“to deliver the

Greeks from their feuds, and to crush barbarian insolence." It is remarkable for a vivid picture of the state of Greece; the date is about 356 B.c. The letter to Timotheus (vii., 345 3.c.), ruler of Heraclea on the Euxine, introduces an Athenian friend who is going thither, and at the same time offers some good counsels to

- **This is shown by the present writer in a paper on "The Sixth Letter of Isoerates," Journal of Philosophy, vol. v. p. 266, 1874. The facet that Thebe, widow of Alexander of Pherz, was the daughter of Jason, is incidentally noticed by Plutareh in his life of Pelopidas, e, 28. It is this faet which gives the clue to the occasion of the letter; ¢f. Diod. xvi. 14.**

the benevolent despot. The letter "to the government of Mytt- lene" (viil., 350 B.c.) is a petition to a newly established oligarehy, begging them to permit the return of a demoeratic exile, a distin- guished musician named Agenor. 'The first of the two letters to Philip of Macedon (ii.) remonstrates with him on the personal danger to which he had recklessly exposed himself, and alludes to his beneficent intervention in the affairs of Thessaly; the date is probably the end of 342 3B.¢. The letter to Alexander (v.), then a boy of fourteen, is a brief grecting sent along with the last, and congratulates him on preferring " practical" to "eristic" studies— a distinction which is explained by the sketch of the author's pidocogla, and of his essay " Against the Sophists," given above. It was just at this time, probably, that Alexander was beginning to receive the lessons of Aristotle (342 B.c.). The letter to Antipater (iv.) introduces a friend who wished to enter the military serviee of Philip. Antipater was then acting as regent in Maccdonia during Philip's absence in Thrace (840-339 B.c.). The later of the two letters to Philip (iii.) appears to be written shortly after the battle of Cheronea in 338 B.c. The questions raised by it have already becn discussed.

No lost work of Isocrates is known from a definite quotation, cx- cept an " Art of Rhetoric," from which some scattered precepts are cited. Quintilian, indeed, and Photius, who had seen this " Art," felt a doubt

as to whether it was genuine. Only twenty-five dis- courses—out of an ascriptive total of some sixty—were admitted as authentic by Dionysius; Photius (circ. 850 a.p.) knew only the number now extant—twenty-one.

With the exception of defects at the end of Or. xiii., at the be- Text.

ginning of Or. xvi., and probably at the end of lettersi., vi., ix., the existing text is free from serious mutilations. It is also unusually pure. The smooth and clear style of Isocrates gave few opportunities for the mistakes of copyists. On the other hand, he was a favourite author of the schools. Numerous glosses crept into his text through the comments or conjectures of rhetoricians. This was already thie case before the 6th century, asis attested by the citations of Priscian and Stobeus. Jerome Wolf and Koraes successively accomplished much for the text. Buta more decided advance was made by Im- manuel Bekker. He used five MSS., viz., (1) Codex Urbinas III., Fr (this, the best, was his principal guide); (2) Vaticanus 986, A; (3) Laurentianus 87, 14, © (18th eentury); (4) Vaticanus 65, A ; and (5) Marcianus 415, £. The first three, of the same family, have Or. xv. entire ; the last two are from the same original, and have Or. xv. incomplete.

Baiter and Sauppe (Zurich, 1850) follow © "even more con- stantly than Bekker." 'Their apparatus is enriched, however, by a MS. to which he had not access,—Ambrosianus O. 144, E, which in some eases, as they recognize, has alone preserved the true read- ing. The readings of this MS. were given in full by G. E. Benseler in his second edition (1854-55). The distinctive characteristic of Benscler's textual criticism was a tendency to correct the text against even the best MS., where the MS. conflicted with the usage of Isocrates as inferred from his recorded precepts or from the state- ments of ancient writers. Thus, on the strength of the rule ascribed to Isocrates,—gwvhevra ph cuumlrrev, —Benseler would remove from the text every example of hiatus. Benseler's edition has been revised by F. Blass (1878-79), who amends a large number of his readings, but usually follows him in details of form and spelling.

Recent Editions. —In Oratores Attici, ed. Imm. Bekker, 1828 and 1828 ; ed. G. S. Dobson, 1828; ed. J. G. Baiter and Hermaun Sauppe, 1850. Separately in Teubner's series, by G. Ei. Benseler, 2d ed. 1854-55 ; revised by F. Blass, 1878-79. Ad Demonicum ct Panegyricum, ed. J, E. Sandys, 1868. Extracts from Orations iii., iv., vi., Vii, vili., ix., xiii., xiv., xv., xix., and Letters ili, v., edited with reviscd text and commentary, in Sclcctions from the Attic Orators, by the present writer (1880). (08, (C6 dis)

ISOMERISM. See Curmistry, vol. v. p. 550.

ISOTHERMS. See METEoroLoey.

ISPAHAN, or Israudy, a city of Persia, in the province of Irak Adjemi, is situated in 32° 39' N. lat. and 51° 44' Ky. long. It enjoys the reputation of a very salubrious climate, except in the autumn, when fevers are prevalent. The following statistics are given by modern authorities ; but the condition of the city and its environs is subject to con- stant change. The city walls—a mere mud curtain ruined in many places—are about 5 miles in circumference. There are some 300 villages, more or less flourishing, in the neighbourhood. In the interior of the city there are reckoned to be sixty mosques (of which about forty are in use), from eighty to a hundred baths, perhaps fifty colleges (which seems, however, far beyond the wants of the popula- tion), and twenty caravanserais in a more or less perfect

state. XIII. — 50

Mannu- serip ts.

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The public buildings of Ispaln (the best specimens of |

modern Oriental design and decoration to be found in Persia, or perhaps anywhere in the East) are of two distinct classes—those constructed by Shah Abbas and his successors, and those erected during the present Kajar dynasty. The two great palaces of Shah Abbas

the Great are named respectively Chihil-Suttin (‘the forty pillars ”) and Hasht Bihisht (“the eight paradises”). They are surrounded by extensive gardens, traversed by avenues of planes and. poplars, and intersected by paved canals of running water, with fountains and reservoirs sparkling in all directions, the whole area being encompassed by a mud wall which is nearly 3 miles in circumference. The buildings theniselves are ornamented with gilding aud mirrors in every possible variety of arabesque decoration ; and large and brilliant pictures of the usual Persian type, representing scenes of Persian history, cover the walls of all the principal apart- ments and have been ascribed in many instauces to Italian and Dutch artists, who are known to have been in the service of Shah Abbas. Attached to these palaces are separate buildings, such as the Améaret-i-Now (or “new edifice”), the Talari-Tavileh (or “ hall of the stables”), the Gul-dastah (“bunch of roses ”), and several others, which have been erected in modern times by wealthy courtiers for the convenience of the sovereign, and which are also generally occupied as residences by the European ministers, and by other distinguished travellers who are provided with royal accommodation on their way to the capital. Perhaps the most agreeable residence of all is the Haft Dast (“seven courts”) in the beautiful garden of Sa’adetabad, on the southern bank of the river, and 2 or 3 miles from the heart of the city. This palace was built by Shah Tahmasp, the successor of Shah Abbas, and until lately was kept in good repair and used as a villa residence by the prince governor. Sir Gore Ouseley resided there with his suite for some months on his deputation to Persia in 1811. The garden of the Chibil-Sutun palace, where Sir Harford Jones’s mission was established in 1809, opens out through the Ali-Kapi (or “Sublime Porte ”) into the great square or Mydan-i-Shah, the most remarkable feature in the city, and probably the largest square in the world, being 2000 feet in length by 700 in breadth. This square is surrounded by a double row of arcades, and formerly resembled a permanent fair ; now, however, it is painfully desolate. The corners of the square face the cardinal points, and in the centre of each face is some remarkable building. On the north-west is the Ali-K4pi, forming the entrance to the royal palace. It is three stories high, and from the summit is obtained a splendid view of Ispahdn and the environs. Opposite to the Ali-K4pi on the south-east side of the square is the

famous Mesjid-i-Shah, or “royal mosque,” covered with glazed tiles of unusual brilliancy, and richly decorated with gold and silver ornaments, being by far the handsomest mosque in all Persia; but, as Europeans are not admitted to the interior, it has never been well described. In the centre of the north-east face of the square is the gate entrance to the great bazaar usually called the Kaiserfeh, while immediately over the gate, where in Chardin’s time the great Dutch clock with its automatic figures used to excite the admiration of the Ispahdnis, the Nokhara-Khana, or “ trumpet house,” now blares forth its dissonant roar at sunrise and sunset, and on the remaining or south-west side is another sacred build- ing, the mosque of Lutf Ollah, which is only inferior in grandeur and beauty to the Mesjid-i-Shah.

Among the other notable buildings of Ispahan must be reckoned its colleges and bridges. The Zindeh-rid or ‘river of life” rises in Zardehkoh, about 90 miles to the west of Ispah4n, where some stupendous tunnelling works

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attempt to turn the Karun or Shuster stream into the eastern river bed. It flows in a well-cultivated valley through the districts of Char-mehel and Liujan to the town of Ispahdn, passing along the southern outskirts of the city from west to east, and being crossed by three principal bridges. The first, the Pul-i-Char-bagh, or, as it is also called, the Pul-i-Julfa, connecting the suburb of Julfa to the south with the stately Char-bagh avenue to the north, consists of a double row of 34 arches, with covered galleries on both sides, and with a roadway, battlemented and paved throughout. It was built by Ali Verdi Khan, one of Shah Abbas’s principal officers. The second bridge, the Pul-i-Khaju, is on the high road to the south, and is thus much frequented. It is also built with great solidity on a double row of arches, and is kept in excellent repair. The third bridge is smaller and less used. It is named Pul-i-Sheheristdén, from a village of that name to which it leads, forming the north-eastern suburb of the city. The river flows on some 30 miles further to the west, and is there lost in the sand.

Of the colleges of Ispahan, which are said to be fifty in number, and the greater part of which are still used as educational establishments for the Mahometan priesthood, the most remarkable building is the Medresseh Shah Sultén Hussain, on the right of the avenue leading northwards from the Pul-i-Khaju. It is thus described by Mr Morier : —

“Tts entrance is handsome.

Another striking feature of Ispahan is the line of covered bazaars, commencing with the Hassanabad and ending with the Kaiserfeh, which extends for nearly 3 miles, and divides the city from south to north. The confluence of people in these bazaars is certainly very great, and gives an exaggerated idea of the populousness of the city, the truth being that while the inhabitants congregate for business in these streets, the rest of the city is compara- tively deserted (see Morier’s lively description).

But although Ispahdn thus abounds with traces of former grandeur and magnificence, although even now, when sur- veyed from a commanding height within the city, or in the immediate environs, the enormous extent of mingled garden and building, at least 30 miles in circumference, gives an impression of populousness aud busy life, a closer scrutiny reveals that the whole scene is nothing more than a gigantic sham. With the exception of the bazaars and a few scattered hamlets, there is really no continuous 1n- habited area. Whole streets, whole quarters of the city have fallen into utter ruin, and are absolutely deserted, the traveller who is bent on visiting some of the remarkable sites in the north-western or north-eastern suburbs, such as the ruins of the old fire temple, the remains of the famous castle of Tabarrak, or the shaking minarets of Guladan, having to pass through miles of crumbling mud walls and roofless houses. It is believed indeed that not a twentieth part of the area of the old city is at present peopled, and that the million of inhabitants, reported in the time of Chardin, have now dwindled to about 40,000 souls.

The Armenian suburb of Julfa, at any rate, which con-

are yet to be seen, the traces of Shah Abbas's abortive | tained a population of 30,000 souls in the 17th century,

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is now tenanted by some 300 wretched families, and the Christian churches, which used to number thirteen, and were many of them maintained in great splendour, are now reduced to half a dozen edifices with bare walls and empty benches. At the same time it must be noted that some improvement has recently taken place in the education of the young, and also in their religious teaching, the wealthy Armenians of India having contributed liberally to the national schools, and a Scottish gentleman, Mr Bruce, having been engaged for some years in missionary labours among the ignorant Christian peasantry of Julfa and Feridun.

The commerce of Ispah4n has also greatly fallen off from its former flourishing condition. The manufactures, it is true, for which the city has been long famous, are still to a certain extent carried on; in the bazaars are yet to be found the brocades, satins, and silks of former days, together with calicoes, chintzes, and other cotton goods ; the daldls still hawk about the lacquered boxes, pen-cases, mnirror-frames, and book-covers, beautifully painted and ornamented, which are peculiar to Ispahdn, while sword- blades, damascened gunbarrels, glass, and earthenware continue here and there to be exhibited in the stalls for sale; but the imports, both from India and from the north, have greatly diminished, and this has crippled the demand for native produce. Whether the trade of former days can ever be restored is doubtful. British mercantile houses, established at Bushire, are making great efforts to push on their operations to the northward. Various schemes have been discussed for opening direct communication with the Persian Gulf, either by railway through Shiraz to Bushire, or across the mountaius to Shuster on the Karun, and thence by river steamer to Mohamreh. If the Persian Government can be induced to throw open the navigation of the Karun to British enterprise, it is probable that an attempt will really be made to connect Shuster and Ispahan by rail, notwithstanding the formidable engineering difficul- ties to be

encountered in crossing the Bakhtidree moun- tains; and in that case, as the Indian trade from the south would compete both with the Russian and British trade from the north, in supplying eastern Persia, Ispahan might be expected to derive great benefit from the com- petition. The position indeed is so favoured by nature and is so conveniently situated in the very focus of the British Indian lines of traffic that in due course of time some improvement may be confidently looked for.

The Ispahénis have a very poor reputation in Persia either for courage or morals. They are regarded as a clever, but at the same time a dissolute and disorderly community, whose government requires a strong hand and unyielding temper. The looties indeed of Ispahan are pro- verbial as the most "'rowdy" set of vagabonds in Persia. There is also a good deal of religious fanaticism and party spirit among the lower classes, the city being divided into two factions of Na'amet Ullahi and Hyderi (so called from two famous saints of former days), who reside in the rival quarters of Jubareh and Deridasht, and are continually coming into collision. The priesthood on the other hand are much respected for their learning and high character, and the decisions of the chief '" mujtehid" of Ispahan are

considered of more authority even than those of the sheikh-

el-Islim at the capital. The merchants also of Ispahan area very respectable class, occupied in extensive dealings with India, with Baghdad, and with Constantinople, and rarely, if ever, failing in their engagements. Altogether Ispahdn is one of the most interesting cities in the East, exhibiting a genuine picture of active Oriental life.

The natural advantages of Ispah4n—a genial climate, a fertile

soil, and abundance of water for irrigation—must have always made it a place of importance. In the most ancient cuneiform docu-

| treme east, as Syria (or Martu-ki) typified the west. | vinces of Ansan and Subarta, by which we must understand the | country from Ispahan

to Shuster, were ruled in those remote ages | by the same king, who undoubtedly belonged to the great Turanian

| ments, referring to a period between 3000 and 2000 z.c., the pro-

vince of Ansan, which certainly included Ispahan, was the limit of the geographical knowledge of the Babylonians, typifying the ex- The two pro-

family; and from this first notice of Ansan down to the 7th century B.C. the region seems to have remained, more or less, dependent on the paramount power of Susa. With regard to the eastern frontier of Ansan, however, ethnic changes were probably in extensive oper- ation during this interval of twenty centuries. The western Iranians, for instance, after separating from their eastern brethren on the Oxus, as early perhaps as 3000 3.c.,must have followed the line of the Elburz mountains, and then bifurcating into two branches must have scattered, westward into Mcdia and southward towards Persia. The first substantial settlement of the southern branch would seem then to have becn at Ispahan, where Jem, the eponym of the Persian race, is said to have founded a famous castle, the remains of which were visible as late as the 10th century A.D. This castle is known in the Zoroastrian writings as Jem-gird, but its proper name was Sar% or Sark (given in the Bundahish as Sruwa or Srobak), and it was especially famous in early Mahometan history as the building where the ancient records and tables of the Persiaus were discovered which proved of so much use to Abu-Mdsher (Albumazar) and his contemporaries. A valuable tradition, proceed- ing from quite a different source, has also been preserved to the effect that Jem, who invented the original Persian character, “ dwelt in Assan, a district of Shuster” (see Fliigel’s Fihrist, p. 12, 1. 21), which exactly accords with the Assyrian notices of Assan or Ansan classed as a dependency of Elymais. Now it is well known that native legend represented the Persian race to have been held in bondage for a thousand years, after the reign of Jem, by the foreign usurper Zohdk or Biverasp, a period which may well repre- sent the duration of Elymean supremacy over the Aryans of Ansan. At the

commencement of the 7th century B.c. Persia and Ansau are still found in the annals of Sennacherib amongst the tributaries of Elymais, confederated against Assyria ; but shortly afterwards the great Susian monarchy, which had lasted for full 2000 years, crumbled away under continued pressure from the west, and the Aryans of Ansan recovered their independence, founding for the first time a national dynasty, and establishing their scat of govern- ment at Gabe on the site of the modern city of Ispahan.

The royal city of Gabe was known as a foundation of the Ache- menidz as late as the time of Strabo, and the inscriptions show that Achemences and his successors did actually rule at Ansan until the great Cyrus set out on his career of western victory. Whether the Kabi or Kavi of tradition, the blacksmith of Ispahan, who is said to have headed the revolt against Zohak, took his name from the town of Gabe may be open to question ; but it is at any rate re- markable that the national standard of the Persian race, named after the blacksmith, and supposed to have been first unfurled at this epoch, retained the title of Darafsh-a Kdvdni (the banner of Kavi) to the time of the Arab conquest, and that the men of Ispahan were, moreover, throughout thislong period, alwaysespecially charged with its protection. The provincial name of Ansan or Assan seenis to have been disused in the country after the age of Cyrus, and to have been replaced by that of Gabenc or Gabianc, which alone appears in the Greek accounts of the wars of Alexander and his succes- sors, and in the geographical descriptions of Strabo. Gabe or Gavi became gradually corrupted to Jat during the Sassanian period, and it was thus by the lattcr name that the old city of Ispahan was generally known at the time of the Arab invasion. Subsequently the title of Jai became replaced by Sheheristdn or Medinch, “ tho city” par excellence, while a suburb which had been founded in the immediate vicinity, and which took the name of Yahudich, or the “ Jews’ town,” from its original Jewish inhabitants, gradually rosa into notice and superseded the old capital.

Sheheristan and Yahudtch are thus in the early ages of Islam described as independent cities, the former being the eastern and the latter the western division of the capital, cach surrounded by a separate wall; but

about the middle of the 10th century the famous Boide king known as the Rukn-cd-Dowlch united the two suburbs and many of the adjoining villages in one general enclosure which

1 The name of Yahudieh or “ Jews’ town” is derived by the early Arab geographers from a colony of Jews who are said to have migrated from Babylonia to Ispahan shortly after Nebuchadnezzar’s conquest of Jerusalem, but this is pure fable. The Jewish settlement really dates from the 3d century A.D., as is shown by a notice in the Armenian history of Moses of Chorene, lib. iii. eap. 35. The name Ispahdén has been generally compared with the Aspadana of Ptolemy in the ex- treme north of Persis, and the identification is probably correct, At any rate the title is of great antiquity, being found in the Bundahish, and being derived in all likelihood from the family name of the race of Feridén, the Athviyaén of romance, who were entitled Aspiydn in Pehlevi, according to the phonetic rules of that language.

was about 10 miles in circumference. The city, which had now re- sumed its old name of Ispahan, continued to flourish till the tine of ‘Timur (1887 A.D.), when in common with so many other cities of the empire it suffered grievously at the hands of the Tartar invaders, Timur indced is said to have erected a Kelleh Mindr or “ skull tower” of 70,000 heads at the gate of the city, as a warning to deter other communities from resisting his arms. The place, however, owing to its natural advantages, gradually recovered from the effects of this terrible visitation, and when the Sefeveean dynasty who suc- ceeded to power in the 16th century, transferred their place of resi- dence to it from Casbin, it rose rapidly in populousness and wealth. It was under Shah Abbas the first, the most illustrious sovereign of this house, that Ispahan attained its greatest prosperity. This monarch adopted every possible expedient, by stimulating commerce, encouraging arts and manufaetures, and introducing luxurious habits, to attract visitors to

his favourite capital. He built several magnificent palaces in the richest style of Oriental decoration, planted gardens and avenues, and distributed amongst them the waters of the Zindeh-rid in an endless series of reservoirs, fountains, and cascades. The baths, the mosques, the colleges, the bazaars, and the caravauserais of the city received an equal share of his atten- tion, and European artificers and merchants were largely encouraged to settle in his capital. Ambassadors visited his court from many of the first states of Europe, and faetories were permanently established for the merchants of England, France, Holland, the Hanseatic towns, Spain, Portugal, and Moscow. The celebrated traveller Chardin, who passed a great portion of his life at Ispahan in the latter half o1 the 17th century, has left a detailed and most inter- esting account of the statistics of the city at that period. He him- self estimated the population at 600,000, though in popular belicf the number exceeded a million. There were 1500 flourishing villages in the immediate neighbourhood ; the enceinte of the city and suburbs was reckoned at 24 miles, while the mud walls sur-

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1. A CCORDING to the Book of Genesis, Israel was the

brother of Edom, and the cousinof Moab and Ammon, These four petty peoples, which may be classed together as the Hebrew group, must at one time have formed some sort of a unity and have passed through a common history which resulted in their settlement in south-eastern Palestine. The Israelites, or rather that section of the Hebrew group which afterwards developed into Israel, appear at first to have been the immediate neighbours of Edom, and to have extended westwards towards the border of Egypt. As regards the ethnological position of the Hebrews as a whole, tradition has it that they had connexions not only with the Arameans of Osrhoene (Nahor), but also with certain of the old half-Arab inhabitants of the Sinaitic peninsula (Kenites, Amalek, Midian), To the Canaanites, whose language they had adopted, their relation was that of foreign conquerors and lords to a subject race (Gen. ix. 26),

Some fifteen centuries before our era a section of the Hebrew group left its ancient seat in the extreme south of Palestine to occupy the not distant pasture lands of Egypt (Goshen), where they carried on their old calling, that of shepherds and goatlerds, Although settled within the territory of the Pharaohs, and recognizing their authority, they continued to retain all their old characteristics,—their language their patriarchal institutions, their nomad habits of life.

But in course of time these foreign guests were subjected to changed treatment. Forced labour was exacted of them for the construction of new public works in Goshen, an exaction which was felt to be an assault upon their freedom and honour, and which in point of fact was fitted to take away all that was distinctive of their nationality. But they had no remedy at hand, and had submitted in despair, until Moses at last saw a favourable opportunity of deliverance. Reminding his oppressed brethren of the God of their fathers, and urging that their cause was His, he taught them to regard self-assertion against the Egyptians as an article of religion ; and they became once more a united people in a determination to seek refuge

rounding the city itself, probably nearly following the lines of the Boide enclosure, measured 20,000 paces. In the interior were counted 162 mosques, 48 public colleges, 1802 caravanserais, 273 baths, and 12 cemeteries. The adjoining suburb of Julfa was also a most flourishing place. Originally founded by Shah Abbas the Great, who transported to this locality 3400 Armenian families from the town of Julfa on the Arras, the colony increased rapidly under his fostering care, both in wealth and in numbers, the Christian population being estimated in 1685 at 30,000 souls. The first blow to the prosperity of modern Isprhan was given by the Afghan in- vasion at the beginning of the 18th century, since which date, although continuing for some time to be the nominal head of the empire, the city has gradually dwindled in importance, and now only ranks as a second or third rate provincial capital. When the Kajar dynasty indeed mounted the throne of Persia at the end of the last century the seat of government was at once

transferred to Teheran, with a view to the support of the royal tribe, whose chief seat was in the neighbouring provinec of Mazenderan; and, although it has often been proposed, from considerations of state policy in reference to Russia, to re-establish the court at Ispahan, which is the true centre of Persia, the scheme has never commanded much attention. At the same time the government of Ispahan, owing to the wealth of tke surrounding districts, has always been much sought after. Early in the century the post was often conferred upon sone powerful minister of the court, but in later times it has been usually the apanage of a favourite son or brother of the reigning sovereign. Feth Ali Shah, who had a particular affection for Ispahan, died at that placc in 1834, and it is still a time-honoured custom for the monarch on the throne to seek relief from the heat of Teheran by forming a summer eamp at the rich pastures of Gan- doman on the skirts of Zardeh-Koh, to the west of Ispahan, for the exercise of his troops and the health and amusement of his courtiers, (H. C. RB.)

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from oppression in the wilderness which was the dwelling place of their kindred and the seat of their God. At a time when Egypt was scourged by a grievous plague, the Hebrews broke up their settlement in Goshen one night in spring, and directed their steps towards their old home again. According to the accounts, the king had consented to the exodus, and latterly had even forced it on, but it was none the less a secret flight. :

To a not very numerous pastoral people such an under- taking presented no great difficulty. Nevertheless its execution was not to be carried out unimpeded. The Hebrews, compelled to abandon the direct eastward road (Exod. xiii. 17, 18), turned towards the south-west and encamped at last on the Egyptian shore of the northern arm of the Red Sea, where they were overtaken by Pharaoh's army. 'The situation was a critical one; buta high wind during the night had left the shallow sea so low that it became possible to ford it. Moses eagerly accepted the suggestion, and made the venture with success. The Egyptians, rushing after, came up with them on the further shore, and a struggle ensued.

But the assailants fought at a disadvantage, the ground being ill suited for their chariots and horsemen; they fell into confusion and attempted a retreat. Meanwhile the wind had changed; the waters returned, and the pursuers were annihilated.'

After turning aside to visit Sinai as related in Exodus, the emigrants settled at Kadesh, eastwards from Goshen, on the southern borders of Palestine,? where they remained

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1 Ex, xiv. 21, 24, 25, 27, 30, 81. According to the Old Testament the exodus took plaee 480 years before the building of Solomon's temple, and 960 years before the end of the Babylonian captivity. These figures are "systematic" or at least systematized, but even so they are certainly more trustworthy than the combinations of the Egyptologists.

2'The site of Sinai (= Horeb?) hardly admits of ascertainment. The best datum would be the sanetuary of Jethro, if we eould identify it with Madian (Jakut, iv. 451), whieh lies on the Arabian coast of the Red Sea obliquely facing the traditional Sinai. With regard to Kadesh, see Quarterly Statement of Palestine Exploration Fund (187) pps 202i

The exodus.

Settle- ment a Kadesh.

Con- quest of the Amo- rites,

Gradual unifica- tion of

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for many years, having at the well of Kadesh their sanctuary and judgment seat only, while with their flocks they ranged over an extensive tract. In all probability their stay at Kadesh was no involuntary detention ; rather wvas it this locality they had more

immediately had in view in setting out. For a civilized community of from two to three millions such a settlement would of course have been impossible ; but it was quite sufficient for the immediate requirements of the Goshen shepherds, few in number as they were, and inured to the life of the desert. That attempts may have been made by them to obtain possession of the more fertile country to the north is very likely ; but that from the outset they contemplated the conquest of the whole of Palestine proper, and that it was only in expiation of a fault that they were held back at the gate of the promised land until the whole generation of the disobedient had died out, is not historically probable.

We can assign a definite reason for their final departure from Kadesh. In the district to the east of Jordan the (Canaanite) Amorites had, sometime previously, driven the Ammonites from the lower Jabbok and deprived the Moabites of all their territory to the north of the Arnon ; on the plateau opposite Jericho Heshbon had become the capital of Sihon, the Amorite king. This sovereign now set himself to subdue southern Moab also, and not without success. 'Fire went out from Heshbon, flame from the stronghold of Sihon, devoured the cities of Moab upon the heights of Arnou, Woe to thee, O Moab! thou are undone, O people of Chemosh!" From these straits the Moabites were rescued by their cousins, the nomads of the wilderness of Kadesh. 'The Israelites came forward on behalf of what was at once the common Hebrew cause and their own par- ticular interest ; they took the field against the Amorites, vanquished them in battle, and broke up the kingdom of Sihon. 'The consequence was that the land to the south of the Arnon remained in the undisputed possession of Moab, while the victors themselves became masters of the territory immediately ta the north, Settled thus between Moab and Ammon their kinsmen, the Israelites supplied the link that was wanting in the chain of petty Hebrew nationalities established in the south of eastern Palestine.

The army that went out against the Amorites from Kadesh was certainly not exclusively composed of men who, or whose fathers, had accomplished the passage of the Red Sea. Israel was not a formed nation when it left Egypt ; and throughout the whole period of its sojourn in the wilderness it continued to be in process of growth.

Instead of excluding the kindred elements which offered themselves to it on its new soil, it received and assimilated them. The life they had lived together under Moses had been the first thing to awaken a feeling of solidarity among the tribes which afterwards constituted the nation; whether they had previously been a unity in any sense of the word is doubtful. On the other hand, the basis of the unification of the tribes must certainly have been laid before the conquest of Palestine proper; for with that it broke up, though the memory of it continued. At the same time it must not be supposed that all the twelve tribes already existed side by side in Kadesh. The song of the con- cubines of Jacob— Dan and Naphtali, Gad and Asher— manifestly do not pertain to Israel in the same sense as do those of Leah and Rachel ; probably they were late arrivals and of very mixed origin. We know, besides, that Benjamin was not born until aftcrwards, in Palestine. If this view be correct, Israel at first consisted of seven tribes, of which one only, that of Joseph, traced its descent to Rachel, though in point of numbers and physical strength 16 was the equal of all the others together, while in intel- lectual force it surpassed them. The remaining six were the sons of Leah:—Reuben, Simeon, Levi, Judah ; Issachar,

Zebulon. They are always enumerated in this order ; the fact that the last two are also invariably mentioned apart from the rest and after Joseph has its explanation in geographical considerations.

The time of Moses is invariably regarded as the properly Begun

creative period in Israel's history, and on that account also in the

as giving the pattern and norm for the ages which followed. In point of fact the history of Israel must be held to have begun then, and the foundations of a new epoch to have been laid. The prophets who came after gave, it is true, greater distinctness to the peculiar character of the nation, but they did not make it; on the contrary, it made them. Again, it is true that the movement which resulted in the establishment of the monarchy brought to- gether for the first time into organic unity the elements which previously had existed only in an isolated condition ;

but Israel's sense of national personality was a thing of much earlier origin, which even jn the time of the judges bound the various tribes and families together, and must have had a great hold on the mind of the nation, although there was no formal and binding constitution to give it support. When the Israelites settled in Palestine they found it inhabited by a population superior to themselves both in numbers and in civilization, which they did not extirpate, but on the contrary gradually subdued and absorbed. The process was favoured by affinity of race and similarity of speech ; but, however far it went, it never had the effect of making Israelites Canaanites ; on the contrary, it made Canaanites Israelites. Notwithstanding their inferiority, numerical and otherwise, they maintained their individuality, and that without the support of any external organization. Thus a certain inner unity actually subsisted long before it had found any outward political expression ; it goes back to the time of Moses, who is to be regarded as its author.

The foundation upen which, at all periods, Israel's sense on a re- of its national unity rested was religious in its character. ligious

It was the faith which may be summed up in the formula, Jehovah is the God of Israel, and Israel is the people of Jehovah. Moses was not the first discoverer of this faith, but it was through him that it came to be the fundamental basis of the national existence and history.1 The exi- gencies of their position severed a number of kindred clans from their customary surroundings, and drove them into his arms. He undertook the responsibilities of their leader, and the confidence of success which he manifested was justified by the result. But it was not through any merit of his that the undertaking (of which he was the soul) prospered as it did; his design was aided in a wholly unlooked-for way, by a marvellous occurrence quite beyond his control, and which no sagacity could possibly have foreseen, One whom the wind and sea obeyed had given him His aid. Behind him stood one higher than he, whose spirit wrought in him and whose arm wrought for him,—-not for his personal aggrandizement indeed, but for the weal of the nation. It was Jehovah. Alike what was done by the deliberate purpose of Moses and what was done without any human contrivance by nature and by

accident came to be regarded in one great totality as the doing of Jehovah for Israel. Jehovah it was who had directed each step in that process through which these so

1 Jehovah is to be regarded as having originally been a family or tribal god, either of the family to which Moses belonged or of the tribe of Joseph, in the possession of which we find the ark of Jehovah, and within which occurs the earliest certain instance of a composite proper name with the word Jehovah for one of its elements (Jebo-shna, Joshua). No essential distinction was felt to exist between Jehovah and El, any more than between Asshur and El; J ehovah was only a special name of El which had become current within a powerful circle, and which on that account was all the more fitted to become the designation of a national god.

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diverse elements, brought together by the pressure of necessity, had been caused to pass, and in the course of which the first beginnings of a feeling of national unity had been made to grow.

This feeling Moses was the first to elicit ; he it was also who maintained it in life and cherished its growth. The extraordinary set of circumstances which had first occasioned the new national movement continued to subsist, though in a less degree, throughout the sojourn of the people in the wilderness, and it was under their pressure that Israel continued to be moulded. 'To Moses, who had been the means of so brilliantly helping out of their first straits the Hebrews who had

accompanied him out of Egypt, they naturally turned in all subsequent difficulties ; before him they brought all affairs with which they were not them- selves able to cope. The authority which his antecedents had secured for him made him as matter of course the great national " Kadhi" in the wilderness. Equally as matter of course did he exercise his judicial functions, neither in his own interest nor in his own nanie, but in the interest of the whole community and in the name of Jehovah. By connecting them with the sanctuary of Jehovah, which stood at the well of Kadesh, he made these functions independent of his person, and thus he laid a firm basis for a consuetudinary law and became the originator of the Torah in Israel. In doing this he succeeded in inspiring the national being with that which was the very life of his awn soul; through the Torah he gave a definite positive expression to their sense of nationality and their idea of God. Jehovah was not merely the God of Israel ; as sucht He was the God at once of law and of justice, the basis, the informing principle, and the implied postulate of their national consciousness.

The relationship was carried on in precisely the same manner as that in which it had been begun. It was most especially in the graver moments of its history that Israel awoke to full consciousness of itself and of Jehovah. Now, at that time and for centuries afterwards, the highwater marks of history were indicated by the wars it recorded. The name " Tsrael" means * El does battle," and Jehovah was the warrior El, after whom the nation styled itself, The camp was, so to speak, at once the cradle in which the nation was nursed and the smithy in which it was welded into unity; it was also the primitive sanctuary. There Israel was, and thcre was Jehovah. If in times of peace the relations between the two had become dormant, they were at once called forth into fullest activity when the alarm of danger was raised ; Israel's awakening was always preceded by the awakening of Jehovah. Jehovah awakened inen who under the guidance of His spirit placed themselves at the nation's head; in them His proper leadership was visibly expressed. Jehovah went forth with the host to battle, and in its enthusiasm His presence was seen (Judg. v. 13, 23). With signs and wonders from heaven Jehovah decided the struggle carried on upon earth. In it He was always upon Israel's side; on Israel was His whole interest

concentrated, although His power (for He was God) reached far beyond their local limits.

Thus Jehovah was in a very real sense a living God; but the manifestations of His life in the great crises of His people's history were of necessity separated by considerable intervals of time. His activity had something abrupt and tumultuary about it, better suited for cxtraordinary occasions than for ordinary daily life. Traces of this feeling appear very prominently in the later stages of the development. But although the relations between [srae] and Israel's God came most strongly into prominence in times of excitement, yet it did not altogether dic out in the periods of comparative repose. It was in the casc of Jehovah just as in the case of the human Icaders of the

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people, who did not in times of peace wholly lose the influence they had gained in war. Jehovah had His per- manent court at tlie places of worship where in times of quietude men clung to Him that they might not lose Him in times of trouble. His chief, perhaps in the time of

Moses His only, sanctuary was with the so-called ark of Thea

the covenant. It was a standard, adapted primarily to the requirements of a wandering and warlike life ; brought back from the field, it became, as symbol of Jehovah's presence, the central seat of His worship. The cultus itself was more than a mere paying of court to Jehovah, more than a mere expedient for retaining His sympathies against times of necessity; the Torah of Jehovah, the holy administration of law, was conjoined with it. This had first of all been exercised, at the instance of the priest of Midian, by Moses at the well of Kadesh ; it was continued after him, at the sanctuary, within the circle of those who had attached themselves to him and were spiritually his heirs. In cases where the wisdom or the competency of the ordinary judges failed, men turned direct to the God- head, 2z.¢., to the sanctuary and those who served it. Their decisions, whether given according to their own lights.or by lot (according to the character of the question), were not derived from any law, but were received direct

from Jehovah.t The execution of their decisions did not lie with them; they could only advise and teach. Their authority was divine, or, as we should say, moral, in its character ; it rested upon that spontaneous recognition of the idea of right which, though unexpressed, was alive and working among the tribes, upon Jehovah Himself who was the author of this generally diffused sense of right, but revealed the proper determinations on points of detail only to certain individuals. The priestly Torah was an entirely unpolitical or rather prepolitical institution ; it had an existence before the state had, and it was one of the invisible foundation pillars on which the state rested. War and the administration of justice were regarded as matters of religion before they became matters of obliga- tion and civil order ; this is all that is really meant when a theocracy is spoken of. Moses certainly organized no formal state, endowed with specific holiness, upon the basis of the proposition "Jehovah is the God of Israel" ; or, at all events, if he did so, the fact had not in the slightest degree any practical consequence or historical significance. The old patriarchal system of families and clans continued as before to be the ordinary constitution, if one can apply such a word as constitution at all to an unorganized conglomeration of homogeneous elements. What there was of permanent official authority lay in the liands of the elders and heads of houses ; in time of war they commanded each his own household force, and in peace they dispensed justice each within his own circle. But this obvi- ously imperfect and inefficient form of government showed a growing tendency to break down just in proportion to the magnitude of the tasks which the nation in the course of its history was called upon to undertake. Appeal to Jehovah was always in these circumstances resorted to; His court was properly that of last resort, but the ordinary authorities were so inadequate that it had often enough to be applied to. Theoeracy, if one may so say, arose as the complement of anarchy. Actual and legal existence (in the modern sense) was predicable only of each of the many clans; the unity of the nation was realized in the first instance only through its religion. It was out of the religion of Israel that the commonwealth of Israel unfolded itself,—not a holy statc, but the state. And tlie state con- tinued to be, consciously, rooted in religion, which prevented

1 They were consulted chiefly on points of law, but also on all sorts of difficulties as to what was right and to be done, or wrong and to be avoided.

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Israel' s religion.

Legisla- tive and histori- cal tra- dition,

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it from quitting or losing its rapport with the soil from which it had originally sprung. With the intermediate and higher stages of political organization, with the build- ing of the upper structure, however, religion had no con- cern ; they were too far removed from the foundation. The derivative, which did not carry immediately in itself its own title to exist, was a matter of indifference to it ; what had come into being it suffered to go its own way as soon as it was capable of asserting its independence. For this reason it always turned by preference to the future, not in a utopian but in a thoroughly practical way; by a single step only did it keep ahead of the present. It prepared the way for such developments as are not derived from existing institutions, but spring immediately from the depths in which human society has its secret and mysterious roots.

The expression " Jehovah is the God of Israel," accord- ingly, meant that every task of the nation, internal as well as external, was conceived as holy. It certainly did not mean that the almighty Creator of heaven and earth was conceived of as having first made a covenant with this one people that by them He might be truly known and worshipped. It was not as if Jehovah had originally been regarded as the God of the universe who subsequently became the God of Israel ; on the contrary, He was primarily Israel's God, and only afterwards (very long afterwards) did He come to be regarded as the God of the universe. For Moses to have given to the Israelites an "enlightened conception of God " would have been to have given them a stone instead of bread; itis in the highest degree probable that, with regard to the essential nature of

Jehovah, as distinct from His relation to men, he allowed them to continue in the same way of thinking with their fathers. With theoretical truths, which were not at all in demand, he did not occupy himself, but purely with practical questions which were put and urged by the pres- sure of the times, The religious starting point of the history of Israel was remarkable, not for its novelty, but for its normal character. In all ancient primitive peoples the relation in which God is conceived to stand to the circumstances of the nation—in other words, reli- gion—furnishes a motive for law and morals; in the case of none did it become so with such purity and power as in that of the Israelites. Whatever Jehovah may have been conceived to be in His essential nature—God of the thunderstorm or the like—this fell more and more into the background as mysterious and transcendental; the subject was not one for enquiry. ll stress was laid upon His activity within the world of mankind, whose ends He made one with His own. Religion thus did not make men partakers in a divine life, but contrariwise it made God a partaker in the life of men; life in this way was not straitened by it, but enlarged. The so-called " parti- cularism" of Israel's idea of God was in fact the real strength of Israel's religion ; it thus escaped from barren mythologizings, and became free to apply itself to the moral tasks which are always given, and admit of being discharged, only in definite spheres. As God of the nation, Jehovah became the God of justice and of right; as God of justice and right, He came to be thought of as the highest, and at last as the only, power in heaven and earth.

In the preceding sketch the attempt has been made to exhibit Mosaism as it must be supposed to have existed on the assumption that the history of Israel commenced with it and that for centuries it continued to be the ideal root out of which that history continued to grow. This being assumed, we cannot treat the legislative por- tion of the Pentateuch as a source from which our knowledge of what Mosaism really was can be derived ; for it cannot in any sense be regarded as the starting point of the subsequent development. If it was the work of Moses, then we must suppose it to have re- mained a dead letter for centuries, and only through King Josiah and Kzra the scribe to have become operative in the national history

(compare sections 8 and 10). Whe historical tradition which has reached us relating to the period of the judges and of the kings of Israel is the main souree, though only of eourse in an indirect way, of our knowledge of Mosaism. But within the Pentateuch itself also the historical tradition about Moses (which admits of being dis- tinguished, and must carefully be separated, from the legislative, although the latter often elothes itself in narrative form) is in its main features manifestly trustworthy, and can only bo explained as resting on actual facts.

From the historieal tradition, then, it is certain that Moses was The But the legislative tradition cannot Mosaic In fact it can Torah.

the founder of the Torah. tell us what were the positive contents of Ais Torah. be shown that throughout tho wholo of the older period the Torah was no finished legislative code, but consisted entirely of the oral decisions and instructions of tho priests; as a wholo it was potential only; what actually existed were the individual sentences given by the priesthood as they were asked for. Thus Moses was not regarded as the promulgator once for all of a national constitution, but rather as the first to call into activity the national sense for law and jus- tice, and to begin the series of oral decisions which were continued after him by the priests. He was the founder of the nation out of which the Torah and prophecy camo as later growths. He laid the basis of Israel's subsequent peculiar individuality, not by any one formal act, but in virtue of his having, throughout the whole of his long life, been the people's leader, judge, and centre of union.

A correct conception of the manner in which the Torah was How made by him can be derived from the narrative contained in Exod. made.

xviii., but not from the long section which follows, relating to the Sinaitic covenant (ch. xix. sgg.). The giving of the law at Sinai has only a formal, not to say dramatic, significance. Itis the pro- duct of the poetic necessity for such a representation of the manner in which the people was constituted Jehovah's people as should appeal directly and

graphically to the imagination. Only so can we justly interpret thoso expressions according to which Jehovah with His own mouth thundered the ten commandments down from the mountain to the people below, and afterwards for forty days held a confidential conferenco with Moses alone on the summit. For the sake of producing a solemn and vivid impression, that is represeuted as having taken place in a single thrilling moment which in reality occurred slowly and almost unobserved. Why Sinai should have been chosen as the scene admits of ready expla- nation. It was the Olympus of the Hebrew peoples, the earthly seat of the Godhead, and as such it continued to be regarded by the Israelites even after their settlement in Palestine (Judg. v. 4, 5). This immemorial sanctity of Sinai it was that led to its being selected as the ideal scene of the giving of the law, not conversely. If we eliminate from the historical narrative the long Sinaitic section which has but a loose connexion with it, the wilderness of Kadcesh becomes the locality of the preceding and subsequent events. It was during the sojourn of many years here that the organization of the nation, in any historical sense, took place. " There he made for them statute and ordinance, and there he proved tliem," as we read in Ex. xv. 25 in a dislocated poetical fragment. "Judgment and trial,' " Massa-and Meribah," point to Kadesh as the place referred to ; there at all events is the scene of the narrative iminediately following (Ex. xvii.—Num. xx.), and doubtless also of Ex. xviii.

If the legislation of tho Pentateuch cease as a whole to be re- The De- garded as an authentic source for our knowledge of what Mosaism ealogue.

was, it becomes a somewhat precarious matter to make any excep- tion in favour of the Decalogue. In particular, the following argu- ments against its authenticity must be taken into account. (1) According to Ex. xxxiv. the commandments which stood upon the two tables were quite different. (2) The prohibition of images was during the older period quite unknown ; Moses himself is said to have made a brazen serpent which down to Hezekiah's time con- tinued to be worshipped at Jerusalem as an image of Jchovah. (3) The essentially and necessarily national character of the older phases of the religion of Jehovah

completely disappears in the quite uni- versal code of morals which is given in the Decaloguc as the funda- mental law of Israel ; but the entire series of religious personalities throughout the period of the judges and the kings—from Deborah, who praised Jael's treacherous act of murder, to David, who causcd his prisoners of war to be sawn asunder and burnt—make it very difficult to believe that the religion of Isracl was from the outset one of a specifically moral character. The true spirit of the old religion may be gathered much more truly from Judg. v. than from Ex. xx. (4) It is extremely doubtful whether the actual mono- theism which is undoubtedly presupposed in the universal moral precepts of the Decalogue could have formed the foundation of a national religion. It was first developed out of the national religion at the downfall of the nation, and thereupon kept its hold upon the people in an artificial manner by means of the idea of a cove- nant formed by the God of the universe with, in the first instanee, Israel alone (eompare seets. 6-10). ae

As for the question regarding the historical presuppositions of Mosaism, there generally underlies it a misunderstanding arising

Histori- eal pre- supposi- tious of Mosaismn.

Early in- vasions of Pales- tine proper.

Oceupa- tion of central plateau.

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out of theological intellectualism—»an attribute found with special frequency among non-theologians. Moses gave no new idea of God to his people. 'lhe question wheuce he could have derived it there- fore need uot be raised. It eould not possibly be worse answered, however, than by a reference to his relations with the priestly caste of Egypt and their wisdom. It is not to be believed that an Egyptian dcity could inspire the Hebrews of Goshen with courage

for the struggle against the Egyptians, or that an abstraction of

esoteric speculation could become the national deity of Israel. It is not inconceivable indeed, although at the same time quite incapable of proof, that Moses was indebted to the Egyptian priests for cer- tain advantages of personal culture, or that he borrowed from them

on all hands in external details of organization or in matters of

ritual. But the origin of the germ which developed into Israel is not to be sought for in Egypt, and Jehovah has nothing in common with the colourless divinity of Penta-ur or with the God-forsaken dreariness of certain modern Egyptologists. That monotheism must have been a forcign importation, because it is contrary to that sexual dualism of Godhead which is the fundamental characteristic of Semitic religion, is an untenable exaggeration which has recently become popular out of opposition to the familiar thesis about the monotheistic instinct of the Senrites (Noldeke, Literar. Centralbl., 1877, p. 365). Moab, Ammon, and Edom, Israel's nearest kinsfolk and neighbours, were monotheists in precisely the same sense in which Israel itself was ; but it would be foolish surely in their case to think of foreign importation.

Manetho's statements about the Israelites are for the most part to be regarded as malicious inventions: whether any genuine tradi- tion underlies them at all is a point much needing to be investi- gated ; the identity of Osarsiph and 5)}DEDN is really very question – able. The story of Exod. ii. 1 sqg. is a mythus of frequent recur- rence elsewhere, to which no further significance is attached, for that Moscs was trained in all the wisdom of the Egyptians is vouched for by no earlier authorities than Philo and the New Testament. According to the Old Testament tradition his connexion is with Jethro's priesthood or with that of the Kenites. This historical presupposition of Mosaism has external evidence in its favour, and is inherently quite probable.

2. The kingdom of Sihon did not permanently suffice the Israelites, and the disintegration of the Canaanites to the west of Jordan in an endless number of kingdoms and cities invited attack. The first essay was made by Judah in conjunction with Simeon and Levi, but was far from prosperous, Simeon and Levi were annihilated ; Judah also, though successful in mastering the mountain land to the west of the Dead Sea,

was so only at the cost of severe losses which were not again made up until the accession of the Kenite families of the south (Caleb). As a conse- quence of the secession of these tribes, a uew division of the nation into Israel and Judah took the place of that which had previously subsisted between the families of Leah and Rachel ; under Israel were included all the tribes except Simeon, Levi, and Judah, which three are no longer mentioned in Judg. v., where all the others are carefully and exhaustively enumerated. This half-abortive first invasion of the west was followed by a second, which was stronger and attended with much better results. It was led by the tribe of Joseph, to which the others attached themselves, Reuben and Gad only remaining behind in the old settlements. The district to the north of Judah, inhabited afterwards by Benjamin, was the first to be attacked. It was not until after several towns of this district had one by one fallen into the hands of the con- querors that the Canaanites set about a united resistance. They were, however, decisively repulsed by Joshua in the neighbourhood by Gibeon; and by this victory the Israelites became masters of the whole central plateau of Palestine. The first camp, at Gilgal, near the ford of Jordan, which had been maintained until then, was now removed, and the ark of Jehovah brought further inland (perhaps by way of Bethel) to Shiloh, where henceforward the headquarters were fixed, in a position which seemed as if it had been expressly made to favour attacks upon the fertile tract lying beneath it on the north. The Bne Rachel now occupied the new territory which up to that time had been acquired,—Benjamin, in immediate con- tiguity with the froutier of Judah, then Ephraim, stretching

to beyond Shiloh, and lastly Manasseh, furthest to the north, as far as to the plain of Jezreel. The centre of gravity, so to speak, already lay in Ephraim, to which belonged Joshua and the ark.

Tt is mentioned as the last achievement of Joshua that at the waters of Merom he defeated Jabin, king of Hazor, and the allied princes of Galilee, thereby opening up the Galilee, north for Israelitish settlers. It is quite what we should expect that a great and united blow had to be

struck at the Canaanites of the north before the new comers could occupy it in peace; and King Jabin, who reappears at a later date, certainly does not suit the situation described in Judg. iv., v.

The book of Joshua represents the conquest of western Palestine Narra. as having been the common undertaking of all the tribes together, tives of which, after the original inhabitants have been extirpated, are ex- Joshua hibited as laying the ownerless country at Joshua's feet in order and that he may divide it by lot amongst them. But this is a " syste- Judges matic" generalization, contradicted by the facts which we otherwise know. For we possess another account of the conquest of Palestine, that of Judg. i., which runs parallel with the book of Joshua, It is shorter indeed and more superficial, yet in its entire mode of pre- senting the subject more historical. According to its narrative, it appears that Joshua was the leader of Joseph and Benjamin only, with whom indeed Issachar, Zebulon, Dan, Naphtali, and Asher made common cause. But before his time the tribe of Judah had already crossed the Jordan and effected a lodgment in the territory which lay between the earlier seat of the nation in the wilderness of Kadesh and its then settlement on the plateau of Moab, forming in some degree a link of connexion between the two. It might he supposed that the tribe of Judah had not taken the longer route to the eastward of the Dead Sea at all, but had already at Kadesh broken off from the main body and thence turned its steps directly northward. But the representation actually given in Judg. i., to the effect that it was from the direction of the Jordan and not from that of the Negeb that they came to take possession of their land, finds its confirmation in the fact that the southern portion of their terri- tory was the last to come into their possession. The tradition is unwavering that Hebron was taken not by Judah but by Caleb, a family which stood in friendly relations with Isracl, but had no connexion with it by blood. It was only through the policy of David that Caleb, Othniel, Jerachmeel, and the rest of the Kenites who had their homes in the Negeb became completely incorporated with Judah, so that Hebron became at last the capital of that tribe.

Its oldest seats, however, lay further to the north, in the region of Tekoa, Bethlehem, Baal Judah.

It harmonizes well with this view to suppose that Simeon and Simeon Levi must have made at the same time their attempt to effect a and settlement in the hill country of Ephraim. One of their famihes, Levi. Dinah bath Leah, met with a favourable reception in the town of Shechem, and began to mix freely with its population, and thus the way was paved for the establishment of peaceable relations between the old inhabitants of the land and the new importations. But these relations were brought to an end by the two brothers who, in concert it must be supposed with their sister, fell upon the She- chemites and massacred them. The final result proved disastrous. The Canaanites of the surrounding country united against them and completely destroyed them. There can be no doubt as to the trustworthiness of the somewhat enigmatical records of those events which are given in Gen. xlix. and xxxiv.; in no other way is it possible to explain why Simeon and Levi, which originally came upon the stage of history on an cqual footing with Reuben and Judah, should have already disappeared as independent tribes at the very beginning of the period of the judges. Now, that the de- struction of Shechem by the Manassite Abimelech is quite distinct from the attack made by Simeon and Levineed hardly be said. On the other hand, the occurrence cannot be regarded as pre-Mosaic, but must be assigned to a time previous to the conquest of the hill country of Ephraim by Joseph ; for after Joseph's settlement there the two sons of Leah had manifestly nothing more to hope for in that locality. We are shut up, therefore, to the conclusion that they crossed the Jordan at the same time as Judah separated himself from the main body in search of a suitable territory. That Simeon accompanied Judah in the first westward attempt is expressly stated in Judg. i. The fate of Levi, again, cannot be separated from that of Simeon (Gen. xlix. 5-7); that he is not expressly mentioned in Judg. i. ought not to cause surprise, when it is considered that later generations which regarded Levi as neither more nor less than a priest would have some difficulty in representing him as a thoroughly secular tribe. Such nevertheless he must have been, for the poet in Gen. xlix. 5-7 puts hin ona footing of perfect equality with Simeon, and attributes to both brothers a very

secular and bloodthirsty character ; he has no conception that Levi has a sacred vocation which is the reason of the dispersion of the tribe; the

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Perman- ent settle- ment.

Canaan- ite reac- tion.

Sisera.

Dan.

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dispersion on the contrary is regarded as a curse and no blessing, an annihilation and not the means of giving permanence to its tribal individuality. The shattered remains of Simeon, and doubtless those of Levi also, became incorporated with Judah, which thencc- forward was the sole representative of the three sons of Leah, who according to the genealogy had been born immediately after Reuben the first-born. Judah itself seems at the same time to have suffered severely. Of its three older branches, Er, Onan, and Shelah, one only survived, and only by the accession of foreign elements did the tribe regain its vigour, —by the fresh blood which the Kenites of the Negeb brought. For Zarah and Pharez, which took the place of Fr and Onan after these had disappeared, belonged originally, not to Israel, but to Hezron or the Kenites; under this designation arc included families like those of Othniel, Jerachmeel, and Caleb, and, as has been already remarked, even in David’s time tliese were not reckoned as strictly belonging to Judah. Thus the depletion which the tribe had to suffer in the struggle with the Canaanites at the

beginning of the period of the judges was the remote cause o. the prominence which, according to 1 Chron. ii., the Bne Hezron after-

wards attained in Judah. ‘The survivors of Simcon also appear to have becn forced back upon these Hezronites in the Negeb; the citics

assigned to them in the book of Joshua all belong to that

region.

Even after the united resistance of the Canaanites had been broken, each individual community had still enough to do before it could take firm hold of the spot which it had searched out for itself or to which it had been assigned. The business of effecting permanent settlement was just a continuation of the former struggle, only on a diminished scale ; every tribe and every family now fought for its own hand after the preliminary work had been accomplished by a united effort. Naturally therefore the conquest was at first but an incomplete one. The plain which fringed the coast was hardly touched ; so also the valley of Jezreel with its girdle of fortified cities stretching from Acco to Bethshean. All that was subdued in the strict sense of that word was the mountainous land, particularly the southern hill country of " Mount Ephraim"; yet even here the Canaanites retained possession of uot a few cities, such as Jebus, Shechem, Thebez. It was only after the lapse of centuries that all the lacunee were filled up, and the Canaanite enclaves made tributary.

The Israelites had the extraordinarily disintegrated state of the enemy to thank for the ease with which they had achieved success. The first storm subsided compara- tively soon, and conquerors and conquered alike learned to accommodate themselves to the new circumstances. Then the Canaanites once more collected all their energies to strike a blow forfreedom. Under the hegemony of Sisera a great league was formed, and the plain of Jezreel became the centre of the reorganized power which made itself felt by its attacks both northwards and southwards. The Israelites were strangely helpless; it was as if neither shield nor spear could be found among their 40,000 fight- ing men. But at last there came an impulse from above, and brought life and soul to the unorganized mass ; Deborah sent out the summons to the tribes, Barak came forward as their leader against the kings of Canaan who had assembled under Sisera's command by the brook Kishon, The cavalry of the enemy was unable to with- stand the impetuous rush of the army of Jehovah, and Sisera himself perished in the flight, From

that day the Canaanites, although many strong towns continued to be held by them, never again raised their heads.

After these occurrences some further changes of a funda- mental character took place in the relations of the tribes. The Danites proved unable to hold against the forward pressure of the Philistines their territory on the coast to the west of Benjamin and Ephraim; they accordingly sought a new settlement, which was found in the north at the foot of Hermon. In this way all the secondary tribes westward of Jordan (Asher, Naphtali, Dan) came to have their seats beside each other in the northern division of the land. Eastward of Jordan, Reuben rapidly fell from

his old prominence, sharing the fate of his next eldest

brethren Simeon and Levi. When Eglon of Moab took Jericho, and laid Benjamin under tribute, it is obvious that

he must previously have nade himself master of Reuben's Reuben,

territory. This territory became thenceforward a subject of constant dispute between Moab and Israel ; the efforts to recover it, however, did not proceed from Reuben himself, but from Gad, a tribe which knew how to assert itself with vigour against the enemies by which it was surrounded. But, if the Hebrews lost ground in the south, they materially enlarged their borders in the north of the land eastward of Jordan. Various Manassite families, finding their holdings at home too small, crossed the Jordan and founded colonies in Bashan and northern

Gilead. Although this colonization, on account of the Gilead.

rivalry of the Arameans, who were also pressing forward in this direction, was but imperfectly successful, it never- theless was of very great importance, inasmuch as it served to give new strength to the bonds that united the eastern with the western tribes. Not only was

Gilead not lost ; it even became a very vigorous member of the body politic.!

The times of agitation and insecurity which followed upon the conquest of Palestine invited attacks by the eastern nomads, and once more the Israelite peasantry showed all its old helplessness, until at last the indignation

of a Manassite of good family, Gideon or Jerubbaal, was Gideon.

roused by the Midianites, who had captured some of his brothers and put them to death. With his family, that of Abiezer, he gave pursuit, and, overtaking the enemy on the borders of the wilderness, inflicted on them such chastisement as put an end to these incursions. His heroism had consequences which reached far beyond the scope of his original purpose. He became the champion of the peasantry against the freebooters, of the cultivated land against the waste; social respect and predominance were his rewards. In his native town of Ophrah he kept up a great establishment, where also he built a temple with an image of Jehovah overlaid with the gold which he had taken from the Midianites. He transmitted to his sons an authority, which was not limited to Abiezer and Manasseh alone, but, however slightly and indirectly, extended over Ephraim as well.

On the foundations laid by Gideon Abimelech his son Abime- sought to establish a kingship over Israel, that is, over lech-

Ephraim and Manasseh. The predominance, however, which had been naturally accorded to his father in virtue of his personal merits, Abimelech looked upon as a thing seized by force and to be maintained with injustice ; and in this way he soon destroyed those fair beginnings out of which even at that time a kingdom might have arisen within the house of Joseph. The one permanent fruit of his activity was that Shechem was destroyed as a Canaanite city and rebuilt for Israel.”

The most important change of the period of the judges National The old population of growth.

went on gradually and in silence. the country, which, according to Deuteronomy, was to

1 It is probable that Manasseh's migration to the territory eastward of Jordan took place from the west, and later than the time of Moses. The older portions of the Hexateuch speak not of two and a half but only of two trans-Jordanic tribes, and exclude Manasseh ; according to them the kingdom of Sihon alone was subdued by Moses, not that of Og also, the latter indeed being a wholly legendary personage. In the song of Deborah, Machir is reckoned among the western tribes, and it was not until much later that this became the designation of the Manassites eastward of Jordan. It is also worth noticing that Jair's colonization of northern Gilead did not take place until the time of the judges (Judg. x. 3 sqg.), but is related also in Num. xxxii. 39-42. '

2 On the narratives contained in the book of Judges see Bleek, Eiint. ins Alte Testament (4th ed.), §§ 88-98, and especially the sections on Barak and Sisera, Gideon, Jephthah, Samson, the Danite migration,

nd the Benjamites of Gibeah (§$ 93-98). oe ea own Br

have been exterminated, slowly became amalgamated with the new. In this way the Israelites received a very import- ant accession to their numbers. In Deborah's time the fighting men of Israel numbered 40,000 ; the tribe of Dan, when it migrated to Laish, counted 600 warriors ; Gideon pursued the Midianites with 300. But in the reigns of Saul and David we find a population of from two to three millions. The rapid increase is to be accounted for by the incorporation of the Canaanites. Appropri- ation of the culture of the Canaanites, and quietly entered into the ate enjoyment of the labours of their predecessors. From "the pastoral they advanced to the agricultural stage ; corn and wine, the olive and the fig, with them are habitually spoken of as the necessaries of life. It was not strange that this change in the manner of their everyday life should be attended with certain consequences in the sphere of religion also. It is inconceivable that the Israelites should have brought with them out of the desert the cultus

they observed in the time of the kings (Ex. xx, xxiii, xxxiv.), which throughout presupposed the fields and gardens of Palestine; they borrowed it from the Canaanites.! This is confirmed by the fact that they took over from these the “Bamoth” or “high places” also, notwithstanding the prohibition in Deut. xii.

Tt was natural enough that the Hebrews should also ap- propriate the divinity worshipped by the Canaanite peasants as the giver of their corn, wine, and oil, the Baal whom the Greeks identified with Dionysus. The apostasy to Baal, on the part of the first generation which had quitted the wilderness and adopted a settled agricultural life, is attested alike by historical and prophetical tradition. Doubtless Baal, as the god of the land of Canaan, and Jehovah, as God of the nation of Israel, were in the first instance coordinated.2 But it was not to be expected that the divinity of the land should permanently be different from the God of the dominant people. In proportion as Israel identified itself with the conquered territory, the divinities also were identified. Hence arose a certain syncretism between Baal and Jehovah, which had not been got over even in the time of the prophet Hosea. At the same time the functions of Baal were more frequently transferred to Jehovah than conversely. Canaan and Baal represented the female, Israel and Jehovah the male, prin- ciple in this union.

Dangers Had the Israelites remained in the wilderness and in of civili- barbarism, the historical development they subsequently i reached would hardly have been possible; their career ‘would have been like that of Amalek, or, at best, like those of Edom, Moab, and Ammon. Their acceptance of civilization was undoubtedly a step in the forward direc-

tion; but as certainly did it also involve a peril. It involved an overloading, as it were, of the system with materials which it was incapable of assimilating at once.

The inaterial tasks imposed threatened to destroy the religious basis of the old national life. The offensive and defensive alliance among the tribes gradually dissolved

under the continuance of peace; the subsequent occupa-

tion of the country dispersed those whom the camp had united. The enthusiastic élan with which the conquest

had been achieved gave way to the petty drudgery by which

the individual families, each in its own circle, had to accommodate themselves to their new surroundings. Yet

under the ashes the embers were still aglow; and the

Baal.

1 In the earliest case where the feast of the ingathering, afterwards the chief feast of the Israelites, is mentioned, it is celebrated by Canaanites of Shechem in honour of Baal (Judg. ix. 27).

2 In Judg. v. Jehovah retains his original abode in the wilderness, on Sinai, and only on occasions of necessity quits it to come to Palestime.

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At the same time the Hebrews learned to participate in |

course of history ever fanned them anew into flame, bring- ing home to Israel the truths that man does not live by bread alone, and that there are other things of worth than those which Baal can bestow ; it brought ever again into the foreground the divineness of heroical self-sacrifice of the individual for the good of the nation.

3. The Philistines were the means of arousing from their ThePhiji., slumber Israel and Jehovah. From their settlements by tines. the sea, on the low-lying plain which skirts the mountains of Judah on the west, they pressed northwards into the plain of Sharon, and thence into the plain of Jezreel beyond, which is connected with that of Sharon by the upland valley of Dothan. Here, having driven out the Danites, they came into direct contact with the tribe of Joseph, the chief bulwark of Israel, and a great battle took place at Aphek, where the plain of

Sharon merges into the valley of Dothan. The Philistines were victorious and carried off as a trophy the Israelite standard, the ark of Jehovah. Their further conquests included, not only the plain of Jezreel and the hill country bordering it on the south, but also the proper citadel of the country, “ Mount Ephraim.” The old sanctuary at Shiloh was destroyed by them; its temple of Jehovah thenceforward lay in ruins. Their supremacy extended as far as to Benjamin; the Philistines had a mecib in Gibeah.? But the assertion that they had confiscated all weapons and removed all smiths must be regarded as an unhistorical exaggeration ; under their regime at all events it was possible for the messengers of a beleaguered city on the east of Jordan to sumnion their countrymen in the west to their relief.

The shame of the Israelites under the reproach of Philis- tine oppression led in the first instance to a widespread exaltation of religious feeling. Troops of ecstatic enthusi- asts showed themselves here and there, and went about with musical accompaniments in processions which often took the shape of wild dances; even men of the most sedate temperament were sometimes smitten with the contagion, and drawn into the charmed circle. In sucha phenomenon, occurring in the East, there was nothing intrin- sically strange; among the Canaanites, such “ Nebiim”— The for so they were styled—had long been familiar, and they Nebiim. ! continued to exist in the country after the old fashion, long after their original character, so far as Israel was concerned, had been wholly lost. The new thing at this juncture was that this spirit passed over upon Israel, and that the best members of the community were seized by it. It afforded an outlet for the suppressed excitement of the nation.

The new-kindled zeal had for its object, not the abolition of Baal worship, but resistance to the enemies of Israel. Religion and patriotism were then identical, This spirit of the times was understood by an old man, Samuel ben Samuel. Elkanah, who lived at Ramah in south-western Ephraim.

He was not himself one of the Nebiim ; on the contrary, he was a seer of that old type which had for a long time ex- isted amongst the Hebrews

much as we find it amongst the Greeks or Arabs. Raised by his foreseeing talent to a position of great prominence, he found opportunity to occupy himself with other questions besides those which he was professionally called on to answer. The national distress weighed upon his heart ; the neighbouring peoples had taught him to recognize the advantages which are secured by the consolidation of families and tribes into a kingdom. But Samuel's peculiar merit lay, not in dis-

3 Necib is an Aramaic word of uncertain meaning. In the name of the town Negibin (Nisibis) it certainly seems to mean '¢nillars"' ; according to] Kings iv. 5 and xxii. 48 (where it is pointed nigcab), * governor" seems the best translation, and this is the only rendering consistent with the expression in] Sam. xiii. 3 (" Jonathan slew the negib," &c.).

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covering what it was that the nation needed, but in finding out the man who was capable of supplying that need.

_'* Samuel is of less importance for history itsclf than he is for the Tradition history of tradition, in which the treatment which his figure received regarding supplics us with some means of judging how far it can be trusted Samuel.

Patriotic : struggle. refused to let him go.

Having come to know Saul ben Kish, a Benjamite of the town of Gibeah, a man of gigantic form, and swift, enthusiastic nature, he declared to him his destiny to become king over Israel.

Saul very soon had an opportunity for showing whether Samuel had been a true seer or no, The city of Jabesh in Gilead was besieged by the Ammonites, and the inhabit- ants declared themselves ready to surrender should they fail in obtaining speedy succour from their countrymen. Their messengers had passed through all Israel without meeting with anything more helpful than pity, until at last tidings of

their case reached Saul as he was returning with a yoke of oxen from the field. Hewing his cattle in pieces, he caused the portions to be sent in all directions, with the threat that so should it be done with the oxen of every one who should refuse to help in relieving Jabesh. The people obeyed the summons, fell suddenly one morning upon the Ammonites, and delivered the beleaguered city.

Having thus found Saul the man for their need, they In Gilgal, Joshua's old camp, they anointed him king. Theact was equivalent to imposing upon him the conduct of the struggle against the Philistines, and so he understood it. The first signal for the attack was given by his son Jonathan, when he slew the negib of the Philistines at Gibeah. These in consequence

advanced in force towards the focus of the revolt, and took |

up a position opposite Gibeah on the north, being divided from it only by the gorge of Michmash. Only a few hundred Benjamites ventured to remain with Saul. The struggle opened with a piece of genuine old heroic daring. While the Philistines were dispersed over the country in foraging expeditions, Jonathan, accompanied by his armour-bearer only, and without the knowledge of Saul, made an attack upon the weak posts which they had left behind at the pass of Michmash. After the first had been surprised and overmastered, the others took to flight, no doubt in the belief that the two assailants were supported. They carried their panic with them into the half-deserted camp, whence it spread among the various foraging bands. The commotion was observed from Gibeah opposite, and, without pausing to consult the priestly oracle, King Saul

treatment of the subject the reader is referred to Wellhausen's

: exaltation of the other.

asa whole. Four stages of the tradition can be distinctly traced. Originally (ix. 1-x. 16) he is simply a seer, but at the same time a patriotic Israelite, who is touched to the heart by the extremities to which his country has been reduced, and who uses his authority as scer

in order to impress upon the man whom he has perceived to be fit for the task the conviction that he hag been called to be the helper and leader of Israel. Samuel's greatness consists in the fact of his having aroused into activity one who came after him and was greater than he ; after he had kindled the light which burns so brightly, he is no longer seen. But his meteoric appearanee and disappearance created a wondcring admiration which led to the pro- duction of the narrative of his childhood, in which he already as a boy predicts the downfall of the Israel of the pre-mouarchical period (1 Sam. i.-iii.). This donc, he disappears into the darkness again, in chap. iv. sqq. we lose sight of him completely, and it is only as an old man that we encounter lim once more.

'¢ On the other hand the circumstanec that after the meeting with Saul nothing more is heard of the seer gave countenance to the belief that a rupture between them must have taken place very soon. This belief we meet with in the second stage of the tradition, which is re- presented by the narratives recorded in chaps. xv. and xxviii. Its origin is to be sought in the inconsistency involved in the fact that Jehovah does not afterwards confirm on the throne him whom he has chosen to be king, but overthrows his dynasty. Thus it becomes necessary that Samucl, who had anointed Saul, should to his sorrow have laid upon him the duty of announcing his rejection. In this stage of the tradition he is represented no longer as a simple seer, but as a prophet after the style of Elijah and Elisha, who regards the Lord's anointed as a piece of his own handiwork, and lays his commands upon him (xv. 1), though, according to x. 7, he has expressly left him to be guided by his own inspirations.

'The transition from the second to the third stage is easy. Here Samuel transfers the unction, as soon as it has been withdrawn from Saul, to David, whom he sets up against his rejected prede- cessor as the de jure king by the grace of God. The respect with which he is regarded has meanwhile increased still further ; the elders tremble before him (1 Sam. xvi. 4), and he possesses a magical power over men (xix. 18 sqq.).

‘¢ But hitherto he has invariably been represented as intellectually the author of the monarchy. It is reserved for the last (exilian or post-exilian) stage in the development of the tradition (1 Sam. vii., viii., x. 17 sqg., xii., xiii. 7-15) to represent him on the contrary as one who resists to the utmost of his power the desire of the people to have a king. Premonarchical Israel is represented as a hierocracy and Samuel as its head ; hence the feelings which he expresses.

“The modern judgment has been prejudiced in Saul’s favour by Samuel’s curse, and to David’s disadvantage by Samuel’s blessing ; the truth has suffered less: by the depreeiation of the one than by the By critics Saul is honoured as the antago- nist and David disparaged as the creature of that craving for

necessary to a true historical appreciation of Hebrew antiquity.”

determined to attack the camp’ ‘The attempt was com | lesa wcontonsot which thy consid Semel hve inp

| pletely successful, but involved no more than the camp and | the kingship is attributed to the prophet which he cannot possibly

its stores; the Philistines themselves effected an unmolested | have possessed unless he had firm ground to stand on and an organ-

I retreat by the difficult: road of Bethhoron. ized power of influence throughout extensive ae But he can-

The aS = en pes not be supposed to have found such support in the Nebiim, who were

kingdom Paull wasno mere raw atripling when he ascended the only then for the first time making their appearance under the in-

séom. throne ; he already had a grown-up son at his side, Nor | uence of an epidemic inspiration which was not as yet restricted was he of insignificant descent, the family to which he | to any exclusive cirele or school; and with whom, besides,

belonged being a widespread one, and his heritage con- according to the old tradition, intimate relations were held by

siderable, His establishment at Gibeah was throughout | ‘te King and not by the seer (for the historical explanation Of

His entire reien th] eel icicad The a familiar saying given in 1 Sam. xix. 18 sqq. is cancelled by

) e reign the nucleus of his kingdom. The men on | the admittedly older passage in 1 Sam. x. 10 sgq.), Nor

whom he could always reckon were his Benjamite kins- | is it possible to hold that Samuel was in conspiracy with the

men. He recognized as belonging to him no other public priests against Saul. In support of such a theory indeed reliance is

function besides that of war; the internal affairs of the | Placed upon I Soe Sater UTR oe Re of Nob supplies

country he permitted to remain as they had been before bread to David in his flight, and expiates this offence with his own

hi : ajoia “Mae = re | death and that of the whole house of Eli. But, in the first place, | Is accession. War was at once the business and the re- | these priests. haveno visible connexion with Samuel; in the second, } source of the new kingdom. It was carried on against there is nothing to make it probable that they were in any league l the Philistines without interruption, though for the most with David; thirdly, it is certain, on the other side of the argument, . : : at as against the king they represented no distinct power in the | part not in the grand style but ther f bord ee Ra ene aD a i Beaches § yte but rather in a series Of border | state, but rather were entirely the creatures of his smile or frown, : —on a faint suspicion they actually were annihilated without a ae . : ; single word of remonstrance being anywhere raised. Such a view

ei aoe paberition of ee Be a theocracy and the zelation of Samuel’s relation to Saul and David as that which we have been Saul. Samuel differ widely. The see ey Men elk G Gerad be ae eee eer oa hid Tes of ee onic ie ae 1s ied upon 1 Sam. ix., x. 1-16, xii, where he appears | monarchy. But the student who carries the hierocracy baek to

ply as a Réeh at Ramah, and has nothing to do either with thc | those early times has still to learn the very elements of what is

administration of the theocracy or with the Nebiim. For a fuller i

Geschichte Israels (1878), vol. i. pp. 256-285, from which the follow- Ing paragraphs may be quoted:—

It is not without significance that the warlike revival of the nation proceeded from Benjamin. By the battle of

Rise of Judah.

David,

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Aphek Ephraim had lost at once the hegemony and its symbols (the camp-sanctuary at Shiloh, the ark of the covenant). The centre of Israel gravitated southward, aud Benjamin became the connecting link between Ephraim and Judah. It would appear that there the tyranny of the Philistines was not so much felt. Their attacks never were made through Judah, but always came from the north ; on the other hand, people fled from them southwards, as is instanced by the priests of Shiloh, who settled in Nob near Jerusalem. Through Saul Judah entered definitely into the history of Israel; it belonged to his kingdom, and it more than most others supplied him with energetic and faithful supporters. His famous expedition against the Amalekites had been undertaken purely in the interests of Judah, for it only could possibly suffer from their maraud- ing hordes.

Among the men of Judah whom the war brought to Gibeah, David ben Jesse of Bethlehem took a conspicuous place; his skillon the harp brought him into close relations with the king. He became Saul's armour-bearer, afterwards the most intimate friend of his son, finally the husband of his daughter. While he was thus winning the affections of the court, he at the same time became the declared favourite of the people, the more so because unexampled good fortune attended him in all he undertook. This excited the jealousy of Saul, naturally enough in an age in which the king always required to be the best man. Its first outburst admitted of explanation as occasioned by an attack of illness ; but soon it became obtrusively clear that the king's love for his son-in-law had changed into bitter hatred. Jonathan warned his friend and facilitated his flight, the priests of Nob at the same time providing him with arms and food. He went into the wilderness of Judah, and became the leader of a miscellaneous band of outlaws who had been attracted by his name to lead a roving life under his leadership. His kinsmen from Bethlehem were of their number, but also Philistines and Hittites. Out of this band David's bodyguard subse- quently grew, the nucleus of his army. They reckoned also a priest among them, Abiathar ben

Ahimelech ben Ahitub ben Phinehas ben Eli, the solitary survivor of the massacre of the sons of Eli at Nob which Saul had ordered on account of suspected conspiracy with David. Through lim David was able to have recourse to the sacred lot before the ephod. In the end he found it impossible to hold his own in Judah against Saul's persecutions, especi- ally as his countrymen for the most part withheld their assistance. He therefore took the desperate step of placing his services at the disposal of Achish the Philistine king of Gath, by whom he was received with open arms, the town of Ziklag being assigned him asa residence. Here with his band he continued to follow his old manner of life as an independent prince, subject only to an obligation to render military service to Achish.

Meanwhile the Philistines had once more mustered their forces and marched by the usual route against Israel. Saul did not allow them to advance upon Gibeah, but awaited their attack in the plain of Jezreel. A disastrous

Battle of battle on Mount Gilboa ensued; after seeing his three

Gilboa.

eldest sons fall one after another at his side, Saul threw himself upon his sword, and was followed by his armour- bearer. The defeat seemed to: have undone the work of his life. The immediate consequence at least was that the Philistines regained their lost ascendency over the country to the west of Jordan. Beyond Jordan, however, Abner, the cousin and generalissimo of Saul, made his son Ishbaal, still a minor, king in Mahanaim, and he was successful in again establishing the dominion of the house over Jezreel, Ephraim, and Benjamin, of course in uninterrupted struggle with the Philistines.

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But he did not regain hold of Judah. David seized the opportunity to set up for himself, with the sanction of the Philistines, and, it may safely be presumed, as their vassal, a separate principality which had its centre of gravity in the south, which was inhabited, not by the tribe of Judah

properly so called, but by the Calebites and Jerachmeelites, This territory Abner disputed with him in vain. In the protracted feud between the houses of Saul and David, the fortunes of war declared themselves ever increasingly for the latter. Personal causes at last brought matters to a crisis. Abner, by taking to himself a concubine of Saul's, called Rizpah, had roused Ishbaal's suspicions that he was aiming at the inheritance, aud was challenged on the point. This proved too much for his patience, and forth- with he abandoned the cause of his ward (the hopelessness of which had already perhaps become apparent), and entered into negotiations with David at Hebron. When about to set out on his return he fell by the hand of Joab in the gate of Hebron, a victim of jealousy and blood-feud. His plans nevertheless were realized. His death left Israel leaderless and in great confusion ; Ishbaal was personally insignificant, and the people's homage continued to be rendered to him only out of grateful fidelity to his father's memory. At this juncture he also fell by assassins' hands, As he was taking his midday rest, and even the portress had gone to sleep over her task of cleaning wheat, two Benjamite captains introduced themselves into his palace at Mahanaim and murdered him in the vain hope of earning David's thanks. The elders of Israel no longer hesitated about offering David the crown, which he accepted,

His residence was immediately transferred from Hebron to Jebus, which until then had remained in possession of the Canaanites, and first derives historical importance from him. It lay on the border between Israel and Judah,—still within the territory of Benjamin, but not far from Bethle-

hem; near also to Nob, the old priestly city. David made Jerus. it not only the political but also the religious metropolis by lem

transferring thither from Kirjathjearim the ark of the covenant, which he placed within his citadel on what afterwards became the temple hill.

Still the crown was far from being a merely honorary possession; it involved heavy responsibilities, and doubtless what contributed more than anything else to David's elevation to the throne was the general recognition of the fact that he was the man best fitted on the whole to

over- take the labour it brought with it, viz. the prosecution of the war with the Philistines, a war which was as it were the forge in which the kingdom of Israel was welded into one. The struggle began with the transference of the seat of royalty to Jerusalem; unfortunately we possess only scanty details as to its progress, hardly anything more indeed than a few anecdotes about deeds of prowess by individual heroes. The result was in the end that David completed what Saul had begun, and broke for ever the Philistine yoke. This was undoubtedly the greatest achievement of his reign.

From the defensive against the Philistines David pro- ceeded to aggressive war, in which he subjugated the three kinsfolk of Israel, Moab, Ammon, and Edom. He appears to have come into conflict first with the Moabites, whom he vanquished and treated with savage atrocity. Not long afterwards the king of Ammon died, and David sent an embassy of condolence to Hanun his successor. Hanun suspected in this a sinister design,—a suspicion we can readily understand if David had already, as is probable, subjugated Moab,—and with the utmost contumely sent back the messengers to their master forthwith, at the same time making preparations for war by entering into alliance with various Syrian kings, and particularly with the power-

Domestic troubles.

Absalom.

Estimate of David.

ISRAEL

David took the initiative, and sent his |

ful king of Soba. army under command of Joab against Rabbath-Ammon. The Syrians advanced to the relief of the besieged city ; but Joab divided his forces, and, leaving his brother Abishai to hold the Ammonites in the town in check, proceeded himself against the Syrians and repulsed them. On their afterwards threatening to renew the attack in increased force, David went against them in strength and

defeated them at Helam "'on the river." It seems that as a result of this the kingdom of Soba was broken up and made tributary to Damascus. Rabbath-Ammon could not now hold out any longer, and the Ammonites shared the fate of their Moabite brethren. the same time coerced and depopulated ; and thus was fulfilled the vision of Balaam, —the youngest of the four Hebrew nationalities trod the three elder under his feet. So far as external foes were concerned, David henceforward had peace; but new dangers arose at home within his own family. At once by illjudged leniency and equally il-timed severity he had completely alienated his son Absalom, who, after Amnon's death, was heir-apparent to the throne. Absalom organized a revolt against his father, and to foster it availed himself of a misunderstand- ing which had arisen between David and the men of Judah, probably because they thought they were not treated with sufficient favour. 'The revolt had its focus in Hebron ; Ahithophel, a man of Judah, was its soul ; Amasa, also of Judah, its arm; but the rest of Israel was also drawn into the rebellion, and only the territory to the east of Jordan remained faithful. Thither David betook himself with pre- cipitancy, for the outbreak had taken him completely by surprise. At Mahanaim, which had once before been the centre from which the kingdom was regained, he collected his faithful followers around him with his 600 Cherethites and Pelethites fora nucleus, Absalom against Ahithophel's advice allowing him time for this. In the neighbourhood of Mahanaim, in the wood of Ephraim, the decisive blow was struck. Absalom fell, and with his death the rebellion was atanend, It was Joseph that, in the first instance, penitently sent a deputation to the king to bring him back. Judah on the other hand continued to hold aloof. Ulti- mately a piece of finesse on the king's part had the effect of bringing Judah also to its allegiance, though at the cost of kindling such jealousy between Israel and Judah that Sheba the Benjamite raised a new revolt, this time of Israelites, which was soon, however, repressed by Joab. David seems to have died soon afterwards. His histori- cal importance is very great. Judah and Jerusalem were wholly his creation, and, though the united kingdom of Israel founded by him and Saul together soon fell to pieces, the recollection of it nevertheless continued in all time to be proudly cherished by the whole body of the people. His personal character has been often treated with undue disparagement. For this we must chiefly

blame his canoni- zation by the later Jewish tradition which made a Levitical saint of him and a pious hymn-writer. It then becomes a strange inconsistency that he caused military prisoners to be sawn asunder and burnt, and the bastard sons of Saul to be hanged up before the Lord in Gibeon. But if we take him as we find him, an antique king in a barbarous age, our judgment of him will be much more favourable. The most daring courage was combined in him with tender susceptibility ; even after he had ascended the throne he continued to retain the charm of a pre-eminent and at the same time childlike personality. Even his conduct in the

1 Soba appears to have been situated somewhat to the north of Damascus, and to have bordered on the west with Hamath. The Arameans were beginning even at that period to press westwards ; the Hittites, Phoenicians, and Israelites had common interests against them. To the kingdom of Soba succeeded afterwards that of Damascus.

Finally, Edom was about.

affair of Uriah is not by any means wholly to his discredit ; not many kings can be mentioned who would have shown repentance public and deep such as he manifested at Nathan's rebuke. Least to his credit was his weakness in relation to his sons and to Joab. On the other hand, the testament attributed to him in1 Kings ii. cannot be justly laid to his charge ; it is the libel of a later hand seeking to invest him with a fictitious glory. In like manner it is unjust to hold him responsible for the deaths of Abner and Amasa, or to attribute to him any conspiracy with the hierocracy for the destruction of Saul, and thus to deprive him of the authorship of the elegy in 2 Sam, i, which certainly was not the work of a hypocrite.

Solomon had already reached the throne, some time Solo-

before his father's death,—not in virtue of hereditary right, ™ reign.

but bya palace intrigue which had the support of the body- guard of the Six Hundred. His glory was not purchased on the battlefield. So far was he from showing military capacity that he allowed a new Syrian kingdom to arise at Damascus, a far more dangerous thing for Israel than that of Soba which had been destroyed, and which it succeeded. During this reign Edom also regained its independence, nothing but the port of Elath remaining in Solomon's hands. As regards Moab and Ammon we have no information ; it is not improbable that they also re-volted. But if war was not Solomon's forte he certainly took much greater pains than either of his predecessors in matters of internal administration ; according to tradition, the wisdom of the ruler and the judge was his special "gift." Disregarding the tribal system, he divided his kingdom into twelve provinces, over each of which he placed a royal governor, thus making a beginning of vigorous and orderly administration."

Judah alone he exempted from this arrangement, as if to show special favour. For his aim was less the advantage of his subjects than the benefit of his exchequer, and the same object appears in his horse traffic (1 Kings ix. 19), his Ophir trade (1 Kings x. 11), and his cession of territory to Hiram (1 Kings ix. 11). His passions were architec- ture, a gorgeous court, and the harem, in which he sought to rival other Oriental kings, as for example his Egyptian father-in-law. For this he required copious means—forced labour, tribute in kind, and money. He had specially at heart the extension and improvement of Jerusalem as a strong and splendid capital; the temple which he built was only a portion of his vast citadel, which included within its precincts a number of private and public build- ings designed for various uses.

It is plain that new currents were introduced into the stream of the nation's development by such a king as this. As formerly, after the occupation, Canaanite culture had come in, so now, after the establishment of the kingdom, the floodgate was opened for the admission of Oriental civilization in a deeper and wider sense. Whatever the personal motives which led to it may have been, the results were very important, and by no means disadvantageous on the whole. On the basis of the firmer administration now introduced,

stability and order could rest; Judah had no cause to regret its acceptance of this yoke. Closer inter- course with foreign lands widened the intellectual horizon of the people, and at the same time awakened it toa deeper sense of its own peculiar individuality. If Solomon imported Phoenician and Egyptian elements into the worship of Jehovah at his court temple, the rigid old Israelite indeed might naturally enough take offence (Ex. xx, 24-26), but the temple itself nevertheless ultimately acquired a great and positive importance for religion. It

2 Very possibly the Canaanites, whose complete absorption falls within this period, were an element that helped to loosen the bonds of tribal unity, and consolidate a state in its place.

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Rehobo- aim.

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need not be denied that mischievous consequences of various kinds slipped in along with the good. The king, moreover, can hardly be blamed for his conduct in erecting in the neighbourhood of Jerusalem altars to deities of Ammonand Egypt. For those altars remained undisturbed until the time of Josiah, although between Solomon and him there reigned more than one pious king who would certainly have destroyed them had he found them as offensive as did the author of Deuteronomy.

4, After the death of Solomon the discontent which had been aroused by his innovations, and especially by the rigour of his government, openly showed itself against his successor; and when Rehoboam curtly refused the demands which had been laid before him by an assembly of the elders at Shechem, they withdrew from their allegiance and summoned to be their king the Ephraimite Jeroboam ben Nebat, who already had made an abortive attempt at revolt from Solomon, and afterwards had taken refuge in Egypt. Only Judah and Jerusalem remained faithful to the house of

Revolt of David. Among the causes of the revolt of the ten tribes,

the ten tribes.

Omri.

jealousy of Judah must certainly be reckoned as one. The power of Joseph had been weakened by the Philistines, and by the establishment of the monarchy the centre of gravity had been shifted from the north where it naturally lay. But now it was restored to its old seat; for once more it was situated, not in Judah, but in Joseph. Monarchy itself, however, was not abolished by the revolting tribes, conclusively showing how unavoidable and how advan- tageous that institution was now felt to be; but at the same time they did not refrain from attempts to combine its advantages with those of anarchy, a folly which was ultimately the eause of their ruin. As for their departure from the Mosaic cultus observed at Jerusalem on the other hand, it was first alleged against them as a sin only by the later Jews. At the time religion put no obstacle in the way of their separation; on the contrary, it actually sug- gested and promoted it (Ahijah of Shiloh). The Jerusalem cultus had not yet come to be regarded as the alone legiti- mate; that instituted by Jeroboam at Bethel and at Dan was recognized as equally right ; images of the Deity were exhibited in all three places, and indeed in every place where a house of God was found. So far as the religious and intellectual life of the nation was concerned, there was no substantial difference between the two kingdoms, except indeed in so far as new displays of vigorous initiative generally proceeded from Israel.}

Rehoboam did not readily accept the situation; he sought to reduce the revolt by force of arms, with what degree of success is shown by the fact that his rival found himself constrained to take up his residence at Peniel (near Mahanaim) on the other side of Jordan. The invasion of Shishak, however, who took Jerusalem and burnt it, gave Jeroboam at last a breathing space. The feud continued indeed, but Rehoboam could no longer dream of bringing back the ten tribes. The scale by and by turned in Israel's favour. King Baasha, who had seated himself on the throne in place of Nadab, Jeroboam's son, took the offensive, and Asa

ben Rehoboam had no help for it but to call in Benhadad of Damascus against his adversary. In this way he gained his immediate purpose, it is true, but by the most dangerous of expedients.

Baasha's son Elah was supplanted by his vizier Zimri, who, however, was in his turn unable to hold his own against Omri, who had supreme command of the army.

1 Hven in the Deuteronomie redaction of the book of Kings indeed, and still more by the Chronicler, the political rebellion of Israel is regarded as having been ecclesiastical and religious in its character. The book of Chronicles regards Samaria as a heathen kingdom, and recognizes Judah alone as Israel. But, in point of fact, Judah takes up the history of Israel only after the fall of Samaria ; see §§ 6, 7.

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Against Omri there arose in another part of the country a rival, Tibni ben Ginath, who succeeded in maintaining some footing until his death, when Omri became supreme. Omri must be regarded as the founder of the first dynasty, in the proper sense of that word, in Israel, and as the second founder of the kingdom itself, to which he gave a permanent capital in Samaria. The Bible has hardly any- thing to tell us about him, but his importance is evident from the fact that among the Assyrians "the kingdom of Omri"? was the ordinary name of Israel. According to the inscription of Mesha, it was he who again subjugated Moab, which had become independent at the death of David or of Solomon. He was not so successful against the Damascenes, to whom he had to concede certain privileges in his own capital (1 Kings xx. 34).°

Ahab, who succeeded Omri his father, seems during the Ahab. greater part of his reign to have in some sort acknowledged Syrian suzerainty. In no other way can we account for the fact that in the battle of Karkar against the Assyrians (854 B.c.) a contingent was contributed by him. But this very battle made the political situation so clear that he was led to break off his relations with Damascus. With this began a series of ferocious attacks on Israel by Benhadad and Hazael. They were met by

Ahab with courage and success, but in the third year of that fifty years' war he fell in the battle at Ramoth Gilead (c. 851).

After the events recorded in 1 Kings xx., a forced alliance with Samaria Damascus on the part of Samaria is incredible ; but the idca of and Da- spontaneous friendly relations is alsoinadmissible. Schrader indeed maseus. finds support for the latter theory in 1 Kings xx. 34; but in that passage there is no word of any offensive or defensive alliance be- tween the rival kings; all that is stated is that Ahab releases the captive Benhadad on condition (M23) that the latter undertakes certain obligations, particularly those of keeping the peace and re- storing the cities which had been taken. By this arrangement no change was made in the previously strained relations of the two kingdoms; and, moreover, the N72 was not kept (xxii. 1 sqq.). Not much nearer the truth than the preceding is the view that the dan- ger threatened by Assyria drove the kings of Syria and Palestine into one another's arms, and so occasioned an alliance between Ahab and Benhadad also. Forif feelings of hostility existed at all be- tween the two last named, then Ahab could not do otherwise than congratulate himself that in the person of Shalmaneser II. there had arisen against Benhadad an enemy who would be able to keep him effectually in check. That Shalmaneser might prove dangerous to himself probably did not at that time occur to him; but ifit had he would still have chosen the remote in preference to the immedi- ately threatening evil. For it was the political existence of Israel that was at stake in the struggle with Damascus ; in such cireum- stances every ally would of course be welcome, every enemy of the enemy would be hailed as a friend, and the political wisdom which Max Duncker attributes to Ahab would have been nothing less than unpardonable folly. The state of matters was at the outset in this respect just what it continued to be throughout the subsequent course of events; the Assyrian danger grew in subsequent years, and with it grew the hostility between Damascus and Samaria. This fact admits only of one explanation,—that the Israelites utilized to the utmost of their power for their own protection against the Syrians the difficulties into which the latter were thrown by Shal- maneser II., and that these in their turn, when the Assyrians gave them respite, were all the fiercer in their revenge. On the evidence of the monuments and the Bible we

may even venture to assert that it was the Assyrian attacks upon Damascus which at that time pre- served Israel from becoming Aramaic,—of course only because Israel made the most of them for her political advantage.

Assuming that Ahab the Israelite (Ahabu Sirlaai) fought in the battle of Karkar (854) on the side of the king of Damascus, it was only because he could not help himself; but, if it is actually the case that he did so, the battle of Karkar must have taken place be- fore the events recorded in 1 Kings xx.

The Moabites took advantage of an accession under such critical circumstances to shake off the yoke imposed by

2 Bit Humri, like ofcos Avoavfov, and similar territorial names in Syriac.

3 Omri's accession is to be placed somewhere about 900 B.c. It is a date, and the first, that can be determined with some precision, if we place the battle of Karkar (854) near the end of Ahab's reign, and take the servitude of Moab, which lasted forty years and ended with Ahab's death, to begin in Omri's first decade.

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Foreign relations of the house of Omri.

'The prophets.

ISRAEL

Omri forty years before; an accurate account of their success, obviously written while the impression of it was still fresh! has come down to us in the famous inscription of King Mesha. Abaziah, Ahab's immediate successor, was obliged to accept the situation ; after his early death a futile attempt again to subjugate them was made by his brother Joram. Such a campaign was possible to him only in the event of the Syrians keeping quiet, and in point of fact it would appear that they

were not in a position to follow up the advantage they had gained at Ramoth; doubtless they were hampered by the inroads of the Assyrians in 850 and 849. As soon as they got a little respite, however, they lost no time in attacking Joram, driving him into his capital, where they besieged him. Samaria had already been brought to the utmost extremi- ties of famine, when suddenly the enemy raised the siege on account of a report of an invasion of their own land by the "Egyptians and Hittites." Possibly we ought to understand by these the Assyrians rather, who in 846 renewed their attacks upon Syria; to ordinary people in Israel the Assyrians were an unknown quantity, for which it would be natural in popular story to substitute something more familiar. This turn of affairs relieved Joram from his straits; it would even seem that, favoured by a change of dynasty at Damascus, he had succeeded in taking from the Syrians the fortress of Ramoth in Gilead, which had been the object of Ahab's unsuccessful endeavours, when suddenly there burst upon the house of Omri the over- whelming catastrophe for which the prophets had long been preparing.

When the prophets first made their appearance, some time before the beginning of the Philistine war, they were a novel phenomenon in Israel; but in the interval they had become so naturalized that they now had a recognized and essential place in connexion with the religion of Jehovah. They had in the process divested themselves of much that had originally characterized them, but they still retained their habit of appearing in companies and living together in societies, and also that of wearing a peculiar distinctive dress, These societies of theirs had no ulterior aims; the rabbinical notion that they were schools and academies in which the study of the Torah and of sacred history was pursued imports later ideas into an earlier time. First- rate importance on the whole cannot be claimed for the Nebiim, but occasionally there arose amongst them a man in whom the spirit which was cultivated within their circles may be said to have risen to the explosive pitch. Histori- cal influence was exercised at no time save by these indi- viduals, who rose above their order and even placed them- selves in opposition to it, but always at the same time had their base of operations within it. The prototype of this class of exceptional prophets,

whom we not unjustly have been accustomed to regard as the true, is Elijah of Thisbe, the contemporary of Ahab.

In compliment to Jezebel his wife, Ahab had set up in Samaria a temple with richly endowed religious services in honour of the Syrian Baal, In doing so he had no intention of renouncing Jehovah; Jehovah continued to be the national God after whom he named his sons Ahaziah and Jehoram. The destruction of Jehovah's altars or the persecution of His prophets was not at all proposed, or even the introduction of a foreign cultus elsewhere than in Samaria, Jehovah's sovereignty over Israel being thus only remotely if at all imperilled, the popular faith found nothing specially offensive in a course of action which had been followed a hundred years before by Solomon also. Elijah alone was strenuous in his opposition; the masses did not understand him, and were far from taking his side.

_ 1 It is obvious that Mesha's narrative is to be taken with 2 Kings i 1, and not with 2 Kings iii,

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To him only, but not to the nation, did it seem like a halt- ing between two opinions, an irreconcilable inconsistency, that Jehovah should be worshipped as Israel's God and a chapel to Baal should at the same time be erected in Israel.

In solitary grandeur did this prophet tower conspicu- Elijah ously over his time; legend, and not history, could alone 24 the preserve the memory of his figure. There remains a vague P°P!* .

impression that with him the development of Israel's con- ception of Jehovah entered upon a new stadium, rather than any data from which it can be ascertained wherein the contrast of the new with the old lay. After Jehovah, acting more immediately within the political sphere, had established the nation and kingdom, he now began in the spiritual sphere to operate against the foreign elements, the infusion of which previously had been permitted to go on almost unchecked.? The Rechabites, who arose at that time, protested in their zeal for Jehovah

altogether against all civilization which presupposes agriculture, and in their fundamental principles aimed at a recurrence to the primi- tive nomadic life of Israel in the wilderness ; the Nazarites abstained at least from wine, the chief symbol of Dionysiac civilization. In this indeed Elijah was not with them; had he been so, he would doubtless have been intelligible to the masses. But, comprehending as he did the spirit from which these demonstrations proceeded, he thought of Jehovah as a great principle which cannot coexist in the same heart with Baal. To him first was it revealed that we have not in the various departments of nature a variety of forces worthy of our worship, but that there exists over all but one Holy One and one Mighty One, who reveals Himself not in nature but in law and righteousness in the world of man. The indignation he displayed against the judicial murder at Jezreel was as genuine and strong as that which he manifested against the worship of Baal in Samaria; the one was as much a crime against Jehovah as the other.

Elijah ascended to heaven before he had actually achieved Elisha.

much in the world. The idea which his successors took from him was that it was necessary to make a thorough clearance from Samaria of the Baal worship and of the house of Ahabas well. For this practical end Elisha made use of practical means. When Elijah, after the murder of Naboth, had suddenly appeared before Ahab and threatened him with a violent end, an officer of high command had been present, Jehu ben Nimshi, and he had never forgotten the incident. He now found himself at the head of the troops at Ramoth Gilead after the withdrawal to Jezreel of Joram ben Ahab from the field to be healed of his wound. To Elisha the moment seemed a suitable one for giving to Jehu in Jehovah's name the command now to carry out

Elijah's threat against the house of Ahab. Jehu gained Jehu.

over the captains of the army, and carried out so well the task with which the prophet had commissioned him that not a single survivor of Ahab's dynasty or of his court was left. He next extirpated Baal and his worshippers in Samaria. From that date no worship of foreign gods seems ever to have recurred in Israel. Idolatry indeed continued to

subsist, but the images, stones, and trees, even the teraphim apparently, belonged to the cultus of Jehovah, or were at least brought into relation with it. Jehu founded the second and last dynasty of the kingdom of Samaria. His inheritance from the house of Omri included the task of defending himself against the Syrians. The forces at his disposal being insufficient for this, he resorted to the expedient of seeking to urge the Assyrians

2 It is worth noticing how much more frequent from this period onwards proper names compounded with the word Jehovah become. During the period of the judges, and under the kings before Ahab in Israel and Asa in Judah, not a single instance occurs ; thenceforward they become the rule.

His suc- cessors

Early Iiebrew litera- ture,

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to renew their hostilities against the Arameeans. For this end his ambassadors carried presents to Shalmaneser IT. ; these were not of a regular but only of an occasional char- acter, but the vanity of the great king represents them as the tribute of a vassal. In the years 842 and 839 Assyrian campaigns against Hazael of Damascus actually took place;

then they were intermitted for a long time, and the kings

of Samaria, Jehu and his two successors, were left to their own resources. These were evil times for Israel. : barbarity never intermitted the frontier war went on 1n Gilead, where Ammon and Moab showed themselves friendly to the Syrian cause (Amos i.) ; occasionally great expeditions took place, one of which brought King Hazael to the very walls of Jerusalem. It was ouly with the greatest difficulty that Israel's independence was maintained. Once more religion went hand in hand with the national

cause ; the prophet Elisha was the main stay of the kings |

in the struggle with the Syrians, ‘the chariot and horse- men of Israel.” Joash ben Joahaz ben Jehu at last succeeded in inflicting upon Syria several blows which proved decisive. Thenceforward Israel had nothing to fear from that quarter. kingdom even reached a height of external power which recalled the times of David. Moab was again subdued ; southwards the frontier extended to the brook of the wilderness (Amos vi. 14), and northward to Hamath.

5. Before proceeding to consider the rise of those prophets who were the makers of the new Israel, it will not be out of place here to cast a glance backwards upon the old order of things which perished with the kingdom of Samaria, With reference to any period earlier than the century 850-750 B.c., we can hardly be said to possess any statistics.

considerable time, a contemporary literature is indispens- able for the description of standing conditions. But it was within this period that Hebrew literature first flourished— after the Syrians had Leen finally repulsed, it would seem. Writing of course had been practised from a much earlier period, but only in formal instruments, mainly upon stone. At an early period also the historical sense of the people developed itself in connexion with their religion; but it found its expression in songs, which in the first instance were handed down by word of mouth only. Literature began with the collection and writing out of those songs ; the Book of the Wars of the Lord and the Book of Jashar were the oldest historical books. The transition was next made to the writing of prose history with the aid of legal documents and family reminiscences ; a large portion of this early historiography has been preserved to us in the books of Judges, Samuel, and Kings. Contemporaneously also certain collections of laws and decisions of the priests, of which we have an example in Ex. xxi., xxii, were committed to writing. Somewhat later, perhaps, the legends about the patriarchs and primitive times, the origin of which cannot be assigned to a very early date, received literary shape. Specially remarkable is the rise of a written prophecy. The question why it was that Elijah and Elisha committed nothing to writing, while Amos a hundred years later is an author, hardly admits of any other answer than that in the interval a non-literary had developed into a literary age. How rapid the process

was may be gathered from a comparison between the singularly broken utterances

1 Even the Jehovistic narratives about the patriarchs belong to the time when Israel had already become a powerful kingdom ; Moab, Ammon, and Edom had been subjugated (Gen. xxvii. 29), and vigor- ous frontier wars were being carried on with the Syrians about Gilead (Gen. xxxi. 52). In Gen. xxvii. 40 allusion is made to the constantly repeated subjugations of Edom by Judah, alternating, with successful revolts on the part of the former ; see Delitzsch on WD.

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Under Joash's son, Jeroboam II, the | jv.) ; the laws contained in Ex. xxi —xxiii. rest entirely

For, while the facts of history admit of | being handed down with tolerable accuracy through a

of the earlier oracle contained in Isa. xv., xvi. with the orations of Isaiah himself.

We begin our survey with that of the family relations. gocia, Polygamy was rare, monogamy the rule; but the right of life concubinage was unlimited. While a high position was accorded both by affection and custom to the married wife, traces still existed of a state of society in which she was regarded as property that went with the inheritance. The marriage of relations was by no means prohibited ; no offence was taken at the circumstance that Abraham was the husband of his sister (bya different mother). Parents had full power over their children; they had the right to sell and even to sacrifice them. In this respect, however, the prevailing usage was mild, as also in regard to slaves, who socially held a position of comparative equality with their masters, and even enjoyed some measure of legal protection. Slavery, it is plain, had not the same political importance as with the Greeks and Romans; it could have been abolished without any shock to the foundations of the State.

Throughout this period agriculture and gardening con- Agricul tinued to be regarded as man's normal calling (Gen. iii, tue. |

upon this assumption. To dwell in peace under his vine and under his fig tree was the ideal of every genuine Israelite. Only in a few isolated districts, as in the country to the east of Jordan and in portions of Judah, did the pastoral life predominate. Art and industry were undeve- loped, and were confined to the production of simple domestic necessaries.

Commerce was in old time followed exclusively by the Trade, | Canaanite towns, so that the word "Canaanite" (like "Jew" in German) was used in the sense of " trader." But by and by Israel began to tread in Canaan's footsteps (Hos. xii. 8, 9).2 The towns grew more influential than the country; money notably increased; and the zeal of piety was quite unable to arrest the progress of the change which set in. The kings themselves, from Solomon on- wards, were the first to set the bad example; they eagerly sought to acquire suitable harbours, and in company or in competition with the Syrians entered upon large commercial transactions. The extortions of the corn-market, the formation of large estates, the frequency of mortgages, all show that the small peasant proprietorship was unable to hold its own against the accumulations of wealth. The wage-receiving class increased, and cases in which free Hebrews sold themselves into slavery were not rare.

On all hands the material progress of the commonwealth Material| made itself felt, the old simplicity of manners disappeared, Progress) and luxury increased. Buildings of hewn stone began to be used even by private individuals. The towns, especially the chief ones, were fortified; and in time of war refuge was sought in them, and not as formerly in woods and. caves. Even in the time of David the Israelites always fought on foot; but now horses and chariots were regarded as indispensable. The bow came to be the principal weapon of offence, and a military class appears to have sprung up.

The monarchy retained in the kingdom of the ten tribes Govern its military character ; the commander-in-chief was the first ment. person in the kingdom. In internal affairs its interference was slight ; with

systematic despotism it had little in com- mon, although of course within its narrow sphere it united executive and legislative functions. It was little more than the greatest house in Israel. The highest official was called “master of the household.” The court ultimately

2“ Canaan (i.e, Ephraim Canaanized) has deceitful balances in his hand, and loves to overreach. Ephraim indeed saith, I am become rich, I have gained wealth; but all his profits will not suffice for (expiation of) the guilt which he has incurred.”

‘own interests.

Law and justice.

culture.

Intellec- tual and moral

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grew into a capital, the municipal offices of which were held by royal officials. ‘The provinces had governors who, however, in time of war withdrew to the capital (1 Kings xx.); the presumption is that their sole charge was collec- tion of the revenue.

The state was not charged with affairs of internal ad- ministration ; all parties were left free to maintain their Only in cases in which conflicts had emerged in consequence could the king be approached. Ruling and judging were regarded as one and the same ; there was but one word for both (2 Kings xv. 5). Still, the king was not altogether the only judge; there were in fact a number of independent jurisdictions. Wherever within a particular circle the power lay, there the right of judging was also found, whether exercised by heads of families and communities or by warriors and powerful lords. It was only because the king was the most powerful that he was regarded as the judge of last resort ; but it was equally permitted to apply to him from the first.

Of method and rule in these things there was but little ; a man was glad to find any court to receive his complaint. Of course without complaint one got no justice. The administration of justice was at best but a scanty sup- plement to the practice of self-help. The heir of the murdered man would not forego the right of blood revenge ; but his family or the commune gave him aid, and in case of need took his place, for bloodshed had at all hazards to be atoned for.

The firm establishment of civil order was reudered all the more difficult by the continual wars and violent changes of dynasty which ever and anon made its very existence problematical. Power, which is more important than righteousness to a judicatory, was what the government was wanting in. In the simpler social conditions of the earlier time a state which was adapted merely for purposes of war might easily be found to work satisfactorily enough, but a more complex order of things had now arisen. Social problems had begun to crop up; for the poor and the proletariat the protection of a thoughtful government had come to be required, but was not forthcoming.

But these defects did not check all progress, The weakness of the government, the want of political consoli- dation, were insufficient to arrest intellectual advance or to corrupt the prevailing moral tone and feeling for justice ; in fact it was precisely in this period (the period in which the main part of the Jehovistic history must have been written) that the intellectual and moral culture of the people stood at its highest. Even when the machinery of the monarchy had got out of order, the organization of the families and communes continued to subsist; the smaller circles of social life remained comparatively untouched by the catastrophes that shook the greater. Above all, the national religion supplied the spiritual life with an immov- able basis.

The favourite illustrations of the power of religion in the Israel of that period are drawn from the instances of great prophets who raised kings out of the dust and smote them to it again. But the influence and importance of these is generally exaggerated in the accounts we have. That among them there occasionally occurred manifestations of such power as to give a new turn to history is indeed true ; a figure like that

of Elijah is no mere invention. But such a man as he was a prophecy of the future rather than an actual agent in shaping the present. On the whole, religion was a peaceful influence, conserving rather than assailing the existing order of things. The majority of the prophets were no revolutionists ; rather in fact were they always too much inclined to prophesy in accordance with the wishes of the party in power. Besides, in ordi- nary circumstances their influence was inferior to that of

the priests, who were servants of royalty at the chief sanctu- aries, but everywhere attached to the established order.

The Torah of Jehovah still continued to be their special Priestly It was not even now a code or law in our sense Forah.

charge. of the word ; Jehovah had not yet made His Testament ; He still was living and active in Israel. But the Torah appears during this period to have withdrawn itself some- what from the business of merely pronouncing legal deci- sions, and to have begun to move in a freer field. It now consisted in teaching the knowledge of God, in showing the right, God-given way where men were not sure of themselves. Many of the counsels of the priests had become a common stock of moral convictions, which indeed were all of them referred to Jehovah as their author, yet had ceased to be matters of direct revelation. Neverthe- less the Torah had still occupation enough, the progres- sive life of the nation ever affording matter for new questions.

Although in truth the Torah and the moral influence Cultus.

of Jehovah upon the national life were things much weightier and much more genuinely Israelitic than the cultus, yet this latter held on the whole a higher place in public opinion. To the ordinary man it was not moral but liturgical acts that seemed to be truly religious. Altars of Jehovah occurred everywhere, with sacred stones and trees—the latter either artificial (Asheras) or natural —heside them ; it was considered desirable also to have water in the neighbourhood (brazeu sea). In cases where a temple stood before the altar it contained an ephod and

teraphim, a kind of images before which the lot was cast by the priest. Of the old simplicity the cultus retained nothing; at the great sanctuaries especially (Bethel, Gilgal, Beersheba) it had become very elaborate. Its chief seasons were the agricultural festivals—the passover, the feast of weeks, and most especially the feast of the ingathering at the close of the year. These were the only occasions of public worship properly so called, at which every one was expected to attend; in other cases each worshipper sought the presence of God only in special circumstances, as for example at the beginning and at the end of particular undertakings. The cultus, as to place, time, matter, and form, belonged almost entirely to the inheritance which Israel had received from Canaan ; to distinguish what belonged to the worship of Jehovah from that which belonged to Baal was no easy matter.' It was the channel through which. also paganism could and did ever anew gain admittance into the worship of Jehovah. Yet that publicity of the cultus which arose out of the very nature of Jehovah, and in consequence of which the teraphim even were removed from the houses to tho temples, cannot but have acted as a corrective against the most fatal excesses.

As for the substance of the national faith, it was summed Creed.

up principally in the proposition that Jehovah is the God of Israel. But "God" was equivalent to "helper"; that was the meaning of the word. "Help," assistance in all occasions of life,—that was what Israel looked for from Jehovah, not "salvation" in the theological sense. The forgiveness of sins wasa matter of subordinate importance ; it was involved in the "help," and was a matter not of faith but of experience. 'The relation between the people and God was a natural one as that of son to father; it did not rest upon observance of the conditions of a pact. But it was not on that account always equally lively and hearty; Jehovah was regarded as having varieties of mood. 'To secure and retain His favour, sacrifices were useful; by them prayer and thanksgiving were seconded.

1 The description of the cultus by the prophet Hosea shows this very clearly. It is obvious enough, however, that the object was to serve

Jehovah, and not any foreign deity, by this worship.

XHL — 52

Amos,

Amos predicts over- throw of Israel by Jehovah.

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Another main article of faith was that Jehovah judges

and recompenses, not after death (then all men were |

thought to be alike), but upon the earth. Here, however, but little account was taken of the individual; over him the wheel of destiny remorselessly rolled; his part was resignation, and not hope. Not in the career of the indi- vidual but in the fate of families and nations did the righteousness of Jehovah find scope for its manifestation ; and this is the only reason why the religion could dispense with the conceptions of heaven and hell. For the rest, it was not always easy to bring the second article into cor- relation with the first ; in practice the fatter received the superior place.

It need hardly be said that superstition of every kind also abounded. But the superstition of the Israelites had as little real religious significance as had that poetical view of nature which the Hebrews doubtless shared in greater or less degree with all the other nations of antiquity.

6. Under King Jeroboam IIL, two years before a great earthquake that served ever after for a date to all who had experienced it, there occurred at Bethel, the greatest and

most conspicuous sanctuary of Jehovah in Israel, a scene |

full of significance. The multitude were assembled there with gifts and offerings for the observance of a festival, when there stepped forward a man whose grim seriousness interrupted the joy of the feast. It was a

Judean, Amos of Tekoa, a shepherd from the wilderness bordering on the Dead Sea. Into the midst of the joyful tones of the songs which with harp and tabor were being sung at tlie sacred banquet he brought the discordant note of the mourner's wail. For over all the joyous stir of busy life his ear caught the sounds of death: "the virgin of Isracl is fallen, never more to rise; lies prostrate in her own land with no one to lift her up." He prophesied as close at hand the downfall of the kingdom which just at that moment was rejoicing most in the consciousness of power, and the deportation of the people to a far-off northern land.

There was something rotten in the state of Israel in spite of the haleyon days it enjoyed under Jeroboam II. From the indirect results of war, from changes in the tenure and

in the culture of the soil, from defective administration of |

justice, the humbler classes had much to suffer; they found that the times were evil. But it was uot this that caused Amos to foresee the end of Israel, not a mere vague foreboding of evil that forced him to leave his flocks ; the dark cloud that threatened on the horizon was plain enough—the Assyrians. Once already at an earlier date

they had directed their course south-westwards, without, |

however, on that occasion becoming a source of danger to the Israelites. But now that the bulwark against the Assyrians, Aram of Damascus, was falling into ruins, a movement of these against Lebauun in the time of Jeroboam IT. opened to Israel the alarming prospect that sooner or later they would have to meet the full force of the irresist- ible avalanche.

What then? The common man was in no position truly to estimate the danger; and, so far as he apprehended it, he lived in the firm faith that Jehovah would not abandon His people in their straits. The governing classes prided themselves on the military resources of Israel, or otherwise tried to disiniss from their minds all thought of the gravity of the situation. enough, and did not hesitate to answer it: the downfall of

Israel is imminent. It was nothing short of blasphemy to utter anything of this kind, for everything, Jehovah Him- self included, depended on the existence of the nation. But the most astounding thing has yet to come; not Asshur, but Jehovah Himself, is bringing about the over- throw of Israel; through Asshur it is Jehovah that is

But Amos heard the question distinctly |

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triumphing over Israel. A paradoxical thought—as if the national God were to cut the ground from under his own feet! For the faith in Jehovah as the God of Israel was a faith that He intervenes on behalf of His people against all enemies, against the whole world; precisely in times of danger was religion shown by staying oneself upou this faith. Jehovah might indeed, of course, hide His face for a time, but not definitively; in the end He ever arose at last against all opposing powers. 'The day of the Lord" was an Object of hope in all times of difficulty and oppres- sion; it was understood as self-evident that the crisis would certainly end in favour of Israel. Amos took up the popular conception of that day; but how thoroughly did he change its meaning! 'Woe to them who long for the day of the Lord !—What to you is the day of the Lord? It is darkness, not light." His own opposition to the popular conception is formulated in a paradox which he prefixes as theme to the principal section of his book :— '6 Us alone does Jehovah know," say the Israelites, drawing from this the inference that He is on their side, and of course must take their part. "You only do I know," Amos represents Jebovah as saying, "therefore do I visit upon you all your sins."

If the question, Whereon did Jehovah's relation to Israel ultimately rest? be asked, the answer, according to the popular faith, must substantially be that it rested on the fact that Jehovah was worshipped in Israel and not among the heathen, that in Israel were His altars and His dwell- ing. His cultus was the bond between Him and the nation; when therefore it was desired to draw the bond still closer, the solemn services of religion were redoubled. But to the conception of Amos Jehovah is no judge capable of accepting a bribe; with the utmost

indignation he repudiates the notion that it is possible to influence Him by gifts and offerings. Though Israel alone has served Him he does not on that account apply any other standard to it than to other nations (chaps. i., ii.). If Israel is better known to Him, it does not follow that on that account He shuts His eyes and blindly takes a side. Neither Jehovah nor His prophet recognizes two moral standards ; right is everywhere right, wrong always wroug, even thongh com- mitted against Israel's worst enemies (ii. 1). What Jehovah demands is righteousness,—nothing more and nothing less; what he hates is injustice. Sin or offence to the Deity is a thing of purely moral character; with such emphasis this doctrine had never before been heard. Morality is that for the sake of which all other things exist ; it is the alone essential thing in the world. Itis no postulate, no idea, but at once a necessity aud a fact,

the most intensely living of personal powers—Jehovali

| the God of Hosts.

In wrath, in ruin, this holy reality makes its existence known ; it annihilates all that is hollow and false.

Amos calls Jehovah the God of Hosts, never the God of Israel. 'Tho nation as such is no religious conception to him; from its mere existence he cannot formulate any article of faith. Sometimes it seems as if he were denying Israel's prerogative altogether. He does not really do so, but at least the prerogative is conditional and involves a heavy responsibility, The saying in ili, 2 recalls Luke xii, 47. The proposition "Jehovah knows Israel" is in the mouth of Amos almost the same thing as " Israel knows Jehovah"; save only that this is not to be regarded as any merit on Israel's part, but as a manifestation of the grace of Jchovah, who has led His people by great deeds and holy men, and so made Himself known. Amos knows no other truth than that practical one which he has found among his own people and nowhere else, lying at the foundation of life and morality, and which he regards as the product of a divine providential ordering of history.

Jehovah the God of Hosts.

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From this point of view, so thoroughly Israelitish, he pro- nounces Israel's condemnation. He starts from premisses generally conceded, but he accentuates them differently and draws from them divergent conclusions.

Amos was the founder, and the purest type, of a new phase of prophecy. The impending conflict of Asshur with Jehovah and Israel, the ultimate downfall of Israel, is its theme, Until that date there had subsisted in Palestine and Syria a number of petty kingdoms and nationalities, which had their friendships and enmities with one another, but paid no heed to anything outside their own immediate environment, and revolved, each on its own axis, careless of the outside world, until suddenly the Assyrians burst in upon them. These commenced the work which was carried on by the Babylonians, Persians, and Greeks, and completed by the Romans. They in- troduced a new factor, the conception of the world,—the world of course in the historical sense of that expression. In presence of that conception the petty nationalities lost their centre of gravity, brute fact dispelled their illusions, they flung their gods to the moles and to the bats (Isa. ii.). The prophets of Israel alone did not allow theinselves to be taken by surprise by what had occurred, or to be plunged in despair; they solved by anticipation the grim problem which history set before them. They absorbed into their religion that conception of the world which was destroying the religions of the nations, even before it had been fully grasped by the secular consciousness. Where others saw only the ruin of everything that is holiest, they saw the triumph of Jehovah over delusion and error. Whatever else might be overthrown, the really worthy remained unshaken. They recognized ideal powers only, right and wrong, truth and falsehood ; second causes were matters of indiffereuce to them, they were no practical politicians. But they watched the course of events attentively, nay, with passionate interest. The present, which was passing before them, became to them as it were the plot of a divine drama which they watched with an intelligence that anti- cipated the dénouement. Everywhere the same goal of the development,

everywhere the same laws. ‘The nations are the dramatis persone, Israel the hero, Jehovah the poet of the tragedy.}

The canonical prophets, the series of whom begins with i- Amos, were separated by an essential distinction from the class which had preceded them and which still continued to be the type of the common prophet. They did not seek to kindle either the enthusiasm or the fanaticism of the multitude; they swain not with but against the stream. They were not patriotic, at least in the ordinary acceptation of that word; they prophesied not good but evil for their people (Jer. xxviii. 8). Until their time the nation had sprung up out of the conception of Jehovah; now the conception of Jehovah was casting the nation into the shade. The natural bond between the two was severed, and the relation was henceforward viewed as conditional. As God of the righteousness which is the law of the whole universe, Jehovah could be Israel’s God only in so far as in Israel the right was recognized and followed. The ethical element destroyed the national character of the old religion. It still addressed itself, to be sure, more to the nation and to society at large than to the individual; it insisted less upon a pure heart than upon righteous institu-

tions ; but nevertheless the first step towards universalism | e south. e aid | pure hypothesis, it might be possible to fit into the general historical

had been accomplished, towards at once the general diffusion and the individualization of religion. Thus, although the prophets were far from originating a new conception of God, they none the less were the founders of what has

1Tn very much the same way the threatened and aetual politieal

annihilation of Ionia led to the rise of Greek philosophy (Xenophanes, Heraelitus).

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been called “ethical monotheism.” But with them this ethical monotheism was no product of the “self-evolution of dogma,” but a progressive step which had been called forth simply by the course of events, The providence of God brought it about that this call came at an opportune period, and not too suddenly. The downfall of the nation did not take place until the truths and precepts of religion were already strong enough to be able to live on alone ; to the prophets belongs the merit of having recognized the independence of these, and of having secured perpetuity to Israel by refusing to allow the conception of Jehovah to be involved in the ruin of the kingdom. They saved faith by destroying illusion.

The event which Amos had foreseen was not long in The coming. The Israelites flew spontaneously, like “silly Assyrians Zechariah ben cae in.

doves,” into the net of the Assyrians. Jeroboam was overthrown after a short reign, Shallum his murderer and successor was also unable to hold his own, and was followed after the horrors of a civil war by Menahem ben Gadi (745 3.c.). But Menahem, in the presence of domestic (and perhaps also foreign) assailants,2 had no other resort than to purchase by payment of a great tribute the assistance of King Tiglath-pileser II., who at that time was giving new force to the Assyrian predominance in these regions. By such means he succeeded in attaining his immediate end, but the further consequence was that the rival party in the state turned for support to Egypt, and Palestine now became the arena of conflict between the two great world-powers.

Menahem transmitted his kingdom to Pekahiah; Pekahiah was murdered about 735 B.c. by Pekah, and Pekah himself shortly afterwards was overthrown. All this happened within a few years. It would have been possible to conjecture the state of the country in these circumstances, even if we had not been informed of it by means of the prophetical book of Hosea, which dates from the time when the Assyrians had begun indeed to tamper with the country, but had not yet shown their full design. After the death of Jeroboam II. there had been wild out- bursts of partisan war; none of the kings who in quick succession appeared and disappeared had real power, none established

order. It was as if the danger from without, which was only too obviously threatening the existence of the kingdom, had already dissolved all internal bonds ; every one was at war with his neighbour. Assyrians and Egyptians were called in to support this or that govern- ment; by such expedieuts the internal confusion was, naturally, only increased. Was there any other quarter in which help could yet be sought? The people, led by the priests, turned to the altars of Jehovah, and outdid itself in pious works, as if by any such illusory means, out of all relation to the practical problein in hand, the gangrene of anarchy could possibly be healed. Still more zealous than

Amos against the cultus was Hosea, not merely on the Hosea.

grouud that it had the absurd motive of forcing Jehovah's

2 It is not ineonceivable that the wars earried on by Tiglath-pileser II. against Hamath had some eonnexion with his interventions in favour of Menahem. The kingdom of Hamath, which may have been threatened by Jeroboam II., may have availed itself of the state of matters whieh followed his death to seeure its own aggrandizement at Israel's expense ; in correspondence with this attaek from the northern side another by Judah in coneert with Hamath may well have been made from the south. In this way, though not without the aid of

eonnexion the fragmentary Assyrian notices about Azariah of Judah and his relations to Hamath ; the explanations suggested by the Assyrio- logists have hitherto been total failures. But in that ease it would eer- tainly be neeessary to assume that the Assyrians were badly informed as to the nature of the relations between Hamath and Judab, and also as to the individual who at that time held the throne of Judah, Uzziah (= Azariah), who in his old age had become a leper, eould only nominally at best have been king of Judah then.

Collision with Assyria.

Fall of Samaria.

King- dom of Judah.

favour, but also because it was of heathenish character, nature-worship and idolatry. That Jehovah is the true and only helper is certainly not denied by Hosea. But His help is coupled with the condition that Israel shall undergo a complete change, and of such a change he sees no prospect. On this account the downfall of the state is in Hosea's view inevitable, but not final ruin, only such an overthrow as is necessary for the transition to a new and fair recommencement. In Hosea's prophecies the relation between Jehovah and Israel is conceived of as dissoluble, and as actually on the point of being dissolved, but it has struck its roots so deep that it must inevitably at last estab- lish itself again. y

The first actual collision between Israel and Assyria occurred in 734. Resin, king of Damascus, and Pekah, king of Samaria, had united in an expedition against Judah, where at that time Ahaz ben J otham occupied the throne. Put Ahaz parried the blow by placing himself under the protection of the Assyrians, who perhaps would in any case have struck in against the alliance between Aram and Israel. Tiglath-pileser made his first appearance in 734, first on the sea-coast of Palestine, and subsequently either in this or in the following year took up his quarters in the kingdom of the ten tribes. After he had ravaged Galilee and Gilead, he finally concluded a peace in Samaria the capital, conditionally on his receiving the head of King Pekah and a considerable yearly tribute. Hosea ben Beeri was raised to the throne in Pekah's place, and acknowledged by the Assyrian as a vassal. For some ten years he held his position quietly, regularly paying hisdues, But when at the death of Tiglath-pileser the Syro-Palestinian king- doms rebelled en masse, Samaria also was seized with the delirium of patriotic fanaticism (Isa. xxviii.) Relying upon the help of Seve, king of Ethiopia and Egypt, Hosea ventured on a revolt from Assyria, But the Egyptians left him in the lurch as soon as Shalmaneser IV., Tiglath-pileser's successor, invaded his territory. Before his capital had fallen, Hosea himself fell into the hands of the Assyrians. Samaria offered a desperate resistance, and succumbed only to Sargon, Shalmaneser's successor (721). Energetic measures were adopted by the victor for the

pacification of the country ; he carried all the inhebitants of mark into captivity to Calachene, Gozanitis, and Armenia. A remnant indeed of the ancient kingdom was still permitted to survive under kings who were mere vassals ; it continued to subsist until the days of Esar-haddon, but the Scriptural representation, according to which the history of Israel terminates in 721, is substan- tially the most correct. Much light is thrown upon the conditions of the national religion then and upon its sub- sequent development by the single fact that the exiled Israelites were absorbed by the surrounding heathenism without leaving a trace behind them, while the population of Judah, who had the benefit of a hundred years' respite, held their faith fast throughout the period of the Babylonian exile, and by means of it were able to maintain their own individuality afterwards in all the circumstances that arose. The fact that the fall of Samaria did not hinder but helped the religion of Jehovah is entirely due to the prophets. That they had foreseen the downfall of the state, and declared in the name of religion that it was inevitable, was a matter of much greater historical importance than the actual downfall itself.

7. Hitherto the small kingdom of Judah had stood in the background. Its political history had been determined almost exclusively by its relation to Israel. Under the dynasty of Omri the original enmity had been changed into a close but perhaps not quite voluntary friendship. Judah found itself drawn completely into the train of the more powerful neighbouring state, and seems even to have

rendered it military service. The fall of the house of Omri was an ominous event for Judah as well as Israel; Jehu, as he passed to the throne, put to death not only Ahaziah the king but also two and forty other members of the royal house of David who had fallen into his hands; and those who still survived, children for the most part, were murdered wholesale by the regent Athaliah for reasons that are unknown. Only one little boy, Joash, was con- cealed from her fury, and by a successful conspiracy six years afterwards was placed upon the throne of his ancestors, At that time the Syrians were extending

their incursions to Judah and Philistia, and Joash bought them off from Jerusalem with the temple treasures. disgrace that he expiated with his death; in like manner perhaps the assassination of his successor Amaziah is to be accounted for by the discredit he had incurred by a reckless and unsuccessful war against Jsrael. Just as Israel was beginning to recover itself after the happy termination of the Syrian wars, Judah also experienced its period of highest prosperity. What Jeroboam JJ. was to the northern kingdom, Uzziah was to that of the south. He appears to have obtained possession of Edom, and for a considerable time to have held that one province of David's conquests which fell to Judah; and at the trading port of Elath he revived the commerce which Solomon had created. The prosperity of his long reign was uninterrupted till in his later years he was smitten with leprosy, and found it necessary to hand over the affairs of the kingdom to his son Jotham. But Jotham appears to have died about the same time as his father,—his successor, still in very early youth (Isa, iii, 12), being Ahaz ben Jotham ben Uzziah,

If Judah could not compare with Israel in political and Stability general historical importance, it nevertheless enjoyed more a its than one considerable advantage over the larger kingdom. lt

Tt was much safer from foreign foes; for the Egyptians, asa rule, were not dangerous neighbours. But its chief advantage consisted in the stability of its dynasty. It was David who had elevated Judah and Jerusalem to a position of historical significance, and the prosperity of his house was most intimately connected with that of the town and territory, and even with that of religion. On two separate occasions it occurred that a king of Judah was murdered by subjects, but in both cases the " people of the land" rose up against the assassins and once more placed a member of the Davidie family upon the throne. The one actual recorded revolution was that against Athaliah, which had for its object the restoration of the throne to the legitimate heir. Under shelter of the nionarchy the other institutions of the state also acquired a measure of permanency such as was not found at all in Israel, where everything depended on the character of indi- viduals, and the existing order of things was ever liable to be subjected to fresh dispute. Life in

Judah was a much more stable affair, though not so exciting or dramatic. Possibly the greater isolation of the little kingdom, its nore intimate relations with the neighbouring wilderness, and the more primitive modes of life which resulted were also factors which contributed to this general result.

In the capital of course the life was not primitive, and its influence was undoubtedly greater than that of the country. Successive kings exerted themselves for its external improvement, and in this respect Hezekiah ben Ahaz was specially distinguished. Above all they mani-

fested sincere interest in the temple, which from an early The

period exerted a powerful force of attraction over the entire t mass of the population. They regulated the cultus accord- ° ing to their individual tastes, added to it or curtailed it at their pleasure, and dealt with the sacred treasures as they chose. Although the priests had in a certain sense great power—the conspiracy against Athaliah was led not by &

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prophet but by a priest,—they were nevertheless subjects of the king, and had to act according to his orders. That the cultus of Jehovah at Jerusalem was purer than that at Bethel or at Samaria is an assertion which is contradicted by more than one well-attested fact. In this respect there was no essential difference between Israel and Judah. It was in Israel that the reaction against Baal-worship origi- nated which afterwards passed over into Judah ; the initia- tive in all sucli matters was Israel's. There the experi- ments were: made from which Jerusalem learned the lesson. How deep was the interest felt in the affairs of the larger kingdom by the inhabitants even of one of the smaller provincial towns of Judah is shown in the instance of Amos of Tekoah.

Step by step with the decline of Israel after the death of Jeroboam II. did Judah rise in importance; it was already preparing to take the inheritance, The man through whom the transition of the history from Israel to Judah was effected, and who was the means of securing for the latter kingdom a period of respite which was fruit- ful of the best results for the consolidation of true religion, was the prophet Isaiah. The history of his activity is at the same time the history of Judah during that period.

Jsaiah became conscious of his vocation in the year of King Uzziah's death ; his earliest discourses date from the beginning of the reign of Ahaz. In them he contemplates the imminent downfall of Samaria, and threatens Judah also with the chastisement its political and social sins deserve. In chap. ix., and also in chaps. ii.—yv., lie still confines himself on the whole to generalities quite after the manner of Amos. But on the occasion of the expedition of the allied Syrians and Ephraimites against Jcrusalem he interposed with bold decision in the sphere of practical politics. To the very last he endeavoured to restrain Ahaz from his purpose of summoning the Assyrians to his help ; he assured him of Jehovah's countenance, and offered him a token inpledge. When the king refused this, the prophet recognized that matters liad gone too far, and that the coming of the Assyrians could not be averted. He then declared that the dreaded danger would indeed be obviated by that course, but that another far more serious would be incurred. For the

Egyptians would resist the westward movement of Assyria, and Judah as the field of war would be utterly laid waste ; only a remnant would remain as the basis of a better future.

The actual issue, however, was not yet quite so disastrous. The Egyptians did not interfere with the Assyrians, and left Samaria and Daniascus to their fate. Judah became indeed tributary to Assyria, but at the same time enjoyed considerable prosperity. Henceforward the prophet's most zealous efforts were directed to the object of securing the maintenance, at any price, of this condition of affairs. He sought by every means at his command to keep Judah from any sort of intervention in the politics of the great powers, in order that it might devote itself with undivided energies to the necessities of internal affairs. He actually succeeded in maintaining the peace for many years, even at times when in the petty kingdoms around the spirit of revolt was abroad. 'The ill success of all attempts else- where to shake off the yoke confirmed him in the convic- tion that Assyria was the rod of chastisement wielded by Jehovah over the nations, who had no alternative but to yield to its iron sway.

While thirty years passed thus peacefully away so far as foreign relations were concerned, internal changes of all the greater importance were taking place. Hezekiah ben Ahaz undertook for the first time a thorough-going refor- mation in the cultus of Jehovah. "He removed the high places, and brake the pillars, and cut down the Ashera,

and brake in pieces the brazen serpent that Moses had

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made"; so we are told in 2 Kings xviii. 4, with a mixture of the general and the special that does not inspire much confidence. For, eg., the "high places" which Solomon had raised on the Mount of Olives were not removed by Hezekiah, although they stood quite close to Jerusalem, and moreover were consecrated to foreign deities. But in every respect there must have been a wide difference between the objects and results of the reformations of Hezekiah and Josiah. Undoubtedly Hezekiah

undertook his reforms in worship under the influence of Isaiah. Following in the footsteps of Hosea, who had been the first to take and to express offence at the use of images in the worship of Jehovah, this prophet, utilizing the impres- sion which the destruction of Samaria had produced in Jerusalem (Isa. xvii, cf. Jer. iii.), strove to the utmost against the adoration of the work of men's hands in the holy places, against the Asheras and pillars (sun-pillars), and above all against the ephods, 7.e., the idols of silver and gold, of which the land was full. But against the high places in and by themselves, against the multiplicity of the altars of Jehovah, he made no protest. '(In the Messianic time) ye shall loathe and cast away as an unclean thing your graven images with silver coverings and your molten images overlaid with gold," he says (xxx. 22); and the inference is that he contemplated the purification of the high places from superstitious excesses, but by no means their abolition. To this one object } Hezekiah's reforma- tion seems to have confined itself,—an object of much greater primary importance than the destruction of the altars themselves. Their destruction was a measure which arose simply out of despair of the possibility of cleansing them.

Sargon, king of Assyria, was succeeded in 705 by Sennacherib. The opportunity was seized by Merodach Baladan of Babylon to secure his independence; and by means of an embassy he urged Hezekiah also to throw off the yoke, The proposal was adopted, and the king of Judah was joined by other petty kingdoms, especially some of the Philistine towns. lished to secure its support in case of need. Sennacherib's 4

more immediate and pressing business in Babylon enabled 2

Palestine to gain some time; but the issue of that revolt made self-deception impossible as to the probable result of the other movement.

This was the period at which Isaiah, already far advanced in life, wielded his greatest influence. The preparations for revolt, the negotiations with Egypt, were concealed from him,—a proof low greatly he was feared at court. When he came to know of them, it was already too late to undo what had been done. But he could at least give vent to his anger. With Jerusalem, it seemed to him, the story of

Samaria was repeating itself; uninstructed by that sad lesson, the capital was giving itself up to the mad intoxication of leaders who would inevitably bring her to ruin. ‘Quietness and rest” had been the motto given by Jehovah to Judah, powerless as it was and much in need of a period of peace; instead of this, defiance based on ignorance and falsehood expressed the prevailing temper. But those who refused to listen to the intelligible language of Jehovah would be compelled to hear Him speak in Assyrian speech in a way that would deafen and blind them. Tsaiah shows himself no less indignant against the crowd that stupidly stared at his excitement than against the God-forsaken folly of the king, with his counsellors, his priests, and his prophets. They do not suffer themselves

1 That is, to the abolition of the images. Jeremiah’s polemic is directed no longer against the images, but against wood and stone, 7.¢., Asheras and pillars. The date of the reformation under Hezekiah is uncertain; perhaps it ought to be placed after Sennacherib’s with- drawal from Jerusalem.

Relations with Egypt were estab- Alliance

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Tsaiah’s attitude: his triumph.

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to be shaken out of their ordinary routine by the gravity of such a crisis as this; the living work of Jehovah is to them a sealed book; their piety does not extend beyond the respect they show for certain human precepts learnt by rote.

Meanwhile Sennacherib, at the head of a great army, was advancing against Philistia and Judah along the Pheenician coast (701). Having

captured Ascalon, he next laid seige to Ekron, which, after the combined Egyptian and Ethiopian army sent to its relief had been defeated at Eltheke, fell into the enemy's hand, and was severely dealt with. Simultaneously various fortresses of Judah were

occupied, and the level country was devastated (Isa. i.).

The consequence was that Hezekiah, in a state of panic, offered to the Assyrians his submission, which was accepted on payment of a heavy penalty, he being permitted how- ever to retain possession of Jerusalem. He seemed to have got cheaply off from the unequal contest.

The way being thus cleared, Sennacherib pressed on southwards, for the Egyptians were collecting their forces against him. The nearer he came to the enemy the more undesirable did he find it that he should leave in his rear so important a fortress as Jerusalem in the hands of a doubtful vassal. Notwithstanding the recently ratified treaty, therefore, he demanded the surrender of the city, believing that a policy of intimidation would be enough to secure it from Hezekiah. But there was another per- sonality in Jerusalem of whom his plans had taken no account, Isaiah had indeed regarded the revolt from Assyria as a rebellion against Jehovah Himself, and there- fore as a perfectly hopeless undertaking which could only result in the utmost humiliation and sternest chastisement for Judah. But still more distinctly than those who had gone before him did he hold firm as an article of faith the conviction that the kingdom would not be utterly annihi- lated ; all his speeches of solemn warning closed with the announcement that a remnant should return and form the kernel of a new commonwealth to be fashioned after

Jehovah's own heart. For him, in contrast to Amos, the

great crisis had a positive character ; in contrast to Hosea, lie did not expect a temporary suspension of the theocracy, to be followed by its complete reconstruction, but in the pious and God-fearing individuals who were still to be met with in this Sodom of iniquity, he saw the threads, thin indeed yet sufficient, which formed the links between the Israel of the present and its better future. Over against the vain

confidence of the multitude Isaiah had hitherto brought into prominence the darker obverse of his religious belief, but now he confronted their present depression with its bright reverse; faint-heartedness was still more alien to his nature than temerity. In the name of Jehovah he bade King Hezekiah be of good courage, and urged that he should by no means surrender. The Assyrians would not be able to take the city, not even to shoot an arrow into it nor to bring up their siege train against it. "I know thy sitting, thy going, and thy standing," is Jehovah's language to the Assyrian, 'and also thy rage against me. And I will put my ring in thy nose, and my bridle in thy lips, and I will turn thee back by the way by which thou camest." And thus it proved in the issue. By a still unexplained catastrophe, the main army of Sennacherib was annihilated on the frontier between Kgypt and Palestine, and Jerusalem thereby freed from all danger. The Assyrian king had to save himself by a hurried retreat to Nineveh ; Isaiah was triumphant. A more magnificent close of a period of influential public life can hardly be imagined.

What Sennacherib himsclf relates of his expedition against his

rebellious vassals in Palestine (Gcorge Smith, Assyrian Eponym Canon, p. 67, 68, 181-136) runs parallel with 2 Kings xviii, 14-16,

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but not with the rest of the Bible narrative. These three verses are Senna- peculiar, and their source is different from that of the context. After cherib's having captured various Phoenician cities, and received tribute from inscrip. anumber of kings, his first measure is forcibly to restore the Assyrian tions, governor who had been expelled from Ascalon, and next he turns

his arms against Ekron. This city had put in irons its own king Padi (who remained loyal to the suzerain), and handed him over to Hezekiah, who appears as the soul of the rebellion in these quarters.

'The Egyptians, who as usual havea hand in the matter, advance with

an army for the relief of the beleaguered city, but are defeated near Eltheke in the immediate neighbourhood; Ekron is taken, remorse-lessly chastiscd, and forced to take Padi back again as its king. For Hezekiah in the meantime has delivered up his prisoner, and, terri-

fied by the fall of his fortresses and the devastation of his territory,

has accepted the position of a vassal once more, paying at the same time a heavy fine, inclusive of 30 talents of gold and 800 of silver, Such is the Assyrian account. If we treat the 300 talents mentioned

in 2 Kings xviil. 14 as Syrian (=800 Babylonian), it completely fills

in the vague outlines given in 2 Kings xviii. 14-16, and, while confirm-

ing in their place immediatcly after ver. 18 these verses, unrelated

as they are to the main connexion of the Biblical narrative, corrects them only in one point by making it probable that the subjection

ot Hezekiah (which is not equivalent to the surrender of his city) took place while Sennacherib was still before Ekron, and not at a later date when he had gone further south towards Libnah. As regards his further advance towards Egypt, and the reasons of his sudden withdrawal (related by Herodotus also from Egyptian tra- dition), the great king is silent, having nothing to boast of in it.

The battle of Elthekc, which is to beregarded only as an episode in the siege of Ekron, being merely the repulse of the Egyptian relieving army, was not an event of great historical importance, and ought not

to be brought into any connexion either with 2 Kings xix. 7 or with xix. 85; Sennacherib's inscription speaks only of the first and pro- sperous stage of the expedition, not of the decisive one which resulted

so disastrously for him, as must be clear from the words themselves

to every unprejudiced reader. The Assyriologists, in their determi-nation to makea history, assume identifications on grounds that do

not admit of proof, and in this way do even mote violence to the Assyrian than to the Biblical narrative.

8. Isaiah was so completely a prophet that even his wife was called the prophetess after him. No such title could have been bestowed on the wife of either Amos or Hosea. But what distinguished him more than anything else from those predecessors was that his position was not, like theirs, apart from the government; he sat close to the helm, and took a very real part in directing the course of 1) the vessel. He was more positive and practical than they ; Practi- he wished to make his influence felt, and, when for the cmlity « moment he was unsuccessful in this so far as the great whole of the state was concerned, he busied himself in gathering round him a small circle of like-minded persons on whom his hope for the future rested. Now that Israel had been destroyed, he wislicd at all events to save Judah. The lofty ideality of his faith (ii. 1 sqgg.) did not hinder him from calling in the aid of practical means for this end. But the current of his activities was by the circumstances of the case directed into a channel in which after his death they continued to flow towards a goal which had hardly been contemplated by himself.

The political importance of the people of J ehovah was reduced to a minimum when Judah only was left. Already at an earlier period in that kingdom the sacred had come to be of more importance than the secular; much more was this the case under the suzerainty of Assyria. 'The circumstances of the time themselves urged that the religion of Israel should divest itself of all politico-national character; but Isaiah also did his best to further this end. It was his most zealous endeavour to hold king and people aloof from every patriotic movement; to him the true religious attitude was one of quietness and sitting still, non-inter- vention in political affairs, concentration on the problems of internal government. But he was compelled to leave over for the coming Messiah (xi. 1 sqg.) that reformation in legal and social matters which seemed to him so neces- sary; all that he could bring the secular rulers of his country to undertake was a reform in worship. This was the most easily solved of the problems alluded to above,

‘tn fluence sjowards ‘making ‘the state 4 church.

Judah again vassal to Assyria.

Manasseh. The re- action.

and it was also that which most closely corresponded to the character of the kingdom of J udah. Thus it came about that the reform of the theocracy which had been contemplated by Isaiah led to its transformation into an ecclesiastical state. No less influential in effecting a radical change in the old popular religion was Isaiah’s doctrine which identified the true Israel with the holy remnant which alone should emerge from the crisis unconsumed. or that remnant was more than a mere object of hope; it actually stood before him in the persons of that little group of pious individuals gathered around him. Isaiah founded no “ ecclesiola in ecclesia” indeed, but certainly an “ecclesia in civitate Dei.” Now began that distinction between the true Israel and the Israel according to the flesh, that bipartite division of the nation which became so important in later times. As head and founder of the prophetic party in Judah, Isaiah was, involuntarily, the man who took the first steps towards the institution of the church.

The catastrophe which befel the army of Sennacherib had no very great effect upon the external affairs of Judah. Sennacherib indeed, being busy in the east, was nnable to retrieve the loss he had sustained, but his son Esarhaddon, who succeeded him in 681, resumed the Egyptian war with better success. He made himself master of the Nile valley, and brought the Ethiopians into submission. That the petty kingdoms of Palestine returned to the old relations of dependence is to be taken asa matter of course. Judali appears to have resumed the yoke voluntarily, but the Samaritans only after force had been applied ; they were afterwards deported, whereupon the deserted country was occupied by foreign colonists, who, however, accepted the cultus of the god of the land.

That Manasseh ben Hezekiah should have again come under Assyrian suzerainty appears at that time to have made but little impression ; since the time of Ahaz Judah had been accustomed to this relation. The

book of Kings speaks only of internal affairs under the reign of Manasseh. According to it, he was a bad ruler, who permitted, and even caused, innocent blood to flow like water. But what was of greater consequence for the fnture, he took up an attitude of hostility towards the prophetic party of reform, and put himself on the side of the reaction which would fain bring back to the place of honour the old popular half- pagan conception of Jehovah, as against the pure and holy God whom the prophets worshipped. The revulsion mani- fested itself, as the reform had done, chiefly in matters of worship. The old idolatrous furniture of the sanctuaries was reinstated in its place, and new frippery was imported from all quarters, especially from Assyria and Babylon, to renovate the old religion ; with Jehovah was now associated a "queen of heaven." Yet, as usual, the restoration did more than merely bring back the old order of things. What at an earlier period had been mere naivet¢ now became superstition, and could hold its ground only by having imparted to it artificially a deeper meaning which was itself borrowed from the prophetical circle of ideas. Again, earnestness superseded the old joyousness of the cultus; this now had reference principally to sin and its atonement. Value was attached to services rendered to the Deity, just in proportion to their hardness and unnatural- ness; at this period it was that the old precept to sacrifice to J ehovah the male that opens the matrix was extended to children. The counter-reformation was far from being unaffected by the preceding reformation, although it under- stood religious earnestness in quite another sense, and sought, not to eliminate heathenism from the cultus, but to animate it with new life. On the other hand, the re- action was in the end found to have left distinct traces of its influence in the ultimate issue of the reformation.

We possess one document dating from Manasseh's time

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in Micah vi. 1-vii. 6. utter disregard of every moral restraint in Judah are set in a hideous light, the prophetic point of view, as contrasted with the new refinements in worship, attains also its simplest and purest

expression. Perhaps to this period the Decalogue also, which is so eloquently silent in regard to cultus, is to be assigned. Jehovah demands nothing for Himself, all that He asks is only for men ; this is here the fundamental law of the theocracy.

Manasseh's life was a long one, and his son Amon walked in his ways. The latter died after a brief reign, and with his death a new era for Judah began. It was introduced by the great catastrophe in which the Assyrian empire came to an end. The sovereignty of the world was beginning to pass out of the hands of the Semites into those of the Aryans. Phraortes of Media indeed was unsuccessful in his attempt against the Assyrians, but Cyaxares beat them and proceeded to besiege their capital.

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juncture gave them another respite of six and twenty years ; but even it tended to break into pieces the great, loosely-compacted monarchy. The provinces became gradually disintegrated, and the kingdom shrivelled up till it covered no more than the land of Asshur.!

The inroad of the Scythians aroused to energy again the voice of prophecy which had been dumb during the very sinful but not very animated period of Manasseh's reign. Zephaniah and Jeremiah threatened with the mysterious northern foe, just as Amos and Hosea had formerly done with the Assyrians. The Scythians actually did invade Palestine in 626 (the 13th year of Josiah), and penetrated as far as to Egypt ; but their course lay along the shore line, and they left Judah untouched. This danger that had come so near and yet passed them by, this instance of a prophetic threatening that had come to pass and yet been mercifully averted, made a powerful impression upon the people of Judah ; public opinion went through a revolution in favour of the reforming party which was able to gain for itself the support also of the young king Josiah ben Amon.

tion of the theocracy. In the year 621 (the eighteenth of Josiah) Deuteronomy was discovered, accepted, and carried into effect.

The Deuteronomic legislation is designed for the refor-

‘mation, by.no means of the cultus alone, but at least quite

as much of the civil relations of life. The social interest is placed above the cultus, inasmuch as everywhere humane ends are assigned for the rites and offerings. In this it is plainly seen that Deuteronomy is the progeny of the pro- phetic spirit. Still more plainly does this appear in thie motifs of the legislation ; according to these, J ehovah is the only God, whose service demands the whole heart and every energy ; He has entered into a covenant with Israel, but upon fundamental conditions that, as contained in the Decalogue, are purely moral and of absolute universality. Nowhere does the fundamental religious thought of pro- phecy find clearer expression than in Deuteronomy,— the thought that Jehovah asks nothing for Himself, but

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1 Our knowledge of the events of the second half of the 7th century has rentained singularly imperfect hitherto, notwithstanding the im- portance of the changes they wrought on the face of the ancient world. The account given above is that of Herodotus (i. 108-106), and there the matter must rest until really authentic sources shall have been brought to light. With regard to the final siege of Nineveh, our chief informant is Ctesias as quoted by Diodorus (ii. 26, 27). Whether the prophecy of Nahum relates to the last siege is doubtful (in spite of ii. 7, and the oracle given in Diodorus, 871 rhv Nivov obdels EXE? KaTe Kparos éay mh mpdtepov 6 wotapos Th WéAEt yevnrat ToAemios), inas- much as Nahum (i. 9) expressly speaks of the siege alluded to by him as the first, saying, “the trouble shall not rise up the second ime.”

Here, where the lawlessness and

The Scythian invasion of Media and western Asia (c. 630) at this

The circumstances were favourable for coming forward with a comprehensive programme for a reconstruc-

Amon.

The Scyth- ians.

Zephan-

iah and Jeremiah,

Deutero- nomy.

Religion and patriot- ism.

Jere- miah's opposi- tion.

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asks it ag a religious duty that man should render to man what is right, that His will lies uot in any unknown height, but in the moral sphere which is known and under- stood by all.t

But the result of the innovation did not correspond exactly to its prophetic origin. Prophecy died when its precepts attained to the force of laws ; the prophetic ideas lost their purity when they became practical. Whatever may have been contemplated, only provisional regulations actually admitted of being carried, and even these only in cooperation with the king and the priests, and with due regard to the capacity of the masses. The final outcome of the Deuteronomic reformation was principally that the cultus of Jehovah was limited to Jerusalem and abolished everywhere else,—such was the popular and practical form of prophetic monotheism. The importance of the Salomonic temple was thereby inereased in the highest degree, and so also the influence of the priests of Jerusalem, the sons of Zadok, who now in point of fact got rid entirely of their rivals, the priests of the country districts.

9, Josiah lived for thirteen years after the accomplish- ment of his great work. It was a happy period of external and internal prosperity. The nation possessed the covenant, and kept it. It seemed as if the

conditions had been attained on which, according to the prophets, the continu- ance of the theocracy depended; if their threatenings against Israel had been fulfilled, so now was Judah proving itself the heir of their promises. Already in Deuteronomy is the “ extension of the frontier ” taken into consideration, and Josiah actually put his hand to the task of seeking the attainment of this end.

Jehovah and Israel, religion and patriotism, once more went handin hand. Jeremiah alone did not suffer himself to be misled by the general feeling. He was a second Amos, upon a higher platform—but, unlike his predecessor, a prophet by profession ; his history, like Isaiah’s, is practi- cally the history of his time. In the work of introducing Deuteronomy he had taken an active part, and throughout his life he showed his zeal against unlawful altars and against the adorationof wood and stone(Asheras and pillars). But he was by no means satisfied with the efforts of the reformation that had been effected; nothing appeared to him more sinful or more silly than the false confidence produced by it in Jehovah and in the inviolability of His one true temple. This confidence he maintained to be delusive ; Judah was not a whit better than Israel had been, Jerusalem would be destroyed one day like the temple of Shiloh. The external improvements on which the people of Judah prided themselves he held to leave this severe judgment unaffected; what was needed was a quite different sort of change, a change of heart, not very easy positively to define.

_ An opportunity for showing his opposition presented itself to the prophet at the juncture when King Josiah had fallen at Megiddo in the battle with Pharaoh Necho (608), and when the people were seeking safety and protection by cleaving to Jehovah and His holy temple. At the instance of the priests and the prophets he had almost expiated with his blood the blasphemies he had uttered against the popular belief ; but he did not suffer himself to be driven from his course. Even when the times had grown quiet again, he persisted, at the risk of his life and under uni- versal reproach and ridicule, in his work as a prophet of

1 The commandments which I command thee are not unattainable for thee, neither are they far off ; not in heaven so that one might say, Who

can climb up into heaven and bring them down, and tell us them that we might do them ! not beyond the sea, so that one might say, Who shall go over the sea, and fetch them and tell us them that we might do them!—but the matter lies very near thee, in thy mouth and in thy heart, so that thou canst do it.—Deut. xxx. 11-14.

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evil. Moments of despair sometimes came to him; but that he had correctly estimated the true value of the great con- version of the nation was speedily proved by the facts, Although Deuteronomy was not formally abolished under Jehoiakim, who as the vassal of Egypt ascended the throne of his father Josiah, nevertheless it ceased to have practical weight, the battle of Megiddo having shown that in spite of the eovenant with Jehovah the possibilities of non-success in war remained the same as before. Jehoiakim tended to return to the ways of Manasseh, not only as regarded idolatry, but also in his contempt for Jaw and the private rights of his subjects ;—the two things seem to stand in connexion.

The course of events at last brought upon the theocracy the visible ruin which Jeremiah had been so long expecting, After the Egyptians had, with comparative ease, subjugated Syria at a time when the Medes and Chaldeans were

busied with the siege of Nineveh, Nebuchadnezzar, that Nebuchei

task accomplished, came upon them from Babylon and nezzar. routed them on the Euphrates near Carchemish (605-4). The people of Judah rejoiced at the fall of Nineveh, and also at the result of Carchemish; but they were soon undeceived when the prospect began to open on them of simply exchanging the Egyptian for the Chaldean yoke. The power of the Chaldeans had been quite unsuspected, and now it was found that in them the Assyrians had suddenly returned to life. Jeremiah was the only man who gained any credit by these events. His much ridiculed "enemy out of the north," of whom he had of old been wont to speak so much, now began to he talked of with respect, although his name was no longer "the Scythian " but "the Babylonian." It was an epoch,—the

close of an account which balanced in his favour. There- fore it was that precisely at this moment he received the Divine command to commit to writing that which for twenty-three years he had been preaching, and which, ever pronounced impossible, had now showed itself so close at hand.

After the victory of Carchemish the Chaldeans drove Pharaoh out of Syria, and also compelled the submission of Jchoiakim (c. 602). For three years he continued to pay his tribute, and then he withheld it ; a mad passion for liberty, kindled by religious fanaticism, had begun to rage with portentous power amongst the influential classes, the grandees, the priests, and the prophets. Nebuchad- nezzar satisfied himself in the first instance with raising against Judah several of the smaller nationalities around, especially the Edomites ; not till 597 did he appear in person before Jerusalem. The town was yield ; the more important citizens were carried into exile, amongst them the young king Jechoniah, son of J ehoiakim,

tion of citizens of Jeru-

made king in his stead over the remnant left behind. The 597 3.0. patriotic fanaticism that had led to the revolt was not broken even by this blow. Within four years afterwards new plans of liberation began to be again set on foot ; but on this occasion the influence of Jeremiah proved strong enough to avert the danger. But when a definite prospect of help from Pharaoh Hophra (Apries) presented itself in 589, the craving for independence proved quite irrepressible. Revolt was declared; and in a very short time the Chaldzan army, with Nebuchadnezzar at its head, lay before Jeru- salem. For a while everything seemed to move prosper- ously ; the Egyptians came to the rescue, and the Chal- deans were compelled to raise the siege in order to cope with them, At this there was great joy in Jerusalem ; but Jeremiah continued to express his gloomy views. The event proved that he was right ; the Egyptians were repulsed and the siege resumed. The city was bent on obstinate resistance ; in vain did Jeremiah, at continual risk of his

compelled to Deporta-

who had died in the interval ; Zedekiah ben Josiah was salem in)

Jews of the exile,

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| Cyrus : how re- | garded,

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life, endeavour to bring it to reason. The king, who agreed with the prophet, did not venture to assert his opinion

against the dominant terrorism. The town in these circum-

- stances was at last taken by storm, and, along with the

temple, reduced to ruins Cruel vengeance was taken on the king and grandees, and the pacification of the country was ensured by another and larger deportation of the inhabitants to Babylon. Thus terminated in 586 the kingdom of Judah.

The prophets had been the spiritual destroyers of the

. old Israel. In old times the nation had been the ideal of

religion in actual realization ; the prophets confronted the nation with an ideal to which it did not correspond. Then to bridge over this interval the abstract ideal was framed into a law, and to this law the nation was to be conformed. The attempt had very important: consequences, inasmuch as Jehovah continued to be a living power in the law, when He was no longer realized as present in the nation ; but that was not what the prophets had meant to effect. What they were unconsciously labouring towards was that religious individualism which had its historical source in the national downfall, and manifested itself not exclusively within the prophetical sphere. With such men as Amos and Hosea the moral personality based upon an inner con-viction burst through the limits of mere nationality ; their mistake was in supposing that they could make their way of thinking the basis of a

national life. Jeremiah saw through the mistake; the true Israel was narrowed to himself, Of the truth of his conviction he never had a moment's doubt ; he knew that Jehovah was on his side, that on Him depended the eternal future. But, instead of the nation, the heart and the individual conviction were to him the subject of religion. On the ruins of Jerusalem he gazed into the future filled with joyful hope, sure of this that Jehovah would one day pardon past sin and renew the relation which had been broken off—though on the basis of another covenant than that laid down in Deutero- nomy. "I will put my law upon their heart, and write it on their mind; none shall say to his neighbour, ' Know the Lord,' for all shall have that knowledge within them."

10. The exiled Jews were not scattered all over Chaldiea, but were allowed to remain together in families and clans. Many of them, notwithstanding this circumstance, must have lapsed and become merged in the surrounding heathenism; but many also continued faithful to Jehovah and to Israel. They laboured under much depression and sadness, groaning under the wrath of Jehovah, who had rejected His people and cancelled His covenant. They were lying under a sort of vast interdict ; they could not celebrate any sacrifice or keep any feast ; they could only observe days of fasting and humiliation, and such rites as had no inseparable connexion with the holy land. The observance of the Sabbath, and the practice of the rite of circumcision, acquired much greater importance than they formerly possessed as signs of a common religion. The meetings on the Sabbath day out of which the synagogues were afterwards developed appear to have first come into use during this period ; perhaps also even then it had become customary to read aloud from the prophetic writings which set forth that all had happened in the pro- vidence of God, and moreover that the days of adversity were not to last for ever.

_ Matters improved somewhat as Cyrus entered upon his victorious career. Was he the man in whom the Messianic prophecies had found their fulfilment? The majority were unwilling to think so. For it was out of Israel (they argued) that the Messiah was to proceed who should establish the kingdom of God upon ite ruins of the king- doms of the

world; the restitution effected by means of a Persian could only be regarded as a passing incident in

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the course of an historical process that had its goal entirely elsewhere. This doubt was met by more than one pro- phetical writer, and especially by the great anonymous author to whom we are indebted for Isa, xl.—Ixvi. “ Away with sorrow ; deliverance is already at the door! Is it then a humiliating thing that Israel should owe its freedom to a Persian? Nay, is it not rather a proof of the world-wide sway of the God of Jacob that He should thus summon His instruments from the ends of the earth? Who else than Jehovah could have thus sent Cyrus? Surely not the false gods which He has destroyed? Jehovah alone it was who foretold and foreknew the things which are now coming to pass,—because long ago He had prearranged and predetermined them, and they are now being executed in accordance with His plan. Mejoice therefore in prospect of your near deliverance; prepare yourselves for the new era; gird yourselves for the return to your homes.” It is to be observed, as characteristic in this prophecy, how the idea of Jehovah as God alone and God over all—in con- stantly recurring lyrical parentheses He is praised as the author of the world and of all nature—is yet placed in positive relation to Israel alone, and that upon the principle that Israel is in exclusive possession of the universal truth, which cannot perish with Israel, but must, through the instrumentality of Israel, become the common possession of the whole world. ‘There is no God but Jehovah, and Israel is His prophet.”

For many years the Persian monarch put the patience of the Jews to the proof; Jehovah’s judgment upon the Chaldeans, instead of advancing, seemed to recede. At length, however, their hopes were realized ; in the year 538 Cyrus brought the empire of Babylon to an end, and Edict of gave the exiles leave to seek their fatherland once more. Cyrus. This permission was not made use of by all, or even by a majority. The number of those who returned is stated at 42.360; whether women and children are included in this figure is uncertain. On arriving at their destination, after the difficult march through the

desert, they did not spread themselves over the whole of Judah, but settled chiefly Resettle- in the neighbourhood of Jerusalem. The Calebites, for ment. example, who previously had had their settlements in and around Hebron, now settled in Bethlehem and in the dis- trict of Ephrath. They found it necessary to concentrate themselves in face of a threatened admixture of doubtful elements. From all sides people belonging to the surround- ing nations had pressed into the depopulated territory of Judah. Not only had they annexed the border territories —where, for example, the Edomites or Idumzans held the whole of the Negeb as far as to Hebron; they had effected lodgments everywhere, and—as the Ammonites, Ashdod- ites, and especially the Samaritans—had amalgamated with the older Jewish population, a residue of which had remained in the country in spite of all that had happened. These half-breed "pagani" (Amme haareg, 6xAu) gave a friendly reception to the returning exiles (Bne haggola) ; particularly did the Samaritans show themselves anxious to make common cause with them. But they were met with no reciprocal cordiality. The lesson of religious isolation which the children of the captivity had learned in Babylon, they did not forget on their return to their home. Here also they lived as in a strange land. Not the native of Juda, but the man who could trace his descent from the exiles in Babylon, was reckoned as beloug- ing to their community.

The first decennia after the return of the exiles, during which they were occupied in adjusting themselves to their new homes, were passed under a variety of adverse circum- stances and by no means either in joyousness or security. Were these then the Messianic times which, it had been foretold, were to dawn at the close of their captivity 1

They did not at all events answer the expectations which had been formed. A settlement had been again obtained, it was true, in the fatherland; but the Persian yoke pressed

imminent. But it was averted by a new accession from Danger of) without. In the year 458 Ezra the scribe, with a great heathen-

number of his compatriots, set out from Babylon, for the *™- purpose of reinforcing the Jewish element in Palestine. Ezra,

now more heavily than ever the Babylonian had done. The sins of God's people seemed still unforgiven, their period of bond-service not yetat anend. A slight improve-

The Jews of Babylon were more happily situated than their Palestinian brethren, and it was comparatively easy

Haggai ment, as is shown by the prophecies of Haggai and for them to take up a separatist attitude, because they were and Zechariah, followed when in the year 520 the obstacles surrounded by a heathenism not partial but entire. They Zecha- disappeared which until then had stood in the way of the | were no great losers from the circumstance that they were po rebuilding of the temple; the work then begun was com- precluded from participating directly in the life of the ane pleted in 516. Inasmuch as the Jews were now nothing ecclesiastical community ; the Torah had long ago become more than a religious community, based upon the traditions separated from the people, and was now an independent of a national existence that had ceased, the rebuilding of | abstraction following a career of its own. Babylonia was the temple, naturally, was for them an event of supreme | the place where a further codification of the law had been importance. placed alongside of Deuteronomy. Ezekiel had led the The law of the new theocracy was the book of Deutero- | way in reducing to theory and to writing the sacred praxis nomy; this was the foundation on which the structure of his time ; in this he was followed by an entire school ; was to be built. But the force of circumstances, and the | in their exile the Levites turned scribes. Since then spirit of the age, had even before and during the exile Babylon continued to be the home of the Torah; and, while exerted a modifying influence upon that legislative code; | in Palestine itself the practice was becoming laxer, their and it continued to do sostill. At first a "son of David" | literary study had gradually intensified the strictness and had continued to stand at the head of the

Bne haggola, | distinctive peculiarities of Judaism. And now there came but this last relic of the old monarchy soon had to give | to Palestine a Babylonian scribe having the law of his God way to a Persian governor who was under the control of | in his hand, and armed with authority from the Persian the satrap of trans-Euphratic Syria, and whose principal | king to proceed upon the basis of this law with a reforma- Hiero- business was the collection of revenue. Thenceforward the | tion of the community. eee sole national chief was Joshua the high priest, on whom, Ezra did not set about introducing the new law evil A

accordingly, the political representation also of the com- munity naturally devolved. In the circumstances as they then were no other arrangement was possible. The way had been paved for it long before in so far as the Assyrians had destroyed the kingdom of Israel, while in the kingdom of Judah which survived it the religious cultus had greater importance attached to it than political affairs, and also inasmuch as in point of fact the practical issue of the pro- phetic reformation sketched in Deuteronomy had been to make the temple the national centre still more than formerly. 'The hierocracy towards which Ezekiel had already opened the way was simply inevitable. It took the form of a monarchy of the high priest, he having stepped into the place formerly occupied by the theocratic king. As his peers and at his side stood the members of his clan, the Levites of the old Jerusalem, who traced their descent from Zadok (Sadduk) ; the common Levites held a much lower rank, so far as they had maintained their priestly rank at all and had not been degraded, in accord- ance with Ezekiel's law (chap. xliv.), to the position of mere temple servitors. ' Levite," once the title of honour bestowed on all priests, became more and more confined to members of the second order of the clergy.

Meanwhile no improvement was taking place in the condition of the Jewish colonists. They were poor; they had incurred the hostility of their neighbours by their exclusiveness ; the Persian government was suspicious ; the incipient decline of the great kingdom was accompanied with specially unpleasant consequences so far as Palestine was concerned (Megabyzus). All this naturally tended to produce in the community a certain laxity and depression. To what purpose (it was

asked) all this religious strictness, which led to so much that was unpleasant? Why all this zeal for Jehovah, who refused to be mollified by it? It is a significant fact that the upper ranks of the priesthood were least of all concerned to counteract this tendency. Their priesthood was less to them than the predominance which was based upon it; they looked upon the neighbour- ing ethnarchs as their equals, and maintained relations of friendship with them. The general community was only following their example when it also began to mingle with the Amme haareg.

The danger of Judaism merging into heathenism was

immediately on his arrival in Judea. In the first instance he concentrated his attention on the task of effecting a strict separation between the Bne haggola and the heathen or half-heathen inhabitants. So much he could accomplish upon the basis of Deuteronomy, but it was long before he gave publicity to the law which he himself had brought. Why he hesitated so long it is impossible to say ; between the seventh and the twentieth year of Artaxerxes Longi- manus (458-445 Bc.) there is a great hiatus in the narrative of the books of Ezra and Nehemiah. The main reason appears to have been that, in spite of the goodwill of the Persian king, Ezra had not the vigorous support of the local authorities. But this was indispensably necessary in order to secure recognition for a new law.

At last, in 445, it fell to the lot of a Jew, who also Nehe- shared the views of Ezra, Nehemiah ben Hakkelejah,! the miah.

cupbearer and the favourite of Artaxerxes, to be sent as Persian governor to Judea. After he had freed the com- munity from external pressure with vigour and success, and brought it into more tolerable outward circumstances, the business of introducing the new law-book was next pro- ceeded with; in this Ezra and Nehemiah plainly acted in concert.

On the first of Tisri—the year is unfortunately not Thenew given, but it cannot have been earlier than 444 B.c.—the law.

promulgation of the law began at a great gathering in Jerusalem ; Ezra, supported by the Levites, was present. Towards the end of the month, the concluding act took place, in which the community became solemnly bound by the contents of the law. Special prominence was given to those provisions with which the people were directly concerned, particularly those which related to the dues payable by the laity to the priests.

The covenant which hitherto had rested on Deuteronomy was thus expanded into a covenant based upon the entire Pentateuch. Substantially at least Ezra's law-book, in the form in which it became the Magna Charta of Judaism in or about the year 444, must be regarded as practically identical with our Pentateuch, although many minor

1 According to the present punctuation this name is Hakalja (Hachaljah), but such a pronunciation is inadmissible ; it has no possible etymology, the language having no such word as hakal. The name in its correct form means " Wait upon Jehovah.",

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amendments and very considerable additions may have been made at a later date.

haracter The character of the post-Deuteronomic legislation (priestly code) is chiefly marked, in its external aspects, by

Its disad- Amos better. | vantages that the kernel needed a shell. It was a necessity that and ad- Jydaism should incrust itself in this manner; without those vantages: ord and ossified forms the preservation of its essential elements would have proved impossible. Ata time when all nationalities, and at the same time all bonds of religion and national customs, were beginning to be broken up in the seeming cosmos and real chaos of the Greco-Roman empire the Jews stood out like a rock in the midst of | the ocean. When the natural conditions of independent | nationality all failed them, they nevertheless artificially

maintained it with an energy truly marvellous, and thereby preserved for themselves and at the same time for the whole world an eternal good.}

Subse- As regards the subsequent history of the Jewish com-

quent munity under the Persian domination, we have almost no

_ hetory information, The high priest in Nehomiah's time was

Persian Eliashib, son of Joiakim and grandson of Joshua, the

rile, patriarchal head of the sons of Zadok, who had returned

from Babylon; he was succeeded in the direct line by

Joiada, Johanan, and Jaddua (Neh. xii. 10, 11, 22); the

last-named was in office at the time of Alexander the

Great (Joseph., Ant., xi. 8). Palestine was the province

which suffered most severely of all from the storms which

marked the last days of the sinking Persian empire, and it

is hardly likely that the Jews escaped their force; we

know definitely, however, of only one episode, in which

the Persian general Bagoses interfered in a disagreeable controversy about the high-priesthood (cir. 375).

_Sama- —-To this period also (and not, as Josephus states, to the

ae time of Alexander) belongs the constitution of the Samaritan

community on an independent footing by Manasseh, a Jewish priest of rank. He was expelled from Jerusalem by Nehemiah in 432, for

refusing to separate from his alien wife. He took shelter with his father-in-law Sanballat the

1 On the age of the priestly legislation of the Pentateuch compare De Wette, Beitrige zur Kinleitung ins A. T., 1806-7; George, Die Jjidischen Teste, 1885 ; Vatke, Die biblische Theologie, 1835 ; Graf, Die Geschichtlichen Bicher des A.T., 1866 ; Kuenen, Godsdienst van Israel, vol. ii, 1870. Great concessions to the view that the priestly code is of post-exilian origin are made by Delitzsch in the Zeitschrift Sir kirchliche Wissenschaft, p. 620, Leipsic, 1880 :—"I am now convinced that the processes which in their origin and progress have resulted in the final form of the Torah, as we now possess it, continued into the post-exile period, and perhaps had not ceased their activity even at the time of the formation of the Samaritan Pentateuch and the Septuagint translation."'

Samaritan prince, who built him a temple on Mount Gerizim near Shechem, where he organized a Samaritan church and a Samaritan worship, on the Jerusalein model, and on the basis of a but slightly modified Jerusalem Pentateuch. If the Samaritans had hitherto exerted them- selves to the utmost to obtain admission into the fellowship of the Jews, they henceforward were as averse to have anything to do with these as these were to have any dealings with them; the temple on Mount Gerizim was now the symbol of their independence as a distinct religious sect. For the Jews this was a great advantage, as they had no longer to dread the danger of syncretism. They could now quite confidently admit the Amme haareg into their communion, in the assurauce of assimilating them without any risk of the opposite process taking place. The Judaizing process began first with the country districts immediately surrounding Jerusalem, and then extended to Galilee and many portions of Perea. In connexion with it, the Hebrew language, which hitherto had been firmly retained by the Bne haggola, now began to yield to the Aramaic, and to hold its own only as a sacred speech.

In all probability the internal development of the Jewish Internal

community throughout this period stood in inverse propor- develop- tion to the eventlessness of its external history. After a a the Torah had been introduced as the law for the com-?”“™S™ munity, the next business was to give it practical effect and secure that all the relations of life should be pervaded by it. The place for doing this was the synagogue, where syna- it was read every Sabbath day, and illustrated from the gogue. historical and prophetical books?; from this point of view a new light was shed upon the whole of antiquity (Midrash, Chronicles). The Torah was most largely indebted to the Scribes. scribes, They had codified it, and moreover the founda- tion of a supplementary and correcting tradition, advancing with the progressive requirements of life, was laid by them. At a very early period they formed a numerous social class, the moral influence of which exceeded that of the priests. For the public cultus, and the public affairs generally speaking presided over by the priests, were not nearly so interesting to that age as was the regulation of the concerns of private life by religious law and ceremony. But here the scribes had the lead ; their avowed object was to make Biwows (the expressive active noun of the prologue to Ecclesiasticus) increasingly &vouos. Their constantly in- creasing prescriptions were felt not as burdens but as reliefs. Never before had the individual so keenly felt his responsibility for all that he did or left undone ; but this responsibility oppressed him, and what he longed for was to be able at every moment of his life to fulfil some positive command which should raise him above all risk of mistake.?

In its individualism this tendency has relations with a Personal deeper and freer type of piety by which to some extent religion. prophecy was continued under the domination of the law, and which connected itself especially with Jeremiah. In the finest Psalms there has grown out of the relation of Jehovah to Israel a relation between God and the pious soul; the pure subjective sense of fellowship with God (Ps. lxxiii. 28) is the highest good, in it a man has enough even when flesh and heart fail. So intensely was the

2 On the history of the canon see Bleek, Hind. ins A. T., secs. 269- 274 (4thed.). That the men of the Great Synagoguc, who are alleged to have

formed the canon, are merely an exegetical mythus having its foundation on the narrative of Neh. viii.-x. has been shown by Kuenen (* Over de Mannen der Groote Synagoge," in the Proceedings of the Royal Netherl. Acad., 1876).

3 Aristeas (Schmidt) 39, 1: mavrd0ev wepieppatey mas aryvetats Kat Sia Bpwrav nal moray Kal apay Kal akojjs Kal dpdoews vomiKay. Ecelus. vi. 29: nad Zrovtal cot af wéSau eis oxéwny ioxios Kab ot KAotod adriis eis oréanv dd&ns. The aim was not to do good, but to avoid sin (Joseph., Ant., xvi. 2, 4).

Universal

religion,

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reality of this relation felt that it became the foundation upon which the hope of immortality was first based, although belief in the doctrine of retribution was what chiefly made it popular. This inner religiosity exercised a modifying influence upon worship even ; the channel through which it was possible to import into it the expression of all kinds of feeling which were individual in their origin was the temple service of song, which was elaborated at this period, and soon reached an importance much higher than that of the sacrifices and other opera operanda,

As religion grew more individualistic, it also became more universal; for developed monotheism in any case 1ts restriction to oue particular nation was only casual and provisional. It is very noteworthy that in the book of Job, to which it is impossible to assign a date previous to the exile,! a religious problem is discussed between men of Uz, Aram, and Edom precisely as if they had been Jews. In the Hokmah, which flourished at that time in J udah as well as in Edom, religion almost entirely abandoned the ground of nationality, and became a kind of philosophy. Through the Hokmah doubt also began to assert a place for itself even within the sphere of religion.

The influence of Parsism upon Judaism was not so great as is usually assumed. It can hardly have affected the doctrine of the resurrection, although it may have influenced the development of angelology. Satan has some relation to old Hebrew conceptions (1 Kings xxii.), but neverthe- less is essentially the product of Zoroastrian dualism.

11. Palestine fell into Alexander's possession in 332; after his death it had an ample share of the troubles arising

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of Jews,—in Asia Minor, in Syria, and especially in Egypt. Alongside of the Palestinian there arose a Hellenistic Juda- ism which had its metropolis in Alexandria. Here, under Ptolemy I. and II., the Torah had already been translated into Greek, and around this sprung up a Jewish-Greek literature which soon became very extensive. At the court and in the army of the Ptolemies many Jews rose to prominent positions ; everywhere they received the pre- ference over, and everywhere they in consequence earned the hatred of, the indigenous population.

After the death of Ptolemy IV. (205) Antiochus ITT. attained the object towards which he and his predecessors had long been vainly striving ; after a war protracted with varying success through several years, he succeeded at last in incorporating Palestine with the kingdom of the Seleucid. The Jews took his side, less perhaps because they had become disgusted with the really sadly degenerate Egyptian rule, than because they had foreseen the issue of the contest, and preferred to attach themselves voluntarily to the winning side. In grateful acknowledgment, Antiochus confirmed and enlarged certain privileges of the "holy camp," ¢.¢., of Jerusalem (Joseph., Ant., xii. 3, 3). It soon, however, became manifest that the Jews had made but a poor bargain in this exchange. Three years after his defeat at Magnesia, Antiochus IIL died (187), leaving to his son Seleucus IV. an immense burden of debt, which he had incurred by his unprosperous Roman war. Seleucus, in his straits, could not afford to be over- scrupulous in appropriating money where it was to be found ; he did not need to be twice told that the wealth

The Seleu.-

cide,

out of the partition of his inheritance. In 320 it wasseized | of the temple at Jerusalem was out of all proportion to The by Ptolemy L, who on a sabbath day took Jerusalem ; but | the expenses of the sacrificial service. The sacred treasure Ptolemies. in 315 he had to give way before Antigonus. Even before | accordingly made the narrowest possible escape from being the battle of Ipsus, however, he recovered possession once | plundered ; Heliodorus, who had been charged by the king more, and fora century thereafter southern Syria continued | to seize it, was deterred at the last moment by a heavenly to belong to the Egyptian crown, although the Seleucide | vision. But the Jews derived no permanent advantage more than once sought to wrench it away. from this, In the priestly dynasty during the period of the It was a priest of rank, Simon by name, who had called The Ptolemies, Onias L ben Jaddua was succeeded by his son | the attention of the king to the temple treasure ; his motive priestly Simon L., after whom again came first his brothers Eleazar | had been spite against the high priest Onias IIL, the son :_ and Manasseh, and next his son Onias IL ; the last-named | and successor of Simon IL 'The circumstance is one indi- was in his turn followed by his son Simon IL, whose | cation of a melancholy process of disintegration that was praises are sung by the son of Sirach (xlix. 14-16). At | at that time going on within the hierocracy. The high- the side of the high priest stood the gerusia of the town | priesthood, although there were exceptional cases, such as of Jerusalem, as a council of state, including the higher | that of Simon IL, was regarded less as a sacred office than ranks of the priesthood. The new sovereign power was at | as a profitable princedom ; within the ranks of the priestly once stronger and juster than the Persian,—at least under | nobility arose envious and jealous factions ; personal the earlier Ptolemies ; the power of the national government | advancement was sought by means of the favour of the increased ; to it was entrusted the business of raising the | overlord, who had something to say in the making of tribute. appointments. A collateral branch of the ruling family, As a consequence of the revolutionary changes which | that of

the children of Tobias, had by means of the ill- had taken place in the conditions of the whole East, the | gotten wealth of Joseph ben Tobias attained to a position al Jewish dispersion (diaspora) began vigorously to spread. | of ascendency, and competed in point of power with the

sion.

It dated its beginning indeed from an earlier period,— from the time when the Jews had lost their land and kingdom, but yet, thanks to their religion, could not part with their nationality. They did not by any means all return from Babylon; perhaps the majority perma- nently settled abroad. The successors of Alexander (diadochi) fully appreciated this international element, and used it as a link between their barbarian and Hellenic populations. Everywhere they encouraged tke settlement

1 The arguments against so early a-.date are such as these:—the occurrence of Satan ; the occurrence of such words as Sap, 27?, DO'NYNY, NIN (=aflliction), NYO (=Aram. NOD); the relation between chap. iii. and Jer. xx. 14 sgg. For that Jeremiah in that cry of despair should have declaimed in imitation of a poetic model is hard:to believe. Job iii. is a product of art; Jer. xx. isnature. For the age of the Hokmah the book of Ecclesiasticus is decisive; it failed to become canonical because its author continued to be known.

high priest himself. It appears that the above-mentioned Simon, and his still more scandalous brother Menelaus, also belonged to the Tobiade, and, relying upon the support of their powerful party (Jos, Ant, xii 5, 1), cherished the purpose of securing the high-priesthood by the aid of the Syrian king.

The failure of the mission of Heliodorus was attributed by Simon to a piece of trickery on the part of Onias the high priest, who accordingly found himself called upon to make 'his own justification at court and to expose the intrigues of his adversary. Meanwhile Seleucus IV. died of poison (175), and Antiochus IV. Epiphanes did not confirm Onias in his dignity, but detained him in Antioch while he made over the office to his brother Jason, who had offered a higher rent. Possibly the Tobiadx

also had something to do with this arrangement; at all events Menelaus was at the outset the right hand of the new high

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priest. To secure still further the favour of the king, Jason held himself out to be an enlightened friend of the Greeks, and begged for leave to found in Jerusalem a gymnasium and an ephebeum, and to be allowed to sell to the inhabitants there the rights of citizenship in Antioch, —a request which was readily granted.

The malady which had long been incubating now reached its acute phase. Just in proportion as Hellenism showed itself friendly did it present elements of danger to Judaism. From the periphery it slowly advanced towards the centre, from the diaspora to Jerusalem, from mere matters of external fashion to matters of the most profound convic- tion! Especially did the upper and cultivated classes of society begin to feel ashamed, in presence of the refined Greeks, of their Jewish singularity, and to do all in their power to tone it down and conceal it. In this the priestly nobility made itself conspicuous as the most secular section of the community, and it was the high priest who took the initiative in measures which aimed at a complete Helleniz- ing of the Jews. He outdid every one else in paganism. Once he sent a considerable present for offerings to the Syrian Hercules on the occasion of his festival, but his messenger, ashamed to apply the money to such a purpose, set it apart for the construction of royal ships of war.

The friendship shown by Jason for the Greek king and for all that was Hellenic did not prevent Antiochus IV. from setting pecuniary considerations before all others.

. Menelaus, entrusted with the mission of conveying to

Antioch the annual Jewish tribute, availed himself of the opportunity to promote his own personal interests by offering a higher sum for the high priesthood, and, having otherwise ingratiated himself with the king, gained his object (171). But though nominated he did not find it quite easy to obtain possession of the post. The Tobiadz took his side, but the body of the people stuck to Jason, who was compelled to give way only when Syrian troops had been brought upon the seene. Menelaus had im- mediately, however, to encounter another difficulty, for he could not at once pay the amount of tribute which he had promised. He helped himself so far indeed by robbing the temple, but this landed him in new embarrassments. Qnias IIL, who was living out of employment at Antioch, threatened to make compromising revelations to the king ; he was, however, opportunely assassinated. The rage of the people against the priestly temple-plunderer now broke out in arising against a certain Lysimachus, who at the instance of the absent Menelaus had made further inroads upon the sacred treasury. The Jews' defence before the king (at Tyre) on account of this uproar resolved itself into a grievous complaint against the conduct of Menelaus. His case was a bad one, but moncy again helped him out of his straits, and the extreme penalty of the law fell upon his accusers,

The feelings of the Jews with reference to this wolfish shepherd may easily be imagined. Nothing but fear of Antiochus held them in check. 'Then a report gained currency that the king had perished in an expedition against Egypt (170), and Jason, who meanwhile had found refuge in Ammanitis, availed himself of the prevailing current of feeling to resume his authority with the help of one thousand men. He was not able, however, to hold the position long, partly because he showed an unwise vindic- tiveness against his enemies, partly (and chiefly) because the rumour of the death of Antiochus turned out to be false. The king was already in fact close at hand, on his return from Egypt, full of anger at an insurrection which he regarded as having been directed against himself. He

} The Hellenizing fashion is amusingly exemplified in the Grecizing

of the Jewish names ; ¢g., Alcimus=Eljakim, Jason=Jesus, Joshua; Menelaus = Menahem.

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inflicted severe and bloody chastisement upon Jerusalem, carried off the treasures of the temple, and restored Menelaus, placing Syrian officials at his side. Jason fled from place to place, and ultimately died in misery at Lacedzmon,

The deepest despondency prevailed in Judzea; but its cup of sorrow was not yet full. Antiochus, probably soon after his last Egyptian expedition (168), sent Apollonius with an army against Jerusalem. He fell upon the unsus- pecting city, disarmed the inhabitants and demolished the walls, but on the other hand fortified Aera, and garrisoned it strongly so as to make it a standing menace to the whole country. Having thus made his preparations, he proceeded to carry out his main instructions, All that was religiously distinctive of Judaism was to be removed; such was the will of the king. The Mosaic cultus was abolished, Sabbath observance and the rite of circumcision prohibited, all copies of the Torah confiscated and burnt. In the desecrated and partially destroyed co te pagan ceremonies were performed, and upon the great altar of burnt offering a small altar to Jupiter Capitolinus was erected, on which the first offering was made on 25th Kislev 168. In the country towns also heathen altars were erected, and the Jews compelled, on pain of death, publicly to adore the false gods and to eat swine's flesh that had been sacrificed to idols.

The princes and grandees of the Jews had represented to Antiochus that the people were ripe for Hellenization ; and inasmuch as, apart from this, to reduce to uniformity the extremely motley constituents of his kingdom was a scheme that lay near his heart, he was very willing to believe them. That the very opposite was the case must of course have become quite evident very soon; but, the resistance of the Jews taking the form of rebellious risings against his creatures, he fell upon the hopeless plan of coercion,—hopeless, for he could attain his end only by making all Judea one vast graveyard. There ex- isted indeed a pagan party; the Syrian garrison of Acra was partly composed of Jews

who sold themselves to be the executioners of theircountrymen, Fear also influenced many to deny their convictions ; but the majority adhercd firmly to the religion of their fathers. Jerusalem, the centre of the process of Hellenization, was abaridoned by its inhabitants, who made their escape to Egypt, or hid themselves in the country, in deserts and caves. The scribes in especial held fast by the law; and they were joined by the party of the Asidzeans (7.¢., pious ones).

12, At first there was no thought of meeting violence with violenee; as the book of Daniel shows, people con- soled themselves with thoughts of the immediate inter- vention of God which would occur in due time. Quite casually, without either plan or concert, a warlike opposition arose. There was a certain priest Mattathias, of the family

Antio- chus Epi- phanes,

25th Kislev 168 B.C.

State of Jewish parties.

of the Hasmonzans, a man far advanced in life, whose The Has-

home was in Modein, a little country town to the west of Jerusalem. Hither also the Syrian soldiers came to put the population to a positive proof of their change of faith ; they insisted upon Mattathias leading the way. But he was steadfast in his refusal; and, when another Jew addressed himself before his eyes to the work of making the heathen offering, he killed him and the Syrian officer as well, and destroyed the altar. Thereupon he fled to the hill country, accompanied by his sons (Johanues Gaddi, Simon Thassi, Judas Maccabzeus, Eleazar Auaran, Jonathan Apphus) and other followers. But he resolved to defend himself to the last, and not to act as some other fugitives had done who about the same time had allowed themselves to be surrounded and butchered on a sabbath day without lifting a finger. Thus he became the head ofa band which defended the ancestral religion with the sword. They

moneans.

Judas Macca- beeus.

25th Kislev 165 B.C.

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traversed the country, demolished the altars of the false gods, circumcised the children, and persecuted the heathen and heathenishly disposed. The sect of the Asidzeans also entrusted itself to their warlike protection (1 Mace. ii. 42),

Mattathias soon died and left his leadership to Judas Maccabsus, by whom the struggle was carried on in the first instance after the old fashion; soon, however, it assumed larger dimensions, when regular armies were sent out against the insurgents. First Apollonius, the governor of Judea, took the field; but he was defeated and fell in battle. Next came Seron, governor of Ccelesyria, who also was routed, near Bethhoron (166). Upon this Lysias, the regent to whom Antiochus IV., who was busied in the far east, had entrusted the government of Syria and the charge of his son, Antiochus Philopator, a minor, sent a strong force under the command of three generals. Approaching from the west, it was their design to advance separately upon Jerusalem, but Judas anticipated their plan and com- pelled them to quit the field (166). The regent now felt himself called on to interpose in person. Invading Judea from the south, he encountered the Jews at Bethsur, who, however, offered an opposition that was not easily overcome ; he was prevented from resorting to the last measures by the intelligence which reached him of the death of the king in Elymais (165),

The withdrawal of Lysias secured the fulfilment of the desires of the defenders of the faith in so far as it now enabled them to restore the Jerusalem worship to its pre- vious condition. They lost no time in setting about the accomplishment of this. They were not successful indeed in wresting Acra from the possession of the Syrians, but they so occupied the garrison as to prevent it from inter- fering with the work of restoration. On 25th Kislev 165, the very day on which, three years before, “the abomina- tion of desolation” had been inaugurated, the

first sacri- fice was offered on the new altar, and in commemoration of this the feast of the dedication was thenceforth cele- brated,

As it was easy to see that danger still impended, the temple was put into a state of defence, as also was the town of Bethsur, where Lysias had been checked. But the favourable moment presented by the change of sovereign was made use of for still bolder attempts. Scattered over the whole of southern Syria there were a number of Jewish localities on which the heathens now proceeded to wreak their vengeance. For the purpose of rescuing these oppressed coreligionists, and of bringing them in safety to Judea, the Maccabees made a series of excursions, extend- ing in some cases as far as to Lebanon and Damascus. Lysias had his hands otherwise fully occupied, and perhaps did not feel much disposed to continue the fight on behalf of the cultus of Jupiter Capitolinus. Daily gaining in boldness, the Jews now took in hand also to lay regular siege to Acra. Then at last Lysias yielded to the pressure of Syrian and Jewish deputations and determined to take serious steps (162). Witha large force he entered Judea, again from the south, and laid siege to Bethsur. Judas vainly attempted the relief of the fortress; he sustained near Bethzachariah a defeat in which his brother Eleazar perished, Bethsur was unable to hold out, being short of provisions on account of the sabbatic year. The Syrians advanced next to Jerusalem, and besieged the temple; it also was insufficiently provisioned, and would soon have been compelled to surrender had not Lysias been again called away at the critical moment by other exigencies. A certain Philip was endeavouring to oust him from the regency ; as it was necessary for him to have his hands free in dealing with this new enemy, he closed a treaty with the temple garrison and the people at large, in accord- ance with which at once the political subjection and the

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religious freedom of the Jews were to be maintained Thus Religiow: IV. was freedom restored. Only no attempt was made to replace Menelaus ¢

the situation as it had existed before Antiochus

as high priest and ethnarch ; this post was to be filled by Alcimus.

The concessions thus made by Lysias were inevitable; and even King Demetrius I,, son of Seleucus IV., who towards the end of 162 ascended the throne and caused both Lysias and his ward to be put to death, had no thought of interfering with their religious freedom. But the Maccabees desired something more than the status quo ante; after having done their duty they were disinclined

to retire in favour of Alcimus, whose sole claim lay in his The Ha

ranted yLysias;

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descent from the old heathenishly-disposed high-priestly monwand|

family, of the king, who caused him to be installed by Bacchides. He was at once recognized by the scribes and Asideans, for whom, with religious liberty, everything they wished had been secured; the claims to supremacy made by the Hasmonzans were of no consequence to them. Doubtless the masses also would ultimately have quietly accepted Alcimus, who of course refrained from interference with either law or worship, had he not abused the momentary

power he derived from the presence of Bacchides to take a

foolish revenge. But the consequence of his action was

that, as soon as Bacchides had turned his back, Alcimus

was compelled to follow him, For the purpose of restoring

him a Syrian army once more invaded Judea under Nicanor (160), but first at Kapharsalama and afterwards at Bethhoron was defeated by Judas and almost annihilated in the subsequent flight, Nicanor himself being among the

slain (13th Adar=Nicanor's day). Judas was now at the acme of his prosperity ; about this time he concluded his

(profitless) treaty with the Romans. But disaster was impending. In the month of Nisan, barely a month after the defeat of Nicanor, a new Syrian army under Bacchides

entered Judea from the north; near Elasa, southward from Jerusalem, a decisive battle was fought which was lost by Judas, and in which he himself fell.

The religious war properly so called had already been

brought once for all to an end by the convention of Lysias. If the struggle continued to be carried on, it was not for

the faith but for the supremacy,—less in the interests of War After for the

the death of Judas the secular character which the conflict ey,

the community than in those of the Hasmonzans. had assumed ever since 162 continually became more con- spicuous. Jonathan Apphus fought for his house, and in doing so used thoroughly worldly means. 'The high-priest- hood, .¢., the ethnarchy, was the goal of his ambition. So long as Alcimus lived, it was far from his reach. Confined to the rocky fastnesses beside the Dead Sea, he had nothing for it but, surrounded by his faithful followers, to wait for better times, But on the death of Alcimus (159) the Syrians refrained from appointing a successor, to obviate the necessity of always having to protect him with military force. During the interregnum of seven years which followed Jonathan again came more and more to the front, so that at last Bacchides concluded an armistice with him on the basis of the sfatws quo (1 Mace. ix. 73). From his residence at Michmash Jonathan now exercised a de facto authority over the entire nation.

When, accordingly, Alexander Balas, a reputed son of Antiochus IV., rose against Demetrius, both rivals exerted themselves to secure the

alliance of Jonathan, who did not fail to benefit by their competition. First of all, Demetrius formally recognized him as prince of Judah; in consequence of this he removed to Jerusalem, and expelled the heathen and heathenishly disposed, who continued to maintain 2 footing ouly in Acraand Bethsur. Next, Alexander Balas conferred on him the title of "high priest of the nation and

Alcimus was compelled to invoke the assistance M4 Aleimus.'

| 'becomes high oriest.

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pucceed- od by 'Simon,

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- became once more a reality (135).

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| yonathan friend of the king" ; in gratitude for which Jonathan went | Parthians, and the complications anew arising in reference

over to his side (152). Ue remained loyal, although Demetrius now made larger offers; he was justified by the event, for Demetrius I. had the worst of it and was slain (150). The victorious Balas heaped honours upon Jonathan, who maintained his fidelity, and fought success- fully in his interests when in 147 Demetrius II., the son of Demetrius I., challenged a conflict. The high priest was unable indeed to prevent the downfall of Alexander in

145 ; but Demetrius IT., won by presents, far from showing | any hostility, confirmed him in his position in consideration

of a tribute of 300 talents.

Jonathan was grateful to the king, as he showed by going with 3000 men to his aid against the insurgent Antiochenes. But when the latter drew back from his promise to withdraw the garrison from Acra, he went over to the side of Trypho, who had set up a son of Alexander Balas (Antiochus) as a rival. In the war which he now waged as Seleucid strategus against Demetrius he succeeded in subduing almost the whole of Palestine. Meanwhile his brother Simon remained behind in Judza, mastered the fortress of Bethsur, and resumed with great energy the siege of Acra. All this was done in the names of Antiochus and Trypho, but really of course in the interests of the Jews themselves. There were concluded also treaties with the Romans and Lacedemonians, certainly not to the advantage of the Syrians.

Trypho sought now to get rid of the man whom he him- self had made so powerful. He treacherously seized and imprisoned Jonathan in Ptolemais, and meditated an attack upon the leaderless country. But on the frontier Simon, the last remaining son of Mattathias, met him in force. All Trypho's efforts to break through proved futile; after skirting all Judzea from west to south, without being able to get clear of Simon, he at last withdrew to Persea with- out having accomplished anything. On the person of Jonathan, whom he caused to be executed, he vented the spleen he felt on the discovery that the cause for which that prince had fought was able to gain the victory even when deprived of his help. Simon in point of fact was Jonathan's equal as a soldier and his superior as a ruler. He secured his frontier by means of fortresses, made him- self master of Acra (141), and understood how to enable the people in time of peace to reap the advantages that result from successful war; agriculture, industry, and commerce (from the haven of Joppa) began to flourish vigorously. In grateful recognition of his services the high-priesthood and the ethnarchy were bestowed upon him as hereditary possessious by a solemn assembly of the people, "until a trustworthy prophet should arise."

13. Nominally the Seleucid still continued to possess the suzerainty. Simon naturally had detached himself from Trypho and turned to Demetrius II., who confirmed him in his position, remitted all arrears of tribute, and waived his rights for the future (142). The friendship of

Demetrius II. and of his successor Antiochus Sidetes with Simon, however, lasted only as long as Trypho still remained in the way. But, he once removed, Sidetes altered his policy. He demanded of Simon the surrender of Joppa, Gazara, and other towns, besides the citadel of Jerusalem, as well as payment of all tribute resting due. The refusal of these demands led to war, which in its earlier stages was carried on with success, but the scales were tarned after the murder of Simon when Sidetes in Person took the field against John Hyreanus, Simon's son and successor. Jerusalem capitulated ; in the negotiations for peace the surrender of all the external possessions of the Jews was insisted upon ; the suzerainty of the Syrians But in 130 the power-

ful Antiochus Sidetes fell in an expedition against the

to the succession to the Syrian throne placed Hyrcanus in a position to recover what he had lost and to make new acquisitions. He subjugated Samaria and Idumea, com- pelling the inhabitants of the latter to accept circumcision. Like his predecessors he too sought to secure the favour of the Romans, but derived no greater beuefit from the effort than they had done. After a prosperous reign of thirty years he died in 105. By Josephus he is represented as a pattern of all that a pious prince ought to be; by the rabbins as representing a splendid high-priesthood. The darkness of the succeeding age lent a brighter colour to his image.

The external splendour of the Hasmonzan kingdom did not at once die away,—the downfall of the Seleucidz, which was its negative condition, being also a slowaffair. Judah Aristobulus, the son of Hyrcanus, who reigned for only one year, was the first to assume the Greek title of royalty ; Ttureea was subdued by him, and circumcision forced upon the inhabitants. His brother Jonathan

were never very prosperous, nevertheless succeeded in adding the whole coast of Philistia (Gaza) as well as a great portion of Perzea to his hereditary dominions! But the external enlargement of the structure was secured at the cost of its internal consistency.

From the time when Jonathan, the son of Mattathias, Pharisees began to carry on the struggle, no longer for the cause of and Sad-

God but for his own interests, the scribes and the Asidzans, @ as we have seen, had withdrawn themselves from the party of the Maccabees. There can be uo doubt that from their legal standpoint they were perfectly right in contenting themselves, as they did, with the attainment of religious liberty, and in accepting Alcimus. The Hasmonzans had no hereditary right to the high-priesthood, and their politics, which aimed at the establishment of a national mouarchy, were contrary to the whole spirit and essence of the second theocracy. The presupposition of that theocracy was foreign domination ; in no other way could its sacred —1.e., clerical—character be maintained. God and the law could not but be forced into the background if a war- like kingdom, retaining indeed the forms of a hierocracy, but really violating its spirit at every point, should ever grow out of a mere pious community. Above all, how could the scribes hope to retain their importance if temple and synagogue were cast into the shade by politics and clash ofarms? But under the first great Hasmonzans the zealots for the law were unable to force their way to the front ; the enthusiasm of the people was too strong for them; they had nothing for it but to keep themselves out of the current and refuse to be swept along by it. Even under Hyrcanus, however, they gained more prominence, and under Janneus their influence upon popular opinion was paramount. For under the last-named the secularization of the hierocracy no longer presented any attractive aspects ; it was wholly repellent. It was looked upon as a revolting anomaly that the king, who was usually in the field with his army, should once and again assume the sacred mantle in order to perform the sacrifice on some high festival, and that his officers, profane persons as they were, should at the same time be holders of the highest spiritual offices. The danger which in all this threatened "the idea of Judaism" could not in these circumstances escape the observation of even the common people; for this idea was God and the law, not any earthly fatherland. The masses accordingly ranged themselves with ever-growing unanimity on the side of the

1 A number of half-independent towns and communes lay as tempt- ing subjects of dispute between the Seleucide, the Nabathzans or Arabs of Petra, and the Jews. The background was occupied by the Parthians and the Romans,

(Jannzeus) Alexander Alexander (104-79), in a series of continual wars, which Janneus.

Rebellion of the Pharisees.

Salome.

Tnsurrec- tion of the Sad- ducees,

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Pharisees (z.c., the party of the scribes) as against the Sadducees (z.e., the Hasmonzan party).!

On one occasion, when Alexander Jannzus had returned to Jerusalem at the feast of tabernacles, and was stand- ing in his priestly vestments before the altar to sacrifice, he was pelted by the assembled crowd of worshippers with citrons from the green branches they carried. By the cruelty with which he punished this insult he excited the populace to the highest pitch, and, when be lost his army in the disaster of Gadara, rebellion broke out. The Pharisees summoned the Syrian king Demetrius Euczerus ; Jannzeus was worsted and fled into the desert. But, as he wandered in helplessness there, the patriotism of the people and sympathy for the heir of the Maccabees suddenly awoke ; nature proved itself stronger than that consistency which in the cause of the Divine honour had not shrunk from treason. The insurgents for the most part went over to the side of the fugitive king; the others he ultimately overpowered after a struggle which lasted through several years, Demetrius having withdrawn his intervention. The vengeance which he took on the Pharisees was a bloody one; their only escape was by voluntary exile. Thence- forward he had peace so far as they were concerned. His last years were occupied with the reacquisition of the

con- quests which he had been compelled to yield to the Arabs during the civil war. He died in the field at the siege of Ragaba in Perea (79).

Under Queen Salome, his widow, matters were as if they had been specially arranged for the satisfaction of the Pharisees. The high-priesthood passed to Salome's son Hyrcanus II.; she herself was only queen. In the management of external affairs her authority was absolute (Ant., xiii. 16, 6); in home policy she permitted the scribes to wield a paramount influence. The common assertion indeed that the synedrium was at that time practically composed of scribes is inconsistent with the known facts of the case; the synedrium at that time was a political and not a scholastic authority.2 In its origin it was the municipal council of Jerusalem (so also the councils of provincial towns are called synedria, Mark. xiii. 9), but its authority extended over the entire Jewish community ; alongside of the elders of the city the ruling priests were those who had the greatest number of seats and votes. John Hyrcanus appears to have been the first to introduce some scribes into its composition ; it is possible that Salome may have increased their number, but even so this high court was far from being changed into a college of scribes like that at Jamnia. If the domination of the Pharisees at this time is spoken of, the expression cannot be under- stood as meaning that they already held all the public offices, but only at most that the holders of those offices found it necessary to administer and to judge in their spirit and according to their fundamental principles,

The party of the Sadducees (consisting of the old Hasmonzan officers and officials, who were of priestly family indeed, but attached only slight importance to their priestly functions) at length lost all patience. Led by Aristobulus, the second son of Jannzus, the leaders of the party eame to the palace, and begged the queen to dismiss them from the court and to send them into the provinces.

1 YD means "separated," and refers perhaps to the attitude of isolation taken by the zealots for the law during the interval between 162 and 105. 'PT¥ (addovxatos) comes from PIT¥ (Saddovn, LXX.), the ancestor of the higher priesthood of Jerusalem (1 Kings ii. 35; 1 Sam. ii.

35; Ezek. xliv. 15), and designates the governing nobility. The original character of the opposition, as it appeared under Jannzus, changed entirely with the lapse of time, on account of the Sadducees' gradual loss of political power, till they fell at last to the condition of a sort of " fronde."

2 Kuenen, '* Over de Samenstelling van het Sanhedrin," in Proceed-ings of Royal Nethert, Acad., 1866.

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There they were successful in securing possession of several fortresses 2 in preparation for insurrection, a favourable opportunity for which they were watching. Such an opportunity occurred, it seemed to Aristobulus, as his mother lay on her death-bed. The commandants of the fortresses were at his orders, and by their assistance an army also, with which he accordingly advanced upon Jerusalem, and, on the death of Salome, made himself master of the situation (69). Hyrcanus was compelled to resign office. With this event the good understanding between the civil government and the Pharisees came to an end; the old antagonisms became active once more, and now began to operate for the advantage of a third party, the Idumezan Antipater, Hyrcanus's confidential friend. Anti- After the latter, aided by Antipater, had at length with pater great difficulty got himself into a position for asserting his rights against Aristobulus, the Pharisees could not do other- wise than rank themselves upon his side, and the masses joined them against the, usurper. With the help of the Nabatzan monarch the effort to restore the elder brother

to the supreme authority would doubtless have succeeded had not the Romans procured relief for Aristobulus, besieged as he was in Jerusalem (65), though without thereby recognizing his claims. Pompey continued to Pompey, delay a decision on the controversy in 64 also when the | rival claimants presented themselves before him at Damascus ; he wished first to have the Nabatzans dis- posed of, and to have free access to them through Judea.

This hesitation roused the suspicions of Aristobulus ; still

he did not venture to take decisive action upon them. He closed the passes (to Mount Ephraim) against the Romans,

but afterwards gave them up; he prepared Jerusalem for

war, and then went in person to the Roman camp at Jericho, where he promised to open the gates of the city

and also to pay a sum of money. But the Roman ambas- sadors found the gates barred, and had to return empty- handed. Aristobulus thereupon was arrested, and siege was

laid to Jerusalem. The party of Hyrcanus, as soon as it

had gained the upper hand, surrendered the town ; but the supporters of Aristobulus took their stand in the temple,

and defended it obstinately. In June 63 the place was carried by storm; Pompey personally inspected the Holy

of Holies, but otherwise spared the religious feelings of

the Jews. But he caused the chief promoters of the war

to be executed, and carried Aristobulus and his family into captivity. He abolished the kingship, but restored the high-priestly dignity to Hyrcanus. The territory was materially reduced in area, and made tributary to the Romans ; the city was occupied by a Roman garrison.

14. Henceforward Roman intervention forms a constant Roman disturbing factor in Jewish history. The struggle between interven- the Pharisees and the Sadducees continued indeed to be “™ carried on, but only because the momentum of their old feud was not yet exhausted. The Pharisees ina sense had been victorious. While the two brothers were pleading their rival claims before Pompey, ambassadors from the Pharisees had made their appearance in Damascus to petition for the abolition of the kingship; this object had now to some extent been gained. Less ambiguous than the victory of the Pharisees was the fall of

the Sadducees, who in losing the sovereignty of the Jewish state lost all real importance. But the intervention of the foreign element exercised its most powerful influence upon the temper of the lower classes. Though in times of peace the masses still continued to accept the guidance of the rabbins, their patriotism instantly burst into flame as soon as a pretender to the throne, belonging to the family of

3 Alexandrium, Cores (whence, according to Tuch, Ish-Karioth, Iscariot), and similar citadels which were at that time of great import- ance for Palestine and Syria,

Aristobulus, appeared in Palestine. During the decennia which immediately followed, Jewish history was practically absorbed in vain attempts to restore the old Hasmonzan kingdom. Insurrections of steadily increasing dimensions were made in favour of Aristobulus, the representative of the national cause. For Hyrcanus was not regarded as a Hasmonzan at all, but merely as the creature of Antipater and the Romans. First, in the year 57, Alexander the son of Aristobulus broke into rebellion, then in 56 Aristobulus himself and his son Antigonus, and in 55 Alexander again. Antipater was never able to hold his own; Roman inter- vention was in every case necessary. The division of the jyabinius. Hasmonzan state into five " aristocracies" by Gabinius had no effect in diminishing the feeling of national unity cherished by the Jews of Palestine. Once again, after the battle of Carrhz, a rising took place, which Cassius speedily repressed.

In 49 the great Roman civil war broke out; Cesar instigated Aristobulus against Antipater, who in common with the whole East had espoused the cause of Pompey. But Aristobulus was poisoned by the opposite party while yet in Italy, and about the same time his son Alexander was also put to death at Antioch; thus the danger to Antipater passed away. After the battle of Pharsalus he went over to Cvesar's side, and soon after rendered him an important service by helping him out of his difficulties at Alexandria. By this means he earned the good will of Cesar towards the whole body of the Jews, and secured for himself (or Hyrcanus) a great extension of power and of territory. The five "synedria" or "aristocracies" of Gabinius were

superseded, the most important conquests of the Hasmonzeans restored, the walls of Jerusalem, which Pompey had razed, rebuilt.

However indisputable the advantages conferred by the rule of Antipater, the Jews could not forget that the Idumzan, in name of Hyrcanus the rightful heir of the Hasmonzans, was in truth setting up an authority of his own. The Sadducwan aristocracy in particular, which formerly in the synedrium had shared the supreme power with the high priest, endeavoured to restore reality once more to the nominal ascendency which still continued to be attributed to the ethnarch and the synedrium. “ When

the authorities (oi év réAe) of the Jews saw how the power of Antipater and his sons was growing, their dis- <—_ towards him became hostile ” (Jos., Ant., xiv. 9,

: Saddu-

| cean

. aristo- cracyand Herod,

. They were specially jealous of the youthful Herod, to whom Galilee had been entrusted by his father. On account of the arbitrary execution of a robber chief Ezechias, who perhaps had originally been a Hasmonzan partisan, they summoned him before the synedrium, under the impression that it was not yet too late to remind him

that he was after all but a servant. But the defiant | demeanour of the culprit, and a threatening missive which |

at the same time arrived from Sextus Cesar demanding his acquittal, rendered his judges speechless, nor did they regain their courage until they had heard the stinging reproaches of Sameas the scribe. Yet the aged Hyrcanus, who did not comprehend the danger that was threatening himself, postponed judgment upon Herod, and gave him opportunity to withdraw. Having been appointed strategus of Coelesyria by Sextus Cesar in the meanwhile, he soon afterwards

appeared before Jerusalem at the head of an army, and the authorities were compelled to address themselves in a conciliatory manner to his father and to Phasael his brother in order to secure his withdrawal.

The attempt to crush the serpent which had thus effected a lodgment in the Hasmonzan house came too late. The result of it simply was that the Herodians had now the advantage of being able to distinguish between Hyrcanus and his "evil counsellors." From that moment

the downfall of the Sadduceean notables was certain. It was of no avail to them that after the battle of Philippi (42) they accused Herod and Phasael (Antipater having been murdered in 43) before Antony of having been help- ful in every possible way to Cassius; Antony declared himself in the most decisive manner for the two brothers. In their despair,—for properly speaking they were not national fanatics but only egoistic politicians,—they ultimately made common cause with Antigonus the son of Aristobulus, and threw themselves into the arms of the Parthians, perceiving the interests of the Romans and of Herod to be inseparable (40). Fortune at first seemed to have declared in favour of the pretender. The masses unanimously took his side; Phasael committed suicide in prison ; with a single blow Herod was stripped of all his following and made a helpless fugitive. He took refuge in Rome, however, where he was named king of Judea by the senate, and after a somewhat protracted war he finally, with the help of the legions of Sosius, made himself master of Jerusalem (37). The captive Antigonus was beheaded at Antioch.

King Herod began his reign by reorganizing the syu- Herod's

edrium ; he ordered the execution of forty-five of its noblest reign. members, his most zealous opponents. 'These were the heise Sadducwan notables who long had headed the struggle ae against the Idumzan interlopers. Having thus made party. away with the leaders of the Jerusalem aristocracy, he directed his efforts to the business of

corrupting the rest. He appointed to the most important posts obscure indivi- duals, of priestly descent, from Babylon and Alexandria, and thus replaced with creatures of his own the old aristo- cracy. Nor did he rest content with this; in order to preclude the possibility of any independent authority ever arising alongside of his own, he abolished the life tenure of the high-priestly office, and brought it completely under the control of the secular power. By this means he succeeded in relegating the Sadducees to utter insignificance. They were driven out of their native sphere—the political—into the region of theoretical and ecclesiastical discussion, where they continued, but on quite unequal terms, their old dispute with the Pharisees.

It was during the period of Herod's activity that the Phari- Pharisees, strictly speaking, enjoyed their greatest pro- seesin sperity (Sameas and Abtalion, Hillel and Shammai); in the oe synedrium they became so numerous as almost to equal , the priests and elders. Quite consistently with their principles they had abstained from taking any part in the life and death struggle for the existence of the national state. Their leaders had even counselled the fanatical defenders of Jerusalem to open the gates to the enemy ; for this service they were treated with the highest honour by Herod. He made it part of his general policy to favour the Pharisees (as also the sect of the Essenes, insignificant though it was), it being his purpose to restrict the national life again within those purely eccle- siastical channels of activity which it had abandoned since the Maccabeean wars. However reckless his conduct in other respects, he was always scrupulously careful to avoid wounding religious susceptibilities (Azt., xiv. 16, 3). But although the Pharisees might be quite pleased that the high-priesthood and the kingship were no longer united in one and the same person, and that interest in the law again overshadowed interest in politics, the populace for their part could never forgive Herod for overthrowing the old dynasty. 'That he himself, at least in religious pro- fession, was a Jew did not improve his position, but rather made it worse. It was not easy for him to stifle the national feeling after it had once been revived among the Jews ; they could not forget the recent past, and objected to being thrust back into the time when foreign domination

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Herod’s home and. foreigu policy.

Close of his reign.

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was endured by them as a matter of course. The Romans were regarded in quite a different light from that in which the Persians and the Greeks had been viewed, and Herod was only the client of the Romans.

His greatest danger seemed to arise from the still sur- viving members of the Hasmoneean family, to whom, as is easily understood, the national hopes clung. In the course of the earlier years of his reign he removed every one of them from his path, beginning with his youthful brother- in-law Aristobulus (35), after whom came his old patron Hyrcanus II. (30), then Mariamne his wife (29), and finally his stepmother Alexandra (28), the daughter of Hyrcanus and the widow of Alexander Aristobuli. Subsequently, in 25, he caused Costobarus and the sons of Babas to be executed. While thus occupied with domestic affairs, Herod had constant trouble also in his external relations, and each new phase in his political position immediately made itself felt at home. In the first instance he had much to suffer from Cleopatra, who would willingly have geen Palestine reduced under Egyptian domination once nore, and who actually succeeded in inducing Antony to take from Herod several fair and valuable provinces of his realm. Next, his whole position was imperilled by the result of the battle of Actium; he had once more ranged himself upon the wrong side. But his tact did not fail him in winning Octavianus, as before it had made Antony his friend. In fact he reaped nothing but advantage from the great overturn which took place in Roman affairs ; it rid him of Cleopatra, a dangerous enemy, and gave him in the new imperator a much better master than before.

During the following years he had leisure to carry out those splendid works of peace by which it was his aim to ingratiate himself with the

emperor. He founded cities and harbours (Antipatris, Czesarea), constructed roads, theatres, and temples, and subsidized far beyond his frontier all works of public utility. He taxed the Jews heavily, but in compensation promoted their material interests with energy and discretion, and built for them, from 20 or 19 B.c. onwards, the temple at Jerusalem. To gain their sympathies he well knew to be impossible. Apart from the Roman legions at his back his authority had its main supports in his fortresses and in his system of espion- age.

But just as the acme of his splendour had been reached, he himself became the instrument of a terrible vengeance for the crimes by which his previous years had been stained ; as executioner of all the Hasmonzeans, he was now con- strained to be the executioner of his own children also. His suspicious temper had been aroused against his now grown-up sons by Mariamne, whose claim through their mother to the throne were superior to his own; his brother Pheroras and his sister Salome made it their special business to fan his jealousy into flame. 'To show the two somewhat arrogant youths that the succession was not so absolutely secure in their favour as they were supposing, the father summoned to his court Antipater, the exiled son of a former marriage. Antipater, under the mask of friendship, immediately began to carry on infamous in- trigues against his half brothers, in which Pheroras and Salome unconsciously played into his hands. For years he persevered alike in favouring and unfavouring circum- stances with his part, until at last, by the machinations of a Lacedemonian Eurycles, who had been bribed, Herod was induced to condemn the sons of Mariamne at Berytus, and cause them to be strangled (Samaria, 7-6 B.o.). Not long afterwards a difference between Antipater and Salome led to the exposure of the former. Herod was compelled to drain the cup to the dregs; he was not spared the know- ledge that he had murdered his children without a cause. His remorse threw him into a serious illness, in which his

strong constitution wrestled long with death. While he lay at Jericho near his end he gave orders for the execution of Antipater also; and to embitter the joy of the Jews at his removal he caused their elders to be shut up together in the

-hippodrome at Jericho with the injunction to butcher them

as soon as he breathed his last, that so there might be sorrow throughout the land. The latter order, however, was not carried out.

His death (4 B.c.) gave the signal for an insurrection of small beginnings which gradually spread until it ultimately infected all the people; it was repressed by Varus with great cruelty. Meanwhile Herod's connexions were at Rome disputing about the inheritance. The deceased king His win, (who was survived by several children of various marriages) had made a will, which was substantially confirmed by Augustus. By it his son Philip received the northern portion of the territory on the east of the Jordan along with the district of Paneas (Czesarea Philippi) ; his thirty- seven years' reign over this region was happy. Another son, Herod Antipas, obtained Galilee and Perea; he beautified his domains with architectural works (Sepphoris, Tiberias ; Livias, Macheerus), and succeeded by his fox-like policy in ingratiating himself with the emperors, particu- larly with Tiberius, for that very cause, however, becoming odious to the Roman provincial officials. The principal heir was Archelaus, to whom Idumza, Judea, and Arche-Samaritis were allotted ; Augustus at first refused him the title of king. Archelaus had experienced the greatest difficulty in carrying through his claims before the emperor in face of the manifold oppositions of his enemies; the vengeance which he wreaked upon his subjects was so severe that in 6 A.D. a Jewish and Samaritan embassy be- sought the emperor for his deposition, Augustus assented, banishing Archelaus to Vienne, and putting in his place a Roman procurator. Thenceforward Judea continued under Judea procurators, with the exception of a brief interval (41-44 peg A.D.) during which Herod Agrippa I. united under his be sway all the dominions of his grandfather.!

15. The termination of the vassal kingship resulted in Advan- manifest advantage to the Sadducees. The high priest ae. and synedrium again acquired political importance ; they ea were the responsible representatives of the nation in presence of the suzerain power, and conceived themselves to be in some sort lords of land and people (John xi. 48).

For the Pharisees the new state of affairs appears to have been less satisfactory. That the Romans were much less oppressive to the Jews than the rulers of the house of Herod was a consideration of less importance to them than the fact that the heathen first unintentionally and then deliberately were guilty of the rudest outrages upon the law, outrages against which those sly half-Jews had well understood how to be on their guard. It was among the lower ranks of the people, however, that hatred to the Romans had its proper seat. On the basis of the views and tendencies which had long prevailed there, a new party was now formed, that of the Zealots, which did not, like Zealots. the Pharisees, aim merely at the fulfilment of all righteous- ness, i.¢., of the law, and leave everything else in the hands of God, but was determined to take an active part in bring-

1 Agrippa was the grandson of Mariamne through Aristobulus, Cali-gula, whose friendship he had secured in Rome, bestowed upon him in 37 the dominions of Philip with the title of king, and afterwards the tetrarchy of Antipas, whom he deposed and banished to Lugdunum (39). Claudius added the possessions of Archelaus. But the kingdom was again taken away from his son Agrippa IJ. (44), who, however, after the death of his uncle, Herod of Chalcis, obtained that principality for which at a later period (52) the tetrarchy of Philip was substituted. His sister Berenice is known as the mistress of Titus ; another sister Drusilla was the wife of the procurator Felix. The descendants of a? through Alexander held for some time an Armenian princi- pality.

ing about the realization of the kingdom of God (Jos.,

Pf. xviu. 1, 1). é As the transition to the new order of things was going

on, the census of Quirinius took place (6-7 A.D.); it

if it had been their special business to encourage and pro- mote it. All the bonds of social order were dissolved ; no

property was secure ; the assassins alone prospered, and the procurators went shares with them in the profits.

occasioned an immense excitement, which, however, was successfully allayed. On the withdrawal of Quirinius, Coponius remained behind as procurator of Judea; he was followed, under Augustus, by Marcus Ambivius and Annius Rufus; under Tiberius, by Valerius Gratus (15-26

It was inevitable that deep resentment against the Dissatis- Romans should be felt in every honest heart. At last it faction found expression. During his visit to Jerusalem in May j). 66 Florus laid hands upon the temple treasure ; the Jews poyern- allowed themselves to go so far as to make a joke about it, ment.

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Agrippa I. |

a.p.) and Pontius Pilatus (26-36 a.p.); under Caligula, by Marcellus (36-37) and Marullus (37-41 a.p.). The pro- eurators were subordinate to the imperial legati of Syria ; they resided in Cvsarea, and visited Jerusalem on special occasions only. They had command of the military, and their chief business was the maintenance of the peace and the care of the revenue. They interested themselves in affairs of religion only in so far as these had a political side; the temple citadel Antonia was constantly garrisoned with a cohort. The administration of justice appears to have been left to a very considerable extent in the hands of the synedrium, but it was not allowed to give effect to any capital sentence. At the head of the native authorities stood at this time not so much the actual high priest as the college of the chief priests. The actual office of high priest had lost its political importance in consequence of the frequency with which its holders were changed ; thus, for example, Annas had more influence than Caiaphas. The principle of interfering as little as possible with the religious liberty of the Jews was rudely assailed by the emperor Caius, who, like a second

Antiochus, after various minor vexations, gave orders that his image should be set up in the temple of Jerusalem as in others elsewhere. It was entirely through the courage and tact of the Syrian governor P. Petronius that the execution of these orders was temporarily postponed until the emperor was induced by Agrippa I. to withdraw them. Caius soon afterwards died, and under the rule of Agrippa I., to whom the govern- ment of the entire kingdom of his grandfather was com- mitted by Claudius, the Jews enjoyed much prosperity ; in every respect the king was all they could wish. This very prosperity seems, however, to have caused them fresh danger. For it made them feel the government by procu-

-rators, which was resumed after the death of Agrippa I.,

to be particularly hard to bear, whatever the individual characters of these might be. They were Cuspius Fadus (from 44, under whom Theudas), Tiberius Alexander (the Romanized nephew of Philo, till 48), Cumanus (48-52, under whom the volcano already began to give dangerous signs of activity), and Felix (52-60). Felix, who has the honour to be pilloried in the pages of Tacitus, contrived to make the dispeace permanent. The influence of the two older parties, both of which were equally interested in the maintenance of the existing order, and in that interest were being drawn nearer to each other, diminished day by day. The masses broke loose completely from the authority of the scribes ; the ruling nobility adapted itself better to the times ; under the circumstances which ther prevailed, it 18 not surprising that they became thoroughly secular and did not shrink from the employment of directly im- moral means for the attainment of their ends. The zealots became the dominant party. It was a combination of noble and base elements ; superstitious enthusiasts (Acts xxi 38) and political assassins, the so-called sicarii, were conjoined with honest but fanatical patriots. Felix favoured the sicarii in order that he might utilize them ; against the others his hostility raged with indiscriminating cruelty, yet without being able to check them. The anarchy which he left behind him as a legacy was beyond the control of his able successor Porcius Festus (60-62), and the last two procurators, Albinus (62-64) and Gessius Florus, acted as

which he avenged by giving over a portion of the city to be plundered, and crucifying a number of the inhabitants. He next insisted upon their kissing the rod, ordering that a body of troops which was approaching should be met and welcomed. At the persuasion of their leaders the Jews forced themselves even to this; but a constant suc- cession of fresh insults and cruelties followed, till patience was quite exhausted at last, and in a violent street fight the Romans were so handled that the procurator withdrew from the town, leaving only the cohort in Antonia. Once again was an attempt at pacification made by Agrippa IL., who hastened from Alexandria with this purpose, but the Jews could not bring themselves to make submission to Gessius Florus. It so happened that at this juncture the fortress of Masada on the Dead Sea fell into the hands of the Zealots; the courage of the party of action rose, and at the instance of the hot-headed Eleazar the son of Ananias, a man, still young, of highest priestly family, the sacrifice

on behalf of the emperor was discontinued, 7.¢., revolt was Revolt.

declared. But the native authorities continued opposed toa war. At their request King Agrippa sent soldiers to Jerusalem ; at first they appeared to have some effect, but ultimately they were glad to make their escape in safety from the city. The cohort in Antonia was in like manner unable to hold its own ; freedom was given it to withdraw ; but, contrary to the terms of capitulation, it was put to the sword. The war party now signalized its triumph over all elements of opposition from within by the murder of the high priest Ananias.

A triumph was gained also over the outer foe. The Syrian legate, Cestius Gallus, appeared before Jerusalem in the autumn of 66, but after a short period raiscd the siege ; his deliberate withdrawal was changed into a preci- pitate flight in an attack made by the Jews at Bethhoron. The revolt now spread irresistibly through all ranks and classes of the population, and the aristocracy found it expedient itself to assume the leadership. An autonomous government was organized, with the noblest members of the community at its head; of these the most important was the high priest Ananus.

Meanwhile Nero entrusted the conduct cf the Jewish war to Vespasian, his best general. In the spring of 67 he began his task in Galilee, where the historian Josephus had command of the insurgents. The Jews entirely dis- trusted him and he them; in a short time the Romans

were masters of Galilee, only a few strong places holding affairs in out against them. Josephus was besieged in Jotapata, Galilee

and taken prisoner; the other places also were unable to hold out long. Such of the champions of freedom iu Galilee as escaped betook themselves to Jerusalem ; amongst these was the Zealot leader John of Giscala, There they told the story of their misfortunes, of which they laid the blame upon Josephus, and upon the aristocratic government

as having no heart for the common cause and liaving and in The Zealots now openly aimed a at the overthrow of the existing government, but Ananus “”:

treachery for their motto.

bravely withstood them, and pressed so hard on them that they summoned the Idumzans into the city to their aid. These honourable fanatics indeed withdrew again as soon as they had discovered that they were being used for sinister designs; but in the meanwhile they had

Titus.

Fall of Jerusa- lem.

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accomplished the work of the Zealots. The old magistracy of Jerusalem was destroyed, Ananus with the heads of the aristocracy and very many other respectable citizens pnt to death. The radicals, for the most part not natives of the city, came into power; John of Giscala at their head tyrannized over the inhabitants.

While these events were taking place in Jerusalem, Vespasian had subdued the whole country, with the excep- tion of one or two fortresses. But as he was setting about the siege of the capital, tidings arrived of the death of Nero, and the offensive was discontinued. For almost two years (June 68 to April 70), with a short break, war was suspended. When Vespasian at the end of this period became emperor, he entrusted to Titus the task of reducing Jerusalem. There in the interval the internal struggle had been going on, even after the radicals had gained the mastery. Asa counterpoise to John of Giscala the citizens had received the guerilla captain Simon bar Giora into the city; the two were now at feud with each other, but were alike in their rapacity towards the citizens. John occupied the temple, Simon the upper city lying over against it on the west. or a short time a third entered into competition with the two rivals, a certain Eleazar who had separated from John and established himself in the inner temple. But just as Titus was beginning the siege (Easter, 70) John contrived to get rid of this inter- loper. :

Titus attacked from the north. After the lower city had fallen into his hands, he raised banks with a view to the storm of the temple and the upper city. But the defenders, who were now united in a common cause, taught him by their vigorous resistance that his object was not to be so quickly gained. He therefore determined to reduce them by famine, and for this end completely sur- rounded the city with a strong wall. In the beginning of July he renewed the attack, which he directed in the first instance against the temple. The tower of Antonia fell on the 5th, but the temple continued to be held notwith- standing; until the 17th the daily sacrifice continued to be offered. The Romans succeeded in gaining the outer court in August only. To drive them out, the Jews in the

night of August 10-11 made a sortie, but were compelled ,

to retire, the enemy forcing their way behind them into the inner court. A legionary flung a firebrand into an annexe

of the temple, and soon the whole structure was in flames. . A terrible slaughter of the defenders ensued, but John with |

a determined band succeeded in cutting his way out, and by means of the bridge over the Tyropceon valley made his escape into the upper city.

No attack had as yet been directed against this quarter ; but famine was working terrible ravages among the crowded population. Those in command, however, refused to capitulate unless freedom to withdraw along with their wives and children were granted. These terms being withheld, a storm, after the usual preparations on the part of the Romans, took place. strong towers were hardly defended at all; Simon bar Giora and John of Giscala now thought only of their personal safety. In the unprotected city the Roman soldiers spread fire and slaughter unchecked (September 7, 70).

Of those who survived also some were put to death ; the rest were sold or carried off to the mines and amphitheatres. The city was levelled with the ground; the tenth legion was left behind in charge. Titus took with him to Rome for his triumphal procession Simon bar Giora and John of Giscala, along with seven hundred other prisoners, also the sacred booty taken from the temple, the candlestick, the golden table, and a copy of the Torah. He was slightly premature with his triumph ; for some time elapsed, and more than one bloody battle was necessary, before the

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rebellion was completely stifled. It did not come wholly End of to an end until the fall of Masada (April 73). the re-

16. Even now Palestine continued for a while to be the bellion, centre of Jewish life, but only in order to prepare the way for its transition into thoroughly cosmopolitan forms, The development of thought sustained no break on account of the sad events which had taken place, but was only directed once more in a consistent manner towards these objects which had been set before it from the time of the Baby- lonian exile. On the ruins of the city and of the temple the Pharisaic Judaism which rests upon the law and the school celebrated its triumph. National fanaticism indeed The was not yet extinguished, but it burnt itself

completely out rabbins, in the vigorous insurrection led by Simeon bar Koziba (Bar Cochebas, 132-135). That a conspicuous rabbin, Akiba, should have taken part in it, and have recognized in Simeon the Messiah, was an inconsistency on his part which redounds to his honour.

Inasmuch as the power of the rabbins did not depend upon the political or hierarchical forms of the old common- wealth, it survived the fall of the latter. Out of what hitherto had been a purely moral influence something of an official position now grew. They formed themselves into a college which regarded itself as a continuation of the old synedrium, and which carried forward its name. At first its seat was at Jamnia, but it soon removed to Galilee, and remained longest at Tiberias. The presidency was hereditary in the family of Hillel, with the last descendants of whom the court itself came to an end.! The respect in which the synedrial president was held rapidly increased ; like Christian patriarchs under Mahometan rule, he was also recognized by the imperial government as the municipal head of the Jews of Palestine, and bore the secular title of the old high priests (nasi, ethnarch, patriarch). Under him the Palestinian Jews continued to form a kind of state within a state until the 5th century. From the non- Palestinian Jews he received offerings of money. (Comp. Gothofredus on Cod. Z'heod., xvi. 8, 'De Judeis" ; and Morinus, Fixer. Bibl, ii., exerc. 3, 4.)

The task of the rabbins was so to reorganize Judaism Their under the new circumstances that it could continue to assert ts its distinctive character. What of external consistency had been lost through the extinction of the ancient com- monwealth required to be compensated for by an inner centralization proportionally stronger. The separation from everything heathenish became more pronounced than before; the use of the Greek language was of necessity still permitted, but at least the Septuagint was set aside by Aquila (Cod. Justinian., Nov. 146) inasmuch as it had now become the Christian Bible. For to this period also belongs the definitive separation between the synagogue and the church ; henceforward Christianity could no longer figure as a Jewish sect. Intensified exclusiveness was accompanied by increased internal stringency. What at

| an earlier period had still remained to some extent fluid The resistance was feeble ; the .

now became rigidly fixed; for example, an authentic text of the canon was now established, and at the same time the distinetion between canon and apocrypha sharply drawn. The old tendency of the scribes to leave as little as possible free to the individual conscience, but to bring everything within the scope of positive ordinance, now celebrated its greatest triumphs. It was only an apparent movement in the direction of liberty, if regulations which had become quite impossible were now modified or cancelled. The most influential of the rabbins were indeed the least solicitous about the maintenance of what was old, and had no hesita-

ee eee 1The following is the genealogy of the first Nasi :—Gamaliel ben Simeon (Jos,, Vit., 88) ben Gamaliel (Acts v. 34, xxii. 3) ben Simeon ben Hillel. The name Gamaliel was that which occurred most frequently among the patriarchs ; see Cod. Theod., xvi. 8, 22.

Mishna and Talmud.

Jewish schools

, in Baby- lonia,

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tion in introducing numerous and thorough-going innova- tions ; but the conservatives R. Eliezer ben Hyrcanus and R. Ishmael ben Elisha were in truth more liberal-minded than the leaders of the party of progress, notably than R. Akiba. Fyven the Ultramontanes have never hesitated at departures from the usage of the ancient and medieval church ; and the Pharisaic rabbins were guided in their innovations by liberal principles no more than they. The object of the new determinations was simply to widen the domain of the law in a consistent manner, to bring the individual entirely under the iron rule of system. But the Jewish communi- ties gave willing obedience. to the hierarchy of the rabbins ; Judaism had to be maintained, cost what it might. That the means employed were well adapted to the purpose of maintaining the Jews as a firmly compacted religious com- munity even after all bonds of nationality had fallen away cannot be doubted. But whether the attainment of this purpose by incredible exertion was a real blessing to them- selves and the world: may very well be disputed.

One consequence of the process of intellectual isolation and of the effort to shape everything in accordance with hard and fast rules and doctrines was the systematiza- tion and codification of juristic and ritual tradition, a work with which a beginning was made in the century following the destruction of Jerusalem. Towards the end of the 2d century the Pharisaic doctrine of Hillel as it had been further matured by Akiba was codified and elevated to the position of statute law by the patriarch Rabban Judah the Holy (Mishna).! But this was only the first stage in the process of systematizing and fixing tradition. The Mishna became itself the object of rabbinical comment and supple- ment; the Tannaim, whose work was registered in the Mathnetha (Mishna, Sevrépwors = doctrine), were followed by the Amoraim, whose work in turn took permanent shape in the Gemara (= doctrine). The Palestinian Gemara was reduced to writing in perhaps the 4th or 5th century; unfortunately it has been preserved to us only in part, but

appears to have reached the Middle Ages in a perfect state (comp. Schiller-Szinessy in the Academy, 1878, p. 170 sq9.). Even thus the process which issued in the production of the Talmud was not yet completed; the Babylonian Amoraim carried it forward for some time longer, until at last at the rise of Islam the Babylonian Gemara was also written down.

In the 5th century Palestine ceased to be the centre of Judaism. Several circumstances conspired to bring this about. The position of the Jews in the Roman empire had changed for the worse with the elevation of Christianity to be the religion of the state; the large autonomy which until then they had enjoyed in Palestine was now restricted ; above all, the family of the patriarchs, which had come to form a veritable dynasty, became extinct.2 But this did not make an end of what may be called the Jewish church- state ; henceforward it had its home in Babylonia. From the period of the exile, a numerous and coherent body of Jews had continued to subsist there; the Parthians and Sassanid granted them self-government; at their head was a native prince (Resh Galutha,—can be clearly traced from 2d century A.D. onwards) who, when the Palestinian patriarchate came to an end, was left without a rival. This

; The Mislma succeeded almost, but not quite, in eompletely doing away with all conflicting tendencies. At first the heterodox tradition of that time was also committed to writing (R. Ishmael ben Elisha) and so handed down,—in various forms (collection of the Baraithas, that is, of old precepts which had not been received into the Mishna, in the Tosephtha), Nor did the active opposition altogether die out even at a later period ; under favouring circumstances it awoke to new life in Karaism, the founder of which, Anan ben David, lived in Babylonia in the middle of the 8th century.

- **Comp. Gothofredus on Cod. Theod., xvi. 8, 29, ad voc. “post excessum patriarcharum.”’**

remarkable relic of a Jewish commonwealth coutinued to exist until the time of the Abassides.? Even as early as the beginning of the 3d century a.p. certain rabbins, at their head Abba Areka (Rab) had migrated from Palestine and founded a settlement for learning in the law in Babylonia. The schools there (at Pumbeditha, Sora, Nahardea) prospered greatly, vied with those of Palestine, and continued to exist after the cessation of the latter, when the patriarchate became extinct; thus they had the last word in the settlement of doctrine.

Alongside of the settlement of tradition went another task, that of fixing the letters of the consonantal text ol

the Bible (by the Massora), its vowel pronunciation (by Massora.

the punctuation), and its translation into the Aramaic vernacular (Targum). after the Palestinians, yet of this sort of erudition Palestine continued to be the headquarters even after the 5th century.

With this task,—that of attaining to the greatest possible conformity to the letter and of continuing therein,—the inner development of Jewish thought came to an end.* The later Hebrew literature, which does not fall to be considered here, contributed very few new elements; in so far as an intellectual life existed at all among the Jews of the Middle Ages, it was not a growth of native soil but proceeded from the Mahometan or Latiu culture of indi- viduals. The Kabb4la at most, and even it hardly with justice, can be regarded as having been a genuine product of Judaism. It originated in Palestine, and subsequently flourished chiefly in the later Middle Ages in Spaiu, and, like all other methodized nonsense, had strong attractions for Christian scholars.

17. Something still remains to be said with reference The dis- to the diaspora. We have seen how it began; in spite of persion.

Josephus (Ant., xi. 5, 2), it is to be carried back not to the Assyrian but merely to the Babylonian captivity ; it was not composed of Israelites, but solely of citizens of the southern kingdom. It received its greatest impulse from Alexander, and then afterwards from Cesar. In the Graeco-Roman period Jerusalem at the time of the great festival

presented the appearance of a veritable Babel (Acts ii. 9-11); with the Jews themselves were mingled the proselytes (Acts ii. 11), for even already that religion was gaining considerable conquests among the heathen ; as King Agrippa I. writes to the emperor Caius (Philo, Legat. ad Gaium, sec. 36), "Jerusalem is the metropolis not only of Judea but of very many lands, on account of the colonies which on various occasions (émt xatpav) it has sent out into the adjoining countries of Egypt, Phoenicia, Syria, and Ccelesyria, and into the more remote Pamphylia, Cilicia, the greater part of Asia Minor as far as to Bithynia and the remotest parts of Pontus; likewise into Europe, —Thessaly, Boeotia, Macedonia, Aitolia, Attica, Argos, Corinth, most parts (and these the fairest) of the Pelopon- nesus. Nor are the Jewish settlements confined to the mainland only ; they are found also in the more important islands, Eubcea, Cyprus, Crete. I do not insist on the countries beyond the Euphrates, for with few exceptions all of them, Babylon and the fertile regions around it, have Jewish inhabitants." In the west of Europe also they were not wanting ; many thousands of them lived in Rome. In those cities where they were at all numerous they during the imperial period formed separate communities ; Josephus has preserved a great variety of documents in which the Roman authorities recognize their rights and liberties (especially as regards the Sabbath rest and the observance of festivals). Of greatest importance was the eS

3 See Néldeke, Tabari, 68, 118, and Kremer, Culturgeschichte des Orients unter den Chalifen, i. 188, ii. 176.

4 Comp. F. Weber, System der alisynagogalen paldstinischen Theo- logie, Leipsic, 1880.

Here also the Babylonians came Targums.

Rela- tions with Islam,

community in Alexandria ; according to Philo a million of Jews had their residence there, under an ethnarch for whom a gerusia was

afterwards substituted by Augustus (In Flac., secs. 6,10). The extent to which this diaspora was helpful in the diffusion of Christianity, the manner in which the mission of the apostles everywhere attached itself to the synagogues and proseuchai, is well known from the New Testament. 'That the Christians of the Ist century had much to suffer along with the Jews is also a familiar fact. For at this period, in other respects more favourable to them than any other had previously been, the Jews had occasionally to endure persecution. The emperors, taking umbrage at their intrusiveness, more than once banished them from Rome (Acts xviii. 2). The good will of the native population they never secured; they were most hated in Egypt and Syria, where they were strongest." The position of the Jews in the Roman empire was naturally not improved by the great risings under Nero, Trajan (in Cyrene, Cyprus, Mesopotamia), and Hadrian. The East, strictly so called, became more and more their proper home. The Christianization of the empire helped still further in a very special way to detach them from the Western world.?2 They sided with the Persians against the Byzantines ; in the year 614 they were even put in posses- sion of Jerusalem by Chosroes, but were not long able to hold their own against Heraclius.? With Islam also they found themselves in greater sympathy than with Chris- tianity, although they were cruelly treated by Mahomet in Arabia, and driven by Omar out of the Hejaz, and not-withstanding the facts that they were as matter of course excluded from citizenship, and that they were held by Moslems as a whole in greater contempt than the Christians. They throve especially well on what may be called the bridge between East and West, in Mauretania and Spain, where they were the intellectual intermediaries between the Arab and the Latin culture. In the Sephardim and Ashkenazim the distinction between the subtler Oriental and the more conservative Western Jews has maintained itself in Europe also. From the 8th century onwards Judaism put forth a remarkable side shoot in the Khazars on the Volga; if legend is to be believed, but little was required at one time to have induced the Russians to accept the Jewish rather than the Christian faith. In the West the equal civil rights which Caracalla had

1 Comp. Schiirer, Weutest. Zeitgeschichte (1874), sec. 31. The place taken by the Jewish element in the world of that time is brilliantly set

forth by Mommsen in his Jistory of Rome (bk. v, ch. ii.; Eng. tr. iv. p. 538 sqq., 1866):—'* How numerous even in Rome the Jewish population was already before Cwsar's time, and how closely at the same time the Jews even then kept together as fellow-countrymen, is shown by the remark of an author of this period, that it was dangerous for a governor to offend the Jews in his province, because he might then certainly reckon on being hissed after his return, by the populace of the capital. Even at this time the predominant business of the Jews was trade. . . . At this period too we encounter the peculiar antipathy of the Occidentals towards this so thoroughly Oriental race and their foreign opinions and customs. This Judaism, although not the most pleasing feature in the nowhere pleasing picture of the mixture of nations which then prevailed, was nevertheless an historical clement developing itself jn the natural course of things,... which Casar just like his pre- decessor Alexander fostered as far as possible. . . , They did not of course contemplate placing the Jewish nationality on an equal footing with the Hellenic or Italo-Hellenic. But the Jew who has not, like the Occidental, received the Pandora's gift of political organization, and stands substantially in a relation of indifference to the state, who more- over is as reluctant to give up the essence of his national idiosyncrasy as he is ready to clothe it with any nationality at pleasure and to adapt himself up to a certain degree to foreign habits—the Jew was for this very reason as it were made for a state which was to be built on the ruins of a hundred living polities, and to be endowed with a some- what abstract and, from the outset, weakened nationality. In the ancient world also Judaism was an effective leaven of cosmopolitanism and ot national decomposition."

2 For a- brief time only were they again favoured by Julian the Apostate ; comp. Gibbon, chap. xxiii. 3 Gibbon, chap. xlvi.

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conferred on all free inhabitants of the empire came to an

against Jews just as against heretics and pagans. As early

end, so far as the Jews were concerned, in the time of Constantine. The state then became the secular arm of the church, and took action, though with less severity,

as the year 315, Constantine made conversion from Christianity to Judaism a penal offence, and prohibited Jews, on pain of death, from circumcising their Christian slaves. These laws were re-enacted and made more severe by Constantius, who attached the penalty of death to marriages between Jews and Christians. Theodosius I. and Honorius, indeed, by strictly prohibiting the destruction of synagogues, and by maintaining the old regulation that a Jew was not to be summoned before a court of justice on the Sabbath day, put a check upon the militant zeal of the church by which even Chrysostom, for example, allowed himself to be carried away at Antioch. But Honorius rendered them ineligible for civil or military service, leaving open to them only the bar and the decurionate, the latter being a privilegium odiosum, Their liberty to try cases by their own law was curtailed ; cases between Jews and Christians were to be tried by Christian judges only. Theodosius II. prohibited them from building new syna- gogues, and anew enforced their disability for all state employments. Most hostile of all was the orthodox Justinian, who, however, was still more severe against Pagans and Samaritans* He harassed the Jews with a law enjoining them to observe Easter on the same day as the Christians, a law which it was of course found impossible to carry out.®

In the Germanic states which arose upon the ruins of the Roman empire, the Jews did not fare badly on the whole. It was only in cases where the state was dominated by the Catholic Church, as, for example, among the Spanish Visigoths, that they were cruelly oppressed; among the Arian Ostrogoths, on the other hand, they had nothing to complain of. One thing in their favour was the Germanic principle that the law to be applied depended not on the land but on the nationality, as now in the east Europeans are judged by the consuls according to the law of their respective nations. The autonomy of the Jewish com- munities, which had been curtailed by the later emperors, was now enlarged once more under the laxer political and legal conditions. The Jews fared remarkably well under the Frankish

monarchy; the Carolingians helped them in every possible way, making no account of the complaints of the bishops. They were allowed to hold property in land, but showed no eagerness for it ; leaving agriculture to the Germans, they devoted themselves to trade. The market was completely in their hands; as a specially lucrative branch of commerce they still carried on the traffic in slaves which had engaged them even in ancient times.°

Meanwhile the church was not remiss in seeking con- stantly repeated re-enactments of the old imperial laws, in the framing of which she had had paramount influence, and which she now incorporated with her own canon law.' Gradually she succeeded in attaining her object, In the later Middle Ages the position of the Jews in the Christian society deteriorated. Intercourse with them was shunned ;

4 Cod, Theod., xvi. 8 : " De Judwis, Ccelicolis, et Samaritanis" ; Cod. Just.,i.9: 'De Judeis et Celicolis."" With regard to these ceelicole, sce Gothofredus on Cod. Theod,, xvi. 8, 9, and also J. Bernays 'Ueber die Gottesfiirchtigen bei Juvenal," in the Comm. Philol. hon. Th. Mommsen, 1877, p. 163. 5 Gibbon, ch. xlvil

6 Agobardus Lugdunensis, De Insolentia Judeorum, De Judaies superstitionibus. Agobard was no superstitious fanatic, but one of the weightiest and most enlightened ecclesiastics of the Middle Ages.

7 Compare Decret. i., dist. 45, c. 3; Decr. ii., caus. 23, quest. 8, c, 9, caus. 28, qu. 1, c. 10-12 ; Decr. iii., de consecr., dist. 4, ©. 93 ; Decretal. Greg. 5, 6 (" De Judeis, Sarracenis, et eorum servis"), 5s 19, 18; Extrav. commun. 5, 2.

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their isolation from being voluntary became compulsory ; from the 13th century onwards they were obliged to wear, a3 a distinctive mark (more necessary in the East than in the West), a round or square yellow badge on their breast.? The difference of religion elicited a well-marked religious hate with oft repeated deadly outbreaks, especially during the period of the crusades, and afterwards when the Black Death was

raging (1348-50). Practical consequences like these the church of course did not countenance ; the popes set themselves against persecutions of the Jews,? but with imperfect success. The popular aversion rested by no means exclusively on religious considerations; worldly motives were also present. The Jews of that period had in a still higher degree than now the control of financial affairs in their hands; and they used it without scruple. The church herself had unintentionally given them a monopoly of the money market, by forbidding Christians to take interest.2 In this way the Jews became rich indeed, but at the same time made themselves still more repugnant to the Christian population than they previously were by reason of their religion.

Having, according to the later medizval system, no rights in the Christian state, the Jews were tolerated only in those territories where the sovereign in the exercise of free favour accorded them protection. This protection was granted them in many quarters, but never for nothing ; numerous and various taxes, which could be raised or changed in a perfectly arbitrary way, were exacted in exchange. But in countries where the feeling of nation- ality attained to a vigorous development, the spirit of tolera- tion was speedily exhausted; the Jews were expelled by the act of the state. England was tle first kingdom in which this occurred (1290); France followed in 1395, Spain and Portugal in 1492 and 1495. In this way it came about that the Holy Roman Empire,—Germany, Italy, and adjoining districts,—became the chief abode of the Jews* In the anarchy which here. prevailed they could best maintain their separate attitude, and if they were expelled from one locality they readily found refuge in some other. The emperor had indeed the right of extirpating them altogether (with the exception of a small number to be left as a memorial); but, in the first place, he had in various ways given up this right to the states of the empire, and, moreover, his pecuniary resources were so small that he could not afford to want the tax which the Jews as his "servi camera" paid him for protecting their persons and property. In spite of Many savage persecutions the Jews maintained their ground, especially in those parts of Germany where the political confusion was greatest. They even succeeded in

‘Comp. Du Cange, s. v. ‘Judi’; also Renter, Gesch. d. Auf- kliirung im Mittelalter, i. 154 sqq. In spite of all the legal restrictions laid upon them, the Jews still continued to have great influence with the princes, and more especially with the popes, of the Middle Ages.

e Deer., ii. 23, 8, 9. Alexander II. omnibus episeopis Hispania : Dispar ; .. est Judeorum et Sarracenorum causa; in illos enim, qui Christianos persequuntur et ex urbibus et propriis sedibus pellunt, Juste pugnatur, hi vero ubique servire parati sunt.

: Decretal. Greg. v. 19, 18. Innocent III. in name of the Lateran Council: Quanto amplius Christiana religio ab exactione eompescitur usurarum, tanto gravius super his Judeorum perfidia insoleseit, ita quod brevi tempore Christianorum exhauriunt faeultates. Volentes igitnr in hae parte prospicere Christianis, ne a Judzis immaniter aggraventur, synodali deereto statuinwus, ut, si de extero quoeunque pretextu Judzi a Christianis graves immoderatasve usuras extorserint, Christianorum eis participium subtrahatur, donee de immoderato gravamine satisfeeerint eompetenter. . . . Prineipibus autem injun- gimus, ut propter hoe non sint Christianis infesti, sed potius a tanto gravamine studeant cohibere Judsos,

The Polish Jews are German Jews who migrated in the Middle Ages to Poland, but have maintained to the present day their German Speech, amedicval south-Frankish dialect, of course greatly corrupted. In Russian “German” and ‘ Jew’? mean the same thing.

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maintaining a kind of autonomy by means‘of an arrange- ment in virtue of which civil processcs which they had against each other were decided by their own rabbins in accordance with the law of the Talmud.®

The Jews, through their having on the one hand separated themselves and on the other hand been excluded on religious grounds from the Gentiles, gained an internal solidarity and solidity which has hitherto enabled them to survive all the attacks of time. The hostility of the

Middle Ages involved them in no danger; the greatest peril has been brought upon them by modern times, along with permission and increasing inducements to abandon their separate position. It is worth while to recall on this point the opinion of Spinoza, who was well able to form a competent judgment (Zract. Theol. polit., c. 4, ad fin.) : —'That the Jews have maintained themselves so long in spite of their dispersed and disorganized condition is not at all to be wondered at, when it is considered how they separated themselves from all other nationalities in such a way as to bring upon themselves the hatred of all, and that not only by external rites contrary to those of other nations, but also by the sign of circumcision which they maintain most. religiously. Experience shows that their conservation is due in a great degree to the very hatred which they have incurred. When the king of Spain compelled the Jews either to accept the national religion or to go into banish- ment, very many of them accepted the Roman Catholic faith, and in virtue of this received all the privileges of Spanish subjects, and were declared eligible for every honour ; the consequence was that a process of absorption began immediately, and in a short time neither trace nor memory of them survived. Quite different was the history of those whom the king of Portugal compelled to accept the creed of his nation ; although converted, they continucd to live apart from the rest of their fellow subjects, having been declared unfit for any dignity. So great importance do I attach to the sign of circumcision also in this connexiou that I am persuaded that it is sufficient by itself to main- tain the separate existence of the nation for ever." The persistency of the race may of course prove a harder thing to overcome than Spinoza has supposed ; but nevertheless he will be found to have spoken truly in declaring that the so-called emancipation of the Jews must inevitably lead to the extinction of Judaism wherever the process is extended beyond the political to the social sphere. For the accom- plishment of this centuries may be required. See JEWs.

Historical Sourccs.—For all that precedes the time of Alexander Histori- the Old Testament is the only native authority. Among foreign cal sources, besides the stone of Mesha, the Assyrian inscriptions hold sources.

the first rank ; for the chronology they are of decisive importance, The Egyptian inseriptions on the other hand are of slight value. Besides these, mention must be made of the notices contained in the Chronicon of Eusebius, and in the Contra Apionem of Josephus (Manctho and Berosus). For the period between Alexander and the destruction of Jerusalem by the Romans we have Daniel, with the commentary of Jerome, the Apoerypha, the Pseudepigraphic writers, and the NewTestament, besides Philo and Josephus,—in otherwords, the entire body of the Grecian Jewish literature that has reached us. Hebrew or Aramaic literature of this period we have none; the writings of the rabbins are to be used only with the greatest eaution as sources for the history of past times, and always only as supple- mentary to the Grecian authorities. The foreign sourees which re- quire to be eonsulted for the Hellenistic and Roman periods aro brought together in Clinton's Fast?; recently there have been added a great variety of coins and very numerous inscriptions (Le Bas and Waddington). For the period of the Palestinian patriarehate thero are the ehureh fathers, —Origen, Eusebius, Jerome, and Epiphanius —besides the law-books. But here the first place belongs to tho rabbinical authorities, although it is an arduous task to extract from sueh a chaos the data of historical value which it contains. Genu- inely historical works are the Megillath Taanith, the Seder Olam Rabba, and the Seder Olam Zutra. For the history of the Jews in the diaspora there are of eourse no special sources. (J. WE.)

5 Stobbe, Die Judenin Deutschl. wihr. d. Mittelalt., Brunsw., 1866.

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Literature.—Among oldcr books still worthy of notice for their historical influence or intrinsic merit, J. J. Sealiger's Thesawrus Temporum (Leyden, 1606) and Archbishop Ussher's Annales Veteris ct Novi Testamenti (London, 1650-54), with the English transla- tion Annals of the World (London, 1658), hold a chief place. To these may be added H. Prideaux, The Old and New Testament connected in the History of the Jews, &c., London, 1716, 10th ed., 1749; S. Shuckford, Zhe Sacred and Profane History of the World, &c., London, 1728-37-

54; Basnage, Histoire des Juifs, 1706, Eng- lish translation by Taylor, 1708. The modern treatment of the subject begins with De Wettc, whose Beitrage zur Hinleitung (1806) brought the higher criticism, which in the hands of Eichhorn had still been purely literary, into close connexion with the historical problems. But a just conception of the order of Israel's historical development, placing the Levitical law at the close not at tho outset, was first unfolded in Vatke's Biblische Theologic (1835), a book which produced no lasting impression. The next work of first-rate importance was Ewald's Geschichte des V. Israel, 1843-49, 3d ed. 1864-69 (English translation of vols. i.-iv., by Martineau, 1867-71; of vol. v., by Glover, 1865; of the Antiquities, by Solly, 1876). In English, Ewald's view of the history has gained cur- rency mainly through Dean Stanley's Lectures on the History of the Jewish Church, 3 vols., 1863-76, and his Sinai and Palestine, 1856. The influence of De Wette and Ewald continued paramount among critics in spite of Reuss, Lagarde, and Graf (Die Geschichtlichen Biicher des A. T., 1866; " Zur Gesch. d. Stammes Levi," in Merx's Archiv, 1870, &c.), till the publication of Kuenen's Gods- dienst van Israel (2 vols., 1869-70; English translation, 1874-75); while in Germany the so-called Grafian theory, really Vatke's,

ISSACHAR (120', "there is a hire, or reward"; 'Iocayap), Jacob's ninth son, his fifth by Leah. Shghtly differing explanations of the reference in the name are given in Gen. xxx. 16 and xxx. 18, The territory of the tribe (Josh. xix, 17-23) included the whole of the great plain of Esdraelon, and the hills to the east of it, the boundary in that direction extending from Tabor to the Jordan, ap- parently along the deep gorge of Wady Bireh. Of the sixteen cities enumerated, the greater number has been successfully identified. (See Conder, Handbook to the Bible, p. 266, 1879, and De Saulcy in Bull. de la Soc. Géogr. de Parts, i. 209 sg., 1879.) In the rich territory of Issachar, traversed by the great commercial highway from the Mediterranean to Bethshean, were several important Canaanitish towns which had preserved their independ- ence; and, although the tribe is mentioned as having taken some part in the war of freedom under Deborah (Judg. v. 15), it is impossible to misunderstand the reference to its tributary condition in the blessing of Jacob (Gen. xlix. 14, 15), or the fact that the name of this

tribe is omitted from the list given in Judg. i. of those who bestirred them- selves against the earlier inhabitants of the country. In the "blessing upon Zebulun and Issachar" in Deut. xxxiii. 18, 19, reference is made to Carmel, their sacred moun- tain, and to the trading and other advantages afforded by their seaboard,

ISSIK-KUL, a large lake of Central Asia, lying in a deep basin between the Trans-Ili Ala-tau and the Tian Shan mountains, and extending from 76° 10' to 78° 20' E. long. The greatest length from west-south-west to east- north-east is 120 or 125 miles, and the greatest breadth 33 miles, the area being estimated at not less than 2260 square miles, 'The name Issik-Kul is Kirghiz for "warm lake," and, like the Chinese synonym Zhe-hai, has refer- ence to the fact that the lake is never entirely frozen over. The surface is variously stated at 4475 (Semenoff) and 5300 (Golubeff) feet above the sea. Towards the east the valley strikes well in among the mountains in the direction of the Santash Pass (6650 feet), and it is traversed by two parallel streams, the Tub and the Jirgalan, which form the most important affluents of the lake. On the south the Tian Shan mountains, or, as that part of the system is locally called, the Terskei Ala-tau, do not come

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remained unpopular up to the publication of J. Wellhausen's @cs- chiehte Israels, vol. i., 1878, in which the currents starting from Ewald and Vatke may be said to meet. Among other books which deal with the Biblical period of the history the following may be named :—Milman's History of the Jews, 1829-30 ; Newman's History of the Hebrew Monarchy, 1847; Lengerke's Kenaan, 1844; Weber and Holtzmann's Gesch. des V. Isr., 1867; Hitzig's Geschichte, 1869, full of paradoxes; Reuss's Histoire des Israelites, 1877; W. R. Smith's Old Testament in the Jewish Church, 1881. See also Duncker's Gesch. des Alterthums. From a conservative or apolo- getical standpoint the subject is treated by Kurtz, Gesch. des A. B., 1848-55, and Hengstenberg, Gesch. des Keiches Gottes u. d. A. B., 1870-71, both translated in Clark's series, and in Koehler's Lehrbuch der Gesch. d. A. T., 1875-77-81, to the death

of Ishbosheth. For the New Testament period, as well as that of the connexion between the Old and New Testaments, Schiirer's Lehrbuch der NTlichen Zettgeschichte (1874) gives an admirable summary and an exhaustive view of relevant literature. Of works of Jewish scholars the follow- ing may be noted: Herzfeld, Geschich. des v. Jisraels von Vollendung des 2" Tempels, 1847 8g.; Jost, Geschichte der Isracliten seit den Makkabdéern, 1820-47, and Gesch. des Judenthwms und seiner Sekten, 1857-59; Graetz, Geschichte der Juden, 1863-77; and especially Derenbourg, Essai sur Vhistoire … de la Palestine, 1877.

Monographs and books elucidating particular features of the sub- ject are too numerous to be cited in detail. For the Biblical chrono- logy sce especially G. Smith, Assyrian Eponym Canon, 1875; Wellhausen in Jahrb. f. Deut. Theol., 1875, p. 607 sq.; Oppert, Salomon et ses Successewrs, 1877; Noldeke, "Chronologie der Richterzcit," in his Untersuchungen, 1867.

down so close to the shore as the mountains on the north (the Kungei Ala-tau), but leave a strip 5 to 13 miles broad. The water is too salt to be fit for drinking. Fish are remark- ably abundant, especially in the bays, the principal species being carps (Cyprinus, Oreinus, and Schizothoraz).

Issik-Kul begins to appear in history in the end of the 2d cen- tury. It was by this route that the tribes driven from China by the Huns found their way into the Aralo-Caspian basin. The Usuns scttled on the lake and built the town of Tchi-gu, probably at the mouth of the Tub, where remains of stone buildings are said to exist below the water. Peculiar remains of the Usun sculptures quite distinct from those of the Calmucks or the Kirghiz, and articles of houschold furniture, such as copper kettles of great size, are some- times found. The town of Tchi-gu still existed in the 5th century, but after that there is no mention of it in the Chinese historians. It is to Hwen T'sang, the Buddhist pilgrim, that we are indebted for the first account of Issik-Kul based on personal obscrvation. In the beginning of the 14th century Nestorian Christians reached the lake and founded a monastery on the northern shore, indicated in the Catalan map of 1874. Timur skirted the southern shore

in the beginning of the 15th century. It was not till 1856 that the Russians made acquaintance with the district.

See Petermann, Miftheilungen, 1858 ; Semenoff's valuable artiele in his Slov. Russ. Imp., whieh is largely based on his own original materials ; Sewerzow, Erforschung des Thian Schan Gebirgs-System, 1867 (Gotha, 1875).

ISSOIRE, chief town of an arrondissement in the depart- ment of Puy-de-Déme, France, situated on the Couze, near its junction with the Allier, 20 miles S.E. of Clermont. It contains a tribunal of the first instance, a tribunal of commerce, and the usual offices appropriate to the capital of a district. The streets in the older part of the town are narrow, crooked, and dirty, but in the newer part there are several fine tree-shaded promenades, while a handsome boulevard encircles the town. The communal college, a good primary school, several religious institutions, an ancient bridge, the granite town-house, and the church of St Paul are among the most interesting buildings. The last, built on the site of an older chapel raised over the tomb of St Austremoine (Stremonius), who introduced Christianity into Issoire in the 3d century, dates from the 10th century, and affords an excellent specimen of the Roman- esque style of early Auvergnese architecture. Issoire has manufactures of agricultural implements, millstones, woollens, and shoes, and trade in cattle, walnut-oil, hemp, apples, and wine. The population in 1876 was 6089.

Issoire, whose name occurs in the Latin forms Zeciodwrum and Issiodurum, is said to have been founded by the Arverni, and in ,

Roman times rose to some reputation for its school. In the 5th century the Christian community established there by Stremonius was overthrown by the fury of the Vandals. During the religious wars of the Reformation, Issoire suffered very severely. Merle, the leader of the Protestants, captured the town in 1574, and treated the inhabitants with great cruelty. The Roman Catholics retook it in 1577, and the ferocity of their retaliation may be inferred from the inscription Ici fut

Issotre, carved on a pillar which was raised on the siteof the town. In the contest of the Leaguers and Henry IY. Issoire, hardly recovered, sustained further sieges, and has never

wholly regained its early prosperity.

ISSOUDUN, chief town of an arrondissement in the department of Indre, France, is situated on the Théols, 17 miles N.E. of Chateauroux, and 145 miles S. of Paris. It is the seat of the usual Government and public offices ; and there are also chambers of agriculture and of arts and manufactures, 2 communal college, a public library, a de- partmental prison, a hospital, an orphanage, and several religious and benevolent institutions. Among the interest- ing buildings are the church of St Cyr, combining various architectural styles, with a fine porch and window, the Hotel de la Préfecture, the chapel of the Hotel Dieu, and the Palais de Justice, begun in 1856. Of the fortifications with which the town was formerly surrounded the White Tower, a massive cylindrical building of the 13th century, alone remains. Issoudun has quarries of lithographic stone, tanneries, grain, woollen, and saw mills, and manufactures of brass, linen, parchment, steam-engines and machinery, cutlery, and cloth. It carries on trade in lithographic stones, grain, wine, iron, cattle, and horses. The popula- tion in 1876 was 11,293.

Issoudun, in Latin 4uxellodunum, Exoldunum, or Isoldunum, existed in Roman times. It has suffered severely from conflagra- tions; a very destructive one in 1651 was the result of an attack on the city in the war of the Fronde. Louis XIV. rewarded the staunch fidelity of the city to him by several privileges.

ISTALIF. See AFGHANISTAN, vol. 1. p. 230.

ISTHMIAN GAMES, one of the four great Panhellenic festivals, were held on the Isthmus of Corinth. Anancient ceremony of the worship of Melicertes or Melkarth, intro- duced by the Phcenician traders who frequented the isthmus from the earliest time, was afterwards modified by the Old Ionic worship of Poseidon; and at the festival the heroes Neleus and Sisyphus received honour along with the two deities. About

582 3.c., the festival was arranged after the analogy of the Olympian and Pythian games, but was celebrated every two years. The festival was managed by the Corinthians ; and after the city was destroyed by Mum- mius (146 3.c,) the presidency passed to the Sicyonians until Julius Czesar restored Corinth. The Athenians were closely connected with the festival, and had the privilege of proedria, the foremost seat at the games, while the Eleans were absolutely excluded from participation. The games included gymnastic, equestrian, and musical con- tests ; and the prize was a crown made at one time of parsley, at a later period of pine.

ISTIB or Isurrs, a town of European Turkey, in the eyalet of Nish (Macedonia), a few miles south-east of Uskub, situated at a height of 590 feet on a small stream of its own name, which joins the Bregalnitza, a tributary of the Vardar. It is estimated to contain from 15,000 to 20,000 houses, and possesses several fine mosques, a number of fountains, and a large bazaar. A small syenitic knoll to the north-west is crowned by the ruins of an old castle. Istib is the ancient Astibas.

ISTRIA (anciently also Histria, in German Istrien, and formerly Histerreich), a margraviate of Austria, forming the southern part of the Kiistenland crownland, is contained in the peninsula which, bounded on the north by the dis- tricts of Trieste, Gérz, and Carniola, stretches southwards into the Adriatic Sea, between the Gulf of Trieste (Sinus

. Lergestinus), and the Gulf of Quarnaro (Sinus Flanaticus).

The area of the official district, which includes Veglia, Cherso, Lussino, and other smaller islands on the south-east coast, is 1908 square miles, of which 1545 belong to the peninsula itself. The surface is mountainous, especially in the north and east regions, which are occupied by off- shoots from the Julian Alps. Monte Maggiore (4573 feet) in the north-east is the highest summit. The Quieto in the west and the Arsa in the east, neither of which is navigable, are the principal streams. The west coast abounds in convenient bays and harbours, of which Pola, an imperial naval station, is the chief; but the steep and

rocky east coast is beset with shallows and islets, and is much exposed to the prevailing winds, the Sirocco from the south-south-east and the Bora from the north-east. The climate of Istria, although it varies with the varieties of surface, is on the whole warm and dry. The soil is not unfertile, but its resources are far from being fully developed. About one half of the total area is occupied with scanty grass and pasture land, while timber and the various annual crops divide the remainder in different pro- portions. Wheat, oats, potatoes, and rye are grown in the north, and in the south wheat, maize, rye, olives, vines, and melons. The harvest of 1872 yielded 46,410 bushels of wheat, 157,385 of rye, 165,800 of oats, and 158,200 of maize ; and the value of the total agricultural produce was £950,000. Beech and oak timber (good for shipbuilding), gall-nuts, oak-bark, and cork are also produced. The minerals include coal, alum, quartz, and good building stone. Many of the inhabitants are engaged in a sea- faring life, in fishing, and in preparing salt for fish- curing. Shipbuilding, sheep and cattle rearing, and the manufacture of oil, wine, and bricks are also noteworthy industries. The best sorts of wine are made near Capo dIstria, Muggia, Isola, Parenzo, and Dignano ; and the oil of Istria was famous even in Roman times. The trade of the peninsula is unimportant. The roads are fairly numerous, and a railway, lately opened, with a branch to Rovigno, connects Pola with Trieste. Istria is divided into the six government districts of Capo d'Istria, Parenzo, Pisino, Pola, Volosca, and, for the islands, Lussino. The estates of Istria, which meet at Parenzo, consist of 3 bishops, 5 representatives of the landed proprietors, 8 representatives of the towns, 12 representatives for the other and rural communities, and 2 representatives of the chamber of commerce at Rovigno. Two-thirds of the people are Slavs, although among these there are many differences of dress and dialect. The remaining third, on the coast and in the towns, is almost entirely Italian. The population in 1869 was 254,905, of whom 35,917 belonged to the islands; 278,218 was the official estimate at the end of 1879.

The modern Istria occupies the same position as the ancient Istria or Histria, known to the Romans as the abode of a fierce tribe of Illyrian pirates. It owed its name to an old belief that the Danube (Ister, in Greek) discharged some of its water by an arm entering the Adriatic in

that region. The Istrians, protected by the difficult navigation of their rocky coasts, were only subdued by the Romans in 177 B.c. after two wars. Under Augustus the greater part of the peninsula was added to Italy, and, when the seat of empire was removed to Ravenna, Istria reaped many benefits from the proximity of the capital. After the fall of the Western empire it was pillaged by the Longobardi and the Goths ; it was annexed to the Frankish kingdom by Pippin in 789; and about the middle of the 10th century it fell into the hands of the dukes of Carinthia. Fortune after that, however, led it successively through the hands of the dukes of Meran, the duke of Bavaria, and the patriarch of Aquileia, to the republic of Venice. Under this rule it remained till the peace of Campo Formio in 1797, when Austria acquired it, and added it to the north-eastern part which had fallen to her share so early as 1874, By the peace of Pressburg, Austria was in 1805 compelled to cede Istria to France, and the department of Istria was formed; but in 1813 Austria again seized it, and has retained it ever since. Saggio di bibliografia Istriana (Capodistria, 1864) contains a classified bibliography of the province.

Plates fv.-VI.

PART IL—GEOGRAPHY AND STATISTICS.

Topography.

TALY, or more correctly Iratta, is the name that has been applied both in aucient and modern times to the great peninsula that projects from the mass of central Europe far to the south into the Mediterranean Sea, where the great island of Sicily may be considered as in fact a mere con- tinuation or appendage of the continental promontory. Confining ourselves, however, to Italy itself, its natural boundaries are marked with a distinctness that is quite exceptional. The portion of the Mediterranean com- monly termed by geographers the Tyrrhenian Sea forms its limit on the W. and S., and the Adriatic on the E. ; while to

the north, where it joins the main continent of Europe, it is separated from the adjacent regions by the mighty chain of the Alps, which sweeps round in a vast semicircle from the head of the Adriatic to the shores of Nice and Monaco, presenting throughout an almost

unbroken mountain barrier.

The land thus circumscribed extends between the parallels of 46° 40’ and 37° 55’ N. lat. and between 6° 35’ and 18° 35’ E. long. Its greatest length is from north- west to south-east, in which direction it measures 620 geographical miles or 718 English miles in a direct line from the boundary near Courmayeur to the Cape Sta Maria di Leuca, south of Otranto, but the great mountain peninsula of Calabria extends about two degrees farther south to Cape Spartivento in lat. 37° 55’. Its breadth is, owing to its configuration, very irregular. The northern portion, measured from the Alps at the Monte Viso to the mouth of the Po, has a breadth of about 230 geographical or 270 English miles, and from the Monte Viso to the head of the Adriatic near the mouth of the Isonzo it measures 290 geographical or 340 English miles. But the peninsula of Italy, which forms the largest portion of the country, nowhere exceeds 130 geographical miles in breadth, while it does not generally measure more than from 90 to 100 miles across. Its southern extremity, now called Calabria, forms a complete peninsula, being united to the mass of Lucania or the Basilicata by an isthmus of only 35 English miles in width, while that between the Gulfs of Sta Eufemia and Squillace, which connects the two portions of the pro- vince, does not exceed 20 miles. The area of the present kingdom of Italy, exclusive of the large islands, is computed at 93,640 square miles. Savoy, which until the treaty of 1860 was commonly considered as included in Italy, on. account of its being comprised in the kingdom of Sar- dinia, as a matter of physical geography unquestionably belongs to France (to which it is now politically united), ceing separated from the Italian province of Piedmont by the main chain of the Alps.

But, though that great range forms throughout the northern boundary of Italy, the exact limits of the country at the two extremities cf the Alpine chain are not very clearly marked, and have been subject to

considerable fluctuations both in ancient and modern times. Ancient geographers appear to have generally regarded the remark- able headiand which descends from the Maritime Alps to the sea between Nice and Monaco as the limit of Italy in that direction, and in a purely geographieal point of view it is probably the best point that could be selected. But Augustus, who was the first to give to Italy a definite political organization, carried the frontier to the river Varus or Var, a few miles west of Nice, and this river continued in modern times to be generally recognized as

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the boundary between France and Italy. It was only in 1860 that the annexation of Nice and the adjoining terri- tory to France carried the political frontier farther east, to a point between Mentone and Ventimiglia, which certainly constitutes no natural limit.

Towards the north-east also the line of demarcation is not clearly characterized. The point where the range of the Julian Alps approaches almost close to the sea-shore (just at the sources of the little stream so celebrated in ancient times as the Timavus) would seem to constitute the best natural limit. But in the constitution of Italy by Augustus the frontier was carried farther east so as to include Tergeste (Trieste), and the little river Formio (Risano) was in the first instance chosen as the limit, but this was subsequently transferred to the river Arsia (the Arsa), which flows into the Gulf of Quarnero, so as to include almost all Istria; and the circumstance that the coast of Istria was throughout the Middle Ages held by the powerful republic of Venice tended to perpetuate this arrangement, so that Istria was generally regarded as belonging to Italy, though certainly not forming any natural portion of that country.

The only other part of the northern frontier of Italy where the boundary is not clearly marked by nature is Tyrol or the valley of the Adige. Here the main chain of the Alps (as marked by the watershed) recedes so far to the north that it has never constituted, as it has done through- out the greater part of its extent, the national limit between populations of different race and language. In ancient times the upper

valleys of the Adige and its tributaries were inhabited by Rhcetian tribes and included in the pro- vince of Rheetia; and the line of demarcation between that province and Italy was purely arbitrary, as it remains to this day. 'Tridentum or Trent was in the time of Pliny included in the tenth region of Italy or Venetia, but he tells us thet the inhabitants were a Rheetian tribe. At the present day the frontier between Austria and the king- dom of Italy crosses the Adige about 30 miles below Trent, —that city and its territory, which previous to the treaty of Lunéville in 1802 was governed by sovereign archbishops of its own, subject only to the German emperors, being now included in the Austrian empire. While the Alps thus constitute the northern boundary of Italy, its con- figuration and internal geography are determined almost entirely by the great chain of the Apennines, which branches off from the Maritime Alps between Nice and Genoa, and, after stretching in the first instance in an unbroken line across from the Gulf of Genoa to the Adriatic, then turns more to the south, and is continued throughout the whole of Central and Southern Italy, of which it forms as it were the backbone, until it ends in the southernmost extremity of Calabria at Cape Spartivento. The great spur or promontory projecting towards the east to Brindisi and Otranto, which figures in the older maps of Italy as if it were constituted by a branch from the main range of the Apennines, is not in reality so formed, and has no direct connexion with the central chain.

One chief result of the manner in which the Apennines thus traverse the whole of Italy from the Mediterranean to the Adriatic is the marked division between Northern Italy, including the region north of the Apennines and extending thence to the foot of the Alps, and the central and more southerly portions of the peninsula. No such line of separation exists farther south, and the terms

Central and Southern Italy, though in general use among geographers, and convenient for descriptive purposes, do not correspond to any natural divisions of the great Italian peninsula. :

1. Northern Italy.—By far the larger portion of Northern Italy is occupied by the basin of the Po, which comprises the whole of the broad plain extending from the foot of the Apennines to that of the Alps, together with the valleys and slopes on both sides of it. Throughout its whole course indeed, from its source in Monte Viso to its outflow into the Adriatic—a distance of more than 5 degrees of longitude, or 220 miles in a direct line—the Po receives all the waters that flow from the Apennines northwards, and all those that descend from the Alps towards the south, till one comes to the Adige, which, after pursuing a parallel course with the Po fora considerable distance, enters the Adriatic by a separate mouth.

There is no other instance in Europe of a basin of similar extent equally clearly characterized,—the perfectly level character of the plain being as striking as the boldness with which the lower slopes of the mountain ranges begin to rise on each side of it. This is most clearly marked on the side of the Apennines, where the great Emilian Way, which has been the high road from the time of the Romans to our own, preserves an unbroken straight line from Rimini to Piacenza, a distance of more than 150 miles, during which the underfalls of the mountains continually approach it on the left, without once crossing the line of road. On the side of the Alps the boundary is more varied and broken, the great projecting masses of those mountains being inter- sected by large rivers, which produce valleys of consider- able extent running far up into the mountains. But still, from whatever point the traveller approaches the Alps, he will be struck by the manner in which the unbroken alluvial plain extends quite up to the foot of the actual mountains or their immediate offshoots, —presenting in this respect a striking contrast with the broken, hilly country which is found on the north side of the Alps both in Switzerland and in Austria.

The only exception to this uniform level occurs in the Monferrat region, which consists principally of hills of moderate elevation and of Tertiary formation, projecting to the north from the Ligurian Apennines, and occupying a breadth of about 50 miles from the neighbourhood of Turin to that of Alessandria, around which the Po is com- pelled to form a great bend between Turin and Valenza, leaving, however, a

broad strip of plain (from 15 to 30 miles across) between its north bank and the foot of the Alps. The detached group of the Euganean hills, within sight of the Adriatic, though separated from the nearest Alps by a very narrow strip of plain, is wholly independent of that great chain, and forms a separate and isolated mass of volcanic origin.

The geography of Northern Italy will be best described by following the course of the Po. That mighty stream has its origin as a mountain torrent descending from two little dark lakes on the north flank of Monte Viso, at a height of more than 6000 feet above the sea; and after a course of less than 20 miles it enters the plain at Saluzzo, between which and Turin, a distance of only 30 miles, it receives three considerable tributaries,—the Clusone on its left bank, bringing down the waters from the valley of Fenestrelle, and the Varaita and Maira on the south, con- tributing those of two valleys of the Alps immediately south of that of the Po itself. Between Turin and Valenza it receives no affluent of importance on its right bank, but a few miles below the latter town it is joined by the Tanaro, a large stream, which brings with it the united waters of the Stura, the Bormida, and several minor rivers. All these have their sources on the northern flank or reverse

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of the Maritime Alps, where the chain bends round towards Savona, and being fed by the snows of those lofty mountains are greatly superior in volume to the rivers that descend from the Apennines farther east.

But far more important are the great rivers that descend from the main chain of the Graian and Pennine Alps, and join the Po on its left bank. Of these the Dora (called for distinction’s sake Dora Riparia), which unites with the greater river just below Turin, has its source in the Mont Genevre, and flows past Susa at the foot of the Mont Cenis. Next comes the Stura, which rises in the glaciers of the Roche Melon; then the Orco, flowing through the Val di Locana ; and then the Dora Baltea, one of the greatest of all the Alpine tributaries of the Po, which

has its source in the glaciers of Mont Blanc, above Courmayeur, and thence descends through the Val d'Aosta for about 70 miles till it enters the plain at Ivrea, and after flowing about 20 miles more joins the Po a few miles below Chivasso, This great valley—one of the most considerable on the southern side of the Alps—has attracted more especial attention, in ancient as well as modern times, from its leading to two of the most frequented passes across the great mountain chain, —the Great and the Little St Bernard, the former diverging at Aosta, and crossing the main ridges to the north into the valley of the Rhone, the other following a more westerly direction into Savoy. In its course below Aosta also the Dora Baltea receives several considerable tributaries, which descend from the range of glaciers between Mont Blanc and Monte Rosa.

About 25 miles below its confluence with the Dora, the Po receives the waters of the Sesia, also a large river, which has its source above Alagna at the southern foot of Monte Rosa, and after flowing by Varallo and Vercelli falls into the Po about 14 miles below the latter city. About 30 miles east of this confluence,—in the course of which the Po makes a great bend south to Valenza, and then returns again to the northward,—it is joined by the Ticino, a large and rapid river, which brings with it the outflow of the great lake called the Lago Maggiore, and all the accumulated waters that flow into it. Of these the Ticino itself has its source about 10 miles above Airolo at the foot of the St Gotthard, and after flowing above 36 miles through the Val Leventina to Bellinzona, where it is joined by the Moesa bringing down the waters of the Val Misocco, enters the lake through a marshy plain at Magadino, about 10 miles distant. On the west side of the lake the Toccia or Tosa descends from the pass of the Gries nearly due south to Domo d'Ossola, where it receives the waters of the Doveria from the Simplon, and a few miles lower down those of the Val Anzasca from the foot of Monte Rosa, and 12 miles farther has its outlet into the lake between Baveno and Pallanza. Besides these two great streams the Lago Maggiore is the receptacle of the waters of two minor but considerable lakes—the Lago di Lugano on the east and the Lago d'Orta on the west. The Ticino has a course of above 50 miles from

Sesto Calende, where it issues from the lake, through the level plain, till it joins the Po just below the city of Pavia.

The next great affluent of the Po, the Adda, forms in like manner the outflow of a great lake—the Lake of Como, and has also its sources far away in the Alps, above Bormio, from whence it flows through the broad and fertile valley of the Val Tellina for a distance of more than 65 miles till it enters the lake near Colico. The Adda in this part of its course has a direction almost due east to west; but at the same point where it reaches the lake, another river, the Lira, descends the valley of 5S. Giacomo, which runs nearly north and south from the pass of the Spliigen, thus affording one of the most direct lines of communication across the Alps. The Adda flows out of

the lake at its south-eastern extremity at Lecco, and has thence a course through the plain of above 70 miles.till it enters the Po between Piacenza and Cremona. In this part of its course it flows by Lodi and Pizzighettone, and receives the waters of two minor but considerable streams, the Brembo, descending from the Val Brembana, and the Serio from the Val Seriana above Bergamo. The Oglio, a more considerable stream than either of the last two, rises in the Monte Tonale above Edolo, and descends through the Val Camonica to Lovere, where it expands into a large lake, called the Lake of Iseo from the town of that name on its southern shore. Issuing from thence at its south- west extremity, the Oglio has a long and winding course through the plain before it finally reaches the Po a few miles above Borgoforte. In this lower part of its course it receives the smaller streams of the Mella, which flows by Brescia, and the Chiese, which proceeds from a small lake called the Lago d'Idro, between the Lake of Iseo and that of Garda. ;

The last of the great tributaries of the Po is the Mincio, which flows from the Lago di Garda, the largest of all the Italian lakes, and has a course of about 40 miles from Peschiera, where it issues from the lake at its south-eastern angle, till its joins the Po. About 12 miles above the confluence it passes under the walls of Mantua, and expands into a

broad lake-like reach so as entirely to encircle that city. Nothwithstanding its extent, the Lake of Garda is not fed, like those of Como and Maggiore, by the snows of the high Alps, nor is the stream which enters it at its northern extremity (at Riva) commonly known as the Mincio, though in reality forming the main source of that river, but is termed the Sarca; it rises at the foot of the Monte Tonale.

The Adige, which is formed by the junction of two streams—the Etsch or Adige proper and the Eisach, both of which belong to Tyrol rather than to Italy—descends as far as Verona, where it enters the great plain, with a course from north to south nearly parallel to the rivers last described, and would seem likely in like manner to dis- charge its waters into those of the Po, but below Legnago it turns to the eastward and pursues a course parallel to that of the Po itself for a space of about 40 miles, till it enters the Adriatic by an independent mouth about 8 miles from the northern outlet of the greater stream. The waters of the two rivers have, however, been made to communicate by artificial cuts and canals in more than one place.

The Po itself, which is here a very large stream, with an average width of from 400 to 600 yards, con- tinues to flow with an undivided mass of waters as far as a place called Sta Maria di Ariano, where it parts into two arms, known as the Po della Maestra and Po di Goro, and these again are subdivided into several other branches, forming an extensive delta above 20 miles in width from north to south. The point of bifurcation is at present about 25 miles from the sea, but was formerly much farther inland, more than 10 miles west of Ferrara, where a small arm of the river, still called the Po di Ferrara, branches off from the main stream. Previous to the year 1154 this channel was the main stream, and the two small branches into which it subdivides, called the Po di Volano and Po di Primaro, were in early times the two main out- lets of the great river. Thesouthernmost of these, the Po di Primaro, enters the Adriatic only about 12 miles north of Ravenna, so that if these two arms be included, the whole delta of the Po extends through a space of about 36 miles from south to north. The whole course of the river, including its windings, is estimated at about 450 miles.

Besides the delta of the Po and the large marshy tracts which it forms, there exist on both sides of it extensive lagoons of salt water, generally separated from the Adriatic

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by narrow strips of sand or embankments, partly natural partly artificial, but having openings from distance to dis- tance through these barriers, which admit of the influx and efflux of the sea-water, and serve as ports for communica- tion with the mainland. The best known and the most extensive of these lagoons is that in which Venice is situated, and which extends from Torcello in the north to Chioggia and Brondolo in the south, a distance of above 40 miles; but they were formerly much more extensive, and afforded a continuous means of internal navigation, by what were called 'the Seven Seas" (Septem Maria), from Ravenna to Altinum, a few miles north of Torcello. That city, like Ravenna, originally stood in the midst of a lagoon; and the coast to the east of it, the whole way to near Monfalcone, where it meets the mountains, is occupied by similar expanses of water, which are, however, continually drying up and becoming gradually converted into dry land. The changes in the coast-line have conse- quently been considerable throughout this extent.

The tract in the interior, adjoining this long line of lagoons, is, like the basin of the Po, a broad expanse of perfectly level alluvial plain, extending from the Adige eastwards to the Carnic Alps, where they approach close to the Adriatic between Aquileia and Trieste, and north- wards to the foot of the great chain, which here sweeps round in a semicircle from the neighbourhood of Vicenza to that of Aquileia. The space thus included was known in ancient times as Venetia, a name applied in the Middle Ages to the well-known city; the eastern portion of it became known in the Middle Ages as the Frioul or Friuli. It is traversed by a number of rivers, descending from the Alpine chain; but these are for the most part nothing more than mountain torrents, bringing down vast masses of stones and shingle to the plain below. Beginning from the Adige and proceeding from west to east the streams

worthy of notice are—(1) the Brenta, a navigable stream of a different character from the rest, which descends from the Val Sugana, and passes within a few miles of Padua; (2) the Piave, flowing by Belluno ; (3) the Tagliamento, which descends from the Carnic Alps above Tolmezzo, and though a large stream has a very torrent-like character; (4) the Isonzo, a deep and rapid river, which has its sources in the highest group of the Julian Alps, at the foot of Mont Terglou, and brings with it the waters of the Natisone, also a considerable stream.

Returning to the south of the Po, the tributaries of that river on its right bank below the Tanaro are very inferior in volume and importance to those from the north. Flowing from the Ligurian Apennines, which are of no great elevation and never attain to the limit of perpetual snow, they have no continuous supply through the year, and in summer generally dwindle into insignificant streams flowing through dry beds of shingle. Beginning from the Tanaro, the principal of them are—(1) the Scrivia, a small but rapid stream flowing from the Apennines at the back of Genoa; (2) the Trebbia, a much larger river, though of the same torrent-like character, which rises near Torriglia within 20 miles of Genoa, flows by Bobbio, and joins the Po a few miles above Piacenza; (3) the Nure, a few miles east of the preceding ; (4) the Taro, a more considerable stream; (5) the Parma, flowing by the city of the same name ; (6) the Enza; (7) the Secchia, which flows by Modena ; (8) the Panaro, a few miles to the east of that city; (9) the Reno, which flows by Bologna, but instead of holding its course till it discharges its waters into the Po, is turned aside by an artificial channel into the Po di Primero. The other small streams east of this—of which the most considerable are the Solaro, the Santerno, flowing by Imola, the Lamone by Faenza, the Montone by Forli —all have their outlet in like manner into the Po di

Primaro, or by artificial mouths into the Adriatic between Ravenna and Rimini. The river Marecchia, which enters the sea immediately north of Rimini, may be considered as the natural limit of Northern Italy. It was adopted by Augustus as the boundary of Gallia Cispadana

; the far- famed Rubicon was a trifling stream a few miles farther north, now called Fiumicino. ons

The narrow stip of coast-land between the Maritime Alps, the Apennines, and the sea—called in ancient times Liguria, and now known as the Riviera of Genoa— though belonging in respect of latitude to Northern Italy, ig in other respects quite distinct from the region included under that name. Throughout its whole extent, from Nice to Genoa on the one side, and again from Genoa to Spezia on the other, it is almost wholly mountainous, being occupied by the branches and offshoots of the mountain ranges at the back, which separate it throughout from the great plain to the north, while they send down their lateral ridges close to the water's edge, leaving only in places a few square miles of level plains at the mouths of the rivers and openings of the valleys. Rugged as it is, the district thus bounded is by no means devoid of fertility, the steep slopes facing the south enjoying so fine a climate as to render them very favourable for the growth of fruit trees, especially the olive, which is cultivated in terraces to a considerable height up the face of the mountains, while the openings of the valleys are generally occupied by towns or villages.

From the proximity of the mountains to the sea none of the rivers in this part of Italy have any long course, and they are generally mere mountain torrents, rapid and swollen in winter and spring, and almost dry in summer. The largest and most important are those which descend from the Maritime Alps between Nice and Albenga. Beginning from the Var, which as already stated is now included in France, the most considerable of them are—the Roja, which rises in the Col di Tenda, and descends to Ventimiglia ; the Taggia, between San Remo and Oneglia ; and the Genta, which enters the sea at Albenga. The other streams, which flow from the range of the Apennines to the sea between Savona and Genoa, are of very little importance, from the proximity of the watershed and its small eleva- tion. The same remark applies to the Riviera east of Genoa, where the Lavagna, which enters the sea at Chiavari, is the only stream of any importance between Genoa and the Gulf of Spezia. But immediately east of that inlet (a remarkable instance of a deep land-locked gulf with no river flowing

into it) the Magra, which descends from Pontremoli down the valley known as the Lunigiana, is a large stream, and brings with it the waters of another considerable stream, the Vara. ‘The Magra (Macra) wasin ancient times the boundary between Liguria and Etruria, and may be considered as constituting on this side the limit of Northern Italy.

The Apennines, as has been already mentioned, here traverse the whole breadth of Italy, cutting off the peninsula properly so termed from the broader mass of Northern Italy by a continuous barrier of considerable breadth, though of far inferior elevation to that of the Alps. The Ligurian Apennines, which may be considered as taking their rise in the neighbourhood of Savona, where a pass of very moderate elevation connects them with the Maritime Alps, of which they are in fact only a continua- tion, are among the least lofty portions of that long range. From the neighbourhood of Savona to that of Genoa they do not rise to more than 3000 to 4000 feet, and are traversed by passes of less than 2000 feet. As they extend towards the east they increase in elevation: thus Monte Penna, at the sources of the Taro, rises to 5704 feet; Monte Molinadigo, at the head of the valley of

Pontremoli, to 5100; and the Alpe di Succisa, near the pass which is crossed by the road from Sarzana to Reggio, to 6600; while the Monte Cimone, a little farther east, attains to the height of 7088 feet. This is the highest point in the northern Apennines, and belongs to a group of summits of nearly equal altitude ; the range which from thence is continued between Tuscany and what are now known as the Emilian provinces has a very uniform char- acter both in elevation and direction, and presents a con- tinuous ridge from the mountains at the head of the Val di Mugello (due north of Florence) to the point where they are traversed by the celebrated Furlo Pass. The highest point in this part of the range is the Monte Falterona, above the sources of the Arno, which attains to a height of 5408 feet. Throughout this tract the Apennines are generally covered with extensive forests of chestnut, oak, and beech; while their upper slopes afford admirable pasturage. But few towns of any importance are found either on their northern or

southern declivity, and the former region especially, though occupying a broad tract of from 30 to 40 miles in width, between the crest of the Apennines and the plain of the Po, is one of the least known and at the same time least interesting portions of Italy.

2. Central Italy.—It has already been observed that this term is merely one used by geographers as a matter of convenience, and does not correspond to any natural division of the peninsula. Nor does it correspond with any received political division, for though the kingdom of Naples, which so long constituted a separate government, might be considered as representing Southern Italy, its three northern provinces, known as the Abruzzi, certainly belong rather to the central portion of the peninsula, with which they correspond in physical characters as well as in latitude and position. Writers on ancient geography gene- rally include Campania and Samnium also in Central Italy, a division rendered convenient by the close relations existing between those countries and Latium, the political centre of Italy in those days. But as a mere geographical division it seems more convenient to include all the pro- vinces that formed part of the kingdom of Naples, with the exception of the three Abruzzi, in Southern Italy.

The geography of Central Italy is almost wholly deter- mined by the great range of the Apennines, which traverse its whole extent in a direction from about north-north-east to south-south-west, almost precisely parallel to that of | the coast of the Adriatic from Rimini to Pescara, The line of the highest summits and of the watershed ranges at a distance of about 30 to 40 miles from the Adriatic, while it is separated by about double that distance from the Tyrrhenian Sea on the west. It is in this part of the range that almost all the highest points of the Apennines are found. Beginning from the group called the Alpi della Luna near the sources of the Tiber, which attain only to a height of 4435 feet, they are continued by the Monte Nerone (5014 feet), Monte Catria (5590), and Monte Maggio to the Monte Penino near Nocera (5169 feet), and thence to the Monte della Sibilla, at the source of the Nar or Nera, which attains an elevation of 7663 feet. Pro- ceeding from thence southwards, we find in succession the Monte Vettore (8134 feet), the Pizzo di Sevo (7945 feet), and the two great mountain masses

of the Monte Corno, commonly called the Gran Sasso d'Italia, the most lofty of all the Apennines, attaining to a height of 9522 feet, and the Monte della Majella, but little inferior, its highest summit measuring 9084 feet. Farther south than this the range decreases in altitude, and no very lofty summits are found till we come to the group of Monte Matese, in Samnium (6660 feet), which according to the division here adopted belongs to Southern Italy. But

besides the lofty central masses above enumerated, two other peaks deserve mention which, though outliers from the main range, and separated from it by valleys of con- siderable extent, rise to a height exceeding that of all but a few of the points already cited. These are the Monte Terminillo, near Leonessa (7278 feet), and the Monte Velino near the Lake Fucino, rising to 8192 feet, both of which are covered with snow from November till May, and being within sight of Rome are familiar objects to most visitors to Italy. But though the Apennines of Central Italy, viewed in the mass, may be considered as thus con- stituting a continuous range, they are far from having the definite arrangement which characterizes their northern extension from the neighbourhood of Genoa to the Adriatic. Instead of presenting, like the Alps and the northern Apennines, a definite central ridge, with transverse valleys leading down from it on both sides, the central Apennines in reality constitute a mountain mass of very considerable breadth, composed of a number of minor ranges and groups of mountains, which though very broken and irregular preserve a generally parallel direction, and are separated by upland valleys, some of them of considerable extent as well as considerable elevation above the sea. Such is the basin of the Lake Fucino, situated in the very centre of the whole mass, and almost exactly midway between the two seas, but at an elevation of 2180 feet above them; while the upper valley of the Aterno, in which Aquila is situated, is not less than 2380 feet above the level of the sea. Still more elevated is the valley of the Gizio (a tributary of the Aterno), of which Sulmona is the chief town, and which communicates with the upper valley of the Sangro by a level plain called the Piano di Cinqua Miglia, at an elevation of not less than 4298

feet, regarded as the most wintry spot in Italy. Nor do the highest summits ever form a continuous ridge of great altitude for any considerable distance ; they are rather a series of groups separated by intervals of very inferior elevation forming natural passes across the range, and broken in some places (as is the case in almost all limestone countries) by the waters from the upland valleys turning suddenly at right angles, and breaking through the moun- tain ranges which bound them. Thus the two loftiest groups of all, the Gran Sasso and the Majella, are separated by the deep valley of the Aterno, while the Tronto, in like manner, breaks through the range between Monte Vettore and the Pizzo di Sevo. This constitution of the great mass of the central Apennines has in all ages exer- cised an important influence upon the character of this portion of Italy, which may be considered as divided by nature into two great regions, a cold and barren upland country, bordered on both sides by rich and fertile tracts, enjoying a warm but temperate climate.

The district west of the Apennines, extending from the foot of the mountains to the sea, which constitutes a region of great beauty and fertility, though inferior in productive- ness to northern Italy, may be considered as coinciding in . @ general way with the countries so familiar to all students of ancient history as Etruria and Latium. In modern times (until the recent union of all Italy) they were comprised in Tuscany and the southern Papal States. The northern part of Tuscany is indeed occupied to a considerable extent by the underfalls and offshoots of the Apennines, which, besides the ordinary slopes and spurs of the main range that constitutes its northern frontier towards the plain of the Po, throw off several outlying ranges or groups, which attain to a very considerable elevation. Of these the most remarkable is the group between the valleys of the Serchio and the Magra, commonly known as the mountains of Carrara, from the celebrated marble quarries in the vicinity of that city. Two of the summits of this group, the Pizzo

d'Uccello and the Pania della Croce, attain to 6155 and 6100 feet. Another lateral range, the Prato Magno, which branches off from the central ehain at the Monte Falterona, and separates the upper valley of the Arno from its second basin, rises to 5188 feet; while a similar branch, called the Alpe della Catenaja, of inferior elevation, divides the upper course of the Arno from that of the Tiber.

The rest of this tract is for the most part a hilly, broken country, but does not in general rise into anything like mountains, with the exception of the Monte Amiata, near Radicofani, a lofty isolated mass of volcanic origin, which attains to a height of 5650 feet. South of this the country between the frontier of Tuscany and the Tiber is in great part of volcanic origin, forming hills of no great elevation, with distinct crater-shaped basins, in several instances occupied by small lakes (the Lake of Bolsena, Lake of Vico, and Lake of Bracciano); and this volcanic tract extends across the Campagna of Rome, till it rises again in the lofty group of the Alban hills, the highest summit of which, the Monte Cavo, is 3160 feet above the sea. In this part the Apennines are separated from the sea by a space of only about 30 miles in width, occupied by the undulating volcanic plain of the Roman Campagna, from which the mountains rise in a wall-like barrier, of which the highest point, the Monte Gennaro, attains to a height of 4165 feet. South of Palestrina again, the main mass of the Apennines throws off another lateral mass, known in ancient times as the Volscian mountains (now called the Monti Lepini), separated from the central ranges by the broad valley of the Sacco, a tributary of the Liris or Garigliano, and forming a large and rugged mountain mass, nearly 5000 feet in height, which descends to the sea at Terracina, and between that point and the mouth of the Liris throws out several rugged mountain headlands, which may be con- sidered as constituting the natural boundary between Latium and Campania, and consequently the natural limit of Central Italy. But besides these offshoots of the Apennines there are in this part of Central Italy several detached mountains, rising almost like islands on the sea-shore, of which the two most remarkable are the Monte Argentaro on the coast of Tuscany near Orbetello (2087 feet high) and the Monte Circello (1771 feet) at the angle of the Pontine

Marshes, by the whole breadth of which it is separated from the Volscian Apennines.

The two valleys of the Arno and the Tiber (called in Italian Tevere) may be considered as furnishing the key to the geography of all this portion of Italy west of the Apennines. 'The Arno, which has its source in the Monte Falterona, one of the most elevated summits of the main chain of the Tuscan Apennines, flows at first nearly south till in the neighbourhood of Arezzo it turns abruptly to the north-west, and pursues that course as far as Pontassieve, where it again makes a sudden bend to the west, and pursues a westerly course from thence to the sea, passing through the two celebrated cities of Florence and Pisa. Its principal tributary is the Sieve, which joins it at Pontassieve, bringing down the waters of the Val di Mugello. The Elza and the Era, which join it on its right bank, descending from the hills near Siena and Volterra, are inconsiderable streams; and the Serchio, which flows from the territory of Lucca and the Alpi Apuani, and formerly joined the Arno a few miles from its mouth, now enters the sea by a separate channel. The most consider- able rivers of Tuscany south of the Arno are the Cecina, which flows through the plain below Volterra, and the Ombrone, which rises in the hills near Siena, and enters the sea about 12 miles below Grosseto,

The Tiber, a much more important river than the Arno, and the largest in Italy with the exception of the Po, rises in the Apennines, about 20 miles east of the source of

the Arno, and flows nearly south by Borgo S. Sepolcro and Citta di Castello, then between Perugia and Todi to Orte, just below which it receives the waters of the Nera. Tts tributaries in the upper part of its course are of little importance, but the Nera, which rises in the lofty group of the Monte della Sibilla, is a very considerable stream, and brings with it the waters of the Velino (with its tributaries the Turano and the Salto), which joins it a few miles below its celebrated waterfallat Terni. The Teverone or Anio, which enters the Tiber a few miles above Rome, is a very inferior stream to the Nera, but brings

down a considerable body of water from the mountains above Subiaco. It is a singular fact in the geography of Central Italy that the valley of the Tiber and that of the Arno are in some measure connected by that of the Chiana, a level and marshy tract, the waters from which flow partly into the Arno and partly into the Tiber.

The eastern declivity of the central Apennines towards the Adriatic is far less interesting and varied than the western. The central range here approaches (as has been already pointed out) much nearer to the sea, and hence, with few exceptions, the rivers that flow from it have but short courses and are of comparatively little importance. They may be briefly enumerated, proceeding from Rimini southwards :—(1) the Foglia ; (2) the Metauro, of historical celebrity, and affording access to one of the most frequented passes of the Apennines; (3) the Esino; (4) the Potenza; (5) the Chienti; (6) the Aso; (7) the Tronto; (8) the Vomano; (9) the Aterno; (10) the Sangro; (11) the Trigno, which forms the boundary of the southernmost province of the Abruzzi, and may therefore be taken as the limit of Central Italy. Much the most considerable of these rivers is the Aterno (called also the Pescara, from the city of that name at its mouth); this has its sources in the Apennines above Aquila, and flows through a broad upland valley in a south-east direction for above 40 miles till it approaches Popoli, when it turns abruptly to the north-east, and cuts directly through the main chain of the Apennines between the range of the Gran Sasso and that of the Majella, descending with a very rapid course till it enters the sea at Pescara.

The whole of this portion of Central Italy, between the Apennines and the sea, is a hilly country, much broken and cut up by the torrents from the mountains, but fertile, especially in fruit-trees, olives, and vines ; and hence it has been, both in ancient and modern times, a populous district, containing many small towns though no great cities. Its chief disadvantage is the absence of ports, the coast preserving an almost unbroken straight line, with the single exception of Ancona, which has in all ages been the al port worthy of the name on the eastern coast of Central

taly.

3. Southern Italy.—The great central mass of the Apennines, which has held its course throughout Central Italy, with a general direction from north-west to south- east, may be considered as continued in the same direction for about 100 miles farther, from the basin-shaped group of the Monti del Matese (which rises to the height of 6660 feet) to the neighbourhood of Potenza, in the heart of the province of Basilicata, corresponding nearly to the ancient Lucania. The whole of the district known in ancient times as Samnium (a part of which still retains the name of Sannio, though now officially designated as the province of Molise) is occupied by an irregular mass of mountains, of mueh inferior height to those of Central Italy, and having still less of the character of a regular range, being broken up Into a number of groups or masses, intersected by rivers, which have for the most part a very tortuous course. This mountainous tract, which has an average breadth of froma 50 to 60 miles, is bounded on the west

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by the plain of Campania, now called the Terra di Lavoro, and on the east by the much broader and more extensive tract of Apulia or Puglia, composed partly of level plains, but for the most part of undulating downs of very slight elevation, and contrasting strongly with the mountain ranges of the Apennines, which rise abruptly above them. The central mass of the mountains, however, throws out two outlying ranges, the one to the west, which separates the Bay of Naples from that of Salerno, and culminates in the Monte St Angelo above Castellamare (4720 feet), while the detached volcanic cone of Vesuvius, which rises to near 4000 feet, is isolated from the neighbouring mountains by an intervening strip of plain. On the east side in like manner the Monte Gargano, a detached lime- stone mass which rises to the height of 5120 feet, and projects in a bold spur-like promontory into the Adriatic, forming the only break in the otherwise uniform coast-line of Italy on that sea, though separated from the great body of the

Apennines by a considerable interval of low country, may be considered as merely an outlier from the central mass.

From the neighbourhood of Potenza, the main ridge of the Apennines is continued by the Monti della Maddalena in a direction nearly due south, so that it approaches within a short distance of the Gulf of Policastro, from wheuce it is carried on as far as the Monte Pollino, the last of the lofty summits of the Apennine chain, which exceeds 7000 feet in height. The range is, however, continued through the whole of the province now called Calabria, to the southern extremity or "toe" of Italy, but presents in this part a very much altered character, the broken limestone range which is the true continuation of the chain as far as the neighbourhood of Nicastro and Catanzaro, and keeps close to the west coast, being flanked on the east by a great mass of granitic mountains, rising to a height of about 6000 feet, and covered with vast forests, from which it derives the name of LaSila. A similar mass, but separated from the preceding by a low neck of Tertiary hills, fills up the whole of the peninsular extremity of Italy from Squillace to Reggio. Its highest point, called Aspromonte, attains toa height of 4300 feet.

While the rugged and mountainous district of Calabria, extending nearly due south for a distance of more than 150 miles, thus derives its character and configuration almost wholly from the range of the Apennines, by which it is traversed from end to end, the case is wholly different with the long spur-like promontory which projects towards the east to Brindisi and Otranto. 'The older maps of Italy, indeed, with one accord represent the Apennines as bifurcating somewhere in the neighbourhood of Venosa, and sending off an arm of the main range through this eastern district, similar to that which traverses Calabria. But this is entirely erroneous ; the whole of the district in question is merely a continuation of the low tract of Apulia, consisting of undulating downs and low bare hills of very moderate elevation, with a dry calcareous soil of Tertiary origin. The Monte Voltore, which rises in the neighbour- hood of Melfi and Venosa to a height of 4357 feet, is of volcanic origin, and in great measure detached from the adjoining mass of the Apennines. But eastward from this nothing like a mountain is to be found, the ranges of low bare hills called the Murgie of Gravina and

Altamura gradually sinking into the still more moderate level of those which constitute the peninsular tract that extends between Brindisi and Taranto as far as the Cape of Sta Maria di Leuca, the south-east extremity of Italy, Itis this projecting tract, which may be termed the "heel" or "spur" of Southern Italy, that, in conjunction with the great pro- montory of Calabria, forms the deep bay called the Gulf of Taranto, about 70 miles in width, and somewhat greater

depth, which receives a number of streams that descend from the central mass of the Apennines.

The rivers of Southern Italy are none of them of any great importance. The Liris or Garigliano, which has its source in the central Apennines above Sora, not far from the Lake Fucino, and enters the Gulf of Gaeta about 10 miles east of the city of that name, brings down a con- siderable body of water; as does also the Volturno, which rises in the mountains between Castel di Sangro and Agnone, flows past Isernia, Venafro, and Capua, and enters the sea about 15 miles from the mouth of the Garigliano. About 16 miles above Capua it receives the Calore, which flows by Benevento, and is a tributary of some importance. The Silarus or Sele, which enters the Gulf of Salerno.a few miles below the ruins of Peestum, is the only other river of consideration on the western coast of Southern Italy. Below this the watershed of the Apennines is too near to the sea on that side to allow of the formation of any streams of importance. Hence the rivers that flow in the opposite direction into the Adriatic and the Gulf of Taranto have much longer courses, and are of more considerable volume and magnitude, though all of them partaking of the character of mountain torrents, rushing down with great violence in winter and after storms, but dwindling into scauty streams in the summer, which hold a winding and sluggish course through the great plains of Apulia. Proceeding south from the Trigno, which has been already mentioned as constituting the limit of Central Italy, we find (1) the Biferno and (2) the Fortore, both of them rising in the mountains of Samnium, and flowing into the Adriatic west of Monte Gargano; (3) the Cervaro, south of the great promontory; and

(4) the Ofanto, familiar to all scholars as the Aufidus of Horace, whose description of it is characteristic of almost all the rivers of southern Italy, of which it may be taken as the typical representative. It rises about 15 miles west of Conza, and only about 25 miles from the Gulf of Salerno, so that it is frequently (though erroneously) described as traversing the whole range of the Apennines. In its lower course it flows near Canosa and traverses the celebrated battlefield of Cannz, (5) The Bradano, which rises near Venosa, almost at the foot of Monte Voltore, flows towards the south-east into the Gulf of Taranto, as do the Basento, the Agri, and the Sinno, all of which descend from the central chain of the Apennines south of Potenza, and water the extensive plains between the mountains and the shores of the gulf. The Crati, which flows from Cosenza northwards, and then turns abruptly eastward to enter the same gulf, is the only stream worthy of notice in the rugged peninsula of Calabria; while the long extent of arid limestone hills projecting eastwards to Capo di Leuca does not give rise to anything more than a merestreamlet, from the mouth of the Ofanto to the south-eastern extremity of Italy.

Lakes.—The only important lakes in Italy are those at the foot of the Alps, formed by the expansion of the tribu- taries of the Po, which, after descending from the mountain valleys-in which they are at first confined, spread out into considerable sheets of water before travers- ing the extensive plain of Northern Italy. They have been already noticed in connexion with the rivers by which they are formed, but may be again enumerated in order of suc- cession. They are, proceeding from west to east, (1)! the Lago d'Orta, (2) the Lago Maggiore, (3) the Lago di Lugano, (4) the Lago di Como, (5) the Lago d'Iseo, (6) the Lago d'Idro, and (7) the Lago di Garda. Of these the last named is considerably the largest, covering a superficial area of about 140 English square miles. It is about 38 miles long by 12 broad at its southern extremity ; while the Lago Maggiore, notwithstanding its name, though considerably exceeding it in length (42 miles), falls

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of the same name, of very trifling extent.

materially below it in superficial extent. They are all of great depth,—the Lago Maggiore having in one part a depth of 2600 feet, while that of Como attains to 1925 feet. Of a wholly different character is the Lago di Varese, between the Lago Maggiore and that of Lugano, which is a mere shallow expanse of water, surrounded by hills of very moderate elevation. Two other small lakes in the same neighbourhood, as well as those of Erba and Pusiano, between Como and Lecco, are of a similar char- acter, and scarcely worthy of notice.

The lakes of Central Italy, which are comparatively of trifling dimensions, belong to a wholly different class, The most important of these, the Lacus Fucinus of the ancients, now called the Lago di Celano, which is situated almost exactly in the centre of the peninsula, occupies (as

| has been already pointed out) a basin of considerable’

extent, surrounded on all sides by mountains, and without any natural outlet, at an elevation of more than 2000 feet. above the sea. Its waters have of late years been in great part carried off by an artificial channel, and more than half its surface laid bare. Next in size is the Lago Trasimeno, often called the Lago di Perugia, so celebrated in Roman history ; it isa broad expanse of shallow waters, surrounded only by low hills, but about 30 milcs in circumference. The neighbouring lake of Chiusi is of similar character, but much smailer dimensions. All the other lakes of Central Italy, which are scattered through the volcanic districts west of the Apennines, are of a wholly different formation, and occupy deep cup-shaped hollows, which have undoubtedly at one time formed the craters of extinct voleanoes. Such is the Lago di Bolsena, near the city of the same name, which is an extensive sheet of water, as well as the much smaller Lago di Vico (the Ciminian lake of ancient writers) and the Lago di Bracciano, nearer Rome, while again to the south of Rome the well known lakes of Albano and Nemi have a similar origin.

The only lake properly so called in Southern Italy is the Lago del Matese, in the heart of the mountain group The so-called lakes on the coast of the Adriatic north and south of the promontory of Gargano are in fact mere brackish lagoons communicating with the sea.

Tslands.—The three great islands of Sicily, Sardinia, and Corsica are so closely connected with Italy, both by geographical position and community of language, that they are frequently spoken of as the Italian Islands, but they will best be considered separately, and we shall here confine our attention to the smaller islands that lie scattered in the Mediterranean within sight of the coasts of Italy. Of these by much the most considerable is that of Elba, situated on the west coast of Central Italy, about 50 miles south of Leghorn, and separated from the main-land at Piombino by a strait of only about 6 miles in width. North of this, and just about midway between Corsica and Tuscany, is the small island of Capraja, steep and rocky, and only 44 miles long, but with a secure port ; Gorgona, about 25 miles farther north, is still smaller, and is a mere rock, inhabited only by a few fishermen. South of Elba are the equally insignificant islets of Pianosa and Monte Cristo, while the more considerable island of Giglio lies much nearer the mainland, immediately opposite the remarkable mountain promontory of Monte Argentaro, itself almost an island. Of a wholly different character are the islands that are found farther south in the Tyrrhenian Sea. Of these Ischia and Procida, both of them situated almost close to the northern headland of the Bay of Naples, are entirely of volcanic origin, as is the case also with the more distant group of the Ponza Islands. These are three in number—Ponza, Palmaruola, and Zannone ; while Vandotena (also of volcanic formation) is

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about midway between Ponza and Ischia. The island of Capri, on the other hand, which is just opposite to the southern promontory of the Bay of Naples, is a precipitous limestone rock. ‘The A®olian or Lipari Islands, a remark- able volcanic group, belong rather to Sicily than to Italy, though Stromboli, the most easterly of them, is about equidistant

from Sicily and fromi the mainland. The islauds to the south of Sicily—Malta and Gozo, and Pan- tellaria—in like manner do not fall within the scope of the present article. Malta indeed has very little natural con- nexion with Sicily, and none with the continent of Italy.

The Italian coast of the Adriatic presents a great contrast to its opposite shores, for while the coast of Dalmatia is pordered by a succession of islands, great and small, the long and uniform coast-line of Italy from Otranto to Rimini presents not a single adjacent island ; and the small outlying group of the Tremiti Islands (north of the Monte Gargano and about 15 miles from the mainland) alone breaks the monotony of this part of the Adriatic.

Climate and Natural Productions.

The geographical position of Italy, extending from about 46° to 38° N. lat., naturally renders it one of the hottest countries in Europe. But the effect of its southern latitude is toa great extent tempered by its peninsular character, bounded as it is on both sides by seas of considerable exteut, as well as by the great range of the Alps with its snows and glaciers to the north. Great differences also exist with regard to climate between Northern and Southern Italy, due in great part to other circumstances as well as to difference of latitude. Thus the great plain of Northern Italy is chilled by the cold winds from the Alps, while the damp warm winds from the Mediterranean are to a great extent intercepted by the Ligurian Apennines. Hence this part of the country has a cold winter climate, so that the thermometer descends as low as 10° Fahr., and the mean winter temperature of Turin is actually lower than that of Copenhagen. Throughout the region north of the Apennines no plants will thrive which cannot stand occa- sional severe frosts in winter, so that not only oranges and lemons but even the olive tree cannot be grown, except in specially favoured situations. On the other hand the strip of coast between the Apennines and the sea, known as the Riviera of Genoa, is not only extremely favourable to the growth of olives, but produces oranges and lemons in abundance, while even the aloe, the cactus, and the palm flourish in many places. Indeed, the vegetation of parts of this favoured district has a more southern

character than is met with again till below Terracina towards the south. The great plain of Lombardy, however, produces rice in large quantities, as well as Indian corn, millet, and wheat ; while the mountain slopes both of the Alps and Apennines are covered with vast forests of chestnuts, and the lower hills are clothed with vineyards, which furnish abundance of wines, many of them of excellent quality. Silk is also an important article of produce both in the north of Italy and in Tuscany, and mulberries are largely planted with a view to its production.

Central Italy also presents striking differences of climate and temperature according to the greater or less proximity to the mountains. Thus the greater part of Tuscany, and the provinces from thence to Rome, enjoy a mild winter climate, and are well adapted to the growth of mulberries and olives as well as vines, but it is not till after passing Terracina, in proceeding along the western coast towards the south, that the vegetation of Southern Italy develops itself in its full luxuriance. Even in the central parts of Tuscany, however, the climate is very much affected by the neighbouring mountains, and the increasing elevation of the Apennines as they proceed south naturally produces

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a corresponding effect upon the temperature. But it is when we reach the central range of the Apennines that we find the coldest districts of Italy. Inall the upland valleys of the Abrazzi and of Sannio, snow begins to fall early in November, and heavy storms occur often as late as May ; whole communities are shut ont for months from any inter- course with their neighbours, and some villages are so long buried in‘snow that regular passages are made between the different houses for the sake of communication among the inhabitants. The district extending from the south-east of Lake Fucino to the Piano di Cinquemiglia, and enclosing the upper basin of the Sangro and the small lake of Scanno, is the coldest and most bleak part of Italy south of the Alps. Heavy falls of snow in June are not uncommon, and it is only for a short time towards

the end of July that the nights are totally exempt from light frosts. Yet less than 40 miles east of this district, and even more to the north, we find the olive, the fig-tree, and the orange thriving luxuriantly on the shores of the Adriatic from Ortona to Vasto. In the same way, whilst in the plains and hills round Naples suow is rarely seen, and never remains long, and the thermometer seldom descends to thie freezing point, 20 miles east from it in the fertilo valley of Avellino, of no great elevation, but encircled by high nlountains, light frosts are not uncommon as late as June ; and 18 miles farther east, in the elevated region of S. Angelo de' Lombardi and Bisaccia, the inhabitants are always warmly clad, and vines grow with difficulty and only in sheltered places. But nowhere are these contrasts so striking as in Calabria. The shores, especially on the Tyrrhenian Sea, present almost a continued grove of olive, orange, lemon, and citron trees, which attain a size unknown in the north of Italy. The sugar-cane flourishes, the cotton- plant ripens to perfection, date-trees are seen in the gardens, the rocks are clothed with the prickly-pear or Indian fig, the enclosures of the fields are formed by aloes and sometimes pomegranates, the liquorice-root grows wild, and the mastic, the myrtle, and many varieties of oleander and cistus form the underwood of the natural forests of arbutus and evergreen oak. If we turn inland but 5 or 6 miles from the shore, and often even less, the scene changes. High districts covered with oaks and chestnuts succeed to this almost tropical vegetation ; a little higher up and we reach the elevated regions of the Pollino and the Sila, covered with firs and pines, and affording rich pastures even in the midst of summer, when heavy dews and light frosts succeed each other in July and August, and snow begins to appear at the end of September or early in October. Along the shores of the Adriatic, which are exposed to the north-east winds, blowing coldly from over the Albanian mountains, delicate plants do not thrive so well in general as under the same latitude along the shores of the Tyrrhenian Sea.

Southern Italy indeed has in general a very differ- ent climate from the northern portion of the kingdom ; and, though large tracts are still occupied by rugged mountains of sufficient elevation to retain the snow for a considerable part of the year, the districts adjoining the sea enjoy

a climate similar to that of Greece and the southern provinces of Spain. Unfortunately several of these fertile tracts suffer severely from malaria, and especially the great plain adjoining the Gulf of Tarentum, which in the early ages of history was surrounded by a girdle of Greek cities, —some of which attained to almost nnexampled prosperity, — has for centuries past been given up to almost complete desolation. 3

It is remarkable that, of the vegetable producticns of Italy, many of those which are at the present day among the first to attract the attention of the visitor, and might

be thought characteristic of the country, are of compara- XIIL — 56

tively late introduction, and were wholly unknown in ancient times. 'The olive indeed in all ages clothed the hills of a large part of the country; but the orange and lemon, which now constitute so prominent a feature in the warmer districts of the peninsula, are a late importation from the East, while the cactus or Indian fig and the aloe, both of them so conspicuous on the shores of southern Italy, as well as of the Riviera of Genoa, are of Mexican origin, and consequently could not have been introduced earlier than the 16th century. 'The same remark applies to the maize or Indian corn, which is now so extensively cultivated in every part of Italy. Many botanists are even of opinion that the sweet chestnut, which now constitutes so large a part of the forests that clothe the sides both of the Alps and the Apennines, and in some districts supplies the chief food of the inhabitants, is not originally of Italian growth ; it is certain at least that it had not attained in ancient times to anything like the extension and importance which it possesses at the present day.

It may have been gathered from the preceding sketch of the physical conformation and the climate of Italy that it is difficult to take a general view of the state of its agri- culture. The cultivation of Lombardy differs from that of Calabria as much as that of Massachusetts does from that of Carolina. All that can be done therefore in this general description is to notice those results of

agriculture which yield food, drink, or clothing to its inhabitants, or which form the basis of manufacturing industry or the rudi- ments of foreign commerce, 'The cereals form, as else- where in Europe, the chief aliment of the inhabitants ; in Italy, however, the lower classes in many parts subsist much on maize and beans, which require little preparation to render them fit for food. In some of the southern provinces wheat is made use of by the same class, both in the form of bread and as macaroni, which is manipu- lated with great facility. Wheat and maize are, on the average of years, about equal to the consumption, but little can be spared for exportation; and in many of the ports depdts of foreign wheat are kept to meet the variations of seasons, or to be used as articles of commerce with other countries.

As Italy produces abundance of wine, and consequently needs neither beer nor grain-spirits, no barley is needed for these drinks, and scarcely any is cultivated. Oats are but little grown, but beans of various kinds are produced in abundance. Rye, the common bread-corn of the far greater portion of Europe, is only raised in a few spots in the very northernmost parts of Italy, where it is made irito bread for the poor; whilst those of the higher classes there, as well as throughout the whole peninsula in the cities, make use of wheaten bread. Rice grows in many parts, in fact wherever there is a sufficiency of water to insure a good produce, at such a distance from towns as not to be injurious to the health of the inhabitants. A great variety of lupines are used as food, especially in the soups. In some parts of the mountainous regions chestnuts are a sub- stitute for corn, and even form the principal food of the population. Fruits are plentifully used, particularly figs, grapes, and melons, as food; whilst the cheapness of onions, garlic, tomatos or love-apples, and capsicums renders them valuable as condiments. The potato, which is in such common use in other parts of Europe, has been but partially introduced into Italy ; and, where it is culti- vated, it occupies a very small proportion of the soil. Lettuces, asparagus, endive, artichokes, and several kinds of turnips and of carrots are grown everywhere,

Animal food is far from being extensively used. The oxen yield in some parts excellent in others very indifferent meat, The mutton is neither

good nor abundant, but has been much improved of late years. Swine furnish a

plentiful supply during the winter months; they are also prepared as bacon or hams, and above all as sausages, the fame of which has reached England under the name of the city of Bologna, where they were early and extensively prepared, ‘The large dairy farms in Lombardy also fur- nish great quantities of cheese of very: superior quality, especially that known by the name of Parmesan. The fisheries contribute largely to the supply of food in Italy, though, from the number of fasts countenanced by the Catholic Church, not enough for the consumption ; and the deficiency is procured by commerce with the English, French, and Americans, who convey to the sea- ports salted cod-fish from the banks of Newfoundland. ‘The native fisheries on the coast give much occupation ; the most considerable are those for the tunny, a very large fish, and for the anchovy, a very small one, ‘These are con- ducted upon a large scale by joint-stock companies. The lakes and the rivers also yield some, though not a great

proportion, of that kind of food which ecclesiastical restric-

tions render indispensable.

The sugar-cane is not cultivated in the south of Italy, as it is found that in point of strength, as well as of cost, the sugar made from it does not succeed in competition with that imported from the West Indies.

The products of agriculture are sufficient for the clothing of all its inhabitants ; for, though wool is in general neither good nor plentiful, hemp and flax are grown everywhere, and are manufactured at home; and, from the nature of the climate, linen can be substituted for woollen dress during most of the months of the year. Some cotton is grown in the southern divisions of Italy, but not sufficient to furnish materials for their inconsiderable manufactures of that article.

The chief product of Italian agriculture is silk. It is produced in every part, and much of is it converted into articles of dress or of furniture, where it is collected ; but the chief production of it is in the Neapolitan provinces and Lombardy, whence the looms of England, Austria, Russia, and Germany are supplied. The value of this commodity exceeds that of all the other productions of Italy which are exported to foreign countries. The manu- facture has of late years made great progress, which it is still steadily maintaining, and the great increase which has taken place in the propagation of the mulberry tree has, within the last fifty years, increased the quantity of raw silk to an extent that had never before been dreamed of.

Another very important Italian product, which is partly used as food, partly employed in home manufactures, and extensively exported as an article of foreign commerce, is the oil of the olive tree, It is used as a substitute for butter in the south, and even to a great degree supplies the place of milk, which is comparatively little used in the peninsula. It is exported to England for use with various fabrics, and as a table luxury. The planting and watching costs but little labour or expense, and in a few years the income more than repays the labour. The best olive oil is produced near Genoa, in Lucca, in Tuscany, and in Calabria; but it is plentiful throughout the whole of Italy, except in Lombardy and in Piedmont.

The wines of Italy are not very highly valued in other countries, and almost the whole that is produced is con- sumed at home. Yet there is little doubt that with more care in the culture and preparation. they might rival those of the best parts of Europe. The vines are not so much grown in vineyards as in the hedge-rows,—a system which doubtless injures the quality of the wine. In the southern parts, however, where the vines are grown in low vineyards as in France, the wines are of higher quality.

The mineral productions of Italy are of comparatively small value ; but the copper mines of Tuscany, which were

extensively wrought in ancient times, are still worked to a considerable extent. The iron of Elba, so celebrated in antiquity, still bears a high character for its excellent quality, but the quantity produced is limited. Many marbles of superior quality are found in different parts of

the Apennines, of which the white statuary marble of

Carrara is the most celebrated. Alabaster also abounds in Tuscany. Coal is wanting in all parts of the peninsula, which must ever be a great drawback to the prosperity of Italy.

The geology of Italy is mainly dependent upon that of the APENNINES (¢.v.). On each side of that great chain, which, as has been already stated, with its ramifications and underfalls, fills up the greater part of the peninsula, are found extensive Tertiary deposits, sometimes, as in Tuscany, the Monferrat, &c., forming a broken, hilly country, at others spreading into broad plains or undulat- ing downs, such as the Tavoliere of Puglia, and the tract that forms the spur of Italy from Bari to Otranto.

But besides these, and leaving out of account the islands, the Italian peninsula presents four distinct volcanic dis- tricts. In three of them the volcanoes are entirely extinct, while the fourth is still in great activity.

(1) The Euganean hills form a small group extending for about 10 miles from the neighbourhood of Padua to Este, and separated from the lower offshoots of the Alps by a portion of the wide plain of the Padovano. Monte Venda, their highest peak, is 1806 feet high.

(2) The Roman district, the largest of the four, extends from the hills of Albano to the frontier of Tuscany, and from the lower slopes of the Apennines to the Tyrrhenian Sea. It may be divided into three groups: —the Monti Albani, the highest of which, Monte Cavo, 3160 fect, is the ancient Mous Albanus, on the summit of which stood the temple of Jupiter Latialis, where the assemblies of the cities forming the Latin confederation were held; the Monti Cimini, which extend from the valley of the Tiber to the neighbourhood of Civita Vecchia, and attain at their culminating point an elevation of more than 3000 feet ; and the

mountains of Radicofani and Monte Amiata, the latter of which is 5650 feet high. The lakes of Bolsena (Vulsiniensis), of Bracciano (Sabatinus), of Vico (Ciminus), of Albano (Albanus), of Nemi (Nemorensis), and other smaller ones belong to this district; while between its south-west extremity and Monte Circello the Pontine Marshes form a broad strip of alluvial soil infested by malaria.

(3) The volcanic region of Terra di Lavoro is separated by the Volscian mountains from the Roman district. It may be also divided into three groups. Of Roccamonfina, at the north-north-west end of the Campanian Plain, the highest cone, called Montagna di Santa Croce, is 3200 feet. The Phlegreean Fields embrace all the country round Baise and Pozuoli and the adjoining islands. Monte Bar- baro (Gaurus), north-east of the site of Cumz, Monte 8. Nicola (Epomeus), 2610 feet, in Ischia, and Camaldoli, 1488 feet, west of Naples, are the highest cones. The lakes Averno (Avernus), Lucrino (Lucrinus), Fusaro (Palus Acherusia), and Agnano are within this group, which has shown activity in historical times. A stream of lava issued in 1198 from the crater of the Solfatara, which still con- tinues to exhale steam and noxious gases; the Lava dell' Arso came out of the north-east flank of Monte Epomeo in 1302 ; and Monte Nuovo, north-west of Pozzuoli, 440 feet high, was thrown up in three days in September 1538. Since its first historical eruption in 79 a.p., Vesuvius or Somma, which forms the third group, has been in constant activity, and repeated eruptions have taken place within the last few years. The Punta del Nasone, the highest point of Somma, is 3747 feet high, while the Punta del Palo, the

highest point of the brim of the crater of Vesuvius, variés sei with successive eruptions from 3856 to 4235 eet.

(4) The Apulian volcanic formation consists of the great mass of Monte Voltore, which rises at the west end of the plains of Apulia, on the frontier of Basilicata, and is sur- rounded by the Apennines on its south-west and north-west sides. Its highest peak, the Pizzuto di Melfi,

attains an elevation of 4357 feet. Within the widest crater there are the two small lakes of Monticchio and S. Michele.

‘In connexion with the volcanic districts we may mention Le Mofete, the Pools of Amsanctus (Amsancti Vallis), lying in a wooded valley south-east of Frigento, in the centre of Principato Ultra and described by Virgil (Znezd, vii. 563 ~71). The largest of the two is not more than 160 feet in circumference, and 7 feet deep. These pools emit noxious gases which, when wafted from the pools by the wind, en- danger animal life in the open air.

Ethnography and Ancient Geography.

The ethnography of ancient Italy is a very complicated and difficult subject, and notwithstanding the researches of modern scholars is still involved in much obscurity. The great beauty and fertility of tle country, as well as the charm of its climate, undoubtedly attracted from the earlicst ages successive swarms of invaders from the north, who sometimes drove out the previous occu- pants of the most favoured districts, at others reduced them to a state of serfdom, or settled down in the midst of them, until the two races gradually coalesced into one. Ancient writers all agreed in regard to the fact of the composite character of the population of Italy, and the diversity of races that were found within the limits of the peninsula. But unfortunately the tradi- tions they have transmitted to us are very various and conflicting, and probably in many instances founded on inadequate information, while the only safe test of the affinities of nations, derived from the comparison of their languages, is to a great extent deficient, from the fact that, with the single exception of Latin, all the idioms that pre- vailed in Italy in the earliest ages have disappeared, or are preserved only in a few scanty.and fragmentary inscriptions. Imperfect as are the means thus afforded to the philological student, they have been of late years diligently turned to account, especially by German scholars, and, when combined with the notices derived from ancient writers, may be con- sidered as having furnished some results that may be relied on with reasonable certainty.

Leaving aside for the present the populations of Northern Italy, which belong to a wholly different stock, the inhabi- tants of the peninsula may be regarded as belonging to three principal divisions. Of these the Messapians or Tapygians in the south may be considered as constituting one; while the different nations of Central Italy, the Umbrians, Oscans, Sabines, and Latins, may also be classed as belonging to one great family; and on the other hand the Etruscans in the west undoubtedly formed a nation apart, distinct from all others within the confines of Italy.

1. The Iapygians and @notrians.—It is certain that when the first Greek colonies in the 8th and 9th centuries B.c. established themselves in the extreme south of Italy, – they found the country in the possession of a people to whom they gave the name of Ginotrians,—a name which appears to have been somewhat vaguely applied by different writers so as to include a wider area or be restricted within narrower limits. But the peninsula which stretches east- ward towards Greece was inhabited by a people termed by the Greeks Messapians or Iapygians, whose relations to the Gnotrians are not very clearly intimated. It is unfor- tunately in this part of the country almost exclusively that

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the extant remains of the language have been found, and these consist of inscriptions of so brief and fragmentary a character as to afford a very imperfect basis for philological inferences. Such as they are, however, they seem to lead to the conclusion that the language spoken in this part of Italy was essentially distinct from the Oscan and Sabellian dialects of Central Italy; while at the same time they present sufficient analogies with the Latin on the one hand and the Greek on the other to show that they belonged to the same family with those two well-known languages. The results, therefore, of the recent examination of these long neglected documents appear distinctly to confirm the statements of ancient authors, according to which the inhabitants of the southern portion of the peninsula were a Pelasgic race,—a term used by them in a very vague and general manner, but usually employed to

designate the most ancient inhabitants both of Greece and Italy, who probably belonged to the same branch of the great Aryan race, The Pelasgic origin of the Cnotrians is not only asserted by the concurrent testimony of many ancient authors, but we are told that the native population of Southern Italy, who had been reduced to a state of serfdom analogous to that of the Penestz in Thessaly and the Helots in Laconia were still called Pelasgi. The evidence as to the Pelasgic origin of the Messapians or Iapygians is less definite ; but the mythical genealogies in which the earliest Greek authors embodied the received traditions concerning the relations of different tribes and nations all point to. the same conclusion; and they certainly regarded the neighbouring tribes of the Peucetians and Daunians, who occupied a part of the country subse- quently known as Apulia, as derived from the same stock. A strong confirmation of this view is found in the facility with which the inhabitants of these countries assimilated Greek customs and mauners, though the actual Greek colonies founded among them in historical times were comparatively few.

It must be observed that the name of Italians was at one time confined to the Cnotrians; indeed, according to Antiochus of Syracuse, the name of Italy was at first still more limited, being applied only to the southern portion of the peninsula now known as Calabria. But in the time of that historian, as well as of Thucydides, the names of CEnotria and Italia, which appear to have been at that period regarded as synonymous, had come to be extended so as to include the shore of the Tarentine Gulf as far as Metapontum and from thence across to the Gulfs of Laus and Posidonia on the Tyrrhenian Sea. It thus still comprised only the two provinces subsequently known as Lucania and Bruttium.

2. The tribes of Central Italy, from the Umbrians in the north to the Campanians in the south, are known by exist- ing remains of their languages to have spoken cognate dialects, presenting unquestionable affinities with eacli other, as well as with the earlier forms of the well-known language of the Latins. The differences, however, are still very considerable, and confirm the testimony of historical tradition, as preserved to us by ancient writers, in lead- ing us to divide them into

five separate groups, viz., the Umbrians, Sabines, Latins, Volscians, and Oscans, or as they are sometimes termed Sabellians, including the Samnites and Campanians, and the tribes (such as the Lucanians, Frentani, &c.) who are distinctly recorded to have emanated from the Samnites.

(1) The Umbrians, who occupied in historical times the eastern portion of the peninsula between Etruria and the Adriatic, were at an earlier period a much more powerful tation, and not only occupied the extensive tract subse- quently wrested from them by the Gauls, but extended their dominion from sea to sea, and held the greater part,

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if not the whole, of the territory afterwards possessed by the Etruscans, which is said to have been wrested by that people foot by foot from the Umbrians. The concurrent voice of the traditions preserved to us from antiquity points to the Umbrians as one of the most ancient nations of Italy ; and this is confirmed by the still extant remains of their language as shown in the celebrated inscriptions known as the Evcusinge TaBLEs (¢.v.), by far the most important monument of any of the early Italian lan- guages that has been transmitted to our time. The ela- borate examination of this valuable record in receut times may be considered as establishing clearly, on the one hand, the distinctness of the language from that of the neighbour- ing Etruscans, and, on the other, its close affinity with the Oscan, as spoken by the Sabellian tribes, and with the old Latin. The same researches tend to prove that the Umbrian dialect is the most ancient of these cognate tongues, and probably represents most nearly the original form of this branch of the great Indo-Teutonic family. They may be taken also as distinctly negativing the theory put forth by some ancient writers, and imaintained by several modern inquirers, that the Umbrians were a Celtic race.

Before the time when the Umbrians came into contact with the advancing power of Rome, their importance had greatly declined. The

Etruscans had conquered from them the whole territory west of the Apennines, from the foot of the mountains to the Tyrrhenian Sea, while the Senonian Gauls, who invaded the north of Italy in the 4th century B.C., permanently establislied themselves in possession of the fertile district between the Apennines and the Adriatic, extending from the neighbourhood of Ravenna to that of Ancona, which continued to be known until long afterwa" 1s as the " Ager Gallicus."

(2) The Sabines are a people of whom, familiar as is their name to the student of Roman history, we know very little. Their language is totally lost ; not a single inscrip- tion has been preserved to us, and it appears to have fallen into disuse at a comparatively early period. But even from the few scattered notices of Sabine words preserved by Roman grammarians it is evident that it possessed strong affinities with the Oscan and Umbrian; and the facility with which it passed into those of the neighbouring races is a strong reason against there being any marked diversity between them, The traditions recorded by ancient writers, untrustworthy as they are in detail, all concur in pointing to the same result,—that the Sabines were a very ancient people, who, at the earliest period of which any memory was preserved, were settled in the lofty mountain districts about the sources of the Aternus and the Velinus, from which they subsequently descended into the more fertile valleys about Reate, and at one time extended their dominion to within a few miles of Rome,—Cures, which was universally reckoned a Sabine city, being only 24 miles from the capital, while Nomentum and Eretum, still nearer Rome, are included by several writers as Sabine towns.

That a people inhabiting so rugged and inclement a dis- trict as that which is represented as the original abode of the Sabines should have spread themselves into the neighbouring regions, and established offshoots in some- what more favoured lands, is entirely in accordance with probability, and hence we can have no difficulty in accept- ing the tradition that the Picentes, or inhabitants of Picenum,—the fertile district along the coast of the Adriatic between that sea and the main ridge of the Apennines, from beyond Ancona to the river Matrino,—were of Sabine origin. The same thing is expressly asserted by Ovid

(himself a native of the district) of the Peligni, a tribe who occupied the upland valley of the Gizio, of which Sulmo was the capital; and there can be little doubt that the

same remark applied to three other tribes which were con-

tiguous to them, and always appear in the Roman history

in close political union with them :—the Marsi, who held the basin of the Lake Fucino and the surrounding mountains, and the Vestini and Marrucini, who extended from the confines of the Marsi and Peligni down to the Adriatic, each people occupying but a narrow strip on the north and south sides respectively of the Aternus.

(3) The Latins, who were destined in the end to become the rulers of all Italy, were in the first instance a compara- tively insignificant people, surrounded on all sides by more powerful nations. When we first become acquainted with their history they occupied only the tract extending from the Tiber on the north to the Volscian mountains and the Pontine Marshes on the south, and from the sea to the underfalls of the Apennines about Tibur (Tivoli) and

_ Preneste (Palestrina). It was not till a much later period that the name of Latium was extended so as to include the land of the Volscians and the Aurunci to the borders of Campania.

The ethnical relations of the Latins have been peculiarly confused by the conflicting statements of ancient authors, who endeavoured to connect them on the one hand with the vast floating mass of Greek traditions, and onthe other to add dignity to their origin by tracing them back to indigenous heroes or deities. Of their real origin as a people, or of the period when they first scttled in the fertile district where we find them established at the dawn of historical record, we have no trustworthy information. But from the manifold traditions preserved to us by Dionysius and other authors we may perhaps gather two facts. The statement that the Latins were derived (in part at least)

from a people who dwelt originally in the lofty mountains of the central Apennines, from whence they descended into the compara- tively fertile region between the mountains and the sea, probably represents in a general way correctly the course of their immigration; while the ideainvolved in several of tliese traditions, that the population of ancient Latium was in part derived from a Pelasgic origin, is confirmed by philological investigation of the Latin language, which may be considered as establishing the conclusion that it con- tained a considerable Pelasgic or old Greek clement, together with another portion which was common to the languages of the adjacent nations of Central Italy, the Umbrians, Oscans, &c, whom we are now considering. The co-existence of these two diverse elements in Latin was long ago pointed out by Niebulr, who attributed it to the conquest of one race by anothcr at a period anterior to all historical record. It may perhaps be more safely ascribed to the branching off of the Latin race from the parent stock at an earlier period than the other languages of Central Italy, while the differences that separated them from those of the early inhabitants of Greece were less marked than they afterwards became.

(4) The Volscians, who ultimately became merged in the more progressive Latin race, are undoubtedly represented to us in the early Roman history as a distinct people, not only politically separate from the Latin league, but having a distinct language of their own, which was neither Latin nor Oscan. The very scanty remains of it that have been preserved to us by inscriptions, while they confirm this statement, show at the same time remarkable analogies with the Umbrian, and thus tend to prove that the Volscians had occupied from a very early period the rugged mountain district where we find them established in his- torical times, and had retained their dialect with less change than their Sabellian and Oscan neighbours.

Of the Ayuians, who held a mountainous district adjoining that of the Volscians, we cannot be said to know anything beyond the fact that the two nations appear

argue their common descent. the Auquians and the petty tribe of the Hernicans are in early ages uniformly represented as distinct from the

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constantly in Roman history in alliance against the rising republic, from which, however, we are hardly entitled to But it is certain that both

Latins, though their territory was included in Latium, in the more extended sense of the term, while the native population had in the days of Livy almost wholly dis- appeared.

(5) The Oscans, or as the Greeks wrote the name Opicans (the native form was Opscans), were the possessors of the

greater part of Central Italy, as well as the southern part of

the peninsula, at the time that the Romans were carrying on their long protracted struggle for its dominion. At the same time it must be observed that it was never used in ancient times as a proper ethnic appellation. No tribe or nation of the name appears among those with which Rome was engaged in hostilities ; and, though the term Oscan is frequently used by ancient writers as applied to the language of Campania, there is no proof that it was ever employed by them in the more general sense adopted by modern scholars. It is, however, asa matter of convenience, a useful term to designate the nation or group of tribes composed of the Samnites, together with their descendants or offshoots, the Campanians, Lucanians, and Lruttians. The name Sabellians, used by the Roman poets, has been eniployed by some modern writers in much the same signification.

Of the nations comprised under this general appellation, much the most powerful were the Sammnztes, who occupied, not merely the small mountain district known in modern days as Sannio, but the whole region of the central Apennines from the upper valley of the Sagrus (Sangro) on

the north to that of the Aufidus on the south, while towards

the west they held the valleys of the Vulturnus and its various tributaries down to the point where they emerged into the fertile plain of Campania. The territory thus defined was, like that of the Sabines, a wholly inland district, but the Samnites were not long content with these narrow limits, and at an early period we find them carrying their arms and extending their settlements to the sea on both sides. The Frentani, who separated them from the Adriatic to the north, are distinctly termed by Strabo a Samnite people, and distinguished by him as such from the adjoining tribes of the Vestini and Marrucini. A more important extension was that towards the west, where they conquered the whole of the rich province of Campania, with the exception of the districts on the coast still retained by the Greek colonies. This conquest appears to have taken place as late at the 5th century B.c., but the same causes continued in operation, and during the course of the next half century the Samnites spread themselves through the whole of Lucania, and even carried their arms to the extremity of the southern peninsula. The Lucanians therefore, when they first became known to the Romans, were a Samnite people, though possessing a separate political organization. They at this time ruled over the whole country called by the Greeks Gnotria, down to the Sicilian Strait, and had reduced the previous inhabitants to a state of serfdom. Hence not long afterwards there arose in the southernmost part of the peninsula (the modern Calabria) an insurrection, represented as a mere casual outbreak of outlaws and fugitive slaves, but probably in reality a revolt of the native population who, under the name of Bruttians, established their independence, and retained possession of the whole of this wild and mountain- ous country, till they passed, together with the Lucanians, under the all-absorbing dominion of Rome.

It is more difficult to determine to what extent the Apulians had received an admixture of the Samnite

element, but there seems no doubt that the northern part of tlie province known to the Romans under that name had been occupied by

a Samnite population, while the tribes south of Mount Garganus—the Daunians and Peucetians—probably retained their nationality, though brought under subjection by the Samnites.

The monuments of the Oscan language, though not numerous, are more considerable than those of any other of the early Italian languages, except the Umbrian, and can for the most part be interpreted with reasonable certainty by the assistance of Latin. The most important of them are—(1) The Tabula Bantina, a bronze tablet found in the neighbourhood of Bantia (Banzi), on the borders of Apulia and Lucania, which relates to the municipal affairs of that town ; (2) the Cippus Abellanus, so called from its having been found near Abella in Campania, containing a treaty or agreement between the two neighbouring cities of Nola and Abella; and (3) a bronze tablet more recently discovered in the neighbourhood of Agnone in northern Samnium, recording the dedication of various sacred offer- ings. It is interesting to observe that these three specimens of the ancient dialect have been found in nearly the most distant quarters of the Oscan territory. None have as yet been found in Lucania or Bruttium, but we know from Festus that the Bruttians spoke Oscan. The language was thus at one time spoken through the whole of the southern peninsula. It doubtless ceased to be employed officially after the defeat of the Samnites and their allies in the Social War (90-88 B.c.); but the numerous minor inscriptions found rudely scratched or painted on the walls of Pompeii show that it continued in vernacular use until a much later period.

3. The Etruscans.—The obscure question of the origin and affinities of this remarkable people, and the attempts that have been made to interpret their language, have been fully discussed in the article Etruria. For the present we must be content to acquiesce in the conclusion, which is in accordance with all the statements of ancient authors, that they were a people wholly distinct from all others in Italy, while the researches of modern writers have been able to throw but very little light upon their language or ethnical affinities.

Northern Italy.—The ethnography of Northern Italy is much more simple than that of the central regions of the peninsula. At the time when the Romans first became acquainted with this part of Italy, the whole country was divided among three nations—the Gauls, the Ligurians, and the Veneti or Venetians.

(1) Of these the Gauls, who occupied the extensive plains in the valley of the Po and its tributaries, and had extended their dominion from the Alps to the Apennines and the Adriatic, were unquestionably intruders or im- migrants, who had crossed the Alps at a comparatively late period. The last emigration was that in which the Senones or Senonian Gauls established themselves, as has been already mentioned, in the coast land of Umbria between the Apennines and the Adriatic ; and this invasion was, according to the Roman historians, directly connected with the capture of Rome in 390 B.c. But the migration of the great mass of the Gauls who occupied the plains of Northern [taly undoubtedly took place at a much earlier period, and is assigned by Livy, our only authority on the subject, and who unfortunately does not mention the sources from which he derived his information, to the reign of the elder Tarquin at Rome (616-578 3,c.). Who were the people that inhabited this country previous to their irruption we do not know with certainty, but the districts adjoining the foot of the Alps on the west were undoubtedly in the hands of Ligurian tribes, and those in the south at the foot of the Apennines had probably been at one time

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occupied by the Umbrians, who had, however, previous to the Gaulish invasion been either driven out or reduced to subjection by the Etruscans. Of the character and extent of the Etruscan settlements in the region north of the Apennines we have very little information ; but the state- ments of ancient authors that they had at one time extended their dominion over a considerable part of Northern Italy, and founded large cities—among which Felsina (afterwards called Bononia) and Mantua are especially mentioned— have been confirmed of late years by the discovery of undoubted Etruscan remains at Bologna and other

places north of the Apennines (see Erruria). But it may well be doubted whether they ever formed the population of these countries ; it appears more probable that they were merely a race of more civilized settlers in the midst of the native tribes.

Of the Gaulish tribes whose names are known to us as established in the north of Italy at the time when they first came into collision with the Roman arms, the most important were the Insubres and Cenomani to the north of the Po, and the Boii and Lingones to the south of that river. Immediately west of the Ticinus, the Levi are expressly called by Livy a Ligurian tribe, while beyond the Adige to the east began the Veneti and Euganei, so that the territory thus occupied by the Gauls was far from comprising the whole tract subsequently known as Gallia Cisalpina.

(2) The Ligurians or Ligures—the Greek form of the name is Ligyes—are a people of whose origin and affinities we know absolutely nothing, but whom we find from the earliest times in possession of the rugged mountainous tract with which their name is inseparably connected. They were, when we first hear of them, considerably more extensively spread than at a later period,—the south coast of Gaul, subsequently included in the Roman province of that name, having been originally occupied by Ligurian tribes. Thus the Sallyes or Salluvii, in whose territory the Greek colony of Massilia was founded (about 600 3.c.), are distinctly described as a Ligurian tribe, and it may be considered certain that they held the whole country from the Maritime Alps to the Rhone, while Scylax represents them as intermixed with Iberian tribes in the tract from the mouths of the Rhone to the foot of the Pyrenees. But all authorities agree that they were a separate nationality, distinct alike from the Iberians and from the Gauls. No trace of their language has been preserved and all theories as to their origin must be purely conjectural.

At the time when they first came in contact with the Roman arms, the Ligurians not only occupied the coast of the Mediterranean and underfalls of the Maritime Alps and Apennines from the Var to the Magra, but the much more extensive tract comprising the northern

slopes of those mountains towards the valley of the Po. As has been already mentioned, it is probable that they were still more extensively spread in this direction prior to the irruption of the Gauls, but even in the historical period we find it distinctly stated that the Levi and Libici, tribes immedi ately west of the Ticinus, were of Ligurian race. The same thing is told us both by Strabo and Pliny of the Taurini, and was probably true also of their neighbours the Salassi. But the tribes who appear in history as_ the indomitable foes of Rome, against whom they waged for nearly a century and a half (237-109 B.c.) a war much re-sembling that of the Circassians against Russia in modern times, were those on the two flanks of the Apennines, and the southern slopes of the Maritime Alps. Here the Ingauni and Intemelii in the western Riviera, and the Statielli on the reverse of the mountains were the most conspicuous tribes ; while towards the east the Apuani, who held the Lunigiana and the rugged mountain group above Carrara,

and the Friniates, who extended along the crest of the

Apennines from thence to the neighbourhood of Florence,

were the subjects of repeated triumphs, and gave the

Romans more real trouble than their more brilliant con- uests in Macedonia and Asia.

(3) The Veneti or Venetians, who held the north-eastern portion of the great plain of Northern Italy, from the Adige to the Alps of the Frioul, were, according to the concurrent statements of ancient authors, a distinct people from their neighbours the Gauls. Attempts were made by soine Greek writers to counect them with the Eneti or Heneti, mentioned by Homer, as a people of Paphlagonia, and several modern authors have sought to identify them with the Venede or Wends on the shores of the Baltic. But all such theories, based as they are solely on resemblances of name, are of little value. On the other hand it is dis-tinctly stated by Herodotus that they were an Illyrian tribe; and, though this may very likely be a mere inference from their

juxtaposition, it is not improbable in itself that they were of the same race with their neighbours the Istrians and Liburnians.

But, besides the Veneti properly so called, two other tribes were found in historical times within the limits of the province as constitutel by Augustus. (1) The Luga- neans, though they had at this period dwindled into an insignificant tribe, had at one time been a powerful people, and according to the statement of Livy (himself a native of this country) had originally occupied the whole tract between the Alps and the sea, from which they had been expelled by the Veneti. And this tradition is confirmed by the fact that remnants of them still lingered in the Italian valleys of the Alps as late as the time of Pliny, and that their name remained inseparably attached, both in ancient and modern times, to the little group of volcanic hills between Padua and Verona, which are still known as the Euganean hills. (2) The Carn, who occupied the northern part of the Frioul, at the foot of the Alps, together with the adjoining mountains, appear to have been certainly a tribe of Celtic or Gaulish origin, and distinct from the Venetians, though included in the province of that name.

Consolidation of Italy.—We have seen that the name of Italy was originally applied only to the southernmost part of the peninsula, and was only gradually extended so as to comprise the central regions, such as Latium and Campania, which were designated by writers as late as Thucydides and Aristotle as in Opicia. The progress of this change cannot be followed in detail, but there can be little doubt that the extension of the Roman arms, and the gradual union of the nations of the peninsula under one dominant power, would contribute to the introduction, or rather would make the necessity felt, for the use of one general appellation. At first indeed the term was appa- rently confined to the regions of the central and soutliern districts, exclusive of Cisalpine Gaul and the whole tract north of the Apennines, and this continued to be the official or definite signification of the name down to the end of the republic. But the natural limits of Italy are so clearly marked that the name came to be generally employed as a geographical term at a much earlier period. Thus we already find Polybius repeatedly applying it in this wider signification to the whole country,

as far as the foot of the Alps; and it is evident from many passages in the Latin writers that this was the familiar use of the term in the days of Cicero and Czxsar. The official distinction was, however, still retained. Cisalpine Gaul, including the whole of Northern Italy, still constituted a “ province,” an appellation never applied to Italy itself. As such it was assigned to Julius Cesar, together with Transalpine Gaul, and it was not till he crossed the Rubicon that he entered Italy in the strict sense of the term.

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Augustus was the first who gave a definite administrative organization to Italy as a whole, and at the same time gave official sanction to that wider acceptation of the name, which had already established itself in familiar usage, and which has continued to prevail ever since.

The division of Italy into eleven regions (Plate V.), insti- Plate V.

tuted by Augustus for administrative purposes, which con- tinued in official use till the reign of Constantine, was based niainly on the territorial divisions previously existing, and preserved with few exceptions the ancient limits.

The first region comprised Latium (in the more extended sense of the term, as including the land of the Volscians, Hernicans, and Auruncans), together with Campania and the district of the Picentini. It thus extended from the mouth of the Tiber to that of the Silarus.

The secoud region included Apulia and Calabria (the name by which the Romans usually designated the district known to the Greeks as Messapia or Iapygia), together with the land of the Hirpini, which had usually been considered as a part of Samnium.

The third region contained Lucania and Bruttium ; it was bounded on the west coast by the Silarus, on the east by the Bradanus.

The fourth region comprised all the Samnites (except the Hirpini), together with the Sabines and the cognate tribes of the Frentani, Marrucini, Marsi, Peligni, Vestini, and Afquiculi. It was separated from Apulia on the south by the river Tifernus, and from Picenum on the north by the Matrinus.

The fifth region was composed solely of Picenum, ex- tending along the coast of the Adriatic from the mouth of the Matrinus to that of the Aisis, heyond Ancona.

The sixth region was formed by Umbria, in the more extended sense of the term, as including the Ager Gallicus, along the coast of the Adriatic from the Aisis to the Ari- minus, and separated from Etruria on the west by the Tiber.

The seventh region consisted of Etruria, which preserved its ancient limits, extending from the Tiber to the Tyr- rhenian Sea, and separated from Liguria on the north by the river Macra.

The eighth region, termed Gallia Cispadana, comprised the southern portion of Cisalpine Gaul, and was bounded on the north (as its name implied) by the river Padus or Po, from above Placentia to its mouth, It was separated from Etruria and Umbria by the main chain of the Apen- nines ; and the river Ariminus was substituted for the far- famed Rubicon as its limit on the Adriatic.

The ninth region comprised Liguria, extending along the sea-coast from the Varus to the Macra, and inland as far as the river Padus, which constituted its northern boundary from its source in Mount Vesulus to its confluence with the Trebia just above Placentia.

The tenth region included Venetia from the Padus and Adriatic to the Alps, to which was annexed the neighbour- ing peninsula of Istria, and to the west the territory of the Cenomani, a Gaulish tribe, extending from the Athesis to the Addua, which had previously been regarded as a part of Gallia Cisalpina,

The eleventh region, known as Gallia Transpadana, in- cluded all the rest of Cisalpine Gaul from the Padus on the south and the Addua on the east to the foot of the Alps.

The arrangementsthus established by Augustus continued almost unchanged till the time of Constantine, and formed the basis of all subsequent administrative divisions until the fall of the Western empire. It is not worth while to follow in detail the changes introduced during the 4th century. It was the invasion of the Lombards that first broke up the general system of the Roman administration, and prepared the way for the redistribution of Italy in the Middle Ages ou a wholly different basis. (E. H. B.)

STATISTICS.

The preceding sections have dealt with Italy the country as a permanent physical unity; here it is proposed to consider Italy the kingdom as a modern political and social unity. In dealing with the various aspects of the subject we shall be continually reminded of the fact that Italy is one of the very youngest of the greater nations of Europe. In attempting to trace back the movement of any department of social activity, the investigator here finds his retrospect soon interrupted and closed ; instead of the statistics of the kingdom of Italy he has only the statistics, fragmentary and incapable of comparison, of the several states by whose incorporation it has been formed. é

Extent.—Of the Italian frontier 294 miles coincide with that of France, 355 with that of Switzerland, and 269 with that of Austria. Owing mainly to natural causes, but partly also to political tradi- tions, the line is a very irregular one ; and at various points it has been subjected to rectifications on a small scale since the consolida- tion of the kingdom. The limits towards France are determined by the eonvention signed at Turin in 1861. The same year saw the revision of the line between Lombardy and Ticino on the basis of the treaty of Varese, 1752. In 1863 the boundary of the Grisons was slightly modified, and tho Lei valley assigned to Italy; in 1873 the frontier was fixed between

Teramo and Brusio and at the Alp de Cravairola ; and in 1875 a district of 4824 acres, or nearly 7 square miles, which had been in dispute was assigned to Italy by the arbitration of the United States, and incorporated with the province of Novara. On the surrender of the Austrian provinces of Italy to the new kingdom in 1867, it was decided that the frontier between the two states should be that of the actual adminis- tration of the Lombardo-Venetian kingdom.

The total area of the kingdom of Italy is given officially as 296,322°91 square kilometres or 114,380°64 square miles ; but the estimate confossedly rests on data that are to a considerable extent

rovisional. It was published by Maestri, the head of the general

irection of statistics in the census returns for 1861, and the investi- gations of the minister of public works in 1871 tended to confirm its general accuracy. But that it should be more than a very fair oe proximation to the 'truth is impossible in the defective state of the Italian surveys. Though various parts of the country were carefully gonc over for eadastral purposes by commissions appointed by several of the independent states of the peninsula,! the methods employed in the different cases were so heterogeneous that the results, even if eom- plete, could not readily and correctly be combined into a whole. Many of the communes are destitute of any authentic demarcation of their territorial limits.

Territorial Divisions. —The kingdom is divided into the following sixteen compartimenti (Table I.) :—

. Piedmont: Alessandria, Cuneo, Novara, Turin.

. Liguria: Genoa, Porto Maurizio.

' ite : Bergamo, Brescia, Como, Cremona, Mantua, Milan, Pavia, on .

. Venice: Belluno, Padua, Rovigo, Treviso, Udine, Venice, Verona, Vicenza.

mee : Bologna, Ferrara, Forh, Modena, Parma, Piaeenza, Ravenna,

: Ag : Perugia.

. Marches: Ancona, Ascoli Pieeno, Maeerata, Pcsaro-Urbino.

. Tuscany: Arezzo, Florence, Grosseto, Leghorn, Lucea, Massa-Carrara,

Pisa, Siena. 9. Latium: Rome.

10. Abruzzi and Molise; Aquila, Campobasso, Chicti, Tcramo.

11. Campania: Avellino, Benevento, Caserta, Naples, Salerno.

12. Apulia; Bari, Foggia, Lecee.

13. Basilicata ; Potenza,

14. Calabrias: Catanzaro, Cosenza, Reggio.

15, Sicily: Caltanisetta, Catania, Girgeuti, Messina, Palermo, Syraeuse,

Trapani.

16, Sardinia; Cagliari, Sassari.

Of these Abruzzi and Molise, Campania, Apulia, Basilicata, and the Calabrias are not unfrequently grouped together in statistical tables under tle name of the Neapolitan territory (Napoletano). The provinces which formed the Sardinian kingdom are often spoken of as the Ancient Provinees.

These compartimenti, however, are not true administrative divisions, but rather conventional groupings of a number of pro- vinces, It is the province which forms the true administrative unit. According to modern nomenclature it always takes its name from the capoluogo (chef-lieu or administrative centre), which is the seat of the prefect. The provinces are subdivided into so many circles or districts (the name

circondario being employed in all parts of the kingdom except tho Veneto, where the old established word

1 In the ancient Piedmont provinces a cadastral survey was undertaken as

early as 1677, but it was not finished till 1729; in the Modenese provinces that of | Garfagnana goes back to 1533, that of Rola to 1785, that of the “ plain and hill” ° to 1791; in the Tusean provinees the caduastre was compiled between 1822 and |

1834; and the Lombardo-Venetian provinces haye a double cadastre, the first dating from 1718, the second commenced in 1828. Sce Atti del primo congresso degli ingegneri ed architetit italiant, Milan, 1875, pp. 420-468, A large map of Italy, in 227 sections, corresponding to that of the English Ordnanee Survey, is in course of publication, under the supervision of the Jstituto topografico militare (formerly of the Stato maggiore) ; and a Government commission, which has issued a Bollettino geologico since 1870, is cngaged in the preparation of a large geologieal map. Sec Giordano in Aiti det Lincet, 1878,

(Ta? ¥

| tho Roman territory was not yet incorporated.

[STATISTICS,

distretto is still in use). The division known as the mandamento has to do with the legal administration only. It must be noted that formerly many of the provinces had special designations other than those of their chief towns, and that some of these are still of not infrequent occurrence especially outside of Italy. Thus Reggio corresponds to Calabria Ulteriore Prima, Catanzaro to Calabria Ulteriore Seconda, Cosenza to Calabria Citeriore, Teramo to Abruzzo Ulteriore Primo, Aquila to Abruzzo Ulteriore Secondo, Chieti to Abruzzo Citeriore, Campobasso to Molise, Foggia to Capitanata, Leece to Terra d’Otranto, Bari to Terra di Bari, Avellino to Priucipato Ulteriore,

Salerno to Principato Citeriorc, Caserta to Terra di Lavoro, Poteuza to Basilicata. ,

The following table (II.) gives the provinces, with their respeetive areas, according to Professor Baccarini in the Annuario Statistico Italiano 1881, pp. 82-9, and the populations ascertained by the census of 1861 and that of December 31, 1871. The figures in this table give a total of 114,403 square milcs, slightly differing from the Maestri estimate.

Area, Population. Provinees. ee || ee, sq. kil. | sq. miles. 1861, 1871. OSeROCOoCe 5,054 1,951 645,607 683,261

1,907 736 254,849 262,349 6,500 2,509 309,451 332,784

oe 3.309 1,277 219,559 234,645

2,095 809 196,030 203,004 8,649 1,409 855,621 875,691 5,936 2,292 554,402 604,540

8,291 1,271 ? 175,282

1,782 688 220,506 232,008 2.816 1,087 847,235 368,152 3,601 1,390 407,452 439,232 4,257 1,644 486,383 456,023 13,615 5,237 327,097 393,208 3,768 1,455 228,178 230,066 , 4,603 1,777 846,007 364,208

@HBGTAT. co-cceccscers 5,974 2,307 653,464 697,408 Catania…..... Bencaocricn 5,102 1,970 450,460 495,415 CALANZALO ....-2cceraree 5,975 2,307 884,159 412,226

2,861 1,105 827,316 339,986 2,719 1,050 457,454 477,642

wel ToS 2,841 431,691 440,468 Gremoiins……...+0 cel again 632 339,641 300,595 CUNEO... secese sess sae oc 7,135 2,755 597,279 618,232 HWA Abees-veas0-s2s00 2,616 1,010 199,158 215,369 Firenze (Florence)..| 5,878 2,267 696,214 766,824 HOUR id ans terserssesc sce 7,648 2,953 312,885 822,758 Gil Weccsserscesscses sess 1,862 719 224,463 234,090 Genova (Genoa)..... 4,114 1,588 650,143 716,759 Girgentinceee| 3,861 1,491 263,880 289,018 GTOSSCLO. ...00000 00008 4,420 1,706 100,626

107,457 ILGCCON, cscosseasscanse ce 8,529 3,293 447,982 493,594 Livorno (Leghorn).. 326 126 116,811 118,851 WAUCCAtetesscncceseosss sts 1,493 576 256,161 280,399 Macerata … cccscccccees 2,736 1,056 229,626 236,994 ~Mantova (Mantua)... 2,490 961 ? 288,942 Massa and Carrara.. 1,779 687 140,733 161,944 MeSSING…..000..,000000 4,579 1,768 895,139 420,649 Milano (Milan).....| 2,992 1,155 948,320 1,009,794 WN OMGNA cciessaccccccessss 2,501 966 260,591 273,231 Napoli (Naples).....| 1,065 411 867,988 907,752 DNGWAN es ccacssnpecreses 6,543 2,526 579,385 624,985 Padova (Padua)..... 1,955 155 cae 364,480 Palermo s.ssereeeeees| 5,086 1,964 585,163 617,678 ATMA sc eccoccecesesssse 3,239 1,250 256,029 264,381 Bavibiccccccstucssces| oneeD 1,291 – 419,785 448,435 PEVUgia….cccrreceeee] 9.638 3,719 513,019 549,601 Pesaro and Urbino.. 2,964 1,144 202,508 213,072 PHAGCNZa) coc000.000 +0556 2,499 965 218,569 265,959 i 3,056 1,180 243,028 225,775

1,209 467 121,330 127,053

POtENZA …srecrsseseeeee| 10,675 4,122 492,959 501,543 Ravenna…....0002.| 1,922 742 209,518 221,115 Reggio Calabria…... 38,928 1,515 824,546 353,608 Reggio Emilia…..... 2,271 817 230,054 240,635 Roma (Romce)..... eee| gate 4,601 — 836,704 ROWS eiecccsccsseeceee| L096 651 — 200,885 Galenmoys.cceetess. conse 5,505 2,126 528,256 541,738 WSS le .ccesescssc-s=-.4 10,726 4,141 215,967 243,452 Siena… 3,794 1,465 193,935 206,446 Siracusa (Syracuse) . 3,697 1,427 259,613 294 885 DONGMO Gs credscos seen 3,267 1,261 106,040 111,241 Teramo…... assisescee 3,324 1,283 230.061 246,004 sesenser 10,534 4,067 941,992 236,888

1,214 214,981 352,538

941 ? 972,086 ? 481,786 Venezia (Venice)... i 337,538 AYO Te Geapandonnonconocen & 367,487 WVICENZA vccscees snes ieee ? 363,161 296,305 | 114,408 25,016,801 26,801,154

Vital Statistics,—Previous to 1871 we have no census for the whole kingdom of Italy, secing that at the previous census of 1861

Approximate totals are obtainable for earlier dates by summing up the returns for

| the Sardinian kingdom, the Lombardo-Venetian kingdom, &c., not | indeed belonging to the same year, but separated from each other

by comparatively slight intervals. It is thus estimated that the

‘ growth of the population of the territory now forming the kingdom

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is represented with some approach to accuracy. in the following table (1II.) :—

1770 Be IAM AIF 1 GEE Mn .n-nce—.cnnenons 21,078,208 16,256,974 | 1848… ... 23,617,153 17,237,421 | 1858… ... 24,857,417 TREN OSB ll MOET fcsccsiccsevceecevcosnss 25,016,801

19,726,977

At this last date (1861) the population of the kingdom exclusive of the province of Rome was 21 777,834. The census of 1871 showed for the whole kingdom a total of 26,801,154 ; and it is estimated that this had inereased by 1875 to 27,482,174, and by 1879 to 98,437,091. The eensus of 1861 gave 10,897,236 males and 10,880,098 females, that of 1871 13,472,213 males and 13,328,892 females. At the latter date 36 per cent. of the population were married, and 6 per eent. in a state of widowhood.

The 1871 eensus showsthat the males are in distinct excess of the females for the first fifteen years of life, that after that age the exeess is on the side of the females, and becomes very strong between nineteen and twenty-one, and that between thirty-one and seventy- one the advantage is for the most part on the side of the males. (See Luigi = elaborate study in Annali di Statistica, series 2, vol. x., 1879.

In spite of the faet that the great mass of the Italian population is engaged in agrieultural pursuits, an unusual proportion of the inhabitants are eongregated in towns. The Italian, to quote the words of Gallenga,! is no lover of the country ; he dreads of all things an isolated dwelling. If he eannot live in the capital, then ina provineial city ; if not, in a country town ; then in a village; —only not in a country house. Landowners (what in England would be known as eounty families), farmers, and most of the labourers huddle together in their squalid boroughs and hamlets; and the peasants have often a journey of several miles before they reach the fields entrusted to their eare,—though this tendeney is indeed now less marked than formerly. At the same time the num- ber of very large cities is comparatively small. At the eensus of

TasLE IV.—Communal Population of Towns in 1879.

Com- ~ Com- > ll Town. aie. Town.

1879. 1871, 1879. 1871,

Naples…….....0-++-| 452,839 | 415,549 || Treviso…..cc..see+e6| 28,397 | 16,824 PRIME Hevrosessescc.cccees 263,016 | 199,009 || Caltanisetta…….....) 28,317 | 21,466 Palermo ….....— ....| 284,156 | 186,145 |) Caltagirone…..... ..| 28,298 | 22,639 TEONAG *esiesesieccasceeas eave cepts et gaa eee es on: BEE eesdsiscsnosa0os ous »572 | 192,443 PUVA nasnanssenanssivain 93 5 Florenee.. 2} 167:714 | 167,093 || Cortona…….....0…. 27/239 | 3,973 PETRORE Sascavi esse sores pot = Casale Monferrato.. —— Tne DACHLOC .ssectescsessss0s 68 098 |) Spegiag. cgucessseteerens 94 Messina…...0.ss00ss.., 121,856 70,307 | Cerignola…...s00-0— 26,824 21,739 Bologna…..... .| 111,773 OSTOR |) UNG. cages snssecese0ss 2€,662 8,664 Leghorn., | 98,302 80,914 || Savona…….....+.-. 26,659 16,030 Catania… 91,417 | 83,496 || Vereelli… 26,648 | 20,140 Ferrara… 75,423 | 28,509 || Carrara… 26,577 7,602 Biers. aca Pane ee = oC, pe pipe RM retersinssscase+e 66,15 NGO | SRPAINNT, cc ssien-sssecsses 49) GWU vee astccens..nss 65,502 | 60,049 || Bitonto… | 26442 | 22,998 Rayenna…....-...., 60,877 | 11,935 |! Torre del Greco….. 25,842 | 18,950 Alessandria…….....| 59,667 | 28,059 || Catanzaro…..... weee| 25,463 |

16,711 Modena…..0…..~~20..| 56,320 | 80,854 |} LOdL…..ccccccccrsvee| 25,401 | 18,537 Bari. saem side eer | eermn, seseasee! — _ gies TEEONB ..000 sess 53. 1966 OCC vases caves anesiesaes Reggio (E. 50,808 | 19,131 |, Mantua …….00.~~ 24,564 | 26,687 PE mnon- ee oth i | =o di Castello… Pete Bon erugia ; OB? WT COmO is cts eevsssiecss occ , Capannori 47.979 | 2,857 : Syracuse. 24,132 | 18,129 Ancona… 46,865 | 28,031 | Chieti… 24,122 | 14,321 pee. ms ae? 12,897 Gubbio….. s ae ot aes ATMA... 0- 915 || Ragusa…...cseeeve| 29s . FOU c….. 39,599 | 15,394 || Aleamo….-+-....| 23,745 | 20,886 ATCZZ0 s.0a0s 39,463 | 11,154 || Bisceglia….....| 23,887 | 19,007 Foggia…..... 39,314 | 34,181 || Ascoli Piceno…....) 22,9387 | 11,357 Andria…..... 38,414 | 32,676 || Foligno…....sseee 22,638 | 8,471 oo ral — aan carga eee mere oe BET seas 08 472 BOT. cenckerasiitinenannent 5 ” Marsala 38,015 | 14,105 CS 22,320 | 19,560 Reggio (C.) .....00 38,006 | 19,083 |, Canieatti…....., 22,027 | 20,908 a ee 37,778 | 26,914 |. Girgenti.. 22,027 | 18,802 eenza., 37,188 | 26,944 || Cuneo….. 21,914 | 11,423 Faenza, 36,665 | 14,280 || Bareellona.. 21,890 | 13,917 Modiea. 36,276 | 30,082 || Caseina…....00+-.| 21,792 | 1,971 Rimini…..... 36,187 | 9,747 || Cava de’ Tirzeni….| 21,702 | 5,725 Bergamo ….cseeceeee 35,286 | 22,639 || Avellino…....0…, 21,660 | 14,393 ee 34,305 | 30,542 || Castelvetrano…..... 21,599 | 19,499 Cagliari… 34,269 | 29,905 |! Partinico…....0 ..| 21,447 | 19,838 os Res, 33,983 | 17,203 || Seiacca…....000-+.| 21,848 | 17,736 HOROEEE. sccasi.ctiee. 33,344 | 38,906 || Benevento…....00+. 21,338 | 17,370 Serna rete 31,297 | 19,905 |, Monopuli….....| 21,144 | 13,800 sete Reashtiecssce’ a eats Eoned Aurunea…..... 7 em Piacenza 31,094 | 34°908 | Aversa. oe 20,853 | 19,734 ade 30,874 | 12,754 || Spoleto. 20,781 | 7,033 brante….. Sarit | ave | tome 20‘560 | 8/829 Corato….. 99687 | 26°018 || Cento 2 201596 5/293 — eta… 29,579 | 26,516 || Franeavilla…..... 20,444 | 16,997 ote Reoereess 28,561 | 18,306 || Reeanati….....| 20,377 4,345 Udie sseessensense 28.437 | 22°004 || Bagni San Giuliano| 20,385 | 1,028 |: mola, 28,421 9,355 || Maeerata….....,) 20,8381 | 11,194

! Country Life in Piedmont. 2 Rome at the end of 1880 had 305,400.

ITALY

1871 Naples ranked first with a communal population of 448,335 ; and there were twenty-two other towns whose inhabitants numbered about 50,000 or upwards. With the exception of four belonging to Sicily, the greater number of these were situated in the north. Table IV. indieates the eommunal population of all the towns that exeeed 20,000 aecording to the munieipal bulletins for 1879. The figures differ from those of the Movimento dello Stat. Civile, as the latter takes into account only births and deaths and not migrations.

The official reports divide the eommunes into wrban, those with an agglomerate population of 6000 inhabitants ; mixed, those in which there is a centre of 6000, but a greater number in the eountry districts ; and rural, comprising all] the others. Of the urban there were 373 in 1875, of the mixed 39, and of the rural 7873.

The following table (V.) shows the number and distribution of the greater centres of population throughout the kingdom :—

Centres.

Piedmont. Marches. Napoletano, Sardinia.

Upwards of pera)

ae Lombardy.

inhabitants …..... From 60,000 to 100,000

AAs =

PRR ee | Veneto.

no i)

–

bo

Total above 6000 14 |170 |116

In 1877 it was found that 238 of the 8295 communes of the king- dom had no register of population, and that the aggregate popula- tion in December 1876 of the communes whieh were thus situated or did not keep their registers up to date was no less than 7,002, 456, or more than one-fourth of the population of the country (Annali di Stat., vol. v., 1879). The statisties of the growth of the popu- lation are consequently attended with a degree of uneertainty ; but the following table (VI.) exhibits the general facts since the completion of the kingdom :—

Births. Deaths,

1,020,682

985,188

951,658 1,035,377 1,083,721 1,029,037 1,012,475 1,064,153

Marriages.

202,361; 214,906 207,997

Still-Births. Population.

26,994,338 27,165,553 27,289,958 27,482,174 27,769,475 28,010,695 28,209,620 28,437,091

827,498 813,973 827,253 843,161 796,420 787,817 813,550 836,682

230,486 295,453 214,972 199,885 213,096

During tho fifteen years 1865-79 the marriages averaged 7°48 annually in every 1000 inhabitants, the births 37:1 (104 males to 100 females), and the deaths 30°4. The average number of ehil- dren (births and still-births) per marriage was 4°68. There is very little difference in the pereentage of the marriages inthe urban and the rural communes ; but in the matter of births and still more in deaths the urban eommunes

stand higher than the rural. The following table (VII.) gives the numbers per 100 of the population:—

Deaths.

’ Births.

Urban. Rural. 3°22 3°00 3°22 2°89 3°34 2°89 3°33 2°95 2°92 2°79 3°07 2°70 8°16 2°76 3°13 2°82

Out of 412,981 women married in the years 1878 and 1879, 184 were under fifteen, 3183 were between fifteen and sixteen, 6610 between sixteen and seventeen, 12,067 between seventeen and eighteen, 20,546 between eighteen and nineteen, and 29,391 between nineteen and twenty; so that altogether 71,981 were married under twenty years of age. Of the men 27°28 per eent. were married before reaching their twenty-fifth year, and 80°99 per cent. before reaching their thirty-fifth year. Although marriages between unele and niece and aunt and nephew are forbidden by the eivil eode, about 127 of this class of marriages are contracted annually under special licence.

The following tables (VIII., 1X.) show the number of legitimate and illegitimate births in 1878 and 1879, as well as of those plaeed in the ruota3 or exposed, and whose parentage is unknown :—

3 The ruota or foundling-wheel still exists in 1222 of the communes, being frequent in the Neapolitan provinees and Sicily, rare in upper and middle Italy. It has been abolished in 400 eommunes during the last twenty years. Nor has the abolition been attended with that inerease of infanticide whieh is observed in Franee, the Italian law being mueh less rigid than the Freneh in regard to illegi-

timate parentage. Xl. — iy

Male.

Female.

Legitimate …..... Tilegitimate aa3 EXPOSED Wisse; sccnsdeee

seas eecnoees 317,245 | 163,097 | 154,148 | 331,353 | 170,047 161,306

Country Communes.

Total. | Male. Female. Total. | Male, | Female.

— —

656,379 | 838,838 | 817,541 | 690,439 856,855 | 333,584

Legitimate …..... Mlegitimate….....] 29,474 | 15,825] 14,149 $2,153 | 16,859| 15,294 EXPOSE, cacessocseseees 9,377 4,685 4,692 | 20,208 5,198 5,010

695,230 | 336,848 | 836,382 732,800 | 378,912 | 353,858

TAU aeiarerxe

It appears from these last figures (1879) that 10°57 per cent. of the children born in the towns, and 5°65 per cent. of those in the country, are either illegitimate or unacknowledged by their parents, and that, while the proportion of males to females is overhead 106 or 107 to 100, the proportion in the case of the illegitimate is 112 in the towns. The province of Rome, the Marches, Umbria, Emilia, and Sardinia are the regions in which illegitimacy most pre- vails,—17, 13, 12, 10, and 9 per cent. being their respective figures for 1878, while little more than 1 per cent, is shown for Campania and Apulia. Itis a painful fact that in the spaco of ten years 305,105 children have been abandoned by their parents, The rate of infant mortality, also, speaks of ignorance and neglect: in 1877, for example, 214,093 children (i.c., nearly 21 per cent.) dicd in the first year of existence, and other 196,844 perished before they completed their tenth year.!

In the matter of emigration proper, it is calculated that out of every 100,000 of its population 82 leave Italy annually. The corre- sponding

number for the United Kingdom 1s 350, for Belginm 230, for Denmark 110,—Italy coming next. According to the Statistica della Emigrazione Italiana all' Estero, the total number of emigrants in the twelve years 1869-1880 is 1,407,723. Taking the figures for 1876-80 it would appear that about 37,000 Italians go every year to France, 19,000 to Austria-Hungary, 14,000 to Switzerland, 7000 to Germany, about 3000 to the other states of Europe, 20,000 to America (about a third of them to the La Plata republics), and from 2000 to 3000 to the other parts of the world, A large proportion of this body of people, however, return to their native country after a longer or shorter period of absence ; and the actual loss of olpedbsseta oy this means is reduced to about 25,000 or 30,000 per annum. The compartimenti which contribute most to the total of the permanent emigration are Piedmont, Liguria, Lombardy, and the Veneto; Emilia, Tuscany, Umbria, the Marches, Latium, Sicily, and Sardinia have only a very small share.

The proportion of women and children to the total number of emigrants is thus indicated (Table X.) :—

Emigrants proper. Emigrants proper and temporary.

Males. | Females. Bn nal Males. '| Females, F eee

1878 12,398 6,137 4,281 82,510 13,758 9,761 187 28,632 12,192 7,896 100,172 19,659 13,329

26,285 11,649 7,286 100,726 19,175 11,989

The greater number—55 per cent.—of the emigrants proper are connected with agricultural pursuits ; 16 per cent. are artisans and operatives. Genoa is by far the most important emigration port, and next, though at a great interval, comes Naples.

According to the census of 1871 the population was grouped by occupation as follows:—no fewer than 8,738,565 were cngaged in the production of raw materials, 3,287,188 in industrial operations, 199,901 in commerce, and 271,003 in transport ; 765,099 were sup- ported by their property ; 145,304 were engaged in the defence of the couutry,

and 136,929 in public administration ; 148,883 wero connected with religion, 25,986 with justice, 54,409 with health, 52,577 with education, 41,151 with the fine arts, and 14,145 with literature and science, while no fewer than 11,773,208 are registered as without profession or as dependent on others.

Agriculture.—In the wide sense of the word, Italy is emphati- cally an agricultural country, and the products of its agriculture are of avery varied order. If the ratio of its grain production to the number of its population, however, be compared with the same ratio in other countries, it is surpassed by Roumania, Denmark, Russia, Prussia, France, Hungary, &c., and in fact is only a little better than Switzerland.2 It is calculated that about 11,545,594 acres are devoted to the cultivation of wheat, and that the annual return is about 142,402,513 bushels. The average per acre is thus very low,

1, Raseri, "1 Fanetulli illegittimi ¢ gli esposti in Italia" in Arch. di Stat., 1881. 2 See Some observations bearing on the Production of the several Countries entering into the Grain Market of the World, Riehmond, Virginia, 1877.

Tr

[sTATISTICS,

only 12 bushels, while England obtains about 31 bushels per acre. Next in importance to wheat comes maize (granturco, or Turkish corn), the most recently introduced of the cereals; it occupies 4,192,083 acres, and yields 85,506,660 bushels. That the culti- vation of rice is less widely distributed is the natural result of the

fact that it requires about 107,000 gallons of water per annum ~

for every acre, and that its cultivation is found in many places to be extremely prejudicial to the healthincss of the locality ;3 in certain favourable regions, however, it forms the predominant crop. The chief seat of this cereal is Novara, and morc particularly the circondario of Vercelli, which alone yields about 6,875,000 bushels of riceina year. The

total acreage is 573,925 acres, with a total production of 26,998,915 bushels, Neither barley nor rye is of great importance, the 1,148,470 acres devoted to their cultivation giving 18,417,542 bushels as an average crop. More than a fourth of the acreage, and nearly a third of the produce, belong to Sicily. Oats occupy about 984,917 acres, and the return is 19,369,000 bushels. 'The best crops are obtained in the provinces of Caserta, Pisa, Benevento, Milan, and Foggia. Millet (Panicum miliacewm), panico (Panicum italicum), and sorghum (Holcus saccharatus) are mainly employed as forage,—the first of the three, which was for- merly of importance as an article of human food, having been in that regard displaced by maize. Buckwheat (the grano Saraceno of the popular language) is hardly grown outside of the provinces of Cuneo, Como, Belluno, and Treviso. The manufacture of maccaroni and similar foodstuff is well known as a characteristic Italian in- dustry. It is pretty extensively distributed, and is often carried on in very primitive fashion. The extent of the industry may be judged from the fact that, while the Italians themselves consuine enormous quantities, they are at the same time able to export from 50,000 to 70,000 quintals of " pastes."

Beans are a very common crop—those belonging to the gencra Phascolus and Dolichos being known as fagioli, and those of the genus Fabaas fave, Of the former no fewer than thirty-five varietics were exhibited by the board of agriculture at the Paris exhibition in 1878. Those most commonly cultivated are the white haricots, In many places a crop of beans is obtained from the field just cleared of the wheat. Lentils are grown in most parts of the country, —a small sort being that most in favour. Pease hold a less important place than that assigned to them in more northern lands. The total area under beans (fagioli—the fave are not included in this estimate), pease, and lentils is calculatedat 773,100 acres, and the pro- duce at 6,664,500 bushels. Lupinesare extensively cultivated both for winter forage and to serve asa manure. Lupinus albus is the variety most usual in Central and Northern Italy. Lupinus varius —which does not do so well for green fodder—is most usual in the south. Lathyrus sativus, a congener of the sweet, pea of English gardens, is sown as food for pigs,—its use as an article of human consumption gradually diminishing as it has been

recently proved that, as Hippocrates long ago asserted, it has a tendency to bring on paralysis of the limbs.

The potato is now found asa common object of cultivation in nearly every region of Italy except the provinces of Mantua, Gir- genti, and Trapani. For field cultivation the varicty still almost universally in vogue is that introduced by the grand-dukes of Tuscany at the beginning of the 17th century. It is calculated that the total crop of potatoes may average 19,387,000 bushels, Turnips are pretty largely grown, more especially in the central districts of the peninsula, for use as winter fodder for the cattle. Many attempts have been made to introduce the cultivation of beet, but the plant does not succeed to much satisfaction.

Gardening is seldom carried on in Italy on a large or expensive scale, except in the neighbourhood of such places as Milan, Genoa, Florence, Palermo, Catania, and Naples. Some of the market- gardens in the outskirts of this last city, however, are said to bring in about £32 per acre, and to be let for £14 or £15. Forcing is seldoni resorted to. Among the plants most largely cultivated in the ordinary gardens are various kinds of cabbage, lettuces, fennel, aspara- gus, spinach, bect, garlic and onions, gourds, melons and cucumbers, and tomatoes. The fennel is eaten both raw and cooked,—often in- stead of fruit after dinner. The asparagus is seldom bleached.

With the exception of rape, colza, and linsecd, few of the oil seeds are grown to any considerable extent. The sun-flower is cultivated ona small scale in the Veneto, and the ground nut (Arachis hypoge#a) in a few places in Lombardy. The annual crop of the castor-oil plant (which has become wild in Sicily and in Verona) is cstimated at 6,000,000 ib of seed. Sesamum, formerly common in the Bologna and Lucca districts, is now almost confined to Sicily. Madder used to be largely cultivated in the provinces of Naples and Caserta (in the former 27,000 acres were devoted to it as late as 1863), but in Italy as elsewhere the dye plants are becoming of less importance. The collecting of saffron is also less common than it used to be. In peieibetinas its ani a AD ms Sl) aaa ln ee

3 A eontest, for instanee, between the rice-growers of the territory of Casale and the other inhabitants of the distriet, which was carried from court to court, and finally became the subject of a Government inquiry, was terminated by a deeree (1879) forbidding the eultivation of the cereal in a large distriet where it was proving a remunerative investment. See Giorn. della Soc. Jtal. dIgiene, 1879.

southern Tuscany (at Piacenza, Montepulciano, and Siena) it was formerly an important industry ; now it chiefly flourishes in the province of Aquila and other parts of the Napoletano, and in the island of Sicily. Aniseed is abundantly grown in the Romagna and the Abruzzi; the province of Aquila produces about 800 quintals per annum. Liquorice grows wild in all the southern part of the peninsula, and in some portions of Sicily is considered a vile weed ; but in certain localities, as in the province of Teramo, it is the object of regular cultivation.

The vine is cultivated throughout the length and breadth of Italy, but in not a few of the provinces its relative importance is slight. While in some of tho districts of the south and the centre the vine occupies from 10 to 20 per cent. of the cultivated area, in some of the northern provinces, such as Sondrio, Belluno, Grosseto, &c., the average is only about 1 or 2 per cent. The methods of cultivation are sufficiently varied ; but the planting of the vines by themselves in long rows of insignificant bushes is decidedly the exception. In Lombardy, Emilia, Romagna, Tuscany, the Marches, Umbria, the Terra di Lavoro, and other southern provinces, they are trained to trees which are either left in their natural state or subjected to

_ pruning and pollarding. In Campania and Terra di Lavoro the vines are allowed to climb freely to the tops of the poplars much as they would do in their native woods; but the wines obtained by this system of cultivation are said to be of inferior quality. In the yest of Italy the elm and the maple are the trees mainly employed as supports. Artificial props of several kinds—wires, cane work, trellis work, &c.—are also in use in many districts, and in some the plant is simply permitted to trail

along the ground. The vintage takes place, according to locality and climate, from the beginning of September to the beginning of November. Table XI. gives details

for the different districts :— Acres. Gallons.

108,714

Acres. | Gallons.

NAAT casas ssi aces Adriatic pro- vinces of the

‘| Piedmont……...| 289,853 | 59,536,312

41,696,644 57,308,878 13,163,480 43,783,542

42,181,612 59,143,612

18,390,828) 660,634 604,048 522,502 59,763

12,621,039

Mediterranean do. BHONG siescascesstasse Sardinia

Marches and Umbria 359,204

Tuscany «.....-..| 542,216

Next to the cereals and the vine the most important object of cultivation in Italy is the olive. In Sicily and the provinces of Reggio, Catanzaro, Cosenza, and Lecce this tree flourishes freely and without shelter; as far north as Rome, Aquila, and Teramo it requires only the slightest protection ; in the rest of the peninsula it runs the risk of damage by frost every ten years or so. The pro- portion of ground under olives is no less than from 20 to 36 per cent. at Porto Maurizio, and in Reggio, Lecce, Bari, Chieti, and Leghorn it averages from 10 to 19 per cent. Throughout Piedmont, Lombardy, the Veneto, and the greater part of Emilia, the tree is of little importance, though in a number of the provinces it is culti- vated on a small scale. In the olive there is great

variety of kinds, and the methods of cultivation differ greatly in different districts ; in Bari, Chieti, and Lecce, for instance, there are regular woods of nothing but olive-trees, while in middle Italy we have olive-orchards with the interspaces occupied by crops of various kinds. The Tuscan oils from Lucca, Calci, and Buti are considered the best in the world ; and those of Bari, Umbria, and western Liguria rank next. The following table (XII.) indicates more particularly the

distribution of the cultivation :—

Gallons.

2,108,348 18,868,278

. | Gallons, Acres.

——” 102,959

eh eeeeceessoeer

pro-

138,996 205,062

667,392

a… 7,551,808 || south …..+..... 824,654 || Mediterranean do.| 344,205 14,003,880 iil 257,905| 16,065,236 vie 4,804,498 | Sardinia ….....| 127,458] 4,642°110 ed 6,270,132 ——_—__ Total…....««|2,224,662| 74,483,002

_ The cultivation of oranges, lemons, and their congeners (collec- tively designated in Italian by the term agrwmi)isof somewhat modern date, the introduction of the Citrus Bigaradia being probably due to the Arabs ; but it has received so great a development in certain parts of the country as to be highly characteristic. Sicily stands facile princeps in this respect,—the area occupied by the agrumeti or lemon and orange orchards in the province of Palermo alone having increased from 11,525 acres in 1854 to 54,340 in 1874. Reggio, Calabria,

Catanzaro, Cosenza, Lecce, Salerno, Naples, and Caserta are the continental provinces which come next after Sicily. In Sardinia the cultivation is extensive, but receives little attention. Crude lime-juice is exported from Italy to the amount of about 10,000 quintals annually, and concentrated lime-juice to the amount of from 11,000 to 17,000 quintals. Essential oils are extracted from the rind of the agrumi, more particularly from that of the lemon and the bergamot ; the latter, however, is almost confined to the

province of Reggio Calabria, where the average production amounts to 220,000 Ib,—an enormous quantity when it 1s remembered that 1000 bergamots are required for every Ib. A perfume called acqua nanfa, or lanfa, is obtained from the distillation of the orange-flowers, and the petals are also made into a conservo at Syracuse. Of the agrumi in their natural state the exportation has increased from 832,410 quintals (value 24,139,890 lire!) in 1878 to 1,007,585 (value 36,022,575 lire) in 1877. In Southern Italy almonds, carob-trees, and figs are cultivated ona very extensive scale. The value of the almonds exported in 1876 (a favourable year) amounted to 13,570,000 lire. Walnuts are mainly grown in Piedmont, and particularly in the province of Cuneo ; hazels, on the contrary, have their greatest diffusion in the south, and particularly in the island of Sicily and the province of Avellino.? The value of the export of walnuts and hazels amounts to between 3,000,000 and 4,000,000 lire per annum. Pistachio culture is confined to the province of Caltanisctta.

The great variety in physical and social conditions which exists throughout the peninsula gives corresponding variety to the methods of agriculture. In the matter for instance of rotation of crops there is an amazing diversity—shifts of two ycars, three years, four years, six years, and in many cases whatever order strikes the fancy of the farmer. The fields of Tuscany for the most part bear wheat one year and maize the next, in perpetual interchanges, relieved to some extent by green crops. A similar method prevailsin the Abruzzi, and in the

provinces of Salerno, Benevento, and Avellino. In the plains of Lombardy a six year shift is common :—either wheat, clover, maize, rice, rice, rice (the last year manured with lupines), or maize, wheat followed by clover, clover, clover ploughed in and rice, rice, and rice manured with lupines. The Emilian region isone where regular rotations are best observed,—a common shift being

ain, maize, clover, beans and vetches, &c., grain, which has the

isadvantage of the grain crops succeeding each other. In the pro- vince of Naples, Caserta, &c., the method of fallows is widely adopted, the ground often being left in this state for fifteen or twenty years ; and in some parts of Sicily there is a regular inter- change of fallow and crop year by year. Tho following scheme indicates a common Sicilian method of a type which has many varieties :—fallow, grain, grain, pasture, pasture—other two divi- sions of the area following tho same order, but commencing respec- tively with the two years of grain and the two of pasture.

In the matter of implements the Italian agriculturist is far behind. The old Roman plough, for instance, as it is described by Virgil and Columella, may still be seen in use in various parts of the country ; in Sardinia the plough that figures on the ancient monuments of the island might have been copied from that at work in the fields. Great improvements, however, have taken _ in the more pro- gressive regions ; iron has replaced wood, and coulter and share have been increased in massiveness. But even in the Veneto the heavy plough drawn by as many it may be as six pair of oxen cuts the furrow no deeper than 9 inches. As we proceed southwards the fashion becomes more simple and antique. The spade or vanga is a favourite implement, and in some parts, as in Emilia for instance, it is used to deepen the furrow made by the plough. Sowing and reaping machines have been successfully introduced in the lowland regions, but a large Ag gett of the country is little fitted for thzir employment. hrashing machines even in the remoter dis- tricts have largely displaced the flail and the floor; and straw cutters, corn-shellers, and similar inventions have begun to make their way. Manuring even of a very ordinary kind is but little attended

to in a great part of the country; though it has been a custom from time immemorial to grow a crop of lupines for the sole purpose of returning them to the soil as a stimulus.

Though Italy is so distinctively an agricultural country, and has been subject so long to regular process of cultivation, a large pro- portion of its arable land is still in astate of utter neglect. It is calculated that the aggregate of the more important districts ready to give abundant increase in return for the labour of reclamation amounts to 571,000 acres; and more than twice that quantity might be utilized. The most important works undertaken in this direction since the formation of the kingdom are the draining of Lago Fucino and Lago Trasimeno, and the great scheme for the improvement of the " Agro Romano" decreed by parliament on 11th December 1878.

The breed of cattle most widely distributed throughout Italy is that known as the Podolian, usually with white or grey coat and enormous horns. Of the numerous sub-varieties, the finest is said to be that of the Val di Chiana, where the animals are stall-fed all the year round; and next to this is ranked the so-called Valle Tiberina type. The wilder and ruder varieties are those which roam in vast herds over the Tuscan and Roman maremmas, and the cor- responding districts in Apulia and other regions. In the Alpine

¥ The Italian lira corresponds in valuc to the franc. 26 lire = £1 sterling. ase hazel has its specific name, Cory/us avellana, from the fact here men-

3A suggestive table of the proportion of mountainous and lowland country in the several provinces will be found in the Studii published by the Geographical

Socicty In 1875. It is reprinted in the Annuario Stat. for 1881. According to this, the mountainous arca is considerably in excess of the lowland.

districts there is a stock quite distinct from the Podolian, generally called razza montanina. These animals are much smaller in stature and more regular in form than their Podolian cousins; and they are mainly kept for dairy purposes. Another stock, with no close allies nearcr than the south of France, is found in the plain of Racconigi and Carmagnola ; the mouse-coloured Swiss breed occurs in the neighbourhood of Milan ; the Tyrolese breed stretches south to Padua and Modena; and a red-coated breed named of Reggio or Friuli, is familiar both in what were the duchies of Parma and Modena, and in the provinces of Udine and Treviso. Other less important types exist in the southern parts of the peninsula ; in Sicily the so-called Modica race is of note; and in Sardinia there is a very distinct stock which seldom exceeds the weight of 700 tb. Buffaloes are kept in several districts, more particularly of Southern Italy. Their total number is estimated at 15,190.

Sheep are not reared in any considerable numbers by the agriculturists of Italy; but enormous flocks are possessed by professional sheep-farmers, who pasture them in the mountains in the summer, and bring them down to the plains in the winter. The brecds vary from region to region, At Saluzzo in Piedmont there is a stock with hanging ears, arched face, and tall stature, kept for its dairy qualities ; and in the Biellese the merino breed is maintained by some of the larger pro-prietors. In the upper valleys of the Alps there are many local varieties, one of which at Ossola is like the Scotch blackface. Liguria is not much adapted for sheep-farming on a large scale ; but a number of small flocks come down to the plain of Tuscany in the winter. With the exception of a few sub-Alpine districts near Bergamo and Brescia, the great Lombard plain is decidedly unpastoral. and that of Cadore and Belluno approaches it in size, In the Venctian districts the farmers often have small stationary flocks. Throughout the Roman province, and Umbria, Apulia, the Capitan- ata, and the Calabrias, we find in its full development a remarkable system of pastoral migration which has been in existence from the most ancient times, and which has attracted attention as much by its picturesqueness as by its industrial importance. Merino sheep have been acclimatized in the Abruzzi, the Capitanata, and the Basilicata. The total number of sheep in the kingdom is estimated at nearly 7,000,000, aud that of goats at more

than 1,500,000. According to returns for 1876 (the figures of which are almost certainly below the mark) the cattle amount to 3,489,125, the horses to 657,544, the asses to 498,766, the mules to 293,868, and the pigs to 1,553, 582.1

The north of Italy has long been known for its great dairy dis- tricts. Parmesan checse, otherwise called Lodigiano (from Lodi) or grana, was presented to King Louis XII. as early as 1509. In 1878 there were in the province of Parma alonc one hundred and sixty- seven caselli or dairies, manipulating about 1,830,554 gallons of milk, and manufacturing 26,091 Parmesan cheeses of aggregate weight of 927,315 Ib, besides 6968 Ib of the variety of Stracchino, 2318 fb of Gorgonzola, 324,062 Ib of butter, and 497,442 of ricotta? (compare Annali di Agricoltura, No. 9). Between 1864 and 1878 the value of the cheesc increased from 1°66 lire to 2°75 lire per fb. Parmesan is not confined to the province from which it derives its name ; it 1s manufactured in all that part of Emilia which is in the neighbour- hood of the Po, and in the provinces of Brescia, Bergamo, Pavia, Novara, and Alessandria. Gorgonzola, which takes its name from a town in the province, has become general throughout the whole of Lombardy, in the eastern parts of the " ancient provinces," and in the province of Cuneo. The cheese known as the caccio-cavallo, which when two or three years old is worth three or four lire the kilogramme, is produced in regions extending from 37° to 43° N. lat. Gruyére, so extensively manufactured in Switzerland and France, isalso produced in Italy in the Alpine regions and in Sicily. With the exception of Parmesan, Gorgonzola, La Fontina, aud Gruytre, most of the Italian cheese is consumed in the locality of its production. It is estimated that in 1879 England imported upwards of 3000 Parmesans and 5000 Gorgonzolas. The institution known as the Jatteria sociale or co-operative dairy-farm has becn in use in Parma for centuries, and is a familiar arrangement in many districts. For further details on this interesting industry the rcader may consult Cantoni's L'industria del latte, and the account of the esposizione di caseifieio, held at Portici in 1877, in the Annali di Agricoltura, 1879. The extent of the butter exportation is seen from Table XXII., p. 456. France is the great market for the fresh butter ; but it appears that England is rapidly becoming a customer of some

importance; instead of 10 tons, as in 1875, it received 500 tons in 1879-80.

Among the various methods by which the relation of the land- holder to the tiller of the soil is regulated, the more noteworthy are the mezzadria (mezzeria or metayer) system, the boaria or schiaven-

-1 Most of the faets in this survey of Itallan agriculture are borrowed from ZL' Italia agraria e forestale, prepared by the Ialian Board of Agrieulture for the Paris Exhibition, 1878.

2 Ricotta means " reeooked."

It is the residue of eream separated from butter-milk by boiling.

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The Bergamo sheep is the largest breed in the country ; "

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deria, the economia, and tlic affittanza or affittamento. This last is practically the same as the ordinary renting system in England and Scotland, the rent sometimes being paid in moncy (afjtto a danari), sometimes in kind (afitto a grano), sometimes partly in money and partly in kind, and the periods varying from one year to leascsof sixor nine years. Inthe typical mezzadria the owner receives frequently one half of the produce of the soil, and the mezzadro or farmer the other; but of course there are many minor modifications in the terms of the contract.* The live-stock is usually the property of the mezzadro, who pays a fixed rent for the use of the pasturage. By the terzeria system, on the other hand, the animals and plant are the property of the landholder, or two-thirds his and one-third the tenant's. Under the schiavenderia or boaria system, the boario (so called from his care of the cattle) reccives such a quantity of the produce of the soil or of money as pays for his labour, and the land- lord remains practically his own farmer. The live stock of course is the landlord's property, but the boario has a right to certain per- quisites connected with this

department of his labour. Economia is the name given to a system by which “ the holder of the land, whether landlord or tenant, pays certain families who perform under his direction, with his capital and at his risk, the various labours of cultivation.”” The peculiar conditions of certain parts of the country produce peculiar arrangements: the Roman Campagna, for example, which could not be permanently inhabited owing to the malaria, used to be cultivated in the following fashion. Com- panies of peasants from the Abruzzi, the Marches, &c., under the direction of chiefs or “ corporals,” performed the work of sowing the fields in the autumn, andreturned in June to gather in the harvest, —the tenants of the farms usually making considerable profits from the undertaking. For further details on this subject the reader may consult the Reports respecting the Tenure of Land in the several Countries of Europe (1869-1870) presented to the English parliament in 1870, and the Monografie agricole, published by Professor Luigi Bodio, tvhose name has so frequently to be mentioned with honour in connexion with the statistics of his country. Table XIII, which is collected from the reports on the Contratti agrari in

TABLE XIII.—Varieties of Land Tenure.

Province. | Cireondario. Tenure. JLT peereoeeceneeny | Lua bbi) Suet Pinerolo | epg terzaria, affittanza, 1 RAE eonnncasagacensean7 Mezzadria. AOStH,.....2..sse0eeee …) Affittanza. Mezzadria (for smaller holdings) UNCON er ssccorersessnt|CUNICO cscaresecccsses { affittanza (for larger). : ‘ z Peasant-proprictorship boaria PAL CORMAN Ac ccacss| MASH cccessesseas els | ncaa ih: ” y Acqui … ....| Peasant-proprictorship. Casale …... cooanod …| Affittanza, mezzadria (rare), boaria. Sle Ulagepessceseoarsiensse ss Colonia, mezzadria. Vercelli,,.....~+.| ~~Affittanza (almost exclusively). Porto Maurizio…..| Taggia (territory) ...) Affittanza, Affittanza (for ficids), mezzadria Albenga Pgs (for olive grounds). Savona …..... nocHOnONe Mezzadria, affittanza. Monticello (com~~ ‘ Ay Como…... aaaisaees { MUTI)”. s.e0scese Ms Affittanza (in kind). . Abbiategrasso : MYIAI...cccc00s0 weed (Cuggiono) = Colonia. ‘ . : (| Affittanza (mezzadria has almost Melulelaaeeccwecarest sects Lomellina,.....+0 + disappeared). Bobbio … ....| Mezzadria (few cases of affittanza),

SONOTIO ccc. cc. ov «nose | HOMO Oncecs.s..ccsnreses Peasant-proprietorship, mezzadria. Bergamo ….....| BETEAUNO .....-.. seoeee| Mezzadria, r , Peasant-proprietorship, affittanza BYESCIR .....c0ccccceee| BECTIO csccccssssecececeees mezzadrin. ; Rudiano (territory),.} Quartirolo. Verolanuova ….....) Affittanza, Cremona, Manttia |.....ssscscceeereeeeeee| Affittanza, VETONH.....06008. Legnago…….....0...| Affittanza, rs Peasant-proprictorship (two-thirds Vicenza …..<3 seuseos| VENUE EMO'. scciecsses { of area), mezzadria, affittanza. Thiene ...../ Peasant-proprietorship, affittanza, , Affittanza (almost no peasant-pro- Marostica..... seaesies { prietorship). Arzignano ....| Affittanza. Vicenza...../ Affittanza (mezzadria disappearing). VENICE Ns scceene ddeesasheaeeesss ..-| ~~Affittanza (in kind). oe Affittanza (for large farins), mez~~ CLIO .or.cersesccee|ocrescecennescoseereosseees zadria (for lesser). MOGGYE ones scsnacselencnseocsswessaisusessa sean se Mezzadria and boaria. IGN e ceassassteceeee|eemememearecerecstsscsssesenas Boaria. Bologna, Ra- : venna, Perugia, > }.....0000 …| Mezzadria, ATICONA....00se.00 AGUA Warectedacesssas| sslarisoe's eocteseses …..| Affittanza (four, six, or eight years). Caserta, Avel- lino, Thaalisaee y Affittanza.

3 Caruso, for instance, in his work on Sistemi d'amministrazione, describes &

varicty in use at Gallico, in Reggio Calabria.

In order to establish new agru-

mett, or orange orchards, advantage is taken of the following arrangements. The peasant undertakes to dig the holes, to furnish and place the cuttings,

and to wateh and take care of the plants up to the seventh year. interspaces between the rows, he cultivates as a garden, and pays The produce of the orchard is

of about 229 lire per hectare. and at the end of the seventh year, the value of

between eontadino and landlord,

The magoli, or for this a rent divided equally

the garden being estimated, the former receives a third of the amount, and the landlord remains in full possession of the rest.

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the last work, indicates very strikingly tho great irregularity of the distribution of the various forms of contraets. The rent system wvould appear to be gaining ground, and the mezzadria and similar methods to be losing in importance.* , ;

~ Manufactures. —Though Italy is pre-eminently an agricultural country, its manufacturing industries are of considerable import- ance, and some of them have a long and varied history. Of chief note is the silk trade,—though it has suffered greatly from the silkworm disease which broke out in 1854. According to De Vecchi (Arch. di Stat., 1876) the total annual production of raw silk in Italy previously amounted to 7,612,000 tb ; in 1865 it was reduced

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Quantity in tb.

1878. 1879.

|

POM M Tes tecc. +. .cceessoveeee 16,905,768 9,142,359 LAGUTIA.... 0,~~2.2 222~~-e reese eeeeesees a 121,000 DERANTUOLY cts 22-020 -sc sce snsesesreres 31,022,110 13,915,649 es seseeeel 17,538,998 7,832,974 I eae cns cocnes sere crecs saqanlst 4,054,207 3,235,513 TUSCANY «0… 40001 severe ercees sapodoe 4,040,333 1,348, 236 ie Umbria, and Com 2,299,079 2,578,769 Neapolitan Provinces…..... 5,270,991 3,110,305 DIMES GP ieois ocr: or seiseoasees ne ae PEEL scene cre ste eeteoeseens 717,200 368,500

81,843,746 41,648,307

As a silk-producing country in fact Italy ranks second only to China, and leaves all its other competitors far behind. The cul- ture is carried on in at least 5300 communes, and in 1877 it was cal- culated that 4839 men, 81,165 women, and 25,373 children were employed in the unwinding of the cocoons—an operation which was formerly effected for the most part by the growers themselves, but has now passed into the hands of those who can bring better appli- ances and more modern methods to bear. The district in which the unwinding is most extensively carried on is Lombardy, and it is there too that improvements in the process are most widely adopted: while in the Veneto, for example, there are 10,031 of the old-fashioned ovens to 4698 of the modern steam apparatuses, in Lombardy the latter number 29,576 and the former only 9305. If we turn to what is more distinctively the manufacture of the silk, we find the pre-eminence of Lombardy more strongly emphasized. The position it occupies is evident from the follow- ing table (XV.) :—

Employed in silk-throwing. Spindles. Chil-

Men. | Women. —

Total.

Total.| Active. |Inactive.

2,414 |10,867 | 273,332| 83,706 | 357,038 121} 549| 8,150, 4,510 | 12,660 $3,051 |58,881 |1,484,302) 153,659 |1,637,961 445 | 5,482| | 42,581| 11,486 | 64,067 110} 610| 3,070} 352] 3,422

‘4,000 6,264

Lombardy ……..... 4,016 coca) 14

2,264

“771 “300 a 58| 2,460]... 2,460 2 4 10 | pe 12

531| 5,882| 2,461 | 8,293 150}... 150

23 841

36,345 |74,352 |1,824,707| 258,461 |2,083,168

The raw material for these silk-throwing factories is partly ob- tained from abroad, in spite of the largo home supply already indi- cated; for a considerable proportion of this—though much less than was formerly the case—is exported for manufacture at Lyons and elsewhere. According to Signor Fuzier in his Paris exhibition report, 44,000,000 Ib of silk from other European countries, and 176,000,000 i from Asia, are worked up by the Italian. spinners. The special department of cascamt employs about 27,000 spindles in Jesi, Novara, Meina, and Zuniglio.

In silk-weaving Italy stands comparatively low. Signor Ellena, goer director of the customs,? estimates the number of looms at rom 10,000 to 12,000, of which only 665 were power-looms—very meagre totals in comparison with those even of the Swiss canton of Zurich, which numbers about 1000 power-looms and 40,000 hand- looms. Lombardy (especially the town of Como)is again the principal seat of the industry, Campania ranking second, and Piedmont third.

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1 On the mezzadria system, sec als: i i i tout Nant y' ; o A. Rabbeno, Sulla mezzadria net suot

'i A large proportion of the facts mentioned in this section on the manufactures are borrowed from V. Ellena's pape: in Arch. di Stat , 1880.

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to 3,876,400 Ib, but it has since considerably recovered its ground. The average, indecd, for the ten years 1868-1877 is given by the same

authority as 5,753,880 tb; and according to the report of Luigi Maccia to the Milan chamber of commerce in 1881 the cocoon harvest amounted in 1878 to 81,843,740 ib, in 1879 to 41,648,200 Ib, and in 1880 to 79,546,280 Ib, whieh would represent in round numbers 5,500,000 fb of raw silk for the first year, 2,798,000 tb for the second, and 5,345,000 for the third.

The following table (XIV.)from the same report indicates, with approximate accuracy, the contributions of the diffcrent regions to these totals :—

Valuc in lire.

1880. 1878. 1879. 1880, 12,209,784 31,640,711 20,674,341 22,247,904

193,600 Ase 297,000 396, 000 33,177,509 51,647,796 Ble Tees0d 50,247,949

19,146,399 30, 426,995 19,834,645 30,276,210 4,045,973 8,001,707 8,581,731 7,488,170 2,881,507 9,736, 425 3,819, 036 5,540,179 3,371,471 5,026, 410 6,995,717 5,914,461 4,189,625 6,748,745 5,802,564 5,990,060

66,000 aes ess 10,000

374,000 1,180,120 708,500 510,000 79,546,471 144,108,909 98,440,611 128,620,933

Next in importance to the silk industry stands the cotton manu- facture. During the American war tle cultivation uf cotton in Italy received a remarkable but temporary stimulus. In 1864 it oc- cupied about 227,645 acres, and the produce amounted to 622,896 quintals, but the corresponding figures for 1873 were only 85,422 acres and 180,230 quintals. In 1877 Italy had only about 880,000 cotton spindles, or rather more than Belgium; and these consumed about 264,000 quintals of the fibre. Liguria and Piedmont contaiu the greatest number of spinning mills. In the number of its cotton looms, however, Lombardy stands highest, and Liguria, Piedmont, and Campania follow. The total number for the country is stated at more than 13,000.

Of the cotton goods the great proportion consists in the coarser fabrics, —muslins, tulles, &c., being obtained almost exclusively from abroad. The avcrage importation of cotton yarn for the ten years 1870-1879 amounted to 109,000 quintals, and that of cotton fabrics during the same period to 116,000 quintals.

As has been already seen, Italy is a great wool-growing country ; and while it exports about 1,760,000 Ib of tho native produce, it imports, mainly from South America, a quantity varying from 10,382,680 Ib in 1870 to 18,983,600 fb in 1879. The ‘sllowite table (XVI.) indicates the extent of the industry, which, unlike that of cotton, has a long and in parts brilliant history in the country :—

Horsc-Power.| Workers in Spinning.| Workers in Weaving.

No. of Factories. Children. Children

Piedmont.

x

=)

a=

Calabria ….. Sardinia

More than 3000 hands are further employed in the shoddy trade. With few exceptions, the Italian factories receive the wool in its raw state from the grower, and perform in succession all the various operations of washing, scouring, carding, dyeing, weaving, and dressing. They manage to supply a large part of the home demand, and also export a small quantity of goods.

The flax and hemp industries have beea prosecuted in Italy for centuries ; but a large proportion of the manufacture is still carried on by hand-loom weavers working in their own houses—to the num- ber

probably of more than 68,000. The following table (XVII) indicates the distribution of the factories :—

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.|Horse-Power. Spinners. Weavers. 3 : [=| s Ssiailg)./218].,/2]|8 eee |e le ializli2is a e = e 5 a Ee 5 Piedmont <..... 71 10 18 45 61 20 | 694) 820 51 1b qn id Ee penpospccacood|| | 25 64 14 36 19 216 87 30 Lombardy…….] 56 | 114 | 1784 | 785 | 1240 | 958 | 789} 941] 314 WEMCUO' .cccccnsess coos (eee 8 90 48 248 53 142 206 48 Emilia …. A) PRY 120 3805 202 234 47 895 694 91 Umbria… "sss toc se 20 112 Aa lleceee Marches .. ee) 20 500 S50 Out ee od USCHILY. secoscsesceres|) oe aoe = coc ace ase 263 | 481 | 230 Abruzzi and Molise| 1 ese ee Bn eae eee 73 ee ees Campania.....00-21 226 190 431 726 130 183 565 211 (NPUN Wee s-cccesscsces 2 oa aoe ais nes nee 6 12 aan DIGI. cscs seosescosees Nini ise nee nd San ace 104 84 45 DATMUDMEG res. eneses cece]! Bel) Geo ROU csccceteacvess 241 |] 508 | 2451 | 1525 | 2565 | 1227 | 30538 | 3394 | 1020

The manufacture of jute is quite insignificant :—two weaving factories in Lombardy and Liguria, and spinning mills at Crema,

Poirino, and Grugliasco. It is estimated that about 8400 hands are employed in the making of ropes and cordage; and of the produce in this department there is a very considerable export, vary- ing in the ten years 1870-79 from aminimum of 20,797 quiutals in 1870 to a maximum of 36,908 in 1873. The factories that produce mixed fabrics are 210 in number, and upwards of 5000 hands are employed in them.

The extent to which weaving is carried on in the simple domestic fashion has been indicated in eonnexion with the linen trade; it also maintains its ground in several of the other departments, and the popular prejudice—if prejudiee it bc—in favour of the firm- wrought fabries that are thus produced will long keep the clack of the solitary loom familiar to the inhabitants of many a town and village. It is said that there are at least 230,000 of them at work throughout the country.

The making of felt hats, which gives employment to nearly 5000 hands, is mainly carried on in Piedmont, and particularly in the cireondario of Biella and at Intra. The produce is for the most part of a coarse quality, but finds a market not only in Italy but also in Franee, Austria and Switzerland, the Argentine Confedera- tion, and Tunis. The trade in straw hats is rapidly growing in importance : while in 1867 the number exported was only 7661, it rose in 1877 to 4,526,000.

Owing to the abundance of the raw material, Italy has long been successful in the manufacture of paper from linen rags aecording to the old-fashioned processes; and the development of the more modern methods has been fostered by the ready availability of water power, though on the other hand the outlays for cliemicals, machin- ery, and fuel are serious drawbacks. The supply of home-made paper is far in exeess of the demand, and there is a corresponding cxeess of export over import, more especially in blotting and pack- ing papers. The imported paper is almost exclusively of the finer qualities. Aceording to Signor Avondo, the annual quantity of rags obtained in Italy is 88,000,000 ib. There was formerly a great export of rags to America in the shape of packing matcrial for marble-bloeks.

In the manufacture of leather and skins Italy has long been suc- eessfully engaged ; and though the industry has now to compete with the new enterprise of India and America, the annual produc- tion is valued at £4,000,000. The staple article is shoe leather ; in tho finer departments—such as kid skins—foreign competition is too strong for the full development of the nativeindustry. It is estimated that there are upwards of 1300 works in the country, employing more than 10,000 hands.

A private company, established in 1868 under the name of Regia Cointercssata, seeured for fifteen years the exclusive privilege of manufaeturing and selling tobacco in continental Italy and Sardinia, on condition of paying to the state an annual rent and a eertain pro- portion of the gains after the rent was deducted. In the period 1869-1870 the rent was to be 66,894,811 lire, in the second period (1871-74) 72,293,032, in the third (1875-1878) 79,484,891, and for the fourth

(1879-1884) 93,000,000. Up to 1875 the Govern- ment share in the nltimate profit was fixed at 40 per cent., and from 1875 at 50 percent. The results of this arrangement have not been equal to the anticipations formed in regard to them. a nae 7, however, the Regia extcnded its control to the island of

icily.

According to the regulation of 1879 the cultivation of tobacco for exportation is permitted in any part of the country on ayment of a licence, while the cultivation for the inland monopoly is restricted to certain regions annually determined, and within these regions no eultivation for export can be carried on. The rules are of a very rigid description. The provinces in which the monopoly eultiva- tion has usually been located are Vicenza, Ancona, Perugia, Rome, Benevonto, Salerno, Lecce, Sassari, Catania, and Messina. The total area of the ground so occupied was only 4500 hectares (11,120 acres)

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in 1877; to satisfy the national demand from internal sources would require from 18,000 to 20,000 hectares (44,480 to 49,490 aeres). On an average it is caleulated that every inhabitant of Italy uses about 5 oz. of snuff, 10 oz. of eut tobaeco, and 94 oz, of cigars annually—the total expense being 5°518 lire or 4s. 6d. per head.

The manufacture of oils is among the most flourishing of the minor industries, and the demand whieh it makes on foreign coun- tries for supplies of raw material is rapidly increasing. The amount of oil-seeds imported in 1870 was 27,000 quintals, in 1879 211,400 quintals. And at the same time the consumption of the oils with- in the country exceeds the quantity manufactured, so that the ex- cess of the import over the export of oil in 1879, for instance, was 135,660 quintals. Thero are 487 oil works in the kingdom (198 in Lombardy), and they employ nearly 2000 hands. Rape, linseed, ricinus, ground-nuts, and sesamum are all made use of, espeeially the first and last. Soap works are said to

number as many as 537 (151 in Sicily alone, and 87 in Apulia), and to engage 1770 men, 185 women, and 179 children ; and the exportation of soap, which was less than a third of the importation in 1870, has increased till the excess is strongly in its favour. The 10 stearine-candle fac- tories employ upwards of 500 hands, and form the nucleus of what may be a large industry.

The sugar manufacture is of limited extent. During the Austrian rule it was carried on in Lombardy and Venice with the support of the state; but the political changes proved fatal to its existence, and it was not till 1872 that the first sugar refinery of the kingdom of Italy was established at Sampierdarena, This, however, proved a flourishing business, and supplied about one quarter of the entire consumption of Italy, which was estimated at 176,000,000 tb; in 1876 it employed 500 hands, and carried on distilling operations, Beet-root sugar has been manufactured since 1869 at Anagni, where the factory was formerly protected and privileged by the Papal Government ; and there are other factories at Rieti, Cesa (in the Val di Chiana), &c. (English Parliamentary Papers:—Reports on Sugar Industries in Foreign Countries, 1876.)

In 1877 thero were 9583 distilleries in the country, and 370 manufactorics of aerated waters. The brewing establishments amounted to 145, and manufactured 2,488,838 gallons. Both barley and hops are largely imported from abroad, the hops mainly from Austria and Germany. In the following table (XVIII.) the first column indicates the quantity of beer annually imported, the second the quantity annually made in the country :— Gallons. Gallons,

Gallons, Gallons.

1,667,292 1,915,254 2,077,416 2,380,070

2,634,082 2,729,892 2,488,838

811,998 922,768 889,108 905,102

577,170

660,286 752,378 916,564

The iron manufaeture has inereased in importance in Italy during the last decade. In 1872 the production of wrought iron and steel was estimated at 48,909 tons; in 1877 it was 73,000 tons, and 12,000 hands were employed in the works. Liguria has the eredit of nearly half of the total amount. The works at Savona, Voltri, and Pra, at Vobarno near Lake Garda, and at Val d'Elsa deserve mention. Some of these have furnaces of the Siemens type.

" Rsatetnertistt progress has also been made in the manufaeture of

machinery ; the number of men employed in this department (the Government factories being omitted) increased from less than 12,000 in 1872 to 15,000 in 1877. The Italian mechanicians do not seek to eompete with foreigners in the production of large steam engines and hydraulic motors, but devote their attention to the minor kinds of machinery for wool and eotton factories, dye works, railways, &c. ;

The principal chemical works are those of sulphuric acid at Milan, Turin, Naples, and Genoa, of hydrochloric acid at Milan, of nitric acid at Milan and Avigliana near Turin, of carbon disulphide at Bari, Pisa, San Giuliano, and of quinine at Milan and Genea. This last manufaeture, though it only dates from 1870, exceeds that of any other European country. The quinine is partly exported to Russia. 'Tartaric acid, as a matter of course in a wine-growing country, is produced in abundanee. Glue-making is also a widel diffused industry, and the manufacture of artificial manures, whic was carried on in 32 factories in 1878, is increasing in importance. India-rubber works exist at Milan. ;

In the various ccramic arts Italy was at one time unrivalled, but the ancient tradition has long lost its primeval impulse ;1 and even where the industry remains the art has for the most part perished. The works at Vinovo, which had fame in the 18th cen- tury, came to an untimely end in 1820; those of Castelli (in Abruzzo Ult. I.) were supplanted by Charles III.'s establishment at Capo-

1 A curious instance of the tenacity of popular art tradition in the country is furnished by the fact that some of the long-lost processes of Etruscan pottcry have been found in use at St Angelo in Vado, a remote corner of the Marches. Sce Aless. Castellani in Amer, Ass. for Adv. of Science, 1876.

dimonte, 1750, which after producing articles of surprising execution was closed before the end of the century. The first place now be- longs to the Della Doccia works at Florence. Founded in 1735 by the marquis Carlo Ginori, they maintained a reputation of the very hichest kind down to about 1860; but since then they have not kept pace with their younger rivals in other lands. They still, however, aro commercially successful, producing to the value of 700,000 or 800,000 lire, and employing 600 workers. Other cities where the ceramic industries keep their ground are Pesaro, Gubbio, Faenza (whose namo long ago became the distinctive term for the fer kind of potter's work in France, fatence), Savona and Albissola, Turin, Mondovi, Cuneo, Castellamonte (more than 30 establish- ments, 500 workmen), Milan, Brescia, Sassuolo, Imola, Rimini, Perugia, Castelli, &c. It is estimated that the total production of the finer wares amounts on the average to 10,000,000 lire per annum. The ruder branches of the art—the making of tiles and common wares—is pretty generally diffused. (For further details see Giuseppo Corona's Report on the French Exhibition of 1878, Class XX., "Ceramica," Rome, 1880.)

The jeweller's art as a matter of course received large encourage- ment in a country which had somany independent courts ; but nowhere has it attained a fuller development than at Rome.

The production of mosaics is an art industry still carried on with much success in Italy, which indeed ranks exceedingly high in the department. The great works of the Vatican are especially famous (more than 17,000 distinct tints are employed in their productions), and there are many other establishments in Rome. The Florentine mosaics are perhaps better known abroad ; they are composed of larger pieces

than the Roman. Those of the Venetian artists are remarkable for the boldness of their colouring.

The small amount of capital accumulated in the country, the heavy expenses involved in the importation of much of the machinery necessary for the larger industries, the comparative in- expertness of the mass of the operatives, and the difficulty con- sequent upon these and other circumstances of competing with foreign manufacturers who can produce at a cheaper rate—theso are some of the reasons of the backward state of Italian manufacturing industry. The inexpertness of the operatives—due to lack of ex- perience and of education—is the more noteworthy because it counteracts tho advantage to be derived from the cheapness of labour. The principle of the division of labour has comparatively limited application. From the same factory, for instance, may be obtained ploughshares and theodolites.

Fisheries.—As the coast-line of Italy extends to about 3937 miles (of which 1048 belong to the islands), the prosecution of the fisheries in the neighbouring seas is carricd on from a great many

oints. The following table (XIX.) gives the principal statistics of ate 1879, for the various " compartimenti" or districts into which the coast is usually divided :—

Total number of Boats,

For Fisheries

proper. For Coral.

Distriets.

Men. No. No. Men.

439 | 62

La Maddalena…..... 6 54 2 Porto Empedoele….. 5 37 : BUCADEM. .ccccccesseesers 68 699 37 1,221 | 9,038 | 785 | 4,559 | 410

'To complete the total for Trapani, it is necessary to add 26 boats with 471 hands, which are employed in the sponge fishery off Tunis. For

Italy, as for the other Mediterranean nations, the tunny fishing is of considerable moment. The more important stations are those in Sicily, Sardinia, and Elba. Apart from local con- sumption the annual value of the Sardinian fishery is estimated at 4,000,000 lire, and that of Sicily at about half as much.

The anchovy and sardine fisheries are carried on by Italian boats, not only on the Ligurian and Tuscan coasts, but on those of France, Spain, Barbary, Dalmatia, and Istria. Among the stations which take an active share in this department are Sestri and Riva,

‘ See, for example, the notice of Veniee in British Consular Reports, 1879.

(Treaty

~ 455

Cecina and Castiglione, Porto Ercole, Porto Lougone in Elba, Ancona, and Chioggia. The success of the fishermen is now seldom so great as it was before 1868 ; and 2 lire per day is the most that can be gained in the best months at the better stations. The annual value of the sardines brought to Terracina is stated at 6300 lire, and that of the anchovies at 7000; and the corresponding figures for Porto d’Anzio and Palermo are respectively 98,000 and 82,000 lire, 200,000 and 400,000. Civita Vecchia has a total for the two kinds of 15,000 lire.

Sword-fish (Xiphias gladius) aro not only constantly caught in the nets of the tunny-fishers, but from time immemorial havo been the object of special pursuit, the weapon mainly used against them being a species of harpoon or drafineria. As many as fifty fish may be caught ina single day off the coast of Sicily, and twenty off the coasts of Calabria. Each fish weighs on an average from 220 to 440 tb; and the quantity captured in the season in the two dis- tricts indicated may amount to 308,000 Ib.

Coral is obtained in various parts of the Italian watcrs, more especially in the neighbourhood of the island of Elba and the Gulf of Naples, and

the Italian coral fishers extend their voyages to tho African coast and the islands of Cape Verd. In 1869 it was stated that upwards of 400 vessels, of 2712 tons total burden, were cm- ployed in the department, by far the greater proportion of them belonging to Torre del Greco. The statistics given in Table XIX. show but little change. The hardships endured by the more ad- venturous fishers are extremely severe, and the gain is compara- tively slight. (Compare Green's Stray Studies, 1879, for a descrip- tion of the coral fishers of Capri.)

Of special importance are the lagoon fisheries of Orbetello, of tho Mare Piccolo of Taranto, the Lago Verzimino or Salpi, and the Lago di Varano, and more particularly of Comacchio, Eels, soles, mullets, and various other kinds of fish are there obtained in enor- mous quantities."

Condition of the Lower Classes.—Though mitigated to some degree by the mildness of the climate and the cheapness of certain articles of food, pauperism in its most painful forms is a wide- spread evil in Italy. At Venice, out of a total population of 130,000, 36,000 are regular recipients of official charity. The slums of Naples are foul and overcrowded as the slums of London. Nor is the destitution confined to the cities. The condition of tho agricultural labourers is in many cases deplorable. In the districts of Como, Milan, Pavia, and Lodi, the food of tho contadino, according to F. Cardani and F. Massara, consists of maize bread, badly cooked, heavy and rancid, and thin soup composed of rice or " pasta" of inferior quality and vegetables often old and spoiled. In Southern Italy, says Villari, the peasants live in miserable houses, with a sack of straw for their bed, and blaek bread for their sole sustenance. Maize is the general food stuff in the northern and central provinces, but begins to be rarer in Tuscany and Rome; it is again widely diffused in the upper provinces of Naples ; but in Calabria and Apulia it forms the principal uutriment of scarcely a fourth of the communcs, and in Sicily it disappears almost com- pletely. In Picdmont, Lombardy, and the Veneto it is used mainly in the form of polenta, but also in the form of bread, and in the Napoletano in the form of a finer kind of polenta. Lom- bardy, the Veneto, Emilia, and the Marches are the regions where wheaten bread is least employed by

the peasants. Barley is mainly consumed in Apulia and Calabria, rye in Sicily and Lombardy. In certain communes of the Marches and the Abruzzi acorns constitute the ordinary diet of the poor. Wheaten pastes are most extensively employed by the people in Liguria, Sicily, and the upper Neapolitan provinces, Animal food holds but little place in the dietary of tho poor ; and even in the house of the well-to-do peasant butcher meat appears but seldom. According to Dr Rascri, who has investigated the point by means of the customs returns and similar statistics, Sardinia is the region where animal food is most largely employed, and Sicily that where it is least.

Wine is naturally the prevailing drink throughont the country ; but the extent of the consumption varics greatly from region to region, the average in tho Roman province, Umbria, and Sardinia much exceeding that in the provinces of Naples and in Sicily. The use of aleohol is greatest in the Lombardo- Venetian cities ; and it is there only that beer is of importance as a beverage. Cases of acci- dental death and of insanity attributable to tho niisuse of stimu- lants are much more frequent in the north than in the south or centre, andin both respects Liguria has an unenviable pre-eminence.

An idea of the extent to which even the peasantry are oppressed by penury may be obtained from the investigations made by the Government into the spread of the terrible disease known _as the pellagra. First clearly described as an Italian disease by Frapolli in 1771, the pellagra has within the present century gradually become more common and severe. In 1839 it was estimated that the number of pellagra patients was 20,282 in the “ compartment of Lombardy, and in 1856 it had increased to 38,777. According to

2 See Friedliindcr, La Pesca nelle lagune di Comacchio, 1872, and compare the

article Comaccnto. For full details on the whole question of the Italian fisheries see Lspoz. intern. di Pesca in Berlino, 1880, Sezione Italiana, Florenee, 1880.

returns for 1879 it appears that there were 97,855 patients in the kingdom—by far the greater proportion being in Lombardy, the Veneto, and Emilia, where they actually formed 31°70, 30°52, and 23°66 per thousand of the agricultural population. The disease has many forms, and not unfrequently ends in insanity. And to what are its ravages to be ascribed? To insufficient and unwhole- some food, and more particularly to the use of maize ina state unfit for human consumption.! When such a state of matters exists among the rural population of some of the most prosperous regions of the country, there is little wonder that the number of conscripts who have to be rejected on the score of physical incapacity is a large one—20 per cent. in Lombardy and 18 per cent. in the Veneto in 1878.?

The interest of the Italians is gradually being aroused in the sanitary condition of their cities and towns. Many of the provin- cial capitals and cathedral cities are portentously filthy. Drainage and sewage works, however, are becoming matters of concern to a number of the more important communes ; and such cities more especially as Naples and Catania are bestowing much attention on the subject. A society of public health, Socteta Italiana d' igiene, was established at Milan, one of the most advanced of Italian cities, in 1877; it publishes a valuable journal. In Milan, Bologna, Genoa, Rome, and some other cities attention is being paid to the question of cheap houses for the working classes. On the general health conditions of Italy compare the elaborate study by Giuseppe Sormani, Geografia nosologica dell' Italia, Rome, 1881.

Commerce. —The extent of its coast and the number and excellence of its ports and harbours, the relation which it holds to the other countries of the Mediterranean seaboard, and the railway communi- cation which it now possesses with the Transalpine lands combine to give Italy an important place as a trading-country,—a place which would have been more important if all departments of activity had not fallen into so sad a state during the long period of its political de- cadence. In a country with a population comparatively so dense, and withso large a

number of considerable cities as we have seen Italy to possess, it is evident on the face of it that the internal trade must amount to nosmall aggregate; but the simple agricultural life which is led by a large proportion of the inhabitants, the capacity which many regions possess of satisfying the demands of local consumption, limited at once in volume and variety, and the lack in many cases of free and frequent means of communication tend to restrain the scope and complexity of this interchange. That both the internal

trade and the foreign commerce of Italy are in process of rapid development it is impossible todoubt. Of the former movement some idea may be obtained from the railway statistics, which, however, owing to the incompleteness of the system, furnish a less accurate representation of the facts than similar statistics in the case of older nations. That the foreign commerce is on the increase is shown by the following statement of the exports, imports, and transit trade from 1871 to 1880 (Table XX.):—

Imports. Exports. Transit Trade. lire. lire. lire.

1,085,459,567 128,350,140

1,167,201,119 121,172,403 1,273,044,646 1,162,153,012 174,551,904 1,275,206,783 985,458,532 215,277,553 1,201,963,663 1,033,681,104 78,928,104 1,313,841,108 1,216,844,813 102,547,875 1,151,222,784 979,162,785 92,182,912 1,070,637 ,230 1,045,301 ,302 80,950,387 1,261,651,423 1,106,919,278 96,986,244

1, 225,644,170

1,132,289,192

“1n1873,” says Dr A. Brunialti, the author of “ Le grandi vie del commercio internazionale,” published in Studi sulla Geografia dell’

Italia (Florence, 1875), issued by the Italian Geographical Society, "'Ttaly, with a total of 2,400,000,000 lire, was eighth in the list of commercial nations of Europe, being exceeded by Great Britain (17,000,000,000 lire), Germany, France, Russia, Belgium, Austria, and Holland, though Belgium is less than one-tenth of Italy in area, and has not more than one-fifth of its population, and Holland is not much bigger than Belgium, and has one-third less of a population." In 1877 it was still eighth on the list, and some of the smaller coun- tries had made greater advance. The Italian trade with France and with Switzerland has enormously increased since the unification of the kingdom; and the same may be said of the trade with Russia. Since the opening of the Suez Canal advantage has been taken of the new opportunities of trade with the East.

Table XXI. gives the geographical distribution of the Italian trade during 1869, 1873, and 1879. In 1880 the whole value of the imports (excluding transit trade) was 1,225,644,170 lire, and the corresponding number for the exports 1,132,289, 192.

The Italian exports, as a natural consequence of the undeveloped state of the industries and the preponderance of its agriculture, mainly consist of such products as wine, oil, fruit, cattle, &c.

963,698,441 1,186,611,328

TABLE XXJ.—Exports and Imports, 1869, 1873, and 1879.

Exports from Italy.

Countries. 1869. 1878. 1879.

lire. lire. lire,

America, except United States…. 26,162,000 57,444,000 81,308,000 RUSIA S ccccaccdteTiecstescccssascspccesse] OD REn,OC0 221,640,000 206,778,000

5,545,000 4,866,000 6,616,000

TY Pt scveceees a sansa elea(eisninnan'=Nsleldsainle 5,550,000 19,827,000 10,265,000 France and Algeria ….....s0..ee «| 166,979,000 447,649,000 473,067,000 Germany 3,021,000 13,815,000 23,800,000 Greece 3,899,000 17,481,000 14,164,000 England …..... 116,995,000 110,553,000 96,513,000 Holland 13,096,000 15,077 ,000 5,635,000 Russia 88,232,000 16,697,000 24,702,000 Spain and Portugal. « 5,120,000 7,049,000 11,080,000 United! Sia best stica cca ictacease bay «| 29,523,000 29,624,000 51,396,000 Sweden, Norway, and Denmark… 3,916,000 1,578,000 2,345,000 GWITZETIANG! ....cscccssconcosscseneraaze-c| LOLA LOGO 159,677,000 107,409,000 Tunis and Tripoli …..... easeuatesne 5,079,000 8,806,000 4,094,000 PUP OY Actesecsedeoustl soascescesbese «..| 12,424,000 6,733,000 17,937,000 British Possessions in Asia …..... . eee see 6,853,000

Imports to Italy, Countries. 1869. 1873. 1879. lire. lire. lire.

America, except United States,,, 24,637,000 52,658,000 28,862,000 i 4 156,619,000 225,371,000 194,364,000 Belgium…..... 10,090,000 14,457,000 14,195,000 BUD ieoucseswaveaveeneverceee 3,702,000 18,137,000 31,551,000 France and Algeria…... 264,424,000 386,862,000 801,098,000

} GeOrMaNy…coss0sees Pasaaane® anaes 10,107,000 23,710,000 45,618,000 GQVCOGO es concn ccevactvssicsseesneecestseer's 7,712,000 6,222,000 10,154,000 Engiland…..... aaa awaaer enadenaseeaees 232,269,000 802,306,000 256,090,000

f TGR eeesanicerensegsscersSeakOs some 35,277,000 44,889,000 11,442,000 LTC EERE oso oee ccecce cactuinsancts 30,448,000 48,502,000 102,249,000 Spain and Portugal ….....seee. 8,893,000 9,535,000 10,510,000 IW mfOM SEATON, 8. ooo ccued Miceccses ..| 87,992,000 49,726,000 71,828,000 Sweden, Norway, and Denmark… 4,607,000 2,112,000 5,186,000 Switzerland…..... 49,442,000 40,977,000 82,436,000 Tunis and Tripoli re 8,941,000 18,566,000 4,362,000 TO yreriawcens ans Rogan tessaghtGncescasa 47,604,000 48,623,000 66,076,000 British Possessions in Asia ….,... als aa 52,645,000

TABLE XXII.—E£xports of Sundry Important Articles, 1865-79.

ae Butter, Cattle Sheep. Wine in : . ’ Fr , y Years. Eels. Olive Oil. hi aoe eae Egag. Gloves. Marble. Sulphur. ar oi —

gallons. quintals. quintals. quintals. quintals. 100 pairs. lire. quintals.

1865 5,819,264 657,132 6,603 4,481 19,844 3,488 5,671,779 1,453,166 31,019 56,881 1866 7,653,130 647,980 4,871 15,225 32,583 3,580 7,405,318 1,795,443 55,079 159,327 1867 6,291,472 377,941 5,263 26,093 49,148 5,296 5,819,573 1,925,928 123,900 199,026 1868 5,035,932 522,808 7,188 29,476 41,401 8,335 7,005,187 1,764,256 85,264 214,290 1869 6,011,016 776,180 6,071 30,659 65,565 10,941 28,657,408 1,705,304 62,987 162,904 1870 4,947,514 578,347 9,076 26,574 48,768 8,931 10,237,020 1,743,180 75,237 169,047 1871 5,010,852 841,106 10,039 25,349 46,190 13,451 9,573,133 1,724,710 164,332 359,314 1872 12,805,068 673,593 11,505 24,007 45,064 19,715 10,111,005 1,826,550 197,210 284,563 1873 6,386,440 602,605 9,998 25,258 54,770 9,545 11,995,943 2,030,510 77,268 213,778 1874 5,908,604 476,832 14,056 27,424 87,239 5,977 13,190,527 1,745,620 49,792 192,455 1875 7,748,290 926,673 12,433 30,681 90,710 14,985 13,480,935 2,166,750 60,146 225,346 1876 10,960,664 812,897 16,082 80,530 247,070 26,263 14,853,675 1,952,800 96,368 318,876 1877 7,803,708 602,301 21,677 44,267 210,340 29,244 12,351,436 2,101,177 159,732 386,420 1878 11,551,254 514,127 23,703 44,792 228,322 26,270 15,215,430 2,183,264 170,141 464,413 1879 23,388,508 886,555 20,067 56,524 231,857 15,886 29,696,526 2,422,706 129,730 387,727

, 1 See Annali ai Agricoltura, No. 18, “La Pellagra in Italia, 1879” (Rome, 1880). The statistics of the hospital of St Clements at Venice, for example, are sufil- ciently startling, as indicating the extent of what the Italians graphically call il delirio della miseria. The first column gives the number of the Junatics received in each year, the second column those whose mental condition is the result of the pellagra, that is, of poverty.

178 153

1876 1877

2 Compare Laveleye, L’ftalie actuelle, Lond., 1880. 3 Compare the aeeounts given by Gallenga in his /taly Revisited.

The total number of pel/agra lunatics in Italy, which in 1874 was 945, had increased by 1877 to 1848.

666 802

175 215

859 924

294 337

nw

STATISTICS. | (FAL Y 457

Table XXII. shows the great increasc that has taken place in the amounts exported in the case of several important articles. :

Among the chief imports is coal, the demand for which, in 1865 only 456,039 tons,! has gradually increased to 1,523, 676 in 1879, and to 1,737,746 in 1880—morce than threefold. The importation of mineral oils has in the same space increased in value from 83,984 quintals to 586,323. Whereas the excess of importation over ex-

ortation in the case of raw wool was 4,249,135 kilogrammes in 1865, in 1880 it was 5,574,700 kilogrammes ; in the case of cotton the corresponding figures were 3,745,009 for 1865 and 29,158,500 for 1880.

According to the Relazione sui Servizi idraulict pel biennio 1877-78 (Rome, 1880), the number of ports in the kingdom is 307, of which 10 are of the first class, 20 of the second, 27 of the third, and 250 of the fourth. Those belonging to the first category are Ancona, Cagliari,

Naples, Palermo, Venice, Genoa, Leghorn, Messina, Civita Vecchia, and Brindisi ; and those of the second in- clude Portofino, Porto Venere, Porto Ferraio, Porto Ercole, Marciano, Porto d'Anzio, Gaeta, Ponza, Baia, Manfredonia, Tortoli, Milazzo, Cotrone, Syracuse, Longone, Nisida. In extent of commerce Genoa is facile prineeps, as is evident from the following table (XXIII) of tonnage, according to thie official Movimento della Navigazione (Rome, 1880) :-—

Foreign Trade. Coasting Trade.

1861. 1879. 1861. 1879.

a 968,848 | 2,078,973 | 967,916 | 1,490,192 Leghorn oecseeccceeeesceevees 980,357 459,884 692,862 1,891,490 ME@SSINA.....sereseeceeneee 401,097 572,254 708,494 1,683,896 Naples….cccsceesere : 730,145 933,762 873,730 2,042,559 Palerm0..0…000. +00 Meee, 202,101 607,649 541,153 1,479,685 VENICE c..0eneyenceeserceess 660,047 878,395 78,760 400, 365

Of the foreign nations that are engaged in the shipping trade of the Italian ports Great Britain has by far the most important sharc (7669 vessels, of 5,950,279 tons burden); next comes France (4256 vessels, 2,061,973 tons); third, but at an enormous distance, is Austria, and fourth Greece. It is calculated that in the vessels, native and foreign, that visited the Italian ports in 1879, no less than 1,748,717 men were engaged as seamen.

The Government undertakes the engineering works necessary for the improvement and maintenance of the harbours of the first three classes, and it further subsidizes the communes which have to main- tain the harbours of the fourth class. In 1878 there were 60 light- houses on the Italian coast, of which 16 are of the first class, exelu- sive of the international light at Cape Spartivento. The whole cost of harbour and lighthouse maintenance is thus indicated (in lire) for 1877 and 1878 (Table XXIV.):—

1877. 1878.

a | ——.

Works executed …..sccecsccseoes 5,786,050 7,409,090 Sums placed in balance . .| 16,945,522 20,431,168

BPRS PIC cscccssscceocessces Geonses 5,714,769 8,524,311 Sums carried to next year….. 11,159,566 11,902,179 Sums funded….....0 peeesenses 71,185 4,676

The Italian seaboard is officially divided into 23 maritime districts (compartmenti) :—Porto Maurizio (from Ventimiglia to Alassio), Savona (onwards to Arenzano), Genoa (to Rapallo), Spezia (to Avenza), Leghorn (to Graticeiare), Porto Ferraio (island of Elba), Civita Vecchia (from Graticciare to Torre Gregoriana), Gaeta (to Lago di Patria), Naples (to Torre del Greco), Castellamare di Stabia (to Sapri), Pizzo (to Bagnara), Taranto (from Melito to Fasano), Bari (to Viesti), Ancona (to mouth of Cesano), Rimini (to Po di Goro), Venice (to the Austrian boundary), Cagliari (from Oristano to Terranuova Pausania), La Maddalena (to Oristano), Messina (con- tinental Italy from Bagnara to Melito, the Lipari Islands, and Sicily from the river Pollina to Alcantara), Catania (to Pachino), Porto Empedocle (to river Belici), Trapani (to Castellamare),

TABLE XXV.—Satling Merchant Vessels, 1879.

Porto Maurizio…... Bari delle Puglie…| 441 10,453 Savona … PATICOHM Ics esese8 sas 3 148 7,569 Genoa ” 477,775 || Rimini . 217 5,192 Spezia . 68,657 || Venice.. 883 | 30,768 Leghorn . 29,418 |) Cagliari. 82 3,363 Porto Ferraio …... 18,149 || La Maddalen an 19 420 vance WWESSING.....—<| 424 15,129

PRED RSMEAt a Se eenbs : onencocnsencnag 260) 14,134 Mepunessivaceceae : Porto Empcdocle…| 189 3,236

eeeves 27 86,372 || Trapani….....) 448 12,661

cocceer ee eee Palermo ….....| 244 | 14,647 Peraeeaceciene 7,910 | 933,306

1 1 ton (tonnellata) =2200 ib,—40 lb less than the English ton.

Palermo (to river Pollina). Thus 15 of the districts are continental and 8 insular.

Table XXY. gives the sailing vessels in the mercantile marine in 1879, the last year for which statisties are available.

The marine showed a total strength of 167,282 men,—8 being captains of the class technically called "superior," 4122 captains of " long course," and 2504 captains of the higher coasting class.

Of the 7910 vessels none exceeded 1500 tons burden, 2 were more than 1200, and 18 others more than 1000. The steamers belonging to the country at the closo of 1879 were 151 in number (aggregate burden 72,666 tons), of which 70 were Genoese, 11 Neapolitan, and 51 Palermitan. Of the total, 128 were screw- steamers and 23 paddle-steamers. Boats adapted for fishing wero registered at the same date as 15,411, of which no fewer than 1953 belonged to the Naples district, and 1399 to that of Messina. Ship- building was carried on in 50 ship yards in 1879; and they pro- duced 269 vessels, witli a total burden of 21,213 tons.

Shipbuilding.—The district which showed the greatest activity in shipbuilding and produced the greatest number of large vessels was that of Genoa. This industry continued to increase in im- portance in Italy from the foundation of the kingdom till 1869 (683 vessels, 96,010 tons); in the next three years there was a decline ; by 1875 the figures of 1869 were again almost reached, but since then there has been avery notable decrease. The number of workmen engaged in 1879 was 14,179, of whom 182 were ship- builders of the first and 70 of the second class.

Railways.—The first railway opened in Italy was a line of 26 kilo-metres, constructed in 1840, between Naples and Castellamare, By 1842 there were 54 kilometres in existence; by 1845, 157; by 1848, 360; by 1858, 1707 ; by 1868, 5679; and by 1879, 8340. Tho system is considered as consisting of the following scctions (Table XXVI.):—

Cost of Construction.

Cost of Average

Length. Material. | per kilo.

1. Railways formerly worked ‘ kilos.

lire. lire. lire. py the Company of Upper > 3,472 | 1,082,317,000 | 125,532,000 | 333,481 Italy (Alta Italia) .....

tion of Basel, of which the state is co-proprictor Liguro-Tuscan lines, &c. 1,083 343,172,000

Lines purchased by conven-

2,389 689,145,000

2. Railways workcd by the Company of the Roman 1,664 470,237,000 | 36,576,000 | 304,574

LAMGS..,....cccccnvseeseoss tte 8. Railways worked by the Company of the Southern Lines :— Lines belonging tothe com-} 7,489 | 896,400,000 | 36,318,000 | 250,707 Calabro-Sicilian lines (state PIOPCLOY),..c

5. Miscellaneous ……sceccecss 20,959,200 3,699,900

Total…...0000. g 2,292,486,200 | 226,446,900 | 308,730

Thus the total cost may be stated at £100,800,000. At the end of 1879 the rolling stock consisted of 1385 locomotives, 4301 car- riages, and 23,483 waggons. The total expenditure of the railways for the ycar 1879 was 101,088,901 lire, and the total receipts

164,672,340.

Except in the northern part of the country the Italian railway system is still far from complete. With the French system it is connected by the coast-line from Genoa to Nice, and by the line from Turin to Geneva,

which passes through the Mont Cenistunnel. With the Austrian system there is connexion by the line which runs up the valley of the Adige from Verona to Botzen and by the lines which cross the eastern frontiers at Pontebba and Cormons respectively. From Milan to Piacenza, from Piacenza to Bologna, from Bologna to Ancona, and from Ancona to Brindisi, there is free route from the north right along the eastern coast ; but the lines on the western coast take the traveller no farther south than a little beyond Salerno, and to reach Reggio from Naples involves a tremendous circuit. By the law of July 29, 1879, a great number of new lines received par- liamentary sanction, the effect of which will be to complete the west- ern coast-line, to increase the number of routes from the western to the eastern seaboard, and to furnish railway communication to numcrous cities and districts which arc now without it.

Roads and Canals.—It was found that on 31st December 1877 there existed in the kingdom 5151 miles of national rcads, 15,596 of provincial roads, and 48,295 of communal roads—all very un- equally distributed throughout the country. The navigable canals have an aggregate length of about 663 miles, and the navigable portions of the rivers an aggregate length of 1100. ;

Postal and Telegraphie System.—The rate of development attained by the postal system is shown by the following figures. From 1862 to 1879 (both inclusive) the number of offices has increased from 2220 to 3272, the number of letters from 71,502,779 per annum to 143,587,709, the yearly expenditure from 21,740,226 lire to

28,659,071, and the yearly revenuc from 11,944,797 lire to 26,998,784. There was a deficit in cach of the six years 1862- 1868 ; since then there has always been at least a slight surplus. Post-office savings banks were introduced by the law of 1875. In the first year 1989 offices were opencd, and the amount of the de- posits was 8,709,857 lire. In 1879 the offices numbered 3259, and the deposits amounted to 33,564,370 lire.

The tclegraphic system took its beginning in Italy in 1861 By the end of 1866 the lines had reached an aggregate length of 14,000 kilometres, and a wire-development of 38,000 ; and by the close of 1879 tho corresponding figures were 25,533 and 84,101 kilometres. The country was thus, if the ratio of the lines to the area be considered, a long way in advance of Spain and Hungary, but considerably behind the other chief states of Europe. The following are the submarine cables belonging to the state :— Bagnara-Torre di Faro (dating from_ 1876); Carmitello-Ganzirri, uniting Sicily and Calabria ; Otranto-Valona (dating from 1868) ; Pozzuoli-Procida; Procida-Ischia ; Sardinia-Carloforte ; Sardinia- Isola della Maddalena ; Piombino-Elba ; Venice-Chioggia. France maintains a cable between Corsica and Leghorn, and between Corsica and Sardinia ; the Mediterranean Extension Company keeps up communication between Sicily and Malta, and between Otranto and Corfu, and the Eastern Telegraph Company has lines between Calabria and Sicily, Orbetcllo and Sardinia, and Otranto and Alexandria (via Zante and Crete). The number of telegraph offices in 1879, Government and private, was 2480. The number of telegrams despatched in 1877 and 1879 was as follows (Tablo XXVII.):—

1877.

Private inland tclegraMs .scoceesseeeeee 4,577,685 4,933,001 Private telegrams for abroad…... 369,890 405,633 Private telegrams from abroad 375,857 412,388 International transit …..s000 210,524 208,452 Total of private telcgrams …..... “ee 5,533,956 5,959,474 Government and service tclegrams… 352,923 428,678

The net gain of the telegraph department in 1879 was 1,182,814 lire, an increase of 418,348 lire on the gain of the previous year.

Army and Navy.—By the law of 7th June 1875, all men capable of bearing arms are under obligation of military service from their twenty-first to the end of their thirty-ninth year. They are divided into three categories : the first and second consist of those who are to scrve successively in the standing army (Esercito perma- nente), in the mobile (Alilizia mobile, equivalent to the Prussian Landwehr), and in tho territorial militia (Afilizia territoriale, equi- valent to Prussian

Landstwrm); the third serve in the territorial militia only. The men of the first category, that is, those who draw the first numbers in the conscription, serve eight or nine years in the regular standing army, four or five years in the mobile, and seven years in the militia, or, in the case of the cavalry, nine years in the regular army and ten in the militia,—the infantry spending three years and the cavalry five years under arms, and for the rest of their time forming the active reserve. The men of the second category, that is, those who do not draw the first figures at the conscription, serve five or six ycars in the regular army, four or three ycars in the mobile, and the remainder of their term in the militia. They only require to be in arms for five montlis, and these months may be distributed over several years.?

Those conscripts who pass a certain examination and pay 1500 lire (in the cavalry 2000) are required to spend only one year with their regiments, and are further permitted, like the university students, to put off their year of service till they are twenty-six years of age.

The following table (XXVIII.) gives the general strength of the army at Septembcr 30 in nine successive years :—

ind With un- Moe, limited | Total. furlough 1871 | 169,980 734,645 1872 | 157,285 701,869 1873 | 175,491 769,588 1874 | 176,766 796,367 1875 | 153,693 By the law of 15th May 1877 the country is divided into ten

Padua, Brescia, Genoa, Ancona, Perugia, Salerno, Chieti, Catanzaro, Messina. The military districts, which have an important share in the mobilization of the army, number eighty-eight.

The following table (XXIX.) indicates the strength of the various arms in October 1879 :—

1 For further information see Army (vol. ii. p. 612), and IL. v. Lubelle, Jahres- berichte tiber die Verdndzrungen tm Miltidrwesen.

{ STATISTICS, 1, Permanent or Standing Army— 2. Mobile Militia— INfantry .ercccccceccncseccceserecces 271,373 Infantry of the line and Military districts 251,255 bersaglieri ….. ~~». 219,659 Alpine companies 13,853 Artillery …. ww 15,994 Bersaglieri 48,753 Engineers . 2,024 Cavalry… 92066) | Officers)". eee Be 100 Artillery .. 63,989 Supernumerary offlcers …... 328 ENGinCerS …cccseeeeeeessceeeeeere 13,518 — CanBINCOUS) .cc.csceeccseeseeerssarae 18,813 Total ee. 240,064 Military instruction estab~~ lishment) .—cesceectessesesressee 8,955 Reserve oMeers)....o..cc:seeerece 2,736 Sanitary COMPS ..ec.secseeseveees 4,203 Territorial militia …….....0… 564,300 Hospital corps … 977 —_— ae SHUG) cccsensccscsascescecsvesencs = os 217 Grand total…..... 1,544,605 Discipline companics …....., 1,300 Penitentiaries…..... 2,112 Officers on service and avail- DIO ...0.crcccccecccceseescesoeeres 11,897 Supernumerary Officers …..... 2,284 Total…..... 737,565

The army cost the country between 1871 and 1875 the sum of 882,471,512 lirc, or in round numbers £7,060,000 per annum, and the navy 171,188,531 lire, or £1,369,500 per annum. The follow- ing figures (Table. XXX.) indicate the expenses, ordinary and extraordinary, since incurred (in millions of lire) :—

Navy. Ext. | Ord. | Ext. 1879 L772 OHS) 42-2 | 2:0 1880 1817 9°3 43°1 | 27

The annual cost of the Italian army is slight as compared with that incurred by other countries ; but compared with the resources of Italy it wears a totally different aspect.

For navy organization the coast regions are divided into three departinents (Spezia, Naples, and Venice) and twenty-two con- scription districts. About 16,000 or 18,000 men are enrolled yearly, and 18,000 have unlimited furlough. On January 1, 1880, the national fleet consisted of the following vessels (Table XXXI.) :—

ss Nominal No. Guns. Tonnage. Fee ae TEOHCIAASSecccscsssccsscost=seresess|| 24 242 101,661 Screw StORMETS .e..crccreeerereee 15 143 23,590 Paddle steamers

……...02.0-] 6 41 7,960 Men-of-war'.....-| 38 426 | 133,211 ISCLOWAVCSSCINiscersensscccrecierers® 13 26 16,479 Paddle vessels …..0:cssscescees 4 10 1510 PDEAMSPOULISNIPSccsssscctecssercens 12 16 2,224

The personnel of the fleet was thus composed :—Oficers—1 admiral, 4 vice-admirals, 9 rear-admirals, 86 capitani di vas- cello, 42 capitani di fregata, 202 lieutenants, 150 sub-lieutenants, 49 officers of the naval engineers, 24 assistants, 78 officers of the mechanicians, 117 officers of the sanitary corps, 235 officers of the commissariat department, and 540 civil employés ; Men—15,055, including 7878 sailors proper and 2162 gunners. The greatest of the naval establishinents in the kingdom is that of Spezia, which was opened about 1876, instead of the similar establishment at Genoa. The arsenal in 1879 had an area measuring 3980 feet in length by 2450 in breadth. Two other arsenals are maintained at Naples and Venice respectively. The workmen employed in the various establishments numbered 6292 in 1879.

Religion. —The Roman Catholie Church claims the great mass of the Italian population ; but, besides the ordinary Latin rite, several others are recognized in the country. The Armenians of Venice maintain their traditional charaeteristics. The Albanians of the southern provinces still employ the Greek rite and the Greek lan- guage in their public worship, and their priests, like those of the Greek Church, are allowed to marry. And certain peculiarities in- troduced by St Ambrose distinguish the ritual of Milan from that of the general church. Up to 1871 the island of Sicily was, according to the bull of Urban II., ecclesiastically dependent on the king, and exempt from the canonical power of the pope.

Though the territorial authority of the papal see was abolished in 1870, the fact that Italy, and Rome more particularly, is the seat of the administrative centre of the vast organization of the church is not without significance tothe nation. In the samc city in which the administrative functions ofthe body politic are centralized there still exists the court of the spiritual potentate with a total personnel (in 1879) of 1821 souls.

The number of episcopal dioceses in Italy is 265 ; but as it some- times happens that more than one is subject to the same bishop, the number of these functionaries is somewhat less. Every diocese has full individuality as a corporation, and possesses a cathedral with a chapter of canons, a numbcr of minor benefices, and a seminary. The number of canons before the law of 1867 was 4699. Including the so-called patriarch of Venice, thereare thirty-seven metropolitans who have jurisdiction not only over their own immediate dioceses, but

——_—— er

STATISTICS. |

also over diocescs administered by suffragan bishops. "Their position is indicated in the following table (XXAII.):—

Metropolitans. Suffragans. 4 Matera seecee Anglona-Tursi, Potenza, Tricarico, Venosa.

AOE iene, Gonversano, Ruvo-Bitonto. ; : : :

BeneventO eereecesscevere §. Agata de' Goti, Alise, Ariano, Ascoli-Cerignola, Avellino, Bojano, Boyino, Larino, Lucera, S. Severo, Telese (Cer- reto), Termoli,

BolOgna .sessserersesecces Faenza, Imola.

Brindisi ..cccccccessseecee Ostuni. 2 , 4

Cagliari …..... ..Galtelll-Nuoro, Iglesias, Ogliastra. _

Capua «..- ..Caiazzo, Calvi-Teano, Cascrta, Isernia-Venafro, Scssa.

ROLL «..00 ». Vasto.

Sion. 5. Angelo de' Lombardi-Bisaccia, Campagna, Laeedonia, Muro Lucano.

Ferm veceeoeseseeeeeseeeeeMacerata-Tolentino, Montalto, Ripatransone, S. Scverino.

FIOTENCCsecesceceeecvecees Borgo S. Sepolcro, Colle di Val d'Elsa, Ficsolc, S. Miniato, Modigliana, Pistoia-Prato,

GTR e ers ecsssvcscece one Albenga, Bobbio, Brugnato, Luni-Sarzana, Savona-Noli, Toitona, Ventimiglia.

Lanciano …....0000.6eOrtona,

Manfredonia …..... Viesti.

MeSSINd .oecccseeesceneees Lipari, Nicosia, Patti,

Milan ….scccesessencseees Bergamo, Brescia, Como, Crema, Cremona, Lodi, Mantua, Pavia.

Modena…..+ :..Carpi, Guastalla, Massa-Carrara, Reggio.

Monreale Caltanisetta, Girgenti.

Naples Acerra, Ischia, Nola, Pozzuoli.

Oristano Ales-Terralba,

Otranto Gallipoli, Leece, Ugento.

Palermo Cefalu, Mazzara, Trapani.

PISA .eessssseeereesserseees Leghorn, Pescia, Pontremoli, Voltcrra.

Havenna…....+...----.-Bertimoro, Cervia, Cesena, Comacchio, Forh, Rimini, Sarsina.

Reggio Calabria …... Bova, Cassano, Catanzaro, Cotrone, Gerace, Nicastro, Oppido, Nicotera-Tropea, Squillacc.

SIGE Olssssaseeeecceseeees Accrno, Cupaccio-Vallo, Diano, Marsico-Nuovo (Potenza), Nocera dei Pagani, Nusco, Policastro.

Sassari ….~~..e0~~....—Alghero, Ampurias (Castel Sardo) Tempio, Bisareio, Bosa.

S. SEVETIMO ...ccceeeeees Cariati,

Giena, ws..e—esseesseeeeeeeChiiusl-Pienza, Grosscto, Massa Marittima, Sovana(Soana)- Pitigliano.

Syracuse ..Caltagirone, Noto, Piazza.

Sorrento. ...Castellamare,

Taranto… ...Castcllaneta, Oria.

ora eaiaalialal Andria, Bisceglie.

TUMIN ..ssessesseessneers ..Aequi, Alba, Aosta, Asti, Cunco, Fossano, Ivrea, Mondovi, Pinerolo, Saluzzo, Susa,

NOME OMrveslecsccssccooeve S. Angelo in Vado-Urbania, Cugli-Pergola, Fossombrone, Montefeltro, Pesaro, Sinigagiia,

Venice ..oceeseeers— Adria, Belluno-Feltre, Ceneda (Vittorio), Chioggia, Con- curdia-Portogruaro, Padua, Treviso, Verona, Vicenza.

Vercelli …....0000000000e-Alessandria della Paglia, Biella, Casale, Novara, Vigevano.

Eleven archbishops and sixty-three bishops are independent of all metropolitan supervision, and hold directly of the Holy See. The archbishops are those of Amalfi, Aquila, Camerino, Catania, Cosenza, Ferrara, Gaeta, Lucca, Rossano, Spoleto, and Udine, and the bishops those of Acireale, Acquapcendente, Alatri, Amelia, Anagni, Ancona-Umana, Aquino-Sora-Pontecorvo, Arezzo, Ascoli, Assisi, Aversa, Bagnorea, Borgo San Donino, Cava-Sarno, Citta di Castello, Citta della Pieve, Civit&s Castellana-Orte-Gallesc, Corneto-Civita Vecchia,

Cortona, Fabriano-Matelica, Fano, Ferentino, Foggia, Foligno, Gravina-Montepeloso, Gubbio, Jesi, Luni-Sarzana, 8. Marco-Visignano, Marsi (Pescina), Melfi-Rapolla, Mileto, Molfetta-Terlizzi-Giovennazzo, Monopoli, Montalcino, Montefiascone, Montepulciano, Nardo, Narni, Nocera in Umbria, Norcia, Orvieto, Osimo-Cingoli, Parma, Penne-Atri, Perugia, Piacenza, Poggio Mirteto, Recanati-Loreto, Rieti, Segui, Sutri-Nepi, Teramo, Terni, Terracina-Piperno-Sezze, Tivoli, Todi, Treia (Camerino), Trivento, Troia, Valva- Sulmona, Veroli, Viterbo-Toscanella.

There are 24,980 parishes in the kingdom, and the parish priest has a considerable influence in the country districts, though since 1866 he can no longer act asa state official. About 800,000 lire are spent annually by the Fondo pel Culto in augmentation of the paro- chial stipends. Tho parishes vary greatly both in size and popula- tion, some having as many as 14,000 inhabitants, and others less than 100. The priest in the country has a glebe or podere which he cultivates like auy of the lesser landholders of his district ; and he is thus interested in the state of the markets, the character of the harvest, and the general condition of affairs.

As in every diocese there is a seminary or diocesan school, the number of such institutions exceeds that of the royal, provincial, and communal lyceums (Jiced) and gymnasiums (ginnasi). In so far as they concern themselves with secular education, they are subject to the supervision of the minister of instruction. At the time of the inspection of 1877-78 they were found to have 17,478 pupils, of whom only 3547 were studying theology.

_ The only Protestant denomination with a true historical position in Italy is that of the Waldensians, which has taken advantage of the religious liberty of the new kingdom to come down from the mountain fastnesscs, Besides the sixteen churches (with 11,958 members in 1879) which: it possessed at the time of its recognition by law in the kingdom of Sardinia in 1848, it numbers thirty-nine churches and thirty-two mission stations scattered throughout the country as far south as Sicily; and it maintains between twenty and thirty elementary schools. The “

Free Italian Church," founded in 1870 by twenty-three churches which declared themselves independent of

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the Waldensian organization, consisted in 1879 of thirty-sixchurches and thirty-five stations ; and since 1876 it has a theological college in Rome. Inanumber of the larger cities of Northern and Central Italy there are considerable congregations of the " Free Christian Church," a community or " brotherhood "' which believes that stated ministers and church statistics are both un-Christian. The Wesleyan Methodist Church, having carried ou evangelizing operations in Italy since 1861, has forty-three cluurches and stations with about 1300 communicants, and in its elementary schools 776 scholars. Of less extent are the more modern attainments of the American Episcopal Methodists, the American Baptists, and the English Baptists. Several orphanages, refuges, and schools of special purpose owe their existence to Protestant benevolence. Compare Giorgio Curcio, '*Progamma per una statistica dei culti in Italia," in Annali di Stat., 1880.

Religious Foundations, —As far back as 1855 an Act was passed in the Sardinian states for the disestablishment of all houses of the reli- gious orders not engaged in preaching, teaching, or the care of the sick, of all chapters of collegiate churches not having a cure of souls or existing in towns of less than 20,000 inhabitants, and of all private benefices for which no service was paid by the holders. The property and money thus obtained were used to form an ecclesiasti- cal fund (Cassa Heelesiastiea) distinct from the finances of the state. This Act resulted in the suppression of 274 monasteries with 3733 friars, of 61 nunneries with 1756 nuns, and of 2722 chapters and benefices. In 1860 and 1861 the royal commissioners (even before the constitution of the new kingdom of Italy had been formally declared) issued decrees by which there were abolished—(1) in Umbria, 197 monasteries and 102 convents with 1809 male and 2393 female associates, and 836 chapters or benefices; (2) in the Marches, 292 monasteries and 127 convents with 2950 male and 2728 femalo associates ; (3) in the Neapolitan provinces,

747 monas- teries and 275 convents with 8787 male and 7493 female associates. There were thus disestablished in the space of seven or cight years 2075 houses of the regular clergy occupied by 31,649 persons ; and the confiscated property yielded a revenue of 9,957,457 lire, or £398,298. And at the samc time there had been suppressed 11,889 chapters and benefices of the secular clergy, which yielded an annual income of 4,978,728 lire, or £199,149. The value of the capital thus potentially freed from the dead hand was estimated at £12,000,000; though hitherto the ecclesiastical possessions in Lombardy, Emilia, Tuscany, and Sicily had been left untouched. As yet the Cassa Kcclesiastica had no right to dispose of the pro- perty thus entrusted to it; but in 1862 an Act was passed by which it transferred all its real property (bent stabili or immobdilt) to the national domain, and was credited with a corresponding amount by the exchequer. The property could now be disposed of like the other property of the domain ; and except in Sicily, where the system of cmphyteusis was adopted, the church lands began to be sold by auction. In order to encourage the poorer classes of the people to become landholders, it was decided that the lots offered for sale should be small, and that the purchaser should be allowed to pay by five or ten yearly instalments. By a new Act in 1866 the process of secularization was extended to the whole kingdom. All the members of the suppressed communities received full exercise of all the ordinary political and civil rights of laymen; and annuities were granted to all those who had taken permanent religious vows prior to 18th January 1864. To priests and choristers, for example, of the proprietary or endowed orders were assigned 600 lire per annum if they were upwards of sixty years of age, 400 if upwards of 40, and 860 if younger. The Cassa Ecclesiastica was abolished, and in its stcad was instituted a Mondo pel Culto, or public wor- ship fund, attached to the department of grace and justice, and administered by a director and a council consisting of three senators, three deputies, and threc nominees of the king. From the general confiscation were exempted the buildings actually used for public worship, as episcopal residences or seminaries, &c., or which had been appropriated to the use of schools, poorhouses, hospitals, &c., by the communes and provinces in keeping with the acts of 1861 and 1864; as well as the buildings, appurtenances, and movable property of the abbeys of Monte Casino, Della Cava dei Tirreni, San

Martino della Scala, Monreale, Certosa near Pavia, and other estab- lishments of the same kind of importance as architectural or his- torical monuments. An annuity equal to the ascertained revenue of the suppressed institutions was placed to the credit of the fund in the Government 5 per cent. consols. A fourth of this sum was to be handed over to the communcs to be employed on works of beneficence or education as soon asa surplus was obtained from that part of the annuity assigned for the payment of monastic pensions ; and in Sicily, indeed, 209 communes entered on their privileges as soon as the patrimony was liquidated. Another Act following on August 15, 1867, decreed tho suppression of certain foundations which had escaped the action of previous measures, put an extraordinary tax of 30 per cent. on the whole of the patrimony of the church, and granted the Government the right of issuing 5 per cent. bonds sufficient to bring into the treasury 400,000,000 lire, which were to be accepted at their nominal value as purehase

money for the alienated property. The result of the whole legis- lation from 1855 to 1867 was the abrogation of nearly 50,000 ecclesiastical foundations which were rendering almost no service to the country beyond that of supporting an idle population of more than 60,000 souls. The following figures (Table XX XIII.) sum- marize the chicf facts of the suppression :—

vi i No of No, of Religious !o, of Individuals) Founda-| wo of suppressed. pensioned. tions of | Teclest: Seeular | astics For For pa deprived. Males, |Females. Holes. |Fem#les: pressed. By law of 1866…. 1,332 585 10,658 8,286 Bee 300 By law of 1867…..... Ore ans 56 OBE 34,348 | 23,878 By law of 1873 for p = ” i vince of Rome……..... 105 57 1,926 | 1,348 : By preeeding laws…...| 1.510 565 17,279 | 14.870 | 11,889 9,600 | Total yiccscsseneel Os Ue.e 1,207 29.863 | 23,999 46,237 | 38,478

The total of the real property taken over by the domain up to 31st December 1877 may be estimated as yielding an aggregate revenue of 30,969,465 lire or £1,238,778 and possessing a capital value of 839,776,076 lire or £33,910,430. Of the latter sum 530,649,932 lire

represent the property disposed of for the benefit of the state, 75,542,813 the property granted in emphyteusis, &c., 8,098,294 the property handed over to Government for administra- tive purposes, 125,191,797 the property transferred to lawful claim- ants, and 100,293,200 the property not yct alicnated. The Fondo pel Culto derives its income froin four different sonrces:—(1) as already indicated, from the public funds; (2) from the buildings still occupied by the ex-monks, &c., and other property not trans- ferred to the domain; (3) from rents, ground-annuals, livelli, tithes, and other annual dues; (4) from contributions exacted from the revenues of ecclesiastical foundations still maintained. The third source is especially valuable, yielding in 1876, for example, 13,984,000 lire, and being capable of considerable augmentation under judicious management. The total expenditure of the fund during the ten years from the institution of the same to the close of 1876 amounted to 278,399,592 lire or £11,135,983, distributed as follows (Table XXXIV.) :—

Per cent.

Lire. of total. 1. Pensions to clergy, regular and sceular ……} 170,959,287 61°41 2, Patrimonial burdens…..... DEnCOICRIRECRROOCRSCACEDIE 17,764,290 6°38 DW ILAXCG .....00. 1,322,868 0°48 7, Restoration and maintenance of churehes, &c. 3,224,807 115 8, ASSIENed FO COMMUNES!....05.5sccscserscssene0 4,907,972 1°76

9. Paid to the state for expenses ineurred 5 4

for publie worship …..... aationee OCnaNEEIN 26,752,955 9°61 10. Cost of re-employment of recovered capital 10,621,546 3°82 PTOUHIN:. <_tc208 sees_="" _78_899_592="" _00="" _="" p="">

The heaviest of these items is one that is gradually diminishing, aud will finally become extinct, by the dying out of the pen- sioners. On the 31st of December 1876 the deficit of the fund was 48,312,686 lire or £1,932,507,—650,180 lire having been the deficit taken over from the Cassa Ecclesiastica, By 1879 the debt was reduced to 1,688,719 lire.

Hitherto only a passing allusion has been made to the legislation relating to the Roman territory acqnired after the passing of the Acts above indicated, In the province as distinguished from the

TABLE

1TAu ¥

igi ° ‘aye : A Ecelesiastieal Foundations preserved and

Religious Corporations suppressed. Other Foundations suppressed. subjected to conversion of real property. No. of Ineome of No. of Ineome of No. of Ineome of Corpora rere ate | Movable | Founda. |Meome ore, Movable | Founda- mime of Real” yovable tions, i Property. tions. AOPSILY: Property. tions. MORE Ie ie Property.

; : lire lire, lire, lire. lire, lire.

Piedmon seegneeeseecssteeesecens secse 58 253,719 101,061 2,877 674,073 476,290 8,165 1,786,069 787,690 Liguria… 39 89,943 74,286 1,472 166,936 125,584 1,221 234,517 142,013 Sardinia.] 50,117 14,811 878 252,919 186,396 §11 423,694 203,207 Umbria.. 6 13,436 8,289 43 1,978 7,136 511 577,486 183,614 Marches eases cs oe 13 68,471 18,310 161 33,776 34,070 389 862,982 288,082 Abr uzzi and Molise .. saescece 3 6,620 7,136 749 247,433 294,643 818 408,738 219,591 CAMPANIA o.seieesses ceeeeseesssnnesees 120 415,155 340,279 871 993,318 598,693 665 1,722,408 574,875 Apulia Gvsrvolvvesssveccserseseess occses 15 60,002 21,332 589 1,624,029 496,216 524 1,882,866 390,048 Basilicata sa aeaeeceecesratssesecenenares 74 5,159 441 164 325,240 264,948 80 416,035 191,577 Calabrias Sravsesevessetcseseswlssessis(. 8 20,125 14,359 595 465,334 229,546 417 798,157 140,234 Roa] Neaetoteaccseoccecns tonconcaocrerore eo LE: 3,819,841 4,906,672 7,443 514,006 1,728,008 536 680,554 1,122,996 DNGMN DANCY tess eetvessarscosesscssers- 53 159,008 31,440 4,756 953,579 967,242 2,716 1,644,581 2,063,153

: 266 1,186,561 787,203 6,545 689,026 1,415,273 485 717,091 826, 283

‘ 201 489,125 596,427 5,486 1,467,814 555,287 1,184 1,547,936 563,168

79 162,521 166,027 1,114 190,286 249,522 2,419 946,518 1,302,210 . 254 611,795 711,550 1,109 248,204 188,290 480 610,294 284,842 6,861,598 7,799,623 34,852 8,847,946 7,767,139 16,121 15,259,921 9,188,583

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city the only thing requisite was to make the existing measures applicable, but in the case of the city and the suburban districts special enactments had to be provided. According to the census of 1871 there were in the city and province of Rome 474 monastic establishments (311 for monks, 163 for nuns), ocenpied by 4826 monks and 3825 nuns, and possessing a gross revenue of 4,780,891 lire. Of these, 126 monasteries and 90 convents were situated in the city, 51 monasteries and 22 convents in the “ suburbicariates,” The action of the law of June 19th 1873 has left untouched 23 of the monasteries and 49 of the convents, which had either the character of private institutions, or were supported by foreign funds, In the city alone 2977 individuals became recipients of pensions from the fund to the aggregate value of 1,319,832 lire.

Table XXXV. furnishes details regarding the suppression and modification of ceclesiastical foundations.

For further information, see G. C. Bertozzi, “ Notizie storiche e statistiche sul riordinamento dell’ asse ecclesiastico nel regno @Italia,” in Annali di Stat., 1879 ; and the summary of the same by Bellini in the Archivio di Stat., 1880.

Education.—In the matter of education the kingdom of Italy at the time of its formation might almost be described as a desert, broken every here and there by an oasis of matchless fertility and luxuriance. ‘The learning of the learned was high, and the ignor- ance of the ignorant profound. As late as the census of 1861 it was found that in a population of 21,777,331 thcre were no less than 16,999,701 “analphabetes,” or persons absolutely destitute of instruction, absolutely unable to read. Of children between five and twelve as many

as 82 per cent. were in this condition; of those between twelve and nineteen 71 per cent. And, as was natural, the ignorance was greater in the female sex than in the male: while 59 per cent. of the men married in 1866 were obliged to make their mark, 78 per cent. of the women were in like case. In certain parts of the country matters were even worse. M. Natoli found, ¢.g., that in the Basilicata the illiterate class comprised 912 out of every 1000 inhabitants. It was thus no light task that presented itself to the department of education ; and the progress that has been attained does honour to its activity: in 1879 only 48 per cent. of the bridegrooms and 70 per cent. of the brides were unable to sign their names.

The administration of the education department is not so strietly centralized as it is in France. The minister of public instruction is assisted by a permanent council of fourteen ordinary and seven ex-traordinary members nominated by the king and chosen from the upper ranks of the educational profession. And this council has no mere nominal existence ; it meets regnlarly thrice a week, though it often contains men of Kuropean celebrity. Five of its members, selected by the king, constitute a fine arts commission. Another general conncil —the Proveditorato Centralc—established in 1867, has special control of secondary and primary instruction. In each of the sixty-nine provinces there is a consiglio scolastico or school board, under the presidency of the prefect, which has the right of super- vision in regard to the sanitary and moral state of the provincial schools, private as well as public. By the law of 1859 (known as the Casati Act) every commune of 4000 inhabitants is bound to maintain a primary school; but as a matter of fact some of the communes are too small and poor to have a school of their own, and are permitted to send their children to the schools of neighbouring communes, Elementary instruction is gratuitous, and by the law of 15th July 1877 the compulsory principle was brought into operation as far as the condition of the communes allows—or, in other words, in all communes of less than 5000 inhabitants provided with one teacher for every 1000, in all communes of from 1000 to 12,000 inhabitants provided with a teacher for every 1200, and in all the larger com- munes with one for every 1500. According to the report published

in 1878 by the minister of public instruction on the effects of the law, Northern Italy was in the most favourable condition, having a much greater proportion of communes than either Central or Southern Italy. While in the north only 383,916 inhabitants— scattercd in little groups through the mountainous districts—were unable to make use of the existing meaus of instruction, in Central Italy this was found to be the case with 1,230,599 (out of a total population of 64 millions); and matters were still worse in the south. In the central regions 498 of the 1235 communes were un- able to enforce the law through lack of the legal number of teachers, and in the southern provinces it would have been requisite to in- crease the teaching staff by 1536. The following statistics indicate the extent of the organization for primary instruction in 1879 21 (1) Asylums for children (infant schools)*—pupils, 183,809 (92,905 boys, 90,904 girls); teachers, 3752. (2) Elementary schools : public 35,171 (890,080 boys, 708,227 girls) ; private 6476 (53,479 boys, 80,416 girls). (3) Evening Classes for adults: 11,161 for men, 472 for women ; pupils—439,624 males, 16,063 females, (4) Sunday'schools (scuole festive): 592 for men, 5979 for women ; pupils—5977 males, 21,194 females.

Most of the institutions known as asili infantili, or infant asylums, are after the Aporti method—/or'se, says an Italian critic, wn poco troppo scuola e troppo poco asilo; but a certain number are conducted on Froebel's kindergarten system, which was intro- duced among the Italians by the baroness Marienholtz-Bulow and George P. Marsh the American minister, The principal institutions for secondary education are the gymnasiums and the lyceums. The former have a course of five years, and the instruction comprises Greek, Latin, Italian, history, geography, and arithmetic; the latter, with a three ycars course, add to those subjects philosophy, mathematics, physics, chemistry, and natural history. There are seven masters or " professors" in each lyceum. The pupils enter- ing the lyceum are usually from fourteen to fifteen years of age ; they are only admitted on presenting a satisfactory gymnasial

certificate. According to a pleasant custom, the lyceum usually bears the name of some person of national and at the same time local celebrity—as the Leopardi lyceum at Macerata. As the gym- nasiums and lyceums are too exclusively devoted to what is known as classical education satisfactorily to subserve the necessities of modern life, they have been supplemented hy a very considerable number of tcchnical schools, the earliest of which in Italy dates as far back as 1848. No fewer than 48 trade schools were subsidized by the minister of instruction in 1878-79. Most of the secondary education institutions were intended for boys. In 1861 the muni- cipality of Milan founded a "high school" for girls, and their example has met with very commendable imitation, A varicty of establishments for female education were of course in existence throughout the country at a much earlier date, but they were organ- ized on the basis for the most part of old-fashioned ideas in regard to what was appropriate for women. Such are the so-called conscr- vatorit of Tuscany—which were originally purely religious foun- dations, and only partially secularized by Leopold I.—and the St Mary colleges of Sicily, which have occasioned so much controversy as to whether they are educational or charitable institutions. The Government lyceums and gymnasiums had 18,021 pupils in 1879, the other public lyceums and gymnasiums 11,779, lyceums and gymnasiums attached to the seminaries 11,650, and private lyceums and gymnasiums 7139—making a total of 48,589.

For the higher education Italy possesses no fewer than seventeen national universities. They are all of more or less ancient date, except that of Rome, which was opened in 1870, and it is a respect for this antiquity which is in some cases the chief causc of their pre- servation, That several of them are of comparatively small import- ance is shown by the following figures, exhibiting the number of students or hearers of lectures for the year 1879 :—Naples had 2817, Turin 1509, Padua 948, Pavia 672, Rome 648, Pisa 586, Bologna 569, Genoa 480, Palermo 449, Modena 195, Parma 194, Siena 181, Catania 168, Messina 128, Cagliari 95, Sassari 93, Macerata 82. Besides the seventeen establishments there are four free universities, those of Perugia and Ferrara with three faculties each, and those of Camerino and Urbino with two faculties. They are all small, —the students for 1879

numbering 65 in Perugia, 60 in Urbino, 46 in Ferrara, and 43 in Camerino. Theology has ceased to be a subject of instruction in the national universities. In 1876-77 there were 3314 students in the faculty of jurisprudence, 2842 in that of medicine, 1257 in that of the mathematical sciences, and 212 in that of philosophy and letters. The univer- sity teaching staff consists of ordinary professors, extraordinary pro- fessors, and free professors, the last corresponding to the ‘ Privat- docenten ”* of Germany. A certificate of attendance at a lyceum is requisite for admission as a university student, and candidates are further subjected to a preliminary examination.

, Among the institutions which cooperate with the universitics it is sufficient to mention the institute for the higher studies and the

be the Italian statistics scwola means rather class than school. There is no statement of the number of the:e asylums or schools.

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academy of Milan, the upper technical institute of Milan, the cn- gineering schools at Naples, Rome, and Turin, the veterinary col- leges at Milan, Naples, and Turin, the royal school of commerce at Veniee, the royal school of medicine and surgery at Naples. As an indication of the extent to which such a list might be carried, we may take the department of agricultural training. Here we have agrarian institutes and farming colleges at Rome (1872), Castelletti near Signi (1864), Motronein the province of Lucca (1874), Macerata (1868), Cosenza (1870), Gruniello del Monte near Bergamo, Brescia (1876), Brusegnane near Padua (1872), Pesaro (1876), Palermo (1819), Caltagirone (1868), Brindisi (1872), Lecce (refounded 1879), &c.; and many of these establishments have considerable pieces of land for the purpose of practical training. The Middle Calabria school of agriculture (1876) is alsoa school of pastorizia or shepherd eraft. An Istituto forestale was started at Vallombrosa in 1869, and in the eight years (1872-1879) it has sent out eighty-three licentiates of forestry. The school of ‘ viticulture and cnology,” or vine-grow- ing and wine-making, at Conegliano dates

from 1876 ; it publishes a Rivista di Vitieoltura. A school of zootechnia and caseificio, or the panes of cattle-breeding and cheese-making, exists at Reggio

‘milia; and at Palermo there is a special school for the art of sulphur-mining.

In 1879 about 2,000,000 lire were devoted by the Government

to the encouragement of art. Art schools exist at Bologna, Car- rara, Florence, Lucca, Massa, Milan, Modena, Naples, Parma, Ravenna, Rome, Reggio Emilia, Turin, Urbino, Venice ; and the number of pupils has increased from about 3000 in 1862 to 5000 in 1879. Besides these fiftecn official establishments, of which that of Milan—with a maximum of 1491 pupils—is by far the largest, thero are academies at Genoa, Bergamo, Verona, Siena, Pisa, and Peru- gia. A Museo Tiberino has been established by the commission charged to superintend the exploration of the Tiber. Five musical conservatorios are supported by Government at Florence, Milan, Naples, Palermo, and Parma. Next to the difficulty of arousing the interest of the mass of the people’in matters of education, so as to secure the realization of the legal enactments, the greatest difficulty perhaps with which the administration has had to contend has been that of obtaining a sufficient supply of teachers competent for their task. In the nor- mal and “ magistral” schools training is provided at the national expense for candidates, whether male or female, for the teaching pro- fession. The age forcntrance is fixed at sixteen for male and fifteen for female students, and the course of study lastsfor three years. In 1877-78 there were 35 normal and “magistral” schools for male and 67 for female teachers. The number of pupils was 7854 (1447 males and 6407 females).

For further information on this section see Hippeau, L’ Instruction publique en Italie, Paris, 1875, and Pécaut, Deux mois de mission en Italie, Paris, 1880.

The great Italian public libraries are those of Turin, Milan, Naples, Florence. Florence receives a copyright copy of all new books and new

editions. The Pavia library is espeeially rich in works in natural science, the legacy left by Professor Frank enab- ling it to purchase from 1500 to 1600 new works per annum, The total number of new books added to all the state libraries, which now number 33, was in 1872 about 14,000. The readers numbered 858,901, besides 9008 teachers who got books home with them. More recent statistics show comparatively little change.

Among the philanthropic educational institutions those for the tuition of deaf-mutes deserve particular mention. It was in Italy that some of the earlier attempts were made to give instruction to this class of unfortunates ; and two of its most important establish- ments, the royal institute of deaf-mutes at Genoa and the corre- sponding institute at Milan, date respectively from 1801 and 1805. From a report (Rome, 1880) which was compiled for the instruction of the second international congress of deaf-mute teachers (Milan, 1881) it appears that there are thirty-five establishments of this class, with 1491 pupils in 1880, the largest being at Milan, Bologna, Naples, Turin, and Genoa. The total number of deaf-mutes in the kingdom is estimated at nearly 12,000 ; and hence it is ealeulated that the number of pupils would require to be about 7000. The oral method is very generally employed in the Italian institutions, —the rich vowel-system of the Italian language giving a favourable basis of operations.

From the Strenna-Album of the Associazione della Stampa (Rome, 1881) we learn that the number of periodicals published in Italy in 1880 was 1454, or about one to every 8000 of the reading popula- tion,—a statement that compares favourably with corresponding statistics of other countries. One paper, Gazzetta Nazionale Genovese, dates its origin as far back as 1797; all the others belong to the present century, 162 having appeared for the first time in 1876, 997 in 1877, 240 in 1878, and 246 in 1879. The total number pub- lished in 1836 was only 185, in 1857 it amounted to 311, in 1864 to 450, in 1871 to 765, and in 1875 to 914. According to the statistics of 1875, more than the half of the total number of 494 were published at Milan (104), Florence (82), Turin (68), Rome, Naples, Bologna, Palermo, and Venicc. See Archivio di Statistica, 1876, fase. 1.

Beneficenee.—A first attempt to form an idea of the number and nature of the beneficent institutions of Italy was made by the Government in 1862, and the result was published in 1864 in the Calendario gencrale del Regno. A fuller inquiry was undertaken in 1863 by the board of statistics under the direction of Pietro Maestri, and the information was communicated to the public in 15 large volumes published between 1868 and 1872. According to this inquiry, usually called of 1861, because the data refer to the state of the institutions in that year, the total number of benevolent institutions (exclusive of the province of Rome) was 20,123 (of which 3866 were purely religious foundations), and their property was valucd at 1,100,932, 000 lire. The amount of money annually expended by these institu- tions was about 86,000,000; and on an average 6,305,000, or about a fourth of the population, were recipients of their bounty in one form or other. In 1862 a law was passed by which the control of all public institutions of a charitable nature was placed in the hands

of the communal authorities, and these have to appoint a charity |

committee to superintend the department and balance the accounts. In the case of all institutions subsidized by the state, the accounts must be presented to the minister of the interior ; and to this func- tionary is assigned the right of dissolving or reorganizing any institution which the communal authorities report as misdirected or defective. Every institution is obliged to have a regular treasurer, with surety. During the eighteen years that the law has been in force, it has greatly improved the state of matters; but that there is much room for further improvement appears from the fact that nearly the half of their gross income is of no avail for the special purposes for which they exist.

The following details, derived from an admirable report presented by Signor Bodio to the international congress of beneficence in Milan, August 1880,! show the present extent of the opere pic, or works of piety. In 1878 there existed in the kingdom 3668 eleemosynary charities, 13 charities for prisoners, 2694 dowry charities, 15 baliatict (charities for poor nursing mothers), 239 asylums for shelter, 16 labour

charities (case di lavoro), 1028 founda- tions for the assistance of the sick in their own homes, 41 for the assistance of women in childbed in their own homes, 1139 hospitals for the sick, hospitals for chronic patients, 18 maternity hospitals, 15 lunatic asylums, 10 seaside hospitals, 508 school charities, 340 infants' asylums, 397 collegie retirt, 463 orphanages, 17 deaf-mute institutions, 9 blind asylums, 695 monti di pieta, 1965 monti frumentari (offices for furnishing grain to poor peasants in return for pledges), 30 agrarian loan funds, 102 nursling and foundling institutions, 2633 " congregations of charity," and 1553 foundations of miscellaneous scope. These 17,870 institutions being distri- buted among 5951 communes, 2431 communes have none of their own; but the advantages of the institutions are seldom confined to the special communes in which they are situated.

The following table (XXXVI.) indicates the gross and the net revenues enjoyed by the opere pie of each of the compartimenti:—

Gross — Revenue.

= a Net Revenue. Per head lire.

13,510,514 4,308,586 20,895,403 6,989,415 8.690,459 5,825,091

3,301,209 4,361,439 8,027,174 1,349,887

Emilia .. Tuscany Marches .. 2,485,702

1,662,248 6,180,813 1,342,927 9,725,328 2,254,387 447,583 548,835 5,476,835 515,895

896,341 3,348,049 616,252 4,823,396 1,138,304 219,443 281,391 2,829,054 314,486

Abruzzi and Molise … Campania

CHERDORY oe; .cssais saaaiass RCH Sehicateradesnsatscun Sardinia

90,859,521

| 47,110,208

Classifying the institutions, the following results appear, the amounts being stated in thousands of lire (Table XXXVII.) :-— pn eel erento ances

ai. . Patrimo- Cost of |Revenue| Institutions, jac wegen nial bur-) Taxes, | admini-| avail- F dens, &e. stration.| able.

Eleemosynary 394,421 | 22,189 3,559 3,429 aseses 560,276 | 30,454 4,258 5,553

eecee 128,443 8,186 3,390 822 Educational… —| 376,198 | 20,795 2,072 3,373 Miscellancous…....] 167,823 | 9,233 921 1,305

15,062

Total…....| 1,626,663 | 90,859 | 14,202

14,484

The following table (XXXVIII.) gives the returns for 1877 for the lunatic asylums of Italy :—

1 Printed in Archivio di Statistica, 1880, fase. iv. 2 It is to be observed that this list does not inelude those institutions which are fee the great Cottolengo Hospital at Turin, under the direct control of their ounders,

TZALRT

[STATISTICS,

Asylims per

or Hospitals. 100,000,

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It appears that the number of asylums is deficient in the Napo- letano and in Sicily and Sardinia, while of all the regions Emilia and the Marches are the best supplied. Of the institutions included in the table, some are maintained by the provinces, such as those of Cuneo, Alessandria, Bergamo, &c., others by the municipalities, others again by private individuals, Among the larger establish- ments are the public asylums of Genoa (Manicomio pubblico), Milan, Aversa (819 inmates), Rome (715), Siena (791), Florence (712), Venice has separate establishments for its male and female lunatics,

The idea of establishing seaside hospitals to which patients could be taken from the inland districts for change of air has been carried into effect more extensively in Italy than in most other countries, Such institutions exist at Viareggio (since 1856), Voltri (1862), Fano (1863), Leghorn (1864), Sestri Levante (1867), Porto d'Anzio (1868), Venice (1868), Porto S. Stefano (1870), Rimini (1870), Riccione (1871), Loano (1871), Celle (1872), Grado (1873), Palermo (1874), Pisa (Bocca d'Arno, 1876), Cagliari (1879). In many cases a very considerable number of communes have the right of sending their patients to a given hospital; that of Loano for instance receives from thirty-four communes which have committees of trans- mission. See Dr Gaetano Pini, "'Gli ospizi marini e le scuole pei rachitici in Italia" in Atti del VI. Congresso dell' Associazione medica italiana, Turin, 1877. :

Administration of Justice.—Though, in the opinion of the most competent judges, Italy is still in the main free from that curse of civilized countries, a distinctly differentiated crimiual class, there is hardly a country of Europe which presents from year to year such appalling tables of criminality. Leaving out of view the question of brigandage—which is of moment only in the southern provinces, where through long inertness the arm of the law had become com- paratively powcrless—crimes of violence are exceptionally frequent, and (to take the statistics of 1875) the number of persons under- going punishment in a given year is in the ratio of 175°51 for every 100,000 inhabitants. In

proportion to population there are four times as many persons condemned to death or penal servitude for life as in France, twice as many to hard labour, five times as many to solitary confinement. And it cannot be said that that part of the administration whose duty it is to deal with this multitude of law- breakers is in a state of competent efficiency. Trial by jury is in force, but there scems good reason to question the fitness of a large part of th population for the exercise of the functions thus devolved upon them. “ Not guilty with extenuating circumstances” is an amusing but suggestive verdict. Though according to the law of 1865 there is only to be one court of cassation in the country, as an actual fact there are five, as follows (Table XXXIX.) :— ‘

Courts of Cassation. Courts of Appeal.

(Turin, Brescia, Casale, Genoa, Milan, Parma und

t Modena.

Florence, Lucca, Venice.

Naples and Potenza, Aquila, Catanzaro, Trani. Palermo, Catania, Messina.

Rome, Ancona-Macerata, Bologna, Cagliari, Perugis.

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eee eereseeeescccer ae eeeccesesanessces ne peer ccescccese

The Roman court of cassation was instituted only in 1876,—the Roman court of appeal having previously been dependent on Flor- ence, and those of Ancona-Macerata, Bologna, and Cagliari on Turin. The number of courts of assize varies from year to year, ac- cording to royal decree: in 1874 there were 86, in 1876, 92. Ofcivil and correctional tribunals there are 162, and of “ pretors” 1813. The pretors are both civil and criminal judges ; in the civil de- partment they can decide in all cases involving less than 1500 lire. It is considered part of their duty

to endeavour to bring liti- oe to terms without proceeding to formal trial ; and, that this

esirable object may be more frequently secured, a special class of judges or arbitrators, known as conciliatori—of ancient establish- ment in the Neapolitan provinces—was rendered common to all Italy at the legislative unification of 1865. At the request of parties in dispute, they may deal with cases involving any amount, but their decisions are final only as far as 30 lire, and they have no control—any more than the pretors—of questions affecting the taxes. The value of this class of functionaries is evident from the fact that in 1875, for example, about 25 per cent. of the cases pre-

sented to the coneiliators or to the pretors exercising concilia- torial functions were settled by compromise, and out of 769,533 eases 580,066 received definitive senteuce.

The "establishments of detention " are of three kinds :—those of preventive detention, or judiciary prisons ; those of penal deten- tion, for culprits of full age; and those of correction, or reformatories for prisoners under age. The following table (XL.) gives details for 1879 (the third coluinn of figures giving the number of prisoners for whom there is sleeping accommodation):—

Prisoner | '*Separa- | "' Punish- in |Accommo-! tion" ment" dation. Cells, Cells. —— Bagni penali, or convict estab- 17,654 957 352 lishments fOr MCM.....seseeereee Houses of correction for men…) 36 417 497 Do. do. womeli 6 48 22 Penal colonies for men…….....| 38 19 28 Prisons (judiciary) ....-.eereeeeseree 237 588 524 Houses of detention formen…| 6 16 63 Bice 1,845 1,416

Of the total number of establishments 51 belong to the Lombardo-Venetian provinces, 42 to the ancient continental provinces, 31 to the Tuscan provinces, 15 to the Parma and Modena provinces, 55 to the Roman, 80 to the Neapolitan, and 40 to the Sicilian and Sar- dinian. The Government report indicates that of the convict establishments

(central and secondary) 12 were neither healthy nor seeure ; the same was the ease with several of tlie houses of correc- tion ; and no fewer than 87 of the prisons are condemned for the latter defect and 51 for the former.

In the convict establishments there were 17,576 prisoners in December 1879. 'The mean for 1870 was 13,663, and every succeed- ing year has seen an increase. In the ten years from 1870 to 1879 the total admissions have been 31,470. During that period 4846 received remission of their sentence, and 5176 died in prison. The following are the convict establishments, arranged in order of importanee—Porto Longone, Civita Vecchia, Nisida, Palermo, Ancona, Cagliari, Orbetello, Genoa, Procida, Brindisi, Finalborgo, Gaeta, Pozzuoli, 8. Stefano (Naples), Alghero, Castiadas, Favignana, Palermo, Pesaro, Piombiuo, Porto Ferraio, Portici, Ponza, Porto d'Anzio, Terracina, and Trapani. The establishment at Varignano was made a lazaretto in 1871. See Stat. decennale delle carcert (1870-79), Civita Veechia, 1880.

According to the eonfession of Italian investigators, the state of the judiciary prisons is often deplorable in the extreme. " When I see," writes Beltrami Scalia,! "the enormous number of 44,415 individuals existing in the judiciary prisons in the beginning of 1875 (and the differences are not very great in the different years), the number of persons committed to prison amounting in the year to 856,511, and the number of those discharged to 257,854, when I see that, while 127,837 are liberated on the termination of their punishment or through act of clemency, no less than 81,087 owe their liberation to the fact that they have not been found guilty of the crimes laid to their charge, and when I consider the unhappy condition of most of our establishments of preventive detention, my heart aches to think what a hotbed of corruption they constitute, and what a current of moral pestilence must find issue from them."

Capital punishment was in 1875, after much debate, adopted as the supreme penalty for the whole kingdom (inclusive of Tuseany, where it had not previously been in force) ; but in November 1877 the chambers voted by a large majority for the exclusion of the death-penalty from

the new code. Between 1867 and 1876 ineln- sive 892 persons were condemued to death, but 351 reeeived commutation of sentence, and only 34 were executed. In the same period 222 cases were subjected to a second trial, with the result that 20 of the aceused parties were completely acquitted of the charge on which they had been previously condemned to death, and the whole of the remainder had their sentences commuted to penal servitude for life or some minor penalty. See Notizie sulle Condanni alla pena di morte (Rome, 1878), epitomized in Arch. di Stat., 1878.

Political Administration.—The constitution of the kingdom of Italy is based upon that presented to the Sardinians by King Charles Albert, 4th March 1848. The crown is hereditary in the male line of the house of Savoy. The king—whose majority is attained at. the close of his eighteenth year—cannot exercise his legislative functions except in agreement with the voice of the national parliament, and on his accession to the throne he is bound to take an oath in the presence of both chambers that he will obey the constitution. By the law of 17th March 1861 his title is " by God's grace and through the will of the nation king of Italy." His executive functions are exercised by means of responsible ministers, nine in number—(1) the minister of foreign affairs, (2) of the interior, (3)

} Author of La Riforma penitenziaria in Italia, and founder of the Rivista di disciplina carceraria, 1871.

of public instruction, (4) of finanee and the treasury, (5) of war, (6) of marine, (7) of grace, justice, and worship, (8) of public works, (9) of agriculture, industry, and commerce. These departments are to all intents the same as those which under slightly different designations existed in the kingdom of Sardinia in 1860, just before the title of king of ltaly was assumed by Vietor Emmanuel. The ministry of agriculture, however, which was instituted by Cavour in July of that year, was abolished in 1878, but it was restored in 1879. A permanent

hydrographic commission was instituted in 1866, a council of metcorelogy in 1876, and an independent board of statistics (Direztone della Statistica) in 1878. There was a meteorological department in eonnexion with the ministry of agri- culture as early as 1865, and a statistical department as early as

1861.

The Italian parliament cousists of two houses or chambers—a senate and a ehamber of deputies. The senate consists of the princes of the royal fainily (who are admitted to the sittings at the age of twenty-one, but cannot vote till they have completed their twenty-fifth year) and an unlimited number of persons, forty years of age or upwards, chosen by the king from the ranks of the archbishops and bishops, ministers of thecrown and highadministrative function- aries, admirals and generals, members of the provincial councils and of the Turin academy, persons who have rendered special services to their country, or who for three years have paid 3000 lire of direet taxation. Since the removal to Rome the parliament is accom- modated in the palace at Monte Citorio. Neither senators nor deputies are paid for their services, but they have the right toa free pass over the whole railway system of the country. All measures must be carried by an absolute majority, or one half of the members and one. The parliamentary oath does not coutain the name of God; the member simply says, "1 swear to be faithful to the king and loyally to observe the statutes and laws of the land." According to the law there must be a new election every five years ; the actual duration of parliaments, however, has hitherto been on an average two and a half.

The registered electors for 1879 amounted to 627,888, out of a population estimated at 28,437,091, or 2°21 per cent.; in other words, Italy has 7°77 electors in every 100 males above twenty-one years of age. The highest proportions were in Porto Maurizio 5°06 per cent., Genoa 3°63, Leghorn 8°67, and Alessandria 3°32 per cent. The lowest of all was Syracuse 0°07 per cent. 'Thirty-five provinces

'besides those mentioned had upwards of 2 per cent., and all the rest

had upwards of 1 and less than 2. Of the total electorate 489,044 had their placc on the roll through the payinent of not Jess than 40 lire of direct Government taxes and provincial "super-imposts" ; 5922 in virtue of the value of their factories, workshops, or ware- houses ; 1412 as sea-captains or employers of at least 30 operatives ; 1502 as holders of Government stock of the anuual worth of 600 lire ; 2984 in virtue of the amount of their house-rent,—making an ageregate of 15,158 whose right was duc to their wealth. On the other hand there were 550 members of scientific academies, chambers of commerce, and directors of agrarian commissions ; 5631 professors, ex-professors, and teachers in the higher institutions ; 43,045 func- tionaries and employés, civil and military ; 1452 persons decorated with the national orders of knighthood ; 38,986 holders of univer- sity degrees (laureati); 27,522 solicitors, accountants, geometricians, chemists, &c.; 870 money agents and brokers,—making a total of 112,906 whose right depended on education and social influence.

According to the law of 1860, in force in 1880, there are 508 electoral colleges, or as they would be called in England parlia- mentary constituencies, the largest of which are the third college of Palermo with 84,767 inhabitants, and the third of Turin with 76,654, and the smallest S. Sepolero with 30,468, and Benevento with 25,460.

The following table (XLI.) indicates the chief statistics of the eight elections which have taken place in Italy. They are interesting as showing an increase of political activity among the people. As is well known, the watchword of the ultramontane party has been "neither electors nor elected"; their abstention helps partly to explain the small percentage of the electors who have voted.*

Voters at the Definitive Elections.

Population. Number.

21,777 ,3843 418,696 | 1:92 | 243,912

: 504,263} 2°08 | 286,990 1867 ¢ | 24278,7764 | 498 { 498,208 | 2:05 | 281,701 530,018 | 1-98 | 266,814

1874 571,939 | 2°13 | 329,933 1976 (| 26:801,154 | 5084 | Go5’007| 2-26 | 368,750 621,896 | 2°32 | 386,593

2 An elcctoral map of Italy and a valuable analysis of the distribution of parties in 1880 will be found in Arch. di Stat., 1880, fasc. iii.

3 Without the Venetian provinces, Mantua, and Rome.

4 Without the provinee of Rome.

Internal Administration.—It was not till 1865 that the adminis- trative unity of Italy was realized. Up to that ycar some of the regions of the kingdom, such as Tuscany, continued to have a kind of autonomy; but by the laws of 20th March the whole country was divided into69 provinces and 8545 communes, The extent to which communal independence had been maintained in Italy through all the centurics of its political disintegration was strongly in its favour. By the new law the communal council was to consist of 80 members if the commune had more than 250,000 inhabitants, of 60 members if more than 60,000, of 40 if more than 30,000, of 30 if more than 10,000, of 20 if more than 3000, and in all other cases of 15. It was found by the census of 1861 that the first category was represented by only 1 commune, the second by 12, the third by 34, the fourth by 265, the fifth by 1762, and the sixth by 6471. As many of the communes, especially in the north, were found to havea very small population, a considerable number of them have been wisely incorporated with others. The syndic (sindaco) or chief magistrate of the commune is appointed by the king for three years, and he is assisted by a ‘¢municipal junta” consisting of ten assessors and four substitutes for the communes of the first category, and of 8+4, 6+2,4+2, and 2+2 respectively in those of the others. The communal council meets in ordinary course twice a year. Eligibility for office as a councillor is determined very much by the same considerations as affect the political suffrage, the main criterion being the ainount of direct taxes paid. All those in receipt of communal salaries are excluded, and, if a sufficient number can be obtained without them, all who are unable to read.

The provincial councils consist of 60, 50, 40, or 20 members, according as the population exceeds 600,000, 400,000, or 200,000, or falls below this last number. Each council elects its own president ; its sessions, which in regular course occur once a year, are opened and closed by the prefect or his substitute in the king's name. The term of office for the provincial council is five years. A 'provincial deputation" or standing committee, appointed by the council, acts under the presidency of the prefect as the repre- sentative of the same throughout the year.

The various sections of the local government—municipal, com- munal, and provincial councils—are left remarkably free from inter- ference on the part of the central authorities. There is a prefect in every province, but, to quote Gallenga's words, he is little more than the head of the provincial police. In point of local influence the syndic, who in the large cities is usually a nobleman or distinguished statesman, is the more important functionary.

The principal law regulative of communal taxation is that of July 3, 1864. By this the communes were allowed, not only to impose independently of the state an additional tax or super-impost (sovrimposta) on the articles already subjected to the national octroi, but also to charge a local customs duty on other articles of meat and drink, on forage, fuel, building materials, soaps, fatty matters, and other objects of the same class. Italy thus took rank, says Alessio, as one of the European countries in which the greatest liberty of taxation was granted to the local corporations. Further licence has been since conceded, in 1869, 1870, &c. In 1877 the total income of the communes amounted to 228,733,014 lire or nearly £9,115,000, and of this sum 38°71 per cent. was fur- nished by the communal octroi proper (dazio conswmo), 31°24 by the super-impost on the land, 6°10 per cent. by the hearth-money or fuocatico, 3°27 by the tax'on cattle and horses, and the remainder by a variety of taxes on public and private conveyances, dogs, domestics, riding and carriage horses, &c. A tax on photographs and insigne, first rendered legal in 1875, and only adopted by a few of the communes, is the least valuable on the list. Foreigners, except when they really take up permanent residence ina commune, are for the most part exempted from the local taxation. The effect of many of the taxes,

especially as applied by the short-sighted local policy, has proved highly prejudicial to the development of indus- tries. The tax, for instance, on wood and coal tells against the glass- works of Venice, the potteries of Florence, the gold and silver work of Milan, At Voltri taxes are paid on nearly all the raw materials of the cotton industry, on the coal, the petroleum, the oil, the very flour needed for the dressing of the stuffs, &c. Paper is taxed in many towns (at Bologna as much as 7 per cent.), at Genoa not only paper but printed matter, at Reggio Emilia types and printing machines. There is often a most extraordinary difference in the amount imposed on the same article: every quintal of wax for stearine candles, for example, pays 5 lire in one city, 10 in another, 40 ina third. In many cases, as at Bergamo, Como, Parma, &c., the result is that the factories show a tendency to locate theinselves outside of the communal limits.! |

And in spite of this superabundant taxation the debts of the coni- munes are unusually numerous, and in some instances give rise to grave concern. Italy has the honour of being the first of European nations to furnish regular returns in regard to the whole department of provincial and communal debts; and the light thrown by these on the state of the local finances is very instructive. At the inquiry

1 See G. Alessio, “ L’imposta del dazio consumo in Italia,” in Aunalé di Scat.,

1880,

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by 1939.

[sTaTISTICs,

in 1873 it was found that the total of the debts of the communes amounted to 545,129,128 lire, and that of the provinces to 54,401,390. By 1877 these figures had increased to 707,551,255 for the communes,

and 90,073,603 for the provinces. Nearly the half of the communal increase of 162 millions was due to the two cities of Florence and Naples, the former being responsible for 36,933,905 lire of the increase, and the latter for 36,726,188 lire. The state of the Florentine finances is particularly noteworthy. It is estimated that the dazto conswmo cost every inhabitant 30°11 lire in 1877, and 31°58 in 1878 (the only other chief cities with similar amounts being Genoa, with respectively 33 and 27% lire, and Rome with 284 and 294), and the total communal taxation is stated at 54 lire per head. On March 18, 1878, Florence suspended pay- ment of the capital and three months later of the interest on its debts, which amounted to about 160,000,000 lire. A royal commis- sion was appointed in Junc 1879 for the liquidation of the debt, and it put into operation a scheme by which the debt will be cleared off Full details will be found in the Report of the British Consul for Florence, 1880, or in Mr Anthony Trollope's interesting survey in the British and Forcign Quarterly Review, 1879. The other cities where the local customs press heaviest on the citizens are Palermo and Catania (20 lire), Leghorn (nearly 20), Siena (19), Pavia (18), Milan (17), Turin (16). Among those that suffer least are Belluno, Arezzo, and Sondrio. At the close of 1878 it was cal- culated that the quota of the communal debt for every individual would amount to 913°62 lire at Florence, to 309°60 at Pisa, to 274 at Genoa, to 248°52 at Naples, and that on an average of all the capoluogt or provincial chief towns the quota would be 140°96 lire. See Statistica dct debiti communali al 1° Gennaio 1879 (Rome, 1880).

Finance.—It is not every Government even in a country of excep- tional wealth like England that is able to keep the balance on the right side of the national account ; in Italy it long seemed as if no Government conld do so. To attain the parcggio, or in familiar phrase to make both ends meet, was the dream and the despair of minister after minister. Money was wanted for so many things; taxes of any considerable value could be imposed on so few. The various parts of the national organization had to be put with all pos- sible speed into a condition not altogether unworthy of the prestige and the promise of the kingdom. What in other countries had been the growth of generations, Italy was called upon to produce at once by *forcing." 'To attain her nominal or

political unity she had to submit to many sacrifices ; to make the unity something better than a musical word, she had to submit to many more. That she should have spent so much on her army, her fortifications, and_her fleet, is matter of regret in spite of the secondary purposes which such things subserve ; that at the same time she has aimed high, and acted liberally in respect of more needful if less ostentatious departments, is worthy of admiration, and, in judging of what she has attained, it must never be forgotten what an inheritance of debt and disorganization passed over to her from the states which she supplanted.

The following table (XLII.) of debt, revenue, and expenditure (given in millions of lire =£40,000), shows that on the whole the financial condition of the country, considered in itself and apart from the causes to which it is due, is an improving if not a satisfac- tory one. It must be noted that in the colunms of revenue and expenditure no account is taken of the movement of the capitals, of the expenses connected with the railway system, or of the debts and payments of one part of the administration to another.

Deficit or Surplus.

Revenue. Expenditure,

617 1,338

714 929

768 1,014

871 1,019

866 1,081

967 1,041 1,014 1,098

1,047 1,136 — 89 1,077 1,090 = i

1,096 1,082 + 14 1,123 1,103 + 20 1,181 1,158 + 93 1,192 1,177 5

1,228 1,186 ae us,

be eee

If the items excluded from the above comparison be taken into consideration, the revenue and expenditure will stand for the later years as follows (Table XLIII.):—

Revenue. |Expenditure

The most noticeable facts indicated by Table XLII. are(1)the rapid increase of the national debt, which at the declaration of the king- dom of Italy in 1861 amounted to only 3,131,053,610 lire, so that it more than doubled itself in seven years and more than trebled

STATISTICS. |

itself in twelve, and (2) the attainment during five consecutive Gat of a very considerable surplus. The following table (XLIV. gives the official report on the items of the national debt in 1879:—

Per| Annuitics, cent &e. i tion . Consolidated Debt. – j Vive POF CCIIS. .secssssessseeseeseecencesceceeacees 5 | 378,193,087 . Three PCY CCNES. .....sseccesesseeeessececsceenes 3 6,408,080 a 1. Sum due to the Holy Seé….c.ssce-sssesesseee 3,225,000 . Debts entered separately. eae POUT TICROL MOO LG snc. cccce: veceneosescore 5 2,823,775 168,975 | 1894 MUO RTINOTMIOTS cscs sceccssesceress 4 248,000 156,420 | 1885 ‘ (ee 4 267,680 | 139,060 | 1887 ATEN i+ ©1850 sesssecseocerseeses 5 5,125 6,525 | 1881 » (English, 1855)..... 3] 1,008,072 29,101 | 1902 AOA OLMEGO | cccceveccccvssecoses 5 493,248 Bes 1881 Tuscany … | m Wisc… rere 5 | 2,201,750 2,050 | 1959 : ard and * ROE OLPUSOU cca: caesscescsccsesc| © 1,185,185 148,148 | 1886 Venice … WNeod@nas Loam OF 1825…....c..cccccccccees 3 13,963 ae a Parma…... Loan of 1827…..... 6 80,116 3,231 | 1883 Parodi loan, 1846 …... | 5 215,250 22,500 | 1886 { Rothschild loan, 1857 …..... 5 5,058,800 219,600 | 1898 Rome «..* Loans of 1860 and 1864 …... 5| 2,646,690 | 591945 | 1907 Wioraunt 1806 ..:.....:---..... 5| 2341769| 5:725 | 1946 (National loan, 1866 …..... 3,104,595 | 4,217,353 | 1880 ; Loan

guaranteed by church| property, 1867 and 1870… 9,823,665 | 1,084,445 |... INOWAY Ele cscrcscceseccs 1 225,280 1,888 | 1917 Rail- CNNE 0 ceoees s0sc ve esess 421,525 2,665 | 1948 Kingdom | way 4 Vitt, Emm …….....$3 | 3,894,000 9,645 | 1961 of Italy…) poans | Turin-Acqui…..... 243,465 915 | 1964 Genoa-Voltri …...| J 56,963 962 | 1906 Udinc-Pontebba …..cce000.| 5 1,397,800 175 cee Cavour Canal loan…….....00., 5 8,765,900 130,000 | 1915 Tiber obligations ….. welgiignocns 625,000 Bt me Debts entered separately …..... 42,148,211 | 6,409,928 IV. Miscellaneous debts} 47,605,291 | 1,604,986 V. Floating deve ..ssereee coeee 17,268,629

Total of debt…..... | 494,848,298 | 8,014,914

The figures, it must be noted, represent the interest, not the capital. A large proportion of the Italian consols are held in small amounts, for the most part by French investors, and the greatest holder after France appears to be England. In the Bourse of Paris in 1879, for instance, 11,912,000 lire of the stock were presented for certification, in the Exchange of London 8,319,000 lire; and after these places comes Berlin with only 1,458,000 lire. The value of the 5 per cent. stock at Paris, which was as low as 89°40 in the course of 1866, has risen rapidly nearly every year, espe- cially since 1875, and in the course of 1880 was as high as 87°60. A similar advance was observable in the Italian exchanges ; from 43°52 in 1866 the value rose to 94°20 in 1880.

In the matter of taxation the Italian statesmen have mainly fol- lowed in the footsteps of the French; and the revenue is eked out by several imposts of the most questionable character. Mr Gallenga even goes so far as to say that " there is hardly an unwise, inhuman, unpopular, or even immoral tax to which the Government has not been compelled to resort." It is a small matter that the aurum lustrale of ancient Rome should again figure in the Italian budget ; but it is a serious thing when the salt monopoly, the lottery, a grist- tax, and an octroi are among the most important of its items. The grist-tax, which pressed heavily on the very means of life, and ag- gravated the already aggravated misery of the poorer classes, has happily been reduced in 1880 from 2 lire to 1°50 per hectolitre, and is destined to disappear altogether in 1884. Against

the octroi, which, as shown in the paragraph dealing with the communal ad- ministration, tells severely on the prosperity of several important industries, an intelligent opposition is beginning to gather head ; and the law in this respect will probably be amended or abrogated before long. The following table (KLY.) gives the actual revenue of the Government for 1878 and 1879, the actual expenditure for 1878, and the estimated expenditure for 1879, all in lire :—

T. Revenue.

1878. 1879.

PRN cesT csc ssecaacecs saves 1,197,196,796 1,215,173,076

78,013,334 82,010,298 60,412,428 51,515,710 101,681,349 111,121,575

1,437,803,907 1,459,820,659

1 The chlef miscellancous debts arc—the annuities due to the South Austrian pty Upper Italian Railway Company, in terms of the convention of November eae (83,160,215 lire, date of extinction 1968), tobacco monopoly obligations (4,503,000 lire), advance in gold made by the national bank at 6°75 per cent.

(2,992,610), and obligation Issued in favour of the company for the sale of tlic state property (2, 060,501).

cFALY

465

Il. Expenditure.

Transforma- tion of Capital.

Real

Compensa- Expenses.

tions,

1878,

Ministry of treasury and finance…..... 785,290,059 | 84,620,435 | 92,508,419 3 grace and justicc. 27,954,811 ae 257,750 FS foreign affairs…..... 6,120,220 500 87,083 AA public instruction….....| 24,917,244 868,362 762,319 of the interior….....00…| 55,420,560 886,895 1,360,447 7 PUBIC WOTKS).....~~0c.000c~~ 89,541,357 | 64,745,628 370,207 Wal ipeecsettesescott a. tssesscess 206,545,102 | 2,299,146 | 4,064,688 ie MATIN CMeet eras ci cccswisssees 45,107,243 200,308 | 2,241,350 Totaleeeess.-s s+ese41,190,896,596| 152,620,774 | 101,652,263

1879.

Ministry of treasury and finance…..... 765,747,254 | 78,416,401 | 103,296,080 9 grace and justice….....] 28,823,991 ses 114,146 $y fOxCign AMAITS:....6.<.00.00es 6,277 894 8,000 72,500 A public instruction…..... 80,305,598 one 788,426 co the interior….....—..-| 60,067,476 1,143,947

public works

Prerrry

108,562,485

..| 223,147,405 wal 47,424,797

9,585,680

69,642,511 273,718 4,088,254 2,237,648

110,587

The relative importance of the various sources of revenue may be seen from the following figures in millions of lire (= £40,000), show- the totals for the ten years 1871-1880 (Table XLVI.) :2—

eG Kieass satseretmencceerceses Sessa- MOOAM BOCHIOl..c.TAXON PCrsOneall PLOPCKCY, csccsceecee Lidl PNODACCOse.:.....0QUBDOMIST ecccesesscesesececdtscsss-seeccs oLUS2) | OM IStRACION. .sces.< 507 SHIEANONODOLY, cccsce cove cesecesnssees 784 | Stamp duty…..... 368 TLOttenyyrercccescsesscsceseossese Mehl): TRORE-GII CCL; ccesssves.ceseceese Reece 243 Succession duty…....000 CUS PRU ay: cece ac-o.scsecceesttcossacoccteases 112 GUIBHEAK Ns scccccceeescecossccccecsoces saose OUBM| NCLOULHDTIB' Feccsscsessccasstesssecenseess, | Ge

Banks.—By the law of April 80th 1874, the right of issuing bank notes was limited to six banks—the National Bank of tho King- dom of Italy founded by the Sardinian law of 1850, the National Tuscan Bank founded by the grand-duke in 1857, the Roman Bank constituted by papal authority in 1850, the Tuscan Bank of Credit for industry el commerce established by the provisional Tuscan Government in 1860, the Bank of Naples dating from 1816, and the Bank of Sicily due to a decree of 1843, The two Tuscan banks and the Roman and the National Bank are joint-stock companies, with their capital subscribed in shares. The capital of the four joint-stock banks amounted in the aggregate to 255,000,000 lire, of which 200,000,000 belonged to the National Bank, 30,000,000 to the National Tuscan, 15,000,000 to the Roman, and 10,000,000 to the Tuscan Credit. By the law of 1874 the Bank of Naples was authorized to carry its capital by 1885 to 48,750,000 lire, and the Bank of Sicily to 12,000,000 ; the actual amounts in 1877 were 89,000,000 in the one case, and 9,200,000 in the other. The law just mentioned united the six banks into a consorzio or union, bound if required to furnish to the national exchequer bank-notes to the value of 1,000,000, 000 lire manufactured and renewed at their com- mon expense; but by the law of 7th a a 1881 (mentioned in detail further. on) the consorzio ceased on the 80th Juno 1881. The following table (XLVII.) indicates the position of the issue of bank notes both by the consortium and by the individual banks on their own account on the 80th September 1880.

Bank- proper.

280,947

Notes. Consortial.

| Notes. Consortial.

es

50 cent,

a

50,323,000 146,439, 750

11,074,171

1 lire 38,984,881

#8 63,679,518

bane 201,866,350

1099 243,533,830

20 lire 494,400

130,639,945

463,412,500 106,670

The total aggregate amounts to nearly 1,665,000, 000 lire. The following table (XLVIII.) gives details (the amounts in millions of lire) as to the working of the institutions in 1879 :—

Reserve Debts at /per 100 lire for Debts

at sight.

Paper Special is- Advances. |Guarantec counted. Fund.

Banks,

National Bank…..... Bank of Naples National Tuscan Bank. Roman Bank,.....00+ Sicily Bank

Tuscan Bank of Credit

33°58 38°20 88°20 87°84 84°56 35°84

167-66 11489

57-03 57°08 19°74 61 29°49 3°69 15°65 6°86

6:29 6°36

189°49

443°77 196°87 38°20 50°17 43°45 17°73

790°19

295°86

The total amount of the circulation and deposits of all the six banks thus amounted to 863,160,000 lire, while that of the Bank of England alone at the same date was 1,657,234, 000.

The following table (XLIX.) indicates the number of the various joint-stock credit institutions at the close of 1878 :—

2 See Marpurgo, Sulla finanza nazionale, Rome, 1874.

No. Capital. lire.

PRISED (MISS C teceesecsetoeatesayscuyneae=tecrecoc ces aretcene 4 255,000,000 PEGMLe Saal eibersecencnectineecensesnoteectacteesesecadeniene: 194 41,187,220 Ordinayy) Credit SOGI@HICS!....—....ccrces-scece-everers=-e-| 102 384,393,371 A CTRTIAN HAMIGS cassceccssesccessossece se 10 9,000,000 InSUTaRCe COMPAMIUS! ....:-ccccecocercecees 37 41,015,000 RAILWAY, COMMIAMICS|. 0. os.cccceccrceracssers 23 420,358,500 Minin GOMPHNICS) .....cversscses ses cevsersesdesesssenuess: 98 48,228,916 Companies of Offer Kinds…..... ...0cccsancossesessres 232 $28,546,231 Foreign insurance COMpamieS ….....cscesess-snee- 33 373,922,000 ” MiscellancOUs COMPANIES .....00+.seeeeeee a2 30,950,000

615 1,882,601,238

a a a a eS,

In 1869 the corresponding list comprised 352 institutions, with a total capital of 1,576,834,299 lire. ‘The agrarian banks were insti- tuted by the Act of June 21, 1869, and in 1870 they were three in number, with a capital of 6,450,000 lire. The twelve existing im 1879 were situated at Alessandria, Asti, Bologna, Oristano (in Sardinia), Cagliari (in Sardinia), Arbora and Casalmaggiore, Florence, Mantua, Terranuova Pausania, Siena, and Cologna Veneta.

The minister of agriculture published in 1880 an account of the friendly societies in the kingdom (Statistica delle Societa di mutuo Soecorso, anno 1878), from which it appears they are rapidly on the increase. In the following table (L.) the second column gives the population of the country, the third the number of societies known to exist, the fourth the number of the societies which gave information of their strength to the Government, and the fifth the number of the members :—

1362 21,929,176 4438 | 417 111,608

1873 27,165,553 1,447 1,146 218,822 1878 28, 209,520 2/091 1/981 331,548

It appears that 50 of these societies existed before 1850, and that 186 were commenced between that year and 1861. How rapid the increase has been is shown by the fact that in 1876, 1877, and 1878 there were nearly as inany new societies started annually as in that decade. Piedmont, Lombardy, Tuscany, and Sicily are the districts where the number is greatest. For the most part the societies are open to operatives in any trade or industry, but at least 391 are exclusively intended for some particular class—e.g., doctors, employés, teachers, &c. Of the 2091 indicated, 1537 are for men only, 70 for women only, and 484 for either.

Banehe popolari, or people's banks, corresponding to the Credit-genossenchaften of Germany, have increased in number from 40 in 1869 to 123 in 1878. From a paper by Luzzati, the enthusiastic and laborious president of the association of the people's banks, we find that 84 of these institutions which furnished him with details of their working had at the close of 1877 a capital of 34,941,593 lire, divided into 710,869 shares, and a reserve fund of 10,436,143 lire. The greater number of these banks are in Lombardy, Venice, Piedmont, and Liguria. Societies of ordinary credit increased from 19 in 1869 to 143 in 1878, but by 1878 the number had again sunk to 1. owing to the monetary crises through which the country had passed.

Currency.—Italy is a member of the Latin monetary league founded in 1865. By this the coining of pieces worth 2 lire or less was limited to 6 lire per inhabitant, so that the amount of such coins permissible before the incorporation of Venice was 141,000,000, and after that date 156,000,000. Bythe convention of 1875 the coining of silver coins of 5 lire was limited to 50,000,000, and this amount was reduced to 30,000,000 by the convention of 1876. The actual value coined from 1862 to 1875 has been :—gold, 236,167,200 lire; silver— 5 lire pieces, 281,637,025, and pieces of minor value (1 lire, 2 lire, 20 eentesimi, and 50 centesimi), all eoined between 1862 and 1868 in- clusive, 156,000,000 ; bronze, 76,190,442 lire. By the conventions of 1878 and 1879 it was agreed that the minor silver eoinage of Italy should not be received in the public exchequer of the other states of the league until an end was put to the forced paper currency ; and France, Belgium, Greece, and

Switzerland have undertaken to withdraw it from circulation in their respective territories, and to

TABLE LI.—Value (in lire) of Coins withdrawn from circulation Srom 1862 to 1871.

Gold. Silver, Copper.

TU OUSICIIGShetesereses «sensi ce 1,507,779 205,276,668 16,205,485 Lombardy …. 101,803 7,080,850 950,037 Wigs \2s 7)s@spocsocn:soecob bac AAe a 454,599 1,552 Parma and Piacenza .. 368,025 795,327 45,781 OWMehawesssecescncccecsacturees 429 9,086,898 4,922,251 Marches and Umpbria…... | 18,782,931 34,684,646 1,876,720 SORGUENE Merecanereceeetoncetcess 6,361,980 17,981,485 2,752,801 PUSAN asc ases esses seonaere ss | 48,473 84,399,880 814,748 ViGHICON .-.OVCHEM <2..cccceccacevessssnsse0 89,957 13, 644,666 =

27,29 | 396,288,967 | 28,340,544

treet Ft

eollect it at Paris, the Italian Government agreeing to exchange it for gold or silver scudi.

The Italian Government has been put to much expense in the matter of the unification of the coinage, and the process of with- drawing the coins of the separate ex-Governments is still going on. Table LI. indicates the value in lire of the coins withdrawn from eirculation between 1862 and 1871.

From 1872 to 1879 the value of the gold withdrawn was 6,080,295 lire, and that of the silver 143,130,871; of the total (149,211,166 lire) the greater proportion (129,898,338) belonged to the Two Sicilies and 16,815,207 to Rome. In 1866 the Govern- ment felt itself constrained to establish a forced paper currency ; the proposals made from time to time for its abrogation remained mere proposals till 1881. The parliament of that year, however, passed an Act (7th April), on the basis of a bill presented by the ministers Magliani and .Miceli, of which

the chief features are as follows:'—The forced currency is to be brought to an end by the close of 1883,—644,000,000 lire of metallic money (400,000,000 of the amount in gold being obtained by a foreign loan) ; of these, 44,000,000 lire to be given to the National Bank as repayment of the loan in gold made to the state in 1875, which, according to the contract, was to be repaid three months before the cessation of the forced eurrency ; the remaining 600,000,000 to be employed in withdrawing from circulation that amount of the "consortial" or union notes, of which 940,000,000 lire are in circula- tion, — the 340,000,000 to become regular Government notes payable at sight in the principal Government treasuries ; all the small notes of 50 centesimi, 1, 2, and 5 lire, the circulation of which in Sep- tember 1879 amounted to 315,500,000 lire, to be got rid of, as well as 284,000,000 in notes of 1000, 250, and 100 lire,—so that the 340,000,000 lire in regular notes left in existence should all be of the value of 10 and 20 lire, with the exception of 46,500,000 in larger amounts. The consortium of the banks came to a elose on the 30th June 1881, and the "eonsortial" notes actually eurrent are formed into a direct national debt.

Titles of Honowr.—The recent existence of so many separate sovereignties and " fountains of honour" as a matter of course gave rise to a great many hereditary titles of nobility. There are 400 princes, 458 dukes, 985 marquises, 1679 counts, 353 barons, and 5 viscounts in the country ; as well as 1234 persons of " patrician" rank, 2273 with a right to the designation sod7le, 318 distinctively signori, and 46 hereditary knights or cavalieri in the kingdom. In the " Golden Book of the Capitol" (Libro d'Oro del Campidoglio) are inscribed 321 patrician families, and of these 28 have the title of prince and 8 that of duke, while the others are marquises, counts, or simply patricians. Five orders of knighthood are recognized :—the order of the Annunciation (Ordine Supremo del? Annunziata), which dates from 1862, the order of St Maurice and St Lazarus (1434), the military order of Savoy (1815), the eivil order of Savoy (1833), and the order of the Crown of Italy, instituted in 1868. The king's brother is duke of Aosta, his eldest son is prince of Naples, and his cousin is duke of Genoa,

Bisliography.—The most elaborate work on Italy is L'Jtalia sotto l'aspetto Jisico, storico, &c., published by Vallardi of Milan, and comprising (1) Diztonario Corografico, edited by Amato Amati, 9 vols. imp. 8vo., of upwards of 1100 pages each ; (2) Geologia d'Italia, by Stoppani and Negri; (8) Oro-idrografia, by De Bartolomeis; (4) Acque minerali, by Marieni; (5) Compendio della flora italiana, by Cesati, Passerini, and Gibelli; (6) Fauna d'Italia, by Cornalia, Cancstrini, Salvadori, and De-Betta; (7) a series of historical studies—Storia antica and I Barbari, by Bertolini; J Comunt, by Lanziano, &c. Some of these divisions are only in course of publication (1881), but the Dzionario Corograjico and several other important sections are either complete or approaching completion. Worthy in its own department to rank with this great work is Gaetano Cantoni's Enciclo- pedia agraria italiana, which contains voluminous articles on the various objects

and methods of agriculture in the country, on its climate, soils, irrigation systems, and the like. The chief agricultural periodicals are the Government Annalt di

Agricoltura, edited by Targioni-Tozzetti, and the L' A gricoltura Italiana, formerly ,

Rivista di Agricolitura. The publications of the Governnient board of statistics, frequently referred to in the foregoing pages, are numerous and various. The Annuario Statistico (vol. ii., 1831) contains an epitome of the various official reports. Questions both of national and international scope are discussed in the Annali di Statistica (new series dating from 1878), and inthe Archivio di Statistica, founded by Professor Bodio and a company of statisticians in 1871. Of non-Government statistical publications there is no lack. It is sufficient to mention Annwario del conumercto ed industria del regno d'Italia, Florence, 1868, &c.; Annuario statistico delle provincie italtane, Florence, 1872; Annuario istorico ttaliano, Milan, 1870, &e.; Guida generale del commiercio e dell' industria italiana, Milan, 1880; Annuario industriale italiano, Naples, 1880; Parela, Saggio di climatologia é di geografia nosologica dell' Italia, Turin, 1881, Gazetteers of less scope than Amati's Dizionario are Muzzi,

Vocabulario geografico-storico-statistico, Bologna, 1873-74; Altayilla, J7 Regno d'Italia, Turin, 1875; and Stivieri, Geogr. e statistica comm. del regno d'Italia, Venice, 1879. Contributions to Italian geograplly and sociology naturally appear from time to time in the Bollettino of the Italian Geogr. Soc., Rome, 1870; in Guido Cora's Cosmos, Turin, 1872, &c.; the Mivista Europea, Florence; and the Nuova Aniologia, Florence; not to mention the periodical publications of scientific societies so well known as the Accademia det Lincei, &e. The literature issucd in foreign countries In regard to Italy is very extenslye, but too frequently the works are slight and " occasional." A biblio- graphy of German contributions to the subject was compiled by Gregorovius, whose own works make no small addition to the list. Recent English works are Wordsworth, Jtaly: Journal of a Tour, London, 1863; W. W. Story, Roba dt Roma, London, 1863, and{ Graffiti d'Italia, 1868; Elliot, Diary in Italy, London, new ed., 1871; Licckethorn, Roba d'/talia, London, 1875; Gallenga, Italy Revisited, London, 1875 ; Mare, Jtalian Cities, London, 1876; Arthur, Italy in Transition, London, 1877. (H, A. W.)

1 Much interesting mattcr on the whole commercial condition of Italy is to be found In this Act.

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PART II.—HISTORY.

The difficulty of Itaiian history lies in this that until | employed Lombard auxiliaries in his campaigns against the The Lom- our own time tho Italians have had no political unity, no | Goths ; and when he was recalled by an insulting message bards in

Split | from the empress in 565, he is said to have invited this Italy.

|

: ; :

independence, no organized existence as a nation. up into numerous and mutually hostile communities, they

never, through the fourteen centuries which have elapsed °

since the end of the old Western empire, shook off the yoke of foreigners completely ; they never until lately learned to merge their local and conflicting interests in the common good of undivided Italy. Their history is therefore not the history of a single people, centralizing and absorbing its constituent elements by a process of continucd evolu- tion, but of a group of cognate populations, exemplifying divers types of constitutional development.

Without attaching undue importance to the date 476 as marking the boundary between ancient and modern history, there is no doubt that this year cpened a new age for the Italian people. Odovakar, a chief of the Herulians, deposed Romulus, the last Augustus of the West, and placed the peninsula beneath the titular sway of the Byzan- tine emperors. At Pavia the barbarian conquerors of Italy proclaimed him king, aud he received from Zeno the dignity of Roman patrician. Thus began that system of mixed government, Teutonic and Roman, which, in the absence of a national monarch, impressed the institutions of new Italy from the earliest date with dualism. 'The same revolution vested supreme authority in a non-resident and inefficient autocrat, whose title gave him the right to interfere in Italian affairs, but who lacked the power and will to rule the people for his own or their advantage. Odovakar inaugurated that long series of foreign rulers— Greeks, Franks, Germans, Spaniards, and Austrians—who have successively contributed to the misgovernment of Italy from distant seats of empire.

Gothic and Lombard Kingdoms.

In 488 Theodoric, king of the East Goths, received commission from the Greek emperor, Zeno, to undertake the affairs of Italy. He defeated Odovakar, drove him to Ravenna, besieged him there, and in 493 completed the conquest of the country by murdering the Herulian chief with his own hand. Theodoric respected the Roman institutions which he found in Italy, held the Eternal City sacred, and governed by

ministers chosen from the Roman population. He settled at Ravenna, which had been the capital of Italy since the days of Honorius, and which still testifies by its monuments to the Gothic chieftain's Roman-izing policy. Those who believe that the Italians would have gained strength by unification in a single monarchy must regret that this Gothic kingdom lacked the elements of stability. 'The Goths, except in the valley of the Po, resembled an army of occupation rather than a people numerous enough to blend with the Italic stock. Though their rule was favourable to the Romans, they were Arians ; and religious differences, combined with the pride and jealousies of a nation accustomed to imperial honours, rendered the inhabitants of Italy eager to throw off their yoke. When, therefore, Justinian undertook the recon- quest of Italy, his generals, Belisarius and Narses, were supported by the south. The struggle of the Greeks and the Goths was carried on for fourteen years, between 539 and 553, when Teia, the last Gothic king, was finally defeated in a bloody battle near Vesuvius. At its close the provinces of Italy were placed beneath Greek dukes, con-trolled by a governor-general, entitled exarch, who ruled in the Byzantine emperor's name at Ravenna.

This new settlement lasted but a few years. Narses had

fiercest and rudest of the Teutonic clans to seize the spoils of Italy. Be this as it may, the Lombards, their ranks swelled by the Gepide, whom they had lately conquered, and by the wrecks of other barbarian tribes, passed south- ward under their king Alboin in 568. The Herulian invaders had been but a band of adventurers; the Goths were an army; the Lombards, far more formidable, were a nation in movement. Pavia offered stubborn resistance ; but after a three years' siege it was taken, and Alboin made it the capital of his new kingdom.

In order to understand the future history of Italy, it is necessary to form a clear conception of the method pur- sued by the Lombards in their conquest. Penetrating the peninsula, and advancing like a glacier or half-liquid stream of mud, they occupied the valley of the Po, and moved slowly downward through the centre of the country. Numerous as they were compared with their Gothic pre- decessors, they had not

strength or multitude enough to occupy the whole peninsula. Venicc, which since the days of Attila had offered an asylum to Roman refugees from the northern cities, was left untouched. So was Genoa with its Riviera. Ravenna, entrenched within her lagoons, remained a Greek city. Rome, protected by in- vincible prestige, escaped. The sea-coast cities of the south, and the islands, Sicily, Sardinia, and Corsica, preserved their independence. Thus the Lombards neither occupied the extremities nor subjugated the brain-centre of the country. The strength of Alboin's kingdom was in the north; his capital, Pavia. As his people pressed south- ward, they omitted to possess themselves of the coasts ; and what was worse for the futnre of these conquerors, the original impetus of the invasion was checked by the un- timely murder of Alboin in 573. After this event, the semi-independent chiefs of the Lombard tribe, who bor- rowed the title of dukes from their Roman predecessors, seem to have been contented with consolidating their power in the districts each had occupied. The duchies of Spoleto in the centre, and of Benevento in the south, inserted wedge-like into the middle of the peninsula, and enclosing independent Rome, were but loosely united to the king- dom at Pavia. Italy was broken up into districts, each offering points for attack from without, and fostering the seeds of internal revolution. Three separate capitals must be discriminated—Pavia, the seat of the new Lombard kingdom ; Ravenna, the garrison city of the Byzantine emperor; and Rome, the rallying point of the old nation, where the successor of St Peter was already beginning to assume that national protectorate which proved so influen- tial in the future.

It is not necessary to writc the history of the Lombard kingdom in detail. Suffice it to say that the rule of the Lombards proved at first far more oppressive to the native population, and was less intelligent of their old customs, than that of the Goths had been. Wherever the Lombards had the upper hand, they placed the country under military rule, resembling in its general character what we now know as the feudal system. Though there is reason to suppose that the Roman laws were still administered within the cities, yet the Lombard codo was that of the kingdom ; and the Lombards being Arians, they added the oppression of religious intolerance to that of martial despotism and

barbarous cupidity. The Italians were reduced to the last extremity when Gregory the Great

(590-604), having strengthened his position by diplomatic relations with the duchy of Spoleto, and brought about the conversion of the Lombards to orthodoxy, raised the cause of the remaining Roman population throughout Italy. The fruit of his policy, which made of Rome a counterpoise against the effete empire of the Greeks upon the one hand and against the pressure of the feudal kingdom on the other, was seen in the succeeding century. When Leo the Isaurian published his decrees against the worship of images in 726, Gregory II. allied himself with Liudprand, the Lombard king, threw off allegiance to Byzantium, and established the autonomy of Rome. This pope initiated the dangerous policy of playing one hostile force off against another with a view to securing independence. He used the Lombards in his struggle with the Greeks, leaving to his successors the duty of checking these unnatural allies. This was accomplished by calling the Franks in against the Lombards. lLiudprand pressed hard, not only upon the Greek dominions of the exarchate, but also upon Rome. His successors, Rachis and Astolf, attempted to follow the same game of conquest. But the popes, Gregory Tit, Zachary, and Stephen II., determining at any cost to espouse the national cause and to aggrandize their own office, continued to rely upon the Franks, Pippin twice crossed the Alps, and forced Astolf to relinquish his acqui- sitions, including Ravenna, Pentapolis, the coast towns of Romagna, and some cities in the duchy of Spoleto. These he handed over to the pope of Rome. This donation of Pippin in 756 confirmed the papal see in the protectorate of the Italic party, and conferred upon it sovereign rights. The virtual outcome of the contest carried on by Rome since the year 726 with Byzantium and Pavia was to place the popes in the position held by the Greek exarch, and to confirm the limitation of the Lombard kingdom. We must, how- ever, be cautious to remember that the south of Italy was comparatively unaffected. The dukes of the Greek empire and the Lombard dukes of

Benevento, together with a few autonomous commercial cities, still divided Italy below the Campagna of Rome.

Frankish Emperors. The Franko-Papal alliance, which conferred a crown on

the Great Pippin and sovereign rights upon the see of Rome, held

and the Caro- lingians.

within itself that ideal of mutually supporting papacy and empire which exercised so powerful an influence in medieval history. When Charles the Great (Charlemagne) deposed his father-in-law Desiderius, the last Lombard king, in 774, and when he received the circlet of the empire from Leo III. at Rome in 800, he did but complete and ratify the compact offered to his grandfather, Charles Martel, by Gregory IIL The relations between the new emperor and the pope were ill defined ; and this proved the source of infinite disasters to Italy and Europe in the sequel. But for the moment each seemed necessary to the other ; and that sufficed. Charles took possession of the kingdom of Italy, as limited by Pippin's settlement. The pope was confirmed in his rectorship of the cities ceded by Astolf, with the further understanding, tacit rather than expressed, that, even as he had wrung these provinces for the Italic people from both Greeks and Lombards, so in the future he might claim the protectorate of such portions of Italy, external to the kingdom, as he should be able to acquire. This, at any rate, seems to be the meaning of that obscure re-settlement of the peninsula which Charles effected. The kingdom of Italy, transmitted on his death by Charles the Great, and afterwards confirmed to his grand- son Lothar by the peace of Verdun in 843, stretched from the Alps to Terracina. The duchy of Benevento remained tributary, but independent. The cities of Gaeta and Naples, Sicily, and the so-called Theme of Lombardy in

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South Apulia and Culabria, still recognized the Byzantine emperor. Venice stood aloof, professing a nominal allegiance to the Hast. The parcels into which the Lom- bards had divided the peninsula remained thus virtually unaltered, except for the new authority acquired by the sce of Rome.

Internally Charles left the affairs of the Italian kingdom much as he found them, except that he appears to have pursued the policy of breaking up the larger ficfs of the Lombards, substituting counts for their dukes, and adding to the privileges of the bishops. We may reckon these measures among the earliest advantages extended to the cities, which still contained the bulk of the old Roman population, and which were destined to intervene with decisive effect two centuries later in Italian history. It should also here be noticed that the changes introduced into the holding of the fiefs, whether by altering their boundaries or substituting Frankish for Lombard vassals, were chief among the causes why the feudal system took no permanent hold in Italy. Feudalism was not at any time a national institution. The hierarchy of dukes and marquises and counts consisted of foreign soldiers imposed on the indigenous inhabitants ; and the rapid succession of conquerors, Lombards, Franks, and Germans following each other at no long interval, and each endeavouring to weaken the remaining strength of his predecessor, prevented this alien hierarchy from acquiring fixity by permanence of tenure. Among the many miseries inflicted upon Italy by

the frequent changes of her northern rulers, this at least —

inay be reckoned a blessing.

The Italians acknowledged eight kings of the honse of Charles the Great, ending in Charles the Fat, who was deposed in 888. After them followed ten sovcreigns, some of whom have been misnamed Italians by writers too eager to catch at any resemblance of national glory for a people passive in the hands of foreign masters, The truth is that no period in Italian history was less really glorious than that which came to a close in 961 by Berengar II.'s cession of his rights to Otto the Great. It was a period marked in the first place by the conquests of the

Saracens, who began to occupy Sicily early in the 9th century, overran Calabria and Apulia, took Bari, and threatened Rome. In the second place it was marked by a restoration of the Greeks to power. In 890 they established themselves again at Bari, and ruled the Theme of Lombardy by means of an officer entitled Catapan. In the third place it was marked by a decline of good government in Rome. Early in the 10th century the papacy fell into the hands ofa noble family, known eventually as the counts of Tusculum, who almost succeeded in rendering the office hereditary, and in uniting the civil and ecclesiastical functions of the city under a single member of their house. It is not neces- sary to relate the scandals of Marozia's and Theodora's female reign, the infamies of John XIL, or the intrigues which tended to convert Rome into a duchy. The most important fact for the historian of Italy to notice is that during this time the popes abandoned, not only their high duties as chiefs of Christendom, but also their pro- tectorate of Italian liberties. A fourth humiliating episode in this period was the invasion of the Magyar barbarians, who overran the north of Italy, and reduced its fairest provinces to the condition of a wilderness, Anarchy and misery are indeed the main features of that long space of time which elapsed between the death of Charles the Great and the descent of Otto. Through the almost impenetrable darkness and confusion we only discern this much, that Italy was powerless to constitute herself a nation.

The discords which followed on the break-up of the Caro- lingian power, and the weakness of the so-called Italian emperors, who were unable to control the feudatories

Frankish

and Italian kings,

590-1024.]

(marquises of Ivrea and Tuscany, dukes of Friuli and Spoleto), from whose ranks they sprang, exposed Italy to ever-increasing misrule. The country by this time had become thickly covered over with castles, the seats of greater Or lesser nobles, all of whom were eager to detach

themselves froin strict allegiance to the '"Regno." The cities, exposed to pillage by Huns in the north and Saracens in the south, and ravaged on the coast by Norse pirates, asserted their right to enclose themselves with walls, and taught their burghers the use of arms. Within the circuit of their ramparts, the bishops already began to exercise authority in rivalry with the counts, to whom, since the days of Theodoric, had been entrusted the government of the Italian burghs.) Agreeably to feudal customs, these nobles, as they grew in power, retired from the town, and built themselves fortresses on points of vantage in the neighbourhood. Thus the titular king of Italy found himself simultaneously at war with those great vassals who had chosen him from their own class, with the turbulent factions of the Roman aristocracy, with unruly bishops in the growing cities, and with the multitude of minor counts and barons who occupied the open lands, and who changed sides according to the interests of the moment. The last king of the quasi-[talian succession, Berengar IT., marquis of Ivrea (951-961), made a vigorous effort to restore the authority of the regno ; and had he succeeded, it is not impossible that now at the last moment Italy might have become an independent nation. But this attempt at unifica- tion was reckoned to Berengar foracrime. He only won the hatred of all classes, and was represented by the obscure annalists of that period as an oppressor of the church and a remorseless tyrant. In Italy, divided between feudal nobles and almost hereditary ecclesiastics, of foreign blood and alien sympathies, there was no national feeling. Berengar stood alone against a multitude, unanimous in their intolerance of discipline. His predecessor in the kingdom, Lothar, had left a young and beautiful widow, Adelheid. Berengar imprisoned her upon the Lake of Como, and threatened her with a forced marriage to his son Adalbert. She escaped to the castle of Canossa, where the great count of Tuscany espoused her cause, and appealed in her behalf to Otto the Saxon. The king of Germany descended into Italy, and took Adelheid in marriage. After this episode Berengar was more discredited and impotent than ever. In the extremity of his fortunes he had recourse himself to Otto, making a formal cession of the Italian kingdom, in his own name and that of his son Adalbert, to the Saxon as his overlord. By this slender tie the crown of Italy was joined to that of Germany; and the formal right of the elected king' of Germany to be

considered king of a emperor ray be held to have accrued from this epoch,

The German Emperors.

Saxon Berengar gained nothing by his act of obedience to oe Otto. The great Italian nobles, in their turn, appealed to

conian Cermany. Otto entered Lombardy in 961, deposed

‘emperors, Berengar, assumed the crown in St Ambrogio at Milan,

| and in 962 was proclaimed emperor by John XII. at

Rome. Henceforward Italy changed masters according as

| one or other of the German families assumed supremacy

beyond the Alps. It is one of the strongest instances

| furnished by history of the fascination exercised by an

idea that the Italians themselves should have grown to

glory in this dependence of their nation upon Cesars

| who had nothing but a name in common with the Roman Imperator of the past.

The first thing we have to notice in this revolution which

placed Otto the Great upon the imperial throne is that the

Italian kingdom, founded by the Lombards, recognized by

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the Franks, and recently claimed by eminent Italian feu- datories, virtually ceased to exist. It was merged in the German kingdom ; and, since for the German princes Cer- many was of necessity their first care, Italy from this time forward began to be left more and more to herself. The central authority of Pavia had always been weak; the regno had proved insufficient to combine the nation. But now even that shadow of union disappeared, and the Italians were abandoned to the slowly working influences which tended to divide them into separate states. The most brilliant period of their chequered history, the period which includes the rise of communes, the exchange of municipal liberty for despotism, and the gradual discrimination of the five great powers (Milan, Venice, Florence, the Papacy, and the kingdom of Naples), now begins. Among the centrifugal forces which determined the future of the Italian race must be reckoned, first and foremost, the new spirit of municipal independence. We have seen how the cities enclosed themselves with walls, and how the bishops defined their authority against that of the counts. Otto encouraged this revolution by placing the enclosures of the chief burghs beyond the jurisdiction of the counts. Within those precincts the bishops and the citizens were independent of all feudal masters but the emperor. He further broke the power of the great vassals by redivisions of their feuds, and by the creation of new marches which he assigned to his German followers. In this way, owing to the dislocation of the ancient aristocracy, to the enlarged jurisdiction of a power so democratic as the episcopate, and to the increased privileges of the burghs, feudalism received a powerful check in Italy. The Italian people, that people which gave to the world the commerce and the arts of Florence, was not indeed as yet apparent. But the con- ditions under which it could arise, casting from itself all foreign and feudal trammels, recognizing its true past in ancient Rome, and reconstructing a civility out of the ruins of those glorious memories, were now at last granted. The nobles from this time forward retired into the country and the mountains, fortified themselves in strong places outside the cities, and gave their best attention to fostering the rural population. Within the cities and upon the open lands the Italians, in this and the next century, doubled, trebled, and quadrupled their numbers. A race was formed strong enough to keep the empire

itself in check, strong enough, except for its own internecine contests, to have formed a nation equal to its happier neighbours.

The recent scandals of the papacy induced Otto to deprive the Romans of their right to elect popes. But when he died in 973, his son Otto II. (married to Theophano of the imperial Byzantine house) and his grandson, Otto IIL, who descended into Italy in 996, found that the affairs of Rome and of the southern provinces were more than even their imperial powers could cope with. The faction of the counts of Tusculum raised its head from time to time in the Eternal City, and Rome still claimed to be a common- wealth. Otto III.'s untimely death in 1002 introduced new discords. Rome fell once more into the hands of her nobles. The Lombards chose Ardoin, marquis of Ivrea, for king, and Pavia supported his claims against those of Henry of Bavaria, who had been elected in Germany. Milan sided with Henry; and this is perhaps the first eminent instance of cities being reckoned powerful allies in the Italian disputes of sovereigns. It is also the first instance of that bitter feud between the two great capitals of Lombardy, a feud rooted in ancient antipathies between the Roman population of Mediolanum and_ the Lombard garrison of Alboin's successors, which proved so disastrous to the national cause. Ardoin retired to a monastery, where he died in 1015. Henry nearly destroyed Pavia, was crowned in Rome, and died in 1924. After this event

Heribert

470

Heribert, the archbishop of Milan, invited Conrad, the Franconian king of Germany, into Italy, and crowned him with the iron crown of the kingdom.

The intervention of this man, Heribert, compels us to

and the turn a closer glance upon the cities of North Italy. It is

Lombard

burghs.

here, at the present epoch and for the next two centuries, that the pith and nerve of the Italian nation must be sought ; and among the burghs of Lombardy, Milan, the eldest daughter of ancient Rome, assumes the lead, In Milan we hear for the first time the word Comune. In Milan the citizens first form themselves into a Parlamento. In Milan the archbishop organizes the hitherto voiceless, defenceless population into a community capable of express- ing its needs, and an army ready to maintain its rights. To Heribert is attributed the invention of the Carroccio, which played so singular and important a part in the war-fare of Italian cities. A huge car drawn by oxen, bearing the standard of the burgh, and carrying an altar with the host, this carroccio, like the ark of the Israelites, formed a rallying point in battle, and reminded the armed artisans that they had a city and a church to fight for. That Heribert's device proved effectual in raising the spirit of his burghers, and consolidating them into a formidable band of warriors, is shown by the fact that it was speedily adopted in all the free cities. It must not, however, be supposed that at this epoch the liberties of the burghs were fully developed. The mass of the people remained unrepresented in the government ; and even if the consuls existed in the days of Heribert, they were but humble legal officers, transacting business for their constituents in the courts of the bishop and his viscount. It still needed nearly a century of struggle to render the burghers indc- pendent of lordship, with a fully organized commune, self. governed in its several assemblies. While making these reservations, it is at the same time right to observe that certain Italian communities were more advanced upon the path of independence than others, This is specially the case with the maritime ports. Not to mention Venice,

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thus initiated upon the precedent laid down by Otto the Great was a remedy for pressing evils. It saved Rome fron: becoming a duchy in the hands of the Tusculan house, But it neither raised the prestige of the

papacy, nor could it satisfy the Italians, who rightly regarded the Roman see as theirs. These German popes were short-lived and inefficient. Their appointment, according to notions which defined themselves within the church at this epoch, was simoniacal ; and during the long minority of Henry IV., who succeeded his father in 1056, the terrible Tuscan monk, Hildebrand of Soana, forged weapons which he used with deadly effect against the presumption of the empire. The condition of the church seemed desperate, unless it could be purged of crying scandals—of the subjection of the papacy to the great Roman nobles, of its subordination to the German emperor, and of its internal demoralization. It was Hildebrand's policy throughout three papacies, dur- ing which he controlled the counsels of the Vatican, and before he himself assumed tlie tiara, to prepare the mind of Italy and Europe for a mighty change. His programme included these three poiuts :—(1) the celibacy of the clergy; (2) the abolition of ecclesiastical appointments made by the secular authority; (3) the vesting of the papal election in the hands of the Roman clergy and people, presided over by the curia of cardinals. How Hildebrand paved the way for these reforms during the pontificates of Nicholas II. and Alexander II., how he succeeded in raising the papal office from the depths of [degradation and subjection to illimitable sway over the minds of men in Europe, and how his warfare with the empire established on a solid basis the still doubtful independence of the Italian burghs, renewing the long neglected protectorate of the Italian race, and be- queathing to his successors a national policy which had been forgotten by the popes since his great predecessor Gregory II., forms a chapter in European history which must now be interrupted. We have to follow the fortunes of unexpected allies, upon whom in no small measure his success depended.

which has not yet entered the Italian commuuity, and remains a Greek free city, Genoa and Pisa were rapidly rising into ill-defined autonomy. Their command of ficcts gave them incontestable advantages, as when, for instance,

In order to maintain some thread of continuity through Norman the perplexed and tangled vicissitudes of the Italian race, conquet it has

been necessary to disregard those provinces which he ‘ did not immediately contribute to the formation of its his- gicilies,

Rome.

Otto IL. employed the Pisans in 980 against the Greeks in Lower Italy, and the Pisans and Genoese together attacked the Saracens of Sardiniain1017. Still, speaking generally, the age of independence for the burghs had only begun when Heribert from Milan undertook the earliest organiza- tion of a force that was to become paramount in peace and war.

Next to Milan, and from the point of vicw of general politics even more than Milan, Rome now claims attention. The destinies of Italy depended upon the character which the see of St Peter should assume. Even the liberties of her republics in the north hung on the issue of a contest which in the 11th and 12th centuries shook Europe to its furthest boundaries. So fatally were the internal affairs of that magnificent but unhappy country bound up with concerns which brought the forces of the civilized world into play. Her ancient prestige, her geographical position, aid the intellectual primacy of her most noble children rendered Italy the battleground of principles that set all Christendom in motion, and by the clash of which she found herself for ever afterwards divided. During the reign of Conrad II., the party of the counts of Tusculum revived in Rome; and Crescentius, claiming the title of con- sul in the imperial city, sought once more to control the election of the popes. Wheu Henry III, the son of Con- rad, entered Italy in 1046, he found three popes in Rome. These he abolished, and, taking the appointment into his own hands, gave German bishops to the see. The policy

tory. For this reason we have left the whole of the south up to the present point unnoticed. Sicily in the hands of the Mussulmans, the Theme of Lombardy abandoned to the weak suzerainty of the Greek catapans, the Lombard duchy of Benevento slowly falling to pieces, and the maritime re- publics of Naples, Gaeta, and Amalfi extending their in- fluence by commerce in the Mediterranean, were in effect detached from the Italian regno, beyond the jurisdiction of Rome, included in no

parcel of Italy proper. But now the moment had arrived when this vast group of provinces, forming the future kingdom of the Two Sicilies, was about to enter definitely and decisively within the bounds of the Italian community. Some Norman adventurers, on pil- grimage to St Michael's shrine on Monte Gargano, lent their swords in 1017 to the Lombard cities of Apulia against the Greeks. 'Twelve years later we find the Nor- mans settled at Aversa under their Count Rainulf. From this station as a centre the little band of adventurers, playing the Greeks off against the Lombards, and the Lombards against the Greeks, spread their power in all di- rections, until they made themselves the most considerable force in southern Italy. William of Hauteville was pro- claimed count of Apulia, His half-brother, Rohert Wis- kard or Guiscard, after defeating the papal troops at Civitella in 1053, received from Leo IX. the investiture of all present and future conquests in Apulia, Calabria, and Sicily, which he agreed to hold as fiefs of the Holy See. Nicholas II. ratificd this grant, and confirmed the title of

War of investi- tures,

1024-1122.]

count. Having consolidated their possessions on the main- land, the Normans, under Robert Guiscard's brother, the great Count Roger, undertook the conquest of Sicily in 1060, After a prolonged struggle of thirty years, they wrested the whole island from the Saracens ; and Roger, dying in 1101, bequeathed to his son Roger a kingdom in Calabria and Sicily second to none in Europe for wealth and magnificence. This while, the elder branch of the Hauteville family still held the title and domains of the Apulian duchy; but in 1127, upon the death of his cousin Duke William, Roger united the whole of the futurerealm. In 1130 he assumed the style of king of Sicily, inscribing upon his sword thie famous hexameter—

Appulus et Calaber Siculus mihi servit et Afer.

This Norman conquest of the two Sicilies forms the most romantic episode in niedizeval Italian history. By the con- solidation of Apulia, Calabria, and Sicily into a powerful kingdom, by checking the growth

of the maritime republics, and by recognizing the over-lordship of the papal see, the house of Hauteville influenced the destinies of Italy with more effect than any of the princes who had previously dealt with any portion of the peninsula. Their kingdom, though Naples was from time to time separated from Sicily, never quite lost the cohesion they had given it; and all the disturbances of equilibrium in Italy were due in after days to papal manipulation of the rights ac- quired by RobertGuiscard's act of homage. The southern regno, in the hands of the popes, proved an insurmountable obstacle to the unification of Italy, led to French interfer- ence in Italian affairs, introduced the Spaniard, and main- tained in those rich southern provinces the reality of feudal sovereignty long after this alien element had been elimin- ated from the rest of Italy.

For the sake of clearness, we have anticipated the course of events by nearly a ceutury. We must now return to the date of Hildebrand's elevation to the papacy in 1073, when he chose the memorable name of Gregory VII. In the next year after his election Hildebrand convened a council, and passed measures enforcing the celibacy of the clergy. In 1075 he caused the investiture of ecclesiasti- cal dignitaries by secular potentates of any degree to be condemned, These two reforms, striking at the most cherished privileges and most deeply-rooted self-indulgences of the aristocratic caste in Europe, inflamed the bitterest hostility. Henry IV., king of Germany, but not crowned emperor, convened a diet in the following year at Worms, where Gregory was deposed and excommunicated. The pope followed with a counter excommunication, far more formidable, releasing the king's subjects from their oaths of allegiance. War was thus declared between the two chiefs of Western Christendom, that war of investitures which out-lasted the lives of both Gregory and Henry, and was not terminated till the year 1122. The dramatic epi- sodes of this struggle are too well known to be enlarged upon. In his single-handed duel with the strength of Germany, Gregory received material assistance from the Countess Matilda of Tuscany. She was the last heiress of the great house of Canossa, whose fiefs stretched from Mantua across Lombardy, passed the Apennines, included the Tuscan plains, and embraced a portion of the duchy of Spoleto. It was in her castle of Canossa that Henry IV.

performed his three days' penance in the winter of 1077 ; and there she made the cession of her vast domains to the church. That cession, renewed after the death of Gregory to his successors, conferred upon the popes indefinite rights, of which they afterwards availed themselves in the consoli- dation of their temporal power. Matilda died in the year 1115. Gregory had passed before her from the scene of his contest, an exile at Salerno, whither Robert Wiskard

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carried him in 1084 from the anarchy of rebellious Rome. With unbroken spirit, though the objects of his life were unattained, though Italy and Europe had been thrown into confusion, and the issue of the conflict was still doubtful, Gregory expired in 1085 with these words on hislips: "I loved justice, I hated iniquity, therefore in banishment I die."

The greatest of the popes thus breathed his last; but the new spirit he had communicated to the papacy was not destined to expire with him. Gregory's immediate successors, Victor III., Urban IL, and Paschal IL, carried on his struggle with Henry IV. and his imperial anti- popes, encouraging the emperor's son to rebel against him, and stirring up Europe for the first crusade. When Henry IV. died, his own son's prisoner, in 1106, Henry V. crossed the Alps, entered Rome, wrung the imperial coronation from Paschal IJ, and compelled the pope to grant his claims on the investitures. Scarcely had he returned to Germany when the Lateran disavowed all that the pope had done, on the score that it had been extorted by force. France sided with the church. Germany rejected the bull of investiture. A new descent into Italy, a new seizure of Rome, proved of no avail, The emperor's real weakness was in Germany, where his subjects openly expressed their discontent. He at last abandoned the contest which had distracted Europe. By the concordat of Worms, 1122, the emperor surrendered the right of investiture by ring and staff, and granted the right of election to the clergy. The popes were henceforth to be chosen by the cardinals, the bishops by the chapters subject to the pope's approval. On the other hand the pope ceded to the emperor the riglit of investiture by the

sceptre. But the main issue of the struggle was not in these details of ecclesiastical govern- ment; principles had been at stake far deeper and more widely reaching. The respective relations of pope and emperor, ill-defined in the compact between Charles the Great and Leo IIL, were brought in question, and the two chief potentates of Christendom, no longer tacitly concord- aut, stood against each other in irreconcilable rivalry. Upon this point, though the battle seemed to be a drawn one, the popes were really victors. They remained inde- pendent of the emperor, but the emperor had still to seek the crown at their hands. The pretensions of Otto the Great and Henry III. to make popes were gone for ever.

Age of the Communes.

The final gainers, however, by the war of investitures Rise of

were the Italians. In the first place, from this time f forward, owing to the election of popes by the Roman curia, the Holy See remained in the hands of Italians; and this, though it was by no means an unmixed good, was a great glory to the nation. In the next place, the antagonism of the popes to the emperors, which became hereditary in thie Holy College, forced the former to assume the protectorate of the national cause. But by far the greatest profit the Italians reaped was the emancipation of their burghs. During the forty-seven years' war, when pope and emperor were respectively bidding for their alliance, and offering concessions to secure their support, the communes grew in self-reliance, strength, and liberty. As the bishops had helped to free them from subservience to their feudal masters, so the war of investitures relieved them of depend- ence on their bishops. The age of real autonomy, signalized by the supremacy of consuls in the cities, had arrived.

In the republics, as we begin to know them after the war of investitures, government was carried on by officers called consuls, varying in number according to custom and accord- ing to the division of the town into districts. These magistrates, as we have already seen, were originally appointed te control and protect the humbler classes. But,

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in proportion as the people gained more power in the field the consuls rose into importance, superscded the bishops, and began to represent the city in transactions with its ucighbours, Popes and emperors, who necded the assist- ance of a city, had to seek it from the consuls, and thus these officers gradually converted an obscure and indefinite authority into what resembles the presidency of a common- wealth. They were supported by a deliberative assembly, called eredenza, chosen from the more distinguished citizens. In addition to this privy council, we find a gran consiglio, consisting of the burghers who had established the right to interfere immediately in public affairs, and a still larger assembly called parlamento, which included the whole adult population. Though the institutions of the communes varied in different localities, this is the type to which they all approximated. It will be perceived that the type was rather oligarchical than strictly democratic. Between the parlamento and the consuls with their privy council, or credenza, was interposed the gran consiglio of privileged burghers. 'These formed the aristocracy of the town, who by their wealth and birth held its affairs within their custody. There is good reason to believe that, when the term popolo occurs, it refers to this body and not to the whole mass of the population. The comune included the entire city—bishop, consuls, oligarchy, councils, handi- craftsmen, proletariate. The popolo was the governing or upper class. It was almost inevitable in the transition from feudalism to democracy that this intermediate ground should be traversed; and the peculiar Italian phrases, primo popolo, secondo popolo, terzo popolo, and so forth, indicate successive changes, whereby the oligarchy passed from one stage to another in its progress toward absorption in democracy or tyranny.

Under their consuls the Italian burghs rose to a great height of prosperity and splendour. Pisa built her Duomo. Milan undertook the irrigation works which enriched the soil of Lombardy for ever. Massive walls, substantial edifices, commodious seaports, good roads, were the benefits conferred by this new government on Italy. It is also to be noticed that the people now began to be con- scious of their past. They

recognized the fact that their blood was Latin as distinguished from Teutonic, and that they must look to ancient Rome for those memories which constitute a people's nationality. At this epoch the study of Roman law received a new impulse, and this is the real meaning of the legend that Pisa, glorious through her con- suls, brought the pandects in a single codex from Amalfi. The very name consul, no less than the Romanizing char-

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Though the communes gained so much by the war of Mmig, investitures, the division of the country between the pope's pal war,

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and emperors parties was no small price to pay for inde- pendence. It inflicted upon Italy the ineradicable curse of party-warfare, setting city against city, house against house, and rendering concordant action for a national end impos- sible. No sooner had the compromise of the investitures been concluded than it was manifest that the burghers of the now enfranchised communes were resolved to turn their arins against each other. We seek in vain an obvious motive for each separate quarrel. All we know for certain is that, at this epoch, Rome attempts to ruin Tivoli, and Venice Pisa; Milan fights with Cremona, Cremona with Crema, Pavia with Verona, Verona with Padua, Piacenza with Parma, Modena and Reggio with Bologna, Bologna and Faenza with Ravenna and Imola, Florence and Pisa with Lucca and Siena, and so on through the whole list of cities. The nearer the neighbours, the more rancorous and internecine is the strife; and, as in all cases where animosity is deadly and no grave local causes of dispute are apparent, we are bound to conclude that some deeply- seated permanent uneasiness goaded these fast growing communities into rivalry. Italy was, in fact, too small for her children. As the towns expanded, they perceived that they must mutually exclude each other. They fought for bare existence, for primacy in commerce, for the command of seaports, for the keys of mountain passes, for rivers, roads, and all the avenues of wealth and plenty. The pope's cause and the emperor's cause were of comparatively little moment to Italian burghers ; and the names of

Guelf and Ghibelline, which before long began to be heard in every street, on every market-place, had no meaning for them. ‘These watchwords are said to have arisen im Germany during the disputed succession of the empire between 1135 and 1152, when the Welfs of Bavaria opposed the Swabian princes of Waiblingen origin. But in Italy, although they were severally identified with the papal and imperial parties, they really served as symbols for jealousies which altered in complexion from time to time and place to place, expressing more than antagonistic poli- tical principles, and involving differences vital enough to split the social fabric to its foundation.

Under the imperial rule of Lothar the Saxon (1125-1137) Swabian and Conrad the Swabian (1138-1152), these civil wars ¢™Pe

increased in violence owing to the absence of authority. Neither Lothar nor Conrad was strong at home; the former had no influence in Italy, and the latter never entered Italy atall. But when Conrad died, the electors chose his nephew

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Frederick, surnamed Barbarossa, who united the rival Frederick honours of Welf and Waiblingen, to succeed him; and it be 4 was soon obvious that the empire had a master powerful of vate brain and firm of will. Frederick immediately determined fombard

to reassert the imperial rights in his southern provinces, cities.

acter of the best architecture of the time, points to the same revival of antiquity. Republic The rise of the Lombard communes produced a sympa- in Rome. thetic revolution in Rome, which deserves to be mentioned in this place. A monk, named Arnold of Brescia, animated

with the spirit of the Milanese, stirred up the Romans to shake off the temporal sway of their bishop. He attempted, in fact, upon a grand scale what was being slowly and quietly effected in the northern cities. Rome, ever mind- ful of her antique past, listened to Arnold’s preaching. A senate was established, and the republic was proclaimed.

The title of patrician was revived and offered to Conrad, king of Italy, but not crowned emperor. Conrad refused it, and the Romans conferred it upon one of their own nobles. Though these institutions borrowed high-sounding titles from antiquity, they were in reality imitations of the Lombard civic system. The patrician stood for the consuls. The senate, composed of nobles, represcnted the credenza and the gran consiglio. 'I'he pope was unable to check this revolution, which is now chiefly interesting as further proof of the insurgence of the Latin as against the feudal elements in Italy at this period.

and to check the warfare of the burghs. When he first crossed the Alps in 1154, Lombardy was, roughly speaking, divided between two parties, the one headed by Pavia pro- fessing loyalty to the empire, the other headed by Milan ready to oppose its claims, The municipal animosities of the last quarter of a century gave substance to these factions; yet neither the imperial nor the anti-imperial party had any real community of interest with Frederick. He came to supersede self-government by consuls, to deprive the cities of the privilege of making war on their own account, and to extort his regalian rights of forage, food, and lodging for hisarmies. It was only the habit of inter- urban jealousy which prevented the communes from at once combining to resist demands which threatened their liberty of action, and would leave them passive at the pleasure of a foreign master. The diet was opened at Roncaglia near Piacenza, where Frederick listened to the

complaints of Como and Lodi against Milan, of Pavia against Tortona, and of the marquis of Montferrat against Asti and Chieri. The plaintiffs in each case were imperia- lists; and Frederick's first action was to redress their supposed grievances. He laid waste Chieri, Asti, and Tortona, then took the Lombard crown at Pavia, and, reserving Milan for a future day, passed southward to Rome. Outside the gates of Rome he was met by a deputation from the senate he had come to supersede, who addressed him in words memorable for expressing the re- publican spirit of new Italy face to face with autocratic feudalism : citizen ;" it is Rome who speaks: "Thou camest as an alien from beyond

the Alps, I have conferred on thee the principality." Moved only to scorn and indignation by the rhetoric of these presumptuous enthusiasts, Frederick marched into the Leonine city, and took the imperial crown from the hands of Hadrian IV. In return for this compliance, the emperor delivered over to the pope his trouble- some rival Arnold of Brescia, who was burned alive by Nicholas Breakspear, the only English successor of St Peter. The gates of Rome itself were shut against Frederick ; and even on this first occasion his good understanding with Hadrian began to suffer. The points of dispute between them related mainly to Matilda's bequest, and to the kingdom of Sicily, which the pope had rendered indepen- dent of the empire by renewing its investiture in the name of the Holy See. Intruth, the papacy and the empire had become irreconcilable. Each claimed illimitable authority, and neither was content to abide within such limits as would have secured a mutual tolerance Having obtained his coronation, Frederick withdrew to Germany, while Milan prepared herself against the storm which threatened, In the ensuing struggle with the empire, that great city rose to the altitude of patriotic heroism. By their suffer- ings no less than by their deeds of daring, her citizens showed themselves to be sublime, devoted, and disinterested,

winning the purest laurels which give lustre to Italian story.

Almost within Frederick's presence, they rebuilt Tortona, punished Pavia, Lodi, Cremona, and the marquis of Montferrat. Then they fortified the Adda and Ticino, and waited for the emperor's next descent. He came in 1158 with a large army, overran Lombardy, raised his imperial allies, and sat down before the walls of Milan. Famine forced the burghers to partial obedience, and Frederick held a victorious diet at Roncaglia. Here the jurists of Bologna appeared, armed with their new lore of Roman law, and expounded Justinian's code in the interests of the German empire. It was now seen how the absolutist doctrines of autocracy developed in Justinian's age at Byzantium would bear fruits in the development of an imperial idea, which was destined to be the fatal mirage of medixval Italy. Frederick placed judges of his own appointment, with the title of podesta, in all the Lombard communes; and this stretch of his authority, while it ex-

acerbated his foes, forced even his friends to join their ranks against him. The war, meanwhile, dragged on. Crema yielded after an heroic siege in 1160, and was abandoned to the cruelty of its fierce rival Cremona. Milan was invested in 1161, starved into capitulation after nine months' resistance, and given up to total destruction by the Italian imperialists of Frederick's army. So stained and tarnished with the vindictive passions of municipal rivalry was even this, the one great glorious strife of Italian annals! Waving ruined his rebellious city, but not tamed her spirit, Frederick withdrew across the Alps. But, in the interval between his second and third visit, a league was formed against him in north-eastern Lombardy. Verona, Vicenza, Padua, Treviso, Venice entered into a compact to defend their liberties ; and when he came again

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"Thou wast a stranger, I have made thee a'

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in 1163 with. a brilliant staff of German knights, the imperial cities refused to join his standards. This was the first and ominous sign of a coming change.

Meanwhile the election of Alexander III. to the papacy in 1159 added a powerful ally to the republican party. Opposed by an anti-pope whom the emperor favoured, Alexander found it was his truest policy to rely for support upon the anti-imperialist communes. They in return gladly accepted a champion who lent them the prestige and influence of the church. When Frederick once more crossed the Alps in 1166, he advanced on Rome, and besieged Alexander in the Coliseum. But the affairs of Lombardy left him no leisure to persecute a recalcitrant pontiff. In April 1167 a new league was formed between Cremona, Bergamo, Brescia, Mantua, and Ferrara. In December of the same year this league allied itself with the elder Veronese league, and received the addition of Milan, Lodi, Piacenza, Parma, Modena, and Bologna. The Lomhard famous league of Lombard cities, styled Concordia in its league, acts of settlement, was now established. Novara, Vercelli, Como,

Asti, and Tortona swelled its ranks ; only Pavia and Montferrat remained imperialist. between the Alps and Apennines. Frederick fled for his life by the Mont Cenis, and in 1168 the town of Alessandria was erected to keep Pavia and the marquisate in check. In the emperor's

absence, Ravenna, Rimini, Imola, and Forli joined the

league, which now called itself the "Society of Venice, Lombardy, the March, Romagna, and Alessandria." For

the fifth time, in 1174, Frederick entered his rebellious dominions. progress with those mud walls contemptuously named

The fortress town of Alessandria stopped his

"of straw," while the forces of the league assembled at

Modena, and obliged him to raise the siege. In the spring of 1176 Frederick threatened Milan. His army found itself a little to the north of the town near the village of Legnano, when the troops of the city, assisted only by a few allies from Piacenza, Verona, Brescia, Novara, and Vercelli, met and

overwhelmed it. The victory was complete. Frederick

escaped alone to Pavia, whence he opened ne otiations p '

with Alexander. In consequence of these transactions, he

was suffered to betake himself unharmed to Venice. Here, as upon neutral ground, the emperor met the pope, anda truce for six years was concluded with the Lombard burghs.

Looking back from the vantage-ground of history upon the issue of this long struggle, we are struck with the

small results which satisfied the Lombard communes. They

had humbled and utterly defeated their foreign lord. They had proved their strength in combination. Yet neither the acts by which their league was ratified nor the terms negotiated for them by their patron Alexander evince the smallest desire of what we now understand as national in- dependence. The name of Italy is never mentioned. The supremacy of the emperor is not called in question. The conception of a permanent confederation, bound together in offensive and defensive alliance for common objects, has not occurred to these hard fighters and stubborn asserters of their civic privileges. All they claim is municipal autonomy ; the right to manage their own affairs within the city walls, to fight their battles as they choose, and to follow their several ends unchecked. It is vain to lament that, when they might have now established Italian independetce upon a secure basis, they chose local and municipal privileges. Their mutual jealonsies, combined with the prestige of the empire, and possibly with the selfishness of the pope, who had secured his own position, and was not likely to foster a national spirit that would have threatened the ecclesia- stical supremacy, deprived the Italians of the only great opportunity they ever had of forming themselves into a powerful nation.

When the truce expired in 1183, a permanent peace XII. — 60

Peace of was ratified at Constance.

Con- stance.

War of cities

against nobles.

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The intervening years had been spent by the Lombards, not in consolidating their union, but in attempting to secure special privileges for their several cities. Alessandria della Paglia, glorious by her resistance to the emperor in 1174, had even changed her name to Cesarea! The signatories of the peace of Constance were divided between leaguers and imperialists. On the one side we find Vercelli, Novara, Milan, Lodi, Bergamo, Brescia, Mantua, Verona, Vicenza, Padua, Treviso, Bologna, Faenza, Modena, Reggio, Parma, Piacenza; on the other, Pavia, Genoa, Alba, Cremona, Como, Tortona, Asti, Cesarea. Venice, who had not yet entered the Italian community, is conspicuous by her absence. According to the terms of this treaty, the communes were confirmed in their right of self-government by consuls, and their right of warfare. The emperor retained the supreme courts of appeal within the cities, and his claim for sustenance at their expense when he came into Italy.

The privileges confirmed to the Lombard cities by the peace of Constance were extended to Tuscany, where Florence, having ruined Fiesole, had begun her career of freedom and prosperity. The next great chapter in the history of Italian evolution is the war of the burghs against the nobles. The consular cities wereeverywhere surrounded by castles ; and, though the feudal lords had been weakened by the events of the preceding centuries, they continued to be formidable enemies. It was, for instance, necessary to the well-being of the towns that they should possess territory round their walls, and this had to be wrested from the nobles. We cannot linger over the details of this warfare. It must suffice to say that, partly by mortgaging their property to rich

burghers, partly by entering the service of the cities as condottieri, partly by espousing the cause of one town against another, and partly by forced submission after the siege of their strong places, the counts were gradually brought into connexion of dependence on the communes, 'These, in their turn, forced the nobles to leave their castles, and to reside for at least a portion of each year within the walls. By these measures the counts became citizens, the rural population ceased to rank as serfs, and the Italo-Roman population of the towns absorbed into itself the remnants of Franks, Germans, and other foreign stocks. It would be impossible to exaggerate the importance of this revolution, which ended by destroying the last vestige of feudality, and prepared that common Italian people which afterwards distinguished itself by the creation of European culture. But, like all the vicissitudes of the Italian race, while it was a decided step forward in one direction, it introduced a new source of discord. The associated nobles proved ill neighbours to the peaceable citizens. They fortified their houses, retained their military habits, defied the consuls, and carried on feuds in the streets and squares. The war against the castles became a war against the palaces; and the system of government by consuls proved inefficient to control the clashing elements within the state. This led to the establishment of podestas, who represented a compromise between two radically hostile parties in the city, and whose business it was to arbitrate and keep the peace between them. Invariably a foreigner, elected for a year with power of life and death and control of the armed force, but subject to a strict account at the expiration of his office, the podesta might be compared to a dictator invested with limited authority. His title was derived from that of Frederick Barbarossa's judges; but he had no dependence on the empire. The citizens chose him, and voluntarily submitted to his rule. The podest' marks an essentially transitional state in civic

government, and his intervention paved the way for

despotism.

The thirty years which elapsed between Frederick

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Barbarossa's death in 1190 and the coronation of his Poni. grandson Frederick II. in 1220 form one of the most ficate of momentous epochs in Italian history. Barbarossa, perceiy- Innocent ing the advantage that would accrue to his house if he s could join the crown of Sicily to that of Germany, and thus deprive the popes of their allies in Lower Italy, pro- cured the marriage of his son Henry VI. to Constance, daughter of King Roger, and heiress of the Hauteville dynasty. When William IJ., the last monarch of the Norman race, died, Henry VI. claimed that kingdom in his wife's right, and was recognized in 1194. Three years afterwards he died, leaving a son, Frederick, to the care of Constance, who in her turn died in 1198, bequeathing the young prince, already crowned king of Germany, to the guardianship of Innocent III. It was bold policy to con- fide Frederick to his greatest enemy and rival; but the pope honourably discharged his duty, until his ward out- grew the years of tutelage, and became a fair mark for ecclesiastical hostility. Frederick's long minority was occupied by Innocent's pontificate. Among the principal events of that reign must be reckoned the foundation of the two orders, Franciscan and Dominican, who were destined to form a militia for the Holy See in conflict with the enipire and the heretics of Lombardy. A second great event was the fourth crusade, undertaken in 1198, which established the naval and commercial supremacy of the Italians in the Mediterranean. The Venetians, who con- tracted for the transport of the crusaders, and whose blind doge Dandolo was first to land in Constantinople, received one-half and one-fourth of the divided Greek empire for their spoils. The Venetian ascendency in the Levant dates from this epoch ; for, though the republic had no power to occupy all the domains ceded to it, Candia was taken, together with several small islands and stations on the main- land. The formation ofa Latin empire in the East increased the pope's prestige; while at home it was his policy to organize Countess Matilda's heritage by the formation of Guelf leagues, over which he presided. This is the meaning of the three leagues, in the March, in the duchy of Spoleto, and in Tuscany, which now combined the chief cities of the papal territory into allies of the Holy See. From the Tuscan league Pisa, consistently Ghibelline, stood aloof. Rome itself

again at this epoch established a re- public, with which Innocent would not or could not interfere. The thirteen districts in their council nominated four caporion?, who acted in concert with a senator, appointed, like the podest& of other cities, for supreme judicial functions. Meanwhile the Guelf and Ghibelline factions were beginning to divide Italy into minute parcels. Not only did commune range itself against com- mune under the two rival flags, but party rose up against party within the city walls. The introduction of the factions into Florence in 1215, owing to a private quarrel between the Buondelmonti, Amidei, and Donati, is a celebrated instance of what was happening in every burgh.

Frederick II. was left without a rival for the imperial Frederick throne in 1218 by the death of Otto IV., and on the 22d HL em of November 1220 Honorius III., Innocent's successor, crowned him in Rome. It was impossible for any section of the Italians to mistake the gravity of his access to power. In his single person he combined the prestige of empire with the crowns of Italy, Sicily, Sardinia, Ger- many, and Burgundy; and in 1225, by marriage with Yolande de Brienne, he added that of Jerusalem. There was no prince greater or more formidable in the habitable globe. The communes, no less than the popes, felt that they must prepare themselves for contest to the death with a power which threatened their existence. Already in 1218 tho Guelfs of Lombardy had resuscitated their old

league, and had been defeated by the Ghibellines in a battle near Ghibello. Italy seemed to lie prostrate before the emperor, who commanded her for the first time from the south as well as from the uorth. In 1227 Frederick, who had promised to lead a crusade, was excommunicated by Gregory IX. because he was obliged by illness to defer his undertaking; and thus the spiritual power declared war upon its rival. The Guelf towns of Lombardy again raised their levies. Frederick enlisted his Saracen troops at Nocera and Luceria, and appointed the terrible Ezzelino da Romano his vicar in the Marches of Verona to quell their insurrection. It was 1236, however, before he was

able to take the field himself against the Lombards. Having established Ezzelino in Verona, Vicenza, and Padua, he de- feated the Milanese and their allies at Cortenuova in 1237, and sent their carroccio as a trophy of his victory to Rome. Gregory IX. feared lest the Guelf party would be ruined by this check. He therefore made alliance with Venice and Genoa, fulminated a new excommunication against Frederick, and convoked a council at Rome to ratify his ban in 1241. The Genoese undertook to bring the French bishops to this council. Their fleet was attacked at Me- loria by the Pisans, and utterly defeated. The French prelates went in silver chains to prison in the Ghibelline capital of Tuscany. So far Frederick had been successful at all points. In 1243 a new pope, Innocent IV., was elected, who prosecuted the war with still bitterer spirit. Forced to fly to France, he there, at Lyons, in 1245, con- vened a council, which enforced his condemnation of the emperor. Frederick's subjects were freed from their allegiance, and he was declared dethroned and deprived of all rights. Five times king and emperor as he was, Frederick, placed under the ban of the church, led hence- forth a doomed existence. The mendicant monks stirred up the populace to acts of fanatical enmity. To plot against him, to attempt his life by poison or the sword, was accounted virtuous. His secretary, Piero delle Vigne, conspired against him. The crimes of his vicar Ezzelino, who laid whole provinces waste and murdered men by thousands in his Paduan prisons, increased the horror with

one of Frederick's many natural children ; and, when Con- Papal rad died in 1254, Manfred still acted as vicegerent for the W@™ Swabians, who were now represented by a boy Conradin, oes Innocent IV. and Alexander IV. continued to make head yick's against the Ghibelline party. The most dramatic incident succes- in this struggle was the crusade preached against Ezzelino. ®°rs- This tyrant had made himself justly odious; and when he

was hunted to death in 1259, the triumph was less for the Guelf cause than for humanity outraged by the iniquities

of such a monster. The battle between Guelf and Ghibel-

line raged with unintermitting fury. While the former faction gained in Lombardy by the massacre of Ezzelino,

the latter revived in Tuscany after the battle of Montaperti, which in 1260 placed Florence at the discretion of the Ghibellines. Manfred, now called king of Sicily, headed

the Ghibellines, and there was no strong counterpoise against him. In this necessity Urban IV. and Clement

IV. invited Charles of Anjou to enter Italy and take the Guelf command. They made him senator of Rome, and vicar of Tuscany, and promised him the investiture of the regno provided he stipulated that it should not be held in combination with the empire. Charles accepted these terms, and was welcomed by the Guelf party as their chief throughout Italy. He defeated Manfred in a battle at Grandella near Benevento in 1266. Manfred was killed ;

and, when Conradin, a lad of sixteen, descended from Ger- many to make good his claims to the kingdom, he too was defeated at Tagliacozzo in 1267. Less lucky than his uncle, Conradin escaped with his life, to die upon a scaffold

at Naples. His glove was carried to his cousin Constance,

wife of Peter of Aragon, the last of the great Norman- Swabian family. Enzio died in his prison four years later.

The popes had been successful; but they had purchased their bloody victory at a great cost. This first invitation

to French princes brought with it incalculable evils.

Charles of Anjou, supported by Rome, and recognized Civil as chief in Tuscany, was by far the most formidable of the wars of Italian potentates. In his turn he now excited the i jealousy of the popes, who began, though cautiously, to aipe cast their weight into the Ghibelline scale. Gregory initi- tines,

which he was regarded. Parma revolted from him, and he spent months in 1247-8 vainly trying to reduce this one time faithful city. The only gleam of success which shone on his ill fortune was the revolution which placed Florence in the hands of the Ghibellines in 1248. Noxt year Bologna rose against him, defeated his troops, and took his son Enzio, king of Sardinia, prisoner at Fossalta. Hunted to the ground and broken-hearted, Frederick expired at the end of 1250 in his Apulian castle of Fiorentino. It is difficult to judge his career with fairness. The only prince who could, with any probability of success, have es-tablished the German rule in Italy, his ruin proved the impossibility of that long-cherished scheme. The nation had outgrown dependence upon foreigners, and after his death no German emperor interfered with anything but miserable failure in Italian affairs. Yet from many points of view it might be regretted that Frederick was not suffered to rule Italy. By birth and breeding an Italian, highly gifted and widely cultivated, liberal in his opinions, a patron of literature, a founder of universities, he antici- pated the spirit of the Renaissance. At his court Italian started into being asa language. His laws were wise. He was capable of giving to Italy a large and noble culture. But the commanding greatness of his position proved his ruin. Emperor and king of Sicily, he was the natural — of popes, who could not tolerate so overwhelming a rival.

After Frederick's death, the popes carried on their war for eighteen years against his descendants. The cause of his son Conrad was sustained in Lower Italy by Manfred,

| of the Holy See, and not of the empire.

ated the policy of establishing an equilibrium between tho

arties, which was carried out by his successor Nicholas

II. Charles was forced to resign the senatorship of Rome and the signoria of Lombardy and Tuscany. In 1282 he received a more decided check, when Sicily rose against him in the famous rebellion of the Vespers. He lost the island, which gave itself to Aragon; and thus the kingdom of Sicily was severed from that of Naples, the dynasty in the

one being Spanish and Ghibelline, in the other French and Guelf. Meanwhile a new emperor had been elected,

/the prudent Rudolf of Hapsburg, who abstained from

interference with Italy, and who confirmed the territorial pretensions of the popes by solemn charter in 1278, Henceforth Emilia, Romagna, the March of Ancona, the patrimony of St Peter, and the Campagna of Rome held The imperial chancery, without inquiring closely into the deeds furnished by the papal curia, made a deed of gift, which placed the pope in the position of a temporal sovereign. While Nicholas III. thus bettered the position of the church in Italy, the Guelf party grew stronger than ever, through the crushing defeat of the Pisans by the Genoese at Meloria in 1284. Pisa, who had ruined Amalfi, was now ruined by Genoa. She never held her head so high again after this victory, which sent her best and bravest citizens to die in the Ligurian dungeons. The Mediterranean was left to be fought for by Genoa and Venice, while Guelf Florence grew still more powerful in Tuscany. Not long after the battle of Meloria Charles of Anjou died, and was succeeded by his son Charles II. of Naples, who played no prominent

Trans- lation

of the papacy to Avignon.

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part in Italian affairs. The Guelf party was held together with a less tight hand even in cities so consistent as Florence. Here in the year 1300 new factions, subdivid- ing the old Guelfs and Ghibellines under the names of Neri and Bianchi, had acquired such force that Boniface VIIL., a violently Guelf pope, called in Charles of Valois to pacify the republic and undertake the charge of Italian affairs. Boniface wasa passionate and unwise man. After quarrelling with the French king, Philip le Bel, he fell into the hands of the Colonna family at Anagni, and died, either of the violence he there received or of mortification, in October 1303.

After the short papacy of Benedict XI. a Frenchman, Clement V., was elected, and the seat of the papacy was transferred to Avignon. Thus began that Babylonian exile of the popes which placed them in subjection to the French crown, and ruined their prestige inItaly. Lasting seventy years, and joining on to the sixty years of the Great Schism, this enfeeblement of the papal authority, coinciding as it did with the practical elimination of the empire from Italian affairs, gave a long period of comparative indepen- dence to the nation. Nor must it be forgotten that this exile was due to the policy which induced the pontiffs, in their detestation of Ghibellinism, to rely successively upon the houses of Anjou and of Valois. This policy it was which justified Dante's fierce epigram—the puttaneggiar co regi.

The period we have briefly traversed was immortalized by Dante in an epic which from one point of view might be called the poem of the Guelfs and Ghibellines. From the foregoing bare narration of events it is impossible to estimate the importance of these parties, or to understand their bearing on subsequent Italian history. Weare there- fore forced to pause awhile, and probe beneath the surface. The civil wars may be regarded as a continuation of the previous municipal struggle, intensified by recent hostilities between the burghers and the nobles. The quarrels of the church and empire lend pretexts and furnish war-cries ; but the real question at issue is not the supremacy of pope or emperor. The conflict is a social one, between civic and feudal institutions, between commercial and military interests, between progress and conservatism. Quelf de- mocracy and industry idealize the pope. The banner of

the church waves above the camp of those who aim at: positive prosperity and republican equality. Ghibelline |

aristocracy and immobility idealize the emperor. The prestige of the empire, based upon Roman law and feudal tradition, attracts imaginative patriots and systematic thinkers. The two ideals are counterposed and mutually exclusive. No city calls itself either Guelf or Ghibelline till it has expelled one-half of its inhabitants; for each

party is resolved to constitute the state according to its |

own conception, and the affirmation of the one programme is the negation of the other. ‘The Ghibelline honestly believes that the Guelfs will reduce society to chaos. The Guelf is persuaded that the Ghibellines will annihilate freedom and strangle commerce, The struggle is waged by two sets of men who equally love their city, but who would fain rule it upon diametrically opposite principles, and who fight to the death for its possession. This con- tradiction enters into the minutest details of life:—armorial bearings, clothes, habits at table, symbolize and accentuate the difference. Meanwhile each party forms its own organization of chiefs, finance-officers, and registrars at home, and sends ambassadors to foreign cities of the same complexion. A network of party policy embraces and dominates the burghs of Italy, bringing the most distant centres into relation, and by the very division of the country augmenting the sense of nationality. The Italians learn through their discords at this epoch that

they form one community. The victory in the conflict practically falls to the hitherto unenfranchised plebeians, The elder noble families die out or lose their preponderance. In some cities, as notably in Florence after the date 1292, it becomes criminal to be scioperato, or unemployed in industry. New houses rise into importance ; a new com- mercial aristocracy is formed. Burghers of all denomina- tions are enrolled in one or other of the arts or guilds, and these trading companies furnish the material from which the government or signoria of the city is composed. Plebeian handicrafts assert their right to be represented on an equality with Jearned professions and wealthy corpora- tions. ‘The ancient classes are confounded and obliterated in a population more homogeneous, more adapted for democracy and despotism.

In addition to the parliament and the councils which Neweo. have been already enumerated, we now find a cownerl of stitution the party established within the city. This body tends to of the become a little state within the state, and, by controlling as the victorious majority, disposes of the government as it thinks best. The consuls are merged in

ancients or priors, chosen from the arts. A new magistrate, the gonfalomer of justice, appears in some of the Guelf cities, with the special duty of keeping the insolence of the nobility in check. Meanwhile the podesta still subsists ; but he is no longer equal to the task of maintaining an equilibrium of forces. He sinks more and more into a judge, loses more and more the character of dictator. His ancient place is now occupied by a new functionary, no longer acting as arbiter, but concentrating the forces of the triumphant party. The captain of the people, acting as head of the ascendant Guelfs or Ghibellines, undertakes the responsi- bility of proscriptions, decides on questions of policy, forms alliances, declares war. Like all officers created to meet an emergency, the limitations to his power are ill-defined, and he is often little better than an autocrat.

Age of the Despots,

Thus the Italians, during the heat of the civil wars, Origin were ostensibly divided between partisans of the empire ft: and partisans of the church. After the death of Frederick II. their affairs were managed by Manfred and by Charles | of Anjou, the supreme captains of the parties, under whose orders acted the captains of the people in each city. The contest being carried on by warfare, it followed that these captains in the burghs were chosen on account of military skill ; and, since the nobles were men of arms by profession, members of ancient houses took the lead again in towns where they had been absorbed into the bourgeoisie. In this way, after the downfall of the Ezzelini of Romano, the Della Scala dynasty arose in Verona, and the Carraresi in Padua, The Estensi made themselves lords of Ferrara ; the Torriani headed the Guelfs of Milan. At Ravenna we find the Polenta family, at Rimini the Malatestas, at Parma the Rossi, at Piacenza the Scotti, at Faenza the Manfredi. There is not a burgh of northern Italy but can trace the rise of a dynastic house to the vicissitudes of this period. In Tuscany, where the Guelf party was very strongly organ- ized, and the commercial constitution of Florence kept the nobility in check, the communes remained as yet free from hereditary masters. Yet generals from time to time

| arose, the Conte Ugolino della Gheradesca at Pisa, Ugue- | cione della Faggiuola at Lucca, the Conte Guido di Monte-

feltro at Florence, who threatened the liberties of Tuscan cities with military despotism. ‘ Left to themselves by absentee emperors and exiled popes, the Italians pursued their own course of develop- ment unchecked. After the commencement of the 14th century, the civil wars decreased in fury, and at the same time it was perceived that their effect had been to confirm

Decline of civil wars. Advent of the bour- geoisie,

1300-1342. |

tyrants in their grasp upon free cities. of the captain of the people or signore of the commune, the tyrant annihilated both parties for his own profit and for the peace of the state. He used the dictatorial powers with which he was invested, to place himself above the law, resuming in his person the state-machinery which had preceded him. In him, for the first time, the city attained self-consciousness ; the blindly working forces of previous revolutions were combined in the will of a ruler. The tyrant’s general policy was to favour the multitude at the expense of his own caste. He won favour by these means, and completed the levelling down of classes, which had been proceeding ever since the emergence of the com- munes.

In 1309 Robert, grandson of Charles, the first Angevine sovereign, succeeded to the throne of Naples, and became the leader of the Guelfs in Italy. In the next year Henry VIL. of Luxembourg crossed the Alps soon after his election to the empire, and raised the hopes of the Ghibellines. Dante from his mountain solitudes passionately called upon him to play the part of a Messiah. But it was now im- possible for any German to control the “Garden of the Empire.” Italy had entered on a new phase of her exist- ence, and the great poet’s De Monarchia represented a dream of the past which could not be realized. Henry established imperial vicars in the Lombard towns, confirm- ing the tyrants, but gaining nothing for the empire in ex- change for the titles he conferred. After receiving the crown in Rome, he died at

Buonconvento, a little walled town south of Siena, on his backward journey in 1313. The profits of his inroad were reaped by despots, who used the Ghibelline prestige for the consolidation of their own power. It is from this epoch that the supremacy of the Visconti, hitherto the unsuccessful rivals of the Guelfic Torriani for the signory of Milan, dates. The Scaligers in Verona and the Carraresi in Padua were strengthened; and in Tuscany Castruccio Castracane, Uguccione's successor at Lucca, became formidable. In 1325 he defeated the Florentines at Alto Pascio, and carried home their carroccio as a trophy of his victory over the Guclfs. Louis of Bavaria, the next emperor, made a similar excursion in the year 1327, with even greater loss of imperial prestige. Ile deposed Galeazzo Visconti on his downward journey, and offered Milan for a sum of money to his son Azzo upon his return, Castruccio Castracane was nominated by him duke of Lucca; and this is the first instance of a dynastic title conferred upon an Italian adventurer by the emperor. Castruccio dominated Tuscany, where the Guelf cause, in the weakness of King Robert, languished. But the adventurer's death in 1328 saved the stronghold of republican institu- tions, and Florence breathed freely for a while again. Can Grande della Scala's death in the next year inflicted on the Lombard Ghibellines a loss hardly inferior to that of Cast- ruccio's on their 'Tuscan allies. Equally contemptible in its political results and void of historical interest was the brief visit of John of Bohemia, son of Henry VII, whom the Ghibellines next invited to assume their leadership. He sold a few privileges, conferred a few titles, and re-crossed the Alps in 1333, It is clear that at this time the fury of the civil wars was spent. In spite of repeated efforts on the part of the Ghibellines, in spite of King Robert's supine incapacity, the imperialists gained no permanent advantage. The Italians were tircd of fighting, and the leaders of both factions looked exclusively to their own interests. Each city which had been the cradle of freedom thankfully accepted a master, to quench the con- flagration of party strife, encourage trade, and make the handicraftsmen comfortable. Even the Florentines in 1342 submitted for a few months to the despotism of the duke of Athens. They conferred the signory upon him

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Growing up out | for life; and, had he not mismanaged matters, he might

have held the city in his grasp. Italy was settling down and turning her attention to home comforts, arts, and liter- ature. Boccaccio, the contented bourgeois, succceded to Dante, the fierce aristocrat.

The most marked proof of the change which came over Italy towards the middle of the 14th century is furnished by the companies of adventure. It was with their own militia that the burghers won freedom in the war of inde- pendence, subdued the nobles, and fought the battles of the parties. But from this time forward they laid down their arms, and played the game of warfare by the aid of mercenaries. Ecclesiastical overlords, interfering from a distance in Italian politics; prosperous republics, with plenty of money to spend but no leisure or inclination for camp-life ; cautious tyrants, glad of every pretext to emasculate their subjects, and courting popularity by ex- changing conscription for taxation,—all combincd to favour the new system. Mercenary troops are said to have been first levied from disbanded Germans, together with Breton and English adventurers, whom the Visconti and Castruccio took into their pay. They soon appeared under their own captains, who hired them out to the highest bidder, or marched them on marauding expeditions up and down the less protected districts. The names of some of these earliest captains of adventure, Fra Moriale, Count Lando, and Duke Werner, who styled himself the "Enemy of God and Mercy," have been preserved to us. As the companics grew in size and improved their discipline, it was seen by the Italian nobles that this kind of service offered a good career for men of spirit, who had learned the use of arms. To leave so powerful and profitable a calling in the hands of foreigners seemed both dangerous and uneconomical. Therefore, after the middle of the century, this profession fell into the hands of natives. The first Italian who formed an exclusively Italian company was Alberico da Barbiano, a nobleman of Romagna, and founder of the Milanese house of Belgiojoso. In his school the great condottieri Braccio da Montone and

Sforza Attendolo were formed; and hence- forth the battles of Italy were fought by Italian generals commanding native troops. This was better in some respects than if the mercenaries had been foreigners. Yet it must not be forgotten that the new companies of adven- ture, who decided Italian affairs for the next century, were in no sense patriotic. They sold themselves for money, irrespective of the cause which they upheld ; and, while changing masters, they had no care for any interests but their own. The name condottiero, derived from condotta, a paid contract to supply so many fighting men in scrvice- able order, sufficiently indicates the nature of the business. In the hands of able captains, like Francesco Sforza or Piccinino, these mercenary troops became moving de- spotisms, draining the country of its wealth, and always eagcr to fasten and found tyrannies upon the provinces they had been summoned to defend. Their generals sub- stituted heavy-armed cavalry for the old militia, and intro- duced systems of carapaigning which reduced the art of war to a game of skill. Battles became all but bloodless ; diplomacy and tactics superseded feats of arms and hard plows in pitched fields. In this way the Italians lost their military vigour, and wars were waged by despots from their cabinets, who pulled the strings of puppet captains in their pay. Nor were the people only enfeebled for resistance to a real foe; the whole political spirit of the race was demoralized. The purely selfish bond between condottierl and their employers, whether princes or republics, involved intrigues and treachery, checks and counterchecks, secret terror on the one hand and treasonable practice on the other, which ended by making statecraft in Italy synony- mous with perfidy.

Com-

panies of adven-

ture.

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It must further be noticed that the rise of mercenaries was synchronous with a change in the nature of Italian despotism. ‘The tyrants, as we have already seen, estab- lished themselves as captains of the people,

vicars of the empire, vicars for the church, leaders of the Guelf and Ghibelline parties. They were accepted by a population eager for repose, who had merged old class distinctions in the conflicts of preceding centuries. They rested in large measure on the favour of the multitude, and pursued a policy of sacrificing to their interests the nobles. It was natural that these self-made princes should seek to secure the peace which they had promised in their cities, by free- ing the people from military service and disarming the aristocracy. As their tenure of power grew firmer, they advanced dynastic claims, assumed titles, and took the style of petty sovereigns, Their government became paternal; and, though there was no limit to their cruelty when stung by terror, they used the purse rather than the sword, bribery at home and treasonable intrigue abroad in preference to coercive measures or open war, Thus was elaborated the type of despot which attained completeness in Gian Galeazzo Visconti and Lorenzo de' Medici. No longer a tyrant of Ezzelino's stamp, he reigned by intelli- gence and terrorism masked beneath a smile. He substi- tuted cunning and corruption for violence. The lesser people tolerated him because he extended the power of their city and made it beautiful with public buildings. The bourgeoisie, protected in their trade, found it con- venient to support him. The nobles, turned into courtiers, placemen, diplomatists, and men of affairs, ended by pre- ferring his authority to the alternative of democratic institu- tions.

Discrimi- Between the year 1305, when Clement V. settled at nation of Avignon, and the year 1447, when Nicholas V. re-estab- pt lished the papacy upon a solid basis at Rome, the Italians Psi approximated more nearly to self-government than at any other epoch of their history. The conditions which have been described, of despotism, mercenary warfare, and bour- geois prosperity, determined the character of this epoch, which was also the period when the great achievements of the Renaissance were prepared. At the end of this century and a half, five principal powers divided the peninsula ; and their confederated action during the next forty-five years (1447-1492) secured for Italy a season of peace and brilliant prosperity. These five powers were the kingdom of Naples, the duchy of Milan, the republic of Florence, the republic of Venice, and the papacy. The subsequent events of Italian history will be

rendered most intelligible if at this point we trace the development of these five con- stituents of Italian greatness separately. The Two When Robert of Anjou died in 13438, he was succeeded Sicilies. by his grand-daughter Joan, the childless wife of four suc- cessive husbands, Andrew of Hungary, Louis of Taranto, James of Aragon, and Otto of Brunswick. Charles of Durazzo, the last male scion of the Angevine house in Lower Italy, murdered Joan in 1382, and held the kingdom for five years. Dying in 1387, he transmitted Naples to his son Ladislaus, who had no children, and was followed in 1414 by his sister Joan II. She too, though twice married, died without issue, having at one time adoptcd Louis III. of Provence and his brother René, at another Alfonso V. of Aragon, who inherited the crown of Sicily.

Change in type of des- potism.

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After her death in February 1435, the kingdom wag fought for between René of Anjou and Alfonso, surnamed the Magnanimous. René found supporters among the Italian princes, especially the Milanese Visconti, whio helped him to assert his claims with arms. During the war of succession which ensued, Alfonso was taken prisoner by the Genoese fleet in August 1435, and was sent a prisoner to Filippo Maria at Milan. Here he pleaded his own cause so powerfully, and proved so incontestably the advantage which might ensue to the Visconti from his alliance, if he held the regno, that he obtained his release and recognition as king. From the end of the year 1435 Alfonso reigned alone and undisturbed in Lower Italy, combining for the first time since the year 1282 the crowns of Sicily and Naples, The former he held by inheritance, together with that of Aragon, The latter he considered to be his by conquest. Therefore, when he died in 1458, he bequeathed Naples to his natural son Ferdinand, while Sicily and Aragon passed together to his brother John, and so on to Ferdinand the Catholic. The twenty-three years of Alfonso's reign were the most prosperous and splendid period of South Italian history. He became an Italian in taste and sympathy, entering with enthusiasm into the humanistic ardour of

the earlier Renaissance, encouraging men of letters at his court, administering his kingdom ou the principles of an enlightened despotism, and lending his authority to establish that equilibrium in the peninsula upon which the politicians of his age believed, not without reason, that, Italian independence might be secured.

The last member of the Visconti family of whom we Duehyof had occasion to speak was Azzo, who bought the city in Milan. 1328 from Louis of Bavaria. His uncle Lucchino suc- ceeded, but was murdered in 1349 by a wife against whose life he had been plotting. Lucchino's brother John, arch- bishop of Milan, now assumed the lordship of the city, and extended the power of the Visconti over Genoa and the whole of North Italy, with the exception of Piedmont, Verona, Mantua, Ferrara, and Venice. The greatness of the family dates from the reign of this masterful prelate. He died in 1354, and his heritage was divided between three members of his house, Matteo, Bernabo, and Galeazzo. In the next year Matteo, being judged incompetent to rule, was assassinated by order of his brothers, who made an equal partition of their subject cities,—Bernabo residing in Milan, Galeazzo in Pavia. Galeazzo was the wealthiest and most magnificent Italian of hisepoch. He married his daughter Violante to our duke of Clarence, and his son Gian Galeazzo to a daughter of King John of France. When he died in 1378, this son resolved to reunite the domains of the Visconti; and, with this object in view, he plotted and executed the murder of his uncle Bernabo. Gian Galeazzo thus became by one stroke the most formidable of Italian despots. Immured in his castle at Pavia, accumu- lating wealth by systematic taxation and methodical economy, he organized the mercenary troops who eagerly took service under so good a paymaster; and, by directing their operations from his cabinet, he threatened the whole of Italy with conquest. The last scions of the Della Scala family still reigned in Verona, the Jast Carraresi in Padua ; the Estensi were powerful in Ferrara, the Gonzaghi im Mantua. Gian Galeazzo, partly by force and partly by intrigue, discredited these minor despots, pushed his dominion to the very verge of Venice, and, having subjected Lombardy to his sway, proceeded to attack Tuscany. Pisa and Perugia were threatened with extinction, and Florence dreaded the advance of the Visconti arms, when the plague suddenly

cut short his career of treachery and conquest in the year 1402. Seven years before his death Gian Galeazzo bought the title of duke of Milan and count of Pavia from

the emperor Wenceslaus, and there is no doubt that he was aiming at the sovereignty of Italy. But no sooner was he dead than the essential weakness of an artificial state, built up by cunning and perfidious policy, with the aid of bought troops, dignified by no dynastic title, and consolidated by no sense of loyalty, became apparent. Gian Galeazzo's duchy was a masterpiece of mechanical contrivance, the creation of a scheming intellect and lawless will, When the mind which had planned it was with- drawn, it fell to pieces, and the very hands which had been used to build it helped to scatter its fragments. The Visconti's own generals, Facino Cane, Pandolfo Malatesta, Jacopo dal Verme, Gabrino Fondulo, Ottobon Terzo, seized upon the tyranny of several Lombard cities. In others the petty tyrants whom the Visconti had uprooted re-appeared. The Estensi recovered their grasp upon Ferrara, and the Gonzaghi upon Mantua. Venice strengthened herself between the Adriatic and the Alps. Florence reassumed her Tuscan hegemony. Other communes which still preserved the shadow of independence, like Perugia and Bologna, began once more to dream of republican freedom under their own leading families. Meanwhile Gian Galeazzo had left two sons, Giovanni Maria and Filippo Maria. Giovanni, a monster of cruelty and lust, was assassinated by some Milanese nobles in 1412; and now Filippo set about rebuilding his father's duchy. Herein he was aided by the troops of Facino Cane, who, dying opportunely at this period, left considerable wealth, a well- trained band of mercenaries, and a widow, Beatrice di Tenda. Filippo married and then beheaded Beatrice after a mock trial for adultery, having used her money,and her influence in reuniting several subject cities to the crown of Milan. He subsequently spent a long, suspicious, secret, and incomprehensible career in the attempt to piece together Gian Galeazzo's Lombard state, and to carry out his schemes of Italian conquest. In this en- deavour he met with vigorous opponents. Venice and Florence, strong in the strength of their resentful oli- garchies,

offered a determined resistance ; nor was Filippo equal in ability to his father. His infernal cunning often defeated its own aims, checkmating him at the point of achievement by suggestions of duplicity or terror. In the course of Filippo's wars with Florence and Venice, the greatest generals of this age were formed—Francesco Carmagnola, who was beheaded between the columns at Venice in 1432 ; Niccolo Piccinino, who died at Milan in 1444; and Francesco Sforza, who survived to seize his master's heritage in 1450. Son of Attendolo Sforza, this Francesco received the hand of Filippo's natural daughter, Bianca, as a reward for past service and a pledge of future support. When the Visconti dynasty ended by the duke's death in 1447, he pretended to espouse the cause of the Milanese republic, which was then reestab- lished; but he played his cards so subtly as to make himself, by the help of Cosimo de' Medici in Florence, duke de facto if not de jure. Francesco Sforza was the only condottiero among many aspiring to be tyrants who planted himself firmly on a throne of first-rate importance. Once 'Seated in the duchy of Milan, he displayed rare qualities as a ruler ; for he not only entered into the spirit of the age, which required humanity and culture from a despot, but he also knew how to curb his desire for terri- tory. The conception of confederated Italy found in him @ vigorous supporter. Thus the limitation of the Milanese duchy under Filippo Maria Visconti, and its consolidation under Francesco Sforza, were equally effectual in preparing the balance of power to which Italian politics now tended.

This balance could not have been established without the concurrent aid of Florence. After the expulsion of

the Florentine proletariate rose up against the merchant princes. This insurgence of the artisans, in a republic which had been remodelled upon economical principles by Giano della Bella's constitution of 1292, reached a climax in 1378, when the Ciompi rebellion placed the city for a few years in the hands of the Lesser Arts. The revolution was but temporary, and was rather a symptom of demo- cratic tendencies in the

state than the sign of any capacity for government on the part of the working classes. The necessities of war and foreign affairs soon placed Florence in the power of an oligarchy headed by the great Albizzi family. They fought the battles of the republic with suc- cess against the Visconti, and widely extended the Floren- tine domain over the Tuscan cities. During their season of ascendency Pisa was enslaved, and Florence gained the access to the sea. But throughout this period a powerful opposition was gathering strength. It was led by the Medici, who sided with the common people, and increased their political importance by the accumulation and wise employment of vast fcommercial wealth. In 1433 the Albizzi and the Medici came to open strife. Cosimo de' Medici, the chief of the opposition, was exiled to Venice, In the next year he returned, assumed the presidency of the democratic party, and by a system of corruption and popularity-hunting, combined with the patronage of arts and letters, established himself as the real but unacknow- ledged dictator of the commonwealth. Cosimo abandoned the policy of his predecessors. Instead of, opposing Fran- cesco Sforza in Milan, he lent him his prestige and influ- ence, foreseeing that the dynastic future of his own family and the pacification of Italy might be secured bya balance of power in which Florence should rank on equal terms with Milan and Naples.

The republic of Venice differed essentially from any Venice.

other state in Italy ; and her history was so separate that, up to this point, it would have been needless to interrupt the narrative by tracing it. Venice, however, in the 14th century took her place at last as an Italian power on an equality at least with the very greatest. The constitution of the commonwealth had slowly matured itself through a series of revolutions, which confirmed and defined a type of singular stability. During the earlier days of the re- public the doge had been a prince elected by the people, and auswerable only to the popular assemblies. In 1032 he was obliged to act in concert with a senate, called pre- gadi; and in 1172 the grand council, which became the real sovereign of the state, was formed. The several steps whereby the members of the grand council succeeded in eliminating the people from

a share in the government, and reducing the doge to the position of their ornamental representative, cannot here be described. It must suffice to say that these changes culminated in 1297, when an act was passed for closing the grand council, or in other words for confining it to a fixed number of privileged families, in whom the government was henceforth vested by hereditary right. This ratification of the oligarchical principle, together with the establishment in 1311 of the Council of Ten, completed that famous constitution which endured till the extinction of the republic in 1797. Meanwhile, throughout the Middle Ages, it had been tlie policy of Venice to refrain from conquests on the Italian mainland, and to confine her energies to commerce in the East. The first entry of any moment made by the Venetians into strictly Italian affairs was in 1336, when the republics of Florence and St Mark allied themselves against Mastino della Scala, and the latter took possession of Treviso. After this, for thirty years, between 1352 and 1381, Venice and Genoa contested the supremacy of the Mediterranean. [Pisa's maritime power having been

the duke of Athens in 1343, and the great plague of 1348, | extinguished in the battle of Meloria (1284), the two

surviving republics had no rivals, They fought their duel out upon the Bosphorus, off Sardinia, and in the Morea, with various success. From the first great encounter, in 1355, Venice retired well-nigh exhausted, and Genoa was so crippled that she placed herself under the protection of the Visconti. The second and decisive battle was fought upon the Adriatic. The Genoese fleet under Luciano Doria defeated the Venetians off Pola in 1379, and sailed without opposition to Chioggia, which was stormed and taken. Thus the Venetians found themselves blockaded in their own lagoons. Meanwhile a fleet was raised for their re- lief by Carlo Zeno in the Levant, and the admiral Vittore Pisani, who had been imprisoned after the defeat at Pola, was released to lead their forlorn hope from the city side. The Genoese in their turn were now blockaded in Chioggia, and forced by famine to surrender. The

losses of men and money which the war of Chioggia, as it was called, entailed, though they did not immediately depress the spirit of the Genoese republic, signed her naval ruin, Dur- ing this second struggle to the death with Genoa, the Venetians had been also at strife with the Carraresi of Padua and the Scaligers of Verona. In 1406, after the extinction of these princely houses they added Verona, Vicenza, and Padua to the territories they claimed on terra firma, Their career of conquest, and their new policy of forming Italian alliances and entering into the management of Italian affairs, were confirmed by the long dogeship of Francesco Foscari (1423-1457), who must rank with Al- fonso, Cosimo de' Medici, Francesco Sforza, and Nicholas V., as a joint-founder of confederated Italy. When Con- stantinople fell in 1453, the old ties between Venice and the Eastern empire were broken, and she now entered on a wholly new phase of her history. Ranking as one of the five Italian powers, she was also destined to defend Western Christendom against the encroachments of the Turk in Europe.

By their settlement in Avignon, the popes relinquished their protectorate of Italian liberties, and lost their position as Italian potentates. Rienzi's revolution in Rome (1347-1354), and his establishment of a republic upon a fantastic basis, half classical half feudal, proved the temper of the times; while the rise of dynastic families in the cities of the church, claiming the title of papal vicars, but acting in their own interests, weakened the authority of the Holy See. The predatory expeditions of Bertrand du Poiet and Robert of Geneva were as ineffective as the descents of the emperors; and, though the cardinal Albornoz con- quered Romagna and the March in 1364, the legates who resided in those districts were not long able to hold them against their despots. At last Gregory XI. returned to Rome; and Urban VL, elected in 1378, put a final end to the Avignonian exile. Still the Great Schism, which now distracted Western Christendom, so enfeebled the papacy, and kept the Roman pontiffs so engaged in ecclesiastical disputes, that they had neither power nor leisure to occupy themselves seriously with their temporal affairs. The threatening presence of the two princely houses of Orsini and Colonna, alike dangerous as friends or foes, rendered Rome an unsafe residence. Even when the schism was nominally terminated in 1415 by the council

of Constance, the next two popes held but a precarious grasp upon their Italian domains, Martin V. (1417-1431) resided princi- pally at Florence. Eugenius IV. (1431-1447) followed his example. And what Martin managed to regain Eugenius lost. At the same time, the change which had now come over Italian politics, the desire on all sides for a settlement, and the growing conviction that a federation was necessary, proved advantageous to the popes as sove- reigns, They gradually entered into the spirit of their age,

assumed the style of despots, and made use of the human- |

istic movement, then at its height, to place themselves in a new relation to Italy. The election of Nicholas V. in 1447 determined this revolution in the papacy, and opened a period of temporal splendour, which ended with the estab- lishment of the popes as sovereigns. Thomas of Sarzana was a distinguished humanist. Humbly born, he had been tutor in the house of the Albizzi, and afterwards librarian of the Medici at Florence, where he imbibed the politics together with the culture of the Renaissance. Soon after assuming the tiara, he found himself without a rival in the church ; for the schism ended by Felix V.'s resignation in 1449. Nicholas fixed his residence in Rome, which he began to rebuild and to fortify, determining to render the Eternal City once more a capital worthy of its bigh place in Europe. The Romans were flattered ; and, though his reign was disturbed by republican conspiracy, Nicholas V. was able before his death in 1455 to secure the modern status of the pontiff asa splendid patron and a wealthy temporal potentate.

Italy was now for a brief space independent. The humanistic movement had created a common culture, a com- mon language, and sense of common nationality. The five great powers, with their satellites—dukes of Savoy and Urbino, marquises of Ferrara and Mantua, republics of Bologna, Perugia, Siena—were constituted. All political institutions tended toward despotism. The Medici became yearly more indispensable to Florence, the Bentivogli more autocratic in Bologna,

the Baglioni in Perugia; and even Siena was ruled by the Petrucci. But this despotism was of a mild type. The princes were Italians; they shared the common enthusiasms of the nation for art, learning, literature, and science; they studied how to mask their tyranny with arts agreeable to the multitude. When Italy had reached this point, Constantinople was taken by the Turks. On all sides it was felt that the Italian alliance must be tightened; and one of the last, best acts of Nicholas V.'s pontificate was the appeal in 1453 to the five great powers in federation. As regards their common opposition to the Turk, this appeal led to nothing ; but it marked the growth of a new Italian consciousness. '

Between 1453 and 1492 Italy continued to be prosper- ous and tranquil. Nearly all wars during this period were undertaken either to check the growing power of Venice or to further the ambition of the papacy. Having become despots, the popes sought to establish their relatives in principalities. 'The word nepotism acquired new signifi- cance in the reigns of Sixtus IV. and Innocent VIL Though the country was convulsed by no great struggle, these forty years witnessed a truly appalling increase of political crime. To be a prince was tantamount to being the mark of secret conspiracy and assassination, Among the most noteworthy examples of such attempts may be mentioned the revolt of the barons against Ferdinand I. of Naples (1464), the murder of Galeazzo Maria Sforza at Milan (1476), and the plot of the Pazzi to destroy the Medici (1478). After Cosimo de' Medici's death in 1464, the presidency of the Florentine republic passed to his son Piero, who left it in 1469 to his sons Lorenzo and Giuliano. These youths assumed the style of princes, and it was against their lives that the Pazzi, with the sanction of Sixtus IV., aimed their blow. Giuliano was murdered. Lorenzo escaped, to tighten his grasp upon the city, which now loved him and was proud of him. During the follow- ing fourteen years of his brilliant career, he made himself absolute master of Florence, and so modified her institu- tions that the Medici were henceforth necessary to the state. Apprehending the importance of Italian federation, Lorenzo, by his personal tact and prudent leadership of the republic, secured peace and a common intelligence between the five powers. His own family was fortified by the

marriage of his daughter to a son of Innocent VIIL., which

rocured his son Giovanni's elevation to the cardinalate, and 'nvolved two Medicean papacies and the future dependence of Florence upon Rome.

Age of Invasions.

The year 1492 openeda new age for Italy. In this year Lorenzo died, and was succeeded by his son, the vain and weak Piero; France passed beneath the personal control of the inexperienced Charles VIII.; the fall of Granada freed Spain from her embarrassments ; Columbus discovered America, destroying the commercial supremacy of Venice; last, but not least, Roderigo Borgia assumed the tiara with the famous title of Alexander VI. In this year the short-lived federation of the five powers was shaken, and Italy was once more drawn into the vortex of European affairs. The events which led to this disaster may be briefly told. After Galeazzo Maria's assassination, his crown passed to a boy, Gian Galeazzo, who was in due course married to a grand-daughter of Ferdinand I. of Naples. But the government of Milan remained in the hands of this youth's uncle, Lodovico, surnamed I] Moro. Lodovico resolved to become duke of Milan. The king of Naples was his natural enemy, and he had cause to suspect that Piero de' Medici might abandon hisalliance. Feeling himself alone, with no right to the title he was bent on seizing, he had recourse to Charles VIII. of France, whom he urged to make good his claim to the kingdom of Naples. This claim, it may be said in passing, rested on the will of King René of Anjou. After some hesitation, Charles agreed to invade Italy. He crossed the Alps in 1494, passed through Lombardy, entered Tuscany, freed Pisa from the yoke of Florence, witnessed the expulsion of the Medici, marched to Naples, and was crowned there ;—all this without striking a blow. Meanwhile Lodovico pro- cured his nephew's death, and raised

a league against the French in Lombardy. Charles hurried back from Naples, and narrowly escaped destruction at Fornovo in the passes of the Apennines. He made good his retreat, however, and returned to France in 1495. Little remained to him of his light acquisitions ; but he had convulsed Italy by this invasion, destroyed her equilibrium, exposed her military weakness and political disunion, and revealed her wealth to greedy and more powerful nations.

The princes of the house of Aragon, now represented by Frederick, a son of Ferdinand I., returned to Naples. Florence made herself a republic, adopting a form of con- stitution analogous to that of Venice. At this crisis she was ruled by the monk Girolamo Savonarola, who inspired the people with a thirst for freedom, preached the necessity of reformation, and placed himself in direct antagonism to Rome. After a short but eventful career, the influence of which was long effective, he lost his hold upon the citizens. Alexander VI. procured a mock trial, and his enemies burned him upon the Piazza in 1498. In this year Louis XII. succeeded Charles VIIL. upon the throne of France. As duke of Orleans he had certain claims to Milan through his grandmother Valentina, daughter of Gian Galeazzo, the first duke. They were not valid, for the investiture of the duchy had been granted only to male heirs. But they served as a sufficient pretext, and in 1499 Louis entered and subdued the Milanese. Lodovico escaped to Germany, re- turned the next year, was betrayed by his Swiss mercenaries, and sent to dieat Loches in France, In 1501 Louis made the blunder of calling Ferdinand the Catholic to help him in the conquest of Naples. By a treaty signed at Granada, the French and Spanish kings were to divide the spoil. The conquest was easy; but, when it came to a partition, ¥erdinand played his ally false. He made himself supreme over the Two Sicilies, which he now reunited under a single

crown. ‘Three years later, unlessoned by this experience, Louis signed the treaty of Blois (1504), whereby he invited the emperor Maximilian to aid him in the subjugation of Venice. No policy could have been less

far-sighted ; for Charles V., joint heir to Austria, Burgundy, Castile, and Aragon, the future overwhelming rival of France, was already born.

The stage was now prepared, and all the actors who were destined to accomplish the ruin of Italy trod it with their armies. Spain, France, Germany, with their Swiss auxiliaries, had been summoned upon various pre- texts to partake her provinces. Then, too late, patriots like Machiavelli perceived the suicidal self-indulgence of the past, which, by substituting mercenary troops for national militias, left the Italians at the absolute discre- tion of their neighbours. Whatever parts the Italians themselves played in the succeeding quarter of a century, the game was in the hands of French, Spanish, and Ger- man invaders. Meanwhile, no scheme for combination against common foes arose in the peninsula. Each petty potentate strove for his own private advantage in the confusion; and at this epoch the chief gains accrued to the papacy. Aided by his terrible son, Cesare Borgia, Alexander VI. chastised the Roman nobles, subdued Romagna and the March, threatened Tuscany, and seemed to be upon the point of creating a Central Italian state in favour of his progeny, when he died suddenly in 1503. His conquests reverted to the HolySee. Julius II., his bitterest enemy and powerful successor, continued Alexander's policy, but no longer in the interest of his own relatives. It became the nobler ambition of Julius to aggrandize the church, and to reassume the protectorate of the Italian people. With this object, he secured Emilia, carried his victorious arms against Ferrara, and curbed the tyranny of the Baglioni in Perugia. Julius II. playeda perilous game ; but the stakes were high, and he fancied himself strong enough to guide the tempest he evoked. Quarrelling with the Venetians in 1508, he combined the forces of all Europe by the league of Cambray against them; and, when he had succeeded in his first purpose of humbling them even to the dust, he turned round in 1510, uttered his famous resolve to expel the barbarians from Italy, and pitted the Spaniards against the French. It was with the Swiss that he hoped to eflect this revolution ; but the Swiss, now interfering for the first time as principals in Italian affairs, were incapable of more than adding to the already maddening distractions of the people. Formed for mercenary

warfare, they proved a perilous instrument in the hands of those who used them, and were hardly less injurious to their friends than to their foes. In 1512 the battle of Ravenna between the French troops and the allies of J ulius,—Spaniards, Venetians, and Swiss,—was fought. Gaston de Foix bought a doubtful victory dearly with his death; and the allies, though beaten on the banks of the Ronco, immediately afterwards expelled the French from Lombardy. Yet J ulius II. had failed, as might have been foreseen. He only exchanged one set of foreign masters for another, and taught a new barbarian race how pleasant were the plains of Italy. Asa consequence of the battle of Ravenna, the Medici returned in 1512 to Florence.

Duel of France and

When Leo X. was elected in 1513, Rome and Florence Triumph

rejoiced ; but Italy had no repose. the game, and the Spaniards were triumphant. But new actors appeared upon the scene, and the same old struggle was resumed with fiercer energy. By the victory of Marignano in 1515 Francis 1., having now succeeded to the throne of France, regained the MHanese, and broke the power of the Swiss, who held it for Massimiliano Sforza, the titular duke. Leo for a while relied on Francis ; for

the vast power of Charles V., who succeeded to the empire XIII. — 61

Louis XII. had lost of

Charles

Settle- ment of Italy by Spain.

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in 1519, asin 1516 he had succeeded to the crowns of Spain and Lower Italy, threatened the whole of Europe. It was Leo's nature, however, to be inconstant. In 1521 he changed sides, allied himself to Charles, and died after hearing that the imperial troops had again expelled the

French from Milan. During the next four years the Franco-Spanish war dragged on in Lombardy until the decisive battle of Pavia in 1525, when Francis was taken prisoner, and Italy lay open to the Spanish armies. Mcan- while Leo X. had been followed by Adrian VI, and Adrian by Clement VIL, of the house of Medici, who had long ruled Florence. In the reign of this pope Francis was released from his prison in Madrid (1526), and Clement hoped that he might still be used in the Italian interest as a counterpoise to Charles. It is impossible in this place to follow the tangled intrigues of that period. The year 1527 was signalized by the famous sack of Rome. An army of mixed German and Spanish troops, pretending to act for the emperor, but which may rather be regarded as a vast marauding party, entered Italy under their leader Frundsberg. After his death, the Constable de Bourbon took command of them; they marched slowly down, aided by the marquis of Ferrara, and unopposed by the duke of Urbino, reached Rome, and took it by assault. The constable was killed in the first onslaught ; Clement was imprisoned in the castle of St Angelo; Rome was abandoned to the rage of 30,000 ruffians. As an immediate result of this catastrophe, Florence shook off the Medici, and estab- lished a republic. But Clement, having made peace with the emperor, turned the remnants of the army which had sacked Rome against his native city. After a desperate resistance, Florence fell in 1530. Alessandro de' Medici was placed there with the title of duke of Civita di Penna ; and, on his murder in 1537, Cosimo de' Medici, of the younger branch of the ruling house, was made duke. Acting as lieutenant for the Spaniards, he subsequently (1555) subdued Siena, and bequeathed to his descendants the grand-duchy of Tuscany.

Spanish-Austrian Ascendency.

It was high time, after the sack of Rome in 1527, that Charles V. should undertake Italian affairs. The country was exposed to anarchy, of which this had been the last and most disgraceful example. The Turks were threatening Western Europe, and Luther was inflaming Germany. By the treaty of Barcelona in 1529 the pope and emperor made terms. By that of Cambray in the same year France relinquished Italy toSpain. Charles then entered the port of Genoa, and on the 5th of

November met Clement VII. at Bologna. He there received the imperial crown, and summoned the Italian princes for a settlement of all dis- puted claims. Francesco Sforza, the last and childless heir of the ducal house, was left in Milan till his death, which happened in 1535. 'The republic of Venice was respected in her liberties and Lombard territories. The Este family received a confirmation of their duchy of Modena and Reggio, and were invested in their fief of Ferrara by the pope. The marquisate of Mantua was made a duchy; and Florence was secured, as we have seen, to the Medici.

The great gainer by this settlement was the papacy, which |

held the most substantial Italian province, together with a prestige that raised it far above all rivalry. The rest of Italy, however parcelled, henceforth became but a depend- ence upon Spain. Charles V., it must be remembered, achieved his conquest and confirmed his authority far less as emperor than as the heir of Castile and Aragon. A Spanish viceroy in Milan and another in Naples, supported by Rome and by the minor princes who followed the policy dictated to them from Madrid, were sufficient to preserve the whole peninsula in a state of somnolent inglorious servitude.

Pfany

[WISTORY.

From 1530 until 1796, that is, for a period of nearly Foreign three centuries, the Italians had no history of their own, dominion,

Their annals are filled with records of dynastic changes and redistributions of territory, consequent upon treaties signed by foreign powers, in the settlement of quarrels which no wise concerned the people. Italy only too often became the theatre of desolating and distracting wars. But these wars were fought for the most part by alien armies; the points at issue were decided beyond the Alps; the gains accrued to royal families whose names were unpro- nounceable by southern tongues. The affairs of Europe during the years when Hapsburg and Bourbon fought their domestic battles with the blood of

noble races may teach grave lessons to all thoughtful men of our days, but none bitterer, noue fraught with more insulting recollections, than to the Italian people, who were haggled over like dumb driven cattle in the mart of chaffering kings. We cannot wholly acquit the Italians of their share of blame. When they might have won national independence, after their warfare with the Swabian emperors, they let the golden opportunity slip. Pampered with commercial pro- sperity, eaten to the core with inter-urban rivalries, they submitted to despots, renounced the use of arms, and offered themselves, in the hour of need, defenceless and disupited to the shock of puissant nations. That they had created modern civilization for Europe-availed them nothing, Italy, intellectually first among the peoples, was now poli- tically and practically last; and nothing to her historian is more heart-rending than to watch the gradual extinction of her spirit in this age of slavery.

In 1534 Alessandro Farnese, who owed. his elevation to his sister Giulia, one of Alexander VI.'s mistresses, took the tiara with the title of Paul III. It was his ambition to create a duchy for his family; and with this object he gave Parma and Piacenza to his son Pier Luigi. After much wrangling between the French and Spanish parties, the duchy was confirmed in 1586 to Ottaviano Farnese and his son Alessandro, better known as Philip II.'s general, the prince of Parma. Alessandro's descendants reigned in Parma and Piacenza till the year 1731. Paul III's pontificate was further marked by important changes in the church, all of which confirmed the spiritual autocracy of Rome. In 1540 this pope approved of Loyola's found- ation, and secured the powerful militia of the Jesuit order. The Inquisition was established with almost unlimited powers in Italy, and the press was placed under its jurisdiction. 'Thus free thought received a check, by which not only ecclesiastical but political tyrants knew how to profit. Henceforth it was impossible to publish or to utter a word which might offend the despots of church or state ; and the Italians had to amuse their leisure with the polite triflings of academics. In 1545 a council was opened at Treut for the reformation of church discipline and the promulgation of orthodox doctrine. The decrees of this council defined Roman Catholicism against the Reformation; and, while failing to regenerate morality, they enforced a hypocritical observance of public decency. Italy to outer

view put forth blossoms of hectic and hysterical piety, though at the core her clergy and her aristocracy were more corrupt than ever.

In 1556 Philip II, by the abdication of his father Charles V., became king of Spain. He already wore the crown of the Two Sicilies, and ruled the duchy of Milan. In the next year Ferdinand, brother of Charles, was elected emperor. The French, meanwhile, had_not entirely abandoned their claims on Italy. Gian Pietro Caraffa, who was made pope in 1555 with the name of Paul IVs endeavoured to revive the ancient papal policy of leaning upon France. He encouraged the duke of Guise to under-

| take the conquest of Naples, as Charles of Anjou had been

Pontifi- cate of Paul III.

Reign of Philip

The

1519-1606.]

summoned by his predecessors. But such schemes were now obsolete and anachronistic. They led to a languid lingering Italian campaign, which was settled far beyond the Alps by Philip's victories over the French at St Quentin and Gravelines. The peace of Cateau Cambresis, signed in 1559, left the Spanish monarch undisputed lord of Italy. Of free commonwealths there now survived only Venice, which, together with Spain, achieved for Europe the victory of Lepanto in 1573; Genoa, which, after the ineffectual Fieschi revolution in 1547, abode beneath the rule of the great Doria family, and held a feeble sway in Corsica ; and the two insignificant republics of Lucca and San Marino.

The future hope of Italy, however, was growiug ina remote and hitherto neglected corner. A clause in the treaty of Cateau Cambresis recognized the right of Emmanuele Filiberto, duke of Savoy, to Piedmont. He owed this recognition, as Alessandro owed his duchy of Parma, to the fact that he was one of Philip's bravest generals. Yet

Emmanuele Filiberto represented the oldest and not the least illustrious reigning house in Europe, and his descendants were destined to achieve for Italy the independence which no other power or prince had given her since the fall of ancient Rome. It is therefore needful at this point to trace the history of the counts of Savoy from the date of their first emergence on the stage of Italian politics.

In the 10th century the founders of the house of Savoy

houseof were masters over Burgundy and Western Lombardy. Savoy. Their provinces stretched beyond what is now called Savoy

on the west and north, and southward touched the Mediterranean at Savona. In the course of the next two centuries the family divided, Its elder branch ruled Savoy and the northern shores of Lake Geneva. The younger line held Piedmont with the city of Turin for capital. The former were frequently at war with the dauphins of Vienne and the house of Hapsburg, seeking to extend their domains in the direction of Switzerland and Provence. The latter proved but ill neighbours to the marquises of Montferrat and Saluzzo. When the first league of the Swiss was formed, the counts of Savoy were vigorously driven back within their northern borders. At the same time the powers of France repelled them from Provence. Entrenched within their mountains, they now looked towards Italy for expansion. This southward growth of a state which had hitherto been undefined between its cisalpine and transalpine provinces was further determined by the union of the two branches of the family in the person of Amadeus VIII. Succeeding to the honours of the elder line in 1391, he joined Piedmont to Savoy in 1418, and received the title of duke from the emperor Sigismund. During his lifetime he annexed Saluzzo, took Chivasso from Montferrat, and received Vercelli from Filippo Maria Visconti. Nice had already joined itself to Savoy in 1388, The duchy of Savoy, checked in its development upon the further side of the Alpine barrier, gained in solidity and extent upon the south, and took rank definitely from this time forward as a considerable Italian power. Amadeus was one of the most remarkable personages of his day. Having built up the fortunes of

his house by diplomatic ability in an age of policy and intrigue, he abdicated in 1434, and went into cloistral retirement at Ripaille. Hence he emerged in 1440 to receive the papal tiara from the council of Basel. He took the name of Felix V., but resigned in 1449, leaving Nicholas V. sole pope. When he died in 1451, he had reigned for sixty-one years as count, duke, prior of a hermit convent, anti-pope, and dean of the Holy College. The immediate successors of Amadeus VIII. undid a great deal of his work. They entered into unprofitable warfare with Geneva, Freiburg, Bern, and Vaud, and were still further shorn of territory

and prestige upon the side of Switzerland. The French invaded Savoy, and their Lombard domains became the theatre of the Franco-Spanish wars. When Emmanuele Filiberto succeeded to his father Charles III. in 1553, he was aduke without aduchy. But the princes of the house of Savoy were a race of warriors; and what Emmanuele Filiberto lost as sovereign he regained as captain of adven- ture in the service of his cousin Philip II. The treaty of Cateau Cambresis in 1559, and the evacuation of the Piedmontese cities held by French and Spanish troops in 1574, restored his state. By removing the capital from Chambéry to Turin, he completed the transformation of the dukes of Savoy from Burgundian into Italian sovereigns. They still owned Savoy beyond the Alps, the plains of Bresse, and the maritime province of Nice.

Emmanuele Filiberto was succeeded by lis son Carlo Emmanuele I., who married Catherine, a daughter of Philip II. He seized the first opportunity of annexing Saluzzo, which had been lost to Savoy in the last two reigns, and renewed the disastrous policy of his grandfather Charles III. by invading Geneva and threatening Provence. Henry IV. of France forced him in 1601 to relinquish Bresse and his Burgundian possessions, In return he was allowed to keep Saluzzo. All hopes of conquest on the transalpine side were now quenched ; but the keys of Italy had been given to the dukes of Savoy ; and their attention was still further concentrated upon Lombard conquests. Carlo Emmanuele now attempted the acquisition of Montferrat, which was soon to become

vacant by the death of Francesco Gonzaga, who held it together with Mantua. In order to secure this territory, he went to war with Philip III. of Spain, and allied himself with Venice and the Grisons to expel the Spaniards from the Valtelline. When the male line of the Gonzaga family expired in 1627, Charles, duke of Nevers, claimed Mantua and Montferrat in right of his wife, the only daughter of the last duke. Carlo Emmanuele was now checkmated by France, as he had formerly been by Spain. The total gains of all his strenuous endeavours amounted to the acquisition of a few places on the borders of Montferrat.

Not only the Gonzagas, but several other ancient ducal families, died out about the date which we have reached. The legitimate line of the Estensi ended in 1597 by the death of Alfonso IJ., the last duke of Ferrara. He left his domains to a natural relative, Cesare d'Este, who would in earlier days have inherited without dispute, for bastardy had been no bar on more than one occasion in the Este pedigree. Urban VIII., however, put in a claim to Ferrara, which, it will be remembered, had been recognized a papal fief in 1530. Cesared'Este had to content himself with Modena'and Reggio, where his descendants reigned as dukes till 1794. Under the same pontiff, the Holy See absorbed the duchy of Urbino on the death of Francesco Maria II., the last representative of Montefeltro and Della Rovere. The popes were now masters of a fine and compact territory, embracing no inconsiderable portion of Countess Matilda's legacy, in addition to Pippin's donation and the patrimony of St Peter. Meanwhile Spanish fanaticism, the suppression of the Huguenots in France, and the Catholic policy of Austria combined to strengthen their authority as pontiffs. Urban's predecessor, Paul V., ad- vanced so far as to extend his spiritual jurisdiction over Venice, which, up to the date of his election (1605), had resisted all encroachments of the Holy See. Venice offered the single instance in Italy of a national church. The republic managed the tithes, and the clergy acknowledged no chief above their own patriarch. Paul V. now forced the Venetians to admit his ecclesiastical supremacy ; but they refused to readmit the Jesuits, who had been expelled in 1606. 'This, if we do not count the proclamation of

Extinc- tion of old ducal families,

484 Trak ¥ [HISTORY,

James IL. of England (1604), was the earliest instance of

the order's banishment from a state where it had proved disloyal to the commonwealth.

Decline Venice rapidly declined throughout the 17th century.

of Venice The loss of trade consequent upon the closing of Egypt

are and the Levant, together with the discovery of America and

pain. the sea-route to the Indies, had dried up her chief source

of wealth. Prolonged warfare with the Ottomans, who

forced her to abandon Candia in 1669, as they had robbed

her of Cyprus in 1570, still further crippled her resources.

Yet she kept the Adriatic free of pirates, notably by sup-

pressing the sea-robbers called Uscocchi (1601-1617), main-

tained herself in the Ionian Islands, and in 1684 added one

more to the series of victorious episodes which render her

annals soromantic. In that year Francesco Morosini, upon

whose tomb we still may read the title Peloponnesiacus,

wrested the whole of the Morea from the Turks. But after

his death in 1715 the republic relaxed her hold upon his |

conquests. The Venetian nobles abandoned themselves to sndolence and vice. Many of them fell into the slough of pauperism, and were saved from starvation by public doles. Though the signory still made a brave show upon occasions of parade, it was clear that the state was rotten to the core, and sinking into the decrepitude of dotage. The Spanish monarchy at the same epoch dwindled with apparently less reason. Philip's Austrian successors reduced it to the rank

of a secondary European power. This decline of vigour |

was felt, with the customary effects of discord and bad government, in Lower Italy. The revolt of Masaniello in Naples (1647), followed by rebellions at Palermo and Messina, which placed Sicily for a while in the hands of Louis XIV. (1676-1678), were symptoms of progressive anarchy. The population, ground down by preposterous taxes, ill-used as only the subjects of Spaniards, Turks, or Bourbons are handled, rose in blind exasperation against their oppressors. It is impossible to attach political importance to these revolutions; nor did they bring' the people any appreciable good. The destinies of Italy were decided in the cabinets and on the battlefields of Northern Europe. A Bourbon at Versailles, a Hapsburg at Vienna, or a thick-lipped Lorrainer, with a stroke of his pen, wrote off province against province, regarding not the populations who had bled for him or thrown themselves upon his mercy.

Wars of | This inglorious and passive chapter of Italian history is

succes- continued to the date of the French Revolution with the

sion. records of three dynastic wars, the war of the Spanish

succession, the war of the Polish succession, the war of the |

Austrian succession, followed by three European treaties, which brought them respectively to diplomatic terminations. Italy, handled and rehandled, settled and resettled, upon each of these occasions, changed masters without caring or knowing what befel the principals in any one of the dis- putes. Humiliating to human nature in general as

are the annals of the 18th century campaigns in Europe, there is no point of view from which they appear in a light so tragi-comic as from that afforded by Italian history. The system of setting nations by the ears with the view of

settling the quarrels of a few reigning houses was reduced |

to absurdity when the people, as in these cases, came to be partitioned and exchanged without the assertion or negation of a single principle affecting thcir interests or rousing their emotions.

Spanish In 1700 Charles II. died, and with him ended the

succes- Austrian family in Spain. Louis XIV. claimed the throne |

sion. for Philip, duke of Anjou. Charles, archduke of Austria, opposed him. The dispute was fought out in Flanders ; but Lombardy felt the shock, as usual, of the French and Austrian dynasties. The French armies were more than once defeated by Prince Eugene of Savoy, who drove them

out of Italy in 1707. Therefore, in the peace of Utrecht (1718), the services of the house of Savoy had to be duly recognized. Vittorio Amedeo II. received Sicily with the title of king. Montferrat and Alessandria were added to his northern provinces, and his state was recognized ag independent. Charles of Austria, now emperor, took Milan, Mantua, Naples, and Sardinia for his portion of the Italian spoil. Philip founded the Bourbon line of Spanish kings, renouncing in Italy all that his Hapsburg predeces- sors had gained. Discontented with this diminution of the Spanish heritage, Philip V. married Elisabetta Farnese, heiress to the last duke of Parma, in 1714. He hoped to secure this duchy for his son, Don Carlos; and Elisabetta further brought with her a claim to the grand-duchy of Tuscany, which would soon become vacant by the death of Gian Gastone de' Medici. After this marriage Philip broke the peace of Europe by invading Sardinia. The Quadruple Alliance was formed, and the new king of Sicily was punished for his supposed adherence to Philip V. by the forced exchange of Sicily for the island of Sardinia, It was thus that in 1720 the house of Savoy assumed

the regal title which it bore until the declaration of the Italian kingdom in this century. Vittorio Amedeo IL's reign was of great importance in the history of his state. Though a despot, as all monarchs were obliged to be at that date, he reigned with prudence, probity, and zeal for the welfare of his subjects. He took public education out of the hands of the Jesuits, which, for the future development. of manli-

"ness in his dominions, was a measure of incalculable value.

The duchy of Savoy in his days became a kingdom, and Sardinia, though it seemed a poor exchange for Sicily, was a far less perilous possession than the larger and wealthier island would have been. In 1730 Vittorio Amedeo abdi- cated in favour of his son Carlo Emmanuele III Repent-

| ing of this step, he subsequently attempted to regain Turin,

but was imprisoned in the castle of Rivoli, where he ended his days in 1732.

The war of the Polish succession which now disturbed Europe is only important in Italian history because the treaty of Vienna in 1738 settled the disputed affairs of the duchies of Parma and Tuscany. The duke Antonio Farnese died in 1731; the grand-duke Gian Gastone de' Medici died in 1737. In the duchy of Parma Don Carlos had already been proclaimed. But he was now transferred to the Two Sicilies, while Francis of Lorraine, the husband of Maria Theresa, took Tuscany and Parma, Milan and

Polish

succes: sion,

Mantua remained in the hands of the Austrians. On this –

occasion Carlo Emmanuele acquired Tortona and Novara.

Worse complications ensued for the Italians when the emperor Charles VI., father of Maria Theresa, died in 1740. The three branches of the Bourbon house, ruling in France, Spain, and the Sicilies, joined with Prussia, Bavaria, and the kingdom of Sardinia to despoil Maria Theresa of her heritage. Lombardy was made the seat of war; and here the king of Sardinia acted as in some sense the arbiter of the situation. After war broke out, he changed sides and supported the Hapsburg-Lorraine party. At first, in 1745, the Sardinians were defeated by the French and Spanish troops. But Francis of Lorraine,

| elected emperor in that year, sent an army to the king's

support, which in 1746 obtained a signal victory over the Bourbons at Piacenza. Carlo Emmanuele now threatened Genoa. The Austrian soldiers already held the town. But the citizens expelled them, aud the republic kept her independence. In 1748 the treaty of Aix-la-Chapelle,

| which put an end to the war of the Austrian succession,

once more redivided Italy. Parma, Piacenza, and Guas- talla were formed into a duchy for Don Philip, brother of Charles ILL. of the Two Sicilies, and son of Philip V. of Spain. Charles III. was confirmed in his kingdom of the

Austrian succes: sion.

Plate VI.

Napo- leonic govern- ment of Italy.

1606-1815.]

Two Sicilies. The Austrians kept Milan and Tuscany. The duchy of Modena was placed under the protection of the French. So was Genoa, which in 1755, after Paoli's insurrection against the misgovernment of the republic, ceded her old domain of Corsica to France.

From the date of this settlement until 1792, Italy en- joyed a period of repose and internal amelioration under her numerous paternal despots. It became the fashion during these forty-four years of peace to encourage the in- dustrial population and to experimentalize in economical reforms. The emperor Francis I. ruled the grand-duchy of Tuscany by lieutenants until his death in 1765, when it was given, as an independent state, to his third son, Peter Leopold. The reign of this duke was long remembered as a period of internal prosperity, wise legislation, and im- portant public enterprise. Leopold, among other useful works, drained the Val di Chiana, and restored those fertile upland plains to agriculture. In 1790 he succeeded to the empire, and left Tuscany to his son Ferdinand. The king- dom of Sardinia was administered upon similar principles, but with less of geniality. Carlo Emmanuele made his will law, and erased the remnants of free institutions from his state. At the same time he wisely followed his father's policy with regard to education and the church. This is perhaps the best that can be said of a king who incarnated the stolid absolutism of the period. From this date, how- ever, we are able to trace the revival of independent thought among the Italians. The European ferment of ideas which preceded the French Revolution expressed it- self in men like Alfieri, the fierce denouncer of tyrants, Beccaria, the philosopher of criminal jurisprudence, Volta, the physicist, and numerous political economists of Tus- cany. Moved partly by external influences and partly by a slow internal reawakening, the people was preparing for the efforts of the present century. The papacy, during this period, had to reconsider the question of the Jesuits, who made themselves universally odious, not only in Italy, but also in France and Spain. In the pontificate of Clement XIII. they ruled the Vatican, and almost suc- ceeded in embroiling the pope with the concerted Bourbon potentates of Europe. His successor, Clement XIV., sup- pressed the order altogether by a brief of 1773. For the divisions of Italy at this time see Plate VI.

Achievement of Independence.

The malarious tranquillity of Italy beneath her Austrian and Bourbon despots was rudely shaken by the French Re- volution. This is not the

place to describe Napoleon's campaign of 1796. But the treaty of Campo Formio, which resettled Italy in 1797, has to be described. Northern and Central Italy was redivided into four republics, —the Cisalpine, with its capital in Milan ; the Ligurian, with Genoa for capital; the Cispadane, with Bologna; the Tiberine, with Rome. Venice (where the last doge, Luigi Manini, had dissolved the republic of St Mark amid the execrations of the populace in the month of May) was flung, together with her territory between the Adige and the Adriatic, as a compensation for other losses, to the Austrian empire. In the next year, 1798, Lower Italy became the Parthenopxzan republic, with Naples for its capital. Carlo Emmanuele III., now king of Sardinia, resigned his dominions. Pius VI. fled from Rome, and died in France in 1799. The whole of the old order of the peninsula was thus destroyed at a blow. Yet the people, at_first, gained little but an exchange of masters, increased taxes, and a participation in the doubtful glories of the French republic. While Bonaparte was absent in Egypt, his recent settlement of Italian affairs was upset, and the French were everywhere driven out of the peninsula by force of arms. He returned, and Marengo (1800) made

him once more master of Italy. Four years later, having proclaimed himself emperor, he took the Lombard crown in St Ambrogio at Milan. Italy now ranked as his king- dom, and a new settlement of her provinces had to be effected. The pope was left in Rome, and Ferdinand in Naples. Tuscany was rechristened the kingdom of Etruria, and given to the Bourbons. The Ligurian and Cisalpine republics were placed under the viceroy Eugene Beau- harnais. After Austerlitz, Venice was added to this North Italian kingdom ; and in 1806 Bonaparte made the Bour- bons yield Naples to his brother Joseph. When Joseph went in 1808 to Madrid, Joachim Murat succeeded him as king in Naples. Sicily remained in the hands of Ferdinand. In 1809 Pius VII. was deposed, and sent to France, and Rome was declared a part of the French em- pire. The gingerbread kingdom

of Etruria was abolished, and Bonaparte's sister, Eliza, wife of a Colonel Bacciocchi, was made duchess of Tuscany, with the titles of duchess of Lucca and princess of Piombino. Ephemeral as were Bonaparte's successive divisions and redivisions of Italy into provinces for his generals and relatives, they exercised no little influence. From the period of the French rule we may date a new sense of nationality among Italians, generated by the military service of recruits drawn together from all districts in Napoleon's armies, by the temporary obliteration of most ancient boundaries, by the dethrone- ment of alien and unloved princes, by the equal admiinis- tration of one code of laws, and by the spirit of the revolu- tion which animated all French institutions. Italy began to feel herself a nation, and though it was long before Europe suffered her to win national rights, the demand for them, which in our own days became too imperious to be resisted, was created in her people at this epoch.

The congress of Vienna in 1815 took down from the Restora-

theatre of Italy all Bonaparte's decorations, old scenery in very nearly the old places. Emmanuele I. received back his kingdom

and set up the Vittorio

tion of Austrian wae = ane

of Sardinia, with Bourbon

the addition of Genoa. Venice and Milan were formed princes.

into the province of Lombardo-Venezia for Francis IT., em- peror of Austria. The old duchy of Parma was given for her lifetime to Maria Louisa, who, though the wife of Bonaparte, was still an Austrian princess. Upon her death +t was to be restored to its former Bourbon princes, who received in the meanwhile Lucca as an equivalent. The Austrian Ferdinand IIL was once again grand-duke of Tuscany, with the reversion of Lucca after Maria Louisa's decease. Francis, son of the Austrian archduke Ferdinand and Beatrice d'Este, became duke of Modena, with the re- version of Lunigiana on the same event. Pius VII.

got back all the states of the church, and on his re-entry into Rome restored the Jesuits, who had proved their indispen- sability to tyrants. The Bourbon Ferdinand I. again joined Naples to his crown of Sicily. We have been careful to label these Ferdinands and Francises with their respective names of Austrian or Bourbon, in order that the partition of Italy between the two dynasties, and the large prepon- derance of Austrian over Bourbon influence, might be apparent. One significant detail has been omitted. The congress of Vienna recognized the independent republic of San Marino. On the top of a little mountain at the out- skirts of the Apennines which overlook the sea by Rimini, sat Liberty, the queen of a few hundred citizens, surveying the muddy ocean of Franco-Spanish, Italo-Teutonic despo- tism which drowned Italy through all her length and breadth. The Italian sovereigns, on returning to their respective states, proved that exile and the revolution had terrorized them into more determined tyranny. The civil and political reforms which had been instituted at the end of the last century were abandoned. The Jesuits were re-

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Austrian prepon- derance.

stored; many suppressed monasteries were re-established ; and the mortmain laws were repealed. Elementary educa- tion was narrowed in its limits, and thrown into the hands of the clergy. Professors suspected of liberal views were expelled from the universities, and the press was placed under the most rigid supervision. All persons who had taken part in the Napoleonic governments, or who were known to entertain patriotic opinions, found themselves harassed, watched, spied upon, and reported. The cities swarmed with police agents and informers. The passport system was made more stringent, and men were frequently refused even a few days' leave of absence from their homes. The Code Napoléon was withdrawn from those provinces which had formed part of the Italian kingdom, while, in the papal states, the administration was placed again in the hands of ecclesiastics.

This political and spiritual reign of terror, which had for its object the crushing of Italian liberalism, was sanc- tioned and supported by Austria. Each petty potentate bound himself to receive orders from Vienna, and, in return for this obedience, the emperor guaranteed him in the possession of his throne. 'The Lombardo-Venetian kingdom, powerfully defended and connected with Austria by land and sea, became one huge fortress, garrisoned with armed men, in perpetual menace of the country. Under these conditions the Italians were half maddened, and thousands of otherwise quiet citizens, either in the hope of finding redress and protection, or only from a feeling of revenge, joined secret revolutionary societies; for it must not be supposed that the revolution had left the Italians as passive as it found them. A new spirit was astir, which was not likely to be checked by the arrangements of the European congress—the spirit of national independence. During the convulsions caused by Napoleon's conquest of Italy, the allied powers had themselves fostered this spirit, in order to oppose French rule. The Austrians, the English, and Murat, in turn, had publicly invited the Italians to fight for their national independence. And now the people, who relied upon these proclamations and expected the fulfilment of so many promises, found them- selves by the consent of Europe delivered over, tied and gagged, to a foreign oppressor. To take but one example: Ferdinand, when he quitted Naples in May 1815, addressed a proclamation to his subjects, solemnly engaging to respect the laws that should in his absence be decreed by a consti- tution. In June he pledged himself at Vienna to introduce into his kingdom no institutions irreconcilable with those which Austria might establish in her own dependencies. Accordingly in 1816 he put an end to the Sicilian consti- tution of 1812.

them, he had nothing to do but to execute vengeance, by mock trials, on his insurgent subjects.

While these events were taking place, another military insurrection broke out in Piedmont, where the Spanish constitution was proclaimed.

‘The king felt himself bound by the congress of Laybach, and refused to make any con- cessions. Therefore, on the 13th of March, he abdicated ; and in the absence of his brother and heir, Carlo Felice, his distant cousin, Carlo Alberto, prince of Carignano, was appointed regent. Carlo Alberto represented a branch of the reigning house which had been separated nearly two centuries from the throne. Educated, during the French occupation, more like a private citizen than like a prince, he grew up with liberal inclinations, and there is no doubt that his concessions to the insurrectionists in Piedmont at this moment were actuated by sympathy rather than by any vulgar desire to gain power. When, however, Carlo Felice returned and declared that his brother’s abdication had been forced and therefore illegal, Carlo Alberto’s sense of loyalty to the dynasty overcame his liberal instincts, He submitted to the new king’s authority, and the old regime was re-established in Piedmont on as absolute a basis as before.

These movements were followed by state trials and executions, and the terrorism of the tyrannies augmented, Silvio Pellico, at the close of an inefficient disturbance at Milan, was sent to life-imprisonment at Spielberg. In the papal states Leo XII. adopted a coercive policy still more grinding and humiliating. For nine years the despots and the conspirators confronted each other, until the July revolution of Paris in 1830 gave new hope and energy to the latter. On this occasion the conflagration burst out at Modena, where the duke Francesco IV. had been for some time past in secret negotiation with the patriotic party headed by Ciro Menotti. It appears that the secret object of this autocrat was to employ the revolution against his neighbours, and to make himself sovereign of Upper Italy by the help of the conspirators. But when the revolution declared itself, and spread to Parma, Bologna, and the Romagna, Francesco turned upon his friend Menotti, and succeeded in putting him to death. It took but little time or trouble to check this revolt, which was unsupported by armed force. Austrian troops moved into Emilia and Romagna, restored the old order, and marched on to Rome, which they occupied. Louis Philippe, now king of the French, being jealous of the Austrians at Rome, occupied Ancona for the French in 1832; but the cause of Italian liberty received no

{support from the bourgeois king, who strove to keep on good terms with established authorities,

From 1831 until 1846 Italy remained discontentedly Revolu- and uneasily tranquil, The infamous misgovernment of tion in

Revolu- Tyranny was met by conspiracy ; and in a short while, . Rome and Naples continued ; and in Lower Italy numerous °°

tionary the Carbonari societies, with Sanfedisti and many other

struggles. —

revolutionary associations, had extended their organiza- tion through the length and breadth of the peninsula. The discontent of the Italians smouldered for five years ; but in 1820 it broke into open flame. On the Ist of January in that year the Spaniards proclaimed their con- stitution of the Cortes, which was modelled on the type furnished by the earlier French Revolution. Moved by this example, the royal army mutinied at Naples in July, and a few days afterwards Palermo rushed toarms. Ferdinand was so surprised by the sudden outbreak of this revolt that he hastily granted the constitution, named his son Francis vicar-general of his kingdom, and betook himself to Austria. The Austrians marched 80,000 men into Lombardy, and Great Britain and France sent their fleets down to the Bay of Naples. Ata congress held in the spring of 182] at Laybach, the allied powers authorized Austria to crush the revolution in Lower Italy. Austrian troops entered Naples on the 23d of March ; and, when Ferdinand followed

petty insurrections, caused by the misery of the people, and the cholera which raged in 1837, were easily suppressed. Yet it was clear to all competent observers that this state of things could not last. The Italian sovereigns were seated over a volcano, which vibrated to the least stir in its neighbour, France, and which was slowly accumulating explosive material. Among the most powerful instruments now invented by the party of independence must be reckoned the scientific congress. This body, ostensibly formed for the study of science, assembled every year in some Italian city. Its meetings really served to propagate liberal

opinions and to establish relations between the patriots of different districts. Meanwhile the great men who were destined to achieve the future union of Italy had appeared upon the stage, and were busy through this period with their pen and voice. Giuseppe Mazzini, born in 1808 at Genoa, made himself the recognized head of a party called by the name of Young Italy. It was his aim

to organize the forces of the revolution, and to establish the one and indivisible republic in Europe. Though he strove in the cause of Italy, his scheme for the regeneration of society far exceeded the limits of that country. He declared war upon established order in its ancient forms all over the world, and was willing to use conspiracy, if not assassination, in order to achieve his ends. Thus, though the spirit infused into the Italians by Mazzini's splendid cloquence aroused the people to a sense of their high destinies and duties, though he was the first to believe firmly that Italy could and would be one free nation, yet the means he sanctioned for securing this result, and the policy which was inseparable from his opinions, proved obstacles to statesmen of more practical and sober views. It was the misfortune of Italy at this epoch that she had not only to fight for independence, but also to decide upon the form of government which the nation should elect when it was constituted. All right-thinking and patriotic men agreed in their desire to free the country from foreign rule, and to establish national self-government. But should they aim at a republic or a constitutional monarchy? Should they be satisfied with the hegemony of Piedmont? Should they attempt a confederation, and if so, how should the papacy take rank, and should the petty sovereigns be regarded as sufficiently Italian to hold their thrones? These and many other hypothetical problems distracted the Italian patriots. It was impossible for them, in the circumstances, first to form the nation and then to decide upon its government; for the methods to be employed in fighting for independence already implied some political principle. Mazzini's manipulation of conspiracy, for instance, was revolutionary and republican ; while those who adhered to constitutional order, and relied upon the arms of Piedmont, had virtually voted for Sardinian

hege- mony. The unanimous desire for independence existed in a vagueand nebulous condition. It needed to be condensed into workable hypotheses; but this process could not be carried on without the growth of sects perilous to common action.

The party of Young Italy, championed by Mazzini, was the first to detach itself, and to control the blindly working forces of the Carbonari movement by a settled plan of action. It was the programme of Young Italy to establish a republic by the aid of volunteers recruited from all parts of the peninsula. When Carlo Alberto came to the throne, Mazzini addressed him a letter, as equal unto equal, calling upon the king to defy Austria and rely upon God and the people. Because Carlo Alberto (who, in spite of his fervent patriotism and genuine liberality of soul, was a man of mixed opinions, scrupulous in his sense of constitutional obligation, melancholy by temperament, and superstitiously religious), found himself unwilling or unable to take this step, the Mazzinisti denounced him as a traitor to 1821 and a retrogressive autocrat. In his exile at Geneva, Mazzini now organized an armed attempt on Savoy. He collected a few hundred refugees of all nations, and crossed the frontier in 1833. But this fecble attack produced no result beyond convincing Carlo Alberto that he could not trust the republicans. Subsequent attempts on the king's life roused a new sense of loyalty in Piedmont, and defined a counter-body of opinion to Mazzini's. The patriots of a more practical type, who may be called moderate liberals, began, in one form or another, to aim at achieving the independence of Italy constitutionally by the help of the Sardinian kingdom. What rank Sardinia would take in the new Italy remained an open question. The publication of Vincenzo Gioberti's treatise, 2 Primato morale e civile degli Italiani, in 1843, considerably aided the growth of definite opinion. His utopia was a con- federation of Italian powers, under the spiritual presidency

of the papacy, and with the army of Piedmont for sword and shield. This book had an immense success. It made timid thinkers feel that

they could join the liberals without sacrificing their religious or constitutional opinions. At the same date Cesare Balbo's Speranze d'Italia exercised a somewhat similar influcnce, through its sound and unsub- versive principles. In its pages Balbo made one shrewd guess, that the Eastern Question would decide Italian independence. Massimo d'Azeglio, who also was a Pied- montese; the poet Giusti, the Baron Micasoli, and the Marchese Gino Capponi in Tuscany; together with Alessandro Manzoni at Milan, and many other writers scattered through the provinces of Italy, gave their weight to the formation of this moderate liberal party. These men united in condemning the extreme democracy of the Mazzinisti, and did not believe that Italy could be regene- rated by merely manipulating the insurrectionary force of the revolution. On political and religious questions they were much divided in detail, suffering in this respect from the weakness inherent in liberalism. Yet we are already justified in regarding this party as a sufficient counterpoise to the republicans ; and the man who was destined to give it coherence, and to win the great prize of Italian indepen- dence by consolidating and working out its principles in practice, was already there. The count Camillo Benso di Cavour had been born in 1810, two ycars later than Mazzini. He had not yet entered upon his ministerial career, but was writing articles for the Mzsorgimento, which at Turin opposed the Mazzinistic journal Concordia, and was devoting himself to political and economical studies. It is impossible to speak of Mazzini and Cavour without remembering the third great regenerator of Italy, Giuseppe Garibaldi. At this date he was in exile; but a few years later he returned, and began his career of popular deliverance in Lombardy. Mazzini, the prophet, Garibaldi, the knight- errant, and Cavour, the statesman, of Italian independence, were all natives of the kingdom of Sardinia. But their several positions in it were so different as to account in no small measure for the very divergent parts they played in the coming drama. Mazzini was a native of Genoa, which ill tolerated the enforced rule of Turin. Garibaldi came from Nice, and was a child of the people. Cavour was born in the midst of that stiff aristocratical society of old Piedmont which has been described so vividly by D'Azeglio in his Ricordi. The Piedmontese nobles had the virtues and the defects of English country squires in the last century. Loyal, truthful, brave, hard-headed, tough

in resistance, obstinately prejudiced, they made excellent soldiers, and were devoted servants of the crown. More- over, they hid beneath their stolid exterior greater political capacity than the more genial and brilliant inhabitants of Southern and Central Italy. Cavour came of this race, and understood it. But he was a man of exceptional quality. He had the genius of statesmanship,—a practical sense of what could be done, combined with rare dexterity in doing it, fine diplomatic and parliamentary tact, and noble courage in the hour of need. Without the enthusiasm, amounting to the passion of a new religion, which Mazzini inspired, without Garibaldi's brilliant achievements, and the idolatry excited by this pure-hearted hero in the breasts of all who fought with him and felt his sacred fire, there is little doubt that Cavour would not have found the creation of United Italy possible. But if Cavour had not been there to win the confidence, support, and sympathy of Europe, if he had not been recognized by the body of the nation as a man whose work was solid and whose sense was just in all emergencies, Mazzini's efforts would have run to waste in questionable insurrections, and Garibaldi's feats of arms must have added but one chapter more to the history of unproductive patriotism. While, therefore, we

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Revolu- tion of

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recognize the part played by each of these great men in the liberation of their country, and while we willingly ignore their differences and disputes, it is Cavourrwhom we must honour with the title of the Maker of United Italy.

From this digression, which was necessary in order to make the next acts in the drama clear, we now return to the year 1846. Misrule had reached its climax in Rome, and the people were well-nigh maddened, when Gregory XVI. died, and Pius IX. was elected in his stead. It seemed as though an age of gold had dawned; for the greatest of all

miracles had happened. The new pope declared himself a liberal, proclaimed a general amnesty to political offenders, and in due course granted a national guard, and began to form a constitution, The Neo-Guelfic school of Gioberti believed that their master's utopia was about to be realized. Italy went wild with joy and demonstrations. The pope's example proved contagious. Constitutions were granted in Tuscany, Piedmont, and Rome in 1847. The duke of Lucca fled, and his domain was joined to Tuscany. Only Austria and Naples declared that their states needed no reforms. On the 2d of January 1848 a liberal demonstration at Milan served the Austrians for pretext to massacre defenceless persons in the streets. These Milanese victims were hailed as martyrs all over Italy, and funeral ceremonies, partaking of the same patriotic character as the rejoicings of the previous year, kept up the popular agitation. On the 12th of January Palermo rose against King Ferdinand IL, and Naples followed her example on the 27th. The king was forced in February to grant the constitution of 1812, to which his subjects were so ardently attached.

While Italy was thus engaged in making terms with her own sovereigns, the French revolution broke out. Louis Philippe fled to England, and the republic was declared. This altered affairs in Italy, and threw a temporary power into the hands of the Mazzinisti. Sicily pronounced her- self independent of the Bourbons, and called the duke of Genoa to the throne. In Naples, the moderate liberal government, of which Poerio had been a member, yielded to a more radical administration. The patriots and the king's troops came to blows, ending in Ferdinand's victory and the remodelling of the constitution. Lombardy rose in insurrection. The Austrians were expelled from Milan, and the governor of Venice capitulated, Provisional re- publican governments were formed, at Milan under the presidency of Casati, at Venice under that of Daniele Manin. Impelled by the overwhelming enthusiasm which prevailed in Upper Italy, Carlo Alberto declared war on Austria in March. On the 8th of April he pushed his troops beyond the Mincio; while Piacenza, Parma, Modena, and the Lombardo-Venetian kingdom voted their union to Sardinia by universal suffrage. But the Austrian general, Radetzky, though he lost a battle at Goito, and was forced to witness the capitulation of Peschiera in May, had not

given up the game. The pope's troops were es- tablished at Vicenza to support the Sardinians. These Radetzky compelled to surrender in June; he then attacked Carlo Alberto's army, who were engaged in the investment of Mantua. A complete victory upon the 25th of July at Custozza enabled Radetzky to re-enter Milan. Carlo Alberto had to retire beyond the Ticino and to beg for an armistice. News of this Austrian victory reached Naples, and gave Ferdinand the heart to quell the Sicilian revolt. On the 30th August Messina was bombarded, and such atrocities were perpetrated in the miserable city that the admirals of the French and English fleets had to inter- fere and extort an armistice from the conquerors. In the meanwhile, affairs had begun to change in Rome. The pope, frightened at the revolution which had already out- run his control, pronounced against the Austrian war and

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Italian alliance. This roused republican hostility. His minister, the excellent Count Pellegrini Rossi, was mur- dered in November, and anarchy seemed to threaten the city. Pius escaped in disguise to Gaeta, where he was re- ceived by Ferdinand, whom not long since he had de- nounced asa rogue. From Gaeta he opened the new year, 1849, with a threat of excommunication to his subjects, The Romans were so irritated that the moderate liberal party had to yield to the ultra-radicals ; and on the 9th of February Rome was declared a republic. The government was entrusted to three dictators, of whom Mazzini was the head. Tuscany, meanwhile, had lost her grand-duke. After opening parliament in January with a declaration that he intended to prosecute the war against Austria, he escaped in February on the English war-steamer "Bulldog" to Gaeta. A provisional government was established in Florence, and Mazzini did his best to render Tuscany a part of the new Roman republic. At this epoch two im- portant personages appeared upon the scene—Gino Capponi, who led the moderate liberals, and Urbano Rattazzi, who headed the democratic party. The Florentines were not at bottom out of sympathy with their duke. Therefore they rejected Mazzini's overtures, and recalled Leopold

upon the understanding that he would respect their free institutions. Still at Gaeta, the grand-duke mistrusted these advances, begged for Austrian troops, and, when they had arrived, re- entered Tuscany and suppressed the constitution. Such acts of perfidy as these, repeatedly committed by all the petty sovereigns of Italy with the exception of the house of Savoy, forced the people to abandon the theory of federa- tion under existing governments, and to look for their salvation to Piedmont.

This growing confidence in the Sardinian monarchy was Sardinia not shaken by the disastrous campaign of March 1849, called to which baptized the cause of Italian independence with the yyj.on best blood of Piedmont, gave ita royal martyr, and pledged hege. the dynasty of Savoy to a progressive policy from which it mony.

never afterwards for a single moment deviated. Pushed by the ultra-radicals, and burning with the purest zeal to liberate Italy, Carlo Alberto took the field again in March 1849 against the Austrians. On the 24th, after some pre- liminary movements, proving a want of good generalship and discipline in the Piedmoutese army, Radetzky obtained a complete victory at Novara. The king of Sardinia abdi- cated on the field, in favour of his son, the duke of Savoy, Vittorio Emmanuele II. Carlo Alberto, who had lived through times so troublous and perplexing, who had ex- posed himself to misunderstanding and misinterpretation, but in whom the devotion to Italy had become a religion, now took refuge at Oporto, where he died, broken-hearted, after a few months of illness. The pathos of this death checked the snarling of discordant parties ; and, when the king's body was brought home to be buried on the heights of the Superga, the heart of Italy recognized his worth. Carlo Alberto, though still anathematized by the republican faction, became the saint of Italy. Hundreds of pilgrims flocked to histomb. The loyalty of his subjects redoubled; and it was felt that, by serving Italy, they would glorify his memory. More than ever, by the disasters of Novara, were the dynasty and aristocracy and people of Sardinia pledged to that national policy which Carlo Alberto's son triumphantly accomplished. In the cottage homes of Pied-mont and Lombardy travellers may still behold the old king's agony

depicted side by side with the portraits of Cavour and Garibaldi and Vittorio Emmanuele.

The intrigues of which Gaeta had been a centre provoked a crusade of the Catholic powers against republican and anti-papal Rome. A French expedition, under General Oudinot, landed at Civita Vecchia on the 25th of April, and on the 29th reached the walls of the city. The Neapolitan

sion of the re- yolution.

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army took up a position at the base of the Alban hills. Spaniards arrived at Fiumicino, and Austrians entered the Legations. ‘The French professed to come as friends~ but the triumvirs of the Roman republic refused them entrance, and General Oudinot established his camp on the Jani- culan. Garibaldi, who was guarding the frontier of the Abruzzi,returned and defeated the Neapolitans at Palestrina on the 11th of May. Still his assistance did not suffice to avert the French attack, and on July 2, after a siege of four weeks, the city capitulated. Mazzini and Garibaldi made good their escape. The French troops entered and held Rome for the pope. It was not until April 1850, however, that Pius IX. ventured to return. When he ar- rived in his capital, he began the reactionary reign, sup- ported by his French garrison and Jesuit advisers, which only ended with the semi-forcible entry of the Italians in

1870.

With the fall of Rome the hopes of the revolutionary party ended. Austrian troops replaced their ducal puppets in Parma, Modena, and Tuscany. King Ferdinand, rightly now named Bomba, terrorized his subjects into silence by the aid of Swiss mercenaries, artillery, and

dungeons too loathsome to be described. Only Venice still held out, blockaded in the Adriatic and bombarded from the land through all the horrors of famine, conflagration, an cholera, until the month of August. Few episodes in the history of that noble city are more glorious than this last desperate and patient struggle; and few names upon her muster-roll of heroes are equally illustrious with that of the lion-hearted and blameless Daniele Manin.

In the disastrous year 1849 it seemed as though the

_ ization of fate of Italy was sealed. The republicans had done their

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‘of Piedmont was broken at Novara.

best and failed at Milan, Rome, and Venice. The power And yet we have good cause to say that the miseries of this epoch wrought the future salvation of the race. The former vain trust in the Italian sentiment of petty conrts, the Neo-Guelfic mysticism of Gioberti’s party, the utopian confidence in papal liberalism, the vague schemes of confederation which had assumed many visionary forms, were all dissipated for ever. To rightly thinking men it became clear that the regeneration of Italy must be entrusted to Piedmont. When Vittorio Emmanuele entered Turin in silence after Novara, with a demoralized army and a ruined exchequer,

~~the spirit of his people was cast down, but not extin~~

guished, They had assumed responsibility, and were not going to abandon it. “The house of Savoy cannot retreat ” became the watchword of the throne. D’Azeglio’s Vous recommencerons expressed the determination of the ruling classes. It is true that at this crisis they had to combat the hostility and bitter jealousy of the republicans. Maz-zini’s party stirred up Genoa to revolution, and La Marmora received the ignoble task of restoring that intract- able city to a sense of duty. “

Better Italy enslaved than delivered over to the son of the traitor Carlo Alberto," exclaimed the prophet of democracy, whom no reverses could persuade that in such politics as those of Italy the half is better than the whole. But Mazzini was no longer a power of the first magnitude. The work which he had done for Italy was solid and abiding. Still he had failed to carry the bulk of the nation with him. Men of more sober aspirations saw that to aim at national independence and European reconstruction at one leap was utopian. Italy must first be made; and the only power capable of calling her into existence was Piedmont, still free and puissant among a crowd of feeble and anarchical despot- isms, Piedmont, in the hour of need, could rely on volunteers of pith and nerve, in cities so downtrodden even as were

Rome and Venice; for it must not be forgotten that the

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d'Azeglio for minister. advances, though enforced by his own wife and mother, both

by La Marmora, and to financial measures.

The experience of '49 proved that the armies of

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republicans who sustained both sieges were members of tho bourgeoisie and proletariate. This consolidation of opinion after the events of 1849 was proved by Gioberti's recan- tation of his earlier mysticism. new treatise the Rinnovamento, which distinctly indicated Piedmont as the substantial basis of Italian independence. Daniele Manin, now an exile in Paris, declared his adhesion to the same doctrine.

In 1851 he published a

The constitutional party was further strengthened by the adhesion of the leading repub- licans, Pallavicino and La Farina; and in 1857 the main

point of unaminity was secured by the formation of the

Societa Nazionale, which kept sectarian jealousies in the

background. Garibaldi, at this time less republican than he afterwards became, was himself a president of this political association. Henceforward the genuine Mazzinisti

formed a permanent minority. They could do little more

than to impede without perplexing or baffling the policy of the Piedmontese statesmen, who felt themselves to be supported by the instincts of the race at large.

Vittorio Emmanuele began his reign with Massimo He steadily refused all Austrian

of whom were Austrian archduchesses. The house of Savoy had pledged itself to Italy, and the house had never

broken faith. The first cares of the new ministry were de-

voted to internal reforms, to the organization of the army In 1850 they passed the so-called Siccardi law, which abolished ecclesi- ustical courts. This was followed by a law of civil marriage; and in 1854 the ecclesiastical reforms were completed by Rattazzi's bill for restricting religious corpo- rations and placing church property under state control. The necessity of these measures is demonstrated by the fact that the little kingdom of Sardinia counted 41 bishops, 1417 canonries, about 18,000 persons vowed to a monastic life, and one ecclesiastic to every 214 inhabitants.

Their importance will be understood when we reflect that

these laws were extended to Italy after the union.

Meanwhile Cavour had joined the government in 1850, as minister of commerce. Not least among his great qualities was a thorough understanding of parliamentary tactics; and, though his first attempts at public speaking were unsuccessful, he soon remedied this defect. Mastery of facts and moral force gave weight to his eloquence far above rhetoric. Meanwhile his study of English politics, and admiration for men like Pitt and Peel, developed what in him was an innate instinct for parliamentary leadership. This sound sense of the conditions of representative govern- ment induced him to form a coalition with Rattazzi, the leader of the democrats, in 1852. D'Azeglio and the king were frightened by so bold a step. But Cavour's prepon- derance in the chambers was irresistible ; and in November 1853 he superseded D'Azeglio as prime minister. From this date the fortunes of Italy were in his hands, and Cavour became one of the foremost men in Europe. It was by his advice that the Sardinian troops under General La Marmora took part with France and England in the Crimean war, where they distinguished themselves in the battle of the Tchernaya. The nation by this step secured powerful allies, forced itself upon the notice of Europe, and accustomed its army to service on a grand scale. At the congress of Paris in 1856 Cavour represented Sardinia, and laid the grievances of Italy before the allied powers. Both France and England remonstrated, but vainly, with Ferdinand IT. for his misgovernment.

Cavour had travelled both in England and France, and had observed that, though the English sympathized with Italy and were horrified by what they heard of Neapolitan atrocities, he was not likely to get more than moral support and non-interference from Great apn Yet a" could

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Cavour's adminis- tration.

Lombard

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not work Italian independence without tlie help of one of the great powers against. Austria. He therefore determined to rely on Louis Napoleon Bonaparte, who had expressed. his willingness to afford substantial assistance at the proper moment. Between the years 1856 and 1859 it was Cavour's one endeavour to maintain the French emperor in this resolve, and at the same time to drive the Austrians into a seasonable declaration of war.

The situation was delicate and dangerous in the extreme ; and in January 1858 the minister's combinations were seriously imperilled by Felice Orsini's attempt on Napoleon's life. It was only by passing a bill which defined the crime of political assassination that he regained the emperor's confidence. Later in the year, Cavour met Napoleon at Plombiéres, where the preliminaries to a Franco-Italian alliance for war against Austria were settled.

'The cabinet of Vienna, harassed by repeated memorials on the subject of their tyranny in Lombardy, complained to Europe that Piedmont was a standing menace to Italian peace, withdrew its minister from Turin, and demanded the disarmament of the Sardinian kingdom. Louis Napoleon now prepared himself for war. On the lst of January 1859 Vittorio Emmanuele opened parliament with a speech which declared the coming struggle : ' We are not insensible to the cry of suffering that rises to us from so many parts of Italy." The words G'rido di dolore were understood to be the watchword of the war. In the early summer of 1859 the French crossed the Alps. The puppets of Parma, Tuscany, and Modena fled, as usual, before the gathering storm,—this time never to return. The battles of Magenta (June 4) and

Solferino (June 24) opened Lombardy to the French and Sardinian troops, as far as the Quadri- lateral of fortresses protecting Venice. There Louis Napoleon sheathed his sword. He met the emperor Francis Joseph at Villa Franca, and, without consulting his allies, agreed to an armistice. At Plombitres he had declared that he meant to free Italy from the Alps to the Adriatic. But now he agreed upon the Mincio as the future boundary between Sardinia and Austria. Venice was not to be liberated. Terrible was the disappointment of the Pied- montese, who had made vast sacrifices for this campaign, and who felt that their king had been insulted. Yet Louis Napoleon was incapable of more. He knew himself to be no general, and he had good reason to be certain

that, if he pushed Austria too far, Prussia would take up |'

arms and carry war to France upon the Rhine. Moreover, the gain to Italy proved greater than at first appeared. Tuscany, Modena, Parma, and Romagna declared their determination to join the kingdom. In March 1860 the annexation of Central Italy to Sardinia was effected, and approved by the French emperor. It now appeared that, according to a hitherto secret understanding with Cavour, Louis Napoleon was to take Savoy and Nice as the price of his assistance. This sacrifice of their ancient home, the cradle of their dynasty, the house of Savoy made to the Italian cause. But it was long before the Italians forgave Cavour. He had to bear reproaches from all quarters, especially from Garibaldi, who was never tired of repeating, "That man has made me a foreigner in my own house."

The same month which witnessed the annexation of Central Italy saw the outburst of a revolution in the south. Bomba was dead; but his son Francis II., by continued acts of cruelty to state prisoners, and by cowardly oppres- sion of his subjects, had merited the nickname of Bombino. Refugees from Naples spread the tale of Bourbon tyranny all over Europe. Even London trembled with rage at Poerio's sufferings. The insurrection broke out at Paler-

volunteers, the famous Mille, each of whom became for Italy a hero. Cavour knew of the expedition and secretly favoured it, though he openly expressed the regret of the Sardinian Government to Europe. It was his policy to wait and see what happened, trusting that the gain of the venture would accrue to the new kingdom. Garibaldi landed at Marsala, and proclaimed himself dictator in the naine of Vittorio Emmanuele, king of Italy. The conquest of Sicily was the matter of a few days. In August the general crossed to Spartivento, defeated the royal army, drove Francis IJ. to Gaeta, and entered Naples on the 7th of September. There Mazzini joined him, and the diffi- culties of the situation began to disclose themselves. Garibaldi had no capacity for administration ; yet he was unwilling to resign his dictatorship. He had proclaimed Vittorio Emmanuele ; yet he lent an ear to the republicans, who hated Piedmont. Moreover, he hardly concealed his intention of marching on Rome. Mad he taken this step, success would have involved reactionary interference ou the part of Europe, while failure might have involved the loss of Lower Italy. Meanwhile the natives of the Two Sicilies were slow to accept annexation. They dispensed with the Bourbons gladly; but they were ready to fulfil the pro- phecy of Bomba, that ‘“‘ whosoever turned the Bourbons out would have enough to do in Lower Italy for the next century.” Anarchy began to reign, and the Bourbon party lifted up its head again at Gaeta. In these circumstances, Cavour, after ascertaining that he had the sanction of Napoleon, resolved on sending troops into the papal states. This seemed the only means of preventing Garibaldi’s

march on Rome, and securing his acquisitions for United

Italy. General Cialdini accordingly occupied Urbino and Perugia, defeated the pope’s general, Lamoricitre, at Cas-

telfidardo, joined Garibaldi, and helped him to gain a vic-

tory over the Bourbon troops on the Volturno. On the 2d of October Cavour defined the situation for the parlia- ment at Turin: “ Garibaldi wishes to perpetuate the revo- lution; we wish to terminate it.” Soon after this, Vittorio Emmanuele himself entered the Abruzzi. Gari- baldi, with the loyalty which never deserted him, resigned his

dictatorship, and returned to Caprera. In November Cavour was able to write to Berlin: ‘“ We are Italy; we

work in her name; but at the same time it is our policy to:

to Italian independence. mained to be liberated. The difficulties under which new Italy laboured were enormously increased by the annexation of the Two Sicilies. Ever since the Norman Conquest they had formed a province apart. Temperament, custom, and tradition separated the inhabitants, as far as it was possible, from the sober people of the north. The national parlia- ment had to contend with brigandage encouraged by the clergy, with deeply-rooted antipathies of race, with the dis- content of disbanded officials, and with the multitudinous obstacles which”a demoralized society offers to strict government. Upper Italy alone was educated for political existence. Elsewhere the bad government of centuries had made the people permanently hostile to the state, while corruption rendered them untrustworthy as agents. There- fore the business of the country had to be conducted by the Piedmontese. Yet this important fact was neglected in the composition of the parliament, where a due preponderance had not been secured for the colleges of Northern Italy.

mo, Messina, and Catania. Garibaldi determined to support | It was impossible not to.own that the work of emancipa- it. On the 5th of May he set out from Genoa with his | tion and annexation had progressed tog quickly.. To add

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to the difficulty; Italy lost hér greatest statesman at this juncture. On the 5th of June 1861, Cavour died with the words “A free church in a free state” upon his lips. The last months of his life had been given to planning the peaceable acquisition of Rome by treaty with the pope and Louis Napoleon.

What remains of Italian history between 1861 and 1870 may be briefly told. Ricasoli formed a conservative Gov-

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Rome, and Garibaldi gained a victory at Monte Rotondo. Meanwhile the king appealed to the Italians to preserve his honour, and the emperor sent a new garrison to Rome. Garibaldi's volunteers surrendered at Mentana, on the 4th of November, to the French and papal troops; and, while the general was retiring to Caprera, he was arrested by order of the Italian Government at Figline. But the end was now not distant.

ernment after Cavour's death, and Rattazzi led the oppo- sition. Garibaldi, who vowed never to rest till Rome and Venice had been liberated, headed the party of action. In 1862 he raised a volunteer army and invaded Sicily. Louis

When the victory of Sedan overthrew the French empire Vittorio in September 1870, Jules Favre declared the September Em- convention to be at an end; Vittorio Emmanuele was re- uele

leased from his obligations, and on the 20th he entered a

ndepend- nce.

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Napoleon regarded this as a menace to Rome, and ordered Rattazzi, who was now in power, to check his progress. Cialdini marched to Reggio, where the royal troops were defeated by the volunteers on the 28th of September 1862. Next day Garibaldi was attacked and beaten at Aspro- monte by General Pallavicini. He retired, wounded, to Caprera, whence he published his defence. The blame was seen to lie with Rattazzi, who had thought to follow Cavour's policy of masterly inaction without first settling with France. The sympathy of Europe

with Italy was so great after this disaster that in September 1864 Louis Napoleon agreed to a gradual withdrawal of French troops from Rome, provided Italy respected what remained of the pope's temporal power. By the same convention Florence became the capital. This wasa good step in advance to- wards the annexation of Rome. In 1866 the Austro-Prussian war gave a new opportunity to the Italians. They entered into alliance with Prussia, and marched an army across the Mincio. The defeats of Custozza, Monte Suello, and Lissa deprived the Italian troops of any claim to military or naval glory in this war. But the Prussian victory of Kéniggratz secured the main objects for which they fought. Venice, with the Quadrilateral, was joined to the Italian kingdom, while Austria kept her Istrian and Dalmatian provinces.

In accordance with the September convention, Louis Napoleon withdrew his garrison from Romein 1866. This event inflamed the party of action. Mazzini called upon

the people to seize the Eternal City; and Garibaldi in 1867

declared his resolve to take Rome or die. Rattazzi, who was again in power, once more attempted the policy which had failed him in 1862. He ignored the obligation which bound Vittorio Emmanuele to defend the papal frontiers, and he hoped that France would tolerate a volunteer inva- sion. He was mistaken. Louis Napoleon interfered, and the Italian cabinet was forced to discountenance the further proceedings of the volunteers. Disturbances occurred in

Rome, which now became his capital. Pius IX. was allowed to retain the Vatican with its dependencies, the church of Sta Maria Maggiore, and Castel Gandolfo on the Alban hill. The state voted him a munificent income, and he was left in peace to play the part of a persecuted prisoner. Thus ended the emancipation of Italy; nor did the events of the following ten years alter the situa- tion created by the king's occupation of Rome in 1870. Vittorio Emmanuele died and was succeeded by his son Umberto in 1878. Pius IX. died the same year, and was succeeded by Leo XIII. The history of Italy during this period has been confined to internal affairs.

Bibliography.—It is difficult to indicate ina short space the most important sources of Italian as distinguished from imperial or ecclesi- astical history. Muratori's great collection of Rerwm Italicarum Scriptores, in combination with his Dissertationes, the chronicles and other historical material published in the Archivio Storico Italiano, and the works of those detached annalists of whom the Villani are the most notable take the first rank. Next may be mentioned Muratori's Annali d'lialia, together with Guicciardini's Storia d' Italia, and its continuation by Carlo Botta. Troya's Storia adItalia del Medio Evo aud Sismondi's Républiques Italicnnes form Sg als the most valuable modern contributions to the history of the whole peninsula. Ferrari's Rivoluziont d' Italia deserves special notice, as a work of singular vigour, though of less scientific value ; and Cesare Balbo's Sommario presents the main outlines of the subject with brevity and clearness. With regard to the history of separate provinces, it may suflice to notice the Storia Fiorentina of Machiavelli and Corio's Storia di Milano, Capponi's Storia della Repubblica di Firenze, Colletta's History of Naples, Romanin's History of Venice, Amari's Musulmani di Sicilia, and the Stadé Rom of.Gregorovius. From the point of view of papal history, Von Ranke's History of the Popes is distinguished for exact insight into one epoch of Italian development. From the point of view of biography, Von Reumont's Lorenzo de' Medici and_Villari's Savonarola and Machiavelli are equally instructive. From the point of view of general culture Burckhardt's Culiur der Renaissance in Italien, Quinet's Révolutions d'Italie, and J. A. Symonds's Renaissance in Italy, 5 vols., may prove of service. No compre- hensive work can be indicated for the history of Italy during the present century, though Reuchlin's Geschichte Italicns, Treitschke's Essay on Cavour. and Massari's Life of Cavour supply important matcrials, (J. A. 8.)

PART III.—LANGUAGE,

The Italian language is the language of culture in the whole of the present kingdom of Italy, in some parts of Switzerland (the canton of Ticino and part of the Grisons), in some parts of the Austrian territory (the districts of Trent and Gorz, Istria along with Trieste, and the Dalmatian coast), and in the islands of Corsica and Malta. In the

Tonian Islands, likewise, in the maritime cities of the Levant, in Egypt, and more particularly in Tunis, this literary language is extensively maintained through the

numerous Italian colonies and the ancient traditions of

trade.

The Italian language has its native seat and living Source in Middle Italy, or more precisely Tuscany and indeed Florence. For real linguistic unity is far from existing in Italy: in some respects the variety is less in others more observable than in other countries which equally boast a political and literary unity.

Thus, for.

example, Italy affords no linguistic contrast so violent as that presented by Great Britain with its English dialects alongside of the Celtic dialects of Ireland, Scotland, and Wales, or by France with the French dialects alongside of the Celtic dialects of Brittany, not to speak of the Basque of the Pyrenees and other heterogeneous elements. The presence of not a few Slavs stretching into the district of Udine (Friuli), of Albanian, Greek, and Slav settlers in the southern provinces, with the Catalans of Alghero (Sardinia), a few Germans at Monte Rosa, and a remnant or two of other comparatively modern immigrations is not sufficient to produce any such strong contrast in the conditions of the national speech. But, on the other hand, the Neo-Latin dialects which live on side by side in Italy differ from each other much more markedly than, for example, the English dialects or the Spanish ; and it must be added that, in Upper Italy especially, the familiar use

of the dialects is tenaciously retained even by the most cultivated classes of the population.

In the present rapid sketch of the forms of speech which occur in modern Italy, before considering the Tuscan or Italian pur excellence,

the language which has come to be the noble organ of modern national culture, it will be con- venient to discuss (A) dialects connected in a greater or less degree with Neo-Latin systems that are not peculiar to Italy ; (B) dialects which are detached from the true and proper Italian system, but form no integral part of any foreign Neo-Latin system ; and © dialects which diverge more or less from the true Italian and Tuscan type, but which at the same time can be conjoined with the Tuscan as forming part of a special system of Neo-Latin dialects.

A. Dialects which depend in a greater or less degree on Neo-Latin systems not peculiar to Italy.

1. Franco-Provengal Dialects (sce Archivio Glottologico, iii. 61- 120).1 —These occupy at the present time very limited areas at the extreme north-west of the kingdom of Italy. The system stretches from the borders of Savoy and Valais into the upper basin of the Dora Baltea and into the head-valleys of the Orco, of the northern Stura, and of the Dora Riparia. As this portion is cut off by the Alps from the rest of the system, the type is badly preserved ; in the valleys of the Stura and the Dora Riparia, indeed, it is passing away and everywhere yielding to the Piedmontese.—The most salient characteristic of the Franco-Provengal is the phonetic pheno- menon by which the Latin a, whether as an accented or as an unac- cented final, is reduced to a thin vowel (e, 7) when it follows a sound which is or has been palatal, but on the contrary is kept intact when it follows a sound of another sort. The following are examples from the Italian versant of these Alps:—Aosta : travalji, Fr. travailler ; zarét, Fr. chercher ; enteruéi, Fr. interroger; zevra, Fr, chévre; zir, Fr. cher; gljdce, Fr. glace; vdzze, Fr. vache ; alongside of sa, Fr, sel; man, Fr. main ; cpdusa, Fr. épousc ; erba, Fr. herbe. Van SOANA: taljér, Fr. tailler ; coéé-sse, Fr. se coucher ; cin, Fr. chien ; éévra, Fr. chévre; vaééi, Fr. vache ; mdngi, Fr. manche; alongside of aldr, Fr. aller; portdé, Fr. porté; amdra, Fr. amére; néva, Fr. neuve. Curamorio (Val di Lanzo): la spranssi dla vendeta, sperantia de illa vindicta. Viv: pansci, pancia. UssEcxio: la miiragli, muraflle. ~— A morphological characteristic is the preservation of that para- digm which is legitimately traced back to the Latin pluperfect indi- eative, although possibly it may arise from a fusion of this pluper- fect with the

imperfect subjunctive (amaram, amarem, alongside of habueram, haberem), having in Franco-Provengal as well as in Provengal and in the continental Italian dialects in which it will be met with further on(C. 8, 0; of B. 2) the function of the con- ditional. VALSOANA: portdéro, portdre, portdret; portdrent; AOSTA: dvre=Prov. agra, haberet (see Arch., iii. 81). The final ¢ inthe third persons of this paradigm in the Val Soana dialect is, or was, constant in the whole conjugation, and becomes in its turn a par- ticular characteristic in this section of the Franco-Provengal. Vau Soana : éret, Lat. erat ; sejt, sit; pértet, portdvet; portgnt, portdvent; CHIAMORIO: jéret, erat; ant dit, habent dictum; éjssount fét, habuissent factum; Viv: che s'minget, Ital. che si mangi; GRAVERE (Val di Susa): at pensd, ha pensato; avdt, habcbat ; GIAGLIONE (sources of the Dora Riparia) : macidvont, mangiavano.—From the valleys, where, as has just been said, the type is.disappearing, a few examples of what is still genuine Franco-Provengal may be sub- joined:—Civreri (the name of a mountain betwecn the Stura and the Dora Riparia), which, according to the regular course of evolution, presupposes a Latin Capraria (ef. maneri, maniera, cven in the Chiamorio dialect); éarastt (ctarasth), carestia, in the Viu dialect; and éintd, cantare, in that of Usseglio, From Cu1amorio, /2 téns, i tempi, and chejches birbes, aleune (qualche) birbe, are worthy of mention on account of the final s.

Further south, but still in the same western extremity of Picdmont, phenomena continuous with those of the Maritime Alps supply the nicans of passing from the Franco-Provengal to the Provengal proper, precisely asthe same transition takes place beyond the Cottian Alps in Dauphiné almost in the same latitude. On the Italian side of the Cottian and the Maritime Alps the Franco-Provengal and the Provengal are connected with each other by the continuity of the phenomenon é (a pure explosive) from the Latin ¢ before a. At OuLx (sources of the Dora Riparia), whicl seems, however, to have a rather mixed dialect, there also occurs the important Franco- Provengal phenomenon of the surd interdental (English th in thief) instead of the surd sibilant (for example 7tht=Fr. ici), At the same time agi=avuto, takes us to the Provengal. At FENEs- rRELLA (upper basin of the Clusone): agi, vengi, venuto; at

ONCINO sources of the Po): éarestio, Vero an campagno, with the Provengal

1 References to this journal (Arch.) without author's name are to papers by Professor Ascoli.

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o for the final unaccented a; at SAMPEYRE (basin of the Vardita); agit, vengtt, volyti, voluto; tina viestio la pliis pressioso ; and finally at VINADIO (basin of the southern Stura): twéccto, tocca; los budnos, le buone, where even the diphthong is Provengal.

2. Ladin Dialects.—The purest of the Ladin dialects occur on the northern versant of the Alps in the Grisons (Switzerland), and they form the western section of the system. To this section also belongs both politically and in the matter of dialect the valley of Minster (Monastero); it sends its waters to the Adige, and might indeed consequently be geographically considered Italian, but it slopes towards the north. In the central section of the Ladin zone there are two other valleys which likewise drain into tributaries of the Adige, but are also turned towards the north,—the valleys of the Gardena and the Gadera, in which occurs the purest Ladin now extant in the central section. The valleys of Miinster, the Gardena, and the Gadera may thus be regarded as inter-Alpine, and the ques. tion may be left open whether or not they should be included even geographically in Italy. There remain, however, within what are strictly Italian limits, the valleys of the Noce, the Avisio, the Corde- vole, and the Boite, and the upper basin of the Piave (Comelico), in which are preserved Ladin dialects, more or less pure, belonging to the central section of the Ladin zone or belt. To Italy belongs, further, the whole eastern section of the zone composed of the Friu- lian territories. It is by far the most populous, containing about 500,000 inhabitants. The Friulian region is bounded on the north by the Carnic Alps, south by the Adriatic, and west by the eastern rim of the upper basin of the Piave and the Livenza; while on the east it stretches into the eastern versant of the

basin of the Isonzo.—The Ladin element is further found in greater or less degree throughout an altogether Cis-Alpine “ amphizone,” and more par- ticularly in the head valley of the Ticino and the head valley of the Mera on the Lombardy versant, and in the Val Fiorentina and central Cadore on the Venetian versant, The valleys of Bormio present a special and conspicuous phase of Ladino-Lombard connexions, and the Ladin element is clearly observable in the most ancient ex- ainples of the dialects of the Venetian estuary (Arch., i. 448-473),— The main characteristics by which the Ladin type is determined may be summarized as follows :—(1) the guttural of the formule c+a and g+a passes into a palatal; (2) the / of the formule pi, el, &c., is preserved; (8) the s of the ancient terminations is preserved; (4) the accented e in position breaks into a diphthong ; (5) the accented o in position breaks into a diphthong; (6) the form of the diphthong which comes from short accented o or from the 0 of position is we (whence we, 6); (7) long accented e and short accented 4 break into a diphthong, the purest form of which is sounded ¢7; (8) the accented @ tends, within certain limits, to change into ¢, especially if preceded by a palatal sound ; (9) the long accented w is represente a. These characteristics are all foreign to true and genuine Italian. C’drn, carne; spelwnéa, spelunca; clefs, claves;

Suormas, forme; infiern, inferno; érdi, hordeo ; méd, modo;

plain, pleno ; pail, “a ; quel, quale; piir, puro—may be taken as exam fen from the Upper Engadine (western section of the zone). The following are examples from the central and eastern sections on the Italian versant :—

a. Central Section.—BASIN OF THE Noce: examples of the dialect of Fondo: éavél, capillo ; peséadér, piscatore; pluévia, pluvia (plovia); pluma (dial. of Val de Rumo: plévia, pliimo); véela, ve- tula ; ééntes, cantas. The dialects of this basin are disappearing.— BASIN OF THE AvISIO ; examples of the dialect of the Val di Fassa: éarn, carne; éé%er, cadere (cad-jere); wdéa, vacca; féréa, furca; gitia (géia), ecclesia; églje (ae), oculi; éans, cancs; rdmes, rail; teila, tela; néif, nive; cessa, coxa. The dialects of this basin which are further west than Fassa

are gradually being merged in the Vencto-Tridentine dialects.—BAsIN OF THE CoRDEVOLE: here the district of Livinal-Lungo (Buchenstein) is Austrian politically, and that of Rocca d'Agordo and Laste is Italian. Examples of the dia- lect of Livinal-Lungo : éarié, Ital. caricarc ; éanté, cantatus ; dgle, oculo; éans, canes; éavéis, capilli; viérm, verme; ftéc, foco; avéi, habere ; éi, nive.—BAsIN OF THE BorTE: here the district of Ampezzo (Heiden) is politically Austrian, that of Oltrechiusa Italian. Examples of the dialect of Ampezzo are éasa, casa; éandéra, candela; férécs, furce, pL; séntes, sentis. It is a decadent form.— Upper Basin oF THE PrAvE: dialect of the Comelico: éésa, casa ; éen (éan), cane; éaljé, caligario ; bos, boves; nevo, novo ; lego, loco.

b. Eastern Section or Friulian Region.—Here there still cxists a flourishing ' Ladinity," but at the same time it tends towards Ital- ian, particularly in the want both of the e from 4 and of the # (and consequently of the 6). Examples of the Udine variety: éarr, carro; éavdl, caballo ; éastiél, castello ; férée, furca ; clar, claro; glag, glacie; plan, plano; colors, colores ; dungs, longi, pl.; dévis, debes; vidiél, vitello ; fiéste, festa; puéss, possum ; cuét, cocto ; wardi, hordeo.—The most ancient specimens of the Frinlian dialect belong to the 14th century (see Arch., iv. 188 sqq.).

B. Dialects which are detached from the true and proper Italian system, but form no integral part of any foreign Neo-Latin system,

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1. Here first of all is the extensive system of the dialects usually called Gallo-Italian, although that designation cannot be considered sufficiently distinctive, since it would be e a applicable to the Franco-Provengal (A. 1) and the Ladin (A, 2). he system ig sub- divided into four great groups,—(a) the Ligurian, (b) the Piedmon- tese, (e) the Lombard, and (d) the Hmilian,—the names furnishing on the whole sufficient indication of the localization and limits. — These groups, considered miore particularly in their more pronounced varieties, differ greatly from each other; and, in regard to the Ligurian, it was even denied until very recently that it belongs to this system at all (see

Arch., ii. 111 sgq.).—Characteristie of the Piedmontese, the Lombard, and the Emilian is the continual elision of the unaccented final vowels except a (¢.g., Turinese 6, oculo ; Milanese vg¢, voce; Faenzan red, rete), but the Ligurian does not keep them company (¢,g., Genovese dggu, aculo; vgze, voce). In the Picdmontese and Kmilian there is further a tendency ta eliminate the protonic vowels—-a tendency much more pronounced in the second of these groups than in the first (¢.g., Pied. dné, danaro; véin, vicino ; Faenzan fnoéé, finocchio ; dsprazion). This phenomenon involves in large measure that of the prothesis of a; as, ¢g., in Turinese and Faenzan armor, rumore; Faenzan alvé, levare ; &c. U for the long accented Latin wand ¢ for the short accented Latin 0 (and even within certain limits the Latin 6 of position) are common to the Piedmontese, the Ligurian, and the Lombard: ¢,g,, Turinese and Milanese, diir, and Genovese diiw, duro; Turinese and Genovese, méve, and Milanese mév, mévere ; Piedmontese dérm, dorme; Milanese, vélia, volta. Hi for the long accented Latin ¢ and for

the short accented Latin 7 is common to the Piedmontese and the:

Ligurian, and even extends over a large part of Emilia: e.g., Turinese and Genovese, avéi, hahere, Bolognese, avéir; Turinese and Geno- vese, beive, bibere, Bolognese, ber. In Emilia e¢ occurs also in the formulx %, ent, emp; e.g., Bolognese and Modenese bei, sola- méint, The system shows a repugnance throughout to ¢e for the short accented Latin ¢ (as it occurs in Italian piede, &c.); in other words, this diphthong has died out, but in various fashions : Piedmontese and Lombard dee, dicci; Genovese dete; Facnzan_ dig. The greater part of the phenomena indicated above have “‘ Gallic ” counterparts too evident to require to be specially pointed out. One of the most important traces of Gallic or Celtic reaction is the reduction of the Latin accented a into e (d, &c.), of which pheno- menon, however, no certain indications have as yet been found in the Ligurian group. On the other hand it remains, in the case of very many of the Piedmontese dialects, in the é of the infinitives of the first ~ oe ge porté, portarc, &e.; and numerous yes- tiges of it are still found in Lombardy (¢.g., in Bassa rjanza: andé, andato; guardé, guardato; sé, sale; see Arch. i, 296-298, 536). Emilia also preserves it in very extensive use: Modenese andér, andare; arivéda, arrivata; peg,

pace; Faenzan parlé, parlare and parlato; parléda, parlata; ches, caso; &c. The phengmengn, jn company with other Gallo-Italian and more specially Emilign characteristics, extends to the valley of the Metauro," and even . to the opposite side of the Apennines, spreading on both anks of the head stream of the Tiber and through the valley of the Chiane: hence the types artrovér, ritrqvare, portéto, portato, &e., of the Perugian and Aretine dialects (see infra C. 3, 6). In the phenomenon of & passing into ¢ (as indeed, the GallosTtalio evolution of other Latin vowels) special distinctions would require to be drawn between bases in which a (not standing in_ position) precedes a non-nasal consonant (¢.g., amdto), and those which have before a nasal: and in the latter case there would be non- positional subdivision (¢.g., fame, pane) and a positional gne (¢.9., quinto, amdndo, edmpo); see Arch. i. 293 sqg. This leads us to the nasals, a category of sounds comprising other Gallo-Italic charactcristics. There occurs more or less widely, throughout all the sections of the system, and in diffcrent gradations, that "velar" nasal in the end ot a syllable (pan, man; ednta, mont) which may be weakened into a simple nasalizing of a vowel (pa, &c.) or even grow completely inaudible (Bergainese pa, pane; padri, padrone; ¢ep, tempo; met, mente; mut, montc ; pat, ponte; puéa, punta, t.e., "puncta"), where Celtic and especially Irish analogies and even the frequent use of ¢ for nt, &c., in ancient Um- brian orthography occur to the mind. Then we have the faucal n by which the Ligurian and the Piedmontese (Jana, lina, &e.) are con; nected with the group which we call Franco-Provengal (A. 1).— We pass on to the ' Gallic"' resglutign of the nexus e¢ (e.g., facto, fajto, fajtjo, fait, faé; tecto, tejto, tejtjo, feit, teé) which invari- ably occurs in the Piedmontese, the iagurian, and the Lombard: Pied. Sait, Lig. fajtw, fetu, Lombard faé; Pied. tét, Lig. féitu, Lom, tcé; &. Here it is to be observed that besides the Celtic analogy the Umbrian also helps us (adveitw=ad-vecto ; &c.) ; and it is further most noteworthy that the Celtic and Umbrian analogies lead us to that fusion of the et series with the pt series (Irish sechd, Welsh seith, septem; Umbrian, screhto, serethtor, scriptum, scripti) by which is explained the seri¢, scripto, of the ancient Milanese, scriéira, seriptura, of the modern; just as also Provengal has eserich (i.¢., eserié).—The Piedmontese and Ligurian come close to each other, more especially by the regular dropping of the d both

primary and secondary, 4 phenomenon common in French (as Piedmontese and Ligurian ric, ridere; Piedmontese pué, potare ; Genoese neghe=niaighe, natiche, &c.). The Lombard typc, or more correctly the type which has become the dominant one in Lombardy (Arch., i. 305-6, 310-11), is more sparing in this re- spect; and still more so is the Emilian. In the Picdmontese is also found that other purely Gallic resolution of the guttural between two vowels by which we have the types brdja, mdnia, over against the Ligurian brdga, mdnega, braca, manica.—Among the phonetic phenomena peculiar to the Ligurian is a continual re- duction of 7 into r and the subsequent dropping of this: r between vowels and at the end of words in the modern Genoese ; just as

-happens also with the primary r: thus d&=durir=dolore, &c.

Characteristic of the Ligurian, but not without analogies in Upper

‘ Italy even (Areh., ii. 157-8), is the resolution of pj, bj, fj into é, g, 3: . git, pit, plus; rdgga, rabbia, rabies; $4, fiore. Finally, the sounds §

and % have a very wide range in Ligurian (Areh,, ii, 158-59). The reduction of s into % occurs in the Bergamo dialects: hira, sera; groh, grosso; cahtél, eastello (see alsq B. 2): —A general phenomenon in Gallo-Italic phonetics which also comes to have an inflexional importance is that by which the unaccented final 7 has an influence on the accented vowel. This enters into-a series of phenomena which even extends into southern Italy; but in the Gallo-Italic there are particular resolutions which agree well with the general connexions of this system. The following plural forms may be quoted : Genoese bdin, from bén-¢; tréin trom tron-t, tuoni ; Milanese quist, from quist-¢ (sing. quest), questi; mis from mes-t, mesi (sing. mes); Bolognese rif, from ref-t, regni (sing. ren); of. Arch., i. 540-41.—Among morphological peculiarities the first place may be given to the Bolognese stpa (seppa), because, thanks to Dante and others, it has acquired great literary celebrity. It

really signifies “sia” (sim, sit), and is an analogical form fashioned on gpa, a legitimate continuation of the corresponding forms of the other auxiliary (habeam, habeat), which is still heard in ch’me apa purté, ch’lu xpa purté, ch’io abbia portato, ch’egli abbia portato. Next may be noted the third person singular in ~~p of the perfect of esse and of the first conjugation in the Forli dialect (fop, fu; man~~ dép, mandd; &c). This also must be analogical, and due to a legitimate ep, ebbe (see Areh., ii. 401, and compare fobbe, fu, in the dialect of Camerino, in the province of Macerata, as well as the Spanish analogy of twvg estuve formed after hube). Lastly, in the domajn of syntax, ma be added the tendency to repeat the pronoun (e.g., ti te edntet of the Milancse, which really is tw tu edntas-tu, equivalent merely to “ cantas”), a tendency at work in the Emilian and Lombard, but more particularly pronounced in the Piedmontcse, With this the corresponding tendency of the Celtic langnages has been more than once and with justice compared; here it may be added that the Milanese niin, apparently a simple form for “ noi,” is really a compound or reduplication in the manner of the n7-nt, its exact counterpart in the Celtic tongues.—The literary documents of this system go back as far as the cnd of the 13th century in the Milanese poems of Fra Bonvicino da Riva and the Lime Genovese (Areh., ii. 161-312).

2, Sardinian Dialeets.—These are three—the Logudorese or cen- tral, the Campidanese or southern, and the Gallurese or northern. ‘he third certainly indicates a Sardinian basis, but is strangely sane by the intrusion of other elements, among which the

southern Corsican (Sartcne) is by far the most copious. The other obs are homogeneous, and have great affinity with each other ; the

ogudgrese comes more particularly under consideration here. —The pure Sardinian _vocalism has this peculiarity that each accented yowel of the J,atin appears to be retained without ‘alteration. Consequently there are no diphthongs representing simple Latin vowels; nor does the rule hold good which is true for so great a pro- portion of the Romance languages that the representatives of the é and the % on the one hand and those of the é and the % on the other ‘are normally coincident,

Hence plenu (2); deghe, decem (é); binw, ving (i); ptlu (t); flore (6); roda, rota (8); duru (x); nughe, nuce (%), The unaccented vowels keep their ground well, as has alrcady been seen in the case of the finals by the examples adduced. —The s and ¢ of the ancient termination are preserved, thou gh not constantly: tres, onus, passados annos, plajtas, faghes, facis, tenemus; mulghet, mul- ghent.—The formule eg, ¢2, ge, gi may be represented by ehe (ke), &c.; but this appearance of special antiquity is really illusory (see Arch., ii, 143-4). The nexus ¢/, &c., may be maintained in the beginning of words (elaru, plus); but jf they are in the body of the word they usually undergo resolutions which, closely related though they be to those of Italian, sometimes bring about very singular results (e.g. usare, which by the intermediate forms uséare, ugare leads back to wselare=ustlare=ustularc). Né is the representative of nj (testiménéu &c.); and U7 is reduced to z alone (¢.9., mézus, melius; Campidanese mellus). For J a frequent substitute 1s dd: massidda, maxilla, &c. Quite characteristic is the continual labialization of the formule qua, gua, eu, gu, &c.; ¢.g., chba, equa; sambene, san- guine (see Arch., ii. 143). The dropping of the primary d (roere, rodere, &c.) but not of the secondary (finidu, sanidade, maduru) is frequent. Characteristic also is the Logudorese prothesis of before

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the initial s followed by a consonant {iscamnu, istella, tspada), like the prothesis of e in Spain and in France (sce Arch., iii. 447 sqq.). ~~—In the order of the present discussion it is in connexion with this territory that we are for the first time led to consider those phonetic changes in words of which the cause is merely syntactical or trausitory, and chiefly those passing accidents which occur to the initial consonant through the historically legitimate or the merely analogical action of the final sound that precedes it. The general explanation of such phenomena reduces itself to this that, given the intimate syntactic relation of two words, the initial consonant of the second retains or modifies its character as it would retain or modify it if the.two words were one. The Celtic languages are especially distinguished by this peculiarity; and among the dialects of Upper Italy the Bergamasc offers a clear example, This dialect is accus~~ tomed to drop the v, whether primary or secondary,

between vowels in the indayiial vocables (cad, cavare; faa, fava, &c.), but to pre- serve it if it is preceded by a consonant (serva, &c.).—And simi- larly in syntactie combination we have, for example, de 7, di vino; but ol vi, il vino. Insular, southern, and central Italy furnish a large number of such phenomena; for Sardinia we shall simply cite a single class, which is at once obvious and easily explained, viz., that represented by su oe, il bove, alongside of sos boes, 1 buoi (cf. biere, bibere ; erba).—The article is derived from ipse instead of from tlle : sw sos, sa sas,—again a geographical anticipa- tion of Spain, which in the Catalan of the Balearic islands still pre- serves the article from tpse, —A special connexion with Spain exists besides in the nomine type of inflexion, which is constant among the Sardinians (Spanish nomne, &c., whence nombre, &c.), nomen, no- mene, rdmine, aerainine, legumene, &c. (seo Arch., ii, 429 sqq.).— Especially noteworthy in the conjugation of the verb is the para- digm cantérc, cantéres, &c., timére, timéres, &c., precisely in the sense of the imperfect subjunctive (cf. A. 1; cf. C, 36). Next comes the analogical and almost, corrupt diffusion of the -sz of the ancient strong perfects (such as post, rosi), by which cantesi, timest (cantavi, timui), dolfesi, dolui, are reached. Proof of the use and even the abuse of the strong perfects is afforded, however, by the participles and the infinitives of the category to which belong the following examples: ténnidu, tenuto; pdrjidu, parso; bdlfidu, valso; ténnere, bdlere, &c. (Arch., ii. 482-88). The future, finally, shows the unagglutinated periphrasis; hayo a mandigare (ho a mangiare= mangcr-6); as indeed the unagglutinated forms of the future and the conditional occur in ancient vernacular texts of other Italian districts. —There are documents of the Sardinian dialect going back as far as the middle of the 12th century.

C. Dialects which diverge more or less from the genuine Italian or Tuscan type, but which at the same time can be

conjoined with the Tuscan as forming part of a special system of Neo-Latin dialects,

1. Venetian.—Between “ Venetian ” and “ Venetic” several dis- tinctions must be drawn (A7ch., i. 391 sqg.). At the present day the

population of the Venetian cities is ‘Venetian ” in language, but the country districts are in various ways Venetie.! Tho ancient language of Venice itself and of its estuary was not a little different from that of the present time ; and the Ladin vein was particularly evident (see A. 2), A more purely Italian vein —the historical explanation of which presents an attractive pro- blem—has ultimately gained the mastery and determined the ‘*Venetian” type which has since diffused itself so vigorously.— In the Venetian, then, we do not find the most distinctive char- acteristics of the dialects of Upper Italy comprised under the denomination Gallo-Italic (see B. 1),—neither the i nor the 6, nor the velar and faucal nasals, nor the Gallic resolution of the cé, nor the frequent elision of unaccented vowels, nor the great redundancy of pronouns. On the contrary, the pure Italian diphthong’of 8 (¢.g., cuér) is heard, and the diphthong of 2 is in full currency (dieze, dieci, &c.). Nevertheless the Venetian approaches the typo of Northern Italy, or diverges notably from that of Central Italy, by the following phonetic phenomena :—the ready elision of

rimary or secondary d (crtio, orudo; séa, seta, &c.); the regular re-

uction of the surd into the sonant guttural (e.g., cuogo, Ital. coco, coquus) ; the pure ¢ in the resolution of ¢/ (e.g., cave, clave ; oréêa, auricula) ; the 4 for ¢ (4évene, Ital. giovane); ¢ for § and ¢ (pége, Ital. pesce; ¢iél, Ital. cielo). Lj preceded by any vowel, primary or secondary, except ¢, gives ¢: faméga, familia. No italian dialect is more averse than the Venetian to the doubling of consonants.—In the morphology the use of the 3d singular for the 3d plural also, and the analogical participle in esto (taéesto, Ital. taciuto, &c.; see Arch., iv. 398 sqq.) are particularly noteworthy. A curious double relic of Ladin influence is the interrogative type re- presented by the exaniple crédis-tu, credis tu,—where apart fron the interrogation ¢¢ credi would be used.—The texts of the Venetian vernacular take us back to the first half of the 138th century. To the beginning of the 14th belongs the 7rattato “ de regimine rec-

1 On this point see the chapter, “ La terra ferma vencta considerata in ispecie ne’ suoi rapporti con la sezione centrale della zona ladina,” in

Arch., i. 406-47,

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toris” of Fra Paolino, also in the Venetian dialect. For other ancient sources relating to Venice, the estuary of Venice, Verona, and Padua, see Arch., i. 448, 465, 421-22; iii. 245-47.

2. Corsican.—lf the “ Venetian,” in spite of its peculiar ‘* Itali- anity,” has naturally special points of contact with the other dia- lects of Upper Italy (B. 1), the Corsican in like manner, particularly in its southern varieties, has special points of contact with Sardin- ian proper (B. 2). Thus for example, in boglio leche lu bunnetru (voglio lasciar la gonnella) from a song of Fiumorban Corsican there is a phonetic phenomenon (bw from gu) which reveals a connexion with Sardinian proper, as well as a morphological plienomenon which implies the same relation, since Jeche must be a verb of the first conjugation (Jagdre in Upper Italy; see, for example, Arch., i. 546) conformed to the analogy of strong verbs as found in Sardinian in the case of ndrrere, narrare, or, for a verb of the fourth conju- gation, in Corsican véne, Sardinian bénnere=venire.—In general, it is in the southern section of the island, which, geographically even, is farthest removed from Tuscany, that the most characteristic forms of speech are found. The unaccented vowels are undisturbed; but ufor the Tuscan o is common to almost all the island,—an insular phenomenon par excellence which connects Corsica with Sardiniaand with Sicily, and indeed with Liguria also, So also -¢ for the Tuscan -e (latti, latte; 12 catenz, le catene), which prevails chieflyin the southern section, is also found in Southern Sardinian, and is common to Sicily. It is needless to add that this tendency to w and 7 manifests itself, more or less decidedly, also within the words. Corsican, too, avoids the diphthongs of é and 8 (pe, ert; cori, fora); but, unlike Sardinian, it treats t and @ in the Italian fashion: beju, bibo ; péveru, piper; pesct ; noci, nuces.—It is one of its characteristics to reduce a toe in the formula ar + a consonant (chérne, bérba, &c.), which should be compared particularly with the Emilian examples of the same phenomenon (A7ch., ii. 133, 144-50). But the gerund in ~~endw of the first~~

~~conjugation (twrnendu, lagrimendu, &c.) must on the con~~ trary be considered as a phcnomenon of analogy, as it is especially re- cognized in the Sardinian dialects, to all of which it is common (see Arch., ii. 183). And the sameis most probably the case with forms of the present participle like merchente, mercante, in spite of enzi and innenzt (anzi, innanzi), in which latter forms there may probably be traced the effect of the Neo-Latin 4 which availed to reduce the t of the Latin ante ; alongside of them we find also anzt and nantu.. —In Southern Corsican dr for // is conspicuous—a phenomenon which also connects Corsica with Sardinia, Sicily, and a good part of Southern Italy (see C. 2; and A7ch. ii. 135, &c). An acute observer (Falcucci) has asserted that cven the phenomena of rv and zd both changing into xn are found in certain veins of Southern Corsican ; but he has given no examples. The former of these would connect Corsican with Sardinian (corrw, cornu; carre, carne, &c.); the latter more especially with Sicily, &c., though it is not unknown even in Sardinia (Arch., ii.142, 143).—As to phonetic phenomena con- nected with syntax, already noticed in B. 2, space admits the following examples only: Cors. na vella, una bella, e¢ bella (ebvélla, et bella); Zw jallu, lo gallo, gran ghiallu; of. Arch., ii. 186 (185, 150), As Tommaseo has already noted, ~~one is for the Corsicans not less than for the French a termination of diminution: ¢9., Fratedronu, fratellino.—In the first person of the conditional the 6 is maintained (¢.g,, farcbe, farei), as even at Rome and elsewhere. Lastly, the series of Corsican verbs of the derivative order which run alongside of the Italian series of the original order, and may be represented by the example dissipeghja, dissipa (Falcucci), is to be compared with the Sicilian series represented by cwadiari, ris~~ caldare, curpidrt, colpire (Arch., ii, 151).

8. Dialcets of Sicily and of the Neapolitan Provinces.—Here the territories on both sides of the Strait of Messina will first be treated together, chiefly with the view of noting their common linguistic peculiarities. Characteristic then of these parts, as compared with Upper Italy and even with Sardinia, is, generally speaking, the tenacity of the explosive elements of the Latin bases, (of. Arch., ii. 154, &c.), Not that these consonants are constantly

reserved uninjured; their degradations, and especially the Neapo- iter degradation of the surd into the sonant, are even more fre- quent than is shown by the dialect as written, but their disappear- ance is comparatively rather rare; and even the degradations, whether regard be had to the conjunctures in which they occur or to their specific quality, are very different from those of the dialects of Upper Italy. Thus, the¢ between vowels ordinarily remains intact in Sicilian and Neapolitan (¢.g., Sicil. sita, Neap. scta, seta, where in the dialects of Upper Italy we should have scda, sca); and in the Neapolitan dialects it is reduced to d when it is preceded by » or 7 (e.g., viende, vento), which is precisely a collocation in which the ¢ would be maintained intact in Upper Italy. The d, on the other hand, is not resolved by elision, but by its reduction to7 (2.95 Sicil. virive, Neap. dialects veré, vedere), a phenomenon whicli has been frequently compared, perhaps with too little caution, with the d passing into7s (d)in the Umbrianinscriptions. The Neapo- litan reduction of n¢ into nd has its analogies in the reduction of ne (nk) into ng, and of mp into mb, which is also a feature of the Neapolitan dialects, and in that of ns into 4; and here and there

we even find a reduction of nf into mb (nf, nv, nb, mb), both in Sicilian and Neapolitan (c.g., at Casteltcrmini in Sicily ’mbiernu, inferno, and in the Abruzzi cwmbonn’, ’mbonn’, confondere, in- fondere). Here we find ourselves in a series of phenomena to which it may seem that some special contributions were furnished by Oscan and Umbrian (nt, mp, ne into nd, &c.), but for which more secure and general, and so to say “ isothermal,” analogies are found in modern Greek and Albanian. The Sicilian does not appear to fit in here as far as the formule né and mp are concerned; it rather agrees with the Neapolitan through ré passing into rd; and it may even be said to go counter to this tendency by reducing ng to né (e.g., punéiri, pungerc). Nay, even in the passing of the sonant into the surd, the Neapolitan dialects would yield special and important contributions (nor is evén the Sicilian limited to the case just specified), among which we will only mention the change of d be- tween vowels into ¢ in the last syllable of proparoxytones (¢.9., ammeto,

umido). From these series of sonants changing into surds comes a peculiar feature of the southern dialects.—A pretty common

characteristic is the regular progressive assimilation by which nd |

is reduced to nn, mb to mm, and even nv also to mm (nv, nb, mb, mm), ¢.g., Sicil. sinniri, Neap. Sénnere, scenderé ; Sicil. ehiummu, Neap. chiwmme, piombo; Sicil. and Neap. ’mmidia, invidia. As belonging to this class of phenomena the Paleo- Italic analogy (nd into nn, »), of which the Umbrian furnishes special evidence, readily suggests itself—Another important com- mon characteristic is the reduction of yj, 07, f7, to é (ky), g, § (ef. the Genoese; B. 1), whence, c.g., Sicil. cheanu, Neap. chiane,

iano (plano, pljano, pjano); Sicil. siééa, Neap. secéa, sepia; Ricil. ragga, Neap. arragga, rabbia; Sicil. Suri (éwri), Neap. Sore, fiore.—Further is to be noted the tendency to the sibi- lation of ce, ci for which Sicil. jazzu, ghiaccio, and Neap. lizete, lecito, may serve as examples (Arch, ii. 149),—a tendency more particularly betrayed in Upper Italy.—There is a common incli- nation also to elide the initial unaccented palatal vowel, and to pre- fix.a, especially before 7 (this second tendency is found likewise in Southern Sardinian, &c.; sce Areh., ii. 188); ¢.9., Sicil. ’nténniri, Neap. ’ndénnere, intendere ; Sicil. arricamdri, Neap. arragamare, ricamare (see Arch., ii, 150).—In complete contrast to the ten- dency to get rid of double consonants which has been particularly noted in Venetian (C. 1), we here come to the great division of Italy where the tendency grows strong to gemination (or the doubling of consonants); and the Neapolitan in this respect gocs farther than the Sicilian (¢.g., Sicil. doppu, dopo; ’nsemmula, insieme, in-simul; Neap. dellecato, dilicato ; eimmeto, umido; débbole).—As to the phonetic phenomena conncсted with the syntax (see B. 2), it is sufficient to cite such Sicilian examples as niSuna ronna, nesuna donna, alongside of c’ é donni, c’ & donne; éincu jorna, cinque giorni, alongside of chit ghiorna, pil giorni; and the Neapolitan la vocca, la bocca, alongside of a bocca a bocca, ad buccam, &c,

We now proceed to the special consideration, first, of the Sicilian and, secondly, of the dialects of the mainland.

a, Sieilian.—The Sicilian vocalism is conspicuously etymological. Though differing in colour from the Tuscan, it is not less noble, and between the two there are remarkable points of contact. The dominant variety ignores the diphthongs of é and of 8, as it has been seen that they are ignored in Sardinia (B. 2), and here also the % and the % appear intact ; but the 4 and the @ are fittingly represented by 7 and w ; and with equal symmetry unaccented e and o are reproduced by 7 and w. Examples: ¢énz, tiene ; ndévu, nuovo ; pilu, pelo ; jugu, giogo; cridiri, credere; sira, sera; vina, vena; sult, il sole ; wra, ora. The é and 6 of position are represented by c and o (vermi, verme ; nuvéddu, novello ; morti, la morte; cornu), and thus normally they correspond to the open ¢ and o of the Tuscan, And if In some cases the Sicilian appears to be exceptional (stidda, stella; vinniri, vendere ; furma, &c.), it usually corresponds cven in this with the Tuscan, where also we find the same apparent exception of the closed instead of the open vowel (stella, vendere, forma, &c., Arch., ii. 146).—In the evolution of the consonants it is enough to add here the change of Uj into gij (e.g., figghiu, figlio) and of I into dd (e.g., gaddu, gallo).

b. Dialects of the Neapolitan Mainland.—The Calabrian (by which is to be understood more particularly the vernacular group of the two Further Calabrias) may be fairly considered as a continuation of the Sicilian type, as is seen from the following examples :—cori, cuore ; petra; fimmina, femina; vuci, voce ; onwri, onore; figghir, figlio; spadde, spalle; trizea, treccia (here the d of the nexus nd, how- ever, 1s not subject to the assimilation which is common to Sicilian and Neapolitan in general: ¢.9., quandu, éangendu, piangendo), Even the h for$=fj, as in huri (Sicil. $urz, fiore), which is character- istic in Calabrian, has its forerunners in the island (see Arch., ii. 456). Along the coast of the extreme south of Italy, when once we have passed the interruptions caused by the Basilisco type (so called from the Basilicata), the Sicilian vocalism again presents itself in the Otrantine, especially in the seaboard of Capo di Leuca. In the Lecce variety of the Otrantine the vocalism which has just been described as Sicilian also keeps its ground in the main (¢f, Morosi, Arch., iv.): stra, sera; lettu, oliveto ; pilus ura, ora; dulure.

Nay more, the Sicilian phenomenon of Jj into ghj (figghiu figlio, &c.) is well marked in Terra d'Otranto fe he eee di Bari, and even extends through the Capitanata and the Basilicata (ef. D'Ovidio, Arch., iv. 159-60). As strongly marked in the Terra @'Otranto is the insular phenomenon of JJ into dd (dr), which is also very widely distributed through the Neapolitan territories on the eastern side of the Apennines, sending outshoots even to the Abruzzo, But in Terra d'Otranto we are already in the midst of the diphthongs of é and of 8, both non-positional and positional, the development or permanence of which is determined by the quaity of the unaccented final vowel,—as generally happens in the

ialects of the south. The diphthongal product of the 6, and hence also of the 6 of position, ishere wc, The following are examples from the Lecce variety of the dialect: core, pl. cweri ; metu, micti, mete, mieto, mieti, miete (Lat. métere); sentw, stenti, sente; olu, uéli, ola, volo, voli, vola; mordu, muerdi, morde. Thewerecallsthe fundamen- tal reduction which belongs to the Gallic (not to speak of the Spanish) regions, and stretches through the Tcrra di Bari, where there are other diphthongs curiously suggestive of the Gallic: ¢.g., at Bitonto alongside of lucchg, luogo, swenne, sonno, we have the ot aud the at from 7 or ¢ of the previous phase (veéoine, vicino), and the aw from o of the previous phase (anawre, onore), besides a diphthongal dis- turbance of the d. Here also occurs the change of & into an ¢ more or less pure (thus, at Cisternino, scwnswléte, sconsolata; at Canosa di Puglia, arruéte, arrivata; n-ghépe, 'in capa,'' that is, in capo); to which may be added the continual weakening or elision of the unac- cented vowels not only at the end but in the body of the word (thus, at Bitonto, vendett, spranz). A similar type meets us as we cross into Capitanata (Cerignola: faédive, facera; afféise, offese ; sfazidnne, soddisfazione ; 1'-ghéipe, in capo; 'nzultéite, insultata; arradggete, arrabbiato) ; such forms being apparently the outposts of the Abruzzan, which, however, is only reached through the Molise—a district not very populous even

now, and still more thinly peopled in bygone days—whose prevailing forms of speech in some measure interrupt the historical continuity of the dialects of the Adriatic versant, presenting, as it were, an irruption from the other side of the Apennines. In the head valley of the Molise, at Agnone, the legitimate precursors of the Abruzzan vernaculars reappear (fatotca, fatica; perdoiva, perdeva; votre, vero; patina, pena; segneura ; cheure; Selleriete, scellerati, wherc, however, the disturbance of the a is only occasional, 7.¢., is dependent on the 7 formerly heard in the end of the word; cf. maltrattata, sperdva, &c.). The following are pure Abruzzan examples. (1) From Bucchianico (Abruzzo Citeriore): vetve, vivo; rraje, re; allaure, allora ; craune, corona ; circhè, cercare ; méle, male ; grénne, grande; guénne; but ’nsultate, insultata ; strade, strada (where again it is seen that the reduction of the & depends on the quality of the final unaccented vowel, and that it is not produced exclusively by 7, which would give rise to a further reduction: scillarite, scellerati; ampire, impari). (2) From Pratola Peligna (Abruzzo Ulteriore II.) : majg, mia ; ’nawre, onore ; “wyuriéte, inguriata ; desperéte, disperata (alongside of vennecd, vendi- care). Italmost appearsthatacontinuity with Emilian ought to be established across the Marches (where another irruption of greater “Italianity” has taken place: a third of more dubious origin las been indicated for Venice, C. 1); see Arch., ii. 445. A negative characteristic for Abruzzan is theabsence of ¢é=pj and of 8=/7; and the reason seems evident. Here the yj and fj themselves appear to be modern or of recent reduction, —the ancient formule sometimes occurring intact (as in the Bergamasc for Upper Italy), ¢.g., planje and prdnje alongside of pidnje, pragnere.! To the south of the Abruzzi begins and in the Abruzzi grows prominent that contrast in regard to the formule ait ald (resolved in the Neapolitan and Sicilian into aut, &c., just asin the Piedmontese, &c.) by which the, types aldarc, altare, and callg, caldo, are reached.—For the rest, when the condition and connexions of the vowel system still retained by so large a proportion of the dialects of the eastern versant of the Neapolitan Apennines, and the difference which exists in regard to the preservation of the unaccented vowels between the Ligurian and the Gallo-Italic forms of speech on the other versant of the northern Apennines, are considered, one can- not fail to see how much justice there is in the longitudinal or

Apenninian partition of the Italian dialects indicated by Dante.— But, to continue, in the Basilicata, which drains into the Gulf of Taranto, and may be said to lie within the Apennines, not only is the elision of final unaccented vowels a prevailing character- istic; there are also frequent elisions of the unaccented vowels within the word. Thus at Matera: sintenn la femn chessa cbs, sen- tendo la femina questa cosa ; disprdt, disperata; at Saponara di Grumento: womnn' seilrati, uomini scellerati; mnetta, vendetta.— But even if we return to the Mediterranean versant and, leaving the Sicilian type of the Calabrias, retrace our steps till we pass Into the Neapolitan pure and simple, we find that even in Naples the unaccented final vowels behave badly, the labial turning to 7 (bielle, bello) and even the a (bell&) being greatly weakened, And here

1 So again even still pleuve and prove, piove, which suggests a fine Latinism

of another sort still retained,—nengue, ninguere; so that in the most ancient chronicle of Aquila (str. 487) the reading se plovevg o nengueva is truly dialectical,

oceurs a Paleo-Italic instance which is worth mention : while Latin was accustomed to drop the w of its nominative only in presence of r (gencr from *gener-u-s, vir from *vir-u-s ; of. the Tuscan or Italian apocopated forms véncr = vénere, venner=vennero, &c.), Oscan and Umbrian go much further: Oscan, hurz=*hort-u-s, Lat. hortus ; Umbr. pihaz, piatus; emps, emptus, &c. In Umbrian inscriptions we find w alternating with the a of the nom. sing. fem. and plur. neut. In complete contrast with the Sicilian vocalism is the Neapolitan ¢ for unaccented and particularly final ¢ of the Latin and Neo-Latin or Italian phases (¢.g., viene, vieni ; of. infra), to say nothing further of the regular diphthongization, within certain limits, of accented e or o in position (apiertg, aperto, fem. aperta ; muortg, morto, fem. morta, &c.).— Characteristic also of the Neapolitan are certain insertions of vowels to obviate certain collocations: hence ddejo for odio, or more curiously dvotre, altro (7.¢., aultro, autro, as in Upper Italy, hence dotro, av-g-

tro) or cudveig, colto (i.e, cuolto, euduto, cudv-9-to). In the quasi-morphological domain it is to be noted how the Siculo-Calabrian w for the ancient 6 and #, and the Siculo-Calabrian ¢ for the ancient 4, %, are also still fonnd in the Neapolitan, and, in particular, that they altcrnate with o and 6 in a manner that is determined by the difference of termination. Thus cosetore, cucitore, pl. coscture (i.¢., coseturt, the -¢ passing into ¢ in keeping with the Neapolitan characteristic already mentioned) ; spos¢, sposo, pl. spuse ; noée, noce, pl. nuée ; credg, io credo; cride (*cridi), tu credi; credc, egli ercde; nigrg, but negra.

Pastiitt now to a cursory mention of purely morphological pheno-mena, we begin with that form which is referred to the Latin pluperfect (see A. 1, B. 2), but which here too performs the func- tions of the conditional. Examples from the living dialects of (1) Calabria Citeriore are faceru, farei (Castrovillari) ; tw te la collerre, tu te l'acolleresti (Cosenza) ; U'aééettéra, l'acccttterebbe (Grimaldi) ; and froin those of (2) the Abruzzi, vulér', vorrei (Castelli) ; dére, darei (Atessa) ; candére, canterei. For the dialects of the Abruzzi, we can check our observations by examples from the oldest chronicle of Aquila, as now habéra lassato, non avrebbe lasciato (str. 180). There are some interesting remains (more or less corrupted both in form and usage) of ancient consonantal terminations which have – not yet been sufficiently studied : s' ineartcaviti, s' incaricava, ~~abat (Basilicata, Senise); ebbiti, ebbe (1b.); avéadi, aveva (Calabria, Grim~~ aldi) ; arrivaudi, arrivd(ib.). The last examplealso gives the -an of the 3d pers. sing. perf. of the first conjugation, which still occurs in Sicily and between the horns of the Neapolitan mainland. In the Abruzzi (and in the Ascolan district) the 8d person of the plural is in process of disappearing (the -no having fallen away and the preceding vowel being obscured), and its function is assumed by the 8d person singular; of. C. 1. The explanation of the Neapolitan forms songhe, io sono, essi sono, donghg, io do, stonghg, io sto, as also of the enclitic of the 2d person plural which exists, ¢.g., in the Sicil. avissivu, Neap. avistcve, aveste, has been correctly given more than once. It may be remarked in conclusion that this Neo-Latin region keeps company with the Roumanian in maintaining in large use the ~~ora derived from the ancient neuter plurals of the type tempora: Sicil. jécwra, giuochi; Calabr. nédura, Abruzz. ntdgre, nidi. As for literary~~

~~documents, if mere fragments and dubious instances are left out of account, Sicilian poetry goes back as far as to the first half of the 18th century, to which century also the chronicles written in Sicilian extend ; but either the copies which we possess are not contemporary or the paleographic key of the readings preserved to us is wanting. In the library of Naples, some MSS. of the 14th century contain poetical translations of which the dialect would seem to belong to the Mediterranean versant of the southern pro~~ vinecs. The old rhymed chronicle of Aquila, which has been referred to more than once above, belongs to the 14th century.

4, Dialects of Umbria, the Marches, and the Province of Rome.— The Ascolan dialect (basin of the Tronto) still depends on the Abruzzan system; and, speaking generally, several conspicuous southern phenomena are widely distributed through the region now tunder review. Thus the 77=/d extends from the Abruzzi (Norcia : callu, caldo; Rome: ariscalla, riscalda ; the phenomenon, however, occurs also in Corsica) ; and the assimilation of nd into nn, and of mb into mm stretches through Umbria, the Marches, and Rome, and even crosses from the Roman province into southern Tuscany (Rieti: quanno, quando; Spoleto: comannava, comandava ; Assisi: pia- gnenno, piangendo ; Sanseverino Marches: piagnenne, ’mmece, invece (imbece) ; Fabriano : vennecassc, vendicarsi ; Osimo: monno, mondo ; Rome: frowna, fronda; piommo, piombo; Pitigliano (Tuscany) : quanno, piagnenno). Even the diphthongs of the e and theo in posi- tionare largely represented. Examples are—at Norcia: tiempt, wocchi, stuortu; Assisi and Fabriano: tiempo; Orvieto: tiempo, tierra, le tuorte, li torti, and even duonna. The change of 7 into 7, so fre- quent throughout this region,and particularly characteristic of Rome, is a phenomenon common to the Aquilan dialect. Similar facts might be adduced in abundance, And it is to be noted that the features common to Umbro-Roman and the Neapolitan dialects must have becn more numerous in the past, as this was the region where the Tuscan current met the southcrn, and by reason of its

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superior culture genie gained the ascendency.1—Thce phonologi- cal connexions between the Northern Umbrian, the Arctine, and the Gallo-Italic type have already been indicated (B. 2). In what relates to morphology, the -orno of the 3d pers. plur. of the perfect of the first conjugation has been pointed out as an essential peculiarity of the Umbro-Roman territory ; but even this it shares with the Aquila vernaculars, which, moreover, extend it to the other par- adigms : amérno, timérono, &c. Further, this termination is found also in the Tuscan dialects.In a large part of Umbria an m or ¢ is prefixed to the sign of the dative: t-a du, a lui; m-al re, al re ;2 which must be the remains of the auxiliary prepositions int(us), a(m)pud, ef. Prov. amb, am, (gf. Arch, ii. 444-46).—By means of the series of Perugine texts this group of dialects may be traced back with confidence to the 13th century ; and to this region should also belong a " Confession," half Latin half vernacular, dating from about the 11th century, edited and annotated by Flechia (Arch., vii. 121 sqg.). The 'chronicle' of Monaldeschi has been already mentioned, A collection of ancient dialectal texts of Perugia and the neighbouring districts is to be published by Monaci in the Archivio Glottologico. D. Tuscan, and the literary language of the Italians,

_ We have now only to deal with the Tuscan territory. It is bounded on the W. by the sea, To the north it terminates with the Apennines; for Romagna Toscana, the strip of country on the Adriatic versant which belongs to it admin- istratively, is assigned to Emilia as regards dialect. In the north-west also the Emilian presses on the Tuscan, extending as it does down the Mediterranean slope of the Apennines in Lunigiana and Garfagnana. Intrusions which may be called Emilian have also been noted to the west of the Apennines in the district where the Arno and the Tiber take their rise (Aretine dialects); and it has been seen how thence to the sea the Umbrian and Roman dialects surround the Tuscan. Such are the narrow limits of the " promised land" of the language which has succeeded and was worthy to succeed Latin in the history of Italian culture and civilization,—the land which comprises Florence, Siena, Lucca, and Pisa.—The Tus- can type may be best

described by the negative method. There do not exist in it, on the one hand, any of those phe- nomena by which the other dialectal types of Italy mainly differ from the Latin base (such as i#=@; frequent elision of unaccented vowels; ba=gua; $=jl; nn=nd, &c.); nor, on the other hand, is there any series of alterations of the Latin base peculiar to the Tuscan. This twofold negative description may further serve for the Tuscan or literary Italian as contrasted with all the other Neo-Latin languages; indeed, even where the Tuscan has a tendency to alterations common to other types of the family, it shows itself more sober and self-denying,—as may be seen in the reduction of the ¢ between vowels into d or of ¢ (&) between vowels into g, which in Italian affects only a small part of the lexical series, while in Provencal or Spanish it may be said to pervade the whole (e.g., Prov. and Span. mudar, Ital. mutare ; Prov. segur, Span. seguro, Ital. sicwro). Tt may consequently be affirmed without any partiality that, in respect to historical nobility, the Italian not only holds the first rank among Neo-Latin languages, but almost consti- tutes an intermediate grade between the ancient or Latin and the modern or Romance.—What has just been said about the Tuscan, as compared with the other dialectal types of Italy, does not, however, preclude the fact that in the various Tuscan veins, and especially in the plebeian forms of speech, there occur particular instances of phonetic decay ; but these must of necessity be ignored in a ae a aren, i Ee gen

1 There is therefore nothing surprising in the fact that, for example, the chronicle of Monaldeschi of Orvieto (14th century) should indicate a form of speech of which Muratori remarks: “ Romanis tune fami- liaris, nimirum que in nonnullis accedebat ad Neapolitanam seu voci- bus seu pronuntiatione.” The alé into ait, &c. (aitro, motto), which occur in the well known Vita di Cola di Rienzo, also shows Abruzzan affinity.

2 This second prefix is common to the opposite valley of the Metauro, aud appears farther south in the form of me,—Camerino: mé: lu pettu, nel petto, me lu Seppurgru, al Sepolcro. .

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so brief a sketch as the present. We shall confine our- selves to noting— what has a wide territorial diffusion— the reduction of c (&) betwecn vowels to a mere breath- ing (e.g. fuoho, fuoco, but porco), or even its complete elision ; the same phenomenon occurs also between word and word (e.g., la hasa, but tn casa), thus illustrating anew that syntactic class of phonetic alterations, either quali- tative or quantitative, conspicuous in this region also, which has been already discussed for insular and southern Italy (B. 2; C. 2, 3), and could be exemplified for the Roman region as well (C. 4). As regards one or two individual phenomena, it must also be confessed that the Tuscan or literary Italian is not so well preserved as some other Neo-Latin tongues. Thus, French always keeps in the beginning of words the Latin formule cl, pl, fl (clef, plaisir, flewr, in_contrast with the Italian chiave, piacere, fore); but the Italian makes up for this by the greater vigour with which it is wont to resolve the same formula within the words, and by the greater symmetry thus pro- duced between the two series (in opposition to the F rench clef, clave, we have, for example, the French ez, oclo; whereas, in the Italian, chiave and occhto correspond to each other). The Italian as well as the Roumanian has lost the ancient sibilant at the end (~~s of the plurals, of the nomina~~ tive singular, of the 2d persons, &e.) which throughout the rest of the Romance area has been preserved more or less tenaciously ; and consequently it stands lower than old Proveugal and old French, as far as true declension or, more precisely, the functional distinction between the forms of the casus rectus and the casus obliquus is concerned. But even in this respect the superiority of French and Provencal has proved merely transitory, and in their modern condition all the Neo-Latin forms of speech are generally surpassed by Italian even as regards the pure grammatical consistency of the noun. In conjugation Tuscan has lost that tense which for the sake of brevity we shall continue to call the pluperfect indicative ; though it still survives outside of Italy and in other dialectal types of Italy itself (C. 3 0; cf. B. 2). It has also lost the futurum exactum, or perfect subjunctive, which is found in Spanish and Roumanian. But no one would on that account maintain that the Italian conjugation is less truly Latin than the Spanish, the Roumanian, or that of any other Neo-Latin language. It is, on the contrary, by far the most distinctively Latin as regards the tradition both of form and function, although

many effects of the principle of analogy are to be observed, sometimes common to Italian with the other Neo-Latin languages, and sometimes peculiar to itself.

Those who find it hard to believe in the ethnological explanation of linguistic varieties ought to be convinced by any example so clear as that which Italy presents in the difference between the Tuscan or purely Italian type on the one side and the Gallo-Italic on the other. The names in this instance correspond exactly to the facts of the case. For the Gallo-Italic on either side of the Alps is evidently nothing else than a modification—varying in degree, but always very great—of the vulgar Latin, due to the reaction of the language or rather the oral tendencies of the Celts who succumbed to the Roman civilization. In other words, the case is one of new ethnic individualitics arising from the fusion of two national entities, one of which, numerically more or less weak, is so far victorious that its speech is adopted, while the other succeeds in adapt- ing that speech to its own habits of utterance. Genuine Italian, on the other hand, is not the result of the com- bination or conflict of the vulgar Latin with other tongues, but is the pure development of this alone. In other words, the case is that of an ancient national fusion in which vulgar Latin itself originated. Here that is native which in the other case was intrasive—This greater

purity of constitution gives the language a persistency which approaches permanent stability. There is no Old Italian to oppose to Modern Italian in the same sense as we have an Old French to oppose to a Modern French. It is true that in the old French writers, and even in the writers who used the dialects of Upper Italy, there was a tendency to bring back the popular forms to their ancient dignity ; and it is true also that the Tuscan or literary Italian has suffered from the changes of centuries; but nevertheless it remains undoubted that in the former cases we have to deal with general transformations between old

aud new, while in the latter it is evident that the language of Dante continues to be the Italian of modern speech and literature. This character of invariability has thus becn in direct proportion to the purity of its Latin origin, while, on the contrary, where popular Latin has been adopted by peoples of foreign speech, the elaboration which it has undergone along the lines of their oral tendencies becomes always the greater the farther we get away from the point at which the Latin reached them,—in proportion, that is, to the time and space through which it has been trans- mitted in these foreign mouths.

As for the primitive seat of the literary language of Italy, not only must it be regarded as confined within the limits of that narrower Tuscany already described ; strictly speaking, it must be identified with the city of Florence alone. Leaving out of account, therefore, a small number of words borrowed from other Italian dialects, as a certain number have naturally been borrowed from foreign tongues, it may be said that all that was not Tuscan was elimin- ated from the literary form of speech. If we go back to the time of Dante we find, throughout almost all the dialects of the mainland with the exception of Tuscan, the change of vowels between singular and plural seen in paese, paisi; quello, quilli; amore, amuri (see B. 1; C. 3 6); but the literary language knows nothing at all of such a phenomenon, because it was unknown to the Tuscan region. But in Tuscan itself there were differences betwecn Florentine and non-Florentine; in Florentine, e., it was and is usual to say dipignere and pugnere, while the non- Florentine had it dipegnere and pognere (Lat pingere, pungere). Now, it is precisely the Florentine forms which alone have currency in the literary language.

In the ancient compositions in the vulgar tongue, espe- cially in poetry, non-Tuscan authors on the one hand accommodated their own dialect to the analogy of that which they felt to be the purest representative of the lan- guage of ancient Roman culture, while the Tuscan authors ‘n their turn did not refuse to adopt the forms which had reccived the rights of citizenship from the literary celebrities of other parts of Italy. It was this state of matters which gave rise, in past times, to the numerous disputes about the true fatherland and origin of the literary language of the Italians, But these have been deprived of all right to

exist by the scientific investigation of the history of that language. If the older Italian poetry assumed or main- tained forms alien to Tuscan speech, these forms were after- wards gradually eliminated, and the field was left to those which were purely Tuscan and indeed purely Florentine. And thus it remains absolutely true that, so far as phonetics, morphology, rudimental syntax, and in short the whole char- acter and material of words and sentences are concerned, there is no literary language of Europe that is more tt. ee eee

1 A complete analogy is afforded by the history of the Aryan or Sanskrit language in India, which in space and time shows always more and more strongly the reaction of the oral tendencies of the aboriginal races on whom it has been imposed, Thus the Pali pre- sents the ancient Aryan organism in a condition analogous to that of the oldest French, and the Prakrit of the Dramas, on the other hand, in a cordition like that of modern French.

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Condi- tion of Italy in the Middle Ages.

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thoroughly characterized by homogeneity and oneuess, as if it had come forth in a single cast from the furnace, than the Italian.

But on the other hand it remains equally true that, so far as concerns a living confidence and uniformity in the use and style of the literary language—that is, of this Tuscan or Florentine material called to nourish the civilization and culture of all the Italians—the case is not a little altered, and the Italian nation appears to enjoy less fortunate conditions than other nations of Europe. Modern Italy had no glowing centre for the life of the whole nation into which and out of which the collective thought and language could be poured in ceaseless current foralland by all. Florence has not been Paris. Territorial contiguity and the little difference of the local dialect facilitated in the modern Rome the elevation of the language

of conversation to a level with the literary language that.

came from Tuscany. A form of speech was thus produced which, though certainly destitute of the grace and the abundant flexibility of the Florentine, gives a good idea of what the dialect of a city becomes when it makes itself the language of a nation that is ripening its civilization in many and dissimilar centres. In such a case the dialect loses its slang and petty localisms, and at the same time also some- what of its freshness; but it learns to express with more con- scious sobriety and with more assured dignity the thouglit and the feeling of the various peoples which are fused in one national life. But what took place readily in Rome could not with equal ease happen in districts whose dialects were far removed from the Tuscan. In Piedmont, for example, or in Lombardy, the language of conversation did not correspond with the language of books, and the latter accordingly became artificial and laboured. Poetry was least affected by these unfortunate conditions; for poetry may work well with a multiform language, where the need and the stimulus of the author's individuality assert them- selves more strongly. But prose suffered immensely, and the Italians had good cause to envy the spontaneity and confidence of foreign literatures—of the French more par- ticularly. In this reasonable envy lay the justification and the strength of the Manzoni school, which aimed at that absolute naturalness of the literary language, that absolute identity between the language of conversation and that of books, which the bulk' of the Italians could reach and maintain only by naturalizing themselves in the living speech of modern Florence. The revolt of Manzoni against

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artificiality and mannerism in language and style was worthy of his genius, and has been largely fruitful. But the historical difference between the case of France (with the colloquial language of Paris) and that of Italy (with the colloquial language of Florence) implies more than one difficulty of principle ; in the latter case there is sought to be produced by deliberate effort of the literati what in the former has been

and remains the necessary and spon- taneous prodnct of the entire civilization. Manzoni's theories too easily lent themselves to deplorable exaggera- tions; men fell into a new artificiality, a manner of writing which might be called vulgar and almost slangy. The remedy for this must lie in the regulating power of the labour of the now regenerate Italian intellect,—a labour ever growing wider in its scope, more assiduous, and more thoroughly united. :

Literature. —Fernow in the third volume of his Rémische Studien (Zurich, 1806-8) gave a good survey of the dialects of Italy. The dawn of rigorously scientific methods had not then appeared ; but Fernow's view is wide and genial. Similar praise is due to Biondelli's work Sui dialctti gallo-italici (Milan, 1853), which, however, is still ignorant of Diez. Fuchs, between Fernow and Biondelli, had made himself so far acquainted with the new inethods ; but his explora- tion (Ueber die sogenaniten wnregelmdssigen Zeitwérter in den Romanischen Sprachen, nedst Andeutungen tiber dic wichtigsten romanisehen Mundarten, Berlin, 1840), though certainly of utility, was not very successful. Nor can the rapid survey of the Italian dialects given by Diez be ranked among the happiest portions of his great masterpiece. Among the followers of Diez who distin- guished themselves in this department the first outside ot Italy were certainly Mussafia, a cautious and clear continuator of the master, and the singularly acute Schuchardt. Next came the Archivio glottologico italiano (Rome, from 1878).—In historical study applied speci- ally to the literary language Nannucci prepared the way with much sagacity and breadth of view ; it is enough to mention his Analisi critica det verbi italiani (Flor., 1844). Among the works of the disciples of the modern method may here be noted Canello, * Gli allotropiitaliani" (Arch., iii, 285-419) and Caix, Origini della lingua poetica italiana (Florence, 1880), which resolves itself into an accurate historical examination of the dialectal forms that occur in the old poetry.—For almost a quarter of a century a matchless investigator, Giovanni Flechia, has devoted assiduous, keen, and genial labour to the history and description both of the dialects and of the literary language (see Arch., ii. 396, iii. 176). —Biondelli's book is of no small service also for the numerous translations which it contains of the Prodigal Son into Lombard, Piedmontese, and Emilian dialects. A

dialogue translated into the vernaculars of all parts of Italy will be found in Zuccagni Orlandini's Raecolta di dialetti italiant con illustraziont ctnologiche (Florence, 1864). And every dialectal division is abundantly represented in a scries of versions of a short novel of Boccaccio's, which Papanti has pub- lished under the title J parlart ttaliani in Certaldo, &c. (Leghorn, 1875). (G. Tae

PART IV.—LITERATURE.

1. Origins.—There is one characteristic fact that distin- guishes the Italy of the Middle Ages with regard to its intellectual conditions, and that is the tenacity with which the Latin tradition clung to life. At the end of the 5th century the northern conquerors invaded Italy. The Roman world crumbled to pieces. A new kingdom arose at Ravenna under Theodoric, and there learning was not extinguished. The liberal arts flourished, the very Gothic kings surrounded themselves with masters of rhetoric and of grammar. The names of Cassiodorus, of Boetius, of Symmachus, are enough to show how Latin thought main- tained its power amidst the political effacement of the Roman empire. And this thought held its ground through- out the subsequent ages and events. Thus, while elsewhere all culture had died out, there still remained in Italy some schools of laymen,' and some really extraordinary men were educated in them, such as Ennodius, a poet more

See Giesebrecht, De Litterarum Studiis apud Italos primis Medti An Sexeulis, Berlin, 1845. ;

pagan than Christian, Arator, Fortunatus, Venantius, Jovannicius, Felix the grammarian, Peter of Pisa, Paulinus of Aquileia, and many others, in all of whom we notice a contrast between the barbarous age they lived in and their aspiration towards a culture that should reunite them to the classical literature of Rome. 'The Italians never had much love for theological studies, and those who were addicted to them preferred Paris to Italy. It was some- thing more practical, more positive, that had attraction for the Italians, aud especially the study of Roman law. This zeal for the study of jurisprudence furthered the establish- ment of the medieval universities of Bologna, Padua, Vicenza,

Naples, Salerno, Modena, and Parma; and these, in their turn, helped to spread culture, and to prepare the ground in which the new vernacular literature was after- wards to be developed. The tenacity of classical traditions, the affection for the memories of Rome, the preoccupatiou with political interests, particularly shown in the wars of the Lombard communes against the empire of the Hohenstaufens, a spirit more naturally inclined to practice

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than to theory—all this had a powerful influence on the | in fact preceded by two periods of Italian literature Pro- fate of Italian literature. Italy was wanting in that com- | in foreign languages. That is to say, there were many vengal bination of conditions from which the spontaneous life of | Italians who wrote Provengal poems, such as the Marchese eas

a people springs. This was chiefly owing to the fact that | Alberto Malaspina (12th century), Maestro Ferrari of — the history of the Italians never underwent interruption,— | Ferrara, Cigala of Genoa, Zorzi of Venice, Sordcllo of a no foreign. nation having come in to change them and make | Mantua, Buvarello of Bologna, Nicoletto of Turin, and periods.

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them young again. That childlike state of mind and heart, which in other Latin races, as well as in the Germanic, was such a deep source of poetic inspiration, was almost utterly wanting in the Italians, who were always much drawn to history and very little to nature ; so, while legends, tales, epic poems, satires, were appearing and spreading on all sides, Italy was either quite a stranger to this move- ment, or took a peculiar part in it We know, for example, what the Trojan traditions were in the Middle Ages; and we should have thought that in Italy—in the country of Rome, retaining the memory of A‘neas and Virgil—they would have been specially developed, for it was from Virgil that the medieval sympathy for the conquered of Troy was derived. In fact, however, it was not so, A strange book made its appearance in Europe,

no one quite knows when, the Historia de eacidio Trojx, which purported to have been written by. a certain Dares the Phrygian, an eye-witness of the Trojan war. In the Middle Ages this book was the basis of many literary labours. Benoit de Sainte-More composed an interminable French poem founded on it, which afterwards in its turn became a source for other poets to draw from, such as Herbort of Fritzlar and Conrad of Wiirzburg. Now for the curious phe- nomenon displayed by Italy. Whilst Benoit de Sainte- More wrote his poem in French, taking his material from a Latin history, whilst the two German writers, from a French source, made an almost original work in their own language,—an Italian, on the other hand, taking Benoit for

others, who sang of love and of war, who haunted the courts, or lived in the midst of the people, accustoming them to new sounds and new harmonies. At the same time there was other poetry of an epic kind, written in a mixed language, of which French was the basis, but in which forms and words belonging to the Italian dialects were continually mingling. We find in it hybrid words exhibiting a treatment of sounds according to the rules of both languages,—French words with Italian terminations, a system of vocalization within the words approaching the Ttalo-Latin usage,—in short, something belonging at once to both tongues, as it were an attempt at interpenetration, at fusion. Such were the Chanson de Geste, Macaire, the Entrée en Espagne written by Niccola of Padua, the Prise de Pampelune, and some others. All this preceded the appearance of a purely Italian literature.

In the Franco-Italian poems there was, as it were, a Attempts

clashing, a struggle between the two languages, the French, however, gaining the upper hand. This supremacy became gradually less and less. As the struggle continued between French and Italian, the former by degrees lost as much as the latter gained. The hybridism recurred, but it no longer predominated. In the Bovo d'Antona and the Rainardo e Lesengrino the Venetian dialect makes itself clearly felt, although the language is influenced by French forms. Thus these writings, which

Ascoli has called “‘miste” (mixed), immediately preceded the appearance of purely Italian works.

his model, composed in Latin the ZHistoria destructionis It is now an established historical fact that there existed Dialect Trojx ; and this Italian was Guido delle Colonne of Messina, | no writing in Italian before the 13th century. It was in poetry one of the vernacular poets of the Sicilian school, who must | the course of that century, and especially from 12504) a

accordingly have known well how to use his own language. | onwards, that the new literature largely unfolded and Teal

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Guido was an imitator of the Provengals; he understood French, and yet wrote his own book in Latin, nay, changed the romance of the Troubadour into serious history. Much the same thing occurred with the other great legends. That of Alexander the Great gave rise to many French, German, and Spanish poems,—in Italy, only to the Latin distichs of Qualichino of Arezzo, The whole of Europe was full of the legend of Arthur. The Italians contented themselves with translating and with abridging the French romances, without adding anything of their own. The Italian writer could neither appropriate the legend nor colour it with his own tints. Even religious legend, so widely spread in the Middle Ages, and springing up so naturally as it did from the heart of that society, only put out a few roots in Italy. Jacopo di Voragine, while collecting his lives of the saints, remained only an historian, a man of learning, almost a critic who seemed doubtful about the things he related. Italy had none of those books in which the Middle Age, whether in its ascetic or its chival- rous character, is so strangely depicted. The intellectual life of Italy showed itself in an altogether special, positive, almost scientific form, in the study of Roman law, in the chronicles of Farfa, of Marsicano, and of many others, in translations from Aristotle, in the precepts of the school of Salerno, in the travels of Marco Polo,—in short, in a long series of facts which seem to detach themselves from the surroundings of the Middle Age,

and to be united on the one side with classical Rome and on the other with the Renaissance.

The necessary consequence of all this was that the Latin language was most tenacious in Italy, and that the elabora- tion of the new vulgar tongue was very slow,—being

developed itself. This development was simultaneous in the whole peninsula, only there was a difference in the subject-matter of the art. In the north, the poems of Giacomino of Verona and Bonvecino of Riva were specially religious, and were intended to be recited to the people. They were written in a dialect partaking of the Milanese and the Venetian; and in their style they strongly bore the mark of the influence of French narrative poetry. They may be considered as belonging to the popular kind of poetry, taking the word, however, in a broad sense. Perhaps this sort of composition was encouraged by the old custom in the north of Italy of listening in the piazzas and on the highways to the songs of the jongleurs. To the very same crowds who had been delighted with the stories of romance, and who had listened to the story of the wickedness of Macaire and the misfortunes of Blanciflor, another jongleur would sing of the terrors of the Babilonia Infernale and the blessedness of the Gerusalemme celeste, and the singers of religious poetry vied with those of the Chansons de Geste.

In the south of Italy, on the other hand, the love-song Love

prevailed, of which we have an interesting specimen in the

Contrasto attributed to Ciullo d'Alcamo, about which South- ern Italy.

modern Italian critics have much exercised themselves. This "contrasto" (dispute) between a man and a woman in Sicilian dialect certainly must not be considered as the most ancient or as the only southern poem of a popular kind. It belongs without doubt to the time of the emperor Frederick II., and is important as a proof that there existed a popular poetry independent of literary poetry. The Contrasto of Ciullo d'Alcamo is the most remarkable relic of a kind of poetry that has perished or which perhaps

was smothered by the ancient Sicilian literature. Its dis- tinguishing point was its possessing all the opposite qualities to the poetry of the rhymers of what we shall call the Sicilian school. ‘Vigorous in the expression of feelings, it seems to come from a real sentiment. The conceits, which are sometimes most bold and very coarse, show that it proceeded from the lowest grades of society. Everything is original in Ciullo’s Contrasto. Convention- ality has no place in it. It is marked by the sensu- ality characteristic of the people of the South. Siculo- The reverse of all this happened in the Siculo-Provengal Proven- gchool, at the head of which was Frederick II. Imitation els was the fundamental characteristic of this school, to which ‘ belonged Enzio, king of Sardinia, Pier delle Vigne, Inghilfredi, Guido and Odo delle Colonne, Jacopo d’Aquino, Rugieri Pugliese, Giacomo da Lentino, Arrigo Testa, and others, These rhymers never moved a step beyond the ideas of chivalry; they had no originality ; they did not sing of what they felt in their heart; they abhorred the true and the real. They only aimed at copy- ing as closely as they could the poetry of the Provencal troubadours.! The art of the Siculo-Provengal scliool was born decrepit, and there were many reasons for this,—first, because the chivalrous spirit, from which the poetry of the troubadours was derived, was now old and on its death- bed; next, because the Provengal art itself, which the Sicilians took as their model, was in its decadence. It may seem strange, but it is true, that when the emperor Frederick IL, a philosopher, a statesman, a very original legislator, took to writing poetry, he could only copy and amuse himself with absolute puerilities. His art, like that of all the other poets of his court, was wholly con- ventional, mechanical, affected. It was completely wanting in what constitutes poetry,—ideality, feeling, sentiment, inspiration. The Italians have had great disputes among themselves about the original form of the poems of the Sicilian school, that is to say, whether they were written in Sicilian dialect, or in that language which Dante called “volgare, illustre, aulico, cortigiano”; and the question is not yet settled. But now the critics of most authority hold that the primitive form of these poems was the Sicilian dialect, modified for literary purposes with the help of Provencal and Latin; the theory of the

“lingua illustre” has been almost entirely rejected, since we cannot say on what rules it could have been founded, when literature was in its infancy, trying its feet, and lisping its first words, The Sicilian certainly, in accordance with a tendency common to all dialects, in passing from the spoken to the written form, must have gained in dignity ; but this was not enough to create the so-called “lingua illustre,” which was upheld by Perticari and others on grounds rather political than literary. Religious In the 13th century a mighty religious movement took a _. place in Italy, of which the rise of the two great vo etnia, orders of Saint Francis and Saint Dominic was at once the cause and the effect. Around Francis of Assisi a legend has grown up in which naturally the imaginative element prevails. Yet from some points in it we seem to be able to infer that its hero had a strong feeling for nature, and a heart open to the most lively impressions. Many poems are attributed to him. The legend relates that in the eighteenth year of his penance, when almost rapt in ecstasy, he dictated the Cantico del Sole. Even if this hymn be really his, it cannot be considered as a poetical work, being written in a kind of prose simply marked by assonances. As for the other poems, which for a long time were believed to be by Saint Francis, their spuriousness is now generally recognized. The true poet

1 See Gaspary, Die Sicilianische Dichterschule des 13ten Jahrhun- derts, Berlin, 1878.

who represented in all its strength and breadth the religious feeling that had made special progress in Umbria was Jacopo dei Benedetti of Todi, known as Jacopone. The story is that sorrow at the sudden death of his wife had disordered his mind, and that, having sold all he possessed and given it to the poor, he covered himself with rags, and took pleasure in being laughed at, and followed by a crowd of people who mocked him and called after him ‘ Jacopone, Jacopone,” We do not know whether this be true. What we do know is that a vehe- ment passion must have stirred his heart and maintained a despotic hold

over him, the passion of divine love, Under its influence Jacopone went on raving for years and years, subjecting himself to the severest sufferings, and giving vent to his religious intoxication in his poems. There is no art in him, there is not the slightest indication of deliberate effort; there is only feeling, a feeling that absorbed him, fascinated him, penetrated him through and through. His poetry was all inside him, and burst out, not so much in words as in sighs, in groans, in cries that often seem really to come from a monomaniac. But Jacopone was a mystic, who from his hermit's cell looked out into the world and specially watched the papacy, scourging with his words Celestine V. and Boniface VIII. He was put in prison and laden with chains, but his spirit lifted itself up to God, and that was enough for him. The same feeling that prompted him to pour out in song ecstasies of divine love, and to despise and trample on himself, moved him to reprove those who forsook the heavenly road, whether they were popes, prelates, or monks. In Jacopone there was a strong originality, and in the period of the origins of Italian literature he was one of the most characteristic writers.

The religious movement in Umbria was followed by The another literary phenomenon, that of the religious drama, religions In 1258 an old hermit, Raniero Fasani, leaving the cavern &™"*

in which he had lived for many years, suddenly appeared at Perugia. These were very sad times for Italy. The quarrels in the cities, the factions of the Ghibellines and the Guelphs, the interdicts and excommunications issued by the popes, the reprisals of the imperial party, the cruelty and tyranny of the nobles, the plagues and famines, kept the people in constant agitation, and spread abroad mysterious fears. The commotion was increased in Perugia by Fasani, who represented himself as sent by God to disclose mysterious visions, and to announce to the world terrible visitations. Under the influence of fear there were formed "Compagnie di Disciplinanti," who, for a penance, scourged themselves till they drew blood, and sang "Laudi" in dialogue in their confraternities. These "Laudi," closely connected with the liturgy, were the first example of the drama in the vulgar tongue of Italy. They were written in the Umbrian dialect, in verses of eight

syllables, and of course they have not any artistic value. Their development, however, was rapid. As early as the end of the same 13th century we have the Devozont del Giovedt e Venerdt Santo, which have some dramatic ele- ments in them, though they are still connected with the liturgical office, Then we have the representation di un Monaco che andd al servizio di Dio ("of a monk who entered the service of God"), in which there is already an approach to the definite form which this kind of literary work assumed in the following centuries.

In the 13th century Tuscany was peculiarly circum= Tuscan stanced both as regards its literary condition and its poli- poe

tical life. The Tuscans spoke a dialect which most closely resembled the mother-tongue, Latin,—one which afterwards became almost exclusively the language of literature, an

which was already regarded at the end of the 13th century as surpassing the others ; " Lingua Tusca magis apta est

Allego- rical poetry,

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ad literam sive literaturam": thus writes Antonio da Tempo of Padua, born about 1275. Being very little or not at all affected by the Germanic invasion, Tuscany was never subjected to the feudal system. It had fierce internal struggles, but they did not weaken its life; on the contrary, they rather gave it fresh vigour and strengthened it, and (especially after the final fall of the Hohenstaufens at the battle of Benevento in 1266) made it the first province of Italy. From 1266 onwards Florence was in a position to begin that movement of political reform which in 1282 resulted in the appointment of the Priori delle Arti, and the establishment of the Arti Minori. This was afterwards copied by Siena with the Magistrato dei Nove, by Lucca, by Pistoia, and by other Guelph cities in Tuscany with similar popular institutions. In this way the guilds had taken the government into their hands, and it was a time of both social and political prosperity. It was no wonder that literature also rose to an unlooked-for height. In Tuscany, too, there

was some popular love poetry; there was a school of imitators of the Sicilians, their chief being Dante of Majano; but its literary originality took another line—that of humorous and satirical poetry. The entirely democratic form of government created a style of poctry which stood in the strongest antithesis to the mediseval mystic and chivalrous style. Devout invo- cation of God or of a lady came from the cloister and the castle ; in the streets of the cities everything that had gone before was treated with ridicule or biting sarcasm. Folgore of San Gimignano laughs when in his sonnets he tells a party of Sienese youths what are the occupations of every month in the year, or when he teaches a party of Floren- tine lads the pleasures of every day in the week. Ceno della Chitarra laughs when he parodies Folgore's sonnets. The sonnets of Rustico di Filippo are half fun and half satire; laughing and crying, joking and satire, are all to be found in Cecco Angiolieri of Siena, the oldest "humorist" we know, a far-off precursor of Rabelais, of Montaigne, of Jean Paul Richter, of Sydney Smith. But another kind of poetry also began in Tuscany. Guittone d'Arezzo made art quit chivalrous for national motives, Provencal forms for Latin. He attempted political poetry, and, although his work is full of the strangest obscurities, he prepared the way for the Bolognese school. In the 13th century Bologna was the city of science, and philo- sophical poetry appeared there. Guido Guinicelli was the poet after the new fashion of the art. In him the ideas of chivalry are changed and enlarged; he sings of love and together with it of the nobility of the mind. The reigning thought in Guinicelli's Canzonz is nothing external to his own subjectivity. His speculative mind, accus- tomed to wandering in the field of philosophy, transfuses its lucubrations into his art. Guinicelli's poetry has some of the faults of the school of Guittone d'Arezzo: he reasons too much; he is wanting in imagination; his poetry is a product of the intellect rather than of the fancy andthe heart. Nevertheless he marks a great development in the history of Italian art, especially because of his close connexion with Dante's lyric poetry.

But before we come to Dante, certain other facts, not, however, unconnected with his history, must be noticed. In the 13th century there were several poems in the allegorical style. One of these is by

Brunetto Latini, who, it 1s well known, was attached by ties of strong affection to Alighieri. His Z'esoretto is a short poem, in seven- syllable verses, rhyming in couplets, in which the author professes to be lost in a wilderness and to meet with a lady, who is Nature, from whom he receives much instruction. We see here the vision, the allegory, the instruction with a moral object,—three elements which we shall find again in the Divina Commedia. Francesco da Barberino, a

lcarned lawyer who was secretary to bishops, a judge, a notary, wrote two little allegorical poems,—the Documents @Amore and Del Reggimento e dei Costumi delle Donne. Like the Yesoretto, these poems are of no value as works of art, but are, on the other hand, of importance in the history of manners. A fourth allegorical work was the Intelligenza, by some attributed to Dino Compagni, but probably not his, and only a version of French poems.

While the production of Italian poetry in the 13th Prose in century was abundant and varied, that of prose was scanty, 13th cen- The oldest specimen dates from 1231, and consists of short ae notices of entries and expenses by Mattasal& di Spinello dei Lambertini of Siena. In 1253 and 1260 there are some commercial letters of other Sienese. But there is no sign of literary prose. Before we come to any, we meet with a phenomenon like that we noticed in regard to poetry. Here again we find a period of Italian literature in French. Halfway on in the century a certain Aldobrando or Aldobrandino (it is not known whether he was of Florence or of Siena) wrote a book for Beatrice of Savoy, countess of Provence, called Le Régime du Corps. In 1267 Martino da Canale wrote in the same "langue d'oil" a chronicle of Venice. Rusticiano of Pisa, who was for a long while at the court of Edward I. of England, composed many chivalrous romances, derived from the Arthurian cycle, and subse- quently wrote the travels of Marco Polo, which may perhaps have been dictated by the great traveller himself. And finally Brunetto Latini wrote his Z'esoro in French.

Next in order to the original compositions in the langue d'oil come the translations or adaptations from the same. There are some moral narratives taken from religious legends; a romance of Julius Cesar; some short histories of ancient knights; the Zavola Rotonda ; translations of the Viaggi of Marco Polo and of the Zesoro of Latini. At the same time there appeared translations from Latin of moral and ascetic works, of histories, and of treatises on rhetoric and oratory. Up to very recent times it was still possible to reckon as the most ancient works in Italian prose the Cronaca of Matteo Spinello da Giovenazzo, and the Cronaca of Ricordano Malespini. But now both of tlieom have been shown to be forgeries of a much later time. Therefore the oldest prose writing is a scientific book —the Composizione del Mondo by Ristoro d'Arezzo, who lived about the middle of the 13th century. This work is a copious treatise on astronomy and geography. Ristoro was superior to the other writers of the time on these subjects, because he seems to have been a careful observer of natural phenomena, and consequently many of the things he relates were the result of his personal investigations. There is also another short treatise, De Regimine Rectoris, by Fra Paolino, a Minorite friar of Venice, who was probably bishop of Pozzuoli, and who also wrote a Latin chronicle. His treatise stands in close relation to that of Egidio Colonna, De Legz-mine Principum. It is written in the Venetian dialect.

The 13th century was very rich in tales. There is a collection called the Cento Novelle Antiche which contains stories drawn from Oriental, Greek, and Trojan traditions, from ancient and medizval history, from the legends of Brittany, Provence, and Italy, and from the Bible, from the local tradition of Italy as well as from histories of animals and old mythology. This book has a distant resemblance to the Spanish collection known as Z7 Conde Iucanor. The peculiarity of the Italian book is that the stories are very short, and that they seem to be mere outlines to be filled in by the narrator as he goes along. Other prose novels were inserted by Francesco Barberino in his work Del Reggimento e det Costumi delle Donne, but they are of much less importance than the others. On the whole the Italian novels of the 13th century have little originality, and are only a faint reflexion of the very rich

New Tuscan school of lyric poetry.

Guido Caval- canti.

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legendary literature of France. Some attention should be paid to the Lettere of Fra Guittone d'Arezzo, who wrote many poems and also some letters in prose, the subjects of which are moral and religious. Love of antiquity, of the traditions of Rome and of its language, was so strong in Guittone that he tried to write Italian in a Latin style, and it turned out obscure, involved, and altogether barbarous. He took as his special model Seneca, and hence his prose assumed a bombastic style, which, according to his views, was very artistic, but which in fact was alien to the true spirit of art, and resulted in the extravagant and grotesque.

2. The Spontaneous Development of Italian Literature.— In the year 1282, the year in which the new Florentine con- stitution of the 'Arti Minori" was completed, a period of literature began that does not belong to the age of first beginnings, but to that of development. With the school of Lapo Gianni, of Guido Cavalcanti, of Cino da Pistoia, and Dante Alighieri, lyric poetry became exclusively Tuscan. The whole novelty and poetic power of this school, which really was the beginning of Italian art, consist in what Dante expresses so happily—

- **Quando**

Amore spira, noto, ed a quel modo Ch'ei detta dentro, vo significando —"

that is to say, in a power of expressing the feelings of the soul in the way in which love inspires them, in an appropriate and graceful manner, fitting form to matter, and by art fusing one with the other. The Tuscan lyric poetry, the first true Italian art, is pre-eminent in this artistic fusion, in the spontaneous and at the same time deliberate action of the mind, In Lapo Gianni the new style is not free from some admixture of the old associations of the Siculo-Provengal school. He wavered as it

were be- tween two manners. The empty and involved phraseology of the Sicilians is absent, but the poet does not always rid himself of their influence. Sometimes, however, he draws freely from his own heart, and then the subtleties and obscurities disappear, and his verse becomes clear, flowing, and elegant.

Guido Cavalcanti was a learned man with a high con- ception of his art. He felt the value of it, and adapted his learning to it. Cavalcanti was already a good deal out of sympathy with the mediseval spirit ; he reflected deeply on his own work, and from this reflexion he derived his poetical conception. His poems may be divided into two classes,—those which portray the philosopher, 'il sottilis- simo dialettico," as Lorenzo the Magnificent called him, and those which are more directly the product of his poetic nature imbued with mysticism and metaphysics. To the first set belongs the famous poem Sulla Natura d Amore, which in fact is a treatise ou amorous metaphysics, and was annotated later ina learned way by the most renowned Platonic philosophers of the 15th century, such as Marsilius Ficinus and others. In other poems of Cavalcanti's besides this, we see a tendency to subtilize and to stifle the poetic imagery under a dead weight of philosophy. But there are many of his sonnets in which the truth of the images and the elegance and simplicity of the style are admirable, and make us feel that we are in quite a new period of art. This is particularly felt in Cavalcanti's Badlate, for in them he pours himself out ingenuously and without affectation, but with an invariable and profound consciousness of his art. Far above all the others for the reality of the sorrow and the love displayed, for the melancholy longing expressed for the distant home, for the calm and solemn yearning of his heart for the lady of his love, for a deep subjectivity which is never troubled by metaphysical sub- tleties, is the ballata composed by Cavalcanti when he was banished from Florence with the party of the Bianclii in 1300, and took refuge at Sarzana.

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The third poet among the followers of the new school Cino da was Cino da Pistoia, of the family of the Sinibuldi (see Pistoia,

Cryo pa Pistora). His love poems are so sweet, so mellow, and so musical that they are only surpassed by Dante. The pains of love are described by him with vigorous touches ; it is easy to sce that they are not feigned but real, The psychology of love and of sorrow nearly reaches perfection.

As the author of the Vita Nuova, Dante also belongs Dante,

to the same lyric school. This is a little book of poetry and prose, which tells the story of his love for Beatrice, who is pretty generally held to be the daughter of Foleo Portinari. In the lyrics of the Vita Nuova (so called by its author to indicate that his first meeting with Bea- trice was the beginning for him of a life entirely different from that he had hitherto led) there is a high idealization of love. It seems as if there were in it nothing earthly or human, and that the poet had his eyes constantly fixed on heaven, while singing of his lady. Everything is supersensual, aerial, heavenly, and the real Beatrice is always gradually melting more and more into the sym- bolical one—passing out of her human nature and into the divine. The life of Dante covered a period of fifty-six years (1265-1321). In 1289 he fought at Campaldino against the Ghibellines of Arezzo. In 1300 he was pro- bably one of the ambassadors from the Guelphs to Pope Boniface VIII. He was afterwards elected a prior, and it is believed that he took part in the measure for banishing the heads of the factions of the Bianchi and Neri which began that same year in Florence, The Neri betook themselves to Boniface, accusing their adversaries of an understanding with the Ghibellines. For the purpose of meeting these accusations, Dante went to Boniface, but in the meanwhile the latter sent Charles of Valois as a peacemaker, with secret injunctions to crush the Bianchi. Charles fulfilled this part of his mission with zeal. One of the proscribed was Dante, on the charge of illicit gains and of extortion during his priorate. Henceforth the poet's life was a perpetual pilgrimage from one Italian town to another. He was also at Paris in 1308. He hoped great things from the descent of Henry VII. of Luxembourg into Italy, and wrote to

the people and princes to announce the coming of the day of redemption. He had hopes, too, of Uguccione della Faggiuola, leader of the Pisans against Florence (1315). But all his hopes proved vain, and he took refuge with Can Grande della Scala at Verona (1316), © moving on later to Busone di Raffaelli at Gubbio (1318), to Vagano della Torre at Udine (1319), and to Guido Novello da Polenta at Ravenna (1320), where he died the next year.

It appears that Dante began the Convito in his youth, that he continued it in his exile, and never completed it. He named the book the Convito, to signify that a banquet of wisdom was served up in it. He meant to comment on fourteen of his songs, and the commentary was to be the promised serving up of the banquet, But he only composed four out of the fourteen treatises. As has been said by one of Dante's chief admirers in modern Italy, "it is a book of much learning, but the symbolism kills the poetry, and the quotations stifle the real knowledge." The Conmto is very valuable as giving a notion of the mind of Dante — and of his scholastic education. On the other hand, his treatise De Monarchia shows us his political conception. It was probably written in 1310, when the coming of Henry VII. revived such hopes in him. He meant to prove in it that a universal monarchy is necessary to the well-being of the world, that the Roman people had a right to claim the exercise of this office, that the authority of a monarch comes straight from God and not from his vicar, the pope. The De Monarchia is written in scholastic

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Latin, and the treatment is scholastic. Another work of Dante's, also written in Latin, is the De Vulgart Eloquio. It seems that it was to have consisted of four books, but only two were written. His work is a defence of the "volgare illustre" (the noble vulgar tongue) against the Italian dialects. Modern criticism regards it as very superficial.!

he work which made Dante immortal, and raised lim above all the other men of genius in Italy, was his Divina Commedia. The author

himself called it a “ comedy,” as he says in his letter to Can Grande della Scala, for two reasons,—because it has, like comedies, a sad beginning and a cheerful ending, and because it is written ina “middle” style, treating alike of lofty and of lowly things. Alighieri is the protagonist of the great drama. He represents himself as lost in a forest, in a night at the end of March and in the first days of April 1300, when he was thirty-five years old. At first he is much alarmed, but afterwards he is cheered when, at dawn, he finds himself at the foot of a hill. He wishes to ascend it, but three wild beasts prevent his doing so, —a panther, a lion, and a she-wolf. When he flees back in haste to the forest, Virgil appears to him, and tells him that he is sent by Beatrice, at the command of the “Gentle Lady” (Mary) and of St Lucy. He tells him that, in order to escape from the she- wolf, he must go through hell and purgatory with him, and afterwards Beatrice herself will lead him up to heaven. Dante’s Inferno takes the shape of a deep valley, reaching down in constantly narrowing circles from the surface of our hemisphere, in the midst of which stands the mount of Jerusalem, to the centre of the earth. This valley, or inverted cone, is cut by nine circles, where the souls of the damned are tortured; they are divided into three principal classes, viz., the incontinent, the violent, and the fraudulent. ‘The valley is shut in at its entrance by the river Acheron, and afterwards crossed by the Stygian marsh, and the rivers Phlegethon and Cocytus. The two poets pass through the ninth part of each circle, talking to some of the shades they meet, and at last they come to Lucifer, stationed in the centre of the earth. “Grappling at his hair,” they pass the centre of gravity, and begin to ascend a narrow way which brings them to the other hemisphere. They reach a little island, whence rises a very high mountain, which is purgatory. It also is divided into nine circles : in the first two are the souls of those who deferred their repentance till the hour of death; in the others the shades are cleansing themselves from the seven deadly sins. Cato of Utica guards this place. The two poets ascend the mountain, going always to the right hand. On the summit they find the earthly paradise, which is the exact antipodes to the mountain of Jerusalem. Here appear a long train of venerable persons, who precede a chariot drawn by griffins. Beatrice makes her appearance, and with her Dante takes hisflight through the nine heavens, where he sees the souls of the blessed

according to the order of their desert. At the tenth heaven, the Empyrean, he sees them again all together, arranged in the shape of a gleaming rose round a most dazzling centre, which is God. Here the poet contemplates the mysteries of the Trinity and of the manhood of Christ. Then the vision comes to an end,

An allegorical meaning is hidden under the literal one of the Commedia. Dante, travelling through the invisible worlds, is a symbol of mankind aiming at the double Object of temporal and eternal happiness. By the forest in which the poet loses himself is meant the civil and religious confusion of society, deprived of its two guides,

1 See "Sul Trattato de Vulgari Eloquentia," in the Saggi Critici, by Francesco d'Ovidio, Naples, 1879.

the emperor and the pope. The mountain illuminated by the sun is universal monarchy. 'The three beasts are the three vices and the three powers which offered the greatest obstacles to Dante's designs: envy is Florence, light, fickle, and divided by the Bianchi and Neri; pride is the house of France; avarice is the papal court ; Virgil repre- sents reason and the empire. Beatrice is the symbol of the supernatural aid without which man cannot attain the supreme end, which is God.

But the merit of the poem does not lie in the allegory, which still connects it with medizeval literature. What is new in it is the individual art of the poet, the classic art transfused for the first time into a Romance form. Dante is above all a great artist. Whether he describes nature, analyses passions, curses the vices, or sings hymns to the virtues, he is always wonderful for the grandeur and delicacy of his art. Out of the rude medizval vision he has made the greatest work of art of modern times. He took the materials for his poem from theology, from philosophy, from history, from mythology,—but more especially from his own passions, from hatred and love ; and he has breathed the breath of genius into all these materials. Under the pen of the poet, the

dead come to life again; they become men again, and speak the language of their time, of their passions. Farinata degli Uberti, Boniface VIII., Count Ugolino, Manfred, Sordello, Hugh Capet, St Thomas Aquinas, Cacciaguida, St Benedict, St Peter, are all so many objective creations; they stand before usinallthe lifeof their characters, their feelings, their habits.

Yet this world of fancy in which the poet moves is not only made living by the power of his genius, but it is changed by his consciousness. The real chastizer of the sins, the rewarder of the virtues, is Dante himself. The personal interest which he brings to bear on thie historical representation of the three worlds is what most interests us and stirs us. Dante remakes history after his own passions. Thus the Divina Commedia can fairly be called, not only the most life-like drama of the thoughts and feel- ings that moved men at that time, but also the most clear and spontaneous reflexion of the individual feelings of the poet, from the indignation of the citizen and the exile to the faith of the believer and the ardour of the philo- sopher. The Divina Commedia fixed and clearly defined the destiny of Italian literature, to give artistic lustre, and hence immortality, to all the forms of literature which the Middle Ages had produced. Dante begins the great era of the Renaissance.

Two facts characterize the literary life of Petrarch Petrarch.

(1304-1374),—classical research and the new human feeling introduced into his lyric poetry. Nor are these two facts separate; rather is the one the result of the other. The Petrarch who travelled about unearthing the works of the great Latin writers helps us to understand the Petrarch who, having completely detached himself from the Middle Ages, loved a real lady with a human love, and celebrated her in her life and after her death in poems full of studied elegance. Petrarch was the first humanist, and he was at the same time the first lyric poet of the modern school. His career was long and tempestuous. He lived for many years at Avignon, cursing the corruption of the papal court; he travelled through nearly the whole of Europe; he corresponded with emperors aud popes ; he was considered the first man of letters of his

time; he had honours and riches; and he always bore about within him discontent, melancholy, and incapacity for satisfaction, —three characteristics of the modern man.

He wrote many Latin works, the most important of which are the Zpistolz and the poem entitled 4 frica. He was the first to have a style of his own, and to attempt to revive the art of the Latin authors. He specially studied

Boccaccio,

Cicero, and endeavoured to copy him. Perhaps there was a sort of affinity between their characters. The Kpistole are of very great importance for the study of Petrarcli's life and mind, as well as for the history of his times. Africa is a long poem in hexameters on the campaigns of Scipio, which in places shows the gleam of genius. In the Itinerarium Syriacum, and in another work that is now lost, Petrarch appears as the first geographer of modern times.

It isnot very certain who was the lady loved by Petrarch. There are some reasons for believing that she was called Laura De Noves, and was the wife of Ugo de Sade, but this is very far from being proved. It appears anyhow that the lady lived at Avignon.

The Canzoniere is divided into three parts,—the first containing the poems written during Laura's lifetime, the second the poems written after her death, the third the Trionfi. The one and only subject of these poems is love ; but the treatment is full of variety in conception, in imagery, and in sentiment, derived from the most varied impressions of nature. Petrarch's love is real and deep, and to this is due the merit of his lyric verse, which is quite different, not only from that of the Provengal trouba- dours and of the Italian poets before him, but also from the lyrics of Dante. Petrarch is a psychological poet, who dives down into his own soul, examines all his feelings, and knows how to render them with an art of exquisite sweetness. 'The lyrics of Petrarch are no longer transcen- dental like Dante's, but on the contrary keep

entirely within human limits. In struggles, in doubts, in fears, in disappointments, in griefs, in joys, in fact in everything, the poet finds material for his poetry. The second part of the Canzoniere is the more passionate. The Z'rionfi are inferior ; it is clear that in them Petrarch tried to imitate the Divina Commedia, but never came near it.

The Canzoniere includes also a few political poems,—a canzone to Italy, one supposed to be addressed to Cola di Rienzi, and several sonnets against the court of Avignon. These are remarkable for their vigour of feeling, and also for showing that Petrarch had formed the idea of Jtalianita better even than Alighieri. The Italy which he wooed was different from any conceived by the men of the Middle Ages, and in this also he was a precursor of modern times and of modern aspirations. Petrarch lad no decided political idea. He exalted Cola di Rienzi, invoked the emperor Charles IV., praised the Visconti; in fact, his politics were affected more by impressions than by prin- ciples; but above all this reigned constantly the love of Italy, his ancient and glorious country, which in his mind is reunited with Rome, the great city of his heroes Cicero and Scipio.

Boccaccio (1313-1375) had the same enthusiastic love of antiquity and the same worship for the new Italian literature as Petrarch. He was the first, with the help of a Greek born in Calabria, to put together a Latin transla- tion of the Jlzad and the Odyssey. His vast classical learning was shown specially in the work De Genealogia Deorum, in which he enumerates the gods according to genealogical trees constructed on the authority of the various authors who wrote about the pagan divinities. This work marked an era in studies preparatory to the revival of classical learning. And at the sante time it opened the way for the modern criticism, because Boccaccio in his researches and in his own judgment was always independent of the authors whom he most esteemed. The Genealogia Deorum is, as Heeren said, an encyclopzdia of mythological knowledge ; and it was the precursor of the great humanistic movement which was developed in the 15th century. Boccaccio was also the first historian of

1 See Hortis, Studi sulle Opere Latine del Boccaccio, Trieste, 1879, pp. 235, 236.

woinen in his De Clarss Muliersbus, and the first to under- take to tell the story of the great unfortunate in his De Casibus Virorum Illustrium. He continued and perfected former geographical investigations in his interesting book De Montibus, Silvis, Fontibus, Lacubus, Fluminibus, Stagnis, et Paludibus, et de Nominibus Maris, for which he made use of Vibius Sequester, but which contains also many new and valuable observations. He also wrote in Latin several eclogues, some letters, and other minor com-

positions. Of his Italian works his lyrics do not come anywhere near to the perfection of Petrarch's. His sonnets, mostly about love, are quite mediocre. His

narrative poetry is better. Although now he can no longer claim the distinction long conceded to him of having invented the octave stanza (which afterwards became the metre of the poems of Boiardo, of Ariosto, and of Tasso), yet he was certainly the first to use it in a work of some length and written with artistic skill, such as is his Z'eseide. This is a poem in twelve books, and the subject is the love of two Theban youths, Arcita and Palemone, for Emilia, one of the Amazons. We find in it great luxury of description, inflated speeches, much erudition, but little poetry. However, the Z'esede is the oldest Italian romantic poem. The /i/ostrato relates the loves of Troiolo and Griseida (Troilus and Cressida). It may be that Boccaccio knew the French poem of the Trojan war by Benoit de Sainte-More; but the interest of the Italian work lies in the analysis of the passion of love, which is treated with a masterly hand. The Jinfale Fiesolano tells the love story of the nymph Mesola and the shepherd Africo. The Amorosa Visione, a poem in triplets, doubtless owed its origin to the Divina Commedia. The Ameto is a mixture of prose and poetry, and is the first Ttalian pastoral romance.

The Filocopo takes the earliest place among prose romances. In it Boccaccio tells in a laborious style, and in the most prolix way, the loves of Florio and Biancafiore. Probably for this work he drew materials from a popular source or from a Byzantine romance, which Leonzio Pilato may have mentioned to him. In the Filocopo there isa remarkable exuberance in the mythological part, which damages the romance as an artistic work, but which con- tributes to the history of Boccaccio's mind. The Miam- metta is another romance, about the loves of Boccaccio and Maria d'Aquino, a supposed natural daughter of King Robert, whom he always called by this name of Fiammetta.

The Italian work which principally made Boccaccio famous was the Decamerone, a collection of a hundred novels, related by a party of men and women, who had retired to a villa near Florence to escape from the plague in 1348. Novel-writing, so abundant in the preceding cen- turies, especially in France, now for the first time assumed an artistic shape. The style of Boccaccio tends to the imitation of Latin, but in him prose first took the form of elaborated art. The rudeness of the old fadliaux gives place to the careful and conscientious work of a mind that has a feeling for what is beautiful, that has studied the classic authors, and that strives to imitate them as inuch as possible. Over and above this, in the Decamerone, Boccaccio is a delineator of character and an observer of passions, In this lies his novelty. Much has been written about the sources of the novels of the Decamerone. Pro- bably Boccaccio made use both of written and of oral sources, Popular tradition must have furnished him with the materials of many stories, as, for example, that of Griselda.

Unlike Petrarch, who was always discontented, pre- occupied, wearied with life, disturbed by disappointments, we find Boccaccio calm, serene, satisfied with himself and with his surroundings. Notwithstanding these funda-

Minor novelists.

The chro- niclers,

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mental differences in their characters, the two great authors were old and warm friends. But their affection for Dante was not equal. Petrarch, who says that he saw him once in his childhood, did not preserve a pleasant recollection of him, and it would be useless to deny that he was jealous of hisrenown. The Divina Commedia was sent him by Boccaccio, when he was an old man, and he confessed that he never read it. On the other hand, Boccaccio felt for Dante something more than love—enthusiasm. He wrote a biography of him, of which the accuracy is now unfairly depreciated by some critics, and he gave public critical lectures on the poem in Santa Maria del Fiore at Florence.

Fazio degli Uberti and Federigo Frezzi were imitators of the Divina Commedia, but only in its external form. The former wrote the Dettamondo, a long poem, in which the author supposes that he was taken by the geographer Solinus into different parts of the world, and that his guide related the history of them. The legends of the rise of the different Italian cities have some importance historically. Frezzi, bishop of his native town Foligno, wrote the Quadriregio, a poem of the four kingdoms—Love, Satan, the Vices, and the Virtues. This poem has many points of resemblance with the Divina Commedia, Frezzi pictures the condition of man who rises from a state of vice to one of virtue, and describes hell, the limbo, purgatory, and heaven. 'The poet has Pallas for a companion.

Ser Giovanni Fiorentino wrote, under the title of Pecorone, a collection of tales, which are supposed to have been related by a monk and a nun in the parlour of the monastery of Forli. He closely imitated Boccaccio, and drew on Villani's chronicle for his historical stories. Franco Sacchetti wrote tales too, for the most part on subjects taken from Florentine history. His book gives a lifelike picture of Florentine society at the end of the 14th century. The subjects are almost always improper ; but it is evident that Sacchetti collected all these anecdotes in order to draw from them his own conclusions and moral reflexions, which are to be found at the end of every story. From this point of view Sacchetti's work comes near to the Moralisationes of the Middle Ages. A third novelist was Giovanni Sercambi of Lucca, who after 1374 wrote a book,

in imitation of Boccaccio, about a party of people who were supposed to fly from a plague and to go travel- ling about in different Italian cities, stopping here and there telling stories.

It has already been said that the chronicles formerly believed to have been of the 13th century are now regarded as forgeries of later times. At the end of the 13th century, however, we find a chronicle by Dino Compagni, which, not- withstanding the unfavourable opinion of it entertained especially by some German writers, is in all probability authentic. Little is known about the life of Compagni. Noble by birth, he was democratic in feeling, and was a supporter of the new ordinances of Giano della Bella. As prior and gonfalonier of justice he always had the public welfare at heart. When Charles of Valois, the nominee of Boniface VIII., was expected in Florence, Compagni, fore- seeing the evils of civil discord, assembled a number of citizens in the church of San Giovanni, and tried to quiet their excited spirits. His chronicle relates the events that came under his own notice from 1280 to 1312. It bears the stamp of a strong subjectivity. The narrative is con- stantly personal. It often rises to the finest dramatic style. A strong patriotic feeling and an exalted desire for what is right pervade the book. Compagni is more an historian than a chronicler, because he looks for the reasons of events, and makes profound reflexionson them. According to our judgment he is one of the most important authorities for that period of Florentine history, notwithstanding the not Insignificant mistakes in fact which are to be found in his

writings. On the contrary, Giovanni Villani, born in 1300, was more of a chronicler than an historian. He relates the events up to 1347. The journeys that he made in Italy and France, and the information thus acquired, account for the fact that his chronicle, called by him Jstorte Liorentine, comprises events that occurred all over Europe. What specially distinguishes the work of Villani is that he speaks at length, not only of events in politics and war, but also of the stipends of public officials, of the sums of money used for paying soldiers and for public

festivals, and of many other things of which the knowledge is very valuable. With such an abundance of information it is not to be wondered at that Villani's narrative is often encumbered with fables and errors, particularly when he speaks of things that happened before his own time. Matteo was the brother of Giovanni Villani, and continued the chronicle up to 1363. It was again continued by Filippo Villani. Gino Capponi, author of the Commentari del? Acquisto di Pisa and of the narration of the Z'umulto dei Crompi, belonged to both the 14th and the 15th centuries.

The Divina Commedia is ascetic in its conception, and Ascetic in a good many points of its execution. To a large extent writers. similar is the genius of Petrarch ; yet neither Petrarch nor Dante could be classified among the pure ascetics of their time. But many other writers come under this head. St Catherine of Siena's mysticism was political. She was a really extraordinary woman, who aspired to bring back thie Church of Rome to evangelical virtue, and who has left a collection of letters written in a high and lofty tone to all kinds of people, including popes. She joins hands on the one side with Jacopone of Todi, on the other with Savon- arola, Hers isthe strongest, clearest, most exalted religious utterance that made itself heard in Italy in the 14th century. It is not to be thought that precise ideas of reformation entered into her head, but the want of a great moral reform was felt in her heart. And she spoke indeed ex abun- dantia cordis. Anyhow the daughter of Jacopo Benincasa must take her place among those who from afar off pre- pared the way for the religious movement which took effect, especially in Germany and England, in the 16th century.

Another Sienese, Giovanni Colombini, founder of the order of Jesuati, preached poverty by precept and example, going back to the religious idea of St Francis of Assisi. His letters are among the most remarkable in the category of ascetic works in the 14th century. Passavanti, in his Specchio della vera Penitenza, attached instruction to narrative. Cavalca translated from the Latin the Vote dec Santi Padri. Rivalta left behind him many sermons, and Franco Sacchetti (the famous novelist) many discourses. On the whole, there is no doubt that one of the most

important productions of the Italian spirit of the 14th century was the religious literature.

Indirect antithesis with this is a kind of literature which Comic has a strong popular element. Humorous poetry, the poetry poetry. of laughter and jest, which as we saw was largely devel- oped in the 13th century, was carried on in the 14th by Bindo Bonichi, Arrigo di Castruccio, Cecco Nuccoli, Andrea Orgagna, Filippo de' Bardi, Adriano de' Rossi, Antonio Pucci, and other lesser writers. Orgagna was specially comic; Bonichi was comic with a satirical and moral pur- pose. Antonio Pucci was superior to all of them for the variety of his production. He put into triplets the chronicle of Giovanni Villani (Centiloguio), and wrote many historical poems called Serventesi, many comic poems, and not a few epico-popular compositions on various sub- jects. A little poem of his in seven cantos treats of the war between the Florentines and the Pisans from 1862 to 1365. Other poems drawn from a legendary source cele- prate the Reina @Oriente, Apollonio di Tiro, the Bel

Gherardino, &c. These poems, meant to be recited to the XH. — 64

people, are the remote ancestors of the romantic epic, which was developed in the 16th century, and the first represeutatives of which were Boiardo and Ariosto.

Political Many poets of the 14th century have left us political

and works. Of these Fazio degli Uberti, the author of Ditta-

| mondo, who wrote a Serventese to the lords and people of iad Italy, a poem on Rome, a fierce invective against Charles IV. of Luxemburg, deserves notice, and Francesco di Van- nozzo, Frate Stoppa, and Matteo Frescobaldi. It may be said in general that following the example of Petrarch mauy writers devoted themselves to patriotic poetry. From this period also dates that literary phenomenon known under the name of Petrarchism. The Petrarchists, or those who sang of

love, imitating Petrarch's manner, were found already in the 14th century. But others treated the same subject with more originality, in a manner that might be called semi-popular. Such were the Ballate of Ser Giovanni Fiorentino, of Franco Sacchetti, of Niccolo Soldanieri, of Guido and Bindo Douati. Ballate were poems sung to dancing, and we have very many songs for

Histories music of the 14th century. We have already stated that

in verse. Antonio Pucci versified Villani's Chronicle. This instance of versified history is not unique, and it is evidently connected withthe preciselysimilar phenomenon offered by the "vulgar Latin" literature. It is enough to notice a chronicle of Arezzo in terza rima by Gorello de' Sinigardi, and the history, also in terza rima, of the journey of Pope Alexander ITI, to Venice by Pier de' Natali. Besides this, every kind of subject, whether history, tragedy, or husbandry, was treated in verse. Neri di Landocio wrote a life of St Catherine ; Jacopo Gradenigo put the gospels into triplets; Paganino Bonafede in the Tesoro dei Rustict gave many precepts in agriculture, beginning that kind of Georgic poetry which was fully developed later by Alamanni in his Coltivazione, by Girolamo Baruffaldi in the Canapajo, by Rucellai in the Api, by Bartolommeo Lorenzi in the Coltivazione dei Monti, by Giambattista Spolverini in the Coltivazione del Riso, &e.

Drama. There cannot have been an entire absence of dramatic literature in Italy in the 14th century, but traces of it are wanting, although we find them again in great abundance in the 15th century. The 14th century had, however, one drama unique of its kind. In the sixty ycars (1250 to 1310) which ran from the death of the emperor Frederick II. to the expedition of Henry VIL. no emperor had come into Italy. In the north of Italy, Ezzelino da Romano, with the title of imperial vicar, had taken possession of almost the whole of the March of Treviso, and threatened Lombardy. The popes proclaimed a crusade against him, and, crushed by it, the Ezzelini fell. Padua then began to breathe again, and took to extending its dominion. There was living at Padua Albertino Mussato, born in 1261, a year after the catastrophe of the Ezzelini; he grew up among the survivors of a generation that hated

the name of the tyrant. After having written in Latin a history of Henry VII., he devoted himsclf to a dramatic work on Ezzelino, and wrote it also in Latin. The EZccerinus, which was probably never represented on the stage, has been by some critics compared to the great tragic works of Greece. It would probably be nearer the truth to say that it has nothing in common with the works of Aschylus ; but certainly the dramatic strength, the delincation of certain situations, and the narration of certain events are very original. Mussato's work stands alone in the history of Italian dramatic literature. Perhaps this would not have been the case if he had written it in Italian.

In the last years of the 14th century we find the struggle that was soon to break out between the indigenous literary tradition aud the reviving classicism already alive in spirit. As representatives of this struggle, of this

antagonism, we may consider Luigi Marsilio and Coluccio Salutati, both learned men who spoke and wrote Latin, whoaspired to be humanists, but who meanwhile also loved Dante, Pctrarch, and Boccaccio, and felt and celebrated in their writings the beauty of Italian literature.

3. The Renaissance.—A. great intellectual movement, Greco. which had been gathering for a long time, made itself felt ol earning,

in Italy in the 15th century. A number of men arose, all learned, laborious, indefatigable, and all intent on one great work. Such were Niccold Niccoli, Giannozzo Manetti, Palla Strozzi, Leonardo Bruni, Francesco Filelfo, Poggio Bracciolini, Carlo d'Arezzo, Lorenzo Valla. Manetti buried himself in his books, slept only for a few hours in the night, never went out of doors, and spent his time in translating from Greek, studying Hebrew, and com- menting on Aristotle. Palla Strozzi sent into Greece at his own expense to search for ancient books, and had Plutarch and Plato brought for him. Poggio Bracciolini went to the council of Constance, and found in a monastery

in the dust-hole Cicero's Orations. He copied Quintilian.

with his own hand, discovered Lucretius, Plautus, Pliny, and many other Latin authors. Guarino went through the East in search of codices. Giovanni Aurispa returned to Venice with many hundreds of manuscripts. What was the passion that excited all these men? What did they search after? What did they look to? 'These Italians were but handing on the solemn tradition which, although partly latent, was the informing principle of Italian medizval history, and now at length came out triumphant. This tradition was that same tenacious and sacred memory of Rome, that same worship of its language and institu- tions, which at one time had retarded the development of Italian literature, and now grafted the old Latin branch of ancient classicism on the flonrishing stock of Italian litera- ture. All this is but the continuation of a phenomenon that has existed for ages. It is the thought of Rome that always dominates Italians, the thought that keeps appearing from Boetius to Dante Alighieri, from Arnold of Brescia to Cola di Rienzi, which gathers strength with Petrarch and Boccaccio, and finally becomes triumph- ant in literature and life,—in life, because the modern spirit is fed on the works of the ancients. Men come to have a more just idea of nature: the world is no longer cursed or despised ; truth and beauty join hands ; man is born again ; and human reason resumes its rights, Every- thing, the individual and society, are changed under the influence of new facts,

First of all there was formed a human individuality, New which was wanting in the Middle Ages. As Burckhardt social

has said, the man was changed into the individual. He began to feel and assert his own personality, which was constantly attaining a fuller realization. As a consequence of this, the idea of fame and the desire for it arose. A really cultured class was formed, in the modern meaning of the word, and the couception was arrived at (completely unknown in former times) that the worth of a man did not depend at all on his birth but ou his personal qualities. Poggio in his dialogue De Mobilitate declares that he entirely agreed with his interlocutors Niccolo Niccoli and Lorenzo de' Medici in the opinion that there is no other nobility but that of personal merit. External life was growing more refined in all particulars ; the man of society was created; rules for civilized life were

made; there was an increasing desire for sumptuous and artistic enter- taiuments. The medieval idea of existence was turned upside down: men who had hitherto turned their thoughts exclusively to heavenly things, and believed exclusively in the divine right, now began to think of beautifying their earthly existence, of making it happy and gay, and returned to a belief in their human rights. This was a great

condl- tions.

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advance, but one which carried with it the seeds of many dangers. The conception of morality became gradually weaker. 'The "fay ce que vouldras " of Rabelais became the first principle of life. Religious feeling was blunted, was weakened, was changed, became pagan again. Finally the Italian of the Renaissance, in his qualities and his passions, became the most remarkable representative of the heights and depths, of the virtues and faults, of humanity. Corruption was associated with all that is most ideal in life ; a profound scepticism took hold of people's minds ; indif- ference to good and evil reached its highest point.

Besides this, a great literary danger was hanging over Italy. Humanism threatened to submerge its youthful national literature. There were authors who laboriously tried to give Italian Latin forms, to do again, after Dante's time, what Guittone d'Arezzo had so unhappily done in the 13th century. Provincial dialects tried to reassert them- selves in literature. The great authors of the 14th century, Dante, Petrarch, Boccaccio, were by many people forgotten

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Canto Carnascialesco to the Lauda. 'The feeling of nature is strong in him,—at one time sweet and melancholy, at another vigorous and deep, as if an echo of the feelings, the sorrows, the ambitions of that deeply agitated life. He liked to look into his own heart with a severe eye, but he was also able to pour himself out with tumultuous fulness. He

described with the art of a sculptor; he satirized, laughed, prayed, sighed, always elegant, always a Florentine, but a Florentine who read Anacreon, Ovid, and Tibullus, who wished to enjoy life, but also to taste of the refinements of art.

Next to Lorenzo comes Poliziano, who also united, and Poliziano.

with greater art, the ancient and the modern, the popular and the classical style. In his Rispedéi and in his Ballate the freshness of imagery and the plasticity of form are inimitable. He, a great Greek scholar, wrote Italian verses with dazzling colours; the purest elegance of the Greek sources pervaded his art in all its varieties, in the Orfeo as well as the Stanze per la Giostra.

As a consequence of the intellectual movement towards The aca- the Renaissance, there arose in Italy in the 15th demies. century three academies, those of Florence, of Naples, and of Rome. The Florentine academy was founded by

or despised. It was Florence that saved literature by reconciling the classical models to modern feeling, Florence that

Influence of Flo- rence,

Cosmo I. de' Medici.

succeeded in assimilating classical forms to the "vulgar" art, Still gathering vigour and elegance from classicism, still drawing from the ancient fountains all that they could supply of good and useful, it was able to preserve its real life, to keep its national traditions, and to guide literature along the way that had been opened to it by the writers of the preceding century. At Florence the most celebrated humanists wrote also in the vulgar tongue, and commented on Dante and Petrarch, and defended them from their enemies. Leon Battista Alberti, the learned Greek and Latin scholar, wrote in the vernacular, and Vespasiano da Bisticci, whilst he was constantly absorbed in Greek and Latin manuscripts, wrote the Vite di Uomini Tllustri, valuable for their historical contents, and rivalling the best works of the 14th century in their candour and simplicity. Andrea da Barberino wrote the beautiful prose of the Reals di Francia, giving a colouring of "romanita" to the chivalrous romances. Belcari and Benivieni carry us back to the mystic idealism of earlier times.

But it is in Lorenzo de' Medici that the influence of Florence on the Renaissance is particularly seen. In forming an opinion of him many people are led away by political preconceptions. Even asa statesman, Lorenzo hasa conspicuous place in the history of bis time, and in our day it will not be deemed reasonable to expect that in the age of lordships and principalities he alone should stand out from his time, and not feel the influence of the general condition of Italy. With this, however, we have nothing todo. We have to consider Lorenzo de' Medici as a man of letters ; and as such he is one about whom tradition and reality best agree. His mind was formed by the ancients: he attended the class of the Greek Argyropulos, sat at Platonic banquets, took pains to collect codices, sculptures, vases, pictures, gems, and drawings to ornament the gardens of San Marco and to form the library afterwards called by hisname. In the saloons of his Florentine palace, in his villas at Careggi, Fiesole, and Ambra, stood the wonderful chests painted by Dello with stories from Ovid, the Hercules of Pollajuolo, the Pallas of Botticelli, the works of Filippino and

Verrocchio. Lorenzo de' Medici lived entirely in the classical world ; and yet if we read his poems we only see the man of his time, the admirer of Dante and of the old Tuscan poets, who takes inspiration from the popular muse, and who succeeds in giving to his poetry the colours of the most pronounced realism, as well as of the loftiest idealism,—who passes from the Platonic sonnet to the impassioned triplets of the Amori di Venere, from the grandiosity of the Salve to Nencia and to Beont, from the

Having heard the praises of Platonic philosophy sung by Gemistus Pletho, who in 1439 was at the council of Florence, he took such a liking for those opinions that he soon made a plan for a literary con- gress which was especially to discuss them. Marsilius Ficinus has described the occupations and the entertain- ments of these academicians. Here, he said, the young men learnt, by way of pastime, precepts of conduct and the practice of eloquence ; here grown-up men studied the government of the republic and the family ; here the aged consoled themselves with the belief in a future world. The academy was divided into three classes :—that of patrons, who were members of the Medici family ; that of hearers, among whom sat the most famous men of that age, such as Pico della Mirandola, Angelo Poliziano, Leon Battista Alberti; that of disciples, who were youths anxious to distinguish themselves in philosophical pursuits. It is known that the Platonic academy endeavoured to promote, with regard to art, a second and a more exalted revival of antiquity. The Roman academy was founded by Giulio Pomponio Leto, with the object of promoting the discovery and the investigation of ancient monuments and books. It was a sort of religion of classicism, mixed with learning and philosophy. Platina, the celebrated author of the lives of the first hundred popes, belonged to it. At Naples, the academy known as the Pontaniana was instituted. The founder of it was Antonio Beccadelli, surnamed I Panormita, and after his death the head was I] Poutano, who gave his name to it, and whose mind animated it.

Romantic poems were the product of the moral scepticism Romantic and the artistic taste of the 15th century. Italy never had Poetry.

any true epic poetry in its period of literary birth. Still less could it have any in the Renaissance. It had, how- ever, many poems called Cantdri, because they contained stories that were sung to the people; and besides there were romantic poems, such as the Buovo d'Antona, the Regina Ancroja, and others. But the first to introduce elegance and a new life into this style was Luigi Pulci, who grew up in the house of the Medici, and who wrote the Morgante Maggiore at the request of Lucrezia Tornabuoni, mother of Lorenzo the Magnificent. The material of the Morgante is almost completely taken from an obscure chivalrous poem of the 15th century recently discovered by Professor Pio Rajna, On this foundation Pulci erected a structure of his own, often turning the subject into ridicule, burlesquing the characters, introducing many digressions, now capricious, now scientific, now theo- logical. Pulci's merit consists in having been the first to

raise the romantic epic which had been for two centuries in the hands of story-tellers into a work of art, and in having united the serious and the comic, thus happily depicting the manners and feelings of the time. With a more serious intention Matteo Boiardo, count of Scandiano, wrote his Orlando innamorato, in which he seems to have aspired to embrace the whole range of Carlovingian legends ; but he did not complete his task. We find here too a large vein of humour and burlesque. Still the Ferrarese poet is drawn to the world of romance by a profound sympathy for chivalrous manners and feelings,—that is to say, for love, courtesy, valour, and generosity. A third romantic poem of the 15th century was the Mambriano by Francesco Bello (Cieco of Ferrara). He drew from the Carlovin- gian cycle, from the romances of the Round Table, from classical antiquity. He was a poet of no common genius, and of ready imagination. He showed the influence of Boiardo, especially in something of the fantastic which he introduced into his work.

The development of the drama in the 15th century was very great, This kind of semi-popular literature was born in Florence, and attached

itself to certain popular festivities that were usually held in honour of St John the Baptist,

patron saint of the city. The Sacra Rappresentazione is | in substance nothing more than the development of the |

medieval Jfistero ("mystery-play"). Although it belonged to popular poetry, some of its authors were literary men of much renown. It is enough to notice Lorenzo de' Medici, who wrote San Giovanni e Paolo, and Feo Belcari, author of the Sax Panunzio, the Abramo ed Isac, &e. From the 15th century, some element of the comic-profane found its way into the Sacra Rappresentazione. From its Biblical and legendary conventionalism Poliziano emanci- pated himself in his Orfeo, which, although in its exterior form belonging to the sacred representations, yet substan- tially detaches itself from them in its contents and in the artistic element introduced.

From Petrarch onwards the eclogue was a kind of litera- ture that much pleased the Italians. In it, however, the pastoral element is only apparent, for there is nothing really rural in it. Such is the Arcadia of Jacopo Sannaz- zaro of Naples, author of a wearisome Latin poem De Partu Virginis, and of some piscatorial eclogues. The Arcadia is divided into ten eclogues, in which the festivi- ties, the games, the sacrifices, the manners of a colony of shepherds are described. They are written in elegant verses, but it would be vain to look in them for the remotest feeling of country life. On the other hand, even in this style, Lorenzo de' Medici was superior. His Nencia da Barberino, as a modern writer says, is as it were the new and clear reproduction of the popular songs of the environs of Florence, melted into one majestic wave of octave stanzas. Lorenzo threw himself into the spirit of the bare realism of country life. There is a marked con- trast between this work and the conventional bucolic of Sannazzaro and other writers. A rival of the Medici in this style, but always inferior to him, was Luigi Pulci in his Beca da Dicomano.

The lyric love poetry of this century was unimportant. In its stead we see a completely new style arise, the Canto Carnascialesco. These were a kind of choral songs, which were accompanied with symbolical

masquerades, common in Florence at the carnival. They were written in a metre like that of the ballate; and for the most part they were put into the mouth of a party of workmen and tradesmen, who, with not very chaste allusions, sang the praises of their art. These triumphs and masquerades were directed by Lorenzo himself. At eventide there set out into the city large companies on horseback, playing and singing these songs.

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There are some by Lorenzo himself, which surpass'

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all the others in their mastery of art. That entitled

Bacco ed Arianna is the most famous.

Girolamo Savonarola arose to fight against the literary Religious and social movement of the Renaissance. He wasa Ferrarese teaction, friar, born in 1452, and he came to Florence in 1489, baa

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Some have tried to make out that Savonarola was an apostle of liberty, others that he was a precursor of the Reformation. In truth, however, he was neither the one nor the other. In his struggle with Lorenzo de' Medici, he directed his attack against the promoter of classical studies, the patron of pagan literature, rather than against the political tyrant. Animated by mystic zeal, he took the line of a prophet, preaching against reading voluptuous authors, against the tyranny of the Medici, and calling for popular government. This, however, was not done from a desire for civil liberty, but because Savonarola saw in Lorenzo and his court the greatest obstacle to that return to Catholic doctrine which was his heart's desire; while he thought this return would be easily accomplished if, on the fall of the Medici, the Florentine republic should come into the hands of his supporters. There may be more justice in looking on Savonarola as the forerunner of the Reformation.

If he was so, it was more than he intended. The friar of Ferrara never thought of attacking the papal dogma, and always maintained that he wished to remain within the church of Rome. He had none of the great aspirations of Luther. He only repeated the complaints and the exhortations of St Catherine of Siena; he desired a reform of manners, entirely of manners, not of doctrine. He pre pared the ground for the German and English religious movement of the 16th century, but unconsciously. In the history of Italian civilization he represeuts retrogression, that is to say, the cancelling of the great fact of the Renaissance, and return to mediseval ideas. His attempt to put himself in opposition to his time, to arrest the course of events, to bring the people back to the faith of the past, the belief that all the social evils came from a Medici and a Borgia, his not seeing the historical reality as it was, his aspiring to found a republic with Jesus Christ for its king, —all these things show that Savonarola was more of a fanatic than a thinker. Nor has he any great merit as a writer. He wrote Italian sermons, hymns (laudi), ascetic and political treatises, but they are roughly executed, and only important as throwing light on the history of his ideas. The religious poems of Girolamo Benivieni are better than his, and are drawn from the same inspirations. In these lyrics, sometimes sweet, always warm with religious feeling, Benivieni and with him Feo Belcari carry us back to the literature of the 14th century.

History had neither many nor very good students in the Histories,

15th century. Its revival belonged to the following age. &e. It was mostly written in Latin. Leonardo Bruni of Arezzo wrote the history of Florence, Gioviano Pontano that of Naples, in Latin. Bernardino Corio wrote the history of Milan in Italian, but in a rude way.

Leonardo da Vinci wrote a treatise on painting, Leon Battista Alberti one on sculpture and architecture. But the names of these two men are important, not so much as authors of these treatises, but as being embodiments of another characteristic of the age of the Renaissance,—versatility of genius, power of application along many and varied lines, and of being excellent in all. Leonardo was an architect, a poet, a painter, an hydraulic engineer, and a distinguished mathematician.

Alberti was a musician, studied jurisprudence, was an architect and a draughtsman, and had great fame in literature. He had a deep feeling for nature, an almost unique faculty of assimilating all that he saw and heard. Leonardo and Alberti are representa- tives and almost a compendium in themselves of all that intellectual vigour of the Renaissance age, which m the

| Develop- ment of 'the Re-

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16th century took to developing itself in its individual parts, making way for what has by some been called the golden age of [talian literature.

4. Development of the Renatssance.—The fundamental characteristic of the literary epoch following that of the Renaissance is that it perfected itself in every kind of art, in particular uniting the essentially Italian character of its This period lasted from about 1494 to about 1560; and, strange to say, this very period of greater fruitfulness and literary greatness began from the year 1494, which with Charles VIII.'s descent into Italy marked the beginning of its political decadence and of foreign domination over it. But this is not hard to explain. All the most famous men of the first half of the 16th had been educated in the preceding century. Pietro Pomponazzo was born in 1462, Marcello Virgilio Adriani in 1464, Castiglione in 1468, Machiavelli in

1469, Bembo in 1470, Michelangelo Buonarroti and

Ariosto in 1474, Nardi in 1476, Trissino in 1478, Guicciardini in 1482. Thus it is easy to understand how the literary activity which showed itself from the end of the 15th century to the middle of the following

one was the product of the political and social conditions of the age in which these minds were formed, not of that in which their powers were displayed.

Niccold Machiavelli and Francesco Guicciardini were the chief originators of the science of history. Machia- velli's principal works are the Jstorde Jvorentine, the Discorsi sulla prima Deca di Tito Livio, the Arte della Guerra, and the Principe. His merit consists in having been the creator of the experimental science of politics,—in having observed facts, studied histories, and drawn conse- quences from them. His history is sometimes inexact in facts ; itis rather a political than an historical work. The peculiarity of Machiavelli's genius lay, as has been said, in his artistic feeling for the treatment and discussion of politics in and for themselves, without regard to an im- mediate end,—in his power of abstracting himself from the partial appearances of the transitory present, in order more thoroughly to possess himself of the eternal and inborn kingdom, and to bring it into subjection to himself. His Principe has been the subject of the severest accusations. But now, especially since Macaulay's essay, it is clear to every one that this book was only the result of the civil and moral conditions of Italy, as it still is the faithful portrait of them.!

Next to Machiavelli both as an historian and a states- man, comes Francesco Guicciardini. He taught law for many years at Florence; then, having devoted himself to politics, he was always in the service of the Medici. Leo X. made him governor of Modena, Reggio, and Parma. Clement VII. gave him the appointment of president of the Romagna, and afterwards that of lientenant-general of the army against Charles V., and finally that of governor of Bologna. He worked for the return of the Medici to Florence, defending Duke Alexander from the ac- cusations of the exiles and supporting the election of Cosmo I. Guicciardini was very observant, and endea- voured to reduce his observations to a science. His Storia @Itaha, which extends from the death of Lorenzo de' Medici to 1534, is full of political wisdom, is skilfully arranged in its parts, gives a lively picture of the character of the persons it treats of, and is written in a grand style. He shows a

profound knowledge of the human heart, and depicts with truth the temperaments, the capabilities, and

: Hitherto there has been no complete and objective study on Machiavelli, although very much has been written about him. This want, it is hoped, will be supplied when Signor Villari has completed his work, of which only the first volume has as yet appeared, Niccold Machiavelli ei suot tempt illustrati con nwovi documenti, Florence, 1877.

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the habits of the different European nations. Going back to the causes of events, he looked for the explanation of the divergent interests of princes and of their reciprocal jealousies. The fact of his having witnessed many of the events he related, and having taken part in them, adds authority tv his words. The political reflexions are always deep: in the Penszerz, as Capponi? says, he seems to aim at extracting tlirough self-examination a quintessence, as it were, of the things observed aud done by him,—thus endeavouring to form a political doctrine as adequate as possible in all its parts. Machiavelli and Guicciardini may be considered, not only as distinguished historians, but as originators of the science of history founded on observation.

Inferior to them, but still always worthy of note, were Jacopo Nardi (a just and faithful historian and a virtuous man, who defended the rights of Florence against the Medici before Charles V.), Benedetto Varchi, Giambattista Adriani, Bernardo Segni; and, outside Tuscany, Camillo Porzio, who related the Congiura de Baroni and the history of Italy from 1547 to 1552, Angelo di Costanza, Pietro Bembo, Paolo Paruta, and others.

Ariosto's Orlando Furioso was a continuation of Boiardo's Romantic

Innamorato. romance of chivalry to the style and models of classicism. Ariosto was an artist only for the love of lus art; his sole aim was to make a romance that should please the generation in which he lived. His Orlando has no grave and serious purpose; on the contrary it creates a fantastic world, in which the poet rambles, indulging his caprice, and sometimes smiling at his own work. His great desire is to depict everything with the greatest possible perfection ; the cultivation of style is what occupies him most. In his hands, the style becomes wonderfully plastic to every conception, whether high or low, serious or sportive. The octave stanza reached in him the highest perfection of grace, variety, and harmony.

His cliaracteristic is that he assimilated the epic. Ariosto.

Meanwhile, side by side with the romantic, there was an Heroic

attempt at the historical epic. Vicenza composed a poem called Jtalia luberata dat Got. Full of learning and of the rules of the ancients, he formed himself on the latter, in order to sing of the campaigns of Belisarius; he said that he had forced himself to observe all the rules of Aristotle, and that he had imitated Homer. In this again, we see one of the products of the Renais- sance ; and, although Trissino's work is poor in invention and without any original poetical colouring, yet it helps one to understand better what were the conditious of mind in the 16th century.

Gian Giorgio Trissino of epic.

Lyric poetry was certainly not one of the kinds that Lyne rose to any great height in the 16th century. Originality poetry.

was entirely wanting, since it seemed in that century as if nothing better could be done than to copy Petrarch. Still, even in this style there were some vigorous poets. Monsignore Giovanni Guidiccioni of Lucca (1500-1541) showed that he had a generous heart. In fine sonnets he gave expression to his grief for the sad state to which his country was reduced. Francesco Molza of Modena (1489— 1544), learned in Greek, Latin, and Hebrew, wrote in a graceful style and with spirit. Giovanni

della Casa (1503- 1556) and Pietro Bembo (1470-1547), although Petrar- chists, were elegant. Even Michelangelo Buonarroti was at times a Petrarchist, but his poems bear the stamp of his extraordinary and original genius. And a good many ladies are to be placed near these poets, such as Vittoria Colonna (loved by Michelangelo), Veronica Gambara, Tullia d'Aragona, Giulia Gonzaga, poetesses of great delicacy, and superior in genius to many literary men of their time.

The 16th century had not a few tragedies, but they are Drama.

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2 Storia della Repubblica di Firenze, Florence, 1876.

Bur- lesque and satire.

Didactie works.

all weak. The cause of this was the moral and religious indifference of the Italians, the lack of strong passions and vigorous characters. The first to occupy the tragic stage was Trissino with his Sofonisba, following the rules of the art most scrupulously, but written in sickly verses, and without warmth of feeling. The Oveste and the Ros- munda of Giovanui Rucellai were no better, nor Luigi Alamanni's Antigone. Sperone Speroni in his Canace and Giraldi Cintio in his Orbecche tried to become innovators in tragic literature, but they only succeeded in making it grotesque. Decidedly superior to these was the Zorris- mondo of Torquato Tasso, specially remarkable for the choruses, which sometimes remind one of the chorus of the Greek tragedies.

The Italian comedy of the 16th century was almost entirely modelled on the Latin comedy. They were almost always alike in the plot, in the characters of the old man, of the servant, of the waiting-maid ; and the argument was

often the same. Thus the Zuczdz of Agnolo Firenzuola, and

the Vecchio Amoroso of Donato Giannotti were modelled on comedies by Plautus, as were the Sporta by Gelli, the Marito by Dolce, and others. There appear to be only three writers who should be distinguished among the many who wrote comedies,—Machiavelli, Ariosto, and Giovan Maria Cecchi. In his Afandragora Machiavelli, unlike all the others, composed a comedy of character, creating types which seem living even now, because they were copied from reality seen with a finely observant eye. Ariosto, on the other hand, was distinguished for his picture of the habits of his time, and especially of those of the Ferrarese nobles, rather than for the objective delinea- tion of character. Lastly; Cecchi left in his comedies a treasure of spoken language, which nowadays enables us in a wonderful way to make ourselves acquainted with that age. The notorious Pietro Aretino might also be included in the list of the best writers of comedy.

The 15th century was not without humorous poetry; Antonio Cammelli, surnamed the Pistoian, is specially de- serving of notice, because of his " pungent bonhomie," as Sainte-Beuve called it. But it was Francesco Berni who carried this kind of literature to perfection in the 16th cen- tury. From him the style has been called " bernesque" poetry. In the " Berneschi" we find nearly the same phenomenon that we already noticed with regard to Orlando furioso. It was art for art's sake that inspired and moved Berni to write, as well as Anton Francesco Grazzini called Il Lasca, and other lesser writers. It may be said that there is nothing in their poetry; and it is true that they specially delight in praising low and disgusting things and in jeering at what is noble and serious. Bernesque poetry is the clearestreflexion of that religious and moral scepticism which was one of the characteristics of Italian social life in the 16th century, and which showed itself more or less in all the works of that period, that scepticism which stopped the religious Reformation in Italy, and which in its turn was an effect of historical conditions. The Berneschi, and especially Berni himself, sometimes assumed a satirical tone. But theirs could not be called true satire. Pure satirists, on the other hand, were Antonio Vinciguerra, a Venetian, Lodovico Alamanni, and Ariosto, 'the last superior to the others for the Attic elegance of his style, and for a certain frankness,

passing into malice, which is particularly interesting when the poet talks of himself.

In the 16th century there were not a few didactic works. In his poem of the Api Giovanni Rucellai approaches to the perfection of Virgil. His style is clear and light, and he adds interest to his book by frequent allusions to the events of the time. But of the didactic works that which surpasses all the others in importance is

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Baldassare Castiglione's Cortigiano, in which he imagines a discussion in the palace of the dukes of Urbino between knights and ladies as to what are the gifts required in a perfect courtier. This book is valuable as an illustration of the intellectual and moral state of the highest Italian society in the first half of the 16th century.

Of the novelists of the 16th century, the two most Fiction,

important were Auton Francesco Grazzini and Matteo Bandello,—the former as playful and bizarre as the latter is grave and solemn. As part of the history of the times, we must not forget that Bandello was a Dominican friar and a bishop, but that notwithstanding his novels were very loose in subject, and that he often holds up the ecclesiastics of his time to ridicule.

At a time when admiration for qualities of style, the Transla. desire for classical elegance, was so strong as in the 16th tions,

century, much attention was naturally paid to translating Latin and Greek authors. Among the very numerous translations of the time those of the Mneid and of the Pastorals of Longus the Sophist by Annibal Caro are still famous; as are also the translations of Ovid's Meta- morphoses by Giovanni Andrea dell' Anguillare, of Apuleius's Golden Ass by Firenzuola, and of Plutarch's Lives and Moralia by Marcello Adriani.

The historians of Italian literature are even now in doubt Tasso.

whether Tasso should be placed in the period of the highest developnient of the Renaissance, or whether he should form a period by himself, intermediate between that and the one following. Certainly he was profoundly out of harmony with the century in which he lived. His religious faith, the seriousness of his character, the deep melancholy settled in his heart, his continued aspiration after an ideal perfec- tion, all place him as it were outside the literary epoch represented by Machiavelli, by Ariosto, by Berni. As Carducci has well said, Tasso "is the legitimate heir of Dante Alighieri: he believes, and reasons on his faith by philosophy ; he loves, and comments on his love in a learned style; he is an artist, and writes dialogues of scholastic speculation that would fain be Platonic." He was only eighteen years old when, in 1562, he tried his hand at epic poetry, and wrote inaldo, in which he said that he had tried to reconcile the Aristotelian rules with the variety of Ariosto. He afterwards wrote the Aminta, a pastoral drama of exquisite grace. Butthe work to which he had long turned his thoughts was an heroic poem, and that absorbed all his powers. He himself explains what his imtention was in the three Duzscorst written whilst he was composing the Gerusalemme: he would choose a great and wonderful subject, not so ancient as to have lost all interest, nor so recent as to prevent the poet from embellishing it with invented circumstances; he meant to treat it rigorously according to the rules of the unity of action observed in Greek and Latin poems, but with a far greater variety and splendour of episodes, so that in this point it should not fall short of the romantic poeni ; and finally, he would write it in a lofty and ornate style. This is what Tasso has done in the Gerusalemme Lnberata, the subject of which is the liberation of the sepulchre of Jesus Christ in the 11th century by Godfrey of Bouillon. The poet does not follow faithfully all the historical facts, but sets before us the principal causes of them, bringing inthe supernatural agency of God and Satan. The Gerusalemme is the best heroic poem that Italy can show. It approaches to classical perfection. Its episodes above all are most beautiful. There is profound feeling in it, and everything reflects the melancholy soul of the poet. As regards the style, however, although Tasso studiously endeavoured to keep close to the classical models, one

cannot help noticing that he makes excessive use of meta- phor, of antithesis, of far-fetched conceits; and it 1s

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specially from this point of view that some historians have placed Tasso in the literary period generally known under the name of “ Secentisnio,” and that others, more moderate in their criticism, have said that he prepared the way for it.

5. Period of Decadence.—From about 1559 began a period of decadence in Italian literature. The Spanish rule oppressed and corrupted the peninsula. The minds of men were day by day gradually losing their force ; every high aspiration was quenched. No love of country could any longer be felt when the country was enslaved to a stranger. The suspicious rulers fettered all freedom of thought and word; they tortured Campanella, burned Bruno, made every effort to extinguish all high sentiment, all desire for good. Cesare Balbo says, “if the happiness of the masses consists in peace without industry, if the nobility’s consists in titles without power, if princes are satisfied by acquiescence in their rule without real independ- ence, without sovereignty, if literary men and artists are content to write, paint, and build with the approbation of their contemporaries, but to the contempt of posterity, if a whole nation is happy in ease without dignity and the tranquil progress of corruption,—then no period ever was so happy for Italy as the hundred and forty years from the treaty of Cateau Cambresis to the war of the Spanish succession.” This period is known in the history of Italian literature as the Secentismio. Its writers, devoid of senti- ment, of passion, of thoughts, resorted to exaggeration ; they tried to produce effect with every kind of affectation, with

bombast, with the strangest metaphors, in fact, with what in art is called mannerism, "'barocchism." The utter poverty of the matter tried to cloak itself under exuberance of forms. It seemed as if the writers vied with one another as to who could best burden his art with useless metaphors, with phrases, with big-sonnding words, with affectations, with hyperbole, with oddities, with every- thing that could fix attention on the outer form and draw it off from the substantial element of thought.

At the head of the school of the " Secentisti" comes Giovan Battista Marini of Naples, born in 1569, especially known by a poem called Z'Adone. His aim was to excite wonder by novelties; hence the most extravagant meta- phors, the most forced antitheses, the most far-fetched conceits, are to be found in his book. It was especially by antitheses that he thought he could produce the greatest effect. Sometimes he strings them together one after the other, so that they fill up whole stanzas without a break. Achillini of Bologna followed in Marini's steps.

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and sometimes he showed that he had lyrical capacities, which in better literary surroundings would have brouglit forth excellent fruit. When he sings, for example, of the victories of the Tuscan galleys against the Turks and the pirates of the Mediterranean, he rises to grand imagery, and seems quite another pvet.

Filicaia the Florentine has a certain lyric élan, particu- larly in the songs about Vienna besieged by the Turks, which seems to raise him more than the others above the vices of the time; but even in him we see clearly the rhetorical artifice and the falseness of the conceits. And in general all the lyric poetry of the 17th century may be said to have had the same defects, but in different degrees, —defects which may be summed up as absence of feeling and exaggeration of form. There was no faith; there was no love; and thus art became an exercise, a pastime, a luxury, for a servile and corrupt people.

The belief then arose that it would be sufficient to change The the form in order to restore literature, in forgetfulness that At.

every reform must be tle effect of a change in social and moral conditions. Weary of the bombastic style of the 17th century, full of conceits and antithesis, men said— let us follow an entirely different line, let us fight the turgid style with simplicity. In 1690 the "Academy of Arcadia" was instituted. Its founders were Giovan Maria Crescim-beni and Gian Vincenzo Gravina. The Arcadia was so called because its chief aim and intention were to imitate in literature the simplicity of the ancient shepherds, who were fabulously supposed to have lived in Arcadia in the golden age. As the "Secentisti" erred by an overweening desire for novelty, which made them always go beyond the truth, so the Arcadians proposed to themselves to return to the fields of truth, always singing of subjects of pastoral simplicity, This was obviously nothing else than the substitution of a new artifice for the old oue; and they fell from bombast into effeminacy, from the hyperbolical into the petty, from the turgid into the over-refined. The Arcadia was a reaction against Secentismo, but a reaction which, reversing the movement of that earlier epoch, only succeeded in impoverishing still further and completely withering up the literature. The poenis of the " Arcadians" fill many volumes, and are made up of sonnets, madrigals, canzonets, and blank verse. The one who most distinguished himself among the sonneteers was Felice Zappi. Among the authors of songs Paolo Rolli was illustrious. Innocenzo Frugoni was more famous than all the others, a man of fruitful imagination but of shallow intellect, whose wordy verses nobody now reads.

He had less genius, however, and hence his peculiarities were more extravagant, becoming indeed absolutely ridi- culous. In general, we may say that all the poets of the 17th century were more or less infected with " Marinism."

Whilst the political and social conditions in Italy in the Symp- 17th century were such as to make it appear that every light os 'a of intelligence, all spirit of liberty, was extingnished, there Ee entite appeared in the peninsula, by that law of reaction which prose.

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Thus Alessandro Guidi, although he does not attain to the exaggeration of his master, is emptily bombastic, inflated, turgid, while Fulvio Testi is artificial and affected. Yet Guidi as well as Testi felt the influence of another poet, Gabriello Chiabrera, born at Savona in 1552. In him the Secentismo took another character. Enamoured as he said he was of the Greeks, he made new metres, especially in imitation of Pindar, treating of religious, moral, historical, and amatory subjects. It is easy to understand that a Pindaric style of poetry in the 17th century in Italy could not but end in being altogether arti- ficial, without anything of those qualities which constitute the greatness of the Greek poet. Chiabrera, though elegant enough in form, proves empty of matter, and, in his vain attempt to hide this vacuity, has recourse to poetical orna- ments of every kind. These again, in their turn, become in him a fresh defect. Nevertheless, Chiabrera's school, in the decadence of the 17th century, marks an improvement;

in great part governs human events, some strong and in- dependent thinkers, such as Bernardino Telesio, Giordano Bruno, Tommaso Campanella, Lucilio Vanini, who turned philosophical inquiry into fresh channels, and opened the way for the scientific conquests of Galileo Galilei, the great contemporary of Descartes in France and of Bacon in England. Galileo was not only a great man of science, but also occupied a conspicuous place in the history of letters. A devoted student of Ariosto, he seemed to trans- fuse into his prose the qualities of that great poet,—a clear and frank freedom of expression, a wonderful art of knowing how to say everything with precision and ease, and at the same time with elegance. Galileo's prose is in perfect antithesis to the poetry of his time. Perhaps it is the best prose that Italy has ever had ; it is clear, goes straight to the point, is without rhetorical ornaments and without vulgar slips, artistic without appearing to be so.

Another symptom of revival, a sign of rebellion against Satire,

- Tassoni.

New political condi- tions.

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the vileness of Italian social life, is given us in satire and in particular in that of Salvator Rosa and Alessandro Salvator Rosa, born in 1615, near Naples, was a painter, a musician, and a poet. As a poet he showed that he felt the sad condition of his country, showed that he mourned over it, and gave vent to his feeling (as another satire-writer, Giuseppe Giusti, said) in generosi rabbuffi. His exhortation to Italian poets to turn their thoughts to the miseries of their country as a subject for their song — their country languishing under the tyrant's hands— certain passages where he deplores the effeminacy of Italian habits, a strong apostrophe against Rome, make Salvator Rosa a precursor of the patriotic literature which in- augurated the revival of the 18th century. Tassoni, a man really quite exceptional in this century, was superior to Rosa. He showed independent judgment in the midst of universal servility, and his Secchia Rapita proved that he was an eminent writer. This is an heroic comic poem, which is at the same time an epic and a personal satire. He was bold enough to attack the Spaniards in his Pilipprcke, in which he urged Duke Carlo Emanuele of Savoy to persist in the war against them.

6. The Revival in the 18th Century.—Having for the most part freed itself from the Spanish dominion in the 18th century, the political condition of Italy began to improve. Promoters of this improvement, which was shown in many civil reforms, were Joseph IL, Leopold L, and CharlesI. The work of these princes was copied from the philosophers, who in their turn felt the influence of a general movement of ideas, which was quietly working in many parts of Europe, and which came toa head in the French encyclopedists.

Giambattista Vico was a token of the awakening of historical consciousness in Italy. In his Scienza Nuova he applied himself to the

investigation of the laws govern- ing the progress of the human race, and according to which events are developed. From the psychological study of man he endeavoured to infer the " comune natura delle nazioni," 7.¢., the universal laws of history, or the laws by which civilizations rise, flourish, and fall.

From the same scientific spirit which animated the philosophical investigation of Vico, there was born a different kind of investigation, that of the sources of Italian civil and literary history. Lodovico Antonio Muratori, after having collected in one entire body (erwm Italicarum Scriptores) the chronicles, the biographies, the letters, and the diaries of Italian history from 500 to 1500, after having discussed the most obscure historical questions in the Antiquitates Italice Medit divi, wrote the Annale @Italia, minutely narrating facts derived from authentic sources. Muratori's associates in his historical researches were Scipione Maffei of Verona and Apostolo Zeno of Venice. In his Verona zlustrata the former left, not only a treasure of learning, but an excellent specimen of historical monograph. The latter added much to the erudition of literary history, both in his Déssertazcona Vosstane and in his notes to the Biblioteca dell' Eloquenza Italiana of Monsignore Giusto Fontanini. Girolamo Tiraboschi and the Count Giovanni Maria Mazzuchelli of Brescia devoted themselves to literary history. The latter meant to give in his Scrittort d'Jtalia, not only the biography of all the writers, but an account of their works. Only six volumes were printed, containing the letters A aud B; but the immense materials collected by him are in the Vatican library, and it is to be hoped that some day they may be arranged and published.

While the new spirit of the times led men to the investi- gation of historical sources, it also led them to inquire into the mechanism of economical and social laws. Francesco

Galiani wrote on currency; Gaetano Filangieri wrote a |

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Scienza della Legislaztone. Cesare Beccaria, in his treatise Det Delitti ¢ delle Pene, made a contribution to the reform of the penal system and promoted the abolition of torture.

The man in whom above all others the literary revival Satire,

of the 18th century was most conspicuously embodied was Giuseppe Parini. He was born ina Lombard village in 1729, was mostly educated at Milan, and asa youth was known among the Arcadian poets by the name of Darisbo Elidonio. Even as an Arcadian, however, Parini showed signs of departing from the common type. Ina collec: tion of poems that he published at twenty-three years of age, under the name of Ripano Eupilino, there are some pastoral sonnets in which the poet shows that he had the faculty of taking his scenes from real life, and also some satirical pieces in which he exhibits a spirit of somewhat rude opposition to his own times. These poems are per- haps based on reminiscences of Berni, but at any rate they indicate a resolute determination to assail boldly all the literary conventionalities that surrounded the author. 'This, however, was only the beginning of the battle. Parini lived in times of great social prostration. The nobles and the rich, all given up to ease and to silly gallantry, consumed their lives in ridiculous trifles or in shameless self-indulgence, wasting themselves on immoral "Cicisbeismo," and offering the most miserable spectacle of feebleness of mind and character. It was against this social condition that Parini's muse was directed. Already, improving on the poems of his youth, he had proved himself an innovator in his lyrics, rejecting at once Petrarchism, Secentismo, and Arcadia, the three maladies that had weakened Italian art in the centuries preceding his own, and choosing subjects taken from real life, such as might help in the instruction of his con- temporaries. In the Odi the satirical note is already heard. But it came out more strongly in the poem Del Giorno, in which he imagines himself to be teaching a young Milanese patrician all the habits and ways of gallant life; he shows up all its ridiculous frivolities, and with delicate irony unmasks the futilities of aristocratic habits. Dividing the day into four parts, the Mattino, the Mezzogiorno, the Vespero, the Notte, by means of each of these he describes the trifles of which they were made up, and the book thus assumes a social and

historical value of the highest importance. Parini, satirizing his time, fell back upon truth, and finally made art serve the purpose of civil morality. As an artist, going straight back to classical forms, aspiring to imitate Virgil and Dante, he opened the way to the fine school that we shall soon see rise, that of Alfieri, Foscolo, and Monti. As a work of art, the Giorno is wonderful for the Socratic skill with which that delicate irony is constantly kept up by which he seems to praise what he effectually blames. The verse has new harmonies ; sometimes it is a little hard and broken, not by accident, but as a protest against the Arcadian monotony. Generally it flows majestically, but without that Frugonian droning that deafens the ears and leaves the heart cold.

Gasparo Gozzi's satire was less elevated, but directed towards the same end as Parini's. In his Osservatore, something like Addison's Spectator, in his Gazzetta Veneta, in the Mondo Morale, by means of allegories and novelties he hit the vices with a delicate touch, and inculcated a practical moral with much good sense. Gozzi's satire has some slight resemblance in style to Lucian's. It is smooth and light, but withal it does not go less straight to its aim, which is to point out the defects of society and to correct them. Gozzi's prose is very graceful and lively. It only errs by its overweening affectation of imitating the writers of the 14th century. Another satirical writer of the first half of the 18th century was Giuseppe Baretti of Turm. In a journal called the J'rusta Letterarva he took to lashing

without mercy the works which were then being published in Italy. He had learnt much by travelling ; and especially his long stay in England had contributed to give an independent character to his mind, and made him judge of men and things with much good sense. It is true that his judgments are not always right, but the Frusta Letteraria was the first book of independent criticism, directed parti- cularly against the Arcadians and the pedants.

Everything tended to improvement, and the character of the reform was to throw off the conventional, the false, the artificial, and to return to truth. The drama felt this influence of the times. Apostolo Zeno and

Metastasio (the Arcadian name for Pietro Trapassi, a native of Rome) had endeavoured to make “melodrama and reason com- patible.” The latter in particular succeeded in giving fresh expression to the affections, a natural turn to the dialogue, and some interest to the plot; and if he had not fallen into constant unnatural over-refincment and unseasonable mawkishness, and into frequent anachronisms, he might have been considered as the first dramatic reformer of the 18th century. That honour belongs to Carlo Goldoni, a Venetian. He found comedy either entirely devoted to classical imitation, or given up to extravagance, to coups de thédtre, to the most boisterous succession of unlikely situations, or else treated by comic actors who recited impromptu on a given subject, of which they followed the outline. In this old popular form of comedy, with the masks of pantaloon, of the doctor, of harlequin, of Brighella, &c., Goldoni found the strongest obstacles to his reform. But at last he conquered, creating the comedy of character. No doubt Moliére’s example helped him in this. Goldoni’s characters are always true, but often a little superficial. He studied nature, but he did not plunge into psychological depths. In most of his creations, the external rather than the internal part is depicted. In this respect he is much inferior to Moliére. But on the other hand he surpasses him in the liveliness of the dialogue, and in the facility with which he finds his dramatic situations. Goldoni wrote much, in fact too much (more than one hundred and fifty comedies), and had no time to correct, to polish, to perfect his works, which are all rough cast. But for a comedy of character we must go straight from Machiavelli’s Mandragora to him. Goldoni’s dramatic aptitude is curiously illustrated by the fact that he took nearly all his types from Venetian society, and yet managed to give them an inexhaustible variety, A good many of his comedies were written in Venetian dialect, and these are perhaps the best.

The ideas that were making their way in French society

Dramatic reform.

| Patriotic

Ee in the 18th century, and afterwards brought about the ‘andre. Devolution of 1789, gave a special direction to Italian

turn to literature of the second half of the 18th century. Love of lassic- ideal liberty, desire for equality, hatred of tyranny, created Bs ar Italy a literature which aimed at national objects, seeking to improve the condition of the country by freeing it from the double yoke of political and religious despotism. But all this was associated with another tendency. The Italians who aspired to a political redemption believed that it was inseparable from an intellectual revival, and it seemed to them that this could only be effected by a reunion with ancient classicism,—in other words, by put- ting themselves in more direct communication with ancient Greek and Latin writers. This was a repetition of what had occurred in the first half of the 15th century. The 17th century might in fact be considered as a new Italian Middle Age without the hardness of that iron time, but corrupted, enervated, overrun by Spaniards and French, an age in which previous civilization was cancelled. A Teaction was necessary against that period of history, and & construction on its ruins of a new country and a new

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civilization. There had already been forerunners of this movement; at the head of them the revered Parini. Now the work must be completed, and the necessary force must once more be sought for in the ancient literature of the two classic nations. Patriotism and classicism then were the two principles that inspired the literature which began with Alfieri. He worshipped the Greek and Roman idea Alfieri. of popular liberty in arms against the tyrant. He took the subjects of his tragedies almost invariably from the history of these nations, made continual apostrophes against the despots, made his ancient characters talk like revolutionists of his time ; he did not trouble himself with, nor think about, the truth of the characters; it was enough for him that his hero was Roman in name, that there was a tyrant to be killed, that liberty should triumph in the end. ‘ But even this did not satisfy Alfieri. Before his time and all about him there was the Arcadian school, with its

foolish verbosity, its empty abundance of epithets, its nauseous pastoralizing on subjects of no civil importance. It was necessary to arm the patriotic muse also against all this. If the Arcadians, not excluding the hated Metastasio, : diluted their poetry with languishing tenderness, if they poured themselves out in so many words, if they made such set phrases, it behoved the others to do just the con- trary, to be brief, concise, strong, bitter, to aim at the sublime as opposed to the lowly and pastoral. Having said this, we have told the good and evil of Alfieri. He desired a political reform by means of letters; he saved literature from Arcadian vacuities, leading it towards a national end; he armed himself with patriotism and classicism in order to drive the profaners out of the temple of art. But in substance he was rather a patriot than an artist. In any case the results of the new literary move- ment were copious.

Ugo Foscolo was an eager patriot, who carried into life Foscolo. the heat of the most unbridled passion, and into his art a rather rhetorical manner, but always one inspired by classical models. His life was a most exciting one: he was a soldier with General Massena, a professor of eloquence at the university of Pavia, an exile after 1815. Three strong passions were always united in him—a passion for Italy, for art, and for beautiful women. Foscolo was born at Zante, and took pride in being a Greek. He translated some books of the Jliad, and the Coma Berenices of Catullus. He studied classical authors widely, and in his original works the reflexion of them is perceptible. The Lettere di Jacopo Ortis, inspired by Goethe's Werther, are a love story with a mixture of patriotism; they contain a violent protest against the treaty of Campo Formio, and an outburst from Foscolo's own heart about an unhappy love-affair of his. His passions were sudden and violent ; they came to an end as abruptly as they began ; they were whirlwinds that were over in a quarter of an hour. To one of these passions Ortis owed its origin, and it is perhaps the best, the most sincere, of all his-writings. Even in it he is sometimes pompous and rhetorical, but much less so than he is, for example, in the lectures Dell?' Origine e dell' Ufficio della Letteratura. On the whole, Foscolo's prose is turgid and affected, and reflects the character of the man who always tried to pose, even before himself, in dramatic attitudes. This was indeed the defect of the

Napoleonic epoch ; there was a horror of anything common, simple, natural; everything must be after the model of the hero who made all the world gaze* with wonder at him; everything must assume some heroic shape. In Foscolo this tendency was excessive; and it not seldom happened that, in wishing to play the hero, the exceptional man, the little Napoleon of ladies' drawing-rooms, he be- came false and bad, false in his art, bad in his life. The Sepolcri, which is his best poem, was prompted by high

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piece, not suited for acting, and epic rather than dramatic. Niccolini's tragedies show a rich lyric vein rather than dramatic genius. At any rate he has the merit of having vindicated liberal ideas, and of having opened a new path

to Italian tragedy.

The literary period we are dealing with had three writers Histor.

who are examples of the direction taken by historical study, ans. It seems strange that, after the learned school begun by

feeling, and the mastery of versification shows wouderful art. Perhaps it is to this mastery more than to anything else that the admiration the Sepolcri excites is due. There are most obscure passages in it, as to the meaning of which it would seem as if even the author himself had not formed aclear idea. He left incomplete three hymns to the Graces, in which he sang of beauty as the source of courtesy, of all

Monti. If in Foscolo patriotism and classicism were united, | in a style that could no longer be so, and hence he failed and formed almost one

passion, so much cannot be said | completely to attain his literary goal.. His fame is only of Vincenzo Monti, in whom the artist was absolutely pre- that of a man of a noble and patriotic heart. Not so bad dominant, Yet we must be careful: Monti was a patriot | as tho two histories of Italy is that of the Guerra dell too, but in his own way. He had noone deep feeling that | Zndipendenza Americana. ruled him, or rather the mobility of his feelings is his char- Close to Botta comes Pietro Colletta, a Neapolitan born acteristic; but each of these was a new form of patriot- | nine years after lim. He also in his Storia del Reame ism, that took the place of an old one. He saw danger | di Napoli dal 1734 al 1825 had the idea of defending to his country in the French Revolution, and wrote the | the independence and liberty of Italy in a style borrowed Pellegrino Apostolico, the Bassvilliana, and the Feroniade; | from Tacitus; and he succeeded rather better than Botta. Napoleon's victories caused him to write the Prometeo and | He has a rapid, brief, nervous style, which makes his } the Musagonia; in his anatismo and his Superstizione he | book attractive reading. But it is said that Pietro | attacked the papacy; afterwards he sang the praises of the | Giordani and Gino Capponi corrected it for him. Lazzaro Austrians, Thus every great event made him change his Papi of Lucca, author of the Commentari della Rivoluzione . mind, with a readiness which might seem incredible, but is | Francese dal 1789 al 1814, was not altogether unlike Botta yet most easily explained. Monti was above everything | and Colletta. He also was an historian in the classical an artist; art was his real, his only passion; everything style, and treats his subject with patriotic feeling; but as else in him was liable to change, that alone was persistent. | an artist he perhaps excels the other two. Fancy was his tyrant, and under its rule he had no time At first sight it seems unnatural that, whilst the most The to reason and to see the miserable aspect of his political | burning political passions were raging, and whilst the most Pus tergiversation. It was an overbearing deity that moved | brilliant men of genius in the new classical and patriotic him, and at its dictation he wrote. Pius V1., Napoleon, school were at the height of their influence, a question Francis IL., were to him but passing shadows, to which he should have arisen about " purism" of language. Yet the hardly gives the attention of an hour; that which endures, phenomenon can be easily accounted for. Purism 18 which is

‘eternal to him, is art alone. It were unjust to | another form of classicism and patriotism. In the second accuse Monti of baseness. If we say that nature in giving | half of the 18th century the Italian language was specially him one only faculty had made the poet rich and the man full of French expressions. There was great indifference poor, we shall speak the truth. But the poet was indeed | about fitness, still more about elegance of style. _ Prose rich. Knowing little Greek, he succeeded in making a | then was to be restored for the sake of national dignity, translation of the Jliad which is remarkable for its | and it was believed that this could not be done except by | Homeric feeling, and in his Bassvilliana he is on a level | going back to the writers of the 14th century, to the | with Dante. In fine, in him classical poetry seemed to | “aurei trecentisti,” as they were called, or else to the revive in all its florid grandeur. classics of Italian literature. One of the promoters of the | Niecolint. Monti was born in 1754, Foscolo in 1778; four years | new school was Antonio Cesari of Verona, who republished

high qualities, and of happiness. Here again what most excites our admiration is the harmonious and easy versifica- tion, Among his prose works a high place belongs to his translation of the Sentimental Journey of Sterne, a writer by whom-one can easily understand how Foscolo should have been deeply affected. He went as an exile to England, and died there. He wrote for English readers some Hssays on Petrarch and on the texts of the Decamerone and of Dante, which are remarkable for the time at which they were written, and which may be said to have initiated a new kind of literary criticism in Italy. Foscolo is still greatly admired, and not without reason. His writings stimulate the love of fatherland, and the men that made the revolu- tion of 1848 were largely brought up on them. Still, his fame both as a man and as an artist is now on the decline.

later still was born another poet of the same school, Giambattista Niccolini. In literature he was a classicist ; in politics he was a Ghibelline, a rare exception in Guelph Florence, his birthplace. In translating or, if the expres- sion is preferred, imitating Auschylus, as well as in writing the Discorsi sulla Tragedia Greca, and on the Sublime e Michelangelo, Niccolini displayed his passionate devotion to ancient

literature. In his tragedies he set himself free from the excessive rigidity of Alfieri, and partly approached the English and German tragic authors. He nearly always chose political subjects, striving to keep alive in his com- patriots the love of liberty. Such are Nabucco, Antonto Foscarini, Giovanni da Procida, Lodovico ut Moro, &e, He assailed papal Rome in Arnaldo da Brescia, a long tragic

Muratori, there should have been'a backward movement here, but it is clear that this retrogression was due to the influence of classicism and patriotism, which, if they revived poetry, could not but spoil history. Carlo Botta, born in 1766, was a spectator of French spoliation in Italy and of the overbearing rule of Napoleon. indignation, he wrote a MHistory of Italy from 1789 to 1814; and later on he continued Guicciardini's History up to 1789. He wrote after the manner of the Latin authors, trying to imitate Livy, putting together long and sonorous periods in a style that aimed at being like Boccaccio's, caring little about that which constitutes the critical material of history, ouly intent on declaiming his academic prose for his country's beuefit. Botta wanted to be classical

Hence, excited by

ancient authors, and brought out a new edition, with additions, of the Vocabolario della Crusca. He wrote a dissertation Sopra lo stato presente della Lingua Italvana, and endeavoured to establish the supremacy of Tuscan and of the three great writers Dante, Petrarch, Boccaccio. An

in accordance with that principle he wrote several books, taking pains to copy the " trecentisti " as closely as possible. But patriotism in Italy has always had something municl- pal in it; so to this Tuscan supremacy, proclaimed and upheld by Cesari, there was opposed a Lombard school,

'which would know nothing of Tuscan, and with Dante's

De Vulgari Eloquio returned to the idea of the "lingua illustre." This was an old question, largely and bitterly argued in the Cinquecento

(16th century) by Varchi,

Giordani.

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Speroni, and others. Now thie question came up again quite fresh, as if no one had ever discussed st before. At the head of the Lombard school were Monti and his son-in-law Count Giulio Perticari. This gave Monti an occasion to write Proposta di alcune Corre- ont ed Aggiunte al Vocabolario della Crusca, in which le attacked the Tuscanism of the Crusca, but in a graceful and easy style, such in fact as to form a prose that is one of the most beautiful in Italian literature. Perticari on the other hand, with a very inferior intellect, narrowed and exasperated the question in two treatises Degli Scrittort del Trecento and Dell Amor Patrio di Dante, in which, often disguising oF altering the facts, he only makes con- fusion where there was none. Meantime, however, the impulse was given. The dispute about language took its place beside literary and political disputes, and all Italy took part in it, —Basilio Puoti at Naples, Paolo Costa in the Romagna, Mare' Antonio Parenti at Modena, Salvatore Betti at Rome, Giovanni Gherardini in Lombardy, Luigi Fornaciari at Lucca, Vincenzo Nanuucci at Florence.

A patriot, a classicist, and a purist all at once was Pietro Giordani, born in 1774; he was almost a compendium of the literary movement of the time. His whole life was a battle fought for liberty. Most learned in Greek and Latin authors, and in the Italian trecentisti, he only left a few writings behind him, but they were carefully elaborated in point of style, and his prose was in his time considered wonderful. Now it is icoked on as too majestic, too much laboured in phrases and conceits, too far from nature, too artificial. Giordani closes the literary epoch of the classicists.

7. Contemporary Period.—-At this point the contem- porary period of literature begins. It has been said that the first impulse was given to it by the romantic school, which had as its organ the Conciliatore

established in 1818 at Milan, and on the staff of which were Silvio Pellico, Lodovico di Breme, Giovile Scalvini, 'Tommaso Grossi, Giovanni Berchet, Samuele Biava, and lastly Alessandro Manzoni. It need not be denied that all these men were influenced by the ideas that, especially in Germany, at the beginning of the 19th century constituted the movement called Romanticism. Nevertheless in Italy the course of literary reform took another direction. There 's no doubt that the real head of the reform, or at least its most distinguished man, was Alessandro Manzoni. He formulated in a letter of his the objects of the new school, saying that it aspired to try and discover and express "il vero storico" and "il vero morale," not only as an end, but as the widest and eternal source of the beautiful. And it is precisely realism in art that characterizes Italian literature from Manzoni onwards. The Promessi Spost is the one of his works that has made him immortal. No doubt the idea of the historical novel came to him from Sir Walter Scott, but he succeeded in something more than an historical novel in the narrow meaning of that word; he created an eminently realistic work of art. The romance disappears ; no one cares for the plot, which moreover is of very little consequence. 'The attention is entirely fixed on the power- ful objective creation of the characters. From the greatest to the least they have a wonderful verisimilitude ; they are living persons standing before us, not with the qualities of one time more than another, but with the human qualities of all time. Manzoni is able to unfold a character in all particulars, to display it in all its aspects, to follow it through its different phases. He is able also to seize one moment, and from that moment to make us guess all the rest. Don Abbondio and Renzo are as perfect as Azzeccagarbugli and Il Sarto. i dives down into

Muzio, Castelvetro,

' Manzoni the innermost recesses of the human heart, and draws thence the most subtle psychological reality. In this his

greatness lies, which was recognized first by his companion in genius, Goethe. With the exception of the Promesst Spost, his works are important for the history of thie author's mind, not for the history of literature. Some of them are rather in contrast to that masterpiece, It is chiefly the Innit Saci and the two tragedies that explain why Manzoni became the head of the school of Roman- ticism. It is not to be denied that even as a poet he had gleams of genius, especially where he describes human affections, as in some stanzas of the Znni and in the chorus of the Adelchi. But it is the Promessi Spost alone that places him at the head of the Italian literature of the 19th century, on account of the artistic realism prevailing in + But Manzoni shared this glory with another writer, Giacomo Leopardi. It may seem absurd, but still it is the case, that the mystic, the religious Manzoni, has his place side by side with the poet of atheism and despair: they are indissolubly bound together for all time by an artistic intention, identical although realized by different means. Leopardi was born thirteen years after Manzoni at Recanati, of a patrician family, bigoted and avaricious, and he almost entirely educated himself. His body was deformed, and he was of a sickly habit, so that in the years that bring cheerfulness and laughter to youths and children he shiut himself up in his father's library and studied. He became so familiar with Greek authors that he used afterwards to say that the Greek mode of thought was more clear and living to his mind than the Latin or even the Italian. Solitude, sickness, domestic tyranny, prepared him for profound melancholy. From this he passed into complete religious scepticism. He sought rest in art, and first wrote a Canzone all' Italia and another for the monument of Dante Alighieri (1818), both full of classical and patriotic feeling. They show that for the time, though only for the time, he was of the school of Alfieri, Foscolo, and the others we have spoken of. His love of classicism always continued, but he changed its subject. He passed on into the poetry of sentiment and nature, describing with an unsurpassable realism what he felt and saw. The Passero solttario, the Quiete dopo la Tempesta, the Sabato del Villaggio, are pictures in which objective realism reaches its highest ideality ; whilst beside them there are the U' ltumo Canto di Saffo, the Racordanze, the Genestra, and other poems, in which is poured out all the sorrow that weighs on the unhappy man to whom nature has denied every joy and every

happiness. Everything is terrible and grand in these poems, which are the most agonizing cry in modern litera- ture, uttered with a solemn quietness that at once elevates and terrifies us. 'The poetry of despair never had a more powerful or a more sorrowful voice than this. In this Leopardi surpasses even Byron and Shelley. But, besides being the greatest poet of nature and of sorrow, he was also an excellent prose writer. In his Operette Morali— dialogues and discourses marked by a cold and bitter smile at human destinies which freezes the reader—the clearness of style, the simplicity of language, and the depth of conceptiion are such that perhaps he is not only the first poet since Dante, but also the most perfect writer of prose that Italian literature has had. .

As realism in art gained ground, the positive method in criticism kept pace with it. From the manner of Botta and Colletta history returned to its spirit of learned re- search, as is Shown in such works as the Archivio Storico Ttaliano, established at Florence by Giampietro Vieusseux, the Storia d'Italia nel M edio Evo by Carlo Troya, @ remark- able treatise by Manzoni himself, Sopra alewnt Punti della storia Longobardica in. Ii talia, and the very fine history. of the Vespri Siciliant by Michele Amari. The same positive method is now being applied to literary history.

But alongside of the great artists Leopardi and Manzoni,

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alongside of the learned scholars, there was also in the first half of the 19th century a patriotic literature. To a close observer it will appear that historical learning itself was inspired by the love of Italy. It is well known what Vieusseux's intentions were when he established the Antologia, in which work all Italian liberals took part, and which was suppressed by the action of the Russian Govern- ment. And it is equally well known that the Archzvo

Storico Italiano was, under a different form, a continuation |

of the Antologia. Florence was in those days the asyluia of all the Italian exiles, and these exiles met and shook hands in Vieusseux's rooms, where there was more literary than political talk, but where one thought and one only animated all minds, the thought of Italy.

The literary movement which preceded and was contem- porary with the political revolution of 1848 may be said to be represented by four writers,— Giuseppe Giusti, Francesco Domenico Guerrazzi, Vincenzo Gioberti, and Cesare Balbo.

Giusti wrote epigrammatic satires in popular language. In _

incisive phrase he scourged the enemies of Italy; his : area

manner seemed very original, but it really was partly imitated from Beranger. writer, but a mediocre poet,—too much a poet of occasion. Few of his verses will survive as works of art. Guerrazzi had a great reputation and great influence; he was the author of historical novels written with a political object, such as the Assedio de Firenze, the Battaglia di Benevento, &c. Read with feverish avidity before 1848, these books of his are now almost forgotten. They struck the imagination then by their style, which is partly affected and partly spasmodic. They seemed to be sublime, but were little less than ridiculous. Gioberti had a noble heart and a great mind ; his philosophical works are already as good as dead, but the Primato morale e civile degli Italiani will last as an important document of the times. It is a book false in substance, but inspired by lofty sentiments, and it is written in an easy and eloquent style, although sometimes a little verbose. The Geswita moderno will live as the most tremendous indictment ever written against the Jesuits. Gioberti was a powerful polemical writer; and in polemics he showed his most original and characteristic qualities. Balbo was an earnest student of history, and made history useful for politics. Like Cioberti in his first period, Balbo was zealous for the civil papacy, and for a federation of the Italian states pre- sided over by it. His Sommario della Storia d'Jtalia is the best epitome that exists of the intricate history of Italy. In the Pensiert sulla Storia d'Jtalia he touched on import- ant subjects, which still await treatment. He did not do himself justice in the Meditaziont

Storiche, a work on the philosophy of history, for which he had not the necessary qualifications.

It is not advisable to speak of living authors. only notice the fact that the political revival in Italy seems to have brought forth good fruit also in the fields of literature.

Giosué Carducci, has as yet acquired a reputation that seems certain to last.

Laterature.—The following are the more important recent works relating to the historyof Italian literature:—Emiliani Giudici, Storia della Letteratura Italiana, 2 vols., Florence, 1855; Francesco de Sanctis, Storia della Letteratura Italiana, 2 vols., Naples, 1870; Adolfo Bartoli, Storia della Lettcratura Italiana (the first three

volumes are published), Florence, 1879-80 ; Giosué Carducci, Studi | Letterari, Leghorn, 1874 ; Alessandro d'Ancona, Origini del Teatro |

in Italia, 2 vols., Florence, 1878; Virgili, Francesco Berni, Florence, 1881; Pasquale Villari, Niccolo Machiavelli ¢ i swoi tempi, vol. 1., Florence, 1877; Pio Rajna, Le Fonti dedi' Orlando Furioso, Florence, 1875; Attilio Hortis, Stwdi sulle Opere latine del Boceaceio, 'Trieste, 1879; Francesco de Sanctis, Saggi Critici, 3 vols., Naples, 1872 ; Francesco d'Ovidio, Saggi Critiei, Naples, 1878. (A, BA.)

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IT H—ITI ol7

ITHACA (T6a«y), vulgarly Thiaki (@céxn), is next to Pasco the smallest of the seven Ionian Islands, with an area of about 44 square

miles. It forms an eparchy of the nomos of Cephalonia in the kingdom of Greece, and its population, which was 9873 in 1870, is given by the census of 1879 at 12,222, of whom 6305 were males. The island consists of two mountain masses, connected by a narrow isthmus of hills, and separated by a wide inlet of the sea known as the Gulf of Molo. The northern and greater mass culminates in the heights of Anoi (2066 feet), and the southern in Hagios Stephanos, or Mount Marovugli (2135 fect). Vathy (Bau), the chief town and port of the island, lies at the northern foot of Mount Stephanos, its whitewashed houses stretching for about a mile round the deep bay in the Gulf of Molo, to which it owes its name (cf. Dieppe and such Dutch names as Hollands Diep). As there are only one or two small stretches of arable land in Ithaca, the inhabitants are dependent on commerce for their grain supply ; and olive oil, wine, and currants are the principal products obtained by the cultivation of the thin stratum of soil that covers the calcareous rocks. Goats are fed in considerable number on the brushwood pasture of the hills ; and hares (in spite of Aristotle's supposed assertion of their absence) are exceptionally abundant. The island is divided into four districts:—Vathy, Aeto (or Eagle's Cliff), Anoge (Anoi) or Upland, and Exoge (Exoi) or Outland.

The name Ithaca (Ird«n), like Utica, has been explained by piny, a "colony," which would point to a Phoenician connexion. It has remained attached to the island from the very earliest times with but little interruption of the tradition ; though in Brompton's travels (12th century) and in the old Venetian maps we find it called Fale or Val de Compar, and at a later date it not unfrequently appears as Little Cephalonia. This last name indicates the general character of Ithacan history (if history it can be called) in modern and indeed in ancient times ; for the fame of the island is almost solely due to its position in the Homeric story of Ulysses. Ithaca, according to the Homeric epos, was the royal seat and residence of King Ulysses, and within its narrow limits lies the scene of much of the poem. The island is incidentally described with no small variety of detail, picturesque and topographical ; but the very apparent dcfiniteness of the description has rendered the process of identification pecu- liarly perplexing, and the coincidences betwecn the Ithaca of the Odyssey and the Ithaca of

the present day are sometimes as puzzling as the points of disagreement. The phraseology in which the posi- tion of the island is indicated is of doubtful interpretation, and the important word x@apaa4 would have naturally been rendered " low- lying" if stress of present fact had not forced the commentators to find or fancy such significations as "with low shores" (the shores after all being rather unusually high) or "slanting downwards. The Homeric localitics for which counterparts have been sought are Mount Neritos, Mount Neion, the harbour of Phorcys, the town and palace of Ulysses, the fountain of Arcthusa, the cave of the Naiads, the stalls of the swincherd Eumeus, the orchard of Laertes, and the Korax or Raven Cliff. The master site may be said to be that of the town ; and several of the minor points may be at once dismissed as hopeless of all certainty of recognition. Aimong the "identificationists" there are two schools, one placing the town at Polis on the west coast in the northern half of the island (Leake, Gladstone, &c.), and the other at Aeto on the isthmus. The latter

site, which was advocated by Sir William Gell (Topography and .

Antiquities of Ithaca, London, 1807), has received a great accession to its probability as opposed to the rival theory by the excavations of Dr Schliemann carried on in 1878 and 1878 (see Schliemann, Ithaque, le Péloponnése, Troie, Paris, 1869, also published in Ger- man ; his letter to The Times, September 26, 1878 ; and the author's life. prefixed to Izios, London, 1880). He found that the valley called Polis or city has never been the site of a town, and that the apparent ruins on a neighbouring height supposed to be the acropolis are really a group of castellated rocks. Remains of Cyclopean structures at the spot known as Homer's school (a name of the most modern origin) were the only evidence in favour of the existence of a town in the northern part of the island. On the ridge of Mount Aeto, on the other hand, he found vast Cyclopean walls built of stones even larger than those of Mycene and Tiryns ; and within the area which thcy enclose there may have been, he calculates, 2000 houses similar to those which le actually made out to the number of 190. Fragments of pottery of a Trojan type, of tiles with impressed ornaments, and of a curious handmill were the only relics of the former inhabitants. "In the south-castern ex- tremity of the island

are a number of rooins like stables, averaging 35 feet in length and 10 feet in breadth, partly rock-cut, partly

formed by Cyclopean walls of very huge rudely wrought stones, and in their immediate vicinity thousands of very conimon but most ancient potsherds." Mr Bunbury (Hist. of Ancient Geography, vol. i. p. 83) is disposed to consider this evidence conclusive as to the site of the capital.

See, besides the works already referred to, the separate works on Ithaca by Schreiber, Leipsic, 1829 Riilile von Lilienstern, Berlin, 1832; N. Karavias Grivas (letopia ts vjoou 1éaxys), Athens, 1849; Bowen, London, 1851; and Gandar, Paris, 1854; Hercher, in /lermes, 1866; Leake's Northern Greece; Mure's Tour in Greece; Bursian's Geogr. von Griechenland ; Gladstone, "The Dominions of Ulysses," in Macmullan's Magazine, 1877. A history of the discussions will be found in Buchholz, Die Homertsche Realten, Leipsic, 1871.

ITHACA, the chief town of Tompkins county, New York, U.S., is prettily situated in a township of the same name on the Cayuga Inlet, 14 miles from the southern end of Lake Cayuga, and 142 miles west by south of Albany. It is at the junction of several railways, has gas and water works, and carries on some commerce, of which the shipping of coal from the Pennsylvanian anthracite district forms an important constituent. The manufactures include agri- cultural implements, paper, glass, leather, and machinery. On an eminence to the north-éast rise the handsome build- ings of Cornell university, chartered in 1865 and opened in 1868, in which a marked characteristic is the prominence given to the study of agriculture and the mechanical arts. Sage College was presented to the university by the Hon. H. W. Sage, on condition that women should have the same advantages for education as men. The public library of Ithaca was built and stocked at a cost of £13,000 by the same munificent citizen whose endow- ment of the university is commemorated in its name. The neighbourhood of Ithaca is remarkable for the number of its waterfalls, of which Ithaca Fall, 160 feet high by 150 feet broad, is the chief. The population of the town in 1880 was 9864.

ITINERARIUM. This Latin word, equivalent to road-book, is more particularly employed to designate the descriptions still extant of the ancient Roman roads and routes of traffic, with the stations and distances. It is usual to distinguish two classes, Jténeraria Adnotata or Scripta and Itineraria Picta,—the former having the character of a book, and the latter being a graphic indica- tion of the route in the form of a chart. Of the Itineraria Scripta the most important are:—(1) Jt. Antonina (see Antonini IvinrRaRIUM and AnToNINUs), which consists of two parts, the one dealing with roads in Europe, Asia, and Africa, and the other with familiar sea-routes,—the distances usually measured from Rome (the better MSS. probably represent a revision dating from the time of Dio- cletian ; edited by Tobler, St Gall, 1863); (2) It. Hvero- solymitanum or Burdigalense, which belongs to the 4th century, and contains the route from Bordeaux to Jeru- salem and from Heraclea by Rome to Milan (see Pindar in Verhandl. of the Berlin Academy, 1860; A. de Bar- thélémy in Revue Archedl., 1864 ; Aures, Concordance des voies apollinaires, &c., Nimes, 1868); (3) It. Alexandr, containing a sketch of the march-route of Alexander the Great, mainly derived from Arrian and prepared for Constantius's expedition in 340-345 a.p. (first ed. by Mai, Milan, 1817, since by C. Miiller in Ditbner's Arrianus, Paris, 1846, and by D. Volkmann, Naumb., 1871; see Kluge, De itin. Alexandri, Berlin, 1861). A collected edition of

'the ancient itineraria was issued by Fortia d'Urban, Paris,

1845. Of the Itineraria Picta only one great example has been preserved. This is the famous Tabula Peutingeriana, which, without attending to the shape or relative position of the countries, represents by straight lines and dots of various sizes the roads and towns of the whole Roman world. The best edition is by Desjardins, Paris, 1868. ITIUS PORTUS, a place of no importance in itself, has a kind of factitious interest as the point whence Julius Ceesar sailed from Gaul to Britain. Although Cesar does not mention the Portus in speaking of his first expedition

(55 B.c.), his language in describing it as the naval ren- dezvous before his second invasion (54 B.c.) leaves little doubt that he had sailed from it before. To determine, therefore, the site of the Portus Itius, while it would de- cide one of the most vexed questions of either ancient or modern geography, would go far to fix the spot where the great captain first set foot in England. It is impossible here to describe the controversy, or to detail the argu- ments which at one time or another have heen advanced in favour of every bay between Calais and Boulogne. Modern criticism selects four sites as probable—Boulogne, Wissant, Ambleteuse, and the mouth of the Somme. The first two number most adherents; and in recent criticism Wissant, about 3} miles north-east of Cape Grisnez (Jtiwm Promontorium), has united a majority of voices.

The question turns upon the interpretation of certain passages in Cresar's De Bello Gallieo (iv. 20 sq., v. 1 sg.), with direct and in- direct mentions in other Latin and Greek writers. See also Camden's Britannia, 1659; Du Cange, Dissertations sur la Vie de Saint Louis, diss. xxviii, Portus Itius," 1678; D'Anville, " Dissertation sur le portus Itius," in Mémoires de l Academie des Inscriptions, xxiii., 1761; Airy, 'On the Place of Julius Cesar's Departure from Gaul, &e.," in Avehxologia, 1862; papers by Airy and Guest in the Athenwum, 1851, 1859, 1863; by George Long in the Reader of 1863; by H. L. Long in Gentleman's Magazine, 1846; and an elaborate article by H. J. Heller in the Zeztschrift fiir Allgemeine Erdkunde, vol. xviii., Berlin, 1865; Thomas Lewin, The Invasion of Britain by Julius Cesar, 1862; Cardwell, " Remarks on Julius Cesar's Invasion of Britain," in Arehxologia Cantiana, vol. iii. ; Captain Becher, "Cesar's Invasions of Britain: Nautical Con- clusious on the place of his departure from Gaul, &c.," in Nautical Magazine, 1862; papers by F. de Sauley and General Creuly in the Revue Arechéologique, 1860 and 1863; E. de Sauley, 'Les Expéditions de César en Grande-Bretagne," in Campagnes de César, vol. i., 1862; Abbé Haigneré, Etude sur le portus Itius de Jules César, 1862 ; Von Goler, Casar's galliseher Krieg in den Jahren 58 bis 53 v. Chr., 1858; Id., Céisar's gallischer Krieg im Jahre 51 v. Chr., 1860; H. L'empereur, " L'ancienne voie romaine d'fipéhy," in

Z'Institut, 1864; and A. Wauter's brochure, Wissant l'aneten Portus Iecius, Brussels, 1879.

ITURBIDE, or Yrursipe, Aveustin pE (1783-1824), emperor of Mexico from May 1822 to March 1823, was born September 27, 1783, at Valladolid, now Morelia, in Mexico, where his father, an Old Spaniard from Pampeluna, had settled with his creole wife. After enjoying a better education than was then usual in Mexico, Iturbide entered the military service, and in 1810 held the post of lieutenant in the provincial regiment of his native city. In that year the insurrection under Hidalgo broke out, and Iturbide, more from policy, it would seem, than from principle, served in the royal army. Possessed of splendid courage and brilliant military talents, which fitted him especially for guerilla warfare, the young creole did signal service, and rapidly rose in military rank. In December 1813 Colonel Iturbide, along with General Llano, dealt a crush- ing blow to the revolt by defeating Morelos, the successor of Hidalgo, in the battle of Valladolid ; and the former followed it up by another decisive victory at Puruaran in January 1814. Next year Don Augustin was appointed to the command of the army of the north and to the governorship of the provinces of Valladolid and Guanajuato, but in 1816 grave charges of extortion and violence were brought against him, which led to his recall. Although the general was acquitted, or at least although the inquiry was dropped, he did not resume his commands, but retired into private life for four years, which, we are told, he spent in a rigid course of penance for his former excesses. In 1820 Apodaca, viceroy of Mexico, received instructions from the Spanish cortes to proclaim the constitution promulgated in Spain in 1812, but, although obliged at first to submit to an order by which his power was much curtailed, he secretly cherished the design of reviving the absolute power for Ferdinand VII. in Mexico. Under pretext of putting down the lingering remains of revolt, he

levied troops, and, placing Iturbide at their head, instructed him to proclaim the absolute power of the king. Four years of reflexion, however, had modified the general's views, and now, led both by personal ambition and by patriotic regard for his country, Iturbide

resolved to espouse the cause of national independence. His subsequent proceed- ings—how he issued the Plan of Iguala, on February 24, 1821, how by the refusal of the Spanish cortes to ratify the treaty of Cordova, which he had signed with O'Donoju, le was transformed from a mere champion of monarchy into a candidate for the crown, aud how, hailed by the soldiers as emperor Augustin I. on May 18, 1822, he was compelled within ten months by his arrogant neglect of constitutional restraints, to tender his abdication to a congress which he had forcibly dissolved—will be found detailed under Mexico. Although the congress refused to accept his abdication on the ground that to do so would be to recognize the validity of his election, it permitted the ex-emperor to retire to Leghorn in Italy, while in considera- tion of liis servicesin 1820 a yearly pension of £5000 was couferred upon him. But Iturbide resolved to make one more bid for power; and in 1824, passing from Leghorn to London, he published a Statement, and on May 11th set sail for Mexico. The congress immediately issued an act of outlawry against him, forbidding him to set foot on Mexican soil on pain of death. Ignorant of this, the ex- emperor landed in disguise at Soto la Marina on July 14th. He was almost immediately recognized and arrested, and on July 19, 1824, was shot at Padilla, by order of the state of Tamaulipas, without being permitted an appeal to the general congress. Don Angustin de Iturbide is described by his contemporaries as being of handsome figure and ingratiating manner. His brilliant courage and wonderful success made him the idol of his soldiers, though towards his prisoners he displayed the most cold-blooded cruelty, boasting in one of his despatches of having honoured Good Friday by shooting three hundred excommunicated wretclies. Though described as amiable in his private life, he seems in his public career to have been ambitious and unscrupulous, and by his haughty Spanish temper, impatient of all resistance or control, to lave forfeited the opportunity of founding a secure imperial dynasty. His son Augustin was chosen by the ill-fated emperor Maximilian as his successor.

See Statement of some of the prineipal events in the publie life of Augustin de Iturbide, written by himself, English translation, 1824.

ITZEHOH, one of the busiest commercial towns of northern Germany, is situated on the Stodr, a navigable tributary of the Elbe, in the circle of Steinburg of the Prussian province of Schleswig-Holstein, 32 miles north- west of Hamburg and 15 miles north of Gliickstadt. As chief town of the circle, it is the seat of the usual local courts aud of a head custom-house. The church of St Lawrence, dating from the 12th century, and the building in which the Holstein estates formerly met, are noteworthy. The town has a convent founded in 1256, a high school, a hospital, and other benevolent institutions. The sugar- refinery, which employs some 500 hands, is the largest in Germany. Iron-founding, shipbuilding, and wool-spinning are also carried on, and the manufactures include machinery, tobacco, fishing-nets, chicory, soap, cement, beer, and other articles, Fishing employs some of the 'inhabitants, and the markets for cattle and horses are important. A consider- able trade is carried on in agricultural products and wood, chiefly with Hamburg and Altona. Including the garrison, the population in 1875 was 9776.

Itzehoe is the oldest town in Holstein. Its nucleus was a castle built to restrain the Danes in 809 by Egbert, one of Charlemagne's counts. The community which sprang up around it was diversely called Esseveldoburg, Eselsfleth, and Ezeho. In 1201 the town was destroyed, but it was restored in 1224. To the new town the Liibeck

rights were granted by Adolphus IV. in 1238, and to the old town in 1303. During the Thirty Years' War Itzehoe was twice de- stroyed by the Swedes, in 1644 and 1657, but was rebuilt on each oeeasion. It passcd to Prussia in 1867, with the duchy of Schleswig- Holstein.

IVAN (or Joann, «¢., Joun) L, grand-duke of Moscow from 1328 to 1340, was surnamed Kalita in allusion to the "purse" which he always carried at his girdle. Some have imagined that it contained alms for distribution ; others with greater probability look upon it as characteristic of the miserly habits of the prince. The great importance of Ivan in Russian history is that he was the consolidator of the power of Moscow, the nucleus out of which the empire was to be formed at a

future period. By treachery he procured from Uzbek, the Tatar Khan, the ruin of his rival the prince of Tver, and by craft and bribery made many additions to his territory. He.also induced the metro- politan to reside at Moscow, which brought dignity and influence to the city.

IVAN IL., grand-duke from 1353 to 1359, son of Ivan I, succeeded on the death of his brother Simon Gordi, or the Proud. He appears to have been a kindly man, but, in so far as-his short reign had any effect, it weakened the principality of Moscow.

IVAN III., surnamed the Great, grand-duke from 1462 to 1505, forms one of the most important figures in the annals of Russia, for to him is due the consolidation of the autocracy. His long reign of forty-three years was very beneficial to his country. He was a skilful diplomatist,

. and often brought about by intrigue what others could only

effect by force of arms. Thus he reduced to submission the haughty republic of Novgorod, and united to the prin- cipality of Moscow those of Tver, Rostoff, and Yaroslavl ; he also took Kazan in 1487, but it was not definitively incorporated with Moscow till the reign of IvanIV. He reconquered the territory as far as the river Sozh, which had fallen under the dominion of the Lithuanians. In 1472 he married Sophia, niece of Constantine Palzeologus. In consequence of this union Ivan considered himself the heir of the Byzantine emperors, and adopted the two- headed eagle for his arms. Embassies were sent to foreign powers. Italian architects were invited into Russia, and many learned Greek monks found refuge there from the yoke of the Turks.

IVAN IV., surnamed the Terrible (Groznz), the first ezar of Russia, was a mere child at the time of the death of his father Vasili in 1533. His reign may be divided into three periods :—(1) his minority, under the regency of his stepmother Helen Glinska; (2) from his attaining his majority till the death of his amiable wife Anastasia Romanova, during which time he was a bold and vigorous tuler, and careful of the happiness of his subjects ; and (3) from her death till the conclusion of his reign in 1584, the period signalized by those atrocities which have earned for Ivan such an unenviable reputation. He was the first

Russian sovereign who took the title of Czar, a Slavonic form of Cesar. In 1552 he annexed Kazan, and Astrakhan two years later. In many points of his character Ivan resembles Louis XI., especially in his statecraft and Superstition ; indeed, just as France owed her aggrandize- ment to some of her most cruel sovereigns, so in Russia the greatest tyrants have been the consolidators of the empire. In the time of Ivan a printing press was set up at Moscow, and the first book published (in 1564) was an Apostol—a name given toa collection of the Acts of the Apostles and the apostolic epistles; but persecution was soon directed against the printers, who, from the jealousy of those who gained their livelihood by copying religious books, were compelled to fly from Russia, and were protected by Sigismund II. of Poland. They afterwards Printed the whole Bible at Ostrog in Vollynia in 1581.

In the British Museum is a copy of this book, which formerly belonged to the terrible Ivan. Sir Jerome Horsey, the English ambassador, has written on the fly-leaf, " this Bibell in the Slavonian tonge had owt of the emperor's librari." Siberia was also annexed in this reign through the enterprise of the Cossack Yermak, and the English first opened up commercial intercourse with the country by means of the expedition of Sir Hugh Willoughby and Richard Chancellor in 1553. The English for a long time enjoyed the monopoly of the Russian trade, and it is to some of them that the Russians are indebted for interesting accounts of their land, especially to Dr Giles Fletcher, uncle of the dramatist, whose Russe Common-Wealth (London, 1591) is a mine of valuable information. The atrocities committed by Ivan at Novgorod in 1569, and at Pskov soon afterwards, are well known. It is from foreigners, such as Horsey, that we get minute accounts of his many cruelties. In the British Museum are preserved some of his letters to Queen Elizabeth, of whom he re- quested that an English wife should be chosen for him and sent to Russia. A Lady Mary Hastings, daughter of the earl of Huntingdon, was selected and introduced to the Russian ambassador Pisemski, but when the time drew near for her departure she entreated her father with tears not to send her to such a husband. The miserable tyrant expired in 1584, from grief for his son, whom he had killed in a fit of passion three years before. Like Louis XI, he loved to surround himself with quacks and magicians, some of whom,

according to Horsey, prophesied the day of his death. The latter has left us the following curious notice of him:—

“Thus much to conclude with this emperor Ivan Vasiliwich. He was a goodlie man of person and presence, well favoured, high forehead, shrill voice, a right Sithian, full of readie wisdom, cruell, bloudye, mereiless; his own experience mannaged by direetion both his state and commonwealth affarcs ; was sumptuously intomed in Miehell Arehangel chureh, where he, though garded daye and night, remaines a fearfull spectacle to the memory of such as pass

by or heer his name spoken of, [who] are contented to cross and bless themselves from his resurrection againe.”

IVAN V., czar from 1682 to 1696, was the son of Alexis by his first wife Maria Miloslavskaia. He was infirm both in mind and body. The Narishkins, to which family the widow of Alexis (his second wife) belonged, were anxious that Peter, the next brother, should succeed, but Sopliia, the ambitious daughter of Alexis by his first wife, wished Ivan to rule, so that she might govern in his name. She was ultimately forced, however, into the Devichi mon- astery, and Ivan reigned conjointly with his brother, the government being really in the hands of Peter assisted by his mother, the Narishkins, Dolgoroukis, and Boris Golitzin.

IVAN VLI., czar in 1740-41, was son of Anthony Ulrich of Brunswick by his marriage with Anne, granddaughter of Ivan V. The reign of this unfortunate young man lasted but a year, under the regencies of his mother and Biren. Owing to the success of the revolution under Elizabeth, daughter of Peter the Great, he was confined as a prisoner in Schiltisselburg, and Anthony and Anne with their other children were banished to Kholmogort in the government of Archangel. By long detention in the fortress Ivan became, it is said, half-witted. In the year 1764 certain

_ Lieutenant Mirovich attempted to deliver him from captivity

and proclaim him emperor. Ivan, however, was. slain in the skirmish that ensued, and Mirovich was afterwards publicly executed. According to some, he had been urged to the act by Catherine, who wanted an excuse for putting Ivan to death.

For the Ivans see Soloviev, Istoriya Rossit, 29 vols. ; Oustrialov,

Rousskaya Istoriya, 2 vols.; W. R. 8, Ralston, Early Russian History ; Rambaud, Histoire de la Russe.

IVANOVO, or IvVaNovo-VozNESENSK, the "' Manchester of Russia," a town in the government of Vladimir, 20 miles north-west of Shua, near the river Uvod, and on the road from Shua to Nerakhta. It consists, as the full name implies, of what were originally two villages—Ivanovo, which existed at least as early as the 16th century, and Voznesensk, of much more recent date—united into a town in 1861. Of best note among the public buildings are the cathedral of the Elevation of the Cross, and the church of the Intercession of the Virgin, formerly asso- ciated with an important monastery founded in 1579 and abandoned in 1754. One of the colleges of the town contains a public library. The industrial history of Ivanovo begins with the 18th century. Linen-weaving was introduced in 1751, and in 1776 the manufacture of chintzes was brought from Schliisselburg by some natives of the village. By 1850 the worth of the chintzes amounted to 6,680,875 roubles, and 10,000 workmen were employed in the manufacture of coarse calico. The reports of 1879 show 35 calico-print works, a wool-spinning factory, 6 cotton-weaving factories, 8 bleachworks, 6 iron- works, 3 chemical works, and several minor establish- ments. The workmen number about 15,000 or 20,000. The cotton factories produce to the annual value of 25,000,000 to 30,000,000 roubles; the iron works manu-facture 110,000 poods (1770 tons) of iron, and there is a considerable turn out of boilers and factory machinery. Bast mats are made to the value of 15,000 roubles.

IVORY is essentially equivalent to dentine, that hard substance, not wholly unlike bone, of which most teeth principally consist. By usage,

however, its application has become almost restricted to the dentine of those teeth which are large enough to be available for industrial purposes, viz., the tusks of the elephant, the hippopotamus, the walrus, the narwhal, and the sperm whales.

Ivory consists of an organic matrix or basis substance (which by prolonged boiling is converted into gelatin), per- meated by an immense number of exceedingly fine canals. The matrix is richly impregnated with calcareous salts, which are probably held in some loose form of chemical combination' with it, and is of such consistence that it retains its form after removal of the salts by an acid solvent. The canals start from the axial pulp cavity, and run ina direction generally outwards towards the periphery of the tusk; in the elephant they are of exceptional fineness, being only about ;,'59 of an inch in diameter, and are placed very closely, being separated by intervals not much greater than their own diameter. To the regularity with which the tubes are disposed, and to their small size and frequent curvature, ivory owes its fineness of grain, and probably also its almost perfect elasticity ; whilst to the peculiarities of their curvatures it owes that very charac- teristic pattern of curved decussating lines, like engine turning, which is seen where the surface is a section transverse to the tusk. For, though it is broadly true that the tubes in elephant ivory run from the axis of the tusk to its periphery, they do not run straight, but make a suc- cession of strong bends at regular intervals, and as the light is differently refracted by the basis substance and by the tubes according to the direction they are pursuing, this peculiarity of their course results in producing that pattern found in the dentine of Proboscidea only. Ivory differs from bone in its finer structure and greater elasticity, and in the absence of those larger canals which convey blood- vessels through the substance of bone, and appear upon it as specks or as stripes, according as it is cut transversely or longitudinally. When a transverse section of a tusk cut at a distance from the growing pulp is examined, its niiddle is seen to be occupied by a darkish spot of obviously different structure; this is the last remains of the pulp,

rudely calcified. The outer border of the section consists of a thick layer of cementum, with which the whole tusk is coated, and the rest is ivory, showing the characteristic engine-turning pattern, and, in addition to this, numerous circular lines, concentric with the central spot. These "contour" lines are due to the occurrence of a large number of minute irregular spaces, found in all dentine, but specially abundant and disposed with a greater regu- larity in ivory; they are known as interglobular spaces, from the form of their boundaries when seen under a moderate magnifying power. In the areas occupied by these spaces there is a smaller proportion of lime salts and more organic matter; consequently the ivory is here less dense and more liable to decomposition, and fossil tusks, as well as the less perfectly preserved of mammoth tusks, are frequently found to have broken up into a number of superposed cones, and in transverse section to present many concentric detached rings of ivory more or less friable. See Plate VII. |

Arguing from the analogy of other dentine, it cannot be doubted that the minute tubes and the interglobular spaces are not empty in living ivory, but that they contain pro- toplasmic substance, though how far this may have perished or altered in that portion of the tusk which is extruded and far distant from the growing pulp can only be deter- mined by observations at present wanting. According to Von Bibra's analyses, ivory contains as much as from 40 to 43 per cent. of organic matter, whereas human dentine contains only about 25 per cent. ; of fat it contains from 24 to '34 per cent. It differs from other dentines chiefly in its richness in organic constituents, in the fineness of its tubes, in their peculiarly curved course, and in the abun- dance of interglobular spaces arranged in "contour " lines. The tusks of the elephant are a pair of upper incisor teeth, which may attain to an enormous development. The largest teeth were possessed by the extinct mammoths, of which tusks have been found in Siberia 12 feet and more in length, and weighing 200 ib each. MHolzapffel men- tions one of very fine quality, that was cut up into piano keys in England, which weighed 186 tb, Among recent elephants the African species possess the largest tusks, these attaining to a length of 9 or 10 feet and a weight of 160 ib each, whilst the tusk of an Indian elephant which measured 8 feet in length and weighed 90 ib has been placed on record as

exceptionally large. A pairof African tusks at the London exhibition of 1851 weighed 325 h, and measured 8 feet 6 inches in length and 22 inches in circumference; but authorities acquainted with the African ivory districts give 20 to 50 Ib as the average weight of tusks. In Africa both males and females are furnished with large tusks; but in the Indian species a sexual difference exists, the tusks of the female projecting only a few inches from the gums, while even of the males by no means all are "tuskers." Sanderson says that 10 per cent. of Indian male elephants have very small tusks, while in Ceylon only one in three hundred of the males is powerfully armed. The peculiarity is not always trans- mitted, tuskless sires ("' mucknas") breeding " tuskers," and vice versa. The importance of tusks as giving an advantage in combat to their possessors is sufficiently indicated by the dread of a "tusker' shown by other elephants less favoured. Tusks are often broken by fighting, and always show marks of considerable wear, while even captive elephants, with their shortened tusks, make great use of them for a variety of purposes ; for example, an elephant will, when set to pull at a rope, take it between his molar teeth and pass it over one of his tusks to get a good purchase. Nothing but an extremely strong and elastic material such as ivory is could withstand the strains to which it is constantly exposed.

Captive elephants have their tusks shortened, and the

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ends bound with metal to prevent their splitting; and, as the tusk is continually growing by the conversion of fresh

portions of vascular pulp into ivory, the operation has to |

be repeated. When this is done at intervals of ten years, the segment cut off is valuable, and is sold as ivory; some prefer, however, to cut the tusks much more frequently. In a young elephant the vascular pulp extends beyond the portion of the tusk implanted in the jaw, while in the older animal it does not reach so far; its probable extent has to be borne in mind in shortening the tusk, as if it be encroached upon much suffering is entailed on the animal. Yet the vascular formative pulp of

an elephant's tooth is singularly tolerant of injury without having its function of ivory formation destroyed, and hence it happens that foreigen bodies which have got access into the pulp chamber become solidly enclosed in ivory. The growing end of the tusk is widely open, and its edges are not much thicker than paper ; the cavity which contains the pulp is of conical form, tapering to a point, which is situated at a distance down the tusk, varying, as has been before stated, with the age of the animal. The tusk grows by the con- version of successive portions of the surface of the conical mass of pulp into ivory, whilst fresh pulp is added at the flat base or open end of the tusk. The tusks are deeply implanted in curved bony sockets, which run nearly verti- cally upwards, so that the open growing ends of the tusks are brought up to about the level of the eyes. Hence it is not a rare occurrence for a sportsman's bullet, intended to pierce the elephant's brain, to penctrate the tusk near to its growing end, where the walls of the pulp cavity are quite thin, and to lodge in the "nerve" of its tooth. Indeed sportsmen remark that the forehead shot is less fatal to African than to Asiatic elephants, owing to the size and position of their tusks. The amount of disturb- ance produced by a bullet in the nerve is variable ; some- times the conversion of pulp into ivory goes on with but little interruption, so that the bullet comes to be imbedded in ivory, which fits closely up against it, instead of in pulp as it was at first. Generally the pulp immniediately around it has been so disintegrated by its impact, or by subsequent inflammation, that it is incapable of conversion into normal ivory, and in its place there is a more or less irregular de- velopment of nodular secondary dentine. And sometimes there is a failure to produce even this less highly organized tissue in the immediate proximity of the bullet, which then ultimately comes to lie loose in an irregular cavity com- pletely surrounded by secondary dentine. Of a similar nature is the so-called "abscess in ivory"; this was really an abscess in the formative pulp surrounded by a limiting membrane ; as the conversion of the pulp into ivory went on, calcification passed all round the abscess and enclosed this, pus, membrane, and all, in solid ivory ; and there it is discovered by the ivory cutter as an empty hole lined by a thin dried skin, the old abscess sac.

African natives sometimes spear elephants to death when they have been surrounded by an extemporized barrier of twisted crecpers, and for this purpose some of them climb into trees; they also set traps made of a very heavy piece of wood shod with an iron spearhead, arranged to fall upon the elephant as he passes along a track beneath (Du Chaillu); elsewhere lances of extreme length are used in the same way. The open base of the tooth, containing the formative pulp, looking directly upwards, a spear from above intended to fall upon the head or to " pith" the animal might casily enter it, and break away, leaving the point in the tooth pulp. Ina specimen now in the museum of the Odonto- logical Society, London, such a spear head remained without Stopping the further growth of the tusk, and came to be solidly enclosed in ivory and secondary dentine, although it measures no less than 74 by 14 inches. Not a trace of

its presence was discernible upon the exterior of the tusk, and it was only discovered when the tooth was sawn up. This specimen is not unique, there being said to be another, which has been turned into a cup with the imbedded spear head as its stem; and there is a specimen of a javelin head firmly built in by ivory in the museum of the Royal College of Surgeons, But that an elephant is not wholly indifferent to a large foreign body in the nerve of his tooth is proved by the fact that a notoriously fierce and dangerous "rogue" elephant in Ceylon was found when killed to have been suffering from inflammation and suppuration consequent upon the presence of a bullet in the pulp of a tooth; the supposed madness of the famed elephant of Exeter Change was also found to have been due to the pain of a diseased tooth. A common result of injury to a growing tusk is the conversion of a portion of the pulp into irregular globular masses of secondary den- tine,—sometimes enclosed solidly in the midst of normal ivory, sometimes forming loose masses as big as hen eggs in the pulp cavity, and sometimes stalagmite-like append- ages to its walls. Of course such deviations from normal structure seriously injure its value for industrial purposes, and they are specially apt to occur in domesticated animals whose tusks are being repeatedly shortened, the cut not being invariably made at a sufficient

distance from the apex of the living pulp. But under no circumstances is the ivory from domesticated elephants so highly esteemed as that from the wild animal.

The large balls of secondary dentinc appear on section as a conglomerate of spherical masscs bound together by softer and looser-textured materials; they are sometimes beautiful, but cannot be made much use of. Small spots of globular dentine sometimes occur in the midst of normal ivory, for which no cause can be detected. Malformed tusks are far from rare; the College of Surgeons pos- sesses one about 2 feet in length, the base of which is an irregular mass of osteodentine nearly as large as a man's head. Spiral tusks are also met with, and are almost always the result of some disease of one side of the pulp, leading to a slower growth on the one side than on the other. Much of the ivory of such tusks will be faulty ; they should not be purchased except as curiosities.

The Board of Trade returns for 1879 give as the total weight of ivory imported into England during the year 9414 cwts., of the value of £406,927 ;! but nearly half this quantity appears again amongst the exports. By far the larger portion of the ivory is entered as coming from African ports, and less than one-fourth from India, while from this fourth a further reduction must be made in esti- mating the quantity produced by the country, as a consider- able weight of African ivory from Zanzibar, &c., is shipped from Bombay. About 1080 cwts. is entered as " from other countries." 2

The best ivory is the African, and the first quality of that comes from near the equator; much is brought down by natives by land from the interior, whilst in other districts expeditions are organized by Europeans to go into the interior, and collect the stores gathered by native tribes ; 20,000 th, valued at Khartoum at £4000, would he considered a good result for a season's expedition with one

1 The imports vary considerably from year to year. In 1875 they

amounted to 16,258 cwt., valued at £772,371.

2 Westendarp states that Africa exports on an average about 15,550 cwt. a year, which would be worth from £600,000 to £750,000, and that the ivory trade is steadily growing, especially on the West Coast. He estimates that in the west not less than 51,000 elephants are killed annually, and anticipates their becoming less numerous. Although the export from India only reached in 187 5-7 from 9000 to 17,000 tb a year, a considerably larger quantity of ivory is used in India for arm rings, &c., and for decorative and ornamental purposes. China also deals in ivory, exporting most of it after it has

been carved. : XII. — 66

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hundred and fifty men. The price of ivory varies much in different districts, being generally higher on the west than on the east coast ; the transaction is generally one of barter, and the price therefore difficult to estimate. The tusks are sold by weight, and stones and iron are sometimes thrust down into the hollow pulp cavity to increase the weight, so that dealers generally feel down the hollow with an iron rod to detect foreign matter. The value of the ivory depends upon the size of the tusks; those below 6 or 7 ib weight are not worth more than half the price per Ib of really fine tusks. Something depends on the care bestowed upon the tusks, which are sometimes roughly treated, while others are waxed and carefully wrapped up for protection. The African ivory trade is an ancient one, and in medizval times Marco Polo speaks of the traffic in ivory at Zanzibar as being astonishing in its amount.

The tusks of the mammoth from northern Siberia are said to furnish almost the whole of the ivory used by Russian ivory workers. They are found in most extra- ordinary abundance, and it is said that from the time of Dr Breyne's quaint paper "Behemoth" in the Philo- sophical Transactions for 1737 till now there has been no intermission in the supply. They come principally from the neighbourhood of the Lena and other great rivers discharging themselves into the Arctic Ocean, and are abundantly found in the Liakhoff Islands. Mammoth

tusks are slenderer, much more curved, and in proportion |

to the size of the animal much larger than those of recent elephants. In Siberia at different times four mammoths have been found entire, their hair, skin, and even all their soft parts having been preserved without change in the ice for countless years. Just as in some few cases all the most perishable soft parts were preserved, so in a vastly greater number the less perishable ivory was kept without change by the low temperature and exclusion of air; thus wlien in the summer the ice tears down portions of river banks, or floods break up frozen morasses, the tusks are brought to light. Some are in the most beautiful pre- servation, like recent ivory ; others having been exposed before, in previous summers, their organic constituents have partly perished, and they are inclined to become broken up along the lines of interglobular space into concentric rings, or may have become so disintegrated that a frag- ment may be used like chalk to write with.

In England this ivory is not very highly esteemed, being considered too dry and brittle for elaborate work, and to be very liable to turn yellow. Most ivory workers strenu- ously deny ever using them, but, though more rarely than in former years, mammoth tusks are occasionally inported. Within the last few years an exceptionally large tusk in splendid condition was offered for sale to the Oxford University Museum at a price of £100, but was not purchased. In 1872 1630 very fine tusks were brought to England ; and in 1873 1140 tusks weighing from 140 to 160 ib each were imported. The best were sold at a very good price, but proved less available, even for such purposes as cutting into knife handles, than was expected, and although smaller importations arrive from time to time they can hardly be considered as a regular article of commerce, and are difficult of sale ; some have been very recently sold at a price so low as ten shillings a cwt. Westendarp personally investigated the Siberian ivory trading districts, and returned with no favourable impres- sion. He found that about 14 per cent. of the teeth were good, 17 per cent. could be made some use of, 54 were quite bad, and 15 wholly useless. The ivory looks better outside than it really is, and, as only about 30 per cent. is usable, it does not pay well for transport. He thought it not worth more than Is. 6d. a pound.

The finest quality of ivory from equatorial Africa | to any suc

is closer in the grain, and has less tendency to become yellow by exposure than Indian ivory. When first cut it is semi-transparent and of a warm colour ; in this state it is called “green” ivory, and as it dries it becomes much lighter in colour and more opaque. ‘This is supposed to be the result of the drying out of the “oil”; but ivory contains less than one-half per cent. of fatty material, and that which dries out is water, not oil. During this drying process the ivory shrinks considerably, so that it is necessary to season it like wood when such things as box lids, which need to fit, are to be made from it. The tusks shrink much more in their width than in their length, which will be readily understood when the many concentric rings of interglobular spaces, containing soft material, which dries up and leaves them empty, are remembered. It is on account of this peculiarity of structure that billiard balls are turned from tusks not greatly exceeding them in diameter, for by the selection of such tusks the ivory ou the opposite sides of the ball will correspond in density and in structure, and the shrinkage will be uniform about its centre. They are usually turned roughly into shape, kept for some time in a warm room to shrink, and then turned true. ‘The thin plates cut for piano keys are dried and shrunk at once by being baked for a time in an oven, but after being dried they are still subject to changes in bulk in a moist atmosphere.

It is not always possible to judge of the quality of ivory before the tusk is cut up. The exterior, or cementum, should be smooth and polished ; it is often of a deep coffee colour in the best tusks, and it should not show any large cracks. But the most profound disorganization of the ivory may exist inside au exterior which promises well, or it may be badly cracked from unequal shrinkage in drying without cracks being noticeable on its exterior. About half of the length of an average sized tusk is implanted ; this will be hollow, and in a young animal the hollow will extend beyond the implanted portion ; the extruded part, recognizable by the deeper colour of its cementum, is solid, and is circular or oval in section. Great care is taken by ivory cutters to cut up the tusk to the greatest advantage, its high price necessitating the strictest economy in its use. Veneers of large size have been cut by a

reciprocating saw cutting a spiral shaving round the tusk, one having been thus produced 40 feet in length by 12 inches in width ; but they are not of much practical value, save as an example of what is possible. With age ivory turns yellow, and various receipts are given for restoring its whiteness; but they mainly depend upon mere removal of the outer surface, and no satisfactory method of bleaching it is known; it preserves its colour best when exposed to light, Con- sidering the high percentage of organic matter which it contains, it is surprisingly durable. In some of the ivories brought by Mr Layard from Nineveh, in which the organic constituent had partially perished, leaving them very friable, its place was supplied by boiling them in a solution of gelatin, a process suggested by Professor Owen as the likeliest means of restoring to them something like what they had lost during the lapse of time by exposure. It is possible that by some such treatment the perished ivory of the mammoth may be rendered useful for some purposes. The existence of chryselephantine statues of Phidias, and of flat plaques of ivory larger than could be cut from any known tusk, renders it probable that ancient workers possessed some method of bending it; and receipts have come down from the 12th century for softening 1 so as to alter its form. But these, which depend upon 1ts partial decalcification, have not been found to yield the excellent results claimed for them, and the larger plaques in question pee no appearance of having been submitted

process. Moreover, Westendarp states that

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from a tusk weighing 200 ib the largest plaques he knows of could have been cut. Ivory can be made flexible by sub- mitting it to the solvent action of phosphoric acid ; when washed and dried it becomes hard, and when moistened again it resumes its flexibility ; but this is at the sacrifice of many of its properties.

Ivory takes a variety of dyes well, without interfering with the polish of its surface ; the actual matrix is stained, and the colour is not merely due to the penetration of pigment into the open dentinal tubes.

The great canine teeth of the hippopotamus furnish an ivory which is harder and whiter than that of the elephant, and less prone to turn yellow; these differences are pro- pably due to its containing a smaller percentage of organic matter. It also lacks the engine-turning pattern of elephant ivory. The tusk of the hippopotamus is a tooth of persistent growth, strongly curved into a segment of a circle, and solid in the greater part of its length. It is thickly coated with enamel on its exterior surface, and istrihedral. On transverse section the remains of the pulp cavity are seen as a line or fissure in the middle, and occasionally there is a nodule of secondary dentine in it. The ivory is not quite homogeneous ; for the back of the tooth, which is not covered with enamel and in use wears down the fastest so as to keep a sharp edge to the tusk, is markedly softer than the rest of the tooth. No large piece can be obtained from a hippopotamus tusk, and the incisors and the upper canines yield even smaller pieces than the lower canines. 'Thirty years ago there was a con- siderable demand for them for dentists' use, and at that time a fine tusk of 5 ib weight was worth from five to seven guineas, but the price is now much lower, and comparatively few are imported.

Amongst the northern nations the tusks of the walrus have long been used as a source of ivory. The great upper canines consist of a body of dentine invested with cementum; they are oval in section, solid, and their axis is made up of secondary dentine, which is far larger in amount than in the hippopotamus, and makes up a con- siderable part of the whole tooth. This is very nodular in appearance when cut and polished, but is of dense and tolerably uniform consistence.

The spirally twisted tusk of the narwhal, the teeth of the sperm whales, the ear bones of whales, and the molar teeth of the elephant, are also all made use of as sources of ivory, though they are far less valuable than the larger tusks. For the subject of carvings in ivory, see CARVING, vol. v. p. 167. The earliest piece of ivory work known is a rude incised drawing of a mammoth upon a fragment of mam- moth tusk, which must have been executed by a contem- porary of the animal. Numerous references to ivory occur in the Old Testament, which show that it was regarded as of great value. It seems to have been used for the

decoration of the temple, and it is often mentioned amongst the presents brought to kings, who employed it for purposes of regal state. Some, however, of the references would seem more strictly applicable to wood than to ivory.

The Nineveh ivories in the British Museum are of very great antiquity, a probable date of 900 Bc. having been assigned to them; yet many of them are in good preserva- tion, and others have been tolerably well restored by boiling in gelatin. All exhibit considerable artistic merit and mastery over the material, whilst some reach a very high degree of excellence alike in design and execution. Competent judges declare that, underlying the obviously Egyptian character of the work, there are differences Suflicient to lead to the inference that the ivories were not executed in that country. Some of them consist of thin plaques on which figures were delineated by means of incised lines ; some were carved in low, and others in high

relief ; whilst there are many examples of detached heads, and even entire figures, carved in close imitation of nature (see Plate VII.). Traces of gilding remain on many of them, and they were often further enriched by being inlaid with fragments of lapis lazuli, or of a coloured glass in apparent imitation of this ; the eyes of the larger heads were generally rendered conspicuous by this means. In one of the panels figured, the border of the dresses, the thrones on which the figures are seated, the ornaments above the cartouche, and the symbols upon the cartouche itself were thus inlaid with colour. The largest object is a carved staff, perhaps a sceptre ; amongst the smaller pieces are heads of animals and entire animals, griffins, human heads, crossed and clasped hands, rings, &. Like the ivory carvers of later times, these early workers seem to have studied economy of their material ; thus a beautiful carving in high relief of two griffins standing upon papyrus flowers has been carved on the interior of a segment of a large tusk, the natural curvature of which it follows. The tendency of ivory to decompose into concentric layers parallel with its exterior has been already noticed, and Mr Layard himself speaks of the trouble he

experienced owing to the flaking of the pieces he discovered; it is by the separation along the contour lines that many ancient ivories have been spoiled. Besides those discovered at Nineveh, some other ivories of great antiquity exist; and ivory workers are mentioned as a distinct class of artificers at the commencement of the Christian era. Many writing tablets of ivory, with raised rims inside, where wax was spread over their surface, have come down to us; these were often made to fold together, and the exterior richly ornamented with carvings. It was the custom for newly appointed consuls under the empire to send these plaques to persons of importance, and the covers sometimes have upon them representations of the consul in his robes of office.

One of the most beautiful of ancient ivories is the Roman 3d century plaque purchased by the South Kensington Museum for £400 (see Plate VII.). It forms one half of a diptych, and measures 11? by 43 inches. The other half is in the Hétel Cluny.

From these times down to the present day there has been a constant succession of ivory workers, though in medieval times artists of higher ability were to be found than any who will now devote themselves to such work. A large proportion of the carvings deal with sacred subjects: one of the most beautiful is a Pieta, the virgin holding the dead body of Christ in her lap (see Plate VIL.) ; this was executed about the 14th century. Tllustrations of old romances were frequently made use of to decorate mirror cases, boxes, &c., and elaborately carved chessmen of walrus ivory referable to an ancient period have been found in the island of Lewis. Schliemann, in his excava- tion at the supposed site of Troy, found many useful articles made of ivory,—pins, buckles, &c.,—but no carvings, even of rude character.

Among the chryselephantine statues of ancient Greece executed by Phidias, Praxiteles, and others, one of Minerva in the Parthenon was 40 feet in height, and was con- structed of ivory and gold; others are mentioned as made of wood, with face, hands, and feet of ivory. Yet in some cases it is expressly said that the statue was entirely of ivory, special exception being made of a portion of the dress which was not. Among the Nineveh ivories are some which apparently belonged to

figures partly wood and partly ivory, but these were of no great size ; the wood employed seems to have been ebony.

In former times ivory was frequently used for the manu- facture of artificial teeth ; but this has become a thing of the past, ivory having been superseded by more durable and more manageable materials. Its use for this purpose

is quite ancient ; thus Martial contemptuously speaks of a lady of his own time "'emptis ossibus indicoque cornu" as having but a poor chance of passing them off as her own teeth. For the use of the dentist elephant ivory was less suitable than that of the hippopotamus or the walrus ; of these two the former was generally preferred. The enamel was chipped off with a chisel, or made to fly off by a judicious application of a blowpipe flame, and the tusk was so cut that the plate might consist as far as possible of the hardest part of the dentine which had formed the front of the tooth. 'This, carved up to fit the mouth accurately, formed a supporting plate which commonly carried in the front actual human teeth secured by pins, though sometimes the teeth were formed of ivory carved in imitation of teeth, and at the back blocks of hippopotamus or walrus ivory were added for the purposes of mastication. They were called "bone pieces," though there was really no bone used in their construction ; their durability was in no case great, though it varied in the mouths of different persons, and a plate had to be ultimately discarded on account of the ivory getting discoloured, softened, and offensive. For dental purposes walrus ivory was more durable than hippo- potamus, but its colour was not so suitable, nor was it so hard. Some specimens of native Indian dental work in ivory exist, but these have probably been copied from plates worn by Europeans.

The principal demand for ivory, beyond the purposes already alluded to, arises in connexion with the cutlery trade, very large quantities being used for the handles of pocket and table knives. It is also extensively employed for the handles of walking sticks and umbrellas, for combs, paper knives, and ladies' fans, and for measuring rules and

mathematical scales. Further, it is in- considerable demand for the manufacture of chess and draughts men, for statuettes, rilievo plaques, caskets, and many minor objects of furniture, decoration, and ornament, and for the purposes of inlaying. Dieppe is now a principal centre of the European ivory manufacture.

But it is in the East, and especially in China, that ivory is now most highly prized and most elaborately worked into decorative forms. No amount of patience and care appears to be considered excessive among the Chinese for the decorative working of ivory, as is obvious in the extremely minute and delicate workmanship in their lace- like carved open-work trays, while their carved nests of concentric ivory balls are still reckoned among the puzzles of industry. By the Japanese ivory is equally held in esteem, and is decoratively treated in their peculiar manner in the form of spill cases, medicine boxes, and the elabor- ately carved and ornamented nitsuké or large buttons. In India ivory is extensively used in the inlaid work of Bombay, &c., and for furniture decoration generally ; and it is also cut into long slender filaments for making the tails of state chowries or fly-flappers, which, both handle and tail, are in many instances made of ivory.

All ivory dust, chips, and pieces unsuited for working are utilized by being converted into gelatin, which they may be made to yield by prolonged boiling, or by being calcined into ivory black. Confectioners are said to make use of ivory dust as a basis for soups, and it forms an excellent colourless size, employed for delicate purposes. When ivory is calcined in a close chamber, in which there is not enough oxygen to burn the carbon into carbonic acid, the organic matrix is burnt into carbon with which remain in the most intimate admixture the lime and mag- nesium salts which had previously hardened it. Strange to say, the calcined ivory retains its form and texture not- withstanding the destruction of the organic matrix, and specimens sometimes show the engine-turning markings on the cut surface with the utmost distinctness. It is an

animal charcoal of great purity, and owes its delicacy and particular properties to the extremely fine division of the carbon particles. priate media, it affords both to the oil and the water-

When ground up and mixed with appro-

colour painter a most valuable black pigment; it is also

used as an ingredient in the fine printing ink used for engravings and etchings.

Attempts have been made to manufacture an artificial ivory, but with no very satisfactory result. Billiard balls and other small objects have been manufactured of celluloid, a combination of gun cotton and camphor with ivory dust, which becomes plastic at a temperature of about 280°, and when cold is again quite hard and somewhat translu- cent. Plaster copies or reproductions of artistic ivories are prepared, under the name of fictile ivories, by casting in very fine plaster of Paris tinted with yellow ochre, and subsequently treating the surface with a mixture of wax and spermaceti or stearine. But it may fairly be said that for the purposes to which ivory is ordinarily applied no substitute approaches it either in beauty or in those other qualities which render it so agreeable and so satisfactory a material for the workman, whether carver, turner, or minia- ture painter.

See Dr Breyne, Phil. Zrans., 1737; Owen, "On the Ivory and Teeth of Commerce," in Journ. Soc. of Arts, 1856; Lyell, Principles of Geology; Boyd Dawkins, Cassell's Natural History, vol, ii; C, S. Tomes, Dental Anatomy ; Catalogue of Hunteriain Museum, Royal College of Surgeons; Holzapfiel, Turning and Mechanical Manipulation ; South Kensington Handbooks, "Ivories"; Colonel Yule's Marco Polo; Du Chaillu, Equatorial Africa; Bur- ton, First Footsteps in Eastern Africa; Tennent, Island of Ceylon ; Bowring, Kingdom of Siam; Westendarp, Mittheil. der geograph. Gesellschaft, Hamburg, 1878-9 ; Layard's Nineveh and tts Remains; Schliemann's JJios. (Cc. 8. T.)

IVORY, Vecrrasie. The plant yielding the vegetable ivory of commerce is known to botanists as Phytelephas macrocarpa, Ruiz and Pavon. It is

a native of South America, occurring chiefly on the banks of the river Magdalena, Colombia, always found in damp localities, not only, however, on the lower coast region as in Darien, but also at a considerable elevation above the sea. It is mostly found in separate groves, not mixed with other trees or shrubs, and where travellers tell us even herbs are rarely met with, "the ground appearing as if it had been swept." The plant is severally known as the "Tagua" by the

'Indians on the banks of the Magdalena, as the " Auta"

on the coast of Darien, and as the "Pullipunta" and 'Homero" in Peru. It is a stemless or caulescent palm- like plant, the top of which is crowned with from twelve to twenty very long pinnatifid leaves. The plants are dicecious, the males forming higher, more erect, and robust trunks than the females. The male inflorescence is in the form of a simple fleshy cylindrical spadix covered with flowers; the female flowers are also in a single spadix, which, however, is shorter than in the male. The fruit consists of a conglomerated head composed of six or seven drupes, each containing from six to nine seeds, and the whole being enclosed in a walled woody covering forming altogether a globular head as large as that of a man. A single plant sometimes bears at the same time from six to eight of these large heads of fruit, each weighing from 20 to 25 tb. In its very young state the seed contains a clear insipid fluid, which travellers take advantage of to allay thirst. As it gets older this fluid becomes milky and of a sweet taste, and it gradually continues to change both in taste and consistence until it becomes so hard as to make it valuable as a substitute for animal ivory. In their young and fresh state the fruits are eaten with avidity by bears, hogs, and other animals. The seeds, or nuts as they are usually called when fully ripe and hard, are used by the American Indians for making small ornamental articles and toys, They are imported into Britain in

considerable quantities, frequently under the name of "Corozo" nuts, 2 name by which the fruits of some species of Aftalea are known in Central America,—their uses

being chiefly for small articles of turnery. The question

of the position of this plant in the vegetable kingdom is one upon which botanists have been much divided. The plant has at different times occupied the attention of such

well-known botanical authorities as Ruiz and Pavon, who gave to it its scientific name of Phytelephas macrocarpa, and of Martius, Morren, Humboldt, Bonpland, Spruce, and

others, by whom it has been considered respectively to be near to the Palmex or the Pandanex, or to belong toa separate and distinct order, the Phytelephasiex of Brong- niart. This order is now placed by Le Maout and Decaisne between Palmex and Paudanex, and Phytelephas one other genus

is of course retained in it as the type, only, that of Wettinia, being included. IVORY, Jams (1765-1842), a Scottish mathematician,

was born in Dundee in 1765. In 1779 he entered the university of St Andrews, where after four years study

he graduated M.A., distinguishing himself especially as an

entered on a regular course of theological training ; but,

after two sessions at St Andrews and oue at Edinburgh, he abandoned all idea of the church, and in 1786 settled in his native town as assistant-teacher of mathematics and natural philosophy in a newly established academy. Three

years later he became partner in and manager of a flax- spiuning company at Douglastown in F orfarshire, still,

however, prosecuting in moments of leisure his favourite

studies. He was essentially a self-trained mathematician, and was not only deeply versed in the ancient and modern geometry, but had also, what was extremely rare in his country in those days, a full knowledge

of the analytical methods and discoveries of the Continental mathematicians. His earliest memoir, dealing with an analytical expression for the rectification of the ellipse, is published in the Transactions of the Royal Society of Edinburgh for the year 1796; and this and his later papers on "Cubic Equations " (1799) and " Kepler's Problem" (1802) evince great facility in the handling of algebraic formule. In 1804 after the dissolution of the flax-spinning company of which he was manager, he obtained one of the mathema- tical chairs in the Royal Military College at Marlow (after- wards removed to Sandhurst); and till the year 1816, when failing health obliged him to resign, he discharged his professional duties with remarkable success, During this period he published in the Philosophical Transactions several important memoirs, which earned for him the Copley medal in 1814, and ensured his election asa Fellow of the Royal Society in 1815. Of special importance in the history of attractions is the first of these earlier memoirs (Phil. Trans., 1809), in which the problem of the attraction of a homogeneous ellipsoid upon an external point is reduced to the simpler caso of the attraction of another but related ellipsoid upon a corresponding point interior to it. This beautiful theorem is known as Ivory's theorem. His later papers in the Philosophical T'ransac- tious treat of astronomical refractions, of planetary pertur- bations, of equilibrium of fluid masses, &c. For his investigations in tho first named of these he received a royal medal in 1826 and again in 1839. In 1831, on the recommendation of Lord Brougham, King William IV. granted him a pension of £300 per annum, and conferred on him the Hanoverian Guelphic order of knighthood, His more purely scientific honours sufficiently prove the high position he held among his contemporaries. Thus, besides being directly connected with the chief scientific Societies of his own country, the Royal Society of Edin- burgh, the Royal Irish Academy, &c., he was corresponding

member of the Royal Academy of Sciences both of Paris and Berlin, and of the Royal Society of Gottingen. He died September 21, 1842.

IVORY COAST, that part of the West African seaboard which lies between the Grain Coast (now almost all belong- ing to Liberia) and the Gold Coast, or between Cape Palmas on the west and the Assini

river on the east. Slightly different limits are assigned by different writers, and part of the territory which belongs to the traditional

‘Ivory Coast is now officially incorporated in the Gold Coast region, the western limit of which is placed at 5° W. long., a good way to the west of the Assini river. In the

older books of travel (both English and foreign) we often – find the alternative names Tooth Coast (Zahn-Kiiste) or Quaqua Coast, and less frequently the coast of the five and six stripes (alluding toa kind of cotton fabric in favour with the natives). ‘The trade in ivory has long lost its importance, and at the present day there are very few European trading stations in this part of Guinea. Fort Nemour, Grand Bassam, Piccaninny Bassam, Drewin, and

Walloo are the chief points of interest. ardent and successful student of mathematics. He then |

IVREA, the ancient Hporedia, a town of northern Italy,

“capital of a district of the same name, is situated at the foot | of the Alps on an eminence at the southern extremity of the

beautiful and luxurious Val d’ Aosta, near the river Dora Baltea, and at the termination of a branch railway line from Chivasso, 29 miles north-north-east of Turin. It is irregularly built, and has an antique and picturesque appearance. The site of the old fortifications is now occupied by promenades. The town possesses an old citadel with three lofty brick towers; a cathedral, sup- posed to occupy the site of a temple of Apollo; an ecclesi- astical seminary, a gymnasium, and several convents and benevolent institutions. Tho river is crossed by a Roman bridge of one arch. There are important silk manufac- tures, and a considerable trade in cheese, cattle, and other produce of the Alps. The population of the town in 1871 was 5093.

Ivrea occupied the site of the old Roman Eporedia, which origin- ally belonged to the Salassi, and received a Roman colony about 100 3.c., founded in accordance with the directions of the Sibylline books. It

afterwards became the seat of the Longobardian dukes, and on the conquest of the Longobards by Charlemagne it was made

the capital of a marquisate. In 950 Berenger II. of Ivrea suc- ceeded in mounting the Italian throne, but he held this position for

-onlya short time. His grandson Otho became the founder of the

line of the dukes of Burgundy. Arduin, marquis of Ivrea, again aspired to the throne of Italy after the death of Otho III. in 1002, and also disputed the possession of the imperial dignity with Henry II., but was defeated by Henry in 1008, after which Ivrea was incorpo- rated with theempire. In 1248 the town and marquisate were given

to the counts of Savoy. The town was occupied by the French in 1554, 1641, and 1704. In 1796 they again made themselves masters

of it; and, after losing it for some time, they reacquired it in 1800, and held it till 1814, making it the capital of the department of

-Doire.

IVRY-SUR-SEINE, a town and commune of France, in the arrondissement of Sceaux and the department of

Seine, is situated near the left bank of the river Seine, ‘4 miles south-east of Paris. ‘church, but of the castle of the 17th century the fine gar-dens are the chief memorial. In the Pctit Chateau died ‘the duchess of Orleans, mother of Louis-Philippe. Ivry ‘manufactures cordage, orgaus, glass, matches, manure, and

It has an interesting old

chemicals. There are numerous handsome villas and fine gardens in the neighbourhood. The population in 1876 was 15,247.

Ivry-sur-Seine is of ancient foundation. In a charter of Louis IV. (D’Outremer), ifs name appears as Ivriacum, and in contem- porary documents as Yvriacum, The fort of Ivry played an import: ant part in

the defence of Paris against the Germans in 1870-71, and in the Communist struggle of the latter year. Ivry-la-Bataille, in the department of Eure, where Henry IV. won his victory over the Leaguers in 1590, is not to be confounded with Ivry-sur-Seine,

IVY (A.8., Zfig; Germ., Hpheu; perhaps connected with apium, amor) is the collective designation of certain species

Fic. 1.—European Ivy (Hedera Helix). Half nat. size.

and varieties of ZZedera, the important alliances of which are Aralia and Panax, which, with some twenty other

Fia. 3.—Fruiting Form of Hedera Helix.

Half nat. size.

they may be reduced to three. The European ivy is the Hedera Helix of Linneus (figs. 1-3), a plant subject to in-

finite variety in the forms and colours of its leaves, but the tendency of which is always to a three-lobed form when climbing and a regular ovate form of leaf when producing fruit (fig. 3). The African ivy is H. canariensis, Willd. (fig. 4), otherwise known as the Irish ivy, a native of Africa and the adjacent islands. This also varies, but in a less degree than H. Helix, from which its leaves differ in their larger size, rich deep green colour, and a prevailing tendency to

Fic. 4.—African Ivy (Hedera canariensis), Half nat. size.

a five-lobed outline. When in fruit the leaves are usually three-lobed, but they are sometimes entire and broadly ovate. The Asiatic ivy is ZZ. colchica, Koch (fig. 5), other- wise known as H. ragneriana and J. ragusina. This has ovate, obscurely three-lobed leaves of a coriaceous texture and a deep green colour; in the tree or fruiting form the leaves

are narrower than in the climbing form, and without any trace of lobes. Distinctive characters are also to be

Fic. 5.—Asiatic Ivy (Hedera colchica), One-third nat. size.

found in the appendages of the pedicels and calyz, H. Helix having six-rayed stellate hairs, H. canarvensis fifteen-rayed hairs, and H. colchica yellowish two-lobed scales. A revision of the natural order Hederacex by the late Dr B. Seemann will be found in the Journal of Botany,

1864-5-6.

It is of the utmost importance to note the difference

IXI—Ix« I

of characters of the same species of ivy in its two con ditions of climbing and fruiting. The first stage of growth, which we will suppose to be from the seed, is essentially scandent, and the leaves are lobed more or less. This stage is accompanied with a plentiful production of the claspers by means of which the plant becomes attached and obtains support. When it has reached the summit of the tree or tower, the stems being no longer able to main- tain a perpendicular attitude fall over and become horizontal or pendent. Coincidently with this change they cease to produce claspers, and the leaves are strikingly modified in form, being now narrower and less lobed than on the ascending stems. In due time this tree-like growth pro- duces terminal umbels of greenish flowers, which are five- divided, with the styles united into a very shortone. These flowers are succeeded by smooth black or yellow berries, containing two to five seeds, ~ The yellow-berried ivy is met with in northern India and in Italy, but in northern Europe it is known only as a curiosity of the garden, where, if sufficiently sheltered and nourished, it becomes an exceedingly beautiful and fruitful tree.

It is stated in books that some forms of sylvestral ivy never flower, but a negative declaration of this kind is valueless, Sylvestral ivies of great age may be found in woods on the western coasts of Britain that have apparently never flowered, but this is probably to be explained by their

inability to surmount the trees supporting them, for until the plant can spread its branches horizontally in full daylight, the flowering or tree-like growth is never formed. As regards the claspers, respecting which various views prevail, they are veritable roots, as may be proved by planting an ivy in a damp fern case, when the claspers acquire a new character and penetrate the soil and perform all the functions of roots, suggesting that the hard felt-like form in which they appear on old ivy stems is the consequence simply of an arrest of development. We occasionally see ivies on towers completely isolated from the soil through the destruction of their stems. In these cases the claspers penetrate the structure, and in the capacity of roots obtain the needful sustenance, and the plant lives though no longer deriving nourishment from the earth.

A question of great practical importance arises out of the relation of the plant to its means of support. A moderate growth of ivy is not injurious to trees; still the tendency is from the first inimical to the prosperity of the tree, and at a certain stage it becomes deadly. Therefore the growth of ivy on trees should be kept within reasonable bounds, more especially in the case of trees that are of special value for their beauty, history, or the quality of their timber. In regard to buildings clothed with ivy, there is nothing to be feared so long as the plant does not penetrate the substance of the wall by means of any fissure. Should it thrust its way in, the natural and continuous expansion of its several parts will necessarily hasten the decay of the edifice. But a fair growth of ivy on sound walls that afford no entrance beyond the superficial attach- ment of the claspers is, without any exception whatever, beneficial. It promotes dryness and warmth, reduces to a minimum the corrosive action of the atmosphere, and is altogether as conservative as it is beautiful.

The economical uses of the ivy are not of great import- ance. The wood is used by leather cutters to sharpen their knives, From the trunk a resinous substance is obtained called “ivy gum,” which is employed for the relief of toothache. The leaves are eaten greedily by horses, deer, cattle, and sheep, and in times of scarcity have proved useful, The flowers afford a good supply of honey to bees ; and, as they appear in

autumn, they occasionally make amends for the shortcomings of the season. The berries

are eaten by wood pigeons, blackbirds, and _thruslies, From all parts of the plant a balsamic bitter may be obtained, and this in the form of hederic acid is the only preparation of ivy known to chemists.

In the garden the uses of the ivy are innumerable, and the least known though not the least valuable of them is the cultivation of the plant as a bush or tree, the fruiting growth being selected for this purpose. The variegated tree forms of H/. Helix, with leaves of creamy white, golden green, or rich deep orange yellow, soon prove handsome miniature trees, that thrive almost as well in smoky town gardens as in the pure air of the country, and that no ordinary winter will injure in the least. The tree-form of the Asiatic ivy (ZH. colchica) is scarcely to be equalled in beauty of leafage by any evergreen shrub known to English gardens, and, although in the course of a few years it will attain to a stature of 5 or 6 feet, it is but rarely we meet with it, or indeed with tree ivies of any kind; but little attention hitherto having been given to this subject. The scandent forms are more generally appreciated, and are now much employed in the formation of marginal lines, screens, and trained pyramids, as well as for clothing walls. A very striking example of the capabilities of the commonest ivies, when treated artistically as garden plants, may be seen in the Zoological Gardens of Amsterdam, where several paddocks are enclosed with wreaths, garlands, and bands of ivy in a most picturesque manner.

The ivies known in gardens number about sixty varieties, the whole of which are figured and described in Zhe Jovy, a Monograph, by Shirley Hibberd, 1872. To cultivate these is an extremely simple matter, as they will thrive in a poor soil and endure a considerable depth of shade, so that they may with advantage be planted under trees. The common Irish ivy is often to be seen clothing the ground beneath large yew trees where grass would not live, and it is occasionally planted in graveyards in London to form an imitation of grass turf, for which purpose it is admirably suited.

The ivy, like the holly, is a scarce plant on the American continent. In the northern United States and British America the winters are not more severe than the ivy can endure, but the summers are too hot and dry, and the requirements of the plant have not often obtained attention. In districts where native ferns abound the ivy will be found to thrive, and the varieties of Hedera Helix should have the preference. But in the drier districts ivies might often be planted on the north side of buildings, and, if encouraged with water and careful training for three or four years, would then grow rapidly and train themselves. A strong light is detrimental to the growth of ivy, but this enhances its value, for we have no hardy plants that may be compared with it for variety and beauty that will endure shade with equal patience. (s. H.)

IXION, a hero of Thessalian legend, was king of Gyrton. As a punishment for the murder of his father-in-law, Deioneus, madness came upon him, until Zeus purified him of his crime and received him as a guest in Olympus. ZEschylus uses him as the type of a guilt-laden mortal purified and pardoned by divine grace, and the mythical representative of all later penitents (Hum., 441), Ixion abused his pardon by trying to seduce Hera; but the goddess substituted for herself a cloud, by which he became the father of the Centaurs. Zeus bound him on a fiery whecl, which rolls unceasingly through the air. The wheel is one of the commonest symbols of the sun, and Ixion is clearly the sun-god, and a form of Zeus. His wife Dia is, as her name shows, the consort of Zeus (Jl., xiv. 317), and her son Pirithous is called son of Zeus as well as of Ixion. Nephele, the cloud, occurs also as wife of Zeus-Athamas, as here of Zeus-Ixion.

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J

THIS letter is a modified I. If we consider its place

- in the alphabet immediately after I, and the corre- sponding position of V and W after U, we are naturally led to conclude that the new letter was intentionally formed by some one who wished to have a special symbol to denote the palatal consonant y, into which ¢ readily passes,

just as w denotes the labial consonant into which % passes. For the symbol is a new one. It is not found in the Latin alphabet, in which I was employed alike for the vowel and consonant—though sometimes the I was doubled for the consonant. So far, however, as we can see, J in its origin was nothing but a fancy of the scribes. In 15th century English MSS. the symbol was drawn a little below the line to denote J, and by degrees this was curled slightly to the left. Again in writing numbers such as Vii, viii, it was usual to write uij, ulij, &« This was imitated in early printing, and hence arose j, the earliest regularly curled form. At the same time we find only I in capitals, not J—a modern letter made to correspond with little 7, This at least seems to have been the history of the symbol in England, and possibly the French history is similar.

It follows from this that the value of J ought to have been in all languages, not that which it has with us, nor yet that which it has in France, but that which it has in Germany, ¢e.g., in " Jahr," our " year,"—which is retained by us in the borrowed Hebrew word " Hallelujah." But generally in English J denotes the sound which is best represented by dzh; in this compound zh represents the French j-sound: the difference between the two may be well seen by comparing the English " John " with French " Jean" (Engl. J =dzh, Fr. J=zh). J, however, is not the only symbol which we employ to represent this sound ; we also use G in " gem," " gin," and GE at the end of words such as " edge," hedge," "' wedge," " knowledge," "singe " ; while the zh-sound (which is the sonant corresponding to the surd sh in "shall," "wish," &.) is never represented with us by J, but by numerous other letters, ¢g., in rouge (a word borrowed from the French), pleasure, division, azure. See A. J. Ellis, Harly English Pronunciation, c. vi.

The way in which this dzh-sound arose seems to have been as follows. In medieval Latin an inorganic d-sound was produced before a y-sound,—sometinies when medial, as in "ma-d-ius" for "maius," sometimes initial, as in "diacere" for ""'iacere." This arose from a careless pronunciation of the palatal y. That sound has been liable to obscuration in many languages—notably in Greek, in which a 6 was de- veloped before it to a very remarkable degree ; see Curtius,

Grundztige, book ili. D. iii. A simple example may be seen in the particle 67, which is identical with German “ja” our “ yea”: the sound of the word was originally ya ; then in Greek a d sprang up before the y, producing dyd ; and finally the y was expelled altogether, leaving the d- sound alone. Sometimes a double sound was produced (denoted by the symbol z) as in fypia for (d)yam-ia or édri~w for édmd-yo; here the sound may have been dezh, but was more probably dz; be this as it may, the change in Greek, which produced a great effect upon the language, may help us to understand how the d sprang up in late Latin, and how the compound sound dzhk was perpetuated in Italian—but there represented by gz, as in “ giacere,” “Giacomo,” &c.—and in Old French, in which language it passed at a later time into the modern zh-sound described above. But it was introduced into England from France

with its original value in French words. The sound, however, had already existed in England in words of Teutonic origin, the class already mentioned ending in ge ; “edge” was originally spelt “ecg,” and was doubtless sounded as we now sound “egg”; but the final g-sound had been palatized, though probably not before the 13th century. These are the two sources of the dzh-sound in England, and it is noteworthy that the sound when final has never been spelt with j, as though a consciousness of the difference of origin in these cases lingered on in the language. A parallel change (but much more common) has taken place in the /-sound: this passed into a ch-sound in very many words and not merely at the end, but also at the beginning as in “chill,” “child,” “church,” &c., and this ch-sound is not the simple palatal ch, but ¢sh, which therefore bears exactly the same relation to & as dzh (our j) bears to g.

It appears then that the symbol J ceased to have its proper signification in English by connexion with that of another compound sound borrowed from the French. Meanwhile another symbol Y was being prepared to do the work of J. Gat the beginning of a word was often weakened into the ysound: thus “genew” (comp. German ‘“ genug ”) became “ ynow,” our “enough.” Then the old English form of g (that is, 3) was used to express this y-sound, and out of it the symbol y was

gradually developed, while the French form (g or nearly so) was kept for the momentary sound.

In Spanish the symbol J denotes the momentary sound corresponding to y,—that is, the palatal denoted by ch in German, and heard also in Scotland, ¢.g., in ‘ loch.”

JABALPUR, or JuppuLrore,! a British district in the commissionership of the Central Provinces, India, between 21° 12’ and 23° 56’ N. lat., and between 76° 40’ and 81° 35’ E. long., is bounded on the N. by Panna and Maihar, on the E. by Rewah, on the 8. by the districts of Mandla, Seonf, and Narsinhpur, and on the W. by Damoh district.

Jabalpur consists of a long narrow plain running north- east and south-west, and shut in on all sides by highlands. This plain, which forms an offshoot from the great valley of the Nerbudda, is covered in its western and southern portions by a rich alluvial deposit of black cotton-soil At Jabalpur town the soil is sandy, and water plentiful near the surface. The north and east belong to the Ganges and Jumna basins, the south and west to the Nerbudda basin. Thus between Jabalpur and Mirzdpur lies the great watershed betwixt the Gulf of Cambay and the Bay of Bengal, The Nerbudda flows through the district for 70 miles from east to west, passing about 9 miles below Jabalpur town through the famous marble rocks, where it throws itself from a rocky ledge with a fall of 30 feet, called Dhudn-dhar, or the “ misty shoot.”

The population was estimated in 1877 at 555,796; but a more careful census taken in 1872 returned it at 528,859, of whom 270,237 were males and 258,622 females. The ethnical division in 1877 showed—Europeans, 776; Eurasians, 201 ; aboriginal tribes, 105,349 ; Hindus, 416,770 ; Mahometans, 27,282 ; Buddhists and Jains, 83654. Jabalpur, the capital, which has a population of 55,188, is the only town with more than 5000 inhabitants. Of the total area of 3918 square miles, only 1320 are cultivated, but 1808 more are returned as cultivable. Of the cultivated land 3949 acres are irrigated—entirely by private enterprise. Cereals, rice, cotton, and oil-seeds are the principal crops. The district is rich in garden

1 The division of Jabalpur or Jubbulpore is one of the four which make up the Central Provinces. It comprises the districts of J. abalpur, Sagar (Saugor), Damoh, Seoni, and Mandla, has an area of 18,564 square

“miles, and in 1878 had a population of 1,839,100.

produce, raising, besides the ordinary Indian fruits, peaches, pine-apples, strawberries, and potatoes. Both the plains and the high Jands are well wooded ; the forest produce is of considerable value, consisting of lac and gum, and ¢asar silk. The trade of the district converges at Jabalpur town, which is one of the most important railway centres in India, being at the junction of the Great Indian Peninsula and East Indian systems. One of the chief manufactures isiron. The most productive mines are at Dabwara, Agaria, and Janti; but the most important are those of the Kumbhi pargan4, which supply Panagur, the chief seat of the iron industry in the district. ‘The other manufactures include brass utensils, cotton cloth, and leather articles. Coal is found at several places. The total revenue in 1876-77 was £76,013. The number of Government or aided schools was 125, attended by 7015 pupils. The climate is healthy, and the temperature extremely moderate. Asa rule, the hot weather extends only over two months, and, except immediately before the rains, is not oppressive. The rains last from early in June until the latter part of September. The prevailing diseases of the district are fevers and dysentery. Cholera and small-pox are occasional visitants, and influenza at times assumes the character of an epidemic. In 1876 eight charitable dispensaries afforded medical relief to 35,795 indoor and outdoor patients.

The early history of Jabalpur is unknown ; but inscriptions revord the existence during the 11th and 12th centuries of a local line of

rinces of that Haihai race which is so closely connected with the om of Gondwana. In the 16thcentury the Gond raja of Garha Mandla extended his power over fifty-two districts, including the

resent Jabalpur. During the minority of his grandson, Asaf

han, the viceroy of Kara Manikpur, conquered the Garha princi- pality and held it at first as an independent chief. Eventually he resigned his pretensions, and submitted himself to the emperor Akbar. The Delhi power, however, enjoyed little more than a nominal supremacy ; and

the princes of Garhd4 Mandla maintained a practical independence until their subjugation by the governors of Sagar (Saugor) in 1781. In 1798 the peshwa granted the Nerbudda valley to the Bhonsla princes of Nagpur, who continued to hold the district until the British occupied it after an engagement on the 19th December 1817. At first the Sagar and Nerbudda territories were governed by a commissioner in subordination to the resident at Nagpur; but in 1861 Jabalpur was formed into a separate district of the Central Provinces.

JABALPUR, or JUBBULPORE, the headquarters of the above district, is situated in 23° 11’ N. lat., 79° 59’ E. long., in a rocky basin, at an elevation above sea-level of about 1458 feet, 165 miles north-east from Nagpur, and 108 miles south-east from Sagar. The numerous gorges in the neighbouring rocks have been taken advantage of to surround the town with a series of lakes, which, shaded by fine trees, and bordered by fantastic crags and massy boulders, add much beauty to the suburbs. The town itself is modern, and is laid out in wide and regular streets. A streamlet separates the civil station and cantonment from the town; but, though the climate is mild, a swampy hollow beneath renders the site unhealthy for Europeans. Jabalpur contains a school of industry, where tents and carpets are largely manufactured. ‘he opening of the railway system has immensely developed the trade of Jabalpur, which has now become one of thie most important centres of commerce in the Central Provinces. In 1875-76 the total imports were valued at £567,000, the chief items being piece-goods, wheat, sugar, metals, salt, rice, country cloth, oil-seeds, spices, gi, oil, inferior grains, lac, and raw cotton, The total exports, principally raw cotton and wheat, were valued at £160,000. The population, almost entirely Hindu, was 55,188 in 1877.

JABIRU, according to Marcgrave! the Brazilian name of a bird, subsequently called by Linnzus Mycteria americana, one of the largest of the Storks, Ciconude, which occurs from Mexico southwards to the territory of the Argentine Republic. It stands between 4 and 5 feet in height, and is conspicuous for its massive bill, slightly upturned, and its entirely white plumage; but the head and neck are bare and black,

except for about the lower third part of the latter, which is bright red in the living

: An apparently accidental transposal of two of the figures given by this author (Hist. Nat. Brasilizw, pp. 200, 201) misled several of his

successors from Piso to Brisson, until noticed by De Buffon (Hist. Nad. Otseaux, vii. pp. 280-286).

bird. Very nearly allied to I/ycteria, and also commonly called Jabirus, are the birds of the genera Xenorhynchus and Ephippiorhynchus—the former containing one or (in the opinion of some) two species, X. australis and X. indicus, and the latter one only, H. senegalensis. These belong to the countries indicated by their names, and differ chiefly by their feathered head and neck, while the last is sometimes termed the Saddle-billed Stork from the very singular shape of its beak. Somewhat more distantly related are the gigantic birds, known to Europeans in India and elsewhere as Adjutants, belonging to the genus Leptoptilus, distinguished by their sad-coloured plumage, their black scabrous head, and their enormous tawny pouch, which depends occasionally some 16 inches or more in length from the lower part of the neck, and seems to be

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Jabiru.

connected with the respiratory, and not, as commonly believed, with the digestive system. In many parts of India L. dubius, the largest of these birds, the Hargila as Hindus call it, is a most efficient scavenger, sailing aloft at a vast height and descending on the discovery of offal, though frogs and fishes also form part of its diet. It familiarly enters the large towns, in many of which on account of its services it is strictly protected from injury, and, having satisfied its appetite, seeks the repose it has earned, sitting with its feet extended in front in a most grotesque attitude. A second and smaller species, L. javanicus, has a

more southern and eastern range ; while a third, Z. crumenifer, of African origin, and often known as the Marabou-Stork, gives its name to the beautifully soft feathers so called, though our markets are mostly supplied with them by the Indian species (in which they form the lower tail-coverts), if not, as some suppose, by Vultures. (A. N.) |

JABORANDI, a name popularly applied in a generic manner in Brazil and South America to a number of different plants, all of which possess more OF less marked sialogogue and sudorifie properties. In the year 1875 a drug was introduced under the above oo igi of 5 = E

medical men in France by Dr Coutinho of Pernambuco, its botanical source being then unknown. When examined by Professor Baillon, the fragments of leaves were found to belong to Pilocarpus pennatifolius, Lem., of the natural order Rutaceez. About the same time Holmes found that the commercial drug in England consisted also to some extent of P. Selloanus, Engl., and his statement was after- wards confirmed by Baillon, and also by Balansa, the

latter of whom observed that species to be employed in |

Asuncion, and collected for exportation to Europe. J. pennatifolius is a slightly branched shrub about 10 feet high, growing in the eastern provinces of Brazil. The compound imparipinnate leaves, which are placed alternately on the stem, are often 14 feet long, and consist of from 2 to 5 pairs of opposite leaflets, the terminal one having a longer pedicel than the others. The leaflets are oval,

Jaborandi—a, leaf (reduced) ; 0, leaflet (natural size) ; ¢, flower ; d, truit (natural size). lanceolate, entire, and obtuse, and often slightly emargi- nate, from 3 to 4 inches long and 1 to 14 inch broad in the middle. When held up to the light they may be observed to have scattered all over them numerous pellucid dots or receptacles of secretion immersed in the substance of the leaf. The leaves in size and texture bear some resemblance to those of the cherry-laurel (Prunus Lauro- cerasus, L.), but are less polished on the upper surface. The flowers, which are produced in spring and early summer, are borne on

a raceme, 6 or 8 inches long, and the fruit consists of 5 carpels, of which not more than two or three usually arrive at maturity. These present the characters of the natural order to which the plant belongs. (See Pharm. Journ., ser. 3, vol. v. p. 582.) P. Selloanus differs from the above chiefly in the leaves never being hairy and in the longer and more slender

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pedicels of the flowers. The leaves are the part of the plant usually imported, although occasionally the stems and roots are attached to them. The active principle for which the name pilocarpine, suggested by Holmes, was ultimately adopted, was discovered almost simultaneously by Hardy in France and Gerrard in England, but was first obtained in a pure state by Petit of Paris. It is an alkaloid, of a soft viscous character, slightly soluble in water, and very soluble in alcohol, ether, and chloroform, It strongly rotates the plane of polarization to the right, and forms crystalline salts of which the nitrate, hydrochlorate, and phosphate are those chiefly used in medicine. The nitrate and phosphate are insoluble in ether, chloroform, and benzol, while the hydrochlorate and hydrobromate dissolve both in these menstrua and in water and alcohol ; the sulphate and acetate being deliquescent are not employed medicinally. The formula of the alkaloid is given by Kingzett as C,,H,,N,0,+4H,O. The volatile oil contained in the leaves was found by Hardy to be a complex body consisting of pilocarpene, which is a dextro- gyre hydrocarbon, sp. gr. 0°852, boiling at 178° C. (852°-4 Fahr.), of another hydrocarbon boiling at 250° C. (492° Fahr.), and a third boiling at a still higher temperature, and forming a colourless transparent solid.

The physiological action of jaborandi is that of an extremely powerful diaphoretic and sialogogue. It acts as a sedative on the heart, probably influencing the circulation through the terminal branches of the vasomotor nerves, and widening the arteries and lessening their tension. The alkaloid does not cause the nausea and vertigo often resulting from the use of the crude drug. Atropine and pilocarpine have

been proved to possess antagonistic and mutually antidotal properties. Jaborandi, in the form of liquid extract, tincture, or alkaloid, has been found useful in some forms of chronic pneumonia, in relieving pleuritic effusion in dropsy, in diabetes insipidus, in Bright's disease, as a galactogogue, and more recently in diphtheria. In small doses it restrains the perspiration of phthisis It has also been proposed as a remedy for hydrophobia. As a mydriatic pilocarpine is said to possess an advantage over eserine, inasmuch as it contracts the pupil of the eye to an: equal extent, while it produces less irritation of the conjunctiva, less supraorbital pain, aud less spasm of the accommodating apparatus.

According to Peckolt the following are known in some of the Brazilian provinces as jaborandi :—Serronia Jabor- andi, Guill. Piper reticulatum, L., P. nodulosum, Link., Artanthe mollicoma, Miq., Aubletia trifolia, Rich., Xan- thoxylum elegans, Engl. To these may be added Piper citrifolium, Lam. Only one of them appears to have undergone chemical examination. In 1875 Parodi isolated from the Serronia Jaborandi a crystalline alkaloid C,,)H,,N,O,, which he named jaborandine. It is slightly soluble in ether, has but a weak affinity for acids, and appears to belong to the piperine group; at the same time

a volatile oil of an acrid and biting taste was also obtained

from the plant.

See Pharmacographia, 2d ed., p. 113; Stillé and Maiseh, National Dispensatory, 1879; Bentley and Trimen, Medicinal Plants, No. 48; Kingsett, Jowrn. Chem. Soe., Oct. 1876, p. 367; Hardy, 10 Pharmaceutical Journal (8) vi. p. 565, vii. p. 496 ; Holmes, Ibid. (8) v. pp. 581, 641, 784; and other papers in the same journal and in British Medical Journal, 1875, 1876, 1877. (E. M. H.)

JACA, a frontier city of Spain, in the province of Huesca, formerly capital of a partido in the kingdom of Aragon, is situated on the left bank of the Aragon, at an elevation of 2333 feet above the sea-level. It is the seat of a bishop, and the most important of the public buildings is the massive cathedral, the construction of which was begun under King

Ramiro in 1040. The industries of the city are unimportant. Its population in 1877 was 4155.

JAC—JAC

The diligence road from Zaragoza to Pau by the Puerto de Canfranc passes through Jaca.

The origin of the city is unknown. The Jaccetani (Iaxxntuvol) are mentioned as one of the most celebrated of the numerous sinall tribes inhabiting the basin of the Ebro by Strabo (p. 161), who adds that their territory was the theatre of the wars between Sertorius and Pompey, and afterwards between Pompey's son Sextus and the generals of Cesar. They are probably identical with the Lacetani of Livy (xxi. 60, 61) and Cesar (B.C., i. 60). Jaca at an early period of the invasion fell into the possession of the Moors, by whose writers it is referred to under the name of Dyaka as one of the chicf places in the province of Sarkosta (Zaragoza). The date of its reconquest is uncertain, but it must have been before the time of Ramiro, who gave it the title of "city," and in 1063 held within its walls a council, which, inasmuch as the people were called in to sanc- tion its decrees, is regarded as having been of great importance in the history of the parliamentary institutions of the peninsula. The original "fuero" of Jaca is one of the oldest extant. In 1705 Jaca was the only city which stood out for King Philip, from whom, in eonsequence, it received the title of "muy noble, muy leal y vence- dora." In the war of independence in 1809 it surrendered to the French ; it also yielded to General Mina in 1814.

JACAMAR, a word formed by Brisson from Jacameri, the Brazilian name of a bird, as given by Marcgrave, and since adopted in most European tongues for the species to which it was first applied and others allied to it, form- ing the Family Galbulidz of ornithologists, the precise position of which is uncertain, since the best authorities differ greatly thereupon. All will agree that the Jacamars belong to the great heterogeneous group called by Nitzsch Picariz, but further into detail it is hardly safe to go. The Galbulide have zygodactylous feet, like the Cuculide, Bucconide, and Picidx, they also resemble both the latter in laying glossy white eggs, but in this respect they bear the same

resemblance to the Momotidx, Alcedinide, Meropide, and some other groups, to which affinity has been claimed for them. In the opinion of Mr Sclater? the Jacamars form two groups—one consisting of the single genus and species Jacamerops aureus (J. grandis of most authors), and the other including all the rest, namely, Vrogalba with two species, Galbula with nine, Brachygalba with five, and Jacamaralcyon and Gialbaleyrhynchus with one each. They are all rather small birds, the largest known being little over 10 inches in length, with sharply pointed bills, and the plumage in every case more or less resplendent with golden or bronze reflexions, but at the same time compara- tively soft. Jacamaralcyon tridactyla differs from all the rest in possessing but three toes (as its name indicates) on each foot, the hallex being deficient. With the exception of Galbula melanogenia, which is found also in Central America and southern Mexico, all the Jacamars inhabit the tropical portions of South America eastward of the Andes, Galbula ruficauda, however, extending its range to the islands of Trinidad and Tobago.? Very little is known of the habits of any of the species. They are seen sitting motionless on trees, sometimes solitarily, at other times in companies, whence they suddenly dart off at any passing insect, catch it on the wing, and return to their perch. Of their nidification almost nothing has been recorded, but the species above-mentioned as occurring in Tobago is said by Mr Kirk—apparently the only European observer of the mode of propagation in these birds—to make its nest in marl-banks, digging a hole about an inch and a half in diameter and some 18 inches deep. From the accounts

1 Galbula was first applied to Marcgrave's bird by Mchring. Itis another form of Galgulus, and seems to have been one of the many names of the Golden Oriole. See IcTERUS (vol. xii. p. 696).

A Monograph of the Jacamars and Puff-birds, 4to, London (in course of publication),

- **The singular appearance, recorded by Canon Tristram (Zoologist, p. 3906), of a bird of this species in Lincolnshire seems to require notice, No instance seems to be known of any Jacamar having been**

kept in confinement or brought to this country alive. The fact, if such it be, is therefore more difficult of explanation than the occurrence of Dr Plot's Toucan near Oxford.

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received by other travellers we may possibly infer that more of the Family possess the same habit. (A. N.) JACANA,! the Brazilian name, according to Marcgrave, of certain birds, since found to have some allies in other parts of the world, which are also very generally called by the same appellation. 'They have been most frequently classed with the Water-hens or Rails (Rallidx), but are now recognized by many systematists as forming a separate Family, Parride,> whose leaning seems to be rather towards the Limicole, as apparently first suggested by Blyth, a view which is supported by the osteological observations of Professor Parker (Proc. Zool. Society, 1863, p. 513), though denied by Professor A. Milne-Edwards (Ois, foss. de la France, ii. p. 110). The most obvious characteristic of this group of birds is the extraordinary length of their toes and claws (the latter being turned upwards), whereby they aro enabled to walk with ease

Jacana,

over water-lilies and other aquatic plants growing in rivers and lakes. It is also remarkable for the carpal spurs with which its members are armed. The Family has been divided into four genera,—of which Parra, as now restricted, inhabits South America; Metopidius, hardly differing from it, has representatives in Africa, Madagascar, and the Indian Region; Hydralector, also very nearly allied to Parra, belongs to the northern portion of the Australian Region ; and Hydrophasianus, the most extravagant form of the whole, is found in India, Ceylon, and China—the draughts- men of the country last named making it a favourite subject of their pictures, in which its flowing tail and the very peculiar filamentous appendages to the tip of its first and fourth primaries are generally faithfully represented. In habits the Jacanas have much in common with the Water- hens, but that fact is insufficient to warrant the affinity asserted to exist between the two groups; for in their osteological structure, as already implied, there is much

difference, and the resemblance seems to be only that of analogy. The Parridz, or at least such of them as have been sufficiently observed, lay very peculiar eggs, of a rich olive-brown colour, in most cases closely marked with dark lines, thus presenting an appearance by which they may be readily known from those of any other birds, though an approach to it is occasionally to be noticed in those of certain Limicole, and especially of certain Charadride. The genus Palamedea, consisting of the bird very commonly

4In pronunciation the c is soft, and the accent placed on the last syllable. :

5 The classic Parra is by some authors thonght to have been the Golden Oriole (cf. IcrERUS), while others suppose it was a Jay or Pie. The word seems to have been imported into Ornithology by Aldro- vandus, but the reason which prompted Linnzus to apply it, as he seems first to have done, to a bird of this group, cannot be satis-

factorily stated.

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called the Horned Screamer, was at one time thought to be allied to this Family, but is now, by almost common consent, relegated to the neighbourhood of the Geese (Anatidz), though forming a separate Family. (A. N.) JACINTH, a name given to the reddish-brown variety of zircon, known also as Hyacinth, The hyacinthus of ancient writers appears to have been our sapphire, or blue corundum, while the jacinth or hyacinth of modern mineralogists may have been the ancient /yncurium. The true jacinth is a silicate of zirconium, crystallizing in the dimetric or tetragonal system, and exhibiting strong double refraction. Its hardness is denoted by 7°5; thatis to say, it is harder than quartz but not so hard as topaz The most distinctive feature of the stone, serving to distinguish it from other minerals with which it is likely to be con- founded—such as garnet, topaz, and cairngorm—is its high specific gravity ; this varies, however, in different varieties of zircon from 4°05 to 4°75. On ignition, most zircous increase in density without loss of weight; but Professor Church has shown that the

jacinth of Mudgee, when heated, remains practically unchanged in density, though it loses colour. Itis only when the native silicate of zirconium pre- sents a red colour that it is known as jacinth or hyacinth,— those varieties which are of yellow brown and green colours being distinguished, if transparent, by the name of jargoon,

while the dull-coloured varieties, more or less opaque, ure |

termed simply zircon. The lustre of the zircon when polished is of the peculiarly brilliant character designated adamantine, and indeed some of the pale jargoons are often sold as inferior diamonds. The Singalese variety, found chiefly at Matura, has been termed ““‘ Matura diamond.” The true jacinth, or red zircon, is an extremely rare stone. Fine examples, however, have been found of late years as pebbles among the auriferous detritus at Mudgee in New South Wales. Small crystals occur in the river-sands of Expailly, Puy-en-Velay, France, but these are too small to be cut as ornamental stones. Most of the gems termed jacinth or hyacinth by jewellers belong to the deep orange-brown variety of garnet known to mineralogists as essondte or

cinnamon stone: the lower specific gravity of the garnet |

serves to distinguish the false from the true jacinth. It :

is probable that many of the antique camei and intagli reputed to be jacinths are merely hyacinthine garnets. JACKAL (Canis aureus), a carnivorous mammal belong- ing to the dog family (Canidx), and believed by many naturalists to be one of the species from which certain of the semi-domesticated dogs of Asia and North Africa have been derived. It is dog-like in external appearance, and there is, according to Geoffroy Saint Hilaire, no constant dif- ference between its structure and that of the small canine races. It resembles them in dentition, in the roundness of its eye pupils, in its period of gestation, and to a large extent also in its habits, while like the dog it is subject to hydrophobia. It grows to a height of 15 inches at the shoulders, and to a length of about 2 feet, exclusive of its bushy fox-like tail. Its fur is of a greyish-yellow colour, darker on the back and lighter coloured beneath. An excrescence consisting of a horny cone, half an inch in length, and

concealed by a tuft of hair, is, according to Emerson Tennent, sometimes found on the head of the jackal. The Singhalese aver that it is only found on the leader of the pack, and they esteem it as an invaluable talisman. Jackals, of which there are several well-marked varieties, are widely distributed throughout southern Asia and the north of Africa. They are nocturnal animals, concealing themselves until dusk in woody jungles and other natural lurking places, thereafter sallying forth in packs, which sometimes number two hundred individuals, and visiting farmyards, villages, and towns in search of food. This consists for the most part of the smaller mammals

and poultry, although their association in packs enables them also to hunt down antelopes and sheep. When unable to obtain living prey, they feed upon carrion and refuse of all kinds, and are thus useful in removing putres- cent matter from the streets of Eastern towns. They are also fond of grapes and other fruits, and are thus the pests of the vineyard as well as the poultry-yard. The ery of the jackal has been described as even more appalling than that of the hyzna, a shriek from one member of a pack being the signal for a general chorus of screams, which is kept up during the greater partof the night. In India these animals are occasionally hunted with foxhounds

Jackal.

and greyhounds, and from their extreme cunning and pluck they are said to afford excellent sport. When brought to bay, they frequently turn upon their assailants and inflict severe wounds with their teeth; at other times they have been known to feign death as a means of escape. Jackals are readily tamed; and domesticated individuals are said, when called by their masters, to wag their tails, crouch, and throw themselves on the ground, and otherwise behave in a dog-like fashion. The jackal, like the fox, has a peculiarly offensive odour, due to the secretion of a gland at the base of the tail, but in domesticated specimens this odour is much fainter than in the wild forms. JACKDAW, or simply Daw (Old Low German, Daka ; Dutch, Kaauw), the prefix being doubtless imitative of the bird's cry, as indeed is probably the substantive name"

—one of the smallest species of the genus Corvus (CROW, vol. vi. p. 617), and a very well known inhabitant of Europe, the C. monedula of ornithologists. In some of its habits it much resembles its congener the Rook (9.%-); with which it constantly associates during a great part of the year ; but, while the Rook only exceptionally places 1ts nest elsewhere than on the boughs of trees and open to the sky, the Daw almost invariably chooses holes, whether 1n rocks, hollow trees, rabbit-burrows, or buildings. Nearly every church-tower and castle, ruined or not, is more OF less numerously occupied by Daws, and if they are not

1 See Professor Skeat's Etymol. Dictionary, pp. 158, 304.

also tenants with us of our own dwellings, it is because convenient recesses are therein ordinarily wanting. Yet our chimneys frequently give them the accommodation they desire, much to the annoyance of the householder, who finds the funnel choked by the quantity of sticks brought together by the birds, since their industry in col- lecting materials for their nests is as marvellous as it often isfutile.! In some cases the stack of loose sticks piled up by Daws in a belfry or tower has been known to form a structure 10 or 12 feet in height, and hence this species may be accounted one of the greatest nest-builders in the world. 'The style of architecture practised by the Daw thus brings it more than the Rook into contact with man, and its familiarity is increased by the boldness of its dis- position, which, though tempered by discreet cunning, is hardly surpassed among birds. Its small size, in com- parison with most of its congeners, alone incapacitates it from inflicting the serious injuries of which some of them are often the authors, yet its pilferings are not to be denied, though ou the whole its services to the agriculturist are great, for in the destruction of injurious insects it is hardly inferior to the Rook, and it has the useful habit of ridding sheep, on whose backs it may be frequently seen perched, of some of their parasites.

The Daw displays the glossy black plumage so char. acteristic of the true Crows, varied only by the hoary grey of the ear-coverts, and of the nape and sides of the neck, which is the mark of the adult; but

examples from the east of Europe and western Asia have tliese parts much lighter, passing into a silvery white, and henge have been deemed by some authorities to constityte a distinct species ((. collaris, Drumm.). Further to the eastward occurs the C. dauuricus of Pallas, which has not only the collar broader and of a pure white, but much of the lower parts of the body white also. Japan and northern China are inhabited also by a form resembling that of western Europe, but wanting the grey nape of the latter. This is the O. neglectus of Professor Schlegel, and is said by Mr Dresser, on the authority of Swinhoe, to interbreed frequently with C. dawuricus. These are all the birds that seem entitled to be considered Daws, though Mr Sharpe (Cat. B. Brit. Museum, vol. iii. p. 24) associates with them (under the little-deserved separate generic distinction Coleus) the Fish-Crow of North America, which appears both in structure and in habits to be a true Crow. (A. N.)

JACKSON, chief city of Jackson county, Michigan, U.S., is situated on the Grand river, about 75 miles west of Detroit. The city is paved and lighted with gas, and several of the buildings are very handsome, It is the seat of the large State penitentiary. The commercial interests of the city are fostered by its position on no fewer than six railways; and its manufactures are assisted by the water powcr, afforded by the river, which flows through the town, and isspanned by an iron bridge. Jackson manu- factures fire-clay goods, railway and other carriages, chemi- cals, agricultural implements, &c., and has foundries, planing-mills, and flour-mills. The presence of bituminous coalin the neighbourhood affords additional stimulus to trade ; and the surrounding country is fertile. A business college and a system of graded schools are among the educational resources of the city. Population in 1870, 11,447 ; in 1880, 16,105.

J ACKSON, capital of the State of Mississippi, U.S., and chief city of Hinds county, is pleasantly situated on the right

u Some writers, as Jesse (Scenes and Tales of a Country Life, p. 57), have ascribed great sagacity to the Daw as a nest-builder, but the statement of this author seems open to a very different interpretation (Yarrell's Br, Birds, ei. 4, ii. p. 808, note); and Jardine's remark (Nat.

Library, x. p. 236) that it. often exhibits great want of instinct, Seems to be quite justified by the known facts.

4} CONSTESS ;

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bank of the Pearl river, about 180 miles north of New Orleans, with which it is connected by rail. 'The city is fairly well built ; the chief buildings are the State capitol, the State penitentiary, and the institutions for the blind and for the deaf and dumb. One mile distant is the lunatic asylum. There are several good schools, and a State library of 15,000 volumes. The chief trade is in cotton, the average export being about 30,000 bales a year. Foundries and a factory for sashes and doors are among the manufactories of the place. Population in 1870, 4234; in 1880, 5205.

JACKSON, chief city of Madison county, Tennessee, U.S., is situated on the Forked Deer river, about 70 miles north-east of Memphis. Its chief trade is in cotton, of which many thousand bales are exported annually. Jackson has flour and planing mills, and manufactories of railway and other carriages, besides smaller industries. Of its several educational institutions the chief is West Tennessee college, founded in 1844, which had in 1874-75 four professors and one hundred students. 'The South-Western Baptist university was opened in 1875. The population in 1880 numbered 5371.

JACKSON, Anprew (1767-1845), seventh president of the United States, was born March 15, 1767, at the Waxhaw or Warsaw settlement (whose position in relation to the later boundaries of North and South Carolina is unknown), whither his parents had immigrated from Carrickfergus in Ireland in 1765. Jackson had no regular education. He had some slight share in the war of inde- pendence, and was taken prisoner in 1781. He studied law at Salisbury, North Carolina, and was admittcd to the bar and began to practise at Nashville in Tennessee. In 1791, on the first incorrect report that Mrs Rachel Robards (née Donelson) had succeeded in getting a divorce bill from her husband passed in Virginia, Jackson married lier ; when, later, it was passed,

they were remarried. In 1796 Jackson assisted to frame the constitution of Tennessee, and represented that State in the federal con- gress, where he distingnished himself as an irreconcilable opponent of Washington. In 1797 he was elected a United States senator; but he resigned the following year. He was judge of the supreme court of Tennessee from 1798 to 1804. In 1804-5 he contracted a friendship with Burr ; and at the latter's trial in 1807 Jackson was one of his conspicuous champions. Up to the time of his nomination for the presidency, the biographer of Jackson finds nothing to record but military exploits in which he displayed per- severance, energy, and skill of a very high order, and a succession of persoual acts in which he showed himself ignorant, violent, perverse, quarrelsome, and astonishingly indiscreet. In 1806 he killed Charles Dickinson in a duel. In 1813, as major-general of militia, he commanded in the campaign against the Creek Indians in Georgia and Alabama, and there first attracted public notice by his talents. In May 1814 he was commissioned as major- general in the regular army to serve against the English ; in November he captured Pensacola, used by the English as a base of operations ; and on January 8, 1815, he inflicted a severe defeat on the enemy before New Orleans. During his stay in New Orleans, he declared martial law, and carried out his measures with unrelenting sternness, banish- ing from the town a judge who attempted resistance. When civil law was restored, Jackson was fined $1000 for contempt of court ; in 1844 congress ordered the fine with interest ($2700) to be repaid. In 1818 Jackson received the command against the Seminoles. His conduct in following them up into the Spanish territory of F lorida gave rise to much hostile comment in the cabinet and in but the negotiations for the purchase of Florida

put an end to the diplomatic question. In 1821 Jackson

5d was appointed military governor of Florida, and there again he came into collision with the civilauthority. From this, as from the previous troubles, J. Quincy Adams extri- cated him.

In August 1822 the house of representatives of Tennessee nominated Jackson for president; and in 1823 he was elected to the senate at

Washington. The rival candidates for the office of president were Adams, Crawford, and Clay. Jackson obtained the largest number of votes in the elec- toral college; but no one had an absolute majority. At the election by the house of representatives (Iebruary 9, 1825) Adams was chosen. Jackson, however, was recog- nized by the abler politicians as the coming man; Van Buren and others, going into opposition under his banner, waged from the first a relentless and factious war on the administration. Van Buren was the most adroit politician of his time; and Jackson was in the hands of very astute men, who advised and controlled him. He was casy to lead when his mind was in solution; and he gave his confidence freely where he had once placed it.

He was not suspicious, but if he withdrew his confidence |

he was implacable. When his mind crystallized on a notion that had a personal significance to himself, that notion became a hard fact that filled his field of vision. When he was told that he had been cheated in the matter of the presidency, he was sure of it, although those who told him were by no means so.

There was great significance in the election of Jackson in 1828. A new generation was growing up under new economic and social conditions. They felt great confidence in themselves, and great independence. They despised tradition and Old World ways and notions; and they accepted the Jeffersonian dogmas, not only as maxims, but as social forces—the causes of the material prosperity of the country. By this generation, therefore, Jackson was recognized as a man after their own heart. They liked him because he was vigorous, brusque, uncouth, relentless, straightforward, and open. They made him president in 1828, and he fulfilled all their expectations. He had 178 votes in the electoral college against 83 given for Adams. Though the work of redistribution of offices began almost at his inauguration, it is yet an incorrect account of the matter to say that Jackson corrupted the civil service. His administration is rather the date at which a system of democracy, organized by the use of patronage, was intro- duced into the federal arena by Van Buren. The adminis- tration had two parties in it from the first, Van Buren's and Calhoun's, and the president's interference

in a purely private matter brought about a rupture. In April 1831 the whole cabinet resigned ; Jackson and Calhoun quar- relled ; and the former transferred to Van Buren his sup- port for succession in the presidency.

In 1832 Jackson was re-elected by a large majority over Clay, his chief opponent. The battle raged mainly around the re-charter of the Bank of the United States. It is probable that Jackson's adviscrs in 1828 had told him, though erroneously, that the bank had worked against him, and then were not able to control him. The first message of his first presidency had contained a severe reflexion on the bank ; and in the very height of this second campaign (July 1832) he vetoed the re-charter, which had been passed in the session of 1831-32. Jackson interpreted his re-election as an approval by the people of his war on the bank; and after the exciting episode of South Carolina's opposition to the tariff-rates he pushed it with energy. In September 1833 he ordered the public deposits in the bank to be transferred to selected local banks, and entered upon the "experiment" whether these could

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adopt sound rules of currency. During the next session the senate passed a resolution condemning his conduct. Jack- son protested, and after a hard struggle the resolution was ordered to be expunged from the record, January 16, 1837,

Jackson was very successful in collecting old claims against various European nations, for spoliations inflicted under Napoleon's continental system. Aiming at a currency consisting largely of specie, he caused the payment of these claims to be received and imported in specie as far as possible ; and in 1836 he ordered land-agents to receive for land nothing but specie. About the same time a law passed congress for distributing among the States some $35,000,000 balance belonging to the United States, the public debt having all been paid. The eighty banks of deposit in which it was lying had regarded this sum almost as a permanent loan, and had inflated credit on the basis of it. The

necessary calling in of their loans in order to meet the drafts in favour of the States, combining with the breach of the overstrained credit between America and Europe and the decline in the price of cotton, brought about a crash which prostrated the whole financial, industrial, and commercial system of the country for six or seven years. The crash came just as Jackson was leaving office; the whole burden fell on his successor, Van Buren.

Jackson is the only president of whom it may be said that he went out of office far more popular than he was when he entered, When he went into office he had no political opinions, only some popular notions. He left his party strong, perfectly organized, and enthusiastic on a platform of low expenditure, payment of the debt, no expenditure for public improvement or for glory and dis- play in any form, and low taxes. His name still remained a spell to conjure with, and the politicians sought to obtain the assistance of his approval for their schemes; but in general his last years were quiet and uneventful. He died near Nashville, June 8, 1845.

Biographies of Jackson have been written by J. H. Eaton, 1824; William Cobbett, 1834 ; Amos Kendall, 1844 ; and James Parton, 8 vols., 1860. (W. G. 8.)

JACKSON, Tuomas JonaTHan (1824-1863), "Stone- wall Jackson," a distinguished Confederate gencral in the American civil war, was born in Harrison county, Virginia, 21st January 1824, and came of that Scotch-Irish stock to whose hardy virtues the middle States of America are largely indebted for the pure and resolute virtues of their people, His early education was only such as could be furnished by an obscure country school. Thence he passed to West Point military academy, where, though he was at first impeded by lis meagre acquirements, his indomitable courage and conscientious diligence eventually raised him to a foremost place. At West Point he exhibited the qualities by which he was distinguished in the splendour of his career,—courage, patience, constancy of purpose, inflexible fidelity to duty, and an artless simplicity of character which engaged instant and universal confidence. Graduating at twenty-two, he was appointed lieutenant of artillery in

the army of the United States, and participated, with distinction, in several of the mast important battles in Mexico. After the war he resigned his commission, and accepted the professorship of natural philosophy in the Virginia military institute at Lexington, a position which he held until the outbreak of hostilities between the Union and the Confederate States. During his sojonrn at Lexington, he entered the Presbyterian communion, and was remarkable ever after for the fervour of his religious devotion. In political discussions or agitations, Major Jackson—such was his title by brevet—had never engaged ; but in principle and by profession he was a State-right

not act as fiscal agents for the Government, and whether | Democrat of the Virginia school; in other words, he the desire to get the deposits would not induce them to | maintained the legitimacy of negro slavery and the

sovereign right of a State to withdraw from the Union, and therefore to the secession movement of 1861 he at once accorded his sympathy. Ou the organization of the Virginia troops he was commissioned colonel of infantry by Governor Letcher, who, long intimate with him, adequately appreciated his yet undisclosed military genius.

Jackson's first exploit in the war of secession was tlic capture, on May 3, 1861, of the Federal arsenal at Harper's Ferry. Soon afterwards he received the command of a brigade—the brigade which, by its immovable fortitude at Bull Run, turned the tide of battle in that long doubtful struggle, and, from the admiration of its comrades, extorted for itself and its chief the now historic name of " Stonewall."

Detached from the army at Manassas for separate service in the Shenandoah Valley, Jackson soon signalized his genius for war. Placing himself between the converging columns of Shields, Milroy, and Banks, he struck one after the other ; and, with a force inferior to his adversaries sepa- rately, he eventually drove them back upon Washington in utter defeat. In this "campaign of the valley" Jackson displayed true military instinct and the highest military art. By

vigilance, sagacity, celerity and secrecy of move- ment, and faultless tactical skill on the field of battle, he achieved the greatest possible results with the smallest possible means. His reputation was now fixed in the estimation alike of friend and foe; and, while the Confede- rate States were filled with the renown of his achievements, the Federal forces were in constant terror of his prowess. Having stayed the invasion of Virginia along the line of the valley, Jackson repaired to Richmond to concert with Lee the deliverance of the Confederate capital, then closely pressed by M'Clellan. Appointed, meanwhile, to the com- mand of a corps, he suddenly revealed himself on the right flank of the Federal army at Mechanicsville ; and ina series of desperately fought engagements he routed the besieging army, and drove M'Clellan to shelter at Harrison's Landing. Richmond relieved, Jackson, without pause, hastened to confront Pope, who was menacing the city from the north. In the battle of Cedar Run he inflicted signal defeat upon that general, and compelled him to retrace his steps across the Rappahannock.

Reinforced by M'Clellan's army and fresh troops from the northern States, Pope made a stand at Manassas ; but in the second battle on that field he suffered an overthrow as decisive as that sustained by M'Dowell in the first fight at Bull Run. As usual Jackson's corps bore the brunt of the battle ; and as usual to his skill and courage the Con- federate army was mainly indebted for itssuccess. Follow- ing up the victory by the invasion of Maryland, Lee

detached Jackson for an attack on Harper's Ferry, again"

in the hands of the Federalists, and garrisoned by 12,000 troops. In a few days the surrender of the place, with all its force and munitions of war, was announced to Lee, who, slowly retiring before M'Clellan, anxiously expected the arrival of Jackson, that he might turn and crush his pursuer. But before he could effect the desired junction Lee was brought to bay at Antietam, and com- pelled to accept battle under every disadvantage. Jackson now arrived, liowever, with two of his divisions, and his presence not only averted an otherwise inevitable disaster, but rescued the Confederate army from the destruction which

awaited it if defeated with its rear resting on the river. Henceforth Jackson's operations were under the Immediate eye and command of Lee; and, while at Fredericksburg and Chancellorsville his gallantry was as conspicuous as ever, to his illustrious chief belongs the glory of those hard-fought fields.

On the afternoon of May 2, 1863, Jackson fought his last battle. Executing a plan of his own conception, he suddenly struck the flank of the 11th Federal corps, and

drove it pell-mell before him. Night fell with the hostile forces in close proximity ; and, while Jackson was making ® reconnaisance with a view to pressing the pursuit, he was fired on in the dark by men of his own coinmand, and received wounds of which he died on May 10, 1863. His death smote the Confederates with a pang of unspeakable anguish. The fall of their foremost chieftain was bewailed as the omen of the fall of the party.

In deportment Jackson was grave and measured ; but he relaxed on approach, and his address was bland and gracious. In conversation he conveyed the impression of a frank, firm character, and of an intellect clear and direct, but in no wise of superior order. No opinion floated languidly in his understanding; he held all his beliefs with an intense earnestness of conviction, and he was prompt and resolute in carrying his convictions into action. He engaged in the war of secession with an unfaltering faith in the justice of the cause and an unhesitating persuasion of its triumph. He was the idol of his troops. At his command they would cheerfully endure any sacrifice or confront any peril. On the field of battle he was never known to lose his self-possession, or to be surprised by any fluctuation of fortune ; his quick eye would detect the exigent moment, and his unerring judgment direct the decisive manceuvre. (Garr)

JACKSON, Witt1AM (1730-1803), an English musician of repute, was born at Exeter, in May 1730. His father, a grocer, bestowed a liberal education upon him, but, on account of the lad's strong predilection for

music, was induced to place him under the care of Jolin Silvester, tho organist of Exeter Cathedral, with whom he remained about two years. In 1748 he went to London, and studied under John Travers, organist of the king's chapel. Returning to Exeter, he settled there as a teacher and composer, and in 1777 was appointed subchanter, organist, lay-vicar, and master of the choristers of the cathedral. In 1755 he published his first work, Z'welve Songs, which became at once highly popular. His next publication, Six Sonatas for the Harpsichord, was a failure. His third work, Sia Elegies for three voices, preceded by an Invocation, with an Accompaniment, was very successful, and placed him among the first composers of his day. Dr Burney considered these as the best of Jackson's works, and added that "no coniposer copied less from others tlian Jackson." His fourth work was another set of Twelve Songs, now very scarce; and his fifth work was again a set of T'welve Songs, all of which are now forgotten. He next published Twelve Hymns, with some good remarks upon that style of composition, although his precepts were better than his practice. A set of Twelve Songs followed, containing some good compositions. Next came an Ode to Fancy, the words by Dr Warton. Twelve Canzonets for two vorces formed lis ninth work; and one of them—""'Time has not thinned my Flowing Hair"—long held a place at public and private concerts. His tenth work was Laght Sonatas for the Harpsichord, some of which were novel and pleasing. He composed three dramatic pieces, —Lycedas (1767), Lhe Lord of the Manor, to General Burgoyne's words (1780), and Zhe Metamorphoses, a comic opera produced at Drury Lane in 1783, which did not succeed. Tn the second of these dramatic works, two airs—" Encom- passed in an Angel's Form" and " When first this Humble Roof I kuew "—were great favourites. Some of his church music, published after his death, did not please the critics. In 1782 he published Thirty Letters on Various Subjects, which are: well written and interesting. In these he severely attacked canons, and described William Bird's Von nobis Domine as containing passages not to be endured, But his anger and contempt were most strongly expressed against catches of all kinds, which he denounced as bai-

barous. In 1791 he put forth a pamphlet, Observations on the Present State of Music in London, in which le found fault with everything and everybody. He published in 1798 The Four Ages, together with Essays on Various

Subjects,—a work which gives a favourable idea of his |

character and of his literary acquirements. It appears that he cultivated a taste for landscape painting, and imitated, not unsuccessfully, the style of his friend Gainsborough. He died July 12, 1803.

JACKSONVILLE, the chief city in Duval county, Florida, U.S., and the largest in the State, is situated on the west bank of the St John's river, 25 miles from the sea. The city is regularly built. The streets, many of which are pleasantly shaded with trees, are laid out on the common American rectangular system. Jacksonville exports very large quantities of lumber, besides fruit, cotton, sugar,

and fish, and carries on a coasting trade with Charleston, |

Savannah, and St Augustine. The fine salubrious climate attracts numerous visitors and invalids from the northern States. Jacksonville, which owes its name to President Jackson was laid out as a town in 1822. In 1880 its population was 7650.

JACKSONVILLE, the chief city of Morgan county, Illinois, U.S., on Mauvaiseterre Creek, a tributary of the Illinois river, is situated at the intersection of several railways, about 200 miles §.8. W. of Chicago. are wide and generally well shaded. The public build- ings include State institutions for the blind, the feeble- minded, the deaf and dumb, and the insane. Among the educational institutions, which are numerous, are I]hinois College, three colleges for women, and a conservatory of of music. There is also a free library, with reading-room. The population in 1880 was 10,928.

JACOB (APM! or APY, derived according to Gen. xxv. 26, xxvii. 36, from apy, and meaning "one who seizes the heel" or "supplants "), the

younger son of Isaac and Rebekah, and the father of the twelve patriarchs. Accord- ing to the Elohistic (Levitical) narrative in Genesis, he was born in the land of Canaan whien his father was sixty years of age. After Esau, his twin brother, at the age of forty years had married two Hittite wives, Isaac at the instigation of Rebekah sent Jacob with his blessing to Padan Aram, there to seek a wife in the family of his maternal uncle Laban. Arrived at his destination, he married Rachel (to whom Bilhah was given as a maidservant) ; the same narrative implies also his union with Leah (whose maid was Zilpah). Before he left Padan Aram he had become the father of twelve sons, including Benjamin (Gen. xxxv. 23-26). On his return, with the property he had acquired, to lis father Isaac in Canaan (xxxi. 18), God met him and blessed him and changed his name from Jacob to Israel ; the place where this occurred was called by him Bethel (xxxv. 9-13, xxxv. 15). In the course of a further migration southwards, Rachel died at a point not far from Ephrath (Bethlehem) ; finally Mamre, near Kirjath Arba

Its streets |

| 98° 17’ N. lat. and 68° 28’ 45” E. long.

(Hebron), where Isaac was living, was reached, and a |

permanent settlement appears to have been made until the

death of Isaac there at the age of one hundred and eighty | years. his household of seventy souls is then briefly indicated,

aud his hospitable reception as an old man of one hundred © and thirty by Pharaoh. A residence was assigned to the | colony in the best part of the land, the land of Rameses, by Joseph, and here the Israelites prospered much and rapidly increased. Seventeen years after the interview with Pharaoh the patriarch died, after having blessed his sons and particularly Joseph, whose two sons Ephraim and —

The subsequent migration of Jacob to Egypt with |

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Canaan. The combined parallel narrative of the Jehovist and the other (elder) Elohist is much fuller, and in some points not easily to be reconciled with the preceding account. Various circumstances connected with the bith of the twins Isaac and Jacob are detailed ; the partiality of Isaac for the elder and of Rebekah for the younger is indicated ; Jacob's departure from Canaan is represented as a flight necessitated by his fraudulent conduct towards Isaac and Esau with reference to the blessing of the former; a revelation received at Bethel in the course of this flight is described ; many minute particulars of his domestic life at Padan Arai and of his relations with Laban his uncle and father-in-law are given; the scene of the change of name is placed at Peniel, where he wrestled with the angel (see Hos. xii. 5) ; a period of residence at Shechem is mentioned ; the death of Rachel at Ephrath is said to have happened in childbed ; after having fixed his home successively at Hebron and Beersheba, he is ultimately led by circum-stances, which are described with much fulness and vivid- ness, to migrate to Egypt, where he dies. Consideration of the relations of these parallel narratives may be postponed to the article Pentateucn. As to the interpretation of the history of Jacob, it is now usual to regard it as having an ethnological at least quite as much as a personal significance ; but none of the attempts hitherto made to mythologize it (as by Popper, who sees in the wrestling Jacob the Asiatic Hercules, Melicertes, Paleemon) can be regarded as even plausible.

See Ewald, Gesch. Israels, i. 412 sqg., 489 sqgq.; Wellhausen, Gesch. Isracis, i. 314, 874; Kuenen in the Theol. Tijdschr. for May, 1871.

JACOBABAD, a municipality and the chief town of the frontier district of Upper Sind, India, is situated in Laid out in 1847 by General John Jacob, on the site of the village of Khangarh, it is now the headquarters of the large military force of the Upper Sind frontier, and also of the local civil administration. It contains therefore a considerable European population, and possesses all the usual public offices and institutions of an important station. In addition to the cantonments, civil and judicial courts, dispensary, jail, post and telegraph offices, &c., it has also a " residency," and lines for the accommodation of trade caravans (kéfélas) from Central Asia. The civil court, which is under

the Shikérpur jurisdiction, was established in 1870, the sessions judge of Shikarpur visiting it twice a year. Popula- tion, including the military camp, 10,954.

JACOBI, Friepricy Heryricu (1743-1819), a distin- guished writer on philosophy, was born at Diisseldorf on the 25th January 1743. The second son of a wealthy merchant, who owned an extensive sugar factory near Diisseldorf, he was educated for a commercial career, partly in his native place, partly at Frankfort-on-the-Main. At the age of sixteen he was sent to complete his training at Geneva, where he remained for four years. Of a retiring disposition, and far more inclined to thoughtful meditation than to practical activity, Jacobi mainly associated himself at Geneva with the literary and scientific circle of which the most prominent member was Lesage. He studied

| closely the works of Bonnet, the Swiss naturalist and _metaphysician, and was brought into contact with the new

political ideas of Rousseau and Voltaire. In 1763 he was

called back to Diisseldorf, and in the following year he

married and took his place at the head of the mercantile concern handed over to him by his father. After a short period he gave up his commercial career, and in 1770 became a member of the council for the duchies of Juliers

Manasseh he put upon a level with Reuben and Simeon. | and Berg, in which capacity he distinguished himself by He was buried by his family, according to his own desire, | his ability in the management of financial affairs, and his in the cave of Machpelah, fronting Mamre, in the land of | zeal in the direction of social reforms. Like his contei-

porary Hemsterhuis, whom he resembles in many points, Jacobi matters by an extensive correspondence, and his mansion at Pempelfort, near Diisseldorf, was the centre of a distin- guished literary

circle. With Wieland he contributed to start a new literary journal, the Mercury, in which some of his earliest writings, mainly on practical or economical subjects, were published. Here too appeared in part the first of his philosophic works, the Correspondence of All-

romance with speculation, containing a remarkable delinea- tion of that which we may call the principle of the early romantic school in Germany. 'This was followed in 1779 by Woldemar, a philosophic novel, of very imperfect struc- ture, but full of genial speculation, and giving the most complete picture of Jacobi's method of philosophizing. In 1779 he was invited to Munich as member of the privy council, but after a short stay there differences with his colleagues and with the authorities of Bavaria drove him back to Pempelfort. A few unimportant tracts on ques- tions of theoretical politics were followed in 1785 by the work which first brought Jacobi directly into relation with the contemporary philosophical public. A conversation which he had held with Lessing in 1780, in which Lessing avowed that he knew no philosophy, in the true sense of that word, save Spinozism, led him to a protracted study of Spinoza's works, while his statement of Lessing's con- fession induced a correspondence with Moses Mendelssohn. The Letters on Spinoza's Theory (Briefe tiber die Lehre Spinoza's, 1785 ; 2d ed., much enlarged and with important

Appendices, 1789) expressed sharply and clearly Jacobi's ©

strenuous objection to a demonstrative system in philosophy, and drew upon him the vigorous enmity of the Berlin clique, whose philosophic protagonist was Moses Mendelssohn. Jacobi was ridiculed as endeavouring to reintroduce into philosophy the antiquated notion of unreasoning belief, was denounced as an enemy of reason, as a pietist, and as in all probability a Jesuit in disguise, and was especially taken to task for his employment of the ambiguous term " belicf " (Glaube, which may mean belief in the ordinary seuse, or

slight acquaintance with the Spinozistic system to which he had so frequently and so earnestly appealed, and his mortification at the public disclosure of the fact that he had remained in entire ignorance that Spinoza's Opera

Posthuma contained the Ethics is said to have hastened .

his death.

Jacobi's next important work, David Hume on Belief, or Idealism and Realism, a dialogue (David Hume tiber den Glauben, oder Idealismus und Realismus, 1785), was an attempt to show not only that the term Glaube had been used by the most eminent writers to denote what he had employed it for in the Letters on Spinoza, but that the nature of the cognition of facts as opposed to the con- struction of inferences could not be otherwise expressed. In this writing, and especially in the Appendix, Jacobi came into contact with the critical philosophy, and sub- jected the Kantian view of knowledge to searching ex- amination.

_ The outbreak of the war with the French republic induced Jacobi in 1793 to leave his home at Diisseldorf, and for nearly ten years he resided in Holstein. While there he became intimately acquainted with Reinhold, in whose Bettrdge, pt. iii., 1801, his important work On the Endeavour of the Critical Philosophy to bring Reason to Understanding was first published, and with Matthias Claudius, the author of the Wandsbecker Bote. During the same period the excitement caused by the accusation

of atheism brought against Fichte at Jena led to the |

kept up his interest in literary and philosophic |

| abstraetions.

| ness of immediate truth. | hopeless ideal of a systematic (¢.e., intelligible) explanation of

| that upon Spinoza's system Jacobi should first

| Wolff is not less fatalistic than | thinker to the very principles of Spinoza ;

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publication of Jacobi's Letter to Fichte, in which he made more precise the relation of his own philosophic principles to theology.

Soon after his return to Germany, Jacobi received a call to Munich in connexion with the new academy of scieuces just founded there. The loss of a considerable portion of his fortune induced him to accept this offer; he settled in Munich in 1804, and in 1807 bccame president of the

Diets Bride Sorter, 1714), » combination of | academy. In 1811 appeared his last philosophic work, wt is z zB 9 3 ;

directed against Schelling specially, On Divine Things (Von den gittlichen Dingen), the first part of which, a review of the Wandsbecker Bote, had been written in 1798. A bitter reply from Sclielling was left without answer by Jacobi, but gave rise to an animated controversy in which Fries and Baader took prominent part. In 1812 Jacobi retired from the office of president, and began to prepare a collected edition of his works. He died before this was completed, on 10th March 1819. The edition of his writings was continued by his friend K6ppen, and was completed in 1825. The works fill six volumes, of which the fourth is in three parts. To the second is prefixed an introduction by Jacobi, which is at the same time an intro- duction to his philosophy. The fourth volume has also an important preface.

The philosophy of Jacobi presents itself as in no way a system,—indeed, as, from its principle, essentially unsystematic. A certain fundamental view which underlies all his thinking is brought to bear in succession upon those systematic doctrines which appear to stand most sharply in contradiction to it, and any positive philo- sophic results are given only occasionally. The leading idea of the whole is that of the complete separation between understanding and apprehension of real fact. For Jacobi understanding, or the logical faculty, is purely formal or elaborative, and its results never transcend the given material supplied to it. From the basis of inmediate experience or perception thought proceeds by comparison and abstraction, establishing connexions among facts, but remaining in its nature mediate and finite. The principle of reason and con- sequent, the necessity of thinking cach given fact of perception as conditioned, impels understanding towards

an endless series of identical propositions, the records of successive comparisons and The province of the understanding is therefore strictly the region of the conditioned ; to it the world must present itsclf as a mechanism. If, then, there is objective truth at all, the

| existence of real facts must be made known to us otherwise than

faith in the specifically theological significance). Mendels-— sohn's reply showed little more than the writer's very |

through the logical faculty of thought; and, as the regress from conclusion to premises must depend upon something not itself capable of logical grounding, mediate thought implies the conscious- Philosophy therefore must resign the

things, and must content itself with the examiation of the facts of consciousness. It is a mere prejudice of philosophic thinkers, a prejudice which has descended from Aristotle, that mediate or demonstrated cognition is superior in eogency and value to the im- mediate perception of truths or facts.

The fundamental principle of Jacobi's system, thus skctched, presents a most interesting analogy with that which has become familiar in English philosophy through the writings of Sir W. Hamilton. Upon the historical relations between the two thinkers nothing requires here to be said. No reader of Hamilton can fail to be made aware of the great obligations the Scotch psychologist was under to his German predecessor. But attention to the results of Jacobi's fundamental doctrine, as these were wrought out by com- parison of it with the speculative systems of Spinoza, Kant, and Schelling, will throw great light upon Hamilton's writings, and make clear the connexions of the several parts which in lis imper- fect expositions too frequently remained in obscurity.

As Jacobi starts with the doctrine that thought is partial and limited, applicable only to connect facts, but incapable of explain- ing their existence, it is evident that for him any demonstrative system of metaphysie which should attempt to subject all existence to the

principle of logical ground must be repulsive. Now in modern philosophy the first and greatest demonstrative system of metaphysic is that of Spinoza, and it lay in the nature of things direct his criticism. A summary of the results of his examination is thus presented (Werke, i. 216-223) :—"(1) Spinozism is atheism ; (2) the Kab- balistic philosophy, in so far as it is philosophy, is nothing but unde- veloped or confused Spinozism ; (3) the philosophy of Leibnitz and that of Spinoza, and carries a resolute (4) every demonstrative methed ends in fatalism ; (5) we can demonstrate only similarities

(agreements, truths conditionally necessary), proceeding always in identical propositions ; every proof presupposes something already proved, the principle of which is immediately given (Offenbarung, revelation, is the term here employed by Jacobi, as by many later writers, ¢.g., Lotze, to denote the peculiar character of an immedi- ate, unproved truth); (6) the keystone (Element) of all human knowledge and activity is belief (@laubc). Of these propositions only the first and fourth require further notico. Jacobi, acccpting the law of reason and consequent as the fundamental rule of demon- strative reasoning, and as the rule explicitly followed by Spinoza, points out that, if we proceed by applying this principle so as to recede from particular and qualified facts to the more general and abstract conditions, we land ourselves, not in the notion of an active, intelligent creator of the system of things, but in the notion of an all-comprehensive, indeterminate Naturc, devoid of will or intelligence. Our unconditioned is either a pure abstraction, or else the impossible notion of a completed system of conditions. In either case the result is atheism, and this result is necessary if the demonstrative method, the method of understanding, is regarded as the only possible means of knowledge. Moreover, the same method inevitably lands in fatalism. For, if the action of the human will is to be made intelligible to understanding, it must be thought as a conditioned phenomenon, having its sufficient ground in preceding circumstances, and, in ultimate abstraction, as the outflow from nature

which is the sum of conditions. But this is the fatalist conception, and any philosophy which accepts the law of reason and consequent as the essence of understanding is fatalistic. Thus for the scientific understanding there can be no God and no liberty. It is impossible that there should be a God, for if so he would of necessity be finite. But a finite God, a God that is known, is no God. It is impossible that there should be liberty, for if so the mechanical order of phenomena, by means of which they are com- prehensible, would be disturbed, and we should have an unintelli- gible world, coupled with the requirement that it shall be understood.

Cognition, then, in the strict sense, occupics the middle place between sense perception, which is belief in matters of sense, and reason, which is belief in supersensuous fact. (Jacobi wavered much in his terminology, especially with respect to the word reason ; but even at this stage of his thinking the distinctions just named are sufficiently apparent.) Such a view, and especially the fundamental peculiarity that the eategories of the understanding are to be regarded as mere forms of the conditioned, from their very nature limited and relative, presented a certain analogy to the critical philosophy, and accordingly, in the second period of Jacobi's speculative development, he is driven to a comparison of his doc- trines with those of Kant.

His adverse criticism of the Kantian doctrines was directed on three points mainly, and, though in itself but ill-founded, it deserves the eareful consideration of all Kantian students. (1) The categories of the understanding and the forms of intuition supply a blank scheme for the given element of sense. But if the given clement be merely sensation, and not actually the external thing, we are still, Jacobi thinks, within the position of subjective idealism. At no point in the whole process do we ever get beyond empty form, bare identity. The synthetical unity of consciousness, if no reality be supplied in regard to which it may operate, is mere repetition of the form of conjunction, mere possibility of cognition. Whence do we obtain the reality, the objectivity, of knowledge? To Jacobi it seemed that Kant, in the second edition of the Kritik, made an effort to demonstrate the external reality of phenomena of cxperi- ence, aud he views the change in Kant's doctrine

as the effect of his own critical comments. Nevertheless such demonstration still seems to him unsatisfactory ; it yields only the thought-form of externality, not externality in fact. (2) Jacobi agrees with Kant so far as the critical view of the incapacity of understanding to encompass the ideas is concerned, but he thinks Kant in error in supposing that such incapacity results from the subjective limitation of our power of thinking and not from the nature of the categories of understanding in themselves. At tlie same time he holds that Kant treats the ideas unjustly, and that in his view of reason he tends to make that faculty inferior to understanding. (3) Kaat's moral theory is as little satisfactory as lis theory of perception. Here, too, in the demand for universally valid law as the law of a will that is its own content, Jacobi can find but the form and not the reality of a universal rule. The universal will is void of con- tent, and the sharp opposition which in the Kantian cthics appears between the cthical motive and all modes of fecling is the natural result of mere formalism. When Jacobi endeavours to supply the place of the Kantian theorems which he rejects, the inherent weak- uess of his own principle becomes apparent. External things are known to us by imniediate perception, a combination of intuition and belief. The principle of inference to realities is that of cause and effect, the significance of which we learn from observing the relation between our will and changes in the objective world, and this principle by a natural necessity we.extend to all existence. The infinite progress from consequents to grounds, which is the

form of procedure of understanding, yields no conclusion as regards the being of a God. But when we regard the whole system of real things, we arc compelled to infer a real cause, which, from the significance of the causal principle, is seen to be of necessity an active intelligent will, a God who foresees events. This apprehen- sion of God is faith, reason, or feeling, as Jacobi, following Fries, is willing to call it.

Not even in his latest work of importance (Von den gittlichen Dingen), which is specifically on religion, does Jacobi manage to make elear the

step, which he has himself characterized as the salto mortale of the human intellect, from the finite to the infinite ; still less the further difficulty as to the possibility of holding that the God who for cognition is the unknown God must be held to possess providence, personality, life. He acknowledges that this is anthropomorphic, bitterly assails Schelling for identifying divine and liuman reason, but leaves the.problem standing. The truth is that what Jacobi called feeling, and regarded as immediate knowledge, is not a.simple act of mind, capable of yielding simple results, but the very essence of complex thinking. We cannot separate know- ledge of things from apprehension of them in the way he has adopted. Nor can the human reason rest satisfied with a system devoid of inner coherence and harmony.

The best introductions to Jacobi's philosophy are the preface to the second yol. of the Works, and Appendix 7 to the Letters on Spinoza's Theory. There aretwo monographs of some extent upon him :—Kuhn, Jacobi und die Philosophie seiner Zeit, 1834; and Zirngiebl, F. H. Jacobi's Leben, Dichten, und Denken, 1867. See also F. H. Jacobi's Auserlesener Briefwechsel, 2d ed., by Roth, 2 vols., 1825-27; and Gildemcister's edition of Hamann's Schriften, yol. v. (R. AD.)

JACOBI, Kart Gustav Jacos (1804-1851), one of the great mathematicians of the present ceutury, was born at Potsdam, of Jewish parentage, December 10, 1804. He studied at Berlin-university, where he obtained the degree of doctor of philosophy in 1825, his thesis being an analytical discussion of the theory of fractions. In 1827 he became "extraordinary" and in 1829 "ordinary" professor of mathematics at Kénigsberg ; and this chair he filled till 1842, when he visited Italy for a few months to recruit his health. On his return he removed to Berlin, where he lived as a royal pensioner till his death, February 18, 1851. His investigations in elliptic functions, the theory of which he established upon quite a new basis, and more particularly his development of the Theta-function, as given in his great treatise Mundamenta Nova Theonz Functionum Ellipticarum (Konigsberg, 1829), and in later papers in Crelle's Journal, constitute his grandest analytical discoveries. Second in importance only to these are his researches in differential equations, notably the theory of the last

multiplier, which is fully treated in his Vorlesungen tiber Dynamik, edited by Clebsch (Berlin, 1866). It was in analytical development that Jacobi's peculiar power mainly lay, and he made many important contributions of this kind to other departments of mathematics, as a glance at the long list of papers that were published by him in Crelle's Journal from 1826 onwards will sufficiently indi- cate. Thus he was one of the early founders of the theory of determinants ; in particular, he invented the functional determinant formed of the 2? differential coefficients of 2 given functions of » independent variables, which now bears his name (Jacobian), and which has played an im- portant part in many analytical investigations. Valuable also are his papers on Abelian trauscendents, and his investigations in the theory of numbers, in which latter department he mainly supplements the labours of Gauss, with whom as with the other great Continental mathe- maticians of the day, Legendre, Bessel, Abel, &c., he was on terms of the closest intimacy. The planetary theory and other particular dynamical problems likewise occupied his attention from time to time. He left a vast store of manuscript, portions of which have been published at intervals in Crelle's Journal. See InrrnrresimaL Cal- CULUS.

JACOBITE CHURCH, an ecclesiastical organization thinly spread over Syria, Mesopotamia, and Babylonia, having for itsdistinctive doctrinal principle the Monophysite thesis with regard to the person of Christ ; it consequently accepts the decrees of the second (" Robber") synod cf

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Ephesus, and rejects those of the council of Chalcedon. It |

has some minor peculiarities in points of detail,—for example, as to the preparation of the communion elements, the mode of making the sign of the cross, and the method of electing patriarchs and bishops. Its head is called the patriarch of Antioch, who has luis residence, however, for the most part at Diarbekir; second to him is the « maphrian" (¢.e., fertilizer"), who has a kind of primacy over the eastern section of the church. No accurate statistics as to the numerical strength of the Jacobite Church exist ; its numbers may probably be safely placed

considerably under 250,000. For a considerable time a Roman Catholic patriarch of the Jacobites has resided at Aleppo, and lately the Jacobites of Damascus have accepted Catholicism. The Jacobite Church owes its origin, as its name, to Jacobus, surnamed Baradxeus and sometimes Yanzalus, a native of Tella, who became a monk at Constantinople, and afterwards receiving episcopal con- secration (541 or 543 a.p.) devoted thenceforward the rest of his life (nearly forty years) to extensive labours through- out Asia Minor, Syria, Egypt, and the Mediterranean islands, on behalf of the Monophysite cause. Such were his energy and zeal that he is said to have consecrated in the course of his travels no fewer than two patriarchs, twenty-seven bishops, and fully 100,000 priests and deacons. The epithet "Jacobite" is sometimes applied 'with less strict propriety to the Coptic, Abyssinian, and Armenian Churches, which also are Monophysite, and owe much to the influence of Baradzeus.

JACOBS, Curistran Friepricu WitnELM (1764-1847), a German scholar and author, was born at Gotha, October 6, 1764. After studying philology and theology at Jena and Géttingen, he in 1785 became teacher in the gymnasium of his native town, and in 1802 was appointed to an office in the publiclibrary. In 1807 he became classical teacher in the lyceum of Munich, but he again returned to Gotha in 1810 to take the charge of the library and the numis- matic cabinet. From 1831 to 1842 he was superintendent of the art collections of the town. He died at Gotha, March 30, 1847.

Jaeobs, besides cditing a large number of the less known Greek and Latin authors, was a voluminous translator and also a sue- cessful writer in various departments of general literature. Of his editorial labours the most important is the edition of the Antho- logia Greea, 13 vols., 1794-1814. He also published translations from the Greek Anthology under the title Tempe, 2 vols., 1803. His Elementarbuch der griechischen Sprache, 1805, has gone through many editions. His miscellaneous essays on elassieal subjeets were published collectively at various periods under the title Vermischte Schriften, and amount in all to 8 volumes. Among his other writings may be mentioned Schriften fiir die Jugend, 3 vols., 1842-44; and Lrzihlungen, 7 vols., 1824-37.

JACOTOT, Joszpy (1770-1840), a French educationist, and author of the method of " Emancipation intellectuelle," was born at Dijon, March 4, 1770. He was educated at the university of Dijon, where in his nineteenth year he was chosen professor of Latin, after which he studied law, became advocate, and at the same time devoted a large amount of his attention to mathematics. In 1788 he organized a federation of the youth of Dijon for the defence of the principles of the Revolution; and in 1792, with the rank of captain, he set out to take part in the campaign of Belgium, where he conducted himself with bravery and distinction. After for some time filling the office of secretary of the " commission d'organisation du mouvement des armées," he in 1794 became deputy of the director of the Polytechnie school, and on the institution of the central schools at Dijon he was appointed to the chair of the "method of sciences," where he made his first expcriments in that mode of tuition which he afterwards developed more fully. On the central schools being replaced by other educational institutions, Jacotot occupied successively the

chairs of mathematics and of Roman law until the overthrow of the empire. In 1815 he was elected a representative to the chamber of deputies; but after the second restoration he found it necessary to quit his native land, and, having taken: up his residence at Brussels, he was in 1818 nominated by the Government teacher of the French language at the university of Louvain, where he perfected into a system the educational principles which he had already practised with success in France. His method was not ouly adopted in several institutions in Belgium, but also met with some approval in France, England, Germany, and Russia. An account of it will be found in the article Epucation, vol. vii, pp. 677-78. After the revolution of 1830 Jacotot returned to France, and he died at Paris, July

30, 1840.

His system was described by him in Enseignement wniversel, Langue maternelle, Louvain and Dijon, 1823—which has passed through several editions—and in various other works; and he also advocated his

views in the Jowrnal de l' Emancipation intellectuclle. For a complete list of his works and fuller details regarding lus earecr, see Biographic de J. Jacotot, by Achille Guillard, Paris, 1860.

JACQUARD, JosrrH Martz (1752-1834), inventor of the Jacquard silk-weaving loom, was born of humble parents at Lyons, July 7, 1752. The earlier part of his life is involved in considerable obscurity, though it is said that his mechanical talent was manifest from an early age. Jacquard married in 1777, and at the death of his father fell heir to two looms and a small sum of money. 'These, however, like Palissy's furniture, were sacrificed to the inventive pursuits of their owner, who was at last forced to become a lime-burner at Bresse, while his wife supported herself at Lyons by plaiting straw. In 1793 Jacquard took part in the unsuccessful defence of Lyons against the troops of the convention; but afterwards served in their ranks on the Rhone and Loire. After seeing some active service, in which his young son was shot down at his side, Jacquard again returned to Lyons, where he succeeded in finding work. He still laboured at his machines, and in 1801 a medal was awarded him for an invention which

| he exhibited in the industrial exhibition at Paris, whereby

oue workman per loom was superseded in the weaving of figured silks. Jacquard was summoncd to Paris, and after interviews with Napoleon and Carnot was attached to the Conservatoire des Arts et Métiers. A loom of Vaucanson's, deposited there, suggested various improvements in his own, which he gradually perfected to its final state. In 1804 he returned to Lyons, and although his invention was fiercely opposed by the silk weavers, whom it threatened to deprive of a livelihood, its advantages were too great to suffer resistance. Many years before his death, which occurred at Oullins, a village near Lyons, on August 7, 1834, the inventor had the satisfaction of seeing his loom in almost universal use, and, as a consequence, the pro- sperity of his native city rapidly advancing. Jacquard was rewarded with a pension of £60, a royalty of £2 upon each loom erected, and the cross of the legion of honour. His statue was erccted in Lyons in 1840. See Lamartine's Jacquard, and the article WEAVING.

JADE, a name popularly applied to several distinct ornamental stones, but restricted scientifically to a definite mineral species known as nephrite. The term nephrite, from vedpés, the kidney, refers to the reputed value of the mineral in renal diseases, whence it was formerly known as Lapis nephriticus. Probably the word jade is a corrup- tion of the Spanish /ijada, since this mincral is one of the stones which were known to the Spanish conquerors of Mexico and Peru under the name of piedra de hyada, or "stone of the loins"—a name which first appears in the writings of Monardes, in 1565, as piedra de la yjada. So numerous have been the names applied to this mineral in

various parts of the world, and at different times, that Professor Fischer has collected nearly one hundred and fifty synonyms of jade.

True jade, or nephrite, is a native silicate of calcium and magnesium, which may be regarded as a compact or crypto-crystalline variety of hornblende, and may be referred either to actinolite or to tremolite, according as its colour tends to green or to white. It never exhibits crystalline form or distinct cleavage ; but, according to recent observers who have visited the old quarries in Turkestan, and have seen the mineral zz situ, traces of cleavage may occasionally be observed ; usually, however, tlle substance breaks with a splintery fracture. The specific gravity of jade varies from 2°91 to 3°06, and offers one of the readiest means of distinguishing between this 'mineral and others with which it is likely to be confounded. Most specimens of jade are scratched by flint or quartz, their hardness being about 6°5 ; but, while the hardness is not excessive, the mineral is remarkable for its toughness. It is notable that Hermann von Schlagintweit, who inspected the quarries in the Kara-kash valley, found that the hardness of the stone when freshly broken was con- siderably less than that assumed by it after a short ex- posure. The colour of jade is subject to great diversity, —some varieties presenting almost every shade of green, while others are yellowish, grey, or even white.

So far as is at present known, no true jade has ever been detected in sttu in Europe. A loose block has been found at Schwemsal near

Leipsic, and the mineral is said to occur in the drift at Potsdam near Berlin. Corsica and Turkey have also been recorded as jade localities, but probably on insufficient grounds.

It is by the Chinese that jade has always been most highly prized, and, notwithstanding its intractability, most elaborately carved. To the Chinese it is known under the name of yu or yu-chi (yu-stone). Much of the Chinese jade was formerly obtained from quarries in the Kuen-lun mountains, on the sides of the Kara-kash valley, in Turkestan. These ancient workings were visited and described a few years ago by H. v. Schlagintweit, by Dr Stolicka, and by Dr Cayley. The mineral is found in nests and veins running through schistose and gneissose rocks. It is probable that jade occurs throughout the Kuen-lun range, and that a rich site exists to the south of Khotan. The Khotan jade has been known to the Chinese for upwards of two thousand years. In Turkestan the jade is known as yashm or yeshm, a word which appears in Arabic as yeshb, and is said to be cognate with fac7ms or jasper. Indeed, by early mineralogists the jade was often described as jaspis viridis. Fine boulders of dark green jade have been found by M. Alibert in the neighbourhood of lis graphite mine near Batougol in Siberia. New Zealand is one of the most famous localities for jade, and the stone is highly prized by the natives, who work it, with great labour, into amulets, axe-heads, and various other objects. Among these objects may be mentioned the peculiar clnb-like implement known as the mere or pattoo- pattoo, and the hideous breast ornament termed hed tk. By the Maories jade is known as punamu or '" green-stone," and the occurrence of this mineral along the western coast of the south island has led to the name Ze wahi punamu, or "the place of the green-stone," being applied to this district. Jade also occurs in New Caledonia and in some of the smaller Pacific islands. In consequence of its use by the South Sea islanders as a material for making axe- heads, it is often known to German mineralogists as Beilstein or "axe-stone."

Under the name of " oceanic jade," M. Damour has described a fibrous variety found in New Caledonia and in the Marquesas Islands, having a specific gravity of

3°18, and differing from ordinary nephrite in the propor- tion of lime and magnesia which it contains. If this oceanic jade be recognized as a distinct variety, the ordinary nephrite may be distinguished as " oriental jade."

Although it was from America that the original jade, or "spleen-stone," was introduced into Europe, it is curious that few, if any, American localities for this mineral are recorded in modern works on mineralogy. Dr Dawson has, however, noted its occurrence in British Columbia. At the time of the Spanish conquest of America, amulets in jade or in some jade-like mineral were highly venerated throughout Mexico, Central America, and Peru. It has been supposed by Mr E. G. Squier that jade was one of the green stones so greatly prized by the ancient Mexicans under the name of chalchihuitl. The " Amazon stone," which has sometimes been regarded as jade, is a green variety of microcline-felspar ; while the " Bowenite" from Smithfield in Rhode Island, which was at one time sup- posed to be nephrite, is found to be a variety of serpentine of unusual hardness. Serpentine is also used as a substi- tute for jade in some of the common objects imported from China.

While true jade has not hitherto been found iz situ in Europe, it is a very suggestive fact that neolithic celts and scrapers have been found among the relics of several of the ancient pile-dwellings in the lakes of Switzerland. The principal localities have been the stations of Liischerz and Schaftis on the Lake of Bienne (Biel), Meilen on the Lake of Zurich, and Robenhausen on the Lake of Pfaffikon. Yet no jade has been discovered among tlie rocks of the Swiss Alps; neither have any chippings been found which mighit lead us to suspect that the stone was worked in Switzer- land. As it seems beyond doubt that the jade must be a foreign material, it becomes an interesting question to determine whether such objects were obtained by barter, or had been brought by the ancestors of the old lake- dwellers from their primitive abode in the East, and pre- served generation after generation during their migration westwards. It should be mentioned that jade celts have been found by Dr Schliemann among the relics of the oldest of the cities at

Hissarlik, A jade celt engraved with a Gnostic formula in Greek characters is preserved in the Christy collection; and among the Assyrian and Babylonian seal-cylinders in the British museum there is said to be one specimen of jade.

It was shown by M. Damour, in 1863, that much of the so-called jade is altogether different from nephrite, and must be separated as a distinct species, for which he suggested the name of "jadeite." Jadeite is a silicate of aluminium and sodium, and therefore differs widely from nephrite in chemical composition. Mineralogically its relations lie rather with epidote than with hornblende. Its colour is generally brighter than that of nephrite, and the paler-tinted kinds often contain veins of a bright-green colour. It is slightly harder than nephrite, but its most distinctive characteristic is its high specific gravity; this ranges from 3°28 to 3°35, while the density of nephrite, even in oceanic jade, never exceeds 3:18.

Much of the Chinese "jade" is really jadeite. Accord- ing to Pumpelly the jadeite of Yu-nan in south-west China is known as fei-tsuz. Jadeite also occurs to the north-west of Bhamo in Burmah. Axes of jadeite are not unfre- quently found in the remains of the Swiss lake-dwellings, but the mineral is not known to occur in the rocks of Enrope. Jadeite forms the substance of many ancient Mexican ornaments, while implements wrought in the same material have been found in Costa Rica. Fischer records an Egyptian scarabzeus in jadeite.

The green jade-like stones which are known to the Maories as kawa-kawa and tangiwai do not appear to be

either jade or jadeite. From analyses published by Von Hochstetter, the former is a hydrated silicate of aluminium and magnesium, while the latter is a silicate of aluminium, calcium, magnesium, and iron.

It was pointed out by Damour, in 1865, that certain stone celts found in the dolmens of France and in the lakes of Switzerland, as well as some from Mexico, are wrought in a material which resembles jadeite, but

contains a larger proportion of iron, and is marked by having a specific gravity as high as 3°4 or even 3°65. This substance he distinguished as chloromelanite, a word which has an un- fortunate resemblance to the name chloromelan which Breithaupt bestowed, as far back as 1823, upon a mineral resembling cronstedite. Damour's chloromelanite is a substance of spinach-green or blackish green colour, fre- quently flecked with paler patches, and enclosing garnets and iron-pyrites. When H. B. de Saussure examined the geology of the Swiss Alps, he found a greenish mineral, of singular toughness, which he described as jade. By Hatiy it was afterwards called jade tenace. Its chemical composi- tion, however, is quite unlike that of jade, and Beudant separated it as a distinct mineral under the name of "sanssurite." Placed by the older mineralogists among the felspars, it seems to take its right position with the species called zoisite. Saussurite is a silicate of aluminium and calcium, having a specific gravity of about 3-2. It forms a constituent of the Alpine rock known as " euphotide," boulders of which are scattered around the Lake of Geneva, and were used by the lake-dwellers in the manufacture of inplements.

Another mineral occasionally mistaken for some of the paler kinds of jade, and used as a material for implements by the Neolithic occupants of western Europe, is the species termed " fibrolite." This is a silicate of aluminium with a specific gravity of about 3:2,—a density serving to dis- tinguish it from quartz, while it may be separated from other jade-like minerals by its infusibility.

The following table, containing a few selected analyses of jade

and the other minerals mentioned in this artiele, may be useful for

reference.

I. If. Ill. IV af | VI VIL. | VIL. 1x. | 58°46) 59°50) 57°75) 56°50) 52°25) 59°17 56°40| 43°59) 37-10

astern 27°09| 24:24) 19°86) 20°09) 18°07; 1°15) 1°82}, 2°98). ....

pint Seles 12°06} 11°60] 14°89} 13°27; 19°27) 2°68) 5°49) 19°71) ...

Ferrous oxide..| 1°15| 1:35] 4:79) 6°75) 6:80| 1°56) 6-06) ... =

Manganous „..| «.. 0°79} 0°46; 0-42) ... aie ina bse To. Alumina…..,... 0°75) 0°90) ... 0°58} 22°58} 14°76) 27°72) 61-03 Ferric oxide … ses 0°38 ove eee 3°27, 2°61) 0-71

Manganic„ .... ape <és 0°66)... eo

0°22 rm See iad aa

ase es 0°26; ... ae wea Sx

ane > os 0°68} 12°93} 11°20) 3°08 … 025) 0°68) 3°50; 15 0°35} + 1°20;

98°76) 100°65 100-07| 99°66

s.g. 2°97

I. White jade, China; Damour, .

i 4) », Turkestan; L. R. von Fellenberg z 2°96 III. Green jade, New Zealand ; » » 3°02 IV. „ „ Swiss Lake-dwelling; ., », 3°02 V. Oceanic jade; Damour, », 318 VI. Jadeite, China; „ . EP i OF VII. Chloromelanite, stone celt; Damour, 3 OM VIII. Saussurite, L. Geneva; T. Sterry Hunt, 3, 3°30 1X. Fibrolite, celt from Morbihan; Damour, 3°18

The literature of jade is very extensive, but it il be sufficient to refer to the work of Heinrich Fiseher, which is almost ex- haustive of the subject: Nephrit und Jadeit, nach ihren mineralo- gischen Higensehaften sowie nach ihrer urgeschichtlichen und ethno- graphischen Bedeutung, 2d ed., Stuttgart, 1880. (B._W..R.*)

J AEN, a province of Spain, in the north-east of Andalucia, is bounded on the N. by Ciudad Real, on the E. by Albacete and Granada, on the S. by Granada, and on the W. by Cordoba, and has an area of 5184 square miles, It may be described in general terms as consisting of the upper basin of the Guadalquivir, by which it is traversed from east to west. The main affluents of that

river within the province are the Guadianamenor on the left and the Guadalimar on the right. Situated immediately between the Morena and Nevada chains, Jaen is largely overrun by lofty spurs from both those systems, the most prominent being the Loma de Chiclana and the Loma de Ubeda in connexion with the former, and the Sierras de Cazorla, de Segura, and del Pozo, with the more isolated Sierra Magina and Monte Jabaleuz in connexion with the latter. As in the other provinces presenting similar physical conditions, there are great inequalities of climate, that of the valleys being warm and admitting of olive and vine culture, while the bleak wind-swept uplands are only available as sheep walks. The mineral wealth of Jaen, which has been known from the time of the Romans, is great, and the mining industry (Linares) is the most important in the province. Agriculture is in a very backward state, the grain produced being insufficient for local demands. The total population in 1877 was 422,972. There are twenty-four towns with a population exceeding 5000,—the most important being, besides Jaen the capital, Alcal& la Real, Andujar, Baeza, Bailen, Linares, Martos, Ubeda.

JAEN, the capital of the above province, is picturesquely situated 37 miles north of Granada and 120 miles east of Seville, on the Jaen (an affluent of the Guadalquivir), at the base and on the slopes of an acclivity surmounted by an ancient Moorish citadel with which the walls of the city are connected. Its elevation above the sea-level is about 1800 feet. The streets, rising above one another on the hill-side, are narrow and irregularly built; but there is a fine alameda commanding magnificent views of the surrounding country. The principal public building is the cathedral, built in the 16th century, in the Graeco-Roman style, on the site of an old Moorish mosque destroyed in 1492. Init is preserved the relic called “El Santo Rostro” or “La Santa Faz,” “the Holy Face,” said to have been

| impressed by the Saviour on the handkerchief of St Veronica.

Besides the cathedral, there are twelve parish churches and fourteen religious houses ; the city also possesses hospitals, barracks, a theatre,

an “instituto,” a library, and a museum of painting and sculpture. The manufactures of Jaen are unimportant. The population in 1877 was 24,392,

The identification of Jaen with the Roman Aurinz, whieh has sometimes been suggested, is extremely questionable. During the

| period of Arab domination it early beeame a eommereial centre of

eonsiderable importance, under the name of Jayyan, and ultimately rose to the dignity of eapital of a petty kingdom, which was brought

| to an end only in 1246 by Ferdinand III., who transferred thither

the bishoprie of Baeza. at Jaen in 1312. quake.

JAFFA. See Joppa.

JAFFNA, or JaFFNAPATAM, a town of Ceylon, situated in a peninsula of the same name at the northern ex- tremity of the island. It is a place of 34,684 inhabi- tants, according to the census of 1871; and, besides the usual administrative buildings of a district-town, it has a college (established in 1872) and a public library. The

Ferdinand IV., “ El Emplazado,” died In 1712 the town suffered severely from an earth-

fort was described by Tennent as “the most perfect

little military work in Ceylon—a pentagon built of blocks of white coral.” The European part of the town bears the Dutch stamp more distinctly than any other town in the island; and there still exists a Dutch Presbyterian church. Several of the church buildings date from the time of the Portuguese. The inhabitants, mainly Tamuls, are remarkably industrious, and their careful system of cultivation has turned the natarally sandy peninsula into a scene of luxuriant beauty. In 1873 there were fifty-one European cocoa-nut estates in the district.

Jaffna, or, as the natives eall it, Yalpannan, was oecupied by the Tamils about 204 B.c., and there continued to be Tamil rajahs of Jaffna till 1617, when the Portuguese took possession of

the place. As early as 1544 the missionaries under Francis Xavier had made converts in this part of Ceylon, and after the conquest the Portuguese maintained their proselytizing zeal. They had a Jesuit college and a Franeiscan and a Dominican monastery. The Duteh drove out the Portuguese in 1658, The Church of England Missionary Society began its work in Jaffna in 1818, and the Ameri- can Missionary Soeiety in 1822.

JAGADHRI, a municipal town in Ambdalé district, Punjab, India, is situated in 30° 10’ N. lat. and 77° 20’ 45” E. long., a little west of the river Jumna, 37 miles south-east of Ambala city, and 3 miles north of the Sind, Punjab, and Delhi Railway. Before the Sikh invasions, Jagddhri was a mere village; but Rai Sinh of Buria, the Sikh conqueror, encouraged the commercial and manufacturing classes to settle on the spot, so that a con- siderable trade rapidly sprang up. Destroyed by Nadir Shah during one of his incursions, but rebuilt in 1783 by Rai Sinh, it passed to the British in 1829 together with the territory of which it was the capital. Jagadhri has imports of copper and iron, considerable manufacture of metal work, and exports of vessels and tools. It contains a tahsili, police-office, and rest-house. The population in 1868 was 11,676, comprising 9220 Hindus, 2319 Maho- metans, and 137 Sikhs.

JAGUAR (Felis onea). This powerful and ferocious animal is the largest of the species of Felide found upon the American continent. It ranges from Texas through Central and South America into Patagonia. In the countries which bound its northern limit it is not fre- quently met with, but in South America it is still quite common, and Azara states that when the Spaniards first Fé

as many as two thousand were killed yearly. The jaguar is usually found singly, or sometimes in pairs, and preys upon such quadrupeds as the horse, tapir, capybara, dogs, or cattle, and its strength is so great that it has been known to swim with a horse it had killed across a wide river, and then to carry its prey into the woods. It rarely slays at a time more than is requisite to satisfy its hunger, and leaves the unconsumed portions for 'the benefit of any stray prowler who may find them. Its manner of killing its victim is, after springing upon it, to strike it to the earth by a blow of its powerful paw. The jaguar often feeds upon turtles, sometimes following the reptiles into the water to effect a capture ; having secured one and turned it over on its back, it inserts a paw between the shells and drags out the body of the turtle by

means of its sharp claws. Occasionally, after having tasted human flesh, the jaguar becomes a confirmed man. eater. The cry of this great cat, which is heard at night, and most frequently during the pairing season, is deep and hoarse in tone, and consists of the sound pu, pu, often repeated. The female brings forth from two to four cubs towards the close of the year; they are able to follow their mother in about fifteen days after birth. The colour of the jaguar varies greatly among individuals, ranging from white to black, the rosette markings in the extremes being but faintly visible. The general or typical coloration is a rich tan upon the head, neck, body, outside of legs, and tail near the root. The upper part of the head and sides of the face are thickly marked with small black spots, and the rest of body is covered with rosettes, formed of black spots, with a black spot in the centre, and ranged lengthwise along the body in five to seven rows on each side. These black rings are heaviest along the back. The lips, throat, breast, and belly, the inside of the legs, and the lower sides of tail are pure white, marked with irregular spots of black, those on the breast being long bars, and on the belly and inside of legs large blotches. The tail has large black spots near the root, some with light centres, and from about midway of its length to the tip it is ringed with black. The ears are black behind, with a large buff spot near the tip. The nose and upper lip are light rufous brown. The size varies, the total length of a very

large specimen measuring 6 feet 9 inches; the average length, however, is about 4 feet from the nose to root of tail. In form the jaguar is thick-set ; it does not stand high upon its legs; and in com- parison with the leopard it is heavily built. But its move- ments are very rapid, and it is fully as agile as its more graceful relative. The skull resembles that of the lion and tiger, but is much broader in proportion to its length. The forehead is concave, and the nasal region broad. The frontal processes of the maxillary are rounded, in contra- distinction to the truncated form of the tiger and the pointed one of the lion, and do not extend as far back as the fronto-nasal articulation. On the inner edge of the orbit is a well-developed tubercule. The canines are long and stout, the molar series well developed. The second sillon on the outer side of the crown of the canines is rudimentary, sometimes absent.

JAHANABAD, a town in Gayd. district, Bengal, situated on the Patna road, 25° 13' 10" N. lat., 85° 2' 10° E. long. Population (1872) 21,022—namely, 12,4138 Hindus and 8609 Mahometans. It was at one period a flourishing trading town, and in 1760 it formed one of the eight branches of the company's central factory at Patna. Since the introduction of Manchester goods, the trade of the town in cotton cloth has almost entirely ceased; but large numbers of the Julaha or weaver caste live in the neighbourhood.

JAHN, Joann (1750-1816), a distinguished Orientalist and Biblical critic of the Roman Catholic Church, was born at Tasswitz, Moravia, on June 18, 1750. After completing his school education at Znaim he studied philo- sophy at Olmiitz, andin 1772 began his theological studies at the Premonstratensian convent of Bruck in the neigh- bourhood of Znaim. Having been ordained to the priest- hood in 1775, he for a short time held a cure of souls at Mislitz, but was soon recalled to Bruck to become professor of Oriental languages and Biblical hermeneutics there. On the suppression of the convent by Joseph IL in 1784, Jahn was removed to a chair at Olmiitz corresponding to that which he had previously held, and in 1789 he was transferred to Vienna as professor of Oriental languages, Biblical archeology, and dogmatics. In 1792 he published his Hinleitung ins Alte Testament (2 vols.), which almost

immediately began to cause him trouble ; a certain Cardinal Migazzi laid @ complaint against him before the emperor because in his preface he had confessed himself to have in some points departed from the views of his learned prede- cessors and adopted opinions of his own, while in the work itself he declared Job, Jonah, Tobit, and Judith to be didactic poems. ‘To these charges was added a third, that ‘n his New Testament lectures he had stated the cases of demoniacal possession there mentioned to be cases of natural disease. On the matter being referred tu an ecclesiastical commission, it was reported that the views themselves were not necessarily heretical, but that Jahn lad shown undue rashness in giving out, as his own, opinions which teachers of theology ought not to mention otherwise than as foreign; in accordance with this it was decided that he ought to modify his expressions in future editions of his work and in his subsequent lecturing. Although he appears honestly to have accepted this judg- ment, the hostility of those who were opposed to his teach- ing did not cease until at last (1806) he was compelled to accept a canonry at Vienna, which involved the resignation of his chair. Thisstep had been preceded by the condem- nation of his Zntroductio in libros sacros Veteris Foderis in compendium redacta, published in 1804, and also of his Archeologia Biblica in compendium redacta (1805). The only work of importance, outside the region of mere philo- logy, afterwards published by him, was the Enchiridion Hermeneuticx (1812). He died August 16,1816, Jahn’s place in the history of the modern science of Biblical criticism is undoubtedly an honourable one, and also of some importance, especially when his ecclesiastical environ- ment is taken into account. If he cannot be said to have been either very original or very profound, he has at least the merit of being laborious, candid, and clear-sighted within his range of vision; one of his books, the Archzxo- logia, is not even yet entirely superseded.

Besides the works already mentioned, he published Hebrdisehe Sprachlehre fiir Anfénger, 1792; Aramiische od. Chaldédisehe u. Syrische Spraehlehre fiir Anfinger, 1793; Arabische Sprachichre, 1796; Elementarbuch der Hebr. Sprache, 1799; Chaldéiusche Chres-

tomathie, 1800; Arabisehe Chrestomathie, 1802; Lexicon Arabieo-Latinum Chrestomathiw accommodatum, 1802; an edition of the Hebrew Bible, 1806 ; Granumatica linguxw Hebraice, 1809 ; a critical commentary on the Messianic passages of the Old Testament (Vaticinia prophetarum de Jesu Messia), 1815. In 1821a collection of Nachtrdge appeared, containing six dissertations on Biblical sub- jects. The English translation of the Archwxologia by Upham has passed through several editions. See A. G. Hoffmann's article in Ersch and Gruber's Eneyelopddie.

JAHN, Oro (1813-1869), eminent alike as an archzo- logist, philologist, and art critic, was born June 16, 1813, at Kiel, where he began under Nitzsch the philological and archeological education which he continued at Leipsic under Hermann and at Berlin under Lachmann and Gerhard. After the completion of his university studies he travelled for three years (1836-39) in France and Italy ; having "habilitated " in 1839 at Kiel, he in 1842 became professor-extraordinary of archeology and philology at Greifswald, where in 1845 he was promoted to the rank of ordinarius. In 1847 he accepted the chair of archeology at Leipsic, but for having taken part in the political move- ments of 1848-49 he was deprivedin 1851. He continued to remain in private life until in 1855 he was appointed ordinary professor of the science of antiquity, and director of the academical art museum at Bonn. In 1867 he was called to succeed Gerhard at Berlin; but after a lingering illness he died at Gottingen, September 9, 1869.

' ae following list of his works is not to be regarded as exhaustive. ie chological : Telephos u. Troilos, 1841; Die Gemilde des i olygnot, 1841; Specimen epigraphicum in memoriam Kellermannt, 842; Pentheus u. die Ménaden, 1842; Paris u. Oinone, 1845; Dic hellenisehe Kunst, 1846; Peitho, die Gottin der Ucberredung, 1847; Ucber einige Darstellungen des Paris-Urtheils, 1849; Die

Ficoronisehe Cista, 1852; Beschreibung der Vasensammlung des Kénigs Ludwig, 1854; Die Wandgemiilde des Columbariwms in der Villa Pamfili, 1857; Pausaniz deseriptio areis Athemensts, 1860;

Darstellunyen gricchischer Dichter auf Vasenbildern, 1861; Ueber bemalte Vasen mit Goldsehmuek, 1865; Ucber Darstellwugen des Handwerks u. des Handelsverkehrs, 1868. 2. Philological : Critical editions of Persius, 1843; Censorinus, 1845; Florus, 1852; the Brutus, 1849, and Orator, 1851, of Cicero; Juvenal, 1851; the Perioehe of Livy, 1853; the Psyche et Cupido of Apuleius; the Eleetra of Sophocles, 1861; Longinus, 1867. 3. Biographical and Esthetic: Ueber Mendelssohn's Paulus, 1842; Biographie Mozart's, a work of extraordinary labour and loving carc, 1856-1860; Ludwig Uhland, 1853; Gesanumelte Aufsitze ber Musik, 1866; Bio- graphisehe Aufsdtze, 1866.

JAINS, the most numerous and influential sect of heretics, or noncomformists to the Brahmanical system of Hinduism, in India, are found in every province of Upper Hindustan, in the cities along the Ganges, and in Calcutta. But they are more numerous to the west—in Mewar, Guzerat, and in the upper part of the Malabar coast—and are also scattered throughout the whole of the southern peninsula. They are mostly traders, and live in the towns ; and the wealth of many of their community gives them a social importance greater than would result from their mere numbers. Of what their actual number may be it is unfortunately impossible to form any exact estimate, as in the census returns they are confounded with the Buddhists. Their magnificent series of temples and shrines on Mount Abu, one of the seven wonders of India, is perhaps the most striking outward sign of their wealth and importance.

The Jains are the last direct representatives on the con- tinent of India of those schools of thought which grew out of the active philosophical speculation and earnest spirit of religious inquiry so rife in the valley of the Ganges during the 5th and 6th centuries before the Christian era. For many centuries Jainism was so overshadowed by that stupendous movement, born at the same time and in the same place, which we call Buddhism, that it remained almost unnoticed by the side of its powerful rival. But when Buddhism, whose widely open doors had absorbed the mass of the community, became thereby corrupted from its pristine purity and gradually died away, the smaller school of the

Jains, less diametrically opposed to the victorious orthodox creed of the Brahmans, survived, and in some degree took its place.

Jainism purports to be the system of belief promulgated by Vardhamana, better known by his epithet of Maha-vira, who was a contemporary of Gautama, the Buddha. But the Jains, like the Buddhists, believe that the same system had previously been proclaimed through countless ages by each one of a succession of earlier teachers. The Jains count twenty-four such prophets, whom they call Jinas, or Tirthankaras, that is, conquerors or leaders of schools of thought. It is from this word Jina that the modern name Jainas, meaning followers of the Jina, or of the Jinas, is derived. This legend of the twenty-four Jinas contains a germ of truth. Maha-vira was not an originator; he merely carried on, with but slight changes, a system which existed before his time, and which probably owes its most distin- guishing features to a teacher named Parswa, who ranks in the succession of Jinas as the predecessor of Maha-vira. Parswa is said, in the Jain chronology, to have lived two hundred years before Maha-vira (that is, abont 700 B.C.) ; but the only conclusion that it is safe to draw from this statement is that Parswa was considerably earlier in point of time than Maha-vira. Very little reliance can be placed upon the details reported in the J ain books concerning the previous Jinas in the list of the twenty-four Tirthankaras. The curious will find in them many reminiscences of Hindu and Buddhist legend ; and the antiquarian must notice the distinctive symbols assigned to each, in order to recognize

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the statues of the different Jinas, otherwise identical, in the different Jain temples.

Very little is at present known of the details of the Jain system of belief. But fresh light is being thrown upon this question year by year, aud some of their principal tenets are already beyond dispute. The Jains are divided

into two great parties,—the Digambaras, or Sky-clad Ones, |

and the Swetambaras, or the White-robed Ones. ‘The latter have only as yet been traced, and that doubtfully, as far back as the 6th century after Christ; tle former are almost certainly the same as the Nigantlas, who are referred to in numerous passages of the Buddhist Pali Pitakas, and must therefore be at least as old as the 4th century B.c. In many of these passages the Nigautlas are mentioned as contemporaneous with the Bnddha; and details enough are given concerning their leader Nigantha Nata-putta (that is, the Nigantha of the Jnatrika clan) to enable us to identify him, without any doubt, as the same person as the Vardhamana Matha-vira of the Jain books. ‘his remarkable confirmation, from the scriptures of a rival religion, of the Jain tradition seems conclusive as to the date of Matha-vira; and, should any one still doubt the antiquity of the sect, it may be mentioned here that the Niganthas are referred to in one of Asoka’s edicts (Corpus Inscriptionum, Plate xx.). Unfortunately the account of the teachings of Nigautha Nata-putta given in the Buddhist scriptures are, like those of the Buddha’s teachings given in the Brahmanical literature, not only very meagre, but also very little to be depended upon. And the Jain scrip- tures themselves, though based on earlier traditions, are not older in their present form than the 6th century of our era. The most distinctively sacred books are called the forty-five Agamas, consisting of eleven Angas, twelve Upangas, ten Pakinuakas, six Chedas, four Mula-siitras, and two other books. Several of these are in process of trans- lation into English for the series of translations from the sacred books of the East now being published under the auspices of the university of Oxford. It was Devaddhi- ganin, who occupies among the Jains a position very similar to that occupied among the Buddhists by Buddho- ghosa, who at the date just mentioned collected the then existing tralitions and teachings of the sect into these forty-five Agamas. It is most probable that, previous to his time, the sacred lore of the Jains was handed down by memory, and not by writing. This mode of transmitting a literature seeins very unsafe according to modern European ideas. But when we call to mind the very great value of the historical results drawn from the Vedas and the Buddhist scriptures, both of which were for many centuries preserved for posterity by memory alone, we may confidently look for- ward to important additions to our knowledge when the Jain Agamas shall

have been made accessible to European scholars. Like the Buddhist scriptures, the earlier Jain books are written in a dialect of their own, the so-called Jaina Prakrit ; and it was not till between 1000 and 1100 a.p. that the Jains adopted Sanskrit as their literary language.

The most distinguishing outward peculiarity of Maha-vira and of his earliest followers was their practice of going quite naked, whenee the term Digambara. Against this custom Gautama, the Buddha, especially warned his followers; and it is referred to in the well-known Greek phrase Gymmnosophist, used already by Megasthenes, which applies very aptly to the Niganthas. Even the earliest name Nigantha, which means "free from bonds," may not be without allusions to this curious belief in the sanctity of nakeduess, though it also alluded to freedom from the bonds of sin and of transmigration. The statues of the Jinas in the Jain temples, some of which are of enormous size, are still always quite naked ; but the Jains themselves have abandoned the practice, the Digambaras being sky-clad at meal time only, and the Swetambaras being always completely clothed. Andeven among the Digambaras it is only the recluses or Yatis, men devoted to a religious life, who carry out this practice. The Jain laity—the Sravakas, or disciples —do not adopt it.

JAI—J AI

The supreme aim of the Jains as of the Buddhists is called Nirvana ; but the word conveys differeut ideas in the two religions. The Jains appear to believe in the existence of a soul inside the human body, and in the transmigration of souls ; and their Nirvana seems to consist in the delivery of the soul from this transmigration. It differs from the moksha of the Hindus in that the Jains, not teaching the existence of a supreme being, do not hope for an absorption of the soul into the deity. This Nirvana will follow ou the belief in certain metaphysical theories, the nature of which still remains unknown toscholars. But it is to be accompanied by the practice of the four virtues—liberality, gentleness, piety, and remorse for failings—by goodness in thought, word, and deed, and by kindness to the mute creation and even to the forms of vegetable life. This last item in their belief, though common to the Jains

and the Buddhists, has been carried out by the Jains to a more extreme result, and seems to be based on the wide extension of the doctrine of the soul. They regard all animals and plants as endowed with souls, and they consider it an act of piety to put up and to maintain hospitals for sick animals. They believe also in the cxisteuce of numerous angels or demons, good and bad, among whom they include most of the deities of the Hindu pantheon ; and the later Jains do not scruple to render a kind of worship to these spirits. This practice is, however, not in aceordance with the earlier and stricter Jainism; and it is the negative side of their creed, their denial of the power of the gods, of the authority of the Vedas, and of the sacredness of caste, which has been the most important part of their teaching. Practically, uo doubt, many of their laity adhere to some of the social caste distinctions of the Hindus; and their anthors quote the Vedas with respect when passages from the Vedas can be used in support of their own views ; but no distinction of caste excludes from their religious orders, or prevents the attainment of their Nirvana; and the Vedas, even when quoted, are not regarded as conclusively authoritative. Professor Jacobi, who is the best authority on the history of this seet, thus sums up the distinction between the Maha-vira and the Buddha: "Maha-vira was rather of the ordinary class of religious men in India. He may be allowed a talent for religious matters, but he possessed not the genius which Buddha undoubtedly had. .... The Buddha's philosophy forms a system based on a few fundamental ideas, whilst that of Maha-vira scarcely forms a system, but is merely a sum of opinions (pannattis) on various subjects, no fundamental ideas being there to uphold the mass of metaphysical matter. Besides this…. it is the ethical clement that gives to the Buddhist writings their superiority over those of the Jains. Maha-vira treated ethics as corollary and subordinate to his metaphysics, with which he was chiefly con- cerned."

Authorities. —Bhadrabiahn's Kalpa Sitra, the recognized and popular manual of the Swetambara Jains, edited with English introduction by Professor Jacobi, Leipsic, 1879; Hemacandra's " Yoga Sastram," edited by Windisch, in the Zezt- schrift der deutschen morg. Ges. for 1874; " Zwei Jaina Stotra," edited in the Indische Studien, vol. xv.; Ein Fragment der Bhagavati, by Professor Weber; Afe-

| moires de U Académie de Berlin, 1866; Niraydvaliya Sutta, edited by Dr Warren,

with Dutch introduction, Amsterdam, 1879; Over de godsdienstige en wijsgeerige Begrippen der Jainas, by Dr Warren (his doctor-dissertation. Zwolle, 1875) ; Bez- trdége zur Grammatik des Jaina-prakrit, by Dr Edward Miiller, Berlin, 1876; Colebrooke's Essays, vol. ii. Mr Burgess has an exhaustive account of the Jain

| Cave Temples (none older than the 7th century) in Fergusson and Burgess's

Cave Tempies in India, London, 1880. (T. W. R. D.)

JAINTIA HILLS. For administrative purposes the Jaintia Hills are regarded as a subdivision of the Khasi and Jaintia Hills district, in the province of Assam. They cover an area of about 2000 square miles, and are bounded N. by the district of Nowgong, E. by Cachar, 8. by Sylhet, and W. by the Khasi Hills.

The Jdintia Hills are divided into twenty-five fiscal divisions, of which three are inhabited by Kuki or Lushai immigrants, and one by Mikirs. The remainder of the inhabitants are Syntengs, a race akin to the Khasis, but with distinct ethnical characteristics and language. The chief crop is rice, grown on the nomadic system of agricul- ture known as jim. The most valuable natural product is limestone, which is quarried on the river banks, aud despatched by water into Bengal from the Sylhet markets. Coal of excellent quality has been found in situations mostly inaccessible to water traffic. The Syntengs are keen traders, and retain in their own hands the valuable commerce of their hills. They frequent the markets held in the chain of villages at the foot of the hills on the Sylhet side. In 1876-77 the total value of exports from the sub- division was £19,000, and of the imports (chiefly cotton, woollen, and silk cloth, rice, dried fish, salt, and tobacco) £34,560. The gross revenue in the same year was £1271.

This tract was annexed in 1835, its raja having been deposed for complicity in carrying away British subjects, and in their immolation as human sacrifices in a shrine of the goddess Kali. At first no change was made in the indigenous revenue system, which consisted simply in the payment of a he-goat onee a year by each village. In 1860, when a fresh taxation was introdueéd, the hillmen objected ; and in January 1862 they rose in open rebellion. The police station at Jowai was burned to the ground, the garrison of sepoys was closely besieged, and all show of British authority was swept away throughout the hills. The hillmen fought bravely for their independence. At first they were suecessful in cutting off several detachments of sepoys and police, but the ringleaders were captured, and order finally restored in Mareh 1868.

JAIPUR. See JEyPorE.

JAISALMIR, a native state in Rdjputana, under the political superintendence of that agency and the Govern- ment of India, lying between 26° 5’ and 28° 24’ N. lat. and between 69° 30’ and 72° 50’ E. long., with an area of 16,447 square miles, is bounded on the N. by Bahawalpur, on the E. by Bikaner and Jodhpur, ou the 8. by Jodhpur and Sind, and on the W. by Khairpur state and Sind.

Jaisalmir is almost entirely a sandy waste, forming a part of “‘the Great Indian Desert.” The general aspect of the country is that of an interminable sea of sandhills, of all shapes and sizes, some rising to a height of 150 feet.

Those in the west are covered with phog bushes, those in | Water is scarce, and |

the east with tufts of long grass. generally brackish ; the average depth of the wells is said to be about 250 feet. and only one small river, the Kakni, which, after flowing a distance of 28 miles, spreads over a large surface of flat ground, and forms a lake or jhéil called the Bhuj-Jhil. The climate is essentially dry and healthy. The tempera- ture is highest in May and June; the coldest months are from the middle of December to the middle of February. Throughout Jdisalmir, only rain-crops, such

as bdjra, jodr, moth, til, &c., are grown; spring crops of wheat, barley, &c., are very rare. Owing to the scanty rainfall, irriga- tion is almost unknown.

The main part of the population lead a wandering life, grazing their flocks and herds. Large herds of camels, horned eattle, sheep, and goats are kept. The principal trade is in wool, ghé, camels, eattle, and sheep. The chief imports are grain, sugar, foreign cloth, piece-goods, &e. There is only one eivil court. Education is at a very low ebb. Jain priests are the chief schoolmasters, and their teaching is very elementary. The income of the state for 1873-74 was £11,854, the expenditure £15,911. The maharawal has a force of 651 infantry and 155 cavalry, who have no drill or discipline, but are very efficient as police. It has been estimated that the total number of inhabitants does not exceed 72,000 ; 43,500 are said to be Hindus, 26,000 Mahometans, and 2500 Jains,

The majority of the inhabitants are Yadu Bhati Rajputs, who take their name from an aneestor nanied Bhati, renowned as a warrior, when the tribe were located in the Punjab. Shortly after this the clan was driven southwards, and found a refuge in the Indian desert, which was thenceforth their home. Deoraj, a famous prince of the Bhati family, is esteemed the real founder of the present Jéisalmir dynasty, and with him the title of rdwal commenced. In 1156 Jaisal, the sixth in succession from Deoraj, founded the fort and city of Jaisalmir, and made it his capital. Jaisal was succeeded by several warlike princes, who were constantly engaged in battles and raids. In 1294 the Bhatis so enraged the emperor Ala-ud-din that his army eaptured and sacked the fort and city of Jdisalmir, so that for some time it was quite deserted. After this there is nothing to record till the time of Rawal Sabal Sinh, whose reign marks an epoch in Bhati history in that he acknow- ledged the supremacy of the Delhi emperor Shah Jahan, and was the first of the Jaisalmir prinees who held his dominions as a fief of the Delhi empire. The Jaisalmir prinees had now arrived at the height of their power, but from this time till the accession of Rawal Mulraj in 1762 the fortunes of the state rapidly declined, and most of its outlying provinces were lost. In 1818 Mulraj entered into political relations with the British. Since

his death Pe 1820, no stirring events have occurred. The present chief is isi Bairi Sal, who was born in 1848, and is a Yadu Bhati eect _ The ruler of Jaisalmir is styled mahdrdwal, and holds : at position as head of the clan of Bhatis. The constitution may

: deseribed as tribal suzerainty in process of conversion to the feudal stage. Many of the tribal chiefs are to a great extent independent, msomuch that they hold their estates reut free.

There are no pereunial streams, |

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JAIPUR, or Jasporz, a municipal town in Cuttack district, Bengal, is situated on the right bank of the Baitar4ni river, in 20° 50’ 45” N. lat., 86°°22’ 56” E. long. It contains the usual subdivisional and public buildings, a charitable dispensary, a Government-aided school, &c. It was the capital of the province of Orissa under the Kesari dynasty until the 11th century, when it was superseded by Cuttack, the modern metropolis. Jajpur is celebrated as a settlement of Brahman Sivaite priests, and as the headquarters of one of the four regions of pilgrimage into which Orissa is divided, viz., that sacred to Parvati, the wife of the All-Destroyer. In Jdjpur are numerous ruins of Sivaite temples, sculptures, &c. In the 16th century this town was the scene of the struggle between Musalm4n and Hindu powers, from which it emerged in ruins. It, however, still ranks as the fourth town of Orissa, and derives much wealth from its yearly fair in honour of Baruni, “Queen of the Waters,” at which numbers of pilgrims assemble to bathe in the holy Baitarani, the Styx of Hindu mythology. The popula- tion in 1872 numbered 10,753.

JAKOB, Lupwie Hetnrich von (1759-1827), a German writer on political economy, was born at Wettin, 26th February 1759. After receiving preparatory instruc- tion at Merseburg and at the gymnasium of Halle, he in 1777 entered the university of the latter city, at first devoting his attention specially to philological studies. In 1780 he was appointed teacher at the gymnasium, and, now occupy- ing his leisure chiefly with the study of philosophy, he in 1785 obtained the

degree of doctor of philosophy, and in 1791 was appointed professor of philosophy at the uni- versity. The suppression of the university of Halle having been decreed by Napoleon, Jakob betook himself to Russia, where in 1807 he was appointed professor of political economy at Kharkoff, and in 1809 a member of the Govern- ment commission to inquire into the finances of the empire. In the following year he became president of the commis- sion for the revision of criminal law, and he at the samo time obtained au important office in the finance department, with the rank of counsellor of state; but in 1816 he returned to Halle to occupy the chair of political economy. He died at Lauchstidt, July 22, 1827.

Shortly after his first appointment to a professorship in Halle, Jakob had begun to turn his attention rather to the practical than the speculative side of philosophy, and in 1805 he published at Halle Lehrbuch der Nationalékonomie, in which he was the first to advocate in Germany the necessity of a distinet scienee dealing specially with the subject of national wealth. His principal other works are Grundriss der allgemeinen Logik, Halle, 1788 ; Grund- sdtze der Polizeigesetzgebung und Polizeianstalten, Leipsic, 1809 ; Einleitung in das Studium der Staatswissenschaften, Halle, 1819 ; Entwurf eines Criminalgesetzbuchs fiir das Russische Reich, Halle, 1818; and Staatsfinanzwissenschaft, 2 vols., Halle, 1821.

JALALABAD. See AFGHANISTAN.

JALANDHAR, or JuttunpvrR, a British district in the lieutenant-governorship of the Punjab, India, lies between 30° 56’ 30” and 31° 37’ N. lat., and between 75° 6’ 30” and 77° 49’ 15” E. long., forming the southernmost dis- trict in the division! of the same name. It is bounded on the N.E. by the district of Hushidrpur, on the N.W. by the native state of Kapurthdla and the river Bias, and on the S. by the Sutlej. The blunt triangular tongue of land enclosed by the confluent streams of the Sutlej and the Bids bears the general name of the Jalandhar Dodb. Its submontane portion belongs to Hushidrpur ; the remainder is divided between Kapurth4la state and the district of

4 Jalandhar, a division under a commissioner in the Punjab, comprises the three districts of Jalandhar, Hoshiarpur, and Kangra, between 30° 56’ 30” and 32° 59’ N. lat., and 75° 6’ 30” and 77° 49° 15 E. long., with an area of 12,181 square miles, of which 2788 are cultivated, and a population (1868) of 2,477,536, of whom 1,334,623 are males and 1,142,883 females.

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Jalandhar. Below the hills, the whole Dodb consists of one unbroken alluvial expanse, whose fertility extends from river to river. A well-defined bank marks the bed of the Sutlej on the Jalandhar side. In winter the river contains about 15 feet of water in its deepest parts, and is navigable at all seasons for large flat-bottomed country boats. The main channel shifts from year to year through the wide bed, often forming new islands by slight changes in its course. The Bids touches upon the district fora few miles only. The torrents from the Siwdlik hills in Hushiarpur district unite in two main streams, the White and the Black Ben, the former of which runs through the whole of Jalandhar. The White Ben receives numerous affluents, which meet it at right angles; and, following a serpentine path in a deep channel, it finally falls into the Sutlej 4 miles above its junction with the Bids. Several marshy lakes (jhéls) collect a considerable quantity of water in the rains, which they retain throughout tlie dry season.

The chief staples are wheat, barley, gram, rice, sugar-canc, Indian corn, jodr, cotton, and moth. Except on the low alluvial tract of the Sutlej, irrigation is carricd on by means of wells, worked with Persian whecls. Water lies everywhere near the surface, and is absolutely necessary for the higher cereals and sugar-cane, so that well irrigation prevails very generally. The traffic of the district consists mainly in its agricultural produce. Sugar-cane forms the chief commercial crop, and sugar and molasses arc largely manufactured. English piece-goods and draught cattle are the principal imports. Cotton cloth, silver wire, and gold and silver lace are manufactured at Jalandhar town. The Sind, Punjab, and Delhi Railway passes through the district, with stations at several of the prineipal towns. Education was carried on in 1875-76 by means of 1615 aided schools, with a total roll of 7876 pupils. The proximity of the hills renders the climate of Jalandhar comparatively moist, and the annual rainfall for the seven years ending 1872-73 amounted to 28°6 inehes. Malarious fever in an endemic form proves the chief cause of mortality, but small-pox often appears as an epidemic, and dysenteric complaints

arc frequent. There are five Government charitable dispensaries, which afforded relief in 1872 to 34,308 persons.

Jalandhar ranks first in the density of its population amongst all the Punjab distriets, and is only exceeded by those of Benares, Jaunpur, and Ghazipur in the North-Western Provinces. The enumeration of 1868, taken over an area of 1332 square miles, dis- closed a total population of 794,764 persons, of whom 436,689 were males and 358,075 females. As regards religion, Hindus numbered 318,401 ; Mahometans, 358,427 ; Sikhs, 117,167 ; and others, 769. The district contained eleven municipal towns in 1875-76, whose names and populations were as follows: —Jalandhar, 48,933 ; Kartarpur, 10,953; Aldwalpur, 4873; Adampur, 3269; Banga, 4508; Nawashahr, 4946; Rahon, 14,394; Phillanr, 7535 ; Nur- mahal, 7866 ; Mahatpur, 6374 ; and Nakodar, 8800. The follow- ing towns had populations exceeding 5000 in 1868 :—Basti Shaikh, 8000 ; Bilga, 6441 ; Jandidla, 6439 ; Malsian, 6286 ; and Rurkha Kalan, 5721. The district contains a total cultivated area of 657,094 acres, of which 200,097 are artificially irrigated.

The Jalandhar Dodb in early times formed a separate Hindu kingdom, ruled by a family of Rajputs, whose descendants still exist in the petty princes of the Kangra hills. Under Mahometan rule the Doab was generally attached to the provinee of Lahore, in which it is iiludal as a sarkdr or governorship in the great revenue survey of Akbar's reign. Its governors seem to have held a partially independent position, subject to the payment of a fixed tribute into the impcrial treasury. The Sikh reaction extended to Jalandhar at an early period, and a number of petty chieftains established themselves by force as independent princes throughout the Doab. In 1766 the town of Jalandhar fell into the hands of the Sikh eonfederacy of Faiz-ulld-puria, then presided over by Khushal Sinh. His son and successor built a masonry fort in the city, while several other leaders similarly fortified themselves in the suburbs. Meanwhile, Ranjit Sinh was consolidating his power in the south, and in 1811 he annexed the Faiz-ulld-puria dominions in the Doab. By the autumn' of the same year the mahdrdja's authority was successfully established. Thenceforth Jalandhar became the eapital of

the Lahore possessions in the surrounding Doab up to the date of the British annexation, which took place at the close of the first Sikh war.

JALANDHAR, @ munictpal town and cantonment in the above district, is situated in 31° 19’ 50” N. lat. and 75° 37’ 20” E. long. It lays claim to considerable antiquity, having been the original capital of the Rajput kingdom of Katoch, which dates back to the period

before Alexander’s invasion. Hwen Tsang, the Chinese Buddhist pilgrim of the 7th century, describes the town as 2 miles in circuit, the metropolis of a considerable state. Tbr4him Shéh of Ghazni reduced the town to the Maho- metan yoke, and it appears as a place of considerable strength during the early Musalmd4n times. The modern city consists of a cluster of wards, originally distinct, and each enclosed by a wall of its own. Some of them still remain detached, but the majority have now united. The cantonment is 4 miles from the town, and was established in 1846. It has an area of 74 square miles, and a popula- tion (1868) of 11,634 persons. Numerous suburbs, known as bastzs, surround the city. The trade, though consider- able, presents little special interest. The staples of local traffic are English piece-goods and country produce. In 1871-72 the imports were valued at £105,248, and the exports at £96,020. The population in 1868 was 50,067, of whom 15,921 were Hindus, 33,601 Mahometans, 468 Sikhs, and 77 Christians.

JALAP, a cathartic drug consisting of the tuberous roots of Exogonium Purga, Benth., a convolvulaceous plant growing on the eastern declivities of the Mexican Andes at

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Jalap (Exogonium Purga).

an elevation of 5000 to 8000 feet above the level of the sea, more especially about the neighbourhood of Chiconquiaco, and near San Salvador on the eastern slope of the Cofre de Perote. In these localities, where the temperature varies during the day from 60° to 75° Fahr. (15° to 24° C.), and rain falls almost every day, it flourishes in the deep rich soil of shady woods. Jalap has been known in Europe

since the beginning of the 17th century, and derives its name from the city of Jalapa in Mexico, near which it grows, but its botanical source was not accurately deter- mined until the year 1829, when Dr Coxe of Philadelphia published a description and coloured figure taken from living plants sent him two years previously from Mexico. The Jalap plant has slender herbaceous twining stems, with alternately-placed cordate acuminate leaves sharply pointed at the basal angles, and salver-shaped deep purplish-pink flowers. The underground stems are slender and creeping; their vertical roots enlarge and form turnip-shaped tubers, which, as they do not bear leaf organs on their surface, are sometimes called tubercules. The roots are dug up in Mexico throughout the year, and are suspended to dry in a net over the hearth of the Indians' huts, and hence acquire a smoky odour. The large tubers are often gashed to cause them to dry more quickly. In appearance they vary from spindle-shaped to ovoid or globular, and in size from a pigeon's egg to a man's fist. Externally they are brown, and marked with small trans- verse paler scars, and internally they present a dirty white resinous or starchy fracture. The ordinary drug is distinguished in commerce as Vera Cruz jalap, from the name of the port whence it is shipped. The average annual imports into Great Britain have been estimated at 180,000 tb.

Jalap has been cultivated for ten years past in India, at Ootacamund, and grows there as easily as a yam, often producing clusters of tubers weighing over 9 tb; but these, as they differ in appearance from the commercial article, have not as yet obtained a place in the English market. They are found, however, to be rich in resin, containing 18 per cent. In Jamaica also the plant has been grown, at first amongst the

cinchona trees but more recently in new ground, as it was found to exhaust the soil. The 1880 crop of jalap in Jamaica amounted to 14,294 Ib, and sold in the fresh state for £62, 3s. 8d. Some of it was exported to the London market.

Jalap owes it properties to jalapin, a resin wltich is present in it to the extent of 12 to 18 per cent. According to Mayer! its composition is C,,H;)O,,. Jalapin is soluble in alcohol, but insoluble in ether and bisulphide of carbon. Jalap also contains in small quantity convolvulin, a resin soluble in ether, homologous with jalapin, and of the composition C,,H,,O,, It yields also about 19 per cent. of sugar according to Guibourt, and starch, gum, un- crystallizable sugar, and colouring matter.

Besides Mexican or Vera Cruz jalap, a drug called Tampico jalap has been imported during the last few years in considerable quantity. It has a much more shrivelled appearance and paler colour than ordinary jalap, and lacks the small transverse scars present in the true drug. It differs also in containing in the place of jalapin a resin identical with the convolvulin above mentioned, and with the para-rhodeoretin of Kayser, which exists in it to the extent of 11 per cent, This kind of jalap, the Purga de Sierra Gorda of the Mexicans, was traced by Hanbury to Ipomexa simulans, Hanbury. It grows in Mexico along the mountain range of the Sierra Gorda in the neighbour- hood of San Luis dela Paz, from which district it is carried down to Tampico, whence it is exported. A third variety of jalap known as woody jalap, male jalap, or Orizaba root, or by the Mexicans as Purgo macho, is derived from Ipomza orizabensis, Ledanois, a plant of Orizaba. The root occurs in fibrous pieces, which are usually rectangular blocks of irregular shape, 2 inches or more in diameter, and are evidently portions of a large root. It is only

: } By Mayer, Gmelin, and others, jalapin is called convolvulin. It is identical with the rhodeoretin of Kayser.

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occasionally met with in commerce. The resin contained in it is identical with that found in Tampico jalap.

According to Dr W. Rutherford, jalap acts as a powerful hepatic and intestinal stimulant. Itis used as a hydra- gogue cathartic-in combination with cream of tartar in dropsy, and in all cases where it is desirable to cause a copious watery evacuation, also asa vermifuge. Buchheim asserts that jalap is only purgative when combined with bile, in which the resin is soluble.

JALAPA, or Xauapa, the Aztec Xalapan, a town of Mexico, in the state of Vera Cruz, and about 70 miles inland from the city and port of that name, with which it communicates by a railway opened since 1870. There are few towns in Mexico which are so happily situated: at a height of 4500 feet above the sea, on the edge of the plateau behind which towers the summit of Macultepec, it looks out over the rich lowlands of the tierra calzente, enjoying their beauty and escaping their baneful vapours. The immediate vicinity is abundantly fertile, and yields a harvest of rare variety for the botanist. The town lost much of its importance as a commercial entrepdt by the opening of the railway from Vera Cruz wa Orizaba to Mexico, but the line above mentioned may help to restore its prosperity. Of chief note among the public buildings are the principal church and the old Franciscan monastery, built in 1555. The population is stated at 10,000.

JALAUN, a British district in the lieutenant-governor- ship of the North-Western Provinces of India, lies between 25° 46’ and 26° 26’ N. lat., and between 78° 59’ and 79° 55’ E. long., with an area of 1553 square miles, and forms the northern district of the Jhansi division. It is bounded on the N.E. and N. by the river Jumna, on the W. by the Gwalior and Datia states, on the 8. by the Samthar state and the river Betwa, and on the E. by Baoni state. The district lies entirely within the level plain of Bundelkhand, north of the hill country, and is almost surrounded by the Jumna and its tributaries the Betwa and Pahuj. The central region thus enclosed is a dead level of cultivated land, almost destitute of trees, and sparsely dotted with villages. The southern portion especially presents one unbroken sheet of cultivation. The

boundary rivers form the only interesting feature in Jaléun. The little river Noh flows through the centre of the district, which it drains by innumerable small ravines instead of watering. Jaldun has little picturesqueness or beauty, but possesses great fertility and abundant agricultural resources.

The census of 1872 gives a population of 404,384, of whom 216,607 were males and 187,777 females. The principal tribes are the Brahmans, the Kurmis, the Gujars, the Kachhwahas, the Lengars, the Kayaths, and the Musalmans. There were four towns in 1872 with a population exceeding 5000 :—Kalpi, 15,570 ; Kunch, 14,448 ; Jalaun, 10,197 ; and Urai, 6398. The staple crops are the cereals, gram, and cotton. Oil-seeds, dye-stuffs, and sugar-cane are also raised, butin no large quantities. lrrigation was employed in 1872 over 19,157 acres. Jalaun has suffered much from the noxious kdns grass, owing to the spread of which many villages have been abandoned and their lands thrown out of cultivation. Drought is the great danger in Jalaun. The last important drought was that of 1868-69 ; no actual famine resulted, but great distress prevailed. Jalaun is almost entircly an agricultural district, and its trade accordingly depends mainly upon its raw materials and food-stuffs. Kdlpi is the great mart of the district ; Kunceh is also a considerable trading town. 'The river traffic by Kalpi is chiefly for through goods ; and the Jumna is little used as a highway. A good commercial road connects Urdi and Jalaun with Phaphund, the railway station on the East Indian line. There is also a great military road from Kalpi to Jhansi. The administration 1s on the non-regulation system, which unites civil, criminal, and fiscal functions in the same officer. In 1860 there were 1434 children under instruction ; in 1871, 2703. The climate, though hot and dry, is not considered unhealthy. The mean temperature 1s 81°-9 Fahr. The prevailing diseases arc fevers, and dysentery and other bowel complaints. : :

Jaliun seems to have been subject to the Naga dynasty, which

lasted from the Ist to the $d century of our era. In course of time | Tist4, Jaldhaka, Duduyé, Mujnai, Torsha, Kaljani,

the eastern portion fell under the power of the Chandels, while the western districts, including that of Jalaun, were ruled by the Kachhwahas, a Rajput clan. These seem to have held most of the district until the invasion of the Bundelas in the 14th century. But the town of Kalpi on the Jumna was conquered for the princes of Ghor as early as 1196. Early in the 14th century the Bundelas occupied the greater part of Jalaun, and even succeeded in holding the fortified post of Kalpi. That iniportant possession was soon recovered by the Musalmans, and passed under the sway

Akbar's governors at Kalpi maintained the surrounding district ; and the native princes were in a state of chronic revolt, which culminated in the war of independence under Chhatar Sal. On the outbreak of his rebellion in 1671 he occupied a large province to the south of the Jumna. Setting out from this basis, and assisted by the Marhattas, he reduced the whole of Bundelkhand. On his death he bequeathed one-third of his dominions to his Marhatta allies, who displayed their usual alacrity in occupying their new territory, and before long succeeded in quietly annexing the whole of Bundelkhand. Under Marhatta rule the country was a prey to constant anarchy and intestine strife. To this period must be traced the origin of all the poverty and desolation which are still con spicuous throughout the district. In 1806 KAlpi was made over to the British, and in 1840, on the death of Nana Gobind Ras, lis possessions lapsed to them also. Various interchanges of territory took place, and in

of the Mughal emperors.

a nominal authority over

1856 the present boundaries were substantially settled. During |

British rule before the mutiny, Jalaun ouly slow degrecs. When the news of Kalpi, the men of the 58d native and in June the Jhansi mutineers The

the whole period of recovered its prosperity by very the rising at Cawnpur reached infantry deserted their officers, reached the district, and began their murder of Europeans.

natives everywhere revelled in the licence of plunder and murder |

which the mutiny had spread through all Bundelkhand, and it was not till September 1858 that the rebels were finally defeated. Since the mutiny the condition of Jalaun seems to have been steadily but slowly improving.

JaLAUN, a decayed town in the above district, and the former capital of a native state, is situated in 26° 8’ 32” N. lat., 79° 22’ 24” E. long. It occupies a large area, and contains a considerable number of good houses, and a ruined fort. The position is low, and swamps surrounding the town engender cholera and malarious fever, for which reason the headquarters of the district have been fixed at Urai. The population in 1872 was 10,197,—8824 Hindus and 1373 Mahometans.

JALNA, or JAULNA, a town in Hyderabad state, southern India, 19° 50’ 30” N. lat., and 75° 56’ E. long., 240 miles north-west of SikandarAbad (Secunderabad), 38 east of Aurangabad, and 210 miles north-east of Bombay. a British cantonment, situated on a gentle declivity, at an elevation of 1652 feet above the sea, in an arid tract of country ; the lines were built in 1827. Two miles south-

west of JAlna is the old town of the same name, once the |

seat of a flourishing trade, but now rapidly decaying. JALPAIGURI, or Junpicorgx, a British district of India, forming the north-eastern part of the Rajshaht Kuch Behar division, under the lieutenant-governor of Bengal, and lying between 26° 0’ 35” and 26° 59’ 30” N. lat., and between 88° 22’ 40” and 89° 55’ 20” E. long, It consists of an irregularly shaped tract south of Bhutan and north of the state of Kuch Behar and Rangpur district, with an area (1875) of 290,464 square miles. The district divides into a “regulation” tract, lying towards the south- west, and a strip of country, about 22 miles in width, running along the foot of the Himalayas, and known as the Western Dwars. The

former is a continuous expanse of level paddy fields, only broken by groves of bamboos, palms, and fruit-trees. The Western Dwars are, for the most part, overgrown with grassy jungle, the secure home of large game, and are everywhere traversed by hill torrents, which, on the higher slopes, lose themselves beneath the sandy soil. The frontier towards Bhutan is formed by the Sinchulé mountain range, some peaks of which attain an elevation of 6000 feet. It is thickly wooded from base to summit. The principal rivers, pro- ceeding from west to east, are the Mahdnanda, Karatoya,

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into the two districts of the Eastern and

Raidhak, and Sankos. The most important is the Tista, which forms a valuable means of water communication. The Government forest reserves in the Western Dwars cover a total area of 342°54 square miles. Lime is quarried in the lower Bhutan hills. During the last few years tea-planting has been introduced, with every prospect of success.

The parliamentary abstract of 1878 gives a population of 418,665, The returns from the Dwars were not drawn up in the form adopted for Bengal generally. The remaining part has a population of 327,985 (169,288 males and 158,697 females), comprising 25 Europeans, 7 Eurasians, 8 Chinese, 144 Nepalis, 553 aborigines, 148,043 semi-Hinduized aborigines, 32,155 Hindus according to caste, 2070 Hindus not recognizing caste, and 144,980 Mahometans, The great bulk of the population belongs to the semi-Hinduized tribe known as Koch or Rajbansi, which numbers 137,135, and is ascertained to form as much as two-thirds of the total inhabitants in the Western Dwars. Rice is the staple crop in all parts of the district. Mustard seed is extensively grown ; cotton is the staple of the Dwars, jute and tobacco of the regulation tract. Irrigation is common in the Western Dwars. There is still some spare land uncultivated in the regulation tract ; and in the Western Dwars it has been estimated that about three-fourths of the land now waste is capable of cultivation. Of late years trade has been stimulated by the demand for agricultural produce from the south, and by the institutions of fairs on the Bhutan frontier. The chief exports aro

jute, tobacco, timber, and rice ; the chief imports are piece- goods, salt, and botcl-nuts.

Education encounters great difficulties in Jalpaiguri, because the people are not gathered into villages, each family living in its own sequestered homestead. In 1875 the number of schools was 153, with 3263 pupils. The climate in the vicinity of Jalpaiguri town does not materially differ from that common to northern Bengal, except that the rainfall is heavier, and during tho cold months fogs and mists are of daily occurrence. The average annual rainfall is over 100 inches ; the average temperature is 76° Fahr. The climate of the Western Dwars is markedly different ; tho hot weather disappears altogether, and the rains last continu- ously from April to October. The average annual rainfall at Bax is 280 inches; the temperature averages 74° Fahr. The principal diseases are malarious fevers, splenitis, enlargement of the liver, diarrhcea, dysentery, and goitre. Of latc years some very fatal outbreaks of cliolera have occurred.

The district of Jalpaiguri first came into existence in 1869, when the Titdly4 subdivision of Rangpur was incorporated with the Western Dwars, and erected into an independent revenue unit. The permanently settled portion of Jalpaiguri has no history of its own, apart from the parent district of Rangpur. The Western Dwars became British territory as the result of the war with Bhutan in 1864-65. The newly acquired territory was immediately formed

ser Dwars, the former of which has since been incorporated with the Assam district of Godlparé. The remainder, with the exception of a subdivision, was

| formed into the new district of Jalpaiguri with the addition of a

portion taken from the unwieldy jurisdiction of Rangpur. Cultiva- tion is now rapidly extending throughout the Dwars ; and it is believed that the population has been doubled during the ten years that have elapsed since British annexation. From motives of precaution, a regiment of native infantry is stationcd in permanent cantonments at the hill pass of Baxa.

JAupArcurt, the administrative head-quarters of the above district, is situated on the west bank of the Tisté, in 26° 32’ 20″ N. lat. 88° 45’ 38” E. long. ‘This town has only risen into importance since the creation of the district in 1869, since which date its population has doubled. The population is estimated at between 4000 and 5000, including the regiment of native infantry in the canton- ments, which lie south of the civil station.

JAM. See Jams AND JELLIES, p. 564.

JAMAICA, an island lying between the Caribbean Plate Sea and the Gulf of Mexico, and about 80 miles to the Vul.

southward of the eastern extremity of the island of Cuba, within 17° 40’ and 18° 30’N. lat., and 76° 10’ to 78° 30″ W. long. It is the largest island of the British West Indies, being 135 (or, as sometimes stated, 144) miles in length and 214 to 49 miles in breadth. Its area 1s about 4200 square miles, or, as stated in the Report of the Geolo- gical Survey, 3250 square miles. Within its government are comprised the three small islands called the Caymanas,

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_Grand Cayman, the principal of these, lying off the centre of the Yucatan passage; British Honduras has a lieutenant-governor under the general government of Jamaica, although distant 660 miles, on the mainland of Central America; and Turks and Caicos islands, lying between 21° and 22° N. lat. and 71° aud 72° 37’ W. long., werc annexed to Jamaica in 1874.

The surface of Jamaica is usually hilly or mountainous, and there is a great variety of climate, according to situation and elevation. ‘The largest extent of level land is to the westward, where the low lands are near the sea. The form of the coasts presents the outline of a turtle, the mountain ridges representing the back. The highest elevations are situated to the east, the inclined slope rising from the west. Vestiges of intermittent volcanic action occur. From the sea-level on all sides a series of ridges gradually ascend towards the central range, dividing

the large rivers, and rising occasionally into peaks of 6000 feet. The Blue Mountains, running centrally from east to west, rise at some points to above 7000 feet. The vapours ascending from the rivers and surrounding ocean produce in the upper regions clouds saturated with moisture, which induce vegetation belonging toa colder climate. During the rainy season there is such an accumulation of vapour as to cause a general coolness over the island, and of course occasion- ing very sudden and heavy showers, and sometimes destruc- tive floods. Upwards of one hundred and fourteen rivers or streams find their way from the interior to the sea, besides the numerons tributaries which issue from every ravine in the mountains. These streams for tle most part are not navigable ; in times of flood they become devastat- ing torrents. In the parish of Portland, the Rio Grande receives all the smaller tributaries from the west ; there is scarcely a mile width between any of these streams, and the land rises about 1000 feet to the mile. InSt Thomas in the east, the drainage of the main ridge is performed by the Plantain Garden river, the tributaries of which form deep ravines and narrow gorges in the mountains, which unite and descend, the valley of the Plantain Garden expanding out into a most picturesque and fertile plain, Black River flows through a level country, and is accessible to small craft for about 30 miles, Salt River and the Cabarita, both also on the south side, are navigable by barges. The others on the south are the Rio Cobre (where irrigation works have been constructed for the sugar estates and provision and fruit growing in the district), Yallahs, and Rio Minho; on the north Martha Brae, the White River at Buff Bay, the Great Spanish River, and Rio Grande, There are several medicinal springs. Jamaica has sixteen harbours, the chief of which are Port Morant, Kingston, Old Harbour, Green Island, Montego Bay, Falmouth, Port Maria, St Ann's Bay, Lucea, and Port Antonio, besides numerous bays, roadsteads, and shipping stations affording tolerable anchorage. The surface of the valleys and level lands consists of alluvial deposits composed of sediment derived from the disintegration of the higher land. The White Limestone formation seems to originate two descriptions of alluvia, one white and the other red, the colour being due to oxide of iron combined with the argillaceous residue of the pre-existing limestone. The red soil is particularly favourable for coffee growing. The area occupied by the

Coast Limestone and White Limestone represents about five-eighths of the island. The substructure of Jamaica consists of igneous rocks. In economic geology Jamaica produces a great variety of marbles, porphyrites, granite, and ochres. Traces of gold lave been found associated with some of the oxidized copper ores (blue and green carbonates) of the Clarendon mines. Copper ores are very widely diffused, though the working of the veins has been found too expensive.

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lead have been worked, but hitherto unprofitably. Manganese occurs, also iron ores and a form of arsenic. There is a great variety (and at the same time great equa- bility) of climate. In the lowlands the temperature rises from 75° at night to 85° in the day, and is tempered by the sea and land breezes. At Up-Park Camp, 225 feet above the sea-level, the mean temperature of the hottest month (July) was 81°-71, and of the coldest month (January) 75°65. At Newcastle, 3800 feet, the hottest month was 67°°75, and the coldest 61°. The temperature therefore is very equable. In the higher levels the tem- perature may be 40° to 50°. In the plains there is much humidity. At Kingston the temperature ranges from 70° to 80° throughout the year. Parts of the island are extremely favourable for sufferers from tubercular disease. The island is generally healthy, though sometimes subject to yellow fever, like most tropical countries. Hurricanes, when they occur, come between July and October. The periodical rains, which generally last for six weeks, constitute the May and October seasons.

The vegetable productions are very numerous. There are forest trees fit for every purpose ; among these are the ballata, rosewood, satinwood, mahogany, lignum vite, lancewood, and ebony. The logwood and fustic are ex- ported for dyeing, There are also the Jamaica cedar, and the silk cotton tree (Ceiba Bombax). Pimento (peculiar to Jamaica) is indigenous, and furnishes the allspice. The bamboo, coffee, and cocoa are well known. Several species of palm abound,—the macaw, the fan palm, screw palm, and palmetto royal. There are plantations of cocoa-nut palm. The Government are raising cocoa-nuts with profit on a barren spit of sand by the sea. Cinchona plantations have recently been

successfully established in the mountains, the produce selling well in the London market. The other noticeable trees and plants are the mango, the breadfruit tree, the papaw, the lacebark tree, and the guava, The Palma Christi, from which castor oil is made, is a very abundant annual, English vegetables grow in the hills, and the plains produce plantains, cocoa, yams, cassava, ochra, beans, pease, ginger, and arrowroot. Maize and guinea corn are cultivated, and the guinea grass, acci- dentally introduced in 1750, is very valuable for horses and cattle,—so much so that pen-keeping or cattle farming is a highly profitable occupation. Among the principal fruits are the orange, shaddock, lime, grape or cluster fruit, pine-apple, mango, banana, grapes, melons, avocado pear, breadfruit, and tamarind. There are public gardens at Kingston, at Castleton, about 20 miles from Kingston, and at Bath, and an experimental plantation of different varieties of cane at Hope plantation. The sugar cane was cultivated at an early period, for in 1671 there were a num- ber of sugar works. There are many beautiful flowers, such as the aloe, the yucca, the datura, the mountain pride, the Victoria regia; the cactus tribe is well represented. Innumerable varieties of ferns grow in the mountains, and orchids in the woods. The sensitive plant grows in pastures.

There are fourteen sorts of Lampyridx or fireflies, besides the Elateride or lantern beetles. There are no venomous serpents, but plenty of harmless snakes and lizards. The large lizard, the iguana, is eaten, as are also the land crab and tortoise. The scorpion and centipede are poisonous, but not very dangerous. Ants, mosquitoes, and sandflies swarm in the lowlands. Gosse enumerates twenty different song birds in Jamaica. Parrots, pigeons, guinea fowl, and a great variety of water birds are found, The sea and rivers swarm with fish, and turtles abound. The seal and manatee are sometimes found, and the croco- dile. The domestic animals are those of the ordinary English kind. Jamaica beef and pork are very good.

Cobalt and | Poultry succeeds well.

The population was returned in the census of 1844 as 380,000, of whom 16,000 were white, 68,000 coloured, and the rest black. In 1861 it was returned at 441,000, of whom 14,000 were white, 80,000 coloured, and 347,000 black. In 1871 the numbers were 13,000 white, 100,000 coloured, 393,000 black; total 506,000. The census of 1881 will probably show a total of 600,000,—a large in- crease in the black and coloured population, and a sta- tionary if not reduced number of white people.

The total value of imports was £1,492,722 (including £757,077 from the United Kingdom) in 1878, and £1,347,342 in 1879— amounts considerably below the values for the preceding six years, in four of which it was above £1,700,000. 'The imports consist principally of provisions for consumption, a considerable proportion coming from the United States. The total value of exports in 1878 was £1,210,705 (£954,584 to the United Kingdom), consisting of 9,572,714 tb of coffee (an extending industry), 908,603 Ib of ginger, 6,195,109 tb of pimento, 18,115 puncheons of rum, 26,066 hhds. of sugar, and 35,157 tons of logwood. The total value is below that of the six preceding years. The sugar exported was below the average of preceding years; but in 1879 sugar exports rose again to 29,000 hhds. The value of the fruit exported (principally to United States) had risen from £9337 in 1875 to £39,451 in 1878. The total exports for 1879 were £1,357,571 value. The area under crops in 1878 was 121,457 acres, in guinea grass 120,264, in pasture 318,549, in wood and runate 1,217,596, leaving 942,134 acres.of the total extent to be accounted for as unpatented primeval forest or rocky land of no value. One of the newest industries, besides cinchona, is the growth of excellent tobacco; Jamaica cigars are now becoming well known in England. The public revenue for 1878 was £438,564, and the appropriated revenues from roads, poor rates, &c., £74,900, making a grand total of £512,465, or about 18s. per head of the population. The estimates for 1880showed a public revenue of £469,875 and appropriated £72,580, total £542,455. £245,000, or more than half the public revenue, is raised from import duties, and £94,000 from rum duties ; the railway re- eeipts (Government having purchased the line by loan witha view to extension) for 1880 were estimated at £23,000. Theremainder comes from licences, postal revenues, and other sources, The public expenditure for 1879 was £460,154, the appropriated

£73,050, total £538,204, and the estimated expenditure for 1880— public £485,655, appropriated £72,580, total £558,235. The main items of expendi- ture are—debt charges and sinking fundsand redemption, £73,000; administrative departments, £33,000; revenue departments, £33,000 ; judicial, £36,000 ; ecclesiastical, £10,000 (the church has been disestablished, and the expenditure will be gradually less as vested interests disappear); medical, £55,000; constabulary, £50,000; penitentiary and prisons, £25,000; education, £25,000 ; railway managing, &c., £14,000; public works and _ irrigation, £58,000.

In 1878, 617 schools underwent inspection by the Government ; 51,488 children were on the books, the average attendance being 29,679. Of these schools, 54 passed first class, 176 second elass, and 348 third class. Theaverage Government grant to each sehool aided during the year was £29, and tle total education grant, exclu- sive of departmental salaries, was £18,572. Elementary education has made progress during the eleven years the present system has been in operation. The eollegiate school in Kingston offers higher education. Among educational institutions, the Church of England high school, the Calabar institution or Jamaica Baptist College, and Wolmer's free school, founded in 1729 by John Wolmer for the free education of poor children, as well as the Mico school, require inention. The ecclesiastical establishment is regulated by Law No. 30 of 1870, which provided for gradual disendowment. This law ereated a synod, to consist of clergymen and lay representatives, and it continued to each existing rector, island curate, and stipendiary curate the payments from the state so long as they ful- filled their functions. Under this law the estimates for 1880 show as still on the establishment five rectors, twenty island curates, and three stipendiary curates, the total amount for the Church of England being £9749 ; this, with £367 to the Church of Scotland, and £100 to the Church of Rome, makes up the ecclesiastical estab- lishment. Besides the state paid clergymen, there are about forty clergymen paid out of the Diocesan Church Fund. Besides three American church missionaries at Kingston, there are about twenty Presbyterian ministers, thirty Wesleyan, eight of the London Mis- sionary Society, fifty Baptist, one Independent, six United Metho- dist

Free Church. The Moravians have fourteen stations and seventeen missionaries, There are two synagogues.

Kingston, the capital, is on the south coast. It was founded in 1693, and is built on a plain which rises from the shore with a gradual ascent to the foot of the Liguanea mountains. This plain is covered with country residences

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and sugar estates. The town population in 1871 was 4393 whites, 13,291 coloured, and 16,630 blacks. It is now estimated at over 40,000. The seat of government was recently transferred from Spanish Town to Kingston, and the principal civil and judicial business is transacted there. The chief retail business street is Harbour Street. Port Royal Street is the chief thoroughfare of the wholesale merchants, who keep wharves which line the seaboard of the town. The public buildings possess little architectural interest. The Victoria Market (opened in 1872) and public landing place at the foot of King Street (where todney's statue was brought from Spanish Town), form a very fine market-place. The court house in Harbour Street is a handsome building. The public hospital (with 170 beds), the law library, the chancery registrar's office (with its piece of tapestry of the royal and island arms, which used to be carried before the governor on state occasions), the court of vice-admiralty, the public library and museum in East Street, are also worthy of mention. The parish church in King Street is one of the oldest churches in the island, dating probably from 1692. It contains the tombs of William Hall (1699) and Admiral Benbow (1702). The only bank is a branch of the Colonial Bank, besides the Government Savings Bank. Up-Park Camp, to the north-east of the city, is the head- quarters of a West India regiment.

Jamaica was discovered by Columbus and possession taken in the name of the king of Spain on the 3d of May 1494. He called it St Jago, but it is known by its Indian name Jamaica, "the isle of springs." It is sometimes written Xamayca. The inhabitants belonged to the gentler Indian tribes, not to the fierce Caribs. In June 1503 Columbus was driven by a tempest into a bay on the north side, now St Ann's Bay.

After his departure the island remajned unvisited until 1509, when his son Diego, having estab- lished his right in the council of the Indies to the governorship of Hispaniola, sent Don Juan d'Esquivel to take possession of the island, in opposition to Alonzo d'Ojeda, who claimed it under a royal grant. Thenceforward, under the rule of the Spaniards, the Indian population diminished, until in 1655, when the island fell into the possession of the English, the race was practically extinct. The controversy respecting the rights of the descendants of Columbus continued for a long time. About the year 1523 Diego Columbus founded St Jago de la Vega, St James of the Plain, which was the official capital, under the name of Spanish Town, until Kingston was recently selected. Attention had been gradually given to agri- culture, the cotton plant, sugar cane, and various kinds of corn and grass having been introduced. Jn 1596, during the alliance of Queen Elizabeth with the Low Countries, and the consequent war withSpain, Sir A. Shirley, a British admiral, invaded Jamaica, but made no attempt at occupation. In the reign of Charles J. Colonel Jaekson defeated the inhabitants at Passage Fort. Shortly afterwards the island was divided into eight districts in the nominal possession of eight noble families, and the total population became extremely small. The next important event was the expedition sent by Cromwell, under Admirals Penn and Venables; failing against Hispaniola, they took possession of Jamaica on the 3d May 1655, the island having been in the possession of the Spaniards one hundred and sixty-one years. UnderCromwellemigrantswerc sentfrom Scotland and Ireland and other places. But the Spaniards and their negroes harassed the new comers, who diedin considerable numbers. On the 8th May 1658 an attack from Hispaniola was defeated, and soon after the remaining Spaniards were driven from theisland. The slaves called Maroons, however, who had fled to the mountains, continued for- midable. Down to the end of the 18th century the disaffection of these Maroons caused much trouble. In 1661 a regular civil government was established, Colonel D'Oyley being appointed governor-general with an elective council. Next year he was suceeeded by Lord Windsor, who was instructed to summon a popular assembly to pass laws. Jamaica became the resort of the buccaneers, who carried on a profitable piracy on these seas during the war with Spain. In 1670 peace was made with

Spain, and the English title was reeog- nized by the treaty of Madrid. The buccancers were suppressed. In 1672 the Fourth or Royal African Company was formed to carry on a monopoly of the slave trade. From 1700 to 1786 the number of slaves imported was estimated at 610,000, of whom about one- fifth were re-exported. In 1673 the governor sent home the first pot of sugar to the sccretary of state ; at this time there were 7768 whites and 9504 negroes on the island. In 1678, while the earl of Carlisle was governor, an attempt was made to saddle the island with a ycarly tribute to the crown, and to restrict the free legis-

lative power of the assembly. ever, were restored under Sir Thomas Lynch in 1682; it was not until 1728 that £8000 (currency) a year was settled on the crown, and the laws and statutes of England.were made equally applicable to Jamaica. This amount was afterwards commuted for £6000, used by the governor for salaries, allowances, and contingencies. Iu 1854 this fund was merged in the ordinary civil list. The other principal event in the gencral history of Jamaica was the threatened invasion in 1782 by the combined flects of France and Spain under De Grasse. It was saved by the victory of Rodney and Hood, off Dominica, in commenioration of which event a statue of Rodney, by Bacon, was erected in Spanish Town.

A great earthquake occurred in 1692, when the chicf part of the town of Port Royal, built on a shelving bank of sand, slipped into the sea. In 1712 and 1722 there were dreadful hurricanes, the last causing the scat of commerce to be transferred from Port Royal to Kingston. Since then there have been a number of hurricanes, the most recent being in August 1880, when considerable damage was done to crops, provision grounds, churches, chapels, and school- houses in the eastern part of the island.

Since 1800 the history of Jamaica has been, with some exceptions (such as the defeat by Admiral Duckworth in 1806 of the French squadron intended to invade Jamaica), confined to its domestic con- cerns and its relations with the mother country. In 1807, when the slave trade was abolished, there were 323,827 slaves in the island. The island was very

prosperous,—sugar, coffee, cocoa, cotton, pimento, ginger, and indigo being produced; and it was also the depot of a very lucrative transit trade between Europe and the Spanish main. The auti-slavery agitation in England, growing stronger every year, caused great excitement in the island, and there was much violence and misrepresentation on both sides of the question. The negrocs revolted in 1832, under the belief that emancipation had been granted; many hundreds of lives were sacrificed, a large amount of property destroyed, and various atrocities were committed. This stimulated the agitation in England, and in 1833 the Emancipation Act was passed, the period of apprenticeship being ultimately reduced to four years. Of the £20,000,000 compensation, £6,161,927 was awarded to Jamaica, being about £19 a head on a slave population of 309,338. The wisdom of the manner in which the emancipation policy was carried out by England has been often questioned. During Sir Lionel Smith's administration, on the 1st of August 1838, the apprenticeship came to an cnd, and entire emancipation was effected by an Act of the assembly. Difficulties arising between the British Government and the assembly as to the Prisons Act, a bill was in- troduced by Mr Labouchere (Lord Taunton) into the House of Commons to suspend the constitution of Jamaica, the rejection of which measure occasioned the resignation of Lord Melbourne's ministry. The dispute was afterwards compromised, and under the government of Sir Charles Metcalfe an improved state of things was brought about. Education and religious instruction and better administration of justice were subjects of attention, together with schemes of agriculture to develop the varied resources of the island. The want of cheap and continuous labour was, however, a great obstacle. The introduction of labourers from Africa was objected to in England as a renewal of the slave trade. Coolie immigration was fenced about with such expensive restrictions by the home Government that no large or comprehensive scheme was possible. The earl of Elgin contiriued Sir C. Metcalfe's policy, and a railway was opened, 12 miles long, between Kingston and Spanish Town, but the prospects of the colony became exceedingly gloomy under the effects of the legislation in 1846 equalizing the duties on free and slave sugar. The advantages of slave labour in Cuba were so great that the utmost economy and skill of practical resident planters in Jamaica failed of success. Differences

between the assembly, the council, and the home Government on the means of retrenching the public expenditure, created much bitterness of feeling, and most disastrous results were brought about, affecting seriously the credit of the island, by the assembly refusing to perform its functions and renew duties necessary for revenue. An outbreak of cholera added to the confusion and gloom. The result of this controversy was that the home Government offered an imperial guarantee for a loan of £500,000 and other financial assistance, conditionally on permanent provision being made for official salaries, on the initiation of all money grants by the crown, and on certain members of the legis- lature being held responsible for the expenditure of the public money. Sir ela Barkly had the task of carrying out these arrangements.

In 1854 the Incumbered Estates Act was passed, under which in recent years considerable sales of property in Jamaica have taken place. During the next decade the island was tranquil, but very oe depressed. Many white people, of a superior class, had left. re ic business suffered by the recriminations in the assembly, and

y per of economy and good management (causing annual deficits)

ot the public finances, But in 1865 an event occurred which opened é perfectly new chapter in Jamaica history. On October 20 ee yre reported to the secretary of statc (the present Lord

well) a "scrious and alarming insurrection of the negro popula-

The privileges of the assembly, how- |

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tion." In this despatch the letter written by Dr Underhill, the secretary to the Baptist Socicty, was referred to as causing public meetings to be held, and giving rise to excitement. Dr Underhill subsequently asserted that it was through Governor Eyre his letter became public. The letter referred to the distress among the population, to alleged unjust taxation, to the alleged refusal of just tribunals, to the denial of political

rights to the emancipated negroes. The despatches of Governor Eyre caused much discussion and excite- ment in England, aud under date of 30th December 1865 a royal commission was issucd to inquire into the disturbances. The com- missioners—Sir Henry Storks (sent out as governor), Mr Russcll Gurney, and Mr J. B. Maule—began their work on January 28, 1866, and sat for fifty-one days. They reported on the 9th April that the disturbances in St Thomas in the east had thcir immediate origin in a planned resistance to lawful authority, arising from the desire to obtain land free of rent, want of confidence in tribunals, fcel- ings of hostility towards political and personal opponents, while not a few contemplated the death or expulsion of the white inhabi- tants. Had more than a momentary success been obtained, tho ultimate overthrow of the insurgents would have becn attended with a still more fearful loss of life and property. The commissioners attributed the speedy termination of the outbreak to the skill, promptitude, and vigour of Governor Eyre in the carly stages ; they viewed the military and naval operations as prompt and judicious ; but they thought martial law was continued too long, and that tho punishments inflicted were excessive. The commissioners expressed. an opinion that the conduct of Gordon, a member of the assembly, whose trial by court martial and execution caused great contro- versy in England, had been such as to convince both friends and eneinies of his being a party to the rising, yet they could not sce any sufficient proof either of his complicity in the outbreak at Morant Bay, or of his having been a party to a general conspiracy. The case was warmly taken up in England by the Jamaica committee under the leadership of Mr J. 8. Mill. A charge was made against Mr Eyre, resulting in an elaborate exposition of martial law by Chief Justice Cockburn, and the stoppage of the prosecution by the grand jury ignoring the bill. On the 20th December 1866 the assembly passed an Act rendering it lawful for the Queen to create and consti- tute a Government for the island; the same was passed by the council on the 22d, and on the 28d it received the governor's consent. Thus the constitution which had existed for two hundred years was swept away. It was composed at the time of a governor, a privy council, a legislative council, an assembly of forty-seven elected mem- bers, and a paid body called the executive committee, who were practi- cally responsible ministers of the crown,

holding office at the gover- nor's pleasure. The present constitution is that ofan ordinary crown colony. It was established by an imperial Act, and an order in council, dated 9th April 1866, and subsequent orders. There is only one chamber, called a legislative council. In 1880 this consisted of the governor as president, eight officials, (viz., colonial secretary, senior military officer, attorney general, director of roads, col- lector general, auditor general, assistant colonial secretary, and crown solicitor), and eight non-officials, nominated by the crown,— all councillors holding office at the royal will and pleasure, No proposal is admitted or debate allowed on any matter affecting revenue, unless introduced by the governor or by his direction. Sir J. P. Grant was governor from 1866 to 1874, and reforms and changes were vigorously effected. The revenue was better collected. Irrigation and other publie works were begun. But the sugar industry has continued in a state of great depression, though Sir A. Musgrave, who was appointed governor in 1877, reported in 1880 that the public debt had been reduced from £719,000 to £485,000 (excluding loans for special purposes), that there had been no in- crease of taxation since 1867, that savings banks deposits had increased from £58,913 in 1868 to £207,000 in 1879 (the Govern- ment paying interest at 4 per cent.), and that the industrious negroes, especially those with small holdings, growing provisions, coffee, cocoa, or possessing small sugar mills, were fairly prosperous, These results are attributed by officials to the change from repre- sentative to crown government, although the latter has been much criticized as too arbitrary, and tending to a narrow officialism. The number of parishes for purposes of local government has been reduced from twenty-two to fourteen. Each parish has its own hospitals, almshouses, &c., managed by its municipal board, the chairman of whom is the custos, nominated by the governor. The members are appointed by the custos, subject to the governor's approval. Each parish also has a road board. The judicial estab- lishment consists of the chancellor (the governor), a vice-chancellor and chief justice, two puisne judges of the supreme court, attorney general, crown solicitor, &c.; there are scven district courts, somewhat on the model of county courts in England, the judges being barristers sent out from England. There are also four stipendiary magistratcs, and a police magistrate for Kingston. The constabulary was placed on its present

footing 1n 1867, and is modelled on the system of the Irish (semi-military) constabulary.

-Parochial medical officers paid by Government attend the parochial

institutions, constabulary, and immigrants. These officers aro

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allowed private practice in addition. The island is in telegraphic communication with England, and indeed with the world, and has also an inland telegraphic service. The Government have pur- chased the 25 miles of railway from Kingston to Old Harbour, and are about to construct 47 miles more. Steam communication is very frequent between England, United States, and the colony.

See Long's History, 1774; Bryan Edward's History, 1809, and Appendix, 1819; Renny's History, 1807; Bridge's Annals, 1828; M. G. Lewis's Journal of a West India Proprietor ; Montgomery Martin's History of the British Colonies, 1835; Phillippo's Past and Present State. 1843 ; Geological Survey Reports, 1869; Gardner's History, 1873; Phillippo's Climate, 1876; Sir Sibbald D. Scott's Jamaica and Back, 1876; parliamentary papers, Colonial Office lists, local pub- lications, and almanacs. For natural history, see Sloane, 1692; Brown, 1754; Barham, 1794; Lunan, 1814; and Gosse's Journal of a Naturalist in Jamaica, 1851, and Birds of Jamaica, 1847. For descriptions of scenery, see Tom Cringle's Log and the Cruise of the Midge, by Michael Scott, a Kingston merchant. See also the map of Harrison, 1873. (J. L. 0.)

JAMES (IdxwBos). This name, the Hebrew Yakob or Jacob, belongs to several persons mentioned in the New

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Testament, of whom the first that appears in the Gospels is |

1. James the son of Zebedee. He was among the first

half sister,—were brought up together.

who were called to be Christ's immediate followers and |

afterwards chosen to be his apostles, and is one—the others being Peter, Andrew, and John (the brother of James)—of the always first-mentioned and, as the narra- tive shows, most remarkable group of the apostolic band. In all the enumerations of the twelve (Matt. x. 2; Mark iii. 17; Luke vi 14; Acts i. 13), his name appears early in the list, twice occupying the second place after Peter's.

The call of Janes and John (the fullest account of which is |

given in Luke v. 1-11; comp. Mark i. 20) took place on the same occasion when Peter and Andrew, the other pair of brothers, were taken from their humble fisher's trade to be fishers of men. After this we next find James noticed as one of the persons present (Mark i. 29) when Jesus restored Simon Peter's wife's mother, who was sick of a fever.

His brother and he were surnamed by our Lord (Mark iii. 17) " Boanerges," a name derived from two Aramaic words signifying "Sons of thunder," as it is interpreted by the evangelist. reference to the powers of their eloquence in preaching,

or even from their being present when the voice like |

thunder spake to Jesus from the cloud (John xii. 29). It is more probable, especially as one meaning of the word translated "thunder " is "rage, anger," that the name was given to them by the Lord because he perceived the fiery impetuosity of their nature. Two instances (Luke ix. 54; Mark x. 32-41) are recorded in the Gospels from which we call discern somewhat of this character of the sons of Zebedee.

James is included among those who after the ascension waited at Jerusalem (Acts i. 13) for the descent of the Holy Ghost on the day of Pentecost. This is one of the passages in which the name of James is placed before those of John and Andrew, and we may judge from the

little that we are told of him subsequently that he was a most zealous and prominent member of the Christian community. For when a victim is to be chosen from among the apostles who should be sacrificed to the ani- mosity of the Jews, it is on James that the blow falls first. The brief notice is given Acts xii. 1, 2: " Now about that time Herod [Agrippa I.] the king put forth his hands to afflict certain of the church. And he killed James the brother of Jéhn with the sword." —_ ~

Eusebius (H. #., ii. 9) has preserved for us from Clement of Alexandria the circumstance that the accuser of the apostle, "beholding his confession and moved thereby, confessed that he too was a Christian. So they were both led away to execution together, and on the road the accuser asked James for forgiveness. Gazing on him for a little while, he said, 'Peace be with thee,' and kissed him. And then both were beheaded together." Other legends which tell of the apostle's preaching in Spain, and of the translation of his body to Compostella,

The name has been explained as having |

are to be found in the Acta Sanctorum, July 25 (vol. vi. pp. 1-124).

2. James the son of Alpheus, We also was one of the apostles, and is mentioned in all the four lists (Matt. x. 3; Mark iii. 18; Luke vi. 15 ; Acts i. 13) by this name, but in no other place. It is, however, thought by some that he is the same with

3. James the Lord's brother. In Matt: xii. 55 and Mark vi. 3 the brethren of the Lord are named James, Joses, Judas, and Simon. It is also to be remarked that they are in both places spoken of as the children of the carpenter, that is, of Joseph the husband of the Virgin Mary. But it has been urged that they were called sons of Joseph and Mary because the children of two families,— of Mary the Virgin and Mary the wife of Clopas, her Those who in this way make James the Lord's brother to be a son of Alphzeus require to establish (a) that Clopas is the same name as Alpheus, (0) that Mary the wife of Clopas (John xix. 25) was the sister of the Virgin Mary, and © that this Mary, wife of Clopas, is the same who is called (Matt. xxvi. 56; Mark xv. 40) Mary the mother of James and Joses, and (Mark. xvii 1; Luke xxiv. 10)

_gimply the mother of James, in which four passages the

same person is evidently intended. But the identity of

| the names Alpheus and Clopas is by no means certain.

Those who maintain it take Clopas as the Aramaic Chalpai, and Alpheus to be a Grecized form thereof. But when we turn to what might be supposed the best source of evidence on this point, viz., the Peshito version of the New Testament, instead of finding the two names treated as the same word, we find in all cases Chalpai where the Greek has Alpheus, and where Clopas or Cleopas occurs, it is simply transliterated Kleopha. The same is the case with the Jerusalem Syriac. The identity of these names is thus far from being established. Then in Jolin xix. 25 the versions and best authorities are in favour of making four persons of those there mentioned: "his motlier, and his mother's sister, and Mary the wife of Clopas, and Mary Magdalene." This is the Peshito rendering, and, even if the conjunction were not there, it is not uncommon in Scriptural enumeration to find names given in pairs without any conjunction, while to make Mary the wife of Clopas the Virgin's sister would be to assume two Maries in the same family of sisters, which is not very probable. Whether Mary wife of Clopas was the mother of a James (called in one place "the little") and of Joses can neither be asserted nor denied from the evidence in the Gospels; but, when the other two assumptions have so little founda- tion to rest on, it seems impossible to consider the son of Alpheus the same person with the " brother of the Lord."

Further, James the Lord's brother was bishop of Jerusa- lem (comp. Gal. i. 19 with Gal. ii, 9-12), and was president of the church in its earliest days (Acts xii. 17, xv. 13, xxL 18). Such a position required him to bea resident in Jerusalem, while had he been an apostle (as the son of Alphzeus was) we should have expected him to take his share of the missionary labour of publishing the gospel in distant lands. But this bishop of Jerusalem was the author of the epistle of St James. He simply styles himself in the introduction thereto "a servant of God and of the Lord Jesus Christ." He who could thus write with the certainty of being identified must have been the most famous person of his name

in the church, must have been what St Paul, in a passage (Gal. ii. 9) where he places James before both Peter and John, calls him, "a pillar of the Christian society. And again Jude, when com- mencing his epistle, calls himself the brother of James, with no other mark of distinction, Here too the same

JAMES

James must be intended, and when we read St Jude's epistle (17, 18) we find him distinguishing himself from the apostles, and as it were disclaiming the apostolic dignity. This is as it would be if James and Jude were both brethren of the Lord and were not apostles, but we should certainly expect one or other would have left some indication in their letters had they been of the number of the twelve, and most surely neither of them would have been likely to give us reason for believing that he was not an apostle.

The two passages (1 Cor. xv. 7; Gal. i, 19) from which it might be argued that James the brother of the Lord was an apostle cannot be relied on, for we find the same title given to Barnabas, and it is certain that the name "apostle" began to be more widely applied after the ascension than it is in the Gospels.

Once more, the brethren of the Lord are expressly said (John vii. 5) not to have believed on Jesus at a period inuch later in his ministry than the appointment of the twelve ; while in the mention of them in Acts i. 14 there is given first a list of the eleven, who are said all to have continued in prayer with the women and Mary the mother of Jesus and with his brethren." Such a studied severance of the brethren of the Lord from the number of the apostles is very significant, while the position which they hold in the list may well be due to the fact that it was only at a late period that they had become disciples of Jesus. The change in their opinions has been thought by many to be sufficiently accounted for by the statement of St Paul (1 Cor. xv. 7) that after his resurrection Jesus '" was seen of James." Such ademonstration of the truth of what others had long believed and Jesus himself had taught could not fail to work conviction on a mind which, if we may accept the tradition of the "Gospel according to the Hebrews" (which also testifies

to this appearance of Christ to James), was somewhat inclined to believe, even before the cruci- fixion.

It seems right therefore to conclude that James the son of Alpheus, one of the apostles, was a different person from James the Lord's brother and bishop of Jerusalem. Of the history of the former we are told nothing except that he was an apostle. The latter is spoken of by St Peter (Acts xii. 17) as if he were at that time the recognized head of the Christian community in Jerusalem. Again (Acts xv. 13), after the debate at Jerusalem about the circumcision of the Gentiles, it is he who sums up the arguments and declares the sentence of the council, as if he were the chief person among them. In Acts xxi. 18, on St Paul's last visit to Jerusalem, he holds the same position, and receives the visit of St Paul in the presence of all the presbyters. In Gal. i. 19, ii, 9 he is placed foremost among "the pillars" of the church of Jeru- salem.

From the New Testament we learn no more of the history of James the Lord's brother, but Eusebius (Z/. #., ii. 23) has preserved for us from Hegesippus the earliest ecclesias- tical traditions concerning him. By that authority he is described as having been a Nazarite, and on account of his eminent righteousness called "Just" and ' Oblias." So great was his influence with the people that he was appealed to by the scribes and Pharisees for a true and (as they hoped) unfavourable judgment about the Messiahship of Christ. Placed, to give the greater publicity to his words, on a pinnacle of the temple, he, when solemnly appealed to, made confession of his faith, and was at once thrown down and murdered. This happened immediately before the siege. Josephus (Antig., xx. 9, 1) tells that it was by order of Ananus the high priest, in the interval between the death of Festus and the arrival of his successor Albinus, that James was put to death; and his narrative gives tho idea

of some sort of judicial examination, for he says that along with some others James was brought before an assembly of judges, by whom they were condemned and delivered to be stoned.

Other less important bearers of this name are (4) James, of whom all we know is that he was the "son of Mary " (Matt. xxviii. 56; Mark xv. 40, xvi. 1; Luke xxiv. 10) and the brother of a certain Joses (comp. Mark xv. 40 with xvi. 1), and that he is called "the little," 6 puxpds (A. V. 'the less," wrongly) ; and (5) James, who was either the father or brother of Judas, one of the apostles. The Greek gives (Luke vi. 16; Acts i. 13) "Judas of James." The ellipsis may, as has been shown by Winer, be sup- plied either by the word "father" or "brother." The A. V. supplies "brother." But, as in both these lists within a line of the name of this Judas a similar form "James of Alpheus" occurs, which is in both places rendered James the "son" of Alphzeus, as it is also in both the other lists of the apostles in St Matthew and St Mark, it seems natural to suppose that the evangelists intended the same noun to be supplied in both cases. If this be so, the James here mentioned would be a person otherwise unknown, but the father of the apostle Judas, who is distinguished as Lebbeeus and Thaddeus, and also by St John (xiv. 22) as " Judas not Iscariot,"

JAMES, tHE GENERAL Epistte or, Of the author of this epistle enough has been said in the previous article (3); it only remains to add in connexion with the intro- ductory words thereof that probably the same reason actuated both St James and St Jude to leave out any mention that they were 'brethren of the Lord." We need not enter into the question of what relationship is intended by those words, though, from the mention of Joseph on each occasion where the " brethren" are spoken of, it is probable that they were really his children by a former marriage. Thus Jesus would be younger than those who are called "'his brethren," and their behaviour in rejecting his teaching for so long a time may have been partly a result of their growing up with him and regarding him as a younger member of the same family, and from familiarity becoming less willing than strangers would be to acknowledge anything which looked like an assertion of superiority. But, whatever the reason for their former un- belief, it is easy to see that, when they had at length come to own Jesus as their Lord, humility would check the mention of the relationship in which they might claim to stand to Jesus, as would also a desire not to appear to place

themselves in a position of close connexion with Christ, to which none others could lay claim.

The epistle is addressed "to the twelve tribes which are of the dispersion." The word "dispersion" (d:ac7opa) was employed in the New Testament times to signify the Jewish population in every part of the then known world. Jews were to be found in Persia, Egypt, Asia Minor, and indeed in all the lands surrounding the Mediterranean Sea. When the writer addresses them as "the twelve tribes" he gives us the key to the character of his epistle. It was written to Christians who had been converts from Judaism, but to whom their ancient faith was still of the very highest importance, indeed, of somewhat more import- ance than it ought to have been. We can see therefore why the language of this epistle partakes so largely of the character of the preaching of John the Baptist (comp. Jas. 1. 22, 27 with Matt. iii. 8; Jas. ii. 15,16 with Luke iii. 11;

1 For a discussion of these traditions, and on the question whether the text of Josephus is interpolated, consult Credner, Hinleitung, p. 581; Hilgenfeld, Hinl., p. 523 seq. ; Wieseler in Jahrb, 5 LD: Theol. ; 1878, p. 99 seq, Compare also Jerome's account of James in his book De vir. ill., 2, where further traditions from the Gospel according to the Hebrews are given. '

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Jas. ii. 19, 20 with Matt. ili. 9; and Jas. v. 1-6 with Matt. iii, 10-12) and of that of our Lord's earliest teaching in the Sermon on the Mount (cf. especially Jas. i. 2, 4, 5, 9, 20; ii, 18,14; i, 17-18. iy OT; v. 2; 10,2 15); and why it is so largely illustrated by the language of books like Ecclesiasticus and the Book of Wisdom, which were specially esteemed by the Jews of Alexandria and other Hellenistic centres of Judaism (see Jas. i. 1, 5, 8, 11, 12, 17, 19, 20, 23, 25; ii 21; iii 5, 6; iv. 14). We should judge from this that the bishop of Jerusalem, in the earlier days of the Christian church, availed himself of his central position to circulate among the scattered Judxo-Christian populations, of whom

representatives would constantly be within his reach, such a letter as was suited to stimulate the new converts to more truly Christian life, and to check errors into which, from their attachment to the older faith, they were prone to fall. The epistle contains many exhor- tations to accept a higher standard for the conduct of life, though a considerable section (i. 22-ii. 26) applies more specifically to the dangers that beset Jewish converts of trusting to a faith which produced no results in the form of Christian love.

But it was not only for those who were scattered into distant parts of the world that the epistle was written. It bears marks of its relation to a time of special trial and hardship, and has much to say of how trials and sufferings are to be borne. 'Count it all joy when ye fall into divers temptations" is the opening language; and the writer returns to the same theme at the close of his letter: " Be ye also patient," " Stablish your hearts," " Behold, we count them happy which endure." Such words agree best with the dis- persion of the first Christian brotherhood after the death of Stephen, and with that persecution by Herod Agrippa I. in which James the brother of John was put to death. Tt is an additional indication that the epistle was written about those times that in it there is no word of that contention which soon agitated the whole Christian church about the circumcision of the Gentiles, and about which James pronounced the sentence of the council of Jeru- salem in 51 a.p. The persecution which ensued on the martyrdom of Stephen (33 a.p.) is too early a date after the ascension for us to think it probable that Christianity could have had enough representatives among the dispersion to make such an epistle as the present necessary. It seems better therefore to refer it to that larger persecution in which the one James suffered death, and after which the other James comes into special prominence in Christian church history. This would lead to the conclusion that the epistle, primarily addressed to the Jewish Christians throughout Palestine, but intended also for others who lived beyond the limits of the Holy Land, was written at Jerusalem, from which James the Just seems never to have departed, and that it should be dated some time after 44 A.D.,"the date of Herod's persecution, and antecedent pro- bably by several years (for the agitation which led to

the council must have existed for some time) to the council at Jerusalem (51 s.D.).

The epistle contains nothing to indicate where it was written, but at the same time there is nothing in the imagery and illustrations employed by the writer which would be out of character with one writing in Palestine. It is therefore probable that, since tradition represents James as constantly resident in Jerusalem, the epistle was written there. He uses the Jewish name " synagogue " (ii. 2) for the place of assembly for worship, which would perhaps be longer preserved among the Christians in Jeru- salem than elsewhere; but on the other hand he speaks (v. 14) of the "elders of the church" (éxxAyoia) just as we find St Luke doing in the Acts of the Apostles. He mentions the " burning wind" (xavowv) spoken of in the

Gospels (Matt. xx. 12; Luke xii. 55), and his language (iii. 4) about ships and the stormis by which they are driven is such as would be natural in one who knew by experience of the tempests that sometimes sweep suddenly over the Sea of Galilee, with which this James must have been familiar as well as the son of Zebedee.

The epistle appears to have been written with a view, in the first place, to comfort some who were undergoing severe trials, This is clear from the opening sentence, "Count it all joy when ye fall into divers trials." But the words also seem to show that there was a spirit pre- vailing among those for whom the letter was first intended which did not tend to that perfect patience under sufferings that should characterize the faithful Christian. And so the writer passes on to notice a want of perfect trust in God, and a too great regard for temporal things, concern- ing which they are exhorted to foster such a mind as shall make changes in worldly affairs, when they are for the worse, yet still no cause for sorrow. For the only perfect gifts are of God's own sending, and in His gifts as in Him- — self there is no change. The epistle next dwells on that which was the great danger with Jewish converts, the pro- fession of a belief in God and Christ without a correspond- ing Christian life; they are further exhorted to avoid sins

of the tongue and sins of presumption, while those to whom wealth had become the chief object in life are severely condemned. But before the close the writer turns once more to his first theme, the commendation of patience under sufferings, which he enforces by the examples of the prophets and of Job. Then with certain cautions about the use of oaths, some precepts for conduct under sorrow, joy, sickness, or the consciousness of sin, the epistle is brought to a close, and has not the apostolic benediction, a feature which also marks the letter as one of the earliest of the Christian writings. The time of trial alluded to suits well with the date which has been suggested, when Herod's persecutions made it necessary for the Christians in Jerusalem to meet in secluded rooms, and to exercise the utmost precaution about all whom they admitted to their meetings, We know too, from the statements of Josephus, that it was from the wealthy Sadducees that the Christians in Jerusalem experienced most persecution, and that they especially were adverse to Christianity because of the preaching of the resurrection of Jesus. The followers of Jesus were, as we know, at this time just beginning to be called Christians, and this name soon became (if it was not at first given as) a name of reproach. These circum-stances seem to be specially noticed in this epistle (ii. 6, 7). To the necessities of those days then the letter appears to be first directed, though it contains precepts eminently profitable for those who, having held firm to the belief in the unity of God (ii. 19), were disposed, even after the acceptance of the teaching of the gospel, to think that an intellectual assent to what was set forth was enough, witl- out any effort to build up on the groundwork of faith the superstructure of Christ-like virtues.

In the time of Eusebius (325 a.p.) the epistle of St James was reckoned among the books not fully accepted by the church. He says (H. Z,, iii. 25) "among the con- troverted books, which are yet well known and recognized by most is the epistle circulated under the name of James.' But among the apostolic fathers we have quotations from it in the writings of Clement of Rome (1 Zp. ad Con, cc. 10, 12) and perhaps of Hermas (Pastor, mand. xu. 5). Further, in the Syriac version of Melito's apology there are some passages which bear a striking resemblance to the words of St James, and may have been quotations (see Cureton's

Spicil. Syr., pp. 42, 48); and the Peshito Syriac version contains the epistle. Origen in his com- mentary on John (Works, xix. 6) speaks of the epistle as

in "circulation under the name of James," and he quotes from it in another place (Works, xii. 129) as that of James, without any comment, Dionysius of Alexandria, who was at the head of the catechetical school there (245), quotes from the epistle. These are all the notices of the epistle on which dependenee can be placed before the council of Laodicea (363), wheu it was included among the canonical books. But there seems no doubt that the words "well known and recognized by most," used by Eusebius indicate that the epistle was by him regarded as a part of Scripture, for in other portions of his works he alludes to it as if he so esteemed it, and evidence of its recognition in the Syrian Church speaks strongly in favour of its authenticity. For that church was most likely to have the best knowledge concerning the origin and early circulation of the epistle. We can account for the slight extent to which it was known from the fact that it was addressed, by a bishop who never moved from his home, to one section only of the Christian church, and was not likely to gain such wide acceptance at first as the epistles of St Paul, whose missionary labours made his name and his writings well known in different countries. Moreover, the tone of the epistle is practical and not doctrinal, and for this reason also it would be less likely to be noticed in the writings of the Christian fathers. Indeed, this feature of the epistle led Luther, who thought there was in it some contradiction to St Paul's teaching on the doctrine of justi- fication by faith, to call it eine rechte stroherne Eprstel (ed. of German N. T., 1522), "a veritable epistle of straw." But language like this is due to the distorted way in which the great Reformer looked at the subject. His day called for prominence to be given to the Pauline view of justification. St James's day had different needs. The character of those for whom this epistle was intended and their special dangers are sufficient to account for the way in which St James emphasizes what St Paul would as stoutly have maintained in a like case, that "faith without works is dead."

The view given above, which dates the epistle before the rise of the Pauline controversy, has been ably maintained by many recent theologians, especially in Germany, in opposition to the Tiibingen school. See Schneckenburger's Annotatio, 18382 ; Huther's Commentar, 1858, 3d ed. 1870; Neander, Pflanzwng, 4th ed. 1847, p. 564 seq.; Ritschl, Altkath. Kirehe, 2d ed. 1857, p. 109 seq., and Reehtf. und Versthn., 1874, ii. 277 seg.; Weiss, Bib. Theol. des N. 7, 1st ed. 1868, 2d ed. 1873; Beyschlag in Stud. wnd Krit., 1874, i.; Hofmann, Heilige Schrift, vii. 3, 1876. Other scholars, while defending the genuineness of the epistle, recognize in it dis- tinct allusions to the Pauline theology, and so prefer a later date. So, for example, Ewald (Geschichte, vi. 591 seg.; Sendsch. an d. Heb. u. Jakobos Rundsch., 1870), who takes the epistle as directed against mistaken inferences from Paul's teaching. The Tubingen school, on the other hand, regards theepistle as directly anti-Pauline, and at the same time denies that it is genuine. So Baur, Paulus, 2d ed. 1867, Anh. 2; Schwegler, Nachap. Zeital., 1846, i. 413 seq.; Hilgenfeld, Hinl., 1875, and in Z. f. w. T., 1877, p. 87 seq.; Blom, De Brief van Jacobus, Dort, 1869, and in Theol. Tijdsch., 1872, p. 241 seg. See also Holtzmann in Schenkel's Bibellex., s.v. " Jakobosbrief." The argument turns mainly on the interpretation of the doctrine of faith and works in chap. ii. 24, which formally at least is in direct opposition to Rom. iti, 28. In other words, Luther's difficulty is still the chief turning-point of the argument. Now it is certain that the antithesis between Paul and James is not really so sharp as it appears in the verses just cited, because the two do not attach the same meaning to the word " faith." In fact, James's faith without works is not Paul's justifying faith, but the useless faith without love spoken of in 1 Cor. xiii. We have to deal with two types of doctrine using the same terms in different senses, so that it is not inconceivable that the two may really be capable of such reconciliation in the practical Christian life as to make their divergences unimportant. But, say Baur and his school, there is no proof and great internal improbability that any type of doctrine existed before Paul, maintaining justification by faith alone, pre- cisely in Pauline terms, and using the very illustrations of Abraham and Rahab which occur in the Pauline theology and the kindred epistle to the Hebrews. Starting with this difficulty, and indicating in detail the proofs of the author's familiarity with the

peculiar ter- minology of the great Pauline epistles, the Tiibingen school urge also that James ii, 5, i. 12 presuppose acquaintance with Rev. 1i.

9, 10, and even that the allusion to Rahab (ii. 25) proves the author to have read Heb, xi. 31. Further, it is contended that the sup- posed marks of an early date, in the condition of the churches addressed, are capable of another interpretation, and that the perse- cution alluded to may be best understood of the time of Domitian. Finally, the language of the epistle is regarded as a proof that the date is not very early, and the author different from the thoroughly Hebrew figure of James as described by Hegesippus. The weight of these arguments is plainly very unequal, and the ultimate solu- tion of the controversy must mainly be in the region of Biblical theology, where one side has often been temptcd to minimize the difference between James and Paul, while the other has not done justice to the positive value of the teaching of our epistle, often speaking of it asa mere ineffective polemic against Paul by one who did not understand him. Compare further Alford, Gk. Test. ; Wordsworth, Gk. Test. ; Bishop Lightfoot's Essay on the Brethren of the Lord ; Davidson's Introduction to the N. Test. ; Plumptre, St James; Semler, Paraphrasis Ep. Jacobi, 1781 ; Monod, /ntro- duction & Vép. de S. Jacques, 1846; Wiesinger, ' Der Brief des Jakobus," in Olshansen's Bibelwerk, 1854 ; Boon, De Jacobi epistolxe cum Siracidx libro convenientia, 1860 ; Reuss, L'Evitre de Jacques, 1878. (J. R. L.)

JAMES I, (1394-1437), king of Scotland, third son of Robert III. and of Annabella Drummond of Stobhall, was born at Dunfermline in 1394. A second son, Jolin, did not survive infancy. David, duke of Rothesay, the eldest son, had died under suspicious circumstances while committed to the care of the king's brother the duke of Albany, to whom had also been delegated the virtual government of the kingdom; and the king, in order to secure the safety of the surviving son, resolved in 1405 to place him under the protection of the king of France. The prince, however, on his way thither fell into the hands of the English, and Henry IV. determined not to admit him to ransom. On the death of his father, April 13, 1406, James became nominal sovereign, but, as he was still retained in captivity in England, the duke of Albany continued regent, and was succeeded, on his death in 1419, by his son Murdoch. At first

James was confined in the Tower of London, but in 1407 he was removed to the castle of Nottingham, where he enjoyed as much liberty as was compatible with detention, and was treated in all respects by his governor, Sir John Pelham, as a member of the household. The physical and intellectual training begun at St Andrews under Bishop Wardlaw was completed by the most accomplished tutors, so that he not only attained to high proficiency in all kinds of manly sports, but reached perhaps a more varied and thorough culture than any of his contemporaries. His figure was not much if at all above the middle height, and, though thickset, was finely proportioned. His agility was no less remarkable than his strength ; he not only excelled in throwing the hammer and putting the stone, but inall kinds of athletic feats demand- ing suppleness of limb and quickness of eye. As regards his intellectual attainments he is reputed to have been well acquainted with philosophy, and it is evident from his subsequent procedure as a sovereign that he had made a special study of jurisprudence ; while, besides being a pro- ficient in instrumental and vocal music, he cultivated the art of poetry with a success not surpassed by any previous English writers with the exception of his models Gower and Chaucer. Henry V., on succeeding his father in 1413, removed James to close confinement in the Tower, but shortly afterwards took him to Windsor, and in 1417, with the view of detaching the Scotch auxiliaries from the French standard, invited him to accompany him in his expedition against France. From this time, and especially after the death of the duke of Albany in 1419, James was treated with much consideration; and, having given a pledge of his friendly intentions towards England by his marriage with Lady Jane Beaufort, February 2, 1424, he finally obtained his release in the end of March of the same year, the Scottish nation agreeing to pay a ransom of £40,000,

in name of expenses for his maintenance while in captivity.

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With the reign of James L., whose coronation took place at Scone on the 21st May, may almost be said to begin the substitution in Scotland of constitutional sovereignty, regulated by definite principles and laws

and modified by a regard to the opinions and interests of the subjects, for the indefinite authority of the king and the arbitrary rule of the nobles. It is true that after his death the lawless contests of the nobles broke out as fiercely as ever, but by his energetic repression of their violence during his lifetime, and more especially by the virtual creation of statute law modelled on that of England, and the additional importance assigned to parliament, the leaven was partly prepared which was to work towards the destruction of their unlicensed influence. During a session of the parliament held at Perth on the 12th March 1425, James suddenly arrested a large number of the nobles, including the duke of Albany and his two sons, whom along with the earl of Lennox he caused to be executed. With similar strategy he at a parliament held at Inverness in 1427 arrested Donald of the Isles and fifty of his chiefs. Donald, however, on making all due submission, received his liberty ; but when, in violation of his oath he made an abortive attempt to assert his independence, the king, on his making uncondi- tional surrender, confined him to Tantallon castle. As was natural, the energetic rule of the king, and especially his stringent coercion of the nobles, aroused a secret purpose of revenge; and, acting on the inspiration of the earl of Athole, uncle of the king, Sir Robert Graham and other accomplices, with a band of three hundred Highlanders, suddenly, on the evening of the 20th or morning of the 21st February 1437, entered the apartment of the king in the priory of the Dominicans at Perth, and stabbed him to death with their daggers,

Although the constitutional reforms introduced by James I., and the general tenor of his reign, showed that in him were united in a rare degree decision in action with far-sighted sagacity, his merits as a statesman have been cast in the shade by his achievements in literature. It is also worthy of mention that it was owing chiefly to his representations when in captivity that the pope was induced to grant a bull for the erection of a university at St Andrews. The Poetical Remains of James I. were first published in 1783, edited by William Tytler. The principal poems of which he is the reputed author are Zhe King's Quai, Christis Kirk on the Grene, and Peblis to the Play, and he also wrote several minor pieces. A manuscript of the King's Quair formerly belonging to Selden is preserved in the Bodleian library at

Oxford. The poem, which is divided into seven cantos, and is written in the seven-lined stanzas of Chaucer, was composed during his captivity in England, to celebrate his love for the lady whom he after- wards married. It is allegorical in form and somewhat tedious in its minute description of details, but always preserves a smooth and harmonious versification, while it contains many finely imaginative passages inspired by true and tender feeling, and characterized by a charming simplicity and grace akin to those of his master Chaucer. One reason why many have doubted that James could be the author of Christis Kirk on the Grene is its entire dis- similarity in manner and style to the King's Quair. Pope's line, " A Scot will fight for Christ's Kirk o' the Green" is sarcastic, but undoubtedly chronicles a fact. The poem is a humorous delineation of a phase of Scotch rustic life, and its spirit and graphic vigour are not unworthy of Burns, who indeed has received from it more than one suggestive hint, and in The Holy Fair and The Ordination has imitated its refrain. The oldest evidence for assigning it to James I. is that of the Bannatyne MS. collection made by George Ban- natyne in 1568 ; and, if this evidence is not conclusive for James I, it is so against James V., the only other probable

author. There is no printed edition earlier than 1663, Since then several separate editions have appeared, and it has also been printed along with Zhe Gaberlunzte Man as the work of James V. That James I. was the author of the poem receives a certain amount of corroboration from its resemblance in subject and style to Peblis to the Play, the first words of which are quoted by John Major in describ- ing a ballad which he attributes to James.

The contemporary authorities on the reign of James I. are princi- pally Wyntoun's Cronykil, and Bower's continuation of Fordun's Scotochronicon. 'To the succeeding century belong the histories of John Major, Hector Boece, and Bishop Lesley. The modern histories of Pinkerton, Tytler, and Burton are of course well known. In regard to questions connected with his character as an author, see Sibbald's Chronicles of Scottish Poetry; Walpole's Royal and Noble Authors;

Chalmers's Historic Remains of Scottish Kings; Tytler's Scottish Worthies; Pinkerton's Ancient Scottish Poems; Ritson's Historical Essay on Scottish Song; Washington Irving's Sketch Book; Prescott's Miscellanies ; and David Irving's History of Scottish Poetry. An account of the murder of James I., professedly translated from the Latin of John Shirley in 1440, has been pub- lished in an Appendix to Pinkerton's History; in vol. ii. of Afiscel- lanca Scotica, Glasgow, 1818; and in Galt's novel, The Spaewife.

JAMES IT. (1430-1460), twin son of James L, was born in 1430, and, Alexander his elder brother having died in infancy, was shortly after the assassination of his father crowned king at Holyrood. During his minority the house of Douglas used every endeavour to extend their influence,— William, who succeeded to the earldom in 1443, ultimately making no pretension to conceal his claims to independent sovereignty, and at the festivities in 1449, in honour of the king's marriage to Mary of QGueldres, with ostentatious bravado bringing in his train as many as 5000 followers. Shortly after the king attained his majority he in 1452 invited Douglas to become his guest in Stirling castle, and, on his refusing to break the " bands" he had made with the other nobles, in sudden passion stabbed him with a dagger, after which Sir Patrick Grey completed the assassination with a poleaxe. It was not till 1454 that the struggle following this act of violence, which involved all Scotland in a series of intermittent contests, was brought to a close by the flight of the Douglas and the forfeiture of his estates to the crown. His own kingdom being freed from distraction, James resolved to take advantage of the protracted intestine conflict in England, known as the Wars of the Roses, to wrest from the English the posses- sions they held in the south of Scotland ; but while con- ducting the siege of Roxburgh castle he was killed by the bursting of a cannon, 3d August 1460.

JAMES ITT. (1452-1488), king of Scotland, son of James ITI., was born lst June 1452, and shortly after the death of his father was crowned king at Kelso. The custody of the young prince was entrusted to Bishop Kennedy of St Andrews, but in 1466 he was seized at Linlithgow by Lord Boyd, who in this way succeeded in obtaining the governorship of the royal fortresses, and also won the apparent

friendship of the king. James was, however, as fickle and faithless as he was weak and pliant, and while Lord Boyd's eldest son, who had been created earl of Arran, and had married the king's sister, was absent in the summer of 1469 on an embassy to bring home the king's bride, Margaret of Denmark, the enemies of the Boyds set agencies in motion for having them tried for their seizure of the king, The earl of Arran, obtaining news of their machinations before landing, returned to Denmark; Lord Boyd fled to England; but Sir Alexander, brother of Lord Boyd, suffered execution, and the estates of the family were forfeited. James, whether the fault was his own or not, was sadly unfortunate in his connexion with his near relations. While his brother-in-law was a fugitive from his vengeance, his two brothers were also, whether justly or not, the objects of his animosity and dread. The earl of Mar, the younger brother, died at

Craigmillar castle in circumstances 80 suspicious that he was generally believed to have been murdered ; and the duke of Albanythe elder, making his escape from Edinburgh castle to France, afterwards in 1482 came to an agreement with Edward IV. to hold the kingdom as his vassal. The rivalry of Albany was the more formidable because Jamies by the preference which he showed for artists and musicians and by his retired and reserved manners had alienated the majority of the nobility. this year was leading an army against England, the nobles, headed by Douglas, suddenly at Lauder seized Cochrane and several of the king's other favourites, and, having hanged them before his eyes, returned with their royal captive to Edinburgh castle. On this Albany suddenly made his appearance, and, having demanded and received the king's liberty, assumed with apparently no objection on the part of James the sovereignty of the kingdom, until an accusa- tion for treasonable connexions with England compelled him to flee thither. For some years after this Scotland enjoyed both outward and inward tranquillity, but the jealousy of the nobles against the king's favourites induced them in 1488, along with the young prince, afterwards James IV., to raise the standard of rebellion. The two armies met at the stream of Sauchieburn, near Stirling, but hardly had

they come to blows when the king fled in panic from the

field. In his flight he was thrown from his horse, and being received into the cottage of a miller near Bannock- burn, was there (June 11) stabbed to death by a person unknown, undoubtedly a straggler from the hostile army. JAMES IV. (1472-1513), king of Scotland, son of James III, was born March 17, 1472, and on the death of his father in 1488 was crowned king at Scone, probably on June 26th. As he not only adopted an entirely opposite policy with the nobles from his father, but also showed great affability towards the lower classes of his subjects, among whom he delighted to wander incognito, few kings of Scot- land won such general popularity or passed a reign so un- troubled by intestine broils. His libertinism was overlooked on account of his open and friendly bearing, and was to some extent atoned for by his hardiness and courage and his just and temperate rule. So slight were the attempts at insur- rection on his accession to the throne that they scarcely required repression ; and, although in 1491 Lord Both- well and others entered into an agreement with Henry VIL. to seize his person, the circumstances were always such as either not to require or not to favour the carrying out of the project. Indeed, Henry seems throughout to have greatly preferred the friendship of the Scotch monarch either to his active hostility or his enforced submission; and accordingly, although James had welcomed " Perkin Warbeck," the pretender to the English throne, and made a futile invasion of England in support of his claims, Henry after Warbeck left Scotland in 1497 was willing to forget all old causes of enmity. In September of that year a truce of seven years was negotiated between the two monarchs, and in August 1503 the alliance was confirmed by the marriage of James with the princess Margaret of England,—a union which led eventually in default of the Tudors to the accession of the Stuart dynasty to the English throne, Of the peace with England James took ad- vantage to establish order in the Highlands, where he intro- duced a more complete legal jurisdiction. After the accession of Henry VIIT. it became apparent that the friendly relations with England were no longer possible; and, James, having several private grounds of quarrel, was induced by the king of France to venture in 1513 on an invasion of England. His methods of warfare seem, however, to have been formed

chiefly according to notions borrowed from the knightly tourneys, the organization of which had made him famous throughout Europe ; and on the threshold of his enterprise

While James in the summer of

he was slain on the 9th September at Flodden Field, his death and the disastrous rout of his army being due to his rash and quixotic bravery.

JAMES V. (1512-1542), king of Scotland, son of James IV., was born at Linlithgow 10th April 1512, and crowned king at Scone in October 1513. At first the regency was vested in his mother, but after her marriage with the earl of Angus in 1514 the office was transferred by the estates to the duke of Albany. The English forebore to follow up their victory at Flodden, but the close connexion of Albany with France now aroused the jealousy of Henry VIII, and Scotland was continually exposed to more or less serious attacks from the English until Albany, to whose arrogant bearing and French manners and habits not even the enmity against him of Henry could reconcile the estates, finally in 1524 took his departure to the country of his choice. Upon this James, through the scheming of Henry, was "erected" king in the Tolbooth of Edinburgh, ruling the kingdom by the advice of his mother and the lords in council. In 1526 James was persuaded to choose as his governor the earl of Angus, who kept him in close confine- ment until May 1528, when he made his escape from Falkland, and put such vigorous measures in execution against Angus as compelled him to flee to England, In 1532 Angus, taking advantage of the discontent in the south of Scotland caused by the king's conduct towards the Armstrongs, and of the distracted condition of the Highlands, aided an English raid on the borders; but shortly afterwards negotiations for peace were begun, and a treaty was finally signed in 1534. In January 1537 James was married to Madeleine of France, but, she dying in July of the same year, he in June 1538 espoused Mary of Lorraine. Henry VIII. was by no means satisfied with the influence he exercised in Scotch affairs, or the amount of deference he received from his nephew; and, his jealousy receiving special provocation from the interest taken by James in foreign politics, he in 1542 despatched an

expedi- tion against Scotland, which failed from want of a com- missariat. James determined to make reprisals, but owing to the indecision of the nobles, who had no love of the enterprise, his army was scattered at the rout of Solway Moss on the 25th November. On the 14th December fol- lowing James died at Falkland. His successor was his daughter Mary, born seven days before his death. Though possessing a weak constitution which was further impaired by his irregular manner of life, James manifested great vigour and independence as a sovereign, both in withstand- ing the machinations of his uncle and opposing the influence of the nobles. The persecutions to which the Protestants were exposed during his reign were, however, due to the excessive influence exercised by the ecclesiastics, especially David Beaton, archbishop of St Andrews. The king's habit of mingling with the peasantry secured him a large amount of popularity, and has led many to ascribe to him the authorship of three poems descriptive of scenes in lower class life—Christis Kirk on the Grene, The Gaberlunze Man, and The Jolly Beggar. There is no proof that he was the author of any of these poems, but from expressions in the poems of Sir David Lyndsay, who was on terms of special intimacy with him, it would appear that he occasion- ally wrote verses,

JAMES I. (1566-1625), king of England. This sovereign, James VI. of Scotland, in whom the crowns of Scotland and England were united, was the son of Mary Queen of Scots and of Henry, Lord Darnley, and was born in the castle of Edinburgh 19th June 1566. His mother while in captivity having been forced to abdicate the sovereignty, James was crowned. king at Stirling July 29, 1567. The regency was vested in the earl of Murray, who by his masterly political skill and force of character held

the various factions in complete restraint until his assassina- tion at Linlithgow in February 1570. The absence of lus authoritative will at once allowed free scope to the various elements of disorder latent in the kingdom, and during the regency of Lennox, who was mortally wounded in a fray at Stirling with the adherents of Mary, Sep- tember

1571, and of the earl of Mar his successor, who died in October 1572, strife and confusion held almost rampant sway. The earl of Morton, the next regent, being possessed, however, of some of the high qualities of his predecessor Murray, succeeded with assistance from Elizabeth of England in quelling the last embers of insurrection, and afterwards held in check the interested ambition of the nobles, until in 1578 they succeeded in discrediting his influence by the scheme of placing the government nominally in the hands of the boy monarch. In June 1581 Morton suffered death for his connexion with the murder of Darnley. James, to whom were thus early entrusted the functions of sovereignty, had spent his infancy under the care of the earl of Mar, on whose death he was taken charge of by the earl's brother, Alex- ander Erskine. For his principal tutor he had George Buchanan, who inspired him with a genuine interest in learning and a strong ambition to excel in poetical com- position ; he was also so far influenced by the Reformed type of religion as to have imbibed a love for theo- logical argument, although he always cherished a strong distaste towards both Calvinistic doctrine and the Presby- terian form of government. His character was indeed formed amidst moral and _ intellectual surroundings strangely mingled and inharmonious, in addition to which the nature he inherited was rather a medley of isolated capacities than a definite and distinct idiosyncracy. From the first compelled to adopt an attitude hostile to his mother, and, at the same time that he could not but resent her imprisonment by Elizabeth, unable to trust in her intentions towards himself, he seems to have regarded her death both as a relief and as a calamity and disgrace. As he knew that each party in the state, the Catholics, the nobles, the Presbyterians, wished to make him their tool, he resolved to act towards them as suited his convenience ; but, although he possessed a certain sharp shrewdness and foresight as well as no small knowledge of character, his inability to take a comprehensive view of affairs, or to form a truly courageous resolution, made his policy often rash and reckless in regard to matters seemingly small, and always shifting and irresolute in regard to affairs of the highest moment. The moral courage he possessed was not incon- sistent with physical cowardice ; indeed the chief element in it was an overweening self-conceit, to which the conscious- ness of superior intellectual attainments gave the consum- mating touch ; and thus it

was that the very difficulties of his position gradually nourished within him the conviction of the divine right inherent in his office, and caused all his conduct, wavering and uncertain as it was, to be inspired by the one purpose of building up his kingly prerogative. Taking advantage of the weakness of the royal authority during the king's minority, the General Assembly of the Scottish Church resolved in 1581 to substitute Presbyterian- ism for Episcopacy, and James, being shortly afterwards seized by the nobles at the raid of Ruthven, was unable to put his veto on their procedure, until after the overthrow

of those implicated in the conspiracy, when in 1584 the

estates passed an act denouncing their assumption of legislative powcr. In 1585 James was, however, besieged in Stirling by the exiled lords, and compelled to pardon them and dismiss his favourite, Arran. As their influence was moreover backed by Elizabeth, and as the hopes of James were even thus early directed towards succeeding ker on the English throne, he discovered it to be advan-

tageous to disguise his sentiments towards the Presbyterians, The destruction in 1588 that overtook the Armada of the Catholic Philip of Spain deprived James of all anxiety regarding the effects of his mother's testamentary disposal of her crown to that monarch, but it naturally inclined him for a time to amore close alliance with the Protestants, the result of which was seen, not only in his marriage in 1589 to the Protestant princess Anne of Denmark, but in an Act of the estates in 1592, which sanctioned the formal abolition of Episcopacy. In 1594 he also found it neces- sary to reduce the Catholic lords of the north of Scotland, but in 1597 he deemed it prudent to balance the influence of the Presbyterians, and also to flatter the hopes of the Catholics of England by securing the revocation of the forfeiture of the estates of the banished nobles, and permit- ting them to return. Previous to this his action against the preacher of a sermon in which Elizabeth was attacked as an atheist led to a " No Popery" riot in Edinburgh. The breach between him and the Presbyterians was still further widened by the statute of 1599, appointing a certain number of

ministers to a seat in parliament with the title of bishop, and by his publication in the same year of his Basilicon Doron, in which he promulgated his views in regard to the divine right of kings. With the exception, however, of his peculiar experiences in connexion with the mysterious Gowrie conspiracy at Perth (August 5, 1600), the remainder of his reign in Scotland until his succession to the English throne in 1603 was quiet and uneventful ; and the only fact of notable importance connected with his subsequent government of that kingdom is his suspension of the meetings of the General Assembly, until by the banishment and imprisonment of Melville and its principal leaders he was able in 1610 to convene an Assembly which agreed to the organization of a modified Episcopacy. The peculiar union of talents and defects which constituted the character of James made him perhaps the most unfit successor of Elizabeth that could have been chosen. His strutting pomposity was rendered strangely ludicrous by a personal appearance the several defects of which were heightened by their contrast with each other, and it was also constantly interfered with by his want of a proper sense of decorum. If he displayed great cleverness im avoiding immediate political difficulties and in gaining for the moment his own ends, he was incapable of adapt- ing himself mentally to his new position as sovereign of England, and his fussy self-importance made it almost in- evitable that he should mortally offend the political tem- perament then in England so peculiarly sensitive. Indeed, the traditional policy which the circumstances of Scotland had rendered almost a second nature to the Stuarts was repugnant to the susceptibilities of England, and utterly alien to her political constitution, and in the case of James all the worst defects of this policy were exaggerated. Thus his seeming shrewduess in small matters, and his witty and terse political axioms, only secured him the reputation of being the "wisest fool in Christendom ;" and, while his absurd personality cast ridicule on his kingly pretensions, the general character of his political procedure estranged from him every party in the state, and called into action influences which in the subsequent reign wrought the overthrow of the monarchy whose prestige he had almost hopelessly tarnished. Having narrowly escaped a plot of the Catholics to seize his person shortly after his arrival in London, James resolved to flatter their hopes by grant- ing them toleration, but his

proclamation in February 1604 against the Jesuits revealed the hollowness of his professions and led to the futile gunpowder conspiracy of November 1605. Its discovery dissipated for the time the alienation already begun between him and the Commons on account of his imprudent assertion of

his prerogative against the Puritans at the Hampton Court conference, and the subsequent disagreements in regard to ecclesiastical reform and a union with Scotland. Against the goodwill of the Commons, which showed itself in the readiness with which a subsidy was granted for his debts, he, however, trespassed almost immedi- ately by abusing the royal custom of placing impositions on merchandise. All attempts at a compromise on the subject having failed, James in February 1611 dissolved the parliament, and a second parliament which he sum- moned in 1614 proving equally recalcitrant was also dis- solved, the fact that it was not allowed the opportunity of transacting business earning for it from the courtiers the name of the "addled parliament." To help in filling the vacuum in his treasury, James had recourse with small success to the odious practice of demanding benevolences, and, in addition to various other misuses of his prerogative, to the excessive increase of monopolies, and to the virtual sale of peerages and other high offices. The administration of the affairs of the kingdom was at the same time gradu- ally withdrawn from the council, and the whole executive authority entrusted to favourites. As the breach between him and his subjects gradually widened he became more anxious—both in order to supply himself with money, and to obtain the support of an influential external authority— for an alliance with Spain, and in 1617 negotiations were entered into for a marriage between the young prince Charles and the Spanish infanta. But on the part of Spain those proposals were never serfously entertained. Their only result was to impart such irresolution to the policy of James in reference to the Bohemian insurrection as to afford Spain the opportunity of seizing the Palatinate ; and by continuing to dangle the possibility of the marriage before the eyes of James the emperor succeeded in delaying his interference till the Palatinate was lost. Still intent on his purpose of the

Spanish marriage, to which he had ruthlessly sacrificed the life of Sir Walter Raleigh, James despatched his favourite Buckingham along with Charles to Madrid, and the return of the bafiled and disappointed wooer in 1624 dissipated the last lingering sentiment of respect which the English nation may have cherished to- wards the king, Buckingham and Charles now virtually overrode the royal prerogative, and at their instance not only was war declared against Spain, but on the condition of granting toleration to the Catholics of Eugland, a treaty of marriage between Charles and Henrietta Maria of France was signed at the close of 1624. James died on March

25, 1625.

James inaugurated his literary career in 1584 by the publication of the Hssayes of a Prentice in the Divine Art of Poetry, and in 1591 he published Poeticall Exereiscs at Vaeant Houres. His other compositions in verse include a paraphrase of the Revelation of St John and a version of the Psalms. As he dcemed it necessary to give to the world his opinion on almost every subject of importance which then occupied public attention, his prose disquisitions are legion, but the best known arc Demonologie, 1597; Basilicon Doron, 1599; and Counterblast to Tobaeco, 1616. A collected edition of his prose writings was published in 1616, edited by the bishop of Winchester. Some of his poetical translations are not without merit, but both his prose and poetry, though displaying occasional wit and cleverness and some faculty of composition, are studded with absurdities, and but for the fact that their author was a monarch would scarcely deserve a reference.

The original authorities for the reign of James I. are the state- papers published in the series of the Master of the Rolls; the register of the Privy Council of Scotland (vol. ii. 1569-78, by Burton, 1878 ; vol iil, 1578-85, by Masson, 1880); the Letters and State-Papers during the reign of James the Sixth, published by the Abbotsford Club; the Letters of the children and othcr relations of James, published by the Maitland Club, in facsimile form, from the originals in the Advocates' Library, Edinburgh ; the letters fr uehed under the title of the Court

and Times of James I., 1846; he eee with Cecil, published by the Camden Society ;

espondence in the Cabala; Camden's Annals; Goodman's Court of James I., edited by J. 8. Brewer, 1839; Caldcrwood's

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History of the Church of Scotland; Melville's Diary; Historie and Life of James the Sext, 1566-96, with a short continuation to 1617, published by the Bannatyne Club, Edinburgh, 1825; the secret histories by Osborne, Weldon, Heylin, and Peston, edited by Sir Walter Scott; Arthur Wilson's Life and Times of James I., Lon- don, 1653. Sec also, in addition to the histories of Burton, Tytler, Gardiner, Ranke, and others, Harris's Historical and Critical Account of the Writings of James I., 1573; Irving's History of pe ad Poetry; and Disraeli's Literary and Political Character of ames I. i

JAMES IT. (1633-1701), king of England, and as king of Scotland James VII., second surviving son of Charles J. and Henrietta Maria, was born at the palace of Bt James's, October 15, 1633, and was created duke of York in January 1643, During the civil war he was taken prisoner by Fairfax at Oxford in 1646, but in 1648 he made his escape to Holland. After the second failure of the Stuart cause he served for some time in the French army under Turenne, but at the command of his brother he in 1656 accepted a military commission from Spain. At the Restor- ation in 1660 he was appointed lord high admiral and lord warden of the Cinque Ports. For the management of the civil administration of the navy he had the qualification of industry and careful regard to details; and if his victory over the Dutch in 1665 was principally a happy stroke of good luck, and his drawn battle with De Ruyter in 1672 was more to his antagonist's credit than to his, still the fact that his career as an admiral was free from disaster shows that his seamanship must have been at least respectable. Outside, however, the sphere of practical routine, James was blind and insensate, and his whole political conduct—while it indicated that he could stoop to compromise and deception when he deemed these necessary—was marked by a heed- lessness and perverse obstinacy possible only to a

rigid and contracted understanding preoccupied with a single purpose. He possessed the vices of his race without its virtues and redeeming points, and in him the propensity to despotism developed itself in a form unmitigated by any mildness or amiable weakness of temper, unenlightened by any gift of foresight or practical wisdom, and unadorned by any personal accomplishment, Although at the Restoration his sympathies were so little Catholic that he supported the policy of Clarendon, whose daughter Anne he secretly married in September 1660, publicly acknowledging the union in the December following, he soon there- after became a convert to Romanism, and in 1672, in opposition to the expostulations of his brother, openly avowed his change of faith. Anne Hyde having died in 1671, he also persuaded his brother to defy the wishes of both Houses of Parliament by permitting him in 1673 to marry the Catholic princess Mary of Modena. On account of the Test Act, passed in this year, he had been compelled to resign his office of admiral, and, although the marriage in 1677 of his daughter Mary to William, prince of Orange, somewhat allayed the distrust with which he was regarded, it was deemed advisable on the discovery of the Popish plot in 1679 that he should retire for a time to Brussels. Afterwards he was appointed lord high commissioner to Scotland, where his arbitrary bigotry found congenial employment in the persecution of the Covenanters; but in 1684 Charles ventured to dispense in his case with the Test Act, and restored him to his office of admiral.

The influence of the loyal enthusiasm which surrounded the last days of Charles in 1685 was felt in the calm acquiescence with which the nation witnessed J ames's suc- cession to the throne on February 6, and his coronation on April 23, 1686. The trust awakened by his promise to pre- serve the Government both in church and state as by law established was indeed almost immediately rudely shaken by his public celebration of mass, by his prohibition of preaching against Catholicism, and by his appointment of Catholic officers to the army; but that the goodwill at

least of the Commons was still strong was manifested by the grant of a revenue of two millions, and by the enactment of severer measures against treason. If the loyalty of the nation had begun to waver, it was also for the time strengthened by the premature and headstrong attempts at rebellion by Argyll in Scotland, and Monmouth in England. The renewal of the Covenanting persecutions had, however, branded the name of James with the hatred of the Scottish people, and the butchery of the Bloody Assizes, which in England followed the discomfiture of Monmouth, left behind it a widespread horror, the repres- sion of which only wrought effects on the mind of the nation the deeper and more ineffaceable. But James was too intent on his one aim —the establishment of irrespon- sible despotism—to scrutinize or consider the indirect con- sequences of his acts. In that aim was necessarily involved the restoration of Popery, because James was a Papist, but happily the accidental prominence given to this secondary and subordinate aim made the other impossible of success. In his imprudent zeal to accomplish his purpose, James outran the wishes even of Rome, but that was because the purpose which to the one was secondary was to the other primary. James required botl a large standing army and freedom from the control of parliament; but for these ends a foreign source of money supply was at first necessary, and this he could only obtain by an arrangement which, while it was unpalatable to him- self and loathsome to the nation, was far from acceptable to the pope,—namely, by becoming the temporary vassal of Louis of France, whose ambitious designs, notwitli- standing his intense and virulent Catholicism, had awakened the jealousy of Rome. Besides, many of the individual acts of James were prompted by the Jesuits, with whom the pope was then at feud. The progress of James's ill-starred design was marked by clear and well- defined steps. While all England was shocked by the cruelties following the revocation by Louis of the edict of Nantes, James resolved to demand the repeal of the Test Act, and when this was refused by parliament he fabricated by means of corrupted judges a semblance of legal sanction for his disregard of its provisions, and not only encamped an army on Hounslow Heath, chiefly officered by Catholics, but manifested his determination that henceforth to be a Catholic should be a recommendation and not a bar to the highest offices of state, by creating Father Petre and five Catholic

peers privy councillors. An appearance of liberality was indeed given to his policy bya declaration of indulgence to Protestant dissenters, but this only quickened suspicion as to his ultimate purpose. Moreover, while a commission was illegally appointed to restrain the discussion of political subjects by the clergy, the publication of Romanist sentiments was freely permitted, monasteries and Catholic schools were being rapidly augmented, and an attempt was made to swamp the Protestantism of the universities by conferring the principal dignities as they became vacant on Catholics. This final step, and a second declaration of indulgence of April 1688, which contained a provision for the prosecution of those clergymen who might refuse to read the declaration in their pulpits, dissipated the last atoms of veneration in the minds of the Tories for the divine right of the king ; and after the birth of a son to James in May of the same year nearly every party in the state was prepared to support the invitation to William of Orange to aid in the restitution of the liberties of the country. The discussion of the motives which induced William to accept this invitation, and the results which followed his landing in England, belong properly to the article on Witt1Am III. James, finding the bulwarks of despotism crumbling around him, after refusing the advice of a council of lay and temporal peers to open negotiations

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with William, made a pretence of yielding only to gain time to escape, and by his cowardly flight, which he per- severed in even after being intercepted and brought back to London, rendered the coronation of Mary and William indispensable. All hope in England was for the time lost, and as by his action on the Test Act he had alienated the sycophantic estates of Scotland, the rising in the Highlands afforded no permanent benefit to his cause ; but in Ireland it might be possible for him still to enjoy, though in diminished lustre, the glories of sovereignty until he should be restored to his wider dignities, If his policy towards Ireland had been dictated by the position in which he was now placed, it failed of its purpose, for even be- fore the arrival of William he discovered that he had to fight his way to dominion, and finally, notwithstanding the aid of French troops, his craven irresolution in the

face of danger lost him the battle of the Boyne, July 1, 1690, after which he made a hurried escape to France. An expedition to England in his favour was projected by Louis in 1692, but was frustrated by the defeat of the French fleet off Cape La Hogue on May 17, and another invasion planned to follow on the success of an assassination plot on February 10, 1696, was foiled by the discovery of the treachery. James died at St Germain, September 1701.

The principal contemporary authorities for the reign of James are the Diaries of Evelyn, Pepys, and Luttrell; Burnet's History of His Own Times; Sir William Temple's Alemoirs; Life of James JT., London, 1705; Bishop Kennet's History of England; The Ellis Correspondence, London, 1829; and the Life of James IL, collected out of Memoirs written by his own hand, by J. C. Clarke, 1816. See also the Life by C. J. Fox; C. T. Wilson, James I1. and the Duke of Berwick, 1876; and the histories of Macaulay, Lingard, and Ranke.

JAMES, or, in full, James FrepErick EDWarp STUART (1688-1766), prince of Wales, called by his adherents James III. of England, but better known as the Pretender, was the son of James II. and Mary of Modena, and was born in St James's Palace, London, June 10th 1688. The general opinion prevailing at the time of his birth that he was a supposititious child seemed to be confirmed by a variety of circumstances, but it has been completely overthrown by undoubted facts. Shortly before the flight of the king to Sheerness, the infant prince along with his mother was sent to France, and afterwards he con- tinued to reside with his father at the court of St Germain. On the death of his father he was immediately proclaimed king by Louis XIV. of France, but a fantastic attempt to perform a similar ceremony in London so roused the anger of the populace that the mock pursuivants barely escaped with their lives. A bill of attainder against him received the royal assent a few days before the death of William III. in 1702, and the Princess Anne, half-sister of the Pretender, succeeded William onthe throne, An influential party still, however, continued to adhere to the Jacobite cause ; and an expedition planned in favour of James failed of success chiefly in all probability because his falling ill of measles, on the eve of its departure, enabled the English to assemble so

powerful a fleet as rendered disem- barkation inadvisable. A rebellion in the Highlands of Scotland was inaugurated in September 1715 by the raising of the standard “on the braes of Mar,” and the solemn proclamation of James Stuart, “the Chevalier of St George,” in the midst of the assembled clans, but its progress was arrested in November by the indecisive battle of Sheriff- muir, and it was practically extinguished a few weeks after- wards by the surrender at Preston. Unaware of the gloomy nature of his prospects, the Chevalier landed in December at Peterhead, and advanced as far south as Scone, accom- panied by a small force under the earl of Mar; but, on learning of the approach of the duke of Argyle, he retreated to Montrose, where the Highlanders dispersed to the

mountains, and he embarked again for France. A Spanish expedition sent out in his behalf in 1718 under the direction of Alberoni was scattered by a tempest, only two frigates reaching the appointed rendezvous in the island of Lewis. In 1719 James was married at Avignon to the Princess Clementina of Poland, by whom he had two sons, Charles Edward, and Henry, afterwards Cardinal York. His licentious habits soon led to a separation from his wife, and his indolence and irresolution having completely unfitted him for the réle of aspirant to the English throne, the hopes and affections of his adherents were gradually trans- ferred to his son Charles Edward, of whose career an account is given in vol. v. p. 426-7. James spent the remainder of his years at Rome, where he was regarded with very little esteem both by the pope and the populace. The papal soldiers mounted guard at the Palazzo Muti, where he resided, and the pope issued an order that he should be styled king of England, but the Italians were in the habit of naming him the king here in contradistince- tion to the king ¢here, that is, in England. Latterly his regular income was 12,000 scudi from the pope, which only was supplemented by the donations, probably not very large, of the adherents of the cause in England. Horace Walpole, writing in 1752, thus describes him, “He is tall, meagre, and melancholy of aspect. Enthiu- siasm and disappointment have stamped a solemnity on his person which rather awakens pity

tlian respect. He seems the phantom which good nature divested of reflexion conjures up when we think of the inisfortunes without the demerits of Charles the First. Without the particular features of any Stuart, the Chevalier has the strong lines and fatality of air peculiar to them all." For several of the last years of his life the Chevalier was so infirm in health that he was unable to leave his bed-chamber, Ife died at Rome, January 12, 1766, and was interred in the church of St Peter's.

The Jacobite cause in Scotland has given rise to some of the finest specimens of national ballad literature. Two volumes of Jacobite Relics were published in 1819-1821, but the collection is very miscellaneous. An edition of Jacobite songs appeared at Glasgow in 1829, and a more complete collection was published in 1861, edited by Charles Mackay. See History of the Jacobite Club, London, 1712; Seeret Memoirs of Bar-le-due, 1716 ; Macpherson's Original Papers; The Deeline of the Last Stwarts, printed for the Roxburghe Club, 1843 ; Chambers's History of the Rebellion, 1824 ; Jesse, The Pretenders and their Adherents, 1858 ; Thackeray, Henry Esmond ; Debrosse, L'Italée il y a Cent Ans, 1836; Lacroix de Marles, Histoire du Chevalier de Saint-Georges et du Prince Charles idouard, 1868 and 1876 ; Doran, Mann and Manners at the Court of Florenee, 1875 ; 1d., London in the Jacobite Times, 1877.

JAMES, Gzorce Payne Ratysrorp (1801-1860), English novelist, was born in George Street, Ianover Square, London, in 1801, and was educated at Greenwich and afterwards in France. He began to write early, and had, according to his own account, composed the stories afterwards published as A String of Pearls before he .was seventeen. Contributing plentifully to news- papers and magazines, he came under the notice of Wash- ington Irving, who is said to have encouraged him to produce (in 1822) his Life of Edward the Black Prince. His next attempt was Richelieu, which was finished in 1825, and was well thought of by Sir Walter Scott (who apparently saw it in manuscript), but was not brought out till 1829. Perhaps Irving and Scott, from their natural amiability and invariable habit of encouraging literary aspirants, were rather dangerous advisers for a writer so well inclined

by nature to abundant production as James. But he took up the ball of historical romance writing at a lucky moment. Scott had firmly established the popularity of the style, and James in England, like Dumas in France, reaped the reward of their masters' labours as well as of their own. For thirty years the author of Richelieu

continued to pour out novels of the same kind though of varying merit. The full list of his works in prose fiction, verse narrative, and history of an easy kind includes between seventy and eighty items, most of them being three-volume novels of the usual length. The best examples of his style are perhaps Richelieu, 1829; Philip Augustus, 1831; Henry Masterton (probably the best of all), 1832; Mary of Burgundy, 1833 ; Darnley, 1839; Corse de Léon, 1841; The Smuggler, 1845. His poetry does uot require special mention, nor does his history, though for a short time in the reign of William IV. he held the office of historiographer royal. After writing vigorously in all these styles for about twenty years, James in 1850 went to America with his family. He was appointed consul at Richmond, Virginia, and held that post from 1852 to 1858. In September of the latter year he was appointed toa similar post at Venice, where he died May 9, 1860.

James has been compared to Dumas, and the comparison holds good in respect of kind, thougli by no means in respect of degree of merit. Both had a certain gift of separating from the picturesque parts of history what could without much difficulty be worked up into picturesque fiction, and both were possessed of a ready pen. Here, however, the likeness ends. Of purely literary talent James had little. His plots are poor, his descriptions weak, his dialogue often below even a fair average, and he was deplorably prone to repeat himself. His "two cavaliers " who in one form or another open most of his books have passed into a proverb, aud Thackeray's good-natured but fatal parody of Barbazure is likely to outlast Richelieu and Darnley by many a year. Nevertheless, though James cannot be allowed any very high rank even among the second class of novelists, the generation that read him, and those chiefly youthful persons who read him now and will read him for

some time to come so long as he is attainable on the bookstalls, are not wliolly without excuse. He had a considerable portion of the narrative gift, and, though his very best books fall far below Les trots Mousquetaires and La Reine Margot, there is a certain even level of interest, such as itis, to be found in all of them. James never resorted to illegitimate methods to attract readers, and deserves such credit as may be due to a purveyor of amusement to the public who never caters for the less creditable tastes of his guests.

JAMES, Joun AncetL (1785-1859), preacher and author, was born at Blandford, Dorsetshire, June 6, 1785. After obtaining at school a knowledge of reading, writing, ciphering, and a little Latin, he was at the age of thirteen bound to a seven years' apprenticeship with a linendraper at Poole, with the view of assisting his father in his business at Blandford; but about the close of his term of

| apprenticeship he began to form the resolution of becoming

a preacher, and in 1802 he went to prosecute his studies at the theological college of Gosport. After remaining there for a year and a half, he happened to pay a visit to Birmingham, where his preaching was so highly esteemed by the congregation of Carr's Lane Independent chapel that they invited him to "exercise his ministry amongst them," and accordingly, after finishing his short theolo- gical course, he was settled there in the beginning of September 1805, and ordained on the 8th May of the following year. For seven years his success as a preacher was comparatively small, but about 1814 his eloquence almost suddenly acquired for him a popularity which attracted large crowds wherever he officiated in England, and never faded during the long term of his subsequent ministry. At the same time his numerous religious writ- ings, the best known of which are Zhe Anxious Inquirer aud An Harnest Ministry, acquired a wide circulation both in England and in America. He ae at Birmingham _— ql

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October 2, 1859. The degree of D.D. was conferred on James by the college of Princeton, New Jersey, and also by the university of Glasgow.

A collected edition of James's works appeared in 1860-64. See A Review of the Life and Character of J. Angell James, by J. Campbell, 1860; Zrwe Greatness, a brief Memoir of J. A. James, 1860; and Life and Letters of J. A. James, edited by R. W. Dale.

JAMESON, Anna (1794-1860), was born in Dublin in 1794. Her father, Mr Brownell Murphy, who was a miniature and enamel painter of some celebrity, took part in his early days in the political commotions which then avitated Ireland. His removal to England in 1798 con- fined his attention fortunately to his more peaceful calling, in which he attained considerable skill, but his daughter's mind seems to have been influenced in the highest sense by the circumstances that surrounded her birth; she was distinguished from her tenderest years by that ardour and courage and keenness to supply the needs and redress the injuries of others which marked her career through life.

At sixteen years of age she undertook the office of governess in the family of the ntarquis of Wincliester, and later in that of Mr Littleton, afterwards Lord Hatherton. Between these two engagements she accom- panied a young pupil, one of a party of travellers, to Italy, a tour which gave rise to a narrative of what she saw and did, written man imaginary character. This, her first literary production, the merits of which she little appreciated, did vot make its appearance until after her marriage with Mr Robert Jameson, a barrister, in 1825, when it was adver- tised by a friend under the title of a Lady's Diary, and ultimately published by Mr Colburn as Zhe Diary of an Ennuyée. Mrs Jameson's marriage was not a happy one ; but, if not more unfortunate than many of her sex in thus form of trial, she set the example of a rare discretion under it. Her marriage troubles were made no excuse for appeal- ing against the laws of the land or the usages of society. The Diary of an Ennuyée attracted much attention. Italy was no such beaten ground then, nor a traveller with ardent feelings for art and nature so common, as botli have become since. Theauthoress has been blamed for assuming the disguiss of an invalid, who dies on her way back ; but such a tinge of romance made no difference in the truth of her descriptions, while it procured them more readers.

In 1829 Mr Jameson was appointed puisne judge in the island of Dominica. It was decided to be impracticable for her to accompany him, and meanwhile Mrs Jameson visited the Continent again with her father. Traces of this journey appear in Visits and Sketches at Home and Abroad. Hitherto the subjects she had treated had been limited to impressions of outer scenes and passing things, or to abridg- ments of history, as in her good schoolbook Memale Sove- reigns. The first work in which her powers of original thought became embodied were her Characteristics of Shakespeare's Women, which appeared in 1832. These analyses of the great poet's heroines are unsurpassed for delicacy of critical insight and fineness of literary touch. They are the result of a penetrating but essentially feminine mind, applied to the study of individuals of its own sex, detecting characteristics and defining differences uot perceived by the ordinary critic, and entirely over-looked by the general reader.

In 1833 Mrs Jameson paid her first visit to Germany, the literature and art of which country may be said to have then first roused the curiosity of English minds. Dresden and Tieck and Retsch, Frankfort and Dannecker, Weimar and, if not Goethe, who had died the year before, yet the homage which more than restored him to life, succes- sively occupied her. Nor was she proof to the spell of the modern German art which the late King Louis of Bavaria had evoked in his capital. Those conglomerations of hard

lines, cold colours, and pedantic subjects which decorated Munich were new to the world, and Mrs Jameson's enthusiasm first gave them the reputation which has long since faded away.

It was in 1836 that Mrs Jameson was summoned by her husband to join him in Canada. She started with many a regret for the life she was leaving, and was not long left in doubt as to the fruitlessness of the step. He failed to meet her, even by a letter, at New York, and she was left to make her way alone at the worst of seasons to Toronto. After six months' experiment she felt it useless to prolong a life far from all ties of family happiness and opportunities of usefulness. Before leaving, she

undertook a journey to the depths of the Indian settlements in Canada; she explored Lake Huron, and saw much of emigrant and aborigines life unknown to travellers, which she afterwards embodied in her Winter Studies and Summer Rambles. She returned to England in 1838, It was at this period that Mrs Jameson first devoted her attentiou to the subject of art. She began by making careful notes of the ehief private collections in and near London which had hitherto received no systematic description. This Companion to the Private Galleries was soon followed by the Handbook to the Public Galleries. These works were useful compilations, and had a certain circulation ; but the authoress laid claim to no powers of rea] discrimination, and many of her ver- dicts, in which she only followed those that went before her, have been since superseded by exacter knowledge. These works, however, led on to those by which her literary career has beeu specially distinguished,—her series of Sacred and Legendary Art. The time was ripe for such contributions to the traveller's library. The Acta Sane- torum and the Book of the Golden Legend had had their readers, but no one had ever pointed out the connexion between these tales and the works of Christian art. The painters employed by convent or church had introduced the local or family saints according to coutract, and the faithful had retained the tradition of their names; but for the modern Protestant traveller the whole was a terra incognita. The way to these studies had been pointed out in the preface to Kugler's Handbook of Italian Painting by Sir Charles Eastlake, who had intended pursuing the subject himself. Eventually he made over to Mrs Jameson the materials and references he had collected. They could not have been placed in better hands. She recognized the extent of the ground before her as a mingled sphere of poetry, history, devotion, and art. She directed the taste of her readers with judgment and even enthusiasm ; and, with the same penetration that had guided her in her literary tasks, she threw many a light on a master's inten- tions which had escaped both artists and critics.

Another service Mrs Jameson rendered to the English public, and that the most valuable of all, has still to be noticed. She began her literary career by analysing books, she proceeded to analyse works of art, and she ended: by analysing society. It was a natural supplement to a course

of varied personal experience and no little struggle that her attention should be directed to the great moral questions of the day, and especially to those affecting the education, occupations, and maintenance of her own sex. Her early essay on Zhe Relative Social Position of Mothers and Governesses is a masterpiece. She knew both sides; and in no respect does she more clearly prove the falseness of the position she describes than in the certainty with which she predicts its eventual reform.

To Mrs Jameson we owe the first popular enunciation of the principle of male and female cooperation in works of mercy and education. Her mind was peculiarly to be trusted with the advocacy of such tenets—it had become as clear and judicious by experience as it was ardent and

In her later years slie took up a | and from his classroom there radiated an influence which

vigorous by nature. succession of subjects all bearing on the same principles of active benevolence, and the best ways of carrying them into practice: Sisters of charity, hospitals, penitentiaries, prisons, and workhouses all claimed her interest—all more or less included under those definitions of “ the communion of love and communion of labour” which are inseparably connected with her memory. To the clear and temperate forms in which she brought the results of ler convic- tions before her friends in the shape of private lectures, subsequently printed, may be traced tlie source whence living reformers and plilanthropists took counsel and courage.

Mrs Jameson died in March 1860. She left the last of her Sacred and Legendary Art series in preparation. It was completed, under the title of The History of our Lord in Art, by Lady Eastlake. E, E.)

JAMESON, or JAMESONE, GuorGE (c. 1587-1644), a Scotch portrait painter, was born, probably in 1587, at Aberdeen, where his father was architect and a member of the guild. After studying painting under Rubens at Antwerp, with Vandyck as a fellow pupil, he returned in

1620 to Aberdeen, wliere he was married in 1624 and remained at least until 1630, after which le took up his residence in Edinburgh. The department of paint- ing which he chiefly practised was portraiture in oil, but he also painted a few historical subjects and land- scapes. His portraits are generally less than life size. According to Walpole they are characterized by " delicacy and softness, with a clear and beautiful colouring"; but, although undoubtedly the instructions of Rubens had left their influence on his style, he has no claim to the title of the Vandyck of Scotland by which he is often known, and perhaps owed even his exceptional fame in Scotland as much to chance as to his own merits. Having been employed by the magistrates of Edinburgh to copy several portraits of the Scottish kings for presentation to Charles I. on his first visit to Scotland in 1633, the king rewarded him with a diamond ring from his own finger. This circumstance appears to have at once established his fame, and he soon found constant though not very remunerative employment in painting the portraits of the nobility and gentry of his native land. He also painted a portrait of Charles, which he declined to sell to the magistrates of Aberdeen for the price they offered. The largest collection of the works of Jameson is said to be that in Taymouth castle, and, be- sides those in the houses of several of the gentry of Scot- land, there are a few in the colleges of Aberdeen. He died at Edinburgh in 1644.

JAMESON, Ropert (1774-1854), regius professor of natural history in the university of Edinburgh, was born at Leith July 11, 1774. After an education at Leith grammar school and Edinburgh university, he became assistant to a surgeon in his native town; but, having studied natural history under Dr Walker in 1792 and 1793, he felt that his true province lay in that science, for which indeed he had had a predilection from boyhood. The course of his studies during the next few years is to be traced in his scientific papers and books. He went in 1800 to Freiberg to study for nearly two years under thie learned Werner, and spent other two in Continental travel. On his return to Edinburgh in 1804, when he succeeded Dr Walker in the chair of natural history, he became, in lectures, writings, and controversy, perhaps the first great exponent in England of the Wernerian geological system ; and it is to lis credit that, when he found that theory untenable, he frankly and

honestly announced his conver- sion to the views of Hutton. As a teacher, Professor Jameson was no less remarkable than Werner for his power of imparting lis own enthusiasm to his students,

gave a marked impetus to the study of geology in Britain. It was his energy also that, by means of Government aid, private donation, and personal outlay, amassed the greater part of the splendid collection which now occupies the natural history department of the Edinburgh Museum of Science and Art. In 1808 Jameson founded the Wer- nerian Natural History Society, and in 1819, along with Sir David Brewster, he originated the Ldinburgh Phito- sophical Journal, which after the tenth volume remained under his sole conduct till his death, whicli took place April 19, 1854. His bust, presented by the Wernerian

| Society to the museum some years before his death, now

stands in the university library hall.

Professor Jameson was the author of Mineralogy of Arran and the Shetland Islands, 1798, incorporated with Mineralogy of the Scottish Isles, 2 vols. 4to, 1800; Adineralogical Description of Scot- land, vol. i. pt. 1, " Dumfriesshire,' 1804 (this was to have becn the first of a series embracing all Scotland); System of Mineralogy, 1804; Characters of Minerals, 1804; Elements of Geognosy, 1809 ; and Manual of Minerals and Mountain Rocks, 1821; besides a number of occasional papers, of which a list will be found in the Edinburgh New Philosophical Journal for April 1854, along with a biographical sketch of the author.

JAMESTOWN, a village in Chautauqua county, New York, is situated on the Chautauqua Outlet at the southern end of Chautauqua Lake, about 55 miles south-south-west of Buffalo. It may be conveniently reached by rail, or by steamer from Mayville at the north end of the lake, and its vicinity is steadily rising into favour as a summer resort. The manufactures include alpaca, woollens, pianos and furniture, sashes and blinds, edge-tools and iron. The population, which in 1870 was 5336, was 7264 in 1880.

JAMI. Nuruddin ’Abdurrahmaén ibn Ahmed (1414— 1492), called el-J&mi from his birthplace Jam in Khorasan, was the last great poet and mystic of Persia. See PERsIA.

JAMIESON, Joun (1759-1838), author of the Scottish Dictionary, was born in Glasgow, where his father was a Dissenting clergyman, March 3, 1759. He was educated at Glasgow university, and subsequently attended classes in Edinburgh. After six years’ theological study, Jamieson was licensed to preach in 1779. From 1780 till 1797 he was pastor of the Secession (Antiburgher) congregation of Forfar ; and from 1797 till his death on July 12, 1838, he occupied the pulpit of the Antiburgher church in Nicolson Street, Edinburgh.

Jamieson’s name stands at the head of a tolerably long list of works in the Bibliotheca Britannica; but by far his most important book is the laborious and erudite compilation, best described by its own title-page: —An Etymological Dictionary of the Scottish Lan- guage ; illustrating the words in their different significations by examples from Ancient and Modern Writers; shewing their Affinity to those of other Languages, and especially the Northern; explaining many terms which though now obsolete in England were formerly common to both countries; and elucidating National Rites, Customs, and Institutions in their Analogy to those of other nations; to which is prefixed a Dissertation on the Origin of the Scottish Language. This appeared in 2 vols. 4to, at Edinburgh in 1808, followed in 1825 by a Supplement, in 2 vols. 4to, in which he was assisted by scholars in all parts of the country. Both appeared together in later editions; in 1879 the first volume of an edition, in which the Sup- plement is incorporated in the body of the work, was published. Abridgments of the Dictionary have been issued in 1818, and in many subsequent years. Among Jamieson’s other works may be mentioned The Use of Sacred History, 2 vols., 1802; Hermes Scythicus, or the Radical Affnitics of the Greck and Latin Lan- guages to the Gothic, 1814; and various essays, sermons, and poems. For his Vindication of the Doctrine of Scripture and of the Primi- tive Faith concerning the Deity of Christ, 1795, a reply to Dr Priest- ley, Jamieson reccived the degree of D.D. from the college of New Jersey.

JAMNIA (‘Iapvia or Idyvea), the Greek form of the Hebrew name Jabneel (Josh. xv. 11) or Jabneh (2 Chron. xxvi. 6), the modern Arabic Yebna, a city of Palestine, on the border between Dan and Judah, situated 13 miles south of Jaffa, and 4 miles east of the seasliore, The

modern village stands on an isolated sandy hillock, sur- rounded by gardens, with olives to the north, and sand- dunes to the west. It contains a small Gothic church, now a mosque. The place belonged to the Philistines in Biblical times, was taken by Judas Maccabzus (2 Mac. xii. 8, 9), and is mentioned by Strabo (xvi. 2) as a very populous village. The population was mainly Jewish (Philo, Leg. ad Catwm, § 30), and the town is principally famous as having been the seat of the Sanhedrin from 70 to 135 ap. In 1144 a crusading fortress was built on the hill; it is often mentioned under the name Thelin. There was also a Jabneel in Lower Galilee (Josh. xix. 33), called later Caphar Yama, the present village Yemma, 12 English miles south of Tiberias ; and another fortress in Upper Galilec was named Jamnia (Joseph, Vita, 37).

JAMRUD, a ruined fort in Peshdwar district, Punjab, India, situated in 34° N. lat. and 71° 24 E. long., at the mouth of the Khyber Pass, 1670 feet above sea-level. It was occupied by Hari Sinh, Ranjit Sinh’s commander, in 1836; but in April 1837 Dost Muhammad sent a body of Afghans to attack it. A battle ensued, in which the Sikhs gained a doubtful victory, with the loss of their general, Hari Sin. During the military operations of 1878-79 Jamrid became a place of considerable import- ance as the frontier outpost on British territory towards Afghanistan.

JAMS anp JELLIES are conserves of the pulp and juice of succulent and juicy fruits prepared by boiling with sugar. They differ from each other only in the fact that jam is a thick pulpy opaque preparation, sometimes of the entire fruit—rind, pulp, and kernel—and sometimes of fruits only partly broken, as in the case of black currant jam, while jellies are pure transparent gelatinous prepara- tions of juices alone. The preparation of these preserves was formerly a purely domestic art; but of recent years manufactures of very large dimensions have sprung

up for the preservation of many of the commoner fruits, as an example of which the marmalade trade may be cited, marmalade being simply a form of jam. The principal fruits commonly used for jam-making are varieties of plums, apricots, cherries, black currants, gooseberries, strawberries, raspberries, mulberries, cranberries, oranges, and quinces; rhubarb stalks are also employed. Jellies have a wider signification than is comprehended in the above definition, which embraces fruit jellies alone, as many jellies have for their basis isinglass and other gelatin- yielding bodies of animal origin, and starches also form with boiling water a kind of jelly. Fruit jellies owe their property of gelatinizing to the presence or development of a gummy principle in their composition, called pectin. Except in its gelatinizing effect pectin is in no way re- lated to gelatin, being indeed a non-nitrogenous body closely allied to cellulose. Pectin is only found in very ripe fruits, but an allied body, pectose, which is abundant in growing and partially ripened fruits, is easily transformed into pectin by the action of heat, and such a transformation takes place in the boiling of the juices of acid unripe fruits. In the preparation of jellies it is essential to obtain the juices as free from all pulp and cloudiness as possible, there- fore the less the fruits are squeezed the more transparent will be the resulting jelly. 'To get the juice to flow freely from hard fruits it is necessary in most cases to heat and in some instances to boil them. 'The quantity of sugar re- quired for the preservation of jams and jellies varies from two-thirds to equal weight of the fruit or juice, and the boil- ing should be conducted ata gentle heat as short a time as possible after the addition of the sugar, which by long or violent boiling tends to becomie syrupy, this destroying the gelatinizing property. Jellies are principally prepared from red, white, and black currants, gooseberries, grapes, apples,

raspberries, cherries, bilberries, pomegranates, quinces, and various other juicy fruits. Jamsand jellies for preservation are poured into earthenware jars ; the surface of the pre- serves is then covered with a disk of paper dipped in brandy, and the jar tightly tied over with membrane or gummed paper, and stored in a cool dry situation. They

must be prepared from clean dry fruit, and it is essential that cane and not beet sugar should be used for their pre- servation. Wet or otherwise damaged fruit, and all fruits preserved with beet sugar, are peculiarly subject to mouldiness, an evil against which some amount of precau- tion is necessary at all times. The domestic uses of these preparations, and the esteem in which they are held, are known universally. They have a refrigerating and gently laxative influence, and the citrate, malate, or tartrate salts they contain give them a positive value as anti- scorbutics, in addition to the pleasant and refresh- ing taste and flavour they possess. While these pre- serves have the same anti-scorbutic efficacy as the respec- tive fresh fruits from which they are prepared, they are frce from the tendency to induce choleraic disorders which frequently attends the consumption of uncooked fruits, and the sugar with which they are prepared possesses its own proper nutritive value as an article of food.

JAMU, or JumMoo, a town in Kashmir state, Punjab, India, headquarters of Jamu province, in 32° 43° 52″ N. lat. and 74° 54’ 14” E. long. on the Tavi, a tributary of the Chenab, among the mountains of the outer Himalayan range. The town and palace stand upon the right bank of the river; the fort overhangs the left shore at an eleva- tion of 150 feet above the stream. The lofty whitened walls of the palace and citadel present a striking appearance from the surrounding country. An adjacent height com- mands the fortress, rendering it untenable against modern artillery. Extensive and handsome pleasure grounds and. ruins of great size in the suburbs attest the former pro- sperity of the city when it was the seat of a Rajput dynasty of independent rajas, whose dominions extended into the plains and included the modern district of Sialkot. It was afterwards conquered by the Sikhs, and formed part of Ranjit Sinh’s dominions. For its susbequent acquisition by Ghul4b Sinh, see Kasumir, The population is esti- mated at about 8000.

JANESVILLE, chief town of Rock county, Wisconsin, U.S., was founded in 1836, and received its city charter in 1853. It contains numerous churches and schools, including the State institute for the blind. Rock river, flowing through the city, supplies water-power for

five flour-mills, two woollen factories, and a cotton factory; and the manufactures comprise boots and shoes, carriages and farm machinery, and beer. ‘The population in 1870 was 8789; in 1880, 9018.

JANGIPUR, or JanAncfrrur, the chief town of the subdivision of the same name, in Murshiddbad district, Bengal, situated on the left bank of the Bhagirathi, in 24° 98’ N. lat. and 88° 6’ 45” E. long, The town is said to have derived its name from having been founded by the Mughal emperor Jahangir. During the early years of British rule it was an important centre of the silk trade, and the site of one of the Company’s commercial residences. Jangipur is best known as the toll station for registering all the traffic on the Bhagirathi. ‘The number of boats registered there annually is about 10,000 ; the amount of toll is £8000, or about one-third of the total gross revenue derived from the N adiya rivers. The population in 1872 was 11,361.

JANIN, Junes Gaprrer (1804-1874), a remarkable instance of a certain kind of critic, was born at St Etienne, the great manufacturing town of the department of the Loire, on December 24, 1804, and died at his house near

Paris in June 1874. His father was a lawyer, and he was well educated, first at St Etienne, and then at the famous Collége Louisle-Grand at Paris. He betook himself to journalism very early, and worked on different papers, the Figaro, the Quotidienne, &e., until in 1836 he fixed himself as dramatic critic of the Débats. Long before this, however, he had made a considerable literary reputation, for which indeed his strange novel L’Ane Mort et la Femme Guillotinée (1829) would have sufficed. La Confessron, which followed, was less remarkable in substance but even more so in style; and Barnave, in 1831, sustained the literary reputation of the author, though the violent attacks it contained on the Orleans family did not, when they were taken with his subsequent conduct, increase his reputation for consistency. rom the day, however, when Janin became the theatrical critic of the Débats, though he continued to write books indefatigably, he was to most Freuchmen a dramatic critic and nothing more. His system was odd

enough. He called himself “ prince of critics,” a self-presented testimonial in which the mixture of irony and vanity (in all senses of the word) which marked all his work may be detected. He was outrageously incon- sistent, and judged things from no general point of view whatsoever, thongh at least latterly his judgment was usually good-natured. But few journalists have ever been masters of a more attractive fashion of saying the first thing that came into their heads, and if he had called himself a prince of journalists he would not have becn far wrong, After many years of fewil/eton writing he collected some of his articles in the work called LHistowre de la littéra- ture dramatique, which, as may be gathered from what has been said, by no means deserves the title. In 1865 he made his first attempt upon the Academy, but was not successful till five years later. Meanwhile he had not been content with his fewilletons, written persistently about all manner of things. No one was more in request with the Paris publishers for prefaces, letterpress to illustrated books, and all the other hackwork which usually engages in France men of letters of a somewhat higher class than those who generally devote themselves to it in England. He travelled (picking up in one of his journeys a curious windfall, a country house at Lucca, which fell to him in a lottery), and wrote accounts of his travels ; he wrote numer- ous tales and novels, for the titles of which we have no space here, and composed many other works, of which by far the best is the oddly entitled Fin d’un Monde et du Neveu de Rameau, in which, under the guise of a sequel to Diderot’s masterpiece, he showed to considerable advantage his great familiarity with the late 18th century. He married in 1841; his wife had money, and he was always in easy circumstances. In the early part of his career he had many quarrels, notably one with Felix Pyat, but latterly, partly owing to his critical authority and partly to his good temper and hospitality, he was a very popular man with his craft, and at his death his library was said to contain the greatest number of gift and dedication copies of con- temporary works that had ever been brought to the hammer. Even in the few years since his death, however, his reputation has rapidly faded, and except with those who know how to look at literature in the largest and most tolerant way, it is not likely to revive. His Ane Jfort is really a most remarkable book. Written half in parody, half in deliberate pursuance of the romantic ideas, it

anticipated by fifty years in point of time and far excelled in point of literary value the recent performances of thie naturalist school. Those who wish to know what Janin might have been should read this, Barnave, and the Fin dun Monde. But for the most part his work is mere Improvisation, and has no elements of vitality in it except a light and vivid style.

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JANINA, JANNINA, JOANNINA, or, as the name is fre- quently written according to its actual Albanian pronuncia- tion, YANINA, a town of European Turkey in southern Albania, or—to retain the ancient designation—Epirus. The position of Janina is strikingly picturesque. At the foot of the grey limestone mass of Mount Mitzekeli (1500 ft.), which forms part of the fine range of hills running north from the Gulf of Arta, there lies a valley (the Hellopia of antiquity) partly occupied by a lake ; and on the slopes of a slight eminence, stretching down to the western shure, stands this town of St John. It has greatly declined from the state of barbaric prosperity which it enjoyed im the beginning of this ceutury, when it was the seat of Ali Pasha, estimated to have fram 30,000 to 50,000 inhabitants. The fortress—Detmir-Kule or Iron Castle, which like the principal seraglio was built on a promontory jutting down into the lake—is nowinruins. But the town still possesses fourteen mosques, cach embosomed by a cluster of trees, and there are also seven churches, two synagogues, 2 Greek college, a library, and a hospital. As the centre of a vilayet it contains a governor's residence (rebuilt in 1870). Sayades (opposite Corfu) and Arta are the places through which it receives its imports. A considerable activity in trade and industry is maintained by the Greek population, the rich gold and silver embroidery for which the town has long been famous being still onc of the notable articles in its bazaar. According to M. Moreau, the French consul (Bull. de la Soc. de Géogr., Paris, 1876), Janina contained 16,230 inhabitants in 1875, of whom 4136 were Mahome- tans, 8989 Christians, and 3105 Jews. Synvet (Les Grees de ' Empire Ottoman, Constantinople, 1878) reckons the Greeks alone at 14,362 (the island on the lake being included). The vilayet of

Janina, previous to the cessions made to Greece in 1881, comprised the sandjaks of Janina, Argyrocastro, Berat (Avlona), Prevesa, and

Thessaly, and the sandjak contains the districts of Janina

(town and country), Aidwat, Prevena, Cognitza, Metzovo, and Philates. The lake (perhaps to be identified with the Pambotus of antiquity) is 6 miles long, and has an extreme breadth of 3 miles. In time of flood it is united with the smaller lake of Labchistas, whichi lies to the north. According to Guido Cora's investigations in 1878, the greatest depth does not exceed 32 feet. There are no affluents of any considerable size, and the only outlets are underground passages or katavothra extending for many miles through the calcareous rocks.

The theory supported by Leake (Northern Greccc) that the eitadel of Janina is to be identified with Dodona, is now generally sur- rendered in favour of the claims of a more southern site. As Anna Comnena, in describing the eapture of the town (74 "lodvyiva) by Bohemond in 1082, speaks of the walls as being dilapidated, it may be supposed that the place existed before the 11th century. It is mentioned from time to time in the Byzantine annals, and on the establishment of the lordship of Epirus by Michael Angelus Com- nenus Dueas, it beeame his eapital. During the 14th eentury it was frequently attacked by the Albanians ; but it was still in pos- session of the sueeessors of Miehael when the forces of Sultan Amurath appeared before it in 1430 (¢f Hahn, Alban. Studien, pp. 319-322). Since 1431 it has continued under Turkish rule. In modern times it became famous as the seat of the tyrant Ali (1788-1822). See Ant PasHa, vol. i. p. 573.

Deseriptions of Janina will be found in Holland's Travels, 1815; Hughes, Travels in Greeee, &c., 1830; Tozer, The Highlands of Turkey, 1869. See also Major R. Stewart, 'On the Phys. Geogr. of Epirus," in Jowrn. Roy. Geogr. Soc., 1869.

JANIZARIES, or Jantssartes (Turkish, Yeni, new, and 'askari, soldier). See Army, vol. ii. p. 617.

JANSEN [Jansenius], CoRNELIUS (1585 — 1638), bishop of Ypres, and the author of the celebrated Augus- tinus, was born, of humble Catholic parentage, at Acquoy or Ackooi, a small village near Leerdam, and 7 miles to the north-east of Gorcum, Holland, on 28th October 1585. After completing his preliminary studies at Leerdam and

Utrecht, he in 1602 proceeded to Louvain, where lie studied for a short time at the Jesuit college; but after- wards, becoming dissatisfied with the doctrines there taught on the hotly discussed questions of free will and grace, he transferred himself to the college of Adrian VL, where*he came under tlie influence of a pious and learned teacher, Jacobus Jansonius by name, who is described as having been an ardent disciple of Augustine and a follower of Michael Bajus (see Basus), whose doctrinal views lad been condemned by Pius V. and Gregory XIII. At the same time he formed an acquaint- ance, which grew into intimate friendship, with the like- minded Vergerius (see Du VERGIER DE HAuRANNE), wlio afterwards became abbé of St Cyran. Having graduated in philosophy at Louvain in 1604, Jansen went to Paris for the benefit of his health, which had suffered from the ardour with which he had pursued his studies in theology with a view to a doctor's degree. Here he remained for some time, supporting himself by teaching ; afterwards he accompained Vergerius to Bayonne, the native place of the latter, where they spent several years together, Du Vergier ultimately becoming canon of the cathedral, and Jansen head of the episcopal college. Every available moment of their time was devoted to the study of the fathers and especially of Augustine. In 1617 Jansen returned to Louvain, whither he had been urgently summoned by Jansonius, who greatly desired to have there a man of real learning and energy who should be able to counteract the growing influence of the Jesuits. On his arrival he undertook the principal charge of the newly founded college of St Pulcheria, but this appointment he did not long retain, feeling, it is said, a growing aversion to philosophical pur- suits, and desiring to possess the utmost possible leisure that he might devote himself wholly to theology. In 1619 he became doctor in that faculty.

The reputation which he even then enjoyed as a theologian is well indicated by the fact that he was formally requested by tle papal nuncio to undertake a reply to the recently published De Republica Ecclesiastica of Mareo Antonio de Dominis, archbishop of Spalatro, while the direction in which his sympathies so strongly ran was at the same time not obscurely indicated by the fact that he excused himself from complying with the invitation. In 1624, and again in 1626, he undertook a journey to Spain, on belialf of the university, with reference to certain encroachments of the Jesuits on its exclusive privileges; in the second of these missions he was successful, the members of the Society of Jesus in the Low Countries being ordered to continue to observe the restrictions which had been laid upon them in 1612. In 1630 Jansen was made regius professor of Biblical exegesis; and in the same year, in connexion with thie recent introduction of the Reformed religion into Bois- le-Duc, he entered upon a controversy about Protes- tantism with the learned Voetius, the issue of which conclusively showed that he had grievously underesti- raated his adversary's strengtl. In 1635 lie published a pseudonymous work entitled Alexandri Patricw Arma- cant, Theologi, Mars Gallicus, sew de justitia armorum et federum Regis Gallix libri duo, embodying an argument and remonstrance against the policy of France in its recent alliance with the Protestant Gustavus Adolphus. For this supposed service to Spain he was rewarded in 1636 with the bishopric of Ypres. He was preparing for the press his great work upon St Augustine, which had occupied him for twenty-two years, when he was cut off by sudden illness on May 6, 1638. By his last will the MSS. of this work were bequeathed to his chaplain Lameeus, and his friends Frontondus and Calenus, to be published " quam fidelis- sime"; at the same time he declared his obedience to the Roman See should any alterations be desired.

JAN—JAN

The title of the first work of Jansen against Voetius was Alexi- pharmacon ; it called forth Notxw in Alexipharmacon, to which he replied in his Spongia, 1630. On the publication of Voct's Des- perata Causa Papatus in 1635, Jansen handed over the further management of

the controversy to Fromond, whose Crisis (1636) was met with Schook's Desperatissima Causa Papatus. Among other works of Jansen are mentioned Tetratewehus sive Commen- tarius in IV. Evangelia and Pentateuchus sive Commentarius in V. libros Moysis. See Leydecker, Historia Jansenismi (Utreeht, 1695),

JANSENISM. The Azugustinus, sew doctrina S. Augustint de humane nature santate, xgritudine, e medicina, adversus Pelagianos et Massilienses of Jansen, publislied in 1640, is a work in three folio volumes. The first of these is devoted to an historical exposition of the Pelagian and Massilian (semi-Pelagian) heresies ; the second sets forth the Augustinian doctrine as to the state of innocence and the fallen state; while the third treats, in ten books, of the grace of Christ the Saviour. The sting of the work is to be found mainly in the epilogue, which draws a parallel, in various particulars, between the errors of the Massilians and those "recentiorum quorundam," the Jesuits being referred to. Its bearing upon previous controversy had become well known long before its pub- lication ; and while it was still in the press at Louvain strenuous efforts were made by the Jesuit party there, through the papal internuncio, to induce the university to prohibit its appearance, on the ground that various popes had forbidden that anything should be written on the delicate subject of the grace of God without express papal permission. These efforts not only failed to attain their immediate object, but had the effect of greatly stimulating public interest in the Augustinus when it appeared ; and as soon as it arrived in Paris it was forthwith reprinted with the written approval of six of the most eminent doctors of the faculty of theology there. In 1641 the reading of the book, thus flung into the arena of theological controversy and ecclesiastical intrigue, was prohibited by the Inquisition; no opinion, however, was pronounced as to its doctrine, and the counter-agitation of the Jesuits in relation to it was condemned as inconsistent with the spirit of the papal injunctions already referred to. But the dispute did not admit of being thus quietly repressed, and accordingly, in 1643, the bull Zz eminenti of Urban VIII. was published, renewing and confirming the constitutions of Pius V. and Gregory XIIT., as well as the decrees of Paul V. and of himself, and forbidding the reading of the Augustenus, not only on the ground that its appearance had not

been sanctioned, but also because it contained various errors. This bull encountered a very general resistance in the Netherlands, on the part both of the university of Louvain and of the clergy at large; but ultimately, through the intervention of the Spanish Government, it was accepted (1651), subscription to it, however, not being insisted on. At the Sorbonne also it was badly received, and the dis- satisfaction it had caused in France found expression 10 the Apology for Jansen by Arnauld in 1644, which was followed by a second in 1645. The strength of these Apologies lyinglargely in the fact that no particulardoctrines of Jansenius had been condemned as heretical in the papal bull, the Jesuits, inflexible in their determination to secure the effectual condemnation of a book which told so power- fully against their distinctive theology, immediately set about obviating this weakness in their attack, and various attempts were accordingly made to formulate, in the shape of definite propositions, the heresy which they believed to exist. In 1646 eight such propositions were stated by Habert, " theologal " of Notre Dame, to be submitted to the judgment of the pope; subsequent successive adjustments – reduced them in 1650 to five, which in the name of eighty- five French prelates were forwarded for condemnation to Rome. They were as follows :—(1) There are some come

mandments of God which just men, although willing and ; which they were now so fully ascertained. Arnauld was

anxious to obey them, are unable with the strength they have to fulfil, and the grace by which they might fulfil them is also wanting to them; (2) in the state of fallen nature inward grace is never resisted; (3) in the fallen state merit and demerit do not depend on a liberty which excludes necessity, but on a liberty which excludes con- straint; (4) the semi-Pelagians admitted the necessity of an inward prevenient grace for the performance of each particular act, and also for the first act of faith, and yet were heretical inasmuch as they maintained that this grace was of such a nature that the will of man was able either to resist

or obey it ; (5) it is semi-Pelagian to say that Christ died or shed His blood for all men without exception. The pope long resisted the pressure with which he was urged to pronounce upon these theses in an adverse sense; it is easy to understand why he should steadily have inclined to the old and simple expedient of enjoining silence upon disputants on either side of the controversy; for, if the Jansenist propositions had a Calvinistic ring about them, there was no denying that they also admitted of an Augustinian and therefore presumably of au orthodox interpretation. At length, however (May 1653), Innocent X. in the bull entitled Cum occasione impressionis libri pronounced the first four points heretical, while the fifth was declared to be false, with the addition that, if it was intended to convey the meaning that Christ died only for the elect, it was impious and blasphemous as well as heretical. This bull was accepted and promulgated in France and the Netherlands with the royal consent, and thie victory of the Jesuits was quite decisive. The Jansenists still seemed indeed to have one line of defence left to them ; they expressed themselves willing to condemn the five propositions in their heretical sense, but not as propositions of Jansen. 'This position, however, ceised to be tenable when, in September 1654, the pope declared that tlie pro- positions were found in the Augustinus of Jansen, and that tlieir coudemnation, as doctrines of Jansen, was imperative. Arnauld nevertheless, with whom were the other Port Royalists (see Port Royat), refused to yield. In the second of his " Letters" to a person of quality (the Duc de Luines), he argued that, while the Holy See had authority to decide with respect to doctrine, and every good Catholic owed submission not only "de respect" but also "de croyance" to such determinations, yet it might be mis- taken on the question of "fact" whether a given book contained certain statements or not. The commotion which ensued called forth in January 1656 the first and second of the Provincial Letters of Pascal, but these brilliant controversial efforts did not suffice to avert the expulsion of Arnauld from the Sorbonne (31st January 1656). In the following year the theological faculty of Paris drew up a formula avowing full acceptance of the bull of Alexander VIL, in which it had been specifically declared that the five propositions contained de facto Jansenist error. This document, sanctioned by the king in 1661, the clergy and all inmates of conventual establishments were called upon to

sign, all who refused being treated as heretics. ‘The leading Jansenists were compelled to go into hiding, and the nuns of Port Royal were subjected to imprisonment and other harsh treatment. Many of the clergy, with whom were fonr bishops, persisted in their refusal to sign, until at last, in September 1668, the compromise called the “peace of Clement IX.” was arranged, in virtue of which, by the omission of a single word (“ purement”), assent was no longer required to the proposition that Jansen had actually taught the five propositions in a “purely” heretical sense. ‘The respite from controversy and persecution thus secured was not of long duration. The Jesuits Were quite unable to make a moderate use of the power of

driven into Holland, where he found congenial society and apt disciples in Catholic circles, and particularly at Delft. In 1705 a bull was obtained from Clement XI. in which the heretical character of Jansen’s teaching, in Jansen’s sense, was authoritatively asserted, and thus the peace of Clement IX. was destroyed. This measure ultimately led, in 1710, not only to the breaking up of the establishment at Port Royal, but also to the destruction of the very buildings. Louis XIV. was further induced to approach the pope for a decision upon the doctrine contained in Quesnel’s Léflexions morales sur le Nouveau Testament, a work of practical edification, which, published in 1693-94, had attained great popularity in France, and been recom- mended by many bishops, including thie cardinal-archbishop of Paris, De Noailles, but was suspected of latent Jansenism. In this way the bull Unigenitus (1713) was obtained, in which no fewer than one hundred and one propositions taken from Quesnel were condemned as erroneous and heretical. The result was to divide the French Church into two parties, the acceptants or constitutionists, and the

| appellants or anti-constitutionists; but again the Jesuit

influence was able to secure the ultimate defeat (1728) of Noailles and his party, and in 1730 the bull was formally registered as the law of the kingdom. Oppressed Jansenism now changed its method of defence. Reports of miracles wrought in the cemetery of St Medard, Paris, at the grave of Francois de Paris, a young Jansenist deacon who had died in

1727, began to be circulated ; and the spot became a pil- grimage centre daily visited by thousands of fanatics. It was in vain that the place was walled up (giving occasion tu the witty epigram “ De par le Roi, défense & Dieu De faire miracle en ce lieu”); portions of earth which had been taken from the grave were equally efficacious, and the number of convulsionary prophets of coming ruin to the state and church continued to increase. Repression by imprison- ment and other violent means was vainly attempted ; but as the novelty of the movement wore off the excitement gradually died down; and after the middle of the 18th century, the appellauts or Jansenists of France ceased to make any figure in the public view. Their cause may be said to have been buried in the grave of Francois de Paris. In Holland the history of the disciples of Jansen followed a different course. The Catholics there, though steadfastly refusing to be called Jansenists, became deeply imbued with his views; at their head was the archbishop of Utrecht, who on this account was deprived by the pope in 1704. In 1723 the chapter there secured the consecra- tion of a successor (which the pope had steadily refused) by an appellant bishop; in similar circumstances bishops were consecrated at Haarlem and Deventer also, and the separatist church thus constituted still subsists, though its members in 1869 were under 6000. Its adherents claim to be disciples of St Augustine and members of the Catholic Church, of which they recognize the pope as the visible head, although they deny his infallibility.

For the earlier stages of the history of Jansenism, see Leydecker, Historia Jansenismi, 1695, and the anonymous work of Gerberon, Histoire Générale du Jansenisme, 1700. Modern authorities are Sainte-Beuve, Port-Royal, 1840-48, 3d ed. 1867; Reuchlin, Geschichte v. Port-Royal, 1889-44; and Bouvier, Ktude critique sur le Jansénisme, 1864.

JANSSEN, or JANSEN (sometimes JoHNSON), CORNELIUS (1590-1665), painter, was born at Amsterdam about 1590. About 1618 he went to England, where he was patronized by James I. and the court. Under Charles I. he continued to paint the numerous portraits which adorn very many of the mansions and collections of England; but in 1648, after the outbreak of civil war, he retired to Holland, where his

brush was busy till his death in 1665. Janssen's pictures, chiefly portraits, are distinguished by clear

colouring, delicate touch, good taste, and careful finish. He generally painted upon panel, and often worked on a sniall scale, sometimes producing replicas of his larger works.

JANSSENS, or JANSENS, VAN NuyssEN, ABRAHAM (1567-1632), painter, was born at Antwerp in 1567, He studied under Jan Snellinck, was a "' master" in 1602, and in 1607 was dean of the master-painters. Till the appearance of Rubens he was considered perhaps the best historical painter of his time. 'The styles of the two artists are not unlike. In correctness of drawing Janssens excelled his great contemporary ; in bold composition and in treatment of the nude he equalled him; but in faculty of colour and in general freedom of disposition and touch he fell far short. A master of chiaroscuro, he gratified his taste for strong contrasts of light and shade in his toreli-lights and similar effects. Good examples of this master are to be seen in the Antwerp museum and the Vicnna gallery. The stories of his jealousy of Rubens and of his dissolute life are quite unfounded. He died at Antwerp in 1632.

JANSSENS, or Jansens, Victor Honortus (1664- 1739), painter, was born at Brussels in 1664. After seven years in the studio of an obscure painter named Volders, he spent four years in the household of the duke of Holstein. The next eleven years Janssens passed in Rome, where he took eager advantage of all the aids to artistic study, and formed an intimacy with Tempesta, in whose landscapes lie frequently inserted figures. Rising into popularity, he painted a large number of cabinet historical scenes ; but, on his return to Brussels, the claims of his increasing family restricted him almost entirely to the larger and more lucrative size of picture, of which very many of the churches

and palaces of the Netherlands contain examples. In 1718 Janssens was invited to Vienna, where he stayed three years, and was made painter to the emperor. The statement that he visited England is based only

upon the fact that- certain fashionable interiors of the time in that country have been attributed to him. Janssens's colouring was good, his touch delicate, and his taste refined. He died in 1739.

JANUARIUS, Sz, or San Genxaro, the patron saint of Naples, according to the Roman Breviary, was bishop of Benevento, and flourished towards the close of the 3d century after Christ. On the outbreak of the persecution by Diocletian and Maximian, he was taken to Nola and brought before Timotheus the governor of Campania on account of his profession of the Christian religion. After he had withstood various assaults upon his constancy, he was at last sentenced to be cast into the fiery furnace, through which he passed wholly unharmed. On the following day, along with a number of fellow martyrs, he was exposed to the fury of wild beasts, which, however, contrary to their nature, laid themselves down in tame sub- mission at his feet. Timotheus, again pronouncing sentence of death, was struck with blindness, but immediately healed | by the powerful intercession of the saint, a miracle which | converted nearly five thousand men on the spot. The ungrateful judge, only roused to further fury by these occurrences, caused the execution of Januarius by the sword to be forthwith carried out. The body was ultimately removed by the inhabitants of Naples to that city, where the relic became very famous for its miracles, especially in counteracting the more dangerous eruptions of Vesuvius. His clotted blood, preserved in a glass phial, even to this day is wont to liquefy and bubble up as if but recently shed whensocver it is placed within sight of the martyr's head. So far the Breviary. 'This liquefaction of the

blood, which is brought about at least twice a year, on

May 1 and on September 19, the day assigned to this saint in the Roman calendar, is a miracle the recurrence of which is observed by believing Neapolitans on each occasion with various festivities extending 'over a whole week. The Januarius of Cordoba, to whom along with Saints Faustus and Martialis, a special local office is assigned in the Spanish Breviary, has a story which bears a general

resemblance to the preceding; he also is stated to have suffered under Divcletian and Maximian, but the scene of his martyrdom was Cordoba. His day is October 13, and the invention of his remains is commemorated on November 26. The number of minor saints of this name is very considerable; the cognomen appears to have been somewhat common.

JANUARY, the first mouth in our present calendar, consists of thirty-one days. It was, however, not the first month of the year in the British Isles till the reformation of the calendar was made in 1752, when the legislature, by an Act passed in the preceding year, altered the mode of reckoning time from the Julian to the Gregorian style. At this period it was directed that the legal year which had commenced in some parts of the country on Marcli 25, and in others with January, should thenceforward be appointed to begin always on the Ist of January. January derives its name from the god Janus, who had two faces looking in opposite directions, and Macrobius states that it was dedicated to him because, from its situation, it might be considered to be retrospective to the past and prospective to the opening year. 'Ihe consecration of the month took place by an offering of meal, salt, frankincense, and wine, each of which was new. On the first of this month all enmities were suspended, presents were exchanged, consuls installed, &c. The principal festivals now observed in this month are the following :—Jan. 1, New Year's Day, Feast of the Circumcision; Jan. 6, Epiphany, Twelfth- Day; and Jan. 25, Conversion of St Paul. See CALENDAR.

JANUS, a Roman god, after whom the month of January was named. His temple was open in war and closed during peace, aud the ceremony of closing it for the third time in Roman history was performed by Augustus, 29 z.c., when he had established his authority over the whole empire. This temple, which was in reality only an arch or gateway, facing east and west, stood near the forum. When most of the Roman gods were merged in Greek divinities, Janus retained his native character. Amid the obscurity that hangs over the genuine Roman religion, it 1s difficult to determine the nature and origin of Janus. It is probable that he was the chicf deity of one of the races which were

united in the Roman people, and that his wor- ship was maintained beside, but overshadowed by, that of Jupiter, the chief deity of another of these races. The hill of Janus, Janiculum, lay on the north or Etruscan side of the Tiber, and was doubtless the seat of his original wor- shippers. An Etruscan origin is thus suggested, and most authorities accept this hypothesis. The Romans them- selves thought that Janus and the feminine Jana, xe, Diana, were sun and moon; and the names are commonly assiinilated to the Greek Zyv, ze, Aimy. If, however, Janus was an Etruscan god, belonging to the Etruscan element in Rome, he must then be identified with the Etruscan deity Ani, the form of the name being prompted by the word janua, as Janus is the god of opening and be- ginning. The god is represented with two faces looking in opposite directions, a design found on the coins of the Etruscan Volaterra, but possibly due to the influence of Greek art.

Sce Preller, Rim. Myth. ; Gerhard, Gricch. Myth., ii. ; Hartune, Relig. der Roéner; Schwegler, Rim. Geschichte, &e. ; Deecke, Templum von Piacenza. Mommsen in his history proposes # diflerent view.

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Plate IX.

Divi- sions.

569

JAPAN

HE empire of Japan consists of a long chain of islands separated from the eastern coast of Asia by the Seas of Japan and Okhotsk, and extending from 24° to 50° 40’ N. lat., and from 124° to 156° 38’E. long. It com- mences with the Kurile Islands and descends in a south-westerly direction to the Loochoo group, to which the Japanese Government reasserted their claim in 1875. The southern portion of the island of Saghalien was ceded to Russia in exchange for the Kuriles.

The whole empire is called by the natives Dai Nippon, or “ Great Japan” ; but Nippon or Nihon is often employed alone. Nippon means literally “sun’s origin,” ¢.¢., the land over which the sun first rises, and thus denotes the position the empire occupies in the extreme Hast. The principal islands may be enumerated as follows :—

1. The main island, which does not bear any special name. In many of the older geographical works it is stated that Nippon is the distinctive appellation of this one island, but by the Japanese themselves the name is applied only to the whole country.

. Kiushiu (lit., “the nine provinces ”).

. Shikoku (lit., “ the four provinces”).

Yezo.

Sado.

Tsushima.

. Hirado (often wrongly written Firando).

Awaji.

. Oshima (“ Vries Island”) and the chain adjacent to it, ter-

minating with Hachijé (misspelt on charts Fatsisio).

Iki, with several smaller isles.

The Oki group.

The Goté group.

The Bonin group.

14. The Riukin (Loochoo) group.

15. The Kurile group (Chijima ; lit., “ the thousand islands”).

Owing to the lack of reliable surveys, it is exceedingly difficult to form a correct estimate of the area of the Japanese empire. A few years ago the Government insti- tuted surveying operations under the direction of skilled foreign engineers, and an ordnance map of the city of T6kié has already been prepared and published ; but any correct calculation of the size of the whole country can hardly be obtained for some years to come. In a work on general geography published a few years ago by the Educa- tion Department at Tékié, the area of Japan is stated to be 24,780 square ri, which measurement, taking the linear rz as equal to 2°45 English miles, gives a total of about 148,742 miles, or nearly one-fourth more than the area of the United Kingdom. This estimate, however, is founded on maps which are far from correct.!

The old division of Japan into provinces was made by the emperor Seimu (131-190 a.p.), in whose time the jurisdiction of the sovereign did not extend further north than to a boundary line running from the Bay of Sendai, on the east coast of the main island, to near the present treaty port of Niigata on the west coast. The northern

12. 13.

E Even in ordinary Japanese maps there are noticeable very glaring discrepancies as to distances, &c. The common measurement of length is the ri, equivalent, as has been said above, to about 2°45 miles. The 7i usually contains 36 ché, though in the extreme western portion of the country 50 ché are sometimes reckoned to the ra be} hilly regions we often meet with what is termed the "mountain si," which is one-half of the ordinary one. In former days, in stating distances along the roads, &c., the space occupied by temple enclo- sures was not reckoned, and thus the traveller had often to traverse a far longer route than that actually noted in the guide-books. The minor linear measures are the swn, or inch, 10 of which make the shaku, which is as nearly as possible equivalent to our foot ; 6 shaku, or 714 English inches, make up the Japanese ken, while the jé contains

10 shaku. See recent works on Japanese weights and measures by Mr W. Bramsen.

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portion beyond this line was then occupied by barbarous tribes, of whom the Ainos (still to be found in Yezo) are probably the remaining descendants. The whole country was then divided into thirty-two provinces. In the 3d century the empress Jingé, on her return from her victorious expedition against Corea, portioned out the empire into five home provinces and seven circuits, in imitation of the Corean system. By the emperor Mommu (696-707) some of the provinces were subdivided so as to increase the whole number to sixty-six, and the boundaries then fixed by him were resurveyed in the reign of the emperor Shému (723-756). The old division is as follows :—

I. The Go-kinati, or 'five home provinces," 7.e., those lying immediately around Kiéto, the capital, viz. :— Yamashiro * also called Jéshiu. Idzumi, also called Senshiu. Yamato, mA Washiu. | Setsu, – Sesshiu. Kawaehi, 5 Kashiu.

II. The seven circuits, as follows :—

1. The Tékaidé, or ‘* eastern-sea circuit,” which comprises fifteen provinces, viz.:—

Iga Ishiu. Kai or Késhiu. Isé 9 Seishiu. Sagame 3 Sdshiu. Shima }, Shishiu. Musashi », Bushiu Owart », Bishin. Awa », Béshiu. Mikawa », Sanshiu. Kadzusa », Soshiu. Totomi », Enshiu, Shiméosa }, Soshiu. Suruga 1 Sunshiu. Hitachi », Joshiu. Idzu », Dzushin.

2. The Tézandé, or ‘ castern-mountain circuit,” which com- prises eight provinees, viz. :—

Omi or Géshiu. Kédzuké — or Séshiu. Mino », Néshiu. Shimotsuké „ YVashiu. Hida », Hishiu. Mutsu 3» Oshiu. Shinano », Shinshiu. Déwas », Ushiu.

3. The Hokurikudé, or *‘ northern-land eircuit,” which com- prises seven provinces, viz. :—

Wakasa or Jakushiu. Etchiu or Esshiu. Echizen », Esshiu. Echigo ;, Esshiu. Kaga », Kashint, Sado (island) „ Sashiu. Noto », Néshiu.

4, Tho Sanindé, or “ mountain-back circuit,” which ecom- prises eight provinees, viz.:—

Tamba or Tanshiu. H6ki or Hakushiu. Tango 5» Tanshiu. Idzumo 5» Unshiu. Tajima », Lanshiu. Iwami » Sékishiu. Inaba », Inshiu. Oki (group of islands).

5. The Sanyédé, or ‘ mountain-front circuit,” which com- prises eight provinees, viz. :—

Harima or Banshiu. Bingo or Bishiu. Mimasaka „ Sakushiw Aki 1, Geishiu. Bizen », Bishiu. Suw6 }, Boshi. Bitehiu », Bishiu. Nagato », Choshin,

6. The Nankaidé, or “southern-sea circuit,” which com- prises six provinces, viz. :—

Kii or Kishiu. Sanuki or Sanshia. Awaji (island) ,, Tanshiu. Lyo »» Yoshiu. Awa », Ashiu. Tosa »» Loshiu.

7. The Saikaidé, or "‘ western-sea circuit," which comprises nine provinces, viz. :—

Chikuzen or Chikushiu. Higo or Hishiu. Chikugo », Chikushiu. Hiuga », Nisshiu. Buzen », Héshiu. Osums », Gfishiu. Bungo » Héshiu. Satsuma »» Sasshtu. Hizen >, Hishiu.

III. The two islands, viz. :—

1. Tsushima or Taishiw. oF Lk », Ishiu.

Upon comparing the above list with a map of Japan it Cee ee ee Ee

2 The names given in italics are those more commonly used. Those in the first column are generally of pure native derivation ; those in the second column are composed of the Chinese word shiw, a ‘*province, added to the Chinese pronunciation of one of the characters with which the native name is written. In a few cases both names are used.

XIII. — 72

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will be seen that the main island contains the Co-kinaz, Tokaidd, Tozandd, Hokurikudé, Sanindd, Sanyéd6, and one province (Kishiu) of the Vankaidé. Omitting also the island of Awaji, the remaining provinces of the Vankaidé give the name Shikoku ("the four provinces") to the island in which they lie; while the Satkaidéd coincides exactly with the large island of Kiushiu ("the nine provinces"). This name Kiushiv must not be confounded with that of the one province of Kishiw on the main island.

In 1868, when the rebellious nobles of Oshiu and Déwa, in the T'ézandé, had submitted to the mikado (the emperor), those two provinces were subdivided, Déwa into Uzen and Ugo, and Oshiu into

Iwaki, Iwashiro, Rikuzen, Rikuchiu and Michinoku (sometimes also called Mutsu). This increased the old number of provinces from sixty-six to seventy-one. At the same time there was created a new circuit, called the Hol' kaid6, or "northern-sea circuit," which comprised the eleven provinces into which the large island of Yezo was then divided (viz., Oshima, Shiribéshi, Ishikari, Téshiwo, Kitami, Ifuri, Hitaka, Tokachi, Kushiro, and Nemuro) and the Kurile Islands (Chijima).

Another division of the old sixty-six provinces was made by taking as a central point the ancient barrier of Osaka on the frontier of Omi and Yamashiro,—the region lying on the east, which consisted of thirty-three provinces, being called the Kuanté, or "east of the barrier," the remaining thirty-three provinces on the west being styled Kuansez, or "' west of the barrier." At the present time, however, the term Kuantd is only applied to the eight provinces of Musashi, Sagami, Kédzuké, Shimotsuké, Kadzusa, Shimésa, Awa, and Hitachi,—all lying immediately to the east of the old barrier of Hakoné, in Sagami.

Chiu-goku, or "central provinces," is a name in common use for the Sanindé and Sanyédé taken together. Sav- koku, or " western provinces," is another name for Kiushiu, which in books again is frequently called Chinsez.

Each province (Aunt) is divided into what may be termed departments (4érz). The latter vary in number according to the size of the province. In the old system there were altogether six hundred and twenty-nine departments, but the addition of the Hok'kaidéd has raised the number to considerably over seven hundred.

For purposes of administration the whole of the empire except the Hok'kaidé was again divided in 1872 into three cities (fu) and seventy-two prefectures (ken). The three cities are Yedo, Ozaka, and Kidto. In 1869 Yedo also received the name of T6ki6, or " eastern capital," as opposed to Saikié (the new name for Kidto), or " western capital." This was in consequence of the removal of the emperor's court from his old capital to Yedo. It may, however, be here remarked that, whilst the Japanese invariably speak of Tokié Fu, "the city of Tékié," they use the name K2dto Fu, "the city of Kidéto," and not, as might have been

supposed, Sackid Fu. The limits of the prefectures (ken) were irrespective of the boundaries of the provinces. There were originally seventy-two, but a gradual process of amalgamation has considerably reduced the list; and in August 1876 a Government notification fixed the prefec- tures at only thirty-five, the names of which are given in the following table :—

The Home Provinces (14)—Sakai, Hidgo (part)—apart from the

two cities of Ozaka and Kidto.

Tékaid6 (8)—Ibaraki, Chiba, Saitama, Kanagawa, Yamanashi,

Shidzuoka, Aichi, Miyé—apart from the city of Tékié.

Tdzand6 (11)—Awomori, Iwadé, Miyagi, Fukushima, Akita,

Yamagata, Tochigi, Gumma, Nagano, Gifu, Shiga.

Hokurikudé (2)—Niigata, Ishikawa.

Sanindé (1)—Shimané.

Sanyddé (34)—Hidgo (part), Okayama, Hiroshima, Yamaguchi.

Nankaidé (3)—Wakayama, Ehimé, Kochi.

Saikaidé (5)—-Oida, Fukuoka, Kumamoto, Nagasaki, Kagoshima.

instances a single ken now contains several provinces or portions of different provinces. fecture (called the Okinawa ken) was created, including

governed by a king of its own, but being in fear of

From the above list it may be noted that in many In 1878-9 a separate pre- the Riukiu (Loochoo) group. Until that time Riukiu was

its powerful neighbours, China and Japan, it had for many years sent tribute to both, A question of double allegiance thus arose, which was solved by Japan assert- ing its sovereignty; the king received the title of noble of Japan, and the Okinawa ken was established. Whether this action on the part of the Japanese Government may not embroil them with China is a point not yet definitely settled.

The total number of islands in the Japanese group, Smaller exclusive of the four main ones, is stated to be over three islands. thousand. Many of these are mere barren rocks, unin- habited and uncultivated. Others, again, are of consider- able size and exceedingly fertile, particularly the countless islets in the Suwo Nada, commonly known to Europeans under the name of the "Inland Sea," lying between the main island on the north and the islands of Shikoku and Kiushiu onthe south. The whole coast-line, too, is dotted with islands and rocks of all sizes. Oshima, also called Vries Island, at the mouth of the Bay of Yedo, is one of considerable importance. It has many inhabitants, and its volcanic soil is fairly productive. It is the most northerly of a chain which extends as far south as the 27th degree of north latitude. The Bonin group, termed by the Japanese the Ogasawara Islands, lies far out at sea, to the south of the entrance of Yedo Bay ; it consists of two large islands, separated from each other by 50 miles of sea, and a host of islets. The Japanese Government reasserted their sovereignty over the Boninsin 1878, The Kurile Islands are merely a chain of barren rocks, and the few inhabitants are chiefly occupied in the fisheries and in hunting the sea-otter. Due south from the province of Satsuma lie several minor groups, terminating with the Riukiu Islands. The Gotdé group (lit. " the five islands ") extends in a westerly direction from the province of Hizen, in Kiushiu, to which it belongs.

Coast-line-—The bays along the coast are often of con- Bays

siderable size. The Japanese, strange to say, have no names for either their bays or their straits, the appella- tions found on maps and charts having been given by European navigators. Yedo Bay is perhaps the

best known to foreigners, but Sendai Bay (on the east coast) and that running up to the north of the island of Awaji, and com- monly called Ozaka Bay, are also famous. Owari Bay, in the province of that name, is of considerable size. The Bay of Kagoshima, in the province of Satsuma, is long and narrow; it is well known to foreigners as having been the scene in 1863 of an attack on Kagoshima (the castle-town of the lord of Satsuma) by a British squadron. The entire coast-line teems with smaller bays and har- bours, in many of which good anchorage can_ be found. An English man-of-war, the "Sylvia," has for several years been employed as a surveying vessel to obtain soundings of the principal inlets and draw up charts of the coast.

The straits best known to foreigners are the Straits Stal of Tsugaru (often miscalled Saugur in maps), which separate Yezo from the northern portion of the main island ; the Straits of Akashi and of Idzumi, near the island of © Awaji, at the eastern entrance of the "Inland Sea"; and the Straits of Shimonoséki, at the extreme western end of that sea, separating the main island from Kiushiw The attack on Shimonoséki in 1864 by an allied squadron of English, French, Dutch, and American vessels, in retalia- tion for injuries inflicted upon foreign shipping passing

Capes.

Har- bours.

Moun- tains,

GEOGRAPHY. |

through the straits by the batteries erected by the lord of Chéshiu (in which province Shimonoséki is situated) is a matter of historical note. The current in these straits is so swift that vessels have difficulty in stemming it unless under steam.

It will suffice to name a few of the almost countless pro- montories and capes along the coast. On the extreme north of the main island we have Riuhi-zaki and Fujishi- zaki in the Tsugaru Straits. Inuboyé no saki lies

on the east coast just below the mouth of the Tonégawa. Su-saki in Awa and Miura no misaki (called by foreigners Cape Sagami) mark the entrance to the Bay of Yedo. Cape Tdzu is in the province of that name, and at the southern extremity of the province of Kishiu are Idzumo-zaki and Shiwo no misaki, Muroto-zaki and Ashizuri no misaki are the chief promontories on the south coast of the island of Shikoku, both being situated in the province of Tosa. Tsutsui-zaki in Hiuga, and Sata no misaki (better known to Europeans as Cape Chichakoff) in Osumi are the ex- treme southern points of the island of Kiushiu. In the island of Yezo there are several noticeable promontories.

The number of harbours and trading-ports called by the natives d-minato ("large harbours") is stated to be fifty-six, but many of these would no doubt be inaccessible to foreign vessels of heavy tonnage. They are, however, admirably adapted for the accommodation of coasting junks and fishing craft, and these vessels have no lack of places of refuge in heavy weather. In many instances the entrances are blocked by one or more small islands or rocks, which render the anchorage-within even more secure. In Yezo the port of Matsumae is the one best known. The Bay of Yedo abonnds with harbours, some being situated within the mouths of the rivers. In Idzu, Shimoda is one that deserves special mention; the water is there very deep, and it is a common occurrence for vessels beating up towards the entrance of Yedo Bay to seek shelter in it. Shimidzu in Suruga is also a well-known place; a long sandy promontory covered with fir trees defends the port from the sea on the south. In the province of Shima are Toba and Matoya, both magnificent harbours. The "Inland Sea" is, of course, especially rich in this respect, the harbour of Mitarai, between two islands near the province of Aki, being a favourite place of call. In Shikoku, Takamatsu in Sanuki is the best known. Kiushiu is abundantly supplied, Kagoshima in Satsuma being one of the largest and best. The harbours on the north-west coast of the main island are also numerous, and each of the islands Tsushima, Iki, and Sado possesses one. The ports thrown open to foreign trade since the year 1859 are Yokohama, Hidgo (Kébe), and Niigata on ~ main island, Nagasaki in Kiushiu, and Hakodaté in

eZ0.

Mountains, —Japan, as might reasonably be expected ina country where volcanoes are so numerous, is very hilly ; and in some districts there are many mountains of considerable height. The most extensive plains are those of the Kuanté and Echigo, and the north of Oshiu. The provinces of Mikawa, Mino, and Owari are also very flat. Half-way between TOkié (Yedo) and Kidto lies the great watershed of the east of Japan, the table-land of Shinano, elevated some 2500 feet above the level of the sea. The ridges around or forming part of it are very lofty, particularly those of the province of Hida. The plain of Yedo lies to the east of this table-land, about 1800 feet below, while to the north the hills gradually slope away to the province of Echigo. Another range of considerable height runs due north from Aidzu to Tsugaru, thus dividing the old pro- vinces of Oshiu and Déwa. The province of Kai is almost entirely surrounded by mountains, and the hill scenery in Kishiu and near Kidéto is exceedingly fine. Shikoku

possesses some large ridges, and the south of Kiushiu, especially in the provinces of Higo and Hiuga, is also by no means deficient. Even in the wide rice-plains through- out the country there may often be seen minor elevations or hills, rising abruptly, in some cases to a considerable height. The mountain best known to foreigners is Fuji-san,—commonly, but most erroneously, termed Fusiyama or Fusi-no-yama in geographical works. It rises more than 12,000 feet above high-water level, and is in shape like a cone; the crater is 500 feet deep. It stands on the boundary line of the three provinces of Kai, Suruga, and Sagami, and is visible at a considerable distance seaward. It is regarded by the natives as a sacred mountain, and large numbers of pilgrims make the ascent to the summit at the commencement of summer. The apex is shaped somewhat like an eight-petaled lotus flower, and offers from three to five peaks to the view from different directions; it is visible from no less than thirteen different provinces. Though now apparently extinct, it was in former times an active volcano, and

Japanese histories mention several very disastrous eruptions. The last of these occurred in 1707, when the whole summit burst forth into flames, the rocks were shattered and split by the heat, and ashes fell even in Yedo (about 60 miles distant in a direct line) to adepth of séveral inches.1 After Fuji-san may be mentioned Gassan in the province of Uzen, Mitaké in Shinano, the Nikkd range in Shimotsuké, Ominé in Yamato, Hakusan in Kaga, Tatéyama in Etchiu, Kirish- ima-yama in Hiuga, Asosan in Higo, Tsukuba-san in Hitachi, Onsen-ga-také in Hizen, Asama-yama in Shinano, Chékaizan in Ugo, and Iwaki in Michinoku. There are several active volcanoes in the country, that best known to foreigners being Asama-yama. This mountain is 8500 feet in height. The-earliest eruption of which records now exist seems to have taken place in 1650; after that the voleano was only feebly active for one hundred and thirty-three years, when there occurred a very severe eruption in 1783. Even so lately as 1870 there was a considerable emission of volcanic matter, at which time, also, violent shocks of earthquake were felt at the treaty port of Yokohama. The crater is very deep, with irregular rocky walls of a sulphury character, from apertures in which sulphurous fumes are constantly sent forth. At present very little is known in regard to the heights of the mountains, but the subject is one that has at- tracted the attention of foreign residents in Japan for several years past. The following is an approximate esti- mate :-—

rn ne Ena naae

1 According to'Japanese tradition, it was upheaved iu a single night from the bottom of the sea, about twenty-one and a half centuries ago, and its history has been carefully recorded. From July to September the wants of the pilgrims are supplied by temporary restaurants dis- tributed along the principal routes of ascent, one of which is from the east by Subashiri, another from the north by Yoshida, and a third from the south by Murayama. The white vestments usually worn by the pilgrims are stamped by the priests at. the top with various seals and images. Sir Rutherford Alcock and a party of Englishmen ascended the mountain in 1860, and since then it has frequently been visited by Europeans. The height as then estimated by Lieutenant Robinson was

14,177 feet ; but a mean of several subsequent measure- ments gives only 12,200.” In the great crater there are neither sul- phuric exhalations uor steam. According to Dr von Drasche this is a circular bowl about 700 or 800 feet deep. The lavas are mainly dolomitic ; those forming the walls of the cratcr are composed of anamesite, in which here and there grains of felspar are visible. The Japanese poets never weary in celebrating the praises of Fuji-san, and its conical form is one of the most familiar objects in Japanese paint- ing and decorative art. See the notice of Sir R. Alcock’s ascent in Journal R. G. Soc., 1861; of A. Jeffrey’s ascent in August 1872, in Proc. of R. Soc., 1873 ; and of Dr von Drasche’s in his “ Bemerkungen iiber die japanischen Vulkauen Asa-yama…- – uud Fusiyama, in Jahrbuch K. K. Geol. Reichsanstalt, 1877 ; also J. Rein’s ‘Der Fuji-no-yama und seine Besteigung,” in Petermann’s Mitthetlungen,

1879.

Rivers.

Lakes,

se Mie 12,365 feet (above high-water mark at

the town of Numadzu).

2. Asama-yama ….eeesseees ‘ 3. Nantai-zan (the loftiest

hillin the Nikké range) 7,800 „

4, Oyama, in Sagami …... 5,400 „ 5. Deulkaba=Sams ss es.+eceeuiee 5,000 „ 6. Onsen-ga-také …..... 4,100 „ (according to Siebold).

ivers.—The rivers of Japan, although very numerous, are in no case of any great length. This of course is easily explained by the fact that the islands are narrow and hilly. ‘The longest and widest river is the Tonégawa, which rises in the province of Kédzuké, and flows due east to the Pacific, throwing off, however, at Sékiyado in Shimésa, a branch that flows into Yedo Bay near the capital. The length of the Tonégawa is

over 170 miles. At Sékiyado (which is a large and thriving river-port) the water is no less than 40 feet in depth, while a few hundred yards above that town foot-passengers can ford the stream without any great difficulty. The Shinano- gawa and Kiso-gawa, both of which take their rise in the province of Shinano, rank next to the Tonégawa. The former flows first in a north-westerly direction, next due north, and then north-east through Echigo to the sea at Niigata; the Kiso-gawa flows to the westward and then to the south, between the provinces of Mino and Owari, and finally falls into the sea at Kuwana. The Oi-gawa rises in the south-west of Kai, and traverses the province of Tétdmi ; it is less remarkable for the length of its course than for the great breadth of its bed, which near the mouth is 24 miles across, its current being also very swift. The Fuji-kawa, flowing due south from the mountains of Kai through the province of Suruga, is famous as being one of the swiftest streams in all Japan. In the north, the Sakata-gawa flows due west from the range of mountains separating the provinces of Uzen and Rikuzen, and enters the Sea of Japan at the town of Sakata, from which it takes its name. Nearly all the rivers are fed by countless tributary streams, which in many cases form a complete network in the lower portions of the country, and thus greatly facilitate transport from the interior to the coast. On the Tonégawa and a few other streams of greater depth small river steamers ply for several miles; but in general large flat-bottomed boats, drawing as a rule but a few inches of water, are employed. It is by no means uncommon to see boats of this description in process of construction even in remote country villages on the banks of streams in which the depth of water is but from 12 to 18 inches at ordinary times. Floods are of frequent occurrence, especially at the commencement of summer, when the melting of the snows on the mountain ranges causes at times an almost incredible downflow from the higher lands to the plains. These floods invariably occasion great destruction of property, as the bridges spanning the rivers are only built of wood and turf, sup- ported by piles. In some localities, notably in the western portion of the province of Shimésa, traversed by the southern branch of the Tonégawa, large tracts of rice-land are almost entirely destroyed by the fine sand from the bed of the river, swept over the fields during inundations. In addition to boats, long rafts of timber are constantly to be seen descending the larger

rivers; the logs are floated down in a rough state, to be afterwards thinned and sawn up at the seaport towns where the timber trade is carried on.

Lakes.—Japan contains a large number of lakes, but only one—the Biwa Lake, in the province of Omi—is worthy of special notice on account of its size. Its length is about 50 miles, and its greatest breadth about 20 miles. At

1 See Naumann's excellent paper, " Ueber die Ebene yon Yedo," in Petermann's Mittheilungen, 1879.

a village called Katada, some 10 miles from its southern extremity, it suddenly contracts to a breadth of only a mile and a half, after which it again slightly expands. This lake derives its name from a fancied resemblance to the biwa or Japanese lute; the scenery around it is parti- cularly beautiful, and it is a favourite resort for sightseers from Kidto. An ancient Japanese legend asserts that in the year 286 3B.c., in the reign of the emperor Kérei, there occurred a terrible earthquake, when the earth opened and Lake Biwa was formed; at the same time rose the mountain called Fuji-san. In Omi there is a small hill called Migami, which in shape slightly re- sembles Fuji-san, and this fact is quoted by the natives in support of the theory connecting the lake with the sacred mountain; and the inhabitants of Omi were privileged to undertake the ascent of Fuji-san after only seven days' purification, instead of one hundred days', the prescribed term for all other persons. After Biwa may be noted the lakes of Chiuzenji, Suwa, and Hakoné, all of which lie far above the level of the sea. That of Chiuzenji is situated at the foot of the mountain called Nantai-zan, in the Nikké range in the province of Shimotsuké. The scenery in its vicinity has given rise to the proverb that he who has not seen Nikké should not pronounce the word " beautiful." The lake of Suwa is in the province of Shinano, and can be reached by a road called the Nakasendé, running north-west from Tékid through the heart of the country to Kidto. The Hakoné Lake lies

in the range of hills bearing the same name just to the east of Fuji-san; the water is exceedingly cold, and of great depth. A Japanese legend, indeed, asserts that it has never been fathomed. The hill scenery around it is very picturesque, and large numbers of foreign residents from T6kid and the neighbouring port of Yokohama visit it during the summer months. 'The Inawashiro Lake, in the province of Iwashiro, is said to be about 10 miles in length. Itis fed by two streams flowing from the east and north-east, while out of it flows the Aka-no-gawa, which falls into the sea near Niigata. It is surrounded by hills of no great elevation ; the temperature there is cool, and in winter the streams are frozen for several weeks. On the boundary line of the provinces of Hitachi and Shimésa there are also large tracts of water, or lagoons (Japanese numa), fed by the Tonégawa; these, though not actually lakes, may almost be classed under that heading, as their connexion with the river itself con- sists in many cases of but one narrow outlet. Those of chief note are the Ushiku-numa in Hitachi, and the Imba-numa, Téga-numa, and Naga-numa in Shimésa. The country in this vicinity is as a rule exceedingly flat, but the Imba-numa is for some distance along its eastern shore bordered by small hills, thickly wooded down to the water's edge, the whole forming a very pretty land- scape. The lagoons are well stocked with fish, the large eels found in the Ushikunuma being especially prized for excellence of flavour; in the winter months they teem with wild fowl. The inhabitants of the numerous villages along the shores are, in fact, almost entirely maintained by fishing and shooting or trapping.

Minerals.—Japan is particularly rich in minerals, Minerals.

among which may be specially mentioned gold, silver, iron, copper, coal, and stone of various kinds. The gold was first discovered and melted in the year 749 a.p., during the reign of the emperor Shému ; it came from the department of Oda in the province of Oshiu, and in the following year more was found in the province of Suruga. During the long period of Japan's seclusion from the rest of the world, the gold discovered remained in the country, and the amount augmented year by year; and this no doubt tended in @ great degree to convey to the earlier foreign visitors the

impression that the supply was far more abundant than was actually the fact. The quantity of bullion exported by the Portuguese during their stay in Japan (1550-1639) may be estimated at the least at fifty-nine and a half millions sterling, or an average of £660,000 yearly. Dr Kaempfer even speaks of some years with an export of two and a half millions of gold. From 1649 to 1671 the Dutch also exported large quantities, together with silver and copper, and the total value of gold and silver alone sent out of Japan during the 16th and 17th centuries may be estimated at nearly one hundred and three millions sterling. Atan exhibition held in Kidto in 1875 were shown about twenty samples of gold ore found in different provinces. The ore is generally poor, and many gold- yielding places are now lying unworked, because the in- creased. cost of labour renders it very difficult to work them with profit. Pure auriferous quartz has been found in the provinces of Satsuma and Kai, gravel in Osumi, and quartz in Rikuchiu and at the mine of Aikawa in the island of Sado. The mode in which the Japanese work the gold ores nearly resembles Western methods. They understand perfectly the separation of even the smallest quantities of gold dust from stones and gravel by means of a system of washing and levigation. They do not, however, possess any good process for the separation of gold from silver, and hence all Japanese gold contains a greater or less proportion of the latter metal. Silver ore was discovered accidentally in the year 667 a.D., in the island of Tsushima ; this ore produced the first Japanese silver metal, in the year 674. From 1400 to 1600 it was obtained and melted in Japan in far larger quan- tities than at the present time. It generally occurs in comparatively small quantities as an admixture in several copper and lead ores. The principal mines are in the provinces of Jéshiu, Iwami, and Setsu; but it is also found mixed with lead in Hida, Iwashiro, Echizen, Echigo, Rikuchiu, Suw6, Hiuga, and Higo. Of the numerous iron ores to be found, the principal is magnetic iron ore, which forms the main basis of the Japanese iron in- dustry. Loadstone was discovered in the year 713 in the province of Omi. The exact date of the first manu- facture of iron is unknown ; it is certain only that the Japanese have worked their iron ores from the 10th

century onward. The principal seats of the industry are in |

the provinces of Idzumo, Bingo, Oshiu, Hiuga, Tajima, Wakasa, Bizen, Bitchiu, Shinano, Tétémi, Kai, Suruga,

H6ki, Idzumo, and Iwami. The excellent temper of the Japanese sword-blades is well known. The most noted smiths formerly resided in the provinces of Sagami, Bizen, and Kishiu, and in the neighbourhood of Kidto. Japanese legends assert that the first sword was forged in the reign of the emperor Sijin (97-30 B.c.), but this statement is of course open to considerable doubt. Copper was, it is said, smelted in Japan for the first time in the year 698 at Inaba in the province of Suw6; and in the year 708 the first Japanese copper coin was cast, in the province of Musashi. Since the 10th century enorm- ous quantities of ore have been smelted, and this metal formed the chief trade of the Dutch and Chinese at Nagasaki from 1609 to 1858,—the amount exported by the former being more than four millions of piculs and by the latter undoubtedly still more.1_ It is perhaps the metal most commonly found in Japan, and is used for all kinds of household goods, doors to storehouses, ornaments, temple-furniture, mirrors, bronzes, smoking utensils, and current coinage. It is found and smelted in all parts of the country, particularly in the northern and western

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1 picul=1834 Ib. avoirdupois,

provinces, and its export figures considerably in the trade returns of the treaty ports during the past few years. As a rule Japanese copper is exceedingly free from the presence of injurious metals. After the year 1600 many bronze guns were cast in Japan, the workman- ship being exceedingly good; these old guns are often to be seen even now, though

by far the larger number, together with the temple bells, &c., made from the same material, have been broken up and exported as old bronze by Euro- pean merchants. Of other metals Japan also produces lead, quicksilver, and tin. Coal is found in large quantities, particularly in Kiushiu, where the province of Hizen contains the well-known mines of Karatsu, and in the island of Takashima, near the treaty port of Nagasaki. Coal-fields also exist in the large northern island of Yezo. Nearly all the steamers plying between Japan and China coal at Nagasaki, where this trade attracts a good deal of enterprise. The numerous quarries throughout the empire afford large quantities of stone. Marble and granite are found principally in the provinces of Shinano, Mino, and Kédzuké; freestone is also procured from Setsu and Idzu. The huge blocks of which the ramparts of the castle at the capital are built were originally brought from the latter province. In the old castle of Ozaka, in Setsu, there is an enormous piece of granite measuring thirteen paces in length and about 9 feet in height. The foundations of all the more ancient temples throughout the country are formed of large blocks, and these, together with the long flights of steps, still remain to prove the durability of the old style of architecture. It is strange, however, that at the present moment stone is but sparingly used for build- ing purposes; even in the great cities the dwelling-houses are almost entirely constructed of timber, stone being used only for bridges and for edifices on a larger scale than ordinary.?

Climate.—The climate of Japan, as might naturally be Climate.

expected in view of the great length of the chain of islands, varies to a considerable extent in different localities. Thus we find that while the Riukiu and Bonin groups, lying close to the tropics, enjoy perpetual summer, the Kurile Islands in the far north of the empire share the arctic temperature of Kamtchatka. The climate is, on the whole, favourable for Europeans, although its frequent changes often prove trying to foreign residents. All the mountain ranges are wrapped deep in snow throughout the

| winter months ; indeed, from many peaks snow never en- and Satsuma. The best steel is manufactured in Harima, |

tirely disappears. In the northern provinces it has been known to fall to a depth of no less than 8 feet, and the pro- vince of Echigo is specially noted in this respect. At the treaty port of Niigata, in that province, small bamboo sheds are built out from the fronts of the dwelling-houses so as to form a covered way along which pedestrians can pass when the rest of the town is snowed up. At T6kid snow falls some three or four times during the winter ; it covers the ground to a depth of from 3 to 5 inches on an average, but does not lie long. In January 1876, however, a remarkably severe snowstorm occurred, when the whole city was covered to a depth of 2 feet or more; so un- usual was this phenomenon deemed that a large number of photographs of the landscape were taken to perpetuate the memory of the event. Farther to the south and west the

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2 See a paper on "Mining and Mines in Japan," in the Memoirs of the Tékid University, and A. J. C. Geerts, Les produits de la nature japonaise et chinoise (Yokohama, 1878). For the geology, see B. 8. Lyman's Geological Survey of Japan, Reports of Progress Sor 1878-79 (Tokio, 1879). 7

3 See Dr J. J. Rein's papers in Petermann's Mittheil., 1875 and 1879; A. Wojeikof's " Reisen in Japan in 1876," inthe Mittheil., 1878, and his "Zum China von Japan," in the Zettschr. d. Oesterr. Ges. f. Meteor., 1878; and T. H. Tizard's Contributions to the Meteorology of Japan (London, 1876). :

Earth- quakes,

cold is not, as a rule, so intense, while in the summer months the heat is far greater. Near Yokohamaand Téki6 the summer commences in May, but the heat only becomes oppressive in July and August, when the thermometer has been known to register 104° F. At the break-up of the summer there are heavy rains, which render the interior of the houses exceedingly damp and uncomfortable. After the winter there also

occurs a short rainy season. The best months for making excursions into the interior are April and October, as the weather is then generally of a mean temperature. Southerly winds blow from the middle of May, and often even from April, until the end of August. On the Sea of Japan south-west winds (known as the south-west monsoon) prevail, while in Yokohama and all parts of the country adjacent to the Pacific Ocean southerly winds pre- dominate. The south-west monsoon sets in in April and prevails until the middle or end of September ; but the regularity with which the monsoons set in and blow on the Chinese coasts is unknown in Japan. On calm days land and sea breezes alternate on the Japanese coast in the same manner as elsewhere. Mention should here be made of the violent revolving storms, known as typhoons, which are closely related to the West Indian hurricanes and to the cyclones of the Indian seas. These generally occur in the months of July, August, or September; they invariably occasion great damage, not only to shipping, but also to property on land. Large trees are often snapped asunder like mere twigs, while the roofs and chimneys of foreign-built edifices suffer severely. As a rule, one of these storms is experienced every year. Destructive earthquakes have often taken place, while slight shocks are of frequent occurrence, several having been felt lately within the space of a few days. Japanese histories furnish numerous records of these phenomena, The aucient legend of the great earthquake in 286 B.o., when Mount Fuji rose and the Biwa Lake was formed, has already been noticed; but it is not possible to procure re- liable information for several centuries later than the date mentioned in that fanciful tale. The earliest authentic instance is perhaps that which is said to have occurred in 416 A.D., when the imperial palace at Kidto was thrown to the ground. Again, in 599, the buildings throughout the province of Yamato were all destroyed, and special prayers were ordered to be offered up to the deity of earth-quakes, In 679 a tremendous shock caused many fissures or chasms to open in the provinces of Chikuzen and Chikugo, in Kiushiu ; the largest of these fissures was over 4 miles in length and about 20 feet in width. In 829 the northern province of Déwa was visited in similar manner ; the castle of Akita was overthrown, deep rifts were formed in the ground in every direction, and the Akita river was dried up. To descend to more recent instances, in 1702 the lofty walls of the outside

and inside moats of the castle of Yedo were destroyed, tidal waves broke along the coast in the vicinity, and the road leading through the famous pass of Hakoné (in the hills to the east of Fuji-san) was closed up by the alteration in the surface of the earth. Of late years these disastrous earthquakes have fortunately been of more rare occurrence, and the last really severe shocks were those felt in 1854 and 1855. In the former year the provinces of Suruga, Mikawa, Tdtédmi, Isé, Iga, Setsu, and Harima, and also the large island of Shikoku, were severely shaken. It was this earthquake which destroyed the town of Shimoda, in the province of Idzu, which had been opened as a foreign port in Japan, while a Russian frigate, the " Diana," lying in the harbour at the time was so severely damaged by the waves caused by the shock that she had to be abandoned. The earthquake of 1855 was felt most severely at Yedo, though its de- structive power extended for some distance to the west,

along the line of the Tékaidé. It is stated that on this occasion there were in all 14,241 dwelling-houses and 1649 fire-proof storehouses overturned in the city, and a destructive fire which raged at the same time further increased the loss of life and property.

Meteorological observations have for some time back been carefully taken at the college in T6kid, and efforts are now (1881) being made to start a seismological society in the capital. Japan is peculiarly a country where a learned society of this nature could gather most interest- ing and useful information from actual observation.

General Aspect of the Country.—The physical structure of the islands alternates between mountain ranges, rugged upland regions, wide plains, and lands consisting of an endless succession of dale and down, level fields and small ridges. Yezo has not yet become thoroughly known to foreigners ; but it possesses both hills and plaius, the latter being in some cases very sandy. The northern portion of the main island of Japan is exceedingly mountainous, though large moors and

uncultivated steppes are to be observed on all sides. To the south-east lies the wide plain of Yedo, remarkably fertile, and closed in by lofty ranges. From this away to the west the couutry is hilly in the centre, with lower ground to the north and south ; while in the large islands of Kiushiu and Shikoku the high ground is far in excess of the plain.

Vegetable Products.—The greater part of the cultivated Rice,

land consists of rice-fields, comnionly termed "‘ paddy-fields." These are to be seen in every valley or even dell where farming is practicable ; they are divided off into plots of square, oblong, or triangular shape by small grass-grown ridges a few inches in height, and on an average a foot in breadth,—the rice being planted in the soft mud thus enclosed. Narrow pathways intersect these rice-valleys at intervals, and rivulets (generally flowing between low banks covered with clumps of bamboo) feed the ditches cut for purposes of irrigation. The fields are generally kept under water to a depth of a few inches while the crops are young, but are drained immediately before harvesting. They are then dug up, and again flooded before the second crop is planted out. The rising grounds which skirt the rice-land are tilled by the hoe, and produce Indian corn, millet, and edible roots of all kinds. The well- wooded slopes supply the peasants with timber and firewood. The rice-fields yield two crops yearly. The seed is sown in small beds, and the seedlings are planted out in the fields after attaining the height of about 4 inches. The finest rice is produced in the fertile plains watered by the Tonégawa in the province of Shimésa, but the grain of Kaga and of the two central provinces of Setsu and Harima is also very good. Prior to the revolution of 1868-9 the fiefs of the various daimié6 or territorial nobles were assessed at the estimated total yield of rice. Until very recently there existed a Government prohibition against the export of the grain. Rice not only forms the

chief food of the natives, but the national beverage, called Saké.

saké, is brewed from it. In colour the best saké resembles very pale sherry; the taste is rather acid. None but the very best grain is used in its manufacture, and the prin- cipal breweries are at Itami, Nada, and Hiégo, all in the province of Setsu. Of saké there are many varieties,

from the best quality down to shiro-zaké, or “ white saké,” and the turbid sort, drunk only in the poorer districts, known as nigori-zaké ; there is also a sweet sort, called meri.

The whole country is clothed with most luxuriant vege- Forests.

tation, except in some of the very hilly regions. The principal forests consist of Cryptomeria (Japanese cedar) and pine; the ilex, maple, mulberry, and giant camellia also abound. Some of the timber is remarkably fine, and the long avenues following the line of the different high roads

Fruits.

afford a most grateful shade in summer. from Tokid to the celebrated temples at the foot of the Nikké hills is an avenue nearly 50 miles in length, of cedars and pines, some of the trees being fully 50 or 60 feet in height. Unfortunately these noble specimens are fast disappearing, as the wood-cutter’s axe and saw have been ruthlessly plied during the past few years. In Japanese wood-felling a common plan is to kindle a fire at the roots of the tree; this dries up the sap in the trunk, aud renders the wood harder and firmer. Two principal varieties of the pine occur, called respectively the red and the black, from the colour of the bark. The former thrives in sandy ground, while the latter grows in softer black soil. It is said that, if one of these varieties be transplanted to the soil bearing the other, it will also in time change in colour till it resembles its new companions. ‘The tints of the maple foliage, bright green in summer and brown-red in autumn, contribute in no slight degree to the beauty of a Japanese landscape. The mulberry tree grows well in the eastern regions, where the silkworm is reared and the silk industry carried on. The bamboo is especially useful and plentiful. Bamboo clumps are seen at frequent intervals in the rice-land ; they line the river banks, and flourish equally well on the higher grounds; and it would be impossible to enumerate the multifarious purposes for which the cane is used. Of fruit- trees Japan possesses the orange, apple, walnut, chestnut, plum, persimmon, damson, peach, and vine.

The fruit, however, is in most cases of quality far below that of European orchards, The best oranges come from the province of Kishiu; these have a smooth and very thin rind, and no seeds. The larger oranges, with thick and rough rind, grow throughout the country. The so-called apple resembles the large russet, but only in colour and shape; it has absolutely no flavour, and is hard and stringy. The plum, of which there are several varieties, may be said to be the best fruit obtained, next to the orange and persimmon. This latter is exceedingly plentiful and has two varieties, the soft and the hard ; it is often dried, and sold packed in boxes like figs. The peaches are not remarkable either for size or flavour. The best grapes are grown in the provinces of Kai and Kawachi; both the black and the white are found, but the fruit is small, and only continues in season for a short time. The tea-plant grows well in Japan, and tea forms one of the chief exports to foreign countries. The best leaf comes from the neighbourhood of Uji, in the province of Yamashiro, to the south-east of Kidto; but it is also largely exported from Yokohama, being produced in the fertile district in the east of the main island. The production of vegetable wax has always formed one of the principal industries of the island of Kiushiu, and the trees bearing the wax berries grow in great number on the hill slopes and round the edges of most of the cultivated fields (excepting rice-land) in the provinces of Hizen, Higo, Chikuzen, and Chikugo; in Satsuma, however, they are not so plentiful. The cotton- plant, introduced from India in 799, also thrives. The camphor tree is found in most parts of the country, parti- cularly in some of the higher regions; on account of its agreeable smell the wood is largely used in the manufac- ture of small cabinets and boxes. Amongst the minor vegetable products the sweet potato is particularly plenti- ful ; it has several varieties, that known as the Satsuma potato being perhaps the best. Water melons and gourds of various sizes and shapes thrive in the more sandy soil ; and onions, carrots, small turnips, tomatoes, and beet-root are also cultivated. The brinjal bears a dark purple fruit shaped like a pear. The long white radish, called by the Japanese daikon (lit. great root ”), is exceeding])y common, and forms one of the chief articles of food amongst the

lower classes, who eat it either raw or dried and pickled ; the average size of the root is from 18 inches to 24 feet in length, and 14 inches or so in diameter. Beans and peas can also be grown. ‘The climate of Yezo is said to be very favourable for both wheat and barley, and it is probable that in future years this large island may thus prove a source of considerable gain to the Japanese. In the island of Shikoku the indigo plant is found in abundance, and it also occurs in the eastern portion of the main island. The poppy is grown in Shikoku. In ferns and creepers of various kinds Japan is particularly rich, but her list of flowers is not very lengthy. The rose, peony, azalea, camellia, lotus, and iris are, however, to be seen.’

Animals.—As regards animal life Japan is well provided. Mammals.

The domestic animals comprise the horse, ox, dog, and cat ; while the wilder tribes are represented by the bear, deer, antelope, boar, fox, monkey, and badger. In Yezo are found very large bears, so powerful as to be able to pull down a pony; in the central provinces of Shimotsuké and Shinano a small black species exists. The deer, antelope, and monkey are caught in nearly all the hilly regions throughout the whole country. Sheep do not thrive, although the hardier goat does,—the reason assigned for this being that the “bamboo grass,” with its sharp-edged and serrated blade, proves very deleterious as pasture. In the western part of the province of Shimésa a sheep- farm was started a few years ago; but it is not yet possible to judge whether the venture will prove successful in any great degree. Inthe meantime sheep are usually imported from China. The Japanese horses, or rather ponies, are not very powerful animals ; they stand on an average from 13 hands 2 inches to 14 hands 2 inches in height. They are thick-necked and rather high-shouldered, but fall off in the hind quarters. Large numbers of ponies are imported from China. At the Shimésa farm experiments have been made in putting an Arab or Barb to a Japanese mare ; the half-bred animal thus obtained compares very favourably with the pure native breed, being of better shape and of far superior

speed. The oxen are small but sturdy, and it is probable that, if the vast tracts of moorland at present lying uncultivated in the northern provinces were utilized for breeding cattle, substantial gains would be secured. The ordinary Japanese dog is very like the Eskimo dog, and is generally white, grey, or black incolour. A few, however, are red-brown, and much resemble the fox ; these are used by the hunters in the pursuit of game. There are several species of monkeys, and large numbers of these animals, taken in the hills of Kai and Shinano, are brought into the T‘6kid market, where they are sold for food; the flesh is white and very palatable. Wild birds? are represented in

1 The great authority on the Japanese flora is Franchet and Sava- tier’s Enumeratio plantarum in Japonia sponte crescentium, Paris, 1875-1879, 2 vols., which contains 2743 species of phanerogamic plants,—700 species more, that is, than were given by Miquel, who in 1866 contributed a survey of the subject to the Mededeelingen of the K. Akad. van Witensch. (Amsterdam), and in 1870 published Catal. Musei Botanici (Leyden, part i., Flora Japonica) on the basis of the rich collections of the Leyden Museum. Much interesting matter will also be found in Rein’s contributions to Petermann’s Mittheilungen, 1875 and 1879 ; in the Mittheil, der deutsch. Ges. Ost-Asiens ; and in Knipping, “ Ozaka, Kidto, &c., in Nippon’ in Petermann’s Afittheil., 1878. It has been shown that the Japanese flora as a whole has a great similarity not only to that of the neighbouring Asiatic continent but also to that of North America, the coincidences being most frequent, however, not with the flora of the eastern but with that of the western coast.

27 Blakiston and H. Pryer, in their “Catalogue of the Birds of Japan” (Trans. of the As. Soc. of Japan, 1880), mention three hundred and twenty-five species of birds, and they do not consider the list as anything like complete. Or these, one hundred and eighty species also occur in China, and about one hundred are identical with those of Great Britain. The Straits of Tsugaru (15 or 20 miles across) appear to be a line of zoological demarcation, as neither the sheep- faced antelope (Nemorhedus crispa), the Japanese monkey (Innuus

Birds.

Fishes.

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Japan by the cormorant, the crane (Grus leucauchen, Jap. Tan-chiyan, is the national crane), wild goose (at least eight species), swan (Cygnus musicus), mallard, widgeon, teal (four species, including falcated teal or Yoshi-gamo), pheasant, woodcock, wood-pigeon, plover, and snipe. There are also found the bittern, the heron, and the white wader, commonly known as the "paddy-bird." Prior to 1868 there existed very stringent laws prohibiting the ordinary Japanese from shooting or snaring the crane, goose, or swan. One species of bittern was even deemed worthy of a special rank of nobility, and is to this day known as the go-i sagt, or " bittern of the fifth grade,"—a quaint conceit, reminding us of the well-known jest of Henry VIII. in knighting the loin of beef. Many varieties of domestic fowls exist, the tiny bantam being one of the most cele- brated ; there is also a large game-cock said to have been originally imported from Siam. Flocks of tame pigeons are to be seen in nearly every farm-yard. The lark, swallow, and common sparrow are as numerous as in England. One of the most beautiful birds is the drake of the species generally called the " mandarin-duck " (Azx galericulata, Jap. Oshi-dort), found on small streams in country districts. When in full plumage this drake pre- sents an exquisite combination of bright colours, and two broad feathers, of a deep golden tint and shaped like a fan, stand erect above the back from under the wings, The Japanese fisheries are marvellously productive, and afford occupation to the inhabitants of the countless villages along the coasts. Herrings are caught off the island of Yezo, and the bonito, cod, sole, crab, and lobster are found in great plenty on nearly every part of the coast. In some of the rivers in Yezo, and also in the Tonégawa, fair-sized salmon are caught ; and there is also a fish very much resembling the trout. The ¢az, a large fish of the carp species, is esteemed a special delicacy: of this there are two varieties, —the red ¢az, caught in rivers with sandy beds, and the black ¢az, found at the mouths of streams where the darker soil of the sea bed commences. Eels, small carp, and fish of many other kinds are freely taken in nearly all the minor lakes and streams. The oyster is found in considerable quantities in the

shallows at the head of the Bay of Yedo and elsewhere. To any student of zoology a visit to Japan would prove in the highest degree interesting.' Communication.—The means of transport, although not exceptionally good, have yet improved considerably during

speciosus), nor the boar (Sus leucomystax) have crossed into Yezo. Heralda glacialis, Tetrates bonasia, Picus minor, Dryocopus martius, Corvus corax, Ampelis garrula, Acredula caudata, Leucosticte brun-neinucha, Gecinus canus, Garrulus Brandti, are apparently confined to Yezo, while Lobivanellus inornatus, Phasianus versicolor and Phasianus Semmeringii (the two species of pheasant peculiar to the country), Gecinus awokira, Cyanopica cyanus, Garrulus japonicus, Acredula trivirgata, are not found north of Tsugaru Straits. One species of cuckoo (Hierococcyx fugax, Horsf.) is supposed to portend earth- quakes, its cry resembling the Jap. jishin, earthquake. Among favourite cage-birds are Zosterops japonica (Jap. Metro); Parus varius (Jap. Yama-gara); the Japanese nightingale, Cettia cantans (Jap. Uguhisu) ; the thrush, Turdus cedis (Jap. Kuro tsugu); aud Emberiza sulphurata, the bunting. The robin, the most expensive bird sold by the dealers, seems to be imported from Corea. Compare Temminck and Schlegel, Fauna Japonica, and papers by Blakiston, H. Whitely, and Swinhoe, in bis, 1862, 1867, 1874, and 1877.

1A, R. Wallace has devoted a chapter of his Island Infe to the treatment of Japan and Formosa. He points out that 40 species of mammals are known to exist in Japan, and that 26 of these are peculiar; whereas of the 165 land-birds already registered ouly 16 species are peculiar. He gives a list of 40 species of birds which are common to Great Britain and Japan, and adds that it does not sufficiently indi- cate the resemblance, as there are many birds which, though distinct species from the British, have the same general appearance. Bleeker, the great Dutch naturalist, has Bydr. tot de kennis der ichthyol. fauna van Japan (Amsterdam and Batavia, 1854, &c.), and "Enumération des espéces de poissons actuellement connus du Japon," in Verhandl. der Kon. Akad. v. Wet. (Amsterdam, 1879). See also Adams's Travels of a Naturalist in Japan and Manchuria (London, 1870).°

the past few years. in Japan, both very short. The first (opened to traffic in 1872) runs from Tokié to Yokohama, and is but 18 miles in length. Shortly afterwards a line of about the same length was completed between the port of Hidgo and the city of Ozaka, and this line was in 1877 extended from the latter place to the city of Kidto, the opening ceremony taking place on the 5th of February in that year. Both these lines were opened by the emperor in person. Surveying operations have been going on for some years, with a view to the construction of other railways, and in some districts the direction of future lines has already been staked out. Mention has been already made of the great facilities for transport afforded by the network

of small streams throughout the country. The system of Roads.

roads, too, is very fair, although in remote districts the work ‘of supervision and repair is not done so carefully as is really necessary. Of the highways the Tokaid6 is that best known to foreigners. This is nearly 307 miles in length, and connects Kidto and Tékié. Its course lies along the south-eastern coast of the main island, and it is the only road in the country which is named after the circuit that it traverses. Dr Kaempfer, one of the early residents in the Dutch factory at Nagasaki, gives in his well-known History of Japan a graphic and entertaining account of his journey from Nagasaki to Yedo in 1691, part of which he made by the Tékaidd. One of the most remarkable works recently completed by Japanese labour, without aid from foreign engineers, is a tunnel on this road. It is situated about 6 miles to the westward of the large town of Shidzuoka, and about 106 miles west of TOki0. The tunnel is cut through a high ridge of hills intersect- ing the Tékaidd. The old line of road passed over the summit of the ridge, but this engineering work renders the journey far shorter and easier. A good roadway, some 18 feet in breadth, leads up the ridge on either side, m a zigzag .direction, so as to admit of wheeled vehicles pass- ing along it with perfect safety; and the tunnel runs through the centre of the hill, thus connecting the two roadways. The passage is about 200 yards in

length; at the eastern end it is faced with stone, then the roof is supported by timber arches for some distance; a small portion is next hewn out of a stratum of solid rock ; and finally the timber arches are again continued as far as the western extremity. The breadth throughout is about 12 feet, and the height about 10 feet. As the tunnel runs in a curved line, owing to the formation of the hill, and is thus very dark, lamps are placed in it at intervals; while at each end are fixed in the ground several posts, each sur- mounted by a brightly polished oblong plate of tin, to reflect the rays of the sun into the interior. This important work was commenced in 1873, but was not completed until March 1876. Another road between Kidto and Tdkié is the Nakasendé, also called the Kiso-kaidé ; this runs through the heart of the country, to the north of the Tokaidé, and is a little over 323 miles in length. Some of the hill scenery on the western half of this road is exceptionally grand ; the elevation in many parts is so great that in winter the roadway is much obstructed by snow. The longest high road in Japan is the Oshiu-kaidé, running northward from Tékid to Awomori on the Tsugaru Straits. It tra- verses the provinces of Musashi, Shimotsuké, Iwashiro, Rikuzen, Rikuchiu, and Michinoku, and its length is given at nearly 444 miles. Two roads from Toki6 to Niigata exist, the longer being about 264 and the shorter about 225 miles in length ; the latter is said to be impassable in winter. Neither of these possesses a name, and for a considerable distance each is identical with the Nakasendd, Another road, which, though far shorter than those already men- tioned, still possesses great interest for the traveller on

There are but two lines of railway Railway.

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account of the beauty of its mountain scenery, is the Késhiu-kaidé. It unites Tékié and Kéfu, the chief town in the province of Kai, and is 77 miles in length; from K6éfu a continuation of it joins the Nakasendé at Shimo- no-suwa, in the province of Shinano, some 32 miles further. To the west of Kidto lie many other roads, but they are of less importance

because there is little traffic in the Sanind6, while that of the Sanyédé6 is conducted injunks which ply on theInland Sea. In the islands of Shikoku and Kiushiu the roads are stated to be very bad, particularly in the inountainous regions lying in the southern portion of the latter, on the confines of the provinces of Hiuga, Higo, and Satsuma.

The question of road superintendence is one of which the Japan- ese Government has fully realized the importance. Ata general assembly of the loeal prefeets held at T6kié in June 1875 there was brought forward a bill to elassify the different roads throughout the empire, and to determine the several sourees from which the sums necessary for their due maintenanee and repair should be drawn. After several days' discussion all roads were eventually ranged under one or other of the following heads :—

I. National roads, consisting of—

Class 1. Roads leading from T6ki6 to the various treaty

orts.

Clase 2. Roads leading from TOkié to the ancestral shrines of Japan in the provinee of Isé, and also to the various fu ("eities"), or to the military stations.

Class 3. Roads leading from Tékié to the various ken ('* prefecture") offices, and those forming the lines of connexion between the various fu and military stations.

lI. Ken (" prefecture ") roads eonsisting of—

Class 1. Roads conneeting different prefectures, or leading from the various military stations to their several out-

osts.

Class 2. Roads eonneeting the head offices of the various eities and prefectures with their several branch offices.

Class 3. Roads conneeting noted localities with the chief town of such neighbourhoods, or leading to the seaports eonvenient of aecess from those loealities.

III. Village roads, consisting of—

Class 1. Roads passing through several localities in sueces- sion, or merely leading from one loeality to another.

Class 2. Roads specially constructed, for benefit of irrigation, pasturage, mines, manufactories, &e., consequent upon measures determined by the local population.

Class 3. Roads construeted for the benefit of Shinté shrines, Buddhist temples, or for cultivation of rice-fields and arable land.

Of the above three headings, it was decided that all national roads should be maintained at the national expense, the regulations for their repair, cleansing, &¢., being entrusted to the care of the

usually employed. In the eity of Tékié alone there exist over 10,000 of these jin-riki-sha, and various improve- ments as regards their style, shape, and build have been introduced since 1870, the year in which they first came into use. Many are of sufficient size to carry two persons, and on a good road they travel at the rate of about 6 miles an hour; the rate of hire is about 5d. per Japanese ri, or about 2d. per mile. For the transport of baggage or heavy goods large two-wheeled carts are in use; these are pushed along by four or six coolies. Until very lately the only vehicle employed in travelling was the palanquin. Of these there were two kinds, viz., the norimono, a large litter carried by several bearers, and principally used by persons of the better class, and the kago, still to be seen in hilly districts where carriages cannot pass. The kagois a mere basket-work conveyance, slung from a pole carried across the shoulders of two coolies; and it is easy to see that the

substitution of the wheeled jin-riki-sha drawn by only one man was a great improvement as regards both economy of labour and facility of locomotion. In country districts, and wherever the roads are stony or narrow, long strings of pack-horses meet the eye. These animals are shod with straw sandals to protect the frog of the hoof, and their burden is attached by ropes to a rough pack-saddle without girths. They go in single file, and move only at a walk. To their necks is attached a string of small metal bells,—a survival of the ancient usage whereby a state courier was provided with bells to give timely warning of his approach at the different barriers along his route, and so to guard against any impediment or delay. The peasants also often employ oxen as beasts of burden in hilly regions ; these animals, too, are shod with straw sandals, having a portion raised so as to fit into the cleft in the hoof. Burdens of moderate weight are usually carried by coolies, one package being fastened at each end of a pole borne across the shoulder. In remote districts even the Government mails are thus forwarded by runners. In all the post- towns and in most of the larger villages are established transport offices, generally branches of some head office in the capital, at which travellers can engage ja-riki-sha, kago, pack-horses, and coolies, or make arrangements for forwarding baggage, &c. The tariff of hire is fixed by the Government, and this is paid in advance, a stamped

prefectures along the line of route, but the cost ineurred being paid from the imperial treasury. Ken roads are to be kept up by a joint contribution from tho Government and from the particular pre-feeture, each paying one-half of the sum needed. Village roads, being for the convenience of tho local distriets alone, are to be

receipt being given in return, Most of the inns in the Travel- post-towns subscribe to one or another of the so-called ling travelling guilds, each of which has a head office in eis. T6kid, and often in Kiéto and Ozaka. Upon application

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Vehicles,

maintained at the expense of sueh districts under the general super- vision of the corresponding prefeeture. The width of the national roads was determined at 7 ken! for class 1, 6 ken for elass 2, and 5 ken for class 3 ; the prefeeture roads were to be from 4 to 5 ken ; and the village roads were optional, according to the necessity of the ease.

On most of the high roads run small stage waggons of various sizes, but these are as a rule badly made, insecure, and for the conveyance of passengers alone. In the mountainous regions, and especially in the hills immedi- ately behind the foreign settlement (Kéb¢é) at Hidgo, in the provinee of Setsu, small bullock cars are to be seen. These are roughly made of untrimmed timber, and are anything but strong; each rests on three wheels of solid wood, and is drawn by one bullock. They are, however, very useful for the conveyance of blocks of stone from the hills, and for rough country work. In the large towns, and also on all fairly level roads, passengers may travel in small two-wheeled carriages called jin-riki-sha ; these are in shape like a miniature gig, and are as a rule drawn by a single coolie, though for rapid travelling two men are

11 ken=714 inehes.

at this office, the traveller can obtain a small book furnish- ing general information as to the route by which he pro- poses to proceed,—such as the distances between the halting places, the names of rivers and ferries, and hints as to places of interest along his road. It also contains a full list of the inns, &ec., enrolled on the books of that guild, a distinction being made between lodging-houses and places where meals alone are provided. To this list each landlord is obliged, at the traveller's request, to affix his stamp or seal at the time of presenting his account ; and by this system cases of incivility or overcharge can be reported at the head office, or application made there in the event of articles being forgotten and left behind at any inn. The Japanese themselves seldom travel in the interior except under this system, and were foreign visitors only to follow their example they might avoid a good deal of the incon- venience they not unfrequently experience.

Towns.—'The towns and villages are very numerous along Cities.

the line of the great roads. The three great cities are T6kié The last-named was the

(Yedo), Ozaka, and Kidto. }

ancient capital, and had been in existence for centuries

before T6ki6, and also for a very toni time before RO is

Treaty ports.

Castle towns.

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Ozaka was built. Now, however, these two have rapidly outstripped Kidto both in size and importance, and are in fact the two great centres of trade throughout the whole country. The emperor's court now resides at T6kid, and it is there that the foreign legations are stationed. The city of Ozaka (often wrongly spelt Osacca) is purely mercantile ; it is intersected by numberless canals spanned by bridges that are in some cases of great length, and a very large proportion of the buildings are storehouses for merchandise. The Japanese mint (opened in April 1871) is at Osaka. Next in importance to these three cities may fairly be classed the various ports thrown open, under the treaties with Western powers, to foreign trade. Commencing from the north, we come first to Hakodaté (erroneously spelt Hakodadi) in the south of the island of Yezo. There is here no distinct foreign settlement, the houses of the few Europeans being mingled with those of the natives. The chief exports are dried fish and seaweed. On the main island the most northern port is Niigata, in the province of Echigo, where also no foreign settlement as yet exists. The trade is exceedingly small, owing to the bad anchorage. A bar of sand at the mouth of the river (the Shinano-gawa) prevents the approach of foreign-built vessels, and the roads off the river mouth are so unprotected that when a heavy gale blows the European ships often run across to the island of Sado for shelter. Some little trade, however, is carried on, the neighbourhood being very fertile ; rice and copper are the chief productions. Yokohama, about 18 miles

to the south of the capital, and situated on the western shore of the Bay of Yedo, enjoys by far the greater proportion of the whole foreign trade of Japan. The foreign settlement is very large, and numerous bungalows and small villas of the European residents are also built on a hill (known as the " Bluff") overlooking the "settle- ment" proper. The chief exports are tea aud silk; the former goes principally to the United States and to England, and the latter to the French markets. Large business transactions also take place in silkworm eggs and cocoons, as well as in copper, camphor, and sundry other articles of trade. Proceeding westward, we come to the port of Hidgo, in the province of Setsu. The foreign settle- ment, generally called Kébé, is not so large as that of Yokohama, but the streets are wider and more commodious. A railway connects this place with Ozaka, where there is also a foreign settlement, though of very small size. The principal exports here are tea, silk, camphor, vegetable wax, &c. Nagasaki, the best known by name of all the open ports, is in the province of Hizen, in the large south- western island of Kiushiu. The foreign settlement is small, though the native town is of considerable extent. Coal is the staple export. Dr Kaempfer's History of Japan gives a most exhaustive and interesting description of the everyday life of the early Dutch residents at this port, where they were pent up in the tiny peninsula of Deshima (commonly. misspelt Decima or Dezima) in the harbour. Throughout the rest of the country the largest towns are as a rule those that were formerly the seats of the territorial nobles (daimié), and are even now commonly known as "'castle-towns." It is easy to conceive that in the olden days, under the feudal system, the resid. ence of the lord of the district formed a kind of small metropolis for that particular locality; and the importance thus attaching to the castle-towns has in most cases sur- vived the departure of the nobles to the capital. The castles usually stood some slight distance from the rest of the town, often on a hill or rising ground overlooking it. In the centre rose the keep or citadel, a strong tower of three or five stories, commanding the whole of the forti- fications ; this was surrounded by high earthen ramparts, faced on the outside with rough-hewn blocks of stone and

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defended by a moat, which was often of considerable width. The gateways were square, with an outer and an inner entrance, constructed of stone and heavy timbers. The lines of fortification were as a rule three in number. Above the ramparts rose a slight superstructure of wattled stakes, whitewashed on the outside and loopholed for musketry and archers' shafts. The whole produced a very striking effect when viewed from some slight distance, the grey stone and the brighter whitewash showing distinctly from among the dark foliage of the trees in the pleasure grounds within the enclosure. It was not, however, every castle that was built on the scale just described; many of them were exceedingly small, and were defended only by narrow ditches and weak wooden gates, the buildings within being thatched with straw and hardly superior to the ordi- nary peasant's dwelling. Most of these castles have been demolished, but a few yet remain nearly intact to tell the tale of the former pomp and state of the feudal nobility. On the outskirts of the castle dwelt the retainers of the dazmid,

their houses being sometimes situated within the outermost Houses.

moat, and sometimes, again, completely beyond it. The houses of the townspeople still stand in their original positions, They are constructed almost entirely of wooden posts, beams, and planks, the roofs being generally tiled. The floors are raised to a height of about 18 inches from the level of the ground, and are covered with large straw mats an inch and a half in thickness. These mats are nearly all 6 feet in length by 3 in breadth, are covered with a layer of finely plaited straw, and have the edges bound with some dark cloth. The doors to the rooms are formed of sliding screens of wooden framework covered with paper; these are 6 feet high, and move in grooves in the beams fixed above and below them. In the houses of well-to-do persons, these slides are often covered with coarse silken stuff, or formed of finely planed boards, usually decorated with paintings. At one side of the room is generally seen a recess, with a low dais ; on this various ornaments or curiosities are ranged, and a painted scroll is hung at the back of the whole. A few

years back, before the wearing of swords was prohibited, a large sword-rack (often of finely lacquered wood) usually occupied the place of honour on the dais. The ceilings are of thin boards, with slender cross-beams laid over them at intervals. Except in the larger towns, there are hardly any buildings of more than two stories, though the inns and lodging- houses sometimes have as many as four. 'The front of the dwelling is either left entirely open, or, with the better class of tradespeople, is closed by a kind of wooden grille with slender bars. Those who can afford it usually shut in the frontage altogether by a fence, through which a low gateway opens upon a small garden immediately in front of the entrance to the dwelling. At the back there 1s generally another tiny garden. All round the house runs a narrow wooden verandah, of the same height as the floor, over which the roof protrudes; this verandah is completely closed at night or in stormy weather by wooden slides known as " rain-doors," moving in grooves like the slides dividing the rooms in the interior. Next

in importance to the castle-towns come the post-towns Post-

along the high roads, where travellers can obtain accom- modation for the night, or engage conveyances and coolies for the road. The houses are similar to those already described, but are built on a smaller scale, and most of them are thatched instead of being tiled. The inns and tea-houses are the grand feature of these towns; as a rule the accommodation there to be obtained is excellent, though this is of course only on the great highways. In remote country districts the traveller is frequently forced to rough it, and put up with what he can find in the way of shelter. Each post-town possesses an office for the receipt, for-

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Villages, Rural Life.—The agricultural villages are often very poor | courts were fixed as follows :— places, the houses being dilapidated,

and the food and | 1. Tékié court….. “TOki6é fu, Chi clothing of the peasants meagre in the extreme. In many | 2. Kiéto court… ee Shige ken instances the farm-buildings are Seiad ahowmnidaiwes | © OME COUT. .....~~…..., Ozaka fu, Sakai ken, and Wake~~ the rice-fields or on a hill slope, at some little distance | 4 yokoh oe Bag | from the road. Even the women and children go out to B A een ne oo. ae till the ground from early morn until late in the evening, | 6. Kobe Pe neo Bei Okayama ke their labour being sometimes varied by felling trees or | 7 Niigata court….....0.-. Niigata ken. : _ cutting brushwood on the hills. In some localities they A es ema ge A Se ae ake out their means of livelihood by snaring birds, or by | 10. bea Sail eee: OS ee eee ee, aa the- numer 4 as » Urawa Court …..seeceeeecrrens Gumma ken, Saitama ken. g erous ponds an rivulets. Those who | 11. Awomori court….....00 Awomori ken, Akita ken can afford to do so keep a pack-horse or’an-ox’to be used | 12. Ichinoseki court ….... Iwadé ken, Miyagi ken. either as a beast of burden or to draw the plough. The > Yonézawa COUrt…..eeseeee Yamagata ken, F ukushima en. Farming farming implements are in many cases very primitive. i ee Re ae ee Loe alll a The plough is exceedingly small, with but one handle, | 16. Kanazawa court eee on eta ae = * and is easily pulled through the soft mud of the rice- 17, Nagoya Court oo… Aichi ken, Miyé ken. fields by a single pony or a couple of coolies. To Tig Rare On oPeTe ia getessces oss piusieogs er: separate the ears of grain from the stalks the latter are ae a aan al a a bi pulled by hand through a row of long iron teeth projecting | 21. Iwakuni Sta: Gees ae ken, Hiroshima ker from a small log of timber; the winnowing fans are two in | 22. Kumamoto court …..... Kumamoto ken, Oida ken. : number, one being worked by cach hand at the same time. 20- Weag alii iet COMET sp. ~~22~~- ~~ 22 Kogesinima ier, The spades and hoes used are tolerably good implements, Four superior courts, having jurisdiction over the above, but the sickle consists merely of a straight iron blade, some | Y°”® then also established, viz. :— 4 inches in length, pointed, and sharpened on one side, | 5 mays. : Tékié, Yokohama, Tochigi, Ura- which projects from a short wooden handle about 15 inches | *” Maitre een 22: wa, Aichi, Shidznoka, Niigata, long. When the grain is gathered in, the straw is stacked a Ree Rabe Ke in small sheaves and left in the fields to dry, after which | 2. Ozaka superior court Rats ane, Kochi a con it is

used for thatchi hi 7 eal iis aie th iii is atching or as litter for cattle. In the wilder and Iwakuni courts. districts the peasantry are wretchedly poor, and cannot | 3. Miyagi superior court .. Awomori, Ichinoséki, Yonézawa, indeed afford to eat even of the rice they cultivate ; their J ——_ og met eepery food is millet, sometimes mixed with a little coarse 4. Nagasakiisupertonieourt … cee anal oie arley. The potato and the lo i } i i di Se, a eee ele ng radish (daikon) are Small police stations have been erected in all towns Police. .. y r articles of food within their means. | and villages of any importance ; along the high roads the grarian riots are not unfrequently occasioned by bad | system i full ized i eal – sy' s carefully organized and well carried out, though r scarcity from other causes, and the consequences | in distant localities the police force is often wholly inade- are sometimes very disastrous, the peasants, when once | quate to the numbers of the population. The Japanese — being prone to burn or pillage the residences of the | lower orders are, however, essentially a quiet and peaceable ocal officials or headmen of the villages. These riots do | people, and thus are easily superintended even by a ver ere en el oe days from the exactions | small body of police. In the capital and the large Seetisn Be Hie : : Sie : ve ae = ; ere is no doubt that prior to | towns it is a different matter, and collisions frequently lution o ~~69 the peasantry were in too many | occur with the riotous soldi Te ili i etal sod , ; lery. e military stations nt g y oppressed by their feudal chiefs, especially | are established in some of the larger castles throughout on those estates owned by the hatamoto or petty nobility | the country, the rincipal i bei bki6 ee ee ie ntry, principal garrisons being at TOki6, a. SS ' eS an sa or some | Sakura in Shimésa, Takasaki in Kédzuké, Nagoya in , resided continuously in the city, | Owari Ozaka in Setsu, Hiroshima 1 i leaving their fiefs under the control and management of | in Higo. ee Ree "aged 7 other officers; whenever money was needed to Since the restoration of the mtkado Japan has undergone many Internal eP enish the coffers of the lord, fresh taxes were laid on changes. Innumerable measures of reform in the internal adminis~~ adminis- the peasantry, and, should the first levies prove insufficient, eae oS country have been introduced. The former terti- tration. Re eeccactione snore. rando, Under. the | snr tatement and srenow ta comimed with £86 oll oor Se central Government, however, the condition of the | nobles of Kidto, classed under the one

name of lena fez ear qe ee agricultural classes has been greatly ameliorated. “nobles.” They now reside in T6kid, the capital of the empire. fixed land-tax is levied, so that the exact amount of To this class of nobles belongs the former king of the Riukiu dues payable ee eed Inethomevent of Islands. After the kuazoku come two other grades, called respec- amategin h — _ tively the shizoku and the heimin, or, as they may be termed, the one a poor harvests, or similar calamities, Govern- | gentry and commoners. The former comprises the old hatamoto, or aa. ae ants are constantly made to the sufferers. petty nobility of the shégunate, and the samurai, or military Pe a ucation.— Throughout the whole country schools have familics, from whom the retainers of the daimié were recruited. , ganecedeblished forthesu ieot’vlineh tly The heimin include the peasantry artisans, and traders. Thus the ohh ives eae ee ~ ai the Government | ancient “four classes” of the population have been reduced to ee ciablich, ; ance. e cost of tuition in | threc. The han system has been abolished, and the system of ken, th ishments is generally fixed at a rate within | or prefectures, directly under the control of officers of the central – i

GEOGRAPHY. |

warding, and delivery of the postal mails; as a rule the mayor or Vice-mayor of the district is charged with this duty.

bperpment officials appointed by the department of justice at the capital. These courts are placed under a smaller

n i j 1 umber of superior courts, to whieh appeals lie, and these | necessity of paying the incomes

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are in turn subordinate to a su 1 e in reme court of appea T6ki6. : at a

A grand scheme for the capitalization of incomes August 1876. The daimié, on sur- the crown, were relieved from the of their retainers,

and, with the old

become necessary. was put into operation in rendering their muster-rolls to

By a Government edict issued on the 13th of Law- September 1876 the titles and jurisdiction of the various cots

Popula- tion,

kugé class, received certain allowances from the Government. It is probable that only the wealthier nobles found any hardship entailed upon them by this arrangement, for, if we take into consideration the payments that had tobe made by a daimié under the old régime in the way of dues to the shégun and allowances to retainers, &c., it cannot be doubted that the lower grades of the former territorial chieftains are in many cases better off at present than they were before the revolution. Their old retainers, too, received from the Government certain fixed incomes, or pensions, calculated upon their former rates of pay, and thus became direct depend- ants of the nation instead of one particular han. In 1876, however, these allowances to both kuazoku and shizoku alike were commuted, according to an elaborate scheme drawn up by the finance department. Government bonds for a total commutation sum were given to each person, to be paid off yearly, by lot, toa certain amount, and bearing in the mcantimo interest varying from 5 to 7 per cent., due every half year. In course of time, therefore, the Government will be entirely relicved from its heavy responsi- bility in this respect. Amongst other reforms, the wearing of swords by the swmurat was also, about this time, prohibited by public edict. This, as might have been foresecn, occasioned con- siderable dissatisfaction for a while, especially in the southern pro- vinecs of Satsuma and Tosa; but, as it had been wisely prepared for, some time before, by a notification making the carrying of these weapons optional, large numbers of the military class had already discarded them ere the second notico was issued, and the task was thus rendered far more easy of accomplishment. An exception was, however, made in the case of

officers and men of the newly-organ- ized army and navy. These two branches of the public service are now on a fixed system, formed on the model of those adopted by Western nations; and large numbers of foreign instructors have been from time to time employed by the Japancso Government.

Numerous departments or bureaus now exist for the direction of |

public affairs, the principal being those for home affairs, finance, public works, foreign affairs, war, admiralty, education, justice, and police. Many of these are subdivided into several sections, varying considerably in number according to circumstances. The whole constitution is avowedly modelled after the Western systems.

There does not as yet exist any house of parliament, but already the seeds have been sown from which it may rise at some future day. Achicf council, termed the genréin or " senate," exists, and throughout the whole country are found numerous '* assemblies," the members of which are elected by vote. These assemblies, however, do not possess any share in tho administra- tion ; their functions are as a rule very limited, and the subjects discussed by them are chiefly matters relating to roads, drainage, bridges, and other local affairs of but minor importance. The local prefects also mcet at intervals to discuss various points of local interest. There are not wanting indications that the establishment of a parliament, like that of England, would be wel- comed with joy by a very large proportion of the people. The press is under the supervision of the Government officials in cach district, and many restrictions are imposed upon any excess of freedom of speech in the newspapers. The editors have in many instances been subjected to fine or imprisonment for having permitted the publication of certain articles that proved distasteful to the Government. The press laws under which these punishments were awarded were issucd in 1875.

Population.—The number of inhabitants in Japan was until lately very uncertain. To the ordinary traveller it would seem to be very dense, as the roadways are lined with villages; but in the wilder regions the population is widely scattered, and indeed in certain localities not a single dwelling-house is to be seen for miles together. Dr Kaempfer's

ideas on the subject may be taken as rather exaggerated, for it must be remembered that they were derived merely from that portion of the country traversed by him in his journeys from Nagasaki to Yedo. As he visited on his route the large city of Ozaka, and as he then passed along the Tdkaidé—the most populous and fre- quented of all the roads throughout the whole empire—it is easy to understand that his theory as to the enormous population was based upon a very deceptive impression. The total has been generally asserted by the Japanese themselves to be about 30,000,000, the authority being a census made so far back as in 1804. A return compiled in 1875, however, put the exact total at 33,997,449 ; and the still later census of 1880 gave it as 34,338,404, of whom 17,419,785 were males, and 16,918,619 females. The population of the city of T6kid is variously stated, but

is probably not much over 800,000. According to a com- putation made in the year 1870, Kidto had then about 370,000 inhabitants. Next in importance after these two cities comes Ozaka, with a population of 414,000 souls. After Ozaka may be mentioned Nagoya, the chief town of the province of Owari, followed closely by Hiroshima in Aki, Saga in Hizen, Kagoshima in Satsuma, Kanazawa in Kaga, and Himéji in Harima,—most of which are said to possess over 100,000 inhabitants. Fukui in Echizen and Gifu in Mino rank in the second class. Of the ports open to foreign trade, Ozaka being excluded, Nagasaki is said to have the largest population, being very slightly in excess of Yokohama; Hakodaté and Niigata have perhaps about 30,000 each. The foreign communities are very sinall: they may be numbered at a few hundreds at Yokohama, T6kidé, Kébé, and Nagasaki, while at Ozaka, Hakodaté, and Niigata the European residents may be reckoned by tens.1

National Wealth.—Although possessed of considerable National mineral wealth, Japan cannot be ealled a rich country. wealth. The early foreign residents, from the time the treaties were made in 1858 and following years, were perhaps over-sanguine in their expectations. Recent commercial returns show that the balance of trade has been against Japan, her exports being considerably in arrear of the imports.2 Up to the present time this deficiency has been chiefly supplied by an export of bullion, paper money being issued in large

quantities for use in the country itself. ‘The value of the notes now in circulation is very great, and it is hard to say how or when they can be redeemed. The notes issued at the time of the revolution | of 1868 bore an endorsement to the effect that they were to be redeemed within thirteen years ; but, instead of this, l they have been replaced by another issue, without any such endorsement. In 1879-80 the Japanese paper currency , fell to a discount of above 50 per cent. as compared with the silver Mexican dollar in use amongst the foreign merchants.

Public Works.—In spite of these financial difficulties, Public the Japanese have made great advances in public works, works. In the number of its lighthouses Japan may compare favourably with many a Western nation. Though all have been erected by foreign engineers during the past ten or twelve years, there is hardly a promontory or island lying in the direct track of the shipping but is possessed of a lighthouse. Many of the lights are very powerful ; but in localities of less importance, or lying off the track of foreign vessels, smaller junk lights are used. Buoys and beacons of various sizes have been moored in many places. The whole system is under the superintendence of a special Government bureau (the lighthouse department), which despatches steamers at stated periods to make the tour of the coast and convey stores and provisions to the different posts. At the more important lighthouses foreign lightkeepers are employed, but in many instances the service is performed by natives alone. The rocky and dangerous character of the Japanese coasts makes this system one of peculiar utility. As already mentioned, good progress is being made in railway construction. Numerous lines of telegraph have been erected throughout the country, not only between the treaty ports but also in the interior, particularly to the garrison, towns and local Government offices. The mint at Ozaka has been working since the year 1871. At Yokosuka, on the western shore of the Bay of Yedo, are a dockyard and arsenal, superintended by French engineers; these

EE 1 According to an official report published in 1880 there are in Japan 108 towns with 10,000 inhabitants and upwards. 2 The consular trade reports for the open ports in Japan, published yearly in the blue

books, afford minute information on all subjects connected with commerce between Japan and other nations.

Religion.

Shinté.

Bud- dhism,

HISTORY. |

have proved of great utility. Large numbers of foreign men-of-war and other vessels have there been docked and repaired. Paper-mills have been established in different localities, and manufactories of various descriptions started. The postal system is exceedingly well managed, and extends over the whole empire. Attention is also given to custom-house arrangements at the open ports. In the capital there are numerous colleges and Government schools, notably for military, naval, and scientific instruction, conducted in many instances by foreign teachers. The mail service along the coast deserves special mention. The steamers employed belong chiefly to the Japanese steamship com- pany known as the Mitsubishi Company ; these ply along the entire length of the coast and also to Shanghai, passing through the " Inland Sea," and smaller boats run to New- chwang in China, and to the Riukiu islands. The com- pany is subsidized by the Government.

Religion.—The religious beliefs of the Japanese people may be divided under two heads, the Shintd and the Buddhist. By the former is meant the religious belief of the natives prior to the introduction from abroad of Buddhism and the Confucian philosophy.

Shinté means literally "the way of the gods." Though often styled by foreign writers a religion, it really is not one. No condise definition of it appears to exist, but the following are some of its leading points.! It contains no moral code, the writer Motoori (a high authority on this subject, born 1730, died 1801) even asserting that in Japan there was no necessity for any system of morals, as every Japanese acted aright if

he only consulted his own heart. He also declared that the whole duty of a good Japanese consisted in obeying implicitly and without question the commands of the mikado. In Shintd Japan is held to be the country of the gods, and the mzkado to be the direct descendant and actual representative of the Sun goddess. In it there also seems to be mixed up a system of hero worship, many renowned warriors and other personages of ancient days being exalted into what we should term demi-gods; thus it inculcates a reverential feeling toward the dead. By it, too, spiritual agencies are attributed to the elements or natural phenomena. The Shintd shrines throughout the country are built in very simple style, being generally constructed of white wood, unadorned by brilliant colouring as in Buddhist temples, and roofed with thatch. Before each shrine stand one or more tori, archways formed of two upright posts with © projecting cross bar laid on their summits, beneath which is a smaller horizontal beam, the ends of which do not pro- ject. As its name implies, the torz2 was originally a perch for the fowls offered to the gods, not as food, but to give warning of daybreak. This archway gradually assumed the character of a general symbol of Shentd, and the number which might be erected in honour of a deity became prac- tically unlimited. The special peculiarity distinguishing the pure Shintd shrines from the Buddhist temples is the absence of images exposed as objects for the veneration of the worshipper ; but at the same time the former nearly always contain some object in which the spirit of the deity therein enshrined is supposed to reside. The principal Shinté shrines are those in the department of Watarai in the province of Isé, known as Isé Dav-jin-gu (“the great divine palaces of Isé”), and maintained by Government.

The first Buddhist images and Sfitras were brought to Japan from Corea in the year 552, if we can believe the Nihongi ; but it was long before the religion obtained much hold on the people. In the beginning of the 9th century the priest Kikai (now better known as K6bé Daishi) com- pounded out of Buddhism, Confucianism, and Shintd a

1 See also Dr Magel’s papers on “ Les Religions du Japon,” in the Annales de Vextréme Orient, 1878-1879.

system of doctrine called Addu Shinté, the most prominent characteristic of which was the theory that Shinté deities were nothing more than transmigrations of Buddhist divinities. Buddhism, thus fairly introduced, ere long obtained complete ascendency ; it became the religion of the whole nation, and held that position until the Tokugawa dynasty of shégun, when it was supplanted in the intellects of the educated class by the philosophy of Choo He. Its teachings were calculated to awaken man to a sense of his own shortcomings and to cause him to long for perfection ; it encouraged belief in a succession of lives and trans- migration of souls; and the highest reward promised to the true believer was to be absorbed into Buddha and to attain to absolute perfection. Under the Tokugawa family, many grants were made from their treasuries to famous Buddhist temples, notably to that of Zdjdji in the district of Shiba, in Yedo, which was endowed by Iyéyasu himself in the concluding years of the 16th century. These grants were, however, withdrawn after the restoration of the mikado in 1868, and Buddhism has been virtually disestablished since Ist January 1874. Many temples are still kept up, but these are maintained by voluntary contributions from the people and from former patrons,

Since the admission of foreigners into Japan, various Christian missions have been established, principally in Tokid and Yokohama, and a tolerably large number of missionaries reside in different parts of the country. Churches have been built, and schools opened for the instruction of children. Christianity is no longer pro- hibited, as of old, by Government edict, and the number of the native converts is said to be increasing.”

HIsToRY.

The ancient history of Japan, as recorded in the native annals, is Early so completely enshrouded in mythological legend as to be absolutely legends.

untrustworthy. In these legends numerous deities play a conspicu- ous part, the country itself being styled the "'land of the gods," and the pedigree of the sovereign traced back to Tenshé Daijin, the "Sun goddess." It is asserted that there first existed seven generations of "heavenly deities," who were followed by five generations of 'earthly deities," who in turn were succeeded by the mortal sovereigns, of whom the present mikado or emperor is the 122d. The earliest date accepted amongst the Japanese them- selves corresponds to 660 B.c., when the first emperor (Jimmu) succeeded to the throne. The present year (1881) is thus the 2541st year of the Japaneseera. The long line of sovereigns comprises one hundred and eleven emperors and cleven reigning empresses. A strong ground for disbclieving the accuracy of ancient Japanese chronology, even after 660 B.c., is the extraordinary longevity assigned by it to the early mikados. Of the fiftcen emperors from Jimmu onwards, eleven are said to have lived considerably over one hundred years ; one of them, Suinin, reached the age of one hundred and forty-one years, while his successor Keiké attained to one hundred and forty-three. After the year 399 A.D., however, these wonderful assertions are no longer made. From the com- mencement of the 10th century the Japanese annals are more to be trusted, and, although many discrepancies no doubt exist, still the events recorded are generally accepted as authentic.

The precise origin of the Japanese race is by no means easy to Origin determine, and it would scem probable that it is an amalgama- of the The present Aino tribes of the Japanese.

tion of several different races. island of Yezo are supposed to be the descendants of the ancient aborigines of the empire. These aborigines, or "' savages," as Japanese historians are wont to style them, were at first spread over by far the greater portion of the country, but were gradually driven towards the north by an opposing race who advanced from the south-west.4 This latter race, the ancestors of the present true wh emer nn pre ge eg ee ee ee

2 On July 1, 1878, the nine American and six British Protestant missions in Japan had 104 inissionaries (77 American), 26 churches,

113 chapels, &e., 1617 church members, 3 theological schools, 173 students, 9 ordained preachers, and 93 assistant preachers, besides many largely attended schools for ehildren. The Roman Catholies and the Greek Church claim many eonverts also.

3 See William Bramsen's Japanese Chronological Tables, A.D. to 1873.

4See D. N. Anutschin, "Der Vélkerstamm der Ainos," in Russ. Rev., 1877 ; and L. de Rosny, " Etude sur les Aino," Congr. intern. d. scienc. géogr., Paris, 1878.

from 645

Relation of the mikado and military class,

Taira and Mina- moto clans.

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Japanese people, are by some writers supposed to have been of Chinese origin; and Japanese annals certainly make mention of such a colony as founded during the reign of the seventh emperor, K6rei (290-215 B.c.). It is, however, beyond all doubt that tho Malay tribes are also represented in the Japanese people, and his- tory further notes an invasion by " black savages," which would seem to point to the natives of Papua or New Guinea. From the relative pea of Japan and Corea, too, it seems probablo that some of the inhabitants of the latter place may also have crossed the narrow seas dividing them from Tsushima and the main island of Japan. Ethnologists are not unanimous in their opinions on these points, but it is generally conceded that thero did exist an ancient indigenons race, who were subsequently subjugated and driven towards the north by certain tribes advancing from the south- west. Thus, in the early history of Japan we find that Kidto and tho provinces immediately aronnd it were occupied by the con- querors, from whom descended the modern Japanese ; while the aboriginal tribes were with difficulty restrained and pent up in the eastern and northern regions.

The mikado himself dwelt at Kiéto, with his court. The nobles composing the court were styled kugé, and were themselves descended from cadet branches of the imperial family. There was but one sovereign, and to him the whole empire owned allegiance ; he lived in extremely simple style both as regards food and dress, and rode out to the chase surrounded by his retainers. But the inroads of the savages on the eastern borders necessitated constant and vigilant measures for their repression. In such expeditions, however, no special class of generals was created ; everything was ordered in the namo of the mzkado himself, or in some cases an imperial prince acted as his representative, so that in no instance did the power even appear to pass from the hands of the sovereign. In the Middle Ages, however, the Chinese military system was adopted as a model, and generals were appointed ; the able-bodied males in each province were formed into distinct military corps, and men were told off according to the muster-rolls to garrison the capital or to guard tho frontiers. Expeditions wero carefully organized, being placed under a general (shégun), who was assisted by subordinato officers. All weapons of war and other appliances were kept in tho military stores, and issued as occasion required ; when warlike operations were suspended, the arms were returned to the stores for safe keeping. As time passed on the powerful family of Fujiwara began to exercise the administrative power hereditarily, in virtue of its rolationship to the throne by the female side, and it then became the usage that high descent should be tho only qualification for office. The rank and title of general were con- stantly conferred on the two rival clans of Hei and Gen, or Taira and Minamoto, as they are also termed. Uponthis there first arose the expression " military class," and during the period 770-780 the complete severance of the agricultural class and the soldiery took place. From this time onwards the military domination acquired yearly greater strength, while the power of the mikado decreased in proportion. The turbulent conimon people of the provinces of Oshiu, Déwa, and the Kuanté were always in the possession of armour and horses, and openly styled themselves "warriors." In the 10th and 11th centuries the clans of Taira and Minamoto increased in warlike power and influencc, became deadly rivals, and virtually ruled the whole country, all the in- habitants owning fealty to one or other of the two

factions. A terrible civil war ensued, extending from the middle to the end of the 12th century, when the Taira clan was annihilated by its rivals, who thereupon seized the supremacy. They in their turn succumbed and were succeeded by others, down to the last dynasty (that of the Tokugawa family), which existed from 1608 till 1868. All this time the mikados were in reality merely puppets swayed at will by the military faction in power at the time ; the ancient stato of affairs was overthrown, and the sovereign himself was kept almost a prisoner in his palace at Kidto. In 1868, how- ever, the revolution shattered the might of the then rnling clan of Tokngawa, the restoration of the mikado was effected, and the present position of the sovereign is at last almost perfectly similar to what it was in the very ancient times.

The most interesting portion of Japanese history is that of the rise and fall in the Middle Ages of the warlike families which in turn seized the power and overawed the crown. Of these the Taira clan stands pre-eminent, though much of its history is mixed up with that of its rival, the Minamotoclan. The two came first into notice in the 10th century, and qnickly increased in influence and strength. It would appear indeed that the court strove to play off the one against the other, being moved by fear that the power of either might become too great. Thus, if one of the Taira rebelled, the Minamoto were authorized by the emperor to subdue him ; while, if any members of the latter clan proved unruly, the Taira were only too glad to obtain an imperial commission to proceed against them. This gave rise to incessant intrigue and frequent bloodshed, ending at last, inthe middle of the 12th century, in open warfare. Taira no Kiyomori was at that time the head of his clan ; he was 2 man of unscrupulous character and unbounded ambition,

and constantly strove to sccure offices at court for himself, his family, and his adherents. In 1156-59 severe fighting took place at the capital between the rival clans, oacli side striving to obtain possession of the person of tho sovereign in order to give some colour of right to its

actions, In 1159 Kiyomori eventually Taire triumphed, and the sword of the executioner ruthlessly completed supre. the measure of his success in the field. Nearly the whole of the macy Minamoto chiefs were cut off,—among them being Yoshitomo, the ‘ head of the clan. A boy named Yoritomo, tho third son of Yoshitomo, was, however, spared through the intercession of Kiyomori’s step-mother ; and Yoshitsuné, also Yoshitomo’s son by a concubine, was, with his mother and two brothers, permitted to live. Yoritomo and his half-brother Yoshitsuné were destined eventually to avenge the death of their kinsmen and completely to overthrow the Taira house, but this did not take place till thirty years later. Inthe meantime Kiyomori’s power waxed greater and greater ; he was himself appointed daijé-daijin (“‘ prime minister”), and he married his daughter to the emperor Takakura, whom, in 1180, he forced to abdicate in favour of the heir-apparent, who was Kiyomori’s own grandson. After raising his family to the highest pinnacle of pride and power, Kiyomori died in 1181, and retribution speedily overtook the surviving members of his clan. The once almost annihilated Minamoto clan, headed by Yoritomo, mustered their forces in the Kuanté and other eastern regions for a final attempt to recover their former influence. Marching west- wards under the command of Yoshitsuné, they started on onc grand series of triumphs, terminating (1185) in a crowning victory in a sea-fight off Dannoura, near Shimonoséki, in the province of Chéshiu. The overthrow of the Taira family was complete : the greater number perished in the battle, and many were cither drowned or delivered over to the execntioner. The emperor himself (Antoku, 82d of his line), then only in the seventh year of his age, was drowned, with other members of the imperial house. The Taira supremacy here came to an end, having existed during the reigns of nine emperors.

The period of the Minamoto supremacy lasted from this time Mina-

until the year 1219, Yoritomo was the leading spirit, as his sons moto

Yoriiyé and Sanétomo, who succeeded him in turn, did not in supre-
Having secured himself against macy.

any way attain to special fame. molestation from the Taira, Yoritomo directed his efforts sys- tematically to the consolidation of his power in the east. Com- mencing from the Kuanté, he soon ovcrawed the whole of the northern provinces, and also extended what was virtually his dominion to the westward in the direction of Kiéto. Kamakura, a town on the sea-shore in the province of Sagami, an old seat of the Minamoto family, was made his metropolis. The site of this town faces the sea, and is conpletely shut in on the rear by a semi- circular ridge of steep hills, through which narrow cuttings or passes lead to the country beyond. Under Yoritomo Kamakura prospered and increased in size and importance ; a large palace was built, barracks were erected, and it became the capital of the east of Japan. In the year 1192 the emperor Takahira (also known as Go-Toba no In) issued a decree creating Yoritomo Se7-t-tai-shégun Sh (literally, " barbarian-subjugating generalissimo"'), and despatched ate. an imperial envoy from Kiéto to Kamakura to invest him with the office. He andeach shégun who came after him were thus nominated commanders-in-chief, holding the office by order of and investment from the emperor, to preserve peace and tranquillity on the eastern marches of Japan. 'his has given rise, in numerous works ou Japan published by different authors (Dr Kacmpfer among them), to the common assertion that Japan possessed ¢wo emperors,—the one "spiritual," residing at Kidto, and_the other '*temporal," residing at Kamakura and afterwards at Yedo. This idea, though entirely crroneous, is not unnatural; for, although each succes- sive shégun owned allegiance to the emperor and was invested by the latter, still his own position as supreme head of the military organization of the country and his influence over the powerful ter- ritorial nobles made him de faeto almost the equal of a sovereign his ownright. This condition of affairs continued until the revolu- tion of 1868, when the shégun's power was shattered, the military domination swept away, and the mikado reinstated in his early position of supreme authority. Yoritomo's two sons Yoriiyé and Sanétomo were in turn invested with the office of shégun; they both dwelt at Kamakura. In 1219 Sanétomo was killed by Yoriiyé's son, in revenge for the supposed murder of Yorliye him- sclf, and, as he died without issue, the main linc of the Minamoto family thus came to an end. , va Upon this commenced the supremacy of the H6jé family, who had H6jé for ycars been

adherents of the Minamotos. g having failed, the office of shégwn was conferred upon different members of the illustrious house of Fujiwara, who all resided at Kamakura. The military administration, however, was invariably in the hands of the Héjés, who acted as regents of the shégun ; their supremacy lasted from 1225 to 1333, through what are com- monly called the "scven generations of the H6j6 family. —_— event of principal importance during this period was the repulse of inva the Mongol invasion, which occurred in the year 1281.

dgun-

The heirs of the latter family.

The Mongol

Kublai sions.

Two bythe Mongols. In 1381, towards the close of the HOj6 supremacy, force. A similar course was adopted by the successors of Iyémitsu, courts. the succession to the crown was disputed, and from that time until | and this system prevailed until the fall of the Tokugawa dynasty 1392 there existed two courts, known as the northern and the | in 1868. Under their rule, however, Japan enjoyed the benefit of southern ; in the latter year, however, the southern dynasty (estab- | almost uninterrupted peace for more than two hundred and fifty lished at the town of Nara, near Kiéto) handed over the regalia to | ycars; and though the burden imposed by them grew in the end too the emperor Go-Komatsu, who from that time was recognized as heavy to be longer borne, it was only cast off after fifteen members of the legitimate mikado. During the period of anarchy and civil war | the clan had in turn succeeded to the chieftainship. Instead of being, that took place in this century, Kamakura was attacked and | as of old, one united empire acknowledging as its sovereign the destroyed, in 1333, by Nitta Yoshisada, head of a family descended mikado alone, Japan was now portioned out into numerous fiefs, in Han from the Minamoto clan. The rule of the Héjés was thus termin- | many ways resembling petty kingdoms. Lach fief or territory was system. ated, and by 1838 the family had well nigh disappeared. ruled by a han or clan of which the

daimié was the chief, assisted by During the confusion and disturbance created by the contest | hereditary karé, or '¢ councillors," and other officials, According between the rival courts, and also throughout the whole of the | to the will of each daimié did the usages and rules to be observed 15th century, Japan was devastated by fire and sword in civil wars | in the respective fiefs differ. Districts actually adjacent to each of the most terrible description. Several families endeavoured in | other might be placed under totally opposite regulations, both as snecession to acquire the supremacy, but none were able to wield | regards taxes and imposts and with respect to the paper money there it long. The dynasty of shégun (the Ashikaga line) proved bad in circulation. The various han issued notes of different denomi- rulers, and, though the families of Nitta, Uyésugi, and others came nations, for use in that one district alone, and this was done with- Later prominently into noticc, they were unable to pacify the whole | out the slightest reference to the paper currency of neighbouring Héjo empire. In the early part of the 16th century what was termed fiefs. The permission of the shégun's ministers at Yedo had to be family. the 'later H6j6" family arose in the Knanté, and for "four obtained for the purpose, but it is beyond all doubt that large quan- generations" established their chief seat at the town of Odawara, in tities of paper money were issued by the han, when pressed by want the province of Sagami, immediately to the east of the Hakoné | of funds, without any such authority. The chief evil was that hills. At this time, too, lived the famous generals Ota Nobunaga | these notes were only local currency, and did not pass frecly Hidé- and Toyotomi Hidéyoshi. The latter is perhaps best known to | throughout the whole country ; thus a person undertaking a long yoshi. Europeans as the Taiké Hidéyoshi, or simply as Taiké-samia, "my journey might be put to considerable inconvenience as soon as he lord the Taiké." aiké, it may here be remarked, is not a name | crossed the boundary of his own clan's territory. The levying of (as commonly supposed) but a title, and signifies literally "great | taxes, too, afforded opportunities for frequent abusc of power: in lord." Another common crror is to speak of Hidéyoshi as the | many an, it is certain, taxes were collected with due regard to shégun ; he never held that office. The 16th century also saw the the condition of the peasantry, but in other instances cruel oppres- first persecutions directed against the native Christians; the |

sion and ruthless extortion were but too prevalent. This, as has religion had becn introduced by the Portuguese in 1549, when already been remarked, was chiefly the case on the estates of the Xavier first came to Japan. In 1586 Ota Nobunaga was assassin- | hatamoto, who enjoyed a life of ease and pleasure in Yedo, and who ated, and the taiké succeeded him in the chief military power. In | cared little or nothing as to the means by which their supplies were 1590 the family of the 'later H6jé" was overthrown by him, and | wrung from their miserable serfs. Some of the dawmié ruled very the town of Odawara taken. Hidéyoshi then bestowed upon his | lar, e territories, —often a whole province or even more ; while others, general Tokugawa Iyéyasu the eight provinces of the Kuanté, at | again, owned an estate measuring but a few sqnare miles. The the same time directing him to take up his residence at Yedo, which | military class, or gentry, who were entitled to wear two swords as was at that period a town of very small importance. Hidéyoshi | a sign of gentle birth, formed the retainers or clansmen of the great died in 1594. nobles, and were recognized as the first of the " four classes " into Toku- The Tokugawa dynasty lasted from the appointment of Iyéyasu | which the whole population was divided. These classes were— (1) The four gawa to the office of shégun in 1603 until the resignation of the last | the military families, commonly known as the samurai ; (2) the classes. dynasty. shégun, Yoshinobu (usually called Keiki), in 1867. This dynasty agricultural or farming population ; (3) the artisans; and (4) comprised fifteen generations of the family, and is undoubtedly the | the mercantile or trading class. But, though by this arrangement most important throughout the whole of Japanese history. Iyé- | the peasants were placed unmediately after the gentry, their lot was lyéyasu. yasu was a consummate politician as well as a succcssful general, undoubtedly far harder than that of the artisans or traders, seeing and to him the powerful territorial nobles (daimié) throughout the that they were at the mercy of any capricious or tyrannical feudal whole country speedily submitted, some from motives of personal noble who might be made lord over the villages in which they interest, and others under compulsion after a crowning victory | dwelt. There existed a small number of independent yeomen obtained over them by the Tokugawa chief at Sékigahara, on the | (called gésh7) who owned no allegiance to any chieftain ; but they confines of the provinces of Mino and Omi, in

1600. This famous | also were included in the second of the "four classes." Tho battle completely established the supremacy of Iyéyasu, and his rule | succession to the shdgunate was vested in the head branch of the was gladly accepted by the country as putting an end to the scencs Tokugawa clan, but, in the event of a direct heir failing, it was of bloodshed and anarchy from which all classes had so severely | determined that the dignity and office should pass to one of the threo suffered for well nigh two centuries back. Under this dynasty of kindred clans of Mito, Owari, and Kishiu, or, failing these, to one of shégun Yedo became a large and populous city, as the presence of the three noble families of Tayasu, Shimidzu, and Hitotsubashi. their court gave a grand impetus to trade and manufactures of all These two lines of kinsmen of the shégun's house were termed the Nobles, kinds. The attendants of the mikado at Kidto were the old kugé, | go-san-ké and the go-san-kié respectively. The ceremonial of in-

HISTORY. |

Khan, founder of the Yuen dynasty in China, had for some years back repeatedly sent to demand submission from Japan, but, this being refused, about 10,000 of his troops attacked 'T'sushima and Oki in 1274. This expedition was repulsed, and some envoys despatched to Japan in 1275 and also in 1279 were decapitated by the regent, H6jé no Tokimuné. Exasperated at this defiance, the Mongol chief collected a mighty armament, which was despatched to Japan in 1281. The numbers of this invading force are by Japanese writers estimated at no less than one hundred thousand Chinese, Mongol, and Corean troops. They descended upon the coast of Kiushiu, where several engagements were fought; even- tually a severe storm destroyed and dispersed the fleet, and the Japanese taking advantage of this favourable opportunity vigorously attacked and completely annihilated the invaders, of whom but threc are said to have escaped to tell the tale. It is not surprising that no further attempt to conquer Japan should have been made

or court nobles, descended from cadet branches of the impcrial linc; they were, as arule, of anything but ample means, yet their rank and prestige received full recognition from all classes. The court of the

shégun at Yedo was, on the contrary, mainly composed of men who were more noted for their territorial possessions and influenccthan for ancient lincage, for skill in warlike accomplishments rather than in literature and art. This court of Yedo was formed from the terri- torial nobles (daimzé), the petty nobility of the Tokugawa clan (called hatamoto), and lower attendants, &c., known as goké-nin. The ha-

forced to attend in Ycdo only at certain stated intervals varying considerably in different cases, and spent tho rest of their time at their castle-towns in the provinces,—their wives and families re- maining behind in Yedo, virtnally as hostages for the good behaviour of the heads of their respective clans. The feudal system was thus introduced by Iyéyasu, but he was too wary to force his yoke in a aS at manner upon the great nobles. He gathered around him

is own immediate adherents, upon whom he conferred the more important positions of trust (notably in regard to the garrisoning of a cordon of minor strongholds around his own castle at Yedo) ; and as the power of his clan became more and more firmly established he was enabled more effectively to impose terms and restrictions upon the daimié. It was, however, reserved for his grandson lyémitsn (1623-1650) to complete the system thus inaugurated: by the latter the nobles were treatcd solely as feudal vassals, and many very stringent regulations for their guidance and direction were put into

vestiture of each shégun by the mtkado was always kept up, the latter being thus still recognized as the sovereign, although there only remained to him the title without the power. The shogun was, in fact, nothing more nor less than the chief subject of the mikado. The chief power and the direction of political affairs were certainly in his hands, but the name of sovereign was never evcn assumed by him; and in point of actual rank the mighty territorial chieftains were held to be inferior to the poverty-stricken nobles of the mikado's court.

The earlier period of the Tokugawa supremacy was disgraced by Persecu- violent persecution of the native Christians. By an edict issued in tions of 1614 by Iyéyasu (who had resigned in 1605 in favour of his son Hi- Chris- détada, but still continucd to exercise administrative functions) tians.

tamoto were originally no less than 80,000 in number, and were in fact the soldicrs composing the victorious army of Iyéyasu and en- nobled by him; they resided continuously in Yedo, very rarcly even visiting their country ficfs. The daimzé, on the other hand, were

Feuds of

nobles.

Appear- auce of

foreign. ers.

Decay of such was not the case.

shégun- ate. Revolu- tion of

1868.

Foreign relations.

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Christianity was finally proscribed, a decree of expulsion was directed against the Jesuit missionaries then in Japan, and persecu- tion raged until1637. In that yearthe peasantry of a convert district in the province of Hizen, oppressed past endurance by the eruelties to which they were subjected, assembled to the number of 30,000, and fortifying an old feudal castle at the town of Shimabara, deelared open defiance to the Government. Iyémitsu, who was then shégun (1623-1650), despatched an army against them, and after a brief but desperate struggle the Christians were all massaered. These stern measures repressed the profession of the religion, but many clung to it in seeret, and several prohibitory edicts were issued through- out the 17th and 18th centuries. So lately, indeed, as 1868 these proclamations might still be seen on the public notice-boards in every Village throughout the country.

Although the Tokugawa period was not disturbed by the warlike expeditions or civil eonfliets from which Japan had until then suffered, there nevertheless existed considerable cause of uneasiness in the numberless intrigues or petty couspiracies whieh prevailed among the great han and in the families of the feudal nobles. The question of succession to the chieftainship of a clan not unfre- quently stirred up strife amongst the retainers, and in many cascs the most unserupulous means were adopted in order to obtain the desired result. Towards the close of the dynasty several con- spiracies were set on foot, but these were promptly stamped out. Japan was now in seclusion from the rest

of the world, the inhabi- tants having been forbidden to leave its shores without express per- mission under pain of heavy punishments; but the direction of the internal affairs of the country was a task that fully occupied the rul- ing house. The jealousy and private feuds of the daimié increased to sueh an extent that on several occasions even the sacred pre- eincts of the shégun's palace became the scene of quarrel and blood- shed, The great nobles gradually rebelled more and more against the rule of enforeed attendance in Yedo, and became far less disposed to brook the restrictions imposed upon them by a lord who was virtually but one of their own class; while to the peasants the feudal system was in most eases exccedingly distasteful. Reaction against the military domination thus set in, and men's eyes natur- ally turned towards the renewal of the ancient régime when the mikado was the sole sovereign, before whose authority every subject, whether gentle or simple, bowed in submission. These, among other eauses, gradually led to the revolution of 1868, by whieh the mikado's power was restored. In the meantime, since 1858, treaties had been made by the shkégun's ministers with several of the foreign powers, and the foreign element had thus been introduced into Japanese political affairs. By some writers undue stress has been laid upon this fact, as if the advent of Western nations had been the main cause of the downfall of the Tokugawa supre- macy. From an attentive perusal, however, of native works treat- ing of political matters for some time previous, it would appear that The decay of the shégunate had gradually been going on for years back ; the whole system was tottering to its fall, and it is not improbable that even in the total absence of foreigners the revolution would have oecurred exactly as it did. The shégun was declared a usurper, and the great clans of Satsuma, Chéshiu, and Tosa warmly espoused the cause of the mikado. The Tokugawa clan did not present any very determined front, and the struggle was exceedingly brief. Some fighting, did, however, take place in the vicinity of Kidto, and also at various points around Yedo; but the most severe confliet was the siege of the castle of Wakamatsu, in Oshiu. This castle was the stronghold of the powerful northern daimié of Aidzu, a partisan of the shégunate ; his troops offered a stout resistancc, but the place was eventually taken by the mikado's army after a siege of some two month' duration. The shégun himself had resigned in 1867, and this

virtu- ally settled the question in favour of the emperor's army, although some desultory fighting occurred both at Yedo and near Hakodaté two years afterwards. In 1869 the official name of Yedo was changed to T6kié (the "eastern capital"), and the mikado re- moved thither from Kiéto with his court. The ex-shégun retired to the town of Shidzuoka, in the provinee of Suruga, where he still lives in retirement, his only title being that of a noble of the empire. The ancicnt form of government was thus restored, and the feudal systein is now a thing of the past.

Since this revolution Japan has become tolerably well known to Europeans. Although her relations with foreign countries were never of any very great importance, they nevertheless commenced at an early date. Allusion has already been made to early Chinese and Corean arrivals in Japan. Dr Kaempfer asserts that in later times young Chinese of good family constantly came to Nagasaki on pleasure excursions. In 201 A.D. the empress Jingé invaded Corea, and gained several victories over the troops that opposed her; and on her return she introduced into Japan the Corean arrangement of geographical division. The Japanese being a maritime nation, it is not surprising that, prior to the edict forbidding them to leave their country, they should have ex- tended their voyages throughout the whole of the Eastern seas, We read of their visiting China, Siam, and India ; indeed at one time

there existed a Japanese colony or settlement at Goa. It ig also known that vessels sailed from Japan to the western eoast of Mexico. The Mongol invasion in 1281 has been already noticed. Inthe 16th century Europeans approached the shores of Japan. As early as 1542 Portuguese trading vessels began to visit the empire, and a system of trade by means of barter was carried on. Seven years later three Portuguese missionaries, Xavier, Torres, and Fernandez, took passage in one of these merehant ships, and landed at Kago- shima in Satsuma. The island of Hirado off the coast of Hizen appears to have been then

the rendezvous of trade between the two nations. From that time commercial relations continued until the Portuguese were expelled the country in 1639. A seeond expedition against Corea was undertaken by the taiké Hidéyoshi in 1592; the Japanese troops not only withdrawn till 1598, and it is interest- ing to note that a number of Coreans were then brought over to Japan, where they practised the art of making pottery. Descen- dauts of these Coreans still occupy a village in the provinee of Satsuma. Towards the end of the 16th century Spanish vessels visited Japan, and in 1602 an embassy was despatched by Iyéyasu to the Philippines; but the relations between the two nations were never very close. The Dutch first arrived in 1610, and from that date down to the close of the Tokugawa dynasty they enjoyed almost a monopoly of the Japanese trade. They at first settled in the island of Hirado, but afterwards removed to Nagasaki, where they were virtually imprisoned in their factory on the small peninsula of Deshima in the harbour, conneeted by narrow eause- ways with the town itself. Dr Kaempfer's History of Japan gives a full and graphic description of the mode of life of the early Dutch settlers ; he himself dwelt in Japan during the rule of Tsunayoshi, the fifth shégun of the house of Tokugawa, 1680-1709. The first Englishman who visited the shores of Japan was William Adams, a Kentish man, who came out to the Kast as pilot to a Duteh vessel. He lived in the city of Yedo for a considerable time in the opening years of the 17th century, during which period he is stated to have frequently been at the court of Iyéyasu. He instructed the Japanese in the art of shipbuilding, and the title of hatamoto was conferred upon him. In 1613 Captain Saris succeeded in found- ing an English factory in Hirado, but it did not exist for any length of time. Finally, in 1854, Commodore Perry's expedition from America took place, when a quasi treaty was made between him and the ministers of the shégunate at Uraga, on the Bay of Yedo; and later in the same year Admiral Stirling coneluded a similar negotiation, at Nagasaki, on behalf of Great Britain. In 1858 these treaties were extended, and others were concluded with the Dutch and French, under whieh the ports of Nagasaki, Hakodaté, and Kanagawa (now known as Yokohama) were thrown open to foreign traders belonging to those nationalitics, from the year 1859. Other European powers gradually followed the ex- ample, and at the present moment Japan is in treaty

with no less than cighteen nations, viz., Austria-Hungary, Belgium, China, Corea, Denmark, France, Germany, Great Britain, Hawaii, Holland, Italy, Peru, Portugal, Russia, Spain, Sweden, Switzerland, and the United States. Prior to the recent revolution the foreign treaties were concluded with the ministers of the shégun, at Yedo, under the erroneous impression that he was the emperor of Japan. title of taikwn (often misspelt tycoon) was then for the first time used; it means literally the " great ruler," and was employed for the occasion by the Tokugawa officials to convey the impression that their chief was in reality the lord paramount. It is, however, worthy of note that even in these earlier treatics the title eorre- ponding to "His Majesty'? was never assumed by the shégun. The actual position of this official remained unknown to the foreign envoys until 1868, when the British, Dutch, and French ministers proceeded to Kidto, and there obtained from the mikado his formal ratification of the treaties already concluded with his powerful subject. Since that time all treaties with Western powers are made out in tho name of the emperor of Japan. It was thus that the foreigners came prominently into notice at the time of the revolution, with which, however, beyond this they had really no connexion.

In 1873-4 Japan sent an expedition against the aboriginal tribes Formosa inhabiting the island of Formosa, off the eastern coast of China, to expedi- demand satisfaction for the murder, some years before, of certain tion.

Japanese subjects who had been shipwrecked on that island. Some skirmishing took place, in which the Japanese gained the advantage. The most important point in the whole matter was the negotiation with China. Formosa is Chinese territory, but the Japanese con- tended that, if the Chinese Government would not exact reparation from the aboriginal tribes, they would themselves attack the latter. This they did, and, although at one period it appeared highly pro- bable that war would be declared between China and Japan, the matter was eventually settled amicably, China paying a sum as indemnity for the outrages complained of.

fired on from a shore fort while engaged in surveying operations close by the Corean eapital. The gunboat returned the fire, and landed a party of men, who attacked and destroyed the fort and stockades, and seized upon the weapons, &e., found in it. Some

The Taikun.

Towards the end of Corean 1875 a dispute arose with Corea, a Japanese gunboat having been disputes.

Satsuma

LANGUAGE. |

diplomatic negotiations ensued, by which the matter was settled peaceably, and on February 27, 1876, a treaty was concluded in Corea, by two Japanese high commissioners despatched for that purpose. Japanese officials and traders now reside in Corea on pre- cisely the same terms as those on which foreigners have dwelt at the open ports in Japan since 1858.

It eould not, of course, be expeeted that the numerous reforms

insurrec- and changes introduced by the present Government would all be

tion. accepted without murmur by the people. Riots have of late years The nouns have no inflexions to distinguish gendcr, number, or occurred in different parts of the eountry among the farming | ease, but they are preceded or followed by particles which serve these classes; and outbreaks of a yet more serious character have been | and other purposes. LExeept in the ease of a few common words, stirred up among the shizoku. The latter took place chiefly in the | no distinction is made between the masculine and the feminine ; western provinces, but were soon quelled. The only one of real | when necessary, however, there may be used the prefix 0 or on for magnitude was the insurrection in Satsuma, which broke out in the | the former, and me or men for the latter. The neuter has no prefix spring of 1877. Excited by

various seditious eries, over 10,000 in- | at all. In general thcre is no mark of the plural, but whenever surgents collected together and marched in a body northwards from | necessary the plural idea may be expressed by the addition of ra, Kagoshima. Their avowed object was to make eertain representa- | gata, domo, tachi, or other particles; a few nouns, again, have a tions tothe emperor in person. Delaying in their advance toattack | kind of plural formed by a repetition of the noun itself. Compound the Government garrison stationed in the castle-town of Kumamoto, | nouns are formed in various ways, the first letter of the second in Higo, the rebels allowed time for large bodics of troops to be | part of such compounds generally changing in sound by the nigori despatched against them from Téki6é. The scene of action was | already noted. – thus confined to the island of Kiushiu, and after severe fighting, The personal pronoun does not demand much attention, except which lasted for several months, the rebels were annihilated, their | as regards that of the second person. Here the word used is differ- leaders either dying on the field or committing suicide. This | ent according to the rank or condition of the person or persons deplorable attempt was, however, useful inasmuch as it proved | addressed. This idca of " honorific" terms is also to be noted in the strength of the Government; and in view of its complete | the use of verbs. Asarule, there are three modes of address,— failure it would seem unlikely that any effort of a similar nature | to superiors, to equals and friends, and to inferiors. The plural should be made in future. The restoration of the ancient régime | of personal pronouns is often formed by the addition of the plural has united and strengthened the empire, instead of letting it remain | particles noticed under the heading of nouns. The personal pronoun broken up into numberless petty territories, each unlike its neigh- | is not to bo used too frequently in speaking; as a rule, it is not bours, as was the case under the old feudal system. employed by natives except where its omission might eause am- : biguity. Possessive pronouns are virtually personal pronouns, eee with the addition of the possessive partieles no or ga. _Dcemon- f strative and interrogative pronouns also exist; by the addition of The Japanese language is by some philologists thought to have | certain particles to the former, the indefinite pronoun is formed, an affinity with the Aryan family; but, as the points of resemblance | There are but few reflective

pronouns, and the relative pronoun are very slight and the differences exeeedingly great, it is evident | does not exist. To express that idea, however, the verb of that, if there be any affinity at all, the divergenee must have taken | the relative clause is put before the word to which the relative place at a period when the eommon ancestor of the Japanese and | pronoun refers. Aryan tongues was a language exceedingly rude and undeveloped. The adjeetive may be declined,—the chief part being what may Nor has any relationship been clearly established with any other | be termed the root, from which (by the addition of eertain syllables) language of Asia. Japanese thus stands, as it were, by itself, and-| various other forms (including the adverb) are obtained. The must be regarded as an almost entirely separate tongue. Japanese adjective has no degrees of comparison, but an idea of Japanese may be considered under the two distinct heads of the | eomparison can be expressed by the use of certain particles and by spoken and the written languages; the former is the ordinary | turning the sentence in a peculiar way. Many nouns do duty as colloquial, and the latter the more elassical style,—of late years | adjectives, and are often eonsidered such. , to a great degree mixed up with Chinese. Aecording to native The verb has no means of expressing the distinetions of number historians, the study of the Chinese elassics was introduced in | or person. In the spoken language there are two conjugations of 285 A.D.; but this assertion may eertainly be questioned, and | verbs, in each of which there are four principal parts, viz., the root, it seems probable that the actual date was considerably later. At | the base for negative and future forms, the present indieative, and the present day, however, the Chinese characters occupy by. far | the base for eonditional forms. To each of the prineipal parts of the most important plaee in the Japanese style of writing. the verb a number of particles or terminations are annexed ; and The Japanese Zana, or syllabary, eonsists of forty-seven syllables, | in this way there arc produced forms somewhat similar to the moods viz., t, 70, ha, ni, ho, he, to, cht, ri, nu, ru, wo, wa, ka, yo, ta, re, | and tenses of European grammars. There are, however, a few 80, tsu, ne, Na, Ta, MU, U, 1, no, 0, ku, ya, ma, ke, fu, ko, ye, te, a, | irregular verbs, in the eonjugation of which slight differences are to sit, ki, yu, me, mt, shi, ye, hi, mo, se, su,—to which may be | be noticed. The conjunetions and the interjections are but few

in added » final. The following modifieations of some of these | number, and do not call for any special reinark.? syllables increase the number to seventy-two :—h and f sometimes In a sentence the first place is occupied by the nominative case, become b or p; ¢ may be modified to d, ts to dz, s to z, sh and ch | the second by the objeetive or other cases, and the last by the verb. toj, andk& tog. This change is called in Japanesc the nigort. The adjective precedes the noun, and the adverb the verb. Pre- PP ei annossipadilikeia in father. positions are placed after the nouns to which they refer. Con- i _ ay , say. junctions and interrogative particles are placed at the end of the oe a ee ,, meet. clause or sentence to which they belong. Po ” ie a The above parts of speeeh are ‘also to be found in use in the Written zm a a at written language. Here, however, there is to be noticed a great lan- I and u are frequently almost inaudible ; in such cases they have | differenee in the inflexions, which are in most eases totally distinct guage. been written , # A final w, in particular, is very seldom sounded | from those used in the ordinary colloquial. Many old expressions in full. The distinction between long and short vowels, and single | and words that have fallen into disuse in conversation are here still and double consonants, demands eareful attention, as the meaning | retained, and the written language is by far the more classical of often depends upon it. Long vowels generally represent the eon- | the two.? traction of two others; thus aw or ow beeomes in sound 6, % In the writing hand at present in usc Chinese characters pre- becomes 4, and so on. The consonants are pronounced as in | dominate. In official documents, despatches, &., the square ehar- English, with the exception of 7, h, f, n, d, t, and g, which differ | acter is eommonly used, generally with Zatakana terminations. In somewhat from the eorresponding English sounds. The true pro- | ordinary letter-writing the cursivo hand, more or less abbreviated, nunciation of these letters must be learned froma Japanese. In tho | is employed, being supplemented, when required, by the hiragana. a case of double consonants, both must be sounded. The characters, though identical with those used in China, are ata

In writing there is a character for each of the forty-seven

kana and syllables given above ; and each character may be written in either

hira- gana,

the katakana or the hiragana style. The former is the ‘square ” hand, consisting in each case of a portion of the particular Chinese character whose sound (to the Japanese ear) is most clearly imitated by the sound of the Japanese syllable in question ; the latter is the cursive or “running” hand, adapted from the katakana charaeters, and having several varying styles. Except by the lower and uneducated classes, these written syllabaries are seldom used in writing letters, &c., unless as mere terminations to be taken in connexion with a Chinese eharacter immediately preceding, as,

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for instance, to mark the teuse of a verb, &. As in writing the pure Chinese eharacters, in the letters of the educated elass, the “square” and “‘running ” hands are also used, the syllabie ehar- acters attached are also, according to circumstances, usually written in the katakana or the hiragana for the sake of appearance.

The spoken language may be elassified under the heads of noun Spoken and particles, pronoun, adjective, verb, adverb, preposition, eonjune- language.

tion, and interjection. There is also a distinct elass of numerals.

arranged in different order, so much so that, though the general meaning and sense of a Japanese document might he intelligible to a Chinese, the latter would scarcely be able to give an exact render- ing of it. The sounds of the eharacters are also in most cases en- tirely

different, the Japanese reading them by what is to them the nearest. approach to the true Chinese pronunciation. Thus, a final

1 The student is referred to the Grammar of the Japanese Spoken Language, by W. G. Aston, M.A. London 1873, from which work the above notes have been compiled.

2 The student is referred to the Grammar of the Japanese Written Language,

by W. G. Aston. Li = 44

Foreign words.

Dialects.

Diction- aries.

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ng preceded by a vowcl in Chinese is generally rendered in Japanese reading by a long 0, while an initial 4 is not unfrequently changed into k. Of late years, since the restoration, there has come into prominent notice an cver-increasing tendency to introduce into ordinary conversation numerous Chinese words that had in many cases been never heard before that time. This style is, of course, affected chiefly by men of Ictters and by officials, and several suc- cessive editions of small dictionaries containing these newly intro- duced expressions alone have been published at intervals; the increase in bulk of the last edition as compared with the first is very peneen unl A rather stilted style of address has always found avour with the military and literary class; the personal pronoun of the second person being usually rendered by the word sensei, "teacher," or kimi, "lord." Intercourse with foreign countries has of late years naturally created a demand for certain words and phrases hitherto unnecessary and consequently unknown, and these have therefore been freshly coined as it were for the occasion. It is worthy of remark that certain European words have for years back been in such common use as to be now deemed actually Japanese.

Among these may be mentioned the following :-— Pan, bread, derived from the Latin, through the Spanish or Italian. Kasutera, a kind of sponge-cake, an adaptation from the Spanish (Castile).

Tabako, tobacco. Dontaku, Sunday, derived from the Dutch.

The English words “minute,” “second” (of timc), “ton,” “electric,” &c., are now freely used, the pronunciation being only slightly at fault. Several Malay expressions have also from time to time crept into use; but these are asa rule heard only among the lower classes at the treaty ports.

Although differences of dialect are distinctly apparent in various localities, these are not by any means so marked as is the case in China. As a rule, a man speaking the pure Yedo dialect might travel through nearly the whole of Japan without experiencing any considerable difficulty ; his words would generally be fully under- stood, though he might now and again be unable to catch the true meaning of the answers he received. In the capital a slight x sound is given before the consonant g, making it almost ng; and in the case of an initial /, a slight sibilant is plainly perceptible, giving almost the sound of sk. The interjection né is often heard in the vulgar Yedo dialect ; it has no meaning, is little used by men, and serves merely to draw the attention of the person addressed. In the north this né is changed to na, and in other parts of Japan to x6. In most of the northern provinces, and also in the far west, a series of aspirate sounds take almost an initial f instead of h ; it is thus apparent, for instance, why the name of the large island off the coast of Hizen is so often termed Firando instead of its true name Hirado. A nasal intonation is very noticeable in Oshiu and other northern districts, particularly in the neighbourhood of Sendai, and this is also heard in the Ozaka dialect. In Ozaka and its vicinity, too, the Yedo né is rendered by the exclamation sakat ; at Kidto, as might be expected, many of the older forms of expres- sion prevail. The Satsuma dialect presents, perhaps, the greatest difficulty : the letter 7, particularly at the commencement of a word, is replaced by a very decided j, and there is a strong tendency to clip off final vowels in all words. This dialect possesses, too, many words peculiar to its own

province, so much so indeed that a conversation carricd on betwecn two Satsuma men is often all but unintelligible toa native of Tékié, although the latter might be able to make himself understood by either of the others. In many country districts also a patois is used known only to the peasants, and presenting great difficulty to any Japanese of the better class who comes from a different locality. Even in cases where the word or expression itself is identical, a peculiar intonation or pro- nunciation so completely disguises it as to convey the impression that it is totally different.

Reading and writing are often almost unknown in remote dis- tricts, and the abstruse Chinese characters are beyond the knowledge of the ordinary Japanese peasant. Some few of the easier charac- ters are uscd, and the kana supplies the place of the rest ; on most of the Government notice boards, &c., and also in the newspapers publishcd for the express benefit of the lower classes, the reading of any Chinese characters used is generally added at the side in kana. It is only among the better-educated ranks that the Chinese writing is well understood and in common use. The dictionaries used are arranged after the Chinese style, each character being looked out, according to the number of strokes contained in it, under its proper radical. The list of radicals is the samc as in China, and they are always printed in regular index form at the commencement of the dictionary. At the side of each character in the work is placed the Japanese attempt at the rendering of the true Chinese sound, and underneath is given the meaning in Japanese colloquial. There are special dictionaries for the running hand. This style consists of the ordinary cursive hand, which is not as a rule very unlike the square hand, and also of what is termed the **grass" hand, which is very much abbreviated and exceedingly difficult to acquire. Unless the square hand of a particular " grass" character be known, it is often wholly impossible to look it up ina

dictionary. The pens and ink used in writing are precisely the same Writing as the Chinese ; the lines of writing are perpendicular, and are

read materials downwards, commencing with the column to the extreme right of and

the reader. The beginning of a Japancse book is thus where our usages,

volumes end. The paper used for letters is thin, and in rolls, the written part being torn off when the note is finished ; for official despatches large ruled sheets of superior paper are now in fashion. The signature of the writer is always placed at the foot of the page, while the name of the person addressed is written near the top, with some honorific title appended to it. Whenever the title of the sovereign occurs in an official document, it is either placed as the first character in a fresh column, or else a small space, generally of size sufficient to contain one character, is left vacant immediately above it. In a letter numerous honorifics are used, and these serve to distinguish the second person ; in speaking of himself the writer omits these, and sometimes also writes the characters in a rather smaller hand and slightly towards the side of the column instead of in the centre. This is of conrse done in affectation of humility, and is a truly Asiatic idea. The honorific expressions applied only to the mikado himself would suffice to compose asmall glossary ; some of these are exceedingly flowery, as, for instance, the “ Phoenix Car,” the “ Dragon Chariot,” the “ Jewelled Throne,” &c.

The language of the Aino tribes in the island of Yezo is totally Aino.

distinct from the pure Japanese tongue. {There does not as yet exist any satisfactory dictionary to throw light upon it,. and it can now only be regarded as a kind of local patois, intelligible to the Ainos alone. Whether this be the descendant of the most ancient form of speech amongst the inhabitants of Japan, it is impossible to conjecture. It does not in sound resemble pure Japanese, being guttural, and spoken in a much lower key.

The natives of the Riukiu group also possess a language of their Riukiu.

own, but this does not differ in any great degree from Japanese. Many of the persons of the better classes speak Japanese with per- fect correctness, and itis also stated that the higher officials are ac- quainted

with the court dialect of China, The Riukiu tongue may be described as nothing more than a very strongly marked dialect of Japanese, and in it there are still preserved many words long since obsolete in Japan itsclf. In writing, the Chinese characters arc chiefly uscd.

LITERATURE.

Literature in Japan has of late years received far more attention and careful study than in ancient times, if we are to judge by the multitude of recently published books as compared with those exist- ing even less than a century ago. The introduction of printing presses with movable type has no doubt been the principal cause of this ; wooden blocks were in use far earlier, but it was a work of great labour to prepare them; and, as only a certain number of copies could be struck from them, in the case of any work much sought after the demand very soon exceeded the supply. As many of the old manuscripts have been set up in type and published in the modern style, there is no great difficulty in procuring specimens of the ancient literature.

In the earliest times Kiéto was the principal if not almost the only seat of learning and literature in Japan. Interminable wars and feuds kept the inhabitants of the eastern portion of the empire too fully occupied with military affairs to allow of their being able to engage in more learned and peaceful pursuits, even had they so wished. The court of the mikado at Kidto enjoyed a far more tranquil existence, and the nobles composing that court devoted themselves with zest to literary pursuits. Poetry was by them held in high honour, and received perhaps the greatcr share of their attention; but the writing of diaries seems also to have been a favourite occupation, and examples of these, still extant, afford a very interesting insight into the mode of life then prevalent at the court and in the neighbourhood of Kidto.

The ancient literature of Japan contains but féw works of a popular character.. Almost everything then composed that is still extant was written by and for tho members of the learned cirele around tho court, and was thus exclusively adapted to the minds of the well-read and highly educated class. Later on, in the 10th century, when the learned were devoted chiefly to the study of Chinese, the cultivation of the

Japanese language was in a great measure abandoned to the ladies of the court. Avery large pro- portion of the best writings of the best age of Japanese literature was the work of women; and the names of numerous poetesses and authoresscs are quoted with admiration even at the present time.

1 The scientific study of Japancse in Europe is of comparatively modern date. The chief names associated with it are Franz von Siebold, J. Hoffmann, Léon de Rosny, and Pfizmaier. Among Léon de Rosny's works may be mentioned Jntro- duction & (étude de la langue japonaise (1857), Manuel de la lecture japonatsé (1859), Recueil de textes japonais (1863), Cours de japonais (1869), Dictionnaire japonais-francais-anglais (Paris, 1857). Pfizmaier is the author of a Japanese-German-English Dictionary (Vienna, 1851), of a Japanese chrestomathy (Vienna, 1847), Untersuchungen tiber den Bau der Aino Sprache (1852), &c., and has pub- lished a variety of critical papers and Japanese texts in the Sitzungsberichte of the Vienna Academy. English workers in Japanese are E. Satow, Aston, Chamberlain, Alcock, Hepburn.

Ancient records.

Later histories.

LITERATURE. |

The earliest of the extant Japanese records is a work entitled the Kojiki, or "Record of Ancicnt Matters," commonly asserted to date from the year 711. Prior to that time, in 620 and again in 681, two other works treating of ancient Japancse history are said to have been compiled, but neither has been preserved. 'The emperor Temmu (673-686 A.D.), according to the preface to the Kojiki, resolved to take measures to preserve the true traditions from oblivion, and he therefore had all the records then existing carefully examined, compared, and purged of their faults. Their contents were then committed to memory by a person in the imperial household, named Hiyeda no Are. Before this record could be reduced to writing, the emperor died, and for twenty-five years Are's memory was the sole

deposi- tory of what afterwards became the Kojikt. At the end of this interval the empress Gemmid (708-715) commanded one of her ministers to write it down from the mouth of Are, and the work was thus ted at the end of the year 711. Soon after this, in 720, another work was completed entitled the Nihongi, or '¢ Japanese Record," which is said to have so far superseded the Kojiki that the latter was almost forgotten. The Nihongi, like the Kojiki, appeared during the reign of an empress (Genshé, 715- 723), and the yet earlier work of the year 620 was commenced under the auspices of the empress Sniko (593-628); the person called Aro is also by some supposed to have been a woman. The Kojiki is to a very large extent pure Japanese, while in the Nihongi there are to be found numerous traces of direct Chinese influence: the chief object of the one was to preserve the form and spirit of Japanese antiquity, while the other rather fell in with the growing adoption of Chinese ideas. Both works may be described as ancient his- tories, purporting to commence from the "divine age"? and the very origin of all things, and replete with allusions to Japanese cosmogony and legends of antiquity ; they are held to be the chief exponents of the Shinéé faith, or " way of the gods." They formed a basis for many subsequent works of almost similar style, and were the subject of numerous commentaries. Of these latter writings the one demanding special mention is the Kajiki-den, an edition of the Kojiki with an claborate commentary by a renowned scholar named Motoori Norinaga, who lived during the 18th century. It was com- menced in 1764, but the first part was not completed until 1786 ; the second was finished in 1792, and the concluding portion in 1796. The printing of this great work was begun in 1789, and concluded in 1822, Motoori himself having died in 1801.}

Foremost among the later Japanese historical works is the Daini-honsht, or " History of Great Japan," in two hundred and forty books. This was composed under the direction of one of Iyéyasu's grandsons, the famous second lord of Mito (1622-1700), com- monly known as Mito no Kémon sama. This illustrious noble was a noted patron of literature, and collected a vast library by pur- chasing old books from various temples or shrines and from the people. At the old castle-town of Mito (in the province of Hitachi) there are still pointed out the ruins

of this noble's library build- ings, situated for greater safety within the castle moat, hard by the palace. Tradition says that among the numerous scholars who aided the lord of Mito in compiling the Dainthonshi there were several learned Chinese who had fled to Japan from the tyranny of their Manchu conquerors. This book is the standard history of Japan to the present day, and all subsequent writers on the same subject have taken it as their guide. most worthy of note is the Nihon Guaishi, or " External History of Japan," by an author named Rai Sanyo (born 1780, died 1832), who also composed several other works, all of them in classical Chinese. The Guaishi isthe most widely read, and forms the chief sourco from which Japanese men of education derive their knowledge of the history of their own country. It was first published in 1827, and numbers twenty-two volumes ; the author was occupied for no less than twenty ycars in its composition ; and ne appends a list of two hundred and fifty-nine Japanese and Chinese works from which he drew his materials. The book treats, in order, of the great families that held supremacy after the commencement of the military domination and the decadence of the mikado's authority, and thus introduces tho reader to the Taira, Minamoto, Hdjé, Kusunoki, Nitta, Ashikaga, later H6jé, Takéda, Uyésugi, Mori, Ota, Toyotomi, and Tokugawa houses. Many of these sections are necessarily very short, as they treat of only one or perhaps two

enerations, but the records of the chief clans are of considerable ength. The writer invariably identifies himself with the particular family in each case, and thus the transactions of two or more factions who strove together for the supreme power at certain epochs have to be detailed twice or even thrice, each time from a different point of view and with varied colouring. The whole period thus rehearsed extends from the middle of the 12th century to the beginning of the 18th. Many other historical works exist, written in less learned style, and adapted for popular reading and the instruction of young students. The Gempei Seisuiki, or 'Record

1 See a most interesting paper entitled "The Revival of Pure Shintd," by E. Satow, in the Transactions of the Asiatic Society of Japan, vol. iii.,

Of all the succeeding histories the

of its class ; it treats only of the two rival clans of Minamoto and Yaira, and of the deeds and feats of arms performed by the herocs on both sides. Most of these popular histories are illustrated by

woodcuts, in many cases taken from portraits, &c.,in ancient scrolls or paintings.

Poetry having always been a favourite study, it is not surprising Poetry.

that there should exist numerous volumes of verses either written or collected by the old court nobles. Of these the most ancient is the Manyéshiu, or “ Collection of a Myriad Leaves,” which dates probably from early in the 8th century. But this work, notwith- standing its great antiquity, is perhaps less familiar to the Japanese than the Hiakuninshiu, or *‘ Collection of One Hundred Persons,” which appeared considerably later, and includes some pieces written by emperors themselves. ‘This was followed by almost numberless minor volumes of the same kind. Verse-making attained to such favour that it was a usual custom for one of the nobles to invite together several of his friends noted for their scholarship, solely for the purpose of passing away the time in this occupation. The collections thus obtained were either kept in the original manuscript or printed for convenience. The verses were in nearly all cases in the style known as uta, which may be described as the purer Japan- ese ode as opposed to the shi, or style of Chinese poetry introduced in later years, and much affected by men of learning. The wia usually consists of thirty-one syllables, the arrangement being in what may be called 5 lines, containing 5, 7, 5, 7, and 7 syllables respectively. The mcaning is continuous, though there is often a slight break at the end of the third line, what follows being in antithesis to what has gone before, or a fresh simile with iden- tical

meaning but a varied expression. Thus if the position of the two portions of the whole wa be reversed, the meaning is generally in no way altered. Each uta is complete in itself, aud expresses one single idea. The J 2 ae do not possess any great epics, or any didactic poems, though some of their lyrics are happy examples of quaint ways of thought and modes of expression. It 1s, however, a hard task to translate them into a foreign tongue with any hope of giving an exact rendering of the allusions contained in the original." The za are often inscribed on long strips of varie- gated paper; and itis even now a common practice, when offering a present, to send with it a verse composed for the occasion by the donor. Again, even down to very recent times, when a man had determined to commit suicide, or was about to hazard his life in some dangerous enterprise, it was by no means uncommon for him to compose and leave behind him a verse descriptive of his intention and of the motive urging him to tho deed. It is stated in Japanese historics that Sanétomo, the third and last shégun of the Minamoto house, was so extravagantly fond of poetry that any criminal could escape punishment by offering him a stanza.

Probably the largest section of Japanese literature is that treat- Geo- ing of tho local geography of the country itself. The works on graphy.

this subject are exceedingly numerous, and include guide-books, itincraries, maps and plans, notes on celebrated localities, &c. In most cases only one particular province or neighbourhood forms the subject of the one book, but as very minute details are usually given these works are often of considerable length. Every province in Japan possesses many scenes of historic interest, and can boast of ancient temples, monuments, and other memorials of the past (this is especially the case in those lying immediately around Kidto or T kid); and it is to preserve and hand down the old traditions relat- ing to them that these guides to celebrated localities have been compiled. They have much resemblance to the county histories in England. Althongh mainly geographical, they contain no inconsider- ablo store of historical information, which, as a rule, is printed at the head of cach section. The traveller can thus ascertain without diffi- culty the names of tho principal villages, rivers, hills, &c., and can decido what temples,

shrines, or monuments along his route are worthy of a visit. Inns, ferries, lodging-houses, &c., receive par- ticular attcntion. correct ; the greater part are struck from wooden blocks, copper- plate engraving having been but lately introduced. Many of the sheets are coloured. he roads are laid down with some degree of care, and distinctive marks are allotted to the former castle-towns, the post-towns, and the minor villages ; the distance from one town to its nearest neighbour is usually added in small characters along the line indicating the road. Very few maps include the whole of the country; most of them show only a few provinces, and some consist of a series of engravings, each plate being devoted to a single province. Plans of all the cities and of. the larger towns are easily procured, and these are drawn for the most part very cor- rectly ; there arc also road-books of the chief highways showing simply the towns, rivers, &c., along tho route in question, much used by travellers in the interior.

There are not many works on art, though there have been pub- Art.

from drawings by famous some slight impetus has and many of the older

lished several collections of engravings Japanese painters. Of late years, however, been given to this branch of literature,

Oe as ee ge 2 See the masterly treatise on this subject, entitled Classical Poetry of the

Japanese, by B. H. Chamberlain, London, 1880.

The Japanese maps are not, as a whole, very Maps.

Drama.

News- papers.

Novels.

editions have been reprinted. Some works on aneient pottcry and other antiquitics have also appcared.

The drama does not hold in Japan the position it enjoys in European countrics. No classic author such as Shakespeare was ever known, and the pieces represented on the stage areas a rule of a popular character. The style of these plays is often rather stilted, a large number of ancient and almost obsolete words and expres- sions being used; but the ordinary farces and light pieces are in the everyday colloquial. Theatre-going is a favourite amusement, especially among the lower classes in the larger towns.

_ The growth of the newspaper press during the past few years deserves special attention. At the period of the recent revolution there existed but one publication that could be properly classed under this head,—the so-called "Government Gazette," which was read only by the official elass, for whom alone its contents possessed any interest. But since then so many newspapers have come into existence that the list for the whole country now comprises several hundreds. In the chief cities they are issued daily, in country districts every two or three days or only once a week. The Tékié papers have the widest circulation, and are forwarded even to the most remote post-towns. Among these the Nichi-nicht Shimbun ('Daily News"), the Chéya Shimbun ('Court and Country News"), and the Héchi Shimbun ("Information News ") are per- haps the best known ; the first-named is a semi-official organ. These journals appear on every day except holidays. They are all similar in style: the first page contains Government notifications anda leading article, the second miscellaneous items of information, and the third contributed articles, sometimes of a political but oftencr of a popular or satirical character, while the fourth page is devoted to advertisements. The papers are chiefly printed from movable metal type. The style of composition is principally Chinesc, interspersed with kana at intervals ; but the papers pub- lished for the express benefit of the very low classes are almost cntirely in kana, and are in many eases illustrated by rough wood. cuts. Freedom of the press is as yet unknown, and many an editor has been fined or imprisoned for publishing what was deemed by the officials an infraction of the press

laws recently notified. These laws are in some respects very stringent, and the newspaper press is in no slight degree trammelled by them. Before a paper is started, a petition requesting the permission of Government must be sent in, and a promise made that if such permission be granted the press laws shall be strictly obeyed. The paper, once it is started, is under the supervision of the local officials, and whatever they may deem to be a eontravention of the laws in question is punished by fine, imprisonment, or suspension or total abolition of the offending journal, It is needless to point out that under this system anything like free and open criticism of the proceedings of Government is well nigh impossible, although ingenious plans have been contrived, whereby, though keeping within the actual letter of the law, the editor ean proclaim his true views on the subject under discussion. A very common method is to draw a satirical icture of Japan under the name of some other country. The bonds imposed by the Government are felt to be galling, and perfect freedom of the press would be hailed with delight by the exceed- ingly large and influential class interested in the maintenance and publication of this kind of literature.

Another large section consists of romances or novels, some of considerable length. In many instances the fiction is woven in with a certain degree of historical-fact, as, for instance, in following the supposed adventures of some noble's retainer, during one of the eampaigns of the medieval civil wars. In these, as in European works of the same description, the reader is generally introduced to a hero and heroine, whose thrilling adventures are described in graphic terms. Pretty little fairy-tales also abound, and short story-books with small woodcuts fill every bookstall in the streets. Many of these are entirely written in Zana, and, the prices being very mode- rate, they are within the reach of even the lowest elasses. Unfortu- nately, hardly any of these popular works would bear translation into a foreign language. Children's toy books, illustrated with large and gaudy pictures in eolours, and representing chiefly the warlike heroes of aneient days or the noted actors of modern times, complote thie final section of the very interesting literature of Japan. (T. M'C.)

ART.

The range of Japanese art, its origin, and its progress, in eon- nexion with some of its most characteristic features, eannot fail to interest all true lovers of art, especially as applied to industries and manufactures. In this latter category should be placed all those applications of art "in the vast and diversified region of human life and action," to quote Mr Gladstone's words, " where a distinct purpose of utility is pursued, and where the instrument employed aspires to an outward form of beauty,"—in which consists '" the great mass and substance of the Kunst-Leben, the art-life of a people." As it is within these limits that art has taken its chief development in Japan it is in this respect more especially that some account will be given here of its leading characters aud principles.

JAPAN

-If art in its application to purposes of utility may be taken as the first stage in all eountries towards the higher art more especially appealing to the imaginative and intellectual faculties, the degree of perfection attained by any nation in this first Kwnst-Leben must be taken into account in judging of their artistic power and capabilities. Viewed in this light, it is not too much to say that no nation in ancient or modern times has been richer in Art-motifs and original types than the Japanese. They un- doubtedly have the merit of having created one of the few original schools of decorative art handed down to us from past ages,—a school uninfluenced by any foreign admixture, if we except the first rudiments of all their arts and industries, derived in remote periods from their more advanced neighbours the Chinese, but from that time left to native influences and powers of development. A strangely constituted race, unlike even the Chinese, from whom in fact they may have descended, voluntarily maintaining am iso- lated state for a long succession of centuries, the Japanese nation has grown up under the eircumstances best adapted to produce originality, and the " insular pride" so natural in their isolated one among a group of islands in the Pacific Ocean. Thus eft to themselves, the genius of the race has led them rather to direct their efforts to confer beauty on objects of

common utility and materials of the lowest value than to create masterpieces of art to be immured in palaces or only exhibited in museums, The faculty of making common and familiar things tell pleasurably upon the ordinary mind, by little artistic surprises and fresh in- terpretations of the common aspects of natural objects and scenes, is specially their gift, and a gift as valuable as it is rare. It is from this standpoint that the art of Japan should be viewed for a right appreciation of its claims to admiration, and for the proper application of the lesson it eonveys to art-workmen and manufac- turers of objects of utility.

Previous to the London International Exhibition of 1862 Japan had in fact been a sealed book to the Western world, save in so far as a small eollection of industrial and natural products of the country to be seen at the Hague eould afford information. The Portuguese via Macao, and later the Dutch traders allowed to occupy a factory at Nagasaki in Japan in the 17th and 18th centuries, were in the habit of shipping a few articles for Europe, of utilitarian rather than ornamental character. These consisted chiefly of dinner serviees of porcelain made to order after European models—known as "Old Japan ""—with heavy gilding and staring colours, as unlike any native work as can well be imagined. Lac- quered cabinets and large coffers or chests of rough workmanship also found their way to Europe, and some of these are still occasionally to be met with in old country houses or curiosity shops, both in England andon the continent. When the London exhibition, therefore, made its display in the " Japanese court," followed, as this was, by a great exhibition in Paris in 1867 and in Vienna in 1875, the Japanese contributions to which were carcfully selected on a large scale by the Japanese Government itself, the rich treasures of art-work came upon Europe as a new revelation in decorative and industrial arts, and have continued since to exercise a strong and abiding influ- ence on all industrial art-work. In London, as in every Continen- tal capital, specimens of Japanese manufacture in great variety speedily followed in the shop windows ; and large importations, taking place almost monthly at depéts in London, are speedily bought up to be distributed over the country, and sold in retail. In the International Exhibition of Paris in 1878, the " Japanese

court ” again presented a matehless collection of perfect workman- ship and design in every variety of material. In textile fabrics, such as silks, gauzes, crapes, and embroidery; in bronzes, cloisonnés, champlevé, repoussé, inlaid and damascened work ; in art-pottery, faience, and porcelain ; and in lacquer and carved wood and ivory,—there was a bewildcring variety ; but only one opinion prevailed as to the palm of superiority due to them. The infcriority of most of the articles of the same elass exhibited in the adjoining “Chinese court,” which from its close proxl- mity provoked while it afforded every facility for a close com- parison, was very marked. Ifother test of excellence were needed, it is amply supplied by the flattery of imitation ; though the mis- chief of merely copying Japanese art work, without any knowledge of the history, religion, popular legends, or the artistic tastes which inspire the workman in Japan, is obvious in tho vulgarized repro- ductions and the incongruous combinations now so common. They may be Japancsque, but they are certainly not Japanese In spirit, feeling, or execution. Defects are exaggerated, and excel- lences are lost sight of altogether.

Before proceeding with a general survey of the most characteristic Art features of Japaneso art, it may be useful for purposes of reference litera- in recent years jure.

to give a list of English works that have appeared on this subject. Mr John Leighton in the spring of 1863 was the first to draw public attention to the collection of Japanese objects in the exhibition of 1862 and their artistic merit, by a lecture delivered at the Royal Institution, which was afterwards printed. Dr C. Dresser, in his Art of Decorative Design, published his opinion that Japan could “supply the world with the most beautiful domestic

Native

ART. |

articles that we can anywhere procure”; and both in that work and in another entitled Unity in Variety, as dedueed From the Vegetable Kingdom, he makes particular reference to Japanese decorative work. A series of articles on “ Art and Art Industries in Japan,” whieh

appeared in the Art Jowrnal in 1875-76, were published, with considerable additions, in a single volume iu 1878. About the same time two works appeared on the same subject, J. J. Jarves's Glimpse at the Art of Japan (1876) and Messrs Audsley & Bowes's Keramie Art of Japan (1875-80). A fourth work entitled Fugaku Hiyaku- Kei, or a Hundred Views of Fusiyama, by Hokusai, with intro- ductory and explanatory prefaces from the Japanese, and descrip- tions of the plates by J. V. Dickins of the Middle Temple, reproduces facsimile plates of the original collection of this celebrated native artist, and even to the paper and form of the thin volumes is a perfect counterpart of the original work as published in Japan. Lastly, there has appeared a valuable contribution to our materials for an intelligent judgment, in Thomas Cutler's Grammar of Japan- ese Ornament and Design (1881). The plates, exceeding sixty in number, are preceded by a carefully written introductory essay, giving a discriminative survey of the chief art-industries and the principles of Japanese ornamentation. ; :

Art in Japan, it has been well observed, "is not, as 1n Europe, the grafting of one style = another, and the accumulated know- ledge of all the various schools frdém the remotest antiquity." It has been agrowth unaffected by any extraneous influences, self-con- tained and strictly national, and hence the astonishment and delight created when the art of Japan was first revealed to the ontside world, It is in comparing the decorative art of Japan with that of China that we see how far the former has distanced its carly Chinese masters, and how thoroughly it has produced a school peculiarly its own. Commenting on its application to ceramic ware, lacquer, bronzes, textile fabrics, &c., Mr Cutler has well remarked, "if we study the decorative art of the Japanese, we find the essential elements of beauty in design, fitness for the purpose which the object is intended to fulfil, good workmanship, and constructive soundness, which give a value to the commonest article, and some touch of orna- ment by a skilful hand, together creating a true work of art."

The school of art due to the native genius of the Japanese as

school of a race is essentially decorative, and, in its application, to a great

art.

Special features.

degree purely industrial. Pictoriat art as understood in Europe can hardly be said to have any existence in Japan. Most of their decorative designs consist of natural objects treated iu a conven- tional way. This conventionalism is, however, so perfect and free in its allurements that nature seems to suggest both the motive and the treatment. Though neither botanically nor ornithologi- cally correct, their flowers and their birds show a truth to nature, and a habit of minute observation in the artist, which cannot be too much admired. Every blade of grass, each leaf aud feather, has been the object of loving and patient study. It has been rashly assumed by some of the writers on Japanese art that the Japanese do not study from nature. All their work is an emphatic protest against so erroneous a supposition. It is impossible to examine even the inferior kiud of work without seeing evidences of minute and faithful study. It can in fact be shown conclusively that the Japanese have derived all their fundamental ideas of symmetry, so different from ours, from a close study of nature and her processes in the attainment of endless variety.

It is a special feature in their art that, while often closely and min- utely imitating natural objects, snch as birds, flowers, and fishes, the especial objects of their predilection and study, they frequently com- bine the facts of external nature with a conventional mode of treat- ment better suited to their purpose. During the long apprenticeship the Japanese serve to acqnire the power of writing with the brush the thousand complicated characters borrowed from the Chinese, they unconsciously cultivate the habit of minute observation and the power of accurate imitation, and with these a delicacy of touch and freedom of hand which only long practice could give. A hair's breadth deviation of a line, or the slight inclination of a dot or an angle, is fatal to good caligraphy, both among the Chinese and the Japanese. When they come to use the pencil therefore in drawing, they arc possessed of the finest

instruments in accuracy of eye and free command of the brush. Whether a Japanese art worker sets himself to copy what he sees before him or to give play to his fancy in combining what he has seen with some ideal in his mind, the result equally shows a perfect facility of execution and easy grace in all the lines.

In their methods of ornamentation the Japanese treat every object flatly, as do their Chinese masters to this day, and this to a certain extent has tended to check any progress in pictorial art, though they have obtained other and very admirable decorative effects. Without being, as Mr Cutler, in common with some other writers, assumes, ignorant of chiaroscuro, or the play of light and shadow, it is true that they usually, though not invariably, paint in flat tones as on a vase, and so dispense with both. It is not a picture so mneh as a decoration that they produce, but it is a decoration full of beauty in its harmonized tints and graceful freedom of design. The delicacy of touch is everywhere seen, whether bird

or leaf or flower or all combined be chosen as the subject. The Japanese artist especially excels in conveying an idea of motion in the swift flight of birds and gliding movements of fishes, one of the most difficult triumphs of art.

It has been said that the golden age of Japanese art is over and gone, and that the conditions no longer exist, and can never be renewed, under which it has developed its most characteristic excellences. A fendal state, in which the artist and the workman were generally one and the same person, or at least in the same feudal relation to a chief who was bound to support them working or idle, and took pride in counting among his subjects or serfs those who could most excel in producing objects of great beauty and artistic value, is a condition as little likely to return in Japan as the former isolation and freedom from all foreign influences of the people. Under these altered circumstances it is to be feared that Japanese art has culminated, and shown the best

of which it is capable. But if the hour of decadence has arrived, aud a deterioration of taste inevitably set in, by an intermixture of foreigu and debasing influences overlaying original thought and moti/s, and leading to imitations of European vulgarities, we have the more reason to be grateful to those who, like Messrs Bowes & Andsley and Mr Cutler, have undertaken to preserve by costly and faithful exainples works produced in the most brilliant period in the life of a singularly gifted people. One of the characteristic features of all Japanese art is individuality of character in the treatment, by which the absence of all uniformity and monotony or sameness is secured. Repetition without any variation is abhorrent to every Japanese. He will not tolerate the stagnation and tedium of a dull uniformity by mechanical reproduction. His temperament will not let him endure the labour of always producing the same pattern. Hence the repetition of two articles the exact copy of each other, and, generally, the diametrical division of any space into equal parts, are instinctively avoided,—as nature avoids the production of any two plants, or even any two leaves of the same tree, which in all points shall be exactly alike. The application of this principle in the same free spirit is the secret of much of the originality and the excellence of the art of Japan. Its artists and artisans alike aim at symmetry, not by an equal division of parts as we do, but rather by a certain balance of correspouding parts, each different from the other, and not numerically even, with an effect of variety and freedom from formality. They seek it in fact, as nature attains the same end. If we take for instance the skins of animals that are striped or spotted, we have the best possible illustration of nature's methods in this direction. Examining the tiger or the leopard, in all the beauty of their symmetrical adornment, we do not see in any one example an exact repetition of the same lines or spots on each side of the mesial line of the spine. They seem to be alike, and yet areall different. The line of division along the spine, it will be observed, is not perfectly continuous or defined, but in part sug- gested ; and each radiating stripe on either side is full of variety— in size, direction, and to some extent in colour and depth of shade. Thus nature works, and so following in her footsteps works the Japanese artist. The same law prevailing in all nature's creation, in the plumage of birds, the painting of butterflies' wings, the marking of shells, and in all the infinite variety and beauty

of the floral kingdom, the lesson is constantly renewed to the observant eye.

Among flowers the whole family of orchids, with all their fau- tastic extravagance and mimic imitations of birds and insects, is especially prolific in examples of symmetrical effects without any repetition of similar parts or divisions into even numbers. We may take any one of this class almost at random for a perfect illustration. The Oneidiwm leweochilum is by no means the most eccentric or baroque member of the family of orchids. But in its uneven number of similar parts, and the variety in form and colour by which a symmetrical whole is produced, there is nothing left to be desired. 'The sepals are nearly alike, but not quite, either in size, shape, or colour-marking. These are balanced, not by three, but by two petals, which match each other, but are broader and more ovate in shape than the sepals, and, instead of being barred and spotted like the sepals, they are broadly painted to about half their length with a deep chestnut colour ; and, while the lip rising fron the centre is pure white and wholly different in form, texture, and colour, the crest rising from the base with tubercles is yellowish, with patches of reddish-brown.

This assemblage of parts, so diverse in form, number, and colour, nevertheless forms a single flower of exceeding beauty and symmetry, affording the strongest contrasts and the greatest variety imagin- able, such as delight the Japanese artist's mind. The orchids may be taken as offering fair types of his ideal in all art work. And thus, close student of nature's processes, methods, and effects as the Japanese art workman is, he ever seeks to produce humble replicas from his only art master. Thus may we understand how he proceeds in all his decorative work, avoiding studiously the exact repetition of any lines and spaces, and all diametrical divisions, cr, if these be forced upon him by the shape of the object, exercising the utmost ingenuity to disguise the fact, and train away the eye from observing the weak point, as nature does in like circumstances.

Pottery and porce- lain.

Thus if a lacquer box in the form of a parallelogram is the object, the artists will not divide it in two equal parts by a perpendicular line, but by a diagonal, as offering a more pleasing linc and division. If the box bo round they will seek to lead the eye away from the naked regularity of the circle by a pattern distracting attention, as, for example, by a zigzag breaking the circular outline, and sup- ported by other ornaments.

A similar feeling is shown by them as colourists, and, though sometimes eccentric and daring in their contrasts, they very seldom produce discords in their chromatic scale. They have undoubtedly a fine sense of colour in common with other Eastern races, and a simi- larly delicate and subtle feeling for harmonious blending of brilliant and sober hues. As arule they seem to prefer a quiet and refined style, using full but low-toned colours. They know the value of bright colours, however, and how best to utilize them cleverly, both supporting and contrasting them with their secondaries and comple- mentaries, as Mr Leighton remarks.

Having thus taken a very rapid glance at some of the leading features of Japanese decorative art as a whole, and traced the prin- ciples that underlie and in great degree determine the processes by which the workman seeks to realize his ideal while taking nature's methods for his guide, we must now pass in review the several art-industries in. which they have most excelled. The following account of these, though by no means supplying an ex- haustive list, may be considered to include the principal industries. Such, however, is -ho delicacy of touch and skill in manipulation exhibited by Jap nese workmen of all kinds that, apart from the general principles applied in all decorative processes, the simplest toy box of wood or papier-maché is apt to be made a work of art, and as a piece of constructive workmanship is not easily rivalled, or in danger of being mistaken for the work of any other than Japanese hands.

Pottery and Porcelain.—There has been much discussion as to the source whence the Japanese derived their skill in pottery and porcelain. The general conclusion that, at a remoto era, some Corean priests

introduced the manufactory of porcelain from China, the country most advanced in civilization in the eastern half of Asia, may be accepted as sufficiently attested. There is evidence that both Chinese and Japanese have since that time borrowed ee from each other, while inventing new forms and processes by their own ingenuity, taste, and skill. Thus differences in treatment and working traditions would become the inheritance of each, giving rise to the very characteristic distinction which may bo observed in the present day between Chinese and Japanese por- celain and pottery of all kinds, notwithstanding a certain generic likeness. The discovery of the art of making hard porcelain, the pate dure of the French in contradistinction to the pdte tendre, cost European workmen much time and labour, after the first importa- tions of Chinese and Japanese porcelain excited the admiration and envy of Europe; and the secret was never revealed by either Chinese or Japaneso to any European.

There are to this day many secrets of these crafts as jealously guarded as ever. The mystery of crackled china, of lace-work translucent porcelain covered with glaze, and of the marvellous egg- shell cups, and the process whereby these are enamelled and covered by a fine woven case of bamboo, as well as the composition and sources of their colours, are still so many secrets to the European manufacturers, although something has been divined or discovered quite lately as to crackle and lace-work porcelain.

The Japanese of late have been much given to lacquering their porcelain, but very often this is not burnt in, and washes off—nor even in the beginning has it much beauty to recommend it. Their enamel painting on this porcelain is in many cases very delicate and beautiful both in design and colour,—but perhaps not as a rule equal to the fine specimens of China of the Ming dynasty, or even of the reign of Kanghi, who was a great patron of the arts early in the 18th century. Of the art-pottery and stoneware of Satsuma and Hizen, and indeed of many other provinces in Japan, it may be said that nothing better in the material has ever been produced. The Japanese have no pretension to rank with the classic designs on the Etruscan and Greek vases, because they have never learned to draw the human figure correctly. But in

flowers, birds, fishes, and insects the Greeks themselves nover approached the perfection of Japanese art, where such objects give a beauty and value often to the very commonest piece of pottery, made with the finger and thumb for the chief tools, and retaining the impress of the skin on the surface.

The great variety of pottery and ceramic ware produced in Japan may most conveniently be arranged under the three heads adopted by Mr Franks in his useful Art Handbook for the Collection in the South Kensington Musewm :—(1) common pottery and stone- ware; (2) a cream-coloured faience, witha glaze often crackled and delicately painted in colours; (8) hard porcelain. The best account perhaps of the very varied substances used by the Japanese in making theso wares and forming their porcelain clay is to be found in the report published under the authority of the Japanese commission, Le Japon a V Exposition Universelle de 1878.

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Porcelain painted or enamelled with flowers and other designs js largely produced in the province of Hizen in the island of Kiushiu, of which Nagasaki, where there are large manufactories, is a port; but it is also manufactured in a great number of other provinces and districts. The decoration, whether in enamel colours or metals, is laid on after the final burning of the clay or péte, and above the

laze. But the artists often live apart from the factories and independent of them, working at their own homes, and owning, separately or jointly according to circumstances, small ovens, where ° at a comparatively low temperature they can fix their easily fused onamels. Thus much of the finer egg-shell porcelain used to be sent in the white state to Tékid, Hizen, and other places, there to be decorated by artists of local celebrity. But from the Hizen factories also comes @ great quantity of low-class porcelain for ship- ment at Nagasaki, to suit the demand of the European markets. That for the most part is vulgar in taste, made on European models for domestic use, and consists of toilet sets, tea

services, jars, trays, &c., coarsely even if elaborately painted, akin to the ware so long received from Canton under similar conditions of deterioration. The colours are bad, with no refined tones. Light greens, red, and blue, all poor in quality, are most common, and have a vulgar and disagreeable effect. This is the result of a demand for cheap articles by tradesmen who have no taste themselves. But Arita, Kidto, Kaga, Satsuma, and Owari are all centres whence the most. char- acteristic and admired ceramic wares of Japan are obtained. Several varieties of enamelled and painted faience are produced in all, and from Satsuma and Owari, especially the former, the faience is very rich. The delicate tints of the paste, and the better ground which the pdte tendre furnishes for the reception of enamel colours compared with the pdte dure of the polished porcelain, give a special beauty to all this ware, while the soft creamy-looking erackled glaze adds an additional charm. j

There is a kind of terra cotta and pottery or earthenware industry in Japan of which the produce has been largely exported of late years in the form of jars and censers or flower-pots. The objects selected for the decorative part are usually in very high rclief and roughly modelled, consisting of flowers, foliage, or animals, but their artistic merit is not great, though as specimens of technical skill and mastery of all the difficulties offered by subject and material they are very remarkable.

Laequer Ware.—China has given its name to all porcelain in the Lacquer Western world, as the country whence it was first imported. So ware.

has Japan given its name to all lacquer ware, first introduced to the knowledge and admiration of Europe in the 17th century after the discovery of that country. The beauty and excellence of Japanese lacquer ware have never been matched in Europe. Not even in China, whcre the varnish tree is also indigenous, and the industry may date quite as far back, has equality been ever established. Japan reigns supreme, now as at first, in this, the most beautiful and perfect product of all her skilled labour and artistic power. The unmatched and apparently unmatchable beauty of Japanese lacquer may be due to

many causes. The varnish tree is of several kinds, and the Urushi tree growing in Japan (the fruit of which yields the vegetable wax), from which is derived the lacquer varnish, supplies, it is said, a finer gum than any other of the same species. It is extracted from the tree at particular seasons only, by incisions in the bark, and from first to last issubjected to many manipulations and refining processes, conducted with a patient attention and a deli- cacy such as could with difficulty be secured in any other country,— perhaps not in Europe at any cost. It admits in these processes of various admixtures of colouring matter, and from the first gather- ing to the last use of it in highly finished work, increasing care as to the dryness or moisture of the atmosphere, the exclusion of every article of dust, and other conditions is essential. The articles to be acquered, whether cabinets or boxes of infinite variety in size and form, are generally made of light fine-grained pine wood, very care- fully seasoned, and smoothed so that not the slightest inequality of surface or roughness of edge remains. Layer after layer of the lacquer is laid on at stated intervals of days or weeks, and after each step the same smoothing process is repeated, generally with a lump of fine charcoal and the fingers, as the finest and most perfect of polishing instruments. These layers vary iu number, according to the intended effect and perfection of the articlo, and_also in rela- tion to the design. Very frequently this is either in basso or alto rilievo, in which ivory and agates, coral, or precious stones are inserted, as well as gold and silver in rich profusion. Some of the older and finer pieces of lacquer, which even in the early days of treaty relations in 1859 were rarely in the market, and now are exceedingly scarce in Japan itself, represent the labour of months and even years of the most skilled workmen, who must be artists as well as masters of the manual craft. On these articles they lavish all their art, and enrich them by every kind of decoration. ——, Fret Fret patterns are in constant use in all Japanese art, sometimesin *T°

the form of borders, and more frequently in diapers, which they use patterns

with excellent effect on surfaces in filling up and varying the spaces, in combination with floral and other designs. ‘ 7 leads them to adopt

several different diapers in covering any sur-

Their love of variety diapets-

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face, often enclosing them fn irregular-shaped compartments, fitting into each other or detached according to the fancy of the artist and the shape of the object ornamented. The same kind of orna- mentation and decorative art is carried out in their woodwork, as may constantly be secn in their cabincts of marquetrie and inlaid boxes. Their predilection for geometrical forms is best to be secn in their great variety of diapers.

Nor must their floral diapers be overlooked, consisting as they do of an almost infinite variety for covering whole surfaces, in which flowers and foliage form the material. In the spaces of decoration as in all clse, the Japanese artist studiously avoids nni- formity or repetition of exact spacing. He repeats, but with the

greatest irregularity possible, to disguise as it were the repetition of

what isin effect the same desigu or pattern. In close connexion with the diaper system of ornamentation is that known as powder- ing, familiar enough in European art ; but in Japan, following the principle of irregularity, the decorator avoids any regular distribu- tion of the design adopted. Lastly, there isa style of ornamentation peculiarly Japanese which consists in the use of medallions grouped or scattered over a surface—of various colours and forms—and filled in with different diapers, the whole producing an effect as pleasing as it was novel when first introduced to European cyes. And in this treatment of medallion powdering may best be seen the triumph of this system for the avoidance of uniformity and diametrical division. The medallions being of definite forms, and usually geometrical in outline, the ingenuity displayed in overcoming the difficulty such forms present is very instructive. They are placed either singly or in groups—in the latter case partially, overlapping, and of different outlines—in different colours, and filled in with various diapers, the whole being irregularly

distributed over the surface in such a way as to avoid diametrical division or uniformity of any kind.

This applies to the finer specimens of the work, where all the principles of surface ornamentation and design adopted , by the Japanese may be seen in their greatest perfection. But lacquer is the common ware for domestic use, almost as common as pottery and earthenware are in Europe. Cups and saucers, trays and saké bottles, medicine boxes and dishes, are in the poorest houses ; and so excellent is the varnish that neither boiling water nor oil will affect the surface. In the finer and older specimens this hardness increases with age, so that some of them can with difficulty be scratched with pin or needle. The value of such specimens, first introduced into England at the London exhibition of 1862, has now been fully recognized, and the cost of the best and oldest lacquer, always high, has greatly increased of late years. Dr Dresser mentioned in a recent lecture a box of about six inches square, 'for which he was asked in Japan £100, and he was told that iu Yedo (now T6kié) fine specimens were "bringing their weight in gold." In the Paris exhibition of 1878 there was a large lacquer screen of great beauty valued at 65,000 francs. It, how- ever, was modern, and, with all its beauty, was over-priced. The Japanese also, besides applying lacquer with colours on porcelain, possess in rare perfection the art of lacquering on tortoiseshell and ivory. On these they present minute figures and land- scapes with a mixture of gilding and rich colours, sometimes in relief, at other times engraved and sunk, and in this manner they ornament miniature. cabinets, jewel boxes, and other quaintly formed miniature boxes, medicine cases, &c., in a way to defy com- petition in their marvellous beauty and delicacy of execution.

Metals Metals and Bronzes.—In all manipulations of metals and_amal- and gams the Japanese are great masters. They not only "are in pos- bronze. session of secret processes unknown to workmen in Europe," by which they produce effects beyond the reach of the latter, but show a mastery of their material in the moulding and designing of their aes which imparts a peculiar freedom and grace to their

est work. A lotus leaf and flower and seed-pod they will produce with inimitable fidelity in the subtle curves and undulating lines and surfaces, and in the most minute markings of leaf and flower. So birds and fishes and insects cast in bronze seem instinct with life, so true are they to nature, while at othcr times the same objects are adopted for a purely conventional mode of treatment. Their in- laying and overlaying of metals, bronze, silver, and steel, more than rival the best productions of the ateliers of Paris or Berlin, and constitute a special art-industry, with some features of finish and excellence not yet attained in Europe.

Of the metallurgic triumphs of art which the Japanese may justly claim over all competitdrs, Chinese, Indian, or European, perhaps the greatest is the perfection to which they have brought the designs in "'shakudé," an amalgam of which are usually made the brooches or buttons used to fasten their tobacco pouches and pocket-books, or to ornament the handles of their swords, Shakuddé is chiefly of iron, relieved by partial overlaying of gold, silver, and bronze. One of the jurors (the late Mr Hunt) of the London exhibition of 1862, an employer of the highest artistic and mechani- eal skill in the working of the precious metals, was convinced, as ho stated in his report to the commissioners, that "the Japanese were in possession of some means not known in Europe of forming amal-

Shakudé.

gams, and of overlaying one metal on another, and in the most minuto and delicate details introducing into the same subject, not covering an inch, silver, gold, bronze, &c., so as tomake a vatiegated picture of divers colours."

Cloisonné, Champlevé, and Repoussé Work.—In the varied appli- Cloi- cations of the art of enamelling, the Japanese have run their great sonné rivals in cloisonné work very close, although upon the whole the work. Chinese have the superiority, their colouring being more brilliant

and finely toned in harmony, and their work more solid and satis- factory both to the eye and the touch. A dull and sombre tone is generally adopted in Japanese cloisonné work, which much se the beauty of their good workmanship in its general effect.

he mode of producing cloisonné work has often been described. It derives this name from the process of building up the design in cells formed by raised septa varying from 75 to 75 of an inch in depth; these labyrinthine cells forming elaborate patterns of flowers, diapers, frets, &c., are soldered on the surface of the vases selected, made generally of copper ; and intothese cells the enamel of the consistence of oil paints and of the various colours required by the pattern is carefully pressed by a wooden spatula. When com- plete the piece is placed in a primitive kind of oven or ** muffle," whereit is fired with a regulated heat until the paste is fused and con- verted into a vitreous substance, when it is allowed very gradually to cool. This isa process which, however primitively conducted, as most things are both in China and Japan, and with very simple tools and rude contrivances, is nevertheless one which requires to be watched with the greatest care and judgment. Too much heat would injure the colours, and might fuse the septa or the copper foundation, in which case the whole vessel would become misshapen, or clouded in colour and otherwise marred and rendered worthless. Apart from the risky nature of the process, the enamel colours aro very valuable, and the artistic labour required in the pattern and manipulation is too great to allow cloisonné articles to become otherwise than costly even in China or Japan. And as to their reproduction in Europe, or any rivalry there, M. Christophile of Paris is understood to have devoted much time and money for the attainment of this object, and succecded in producing some very beautiful specimens which were exhibited at one of the international exhibitions in London; but the production proved too costly to pay as a matter of business. A good deal has becn manufactured in China of late years, it is true, to meet a somewhat indiscriminating demand for articles in such great request. That these modern productions should be inferior to the older work,)ro- duced in a much more leisurely way, and for temples or palaces rather than for sale in open market, will be readily understood.

The arts of champlevé and repoussé are not unknown to the Japanese, but both are less practised than the other kinds of metal work above described. Of the latter Mr Mounscy, late secretary of legation in Japan, succeeded in finding and bringing away many very fine specimens in silver.

Carving.—A nation showing such artistic power in metals, and in Carving. more fictile material, such as clay, could not fail to excel in wood and ivory carving. Perhaps in no department are they better known, owing to the large number of "nitsuké," as the little ivory groups of figures are called, replete with life and humour, that are to be seen ina hundred shops in every capital. These in the days now rapidly passing away used to be employed as buttons, and were as much matters of costly fancy as seals and rings or brooches with us. Whether they take wood or ivory for their material, the result is equally admirable. There are nitsuké and nitsuké, however, as there are artists and artists. Many of the nitsuké that have been imported into Europe in vast quantities of late years are but poor specimens of the Japanese carver's skill, fancy, and invention.

Wall Papers.—There is a great field for the display of their origin- Wall ality and love of variety in the wall papers, which are much used papers. to ornament their walls and screens. What has already been said of their decorative system and methods of surface ornamentation applies to their wall papers ; and the system itself is nowhere so severely tried, because something of mechanical reproduction is unavoidable. Whether stencilled or printed, the design of a single square must of necessity be the same in each. By what force of imagination and ingenuity they. disguise the effect of exact repetition, and lead the eye away from noticing the uniformity, can only be realized by inspection of the papers covering the walls of an apartment, and no description could supply a substitute. Suffice it to say that their art-principles triumph, even under this severe trial.

Textile Fabrics and Embroidery.—Of textile fabrics and em- Textile broidery, in both of which they have developed an industry pecu- fabrics. liarly their own, something of the same kind may be said as of

their wall papers, These fabrics have, however, been so fainiliarized in England by the eager adoption of the best and most novel in female costumes that their chief characteristics must be very generally known. It was the custom in former times for each daimio to have his private looms, for weaving the brocades which he himsclf and his wife and family required, and also the fabrics of less costly matcrial!s for his retainers. The robes manufactured for the court at Kiéto and Yedo werc in like manner only to be

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had from the imperial looms ; some of these, a gift from the shégun on a minister taking leave of his court, were to be seen in the London exhibition of 1862.

But in many of the more common textile fabrics thé best cvi- dence perhaps may be found of the artistic feeling of the nation, and the universality of art work. Towels and dusters of the least expensive material often display very choice designs—as do also the Turkish and Syrian fabrics of the same quality. A piece of bamboo, a broken branch of blossoms, or a flight of birds in counter-changed colours, suffices in their hands to produce the most charming effect, in the most perfect taste. Their embroidery has never been excelled in beauty of design, assortment of colours, and perfection of necdlework.

This summary of the leading charactcristics of Japanese art, and the industries to which it has been applied with such unequalled success, is much too brief to be otherwise than imperfect. The art works and the art thought of a people so truly artistic as the Japanese have proved themselves to be form a subject of wide scope and great complexity. The reports issued by the Japanese cominissioners at the great exhibitions held successively in Paris in 1867 and 1878, in Vienna in 1875, and in Philadelphia in 1876; and the report written by direction of the Japanese Government for the South Kensington Museum, and now embodied in the valuable Art Handbook on Japanese Pottery, by Mr A. W. Franks, its editor, afford the best evidence of the extent and variety of art work for which as a nation they have now a world-wide reputation.

It is true, and strange as true, that the Japanese have apparently never sought to overstep the limits of a purely decorative art, and have thus stopped short of the art development of other nations. Whether this limitation may befrom some organic defect,or is merely a result of their neglect to study the human figure and master the difficulties of rendering the fine harmony of line and proportion seen in greatest perfection there, it is difficult to determine. Certain it is, they have never advanced so far. They have always been content to treat the human figure in a conventional style, not much in advance of the Egyptian rendering, and quite incompat- ible with good drawing. (R. AL.)

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Bibliography.—For its knowledge of Japan Europe was for a long time in- debted mainly to the members of the Duteh colony; but since the restoration of intercourse between Japan and the Western nations a very extensive literature de rebus japonicis has grown up in the chlef European languages. The following works are among the more important :—F. Caron, Beschrijvinge van het macht- igh Koninckrijke Japan, Amst., 1649; R. Manley's English version of Caron, London, 1663; A. Montanus, Gesanischappen .. . aan de Kaisaren van Japan, Amst., 1669; Kaempfer, History of Japan, Lond., 1728, a translation by J. G. Scheuchzer; Titsingh, Mémoires, &c., Paris, 1820; Thunberg, Voy. au Japon, Paris, 1795; G. F. Meylan, Japan voorgesteld in Schetsen, Amst., 1830; Fischer, Bijdrage tot de kennis van het Japansche Rik, Amst ,1833; Pistorlus, BYdrage tot de geschiedenis van Japan, Amst., 1849; Francis L. Hawks, Narrative of the American Expedition by Commodore Perry, New York, 1856; Fraissinet, Le Japon Contemporain, Paris, 1857; Lithdorf, Acht Monate in Japan nach dem Abschluss des Vertrages von Kanagawa, Bremen, 1857; Cornwallis, Two Journeys to Japan, Lond., 1859; Furet, Lettres M. Léon de Rosny sur Uarchipel japonats et la Tartarie orientale, Paris, 1860; Vankattendijke, Uittreksel uit het dagboek van .. - gedurende zijn verblijf in Japan 1857-1859, Hague, 1860; Heine, Japan und

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JAPANNING is the art of coating surfaces of metal, wood, &c., with a variety of varnishes, which are dried and hardcned on, by means of a high temperature, in stoves or hot chambers, which drying processes constitute the main distinguishing features of the art. The trade owes its name to the fact that it is an imitation of the famous lacquering of Japan, although the latter is prepared with entirely different materials and processes, and is in all respects much more brilliant, durable, and beautiful than any ordinary japan work, Japanning is done in clear transparent varnishes, in black, and in body colours; but black japan is the most characteristic and common style of work. 'The varnish for black japan consists essentially of pure natural asphaltum with a proportion of gum animé dissolved in linseed oil and thinned with turpentine; but there are numerous receipts given for the varnish, and manufacturers generally conceal the composition of their own preparations. In thin layers such a japan has a rich dark brown colour, and only shows a brilliant black in thicker coatings. For fine work, which has to be smoothed and polished, several coats of black are applied in succession, each being separately dried in the stove ata heat which may rise to near 300° Fahr. Body colours consist of a basis of transparent varnish mixed with the special mineral paints of the desired colours or with bronze powders, The transparent varnish used by japanners is a copal varnish which contains less drying oil and more turpentine than is contained in ordinary painter's oil varnish. By japan- ning a very brilliant polished surface may be secured which is much more durable and less easily affected by heat, moisture, or other influences than any ordinary painted and varnished work. Japanning may be regarded as a process intermediate between ordinary painting and enamelling. It is very extensively applied in the finishing of ordinary ironmongery goods, and domestic iron work, deed boxes, clock dials, and papier miché articles. The process is also applied to blocks of slate for making imita-

tion of black and other marbles for chimney pieces, &c., and a modified form of japanning is employed for prepared enamelled, japan, or patent leather.

The beautiful lacquer work of Japan owes its hardness and durable qualities solely to the natural varnish which forms the basis of the lacquer. That varnish is simply an exudation from a tree (hus vernicifera) cultivated for the sake of this product throughout a wide area in Japan. The varnish is obtained by making incisions in the bark of the tree, from which a mingled clear and milky juice flows abundantly, which on exposure quickly darkens and blackens in colour. After resting in tubs for some time the juice becomes thick and viscuous, the thicker portions settle at the bottom of the vessel, and from it the thinner top stratum is separated by decanting. Both qualities are strained to free them from impurities, and when ready for use they have a rich brown-black appearance, which, how- ever, in thin layers presents a yellow transparent aspect. This varnish when applied to any object becomes exceedingly hard and unalterable, and with it as a basis all the coloured lacquers of Japan are prepared. The black variety of the lacquer is prepared by stirring the crude varnish for a day or two in the open air, by which it becomes a deep brownish black. Towards the completion of the process a quantity of highly ferraginous water, or of an infusion of gall nuts 'darkened with iron, is mixed with the varnish, and the stirring and exposure are continued till the added water has entirely evaporated, leaving a rich jet black varnish of proper consistence. In preparing the fine qualities of Japanese lacquer, the material receives numerous coats, and between each coating the surface is carefully ground and smoothed. The final coating is highly polished by rubbing, and the manner in which such lacquered work 18 finished and ornamented presents endless variations. The durability of Japanese lacquer work is such that it can be used for vessels to contain hot tea and other food, and

it is even unaffected by highly heated spirituous liquors.

JAP—JSAR

JAPHETH (N53), son of Noah. The most natural rendering of Gen. x. 21 is that which makes Shem the elder brother of Japheth, though the opposite view of the passage in the A. V. follows the Hebrew accents. Inter- preters are not agreed whether the sacred text regards Japheth

as the second or third son of Noah. In Gen. ix. 24 “youngest” is an easier rendering than ‘“ younger,” but the name of Ham is always placed between those of his brothers. The whole Biblical importance of the sons of Noah is geographical or ethnographical; even in the narrative of Gen. ix. 20-27 the point lies in the blessings assigned to the nations or groups of nations named after each. ‘The distribution of the Japhetic group is sketched in Gen. x. 2~4 from the geographical standpoint of the Levitical narrator, that is, according to the most recent criticism, of the 6th century B.c. The seven sons of Japheth are the nations lying north of the Semitic group or westward across the Mediterranean. The details are in part obscure. Madai certainly means the Medians and Javan the Ionians, but in our passage the latter name is used in an extended sense, not so much for the Greeks proper—a. common Eastern usage of the word—as for the inhabitants of the trading ports and coast-lands of the Mediterranean known to Phcenician commerce. Thus Javan includes Elishah (probably Carthage), Tarshish (Tartessus in Spain), Kittim (Cyprus), and Dodanim, for which we must rather read Rodanim (Rhodes), with the LXX. in our passage and the Hebrew of 1 Chron. i. 7. Tubal and Meshech appear in Ezek. xxvii. 13 as associated with Javan in exporting slaves and bronze to Tyre, and the same nations along with Gomer occur in Ezek, xxxviii. in the great army of Magog which issues from the “ extreme north” (A. V. “north quarters,” vv. 6, 15). Magog in fact means the Scythians, and whatever doubt there may be as to the identification of the associated names (Gomer, Cimmerians or Cappadocians, with the subdivisions Ascanians, Paphlagonians, and perhaps ‘Teuthranians ; Tubal, Tibareni; Meshech, Moschi), the whole group appears to be connected with the shores of the Black Sea or to be known from Phoenician voyages in that direction. The seventh son Tiras is quite unidentified ; Thracians and Tyrsenians are mere guesses. The wide range of the Japhetic lands sufficiently explains the blessing in Gen. ix. 27, “May God enlarge Japheth.” In the succeeding clause, “and let him dwell in the tents of Shem” it is disputed whether the subject is God or Japheth. In the latter case the allusion must be to friendly intercommuni- cation and common settlements on equal terms, in contrast to the position of the subjugated Hamites (Canaan) under the lordship of the victorious Semites (Israel). The precise point of view

from which the northern nations, and particularly those over the sea (Gen. x. 5), came to be grouped as sons of Japheth is the more obscure because the etymology of the name is quite uncertain. The resemblance in sound to the Greek Iapetos has been often noticed, but leads to nothing.

Compare, in addition to Bochart's Phaleg et Canaan and the commentaries on Genesis, Knobel, Volkertafel, Giessen, 1850; Kiepert in Monatsber. der Berl. Ae. d. Wiss., February 1859; Lagarde, Abhandlungen, Leipsic, 1866; Stade, Javan, Giessen, 1880 ; Delitzsch, Wo lag das Paradies, p. 245 sq., 1881.

JARCHI. See Rasut.

JARNAC, chief town of a canton in the arrondissement of Cognac, in the department of Charente, France, is situated on the right bank of the river Charente, about 8 miles east of Cognac, and 18 miles west of Angouléme. The town is well built ; and a handsome avenue, planted with poplar trees, leads to the striking suspension bridge. The church contains an interesting ogival crypt. Brandy, wine, and Wine-casks are made in the town. At the battle of Jarnac, fought in 1569 between 26,000 Catholics under the Duc

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d'Anjou and 15,000 Protestants under Coligny and Condé, the last was treacherously shot after surrendering. A pyramid marks the spot where he fell. In the vicinity of the town are some Roman remains. Jarnac gave name to an old French family, of which the best known member is Gui Chabot, baron de Jarnac (d. civ. 1575), who gave rise to the proverbial phrase coup de Jarnac by a sudden thrust during a duel. The population in 1876 was 4390.

JAROMIERZ, a town in the department of K6niginhof, Bohemia, situated at the junction of the Aupa and Elbe. It possesses a district court, a suspension-bridge, a pretty church, and a hospital, and manufactures beet-root sugar. On June 29, 1866, a skirmish between

the Austrians and Prussians took place in the neighbourhood. The popula- tion in 1869 was 5442,

JARRAH WOOD is the product of a large tree (Zu- calyptus marginata) found in western Australia, where it is said to be very abundant. The trees grow straight in the stem to a great size, and yield squared timber up to 40 feet in leugth and 24 inches in diameter. The wood is very hard, heavy (sp. gr. 1010), and close-grained, with a mahogany-red colour, and sometimes sufficient ‘“ figure ” to render it suitable for cabinetmakers’ use. The timber possesses several useful characteristics ; and great expecta- tions have been formed as to its value for shipbuilding and general constructive purposes. These expectations have not, however, been realized, and the exclusive possession of the tree has not proved that source of wealth to western Australia which was at one time expected. Its greatest merit for shipbuilding and marine purposes is due to the fact that it resists, better than any other timber, the attacks of the Z’eredo navalis and other marine borers, and on land it is equally exempt, in tropical countries, from the ravages of white ants. When felled with the sap at its lowest point and well seasoned, the wood stands exposure in the air, earth, or sea remarkably well, on which account it is in request for railway sleepers, telegraph poles, and piles in the British colonies and India. The wood, however, frequently shows longitudinal blisters, or lacuna, filled with resin, the same aS may be observed in spruce fir timber ; and it is deficient in fibre, breaking with a short fracture under comparatively moderate pressure. It has been classed at Lloyd’s for shipbuilding purposes in line three, table A, of the registry rules.

JARROW-ON-TYNE, a town and municipal burg of Durham, is situated on the south bank of the Tyne, 3 miles south-west by west of South Shields, and 7 miles south-east of Newcastle, with which it is connected by rail. The parish church of St Paul, rebuilt in 1783 and again in 1866, still retains some fragnients of the original Saxon edifice founded about 685. Close by are the scattercd ruins of thé monastery begun by the pious Biscop in 681, and consecrated with the church by Ceolfrid in 685. Within the walls of this monastery the Venerable Bede spent his life from childhood; and his body was at first buried within

the church, whither, until it was removed under Edward the Confessor to Durhan, it attracted many pilgrims. The other chief buildings are the various chapels, the mechanics' institute, and the hospital. Jarrow Slake is ariver bay, 1 mile long by 4 mile broad, in which it is said the fleet of King Egfrid found a station. Onits banks are the new Tyne docks, formed at a great expense by the North-Eastern Railway Company. These with the quays and adjacencies cover about 300 acres, of which 50 are water surface with a tidal basin of 10 acres. The erection of the docks gave a great impetus to the trade of Jarrow. In 1877, 4,000,000 tons of coal were shipped thence. Tron shipbuilding (one yard employing 5000 hands), iron- founding, and the manufacture of paper and chemicals are the chief sources of wealth, in addition to coal-mining. In

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1875 Jarrow was constituted a municipal borough, with an extent of 851 acres. The population in 1881 was 25,296. Previous to 1875 Jarrow had been a local board district ; this had a population in 1871 of 18,115.
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JASHAR, Book or. See Hesrew LancuaGE AND LITERATURE, vol, xi. p. 598.

JASHPUR, a tributary state of Chutiaé Nagpur, Bengal, between 22° 17' 5" and 23° 15' 30" N. lat., and between 83° 32' 50" and 84° 26' 15" E. long., with an area of 1947 square miles, is bounded on the N. and W. by the tribu- tary state of Sargujd, on the S. by Gangpur and Udaipur, and on the E. by Lohardagé district. The state of Jashpur consists in almost equal proportions of highland and low- land areas. On its eastern side the tableland of the Uparghat (2200 feet above the sea) forms an integral part of the plateau of Chutié Nagpur; towards the west it springs abruptly from the Hetghat, with a wall buttressed at places by projecting masses of rock. The lowlands of Hetghat and of Jashpur proper lie to the south in successive steppes, broken by low hills. The plateau of Khuria (3000-3700 feet) occupies the north-west

corner of the state. The principal peaks in Jashpur are Ranijul4 (3527 feet), Kohiar (3393 feet), Bharamurio (3390 feet). The chief river is the Ib, which flows through the state from north to south ; but numerous rapids render it unnavigable. The small rivers to the north are feeders of the Kauhar. Iron and gold are found; séJ, sis%, ebony, and other valuable timber trees abound. Lac, tasar-silk, and bees- wax, with cereals, oil-seeds, fibres, and cotton are produced. Jashpur, with the rest of the Sarguj4 group of states, was ceded to the British by the provisional engagement con- cluded with Madhuji Bhonsld (Ap& Sahib) in 1818. Although noticed as a separate state, it was at first treated as a fief of Sargujd. It is, however, dealt with as a distinct territory.

The chief of Jashpur's annual income is £2000; the tribute to Government is £77, 10s. The total population in 1872 was 66,926, comprising 34,648 males and 32,278 females,—the Dravidian aborigines numbering 40,935; Kolarian aborigines, 14,070 ; semi-Hinduized aborigines, 6374; Hindus, 5124; Mahometans, 423. The residence of the raja is at Jagdispur or Jashpurnagar.

JASMIN, Jacques (1798-1864), a noted Gascon poet, was born at Agen, March 6, 1798. His childhood was spent in the midst of privations and all the straits of poverty, and he boasted in after life that he had succeeded in breaking up the traditional chair in which the Jasmins had hitherto been carried tothe workhouse in sickness and old. age. His father, who wasa tailor, had a certain facility for making doggrel verses, which he sang or recited at fairs and such like popular gatherings ; and the younger Jasmin, who used generally to accompany him, was thus early familiarized with the double part which he afterwards so successfully filled himself. When sixteen years of age he found employment at a hairdresser's shop, and subse- quently started a similar business of his own on the Gravier at Agen. It is opposite this scene of his ripen- ing genius and daily work that a statue has been erected to his memory by public subscription. In 1835 he published his first volume of Papillotos ("Curl Papers "), containing poems in French (a language he used with a certain sense of restraint), and in the

familiar Agen patois —the popular speech of the working classes—in which he was to achieve all his literary triumphs. Many of the

pieces in this volume had already been printed and sub- .

mitted to the public. The dialect which Jasmin spoke, though still harmonious and full of picturesque idioms, was now almost exclusively used by illiterate persons, and was greatly modified by a daily contact with French. It was, however, his native speech—the one in which he found spontaneous and adequate expression, and he lost

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by intercourse with the rural population in outlying dis- tricts where it was spoken with less admixture. He rehia- bilitated, disencumbered, and in a measure reconstructed his literary medium, and then, fully realizing that his poems needed other exposition than the mere printed text, he began those numerous public recitations which so largely added to his reputation. His real poetic gift, and his flexible voice and action, fitted him admirably for this double réle of troubadour and jongleur. In 1835 he recited his "Blind Girl of Castel-Cuillé" at Bordeaux, in 1836 at Toulouse ; and he met with an enthusiastic recep- tion in both those important cities. Most of his public recitations were given for benevolent purposes,—1,500,000 francs, the proceeds of his poetical rounds, being contri- buted by him to the restoration of the church of Vergt and other good works. Four successive volumes of Papillotos were published during his lifetime, and contained amongst others the following remarkable poems, quoted in order: "The Charivari," " My Recollections" (supplemented after an interval of many years), 'The Blind Girl," '" Francou- netto," 'Martha the Simple," and "The Twin Brothers." With the exception of the "Charivari," these are all touching pictures of humble life,—in most cases real episodes,—carefully elaborated by the poet till the graphic descriptions, full of light and colour, and the admirably varied and melodious verse, seeni too spontaneous and easy to have cost an effort. Jasmin was not a prolific writer, and, in spite of his impetuous nature, would work a long time at one poem, striving to realize every feeling he wished to describe, and give it its most lucid and natural expression. A

verse from his spirited poem, “The Third of May,” written in honour of Henry IV., and published in the first volume of Papillotos, is engraved on the base of the statue erected to that king at Nérac. In 1852 Jasmin’s works were crowned by the Académie Fraugaise, and a pension was awarded him. The medal struck on the occasion bore the inscription “Au poéte moral et populaire.” His title of “ Maistre es Jeux” is a distinction only conferred by the academy of Toulouse on illustrious writers. Pius IX. sent him the insignia of a knight of St Gregory the Great, and he was made chevalier of the legion of honour. He spent the latter years of his life on a small estate which he had bought near Agen and named “ Papillotos,” and which he describes in A/a Bigno (“My Vine”). Though invited to represent his native city, he refused to do so, preferring the pleasures and leisure of a country life, and wisely judging that he was no really eligible candidate for electoral honours. He died October 4, 1864. His last poem, an answer to Renan, was placed between his folded hands in his coffin.

The linguistic and literary revival in the south of France, which received such lustre from the genius of Jasmin, has now become a well-organized movement, and has extended from Gascony to Languedoc, and to Provence, where it is most marked,

JASMINE, or JEssaMINE, botanically Jasminum, a genus of shrubs or climbers constituting the principal part of the natural order Jasminacex, aud comprising about sixty species, of which forty or more occur in the gardens of Britain. The plants of the genus are mostly natives of the warmer regions of the Old World, but there are one or two South American species. The leaves are pinnate or ternate, or sometimes apparently simple, consisting of one leaflet, articulated to the petiole. The flowers, usually white or yellow, are arranged in terminal or axillary panicles, and have a tubular 5-or 8-cleft calyx, and a cylindrical corolla- tube, with a spreading limb, two included stamens, and a two-celled ovary.

The name is derived from the Persian ydésmin. Linnzus

no opportunity of making himself complete master of it | obtained a fancied etymology from ia, violets, and dcp,

smell, but the odour of its flowers bears no resemblance to that of the violet; it is in fact so peculiar as to be incom- parable, and is probably the only floral perfume which cannot be imitated by art. The common white jasmine, Jasminum officinale, one of the best known and most highly esteemed of British hardy ligneous climbers, is said to be a native of India, and to have been introduced about the middle of the 16th century. In the centre and south of Europe it is thoroughly acclimatized. Although it grows to the height of 12 and sometimes 20 feet, its stem is feeble and requires support; its leaves are opposite, pinnated, and dark green, the leaflets are in three pairs, with an odd one, and are pointed, the terminal one larger and with a tapering point. The fragrant white flowers bloom from June to October ; and, as they are found chiefly on the young shoots, the plant should only be pruned in the autumn. Varieties with golden and silver-edged leaves and one with double flowers are known.

Fic. 1.—Jasminwm grandiflorum, half nat. size ; flower, natural size.

The Zambak or Arabian jasmine, Jasminum Sambae, is an evergreen white-flowered climber, 6 or 8 feet high, intro- duced into Britain in the latter part of the 17th century. Two varieties introduced somewhat later are respectively 3-leaved and double-flowered, and these, as well as that with normal flowers, bloom throughout the greater part of the year. On account of their exquisite fragrance the flowers are highly esteemed in the East, and are frequently referred to by the Persian and Arabian poets. An oil obtained by boiling the leaves is used to anoint the head for complaints of the eye, and an oil obtained from the roots is used “medicinally to arrest the secretion of milk. The flowers of one of the double varieties, known as ‘“ Moogree,” are held sacred to Vishnu, and used as votive offerings in Hindu religious ceremonies. In China the flowers of this plant, under the name of “ Mo-le-hwa,” are used for scent- ing tea. The Spanish, or Catalonian jasmine, J. grandz- florum (fig. 2), which grows wild on the island of Tobago, is very like J. officinale, but differs in the size of the leaflets ; the branches are shorter and stouter, and the flowers very

much larger, and reddish underneath. By grafting it on two-year-old plants of J. officinale, an erect bush about 3 feet high is obtained, requiring no supports. In this way it is very extensively cultivated at Cannes and Grasse, in the south of France; the plants are set in rows, fully ex- posed to the sun; they come into full bearing the second year after grafting; the blossoms, which are very large and intensely fragrant, are produced from July till the end of October, but those of August and Septembcr are the most odoriferous. An acre of land is said to yield about 500 ib of blossoms during the season, value £25 to £35. The aroma is extracted by the process known as "'enfleurage," t.¢., absorption by a fatty body, such as purified lard or olive oil. Square glass trays framed with wood about 3 inches deep are spread over with grease about half an inch thick, in which ridges are made to facilitate absorption, and sprinkled with freshly gathered flowers, which are renewed every morning during the whole time the plant remains in blossom; the trays are piled up in stacks to prevent the evaporation of the aroma ; and finally the pomade is scraped off the glass, melted at as low a temperature as possible, and strained. When oil is em- ployed as the absorbent, coarse cotton cloths previously saturated with the finest olive oil are laid on wire-gauze frames, and repeatedly covered in the same manner with fresh flowers ; they are then squeezed under a press, yield- ing what is termed "huile antique au jasmin." 3 fb of flowers will perfume 1 ib of grease,—this is exhausted by maceration in 1 pint of rectified spirit to form the "extract." An essential oil is distilled from jasmine in Tunis and Algeria, but its high price prevents its being used to any extent. The East Indian oil of jasmine is a com- pound largely contaminated with sandalwood-oil. The dis- tinguishing characters of J. odoratissimum consist princi- pally in the alternate, obtuse, ternate, and pinnate leaves, the 3-flowered terminal peduncles, and the 5-cleft yellow corolla with obtuse segments. The flowers have the advantage of retaining when dry their natural perfume, which is suggestive of a mixture of jasmine, jonquille, and orange-blossom. In China the J. panzculatum is cultivated as an erect shrub, known as Sieu-hing-hwa; it is valued for its flowers, which are used with those of J. Sambac, in the proportion of 10 hb of the former to 30 ib of the latter, for scenting

tea—40 ib of the mixture being required for 100 tb of tea. The "narrow leaved jasmine," J. angustt- folium, is a beautiful evergreen climber 10 to 12 feet high, found in the Coromandel forests, and introduced into Britain during the present century. Its leaves are of a bright shining green ; its large terminal flowers are white with a faint tinge of red, fragrant, and blooming through- out the year. The bitter root, ground small and mixed with lime-juice and root of Acorus Calamus, is considered in India a good remedy for ringworm and herpes. In Cochin China a decoction of the leaves and branches of J- nervosum is taken asa blood-purifier ; and the bitter leaves of J. floribundum (called in Abyssinia '" Habbez-zelim "') mixed with Kousso is considered a powerful anthelmintic, especially for tape-worm; the leaves and branches are added to some fermented liquors to increase their intoxi- cating quality. In Sierra Leone a poultice made with the leaves of J. noctiflorum is applied to ulcers. The leaves of J. hirsutum boiled in oil are applied in India and China in cases of ophthalmia, and its root is said to be a really good remedy for snake bites. In Catalonia and in Turkey the wood of the jasmine is made into long, slender pipe- stems, highly prized by the Moors and Turks. Syrup of jasmine is made by placing in a jar alternate layers of the flowers and sugar, covering the whole with wet cloths and standing it in a cool place; the perfume is absorbed by the sugar, which is converted into a very palatable syrup.

The plant known in America as the " Carolina jasmine " (fig. 2) is not a true jasmine (see GrLsEMrum). Other hardy species commonly cultivated in gardens are the low or Italian yellow-flowered jasmine, J. humile, an erect shrub 3 or 4 feet high, with angular branches, alternate and

Fia. 2.—Gelsemium, half natural size ; flower, nat. size. mostly ternate leaves, blossoming from June to September ; the common yellow jasmine, J. fruticans, a hardy deciduous shrub, 10 to 12 feet high, with weak, slender stems requir- ing support, and bearing yellow, odourless flowers from spring to autumn ; and J. nudzjlorum, which flowers before the leaves appear. (J. OH. 8.)

JASON, grandson of the god Poseidon or of the king Cretheus, is by this descent as by his name (Idcwr, “Iacos, “Taciwv, &c., can hardly be separated from “Ids, lacri, ‘Idoves &c., see Curt., Gr. Gesch., i, note 34) connected with the seafaring Ionians and their Poseidon religion. He was the leader of the Argonautic expedition, for the details of which see ARconavts. After he returned from ithe lived at Corinth with his wife Medea for many years. At last he put away Medea, in order to marry Glauce, daughter of the Corinthian king Creon. The revenge which Medea took on Jason’s new wife and on her own children by him, is the subject of Euripides’s greatest play. The story of Jason is one of the most famous in Greek mythology, and has run through a long course of development. Strip- ping off the later embellishments of poetic fancy, we find that the main outlines were not completed till the voyages of the Eubcean mariners to the Hellespont and the Euxine determined the order of the incidents of the outward voyage. Beneath this outward form we find that the scenes of Jason’s life are the places where Ionian mariners exerted most influence—the coasts of Thessaly and Beeotia, the Augean islands, Corinth, and the Adriatic shores; moreover, the Minyz, who supplied most of the Argo’s crew, are closely connected with the old Ionians. The myth therefore was an accompaniment of the religion carried with them by these mariners, and preserves to us the memory of a genuine connexion once existing between these widely separate places. We can analyse the legend still further, determining the religious centre round which this his- torical framework has been constructed ; this we shall find to be oneof the commonest naturalistic myths. The sun, the ram with the golden fleece, flies through the air to the land at once of setting and of rising sun; there he is sacrificed on the shore in the fire of sunset; his skin is hung upon the tree of the nightly heaven, and guarded by

the envious power, the dragon, till it is captured by the solar hero, by whom the darkness is dispelled and the dragon slain. ‘

JASPER, an opaque close-grained variety of quartz, variously tinted, but usually either red or brown,—the colour being due in the former

case to the presence of peroxide of iron, and in the latter to the same oxide ina hydrated condition. Frequently the colour is not uniform, and if the tints be disposed in stripes or bands the mineral is termed riband jasper. A brown jasper occurring in nodules, and exhibiting variations of tint arranged in zones, is termed, from its locality, Lgyptian jasper. Although the term jasper is now restricted to such varieties of quartz as present opacity, it is certain from the descriptions of classical writers that their jaspis or tacmts was a stone of considerable translucency. The original jasper appears to have been green, inasmuch as itis often compared with the emerald and other green objects. Probably the jasper of the ancients included stones which we should now class as chalcedony and agate, while our jasper was then known as the achates. The emerald-like jasper appears to have been a green chalcedony, like the plasma and chrysoprase of modern mineralogists.

See Rev. C. W. King's Natural History of Precious Stones, 1865.

JASSY, Jasi1, or Jascu1, formerly the capital of the principality of Moldavia, and now the chief town of a district in Roumania, is situated in the valley of the Bachlui (a tributary of the Pruth), in 47° 10' N. lat. and 27° 30' E. long., about 200 miles to the north of Bucharest. The surrounding country consists of hill and dale, and the town with its widely scattered houses intermingled with trees occupies two eminences, of which the one has a rapid and the other a very gradual ascent. The exterior aspect of the place is decidedly attractive and imposing; but the character and condition of the interior is disappointing. A large number of the houses are built of wood, the streets are irregular and dirty, and there is no satisfactory drainage. Since 1873, however, the principal streets have been paved with asphalte, &c.. by W. O. Callender of London, at a cost to the town of £200,000. Jassy is the residence of a prefect, and the see of the archbishop of Moldavia ; and it has a court of the first instance, a court of appeal, a number of synagogues, and about forty-seven Greek churches, including the cathedral and the church of the monastery of St Spiridion, a museum with a public library, a fine hall, and a theatre. Besides the university (which has three faculties—law, letters, and philosophy—and in 1876 num- bered 22 professors and 146

pupils),there are two gymnasia in the town, one academy, several national schools (both girls' and boys'), and upwards of twenty private schools. The foundation of St Spiridion (due to the liberality of Gregorius Ghika in 1727, and available for the sick of all countries and creeds) has an income of nearly £50,000 per annum, and maintains hospitals in several towns of Moldavia. The main hospital in Jassy is a large building, and possesses a maternity institution, a midwifery school, and other auxiliaries. A society of physicians and naturalists has existed in Jassy since the early part of the century, and a number of periodicals are pub- lished in the town. In the vicinity are Belvedere Castle (the residence formerly of Stourza Citacnie), the mineral springs and convent of Galata, the water-cure establish-. ment of Rapide, and the great ecclesiastical college of Socola. The industrial activity of Jassy is but slight,— a tobacco factory, a flour-mill, a brewery, and two or three small manufactories of aerated water making the total sum in 1878. The trade of the town is mainly in the hands of the Jews, who form a large and increasing proportion of its 90,000 inhabitants. By a branch line to Pascani, Jassy communicates with the Austrian railway system, and by a

line to Unghani with that of Russia. The town is governed by a mayor and council. Its income is to a considerable extent derived from a tax on the wines.

The inscription by which the existence of a Jassiorum municipium in the time of the Roman empire is sought to be proved lies open to grave suspicion ; but the town is mentioned as early as the 14th century, and probably does derive its name from the Jassians, or Jazygians, who accompanied the Cumanian invaders. About 1564 it was made the capital of Moldavia, instead of Suczava, b Alex- ander Lapusnenu. It was reduced to ashes by Sultan Soliman in 1538, and by Sobieski in 1686. By the peace of Jassy the second Russo-Turkish war was brought to a close in 1792, A Greek insurrection under Ypsilanti in 1821 led to the storming of the town by the Turks in 1822. In 1844 there was a severe conflagra- tion. For the loss caused to the town in 1861 by the

removal of the seat of government to Bucharest the constituent assembly voted £148,150, to be paid in ten annual instalments, but no payment has been made,

JASZ-~BERENY, a corporate town of Hungary, and formerly capital of the Jaszsig (Jazygia) district (since 1876 incorporated with the Cis-Tisian county of Jasz- Nagy-Kun-Szolnok), is pleasantly situated on both banks of the Zagyva, crossed there by a stone bridge, and on the Hatvan-Szolnok line of railway, 39 miles east of Budapest, 47° 29' N. lat., 19° 57' E. long. It is the seat of a royal court of law and a circuit court, and has several churches, one of which is large and handsome, a Franciscan monas- tery, 2 Roman Catholic gymnasium, a high school, a guard house, and an elegant town-hall, in which are preserved archives of considerable importance. In the centre of the town the channels of the Zagyva form two islands, which are planted with trees and laid out as promenades. On one of these stands a marble bust erected (1797) in honour of the Palatine Archduke Joseph. Not far from the same place are the ruins of a fortress, where it is popularly believed that Attila, king of the Huns, was buried (453). The inhabitants of the town and neigh- bourhood are much engaged in agricultural pursuits and in pasturing horses, cattle, and sheep on the vast communal lands. Fairs are periodically held in the town, and the trade in field produce, fruit, grain, and cattle is generally brisk. The population at the end of 1880 amounted to 21,781, chiefly Magyars by nationality, and Roman Catholics by creed.

JATIVA, or San Feuipe pe JArtiva, according to the |

old orthography XAtrva, a city of Spain in the province |

of Valencia, is picturesquely situated on the margin of a harmless, industrious people, preserving in songs and

beautiful and fertile huerta or plain, at the foot of an overhanging eminence, on the right bank of the Albdida, a tributary of the Jucar. The principal public building is

the collegiate church, begun in 1414; it has a fine dome.

There are three parish churches besides, and twelve religious houses, also a hospital. The manufactures of the place are unimportant, and its trade purely local. The popula- tion in 1877 was 14,534.

Jativa, the Setabis of Pliny and Martial, was celebrated in the time of the Romans for its linen manufactures. It was then known also as Valeria Augusta. It is believed to have been of Pheenician origin. During the time of the Moors, who knew how to utilize its fine situation and fertile neighbourhood, it enjoyed great prosperity. It was taken in 1224 by Jaime I. of Valencia; and in 1347 it received the rank of a city. In the succession war it sustained a long siege with great firmness and bravery, and, when taken at last, received from its captors the name of San Felipe. birthplace of the painter Ribera (1588), and to it also the historical family of the Borgias or Borjas originally belonged.

JATS, an Indian people estimated to form two-fifths of the entire population of the Punjab and half that of the Rajput states. They are also widely spread through Sind, Baluchistan, and the North-Western Provinces. Their

traditions indicate an immigration from Ghazni or |

Kandahar, but writers of authority have identified them with the ancient Getze,! and there is strong reason to

1 See article Inp1A, vol. xii. p. 789.

Jativa was the |

| preter to Napoleon | return to Paris held various posts under Government.

| heutige Bevoélkerung des Panjab,”

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believe them a degraded tribe of Rajputs, whose Scythic origin has also been maintained. Dr Trumpp," however, regards them as the first Aryan settlers in the valley of the Indus, and their language strongly favours this view. The Jadtaki, or Jét vernacular, retained by them with singular tenacity, is a variety of Sindhi, and a pure Sanskrit tongue, exhibiting unusually early grammatical forms. Hindu legends point to a prehistoric occupation of the Indus valley by this people, and at the time of the Mahometan conquest of Sind (712 a.p.) they, with a cognate tribe called Meds, constituted the bulk of the population. They enlisted under the banners of Mohammed Kasim, but at a later date offered a vigorous resistance to the Arab invaders. In 836 they were overthrown by Amran, who imposed on them a tribute of dogs, and used their arms to vanquish the Meds. In 1025, however, they had gathered audacity, not only to invade Mansura, and compel the abjuration of the Mussulman emir, but to attack the victorious army of Mahmud, laden with the spoil of Somn4th. Chastisement duly ensued: a formidable flotilla, collected at Multan, shattered in thousands the comparatively defencelese Jat boats on the Indus, and annihilated their national preten- sions. In recent times the valour of the race showed itself in the two sieges of Bhartpur, the seat of a Jat dynasty, in 1805 and 1826, and has long been conspicuous in the military qualities of the Sikhs. They are a migratory stock. We hear of early Jat settlements on the shores of the Persian Gulf; there was in the 9th century a Jat quarter in Antioch; and a colony established in the Chaldean marshes defied during twenty-four years the power of the caliphs, and was finally vanquished and deported to the Cilician frontier in 834. The Jats are now mainly agriculturists and cattle breeders, rearing with extraordinary skill and care large flocks of camels, in the Mekran and the desert tracts of Sind. In their settlements on the Ganges and Jumna, extending as far east as Bareilly, they are divided into two great clans, the Dhe and the Hele ; while in the Punjab there are said to be one hundred different tribes. Their religion varies with locality. East of the Ravi they profess a modified Brahmanism, discard- ing the restrictions of caste; in the Punjab they have largely embraced Sikh tenets ; while in Sind and Balu- chistan they are Mahometans. They are in general a

legends the memory of better times. Under favourable conditions, however, old predatory habits revive, and their wandering instinct leads them, in the guise of itinerant traders, far into Central Asia. Indeed, there is plausible though not conclusive evidence that the Gipsies owned them as progenitors. In appearance they are not ill-favoured, though extremely dark; they have good teeth, and large beards, sometimes stained with indigo. Their inferiority of social position, however, to some extent betrays itself in their aspect, and tends to be perpetuated by their intel- lectual apathy.

JAUBERT, Prerre AMEDEE Emitien Prose (1779- 1847), French Orientalist, was born at Aix in Provence, June 3, 1779. He was one of the most distinguished pupils of the Orientalist Silvestre de Sacy, whose funeral | Discours he pronounced in 1838. Jaubert acted as inter- in Egypt in 1798-99, and on his In 1802 he accompanied Sebastiani on his Eastern mission ; and in 1804 he was with General Brune at Constantinople. Next year he was despatched to Persia to arrange an

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2 Zeitschrift d. Deutsch. Morg. Gesellschaft, xv. p. 690, and " Die in Mittheilungen d. anthropol. Gesclisch. in Wien, 1872.

3 See GrpsiEs, vol. x. p. p- 131. .

617; also Edinburgh Review, No. Be:

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alliance with the shah ; but on the way he was seized and imprisoned in a dry cistern for four months by the pasha of Bayazid. The pasha's death freed Jaubert, who success- fully accomplished his mission, and rejoined Napoleon at Warsaw in 1807. In 1818 he undertook a journey with Government aid to Tibet, whence he succeeded in introduc- ing into France 400 Cashmere goats. The rest of his life Jaubert spent in study, in writing, and in teaching. He became professor of Persian in the Collége de France, and in 1830 was elected member of the Académie des Inscrip- tions. In 1841 his erudite services were still

further rewarded by admission to the peerage of France, and by the rank of counsellor of state. He died at Paris, January

27, 1847.

Besides articles in the Journal Astatigue, we have from Jaubcrt Voyage en Arménie et en Perse, fait dans les années 1805-6, 1821 (the cdition of 1860 has a notice of Jaubert, by M. Sédillot) ; Eléments de la Grammaire Turque, 1823; Géographie d'Edrisi, 1824; Vie de Djenghiz Khan, 1841; and Relation de Pambas- sade de Mohammed Seid Wahid Effendi (Texte Turque), 1843. He also revised Meyendorffs Voyage d'Orenbourg a Boukhara, 1826 ; and abridged Venture's "Grammaire et Dictionnaire de la langue Berbére," 1824 (in Reewetl de Voyages de la Soeiété de Géo- graphie, tome vii.). See notices inthe Journal Asiatique, January 1847, and the Journal des Débats, January 30, 1847.

JAUER, chief town of a circle in the government dis- trict of Liegnitz, in the province of Silesia, Prussia, is situated on the Wiithende Neisse. St Martin's church, recently renovated, dates from 1267-90, and the evangel- ical church from 1655. The castle has been a penitentiary since 1746 ; and in the town there is a Protestant gymna- sium and a hospital. Jauer manufactures leather, buck- skin, carpets, cigars, carriages, and gloves, and is specially famous for its sausages. Its weekly grain and cattle market was instituted in 1404. The population in 1875 was 10,404.

Jauer was formerly the capital of a principality embracing 1200 square milcs of the principality of Schweidnitz, now occupied by the circles of Jauer, Bunzlau, Lowenberg, Hirschberg, and Schonau. It was scparated from Schweidnitz in 1314, but lapsed to the Bohemian crown in 1892. Jaucr was formerly the prosperous seat of the Silesian linen trade, but the troubles of the Thirty Years'

War, in the course of which it was burned down three times, per- manently injured it.

JAUHARY. Abu Nasr Isma'il ibn Hammad el-Jauhary'

of Farab, a district beyond the Jaxartes, on the borders of Turkestan, is one of the fathers of Arabic lexicography. After the fashion of the older Arabic philologers he com- pleted his studies by a residence among the tribes of the Arabian desert, and finally established himself at NaisApftir, where he died by a fall from the roof of his house, leav- ing the revision of his great lexicon, the Sidh ji'l-Lugha, incomplete. According to some accounts he committed suicide in a fit of insanity. Hajji Khalifa (iv. 91) places his death 303 a.m. (1002-3 a.D.) ; others give 398 or 400.

The Sika has been repeatedly printed in the East, as at Bulak 1282 (1865), and again in 1875. Of the edition projected by Ev. Scheidius, only one part appeared in 1776. See Hamaker, Syee. Cat., a 48; Dozy, Leyden Catalogue, i. 67; Pertsch, Gotha Cat., No. 378; H. Khalifa, wt supra.

JAULNA. See JAzna.

JAUNDICE (Fr. Jaunisse, from jaune, yellow), or Icrerus (from its resemblance to the colour of the golden oriole, of which Pliny relates that if a jaundiced person looks upon it he recovers but the bird dies), a term in medicine applied to a yellow coloration of the skin and other parts of the body, depending in most instances on some derangement affecting the liver. This yellow colour is due to the presence in the blood of bile or of some of the elements of that secretion. Jaundice, however, must be regarded more as a symptom of some morbid condition previously existing than as a disease per se.

The manner in which jaundice is produced is still a

matter of debate among physicians, but it is gencrally adinitted that there are two classes of causes, either of which may bring about this condition. In the first place any obstruction to the passage of bile from the liver into the intestinal canal is sooner or later followed by the appear- ance of jaundice, which in such circumstances is due to the excessive absorption of bile into the blood. To this variety the term

obstructive jaundice is applied. But secondly, a form of jaundice may be produced by causes not embracing obstruction, but including a variety of morbid conditions affecting either the secreting structure of the liver or the state of the blood, and to this the term non-obstructive jaundice is applied.

Obstructive jaundice may be due to the following causes: —(1) simple catarrh of the hepatic and common bile duct (see DicEsTIvE Orcans), whereby the calibre of these channels is narrowed (this is frequently the result of cold or of temporary gastric disturbance, but it may become a chronic condition) ; (2) impaction of gall stones or plugs of hardened mucus in the ducts; (3) general congestion of the liver, either alone or in connexion with pre-existing disease in the heart or lungs; and (4) pressure of morbid growths either external to the liver or in its substance.

Obstruction from these causes may be partial or com- plete, and the degree of jaundice will vary accordingly, but it is to be noted that extensive organic disease of the liver may exist without the evidence of obstructive jaundice.

The effect upon the liver of impediments to the outflow of bile such as those above indicated is in the first place an increase in its size, the whole biliary passages and the liver cells being distended with retained bile. This enlarge- ment, however, speedily subsides when the obstruction is removed, but should it persist the liver ultimately shrinks and undergves atrophy in its whole texture. The bile thus retained is absorbed into the system, and shows itself by the yellow staining seen to a greater or less extent in all the tissues and many of the fluids of the body. The kidneys, which in such circumstances act in some measure vicariously to the liver and exercte a portion of the retained bile, are apt to become affected in their structure by the long continuance of jaundice.

The symptoms of obstructive jaundice necessarily vary according to the nature of the exciting cause, but there generally exists evidence of some morbid condition before the yellow coloration appears. Thus, if the obstruction be due to an impacted gall stone in the common or hepatic

duct, there will probably be the symptoms of intense suffering characterizing “hepatic colic” (see Cottc), after which the jaundice appears. In the cases most frequently seen—those, namely, arising from simple catarrh of the bile ducts due to gastro-duodenal irritation spreading on to the liver through the common duct—the first sign to attract attention is the yellow appearance of the white of the eye, which is speedily followed by 4 similar colour on the skin over the body generally. The yellow tinge is most distinct where the skin is thin, as on the forehead, breast, elbows, &e. It may be also well seen in the roof of the mouth, but in the lips and gums the colour is not observed till the blood is first pressed from them. ‘The tint varies, being in the milder cases faint, in the more sevcre a deep saffron yellow, while in extreme degrees of obstruction it may be of dark brown or greenish hue. The colour can scarcely, if at all, be observed in artificial light. :

The urine exhibits well marked and characteristic changes in jaundice which exist even before any evidence can be detected on the skin or elsewhere. It is always of dark brown colour resembling porter, but after standing i the air it acquires a greenish tint. Its froth is greenish-yellow, and it stains with this colour any white substance. It contains not only the bile colouring matter but also the

bile acids, The former is detected by the play of colours yielded on the addition of nitric acid, the latter by the purple colour produced by placing a piece of lump sugar in the urine tested, and adding thereto a few drops of strong sulphuric acid. This test for the bile acids is dwelt upon by Dr George Harley as an important point in serving to distinguish jaundice with obstruction from jaundice without obstruction, in the latter of which, although there is bile pigment in the urine, the bile acids are absent.

The contents of the bowels also undergo changes, being characterized chiefly by their pale clay colour, which is in proportion to the amount of hepatic obstruction, and to their consequent want of admixture with bile. For the same reason they contain a large amount of unabsorbed fatty matter, and have an extremely offensive odour.

Constitutional symptoms always attend jaundice with obstruction. The patient becomes languid, drowsy, and irritable, and has generally a slow pulse. The appetite is usually but not always diminished, a bitter taste in the mouth is complained of, while flatulent eructations arise from the stomach. Intolerable itching of the skin is a common accompaniment of jaundice, and cutaneous erup- tions or boils are occasionally seen. Yellow vision appears to be present in some very rare cases. Should the jaundice depend on advancing organic disease of the liver, such as cancer, the tinge becomes gradually deeper, and the emaciation and debility more marked towards the fatal ter- mination, which in such cases is seldom long postponed. Apart from this, however, jaundice from obstruction may exist for niany years, as in those instances where the walls of the bile ducts are thickened from chronic catarrh, but where they are only partially occluded. In the common cases of acute catarrhal jaundice recovery usually takes place in two or three weeks.

The treatment of this form of jaundice bears reference to the cause giving rise to the obstruction. In the ordinary cases of simple catarrhal jaundice, or that following the passing of gall stones, a light nutritious diet (milk, soups, &c., avoiding saccharine and farinaceous substances and alcoholic stimulants), along with counter-irritation applied over the right side, and after a few days the use of laxa- tives which tend to promote the flow of bile, will be found to be advantageous. Rhubarb, taraxacum, podophyllum, mercury, are among the remedies which have long been employed for this purpose, but the recent researches of Professor Rutherford have brought to light certain other agents (euonymin, iridin, leptandrin, &c.), which exercise a powerful influence as cholagogues, and are now coming into use, Diaphoretics and diuretics to promote the action of the skin and kidneys are useful in jaundice. In the more chronic forms, besides the remedies above named, the waters of Carlsbad are of special efficacy. Where the jaundice depends on changes in the substance of the liver, altering its structure, such as cancerous deposit, all that can be accomplished is the palliation of symptoms, includ- ing the jaundice, which may be mitigated by the treatment already indicated. With the view of supplying bile to the alimentary canal, Dr Harley recommends the use

of inspis- sated ox-gall in doses of 5 to 10 grains administered in capsules of gelatin.

2. Jaundice without obstruction is observed to occur as a symptom in certain fevers, ¢.g., yellow fever, ague, and relapsing fever, and in pyzmia (blood poisoning), also as the effect of the action of certain poisonous substances, such as copper, mercury, antimony, phosphorus, &c., and the venom of snake bites. It is occasionally seen in new-born infants. It is sometimes suddenly induced as the result of strong mental excitement or emotion. Much difficulty has always been felt to account for this form of jaundice, and numerous theories have been advanced to explain its

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occurrence. Many of such cases might probably, as Virchow observes, be found on careful investigation to depend on some obstruction in the biliary passages ; but there can be no doubt that many others admit of no such explanation, and as regards these it is generally held that they are probably connected with some alteration in the colouring matter of the blood, the source, it is believed, of the bile pigment. Others suppose this form of jaundice to be due to an excess in the normal reabsorption of bile into the blood. The pathology, however, is still unsettled. Jaundice of this kind is almost always slight, and neither the urine nor the discharges from the bowels exhibit changes in appearance to such a degree as in the obstruc- tive variety. Grave constitutional symptoms are often present, but they are less to be ascribed to the jaundice than to the disease with which it is associated.

The name malignant jaundice is sometimes applied to that very fatal form of disease otherwise termed acute yellow atrophy of the liver. See ATRopHy. (J. 0. a.)

JAUNPUR, a British district in the lieutenant- governorship of the North-Western Provinces, India, lying between 25° 23’ 15” and 26° 12’ N. lat., and between 82° 10’ and 83° 7’ 45” E. long. It forms the north-eastern district of the Allah&bd4d division, and is bounded on the N. and N.W. by the Oudh districts of Faizabad, Partabgarh, and

Sulténpur, on the E. and N.E. by Ghazfpur and Azamgarh, on the 8. by Benares and Mirzd4pur, and on the W. by Allahabad.

The district of Jaunpur forms part of the wide Gangetic plain, and its surface is accordingly composed of a thick alluvial deposit. The whole country is closely tilled, and no waste lands break the continuous prospect of cultivated fields. The northern and central positions are richly. wooded. The district is divided into two unequal parts by the sinuous channel of the Gumti, a tributary of the Ganges, which flows past the city of Jaunpur. Its total course within the district is about 90 miles, and it is no- where fordable. It is crossed by two famous bridges, one at Jaunpur and the other 2 miles lower down. The other rivers are the Sai, Barna, Pilli, and Basohi. Lakes are numerous in the north and south; the largest has a length of 8 miles.

The census of 1872 was taken upon an area of 1556 square miles, and it disclosed a total population of 1,025,961, of whom 545,752 were males and 480,209 females. Jaunpur is essentially a Hindu district, in spite of its long subjection to Mahometan rulers. 'The returns show 929,525 Hindus to 96,319 Mahometans; the Christian population (European and native) numbers 117. There are only two towns with more than 5000 inhabitants,—Jaunpur, 23,327, and Machhlishahr, 8715.

The ordinary soil of Jaunpur is a mixture of mould, clay, and sand ; but in old river beds and the basins of temporary lakes a rich black alluvial deposit may occasionally be found. The harvests are those common to the rest of Upper India. The crops yielded are cotton, rice, bdjra, jodr, moth, wheat, barley, oats, pease, and other pulses. Sugar yields the greatest profit, but it requires great care. Indigo, poppy, tobacco, and vegetables are also cultivated. The Gumti is liable to sudden inundations during the rainy season, owing to the high banks it has piled up at its entrance into the Ganges, which act as dams to prevent the prompt outflow of its flooded waters. These inundations extend to its tributary the Sat. Much damage was thus effected in 1774 ; but the greatest recorded flood took place in September 1871, when 4000 houses in the city were swept away, besides 9000 more in villages along its banks. On the other hand, Jaunpur has been comparatively

free from drought, the great plague of the north-west generally, as of the rest of India. The district is almost entirely devoted to agriculture, and its trade is confined to raw materials and food-stuffs. The principal fairs are held at Mariahu in September, and at Karchuli in March ; they are attended by from 20,000 to 25,000 pilgrims and traders. The Oudh and Rohilkhand railway passes through the district. There are 145 miles of metalled and 364 of unmetalled roads. The Gumti and Sat are navigable for boats of moderate burden. 'The climate is moist, and the temperature is more equable, and the rain more evenly distributed throughout the year, than in most districts of the North-Western Provinces. Thé average rainfall for 1861-70 was

43 inches; durinig that period the maximum was 51°6 inches, the minimum 22 inches. There arc two charitable dispensaries.

In prehistoric times Jaunpur scems to have formed a portion of the Ajodhya principality, and when it first makes an appearance in authentic history it was subject to the rulers of Benares. With the rest of their dominions it fell under the yoke of the Musalman invaders in 1194. From that time the district appears to have been ruled by a prince of the Kanauj dynasty, as a tributary of the Mahometan suzerain. In 1388 Malik Sarwar Khwaja was sent by Muhammad Tughlak to govern the eastern province. He fixed his residence at Jaunpur, made himself independent of the Delhi court, and assumed the title of Sultan-us-Shark, or eastern emperor. For nearly a century the Sharki dynasty ruled at. Jaunpur, and proved formidable rivals to the sovereigns of Delhi, The last of the dynasty was Sultin Hussen, who passed his life in a fierce and chequered struggle for supremacy with Bahlol Lodi, then actual emperor at Delhi. At length, in 1478, Bahlol succeeded in defcat- ing his rival in a scries of decisive engagements. He took the city of Jaunpur, but permitted the conquered Hussen to reside there, and to complete the building of his great mosque, the Jama Masjid, which now forms the chief ornament of the town. Many othr architectural works in the district still bear witness to its greatness

under its independent Musalmén rulers. Under the Lodi dynasty the history of Jaunpur contains nothing more than the stereotyped narrative of provincial intrigue, constant revolt, and bloody repression. When the last of that line was killed, a local kingdom was once more established for a short time in the district, but after the fall of Agra and Delhi Jaunpur was recovered, and the district thenceforward formed a portion of the Mughal empire. Nothing worthy of note occurred in connexion with this district until 1722, when it was transferred, with Benares, Ghazipur, and Chunar, to the nawab wazir of Oudh, who appointed a commander to the districts with the titlc of raja of Benares. The first connexion of the British with the district arose in 1765, when it passed for a short time into their hands after the battle of Baxar. In 1775 it was finally made over

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MONG the islands of the Indian archipelago Java is not the largest, being surpassed in this regard by Borneo, New Guinea, Sumatra, and Celebes ; but in every other respect it is the most important of them all. It has passed through the most remarkable vicissitudes, has been the scene of the most eventful occurrences, and possesses the noblest memorials of bygone splendour. It supports a larger population tLan all the other islands of the Indian Ocean together, a population as dense indeed as that of the most populous of European countries. In natural beauty it rivals the most favoured regions of the world. Through the mildness of its climate and the industry of its people it possesses a richer store of valuable productions than almost any country of equal extent can boast : its rice-fields make it the granary of the East Indian islands, and its coffee and sugar plantations are a perpetual source of wealth to Holland, the country which has the good fortune to claim its allegiance.!

Java lies between 105° 10’ and 114° 34’ E. long., and between 5° 52’ and 8° 46’ S. lat. Its greatest length— measured from Pepper Bay in the west to Banyuwangi in the east—amounts to no less than 622 miles; its greatest breadth—from Cape Bugel in Japara to the south coast of Jokjokarta—is only 121. The area is estimated at 49,176 square miles,

nearly four times that of Holland (12,731 square miles). Both physically and administratively the island of Madura, separated from the main island by a narrow strait, must be taken along with Java; and the same is more or less the case with a number of smaller islands—Pulo Panitan or Princes' Island, lying off the most western promontory, the Thousand Islands, the Karimon- Djawa (Carimon Java) archipelago, about 50 miles to the north of Japara, Bawean (Bavean), a little further to the north of Madura, the Sumanap islands to the north-east of Madura, and Deli, Tindjil, Nusa Kambangan, Sempu, and Nusa Barung off the south coast. These all being

1 The above general description is taken from the Java of Professor Veth of Leyden, the standard work on the subject.

to them by the treaty of Lucknow. From that time nothing occurred which calls for notice till the date of the mutiny. On the 5th June 1857, when the news of the Benares revolt reached Jaunpur, the Sikhs mutinied. The district continucd in a state of complete anarchy till the arrival of the Gurkha force from Azamgarh in Sep- tember. In November the surrounding country was lost again, aud it was not till May 1858 that the last smouldering embers of dis- affection were stifled by the repulse of the insurgent leader at the hands of the people themselves.

JAUNPUR, a municipal town and the administrative headquarters of the above district, situated in 25° 41’ 31” N. lat. and 82° 43’ 38” E. long., on the northern bank of theriverGumti. Jaunpur isa very ancient city, the former capital of a considerable Mahometan kingdom, which once extended from Buddun and Etéwah to Behar. It abounds in splendid architectural monuments, most of which belong to the Pathdn period, when the rulers of Jaunpur made themselves independent of Delhii Among the remains are the fort of Firoz, the hammams or baths, the Atdla Masjid and the Jinjiri Masjid, mosques built by Ibrahim, the Dariba mosque constructed by two of Ibrahim’s governors, the Lél Darwdza erected by the queen of Mahmud, the Jama Masjid or great mosque of Hussen, and the splendid bridge over the Gumti, erected by Mumzin Khan, governor under the Mughals, in 1569-73. During the mutiny of 1857 Jaunpur formed a centre of great disaffection. The town still possesses a considerable trade. There are two railway stations there. The population in 1872 was 23,327, comprising 12,369 Hindus and 10,949 Maho- metans and 9 “ others.”

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included, the area of what is officially known as Java and Madura amounts to 51,961 square miles.”

There is a striking difference between western and eastern Java in the main features of relief. The western portion, exclusive of the northern alluvial coast-land, is a compact mass of mountains culminating in voleanic peaks nowhere interrupted by plains or lowland valleys. In the eastern and larger portion the volcanoes rise in independent clusters, and the valleys between open out into wide champaigns. Even in the east the number of volcanic eminences is exceptionally large ; and, if the whole island be taken into view, there is scarcely any region of the world of equal extent which can boast of so many. The following are those which are still in a state of activity :—Gedé (the most western), Tangkuban Prahu, Guntur, Pepandayan, Telaga Bodas, Galung-gung, Tjermé, the Slamat (sometimes called Gedé), Sendari, Sumbing, Merapi, Lawu, Wilis (%), Kelut, Ardjuni, Kawi (?), Tenger, Smeru or

Semeru, Lamongan, Rawun, and Idjen. The loftiest of them all is Semeru, with a height of 12,238 English feet.*

2 The orthography of East Indian namesis far from constant. Even in the same Dutch book Madura and Madoera, Jokjakarta, Djok-jokarta, and Djokdjokarta are to be found. In the present article the Dj or J is usually given in the more English form of J, the oe as % and so on.

3 See Junghuhn's Java. Chronological lists of the eruptive and seismical phenomena of the island, and indeed of all the Indian archi-pelago, are given from time to time in the Vat. Tijds. voor Ned. Ind. From Dr Bergsma's report in the volume for 1880 it appears that in 1878 there were sixteen distinct earthquakes registered throughout the island. That both volcanoes and earthquakes are not without present importance among the physical agencies engaged in the new shaping of the land is shown by such facts as the following :—in 1843, according to Junghuhn's estimate, Mount Guntur flung forth ashes and sand to the extent of 30 million tons ; by the great eruption of Mount Galung-gung in 1822, no fewer than 114 villages were laid waste and 4000 persons destroyed ; in 1867 an earthquake caused the death of 1000 people in the town of Jokjokarta alone ; in 1872 the eruption of Merapi (one of the most active of the volcanoes) proved fatal to many of the inhabitants of Kadu; and the damage to be feared from the ashes thrown out by the same mountain interferes with the

The central ridge, in which, with the single exception of Muria, all the volcanic peaks are situated, contains a large number of other summits upwards of 6000 feet in height, and several—such as Wallet, Pangerangu, Merbabu, Gun- ong Butak, G. Weliran, G. Argowulan, the Yang (Jang) mountains, G. Rante—rise beyond 9000 feet. On both the north and south sides the volcanic chain is flanked by ranges composed of Tertiary rocks; these attain an elevation on the south frequently of between 2000 and 4000 feet, and

occasionally in the Preanger Regencies of 5000 or 6000 feet.

To the northern flanking range belongs the whole of the island of Madura, which has its highest point in Gunong Tambuko (1541 feet). The northern versant of Java differs from the southern in the great development of its alluvial border, which in one or two places widens out into considerable plains, and from this it naturally results that the streams flowing into the Sea of Java are both in length of course and volume of water more important than those that fall into the Indian Ocean. Their number in both cases is very great; but none even of the northern streams are navigable for vessels of burden, and only a few for boats beyond the reach of the tide. They are all more or less obstructed by mud or sandbanks at their mouths. In the Sunda lands the river names are usually introduced by 7%i, the Sunda word for river; the equiva- lent Kali is prefixed less frequently to the names in the Javanese portions of the island. The largest and in some

aspects the most useful of all the rivers is the Bengawan,

or river of Solo, so called from Solo, the popular name of

the city of Surakarta. It is in the residency of Surakarta that it takes its rise in the plain bounded by Merapi on the W., by Lawu on the E., and by Gunong Kidul on the S., and it flows through the residencies of Madiun, Rem- bang, and Surabaya. Except for the last three months of the dry season it is navigable for large boats, and during the whole year for small ones. Next in magnitude to the Solo is the Brantas, called in its lower part the Kalimas, and by Europeans the river of Surabaya, Both rivers debouch into the strait of Madura, and the rapid forma- tion of alluvial deposits in the neighbourhood of their mouths gives abundant proof of their disintegrating agency. In 1818 the largest vessels were able to anchor in the road- stead of Surabaya; by 1825 considerable caution had to be observed; and it speedily became evident that the northern approach would soon be completely closed. Be- tween 1850 and 1854 the lower part of the Solo river was diverted into a new channel, and a permanent fairway seemed to be secured. But the condition of the strait has again been the object of solicitude, and two different schemes have been under consideration for the removal of the lower course of the river still further to the north. “7 All

along the north coast of Java similar accretions of land are taking place ; and steam dredgers have to be kept at work in all the important harbours.

The endless disturbances produced in the original con- dition of the strata by the continued activity of the volcanic forces render the task of the geologist peculiarly difficult. The volcanic rocks for the most part appear to rest on sedimentary rocks, and these in their turn are pretty certainly supported by granite and syenite. That the sedimentary rocks should all (the modern alluvium of course being excluded) be assigned to the Tertiary period was argued by Junghuhn from the fact that in spite of

planting of coffee in the districts of Probolingo and Remaneh. In 1879 the Preanger Regencies were visited by several severe shocks, and a number of persons were killed. Besides the volcanoes them- selves, there are a number of striking forms of volcanic activity to be observed in the island, such as the so-called mud-volcano at Grobogan,

the gas-fountains or holy-fires of Melati Derat, and the Pakaraman or

Guwa Upas (Valley of Poison) in Banyumas on the Dieng mountains. Hot springs are common.

their difference in composition and character they all con- tain the same class of fossils; but a few striking examples of fossils and formations that must belong to the diluvial division of the Quarternary period have been pointed out by Staring and Verbeek. Throughout the rocks remains of vertebrates are exceedingly scarce ; but of invertebrates there is a great profusion.!

In keeping with its geological structure, Java appears in general to be in the matter of economic minerals the poorest of the great islands of the archipelago.? Coal is very common, in thin strata and small “ pockets,” both in Java itself and in Madura and the lesser islands, but it has hitherto been found impossible to turn it to any consider- able account. A variety of clays fit for bricks, earthen- ware, and porcelain, a peculiar kind of clay (ampo) eaten as a dainty by the natives, good

limestone and marble, petroleum, and sulphur have been more or less regularly worked, Salt is obtained from the mud wells of Kuwu and Selo (Samarang), and saltpetre at Sutji in the depart- ment of Gresik.

Climate.—Java being situated but a short distance from the equator, with the wide expanse of the Indian Ocean extending to the south, the climate is one of tropical heat and moisture.

At Batavia, the only place where a long series of meteorological observations is available, the greatest maximum tempcrature of the air between 1866 and 1878 was 96°08 Fahr., in November 1877, and the lowest minimum 66°02, in September of the same year. The mean temperature during the same period was 78°69. Taking the monthly means we find January 77°48, February 77°52, March 78°24, April 79°34, May 79°59, June 78°83, July 78°25, August 79°14, September 79°35, October 79°50, November 79:28, December 77°86. It is this long unbroken continuity of high tem- peratures which proves trying to the European constitution, for the new-comer seldom feels himself much oppressed by the heat. The maximum daily temperature occurs in January, June, and July at 2o0'clock and in the other months at 1 o'clock p.m. The highest maximum of barometric pressure recorded between 1866 and 1878 was 30 inches in July 1877, and the lowest minimum 29°64 inches in December 1870. In the ten years 1866-1875 the difference be- sed the highest daily mean and the lowest was only 0°295 of an incn.

Java is situated in the region of the south-east trade wind, and that is the prevailing direction of the wind during one half of the year, from April to October. During the other half of the year a north-west or west wind (the physical continuation of the north-east trade wind) blows with nearly equal steadiness. The former period is known as the dry season or east monsoon, and the latter as the rainy season or the west monsoon. The distinction between the dry and the rainy seasons is most marked in the eastern portion of the island; and indeed when we come as far west as Batavia it cannot be said that there is any part of the year altogether free from rain. During the dry season the well-known phenomenon of land and sea breezes is very distinctly exhibited ;

during the rainy season, through obvious causes, the alternation becomes much less regular.

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1 See Staring, “Sur l’existence du terrain diluvien 4 Java,” in Archives Néerlandaises, 1867, and “ Voorkomen van dil. gronden op Java,” in Vers. of Kon. Akad. van Wet., Afdeel. Natuurk., 1865 ; Verbeek, “ Geologie van Java” in Tijdschr. van het Aardk. Genoot., part i.; Lorié, Bijdrage tot de Kennts der Jav. eruptiefgesteenten, Rotterdam, 1879; Martin, Die Tertidrschichten auf Java nach den Entdeckungen von Fr. Junghuhn, Leyden, 1879; ‘Sur les volcans de Vile de Java et leurs rapports avec le reseau pentagonal,” in Comptes Rendus, tom. 1xxix. pp. 1058-1061. There has as yet been no regular geological survey of Java; and much new light may be expected from the labours which the Government has at last deter- mined to prosecute. From Verbeek and Fannema’s “‘ Nouv. faits géol. observés 4 Java,” in Arch. Néerland., 1881, we learn that the exist- ence of granite and other pre-Tertiary rocks, the absence of which has long been regarded as one of the chief points of difference between Java and Sumatra, is now ascertained beyond all dispute. 2 See Verbeek, De Mijnwetten in Ned. Ind., Batavia, 1879. Xi, — 76

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In a country of such bold and varied relief as Java, the rainfall naturally differs very strikingly according to locality both in annual amount and in distribution in time. In 1878, for example, the nuniber of rainy days (Natuurk. Tijds. voor Ned. Ind., 1880) was for Batavia (at 28 feet above the sea-level) 131, at Buitenzorg (1069 feet) 220, at Wiradessa in Pekalongan (at the sca-level) 118, and so on. According to the Batavian observations for 1864-1878, the following figures show the annual rainfall :—

Inches. Inches. | Inches, 1864 61°57 1869 76°22 1874 77°75 1865 79 33 1870 80°78 1875 75°82 1866 84°88 1871 89-40 1876 96°57 1867 91°65 1872 93°58 1877 55°35 1868 54°21 1873 56°77 1878 59°60

This gives a mean annual fall of 75°89 inches. During these fifteen years the largest amount registered for any twenty-four hours was 6-9 inches; and during the thirteen years from 1866 to 1878 the largest amount registered in any single hour was 3°6 inches. More than half of the annual amount of rain on an average falls in the three months December, January, and February. The following figures are the percentages for all the months according to the 1864-1878 observations :—

Between 1867 and 1877 1041 thunderstorms were observed at Batavia, —November, December, and January being the months with the greatest number, and June, July, and August those with the least. +

Vegetation.—The vegetation of Java is rich and diver- sified. Few of the plants being deciduous, the island at all times presents the same appearance as the most fertile temperate regions at the height of summer. The villages and even the smaller towns are in great measure concealed from view by the abundant and abiding verdure ; and their position in the landscape is to be recognized mainly by the different appearance presented by their groves and orchards. The character of the vegetation as a matter of course varies with the character of the soil; but at once more obvious and more general are the modifications conditioned by in- crease of elevation. Junghuhn divided the island into four botanical zones, and his division has been commonly adopted by his successors. The first or tropical zone extends from the seaboard to a height of 2000 feet; the second or that of moderate heat has its upper limit at a height of about 4500 feet ; the third or comparatively cool region reaches a height of 7500 feet; and the fourth or coldest region comprises all that lies above that elevation. It need hardly be added that the lines of demarcation are far from rigid, and, if they were to follow the actual appearance of certain definite vegetable forms, would dip and rise at every advance. It is at once evident also that from the structure of the island the lowest zone has by far the most extensive area; the second indeed is only a fiftieth of the first, and the third is only a five-thousandth. The lowest zone is the region of the rice-fields and sugar planta- tions, of cocoa-nuts, cinnamon, and cotton. their character the coasts are fringed with mangroves, nipah, and other palm

trees, and the kayu gabas (Alstonia scholarts) ; the ponds and lakelets are covered with Utricu- lariz and lotus flowers ; vast prairies are clothed with the silvery alang-alang grass, broken by thickets of bamboos and patches of the taller eri grass and glagah. The second zone is the region more especially of the coffee and the tea plantations, of the areng or sugar palm, and of maize. In the forests there is a great profusion of woody lianas, rotangs, and cissus varieties. consists mainly of the slopes of volcanic mountains, but

also comprises a few plateaus, there is little cultivation |

except in the Tenger mountains, where the natives raise Indian corn, cabbage, and potatoes, and at Simpungan

1 See Observations made at the Magnetical and Meteorological Obser- |

vatory at Batavia (vol. i., 1871; vol. iv., 1879).

According to |

In the third zone, which |

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(the highest village in Java, 6680 feet) on the Dieng plateau, where even tobacco is most successfully culti- vated. The fourth zone, so far as phanerogamous plants are concerned, has a very restricted vegetation, somewhere about one hundred species being known; but there is a corresponding abundance of cryptogams: fungi are com- mon, and mosses cover the ground and invest the trees. The whole flora of this upper region bears a strong Euro- pean cast.

According to a writer in the Tijdschrift van Nijverheid en Landbouww, 1879, not less than one-fourth to one-fifth of the area of Java is still covered with forest, in spite of the fact that in various quarters reckless destruction has been allowed to go ou. The abundant moisture of the vegetation happily prevents the spread of the fires by which the natives often clear the prairies or jungles. Extensive tracts of virgin forest exist,

more particularly in the south of the residencies of Bantam, the Preanger Regencies, Banyumas, Pasuruan, Kediri, Probolingo, Besuki, and Banyuwangi ; and many of the principal mountains—G. Ayang, G. Tjermé, G. Slamat, G. Wilis, G. Ardjuna, G. Raon, &c.—still preserve their natural covering of luxuriant foliage. In the first zone the forests are largely composed of Magnoliacew and Anonacez ; but the loftiest trees are rather the Mimusops acuminata, the Spathodea gigantea, and the Jrina glabra, which reach a height of 120 feet. In the second zone the first rank must be given to the rasamala (Liquidambar Altingia), the trunks of which run straight up for 90 or 100 feet before they break into branches. The tree, however, is only found in the Preanger Regencies and the contiguous portions of Buitenzorg. Among the other trees more generally characteristic of the zone are the puspa (Schima Noronhzx), yielding fine, red, heavy timber, the ki sapi (Gordonia excelsa), the gadok (Bischofia javanica), the bayur (Pterospermum Blumeanum), and Epicharis densiflora. Throughout the greater part of both the lower regions the banyan-tree and several closely allied forms are extremely common.

Hitherto comparatively little advantage has been taken of the Javanese wealth of timber. If the native states and Madura be left out of account, all the woods and forest, with the exception of such portions as have been formally disposed of to private possessors, are considered as Government property, and are managed under a new system introduced in 1874. By this the teak forests or planta- tions are singled out for particular treatment. They exist in the resi- dencies of Tagal, Samarang, Japara, Surabaya, Madiun, Kediri, and are estimated to occupy 2300 square miles. Theseaports where the timber trade is chiefly carried on are Batavia, Samarang, Surabaya, and Gresik. The net profit realized by the Government from the forest department was only £58,000 in 1879.

Reforesting has been commenced in various places—more parti- cularly on the Sumbing, Sendara, Merbabu, and Unarang. The Eucalyptus globulus, the juar (Cassia florida, Vahl), a rapidly growing tree indigenous to Sumatra, and the surian (Cedrela febri- Fuga, Bl.), are being largely employed by the Government for this purpose.

Zoology.—In respect of its fauna, Java differs from Borneo, Sumatra, and the Malay peninsula far more than these differ among themselves; and at the same time it shows close resemblances—not exhibited by Borneo and Sumatra—to the Siamese peninsula and also to the Hima-layas. No genus and only five or six of the ninety species of Javanese mammals are confined to the island; and of the two hundred and seventy species of land birds only forty are peculiar. Thirteen genera of mammals, includ- ing the elephant, the tapir, and the Malay bear, found in the rest of the Malay region, are altogether absent; and twenty-five Malayan genera of birds—comprising jays, gapers, bee-eaters, woodpeckers, hornbills, cuckoos, pheasants, and partridges—are in like case."

The Javanese rhinoceros, the largest of the mammals in the island, differs from that of Sumatra in having only one horn instead of two. It ranges over the highest mountains, and its regular paths— worn into deep channels—may be traced up the steepest slopes and round the rims of even active volcanoes. Of wild swine there are two species, Sus vittatus in the hot region and Sus verrucosus In the temperate. Both are extremely abundant, and their depreda- tions are the cause of much loss; in the residency of Japara, for instance, upwards of five thousand have been killed in two months. Not much less than the rhinoceros is the banting or Bos sundaicus, to be found in all the uninhabited districts between 2000 and 7000

feet or elevation. The kidang or mintjac (Cervulus muntjac) and the rusa (Rusa hippelaphus) are the chief representatives of the deer Na a ee a

2 See A. R. Wallace, Island Life, 1881.

1A 7 4

kind ; the former is @ delicate little creature oceurring singly or in |

pairs both in the mountains and in the coast districts ; the latter, living in herds of from fifty to one hundred in the grassy " opens," gives excellent sport to the native hunters. The kantjil (Zragulus javanicus) is

little bigger than a hare. The royal tiger—the same species as that of India—is still frequent enough in the forests to make a tiger-hunt a characteristic Javanese scene, and to evs the native princes to exhibit at times a tiger and buffalo fight.!_ The leopard is also common: in the warm region specimens are occaslon- ally found in which the coat is almost uniformly black, the spots, however, being visible on inspection. In the tree tops, the birds find a treacherous enemy in the matjan rempak or wild cat (Felis minuta or Leopardus javanensis), about the size of a common cat, with the markings of its larger namesake. The dog-tribe is repre- sented by the fox-like adjag (Canis rutilans), which hunts in fero- cious packs.

The Cheiroptera hold a prominent place in the fauna. Remarkable especially for size is the kalong or flying-fox (Péeropus edulis), a fruit-eating bat, which may be seen hanging during the day in black clusters asleep on the trees, and in the evening hastentng in dark flocks to its favourite feeding grounds in the forest. 'The damage these do to the young cocoa-nut trees, the maize, and the sugar-palm leads the native to snare and shoot them ; and their fleshis good toeat. Smaller kinds of bats are not less abundant,— perhaps the most common species being the Nyctieejus Temminckir. In certain places they congregate in myriads like seafowl on the cliffs, and theirexcrements produce extensive guano deposits, which the natives of Surakarta and Madiun, for example, utilize as sources of saltpetre. The house of Canneman, near Besuki, is the chosen haunt of a monstrous colony which have successfully defied atl efforts made to expel them. 'he creature known to the Europeans as a flying cat, and to the natives as the kubin, is the Galeopitheeus variegatus, marking a sort of transition from the bats to the lemuroids. Of these last Java has several species, held in awe by the natives for thcir supposed power of fascination. The apes are represented by the wou-wou (Hylobates leuciscus), the lutung, and kowi (Presbytes meurus and pyrrhus), the surili (Presbytes mitratus), and, most general of all, Macaeus cynomolgus. The existence of bands of the wou-wous is only too distinctly proved in the second zone by the loud and cacophonous outcry from which their name is derived. The lutung or black ape prefers the temperate region, though it is met with as high as 7000 feet above the sea and as low as 2000. The Afacacus

kecps for the most part to the warm coast regions. Rats, mice, porcupines, a particular kind of hare (Lepus nigricollis—confined to a very limited habitat), squirrels, flying squirrels, are the Javanese representatives of the Rodentia; and the Inscctivora comprise a shrew mouse, three species of Cladobates, and Hylomys suillus, peculiar to Java and Sumatra.

Agriculture,—In the eyes of a Javanese to lack rice is to lack food. About the introduction of this divine cereal he tells strange legends, considering it the offspring of the body of Dewie Srie. The priesthood of this goddess is more influential often than that of the Prophet; at an autumn festival the worshippers may be heard uttering the Mahometan Bismillah, and following it up with the seven- fold repetition of her name. For a full harvest the choice of a lucky day is of greater importance than the careful tillage of the field; and to ensure a proper selection the Javanese must have the " windu," the year, the month, the day, the hour. In each of the eight years of the windu a special method of ploughing, of sacrificing, praying, ane: , must be employed.2 The Javanese is thus far from being an enlightened cultivator even of his one indispensable grain; and, though the ancestral custom must in many cases be really the result of ancient experience, the blindfold way in which it is applied results in very bad husbandry. The cultivation of the rice appears at present to be often carried on ata dead loss, The varieties of the cereal known to the Javanese are numerous; but they are commonly grouped as Oryza sativa, preecox, montana, and glutmosa. The first is the kind mainly sown in the sawahs or irrigation-fields ; the montana, on the other hand, is suited

1 See, in Beauvoir's Voyage Round the World, a description of the menagerie of the prince of Jokjokarta.

2 In the first year, for example, of the windu, Alip, the work is begun on Friday, and the first furrow is drawn from south to north in the middle of the field. The sacrificial feast consists mainly of rice not cooked in steam (Sega liwet). For details as to rice culture, its super- stitions, &c., see Bijdr. tot de T. L. en V. Kunde van Ned. Ind., 1874.

for those in which there is no artificial irrigation,—either gogo-land, which has been only rudely cleared from the forest and brought under imperfect or temporary tillage, or the tagal, which is regularly subject year after year to the processes of husbandry.

Some idea may be formed of the extent of agricultural activity in Java from the following statement of the amount of land (in bouws,—the bouw or bahu being about 1} acres) cultivated for

their own use by the natives of Java and Madura, excluding the native states and the private properties :—

¢ A 5 With any “4 With any

Total, 7.e,, | With Rice Sinenelnnt With Rice | other Plant

2a and 3d as First As First as Second eatecond

Columns. Crop. Crop. Crop. Crop. 1874 | 2,481,702 | 2,182,146 } 299,556 22,302 732,949 1875 | 2,399,770 } 2,092,152 307,618 91,531 823,125 1876 |} 2,581,807 | 2,247,490 334,317 98,210 870,725

1877 2,615,906 2,291,185 324,771 97,899 871,662 1878 2,840,856 2,417,480 423,576 106,252 950,372

In 1879, leaving out of view the native territories and the private estates, the area under cultivation was 2,929,644 bouws. Of this aggregate, 1,504,052 bouws were sawahs capable of irrigation, 813,153 sawahs dependent on the rains, 49,219 marsh-sawals, and 563,220 tagal fields. The system of communal proprietorship and annual redivision of the soil largely holds throughout Java, especially in the case of the irrigated lands; in a large number of instances it has taken the place of individual ownership within quite recent years, and in other instances the opposite process has been carried through. There are villages where the redistribution is repeated regularly every year, others where this is only done as often as the number of legitimate share-takers is increased or diminished. In some to prevent the excessive parcelling of the land a certain quota of the claimants are kept in abeyance at each terin of

allotment. To the reclaimer of virgin land belongs the ownership of the same. Details will be found in the official Hindresume van het onderzock naar de rechten van den inlander op den grond, of which an epitome appears in De Indische Gids, 1880.

Besides rice the Javanese cultivate for their own use, on a smaller scale, maize (jagwng), ground nuts, yams, Colocasia antiquorum, Coleus tuberosus, and cassava. The gardens and orchards in which their huts are embowered contain a great variety of fruits. The cocoa-nut holds an increasingly important place,—the best of the many varieties being the idjo; and the banana is even more common. For an account of these as well as other fruits cultivated in the native orchards (Artocarpus integrifolia, &c.) see a paper by Gelpke in De Indische Gids, 1880.

The Javanese possess buffaloes, ordinary cattle, horses, dogs, and cats. Attempts made by the Government to introduce the ass (1841) and the camel (1843-45) were not successful. The buffalo was probably introduced by the Hindus. The ordinary cattle are of very mixed race ; the Indian zebu having been crossed with the banting and with European cattle of miscellaneous origin. The horses, though small, are of excellent character, and their masters, according to their own ideas, are extremely particular in regard to pain of race. Riding comes very naturally to the Javanese ;

orse-races and tournays have been in vogue amongst them from early times. The native sheep are of no value for their wool, and the finest merinos, introduced by Holle in 1872, soon degenerated to the. same condition. Bees (apparently the small stingless J/eli- pona minuta) are kept by the natives of the Preanger. The attempt to introduce the European varieties made in 1877-8 has proved very much ofa failure. See Buitenzorg Report, 1879.

he production of rice is not of more importance to the native Javanese than the cultivation of the coffee-plant is to their European masters. The first coffee-plants grown in Java of which we have historical accounts were brought from Kananore on the coast of Malabar in 1696; but they perished in the earthquake and flood of 1699, and the

honour of reintroducing the precious shrub belongs to Hendrik Zwaardekroon.* The first shipment of Javanese

3 The number of buffaloes in Java (exclusive of Batavia, Surakarta, and Jokjokarta) in 1837 was 1,046,844 ; of cattle, 340,125 ; and of horses, 221,150. By 1876 the corresponding numbers were 2,235,613 buffaloes, 1,290,649 cattle, 532,612 horses. Since 1873 there are statistics for the whole istand: in1877 the buffaloes numbered 2,754,498; the cattle, 1,727,841; and the horses, 618,411. The cattle plague made its appearance in the island in 1879. See Kesteren, "De Veestapel of Java," in De Indisehe Gids, 1880.

4 See N. P. van den Berg, " Voortbrenging ent Verbruik van Koffie"* (Tijdseh. voor Nijver. en Landb., 3879). Widji Kawah is mentioned in a Kawi inscription of 856, and " Boan-soup " is included in the list of Javanese beverages by David Tappen (1667-1682),

coffee to the Netherlands was made in 1711-12; but it was not till after 1721 that the yearly exports reached any considerable amount. The aggregate quantity sold in the home market from 1711 to 1791 was 2,036,437 piculs (of 133 tb avoird.), and this must have represented nearly the whole production of the island. By the beginning of the 19th century the annual production was 120,000 piculs, and in spite of political interruptions this had increased by 1825 to 268,000 piculs. After the introduction of the Van den Bosch system a further augmentation was effected ; and from the official reports it appears that from 1840 to 1873 the amount has ranged from 769,000 to 1,234,000 piculs. During the ten years 1869-1878 the average annual produce of the Government plantations was 878,000, that of the private planters 156,000 piculs. In 1878 the actual quantity of Government coffee was 831,515 piculs, and it was estimated that the total number of full grown plants in the island was 14,180,000. The collecting ware-

houses were 367.

Next in importance to the coffee plant is the sugarcane. Between 1853 and 1857 the average production of Java was 1,652,112 piculs ; between 1869 and 1873, 2,809,968 ; and between 1875 and 1880, 3,438,912; the corresponding numbers for Brazil being 1,683,200, 2,176,000 and 2,110,256. The largest harvest in any single year in Java during all that period was that of 1877, 3,721,984 piculs. The cultivation of tea, commenced by Du Bus, has also attained a considerable development ; in 1879 the production amounted to upwards of 5,700,000 ib. The plantations are private enterprises on lands leased or granted as freehold by the Government. Most of them are in Batavia (Depart. Buitenzorg) and the Preanger Regen- cies. Cinchona is largely grown by the Government, and to some extent by the private plauters. In 1879 the Government had 1,678,670 trees; the production was about 115,000 ib. Teun dis- tinct varieties are in cultivation, Succiruba and Calisaya javanica preponderating. The tobacco plant is grown in nearly all the re- sidencies, but most extensively in Kediri and Besuki. The produc- tion for the foreign market amounted in 1879 to 7,050,000 tb.

The cultivation of the great wealth-giving crops of Java has long been carried on in the interest of the Government, the native peasantry being obliged to devote so much of their soil and toil to satisfy the demands of their European masters. The system by which, in this regard, the relations of the Government to the native were for a long time determined is generally known as the “ culture system.” Introduced in 1830 by Van den Bosch, it continued in force till 1873, and has not altogether disappeared even yet. As far back as 1856 modifications of its arrangements were introduced by Duijmaer van Twist ; and the position of the native was further improved by Sloet van de Beele. The reforms were for a time re- tarded by Governor Mijer ; but in 1870, under the colonial minister Waal, a new agrarian law was passed which permitted the cession of uncultivated ground to Europeans on a lease of seventy-five years. The principal object of the “ culture system ” was the coffee plant, and it is only gradually that the restrictions of the older regulation have been relaxed. In 1872 a new regulation was introduced into the Preanger Regencies ; in 1875 it was extended to the rest of the island with the exception of Pasuruan and the Tenger mountains ; and in 1877 it was made applicable in Pasuruan

likewise. By this new system the large plantations at a distance from the abodes of the “culture” peasants are to be replaced by smaller plantations near the villages ; no service is demanded from those whose lands and gardens are below a definite minimum, and the people cannot be called out for field work en masse; fifty coffee plants is the greatest number that any one can be called on to plant in a year. The general scope of the newer Icgislation is to leave as much as possible to private initiative, native and European, but it will be a long time Bolte the leading strings can be altogether dropped. In the words of Mr Kesteren :—

‘The Javanese knows no freedom. His whole existence is ‘ regulationed.’ If he is bound to render ‘ culture ’-service, the administration shows him to what department to apply himself, when and how he must plant. If heisnot bound to render ‘culture’-service, but has the position of a so-called free agriculturist, the administration prescribes the time and method of sowing and planting his land. If he wishes to fix his habitation outside his village, the village chief may prevent him. If he has a dwelling of his own, the administration decides for him what sort of materials he must use for the roof. If he has a hanging night lamp in his bamboo hut, he must not hang it against the wall”

It is not in the coffee plantations only that his service is demanded by the Government. In 1879 there were 2,030,136 persons subject to the corvée ; and the actual days of work required were 32,197,561, the greatest number of days which can be exacted from any indivi-

1 In regard to coffee, sugar, cinchona, &c., see K. W. van Gorkom, De Ost-Indische Cultures-in Betrekking tot Handel en Nijverheid, Amsterdam, 1881.

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dual being 52 perannum. To watch the Government warehouses, to escort prisoners, to keep the roads and bridges in repair, to give assistance to persons travelling in the public service, are some of the many tasks which the native is called on to perform.

Mcchanie Arts.—In these the Javanese are in advance of the other peoples of the archipelago. Of thirty different crafts practised among them, the most important are those of the blacksmith or cutler, the carpenter, the kris-sheath-maker, the coppersmith, the goldsmith, and the potter. Their skill in the working of the metals is the more noteworthy as they have to import the raw materials. The most esteemed product of the blacksmith's skill is the kris ; evcry man and boy above the age of fourtecn wears one at least as part of his ordinary dress, and men of rank two and sometimes four. In the finishing and adornment of the finer weapons no expense is spared ; and ancient krises of good workmanship sometimes fetch enormous prices.? The Javanese gold and silver work possesses con- siderable beauty, but there is nothing equal to the filigree of Sumatra; the brass musical instruments are of exceptional excellence. Both bricks and tiles are largely made, as well asa coarse unglazed pottery similar to that of Hindustan ; but all the finer wares are imported from China, Cotton spinning, weaving, and dyeing are carried on for the most part as purely domestic operations by the women. The usual mode of giving variety of colour is by weaving in stripes with a succession of different-coloured yarns, but another mode is to cover with melted wax or damar the part of the cloth not intended to receive the dye. This process is naturally a slow one, and has to be repeated according to the number of colours required. As a consequence the "battiks," as the cloths thus treated are called, are in request by the wealthier classes. European imitations are easily detected, and do not pass muster; but a more rapid process of battiking by means of hand stamps has begun to be employed both by native and Chinese workers. For the most part quiet colours are preferred. To the Javanese of the present day the ancient buildings of the Hindu periods are the work of supernatural power. Except when eniployed by his European master he seldom builds anything more substantial than a bamboo or timber frame work ; but in the details of such erections he exhibits both skill and taste. When Europeans first came to the island they found native vessels of large size well entitled to the name of ships ; and, though shipbuilding proper is now carried on only under the direc- tion of Europeans, boat-building is a very extensive native industry along the whole of the north coast—the boats sometimes reaching a burden of 50 tons.

The only one of the higher arts which the Javanese have carried to any degree of perfection is music ; and in regard to the value of their efforts in this direction Europeans differ greatly. The orchestra (gamelan) consists of wind, string, and percussion instruments, the latter being in preponderancy to the other two. (Details on the instruments will be found in Laffles, and a description of a perform- ance in the Towr du Monde, 1880.) In connexion with this attention may be called to the wayangs or puppet plays, in which grotesque figures of gilded leather are moved by the performer, who recites the appropriate speeches, and as occasion demands plays the part of chorus. At least one Javanese, Raden Saleh, has attained emi- nence as a painter.

Population.—The data for tracing the increase of the population are far from satisfactory ; and the returns even of the present time can only be accepted as rough approxi- mations.2 Of the following tables the first gives the totals for Java and Madura for several years, and the second the details for the individual provinces at December 31, 1878, according to the Koloniaal Verslag of 1880.

Chinese. Natives.

167,620 172,280 174,540 181,732 198,233

Arabs, &c.

Europeans.

28,466 29,139 27,585 28,003 28,672

15,712 16,850 16,943 19,955 13,340

15,265,931 16,010,114 16,452,168 16,891,068 18,567,075

2 The reader will find drawings of a great variety of kris blades in Raffles, Java, vol. i.

3 In 1781 Radermacher estimated the population of Java at 2,029,915 souls ; in 1795 Nederburg gave it as at least three and a half millions,

and Daendels in 1808-1811 as over 3,770,000. It was certainly not on the side of excess that these estimates erred. About 1815 the first real census of the population, carried out by Raffles, gave an aggre- gate of 4,615,270—Java 4,390,661, and Madura 224,609—of whom 4,499,250 were natives. According to Bleeker's estimates (Tijdschr. voor Nederl. Indié, 1847), the total about 1845 was 9,542,045, of whom 9,373,989 were natives. The only year since 1849 in which, according to the official returns, there has been a decrease in the popu- lation is 1850, due to the famine and pestilence that prevailed in Demak and Grobogan. There appears to be about the same preponderance of male over female births in Java as in Europe.

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Square| Enro- 4 Arabs and ae

Resideneies. Miles.!| peans. Chinese. ae Natives. Bantam… 346 1,746 ies 755,698 757,707 Batavia… 2631 | 6,066 | 71,622 é 882,065 960,736 Krawang…....—..~~| 1785 218 3,742 291,203 295,240 ee… | 988) 15608 1,248,958 | 1,251,667 Gliewbou.. .....+~~.... 2608 867 | 17,400 1,232,678 | 1,252,174 feelers. .---c—.>~~) 1466 573 5,948 Bi 926,896 933,576 Pekalongan …..... 691 490 4,667 506,554 512,454 Samarang …....~~+8 2002 } 4,072 | 14,153 1,254,991 | 1,276,143 JAPAVA .....c00eeeeeceee 1205 567 9,854 823,912 834,416 Rembang Mecezeee| SU EO 661 | 16,047 1,000,809 | 1,017,800 Surabaya…....---] 2091 | 5,829 | 12,165 , 1,612,026 | 1,631,009 IRASHEUAN:..00-0sc0n.0s 2066 1,277 4,721 649,433 656,905 Probolingo…....00- 1126 739 2,206 433,911 Besukl …...0c-eeceeees eae 478 959 412,843 Banyuwangi …....- one 170 227 61,383 Banyumas…....se00 2147 521 3,700 996,509 Bagelen ….....| 1324 453 2,599 ; 1,198,490 eA rcess cccrsesee| COD 499 5,323 694,761 MOMJOKATLA.—....| 1192 | 3,472 1,837 444,650 Surakarta …....0- 2404 | 2,387 6,301 927,430 Madiun..,.. Bere -sea| $2006 564 3,158 " 970,455 PMC Clilersecers.cclcce 7c e~ 2610 817 6,445 aos 719,546 726,808

Madura…….....2.22+-+ tes 484 3,790 779,478 785,293

29,998 | 200,303 18,824,574 |19,067,829

The population has thus increased considerably since 1872, when the return showed a total of 17,291,200. The most densely peopled districts (those occupied by the Javanese proper) have a greater number of inhabitants to the square mile than Belgium; the Sunda lands,? on the other hand, and the Madurese districts have in comparison a sparse population,

The Government returns furnish the population of only the three largest towns. At the close of 1878 Batavia (town and suburbs) contained 97,585 inhabitants, of whom 4427 were Europeans, 23,466 Chinese, 68,822 natives, and 890 Arabs, &c, ; the numbers for Sama-rang (total 79,443) were Europeans 2976, Chinese 7088, natives, 66,691, Arabs, &c., 2688, and for Surabaya (total 118,824), Euro- peans 4471, Chinese 6298, natives 106,599, Arabs, &c., 1461. It thus appears that in respect of population Batavia is only second. The great bulk of the population is distributed over the country in villages usually called by Europcans dessas, from the Low Javancse word désé (High Javanese dusun).3 Every dessa, however small (and those containing from 100 to 1000 familics are exceptionally large), forms an independent community ; and no sooner does it attain to any considerable size than it sends off a score of families or so to form a new dessa. LEacli lics in the midst of its own area of cultivation. The general enceinte is formed by an impervious hedge of bamboos 40 to 70 feet high. Within this lie the houses, each with its own enclosure or garth, which, even when the fields are the communal property, belongs to the individual householder. In the centre of the alun-alun or forum there is usually a giant waringin or tjaringin tree (Urostigma benjaminum), and on the west side stands the mosque. The capital of a district is only a larger dessa, and that of a regency (in Sundanese daywh, in Low Javanese negdérd, hence the familiar negerie) has the same general type, but consists of several kampongs or villages. The houses in the strictly Javanese districts are always built on the ground ; in the Sunda lands they are raised on piles.

Administration.—The principal local European authority is known as the resident, who exercises judicial, financial, and administrative functions, As president of the council (landraad) and judge of the residency court he deals both with civil and with criminal cases; and he also acts as police niagistrate in his more immediate district. Each of the assistant residents administers under his supervision one of the territorial departments (afdeelings) into which each residentship is divided. Next in rank is the European secretary of the resident, who, as occasion demands, acts as the resident's substitute as president of the council, and performs a great variety of duties as recorder, notary public, registrar, &c. Subject to the assistant resident is

1 These areas are the result of the Government survey begun in 1854. See Havenga, Apereu de l'origine et du dévelop. des reconn. mil. a Java (Bat., 1878).

2 That is, the residencies of Bantam, Batavia, Krawang, Cheribon, and the Preanger Regencies.

3 This is really a Sanskrit word, known also in British India in the compounds desai (7.e., desadhipati), desmukh (2.e., desa-mukha), equiva- lent to village chief. The Sundanese quasi-equivalent is dembur, and several lemburs or kampongs compose a. kalurahan or lurah-ship.

the controller. "It is his first duty to look after the interests of the native population, and he may be con- sidered as the link that connects the European with the native functionaries." His district is of so limited an ex- tent that he is able to make a personal inspection of every portion of it once a month, and to become intimately acquainted with all the native officials within its boundaries. There isalmost nothing which can be considered as affecting either the welfare of the population or the success of the Government administration which lies beyond the scope of his supervision. At the same time he is entrusted with a very small share of executive authority ; his function is to observe, to advise, to report. Under the perpetual guidance of these residents, assistant residents, and controllers, a large part of the administration of the country is carried on by the native functionaries. Of these the highest is the regent, whose rank and right of precedence is superior even to that

of all European officials below the resident. Always belonging to one of the ancient noble families, he maintains the state and retinue of an independent priuce, with all the elaborate environment of Oriental etiquette. He receives a large salary from the Dutch Government, possesses, in virtue of his office, a landed estate, and exercises large authority over the people of his regency. By the European officials also he is treated with full respect and consideration. But, appointed by the governor-general, he, as much as any ordinary official in the civil service, holds his office by the good-will of the Dutch Government. Insubordination is followed by dismissal; and dismissal involves the forfeiture of all the wealth and prestige which he possessed as regent. The regent's substitute is known as pattih. The several districts of the regency (there are usually five or six) are administered by a wedana (wedono) or demang; and secondary subdivisions by assistant wedanas or mantris (salaried), The wedana has also at his disposal a considerable number of volunteer mantris not officially recognized.+*

The following table shows the residentships and departments into which Java (with Madura) is divided :—

Bantam :5 Anyer, Pandeglang, Tjiringin, Lebak,

Batavia: Batavia (town and suburbs), Meester-Cornelis, Tangerang, Buitenzorg,

Krawang: two eontrol] departments.

Preanger Regencies: Bandung, Tjitjalengka, Tji Andjur (Tjandjur), Suka- bumi, Sumedang, Tasik-malaya, Limbangan, Sukapura, Sukapnra-kolot. Cheribon: Cheribon, Indramayu (Dermayu), Galuh, Madjalengka,. Kuningan.

Tagal: Tagal (Tegal), Brebes, Pemalang.

Pekalongan: Pekalongan, Batang.

Samarang: Samarang (Semarang), Salatiga, Ambarawa (Embah-rowo or Bah-

rowo), Unarang (Oenarang), Demak, Grobogan, Kendal.

Japara: Japara (Djepara), Kudus, Joana (Juwana), Carimon Java (Karimun

Djawa).

Rembang: Rembang, Tuban, Bodjo-Negoro, Blora.

Surabaya: Surabaya, Grissee (Gresik), Modjokerto, Sidoardjo, Sidayu, Leman-

gan, and the island of Bawean.

Madura: Pamekasan, Madura, Sumanap (Sumenep), Sampang.

Pasuruan: Pasuruan, Malang, Bangil.

Probolingo: Probolingo, Kraksaan (Kareksan), Lumadjang.

Besuki: Besuki, Panarukan, Bondowoso.

Banyuwangi: Banyuwangi, Buleleng, and Jembrana (the Inst two in Ball.

Banyumas: Banyumas, Tjilatjap, Purwokerto, Purbolingo, Bandjernegara.

Bagelen: Purworedjo, Kutoardjo, Ledok (Wonosobo), Kebumen, Karanganyer.

Kadu (Kedu): Magelang, Temanggung.

Jokjokarta: Sulans territory, with eight regeneies, and Paku Alams territory,

forming one regeney.

Surakarta: Surakarta, Sragen, Boyolali, Klaten, Wonogiri.

Madiun: Madiun, Ngawi, Patjitan, Ponorogo, Magetan. |

Kediri: Kediri, Ngrowo, Berbek, Blitar.

There are thus (excluding the governor-general) 22 residents and 73 assistant residents. The normal number of controllers is 100, and of aspirant controllers 48, there being no controllers in Batavia, Jokjokarta, or Surakarta.

_ Chief Towns.—The principal town of the residency of Bantam is Serang (6° 6’ 45” S, lat. and 106° 8’ 37” E. long.), bearing the same relation to the town of Bantam (about 6 milcs distant) as New Batavia bears to Old Batavia. It is only 100 feet above the sea- level, but even this elevation renders the climate much better for Europeans than that of Bantam, and it is owing to this that Serang has come to supplant the older city. For Bantam, see vol. iii. p. 347. Anyer lies on the coast at the narrowest part of the Sunda Straits, and vessels from Europe usually receive fresh

4 See further in J. W. B. Money’s Java, London, 1861. 5 The correct form of this name, Banten, is getting into use in Dutch works,

provisions and water there. Pandeglang is 787 feet above the sea; in the vicinity are sulphur springs, both hot and cold.

BATAVIA, the capital of Dutch India, has already been described in vol. iii. p. 481.1 Afeester Cornelis, between 6 and 7 miles from Batavia on the way to Buitenzorg, was the seat of a fort as early as the time of Valentijn. It was there that Daendels established his great entrenched camp, and it was there that the battle was fought (in 1811) which placed Java in the hands of the british. About 14 miles from Batavia lies Tangerang, a small but busy place, with several thousand Chinese among its inhabitants. In its vicinity is Bergzicht (Berzigt), formerly famous for its indigo. For BUITENZORG, see vol. iv. pp. 514-5.

The Krawang residency is one of the least populous in the whole island. The great post road does not enter the territory; the resident has less direct authority over his district than is enjoyed by his official compeers, and has no assistant resident. Krawang, the old capital, has lost its importance since Purwakarta became the administrative centre. This place, laid out by the commis- sioner Du Bus, has a large native and Chinese population. At Wanayasa, a considerable negara, the first tea gardens on a large scale were atternpted on the island.

The Preanger Regencies (Bandung, Tjandjur, Sumedang, Lim- bangan, Sukapura) constitute the most important of all the residencies. Bandung, the capital of the residency since 1864, is a flourishing place, with a handsome mosque, and normal school for native teachers. 777i Andjur, which was the administrative centre up to 1864, is of similar character to Bandung, though the removal of the resident and his subordinates has produced a certain decline in its importance. Zyitjalengka, in the very heart of the coffee districts, has developed greatly since the new system was introduced in 1870, and is certain to make further progress when the projected railways give it better communication with Bandung and Batavia. Sumedang is already a populous and prosperous negéré. The ancient settlement of this name lay in another part of the regencies.

Cheribon (Tjeribon) is one of the most important places in Java, though the unhealthiness of the site has caused a nuniber of the principal Europcans to settle about 2 miles to the north at Tangkil. The church erected in 1842, the regent's residence, large warehouses for coffee and salt, and a prison are among the principal buildings. The native part of the town is to some extent laid out in European style. The Chinese quartcr, large and populous, possesses the finest Chinese temple in Java. Cheribon is the rasidence of the descend- ants of the old sultan of Cheribon. The palaces are not so exten- sive as those of Surakarta and Jokjokarta. By the mud bank at its mouth, the Tjeribon (Shrimp River) does more harm than good to the town. 'he harbour is only kept available by constant dredging, but the roadstead is very good all the year round. A strange pleasure palace of Sultan Sepuh, frequently described by travellers, lies about 2 miles from Cheribon

near Sunya Raja. Mundu, a village 4 miles south-east of Cheribon, is remarkable as the only spot on the north coast of Java which is visited by the ikan prut or belly fish, a species about as large as a cod, caught in thousands, and salted by the local fishermen. Indramayu lies on both sides of the Tji Manuk, about 8 miles from the coast. It is mentioned as Dermayo in the old Portuguese and Dutch travels. As a port for the rice of the district of Indramayu, and for the coffee of the Preanger and Cheribon, the town seemed at one time to have a great commercial future before it, but the roadstead was safe only during the east monsoon. The river has a tendency to send its waters by the channel of the Kali Rambatan, and a process of silting up is going on rapidly. In 1876 the Government began the construction of works to prevent the change of course.

Tagal has long been one of the chief towns in Java,—foreign commerce, and native trade, industry, and fisheries, being all well developed. About 1845 Dr Bleeker estimated its population at 29,536, and, if the growth of the town has been similar to that of the residency, the total may now be set down as about 80,000. Since 1871 the harbour has been the object of various improve- ments. The town is regularly and well built. The native stone- cutters, carpenters, dyers, and smiths of Tagal are particularly skilful. Pamalang is a thriving coast village, noteworthy for the quality of the oysters. Pekalongan (“ abode of the kalongs”) is, like Tagal, an important town. It posssesses a large mosque, a Protestant church, a fort (now used as a prison and barracks), and a large number of European houses. The Chinese ward consists of neat stone or brick buildings. Dr Bleeker estimated the popula- tion at 15,000 in 1848; it must be now considerably more. The name of Pckalongan is associated with the smoked ducks prepared in the district. Batang is only 5 miles distant.

Samarang lies on the Kali Ngaran near the centre of the north coast. Round the market place are grouped the residences of the regent and his substitute, the mosque, the military hospital, the town-house (erected in 1854-1864), the Government warehouses, &c. The hospital, formerly the palace of the governor of the

1 A plan of the town will be found in Jaarboek van het Mijnwezen, Batavia, 1880.

north-east coast, has accommodation for 550 European patients. The town was formerly surrounded by a wall and ditch, but these were removed in 1824, and it is now protected by a fort and a coast battery. The old European portion of the town is almost the exact reproduction of a Dutch town, without the slightest accomimoda- tion to the exigencies of the climate. A new impulse was given to Samarang by the opening of the railway to Surakarta and Jok- jokarta (1873). Asa seaport the place is unfortunately situated : the river is long since silted up; the roads are insecure during the west monsoon; it was only after many delays that in 1879 the artificial canal, commenced in 1858 as a substitute for the river, became available ; and in the opinion of the Government commis- sion of 1876 it would be useless to attempt the erection of works similar to those of Batavia. Demak, the chief town of a regency famous in the ancient Javanese history, lies 18 miles north-east of Samarang. The mosque, erected by the first sultan of Demak, was rebuilt in 1845, and only a small part of the old structure has been preserved; but the tombs of several of the sultans are to be seen near at hand. Salatiga (that is, "Three Stones," with allusion to three temples now destroyed) was in early times one of the regular resting-places for ambassadors proceeding from the coast to the court of Mataram ; and in the European history of Java its name is associated with the peace of 1755 and the capitulation of 1811. Itis the headquarters of the only regiment of cavalry in the Dutch East Indian army. Besides the garrison, the European population numbers some 400 or 500 persons. About the same number of Europeans are settled at Ambarawa, which consists of the contiguous villages Pundjang, Ambarawa, Losari, and Kupang, and lies about a mile north of the fortress Willem I., which Van den Bosch intended to make the central point of the Javanese system of defensive works. Ungaran (1026 feet above the sea) was a place of importance as early as the time of Valentijn, and in modern times has become known as a sanatarium.

Japara was in Valentijn's days one of the most flourishing of the Javanese coast towns ; and it was still a place of prosperous coni- merce during the British occupation ; but the harbour has greatly deteriorated, and the town is declining. Joana has a strikingly Dutch appearance ; it is often mentioned in the early narratives. Kudus isa place of more than 14,000 inhabitants. Rembang, a well- built town, contains a considerable European settlement and a num- ber of European institutions; the population exceeds 10,000.

Surabaya, as already mentioned, is the largest town in Java, and ranks next to Batavia in the varicty of its religious, edu- cational, charitable, and commercial institutions. It owes this position to the fact that its harbour is the best in theisland. Since 1849 it has been the seat of Government dockyards and arsenals ; and there are also extensive barracks, a military hospital, &c. The population includes Javanese, Madurese, Indians from Bengal, Moors, and Chinese. Grissee (Gresik) has a fairly good harbour, and is of special interest in the early European history of Java. Pasu- yuan ranks as the fourth town in the island; it is well built, and has a considerable European settlement. Probolingo (called by the natives Banger), Besuki, and Banywwangi are all prosperous

laces of from 7000 to 15,000 inhabitants. The residency of

anyuwangi is one of the least opened up of the whole island. Banyumas contains a population of about 10,000 inhabitants, but there are no objects worthy of particular notice. The name, equivalent to "gold-water," was bestowed by its founder Arya Sureng Rana from the auriferous character of the river Serayu on which it stands. Zjilatjap, though not the capital of the residency, is a much inore important and interesting place. It possesses the best harbour of all the south coast, situated at the mouth of the canal Kali Sesukan, which runs between the Serayu and the sea, and protected by the island of Nusa Kambangan ; and it has been, chosen as the seat of a principal military establishment. A battery was erected close to the town in 1878, and on Kambangan lie the forts Karang Bolong and Batu Njapa. The pile-villages of the Segara Anakan (as the enclosed bay is called) and the

stalac- tite and mephitic caves of the island are objects of much interest. Purworedjo, the chief town of Bagelen,* became of some import- ance during the Java war as a military establishment, and is still occupied by a considerable garrison. It is laid out ina spacious style; and both the native and the Chinese quarters are well kept. The population is large, and it is an important seat of native industry. :

Very similar to each other are Surakarta and Jokjokarta, the chief towns of the independent states. The former contains the palace of the susuhunan or emperor, the residence of the independent prince Mangku Negoro, the fort of Vastenburg, a Protestant church, and considerablo number of European buildings.

Inhabitants.—Leaving out of view the Europeans and the Oriental immigrants—scarcely a seventh part of the

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2 The village from which the residency takes its name is situated in the district of Tjangkreb in the Purworedjo regency. It is so called from a ‘*linga ” pillar still reverenced by the natives.

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population—the inhabitants of Java consist of the Javanese proper, the Sundanese, and the Madurese. All three belong to the Malay stock. Between Javanese and Sundanese the distinction is mainly due to the influence of the Hindus on the former and the absence of this on the latter. Be- tween Javanese and Madurese the distinction—not so deeply wrought—is rather to be ascribed to difference of natural environment. The Sundanese have best retained the Malay type, both in physique and fashion of life. They occupy the five residencies of Bantam, Batavia, Krawang, Cheribon, and the Preanger Regencies. The limits of the Madurese area are not so easily given. Be- sides the island of Madura, the residencies to the east of Surabaya and Kediri are largely occupied by them. The residencies of Tagal, Pekalongan, Banyumas, Bagelen, Kadu, Samarang, Japara, Surakarta, Jokjokarta, Rem- bang, Madiun, Kediri, and Surabaya have an almost purely Javanese

population. Professor Veth estimates the number of the Sundanese at about 4,000,000, the Madurese at 1,600,000, and the Javanese at 11,500,000. The Javanese are the most civilized of the three peoples. The colour of the skin in all three cases presents various shades of yellowish-brown with a touch of olive-green ; and it is observed that, owing perhaps to the Hindu strain, the Javanese are generally darker than the Sundanese. The eyes are always brown or black, the hair of the head black, long, lank, and coarse. Neither breast nor limbs are provided with hair, and there is hardly even the suggestion of a beard. In stature the Malay is usually less than the European. The Sundanese is less than the Javanese proper, being seldom 5 feet in height ; at the same time he is more stoutly built. The Madurese is as tall as the Javanese, and as stout as the Sundanese. The eye is usually set straight in the head in the Javanese and Madurese ; among the Sundanese it is often oblique. The nose is generally flat and small, with wide nostrils ; but among the Javancse it not unfrequently becomes aquiline. The lips are thick but well formed ; the teeth are naturally white, but often filed and stained. The cheek bones are well developed, more particularly with the Madurese. In expressiveness of countenance the Javanese aud Madurese are far in advance of the Sundanese. The women are not so well made as the men, and among the lower classes especially soon grow absolutely ugly. In the eyes of the Javanese a golden yellow complexion is the perfection of female beauty :—"She shone bright even in the dark" is the highest compliment of poetic adulation (compare Raffles, Java, vol. 1. p. 92). To judge by their early history, the Javanese must have been a warlike and vigorous people, with somewhat of ferocity to boot. At present they are peaceable, docile, sober, simple, and industrious. The practice of running amuck is of very rare occurrence among them. Religion.—The Javanese are nominally Mahometans, as in former times they were Buddhists and Brahmans ; but in reality, not only such exceptional groups as the Kalangs of Surakarta and Jokjokarta and the Baduwis or nomad tribes of Bantam, but the great mass of the people must be considered as believers rather in the primitive animism of their ancestors, and in the essence of their creed but little removed from their ruder brethren the Dayaks of Borneo and the Battaks of Sumatra. Into the original web indeed they have from time to time introduced frag- ments from every

religious system with which they have come into contact; and no attempt has been made to rationalize into even superficial harmony the rudest of the resulting incongruities. The number of the spirits (Hyang or Yang, and with honorific prefix Sanghyang) worshipped by the Javanese is limitless) Every village has its patron spirit, whose presence was the indispensable condition of its foundation; to his influence all the fortune, good or bad, of the village is ascribed. Under a great shadowy tree stands an altar on which the worshipper lays his offering of incense and flowers, uttering meanwhile in broken Arabic the alien formula—'" There is no God but God, and Mahomet is his prophet." To every field likewise belongs its special patron spirit, to whom due reverence must be shown. Nor is protection the only office of the Hyang. Mentik causes a particular disease in

and rheumatism are ascribed to the influence of Dengen ; Ki or Kyai Belorong gives men wealth in exchange for their souls. Ratu Loro Kidul is princess of the southern sea, and has her seat among the caves and fiords of the southern coast. Within the region of her sway the Javanese will not speak loud lest he disturb the repose of her subject spirits. Near Rongkob in Jokjokarta, one of the places where edible nests are collected, the princess has a temple which none may enter save the priest alone; and similar temples exist in similar localities: The whole life of the Javanese, indeed, is enveloped in a mesh of mystery ; not the stars only and the heavens rain influence, but from every object a spiritual emanation, invisible for the most part, but potent and exhaustless, flows forth to him for blessing or for curse. Even Mahometanism with its One God has done little more tlian increase the number of supersensual beings to whom he prays. To Joseph he presents offerings that he may obtain beautiful children, to Solomon for honour and rank, to Moses for bravery, to Jesus for learning. The ritual of his religion—and his whole round of life is part of his religion —is intricate almost beyond conception, and at the same time rigid and precise. Everything must be done by rule and rubric; the unwritten law handed down from father to son allows of no curtailment or modification. Each individual class of offering must be prepared in its own

peculiar way; the rice, for example,—which is one of the chief sacrificial substances,—must now be white, now red, now hard, now soft.

As we ascend in the social scale we find the name of Mahometan more and more applicable ; aud consequently in spite of the paganism of the populace the influence of the Mahometan "priests" (this is their official title in Dutch) is widespread and real. Great prestige attaches to the name of Mecca pilgrim. In every considerable town there is a mosque. Compare INDIAN ARCHIPELAGO, vol. a. oe OLY.

For the Christianizing of the Javanese very little has been done. In East Java the chief mission stations are Modjo Warno (with a population of 2327 souls in 1879, inclusive of seven out-statious), Kediri (698), and Malang (700), maintained by the Netherlands Missionary Society, and Japara maintained by the Dutch Baptist Society. In West Java the Netherlands Mission Union has seven stations—Tjandjur, Buitenzorg, Indramayu, Sukabumi, Sumedang, Madjalengka, and Cheribon. At Depok, 18 miles from Batavia, the Batavian Missionary Society established in 1878 a seminary for native preachers. The native church of Depok was originated by Cornelis Chastelein, who left his estate to his slaves, whoin he libe- rated on condition of their embracing Christianity. Mr Briickner of Samarang, appointed to Java in 1812 by the Netherlands So- ciety, translated the New Testament into Javanese, but the work was eonfiscated by the Government. Gericke, an agent of the Netherlands Bible Society, was more fortunate; his versions of both the Old and the New Testament, as well as his grammar and dictionary (edited by Roorda, Amst., 1848, 1847), have scen more than one edition.!

Language and Interature.—Javanese, Sundanese, and Madurese are the three native languages of Java and Madura. 'To take the least important first,—Sundanese is only spoken in its purity in the Preanger Regencies and the neighbouring parts of Bantam, Buitenzorg, Krawang, and Cheribon, and it is gradually losing ground. To Javanese it stands in the relation that Scotch stood to English about a century

ago.2, The main body of Madurese is distinctly different from both old and new Javanese ; but it has incor-

1 See Brumund, Evangelisatie van Java, Amsterdam, 1854 ; H. C. Voorhoeve, De Evangelische Zending op Oost. Java, Hague, 1864; and J. C. Neurdenburg, ©. Poenson, &e., in Mededeelingan van wege het Nederl. Zendelinggenootschap, Rotterdam, 1880.

2 See Coolsma, Handleiding tot de beoefening der Soendaneesche taal; Grashuis, Soendaneesche tolk, and Soend. lesboek ; Rigg, Dic- tionary of Sundanese, Batavia, 1862; Blussé and Kartawinata, J/ol- – landsch-Sondaasch woordenboek, Samarang, 1877; Oosting, Soendasch-

the rice; Sawan produces convulsions in children; gout | Nederlandsch woordenboek, 1879.

porated a very large number of purely Javanese words.! In spite of these two languages and the intrusive Malay, Javanese has a full right to its name as the dominant speech of the island. It is not one language, but two. The nobles speak to the commonalty in the language of the commonalty, the commonalty to the nobles in the language of the nobles; and according to clearly understood regula- tions of etiquette every Javanese plays the part of noble- man or commoner to his interlocutor. The aristocratic form is known as Xrama or court speech, the popular as Vgoko, or the “thou-“ing speech (Fr., tutoyant, Germ., duzend) ; and between the two forms there is a sort of compromise, the Madja or middle speech, employed by those who stand to each other on an equal and friendly footing, or by those who feel little constraint of etiquette. For every idea that can be expressed in the language Kram& has one expression, Ngoko another, the two words being sometimes completely different, sometimes only differing in the termination, the beginning, or the middle. Thus every Javanese makes use of two languages, and, what is more difficult, of two languages delicately differentiated from each other. Java- nese as now spoken is far from being the same as the language of the old inscriptions and manuscripts) The latter (which is usually called Kawi,? though some scholars

insist on the name Old Javanese) was probably basea on the Javanese of Madjakerto, while the Kram& of the present day finds its type in that of Surakarta. It is easy to explain the existence of the Krama and the Ngoko. The Hindu conquerors of Java, in gradually adopting the speech of their Malay subjects modified it to suit their own taste and sense of superiority; and the subjects mean- while continued to speak as they were wont In its vocabulary Javanese Krama has a large number of words of Sanskrit origin; and in modern times there has been a considerable adoption of foreign words from and through the Dutch. Krama usually takes one form, Ngoko another ; thus the word particulier appears in the former as pedjahkelir, in the other as pattkelir.2 Like all the alphabets of the Indian archipelago except the Malay, the Javanese is derived from the Devanagari. When Javanese is written in Arabic characters it is called pégon.

Though a considerable body of Kawi literature is still extant, nothing like a history of it is possible. The date and authorship of most of the works are totally unknown. The first place may be assigned to the Brata Yudu (that is Sansk., Bharata Yudha, the conflict of the Bharatas), an epic poem dealing with the struggle between the Pand&was and the Korawas for the throne of Ngastina celebrated in parwas 5-10 of the Mahabharata. To the concep- tion, however, of the modern Javanese it is a purely native poem ;

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Fig. 1.—General View of Bara-Budur.

its kings and heroes find their place in the native history and serve as ancestors to their noble families. (Cohen Stuart pub- lished the modern Javanese version with a Dutch translation and notes, Brata-Joeda, &c., Samarang, 1877. The Kawi text was litho- graphed at the Hague by S. Lankhout.) Of greater antiquity pro- bably is the Ardjund Wiwahé (or marriage festival of Ardjuna), which Professor Kern thinks may be assigned to the first half of the 11th century of the Christian era. The very name indicates its Mahabhirata origin. (Friederich published the

Kawi text from a Bali MS., and more recently we have from him Wiwéhd Djarwa en Braté Jocdo Kawi, lithographed facsimiles of two palm leaf MSS., Batavia, 1878. Djarwa is the name of the poetic diction of modern Javanese.) The oldest poem of which any trace is preserved is probably the mythological Kanda (i.e., tradition) ; the contents are to some extent known from the modern Javanese version.

In the literature of modern Javanese there exists a great varicty of so-called babads or chronicles. It is sufficient to mention the 'history " of Baron Sakender, which appears to give an account— often hardly recognizable—of the settlement of Europeans in Java (Cohen Stuart has published text and translation ; Professor Veth gives an analysis of the contents), and the Babad Tanah Djawi (Hague, 1874, 1877), giving the history of the island to 1647 of the Javanese era. Even more numerous are the puppet-plays

1 See A. C. Vreede, Handletding tot de beoefening der Madoeresehe ©

taal, Leyden, 1874. 2™m full form tembung or bisa Kawi, t.¢., the "language of poems,"

which usually take their subjects from the Hindu legends or from those relating to the kingdoms of Madjapahit and Padjadjaram (see, ¢.g., H. C. Humme, Abidsd, een Javaansehe toneelstuk, Hague,

1878).

Several Javanese specimens are which plays so important a part in van den Broek, Javaansche Vertellingen, bevattende de lotgevallen van een kantjil, een reebok, &., Hague, 1878). To the Hindu- Javanese literature there has naturally succeeded a Mahometan- Javanese literature consisting largely of translations or imitations of Arabic originals ; it comprises religious romances, moral ex- hortations, and mystical treatises in great variety. ; ;

The reader may consult Rodet, Etudes sur la littérature javanaise 5 Van der Berg's account of the MSS. of the Batavian Society, Hague,

1877 ; and a series of papers by C. Poensen in Meded. van wege het Ned. Zendelinggenootsehap, 1880.

Antiquities. —The ruins left by the early Hindu con- querors of Java are among the most remarkable objects of

interest throughout the island. Temples (or tjandis, to 2 SS eee

3 Humboldt's study, Veber die Kawi Sprache, is one of the celebrated works of modern philology ; but in the absence of the necessary material it was to some extent a tour de force. Professor Kern's Kawi Studien form the most important of the more recent contributions to the investigation of the language. For modern Javanese the standard grammar is Groot and Gericke's Javaasehe Spraukkunst, edited by Roorda (Amst., 1843).

also known of the beast fable, Sanskrit literature (W. Palmer

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use the Javanese name) are common in both middle and eastern Java, —in Banyumas, Bagelen, Kadu, Jokjokarta, Surakarta, and Samarang, and in Surabaya, Kediri, Pasu- ruan, and Probolingo. 'They are absent from the Sunda lands in the one direction and from Madura in the other. Most famous of all the temple ruins is that of Bara-Budur. It lies a little to the west of the right bank of the Praga, which falls into the Indian Ocean. A hill rising above the plain 154 feet afforded a ready site for the structure, and the lava blocks with which the ground was strewn supplied abundance of material. The accompanying view and ground plan will give some idea of the general arrangement and effect.1 A square terrace, each side 497 feet long, encloses the hill at a height of 50 feet ; 5 feet above this there is a second terrace, each side 365 feet ; 11 feet higher comes a third terrace of similar shape ; and then follow four other ramparts and

Fia. 2.—Ground Plan of Bara-Budur.

four other terraces. The whole structure is crowned bya cupola 52 feet in diameter, surrounded by sixteen smaller bell-shaped cupolas. It is suggestive of the richness of the style to mention that on the outside of the wall of the second enceinte there are one hundred and four niches, each with its image of Buddha on a lotus throne hewn out of a single block 5 feet high ; and between the niches are sitting figures, man and woman alternately. The inside of the same enceinte is even more richly adorned with at least five hundred and sixty-eight bas reliefs, representing scenes in the Buddha legend. Of the chronological date of the temple there is no certain knowledge, but it contains evidence enough in itself to fix its position in the historical movement of the Hindu creeds.

"The mixture of Buddhism and Brahmanism is best seen," says R. Friederich (Tydsch. der Ind. T. L. en Volkenkunde), "in the three upper and inner gallerics of Boro Budur. In the first we see the history of Sakyamuni from the annuncia- tion of his descent from the heaven of Indra till his transformation into Buddha, with some scenes of his life. The thirteen first scenes in the second gallery like- wise represent Buddha as ateacher with his pupils; after that it wonld seem as if a concordat had been formed between the different cults; we have first in three separate scenes Buddha, Vishnu (Batara Guru), and Siva, all together, and other groups follow, Buddhistic and Sivaite without distinction. It is only in the fourth gallery that we again find Buddha dominant….. Already in the first gallery we also see Brahmanic divinities, Garonda for example, but not in separate scenes, In my opinion the cupola is the principal and the most ancient part of the temple of Boro Budor; it must have been intended to scrve as a daha-gopa (dagoba), z.¢., a place for the enshrining of relics. I do not as yet know of any other dagoba in Java; but I should not be surprised at their discovery. The dagobas of Ceylon have an exterior resemblance to the Boro Budur cupola; but I prefer to classify it rather with the topes or stupas of Afghanistan."

The writer goes on to point out that the sculptures of the lower galleries are not so carefully finished ; and the lions and some other subjects on

the outside of the temple have never becn com- a About 3 miles to the north-east of Bara Budur, and pro-

ably belonging to the same period, stands another beautiful temple—Tjandi Mendut or Mundut—on the left bank of the Ella before it joins the Praga. It was first discovered by Hartmann, the resident of Magelang, in 1834, under the sand and ashes with which the Merapi volcano had covered it. See C. W. Mieling's J avasche Oudheden, 1852 and 1856; and Colonel Yule's account of his visit in Journ. Roy. As. Soe. Bengal, 1862.

On the Dieng plateau in Bagelen, mentioned as a holy mountain SEE oy le lemme naa

1 See Leeman's Béré Boedoer, based on the MSS. of Wilsen and |

— and accompanied by 394 plates on elephant folio, Leyden,

| interpreting is peculiarly diffieult. ; Society in 1848 to issue a Corpus of Javanese inscriptions came to

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in the oldest known Javanese inscription, there exists a remarkable group of temples—which has been styled the Benares of Central Java. They stand 6500 feet above the sea ; and roads and stairways (locally known as Buddha's roads) lead up from the lowlands of Bagelen and Pekalongan. The stairway between Lake Mendjer and Lake Tjebong alone consisted of upwards of 4700 steps. A great subterranean channel served to drain the plateau. The Tjandis are very numerous, the largest and most beautiful being Tjandi Bima, but the best preserved the Ardjund group. The buildings are unfortunately covered to about a third of their height. In the same residency as Dieng are situated the temple caves of Kuta Ardja discovered by Kinder in 1853. They are distributed in four groups, and apparently from the linga symbol belong to the worship of Siva. Near Ragi Djampi (Banyuwangi) are the ruins of the town of Matjan Putih—of astonishing extent, but for the most part only shapeless mounds. The town walls were 12 feet high and

6 fect broad. A temple built of white limestone is the chief ruin. It seems to belong to the late Siva period of Javanese Hindu art. The much more famous city of Madjapahit has left its ruins not far from Madjakerto, in Surabaya.

Of the minor antiquities of Java the most valuable are the in- scriptions on stone and copper, though, owing to the variety of the characters which have been employed, the task of deciphering and The proposal of the Batavian

nought ; of private investigators the most successful are Friederich and Kern. ‘he inscriptions of Batu Beragung (1347) and Payer- raynng (1356), that on an image of Buddha now in the Berlin Museum, that. on a rock in the Dieng monntains discovered by Junghuhn, and that preserved at Minto House, in Scotland, are considered of special importance. At Sukuh and Tjeta, on the slope of Lawu, there is a peculiar serics in a special character deciphered by Van der Vlis. The famous Menang Kebau inscrip- tions, being the work of Javanese settlers, belong rather to Java than Sumatra; but Professor Kern has shown that, instcad of being, as at one time supposed, the oldest epigraphic monument in the Archipelago, they really belong to the most modern Hindu period (cf. Cohen Stuart in Bijd. tot de T. L. en V. Kunde, viii. 1, 1873). Of the Javanese copper plates the most important collec- tion is Cohen Stuart’s Kawi Oorkonden in Faesinmile, 1875.

The Name Java.—The origin of this name is very doubtful. It is not improbable that it was first applied either to Sumatra or to what was known of the Indian archipelago—the imsular character of the several parts not being at once recognized. Jawa Dwipa, or “land of millet,” may have been the original form? and have given rise both to the Jaba diu of Ptolemy and to the Je-pho-thi of Fattien, the Chinese pilgrim of the 4th or 5th century. The oldest form of the name in Arabic is apparently Zabej. The first epigraphic occurrence of Jawa is in an inscription of 1348. In Marco Polo the name is the common appellation of all the Sunda islands. The Jawa of Ibn Batuta is Sumatra; Java is his Mul Jawa (i.¢., pos- sibly ** original Java”). Jawa is the modern

Javanese name (in the court speech Jawi), sometimes with Nusa, “ island,” or Tanah, “country,” prefixed.

History.—The history of Java in its main outlines can be very briefly given ; in detail it is burdened with endless complications, inconsistent accounts, and imaginative adornments. It is impos- sible to extract a rational narrative from the earlier babads or native chronicles, and even the later are destitute of any satisfac- tory chronology. The first great moment in the history is the ascendency of the Hindus, and that breaks up into three periods, —a period of Buddhism, a period of aggressive Sivaism, and a period of apparent compromise. Of the various Hindu states that were established in the island, that of Madjapahit was the most widely dominant ; its tributaries were many, and it even ex- tended its sway into other parts of the archipelago.? The second moment of the history is the invasion of Islam in the beginning of the 15th century ; and the third is the establishment of European and more particularly of Dutch influence and authority in the island. In its general features this last and most important section reads very much like the narrative of the British subjugation of India. At the time when the Dutch East Indian Company began to fix its trading factories on the coast towns, the chief native state was Mata- ram, which had in the 16th century succeeded to the overlordship possessed by the house of Demak—one of the states that rose after the fall of Madjapahit. The “emperors of Java,” as the princes of Mataram are called in the early accounts, had their capital at Karta- snra, now an almost deserted place, 6 miles west of Surakarta. At first and for long the company had only forts and little fragments of territory at Jakatra (Batavia), &c.; but in 1705 it obtained de- finite possession of the Preanger by treaty with Mataram ; and in 1745 its authority was extended over the whole north-east coast, from Cheribon to Banyuwangi. In 1755 the kingdom of Mataram Lista py eo

2 Dwipa is also part of the names Maldive and Laecadive.

3 The work entitled Madjapahit, by Gramberg, is an historical romance based on the somewhat extravagant accounts of this kingdom.

was divided into the two states of Surakarta and Jokjokarta, which still retain nominal independence. The kingdom of Bantam was finally subjugated in 1808. By the English occupation of the island (1811-18) the European ascendeney was rather strengthened than weakened ; and the great Java war (1825-30), in which Dipa Negara made a last great struggle to maintain the position of the native dynasty, resulted in the complete success of the Dutch.

The fullest aceount of Java is contained in Professor Veth's Java: Geograph- isch, Ethnologisch, Hisiorisch, 8 vols., Haarlem, 1875-80. 'The first volume tonsists of a general deseription of the geography, flora, fauna, inhabltants, language, &¢.; the second gives a history of the native states (leaving the growth of the Dutch power, already treated in detail by De Jonge, as much as possible out of view); and the third presenfs a topographical deseription of each of the

residencies, The very existence of such a work implies the previous existence of a vast literature onitssubject. Besides Junghuhn, Raffles, and others referred to above, and under the heading INDIAN ARCHIPELAGO, We may mention Ryckloff van Goens, Javaense Reyse .. . in den Jare 1656, Dort, 1666 ; Hogendorp, Coup dil sur Vile de Java, Brussels, 1850; Pfyffer von Neueek, Skizzen von der Insel Java, &¢., 1829; Kussendragen, Natuur. en aardrijksk, beschrijving van Java, Groningen, 1841; W. R. van Hoevell. Reis orer Java, Amsterdam, 1849, &c., — and Uit het Ind. leven, Zaltbommel. 1860; D'Almeida, Life in Java; Pijnappel, Geographie van Ned. Ind.; Hollander, Mandleiding voor de land en volkenkunde van WNederlansch Indie. Gramberg's historical romances, and E. D, Dekker (Multatuli), Max Havelaar of de Koffeveilingen der Nederlandsche Handelsmaat- schapptyj, Amsterdam, 1869, are of value for their pictures of Javanese life. Professor Veth's work contains physical, historical, and topographical maps. Others on a larger scale will be found in the Atlas van Nederland en ztjne Over- zcesche Bezittingen, published by A. W. Sijthoff, 1879. CH. A. W.)

JAWAROW, the chief town of a district in the Austrian crown-land of Galicia, with extensive suburbs. It coutains a nunnery, and has a good grain market. The town was 2 favourite residence of the Polish king John Sobieski, who there received the congratulations of the pope and the Venetian republic on his success against the Turks at

Vienna (1683), At Jawarow Peter the Great was betrothed —

to Catherine I. The population in 1869 was 8699.

JAXARTES. See Sir Daria.

JAY (French, Géaz), a well-known and very beautiful European bird, the Corvus glandarius of Linnzus, the Garrulus glandarius of modern ornithologists. 'To this species are more or less closely allied nuicrous birds in- habiting the Palsearctic and Indian Regions, as well as the greater part of America, but not occurring in the Antilles, in the southern portion of the Neotropical Region, or in the Ethiopian or Australian. All these birds are commonly called Jays, and form a group of the Crows or Corwdz, which may fairly be considered a Subfamily, Garrulinz. Indeed there are, or have been, systcmatists who would elevate the Jays to the rank of a Family, Garrulidz—a proceeding which seems unnecessary. Some of them have an unquestionable resemblance to the Pies, if the group now known by that name can be satisfactorily severed from the true Corvine. In structure the Jays are not readily differentiated from the Pies; but in habit, so far as is known of them, they are much more arboreal, delighting in thick coverts, seldom appearing in the open, and seeking their food on or under trees. They seem also never to walk or run when on the ground, but always to hop. The body-feathers are commonly loose and soft; and, gaily coloured as are niost of the species, in few of them has the plumage the metallic glossiness it generally presents in the Pies, while the proverbial beauty of the "Jay's wing" is due to the vivid tints of blue—turquoise and cobalt, heightened by bars of jet-black, an indication of the same style of ornament being observable in the greater number of the other forms of the group, and in some predominat- ing over nearly the whole surface. Of the many genera that have been proposed by ornithologists, perhaps about nine may be deemed sufficiently well established.

The ordinary European Jay, Garrulus glandarius (fig. 1), has of late years suffered so much persecution in the British Islands as to have become in many districts a rare bird. In Ireland it seems now to ba indigenous to the southern half of the island only ; in England generally, it is far

less numerous than formerly; and Mr Lumsden (Scottish |

Naturalist, iii. pp. 230-240) has shewu that in Scotland its numbers have decreased with still greater rapidity.

There is little doubt that it would have been exterminated |

by this time but for its stock being supplied in autumn by immigration, and for its shy and wary bchaviour, especially at the brceding-season, when it becomes almost wholly mute, and thereby often escapes detection. No truthful man, however inuch he may love the bird, will gainsay the depre- dations on fruit and eggs that it at times commits; but the gardeners and gamekeepers of Britain fall into the usual

error of persons imperfectly acquainted with the ways of Nature, and, instead of taking a few simple steps to guard their charge from injury, or at most-of punishing the indi- vidual birds from which they suffer, deliberately adopt methods of wholesale destruction—methods that in the case of this species are only too easy and too effectual— _by proffering temptation to trespass which it is not in Jay-nature to resist, and accordingly the bird runs great chance of total extirpation. Notwithstanding the war carried on against the Jay, its varied cries and active ‘gesticulations shew it to be a sprightly bird, and at a distance that renders its beauty-spots invisible, it is yet rendered conspicuous by its cinnamon-coloured body and pure white tail-coverts, which contrast with the deep black _and rich chestnut that otherwise mark its plumage, and even the young at once assume a dress closely resembling ‘that of the adult. The nest, generally concealed in a leafy tree or bush, is carefully built, with a lining formed of fine roots neatly interwoven. Herein from four to seven eggs, of a greenish-white closely freckled, so as to seem suffused with light olive, are laid in March or April, and the young on quitting it accompany their parents for some weeks.

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Fig. 1.—European Jay.

Though the common Jay of Europe inhabits nearly the whole of this quarter of the globe south of 64° N. lat., its territory in the east of Russia is also occupied by G. brandti, a kindred form, which replaces it on the other side of the Ural, and ranges thence across Siberia to Japan ; and again on the Lower Danube and thence to Constantinople the nearly-allied G. krynicki (which alone is found in southern Russia, Caucasia, and Asia Minor) shares its haunts with it.) It also crosses the Mediterranean to Algeria and Morocco; but there, as in southern Spain, it is probably but a winter immigrant. The three forms just named have the widest range of any of the genus. Next to them come G. atricapillus, reaching from Syria to Beloochistan, G. japonicus, the ordinary Jay of southern Japan, and G. sinensis, the Chinese bird. Other forms have a much more

1 Further information will possibly shew that these districts are not

occupied at the same season of the year by the two forms,

JAY

limited area, as G. cervicalis, the local and resident Jay of

Algeria, G. hyrcanus, found on the southern shores of the |

Caspian Sea, and.G. taevanus confined to the island of Formosa. The most aberrant of the true Jays is G. lidthi, a very rare species, which seems to come from some part of Japan (vide Salvadori, Atte Accad. Torino, vii. p. 474), though its exact locality is not known,

Leaving the true Jays of the genus Garrulus, it is expe- dient next to consider those of a group named, in 1831, Perisoreus by Bonaparte

(Saggio, &c., Anim. Vertebrati, p. 43) and Dysornithia by Swainson (/. B,-Americana, ii. p.

495).

This group contains two species—one the Landus wnfaustus of Linnzus and the Siberian Jay of English writers, which ranges throughout the pine-forests of the

north of Europe and Asia, and the second the Corvus |

canadensis of the same author, or Canada Jay, occupying & similar station in America. The so-called Siberian Jay is one of the most entertaining birds in the world. Its versatile cries and actions, as seen and heard by those who

penetrate the solitude of the northern forests it inhabits, |

can never be forgot- ten by one who has had experi- ence of them, any more than the pleas- ing sight of its rust- coloured tail, which an occasion- al gleam of sun- shine will light up into a bril- liancy quite unexpected by those who have only sur-

Fie. 2.—American Blue Jay. veyed the bird's otherwise gloomy appearance in the glass-

case of a museum. It seems scarcely to know fear, ob-

truding itself on the notice of any passenger who invades |

its haunts, and, should he halt, making itself at once a denizen of his bivouac. In confinement it speedily becomes friendly, but suitable food for it is not easily found. Linnzeus seems to have been under a misapprehen- sion when he applied to it the trivial epithet it bears; for by none of his countrymen is it deemed an unlucky bird, but rather the reverse. In fact, no one can listen to the cheery sound of its ordinary calls with any but a hopeful feeling. The Canada Jay, or " Whiskey-Jack" (the cor- ruption probably of a Cree name), seems to be of a

similar nature, but it presents a still more sombre coloration, its nestling plumage,? indeed, being thoroughly Corvine in appearance and suggestive of its being a pristine form,

As though to make amends for the dull plumage of the species last mentioned, North America offers some of the most brilliantly coloured of the Subfamily, and the common

? Recent writers have preferred the former name, though it was only used subgenerically by its author, who assigned to it no characters, which the inventor of the latter was careful to do, regarding it at the same time as a genus,

In this it was described and figured (F. B. Americana, ii. p. 296, pl. 55) as a distinct species, G. brachyrhynchus.

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Blue Jay of Canada and the Eastern States of the Union, Cyanurus cristatus (fig. 2), is one of the most conspicuous birds of the transatlantic woods, The account of its habits by Alexander Wilson is known to every student of ornithology, and Wilson's followers have had little to do but supplement his history with unimportant details.? ~In this bird and its many allied forms, coloration, though almost confined to various tints of blue, seems to reach its climax, but want of space forbids more particular notice of them, or of the members of the other genera Cyanocitta, Cyanocorar,

| Aanthura, Psilorhinus, and more, which inhabit various

parts of the Western continent. It remains, however, to mention the genus Cissa, including many. beautiful forms belonging to the Indian Region, and among them the C. speciosa and C'. sinensis, so often represented in Oriental drawings, though doubts may be expressed whether these birds are not more nearly related to the Pies than to the Jays. (A. N.) JAY, Joun (1745-1829), American statesman, was the descendant of a refugee Huguenot family, and was born at New York, December 12, 1745. After three years spent

| in the house of the pastor of the French church at New

Rochelle, followed by four under a private tutor at home, he entered King's (now Columbia) College in 1760. On graduating there, May 15, 1764, he entered the office of Mr Kissam, an eminent New York lawyer; and in 1768 he was called to the bar. He rapidly rose into a lucrative practice, and in 1774 was married to Sarah, youngest daughter of William Livingston, afterwards governor of New Jersey. The great crisis in the fate of the American colonies was fast approaching ; and, like many other clever young lawyers, Jay took an eager, active part in the pro- ceedings that resulted in the independence of the United States. He was one of the committee of fifty selected by the citizens of New York in 1774 to correspond with other colonial committees on the subject of the Boston Port Bill. He was returned as a delegate from New York city to the continental Congress held at Philadelphia in September 1774, and, though almost the youngest member, was entrusted with drawing up the Address to the People of Great Britain. The numerous committees and associations which were from time to time appointed to meet the exigencies of that troubled period almost always included Jays name. Of the second Congress also, which met at Philadelphia on May 10, 1775, Jay was a member; and his able and eloquent pen was again useful in writing addresses to the peoples of Canada and Ireland. He was a member of the secret committee of Congress for corre- sponding with the friends of America in Europe. In April 1776, while still retaining his seat in Congress, Jay was returned to the provincial convention of New York by New York city and county; and his consequent absence from Philadelphia deprived him of the honour of affixing his signature to the declaration of independence issued on July 4, 1776. It was Jay who drafted the constitution that was finally adopted by the New York convention ; and that statesman, after acting as one of the council of safety for some time, accepted a provisional appointment as chief justice of New York State, which was afterwards confirmed under the organized constitution, with the proviso that he could hold with his judicial post no other save that of delegate to Congress "on special occasion." Such occasion was found in the secession of what is now the State of Vermont from the jurisdiction

of New Hampshire and New York. Jay was sent to Congress (December 7, 1778), of which he was immediately elected president. The follow-

3 The “ Blue Jay” of a recent American humorist would, however,

‘from the locality assigned to his inimitable story, appear to be, not this

species, but one of its western kindred—American ornithologists ninst determine which.

was addressed to the people of the States on the subject

of currency and finance; and before the end of the year, –

having previously resigned his chief-justiceship and his presideney, he was despatched as plenipotentiary to Spain, where he landed January 22,1780. The results of the mission were unsatisfactory. In addition to the fact that he was not reeeived by the Spanish court in a formally diplomatie charaeter, he was seriously embarrassed by the action of Congress in drawing bills upon him for more than half a million dollars, in the hope apparently that he would have received a subsidy from Spain before the bills fell due. Although by stooping to the humiliation of impor- tuning the Spanish minister, and by accepting a number on his own personal responsibility, Jay was able to meet some of the bills, he was at length foreed to protest others ; and the credit of the new country was only saved by a timely subsidy from France, out of which Franklin was enabled to remit from Paris the sum required to meet the bills then due. In 1781 Jay was commissioned to act with Franklin, Adams, Jefferson, and Laurens in negotiating a peace with Great Britain. He arrived in Paris from Spain, June 23, 1782; and after a variety of negotiations, in the eourse of which Jay evinced a jealous suspieion of the dis- interestedness of France and a punctilious attention to the dignity of his country, the provisional artieles were signed on November 30, 1782, and the formal treaty on September 3, 1783. Jay resigned his commissions, and on July 24, 1784, landed as a private citizen in New York, where he was presented with the freedom

of the city, and elected a delegate to Congress. On May 7th the last-named body had already chosen him to be foreign seeretary; and in that post he remained till the beginning of the Federal Government in 1789. In the question of the institution of such a government he had taken a keen interest: he joined Hamilton and Madison in issuing the Federalist ; he published anonymously (though without sueceeding in concealing the authorship) An Address to the People of New York, in vindieation of the constitution ; and he ably seconded Hamilton in inducing his native State to adopt it. On September 26, 1789, he became the first chief- justiee of the supreme court of the United States. During one of his circuits Harvard University eonferred on him the degree of LL.D. In 1792 he consented to stand for the governorship of New York State; but the " canvassers " who scrutinized the votes disqualified the returns of three counties ; and, though Jay had reeeived an actual majority of votes, his opponent General Clinton was declared elected.

During the war between Great Britain and France, the relations between the former and the American States became critical; a definite eommercial treaty seemed the only means of averting war. Chief-Justice Jay was chosen envoy to England, though not without strong opposition. He landed at Falmouth in June 1794, signed a treaty with Lord Grenville on November 19, and disembarked again at New York, May 28, 1795. Several of the articles of " Jay's Treaty," especially that which declared that a free ship did not make free cargo, were hailed at home with furious denunciation. Jay was accused of having betrayed his eountry; his effigy was burnt along with copies of the treaty, and even after Washington signed the ratification in Augnst, the States were in a ferment that prevented for a time the really beneficial action of the treaty. Two days before he landed, and before the parti- culars of the treaty had been published, Jay had been triumphantly returned as governor of his native State, and, notwithstanding his temporary unpopularity, he was re- elected in April 1798. With the close of this second term of office in 1801, he closed his publie career. Although not yet fifty-six years old, he refused all offers of offiee, and,

ing September his letter, written in the name of Congress, |

retiring to his estate near Bedford in Westchester county, New York, spent the rest of his life in rarely interrupted seclusion. His public utterances from 1821 till 1828 were mostly as president of the American Bible Society. On May 17, 1829, John Jay, in his eighty-fourth year, ended a life whose purity and integrity are commemorated in a sentence by Daniel Webster : " When the spotless ermine of the judicial robe fell on John Jay, it touched nothing less spotless than itself."

The Life of John Jay, with Selections from his Correspondence and Miseellancous Papers, was published in 2 vols. by his son Wilham Jay in 1833.

JAY, Wiit1am (1769-1853), dissenting preacher and religious author, was born at Tisbury in Wiltshire on May 6, 1769, The son of a stone mason, he had adopted his father's calling, when his appearance attracted the attention of the Rev. Cornelius Winter, the dissenting minister. Mr Winter at that time presided over a religions serninary at Marlborough, in which, with his advice and assistance, the young mason became a student in 1785. During the three years and a half that Jay spent at Marlborough, the wonderful preaching powers which distinguished him till the day of his death were rapidly developed. His first sermon was delivered in his seventeenth year; and before his majority he had preached nearly a thousand times. In 1788 he had even for a season occupied Rowland Hill's pulpit in London. But his youth warned him to seek more time for study, and he therefore accepted the humble pastorate of Christian Malford, near Chippenham, where he remained about two years. He had hardly spent a year in his next charge at the Hot Wells, Clifton, when he was unanimously chosen to be minister of Argyle Independent Chapel in Bath ; and on January 30, 1791, he entered the sphere in which he was to spend the rest of his aetive life, attraeting to his ehapel hearers of every religious denomination and of every social and literary rank, and winning for himself a wide and solid reputation as a brilliant pulpit orator, as an earnest religious author, and as a pious minister. In 1841 the jubilee of his

pastorate was cele- brated ; in 1852 he was requested to retire; and the con- nexion of sixty-three years formally ended in January 1853. He died on Deeember 27, 1853.

As a preacher Jay was cloquent and impressive ; but his expres- sions and style at times wanted refinement and delicacy. His sermons were often so practical and direct as to excite suspicion, though quite unfounded, of being aimed at individuals. He was fond of peculiar texts, and did not always restrain his sense of humour when in the pulpit. The popularity which his writings, especially his devotional writings, have found with a wide circle of readers vouches for their worth. In his books he is always earnest, homely, and practical, and at times attains a certain neatness of diction and aptness of illustration. Perhaps the best known of his works are his Morning and Evening Exercises ; The Christian Contemplated ; The Domestie Minister's Assistant ; and his Discourses. For his Short Discourses for the Use of Families the diploma of D.D. was conferred upon him by the college of New Jersey ; but he did not avail himself of the title. Jay also wrote an excellent Life of Rev. Cornelius Winter, and Memoirs of Rev. John Clarke. An edition of Jay's Works in 12 vols. 8vo, revised by himself, was issued in 1842-44 ; again, reduced in price, in 1856. A new edition, in 8 vols. 8vo, was announced in 1876. For further particulars sce Jay's Autobiography, 1854; Rev. 8. Wilson's Memoir of Jay, 1854; Wallace's Portraiture of Jay, 1854; and Cyrus Jay's Recollections of William Jay, 1859.

JEAN D'ANGELY, Sainz, chief town of an arrondisse- ment in the department of Charente-Inférieure, France, is situated in a fertile vine-bearing district on the right bank of the river Boutonne, 16 miles south-east of La Rochelle. The most interesting buildings are the ruined abbey, destroyed in 1568, two large towers used as a prison and forming the remains of a 17th century chureh, an embattled cloek-tower dating from 1276, a handsome eolonnaded market-plaee, and a hospital. The inhabitants are engaged in distilling brandy, wool-spinning, and the

manufacture of cast-iron tools, agricultural implements, serges, &c.; and a trade in spirits, wines, cereals, and oil seeds is carried on. The population in 1876 was 6309.

St Jean d'Angély (Angeriacwm) owes its origin to Pippin the Short, who founded a monastery on the spot about 768. The report that the head of John the Baptist was deposited there attracted crowds of pilgrims, for whose accommodation a town gradually grew up. In 1572 the duke of Anjou captured it from the Huguenots ; but they retook it soon after. Its fortifications were razed under Louis XIII.

JEBEIL, Jupert, or DsEBatt, an ancient town of Syria, is pleasantly situated on a slight eminence near the sea, about 20 miles north of Beyrout. It is surrounded by a wall, a mile and a half in circumference, with square towers at the angles, which along with the old castle at the south-east corner are attributed to the crusaders. In the gardens and vineyards that surround the town lie numerous broken granite columns, —these, with the number of ruined houses within the walls, testifying to its former importance. The stele of Jehawmelek, king of Gebal, found here is one of the most important of Pheenician monuments.! The small port is almost choked up with sand and ruins. The place has dwindled to a village of some 600 inhabitants.

Jebeil is the Pheenician Gebal and the Byblos of the Greeks. Its inhabitants were renowned as stone-eutters (1 Kings v. 18, margin) and as shipbuilders (Ezekiel xxvii. 9); while Arvian (ii. 20, 1) represents Enylus, king of Byblos, as joining Alexander with a fleet, after that monarch had captured the city. Philo of Byblos makes it the most ancient city of Phcenicia, founded by Kronos, i.¢., the Moloch (Melek) who appears from the stele of Jehawmelek to have been with Baaltis (say nby2) the chief deity of the eity. Baaltis on this stele has the characteristics of Isis-Hathor. Com- pare the legend that the ark with the corpse of Osiris was cast ashore at Byblos, and there found by Isis (Plut., Afor., 357). The orgies of Adonis in the temple of Baaltis (Aphrodite Byblia) are deseribed by Pseudo-Lucian, De Dea Syr., eap. vi. The river Adonis is the Ibrahim river, which flows near the town. The ernsaders, after failing before it in 1099, captured "Giblet" in

1103, but lost it again to Saladin in 1189. Under Mahometan rule it has gradually decayed. See Renan, Miss. de Phen. ; Movers, Phénizier, ii. 1, 107 ; Badeker-Socin's Handbook.

JEDBURGH, a royal and parliamentary burgh of Scot- land, the county town of Roxburghshire, is situated on the river Jed, a tributary of the Teviot, 49 miles south-east of Edinburgh, and 10 miles north of the English border. The town consists mainly of four well-paved streets diverg- ing at right angles from the central market-square. Next to the abbey in point of historical interest is Queen Mary's house, where she resided for some time in 1566. The county prison occupies the site of the ancient castle of Jed- burgh, destroyed in 1409. The abbey, one of the grandest ecclesiastical ruins in Scotland, was founded in 1118 by Prince David, afterwards David L., for the reception of certain Austin canons from St Quentin's at Beauvais. The nave, an exquisite example of the transition from Norman to Early English, measures 133} feet by 594 feet. With the exception of the north piers and a small portion of the wall above, which are Norman, the whole of the tower, 30 feet square and 86 feet high, belongs to the end of the 15th century. In the choir there is some very early Norman work ; the south chapel of the choir affords good specimens of the Decorated period. The total length of the magnificent pile, reduced to ruins by the conflicts of which Jedburgh was so often the scene, is 235 feet. Jedburgh,' one of the first Scottish towns to take up the woollen manufacture (its first mill began in 1728), at present has five factories, employing 200 hands, and producing goods—chiefly tweeds—to the annual value of about £70,000. The burgh unites with Haddington, Dunbar, North Berwick, and Lauder in returuing a mem- ber to parliament. The population in 1881 was 3400.

1 See the recent discussions by Euting (7. D.M.G., 1876), Halévy, (Journ. As., 1879), and Ganneau (Et. d'Areh. Or., i., 1880).

Jedburgh, the final form of a name of which eighty-two variations have been collected, does not appear before the 15th century ; Jed- worth, still lingering among the lower ranks as Jethart, is much more aneient ; Ecgred, bishop of Lindisfarne (830-838), gifted that see with the village

and lands of Geddewrd. Before the end of the 11th century the village had become a burgh ; and under David I. (1124-1153) it was a royal residence, and the chief town of the Middle Marehes. The town received a charter from Robert I., and another in 1566 from Mary. During the troublous times on the borders in the Middle Ages, Jedburgh was an important place, and often experienced the disastrous effeets of fire and sword. The phrase " Jethart Justice," meaning hanging a man and trying him afterwards, has passed into a proverb.

JEFFERSON, Tuomas (1743-1826), the third presi- dent of the United States, and the most conspicuous apostle of Democracy in America, was born April 2, 1743, at Shadwell, Albemarle county, in the State of Virginia, a region of which his father Peter Jefferson, an obscure and unlettered planter, was the third or fourth settler.

At the early age of five years Thomas was sent to an English school, and from that time until he finished his studies at William and Mary's College in 1762 appears to have enjoyed superior educational advantages, and to have turned them all to good account. He carried with him from college, at nineteen, a tolerably thorough reading knowledge of the Latin, Greek, and French languages, to which he added a familiarity with the higher mathematics and natural sciences only possessed at his age by men who have, as he had, a rare natural faculty for the prosecution of those studies. Soon after leaving college he eutered the law office of Mr George Wythe, then at the head of the Virginia bar, and withal, Jefferson being judge, "the best Latin and Greek scholar in the State." In Mr Wythe he found a "faithful and beloved mentor in youth and most affectionate friend through life." In 1767, after five years' close application to the study of his profession, he was admitted to the bar. 'The death of his father in 1757 left Thomas, who was the eldest son, heir to the estate on which he was born, and which yielded him an income of about £400 a year, a sum in those days sufficient to gratify all his tastes, and to give him, as he matured, the position of an independent country gentleman. At the time of his admission to the bar he is described by his contemporaries as 6 feet 2 inches in height, slim, erect as an arrow, with angular features, a very ruddy complexion, an extremely delicate skin, full deep-set hazel eyes,

and sandy hair, an expert musician (the violin being his favourite instrument), a good dancer, a dashing rider, and a proficient in all manly exercises) He was, and continued through life, frank, earnest, cordial, and sympathetic in his manner, full of confidence in men, and sanguine in his views of life.

Though mostly known to fame as astatesman, Jefferson's success as a lawyer showed that the bar had no rewards which were not fairly within his reach. He had sixty-eight cases before the chief eourt of the province the first year of his practice, and nearly twiee that number the second. In the fourth, his register shows that he was employed in fonr hundred and thirty eases. During the eight years that he continned in active practice his income had enabled him to live like a gentleman, and to add a few hundred acres to his landed estate from time to time, until his inheritance of 1900 acres had become, in 1774, 5000 acres, an'] all paid for. But, while fired with the Virginian passion of the period for acquiring land, Jefferson docs not appear to have shared the pas- sion whieh usually accompanied it, of multiplying slaves to clear and till it. He was one of the first of English-speaking statesmen with foresight enough to diseover the thunders with which the dark cloud of slavery was charged, and with courage enough to warn his countrymen against them. It does not appear that he ever acquired any slaves by purchase and as an investment.

In 1767 Governor Fauquier, the colonial governor of Virginia, died, he arrival of the new governor, Baron de Botetourt, in October 1768, was followed, aceording to usage, by the dismissal of the Honse of Burgesses, and a new election was ordered. Jeffer- son, offering himself as a candidate, was elected from the county of Albemarle, and continued to be annually re-elected until the House of Burgesses was closed by the revolution, His public eareer began, like that of some of the greatest parliamentarians before

him, in a mortifying failure. In conformity with a usage brought from the mother country of selecting one of the younger mem- bers to draft the reply to the governor's speech, this complimentary duty was

devolved upon Jefferson. He confined himself too elosely for the taste of the committee to the language of the resolutions which he was expeeted to amplify and glorify. His address was rejected, and the duty of preparing a substitute was confided to another member. This humiliation doubtless had some share in giving to his pen the parliamentary distinction usually won only by the tongue; for he was no orator—indeed, though one of the foreniost members of several deliberative bodies in his time, he can fairly be said to have never made a speech.

Jefferson's legislative duties were not destined to detain him long from his profession. The king having abandoned the policy of levying internal taxes, and directed instead that a duty upon ecrtain leading articles of foreign eommerce should be levied at the custom-houses in the eolonies, in the spring of 1769 a mes- senger arrived at Williamsburg, then the seat of government of Virginia, announeing to the Housc of Burgesses the firm resolve of Massaehusetts to resist these duties by all eonstitutional means, and asking the coneurrenee and eo-operation of Virginia. On the third day of the session of the House of Burgesses four resolutions were adopted with substantial unanimity, in harmony with those adopted by Massaehusetts. The first declared against taxation without representation ; the second, that the eolonies may eoncur and co-operate in seeking redress of grievanees; the third, that sending accused persons away from their eountry for trial is an inexpressible complexity of wrong; the fourth, that they should send an address on these topies to the 'father of all his people," beseeching his " royal interposition." On the following day, and without waiting for an official copy of these resolutions to reach him, Governor Botetourt dissolved the House of Burgesses.

Thus in five days terminated, for the present, Jetierson's career as a legislator. But, though brief and crowned with no results to satisfy his ambition, history does not pronounce his first experience as a legislator inglorious, for it was illustrated by an effort, which was not the less honourable to him beeause it was unsucecssful, to ameliorate the condition of the African bondmen in Virginia. The law of those days forbade the manumission of a slave, except upon the condition that he was immediately sent out of the State. Jeffer- son desired the repeal of this law. His efforts were not only un- suceessful, but they devcloped sneh a state of feeling upon the subject as to bring into grand relief the courage which even at that early day ventured to propose sueh a measure.

The day after the House of Burgesses dispersed, its members met at a public hall in the Raleigh Tavern in Williamsburg, and, fol- lowing the example of Massachusetts, resolved, with a near ap- proach to

unanimity—(1) to be more saving and industrious ; (2) never to buy any artiele taxed by parliament for revenue, except low qualities of paper which they could not dispense with, nor (8) to import any artiele from Britain or in British ships if they could help it, until the offensive Act was repealed; and (4) to save all their lambs for wool. Every man who signed the agreement was re-eleeted, and every man who refused lost his election.

On February 1, 1770, while Jefferson and his mother were absent from home, his house was burned down.. He had, however, already begun elearing the grounds and preparing for the ereetion of a new residence at Monticello, which occupied no inconsider- able portion of his time and thoughts for the next two years, and which was destined to become, for more than half a century, the most distinguished seat of private hospitality in Ameriea. On the 1st of January 1772 he married Martha Skelton, a widowed daughter of a wealthy neighbour and associate at the bar of Williamsburg, of large fortune in lands and slaves. The lady was very handsome, ehildless, fond of music, twenty-three ; she proved to him a loving and devoted wife, and was the eentre of a domestic circle the joys of whieh seemed only to be intensified and eonsecrated by the distractions of his publie life.

In the spring of 1773 Jefferson was appointed by the House of Burgesses a2 member of " a Committee of Correspondence and In- quiry for the Dissemination of Intelligence between-the Colonies." 'The appointment of this eommittee responded to the necessity then beginning to be felt by all the eolonies of making eommon eause against the pretensions of the Crown, and looked to a eonvention in which their united purposes might find expression. The resolutions whieh gave birth to this eomimittee provoked an immediate dis- solution of the House, but its members were all re-elected. Soon after they had resumed their sittings in the following spring, news reached them of what is known in history as "The Boston Port Bill," by which the ehief port of Massachusetts was to be elosed to commerce on the Ist of June uf that year (1774). The House of Burgesses thereupon set apart that day for fasting, humiliation, and prayer, thereby provoking from the governor another dissolu- tion, May 20, 1774. This immediately led to

the selection of delegates from the several counties to meet at Williamsburg in August, to consider the state of the eolony, and to provide for an annual congress of the colonies. Jefferson was chosen a dele-

gate to the State Convention, but, owing to sudden indisposition which overtook him on his way, was unable to attend. His in- fluenee there, however, was not to be wanting, for much of the interval between the dissolution of the House and the meeting of the Convention was devoted to the eonsideration and pre- paration of a series of instructions for the deputies who were to be sent to the General Congress, whieh was to meet at Philadelphia in September. In these instructions, which he had intended him- self to propose, eould he have been present, he maintained " that the relation between Great Britain and these colonies was exactly the same as that of England and Seotland after the aceession of James and until the Union, and the same as her present relations with Hanover,—having the same executive chief, but no other necessary politieal eonnexion ; and that our emigration to this country gave no more rights over us than the emigration of the Danes and Saxons gave to the present authorities of the mother country over England." These instructions, though too radical then for the purpose for whieh they were designed, were laid upon the table of the delegates, read by many, and published in a pamphlet entitled 4 Summary View of the Rights of America, and extensively cireulated. It ran through edition after edition in England, after receiving sueh modifieations (attributed to the pen of Burke) as adapted it to the purposes of the Opposition ; and it procured for its author, to use his own language, "the honour of having his name inserted in a long list of proseriptions enrolled in a bill of attainder commenced in one of the two Houses of Parlia- ment, but suppressed in embryo by the hasty comrse of events." This paper placed Jefferson among the leaders, if not at the head of the revolutionary movement in America—events rapidly ripen- ing in the publie mind its novel and startling doctrines. The Declaration of Independence two years later, of whieh he asked that his tombstone should testify as the greatest

achievement of his life, was but a perfected transcript of the Summary View.

Jefferson was the leading spirit in the sneeeeding sessions of the Virginia Convention; he was one of a eommittee of thirteen appointed to report a plan for arming Virginia; he was named a delegate to the General Congress, where he took his seat eight days after Colonel George Washington had been appointed by Congress commander-in-ehief of the armies of the colonies ; and he was placed upon the eommittce to draw up a statement of the eauses whieh had impelled the colonies to take up arms against the mother eountry, and upon another eommittee to report on Lord North's " eonciliatory proposition." In the winter of 1775-6 disastrous news arrived from England. 'The king in opening parliament had denounced the colonists as rebels, and reeommended decisive eoereive measures against them; and this was promptly followed by a law authorizing the confiscation of American vessels and eargoes, and those of all nations found trading in American ports, and the impressment of Ameriean crews into the British navy. This measure and the large vote by which it was passed instantly crystallized the eolonics, and on the 11th June 1776 Congress appointed Jefferson, Adams, Franklin, Sherman, and Livingston to prepare a Declaration of Independenee. '

Jefferson at the request of his associates prepared a draft of the Deelaration, which, after two or three verbal correetions by them, was taken up for consideration in the House on the 2d of July. In the debate on the Declaration Jefferson took no part, " think- ing it a duty to be on that occasion a passive auditor of the opinions of others, more impartial judges than he eould be of its merits and demerits." 'I'wo or three expressions had been used whieh gave offence to some members: the words "Seoteh and other foreign auxiliaries" were resented by some delegates of Scottish birth ; and the strictures on the king's repeated veto of colonial laws repealing the law whieh permitted the slave trade were disapproved by some of the southern delegates.

On the evening of the 4th of July 1776 the Declaration was reported back from the commtittee of the whole House, and agreed to.

Cireumstanees have given an historical importance to this document somewhat disproportioned to its merits as a statement of the grievances of the colonies ; for it seemed to be the weapon that dismembered a great empirc, and that gave birth to a nation of unlimited possibilities; it gave guarantees for the fame of its author which are possessed by no other production of an American pen; for more than a century it has been read to assembled multi- tudes in every considerable town in the United States on the anni- versary of its adoption ; and its style and sentiments have been the model for every people which since that time has sought to assert for itself the right of self-government.

Jefferson continued to partieipate actively in the efforts to organize the government of the confederation, and prepare it for the life and death struggle whieh was impending, until the 2d of September, when he resigned, to take his seat in the legislature of Virginia, to which he had been elected, and where he thought his serviees would be most needed. " When I left Congress in 76," he says in his autobiography, "it was in the persuasion that our whole eode must be reviewed, adapted to our republican form of government, and, now that we had no negatives of couneils, gover-

nors, or kings to restrain us from doing right, that it be corrected in all its parts with a single cye to reason and the good of those for whose government it was framed." To this task he now devoted himself. Of the various measures introduced in furtherance of this purpose he says: "I considered four, passed or reported, as forming a system by which every fibre would be eradicated of ancient or future aristocracy, and a foundation laid for a govern- ment truly republican." These were—the repeal of the laws of entail, the abolition of primogeniture and equal partition of inherit- ances, the restoration of the rights of conscience and relief of the people from taxation for the support of a religion not theirs, and a system of general education. He tried to add to these, but with- out success, the introduction of trial by jury into the courts of chancery, and to provide for the gradual emancipation of the slaves. He did, however, introduce a bill, which passed without opposition,

forbidding the further importation of slaves into the State—the only important change effected in the slave system of Virginia during the revolutionary period. The importance he attached to his work in Virginia at this time he showed by resign- iug his seat in Congress, and by declining the appointment ten- dered him by Congress in 1776, to go with Franklin to Paris, to assist in negotiating treaties of commerce and alliance with France.

In the third year of the war (1779), and just as the darkest and most threatening clouds were gathering over Virginia, Jefferson was elected governor. The enemy had decided to carry the war into the south. The commonwealth was almost defenceless, all her niilitary resources having been exhausted in sustaining Washing- ton's policy of driving the enemy out of the north. Arnold entered Richmond, recently become the capital, on the 5th of January 1781, and ravaged the place. The legislature, which had taken refuge at Charlottesville, were pursued and dispersed by Tarleton, who im- mediately sent a party to capture Jefferson at Monticello. He narrowly escaped, his pursuers being in sight of him as he mounted his horse and rode off to join his family. Though Monticello was spared by Tarleton's order, Jefferson's estate of Elk Hill, on the James river, was less fortunate. It was completely despoiled by the orders of Cornwallis. It was natural that the ineffectual resistance made to the enemy in Virginia should have exposed the governor's conduct to criticism, for few knew, as he did, that a more effective defence was impossible without weakening the northern army, and totally disarranging the plans upon which the cominander-in-chief wisely relied for the ultimate success of the national defence. An investigation of his conduct was threatened ; but when it was ascer- tained that he had been acting in harmony with the poliey of Washington, the investigation was not only abandoned but the legis- lature shortly after the expiration of his term of office resolved unani- mously " That the thanks of the general assembly be given to our former governor, Thomas Jefferson, for his impartial, upright, and attentive administration while in office. The assembly wish to de- clare in the strongest inanner the high opinion which they entertain of Mr Jefferson's ability, rectitude, and integrity as chief magistrate in this commonwealth, and mean, by thus publicly avowing their opinion, to

obviate and to remove all unmerited censure." Jefferson became sensible that in the exhausted condition of Virginia, without money, without equipment, without troops, without any currency except the products of the soil, no governor not a trained soldier could hope to retain the confidence of the people during the crisis, and therefore he determined to decline re-election.

In 1782 he was summoned by Congress to act as one of the plenipotentiaries to negotiate a treaty of peace with the mother country, but the business was found to be so far advanced before he was ready to sail that his appointment was recalled, and we find him at the following winter session again occupying his seat in Congress, where, as chairman of the committee to which it was referred, he reported the definitive treaty of peace with England. At the succeeding session le introduced an elaborate report, and secured the adoption of the system of coinage which is still in vogue in the United States. In the same session he drafted the report of a plan for the government of the vast territory lying to the north- west of the Ohio river, which Virginia had ceded to the Federal Government in 1780. Among other provisions which he suggested, and which were adopted, was one big with a rebellion of far more threatening proportions than that which its author had just assisted in bringing to a successful issue. The clause in question provided 'that after the year 1800 of the Christian era there shall be neither slavery nor involuntary servitude in any of the said States, otherwise than in punishment of crimes whereof the party shall be duly convicted to have been personally guilty." It was the attempt to organize States from this territory in defiance of this restriction that led to the war of 1861, and to the final, though costly, vindication of Jefferson's sagacity and forecast in 1783.

In 1784 Jefferson was again commissioned by Congress as minister plenipotentiary, this time to assist Franklin and Adams In negotiating treaties of eommerce with European states. He Joined his associates in Paris in July. The mission upon which he was sent proved somewhat premature. Jeffcrson, wisely judging that fuller and more correct information about America must pre-

cede any successful attempts to deal with European states to ad- vantage, printed at his own expense, and distributed among his friends, some Notes on Virginia, which he had prepared two years before. It was in these notes that the oft-quoted passage occurs : ““T tremble for my country when I think that God is just ; that his justice cannot sleep for ever ; that, considering numbers, nature, and natural meaus only, arevolution of the wheel of fortune, an ex- change of situations, is among possible events; that it may become probable by supernatural interference. The Almighty has no attribute that can take sides with us in sucha contest.”

In January 1785 Dr Franklin, after eight years’ residence at the French court, pressed his application to be relieved, and Jefferson was selected, as he gracefully put it in presenting his letters of eredence, ‘*to succeed him, for no one could replace him.” Jefferson was exceedingly popular as a minister, and was fortunate in securing several important modifications of the French tariff in the interests of American commerce.

In the summer of 1789 Washington, who had been elected president of the United States under the new constitution, gave Jefierson leave of absence, and soon after his arrival in America, ‘*as well from motives of private regard as a conviction of public propriety,’ tendered him the oflice of secretary of state. Reluct- ant as Jefferson was to leave Paris, he yielded at once to the wishes of the president, and entered upon the duties of his new office in March 1790. Alexander Hamilton, who was the head of the Federal party as distinguished from the Democratic, of which Jefferson was the most conspicuous representative, was appointed the secretary of the treasury. They represented the two great schools of political thought whieli contended for mastery in American politics, not ouly during Washington’s adininistration, but for the succeeding sixty years, and until their differences were inerged in the graver and more absorbing issues that grew out of the conflict between free and servile labour. Jefferson was an advocate of State sovereignty aud of decentralization. He was strongly opposed to the leading features of the British constitution, and in cordial sympathy with the new school of polities which had recently begun to be felt in the

government of France. His five years' residence in that country had greatly strengthened him in these views, and they more or less affected his treatment of all questions that came before him as a cabinet minister. Hamilton's great fear, on the other hand, was that the central government under the new constitution would be too weak, and he favoured all measures that tended to exalt and strengthen the executive, and to bring the government nore in harmony with that of England. Washington very prudently gave the victory to the partisan of neither theory, though his sym- pathies were supposed to be more frequently with the Federal than with the Republican leader.

The most perplexing questions which occupied Jefferson's atten- tion as secretary of state grew out of the war declared by France in 1793 against Holland and Great Britain. What should be the neutral policy and what were to be insisted upon as the neutral rights of the United States? Upon this question both parties put forth their whole strength. The Republicans, under Jefferson's lead, pretty generally sympathized with the French, and were inclined to authorize privateers to be fitted out in American ports to cruise against English vessels. This policy was energetically and wisely resisted by the Federalists, who were for peace with all and entangling alliances with none. Jefferson advocated the propriety of receiving a diplomatic representative from the French republic. In this his advice prevailed, and Genest was promptly sent as minister. With more zeal than discretion he proceeded at ouce to fit out privateers, and empower French consuls in the United States to organize courts of admiralty to condemn prizes. This led to heated discussions in the cabinet, and finally to the recall of Genest. Partly from discontent with a position in which he did not feel that he enjoyed the absolute, which meant pretty much the exclusive, confidence of the president, and partly because of the embarrassed condition of his private affairs, due mainly to the ravages of war, Jefferson resigned his seat in the cabinet December 31, 1793, and retired to Mouticello. There he remained till the fall of 1796, when he was made vice-president at the election which called Jolin Adams to the presidency. The duties of this position being limited to presiding over the Senate during its sessions, Jefferson spent most of the four years of his official term in

improving his estate, and by his counsels directing the poliey of the party of which he was the aeknowledged leader. The excesses of the

1 Jefferson took a very modest view of this book, and in a purely literary point of view he could not afford to take any other; but it was so thoroughly saturated with democratic-republican ideas, of which he was then the most complete living exponent, with the possible exception of Franklin, that it was widely and eagerly read, and no doubt did much to relax the hold the doctrines of divine right and of passive obedience had upon the educated classes of France, and measur- ably contributed to precipitate the great popular uprising in that kingdom, with which Europe was soon to be convulsed.

Reign of Terror had worked a formidable reaction in America against the sympathizers with revolutionists in France. This, with the aggressive policy of the Directory, and the insulting reception given to the American envoys in Paris, for a time paralysed the Republican party. President Adams, mistaking the resentment felt in the United States towards France for a popular reaction there against republicanism, was betrayed into a series of ill-considered measures, which were not long in tell- ing upon the fortunes of his party. Among tlicse measures the most unfortunate perhaps were the alien and sedition laws, the former empowering the president to expel from the country such aliens as he should decm dangerous, and the latter punishing as sedition, with fine and imprisonment, the printing or uttering malicious charges against the president or Congress. The Re- publicans commenced an active agitation against the laws through- out the country, which, co-operating with a strong and popular sympathy with the Republican doctrines, finally resulted in the election of Jefferson and Burr, the candidates of the Republican party, as president and vice-president, and the defeat of Adams and Pinckney the candidates of the Fcderalists. Washington having died only a few months before, this election proved the coup de grace of the Federal party, and established Jeffersonian Republicanism as the permanent policy of the country. Jefferson entered upon the duties of the

presidency on the 4th of March 1801, and was re- elected for the terin commencing March 4, 1805, by 148 out of 176 dlectoral votes. His administration of twice four years was charac- terized by the simplicity which distinguished his conduct in private life. He eschewed all pomp and ceremony designed artificially to distinguish the president from the people. His dress "was of plain cloth" on the day of his inauguration. Instead of driving to the capital in a coach and six as had been the practice, he rode there on horseback, without a guard or even a servant in his train, dismounted without assistance, and hitched the bridle of his horse to a fence. Instead of opening Congress in the English fashion, with a speech to which a formal reply was expected, he sent his message by a private hand. Court etiquette was practi- cally abolished, and the weekly levee with it. The code of prece- dence was essentially modified. Titles of honour were not. recog- nized as such. " Excellency," " Honourable," and even " Mr," were distasteful to him. Between the President and governors of States he recognized no difference in rank, cach being the supreme head of an independent state. "If it be possible," he said, "to be certainly conscious of anything, I am eonscious of feeling no difference between writing to the highest and lowest being on earth."

In public official station he regarded himself purely as a trustee for the public. He discontinued the practice of sending ministers abroad in Govcrument vessels, nor would he have his birthday celebrated by state balls; he refused to appoint days of fasting and thanksgiving on the ground that they were religious rites, and no recommendation from him, therefore, eould inake them more or less binding upon tle conscience. To sccularize and republicanize the Government were the para- mount purpose and the distinguishing feature of his administra- tion. His cabinet, of which Madison and Gallatin were the pillars, was in thorough sympathy with Jefferson in his general policy, and its perfect harmony was uninterrupted. He gave his ministers his entire confidence. "If I had the world to choose from," he once said, "I could not change one of my associates to my better satis- faction." The first important act of his administration was to send four of the six vessels constituting the so-called navy of the republic to the Mediterranean to exterminate the Algerine pirates who for half aeentury had preyed

upon the commerce of the world, thus initiating a series of events which in a few years ren- dered the commerce of the Mediterranean as safe as that of the English Channel. Possessed with a conviction of the supreme com- mercial importance of New Orleans, he directed negotiations to be opened with the French Government, which resulted in the pur- chase for $15,000,000 of the territory of Louisiana, which had been ceded by Spain to France. 'Though the constitutional power under which this important transaction was consummated was far from clear, neither its validity nor its wisdom was ever scriously questioned ; and it is now justly regarded by his eountry- men as the crowning achievement of his adininistration,and none the less meritorious for the responsibility he deliberately assumed in bringing it to pass. The remainder of his administration derives most of its historie importance from his unsuccessful attempt to convict Aaron Burr, the late vice-president, of having engaged in treasonable projects in the south-west, and from his efforts to maintain, without war, the rights of neutrals on the high seas. Among the less conspicuous though scarcely less important mea- sures of his administration were the careful exploration of the Western Territories; reducing the public debt, and practically ex- tirpating from the country the then not unpopular delusion that a national debt is a national blessing; fortifying the seaports; reorganizing and rearming the militia; diminishing the taxes; and extinguishing the Indians' titles by fair purchase, and promot- ing their emigration beyond the Mississippi. Ou the 4th of

March 1809 he retired from the presidency, after an almost con- tinuous public service of over forty years. He was pressed to allow himself to be re-elected for a third term, but refused un- conditionally, though the legislatures of five States formally re- quested hint to be a candidate.

Jefferson, whose private fortune had been seriously compromised by the interruptions of foreign commerce before and during his ad- ministration, and by the expenses incident to his representative position, lived seventeen years after his retirement, and to the last was

the most considerable personage in the United States. His immediate successors in the presidency for the next sixteen years were his pupils and devoted personal friends, and rarely ventured upon any important step without the support of lis approval. 'The employments of his closing years were in har- niony with the dignificd and patriotic purposes of his active life. Nothing that concerned the welfare of the country was a matter of indifference to him. He urged successfully the foundation of a uuiversity, and became one of its most efficient trustees. His cor- respondence during this period is regarded as one of the most in- teresting and instructive contributions to the early literature of the United States. He had inherited a wonderful constitution and herculean strength, neither of which did he ever abuse.

In the spring of 1826 the decline of his strength, which had been gradually increasing for two or three years, becamc more rapid, and on the 4th of July he expired, in the eighty-third year of his age. Jolim Adams, his predecessor in the presidency, by an impressive coincidence, died on the samc day,—the fiftieth anniversary of an event imperishably associated with the names of both and with the fortunes of a nation.

See The Writings, Correspondence, &c., of Thomas Jefferson, edited by A. Washington, 9 vols, New York, 1853-54; Memoir, Correspondence, &c., of Thomas Jefferson, edited by T. J. Randolph, 4 vols., Charlottesville, 1829 ; George Tucker, Liye of Thomas Jefferson, 2 vols., Philadelphia, 1837; Henry Randall, Life of Thomas Jefferson, 3 vols., New York, 1858; James Parton, Life of Thomcs Jefferson, Boston, 1874; Sarah N. Randolph, Domestic Life of Thomas Jefferson, New York, 1871; H. Lee, Observations upon the Writings of Jefferson, Phila- delphia, 1839; Cornélis De Witt, Thomas Jefferson, Paris, 1861. (J. BL.)

JEFFERSON CITY, capital of the State of Missouri, occupies an elevated and picturesque site in Cole county, on the right bank of the Missouri river, 125 miles west of St Louis. The city is well built. It has an efficient school system, and is the seat of an Episcopal college, and of Lincoln Normal Institute, which is maintained by the State for the

instruction of coloured youths of both sexes. The State library contains about 25,000 volumes. The manufactures comprise flour, furniture, carriages, farm implements, and iron goods. Population in 1880, 5271.

JEFFERSONVILLE, the county seat of Clark county, Indiana, U.S., is situated on the north bank of the Ohio river. The streets are of a uniform width of 60 feet. The falls of the Ohio afford a fine water-power, so that manufactories are numerous. Among them are loco-motive and car works, plate-glass works, two ship-yards, and railway machine shops. The southern State peni- tentiary and an extensive Government depét of army supplies are situated here. Population in 1880, 9357.

JEFFREY, Francis (1773-1850), a judge in the Scottish Court of Session, with the title of Lord Jeffrey, was the sou of a depute-clerk in the supreme court of Scotland, and was born at Edinburgh, 23d October 1773. After attending the High School six years, he studied at the university of Glasgow from 1787 to May 1789, and at Oxford from September 1791 to June 1792. Having in the following winter begun the study of law at Edinburgh University, he became a member of the Speculative Society, in the debates of which he measured himself not disdvantageously with Scott, Brougham, Fraucis Horner, the marquis of Lansdowne, Lord Kin- naird, and others.

He was admitted to the bar on December 18, 1794, but, having abandoned the Tory principles in which he had been educated, he of course found his father's connexion of little advantage to him; indeed the adoption of Whig politics was at this time almost a complete obstacle to legal success. His failure to obtain sufficient profes- sional employment Jed him to the conception of a variety of schemes of "literary eminence," none of which were put into execution ; and more than one attempt to obtain an

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office which would secure him the advantage of a small but fixed salary likewise proved abortive. To the proposal made by Sydney Smith in Jeffrey's house to a company of young men, none of whom had yet achieved fame or occupied any professional position of importance, that they should start a review, Jeffrey was accordingly pre- pared to give a favourable reception; and, the scheme being received with acclamation, the result was the appearance on the 10th October 1802 of the first number of the Edinburgh Review. At the outset the Review was not under the charge of any special editor. The first three numbers were, however, practically edited by Sydney Smith, and on his leaving for England the work devolved chiefly on Jeffrey, who, after an arrangement with Constable tle publisher, was appointed editor at a fixed salary. Most of those associated in the undertaking were Whigs in their political convictions; but, although the general bias of the /evzew was towards social and political reforms, it was so little of a party organ that for a time it numbered Sir Walter Scott among its contributors ; and no distinct emphasis was given to its political leanings until the publication in 1808 of an article on the work of Don PedroCevallos on the French Usur pation of Spain, which led shortly afterwards to the appearance of the rival Quarterly. According to Lord Cockburn the effect of the first number of the Hdinburgh Review was " electrical," and it is not diffi- cult to understand why it should have been so, for, if its learn- ing was far from being so omniscient as was then imagined, and if much of its speculation was superficial and rambling, and its literary criticisms greatly deficient in true subtilty and discernment, it certainly did not err on the side either of modesty or of dulness. Indeed, not only were its opinions generally expressed in telling and forcible language, but tlie clever vivacity and wit as well as the external glitter and brilliancy of many of the articles, and their easy and jaunty air, were fitted to produce an imposing impression of latent resources of many-sided talent and comprehensive erudition. The novelty, nioreover, of such a voluminous and elaborate periodical, the anonymousness of its contributions, and the fact that it devoted its pages chiefly to extended criticisms— often by no means flattering or complimentary—of living authors, were all elements in its success. Of course, on the other hand, allowance must be made for its early deficiencies, not only on account of the literary inexperience of the

writers, but from the fact that it was itself practically a hitherto untried experiment in literature. Its improve- ment as regards substantiality of matter and genuineness and depth of learning was very marked as soon as its success permitted Jeffrey to enlist in its service a staff of writers who had generally made a special study of the particular subjects on which they wrote, and who, instead of contenting themselves with a summary and an interspersed criticism of the works they reviewed, made them the occasion of au independent and original contribution, often having only a very remote connexion with the works which suggested it. Whatever deductions also it may be necessary to make in distinguishing between the merits of the Review and its reputation, its influence both as a literary and as a political organ has much exceeded that of any other English periodical, and its relation to the social, political, and literary history of England during the first half of the present century his been of no small importance. The period of Jeffrey's editorship extended to about twenty-six years, having ceased with the ninety-eighth number, pub- lished in June 1829. The Macvey Napier Correspondence gives some indication of what must have been the delicacy and difficulty of his task, and enables us to appreciate more intelligently the panegyric of his biographer in regard to the literary skill and practical discernment which gathered together sucli a brilliant galaxy of talent, the

suave firmness and wise prudence which. controlled and utilized to such advantage their several idiosyncracies, and the tact and cleverness which arranged and adjusted their varied lights with such correct appreciation of harmonious unity.

Jeffrey's own contributions, according to a list which has the sanction of his authority, numbered two hundred, all except six being written before his resignation of the editorship, and two immediately subsequent to this. A selection from these contributions was published in 1843 in four volumes. The composition of eight /'eview articles in a year is not au excessive literary task, but the subjects on which Jeffrey elected to give his opinion were very multi- farious, and he wrote with

great rapidity, at odd moments of leisure, and with little special preparation. Although also he possessed a considerable accumulation of accurate information on a great variety of subjects, and had disciplined his taste by a wide and catholic acquaintance with English literature, he had given no thorough and systematic attention to any particular branch of study. Great fluency and ease of diction, considerable command of illustration, a certain superficial warmth of imagination and moral sentiment, a natural tendeucy towards mockery and ridicule, aud a sharp eye to discover any oddity or peculiarity of style or violation of the accepted canons of good taste, were what lent to his criticisms the kind of pungency and effectiveness they possessed. It must, moreover, be added that, if he failed egregiously in the appreciation of the highest kinds of excellence both in style and in thought, the blemishes and defects which occupied so mucli of his attention, and which he magnified and distorted, had generally a real existence. Notwithstanding, however, lis keen practical judgment and his liberal tendencies, both his political and his literary prognostications were generally falsified by the result. He never showed any proper com- prehension of principles, or power of detecting and estimat- ing latent forces either in politics or in matters strictly intellectual and moral ; and certain of the higher spheres of reflexion and imagination, as for example, that of the "Lake Poets," his unhappy mistakes in regard to whom have earned for him such unenviable fame, were utterly remote from his understanding and sympathy. Had an adequate share of his attention been concentrated on some special branch of literature, had his fluency been held in check by a more thorough acquaintance with the subjects which engaged his interest, his regard for immediate impressive- ness not been exaggerated by the influence of his profes- sional duties, his artistic sense, which was keen and true so far as it went, not been mutilated and deteriorated by untoward circumstances, he would undoubtedly have earned for himself a high place among the writers of his epoch. As it is, his reputation is now unsubstantial and shadowy, and he is remembered chiefly from his accidental and not always gratifying and desirable relation to others who have gained an independent fame.

Notwithstanding the increasing success of the Mevew, Jeffrey always continued to look to the bar as the chief field of his ainbition, and indeed he soon experienced tliat his literary reputation was a help aud not an obstruction to professional advancement. Probably one reason of this was that his literary talents were supplemented by a personal character of the highest integrity and honour, and by fine social gifts rooted in true geniality and kindness, and adorned with an agreeable pleasantry and wit never tainted with the venom of bitterness. As an advocate his sharpness and rapidity of insight gave him a formidable advantage in the detection of the weaknesses of a witness and the vulnerable points of his opponent's case, while he grouped his own arguments with an admirable eye to effect,

especially excelling in eloquent closing appeals to a jury, XTi. — 78

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inore particularly when an opportunity presented itself for the introduction of the pathetic element. Probably but for his rapid utterance and affected accent, his weak physique, and lis too copious command of language, he might have attained to the highest rank as an orator. Jetirey was twice, in 1820 and 1822, elected lord rector of the university of Glasgow. In 1829 he was chosen dean of the faculty of advocates. On the Whigs obtaining office in 1831, he became lord advocate, and entered parliament as member for the Perth burghs. After the passing of the Reform Act, in the framing of which measure he had the principal charge so far as it related to Scot- land, he was returned for Edinburgh; but his parliamen- tary career, which, though not so brilliantly successful as some expected, had won him high general esteem, was terminated by his elevation to the judicial bench as Lord Jeffrey in May 1834. He dicd at Edinburgh 26th June

1850.

The Life of Lord Jeffrey, with a Selection from his Correspondence, by Lord Cockburn, appeared in 1852 in two volumes. See also the Selected Correspondence of Maevey Napier, 1877, and the sketch of Jeffrey in Carlyle's Reminiscences, vol. ii., 1881. (GE.)

JEFFREYS, Grorce Jerrreys, Lorp (c. 1648-1689), lord chancellor of England, was born probably in 1648 at Acton in Denbighshire, of a respectable but not rich family. He was smitten with the desire of becoming a lawyer by seeing, when a boy at St Paul's school in London, the magnificent procession of the judges to the cathedral; and, although his family was hard put to it by the expense, he spent some time at Westminster school before entering the Inner Temple as a studcnt at sixteen. The allowance he received from home was quite unequal to the demands of the dissolute habits into which he quickly fell, but it is said that the promise of future eminence, afforded by the fits of studiousness which divided his orgies, procured for the dissipated student both long credit and presents of money. He was exceedingly popular as a table companion, especially with the inferior attorneys and attorneys' clerks with whom, then as afterwards, he preferred to drink; and in the low practice which hc began at Old Bailey and the London Sessions immediatcly on being called to the bar in November 1668, he found his boon companions very useful in procuring him briefs. Voluble, unscrupulous, and overbearing, he rapidly developed in his constant dealings with the most degraded criminals the coarse bullying manner which disgraced him throughout his whole career. He sought evcry means of ingratiating himself with the city aldermen, and in 1671, at the singularly early age of twenty-three, became their common serjeant, and in 1678 recorder of London. He had by that time pushed his way into the higher courts, wherc his marvellous address in speaking and cross-examination made up for, if it did not conccal, his shallow legal know- ledge. Jeffrcys had hitherto nominally belonged to the anti-court or liberal party ; but, perceiving that they had but little patronage in their gift, he had opened secret negotiations with Charles IJ., and immediately on taking the oaths as recorder he openly declared himself a partisan of the court. The year before he had been knighted and appointed solicitor to the duke of York. To reward him for the servility which he displaycd, especially in connex- ion with the Popish plot trials, he was appointed chief justice of Chester, and advanccd to a baronetcy. His insolence and intemperance, already notorious, became in luis chief-justiceship well nigh intolerable. He received a rebuff in 1680 when for his conduct in obstructing tho assembling of parliament

he was reprimanded on his knees by the speaker, and forced to resign his recordership in December of the same year. Such indignities were

merits in the eyes of the king, to whose fuvour Jetfreys laid additional claims by his efforts to abrogate the charter of London, and by his activity as counsel against the suspected Rye Ilouse conspirators. He received his reward. Lord Campbell remarks, “Jeffreys became chief-justice of England, as the only man fit to condemn Algernon Sidney.” He was sworn in in November 1683, and shortly became privy councillor and member of the cabinet. In the court of the King’s Bench, the new chief- justice let few considerations stand between him and his desire to satisfy the king. His miquitous servility is to be traced in the State 7rials. When Charles died in February 1685, Jeffreys exchanged a master who disliked him as a wretch “ with no learning, no sense, no manners, and more impudence than ten carted street-walkers,” for one wlio found in him a thoroughly congenial tool. In May 1685 Jeffreys was raised to the peerage by the style of Baron Jeffreys of Wem, and in August went into the western counties as president of a special commission appointed to try the numerous cases of treason arising from the duke of Monmouth’s ill-fated rebellion. It was in this ‘ bloody assize” that le was to deepen the stain that already tarnished his fame, and to make the name “ Judge Jeffreys ” a synonym for a monster of bloodthirsty cruelty, blasphe- mous rage, and brutish intemperance. In the “ campaign” he gave the rein to his ferocity; he was maddened with slaughter, and his appetite for blood grew by what it fed on. ‘The horrible glare of his eye, the savage lines of his face, his fierce shouts of wrath, terrified and confused guilty and innocent alike. With hateful cunning he let it be bruited that the only hope of mercy lay in pleading guilty, and by this cold-blooded artifice lightened his labours. He had a powerful incentive to active butchery: the vacant post of lord chancellor was to be won by good service. The estimates of the numbers of victims of the commission vary: 320 was the official return to the treasury ; Lord Lonsdale says 700, and Burnet 600. Upwards of 800 were transportcd as slaves to the West Indies, while others only escaped by purchasing their pardons from the judge at most exorbitant rates.

When the chief-justice returned to Windsor in September, the great seal of England was placed in his blood-stained hands. For the rest of his career the lord chancellor was an unresisting agent of King James in his most illegal schemes. Finding himself losing favour at court, he even revived the ecclesiastical court of high com- mission, abolished in 1640 by an Act which forbade its re- vival,and himself engaged to act aspresident. Inthe attempt against the rights of the fellows of Magdalen College, Oxford, and in the trial of the seven bishops, Jeffreys was the king's right hand; but, when the proceedings of James had at last roused the indignation that cost him his crown, the lord chancellor was one of the first to advise concession. When the king fled in 1688, Jeffreys was in the utmost consternation. For him, he knew, there could be no mercy. Shaving off his shaggy eycbrows, and disguising himself as a common sailor, he attempted to escape to Namburg in a small collier, but, while drinking in a low public-house at Wapping, he was recognized by a poor scrivener who had once encountered the wrath of the judge, and had never forgotten the glare of his eye. Jeffreys was only saved from being torn in pieces by the mob by the timely arrival of a strong guard, who conducted the trembling wretch to the Tower. There he lay for some months, tortured by anguish both of mind and body, which he endeavoured to drown in copious draughts of brandy. He died miserably on April 19, 1689. Jeffreys was twice married, and had ten children, but his title became extinct in 1703, in the person of his son John, notorious for having interrupted the funeral of Dryden. It is said that in 1688 Lord Jeffreys was about to be created earl of Flint ; and, though

the patent never passed the great seal, a book was dedicated to him, giving him the title.

For the character of Jeffreys not even the most impartial historian can say a good word. Of strong intelligence and clear legal head, aud, according to Roger North, when he was in temper and matters indifferent came before hin, becoming his seat of justice better than any other that author had seen in his place, he might have risen to a high

position among the learned luminaries of the bench, had lie not prostituted his talents to unworthy ends, and swamped his faculties in the most brutal intemperance. He treated all from whom he had nothing to expect with coarse insolence, taking an especially malicious delight in giving, as he phrased it, "'a lick with the rough side of his tongue" to those whom his maudlin caresses of the night before had encouraged to presume. No less was he pleased to revile at dissenters ; "Show me," he said, "4 Presbyterian, and I will engage to show a lying knave." He is remarkable as the only politically promi- nent lawyer of his century who never sat in the Honse of Commons, nor left a single publication behind him. In the House of Lords he once attempted to use the insolent abuse of his court habits, but was compelled humbly to apologize, in tears of maudlin chagrin, to all whom he had attacked.

The ehief sources for particulars about Jeffreys are the State Trials and Nocth's Life of Lord Keeper Guildford, together with contemporary pamphlets and squibs. These inaterials have been skilfully used by Lord Campbell in his Lives of the Lord Chancellors, aud by Macaulay in his History. See also Woolrych's Memoirs of Judge Jeffreys, 1827.

JEHOL, or CHENG-TE-FU, a city of Mongolia, famous as the seat of the summer palace of tle emperor of China, is situated near 118° E. long. and 41° N. lat., about 140 miles north-east of Peking, with which it is connected by an excellent line of road. Though not enclosed by walls, the town, which is about 2 miles long, bears the stamp of "a flourishing Chinese town of the same rank." 'The population is stated at 10,000. The palace, called Pr-shu- shan-chuang, or "mountain lodge for avoiding heat," was built in 1703 on the plan of the palace of Yuan-ming-yuan near Peking. A substantial brick wall 6 miles in circuit encloses several well-wooded heights and extensive gardens, rockeries, pavilions, temples, &c., after the usual Clunese style. In the vicinity of Jehol are numerous Lama monas- terics and temples, the most remarkable being Putala-su, built on the model of the palace of the grand lama of Tibet at Putala. It is thus described by Mr Bushell (Journ. R. Geog. Soc, Lond., 1874): "The principal building of this temple is a huge square erection with eleven rows of windows, the stories coloured alternately red, green, and yellow, surmounted by a

row of five dagobas, and with the roof covered with enamelled tiles of a bright torquoise blue. The general effect is inexpressibly bizarre.”

JEHOVAH is the current European trauscription of the sacred tetragrammaton min’. This was punctuated by the Massorets with the vowels é (for), 6, of the word Adonai which the later Jews habitually substituted in reading the in- effable name. It isnow geuerallyagreed that Jahwé (Yahwé) is the true pronunciation, conclusion which is supported not only by the linguistic argument derived from the fact that the various contracted forms in which the name appears, eitlicr separately (Jah) or in compound proper names (Jo, Jtho, Jahu) are all reducible to Jahw, but also by the testimony of ancient tradition (thus Theodoret ascribes the pronun- ciation “la@é to the Samaritans, Epiphanius gives Iofe or Tavé, and Clement apparently “Iaové). Etymologically, Jahwé may be regarded as the imperfect either of Qal or Hiphil of myn; the former view seems to be that taken in the Pentateuch, bnt many critics now incline to the

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| other, according to which the name may be translated as

meaning “ He who causes to be.” It seems to have come to be invested with new and richer meanings as tlic religion of Israel developed in spirituality and depth ; but as the naine of the national deity it must have been older than the time of Moses; at least the name of the mother of Moses is compounded with it. It is conceivable that in the earliest period of its history the word was not associated with any idea so high even as that of “creator”; the Hiphil of myn in the Aramaic sense of “ fall” would give “ lhe who causes (rain or lightning) to fall” as the nearest approach to the original meaning. For the later sense of the name Exod. iii. 14 is the locus classtcus. The Palestinian tradi- tion finds in this verse the assertion of God’s eternity (comp. Rev. i. 8) ; the Alexandrian exegesis refers it to his absolute existence. More probably the vague “I will be what I will be” (the emphasis lying on the first verb as in Exod. xxxiii. 19) is used to convey the idea of that all-sufficiency of God’s grace which is wider than the widest faith (comp. Hos. i. 6, 7).

The literature of the subject is immense. Of older books it is enough to refer to the Decas Exercitationum colleeted by Reland (Utrecht, 1707); for the latest aspects of the questions involved, see Gesenins, Thes., s.v.; Ewald, Gesch., ii. 121 sg.; Lagarde, Psalt. Hieron. (1874), p. 158 sg., and Orientalia, ii, 27 89.; Schrader in Schenkel's Bib. Lew, s.v. "'Jahvo"; W. Aldis Wright in Journ. of Philol., iv. p. 70. Against recent proposals to identify Jahwé with non-Israelite deitics, seo Baudissin, Studien, i. (Leipsic, 1876); and in favour of derivation from an Assyrian form of the Divine name ta-u (Accadian 7), sec Delitzsch, Wo lag das Paradies, P. 158 sq., Leipsic, 1881. A summary of recent discussion is given xy W. Robertson Smith in Brit. and For. Evang. ev., January

1876.

JEJEEBHOY, Sir Jamserser (1783-1859), a Parsee merchant and great public benefactor, was born of poor parents in Bombay, July 15, 1783. Left an orphan while still very young, he had many difficulties to overcome at the outset of the mercantile career he chose for himself. On one occasion the ship in which he and all his goods were was captured by the French, and the young merchant was landed penniless at the Cape of Good Hope. Thence he procured a passage to Bombay through the charity of some Dutch ladies; and, resolutely beginning life afresh, he rose to be one of the most opulent Parsee merchants in India. His lavish benevolence, which recoguized no differcnce of nation, scct, or class, and extended even to the brute creation, has won him enduring honour. In 1822 le paid the debts of all the poor debtors in Bombay jail ; he enriched his native city with a hospital and an educa- tional establishment for Parsee children, a school of art and other benevolent institutions, and contributed largely to the Grant Medical College, while to the public works at Bombay, Nowsaree, and elsewhere he gave large grants, as well as to the patriotic fund and the Indian sufferers' fund after the mutiny. Eleven schools owe their founda- tion to his munificence, in which 2710 Parsee children are educated. It is estimated that he gave away upwards of 26 lakhs of rupees. Knighted in 1842, he was promoted to a baronetcy in 1857; a statue was voted to him in 1856, and was unveiled in Bombay town-hall on August I, 1859.

At his death on April 15, 1859, his property was estimated at 8,550,000 rupees. According to an act of the legislative council of India, the name Jamsetjee J ejeebhoy must be assumed by all his successors in the baronetcy. His son (1811-1877) was prominent as the head of the Parsee community in Bombay, and exercised a considerable influence among tle Europeans. He was a member of the legislative council of Bombay.

JELAL-ED-DIN, Monammep Er-Rvmi (born at Balkhi c. 1200 a.p., died at Iconium, 1273, as head of a college for mystic theology), one of the greatest poets and thinkers of Persia. See PErsta.

province of Hainault, Belgium, is situated on the Haine, near the " Bassin du Flenu," one of the richest coal-fields in the province. It has manufactures of mining gear, salt, soap, brass, and leather. The population of the commune in 1876 was 10,816.

Jeminapes is famous as the scene of a sanguinary battle fought November 6, 1792, between the French under Dumouriez and the Austrians under the duke of Saxe-Teschen, in which the latter were defeated. The French gained temporary possession of Belgium, and Jemmapes gave its name to a French department, comprising most of Hainault.

JENA, a town in the department of Apolda, in the grand-duchy of Saxe-Weimar-Eisenach, Germany, is situ- ated, about 56 miles south-west of Leipsic by rail, at the junction of the Leutra and Saale, in a beautifnl valley, surrounded by romantic hills, and dotted over with villages, The town is tolerably well built, though the houses are quaint, and many of the streets narrow. Besides the university buildings, the more interesting edifices are the 15th century church of St Michael, with a tower 318 feet high, and containing the bronze statue of Luther, originally intended for his tomb; the college-church; the library ; the old-fashioned town-house in the market-place; the 'castle, built in 1620, where Goethe wrote his Hermann and Dorothea; the Black Bear tavern (now a_ hotel), where Luther spent the night after his flight from the Wartburg ; and Weigel's house. Tlie carcer, or students' prison, ceased

to be used for academic discipline in 1880. In 1858, the tercentenary of the inauguration of the university, the various houses in Jena that had been occupied by illustrious men were marked by memo- rial tablets. Close to the town are the Thuringian dis- trict court and the large lunatic asylum—both built in 1879. Of the old fortifications there remain only four towers and an ancient gateway; while the moat has been Jnid out as a promenade, adorned with busts and statues. On the Hausberg to the east rises the gaunt and legendary Fuchsthurm ; and 2 miles to the west, on the Forstberg, is the tower raised to the students of Jena who fell in the war against France, 1870-71. Among the schools are 2 gymnasium opened in 1876, and a commercial school. Jena is the seat of an upper appeal court, of a statistical bureau for the Thuringian states, and of a chamber of commerce. 'The town owes what prosperity it now has to the presence of the university founded by the elector, Johu Frederick of Saxony, whose statue stands in the market- place. In 1547 that prince, while a captive in the hands of Charles V., conceived the plan of erecting a university at Jena, in place of that of Wittenberg, which he had forfeited. The academy, founded accordingly at Jena in 1548 by the elector's three sons, obtained the necessary charter from the emperor Ferdinand I., and on February 2, 1558, was formally inaugurated as a university. The students were most numerous about the middle of the 18th century, when some 3000 attended ; but the most brilliant professoriate was under Duke Karl August, Goethe's patron (1787-1806), when in the different faculties Reinhold, Fichte, Schelling, Hegel, Schlegel, Oken, and Schiller read lectures. Founded as a home for the new religious opinions of the 16th century, Jena has always liberally granted a hearing to new teaching; and it distances perhaps every other German university in the extent to which it carries what are popularly regarded as the characteristics of German student-life,—duelling, and the sentimental passion for /recheit. At the end of last and the beginning of the present century, the opening of new universities, co-operating with the suspicions of the various German Governments as to the democratic opinions which obtained at Jena, militated against it, and the uni- versity has never regained its former prosperity. In the

JEMMAPES, or Jemappes, a village in the arron- ‘ dissement and 3 miles west of the town of Mons, in the |

session 1880-81 the teaching-staff numbered 80 members ; in the winter session 1879-80 the students numbered 481, and in the summer session 1880, 546. Amongst the numerous auxiliaries of the university may be mentioned the lbrary with 180,000 volumes; the seminaries of philology, theology, and education; the institutes for chemistry, pharmacy, zoology, botany (with a botanical gar- den), and meteorology (with an observatory in the garden of which a bust of Schiller marks the spot where he wrote his Wallenstein) ; the veterinary and agricultural institutions ; and the varivus physical and archeological collections, which now occupy the castle. A clinical institute and the several hospitals assist the study of medicine. The Jenaer Lnteraturzeitung, whose issue in its present form began in – 1874 under the patronage of the university, is the ultimate successor of the first Literaturzettung fiir Deutschland, which appeared at Jena in 1785. The manufactures of Jena, which are not important, comprise cigars, pianos, cloth, woollens, cement, beer, and sausages. There is some

activity in the book-trade and in vine-growing; and the

traffic of wood-rafts on the Saale deserves mention. The population in 1875 was 9020. Jena appears to have possessed town-rights in 1029. At the

leginning of the 14th century it was in the possession of the margraves of Meissen, from whom it passed in 1428 to the clector of Saxony. Since 1485 it has remained in the Ernestine line of the house of Saxony. In 1662 it fell to Bernhard, youngest son of the duke of Weimar, and became the capital of a small separate duchy. Bernhard’s line having become extinct in 1690, Jena was united with Eisenach, and in 1741 reverted with that duchy to Weimar. In more modern times Jena has been made famous by the defeat inflicted in the vicinity, on October 14, 1806, by Napoleon upon the Prussian army under the duke of Brunswick

See Schreiber and Fiirber, Jena von seinem Ursprung bis zur neuesten Zeit, 2 ed., 1858 ; Ortloff, Jena und Umgegend, 3d ed., 1875.

JENGHIZ KHAN (1162-1227) Mongol emperor, was born in a tent on the banks of the river Onon, in 1162. His father Yesukai was absent at the time of his birth, being engaged in a campaign against a Tatar chieftain named Temuchin. In this conflict the fortune of war favoured the side of Yesukai, who having slain his enemy returned to his encampnient in triumph. Here he was met by the news that his wife Yulun had given birth to a son. On examining the child he observed in its clenched fist a clot of coagulated blood like a red stone. In the eyes of the superstitious Mongol this circumstance took the shape of a mysterious reference to his victory over the Tatar chieftain, and he therefore named the infant Temuchin. The death of Yesukai, which placed Temuchin, who was then only thirteen years old, on the Mongol throne, was the signal also for the dispersal of several tribes whose allegiance the old chieftain had retained by the exer- cise of an ironrule. When remonstrated with by Temu- chin on their desertion of his banner, the rebels replied: "The deepest wells are sometimes dry, and the hardest stone is sometiines broken; why should we cling to thee?" But Yulun was by no means willing thus to see her son's power melt away, and seizing the national standard she led those retainers who remained faithful against the deserters, and succeeded in bringing back fully one half to their allegiance. With this doubtful material for the maintenance of his chieftainship, Temuchin succeeded in holding his ground against the insidious plots and open hostilities of the neighbouring tribes, more especially of the Naimans, Keraits, and Merkits. With one or other of these he maintained an almost unceasing warfare until the year 1206, when his power was so firmly established that he felt the time had arrived when he might proclaim himself the ruler of an empire. He therefore summoned the notables of his kingdom to an assembly on the banks of the Onon, and at their unanimous request adopted the name and title of Jenghiz Khan (Chinese,

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Ching-sze, or “perfect warrior”) At this time there remained to him but one open enemy on the Mongolian steppes, namely, Polo the Naiman khan. Against this chief he now led his troops, and in one battle so completely shattered his forces that Kushlek, the successor of Polo, who was left dead upon the field, fled with his ally Toto, the Merkit khan, to the river Irtish. Having thus further consolidated his sovereignty, Jenghiz Khan now meditated an invasion of the empire of the Kin Tatars, who had wrested northern China from the emperors of the Sung dynasty. Asa first step in this programme he invaded western Hea, and, having captured several strong- holds, retired in the summer of 1208 to Lung-ting to escape > the great heat of the plains. While there news reached him that Toto and Kushlek, the Merkit and Naiman khans, were preparing for war. He thereupon at once marched against them, and in a pitched battle on the river Irtish overthrew them completely. Toto was amongst the slain, and Kushlek fled for refuge to the Khitan Tatars. Satisfied with his victory, Jenghiz again directed his forces against Hex. There also good fortune attended him, and, after having defeated the Kin army under the leadership of a son of the sovereign, he captured the Wu-leang-hai Pass in the Great Wall, and penetrated as far as Ning-hea Fu in Kansuh. troops into the country, and even established his sway over the province of Leaou-tung. The saying that nothing succeeds like success was eminently true in his case. Several of the Kin commanders, seeing how persistently victory attended his banners, deserted to him, and garrisons surrendered at his bidding. Having thus secured a finn footing within the Great Wall, he despatched three armies in the autumn of 1213 to overrun the empire. The right wing, under the command of his three sons Juji, Jagatai, and Oghotai, marched towards the south; the left wing under his brothers Hochar, Kwang-tsin Noyen, and Chow- tse-te-po-shi, advanced eastward towards the sea; while Jenghiz and his son Tulé with the centre directed their course in a south-easterly direction. Complete success attended all three expeditions. The right wing advanced as far as Honan, and after having captured upwards of twenty-eight cities rejoined headquarters by the great western road. Hochar made himself master of the country as far as Leaou-se; and Jenghiz ceased his triumphal career only when he reached the cliffs of the Shan-tung promontory. But either because he was weary of the strife, or because it

was necessary to gain a respite that he might revisit his Mongolian empire, he sent an envoy to the Kin emperor in the spring of the following year (1214), saying, “All your possessions in Shan-tung and the whole country north of the Yellow river are now mine with the solitary exception of Yenking (the modern Peking). By the decree of heaven you are now as weak as I am strong, but I am willing to retire from my conquests ; as a condition of my doing so, however, it will be necessary that you distribute largess to my officers and men to appease their fierce hostility.” These terms of safety the Kin emperor eagerly accepted, and as a peace offering he presented Jenghiz with a daughter of the late emperor, another princess of the imperial house, 500 youths and maidens, and 3000 horses. No sooner, however, had Jenghiz passed beyond the Great Wall than the Kin emperor, fearing to remain any louger so near the Mongol frontier, moved his court to Kai-fung Fn in Honan. This transfer of capital appearing to Jenghiz to indicate a hostile attitude, he again turned southward and once more marched his troops into the doomed empire.

While Jenghiz was thus adding city to city and province to proviuce in China, Kushlek, the fugitive Naiman chief, was not idle. With characteristic treachery he requested

With unceasing vigour he pushed on his |

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permission from his host, the Khitan khan, to collect the fragments of his army which had been scattered by Jenghiz at the battle on the Irtish, and thus having collected a considerable force he leagued himself with Muhammed, the shah of Khuarezm, against the confiding khan. After a short but decisive campaign the allies remained masters of the position, and the khan was compelled to abdicate the throne in favour of his late guest.

With the power and prestige thus acquired, Kushlek prepared once again to measure swords with the Mongol chief. On receiving the news of his hostile prepara- tions, Jenghiz at once took the field, and in the first battle

| routed the Naimaa troops and made Kushlek a prisoner.

A short shrift was given to the treacherous Naiman, and his ill-gotten kingdom became an apanage of the Mongol

erapire. Jenghiz now held sway up to the Khuarezm frontier. Beyond this le had no immediate desire to go,

and he therefore sent envoys to Muhammed, the shah, with presents, saying, "I send thee greeting ; I know thy power and the vast extent of thine empire; I regard thee as my most cherished son. On my part thou must know that I have conquered China and all the Turkish nations north of it; thou knowest that rify country is a magazine of warriors, a mine of silver, and that I have no nced of other lands. Itake it that we have an equal interest in encour- aging trade between our subjects." This peaceful message was well received by the shah, and in all probability the Mongol armies would never have appeared in Europe but for an unfortunate occurrence which turned Jenghiz's friendly overtures into a declaration of war. Shortly after the despatch of this first mission Jenghiz sent a party of traders into Transoxiana who were seized and put to death as spies by Inaljuk, the governor of Otrar. As satisfaction for this outrage Jenghiz demanded the extradition of the offending governor. Far from yielding to this summous, however, Muhammed beheaded the chief of the Mongol envoys, and sent the others back without their beards. This insult made war inevitable, and in the spring of 1219 Jenghiz set out from Karakoram on a campaign which was destined to be as startling in its immediate results as its ulterior effects were far reaching. The invading force was in the first instance divided into two armies: one commanded by Jenghiz's second son Jagatai was directed to march against the Kankalis, the northern defenders of the Khuarezm empire ; and the other, led by Juji, his eldest son, advanced by way of Sighnak against Jend. Against this latter foree Muhammed led an army of 400,000 men, who after a bloody battle with the invaders were completely routed, leaving it is said 160,000 dead upon the field. With the remnant of his host Muhammed fled to Samarkand. Meanwhile Jagatai marched down upon the Jaxartes by the pass of Taras and invested Otrar, the

offending city. After a siege of five months the citadel was taken by assault, and Inaljuk and his followers were put to the sword. To mark their sense of the crime of which it had been the scene, the conquerors levelled the walls with the ground, after having given the city over to pillage. At the same time a third army besieged and took Khogend on the Jaxartes ; and yet a fourth, led by Jenghiz and his youngest son Tulé, advanced in the direction of Bokhara. Tashkend and Nur surrendered on their approach, and after a short siege Bokhara fell into their hands. On entering the town Jenghiz ascended the steps of the principal mosque, and shouted to his followers, “The hay is cut; give your horses fodder.” No second invitation to plunder was needed ; the city was sacked, and the inhabi- tants either escaped beyond the walls or were compelled to submit to infamies which were worse than death. As a final act of vengeance the town was fired, and before the last of the Mongols left the district, the great mosque and

ertain palaces were the only buildings left to mark the spot where the “centre of science” once stood. From the ruins of Bokhara Jenghiz advanced along the valley of the Sogd to Samarkand, which, weakened by treachery, surrendered to him, as did also Balkh. But in neither case did submission save eitlicr the inhabitants from slaughter or the city from pillage. Beyond this point Jenghiz went no further westward, but sent Tulé, at the head of 70,000 nen, to ravage Khorassan, and two flying columns under Chépé and Sabutai Bahadar to pursue after Muhammed, who had taken refuge in Nishapoor. Defeated and almost alone, Muhainmed fled before his pursuers to the village of Astara on the shore of the Caspian Sea, where he dicd of an attack of pleurisy, leaving the cause of his empire to his son Jalaluddin. Meanwhile Tulé carried his arms into the fertile province of Khorassan, and after having captured Nessa by assault appeared before Merv. By an act of atrocious treachery the Mongols gained possession of tlie city, and, after their manner, sacked and burnt the town. From Merv Tulé marched upon Nishapoor, where he met with a most determined resistance. For four days the garrison fought desperately on the walls and in the streets, but at length they were overpowered, and, with the

excep- tion of 400 artisans who were sent into Mongolia, every man, woman, and child was slain. Herat escaped the fate which had overtaken Merv and Nishapoor by opening its gates tothe Mongols. At this point of his victorious career Tulé received an order to join Jenghiz before Talikhan in Badakshan, where that chicftain was preparing to renew his pursuit of Jalaluddin, after a check he sustained in an engagement fought before Ghazni. As soon as sufficient reinforcements arrived Jenghiz advanced against Jaléluddin, who had taken up a position on the banks of the Indus. Here a desperate battle was fought. The Turks, though far outnumbered, defended their ground witli undaunted courage, until, beaten at all points, they fled in confusion. Jalaluddin, seeing that all was lost, mounted a fresh horse and jumped into the river, which flowed 20 feet below. With admiring gaze Jenghiz watched the desperate venture of his enemy, and even saw without regret the dripping horseman mount the opposite bank. From the Indus Jenghiz sent in pursuit of Jalaluddin, who fled to Delhi, but failing to capture the fugitive the Mongols returned to Ghazni after having ravaged the provinces of Lahore, Peshawur, and Melikpoor. At this moment news reached Jenghiz that the inhabitants of Herat had deposed the governor whom Tulé had appointed over tlic city, and had placed one of their own choice in his room. To punish this act of rebellion Jenghiz sent an army of 80,000 men against the offending city, which after a siege of six montlis was taken by assault. For a whole week tle Mongols ceased not to kill, burn, and destroy, and 1,600,000 persons are said to have been massacred within the walls. Having consummated this act of vengeance, Jenghiz returned to Mongolia by way of Balkh, Bokhara, and Samarkand.

Meanwhile Chépé and Sabutai marched through Azer- bijan, and in the spring of 1222 advanced into Georgia. Here they defeated a combined force of Lesghs, Circassians, and Kipchaks, and after taking Astrakhan followed the retreating Kipchaks tothe Don. The news of the approach of the mysterious encmy of whose name even they were ignoraut was received by the Russian princes at Kief with dismay. At the instigation, however, of Mitislaf, prince of Galicia, they assembled an opposing force on the Dnieper. Here they received envoys from the Mongol camp, whom they barbarously put to death. “You have killed

our envoys," was the answer made by the Mongols; " well, as you wish for war you shall have it. We have done you no harm. God is impartial ; He will decide onr quarrel." If

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the arbitrament was to be thus decided, the Russians must have been grievously in the wrong. In the first battle, on the river Kaleza, they were utterly routed, and ficd before the invaders, who after ravaging Great Bulgaria retired, gorged with booty, through the country of Saksin, along the river Aktuba, on their way to Mongolia.

In China the same success had attended the Mongol arms as in western Asia. The whole of the country north of the Yellow river, with the exception of one or two cities, was added to the Mongol rule, and, on the death of the Kin emperor Seuen Tsung in 1223, the Kin empire virtually ceased to be, and Jenghiiz's frontiers thus became conterminous with those of the Sung emperors who held sway over the whole of central and southern China. After luis return from central Asia, Jenghiz once more took the field in western China. While on this campaign the five planets appeared in a certain conjunction which to the supersti- tiously minded Mongol chief foretold that evil was awaiting him. With this presentiment strongly impressed upon him he turned his face homewards, and had advanced no farther than the Se-Keang river in Kansuh when he was seized with an illness of which he died a short time after- wards (1227) at his travelling palace at Ha-laou-tu, on the banks of the river Sale in Mongolia. By the terms of his will Oghotai was appointed his successor, but so essential was it considered to be that his death should reniain a seerct until Oghotai was proclaimed that, as the funeral proces- sion moved northwards to the great ordu on the banks of the Kerulon, the escort killed every one they met. The body was then carried successively to the ordus of his several wives, and was finally laid to rest in the valley of Keleen.

Thus ended the career of one of the greatest conquerors the world has ever seen. Born and nurtured as the chief of a petty Mongolian tribe, he lived to see his armies victorious from the China Sea to the banks of the Dnieper; and, though the empire which he created ultimately dwindled

away under the hands of his degenerate descend- ants, leaving not a wrack behind, we have in the presence

of the Turks in Europe a consequence of his rule, since it

was the advance of his armies which drove their Osmanli ancestors from their original home in northern Asia, and thus led to their invasion of Bithynia under Othman, and finally their advance into Europe under Amurath I.

See H. H. Howorth, The History of the Mongols; Robert K. Douglas, The Life of Jenghiz Khan. (R. K. D,)

JENNER, Epwarp (1749-1823), the discoverer of vac- cination, was born at Berkeley, Gloucestershire, on May 17, 1749. His father, the Rev. Stephen Jenuer, rector of Rockhampton and vicar of Berkeley, came of a family that had been long established in that county, and was possessed of considerable landed property ; he died when the snbject of this notice was only six years old, but his place was admirably taken by his eldest son, the Rev. Stephen Jenner, who brought his brother up with paternal care and tenderness. Tdward received his early education in local schools at Wotton-under-Edge and Cirencester, where he already showed a strong taste for natural history. The medical profession having been selected for him, he began his studies under Mr Ludlow, a surgeon of Sodbury near Bristol; but in his twenty-first year he proceeded to London, where he became a favourite pupil of the celc- brated John Hunter, in whose house he resided for two years. During this period he was employed by Sir Joseph Banks to arrange and prepare the valuable zoological speci- mens which he had brought back from Captain Cook's first voyage in 1771. He must have acquitted himself satis- factorily in this task, since he was offered the post of

'naturalist in the second expedition, but declined it as well

as other advantageous offers, preferring rather to practise

his profession in bis native place, and near his eldest brother, to whom he was much attached. His speedy success in practice did not engross his intellectual activity. He was the principal founder of a local medical society, to which he contributed several papers of marked ability, in one of which he apparently anticipated later discoveries concern- ing the rheumatic inflammations of the heart. He main- tained a correspondence with John Hunter, under whosc direction he investigated various points in biology, particu- larly the hiberuation of hedgehogs and the habits of the cuckoo ; his paper on the latter subject was laid by Hunter before the Royal Society, and appeared in the DPhzlosophi- cal Transactions for 1788 He also devoted considerable attention to the varied gcological character of the district in which lie lived, collecting fossils from the Oolite and Lias, and constructed the first balloon seen in those parts. He was a great favourite in general society, from his agree- able and instructive conversation, and the many accomplish- ments he possessed. Thus he was a fair musician, both as a part-singer and as a performer on the violin and flute, and a very successful writer, after the fashion of that time, of fugitive pieces of verse, one of which—“ The Signs of Rain”—has been frequently reprinted, and enumerates minutely all the signs of the weather in verse not un- worthy of Crabbe. In 1788 he married Catherine Kings- cote, a union destined to form a most important element in his happiness. In 1792 he resolved to confine himself to practising as a physician, and accordingly obtained the degree of doctor of medicine from St Andrews. Finding that Berkeley could not support a physician, he began, a few years later, to visit Cheltenham annually.

Meanwhile the discovery that was to immortalize his inemory liad been slowly maturing in his mind. When only an apprentice at Sodbury, his attention had been directed to the relations between cow-pox and small-pox in connexion with a popular belief which he found current in Gloucestershire, as to the antagonism between these two diseases. During his stay in London he appears to have mentioned the thing repeatedly to Hunter, who, being engrossed by other important pursuits, was not so strongly persuaded as Jenner was of its possible importance, yet spoke of it to his friends and in his lectures. After he began practice in Berkeley, Jenner was always accustomed to inquire

what his professional bretliren thought of it; but he found that, when medical men had noticed the popular report at all, they supposed it to be based on an imperfect induction of facts. His first careful investigation of the subject dates from about 1775, and five years elapsed before he had succeeded in clearing away tle most perplex- ing difficultics by which it was surrounded. He first satis- fied himself that two different forms of disease had been hitherto confounded under the term " cow-pox," only onc of which protected against small-pox, and that many of the cases of failure were to be thus accounted for; and his next step was to ascertain that the true cow-pox itself only protects when communicated at a particular stage of the disease. At the same time he came to the conclusion that "the grease" of horses is the same disease as cow-pox and small-pox, each being modified by the organism in which it was developed—an opinion which is generally held at the present day. For many years, cow-pox being scarce in his county, he had no opportunity of inoculating the disease, and so putting his discovery to the test, but he did all he could in the way of collecting information and com- municating what he had ascertained. Thus in 1788 he carried a drawing of the cow-pox, as seen on the hands of a milkmaid, to London, and showed it to Sir E. Home and others, who agreed that it was 'an interesting and curious subject," but by no means realized its practical import- ance. At length, on the 14th of May 1796, he was able

to inoculate James Phipps, a boy about eight years old, with cow-pox matter. On the first of the following July the boy was carefully inoculated with variolous matter, but (as Jenner had predicted) no small-pox followed. The dis- covery was now completes, but lie desired to act without precipitation, and was unable to repeat his experiment until 1798, owing to the disappearance of cow-pox from the dairies. He then repeated lis inoculations with the utmost care, aud prepared a pamplilet which should announce his discovery to the world. Before publishing it, however, he thought it well to visit London, so as to demonstrate the truth of his assertions to his friends; but he remained in London nearly three montlis, without being able to find any person

who would submit to be vaccinated. Soon after he had returned home, however, Mr Cline, an eminent surgeon, inoculated some vaccine matter over the diseased hip-joint of a child, thinking the counter-irritation might be useful, and found the patient afterwards incapable of acquiring small-pox. In the autumn of the same year, Jenner met with the first opposition to vaccination ; and this was the more formidable because it proceeded from Dr Ingenhousz, a celebrated physician and man of science. But mean- while Mr Cline's case, and. his advocacy of vaccination, brought it much more decidedly before the medical pro- fession, of whom the majority were prudent enough to suspend their judgment until they had more ample in- formation. But besides these there were two noisy and troublesome factions, the one of which opposed vaccination as an useless and dangerous practice, while the other endangered its success much more by their rash and self-seeking advocacy. At the head of the latter was one Dr Pearson, who in November 1798 published a pamphlet speculating upon the subject, before even seeing a case of cow-pox, and afterwards endeavoured, by lecturing on the subject, and supplying the virus, to put himself forward as the chief agent in the cause. 'The matter which he distri-buted, which had been derived from cows that were found to be infected in London, was found frequently to produce, not the slight disease described by Jenner, but more or less severe eruptions resembling small-pox. Jenner concluded at once that this was due to an accidental contamination of the vaccine with variolous matter, and a visit to London in the spring of 1799 convinced him that this was the case. In the course of tls year the practice of vaccination spread over England, being urged principally by non-professional persons of position; and towards its close attempts were made to found institutions for gratuitous vaccination and for supplying lymph to all who might apply for it. Pearson proposed to establish one of these in London, without Jenner's knowledge, in which he offered him the post of honorary corresponding physician! On learning this scheme to supplant him, and to carry on an institution for public vaccination on principles which he knew to be partly erroneous, Jenner once more visited London early in 1800, when he had influence enough to secure the abandonment of the project. He was afterwards pre- sented to the king, the queen, and the prince of Wales, whose encouragement

materially aided the spread of vac- cination in England. Meanwhile it had made rapid pro- gress in the United States, where it was introduced by Dr Waterhouse, the professor of physic at Cambridge, Massachusetts, and on the continent of Europe, where it was at first diffused by Dr de Carro of Vienna, who practised it with the greatest zeal and discretion, and thence spread to Geneva. In consequence of the war between England and France, the discovery was later in reaching Paris; but, its importance once realized, it spread rapidly over France, Spain, and Italy. It would be tedious aud unprofitable to dwell minutely on the extension of vaccination over the whole world; but a few of the inci-

dents connected with it are too remarkable to be omitted. Perhaps the most striking is the expedition which was sent out by the court of Spaiu in 1803, for the purpose of diffusing cow-pox through all the Spanish possessions in the Old and New Worlds, and which returned in three years, having circumnavigated the globe, and succeeded beyond its utmost expectations. Many of the expressions of enthusiasm seem to us strained and almiost ridiculous. Thus we read with surprise how clergymen in Geneva and Holland urged vaccination upon their parishioners from the pulpit; how in Sicily, South America, and Naples religious processions were formed for the purpose of receiving it; how the anniversary of Jenner's birthday, or of the successful vaccination of James Phipps, was for many years celebrated asa feast in Germany ; and how the empress of Russia caused the first child operated upon to receive the name of " Vaccinoff," and to be educated at the public expense. The truth is that we who live in that security from the horrible and universal plague of small-pox for which we are indebted to Jenner's imniortal discovery cannot realize the greatness of the blessing he conferred upon mankind. 'This universal enthusiasm caused vaccina- tion to spread over the whole world in the marvellously short period of six years, it being accepted with equal readiness by nations of the most diverse climes, habits, and religions. About the close of the year 1801 Jenner's friends in his native county of Gloucester presented him with a small service of plate as a testimonial of the esteem in which

they held his discovery. This was intended merely as a preliminary to the presenting of a petition to Parliament for a grant. He was advised to apply for this, partly to obtain the formal approval of the highest court in this country for vaccination, but also for personal reasons. The premier, Mr Addington, approved fully of this step, and fixed the 17th of March 1802 for the presentation of his petition. This was referred to a committee, of which Admiral Berkeley, one of his warmest friends, was chair- man, which examined carefully into the utihty of vac- cination, and Jenner's claims to its discovery. The in- vestigations of this committee resulted in a report in favour of the grant, and ultimately in a vote of £10,000. Towards the end of 1802 steps were taken to form a society for the proper spread of vaccination in London, and the "Royal Jennerian Society" was finally established, Jenner returning to town (having retired to Berkeley for three months) to preside at the first meeting. This institution began very prosperously, more than twelve thousand persons having been inoculated in thie first eighteen months, and with such effect that the deaths from small-pox, which for the latter half of the last century had averaged 2018 annually, fell, in 1804, to 622. Unfor- tunately the chief resident inoculator soon set himself up as an authority opposed to Dr Jenner, and this led to such dissensions as caused the society to die out in 1808. Jenner was led, by the language of the chancellor of the exchequer when his grant was proposed, to attempt practice in London, but after a year's trial he returned to Berkeley. His grant was not paid until 1804, and then, after the deduction of about £1000 for fees, it did little inore than pay the expenses attendant upon his discovery. For he was so thoroughly known everywhere as the discoverer of vaccination, that the correspondence of the whole world on this subject was upon him. As he himself said, he was "the vaccine clerk of the whole world"; and, at the same time, he continued to vaccinate gratuitously all the poor who applied to him on certain days, so that he sometimes had as many as three hundred persons waiting at his door. Meanwhile honours began to shower upon him from abroad: he was elected a member of almost all the chief scientific societies on the Continent, the first being

that of Géttingen, where he was proposed by the illustrious Blumenbach. But perhaps the most flattering proof of his influence was derived from France. He endeavoured on

| several occasions to obtain the release of some of the unfur-

tunate Englishmen who had been detained in France on the sudden termination of the peace of Amiens, but with- out success, until, in the case of two persons (Dr Williams, a Ratcliffe travelling fellow, and a Mr Williams) he applied to the emperor Napoleon himself. It was on this or some such occasion (for he afterwards repeated his intercession) that Napoleon was about to reject the petition, when Josephine uttered the name of Jenner. The emperor paused and exclaimed—" Ah, We can refuse nothing to that name." Somewhut later he was of the same service to Englishmen confined in Mexico and in Austria; and during the latter part of the great war persons before leaving England would sometimes obtain certificates signed by him which served as passports. In his own country his merits were less recognized. His applications on behalf of French prisoners in England were less successful ; he never shared in any of the patronage at the disposal of the Government, and was even unable to obtain a living for his nephew George.

In 1806 Lord Henry Petty (afterwards the marquis of Lansdowne) became chancellor of the exchequer, and was so convinced of the inadequacy of the former parliamentary grant that he proposed an address to the crown, praying that the college of physicians should be directed to report upon the success of vaccination. Their report being strongly in its favour, the then chancellor of the exchequer (Mr Spencer Perceval) proposed that a sum of £10,000 without any charge for fee or reward should be paid to Dr Jenner. The anti-vaccinationists found but one advocate in the House of Commons ; and finally the sum was raised to £20,000. Jcnner, however, at tle same time had the niortification of learning that Government did not intend to take any steps towards checking small-pox inoculation, which so persistently kept up that disease. About the same time a subscription for his benefit was begun in India, where his discovery had been gratefully received, but the full amount of this (£7383) only reached him in

1812.

The Royal Jennerian Society having failed, the National Vaccine Establishment was founded, for the extension of vaccination, in 1808. Jenner spent five months in London for the purpose of organizing it, but was then obliged, by the dangerous illness of one of his sons, to return to Berkeley. He had been appointed director of the institution ; but he had no sooner left London than Sir Lucas Pepys, the president of the college of physicians, neglected his recom- mendations, and formed the board out of the officials of that college and the college of surgeons. Jenner at once resigned his post as director, though he continued to give the benefit of his advice whenever it was needed, and this resignation was a bitter mortification to him. In 1810 his eldest son died, and Jenner's grief at his loss, and his incessant labours, materially affected his health. In the following year he happened to be in London when the town was much excited by the case of one of Lord Grosvenor's children, who took the small-pox severely, after having been vaccinated by Jenner himself ten years before. The boy's recovery was no doubt to be ascribed to his vaccination, but the occurrence revived for a time all the clamour with which the discovery had been from the first greeted. !

In 1813 the university of Oxford conferred on Jenner the degree of M.D. It was believed that this would lead to his election into the college of physicians, but that learned body decided that he could not be admitted until he had undergone an examination in classics, This

Jenner at once refused; to brush up his classics would, he said, "be irksome beyond measure. I would not do it for a diadem. That indeed would be a bauble; I would not do it for John Hunter's museum."

He visited London for the last time in 1814, when he was presented to the allied sovereigns, and to most of the principal personages that accompanied them. In the next year his wife died after a long illness, and he felt her loss most acutely. It was the signal for him to retire from public life: he never left Berkeley again, except for a day or two, as long

as he lived. He found sufficient occupation for the remainder of his life in collecting further evidence on some points connected with his great discovery, and in his engagements as a physician, a naturalist, and a magis- trate. In 1818 a severe epidemic of small-pox prevailed, and fresh doubts were thrown on the efficacy of vaccination, in part, apparently, owing to the bad quality of the vaccine lymph employed. This caused Jenner much annoyance, which was relieved by an able defence of the practice, written by Sir Gilbert Blane. But this led him, in 1821, to send a circular letter to most of the medical men in the kingdom inquiring into the effect of other skin diseases in modifying the progress of cow-pox. A year later he published his last work, On the Influence of Artificial Lruptions in certain Diseases ; and in 1823 he presented his last paper—“ On the Migration of Birds ”—to the Royul Society. In these pursuits the evening of his days passed happily away. On the 24th of January 1823 he retired to rest apparently as well as usual, and next morning rose and came down to his library, where he was found insensible on the floor, in a state of apoplexy, and with the right side paralysed. He never rallied, and died the following morning, January 26, 1823.

A public subscription was set on foot, shortly after his death, by the medical men of his county, for the purpose of erecting some memorial in his honour, and with much difficulty a sufficient sum was raised to enable a statue to be placed in Gloucester cathedral. In 1850 another attempt was made to set up a monument to him; this appears to have failed, but at length, in 1858, a statue of him was erected by public subscription in London.

Independently of that great discovery which will for ever render his name immortal, Jenner possessed taleuts of observation and reflexion that would have made him eminent as a naturalist and a physician. These qualities would have been more widely appreciated had not his tastes for rural scenes and domestic life led lim to sacrifice such fame as is to be gained only amid the busy throng of men. This resolution was strengthened by his love for the simple pleasures of society, for which his varied accomplishments so well fitted him; indeed, there can be little doubt that he would never have had the perseverance to carry

through his great discovery of vaccination had not his earnest benevolence pressed it on him, as a duty, to confer such a great and permanent benefit on the whole human race.

Jenner's life was written by the intimate friend of his later years, Dr Baron of Gloucester (2 vols. 1827, 1838), and this excel- lent work is almost the sole source from which the present and other biographies of him have been taken. (J. R. G.*)

JENYNS, Soame (1704-1787), author of the Free Inquiry into the Nature and Origin of Evil, was born at Loudon, of a good family, in 1704. He enjoyed the best educational advantages, and studied at St John's College, Cambridge. In 1742 he was chosen M.P. for Cambridge- shire, in which his property lay, and he afterwards sat for the borough of Dunwich and the town of Cambridge. From 1755 to 1780 he was one of the commissioners of the board of trade. He died December 18, 1787.

For the measure of literary repute which he enjoyed during his life Jenyns was indebted as much to his wealth

and social standing as to his accomplishments and talents, though both were considerable. His poetical works, the Art of Dancing, 1727, and Miscellanies, 1770, contain many passages graceful and lively, though occasionally verging on licence. The first of his prose works was his Free Inquiry into the Nature and Origin of Evil, 1756. This essay was severely criticized on its appearance, especially by Dr Johnson in the Literary Magazine. Johnson in this critique—the very best paper of the kind he ever wrote—condemned the book strongly as a slight and shallow attempt to solve one of the most difficult of moral problems. Jenyns, a gentle and amiable man in the main, was extremely irritated by his failure. He put forth a second edition of his work with a vindication prefixed, and tried to take vengeance on Johnson after his death by a sarcastic epitaph. In 1776 Jenyns published his View of the Internal Evidence of the Christian Religion. Though at one period of his life he had affected a kind of deistic scepticism, he had now

returned to the orthodox creed of his youth, and there seems no reason to doubt his sincerity, questioned at the time, in defending Christianity on the ground of its total variance with the principles of human reason. The work was deservedly praised in its day for its literary merits, but is so plainly the production of a dilettante in theology that as a scientific treatise it is valueless. A collected edition of the works of Jenyns appeared in 1790, with a biography by Charles Nelson Cole.

JEPHTHAH (MM5!, 'IepOde), one of the "judges" of Israel, was an illegitimate son of " Gilead," and, being ex- pelled from his father's house by his lawful brethren, took refuge in the Syrian land of Tob, where he gathered around him a powerful band of homeless men like himself. The Ammonites pressing hard on his countrymen, the "elders of Gilead " called for his help, which he consented to give ou condition that in the event of victory the supremacy should be conferred upon him. The success of his arms was complete, and he became in consequence "judge" of Israel until his death six years afterwards. His name is best known in history and literature in connexion with his *' vow," which led to the sacrifice of his daughter as a burnt offering on his return from the war. Much reluctance has been, and continues to be, shown by many writers in accept- ing the plain sense of the Scripture narrative on this point, —reluctance which proceeds to a large extent on unwar- ranted assumptions as to the stage of ethical development which had been reached in Israel in the period of the judges, or at the time when the narrative took shape. Several modern writers, on the other hand, are disposed to find a mythical element in the history of Jephthah. In this connexion weight has been laid on his name, " the opener," on the fact that Gilead is not a personal name, and particularly on the circumstance that what is related about his daugliter appears to be the popular explanation of a ceremony closely allied to well-known rites connected with solar mythology. The story of Jephthah is told in Judg. x. 15-xii. 7; a great part of this section of that book, however, is occupied with an allocution (xi. 14-27) to the children of Ammon which almost certainly belongs to a later hand.

See Wellhausen-Bleek, Einleitung; Goldziher's Ifythologie der Hebréer ; and Studer and Bertheau's commentaries on Judges.

JERBOA, a family of rodent mammals (Dipodidz), chiefly characterized by the great length of the hind limbs as compared with those in front, the disproportion being, in most cases, greater even than in the kangaroos. Like the latter, the jerboas, or jumping mice, as they are also called, raise themselves when disturbed on their hind legs, and execute enormous leaps by the aid of a long muscular tail. When undisturbed, however, they make use of all their

limbs in walking, while the front pair are also employed by many species as hands for the conveyance of food to the mouth. The jerboas, of which there are three genera and twenty-two species known, occur chiefly throughout northern and central Africa, south-eastern Europe, and central and southern Asia, while one genus (Pedetes) is confined to South Africa and another (Jaculus) to North America, Of the third genus (Dipus) there are twenty known species, a typical example of which is the Egyptian jerboa (Dipus xgyptius). The length of its body is 8 inches, and of its tail, which is long, cylindrical, and covered with short hair, terminated by a tuft, 10 inches. Its front limbs are pentadactylous, and only | inch in length, the hind pair three-tued and six times as long. When about to spring, it raises its body by means of the hinder extremities, and supports itself at the same time upon its tail, while the fore feet are so closely pressed to the breast as to be scarcely visible. Hence probably the name Dipus, or two-footed. It then leaps into the air and alights upon its four feet, but instantaneously erecting itself, it makes another spring, and so on in such rapid succession as to appear as if rather flying than running. It is a gregarious animal, living in considerable colonies in burrows, which it excavates with its nails and teeth in the sandy soil of Egypt and Arabia. In these it remains during great part of the day, emerging at night in search of the herbs on which it feeds. It is exceedingly shy, and this, together with its extraordinary agility, renders it difficult to capture.

The Arabs, however, succeed, it is said, in this by closing | up all the exits from the burrows with a single exception, |

by which therefore they are forced to come, and over which a net is placed for their capture. When confined, they will gnaw through the hardest wood in order to make their escape. The Indian jerboa (Dipus indicus) is also a nocturnal burrowing animal, feeding chiefly on grain, which it stores up in underground repositories, closing these when full, and only drawing upon them when the supply of food above ground is exhausted. The natives in some parts of India are in the habit of searching for and robbing those granaries. The South African form, known as the spring haas or jumping hare of the colonists (Pedetes capensis), is the largest member of the family, measuring about a foot in length, exclusive of the tail, which is somewhat longer, and is bushy throughout. Its molar teeth are rootless, while its toes, which are tlree in number on each hind foot, are armed with long hoof-like nails. It is a powerful animal, nearly as large as a hare, and progresses when pursued by a series of leaps, each usually from 20 to 30 feet in length. Those jumping hares are found abundantly in the rocky plateaus of South Africa, where colonies of them form extensive burrowings some-what similar to the rabbit warrens of Britain. Like other jerboas it is chiefly nocturnal, and occasionally it does considerable injury to the grain crops on which it feeds. Of the American genus (Jaculus) there is only a single species—the Labrador jumping monse (Jaculus hudsonius). It occurs over a wide area of North America, extending from Missouri northward to Labrador, and from the Atlantic westward to the Pacific coast. It resembles the spring haas, and differs from all other jerboas in having the metatarsal bones separated, and also in having its feet five- toed, It is a small creature, measuring about 5 inches in length, exclusive of the much longer and very rat-like tail, and lives chiefly in the neighbourhood of woods and shrubby places, where it conceals itself by day but roams in com- panies at night. Its agility is extraordinary ; one kept in

confinement by General Davies took, he says, “ progressive |

leaps of from 3 to 4 and sometimes of 5 yards”; while Audubon considered it as probably the most agile of all wild animals, On the approach of winter the American

jumping mouse retires into its burrow, and there encloses itself within a hollow ball of mud, in which it passes the cold season in a state of complete torpidity. The North American Indians neither eat its flesh nor make any use of its skin,

JERDAN, Wittt1am (1782-1869), journalist, was born April 16, 1782, at Kelso, Scotland. After leaving the parochial school of his native town, his erratic youth be- tween the years 1799 and 1806 was spent in the successive spheres of a country lawyer's office, a London West India merchant's counting-house, an Edinburgh solicitor's chambers, and the position of surgeon's mate on board H.M. guardship "Gladiator" in Portsmouth harbour, under his uncle, who was surgeon. In 1806 the insertion of some verses of his in a Portsmouth paper determined Jerdan's choice of literature as a profession; and, proceeding to London, he found employment as a newspaper reporter. By 1812 he had become editor of The Sun, a semi-official Tory paper ; but a quarrel with the chief proprietor brought that engagement to a close in 1817. He passed next to the editor's chair of The Literary Gazette, which he con- ducted with success for thirty-four years. Jerdan's position as editor introduced him into high social and literary circles; and it is not easy to account for the deference he met with, unless one is content to accept him at his own somewhat self-satisfied estimate, as contained in his Autobiography (4 vols., 1852-3), for which, however, there is no other warrant. An account of his acquaintance, among whom Canning was a special intimate, is to be found in his Men I have Known (1866). When Jerdan retired in 1850 from the editorship of the Lzterary Gazette, his pecuniary affairs, either through misfortune or imprudence, were far from satisfactory. A testimonial of over £900 was subscribed by his friends; and in 1852 a Government pension of 100 guineas was conferred on him by Lord Aberdeen. Among other works, including trans- lations from the French, Jerdan contributed to Misher's National Portrait Gallery of Illustrious and Eminent Personages of the 19th Century. He died July 11, 1869.

JEREMIAH. 1. Zife.—The narrative portions of the Book of Jeremiah are singularly full and precise, and even apart from these the subjective, lyric tone of the prophet's mind enables us to form a more distinct idea of his character than we have of any other prophetic writer. He was the son of a priest named Hilkiah, and it has been held by many both in ancient and in modern times that this Hilkiah was the celebrated high priest of that name, who "found the book of the law (Torah) in the house of Jehovah" (2 Kings xxii. 8). This conjecture, indeed, is not a very probable one, for Hilkiah the high priest was of the house of Eleazar (1 Chron. ii, 13), and Anathoth, where Jeremiah's family lived, was occupied by priests of the line of Ithamar (1 Kings ii. 26). It is certain, how- ever, that the prophet was treated by priests and officials with a consideration which secms to argue that he had high connexions. Jeremiah was still young when he was called to the prophetic career (i. 6); the year is stated by himself (i, 2,xxv. 3) to have been the 13th of Josiah (629 or 627 B.c.). This was before the memorable " discovery" of the Torah, but the year immediately following that in which Josiah "began to purge Judah and Jerusalem from the high places and the images of Asherah" (2 Chron. xxxiv. 3). As yet, it appeared as if Judah was enjoying the peace promised to faithful worshippers of J ehovah ; but the punishment of the sins of Manasseh was not to be long delayed. The battle of Megiddo (609 3.c.), which cost Josiah his life, and that of Carchemish (605 B.c.), which determined the Babylonian predominance to the west of the Euphrates, were the heralds of a fatal turn in 'the fortunes of the kingdom of Judah. Jeremiah (the

Phocion of Judzea) saw this, and at once foretold the vast extension of Nebuchadnezzar's power. For tlie most part, his ministry was exercised in the capital, though from xi, 21 it may perhaps be inferred that he prophesied for some little time in his native place. It was during the reign of Jehoiakim that he went through that baptism of complicated suffering which has made him in a very high and true sense a type of One greater than he. King and people, priests and (official) prophets, were all against him, or at least the number of his supporters was too

small to counterbalance the opposition. Only on one occasion, when accused of a capital crime as having " pro- phesied against this city," the "princes," supported by "certain of the elders" and "the people," were successful in quashing the accusation, and setting the prophet free. At a later time Jeremiah incurred a still greater danger, though he was providentially saved from the hands of his persecutors. In the fourth year of Jehoiakim (which, it is important to remember, was the first of Nebuchadnezzar) Jeremiah was commanded to write down 'all the words that I have spoken unto thee against Israel, and against Judah, and against all the nations… from the days of Josiah even unto this day " (xxxvi. 2). The interpretation of this passage, clear as it seems at first sight, is by no means easy. "First of all, an historically accurate reproduction of the pro- phecies would not have suited Jeremiah's object, which was not historical but practical ; he desired to give a salutary shock to the people, by bringing before them the fatal consequences of their evil deeds. And next, it appears from ver. 29 that the purport of the roll which the king burned was that the king of Babylon should 'come and destroy this land,' whereas it is clear that Jeremiah had uttered many other important declarations in the course of his already long ministry." The most probable view is that of Gratz, viz.,that the roll simply contained chap. xxv., which is in fact (omitting the interpolations in vers. 12, 26) entirely concerned with the invasion of Nebuchad- nezzar and its consequences, and which expressly claims to have been written in the fourth year of Jehoinkim. 'Is not thes the prophecy which Jeremiah dictated to Baruch, and is not ver. 2 a loose, inaccurate statement due to a later editor? That the prophetic as well as the historical books have passed through various phases (without detri- ment to their religious value) is becoming more and more evident. The 7th and 8th chapters of Isaiah, and the 37th and 388th of the saine book, have demonstrably been brought into their present shape by an editor; is it not highly reasonable to conjecture that these narrative chapters of Jeremiah have, to a greater or less extent, passed through a similar process?" The "princes," on this as on the former occasion (chap. xxvi.), were disposed to be friendly to Jeremiah and his secretary; but for some reason they felt themselves bound (as they did not feel themselves bound before) to refer the matter to the king. Jehoiakim was enraged at the contents of the prophetic roll, cut it in

pieces, and threw them intv the fire. This time Jereiniah escaped; but under the wenk-minded Zedekiah he was more than once imprisoned (chaps. xxxii., xxxiii., xxxvii., xxxviii.). It is remarkable that, in the tension of feeling, the "princes," who were formerly friendly to Jeremiah, now took up an attitude of decided hostility to him. At last they had him consigned to a miry dungeon, and it was the king who interfered for his relief, though he remained a prisoner till the fall of Jerusalem. Nebuchad- nezzar, who had doubtless heard of Jeremiah's constant recommendations of submission, gave him the choice either of going to Babylon or of remaining in the country (chaps. XXXviil., xxxix.). He chose the latter, and resided with Gedaliah, the native governor, at Mizpah. On the murder of Gedaliah he was carried to Egypt against his will (chaps.

xl.—xhii.), where he predicted the approaching conquest and desolation of the Nile valley. A legendary tradition states that he suffered death by stoning.

2. Character and Interary Style.—It is interesting to compare Jeremiah with Isaiah. The earlier prophet had advantages which were denied to the latter; he lived at a period of comparative national prosperity, and his moral and intellectual gifts were of a stronger and more striking order. But Jeremiah has this noteworthy point in his favour that he overcame the natural shrinking of a some- what feminine character, and showed himself able, in a strength not his own, to resist impediments which even Isaiah would have found terribly great. " When," as Ewald says, 'the truth and the spirit of Jehovah call him or the resisting world provokes him to the contest, he then

_ knows nothing of diffidence and fear, nothing of tenderness-

and pliability, he contends before the eyes of all with the most decisive energy against every false prophet who mis- leads the people (xxviii. 6 sq., xxix. 15 sq., 24 sq.); if the truth has not been proclaimed with due faithfulness to the king, he goes still, as Isaiah did in his day, without hesitancy, to the royal palace (xxii. 1-19, xxxiv. 2-7); and, although

himself of a priestly family, he speaks from the very first with special emphasis against the growing degeneracy of the priests (i. 18, ii. 26, iv. 9), and is never weary of speaking against every kind of arbitrariness wherever and in whatever form it is found (xxxiv. 8-22, xxxvii. 14 sq.).” Another point of contrast is well worth noticing. Only five years after Jeremiah’s first appearance as a prophet that great reform took place which was associated with the “discovery” of the Deuteronomic Torah, It is a highly probable conjecture (comp. chap. xi.) that Jeremiah was at the outset an ardent preacher of the contents of this great book; at any rate, his memory became surcharged with the ideas and even the phrases of Deuteronomy. The consequences of the reforming endea-vours of what may be called the Deuteronomic party were both good and evil. The centralization of religion, and the emphasis laid on the moral duties, were steps of the highest importance. ‘But inasmuch as a sacred book was as such for the first time looked upon with greater reverence as a state authority, there arose thus early a kind of book-science with its pedantic pride and erroneous learned endeavours to interpret and apply the Scriptures ; whilst at the same time there arose also a new kind of hypocrisy and idolatry of the letter, through the new pro- tection which the state gave to the religion of the book acknowledged by the law. Thus scholastic wisdom came into conflict with genuine prophecy ” (Ewald, Zhe Prophets, iii. 63, 64). But something more than this was the result. “Hear ye the words of this covenant,” was the address with which Jeremiah began his Deuteronomic preaching ; but, as time went on, a deeper view of the covenant forced itself upon his mature mind, and the expression which it has found in xxxi. 31-34 is one of the passages which best deserve to be called “‘ the gospel before Christ.” It is sad that Jeremiah could not always keep his spirit under the calming influence of these high thoughts. No book of the Old Testament, except the Book of Job and the Psalms, contains so much which is difficult to reconcile with the character of a self-denying servant of Jehovah. Such expressions as those in xi. 20, xv. 15, and especially xviii. 21-23, contrast powerfully with Luke xxiii. 34, and show that the typical character of Jeremiah is not absolutely complete.

No wonder if Jeremiah's style is feeble compared with that of the "royal prophet" Isaiah,—if he gladly leans on older prophets, and copies or imitates more than a bolder genius would have permitted. His utterance is interrupted by sobs, and he is without the energy to soar to poetic

heights. His brevity is that of "'the evening star of pro- phecy," and Ewald even remarks (with some exuberance, perhaps) that he has "great wealth of new figures with great delicacy of description, a literary facility that readily adapts itself to the most different subjects, ... and with all this an unadorned simplicity which is very unlike the greater artificiality of his contemporary Habakkuk."

3. Dates of the Prophecies—According to Bleek, the following prophecies belong in all probability to the reign of Josiah, (a) ii. 1-iii, 5, (6) iii, 6-vi. 30 (expressly referred to this period), (c) vii. l-ix. 25, (d) xi. 1-17. Dated prophecies meet us again in the time of Jehoiakim. Chap. xxvi., according to its own statement, arose in the beginning of his reign; and it is held by some that chap. vii. gives the same prophecy as xxvi. 2-6, only in a fuller form. prophecy of the vast extension of the Babylonian power in chap. xxv., are both dated in the fourth year of Jehoiakim (the latter is evidently not free from interpolations). To the same eventful year, according to most scholars, belongs

the writing of all Jeremiah's prophecies in the roll which |

was read before Jehoiakim; but we have already seen reason to doubt the soundness of this view. At any rate, chap. xxxv. belongs to this period, as the superscription and the contents combine to show. Bleek also refers several other prophecies to the reign of Jehoiakim, e.., («) xvi. l-xvii. 18, (6) xvii. 19-27, (c) xiv., xv., (d) xviii, (e) xi. 18—xii. 17. to the last period of Jehoiakim's, we may refer x. 17-23, and perhaps chap. xiii, with its account of a strange symbolical action connected with the Euphrates or more probably (Hitzig) Ephrath, te, Bethlehem. Zedekiah's reign is much more fully represented in the prophecies ; see chaps. xxii.—xxiv., xxvii.~~xxix., and, if li, 59 is to be followed, chaps. 1, li.~~

~~A little later in the same reign we may place chaps. xix., xx., which describe some remark~~ able scenes in Jeremiah's history. Later still, at the beginning of the siege of Jerusalem, fall xxxiv. 1-7, chap. xxi, and the group of chapters beginning at chap. xxxil., the important prophecies in chaps. xxx., xxxi., also perhaps belong to this period; and of course chap. xxxvil. and the two following chapters.

It should be mentioned here that there are some portions of the book the Jeremianic authorship of which has been entirely or in part denied. (a) Chap. x. 1-16 was written, according to Movers, Hitzig, Graf, Knobel, and Naegelsbach by a prophet of the captivity—-Movers and Hitzig say, by the author of Isaiah xl—Ixvi. (6) Chaps. xxx.-xxxiil, according to Movers and Hitzig, have been brought into their present shape by the author of Isa. xl.-lxvi., though the basis is Jeremianic. (c) Chaps. 1, li, which Bleck assigns to the fourth year of Zedekiah, was according to Movers and Hitzig brought into its present form by a captivity prophet, working on a Jeremianic basis, while Ewald and Knobel hold it to have been entirely written at the close of the captivity. (d@) Chap. lii. evidently forms the close of a history of the kings of Judah, and no doubt of the history followed very closely by the editor of the Books of Kings.

We cannot here enter fully into this subject. But some- thing may be said on chaps. 1., li? It is open to grave doubt whether Jeremiah wrote these chapters. That he composed a prophecy against Babylon may be granted, and that he gave it to Seraiah with the charge described in li. 61-64 ; but it does not follow that the present prophecy on Babylon was the one referred to in ver. 60, There are special reasons for the opposite view, and they are analogous

1 In xxvii. all critics agree that for " Jehoiakim " we should substi-

tute, with the Syriac version, " Zedekiah." 2 Compare a paper by Budde in Jahrb. jf. D, Theol., 1879.

The prophecy against Egypt in xlvi. 2-12, and the |

To the short reign of Jehoiachin, or |

to these which lead so many students to doubt the Isaianic origin of Isa. x].-Ixvi. For example,—(1) the author of the latter prophecy (or the greater part thereof) writes as if he were living at the close of the Babylonian exile, So does the author of Jer. 1. li. See chap. li. verses 33, 6 and 45, 11 and 28, 20-23. (2) Although the above statement is literally true of most of Isa. xl.—-lxvi., yet there are some passages which are much more sugges- tive of a Palestinian than of a Babylonian origin (see IsalAH). Precisely so in Jer. L, li., at least according to one prevalent interpretation of 1. 5, li. 50 (which are thought to imply a residence in Jerusalem), 1. 28, li. 11, 35, 51 (suggestive, perhaps, of the continuance of Jerusalem and the temple),]. 17, li. 34 (implying, as some think, that Nebuchadnezzar is still alive). Still there is so much doubt respecting the soundness of the inferences that it is hardly safe to rely too confidently upon them. The case of Jer. 1, li. is therefore in so far rather less favourable to Jeremiah's authorship than that of Isa. xl —Ixvi. is to that of Isaiah. (3) Amongst much that is new and strange in the style and phraseology of Isa. xl—Ixvi., there is not a little that reminds one forcibly of the old Isaiah. Similarly with Jer. 1, li. " Every impartial judge," says Kuenen, "must admit that the number of parallel pas- sages is very large, and that the author of chaps. 1, li. agrees with no one more than with Jeremiah." For instance, the formula, " Thus saith Jehovah Sabaoth, the God of Israel " (1. 18, Hi, 33) also occurs in vil. 3, ix. 15, and some twenty-six other passages ; comp. also 1. 3 with ix. 9; 1.5 with xxxii. 40; 1 7 with ii. 3, xiv. 18, xvii.

13.

The probability would therefore appear to be that, what- ever solution we adopt for the literary problems of Isa. xl.-Ixvi., an analogous solution must be adopted for Jer. L., li. The whole question is so large, and connects itself with so many other problems, that the present writer declines to pronounce upon it here. Only it should be observed—(1) that both subject and tone remind us of Isa. xl.~~lxvi., and the kindred prophecies scattered about in the first part of the Book of Isaiah, and more especially of Isa. xiii. and the closely related prophecy, Isa. xxxiv.;~~

~~(2) that these two chapters, Jer.]. and li, present some striking points of contact with Ezekiel, who, though contemporary with Jeremiah, was still a late contemporary, and allusions to whom (since Ezekiel was a literary rather than an oratorical prophet) imply that his prophetic book was already in circulation—in other words, suggest a date well on in the exile for the prophet who alludes to him ; (3) that, though there are many Jeremianic allusions in Jer. 1., li., there are also several passages copied almost verbally from prophe~~ cies of Jeremiah and applied to Babylon and its assailants (it seems difficult to believe that Jeremiah should have been so economical of his literary work). It deserves to be added (4) that, though Jeremiah is a great student of the earlier prophetic writings, and makes numerous allu- sions to them (see especially chaps. xlvi.—xlix.), nothing approaching to the mosaic work in Jer. L, li. can be pointed to in the undoubted prophecies of Jeremiah. In fact, the author of these chapters has borrowed almost the whole of their contents from other prophets,—his own property, so to speak, being too insignificant to be worth mentioning.

4. The Massoretic Text and the Septuagint Version.— The Alexandrian version presents an unusually large amount of variation from the received Hebrew text. Even in the order of the prophecies there is one remarkable dis- crepancy, viz., in the series of prophecies against foreign nations (chaps. xxv. 15-xlv. become in the LXX. chaps. xxxii—li, the series of prophecies in question being transposed); and there is no doubt an approach to the truth in the LXX. arrangement. More important are the

differences of reading. ‘The LXX. has very few additions, and these only single words or syllables ; on the contrary, there are many omissions of words, sentences, verses, and whole passages (altogether about 2700 words are wanting, or the eighth part of the Massoretic text) ; also alterations of passages, sometimes not without influence on the sense ” (Bleek) ; and these discrepancies are of extremely early date, for the state of the Greek text was already noticed by Origen (Zp. ad Afric., p. 56, Migne). Three principal explanations have been offered

:—(1) the error of copyists (Jerome, Grabe) ; (2) negligence and caprice on the part of the Greek translators (Spohn, Naegelsbach, Wichelhaus, Keil, Graf); (3) the existence of various (or at least two) recensions of the Hebrew, the recension used by LXX. being nearer to the original text than that of the Massorets (J. D. Michaelis, Movers, Hitzig, Bleek). A better view is that adopted by Ewald, Schrader, and Kuenen, according to which the Massoretic text is on the whole the best ; but the Greek version, in spite of the manifold errors and caprices of the translator, sometimes approaches more nearly to the original than the Massoretic text.

Modern Literature.—Venema, Comment. in librum prophet. Jere- miz, 2 vols., Leeuwarden, 1765; Blayney, Jeremiah and Lamen- tations, a new translation, with notes eritical, philological, and explanatory, London, 1784; Spohn, Jeremias vates e vers. Jud. Alexandr. ac reliqu. interpr. Gree. emendatus, notisque crit. illus- tratus, 2 vols., Leipsic, 1794, 1824 (of little value); Roorda, Comm. in aliquot Jer. loca, Groningen, 1824; Movers, De wtrius- que recensionis vatieiniorum Jeremis, Grece Alexandrina et Hebraica Masorethicz, indole et origine, Hamburg, 1837 ; Kiipcr, Jeremias librorum sanetorum interpres atque vindex, Berlin, 1837 ; Wichelhaus, De Jeremia versione Alexandrina, Halle, 1847 ; Scholz, Der Afas. Text und die LXX. Uebers. d. B. Jer., 1875, Guthe, De Federis notione Jeremiana, 1877. Commentaries by Graf, Leipsic, 1862; Hitzig, 2d ed., Leipsic, 1866; Naegclsbach, Bielefeld and Lcipsic, 1868; Keil, Leipsic, 1872; Payne Smith (Speaker's Commentary, vol. v.), London, 1875; Ewald (vol. iii. of English translation of Die Propheten), London, 1879 ; Scholz, 1880; Cheyne (Pulpit Commentary), in the press. (iF KSC)

JEREZ DE LA FRONTERA, a city in the province of Cadiz, Spain, near the right bank of the Guadalete, 16 miles N.N.E. of Cadiz (28 by rail), and 67 S.S.E. of Seville. It is pleasantly situated on an undulating plain of much fertility, and covers a considerable extent of ground. The old crenated Moorish wall by which it was formerly surrounded, but which it has now quite outgrown, still par- tially exists, as also do some of the ancient gateways. The newer portions of the town are well built, having broad regular streets with numerous " plazas " or squares

adorned with fruit trees. The principal buildings are the Alcazar, an old palace fortress belonging to the Moorish period, adjoining the modern "alameda" or promenade ; the collegiate church (1695), which, however, though large, presents no attractive architectural features; and the municipal buildings, belonging to the end of the 16th cen- tury, which display considerable taste. There are numer- ous other churches, a theatre, an orphanage, four hospitals, an "institute," a library, and various schools. The bull ring (1875) is a large one, and enjoys a good repute in Andalusia. The staple article of trade is the wine grown in the neighbourhood, known from the name of the town as "sherris " (xeres) or sherry, of which in 1876 a total of 4,607,550 imperial gallons was exported. Of these Great Britain and Ireland took 4,024,114, British colonies 51,122, and other parts of the world 532,314. The popu- lation in 1877 was 64,533.

Jerez has sometimes been identified with the ancient Asta Regia, but is most probably the Asido (" qua Cesariana") of Pliny. The Sherish of the Arabs is said to have been a corruption from Cwxsaris Asido, It was in this neighbourhood that the decisive battle of the Guadalete (J uly 711) was fought which practically made Tarik master of the entire Pyrenean peninsula. Jerez, which is frequently

mentioned in the chronicles of the Spanish Arabs, was recovered by Alphonso the Wise in 1255.

JEREZ DE LOS CABALLEROS, a city in the pro- vince of Badajoz, Spain, is picturesquely situated 39 miles to the south of that city, on two heights near the Ardila, a tributary of the Guadiana. The old town is surrounded by a Moorish wall with six gates ; the newer portion of the city is well and regularly built, and adorned with numerous orange and other fruit trees, It has linen and woollen manufactures to a limited extent and several tanneries ; but its principal articles of trade are the various agricul- tural and other products of the district, especially the fine quality of pork which is reared in the oak forests of the neighbourhood. The town is said to have been founded by Alphonso IX. of Leon in 1229 ; in 1232 it was extended by his son Saint Ferdinand,

who gave it to the Knights Templars, whence the name delos Caballeros. It was made a city by Charles V. The population in 1877 was 8463.

JERICHO (in), Ih, "fragrant," or perhaps, accord- ing to an old interpretation, "city of the moon") was the first city west of the Jordan occupied by the Israelites. The city was destroyed, and, though it is mentioned from time to time under its usual name (2 Sam. x. 5) or by its epithet 'city of palm trees" (Judg. i. 16, iii. 13; comp. Deut. xxxiv. 3), it was not rebuilt as a fortified place till the reign of Ahab (1 Kings xvi. 34), when it became the seat of a prophetical society, and appears in the history of the prophet Elisha (2 Kings ii.). The narrative of the healing of the waters by Elisha is referred by Josephus (B. J. iv. 8, 3) to the copious fountain now called the Sultan's Spring, which lies on the western margin of the Jordan val- ley, 700 feet below the Mediterranean level, and just under the cliffs of M. Quarantania. The mounds surrounding the spring are of sun-dried brick, and show no traces of ancient building. The position of the town, in a district of great fertility, with rose gardens (Eccles, xxiv. 14), various species of date palms, and valuable cultivation of henna, opobal- samum, and myrobalan (Jos., wt supra; Strabo, xvi. 2), secured its prosperity, while its situation at the gate of the great pass leading up from the Jordan valley to Jerusalem gave it strategical importance. Thus we find that it shared the calamities of the Babylonian exile (Ezra ii. 34), was re-occupied on the restoration (Neh. iii. 2), and was fortified by Bacchides in the Maccabee wars (1 Mac. ix. 50). In the time of Strabo there were two forts, Threx and Taurus, pro- tecting the pass above Jericho. Antony gave the groves of Jericho as a rich gift to Cleopatra. From her they passed to Herod the Great, who made the city his winter residence, and adorned it with buildings, crowning the height above with a fortress named after his mother Cyprus. Here it was that the tyrant died. It appears, however, that the Jericho of Herod was not on the site of the old city (Jos., wt supra) but a mile to the south, where there are also mounds and the remains of five aqueducts conveying water from three distant springs. A great tank, of which the ruins are still traced, has been conjectured to be the same in which Herod drowned Aristobulus (Jos., Ant., xv. 2, 3). In the time of Christ the pilgrims from

Persea and Galilee appear to have gathered at Jericho on their way to Jerusalem, and so the town is repeatedly mentioned in the Gospels, According to Eusebius (Onom., ed. Lagarde, p. 265) Jericho was destroyed at the time of the fall of Jeru- salem, and a new town sprang up, from which he distiu- guishes the ruins of two earlier cities as still visible. To the third Jericho, which was an episcopal city, may be referred the Byzantine remains immediately east of Tell es Sultan. The present village of Rth& or Arih&, which stands nearly half an hour south-east of the Sultan's Spring, is a still more modern site, with a square tower of crusading date. Yakut, in the beginning of the 13th century, still speaks of Jericho as producing dates, bananas, and excellent sugar, but all these have disappeared with the gradual decay of

the place. The modern village is but a group of squalid huts, and the ancient groves are represented by a thicket of the Spina Christi and other trees between the village and the Sultan's Spring.

JEROME, Sr (Hieronymus, in full Evsesrus Sora- RONIUS HreronyMus), was born at Strido (modern Strigau?), a town on the border of Dalmatia fronting Pannonia, destroyed by the Goths in 377 a.p. Some authorities, following Prosper's chronicle, give 330 or 331 as the date of his birth, but from certain passages in his writings it is more probable that he was not born till 340 or 342. He says, for example, that he was a boy learning grammar when Julian died; but Julian died in 363, and Jerome would scarcely call himself a boy if he had been thirty-three years old. What is known of Jerome has mostly been recovered from his own writings, for he was a gossiping sort of man, and biographers have only to string together extracts from his evistles and prologues to get a very good account of his life. His parents were Christians, orthodox though living among people mostly Arians, and wealthy, He was at first educated at home, Bonosus, a life-long friend, sharing his boyish studies, and was after- wards sent to Rome to perfect his education. Donatus,

-whose Latin grammar was to be the plague of generations

of medizval school-boys from St Andrews to Prague till Corderius and the Reformation drove it out, taught him grammar and explained the Latin poets. Victorinus taught him rhetoric. He attended the law-courts, and listened to the Roman advocates pleading in the Forum. He went to the schools of philosophy, and heard lectures on Plato, Diogenes, Clitomachus, and Carneades ; the conjunction of names shows how philosophy had become a dead tradition, [lis Sundays were spent in the catacombs in discovering graves of the martyrs and deciphering inscriptions. Pope Liberius baptized him in 360; three years later the news of the death of the emperor Julian the Apostate came to Rome, and Christians felt relieved from a great dread.

When his student days were over Jerome returned to Strido, but did not stay there long. His character was formed. He was ascholar, with a scholar's tastes and crav- ings for knowledge, easily excited, bent on scholarly dis- coveries. From Strido he went to Aquileia, where he formed some friendships among the monks of the large monastery there, the most notable being his acquaintance with Rufinus, with whom he was destined to quarrel bitterly over the question of Origen's orthodoxy and worth as a commentator; for Jerome was a man who always sacrificed a friend to an opinion, and when he changed sides in a controversy expected his acquaintances to follow him. From Aquileia he went to Gaul, visiting in turn the principal places in that country, from Narbonne and Toulouse in the south to Treves on the north-east frontier. He stayed some time at Treves studying and observing, and it was there that he first began to think seriously upon' divine things. From Treves he returned to Strido, and from Strido to Aquileia. He settled down to literary work in Aquileia, and com- posed there his first original tract, De Muliere septies percussa, in the form of a letter to his friend Innocentius. Some quarrel, no one knows what, caused him to leave

Aquileia suddenly ; and with some companions, Innocentius, _

Evagrius, and Heliodorus being among them, he started for a long tour in the East. The epistle to Rufinus (3d in Vallarsi's enumeration) tells us the route. They went through Thrace, visiting Athens, Bithynia,

Galatia, Pontus, Cappadocia, and Cilicia, to Antioch, Jerome observing and making notes as they went. He was interested in the theological disputes and schisms in Galatia, in the two languages spoken in Cilicia, &c. At Antioch the party remained some time. Innocentius died of a fever, and – Jerome was dangerously ill. This illness brought him face

| uncouth style of the Scriptures.

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JER—JER

to face with death; he experienced conversion, and resolved to renounce whatever kept him back from God. His greatest temptation was the study of the literature of pagan Rome. In his dreams God reproached him with caring more to be a Ciceronian than a Christian. He disliked the "O Lord," he prayed, "Thou knowest that whenever I have and study secular MSS. I deny Thee," and he made a resolve henceforth to devote his scholarship to the Holy Scripture. "' David was to be henceforth his Simonides, Pindar, and Alezus, his Flaccus, Catullus, and Severus." Fortified by these resolves he betook himself to a hermit life in the wastes of Chalcis. Chalcis was the Thebaid or the Marseilles of Syria. Great numbers of monks, each in solitary cell, spent lonely lives, scorched by the sun, ill-clad and scantily fed, pondering on portions of Scripture or copying MSS. to serve as objects of meditation. Jerome at once set himself to such scholarly work as the place afforded. He discovered and copied MSS., and began to study Hebrew. There also he wrote the life of St Paul of Thebes, probably an imaginary tale embodying the facts of the monkish life around him. Just then the Meletian schism, which had to do with the relation of the orthodox to Arian bishops and to those baptized by Arians, distressed the church at Antioch, and Jerome as usual eagerly joined the fray. Here as elsewhere he had but one rule to guide him in matters of doctrine and discipline,—the practice of Rome and the West ; for it is singular to see how Jerome, who is daringly original in points of scholarly criticism, was simply a ruthless partisan in all other matters ; and, having discovered what was the Western practice, he set tongue and pen to work with his usual bitterness (Altercatio Luciferiani et

Orthodoxi). From Antioch he went to Con- stantinople, where he met with the great eastern scholar and theologian Gregory of Nazianzus, and with his aid tried to perfect himself in Greek. The result of his studies there was the translation of the Chronicon of Eusebius, with a continuation,! of twenty-eight homilies of Origen on Jeremiah and Ezekiel, and of nine homilies of Origen on the Visions of Isaiah.

In 381 Meletius died, and Pope Damasus interfered in the dispute at Antioch, hoping to end it. Jerome was called to Rome in 382 to give help in the matter, and was made secretary during the investigation. His work brought him into intercourse with this great pontiff, who soon saw what he could best do, and how his vast scholarship might be made of use to the church. Damasus suggested to him to revise the existing Latin translation of the Bible; and to this task he henceforth devoted his great abilities '(see Brstz). At Rome were published the Gospels (with a dedication to Pope Damasus, an explanatory introduction, and the canons of Eusebius), the rest of the New Testa- ment, and the version of the Psalms from the LXX. text, known as the Psalterium Romanum, which was followed in 385 by the Psalt. Gallicanum, based on the Hexaplar Greek text. These scholarly labours, however, did not take up his whole time, and it was almost impossible for Jerome to be long anywhere without getting into a dis- pute. He was a zealous defender of that monastic life which was beginning to take such a large place in the church of the 4th century, and he found enthusiastic dis- ciples among the Roman ladies. A number of widows and maidens met together in the house of Marcella to study the Scriptures with him; he taught them Hebrew, and preached the virtues of the celibate life. His argu- ments and exhortations may be gathered from many of his epistles and from his tract Adversus Helvidium, in which he defends the perpetual virginity of the Virgin Mary

1 Comp. Schoene's critical edition (Berlin, 1866, 1875).

against Helvidius, who maintained that Mary bore chil- dren to Joseph. His influence over these ladies alarmed their relations, and excited the suspicions of the regular priesthood and of the populace, but while

Pope Damasus lived Jerome remained secure. Damasus died, however, in 384, and was succeeded by Siricius, who did not show much friendship for Jerome. He found it expedient to leave Rome and set out for the East in 385. His letters (especially Ep. 45) are full of outcries against his enemies and of indignant protestations that he had done nothing unbecoming a Christian, that he lad taken no money, nor gifts great nor small, that he had no delight in silken attire, sparkling gems, or gold ornaments, that no matron moved him unless by penitence and fasting, &c. His route is given in the third book Zn Rufinum; he went by Rhegium and Cyprus, where he was entertained by Bishop Epiphanius, to Antioch. There he was joined by two wealthy Roman ladies, Paula, a widow, and Eustochium her daughter, one of Jerome's Hebrew students. They came accompanied by a band of Roman maidens vowed to live a celibate life in a nunnery in Palestine. Accompanied by these ladies Jerome made the tour of Palestine, carefully noting with a scholar's keenness the various places mentioned in Holy Scripture. The results of this journey may be traced in his trans- lation with emendations of the book of Eusebius on the situation and names of Hebrew places, written probably three years afterwards, when he had settled down at Bethlehem. From Palestine Jerome and his companions went to Egypt, remaining some time in Alexandria; and they visited the convents in the Nitrian desert. Jerome's mind was evidently full of anxiety about his translation of the Old Testament, for we find him in his letters recording the conversations he had with learned men about disputed readings and doubtful renderings; Didymus of Alexandria appears to have been most useful. When they returned to Palestine they all settled at Bethlehem, where Paula built four monasteries, three for nuns and one for monks. She was at the head of the nunneries until her death in 404, when Eustochium succeeded her ; Jerome presided over the fourth monastery. In this monastery at Bethlehem Jerome did most of his literary work and, throwing aside his unfinished plan of a translation from Origen's Hexaplar text, translated the Old Testament directly from the Hebrew, with the aid of Jewish scholars. He men- tions a rabbi from Lydda, a rabbi from Tiberias, and above all Rabbi Ben Anina, who came to him by night secretly for fear of the Jews. Jerome was not familiar enough with Hebrew to be able to dispense with such assistance, and he makes

the synagogue responsible for the accuracy of his version: “Let him who would challenge aught in this translation,” he says, ‘“‘ask the Jews.” The result of all this labour was the Latin translation of the Scriptures which, in spite of much opposition from the more conservative party in the church, afterwards becanie the Vulgate or authorized version; but the Vulgate as we have it now is not exactly Jerome’s Vulgate, for it suffered a good deal from changes made under the influ- ence of the older translations; the text became very corrupt during the Middle Ages, and in particular all the Apocrypha, except Tobit and Judith, which Jerome translated from the Chaldee, were added from the older versions.? Notwithstanding the labour involved in translating the Scriptures, Jerome found time to doa great deal of literary work, and also to indulge in violent controversy. Earlier in life he had a great admiration for Origen, and translated many of his works, and this lasted after he had settled at

1 See Vercellone, Varia Lectiones Vulgatz, Rome, 1860, 1864 (unfinished), |

; Bethlehem, for he translated in 389 Origen’s homilies

on Luke; but he came to change his opinion and wrote violently against the admirers cf the great Alexandrian scholar, Contra Joannem IKerosolymitanum, and Adversus Raujinum Lib. IITL., for both John, bishop of Jerusalem, and Rufinus, Jerome’s old friend, were followers of Origen. At Bethlehem also he found time to finish Didymz de Spiritu Sancto Liber, a translation begun at Rome at tle request of Pope Damasus, to denounce the revival of Gnostic heresies by Jovinianus and Vigilantius (Adv. Jovinanum Lib. II, and Contra Vigilantium Liber), and to repeat his admiration of the hermit life in his Veta S. Hilarionis Erenutx, in his Vita Malcht Monachi Captivi, in his translation of the Rule of St Pachomius (the Benedict of Egypt), and in his S. Pachomi et S. Theo- dorict Eptstole et Verba Mystica. He also wrote at Bethlehem De Viris illustribus sive de Scriptoribus Ecelesiasticis, a church history in biographies, ending with the life of the author; De Nominibus Hebraicis, compiled from Philo and Origen ; and De Situ et Nominibus Locorum Ilebraicorum.2 At the same place,

too, he wrote Ques- tiones Ilebraice on Genesis, and a series of commentaries on Isaiah, Jeremiah, Ezekiel, Daniel, the Twelve Minor Prophets, Matthew, and the Epistles of St Paul. Jerome engaged in the Pelagian controversy with more than even his usual bitterness (Dialog contra Pelagianos) ; and it is said that the violence of his invective so provoked his opponents that an armed mob attacked the monastery, and that Jerome was forced to flee and to remain in conceal- ment for nearly two years. He returned to Bethlehem in 418, and after a lingering illness died on September

30, 420.

By far the best cdition of Jerome's works is that of Vallarsi (Verona, 1734-42), which contains in prefaces and appendices almost all that is known of the great Western scholar. The student will find the article on " Hieronymus" by Colln in Ersch and Gruber's Encyclopédie very useful, and the English reader will find a suc- cinct account of his writings taken from Vallarsi in Smith's Diet. of Greck and Roman Biography and Mythology, art. " Hierony- mus." (T. M. L.)

JEROME or PracuE (¢, 1365-1416), the friend and disciple of John Huss, derives the surname by which he is best known from his native town, where he was born somewhere between 1360 and 1370. His family name is sometimes, but erroneously, said to have been Faulfisch. After completing his studies in the university of Pragne, he proceeded (about 1396) to Oxford, where in course of a residence of some duration he became acquainted with the teaching and writings of Wycliffe, of which he became a zealous disseminator on his return to his native land. In 1398 he took his bachelor's degree at Prague, and then visited Paris, Heidelberg, and Cologne; at the first- mentioned university he seems to have graduated as master of arts. Returning about 1407 to Prague, he took a prominent part with Huss in the university disputes which led to the withdrawal of the German "nation." So great did his reputation for learning, energy, and sagacity become that he was employed by Ladislaus IT., king of Poland, in 1410 to assist in placing the university of Cracow upon a proper footing, while by Sigismund, king of Hungary, he was, although not in orders,

invited to preach before him at Ofen. His public discourses in Hungary, however, soon brought him under suspicion of Wycliffite heresy, and he found it necessary to fly the country ; taking' refuge in Vienna, he was there arrested and thrown into prison, but on the intervention of his friends in Prague obtained his release. He now again became closely asso-

2 Compare the critical edition of these two works in Lagarde's Onomastica Sacra, Gotting., 1870. _ 3 See Lagarde's edition appended to his Genesis Grace, Leipsic,

1868,

ciated with Huss in his native city, to which he had once more returned, and where he remained after the expulsion of his friend. In 1415 he went spontaneously to Con- stance, determined to do what he could for Huss, who had meanwhile been imprisoned there; the news he received on his arrival were so discouraging, however, that, panic-stricken, he immediately again withdrew. Though without a safe conduct he would no doubt have reached Prague in safety had he only been able to hold his peace ; but while resting at Hirschau he allowed his feelings to gain the mastery of lim, and, in the presence of many clergy, broke out in vehement denunciation of the injustice of the council ; the consequence was that he was forthwith arrested by order of the duke of Bavaria and sent back a prisoner to Constance (May 1415). There, after enduring the most rigorous confinement for some months, he was brought before a public session of the council on Septem- ber 23, 1415, when he made a full retractation of all errors against the Catholic faith, especially those of Wyc- liffe and Huss. His enemies, however, were deterniined that not even thus should he escape their hands; by Michael de Causis and Stephen Palecz (who also had made themselves conspicuous in the persecution of Huss) it was declared that the recantation was ambiguous, and new articles were exhibited against their victim. Thrice again he was brought before a general congregation of the council. On the last of these occasions (May 26, 1416) all his timidity seems to have finally left him. In a bold and vigorous declamation he solemnly

retracted the retractation which had been wrung from him eight months before; “of all the sins that I have committed since my youth, none weigh so heavily on my mind and cause me such keen remorse as that which I committed in this evil place when I approved of the iniquitous sentence given against Wycliffe aud against the holy martyr John Huss, my master and friend.” Four days afterwards he was con- demned as a relapsed heretic ; his reply was an appeal to the supreme Judge before whom he and his accusers alike were destined to stand. ‘Two days later he marched with a cheerful countenance to the stake, bidding the execu- tioner light the fire before his face ; “ had I the least fear, I should not be standing in this place.” His ashes, like those of Huss, were gathered and thrown into the Rhine. Jerome owes his fame to his association with Huss, and par- ticularly to the splendid heroism with which in his death he atoned for one moment of faltering in his loyalty to the doctrines to which he had faithfully devoted his life. No literary remains survive by which we miglit estimate with precision how far the claims to learning and superiority of intellect often made for him can be justified. Of absolute originality he obviously had none. The truth seems to be that, with considerable advantages of birth and early train- ing, and with a mind more variously accomplished than that of Huss, he nevertheless wanted the moral weight which gave his master so great an ascendency over the minds and hearts of men. Bold even to rashness, his courage was shown rather in bursts of furious vehemence than in the equable tenor of his life, and more than once failed him in critical moments. In this weakness he only reflected the turbulent and unruly spirit of the age he lived in; but it is also a weakness that sufficiently justifies history in assigning to him a comparatively subordinate though still highly honourable place among the pioneers of the Reformation.

See Heller, Hieronymus von Prag, 1885 ; Neander, Church His- tory; and Lechler, Johann von Wiclif u. die Vorgesehichte der Reformation, 1873.

JERROLD, Doveras Winttam (1803-1857), dramatist, satirist, and one of the most brilliant of the English wits who distinguished the first half of the 19th century, was

born in London, January 3, 1803. His father, Samuel Jerrold, actor, was at that time lessee of the little theatre of Wilsby near Cranbrook in Kent, but in 1807 he removed to Sheerness. There, among the blue-jackets who swarmed in the port during the war with France, little Douglas grew into boyhood, a stout, well-made, rosy-cheeked, white-haired urchin, fond of reading and pugnacious withal. Familiarity with the tinsel and glitter of his father's profession robbed it of its chief attractions for the boy; but the glorious renown of Nelson and the anti-Gallic enthusiasm of his father's naval patrons filled his susceptible bosom, and wooed him to his majesty's uniform. From December 1813 till October 1815 Douglas Jerrold served his country as a midshipman. He saw nothing of the war save a cargo of maimed warriors from Waterloo; but till his dying day there lingered traces of his early passion for salt water. The peace of 1815 ruined poor Samuel Jerrold ; there was no more prize money. On January 1, 1816, he removed

| with his family to London, where the plucky little ex-

midshipman began tle world again asa printer's apprentice, studying hard in the grey of the early morning at Latin, pinching himself to get the Waverley Novels from the library, and finding unspeakable delight in the pages of his Shake- speare. In 1819 Douglas Jerrold was a compositor in the printing-office of the Suxday Monitor. Several short papers and copies of verses by him had already appeared in the sixpenny magazines, but he aspired now to contribute to the Monitor; and stealthily one evening he dropped into the editor's box a critique of the opera Der Freischiitz. Next morning he received his own copy to set up, together with a flattering note from the editor, requesting further contributions from the anonymous author. Thenceforward Jerrold was engaged in journalism.

He soon entered another field where he was to reap no less honourable laurels, In 1821 he had the satisfaction of seeing a comedy that he had composed in his fifteenth year brought out at Sadler's Wells Theatre, under the title More Frightened than Hurt. Other pieces followed, and in 1825 the popular young dramatist was engaged for a few pounds

weekly to produce dramas and farces to the order of Mr Davidge of the Coburg Theatre. By his marriage in the autumn of 1824 the "little Shakespeare in a camlet cloak," as he was called, had found a less fitful incentive to industry than his mere ambition; and, while he was engaged with the drama at night, he was steadily pushing his way as a journalist by his daily labours. For a short while he was part proprietor of a small Sunday newspaper. In 1829, through a fortunate quarrel with the exacting Davidge, Jerrold left the ' Coburg," and Black-Eyed Susan was brought out on the "Surrey" boards. Tlie success of the piece was enormous, With its free gallant sea-flavour, it took the town by storm, and "all London went over the water to see it." On the three hundredth night the theatre was illuminated. Elliston, manager of the "Sur- rey," made thousands of pounds; T. P. Cooke, who played William, made his reputation ; Jerrold received about £70. But his fame as a dramatist was achieved. In 1830 it was proposed that he should adapt something from the French for Drury Lane. ' No," was his reply to the offer, "I shall come into this theatre as an original dramatist or not at all." In December of the following year he was received on his own terms; Zhe Bride of Ludgate was the first of a number of plays which found their way to Drury Lane stage. The other patent houses threw their doors open to him also (the Adelphi had already done so) ; and in 1836 Jerrold himself became co-manager of the Strand Theatre with Mr Hammond his brother-in-law. The ven- ture was not successful ; and the partnership was dissolved. While it lasted Jerrold wrote his only tragedy, The Painter of Ghent, and appeared himself in the title réle, without

any very marked success. His pen continued to be fruit- ful of sparkling comedies till 1854, when his last piece, The Heart of Gold, was written.

Meanwhile he had won his way to the pages of numerous periodicals,— before 1830 of the second-rate magazinesonly, but after that to those of more importance; and he lad almost reached comfort and ease when an obligation, undertaken for an unfortunate friend, drove him forth to fresh years of hard toil. When at last he could settle in comfort he

found himself the ceutre of a host of friends, whose affection was his no less than their admiration; and his last years were spent in peaceful happiness. 'The Monthly Magazne, Blackwood's, the New Monthly, and the Athenzum, all welcomed his brilliant articles. To Punch, the publication which of all others is associated with his name, he contributed from its second number in 1841 till within a few days of his death. He founded and edited for some time, though with indifferent success, the Illuminated Magazine, Jerrold's Shilling Magazine, and Douglas Jerrold's Weekly Newspaper, and under his editor- ship Lloyd's Weekly Newspaper rose from almost nonentity to a circulation of 182,000. The history of his later years is little more than a catalogue of his literary productions, interrupted now and again by brief flights to the Continent or to the country. Douglas Jerrold died at his house, Kilburn Priory, in London, on June 8, 1857.

Jerrold's figure was small and spare, and in later years bowed almost to deformity. His features were strongly marked and expressive from the thin humorous lips to the keen blue eyes gleaming from beneath the shaggy eyebrows. He was brisk aud active, with the careless bluffness of a sailor. nor his pleasure; to his simple frankness all polite duplicity was distasteful. Hating the conventionalities of the town, he loved to make his home in some rural retreat where he could roam at ease, with loose coat and straw hat. To his house, always hospitable, he was especially fond of attract- ing young men, whom he encouraged with strong, cheery words, and often with more material aid. The cynical side of his nature he kept for his writings; in private life his hand was always open. In politics Jerrold was a Liberal, and he gave eager sympathy to Kossuth, Mazzini, and Louis Blanc. In social polities especially he took an eager part he never tired of declaiming against the horrors of war, the luxury of bishops, and the iniquity of capital punishment.

Douglas Jerrold is now perhaps better known from his reputation as a brilliant wit in conversation than from his writings. In animated talk his retorts and fancies flew from his lips like a shower of sparks. His jests were un- premeditated and unforced ; their spontaneity, which not seldom surprised Jerrold himself, was one of their most telling

characteristics, and often robbed his sharpest retorts of their sting. For he let no sentimental or polite con- sideration stand in the way of a brilliant rejoinder. As Dr Charles Mackay expresses it, “when his jest came to the tip of his tongue, it had to explode though the heavens should crack, and his best friend should take it amiss.” Yet no one can accuse Jerrold of being spiteful. Ill-advised and thoughtless, even unjust, his wit often was ; but it was not barbed. It did not rankle in the wound. Jerrold’s wit was of a tolerably high intellectual order. It is said that no pun is to be found in his writings. Their wit is the wit of burnished epigram and quaint conceit, of happy phrase and lightning retort. But the puns that abounded in his talk were often wise as well as witty. The well-known description of dogmatism as “ puppyism come to maturity ” 18 an excellent example of the flashing insight that gave life and meaning to his jests.

As a dramatist Jerrold was very popular, and struck out quite a line for himself in the domestic drama. Here he

Open and sincere, he concealed neither his anger |

dealt with rather humbler forms of social life than had commonly appeared on the stage ; and it is worthy of note that plays of this kind have had the greatest run in modern times. Jerrold was one of the first and certainly one of the most successful of those who in defence of the native English drama endeavoured to stem the tide of translation from the French, whicli threatened early in the 19th century altogether to drown original native talent, Thoroughly English in motive, action, and atmosphere, his plays, whether comedy or domestic drama, are all effective from their freshness, point, and spirit. The author is at his best in construction as well as in sparkling epigram and brilliant dialogue in Bubbles of the Day, and Time Works Wonders. The latter perhaps excels in plot and human interest. Tho tales and sketches which form the bulk of Jerrold’s collected works vary much in skill and interest; but, although the artistic symmetry is here and there marred by traces of their having been composed from week to week, they are always marked by keen satirical observation and pungent wit. While reading them it is well to remember that they have a higher aim than the

beguiling an idle hour by the mere interest of the story ; for the author is always trying to call attention to some wrong, to rouse pity for some hardship, to stir up indignation against some form of social oppression or abuse.

Jerrold's writings are scattered over all the periodical literature of his day; but perhaps his most important works are in the following list. den of Character are seven sketches (collected in 1838), in which he throws sarcastic ridicule on various foibles and hypocrisies of every-day men; Cakes and Ale, a collection of short papers of all sorts made in 1842, contains whimsical tales directed

against the tyranny of riches, the folly of judging by ap-

pearances, with similar thrusts at the weaknesses and vices of humanity; Zhe Story of a Feather, which originally appeared in Punch in 1842-43, tracing the career of an ostrich feather as it passes to successive owners, affords the author opportunites of exposing shams, lashing vice, and gibbeting successful villany in every rank of life. In Lhe Chronicles of Clovernook he ventilates his philosophy of life, and his objections to existing social and political institutions ; in A Man made of Money, where the super- natural forms the basis for a story of an eminently matter- of-fact character, he fulminates against the blind worship of lucre ; St Giles and St James, perhaps his best work of this class, is described in his own words as "an endeavour to show in the person of St Giles the victim of an ignorant disregard of the social claims of the poor upon the rich, ... topresent . . . the picture of the infant pauper reared in brutish ignorance." Of his professedly satirical papers the chief are Punch's Letters to his Son, Punch's Complete Letter-Writer, and Sketches of the English. Mrs Caudle's Curtain Lectures, possibly the most widely known of all Jerrold's writings, explain themselves by their title. Be- sides the "Q Papers," which began in the second number of Punch, Jerrold wrote various political articles for his own and other newspapers.

Were a reader now to go to Jerrold's writings, he would find much that seems commonplace and trite. The fault is not with Jerrold, but with the host of his imitators who have sought with more or less success to

reproduce in the pages of every magazine the social cynicism which is apt at first view to be taken for the essence of Jerrold's style. But Jerrold has his own happy knack of handling ordinary subjects, his own singular method of regarding things. His truths may sometimes be commonplaces, and his moralizings trite ; his descriptions may sometimes drag on to tedium, and his characters stiffen into lay figures ; even his passion may sometimes attenuate to fustian, but every paragraph is lit up by quaint phrase or happy conceit;

cvery page is illumined by some gleaining epigram or flash of originality. Jerrold seems to revel in the sarcastically satirical, perhaps the easiest and most directly effective of all satire. He appears to have reserved the softer side of his nature for his private life. He is far more at home in satirizing the foibles of men than in praising their good points. Here and there there are tender gleams of rarest pathos in his pages; but these do not occur in scenes ela- borated to move pity, but in the simple half unconscious finishing touch to some little picture, drawn from the author's heart. That Jerrold has painted for us no full-length portrait of a thoroughly noble character is due to his ultra-keen perception of the bad in human nature. "Mr Capstick" in St Giles and St James, who is perhaps the most truly benevolent of all his personages, escapes the difficulty of revealing his excellence in consistent speech by becoming an amiable hypocrite, and poses as "the man with gall in his words and balm in his deeds."

A writer in the Hdinburgh Review for 1859 accuses Jerrold of being a "sentimentalist,"—of writing "to gratify his sympathies and antipathies, and not to bring out the truth." That is an extreme statement, which has some foundation in fact. Jerrold often attacked what he con- sidered an abuse without stopping to weigh the ultimate consequences, and without being swayed by very satisfac- tory or conclusive reasons. Sometimes too the epigram or the jest seems to have suggested the opinion, rather than the opinion the epigram. That he generally espoused the healthy side was due more to his instinct than to

his reason, more to his heart than to his head. His keen feelings often carried him to great lengths in invective. He did not escape the besetting sin of all social reformers. He is tempted to elaborate and intensify the peculiar aspect of the question that best suits the lesson he seeks to read ; and although it is impossible to doubt his perfect sincerity and honest intention, yet the darkening of the shadows has a disingenuous air, and we are tempted to suspect that he has been unconsciously impelled to exaggerate reality or distort fact in order to justify his diatribe. Such a sus- picion is fatal to satire. It enlists our sympathies, on a most healthy principle, on the side of what is attacked ; and it is the cause why so much of what Jerrold wrote has uuissed fire. This fault of colouring, which earnest social satire can scarcely escape, has been commonly translated by critics as “bitterness” ; but bitterness is far too ill-natured a word to describe the vivid, quivering feeling in which there is not the faintest tincture of personal animus, and in which all the sharpness is on behalf of the poor and the op- pressed, with whom his own life had taught him sympathy.

Douglas Jerrold’s Works were collected by himself in 8 vols. 8vo., 1851-55, and again in 4 vols. 8vo in 1859. Zhe Life and Remains of Douglas Jerrold, by his son Blanchard Jerrold, was published in 1858; 2d ed., 1869. (F. MU.)

JERSEY, the largest and most important of the CHANNEL IsLANDS (q.v.), is situated between 49° 153’ and 49° 10’ N. lat., and between 2° 0?’ and 2° 153’ W. long., 16 miles west of Normandy and 125 south of Southampton. The total area comprises 28,717 imperial acres, or about 45 square miles. It is of oblong form, with a length of about 11 utiles from east to west, and an average breadth of about 5% miles. Along the northern part of the island a belt of clevated land runs from east to west, displaying bold and picturesque cliffs towards the sea. The east, south, and west coasts consist of a continuous succession of large open bays with marshy or sandy shores terminated by rocky headlands. The principal bays are Greve au Lancon, Gréve de Lecq, and Bouley Bay on the north coast; St Catherine’s Bay and Grouville Bay on the east coast ; St Clement’s Bay, Samarez Bay, St Aubin’s Bay, and St Brelade’s Bay on the south coast; and St Ouen’s Bay on

the west coast. The sea in many places has encroached greatly on the land, and sand drifts have been found very troublesome, especially on the west coast. The sur- face of the country is broken by winding valleys having a general direction from north to south, and as they approach the south uniting so as to form small plains. The lofty hedges which bound the small enclosures into which Jersey is divided, the trees and shrubbery which line the roads and cluster round the uplands and in almost every nook of the valleys unutilized for pasturage or tillage, give the island a rich and luxuriant appearance, and completely neutralize the bare effect of the few sandy plains and sand- covered hills. Some of the coast scenery is grand and striking, presenting many features of special interest.

According to J. A. Bird ("Geology of the Channel Islands," in the Geological Magazine, Loudon, 1878), Jersey rests on syenite rocks, which appear in three great masses in the north-west, south-west, and south-east of the island. Between these masscs there is in the west an extensive formation of shale and schist, and in the north-west a for- mation variously composed of porphyries, limestone schist, altered sandstone, quartzite and quartzose conglomerate. In the neighbourhood of St Helier there is an accumula- tion of volcanic rocks consisting of trap, porphyry, and amygdaloid. China stone clay is obtained in large quantities. There are some veins of lead, and ironstone is occasionally found. 'The climate of Jersey is somewhat warmer in summer and colder in winter than that of Guernsey. The annual mean temperature is 51°, the annual rainfall about 30} inches, and the number of days upon which rain falls about one hundred and fifty. The wettest season is from October to January, but rain seldom continues long. 'The island enjoys a very early spring and a lengthened autumn. Snow and frost are rare, but dense fogs frequently prevail. Fruits and flowers indigenous to warm climates grow frecly in the open air. The land is rich and very productive, the soil being chiefly a deep loam, which is lighter upon syenite and granite than upon the other formations; the sandy portions in the vicinity of the bays have become very fruitful through cultivation. The lands are held either as freeholds

or on a nine years' lease. On account of the Norman law of succession the farms have become very much subdivided. It is only rarely that they exceed 50 acres, and very many are less than 3 acres. The farmhouses and cottages are remarkably neat and comfortable ; and the peasantry, who all farm their own land, are perhaps the most contented and prosperous in the United Kingdom. A five-course. shift (turnips, potatoes or parsnips, wheat, hay, hay) is that usually followed. The frequency with which root crops are grown, and the abundant supply of sea manure, have greatly enriched the soil. The seaweed or vraic harvest occurs at certain seasons which are prescribed by law. It is only then that it is permissible to cut the vraic from rocks; but loose vraic is gathered in large quantities at allseasons. The implements of husbandry are generally old-fashioned. The peasantry take advantage of every bit of wall and every isolated nook of ground for growing fruit trees. Grapes are ripened under glass; oranges are grown in sheltered situations, but the most common fruits are apples, which are used for cider, and pears. The island is intersected by a network of roads. 'There is a railway line between St Helier and St Aubin's, and connects St Helier and Gorey.

According to the agricultural returns for 1880 the total arca of arable land was 18,950 acres,—a percentage of 66:2 to the total area,—of which 2920 acres were under corn crops, 7456 under green crops, 4359 under rotation grasses, 4087 under permanent pasture, and 128 fallow. Under orchards there were 1345 acres, under markct

gardens 186, and under nursery grounds 38. Wheat, which in 1880 occupied 2524 acres, is the principal and almost exclusive corn crop, the kinds grown being prin- cipally Velouzé and Petit Blanc. For the cropa manure of burnt seaweed is generally used. The area under potatoes in 1880 was 4671 acres. They are grown chiefly for the Covent Garden Market, the earliest crop being ready about the end of April or beginning of May. Only 1313 acres were under turnips. The pasturage is very rich, and is much improved by the application of seaweed to the surface. The mainstay of Jersey is cattle, which in 1880 numbered

11,022, or the large average of 58 to every 100 acres under cultivation, the average of the United Kingdom being only 20°7. The breed is that commonly known as the Alderney, and is kept pure by stringent laws against the importation of foreign animals. The number of cows was 5884, of other cattle above two years of age only 756, and of cattle below two years of age 4382. It will thus be seen that cattle are kept chiefly for dairy purposes. The milk is used almost exclusively to manufacture butter. The cattle are always housed in winter, but remain out at night from May till October. Horses in 1880 numbered 2261. Originally there was a small black breed of horses peculiar to the island, but now they are chiefly imported from France or England. Pigs form the staple food of the inhabitants, and numbered 5844. Only a few sheep are kept, 346 in 1880.

The number of ships that entered the ports of Jerscy in 1879 was 2001, of 281,663 tons burden,—British vessels numbering 1859, of 275,990 tons, and foreign vessels 142, of 5673 tons. In the same year 2018 vessels, of 279,485 tons burden, cleared,—British vessels numbering 1876, of 273,319 tons, and foreign vessels 142, of 6166 tons. The number of vessels belonging to the island was

234, with a burden of 17,027 tons, in addition to which there is a |

large number of fishing boats. There is regular steam communi- cation with England via Southampton, Weymouth, and Plymouth, and with France via Granville and St Malo. The principal exports are granite, fruit and vegetables (especially potatoes), oysters, butter, and eattle; and the principal imports coal, winc, rum and other spirituous liquors, sugar, tea, wheat, and eggs. Kelp and iodine are manufactured from seaweed. Fish are not so plentiful as around the shores of Guernsey, but mackercl, turbot, cod, mullet, and especially the conger eel, are abundant at the Minquiers. There is a large oyster bed between Jersey and France, but partly on account of over-dredging the supply is not now so abundant as formerly. There is a great variety of other shell-fish. The islanders build their own ships. aS

Jersey is under a distinct and in several respects different form of |

administrative government from Guernsey and the smaller islands included in the bailiwick of Guernsey. The administration is under the superintendence of a licutenant-governor appointed by the erown, The main business of legislature in Jersey is carried on by

the " states," which consist of the bailiff or judge of the royal court |

elected by the crown, twelve jurats of the royal court elected for life by the ratepayers, the rectors of the twelve parishes, twelve con- stables elected every three years, and fourteen deputies elected every three years. though he has no vote, has the power of veto. The states have the power of passing ordonnances which unless they obtain the sanction of the sovereign of England are in force for only three years. Eng- lish Acts of Parliament after registration become laws in Jersey.

Taxation is very light in the island. The only legal tribunal is |

The lieutenant-governor has a deliberative voice, and, |

the royal court, composed of the bailiffs and twelve jurats. The |

lieutenant-governor has the supcrintendence of the militia, in which every male betwecn seventeen and sixty-five years of age, who is medically fit, is liable for service. Jersey is divided into twelve parishes, and ecclesiastically it constitutes a deanery in the diocese of Winchester in England.

The only town of importance is St Helier, situated on St Aubin's Bay. It has rather a mean and uninteresting appearance, but beautiful views are obtained from various points. Although the streets are generally narrow and irregular, they are clean and well paved, and the Royal Square is spacious and airy. The town possesses an outer and an inner harbour. Fort Regent, a fortress eompleted in 1815 at a cost of £1,000,000, is situated on a lofty ridge of granite to the east of the harbour ; and on the rocks to the west stands Elizabeth Castle, a disused stronghold erected in the time of Elizabeth on the site of an abbey founded in the 12th century. Closely adjoining it there is an

ancient ruin called the hermitage. The other principal buildings are the parish church in

the Early Pointed style, dating from 1341, and lately completely renovated, the court-house, the Albert Hall for concerts and assem- blies, Victoria College, the hospital, and the jail. The population of the town and parish in 1881 was 26,893.

_ The population of Jersey in 1806 was 22,855. From 1821, when it numbered 28,600, it increased rapidly till 1851, when it had reached 57,020. In 1861 it had declined to 55,613 ; and, although owing to the number of French who sought refuge in the island it increased in 1871 to 56,627, in 1881 it was only 52,372, of whom 23,415 were males and 28,957 females.

An historical account of Jersey will be found under CHANNEL IstANDs. The principal objects of antiquarian interest are the cromlech near Mont Orgueil ; the castle of Mont Orgueil, of very old datc; St Brelade's Church, the oldest church in the island, and dating from the 12th century; the remains of an old chapel on whose site Prince's Tower was erected at the close of the last cen- tury; and Bel Royal, a cottage near St Helier, where Charles II. is said to have concealed himsclf.

See, in addition to the works mentioned under CHANNEL IsLanps, T. Lyte, Sketch of the History and Present State of the Island of Jersey, 1808; History of the Island of Jersey, 1840; Charles le Quesne, A Constitutional History of Jersey, 1856; Francois-Vietor Hugo, La Normandie Inconnue, 1857; Report of the Commission appointed to Enguire into the Civil, Munictpal, and Ecclesiastical Laws of Jersey, 1861; Le Hericher, Jersey monumental et historique, 1862; Le Cerf, LZ' Archipel des Isles Normandes, 1863; Lefevre, 'Channel Islands," in the Fortnightly for October 1879; " L'fle de Jersey," In the Explorateur for 1876; Pegot-Ogier, Histoire des fles de la Manche, 1881.

JERSEY CITY, the chief city of Hudson county in the State of New Jersey, U.S., is situated on the west bank of the Hudson, opposite New

York, to which it stands in a

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Plan of Jersey City.

relation similar to that of Birkenhead to Liverpool. It is laid out irregularly, owing to its being an aggregation of three formerly distinct municipalities. Many of the streets are broad and well paved, and the city is provided with efficient gas, water, and sewerage systems. It has few

striking buildings, the most prominent structures being the immense grain elevators near the river, three hospitals, an orphan's home, and the public school buildings, 21 in number. The public schools are supported by State and city taxes, and administered by a board of education. The trade of the city is very considerable; but, as it is embraced in the New York customs district, separate returns are not made. The fact that it is a terminus for three

lines of ocean steamers, five trunk-lines of railways, seven | | and Bergen in 1870, and Greenville in 1872. transport of coal, iron, &c., and materially fosters its |

lesser railways, and the Morris canal, greatly facilitates the

industries. Jersey City has iron-foundries, iron, steel, and zine works, boiler yards, machine shops, railway plant

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manufactories, tobacco factories, breweries, and other establishments which turn out watches, glass, crucibles, sugar, soap, candles, and a large variety of hardware and other articles. 'The extensive abattoirs at Long Dock are noteworthy for their excellent management. The " City of Jersey" was incorporated in 1829; but in 1851 it received another charter, under its present name. Its very rapid growth has been largely owing to its absorption of the townships and cities of Van Voorst in 1851, Hudson The popu. lation in 1850 was 6856; in 1870, 82,546; and in 1880, 120,722, making it the seventeenth city in point of population in the United States.

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ERUSALEM (Heb. nowy, Yerushalayim, pronounced J as a dual; but the old pronunciation seems to have been Yerushalem, whence, through the LXX., 'IepovoaAyp, we have the common English form). The meaning of the name is obscure, none of the current interpretations, " vision of peace," "abode of peace," and the like, being free from difficulty. A later abbreviated form is pow. Salem (Ps. Ixxvi. 2),!

whence XéAvya, Solyma. The ordinary Greek and Latin forms are ‘IepoodAvja, Hierosolyma. “Hadrian changed the name of the city to Allia Capitolina, and filia long continued the official name, and even passed over into Arabic in the form fliy&. The Arabs, however, com- monly designate Jerusalem by epithets expressive of its sanctity, Beit el Makdis, El Mukaddas, El Mukaddis,? or, in the modern vernacular, more briefly E] Kuds, “the sanctuary.”

IL NaturaL TopoGRAPHY AND RESULTS oF EXCAVATIONS.

The history of Jerusalem exploration dates from the year 1833, when Bonomi, Catherwood, and Arundale succeeded in obtaining admission into the Haram (Haram) enclosure and made the first survey of its buildings. In 1838 and 1852 the city was visited by the famous American traveller Dr Robinson, and his bold impeachment of the traditional topography, while raising a storm of controversy, laid the foundation of a truer understanding of the antiquities of Jerusalem. In 1849 Jerusalem was surveyed by Lieu- tenants Aldrich and Symonds of the Royal Engineers, and maps by Vandevelde, Thrupp, Barclay, and others were subsequently published. All these earlier attempts were, however, superseded in 1866 by the ordnance survey executed by Captain (now Colonel) Wilson, R.E., whose plans of the city and its environs, and of the Haram enclosure and other public buildings are the standard authorities on which all subsequent work has been based. During the years 1867-70 excavations of a most adven- turous description were carried on by Captain (now Colonel) Warren, R.E. The results, especially in the vicinity of the Haram, were of primary importance, and many stoutly contested theories have now succumbed to the testimony of the spade. During 1872-75 some further explorations were carried on by Lieutenant Conder, R.E., while for many years a most valuable series of observations of the levels of the rock beneath the rubbish on which the modern city stands has been carried out by Mr C. Schick, architect.?

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1 Whether the narrator of Gen. xiv. 18 means Jerusalem by Salem, the city of Melchizedek, is still disputed, and the decision of the ques- tion

is embarrassed by the uncertainty attaching to the date of his _ narrative. Ifthe chapter is early, Salem can hardly mean Jerusalem, but many critics now assign to it a very late date.

2 See VAkut, iv. 590; Taj el ‘Ards, iv. 214.

3 See Zimmermann’s Karten und Pline zur Top. d. alt. Jerus., based on Schick’s measurements (Basel, 1876); Quart. Stat. of P.E.F., 1880, p. 82.

The preset account of the city is based on the results which have thus been obtained by actual exploration ; but, although so much has been done during the last fifteen years to clear up disputed questions, much still remains to be accomplished.

The geographical situation of Jerusalem has now been determined by trigonometry to be 31° 46’ 45” N. lat. and 35° 13’ 25” E. long. of Greenwich (taken at the dome of the Holy Sepulchre church). The city stands at the extremity of a platean which shelves down in a south-east direction from the watershed ridge of Judea, which is here somewhat contorted. About a mile north of the town the ridge coming from the north is deflected towards the west at an elevation averaging 2600 feet above the Mediter- ranean, and thus passes clear of the city on its west side. From this ridge at the point of deflexion an important spur with steep and rugged eastern slopes runs out south- east for 14 miles, and thence southwards for 1} miles more. ‘The spur culminates in two principal summits, the most northerly 2725 feet above the sea, the second (now crowned with a village and a minaret) 2650 feet above the same level; and there is a third summit or knoll on the south terminating the spur and rising to an elevation of 2410 feet. To this chain (but more especially to the central summit with the minaret on it, now called Jebel et Tér) the name Olivet applies. The plateau between this chain and the watershed ridge is drained by two flat open valley heads which form a junction about 4 mile north of the north-east angle of the modern city, and become a deep ravine with sides steep and in places precipitous, running immediately beneath and west of Olivet for a distance of 1} miles from the junction to a well called Bir Lytb, where the bed is 1979 feet above the Mediterranean and 430 feet below the termination of the Olivet chain. This valley is the *‘ brook ” (nahal or fiwmara) Kidron, bounding the site of Jerusalem on the east. A second valley (W. er Rababy) has its head in a shallow depression north-west of the city close to the watershed, whence it first runs south for about 4 mile, and then—rapidly deepening and flanked by low precipices—trends east for another } mile, joining the Kidron in an open plot close to the Bir Eyib above noticed. The second valley thus flanking Jerusalem on the west and south encloses an area half a mile wide and

rudely quadrangular,—the seat of the city itself whether ancient or modern.

The site thus generally described—a natural fortress standing on spurs of hill surrounded on three sides by valleys 300 to 400 feet deep—is but imperfectly supplied with water. Only one spring exists anywhere near the city, namely, that in the Kidron valley, about 700 yards above the junction with the western ravine, now called the "spring with steps" (Umm ed Derg), or the " Virgin's spring." The vicinity of Jerusalem consists of strata of

the Eocene and Chalk formations, having a general dip

down from the watershed of about 10° E.S.E. The action |

of denudation has left patches of the various strata, but generally speaking the oldest are on the west. The upper part of the Olivet chain consists of a soft white limestone, with fossils and flint bands belonging to the Upper Chalk; beneath this are—first, a hard silicious chalk, with flint bands ; secondly, a soft white limestone, much uscd in the ancient buildings of the city ; thirdly, a hard chalk, often pink and white in colour, and then known as Sta. Croce marble. The underlying beds belonging to the period of

the Greensand are not visible, the lowest strata in the |

Kidron precipices belonging to the Lower Chalk epoch. The actual position of the city at various times has

differed but little in comparison with other capitals. The

outline of the small spurs concerning which so many famons

controversies have arisen is now much obscured by thie |

accumulation of rubbish, which has been increasing ever since the time of Nehemiah (Neh. iv. 10). There is an average depth of from 30 to 40

fect of this debris through- out the town, and the foundations of the modern houses

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Contours of Ancient Jerusalem, with the line of the Walls, according to Lieut, Conder.

often stand upon it. In the valleys there is a depth of 70 feet, and east of the temple in one place shafts were sunk 120 feet before the rock was reached. The natural features of the ground, although unaltered and traceable to a practised eye, are thus less sharply accentuated than in the ancient period of the city’s history. As, however, we have now more than two huudred and fifty actual observations of the rock levels in an area of 210 acres, there is no diffi- culty in recovering the general features of the ancient natural site of the town.

The quadrangle included between the two outer valleys above described is again split up by a valley, the Tyropceon of Josephus, which divides the plateau into two main spurs, —that on the east being the temple hill, that on the west the Seat of the upper city. The Tyropceon is both shallower and broader than the boundary ravines already noticed, its depth averaging only from 100 to 150 feet below the crests of the ridges. Its real head is immediately outside the

present Damascus gate and the north wall of the modern city, whence it runs with a curved course southwards to

join the Kidron just above the junction with the western boundary valley, a distance of about 1600 yards. There

| 1s, however, a second afiluent or head of the central valley

on the west side of its main course—a kind of dell or theatre-shaped depression extending westwards for more than 300 yards, and measuring not quite 200 yards north and south. Thus, while the eastern ridge is unbroken, the western is divided into two summits joined by a narrow saddle which separates the head of the broad central valley just described from the upper part of the western boundary valley.

Of the two western hill tops, that towards the south is the largest and most lofty. It has a trapezoid shape, and terminates on all sides in steep slopes, which are in places precipitous, and it is only joined to the watershed by the connecting saddle, which is scarcely 50 yards in width.

This high southern hill measures 2000 feet north and south by about 1300 feet east and west. The highest part is towards the west, where tle level of the flat broad sumnuit is about 2520 feet above the Mediterranean. The smaller northern knoll or hill top, bounded on the east by the great central valley of Jerusalem, on the south by the theatre-shaped valley which separates it from the high southern hill, and on the west by a small subsidiary depres- sion running north, rises to a summit not more than 2490 feet in elevation, or 30 feet below the flat top of the larger southern hill.

The eastern ridge, on which the temple stood, has a height towards the north of about 2500 feet; it then becomes narrower, and is artificially divided by a deep rock-cut trench running east and west. Its original form within the temple enclosure was that of a rounded top with a steep western slope and a more gentle gradient on the east, the level of the ridge falling from 2460 to 2300 feet in a length of about 500 yards. The end of this ridge is formed by a tongue of ground between the Kidron and the shallow central valley, falling rapidly in 400 yards to a level only 50 feet above the valley beds.

The identity of the present Haram (or sanctuary) with the ancient temple enclosure is undisputed, the only question which has arisen being whether the boundary walls now existing coincide with the outer ramparts of Herod's temple enclosure. The Haram is a quadrangle containing 35 acres, the interior surface roughly levelled, partly by filling up with earth the portions where the rock is lowest, partly by means of vaulted substructures. of

various ages. The most important results of Captain Warren's excavations were those connected with the exploration of the rampart walls, which measure 1601 feet on the west, 922 on south, 1530 on east, and 1042 feet on north, tle south-west angle being 90° and the south-east 92° 30'. The height of the wall varies from 30 to 170 feet. On the west, on the south, and on the east for probably 1090 feet from the south-east corner, the masonry is all of one style, the stones being of great size with a marginal draft,—the imperfect finish of the faces in some of the | lower courses apparently showing that the foundation-stones were never ~~visible above the surface. The north part of the east wall consists, however, of masonry differ~~ ing somewhat from the rest, the finish being rougher and the stone of inferior quality. It was found that this wall is continued for some distance beyond the north-east corner of the present area. The present north wall is of quite a different kind of masonry, and appears to be much more recent, the substructures immediately inside being only as old as the 12th century. The north-west angle is formed by a projecting scarped block of rock measuring 350 feet east and west and 50 feet north and south, the height

above the interior court being about 30 feet. On this scarp the modern barracks stand, and a fosse 60 feet deep and 165 feet wide is still traceable outside the rock on the north. A valley bed 100 feet below the level of the Haram court ran across the north-east portion of the area into the Kidron ; and south of this the remains of a scarp running east and west have been discovered, but are not as yet completely explored. The prolongation of this scarp east- wards cuts the east wall of the

Haram at the point 1090 feet from the south angle, at which the change in the character of tlle masonry above explained probably occurs. The evidence thus obtained seems to indicate that an area of about 74 acres has been added to the ancient enclosure on the north-east to give it the present quadrangular form, and the rougher masonry on the east appears to have belonged to the city wall constructed by Agrippa and not to the older wall of Herod's temple.

At the south-west angle of the Haram enclosure are the remains of an ancient arch (Robinson's arch), 42 feet span, belonging to a bridge across the Tyropceon, the west pier of which Captain Warren discovered, as well as the fallen voussoirs, lyiug on a pavement 40 feet beneath the surface, while under the pavement 20 feet lower was found the voussoir of a former bridge on the same site (cf. Jos., B. J, i. 7,2). At the south-east angle of the enclosure Captain Warren found beneath the surface remains of an ancient wall of finely drafted masonry abutting on the east ram- part of the Haram, and here some unexplained marks or letters in red paint were discovered on the lower stones. The buried wall runs southward for 250 yards at a height of 70 feet, and is held to be part of the wall of Ophel. The base of a great projecting tower was also laid bare, and identified by the discoverer with the tower of Neh. iii. 25. Another noticeable discovery was the fact that an ancient aqueduct is intersected by the west Haram wall, which must consequently be more recent than the rock tunnel thus destroyed.

The facts thus ascertained allow of the identification of the great walls still standing with those which supported tlie outer cloisters of the temple enclosure in tlie time of Herod's reconstruction of the edifice. The original area of Solomon's temple enclosure was doubled by Herod (B. J., 1. 21, 1), who took away the ancient foundations and made a quadrangle extending from the fortress of Antonia to the royal cloister, to which a great bridge led from the upper city (B. J., vi. 6, 2), while the eastern limit was formed by the Kidron ravine, the Ophel wall joining the plateau of the temple at the south-east angle (Anz., xv. 11, 5; B. J, v. 4, 2).

The scarped rock at the north-west angle of the Haram, with its outer fosse dividing the temple hill from Bezetha, answers exactly to the description by Josephus of the tower of Antonia (B. J., v. 5, 8) and thus serves to identify the north-west angle of the ancient enclosure with the corre- sponding angle of the modern Haram. The correspondence of the south-west angles of the two areas is established by the discovery of the great bridge, and that of the south- east angles of the same by the exploration of the Ophel wall. The northern boundary of Herod's temple probably coincided with the scarp already described, 1090 feet north of the south-east angle. The area was thus, roughly speaking, a quadrangle of 1000 feet side, from which the citadel of Antonia, as described by Josephus, projected on the north-west (cf. BD. J., vi. 5, 4).

The natural water-supply of Jerusalem is from the Virgin's spring already noticed, which comes out from be- neath the Ophel ridge in a rocky cave extending 12 feet from the face of the hill, and reached by flights of twenty- eight steps. The water fows with an intermittent action, rising from beneath the lowest steps, at intervals varying,

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according to the season and the rainfall, from a few hours to one or even two days.

From this spring a rock-cut tunnel 1708 feet in length leads through the Ophel ridge to the Pool of Siloam (now Birket Silwdén), which is a rock-cut reservoir with masonry retaining-walls measuring 52 feet by 18 feet, having a rock-cut channel leading away from it to a larger pool formed by damniing up the flat valley bed with a thick wall of masonry close to the junction of the Kidron and the Tyropceon.! A rock-cut shaft —like the great tunnel a work of immense labour—leads from the spring west- wards to an entrance from the surface of the ground 120 feet above and 180 feet west of the spring. The rock tunnel was known in the 17th century, but the shaft which formed a secret entrance to the one spring of Jerusalem was discovered by Captain Warren. The water of Siloam was originally sweet, but has been fouled and made bitter since the 12th century. From the reservoir it runs south- wards to the bir Hytb already noticed, a well 125 feet deep.

The remaining reservoirs of Jerusalem are fed by aque- ducts and by the rains. West of the city is the rock-cut Mamilla pool. In the upper part of the valley of Hinnom is Birket es Sultén, constructed in the 12th century. Since the 14th century these two tanks have been erroneously named the Upper and Lower Pools of Gihon. Inside the city is the Patriarch's Pool near the west (the ancient Amygdalon or "Tower Pool," B. J, v. 11, 4), while imme- diately north of the Haram are the Twin Pools made by roofing in part of the ancient fosse, and the Birket Isrdil, measuring 360 by 130 feet, and apparently constructed after the great destruction of 70 a.p.

The Twin Pools were identified in the 4th century with Bethesda, but since the 12th that name has been given to the Birket Israil. The site of Bethesda is still doubtful.

Three aqueducts supplied the city, one of which, con- structed by Pilate (Ant., xviii. 3, 2), led from the so-called pools of Solomon, 7 miles distant, to the temple, and still conveys water when in repair. Its course appears on the map ; the second from the same locality probably fed the Birket Mamilla, but is now lost ; the third from the north collected surface drainage and led to the temple enclosure underground, a distance of 2000 feet only. The great reservoirs in this enclosure, about thirty in number, were capable of holding a total supply of 10 million gallons of water. . (cm. ¢.)

II, ANCIENT JERUSALEM.

Up to the time of David the strong fortress of Jerusalem remained in the hands of the ancient Canaanite inhabitants who were known as Jebusites.?

The city was deemed impregnable, but its conquest was one of the first exploits of David, when he became king of all Israel, and had need of a capital that should serve as a base for his military operations and a centre of union for Judah and Israel. Lying on the frontier line between his own tribe of Judah and the difficult country of Benjamin, which had been the centre of the struggle with the Philis- tines since the fall of Shiloh, Jerusalem was admirably adapted for these purposes. The

Jebusites were not expelled, but continued to live side by side with the Hebrews (Josh. xv. 63; Judg. i 21; 2 Sam. xxiv. 18;

? A very ancient Iebrew inscription, referring to the construction of the tunnel, was discovered in June 1880. The date and many points in the reading and interpretation are still obscure.

2 In Judg. xix. 10, 1 Chron xi. 4, the city itself is called Jebus; but as this part of the Book of Judges (as well as Josh. xv. 8, xviii. 28) is probably of late date, and the older records use the name Jerusalem, it is not safe to regard Jebus as the earliest name of the city. The refercnce to Jerusalem in Judg. i. 7 seems to be an interpolation, and Josh. xv. 63, Judg, i. 21 to refer to the time after David.

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Yech. ix. 7). David himself occupied 'the mountain fortress (778) of Zion," which was strengthened by new walls and received the name of the city of David. Here a palace was built by Tyrian architects, and the new capital was consecrated by the removal to it of the ark.

The site of the city of David forms the fundamental question of Jerusalem topography. The current traditional view (but not that of the most ancient tradition even in the Christian church) makes Zion the southern eminence of the western hill, and places David's fortress there. More recently Messrs Warren and Couder have contended that the city of David is identical with the Acra of Josephus, and place the latter on the northern summit of the western hill, between the two branches of the Tyropceon (see below). A third view places the city of David on the southern part of the Temple hill; and this opinion is not only conformed to the oldest post-Biblical tradition (1 Maccabees, Jerome, &c.), in which Zion ccrtainly means the Temple hill, but is the only view that does justice to the language of the Old Testament.

It is necessary at the outset to clear away the popular idea that the capital of David was already a great town, occupying a site comparable in extent with that of the later city. Certainly if all the Levites and sacred ministers mentioned in Chronicles were actually assembled at

Zion in David's time, we might conclude that the town was already a capital on a grand scale. But the Chronicler constantly carries back later institutions into primitive times, and the early history, which alone can be viewed as a safe guide, gives quite another picture. Zion was merely one of the " mountain fortresses " found all over Palestine as places of refuge in time of invasiou, and was garrisoned by a handful of mercenaries (the Gibbérim). The whole levy of Israel in David's time was but 30,000 men (2 Sam. vi. 1; comp. the 40,000 of Judg. v. 8), and before the development of trade among the Hebrews Jerusalem had not the natural conditions for the growth of a great city. In the first instance the town doubtless consisted mainly of the court and its dependants, with the Jebusite popula- tion, who must have been predominantly agricultural and limited in number by the limitation of their territory. Now it is quite incredible that the Temple hill was ever excluded from Zion. Throughout the Old Testament Zion appears as the holy mountain, the seat of the sanctuary. It is true at the same time that Zion and tlie site of Jerusalem are interchangeable ideas in Hebrew literature ; but this only proves that the mountain of the sanctuary was essentially the mountain on which the city stood.} Further, it is clear from 1 Kings viii. 1 sq., 2 Sam. xxiv. 18, that the temple stood above the city of David, as else- where in Hebrew holy places the sanctuary crowned the hill on whose slopes the town stood. Moreover, the graves of the kings, which were certainly in the city of David, encroached on the temple enclosure (Ezek. xlili. 7, 8), which indeed at the time of the captivity was closely built up (ibid.), and stood in the middle of the city (Ezek. xi. 23). Again, Micah iv. 8 identifies the ancient " tower of the flock," the original seat of the kingdom at Jerusalem, with " Ophel of the daughter of Zion." But Ophel is one of the few topographical names that can be traced down to the time of Josephus, whose description shows that it lay to the south-east of the temple. Still more precise is the determination given by references to the one fountain of Jerusalem, which, as we have seen, springs out under the temple hill on the east. According to Neh. iii. 15, xii. 37, the city of David was reached by a stair in the

' The explanatory note of an editor in 1 Kings viii. 1, " the eity of David, which is Zion," eannot be strained to mean that the removal of

the ark from the city of David to the temple was its removal from the mountain of Zion to another hill.

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vicinity of the fountain gate and the pool of Siloah.? This ascent led up above David's palace to the water gate, where in Nehemiah's time there was an open space in front of the temple (comp. Neh. viii. 1, 16 with Ezra x. 9). Thus we see that David's palace lay between the temple and the pool of Siloah or King's pool (Neh. ii 14). These notices are the more important because the water system connected with the Virgin's spring forms almost the only quite certain part of Jerusalem's topography. The spring itself is Gihon, which from its name must have been a true spring, while 2 Chron. xxxiil. 14 teaches us to look for it in the Kidron valley (5n3). The subterranean conduit which still exists had for its object to conduct the water inside the city, and appears to be that constructed by Hezekiah (2 Kings xx. 20). In Isa. xxii. 8, 11 we read of a lower pool and an old pool (no doubt identical with the upper pool, Isa. vii. 3; 2 Kings xviii 17), whose waters were collected in the time of Hezekiah, under apprchension of siege, in a reservoir between the two walls. From this passage, compared with Neh. iii 15, we gather that Hezekiah's pool was protected by an outer line of fortifica- tion, and here lay the gate of the two walls (2 Kings xxv. 4), with the royal gardens beside them. The supplementary notices of the conduit and the outer wall, given in Chronicles, have not the weight of contemporary history, but they show the writer to have still possessed the same tradition as to the place of the city of David, for he describes its outer wall as running along the Kidron valley west of Gillon (ze, so as to leave the fountain outside, 2 Chron. xxxiii. 14; comp. xxxii. 3, 4), and tells us that Hezekiah's conduit brought the water of Gihon in a westerly direction to the city of David (chap. xxxii. 30).

According to the Bible, then, the city of David lay on the southern part of the hill which his son crowned with the temple.* The chief feature in the fortifications was a tower named Millo, perhaps on the site of the modern barracks, protecting the approach to Zion from the north. The town had but little splendour. The king occupied a wooden palace, the

work of foreign craftsmen, and the ark still dwelt in curtains. Under Solomon, who had the true Oriental passion for building and luxury, and squandered enormous sums on his court, great improvements were made, especially by the erection of the twin palaces " the house of Jehovah and the house of the king," constructed of stonework strengthened by string courses of wooden beams in the still familiar style of Arabian building. The palace, which took nearly twice as long to erect as the temple, consisted of a great complex of buildings and porticos, including the porch of judgment, an armoury, and the palace of the queen.

The site of the palace has been variously assigned by topographers. But it lay above the old residence of David 4 (1 Kings ix. 24), and all the indications given in the Old Testament lead us to place it quite close to the temple, with which its porticos seem to have been connected (2 Kings xvi. 18; xxiii, 11). Wellhausen indeed, from an examination of 1 Kings vi., vii., has made it probable that the royal buildings lay within the outer court of the temple (Well.~~Bleek, Zinl., p. 232). The clearest details are con~~ nected with a court of the palace called the prison court (Jer. xxxii. 2), where there was a gate called the prison gate, and a great projecting tower (Nch. iii. 25-27). This part of the building must have been close to the temple, for it was at the prison gate that the second choir in the

- **The fountain gate is the gate beside Siloah, which is itself called the fountain (rnyn) by Josephus (B. J., v. 4, 1).**

3 The statements of Josephus as to the topography of the eity of David and Solomon are of no independent value. He possessed no sourees exeept the Old Testament. é

4So in Neh. iii. 25 it is ealled the upper palace in distinetion from the house of David, ehap. xii. 37.

procession of Neh. xii. halted and stood "'in the house of God," meeting the other choir, which ascended from Siloah by the stair above David's

house and reached the temple at the water gate. It appears further from Neh. iii. 27 that the fortifications of the prison were adjacent to Ophel, so that the palace seems to have stood about the south-east corner of the temple area.?

After the division of the kingdoms Jerusalem was shorn of its political glory. The city itself was taken by Shishak in the reign of Rehoboam, and lost the riches accumulated by Solomon. The great houses of Omri and Jehu quite overshadowed the kingdom of Judah, which forgot its weakness in the reign of Amaziah only to receive signal chastisement from Jehoash, who took Jerusalem, and partly levelled the walls (2 Kings xiv.). The decline and fall of Samaria raised the relative importance of thie southern capital; the writings of the prophets show that wealth had accumulated and luxury increased, and so we find King Jotham adding an upper gate in the northern or higher court of the temple (2 Kings xv. 35; Jer. xxxvi. 10; Ezek. ix. 2), while Hezekiah, as we have already seen, laboured for the improvement of the water supply, and so rendered the city more capable to resist siege The later history in Chronicles adds dctails of fortifications erected by Uzziah and Manasseh, which probably express the oral tradition current in the author's day. In the later days of the monarchy Jerusalem had so far increased that we read of a second town or quarter (2 Kings xxii 14 ; Zeph. i. 10, Heb. ; comp. Neh. iii. 9). There was also a trading quarter called the Maktesh, inhabited by Canaanites or Tyrians (Zeph. i. 11), who still formed a large part of the mercantile population after the exile (Neh. xiii; Zech. xiv. 21). Maktesh means mortar, so that we must suppose the traders to have lived in a hollow valley, perhaps the upper part of the Tyropeon. But the main part of the town was still grouped round the temple plateau, from which steep streets ran down the slope of the hill (Lam. iv. 1), the houses rising tier above tier, so that the roof tops com- manded a view of the environs (Isa. xxii.). According to Eastern custom the handicrafts—eg., the bakers, Jer. xxxvii. 21—had their own streets or bazaars.

For the compass of the walls of Jerusalem at the time of its capture by Nebuchadnezzar the chief document is the account of the restoration of the fortifications by Nehemiah, who followed the old line, and speaks of

the various gates and towers by their old names. His description presents many difficulties, the most intelligible part being that which deals with the eastern wall, from Siloah and the fountain gate to the point where the temple and the palacc joined one another. The western boundary of the city is particularly obscure, and its position must be mainly determined by reference to the "valley gate" (Neh. i. 13; iii 13). The valley (gay) is used as a proper name, and is no doubt identical with the valley (gay) of the son of Hinnom, the Kidron valley being always called nahal z.é., fiumara. The common opinion makes this gay the valley to the west of modern Jerusalem (Wady er Rababy), in which case the valley gate must necessarily have occupied much the same position as the modern Jaffa gate, and the whole of the later upper city on the south-west hill must already have been included within the walls. This view, however, is far from indisputable. A thousand cubits south of the valley gate was the dung gate, the gate before which the rubbish heaps of the city lay. This on the common theory must have been about the south-west corner

1 Another view is that Solomon's palace stood on the western hill, and was connected with the temple by a bridge. But "the ascent" of the A. V. of 1 Kings x. 5 does not exist in the original, and seems to rest on a false reading in Chronicles. In Ezek. xliv. the sovereign enters the temple from the east.

of the hill, near the present Protestant school. Between this point and the fountain gate in the vicinity of the pool of Siloah is nearly half a mile in a straight line, and the intervening wall must have been much longer if it followed the natural line of defence. Yet Nehemial: gives no account of this section of the ramparts (Neh. iii. 14, 15). His record secms to imply that the fountain gate was near the dung gate; and similarly in chap. xii. the procession which went southward to the dung gate is immediately afterwards found at the fountain gate. It is hardly possible that so important a part of the circuit should be twice omitted, aud in fact the vast lacuna disappears at once if we suppose that the gay is the Tyropceon, and that the upper city of Josephus on the south-

west hill was not enclosed in the circuit of Nehemiah's walls. In that case the valley gate lay on the Tyropceon, somewhere near the south-east angle of the Haram area, and the wall ran sonth- ward along the east side of the valley, till at the pool of Siloah an outwork was thrown out to protect the water supply.

Besides simplifying the topographical difficulties of Neh. ili., this view has several other advantages. On the received view the Tyro- peon is nowhere mentioned in Scripture, though it layin the heart of the city. This difficulty is removed by the view above suggested, and the third valley (W. er Rababy) appears to be quite out of re- lation to the circuit of the Biblical Jerusalem, so that one does not look for much mention of it. Again, we haveseen that the Canaan- ite quarter of the city lay in a hollow—presnmably in the Tyropeon, and it is very natural that the seat of Canaanite worship in the valley of Hinnom should be in the vicinity of this quarter. Once more, by placingthe valley gate quite near the temple, we understand how it was in this neighbourhood that the sacred procession in Nch. xii. began its course. Even at a much later date the Temple hill was the real stronghold of Jerusalem, which Judas and his suc- cessors were concerned to fortify with walls. It would have been folly in Nehemiah to enclose a much vaster and less defensible cir-

| cuit when the inhabitants were so few that it was necessary to draft

one-tenth of the whole people into the capital (Neh. xi. 1). The course of the wall north of the valley gate must still

| have skirted the base of the Temple hill east of the Tyropceon.

It is not improbable that the Maktesh or Canaanite trading quarter lay outside the fortifications, a bazaar beyond the gate being a common feature in Eastern towns.? From the tower of furnaces or ovens the " broad wall" ran to the point where in the Persian time the governor of the Syrian provinces had his throne. The throne would stand in an open place by a gateway, and comparison of Neh. iii. 7 with xii. 89 shows that the gate niust have been that of Ephraim, 7.¢., the gate of the main road leading to the north, which then as now must almost of necessity have followed the upper course of the Tyropcon, and so would skirt the

walls for some distance before entering the city. In fact there were 400 cubits between the gate of Ephraim and the corner gate (2 Kings xiv. 18). The corner gate is also named the first gate (Zech. xiy. 10), and so is probably identical with the old gate of Nehemiah, For obvious engineering reasons the emincnce at the north-west of the Haram area must always have been a principal point in the fortifications, and here the old gate may very well be placed. It is indeed very likely that this was the site of the ancient bastion of Millo. From the corner gate the north line of the wall ran by the fish gate to the towers of Meah and Hananeel, the latter of which appears in Zech., loc. cit., as the opposite extremity of the city from the royal wine vats in the gardens by Siloah, while in Jer. xxxi, 88 the line between it and the corner gate is named as the natural direction of extension for the city. The tower, therefore, must haye stood very near the north-east corner of the wall, but not so far east as the angle of the Haram area, which is here built out, disguising the natural line of the hill side. From Zech., oc. cit., we see that the Benjamin gate was at the east end of the north wall. There was a road into Benjamite territory over the Kidron (1 Kings ii. 87), and to this there was a natural descent by a small valley now nearly obliterated, having its head a little south of the Birket Isra{l. Here too is the direct way to Anathoth, which was through the Benjamin gate (Jer. xxxvii. 13). In Nehemiah's record the sheep gate seems to have the same position. From the angle near the tower of Hananeel and the Benjamin gate the line of the hill run southwards, trending to the east. At the extreme east point, beyond the present line of wall, and a little south of the modern

2 In fact at the siege of Titus the wool and clothes market and the brassworkers' bazaar still lay in much the same quarter, in the new city, outside the old line of fortification, though within the second wall (Biad., -venas 10):

golden gate, must be placed the horse gate (Jer. xxxi. 40). South of this again came the fortifications of Ophel and the upper palace, and from this point the enceinte swept round to the pool of Siloah. The lower wall

of Manasseh in 2 Chron. xxxiii. 14 is described as an outwork in the Kidron valley extending all along the eastern side of the town and round the north-east corner.

The long blank in the history of the Jews which follows the time of Nehemiah makes it impossible to trace thie progress of Jerusalem in any detail. Under the Persian empire the Jews enjoyed little prosperity. Alexander spared the city, but in 320 its walls were rased by Ptolemy I. (Appian, Syr., 50). A period of comparative prosperity followed, culminating in the high priesthood of Simon II. (219-199 u.c.), who repaired the temple and strengthened its defences and fortified the city. The walls were again destroyed and the city burned by the army of Antiochus Epiphanes in 168 B.c. When Judas Maccabeus reconsecrated the temple (165) he also fortified the holy mountain of Zion (the Temple hill) with wall and towers. Once more rased by the Greeks, the walls of the city were renewed with hewn stone by Jonathan.

It is plain from 1 Macc. iv. 60, vi. 7, x. 11, that up to this time the fortified city was still identical with the Temple hill ; but a new topographical problem is raised by what is related of the citadel (Akra) erected by Epiphanes to dominate the town. The Akra is identified by the author with the city of David. It continued to be held by the Greeks after the town was fortifiod by the Macca- bees, and indeed was ultimately reduced by the erection of a special wall cutting off the Greek garrison from access to the city and market (xii. 86). The natural inference from all this is that the Greek citadel lay on the Temple hill, and presumably on the site of the later Antonia. That hill is certainly the Zion of 1 Macc.; and the city of David, with which the Akra is identified, had always meant the fortress of Zion. The same result seems to follow from the language of Josephus. When Josephus lived Jerusalem was almost anew town. Under the Maccabees, and again under Herod, the prosperity of tho Jews was greater than at any previous time. The sanctuary was a centre of pilgrimage from the most distant lands, and the sovereigns of Jerusalem had an empire greater than any of the kings after Solomon. The growth of the city must have been enormous, and the great buildings of Herod and his successors

had wholly changed its aspect, especially in the quarter of the temple and on the western hill where the royal palace stood. These changes were very apt to mislead an uncritical writer with regard to the ancient topography, and in fact Josephus falls into a radical blunder by assuming that the fortress of David belonged to tho upper city, like the royal castle of his own day,! and that the western hill had always been part of Jerusalem. But of Jerusalem as he himself saw it he gives a vivid deseription (B. J., v. 4, 1). The city stood on two hills divided by the Tyropeon valley, into which the houses descended tier beneath tier. The higher western hill was called the upper market, the lower hill across the Tyropeon was the citadel hill, and was called indifferently the Akra or the lower city. That this Akra included the ridge south of the temple is clear from several marks: the hill was dugixupros, "hog-backed" ; it was cut off by ravines on the outer side, and had a continuous approach to the temple, which stood on the higher ground ; finally, it extended to Siloah at the mouth of the Tyropeon.? Thus we sce that, though Josephus himself has lost tho true tradition as to tho city of David, he furnishes additional proof that tho citadel hill, still identified with it by the author of 1 Macc., was no other than the eastern hill.

A different view of the Akra was maintained by Robinson, and has been elaborated by Messrs Warren and Conder? in connexion with recent better observations as to the two heads of the Tyropceeon valley. It is maintained that the Akra was a knoll, west of the Temple hill and north of the traditional Zion, between the two heads of the Tyropeon. To gain any show of plausibility for this view it 1s necessary to lay great weight on a statement of Josephus that the Temple hill was once a third eminence lower than the Akra, and divided from it by a broad ravine, and that Simon after taking tho Akra destroyed tho citadel and laboured for three years to reduco its site below the Icvel of the templo plateau and fill up the inter- vening hollow (B. J., v. 4; Ant., xiii. 6, 6). This story is pro-

1 A perpetuation of this blunder gives the current name Tower of David to the Herodian tower, probably Phasael, which still stands by the Jaffa gate. On this tower compare a paper by Sehick in Zeitschr. ad. Deut. Palistina- Vereins, vol. i.

oJ. vi. 7, 2 ; comp. v. 4, 1, and the association of Siloah and the Akra in v. 6, 1.

3 See Warren, The Temple or the Tomb, London, 1880; and Conder, Tent Work in Palestine, London, 1878, vol. i.

bably exaggerated, for according to the early and trustworthy evidence of 1 Mace. xiii. the Akra was not destroyed, but only purged, and strengthened by additional fortifications on the sacred moun- tain. And in any case we know that the Akra was opposite the temple, and that in the time of Josephus there was no longer -a ravine between, whereas the city opposite the temple to the west was still cut off by the deep Tyropeeon (Axt., xv. 11, 5), except where a bridge led to the palaco on the western hill. Nor is it possible that the western head of the Tyropewon can be the deep ravine which, according to Josephus, separated the upper and lower city, for that head is the theatre-shaped basin described in Ant., xv. 11, 5 as facing the temple across the ravine.

Under the Hasmonean dynasty we meet with the first unambiguous evidence that the city had extended to the loftier western hill, where a new palace was erected over- looking the temple (Ané., xx. 8, 11). This continued to be the royal quarter, and was raised to great splendour by Herod, who covered a vast extent of ground with his palace, its courts and pleasure grounds. The palace of Herod embraced two edifices transcending the temple in magnificence, and tle three enormous adjoining towers, Hippicus, Phasael, and Mariamne, made the upper city the strongest part of Jerusalem. Here also in Herod’s days stood the xystus or gymnasium, beneath the Hasmonean palace, where a bridge spanned the Tyropeon. The bridge already existed under the later Hasmoneans, when the new quarter had as yet minor importance and the Temple hill was still the only citadel. Here the warlike high priest Hyrcanus usually dwelt in the castle (Bapes, 77.3) which Herod afterwards converted into the fortress of Antonia in the north-west corner of the enceinte of the temple (Ant, xv. 11, 4; B J, v. 5,8). Antonia had the form of a square keep, with loftier towers rising pinnacle-like at the corners. It commanded the temple.and therefore the whole lower

city, and by its two staircases the Roman soldiers descended into the porticoes of the temple to keep order among the worshippers (comp. Acts xxi. 35),

When Pompey besieged the Temple hill in 65 3.a, the bridge was broken down, and the Tyropceon afforded a complete defence on the west. His assault was made from the north, where there was a strong wall with towers and a deep fosse which was with difficulty filled up to permit the advance of his siege train. This fosse must be identified witli the rock-cut trench north of the Haram area, and from Josephus's description seems to have been still the northern limit of the town. The walls destroyed by Pompey were restored by Antipater, and ten years later yielded, after an obstinate resistance, to Herod and the Romans (37 Bc.) The Baris, occupied by Antigonus, was not surrendered till the temple and the rest of the city had been carried by storm, and we now read of two walls which had to be reduced successively.

The most important buildings erected by Herod have already been alluded to, and his reconstruction of the temple will be considered under that heading. But the walls of the city as they existed at the time of the siege by Titus must still be described. They were three in number. The first wall consisted of a rampart to the north of Herod's palace, connecting Hippicus in the citadel of the upper city with the western porch of the temple, and of another line skirting the face of the western hill from Hippicus southward, thence curving round beyond Siloah, and joining the eastern wall of the temple enclosure at Ophel. Several traces of this wall still exist. The second wall, connecting a point in the northern line of the first wall with Antonia, enclosed the new town or trading quarter. Outside both these walls, on the hill side sloping southwards towards the temple, a suburb called Bezetha had grown up, which Agrippa I. in the time of Claudius Cesar began to protect with a third wall conceived on a gigantic scale, but never altogether finished. The precise compass of this wall, which began at Hippicus and rejoined the first wall in the

Kidron valley, has been much disputed,—the great tower of Psephinus, which stood on very high ground, and formed its north-west angle, being supposed by some to have stood near the modern castle of Goliath (Kasr Jalud), while others place it as far north as the Russian cathedral. measurements by which it has been proposed to decide the northern limits of Jerusalem are the distance of 3 stadia from the city to the tomb of Queen Helena of Adiabene (commonly identified with the Tombs of the Kings, Kubir es Saldtin), and the circuit of 33 stadia assigned by J ose- phus to the whole city. These measurements would seem to imply that the ancient city stretched further north than the modern walls, but they can hardly claim to be taken as mathematically accurate ; the estimates of the compass of the city vary, and Eusebius places it at 27 stadia. This again would imply a line closely coincident with the north wall of the modern town, agreeing with the remains of ancient scarping still visible, and with the express statement of Josephus that the line of the third wall passed through the royal caves, 2¢., the catacombs, or the cotton grotto and grotto of Jeremiah, which are separated by a kind of fosse cut through the live rock, and manifestly forming part of the old wall line? In the siege under Titus the Romans successively carried the third and second walls. They then occupied Antonia, which was levelled to facilitate the approach of the forces for the attack on the temple stronghold. The temple was opened by fire rather than force, and, the Jewish leaders having retired to the upper city, the lower town from the temple to Siloah was burned by the Romans. The capture of the upper city was effected by a regular approach with mounds and battering rams (September 70 a.p.), and even then the huge citadel of Herod could only have yielded to 'famine had it not been abandoned by the Jewish leaders in a vain attempt at escape. Its three great towers, with a portion of the western wall, were left as a memorial, and

of this group the so-called tower of David (Phasael) still |

stands. The rebuilding of Jerusalem by Hadrian seems to have been originally conceived in a spirit friendly to the Jews,

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and there is even some evidence that the restoration of the |

temple was contemplated or commenced. After the great

revolt, however, Alia Capitolina was transformed into a. purely pagan town with seven quarters and many buildings |

of heathen fashion.? rise of the practice of pilgrimage gave a new importance to the eity of the crucifixion and resurrection, and in the time of Constantine the discovery of the Holy Sepulchre and the erection of the magnificent church of the Anastasis (dedicated 336 a.p.) again made Jerusalem a great religious centre. Tn the pagan reaction under Julian an attempt was made

to rebuild the temple, but was frustrated by an outburst of |

fire from the foundations (362). The unfortunate empress Eudocia spent her last years at Jerusalem (c 350-360), repaired the walls, built the church of St Stephen, founded monasteries and hospitals, and enriched the churches. The next great builder was Justinian, part of whose splendid church of St Mary perhaps still remains in or to the east of the mosque El-Aksa. In 614 Jerusalem was taken by Chosroes, and the churches and sepulchre were burned, but the patriarch Modestus restored them as soon as the Persians retired. In 637 Jerusalem capitulated to the caliph Omar, who gave directions for the erection of a place of worship on the site of the “remotest shrine,” 7.¢., the temple, to which Mahomet, according to Kor. xvii. 1, was transported from Mecca in his famous night journey. From this verse the great sanctuary of Jerusalem received the name El-

1 The eminence over the grotto of Jeremiah (El Heidemiyeh in Plate X.) is supposed by Lieutenant Conder to be Calvary. 2 Details in Chron. Pasch., Ol. 224, 3.

The spread of Christianity and the |

‘and other gates. _ gates at different times in consecutive order :—

JERUSALEM

Aksa, now generally confined to the building at the south end of the Haram. The original mosque as described by Arculphus (670) was a rude edifice of wood capable of con- taining 3000 worshippers; but soon after the sanctuary was reconstructed ina style of great magnificence by the caliph “Abd el Malik, whose date (72 a.H.=691 A.D.) is still read on a Cufic inscription on the Dome of the Rock, though the name of the caliph seems to have been changed to that of El-Mamtn, who restored the buildings after a great earthquake, which, according to Mokaddasy left nothing standing except the part around the mikrdb or niche indicating the direction of Mecca. In their present condition the buildings of the sanctuary show features of very various styles from the Byzantine downwards. The architectural problems which they suggest are closely connected with controversies as to the topography of the temple and the true site of the Holy Sepulchre, both of which subjects will be more conveniently discussed under. TempLe. Apart from the question of the holy sites, the later topography of Jerusalem presents no feature that need detain us, and the subsequent fortunes of the city belong to the general history of Palestine and the crusades. (w. Bs.)

IIL Mopern JERUSALEM.

It .appears probable that the crusading wall ran PlateX.

just outside the present one on the north-west side of the town—the remains of medizeval masonry existing all along this line, In 1192 Saladin fortified the same quarter with a second wall and a fosse, and, as remains of an interior wall are still traceable at the ruined tower called Kal‘at Jdldéd, it appears that the two ramparts must have run about 60 yards apart on this side of the town. Dismantled in 1219 and restored again in 1229, the fortifications were again destroyed in 1239, and the present walls were built in 1542 by Suleiman the Magmfi- cent, as witnessed by inscriptions over the present Jaffa The following is a conspectus of the

Fourth to Eighth

Modern Name. Twelfth Century. Centukes Position.

1, St Stephen's Gate,) Gate of Valley of Bab Sitti Maryam; Jehosaphat 2. Herod's Gate, \ Postern of the Bab ez hl eee Magdalen…..... i 8. Damascus Gate, : Gate of Galilee…. & Bab el 'Amid = py ee vel ete | Gate of nee N. 4 Postern of St Laza- {| Gate of Fuller's Field!) rus, Bab es Serb | Gate of Judgment…|}~" "

Gate of David…..... Gate of David…....

"Gate of Valley of Jehosaphat E. wall.

Gate of Benjamin…| N.

an

:

Jaffa Gate, \ Bab el Khalil ….

. Sion Gate,

Bab Neby Déiid

. Dung Gate,

Bébdb el Magharibeh

Golden Gate,

Bab ed Daheriyeh

Sion Gate…....s0.0-. Sion Gate

Postern of Tannery

np A &

Golden Gate

In 680 the city had eighty-four towers. In the 12th ceutury the two principal ones were—first, Tancred's tower on the north-west, the present Kal'at Jdléid (Goliath's castle), where remains of a medizval square tower of 80 feet side still exist, and, second, David's tower, still so called (the ancient Phasaelus), forming part of the castle of the Pisans, as the present citadel was called in the 16th century.

The walls of the modern city enclose an arca of 210 acres, the greater part thickly crowded with houses, although on the north-east and south there are plots of ground near the ramparts not occupied by buildings. The houses are of stone, with flat stone roofs having small domes supported on arches in the middle, and the aspect of the city is specially colourless and stony. The streets are only narrow lanes running at right angles to one another. The principal streets are the same as in the 12th century, and

in many cases retain Arabic names at least four hundred years old. They are arched over here and there, and the bazaars, with portions of the Via Dolorosa and of other streets, are entirely covered in. There are now four quarters:—that of the Moslems (including the Haram) on the north-east, the Jewish quarter on the south-east, the Armenian quarter on the south-west, the Christian on the north-west. The quarters are bounded by David (or Temple) Street, running east from the Jaffa gate, and by the street running north and south immediately east of the Holy Sepulchre (called Mérat el Yehid on the south and Zartk Bab el 'Amid on the north). The quarters are not, how- ever, exclusively occupied by any nationality, many rich Jews having houses in the Armenian and even in the Moslem quarter. In the 12th century the present Moslem quarter was occupied by the Jews, and called the Juzverve.

Viewed from the Mount of Olives, the most conspicuous object is the Haram enclosure, occupying nearly one-sixth of the city, with the Dome of the Rock rising in the centre and the Aksa mosque extending to the southern wall, while between these two buildings are the tall cypresses

which surround the fountain El Kéds. Arcades with pointed arches stand on the flights of steps leading to the platform surrounding the Dome of the Rock, and three minarets rise from the west and north walls, while the great eastern rampart is unbroken save by the projecting tower of the Golden gate. In the Jewish quarter two large synagogues with domes—one painted green—are conspicuous, while the church and convent of St James is the special feature of the Armenian quarter. Close to the Jaffa gate rise the square tower of David and a minaret within the citadel, while immediately east of this fortress stands the Protestant English church and the large palace of the Anglo-German Protestant bishop. North-east of these are seen the two domes of the rotunda and choir of the Holy Sepulchre, and immediately south of them the minaret of Omar's mosque on the site of the great hospital of St John. The modern Latin cathedral and patriarchate appear behind the Holy Sepulchre church, while the highest ground outside the city on the north-west is occupied by the Russian cathedral, hospice, and consulate, only completed in 1866.

The country round the city is barren and stony. Olive groves exist on the north, and the white slopes of Olivet are dotted with the trees whence it is named. Vineyards also exist on the west, but since the destruction of the fruit trees by Titus (B. J., v. 3, 2) the vicinity of Jerusalem seems always to have presented a sterile appearance.

The number of churches and monasteries in the modern city, without counting many crusading chapels now either in ruins or else converted into mosques, is very large. There are 18 monasteries of the Greek Orthodox sect, 8 Catholic (or Latin), including the patriarchate, 3 Armenian, 2 Coptic, 1 Syrian, 1 Armenian Catholic, 1 Greek Catholic, and 1 Abyssinian. The Protestant institutions, including schools, &c., number 14 in all. In the Jewish quarter there are no less than 14 synagogues and 2 schools. There are also many charitable institutions in and near the city, of which the principal are Rothschild's hospital near the south wall, founded in 1855, and Sir Moses Montefiore's alms-houses, west of the great reservoir called Birket es Sultan. In the centre of the city excavations have been car,ied on by the German Government (to whom the site was given by the sultan) in the grounds

of the crusading convent of Sta. Maria Magna (now called Hl Méristén) immediately east of the hospital of St John; a Lutheran chapel is now established in the ruins. The Moslem buildings of the city date principally from the 13th, 14th, and 15th centuries, and some of the ancient Moslem schools near the Haram are remarkably solid structures. There are two barracks, one on the scarped rock (Antonia) north

of the Haram, the other in the citadel on the south-west. The serat or court-house is near the former. All the European powers are represented by resident consuls, and every nationality has some kind of hospice or hotel for the reception of pilgrims. The market-places have remained unchanged from very early times, the upper or vegetable market being in the upper city opposite the tower of David, and the bazaars or lower markets in the valley north of David Street. The money-changers occupy the site of the old exchange of the 12th century (first established by Charlemagne) in the western portion of David Street.

Jerusalem under the Turks is the capital of southern Palestine (about 2000 square miles), and the seat of a mutasarrif under the wély of Syria. The mejlis or town council consists of 8 members :—4 Moslem, 3 Christian, 1 Jewish, the latter being the chief rabbi of the Sephardim. The export trade of the city consists chiefly of oil, corn, sesame, cotton (of poor quality), and soap, also of rosaries, crucifixes, and cameos, carved in olive wood and mother of pearl. The imports in 1871 amounted to £72,000, includ- ing cotton, wool, hardware, timber, silk, and glass from England and Austria; wines and spirits from France ; and £3500 value of flour from Russia. Rice is imported in coasting vessels from Egypt; wine, spirits, dried fish, &c., from Cyprus and the Greek islands ; carpets and shawls are brought by the Moslem and Christian pilgrims. There are also a few potteries in the city.

The present cemeteries of Jerusalem are six in number.

_The Moslem inhabitants bury immediately outside the east

wall of the Haram, especially beside and north of the Golden gate, while a second Moslem cemetery exists on the knoll of Jeremiah's grotto, and a third (on the site of the old Carnarium Leonis) is close to the Muamilla pool west of the city. The Christians have cemeteries on the south-west of the brow of Sion, and the Jews are buried on Olivet opposite the temple, excepting the Karaites who have a cemetery on the south-east part of Sion.

The remains of an old Christian cemetery, including tombs belonging to the old church of St Sion, are found in the southern boundary valley, and there are a few sepulchres of crusading date near the north-east corner of Jerusalem on the outside. Of the ancient Jewish tombs the most striking are that known as the Tombs of the Kings, and the monument called Absalom's tomb on the east of the Kidron valley, which is perhaps the tomb of Alexander Janneus (B. J., v. 7, 2).

The climate of Jerusalem is healthy in comparison with that of the plains beneath it. A fresh sea breeze blows throughout the day in summer, and the average daily maximum temperature is 86° F. August is the hottest month, but in May the prevalence of dry east winds is specially trying. The autumn months are very unhealthy. In winter there are occasionally heavy falls of snow, which lies on the hills for several days. The waters of the Bir Eytb overflow annually through a hole in the ground near the well, and a running stream then flows for many days down the Kidron valley. This overflow is a cause of re-joicing to the inhabitants, who make it a holiday occasion. The annual rainfall averages about 18 inches. Years of drought occasionally occur, when the inhabitants of the city suffer much from want of water. The repair of the aqueduct from Bethlehem and of the large reservoirs in the city would, however, be sufficient to ensure a plentiful supply. The present supply is obtained principally from cisterns under the houses. Slight shocks of earthquake are occasionally experienced (as for instance in 1874), and appear to have been specially prevalent in the 8th and 11th centuries (cf. Zech. xiv. 5).

The population of Jerusalem, stated in 1838 at about 11,000, has increased rapidly of late years, owing to a

great increase in the Jewish population, which has risen in that time from 3000 to over 10,000 souls. According to a consular estimate in 1872, the population was as follows, the total agreeing very closely with an independent estimate by Frére Lievin the Franciscan :—Jews (Sephardim, 4600; Ashkenazim, 6000), 10,600; Moslems, 5000 ; Christians, 5300; total, 20,900.

At Easter this population is increased by about 5000 pilgrims, who crowd the narrow streets until they are almost impassable. Throughout the year there are gene- rally about 100 pilgrims in the Russian hospice. The num- ber of Jews is said to be increasing at the rate of 1200 to 1500 souls per annum, chiefly though fresh arrivals from Russia and Poland. A building-club has been established and 130 houses erected in four years by the Jews, outside the walls. Along the Jaffa road many country villas have also been erected of late by European residents as summer abodes.

A very large majority of the Christians in Jerusalem are either priests, monks, or nuns. The majority belong to the Greek Orthodox church (about 2800 souls). The Greek patriarch has a province including all Palestine, with ten bishops, viz., of Nazareth, Acre, Kerak, Tabor, Bethlehem, Lydda, Gaza, Nablus, Es Salt, and Sebastieh, the last five being residents in Jerusalem. The Russian cathedral is presided over by an archimandrite with two assistant priests and a deacon.

The Latins in Palestine are not numerous, the country villages when Christian belonging generally to the Greek church. The Latin priests and monks are principally Jesuits and Franciscans. The number of Latins in Jeru- salem is about 1500. Their churches are the cathedral of St Saviour, close to the patriarchate on the west, and the chapel of the Flagellation. They have established also many useful institutions, including a boys’ school for 150 and a girls’ school for 100 pupils.

The number of Armenian and Greek Catholics together does not exceed 50 souls. The orthodox Armenians are the richest sect in the city, numbering about 500. Great numbers of Armenian pilgrims visit

the city, and their hospice (for 2000) is the largest in Jerusalem. Their principal church is that of St James on Sion. The Pro- testants (about 300) belong to the English Church and the Lutheran. The bishopric was established by England and Prussia in 1841. The mission to the Jews was established in 1824, and supports a hospital and church with resident chaplain and parsonage, a boys' school, and other institutions. There are also several German institu-

tions, including a girls' school and an orphanage outside the walls. The remaining Christian sects, Copts, Syrians, and Abyssinians, number only about 200 souls. For the Jews in Jerusalem see JEWS, page 686 of the present volume.

The streets of Jerusalem at Easter present a strange spectacle from the numerous national costumes seen together. The European tourist, the Turkish nizam, the hooded Armenian, the long-haired Greek monk, are mingled with the native peasants in yellow turbans and striped mantles, with Armenian pilgrims wearing broad red sashes, Jews in Oriental costume or with the fur cap and lovelocks of the Pharisee, Russians in knee boots and padded robes, and native ladies in white mantles with black face veils. The architecture of the city, Oriental, Gothic, Byzantine, or Italian, tells the same story—that Jerusalem has been for eighteen centuries a holy city in the eyes of Jew, Christian, and Moslem alike, and the religious centre of half the world. ened (comue)

Literature.—For the oldest period the Bible is the only source ; for the city of Herod Josephus, to whom classical authors (Strabo, Tacitus) add little. The Talmudic material has been collected by Neubauer, Géographie du Talmud, Paris, 1868 ; comp. Schwarz's Palestine (YIN NIWiIAN, 1845; Eng. transl., Philadelphia, 1850 ; German transl., 1852). The materials for Christian Jerusalem in patristic literature, histories, and pilgrimages are immense, The best list is Tobler's Bibliographia Geographica Palestine, Leips., 1867, with the supplement (1875) for 383-1000 a.p. See also A. B. M'Grigor's Index of Passages bearing upon the Topography from Writings prior to the 11th century, Glasgow, 1876. The Arabic sources have hitherto been imperfectly

utilized. Of the more ancient Istakhry and Mokaddasy (988 a.D.), on whom Yakut and Kazwini mainly depend, deserve special notice. For Arabic works on Jerusalem see H. Khalifa, ii. 189. Recent writers have chiefly followed two very modern works, the Uns Jalil of Mujir ed Din (1494 a.p., see H. Kh., i. 452), of which extracts are given by Williams (vol. i., app. 2), and by Sauvaire (Hist. de Jéerusalem et ad' Hebron, 1876), and the lthdf el Ahissdé of Kemal ed Din (1470 a.p., see H. Kh., i. 148), which through an error of the translator Reynolds (Lond., 1836) is often ascribed to the famous Jelal ed Din (Soytty). This book by no means deserves the authority attached to it by English writers. Results of recent research are embodied in the ordnance survey map, 1865 ; Zimmermann's maps, 1876, 1880; Warren's Recovery of Jerusalem, 1871. Of the innumerable topographical discussions (excluding works specially devoted to the Temple and Holy Sepulchre) may be named Reland, Palestina, 1714; Olshausen, Zur Topographic. des alten Jerusalem, 1833; Fergusson, Topography of Jerusalem, 1847; Robinson, Biblical Researches; Thrupp, Ancient Jerusalem, 1855; Lewin, Siege of Jerusalem by Titus, 1863; Williams, The Holy City, 2d ed., 1849; Furrer, Wanderwngen, 1865 ; Id., "Jeru- salem" in Schenkel's Bib. Lex. For the history see Williams, op. eit., and Besant and Palmer, Jerusalem, 1871 (from crusading and Arabic sources). Socin-Badeker's Handbook deserves special notice.

JESI, a city in the circle and province of Ancona, Italy, is situated on a slight eminence on the left bank of the Esino, 17 miles west-south-west of Ancona, with which it is connected by rail. It is surrounded by a wall with towers. The streets, of which the Corso is the finest, are fairly good, and contain several noteworthy buildings, including a theatre and several churches. The cathedral, restored in the 18th century, is dedicated to St Septimius the martyr, who was first bishop of the see in 308. Jesi possesses a hospital and several benevolent institutions, besides a seminary, a lyceum, a communal college, and other educational establishments. It is one of the most active industrial towns of the province. Its manufactures include silk and woollen stockings, paper, cordage, leather, &e. ; and it carries on trade in wine, oil, and grain. Jesi takes its title of "royal" city from having been the birth-place of the emperor Frederick II. in 1194, The popula- tion is 11,469.

Jesi represents the Roman colony and municipium Zsis (in Strabo, sium), which traces a traditional origin to the Pelasgi. Vestiges of Roman remains render improbable the opinion that, after being destroyed during the barbarian invasion of Italy, the town was removed to a newsite. Jesi was a bone of contention between the Longobardi and the Byzantine exarchs, who alternately possessed it. Ultimately it fell into the hands of the Franks. During the early Middle Ages it enjoyed prosperity under Frederick H. and

| his immediate successors; but about the beginning of the 14th cen- | tury it began to have its full share of internal and external troubles.

It passed into the power of the Holy See in the pontificate of Nicholas V. (1447-1455) ; under Napoleon it figured as a vice-pre- fecture; and in 1860 it was incorporated with the kingdom of Italy.

JESSE, Epwarp (1780-1868), a writer on natural history, was born 14th January 1780, at Hutton Cranswick, Yorkshire, where his father was vicar. He became clerk in one of the Government offices in 1798, and for a time was secretary to Lord Dartmouth, when president of the Board of Control, through whom he also received an office at court. In 1812 he was appointed commissioner of

hackney coaches, and not long afterwards he became deputy surveyor-general of the royal parks and palaces. On the abolition of this office he retired on a pen- sion, and he died at Brighton 28th March 1868. The office which Mr Jesse filled in connexion with the royal parks induced him to take a considerable interest in the habits and characteristics of animals, the result of which was seen in a series of pleasant and popular books on natural history, the principal of which are Gleanings in Natural History, 3 vols., 1832-35 ; An Angler’s Rambles, 1836 ; Anecdotes of Dogs, 1846; and Lectures on Natural History, 1863. He also edited Walton’s Complete Angler, White’s Selborne, and Ritchie’s Windsor Castle, and wrote a number of handbooks to places of interest, including Windsor and Hampton Court.

JESSE, Joun Heneace (1808-1874), son of Edward Jesse noticed above, was born in 1808. From his early manhood he held an office in the secretary's department of the Admiralty at Whitehall. His first contribution to literature, a poem on Mary Queen of Scots, which he dedicated to Sir Walter Scott, was published in 1829, and this was followed in 1830 by a collection of poems entitled Tales of the Dead. Among his other efforts in verse were a drama (Richard JIJ.) and a fragmentary poem entitled London, dedicated to Mr Rogers the poet. None of these ventures achieved any success, but his series of historical works, which together form a continuous narrative from the reign of Richard ILI. to that of George III. inclusive, are written with vivacity and interest, and in their own style are a not unimportant contribution to the history of England. His Memoirs of the Court of England during the Reign of the Stuarts was published in 1839-40, Memoirs of the Court of London from the Revolution of 1688 to the Death of George IJ. in 1843, George Selwyn and his Contemporaries in 1844, Memoirs of the Pre- tenders and ther Adherents in 1845, Richard the Third and his Contemporaries in 1861, and Memoirs of the Life and Reign of King George the Third in 1867. The titles of these works are sufficiently indicative of their character. They are sketches of the principal personages and of the social details of various periods in the history of England rather than complete and comprchensive historical narra- tives. In addition to these works, Mr Jesse wrote Leterary and Historical Memoirs of London, 1847, and London and its Celebrities, 1871. His Memoirs of Celebrated Ltomans appeared in 1875. He died July 7, 1874.

JESSELMERE, a form of JAISALMIR (¢.2.).

JESSOR, or Jessorz, a British district in the lieutenant- governorship of Bengal, lying between 22° 25' 50" and 23° 47′ N. lat., and between 88° 57' 33" and 90° 0' 13″ E. long., with an area (1878) of 3658 square miles, forms the eastern portion of the presidency division. It is bounded on the N. and W. by Nadiyé district, on the S. by the Sundarbans, and on the E. by the district of Faridpur.

Jessor forms the central portion of the delta between the Hooghly and the united Ganges and Brahmaputra. It is a vast alluvial plain intersected by rivers and watercourses, which at places in the southern portion of the district spread out into large marshes. The northern part of the district is verdant, with extensive groves of date-palms ; villages are numerous and large; and the people are prosperous. In the central portion the population is sparse, the only part of the tract suitable for dwellings being the high land on the banks of rivers. The principal rivers of Jessor are the Madhumati (which forms the eastern boundary of the district), with its tributaries the Nabagangd, Chitra, and Bhairab ; the Kumar, Kabadak, Katki, Harthar, Bhadra, and Athdr4bankdé. Within the last century the rivers in the interior of Jessor have ceased to be true deltaic rivers ; and, whereas the northern portion of the district formerly

lay under water for several months every year, it is now reached only by unusual inundations. The tide reaches as far north as the latitude of Jessor town.

The population of Jessor in 1872 numbered 2,075,021, of whom 1,051,126 were males and 1,023,895 females. The inhabitants of the district are all Bengalis; the better classes are Hindus, the lower orders being principally Mahometans. The Hindus number 915,413, the Musalmans 1,151,936, and the Christians 1142. The Brahma Samaj has a few adherents. Among the lower ranks, the fishing and boating castes deserve attention, the fisheries in the rivers and deeper swamps being very valuable, aud the right to fish being a regular tenure paid for like the right to eultivate land. Jessor is noted for a eolony of pure Kulin Brahmans, who live at Lakshmipdsa, a village on the Nabaganga. These Kulins traee their origin to Ramanand Chakrabartti, who five generations ago emigrated from Sarmangal in Bikarganj, a great Kulin settlement. The only plaee with a population exeeeding 5000 is Jessor town, which has 8152.

The principal staple in Jessor is rice; among other erops are barley, Indian corn, pease, mustard, jute, tobacco, potatoes, sugar- cane, indigo, pdén, dates, &c. The total cultivated areca is about 1,381,800

acres, more than a million of whieh are said to be under rice. The estimated area covered by date-palms for the manufac- ture of sugar is 17,500 aeres. The area under indigo is. 31,383 acres. The total produce in 1872-73 was 203 tons, valued at £114,400. There are about fifty-five European faetories, besides fifty worked in the intcrest of native proprietors under European or native management. Blights occur occasionally. The district is subject to heavy floods, which have sometimes been immediatcly followed by disastrous cyelones. Several inundations have taken place, eausing famine.

The trade of Jessor is carried on chiefly by means of permanent markets, but there is also a considerable traffic at the numerous fairs and religious gatherings held throughout the district. The chief exports are sugar, indigo, rice, pulse, timber, honey, shells, &e.; the chief imports arc salt, English goods, and cloth. The principal manufactures are date-sugar and indigo. The police-force consisted in 1871 of 590 offiecrs and men, maintained at a cost of £13,548. In 1871 the number of Government and aided schools was 390, with 12,349 pupils. The climate does not differ from that of the other districts of Lower Bengal. April, May, and June are very trying, their average inean temperature being 83°°6 Fahy. The average rainfall is about 65 inches. Malarious diseases are very prevalent, intermittent fever being common throughout the year. Cholera breaks out every hot season.

British administration was eompletely cstablished in the distriet in 1781, when the governor-general ordered the opening of a court at MuraH near Jessor. Before that, however, the fiscal administra- tion of the district had been in the hands of the English, having been transferred tothe East India Company with that of the rest of Bengal in 1765. The changes in jurisdiction in Jessor have been very numerous. After many transfers and rectificatious, the dis- trict was in 1863 finally constituted as it at present stands. The rajas of Jessor or Chanchra trace their origin to Bhabeswar Rai, a soldier in the army of Khan-i-Azam, an imperial general, who de- prived Raja Pratapaditya, the popular hero of the Sundarbans, of several fiscal divisions, and conferred them on Bhabeswar. But Manohar Rai (1649-1705) is regarded as the principal founder of the family. 'The estate when he

inherited it was of moderate size, but he acquired one pargana after another, until, at his death, the pro- perty was by far the largest in the neighbourhood.

JESUITS. The "Company of Jesus," in its original conception, and in its avowed or ostensible objccts, does not at the first glance appear as more than one of many similar communities which have grown up in the bosom of Latin Christianity. Like several of them, it is a congre- gation of ecclesiastics living in accordance with a definite rule, whence technically called " Clerks Regular"; like the Templars, Hospitallers, and Teutonic Knights, military ideas have entered largely into its plans ; like Benedictines, Dominicans, and Franciscans, its spiritual labours have been those of teaching the young by schools and catechiz- ings, conducting home missions by such agencies as sermons, retreats, and the like, combating heresy with the pulpit and the pen, and converting the heathen. In each and all of these peculiarities and occupations it comes late into a field where its precursors had been busy for centuries, and it might seem to differ from them merely by a more careful selection of instruments, a more skilful organization, and a more perfect discipline.

But such a view is entirely misleading. On closer

examination the Jesuit body proves to resemble those other religious societies only in external and separable accidents, differing from them and from all others in its essential character,—and that not in degree merely, but in kind also, so as to be an institution absolutely unique in history.

In the first place, all the earlier associations of the kind, even the military orders themselves, have their origin in a desire to withdraw so far as possible from contact with the world and its concerns, to seek spiritual perfection in a retired life of contemplation and prayer, to concentrate efforts for this end chiefly within the cloister where each such group is collected, and to act only indirectly, and as it were with the mere surplus overflow of religious energy, on their more immediate

neighbours around, and even then chiefly with the idea of persuading all the most devout and fervent amongst them to forsake the world in a similar fashion. Contrariwise, the Jesuit system is to withdraw religious men from precisely this sort of retirement, except asa mere temporary preparation for later activity, and to make habitual intercourse with society a prime duty, rigidly suppressing all such external regulations of dress, rule, and austerities as tend to put obstacles in the way, so leaving the members of the " Company" free to act as emissaries, agents, or missionaries in the most various places and circumstances. Next, the constitution of the elder societies was for the most part democratic. Allowing for special exceptions, the normal scheme of government was this. Each house of an order had a separate life and partial in- dependence of itsown. It elected its own superior and officers, usually by ballot, for a short term of years, it discussed its business, and its members confessed their faults, in open chapter. Each group of houses elected a provincial ; the provincials, or delegates from among them, elected the general, whose authority was strictly constitu- tional, and limited as definitely by the rule and statutes as the rights of the youngest novice. Further, admission was seldom difficult ; the noviciate rarely exceeded two years, and the novice, professed at the close of that probation, at once entered on a share in the government of the society, and became eligible for its highest offices. Unlike this method in every respect, the Jesuit polity is almost a pure despotism, guarded, no doubt, with certain checks, but even those of an oligarchical kind. The general is indeed elected by the congregation of the society ; but, once appointed, it is for life, and with powers Jodged in his hands, partly due to the original constitutions, and partly to special faculties and privileges conferred by various popes, which enormously exceed, as regards enactment and repeal of laws, as to restraint and dispensation, and both in kind and degree, those wielded by the heads of any other communities. He alone nominates to every office in the society (with certain significant exceptions to be named presently) and appoints the superiors of all the houses and colleges. The vow of obedience is taken directly to him, and not, as in the older orders, to the rule, as distinguished from the mere chief of the executive. The admission or dismissal of every member depends on his absolute fiat; and, by a simple provision for reports to him, he holds in

his hands the threads of the entire business of the society in its most minute and distant ramifications.

Once more, the distinguishing peculiarity of the earlier communities, dating from the origin of the Benedictine rule, is their hostility to local change. The vow of stability, soon added to the three customary pledges of poverty, chastity, and obedience, was designed to impede, not merely itinerancy without settled abode, such as had brought discredit on those ancient monks who were styled ctrcumcellions, nor even easy transition from one religious community to another, unless in search of greater austerity,

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but even facility of transfer from one house to another of the very same order. Where the profession was made, there, in the absence of exceptional reasons, the life should be spent ; and this rule of course tended to nationalism in the monasteries of every country, even in the great military orders, which, though accepting recruits from all quarters, yet grouped them into tongues. But mobility and cosmopolitanism are of the very essence of the Jesuit programme. 'The founder of the society has excluded the possibility of doubt on this subject, for having chosen the military term "Company," rather than " Order" or "Con- gregation" to describe his new institute, he explained its meaning-to Paul ITI. as being that, whereas the ancient mon- astic communities were, so to speak, the infantry of the church, whose duty was to stand firmly in one place on the battlefield, the Jesuits, contrariwise, were to be the " light horse," capable of going anywhere at a moment's notice, but especially apt and designed for scouting or skirmishing. And, to carry out this view, it was one of his plans to send foreigners as superiors or officers to the Jesuit houses of each country, requiring of these envoys, however, to use invariably the language of their new place of residence, and to study it both in speaking and writing till entire mastery of it had been acquired,—thus by degrees making all the parts of his vast system mutually interchangeable, and so largely increasing the number of persons eligible to fill any given post, without reference to locality.

Further, the object of the older monastic societies was the sanctification of their individual members. In truth, community life was only a later development of the original system, as exhibited in the Thebaid, in accordauce with which solitary hermits began to draw near to each other, until the collection of separate huts gradually assumed the form of a laura or hamlet of cells, grouped under an abbot, and with a common place of worship—a model still sur- viving in the Camaldolese order. Their obedience to a superior, aud the observance of some kind of fixed rule, had no further intention than the improvement of the spiritual character of each person who entered such a community ; and, with certain qualifications, this has con- tinued the ideal of the older orders,—modified chiefly by the natural desire of each such body to gain influence and credit from the personal character of all its members and the efficiency of its active operations. But the founder of Jesuitism started at once with a totally different purpose. To him, from the first, the society was everything, and the individual nothing, except so far as he might prove a useful instrument for carrying out the society's objects. In a MS. collection of sayings by Loyola, whose genuineness is accepted by the Bollandists, themselves Jesuits, and by his biographer F. Genelli, he is stated to have said to his secretary, Polanco, that "in those who offered themselves he looked less to purely natural goodness than to firmness of character and ability for business, for he was of opinion that those who were not fit for public business were not adapted for filling offices in the society." He went even further than this, and laid down that even exceptional qualities and endowments in a candidate were valuable in his eyes only on the condition of their being brought into play or held in abeyance strictly at the command of a superior. On this principle, he raised obedience to a position it had never held before, even amongst monastic virtues. His letter on this subject, addressed to the Jesuits of Coimbra in 1553, is still one of the standard formularies of the society, ranking with those two other products of his pen, the Spiritual Haercises and the Con- stitutions ; and it is evident that his views differ very seriously from the older theories on the subject, as formu- lated in other rules. In them the superior is head of a local family, endued with paternal authority, no doubt as

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understood by the old civil code of the Roman empire, centuries after the very memory of freedom had been lost, yet having fixed limits, alike traditional and prescribed, besides being exercised only within a limited area and for certain specified purposes. Loyola, true to his military training and instincts, clothes the general with the powers of a commander-in-chief of an army in time of war, giving him the absolute disposal of all members of the society in every place and for every purpose. Not only so, but he pushes the claim much further, requiring, besides entire vutward submission to command, also the complete identi- fication of the inferior's will with that of the superior. He lays down that this superior is to be obeyed simply as such, and as standing in the place of God, without reference to his personal wisdom, piety, or discretion ; that any obedience which falls short of making the superior's will one's own in inward affection as well as in palpable effect, is lax and imperfect ; that going beyond the letter of command, even in things abstractly good and praiseworthy, is dis- obedience ; and that the "sacrifice of the intellect "—a familiar Jesuit watchword—is the third and highest grade of obedience, well-pleasing to God, when the inferior not only wills what the superior wills, but thinks what he thinks, submitting his judgment so far as it is possible for the will to influence and lead the judgment. So far- reaching and dangerous are these maxims that the Letter on Obedience was formally condemned, not long after Loyola's death, by the Inquisition in Spain and Portugal, and it tasked all the skill and learning of Bellarmine as its apologist, together with the whole influence of the company, to avert the ratification of the sentence at Rome.

It has, however, been alleged in defence that this very strong language must be glossed and limited by two other maxims penned by Loyola: (1) " Preserve your freedom of mind, and do not relinquish it by the authority of any person, or in any circumstances whatever"; and (2) "In all things except sin I ought to do the will of my superior, and not my own." But the value of these checks is seriously diminished when it is added that the former of them occurs in the introductory part of the Spiritual Hixercises, a manual expressly designed and used for the

purpose of bredking down the will of those who pass through its appoiuted ordeal under a director; while the latter is qualified in its turn, not only by the whole principle of probabilism, the special doctrine of the society, which can attenuate and even defend any kind of sin, but by the four following maxims, in close juxtaposition to itself in the very same document: "I ought to desire to be ruled by a

superior who endeavours to subjugate my judgment or |

subdue my understanding"; ""' When it seems to me that I am commanded by my superior to do a thing against which my conscience revolts as sinful, and my superior judges otherwise, it is my duty to yield my doubts to him, unless I am otherwise constrained by evident reasons"; "If submission do not appease my conscience, I must impart my doubts to two or three persons of discretion, and abide by their decision" ; "I ought not to be my own, but His who created me, and his too by whose means God governs me, yielding myself to be moulded in his hands like so much wax….. I ought to be like a corpse, which has neithe® will nor understanding, or like a small crucifix, which is turned about at the will of him that holds it, or like a staff in the hands of an old man, who uses it as may best assist or please him." And one master-stroke of Loyola's policy was to insure the permanence of this sub- mission by barring access to all independent positions on the part of members of the society, through means of a special constitution that no Jesuit can accept a cardinal's hat, a bishopric other than missionary, an abbacy, or any similar dignity, save with permission of the general, not to

be accorded unless and until the pope has commanded its acceptance under pain of sin.

The next matter for consideration is the machinery by which the society is constituted and governed, so as to enable this principle to become a living energy, and not a mere abstract theory, The society, then, is distributed into six grades :—novices, scholastics, temporal coadjutors, spiritual coadjutors, professed of the three vows, and pro-

fessed of the four vows. The novice cannot become a postulant for admission to the society till fourteen years old, unless by special dispensation, and is at once classified according as his destination is the priesthood or lay brotherhood, while a third class of ‘ indifferents” receives such as are reserved for further inquiry before a decision of this kind is made. They first undergo a strict retreat of a month in what is practically solitary confinement, during which they go through the Spiritual Hxercises, and make a general confession of their whole previous life ; after which the first noviciate, of two years’ duration, begins. This is spent partly in daily study, partly in hospital work, and partly in teaching the rudiments of religious doctrine to children and the poor. They may leave or be dismissed at any time during this noviciate, but if approved are advanced into the grade of scholastics, corresponding in some degree to that of undergraduates at a university. The ordinary course for these is five years in arts, when, without discontinuing their own studies, they must pass five or six years more in teaching junior classes, not reach- ing the study of theology till the age of twenty-eight or thirty, when, after another year of noviciate, a further course of from four to six years is imposed, and not till this has been completed can the scholastic be ordained as a priest of the society, and enter on the grade of spiritual coadjutor, assuming that he is not confined to that of tem- poral coadjutor, who discharges only such functions as are open to lay-brothers, and who must be ten years in the society before being admitted to the vows. The time can be shortened at the general’s pleasure, but such is the normal arrangement. Even this rank confers no share in the government, nor eligibility for the offices of the society. That is reserved for the professed, themselves subdivided into those of the three vows and of the four vows. It is these last alone, forming only a small percentage of the entire body, who constitute the real core of the society, whence its officers are all taken, and their fourth yow is one of special allegiance to the pope, promising to go in obedience to him for missionary purposes whenso- ever and whithersoever he may order,—a pledge seriously qualified in practice, however, by the power given to the general of alone sending out or recalling any missionary. The constitutions enjoin, by a rule seldom dispensed with, that this final grade cannot be attained till the candidate has reached his forty-fifth year, which involves a probation

of no fewer than thirty-one years for even such as have entered on the noviciate at the earliest legal age. These various members of the society are distributed in its noviciate houses, its colleges, its professed houses, and its mission residences. The question has long been hotly debated whether, in addition to these six avowed grades, there be not a seventh, answering in some degree to the Tertiaries of the Franciscan and Dominican orders, secretly affiliated to the society, and acting as its unsuspected emissaries in various lay positions. This class is styled in France * Jesuits of the short robe," and some evidence in support of its actual existence was alleged during the lawsuits against the company under Louis XV. The Jesuits them- selves deny the existence of any such body, and are able to adduce the negative disproof that no provision for it is to be found in their constitutions. On the other hand, there are clauses therein which make the creation of such

a class perfectly feasible if thought expedient. One is the power given to the general to receive candidates secretly, and to conceal their admission, for which there is a remark- able precedent in the case of Francis Borgia, duke of Gandia, afterwards himself general of the society; the other is an even more singular clause, providing for the admission of candidates to the company by persons who are not themselves members of it. The known facts on either side are insufficient for a decisive verdict, and "* Not proven" is the only impartial judgment possible. The general, who should by the statutes of the society reside permanently at Rome, holds in his hands the right of appointment, not only to the office of provincial over each of the great districts into which the houses are mapped, but to the offices of each house in particular, no shadow of electoral right or even suggestion being recognized.

The superiors and rectors of all houses and colleges in Europe must report weekly to their provincial on all matters concerning the members of the society and all outsiders with whom they may have had dealings of any sort. Those employed in district missions report at such longer intervals as the provincial may fix. The provincial, for his part,

must report monthly to the general, giv- ing him a summary of all details which have reached himself. But, as a check on him, all superiors of houses in his province are to make separate reports directly to the general once in three months, and further to com- municate with him without delay every time any matter of importance occurs, irrespective of any information which the provincial may have forwarded. Nor is this all; an elaborate system of espionage and delation forms part of the recognized order of every house, and, in direct contrast to the ancient indictment and confession of faults in open conventual chapter, every inmate of a house is liable to secret accusation to its superior, while the superior himself may be similarly delated to the provincial or the general.

Nor is the general himself exempt from control on the part of the society, lest by any possibility he might prove, from disaffection or error, unfaithful to its interests. A consultative council is imposed on him by the general con- gregation, consisting of six persons, whom he may neither select nor remove,—namely, four assistants, each represent- ing a nation, an admonisher or adviser (resembling the adlatus of a military commander) to warn him of any faults or mistakes, and lis confessor. One of these must be in constant attendance on him ; and, while he is not at liberty to abdicate his office, nor to accept any dignity or office outside it without the assent of the society, he may yet be suspended or deposed by its authority. No such instance, however, has yet occurred in Jesuit history, although steps in this direction were once taken in the case of a general who had set himself against the current feeling of the society. With so widely ramifying and complex a system in full working order, controlled by the hand of one man, the Company of Jesus has been aptly defined as "a naked sword, whose hilt is at Rome, and whose point is every- where."

There would seem at first to be an effectual external check provided, however, in the fact that, while all the officers of the society, except the council aforesaid, hold of the general, he in turn holds of the pope, and is his liegeman directly, as well as in virtue of the fourth vow, which he has taken in common with the other professed. But such is the extraordinary skill with which the relations of the society to the papacy

were originally drafted by Loyola, and subsequently worked by his successors, that it has always remained organically independent, and might very conceivably break with Rome without imperilling its own existence. Tlie general has usually stood towards the pope much as a powerful grand feudatory of the Middle Ages

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did towards a weak titular lord paramount, or perhaps as the captain of a splendid host of " Free Companions" did towards a potentate with whom he chose to take temporary and precarious service; and the shrewd Roman populace have long shown their recognition of this fact by styling these two great personages severally the "White Pope" and the " Black Pope." In truth, the society las never, from the very first, obeyed the pope, whenever its will and his happened to run counter to each other. Even in the very infancy of the company, Loyola himself used supplications and arguments to the pope to dissuade him from enforcing injunctions likely to prove incompatible with the original plan, and on each occasion succeeded in carrying his point ; while his immediate successors more openly resisted Paul IV. when attempting to enforce the daily recitation of the breviary on the clerks of the society, and to limit the tenure of the generalship to three years, and Pius V. when follow- ing his predecessor's example in the former respect. Sixtus V. having undertaken with a high hand the wholesale reform of the company, including the change of its name from " Society of Jesus" to " Society of Ignatius," met with strenuous opposition, and the fulfilment of Bellarmine's prophecy that he would not survive the year 1590 was looked on less as the accomplishment of a prediction than of a threat,—an impression deepened by the sudden death of his successor, Urban VII., eleven days after his election, who, as Cardinal Castagna, had been actively co-operating with Sixtus in his plans. The accuracy of a similar fore- cast made by Bellarmine as to Clement VIII, who was also at feud with the society, and who died before he could carry out his intended measures, confirmed popular suspicion. Urban VIII., Innocent XI., Alexander VIIL, and Clement XII. vainly contended against the doctrines taught in Jesuit books and colleges, and could effect no change. Nine popes fruitlessly condemned the 'Chinese rites,"

whereby the Jesuit missionaries had virtually assimi- lated Christianity to heathenism, and the practical reply of the latter was to obtain in 1700 an edict from the emperor of China, in opposition to the papal decree, declaring that there was nothing idolatrous or superstitious in the incul- pated usages, while in 1710 they flung Cardinal Tournon, legate of Clement XI., into the prison of the Inquisition at Macao, where he perished ; and finally, they disobeyed the brief of suppression issued by Clement XIV. in 1773, which enjoined them to disperse at once, to send back all novices to their houses, and to receive no more members. It is thus clear that the society has always regarded itself as an independent power, ready indeed to co-operate with the papacy so long as their roads and interests are the same, and to avail itself to the uttermost of the many pontifical decrees in its own favour, but drawing the line far short of practical submission when their interests diverge.

So constituted, with a skilful combination of strictness and laxity, of complex organization with the minimum of friction in working, the society was admirably devised for its purpose of introducing a new power into the church and the world, and for carrying out effectively every part of its vast programme. Thus equipped, its services to Roman Catholicism have been incalculable. The Jesuits alone rolled back the tide of Protestant advance when that half of Europe which had not already shaken off its allegiance to the papacy was threatening to do so, and the whole honours of the counter-Reformation are theirs singly. They had the sagacity to see, and to admit in their corre- spondence with their superiors, that the Reformation, as a popular movement, was fully justified by the gross ignorance, negligence, and open vice of the Catholic clergy, whether secular or monastic ; and they were shrewd enough to discern the only possible remedies. At a time when primary and even secondary education had in most places

become a mere effete and pedantic adherence to obsolete methods, they were bold enough to innovate, less in system than in materials, and, putting fresh spirit and devotion into the work, not merely taught and catechized in a new, fresh, and attractive manner, besides establishing

free schools of good quality, but provided new manuals and schoolbooks for their pupils, which were an enormous advance ou those they found in use, so that for nearly three centuries the Jesuits were accounted the best schoolmasters in Europe, as they were, till their forcible suppression the other day, confessedly the best in France,—besides having always conciliated the good will of their pupils by mingled firmness and gentleness as teachers. And, although their own methods have in time given way to further improve- ments, yet they revolutionized instruction as completely as Frederick the Great did modern warfare, and have thus acted, whether they meant it or not, as pioneers of human progress. Again, when the regular clergy had sunk into the moral and intellectual slough which is pictured for us in the writings of Erasmus and in the powerful satire Epistole Obscurorum Virorum, while there was little of a better kind visible in the lives of the parochial priesthood, the Jesuits won back respect for the clerical calling by their personal culture and the unimpeachable purity of their lives. These are qualitics which they have all along carefully maintained, and probably no body of men in the world has been so free from the reproach of discreditable members, or has kept up an equally high average level of intelligence and conduct. As preachers, too, they delivered the pulpit from the bondage of an effete scholasticism, and reached at once a clearness and simplicity of treatment such as the English pulpit scarcely begins to exhibit till after the days of Tillotson; while in literature and theology they count a far larger number of respectable writers than any other religious society can boast. It is in the mission-field, however, that their achievements have been most remarkable, which might fully justify their taking as their motto—

‘ Quee regio in terris nostri non plena laboris?” Whether toiling amongst the teeming millions of Hindustan and China, labouring amongst the Hurons and Iroguois of North America, governing and civilizing the natives of Brazil and Paraguay, in the missions and “reductions,” or ministering, at the hourly risk of his life, to his coreligionists in England under Elizabeth and James I., the Jesuit appears alike devoted, indefatigable, cheerful, and worthy of hearty admiration and respcct.

Nevertheless, two most startling and indisputable facts meet the student who pursues the history of this unique society. The first is the universal suspicion and hostility it has incurred,—not, as might reasonably be expected, merely from those Protestants whose avowed and most successful foe it has been, nor yet from the enemies of all clericalism and religious dogma, to whom it is naturally the embodiment of all they most detest, but from every Roman Catholic state and nation in the world, with perhaps the insignificant exception of Belgium. Next is the brand of ultimate failure which has invariably been stamped on all its most promising schemes and efforts. It controlled the policy of Spain, when Spain was aiming, with good reason to hope for success, at the hegemony of Europe, and Spain came out of the struggle well-nigh the last amongst the nations. It secured the monopoly of religious teaching and influence in France under Louis XIV. and XV. only to see an atheistic revolution break out under Louis XVI. and sweep over the nation after a century of such training. It guided the action of James II., lost the crown of England for the house of Stuart, and brought abont the limitation of the throne to the Protestant succession. Its Japanese and Red Indian missions have vanished without

leaving a trace behind; its labours in Hindustan did but prepare the way for the English empire tlre ; it was swept out of its Paraguayan domains without power of defence ; and, having in our own day concentrated its efforts on the maintenance of the temporal power of the popes, and raised it almost to the rank of a dogma of the Catholic faith, it has seen Rome proclaimed as the capital of united Italy, and a Piedmontese sovereign enthroned in the Quirinal. These two phenomena demand some inquiry and analysis. As regards the former of them, the hostility the Jesuits have encountered has been twofold, political and moral or religious. There has been, from a very carly date in their annals, a strong conviction prevalent that tlie famous motto of the society, ““A.M.D.G.” (Ad majorem Dei gloriam), did uot adequately represent its policy and motives, that its first and last aim was its own aggrandize- ment in power and wealth (for Julius II. had dispensed the general from the vow of poverty, and the colleges also were allowed to hold property), and that it spared no efforts to compass

this end, even to the extent of embroil- ing cabinets, concocting conspiracies, kindling wars, and procuring assassinations. In several of these cases, notably as regards the charges which led to their first expulsion from France and Portugal, inclusive in the latter instance of their exile from Paraguay, the Jesuits are able to make one very telling reply, pleading that motives of statecraft alone, of an unworthy kind, and the evidence of untrust- worthy and disreputable agents of their enemies, were suffered to decide the matter. In other cases, as for example the assassination of Henry IV. by Ravaillac, they deny all complicity, and no sufficient proof has ever bccn adduced against them. But, when full allowance has been made for such rejoinders, there remain several counts of the indictment which are but too clearly made out : as, for instance, their large share, as preachers, in fanning the flames of polemical hatred against the Huguenots under the last two Valois kings, their complicity in the plots against the life of Queen Elizabeth which followed on her excommunication by Pius V.; their responsibility for kindling the Thirty Years' War; the part they took in prompting and directing the cruelties which marked the overthrow of Protestantism in Bohemia; their decisive influence in causing the revocation of the Edict of Nantcs, and the expulsion of the Huguenots from the French dominions ; and thcir accountability for precipitating the Franco-German war of 1870. And in regard toa large number of other cases where the evidence against them is defective, it is at least an unfortunate coincidence that there is always direct proof of some Jesuit having been in communication with the actual agents engaged. So it was with the massacre of St Bartholomew, almost immediately preceded by a visit of the Jesuit general, Francis Borgia, to the French court, though there is no further evidence to connect him therewith ; so with Chatel and Ravaillac, the unsuccessful and successful assassins of Henry IV.; so with Jaureguay and Balthasar Gerard, who held the like relation to William the Silent, prince of Orange; so (as is more faniiliarly known) with the accomplices in the Gunpowder Plot. In all these and several other instarices, the pre- cautions which would naturally, and even inevitably, be taken by skilled and wary diplomatists for their own pro- tection are sufficient to account for the lack of direct proof against them, but it is not easy to explain the invariable presence of a Jesuit in the background, on any hypothesis

which will secure the complete acquittal of the society from charges of the sort. It is sufficient to say here in illustration that the English Roman Catholics under Elizabeth, addressing the pope with regard to the severe penal laws which oppressed them, laid the whole blame of the Government's action on the Jesuits, as having provoked XIII. — 82

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it by their conspiracies ; while the secular priests in England issued in 1601 by the pen of one of their number, William Watson (afterwards executed in 1603), a pamphlet known as Important Considerations, to the same effect.

The merited odium which has overtaken the Inquisition, usually officered by Dominicans, has induced the Jesuits, whose own controversial method has for the most part been different, to disclaim all connexion with that tribunal, and to represent their society as free from complicity in its acts. But, in truth, it was Ignatius Loyola himself who procured its erection in Portugal in 1545-6, and F. Nithard, one of the very few cardinals of the society, was inquisitor-general of that kingdom in 1655.

The charges against the Jesuits on moral and doctrinal grounds are not less precise, early, numerous, and weighty. Their founder himself was arrested more than once by the Inquisition, and required to give account of his belief and conduct. But Loyola, with all his powerful gifts of intel- lect, was entirely practical and ethical in his range, and had no turn whatever for speculation, nor desire to reason on, much less question, any of tle received dogmas of his church. He was therefore acquitted on every occasion, and sagaciously applied for and obtained each time a formally attested certificate of his orthodoxy, knowing well that, in default of such documents, the fact of his arrest as a suspected heretic would be more distinctly recollected by opponents than that of his honourable dismissal from custody. His successors, however, have not been so fortunate. On doctrinal questions indeed, though their teaching on grace, especially in the form given it by Molina, one of their number, was directly Pelagian (the result of reaction from Luther's teaching, which they had combated in

Germany), and condemned by several popes, yet their pertinacity in the long run carried the day, and gained a footing for their opinions which was denied to the opposite tenets of the Jansenists. But the accusations against their moral theology and their action as guides of conduct, nay, as themselves involved in many doubtful transactions, have not been so appeased. They were censured by the Sorbonne as early as 1554, chiefly at the instance of Eustache de Bellay, bishop of Paris, on grounds of which some were quite true, though others appear to have been at least exaggera- tions; but they can plead that no other theological faculty of the time joined in the condemnation. Melchior Cano, one of the ablest divines of the 16th century, never ceased to lift up his testimony against them, from their first beginnings till his own death in 1560, and, unmollified by the bribe of the bishopric of the Canaries, which their interest procured for him, succeeded in banishing them from the university of Salamanca. St Charles Borromeo, to whose original advocacy they owed much, and especially the exception made in their favour by the council of Trent (Sess. XXV., xvi.) from the restrictions it laid on other communities, retracted his protection, and expelled them from the colleges and churches which they occupied in his diocese and province of Milan,—a policy wherein he was followed in 1604 by his cousin and successor, the equally saintly Cardinal Frederick Borromeo. 'The credit of the society was, however, far more seriously damaged by the publication at Cracow in 1612 of an ingenious forgery (whose authorship has been variously ascribed to John Zaorowsky or to Cambilone and Schloss, all ex-Jesuits) entitled Afonita Secreta, professing to be the authorita- tive secret instructions drawn up by the general Acquaviva and given by the superiors of the company to its various officers and members, and to have been discovered in MS.

by Christian of Brunswick in the Jesuit college at Prague. .

It is full of suggestions for extending the influence of the Jesuits in various ways, for securing a footing in fresh places, for acquiring wealth, and so forth, all marked with

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ambition, craft, and unscrupulousness. It had a wide success and popularity, passing through several editions, and, though declared a forgery by a congregation of cardinals specially appointed to examine into it, has not ceased to be reprinted and credited down to the present day. The truth seems to be that, although both caricature and libel, it was drafted by a shrewd and keen observer, who, seeing what the fathers actually did, travelled analy- tically backwards to find how they did it, and on what methodical system, conjecturally reconstructing the process, and probably coming very near the mark in not a few details. Later on, a formidable assault was made on their moral theology in the famous Provincial Letters of Blaise Pascal, eighteen in number, issued under the pen-name of Louis de Montalte, from January 1656 to March 1657. Their wit, irony, eloquence, and finished style have kept them alive as one of the great French classics, —a destiny more fortunate than that of two kindred works by Antoine Arnauld, his collaborator in the Provincial Letters, namely, Théologie Morale des Jesuites, consisting of extracts from writings of members of the society, and Morale Pratique des Jeswites, made up of narratives exhibiting the manner in which they carried out their own maxims in their personal action. The reply on behalf of the society to Pascal's charges of lax morality, apart from mere general denials (such as that embodied in F. Ravignan's name for the Provinciales, "' Le Dictionnaire de la Calomnie"), is broadly as follows. (1) Ignatius Loyola himself, the founder of the society, had a special aversion from untruth- fulness in all its forms, from quibbling, equivocation, or even studied obscurity of language, and it would be con- trary to the spirit of conformity with his example and institutions for his followers to think and act otherwise. (2) Several of the cases cited by Pascal are mere abstract hypotheses, many of them now obsolete, argued on simply as matter of intellectual exercise, but having no practical bearing whatever. (3) Even such as do belong to the sphere of actual life are of the nature of counsel to spiritual physicians, how to deal with exceptional maladies, and were never intended to fix the standard of moral obligation for the general public. (4) The theory that they were intended for this latter purpose, and do represent the normal teaching of the Jesuit body, becomes more unten- able in exact proportion as this immorality is insisted on, because it is matter of notoriety that the Jesuits themselves have been

singularly free from personal, as distinguished from corporate, evil repute, and no one pretends that the large numbers of lay-tolk whom they have educated or influenced exhibit any great moral inferiority to their neighbours. The third of these replies is the most cogent as regards Pascal, but the real weakness of his attack lies in that nervous dread of appeal to first principles and their logical results which has been the besetting snare of Galli- canism, Afraid to deal with the fact that the society was on the whole what its founder meant it to be, and was merely carrying out his programme, because that admission would have involved challenging Loyola's position as a canonized saint, and the action of the Holy See in approv- ing his institute, Pascal was obliged to go on the histori- cally untenable ground that the Jesuits of his day had degenerated from their original standard ; and thus he was not at liberty to go down to that principle which underlies the whole theory of probabilism, namely, the substitution of external authority for the voice of conscience. Hence the ultimate failure of his brilliant attack. The same error of complaining against integral parts of the original system as though they were departures from its spirit marks the treatise of the Jesuit Mariana on certain faults in the government of the society, which was published at Bordeaux soon after his death, in Spanish, French, Latin,

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and Italian, from a MS. taken from him when he was in prison. The evils he specifies are the spy system (which he declares to be ctrried so far that, if the general's archives at Rome should be searched, not one Jesuit's character would be found to escape), the monopoly of the higher offices in the hands of a small clique, the narrow range of study, and the absence of encouragement and recompense for the best men of the society. But any fair examination of the constitutions will show that all these belong to the original scheme of government, and should have been challenged on that ground, if at all. Yet, on the broad issue, Pascal's censures have in the main been justified by the subsequent teaching of the society, for the lax casuistry which he held up to ridicule

has been formally reproduced in the most modern and popular Jesuit text book on the subject, that of F. Gury, while the works of Liguori and Scavini, though not of direct Jesuit origin, are yet inter- penetrated with the same opinions. And the result of dis- passiouate examination of these and kindred works—always bearing in mind that no Jesuit writings can be published without special licence from the general, after careful scrutiny and review—is that the three principles of probabilism, of mental reservation, and of justification of means by ends, which collectively make up what educated men intend by the term " Jesuitry," are recognized maxims of the society. As the last of these three is at once the most odious in itself and the charge which is most anxiously repelled, it is well to cite three leading Jesuit theologians in proof. Busembaum, whose dfedulla Theologie has been more than fifty times printed, and lately by the Propaganda itself, lays down the maxim in the following terms: "Cum finis est licitus, etiam media sunt licita," and, "Cui licitus est finis, etiam licent media." Layman, similarly, in his Theologia Moralis, " Cui concessus est finis, concessa etiam sunt media ad finem ordinata ;" and Wagemann, in his Synopsis Theologiz. Moralis, yet more tersely, ' Finis determinat probitatem actus." In point of fact, many rules of conduct based on these three principles have gradually percolated, as might have been expected, into popular catechisms, and so have weakened the plea that we are dealing only with technical manuals for a professional class; while the plausible defence from the fair average honesty and morality of the lay-folk taught by a clergy which uses these manuals, amounts simply to a confession that the ordinary secular conscience is a safer guide in morals than a Jesuit casuist, since the more nearly the code deducible from his text-books is conformed to the more widely must the pupil diverge from all accredited ethics.

Two causes have been at work to produce the universal failure of the great company in all its plans and efforts. And first stands its lack.of powerful intellects. Nothing can be wider from the truth than the popular conception of the ordinary Jesuit as a being of almost superhuman abilities and universal knowledge. The company is without doubt a corps d'élite, and an average member of it is of choicer quality than the average member of any equally large body, besides

being disciplined by a far more perfect drill. But it takes great men to carry out great plans, and of great men the company has been markedly barren from almost the first. Apart from its mighty founder, and his early colleague Francis Xavier, there are absolutely none who stand in the very first rank. They have had, no doubt, able administrators, like Acquaviva; methodical and lucid compilers, like the Bollandists and Cornelius a Lapide ; learned and plausible controversialists, like Bellarmine ; elegant preachers, as Bourdaloue, Segneri, and Vieyra; dis- tinguished mathematicians, like Le Seur, Jacquier, and more lately Secchi ; but even their one boldest and most original thinker, Denis Petau, has produced no permanent influence

over the current of human thought. They have had no Aquinas, no Anselm, no Bacon, no Richelieu. Men whom they trained and who broke loose from their teaching, Pascal, Descartes, Voltaire, have powerfully affected the philosophical and religious beliefs of great masses of man- kind, but respectable mediocrity is the brand on the long list of Jesuit names in the catalogues of Alegambe and De Backer. This result is due chiefly to the destructive pro- cess of scooping out the will of the Jesuit novice, to replace it with that of his superior (as a watchmaker might fit a new movement into a case), and thereby annihilating in all instances those subtle qualities of individuality and origin- ality which are essential to genius. Men of the highest stamp will either refuse to submit to the process, or will come forth from the mill with their finest qualities pulverized and useless, Nor is this all. The Latzo Studiorum, as devised by Acquaviva, and still followed in the colleges of the society, lays down rules which are incompatible with all breadth and progress in the higher forms of education. True to the anti-speculative and traditional side of Loyola’s mind, it prescribes that even where religious topics are not in question, the teacher is not to permit any novel opinions or discussions to be mooted ; nor to cite himself, or allow others to cite, the opinion of an author not of known repute ; nor to teach or suffer to be taught anything con- trary to the prevalent opinions of acknowledged doctors current in the schools. Obsolete and false opinions are not to be mentioned at all, even for

refutation, nor are objec- tions to received teaching to be dwelt on at any length. The professor of Biblical literature is always to support and defend the Vulgate reading, and to eite the Hebrew and Greek only when they can at least be reconciled therewith ; while all versions except the LXX. (which is to be spoken of respectfully) are to be passed over entirely, save when they help to confirm the Vulgate text. In philosophy, Aristotle is to be always followed, and Aquinas generally, care being taken to speak respectfully of him even when abandoning his opinion. It is not wonderful that, under such a method of training, highly cultivated commonplace should be the inevitable average result, and that in pro- portion as Jesuit power has become dominant in Latin Christendom, the same doom of intellectual sterility, and consequent loss of influence with the higher and thoughtful classes, has spread from the part to the whole. The second cause which has blighted the efforts of the company is the lesson, too faithfully learnt and practised, of making its corporate interests the first object at all times and in all places. The most brilliant exception to this rule is found in some of the foreign missions of the society, and notably in that of St Francis Xavier. But Xavier quitted Europe in 1541, before the new society had hardened into its final mould, and never returned. His work, so far as we can gather from contemporary accounts, was not done on the true Jesuit lines, though the company has reaped all its credit ; and it is even possible that had he succeeded Loyola as general of the Jesuits the institute might have been seriously and healthfully modified. It would almost seem that careful selection was made of the men of greatest piety and enthusiasm, such as Anchieta, Baraza, and Brebeuf, whose unworldliness made them less apt for the diplomatic intrigues of the society in Europe, to break new ground in the various foreign missions, where their successes would throw lustre on the society, and their scruples need never come into play. But such men are rare, and as they died off, their places had to be filled with more sophisticated and ordinary characters, whose one aim was to increase the power and resources of the society. Hence the con- descension to heathen rites in Hindustan and China, The first successes of the Indian mission were entirely amongst the lowest class; but when Robert de' Nobili, to win the

Brahmans, adopted their insignia and mode of life in 1605 -—a, step sanctioned by Gregory XV. in 1623—the fathers who followed his example pushed the new caste-feeling so far as absolutely to refuse the ministrations and sacraments of religion to the pariahs, lest the Brahman converts should take offence,——an attempt which was reported to Rome by Norbert, a Capuchin, aud by the bishop of Rosalia, and was vainly censured in the pontifical briefs of Innocent X. in 1645, Clement IX. in 1669, Clement XII. in 1734 and 1739, and Benedict XIV. in 1745. The Chinese rites, assailed with equal unsuccess by one pope after another, were not finally put down until 1744, bya bull of Benedict XIV. or Japan, where their side of the story is that best known, we have a remarkable letter, printed by Wadding, addressed to Paul V. by Soleto, a Franciscan missionary, who was martyred in 1624, in which he complains to the pope that the Jesuits had systematically postponed the spiritual welfare of the native Christians to their own con- venience and advantage, while, as regards the test of martyrdom, no such result had followed on their teaching, but only on that of the other orders who had undertaken missionary work in Japan. Again, even in Paraguay, the most promising of all Jesuit undertakings, the evidence shows that the fathers, though civilizing the Guarani population just sufficiently to make them useful and docile servants, happier, no doubt, than they were before or after, stopped short there, and employed them simply in raising produce to be traded with for the interests of the society, in accordance with a privilege conferred on them by Gregory XIIL, licensing them to engage in commerce.

These examples are sufficient to explain the final collapse of so many promising efforts. The individual Jesuit might be, and often was, a hero, saint, and martyr, but the system of which he was a part, and which he was obliged to administer, is fundamentally unsound, and in contraven- tion of inevitable laws of nature, so that his noblest toils were foredoomed to failure, save in so far as they tended to ennoble and perfect himself, and offered a model for others to imitate.

The influence of the society since its revival in Latin Christendom has not been beneficial. It presents the seeming paradox of the strictest and most irreproachable body amongst the Roman clergy doing nothing to raise the general standard of clerical morals ; of that which is collec- tively the best educated order setting itself to popularize merely emotional and material cults, to the practical neglect and disparagenient of more spiritual agencies ; of the most intellectual religious teachers deliberately eviscerating the understanding, and endeavouring to substitute mechanical submission to a word of command for intelligent and spontaneous assent to reasonable argument. And yet in all this they are but carrying out the fatal principles of the original institute. True to the teaching of that remarkable panegyric on the society, the Jmago Primi Secult Societatis Jesu (probably written by John Tollenarius in 1640), they have identified the church with their own society, and have considered only what mode of action wonld make it more easily governed in the same spirit. It is thus for the advantage of such a scheme that laymen should reason as little as possible on questions of theology, that the fathers of the company should hold an acknowledged position of moral and intellectual superiority to the ordinary secular clergy, that all the threads of ecclesiastical authority should be gathered up into one hand, and that one hand in the stronger grasp of the society—a policy modelled exactly on the lines of the concordat of Napoleon I. with Pius VIL Heuce the long preparation and elaborate intrigues which issued in the Vatican decrees of papal infallibility and immediate jurisdiction in all dioceses, the ultimate issues of which are still hidden in futurity.

illness, to devote himself to a religious life.

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History. Such being in outline the coustitution and character of the

Company of Jesus, it remains to summarize its historical career. Don Inigo de Loyola, a nobleman of Guipuzcoa, brave and accom- plished, but unversed in letters, was severely wounded at the siege

of Pampeluna in 1521, when he was thirty years of age. Sent to

his father's castle by his chivalrous eaptors, he was induced by

the reading of some pious books, intended to divert the tedium of Quitting his home, he betook himself first to Montserrat and thence, in the garb of a pil- grim, to Manresa, a small town near Barcelona, whence, after serving

for a time in the hospital, he withdrew to a cavern close at hand,

where, amidst the practice of various austerities, he made the first draft of his famous Spiritual Exercises, a work whieh, often re- touched and amplified in his later years, is one of the chief authori- tative formularies of his society. Thence he proceeded by way of Barcelona to sail for Italy, and, after visiting Rome and Venice, he made a pilgrimage to Jerusalem, intending if possible to establish a missionary society there for the conversion of the Mahometans. Compelled to withdraw by the provineial of the Franciscans, who feared a collision with the Turkish authorities, Loyola returned to Spain, and at thirty-three years of age attended school at Barcelona to-aequire the rudiments of Latin, spending two years there between his studies and suel missionary work as was possible for him. He then removed in 1526 to the newly founded university of Aleala, where he first began to gather round him a little band of fellow- workers, holding religious conferences amongst the students, and giving private instruction besides to various townsfolk. This eon- duct drew on him the suspicions of the Inquisition, but after a short imprisonment he was released, and migrated to Salamanca, whither two of his friends had preceded him. Here he was again thrown into prison on suspicion of heresy, and formed the plan of going to Paris on recovering his liberty, as a place where he could have more freedom of action, superior teaching, and a greater likelihood of finding able recruits in so central and populous a eity for the society he was preparing to found. He reached Paris in 1528, and entered at tho college of St Barbara in the university. Not until his sixth year of residence did he attempt the regular organization of the most promising of the young men whom he drew around him. It was in July 1534 that he opened his plans to them for starting a missionary society to work in the Holy Land, and the actual vows,

binding the new companions to one another and to the sort of life they con- templated, or to direet service of the pope, should that prove impracticable, were taken in the crypt of Notre Dame de Montmartre on August 15, 1534, by Ignatius Loyola himself; Peter Faber or Le Févre, a Savoyard ; Francis Xavier, Diego Laynez, Alfonso Salmeron, Nicolas Alfonso de Bobadilla, Spaniards ; and Simon Rodriguez, a Portuguese. With his usual practical foresight, Loyola postponed the execution of their scheme till January 25, 1537, and provided for its possible modification or abandonment. Three more disciples speedily joined the infant soeicty, Jean Codure, Claude le Jay, and Paschase Brouet. In March 1535 Loyola quitted Paris, committing his society to Faber, the eldest, and betook himself to Spain, where he remained a few months, and then proceeded to Venice, whenee he wrote to summon his companions to join him. They left Paris on November 15, 1536, and reached Venice on January 6, 1537, where their leader had already gained three fresh reernits, Hosez aud the two brothers D'Eguia. Remaining in Venice himself for prudeu- tial reasons, he sent all the others to Rome to solicit from Paul HI. leave to go as missionaries to Jerusalem. They were aided in their application by Pedro Ortiz, the emperor's envoy, and readily ob- tained the desired permission, with further licence to be ordained priests by any bishop, on being duly qualified. :

Returning to Venice, they were ordained on St J ohn Baptist's Day, 1537, along with Loyola himself, by Vincenzio (or Antonio) Nigu- santi, bishop of Arba. A war which broke out between Turkey and Venice made the intended journey to Palestine impracticable ; and accordingly Loyola, Faber, and Laynez betook themselves to Rome, while the others dispersed themselves through the chief university 4© towns of North Italy, and began their work as home missionary preachers ; and it was immediately before they separated on this oceasion, at Vicenza in November 1537, that Loyola announced his intention that their fellowship should henceforward be known as the 'Company of Jesus," and that, abandoning their original plan of a purely Oriental mission, they should offer themselves to the pope as a special militia. It may be here remarked that the more popular name "Jesuits" scems to have been first used by Calvin, and _it appears also in the register of the

parliament of Paris as early as 1552, while the enemies of the society in Spain usually spoke of its mem- bers as “ Inigistas,” after the name of its founder.

On their arrival at Rome, the three Jesuits wee favourably received by Paul III., who at once appointed Faber to the chair of Biblical exegesis, and Laynez to that of scholastie theology, in the collegeof Sapienza. But they encountered much opposition, and were even charged with heresy, nay, when this accusation had been dis- posed of, there still were difficulties in the way of starting any

new order. Despite the approval of Contarini, and the goodwill of the pope himself (who is said to have exclaimed, on perusing Loyola’s papers, “ The finger of God is here”’), there was a strong and general feeling that the monastic system had broken down utterly, and could not be wisely developed further. Cardinal Guidiccioni, one of a committeo of three appointed to examine the draft constitutions, was known to advocate the abolition of all existing orders save four, which were to be remodelled and put under striet control. And it was that very year, 1538, that a committee of cardinals, consisting of Reginald Pole, Coutarini, Sadolet, Caraffa (afterwards Paul IV.), Fregoso, Aleander, and Badia, had just re- ported to the pope that the conventual orders were such a scandal to Christendom tliat they should be all abolished—“ abolendos putamus omnes.” Not only so, but, when greater strictness of rule and of enclosure scemed the most needful reforms in communities which had become too secular in tone, the proposal of Loyola to make it a first principle that the members of his new institute should mix freely with the world, and be as little marked off as possible externally from secular life and usages, ran counter to all tradition and prejudice, save that Caraffa’s then recent order of Theatines, from which Loyola copied some details, had taken some steps in the same direction.

Loyola and his companions, however, had little doubt of ulti- mat success, and so bound themselves, on April 15, 1539, to obey any superior chosen from amongst their body, and added on May 4 eertain

other rules, the most important of which was the vow of special allegiance to the pope for mission purposes, to be taken by all members of the society. But Guidiecioni, on a careful study of the papers, changed his mind,—partly, it is supposed, because of the strong interest in the new seheme exhibited by the king of Portugal, who instructed his ambassador to press it on the pope, and to ask Loyola himself for some priests of his society for mission work in Portugal and its Indian possessions, and accordingly Xavier and Rodriguez were sent to the king in March 1540. And on September 27, 1540, the bull Regimint militantis ecclesie was published, confirming the new order, but limiting its members to sixty, a restrietion which was removed by a later bull in March 1543. In the Latin translation of the original draft constitutions, approved by the pope, the word compaftia was represented by socictas, though cohors or some such military term would have more exaetly reproduced the founder's idea, and thus the Jesuit body is known indifferently as " Company " or " Society," while the title " Order" is never officially given to it. This title was finally settled by Gregory XIV. in a bull of June 28, 1594.

On April 7, 1541, Loyola was unanimously chosen superior. His refusal of this post was overruled, so he entered on his new office on April 13, and on April 15 the newly constituted socioty took its formal eorporate vows as a religious order in the chureh of St Paul- without-the-Walls. The general entered on his duties by holding public catechizings in Sta Maria in Strata for eight and forty days, a precedent followed ever since by his successors in office. Scarcely was the society launched when its members dispersed in various directions to their new tasks. Salmeron and Brouet were sent, clothed with the powers of papal legates, on a secret mission to Ireland, to encourage the native clergy and people in resistance to the religious changes introduced by Henry VIII. ; Bobadilla went to Naples; Faber, first to the diet of Worms, and then to Spain ; Laynez ani Le Jay to Germany, while their general busied himself in founding the convent of St Martha at Rome for feinale penitents, and that of St Catherine for unprotected young women, as also in perfecting the original draft of the constitutions, a task he did not finish till 1550. Success crowned these first efforts, and the earliest college of the society was founded at Coimbra in 1542 by

King Johu Ill. of Portugal, who secured the appointment of Simon Rodriguez as its rector. It was designed as a training-school to feed the Indian mission, of which Francis Xavier had already taken the oversight, while a seminary at Goa was the second institution founded out of Rome in connexion with the society. In Spain, national pride in the founder aided their cause almost as much as royal patronage in Portugal, and the next house of the society after Goa was opened at Gandia under the protection of its duke, Francis Borgia; in Ger- many they were eagerly welcomed as the only persons able to meet the Lutherans on equal terms ; and only in France, of the countries still belonging to the Roman communion, was their advance checked, owing to political distrust of their Spanish origin, together with the hostility of the Sorbonne and the bishop of Paris. However, after many difficulties, they succeeded in getting a footing through the help of Duprat, bishop of Clermont, who founded a college for them in 1545 in the town of Billom, besides making over to them his house at Paris, the Hotel de Clermont, which became the nucleus of the afterwards famous college of Louis-le-Grand, while a formal He ation was granted to them by the states-general at Poissy in

In Rome, Paul III.'s favour did not lessen. He bestowed on them the church of St Andrea, where now Cardinal Alessandro Farnese's stately erection, the Gest, stands, and conferred on them at the same time the more valuable privilege of altering their own statutes,

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besides two others procured in 1546, which Loyola had still more at heart, as touching the very essence of his institute, namely, exemption from ecclesiastical offices and dignities, and from the task of acting as directors and confessors to convents of nuns. The former of these measures effeetually stopped any drain of the best members away from the society, and limited their hopes within its bounds, by putting them more fully at the general's disposal, especially as it was provided that the final vows could not be annulled, and that only the joint action of the general and the pope could dismiss a professed member from the society. The regulation as to convents seems due partly to a desire to

avoid the worry and expenditure of time involved in the diseharge of such offices, and partly to a con- viction that penitents of the kind would be of no effectual use to the society ; whereas Loyola, against the wishes of several of his companions, laid much stress on the duty of aecepting the post of confessor to kings, queens, and women of high rank, when oppor- tunity presented itself. And the year 1546 is notable in the annals of the society as that in which it cmbarked on its great educational a especially by the annexatiou of free day-scliools to all its colleges.

The council of Trent did much to inerease the reputation of the new society, for the pope chose three of its members, Laynez, Faber, and Salmeron, to act as his theologians in that assembly, and they had no little influence in framing its dogmatic definitions and decrees. In 1548 the company received a valuable recruit in the person of Francis Borgia, duke of Gandia, afterwards third general, while two important events marked 1550,—the foundation of the Collegio Romano, and a fresh confirmation of the society by pope Julius III. The German college, for the children of poor nobles, was founded in 1552, and in the same year Loyola firmly settled the discipline of the soeiety by putting down with promptness and severity some attempts at independent action on the part of Rodriguez at Coimbra ; while 1553 saw the despatch of a mission to Abyssinia, and the first quarrel of the society with the pope, who thought that the Spanish Jesuits were taking part with the emperor against the Holy See, but was reconeiled by the good offices of Ferdinand, king of the Romans. Paul IV. (whose cleetion at first alarmed the Jesuits, for they had found him not very friendly as Cardinal Caraffa) proved as favourable to them as his predecessors ; and, when Ignatius Loyola died in 1556 under his pontificate, the society already counted forty-five professed fathers and two thousand ordinary members, distributed over twelve provinces, with more than a hundred colleges and houses. After two years' in- terregnum, Laynez, who had acted as vicar in the meanwhile, was elected general in 1558, and was suecessful in a struggle with the pope, who desired to enforce the recitation of the breviary on the society, and to limit the tenure of the generalship to a term of three years, but could effect neither object. Laynez also sueeeeded in increasing further the already enormous

powers of the general by adding these four clauses to the constitutions : —that the gencral alone can make contracts binding the society ; that he can authori- tatively gloss and interpret the rules and laws, can enact new or repeal old laws, and may have prisons for the incarceration of refractory members. He took a leading part in the colloquy of Poissy in 1561 between the Catholics and Huguenots, and obtained, as already said, a legal footing from the states-general for colleges of the soeiety in France. He died in 1564, leaving the soeicty in- creased to eighteen provinces, with a hundred and thirty eolleges, and was succeeded by Francis Borgia. It was during his generalship that the greatest favour yet vouchsafed the company was bestowed by Pius Y., who not only confirmed by bull all former privileges, and extended to it further every privilege that had been or might afterwards be granted to any order with vows of poverty, but also decreed that these letters should at no time be capable of being revoked, limited, or derogated from by the Holy Sec, nor be included within any revocation of similar or dissimilar privileges, but be for ever excepted therefrom. It was a trifling set-off to such a grant that the pope in 1567 again enjoined the tathers to recite the canonical hours in choir, and to admit only the professed to priest's orders, especially as Gregory XIII. rescinded both these injunctions in 1573; and indced, as regards the hours, all that Pins V. was able to obtain was the nominal concession that the breviary should be recited in the professed houses only, and that not of necessity by more than two persons at a time.. Eberhard Mercurian, a Fleming, succeeded Borgia in 1572 (being foreed on the company by the pope, in pre- ference to Polanco, Loyola's secretary and then vicar-general, who was rejected partly as a Spaniard, and still more because he was a "' New Christian" of Jewish origin, and therefore objected to in Spain itself), and was in turn followed by Claudio Acquaviva, an able and strong-willed man, who sat from 1581 to 1615, a time almost exactly coinciding with the high tide of the great and suc- ecssful countcr-Reformation movement, chiefly due to the Jesuits, which had begun under Borgia. It was, however, during his generalship that the company's evil reputation began to eclipse its good report, that they first had the pope their avowed encmy, and that they were driven from England (whither they had come chiefly from the seminary founded at Douay by Cardinal Allen in 1568),

once in 1581, nd again in 1601, as conspirators against the life of Queen Elizabeth, and later again for their share in the Gunpowder Plot ; from France as accomplices in the attempt of Ch&tel to assas- sinate Henry IV.; and from Antwerp as having resisted the pacifi- eationof Ghent. It is true that the edict of the parliament of Paris in 1594, which banished them from France, was revoked in 1608, by desire of Henry IV., who permitted them to return under con- ditions ; and this fact has been much relied on by Jesuit writcrs in proof of their innocence of all complicity in Chatel's plot. But as Sully has recorded for us that Henry declared his only motive to be the expediency of not driving them into a corner, and so inducing them to murder him through despair or revenge, and that his only hope of tranquillity lay in appeasing them, his eonduct does not tell much in their favour.

It was also during Acquaviva's generalship that Philip II. of Spain complained bitterly of the eompany to Pope Sixtus V., and encouraged him in those plans of reform which were eut short by his death in 1590, and also that the long-protracted discussions on grace, wherein the Dominicans contended against the Jesuits, were carried on at Rome, with little practical result, by the Con- gregation De Auziliis, which began to sit in 1598, and eontinued till 1607. He saw too the expulsion of the Jesuits from Venice in 1606 for siding with Paul V. when he placed the republic under an interdict, but did not live to see their reeall, which took place at the intercession of Louis XIV. in 1657. But the eoncessions made to the company by Gregory XIV., successor of Sixtus V., during his short reign of twelve months, almost seemed to eompensate for all these troubles ; for he not only confirmed all existing privileges, but conferred also that of being able to expel members of the society without any form of trial, or even documentary procedure, besides denouncing excommunication against every one save the pope or his legates who directly or indirectly infringed the constitutions of the society, or attempted to bring about any change thcrein.

Under Vitelleschi, Acquaviva's successor, the firstcentenary of the society was held on September 25, 1639, the hundredth anniversary of

the verbal approbation given to the draft constitutions by Paul III., and there were then thirty-six provinces, with eight hundred honses, containing fifteen thousand Jesuits, It was in the following ioe that the great controversy which raged for a century in the

atin Church broke out by the posthumous publication of the Augustinus of Cornelius Jansen, bishop of Ypres, in which the Jesuits took the leading part, and finally secured the victory for their teaching throughout the Romau obedience. It was in this same year 1640 that, considering themselves ill-used by the count- duke Olivarez, prime niinister of Philip IV. of Spain, they power- fully aided the revolution which placed the duke of Braganza on the throne of Portugal, and their services were rewarded with a

ractical control of ecclesiastical and almost of civil affairs in that kingdom, which lasted for more than a hundred years.

The society also gained ground steadily in France, for, though held in check during Richelieu's life, and little more favoured by Mazarin, yet from the moment Louis XIV. assumed the reins of government, their star was in the aseendant, and Jesuit confessors, the most celebrated of whom were La Chaise and Letellier, guided the policy of the king, not hesitating to take his side in his quarrel with the Holy See, which nearly resulted in a schism, nor to sign the Gallican articles. How their hostility to the Huguenots forced on the revocation of the Edict of Nantes in 1685, and their war against Jansenism did not cease till the very walls of Port Royal were demolished in 1710, even to the abbey church itself, and the bodies of the holy dead taken with every mark of insult from their graves, and literally flung to the dogs to devour, is well known. But, while thus gaining power in one direction, the eompany was losing it in others. The Japancse mission had vanished in blood by 1651, and, though many Jesuit fathers and thcir converts died bravely as martyrs for the faith, yet it is impossible to acquit them of a large share in the causes of that overthrow. And it was about this same period that the grave scandal of the Chinese and Malabar rites, already referred to, began to attract attention in Europe, and to make thinking men ask seriously whether the Jesuit missionaries taught anything

which could be fairly called Christianity at all. When it is remembered, too, that they decided in a council at Lima that it was inexpedient to impose any act of Christian devotion except baptism on their South American converts, without the greatest Is ae on the ground of intellectual difficulties, it is not wonderful that this doubt was not satisfactorily cleared up, notably in face of the charges brought against the society by Bern- ardin de Cardonas, bishop of Paraguay, and the saintly Palafox, bishop of Augelopolis in Mexico, whom they persecuted till he had to fly for his life, and could be protected by the pope himself only by lis translation to a European see. As regards their North American work, the Abbé Badiche, continuator of Helyot, pays the Jesuits the deubtful compliment of saying that the Red Indian tribes which accepted the gospel with joy, "learned to mingle Jesus Christ and France together in their affection."

The seeds of decay were alrcady germinating within the company itself. A succession of devout but incapable generals after the death

of Acquaviva saw the gradual sectilarizatien of tone by the flocking in of recruits of rank and wealth, desirous to share in the glories and influence of the company, but not well adapted to increase them, and too readily admitted on merely temporal grounds ; while the old strict discipline was relaxed, as the professed fathers gradually encroached on the general's authority, till they went the length, in 1661, of appointing a vicar-general with powers which practically superseded thosc of the gencral, Goswin Nickel, whom they did net think it expedient to depose formally. And, though the political weight of the company continued to increase in the cabinets of Europe, yet it was being steadily weakened internally. They abandoned, too, the system of free education, which had won them so much influence and honour ; by attaching themselves exclusively to the interests of courts, they lost favour with the middle and lower classes ; and, above all, their monopoly of power and patronage in France, with the fatal use they had made of it, drew down the bitterest hostility upon them. It was indeed to their credit that the Encyclopedists attacked them as the

foremost representatives of Christianity, but they are accountable in no small degree for the unfavourable opinion of the nature and merits of Christianity itself which their opponents entertained. But that part of the policy of the company which proved most fatal to it, and served as the pre- text of the attacks before which it fell, was its activity, wealth, and importance as a great trading firm, with branch houses scattered over the richest producing countries in the world. Its founder, with a wise instinct, had forbidden the accumulation of wealth ; its own constitutions, as revised in the eighty-feurth decree of the sixth general congregation, had forbidden all pursuits of a commer- cial nature, as also had various popes, rescinding the decrce of Gregory XIII. ; but nevertheless, the trade went on unceasingly. The first mutterings of the storm which was seon to break were heard in a severe brief issued in 1741 by Benedict XIV., the most learned and able of the later popes, wherein he denounced the Jesuits as "disobedient, contumacious, eaptious, and reprobate persons," and enacted many stringent regulations for their better government ; and this was followed up by two bulls, Ex quo singulari in 1742, and Omnium sollicitudinum in 1744, striking at their continued insubordination in the matter of the Cliinese rites, which, however, did not save them from an edict of banishment from China itself in 17538, and the last of them disappeared thence in 1774.

The first serious attack came from a country where they had been long dominant. In 1753 Spain and Portugal exchanged certain American provinces with each other, which involved a transfer of sovereign rights over Paraguay, but it was provided that the popula- tions should sevcrally migrate also, that the subjects of each crown might remain the same as before. The inhabitants of the' reduc- tions," whom the Jesuits had trained in the use of European arms and discipline, rose in revolt, and attacked the troops and authorities. Their previous docility, and their entire subinission to the Jesuit missionaries, left no doubt possible as to the source of their rebellien, though direct proof was, as usual, lacking ; and the matter was not soon forgotten. In 1757 Carvalho, marquis of Pombal, prime ininister of Joseph I. of Portugal, dismissed the three Jesuit chap- lains of the king, and named three secular priests in their stead. He next complained to Benedict XIV. that

the trading operations of the society hampered the commercial prosperity of the natien, and asked for remedial measures. The pope granted a visitation of the society, and eommitted it to Cardinal Saldanha, a close inti- mate of Pombal's. He issued a severe decree against the Jesuits, and ordered the confiscation of all their merchandise.

But at this juncture Benedict XIV. died, and was succceded, much as had happened on several previous occasions, by a pope strongly in favour of the Jesuits, Cardinal Rezzonico, who took the title of Clement XIII. Pombal, finding that no help was to be expected from this quarter, adopted other mcans. The king was fired at and wounded on returning from an assignation with his mistress, the marchioness of Tavora, September 3, 1758. The duke of Aveire, the marquis of Tavora, and other persons of high rank were tried and executed for conspiracy, while some of the Jesuits, who had undoubtedly been in communication with them, were charged, on evidence whose value there are no eertain means of testing, but which seems very doubtful, with complicity in the attempted assassination. Pombal charged the whole society with its guilt, and, unwilling to await the dubious issue of au application he had made to the pope for licence to try them in the civil courts, whence they were exempt, issued a decree on September 1, 1759, ordering their immediate deportation from Portugal and all its dependencies, and their supersession by the bishops in the schools and universities. Those in Portugal were at once shipped to Italy, and such as were in the colonics expelled speedily after. In France, Madame de Pompadour was their enemy,—it is said, because they endea- voured to make her break off her connexion with Louis XV., and refused her absolution on any other terms ; but the immediate cause of their rnin was the bankruptcy of F. Lavalette, the Jesuit administrator of Martinique, a daring speculator, who failed for 2,400,000 francs, and ruined some French coinmercial houses of note. Ricci, then general of the Jesuits, repudiated the debt,

alleging lack of authority on Lavalette's part to pledge the credit of the society, and was sued by the ercditors. Losing his cause, he appealed to the parliament of Paris, and it, to decide the issue raised by Ricci, required the constitutions of the Jesuits to be pro- duced in evidence, and affirmed the judgment of the courts below. But the publicity given to a document scarcely known till then (indeed the first authoritative edition of the Constitutions is that of Prague in 1757) raised the utmost indignation against the company. Aroyal conimission, appointed by the duke of Choiseul to examine the constitutions, convoked a private assembly of fifty-one archbishops aud bishops under the presidency of Cardinal de Luynes, all of whom except six voted that the unlimited authority of the general was incompatible with the laws of France, and that the appointment of a resident vicar, subject to those laws, was the only solution of the question fair on all sides. Ricci replied with the historical answer, ** Sint ut sunt, aut non sint"; and after some further delay, during which much interest was exerted in their favour, the-Jcsuits were suppressed by an edict in November 1764, but suffered to remain on the footing of secular priests, a grace withdrawn in 1767, when they were expelled from the kingdom. In the very same year, Charles III. of Spain, a monarch known for personal devoutuess, convinced, on evidence not now fortlicoming, that the Jesuits were plotting against his authority, prepared, through his minister D'Aranda, a decree suppressing the society in every part of his dominions. Sealed despatches were sent to every Spanish colony, to be opened on the same day, April 2, 1767, when the measure was to take effect in Spain itself, and the expulsion was relentlessly eatricd ont, nearly six thousand priests being deported from Spain alone, and sent to the Italian coast, whence, however, they were repelled by the orders of the pope and Ricci himself, finding a refuge at Corte in Corsica, after some months' suffering in overcrowded vessels at sea. The general's object may probably have been to accentuate the harshness with which the fathers had bceu treated, and so to increase public sympathy, but the actual result of his policy was blame for the cruelty with which he enhanced their mis- fortunes, for the poverty of Corsica made even a bare subsistence scarcely procurable for them there. The Bourbon courts of Naples and Parma followed the exainple of France and Spain, and Clement XIII. retorted with a bull launched at the

weakest adversary, and declaring the rank and title of the duke of Parma forfeit. The Bourbon sovereigns threatened to make war on the pope in return (France, indeed, seizing on the county of Avignon), and a joint note demanding a retractation, and the abolition of the Jesuits, was pre- sented by the French ainbassador at Rome on December 10, 1768, in the name of France, Spain, and the Two Sicilies. The pope, a man of eighty-two, died of apoplexy, brought on by the shock, early in 1769. Cardinal Lorenzo Ganganelli, a Franciscan, was chosen to succeed him, and took the name of Clement XIV. Heendeavoured to avert the decision forced upon him, but, as Portugal joined the Bourbon league, and Maria Theresa with her son the emperor Joscph I]. ceased to protect the Jesuits, there remained only the pctty kingdom of Sardinia in their favour, though the fall of Choiseul in France raised the hopes of the society foratime. The pope began with some preliminary measures, permitting first the renewal of lawsuits against the society, which had been suspended by papal authority, and which, indeed, had in no case been ever successful at Rome. He then closed the Collegio Romano, on the plea of its insolvency, seized on the houses at Frascati and Tivoli, and broke up the establishments in Bologna and the Legations at large. Finally, on July 21, 1773, the famous brief Dominus ac Redemptor appeared, suppressing the Society of Jesus. This remarkable docu- ment opens by citing a long series of precedents for the suppression of religious orders by the Holy See, amongst which occurs the il]- omened instance of the Templars. It then briefly sketches the objects and history of the Jesuits themselves. It speaks of their defiance of their own constitution, expressly revived by Paul V., for- bidding them to meddle in polities ; of the great ruin to souls caused by their quarrels with local ordinaries and the other religious orders, their conformity to heathen usages in the East, and the disturbances, resulting in persecutions of the ehurch, which they had stirred up even in Catholic countries, so that several popes had been obliged to punish them. Seeing then that the Catholic sovereigns had been forced to expel them, that many bishops and other eminent persons demanded their extinction, and that the society had ceased to fulfil the intention of its institute, the pope declares it necessary for the peace of the church that it should be suppressed, extinguished, abolished, and abrogated for ever, with all its rites, houses, colleges, schools, and hospitals ; transfers

all the authority of its general or officers to the local ordinaries ; forbids the reception of any more novices, directing that such as were actually in probation should be dismissed, and declaring that profession in the society should not serve as a title to holy orders. Priests of the society are given the option of either joining other orders or remaining as secular clergy, under obedience to the ordinaries, who are empowered to grant or withhold from them licences to hear confessions. Sucli of the fathers as are engaged in the work of education are permitted to continue, on condition of abstaining from lax and question-

able doctrines, apt to cause strife and trouble. The question of missions is reserved, and the relaxations granted to the society in such matters as fasting, reciting the hours, and reading heretical books, are withdrawn; while the brief ends with clauscs carefully drawn to bar any legal exceptions that might be taken against its full validity and obligation. It has been neccessary to cite these heads of the brief, because the apologists of the society allege that no motive influenced the pope save the desire of peace at any price, and that he did not believe in the culpability of the fathers. The categorical charges made in the document, and that in the most solemn fashion, rebut this plea. The pope followed up this brief by appointing a congregation of cardinals to take possession of the temporalities of the society, and armed it with summary powers against all who should attempt to retain or con- ceal any of the property. He also threw Lorenzo Ricci, the general, into prison in the castle of St Angelo, where he died in 1775, under the pontificate of Pius VI., who, though not unfavourable to the company, and owing his own advancement to it, dared not release him, probably because his continued imprisonment was made a condition by the powers who enjoyed a right of veto in papal elec- tions. In September 1774 Clement XIV. died after much suffering, and the question has been hotly debated ever since whether poison administercd by the Jesuits was the cause of his death. It is im- possible to decide the doubt, as the opinions and evideuce on each side are nearly balanced. On the one hand, Salicetti, the pope's physician,

denied that the body showed signs of poisoning, and Tanucci, Neapolitan ambassador at Rome, who had a large share in procuring the brief of suppression, entirely acquits the Jesuits, while F. Theiner, no friend to the company, does the like. On the other hand, Scipio de' Ricci, bishop of Pistoia, nephew and heir of the unfortunate general, distinctly charges the Jcsnits with the crime, as also does Cardinal de Bernis; and the report by the Spanish minister to the court of Madrid, printed by De Potter in his Vie et Mémoires de Scipion de Ricct, vol. iii. pp. 151-74, con- tains the noteworthy fact that the date of the pope's death was predicted beforehand, notably in a statement made by the viear- general of Padua to the secretary of the congregation for Jesuit affairs, that several members of the company, believing him to be one of their friends, told him that the pope would die before the end of September.

At the date of this suppression, the company had 41 provinces and 22,589 members, of whom 11,295 were priests. Far from sub- initting to the papal brief, the Jesuits, after some ineffectual attempts at direct resistance, withdrew into the territories of the non-Roman-Catholic sovereigns of Russia and Prussia, Frederick II. and Catherine II., both of them freethinkers, who became their active friends and protectors; and the fathers alleged as a principle, in so far as their theology is concerned, that no papal bull is bind- ing in a state whose sovereign has not approved and authorized its publication and execution. Russia formed the headquarters of the company ; and two forged briefs were speedily circulated, being dated June 9 and June 29, 1774, approving their cstablishment in Russia, and implying the repeal of the brief of suppression. But these are contradicted by the tenor of five genuine briefs, all issued in September of that year to the archbishop of Gnesen, and making certain assurances to the Jesuits, on condition of their complete obedience to the injunctions already laid on them. They also pleaded a verbal approbation by Pius VI., technically known as an Oraculum vive vocis, but no proof of either its existence or its validity is forthcoming.

They elected three Poles successively as generals, taking, how- ever, only the title of vicars, till on March 7, 1801, Pius VII. granted them

liberty to reconstitute themselves in North Russia, and per- mitted Kareu, then vicar, to exercise full authority as general. On July 30, 1804, a similar brief restored the Jesuits in the Two Sicilies, at the express desire of Ferdinand IV., the pope thus anticipating the further action of 1814, when, by the brief Soldici- tudo omnium Ecclcesiarum, he revoked the action of Clement XIV., and formally restored the society to corporate legal existence, yet not only omitted any censure of his predecessor's conduct, but all vindication of the Jesuits from the heavy charges in the bricf Dominus ae Redemptor. In France, even after their expulsion in 1765, they had maintained a precarious footing in the country under the partial disguise and names of " Fathers of the Faith," or "' Clerks of the Sacred Heart," but were obliged by Napoleon I. to retire in 1804. They reappeared under their true name in 1814, and obtained formal licence in 1822, but became the objects of so much hostility that Charles X. deprived them by ordinance of the right of instruction, and obliged all applicants for licences as teachers to make oath that they did not belong to any coin- munity unrecognized by the laws. They were dispersed again by the revolution of July 1830, but soon reappeared, and, though put to much inconvenience during the latter years of Louis Philippe's reign, notably in 1845, maintained their footing, recovered the right to teach freely after the revolution of 1848, and gradually became the leading educational and ecclesiastical power in France, notably under the second empire, till they were once more expelled

since the execution of those measures. In Spain they came back with Ferdinand V1I., but were expelled at the constitutional rising in 1820, returning in 1823, when the duke of Angouléme's army replaced Ferdinand on his throne; they were driven out once more by Espartcro in 1835, and have had no legal position since. In 'Portugal, ranging themselves on the side of Don Miguel, they fell with his cause, and were exiled in 1834. Russia, which had been their warmest patron, drove them from St Petersburg and Moscow in 1818, and from the whole empire in 1820, mainly on the plea of attempted prosclytizing in the imperial army. Holland drove them out in 1816, and, by giving them

thus a valid excuse for aiding the Belgian revolution of 1830, secured them the strong position they have ever since held in Belgium. They were expelled from Switzerland in 1847-48 for the part they had taken in exciting the war of the Sonderbund. In South Germany, inclusive of Austria and Bavaria, their annals since their restoration have been unevent- ful; but in North Germany, owing to the footing Frederick II. had given them in Prussia, they became very powerful, especially in the Rhine provinces, and, gradually moulding the younger genera- tion of clergy after the close of the War of Liberation, succeeded in spreading Ultramontane views amongst them, and so leading up to the difficulties with the civil Government which issued in the Falk laws, and their own expulsion by decree of the German parliament, June 19, 1872. In Great Britain, whither they began to straggle over during the revolutionary troubles at the close of the last century, and where, practically unaffected by the clause directed against them in the Emancipation Act of 1829, their ehicf settlement has been at Stonyhurst in Lancashire, an estate conferred on them by Mr Weld in 1795, they have been un- molested ; but there has been little affinity to the order in the British temperament, and the English province has conse- quently never riseu to numerical or intellectual importance .in the society. In Rome itself, its progress after the restoration was at first slow, and it was not till the reign of Leo XII. (1823-29) that it recovered its place as the chief cducational body there. It advanced steadily under Gregory XVI., and, though it was at first shunned by Pius [X., it secured his entire confidence after his return from Gaeta in 1849, and obtained from him a special brief erecting the staff of its literary journal, the Civilta Cattolica, into a perpetual college uuder the general of the Jesuits, for the purpose of teaching and propagating the-faith in its pages. How, with this pope's support throughout his long reign, and the gradual filling of nearly all the sees of Latin Christendom with bishops of their own selection, they contrived to stamp out the last remains of independ- ence cverywhere, and to crown the Ultramontane triumph with the Vatican decrecs, is matter of familiar knowledge.

The society has been ruled by twenty-two generals and four vicars from its foundation to the present day; and the most notable fact to

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WE Christian religion, besides its natural and spiritual elements, has also an historical element. It believes that, in accordance with a Divine purpose, prophesied at the very dawn of human life, God was manifest in the flesh in the man Christ Jesus. The actual life of Jesus on earth is but the central part of a scheme which, in the belief of Christians, extends through all the ages. Our present object is merely to furnish a brief sketch of that life as it appears in the full light of history, without entering into the numberless collateral questions which it offers for con- sideration, a task which in these limits is obviously im- possible.

I. The word Jesus is the form assumed in Latin by the Greek Jesous, which is the transliterated form of the Hebrew Jehoshua, Jeshua, or Joshua, meaning " Jehovah is salvation." In one or other of its forms the name is found in many passages of the Old Testament. It was not, however, borne by any person who rose to historic eminence between the days of Joshua the son of Nun and the high priest Joshua who was the colleague of Zerubbabel at the return from the exile. The prominent position held by Joshua in the later propheti#books seems to have made the name popular. We find frequent traces of it after the exile.) During the Hellenizing period, which excited so deep an indignation among patriotic Jews, many of the

1 Jos., Ant. xii, 5,1 and 10, 6, xv. 3, 1; Ecclus., prol., 1. 27, &e.

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by the Ferry laws of 1880, though they have been quietly returning ©

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signalize with reference to them is that, of all the various nationa- lities represented in the company, France, its original cradle, has never given it a head, while Spain, Italy, Holland, Belgium, Ger- many, and Poland were allrepresented. The numbers of the society at present are not accurately known, but are estimated at about 6000 in all parts of the world.

The generals ot,the Jesuits have been as follows :—

1. Inigode Loyola, (Spaniard) s2…..<.nueesceatee rae 1541-1556 2.. Diego Jnayner (Spaniard)... . ce -he... sce s-0<: Wn ce eosee 1558-1565 3. Hranciséo Boroial(Spantard)) acceso nes eae eee see 1565-1572 4, Eberhard Mercurian (Belgian) .....!a0 nse sams «02 1578-1580 5. Claudio Acquaviva (Neapolitan).....06. ccscseees 1581-1615 6. Mutio Vitelleschi (Roman)..... b Sreiccna ane 1615-1645 1.» Naneenzio Carattay (Nea olitam)...e-c..000- G20) <- occa 1646-1649 8. Franceseo Piccolomini (Florentine).....60c0008 1649-1651 9. Alessandro Gottofredi (Roman).....cseceeeeeees 1652 10: Goswin Nickell (Germiam)s.....:.5,..0-- see o cere eee 1652-1664 11. Giovanni Paolo Oliva (Genoese) vicar-general and coadjuton, L6G generally. cs. saestoene eee. 1664-1681 12. Charles 'von, Noyelle (Belgian).....2....-.0-20++- 1682-1686 13. Tirso Gonzalezs(Spaniard) ya... waa te ere eee ree 1687-1705 14. Michele Angelo Tamburini (Modenese)..... 1706-1730 15, HranzeRetz (Bolemian)y.....0. eee ee ee 1730-1750 16. Ignazio Viseonta(Milamese) ccc. sess: See - 2 1751-1755 17. Alessandro Centurioni (Genoese).....0::.:0000+0e 1755-1757 18: Worenzo Ricciy(ilorentine)..c.. eee eee ee eee 1758-1775 a. Stanislaus Czerniewicz (Pole), vicar-general....1782-1785 b. Gabriel Lienkiewicz (Pole), nD .. 1785-1798 c. Franciscus Xavier Kareu (Pole), (general in Russia, /cimMareholsO)) eee. se seene ees 1799-1802 dé. Gabriel Gruber (Gevman)*>.....0-0 nsec eee 1802-1805 19. Thaddeus brzozowsic (Bole). nossa sees ee 1805-1820 20, Aloysio' Hortisi(Veromese)) ..).. ae oe:. eee ee ere ee 1820-1829 21. Johannes Roathaan) (Dutelmean) ye. .-es-1— =e eee 1829-1853 22, Peter, J ohamunes, Beckx (Belgiam), ~~.ceeeeeeacceen.~~ cee eee 1853

The bibliography of Jesuitism is of enormous extent, and it is impraetieable to cite more than a few of the most important works. They are as follows:— Instituitum Societatis Jesu,7 vols., Avignon, 1830-38; Orlandini, istoria Societatis Jesu, Antwerp, 1620; Imago Primi Szculi Societatis Jesu, Antwerp, 1640; Nier- emberg, Vida de San Ignacio de Loyola, 9 vols. fol., Madrid, 1645-1736 , Genelli, Life of St Ignatius of Loyola, London, 1872; Baeker, Bibliothéque des Ecrivains

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CHRIST

bearers of the name preferred to adopt the purely Greek analogon Jason,? and the name occurs in this form in the New Testament also.? Later on it became one of the commonest Jewish names which we find in the New Testa- ment,‘ and again and again in Josephus.®> There is some reason for believing that the name of Bar Abbas was also “ Jesus,” although it may have disappeared from the chief manuscripts, partly from feelings of reverence, partly from tlie mistaken fancy of Origen that we find no sinner among all those who had borne the name.® But the name, though common, was meant to be deeply significant of the work for which Jesus was born into the world—namely, to save His people from their sius; and for this reason, in the account of the Annunciation, as given by St Luke (i. 31), His mother is expressly bidden to call her babe by this name.”

21 Maee. viii. 17, xii. 16; 2 Mace. ii. 19, iv. 7; Jos., Ant, xii. 10, 6. The Greek Jason was connected with idowa:, and the Greek fathers by a play on words—of which traces may be found even in the New Testament (Acts ix. 34, x. 838)—connect the name Jesus with the same root (Euseb., Dem. Evang., iv.).

3 Acts xvii. 5; Rom. xvi. 21.

4 Acts xiii. 6, xvii. 5, xviii. 7; Rom. xvi. 21; Col. iv. 11.

5 Jos, Ant., xv. 0,2, xvii. 13, 1, xx. 9,1; 2. J, mt. Oe Bete We ao in. A

5 In MS. S. the reading is said to be found in “ exeeedingly ancient MSS.” It is now chiefly found in some cursive MSS., and the Armenian and Syriac versions. Sce Origen on Matt. xxvii. 16.

7%n Matt. i. 21 the same command is given to Joseph. For the

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On the other hand, tlle word Christ was not originally a name but a title. In the Gospels we scarcely ever read of Christ, but always of ‘“‘the Christ.”2 It was only after the resurrection that the title gradually passed into a name, and “Jesus Christ,” or later still ‘Christ Jesus,” becomes one designation. The Greek word means

“anointed,” and is a translation of the Hebrew “ Messiah.”

The coming Deliverer for whom the Jews had yearned for so many centuries was spoken of as the "anointed one," with special reference to the prophecies of Isaiah (lxi. 1) and Daniel (ix. 24-26), which again referred backward to the language of the Psalms (ii. 2, xx. 6, xlv. 7). The anointing of Jesus was the special outpouring of the Holy Spirit upon Him, not only throughout His life (Acts x. 33), but specially at His baptism (John i. 32). Unction was the recognized mode of consecrating any one to the offices of priest (Ex. xxix. 29; Lev. iv. 3) and king (1 Sam. x. 1, xxiv. 6); and prophets were supposed to be anointed by God's grace for the fulfilment of their task (Isa. lxi. 1). The Messiah combined in His office the threefold dignity. He was a prophet to reveal (John vi. 14; Matt. xii. 57; Luke xiii. 33, xxiv. 19), a king to reign and to judge (Luke xxiii. 2; Acts xvii. 7; 1 Cor. xv. 24; Rev. xv. 3), and a high priest to offer up the sacrifice of Himself (Heb. ii. 17 and passim).

Since these, however, were distinctively Jewish concep- tions, it was natural that theyshould be but little understood by the Greeks and Romans. The word "anointed" con- veyed to them no sacred conceptions, and it was restamped (surfrappé) by them into accordance with their own notions. They fancied that the real name of the founder of the new religion must be Chrestus or ""'excellent,"? and they con- stantly spoke of the Christians as "' Chrestians." Suetonius says that the Jews were expelled from Rome by Claudius because they were raising seditions at the constant instiga- tion of " Chrestus"; and he cared so little to inform himself on the subject that he made no distinction between Jews and Christians, and seems to have imagined that '" Chrestus" was some leader of sedition then living at Rome.* On the other hand the Christians in no wise objected to the mistaken designation. 'If you call us Christians," said Tertullian, " you bear witness to the name of our master ; if you call us 'Chrestians,' you testify to the blamelessness of our lives.'"'5

II. The designation of "the Christ" given to Jesus shows that His followers saw in Him the long-promised Messiah of Judaism; and the rapidity with which the title developed into a name proves the strength and permanence

significance of the name see Ecclus. xlvi. 1, where it is said of Joshua that, "'according to his name, he was made great for the saving of the elect of God."

1 "Non proprium nomen est, sed nuncupatio potestatis et regni,"' Lactant., Div. Inst., iv. 7. * ? The only exceptions are Matt. i. 1, 18, Mark i. 1, John i. 17 (which are all in the headings and prefaces), and John xvii. 8, where we find "Jesus Christ." The only other passages in which the article is omitted before " Christ" in the Gospels are Mark ix. 41, Luke ii. 11, xxill. 2, John ix. 22. Thus Matt. ii. 4is 'where the Christ should be born" ; Matt. xi. 2is 'John hearing in prison the works of the Christ," 1.€., Messianic works; and Matt. xxii. 42 is "what think ye of the Messiah ?" _ > There is a possible allusion to the similar sound of the two words in 1 Pet. ii. 8, 87t xpnards 6b Kdptos.

*The Romans did not fully learn to discriminate Jews from Christians, and to recognize the latter as members of an entirely dis- tinct religion, until the savage attacks upon Cliristians by the Jewish false Messiah Barcochba, in the reign of Hadrian, 132 a.p.

be Xpioriavol yap eivar xarnyopotueba, Td 8& xpnordy mioetobau ov dixcudy, Just. Mart., Apol., i. 4; Adriica of els Xpirrov wemiarevndres Xpnorol re cio nal Aéyovra, Clem. Alex., Strom., ii. 4, §18. Christianus vero… . de unctione deducitur, sed et cum perperam Chrestianus pronunciatur a vobis (nam nec nominis certa est notitia penes vos) de suavitate et benignitate compositum est,'' Tert., Adv. Gentes, ii., comp. Lactantius, Div. Inst., iv.7, 5; Jerome on Gal. v. 22.

of this conviction. And this much at least is conceded by all, that Jesus more than fulfilled the conditions for which the Jews had hoped in the Deliverer of whom so many prophets had spoken, and that He fulfilled them in a manner transcendently wider, deeper, and more permaneut than even the prophets had fully foreseen. Even the most advanced sceptic cannot deny that by His life and teaching He has altered the entire current of human history, and raised the standard of human morality. He was, says Renan, 'the individual who had made the species

take the greatest step towards the divine.”® But as His life was passed and His work accomplished, not in a corner,’ but on the open stage and under the full light of a civilized epoch, it becomes a matter of great importance to estimate the value of the sources from which our knowledge of His life is derived. Those sources are (1) heathen, (2) Jewish, and (3) Christian.

1. The knowledge derivable from heathen sources, if much smaller than we could have desired, or a priori expected, is not smaller than is fully accounted for in the simple and unsophisticated narratives preserved for us by the evangelists and apostles. They show us that Christianity began from the most humble origin, and was regarded by the whole non-Christian world—alike Jewish and pagan— with unconcealed hatred, largely mingled with a contempt which ultimately passed into terror and exasperation. They faithfully record for us the obscure position, the extreme poverty, the persecuted lives, the unlearned training of the apostles, and the disdain to which they were on all sides subjected. The silence of contemporary Centile and Jewish writers, which would be otherwise inexplicable, finds its undesigned explanation in the New Testament itself, which never attempts to conceal the contemptuous indignation of the Jewish aristocracy, and the lordly in- difference of the higher Gentile authorities.

Accordingly, from heathen writers we do not learn a single new fact respecting Jesus Christ, while yet all that they do tell us, even when expressed in language of calumny and abhorrence, proves the historical reality of the facts which the Gospels record. If it be true that Napoleon once asked Herder whether Jesus ever lived at all, such a passing phase of incredulity is so perfectly un- reasonable that it has long been abandoned even by the most destructive critics, Whether there ever existed any authentic census tables of Quirinius, or any official report of Pilate to the emperor Tiberius or not,’ Tacitus tells us with perfect accuracy that the founder of Christianity had been put to death in the reign of Tiberius by the procu- rator Pontius Pilate, and that his religion, which Tacitus calls a “deadly superstition,” “though crushed for a time, burst forth again, not only throughout Judea, in which it sprung up, but even in Rome, the common reservoir for all the streams

of wickedness and infamy.” He further tells us that Nero diverted from himself the odium of the burning of Rome by charging the crime upon the Christians ; and, though he implies that their fate was not undeserved because of their universal misanthropy, he yet honestly admits that they were not guilty of this crime of incendi- arism, on pretence of which they were subjected to the most awful forms of martyrdom.? Itis clear that Tacitus, in common with all his contemporaries, confounded the Christians with the Jews, only regarding them as being Jews whose belief was more than usually abject. How littie information could be expected from this eminent historian appears from the credulity with which he accepted

8 Vie de Jésus, p. 457. 7 Acts xxvi. 26.

8 A writing called “the Acts of Pilate” existed in the 2d century (Justin, Apol., i. 35), and long continued to be used in heathen schools to warn boys against the belief of the Christians (Euseb., H. Z., 1. 9, be BE – 9 Tac., Ann., xv. 44,

the most foolish legends and calumnies about the origin and early history even of the Jews.! His contemporary Suetonius evidently held the same opinions. He seems to regard Nero as a public benefactor because he punished the Christians, ‘a class of men of a strange and pestilent superstition.”2 In his life of Claudius, as we have already seen, he ignorantly confuses Christ with some Chrestus whom he supposes to have been at that time living at Rome. From the younger Pliny, who wrote to the emperor Trajan for advice how to deal with Christians,* we learn the valuable fact that they lived lives confessedly innoceut, since he was unable to establish against them any crime beyond that of the belief which, like his contem- poraries, he regarded as a perverse and extravagant super- stition. We learn also from this celebrated letter that nothiug could shake the allegiance of Christians to Christ, and that they were accustomed to meet early in the morn- ing to celebrate Him as God with hymns of praise. Later in the 2d century the scoffer

Lucian, in his Death of Pere- grinus, and his Philopsewdes,> spoke with bittcr sneers both of Christ and Christians. He alludes to the fact of the crucifixion of Christ, to His miracles, to the mutual love and help which prevailed among His followers, and their belief in Him as a divine person. Passing over the asserted allusions to Christ by Numenius,® to His parables in Galerius, and to the earthquake at the crucifixion in Phlegon,'? we come to the "True Word" ® of Celsus the Platonist, towards the close of the second century. We only know this by the quotations and refutation of Origen, but it furnishes us with indisputable testimony that in his day the facts of the Gospels from first to last were

current in the exact form in which we now possess them |

(see CeLsus). Thus, from the scanty notices of heathens even, we can derive a confirmation of the main external facts in the life of Christ :— His miracles, His parables, His cruci- fixion, His claim to divine honour, the devotion, innocence, heroic constancy, and mutual affection of His followers, and the progressive victorics won by His religion in despite of overwhelming opposition alike physical and intellectual.

2. From Jewish writers we can glean similar confirmation of the gospel story. Philo indeed is silent. The legends preserved by Eusebius®?— that Philo had met St Peter in Rome during his mission to the emperor Caius, and that

iu his book on the contemplative life he is describing not |

the life of the Essenes and Therapeutz, but those of the Christian church in Alexandria founded by St Mark !°—are valueless. It is extremely probable that Philo had scarcely heard either of Christ or of the Christians." He died after 40 a.p., but at that period Christianity had hardly emerged into the recognition claimed by prominent historical pheno- mena. The writings of Philo are valuable, not for any light which they throw on the gospel histories, but for the evidence which they afford of prevalent modes of thought and phraseology, in which some even of the apostles shared. When, however, we turn to Josephus, we find in his writ- ings, as now extant, no less than three

allusions to events in the gospel history. It cannot be decided with certainty whether two of these passages are genuine as they now stand, but modern opinion tends to the view that in each of the actual allusions to Jesus there is a genuine basis with later Christian interpolations. The passage in which

1[ac., Hist., v. 8, 4. 2 Suet., Vero, 16.

3 Suet., Claud., 16. 4 Pliny, Hp., x. 97, 98.

5 See Philops., §§ 18, 16, which have been thought to imply ridi- cule of Christian miracles.

8 In Origen, Cont. Cels., iv. 51. 7 Ibid., 11.14.

8 Adyos aAnbhs. ® Euseb., WZ. H., ii. 4. ~ 10 See also Photius, Bibl., cod. ev.; Jerome, Cat. Script. Eccl.; and Suidas.

11 Philo only mentions a single visit which he paid to Jerusalem (in a fragment ap. Euseb., Prep. Evang., viii. 14).

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lie speaks of the preaching and execution of John the Baptist is not disputed,!? and it is very important as show- ing that Josephus must have becn perfectly well acquainted with the facts of Christ's life, and that he has passed them over, in his usual unscrupulous way, with a reticence due only to dislike or perplexity. Forin speaking of St John's preaching he deliberately, and it must be feared dishonestly, excludes the Messianic element from which it derived its main power and significance. In another passage he mentions with strong disapproval the judicial murder by the younger Annas of James the Just, "the brother of Jesus, called the Christ."!°> The passage was early tampered with by Christian interpolators who wished to make it a more emphatic testimony in favour of Christ, but in its present form its genuineness is undisputed.'* Respecting the third passage, in which

Josephus speaks directly of Jesus, the only question is whether it be partly or entirely spurious. Placing in brackets the words which are undoubtedly inter- polated, it runs as follows :—

At this time appeared a certain > Jesus, a wise man [if indeed He may be called a man, for He was a worker of miracles, a teacher of such men as receive the truth with joy], and Hc drew to himself many Jews [and many also of the Greeks. This was the Christ]. And when at the instigation of our chief men Pilate condemned Him to the cross, those who had first loved Him did not fall away. [For He appeared to them alive again on the third day, according as the holy prophets had declared this and countless other marvels of Him.] To this day the scct of Christians, called after Him, still exists." 16 That Josephus wrote the whole passage as it now stands no sane critic can believe. Vespasian, not Jesus, was the Messiah of the "ambiguous oracle" of that apostate Jew.!' There are, however, two reasons which are alone sufficient to prove that the whole passage is spurious,—one that it was unknown to Origen and the earlier fathers, the other that its place in the text is uncertain. It is now found after the historian's notices of Pilate, but the remarks of Eusebius show that in his time it was found before them.® We must conclude then that Josephus preserved a politic silence respecting Christ and the Christians, confining himself to remote allusions; and this was quite possible, because he was writing mainly for Greeks and Romans who were profoundly ignorant of the whole subject. That Josephus knew a great deal more than he chose to say is evident. There is reason to suspect that his account of his own juvenile precocity before the leading teachers of his nation is borrowed from the Gospels, and that his account of his shipwreck on the journey to Rome is not uncoloured by the facts of St Paul's shipwreck about that very time? But the most striking indication of his hostile reticence is found in the chapter of his Antiquities which follows the supposed allusion to Jesus.2! He there breaks his narrative in the most arbitrary manner to drag in a disgusting story of a trick played by the priests of Isis on a Roman lady; and no one who is acquainted with the Jewish calumnies about the incamation can doubt that in this story we have an oblique and malignant an- ticipation of the falsehood which ultimately took

form in the Talmud and the anti-Christian writings of the later Jews. From other Jewish sources not a single fact about Jesus

can be gleaned. In the unexpurgated editions of the nee ee ee

12 Jos., Ant., xviii. 5, 2. 13 Ant., xx. 9, 1.

14 Origen, C. Cels., i. 47; Euseb., H. #., ii. 23.

15 “Ingods tis is the reading in Euseb., i. 11; and, if the passage be genuine at all, there can be no doubt that this is the true reading.

IGWA Mts, EXVlller Mme:

17 Jos., B. J., vi. 5, 4,—a passage which, as Hausrath says (Weulest. Zeitgesch., iv. § 4), must have been penned at a peculiarly shameless hour.

18 Huseb., ii. 6.

WO ili, OD.

See Keim, Jesu von Nazara, i. 2D Vita 3: “1 Ant., xvill. 3, 4.

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Talmud there are about twenty allusions to Christ and the Christians characterized by intense hatred. He is usually spoken of indirectly as “that man,” “the Nazarene,” “the fool,” ‘“ Absalom,” “the hung,” “the son of Stada,” “the son of Pandera.” Many allusions to Him are veiled in cryptographs of which the key is in the possession of but few. All the grossest fictions respecting him—that He was a seducer (mesith) who had learned magic in Egypt, and had been excommunicated by Rabbi Joshua ben Perachia in the reign of Alexander Jannzeus (nearly a century before His birth !), and that He was crucified at Lydda, because no one, during forty days, came forward to give any evidence in His favour—are collected in a miserable Jewish tract called the Zoldoth Jeshu, which may be consigned to oblivion, because even the Jews now regard it with con- tempt and shame.! It is, however,

remarkable that from these intensely embittered Jewish sources we derive an absolute confirmation of Christ's stay in Egypt, of His Davidie descent,? of His miracles, of His disciples, of His excommunication by the Sanhedrin, of His crucifixion on the evening before the Passover, and even of His innocence, —for not a single crime but that of working miracles by magic, and claiming divine honour, is, even in these sources, laid to His charge. And thus even from pagan and Jewish enemies we derive all that we want and all that we could expect in the recognition of the historic personality of Christ, and of the chief facts in His outward life.

3. If we had nothing to help us but these allusions, the two great facts of Christianity and Christendom would be an inexplicable enigma. In the Christian sources of information al] becomes intelligible. Of these. we may dismiss for practical purposes all but the New Testament. From the fathers we derive surprisingly little A few sayings—of which some are very dubious,? and of which the most valuable are only variations of those in the Gospels— and one or two highly uncertain incidents,' are all that we can glean from them. The Apocryphal Gospels help us still less. They are for the most part heavy fictions, the inventions of an indiscriminate curiosity, often grossly heretical, abounding in coarsely-conceived and even pernicious miracles, and dwelling chiefly on imaginary details of the nativity, the infancy, or the last scenes.® Their chief value is to set forth by contrast the immeasur- able superiority of the canonical Gospels, by showing us what these also might have been if they had been the products of human invention. But it is not the Gospels alone on which we have to depend. We have four works of which the authenticity has never even been assailed by any serious writer, namely, St Paul's four epistles to the Galatians, Romans, and Corinthians. These may truly be regarded as a fifth Gospel, of which the testimony is all the nore valuable because it is undesigned and incidental. It is also earlier than that of any Gospel, and is the testimony of one whose personality stands forth with absolute clear-ness in the light of history. Further than this, it is the

1 See Gritz, iii, 243; Jost, Gesch. des Judenth., i. 405, 414; Wagenseil, Tela Ignea Satane (where it is published with a transla- tion);

Schéttgen, Hor. Ied., ii. 697.

- **Sanhedr., 43, 1, See Derenbourg, L' Hist. de la Palestine, p. 349 ; Farrar, Life of Christ, Exc. ii. (vol. ii. p. 475).**

1. **These are collected in Fabricins, Cod. Apoe., i. 322 sq. ; Hoffmann, Leben Jesu naeh d. Apokryphen, 317-329 ; Westcott, Introduction to the Gospels, Append. C; and Farrar, Life of Christ, ii. 499.**

4 H.g., that the nativity took place in a cave; that a fire was kindled in Jordan at the time of Christ's baptism ; that the vilest sinners were chosen as apostles ; that there was astutue at Paneas of the woman with the issue of blood, &c.

® They are collected by Fabricius, Cod. Apoc. NV. T., 1743; Thilo,

~ Cod. Apoc. N. T., 1832; and Tischendorf, Hv. Apoeryph., 1853. They have been excellently translated by Mr B. Harris Cooper (The Apoeryphal Gospels), and Hoffmann has written the life of Jesus as represented in these late and worthless forgeries (Das Leben Jesu nach d. Apokryphen, 1851).

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testimony of a man of commanding intellect, and of the highest Jewish culture, who, after the death of Christ, was converted from the most bitter hostility to the most intense devotion, and who bears his witness within twenty- five years of the events respecting which he speaks. And yet, if we had the epistles of St Paul alone, we could find a contemporary testimony to almost every single fact of primary importance in the life of Christ,—His birth of the seed of David, His poverty, His Messiahship, His moral teaching, His proclamation of the kingdom of God, His calling of the apostles, His supernatural power, His divine claims, His betrayal, His founding of the Last Supper, His passion, crucifixion, burial, resurrection, and repeated appearances.® If we add the testimony of the other epistles, we have further

testimonies to almost every fact of import- ance in the Gospels, as we have also in the catholic epistles and in the Revelation of St John.

It is, however, from the Gospels that our fullest light is derived. They are not, aud do not profess to be, full biographies written for the gratification of curiosity, but they preserve for us all that is necessary to explain the In the first tree Gospels, called Synoptic, we have sketches of the life and teaching of Christ of which the latest was probably written within forty years of the crucifixion. No one has ever denied that the representation of Christ in these three Gospels is essentially the same. The view of Him presented in the Fourth Gospel, which was not published till towards the close of the Ist century, is more subjective. It is the spiritual Gospel, the Gospel for the church, and even those critics who deny its Johan- nine authorship admit its value as a very ancient document written by a Jewish Christian of extraordinary genius who had access to the most valuable sources of contemporary information.

Iil. Since, then, it may be regarded as a truth for which the close investigations of historical criticism have only secured more universal admission that the life of Jesus was a life of which the main outlines are historically certain, we must now glance at its chronology and duration.

It must be adinitted that we cannot demonstrate the exact year of the nativity, but critics of all schools are verging more and more towards the acceptance of 4 B.c. as the probable year of Christ's birth. Our present era was fixed (525 a.D.) by a learned Scythian, Dionysius Exiguus, who was an abbot at Rome, and died about 550; but it is now admitted to be erroneous by at least four years. Many methods have been adopted to arrive at the true date; but all attempts to fix it by the enrolment of Quirinius, the order of the Jewish courses of priests, the consulships mentioned by Tertullian, and the extremely remarkable astronomical conjunction of Mars, Jupiter, and Saturn in Pisces in the spring of a.v.c. 748," have led to nothing but highly dubious results. We are left with two data which furnish us with an approximation to the accu- rate date. One of these is the death of Herod the Great. Josephus tells us that he died thirty-seven years after he had been declared king

by the Romans.* Now this took place a.u.c. 714, and therefore—by the Jewish mode of reckoning the year from Nisan to Nisan, and counting fractional parts of a year as a whole year—he must have died between 4 B.c and 3 B.c. Further, we know that there was an eclipse of the moon on March 12, 4 B.c., on which night Herod ordered some Jewish rabbis to be burnt

6 See Rom. i. 3, 4, v. 12, viii. 2, 8, 32, ix. 5, xv. 8; Gal. ii. ss iii. 13, iv. 4, v. 21; 1 Cor. vi. 9, vii. 10, xi. 25, xv. passim ; 2 Cor. iii. 17, iv. 4, xii. 12, xiii. 4, &e. See Stanley's Corinthians, pp. 580-589.

7 As calculated by Kepler. According to more recent investigations it occurred in A.U.c. 747.

for urging their pupils to destroy his golden eagle,! and that he was dead before the passover which took place on April 12, 4 3.c.2 Christ must therefore have been born before February, 4 Bc. Again, St Luke tells us that John the Baptist began to preach in the fifteenth year of Tiberius, and as the reign of Tiberius was usually reckoned in the provinces from the date of his association with Augustus in the empire, this gives us a.U.c. 780 for the baptism of John, at which period Jesus was about thirty years old. As to the day and month of the nativity it is certain that they can never be recovered; they were abso- lutely unknown to the early fathers, and there is scarcely one month in the year which has not been fixed upon as probable by modern critics The date now observed—December 25—cannot be traced further back than the middle of the 4th century, but was adopted by St Jerome, St Augustine, Orosius, and Sulpicius Severus, and in the East by St Chrysostom and St Gregory of Nyssa. If 4 B.c. be accepted as the date for the nativity, which has most pro- bability in its favour, the question of the date of the crucifixion depends mainly on that of the duration of the ministry. Now on this point the data of the evangelists have been disturbed by a prevalent early tradition that Christ's public ministry only lasted one year, and by another tradition that Jesus did not dic till

the age of fifty. The first of these notions is a mistaken inference drawn by Clement of Alexandria,® Origen, and other fathers, as also by the Valentinians, from Luke iv. 15; and it was by no means universal even in early days, for Irenzeus' says that Christ taught for three years. The othcr notion was a mistaken inference from John vill. 57. That both views are mistakes appcars from the positive testimony of St Luke that Jesus was about thirty years old when he began His ministry, and from the clear indications given by St John (ii, 13, vi. 4, xi. 55) that there were at least three passovers during the public ministry. On other grounds it is probable that there was one passover during the ministry which our Lord did not attend ; and if so, we see the grounds for the ancient tradition that His public preaching lasted upwards of three years, and that Jesus died at the age of thirty-three.® He died during the rcign of Tiberius, the procuratorship of Pontius Pilate, the tetrarchate of Antipas, and the high priesthood of

Joseph Caiaphas. Now Tiberius died on March 16, 37 a.p.,

and Pilate ceased to be procurator before, and Caiaphas to be high priest immediately after, the passover of 36 A.D. ; the date therefore cannot be later than 35 a.p. We may set aside dubious considerations derived from the allusion to an eclipse and earthquake by the pagan historian Phlegon, and may regard it as highly probable that the crucifixion took place at the passover of March 30 a.p.° IV. The circumstances of the nativity are only related by St Matthew and St Luke, and by each of them in a manner so absolutely independent that facts known to the one may

1 Ant., xvii. 6, 4. 2 Thid., xvii. 8, 4. 3 Luke iii, 23.

4 Eiol 5& of mepiepydrepoy TH yevére: Tod SwThpos huav od pdvov ae GAAG Kal thy nudpay mpootiberyres, Clem. Alex., Strom., i. 21,

>See Keim, Jesu von Nazara, i. 410; Gieseler, Kirchengesch., i. § 20; and on the whole subject Wieseler, Chron. Synops., 1843; Ideler, Chronolog., ii.; Zumpt, Geburtsjahr Christi, 1869 ; Caspari, Chronol.~~Geogr. Einleit., 1869 ; Sanclemente, De vulg. xre% emenda~~

tione, 1798. Miinter, Wurm, Auger, Piper, and many others have devoted special works to this subject.

6 Clem, Alex., Strom., i., xxi., § 145; Origen, De Princip., iv. 5 (but eompare C Cels., li. 897 ; and on Matt. xxiv. 15); Tert., C. Jud., 8; Lact., Inst. Div., iv. 10; Aug., De Civ. Det, xviti. 54.

7 Tren., Her., ii. 38, 89; and so too Melito, St Hippolytus, St Jerome, &c.

® Hippolytus on Dan. iv. ; Euseb., HW. #., i. 10; Theodoret and Jerome on Dan, ix. 27. :

9 Sevin, Chronol. d. Leb. Jesu, 23; Keim, Jesu von Nazara, iii.

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have been unknown to the other. There is no difficulty in reconciling their fragmentary intimations if we suppose that Nazareth was the native place of Joseph and Mary, and that there the coming nativity was announced to the Virgin, but that the exigences of the enrolment undertaken by Quirinius for imperial purposes required Joseph to regis- ter his name at Bethlehem, the native town of David, from whom both he and, probably, his espoused wife were descended. !©

Assuining that there was an enrolment of Quirinius in 4 B.c., the difficulties which have been raised about the registration taking place at the home of the family and not at the place of residence

are @ priori objections which have but little weight against testi-

mony. The Jews clung to their genealogies and tribal relations, and in consequence of the settled habits of Oriental life most fami- les would be naturally resident at their native place. The incon- venience to those who were not resident would be but slight in comparison with the danger of exciting tumults by needlessly forcing the Roman methods of registration on a reluctant people. The sinallness of Palestine, and the

regular custom of attending a yearly passover, would tend to minimize any inconvenience ; and, if the attendanee of Mary was not obligatory (which is uncertain), nothing is more natural than that at such a time of trial and danger she should have accompanied the only person who could protect her.

| Those who charge St Luke with a gross chronological error in ante-

dating by ten years the registration of Quirinius shonld remember that in every other instanee in which his statements have been ehallenged on grounds open to historic decision his accuracy has been triumphantly vindicated.1!_ And since the celebrated treatise of A. W. Zumpt (Das Geburtsjahr Christi, 1869) it has been all but demonstrated that Quirinius—although the fact is not distinctly mentioned by any ancient author—was twice legate of Syria, viz., A.U.0. 750-753 and again A.u.c. 760-765. Neither the sneers nor the attacks of critics have in the slightest degree shaken this probability; and, since Justin Martyr appeals to the eensus table of Quirinius, and Tertullian to those of Sentius Saturninus,}? there is no critical unlikelihood in the conjecture that the census may have been ordered by Sentius Saturninus, begun by Publ. Sulpic. Quirinins during his first term of office as legate of Syria, and completed during his second.

V. It is not of course our object to narrate or even to touch upon all the events and teachings which occupy the four Gospels, but only to glance at their general bearing. The life of Jesus naturally falls into five epochs :—(1) the infancy and childhood ; (2) the youth and early manhood ; (3) the public ministry, including (4) the closing scenes and crucifixion, and (5) the resurrection and ascension. These epochs are well marked in the Gospels.

1. The two who alone preserve for us any details of the infancy and childhood are St Matthew and St Luke, and they relate four events. Of these the circumcision and the presentation in the temple present no difficulties. The circumcision, at which the name was always publicly given, took place on the eighth day after the birth, and was per- formed in the presence of the nearest friends. It illustrated the truths that Christ was “born under the law ” which he came “ not to destroy but to

fulfil.” Thirty-three days after the circumcision was the purification in the temple, and St Luke tells us how the aged Simeon and Anna welcomed the infant Saviour with words of prophecy. The third event, the visit of the Magi, is known as the Epiphany or manifestation of Christ to the Gentiles.

It rests on the sole authority of St Matthew, but there is no feature in his account which is out of keeping with known events and possibilities. The Magi, Persian or Chaldean astrologers, were a class extremely common at that epoch, and under different names are repeatedly mentioned by the contemporary historians and satirists.13 That they were accustomed to wander to various countries, and to interest themselves in horoscopes, we know from the story of Diogenes Laertius that a Syrian magus had foretold his aN AUC IT TOL LO A

10 The deseent of Mary from David is implied in the New Testa- ment (Acts ii 36, xiii, 23; Rom. i. 3; Luke i, 32), and traditionally asserted by Justin Martyr and Ireneus.

11 Such are the tetrarehs of Abilene, the ethnarchs under Aretas, the “asiarchs” of Ephesus, the “pretors” of Philippi, the “ politarchs of Thessalonica, the “protos” of Malta, the “ propretor’” of Cyprus, the “proconsul”’ of Achaia, the Italian band, and many more.

12 Ado. Ware: v. 19: 13 Magi, Chaldwi, mathematici, &ce.

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death to Socrates,! and from Sencca’s statement that magi, “ who then chanced to be at Athens,” had visited the tomb of Plato and offered incense to him as toa divine being.? That they should have been deeply interested in any sidereal phenomenon is in accord- auce with what we know of their studies, and that a sidereal phenomenon of the rarest kind,* and one which by the recognized rules of astrology was of stupendous significanee, actually did occur at this very epoch we know by the independent and, so to speak, accidental investigations of the great Kepler.4 The conjunction of planets which occurred on December 17, 1613, was followed the next year by the appearance of a new

evanescent star of the first imagni- tude in the foot of Ophiuchus, which first attracted the notice of Kepler's pupil Brunowski, and continued to shinc for a whole year. Such a phenomenon may have some bearing on the "star of the wise men," although taken alone it will not minutely correspond with the language of St Matthew. But that such an astrological event would naturally turn the thoughts of these Chaldxans to some great birth, and that its occurrence in the sign of the zodiac which astrology connected with the fortuncs of Juda should turn their iuquiries thitherward, is again in accordance with the tension of Messianic expectations in those days, which especially affected the East, but which has left deep tracos even on the pages of Roman writers. Again, the answer of the Jewish rabbis to these inquirers is in exact accordance with their own anticipa- tions.

The sequel of the story—Herod's jealousy and the massacre of the innocents—has been mainly doubted because it is not mentioned in Josephus. But there must have been hundreds of events of that day of which the Jewish historian has taken no notice, though they were far more sanguinary than the murder of a handful of infants in a little village. The act eorresponds to the jealousy and cruelty which were the master passions of the Idumzan usurper, and, if Josephus here follows Nicolaus of Damascus, we may be quite sure that he would not have mentioned a fact so damaging to the character of his patron. There are, however, two allusions in Josephus, which, if they do not specifically indicate this event, yet may well allude to it, or at least show how eonsonant it was with Herod's impulses.' Further, Macrobius speaks of "the boys under two years of age (comp. Matt. ii. 16) whom Herod ordered to be slain in Syria," and, although he confuses this with the sentence upon Herod's sons, of whom Antipater was executed within five days of Herod's death, his words may well point to the murder of the children of Bethlehem.8 Thus, while this event is not recognizable in other histories, it meets with unexpected confirmations of its possibility from many quarters. That Joseph should have fled with Mary and the child into Egypt was exactly what would have been done by every Jew similarly circumstanced. Three days journey, as far as the Wady Rhinocolura, would have placed the fugitives beyond the reach of Herod's jurisdiction.

The sojourn of the holy family in Egypt was probably very short, nor indeed would there have been any tempta- tion to stay a day longer than was necessary. Joseph's first intention was to return to Bethlehem when the news that Herod the Great was dead seemed to open the pro- spect of happier times. But when he was met on the way by the intelligence that Judza had fallen by his father's

1 Diog. Laert., ii. 45. 2Sen., Hp. 58.

3 The conjunction of the three planets in the same constellation of the same trigon only occurs once in 794 ycars. ;

4 He found that the three planets Jupiter, Mars, and Saturn had been conjoined in Pisees in a.v.0. 748, De nova stella in pede Serpentarit, 1606 ; Ideler, Chronol., ii. 406; Miinter, Stern der Weisen, 1827 ; Pfaff, Das Licht und die Weltgegenden, 1821.

5 According to the Chinese astronomical tables, if Wieseler's account of them (Chronol., p. 61) can be relied on, a new star actually did appear in the heavens at this very epoch.

® Virgil, Zcl., ix. 47; Sueton., Vespas., 4; Tac., Hist., v. 13; Ja, By J., vi. 5, 4.

7 Jos., Ant., xvi. 11, 7, where he speaks of Pharisees and others massacred for a prediction that Herod's posterity should not enjoy his crown ; and xvii, 2, 4, where he speaks of a clamour of " the mothers (comp. Matt. ii, 18) of those who had been slain by him."

8 Macrob., Saturnal., ii. 4.

will to the share of the cruel Archelaus® he was afraid to establish himself so near to the palace of that jealous tyrant, and "retired" (dvexépyoev) to tle mountain seclusion of remote and despised Nazareth. How deep was the impression which these events had made on the memory of the pcople, and how little likely it was that a con-

temporary evangelist could fall into a mistake about tliem, is shown by the fact, which has only recently been noticed, that fully thirty years afterwards Jesus made the events which happened at the succession of Archelaus even in minute particulars the groundwork of a striking parable.!

2. At Nazareth He who, even as a mere matter of history, was to influence for ever the entire development of human civilization grew up in extreme seclusion. A single anecdote and two or three incidental expressions comprise every glimpse of Him which we can obtain. We learn that " He was subject to His parents "11 at Nazareth ; that "He grew and waxed strong in spirit, filled with wisdom, and the grace of God was upon Him" ;!? that "He gradu- ally advanced (zpocxorre) in wisdom and stature, and in favour with God and man." 3 We further learn that He was not subjected to the training of any of the rabbinic schools. He had never learned that complicated system of oral tradition which was known by the Jews as " letters." !4 It is doubtful whether the schools which afterwards became common existed at this early period in country villages. Schools for infants are said to have been first founded by tlie son of Gamaliel, but possibly by this time the custom had begun of employing the scribes and lower officers of the synagogue (chazzanim) to teach the boys of each village. We can trace proofs that Jesus was wonderfully familiar with the sights and sounds of nature, as well as with the habits of men of all classes, for He drew His . illustrations in abundance from both sources. It is also certain that He knew both Greek and Aramaic, which were at that time universally spoken throughout Palestine ; and there are slight indications that He was acquainted with Latin and with Hebrew, though the latter had now become a dead and learned language. We also find that He was acquainted with the then by no means common art of writing. It is eertain that in His home He must, like other Jewish children, have learned first the Shema' (Deut. vi. 4), then the Hallel (Psalms exiv. to cxviii.), and then the Scriptures generally, to all parts of which, and especially to the Psalms and prophetic books, He constantly referred. The certainty that He never passed through the ordinary training of the learned classes nullifies the sugges- tion that any part of His wisdom was borrowed from such writers as Philo and such rabbis as

Hillel and Shammai. His methods and His whole moral eonception difter funda- mentally from those of the Alexandrian philosopher and the Jerusalem Pharisees. His teachers, humanly speaking, were the books of God,—the books of Scripture, of nature, and of life,—and the voice of God within His soul.

At the age of twelve a Jewish boy was held to have finished the elementary stages of his education, and beeame a "son of the law." At this age He was presented by His father in the synagogue, began to wear the phylacteries, learnt a trade for His own support, and "advanced," as the Jews phrased it, from the study of the Scriptures to

9 St Matthew uses the word BaciAevet, and Archelaus, having been saluted "king" by the army, actually did wear that title for a short time after his father's death (Jos., B. J., ii, 1, § 15 Anté., xvii. 9, § 2) until Augustus ordered him to be called only " ethnarch."

10 'Phe * parable of the pounds," Luke xix. 11-27. St Luke does not himself allude to the fact that this parable is a veiled sketch of what had happened to the ethnarch thirty years before, and that the cir- cumstance may well have been recalled to the memory alike of the Speaker and the hearers by the vicinity of the splendid palace which Archelaus had built at Jericho (see Jos., Ant., xvii. 18, §§ 1, AN

H Luke ii. 51. 12 Luke ii. 40. 13 Luke ii. 52. 14 Mark vi. 2; John vi. 42, vii, 15.

that of the oral law. At this age Josepli and Mary took Jesus for the first time to Jerusalem, and there occurred the memorable incident of the temporary loss of Hin by Ilis mother and Joseph, and their discovery of Him in the Temple seated among the doctors, " both hearing, and asking them questions." His answer to the astonished

inquiry "' Why dost thou treat us thus?" was, " Why is it |

that ye looked for me?”; “ Did ye not know that I must be in my Father’s house?”! These are His first recorded words, and their beauty and simplicity give them such a stamp of truthfulness as no art could imitate. They are the first gleam of that character and personality which has

transcended anything of which the world has had any |

experience during all the former or subsequent ages. The evangelists record no further particulars of these early years.

Of the remaining life of Jesus during the period be- tween this visit to Jerusalem and His baptism one word alone remains tous. It isin the question, ‘Is not this the carpenter?”? in Mark. vi. 3. It shows us that these eighteen years of youth and opening manhood were spent, not only in the obscurity of a despised provincial village, bnt also in the manual toils of a humble trade? It shows us that Jesus worked with His hands for His own support, and that of His mother and brethren.

expected in the life of Him whom Christians adore as the Son of God and the Saviour of the world, that we once more see the faithfulness of the narrators, who do not attempt to break by unauthorized inventions the deep silence of those long unknown years in which He conse- crated the common lot of toil and poverty, and thereby

showed the inherent dignity of manhood and the intrinsic |

sacredness of human life.

3. Before entering on the third epoch of the life of Jesus,—the baptism and public ministry,—we must pause for a moment to touch on the political and religious aspect of the world during the brief period of Ilis Messianic activity.

Politically the world was passing through a bad epoch. Rome under the emperors, as she attained the zenith of her apparent power and splendour, sank almost to the nadir of her real degradation. The genius of Julius Cesar, the astute policy of Augustus, could not delay the ever-

deepening degeneracy which revealed itself in its worst |

colours in the reign of Tiberius. The condition of the Roman world during the later years of Tiberius, when he was hiding at Capres, the infamies of his sanguinary lust, was that condition of terror and despair which Tacitus has portrayed with such unequalled power. The words in which he describes the characteristics of a somewhat later period apply also to this ; it was "rich in disasters, terrible in battles, rent by scditions, savage even in its peace."4 The murder of princes, the outbreaks of rebellion and civil war, the prevalence of alarming rumours, the decimation of the noblest families by means of spies and informers, the con- flagrations of temples and citics, the oppression of provinces by the greed and cruelty of legates and procurators, the horrible degradation of private morals, the awful tragedies of irapurity and bloodshed which were enacted in varions

of famines, storms, and earthquakes, combined to render a

1 Luke ii. 49. This and not "about my Father's business" is the correct rendering of év trois tod matpés pov, as has been conclusively proved in an unpublished paper of Dr Field. See the present writer's St Luke (in Cambr. Bibl. for schools) ad loc.

2 This is the true reading, though a false feeling of reverence and a wrong dogmatic bias have led the cdpyists of the later MSS. to alter it into '*the son of the carpenter." ; |

3 Justin, C. Tryph., 88, says that He specially made '* ploughs and yokes," eellachmiyise.. 1982

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the early years of the Christian era a period of gloom and anguish throughout large portions of the Roman empire. Judwa was tlie scene of special miseries, because it groaned under the ruthless and hypocritic tyranny of Idumean usurpers.

Meanwhile the religious condition of the world and of the nation was no less unsatisfactory. Throughout the Roman e1apire the belief in the popular mythology had died away, and, while a few of the noblest spirits took refuge in the hard and despairing dogmas of Stoicism, the mass of the people was plunged in practical atheism or abject superstition. Such religion as there was among the people usually took the form of Egyptian and Phrygian worships, which were often connected with the vilest immorality. In Juda the dominant religion consisted in scrupulous devotion to the petty external ordinances of the oral law.

Thus at the epoch of Chirist's birth the heathen world had sunk into practical atheism, and the Jewish world was deeply corroded by formalism and hypocrisy. In the heathen world religion had almost ceased to exist ; in the Jewish world it was tainted at its source.

It was no doubt due tothe darkness of the religious and

| political horizon, and to the sense of despair and weariness The fact is so | entirely unlike anything which we should a prior? have |

which was prevalent in the hearts alike of Jews and Gentiles, that the Messianic hope, fostered by generations of prophets, gained a powerful hold on the hearts of all sincere Israelites, and even found its expression in secular literature. Virgil, Tacitus, and Suetonius, no Jess than Josephus, show that the thoughts of the civilized world were turned to the East in expectation of some great deliverer. But the character of their hope was utterly mistaken. Overlooking the prophetic passages which told of a suffering Messiah, a servant of Jehovah, who should bear the sorrows of His people, the Jews were anticipating the advent of some temporal sovereign who would rule their enemies with a rod of iron, and dash them in pieces like a potter's vessel, while He raised Isracl to the summit of earthly prosperity and luxury. The Messiah, the son of David, was to be a conqueriug warrior, which accounts for the grossly unspiritual conceptions which induced one party to represent Herod as the promised Messiah, and which enabled Josephus to pretend that he found a ful- filment of the Messianic prophecics in the

elevation to the empire of Vespasian, the bourgeois soldier who had crushed his country under the iron heel of the Roman legionaries.

At this time of extreme trouble and expectation the Baptist began his preaching, It was confessedly prepara- tory. The coming of the Messiah was always declared to depend on the "righteousness" of the nation, that is—in ordinary Jewish phraseology—their rigid observance of the Mosaic law. But John saw that what was needful was morality, not legalism, and his ery "Repent ye, for the kingdom of heaven is at hand," was explained to each of the great classes which applied to him for advice by practical directions as to their daily duties. John created an intense though transitory impression by his dress and appearance, which recalled the memory of ancient prophets,

/and specially of Elijah, and still more by the burning courts, the multiplications of banishments, even the terror —

sincerity and.reality of a style of teaching which presented

_ So strong a contrast to the ordinary teaching of the scribes.

He adopted the rigid seclusion and asceticism of the

_ Essenes, and his language rang with denunciations clothed

in the imagery of the desert. Refusing all the titles which the people wished to force upon him, he described himself as "a voice of one crying in the wilderness," and announced

_ the coming of one greater than himself, who would found

5 See Bartolocci, Bibl. Rabbin., i. 511-514; Lightfoot, Wor. Heb., p. 552; Buxtorf, Synag. Jud., p. 52.

the kingdom which he only announced, The submission to the simple rite of baptism, a rite already familiar to the Jews in the admission of proselytes, was the only sign of the acceptance of his mission which he

required; and the multitudes were so deeply moved by his preaching that they thronged to be baptized of him in Jordan, confcssing their sins, It was in order to receive this baptism, and to ratify the mission of the great forerunner, that Jesus left thie deep provincial seclusion in which He had hitherto lived. The stainless personality of his Kinsman overawed the bold and mighty spirit of the desert preacher. He shrank from baptizing one in whom he at once recognized that "royalty of inward happiness," and purity of sinless life, which he could not himself claim. Jesus, however, though He had no sins to confess, bade John to baptize Him, " for thus it becometh us," He said, "to fulfil all righteousness," He received the baptism, as a representative of the people whom He came to save, as a beautiful symbol of moral purification, and as the fit inauguration of a ministry which came not to destroy the law but to fulfil, And during the baptism John saw the overshadowing radiance and heard the voice from heaven which revealed to him that the promised Messiah had now come, and that this Messiah was the Son of God.

After this great crisis, which finally closed the private period of the life of Jesus, He was "driven" by the spirit into the wilderness for His mysterious temptation. 'The details of what occurred could of course only have been derived from what He Himself made known to His apostles. What is clear is that in that region of Quarantania, in the desert of Jericho, He was divinely strengthened for this mission by victoriously wrestling with every suggestion of the powers of evil which could have altered the character of His work. Although this was not His only temptation?, it was evidently the most deadly. The first temptation appealed subtly and powerfully to the exhaustion of His physical nature ; the second to spiritual pride, as it would have been manifested by an unwarranted challenge of the providence of God; the third to unhallowed personal ambition. In the two greatest temptations of His life— in the wilderness and at Gethsemane —He was tempted both positively and negatively,—positively by allurements to a lower line of action, and negatively by the seductive pleas which would have drawn Him aside from the path of suffering. But He won the perfect victory because temptation never passed into even the thought of sin, but was

so wrestled with and overcome that it made no deter- niining impression upon His heart.”

After this victory over the power of evil, Jesus returned to the fords of Jordan. It will not of course be possible or needful to dwell on the narratives of His ministry in all their details; but, since these narratives are confessedly fragmentary, we shall endeavour to furnish from the four Gospels in rapid outline a sketch of the general events of His ministry before touching upon its eternal significance. The events described in the Gospels are often grouped together by subjective considerations, and it was the evident object of St John to dwell preponderantly on the Judgzan ministry, and on those discourses which brought out the deeper and more mysterious side of the being of Christ, while the Synoptists chiefly describe the work in Galilee, and preserve what may be called the more exoteric discourses. The combination of these disintegrated records into one harmonious and consecutive whole is a task which can never be accomplished with absolute certainty ; but it is possible, without a single arbitrary conjecture, to construct a continuous narrative which shall simply follow the indi- cation of our authorities without doing violence to them

! Luke iv. 18 ; John vii. 4; Heb. ii. 10, 18, iv. 15. 2 See Ullmann, Sinlessness of Jesus (Eng. tr.), pp. 80, 140.

/is at hand.”

in any instance. In this scheme the ministry of Christ falls into the following epochs :—(1) the early sccnes, narrated by St John alone, until the beginning of the public preaching in Galilee ; (2) the Galilean ministry till the murder of the Baptist; (3) the period cf decided opposition ; (4) the period of flight and peril until the final farewell to Galilee; (5) from the great journey to Jerusalem till the retirement to Ephraim; (6) from this retirement to the Passover; (7) the last supper, passion, trial, and crucifixion ; (8) the resurrection and ascension. (1) The scenes of the first period are related by St John with a beauty and simplicity which can only be called idyllic. He tells us how the Baptist, on the banks of the Jordan, saw Jesus pass by, and exclaimed, in language of deep significance, “‘ Behold the Lamb of God, that taketh

away the sin of the world!" Whether the prominent thought in the Baptist's mind was the paschal lamb, or the lamb of morning and evening sacrifice, or the lamb which Isaiah and Jeremiah had used as an emblem of patient and suffering innocence, it is clear that in the spirit of prophecy he saw in Jesus one who was predestined to a life of sorrows which should be for the salvation of the world. The next day the Baptist repeated the same emphatic testimony in the presence of two Galilean youths, St Andrew and St John, who were so deeply impressed

| by it that they followed Jesus, saw Him in the place where

He was then dwelling, and became His first disciples. Andrew then brought to Jesus his brother Simon, who also recognized in Him the promised Messiah. Three days afterwards Jesus called Philip, another young fisherman of Galilee, who in his turn brought to Jesus his friend Nathanael, the guileless Israelite who is known in the Gospels as Bartholomew, or the son of Tholmai. Accom- panied by these pure and warmhearted young men, and also by His mother, Jesus was a guest at the simple wedding feast of Cana in Galilee, at which He first displayed His possession of supernatural power by turning the water into wine. 'Then, after a brief stay at Capernaum, He went to the Passover at Jerusalem. His first visit to the temple as a recognized teachcr was signalized by an authoritative Messianic act. He cleansed the temple of its mean and desecrating traffic, although neither priests nor Pharisees nor the Roman authorities had ever taken a step in that direction. When His right toact thus was challenged, He answered in mysterious words, of which the meaning was uot thoroughly understood till long afterwards, " Destroy this temple, and in three days I will raise it up "—speaking of the spiritual temple of His body. The words created so deep an impression that after being distorted both in form and meaning they formed one of the chief charges against Him at His trial. Even at this early phase of His work Jesus touched the heart and won the secret allegiance of Nicodemus, with whom He held at night the memorable discourse on the new birth. But He was met from the first by such signs of opposition that He went with His disciples into Judza, and there allowed them to baptize. The work of the Baptist was not yet

over, and, until it was, Jesus both permitted the disciples to adopt the symbol of puri- fication which had been used by His forerunner, and Him- self similarly preached " Repent, for the kingdom of heaven Some Jew' raised a discussion with the disciples of John about purification, and they in their perplexity and jealousy applied to their great master with the complaint that his ministry was being eclipsed by that of Him whom he had baptized beyond Jordan. Jolm, with noble self-suppression, pointed out that he must

3 Johnii. 19. That "the Jews," as St John calls the opponents of Christ, were not so entirely ignorant of His meaning as they chose to appear results from Matt. xxvii. 63.

4 Merd Iovdalov is the true reading in John iii. 25.

thenceforth decrease; and shortly after this time he was thrown into prison by Herod Antipas. In consequence of this event Jesus withdrew into Galilee. He chose the route through Samaria, and it was to a poor frail woman by Jacob's well that He seems first to have distinctly revealed His Messiahship. His acceptance of the invitation of the Samaritans to stay a few days with them wasa rebuke to the spirit of fanatical hatred and exclusiveuess, which in that day so filled the minds of His countrymen that they regarded any intercourse with Samaritans as involving pollution.

(2) Although Jesus was aware that a prophet is often least known in his own couutry and among his own kindred, He made His way, preaching as He went in various synagogues, direct to Nazareth.! There, in the synagogue, He read aloud part of Isaiah Ixi., aud amid deep silence applied it to Himself. But He had not proceeded far when the spell of His divine teaching was broken by the pride and ignorance of the Nazarenes, who began to murmur among themselves about His humble birth and occupation, and to demand that He should do some deed of power among them. It was on His reminding them that Elijah and Elisha had wrought their miracles of healing upou strangers that they rose in fury, and dragged Him to the brow of the hill on which their city

was built. Something, however, in the majesty of His bearing seems to have created in their minds a supernatural awe, so that, as on later occasions, He was able "to pass through the midst of them, and go on His way." 'To the place of His birth He seems never to have returned.

From this time His home, so far as He could in any sense be said to have a home, was at the bright little city of Capernaum on the shores of the Sea of Galilee, to which, perliaps in consequence of the churlishness of the Nazarenes, His mother and brethren also migrated. At this point begins the period of His brightest activity, the year which was in a pre-eminent sense "the acceptable year of the Lord." The scene of that ministry was mainly the beauti- ful and populous plain of Gennesaret through which passed "the way of the sea," the great caravan road which led to Damascus. It was the manufacturing district of Palestine, thronged by men of all nationalities, and therefore pre-eminently suited for the proclamation of the kingdom. At the same time it was a scene of infinite charm, and the opportunities of sailing from place to place, and of earning a livelihood, which were afforded by the inland lake, rendered it specially appropriate. On the way to Caper- naum Jesus healed by His word the son of the courtier of Herod,? who in consequence believed with his whole house. Much of the brief story of the Gospels is made up of the records of single days which stood out with marked prominence. One such day was the first Sabbath at Capernaum. Christ began with a sermon in the synagogue, during which He wrought one of His great exorcisms on a raving demoniac who was present in the audience. Retir- ing to the house of Peter, He healed Peter's mother-in-law of a fever, and at sunset, when the Sabbath ended, wrought many cures upon a multitude of sufferers. The fame of this day rang even to Syria, and, finding that even tem- porary seclusion was now impossible, Jesus went from village to village preaching the kingdom of God.? It was at this time that He preached to the multitude from Peter's boat, and after the miraculous draught of fishes called Andrew, Peter, and the sons of Zebedee' to a closer and

1 Luke iv. 15.

? Not improbably Chuza, Herod's steward, whose wife Joanna was one of the " ministering wonien."

3 Three such circuits in Galilee are faintly traceable ; but it is not possible to mark their separate incidents.

4 They were probably first cousins of Jesus, for it seems probable from Mark xv. 40, John xix. 25, that Salome the wife of Zebedee was a sister of the Virgin Mary.

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more unremitting discipleship. Matthew the publican was the next to "leave all" and follow Christ. 'The choice of the full number of twelve to be apostles took place just before the sermon on the mount, and nothing can more decisively show the wisdom and insight of Jesus than the fact that among the twelve were characters so opposite as a zealot anda publican. Judas, the " man of Kerioth," was probably the only Judzean in the little band of Galileans. The great discourse known as the Sermon on the Mount was delivered primarily to the disciples, but was intended also for the multitude. The hill by the Galilean lake® was the Sinai of the new dispensation, but it was a mount not of terrors but of beatitudes. 'The sermon first sketched the character of the citizens of the new kingdom both absolutely and relatively.6 It proceeded to sketch the new law in contrast, both general and special, with the old.? The last great section of it was occupied with the characteristics of the new life—its devotion, its duties, and its dangers. It ended with the contrast between doers and mere hearers.? The grandeur, originality, independ- ence, and authoritative tone of the sermon, with its vivid illustrations aud divine idealism, produced a very deep and wide impression. The inauguration of the doctrine was followed by deeds of mercy and power. From this time He was constantly surrounded by thronging multitudes, and was constantly appealed to for miracles of compassion. We are told in quick succession of the healing of a leper by a touch, of the centurion's servant by a word, and the raising from the dead of the widow's son at Nain; and so incessant was His activity that

His mother and His brethren began to be alarmed. Soon after the miracle at Nain He received the deputation from John the Baptist, then in his gloomy prison at Macheerus, to ask whether He were indeed the Messiah. He bade the messengers take back no other answer than the works which they had witnessed or heard, and pre-eminent among them was the preaching the gospel to the poor. It was after their departure that He pronounced the unequalled eulogy on John as the greatest of the prophets, while yet 'the least in the kingdom of heaven" was, in spiritual privileges, greater than He. It was in this discourse that He con- trasted the glad and natural geniality of His own example —as one who came "eating and drinking "—with the asceticism and gloom of the Baptist. He never refused the invitations even of the Pharisees, and it was at the banquet of a Pharisee named Simon that He accepted the pathetic devotion of the "woman that was a sinner" (whom Christian tradition persistently identifies with Mary of Magdala), and rebuked the haughty and untender for- malism of His host. His life during this period, as He wandered about Gennesaret and its vicinity, preaching to rejoicing crowds, was a life of poverty, toil, and simplicity, but it was also a life of exalted joy from the rapturous gratitude of the people and the faith which enabled Him to work many dceds of mercy among them. Of one episode of the period many details are preserved. After one of the missionary tours in Galilee, Jesus, finding Him- self surrounded by a vast throng, began for the first time to preach to them in those parables which were the most characteristic form of His subsequent teaching, and which had the additional advantage of testing the moral and spir- tual qualities of His hearers. He began with the parable of the sower, and this method of instruction naturally stimu- lated to such an extent the eagerness of His-hearers that He was kept teaching till evening came. A second ill-judged attempt of His mother and brethren to control His pro- ceedings probably combined with the sense of deep wearl- ee! Oe ee a er

6 Matt. v. 1-16.

5 Probably Karn Hattin. 8 Matt. vi. 1 to vii. 23.

7 Matt. v. 17-48. 9 Matt vii. 24-27.

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ness to create a desire for brief rest and retirement, and He urged His disciples to a hasty departure to the lonelier eastern shores of the lake. During the sail of about 6 miles there rose one of the violent sudden storms to which the Sea of Galilee is specially liable. He was sleeping on the leather cushion of the steersman the deep sleep of fatigue, which not even the waves now dashing into the boat could disturb. The disciples woke Him in wild alarm, aud the calm majesty with which He hushed the storm made an indelible impression on their minds. No sooner had they landed on the other side than they were met by a naked and raving maniac, whose dwelling was in the tombs which are still visible on the neighbouring hillsides. Jesus healed him, and (as we are told in a narrative which evidently touches on things entirely beyond our cognizance) suffered the demons to enter into a herd of swine hard by, which immediately rushed violently over a steep place into the sea. The semi-heathen inhabitants of the district, alarmed by His presence, and vexed at the loss of their swine, entreated Him to depart out of their coasts. He granted their evil petition, but left the healed demoniac to lead them to a better frame of mind. The people on the other side recognized the sail of His return- ing vessel, and were waiting in multitudes to meet Him. While preaching to them iu a house at Capernaum, the friends of a paralytic, who had been unable to get near Him for the press, let down the sick man through the roof in front of Him, and He healed him, exciting some murmurs from the Scribes, who had already begun to watch Him with suspicion, by first using the formula “ Thy sins are forgiven thee.” From the house He adjourned to the shore, and after another brief time of teaching there went to the farewell feast which Matthew gave to the “ publicans aud sinners” who had been his friends. The Pharisees, afraid as yet to find fault with Him directly, asked the disciples in great displeasure why their Master ate with publicans and sinners, whose very tonch they regarded as a pollution. The answer of Jesus was given in the memor- able quotation, to which He more than once referred, “ Go ye and learn what that meaneth, I will have mercy and not sacrifice”! He answered the inquiry

of St John's disciples about fasting by pointing out to them that the glad initiation of the marriage feast of the kingdom of heaven was no time for fasting,? and that the embodiment of a new spirit in old form was like putting new wine in worn skins, or a new patch on an old garment. It seems to have been immediately after the banquet that He received the heartrending appeal of Jairus that He would come and heal his little daughter. Onthe way He healed tlie woman with the issue who secretly touched the fringe of His garment.2 By the time He reached the house of Jairus the little maid was dead, and His three most chosen disciples —Peter, James, and Johu—were alone admitted with the father and mother to witness this second instance in which He recalled the dead to life.

It was probably at this point of the ministry that there occurred the visit to that unnamed feast at Jerusalem,* which was almost certainly the Feast of Purim. Perhaps with a view to this absence from Galilee He sent out the twelve, two and two, to preach and perform works of mercy in His name, sending them "like lambs among wolves," and bidding them set the example of the most absolute contentment and simplicity. During His visit to Jerusalem,

Hos. vi. 6.

? His reference to the days " when the bridegroom should be taken away from them" (&map@q) is one of those early intimations of His death of which one hint had already been given in the night discourse to Nicodemus (John iii. 16).

3 An interesting indication that he observed even the minute par- ticulars of the Mosaic law (Numb. xv. 87-40; Deut. xxii. 12).

4 John v. 1.

where—as we learn from St John, whose facts are inciden- tally confirmed by allusions in the Synoptists—He had many friends and followers, He healed the impotent man at the Pool of Bethesda, and

excited the bitter enmity of the Jews by deliberately ignoring the exaggerated minutis of the traditional law which made them regard it as a heinous crime to carry even the smallest burden on the Sabbath. The siniple command to the healed man to take up the mat on which he lay and walk aroused the Jews to fury ; and from that incident, as St John expressly tells us, the overt persecution of Jesus began.5 He seems to have been summoned before some committee of tlie Sanhedrin, but on this occasion they did not dare to punish His violation of their traditions, and on the contrary had to listen in unavailing wrath, not ouly to His irresistible defence of what He had done on tlie Sabbath, but to Divine claims which they declared to be blasphemy. They did not dare to touch Him, knowing His power with the people, but from that day the leading authorities of Jerusalem seem to have determined on His death, and their hostility was so bitter aud persistent that He left Jerusalem without waiting for the approaching Passover.

(3) It was from this nioment that the period of determined opposition began. Hitherto the local Pharisees and Scribes of Galilee might disapprove and murmur, but they had not dared to set themselves in distinct and public antagonism against Him. 'They were now encouraged to do so by the fact that the leading authorities of the capital had repudi- ated His claims. The high priests and Pharisees even sent some of their number to act as spies upon His words and actions, and see how they might contrive occasions for His ruin. He returned to Galilee with the full knowledge that His human day was beginning to fade into evening, and that the sentence of violent death hung over Him. It was at this solemn time that the murder of John thrilled men's hearts with horror. Jesus retired with the disciples to a desert plain near the town at the northern end of the lake known as Bethsaida Julias, which was in the dominion of the milder Philip, and beyond the jurisdiction of the blood-stained Antipas. Even to this retirement, however, the multitude followed Him, and here it was that, moved with deep compassion, He fed the five thousand with five barley loaves and two small fishes. Then urging the departure of His disciples by boat to Capernaum, He dismissed the multitude in the gathering dusk, and at last fled from thence® to the top of a neighbouring hill where He spent the night in prayer. During the night a terrible storm

arose, and He came to His disciples walking upon the sea, and rescued St Peter as with a half faith he en- deavoured to meet Him on the water. The next day at Capernaum He uttered that memorable disconrse abont Himself as the bread of life, and the necessity of " eating the flesh of the Son of Man and drinking His blood," which was expressly designed to dissipate idle-chiliastic and material delusions, and to test tlie sincerity of a spiritual faith. The discourse created deep discontent, and from that time many forsook Him. He even foresaw that one of His chosen apostles was "a devil"; but Peter spoke the conviction of the rest in the noble words, " Lord, to whom shall we go? Thou hast the words of eternal life."

But henceforth opposition became more marked and more fearless. It had already been stirred up in the hearts of all Jewish formalists by His claiming to forgive sins, by His disapproval of asceticism, by His intercourse with publicans and sinners. It gathered force from His consistent depreciation of the petty traditional superstitions which had degraded the Sabbath from a delight and a blessing into a mere fetish of servitude. When the incident at Bethesda had attracted the notice of the Sanhedrin, the

S Solnuy 16. €& (Vulg.) devyer, John vi. 22.

Pharisaic spies from Jerusalem especially watched His Sabbath proceedings. Again and again their hatred was kindled on this point. Now they indignantly challenged the conduct of the hungry disciples for plucking ears of corn and rubbing them in their hands on the Sabbath day ; on another occasion they attacked Him for healing on the Sabbath day the man with the withered hand, and later on for healing the bowed woman, and the blind man at Jerusalem. On each of these occasions He exposed with irresistible demonstration their inconsistency and hypocrisy, but thereby only deepened their anger against Him. On other occasions He came into violent collision with their whole system of traditional ceremonialism by pouring con- tempt

on their superfluous and meaningless ablutions, by showing how comparatively meaningless was their scru- pulosity about clean and unclean meats, and generally by denouncing the spirit which had led them to place the cumbrous pettinesses of their oral law above the word of God and the inmost spirit of all true religion. The rage of His Pharisaic opponents culminated on one day of open and final rupture between Himself and the spies of the Sanhedrin. Finding Him standing in silent prayer, the disciples had asked Him to teach them to pray, and in reply He had taught them "the Lord's prayer," and told them, in such accents as man had never heard before, about the fatherhood of God, and the consequent efficacy of prayer. Shortly afterwards He had wrought one of His most marvel- lous cures upon a poor wretch who was at once blind, dumb, and mad. The Pharisees felt bound to check the astonished admiration which this act had once more excited, and with impotent and stupid malignity had tried to teach their followers that He cast out devils by Beelzebub the prince of the devils. This blasphemous folly had drawn down upon their heads words of rebuke more intense and stern than they had ever heard. Such words, addressed to men accustomed to unbounded admiration as infallible teachers, aroused them to the deadliest hostility, and they soon found a weapon of annoyance and injury by demanding on every possible occasion that "'sign from heaven" which Jesus always refused to give. Their exacerbation seems to have alarmed His mother and brethren into the third of their ill-timed interferences, which Jesus had once more to check by declaring that the day had now come on which human relationships were as nothing compared to the spiritual. The time for the mid-day meal had now arrived, and Jesus accepted, though it seems to have been given in no good spirit, the invitation of a Pharisee to break bread in lus house. On entering He at once sat down at table, since it was but a brief and trivial meal, perhaps of bread and fruits, and the multitude were waiting outside to hear the word of God. Instantly He recognized that He was alone in the midst of enemies, and, moved to deep indignation by their hypocrisy and baseness, He delivered a terrible denunciation of the whole system and religion of the legalists and Pharisees. The feast broke up in confusion, and the guests began to surround Jesus with vehement, taunting, and threatening demonstrations! Passing from amongst them He found the

multitude actually treading on each other in their haste and eagerness, and perhaps it was to their pre- sence that He owed His safety. He preached to them a sermon, characterized throughout by the deep emotions by which His spirit had been agitated, of which the main topic was the awful peril of hypocrisy and greed ; and then—as though some solemn agony had passed over His spirit—He warned them of the signs of the times, and of the awful consequences of rejecting His teaching.

(4) With that day of conflict ended the second and darker stage of His work in Galilee. The remainder of His life

1 Luke xi. 53.

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was mainly passed in flight, in peril, and in concealment, only broken by brief occasional appearances in Galilee and Jerusalem. He departed from Capernaum, and went into the heathen region of Tyre and Sidon. But few particulars of this period are recorded. Somewhere in those regions He tested the strong faith of the Syro-Phoenician woman, and healed her demoniac daugliter. From Tyre and Sidon He wandered southwards again, keeping mainly to the eastward and less inhabited region, only now and then healing a sufferer, but gradually attracting crowds once more. Somewhere on the Perzan side of the lake He fed the four thousand. After this period of wandering and absence He once more sailed to Magdala, but was met immediately by the ominous conjunction of Herodians and Pharisees with their hostile demand for a sign, Turning away from them, He uttered His last sad farewell and prophecy to the cities in which He had laboured, and once more journeyed northwards. During this journey they came near to Ceesarea Philippi, and, after standing in silent prayer, He asked His disciples " Whom do men say that I the Son of manam?" Thesorrowful confession had to be made that, though they recognized Him as a prophet, they had not recognized Him as the Messiah. Then came the momentous question, which was to test how much of His task was accomplished in the hearts of those apostles whose training had now for some time been His principal work, "But whom say ye that lam?" Then it was that Peter won the immortal glory of giving that which has thenceforth been

the answer of all the Christian world, “ Thou art the Christ, the son of the living God.” That answer is the inauguration, in human convictions, of Christianity and of Christendom ; and it was rewarded by the promise of the power of the keys, and the power to bind and loose, and the foundation of the Christian church upon a rock. Whatever may be the difficulties of the passage, we see that Jesus meant to confer on His church the teaching power of which the key was the symbol, the power of legislative action indicated by binding and loosing, and the prophetic insight on which depended the ability to absolve in God’s name. But to obviate all delusions He at once revealed to them the dark abyss of suffering down which He had first to tread ; and, as though to prove how little claim His words gave to sacerdotal usurpations, He proceeded to rebuke in the sternest words the presumption of Peter, who ventured to set aside His predictions as to His coming sufferings and death. It was six days after this that He took the three most chosen apostles with Him up the snowy slopes of Hermon, where they witnessed the transfiguration, as though to strengthen their faith in the dark hours to come. On descending the hill, He healed the demoniac boy whom the apostles had vainly tried to help, and built on this exorcism the lesson of faith which He was never weary of inculcating on His followers. Having now reached the northern limit of the Holy Land, He turned His footsteps southwards by the most secluded paths, omitting no opportunity to train the apostles, now teaching them humility by the example of a little child, and now warning them by significant parables of the need of self-sacrifice and of the spirit of forgiveness.

(5) At the ensuing Feast of Tabernacles we find Him once more at Jerusalem, where He appeared suddenly in the temple. St John records His teachings, drawn from the various incidents of the feast, and also the divided opinions of the people, and the almost unanimous opposition of the ruling classes. This visit to the Holy City was marked by the incident of the woman taken in adultery, in which He showed such sovereign wisdom and tenderness, and by the Sabbatarian disputes which arose from the healing of the blind man. On one occasion Jesus had to leave the

temple amid a burst of fury in which the Jews threatened

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to stone Him, and when [fle left Jerusalem it was under the direct ban of excommunication. Under these circum- stances He returned for one more brief visit to Galilee. The news which He received of the murder of some Galilzeaus in the temple by Pilate, and of Herod's designs against His safety, show how surrounded by perils was His human life. But He now calmly ended His work in Galilee by the mission of seventy disciples to prepare for His great last journey southwards. His words of farewell to the cities which had rejected Him were full of sadness and svlem- nity, as He started from the land which had refused His mission to tlie city in which He was to be crucified.

We now enter on the last great phase of His work, the incidents of His final journey and the close of His ministry. First He was refused shelter by the rude villagers of En- gannim, and lad to change his route. Next came the healing of the ten lepers, of whom but one showed gratitude, and he was a Samaritan. The Sabbath healings of the bowed woman and of the man with the dropsy are the two chief miracles of the journey, during which He also delivered many most memorable discourses, and some of His divinest parables—such as those of the good Samaritan and the prodigal son. So we trace His steps to the house of Martha and Mary at Bethany, and to Jerusalem, which He visited at the Feast of the Dedication. His appearauce in the temple was always the signal for the fiercest opposition of Sadducees and Pharisees, who watched with jealousy and hatred the eagerness of the multitude to hear Him. After serious conflicts He retired to the other Bethany, beyond Jordan. Among the few recorded incidents of His stay in Perea are the attempts to entangle Him with Herod and the Jewish schools by questions about divorce, the beautiful scene of blessing the little children, and the discourse about riches on the occasion of the test which He applied to the rich young ruler who "made the great refusal." The death of Lazarus summoned Him to Bethany, and the most signal miracle which He there wrought by raising Lazarus from the dead excited such notice that the Sanhedrin now met under the pre- sidency

of Caiaphas, and came to the deliberate conclusion that they must put Him to death, lest the populace should raise tumults on His behalf which might precipitate the final intervention of Rome in the affairs of their nation. But, as His time was not yet come, Jesus avoided the peril of public arrest or private assassination by retiring to an ob- scure village called Ephraim, on the edge of the wilderness.

(6) He did not leave Ephraim till He could join the great caravan of Galilean pilgrims with whom He could proceed in safety to His last passover. His apostles, both from His own warnings and from the visible grandeur of His transfiguration of self-sacrifice, were well aware that a crisis of His career had now arrived; and nothing can show more clearly the mistaken character of their Messianic hopes than the fact that, though He now distinctly told them the crowning horror that He should be crucified, the sons of Zebedee came with their mother Salome to beg for places at His right hand and His left in His kingdom. Jesus made their ambitious request a theme for rich and solemn teachings on the beatitude of suffering for the cause ofGodand man. As they approached Jericho, accompanied by excited multitudes, He healed the blind Bartimaeus, and in Jericho He excited the murmurs of the crowd by accepting the hospitality of the publican Zaccheus. On the road between Jericho and Bethany He delivered the parable of the pounds. He arrived at Bethany probably on Friday, Nisan 8, a.u.c. 783 (March 31, 30 a.p.), six days before the passover, and before the sunset had begun the Sabbath hours. The Sabbath was spent in quiet. In the evening Martha and Mary gave him a banquet in the house of Simion the leper, at which Mary, in her devotion and

gratitude, broke the alabaster of precious ointment over His head and feet, and so awoke the deadly avarice of Judas that he seems on that very evening to have communed with the Jewish priests for the paltry blood-money of thirty pieces of silver (less than £4) for which he was willing to betray Him. On the morning of Palm Sunday Jesus made His triumphant entry into Jerusalem amid the palm-waving throngs, who shouted "' Hosanna to the son of David," and at the point of the road

where the city first bursts upon the view He paused to weep over it and prophesy its doom. After once more cleansing the temple, and protect- ing from the anger of the priests and Pharisees the children who still shouted Hosanna, He spoke to Philip about the Greeks (probably from Edessa) who wished to see Him, and, streugthened by a voice from heaven, spent the rest of the day in teaching. At evening He retired for safety with the twelve outside the city walls in the direction of Bethany. On the Mouday morning, as He went to Jeru- salem, He pronounced the symbolic doom upon the fig-tree which had only leaves. On entering the temple He was met by a formidable deputation of priests, scribes, and rabbis, who demanded "' by what authority He was acting," —a question which He declined to answer until they proved their right to ask it, by giving a definite opinion respecting the baptism of John. Their confession of inability to do this was so marked a proof of their incompetence to claim the fuuction of religious teachers, that He refused to meet their challenge. The day may be called "a day of parables," for during His teaching He spoke the parables of the two sons, the rebellious husbandmen, the builders and the corner stone, and the marriage of the king's son. These parables were so obviously aimed at the hypocrisy, malevolence, and presumption of the Jewish authorities that fear alone restrained them from immediately seizing Him. At even- ing He again retired from the city. The next day, the Tuesday in Passion week, may be called the day of temp- tations, for it was marked by three deliberate attempts to undermine His authority by involving Him in some difficulty either with the rulers or the people. In the morning walk to Jerusalem He taught to His disciples a lesson of faith from the withered fig-tree. In the temple He was first met by the plot of the Herodiaus and Pharisees to embroil Him either with the Romans or the populace by a question as to the lawfulness of paying tribute, then by a piece of poor casuistry on the part of the Sadducees con- cerning the resurrection, then by the question of a Scribe as to the great commandment of the law. In each instance the divine and ready wisdom of His answers not only entirely defeated the stratagems of the Sanhedrists, but showed His immeasurable superiority to them in knowledge and insight. Then, to prove how easily He miglit have turned the tables on them, had He desired their humilia- tion, He exposed their complete ignorance respecting the very subject on which

they claimed the fullest knowledge by reducing them to a confession of their inability to explain why David in thespirit had given the name of Lord to the Messiah who was to be his sou. And then, knowing that the time had come when their degradation of religion into a mere tyranny aud semblance should be set forth, He delivered the terrible denunciation which, with its eightfold " Woe unto you, Scribes and Pharisees, hypocrites," was intended to leave them utterly inexcusable. The Jewish authorities felt that this was a final rupture, that they must now, at all costs, bring about His immediate death. Before He left the temple for ever He taught the lesson of true charity as illustrated by the widow's mite, and then went and sat on the green slopes of the Mount of Olives. There He pronounced to His disciples that great eschato- logical discourse which was suggested by their admiration of the temple buildings, destined so soon to sink in blood

and ashes. In the cool of evening they walked to Bethany, perhaps at the very time that Judas was arranging with the priests the final details of His betrayal and arrest. The Wednesday was spent in deep retirement at Bethany, and not a single word or incident is recorded on that day. On the Thursday morning He woke never to sleep again.

(7) On the evening of Thursday Jesus went with His disciples to Jerusalem to keep that quasi-paschal feast at which He instituted the sacrament of the Eucharist. Even then the apostles had jealousies about precedence, and it was to cure them of their fatal tendency to selfish pride and ambition that He washed the disciples' feet. During the supper He first indicated to John, and through him to Peter, that He knew who the traitor was. He clearly told them that this was the last meal which He should eat with them, and bade them henceforth " eat bread and drink wine" in sacramental memory of Him. It was after Judas had gone forth into the night that He began those last discourses preserved for us by St John alone, which are so "rarely mixed of sadness and joys, and studded with mysteries as with emeralds." There is a matchless beauty and tenderness in the records of His gentle words of warn- ing and help to Peter, Thomas, Philip, and Jude, and of that

familiar intercourse with his dearest followers, whose sinking spirits He sustained by the promise of the Com- furter. Then they sang a hymn, probably the Psalm known to the Jews as the Great Hallel, and in the darkness walked to the olive garden of Gethsemane, where Jesus passed through His hour of mysterious agony and passion, while even His most beloved apostles could not watch with Him. Then torches suddenly flashed upon the night as the traitor, accompanied by priests and their servants, and Levites of the temple guard, and Roman soldiers, made their way across the valley of the Kidron to the slope of Olivet on which the garden lay. There Judas betrayed Him with a kiss; and, in spite of the supernatural awe which His presence inspired even into His enemies, He resigned Himself into their hands, rebuked the rash blow of Peter, and by one last act of mercy healed the slight wound of Malchus. '" Then all His disciples forsook Him and fled."

(a) He was taken first to the astute and aged Annas, who was regarded as high priest de jure, though not de facto. From this time forward it was the priestly party—the Sadducees, not the Pharisees—who were almost exclusively responsible for His death. On His refusal to plead before this disorderly midnight tribunal, He was struck on the mouth ; and, failing to extort anything from Him, Annas sent Him bound across the courtyard to his son-in-law Caiaphas, the de facto high priest.

(8) It was still night, and here took place the second irregular and illegal trial, before His worst enemies among the priests and Sadducees. The false witnesses who endeavoured to convict Him of having threatened to destroy the temple failed, and He preserved unbroken silence until Caiaphas adjured Him by the living God to tell them whether He was the Messiah, the Son of God. In answer to this appeal He said "JI am," and told them that they should see His returnhereafter in theclouds. ThenCaiaphas rent his robes with the cry of blasphemy, and this committee of the Sanhedrin declared Him " guilty of death."

(y) After this second examination Jesus was remanded to the guardroom until break of day, before which time the whole Sanhedrin could not meet. As He was led past the brazier in the courtyard, His

one glance broke into penitence the heart of His backsliding apostle, who had just denied Him with oaths. As He waited, He was insulted by the coarse derision and brutal violence of the priestly menials. When the Sanhedrin met, they once more entirely failed to fix any charge upon Him, until He renewed in their presence His claim to be the Son of God. He was

then formally condemned to death, and underwent a second derision at the hands of the assembled elders. It was after this condemnation that remorse seized the dark soul of Judas. He flung down the blood-money before his tempters, and with an agonized confession of guilt rushed out to his terrible suicide.

At this period the Jews liad lost all legal right to put any one to death, and they were further anxious to avoid personal responsibility, and danger of vengeance from the followers of Jesus, by handing Him over for execution to the Roman procurator. Accordingly they led Him bound to Pilate in imposing procession. They were, how- ever, mistaken in supposing that Pilate would crucify Jesus at their bare word without seeing whether He was guilty ; and, as they could not enter the Herodian palace, in which the Gentile ruler lived, without pollution, which would have prevented them from partaking in the passover that evening, Pilate went out to them. In every line of the brief colloquy which ensued we trace the haughty con- tempt of the Roman, and the burning hatred of the Jews. Failing to arrive at any definite charge, Pilate questioned Jesus alone inside the pretorium, and after a brief exami- nation came out to the Jews with the declaration of com- plete acquittal.

In the wild clamour which ensued he caught the word Galilee, and, understanding that Jesus had chiefly taught in Galilee, eagerly seized the opportunity of getting rid of the matter by sending Him to Herod. But before Herod as before Pilate Jesus retained His majestic silence, and, unable to condemn Him, Herod contented himself with arraying Him in a white festive robe, setting Him at nought with his myrmidons,

and sending Him back with a second practical acquittal to the procurator.

Then, in three stages, began the third and most agoniz- ing phase of the public trial. Pilate, seated on his bema upon the marble pavement, declared that, as His innocence was now certain, He would merely scourge and dismiss Him, It was a disgraceful proposal, due partly to his desire to save the life of one whom he saw to be innocent, but dictated by fear ofa new riot. Further than this, the warning of his wife, and the awful majesty of the sufferer, liad created a strong presentiment in Pilate's mind, But liis actions were practically controlled by the past guilt which made him tremble at the thought of the complaints which Jews, Samaritans, and Galileeans could alike prefer against him. He did not therefore venture to refuse the cry of the mob—hounded on as they were by the priests and Sanhedrists—for the passover boon of having a prisoner liberated to them; and he vainly tried to induce them to ask for the liberation of Jesus. They demanded the rebel and murderer Bar Abbas, and began to shout for the cruci- fixion of Jesus. Bar Abbas was set free, and Jesus under- went the horrible Roman scourging, which was followed by the ruthless mockery of the soldiers, who arrayed Him in an old crimson robe and placed a crown of thorns on His head, and a reed in his hand as a sceptre, and so paid Him mock homage as a king of the Jews.

When He came forth after this hour of agony, Pilate made one more appeal to their compassion in the words "Behold the man!" and on hearing that He claimed to be "a Son of God "—for since the charge of treason had broken down, the priests now substituted for it a charge of blasphemy—he became still more alarmed, and once more questioned Jesus ina private interview. For some time Jesus would not speak. When He did, it was to say that He regarded Pilate as less guilty than the Jews. As Pilate led Him forth, and saw Him stand before that shameful yelling multitude in His majesty of solemn woe, he broke forth into the involuntary exclamation, " Behold your King!" That word raised among the multitude some

very ominous allusions to Czesar, and Pilate, after publicly washing his hands, in token that he was innocent of this death, pronounced the fatal order for His crucifixion.

Jesus was then clad in His own garments and led forth with two robbers to be crucified. As He was unable to bear the weight of His cross, Simon of Cyrene was impressed for that service. On His way Jesus gently consoled the weeping daughters of Jerusalem, and, when they reached the fatal spot of Golgotha, He refused the stupefying potion which was offered to Him, and prayed fur His murderers even as they drove the nails through His hands. Pilate managed to insult the Jews by putting over the cross the title "The King of the Jews," in three languages, which thus in the presence of the vast passover multitude testified to the truth. On the cross Jesus hung for three hours in agony. The soldiers parted His garments, and cast lots for His seamless robe. The mob, the priests, even the crucified malefactors, joined in taunting Him, But He answered not. After His prayer for His murderers He only spoke to promise paradise to the penitent robber ; to assign His mother to the care of the beloved disciple; to quote in the lowest depth of His agony the first words of the 22d Psalm; to give vent to the sole expression of physical anguish which He uttered, "I thirst"; to coni-mend His spirit into His Father's hands; and lastly, in the one victorious word TeréAeorar, "it is finished," to end His work on earth. The bearing of Jesus on the cross, together with the circumstances which accompanied the crucifixion—the darkness, earthquake, and rending of the temple veil—produced a deep impression even on the mind of the heatheu centurion. They so powerfully affected the multitude that they returned to Jerusalem wailing and beating on their breasts, at once with a feeling of guilt and a presentiment of future retribution.

(8) At evening the soldiers despatched the two crucified robbers by breaking their legs, in order that their bodies might be removed before the passover. But they found Jesus already dead, and the certainty of His death was assured by one of the soldiers driving his spear into the region of the heart, whence came out blood and_ water. As very little time was left before the sunset marked the beginning of the Sabbath,

and rendered labour impossible, the body of Jesus was hastily buried by Nicodemus and by Joseph of Arimatha, who had obtained the requisite permission. They wrapped it in fine linen and spices, and laid it in the rockhewn garden-grave of Joseph, rolling a great stone to the aperture, which was further guarded by soldiers sent by the Jews to prevent its removal for purposes of fraud. This was on Friday evening. Very early on the morning of Sunday, while it was yet dark, the two Marys were met at the sepulchre by a vision of angels which announced His resurrection. Of that resurrection, in spite of their original doubts and mis- givings, the whole body of the disciples became unalterably convinced, and on their unalterable conviction, and the subsequent witness of history to the blessed truth of their doctrines, has rested in great measure the belief of the Christian church. Uniting the contemporary testimony of St Paul, who must have been in personal communication with many of the five hundred witnesses to whose evidence he appeals, with those of the Gospels, we find ten re- corded appearances :—(1) to Mary Magdalene (John xx. 17); (2) to other women (Matt. xxviii. 9, 10); (8) to Peter (Luke xxiv. 34; 1 Cor. xv. 5); (4) to the two disciples on their way to Emmaus (Luke xxiv. 13-32) ; (5) to the ten apostles. All these appearances occurred on the first Easter day. On the following Sunday Jesus appeared (6) to the eleven apostles, Thomas having been absent on the previous occasion. He further appeared (7) to seven apostles by tle Sea of Galilee (John xxi. 1-24) ;

(8) to more than five hundred at once on a mountain in Galilee ; (9) to James (1 Cor. xv. 3, 8); and (10) at the ascension. These appearances continued for forty days. On the last occasion Jesus led His disciples towards Bethany, gave them His last command, blessed them, and as He blessed them passed away, and "a cloud received Him out of their sight."

VI. Such, in briefest outline, are the main recorded events of the life of Jesus Christ on carth. It only remains to say a few words concerning His person and His work, regarded here in their historical rather than in their theological aspect.

As regards His person, Christians who accept the New Testament as the record of inspired teaching, and whio believe it to be evidenced, not only by inward and super- natural revelation, but also by the subsequent history of the church and the world, believe that Jesus Christ was (in the words of what is probably a very ancient Christian hymn quoted by St Paul) the only begotten Son of God, "manifest in the flesh, justified by the Spirit, seen of angels, preached unto the Gentiles, believed on in the world, received up into glory ";! and as a part of this belief they hold that, just as Adam the first man was not born but created, so the second Adam, who came to redeem our nature, was not born by ordinary generation but was "incarnate by the Holy Ghost of the Virgin Mary." But even those who do not accept this faith see in Jesus a unique and sinless personality, one with whom no other human being can even distantly be compared, either in His character, His teaching, or the results which He accom- plished by His brief ministry. He taught but for three years, and not continuously cven during them. He accepted the most ordinary customs of tlie teachers of His day. He wore no broad phylacteries like the Pharisees; He was not emaciated with asceticism like the Essenes; He preached the kingdom of God, not, as John had done, between the gloomy precipices of the wilderness, but from the homely platform of the synagogue, to give the Midrash when the Torah had been read.2 He appeared before the people, not in the hairy mantle of a prophet, but "in the ordinary dress of a Jewish man, at the four ends of which the customary tassels were not wanting."? He came "eating and drinking" ; He had no human learning; His rank was but that of a village carpenter; He checked all political excitement ; He directed that respect should be paid to all the recognized rulers, whether heathen or Jewish, and even to the religious teachers of the nation ; He was obedient to the Mosaic law; His followers were 'unlearned and ignorant men" chosen from the humblest of the people. Yet He has, as a simple matter of fact, altered the whole current of the stream of history; He closed all the history of the past, and inaugurated all the history of the future, and all the most brilliant and civilized nations of the world worship Him as God. Kant testifies to His ideal perfection. Hegel saw in Him tha union of the human and the divine. Even the most advanced of sceptics do Him homage. Spinoza spoke of Him as the truest symbol of heavenly

wisdom. The beauty and grandeur of His life overawed even the flippant soul of Voltaire.5 ‘Between Him and whoever else in the world,” said Napoleon I. at St Helena, “there is no possible term of comparison.” ‘If the life and death of Socrates are

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1] Tim. iii, 16.

2 See Hausrath, Neutest. Zeitgesch., vi. § 8 ad fin.

3 Matt. ix. 20; Mark vi. 56; Luke viii. 44.

4 When Borowski rashly placed too near to each other the names of Christ and of Kant, Kant nobly said, ‘“‘The one name is holy; the other is that of a poor bungler doing his best to interpret Him,”—“An den Kirchenrath Borowski,” Works, xi. 131.

5 See Dict. Philos., art. “ Religion.”

8 Montholon, Récit de la Captivité de l Emp. Napoléon,

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those of a sage,” said Rousseau, “the life aud death of Jesus are those of a God.”! “ He is,” says Strauss, “the highest object we can possibly imagine with respect to religion, the Being without whose presence in the mind perfect piety is impossible.”? “The Christ of the Gospels,” says Renan, “is the most beautiful incarnation of God in the most beautiful of forms. His beauty is eternal; His reign will never end.” John Stuart Mill spoke of Him as “a man charged with a special, express, and unique com- mission from God to lead mankind to truth and virtue.”

The transcendent power of His personality, which is betokened in such expressions as those quoted above, is due, not only to His devotion and self-sacrifice, but to His absolute sinlessness. This constitutes the unique character of His individuality. He alone of mankind has claimed

to be sinless, and has had the claim granted by unanimous consent both in His lifetime and in subse- quent ages. He alone among men has never even been assailed by the breath of moral calumny, and never even in His most sacred utterances and prayers betrayed the faintest consciousness of any evil as present in His soul. He therefore alone has furnished mankind with a perfect ideal ; and, though no saint has ever even distantly attained to the perfectness of that ideal, yet those who have done so in greatest measure have always said that they have done so solely by the aid of His grace, and the imitation of His example.

Nor was His teaching less unique than His personality. It was marked by a tone of sovereign authority ; " Ye have heard that it was said—but I say unto you." In thus it was the very opposite to the teaching of His own day and of centuries afterwards, which relied exclusively upon precedent. It was also marked by absolute originality. The test of its originality is the world's acceptance of it as specifically His. Isolated fragments of it may be compared with truths uttered by others; but it stands alone in its breadth and in its power, in its absence of narrow exclu- siveness and scholastic system and abstract speculation. It was fresh, simple, natural, abounding in illustrations at ouce the most beautiful and the most intelligible, drawn from all the common sights and sounds of nature, and all the daily incidents and objects of social and domestic life. It flowed forth without reserve to all and on every fitting occasion, —on the road, on the hillside, on the lake, or by the lonely well, or at the banquet whether of the Pharisee or the publican. Expressed in the form of parables, it has seized the imagination of mankind with a force and tena- city which is not distantly approached even by the sacred writers, and even when not directly parabolic it was so full of picturesqueness and directness that there is not one recorded sentence of it which has not been treasured up in the memory of mankind. His utterances not only rival and surpass all that preceded and all that has followed them, but "they complement all beginnings." Sometimes they consist of short suggestive sayings (gnomes), full of depth, yet free from all affectation or obscurity,> which make even what is most mysterious and spiritual humanly perceptible, throwing over it the glamour both of poetry and of a long- ing presentiment, and incessantly enticing man towards something yet higher. There is never

in them a lurking fallacy nor a superfluous word, but all is " vivacity, nature, intelligibility, directly enlightening grace," intended only to conviuce and to save. And while such was the incompar-

1 Emile.

2 Vergdngl. u. Bleibendes in Christenthum, 132. In his Leben Jesu, ii. 229, he says that Jesus "in His all but perfect life stood alone and unapproached in history."

3 Etudes @ Hist. Rel., 218, 214. .

4 Three Essays, p. 254, where he also speaks of Christ as " the ideal representative and guide of humanity."

® See Keim, Jesu von Nazara, ii. 1, 3.

able form of His teaching, its foree was even more remark- able. It is all centred in the two great truths of the Fatherhood of God and the brotherhood of man ; from the former springs every truth of theology, from the latter every application of morals. Judaism had sunk into a religion of hatreds; the one message of Jesus was love. In this He differs even from John the Baptist and the prophets. "Their emblem is the storms, His the sun."

Once more,—as regards the work of Jesus, the Christian believer contemplates it in that aspect in which it is pre- sented by St Paul as a work of atonement, the redemption of a guilty race ;° but even apart from this the mere historical student must admit that Christ elevated both the individual and the race as none have ever done before or since. His doctrine purified the world from the loathly degradation of lust and luxury into which society had fallen. By con- vincing men of the inherent dignity of manhood, He added to the value of human life. He made holiness a common possession. Heathen morality had reached its loftiest point in the Stoic philosophy ; but Stoicism was scornful, ineffectual, despairing, and Christ gave a moral system infinitely more

perfect, more hopeful, and more tender to all mankind. To Him is alone due the Christian signifi- cance of such words as charity, humility, and humanity. He first taught the sacredness of the body as a temple of the Holy Ghost. He has inspired the aims of the noblest culture, while at the same time He has restored the souls of men, and made the care of the moral and spiritual being the supreme end of life. The gradual emancipation of the world from the tyrannies of sensuality, cruelty, and serfdom has been won step after step from His principles. The supremacy of the spiritual, the solidarity of nations, the universality of God's love, the essential equality of all men in His sight, are but a few of the great and fruitful con- ceptions which have sprung directly from His teaching, and which still have an unexhausted force, to bring about, in ever-increasing measure, the amelioration of the world.

VII. It only remains to touch on the growth and progress of Christian doctrine relative to the Person of Christ. It would have been impossible for the Christian world to have drawn from the teaching of the apostles and evangelists any other conclusion respect- ing Jesus than that He was more than man,—that He was " God manifest in the fiesh." The Gospels spoke of His incarnation, His sinlessness, His miraculous power, His claims far loftier than would have been possible to simple man, His fearless conjunction of His own name with that of the Eternal Creator. Alike the Gospels and the Epistles testify to His pre-existence (John i. 15, vi. 52, viii. 58), His eternal existence (1 Pet. iii. 18-20; Phil. ii. 6, 7; Rev. i. 11), His part in the creation of the world (Heb. i. 11), His miracles of power; and they speak of Him in terms incompatible with simple humanity." It is indisputable that no Christian, who accepted as divine revela- tions the writings of St John and of St Paul, could possibly suppose that the Saviour, in whom he was taught to trust, and into whose name he was baptized, was a mere human being like himself. And yet, that Jesus was perfectly human, as well as divine, they could not for asingle moment doubt. He was born of a woman. He grew like otherchildren. He suffered hunger, and thirst, and wearl- ness, and pain, and wounds, and death. He had flesh and bones like all other men, and passed through the stages of life as others do. And His soul was a human soul no less than His body was a human body, for He increased gradually in wisdom no less than in stature; and felt sorrow

and sympathy, and was subject to temptation, and was liable to the common emotions of our mortal nature.

With these facts the earliest teachers of the church were content. When they had asserted that Christ was both human and divine, 'born and unborn, God in flesh, life in death, born of Mary and born of God " (Iren., Ep. ad Ephes., 7), they entered into no specu- lations respecting the mode and definition of that union of natures. But such reticence soon became impossible. The! doctrine of a God-man was openly assailed or secretly undermined by twofold

6 For St Paul's two most elaborate and concentrated statements of his theology see Rom. iii, 20-26; 1 Tim. i1.-5, 6 (iii. 16). See also 2 Tim. i. 9, 10.

7 Gol. ii. 9; John xii. 41; Matt. xxviii. 18; 1 Thess. ili, 2; 2 Thess. ii. 16, 17; Phil. iii, 21; 1 Cor. iv. 5; 2 Cor. v. 10; 2 Tim. iv. 1; the Gospel and Epistles of St John, the Epistles to the Colos- sians and Ephesians, and the Apocalypse passim, &c.

JESUS

forms of heresy—partly by Jewish Ebionites, partly by Gentile Doeete. The Ebionites, the Nazarenes, the followers of Artemon, the Alogi, and many seets allied to them in their main prineiple, denied the true divinity of Christ. In the opposite direction many of the Gnostie sects entirely explained away His humanity, either with the Basilidians ees that He only beeame divine at His baptism, or holding with the Valentinians that Mary was only the ehannel by which He entered the world. To both these conflieting fancies the orthodox fathers opposed the simple statement of St John that " the Logos became flesh." But, as was natural, their opinions were as yet vague and even in some instances erroneous. Thus Justin Martyr thought that in Christ the Logos took the plaee of the human intelligence (Apol. min., ch. x.). Clement of Alexandria thought that the human needs and sufferings were only apparent, or by way of "aceommodation" (Pxd., i. 5, p. 112; Strom., vi. 9, p. 775, ed. Sylb.). Origen had clearer views, and was the first to use the term God-man_ (edvpwmos), as well as to guard against

the double error of excluding the Logos from Christ, or of eonfounding the Logos with the existence of the human Christ (Hom. in Ezek, iii. 3; C. Cels., iii. 29). It is, however, important to observe that the existence of technical errors of theology in the modes of expressing this doctrine adopted by the Ante-Nicene fathers was freely admitted, and was not regarded as formal heresy. Their individual insight was not suffieient to enable them to arrive at those eareful scholastic definitions to which the ehurch was only guided by the. collective wisdom of ceeumenical couneils after periods of long and painful eonfliet. The remarks of St Jerome on the real orthodoxy of the early fathers are both charitable and explicit. "]t may be," he says, "that they erred in simplicity, and that they wrote in another sense, or that their writings were gradually cor- rupted by unskilful transeribers; and, certainly, before Arius like 'the destruetion that wasteth at noonday' was born in Alexandria, they made statements ineautiously which are open to the misin- terpretations of the perverse." We find a remarkable illustration of the extent to which the terminology was ag yet unsettled in the fact that the council at Antioch whieh condemned Paul of Samosata in 269 also condemned the expression homoousios (" consubstan- tial"), whieli a century afterwards became the very watchword of Nieene orthodoxy.?

By the 3d century the Ebionizing heresies were practically dead, but the Docetie were still flourishing in various forms. Two sects had arisen ; one was that of the Patripassians, who so completely obliterated all real distinction between the first and second person of the Trinity as to lay themselves open to the eharge of teaching that the Supreme Father had been crueified. Thus Praxeas taught that the same God is at once the Father and Son. WNoetus of Smyrna, when banished from Ephesus, taught these notions at Rome, and even the Popes Zephyrinus and Callistus seem to have been imbued with them. Sabellius, a presbyter of Ptolemais, elaborated these opinions into a system in which Father, Son, and Holy Spirit were only three modes of manifestation, three names, three aspects of the divine monad revealing itself under three differ- ent forms (Greg. Nyss., Orat. ce. Arian. et Sabell.), The Monarchians, on the other hand, in their equal anxiety to avoid all danger of Ditheism and Tritheism, admitted the supernatural birth of Chirist, but only saw in Him the holiest of the prophets; these

views were expounded at Rome by Theodotus of Byzantium, who was conse- quently expelled from the ehureh by Pope Vietor. The heresies of Paul of Samosata, the vain and brilliant patriarch of Antioch, seem to have originated in an unhappy attempt to reconcile the views of these Monarehian seets by teaching that not the whole divine sub- stance was manifested in Christ, but only one single divine power, He thus distinguished between the Logos and the human Son of God. He was banished and died in obseurity, but the seet, which was generally ealled Patripassian in the West and Sabellian in the Fast, continued to linger on for a time.

All these controversies were but preludes to the great struggle of the church against Arianism. Hitherto she had eondemned the Noetians and Sabellians for denying the hypostasis of the Son as distinet from the Father, and the Theodotians and Ebionites for denying His divinity. Arius, a presbyter of Alexandria, admitted both the divine and the human nature of Christ, but by making Him subordinate to God denied His divinity in its highest sense. He was led to this error by the reaction against Sabellianism, and he tanked the Son among ereated beings, saying that " there was (a time) when He was not." Arius was deposed and excommunicated by a couneil at Alexandria, but since many bishops, and among them the distinguished Eusebius of Cesarea, and Eusebius of Niecomedia, intereeded in his favour, the dispute assumed sueh wide proportions that Constantine was compelled to intervene by sum- moning in 325 the first ceeumenical couneil of Niee. By this eouneil the doctrine of Arius was condemned, and it was deelared to bea matter of the Catholic faith that the Son was not only of like essence (homotousios) but of the same essence (homoousios) with the Father.

It was long, however, before the voice of controversy was silenced. "= a ee

1 Mansi, i, 1001; Euscb., H. E., vii. 27-30; Epiphan., Her., Ixv. 1.

Many bishops still continued to be on the one hand Arian or Semi-Arian, while on the other hand men of grzat power and enlighten- ment, like Marcellus of Aneyra and Photinus of Sirmium, slid back into dangerous affinity to Sabellianism. It was in consequenee of a similar reaction that Apollinaris, bishop of Laodicea, in the desire to maintain the glory of Christ, fell into a new heresy and revived an old error, by arguing that in Jesus the Logos supplied the place of the reasonable soul. It is obvious that such a view undermined the doctrine of the example and atonement of Christ, and it was con- demned in 381 at the council of Constantinople.

The next great controversy arose from the refusal of Nestorius, patriarch of Constantinople, to apply to the Virgin Mary the term Lheotokos or mother of God. In his endeavour to avoid the extremes whieh had already been eondemned, he spoke of the union of the two natures in Christ as a connexion (ovvdd@em) or indwel- ling (évolxnors), but denied that there was any communieation of attributes (xowwvla idtwudétwv). He maintained, in fact, a mechanical rather than a supernatural union of the two natures. He was condemned in the eouncil of Ephesus, 431, and died in exile ; but the schools of Edessa and Nisibis still maintained the Nestorian doetrine, which has continued in the East even till the present day.

The last great controversy on the two natures was raised by Eutyches, archimandrite of Constantinople, who confounded together the two natures whieh Nestorius had separated, thus inaugurating what is known as the Monophysite heresy, which was condemned in the eouncil of Chalcedon, 451. It is needless to explain the obscure heresies of Theopasehites, Phthartolatri, Aphthartodocetz, or to do more than name the views of the Mono- thelitecs, who strove to put an end to controversy by maintaining that though there were two natures in Christ there was only one will, The main results at whieh the church arrived cannot be better summed up than they are in an admirable passage of Hooker (Ecel. Pol., v. 54, 10): " There are but four things which coneur to make complete the whole state of our Lord Jesus Christ. His deity, His manhood, the conjnnetion of both, and the distinetion of the one from the other being joined in one. Four principal

lieresies there are which have in those things withstood the truth: Arians by bending themselves against the deity of Christ; Apollinarians by maiming and misinterpreting that which belongeth to His human nature ; Nestorians by rending Christ asunder and dividing Him into two persons ; the followers of Eutyches by confounding in His person those natures which they eould distinguish. Against these there have been four most ancient general councils: the eouncil of Niee to define against Arians; against Apollinarians the council of Constantinople; the eouncil of Ephesus against Nestorians ; against Eutyehians the Chaleedon council, In four words éAn6és, TEAEws, Adiaipérws, aouvyxuTws, truly, perfectly, indivisibly, dis- tinetly—the first applied to His being God, the seeond to His being man, the third to His being of both One, and the fourth to His still eontinuing of that one Both—we may fully, by way of abridgement, comprise whatever antiquity hath at large handled either in declaration of Christian belief, or in refutation of the fore- said heresies." The result of these eenturies of controversy was enshrined in the so-ealled Nieene creed—" the holy symbol declared at Nice, established at Constautinople, strengthened at Ephesus, sealed at Chaleedon."

When the ehurch had thus rigidly defined the limits of Catholic orthodoxy, the decisions of the four cecumenieal eouncils were aceepted, and no further controversies rose on these subjects for about 800 years. Thedisputes between the Nominalists and the Realists, and the speculations of the Sehoolmen generally as regards this sub- jeet, turned rather on the proofs or illustrations of the doetrine of the Trinity than on theories respeeting the two natures of Christ. There are remarks and illustrations not only in the Schoolmen but even in the Reformers which might be regarded as questionable, but none of them were intended to diverge from the Catholic verity. Passing over the erude system of Servetus, we hear of Unitarian eommunities in Poland as early as 1568. In 1544 Lelius Socinus had been obliged to leave ltaly because hisopiniouswere known to be unfavour- able to the divinity of Christ. On his death at Zurich in 1562 his nephew Faustus Socinus openly taught the opinions which he had learnt from his uncle's papers, and acquired a considerable following in Poland. The exegetic methods of Socinianism were so weak, and its rupture with Christian history so

absolute, that the special views of the Soeini—which were that Christ, though miraculously born, was only the highest of men, and was deified after His death asa reward for His virtue—have had an indirect rather than a direct influenee. In 1611 three men were burnt in England for denying the doctrine of the Trinity, but in the middle of the 17th century we find John Biddle recognized as a leader of the Unitarians, and the spread of Unitarian doctrines led Bull to write his celebrated Defensio Fidet Nicene in 1685. The first Unitarian ehureh in Eng- land wasfounded in 1773 by Lindsay. The writings of Spinoza and of the English deists—Herbert, Toland, Shaftesbury, Chubb, Bolingbroke—helped largely to weaken the orthodox faith. But in later periods it has been rather undermined than denicd.

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While nominally accepted it has been understood and explaincd in a mauner of which the ancient church never so much as dreamt. Kant used all the traditional formule, but they do not appear to have been more to him than symbolic expressions. Similarly Schelling spoke of the Three Persons of the creeds as three Momen- tums, for which he substituted in later years the word Potenzen, and the language of Fichte and Hegel practically sublimates to nothing the doctrine of Christ's divinity.

3ut this " dispersive analysis" of the later centuries has shown itself most markedly in some of the Lives of Jesus, and these prove very conclusively that many Christians have not preserved the Nicene faith, but find an insuperable stumbling block in the miracles. Even in the treatment of the life of Jesus by Hess (1768) there isa spirit of concession to modern doubt which becomes still more marked in the similar sketches of Herder (1796), who leans, wherever he can, to the natural or the symbolic view of miracles. The Leben Jesu of Paulus was written with the avowed object of explaining away the supernatural elements in the Gospels while yet the evangelists themselves were accepted as faithful witnesses, —an attempt which at once fell to the ground under the weight of its own absurdity. Far different was the line adopted by Schleicrmacher in his Leetures on the Life of Jesus

(published from notes by Riitenik in 1864). Schleiermacher wished to steer between the Ebionitic and the Docetic views of Christ, but while maintain- ing the divinity he systematically endeavours to reduce the miracles within the scope of natural laws, and treats even the resurrection in a rationalizing manner, as though Jesus had not really died. Hase, in his Leben Jesu (1829), leans in the same direction, supposing that Jesus possessed sonie unknown power and a sort of sanative mag- netism. None of these writers have, however, produced so deep an impression as Strauss and Renan. Strauss, instead of endeavouring to eliminate the supernatural, or to invest it in some sort with a natural appearance, treated the Gospel narratives as myths from which it was hardly possible to understand the historic personality of Christ. In his Leben Jesu (1835) he rejected the Fourth Gospcl altogether; in his second edition, in deference to Neander, he Icft the question neutral. In this earlier phase he regarded Jesus as merely "the idea of the identity of God and man, and the mission of humanity" built up on Messianic prophecy ; but he afterwards, as in his Life of Christ for the People (1864), attached more importance to the tendency-theory of Baur, and in his later writings (The Old Faith and the New, 1878) treated the existence of Christianity in as disdainful a tone as though it were hardly worthy of any explanation at all. Renan (Vie de Jésus, 1863) entirely abandoned all faith in Christ's divinity, and, while speaking of Him as one " whom His death had made divine," treated Him from the point of view of an amiable rabbi who, beginning as an innocent enthusiast, developed into something hardly if at all removed from conscious imposture. Meanwhile these negations had provoked a strong reaction ; and writers like Neander (1837), Ebrard (1842), Lange (1848), Olshausen (1853), Weisse (1856), Riggenbach (1858), and above all Ewald (1855), maintained with abundant learning the truth of the Gospel narratives, though the works of all of them betray, in a greater or less degree, the signs, to which Neander so touchingly alludes, that they were produced "in an age of crisis, of isolation, of pain, and of throes." The most important recent contribution to the literature of this subject is the Jesu von Nazara of Kcim (1867). He writes in a reverent spirit aud a powerful style, with abundant learning and patient research. He takes his stand on the sinlessness of Jesus, and presents Him as human indeed but still divine

in the exaltation of His humanity. Keim attributes the Fourth Gospel to a late and post-apostolic author, and when he gives it as his conclusion that "in the life of Jesus, where the most genuine and unadulterated humanity dwelt, was revealed at the same time not only a religious genius, but the miracle of God and His presence upon earth," and

that "the person itself and nothing else is the miracle," he shows by how vast a space modern opinion has receded from the views of the Catholic chureh. The English works on the Life of Christ have been very numerous of late years, and have been marked with few exceptions by their fidelity to Cliristian faith.

Literature.—The bibliography of the life of Christ is immense, and the mono- graphs on isolated questions which bear upon it may be counted by hundreds. The reader will find a fairly adequate account of the results of a eomprehensive critical survey of the whole field in Hase's Geschichte Jesu, 1875. So far as the patristic and medieval periods are concerned, the gospel-harmonies of Tatian, Ammonius of Alexandria, Victor of Capua, Gerson, and the poetical eompositions based upon the Gospel narratives by Prudentius, Sedulins, Nonnus, Ca:dmon, the author of the Zeliand, Otfried of Weissenburg, and others, may be dismissed with a mere reference. Of greater importance as early examples of a large class of works, designed for religious edification rather than for historical portraiture, are the Vita Christt of Bonaventura (first printed in 1480, and often since, the latest English translation bearing so recent a date as 1880), and the Vita Jesu Christé of Ludolphus Saxo (written about the middle of the 14th century, and first printed at Strasburg in 1470). After the Reformation the harmony of the Gospels eontinued to absorb much of the attention of scholars, and many able works in this field, from that of Osiander (1537) to that of Bengel (1736), appeared, all of them, however, unnaturally restricted by the limitations of a conventional ortho- doxy, and marked by a characteristic absence of the critical spirit. The only work belonging to this early period which can be said still to possess permanent value is the Life of Christ by Jeremy Taylor, 1653. Such works as the Afessiah

of Klopstoeck, 1748, belong to literary rather than to theological history. The beginnings of a new historical method can be traced in the writings of the English deists, sueh as Woolston and Chubb, a method which somewhat later was taken up by Reimarus and Lessing, and gave rise on the other side to the apologetic works of Lardner, Paley, and others in England, and in Germany to those of Herder (Vom Erléser des Menschen, oder unsere drei ersten Evangelien, and Von Gottes Sohn der Welt JIeiland nach Johannes) and of Hess (Geschichte der drei letzten Lebensjahre Jesu, 1768; 7th ed., 1823, with the title Lebensgeschichte Jesu). In chronologieal order, the names of Schleiermacher and Ifase come next. The leetures of the former, first delivered in Berlin in 1819, and frequently repeated In subsequent years, had almost expended their great influence before their pub- Ilcation by Riitenik (Vorlesungen uber das Leben Jesu, 1864) 5 those of the latter, begun at Tiibingen in 1823-4, first saw the light as a Leben Jesu in 1829 (5th ed., 1865, and in a still more expanded form entitled Geschichte Jesu in 1875). Their publication was preecded and occasioned by that of the Leben Jesu als Grundlage einer reinen Geschichte des Urchristenthums of Paulus in 1828. A new phase of negative criticism was introduced by the publication in 1835 of the Leben Jesu of Stiauss, further developments of which are to be found in his Leben Jesu fiir das deutsche Volk bearbettet (1865; Eng. trausl., 1865), and in the writings of his fel- lowers, among whom may be mentioned C. lI. Weisse (Das Leben Jesu kritisch u. philosophisch bearbeitet, 1838), Salvator (Jésus Christ et si doctrine, 1838), and Gfriver (Geschichte des Urchristenthums, 1838). Among the very numerous works eontroverting these in the interests of Christian apologetics, the most important are those of Tholuck (Die Glaubwiirdigkeit der Evangelischen Geschichte, 1837), Neander (Das Leben Jesu Christi, 1837; 7th ed., 1873; Eng. transl., 1848), Ebrard (Wissenschaftliche Kritik der Evangelischen Geschichte, 1842), Wieseler (Chrono- logische Synopse der vier Evangelien, 1843), Lange (Leben Jesu, 1844-47 ; Eng. transl., 1864, 1871), from the Protestant standpoint ; and those of Kuhn (Leben Jesu, vol. i., 1838), Sepp (Leben Christi, 1843), and Bucher (Das Leben Jesu Christi, 1859), from the Catholic. The writings of the Ttibingen school (Bruno Bauer, Kritik der Evangelischen Geschichte des Johannes, 1840; Krit. d. Ev. Gesch. der

Synoptiker, 1841; Krit. d. Ev. Gesch. der Synopt. u. d. Johannes, 1842; Krit. der Evangelien u. Gesch. ihr. Ursprungs, 1850; F. C. Baur, Arit. Untersuchungen i. d. Kanon. Evangelien, 1847 ; Das Christenthum u.d. Christliche Kirche der drei ersten Jahrhunderte, 1853) on the other hand oceasioned Ewald's Geschichte Christus u. seiner Zeit (1855), and the similar works of Liehtenstein (Lebensgeschichie Jesu Christi in chronol. Uebersicht, 1856), Riggenbach (Vorlesungen wu. d. Leben ad. H, Jesu, 1858), Baumgarten (Die Geschichte Jesu, 1859), Ellieott (Historical Lectures on the Life of our Lord Jesus Christ, 1860). Renan's Vie de Jésus appeared iu 1863, Schenkel's Characterbild Jesu in 1864 (compare the Christusbild der A postel u. der nachapostolischen Zeit of the same author, 1878), Keim's Der Geschichtliche Christus in 1865, his Jesu von Nazara in 1867-72, llausrath's " Die Zeit Jesu" In the W7liche Zeitgeschichte in 1870, Wittichen's Leben Jesu in 1876. and Volk- mar's Jesus Nazarenus n.d. Schrifizeugen d.1lten Jhdts., p. i. in 1881. With these may be contrasted, amongst many others whieh might be named, the follow- ing well-known works:—Pressensé, Jésus Christ, son tenips, sa vie, son euvre, 1865; Weizsacker, Untersuchungen ti. d. Evangelische Geschichte, 1864; Gess, Christi Person u. Werk, 1870-79 ; Dupanloup, Hist. de Notre Seigneur Jésus Christ, 1870; Andrews, Life of our Lord upon Earth, 1863 ; F. W. Farrar, Life of Christ, 1874, 23d ed., 1881; Geikie, Life and Words of Christ,1877. Ecce JJomo, a survey of the life and work of Christ, an anonymous work, which attracted much attention in its time, is also worthy of mention here. From Catholic sources we have the second volume of Bougaud's Le Christianisme et les tenps presents, entitled Jésus Christ, 1871; also Grimm's Leben Jesu nach den vier Evangelien, of which as yet only two volumes have appeared, 1876-78. On Christology the standard work is Domer's Darstellung der Lehre von der Person Christi, 1845-56; Eng. trans., 1862, (F. W. F.)

JESUS, Tue Son or Srracu (Sirachides), the author of the book of Ecclesiasticus, was a native of Jerusalem, of whose personal life, apart from this one fact, vouched for by himself (Ecclus. 1. 27), nothing is known, except that it was devoted to the study of the sacred literature. Accord- ing to indications contained in chaps. xxxiv. 11, 12, xxxix. 4, 5,

li. 1 sg., he seems to have travelled abroad, associated with princes, and once at least been placed in danger of his life by intrigues against him at a royal court. His collection of moral sayings (codia Inaod viod Supdy, LXX.; Zcclestasticus, sc. Liber, Vulg.), originally written in Hebrew, and bearing according to Jerome the title of " Proverbs," was translated into Greek by his grandson, who came to Egypt in the thirty-eighth year of Ptolemy Euergetes (see the Prologue). By this Ptolemy Euergetes

we can only understand the second of that name, who began to reign as king of Libya and Cyrene in 170 B.c. Reckon- ing two generations back from 132 B.c., we reach the high priesthood of Simon II. (219-199 3.c.), to whom, and not to Simon I., the eulogy spoken in Ecclus. 1. is most probably to be assigned. The book was thus originally composed about 180 B.c.

JET, a mineral substance belonging to the carbonaceous group, and generally regarded as a compact variety of lignite, or wood-coal, impregnated with bitumen. The word jet (German Gagat) is corrupted from yagates, the naine applied to it, or to a similar substance, by Greek and Roman writers, and derived, according to Pliny (ZZ. W., xxxvi. 34), from the river Gagas in Lycia, where the mineral was originally found. Its occurrence in Britain is

mentioned by Solinus ; but it was certainly used there in pre-Roman times. Barrows of the Bronze Age have yielded beads, buttons, rings, armlets, and other personal ornaments of jet. The early supply was probably obtained from the Yorkshire coast, near Whitby—a locality which still yields the finest varieties. The Whitby jet occurs in isolated masses, of irregular shape, but frequently more or less lenticular, imbedded in bituminous shales near the base of the Upper Lias. The particular horizon of the jet-rock is known to geologists as the zone of Ammonites serpentinus. Opinion is divided as to the exact nature and origin of the jet : some regard it as a variety of lignite, others as a kind of cannel coal, and others again as a hardened form of bitumen. There is little doubt that the jet has in all cases resulted from the decay of

organic matter. Microscopic sections of jet frequently reveal a ligneous structure, in most cases of coniferous type. It has been suggested that masses of wood brought down by a river have drifted out to sea, where, becoming water-logged, they have sunk and have gradually been covered with a deposit of fine black mud, beneath which the decay has slowly proceeded. Possibly bituminous matter may have been distilled from this decaying vegetation, and deposited between the layers of shale in its neighbourhood. Drops of liquid bitumen are frequently found in the fossils of the jet-rock, and inflammable gas, derived from the bituminous shales, is not uncommon iu the jet-mines. Moreover, scales of fish and other fossils of the jet-rock are frequently converted into jet, the bituminous matter having replaced the original tissues. When jet is heated, it betrays its bituminous character by burning with a dense pungent smoke, which was formerly reputed to possess powerful medicinal virtues. At present the material is used only for trivial ornaments, principally for mourning jewellery. To obtain jet, the shale is systematically mined not only at its outcrop in the cliffs but in the inland dales of the Cleveland district. It is now rare to find washed jet upon the sea-shore, but formerly a considerable quantity was thus obtained. The best hard jet is exceedingly tough, and may be readily carved or turned on the lathe, while its compact texture allows it to receive ahigh polish. The final polish is given by means of rouge, which produces a beautiful velvety surface. The softer kinds, not capable of being freely worked, are known as bastard jet. From the estuarine beds of the Lower Oolites of Yorkshire, a soft jet is obtained ; but, though occasionally used for ornamental purposes, it is far inferior to the true Whitby jet. Spanish jet has been largely imported into Whitby, but is deficient in hardness and lustre. Cannel coal from Scotland is occasionally used in the place of jet ; and it is not uncom- mon for brooches to be made of a carving of Whitby jet set in a plain polished rim of either Spanish jet or cannel.

For descriptions of jet and jet-~working see The Yorkshire Lias, by Ralph Tate and J. F. Blake, 1876; and a paper on Whitby Jet, by J. A. Bower, in Jour. Soc. Arts, December 19, 1873.

JEW, THE Wanverine. The legend of a Jew doomed to wander until the day of judgment, for an iusult offered to Christ, is first mentioned by Roger of Wendover in the Chronicle completed by Matthew Paris, who received the story from an Armenian bishop, who visited England in the year 1228. As told in Matthew's Historia Major, the legend runs that the wanderer's name was Carta- philus, that he was doorkeeper of Pilate's palace, and that as Jesus was led out to be crucified he struck him on the neck, saying, "'Go, Jesus, go on faster; why dost thou linger?" Jesus replied, "I go, but thou shalt remain waiting till I return." The Armenian bishop, if his French servant and interpreter is to be trusted, said that this wanderer had dined with him shortly before his leaving home, and that he was now a penitent man and had

been baptized by Auauias, who also baptized Paul, under the name of Joseph. At the time of the crucifixion he was thirty years of age ; whenever he reaches the age of one hundred he becomes faint, and when le becomes conscious again he is as young as when his doom was pronounced. He never smiles, refuses all gifts, and narrates many ancient events to those who come from far and near to listen. On the same authority rests the somewhat later account by Philippe de Mousket in his Chronique rimée. The English chronicler states that the bishop's statement was in reply to a question whether he had seen or heard of one Joseph, said to have been present at the crucifixion to be preserved in the world as a witness of that event. It would appear, therefore, that there was already in existence a legend of an undying Jew, although nothing was intimated of his insult to Christ. The idea of wandering did not enter into the legend until a later period, when persons pretending to be the undying Jew appeared in various parts of Europe. Near the middle of the 16th century the legend appears in Germany, brought there by a man who professed to be the "Ewige Jude" himself. He appeared at Hamburg, in 1547, giving his name as Ahasuerus, and stating that he had been a shoemaker in Jerusalem who would not suffer Christ to rest at his door when fainting under the weight of the cross. He struck Jesus, and bade him move on. Jesus said, "TI will stand here and rest, but thou shalt go on ubtil the last day."

This story, however, also rests upon the authority of an irresponsible reporter. It is attributed to Dr Paulus von Eizen, bishop of Schleswig, whose long conversations with Ahasuerus are given, in a work by one Chrysostomus Duduleus Westphalus,—probably a pseudonym. This was published some years after the death of Paulus von Eizen, which occurred in 1598, and its aim is to make the story as sensational as possible as a "warning." 'This earliest known book on the legend, published at Leipsic, 1602, professes to be derived from a previous one :—Strange Report of a Jew born at Jerusalem, who pretends he was present at the crucifixion of Christ ; newly printed at Leyden. Other small works appeared somewhat later, as at "'Augspurg, 1619," and elsewhere, and were continued throughout the 17th century, these containing rumours of the Jew's appearance in Hamburg, Dantzic, Naumburg, Liibeck, Brussels, Moscow, and Madrid. Rudolph Botoreus, parliamentary advocate of Paris (Comm. histor., 1604), mentions contemptuously the rumours of the appearance of this Jew in Germany, Spain, and Italy, and the popular credulity. The most important account of any of these monomaniacs or pretenders is that given of one in Paris (1644) by The T'urkish Spy (book iii., letter i.). 'One day I had the curiosity to discourse with him in several languages; and I found him master of all those I could speak. I conversed with him five or six hours together in Arabic." 'The common people are ready to adore him; and the very fear of the multitude restrains the magistrates from offering any violence to this impostor." From a letter of Madame de Mazarin to Madame de Bouillon, it appears that an individual appeared in England in the beginning of the 18th century professing to have been an officer of rank in Jerusalem who for an insult given to Jesus was doomed to live and wander. It is said that the universities sent professors to cross-examine him, and that many were satisfied of the truth of his story. Several pretenders of the kind appeared in England in the last century. Brand remembered to have seen one going about the streets of Newcastle muttering "Poor John alone." It is difficult, however, to discover whether in all these cases the rdle of the Wandering Jew was assumed or was added to aged beggars by popular credulity. The names given to these wanderers are various. Cartaphilus is probably xépta pidos, the "much beloved," XIII. — 85

in allusion to St John, who was believed to “tarry” until the coming of Christ. Joseph was perhaps caught from the legend of Joseph of Arimathzea, who was said to have wandered into Britain in the year 63, when his flowering staff indicated the spot where Glastonbury abbey should be built. Zhe Turkish Spy in Paris gives his name as Michob Ader; Libavius (Praxis Alchymiz) as Butadeus. In Brussels he was called Isaac Laquedem, a name believed by Griisse to be the French Ja combined with kedem, Heb. for “aforetime.” Mr Karl Blind has suggested that his name in Germany, Ahasuerus, may have been formed out of a corruption of As-Vidar, “god Vidar,”—the Teutonic deity who was to survive the destruction of the world and conquer the woif Fenris by thrusting his foot covered with an enormous shoe down the monster’s throat (Gentleman’s Magazine, July 1880). This ingenious suggestion would account for the transformation of the wanderer between 1228, when the Armenian bishop described him as Pilate’s doorkeeper, and 1547, when he claims to have been a shoemaker. For a long time there were kept at Bern and also at Ulm enormous pairs of shoes said to have been left by the Wandering Jew on his visits to those places. ;

The legend of the Wandering Jew seems clearly related to a class of myths, found in every part of the world, in which certain saints or heroes are represented as having never died. Many of these myths,—as those of King Arthur, Charlemagne, Barbarossa, Tell,—are no doubt ethnically connected ; but the corresponding myths found

among the Incas, and among various American tribes, .

may lead us to seek for a common root of them all in human nature,—in the unwillingness of men to believe that their heroes can be really dead. In a primitive race, which had not yet conceived the idea of animistic immortality, the notion of a continued existence in happy isles, valleys, or grottoes, would naturally arise. The earliest instance of this earthly immortality would appear to be that of the Persian Yima, king of the Golden Age, who, in the Zend-Avesta, “gathers around him men and animals in flocks, and fills the earth with them, and after the

evils of winter had come over his territories leads a select number of the beings of the good creation to a secluded spot, where they enjoy uninterrupted happiness" (Haug's Hssays, &c., p. 277). In a corresponding phase of development the Semitic races ascribed a similar terres- trial immortality to Enoch, Elijah, and some others. The Arabs have very particular accounts of the secret abodes of these ; and there are indications that in Eastern folklore Moses was believed to be sleeping in his unknown sepulchre.

By the action of religious dualism on this belief there arose evil counterparts of the immortal heroes, who instead of dwelling in blissful retreats were doomed to wander without finding even the repose of the grave. Of this class Cain was the most conspicuous, and the Bedouin still feels his presence in the feverish desert-winds (Cain-winds), as the Picardy peasant says of a destructive gale, C'est le juif errant qut passe. Esau, Ishmael, and others have been evil wanderers in the superstitions of various localities ; but there is one tradition of high antiquity which would appear to have especially prepared the way for our legend. It is related by G. Weil (Zhe Bible, the Koran, and the Talmud, p. 127) that, according to this tradition, the golden calf was made by Al Samiri. Moses was about to put this man to death when Allah declared he should be banished. 'Ever since that time he (Samiri) roams like a wild beast throughout the world ; every one shuns him, and purifies the ground on which his feet have stood; and he himself, whenever he approaches men, exclaims, Touch me not!" There also arose a belief that this monster dwelt with his progeny on a rocky island in the Arabian

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Gulf, from which emanated the plague (Sale, Koran, 0.5) B

These traditions were inherited by the folklore of Christendom. The mantle of Enoch and Elijah, and other saintly sleepers, fell upon the seven supposed to be slumber- ing in a cave near Ephesus, near to the slumbering St John, belief in whose earthlyimmortality is mentioned in the New Testament (John xxi. 23). On the other hand, the mantle of Cain and other evil wanderers would seem to have fallen on Nero, who

for some time after his death was believed by friend and foe to be still living. At a later period, after Rome had been Christianized, the idea of a perpetual enemy of the Messiah was temporarily detached from any one man and personified as Antichrist, —ua restless invisible spirit appointed by the adversary to resist the rival kingdom. This more abstract conception was prolific of evil wanderers. When, in course of the diffusion of Christianity throughout Europe, its missionaries came in contact with popular beliefs in deities which in many cases had been developed from traditional heroes and warriors,—such as Odin, Waldemar, Vidar,—these imaginary potentates were- degraded into phantoms, demons ; the brand of Cain was set on their names by solemn anathema, and thenceforth all regions of space had their doomed wanderers,—the Wild Huntsman in the air, the Flying Dutchman on the sea, and various forest- phantasms like the Gros Veneur of Fontaincbleau and Diedrich of Bern on the earth. The Jewish race, however, was the one race which did not yield to Christianity ; its special identification with Antichrist was therefore inevit- able. Many superstitions affecting them had long been accumulating. There was a belief that the seven whistlers —plovers or sometimes wild geese—were Jews that had been transformed because they had assisted in the cruci- fixion of Christ, and to see or hear those birds was regarded as ominous of disaster. The Witch Sabbaths were so called because the Jews were supposed to assemble at them. Their wealth was believed to be obtained from Satan. There was also a belief that they carried about plagues) This idea may partly have been derived from the tradition of Samiri and his island, already mentioned, but possibly derived some confirmation from the actual results of crowding the Jews into the confined and neglected quarters of cities, in disregard of sanitary laws. From innumerable sources like these gathered the cloud of fanaticism which sent its thunderbolts upon the Jewish people. The legend of the Wandering Jew, when it was pieced together, represented precisely the popular belief that this race, having betrayed its supernatural mission, had received a supernatural doom. The legendary figure was invested with the fatal associations of most of the demons which Christianity had degraded. He passed in the storm, presided at orgies, diffused diseases, instigated revolutions, burned cities. He was not only associated with European demons but with those of the Jewish race

also. There was a wild fable about Judas,—that he had fulfilled a fearful dream of his mother before his birth, living, despite her throwing him into the sea, to “kill his father and sell his God,”—— which reappears in our legend. Judas was said to have become page to Pilate, as Carta- philus was his doorkeeper. Death refused to touch Judas until his doom had been fulfilled, as it spared the Wandering Jew. In the familiar legend of the discovery of the True Cross, the Jew who, after torture, points out its place of concealment to Helena is named Judas; and M. Magnin has plausibly suggested that the story of the Wandering Jew grew up in connexion with the True Cross legend. As Cain was a prototype of Judas, so was Judas of such doomed wanderers as Malchus in Italy and Ahasuerus in Germany. M. Gaston Paris believes the legend of

Malchus to be the earlier. He was said to have struck Jesus with an iron bar, and to have been condemned to walk until judgment-day around a subterranean column, against which he often dashes his head in the vain hope of death. :

The respect shown by peasants to persons pretending to be the Wandering Jew was such as might have been expected for Cain with a mark upon his brow defending him from the hand of man. Such a mark was indeed supposed to be on the Wandering Jew’s forehead. Xemola says it was a red cross concealed by a black bandage, on which account the Inquisition vainly tried to find him. While persecuting actual Jews, the peasantry had some compassion for this imaginary one, and in some parts of Germany two harrows were sometimes left in the field, set up together with teeth downward, it being believed that so the wanderer might obtain a night’s rest.

The Wandering Jew has been a favourite subject of poctry and romanee. Goethe (Dichtung und Wahrheit, xv.) has given the scheme of a dramatie poem on the theme which he had eontem- plated. It has been dealt with by C. F. D. Sehubart, Der ewige Jude, 1787; A. W. Schlegel, Warnung, 1811; Aloys Schreiber, Der ewige Jude, 1807; W. Miiller, Wanderlicdern, 1830; Edgar Quinet, Ahasuerus, 1883;

Chamisso, Newer Ahasuer, 1836; F. Hauttral, Ahasweriad, 1838; Julius Mosen,

JEWEL, or Jewett, Jon (1522-1571), bishop of Salisbury, was born May 24th 1522, at Berry Narbor, near Ilfracombe, Devonshire. At the age of thirteen he entered Merton College, Oxford, where he had for tutor John Parkhurst, afterwards bishop of Norwich, from whom his mind received a bias towards Protestantism. Becoming tutor in Corpus Christi College in 1539, he in his turn took the opportunity of inculeating Protestant principles on his pupils; and in 1546 he received an allowance from a private fund instituted for the benefit of indigent scholars who publicly professed the doctrines of the Reformed faith. After the accession of Mary in 1553 he was expelled by the fellows from the college on account of his opinions, and in a moment of weakness he was induced to sign his adherence to a form of doctrine essentially Romanistic. He, however, speedily repented of his momentary faithlessness to his convictions, and in order to escape the penalties of martyrdom he fled in 1555 to Frankfort, where he publicly abjured his former recantation. On the death of Mary he returned to England. He was one of the learned Protestant doctors appointed to dispute before Elizabeth at Westminster with a like number of Catholics. In the beginning of 1560 he was created bishop of Salisbury, and in the same year he published, with the sanction of the queen and bishops, his Apologia Eeclesix Anglican, which was in fact an argument against the decision of the pope to exclude the Reformers from the council of Trent, convoked to be held in December of that year. The work, as was to be expected, excited very great

attention at the time ; it was condemned at the meeting of the council, who appointed two divines to reply to its arguments. It was translated into English by Anna, wife of Sir Nicholas Bacon, and Elizabeth ordered that a copy of it should be chained in every parish church in England. Its chief English opponent was Thomas Harding, who in 1565 published a Confutation of the Apology, to which Jewel replied in 1567 by the Defence of the Apology. 'The general argument of Jewel is that

unity or predominance of opinion is not a test of truth, and, although he denied that Rome had the support of the fathers, he rested his general case on the fact that the foundation on which the Church of England was built was not that of the fathers but of the apostles and Jesus Christ. His views were strongly anti-sacramentarian, as he held that the Lord's Supper had nothing more than a commemorative use. Jewel died suddenly at Monkton Farleigh, a small village in his diocese, September 22, 1571.

Joannis Juelli vita et mors, T. Humfredo autore, was published at: London in 1573. The Apology, translated with notes and life by Isaaeson, appeared in 1823, and the other biographies of Jewel are one by Le Bas in the Theological Library, 1835, and a short sketeh published by the Society for the Promotion of Christian Knowledge, 1850. His works, which are mostly controversial, were eollceted by Dr R. W. Jelf, and published in 8 vols. at Oxford, 1848.

JEWELLERY (Latin, gaudium; French, jouel, joyaw). Plates Personal ornaments appear to have been among the very XI., XII.

first objects on which the invention and ingenuity of man were exercised ; and there is no record of any pevple so rude as not to employ some kind of personal decoration. Natural objects, such as small shells, dried berries, small perforated stones, feathers of variegated colours, were com- bined by stringing or tying together to ornament the head, neck, arms, and legs, the fingers, and even the toes, whilst the cartilages of the nose and ears were frequently perfor- ated for the more ready suspension of suitable ornaments.

Amongst modern Oriental nations we find almost every kind of personal decoration, from the simple caste mark on the forehead of the Hindu to the gorgeous examples of beaten gold and silver work of the various cities and provinces of India. Nor are such decorations mere orna- ments without use or meaning. The hook with its cor- responding perforation or eye, the clasp, the buckle, the button, grew step by step into a special ornament, according to the rank, means, taste, and wants of the wearer, or became an evidence of the dignity of office. That these ornaments were considered to have some representative purpose even after death is abundantly proved; for it is in truth to the tombs of the various ancient peoples that we must look for evidence of the early existence of the jeweller's art.

That the Assyrians used personal decorations of a very distinct character, and possibly made of precious materials, is proved by the bas reliefs. In the British Museum we have a representation of Samsi Vul IV., king of Assyria (825 8.c.). He wears across (Plate XI. fig. 1) very similar to the Maltese cross of modern times. The still more ancient Egyptian jewellery is distinctly brought before us by the objects themselves, placed with the embalmed bodies of the former wearers in sarcophagi, only to be opened in our own time. The most remarkable collection of Egyptian art in this direction is to be found in the jewellery taken from the coffin of Queen Aah-hotep, discovered by M. Mariette in the entrance to the valley of the Tombs of the Kings in 1859, and now preserved in the Bulak museum. In these objects we find the same ingenuity and perfect mastery of the materials as characterize the monumental work of the Egyptians. Hammered work, incised and chased work, the evidence of soldering, the combination of layers of gold plates, together with coloured stones, are all there,—the handicraft being complete in every respect.

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A diadem of gold and enamel, found at the back of the head of the mummy of the queen (fig. 2), was fixed in the back hair, showing the cartouche in front. The box holding this cartouche has on the upper surface the titles of the king, "the son of the sun, Aahmes, living for

ever and ever," in gold on a ground of lapis lazuli, with a chequered ornament in blue and red pastes, and a sphinx couchant on each side. A necklace of the order or decoration of the Fly (fig. 3) is entirely of gold, having a hook and loop to fasten it round the neck. A small porcelain cylinder (fig. 4) is ornamented with interlaced lotus flowers in intaglio, having a ring for suspension, and fig. 5 is a gold drop, inlaid with turquoise or blue paste, in the shape of a fig. A gold chain (fig. 7) is formed of wires closely plaited and very flexible, the ends termi- nating in the heads of water fowl, and having small rings to secure the collar behind. To the centre is suspended by a small ring a scarabeus of solid gold inlaid with lapis lazuli. These scarabei were in constant use in Egyptian ornaments, and were worn in rings by the military caste. We have an example of a bracclet, similar to those in modern use (fig. 6), and worn by all persons of rank. It is formed of two pieces joined by a hinge, and is decorated with figures in repoussé with a ground inlaid with lapis lazuli. A signet ring (fig. 8) has a square revolving bezel on which are four serpents interlaced.

The discoveries of Dr Schliemann at Mycenz and at Hissarlik, the assumed site of ancient Troy, supply further illustrations of ancient jewellery and gold work. In extent and in the wonderful character of the design and workmanship, the relics found at Mycenz present the most perfect examples, although some of the objects brought from the "burnt city" at Hissarlik give evidence of singular skill and ingenuity in the methods of com- bining the various portions of an ornament and finesse in working the gold. From Mycenz the objects ranged over most of the personal ornaments still in use: neck- laces with gold beads and pendants, butterflies (fig. 16), cuttlefish (fig. 10), single and concentric circles, rosettes, and leafage, with perforatious for attachment to clothing, crosses (fig. 9), and stars formed of combined crosses, with crosses in the centre forming spikes,—all elaborately ornamented in detail. The spiral forms an incessant decoration from its facile production and repetition by means of twisted gold wire. Grasshoppers or tree crickets in gold repoussé suspended by chains and probably used for the decoration of the hair, and a griffin (fig. 17), having the upper part of the body of an eagle and the lower parts of a lion, with wings decorated with spirals, are among the more remarkable

examples of perforated ornaments for attachment to the clothing. There are also perforated ornaments belonging to necklaces, with intaglio engravings of such subjects as Hercules and the Nemean lion, and a duel of two warriors, possibly Hector and Achilles, one of whom stabs his antagonist in the throat. Another has a representation of a lion, very archaic in treatment, the style resembling that of the fore part of the lion found on the statue of Sardis, attributed to Croesus, 560 B.c. There are also pinheads and brooclies formed of two stags lying down (fig. 15), the bodies and necks crossing each other, and the horns meeting symme- trically above the heads, forming a finial. The heads of these ornaments were of gold, with silver blades or pointed pins inserted for use. The bodies of the two stags rest on fronds of the date-palm growing out of the stem which receives the pin. Another remarkable series is composed of figures of women with doves (fig. 20). Some have one dove resting on the head ; others have three doves, one on the head and the others resting on arms. 'I'he arms in both instances are extended to the elbow, the hands being

placed on the breasts. These ornaments are also per- forated, and were evidently sewed on the dresses, although there is some evidence that an example with three doves has been fastened with a pin,

Mention must be made of an extraordinary diadem found upon the head of one of the bodies discovered in the same tomb with many objects similar to those noticed above. It is 25 inches in length, covered with shield- like or rosette ornaments in repoussé, the relief being very low but perfectly distinct, and further ornamented by thirty-six large leaves of repoussé gold attached to it. As an example of design and perfection of detail, another smaller diadem found in another tomb may be noted (fig. 11). It is of gold plate, so thick as to require no "piping" at the back to sustain it; but in general the repoussé examples have a piping of copper wire. Diadems of similar form are found on statues of Aphrodite, and also on statuettes of Hercules in ivory, in the Assyrian collection at the British Museum. Fig. 13 represents a remarkably elegant pendant ornament, the design being of an

exceptionally beautiful character. A cross of thin gold work formed of four leaves (fig. 18), a finial-like orna- nent (fig. 19), and the head of a pin or brooch evidently suggested by a butterfly (fig. 14), are all characteristic of the gold work of Mycense.

The gold ornaments found at Hissarlik, in what Dr Schliemann calls the "Treasury of Priam," partake in most instances of the same characteristics as those found in the sepulchres at Mycenz. There are necklaces, brooches, bracelets (fig. 29), hair-pins (fig. 23), earrings (figs. 21, 22, 25, 26, 27, 28), with and without pendants, beads, and twisted wire drops. The majority of these are ornamented with spirals of twisted wire, or small rosettes, with fragments of stones in the centres. The twisted wire ornaments were evidently portions of neck- laces. A circular plaque decorated with a rosette (fig. 30) is very similar to those found at Mycene, and a con- ventionalized eagle (fig. 31) is characteristic of much of the detail found at that place as well as at Hissarlik. They were all of pure gold, and the wire must have been drawn through a plate of harder metal—probably bronze. The principal ornaments differing from those found at Mycenz are diadems or head fillets of pure hammered gold (fig. 24) cut into thin plates, attached to rings by double gold wires, and fastened together at the back with thin twisted wire. To these pendants (of which those at the two ends are nearly three times the length of those forming the central portions) are attached small figures, probably of idols. It has been assumed that these were worn across the forehead by women, the long pendants falling on each side of the face. If, however, the position on which they were found was formerly part of a temple instead of a palace, it may be suggested that they were used as veils for the priests when giving forth the oracles from the shrine.

Jewellery and gold work of a very similar character has been found at Cyprus within the last few years by Major Cesnola. The rings (Plate XII. figs. 5 and 6) have a great resemblance to the Greek, whilst the beetle, which is of green stone set in gold (fig. 6), has a very Egyptian-like appearance. The great similarity in design and workman- ship between these Eastern examples and the gold jewellery and personal ornaments found in Peru and Mexico (figs. 1, 2, 3, 4) is not a little

remarkable. These, however, are more rude in design, though equally good in workmanship.

Greek, Etruscan, and Roman ornaments partake of very similar characteristics. Of course there is variety in design and sometimes in treatment, but it does not rise to any special individuality. Fretwork is a distinguishing feature of all, together with the wave ornament, the

guilloche, and the occasional use of the human figure, | precious stones, niello work, and engraving, in combination

The workmanship is often of a character which modern gold workers can only rival with their best skill, and can never surpass. The pendant oblong ornament for contain- ing a scroll (Plate XI. fig. 34) is an example of this, as also the Italo-Greek earring (fig. 32). The earring (fig. 36) is an exquisite illustration of Greek skill in the introduction of the human figure ; the rosette for concealing the hook and the winged ornament at the back of the Cupid are beautifully wrought. The other earrings (figs. 33, 35, 37) are all characteristic. The Etruscan examples are of the sanie character. The pendant (fig. 40), the rosette (fig. 38), and the plaque of gold (fig. 38) repeat some of the forms found at Mycenz, with possibly a little more classic grace of detail and refinement of workmanship. The brooch (fig. 41) is perhaps the most characteristic example of purely classic design, essentially Greek in its principal details, whilst the workmanship is all that can be desired.

The granulation of surfaces practised by the Etruscans was long a puzzle and a problem to the modern jeweller, until Signor Castellani of Rome discovered gold workers in the Abruzzi to whom the method had descended through many generations, and, by inducing some of these men to go to Naples, revived the art, of which he contributed examples to the London Exhibition of 1872, successfully applied to modern designs.

The Merovingian jewellery of the 5th century, the Anglo- Saxon of a later date, and the Celtic as leading to the Gothic or medizeval, have each distinguishing features. In the first two the characteristics are thin plates of gold, decorated with thin slabs of garnet, set in walls of gold soldered vertically like the lines of cloisonné enamel, with the addition of very decorative details of filigree work, beading, and twisted gold. In Plate XII. figs. 9 and 13 we have examples of Anglo-Saxon fibule, the first being decorated with a species of cloisonné, in which garnets are inserted, while the other is in hammered work in relief. A pendant (fig. 8) is also set with garnets. The buckles (figs. 10, 11, 12) are remarkably characteristic examples, and very elegant in design. A girdle ornament in gold, set with garnets (fig. 14), is an example of Carlovingian design of a high class. The Celtic ornaments are of hammered work, adapted to uses now comparatively unknown, but display another style of workmanship,—details in repoussé, fillings in with amber, rock crystal with a smooth rounded surface cut en cabochon, with the addition of vitreous pastes. The minute filigree and plaited work, in combination with niello and enamel, communicate to the ornaments of this class found in Ireland and Scotland an unmistakable Oriental spirit alike in design and workmanship.

In figs. 15 and 17 are illustrations of two brooches, The first is 13th century; the latter is probably 12th century, and is set with paste, amber, and blue. The brooch in the form of a figure of St Christopher bearing the infant Saviour, and supported by his staff (fig. 16), is of silver gilt. Chaucer mentions such a brooch as worn by the yeoman: —'A Crystofre on his brest of silvyr schene,"

Rings are the chief specimens now seen of medizval jewellery from the 10th to the 13th century. They are generally massive and simple. Through the 16th century a variety of changes arose; in the traditions and designs of the Cinquecento we have plenty of evidence that the workmen used their own designs, and the results culminated in the triumphs of Albert Diirer, Benvenuto Cellini, and Hans Holbein. The goldsmiths of the Italian republics must have produced works of surpassing excellence in workmanship, and reaching the highest point in design as applied to handicrafts of any kind. The use of enamels,

with skilful execution of the human figure and animal life, produced effects which modern art in this direction is not likely to approach, still less to rival.

In Plate XII. illustrations are given of various charac- teristic specimens of the Renaissance, and later forms of jewellery. A crystal cross set in enamelled gold (fig. 18) is German work of the 16th century. The pendant reli- quary (fig. 19), enamelled and jewelled, is of 16th century Italian work, and so probably is the jewel (fig. 20) of gold set with diamonds and rubies.

The Darnley or Lenox jewel (fig. 21), now in the pos- session of the Queen, was made about 1576-7 for Lady Margaret Douglas, countess of Lenox, the mother of Henry Darnley. It is a pendant golden heart set with a heart-shaped sapphire, richly jewelled and enamelled with emblematic figures and devices. It also has Scottish mottoes around and within it. The earring (fig. 22) of gold, enamelled, hung with small pearls, is an example of 17th century Russian work, and another (fig. 23) is Italian of the same period, being of gold and filigree with enamel, also with pendant pearls. A Spanish earring, of 18th century work (fig. 24), is a combination of ribbon, cord, and filigree in gold; and another (fig. 25) is Flemish, of probably the same period; it is of gold open work set with diamonds in projecting collets. The old French-Normandy pendant cross and locket (fig. 26) presents a characteristic example of peasant jewellery ; it is of branched open work set with bosses and ridged ornaments of crystal. The earring (fig. 27) is French of 17th century, also of gold open work set with crystals. A small pendant locket (fig. 28) is of rock crystal, with the cross of Santiago in gold and translucent crimson enamel; it is 16th or 17th century Spanish work. A pretty earring of gold open scroll work (fig. 29), set with minute diamonds and three pendant pearls, is Portuguese of 17th century, and another earring (fig. 30) of gold circular open work, set also with minute diamonds, is Portuguese work of 18th century. These examples fairly illustrate the general features of the most characteristic jewellery of the dates quoted.

During the 17th and 18th centuries we see only a mechanical kind of excellence, the results of the mere tradition of the workshop,—the lingering of the power which when wisely directed had done so much and so well, but now simply living on traditional forms, often combined in a most incongruous fashion. Gorgeous effects were aimed at by massing the gold, and introducing stones elaborately cut in themselves, or clustered in groups. Thus diamonds were clustered in rosettes and bouquets ; rubies, pearls, emeralds, and other coloured special stones were brought together for little other purpose than to get them iuto a given space in conjunction with a certain quantity of gold. The question was not of design in its relation to use as personal decoration, but of the value which could be got into a given space to produce the most striking effect.

The traditions of Oriental design as they had come down through the various periods quoted, were comparatively lost in the wretched results of the rococo of Louis XIV. and the inanities of what modern revivalists of the Anglo-Dutch call "Queen Anne." In the London Exhibition of 1851, the extravagances of modern jewellery had to stand a comparison with the Oriental examples contributed from India. Since then we have learnt more about these works, and have been compelled to acknow- ledge, in spite of what is sometimes called inferiority of workmanship, how completely the Oriental jeweller under- stood his work, and with what singular simplicity of method he carried it out. The combinations are always

harmonious, the result aimed at always achieved; and, if in attempting to work to European ideas the jeweller failed, this was rather the fault of the forms he had to follow, than due to any want of skill in making the most of a subject in which half the thought and the intended use were foreign to his experience.

A collection of peasant jewellery got together by Castellani for the Paris Exhibition of 1867, and now in the South Kensington Museum, illustrates in an admir- able manner the traditional jewellery and personal ornaments of a wide range of peoples in Europe. This

collection, and the additions made to it since its acquisition by the nation, show the forms in which these objects existed over several generations among the peasautry of France (chiefly Normandy), Spain, Portugal, Holland, Denmark, Germany, and Switzerland, and also show how the forms popular in one country are followed and adopted in another, almost invariably because of their perfect adaptation to the purpose for which they were designed.

So far we have gone over the progress and results of the jeweller's art in the past. We have now to speak of the production of jewellery as a modern art industry, in which large numbers of men and women are employed in the larger cities of Europe, but which also has its special localities in which it flourishes, and out of which an im- portant national commerce arises,

Nearly all the great capitals of Europe produce jewellery, but Paris, Vienna, London, and Birmingham are the most important centres. An illustration of methods and pro- cesses and the various kinds of jewellery produced at the present day in the manufacture as carried on in London and Birmingham will be sufficient for al] practical purposes, and as giving an insight into the technique and artistic manipulation of this branch of art industry; but, by way of contrast, it may be interesting to give in the first place a description of the native working jeweller of Hindustan. Travelling very much after the fashion of a tinker in England, his "budget" contains tools, materials, fire pots, and all the requisites of his handi- craft. The gold to be used js generally supplied by the patron or employer, and is frequently in gold coin, which the travelling jeweller undertakes to convert into the ornaments required. He squats down in the corner of a courtyard, or under cover of a, veranda, lights his fire, cuts up the gold pieces entrusted to him, hammers, cuts, shapes, drills, solders with the blow-pipe, files, scrapes, and burnishes until he has produced the desired effect. If he has stones to set or coloured enamels to introduce, he never seems to make a mistake; his instinct for harmony of colour, like that of his brother craftsman the weaver, is as unerring as that of the bird in the construc- tion of its nest. Whether the materials are common or rich and rare, he invariably does the very best possible with them, according to native

ideas of beauty in design and combination. It is only when he is interfered with by European dictation that he ever vulgarizes his art or makes a mistake. The result may appear rude in its finish, but the design and the thought are invariably right. We thus see how a trade in the working of which the "plant" is so simple and wants are so readily met could spread itself, as in years past it did at Clerkenwell aud at Birmingham, before gigantic factories were in- vented for producing everything under the sun.

It is impossible to find any date at which the systematic production of jewellery was introduced into England. Probably the Clerkenwell trade dates its origin from the revocation of the Edict of Nantes, as the skilled artisans in the jewellery, clock and watch, and trinket trades appear to have been descendants of the emigrant Huguenots, as the Spitalfields weavers were. The Birmingham trade

would appear to have had its origin in the skill to which the workers in fine steel had attained towards the middle and end of last ceutury, a branch of industry which collapsed after the French Revolution.

Modern jewellery may be classified under three heads: —(1) objects in which gems and stones form the principal portions, and in which the gold work is really only a means for carrying out the design by fixing the gems or stones in the position arranged by the designer, the gold being visible only as a "setting"; (2) when gold work plays an important part in the development of the design, being itself ornamented by engraving or enamelling or both, the stones and gems being arranged in subordination to the gold work in such positions as to give a decorative effect to the whole; (3) when gold or other metal is alone used, the design being wrought out by hammering in repoussé, casting, engraving, or chasing, or the surfaccs left absolutely plain but polished and highly finished.

Of course the most ancient and primitive methods are those wholly dependent upon the craft of the workman; but gradually various ingenious processes were invented, by which greater accuracy in the

portions to be repeated in a design could be produced with certainty and economy : hence the various methods of stampiug used in the production of hand-made jewellery, which are in themselves as much mechanical in relation to the end in view as if the whole object were stamped out at a blow, twisted into its proper position as regards the detail, or the various stamped portions fitted into each other for the mechanical completion of the work. It is therefore rather difficult to draw an absolute line between hand-made and machine- made jewellery, except in extreme cases of hand-made, when everything is worked, so to speak, from the solid, or of machine-made, when the hand has only to give the ornament a few touches of a tool, or fit the parts together if of more than one piece,

The best and most costly hand-made jewellery produced in England, whether as regards gold work, gems, enamelling, or engraving, is made in London, and chiefly at Clerkenwell. A design is first made on paper, or drawn and coloured, and when needful with separate enlargement of details, everything in short to make the drawing thoroughly intelligible to the working jeweller. According to the nature and purpose of the design, he cuts out, hammers, files, and brings into shape the constructive portions of the work as a basis, Upon this, as each detail is wrought out, he solders, or fixes by rivets, &c., the ornamentation necessary to the effect, The human figure, representations of animal life, leaves, fruit, &c., are modelled in wax, moulded, and cast in gold, to be chased up and finished. As the hammering goes on the metal becomes brittle and hard, and then it is passed through the fire to anneal or soften it, in fact to restore the particles of gold to their original position. In the case of elaborate examples of repoussé, after the general forms are beaten up, the interior is filled with a resinous compound, pitch mixed with fire- brick dust; and this, forming a solid but pliable body underneath the metal, allows of the finished details being wrought out on the front of the design, and being finally completed by chasing. When stones are to be set, or when they form the principal portions of the design, the gold has to be wrought by hand so as to receive them in little cup-like orifices, these walls of gold enclosing the stone and allowing the edges to be bent over to secure it. Set- ting is never effected by cement in well-made jewellery. Machine-made

settings have in recent years been made, but these are simply cheap imitations of the true hand- made setting. Even strips of gold have been used, serrated at the edges to allow of being easily bent over, for the retention of the stones, true or false.

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Great skill and experience are necessary in the proper

setting of stones and gems of high value, in order to bring |

out the greatest amount of brilliancy and colour, and the angle at which a diamond (say) shall be set, in order that the light shall penetrate at the proper point to bring out the "spark" or "flash," is a subject of grave consideration tothe setter. Stones set in a haphazard, slovenly manner, however brilliant in themselves, will look commonplace by the side of skilfully set gems of much less fine quality and water. Enamelling has of late years largely taken the place of " paste" or false stones. This may be divided into two kinds—champlevé and cloisonné. In champlevé the enamelling substance is applied to the surface of the gold as ornamental details, and is "'fired" in a muffle or furnace under the eye of the enameller. Here the metallic oxides play an important part in imparting variety of colour, as in the case of the "strass" of which "naste" or false stones are made. Cloisonné enamelling is effected by walls of gold wire being fastened to the surface to be decorated, upon which surface the design has been already drawn in outline. Within these walls or " cloisous " the various-coloured enamels are placed, and the whole fixed together by firing until the surface is more than filled up. The surface is levelled by grinding down with pumice stone, and then polished. One kind of champlevé closely approaches in its character to cloisonué It is when the gold is thick enough to allow of portions to be cut away by the graver, and in these incised parts the coloured enamels are fused as in the manner of the true cloisonné.

Enamelled subjects or paintings, portraits, landscapes, animals' heads, &c., are sometimes used as a setting for pins, brooches, pendants, bracelets, &c. These are of course true champlevé ; and formerly very

able artists, such as Bone, Essex, and others, were employed in the produc- tion of costly works of this kind.

Engraving is a simple process in itself, and diversity of effect can be produced by skilful manipulation. An inter- esting variety in the effect of a single ornament is often produced by the combination of coloured gold of various tints. This colouring is a chemical process of great delicacy, and requires much skill and experience in the manipula- tion, according to the quality of the gold and the amount of silver alloy in it. Of general colouring it may be said that the object aimed at is to enhance the appearance of the gold by removing the particles of alloy on the sur- face, and thus allowing the pure gold only to remain visible to the eye.

The application of machinery to the economical produc- tion of certain classes of jewellery, not necessarily imitations, but as much "real gold" work, to use a trade phrase, as the best hand-made, has been on the increase for many years. Nearly every kind of gold chain now made is manufactured by machinery, and nothing like the beauty of design or perfection 6f workmanship could be obtained by hand at, probably, any cost. The question therefore in relation to chains is not the mode of manufacture, but the quality of the metal. THighteen carat gold is of course always affected by those who wear chains, but this is only gold in the proportion of 18 to 24, pure gold being represented by 24. The gold coin of the realm is 22 carat ; that is, it contains one-twelfth of alloy to harden it to stand wear and tear. Thus 18 carat gold has one-fourth of alloy, and so on with lower qualities down to 12, which is in reality only gold by courtesy.

The application of machinery to the production of personal ornaments in gold and silver can only be econo- mically and successfully carried on when there is a large demand for similar objects, that is to say, objects of pre- cisely the same design and decoration throughout. In

hand-made jewellery, so-called, mechanical appliances are enly used to economize time and reduce the necessity for the handicraftsman doing

that which can be done as well, perhaps better, by some simple mechanical method applied under the hand. In machine-made jewellery everything is stereotyped, so to speak, and the only work required for the hand is to fit the parts together,—in some instances scarcely that. A design is made, and from it steel dies are sunk for stamping out as rapidly as possible from a plate of rolled metal the portion represented by each die. It is in these steel dies that the skill of the artist die-sinker is manifested. Brooches, earrings, pinheads, bracelets, lockets, pendants, &c., are struck out by the gross. This is more especially the case in silver and in plated work,—that is, imitation jewellery,—the base of which is an alloy, afterwards gilt by the electro-plating process. With these ornaments imitation stones in paste and glass, pearls, &c., are used as setting, and it is remarkable that of late years some of the best designs, the most simple, appropriate, and artistic, have appeared in imitation jewellery. It is only just to those engaged in this manu- facture to state distinctly that their work is never sold wholesale for anything else than what it is. The worker in gold only makes gold, or real jewellery, and he only makes of a quality well known to his customers. The producer of silver work only manufactures silver ornaments, and so on throughout the whole class of plated goods. It is the unprincipled retailer who, taking advantage of the ignorance of the buyer, sells for gold that which is in reality an imitation, and which he bought as such.

Space will not permit of any notice of various kinds of personal ornaments coming under the head of jewellery, such as the elegantly designed hand-made pearl ornaments, Whitby jet, coral, &c., nor can we allude to the methods adopted in the workshops where gold and silver alone are used to economize the metal that would be wasted without proper precautions. Even the minute quantities of the material which adhere to the hands of the workman are washed off before he leaves the premises, carried into a proper receptacle, and recovered by chemical agency.

The special localities of the jewellery trade proper, in England, are Clerkenwell and Pentonville in London, and Birmingham. In Clerkenwell an inquiry made some years ago showed that from 1600 to

2000 persons were employed in the trades connected witl the production of jewellery and personal ornaments. In Birmingham at least 8000 were thus occupied, chiefly in production of what may be considered as pnrely mechanical work. Among the higher class of jewellers in Birmingham some of the best work sold in the London shops is produced, the mechanical means employed being so ingenious, and the handicraft power so skilfully applied in fitting, setting, and finishing, as to leave little or nothing to desire, when compared with hand-made work of the same class. (G. W.)

JEWS, Mopern. An outline of the medieval history of the Jews is given in the article IsrarL. The modern history of tlie race in its political and intellectual emanci- pation begins with Moses Mendelssohn, who flourished at Berlin in the latter part of the 18th century. The persecu- tions of the Middle Ages had produced their natural effect. Cut off from their fe!low-citizeus, excluded by oppressive laws from all trades except that of peddling in old clothes and even from buying certain classes of these, specially taxed, confined to Ghettos and Judengassen, strictly pro- hibited from entering some towns, limited in numbers in others, forbidden to marry except under restrictions designed to check the growth of the Jewish population, disabled from employing Christian servants or being members of trade guilds, the Jews seemed by their abject condition to deserve the evils which were its cause.

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There were always, it is true, exceptions to the general degradation of the race. The exiles from the Spanish peninsula (who in western Europe were found chiefiy in Amsterdam, Bordeaux, Paris, and London, and also in Hamburg and Copenhagen) were in many cases persons of distinguished culture and intelligence, having been enabled, while protected by their disguise of Christianity, to live a life more worthy of freemen than was that of their oppressed and pillaged brethren in the north. In Germany itself Frederick William, the great elector of Brandenburg (1640 to 1688), was indebted for zealous service to Gompertz and Solomon Elias. Beckman of Frankfort-on-the-Oder

obtained permission in 1696 to print the Talmud. In Austria Wolf Schlesinger was personally exempted from the decree which banished the Jews from Vienna in the time of Leopold I. The Oppen- heimers had sufficient influence in Austria to prevent the publication there of Eisenmenger's libels on their race; the Arnsteins, Sinzheimers, and other families earned the favour of Maria Theresa, and were decorated with titles of nobility. But the general condition of the multitude was shown by the excommunication of Spinoza at Amsterdam, by the rise of the Chasidim and of Frank, and the mar- vellous history of Sabbathai Zebi. The German Jews grew distrustful of their knowledge of their own religion, and instructed their children by the aid of long-ringleted rabbis from Poland, who overspread the country, inculcating con- tempt for all except the too subtle dialectics of their peculiar school of disputation. Led by these blind guides, the German Jews continued to speak their own jargon of Hebrew and German, to correspond and even endorse their commercial bills in Hebrew characters, and abandoned the hopeless attempt to enter into the general life of their country. Fortunately the hereditary desire of learning still survived, though the selection of subjects for study helped to isolate them from their happier neighbours. Moses Mendelssohn (1729-1786), who did so much to induce the Jews to become at one with the spirit of the age, and the Christians to tolerate them, was at three years old taught by his father, a professional copyist of Hebrew religious manuscripts, to repeat the wise sayings of the Talmud. Later on he found in the rabbi Frinkel, of his native town of Dessau in Anhalt, a capable and en- lightened teacher. When Frankel was promoted, the young Mendelssohn followed him, at the age of fourteen, to Berlin. In Prussia the condition of the Jews had been comparatively favoured. Forty or fifty respectable families fleeing from persecutions in Austria had been admitted to Berlin towards the end of the 17th century. The colony increased, and was specially patronized in his own grotesque and tyrannical fashion by the half-mad sovereign Frederick William I. Frederick the Great held the maxim that "to oppress the Jews never brought prosperity to any Govern- ment," but his "general privilege," issued in 1750, while it abolished some old restrictions, was only a halting step in advance. It divided the Jews into two classes,—the hereditarily and the personally tolerated. In the first were those

who were actually engaged in commerce or who occupied some office in connexion with the synagogue. Their right of abode extended to merely one child of the family. Those who were personally tolerated were men who had means of independent subsistence, though not engaged in commerce, and their right did not descend to their children. The right to residence for a second child of each family of hereditary inhabitants was purchased by the Jews for 70,000 thalers. The restrictions imposed by Frederick on marriage were severe ; poor Jews could not marry at all. No Jew was permitted to own land in fee or to possess more than forty houses. Their business was confined to trade in money or goods. Frederick the Great,

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| penetrated as he was by the sentiments of Voltaire, yet struck out Mendelssohn's name when it was put forward for election into the Berlin Academy. Mendelssohn was with difficulty admitted into Berlin when he presented himself at its gates as a poor boy, having no friend but his teacher Friénkel. He went into a silk manufacturer's house as teacher to the children, and became a clerk and afterwards a partner in the firm. He formed a warm friendship with Lessing, and inspired the drama of Nathan the Wise, in which the Jew was for the first time in modern literature represented ina benevolent light. He translated the Pentateuch into German, and issued his translation in Hebrew characters, added to it a commentary in Hebrew (incorporating the rational as distinguished from the Aga- distic interpretations of former Hebrew commentators), partly by himself and partly by others, whom he associated with himself, and by this and other works introduced the Jews to modern culture, At the same time he gained a distinguished place in the world of letters by the pure and exalted tone, and the charming style, of his Philosophical Dialogues, his Pheedo, or the Immortality of the Soul, and other works, which showed him to be at the height of the philosophy of that time. He remained warmly attached in feeling and practice to the synagogue, and was requested by the chief rabbi of Berlin, Hirschel Levin, who for a brief period had been chief rabbi in London, to prepare the German digest of the ritual laws of the Jews, which was ordered by Frederick the Great. Every visitor to

Berlin, Jew or Gentile, sought to make his acquaintance at a kind of salon which he held in the afternoons. By the great majority of the orthodox Jews the writings of Mendelssohn were received with delight, and it was only by exception (as in Hamburg, Prague, Fiirth, and Poland) that they were fiercely denounced as rationalistic in tendency. The times were favourable to the development to which he led the way. The ideas of the great writers who preceded the French Revolution were teaching the abolition of privilege and of religious persecution. Although neither Voltaire nor Bayle wrote in a kindly spirit of the degraded Hebrew race, the general tendency of their teaching was in the direction of toleration, and so it happened that, just at the moment when the Jews were become more than ever willing and ready to enter into the national life of Germany, the country was being prepared to receive them. The civil restrictions were only gradually abolished ; painful revivals of hatred recurred from time to time, but henceforth the name of Jew grew year by year to mean less a distinction of nationality, and became more exclusively a denomination referring merely to ancestry and religious belief.

Among the friends and disciples of Mendelssohn who continued his work were Wessely (the father of modern Hebrew poetry), David Friedlander (founder of the Jews' Free School in Berlin), Jocl Lowe (professor at the Jewish Wilhelmschule in Breslau), Herz Homberg (tutor in the house of Moses Mendelssohn, and inspector of German schools of the Jews in Galicia), Aaron Wolfsohn (teacher at Breslau), Baruch Lindau (writer on physics), Marcus Herz (Mendelssohn's family doctor, whose more famous wife, afterwards converted to Christianity, received at her house a brilliant society, the two Humboldts, Count Bernstorf, Gentz, and Borne), Isaac Euchel (translator of the Jewish prayer-book), Lazarus Bendavid (who was specially concerned with education). All these and others contri- buted to the Hebrew periodical Meassef ("The Gatherer"), pub- lished at Kénigsberg and Berlin, 1783-1790; Breslau, 1794-1797 ; Berlin, Altona, Dessau, 1809-1811. The activity of the literary period which followed appears from the long list of rabbinical reprints, some with valuable notes, or translations, issued immedi-

ately before the close of the 18th century from the Jews' Free School printing-press at Berlin, under the direction of Isaac Satanow.

From minimizing differences in religion some were led to give up their distinctive religion altogether, and adopt a nominal, sometimes a real, Christianity, and thus the famous names of Heine, Bérne, Edward Gans the jurist, Rahel, the younger Mendelssohn the composer, and Neander

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the historian pass out of the scope of this article. These celebrated persons belong rather to the general history of German culture than to that of the race from which they sprang. Among the general body of the Jews, the removal of political restrictions and a closer communion with modern thought worked noticeable, though less radical, changes. The old system of preaching in the synagogue was revived, and led to the excision of some of the interminable prayers and sacred poems which the piety of preceding ages had accumulated in embarrassing profusion. After the estab- lishment of the consistory in the (French) kingdom of Westphalia, German lectures were held in Cassel, Dessau, Berlin, Hamburg, &c.; and now there is scarcely anywhere an important Jewish community without a preacher. Organs were introduced into some synagogues. The altera- tions brought about disputes in several communities and even secessions, as at Hamburg in 1819. In Prussia the Government, acting on the principles urged in Mendelssohn's time by his friend Dohm, but vigorously combated by the Jewish philosopher, gave the sanction of state authority to the resolutions of the orthodox. The private synagogue founded in Berlin by Israel Jakobsohn, after the breaking up of the Westphalian consistory, on principles similar to those of the reformed Hamburg Temple, was closed, and suffered the same fate when reopened as a public synagogue in 1817 and again in 1823. Even choirs and sermons were prohibited as un-Jewish innovations. Such regula- tions tended to disgust many educated persons who might otherwise have continued to remain attached to the faith of their fathers. They felt themselves isolated in the midst of their less advanced brethren, and were tempted to identify themselves even in religion with their more cultured

Christian associates, Besides, a change of faith offered an escape from humiliating legal restrictions, and opened the way to more dignified careers than those permitted to the conforming Jews. The smaller German states appointed rabbis who were more or less state officials. When the Government restrictions were removed, considerable divergences manifested themselves, which the assemblies of rabbis and synods, beginning in 1844, and continued from time to time to the present day, did little to heal. There now exist in most German towns an orthodox and a reform congregation, which differ in their mode of conducting public service, in the prominence given to the belief in the Messiah and the return to the Holy Land, and in their greater or less adherence to the laws of the Sabbath, and laws concerning diet, &c. One reformed congregation in Berlin keeps the Sabbath on the first day of the week. More remarkable examples of sectarian dissent were the move- ments known by the names of Sabbathai Zebi, of Frank, and of the Chasidim. Sabbathai's career had Turkey for its theatre, but the influence of his strange pretensions was felt in Poland and Germany, as well as throughout the East. Sabbathai Zebi was born at Smyrna in 1626. He announced himself the Messiah in Jerusalem, named his brothers kings of Judah and Israel, took the title for himself of king of the kings of the earth. Miracles were related of him ; from Poland, Hamburg, and Amsterdam treasures poured into his court ; in the Levant young men and maidens prophesied before him ; the Persian Jews refused to till the fields. " We shall pay no more tribute," they said, "our Messiah is come." The pretender, whom so many unhappy people were ready to acclaim as their deliverer from unendurable evils, afterwards embraced Mahometanism to escape death from the Porte. Some of his followers went over with him to Islam; others treated his conversion as forced, and still pro- claimed themselves Jews and his disciples. Their faith was nearer to immortality than their Messiah, and he was still believed in and his return expected after his death. Out of the wrecks of the Sabbathaic party Jacob Frank formed in Podolia the Zoharites, whose Bible was the Cabbalistic work called Zohar. Persecuted by the orthodox, he put himself under the protection of the bishop of Kaminiek, and burnt the Talmud in public. When his protector died he migrated with hundreds of followers, and afterwards lived in royal state at Vienna, Briinn, and Offenbach, ending by becom-

Ing a Roman Catholic. He died in 1791, and his sect perished with him. Very different was the fate of the Chasidim (“the pious”),

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who preceded Frank and have survived him. They also swear by the Zohar, and revere as their founder Isracl Baal Shem (“ pos- sessor of the wondcr-working name”), or Besht, who flourished at Miedziboz in Podolia in 1740. Besht pretended to be the pro- mised child foretold by the prophet Elijah, and named by him Israel before his birth. A long sojourn in solitary places, much fasting and physical torment, the tortures of rolling in thorns in summer and of bathing in half-frozen rivers at midnight in the winter, gave this prophet the faculty of seeing visions, the power to heal diseases, and to release souls held captive in the bodies of brutes. Like the older Kabbalists he treated the Talmud with contempt ; he exhorted his followers not to lead a gloomy ascetic life, but praised gaiety and enjoyment as tending to a carcer agreeable to God. Joyful religious worship was to be induced by drinking, jumping, clapping of hands, making noises and screaming, to which were added ablutions according to the fashion of the Essenes of old, and the wearing of a peculiar dress. Amongst his followers many found out how to derive advantage from the superstition and ignorance of the masses. Dob Beer (Berush) of Mizricz seldom showed him- self but to his disciples, and had reports of his wondrous works spread by them; many sick and lame went to him for cure; offerings of money came in and supplied the Zaddik with means to lead a princely life. The Chasidim still flourish in Russia and Jerusalem, and the Zaddikim (or “righteous”) and Rebbés, as their leaders are called, live in magnificence upon the contributions of the most ignorant of the people.

While this and cognate heresies were driven back into the over-crowded Jewish communities of Russia and Poland from which they came, in Germany Talmudic studies were pursued with undiminishing zeal, though carried on in gradually narrowing circles, and largely owing to the knowledge of the Talmud being a qualification for appoint- ments in large congregations. Gradually the Talmud, which had been once the common pabulum of all education, passed out of the

knowledge of the laity, and was abandoned almost entirely to candidates for the rabbinate. In the earlier part of this period, the rabbis received their educa- tion at the Yeshiboth ("sessions " of academies devoted to the Talmud, the Shaulchan Aruch, and their commentators). As the spirit kindled by Mendelssohn penetrated the various sections of the Jews, it was felt that this mode of instruc- tion would not suffice, and institutions were founded, not confined exclusively to these studies, but embracing the whole domain of Hebrew theology, philosophy, and history. Jonas Frankel in 1854 established the Judzo-theological seminary at Breslau, an institution which has provided Germany and Austria as well as England and the United States with many rabbis. Its first director was Zacharias Frankel (1801-1875), predecessor of Graetz in editing the Monatschrift, and author of works on the Septuagint, the Mishna, and the Talmud of Jerusalem. Of later date are the high school for the study of Judaism, founded in 1872, and the 'seminary for rabbis for orthodex Judaism," under Dr Hildesheimer, established at Berlin in 1877. Israel Jakobsohn, president of the Westphalian consistory (1768- 1823), did good service in improving teaching. He founded in Seesen (Brunswick) an educational and normal institution, bearing his name, for Jews and Christians, which still flourishes. A similar college was instituted by his brother-in-law Isaac Samson, and directed by S. M. Ehrenberg, amongst whose pupils were Jost and Zunz. Schools of a more elementary character were the Berlin Free School, already referred to, and others. In Dessau, Moses Mendelssohn's birthplace, the free school fostered by the duke, and called after him Franzschule, flourished under David Friinkel (1779-1865), editor of the journal Sulamet ; in Frankfort-on-the-Main was the Philanthropin, now converted into a technical school. In almost all Jewish communities we now find institutions teaching religion. After a first and unsuccessful attempt, Dr Moritz Veit founded a normal school, which existed under Zunz in Berlin from 1840 to 1852, and was revived by Dr Veit and the famous preacher and author Dr M. Sachs. Similar schools were founded in other places—Hanover, Miinster, Diisseldorf, Cassel,—with more or less success. The union

for the culture and science of Judaism (1823) and the Culturverein had a brief existence. Instead of receiving support and thanks, the chief workers were regarded as heretics.

The modern historical study of Judaism was inaugurated by Rapoport and Zunz. Solomon Juda (Lob) Rapoport, sprung from an old family boasting many learned Talmud- ists, was born in Lemberg in 1790, and was rabbi at Tarnopol and in Prague, where he died in 1867. His published essays in various periodicals or in the form of prefaces are largely biographical, and display a great range of reading and power of combining distant references. Of his pro- jected Talmudic encyclopzedia but one part appeared, and his scheme for a biographical series under the title of Men of Renown remained unrealized, except some fragnients. Nachman Krochmal (1780-1840) was not less learned than Rapoport, and perhaps surpassed him in philosophical acuteness.!

Of greater importance and influence were the writings of the patriarch of living Jewish scholars, Leopold Zunz, especially his epoch-making work Die Grottesdsenstlichen Vortrdge der Juden (Berlin, 1832).2 Among other his- torical writers may be named Isaac Marcus Jost (1793- 1860), teacher in the Jewish normal school at Frankfort, editor of a valuable edition of the Mishna with a German translation (1832-34), and author of several important histories of Judaism and its sects, A. GEIGER (¢.v.), and H. Graetz of Breslau, who has composed the most com- prehensive history of the Israelites that has yet appeared. To the names of these scholars may be added Férst the lexicographer (qg.v.), M. Steinschneider the bibliographer, Herxheimer the translator of the Bible (Pent., 1841; Proph. and Hag., 1841-48), and Herzfeld the historian (Gesch. d. V. Jis., 1847). In modern German-Jewish literature Philippson of Bonn and Lehmann of Mainz are leading representatives in journalism of reform and orthodoxy. German Jews have also distinguished themselves in general public life, claiming such names as Jasker in politics, Auerbach in literature, Riibenstein and Joachim in music, Traube in medicine, Lazarus in psychology. Especially famous

have been the Jewish linguists, pre-eminent among whom are T. Benfey of Gottingen (1809-1881), the most original of modern comparative philologists and the greatest Sanskrit scholar of our day, and the admirable Greek scholar and critic Jacob Bernays of Bonn (1824—

1881).

Within the last year or two the success of the Hebrew race in commerce and the professions has led in Germany to a singular revival of old-world prejudices. A series of leagues of " Germans" were formed against the "Semites." Sticker, a 'Christian Socialist" and court preacher to the emperor, gave importance to the movement by placing himself at its head. Its weapon is social ostracism: meetings are held at which the Jews are loudly denounced ; and members of the " German" leagues vow to have no commerce with the hated race. Occasionally the two parties came to blows, some Jewish houses were wrecked, and a synagogue at Neu-Stettin burnt. At this point the Government interfered.

The universal admission of the Jews to public posts only dates from the establishment of the empire. In the German states the spiritual emancipation of the Jews was not immediately followed by political emancipation. They were freed in Germany by the French law as a result of the conquests of Napoleon, but lost their civil equality when the French retired, to regain it bit by bit in succeed- ing years.

The Leibzoll, the odious tax imposed upon a Jew as often as he crossed the boundary of a city or petty state, even if he went in and out twenty times in the day, was

1 His fragmentary works were collected by Zunz, under the title More Neboche ha-seman, 1851.

2 A collected edition of Zunz's scattered essays was commenced by the '* Zunzfund"' in honour of his eightieth birthday, 1874.

removed in Prussia in 1790, and in other German states in 1803. In 1812 the royal edict declared all Jews in Prussia to be citizens, and gave then equal rights and privileges with their Christian fellow countrymen. They fought in the war of liberation, but after its success there was a reaction, and the new privileges (more particularly free admission to academic posts) were in part withdrawn. The Jews who had been promoted to the rank of officers during the war had to quit military service to escape the degradation of losing their commissions. The national parliament, which met at Frankfort in 1848, adopted re- solutions in favour of the removal of religious disabilities. The Prussian constitution of 1850 declared that the en- joyment of civil rights was independent of religious con- fession. The legislation with which the empire was inaugurated in 1871 at length gave political and civil equality to the Jews throughout Germany.

The number of the Jews in the German empire is now 520,575, or 1 per cent. of the whole population (census of 1875). The Gemeindebund, or union of congregations for some religious and charitable purposes, has recently been established at Leipsic. The Jews are engaged in all the occupations which other citizens pursue in Germany. While they show a marked predilection for and success in commerce and the learned professions, a few are farmers and sailors. Being subject to the ordinary military laws, they serve in the army, and many Jews hold commissions in those regiments in which noble descent is not a necessary qualification.

While the spiritual awakening of the Jews was essenti- France.

ally a German movement, having its centre in Prussia, the most powerful impulse to their political liberation came from France, The Jews had been banished from France by Charles VI., but a few had returned. Some Portuguese fugitives had taken up their residence at Bordeaux and Bayonne. Others had settled at Avignon under papal protection, and at Carpentras there was a congregation with a liturgy in some respects peculiar. To Paris the Jews began to return in 1550, but held the privilege of domicile by a precarious tenure till Pereyre, the founder of the institution for deaf mutes, obtained in 1776 formal

confirmation of the leave given to the Portuguese Jews to reside in the capital. There were already several hundred German Jews resident in an unlawful way, and protected chiefly through the influence of a German Jew named Calmer, who had been naturalized for services to the Government. The conquest of Alsace had added largely to the Jewish subjects of France. In 1780 the Alsatian Jews presented to the king a petition complaining of the seignorial dues exacted of them, of the restrictions on their trade, and the efforts of the priests to convert their children. The complaint was not without effect. The capitation tax was abolished in 1784, projects of eufranchise- ment began to be broached, and a commission was ap- pointed for the revision of the laws about the Jews, but its work was interrupted by the Revolution. The Jews addressed themselves with better hopes to the national assembly, and those of Paris distinguished themselves by demanding the withdrawal of the authority of the syna- gogue overits members. In1790 the French Jews united in sending into the assembly a petition demanding their admission to full and equal rights with other citizens. This requisition at first met with some serious opposition even among the advocates of universal liberty ; the ancient pre- judice against this people had not been entirely eradicated. But the exertions and influence of Mirabeau and Rabaut St Etienne prevailed. In 1790 the Portuguese Jews, and in 1791 the whole Hebrew population of France, were admitted to complete rights of citizenship. The constitu- tion of 1795 confirmed the declarations of the assembly.

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The gratitude of the Jews was shown by their patriotic devotion in the wars of the Revolution.

One of the most remarkable events in modern Jewish history was the convocation of the Sanhedrin (Synedrion) by Napoleon. It was preceded by the session of a general assembly of one hundred and eleven delegates, held in Paris in 1806 under the presidency of Abraham Furtado, merchant, author, and scientific agriculturist, the delegate of the Portuguese congregation in the port of the Gironde. To this assembly twelve questions were submitted by the emperor, and its

principal answers were afterwards confirmed and formulated in nine propositions of law by a Sanhedrin formally elected by the synagogues in France and Italy. The Sanhedrin eommenced its. sittings on February 9, 1807, under the presidency of Rabbi David Sintzheim of Strasburg, with a Piedmontese rabbi as first, and an ex-legislator of Italy as second assessor. The forms of the old Sanhedrin were observed as far as possible ; the responses are couched in the form of statutes binding the constituents of the Sanhedrin, and these decisions have usually been treated with much respect even by communities which sent no delegates, while the Jews of Frankfort and Holland formally accepted them.

The following are the nine decrees :—(1) polygamy is forbidden, according to a decree of the synod of Worms in 1050 ; (2) divorce is allowed to the Jews if and so far as it is confirmatory of a legal divorce pronounced by the authority of the civil law of the Jand in which they live ; (3) no Jew may perform the ceremony of marriage unless civil formalities have been fulfilled,—intermarriages with Christians are valid civilly, and, although they cannot be solemnized with any religious celebration, they involve the parties to them in no ban ; (4) the Jews of France recognize in the fullest sense the French people as their brethren ; (5) acts of justice and charity are to be performed towards all mankind who recognize the Creator, irre- spective of their religion ; (6) Jews born in France and treated by its laws as citizens consider it their native country,—they are bound to obey the laws of the land; Jews are dispensed from ceremonial observances during service in the army ; (7) the Sanhedrin exhorts the Jews to train their children to laborious lives in useful and liberal arts, to acquire landed property as a means of becoming more firmly attached to their fatherland, to renounce occupations which render men odious and contemptible in the eyes of their fellow-citizens, and to do all in their power to acquire their neighbours' esteem and good wishes; (8) interest is not allowed to be taken when money is lent for the support of a family, but interest is per- mitted when money is lent for commercial purposes, if the lender runs any risk, and if the legal rate is not exceeded ; (9) the above declarations concerning interest, and the texts of the Holy Scrip- ture on the same subject, apply between Jews and fellow-citizens in

precisely the same way as between Jews and Jews. Usury is altogether forbidden. At the close of the Sanhedrin, the emperor established the consistorial organization which in its main features still exists in France. Every two thousand Jews were to form a synagogue and a consistory consisting of one chief rabbi, and two rabbis with three laymen householders belonging to the capital town of the consistory. Bankrupts and usurers were excluded from the consistory, which was to watch over the conduct of the rabbis, to maintain order in the synagogues, and to admonish the Jews of the district to follow handicrafts and obey the Jaws of the conscrip- tion. The central consistory, sitting at Paris, had power to appoint and depose the rabbis. The rabbis were to publish the decrees of the Sanhedrin, to preach obedience to the laws, and to pray in the synagogues for the imperial house. Many Hebrew hymns of praise were composed in honour of the despot who had framed this or- ganization, although at the same time the emperor issued a decree which made considerable concessions to the popular prejudices against the Jews in Alsace and eastern France generally, forbade the Jews to change their domicile or enter into occupation without special permission, framed stringent precautions against usury, and excepted the Alsatian Jews from the right to provide substitutes for military service. The laws of 1814, 1819, and 1823 made some beneficial changes in the position of the Israelites, and in 1829 Charles X. established at Metz a central school for the instruction of candi- dates for the rabbinate. It was subsequently removed to Paris. In 1831 theGovernment definitively decided,in accordance with the ideas of Napoleon, that the rabbis should be state functionaries. From that year they have been paid by the state. In 1833 the French Govern- ment suspended relations with a Swiss canton which had denied equal rights to a French subject on the ground that he was a Jew.

In France the absence of political restrictions has been unfavourable to the separate development of Judaism. The ministers Crémieux (1796-1879), Fould, and Goudchaux, the archxologists and philologians Jules Oppert and Halévy and the Darmesteters, the composer Meyerbeer, and many others, are well-known names in the general history of their country. Many Israelites have occupied high civil and military posts. Other Israelites by race have become

indistinguishable by religious practice from the main body of the citizens; and the principal contributions in France to Hebrew literature have been from writers born in Germany, like Munk (1802-1867) and Derenbourg, like Samuel Cohen and Franck.

Before the year 1860, an outbreak against the Jews in Russia, the accusations at Damascus, the Mortara abduction case in Italy, and about this time the sufferings of the Jews in Morocco, had vividly excited the sympathies of the Jews in western Europe ; they had joined together to make con- tributions of money for relief of distress at Konigsberg and in the Holy Land, and had even made representations to the Governments of the various countries in which they resided in order to bring political means to bear to alleviate the fate of their unfortunate co-religionists. An English Jew, Sir Moses Montefiore, took the lead in these efforts. But there was no regular provision for prompt and concerted action in defence of outlying and oppressed communities of Jews till, in 1860, an organization was established in Paris which was destined to exert a permanent watchful- ness over the oppressions practised in the less civilized countries upon Jews, as well as to improve the backward communities of Hebrews by education. This was the Alliance Israélite Universelle, which on January 1, 1881, had 24,000 subscribers in all parts of the world, though Israelites are by no means unanimous in supporting it.

The connexion between the local committees and the central body is not very intimate, but a correspondence is constantly kept up, and subscriptions for public objects flow from one to the other according to their respective wants and wealth. The Alliance and similar societies of a more strictly national character which exist in London and Vienna made represcntations at the Berlin conference in 1878, and helped to procure some alleviations of the state of the Jews in Roumania and Servia. The exertions of the same bodies had previously arrested, by making them known to Europe, the atrocities practised upon the Roumanian Jews in 1872. Similar action was brought to bear at the Madrid conference in 1880 in favour of the Jews in Morocco. Another

part of the work of the Alliance is to maintain or assist schools for boys and girls in North Africa and in the Turkish empire, &c. In this task it co- operates with the Anglo-Jewish association formed for similar objects in England, the Board of Deputies in London, and the Alliance in Vienna. The Alliance has also an organization for apprenticing Jewish children touseful tradesin eleven Eastern towns. OtherJewish public institutions at Paris are the rabbinical seminary under chief rabbi Wogue, schools and an industrial school for girls, the hospital founded by the late Baron James de Rothschild, the orphanage established by the late Baron Salomon de Rothschild, the ladies' committee and house of refuge, a central committee for Jerusalem schools, the society of Talmudical studies, and many burial and mutual aid societies. At Lyons and Marseilles there are similar institutions.

The distinction between reform and orthodox congrega- tions, which has been noticed in Germany, and reappears elsewhere, is not found in France. The older distinction between the Spanish and Portuguese Jews (Sephardim) on the one hand, and the Polish and German Jews (Ashken- azim) on the other, is, however, still made. They have different synagogues, in which a somewhat different ritual and a different pronunciation of Hebrew are employed. No doctrinal distinction, however, exists between the: two divisions, and they now freely intermarry and associate with each other, although at their first meeting in France and England, about a century ago, and for some time later, the rich and polished emigrés from the south refused to mix with their uncultured northern brethren. 'The Jews of German rite are now much more numerous and wealthy in western Europe than the Sephardim.

The number of Jews in France in 1880 was about 60,000, of whom 34,000 were in the cousistorial circonscription of Paris, 8800 in that of Nancy, 2200 in Lyons, 4000 in Bordeaux, 2200 in Bayonne, 4000 in Marseilles. The Jewish population in France (including northern Italy, and Treves, Mainz, Coblentz, &c.) in 1808 was 77,000 ; it had risen to 158,994 (without including Italy or Treves and its sister cities) when the census of 1866 was taken, but fell to 49,489 in the census of 1872, owing to the loss of Alsace-

England.

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Lorraine, the part of France in which the most numerous Jewish population existed. The Jewish inhabitants of the Paris circon-scription were in 1808 only 3585 in number, about a tenth of their numberin 1880. TwoJewish newspapers are published in the French language at Paris, and one at Avignon. The Jewish population of Algeria in 1880 was (according to the Annuaire Israélite) 72,800, of whom 52,000 were in the consistorial circonscription of Oran. These figures show a large increase in the population in recent years. M. Crémieux by a stroke of the pen obliged the Israelites in Algiers to become French citizeus, a step that had previously involved certain formalitics which their conservative feeling resisted. measure, however, led to an outbreak of the Arabs. In Versailles exertions were made to cancel it, and its operation was suspended, but finally the decree was sustained, and the Jews, who form the class ainorg the native population most fitted for civilization, retain the franchise.

The Jews were readmitted into England by Cromwell on the application of Manasseh ben Israel; and the Spanish and Portuguese Jews from Amsterdam took a lease of ground for a burying-place at Stepney in February 1657. The first recorded intermeut was in 1658. The city of London, which was afterwards to aid so powerfully in the emancipation of the Jews, petitioned the council in the first years of the restoration to remove the competing Jewish merchants, but, this and other petitions being unsuccessful, a synagogue was built and the copyhold of the cemetery was acquired, although up to fifty years ago doubt was sometimes expressed whether Israelites even if born in the country could hold land in England. The right of Jewish charities to hold land was clearly established by an Act passed in 1846. The Jews were too few in number to be visited with special disabilities, but suffered from the general operation of the Tests Acts, which excluded them from political, civil, and municipal offices, from the bar, &e., and could be invoked to prevent them from voting at parliamentary elections. Jacob Abendana and David Nieto are rabbinical writers who

flourished in England in the 17th and early in the 18th centuries. In 1725 Sarmento, a mathematician, was (like Gompertz and others after him) made a Fellow of the Royal Society. Emanuel Mendes da Costa was secretary and librarian of the society a few years later (died 1769). Sir Solomon Medina financed the com- missariat in the duke of Marlborough's campaigns. But the Sephardic immigration is best known by the converts to Christianity whom it supplied, as Isaac Disraeli, and his son Lord Beaconsfield (who was baptized at the age of twelve), David Ricardo, the Lopes family, and others. Conversion to Christianity was encouraged by a statute of Anne (repealed in 1846), which compelled Jewish parents to make an allowance to their children who embraced the dominant faith, German Jews began to immigrate in large numbers after the accession of the house of Hanover. English statesmen soon perceived what important contribu- tions the business ability of the Jews was capable of render- ing to the wealth of the country in which they settled, but the enlightened appreciation of the governing class was long in making its way among the electors. In 1753 Mr

Pelham passed his Jewish Naturalization Act, which was |

repealed the next year owing to popular clamour, " No more Jews, no wooden shoes," becoming as influential a refrain as Lilliburlero. This premature emancipation supplied an argument which afterwards assisted to retard the political liberation of the Jews. The Jews were excepted from the benefit of the Irish Naturalization Actin 1783; the excep- tion was abolished in 1846; in that year also the obsolete statute De Judaismo, which prescribed a special dress for Jews, &c., was formally repealed. It had been disregarded ever since the return of the Jews under Cromwell. The Reform Act of 1832 gave the right of voting for members of parliament in all constituencies to Jews who possessed the property or other qualification required. Mr Robert Grant, M.P. for Inverness, in 1830 proposed to admit Jewish mem- bers to the House of Commons, Mr Huskisson having pre-

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viously presented a petition asking for this concession. The bill was carried on the first reading by eighteen votes, but lost on the second by sixty-three. The Board of Deputies had been appointed in 1760 to watch over the interests of the " Portuguese nation" as the Sephardic Jews called themselves in England and France ; it was shortly afterwards joined by delegates of the German congregation, and now represents the orthodox congregations in the principal towns of the United Kingdom. Through this board the House of Commons was frequently petitioned in the next thirty years to grant political equality to the Jews, and the claim was supported by eminent statesmen, notably by Macaulay and by Lord Russell, the latter of whom brought in an annual bill on the subject. Baron Lionel de Rothschild was elected five times by the city of Lon- don before he was allowed to vote, and was eleven years a member of the House of Commons without taking the oath. Alderman Salomons was returned for Greenwich in 1851, and took his seat, spoke, and voted, having in repeating the oath omitted the words "on the true faith cf a Christian." He was fined £500 by the court of ex- chequer, and was obliged to retire from parliament. The enabling bills had been passed year after year in the House of Commons, but as often rejected by the Lords, until in 1858 a compromise was effected, and Jews were permitted by the joint operation of an Act of Parliament and a resolution of the House of Commons to omit on taking the oath required of a meniber of the Lower House the words to which they conscientiously objected. In 1866 and 1868 Acts were passed which prescribed an oath in a form unobjectionable to Jews to be used in the Houses of Lords and Commons alike, but no Jew by religion has yet been raised to the peerage. Remarkable legislative provisions in favour of the Jews are the exceptions by which they have enjoyed since 1870 under the Factories Acts the right to labour on Sunday in certain factories if they rest on their own Sabbath. Till 1828 only twelve Jewish brokers were permitted to carry on business in the city of London, and the patent was purchased for large sums when vacancies occurred. No Jew could open ashop in the city till 1832, because that permission was only accorded to freemen. Even baptized Jews were not admitted to the freedom of the city between 1785 and 1828. The first Jewish sheriff of London, Sir D. Salomons, was unable to take the oaths till a special Act was passed by Lord Campbell in 1835, and, although he was followed

two years later by another Jewish sheriff, Sir Moses Montefiore, it was not until ten years after his election as alderman that Lord Lyndhurst's Act (1845) enabled him to perform the duties of that office. Among the names of Jews in England distinguished in science and literature are the mathematician Sylvester, the Sanskrit scholar Goldstiicker, and the Orientalists Zedner and Deutsch. The first Jewish barrister (Sir F. Goldsmid) was called to the bar in 1833.

The Jews' Free School in London is probably the largest and most efficient elementary school in England. Two Jewish uewspapers are published in London. The Jewish community in England maintains many charitable and other public institutions, The most important are the boards of guardians in London and Manchester, which are chiefly occupied in the relief of penniless emigrants from Russian Poland. Dr Benisch, the late editor of the Jewish Chronicle, founded in 1871 the Anglo-Jewish association to co-operate with the Alliance Israélite of Paris, which has been already described. The association has nearly 3000 members, chiefly in England and the colonics, but also at Alexandria and Tangiers. The Jews' college in London and the Aria college at Portsea are designed for the training of ministers and teachers. Three societies for the promotion of Hebrew literature have been formed. The only one which still exists is the Society of Hebrew Literature, to which Christian scholars have contributed equally with the Jewish students of the same subject. The principal religious movement has been the formation of the West London congregation of British Jews, a body of dissent-

ers, who have simplified the ritual, only keep one day of the festivals, and do not acknowledge the spiritual ascendency of the chief rabbi.

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They scceded in 1840. Congregations at Manchester and Bradford worship with the same rites. The Sephardim and Ashkenazim still differ in liturgy and in pronunciation of Hebrew. The principal London synagogues of the latter body were federated by private Act of Parliament in 1870 under the name of tho United Synagogue, which now consists of ten London congregations. Its liturgy was modified in

the direction of brevity in 1880. Forty provineial orthodox synagogues are recognizod by tho Board of Deputies, which under the Marriage Acts certifies the seeretaries of orthodox syna- gues entitled to register marriages.

The Jewish population of Great Britain is estimated (in the absence of a census by religions) to be 62,000, of whon: 40,000 are reckoned to be in London, There were 453 Jews in Ireland at the census of 1881.

In the British colonies Jews are numerous and tlicir congregations flourishing. There are nearly 2000 Jews in Gibraltar, who carry on an active commerce with their brethren in Morocco, sending Man- chester and Sheffield goods, and receiving corn, hides, and other pro- duce. Their settlement dates from the British oceupation in 1704, whieh allowed the unhappy Spanish refugees in Morocco to return to a corner of Spain. Jews have been law-officers, ministers, mem- bers of the legislatures, and magistrates in the Australasian colonies, Cape Colony, the West Indies, &. In Victoria there were 3571 Jews in 1870, and a Jewish newspaper is published at Melbourne; in West Australia there were 62 only in 1870; in Tasmania they formed only 0°23 per cent. of the total population of 99,328.

A remarkable sottlement exists in Bombay under the name of the Beni Israel. They are 5000 in number, and are for the most part artisans, some of them soldiers. the Anglo-Jewish association in London and Manchester contri- butes. The Beni Israel have a tradition that they were ship- wreeked on that coast more than one thousand years ago. They have always strictly observed the Sabbath, refraining from cooking their food or doing any other work on that day. They do not eat unelean fish or flesh ; they observe the great feasts, and have a Jewish type of countenance. The Beni Israel are found not only in Bombay itself but in other towns on the coast not beneath the direct rule of the British Government. They relate that David Rababia, a Jew either of Baghdad or Cochin, came to that part of India about nine hundred years ago, and, having discovered that the Beni Israel were observing the Jewish code, was convineed of their Jewish origin, and established a Hebrew sehool. Before his death he gave a written order

to two of his scholars to succeed him as religious ministers. This office has been retained to this day by their descendants. These ministers are called kajees, and are con- sidered superior to the ordinary religious ministers who receive payment for officiating in the synagogues. They are in some re- spects like high priests and civil heads of the community ; and in the outlying villages ecclesiastical and civil matters are investigated and settled by them with the aid of a council. With these kajees maybe compared the cohanim (priests) in the Western Jewish com- munities, who are reputed to be descendants of Aaron, and enjoy the prerogative of blessing the people, and a certain precedence in synagogue, to the exclusion of ministers who are not of the same lineage. In Bombay judicial and other civil functions for the Beni Israel are performed by a person called Nassi or head, aided by a couneil. The Beni Israel have been settled in Bombay itself for upwards of one hundred and fifty years. Their first synagogue was built in 1796 by Samuel Ezekiel, a native commandant in the British army sent against Tippoo Sahib. The Sephardie daily prayer-book, Dr Hermann Adler's sermons, and soine other works have been translated by the Beni Israel into Marathi. Some of them know Hebrew, although Marathi is their ordinary language, and their knowledge of Hebrew is probably rather due to frequent intereommunication with the Jews of Baghdad and Europe than to independent tradition. The Beni Israel rarely intermarry with the ordinary Jews. They have a literature in Marathi, They tie a golden band (" munny") with black glass beads round the bride's neek during marriage to show that the bride is a married woman; when sheis stripped of it she is considered a widow. They say that they adopted the title of Beni Israel because that of Jehudim or Jews was hateful to the Mussulmans. The Baghdad and Cochin Jews attend their synagogues and eat with them, and vice versa, They have among them a class of Beni Isracl whom they designate Kala Israel or Black Israel. Between them and the white Beni Israel no intermarriages are ever solemnized. They are descendants of Beni Israel by heathen wives, or are proselytes or their descendants. They have separate burying-grounds.

The Jews of Cochin, found in that British port of the Madras presidency and elsewhere on the Malabar coast, have the tradition that

they arrived at Cranganore in the sixty-eighth year of the Christian era, and received a written charter from the native ruler, and that when the Portuguese came they suffered oppression and removed to Cochin, where the rajah granted them: places to build their synagogues and houses. They again suffered from the Portu- guese, but the Dutch conquest in 1662 gave them protection. At Cochin there are black and white Jews. The white Jews consider

They support a school to which –

themselves as immigrants from Palestine. The black Jews are regarded as proselytes and emaneipated slaves of the white Jews. The black and white do not intermarry with each other, and the black Jews do not observe all the ceremonies of the law.

The history and condition of the Jews in three important Austria.

countries and their colonies having been somewhat fully sketched, a shorter aecount of their situation elsewhere will be sufficient. The Austrian Jews participated in all the intellectual movements of thcir brethren in Germany. ‘Their ehief writers are Kompert (the brilliant author of Zales of the Ghetto), Frankl the poet, G. Wolf, historian, Mosenthal, dramatist, Dukes, Kayserling, Mannheimer, Jellinek, Giidemann, Kaufmann, Letteris. The chief training establishment for rabbis is the Budapest seminary established with the proeeeds of the fine imposed upon the Jews for participation in the insurrection in 1848. Austria was long notorious for ill-treatment of the Jews, but Joseph II. made in 1783 a new departure in his policy towards this class of his subjects. He abolished the Leibzoll, night-notices, passport regulations, and gave the Jews permission to learn trades, art, science, and, under certain restrictions, agriculture. The doors of the universities and academies were opened to them. He founded Jewish elementary aud normal sehools, and also compelled the adults to learn the language of the country. Iu spite of these reforms, considerable restrictions were still imposed upon the Jews with regard to right of residence, &c., and the successors of the philosophic emperer, Leopold

II. and Francis I., restored many of the old humiliating regulations, The Jews in Austria remained during the greater part of the present century subject to special restrictions. To remove from province to province they required the permission of the central Government. In many parts of the empire they were not allowed to rent or purchase lands beyond their own dwellings. The Magyar nobles, however, employed them largely as bailitts, gave them great freedom of tenure, and actually fought under their lead as military officers in the struggle for independence. After 1848 the Jewish capitation tax was reduced except in Vienna ; but, as many Jews had taken part in the revolutionary movement in Hungary, a heavy exaction was imposed upon them after its suppression. The reforms inaugurated by the constitution of 1860 for Austria and in 1861 for the rest of the empire, and completed in 1868, at length gave the Austrian Jews the freedom whieh they now enjoy, which makes them influential and respeeted in Vienna and the other great towns, and even in the backward province of Galjcia a striking contrast to their less favoured brethren in the noighbouring country of Russian Poland. Several Jews, two of them rabbis, sit in the legislatures. The Israclitish Alliance was founded in Vienna in 1872. The number of the Jews in the empire of Austria-Hungary is 1,372,333, or more than 3 per cent. of the total population. Of the total number, 820,200 are found in Austria (including 575,433, or more than a tenth of the total population in Galicia), and 552,133 in Hungary.

In Italy, while Venice and Leghorn sheltered large and compara- Italy.

tively flourishing colonies, the Roman Jews had long an unenviable re-eminenee in suffering. Till 1847 they were not permitted to eave the Ghetto, and their eonversion was sought by most oppres- sive means. It was in the papal states after this date that the young Mortara, secretly baptized by his nurse, was torn from his parents, and trained to be amonk. The kingdom of Italy brought freedom and political equality to the Jews. The most celebrated of recent Jewish scholars in Italy was S. D. Luzzatto (1800-1865). The rabbinical college at Padua, founded by J. S. Reggio of Gorz (1784-1855), fell with the Austrian domination in 1866. The number of Jews in Italy was in 1876 estimated to be 53,000,

of whom 5000 were in Rome, 2800 in Modena, 3000 in Venice, 2000 in Sicily, 7688 in Leghorn, 2500 in Turin, 2000 in Padua.

The censys of 18/0 gave 2582 as the number of the Jews in Greece.

Greece, They enjoy perfect freedom of worship, and live on terms of friendship and equality with their neighbours in the kingdom of Greece, although at Alexandria, Smyrna, and other towns of the Levant, quarrels sometimes occur between the two races.

The liberal institytions established during the last few years in Spain.

Spain have permitted the Jews to return to a country in whieh their ancestors enjoyed a glorious period of literary and soeial activity. In 1881 the Spanish representative at Constantinople was autho- yized to assure some distressed Jews who fled into Turkey to eseape the persecutions of Russia that the Government of Spain would welcome them to that country, in which, he added, all Jews could now settle. At Seville Jewish worship is regularly held, and meat killed according to Jewish rites can be bought. At Madrid a con- gregation assembles on the most solemn fast in a private house.

Since the commeneement of this century foreign Jews of Portugal.

Portuguese origin from Gibraltar and Africa have immigrated into Portugal and been permitted to solemnize religious service there. There aie three synagogues at Lisbon and one in Oporto. On the Day of Atoncment, unknown persons from a distance in the interior have been observed to join these congregations ; they were members of Jewish families who had secretly preserved their religion and the tradition of their origin during the whole timo of the exclusion of

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the Jews from Portugal. In 1821 the cortcs abolished the Inquisi- tion, and resolved that all rights and privileges which had been accorded to the Jews by former sovereigns should be renewed, and that all Jews

who dwelt in any part of the world might settle in Portugal. About 1000 Jews reside in this country.

Holland. In Holland, which was long the refuge of the Jews, and was the cradle of a flourishing Jewish literature, the Israelite immigrants were not entirely without restrictions, although Mendelssohn pointed to Amsterdam as a commercial paradise where all meu were allowed free interchange of commodities. The 50,000 Jews of Holland, 20,000 of whom resided in Amsterdam, were first admitted to political equality in 1796, and the closer union with France which followed completed the work of liberation. At first this gift was not will- ingly reccived by the leaders of the Jewish community. They en- joyed great power over individuals, could levy large fines upon tllose members of the congregation who incurred their displeasure, and feared that the new duty of serving as soldiers and the new right of filling all the employments of the state would alienate their flocks. The Portuguese (or Sephardic) Jews, who were regarded as the aristocracy of their race, were especially conservative, and ulti- mately the discussions about emancipation led to the secession of the neoterizing party under the name of 'Adat Jeshurun. The num- ber of Jews in Holland is now 68,000, to whom 665 may be added for Luxembourg.

Belgium. In Belgium there are about 2000 Jews, who enjoy freedom and state subvention for their worship as in France.

Switzer- In Switzerland the Jews were long treated with great severity, and

land. the French domination brought them only temporary relief. It was only in 1874 that full religious equality was conceded to the Swiss Jews. Their number is now 6996.

Denmark. In Denmark the number of Jews does not exceed 4500. Since 1814 they have been eligible as magistrates.

Sweden. The archives of the Sephardic synagogue in London contain a curious printed invitation from the king of Sweden, sent in the year 1746, in which wealthy Jews are invited to Sweden, while the poor are

warned that their residence will be unwelcome. The Loudon Jews declined this calculating hospitality. There are now 1836

_ Jews in Sweden, and an insignificant number in Norway.

Russia. In Russia the Jews are more numerous and more harshly treated than in any other country in the world. From Russia proper the Jews were long and still are excluded, but the conquests of the Muscovites bronght them face to face with large numbers of Israel- ites who, driven out of Germany by persecution, had taken refuge in Poland under the sway of Casimir the Great. The half Hebrew half German patois (Jiidisch-Deutsch) which Jews still speak in Russia and Roumania preserves this part of their history. A literature exists in this language: journals are printed in it with Hebrew characters ; theatrical representations are given in it, and two com- panies in London lately played dramas in it, in which the main point of the action was the misery of the religious Jew, who is dragged away from the study of lis favourite Talmudical books to serve in the army, where he can hope, asa Jew, for no promotion. The flourishing factories, agriculture, and commerce of the Polish and Lithuanian Jews were wrecked by the intolerance of the succes- sors of Casimir, and Russian oppression completed the ruin. The Jews are still confined to a few over-populated provinces, and loaded with special taxes and restrictions. Under Alexander II. the condition of the Jews was in some respects improved, and the permission accorded for three Jews to settle at each railway station has enabled a few to escape from the old overcrowded settlements and find a new sphere for their commercial activity. They are still, however, largely at the mercy of the official class, and popular risings against them have been repeatedly permitted or encouraged. They are excluded from many vocations, or practise them only by the connivance of bribed officials. For some purposes they are still subject to the jurisdiction of the rabbis, Harkavy, Pinsker, Mandelstamm, Reiffman, and Levinsohn are among their most learned writers ; Baron Giinzburg is at the head of a society for spreading culture among the masses. In spite of their disabilities, there are among the Russian Jews enterprising contractors, skilful doctors, and successful lawyers. The number of Jews in European Russia was returned for 1876 as

2,612,179. In Russia in Asia they are estimated to number 25,000. For the Karaires in Russia see that article.

Moldavia At the beginning of the present eentury the Jews were found in

and Moldavia everywhere keeping the village' inns and forming the

Rou- centres for the commerce of their districts. Engaged in this occu-

mania. pation, or travelling through the country to buy or advance money upon the crops, and to sell foreign merchandise, were Jews, some of whom had come from Poland or Russia, while the families of others, resident chiefly at Bucharest, had been in the country from time immemorial. They also exercisod many handicrafts. They were glaziers, locksmiths, tinmen, tailors, &c. The metal roofs and Pinnacles of churches were all the work of Jews. In the great towns of Moldavia, and also in the Wallachian city of Bucharest, there were established wealthy communities belonging to both divisions of the modern Jews, Ashkenazim and Sephardim. Of the

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Sephardim or Spanish Jews it is known beyond a doubt that they settled in the country many centuries ago. They belonged to the families driven from Spain by the Inquisition. The principal bankers of Roumania are Jews. Their children have been in the habit of attending the same schools as the wealthy native families, and the parents held a good position in society. In Jassy, the prin- cipal city of Moldavia, 30,000 or 40,000 out of the 90,000 inhabi- tants are Jews. In 1804 the practice of the neighbouring states began to creep into Roumania. In that year an ordinance of Prince Mourousi of Moldavia deprived the Jews of the right to hold farms except when attached to village inns. Since that time there have been a series of laws and edicts limiting the freedom of the Jews to hold land and engage in various professions and trades ; the Jews have also had much to suffer from popular outbreaks, and even the treaty of Berlin, which abolished all incapacitation on grounds of religion, has been interpreted by the Roumanian

Government as not applying to the Jews, who are regarded as foreigners, and only naturalized in small numbers and by special acts of the legis- lature. There are 200,000 Jews in Rouinania, and perhaps two or three thousand may have becn admitted to naturalization.

In Servia there are 2000 Jews. They have suffered from occa- Seryia,

sional orders of expulsion from the country districts, but on the whole their condition is comparatively favoured, and they are believed to be on the eve of being admitted, if not already admitted, to political rights.

The Jews in European Turkey before the war which ended with Turkey,

the treaty of 1878 were estimated to number 72,000 (in Adrianople 15,000, Shumla 1500, Widdin 1200, Varna 300, Tatar Bazardjik 1050, Dardanelles 2000, Philippopoli 2100, Rustshuk 2500, &c.). There are some thousands in eastern Roumelia, and others in Bul- garia, who have been very fairly treated by the authoritics of the new principality, having grants for their schools, &c. The exertions of Dr Allatini of Salonica have provided the community of that town (25,000 to 30,000 persons) with excellent means of education. Here is published the Hyoca, a Spanish newspaper in Hebrew characters, which recalls the fact that this, like so many of the Jewish com- munities on the shores of the Mediterranean, sprang froin exiles from Spain. The Jewish population of Constantinople consists of about 30,000 souls. Most of the Jews areSephardim. Two thousand follow the German rite, and are principally to be found in Galata. The Jews in Constantinople are chiefly engaged in traffic. They are governed by a caim-macam appointed by themselves, and salaried

by the Government. There are forty-two synagogues in the suburbs.

Besides the schools of the Alliance, there are 2287 pupils in the wretched Talmud Torah schools. There are also three infant schools. The number of Jews in Asiatic Turkey is stated to be from 106,000 to 130,000. The Smyrna Jews number 25,000. In Baghdad, where there are 30,000 Jews, and where the wealthy family of Sassoon first became

known, there are twenty-one synagogues. Pilgrimages are made to the tombs of Ezra, Ezekiel, Joshua the priest, and Sheikh Isaac. There are 500 families in Aidin, 400 in Magnesia, 250 in Casaba, 180 in Pergamos, 516 in Canea in Crete, 200 in Candia, 1200 in Beyrout, 2000 in Damascus, 10,200 in Aleppo. Outbreaks of religious hatred between the Greeks aud the Jews, and even between the Mahometans and the Jews, have occasionally occurred at Smyrna, Rhodes, &. The Jews on each occasion have been accused of using Christian blood at the passover. The falsity of this charge was publicly established in 1840, owing to the efforts of Sir Moses Montefiore, who journeyed to the East, accompanied by Crémieux and Munk, to vindicate the innocence of those of his coreligionists who had been put to death, and to liberate those who were imprisoned. The sultan then issued, at the request of Sir Moses Montefiore, a firman declaring the innocence of the Jews, and their title to his equal protection. They now suffer under no disabilities, and are admissible to office.

There are 15,000 Jews in Jerusalem (forming half the population), Pales- whose chief occupation is to study the Talmud. To maintain them tine.

in this hallowed indolence their brethren throughout the world send annual contributions (haluka) amounting to about £50,000 a year, or five-sevenths of the total revenue of Palestine. The rabbis who administer these large funds, and also wield the dreaded weapon of excommunication (herem), have set their faces against secular education, regarding Jerusalem as the one great rabbinical college of the world, where the contributors of the haluka fulfil the sacred duty of studying the law by proxy. Both Ashkenazim and Sephardim (whose leaders, more liberal than the Ashkenazim, permit Arabic to be tanght), both Chasidim and Karaites, are represented here ; the Sephardim dress as Orientals; the Russians and Poles wear their long silk or cloth gowns and fur caps, the Germans the quaintly cut coat and flattened wideawake of the early part of this century. All cultivate the long love-locks brought down in front of the ears m obedience to Lev. xix. 27. Boys often marry at fifteen, girls at thirteen. There are two weekly Hebrew newspapers. The syna- gogues are very numerous;

around them cluster the Talnud schools. There are three hospitals for Jews, one of which is main- tained by a Christian mission, numerous almshouses, of which the Juda Touro house is the principal, and several endowed schools.

Africa.

Persia.

Central and Eastern Asia,

Arabia,

America,

Ji

Jewish agricyltural colonics have been formed at Lydda and elsc- where, and an excellent agricultural school at Jaffa reccives thirty

upils. Jews are found at Hebron, Tiberias (1100 in number), Ramleh, Safed (5666), and elsewhere in the Holy Land.

In the mountains of Kurdistan and on the plain of Urmiah thcre are Jews who speak an Aramaic dialect—"the language of the Targum." 'The Jews in Persia, as in many other countries, write their vernacular in Hebrew characters. They are engaged as peddlers in petty trades or in larger commerce, or enter into partner- ship with Kurdish farmers, to whom they supply capital, receiving half the produce. As a rule monogamy prevails, but exceptions are frequent when the marriage proves childless, or when the levirate law comes into operation. Jcws settle their differences with each other by applying to the malum (7.e., the rabbi) of the place, who together with his beth din forms the authorized court of justice. Boys are taught reading, writing, the Scripturcs, and sometimes the Mishna. Every man and woman wears charms as safeguards against the evil eye, as protections both from ailments and from the attacks of enemies. The fear of infidelity is one of the causes which deter parents from letting their children learn secular

subjects. Yet as each congregation requires the services of a dayan or religious chief, the necessity of cultivating some kind of knowledge cannot be entirely ignored. Persons desirous of pursuing a course of studies have had to resort to Urmiah and to Baghdad. There are ten synagogues, and 30 families in Teheran, partly engaged in skilled trades and professions. Jews are also found in Ispahan and other towns, &c. They are very poor, the majority in Ispahan being day-labourers and porters. The total number of the Jews in Persia is estimated to be 16,000.

In Bokhara (18,000), in Samarkand (10,000), in Merv, through- out Central Asia, Jews are scattered. The small colonics of Jews in Kai-fung-foo, Hansho, Ningpo, and Peking are regarded by the Chinese as a sect of Mahometans. Thcy are termed Taou-Kin-Kedou ('separators of the sinew from the flesh"). Thesc colonies, of ancient settlement, are not to be confounded with the European Jewish merchants, who under European protection now trade in the ports. The Jews of Kai-fung-foo have parted with their sacred scrolls, and their synagogues are ruined.

The Jews in Yemen have a long history, but the present Jewish population is stated by the latest observer (a correspondent of the Alliance Israélite, writing in 1881) to be only 15,000 innumber. An older estimate (1876) made them number 200,000. They are chiefly found in Sanaa, the capital (where they are from 2000 to 3000 in number, and have thirteen synagogues under a Chacham Bashi), and also in the mountain villages. For upwards of eighty years the Jews of Sanaa have been the victims of repeated persecutions, false accusations, and exactions ; and until twelve years ago to these were added the duties of scavengers and night-men, imposed even upon the rabbis, and not redeemable by money payments. The assumption of sovereignty by the Porte much improved their position. They are artisans, labourers, and merchants.

Wealthy Jews reside at Cairo (3000), others at Alexandria (where the odious blood accusations were recently revived against them) and Port Said. There are in all about 8000 Jews in Kgypt.

In Abyssinia are found the Falashas, whose Jewish descent is doubted by some ethnologists. See FauasHas, and Halévy in Misc. Soc. Heb. Lit., 2d ser., vol. ii., 1877.

The Jews in Tripoli are estimated at 100,000. Tunis is variously said to contain 40,000 or 60,000 Jews. Those in the ports are European, chiefly Spanish, in recent origin. In the interior Jews live in tents, carry on agriculture on a communal basis, dress like their neighbours, bear long matchlocks, and rove from place to place like them ; many, however, are goldsmiths. They conform strictly to the Jewish ceremonial laws.

The number of the Jews in Morocco was stated by the deputation which petitioned the British foreign office on their behalf in 1880 to be 300,000. There are 1200 in Larache, 1400 in Alcazar, 6000 in Tetuan, 8000 in Tangiers. Many are of Spanish origin. Jews have frequently been chosen, in bygone times, to represent the sultan as envoys. They now suffer from the fanaticism of the Mahometans, and are compelled to go barefoot in sign of their submission in nearly all the cities. Robbers plunder them almost with impunity, and murders of Jews are frequent. About a hundred enjoy pro- tection from Christian powers, which was confirmed at the con- ae of Madrid in 1880, but is impatiently submitted to by the sultan,

Jews in the interior or beyond the boundary of Morocco live a nomad life like the Jewish tribes of Arabia, and conduct caravans across the desert as far as Timbuctoo. Mardochée, a member of the first Israelite family who settled in Timbuctoo, has described the Daggatoun (merchants), a tribe of Jews who have forgotten their religion, but cherish the tradition of their descent, and proclaim it by their fair complexions and the character of their features ; they live in the Sahara in the midst of-a Mussulman race, with whom they do not intermarry.

There are several thousands of Jews in Brazil; a Dutch Jewish colony was founded at Savannas in Surinam, but has lost its distinc-

tive character ; a few Jews are scattered in Mexico and the South American ports.

In the United States Jews are numerous, and enjoy full equality of rights and great material prosperity. A Jewish colony was founded by Judge Mordecai Noah, sheriff of New York, in 1825, at Grand Island in the Niagara river, but did not long endure. The Jews of the United States organize themselves in great friendly societies. Of these there are four principal orders :—the B'nai Berith (Sons of the Covenant), which in 1878 had 22,814 members, had paid $1,000,000 in benefits, and retained $570,000 in hand; the Independent Order of Free Sons of Israel, with 8604 membcrs; the Kesher shel Barzel (Iron Link), with 10,000 members and $112,000; the Improved Order Free Sons of Israel, with 2849 members. Jewish hospitals, orphan asylums, free schools, benevolent institutions, exist in very many cities. The union of American congregations comprises 118 con- gregations, and has for its objects (1) to promote religious instruc- tion, and (2) to co-operate with similar associations throughout the world to relieve and elevate oppressed Jews. Many ways of interpret- ing Scripture prevail among the Jews in the United States.1 Some keep Sabbath on Sunday, others pray in English without any use of Hebrew ; there is much laxity in observaucc, but all sccts agree in building magnificent synagogues. In 1878 there were in the Unitcd States 278 congregations with 12,546 members, owning in their cor- porate capacity real estate worth $4,778,700 and other property worth $1,860,030, sending 12,886 children to their schools, and forming a population of about 250,000.

Some further particulars may be given regarding the Jewish press. There are, according to Lippe, 86 Jewish periodicals, as follows :— 18 in the Hebrew language, published at Vicnna (2), Warsaw (2), Wilna, St Petcrsburg, Konigsberg (2), Lyck (2), Mainz, Jerusalem (3), and 4 in Galicia (at Brody, Kolomea, Tarnopol, and Lemberg) ; 14 in Jiidisch-Dentsch, published at Vienna (2), Bucharest (3), Mainz, New York, Pressburg, Chicago, Konigsberg, Lemberg, Budapest (2); 22 in German, published at Wiirzburg, Breslau, Berlin (4), Frankfort-on-the-Main, Leipsic (3), Bromberg, Kroto- schin, Mainz, Magdeburg, Lemberg, Budapest (2), Melnik (Bohemia), Bilni (Bohemia), Vienna,

Cincinnati, and Milwaukee; 4 in French (reckoning the bulletin of the Alliance as one) at Paris (3), Avignon; 14 in English, at London (2), New York (4), Cincinnati (2), San Francisco (partly in German), Chicago, Philadelphia, Atalanta, St Louis, and Melbourne; 3 in Italian, at Trieste, Casale Monferrato, and Corfu; 3 in Dutch, at Rotterdam (2), Amsterdam; 2 in Russian, both at St Petersburg; 2 in Polish, at Warsaw and Tarnopol in Galicia ; 1 in Hungarian, at Budapest ; 6 in Spanish (5 of them in Hebrew characters), at Vienna (2), Constantinople (2), Salonica, and Smyrna. In addition to these, Lippe gives 8 annuals:—1 in Roumanian at Bucharest, 1 in French at Paris, 1 in Russian at St Petersburg, 1 partly in German and partly in Hebrew at Bamberg, and 4 in German at Brody, Frankfort-on-the-Main, Halberstadt, and Prague. Two Jewish calendars appcar annually in London.

From the numbers of the Jewish population whieh we have given it results that there are about 5,000,000 Jews in Europe. In Asia 200,000, in Africa 700,000, may be approximately correct totals, in Amcrica 300,000, in Australia 20,000. The total Jewish population of the world would thus be 6,200,000. It may be added that the vital statistics of the Jews differ a little from those of the nations with which they have been eompared. Thc Jews have a somewhat greatcr average longevity, which isattributed to their abstincnce, com- parative freedom from phthisis, &c., and to their not often following employments which shorten life. Their dietary laws and cercmonial ablutions have an influence in preserving them from epidemics.

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1 The leader of the most advaneed sehool is Dr Felix Adler, who, in his dis- courses, Creed and Deed, advocates the supersession of religion by ethical culture.

JEWS HARP, or Jew's Trump (Fr. Trompe), a small musical instrument, known for centuries all over Europe, and consisting of a metal frame with two branches, between which a slender tongue of steel, fastened at one

end, and free at the other, is made to vibrate by twitching |

with the finger, while the frame is held between the teeth. The English name " Jew's trump," seems to be merely a corruption of the French words jew and trompe. Prefixed to the Rev. Patrick Macdonald's Collection of Highland Airs (1781) is a dissertation by the Rev. Walter Young, in which he states that the natives of the island of St Kilda, "being great lovers of dancing, have a number of reels, which are either sung, or played on the Jew's harp or trump, their only musical instrument" (p. 11). In the Himalaya journals one of the travellers mentions that he procured a Jew's harp from Tibet. At the commencement of the present century this instrument was improved, and several Jew's harps were combined, it being thus possible by using several instruments in different keys to obtain a complete scale. Eulenstein, a native of Wiirtem- berg, made a sensation in London in 1827 by playing on no less than sixteen Jew's harps. No. 30 of the Letpsie Musical Gazette (1816) contains an account of the compound Jew's harp, with pieces of music suited for it.

JEYPORE, or JArpur, a native state in Rajputana, under the political superintendence of the Rajputana agency and the Government of India, lies between 25° 41' and 28° 27' N. lat. and between 74° 55' and 77° 15' E. long. Jhajjar, and Patiala; on the E. by Alwar, Bhartpur, and Karauli; on the 8. by Gwalior, Bundi, Tonk, and Udaipur ; on the W. by Kishangarh, Jodhpur, and Bikaner. Its area is 14,465 square miles. The country is tolerably level and open, although its surface is diversified by groups and ranges of hills and by isolated peaks. The centre of the state is an elevated triangular table-land from 1400 to 1600 feet above sea-level, whose eastern limit is formed by ranges running north and south. On the north and west it is bounded by a broken chain of hills, an offshoot from the Aravalli mountains, which forms the apex of the triangle. To the east, beyond the hills, the country becomes gradually more open as it spreads out towards the alluvial flats of the Jumna. On the nortli-west stretches the sandy and desert tract of Shaikhawati (or the country of the Shaikhawat clan). The general drainage of Jeypore from the central table-land is to the east and south-east, though a few streams follow the slope to the north-west. Those flowing south are the Bands and the Banganga, the tributary of the Jumna, and their tributaries, the Aman-i- shah, Bandi, Moril, Dund, and Khari. The

Sabi and Kaotli flow north. In the south of the state, water is everywhere found at a depth varying from a few feet to 30 or 40 feet; but in Shaikhawati water is always at a great depth, averaging fron 80 to 100 feet. The soil is generally sandy. The hills are more or less covered with jungle trees, of no value except for fuel. The hill ranges are said to consist in the north chiefly of granite, and in the south and east of sandstones, mixed sometimes with white and black marble, and occasionally with mica. Copper ore and cobalt are found. Salt is largely manufactured and exported from the Sambhar Lake, the average yearly turn-out amounting to nearly 40,000 tons.

In Shaikhawati there is generally but one crop in the year, consisting chiefly of bdjra, mung, and moth, In the north, besides these, a little wheat and barley are grown. Towards the south and east, as the soil becomes richer and firmer, jodé, Indian corn, cotton, ¢é/, wheat, barley, gram, sugar-cane, opium, tobacco, ddl, and linseed are extensively grown. Since 1868 the state has spent £5000 annually on irrigation.

It is bounded on the N. by Bikaner, Loharu ;

JHEW—JEY

In the absence of a census the population has been roughly estimated at about 12 millions for the whole territory, with the following proportions of the various classes :—Rajputs, } ; Hindus, 5; Mahometans, 3%; Jains 745. The most notable feature in the commerce of the state is the large banking and exchange business carried on at the capital and in the large towns. The chief manu-factures are marble sculpture, enamel work done on gold, woollen

| cloths and fabrics. Education has made great progress in the state.

Jeypore city is the site of a college, with a daily attendance (1876) of 800 students ; also of a school for the sons of thakurs and higher officials, and a Sanskrit college and industrial school. In the district there are 33 elementary schools, wholly supported by the state, and 379 indigenous schools, with an aggregate attendance of nearly 8000. The coins minted at Jeypore are distinguished from those of other indenendent states by

the jhar or sprig on the reverse. The Rajputana State Railway on the metre gauge runs from Agra to Jeypore city, and thence to Ajmir and Nusseerabad. The military force of the state consists of 824 artillerymen, 4450 cavalry, and 15,858 infantry. The number of forts is 38, with an aggregate of 220 guns of all calibres. Some £700,000 from the revenues of the state are alienated in jdgirs and religion grants, but the available receipts are about £475,000. The climate isdryand healthy. The average temperature, taken from a record of five years, is 81° Fahr. The average rainfall is 254 inches.

The maharaja of Jeypore belongs to the Kachhwaha tribe of Rajputs, and claims descent from Rama, king of Ajodhya in Oudh, Jeypore state was founded in 967 by Dhola Rao, who, along with his Kachhwahas, is said to have absorbed or driven out the petty chiefs. On the irruption of the Mahometans, Jeypore state had very soon to succumb to them, and the Jeypore house furnished some of their most distinguished generals. Among them were Man Sinh, who fought in Orissa and Assam, Jai Sinh, commonly known by his imperial title of Mirza Raja, whose name appears in all the wars

‘of Aurangzeb in the Deccan, and Jai Sinh I1., the famous mathe-

matician and astronomer, and the founder of Jeyporecity. Towards the end of the 18th century the Jats of Bhartpur annexed a portion of the state. The chief of Alwar reduced the territory of Jeypore. By the end of the century the state was in great confusion, dis- tracted by internal broils, and impoverished by the exactions of the Marhattas. The disputes between the chiefs of Jeypore and Jodhpur had brought both states to the verge of ruin, and Amir Khan, with the Pindharis, was exhausting the country. By a treaty in 1818 the protection of the British was extended to Jeypore, and an annual tribute fixed. In 1835, on the accession of the maharaja, then two years old, there was a serious disturbance in the city, after which the British Government took measures to insist upon order, and to reform administration as well as to support its effective action ; and the state has become gradually well governed and prosperous. When the mutiny broke out in 1857, the maharaja assisted the British in every way that lay in his power.

JEYPORE, or JAIPUR, capital of the state of the same name, is situated in 26° 55’ N. lat. and 75° 52’ E. long., on the Rajputana State Railway and the Agra and Ajmere trunk road. It is the largest town and the chief com- mercial centre of RAjputana, and in many respects the finest of modern Hindu cities. The city, which takes its name (Jdinagar or Jéipur) from the famous Maharaja Siwai Jai Sinh IL, by whom it was founded in 1728, stands on a small plain surrounded on all sides except the south by rugged hills, the summits of which are at all important points crowned with forts. At the end of the ridge, overhanging the city on the north-west, is the chief defensive work, the Nakargarh, or “Tiger Fort,” the rock face of which is so scarped as to be inaccessible on the south or city side. Jeypore is remarkable for the regularity and wideness of its streets, and the architectural beauty of the mosques, temples, and private residences which adorn them. From east to west the town is a little over 2 miles in length, with a breadth of about 1} miles. The main streets are paved, and the city is lighted by gas. The houses of the nobility and the citizens are in the suburbs, while the mahdrdj4’s palace with its pleasure-grounds occupies the centre of the town. In Jeypore there are as many as seven banking firms, whose aggregate annual business amounts to about £2,500,000, and which possess a capital of upwards of £6,000,000 sterling. Besides these, there are several minor houses, whose collective business may be estimated at £500,000 a year. Exchange and banking form the greater portion of the business of

the place. The city is well provided with hospitals, dispensaries, alms-houses, and schools. One of the most interesting antiquities of the state is the Hindu observatory in the capital, erected by the founder of the city.1 The population in 1870 was 137,547.

JEZREEL (ONY), the well-known capital of the Israelite monarchy under Ahab. Its site has never been lost, and the present village Zer‘én retains the name radically unchanged. In Greek the name appears under the form “EodpanAd (Stradela in the Itiner. Hreros.), and to the crusaders the place was known as Parvum Gerinum. The modern

village stands at the north extremity of a long ledge terminating in steep cliffs forming part of the chain of Mount Gilboa, east of the plain of Esdraelon. The top of the swell is 500 feet above the broad northern valley; the knoll on which the stone village is built is bare and rocky; the buildings are apparently modern, but numerous ancient cisterns and scattered sarcophagi, lying on the hill side, mark the autiquity of the site. The view over the plains from Beisin on the east to Carmel on the west, and from the Samaritan hills on the south to the mountains of Galilee on the north, is fine and extensive. No vineyards now exist, but rock-cut wine presses occur east of the village, perhaps marking the site of Naboth's vineyard (1 Kings xxi. 1). The fountain mentioned in the Bible (1 Sam. xxix. 1) is very probably the fine spring "Ain el Meiyiteh north of the village, a shallow pool of good water full of small fish, rising between black basalt boulders. A very large spring, 'Ain Jélud or Jalut (Yakut, iii. 760), exists in the valley of Jezree) (Josh. xvii. 16) north of the hill, A second city called Jezreel existed in the tribe of Judah, somewhere near Hebron (Josh. xv. 56).

JHALAWAR, a state in Rajputéna, under the political superintendence of the Rajputana agency and the Govern- ment of India, mainly consisting of two separate areas. The larger is bounded on the N. by the state of Kotah; on the E. by Sindhia's territory and a detached district of the Tonk state; on the S. by the petty state of Rajgarh, a detached district of the Dewas state, and the state of Jaora; and on the W. by detached tracts belonging to Sindhia and Holkar. This portion lies between 23° 48' and 24° 48' N. lat., and between 75° 55' and 77° E. long. The lesser detached area is bounded on the N., E., and S. by the Gwalior state, and on the W. by Kotah, and lies between 25° 5' and 25° 25' N. lat., and 76° 55' and 77° 25′ EB. long. The main portion of Jhalawar is situated on a raised plateau. 'The northern, eastern, and part of the southern portions are very hilly, and intersected by numerous streams. The hills are for the most part covered with timber and grass, and frequently enclose Jakes. The rest of this tract is a rich undulating plain, dotted with evergreen trees. The soil generally is very rich, consisting in great part of dark clayey mould, which produces valuable crops. Of the many streams running through the territory, the most important are—the Parwau, with its tributary the New4j; the

Kali Sind, with its tributary the Au; and the Chhota Kali Sind. The population in 1875 was 226,000, of whom the majority were Hindus. The area of the whole state is 2500 square miles.

In Jhalawar all the ordinary Indian grains are cultivated, and in

the southern districts opium is extensively grown. In the rest of the state wheat and opium are the chief crops, except in Shahabad,

1 On the summit of a range of hills, about a mile and a half east of Jeypore town, is a sacred shrine called the "Gulta," where there is a temple dedicated to " Surya,' or the Sun-god. Below the platform a spring issues, which pours over the rock by a fall of 70 feet into the valley below. The water of this spring is considcred peculiarly sacred by the Brahmans.

where bdjra is chiefly produced. Irrigation is principally carried on by means of wells. Near Jhalra Patan, the capital, there is a large artificial lake, from which water is drawn by achanncl 2 miles long. In 1876, 507,418 acres, or barely two-fifths of the total area, were cultivated. The total revenue for 1876 was £174,719. The police number 100 horse and 2000 foot. Education is at present very backward in the state. In the districts the village priest teaches the young people. In the capital and cantonment there are schools in which Hindi, Urdu, and English are taught. The only metalled roads in the state are in the cantonment. All other roads are simply cart tracks, which in the rains arc uscless for wheel traffic. Opium is exported; the imports are English cloths and grain. The chicf towns are Jhalra Patan and the chhaoni or cantonment, Shahabad, and Kailwara. The climate resembles that of Central India, and is generally healthy. In the hot weather the thermometer ranges during the day from 85° to 88° Fahr. The temperature during the rains is cool and pleasant, and in the cold weather it is occasionally frosty.

The ruling family of Jhalawér belongs to the Jhala clan of Raj- puts, and their ancestors were petty chicfs of Halwad in the dis- trict of Jhdldwar, in Kathiawar. About 1709 one of the younger sons of the head of the clan left his country with his son to try his fortunes at Delhi.

At Kotah he left his son Madhu Sinh, who soon got into great favour with the maharaja, and got from him an important post, which became hereditary. On the deathbed of one of the Kotah rajas, the country was left to the charge of Zalim Sinh, a descendant of Madhu Sinh. From that time Zalim Sinh was the real ruler of Kotah. He brought it to a wonderful state of prosperity, and under his administration, which lasted over forty-five years, the Kotah territory was respected by all parties. In 1838 it was resolved, with the consent of the chief of Kotah, to dismem- ber the state, and to create the new principality of Jhalawar as a separate provision for the descendants of Zalim Sinh. The districts then severed from Kotah were considered to represent one-third (£120,000) of the income of Kotah ; by treaty they acknowledged the supremacy of the British, and agreed to pay an annual tribute of £8000. Madan Sinh received the title of maharaja rand, and was placed on the same footing as the other chicfs in Rajputana. The present maharaja rand of Jhdéldwar has a force of 20 field and 75 other guns, 150 artillerymen, 425 cavalry, and 4400 infantry.

JHANG, a British district in the lieutenant-governorship of the Punjab, India, between 30° 35’ and 32° 4’ N. lat., and between 71° 39’ and 73° 38’ E. long., with an area of 5712 square miles. It forms the northern district of the Mult4n division, and is bounded on the N. by Shdhpur and Gujranwala, on the W. by Dera Ismail Khan, and on the S.E. by Montgomery. It comprises an irregular triangle, artificially: constituted for administrative purposes from portions of three separate tracts. Its eastern half embraces a large part of the high dorsal bridge in the Rechna Dodb ; thence it stretches across the Chenab into the wedge of land between that stream and the Jhélum, whose waters unite a few miles below the town of Jhang ; while westward again the boundary runs beyond the joint river, far into the heart of the Sind Sdgar Dodb. The Ravi also bounds the district for a few miles along its southern edge. So artificial a tract can hardly be said to possess any common natural features of its own. Along the banks of the river strips of comparatively fertile lowland support a dense population.

At the census of 1868 the population was 348,027 (198,624 males and 154,408 females). The Mahometans numbercd 270,819; Hindus, 57,297

; Sikhs, 2994; and “others,” 16,917. Only three towns contain a population exceeding 5000—Jhang, 9124; Maghiana, 10,525 ; and Chiniot, 11,477. The arca under cultivation in 1873 amounted to 241,325 acres, out of an assessed total of 3,650,867 acres. No crops can anywhere be grown without irrigation. Wheat, barley, gram, sarson, china, jodr, maize, and cotton form the staples of the district. Grain is imported. Country cloth is manufactured at Jhang and Maghiana, and bought up by the Po- winda merchants of Afghanistan. Manufactures of gold and silver lace also exist. The principal road from Multan to Wazirabad passes through the chief towns in the district. A bridge of boats is in course of construction (1875) across the united stream of the Jhelum and the Chendb. Bothriversare navigable. The total revenue for 1873 was £49,302. The police force in 1872 numbered 503 men. In 1872 there were 32 Government and 123 native schools, with a joint roll of 3696 pupils. The district bears a good reputa- tion for healthiness. Small-pox and fever form the most prevalent diseases. The average rainfall for the seven years ending 1872-78 was 10 inches. There are seven charitable dispensaries.

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The distriet of Jhang possesses unusual historical interest from the presenee within its borders of the ruins whieh crown the rocky eminenee of Sanglawala Tiba. This site has been identified with the Sdkala of the Brahmans, the Sagal of Buddhism, and the San- gala of Alexander’s historians. In modern times the history of Jhang centres in the famous family of Sidls, who exereised an ex- tensive sway over a large traet between Shahpur and Multan, with little dependenee on the imperial eourt at Delhi, until they finally fell before the all-absorbing power of Ranjit Sinh. The Sidls of Jhang are Mahometans of Rajput deseent, whose aneestor, Rai Shankar of Daranagar, emigrated early in the 18th eentury froin the Gangetic Doab to Jaunpur, In the beginning of the present century the maharaj4 Ranjit Sink invaded Jhang, and eaptured the Sial chieftain’s territories. He recovered a small portion after- wards, whieh he was allowed to retain on payment of a yearly

tribute. In 1847, after the establishment of the British ageney at Lahore, the distriet eame under the eharge of the British Govern- ment; and in 1848 Ismail Khan, the Sial leader, rendered important serviecs against the rebel ehiefs, for whieh he reeeived a peusion. During the mutiny of 1857 the Sial Jeader again proved his loyalty by serving in person on the British side, His pension was after- wards inereased, and he obtained the title of Khan Bahadur, witha small jdgtr for life.

JuAaNc, a municipal town in the above district. The sister town of Maghidna, containing the civil station for the district, lies 3 miles south of Jhang, and has a population of 10,525 persons. They form together a single munici- pality, and may be regarded as practically one town, situated in 31° 16’ 16” N. lat., and 72° 21’ 45” E. long., about 3} miles to the west of the present bed of the Chenab. Jhang itself lies on the lowland, a little apart from the regular lines of trade, and since the removal of the Government offices to Maghidna, has yielded its commerce and import- ance to its younger rival, Founded by Mal Khan, a Sial chieftain, in 1462, it long formed the capital of a native Mahometan state. The population of Jhang proper in 1868 was 9124, comprising 4568 Hindus, 4244 Mahome- tans, 129 Sikhs, 12 Christians, and 171 “others.” Popula- tion of the united towns, 19,649.

JHANSI, a British district in the lieutenant-governor- ship of the North-Western Provinces, India, between 25° 3’ 45” and 25° 48’ 45” N. lat., and between 78° 21’ 15” and 79° 27′ 30” E. long, It forms the central district in the division! of the same name, and is bounded on the N. by the Gwalior and Samthar states, on the E, by the river Dhasdn, on the S. by the district of Lalitpur and the Orchha state, and on the W. by the Datiy4, Gwalior, and Khaniya Dand states. Jhdnsi forms a portion of the hill country of Bundelkhand, sloping down from the outliers of the Vindhy4n range on the south to the tributaries of the Jumna on the north. The extreme south is com- posed of parallel rows of long and narrow-ridged hills. Through the intervening valleys the rivers of the district flow down impetuously over ledges of granite or quartz. North of the hilly region, the rocky granite chains gradually lose themselves in clusters of smaller hills. The northern portion

consists of the level plain of Bundelkhand, distin- guished for its deep black soil, known as mdr, and admir- ably adapted for the cultivation of cotton. The district is intersected or bounded by three principal rivers—the Pahij, Betwa, and Dhasin. There are many minor streams, most of which are feeders of the Dhasdan. The district is much cut up, and portions of it are insulated by the surrounding native states.

The census of 1872, taken over an area of 1567 square miles, re- turned a population of 317,826, of whom (exclusive of non-Asiatics) 167,519 were males and 150,216 feinales. As regards religion, 305,151 were Hindus, while only 12,417 were Makhometans. Five towns have a population exceeding 5000:—Mhow, 15,065; Ranipur, 6326; Gursardi, 5897 ; Barwa Sagar, 5556; and Bhander, 5141. Jhansi, in the nature of its soil, the eharaeter of its people, the poor

1 The division of Jhansi is under a commissioner in the North-Western Provinees, and comprises the three districts of Jhansi, Jalaun, and Lalitpur, which contain a large portion of the tract known as Bundel- khand, 'The area in 1872 was 5067 square miles, the population 934,948. nee

means of irrigation, and the want of good communieation, is worse off than any other distriet in the North-Western Provinces, except Lalit- pur. Out of a total area of 1,002,734 acres, only 428,348 acres were under eultivation. The prineipal erops are jodr, bdjra, eotton, tilt or oilseed, odon (a kind of pulse), wheat, gram, and barley. The most important produet is the al dye, procured from the root of the Morinda citrifolia, whieh is only dug up every third year. The destructive kéns grass has proved as great a pest here as elsewhere in Bundelkhand. Jhansi is specially exposed to blights, droughts, floods, hailstorms, epidemies, and their natural consequence— famine. It is considered that famine may be feared on an average every five years, The distriet imports grain, and in return exports the al dye and eotton, The 110 sehools in 1870 taught 2235 pupils at a eost of £1247. The climate is hot and very dry, but not unhealthy. The mean annual temperature for 1871 was 81°°7 Fahr. The average rainfall for the ten years ending 1870

was 31 inehes. The population are habitually underfed, and consequently sueeumb readily to slight diseases.

Nothing is known with certainty as to the history of this distriet before the period of Chandel rule, about the 11th eentury of our era. To this epoeh must be referred the artificial reservoirs and architee- tural remains of the hillyregion, 'The Chandels were sueeeeded by their servants the Khangars, who built the fort of Karar, lying just outside the British lines. About the 14th eentury the Bundelas poured down upon the plains, and gradually spread themselves over the whole region whieh now bears their name. The Mahometan subahddrs were eonstantly making irruptions into the Bundela eountry; and in 1782 Chhatarsal, the Bundela chieftain, called in the aid of the Marhattas. They eame to his assistance with their accustomed promptitude, and were rewarded, on the raja's death in 1734, by one-third of his dominions. Their general founded the city of Jhansi, and peopled it with inhabitants from Orehha state. In 1806 the British proteetion was promised to the Marhattd viceroy, and in 1814 the peshwa ceded to the East India Company his rights over Bundelkhand. In 1853 Gan- gadhar Rio died childless, and his territories lapsed to the British. The Jhansi state and the Jalaun and Chanderi districts were then formed into a superintendeney. The widow of the late raja eon- sidered herself aggrieved beeause she was not allowed to adopt an heir, and beeause the slanghter of eattle was. permitted in the Jhansi territory. Reports were spread which exeited the religious prejudices of the Hindus. The events of 1857 aceordingly found Jhansi ripe for mutiny. In June a few men of the 12th native infantry seized the fort containing the treasure and _maga- zine, and massaered the European officers of the garrison. Every- where the usual anarehic quarrels rose among the rebels, and the country was plundered mereilessly. The rani put herself at the head of the rebels, and died bravely in battle. It was not till November 1858, after a series of sharp contests with various guerilla leaders, that the work of reorganization was fairly set on foot. Sinee that time Jhansi has remained a British distriet, and famines and floods. alone have disturbed the prosperous course of civil administration.

Juansi, a city and fort in Gwalior state, North- Western Provinces, India, in 25° 27’ 30” N. lat. and 78° 37′ E. long. Avstone fort crowns a neighbouring rock, and commands the town, as well as the British outpost, Jhansi Naodbad, which adjoins the city. It lapsed to the British in 1853, and during the mutiny was the scene of insurrection and massacre. In 1861 the town, fort, and surrounding territory beyond the Pahtj were handed over to Gwalior state. The administrative headquarters of Jhansi district is Jhansi Naodbad, which had a population in 1872 of 536 persons, The estimated population of Jhansi proper is 30,000.

JHELUM, or Juitam, a district in the lieutenant- governorship of the Punjab, India, between 32° 26° ena 33° 15’ N. lat., and between 71° 51’ and 73° 50’ E long., bounded on the N. by Rawal Pindi district, E. by the Jhelum river, 8. by Sh4hpur district, and W. by Bannu district. It forms the south-eastern portion of a rugged Himalayan spur, extending between the Indus and J helum to the borders of the Sind Sagar Dodb. Its scenery is very picturesque, although not of so wild a character as the mountain region of Rawal Pindi to the north, and 1s lighted up in places by smiling patches of cultivated valley. The backbone of the district is formed by the Salt Range, a treble line of parallel hills running in three long forks from east to west throughout its whole breadth. The range rises in bold and striking precipices, broken by gorges,

clothed with green brushwood and traversed by trickling streams, at first pure and fresh, but soon impregnated with the saline matter over which they pass. Between the line of hills lies a picturesque table-land, in which the beautiful little lake of Kallar Kahar nestles amongst the minor ridges. North of the Salt Range, the country extends upwards in an elevated plateau, diversified by countless ravines and fissures, until it loses itself in the tangled masses of the Rawal Pindi mountains. In this rugged tract cultivation is rare and difficult, the soil being choked with saline matter. At the foot of the Salt Hills, however, lies a small strip of level soil, lying along the banks of the Jhelum, and thickly

dotted with prosperous villages. The drainage of the district is determined by a low central watershed running north and south at right angles to the Salt Range. The waters of the western portion find their way into the Sohn, and finally into the Indus; those of the opposite slope collect themselves into small torrents, and empty themselves into the Jhelum.

The census of 1868 returned the population of Jhelum district at 500,988, inhabiting 113,010 houses, and spread over an area of 3910 square miles. The Mahometans nunibered 434,157; Hindus, 49,111; Sikhs, 13,865; and "others," 3855. Five towns contained in 1868 a population exceeding 5000 :—Pind Dadan Khan, 15,740; Chakwal, 5767; Talagang, 5767; Lawa, 5256 ; and Jhelum, 5148. Of a total area of 2,502,290 acres, but 763,845 acres are under culti- vation, and only 258,825 acres more are returned as capable of tillage. The staple crops are wheat and bdjra. Trade is chiefly concentrated in tle town of Pind Dadan Khan. The exports are salt, silk and cotton goods, brass and copper wares; the imports, English piece goods and metals, and woollen fabrics from Kashmir and from Central Asia via Peshawar. Salt is procured in immense quantities from the central hills of the Salt Range ; the net revenue from this source in 1871-72 amounted to £362,193. The total revenue in 1872-78, excluding salt, was £70,299, of which £59,766 was derived from the land tax. The police force consisted in 1873 of 527 men. For fiscal and administrative purposes the district is subdivided into 4 tahsils and 10 pargands, containing 939 estates, and owned by 49,866 proprietors.

The history of the district dates back from the semi-mythical period of the Mahdbhdrata. Hindu tradition represents the Salt Range as the refuge of the five Pandava brethren during the period of their exile, and every salient point in its scenery is connected with some legend of the national heroes. Modern research has fixed the site of the conflict between Alexander and Porus as within Jhelum district, although the exact point at which the Macc- donian king cffected the passage of the Jhelum (or Hydaspes) is disputed. After this event, we have little information with regard to the condition of the district until the Mahometan conquest brought back literature and history to Upper

India. The Janjuahs and Jats, who now hold the Salt Range and its northern plateau respectively, appear to have been the earliest inhabitants. The Ghakkars seem to represent an early wave of conquest from the east, and they still inhabit the whole eastern slope of the district ; while the Awans, who now cluster in the western plain, are apparently later invaders from the opposite quarter. The Ghakkars were the dominant race at the period of the first Mahometan incursions, and long continued to retain their independence. During the flourish- ing period of the Mughal dynasty, the Ghakkar chieftains were among the most prosperous and loyal vassals of the house of Babar; but after the collapse of the Delhi empire Jhelum fell, like its neighbours, under the sway of the Sikhs. In 1765 Gujar Sinh defeated the last independent Ghakkar prince, and reduced the wild mountaineers to subjection. His son succeeded to his dominions, until 1810, when he fell before the irresistible power of Ranjit Sinh. In 1849 the district passed, with the rest of the Sikh territories, into the hands of the British. Ranjit Sinh, how- ever, had so thoroughly subjugated the wild mountain tribes that little difficulty was experienced in reducing it to working order, and the subsequent history of Jhelum has been purely fiscal and administrative.

JuELuM, the headquarters of the above district, situ- ated on the north bank of the Jhelum river, in 32° 55’ 26” N. lat. and 73° 46’ 36” E. long. The town is quite of modern origin, and in 1868 contained a population of 5148, viz, Mahometans, 2831; Hindus, 1858; Sfkhs, 442; Christians, 3; and “others,” 14. The civil lines and cantonments for a regiment of native infantry lie about a mile north of the town, which is noted for boat building.

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JHIND, or JInD, a native state in the Punjab, India, consisting of three or four isolated tracts to the east of the Sutlej. The area is 1236 square miles, and the estimated population 311,000. The principality was founded in 1763 by a Sikh of the Sidhu Jat tribe, and the chief was recognized as raja by the Mughal emperor in 1768. The family have always been loyal supporters of the British Government. On the

overthrow of the Marhattaé power in northern India in 1804-5, the Jhind raj4 was among the foremost to tender his allegiance to Lord Lake, who confirmed him in the possession of the estates he had held under the Mughal emperors and the Marhattds. After the Sutlej campaign a further grant of land was awarded the chief in recognition of his services. In 1857 Raja Swartp Sinh of Jhind was the first to march against the mutineers at Delhi. His troops acted as the vanguard of the army, and he himself remained in the British camp until the reoccupation of the city, a portion of his soldiers aiding in the assault. For these services he received a grant of additional territory, yielding £11,681 per annum. The raja enjoys an estimated revenue of between £60,000 and £70,000, and maintains a force of 10 guns, 79 artil- lerymen, 200 cavalry, and 1600 infantry. No tribute is paid by the state, but a contingent of twenty-five horsemen is furnished to the British Government.

JIDDAH, or Juppau,! also written Jeddah, Djiddah, or Djeddah, a town of Arabia, on the eastern coast of the Red Sea, in 21° 28’ N, lat. and 39° 17’ E. long., is of import- ance mainly as the principal landing-place of the pilgrims to Mecca. Its distance from that city is estimated at 44 or 46 miles. Built on a slight eminence, with a purple background of distant hills, Jiddah as seen from the sea presents an attractive aspect. The white tower-like houses, fancifully enriched with balconies, cornices, and lattices of rich-toned woodwork, shine out from an environment of grey sand and blue-green sea with startling effect. The town extends along the beach for about a mile, and is sur- rounded by a high wall of modern date and in bad repair, with towers at intervals. At the northern end of the sea- face stand the prison and other public buildings, and at the southern end a small fort no lenger available for the defence of the harbour. There are three landward gates, the Mecca gate to the east, through which all caravans pass, and where toll is levied on the transit of camels, the Medina gate to the north, and the Yemen gate to the south. In front of the Mecca gate is a rambling suburb, with shops, coffeehouses, and an open market-place. Before the Medina gate are the Turkish barracks, and beyond them the great holy place of Jiddah, the singular tomb of “our mother Eve,” surrounded by the principal cemetery.

The tomb is a walled enclosure said to represent the dimensions of the body, about two hundred paces long and 15 feet broad. At the head isa small erection where gifts are deposited, aud rather more than half-way down a whitewashed dome encloses a small dark chapel within which is the black stone kuownas El-surrah, the navel. The grave of Eve is mentioned by Edrisi, but except the black stone

nothing bears any aspect of antiquity. Further detailsin Burton's Pilgrimage, vol. ti. p. 298, and a view in Mrs Burton's 4. £. J.

Beyond the immediate suburbs the country as far as the foot of the hill is desert, with scanty pasturage and a few villages of Arab huts. The inhabitants (Harb, Huteym, Zobeid) are engaged in camel transport, slave running, and mother of pearl fishery.

The town itself, which consists of four quarters, is well built, with a good bazaar and many lofty and spacious houses, built of the madrepore rock of the district. The best dwellings are near the Mcdina gate ; the mosques are not remarkable, and the streets are narrow and in part very filthy. The wretched huts which formerly occupied part

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1 The form Juddah has the authority of Yakut, but is not now used.

of the enceinte have been almost entirely removed since the

frightful outbreak of cholera among the pilgrims in 1864-65, |

and the lowest strata of the population now occupy a village without the walls. The sanitary condition of Jiddah still, however, leaves much to be desired, especially in the pilgrim season, The chief defect is the scanty water supply derived from cisterns and wells outside the town. A conduit from the hills has been projected, and would yield a copious stream of excellent water, but the scheme is opposed by the owners of the cisterns, who drive a lucrative trade, a camel-load of water (16

skins of about 7 pints each) costing as much as sixteenpence, or after pro- tracted drought much more. The permanent population of Jiddah is very variously estimated. Mr Beyts (Consular Reports, 1875) places it at 30,000, including 2000 Indian settlers, 100 Greeks, Syrians, and Maltese, and 25 Franks ; but the Dutch consul in 1879 allows a total of 15,000 only. The native population is of very mixed blood.

Jiddah is said to have been founded by Persian merchants in the caliphate of Othnian, but its great commercial pro- sperity dates from the beginning of the 15th century, when it became the ceutre of trade between Egypt and India. Down to the time of Burckhardt the Suez ships went no farther than Jiddah, where they were met by Indian vessels. The introduction of steamers in the Red Sea has deprived Jiddah of its place as an emporium not only for Indian goods but for the products of the Red Sea, which formerly were collected here, but are now largely exported direct by steamer from Hodeida, Sudkin, and other ports, though coffee from Yemen and gums from the African coast still pass in cousiderable quantities through the hands of the Jiddah merchants. The chief exports apart from these are mother of pearl (fished by slave divers) and hides. The chief local manufactures are a coarse cotton fabric, embroideries in gold and silver, lacquer work, beads in black coral, and the like. Boat-building is carried on with great skill, The baggalas of from 50 to 60 tons are built of East Indian wood, and are excellent sailers, The imports of Jiddah are considerable, as the town supplies the interior not only with manufactured goods but with grain and other provisions. See full details of the trade in a valuable paper by the Dutch consul, Mr Kruyt, in Tydsch. v. h. Aardr. Genootschap (Amsterdam, 1880, No. 5). The total exports and imports for 1879 are valued at £2,204,030. In the same year the port was visited by 241 steamships (213,295 tons) and 1156 sailing vessels (55,932 tons). The harbour is not convenient of access, but the roadstead whien entered is well protected by coral reefs.

The introduction of steam traffic, while fatal to other local interests, has given a great impulse to the pilgrim trade, which is now regarded as the annual harvest of Jiddah. The pilgrim steamers are usually chartered by European merchants in conjunction with native

capitalists and persons of religious influence. The average number of pilgrims annually landed at the port is not much short of 40,000. For 1879 Mr Kruyt enumerates 7995 Turks, 2286 from the Barbary states, 3459 Egyptians, 8787 Malayans and Javanese, 10,894 Indians, 3506 Persians, 3300 Arabs from Yemen, the Suiddn, and other places.

In the early years of the present century Jiddah resisted with success repeated attacks of the Wahhdabites, and remained in the hands of the grand sherif when he had lost the rest of the Hijaz. It was governed by Egypt during the Arabian wars of Mehemet Ali, but since 1840 has been again occupied by the Turks. There is a Turkish caim-macam under the waly of the Hij4z and a Turkish cadi, but the sheriff through his resident agent exercises an authority practically superior to that of these officials. In 1858 the attempts of England to suppress the slavo

trade and a supposed insult to the Ottoman flag led to a plot to murder all the Christians in town, which was executed with fatal success (15th June), the English consul Page and the French consul Eveillard being among the victims. This outrage was followed by the bombardment of the town by the English man-of-war “Cyclops,” and the authorities were compelled publicly to execute the Turkish governor and two leading citizens involved in the plot.

For further details sce, in addition to the works already cited, Niebuhr’s Voyage; Burckhardt’s Travels in Arabia, vol.i., London, 1829; Von Maltzan’s Reise nach Siidarabien, Brunswick, 1873. Sce also Ritter, Erdkwnde von Arabien, 1847; Zehme, Arabien und die Araber, Halle, 1875.

JILOLO, Gitoro, or Dsitoto (properly Jailolo or Djailolo, and in the native tongue Halmahera or Halema- hera, .e., the mother or great land), is one of the larger islands of the East Indian archipelago, forming part ad- ministratively of the Dutch residency of Ternate. The equator cuts across the southern peninsula, the most northerly point of

the island lying in 2° 13’ N. lat., and the southern extremity in 0° 52’S. A large proportion of Jilolo is practically terra incognita, though information has somewhat accumulated since Wallace complained in 1856 of the smallness of our knowledge in regard to it. The area is stated at 6410 square niiles ; the extreme irregularity of the outline, however, renders the estimate a peculiarly precarious one. Jilolo may be said to consist of four peninsulas so arranged as to enclose three great bays (Kaou, Bitjoli, Weda), all opening towards the east,—the northern peninsula being connected with the others by an isthmus only 5 miles wide. On the western side of the isthmus lies another bay, that of Dodinga, in the mouth of which are situated the two islands Ternate and Tidore, whose political celebrity so far exceeds that of their larger neighbour Jilolo, To the north-east of the northern peninsula we have the considerable island of Morotai, and to the west of the southern peninsula the far more important island of Batchian. The northern peninsula is full of mountain chains, which give clear evidence of former volcanic activity ; and at least one of the summits, Tolo or Gunong Api (3000 feet), was not quite extinct in the 16th century according to Valentijn’s report. At present the crater, as described by Bernstein, is 200 feet deep, and contains a small lake. Gunong Tabello is higher than Tolo, and Gunong Mamuya has a similar altitude. In the south of the peuinsula lies a lake, Talaga Lamo (the Tela- galina of Bernstein’s account), about 4 or 5 miles long. The principal village is Galela, situated on a bay of the same name on the east coast, in a well-cultivated plain which extends southward and inland. The three remaining peninsulas, which have been less explored, seem to be hardly so mountainous. The whole island is clothed with a prolific vegetation, some of the more important features of which will be found described in Teysmann’s paper iu the Report of the Botanic Garden at Buitenzorg. Rice is grown by the natives, but the sago tree is of far greater importance to them.

The people of Jilolo are for the most part pagans, living in a very backward state of civilization. Attempts to Christianize them have been made with but small success by the mis- sionaries of the Utrecht Society, who have their chief stations at Swakenora and Dokolamo, near Lake Talaga Lamo (see Berigten der Utreehtsche

Zendingsverceniging, 1869). M. Achille Rafiray gives the following description of the Halmaherians in Tour du Monde, 1879, where photographs of a number of the natives will be found. “They are a3 unlike the Malays as we are, excelling them in tallness of stature and elegance of shape, and being perfectly distinguished by their oval face, with a fairly high and open brow, their aquiline nose, and their horizontally placed eyes. Their beards are sometimes thick ; their limbs are muscular ;

the colour of their skins is cinnamon brown. Spears of iron-wood, abundantly barbed, and small bows and bamboo arrows free from

poison are their principal weapons.” According to Teysmanu they have temples (sabwas) in which they suspend images of serpents and other monsters as well as the trophies procured by war. They believe in a better life hereafter, but have no idea of a hell ora devil, their evil spirits only tormenting them in the present state.

The Portuguese and Spaniards were better acquainted with Jilolo than with many other parts of the archipelago ; they called it some- times Batu China and sometimes Moro. It was circumuavigated by one of their vessels in 1525, and the general outline of the coasts is correctly given in their maps at a time when separate portions of Celebes, such as Macassar and Menado, are represented as distinct ‘slands. ‘The current name of the island (Jilolo) was really that of a native state, the sultan of which had the chief rank among the princes of the Moluccas before he was supplanted by the sultan of Ternate about 1380. His capital, Jilolo, lay on the west coast on the first bay to the north of that of Dodinga. In 1876 Danu Hassan, a descendant of the sultans of J ilolo, raised an insurrection in the island for the purpose of throwing off the authority of the sultans of Tidore aud Ternate ; and his efforts would probably have been successful but for the intervention of the Dutch.

See J. P. C. Cambier, “ Rapport over Tidoreeseh-Halmahera (1825) ;” “ Beknopte Woordenlijst van Talen op Tidoreesch-Halmahera” ; and Robidé van der Aa, “ Viuehtige Opmerkingen over de Talen der

Halmahera groep”—all three in Bijdr. tot de T. L. en V. Kunde van N. Ind., 1873; Meinicke, ‘Dr Bernstein’s Reise in den Nérdl. Molukken,” in Petermann’s Mittheilungen, 1873; Dr Hamy, “Les Alfourous de Gilolo,” in Bull. de la Soc, de Géogr. 1877 (based on informa- tion from Raffray); Teysmann, in Bid. tot de T. L. en V. Kunde, 1878, trans- lated in Annales de 0 Extréme Orient, 1879.

JIMENES, or XIMENES, DE CISNEROS, FRANCISCO (1436-1517), cardinal and statesman, was born in 1436 at Torrelaguna in Castile, of good but poor family. He studied at Alcala de Henares and afterwards at Salamanca ; and in 1459, having entered holy orders, he went to Rome. Returning to Spain in 1465, he brought with him an “expective” letter from the pope, in virtue of which he took possession of the archpriestship of Uzeda in the diocese of Toledo in 1473. Carillo, archbishop of Toledo, opposed him, and on his obstinate refusal to give way threw him into prison, For six years Jimenes held out, and at length in 1480 Carillo restored him to his benefice. This Jimenes exchanged almost at once for a chaplaincy at Siguenza, under Cardinal Mendoza, bishop of Siguenza, who shortly appointed him vicar-general of the diocese. In that position Jimenes won golden opinions from ecclesiastic and layman; and he seemed to be on the sure road to distinction among the secular clergy, when he abruptly resolved to become a monk, Throwing up all his benefices, and changing his baptismal name Gonzales for that of Francisco, he entered the Franciscan monastery of San Juan de los Reyes, recently founded by Ferdinand and Isabella at Toledo. Not content with the ordinary severi- ties of the noviciate, he added voluntary austerities. He slept on the bare ground, wore a hair-shirt, doubled his fasts, and scourged himself with much fervour; indeed throughout his whole life, even when at the acme of his greatness, his private life was most rigorously ascetic. The report of his sanctity brought crowds to confess to him ; but from them he retired to the lonely monastery of Our Lady of Castafiar ; and he even built with his own hands a rude hut in the neighbouring woods, in which he lived at times as an anchorite. He was afterwards guardian of a monastery at Salzeda. Meanwhile Mendoza (now arch- bishop of Toledo) had not forgotten him; and in 1492 he recommended him to Isabella as her confessor. The queen sent for Jimenes, was pleased with

him, and to his great reluctance forced the office upon him. The post was politically important, for Isabella submitted to the judg- ment of her father-confessor not only her private affairs but also matters of state. Jimenes's severe sanctity soon won him considerable influence over Isabella; and thus it was that he first emerged into political life. In 1494 the queen's confessor was appointed provincial of the order of St Francis, and at once set about reducing the laxity of the Conventual to the strictness of the Observantine Franciscans, As was to be expected, intense opposition was offered, and continued even after Jimenes became arch-

bishop of Toledo, The general of the order himself came from Rome to interfere with the archbishop's measures of reform, but the stern inflexibility of Jimenes, backed by the influence of the queen, met and subdued every obstacle. Cardinal Mendoza had died in 1495, and Isabella had secretly procured a papal bull nominating her confessor to his diocese of Toledo, the richest and most powerful in Spain, second perhaps to no other dignity of the Roman church save the papacy. Long and sincerely Jimenes strove to evade the honour; but his nolo episcopart was after six months overcome by a second bull ordering him to accept consecration. With the primacy of Spain was associated the lofty dignity of high chancellor of Castile ; but Jimenes still maintained his lowly life; and, although . a message from Rome required him to live in a style befitting his rank, the outward pomp only concealed his private asceticism, just as his splendid robes covered his monk's frock. In 1499 Jimenes accompanied the court to Granada, and there eagerly joined the mild and_pious Archbishop Talavera in his efforts to convert the Moors. Talavera had begun with gentle measures, but Jimenes preferred to proceed by haranguing the fakihs, or doctors of religion, and loading them with gifts. Outwardly the latter method was successful ;.in two months the converts were so numerous that they had to be baptized by aspersion. The indignation of the unconverted Moors swelled into open revolt. Jimenes was besieged in his house, and the utmost difficulty was found in quieting the city. Baptism or exile was offered to the Moors as a punishment for

rebellion. The majority accepted baptism; and Isabella, who had been momentarily annoyed at her archbishop's imprudence, was satisfied that he had done good service to Christianity. On November 26, 1504, Isabella died. Ferdinand at once resigned the title of king of Castile in favour of his daughter Joan and her husband the archduke Philip, assuming instead that of regent. Philip was keenly jealous of Ferdinand's pretensions to the regency ; and it required all the tact of Jimenes to bring about a friendly interview between theprinces, Ferdinand finally retired from Castile ; and, though Jimenes remained, his political weight was less than before. The sudden death of Philip in September 1506 quite overset the already tottering intcllect of his wife; his son and heir Charles was still a child ; and Ferdinand was at Naples. The nobles of Castile, mutually jealous, agreed to entrust affairs to the archbishop of Toledo, who, moved more by patriotic regard for his country's welfare than by special friendship for Ferdinand, strove to establish the final influence of that king in Castile. Ferdinand did not return till August 1507; and with him he brought a cardinal's hat for Jimencs. Shortly after- wards the new cardinal of Spain was appointed grand in- quisitor-general for Castile and Leon. See [nquisirion. The next great event in the cardinal's life was the expe- dition against the Moorish city of Oran in the north of Africa, in which his religious zeal was supported by the prospect of the political and material gain that would accrue to Spain from the possession of such a station. A pre- liminary expedition, equipped, like the following, at the expense of Jimenes, captured the port of Mers-el-Kebir in 1506; and in 1509 a strong force, accompanied by the cardinal in person (now in his seventy-second year), set sail for Africa, and in one day the wealthy city was taken by storm. Though the army remained to make fresh conquests, Jimenes returned to Spain, and occupied himself with the administration of his diocese, and in endeavouring to recover from the regent the expenses of his Oran expedition. On January 23, 1516, Ferdinand died, leaving Jimenes as regent of Castile for Charles (afterwards Charles V.), then a youth of sixteen in the Netherlands. Though Jimenes at once took firm hold of the reins of government, and ruled

in a determined and even autocratic manner, the haughty and turbulent Castilian nobility and the jealous intriguing Flemish councillors of Charles combined to render his position peculiarly difficult; while the evils consequent upon the unlimited demands of Charles for money threw much undeserved odium upon the regent. In violation of the laws, Jimenes acceded to Charles's desire to be proclaimed king; he secured the person of Charles's younger brother Ferdinand; he fixed the seat of the cortes at Madrid ; and he established a standing army by drilling the citizens of the great towns. Immediately on Ferdi- nand's death, Adrian, dean of Louvain, afterwards pope, produced a commission from Charles appointing him regent. Jimenes admitted him to a nominal equality, but took care that neither he nor the subsequent commis- sioners of Charles ever had any real share of the power. In September 1517 Charles landed in the province of Asturias, and Jimenes hastened to meet him. On thie way, however, he fell ill, not without a suspicion of poison. While thus feeble, he received a letter from Charles coldly thanking him for his services, and giving him leave to retire to his diocese. A few hours after this virtual dis- missal, which some, however, say the cardinal never saw, Francisco Jimenes died at Roa, November 8, 1517.

Jimenes was a bold and determined statesman. Sternly and inflexibly, with a confidence that became at times overbearing, he carried throngh what he had decided to be right, with as little regard for the convenience of others as for his own. In the midst of a corrupt elergy his morals were irreproachable. He was liberal to all, and founded and maintained very many benevolent institutions in his diocese. His whole time was devoted either to the state or to religion; his only recreation was in theological or scholastic discussion. Perhaps one of the most noteworthy points about the cardinal is the advanced period of life at which he entered upon the stage where he was to play such leading parts. Whether his abrupt change from the secular to the regular clergy was the fervid outcome of religious enthusiasm or the far-seeing move of a wily schemer has been disputed ; but the constant austerity of his hfe, his unvarying superiority to small personal aims, are arguments for the former alternative that are not to be met by merely pointing to the actual honours and power he at last attained.

His services to learning and literature have yet to be noted. In 1500 was founded, and in 1508 was opened the university of Alcala de Henares, which, fostered by Cardinal Jimenes, at whose sole expense it was raised, attained a great pitch of outward magnificence and internal worth. At one time 7000 students met within its walls. In 1836 the university was removed to Madrid, and the costly buildings were left vacant. Inthe hopes of supplant- ing the romances generally found in the hands of the young, Jimenes caused to be published religious treatises by him- self and others. He revived also the Mozarabic liturgy, and endowed a chapel at Toledo, in which it was to be used. But his most famous literary service was the print- ing at Alcala (in Latin Complutum) of the Complutensian Polyglott, the first edition of the Christian Scriptures in the original text.?

In this work, on which he is said to have expended half a million of ducats, the cardinal was aided by the celebrated Stunica (D. Lopez de Zufiiga), the Greek scholar Nufiez de Guzman (Pincianus), the Hebraist Vergara, and the humanist Nebrija, by a Cretan Greek Demetrius Ducas, and by three Jewish eonverts, of whom Zamora edited the Targuin to the Pentateuch. The other Targums are not included. In the Old Testament Jerome's version stands between the Greek and Hebrew. The synagogue and the Eastern Church, as the preface expresses it, are set like the thieves on this side and on that, with Jesus (that is, the Roman Church) in the midst. The text occupies five volumes, and a sixth contains a Hebrew lexicon, &. The work commenced in 1502. The New Testament was finished in J anuary 1514, and the whole in April 1517. It was dedicated to Leo Exon

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The work by Alvaro Gomez de Castro, De Rebus Gestis Francisci Ximenii (folio, 1659, Alcala), is the quarry whence have come the materials for biographies of Jimenes—in Spanish by Robles (1604) and Quintanilla (1633); in French by Baudier (1635), Marsollier (1684), Fléchier (1694), and Richard (1704) ; in German by Hefele (1844, translated into English by Canon Dalton, 1860) and Have- mann (1848) ; and in English by Barrett (1813). See also Prescott's Ferdinand and

Isabella ; Revue des Deux Mondes, May 1841 ; and Mém. de? Acad. @hist. de Madrid, vol. iv.

JITOMIR. See Zurromir.

JOACHIM (c. 1145-1202), abbot of Floris, has a place of considerable prominence in the category of those mystics who, like St Hildegard or the abbess Elizabeth, on behalf of a sounder morality protested in prophetic denunciation against the many and gross abuses connected with the ecclesiasticism which prevailed in Europe towards the close of the 12th century. The few details of his life that can be given are neither very precise nor quite trustworthy ; but it appears that he was born about 1145 at a village in the neighbourhood of Cosenza, and that when a youth he had attended the Sicilian court; afterwards he made a pilgrimage to Palestine, and, having (whether previously or subsequently to his return is not stated) become a monk, he ultimately attained to the dignity of abbot of the monastery of Corace in Calabria (onwards from 1178). Here his studies in prophecy and apocalyptic brought him into great repute, and successive popes—Lucius III., Urban III, and Clement III.—manifested an interest in them. The last-named especially, in the first year of his pontificate (1188), urged Joachim to the completion of his commentary on the Apocalypse and also of his Concordia utriusque Testamenti. Soon afterwards the abbot, accom- panied by a friend named 'Rainerius, leaving Corace in search of a more solitary life, set up among the lonely hills of Sylz near Cosenza a new establishment, named " Sancti Joannis in Flori," for which he drew up a new and stringent rule, afterwards sanctioned (in 1196) by Celestine III. From this cloister ultimately sprang a whole congregation, —the so-called "Ordo Florensis." The only work pub- lished during his lifetime was the Concordia, which had been duly submitted to the judgment of the Holy See ; and before his death (which occurred between September 1201 and June 1202) he left in writing a memorandum with reference to his other compositions,—the Zypositio in Apocalypsin, the Psalterium decem chordarum, Contra Judxos, and Contra cathol. fidet adversarios,—intimating his desire and intention that these should also be subject to the same censorship.

His study of apoealyptie prophecy had resulted im the construc- tion of an elaborate scheme of the past and future course of the divine kingdom which is as interesting as it is curious. He distin- guished three stages or ages of the world corresponding to the three persons of the Trinity, the three conditions of married persons, clergy, and monks, the three periods of the Old Testament, the New Testament, and the final dispensation, The advent of the last of these periods, that of the Holy Spirit, the 'spiritualis imtelligentia," proceeding from the Old and New Testaments, he regarded as imminent. It was to be the period of perfect freedom from the letter, of monastic contemplation, adoration, and jubilation, and of the widest possible diffusion of the gospel (even to the Jews); but it was to be preceded by fearful judgments, in which Antichrist should become manifest. He regarded the Church of Rome as having been typified by the kingdom of Jadah, while the Eastern Church corresponded to that of Israel. The way in which he worked out this analogy gave him seope for pointing out the manifold errors and corruptions into which he believed the Church of the West to have fallen, yet in no spirit of hostility to that organization as such. His eschatology found great currency and much acceptance amongst the stricter members of the Franciscan order,—the "Zelatores" as they were called,—and gradually gave rise to a cognate literature more manifestly opposed to Rome and

whose permission to publish was so tardy that the book did not come before the public till 1522. The MSS. on which the Hebrew text was based are still at Madrid; the history of those used for the New Testament has long been a problem, but the story that they were sold to a fireworks maker appears to be a fable. See Delitzsch's unfinished studies on the subject (London, 1872, and Leipsic, 1878).

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even to ccclesiasticism of any kind. Among this class of composi- tions the greatest historical importance belongs to the Leber intro- ductorius in Evangelium xternwm, now no longer extant, except in some excerpts. 'The work was censured as heretical by the univer- sity of Paris, and the order for its destruction. was obtained from Alexander IV. in 1255;

this, however, only stimulated the pnblic interest in the books of Joachim himself, which now began to be circulated and read more widely than ever. That interest died 2) natural death, however, when the year 1260, which Joachim had fixed as the time of the end, had come and gone, leaving the old and evil world practically unchanged.

See Engelhardt, Kirchengesehichtliche Abhandlungen, 1832 ; Neander, Gesch. d. christl. Religion u, Kirche (English transla- tion, vol. vii., 1852); Renan, "Joachim de Flore et VEvangile éternel," in the Revue des Deux Mondes for 1866; Preger, Gesch. d. deutschen Mystik, vol. i., 1875; and Moller's art. " Joachim von Floris," in Herzog-Plitt's Real-Eneyk., vol. vi.

JOACHIMSTHAL (Boh., Jéchimov), a mining town of Bohemia, in the circle of Eger, is favourably situated in a valley on the southern slopes of the Erzgebirge, about 10 miles north of Carlsbad, and 3 miles from the Saxon frontier, at an elevation of 2000 feet above the level of the sea, 50° 23' N. lat., 12°54' E. long. It is the seat of a circuit court and board of mines, and has two commer- cial schools and establishments for teaching lace-making and straw-plaiting. The inhabitants are chiefly employed in mining, and in the manufacture of white and red lead, vermilion, cobalt, smait, uranium yellow, bismuth, and nickel ; also of thread, lace, basket-work, cutlery, paper, and cigars. The town owes its celebrity to the silver, lead, tin, and iron mines in its vicinity. During the 16th century the silver mines reached a very high point of pro- ductiveness, but since that period the yield has considerably declined. Population in 1870, 6586.

In place of the present town of Joachimsthal, which dates from the year 1516, there stood formerly the village of Conradsgriin. This was ceded by the kings of Bohemia to the counts of Schlick, from whom it passed by feudal tenure to the knights of Haslava. It is from the silver guldengroschen, first coined in 1518 by order of Count Schlick, and afterwards known as Joachimsthaler, that the German term thaler is derived. In 1547, during the Smalkald war, the town was besieged by William Thumshirn, general of John Frederick, elector of Saxony, but the siege was soon raised. In 1579 certain special privileges and

additional lands were granted to Joachimsthal by the emperor Rudolph II. The last emigration of Protestants from the neighbourhood to Saxony took place in 1663. Three-fourths of the town was destroyed by fire on the 31st March 1873. The large church of St Joachim, which was also burned, was rebuilt and restored in 1876. In the neighbourhood are the ruins of the castle of Freudenstein,

JOAN, the name given to a female pope, now regarded as a fictitious personage, who under the title of John VIL or VIII. was said, according to the most general accounts, to have occupied the papal chair between the pontificate of Leo IV, and Benedict IIL, although various other dates are given, 'Tradition represents her as of English descent, but born in Ingelheim or Mainz. By some her original name is given as Gilberta, by others as Agnes. She was credited with having fallen in love with a young Benedictine monk, and with having on that account assumed tlie male monastic habit and lived for some time in the monastery of Fulda. Her lover, it is affirmed, died while they were pursuing their studies together at Athens, and after his death she went to Rome, where, according to the most approved ver- sion of the story, she became a very successful professor. So high indeed became her reputation for piety and learning that the cardinals with one consent elected the supposed young monk the successor of Pope Leo IV. In this posi- tion she comported herself so as entirely to justify their choice until the catastrophe of giving birth to a male child during a procession to the Lateran palace suddenly and urevocably blasted her reputation. She is said either to have died in childbirth or to have been stoned to death.

The story of the pontificate of Joan was received as fact from the 18th to the 15th century, but it has been discredited by later researches. The circumstantial evidence around which it clung, and which may have aided in suggesting it, was the observance of

a cirenit by the papal processions so as to avoid passing through a certain street (a statue at onc time standing in that street, said to represent a woman and child, with a monumental stoue near it having

a peculiar inscription), and the use of a pierced seat at the enthronement of the popes. Of these facts other and more credible explanations lave, however, been given, although there is no sutli- cient evidence to demonstrate beyond dispute the manner in which the story originated. According to Dr Déllinger, who gives an elaborate analysis of the story in Die Papst-Fabeln des Mittclalters, Munich, 1868, the tradition finds no support in the original text either of Marianus Scotus, Sigebert of Gemblours, or Otto of Freysingen. She is first mentioned by Stephen de Bourbon, who died in 1261, and who took his information probably from the chronicle of the Dominican Jean de Mailly, no copy of which is now known to be in existence. The story is not found in any of the original manuscripts of Martinus Polus, and according to Dollinger was interpolated in that chronicle some time between 1278 and 1312. He attributes the propagation of the myth chiefly to its insertion in Martinus Polus, from which it was copied into the Flores Temporum, a chronicle founded on Martinus, and its real originators he supposes to have been the Dominicans and Minorites, who had a grudge against the papacy on account of the persecutions they were experiencing at the hands of Benedict VIII. So rapidly did the tradition spread that in 1400 a bust of the papess was placcd in the cathedral of Siena along with the other popes, having the inscription " John VIII., a woman from England." The statue ocenpied this position till the beginning of the 17th century.

See the work of Dollinger above mentioned, which has been translated into English both in England and in America, and the authoritics therein referred to.

JOAN or Arc, or more properly Joanneta Dare, after- wards known in France as Jeanne d'Arc,! the Maid of Orleans, was born about 1411, the daughter of Jacques Darc, peasant proprietor of Domremy, a small village partly in Champagne and partly in Lorraine, and of his wife Isabeau de Vouthon, who from having made a pilgrimage to Rome had received the usual surname of Romée. Joan never learned to read or write, and received her sole religious instruction from her mother, who taught her to recite the Pater Noster, Ave Maria, and Credo. In her childhood she was noted for her abounding physical energy ; but her

vivacity, so far from being tainted by any coarse or unfeminine trait, was the direct outcome of intense mental activity and an abnormally sensitive nervous temperament, Towards her parents her conduct was uniformly exemplary, and the charm of her unselfish kindness made her the special favourite of many in the village. In all household work she was specially proficient, her skill in the use of the needle not being excelled by that of any matron even of Rouen. As she grew to womanhood she became inclined to silence, and spent much of her time in solitude and prayer. All advances made by the young men of her acquaintance with the view of win- ning her attention or favour she decisively repelled ; and, while active in the performance of her usual round of duties, and apparently finding her mode of life quite pleasant and congenial, inwardly she was engrossed with thoughts reaching far beyond the circle of her daily concerns,

At this time, through the alliance and support of Philip of Burgundy, the English had extended their conquest over the whole of France north of the Loire as well as Guienne ; and, while the infant Henry VI, of England had in 1422 been proclaimed king of France at his father's grave at St Denis, Charles the dauphin, devoted only to present ease and pleasure, was almost passively contemplating the slow dismemberment of his kingdom by internal confusion and misery, and by the progressive encroachments of the English rule. The fact that the hard straits to which the kingdom was reduced were greatly owing to the conduct of Isabella, the dauphin's mother, who disinherited her son

1 In the Act of ennoblement the name is spelt Day, due probably to the peculiar current pronunciation. It has been disputed whether the name was written originally d'Arc or Dare. It is beyond doubt that the father of Joan was not of noble origin, but Bouteiller suggests that at that period the apostrophe did not indicate nobility.

in favour of Henry V. of England, the husband of her daughter Catherine, supplied an opportunity for the ful- filment of the ancient prophecy of the enchanter Merlin, that the calamities which should fall upon France through the depravity of a woman would be removed by

the instru- mentality of a chaste virgin. To the imagination of the time there was, moreover, nothing strange in such a mode of deliverance, for it was no uncommon occurrence for damsels to accompany their lovers to the wars, and, dis- guised as pages, to share to some extent in their dangers and adventures. In the country of Joan the tradition was current that this virgin should come out of the forest of Domremy, where Joan was accustomed in her childhood to tend her father's sheep. How it therefore became fixed in her mind that she was the destined deliverer of her country there is little difficulty in under- standing. She possessed a nature strongly sympathetic, and it was kindled to ardent patriotism by the sad con- dition of her country ; her imagination was so overpower-

ingly vivid that it frequently deceived her reason ; and |

her consciousness of endowments which could find no proper scope for their activity within her narrow sphere must have confirmed if they did not originate her prognos- tications that she was appointed to some high destiny. Gradually her whole attention became so engrossed with her country's wrongs that all her waking hours were one continued and prolonged prayer for its deliverance. The result was that, owing to a peculiarity in her nervous con- stitution, her own thoughts and hopes seemed to take audible voice, and returned to her as assurances and com- mands spoken to her by the saints. At last, when in 1428 Orleans, the key to the south of France, was invested by the English under the earl of Salisbury, the voices became so peremptory and urgent as to overcome all pretexts for delay on account of previous discouragements and rebuffs. Notwithstanding the strong remonstrances of her parents, who viewed her resolve with poignant grief and dismay, she now renewed with increased determination her efforts to win from Robert de Baudricourt, governor of Vaucou- leurs, an introduction to the dauphin Charles, In all her subsequent acts she professed to be guided: by the voices of the saints, who had set before her the twofold task of relieving Orleans and crowning the young dauphin at Rheims. By persistent importunity, the effect of which was increased by the simplicity of her demeanour and her calm assurance of success, she at last prevailed on the governor to grant her request; and in February

1429, accompanied by two knights, she set out on her perilous journey to the court of the dauphin at Chinon. At first

Charles refused to see her, but the rising tide of popular .

feeling in her favour induced his advisers to persuade him after three days to grant her an interview. Of the divinity of her cominission she is said to have persuaded him by discovering him though disguised in the crowd of his courtiers, and by assuring him regarding his secret doubts as to his legitimacy. Accordingly, after a commission of doctors had reported that they had found in her nothing of evil or contrary to the Catholic faith, and a council of matrons had reported on her chastity and virginity, she was permitted to set forth with an army of 4000 or 5000 men designed for the relief of Orleans. At the head of the army she rode clothed in a coat of mail, armed with an ancient sword which she had divined to be hidden near the altar of St Catherine de Fierbois, and carrying a white standard of her own design embroidered with lilies and having on the one side the image of God seated on the clouds and holding the world in his hand, and on the other a representation of the annunciation. Joan was of medium height, stoutly built, but finely proportioned; and her frame was capable of enduring great fatigue. Notwithstanding

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subsequent traditions, she does not appear to have been strikingly handsome. Conventional beauty of the highest type could not be expected in one accustomed to her mode of life, but the most authentic testimonies represent her as less comely than many in her own station, Her features were, noreover, expressive rather of rustic honesty and innocence than of mental power, although she is said to have possessed grand melancholy eyes which, probably on account of the high and noble purpose which animated them, exercised an indescribable charm.! Her voice was powerful, but at the same time of great sweetness, and her manner possessed a fine natural dignity and grace, which, while it repelled familiarity, softened and subdued even the rudest of the soldiers. Nominally she had been entrusted with the command of the army, but in reality it was under the direction of

experienced generals; and it cannot be pretended that the victories accomplished in consequence of her co-operation were the result of brilliant military genius. Indeed, the blind obstinacy with which in the face of overwhelming odds she refused to ackuow- ledge defeat place it beyond doubt that she was unable to ~ estimate the elements of success in battle, and was actuated throughout by a fatalistic persuasion that victory was in- evitable if she persevered unflinchingly in her efforts to obtain it. At the same time she possessed a shrewd and penetrating judgment both as to men and things, and the manner in which she conducted herself amid the varied difficulties of her career indicated extraordinary force of character and high and noble prudence. What, however, she chiefly supplied to the French cause was concentrated energy and resolution. Above all, she inspired the soldiery with a fanatic enthusiasm armed with the sanctions and ennobled by the influences of religion; and she overawed the enemy by the superstitious fear that she was in league with supernatural powers.

By a remarkable stroke of good luck Joan succeeded in entering Orleans on the 29th April 1429, and through the vigorous and unremitting attacks of the French the English gradually became so discouraged that on the 8th of May they raised the siege. By the capture of Jargeau and Beaugency, followed by the great victory of Patay, where Talbot was taken prisoner, the English were driven beyond the Loire. With some difficulty the king was then per- suaded to set out towards Rheims, which he entered with anarmy of 12,000 men on July 16th, Troyes having on the way been taken by assault at the sole instigation of the Maid. On the following day, holding the sacred banner, she stood next to Charles at his coronation in the cathedral. After au endeavour to detach Burgundy from the English cause, the king at last agreed to attempt the capture of Paris, but on account of the disastrous result of an attack made on the 8th September, in which Joan was wounded, he resolved, notwithstanding her passionate remonstrance, to withdraw from the city, and disbanded his troops. Joan went into Normandy to assist the duke of Alencon, but in December returned to the court, and on the 29th she and her family were ennobled with the surname of du Lis. Unconsoled by such honours, she rode away from the court in March, to assist in the

defence of Compidgne against the duke of Burgundy ; and on the 24th May she led an unsuccessful sortie against the besiegers, when on account of her determination to fight to the last she was surrounded and taken prisoner. Charles, partly perhaps on account of his natural indolence, partly on account of the intrigues at the court, made no effort to

effect her ransom, and never showed any sign of interest

in her fate. Probably he had found her so difficult to

1 Qn the personal appearance of the Maid, see especially E, de Bouteiller, Notes Jconographiques sur Jeanne d'Arc, 1879, contaiming engravings of the most authentic statues.

manage and control that he as well as his generals regarded her presence with the army as more embarrassing than help- ful; and doubtless her capture dissipated the halo of super- natural power that had surrounded her. By means of negotiations instigated and prosecuted with great perse- verance by the university of Paris and the Inquisition, and through the persistent scheming of Pierre Cauchon, the ejected bishop of Beauvais, she was sold in November by Luxembourg and Burgundy to the English, who on January 3, 1431, at the instance of the university of Paris, delivered her over to the Inquisition for trial. After a public exami- nation, begun on the 9th January and lasting six days, and another conducted in the prison, she was, on the 20th March, publicly accused as a heretic and sorcerer, and, being in the end found guilty, she made her submission at the scaffold on the 24th May, and received pardon. She was still, however, the prisoner of the English, and, having been induced by those who had her in charge to resume her male clothes, she was on this account judged to have relapsed, was sentenced to death, and burned at the stake on the streets of Rouen, May 30,1431. The sentence was revoked by the pope on the 7th July 1456, and since then it has been the custom of Catholic writers to uphold the reality of her divine inspiration. In 1436 an impostor appeared, professing to be Joan of Arc escaped from the flames, who succeeding in inducing many people to believe in her state- ment, but afterwards confessed her imposture.

There is no doubt that Joan herself believed in her super- natural guidance, and her judges, notwithstanding all their efforts, were unable to bring to light the smallest semblance of a sign of conscious dishonesty on her part. Atthe same time the nobility of her purpose was unstained by the faintest symptom of selfish regard to her own fame and glorification. Indeed the greatness of her career did not consist in her military achievements, but in her pure, true, and ardent character, wliich made her a pathetic victim to the mean and grovelling aims of those in whose cause she fought with such simple sincerity of faith, and to the eruelties of a superstitious age.

Literature.—All previous works on Joan of Arc were deprived of a great part of their critical value by the publication, in 5 vols., 1841-49, of the Procés de condamnation ct de réhabilitation de Jeanne Arc, edited by J. Quicherat. Therecord of the Procés de condamnation consisted originally of the official notes of the trial, afterwards edited in Latin by P. Cauchon, and bears internal marks of general truthfulness. The original French minute does not exist except in a fragment which has been reproduced by M. Vallet de Viriville in his French translation of the Latin version, published in 1867. A French translation of the Procés de condamnation and Proces de réhabilitation by E. O'Reilly appeared in 1868. The 4th vol. of Quicherat is occupied with old chronicles and histories, the principal of which are those of Percival de Cagny, a retainer of the duke of Alengon, never before published; Jacques Ic Bouvier (Berri), that from 1402-1411 first published in 1653 as part of a history of Charles VI., and the remainder, 1411-1444, in the collection of Denis Godefroy, 1661; Jean Chartier, only contemporaneous from 1437, before which it borrows chiefly from the Chronique de la Pucelle and Le Bouvier, what it does not borrow being utterly untrustworthy, published 1476-77, 1493, 1514, 1517-18, by Denis Godefroy, 1661, and Vallet de Viriville, with notes, 1858; Journal du Siége d'Orléans, founded on the chronicles of Berri and Jean Chartier, with a few other documents, published 1576, 1606, 1611, 1619, 1621, and reprinted with notes by Jacob in 1855 ; la Geste des nobles Frangois, or Chronique de Cousinot, which closes with 1429, but some years after- wards was completed by a nephew of Cousinot to the siege of Paris so as to form the Chronique de la Pucelle, published by Denis Gode-froy, 1661, by M. Petitot, 1825, in vol. vili. of Afémoires relatifs a histoire de France, and with notes by Vallet de Viriville, 1859 ; Chronique d Enguerran de Monstrelet, first published about 1500 and very frequently afterwards, English translation by Thomas Johnes, 1840, the last and best French edition, that of L. Douét @'Arcq, 6 vols, 1857-62. The principal other contemporary authorities are Basin's Histoire des Regnes de Charles VII. ct de Louis XI., first published in a complete form by Quicherat,

with notes and life, 4 vols., 1855-1859; the Chronique Normande of Pierre Cochon, the part referring to Joan published along with Chronique de la Pucelle by Vallet de Viriville, 1859, the

whole by De Robillard de Beaurepaire, 1870; Chronique de Robert Blondel, first published by Vallet de Viriville, 1859 ; Chro- nique de Jcan Raoult, or Chronique anonyme de Charles VIL, first published by Vallet de Viriville, 1858; Abregé d Histoire chronolo- gique, by Denis Godefroy, 1661 ; Le mystérc du Siége d' Orléans, in verse, published from a manuscript in the Vatican in Collection de Documents inédits sur [Histoire de France, 1862; a Latin poem by Valesan Vasanius, 1501; ananonymous Latin poem, manuscript 5970 of the Imperial Library of Paris; a poem by Christine de Pisan, 1429, printed in 1865; Martial Auvergne, Les Vigilles du roy Charle, in verse, 1505—one hundred copies of the portion relating to Joan of Arc printed at Orleans, 1866, of which one copy is in the British Museu.

The earliest life by other than contemporaries is that in Latin by Jean Hordal, 1612. Edmond Richer, who had procured the original documents of the Procés, finished a life of Joan in 1628 which was never published, but of which Lenglet-Dufresnoy made use to correct his own work, published in 1754 in two volumes, Charles du Lys, a descendant of her kin, published D'lextraction et parenté de la Pucelle d Orléans, 1611, enlarged edition 1612, 3d in 1628, all of which were republished by Vallet de Viriville in Trésor des piéces rares ct anciennes, 1856. In 1790 L'Averdy published an analysis of the manuscript of the Proeés in the 3d vol. of Mémoires of the Academy or Inscriptions. The principal other works previous to the publication of the Procés are those of Lebrun des Charmettes, 1817, 4 vols.; Saint-Prix, 1817; Lemaire, 1818; Jollois, 1821; Dumas, 1843; De Beauregard, 1847; and the accounts by De Barante, Michelet, and Sismondi in their several histories. Since the publication of the Procés the works of original critical value are Apercus Nouveaux by J. Quicherat, 1850; the lives by B. Henri Martin, last ed., 1875; Wallon, 1860; and Villiaumé, 1868. Other lives have been written by Lamartine, 1852; Lafontaine,

1854; Desjardins, 1854; Michaud, 1861; Sepet, 1869. See also Vallet de Viriville, Recherches sur la famille de Jeanne d' Arc, 1854; Histoire de Char les VII., by the same, 3 vols., 1862-65; De Robillard de Beaurepaire, Recherches sur le proces de condamnation de Jeanne Arc, 1869; Boucher de Molandon, Premiere Expédition de Jeanne d Arc, 1874; KE. de Bouteiller, Jeanne d' Arc dans les chroniques Missincs de P. Vigneulles, 1878; and E. de Bouteiller and G. de Braux, La famille de Jeanne d' Arc, 1878, Nowvelles Recherches sur la famille de Jean @ Arc, 1879, and Notes Feonographiques, 1879. The principal German works arc those of Gérres, 2d ed., 1835 (French transl., 1843); Hase, 1861; Eysell, 1861; and Hirzell, 1877. In English, in addition to the cssays of De Quincey and Lord Mahon, there are lives by Harriet Parr, 1866; Mrs Bray, 1874; and Janet Tuckey, 1880. Of the numerous dramas and poems of which Joan of Arc has been the subject, mention can only be made of Die Jungfrau von Orleans of Schiller, the Joan of Are of Southey, and the scandalous burlesque-epic of Voltaire. A drama in verse by Jules Barbier has been set to music by C. Gounod, 1878.

JOB. The book of Job (Heb. ais Zyyob, Gr. "Ief),

the most splendid creation of the Hebrew poetry, is so called from the name of the man whose history and afflictions and sayings form the theme of it.

Contents.—As it now lies before us it consists of five parts. 1. The prologue, in prose, ch. i-ii., describes in rapid and dramatic steps the history of this man, his piety and prosperity and greatness corresponding to his godliness ; then how his life is drawn in under the opera- tion of the trying, sifting providence of God, through the suspicion suggested by the Satan, the minister of this aspect of God's providence, that his godliness is but selfish and only the natural return for the unexampled prosperity bestowed upon him, and the insinuation that if stripped of his prosperity he will renounce God to His face. These suspicions bring down two severe calamities on Job, one depriving him of all external blessings, children and possessions alike, and the other throwing the man himself under a loathsome and painful malady. In spite of these afflictions Job retains his integrity and

ascribes no wrong to God. Then the advent of Job's three friends is described, Eliphaz the Temanite, Bildad the Shuhite, and Zophar the Naamathite, who, having heard of Job's calamities, come to condole with him. 2. The body of the book, in poetry, ch. iii.xxxi., contains a series of speeches in which the problem of Job's afflictions and the relation of external evil to the righteousness of God and the conduct of men is brilliantly discussed. This part is divided into three cycles, each containing four speeches,

| one by Job and one by each of the friends (ch. iii.—xiv.;

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ch. xv.-xxi.; ch, xxii.~~xxxi.), although in the last cycle the third speaker Zophar fails to answer, and Job, having driven his opponents from the field, carries his reply through a series of discourses in which he dwells in pathetic words upon his early prosperity, contrasting with it his present misery and humiliation, and ends with a solemn repudiation of all the offences that had been insinuated or might be suggested against him, and a challenge to God to appear and put His hand to the charge which He had against him and for which He afflicted him. 3. A youthful bystander named Elihu, the representative of a younger generation, who had been a silent observer of the debate, intervenes and expresses his dissatisfaction with the manner in which both Job and his friends had conducted the cause, and offers what is in some respects a new solution of the question (ch. xxxii—xxxvii.). 4. In answer to Job's repeated demands that God would appear and solve the riddle of his life, the Lord answers Job out of the whirlwind. The Divine speaker does not condescend to refer to Job's individual problem, but in a series of ironical interrogations asks him, as he thinks himself capable of fathoming all things, to expound the mysteries of the origin and subsistence of the world, the phenomena of the atmosphere, the instincts of the creatures that inhabit the desert, and, as he judges God's conduct of the world amiss, invites him to seize the reins himself and gird him with the Divine thunder and quell the rebellious forces of evil in the universe (ch. xxxviii.—xlii. 6). Job is humbled and abashed,~~

~~and lays his hand upon his mouth, and repents his hasty words in dust and ashes. No solution of his problem is vouchsafed ; but God Himself effects that which neither the man's own thoughts of God nor the representa~~ tions of the friends could accomplish: he heard of Him with the hearing of the ear without effect, but now his eye saw Him. This is the profoundest religious deep in the book. 5. The epilogue, also in prose, ch. xlii. 7-17, describes Job's restoration to a prosperity double that of his former estate, his family felicity, and long life. Design.—With the exception of the episode of Elihu, the connexion of which with the original form of the poem may be doubtful, all these five parts are essential elements of the work as it came from the hand of the first author, although some parts of the second and fourth divisions may have been expanded by later writers. The idea of the composition is not to be derived from any single element of the book, as from the prologue, but from the teaching and movement of the whole piece. Job is unquestionably the hero of the work, and in the ideas which he expresses and the history which he passes through combined we may assume that we find the author himself speaking and teaching. The discussion of the question of suffering between Job and his friends occupies two-thirds of the book, or, if the space occupied by Elihu be not considered, nearly three-fourths, and in the direction which the author causes this discussion to take we may see revealed the main didactic purpose of the book. When the three friends, the representatives of former theories of providence, are reduced to silence and driven off the ground by Job, we niay be certain that it was the author's purpose to discredit the ideas which they a cn Job himself offers no positive contribution to the doctrine of evil ; his position is negative, and merely antagonistic to that of the friends. But this negative position victoriously maintained by him has the effect of clearing the ground, and the author himself supplies in the prologue the positive truth, when he com- municates the real explanation of his hero's calamities, and teaches that they were a trial of his righteousness. It was therefore the author's purpose in his work to widen men's views of the providence of God and set before them a new view of suffering. This may be considered the first great

object of the book. This purpose, however, was in all probability no mere theoretical one, but subordinate to some wider practical design. No Hebrew writer is merely a poet ora thinker. He is alwaysa teacher. He has men before him in their relations to God. And it is not usually men in their individual relations, but as members of the family of Israel, the people of God. It is consequently scarcely to be doubted that the book has a national scope. The author considered his new truth regarding the meaning of affliction as of national interest, and to be the truth needful for the heart of his people in their circumstances. But the teaching of the book is only half its contents. It contains also a history —deep and inexplicable affliction, a great moral struggle, and a victory. The author meant his new truth to inspire new conduct, new faith, and new hopes. In Job's sufferings, undeserved and inexplicable to him, yet capable of an explanation most consistent with the goodness and faithfulness of God, and casting honour upon his faithful servants; in his despair bordering on unbelief, at last overcome ; and in the happy issue of his afflictions—in all this Israel may see itself, and from the sight take courage, and forecast its own history. Job, however, is not to be considered Israel, the righteous servant of the Lord, under a feigned name; he is no mere parable (though such a view is found as early as the Talmud); he and his history have both elements of reality in them. It is these elements of reality common to him with Israel in affliction, common even to him with humanity as a whole, confined within the straitened limits set by its own ignorance, wounded to death by the mysterious sorrows of life, tortured by the uncertainty whether its cry finds an entrance into God's ear, alarmed and paralysed by the irreconcilable discrepancies which it seems to discover between its necessary thoughts of Him and its experience of Him in His providence, and faint with longing that it might come into His place, and behold Him, not girt with His majesty, but in human form, as one looketh upon his fellow, —it is these elements of truth that make the history of Job instructive to Israel in the times of affliction when it was set before them, and to men in all ages. It would probably be a mistake, however, to Imagine that the author con- sciously stepped outside the limits of his nation, and assumed a human position antagonistic to it. The chords he touches vibrate through all hunianity ; but this is because Israel is

the kernel of humanity, and because from Israel's heart the deepest music of mankind is heard, whether of pathos or of joy.

Two threads requiring to be followed, therefore, run through the book, —the one the diseussion of the problem of evil between Job and his friends, and the other the varying attitude of Job's mind towards heaven, the first being subordinate to the second. Both Job and his friends advance to the discussion of his sufferings and of the problem of evil, ignorant of the true cause of his calamities, — Job strong in his sense of innocence, and the friends armed with their theory of the righteousness of God, who giveth to every man aecording to his works. With fine psychological instinct the poet

lets Job altogether lose his self-eontrol first when his three friends, the men his fellows, came to visit him. His bereavements and the

_acute anguish of his malady he bore with a steady courage, and the

direct instigations to godlessness of the woman, his wife, he repelled with severity and resignation. But when men, his equals and the old associates of his happiness, eame to see him, and when he read in their looks and in their seven days' silence the depth of his own misery, his self-command deserted him, and he broke out into a cry of despair, eursing his day and erying for death (ch. iii.). Job had somewhat misinterpreted the demeanour of his friends. It was not all pity that it expressed. Along with their pity they had also brought their theology with them, and they trusted to heal Job's malady with this. Till a few days ago Job would have agreed with them on the sovereign virtuesof this remedy. But he had learned through a higher teaching, the events of God's providence, that it was no more a specific in his ease. His violent impatience, how- ever, under his afflietions and his covert attaeks upon the divine rectitude only served to confirm the view of his sufferings which their theory of evil had alrcady suggested to his friends. And thus

commences the high debate which continues through thirty chapters of the book.

The prineiple with which the three friends of Job came to the consideration of his i:istory was the prineiple that calamity is the result of evil-doing, as on the other hand prosperity is the reward of righteousness. Suffering is not an accident or a spontaneous growth of the soil; man is born unto trouble as the sparks fly upwards ; there is in human life a tendeney to do evil which draws down upon men the chastisement of heaven (ch. v. 6). The form in which the prineiple is enunciated by Eliphaz, from whom the other speakers take their cue, is this : where there is suffering there has been sin in the sufferer, not necessarily deadly sin, though where the suffering is great the sin must have been heinous. Not suffering in itself, but the cffect of it on the sufferer is what gives insight into his true character. Suffering is not always punitive ; it is far oftener disciplinary, designed to wean the good man from his sin. If he sees in his suffering the monition of God and turns from his evil, his future shall be rieh in peaee and happiness, and his latter estate more prosperous than his first. If he murmurs or resists, he can only perish under the multiplying chastisements which his impenitence will provoke. Now this principle of the friends is far fronr being a peculiar erotchet of theirs ; its truth is undeniable, though they erred in supposing it a principle that would cover the wide providence of God. The principle is the fundamental idea of moral government, the expression of the natural conscience, a principle common more or less to all peoples, though perhaps more prominent in the Semitic mind, because all religious ideas are more prominent and simple there,—not suggested to Israel first by the law, but found and adopted by the law, though it may be sharpened by it. It is the fundamental principle of prophecy no less than of the law, and, if possible, of the wisdom or philosophy of the Hebrews more than of either. Speculation among the Hebrews had a simpler task before it than it had in the West or in the further Kast. The Greek philosopher began his operations upon the sum of things ; he threw the universe into his erueible at once. His object was to effect some analysis of it, such an analysis that he could call one element cause and another effect. Or, to vary the figure, his endeavour was to pursue the streams

of tendency which he could observe upwards til] he reached at last the central spring which sent them all forth. God, a single eausc and explanation, was the object of his search. But to the Hebrew this was already found. The aualysis resulting in the dis- tinetion of God and the world had been effeeted for him long-ago, so long that the history and circumstances of the process had been forgotten, and only the unchallengeable result remained. His philosophy was not a quest of God whom he did not know, but a

reeognition on all hands of God whom he knew. The great primary »

idea to his mind was that of God, a Being wholly just, doing all. And the world was little more than the phenomena that revealed the mind and the presence and the operations of God. Consequently the nature of God as known to him and the course of events formed a perfect equation. The idea of what God was in Himself was in complete harmony with His manifestation of Himself in providence, in the events of human life, and the history of men and nations. The philosophy of the wise did not go behind the origin of sin, or referred it to the freedom of man; but, sin cxisting, and God being in immediate personal contact with the world, every event was a dircet expression of His moral will and energy; calamity fell on wiekedness, and success attended right-doing. This view of the moral harmony between the nature of God and the events of provi- dence in the fortunes of men and nations is the view of the Hebrew wisdom in its oldest form, during what might be called the period of prineiples, to which belong Prov. x. sg.; and this is the posi- tion maintained by Job's three friends. And the significance of the book of Job in the history of revelation arises from this that it marks the point when such a view was definitively overeome, closing the long period when this principle was merely subjected to ques- tionings, and makes a new positive addition to the doctrine of evil.

Job agreed with the friends that afflictions came directly from the hand of God, and also that God afflicted those whom He held guilty ofsins. But his conscience denied the imputation of guilt, whether insinuated by his friends or implied in God's chastisement of him. Hence he was

driven to conclude that God was unjust, that He sought occasions against him, and perverted hisright. The position of Job appeared to his friends nothing else but impiety, as it came very near being ; while theirs was to him merc falsehood and the

special pleading of sycophants in behalf of God bevause He was the'

Stronger. Within these two iron walls the debate moves, making little progress, but with much brilliancy, if not of argument, of illustration. A certain advance indeed is perceptible. In the first series of speeches, ch. iv.—xiv., the key-note of which is struek by Eliphaz, the oldest and most considerate of the three, the position is that affliction is caused by sin, and is chastisement designed for the sinner's good ; and the moral is that Job should reeognize it and use it for the purpose for which it was sent. In the second, ch. xv.-xxi., the other side of the picture is held up, the terrible fate of the sinner, and those brilliant pictures of a restored future,

thrown in by all the speakers in the first series, are absent. Job's demeanour under the consolations offered him afforded little hope of his repentanee. In the third series, ch. xxii. sg., the friends cast off all disguise, and openly charge Job with a course of evil life. That their armoury was now exhausted is shown by the brevity of the second speaker, and the failure of the third to answer in any form. In reply Job disdains for a time to touch what he well knew lay under all their exhortations; he laments with touching pathos the defection of his friends on whom he counted, who were like the winter torrents looked for in vain by the perishing caravan in the summer heat ; he moets with bitter scorn their constant cry that God will not cast off the righteous man, by asking—How one can be righteous with God? what can human weakness, however inno- cent, do against infinite might and subtlety? they are righteous whom an omnipotent and perverse will thinks fit to consider so; he falls into a hopeless wail over the universal misery of man, who has a weary campaign of life appointed him ; then, rising up in the strength of his conseience, he upbraids the Almighty with His mis- use of His power and His indiscriminate tyranny,—

righteous and innocent He destroys alike—and challenges Him to lay aside His majesty and meet His creature as a man, and then he would not fear Him. Even in the second series Job can hardly bring himself to face the personal issue raised by the friends. His rclations to God absorb him alinost wholly,—his pitiable isolation, the indignities showered on his once honoured head, the loathsome spectacle of his body ; and, abandoned by all, he turns for pity from God to men and from men to God. Only in the third series of debates does he put out his hand and grasp firmly the theory of his friends, and their " defences of mud" fall to dust in his hands. Instead of that roseate moral order which they are never weary insisting upon, he finds only disorder and moral confusion. When he thinks of it, trembling takes hold of him. It is not the righteous but the wicked that live, grow old, yea wax mighty in strength, that send forth their children like a floek and establish them in their sight. Before the logie of facets the theory of the friends goes down ; and with this negative result, which the author skilfully reaches through the debate, has to be combined his own positive doctrine of the uses of adversity advanced in the prologue.

To a reader of the poem now it appears strange that both parties were so entangled in the meshes of their preconceptions regarding God as to be unable to break through to broader views. The friends, while maintaining their position that injustice on the part of God is ineonceivable, might have given its due weight to the per- sistent testimony of Job's conscience as that behind whieh it is impossible to go, and found refuge in the reflexion that there might be something inexplicable in the ways of God, and that affliction might have some other meaning than to punish the sinner or even to wean him from his sin. And Job, while maintaining his inno- cence from overt sins, might have bowed beneath the rod of God and confessed that there was such sinfulness in every humau life as to account for the severest chastisement from heaven, or at least have stopped short of charging God foolishly. Such a position would certainly be taken up by an afflicted saint now, and sueh an explanation of his sufferings would suggest itself to the sufferer, even though it might be in truth a false explanation. Perhaps here, where an artistic fault might seem to be committed, the art of the writer, or what is the same thing his truth to

nature, and the extraordinary freedom with which he moves among his materials, as well as the power and individuality of his dramatie ereations, are most remarkable. It was the réle which the author reserved for himself to teach the truth on the question in dispute, and he aceom- plishes this by allowing his performers to push their false prineiples to their proper extreme. There is nothing about which men are usually so sure as about God. They are ever ready to take Him in their own hand, to interpret His providence in their own sense, to say what things are consistent or not with His character and word, and beat down the opposing eonsciences of other men, by His so-called authority, which is nothing but theirown. The friends of Job were religious Orientals, men to whom God was a Being in im- mediate contact with the world and life, effeeting all things with no intervention of second causes, men to whom the idea of second causes was unknown, on whom science had not yet begun to dawn, nor the conception of a divine scheme pursuing a distant end by com- plieated means, in which the individual's interest may suffer for the larger good. The broad sympathics of the author and his sense of the truth lying in the theory of the friends are seen in the seope which he allows them, in the richness of the thought and the splendid luxurianee of the imagery—drawn from revelation, the immemorial moral eonsent of mankind, the testimony of the living conscience, and the observation of life—-with whieh he makes then clothe their views. He felt it needful to make a departure from a position too narrow to confine the providence of God within, but he remembered the elements of truth in the theory which he was departing from, that it was a national heritage, which he himself perhaps had been eonstrained not without a struggle to abandon ; and, while showing its insufficiency, he sets it forth in its most brilliant form.

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Then, in regard to the position maintained by Job,—the extrava- gance of his assertions was occasioned greatly by the extreme position of his friends, which left no room for his conscious innocence along with the rectitude of God. Again, the poet's purpose, as the prologue shows, was to teach that afflictions may fall on a man out of all connexion with any offence of his own, and merely as the trial of his righteousness ; and

hence he allows Job, as by a true in- stinct of the nature of his sufferings, to repudiate all connexion between them and sin in himself. And further, the terrible conflict into which the suspicions of the Satan brought Job could not be exhibited without pushing him to the verge of ungodliness. These are all elements of the poet's art; but art and nature are one. Under the Old Covenant the sense of sin was less dcep than it is now. In the desert, too, men speak boldly of God. Such a creation as Job would be an anomaly in Christianity. But nothing is more false than to judge the poet's creation from our later point of view, and construct a theory of the book according to a more developed sense of sin and a deeper reverence of God tlian belonged to antiquity. In complete contradiction to the testimony of the book itself, some theorists, as Hengstenberg, have assumed that Job's spiritual pride was just the cause of his afflictions, that this was the root of bitterness in him which must be killed down ere he could become a true saint. The fundanicntal position of the book is that Job was already a true saint ; this is testified by God Himself, is the radical idea of the author in the prologue, and the very hypotliesis of the drama. We might be ready to think that Job's afflictions did not befall him out of all connexion with his own condition of mind, and we might be disposed to find a vindication of God's ways in this. There is no evidence that such an idea was shared by the author of the book. The interpretation of Job has suffered not a little from the righteousness overmuch of its expounders. The writer did not consider that God's ways needed this vindication. The confession of sin which he puts into Job's mouth had reference exclusively to his demeanour under his afflictions. This demeanour may be evidence of the imperfection of his previous religious state. It is evidence of this, of which, however, no evidencc was needed, for Job does not claim to be nor is he supposed sinless, but it is no evidence that this imperfection was the cause of his afflictions. These were the trial of his faith, which, maintaining itself in spite of them, and becoming stronger through them, was rewarded with a higher felicity. It is remarkable that the attitude which we imagine it would have been so easy for Job to assume, viz., while holding fast his integrity, to fall back upon the inexplicablencss of Providence, of which there are such imposing descriptions in his speeches, is just the attitude which he takes

up in ch, xxviii. It is far from certain, however, that this chapter is an integral part of the original book.

The other linc running through the book, the varying attitude of Job's mind towards heaven, exhibits dramatie action and tragic intcrest of the highest kind, though the movement isinternal. That the exhibition of this struggle in Job's mind was a main point in the author's purpose is seen from the fact that at the end of each of his great trials he notes that Job sinned not, nor ascribed wrong to God (ch. i. 22; ii. 10), and from the effect which the divine voice from the whirlwind is made to produce upon him (ch. xl. 3). In the first cycle of debate (ch. iv.—xiv.), Job's mind reaches the deepest limit of estrangement. There he not merely charges God with injustice, but, unable to reconcile His former goodness with His present enmity, he regards the latter as the true expression of the divine mind towards His creatures, and the former, comprising all His infinite creative skill in weaving the delicate organism of human nature and the rich endowments of His providence, but as the means towards exercising His mad and immoral cruelty in the time to come. When the Semitic skin of Job is scratched, we find a modern pessimist beneath. Others in later days have brought the keen sensibility of the human frame and the torture which it endures together, and asked with Job to whom at last all this has to be referred. Towards the end of the cycle a star of heavenly light seems to rise on the horizon ; the thought scizes the sufferer's mind that man might have anothcr life, that God's anger pursuing him to the grave might be sated, and that He might call him out of it to Himself again (ch. xiv. 13). This idea of a resurrection, unfamiliar to Job at first, is one which he is allowed to reach out of the necessities of the moral complications around him, but from the author's manner of using the idea we may judge that it was not unfamiliar to himself. In the second cycle the thought of a future reconciliation with God (for of course he regarded his afflictions as evidence of God's anger) is more firmly grasped. That satisfaction or at least composure which, when we observe calamities that we cannot morally account for, we reach by reflecting that providence is a great scheme moving according to general laws, and that it does not always truly reflect the relation of God to the individual, Job reached in the only way possible to a Semitic mind. He

drew a distinction between God and God, between an outer God whom events obcy, pursuing him in His anger, and an inner God whose heart was with him, who was conscious of his innocence; and he appeals from God to God, and beseeches God to pledge Himself that

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he shall receive justice from God (ch. xvi. 19; xvii. 8). And so high at last does this consciousness that God is at one with him rise that he avows his assurance that He will yet appear to do him justice before men, and that he shallsee Him with his own eyes, no more estranged but on his side, and for this moment he faints with longing (ch. xix. 25 sq.).1 Roo,

After this expression of faith Job's mind remains' calm, though he ends by firmly charging God with perverting his right, and demanding to know the eause of his afflictions (ech. xxvii. 2 sq.; xxxi. 35, where render, Oh, that I had the indietment which mine adversary lias written). In answer to this demand the Divine voice answers Job out of the tempest— Who is this that darkeneth counsel by words without knowledge? The word "counsel" intimates to Job that God does not act without a design, large and beyond the comprehension of man; and to impress this is the purpose of the Divine speeches. The speaker does not enter into Job's particular cause ; there is not a word tending to unravel his riddle ; his mind is drawn away to the wisdom and majesty of God Himself. His own words and those of his friends are but re-echoed, but it is God Him- self who now utters them. Job is in immediate nearness to the majesty of heaven, wise, unfathomable, ironical over the littleness of man, and he is abascd ; God Himself cffects what neither the man's own thoughts of God nor the representations of his friends could accomplish, though by the same means. The religious insight of the writer sounds here the profoundest deeps of truth.

Integrity.—Doubts whether particular portions of the present book belonged to the original form of it have been raised by many. Half a century ago De Wette expressed himself as follows: "It appears to us that the present book of Job has not all flowed from one pen. As many

books of the Old Testament have been several times written over, so has this also" (Ersch and Gruber, Zncyh., sect. ii., vol. viii.). The judgment formed by De Wette has been adhered to more or less by most of those who have studied the book. Questions regarding the unity of such books as this are difficult to settle ; there is not unanimity among scholars regarding the idea of the book, and con- sequently they differ as to what parts are in harmony or conflict with unity; and it is dangerous to apply modern ideas of literary composition and artistic unity to the works

1 This remarkable passage reads thus: " But I know that my re- deemer liveth, and afterwards he shall arise upon the dust, and after my skin, even this body ts destroyed, without my flesh shall I see God ; whom I shall see for myself, and mine eyes shall behold, and not as a stranger; my reins within me are consumed with longing." The redeemer who liveth and shall arise or stand upon the earth is God whom he shall see with his own eyes, on his side. The course of exegesis was grcatly influenced by the translation of Jerome who, departing from the Itala, rendered: " In novissimo die de terra sur- recturus sum… et rursum circumdabor pelle mea et in carne mea yidebo deum meum." The only point now in question is whether— (a) Job looks for this manifestation of God to him while he is still alive, or (6) after death, and therefore in the sense of a spiritual vision and union with God in another life ; that is, whether the words '*destroyed" and " without my flesh"' are to be taken relatively only, of the extremest effects of his disease upon him, or literally, of the separation of the bodyin death. A third view which assumes that the words rendered " without my flesh," which run literally, " out of my flesh," mean looking out from my flesh, that is, clothed with a new body, and finds the idca of resurrection repeated, perhaps imports more into the language than it will fairly bear. In favour of (6) may be adduced the persistent refusal of Job throughout to entertain the idea of a restoration in this life; the word " afterwards"; and perhaps the analogy of other passages where the same situation appears, as Ps. xlix. and Ixxiii., although the actual dénouement of the tragedy sup- ports (a). The difference between the two senses is not important, when the Old Testament view of immortality is considered. To the Hebrew the life beyond was not what

it is to us, a freedom from sin and sorrow and admission to an immediate divine fellowship not attainable here. ‘To him the life beyond was at best a prolongation of the life here ; all he desired was that his fellowship with God here should not be interrupted in death, and that Sheol, the place into which deceased persons descended and remained, cut off from all life with God, might be overleapt. On this account the theory of Ewald, which throws the centre of gravity of the book into this passage in ch. xix., considering its purpose to be to teach that the riddles of this life shall be solved and its inequalities corrected in a future life, appears one-sided. The point of the passage does not lie in any distinction which it draws between this life and a future life ; it lies in the assur- ance which Job expresses that God, who even now knows his innocence, will vindicate it in the future, and that, though estranged now, He will at last take him to His heart.

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The problem raised in the | that accompany his own discomfiture.

of antiquity and of the Fast. book of Job has certainly received frequent treatment in the Old Testament; and there is no likelihood that all efforts in this direction have been preserved to us. It is probable that the book of Job was buta great effort amidst or after many smaller. It is scarcely to be supposed that one with such poetic and literary power as the author of chap. lil—xxxi, xxxvili.-xli. would embody the work of any other writer in his own. If there be elements in the book which must be pronounced foreign, they have been inserted in the work of the author by a later hand. It is not unlikely either in itself or when the history of other books is considered that our present book may, in addition to the great work of the original author, contain some fragments of the thoughts of other religious minds upon the same question, and that these, instead of being loosely appended, have been fitted into the mechanism of the first work. Some of these fragments may have originated at first quite independently of our book, while others may be expansions and insertions that never existed separately. At the same time it is scarcely safe to throw out any portion of the book merely because it seems to us out of harmony with the unity of the main

part of the poem, or unless several distinct lines of consideration conspire to point it out as an extraneous element.

The arguments that have been used against the originality of the prologue—as, that it is written in prose, that the name Jehovah appears in it, that sacrifice is referred to, and that there are inconsistencies between it and the body of the book—are of little weight. There must have been some introduction to the poem explaining the circumstances of Job, otherwise the poetical dispute would have been unintelligible, for it is improbable that the story of Job was so familiar that a poem in which he and his friends figured as they do here would have been understood. And there is no trace of any other prologue or introduction having ever existed. The prologue, too, is an essential element of the work, containing the author's positive contribution to the doctrine of suffering, for which the discussion in the poem prepares the way. The intermix- ture of prose and poetry is common in Oriental works containing similar discussions; the reference to sacrifice is to primitive not to Mosaic sacrifice ; and the author, while using the name Jehovah freely hiniself, puts the patriarchal Divine names into the month of Joband his friends because they belonged to the patriarchal age and to a country outside of Israel. That the observance of this rule had a certain awkwardness for the writer perhaps appears from his allowing the name Jehovah to slip in once or twice (xii. 9, comp. xxviii. 28) in familiar phrases in the body of the poem. The discrepancies, such as Job's references to his children as still alive (xix. 17, the interpretation is doubtful), and to his servants, are trivial, and even if real imply nothing in a book admittedly poetical and not history. The objections to the epilogue are equally unimportant,—as that the Satan is not mentioned in it, and that Job's restoration is in conflict with the idea of the poem that earthly felicity does not follow righteousness, and undoes its teaching. The epilogue confirms the teaching of the poem when it gives the Divine sanction to Job's doctrine regarding God in opposition to that of the friends (xlii. 7). And it is certainly not the intention of the poem to teach that earthly felicity does not follow righteousness, but to correct the exclusiveness with which the friends of Job maintained that principle. The Satan is introduced in the prologue, exercising his function as minister of God in heaven; but it is to misinterpret the

doctrine of evil in the Old Testament wholly to assign to the Satan any such personal importance or independence of power as that he Should be called before the curtain to receive the hisses

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The Satan, though he here appears with the beginnings of a malevolent will of his own, is but the instrument of the trying, sifting provideuce of God. His work was to try; that done he disappears, his personality being too slightly important to have any place in the result.

Much graver are the suspicions that attach to the speeches of Elihu. It is the opinion of most of those who have studied the book carefully that this part does not belong to the original cast of it, but has been introduced at a considerably later time. The piece is one of the most interesting parts of the book; both the person and the thoughts of Elihu are marked by a strong individuality. This individuality has indeed been very diversely estimated. The ancients for the most part passed a very severe judg- ment on Elihu: he is a buffoon, or a boastful youth whose shallow intermeddling is only to be explained by thie fewness of his years, the incarnation of folly, or even the Satan himself gone a-mumming. Some moderns on the other hand have regarded him as the incarnation of the voice of God oreven of God Himself. The main objections that may be urged against the connexion of the episode of Elihu with the original book are—that the prologue and epilogue know nothing of him; that on the cause of Job's afflictions he occupies virtually the same position as the friends ; that his speeches destroy the dramatic effect of the Divine manifestation by introducing a lengthened break between Job's challenge and the answer of God; that the language and style of the piece are marked by an excessive mannerism, too great to have been created by the author of the rest of the poem, even when introducing an interlocutor out of the ranks of the bystanders, and of another race ; that the allusions to the rest of the book are so minute as to betray a reader rather than a hearer ; and that the views regarding sin, and especially the scandal given to the author by the irreverence of Job, indicate a religious advance which marks a later age. The position taken by Elihu is almost that of a critic

of the book. Regarding the origin of afflictions he is at one with the friends, although he dwells more on the general sinfulness of man than on actual sins, and his reprobation of Job's position is even greater than theirs. His anger was kindled against Job because he made himself righteous before God, and against his friends because they found no answer so as to condemn Job. His whole object is to refute Job's charge of injustice against heaven. What is novel in Elihu, there- fore, is not his position but entirely his arguments. These do not lack cogency, but betray a kind of thought different from that of the friends. Injustice in God, he argues, can only arise from selfishness in Him; but the very existence of creation implies unselfish love on God's part, for if He thought only of Himself, He would cease actively to uphold creation, and it would fall into death. Again, without justice mere earthly rule is impossible ; how then is injustice conceivable in Him who rules over all? It is probable that the original author found his three interlocutors a sufficient medium for expressing all that he desired to say, and that this new speaker is the creation of another. To a devout and thoughtful reader of the original book, belonging perhaps to a more reverential age, it appeared that the language and bearing of Job had scarcely been sufficiently reprobated by the original speakers, and that the religious reason, apart from any theophany, could suggest arguments sufficient to condemn such demeanour on the part of any man.

It is more difficult to come to a decision in regard to some other portions of the book, particularly ch. xxvii. 7-xxvili. In the latter part of ch. xxvii. Job seems to go over to the camp of his opponents, and expresses sentiments in complete contradiction to his former vicws. Hence

some have thought the passage to be the missing speech of Zophar. Others, as Hitzig, believe that Job is parodying the ideas of the friends; while others, like Ewald, consider that he is offering a recantation of his former excesses, and making such a modification as to express correctly his views on evil. None of these opinions is quite satisfactory, though the last probably expresses the view with which the passage was

introduced, whether it be original or not. The meaning of ch. xxviii. can only be that " Wisdom," that is, a theoretical comprehension of providence, is unattainable by man, whose only wisdom is the fear of the Lord or practical piety. But to bring Job to the feeling of this truth was just the purpose of the theophany and the Divine speeches ; and, if Job reached it already through his own reflexion, the theophany becomes an irrelevancy. It is difficult, therefore, to find a place for these two chapters in the original work. The hymn on Wisdom is a most exquisite poem, which probably originated separately, and was brought into our book with a purpose similar to that which suggested the speeches of Elihu. Objections have also been raised to the descriptions of leviathan and behemoth (ch. xl. 15-xli). Regarding these it may be enough to say that in meaning these passages are in perfect harmony with other parts of the Divine words, although there is a breadth and detail in the style unlike the sharp, short, ironical touches, otherwise characteristic of this part of the poem.

Date.—The age of such a book as Job, dealing only with principles and having no direct references to historical events, can be fixed only approximately. Any conclusion can be reached only by an induction founded on matters which do not afford perfect certainty, such as the compara- tive development of certain moral ideas in different ages, the pressing claims of certain problems for solution at particular epochs of the history of Israel, and points of contact with other writings of which the age may with some certainty be determined. It may be said without doubt that the book belongs to the period between David and the return from exile. The Jewish tradition that the book is Mosaic, or the other idea that it is a production of the desert, written in another tongue and translated into Hebrew, wants even a shadow of probability. The book is a genuine outcome of the religious life and thought of Israel, the product of a religious knowledge and experience that was possible among no other people. That the author lays the scene of the poem outside his own nation and in the patriarchal age is a proceeding common to him with other dramatic writers, who find freer play for their principles in a region removed from the present, where they are not hampered by the obtrusive forms of actual life, but free to mould occurrences into the moral form that their ideas require.

It is the opinion of many scholars, e.g., Delitzsch, that the book belongs to the age of Solomon. It cannot be earlier than this age, for Job (ch. vii. 17) travesties the ideas of Ps. villi. ina manner which shows that this hymn was well known. Undoubtedly many of the means and conditions necessary for its production existed in this age. It is a creation of that direction of thought known as the Wisdom, a splendid efflorescence of which distinguished this time, unless history and tradition alike are to be altogether discredited. The cosmopolitanism of Solomon's reign, and the close relations into which Israel then entered with Egypt, the further East, and even the West, may seem reflected in the poem, the author of which had seen many lands and strange peoples, and draws his illustrations from many distant sources. When, however, we compare Job with the literature of the Wisdom, presumably of the Solomonic age and even later, the difference is found to be extreme. Job is not only a creation of the Wisdom; it is its highest creation. The literature of the Wisdom falls

into three periods:—the period of principles, referred to above, to which belongs the book of Proverbs; the period of problems, illustrated by such compositions as Ps. xxxvil., xlix., lxxili., and others; and the period of exhaustion, where a solution of the problems was scarcely sought, and only a modus vivendi in the face of them, through a practical prudence, was aimed at, to which belongs Ecclesiastes. Job has no affinity with the last-named period. But it is almost equally impossible that it can belong to the first. The point of view of this period on the question of evil is that represented by Job's friends, a point of view from which our book signalizes a final departure. On the other hand, the spirit of Job is that which breathes in the psalms referred to and in many other fragments of the Scriptures of the prophetic age. Such problems as burn in the pages of Job—the miseries of the just, and the felicity of the ungodly—were not likely to force themselves on men's attention in the Solomonic age. In the settled, well-ordered life of Israel in this happy time, the general principles of moral well-being were receiving their most splendid illustration. Only later, when the state began to receive fatal blows from without, and when

through revolution and civil discord at home great and unmerited sufferings befell the best citizens in the state, would such problems rise with an urgency that demanded some solution. In some of the psalms which treat of these questions, the "ungadly " oppressor, whose felicity occasions disquietude to the religious mind, is probably the heathen conqueror. But these shorter pieces in all likelihood preceded in time the elaborate treatment to which such problems are sub jected in Job, It is doubtful if there is a trace of such questions in Proverbs, which, however, did not receive its final form till the age of Hezekiah. In one direction the Wisdom receives a higher development in Prov. viii. than it does in Job, but that despair of the attainment by man of any theoretical wisdom at all, which is the burden of Job xxviii, is unheard of even in Prov. i-ix., which certainly dates from a time long posterior to the Solomonic age. The book of Job pfobably has behind it some public calamity which forced the question of evil on men's minds with an urgency that could not be resisted. Such a calamity, wide and national, could be nothing less than the dismemberment or subjugation of the state. The question may be difficult to settle whether it was a misfortune befalling the northern kingdom or that of the south. We gain no help here from the book itself, for the author of Job is an Israelite indeed, who belongs to none of its divisions. Somewhere in the troubled period between the early part of the 7th and the early part of the 5th century the poem may have been written. Ewald and many distinguished writers on the book support the earlier date, while on the part of living scholars there is rather a growing feeling that the book is later than some of the prophecies of Jeremiah. .

This question has to be settled largely by a comparison of literary coincidences and allusions. This is a very delicate operation. For, first, owing to the unity of thought and language which pervades Scripture, in which, regarding it for 2 moment merely as a national literature, it differs from all other national literatures, we are apt to be deceived, and to take mere similarities for literary allusions and quota- tions; and, secondly, even when we are sure that there is dependence, it is often uncommonly difficult to decide which is the original source. The reference to Job in Ezek. xiv. 14 may not be to our book, but to the man who was afterwards made the hero of it. The affinities between Job and

Isa. xl.-Ixvi. are very close. The date of this part of Isaiah is uncertain, but it cannot have received its final form, if it be composite, long before the return. Its affinity with Job is not only literary; the problem is the

same, the meaning of the afflictions of the "servant" of the Lord. "My servant Job" may not be the same as 'my righteous servant" of Isaiah, but there is no doubt national allusion in Job. The solution of the problem differs in the two. In Job sufferings are a trial of faith, which, successfully borne, issues in restoration. In Isaiah they are vicarious, borne by one element in the nation in behalf of the whole, and issuing in the national redemption. Two such solutions can scarcely be entirely contemporane- ous. That of Isaiah is the profounder truth and may be the later, though certainty on such a point is of less con- sequence than the reflexion both solutions force upon us that this is the period in Israel's history at which the profoundest depths of religious thought were sounded. Between Job iii. and Jer. xx. 14 sg. there is certainly Siterary connexion. The judgment of different minds differs on the question which passage is dependent on the other. The language of Jeremiah has a natural pathos and genuineness of feeling in it, somewhat in contrast with the elaborate poetical finish of Job's words, which might suggest the originality of the former; and there is a growing feeling among many in favour of this view. At the saine time a good deal remains yet to be said on both sides.

The book of Job is not literal history, though it reposes onan historical tradition. To this tradition belong probably the name of Job and his country, and the names of his three friends, aud perhaps also many other details impossible to specify particularly. The view that the book is entirely a literary creation with no basis in historical tradition is as old as the Talmud, in which a rabbi is cited who says, Job was not, and was not created, but isan allegory. And this view has still supporters, e.g., Hengstenberg. Pure poetical creations on so extensive a scale are not probable in the Hast and at so early an age.

Author.—The author of the book is wholly unknown.

No literature has so many great anonymous works as that of Israel. The religious life of this people was at certain periods very intense, and at those times the spiritual energy of the nation expressed itself almost impersonally, through men who forgot themselves and were speedily forgotten in name by others. Hitzig conjectures that the author was a native of the north on account of the free criticism of providence which he allows himself. Others, on account of some affinities with the prophet Amos, infer that he belonged to the south of Judah, and this is supposed to account for his intimate acquaintance with the desert. Ewald considers that he belonged to the exile in Egypt, on account of his minute acquaintance with that country. But all these conjectures localize an author whose knowledge was not confined to any locality, who was a true child of the East and familiar with life and nature in every country there, who was at the same time a true Israelite and felt that the earth was the Lord's and the fulness thereof, and whose sympathies and thought took in all God's works, _ Literature.—The literature of the book will be found fully given in Delitzsch's commentary, or in Lange's Bibelwerk. A few more recent essays may be mentioned bearing on the criticism and the problem of the book: Hoekstra, 'Job, de Knecht van Jehovah," In the Theolog. Tijds., 1871, and in reply, Kuenen, "Job en de leidende Knecht van Jahveh," ibid., 1873; Studer, " Ueber die Integritit des Buches Hiob," in the Jahrb. fiir Prot. Theologie, 1875, and Das Buch Hiob fir gebildete Laien, Bremen, 1881; Budde, Beitrige zur Kritik des B. Hiob, Bonn, 1876, with the review of Smend, Stud. u. Krit., 1878; Cheyne, "Job and the second part of Isaiah," Isaiah, ii. p. 235 sq. (A. B. D.)

JOBS TEARS. The seeds, or properly fruits of Job's tears, Covx lachryma, Willd., a species of grass, are con- tained singly in a stony involucre or bract, which does not open until the enclosed seed germinates. The young involucre surrounds the female flower and the stalk support-

ing the spike of male flowers, and when ripe has the appearance of bluish white porcelain. Being shaped somewhat like a large drop of

fluid, the form has sug- gested the name Job's tears, or Lachryma Jobt, under which the plant has been long known. The seeds are esculent, but the involucres are the part chiefly used, for making necklaces and other ornaments. The plant is a native of the East Indies, and was cultivated by Gerard as a tender annual.

JODHPUR, also called MArwAkR, a native state in Raj- putana, India, situated between 24° 36' and 27° 42' N. lat., aud between 70° 6' and 75° 24' E. long. It is bounded on the N. by Bikaner and Jeypore states, on the E. by Jeypore and Kishangarh, on the S. by Sirohi and Palanpur states, and on the W. by the Rann of Kachchh (Runn of Cutch) and the British district of Thar and Parkar in Sind. The general aspect of the country is that of a sandy plain, divided into two unequal parts by the river Luni, and dotted with bold and picturesque conical hills, attain- ing in places an elevation rising to 3000 feet. The river Luni is the principal feature in the physical aspects of Jodhpur. It takes its rise in the sacred lake of Pushkar in Ajmere, and flows through Jodhpur in a soutli-westerly direction till it is finally lost in the marshy ground at the head of the Runn of Cutch. It is fed by numerous tributaries and occasionally overflows its banks, fine crops of wheat and barley being grown on the saturated soil. Its water is, as a rule, saline or brackish, but comparatively sweet water is obtained from wells sunk at a distance of 20 or 30 yards from the river bank. The famous salt-lake of Sambhar is situated on the borders of Jodhpur and Jeypore, and two smaller lakes of the same description lie within the limits of the district, from which large quantities of salt are annually extracted. Zinc is also obtained in considerable quantities, and marble is mined in the north of the state, and along the south-east border.

The population consists of Rahtor Rajputs (who form the ruling class), Charans, Bhats, Jats, Bishnawis, Minas, Bhils, and Bauris, with a small proportion of Mahometans. The Charans, a sacred race, hold large religious grants of land, and enjoy peculiar immunities as traders in local produce. The Bhats are by profession genealogists, but also engage in trade. The Minas, Bauris, and Rhils are predatory classes, but are employed in menial capacities. The Mahometans are principally soldiers. The natives, as a race, are enterprising and

industrious, but the agricultural classes have to undergo great privations from poor food, and often bad water. Marwari traders are to be found throughout the length and breadth of the peninsula. No census of the population has ever been taken, but it has roughly been estimated at about 2,850,000, of whom 86 per cent. are said to be Hindus, 10 per cent. Jains, and 4 per cent. Mahometans.

The principal crops are pulses and millets, but wheat and barley are largely produced in the fertile tract watered by the Luni river. The manufactures comprise leather boxes and brass utensils; and turbans and searfs and a description of embroidered silk knottcd thread are specialities of the country. A large proportion of the population can read and write Hindi, including most ladies of good. birth, which is believed to be peculiar to this state. Jodhpur town contains two good schools, one for the sons of chiefs and the higher classes, and the other for the children of tradespeople downwards. Every large village also hasa school of its own, in whieh the verna- cular is taught.

The maharaja belongs to the Rahtor clan of Rajputs. _ The local historians relate that aftcr the downfall of the Rahtor dynasty of Kanauj in 1194 at Sivaji, the grandson of Jéi Chand, the last king of Kanauj, entered Marwdr on a pilgrimage to Dwarka, and on halting at the town of Péli he and his followers settled there to protect the Brahman community from the constant raids of marauding bands. The Rahtor chief thus laid the foundation of the state, but it was not till the time of Rao Chanda, the tenth in succession from Sivaji, that Marwér was actually conquered. His grandson Jodha founded the city of Jodhpur, which he made his

capital. In 1561 the country was invaded by Akbar, and the chicf was forced to submit, and to send his son as a ark of homage to take service under the Mughal emperor. When this sou Udai Sinh succeeded to the chiefship, he gave his sister Jodlibai in marriage to Akbar, and was rewarded by the restoration of most of his former possessions. UdaiSinh's son, Raja Geve Sinh, held high service under Akbar, and conducted successful expeditions in Guz- erat and the Deccan. 'The

bigoted and intolerant Aurangzeb in- vaded Marwar in 1679, plundered Jodhpur, sacked all the large towns, and commanded the conversion of the Rahtors to Mahomet- anism. 'This cemented all the Rajput clans into a bond of union, anda triple alliance was formed by the three states of Jodhpur, Udaipur, and Jeypore, to throw off the Mahometan joke. One of the conditions of this alliance was that the chiefs of Jodhpur and Jeypore should regain the privilege of marriage with the Udaipur family, which they had forfeited by contracting alliances with the Mughal emperors, on the understanding that the offspring of Udaipur princesses should succeed to the state in preference to all other children. The quarrels arising from this stipulation lasted through many generations, and led to the invitation of Marhatta help from the rival aspirants to power, and finally to the subjection of all the Rajput states to the Marhattas. Jodhpur was conquered by Sindhia, who levied from it a tribute of £60,000, and took from it the fort and town of Ajmere. Interne- cine disputes and succession wars disturbed the peace of the early years of the century, until in January 1818 Jodhpur was taken under British protection. In 1839 the misgovernment of the raja led to an insurrection which compelled the interference of the Pritish, and Jodhpur was held in military occupation for five months, uutil the raja entered into engagements for the future good government of his subjects. In 1848 the chief having died with- out a son, and without having adopted an heir, the nobles and state officials were left to select a successor from the nearest of kin. Their choice fell upon Raja Takht Sinh, chief of Ahmadnagar. This chief, who did good service during the mutiny, died in 1873. The constitution of Jodhpur may be described as a tribal suzerainty rapidly passing into the feudal stage. The paétadé or tribal chief is the ruler of his estate, and the judge almost exclusively in all matters of civil and criminal jurisdiction over his people. These chiefs owe military service to their suzerain, and exact the same from their dependants, to whom assignments of land have been made, and who form their following—the whole constitut- ing the following of the suzerain himself. The maharaja alone has the power of life and death. The revenue of the state is mainly derived from the land, salt, and customs duties, a cess imposed on the feudatory nobles, succession dues, &c., estimated at a total of about £250,000 a year. The state pays

a tribute to the British of £9800 a year, besides an annual payment of £11,500 for the support of a contingent—the Erinpura Irregular Force. The maharaja also maintains an independent military force of 20 field and 250 other guns, 200 gunners, 3545 cavalry, and 5020 infantry.

JODHPUR, the capital of the above state, in 26° 17’ N. lat. and 73° 4’ E. long., was built by Réo Jodha in 1549, and from that time has been the seat of government of the principality. It is surrounded by a strong wall nearly 6 miles in extent, with seventy gates. The fort stands on an isolated rock, and contains the mahdaraja’s palace, a large and handsome building, completely covering the crest of the hill on which it stands, and overlooking the city, which lies several hundred feet below. The city contains niany handsome buildings—palaces of the mahdrdja4, and town residences of the ¢thékurs or nobles, besides numerous fine temples and tanks. Building stone is plentiful, and close at hand, and the architecture solid and handsome. Three miles north from Jodhpur are the ruins of Mandor, the site of the ancient capital of the Purihar princes of Marwar, prior to its conquest by the Rahtors.

JOEL. The second book among the minor prophets is entitled Z’he word of Jehovah that came to Joel the son of Pethuel, or, as the Septuagint, Latin, Syriac, and other versions read, Bethuel. Nothing is recorded asto the date or occasion of the prophecy, whicli presents several peculiarities that aggravate the difficulty always felt in interpreting an aucient book when the historical situation of the author is obscure. Most Hebrew prophecies contain pointed references to the foreign politics and social relations of the nation at the time. In the book of Joel there are only scanty allusions to Phcenicians, Philistines, Egypt, and

Edom, couched in terms applicable to very different ages,

while the prophet’s own people are exhorted to repentance without specific reference to any of those national sins of which other prophets speak. The occasion of the prophecy, described with great force of rhetoric, is no known historical event, but a plague of locusts, perhaps

repeated in successive seasons ; and even here there are features in the description which have led many expositors to seek an allegorical interpretation. The most remarkable part of the book is the eschatological picture with which it closes; and the way in which the plague of locusts appears to be taken as foreshadowing the final judgment—the great day or assize of Jehovah, in which I[srael's enemies are destroyed—is so unique as greatly to complicate the exegetical problem. It is not therefore surprising that the most various views are still held as to the date and meaning of the book. Allegoristsand literalists still contend over the first andstill more over the second chapter, and, while the largest number of recent interpreters accept Credner's view that the prophecy was written in the reign of Joash of Judah, a rising and powerful school of critics follow the view suggested by Vatke (Bib. Theol., p. 462 sq.), and reckon Joel among the post-exile prophets. Other scholars give yet other dates: see the particulars in the elaborate work of Merx, Die Prophetie des Joels und thre Ausleger, Halle, 1879. The followers of Credner are literalists ; the opposite school of moderns includes some literalists (as Duhm), while others (like Hilgenfeld, and in a modified sense Merx) adopt the old allegorical interpretation which treats the locusts as a figure for the enemies of Jerusalem.

The reasons for placing Joel either earlier or later than the great series of prophets extending from the time when Amos first proclaimed the approach of the Assyrian down to the Babylonian exile are cogent. In Joel the enemies of Israel are the nations collectively, and among those specified by name neither Assyria nor Chaldza finds a place. This circumstance might, if it stood alone, be explained by placing Joel with Zephaniah in the brief interval between the decline of the empire of Nineveh and the advance of the Babylonians. But it is further obvious that Joel has no part in the internal struggle between spiritual Jehovab-worship and idolatry which occupied all the prophets from Amos to the captivity. He presupposes a nation of Jehovah-worshippers, whose religion has its centre in the temple and priesthood of Zion, which is indeed conscious of sin, and needs forgiveness and an outpouring of the Spirit, but is not visibly divided, as the kingdom of Judah was, between the adherents of spiritual prophecy and a party whose national worship

of Jehovah involved for them no fundamental separation from the surrounding nations. The book, therefore, must have been written before the ethico-spiritual and the popular conceptions of Jehovah came into conscious antagonism, or else after the fall of the state and the restoration of the community of Jerusalem to religious rather than political existence had decided the contest in favour of the prophets, and of the Law in which their teaching was ultimately crystallized.

The considerations which have given currency to an early date for Joel are of various kinds. The absence of all mention of one great oppressing world-power seems most natural before the westward march of Assyria involved Israel in the general politics of Asia. The purity of the style is also urged, and a comparison of Amos i. 2, Joel iil. 16 (Heb.,iv. 16), and Amos ix. 13, Joel iii. 18 (iv. 18), has been taken as proving that Amos knew our book. The last argument might be inverted with much greater pro- bability, and numerous points of contact between Joel and other parts of the Old Testament (e.g., Joel i. 2, Exod. x. 14; Joel ii 3, Ezek. xxxvi. 35; Joel iii. 10, Mie. iv. 3) make it not incredible that the purity of his style—which is rather elegant than original and strongly marked—is in

large measure the fruit of literary culture. The absence of allusion to a hostile or oppressing empire may be fairly taken in connexion with the fact that the prophecy gives no indication of political life at Jerusalem. When the whole people is mustered in chap. i., the elders or sheikhs of the municipality and the priests of the temple are the most prominent figures. The king is not mentioned,— which on Credner's view is explained by assuming that the plague fell in the minority of Joash, when the priest Jehoiada held the reins of power,—and the princes, councillors, and warriors necessary to an independent state, and so often referred to by the prophets before the exile, are altogether lacking. 'The nation has only a municipal organization with a priestly aristocracy, precisely the state of things that prevailed under the Persian empire. That the Persians do not appear as enemies of Jehovah and His people is perfectly natural. They were hard masters but not

invaders, and under them the enemies of the Jews were their neighbours, just as appears in Joel! Those, however, who place our prophet in the minority of King Joash draw a special argument from the mention of Pheenicians, Philistines, and Edomites (iii. 4 sq., 19), pointing to the revolt of Edom under Joram (2 Kings viii. 20) and the incursion of the Philistines in the same reign (2 Chron. xxi. 16, xxii. 1). These were recent events in the time of Joash, and in like manner tlie Phoenician slave trade in Jewish children is carried back to an early date by the reference in Amos i. 9. This argument is rather specious than sound. Edom's hostility to Judah was incessant, but the feud reached its full intensity only after the time of Deuteronomy (xxiii. 7), when the Edomites joined the Chaldeans, drew profit from the overthrow of the Jews, whose land they partly occupied, and exercised barbarous cruelty towards the fugitives of Jerusalem (Obad. passim; Mal. i. 2 sq.; Isa. lxiii.). The offence of shedding innocent blood charged on them by Joel is natural after these events, but hardly so in connexion with the revolt against Joram.

As regards the Philistines, it is impossible to lay much weight on the statement of Chronicles, unsupported as it is by the older history, and in Joel the Philistines plainly stand in one category with the Pheenicians, as slave dealers, not as armed foes. Gaza in fact was a slave emporium as early as the time of Amos (i. 6), and continued so till Roman times,

Thus, if any inference as to date can be drawn from chap. iii., it must rest on special features of the trade in slaves, which was always an important part of the commerce of the Levant. In the time of Amos the slaves collected by Philistines and Tyrians were sold en masse to Edom, and presumably went to Egypt or Arabia. Joel complains that they were sold to the Grecians (Javan, Jonians).2 It is probable that some Hebrew and Syrian slaves were exported to the Mediterranean coasts from a very carly date, and Isa. xi. 11 already speaks of Israelites captive in these districts as well as in Egypt, Ethiopia, and the East. But the traffic in_this direction hardly became extensive till a later date. In Deut. Xxvili. 68 Egypt is still the chief goal of the maritime slave trade, and in Ezek. xxvii. 13 Javan exports slaves to Tyre, not conversely.

Thus the allusion to Javan in Joel better suits a later date, when Syrian slaves were in special request in Greece.? And the name of Javan is not found in any part of the Old Testament certainly older than Ezekiel. In Joel it seems to stand as a general repre- sentative of the distant countries reached by the Mediterranean (in contrast with the southern Arabians, Sabzans, chap. ili. 8), the furthest nation reached by the ficets of the Red Sea. This is pre- cisely the geographical standpoint of the post-exile author of Gen. x. 4, where Javan includes Carthage and Tartessus.

- **On the Authorized Version of ii. 17 it appears that subjection toa foreign power is not a present fact but a thing feared. But the par- allelism and ver. 19 justify the now prevalent rendering, 'that the heathen should make a mock of them."**

2 The hypothesis of an Arabian Javan, applied to Joel iii. 6 by Credner, Hitzig, and others, may be viewed as exploded. See Stade, De Populo Javan, Giessen Programme, 1880.

- **Compare Movers, Phinizisches Alterthum, III. i. p. 70 sg.**

Finally, the allusion to Egypt in Joel iii. 19 must on Credner's theory be explained of the invasion of Shishak a century before Joash. From this time down to the last period of the Hebrew monarchy Egypt was not the enemy of Judah.

If the arguments chiefly relied on for an early date are sO precarious or can even be turned against their inventors, there are others of an unambiguous kind which make for a date in the Persian period. It appears from chap. iii. 1, 2 that Joel wrote after the exile. The phrase "to bring again the captivity" would not alone suffice to prove this, for it is used in a wide sense, and perhaps means rather to "reverse the calamity;"* but the dispersion of Israel among the nations, and the allotment of the Holy Land to new occupants, cannot fairly be referred to any calamity less than that of the captivity. With this the whole standpoint of the prophecy agrees. To Joel Judah and the people of Jehovah are synonyms ; northern Israel has disappeared. Now it is true that those who take their view of the history from Chronicles, where

the kingdom of Ephraim is always treated as a sect outside the true religion, can reconcile this fact with an early date. But in ancient times it was not so; and under Joash, the contemporary of Elisha, such a limitation of the people of Jehovah is wholly inconceivable. The earliest prophetic books have a quite different standpoint ; otherwise indeed the books of northern prophets and historians could never have been admitted into the Jewish canon. Again, the significant fact that there is no mention of a king and princes, but only of sheikhs and priests, has a force not to be invalidated by the ingenious reference of the book to the time of Joash's minority and the supposed regency of Jehoiada.® And the assumption that there was a period before the prophetic conflicts of the 8th century when spiritual prophecy had unchallenged sway, when there was no gross idolatry or superstition, when the priests of Jerusalem, acting in accord with prophets like Joel, held the same place as heads of a pure worship which they occupied after the exile (comp. Ewald, Propheten, i. 89), is not consistent with history. It rests on the old theory of the antiquity of the Levitical legislation, so that in fact all who place that legislation later than Ezekiel are agreed that the book of Joel is also late. In this connexion one point deserves special notice. The religious significance of the plague of drought and locusts is expressed in chap. 1. 9 in the observation that the daily meat and drink offering are cut off, and the token of new blessing is the restoration of this service, chap. 11. 14. In other words, the daily offer- ing is the continual symbol of gracious intercourse between Jehovah and His people and the main office of religion. This conception, which finds its parallel in Dan. viii. 11, xi. 31, xil. 11, is quite in accordance with the later law. But under the monarchy the daily oblation was the king's private offering, and not till Ezra's reformation did it become the affair of the community and the central act of national worship (Neh. x. 33 sg.).6 That Joel wrote not only after the exile but after the work of Ezra and Nehemiah may be viewed as confirmed by the allusions to the walls of Jerusalem in chap. ii. 7,9. Such is the historical basis which we seem to be able to lay for the study of the exegetical problems of the book.

The style of Joel is clear, and his language presents little difficulty beyond the occurrence of several unique words, which in part may very well be due to errors of the text.

1873, p. 519 sq. ‘

5 Stade not unreasonably questions whether 2 Kings xii, 1-3 implies the paramount political influence of Jehoiada, Op. cit., p. We

8 See Wellhausen, Geschichte Israels, p. 78 sg. XIII. — 89

But the structure of the book, the symbolism, and the con- | J ehovah’s innocents. Compare the similar predictions

nexion of the prophet’s thoughts have given rise to much controversy. It seems safest to start from the fact that the prophecy is divided into two well-marked sections by chap. ii. 18, 19a. According to the Massoretic vocaliza- tion, which is in harmony with the most ancient exegetical tradition as contained in the LXX., these words are historical : “Then the Lord was jealous, . . . and answered and said unto his people, Behold,” &. Such is the natural meaning of the words as pointed, and the proposal of Merx to change the pointing so as to transform the perfects into futures, and make the priests pray that Jehovah will answer and deliver the gracious promises that fill the rest of the book, is an exegetical monstrosity not likely to find adherents.

Thus the book falls into two parts, In the first the prophet speaks in his own name, addressing himself to the people in a lively description of a present calamity caused by a terrible plague of locusts which threatens the entire destruction of the country, and appears to be the vehicle ofa final consuming judgment (the day of Jehovah), There is no hope save in repentance and prayer; aud in chap. il. 12 the prophet, speaking now for the first time in Jehovah’s name, calls the people to a solemn fast at the sanctuary, and invites the intercession of the priests. The calamity is described in the strongest colours of Hebrew hyperbole, and it seems arbitrary to seek too literal an interpretation of details, eg., to lay weight on the four names of locusts, or to take chap. i. 20 ofa conflagration produced by drought, when it appears from ii. 3 that the

ravages of the locusts themselves are compared to those of fire. But when due allowance is made for Eastern rhetoric, there is no occasion to seek in this section anything else than literal locusts. Nay, the allegorical interpretation, which takes the locusts to be hostile invaders, breaks through the laws of all reason- able writing ; for the poetical hyperbole which compares the invading swarms to an army (ii. 4 sq.) would be in- conceivably lame if a literal army was already concealed under the figure of the locusts. Nor could the prophet so far forget himself in his allegory as to speak of a victorious host as entering the conquered city like a thief (ii. 9). The second part of the book is Jehovah's answer to the people's prayer. The answer begins with a promise of deliverance from famine, and of fruitful seasons compensat- ing for the ravages of the locusts. In the new prosperity of the land the union of Jehovah and His people shall be sealed anew, and so the Lord will proceed to pour down further and higher blessings. The aspiration of Moses (Num. xi. 29) and the hope of earlier prophets (Isa, xxxii. 15, lix, 21; comp. Jer. xxxi, 33) shall be fully realized in the outpouring of the Spirit on all the Jews and even upon their servants (compare Isa. Ixi. 5 with Ivi. 6, 7); and then the great day of judgment, which had seemed to overshadow Jerusalem in the now averted plague, shall draw near with awful tokens of blood and fire and darkness. But the terrors of that day are not for the Jews but for their enemies. The worshippers of Jehovah on Zion shall be delivered (comp. Obad. ver. 17, whose words Joel expressly quotes in chap. ii. 32), and it is their heathen enemies, assembled before Jerusalem to war against Jehovah, who shall be mowed down in the valley of Jehoshaphat (Jehovah judgeth) by no human arm but by heavenly warriors, Thus definitively freed from the profane foot of the stranger (comp. Isa. lii. 1), Jerusalem shall abide a holy city for ever. The fertility of the land shall be such as was long ago predicted in Amos ix. 13, and streams issuing from the temple, as Ezekicl had described in his picture of the restored Jerusalem (Ezek, xlvii.), shall fertilize the bar- ren Wady of Acacias. Egypt and Edom, on the other hand, shall be desolate, because they have shed the blood of

against Edom, Isa. xxxiv. 9 sg. (Mal. i. 3), and against Egypt, Isa. xix. 5 eg., Ezek. xxix. Joel's eschatological picture appears indeed to be largely a combination of elements from older unfulfilled prophecies. Its

central feature, the assembling of the nations to judgment, is already found in Zeph. iii. 8, and in Ezekiel's prophecy concerning Gog and Magog, where the wonders of fire and blood named in Joel ii. 30 are also mentioned (Ez. xxxviii. 22). The other physical features of the great day, the darkening of the lights of heaven, are a stauding figure of the prophets from Amos v. 6, vill. 9, downwards. It is characteristic of the prophetic eschatology that images suggested by one prophet are adopted by his successors, and gradually become part of the permanent scenery of the last times; and it isa proof of the late date of Joel that almost his whole picture is made up of such features. In this respect there is a close parallelism, extending to minor details, between Joel and the last chapters of Zechariah.

That Joel's delineation of the final deliverance and glory attaches itself directly to the deliverance of the nation from a present calamity is quite in the manner of the so-called prophetic perspective. But the fact that the calamity which bulks so largely is natural and not political is charac- teristic of the post-exile period. Other prophets of the same age speak much of dearth and failure of crops, which in Palestine then as now were aggravated by bad govern- ment, and were far more serious to a small and isolated community than they could ever have been to the old kingdom. It was indeed by no means impossible that Jerusalem might have been altogether undone by the famine caused by the locusts; and so the conception of these visitants as the destroying army, executing Jehoval's final judgment, is really much more natural than appears to us at first sight, and does not need to be explained away by allegory. The chief argument relied upon by those who still find allegory at least in chap. ii. is the expression spyn, "the Northener," in ii, 20. In view of the other points of affinity between Joel and Ezekiel, this word inevitably suggests Gog and Magog, and it is difficult to see how a swarm of locusts could receive such a name, or if they came from the north could perish, as the verse puts it, in the cesert between the Mediterranean and the Dead Sea. The verse remains a crux interpretum, and no exegesis hitherto given can be deemed thoroughly satis- factory ; but the interpretation of the whole book must not be made to hinge ona single word in a verse which might be altogether

removed without affecting the general course of the prophet's argument.

The whole verse is perhaps the addition of an allegorizing glossator, The prediction in ver. 19, that the seasons shall hence- forth be fruitful, is given after Jehovah has shown His zeal and pity for Israel, not of course by mere words, but by acts, as appears in verses 20, 21, where the verbs are properly perfects recording that Jehovah hath already done great things, and that vegetation has already revived. In other words, the mercy already experienced in — the removal of the peer is taken as a pledge of future grace not to stop short till all God's old promises are fulfilled. In this con- text ver. 20 is out of place. Observe also that in ver. 25 the locusts are spoken of in the plain language of chap. i.

For the literature on Joel in eommon with the other minor prophets, see Hosea. There are separate eommentaries by Credner (Halle, 1831), Wiinsche (Leips., 1872), Merx (Halle, 1879). The last-named gives an elaborate history of interpretation from the Septuagint down to Calvin, and appends the Ethiopic text edited by Dillmann. Of older eommentaries the most valuable is Poeoeke's (Oxford, 1691). Boehart's Hiexozoicon may also be eonsulted, cw. R. 8.)

JOHN, the Apostle (271, "Jehovah hath been gracious"), was the son of Zebedee, a Galilean fisherman, and Salome. It is probable that he was born at Bethsaida, where along with his brother James he followed his father's occupation. The family appear to have been in easy cir- cumstances ; at least we find that Zebedee employed hired servants, and that Salome was among the number of those

APOSTLE. |

women who contributed to the maintenance of Jesus ; he himself was perhaps related to Annas the high priest (John xviii 15, 16). It seems to have been when attending as a disciple the preaching of John the Baptist at Bethany beyond Jordan that he first became personally acquainted with our Lord (John i. 35 sg.); his "call" to follow Him occurred simultaneously with that addressed to his brother and to

Andrew and Peter (Mark i. 19, 20). He speedily took his place among the twelve apostles, sharing with James the title of Boanerges ("sons of thunder"), became a member of that inner circle to which, in addition to his brother, Peter alone belonged, and ultimately was recognized as the disciple par excellence whom Jesus loved, a distinction usually attributed to his amiability and gentle- ness of character, but much less probably due to any special sweetness of temperament (see Luke ix. 54; Mark ii. 17, ix. 38) than to a quickness and depth of insight which enabled him to enter more fully than his companions into the larger and wider-reaching views of his Master. After the departure of Jesus John remained at Jerusalem, where he was one of the most prominent among those who bore personal testimony to the fact of the resurrection ; we find him for a short time in Samaria (Acts viii. 14, 25) after the martyrdom of Stephen, but on Paul's second visit to the Jewish capital (Gal. ii 9) John was again there. His subsequent movements are obscure, but he can hardly have been in Jerusalem at the time of Paul's last visit there in 58 a.v.

At this point the history of the apostle is taken up by ecclesiasti- cal tradition. Polycrates, bishop of Ephesus, 196 a.D. (in Euseb., H.E., iii. 31; v. 24), attests that John "who lay on the bosom of the Lord" died at Ephesus; and, though this evidence is weakened by the legendary trait that he "was a priest wearing the mwéTadov" or gold plate that distinguished the high-priestly mitre, it is fair to infer that the grave of the apostle was already shown (comp. H. E., iii. 39). Irenzeus in various passages of his works confirms this tradition. He says that John lived up to the time of Trajan, and published his Gospel in Ephesus. Irenzus also identifies the apostle with John the disciple of the Lord, who wrote the Apocalypse under Domitian, whom his teacher Polyearp had known personally, and of whom Polycarp had much to tell. These traditions are accepted and enlarged by later authors, Tertullian adding that John was banished to Patmos after he had miraculously survived the punishment of immersion in boiling oil. As it is evident that legend was busy with John as early as the time of Polycrates, while Ireneus's vicw that the Apocalypse was written under Domitian is inconsistent with the internal evidence offered by that book, the real worth of these traditions requires to be tested by examination of their

ultimate source. This inquiry has been pressed upon scholars since the apostolic authorship of the Apocalypse or of the Fourth Gospel or of both these works has been disputed. See Gosrets and REVELATION. The question is not strictly one between advanced and conservative criticism, for the Tiibingen school recog- nized the Apocalypse as apostolic, and found in it a confirmation of John's residence in Ephesus. On the other hand, Liitzelberger (1840), Keim (Jesu v. Naz., vol i., 1867), Holtzmann (in Bibel-Lex., Se0n)s Scholten (Theol. Tijdsch., 1871), and other recent writers wholly rejeet the tradition, while it has able defenders in Stcitz (Stud. u. Krit., 1868), Hilgenfeld (Hini., 1875, p. 394 sq.; Z.f. W. T. 1872, 1877), and Lightfoot (Contemp. Rev., 1875, 1876).

The opponents of the tradition lay weight on the absence of posi- tive evidence before the latter part of the 2d century, especially in Papias, and in the epistles of Ignatius and of Treneus's authority Polycarp. But they also find it necessary to assumc that Ireneeus

~~mistook Polycarp, and that John "the disciple of the Lord," who was known to the latter, was not the apostle but a certain pres~~ byter John of whom we hear from Papias. This view would be at once refuted if we could hold with some scholars that the pres- byter is but another name for the apostle. This identification had already supporters in the time of Jerome (Vir. Lil., 9; comp. Usener, 4cta 8. Timothei, Bonn, 1877), but scems inconsistent with a fair reading of the words of Papias. It is therefore very possible that some things which Ireneus in his later years supposed Polycarp

to have related of the apostle really belong to the other John (sec |.

Gospnts, x. 820); but it isa much stronger thing to assume that he was mistaken in supposing that Polycarp had conversed with the apostle at all. An altogether independent and apparently inconsistent tradition that John was killed by the Jews is given on the authority of Papias by Georgius Hamartolus in the 9th century.

JOHN

JOHN, Epistixs or, Of the three Epistles which are ascribed to the apostle John, the First is by far the most important, both from the space which it occupies in the canon and from the weightiness of its teaching,

First Epistte.—Title.—Some exception has been taken to the title "epistle" as applied to this document, seeing that it bears the name neither of sender nor of recipient, and carries with it no definiteness of message to a special correspondent. But, though it may be admitted that with regard to its literary form it would more properly be described as a homily or discourse, the frequently recurring terms "TI wrote," "I have written," imply that the message was written, not orally delivered.

Genuineness. —The external evidence for the genuineness of this epistle is weighty. Polycarp, a disciple of John, writes with evident reference to 1 John iv. 3: was yap Os dy py Gporoyy Inooty Xpicrov év capi @AndvOevar dytixpio- tos eorw (Ad Phil., vii.). Eusebius, writing of Papias (H. F., iii. 39), says: Kexpyrar 8 6 atrés paptupiaus dao ths lwavvov mpotépas émictoAs Kal ard tis Wlérpov épotws.* The epistle was frequently cited by Irenzeus, a disciple of Polycarp, as we learn both from the statement of Eusebius (H, E., v. 8) aud from his extant work against heretics.(Adv. Heret., iii. 16, v. and viii.). The two epistles of St John mentioned in the canon of Muratori are probably the Second and Third, but the absence of reference to the First in that particular connexion implies its acknowledged canonicity ; moreover, the same canon contains a citatiou of 1 John 1. 1, 4. The early fragment called the letter to Diognetus has unmistakable allusions to the Johannine epistles. The Peshito contains the epistle, and there is an undoubted reference to it in the letter from the churches of Vienne and Lyons. All those authorities belong to the first two centuries. In the succeeding centuries the volume of evidence grows. Eusebius reckons the epistle among the Homologoumena or writings of acknowledged authority, and the testimony of Tertullian, Clemens Alexandrinus, Origen, and

Cyprian, in addition to the evidence already adduced, indicates its reception in all the churches.”

To those who accept the Fourth Gospel as John’s, the strength of the internal evidence for the Johannine author- ship of the epistle lies in thesimilarity of words, of teaching, and of style between the two writings. This similarity is so marked that it requires no argumentative proof. It is a similarity not only of diction, or of parallel expressions and peculiarities of style, but one which is penetrated by the more subtle correspondence of under-currents of thought and of implied knowledge. See on this part of the subject Westcott, Introduction to the Gospel of St John, p. 1x. sq., in the Speaker’s Commentary; and Davidson’s Zxtroduction to the Study of the New Testament, ii. 293 sq. On the other hand, the very closeness of the connexion between the epistles and the gospel has necessarily involved the former in the assaults of recent criticism upon the genuine- ness of the latter. Some critics, however, while admitting the similarity of style, contend that there are differences of doctrine between the gospel and epistle which preclude identity of authorship. The main points advanced in behalf of this statement are—the supposed differences in eschatological views, the application of the term “ Para- clete” to the work of the Holy Spirit in the gospel and to the office of Christ alone in the epistle, the introduction into the epistle of such terms as tAacpds and xplopo, which are not found in the gospel, and, lastly, the polemical and

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1 See, however, for exeeptions that may be taken to these testi- monies, GOSPELS, vol. x. pp. 820, 822.

2 The epistle was not included in the Mareionite eanon, and the Alogi, an obseure sect so named by Epiphanius (H#@r., i. 1-3), seen to have rejected this, together with the other writings of St John.

3 See GOSPELS, vol. x. p. 828.

strongly anti-Docetic tone which is said to distinguish the epistle from the gospel. Such differences, however, are in part more apparent than real (they are certainly not contradictions), and in part may be naturally explained by the changed circumstances in which the two writings were composed and the different aims proposed in them. On this point see Westcott, p. lxxxviii., and Reuss, /ntro- duction, p. 358 sq.

Date.—The date of the epistle must remain in uncer- tainty; but it is generally viewed as later in composition than the gospel. "The phrases in the gospel," writes Professor Westcott, "have a definite historic connexion ; they belong to circumstances which explain them. The phrases in the epistle are in part generalizations and in part interpretations of the earlier language in view of Christ's completed work, and of the experience of the Christian church." The same writer assigns on good grounds to the gospel as well as to the epistle a date subsequent to the fall of Jerusalem. In this view éoydry apa, ch. ii, 18, must be understood of the approach of the second advent of Christ.

Occasion and Contents.—Mr Browning has in his Death in the Desert caught the true occasion of the apostle's letter : it was written in view of the time when

'* There is left on earth No one alive who knew (consider this), — Saw with his eyes and handled with his hands

That which was from the first, the Word of Life; How will it be when none more saith 'I saw'?"

It is the testimony of the last surviving eyewitness of the Lord, far removed from the scenes and words which he attests, giving, in view of rising error,—Gnostic and Docetic, —the apostolic judgment on questious of the day, and founding the truth of Christian doctrine on a recognition of the historical Christ.

The subject and character of the epistle answer these conditions. The direct testimony to the real existence of Jesus Christ in the flesh, the declaration of spiritual tests (as in ch. i. 6, ii. 29, iii, 19, and in many other passages) which gives an introspective element to the epistle, and,

lastly, the impressive re-delivery of familiar truths not freshly defined but exhibited in different mutual relations, are characteristic of an address given by an aged teacher to a generation of men who had not seen the Lord,—from whom therefore objective proof had been withdrawn, and who in consequence would desire some clear testimony of the facts about Jesus, and some definite tests of communion with God and of the reality of their spiritual condition. It is an address to the instructed. Much therefore is taken for granted ; many elementary principles and truths of the Christian life are left unnoticed ; and religious terms fre- quent in other parts of the New Testament are absent from this epistle. The apostle writes "because they have known Him that was from the beginning" (ii. 13), and his aim is a deepening of the spiritual life and a confirmation of faith.

After an introduction, giving his credentials as a witness and stating his aim, the apostle delivers his message to the church, "God is light" (i. 5). This thought is the subject of the epistle ; it is illustrated by the opposite of light—darkness, and by analogous pairs of opposites, in which the principal theme is exhibited in different aspects : these are—righteousness and sin, truth and falsehood, love and hate, God and the world, life and death. To those ideas, which are in truth varied expressions of one and the same idea, the apostle turns and returns, not repeating himself, but on each reiteration of the truth adding some fresh thought and deeper truth. Through these opposites ruus another thought—judgment or deci- sion,—which is viewed not as a future but as an ever- present fact in the Christian life.

JOHN

| letter to the churches of Asia.

[EPISTLES,

After the delivery of his message (dyyeA/a) the apostle proceeds to set forth some effects of the "light,"—fellow- ship with one another, confession of sin, forgiveness of sin (i. 5-10). This suggests one aspect of the object of the " message," freedom from sin, the test of which, z.e., in other words, the test of knowing God, is observance of His

commandments, which are summed up in love (ayazn) (ii. 1-11). Here the apostle reminds his readers why he sends the message; it is because (érz) they to whom it comes are Christians, whose sins have been forgiven, who have known Christ, who have conquered Satan ; it comes to all,—to little children, to young men, to the aged (ii. 12-14). Therefore let them not love the world nor the things of the world (ii, 15-17). Hence the thought of the end of the world and the signs thereof. Of these one is the Antichrist. There are now many Antichrists even in the nominal church. But there is a test of the true Chris- tian,—to have the Father, the Son, the unction (ypiopa) of the Holy Spirit, and the truth (ii. 18-28).

A new section begins with the thought of sonship of God. The test of sonship is doing righteousness because God is righteous. Sonship is a proof of the Father's love, and the condition of it is likeness to the Father (ii. 28-iii. 9). The connexion is then traced between righteousness and love (10-13), between love and life, and hate and death (14, 15). This suggests the range of love,—self- sacrifice even to death (16-18). Truth (suggested by reality of love) is shown to be tested by keeping the com- mandments, the first of which is love (19-23), the result is the indwelling of Christ which the Spirit testifies (24). The mention of the Spirit leads the apostle's thoughts once more, as in ch. li. 18 sqg., to the distinction between true spirits and false. The test is the same, the acknow- ledgment that Christ has come in the flesh (iv. 1-6). The thought of the true Christian as distinguished from the false again suggests mutual love, which springs from God's love to us manifested by the mission of Christ. Mutual love is a proof of the indwelling Christ (7-13). Here the apostle pauses to bear impressive witness to the mission of Christ and the love of God (14-16), and then resumes the subject of love. A result of perfect love is confidence in the day of judgment. But absence of brotherly love means want of love to God (17-21). For the test of brotherly love is love to God, which consists in keeping His commandments through the faith in Jesus Christ that overcomes the world (v. 1-5). Jesus Christ then is the object of faith. Faith brings its own evidence, and its evidence is that God gave eternal life (6-12). To effect the knowledge of this (the possession of eternal life), and the belief in the Son of God, were the apostle's objects in

writing. Such knowledge and belief bring assurance, from which results certainty of answer to prayer. The instance given is intercessory prayer (13-17). In con- clusion the apostle recapitulates some of the leading truths dwelt upon in the epistle.

From this brief summary it will be seen that the sections are sometimes linked together by a manifest chain of reasoning, and that sometimes the concluding word in one paragraph suggests the fresh train of thought in the next. Some expositors detect a more logical sequence in the epistle. But the varying results of their expositions go to prove the improbability that the apostle had in view any such sys- tematic arrangement. See, however, Diisterdieck, whose scheme is mainly followed by Alford, and Davidson, [ntro- duction to the Study of the New Testament.

Where Written and to Whom Addressed.—The epistle was probably written at Ephesus, where the most ancient tradition places the closing scenes of St John's life, and addressed to the church of Ephesus, or as an encyclical In some Latin MSS., how-

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ever, and in St Augustine's Quest. Hvang., il. 39, the address ad Parthos is found. Bede adds testimony to the same effect. But such a destination of the epistle is unlikely in itself, receives no support from the Greek Church, and is opposed to ecclesiastical tradition. Hence the best criticisin rejects the superscription. It is variously accounted for. Whiston, in his Commentary on the Epistles (1719), suggests that the original address was Tpos Tap- Oévovs, and that this abbreviated appeared in Latin as ad Parthos ; according to others it is a corruption of ad Sparsos, "to the dispersed."

Before textual criticism was studied scientifically, much controversy turned upon the words contained in vers. 7 and 8 of ch. v. The disputed passage, év T@ otpayg. . . &v Th ym is now omitted by all the leading editors, on indis- putable authority.

SreconD AND TurrD EprsTLes.—These are interesting as the only examples of apostolic letters to private persons, except the epistle to Philemon, which have descended to us. Their genuineness is well attested, though with less decisive evidence than that of the First Epistle. Irenzeus quotes 2 John 10, 11. Clement of Alexandria (Strom., il. 66) alludes to the First Epistle in a way which implies another, év r9 petLove emuarody. Dionysius of Alexandria (248 s.D.) makes express mention of the Second and Third Epistles ; Alexander, bishop of Alexandria, cites a passage from the Second. The Muratorian canon, as already stated, probably contains a reference to the two minor epistles.

On the other hand, Eusebius mentions those epistles among the dyrAcydpeva, or disputed writings (£7. E., iii. 25); Jerome writes that they were ascribed to John the Presbyter ; Cyprian appears never to cite from them in his own writings (though he records words of Bishop Aurelius, who, speaking in a synod, quotes 2 John 3 Tertullian is equally silent; the Peshito does not contain either epistle.

In answer to the doubts thus raised it has been urged that the brevity and unimportance of the two minor epistles sufficiently account for the comparative silence of the first two centuries respecting them ; that the existence of John the Presbyter rests on the slender authority of an inference from a statement by Papias (Eus., J. £., iii. 39); that the style and expressions in the disputed epistles are so manifestly Johannine that, if they did not proceed from John the apostle, they must be the work of a conscious imitator, who, if honest, would have used his own name, if an intentional deceiver, that of the apostle; that the term & pec Bvrepos ("the elder," or "the aged "), 2 John 1, 3 John 1, is either a title of dignity or descriptive of age (if the first it may be paralleled by the use of cupmperBurepos, 1 Pet. v. 1; if the second, by that of mpeoBirys, Phil. 9, both applied by an apostle to himself).

The greeting in the Second Epistle éxAexry kupia. is variously interpreted—either (a) of a person (to the elect lady, to the elect Kyria, or to the lady Eclecta), or (0) of a church mystically addressed under a personal appellation. The last hypothesis is unlikely, and is not supported either by New Testament usage or by the early apocryphal

writings. If cither éxAcxry or xupia be a proper name, it is better to regard xupia.as such, since éxAexrds is a term applied to all the saints, and in this very letter to the lady's sister, ver. 13. On the whole it is more probable that both éxAexry and kupia bear their ordinary meanings, and that the A.V. 1s correct.

The Third Epistle is addressed to Gaius or Caius, a name so common that all identifications must be regarded as purely conjectural. From the epistle we learn that he was a Christian of good report, probably a layman, whom the apostle commends for his hospitality to certain missionaries of the faith who seem to have visited his city. Two other

names are mentioned—Diotrephes, a leading and ambitious presbyter, who had refused to obey the apostle's injunctions, and Demetrius, either the bearer of the epistle or a member of the same church to which Caius belonged.

The time when and the place where these epistles were written must remain unknown from the absence of any data by which to determine them.

The works consulted for this article have been the commentaries of Alford, Ebrard, Liicke, and Reuss on the Epistles, and that of Westcott on the Gospel of St John (Speaker's Commentary) ; West- cott, The Canon of the New Testament; Neander's Planting of Chris- tianity (Bohn's trans., vol. ii.); F. D. Maurice's Lectures on the Epistles of St John; and Davidson's Introduction to the New Testa- ment. There are also commentaries, among others, by Diisterdieck, 1852; Luthardt, 1860; Haupt, 1869; Baur, 1848; Hilgenfeld, 1854, the last two representing the Tiibingen school of criticism. (A. C.*)

JOHN, Gosren or. See Gospets, vol. x. p. 818.

JOHN tux Baptist, the last of the prophets and the "forerunner" of Christ, was born in a wéAus Tovda (accord- ing to rabbinical tradition, at Hebron, but according to an ingenious modern interpretation of the phrase, at Jutta), in the beginning of the second half of the year 749 a.v.c. His father Zechariah was a priest "of the course of Abia"; his mother Elizabeth was related to Mary, the mother of Jesus, whose senior he was by six months. The circum- stances of his birth are related with much detail in Luke i., but those of his early years are summed up in the single expression at ver. 80 that he "grew, and waxed strong in spirit, and was in the deserts till the day of his shewing unto Israel." In his thirtieth year (Autumn, 779 a.v.c.) he began his public life in the " wilderness of Judza," the wild district that lies between the Kidron and the Dead Sea, and particularly in the neighbourhood of the Jordan, where multitudes were attracted by his eloquence. His appearance, costume, and habits of life were such as to recall to the minds of his hearers what they had read about the ancient prophets, and particularly about Elijah, who came to be regarded as his prototype. Nor was his preach- ing in substance different from theirs: his central doctrine was that "the kingdom of heaven" had come near, and preparation for its speedy arrival by an appropriate change of heart and life was the practical duty he urged. With regard to the nature of the baptism he administered, much uncertainty exists; for some discussion of its origin and meaning, the reader is referred to the article Baprism (vol. iii. p. 348-9). Amongst those who resorted to this rite was John's kinsman, Jesus of Nazareth, whom he had foretold, and now acknowledged, as one mightier than himself, the latchet of whose shoes he was not worthy to unloose. The duration of John's ministry cannot be deter- mined with certainty ; it terminated in his imprisonment in the fortress of Macherus, to which he had been committed by Herod Antipas, whose incestuous marriage with Herodias the Baptist had sternly rebuked, and where he was beheaded under circumstances which are familiar to every reader of the Bible. The date of this event cannot with safety be placed later than the end of 782 a.v.c. For our knowledge of John the Baptist we are almost entirely dependent on the notices contained in the Gospel narratives, but a brief account of his career is also given by Josephus (Ant., xviii. 5); some

legends of an obviously fictitious character are contained in the apocryphal Gospels.

JOHN, the name of twenty-two popes.

JOHN I. (pope from 523 to 526) was a Tuscan by birth, and was consecrated pope on the death of Hormisdas. In 525 he was sent by Theodoric at the head of an embassy to Constantinople to obtain from the emperor Justin toleration for the Arians; but, whether designedly or not, he succeeded so imperfectly in his mission that Theodoric on his return, suspecting that he liad acted only halfheartedly, threw him into prison, where he shortly afterwards died, Felix IV. (or

III.) succeeding him. He was enrolled among tlie martyrs, his day being May 27.

JOHN ILI. (pope from 532 to 535), surnamed on account of his eloquence Mercurius, was elevated to the papal chair on the death of Boniface II. During his pontificate a decree against simony was engraven on marble and placed before the altar of St Peter's. At the instance of the emperor Justinian he adopted the proposition unus de Trinitate passus est in carne as a test of the orthodoxy of certain Scythian monks accused of Nestorian tendencies. He was succeeded by Agapetus I. ;

JOHN IIL. (pope from 560 to 573), successor to Pelagius, was descended from a noble Roman family. He is said to have been successful in preventing an invasion of Italy by the recall of the deposed exarch Narses, but the Lombards still continued their incursions, and, especially during the pontificate of his successor Benedict I., inflicted great miseries on the province.

JOHN IV. (pope from 640 to 642) was a Dalmatian by birth, and succeeded Severinus after the papal chair had been vacant four

months. While he adhered to the repu- diation of the Monothelitic doctrine by Severinus, he endeavoured to explain away the connexion of Honorius I. with the heresy. His successor was Theodorus I.

JOHN V. (pope from 686 to 687) was a Syrian by birth, and on account of his knowledge of Greek had in 680 been named papal legate to the sixth cecumenical council at Constantinople. He was the successor of Benedict II., and after a pontificate of little more than a year, passed chiefly in bed, was followed by Conon.

JOHN VI. (pope from 701 to 705) was a native of Greece, and succeeded to the papal chair two months after the death of Sergius I. An attempt of the exarch Theo- phylact of Ravenna to extort from him certain concessions to the Byzantine emperor Tiberius was frustrated by the revolt of the Italian portion of the army with which he threatened Rome, who but for the intervention of the pope would have put their leader to death. Partly by persuasion and partly by means of a bribe, John also succeeded in inducing Gisulph, duke of Benevento, to withdraw from the territories of the church.

JOHN VII. (pope from 705 to 707), successor of John VI, was also of Greek nationality. He declined to accede to the request of the emperor Justinian II. that he should

give his sanction to the decrees of the Quinisext or Trullan'

council of 691, on the ground that a papal legate was not present, and his death shortly afterwards delivered him from the necessity of committing himself to a more decided opinion. He was followed by Sisinnius.

JOHN VIIL (pope from 872 to 882), successor of Adrian IL, was a Roman by birth. His chief aim during his occu- pancy of the papal chair was to build up his temporal power by uniting the various discordant political elements of Italy into a theocracy under his own immediate control, and by subordinating the empire to the ecclesiastical authority of Rome. The qualifications he brought to the task he had undertaken were a resolute and unbending will, an unscru-

pulous readiness to employ any means that might best advance his purpose, and a thorough mastery of diplomatic intrigue. Events, however, were so fatally opposed to his designs that no sooner did one of his schemes begin to realize itself in fact than it was shattered and dissipated by an unlooked-for chance. To take advantage of the opportunity of winning a recognition of the dependence of the imperial authority on that of Rome, as well as to obtain an influential alliance against his enemies, he agreed, in 875, to bestow the imperial crown on Charles

the Bald, but that monarch was too. much occupied in'

Germany to grant him much effectual aid, and about the time of the death of Charles he found it necessary to come

JOHN

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to ignominious terms with the Saracens, who were only prevented from entering Rome by the promise of an annual tribute. Carloman, the opponent of Charles's son Louis, soon after invaded northern Italy, and, securing the sup- port of the bishops and counts, demanded from the pope the imperial crown, John attempted to temporize, but Duke Lambert of Spoleto, a partisan of Carloman, whom events had recalled to Germany, entered Rome in 878 with an overwhelming force, and for thirty days virtually held him a prisoner in St Peter's. He was, however, unsuc- cessful in winning any concession from the pope, who after his withdrawal carried out a previous purpose of going to France. There he presided at the council of Troyes, which promulgated a ban of excommunication against the sup- porters of Carloman—amongst others Adalbert of Tuscany, Lambert of Spoleto, and Formosus, bishop of Porto, who was afterwards elevated to the papal chair. In 879 John returned to Italy accompanied by Duke Boso of Provence, whom he adopted as his son, and made an unsuccessful attempt to get recognized as king of Italy. In the same year he was compelled to give a promise of his sanction to the claims of Charles the Fat, who received from him the imperial crown in 881. Previous to this, in order to secure the aid of the

Greek emperor against the Saracens, he had agreed to sanction the restoration of Photius to the see of Constantinople, and had withdrawn his consent on finding that he reaped from the concession no substantial benefit. Charles the Fat, partly from unwillingness, partly from natural inability, gave him also no effectual aid, and the last years of John VIII. were spent chiefly in hurling vain anathemas against his various political enemies. According to the authority of Fulda, he was murdered by one of his near relations. His successor was Martin II.

JOHN IX. (pope from 898 to 900) was of German birth, and belonged to the Benedictine order. He not only con- firmed the judgment of his predecessor Theodore II. in granting Christian burial to Formosus, but at a council held at Ravenna decreed that the records of the synod which had condemned him should be burned. Finding, however, that it was advisable to cement the ties between the empire and the papacy, John gave unhesitating support to Lambert in preference to Arnulf, and also induced the council to determine that henceforth the consecration of the popes should take place only in the presence of the imperial legates. The sudden death of Lambert shattered the hopes which this alliance seemed to promise. Jobn was succeeded by Benedict IV.

JOHN X. (pope from 914 to 928) was deacon at Bologna when he attracted the attention of the empress Theodora, through whose influence he was elevated first to that see and then to the archbishopric of Ravenna. In direct oppo- sition to a decree of council, he was also at the instigation of Theodora promoted to the papal chair as the successor of Lando. Like John IX. he endeavoured to secure him- self against his temporal enemies through a close alliance with the imperial power and the establishment of an inde- pendent Italian kingdom. With this view he in December 915 granted the imperial crown to Berengar, and with the assistance of the imperial troops and the forces of the duke of Benevento and Naples he took the field in person against the Saracens, over whom he gained a great victory on the banks of the Garigliano. The defeat and death of Beren- gar through the combination of the Italian princes again frustrated the hopes of a united Italy subservient to papal purposes, and after witnessing several

years of anarchy and confusion John perished through the intrigues of Marozia, daughter of Theodora. His successor was Leo VI.

JOHN XI. (pope from 931 to 936) was born in 906, the son of Marozia and the reputed son of Sergius III. Through the influence of his mother he was chosen to

succeed Stephen VII. at the early age of twenty-one. He was the mere exponent of the purposes of his mother, until her son Alberic succeeded in 933 in overthrowing their authority. The pope was kept a virtual prisoner in the Lateran, where he is said to have died in 936, in which year Leo VII. was consecrated his successor.

JOHN XII. (pope from 955 to 964) was the son of

Alberic, whom he succeeded as patrician of Rome in 994, |

being then only sixteen years of age. THis original name was Octavian, but when he assumed the papal tiara as suc- cessor to Agapetus II., he adopted the apostolic name of John, the first example, it is said, of the custom of altering the surname in connexion with elevation to the papal chair. As a temporal ruler John was devoid of the vigour and firmness of his father, and his union of the papal office— which through his scandalous private life he made a byword of reproach—with his civil dignities proved a source of weakness rather than of strength. In order to protect himself against the intrigues in Rome and the power of Berengar II. of Italy, he called to his aid Otho the Great of Germany, to whom he granted the imperial crown in 962. Even before Otho left Rome the pope had, however, re- pented of his recognition of a power which threatened altogether to overshadow his authority, and had begun to conspire against him on whom he had newly conferred the dignity of emperor. His intrigues were discovered by Otho, who after he had defeated and taken prisoner Berengar, returned to Rome and summoned a council which deposed John, who was in hiding in the

mountains of Campania, and elected Leo VIII. in his stead. An attempt at an insur- rection was made by the inhabitants of Rome even before Otho left the city, and on his departure John returned at the head of a formidable company of friends and retainers, and caused Leo to seek safety in immediate flight. Otho determined to make an effort in support of Leo, but before he reached the city John had died, in what manner is uncertain, and Benedict V. had mounted the papal chair.

JOHN XIII. (pope from 965 to 972) was descended from a noble Roman family, and at the time of his election as successor to Leo VIII. was bishop of Narni. He had been somewhat inconsistent in his relations with his prede- cessor Leo, but his election was confirmed by the emperor Otho, and his submissive attitude towards the' imperial power was so distasteful to the Romans that they expelled him from the city. On account of the threatening pro- cedure of Otho, they permitted him shortly afterwards to return, upon which, with the sanction of Otho, he took savage vengeance on those who had formerly opposed him. Shortly after holding a council along with the emperor at Ravenna in 967, he gave the imperial crown to Otho II. at Rome in assurance of his succession to his father ; and in 972 he also crowned Theophania as empress immediately before her marriage. On his death in the same year, he was followed by Benedict VI.

JOHN XIV. (pope from 984 to 985), successor to Benedict VII., was born at Pavia, and before his elevation to the papal chair was imperial chancellor of Otho IL. Otho died shortly after his election, and, taking advantage of the opportunity, Boniface VII., on the strength of the

popular feeling against the new pope, returued from Con-.

stantinople and placed John in prison, where he died either by starvation or poison.

JOHN XY. (pope from 985 to 996) is now generally recognized as the successor of Boniface VII., the pope of the same name who was said to haveruled for four months after the murder of Boniface being now omitted by the best authorities. John XV. was the son of Leo, a presbyter in Gallina Alba. At the time he mounted the papal chair

Crescentius was patrician of Rome, but, although his influence was on this account very much hampered, the

presence of the empress Theophania in Rome from 989 to 991 restrained also the ambition of Crescentius. On her departure the pope, whose venality and nepotism had made him very unpopular with the citizens, found it necessary to flee to Tuscany. The news of the approach of Otho III. made it possible for him soon afterwards to return, but he died of fever before the arrival of Otho, who elevated his own kinsman Bruno to the papal dignity under the name of Gregory V.

JOHN XVI. (pope or antipope from 997 to 998) was a' Calabrian Greek by birth, and a favourite of the empress Theophania, from whom he had received the bishopric of Placentia. His original name was Philagathus. In 995 he was sent by Otho III. on an embassy to Constantinople to negotiate a marriage with a Greek princess. On his way back he either accidentally or at the special request of Crescentius visited Rome. A little before this Gregory V., in the beginning of 997, had been compelled to flee from the city; and the wily and ambitious Greek had now no scruple in accepting the papal tiara from the hands of Crescentius, to whom he consented to give up the temporal authority on condition that he recognized his subordination to the Western empire. The arrival of Otho at Rome in the spring of 998 put a sudden end to the treacherous compact.

John sought safety in flight, -but was discovered in his place

of hiding and brought back to Rome, where aftcr enduring cruel and ignominious tortures he was immured in a dungeon.

JOHN XVIL., whose original name was Sicco, succeeded Silvester IT. as pope in June 1003, but died in less than five months afterwards.

JOHN XVIIL (pope from 1003 to 1009) was, during his whole pontificate, the mere creature of the patrician John Crescentius, and

ultimately he abdicated and retired to a monastery, where he died shortly afterwards. His successor was Sergius LV. ;

JOHN XIX. (pope from 1024 to 1033) succeeded his brother Benedict VIIL., both being members of the powerful house of Tusculum. He merely took orders to enable him to ascend the papal chair, having previously been a consul and senator. He displayed his freedom from ecclesiastical prejudices, if also his utter ignorance of ecclesiastical history, by agreeing, on the payment of a large bribe, to grant to the patriarch of Constantinople the title of an cecumenical bishop, but the general indignation which the proposal excited throughout the church compelled him almost im- mediately to withdraw from his agreement. On the death of the emperor Henry II. in 1024 he gave his support to Conrad IL, who along with his consort was crowned with great pomp at St Peter's in Easter of 1027. In 1033 a conspiracy of the nobles compelled the pope to flee from Rome, but he was restored by Conrad, and died the same year in the full possession of his dignities. A successor was found for him in his nephew Benedict IX., a boy of only twelve years of age.

JOHN XXI. (pope from 1276 to 1277), successor to Adrian V., should, according to the order observed above, be named John XX., but there is an error in the reckoning through the insertion of an antipope before John XV. or some time after John XIX. At the time of his elevation to the papal chair he was cardinal-bishop of Tusculum, and he had previously been archbishop of Braga. He was a Portuguese by birth, and his original name was Pedro Juliani. The son of a physician, he had studied with distinction at Paris, was the author of several medical and scholastic treatises, and is men- tioned by some chroniclers as a magician. His small affection for the monks, his unecclesiastical tone and habits, free and unaffected intercourse with every class of men, and proficiency in secular science, awakened against him

the jealousy and distrust of the clergy, but probably his coniprehensive and liberal policy would have shed excep- tional lustre on the church had not his life been brought to a premature close through the fall of

the roof which he had planned for one of his rooms in the palace of Viterbo. His successor was Nicholas III.

JOHN XXII. (pope from 1316 to 1334) was born at Cahors about 1244, His original name was Jacques d'Euse, and his father is said to have been a cobbler. Tradition also affirms that the son learned the same employment, but afterwards he was taken charge of by his uncle, a succcssful merchant, who rose to be chancellor of Robert of Sicily. Through the instruction of a Franciscan friar, Jacques d'Euse acquired, besides an acquaintance with theology, a masiery of canon and civil law which afterwards stood him in good stead ; but, although he was also versed in all the details of statemanship, his learning was saturated with scholasticism, and his political ideas were narrowed by a mean and paltry ambition, the principal element of which was a miserly love of gold. He was small in stature and slightly deformed, and his features are said to have unpleasantly indicated his special moral defects. It is uncertain whether he ever joined the Franciscan order, but at any rate he afterwards had intimate connexions with the court of Naples, and some time before 1300 he was, at the instance of the king, appointed by Boniface VIIL. bishop of Frejus. By means of forged letters purporting to have the authority of the king of Naples, Clement V. was induced in 1310 to bestow upon him the see of Avignon; and, notwithstanding that the fraud was soon discovered, he so reconimended himself to the pope by his prudent conduct and his knowledge of law that in 1312 he wag named cardinal-bishop of Porto. Robert of Naples also condescended to forget the liberty that had been taken in tlle use of the royal seal, and, on the death of Clement V. in 1316, the cardinals, through the liberal expenditure of Neapolitan gold, were won over to elect the bishop of Porto to the papal chair. The leanings of the new pope towards the French party were at once shown by his choice of Avignon as his residence, and by his first promotion of cardinals, all of whom except one were French. During the strife for the empire between Louis of Bavaria and Frederick of Austria, John took no active part on either side, but made use of the opportunity quictly to establish an Italian kingdom under the rule of King Robert of Sicily, and after fortune declared for Louis at the battle of Muhldorf in 1322 continued to act as if the imperial throne were still vacant. In

consequence of this, Louis found himself compelled to enter into a league with the Ghibellines, whereupon the pope summoned him to appear before him at Avignon, and, on his declining immediate compliance with the request, promulgated against him a ban of excommunication. The empire was offered to Charles the Fair of France, who had married a daughter of the emperor Henry VIL. but her death lost him his chief support in Germany; and Louis, owing in a great measure to the influence of the Franciscans, whom the persecutions of John had greatly incensed against the authority of Rome, was accepted as emperor with the unanimous consent of the states at Ratisbon in 1324, a decision fully confirmed by the diet of Spires in 1326. In the following year he experienced equal goodwill at the diet of the imperial feudatories at Trent. After receiving the crown of Italy at Milan he entered Rome with the general acclamation of the inhabitants, and was crowned emperor by two excom- municated bishops. But, although the election of Peter of Corvara as rival pope under the name of Nicholas V. was greeted with the loud approval of the citizens, the threaten- ing attitude of Robert of Naples made it impossible for the

afterwards a gradual reaction against the imperial cause took place throughout the whole of Italy. Nicholas was taken prisoner at Pisa, but on making a complete recanta- tion of his errors was forgiven and absolved. With Louis, however, the pope altogether declined to come to terms, although he found it impossible to establish a rival against him. The last years of Jolin were disquieted by a dispute regarding his tenet —held by most theological authorities to be heretical—that the saints at death fall asleep and do not enjoy the beatific vision until after the resurrection. So great latterly became the general clamour against the doctrine that he found it necessary to make an ambiguous semblance of retracting what le had formerly promulgated with passionate zeal. He, llowever, never showed any tendency to relent in his persecution of the Franciscans, and his persistent animosity against them was a not

unimportant element among tlie influences which produced the Reformation. He died in1334. By means of annates he had greatly enriched the papal treasury. His successor was Benedict XIL

JOHN XXIII. (pope from 1410 to 1415) was born in Naples about 1360. He was of noble descent, his original name being Balthasar Cossa. In his youth he had, along with his brotliers, served as a corsair, and at the university of Bologna, which he afterwards entered, he led a loose and intemperate life. After occupying the office of archdeacon of Bologna, he became chamberlain of Boniface IX., and in that office greatly enriched both himself and the pope by his unscrupulous traffic in indulgences. In recognition of the high value of his services he was in 1402 created by Boniface a cardinal, and shortly afterwards he was appointed papal legate to Bologna, which he succeeded in wresting from the Visconti. The scandalous and cruel excesses in which he indulged when governor of the city caused Gregory XII. to pass against him a sentence of excommunication, but he was restored to his full dignities by Alexander V. The death of this pope, which took place suddenly at Bologna in 1410, was generally believed to have been contrived by the governor, but the cardinals were unanimous in electing him his successor, other two popes, Benedict XIII. and Gregory XII, the predecessors of Alexander, being still alive. Previously John had entered into a close alliance with Louis of Anjou, and he now united with him against Ladislaus of Naples, but notwithstanding the victory of Rocca Secca in 1411 he found it necessary to come to ignominious terms with Ladislaus in 1412. The compact was, however, congenial to neither party, and i the following year Ladislaus, advancing on Rome, compelled the pope to flee to Florence and thence to Bologna. In his extremity John implored the protection and help of the emperor Sigismund, who condescended to acknowledge him to the extent at least of requiring him to summon a council at Constance by which his claims and that of the other two rival popes should be decided. John opened the council in person in 1414, but, after consenting to abdicate preliminarily to the council deciding on his claims, he made his escape in disguise to Freiburg, where he obtained the protection of the duke of Austria, On his refusal to return he was solemnly deposed by the council as guilty of a long list of heinous crimes. The duke of Austria

then surrendered him to the.emperor, and after he had acknowledged the justice of his seutence he was con- fined in the castle of Heidelberg. At the end of four years' imprisonment he obtained his freedom, in all probability through a bribe, and, having made his submission to his successor Martin V., he was appointed by him cardinal- bishop of Frascati and dean of the college of cardinals, but he died a few months afterwards.

JOHN I. (925-976), emperor

of Constantinople, Greek emperor and antipope to prolong their stay in Rome, and | surnamed on account of his short stature Zimdsces, was 'PO

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descended from a distinguished family of Cappadocia, and was the nephew of Nicephorus Phocas, whom he aided to obtain the throne, and with whom he afterwards shared the military command of the empire. Being, however, deprived of this: dignity through the intrigues of the emperors brother Leo, he entered into a conspiracy to assassinate Nicephorus, which was put into execution on the 10th December 969. The reign of Zimisces is chiefly remarkable for his victories over the Russians, and the conquest of Bulgaria. Afterwards he achieved many brilliant exploits against the Saracens, but on his way home from his Syrian campaign he was seized near Constantinople with a sudden illness, caused it is supposed by poisoning, and died there in January 976.

JOHN II. (1088-1143), Comnenus, surnamed Kalo- joannes (John the Good), was the eldest son of the emperor Alexius, whom he succeeded on the throne in 1118. On account of his mild and just reign he has been called tlie Byzantine Marcus Aurelius, but he displayed little vigour in the internal administration of his kingdom or in ex- tirpating the governmental corruptions and abuses he had inherited. Nor did his various successes against the Hungarians, Servians, and Turks, though they won him the high admiration of his soldiers, add much tv the stability of his kingdom. He was accidentally killed during a wild- boar hunt on Mount Taurus, 8th April 1143.

JOHN III. (1193-1254), Vatatzes, surnamed Ducas, emperor of Nicaea, was born in 1193, and earned for himself such distinction as a soldier that in 1222 he was chosen to succeed Theodore I. His successes in war, which earned for him great renown, were rendered of little advantage to him through the intrigues of other sovereigns, but he administered the internal affairs of his dominions with much enlightenment and skill, and devoted great attention to agriculture. He died 30th October 1254, —not in 1255 as writers previous to Finlay have generally alleged.

JOHN IV., Lascaris, emperor of Nicaea, son of Theodore Il., was born about 1250. His father dying in 1258, Michael Paleologus conspired shortly after to make him- self regent, and in 1261 dethroned the boy monarch and put out his eyes. John died in prison.

JOHN V. (1329-1411), Cantacuzenus. CUZENUS, vol. v. p. 27.

JOHN VI. (1332-1391), Paleologus, emperor of Con- stantinople, born in 1332, was the son of Andronicus IIL, whom he succeeded in 1341. From 1342 John Canta- cuzenus shared the throne with him, till on the abdication of his colleague, who had been virtually the sovereign, he hecame sole emperor in 1334. His reign was marked by the gradual dissolution of the imperial power through the rebellion of his son Andronicus and the encroachments of the Ottomans, to whom in 1381 John acknowledged him- self tributary.

JOHN VII. (1390-1448), Paleeologus, emperor of Con- stantinople, son of Manuel II., was born in 1390, and in 1425 succecded to the

semblance of dominion and the wreck of the empire. To secure the favour of the Latins he consented to the union of the Greek and Roman Churches, which was ratified at Florence in 1439. The union failed of its purpose, but by his prudent conduct towards the Ottomans he succeeded in holding possession of Constantinople till his death in 1448.

JOHN (1167-1216), king of England, youngest son of Henry II. and Eleanor of Aquitaine, and third king of the Plantagenet family, was born December 24, 1167. He was his father's favourite child, and Henry hoped to bestow on him the kingdom of Ireland. The Trish princes did homage to John at Oxford in 1177, and in 1185 he was sent to Ireland. His arrogant behaviour roused the resentment of the natives, and lie was recalled in disgrace.

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In the last revolt of Richard against Henry, John was base enough to join with his father's enemies. This treachery was the death-blow of Henry IL. (1189). Richard, on his accession, made the most ample provision for John, giving him several English counties, and marrying him to the heiress of the great earldom of Gloucester. But he liad so little trust in his brother's character that, before his own departure on the third crusade, he bound John to stay away from England for three years. At the end of the term John returned, and harassed Richard's justiciar, William Long- champ. The unpopularity of Longchamp enabled John, aided by the archbishop of Rouen, to lead a revolutionary movement by which Longchamp was deprived of the jus- ticiarship, and John recognized as swmmus rector of the kingdom ; but the real power remained with the archbishop of Rouen. When the news of the king's captivity arrived, John entered into an active alliance with Philip IL. of France, Richard's malignant enemy, and tried to seize the reins of government, asserting that the king was dead. But he was baffled by the fidelity of Richard's ministers and mother, and at Richard's return his castles had to be sur- rendered to the king.

Richard treated Jolin with great generosity, and for the rest of his reign Jolin gave no further trouble. Richard on his deathbed declared John his heir, The principle of primogeniture, now generally adopted, would have pointed out Arthur of Brittany, son of John's elder brother Geoffrey, as the heir, and Philip IT. made himself the champion of Arthur. John made fresh enemies by divorcing his wife, and marrying Isabella, heiress of the count of Angouléme, who was already betrothed to the Count of La Marche. The anger of the La Marche family caused a fresh outbreak of war, in which Arthur became involved. In a misguided attempt to capture his grandmother Eleanor, in the castle of Mirabeau, he was defeated and taken prisoner by Jolin, who marched with great swiftness to his mother's aid. Arthur now dis- appears from history ; and, though there is no certain in- formation about his death, it was generally believed at the time that John murdered him. Philip's court of peers de- clared John guilty, and sentenced him to forfeiture. John abandoned himself to pleasure, and made no attempt to defend his dominions; he showed such complete indiffer- ence, while Philip was reducing castle after castle in Nor- mandy, that it was said he was spell-bound by witchcraft. In 1204 all Normandy was lost. Anjou, Maine, and part of Aquitaine soon followed the fate of Normandy ; John made only feeble or abortive attempts to save them. In 1205 his great quarrel with the church began. The mouks of Canterbury had elected their sub-prior to the archbishopric, and John had nominated a minister of his own ; all parties appealed to Pope Innocent III., who took the matter into his own hands, and ordered the convent proctors to elect Stephen Langton, an Englishman already distinguished by learning and character. John's refusal to accept Langton brought sentence of interdict on his kingdom (1208). He was personally excommunicated in 1209, and in 1211 the pope issucd a bull deposing him from his throne; the execution of the decree was committed to Philip, who prepared to invade England. John at last gave way, moved chiefly by a prophecy that on the next Ascension Day he would be no longer king. He made an abject submission to the papal legate Pandulph, agreeing to hold his kingdom henceforth as a tributary fief of the popedom. Thus the ecclesiastical difficulty was settled, but now John had to settle a quarrel with his own people. He had incurred their hatred by his personal vices, by his cruelty and perfidy, of which the

supposed murder of Arthur was only one instance among many, and by lis exaction of taxes greatly in excess of the customary rates. The barons of the north began the quarrel by refusing to XIITT. — go

accompany John on the expedition to France which he planned immediately after his absolution, alleging that their tenures did not oblige them to service abroad.

Langton restraincd the king from doing immediate ven- |

geance on the barons, and in the meantime an import- ant assembly was held at St Albans (the first to which representatives from the towns are known to have been summoned), at which the justiciar promised in the king's name that the laws of Henry I. should be observed. At an assembly at St Paul's the same year, Langton, who was the moulding spirit of the movement, produced the charter of Henry I., which became the basis of Magna Charta. John was now bent on trying to knit together the Germanic confederacy against Philip, which had been originated by Richard. He showed both policy and energy in this matter, but the barons of Poitou failed him at the critical moment of the war, and his nephew the emperor Otho was utterly defeated by Philip at Bouvines. John was forced to con- clude the peace of Chinon (1214), by which he ceded to Philip all bis claims on lands lying north of the Loire. He lad scare2ly returned to England when his barons formed a confederacy against him at Bury St Edmunds. He attempted to bribe the clergy by granting them free election; but they stood firm to the national cause. The city of London gave its adhesion to the barons, and John found himself abandoned by all. He was obliged to grant the demands of the barons, and to sign (at Runnymede, June 15, 1215), the Great Charter, which for two hundred years was to be the watchword of English freedom. John sisued the charter without the least intention of keeping it, and he found a powerful ally in his new master Inno- cent ILL, who issued a bull against the charter, and suspended Langton. Langton went to Rome to appeal, and the patriot party was thus deprived of its wisest leader. War soon broke out again, but John was able to obtain a host of foreign mercenaries, and the barons were

driven to make alliance with France. Louis, son of Philip IL, arrived in England in May 1216, and John's unusual audacity and success deserted him at once. In three months the greater part of the country was in the hands of Louis. Yet the national mistrust of the foreigner was already causing a reaction in favour of John, when in marching across the Wash he met with the accident which led to his death. He was overtaken by the tide, lost all his baggage aud treasure, and narrowly escaped himself, Vexation and fatigue, aggravated by excess in eating and drinking, brought on au attack of dysentery; with difficulty he reached Newark, where he died October 19, 1216,

The reign of John is a turning point in English history, and marks the beginning of anewera, (1) The separation of Normandy insured the free development of English life, and the absorption of the Norman nobility in the English people. (2) Magna Charta marks the first united attempt of the English people to limit the' power of the king. Hitherto the people had been the allies of the royal power against the baronage ; for the two following centuries they are leagued with the baronage and the church against royal tyranny. (3) The surrender of John's kingdom to the pope, followed by the opposition of Innocent to English freedom and the papal exactions of the next reign, caused a change of feeling towards the papacy, and led to the anti- Roman legislation which went on from the reign of Edward I. till the Reformation. (E. 5. A.)

JOHN L., king of France, son of Louis X. and Clementia

Fiance. of Hungary, was born, after his father's death, 15th Novem-

ber 1316, and only lived seven days.

JOHN II. (1319-1364), surnamed the Good, son of Philip VI. and Jane of Burgundy, was born in 1319, and succeeded his father in 1350. On the 19th September 1356 he was defeated and taken prisoner by the Black Prince at

the battle of Poitiers. He gained his liberty at the peace of Bretigny in 1360; but, his son the duke of Anjou, whom he left as hostage in

England, having fled, John thought himself bound to return to captivity. He died in London in 1364. See France, vol. ix. p. 546.

JOHN II. (1609-1672), Casimir, king of Poland, second Kings of son of Sigismund IIL. and the duchess Constantia of Poland. Austria, was born March 21, 1609. After journeying in several countries of Europe, he in 1640 joined the Jesuit order at Rome, and shortly afterwards was chosen cardinal. Subsequently he returned to Polund, where he resided as a a layman until the death of his brother, 20th November 1648, when he succeeded him on the throne. In Septem- ber 1668 he abdicated, after which he went to France, and became abbot of St Germains de Prés and of St Martin at Nevers. He died September 16, 1672. For the events of his unfortunate reign see PoLaNnD.

JOHN III. (1624-1696), Sobieski, king of Poland, son of Jakob Sobieski, castellan of Cracow, was born 2d June 1624, at Olesko in Galicia. He so distinguished himself in the defensive wars of Poland that in 1667 he received the supreme command of the army, and on the death of Michael Corybut was chosen king, 20th May 1674. He died June 17, 1696.

JOHN (JOAO) L (1357-1433), king of Portugal, the Kings of natural son of Pedro I. (el Justicieiro), was born at Lisbon Portugal. on April 22, 1357, and in 1364 was created grand-master of Aviz. On the death of his lawful brother Ferdinand L., without male issue, in October 1383, strenuous efforts were made in various quarters to secure the succession in the legitimate line for Beatrice, the only child of Ferdinand L, who as heiress apparent had been married to John I. of Castile ; but the popular voice declared decisively against an arrangement by which Portugal would virtually have become a Spanish province, and John was after violent tumults preclaimed protector and regent in the following December. In April 1385 he was unanimously chosen king by the estates of the realm at Coimbra, and the coronation took place some little time afterwards. The king of Castile resorted to arms on behalf of his wife, and invested Lisbon, but the besicging army was compelled by the ravages of a pestilence to withdraw, and subsequently by the decisive battle of Aljubarrota (14th August 1589)

the stability of John's throne was permanently secured. Hostilitics continued, however, with more or less of 'inter- ruption until the death of John of Castile, without leaving issue by Beatrice, in 1390; and even after that event rela- tions between the two countries continued to be strained.

In the meanwhile John went on consolidating the power of the crown at home and the influence of the nation abroad. In 1415 Ceuta was taken from the Moors by his sons who had been born to him by his wife Philippa, daughter of John, duke of Lancaster; specially dis- tinguished in the siege was Prince Henry, afterwards gene- rally known as "the Navigator," who in this and also in the following reign did so much to prepare the way for the position of colonial importance subsequently held by Portugal. Porto Santo and Madeira were occupied re- spectively in 1419 and 1420. John L, sometimes sur- named "the Great," and sometimes ' father of his country," died August 11, 1433, in the forty-eighth year of a reign which had been characterized by great prudence, ability, and success ; he was succeeded by his son Edward or Duarte, so named out of compliment to Edward IIL. of England.

JOHN II. (1455-1495), "the Perfect," king of Portugal, succeeded his father, Alphonso V., in August 1481. His first business after ascending the throne was to curtail with a vigorous hand the overgrown power of his aristocracy ; noteworthy incidents in the contest were the execution (in 1483) of the duke of Braganza for correspondence with

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Castile, and the murder, by the king's own hand, of the youthful duke of Viseu for conspiracy. This reign was signalized by Bartolommeo Dias's discovery of the Cape of Good Hope in 1486, and also by the equipment (1493) of a squadron for exploration of the new world recently discovered by Columbus. The latter proceeding led to disputes with Castile, until the claims of the disputants were adjusted by the famous treaty of Tordesillas (7th June 1494). John II. died, without

leaving male issue, in October 1495, and was succeeded by his brother-in-law Emmanuel (Manoel) I.

JOHN IIL. (1502-1557) of Portugal was born at Lisbon, June 6, 1502, and ascended the throne as successor of his father Emmanuel I. in December 1521. In 1524 he married Catherine, sister to the emperor Charles V., who in turn shortly afterwards married the infanta Isabella, John's sister. Succeeding to the crown at a time when Portugal was at the height of its political power, and Lisbon in a position of commercial importance previously unknown, John III, unfortunately for his dominions, yielded so far to the counsels of the clerical party among his subjects as to consent to the introduction of the Inquisi- tion (about 1526); this led to measures of tyranny and oppression which, notwithstanding the enactment of many wise laws, soon avenged themselves in disastrous conse- quences to the commercial and social prosperity of his king- dom. The conflicts in which Portugal engaged with the Moors and the Turks during his reign were comparatively unfruitful of results. He died of apoplexy on June 6, 1557, and was succeeded by his grandson Sebastian, then a child of only three years.

JOHN IV. (1603-1656), "the Fortunate," of Portugal, was born at Villaviciosa in March 1603, succeeded to the dukedom of Braganza in 1630, and married Luisa de Guzman, eldest daughter of the duke of Medina Sidonia, in 1633. By the unanimous voice of the people he was raised to the throne of Portugal (of which he was held to be the legitimate heir) at the revolution effected in December 1640 by a conspiracy of the nobles against the grievances inflicted by Spain and the insolence of Philip IV.'s minister, the duke of Olivarez. His accession ultimately led to a protracted war with Spain, of which the final issue—the recognized independence of Portugal—did not declare itself until a subsequent reign (1668). He died after a prosperous reign of sixteen years, on November 6, 1656, and was succeeded by his son Alphonso VI.

JOHN V. (1689-1750) of Portugal was born at Lisbon on October 22, 1689, and succeeded his father Pedro IT. on Deceniber 1706, being proclaimed on January 1, 1707. One of his first acts was to intimate his

adherence to the Grand Alliance, which his father had joined in 1703, and his resolution to take his full share in the war then in progress. Accordingly his general Das Minas, along with Lord Galway, advanced into Castile, but sustained the defeat of Almanza (14th April). In October 1708 he married Maria Anna, daughter of Leopold I, thus strengthening the alliance with Austria; the series of campaigns which ensued were equally unsuccessful with the first, but ultimately terminated in a favourable peace with France in 1713 and with Spain in 1715. The rest of his long reign presents no striking features, except that it was characterized by perfect subservience on his part to the clergy, the kingdom being administered by ecclesiastical persons and for ecclesiastical objects to an extent that gave him the best of rights to the title " Most Faithful King," bestowed upon him and his successcrs by a bull of pope Benedict XIV. in 1748. John V. died on July 31, 1750, and was succeeded by his son Joseph.

JOHN VI. (1769-1826) of Portugal was born at Lisbon May 13, 1769, and received the title of prince of Brazil in

1788. In 1792 he assumed the reins of government in name of his mother Queen Mary I., who had become insane. He himself having been brought up in an unhealthy ecclesi- astical atmosphere, and being naturally of a somewhat weak and helpless character, was but ill adapted for the responsibilities he was thus called on to undertake. In 1799 he assumed the title of regent, which he retained until his mother's death in 1816. The political relations of Portugal with England and France from the period of the first coalition against France in 1793 to the treaty of Fontainebleau (1807), by which the partition of .the first- named country was agreed upon, will be elsewhere explained (see PortucaL). In consequence of the latter treaty the prince of Brazil found it necessary to leave the kingdom (November 1807), and transfer the seat of his government to Rio Janeiro. The occupation and annexa- tion of the whole country immediately ensued ; against this he recorded his protest in November 1808, and in a more

practical manner by the seizure of French Guiana in the following year. He also entered into alliance with England in 1810, and was a party to the treaty of Paris in 1814, Jn 1816 he was recognized as king of Portugal on the death of Mary, but he continued to reside abroad ; the consequence was the spread of a feeling of natural dis- satisfaction, which resulted in the peaceful revolution of 1820, and the proclamation of a constitutional government, to which he swore fidelity on his return to Portugal in 1822. In the same year, and again in 1823, he had to suppress a rebellion led by his son Dom Miguel, whom he ultimately was compelled to banish in 1824. He died at Lisbon, March 26, 1826, and was succeeded by Pedro IV.

JOHN (1801-1873), king of Saxony, brother and suc- King of cessor of Frederick Augustus IL, and younger son of Duke Saxony.

Maximilian and Caroline of Parma, was born at Dresden 12th Deceniber 1801. In youth he showed a special bent towards mathematics, and he also studied with great dili- gence law and history. His interest in Italian literature having been awakened by a journey to Italy in 1821, lie in 1825 printed for private circulation, under the pseudonym of Philalethes, a metrical translation of a portion of Dante's Inferno, and in 1829 he published a complete translation of the Divine Comedy, with critical and historical notes. At an early age he also took an active part in political life. In 1821 he became a member of the college of finance, of which he was president from 1825 to 1831. From 1831 to 1846 he acted as commander of the national guards. On ascending the throne in 1854 he followed the same enlightened and liberal policy as his brother, and introduced several reforms of great benefit to the country. In tlie wars of 1866 he sided with Austria against Prussia, and on that account had to submit to the payment of a large sum of money and the cession of tle fortress of Kénigstein at the conclusion of peace. He, however, afterwards entered the North German federation, and his troops took a very prominent and distinguished part in the Franco- Prussian war of 1870-71. He died at Dresden, October

29, 1873.

JOHN (JUAN) I. (1350-1395), king of Aragon, was Spanish born December 27, 1350, and succeeded his father, Pedro kings.

IV., in 1387. He left the affairs of his kingdom toa large extent in the hands of his wife Yolande, a granddaughter of John the Good, king of France, while he himself led a life of pleasure and inglorious ease. A characteristic feature of his reign was the encouragement he gave to the poetical institutions of the troubadours, a "'consistory of the Gaya Sciencia" having been founded at Barcelona under his auspices in 1390. In that year he repelled an attack by the count of Armagnac, who had laid claim to the domains in Majorea previously in possession of his family ; and in 1392 he quelled a revolt of the Sardinians.

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He died in 1395, in consequence of an accident on the hunting field, and was succeeded by his brother Martin.

JOHN II. (1397-1479), king of Aragon from 1458, was the younger son of Ferdinand I. (the Just), and was born June 29, 1397. He was twice married,—first to Blanche, daughter of Charles III. of Navarre, by whom he had three children (Carlos, heir to the crowns of Navarre and Aragon; Blanche, for some time the wife of Henry IV. of Castile; and Eleanor, wife of Gaston, count of Foix) ; and afterwards (in 1447) to Joanna Henriquez, of the blood-royal of Castile, by whom he became the father of Ferdinand V. (the Catholic). For a long tine he acted as lieutenant-general in Aragon for his brother Alphonso V., whom business detained in his Neapolitan dominions ; in this capacity he intervened frequently in the affairs of Castile, where his weak and inexperienced kinsman John II. occupied the throne, and on one occasion (1444) he invaded that kingdom, but was defeated at Olmedo. On his second marriage he irritated his son Carlos and the community by sending his queen Joanna to share the administration of Navarre with his son; in the revolt which ensued victory declared for John, Carlos himself being reduced to captivity (1452), in which he was detained for many months. In May 1458 John succeeded his brother in Aragon, Sicily, and Sardinia; but the influence of Joanna Henriquez prevented him from recognizing the legitimate claims of his own eldest

son to the reversion ; an attempt by Carlos to obtain support in other quarters led to his arrest and imprisonment, from which he was released only after Catalonia had risen in arms and the king of Castile had begun an irruption into Navarre. Shortly after this temporary triumph Carlos was carried off by a fever in September 1461, bequeathing the crown of Navarre to his sister Blanche and her posterity. Ferdinaud, the half-brother of Carlos, was now put forward as heir apparent of the Aragonese throne, but the indignant Catalouians raised a revolt which did not come to an end until December 1472. Immediately afterwards John entered upon a war with Louis XI. of France in con- sequence of disputes about Roussillon and Cerdagne ; first successful, but afterwards worsted, this bold and energetic but ambitious and unjust prince died January 20, 1479, before the conclusion of the peace. He was succeeded by Ferdinand V.

JOHN (JUAN) I. 1358-1390), king of Castile and Leon, born in August 1358, was the son of Henry II. ("Kl Bastardo"), whom he succeeded in 1379. At his accession the Lancasterian claims to the throne of Castile were renewed, and gained the support of Portugal; the result was a war with the latter power, which ended in a marriage (1382) between John and the Portuguese infanta. The peace thus ratified did not subsist long, for, ou the death of Ferdinand of Portugal in the following year with- out male issue, John sought to establish a claim to the succession on behalf of his wife, and crossing the frontier penetrated as far as to Lisbon, to which he began to lay siege while Jolin, the grand-master of Aviz, was being proclaimed king. Compelled by pestilence and other un- favourable circumstances to withdraw, he encountered the Portuguese in the neighbourhood of Aljubarrota in August of 1385; the disastrous defeat he there sustained was followed by a descent of Jolin of Gaunt, duke of Lancaster (July 1386), which led to the conclusion of the peace of Troncoso (1387), in virtue of which the constantly recur- ring disputes about the crown were settled by the marriage of the crown prince Henry to Catherine, the representative of the Lancasterian claims, The last four years of the reign of John were marked by important legislative re- forms in the town brotherhoods (hermandades), in the army, and in the system of taxation. In 1390 he was

killed by a fall from his horse, and was succeeded by his son Henry III.

JOHN II. (1404-1454) of Castile and Leon, grandson of the preceding, succeeded to the throne when only twenty-two months old. Until 1412 the regency was shared with his mother Catherine by his uncle Ferdinand (afterwards Ferdinand IV. of Aragon) ; this period was marked by much internal prosperity and by important conquests from the Moors, especially by the capture of Antequera. Unfortunately for Castile, Ferdinand was called away (in 1412) to occupy the throne of Aragon ; but it was not until after the death of Catherine in 1418 that John's weakness and incapacity came to be fully seen. Abandoning himself recklessly to a life of frivolous pleasure, he left the affairs of his kingdom in the hands of a few favourites, such as the archbishop of Toledo and Juan de Velasco. From 1423 onwards he was the tool principally of Alvaro de Luna, a brilliant, ambitious, and crafty courtier. Henceforward the history of his reign is largely a record of the internal commotions, rising sometimes to the height of civil war, occasioned by the nobles' jealousy of Alvaro, and by the oppressions to which the commou people were exposed under the absolutist policy of that minister. The period of John II. is chiefly and most favourably remembered in connexion with the history of Castilian literature: a man of some literary turn himself, he was a liberal patron of letters; and his countenance gave an impulse to refinement and culture of literary style, the effects of which were distinctly traceable through several subsequent generations. By his first wife John II. became the father of Henry IV., his successor; the daughter of a second marriage was Isabella, afterwards known as "the Catholic." He died in June 1454.

daughter of a well-to-do citizen of Ratisbon. He was bern in that free imperial city (according to a not very probable tradition in the "imperial hostelry" there, which still sur- vives as the inn of the Golden Cross), on February 24, 1545, the anniversary of his father's birth and coronation, and of the battle of Pavia. On another visit to Ratisbon in the following year, after arranging a marriage between the fair

Barbara and one of his German courtiers, Hiero- uymus Piramis Kegell, the emperor carried off the young Geronimo, as he was then conveniently called. The worthy Don Luis de Quijada, to whose care he was here- upon confided, watched over his early childhood with jealous care. It was at first sought to conceal the con- nexion between the emperor and the child of his declining years, who was brought up in retirement, chiefly in Quijada's castle of Villagarcia in Spain. In the year before the emperor's death, however, the boy was brought into the immediate neighbourhood of San Yuste, where his presence brightened the close of his father's life. In his last will Charles V. acknowledged " Geronimo" as his son, and commended him to the care of his successors, expressing a wish that he should take monastic vows, but that in the event of his declining these a handsome income should be provided for him out of the revenues of Naples.

In September 1559 the boy was publicly recognized by king Philip II. as his brother; and henceforth he resided at court under the name of Don Juan d'Austria as a member of the royal family. With the heir to the throne, the unhappy Don Carlos, his relations were so friendly that, when at the end of the year 1567 the.infante was plotting his flight from Spain, he confided his more or less treasonable scheme to his half-brother, and even requested the latter to accompany him on his expedition. A sense of duty, at which it is difficult to cavil, prompted Don | Jolin to reveal this unsought confidence to the king, and

JOHN, Don, of Austria (1545-1578), was the bastard Don

son of the emperor Charles V. by Barbara Blomberg, the ee of Ustria.

thus he helped to bring about the fatal catastrophe, as it |

proved, of the imprisonment of Don Carlos.

It was not the habit of Philip II. to allow those who served him to choose their own seasons and methods of doing so. The impetuous Don John, whom the king would have preferred to see a monk, had in 1565

been refused permission to serve in the fleet ordered to sail for the relief of Malta ; and an express royal command had been needed to bring him back when on the point of making the voyage on his own account. His obedience was rewarded when in 1568 he was appointed to the great office of capitan general dela mar. His first actual service, however, was by land, and ofa kind unattractive to any but the genuine Spanish blood. In 1569 he was charged with a task, the execution of which the captain-general of Granada, the mar- quis of Mondejar, had begun, but was unwilling relent- lessly to complete. The reformation of the converted Moriscoes had come to mean the suppression of the remnants of their national as well as religious hfe; and after the insurrection of Aben Humeya had been overcome, the wholesale deportation of all the Moriscoes from their habitations was decreed, and executed on All Saints' Day 1570. Don John cannot be held responsible either for the cruelty of this ordinance, or for the general policy of the war, which from the time when the jealousy of the king had allowed him to take the field, instead of remaining at Granada, he had carried on with vigour and skill. The capture of Guejar had been his first deed of arms (December 1569); it had been followed by that of Galera; and in August 1570 the Alpujarras mountains were cleared of the Moriscoes, of whom more than 10,000 are said to have been killed or captured in the space of a single month.

Before long a nobler crusade engaged the energy of the obedient and successful commander. Philip IIL, though he was during nearly the whole of his reign engaged in hostilities with the Turks, had hitherto displayed no great vigour in resisting their still unceasing inroads upon the domain of Christendom. His fleet had for the time saved Malta; but Cyprus was torn by the infidel from the Venetians without his having offered timely co-operation for its defence (1571); and the barbarous proceedings of the conquerors had filled Europe with horror and shame. Not even the waters of the Adriatic were secure from the Turkish vessels, and the league which shortly before the loss of Cyprus papal diplomacy had succeeded in knitting between Spain, Venice, and Rome, and which purported to aim at the extinction of tle Mahometan power, had as yet remained a dead letter. At length the forces of the allies— 208 galleys, 6 galeases, and a number of smaller craft, with

more than 20,000 Spanish, German, and Italian soldiers on board— assembled at Messina. Don John of Austria had been named admiral of the league, with power (granted at the request of Pope Pius V.) of free action after consultation with his captains and the Venetian commander. Thus the day of Lepanto was in every sense his own, though it was his good fortune that the Turks had under- estimated his numbers, which were in truth little inferior to theirs. The Christian victory was complete. Only forty of the Turkish vessels effected their escape, the rest being burnt or captured; and 35,000 of their men were slain or captured, while 15,000 Christian galley-slaves were released. At Constantinople apprehensions were even entertained of an immediate attack on the part of the victors. The battle of Lepanto (October 7, 1571) was, as Itanke observes, like that of Actium, a decisive historic struggle between West and East; and the ecstatic joy which it inspired was shared by all Christian Europe. Bunt though, on receiving the great news of a success which seemed in its momentousness to surpass any of his father's

achievements, Philip II. had vowed to carry on this |

Christian war, jealousy between the allies wasted thie immediate fruits of the victory, and the by no means remotely possible consequences of an active Franco-Turkish alliance inclined the king of Spain to keep his brother inactive in Sicily. Soon the ever vigilant suspicions of Philip were aroused by information which he received— partly from the candid Don John himself—as to the visions which (instigated by the inveterate papal habit of giving away kingdoms before they had been conquered) suggested tlemselves to the restless imagination of the hero of Lepanto., At one time Albania and the Morea entreated him to reign over them, after he should have previonsly freed them from the Turkish yoke ; next, Rhodes besought the aid of his invincible arm for the work of its liberation. Meanwhile, after the Turks had brought together another fleet, he was unable to force them to accept another battle at Navarino (September 1572); and soon afterwards Venice, by con- cluding a separate treaty of peace with the sultan, put an end to the league which had been victorious at Lepanto. Spain was by herself no

match for the Turkish power; and though in 1573 Don John captured Tunis, it was speedily recaptured in the following year.

Although unable to obtain from his brother even so much as the title of an infante of Spain, the ardent spirit of Don John had continued to indulge in wild dreams of a kingdom to be erected by him for himself in those regions which he had successfully disputed with the infidel ; and, after suppressing a momentary hankering after the crown of France which the death of Charles IX. had excited, he had solicited the good offices of pope Gregory XIII. towards his establishment as king of Tunis. The pope, however, had destined him for higher things. As yet King Philip had shrunk from taking up the cause of Rome's unfortunate daughter, held captive in heretic England. Might not a share in the throne of three northern kingdoms tempt Don John to become the hero of a second and more rewardful crusade 4

In the midst of schemes and dreams such as these Don John was summoned by King Philip to an office which might seem to bring him near to the accomplishment of the most glorious of them all. He was appointed (in 1576) to the government of the Netherlands, vacant by the death of Requesens. The administration of the latter had not been intended to introduce any radical cliange into the system of his predecessor Alva ; his military operations had been only partially successful; and the pacification of Ghent (October 1576), concluded since his death, had greatly improved the prospects of William of Orange and tlre insurrection. The magic of Don John's name, and the loyal energy of which he had given proof, were to recover what had been lost; and he was willing to undertake a task the accomplishment of which might lead to higher tasks beyond. He was, however, now brought into conflict with an adversary of a very different calibre from his own. He showed himself willing to consent to the demand of the dismissal of the Spanish troops from the Netherlands, hoping to be able to employ them in a descent upon England. William of Orange, by warning Queen Elizabeth of these designs, secured not only her goodwill, but the rarer proof of it in the shape of a sum of money, and at home drew still tighter the alliance established by the Ghent pacification. Hereupon Don John found himself obliged to grant the

perpetual edict (February 1577) which in accordance with the pacification dismissed the Spanish troops designed by him for the conquest of England, and held his entry into Brussels (May 1st) amidst popular acclamations. In secret, however, he was counselling and preparing a renewal of the war; and before the end of the summer he took Namur by a stratagem, The answer was the proclamation of Orange as protector of Brabant, and

the nomination as governor-general of the archduke Matthias, under whom Orange continued to hold the actual supremacy, while Don John's control was almost entirely confined to the south-western part of the Netherlands. He now (January 1578) declared war against the insurgent provinces, and the dismissed Spanish troops were soon with other forces reassembling under his standard. A large army brought from Lombardy by Alexander Farnese, prince of Parma (Don John's nephew), raised the Spanish forces to a virtual equality in numbers with those of their opponents ; and Farnese's victory of Gemblours (January 31, 1578) hopefully opened the campaign. an open question whether the aid of France (which appeared to be warranted by the arrival with an army of the duke of Anjou, the " protector" of the liberties of the Netherlands), together with the money of England and the men of the

Palatinate, would suffice to make the cause of freedom |

prevail against the determination of Philip, the ambitious devotion of Don John, and the military genius of Alexander Farnese. On the other hand, it seemed doubtiul whether

the disunion among Philip's adversaries would weaken them |

more than his parsimony and suspicion vexed the soul and crippled the energies of his brother.

shortly before escaped the dagger of an English assassin (a Catholic refugee, who had hoped by the act to secure the pardon of the queen),

Don John succumbed to a sudden illness at Namur on October 1, 1578.

inexplicable, suspicion accused King Philip of having by poison brought about the death of a half-brother whose action his jealousy and distrust of all the world except himself had thwarted after Gemblours as after Lepanto. The settlement of the Netherlands, after whatever fashion Don John might have accomplished it, was a harder task than any he ever executed; and the subjection of heretic England to the authority of a Catholic queen seems to posterity a dream more marvellous than were even the actual glories of Lepanto. But his life, which spanned but little more than thirty-three years, was the reverse of an empty or an ignoble one, and though it was full of imperfections and disappointments, yet its enthusiasm shines forth even under the cold shade spread over it by the fraternal jealousy of a Philip II.

The only modern monograph on the life of Don John of Austria is that by Professor W. Havemann (Gotha, 1865), which ecorreets some of Motley's vivacities. For the rebellion of the Moriseoes and the battle of Lepanto see Prescott's Reign of Philip IT., and Forneron's Histoire de Philippe IT. (vols. i. and ii., Paris, 1880);

for the battle, see also Ranke's Die Osmanen u. die Spanische Monarehie (4th ed., 1877). (A. W. W.)

ft OHN or Damascus. See Damascenvs, vol vi. p.

JOHN or Gaunt. See Lancaster, DUKE oF.

JOHN, Sz, or Nepomux, or Pomux (c. 1330-1393), the patron saint of Bohemia, was born at Pomuk about 1330. After studying at the university of Prague he took holy orders and was for some time a priest in the diocese of Prague. In 1372 he is mentioned as imperial notary ; in 1380 he became rector of the church of St Gall in Prague, and notary and secretary of the archbishop ; and in 1381 he was made doctor of canon law and canon of the metro- politan chapter. He appears to have taken an important part as adviser or supporter of the archbishop John of Janstein in his disputes with King Wenceslaus, and on this account, after suffering cruel torture, he was drowned in the Moldau.

The chief events of his life were afterwards adorned with a variety of legends, and in 1729 he was canonized by Benedict XIII An annual procession in his honour takes place at Prague on May 16. See Abel, Die Legende vom St Johann von Nepomuk, Berlin, 1855.

It remained |

Such was the situation | when Don John was removed by death. After having |

An altogether | unwarranted, but under the circumstances far from |

JOHN

JOIIN oF Satispury (c. 1115-1180), a distinguished writer of the 12th century, was born at Salisbury in Wiltshire between the years 1110 and 1120. Frota the cognomen Parvus, which he applies to himself, and from the fact that he was of Saxon, not of Norman race, it may be inferred that his name was Short, or Small, or Little. Few details are known regarding his early life or rank in society; but from his own statements it is gathered that he crossed to France about the year 1131, and began regular studies jn Paris under Abelard, who had there for a brief period reopened his famous school on Mont St Genevieve. After Abelard's retirement, John carried on his studies under Alberich, Robert of Melun, and Robert Pulleyn. Three years he spent at the great school of Chartres, mainly under William of Conches, though it would seem that he had been a pupil of the founder of the school, Bernard Silvester. Bernard's teaching was distin- guished partly by its pronounced Platonic tendency, partly by the stress laid upon literary study of the greater Latin writers ; and the influence of the latter feature is noticeable in all John of Salisbury's works. Returning to Paris, he spent some years there, partly as teacher, partly as pupil of Adam de Ponto Parvo and Gilbert de la Porrée. Whether he attended any of the teachers of the Victorin school is uncertain, but his mode of thinking in theological subjects bears unmistakable traces of the peculiar views of these writers. Probably in the year 1147 or 1148 he crossed to England, with a letter of recommendation from Peter of Celli to Theobald, archbishop of Canterbury. For thirteen years he acted as secretary to Theobald, and was frequently ambassador from the English primate to the papal see. During this time he composed his greatest works, published almost certainly in 1159, the Policraticus, sive de Nugis Curialium et de Vestigiis Philosophorum and the Meta- logicus, writings invaluable as storehouses of information regarding the matter and form of scholastic education, and remarkable for their

cultured literary style and humanist tendency. After the death of Theobald in 1061, John continued to occupy the post of secretary to his successor, the famous chancellor Thomas Becket, and took an active part in the long disputes between the primate and his sovereign, Henry II. His letters are of great value for the light they throw upon the obscure course of the consti- tutional struggle then agitating the English world. With Becket he withdrew to France during the king's displea- sure; he returned with him in 1169, and was present at his assassination in 1170. In the following years, during which he continued in an influential situation in Canter- bury, but at what precise date is unknown, he drew up the ' Infe of St Thomas & Becket, and somewhat later the Life of St Anselm. In 1176 he was made bishop of Chartres, where he passed the remainder of his life. The date of his death has been variously given as 1182, 1181, or 1180; the strongest reasons are in favonr of the last.

John's writings are not in any strict sense philosophical, but they give much information regarding the general currents of thinking at the time, and enable us to under- stand with much completeness the literary and scientific position of the 12th century. So far as his own views are concerned, they are such as one might expect from a | cultured intelligence well versed in practical affairs. His doctrine, on the whole, is a kind of a utilitarianism, with a strong leaning, on the side of speculative questions, to the modified, literary scepticism of Cicero. For Cicero, indeed, he has unbounded admiration, and his Latin style, unusually excellent when compared with the average Latinity of the scholastic writers, is evidently moulded on that of Cicero. The remarkable feature of his writings, apart from their value as giving information respecting studies in the 12th | century, is their strongly marked humanist tendency. To

some extent this iscommon to John and to his predecessors in the school of Chartres, but no other writer seems to have possessed so extensive and competent an acquaintance with the great works of Latin classical literature. Of Greek writers he appears to have known nothing

at first hand, and very little in translations. The Z%meus of Plato in the Latin version of Chalcidius was known to hin as to his contemporaries and predecessors, and probably he had access to translations of the Phedo and Meno, Of Aris- totle he possessed, in Latin version, the whole of the Organon ; he is, indeed, the first of the medisval writers of note to whom the whole was known. Of other Aris- totelian writings he appears to have known nothing.

The Policraticus scems first to have becn printed in 1476, in folio; a quarto reprint reappeared in 1513, and an octavo in the same year, but from different MS. sources; the most common edition is that of 1639. ‘The Afetalogicus was first printed in 1610; the best known edition is that of 1639. The ZLntheticus, or more correctly Nuthcticus, was first printed in 1843 by C. Petersen. The collected editions of the works are by J. A. Giles, 5 vols., Oxford, 1848, and by Migne, in the Patrologiz Cursus, vol. 199,—neither accurate, The most complete study of John of Salisbury is the monograph by Schaarschmidt, Johannes Sarisherienis nach Leben und Studien, Schrificn und Philosophie, which is a model of accurate and com- plete workmanship.

JOHN, Prester. See Prester Jonny.

JOHNSON, Anprew (1808-1875), seventeenth pre- sident of the United States, was born in Raleigh, North Carolina, December 29, 1808. His youth was passed in

such poverty that it was not till during his apprenticeship |

as tailor that he learned to read. His wife taught him to write and cipher after their marriage. Settling in Green- ville, Tennessee, he worked at lis trade, and in 1828 began to take an active part in politics, organizing a working man’s party, by which he was elected to several local offices. He served in the State legislature ; from 18438 till 1853 he was member of Congress; in 1853, and again in 1855, he was elected governor of Tennessee; and in 1857 he took his seat as United States senator from Tennessee. His independence procured him prominence in the senate. In opposition to the general policy of the Democratic party, whose nominee he was, he ardently supported the homestead bill; and,

though in the important presidential election of 1860 he had supported Breckenridge and Lane, the candi- dates of the southern wing of the Democratic party, yet, when Lincoln was elected, Johnson made a strong speech in the senate, denouncing secession, and pledging himself to unconditional support of the Union. This loyalty to the Union subjected him to grave personal danger from the secessionists of Tennessee, when he returned to the State to organize a Union party. In 1862 Lincoln appointed Johnson military governor of Tennessee, a post of difficulty and danger, in which he displayed an amount of energy and ability in dealing with the secessionists that attracted attention in the north, and led to his nomination for the vice-presidency by the Republican convention of 1864, which nominated Lincoln for the presidency. When, a few weeks after his inauguration, the assassination of Lincoln, on April 14, 1865, made Johnson president, his vigorous denunciation of treason as “a crime that must be punished” placed him for a time high in public favour. The rest of his term of office was spent in dissension with Congress as to the conditions upon which the seceding States should be allowed to return to the Union. Johnson vetoed bill after bill ; but Congress passed them over his veto. In August 1866 the president, attended by members of his cabinet, ade a tour through several of the northern and western States, denouncing the action of Congress as rebellious, and appealing to the people to support him. But at the congressional elections of that year the policy of Congress was endorsed by large majorities. The conflict became still more bitter, and was at last brought to a crisis

| impediment.

by the president’s attempts to remove secretary Stanton from office, after the senate had refused its approval. The Republicans in Congress claimed that Johnson had violated the tenure of office law, and on Febrnary 24, 1868, the House of Representatives passed a resolution impeaching him for high crimes and misdemeanours. At the trial before the senate the articles of impeachment were not sustained, A two-thirds majority was necessary for con- viction; and thirty-five voted ““‘guilty,” nineteen “not guilty.” On March 4, 1869, Johnson was succeeded in the presidency by U. 8. Grant. Retiring to Greenville, he

immediately prepared to re-enter public life; and in January 1875 he was elected United States senator. He died July 31, 1875.

JOHNSON, Samven (1709-1784), one of the most eminent English writers of the 18th century, was the son of Michael Johnson, who was, at the beginning of that century, a magistrate of Lichfield, and a bookseller of great note in the midland counties. Michael's abilities and attainments seem to have been considerable. He was so well acquainted with the contents of the volumes which he exposed to sale that the country rectors of Staffordshire and Worcestershire thought him an oracle on points of learning. Between him and the clergy, indeed, there was a strong religious and political sympathy. He was a zealous churchman, and, though he had qualified himself for municipal office by taking the oaths to the sovereigns in possession, was to the last a Jacobite in heart. At his house, a house which is still pointed out to every traveller who visits Lichfield, Samuel was born on the 18th of September 1709. Inthe child the physical, intellectual, and moral peculiarities which afterwards distinguished the man were plainly discernible: great muscular strength accompanied by much awkwardness and many infirmities ; great quickness of parts, with a morbid propensity to sloth and procrastination; a kind and generous heart, with a gloomy and irritable temper. He had inherited from his ancestors a scrofulous taint, which it was beyond the power of medicine to remove. His parents were weak enough to believe that the royal touch was a specific for this malady. In his third year he was taken up to London, inspected by the court surgeon, prayed over by the court chaplains, and stroked and presented with a piece of gold by Queen Anne. One of his earliest recollections was that of a stately lady ina diamond stomacher and a long black hood. Her hand was applied in vain. The boy's features, which were originally noble and not irregular, were distorted by his malady. His checks were deeply scarred. He lost for a time the sight of one eye ; and he saw but very imperfectly with the other. But the force of his mind overcame every Indolent as he was, he acquired knowledge with such ease and rapidity that at every school to which he was sent he was soon the best scholar. From sixteen to eighteen he resided at home, and was left to his own devices. He learned much at this time, though his studies were without guidance and

without plan. He ransacked his father's shelves, dipped into a multitude of books, read what was interesting, aud passed over what was dull. An ordinary lad would have acquired little or no useful know- ledge in such a way; but much that was dull to ordinary lads was interesting to Samuel. He read little Greek ; for his proficiency in that language was not such that he could take much pleasure in the masters of Attic poetry and eloquence. But he had left school a good Latinist, and he soon acquired, in the large and miscellaneous library of which he now had the command, an extensive knowledge of Latin literature. That Augnstan delicacy of taste which is the boast of the great public schools of England le never possessed. But he was early familiar with some classical writers who were quite unknown to the best

scholars in the sixth form at Eton. He was peculiarly attracted by the works of the great restorers of learning. Once, while searching for some apples, he found a huge folio volume of Petrarch's works. 'The name excited his curiosity, aud he eagerly devoured hundreds of pages. Indeed, the diction and versification of his own Latin com- positions show that he had paid at least as mucli attention to modern copies from the antique as to the original models.

While he was thus irregularly educating himself, his family was sinking into hopeless poverty. Old Michael Johnson was much better qualified to pore upon books, and to talk about them, than to trade in them. His busi- ness declined; his debts increased; it was with difficulty that the daily expenses of his household were defrayed. It was out of his power to support his son at either university ; but a wealthy neighbour offered assistance ; and, in reliance on promises which proved to be of very little value, Samuel was entered at Pembroke College, Oxford. When the young scholar presented himself to the rulers of that society, they were amazed not more by his ungainly figure and eccentric manners than by the quantity of extensive and curious information which he had picked up during many months of desultory but not unprofitable study. On the first day of his residence he surprised his teachers by quoting

Macrobius ; and one of the most learned among them declared that he had never known a freshman of equal attainments.

At Oxford Johnson resided during about three years. He was poor, even to raggedness; and his appearance excited a mirth and a pity which were equally intolerable to his haughty spirit. He wasdriven from the quadrangle of Christ Church by the sneering looks which the members of that aristocratical society cast at the holes in his shoes. Some charitable person placed a new pair at his door; but he spurned them away ina fury. Distress made him, not servile, but reckless and ungovernable. No opulent gentle- man commoner, panting for one-and-twenty, could have treated the academical authorities with more gross dis- respect. The needy scholar was generally to be seen under the gate of Pembroke, a gate now adorned with his effigy, haranguing a circle of lads, over whom, in spite of his tattered gown aud dirty linen, his wit and audacity gave him an undisputed ascendency. In every mutiny against the discipline of the college he was the ringleader. Much was pardoned, however, to a youth so highly distinguished by abilities and acquirements. He had early made himself known by turning Pope's Messiah into Latin verse. The style and rhythm, indeed, were not exactly Virgilian ; but the translation found many admirers, and was read with pleasure by Pope himself.

The time drew near at which Johnson would, in the ordinary course of things, have become a bachelor of arts; but he was at the end of his resources. Those promises of support on which he had relied had not been kept. His family could do nothing for him. His debts to Oxford tradesinen were small indeed, yet larger than he could pay. In the autumn of 1731 he was under the necessity of quit- ting the university without a degree. In the following winter his father died. The old man left but a pittance ; and of that pittance almost the whole was appropriated to the support of his widow. The property to which Samuel succeeded amounted to no more than twenty pounds.

His life, during the thirty years which followed, was one hard struggle with poverty. The misery of that struggle needed no aggravation, but was aggravated by the suffer- ings of an unsound body and an unsound

mind. Before the young man left the university, his hereditary malady had broken forth in a singularly cruel form. He had become an incurable hypochondriac. He said long after

that he had been mad all his life, or at least not perfectly sane; and, in truth, eccentricities less strange than lis have often been thought ground sufficient for absolving felons, and for setting aside wills. His grimaces, lis gestures, his mutterings, sometimes diverted and sonie-times terrified people who did not know him. Ata dinner table he would, in a fit of absence, stoop down and twitch off a lady's shoe. He would amaze a drawing-room by suddenly ejaculating a clause of the Lord's Prayer. He would conceive an unintelligible aversion to a particular alley, and perform a great circuit rather than see the hate-ful place. He would set his heart on touching every post in the streets through which he walked. If by any chance he missed a post, he would go back a hundred yards and repair the omission. Under the influence of his discase, his senses became morbidly torpid, and lus imagination morbidly active. At one time he would stand poring on the town clock without being able to tell the hour. At another he would distinctly hear his mother, who was many miles off, calling him by his name. But this was not the worst. A deep melancholy took possession of him, and gave a dark tinge to all his views of human nature and of human destiny. Such wretchedness as he endured has driven many men to shoot themselves or drown themselves. But he was under no temptation to commit suicide. He was sick of hfe; but he was afraid of death; and he shuddered at every sight or sound which reminded him of the inevitable hour. In religion he found but little comfort during his long and frequent fits of dejcction ; for his religion partook of his own character. The light from heaven shone on him indeed, but not in a direct line, or with its own pure splendour. The rays had to struggle through a disturbing medium ; they reached him refracted, dulled, and discoloured by the thick gloom which had settled on his soul, and, though they might be sufficiently clear to guide him, were too dim to cheer him.

With such infirmities of body and of mind, this celebrated man was left, at two-and-twenty, to fight his way through the world. He remained during about five years in the midland counties. At Lichfield, his birthplace and his early home, he had inherited some friends and acquired others. He was kindly noticed by Henry Hervey, a gay officer of noble family, who happened to be quartered there. Gilbert Walmesley, registrar of the ecclesiastical court of the diocese, a man of distinguished parts, learning, and knowledge of the world, did himself honour by patronizing the young adventurer, whose repulsive person, unpolished manners, and squalid garb moved many of the petty aristocracy of the neighbourhood to laughter or to disgust. At Lichfield, however, Johnson could find no way of earn- ing a livelihood. He became usher of a grammar school in Leicestershire ; he resided as a humble companion in the house of a country gentleman ; but a life of dependence was insupportable to his haughty spirit. He repaired to Birmingham, and there earned a few guineas by literary drudgery. In that town he printed a translation, little noticed at the time, and long forgotten, of a Latin book about Abyssinia. He then put forth proposals for publish- ing by subscription the poems of Politian, with notes con- taining a history of modern Latin verse ; but subscriptions did not come in, and the volume never appeared.

While leading this vagrant and miserable life, Johnson fellin love. The object of his passion was Mrs Elizabeth Porter, a widow who had children as old as himself. To ordinary spectators the lady appeared to be a short, fat, coarse woman, painted half an inch thick, dressed in gaudy colours, and fond of exhibiting provincial airs and graces which were not exactly those of the Queensberrys aud Lepels. To Johnson, however, whose passions were

strong, whose eyesight was too weak to distinguish cerse

from natural bloom, and who had seldom or never been in the same room with a woman of real fashion, his Titty, as he called her, was the most beautiful, graceful, and accom- plished of her sex. That his admiration was unfeigned cannot be doubted ; for she was as poor as

himself. She accepted, with a readiness which did her little honour, the addresses of a suitor who might have been her son. The marriage, however, in spite of occasional wranglings, proved happier than might have been expected. The lover con- tinued to be under the illusions of the wedding-day till the lady died in her sixty-fourth year. On her monument he placed an inscription extolling the charms of her person and of her manners ; and when, long after her decease, he had occasion to mention her, he exclaimed with a tender- ness half ludicrous half pathetic, “ Pretty creature !”

His marriage made it-necessary for him to exert himself more strenuously than he had hitherto done. He took a house in the neighbourhood of his native town, and ad- vertized for pupils. But eighteen months passed away, and only three pupils came to his academy. Indeed, his appearance was so strange, and his temper so violent, that his schoolroom must have resembled an ogre’s den. Nor was the tawdry painted grandmother whom he called his Titty well qualified to make provision for the comfort of young gentlemen. David Garrick, who was one of the pupils, used, many years later, to throw the best company of London into convulsions of laughter by mimicking the enfdearments of this extraordinary pair.

At length Johnson, in the twenty-eighth year of his age, determined to seek his fortune in the capital as a literary adventurer. He set out with a few guineas, three acts of the tragedy of Zrene in manuscript, and two or three letters of introduction from his friend Walmesley. Never since literature became a calling in England had it been a less gainful calling than at the time when Johnson took up his residence in London. In the preceding generation a writer of eminent merit was sure to be munificently rewarded by the Government. The least that he could expect was a pension or a sinecure place ; and, if he showed any aptitude for politics, he might hope to be a member of parliament, a lord of the treasury, an ambassador, a secretary of state. It would be easy, on the other hand, to name several writers of the 19th century of whom the least successful has received forty thousand pounds from the booksellers. But Johnson entered on his vocation in the most dreary part of the dreary interval which separated two ages of prosperity.

Literature had ceased to flourish under the patronage of the great, and had not begun to flourish under the patronage of the public. One man of letters, indeed, Pope, had acquired by his pen what was then considered as a hand- some fortune, and lived on a footing of equality with nobles and ministers of state. But this was a solitary exception. Even an author whose reputation was established, and whose works were popular—such an author as Thomson, whose Seasons were in every library, such an author as Fielding, whose Pasguin had had a greater run than any drama since The Beggar's Opera—was sometimes glad to obtain, by pawning his best coat, the means of dining on tripe at a cookshop underground, where he could wipe his hands, after his greasy meal, on the back of a Newfoundland dog. It is easy, therefore, to imagine what humiliations and privations must have awaited the novice who had still toearna name, One of the publishers to whom Johnson applied for employment measured with a scornful eye that athletic though uncouth frame, and exclaimed, ' You had better get a porter's knot, and carry trunks." Nor was the advice bad, for a porter was likely to be as plentifully fed, and as comfortably lodged, as a poet.

Some time appears to have elapsed before Johnson was able to form any literary connexion from which he could

expect more than bread for the day which was passing over him. He never forgot the generosity with which Hervey, who was now residing in London, relieved his wants during this time of trial. "Harry Hervey," said the old philosopher many years later, " was a vicious man ; but he was very kind to me, If you call a dog Hervey, I shall love him." At Hervey's table Johnson sometimes enjoyed feasts which were made more agreeable by contrast. But in general he dined, and thought that he dined well, on sixpennyworth of meat and a pennyworth of bread at an alehouse near Drury Lane.

The effect of the privations and sufferings which he endured at this time was discernible to the last in his temper and his deportment. His manners had never been courtly. They now became almost savage.

Being fre- quently under the necessity of wearing shabby coats and dirty shirts, he became a confirmed sloven. Being often very hungry when he sat down to his meals, he contracted a habit of eating with ravenous greediness. Even to the end of his life, and even at the tables of the great, the sight of food affected him as it affects wild beasts and birds of prey. His taste in cookery, formed in subterranean ordi- naries and @ la mode beefshops, was far from delicate. Whenever he was so fortunate as to have near him a hare that had been kept too long, or a meat pie made with rancid butter, he gorged himself with such violence that his veins swelled and the moisture broke out on his fore- head. The affronts which his poverty emboldened stupid and low-minded men to offer to him would have broken a mean spirit into sycophancy, but made him rude even to ferocity. Unhappily the insolence which, while it was defensive, was pardonable, and in some sense respectable, accompanied him into societies where he was treated with courtesy and kindness. He was repeatedly provoked into striking those who had taken liberties with him. All the sufferers, however, were wise enough to abstain from talking about their beatings, except Osborne, the most rapacious and brutal of booksellers, who proclaimed everywhere that he had been knocked down by the huge fellow whom he lad hired to puff the Harleian Library.

About a year after Johnson had begun to reside in London he was fortunate enough to obtain regular employ- ment from Cave, an enterprising and intelligent bookseller, who was proprietor and editor of the Gentleman's Magazine. That journal, just entering on the ninth year of its long existence, was the only periodical work in the kingdom which then had what would now be called a large circula- tion. It was, indeed, the chief source of parliamentary intelligence. It was not then safe, even during a recess, to publish an account of the proceedings of either House without some disguise. Cave, however, ventured to enter- tain his readers with what he called 'Reports of the Debates of the Senate of Lilliput." France was Blefuscu ; London was Mildendo ; pounds were sprugs ; the duke of Newcastle was the Nardac secretary of state ; Lord Hard- wicke was the Hurgo Hickrad ; and William Pulteney was Wingul Pulnub. To write the speeches was, during several years, the business of Johnson. Ho was generally furnished with notes,

meagre indeed, and inaccurate, of what had been said; but sometimes he had to find arguments and eloquence both for the ministry and for the opposition. He was himself a Tory, not from rational conviction—for his serious opinion was that one form of government was just as good or as bad as another—but from mere passion, such as inflamed the Capulets against the Montagues, or the Blues of the Roman circus against the Greens. In his infancy he had heard so much talk about the villanies of the Whigs, and the dangers of the church, that he had become a furious partisan when he could scarcely speak. Before he was three he had insisted on being taken to hear

Sacheverel preach at Lichfield cathedral, and had listened to the sermon with as niuch respect, and probably with as much intelligence, as any Staffordshire squire in the con- gregation. 'The work which had been begun in the nursery had been completed by the university. Oxford, when Johnson resided there, was the most Jacobitical place in England; and Pembroke was one of the most Jacobitical colleges in Oxford. The prejudices which he brought up to London were scarcely less absurd than those of his own Tom Tempest. Charles II. and Jaines II. were two of the best kings that ever reigned. Laud, a poor creature who never did, said, or wrote any thing indicating more than the ordinary capacity of an old woman, was a prodigy of parts and learning over whose tomb Art and Genius still continued to weep. Hampden deserved no more honour- able name than that of "the zealot of rebellion." Even the ship money, condemned not less decidedly by Falkland aud Clarendon than by the bitterest Roundheads, Johnson would not pronounce to have been an unconstitutional impost. Under a Government the mildest that had ever been known in the world, under a Government which allowed to the people an unprecedented liberty of speech and action, he fancied that he wasa slave ; he assailed the ministry with obloquy which refuted itself, and regretted the lost freedom and happiness of those golden days in which a writer who had taken but one-tenth part of the licence allowed to him would have been

pilloried, mangled with the shears, whipped at the cart's tail, and flung into a noisome dungeon to die. He hated dissenters and stock- jobbers, the excise and the army, septennial parliaments, and Continental connexions. He long had an aversion to the Scotch, an aversion of which he could not remember the commencement, but which, he owned, had probably originated in his abhorrence of the conduct of the nation during the Great Rebellion. It is easy to guess in what manner debates on great party questions were likely to be reported by a man whose judgment was so much disordered by party spirit. A show of fairness was indeed necessary to the prosperity of the Magazine. But Johnson long afterwards owned that, though he had saved appearances, he had taken care that the Whig dogs should not have the best of it; and, in fact, every passage which has lived, every passage which bears the marks of his higher faculties, is put into the mouth of some member of the opposition. A few weeks after Johnson had entered on these obscure labours, lic published a work which at once placed him high among the writers of his age. It is probable that what he had suffered during his first year in London had often reminded him of some parts of that noble poem in which Juvenal had described the misery and degradation of a needy man of letters, lodged among the pigeons' nests in the tottering garrets which overhung the streets of Rome. Pope's admirable imitations of Horace's Sattres and Epistles had recently appeared, were in every hand, and were by many readers thought superior to the originals. What Pope had done for Horace, Johnson aspired to do for Juvenal. The enterprise was bold, and yet judicious, For between Johnson and Juvenal there was much in common, much more certainly than between Pope and Horace. Johnson's London appeared without his name in May 1738. He received only ten guineas for this stately and vigorous poem; but the sale was rapid, and the success complete. A second edition was required within a week. Those small critics who are always desirous to lower estab- lished reputations ran about proclaiming that – the anonymous satirist was superior to Pope in Pope's own peculiar department of literature. It ought to be remenibered, to the honour of Pope, that he joined heartily in the applause with which the appearance of a rival genius was welcomed, He made inquiries about the author of

London. Such a man, he said, could not long be concealed. The name was soon discovered; and Pope, with great kindness, exerted himself to obtain an academical degree and the mastership of a grammar school for the poor young poet. The attempt failed, and Johnson remained a book- seller's hack.

It does not appear that these two men, the most eminent writer of the generation which was going out, and the most eminent writer of the generation which was coming in, ever saw each other. They lived in very different circles, one surrounded by dukes and earls, the other by starving pam- phleteers and indexmakers. Among Johnson's associates at this time may be mentioned Boyse, who, when his shirts were pledged, scrawled Latin verses sitting up in bed with his arms through two holes in his blanket, who composed very respectable sacred poetry when he was sober, and who was at last run over by a hackney coach when he was drunk ; Hoole, surnamed the metaphysical tailor, who, instead of attending to his measures, used to trace geome- trical diagrams on the board where he sat cross-legged ; and the penitent impostor, George Psalmanazar, who, after poring all day, in a humble lodging, on the folios of Jewish rabbis and Christian fathers, indulged himself at night with literary and theological conversation at an alehouse in the city. But the most remarkable of the persons with whom at this time Johnson consorted was Richard Savage, an carl's son, a shoemaker's apprentice, who had seen life in all its forms, who had feasted among blue ribands in Saint James's Square, and had lain with fifty pounds weight of irons on his legs in the condemned ward of Newgate. This man had, after many vicissitudes of fortune, sunk at last into abject and hopeless poverty. His pen had failed him. His patrons had been taken away by death, or estranged by the riotous profusion with which he squandered. their bounty, and the ungrateful insolence with which he rejected their advice. He now lived by begging. He dined on venison and champagne whenever he had been so fortunate as to borrow a guinea. If his questing had been unsue- cessful, he appeased the rage of hunger with some scraps of broken meat, and lay down to rest under the piazza of Covent Garden in warm weather, and, in cold

weather, as near as he could get to the furnace of a glass house. Yet, in his misery, he was still an agreeable companion. He had an inexhaustible store of anecdotes about that gay and brilliant world from which he was now an outcast. He had observed the great men of both parties in hours of careless relaxation, had seen the leaders of opposition with- out the mask of patriotism, and had heard the prime minister roar with laughter and tell stories not over-decent. During some months Savage lived in the closest familiarity with Johnson; and then the friends parted, not without tears. Johnson remained in London to drudge for Cave. Savage went to the west of England, lived there as he had lived everywhere, and in 1743 died, penniless and heart- broken, in Bristol jail.

Soon after his death, while the public curiosity was strongly excited about his extraordinary character and his not less extraordinary adventures, a life of him appeared widely different from the catchpenny lives of eminent men which were then a staple article of manufacture in Grub Street. The style was indeed deficient in ease and variety ; and the writer was evidently too partial to the Latin element of our language. But the little work, with all its faults, was a masterpiece. No finer specimen of literary biography existed in any language, living or dead ; and a discerning critic might have confidently predicted that the author was destined to be the founder of a new school of English eloquence. :

The Life of Savage was anonymous; but it was well known in literary circles that Johnson was the writer.

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During the three years which followed, he produced no important work ; but he was not, and indecd could not be, idle. The fame of his abilities and learning continued to grow. Warburton pronounced him a man of parts and genius; and the praise of Warburton was then no light thing. Such was Johnson's reputation that, in 1747, several eminent booksellers combined to employ him in the arduous work of preparing a Dictronary of the English Language, in two folio volumes. The sum which they agreed to pay him was only fifteen hundred guineas; and

out of this sum he had to pay several poor men of letters who assisted him in the humbler parts of his task.

The prospectus of the Dictionary he addressed to the earl of Chesterfield. Chesterfield had long been celebrated for the politeness of his manners, the brilliancy of his wit, and the delicacy of his taste. He was acknowledged to be the finest speaker in the House of Lords. He had recently governed Ireland, at a momentous conjuncture, with eminent firmness, wisdom, and humanity ; and he had since become secretary of state. He received Johnson's homage with the most winning affability, and requited it with a few guineas, bestowed doubtless in a very graceful manner, but was by no means desirous to see all his carpets blackened with the London mud, and his soups and wines thrown to right and left over the gowns of fine ladies and the waistcoats of fine gentlemen, by an absent, awkward scholar, who gave strange starts and uttered strange growls, who dressed like a scarecrow, and ate hke a cormorant. During some time Johnson continued to call on his patron, but, after being repeatedly told by the porter that his lordship was not at home, took the hint, and ceased to present himself at the inhospitable door.

Johnson had flattered himself that he should have completed his Dictionary by the end of 1750; but it was not till 1755 that he at length gave his huge volumes to the world. During the seven years which he passed in the drudgery of penning definitions and marking quotations for transcription, he sought for relaxation in literary labour of a more agreeable kind. In 1749 he published the Vanity of Human Wishes, an excellent imita- tion of the tenth satire of Juvenal. It is in truth not easy to say whether the palm belongs to the ancient or to the modern poet. The couplets in which the fall of Wolsey is described, though lofty and sonorous, are feeble when com- pared with the wonderful lines which bring before us all Rome in tumult on the day of the fall of Sejanus, the laurels on the doorposts, the white bull stalking towards the Capitol, the statues rolling down from their pedestals, the flatterers of the disgraced minister running to see him dragged with a hook through the streets, and to have a kick at his carcase before it is hurled into the Tiber. It must be owned too that in the concluding passage the

Christian moralist has not made the most of his advantages, and has fallen decidedly short of the sublimity of his pagan model. On the other hand, Juvenal's Hannibal must yield to Johnson's Charles ; and Johnson's vigorous and pathetic enumeration of the miseries of a literary life must be allowed to be superior to Juvenal's lamentation over the fate of Demosthenes and Cicero. For the copyright of the Vanity of Human Wishes Johnson received only fifteen guineas, ;

A few days after the publication of this poem, his tragedy, begun many years before, was brought on the stage. His pupil, David Garrick, had in 1741 made his appearance on a humble stage in Goodman's Fields, had at once risen to the first place among actors, and was now, after several years of almost uninterrupted success, manager of Drury Lane Theatre. The relation between him and his old preceptor was of a very singular kind. They repelled each other strongly, and yet attracted each other

strongly. Nature had made them of very different clay ; and circumstances had fully brought out the natural peculiarities of both. Sudden prosperity had turned Garrick'shead. Continued adversity had soured Johngon's temper. Johnson saw with more envy than became so great a man the villa, theplate, the china, the Brussels carpet, which the little mimic had got by repeating, with grimaces and gesticulations, what wiser men had written ; and the exquisitely sensitive vanity of Garrick was galled by the thought that, while all the rest of the world was applauding him, he could obtain from one morose cynic, whose opinion it was impossible to despise, scarcely any compliment not acidulated with scorn. Yet the two Lichfield men had so many early recollections in common, and sympathized with each other on so many points on which they sympathized with nobody else in the vast population of the capital, that, though the master was often provoked by the monkey-like impertinence of the pupil, and the pupil by the bearish rudeness of the master, they remained friends till they were parted by death. Garrick now brought Jrene out, with alterations sufficient to displease the author, yet not sufficient to make the piece pleasing to the audience. The public, however, listened, with little emotion, but with much civility, to five acts of monotonous

declamation. After nine representations the play was withdrawn. It is, indeed, altogether unsuited to the stage, and, even when perused in the closet, will be found hardly worthy of the author. He had not the slightest notion of what blank verse should be. A change in the last syllable of every other line would make the ver- sification of the Vanity of Human Wishes closely resemble the versification of Jrene. The poet, however, cleared, by his benefit nights, and by the sale of the copyright of his tragedy, about three hundred pounds, then a great sum in his estimation.

About a year after the representation of Zrene, he began to publish a series of short essays on morals, manners, and literature. This species of composition had been brought into fashion by the success of the Tatler, and by the still more brilliant success of the Spectator. A crowd of small writers had vainly attempted to rival Addison. The Lay Monastery, the Censor, the Freethinker, the Plain Dealer, the Champion, and other works of the same kind had had their short day. None of them had obtained a permanent place in our litcrature; and they are now to be found only in the libraries of the curious. At length Johnson undertook the adventure in which so many aspirants had failed. In the thirty-sixth year after the appearance of the last number of the Spectator appeared the first number of the Rambler. From March 1750 to March 1752 this paper continued to come out every Tuesday and Saturday.

From the first the eambler was enthusiastically admired by a few eminent men. Richardson, when only five numbers had appeared, pronounced it equal if not superior to the Spectator. Young and Hartley expressed their approbation not less warmly. Bubb Dodington, among whose many faults indifference to the claims of genius and learning cannot be reckoned, solicited the acquaintance of the writer. In consequence probably of the good offices of Dodington, who was then the confidential adviser of Prince Frederick, two of his royal highness's gentlemen carried a gracious message to the printing office, and ordered seven copies for Leicester House. But these overtures seem to have been very coldly received. Johnson had had enough of the

patronage of the great to last him all his life, and was not disposed to haunt any other door as he had haunted the door of Chesterfield.

By the public the Rambler was at first very coldly received. Though the price of a number was only two-

pence, the sale did not amount to five hundred. profits were therefore very small. But as soon as the fly- ing leaves were collected and reprinted they became popular. The author lived to see thirteen thousand copies spread over England alone. Separate editions were published for the Scotch and Irish markets. A large party pronounced the style perfect, so absolutely perfect that in some essays it would be impossible for the writer himself to alter a single word for the better. Another party, not less numerous, veheniently accused him of having corrupted the purity of the English tongue. The best critics admitted that his diction was too monotonous, too obviously artificial, and now and then turgid even to absurdity. But they did justice to the acuteness of his observations on morals and manners, to the constant precision and frequent brilliancy of his language, to the weighty and magnificent eloquence of many serious passages, and to the solemn yet pleasing humour of some of the lighter papers. On the question of precedence between Addison and Johnson, a question which, seventy years ago, was much disputed, posterity has pronounced a decision from which there is no appeal. Sir Roger, lis chaplain, and his butler, Will Wimble and Will Honeycomb, the " Vision of Mirza," the " Journal of the Retired Citizen," the " Everlasting Club," the " Dun- mow Flitch,' the "Loves of Hilpah and Shalum," the "Visit to the Exchange," and the "Visit to the Abbey" are known toeverybody. But many men and women, even of highly cultivated minds, are unacquainted with Squire Bluster and Mrs Busy, Quisquilius and Venustulus, the " Allegory of Wit and Learning," the "Chronicle of the Revolutions of a Garret," and the sad fate of Aningait and Ajut.

The last Rambler was written ina sad and gloomy hour. Mrs Johnson had been given over by the physicians. Three days later she died. She left her husband almost broken- hearted. Many people had been

surprised to see a man of luis genius and learning stooping to every drudgery, and denying himself almost every comfort, for the purpose of supplying a silly, affected old woman with superfluities, which she accepted with but little gratitude. But all his affection had been coucentrated on her. He had neither brother nor sister, neither son nor daughter. To him she was beautiful as the Gunnings, and witty as Lady Mary. Her opinion of his writings was more important to him than the voice of the pit of Drury Lane Theatre, or the judgment of the Monthly Review. The chief support which had sustained him through the most arduous labour of his life was the lope that she would enjoy the fame and the profit which he anticipated from his Déctionary. She was gone; and in that vast labyrinth of streets, peopled by eight hundred thousand hunian beings, he was alone. Yet it was necessary for him to set himself, as he expressed it, doggedly to work. After three more laborious years, the Dictionary was at length complete.

It had been generally supposed that this great work would be dedicated to the eloquent and accomplished nobleman to whom the prospectus had been addressed. He well knew the value of such a compliment ; and there- fore, when the day of publication drew near, he exerted himself to soothe, by a show of zealous and at the same time of delicate and judicious kindness, the pride which he had so cruelly wounded. Since the Ramblers had ceased to appear, the town had been entertained by a journal called the World, to which many men of high rank and fashion contributed. In two successive numbers of the World, the Dictionary was, to use the modern phrase, puffed with wonderful skill, The writings of Johnson were warmly praised. It was proposed that he should be invested with the authority of a dictator, nay, of a pope, over our language, and that his decisions about the meaning and

The | the spelling of words should be received as final.

JOHNSON

His two folios, it was said, would of course be bought by everybody who could afford to buy them. It was soon known that these papers were written by Chesterfield. But the just resentment of Jolinson was not to be so appeased. Ina letter written with singular energy and dignity of

thought and language, he repelled the tardy advances of his patron. The Dictionary came forth without a dedication, In the preface the author truly declared that he owed nothing to the great, and described the difficulties with which he had been left to struggle so forcibly and pathetically that the ablest and most malevolent of all the enemies of his fame, Horne Tooke, never could read that passage without tears.

The public, on this occasion, did Johnson full justice, and something more than justice. The best lexicographer may well be content if his productions are received by the world with cold esteem. But Johnson's Dictionary was hailed with an enthusiasm such as no similar work has ever excited. It was indeed the first dictionary which could be read with pleasure. The definitions show so inuch acute- ness of thought and command of language, and the passages quoted from poets, divines, and philosophers are so skil- fully selected, that a leisure hour may always be very agreeably spent in turning over the pages. The faults of the book resolve themselves, for the most part, into one great fault. Johnson was a wretched etymologist. He knew little or nothing of any Teutonic language except English, which indeed, as he wrote it, was scarcely a Teutonic language; and thus he was absolutely at the mercy of Junius and Skinner.

The Dictionary, though it raised Johnson's fame, added nothing to his pecuniary means. The fifteen hundred guineas which the booksellers had agreed to pay him had been advanced and spent before the last sheets issued from the press. It is painful to relate that twice in the course of the year which followed the publication of this great work he was arrested and carried to spunging-houses, and that he was twice indebted for his liberty to his excellent friend Richardson. It was still necessary for the man who had been formally saluted by the highest authority as dictator of the English language to supply his wants by constant toil. He abridged his Dictionary. He proposed to bring out an edition of Shakespeare by subscription, and many subscribers sent in their names and laid down their money; but he soon found the task so little to his taste that he turned to more attractive employments. He con- tributed many papers to a new monthly journal, which was called the Literary Magazine. Few of these papers have much interest ; but

among them was the very best thing that he ever wrote, a masterpiece both of reasoning and of satirical pleasantry, the review of Jenyns's Jnguiry into the Nature and Origin of Evil.

In the spring of 1758 Johnson put forth the first of a series of essays, entitled the /d/er. During two years these essays continued to appear weekly. 'They were eagerly read, widely circulated, and indeed impudently pirated, while they were still in the original form, and had a large sale when collected into volumes. The /d/er may be described as a second part of the Rambler, somewhat livelier and somewhat weaker than the first part.

While Johnson was busied with his /dlers, his mother, who had accomplished her ninetieth year, died at Lichfield. It was long since he had seen her, but he had not failed to contribute largely out of his small means to her comfort. In order to defray the charges of her funeral, and to pay some debts which she had left, he wrote a little book in a single week, and sent off the sheets to the press without reading them over. A hundred pounds were paid him for the copyright, and the purchasers had great cause to be pleased with their bargain, for the book was Lasselas.

1OCHN SOR

The success of Lasselas was great, though such ladies as Miss Lydia Languish must have been grievously dis- appointed when they found that the new volume from the circulating library was little more than a dissertation on the author's favourite theme, the " vanity of human wishes ;" that the prince of Abyssinia was witliout a mistress, and the princess without a lover; and that the story set the hero and the heroine down exactly where it had taken them up. The style was the subject of much eager controversy. The Afonthly Review andthe Critical Review took different sides. Many readers pronounced the writer a pompous pedant, who would never use a word of two syllables where it was possible to use a word of six, and who could not make a waiting woman relate her adventures without balancing every noun with another noun, and every epithet with another epithet. Another party, not less zealous, cited with delight numerous passages in which weighty meaning was

expressed with accuracy and illustrated with splendour. And both the censure and the praise were merited.

About the plan of Rasselas little was said by the critics ; and yet the faults of the plan might seem to invite severe criticism, Johnson has frequently blamed Shakespeare for neglecting the proprieties of time and place, and for ascrib- ing to one age or nation the manners and opinions of another. Yet Shakespeare has not sinned in this way more greviously than Johnson. asselas and Imlac, Nekayah and fPekuali, are evidently meant to be Abyssinians of the 18th century; for the Europe which Imlac describes is the Europe of the 18th century, and the inmates of the Happy Valley talk familiarly of that law of gravitation which Newton discovered, and which was not fully received even at Cambridge till the 18th century. Whatareal company of Abyssinians would have been may be learned from Bruce's Travels. But Johnson, not content with turning filthy savages, ignorant of their letters, and gorged with raw steaks cut from living cows, into philosophers as eloquent and enlightened as himself or his friend Burke, and into ladies as highly accomplished as Mrs Lennox or Mrs Sheridan, transferred the whole domestic system of England to Egypt. Into a land of harems, a land of polygamy, a land where women are married without ever being seen, he introduced the flirta- tions and jealousies of our ball-rooms. In a land where there is boundless liberty of divorce, wedlock is described as the indissoluble compact. 'A youth and maiden meet- ing by chance, or brought together by artifice, exchange glances, reciprocate civilities, go home, and dream of each other. Such," says Rasselas, "is the common process of marriage." Such it may have been, and may still be, in London, but assuredly not at Cairo. A writer who was guilty of such improprieties had little right to blame the poet who made Hector quote Aristotle, and represented Julio Romano as flourishing in the days of the oracle of Delphi.

By such exertions as have been described Johnson supported himself till the year 1762. In that year a great change in his circumstances took place. He had from a child been an enemy of the reigning dynasty. His Jacobite prejudices had been exhibited with little disguise both in his works and in his conversation. Even in his massy and elaborate

Dictionary he had, with a strange want of taste and judgment, inserted bitter and contumelious reflexions on the Whig party. The excise, which was a favourite resource of Whig financiers, he had designated as a hateful tax. He had railed against the commissioners of excise in language so coarse that they had seriously thought of prosecuting him. He had with difficulty been prevented from holding up the lord privy seal by name as an example of the meaning of the word "renegade." A pension he

had defined as pay given to a state hireling to betray his country ; a pensioner as a slave of state hired by a stipend to obey a master. It seemed unlikely that the author of these definitions would himself be pensioned. But that was a time of wonders. George III. had ascended the throne, and had, in the course of a few months, disgusted many of the old friends, and conciliated many of the old enemies of his house. The city was becoming mutinous ; Oxford was becoming loyal, Cavendishes and Bentincks were murmuring ; Somersets and Wyndhams were hasten- ing to kiss hands. The head of the treasury was now Lord Bute, who was a Tory, and could have no objection to Johnson's Toryism. Bute wished to be thought a patron of men of letters; and Johnson was one of the most eminent and one of the most needy men of letters in Europe. A pension of three hundred a year was graciously offered, and with very little hesitation accepted.

This event produced a change in Johnson's whole way of life. For the first time since his boyhood he no longer felt the daily goad urging him to the daily toil. He was at liberty, after thirty years of anxiety and drudgery, to indulge his constitutional indolence, to lie in bed till two in the afternoon, and to sit up talking till four in the morning, without fearing either the printer's devil or the sheriff's officer.

One laborious task indeed he had bound himself to perform. He had received large subscriptions for his promised edition of Shakespeare; he had lived on those subscriptions during some years; and he could not without disgrace omit to perform his part of the contract. His friends repeatedly exhorted him to make an effort, and he repeatedly

resolved to do so. But, notwithstanding their exhortations and his resolutions, month followed month, year followed year, and nothing was done. He prayed fervently against his idleness; he determined, as often as he received the sacrament, that he would no longer doze away and trifle away his time; but the spell under which he lay resisted prayer and sacrament. His private notes at this time are made up of self-reproaches. ‘ My indolence,” he wrote on Easter eve in 1764, “has sunk into grosser sluggishness. A kind of strange oblivion has overspread me, 50 that I know not what has become of the last year.” Easter 1765 came, and found him still in the same state. “My time,” he wrote, “has been unprofitably spent, and seems as a dream that has left nothing behind. My memory grows confused, and I know not how the days pass over me.” Happily for his honour, the charm which held him captive was at length broken by no gentle or friendly hand. He had been weak enough to pay serious attention to a story about a ghost which haunted a house in Cock Lane, and had actually gone himself, with some of his friends, at one in the morning, to St John’s Church, Clerkenwell, in the hope of receiving a communication from the perturbed spirit. But the spirit, though adjured with all solemnity, remained obstinately silent; and it soon appeared that a naughty girl of eleven had been amusing herself by making fools of so many philosophers. Churchill, who, confident in his powers, drunk with popularity, and burning with party spirit, was looking for some man of established fame and Tory politics to insult, celebrated the Cock Lane ghost in three cantos, nicknamed Johnson Pomposo, asked where the book was which had been so long promised and so liberally paid for, and directly accused the great moralist of cheating. This terrible word proved effectual, and in October 1765 appeared, after a delay of nine years, the new édition of Shakespeare.

This publication saved Johnson’s character for honesty, but added nothing to the fame of his abilities and learning. The preface, though it contains some good passages, is not in his best manner. ‘The most valuable notes are those in

which he had an opportunity of showing how attentively he had during many years observed human life and human nature. The best specimen is the note on the character of Polonius. Nothing so good is to be found even in Wilhelm Meister's admirable examination of JZamlet. But here praise must end. It would be difficult to name a more slovenly, a more worthless edition of any great classic. The reader may turn over play after play without finding one happy conjectural emendation, or one ingenious and satisfactory explanation of a passage which had bafiled preceding commentators. Johnson had, in his prospectus, told the world that he was peculiarly fitted for the task which he had undertaken, because he had, as a lextco- grapher, been under the necessity of taking a wider view of the English language than any of his predecessors. That his knowledge of our literature was extensive is indisputable. But, unfortunately, he had altogether neglected that very part of our literature with which it is especially desirable that an editor of Shakespeare should be conversant. It is dangerous to assert a negative. Yet little will be risked by the assertion that in the two folio volumes of the Znglish Dictionary there is not a single passage quoted from any dramatist of the Elizabethan age, except Shakespeare and Ben Jonson. Even from Ben the quotations are few. Johnson might easily in a few months have made himself well acquainted with every old play that was extant. But it never seems to have occurred to him that this was a necessary preparation for the work which he had undertaken. He would doubtless have admitted that it would be the height of absurdity in a man who was not familiar with the works of Auschylus and Euripides to publish an edition of Sophocles. Yet he ventured to publish an edition of Shakespeare, without having ever in his life, as far as can be discovered, read a single scene of Massinger, Ford, Dekker, Webster, Marlow, Beaumont, or Fletcher. His detractors were noisy and scurrilous. Those who most loved and honoured him had little to say in praise of the manner in which he had dis- charged the duty of a commentator. He had, however, acquitted himself of a debt which had long lain heavy on his conscience, and he sank back into the repose from which the sting of satire had roused him. He long continued to live upon the fame which he had already won. He was honoured by the university of Oxford with a doctor's degree, by the Royal Academy with a professorsliip, and by the king with an

interview, in which his Majesty most graciously expressed a hope that so excellent a writer would not cease to write. In the interval, however, between 1765 and 1775 Johnson published only two or three political tracts, the longest of which be could have produced in forty-eight hours, if he had worked as he worked on the Life of Savage and on Rasselas.

But, though his pen was now idle, his tongue was active, The influence exercised by his conversation, directly upon those with whom he lived, and indirectly on the whole literary world, was altogether without a parallel. His colloquial talents were indeed of the highest order. He had strong sense, quick discernment, wit, humour, immense knowledge of literature and of life, and an infinite store of curious anecdotes. As respected style, he spoke far better than he wrote. Every sentence which dropped from his lips was as correct in structure as the most nicely balanced period of the Lambler. But in his talk there were no pompous triads, and little more than a fair proportion of words in -ostty and -ation. All was simplicity, ease, and vigour. He uttered his short, weighty, and pointed sentences with a power of voice, and a justness and energy of emphasis, of which the effect was rather increased than diminished by the rollings of his huge form, and by the

eloquence generally ended. Nor did the laziness which made him unwilling to sit down to his desk prevent him from giving instruction or entertainment orally. To discuss questions of taste, of learning, of casuistry, in language so exact and so forcible that it might have been printed without the alteration of a word, was to him no exertion, but a pleasure. He loved, as he said, to fold his legs and have his talk out. He was ready to bestow the overflowings of his full mind on anybody who would start a subject, on a fellow-passenger in a stage coach, or on the person who sat at the same table with him in an eating-house. But his conversation was nowhere so brilliant and striking as when he was surrounded by a few friends, whose abilities and knowledge enabled them, as he once expressed it, to send him back every ball that he threw. Some of these, in 1764, formed themselves into a club, which

gradually became a formidable power in the commonwealth of letters, The verdicts pronounced by this conclave on new books were speedily known over all London, and were sufficient to sell off a whole edition in a day, or to condemn the sheets to the service of the trunkmaker and the pastrycook. Nor shall we think this strange when we consider what great and various talents and acquirements met in the little fraternity. Goldsmith was the representative of poetry and light literature, Reynolds of the arts, Burke of political eloquence and political philosophy. There, too, were Gibbon the greatest historian and Jones the greatest linguist of the age. Garrick brought to the meetings his inexhaustible pleasantry, his incomparable mimicry, and his consummate knowledge of stage effect. Among the most constant attendants were two high-born and high-bred gentlemen, closely bound together by friendship, but of widely different characters and habits,—Bennet Langton, distinguished by his skill in Greek literature, by the orthodoxy of his opinions, and by the sanctity of his life, and Topham Beauclerk, renowned for his amours, his knowledge of the gay world, his fastidious taste, and his sarcastic wit. To predominate over such a society was not easy. Yet even over such a society Johnson predominated. Burke might indeed have disputed the supremacy to which others were under the necessity of submitting. But Burke, though not generally a very patient listener, was content to take the second part when Johnson was present; and the club itself, consisting of so many eminent men, is to this day popularly designated as Johnson's club.

Among the members of this celebrated body was one to whom it has owed the greater part of its celebrity, yet who was regarded with little respect by his brethren, and had not without difficulty obtained a seat among them. This was James Boswell, a young Scotch lawyer, heir to an honourable name and a fair estate. That he was a coxcomb and a bore, weak, vain, pushing, curious, garrulous, was obvious to all who were acquainted with him. That he could not reason, that he had no wit, no humour, no eloquence, is apparent from his writings. And yet his writings are read beyond the Mississippi, and under the Southern Cross, and are likely to be read as long as the English exists either as a living or as a dead language. Nature had made him a slave and an

idolater. His mind resembled those creepers which the botanists call parasites, and which can subsist only by clinging round the stems and imbibing the juices of stronger plants, He must have fastened himself on somebody. He might have fastened himself on Wilkes, and have become the fiercest patriot in the Bill of Rights Society. He might have fastened him- self on Whitfield, and have become the loudest field-preacher among the Calvinistic Methodists. Ina happy hour he fastened himself on Johnson. The pair might

asthmatic gaspings and puffings in which the peals of his | seem ill-matched. For Johnson had early been prejudiced

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against Boswell's country. 'To a man of Jolinson's strong understanding and irritable temper, the silly egotism and adulation of Boswell must have beeu as teasing as the constant buzz of a fly. Johnson hated to be questioned ; and Boswell was eternally catechizing him on all kinds of subjects, and sometimes propounded such questions as, "What would you do, sir, if you were locked up in a tower with a baby?" Johnson was a water drinker and Boswell was a Winebibber, and indeed little better than an habitual sot. It was impossible that there should be perfect harmony between two such companions. Indeed, the great man was sometimes provoked into fits of passion, in which he said things which the small man, during a few hours, seriously resented. Every quarrel, however, was soonmade up. During twenty years the disciple continued to worship the master; the master continued to scold the disciple, to sneer at him, and to love him. The two friends ordinarily resided at a great distance from each other. Boswell practised in the Parliament House of Edinburgh, and could pay only occasional visits to London. During those visits his chief business was to watch Johnson, to discover all Johnson's habits, to turn the conversation to subjects about which Johnson was likely to say something remarkable, and to fill quarto notebooks with minutes of what Johnson had said. In this way were gathered the materials out of which was afterwards constructed the most interesting biographical work in the world.

Soon after the club began to exist, Johnson formed a connexion less important indeed to his fame, but much more important to his happiness, than his connexion with Roswell. Henry Thrale, one of the most opulent brewers in the kingdom, a man of sound and cultivated understand- ing, rigid principles, and liberal spirit, was married to one of those clever, kind-hearted, engaging, vain, pert young women, who are perpetually doing or saying what is not exactly right, but who, do or say what they may, are always agreeable. In1765 the Thrales became acquainted with Johnson, and the acquaintance ripened fast into friend- ship. They were astonished and delighted by the brilliancy of his conversation. They were flattered by finding that a man so widely celebrated preferred their house to any other in London. Even the peculiarities which seemed to unfit him for civilized society, his gesticulations, his rollings, lis puffings, his mutterings, the strange way in which he put on his clothes, the ravenous eagerness with which he devoured his dinner, lis fits of melancholy, his fits of anger, his frequent rudeness, his occasional ferocity, increased the interest which his new associates took in him. Yor these things were the cruel marks left behind by a life which had been one Jong conflict with disease and with adversity. In a vulgar hack writer such oddities would have excited only disgust. But in a man of genius, learn- ing, and virtue their effect was to add pity to admiration and esteem. Johnson soon had an apartment at the brewery in Southwark, and a still more pleasant apartment at the villa of his friends on Streatham Common. A large part of every year he passed in those abodes, abodes which must have seemed magnificent and luxurious indeed, when compared with the dens in which he had generally been lodged. But his chief pleasures were derived from what the astronomer of his Abyssinian tale called " the endearing elegance of female friendship." Mrs Thrale rallied him, soothed him, coaxed him, and, if she sometimes provoked him by her flippancy, made amiple amends by listening to his reproofs with angelic sweetness of temper. When he

was diseased in body and in mind, she was the most tender

of nurses. No comfort that wealth could purchase, no contrivance that womanly ingenuity, set to work by womanly compassion, could devise,

was wanting to his sick room. He requited her kindness by an affection pure

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as the affection of a father, yet delicately tiuged witha gallantry which, though awkward, must lave been more flattering than the attentions of a crowd of the fools who gloried in the names, now obsolete, of Buck and Maccaroni. It would seem that a full half of Johnson's life during about sixteen years was passed under the roof of the Thrales. He accompanied the family sometimes to Bath, and sometimes to Brighton, once to Wales and once to Paris. But he had at the same time a house in one of the narrow and gloomy courts on the north of Fleet Street. In the garrets was his library, a large and miscellaneous collection of books, falling to pieces and begrimed with dust. On a lower floor he sometimes, but very rarely, regaled a friend with a plain dinner—a veal pie, or a leg of Jamb and spinach, and a rice pudding. Nor was the dwelling uninhabited during his long absences. It was the home of the most extraordinary assemblage of inmates that ever was brought together. At the head of the estab- lishment Johnson had placed an old lady named Williams, whose chief recommendations were her blindness and her poverty. But,in spite of her murmurs and reproaches, he gave an asylum to another lady who was as poor as herself, Mrs Desmoulins, whose family he had known many years before in Staffordshire. Room was found for the daughter of Mrs Desmoulins, and for another destitute damsel, who was generally addressed as Miss Carmichael, but whom her generous host called Polly. An old quack doctor named Levett, who bled and dosed coal-heavers and hackney coachmen, and received for fees crusts of bread, bits of bacon, glasses of gin, and sometimes a little copper, com- pleted this strange menagerie. All these poor creatures were at constant war with each other, and with Johnson's negro servant Frank. Sometimes, indeed, they transferred their hostilities from the servant to the master, complained that a better table was not kept for them, and railed or maundered till their benefactor was glad to make his escape to Streatham, or to the Mitre Tavern. And yet he, who was generally the haughtiest and most irritable of mankind, who was but too prompt to resent anything which

looked like a slight on the part of a purse-prond bookseller, or of a noble and powerful patron, bore patiently from mendi- cants, who, but for his bounty, must have gone to the workhouse, insults more provoking than those for which he had knocked down Osborne and bidden defiance to Chesterfield. Year after year Mrs Williams and Mrs Desmoulins, Polly and Levett, continued to torment him and to live upon him.

The course of life which has ~~been described was inter~~ rupted in Johnson's sixty-fourth year by an important event. He had early read an account of the Hebrides, and had been much interested by learning that there was so near him a land peopled by a race which was still as rude and simple as in the Middle Ages. A wish to become intimately acquainted with a state of society so utterly unlike all that he had ever seen frequently crossed his mind. But itis not probable that his curiosity would have overcome his habitual sluggishness, and his love of the smoke, the: mud, and the cries of London, had not Boswell importuned him to attempt the adventure, and offered to be his squire. At length, in August 1773, Johnson crossed the Highland line, and plunged courageously into what was then considered, by most Englishmen, as a dreary and perilous wilderness. After wandering about two months through the Celtic region, sometimes in rude boats which did not protect him from the rain, and sometimes on small shaggy ponys which could hardly bear his weight, he returned to his old haunts with a mind full of new images and new theories. During the following year he employed himself in recording his adventures. About the beginning of 1775 his Journey to the Hebrides was published, and

was, during some weeks, the chief subject of conversation in all circles in which any attention was paid to literature. The book is still read with pleasure. The narrative is entertaining ; the speculatious, whether sound or unsound, are always ingenious; and the style, though too stiff and pompous, is somewhat easier and more graceful than that of his early writings. His prejudice against the Scotch had at length become little more than matter of jest; and whatever remained of the old

feeling had been effectually removed by the kind and respectful hospitality with which he had been received in every part of Scotland. It was, of course, not to be expected that an Oxonian Tory should praise the Presbyterian polity and ritual, or that an eye accustomed to the hedgerows and parks of England should not be struck by the bareness of Berwickshire and East Lothian. But even in censure Johnson's tone is not uufriendly. The most enlightened Scotchmen, with Lord Mansfield at their head, were well pleased. But some foolish and ignorant Scotchmen were moved to anger by a little unpalatable truth which was mingled with much eulogy, and assailed him whom they chose to consider as the enemy of their country with libels much more dis- honourable to their country than anything that he had ever said or written. They published paragraphs in the newspapers, articles in the magazines, sixpenny pamphlets, five-shilling books. One scribbler abused Johnson for being blear-eyed, another for being a pensioner ; a third informed the world that one of the doctor's uncles had been convicted of felony in Scotland, and had found that there was in that country one tree capable of supporting the weight of an Englishman. Macpherson, whose Frngal had been proved in the Journey to be an impudent forgery, threatened to take vengeance withacane. The only effect of this threat was that Johnson reiterated the charge of forgery in the most contemptuous terms, and walked about, during some time, with a cudgel, which, if the impostor had not been too wise to encounter it, would assuredly have descended upon him, to borrow the sublime language of his own epic poem, "'like a hammer on the red son of the furnace."

Of other assailants Johnson took no notice whatever. He had early resolved never to be drawn into controversy ; and he adhered to his resolution with a steadfastness which is the more extraordinary because he was, both intellectually and morally, of the stuff of which controver- sialists are made. In conversation he was a singularly eager, acute, and pertinacious disputant. When at a loss for good reasons, he had recourse to sophistry ; and when heated by altercation, he made unsparing use of sarcasm and invective. But when he took his pen in his hand, his whole character seemed to be changed. A hundred bad writers misrepresented him and reviled him; but not one of the

hundred could boast of having been thought by him worthy of a refutation, or even of a retort. The Kenricks, Campbells, MacNicols, and Hendersons did their best to annoy him, in the hope that he would give them importance by answering them. But the reader will in vain search his works for any allusion to Kenrick or Campbell, to MacNicol or Henderson. One Scotchman, bent on vin- dicating the fame of Scotch learning, defied him to the combat in a detestable Latin hexameter—

‘* Maxime, si tu vis, cupio contendere tecum.” But Johnson took no notice of the challenge. He had learned, both from his own observation and from literary history, in which he was deeply read, that the place of books in the public estimation is fixed, not by what is written about them, but by what is written in them, and that an author whose works are likely to live is very unwise if he stoops to wrangle with detractors whose works are certain to die. He always maintained that fame was a shuttlecock which could be kept up only by being beaten

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back as well as beaten forward, and which would soon fall if there were only one battledore. No saying was oftener in his mouth than that fine apophthegm of Bentley, that no man was ever written down but by himself.

Unhappily, a few months after the appearance of the Journey to the Lebrides, Johnson did what none of his envious assailants could have done, and to a certain extent succeeded in writing himself down. The disputes between England and her American colonies had reached a point at which no amicable adjustment was possible. Civil war was evidently impending; and the ministers seem to have thought that the eloquence of Johnson might with advantage be employed to inflame the nation against the opposition here, and against the rebels beyond the Atlantic. He had already written two or three tracts in defence of the foreign and domestic policy of the Government ; and those tracts, though hardly worthy of him, were much superior to the crowd of pamphlets which lay on the counters of Almon and Stockdale. But his Zaxation No Tyranny was a pitiable failure. The very title was a silly phrase, which can have been recommended to his choice by nothing but

a jingling alliteration which he ought to have despised. The arguments were such as boys use in debating societies. The pleasantry was as awkward as the gambols of a hippopotamus. Even Boswell was forced to own that in this unfortunate piece lhe could detect no trace of his master's powers. The general opinion was that the strong faculties which had produced the Dictionary and the Rambler were beginning to feel the effect of time and of disease, and that the old man would best consult his credit by writing no more.

But this was a great mistake. Johnson had failed, not because his mind was less vigorous than when he wrote Jtasselas in the evenings of a week, but because he had foolishly chosen, or suffered others to choose for him, a subject such as he would at no time have been competent to treat. He was in no sense a statesman. He never willingly read or thought or talked about affairs of state. He loved biography, literary history, the history of manners; but political history was positively distasteful to him. The question at issue between the colonies and the mother country was a question about which he had really nothing to say. He failed, therefore, as the greatest men must fail when they attempt to do that for which they are unfit,—as Burke would have failed if Burke had tried to write comedies like those of Sheridan, as Reynolds would have failed if Reynolds had tried to paint landscapes like those of Wilson. Happily, Johnson soon had an opportunity of proving most signally that his failure was not to be ascribed to intellectual decay.

On Easter eve 1777 some perscns, deputed by a meeting which consisted of forty of the first booksellers in London, called upon him. Though he had some scruples about doing business at that season, he received his visitors with much civility. They came to inform him that a new edition of the English poets, from Cowley downwards, was in contemplation, and to ask him to furnish short biographical prefaces. He readily undertook the task, a task for which he was pre-eminently qualified. His knowledge of the literary history of England since the Restoration was unrivalled. That knowledge he had derived partly from books, and partly from sources which had long been closed: from old Grub Street traditions ; from the talk of forgotten poetasters and

pamphleteers, who had long been lying in parish vaults ; from the recollections of such men as Gilbert Walmesley, who had conversed with the wits of Button, Cibber, who had mutilated the plays of two generations of dramatists, Orrery, who had been admitted to the society of Swift, and Savage, who had rendered services of no very honourable kind to Pope. The biographer therefore

sat down to his task with a mind full of matter. at first intended to give only a paragraph to every minor poet, and only four or five pages to the greatest name. But the flood of anecdote aud criticism overflowed the narrow channel. The work, which was originally meant to consist only of a few sheets, swelled into ten volumes, small volumes, it is true, and not closely printed. The first four appeared in 1779, the remaining six in 1781.

The Lives of the Poets are, on the whole, the best of Johnson's works. The narratives are as entertaining as any novel. 'The remarks on life and on human nature are eminently shrewd and profound. The criticisms are often excellent, and, even when grossly and provokingly unjust, well deserve to be studied. For, however erroneous they may be, they are never silly. They are the judgments of a mind trammelled by prejudice and deficient in sensibility, but vigorous and acute. They therefore generally contain a portion of valuable truth which deserves to be separated froin the alloy ; and, at the very worst, they mean something, a praise to which much of what is called criticism in our time has no pretensions.

Savage's Life Johnson reprinted nearly as it had appeared in 1744, Whoever, after reading that life, will turn to the other lives will be struck by the difference of style. Since Johnson had been at ease in his circumstances he had written little and had talked much. When therefore he, after the lapse of years, resumed his pen, the mannerism which he had contracted while he was in the constant habit of elaborate composition was less perceptible than formerly, and his diction frequently had a colloquial ease which it had formerly wanted. The improvement may be discerned by a skilful critic in the Journey to the

Hebrides, and in the Lives of the Poets is so obvious that it cannot escape the notice of the most careless reader.

Among the Lives the best are perhaps those of Cowley, Dryden, and Pope. The very worst is, beyond all doubt, that of Gray.

This great work at once became popular. There was, indeed, much just and much unjust censure; but even those who were loudest in blame were attracted by the book in spite of themselves. Malone computed the gains of the publishers at five or six thousand pounds. But the writer was very poorly remunerated. Intending at first to write very short prefaces, he had stipulated for only two hundred guineas. The booksellers, when they saw how far his performance had surpassed his promise, added only another hundred. Indeed Johnson, though he did not despise or affect to despise money, and though his strong sense and long experience ought to have qualified him to protect his own interests, seems to have becn singularly unskilful and unlucky in his literary bargains. He was generally reputed the first English writer of his time. Yet several writers of his time sold their copyrights for sums such as he never ventured to ask. To give a single instance, Robertson received four thousand five hundred pounds for the History of Charles V.; and it is no disrespect to the memory of Robertson to say that the History of Charles V. is both a less valuable and a less amusing book than the Lives of the Poets.

Johnson was now in his seventy-second year. The infirmities of age were coming fast upon him. That inevitable event of which he never thought without horror was brought near to him; and his whole life was darkened by the shadow of death. He had often to pay the cruel price of longevity. Every year he lost what could never be replaced. The strange dependants to whom he had given shelter, and to whom, in spite of their faults, he was strongly attached by habit, dropped off one by one; and, in the silence of his home, he regretted even the noise of their scolding matches. The kind and generous Thrale

He had | was no more; and it would have been well if his wife had

been laid beside him. But she survived to be the laughing- stock of those who had envied her, and to draw from the eyes of the old man who had loved her beyond anything in the world tears far more bitter than he would hive shed over her grave. With some estimable and many agreeable qualities, she was not made to be independent. The control of a mind more steadfast than her own was necessary to her respectability. While she was restrained by her husband, a man of sense and firmness, indulgent to her taste in trifles, but always the undisputed master of his house, her worst offences had been impertinent jokes, white lies, and short fits of pettishness ending in sunny good humour. But he was gone; and she was left an opulent

widow of forty, with strong sensibility, volatile fancy, and

slender judgment. She soon fell in love with a music- master from Brescia, in whom nobody but herself could discover anything to admire. Her pride, and perhaps some better feelings, struggled hard against this degrading passion. But the struggle irritated her nerves, soured her temper, and at length endangered her health. Conscious that her choice was one which Johnson could not approve, she became desirous to escape from his inspection. Her manner towards him changed. She was sometimes cold and sonietimes petulant. She did not conceal her joy when he left Streatham; she never pressed him to return ; and, if he came unbidden, she received him in a manner whicli convinced him that he was no longer a welcome guest. He took the very intelligible hints which she gave. He read for the last time a chapter of the Greek Testament in the library which lad been formed by himself. Ina solemn and tender prayer he commended the house and its inmates to the Divine protection, and, with emotions which choked his voice and convulsed his powerful frame, left for ever that beloved home for the gloomy and desolate house behind Fleet Street, where the few and evil days which still remained to him were to run out. Here, in June 1783, he had a paralytic stroke, from which, however, he recovered, and which does not appear to have at all impaired his intellectual faculties. But other maladies came thick upon him. His asthma tormented him day and night. Dropsical symptoms made their appearance. While sinking under a complication of diseases, he heard that the woman

whose friendship had been the chief happiness of sixteen years of his life had married an Italian fiddler, that all London was crying shame upon her, and that the newspapers and magazines were filled with allusions to the Ephesian matron and the two pictures in Hamlet. He vehemently said that he would try to forget her existence. He never uttered her name. Every memorial of her which met his eye he flung into the fire. She meanwhile fled from the laughter and hisses of her countrymen and countrywomen to a land where she was unknown, hastened across Mount Cenis, and learned, while passing a merry Christmas of concerts and lemonade parties at Milan, that the great man with whose name hers is in- separably associated had ceased to exist.

He had, in spite of much mental and much bodily afflic- tion, clung vehemently to life. The feeling described in that fine but gloomy paper which closes the series of his Idlers seemed to grow stronger in him as his last hour drew near. He fancied that he should be able to draw his breath more easily in a southern climate, and would pro- bably have set out for Rome and Naples but for his fear of the expense of the journey. That expense, indeed, he had the means of defraying ; for he had laid up about two thousand pounds, the fruit of labours which had made the fortune of several publishers. But he was unwilling to break in upon this hoard, and he seems to have wished even to keep its existence a secret. Some of his friends

hoped that the Government might be induced to increase his pension to six hundred pounds a year, but this hope was disappointed, and he resolved to stand one English winter more. That winter was his last. His legs grew weaker; his breath grew shorter; the fatal water gathered fast, in spite of incisions which he, courageous against pain but timid against death, urged his surgeons to make deeper and deeper. Though the tender care which had mitigated

his sufferings during months of sickness at Streatham was |

withdrawn, he was not left desolate. The ablest physicians and surgeons attended him, and refused to accept fees from him. Burke parted from him with deep emotion. Windham sat much in the sick room, arranged the pillows, and sent his own servant to watch at night by the bed. Frances Burney, whom the old man had cherished with fatherly kinduess, stood weeping at the door; while Langton, whose piety eminently qualified him to be an adviser and comforter at such a time, received the last pressure of his friend's hand within. When at length the moment, dreaded through so many years, came close, the dark cloud passed away from Johnson's mind. His temper became unusually patient and gentle; he ceased to think with terror of death, and of that which lies beyond death ; and he spoke much of the mercy of God, and of the pro- pitiation of Christ. In this serene frame of mind he died on the 13th of December 1784. He was laid, a week later, in Westmiuster Abbey, among the eminent men of whom he had been the historian,—Cowley and Denham, Dryden and Congreve, Gay, Prior, and Addison.

Since his death the popularity of his works—the Lives of the Poets, and perhaps the Vanity of Human Wishes, excepted—has greatly diminished. His Dictionary has been altered by editors till it can scarcely be called his. An allusion to his Raméler or his Idler is not readily apprehended in literary circles. The fame even of Rasselas has grown somewhat dim. But, though the celebrity of the writings may have declined, the celebrity of the writer, strange to say, is as great as ever. Boswell's book has done for him more than the best of his own books could do. The memory of other authors is kept alive by their works. But the memory of Johnson keeps many of his works alive. The old philosopher is still among us in the brown coat with the metal buttons and the shirt which ought to be at wash, blinking, puffing, rolling his head, drumming with his fingers, tearing his meat like a tiger, and swallowing lis tea in oceans. No human being who has been more than seventy years in the grave is so well known to us. And it is but just to say that our intimate acquaintance with what he would, himself have called the anfractuosities of his intellect and of his temper

serves only to strengthen our conviction that he was both a great and a good man. M.)

JOHNSTON, Atzert Srpney (1803-1862), American soldier, was born in Kentucky in 1803. After graduating at West Point in 1826 he served for eight years in the United States army, emigrated to Texas in 1834, and entered the Texan service as private in 1836. His promotion was so rapid that in 1838 he was appointed commander-in-chief, and till 1840 acted as secretary for war. From 1840 till 1846 he lived in retirement on his farm in Texas; but in the latter year he accepted thie colonelcy of a regiment of Texan volunteers to serve against Mexico. As a staff-officer he was present at the battle of Monterey in September 1846. Texas joined the Union in 1846; andin 1849 Johnston received a major's commission in the United States army. After various services he won the rank of brevet brigadier-general by his skilful conduct of tle expedition sent to Utah in 1857 to bring the Mormons to order. In January 1861 he was transferred from the command of the Texas department to that of

the Pacific department; but in April he was superseded, probably on account of his secessionist sympathies. He resigned his national commission in May 1861, and accepted a command in the Confederate army. While acting as commander-in-chief at the battle of Shiloh, he was killed, April 6, 1862.

JOHNSTON, Atexanper Kerru (1804-1871), geo- grapher, was born at Kirkhill near Edinburgh, in December 1804. After an education at the High School of Edin- burgh he was apprenticed to an engraver; and about 1830 he joined his brother in a prosperous printing and engraving business. His passion for geography had early developed itself, but his first important work was the National Atlas of general geography, which gained for him in 1843 the appointment of geographer-royal for Scotland. Jolinston was the first to bring the study of physical geography into competent notice in England. His attention had been called to the subject by Humboldt; and after years of labour he published his magnificent Physical Atlas in 1848, followed

by a second and enlarged edition in 1856. This, by means of maps with descriptive letterpress, illustrates the geology, hydrography, meteorology, botany, zoology, and ethnology of the globe, and undoubtedly marks an epoch in the history of English geographical science. The rest of Johnston's life was equally given to geography, his later years to its educational aspects especi- ally. His services were recognized by election to fellow- ships of the leading scientific societies of Europe, India, and America. For his chart of the geographical distribution of health and disease he received the diploma of the London Epidemiological Society ; in 1865 he received the degree of LL.D. from Edinburgh University; and in 1871 the Royal Geographical Society awarded him its Victoria medal. He died July 9, 1871. His son of the same name (1844-1879) was also the author of various geographical works and papers.

Johnston published a Dictionary of Geography in 1850, with many later editions; The Royal Atlas of Modern Geography, begun in 1855; an atlas of military geography to accompany

Alison's History of Europe; and a variety of other atlases and maps for educational or scientific purposes.

JOHNSTONE, a manufacturing town in the county of Renfrew, Scotland, is situated on the Black Cart river, about 10 miles west of Glasgow, with which it is connected by rail. First feued in 1781, it rose rapidly in prosperity owing to the introduction of the cotton-manufacture. The town contains several engineering works, a paper mill, and the largest flax mill in Scotland. About a mile to the east is Elderslie, the traditional birthplace of Wallace. The population in 1871 was 7538, and in 1881 9268.

JOHNSTOWN, a burgh of Cambria county, Pennsyl- vania, U.S., is situated on the Stony Creek and the Cone- maugh river, 78 miles east of Pittsburg and 277 miles west of Philadelphia. It is the centre of nine contiguous boroughs constituting one town of 22,000 inhabitants, who are mainly employed by the Cambria Iron Company in the manufacture of iron, steel, railway bars, wire, &c. There are large woollen and flouring mills, numerous churches, and a public library.

The library building was presented to the Library Association by the Cambria Iron Company. The population in 1870 was 6028, and in 1880 8380.

JOHORE, a native state at the southern end of the Malay or Malacca peninsula, bounded by the Moar river on the N.W. and by the Indu on the N.E.,, with an area estimated at 20,000 square miles. The territory, covered for the most part by virgin forest, has been but partially explored ; but it is gradually being opened up under the patronage of the rajah Abubaker (born 5th December 1833), who has visited Europe, as well as Java and other eastern countries, and takes a keen interest in the development of his country, At present the principal

exports from Johore are gambier and catechu, black pepper, timber, rattans, and dammar ; but the soil and climate are well fitted for the growth of sugar-cane, rice, tobacco, coffee, and similar products, and the rajah is pro- moting the formation of regular plantations. The town of Johore is a flourishing little settlement 15 miles north-east of Singapore, in 1° 0’ 26” N. lat. and 103° 47’ E. long. A school where English is taught has been founded in the town by the rajah, who also maintains a similar institution in Singapore. The population of the country, exclusive of the tribes of the interior, is estimated at 100,000, the greater number being Malays and Chinese. It was the present rajah’s grandfather—Abdulrahman Tumongong of Rio, Singapore, and Johore—who ceded Singapore to the British. The dynasty is the continuation of the sultans of Malacca, who retired to Johore on the conquest of their capital in 1311 by Albuquerque. Bokhari, author of Makéta Raja Raja, one of the most remarkable produc- tions in the Malay tongue, was a native of Johore.

JOIGNY, chief town of an arrondissement in the depart- ment of Yonne, France, is situated on the right bank of the Yonne, about 12 miles north-west of Auxerre. Its streets are steep and narrow ; some of the houses are of wood, and date from the 15th or 16th century. Joigny has tribunals of first instance and commerce, a communal college, a library with 9000 volumes, and a civil and military hospital, and

manufactures cloth, hunting and other arms, percussion- caps, leather, cooper work, and brandy. It has also trade in cereals, cattle, and wood, and in an excellent variety of wine, produced in the neighbourhood. The chief buildings are the old and interesting churches of St Andrew, St John, and St Thibaut; the ruins of the old castle of the 10th century ; the partly destroyed later castle; the large 10th century tower beside the prison ; the hétel-de-ville, of 1727; the palais-de-justice, including the fine chapel of the Ferrands; the college; and the stone bridge of seven arches. Of the former massive fortifications, St John's gate and the moat are the chief remains. The population in 1876 was 5975.

Joigny, in Latin Joviniacum, is held to have been founded by Flavius Jovinius, magister equitum under the emperor Valentinian (364 A.D.). It gave its name to an important line of medieval counts (whence sprang the counts of Joinville), who about 1716 merged in the dukes of Villeroy.

JOINERY. See Buiiprne, vol. iv. p. 485.

JOINT, in law, as applied to obligations, estates, &c., implies that the rights in question relate to the aggregate of the parties joined. Obligations to which several are parties may be several, z.e., enforceable against each independently of the others, or joznt, z.e., enforceable only against all of them taken together, or joint and several, z.c., enforceable against each or all at the option of the claimant. So an interest or estate given to two or more persons for their joint lives continues only so long as all the lives are in existence. Joint-tenants are co-owners who take together at the same time, by the same title, and without any difference in the quality or extent of their respective interests; and when one of the joint-tenants dies his share, instead of going to his own heirs, lapses to his co-tenants by survivorship. This estate is therefore to be carefully distinguished from tenancy in common, when the co-tenants have each a separate interest which on death passes to the heirs and not to the surviving tenants. When several take an estate together any words or facts implying severance will prevent the tenancy from being construed as joint.

JOINTS, in the sense in which engineers use the word, may be classed either (a) according to their material, as in stone or brick, wood, or metal; or (6) according to their object, to prevent leakage of air, steam, or water, or to transmit forcé, which may be thrust, pull, or shear ; or (c) according as they are stationary or moving (“ working ”

in technical language). Many joints, like those of shtp- plates and boiler-plates, have simultaneously to fulfil both objects mentioned under (8).

All stone joints of any consequence are stationary. It being uneconomical to dress the surfaces of the stones resting on each other smoothly and so as to be accurately flat, a layer of mortar or other cementing material is laid between them. This hardens and serves to transmit the pressure from stone to stone without its being concentrated at the “high places.” If the ingredients of the cement are chosen so that when hard the cement has about the same coefficient of compressibility as that of the stone or brick, the pressure will be nearly uniformly distributed. The cement also adheres to the surfaces of the stone or brick, and allows a certain amount of tension to be borne by the joint. It likewise prevents the stones slipping one on the other, ze, it gives the joint very considerable shearing strength. The composition of the cement is chosen according as it has to “set” in air or water. The joints are made impervious to air or water by “ pointing ” their outer edges with a superior quality of cement.

Wood joints arealso nearly all stationary. Lignum vitze is still used by engineers for the one half of some special working joints, but even in these few instances its use is rapidly dying out. Wood joints are made partially fluid- tight by “grooving and tenoning,” and by “caulking” with oakum or similar material. If the wood is saturated with water, it swells, the edges of the joints press closer together, and the joints become tighter the greater the water-pressure is which tends to produce leakage.

Relatively to its weaker general strength, wood is a better material than iron so far as regards the transmission of a thrust past a joint. So soon asa heavy pressure comes on the joint all the small irregularities of the

surfaces in contact are crushed up, and there results an approximately uniform distribution of the pressure over the whole area (¢.e., if there be no bending forces), so that no part of the material is unduly stressed. To attain this result the abutting surfaces should be well fitted together, and the bolts binding the pieces together should be arranged so as to ensure that they will not interfere with the timber surfaces coming into this close contact.

Owing to its weak shearing strength on sections parallel to the fibre, timber is peculiarly unfitted for tension joints. If the pieces exerting the pull are simply bolted together with wooden or iron bolts, the joint cannot be trusted to transmit any considerable force with safety. The stresses become intensely localized in the immediate neighbourhood of the bolts. A tolerably strong timber tension-joint can, however, be made by making the two pieces abut, and con- necting them by means of iron plates covering the joint and bolted to the sides of the timbers by bolts passing through the wood. These plates should have their surfaces which lie against the wood ribbed in a direction transverse to the pull. The bolts should fit their holes slackly, and should be well tightened up so as to make the ribs sink into the surface of the timber. There will then be very little localized shearing stress brought upon the interior portions of the wood.

Metal Joints.—Iron and the other commonly used metals possess in variously high degrees the qualities desirable in substances out of which joints are to be made. The joint ends of metal pieces can easily be fashioned to any advan- tageous form and size without waste of material. Also these metals offer peculiar facilities for the cutting of their surfaces at a comparatively small cost so smoothly and evenly as to ensure the close contact over their whole areas of surfaces placed against each other. This is of the highest importance, especially in joints designed to transmit force, .

Wrought iron and mild steel are above all other metals suitable for tension joints where there is not continuous rapid motion. Where such motion occurs, a layer, or, as it is technically termed, a “bush,” of brass

is inserted underneath the iron. The joint then possesses the high strength of a wrought iron one and at the same time the good frictional qualities of a brass surface.

Where the running speed is high and the intensity of pressure can be made small by adopting large bearing surfaces, cast iron is now increasingly preferred for pressure joints. But when, owing to want of space or for other reasons, the bearing surface cannot be made large in proportion to the thrust to be transmitted, gun-metal, 2.¢., the toughest quality of brass, should be used if the speed be high, and steel if the speed be small.

Leakage past moving metal joints can be prevented by cutting the surfaces very accurately to fit each other. Steam-engine slide-valves and their seats, and piston " packing-rings"" and the cylinders they work to and fro in, may be cited as examples. A subsidiary compressible " packing" is in other situations employed, an instance of which may be seen in the "stuffing boxes" which prevent the escape of steam from steam-engine cylinders through the piston-rod hole in the cylinder cover.

Fixed metal joints are made fluid tight—(a) by caulking a rivetted joint, z.¢e, by hammering in the edge of the metal with a square-edged chisel (the tighter the joint requires to be against leakage the closer must be the spacing of the rivets—compare the rivet-spacing in bridge, ship, and boiler-plate joints); (6) by the insertion between the surfaces of a layer of one or other of various kinds of cement, the layer being thick or thin according to circum- stances; (c) by the insertion of a layer of soft solid substance called " packing" or "insertion." A special kind of indiarubber and canvas sheet is prepared for this purpose. A very effective species of "insertion" is thin copper gauze. Sometimes a single round of thick copper wire laid in opposite grooves cut on joint-surfaces serves the purpose.

The Principles of the Strength of Joints.—The conditions of strength of cemented and glued joints are too obvious to require description. It may, however, be mentioned that in most cases the joint is stronger the

thinner the layer of cementing material interposed between the surfaces.

Nearly all other joints are formed by cutting one or more holes in the ends of the pieces to be joined, and inserting in these holes a corresponding number of pins. The word “pin” is technically restricted to mean a cylindrical pin in a movable joint. The word “bolt” is used when the cylindrical pin is screwed up tight with a nut so as to be immovable. When the pin is not screwed, but is fastened by being beaten down on either end, it is called a “ rivet.” The pin is sometimes rectangular in section, and tapered or parallel lengthwise. ‘ Gibs” and “cottars” are examples of the latter. It is very rarely the case that fixed joints have their pins subject to simple compression in the direc- tion of their length. They are, however, frequently subject to simple tension in that direction. A good example is the joint between a steam cylinder and its cover. Here the bolts have to resist the whole thrust of the steam, and at the same time to keep the joint steam-tight.

If D be the eylinder diameter, ¢ the thickness of the flange of the cover, and n the number of bolts used, it can be shown that the amount the flange rises between the bolts by bending is proportional

4

to p a3 where p is the steam pressure per unit area. If the same

degree of tightness be desired for all sizes of cylinders, this deflexion should be the saine for all. The spacing of the bolts is proportional

D to —, and, therefore, we should have the spacing « Bp-t, If then the total bolt area is made proportional to the total steam

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pressure, it would follow that the diameter of bolt « p%séDA, Again, if ¢ were reckoned in accordance with the shearing force of the steam on the circular section of the cover at the circumference of the cylinder, z.e., «pD, we would have

spacing « pD3, and bolt diam. « pip,

For reasons connected with technical difficulties in the foundry, ¢ is made larger in proportion to D than this rule indicates for the smaller sizes of cylinders; and, therefore, the spacing and the bolt diameter are not made to increase quite so rapidly as the 3? and % powers of D,

No moving joints have their pins exposed to simple stress on sections transverse to the pins" axes. The pins of such joints have these transverse sections subjected to shearing and bending stresses, and the sections parallel to the pin axes to compressive stress.

The simplest case by which the subject can be illustrated is that in which a cylindrical pin passes through the ends of two links—one forked, and the other simple and lying between the branches of the fork of the other,

Let the accompanying diagram represent the end of the unforked link. The width of the link parallel to CC' is taken as unity, and the letters on the figure indieate the ratios of the respective dimen- sions to this width. Let b represent the ratio of the thickness, perpendicular to the paper, of the "eye" to the thickness in the same direction of the main body of the link at D. Let also / be the in- tensity of uniform tensive stress on the section at D. Evidently no pres- sure comes on the under side of the pin below CC'. The whole pull at D is passed round half C-~-(—— _ on each side of the pin, and is delivered to the upper side of the pin, on which it produces com- pression. Since the side sections ¢, through which the pull passes, lie out of the direct line of that

ull, the stress is much

igher on the parts of these sections towards the centre line DD' than on those further off. The lines of force crowd as close as possible together near the surface of the pin, @.¢., towards the main line DD' of the pull. In other words, the inequality of stress is occasioned by the bending moments due to the centre of force not passing through the centres of gravity of area of the sections. The inequality begins at the root of the

widening out of the link to form the eye, and reaches its maximum at CC’.

The bending moment at CC’ and the stress eaused by it at the edge of the section can be found by the help of the ordinary theory of elasticity. The best method of doing so is to ealculate the amount by which the portion of the eye below CC’ is bent by the forces applied to it. In the equations the bending moment at CC’ is inserted as an unknown quantity. The section on DD’ epee unmoved, each element of the linear deflexion is resolved paralle to CC’, and the integral from DD’ up to CC’ of all these eomponents parallel to CC’ is equated to zero, the resultant deflexion at C in the direction of CC’ being evidently nil. This equation gives value of the bending moment at CC’, and from it the correspond stress is obtained.

If the section at D be rectangular, as also that at CC’, then the average tensive stress on ¢ is

!

and the extra stress caused at the edge of the section by the bend- ing moment is

1

? I Tra

The total maximum stress is, therefore,

“Sei | -ga} L+P’ Spy, | Bt + 8d Hid

This gives the ratio of the maximum tension at the side of the eye

| 8¢+4)- 5}.

JOI—J OT

-

to the uniform tension (/) on the main body of the link at D. If the section at D be circular while ¢ remains rectangular, the corre- sponding ratio is a little more than } 7, or about % of tho above. lf it is desired that this maximum should not excced /, we obtain a relation between the ratios d, 4, and 6 by putting f/+/f'=f. The following table exhibits the results of this calculation for rectan- gular section at D:—

For circular section at D, 6 is about 4 of these valucs.

Although the values of ¢ and d that are commonly used all fall considerably within the limits of the above tables, the values of d usually found in practice are much less than those shown above. This means that the eyes of links as commonly proportioned are much more severely stressed than is the main body of the link.

In working joints the frictional resistance to rotation throws more than half the main pull on one side of the eye, and this side is therefore still more severely stressed than is indicated by the above equations,

The stresses on the portion of the eye lying above CC' are com- plicated by the combination with the direct pull already mentioned of the pressure of the upper surface of the pin. This latter is normal at each point if the surface be smooth and the joint a motionless oue. It increases from zero at CO' to a maximum at the line DD'. At this point the intensity of the surface pressure is,

according to an approximate theoretic estimate, about =, or 1} wv

times greater than if the whole pull were evenly distributed over the projection on CC' of the upper half surface of the pin. It has often been fallaciously imagined that the central scction 4 is exposed to severe shearing stress. From the symmetry of the case, however, it is evident that on this section the shear is zero. The maximum shear occurs on a section nearly parallel to DD', and 'somewhat less than $d distant from DD'. The exact position of this section of maximum shear depends upon the dimension-ratio t,, which is usually made considerably greater than ¢.

The pin surface pressure has transverse components parallel to CC’, which produce tension and a bending momcnt on the scction ¢).

A theoretical approximation to this bursting pressure is a , or about is

4, of the whole pull exerted by the link, and the line of the resultant (parallel to CC’) is situated 4d distant from the centre of the pin. A small portion of this is borne by the central scction on DD’ of the main part of the link below CC’, but by far the larger part is borne by the section marked ¢,. If it were wholly borne by that section, the average tension on ¢, would, for a circular section at D,

be a , and the extra stress produced by this bending moment

1

a

ould be /-(3 4

would be A(2 + +)

throwu on this. section due to—first, the resultant of the pin-surface-

Other bending moments, however, are

pressure-components parallel to DD’, which lies at ea » or about T

4d, from the line DD’; and, second, the stress at the section CC’, Adding all these together, there is obtained an approximation to the actual tension parallel to CC’ on the lower edge of the section 4), namcly, St Bs sel 1

Jal, ea ee

The shearing and bending stresses upon the pin itself depend upon whether one of the links is forked or both are simple; and also greatly upon the exactitude with which the pin fits the holes.

When the link exerts a thrust instead of a pull through the joint, a similar investigation of the state of stress may be made.

A couple of plates joined together by a single row of rivets may, so far as concerns the sections lying between the rivets, be looked upon as a number of flat links laid side by side with their eyes of equal width with the body of the link.

We may therefore apply the first of the above equations for / +/” to find the stress close to the rivets on the section coinciding with the line of the rivets. To adapt the formula to this case, it is only necessary to put 6=1 and ¢=4(1-d). The formula thus derived, however, gives results probably considerably higher than those actually occurring, because of the strips into which the plate has been supposed to be divided, acting on each other in such a way as e produce bending moments partly neutralizing the above increase of stress.

The strip of metal between the rivcts and the edge of the plate is in the condition of a continuous beam supported by the rivets.

The maximum moment occurs just over the rivets, and is nearly the same as if the load were uniformly distributed over the length of the beam. If ¢, be the ratio to the rivet-spacing of the distance of the edge of the plate to the rivet hole, the supposition of

uniformity of distribution of load gives the equation /’= fat

2t,? the maximum stress on a section perpendicular to the plate edge.

To make /’=/, it is necessary to make t;= ,/0°5=0°7. The edge of the plate will then be amply strong enough to resist the greatest shear to which it is anywhere exposed.

When there are two or more rows of rivets the investigation of the stress is quite similar to the above.

In joints where the movement is rapid and continuous, the size of the pin is determined by considerations of durability against wear. The metal wears rapidly if the bearing surfaces are not well lubricated. The lubricant is pressed out from between these surfaces if the intensity of pressure exceeds a limit determined by the character of the lubricant. The size of the pin must be sufficient to prevent this limiting pressure being reached. Even before the oil is wholly squeezed out the friction becomes so great as to heat the metal surfaces to a high temperature, which hastens the evaporation of the remaining oil. In order to ensure that the temperature may be kept low by the con- tinuous dissipation of the heat generated, some engineers design the bearing surface in proportion to the product of the pressure and the speed, so as to allow a certain area of " conducting surface" for each unit of heat generated per second. (R. H. 8.*)

JOINT STOCK COMPANIES. See Company, vol. vi. p. 221.

JOINVILLE, Jean pe (1224-1319), was the second great writer of history in Old French, and in a*anner occupies the interval between Villehardouin and Froissart. From the point of view of literary history there are numerous minor chroniclers who fill up the gaps, but no one of tlem has the idiosyncrasy which distinguishes these three writers, and for general purposes it may be said that they complete the series of historians illustrating, as no series in any other country or language illustrates, the three periods of the Middle Ages—adolescence, complete manhood, and decadence, Joinville was born in 1224 of a good family of the province of Champagne, allied to many distinguished houses in the east of France and connected by marriage with the emperor Frederick II. The property of the Joinvilles came, curiously enough, like that of Comines, the fourth great historian of old France, into the hands of the Orleans family, and the castle, which overhung the Marne, was sold in 1791 for purposes of demolition. The provincial court of the counts of Champagne had long been a distinguished one, and the action of Thibaut the poet, together with the neighbourhood of the district to Paris, made the province less rebellious than most of the great feudal divisions of France to the royal authority. Joinville's first appearance at the king's court was in 1241, when he performed the functions of

carver for his feudal superior ou the occasion of the knighting of Louis IX.'s younger brother Alphonse. Seven years afterwards, when he was four and twenty, he took the cross, thereby giving St Louis a valuable follower, and supplying himself with the occasion of an eternal memory. His family had been persistent crusaders for several generations. The crusade, however, in which he distinguished himself equally by wisdom and prowess, taught his. practical spirit several lessons. He returned with the king in 1254. But, though his reverence for the personal character of his prince seems to have known no bounds, he had probably gauged accur- ately enough the strategic faculties of the saintly king, and he certainly had imbibed the spirit of the dictum that a man's first duties are those to his own house. He was in the intervals of his residence on his own fief a constant attendant on the court, but he declined to accompany the

king on his last and fatal expedition. Some years later, in 1282, he was one of the witnesses whose testimony was formally given at St Denis in the matter of the canonization of Louis, and long afterwards, in 1298, being then a man of more than seventy years, he was present at the exhuma- tion of the saint's body. It was not till even later that he began his literary work, the occasion being a request from Jeanne of Navarre, the wife of Philippe le Bel and the mother of Louis le Hutin. The great interval between his experiences and the period of the composition of his history is important for the due comprehension of the latter. Books were not hastily written in those days, and some years passed before the task was completed, on its own showing, in October 1309. Jeanne was by this time dead, and Joinville presented his book to her son Louis the Quarreller. This the original manuscript is now lost, whereby hangs a tale. Great as was his age, Joinville had not ceased to be actively loyal, and in 1318, being then almost ninety, he complied with the royal summons to bear arms against the Flemings. He was at Joinville again in 1317, and on the 11th July 1319 he died at the age of ninety-five, leaving his possessions and his position as seneschal of Champagne to his second son Anselm. He was buried in the neighbouring church of St Laurent, where during the Revolution his bones underwent the usual

pro- fanation. In the next generation but one his male heirs failed, and the fief passed by marriage through the house of Lorraine to the Guises, and so to the house of Orleans. Besides his Histoire de Saint Louis and his Credo or '* Confession of Faith," written much earlier, a considerable numbef, relatively speaking, of letters and business documents concerning the fief of Joinville and so forth are extant. These have an importance which we _ shall consider further on; but Joinville owes his place in general estimation only to his history of his crusading experiences and of the subsequent fate of his hero.

Of the famous French history books of the Middle Ages Joinville's is beyond all doubt that which bears most vivid impress of the personal characteristics of its composer. It does not, like Villehardouin, give us the picture of the temper and habits of a whole order or cast of men during an heroic period of human history; it falls far short of Froissart in vivid pourtraying of the picturesque and external aspects of social life; but it is altogether a more personal book than either. As has been already noticed, the age and circumstances of the writer must not be forgotten in reading it' He isa very old man telling of circumstances which occurred in his youth. He evidently thinks that the times have not changed for the better— what with the frequency with which the devil is invoked in modern France, and the sinful expenditure common in the matter of embroidered silk coats. But his laudation of times past concentrates itself almost wholly on the person of the sainted king whom, while with feudal independence he had declined to swear fealty to him, "because I was not his man," he evidently regarded with an unlimited reverence. His age, too, while it is garrulous to a degree, seems to have been entirely free from the slightest taint of boasting. No one perhaps ever took less trouble to make himself out a hero than Joinville. He is constantly admitting that on such and such an occasion he was terribly afraid ; he confesses without the least shame that, when one of his followers suggested defiance of the Saracens and voluntary death, he (Joinville) paid not the least attention to him ; nor does he attempt to gloss in any way his refusal to accompany St Louis on his unlucky second crusade, or his invincible conviction that it was better to be in mortal sin than to have the leprosy, or his decided preference

for wine as little watered as might be, or any other weakness. Yet he was a sincerely religious man, as the curious Credo

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JOUINVIDLE

written at Acre and forming a kind of anticipated appendix to the history secms sufficiently to show. He presents him- self as an altogether human person, brave enough in the field, and at least when young capable of extravagant devo- tion to an ideal, provided the ideal was fashionable, but having at bottom a sufficient respect for his own skin and a full consciousness of the side on which his bread is buttered. Nor can he be said to be in all respects an in- telligent traveller. There were in him what may be called glimmerings of deliberate literature, but they were hardly more than glimmerings. His famous description of Greek fire has a most provoking mixture of circumstantial detail with absence of verifying particulars. It is as matter of fact and comparative as Dante, without a touch of Dante's genius. "Thc fashion of Greek fire was such that it came to us as great as a tun of verjuice, and the fiery tail of it was as big asa mighty lance; it made such noise in the coming that it seemed like the thundcr from heaven, and looked like a dragon flying through the air; so great a light did it throw that throughout the host men saw as though it were day for the light it threw." Certainly the excellent seneschal has not stinted himself of comparisons here, yet they can hardly be said to be luminous. That the thing made a great flame, a great noise, and struck terror into the beholder, is about the sum of it all. Every now and then indeed a striking circumstance, strikingly told, occurs in Joinville, such as the famous incident of the woman who carried in one hand a chafing dish of fire, in the other a phial of water, that she might burn heaven and quench hell, lest in future any man should serve God merely for hope of the one or fear of the other. But in these cases the author only repeats what he has heard from others. On his own account he is much more interested in small personal details than in greater things. How the Saracens, when they took him prisoner, he being half dead with a complication of diseases, kindly left him "un mien couverture

d’écarlate” which his mother had given him, and which he put over him, having made a hole therein and bound it round him with a cord; how when he came to Acre in a dilapidated condition an old servant of his house presented himself, and “brought me clean white hoods and combed my hair most comfortably”; how he bought a hundred tuns of wine and served it—the best first, according to high authority—well-watered to his private soldiers, somewhat less watered to the squires, and to the knights neat, but with a suggestive phial of the weaker liquid to mix “si comme ils vouloient,”—these are the details in which he seems to take greatest pleasure, and for readers six hundred years after date perhaps they are not the least interesting details.

It would, however, be a mistake to imagine that Joinville’s book is exclusively or even mainly a chronicle of small beer. If he is not a Villehardouin ora Carlyle, his battlepieces are vivid and truthful, and he has occasional passages of no small episodic importance, such as that dealing with the Old Man of the Mountain. But, above all, the central figure of his book redeems it from the possibility of the charge of being commonplacé or ignoble. To St* Louis Joinville is a nobler Boswell; and _ hero- worshipper, hero, and heroic ideal, all have something of the sublime about them. The very pettiness of the details in which the good seneschal indulges as to his own weak- nesses only serves to enhance the sublime unworldliness of the king. Joinville is a better warrior than Louis, but, while the former frankly prays for his own safety, the latter only thinks of his army’s when they have escaped from the hands of the aliens. One of the king’s knights boasts that ten thousand pieces have been “ forcontés” (counted short) to the Saracens; and it is with the utmost trouble that Joinville and the rest can persuade the king that this is a

joke, and that the Saracens are much more likely to have got the advantage. He warns Joinville against wine- pibbing, against bad language, against all manner of foibles small and great; and the pupil acknowledges that this physician at any rate had healed himself in these respects. It is true that he is severe towards infidels; and his

approval of the knight who, finding a Jew likely to get the

better of a theological argument, resorted to the baculine variety of logic, does not meet. the views of the 19th century. But Louis was not of the 19th century but of the 13th, and after his kind he certainly deserved Joinville's admiration. Side by side with his indignation at the idea of cheating his Saracen enemies may be mentioned his answer to those who after Taillebourg complained that he had let off Henry IIL too easily. "He is my man now,

and he was not before," said the king, a most unpractical person certainly, and in some ways a sore saint for France.

But it is easy to understand the half-despairing adoration with which a shrewd and somewhat prosaic person like Joinville must have regarded this flower of chivalry born out of due time. He has had his reward, for assuredly the portrait of St Louis from the early collection of anec- dotes to the last hearsay sketch of the woeful end at Tunis, with the famous Lnsetgnement which is still the best sum- mary of the theoretical duties of a Christian king in medizval times, is such as to take away all charge of vulgarity or mere commérage from Joinville, a charge to which othier- wise he might perhaps have been exposed.

The arrangement of the book is, considering its cireum- stances and the date of its composition, sufficiently methodi- cal. According to its own account it is divided into three parts,—the first dealing generally with the character and conduct of the hero; the second with his acts and deeds in Egypt, Palestine, &c., as Joinville knew them; the third with his subsequent life and death. Of these the last is very brief, the first not long; the middle constitutes the bulk of the work. The contents of the first part are, as might be expected, miscellaneons enough, and consist chiefly of stories chosen to show the valour of Louis, his piety, his justice, his personal temperance, and so forth. The second part enters upon the history of the crusade itself, and tells how Joinville—he would hardly have done this later—pledged all his land save so much as would bring in a thousand livres a year, and started with a brave retinue of nine knights (two of whom besides himself wore bannerets), and shared a ship with the Sire d'Aspremont, leaving Joinville without

raising his eyes, “ pour ce que le cuer ne me attendrisist du biau chastel que je lessoie et de mes deux enfans” ; how they could not get out of sight of a high mountainous island (Lampedusa or Pantellaria) till they had made a procession round the masts in honour of the Virgin ; how they reached first Cyprus and then Egypt; how they took Damietta, and then entangled themselves in the Delta. Bad generalship, which is sufficiently obvious, unwholesome food,—it was Lent, and they ate the Nile fish which had been feasting on the carcases of the slain,— and Greek fire did the rest, and personal valour was of little avail, not merely against superior numbers and better generals, but against dysentery and a certain “mal de lost” which attacked the mouth and the legs, a curious human version of a well-known bestial malady. After ransom Acre was the chief scene of Louis’s stay in the East, and here Joinville lived in some state, and saw not a few interesting things, hearing besides much gossip as to the interior affairs of Asia from ambassadors, merchants, and others. At last they journeyed back again to France, not without considerable experiences of the perils of the deep, which Joinville tells with a good deal of spirit. The remainder of the book is very brief. Some anecdotes of the king’s *‘justice,” his favourite and distinguishing

attribute, during the sixteen years which intervencd be- tween the two crusades are given; then comes the story of Joinville’s own refusal to join the second expedition, a refusal which bluntly alleged the harm done by the king’s men who stayed at home to the vassals of those who went abroad as the reason of Joinville’s resolution to remain behind. The dcath of the king at Tunis, his Enseignement

to his son, and the story of his canonization, complete the work,

The book in which this interesting story is told has had a literary history which less affects its matter than the vicissitudes to which Froissart has been subjected, but which is hardly less curious in its way. There is no reason for supposing that Joinville indulged in various editions, such as those which have given MM. Kervyn de Lettenhove and Siméon Luce so much trouble, and which make so vast a difference between the first and the last redaction of the ehronicler of the

Hundred Years' War. Indeed the great age of the seneschal of Champagne, and his intimate first-hand acquaintance with his subject, made such variations extremely improbable. But, whereas there is no great difficulty (though much labour) in ascer- taining the original and all subsequent texts of Froissart, the ori- ginal text of Joinville was until a few years ago unknown, and even now may be said to be in the state of a conjectural restoration. It has been said that the book was presented to Louis le Hutin. Now we have a eatalogue of Louis le Hutin's library, and, strange to say, Joinville does not figure in it. His book seems to have under- gone very much the same fate as that which befell the originals of the first two volumes of the Paston Letters which Sir John Fenn presented to George the Third. Several royal library catalogues of the 14th century are kuown, but in none of these does the Histoire de St Louis appear. It does appear in that of Charles V. (1411), but apparently no copy even of this survives. As every- body knows, however, books could be and were multiplied by the process of copying tolerably freely, and a copy at first or second hand whieh belonged to the fiddler king René in the 15th eentury was used for the first printed edition in 1547. Other editions were printed from other versions, all evidently posterior to the original. But in 1741 the well-known medievalist La Curne de St Palaye found at Lucea a manuseript of the 16th century, evidently repre- senting an older text than any yet printed. Three years later a 14th century copy was found at Brussels, and this is the standard manuscript authority for the text of Joinville. Those who prefer to rest on MS. authority will probably hold to this text, which appears in the well-known collection of MM. Michaud and Pou- joulat as well as that of Buchon, and in a eareful and useful sepa- rate edition by M. Francisque Michel. The modern science of eritical editing, however, which applies to medixval texts the prin- ciples long recognized in editing the classics, has discovered in the 16th century manuscript, and still more in the original miscellane- ous works of Joinville, the letters, deeds, &e., already alluded to, the materials for what we have already called a conjectural resto- ration, which is not without its interest, though perhaps it is possible for that interest to be exaggerated. M. Natalis de Wailly is the Joinvillian Orelli or Lachmann, and his later editions (for he has produeed several) exhibit the results of the new learning. These results are not trifling, for all

students of Old French know that a remarkable change—from the purely linguistie point of view more remarkable perhaps than any of subsequent occurrence—passed over the language between the beginning and the end of the century in which Joinville died. But they affect the matter of the book little, and as such cannot be compared with the changes evident in the Anglican and Galliean editions, so to speak, of Froissart. Their interest, however, is much too great and too typieal not to deserve that some notice should be given to them here.

For merely general readers Buehon's or Michaud's editions of voinville will amply suffice. Both possess translations into modern French, which however, are hardly necessary, for the language is very easy. M. de Wailly's editions of 1868 and 1874 are critical editions, the value of which is considerable, but contestable. They are accompanied by ample annotations and appendices, with illus- trations of great merit and value. Much valuable information appeared for the first time in the edition of M. F. Michel, 1859. T'o these may be added M. A. F. Didot's Etudes sur Joinville, and some articles in the Bibliotheque de Kcole des Chartes and in Romania. A good sketch of the whole subject will be found in Aubertin's Histoire de la Langue et de la Littérature Francaises au Moyen Age, ii. 196-211. (G. SA.)

JOLIET, the county seat of Will county, Illinois, United States, is situated on both sides of the Des Planes river, 40 miles south-west of Chicago, with which it is connected by three railroads and the Illinois and Michigan canal. The State penitentiary near the city, erected at a cost of over

$1,000,000, is one of the largest in the United States.

Manufactures of various kinds, especially of iron and steel, barbed fence wire, agricultural implements and machinery, paper, boots and shoes, cut stone, draining tiles, and sewer pipes, are extensively carried on. The coal-fields of Wilmington, Morris, and Streator are within a few miles of the city. Quarries of good building stone, and deposits of fireclay, sand, and cement gravel abound in the neighi- bourhood.

Joilet is an important railroad centre, from which large quantities of manufactured articles, grain, cattle, and hogs are despatched daily. Population in 1880,

11,659.

JOMINI, Henry, Baron (1779-1869), general in the French and afterwards in the Russian service, and writer on military tactics, was born 6th March 1779 at Payerne in the canton of Vaud, Switzerland, where his father held the dignity of magistrate. At an early period he showed a marked preference for a military life, but at first he was disappointed of his hopes by the dissolution of the Swiss regiments of France at the Revolution. For some years he acted as clerk in a banking house in Paris, until the out- | break of tle Swiss revolution, when he returned to his native | country, and at the early age of nineteen was appointed chief secretary of war. At the peace of Luneville in 1801 he returned to Paris and introduced himself to Marshal Ney, who made him his aide-de-camp and private secretary. In 1804 he published Zrazté des grandes opérations milt- taires, which in 1805 he presented to Napoleon on the field | of Austerlitz as the work of a young Swiss officer. A few days afterwards he was named colonel, and appointed first aide-de-camp to Marshal Ney. In 1806 he published a treatise on the probabilities of the war with Prussia, the ability of which so impressed Napoleon that he resolved to attach him to his person. He was present with Napoleon | at the battle of Jena, but afterwards joined Ney, and afforded him important assistance in delivering his army from a very perilous situation. After the peace of Tilsit he was made chief of the staff to Ney, and created a baron. In the Spanish campaign of 1808 his skilful advice contributed in no small degree to the victories of Ney, but on account of that general's jealousy he resigned his commission, and he was entering into negotiations with the emperor of Russia, when Napoleon, learning his intention, compelled him to remain in the French service with the rank of brigadier- general. On his refusal to take part in the Russian campaign, Napoleon named him governor of Wilna; but during the retreat from Moscow he at once placed his strategic skill and knowledge of the country at the service of France, and, having after the battle of Liitzen obtained his old office

under Marshal Ney, he suggested the happy manoeuvre which led to the victory of Bautzen. Finding, however, that the road to promotion was closed against him, he again offered his services to Russia. They were accepted, and he obtained the rank of lieutenant-general and was named aide-de-camp to the emperor. He gave the important assistance of his counsel to the allied armies during the German campaign, but declined to take part in the passage of the Rhine and the invasion of France in 1814. In 1817 he returned to Paris, where he published Principes de la stratégie, 3 vols., 1818; Histoire critique et militaire des campagnes de la Révolution de | 1792 & 1801, 15 vols., 1819-24; Vie politique et militaire de Napoléon, 1827. In 1826 he again entered the service | of Russia, and in the Turkish campaign of 1828 his sagaci- | ous advice led to the capitulation of Varna. Afterwards he was employed in organizing the military academy at St Petersburg and in superiritending the military studies of the czarowitz, for the use of whom he wrote TZableau analytique des principales combinaisons de la guerre, the new and improved edition of which was named Précis de Part de. la guerre. During the later period of his life |

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Jomini resided at Brussels, but he afterwards returned to Paris, where he died March 24, 1869. Although Jomini played a secondary and unobtrusive part in the great military events of his time, the military triumphs of France were in no inconsiderable degree due to his masterly counsels; and doubtless, had circumstances conspired to grant him the opportunity of playing a practical and in- dependent réle, he would have achieved for himself a place among the greatest generals of his country. His delinea- tions of the campaigns of Napoleon are the ablest military account of these great wars, and his exposition of the laws of tactics and strategy have achieved for him European fame.

See Ferdinand Lecomte, Le Général Jomini, sa vie et ses écrits, 1861 ; and Le Général Jomini, by Sainte-Beuve, 1869.

JOMMELLI, Niccotd (1714-1774), a famous Italian composer of the last century, was born at Aversa near Naples, September 11, 1714, and received his musical edu- cation at two of the famous music schools of that capital, being at first a pupil of Durante at the Conservatorio di San Onofrio, and subsequently studying composition under Leo at La Pieta dei Turchini. His first opera, L'Zrrore Amoroso, was produced when Jommelli was only twenty- three, at Naples, and so timid was the young composer that

he prefixed a pseudonym to his work. The result, how-

ever, was favourable beyond all expectation, and encouraged Jommelli to continue his career as a dramatic composer. Three years afterwards he went to Rome to produce two new operas, and thence to Bologna, where he became acquainted with and profited by the advice of Padre Martini, the greatest contrapuntist of his age. In the meantime Jommielli's fame began to spread beyond the limits of his country, and in 1745 he went for the first time to Vienna,

| where one of his finest operas, Didone, was produced.

Three years later he returned to Italy, and in 1754 he obtained the post of chapel-master to the music-loving duke of Wiirtemberg at Stuttgart, which city he made his home for a number of years. Here he considerably modified his style in accordance with German taste, so much so that, when after an absence of fifteen years he returned to Naples, his countrymen hissed two of his operas off the stage. He retired in consequence to his native village, and only occa- sionally emerged from his solitude to take part in the musical life of the capital.

His last composition was a Mcserere written a few weeks before his death, which took place at Naples, August 28, 1774. In the last-named work, as well as in his other church compositions, Jommelli proves himself to be a

| musician of earnest purpose and sound scholarship. In

his operatic music he follows essentially the style of his age, being intent on writing effective pieces for the voice rather than upon expressing the feelings and passions of the characters ; but even here he betrays a certain elevation of sentiment not always to be found amongst the composers of the latter half of the 18th century. His best dramatic work is generally supposed to be Armida, one of the operas scorned by the Neapolitans in 1771.

JONAH. The Book of Jonah is so named from the principal personage of the narrative, only mentioned elsewhere in 2 Kings xiv. 25. Jonah there appears as a native of Zebulun, and a contemporary of Jeroboam I. (8th ceutury B.c.). If the book of Jonah were written then, it has a claim to rank as the oldest of the prophetic writings (Joel being in all probability of post-exile origin). The problems connected with this little book are, however, so great that no judicious critic would think of admitting such a date as proved. The problems are twofold :—(1) was the book written at one jet? and (2) is it to be under- stood as a history, or as an allegorical tale, and, if the latter, is it, or is it not, based at all upon tradition, or upon a

nature-myth ? Kohler thinks that he can trace “ the hand of a late reviser, who has made alterations, interpola- tions, and transpositions of verses and sentences… . There is at the very beginning of the story a perceptible lacuna in the second verse, where we are not told what Jonah was to announce to the men of Nineveh.” He offers very plausible grounds for preferring the reading of the Septuagint in ili. 4, “yct three days, and Ninevch shall be overthrown,” and points out that the alteration into “forty days” involves an interference with part of the details of the narrative. He detects traces of interpolation in 1. 8, ii, 2-10 (A. V. 1-9), iii. 9, iv. 1-4, and other passages, and regards the passage iv. 5-8 as “ full of inser- tions and variants.” After purging the text from later additions and enlargements, we obtain a brief but simple and striking story, which, according to Kéhler, formed part of a book of prophetic narrations, and therefore com- menced with “And.” Later Jews, by very plausible conjec- tures, in search of a lesson-book on

penitence for reading in times of public calamity, modified and interpolated it (comp. Mishna, Z'aaniyyoth, ii.). This is not the place to discuss this conjecture in detail ; it is favoured by analogy and cannot be rejected without consideration. It enables us to nccount for comparatively primitive conceptions of the (todhead, and the naiveté in the description of the heathen mariners, and supplies a locus standi to the orthodox view of the book which would otherwise be destroyed by acute rationalistic criticism. The additions may be later, but the kernel of the narrative may be old.

At the same time, it will be seen at once that to grant that the kernel of the narrative may be pre-exile is not to grant that it is historical. From a purely literary point of view it has been urged that "the marks of a story are as patent in the book of Jonah as in any of the tales of the Thousand and One Nights." 'The greatest of the improba- bilities is a moral one ; can we conceive of a large heathen city being converted by an obscure foreigu prophet? 'To judge of the degree of this improbability, it is enough to read any inscription you please of an Assyrian king. Fancy Sargon or Sennacherib in the presence of Jonah. The case quoted by the Speaker's Commentary of a Christian priest frightening a Mahometan town into repentance is not to the point, for Christians and Mos- lems have a common basis in theism. Iow could the Ninevites give credence to a man who was not a servant of Asshur?" It is obvious that in New Testament times (see Matt. xii. 39-40, Luke xi. 29-30, and Matt. xvi. 4) the symbolic meaning of the book was the most imn- portant part of it. Why should it not have been origin- ally composed with a symbolic or allegorical object? Tor the hearers of Christ, one symbolic meaning was the most important, but probably enough (for Scripture is many- sided) other ages saw different meanings. The trutlis of the equality of Jews and heathen before God, the prophetic and missionary character of the people of Israel, and the conditional character of prophecy, have all been suggested as possible meanings, and all possess great plausibility.

Mr Tylor (arly History of Mankind, pp. 336, 337, and Primitive Culture, i. 306) has already pointed out the close superficial resemblance between the story of Jonah and various solar myths ; and

indeed the former was long ago connected with the myths of Hercules and Hesione, and Perseus and Andromeda. To suppose a direct imitation of these Greek myths is, indeed, quite gratuitous. Preller's handbook will show that the most circumstantial parallels to the Hebrew only occur in the narratives of later writers. These late narratives, however, are not improbably derived in part from earlier sources, and at any rate M. Lenormant and M. Clermont Ganneau have pointed out Babylonian and Egyptian affinities for the Greek myths in

gnestion. "In Mesopotamia the story is naturally more original and morc transparcnt. In Mr George Smith's translation, Tiamtu the dragon opens its mouth to swallow Bel Merodach, but in vain (Smith's Chaldzan Genesis, by Sayce, p. 111)." A remarkable passage in Jeremiah (li. 44), evidently alluding to a popular mythic story, secms to supply a missing link between the narrative of Jonah and the original myth. '"' Like the latter, it describes the destroyer as the dragon, like the former, it converts both destroyer and destroyed into symbols," no uncommon phenomenon in poetical passages of the Old Testament.! The evidences of date are difficult to seize. The use of the uncommon phrase, Yaliveh Elohim (iv. 6), points to a date synchronizing with that of Gen. ii., ii, but when those chapters were written isa debatable question. Many have argued the exile or post-exile origin of the book from the supposed Aramaizing character of the style; against this view, Pusey's introduction deserves reading. The arguments from internal evidence have becn made best use of by Kuenen, who couples it with the book of Ruth as a product of the opposition to the strict and exclusive policy of Ezra towards heathen nations. Kalisch's theory is that the book is a romance founded perhaps on fact. "Why should not the substance of the story, though tlie historical annals make no allusion to such enterprise, be founded en a real fact? Jonah, being on intimate rela- tions with his sovereign, might have been employed by him for important offices; foreign embassies were not unusual, and some such legation from the king of Israel to the king . of Assyria is actually mentioned by Jonah's contemporary

Hosea (v. 13)" (Bible Studies, ii. 122).

Modern Litcrature—Besides the commentaries, see Kuenen, Religion of Israel, ti. 237-44 ; Noldeke, Die Alttestamentl. Liter- atur, Leipsic, 1868, pp. 72-80; Cheyne, "Jonah, a Study in Jewish Folklore and Religion," in Theological Review, 1877, pp. 211-19 ; Kalisch, Bible Studies, part ii., 1878 (reviewed by Oort, Zheologisch Tijdschrift, 1878); Kohler, "The Original Form of the Book of Jonah," in Vheological Review, 1879, pp. 189-44. (RG IG CG)

JONAH, Rasst, of Cordova, the most eminent Jewish grammarian and lexicographer of the Middle Ages, known also among [ebrew authors as R. Merinos (Marinus), but now usually called by his Arabic name Abu ']1 Walid Merwan ibn Jandh, was born at Cordova towards the close of the 10th century, but spent his youth partly at the neighbouring Jewish town of Lucena (Alisana), where he studied under Isaac ben Gikatila and Isaac ben Saul. He appears not to have returned to Cordova till after the death of the famous Iayytj, the founder of a scientific Hebrew grammar bascd on the doctrine of triliteral roots. Though not a personal disciple of Hayyuj, Abu 71 Walid adopted the general principles of his system, and early applied himself to the task of completing and correcting the observations of his predecessor on the subject of weak roots. While engaged in these studies he retired from Cordova during the siege of the town by the Berber prince Suleiman (1013), and took up his residence in Saragossa, wlicre lie published his first work, the Avtéb el Mustalhik, so named because it contained an attempt to supply the omissions of Hayyttj. The Jews of Saragossa were not favourably disposed to the new philology, and the writings of Abu 'l Walid were not only displeasing to men of the old school, but involved him in bitter controversy with the professed disciples of Hayytj, on whose views he had presumed to improve. The most formidable of these antagonists was Samuel Ibn Nagdela Hallevy, the prime minister of Granada. Abu 'l Walid had mnch to suffer from the rancour of so influential an opponent, but he persisted in his studies, which were finally crowned by the

1 It is worth noticing that the “ fish” of Jonah is found five or six times in paintings in the Roman catacombs assigned to the first two centuries, and that it is distinctly a dragon.

publication of the Avtdb el Tankih, or “‘ Book of Minute Research,” a grammatical and lexicographical work of the first order, which is still consulted by scholars, and can usver be opened without admiration for the range and precision of the author’s scholarship and the soundness of his philological method. There is more Hebrew to be learned from Abu 71 Walid than from all the later rabbins put together. Abu ’l Walid was essentially a philologist. He had essayed poetry in his youth, was read in philosophy, and not only practised as a pliysician but wrote on medicine; but the devotion of his life was concentrated on the exact verbal study of Scripture. Armed with a thorough knowledge of the language and grammatical system of the Arabs, as well asof the dialects of Jewish Aramaic, he studied the Biblical idiom in the light of the cognate Semitic tongues, and in a spirit of pure scholarship, free from traditional prejudice.

The extant minor works of R. Jonah have becn published in Arabic with a French translation by J. and H. Derenbourg, Opuseules ct Traités @’ Abou ’l- Walid, Paris, 1880. The first or grammatical part of the Kztdb cl-Tankih has been published in the imperfect Hebrew version entitled Sefer Harikma by Goldberg, Frankfort- on-the-Main, 1856. The lexicographical part of the Kitab el-Usil, or Book of Roots, was published in Arabic by Neubauer, Oxford, 1875. For further details as to the life and works of Abu ’1- Walid see Munk’s articles in Journal Asiatique, 1850, 1851; and Derenbourg, op. cit.

JONAS, Justus (1493-1555), a German Protestant Reformer, was born at Nordhausen in Thuringia 5th June 1493. In 1506 he entered the university of Erfurt, where he graduated in law in 1516; but, having been converted to the doctrines of Luther, he, about 1519, resolved to study theology. In 1521 he accompanied Luther to the diet of Worms.

‘Thé same year he was appointed professor of canon law at Wittenberg, where shortly afterwards he be- came doctor in theology, and occupied himself much in preaching. During the next twenty years he took part in many church visitations and conferences, and translated into German several of the works of Luther and Melanchthon. In 1541 he became superintendent of the churches at Halle, whence he was banished by the elector Maurice of Saxony in 1546. He returned for a short time in 1547 and again in 1548, but was unable to resume his interrupted tasks ; after a short stay at Jena, where he had some share in the ordering of the new university, he became court-preacher at Coburg in 1551. In 1553 he was called as first pastor to Eisfeld, where he died 9th October 1555. Among the theological tractates of Jonas is Discussto pro conjugio sacerdotah, 1523. He also wrote an account of the pro- ceedings of the conference of Marburg.

See Reinhard, De Vita et obitu Justi Jonw, 1713; Knapp, Nar- ratio de Justo Jona, 1817 ; and the life by Hasse in Meurer’s Leben der Altvater der luth. Kirche, 1864.

JONES, Intco (c. 1572-1651), an English architect, sometimes called the ‘ English Palladio,” was the son of a cloth-worker, and was born in London about 1572. It is stated that he became apprenticed to a joiner, but at any rate his talent for drawing attracted somehow the atten- tion of a nobleman, by some affirmed to have been the earl of Arundel, by others the earl of Pembroke, who sent him to study landscape-painting in Italy. His preference soon transferred itself to architecture, and, following chiefly the style of Palladio, he acquired at Venice such consider- able reputation that in 1604 he was invited by Christian TV. to Denmark, where he is said to have designed the two great royal palaces of Rosenborg aud Frederiksborg. In the following year he accompanied Anne of Denmark to the court of James I. of England, where, besides being appointed architect to the queen and Prince Henry, he was employed in supplying the designs and decorations of the court masques. Aftera second visit to Italy in 1612, Jones Was appointed surveyor-general of the royal buildings by

James I., and was engaged to prepare designs for a new palace at Whitehall. In 1620 he was employed by the king to investigate the origin of Stonehenge, when he came to the absurd conclusion that it had been a Roman temple. Shortly afterwards he was appointed one of the commissioners for the repair of St Paul's, but the work was not begun till 1633. Under Charles I. he enjoyed the same offices as under his predecessor, and in the capacity of designer of the masques he caine into collision with Ben Jonson, who on this account has frequently made him the butt of his satire. After the civil war Jones was forced to pay heavy fines as a courtier and malignant. He died in poverty July 5, 1651.

A list of the principal buildings designed by Jones is given in Dalaway's edition of Walpole's Anecdotes of Painting, and for an estimate of him as an arehitect see the article ARCHITECTURE, vol. ii. p. 442, and also Fergusson's History of Modern Architecture. The Architecture of Palladio, in 4 books, by Inigo Jones, appeared in 1715; The Most Notable Antiquity of Great Britain, catled Stone- henge, restored by Inigo Jones, in 1655 (an edition, with memoir, 1725); the Designs of Inigo Jones, by W. Kent, in 1727; and The Designs of Fnigo Jones, by J. Ware, in 1757. –

JONES, Joun Pav (1747-1792), was born July 6, 1747, on the estate of Arbigland, in the parish of Kirkbean and the stewartry of Kirkcudbright, Scotland, where his father, John Paul, was gardener. At twelve he went to sea as apprentice to a merchant of Whitehaven, in whose ships he visited America several times. He became a skilful sailor, and was for some time mate of a slaver in the West Indies. On his way back to England, after leaving the slave trade in disgust, the captain and mate of the ship in which he was both died; and the skilful manner in which Paul Jones brought the ship safely into port induced the owners to appoint him captain. In 1773, having for some unknown reason assumed the cognomen Jones, he settled in Virginia, on a property which had fallen to him on the death of an older brother. When the American war of independence broke out two years later, Jones took up arms for the colonies, and accepted a command in the navy of the new republic. He did good service against his native land,

and in 1777 was sent to France to receive a more important command. Disappointed in that, he sailed in 1778 to the English coast in his ship "Ranger," and availed himself of his early knowledge to land at White-haven, where, however, he was unsuccessful in his attempt to fire the shipping. Next year he sailed on a similar expedition in the " Bonhomme Richard," along with other vessels, and, steering up the Firth of Forth, was only pre- vented by a strong westerly gale from attacking Leith. On his way south again he fell in, off Flamborough Head, with the English ship '"Serapis," which after a long and bloody combat he compelled to strike. That exploit raised his fame to its acme. On his return to Paris he was féted and caressed by the best society; and Louis XVI. pre- sented him with a gold-hilted sword, and decorated him with the military Order of Merit. After some time spent in America, where he was much chagrined by the neglect that met his boastful requests for further employment, Paul Jones returned to Paris as agent for all prizes taken in Europe under his own command. While he resumed his efforts to pose as a man of fon, he attended carefully to his duties. A favourable report to Congress as to his naval services was followed by a vote of a gold medal from that body in 1786. In 1788 the Chevalier Jones entered the service of the empress Catherine of Russia, and became as enthusiastic a Russian as he had been an American. He was appointed to a command in the Black Sea, with the rank of rear-admiral, to act against the Turks; but the jealousy and rivalry of the Russian commanders brought about his recall in less than eight months, Summoned to St Petersburg, on pretext of

receiving a post in the North Sea, he was left in restless |

idleness, until at last two years' formal leave of absence was granted him. On this virtual dismissal, Paul Jones retired to Paris, soured and disappointed ; and after two years spent in fruitlessly importuning the Russian court, he died in that city on July 18, 1792.

Paul Jones is described as a "short, thick, little fellow, about 5 feet 8 inches in height, of a dark swarthy com- plexion." Naval skill and bravery he certainly had, but his letters prove him to have been

boastful and quarrel- some. He writhed under the suspicion of being an "adventurer "; once and again he eagerly repels the charge. English contemporary accounts generally speak of him as a pirate; and, though he certainly ranked as an officer of the United States, the independent manner in whicli he cruised might well suggest letters of marque rather than a Government commission,

The life of Paul Jones hag given rise to much: romanee. Cooper, Dumas, and Allan Cunningham have celebrated him in their novels ; and seareely less fietitious are some of his so-called bio-

graphies. The most authentic scems to be the Afemoirs of Paul Jones, 2 vols., Edinburgh, 1830.

JONES, Owen (1741-1814), a Welsh antiquary, was born in 1741 at Llanvihangel Glyn y Myvyr in Denbigh- shire, and died September 26, 1814, in Thames Street, London. Introduced in 1760 to the service of a London firm of furriers (Kidney & Nutt), he ultimately succeeded to their business, and continued to carry it on with success till his death. His fancy had been fired in boyhood with a passion for the poetry of his country, and, when wealth and leisure were attained, he devoted them both to the acquisi- tion of the ancient monuments of the art. Assisted by Edward William of Glamorgan (Iolo Morganwg), and Dr Owen Pughe, he published, at a cost of more than £1000, the well-known Afyvyrian Archaiology of Wales (Lond., 1801-7, 3 vols.), a great collection of picces dating from the 6th to the 14th century. The manuscripts which he had brought together are now deposited in the British Museum,—the material not utilized in the Alyoyrian Archaiology amounting to 100 volumes containing 16,000 pages of verse and 15,300 pages of prose. Jones was the founder of the Gwyneddigion Socicty (1772) in London for the encouragenient of Welsh studies and literature ; anil he commenced in 1805 a miscellany —the Greal—of which, however, only one volume appeared. An edition of the poems of Davydd ab Gwilym was also issued at his expense. A new edition of the Myvyrian Archaiology was published at Denbigh in 1870.

JONES, Owen (1809-1874), architect and art-decorator, son of the subjcct of last notice, was born in London in 1809. After an apprenticeship of six years in an architect's office, he travelled for fonr years in Italy, Greece, Turkey, Egypt, and Spain, making a special study of the Alhambra in the last-mentioned country. On his return to England in 1836 he busied himself in his professional work. His forte was interior decoration, for which his formula was— "form without colour is like a body without a soul." He was one of the superintendents of works for the Exhibition of 1851; and, as director of decorations for the Crystal Palace at Sydenham, he arranged the Egyptian, Greek, Roman, and Alhambra courts, besides being responsible for the general decoration of the whole building. Along with Mr (afterwards Sir Digby) Wyatt, Jones collected the casts of works of art on the Continent which adorn the different courts. In his later years he was much engaged in the decoration of private houses, among which may be reckoned the viceroy of Egypt's palace at Gesch. In 1857 he received the royal medal for architecture ; and after other distinctions, he was awarded a diploma of honour at the Vienna Exhibition of 1873. He died in London, April

19, 1874.

Owen Jones is deseribed in The Builder for 1874 as 'the most potent apostle of eolour that arelriteetural England has had in these days." – His range of aetivity is to be traced in his works: Plans, Elevations, and Details of the Alhambra (1835-45), in whieh he was assisted by MM. Goury and Gayangos; Designs for Mosaie and Tesselated Pavements, 1842; Polychromatie Ornament of Italy, 1845; An Attempt to define the Prineiples which regulate the Employment of Colour in Deeorative Arts, 1852; Handbook to the Alhambra Court; Grammar of Ornament, fol., 1856, a very important work; One Thousand and ,One Initial Letters, 1864; Seven Hundred and Two Monograms, 1864; and Examples of Chinese Ornament, 1867.

JONES, Sir Witiiam (1746-1794), one of the most accomplished linguists and Oriental scholars that England has produced, was born in

London September 28, 1746. When seven years old he was sent to Harrow, where he soon far excelled all his school-fellows in every branch of study. But the classical routine of a public school failed to satisfy the ardent thirst for knowledge dis- played by the boy from his earliest childhood. He accordingly began to apply himself, during the last three years of his life at Harrow, to the study of Oriental languages, teaching himself the rudiments of Arabic, and becoming sufficiently familiar with Hebrew to be able to read that language with tolerable ease. The greater part of his vacations he devoted to the improvement of his acquaintance with French and Italian by assiduously practising composition in those tongues. In 1764 young Jones went to Oxford and entered University College, where he continued to prosecute his studies with unabated vigour. Though obliged to give up a considerable portion of his time to the classical studies required by the university course, he still directed his attention chiefly to Oriental literature, particularly to Persian and Arabic. In acquiring the latter language he received effective assistance from a Syrian named Mirza, whom he discovered in London and brought with him to Oxford. Meanwhile, however, not content with all this work, he managed to make consider- able progress in Italian, Spanish, and Portuguese. At nineteen he left Oxford to become tutor to Earl Spencer's eldest son, and remained with that nobleman's family for five years. In 1766 Jones obtained a fellowship which placed him in a position of independence, and enabled him to give his undivided attention to his linguistic pursuits. On his return from a short visit to thle Continent, where he picked up some knowledge of German, he began the study of Chinese, and made himself master of the radical characters of that language. Though not more than twenty-two years of age, he was already becoming famous for his acquirements as a linguist and Oriental scholar. Accordingly when Christian VII., king of Denmark, visited England in 1768, bringing with him a life of Nadir Shah in Persian, Jones was requested to render the MS. into French. He agreed, and the translation appeared in 1770, with an introduction containing a description of Asia and a short history of Persia (2 vols. 8vo ; new ed., 1790). This was followed in the same year by a treatise in French on Oriental poetry, and by a metrical translation, in the same language, of the odes of Hafiz.

For some time Jones had been thinking of taking up the law as a profession, and, having now finally decided on doing so, he became a member of the Temple. About this time the French Orientalist, Anquetil Du Perron, published his translation of the Zend Avesta, in the intro- duction to which he made an unjustifiable attack on Oxford. Jones, taking on himsclf the defence of his university, addressed an anonymous letter in French to Du Perron, in which he convicted that scholar of unwarrantable invective and wilful misrepresentation. It is a remarkable proof of Jones's great talent for languages that the racy and idiomatic style of the French in this pamphlet led several foreign savans to attribute it to the pen of some bel esprit

of the French capital. In the same year appeared his grammar of the Persian language (9th ed., with corrections and additions by Saniuel Lee, D.D., Lond., 1828), which is still considered onc of the best text-books on the subject. In 1772 Jones published a small volume of poems, chiefly translations from Asiatic languages, together with two clegant essays on the poetry of Eastern nations and on the arts commonly called imitative. His next publication, which appeared in 1774, was a treatisc entitled Pocseos Asiatice commentariorum libri sex, the chicf aim of which was to familiarize the European mind with the genius of Oriental poetry.

Being now admitted to the bar, Jones determined to give up all his energies to his legal studies, and renounced polite literature for some years. Setting to work with the same eagerness which he displayed in the pursuit of all other kinds of knowledge, he made it his endeavour, not merely to master the technicalities of law, but to devote himself to it as a branch of plilosophy. Having within two years acquired a considerable legal reputation, he was in 1776 appointed commissioner of bankrupts. In 1780 he was induced by his friends to come forward as a candidate for the representation of the university of Oxford in parliament, but he withdrew from the contest before the day of election, as hc found he had no chance of success, owing to the liberal principles he held, especially on the questions of the American war and of the slave trade.

In the winter of 1780-81 he found leisure to complete lus translation of the seven ancient Arabic poems called Moallakat. Besides writing an L’ssay on the Law of Bail- ments, Joncs translated in 1781 the speeches of Iseeus on the right of inheritance, and an Arabian poem on the Mahometan law of succession to the property of intestatecs, as bearing on his legal studies.

The hopes which he had for some time entertained of obtaining a seat on the judicial bench in Bengal, were at last gratified on the accession to power of the Shelburne administration, by which he was in 1783

appointed a judge of the supreme court of judicature at Fort William, at the same time receiving the honour of knighthood. Shortly after his arrival in Calcutta he founded, in January 1784, the Asiatic Socicty, of which he remained president till his death. Convinced as he was of the great importance of consulting the Hindu legal authorities in the original, he lost no time in commencing the study of Sanskrit. Having in a few years made himself complete master of the language, he undertook, in 1788, the task of compiling a digest of Hindu and Mahomctan law, the completion of which he did not live to scc; the work was finished, however, by Colebrooke, who edited it at Caleutta in 1800 under the title of Digest of Hindu Laws. In 1789 Sir William Jones published the first volume of Asiatic Lesearches and his translation of Sakuntala, the most famous play of Kalidasa, the greatest Indian dramatist. He also translated the well-known collection of fables entitled the LZitopadeca, the Gitagovinda, an erotic poem by Jayadeva, and considerable portions of the Veda, besides editing the text of the Ritusamhdra, a short but celebrated poem by Kalidasa. His last work, which appeared in 1794, was the translation of the Institutes of Manu, a compilation of laws and ordinances, dating from the 5th century B.c. Sir William's unremitting literary labours, together with the conscientious performance of his heavy judicial work, could not fail to tell on his health after a ten years' residence in the climate of Bengal; and he was about to return to England when a sudden attack of inflammation of the liver carried him off in the forty-eighth year of his age (April 27, 1794).

The amount of labour of various kinds which Sir William Jones

incredible. In addition to numerous other acquirements, he knew thirteen languages well, and had an elementary acquaintance with twenty-eight others. His capacity for assimilating and reproducing knowledge of evcry sort was almost unparalleled. But his works, though they display a vast amount of learning, do not bear the stamp of genius. Ie shows no originality either in diseovering new truths or in placing old truths in a new light. Had he eoncentrated his powers, his

extraordinary industry might have seeured him great- ness in some one branch of knowledge; but their diffusion over too great a surface contributed greatly to that weakness which is so manifest both in his style and in his critical faeulty. His chief elaim to the remembrance of posterity will rest on the fact that by founding the Asiatie Society he rendered the language and litera- ture of the ancient Hindus aecessible to European scholars, and thus became the indirect cause of the splendid achievements in the field of Sanskrit and comparative philology which the present century has witnessed.

Sir William Jones's complete works were edited in 1799 (6 vols. 4to), and reprinted in 1807 (18 vols. 8vo), Lord Teignmonth published memoirs of his life, writings, and correspondence in 1807 (new ed. 1835, 2 vols. 8yo); and an autobio- graphy, published by his son, was printed in 1846, (A. A. M.)

JONES, Wittiam (1726-1860), a divine of the Church of England, and one of the principal followers of John Hutchinson, was born at Lowick, Northamptonshire, July 30, 1726. By his father's side he was descended froin an old Welsh family, and one of his progenitors was Colonel Jones, brother-in-law of Cromwell. He was educated at Charterhouse school, from which he reccived an exhibition to University College, Oxford. There a kindred taste for music, as well as a similarity in regard t> other points of character, led to his close intimacy with George Horne, afterwards bishop of Norwich, who, chiefly through his arguments, was induced to embrace Hutchinsonian doc- trines. After obtaining his bachelor's degree in 1749, Jones was curate successively at Finedon and Waddenhoe in Northamptonshire. In 1764 he was presented to the vicarage of Bethersden in Kent, and shortly afterwards to the rectory of Pluckley in the same county, where he took up hisresidence. In 1776 he removed to Nayland, Suffolk, of which he obtained the perpetual curacy, and, although in 1798 he became rector of Hollingbourn, Kent, he con- tinued to reside at Nayland till his death, 6th January

1800.

In 1756 Jones published his tractate On the Catholic Doetrine of the Trinity, a statement of the doctrine from the Hutchinsonian point of view, with a succinct and able summary of Scriptural proofs. This was followed in 1762 by an Essay on the First Prin- ciples of Natural Philosophy, in which he maintained the theories of Hutchinson in opposition to those of Sir Isaac Newton, and in 1781 he gave a more extended exposition of his opinions in Physio- logieal Disquisitions. Among his other works are—Lectures on the Figurative Language of the Holy Scripture, 1786; The Scholar Armed, 1792; and a life of Bishop Horne, prefixed to Horne's collected Works, 1795. Jones was also the originator of the British Critie, the first number of which appeared in May 1798. His col- lected works, with a life by W. Steevens, appeared in 1801, im 12 vols., and his theological and miscellaneous works with life were reprinted in 1810. Sinee that time various cditions of his works have appeared, as well as some volumes of his sernions.

JONKOPING, a town of Sweden, at the head of the lin of the same name, in 57' 48° N. lat., about 170 miles south-west of Stockholm, and 80 east of Gothenburg. It occupies a beautiful but somewhat unhealthy position in a valley between the southern end of Lake Wetter and two smaller lakes known as the Rocksjé and the Munksjé ; the very names, indeed, of two parts of the town, the Tyska Mad and the Svenska Mad, refer to the time when the site was a marsh and the buildings had to be ereeted on piles. The church of St Christina, dating from 1649-1673, the supreme court (built as a private enterprise in 1665), the town-house (rebuilt after the conflagration of 1691), the buildings of the provincial administration, the artillery barracks, a theatre, and the high school are the more notc- worthy edifices. Jénképing is well known as the seat of

compressed into the space of 4 comparatively short life seems almost | a great safety-match factory, which produced in 1860

upwards of 35,000,000 boxes, of the value of £11,390, while in 1874 the value reached the sum of £150,000. It also contains snuff and cigar

factories, an asphalt factory, dye-works, damask factories, and a variety of minor estab-

lishments. The population, which has been steadily in- creasing, numbered 15,037 in 1878.

Jénképing is mentioned as early as 12S4 or 1288, and the castle in 1263, when Waldemar Birgersson married the Danish princess Sophia. It was afterwards the scene of many events of moment in Seandinavian history:—the parliaments of 1357, 1439, and 1599; the meeting of the Danish‘and Swedish plenipotentiaries in 1448; and the death of Sten Stura, the elder, in 1503, Gustavus Adolphus caused the inhabitants to destroy their town lest it should fall into the hands of the Danes; but it was rebuilt soon after, and in 1620 received special privileges from the king.

It was from the Duteh and German worknien, introduced at this |

time, that the quarter Tyska Mad received its name. In 1809 the plenipoteutiaries of Sweden and Denmark concluded peace in the town.

JONSON, Bey (for thus his Chiristiau namo was usually

In 1612 |

abbreviated by himself and his contemporaries, and thus, ©

in accordance with his famous epitaph, it will always con- tinue to be abbreviated by posterity), was born about the beginning (N. 8.) of the year 1573. By the poet’s account his grandfather had been a gentleman who “came from ” Carlisle, and originally, the grandson thought, from An- nandale, where Johnstons or Jolnstones appear to have

abounded, aud where indeed at least one resident of that

name is noticed in the reminiscences of a later native of the border district resembling Ben himself in the quick- ness of his temper and in his impatience of pretences and pretenders,—the late Thomas Carlyle.

Ben Jonson further related that he was born a month after the death of his father, who, after suffering in estate and person under Queen Mary, had in the enl "turned minister." years after the birth of her son the widow married again ; she may be supposed to have loved him in a passionate way peculiar to herself, since on one occasion we shall find her revealing an almost ferocious determinatiun to save his honour at the cost of both his life and her own. Jonson's stepfather was a master bricklayer in or near Westminster, who—whether or not he afterwards constrained his step- son, while acquainting himself with the business into which he had been admitted, to undergo the degradation of laying a few bricks with his own trowel—certainly allowed him to lay for himself the foundations of a good education. After attending a private school in the neighbourliood, he was seut to Westminster school,—nor is it at all obvious why the master bricklayer should have been denied the credit of having sent him there. Jonson's gratitude, how- ever, for au education to which in truth he owed an almost inestimable debt, concentrated itself upon the 'most re- verend head" of the illustrious Camden, then second and afterwards head master of the famous school, and the firm friend of his pupil in later life.

After reaching the highest form at Westminster, Jonson is stated, but on unsatisfactory evidence, to have proceeded to the university of Cambridge; but at the utmost he can only have made a transitory appearance in a scene of which as a painter of men and manners he nowhere reproduces a single feature. And doubtless he felt that neither his crop of learning and experience nor his wild oats were yet fully sown, when, goose quill or other implement in hand, he had to apply himself to the family business. He soon had enough of it, and was soldiering in the Netherlands, much to his own subsequent satisfaction when the days of seif- couscious retrospect arrived, but to no further purpose beyond that of seeing something of the world. By the middle of 1597 we at last come across documentary evidence of him at home in London, in the shape of an entry in Henslowe's diary on July 28th of 3s. 6d. "received ef Bengemenes Johnsones share," He was therefore by

this time, when Shakespeare, his senior by nearly nine years, was already in prosperous circumstauces and good esteem, at least a regular member of the profession, with a fixed engagement in the Lord Admiral's company, then performing under the experienced Henslowe's management at the Rose. The traditions may very possibly be true according to which he had previously acted at the Curtain (a former house of the Lord Adiiral's men), and "taken nad Jeronimo's part" asa stroller. This latter appearance would in that case have probably been in The Spanish Tragedy, since in The First Part of Jeronimo Jonson would

| have had to dwell ou the "smallness" of his "bulk." He was at a subsequent date (1601) employed by Henslowe to

write up Zhe Spanish T'ragedy, in pursuance of a fashion differing from that of later times, when old plays have more usually been written down to the taste of modern audiences. Jonson's additions, which were uot the first

_ changes made in the play, are usually supposed to be those

printed with The Spanish Tragedy in the edition of 1602 ; Charles Lamb's doubts on the subject are an instance of that subjective kind of criticism in which it is unsafe to put absolute trust.

Ben Jonson may be supposed to have married two or three years before the date of Ilenslowe's first entry of his name. Of his wife he afterwards spoke with scant enthusiasm, and for one (undated) interval of five years he preferred to ive without her. Long burnings of "oil" among his books, and long spells of recreation at the tavern, such as Jonson loved, are not the most favoured accompaniments of family life. But Jonson was no stranger to the tenderest of affections : two at least of the several children whom his wife bore to him he commemo- rated in touching little tributes of verse; nor in speaking of his lost eldest daughter did he forget "her mother's tears."

Within a year's time, or little more, from the date at which we first find Ben Jonson in well-authenticated con- nexion with the English stage, he had produced one of the most memorable plays in its history. very Alan in his Tumour, the original example of a species of English comedy which cannot be said to have become altogether extinct even with the Restoration, was first acted in 1598 —probably in the earlier part of September—by the Lord Chamberlain's company, which was then still performing at the so-called Theatre, and in which Shakespeare was just on the eve of acquiring one or more shares. Tle certainly was one of the actors in Jonson's comedy, and it is in the character of Old Knowell in this very play that, according to a bold but ingenious guess, Shakespeare is represented in the half-length portrait of him in the folio of 1623, beneath which were printed Jonson's lines con- cerning the picture. very Man in his Humour was probably followed by Zhe Cuse zs Altered, which was certainly acted by 1599, and which contains a satirical attack upon the pageant poet Anthony Munday. Inas- much as the earlier of these two comedies was indisputably successful, and as Jouson's reputation was already sufficient to ensure him a mention in the Palladis Tamia of Francis Meres, published in the same year, 1598, as oue of tho chief writers in tragedy (on the strength of what play or plays is unknown), it was an awkward fatality that before the year was out he should have found himself in prison and in danger of the gallows. He had had the misfortune of killing in a duel, fought in Hogsden Fields, for some cause unknown, an actor of Henslowe's company named Gabriel Spenser; possibly Henslowe's uncourteous desig- nation of Jonson as a "bricklayer" may imply that the success of the new comedy at the other house had not been a subject of congratulation at that to which its author had formerly belonged, In prison Jonson was visited by 9

Roman Catholic priest—a prison being the most likely place in which to meet a priest in those days; and the result was his conversion to the Church of Rome, to which he adhered for twelve years. Jonson was afterwards a diligent student of divinity; but, though his mind was religious, it is not probable that its natural bias much inclined it to

dwell upon creeds and their controversies. Though in prison spies were set upon him, which was then thought to be an admirable method for expediting justice, yet his judges (he afterwards boasted) could get nothing out of him but "aye" or "no." And thus after a short imprisonment he was released, some tiine carly in 1599, in which year he is found back again at work for Henslowe, receiving, together with Dekker, Chettle, and 'another gentleman," earnest-money for a tragedy called Robert JT, King of Scots. It is of more importance that in-fhe same year he brought out through the Lord Chamberlain's com- pany (possibly already at the Globe, then newly built or building) the elaborate comedy of Zvery Man out of his Humour,—a work which subsequently had the honour, for which it was in some respects specially fitted, of being presented before Queen Elizabeth. The sunshine of court favour, rarely diffused during her reign in rays more than metaphorically golden, was not to bring any material comfort to the most learned of her dramatists, before the inevitable hand was laid upon her of which his courtly epilogue had besought death to forget tle use. Indeed, of his Cynthia's Ievels (1600), no doubt primarily designed as a piece of unctuous flattery to the address of the queen, the most marked result had been to offend two playwrights of note with whom he had formerly worked in company— Dekker, who liad a coarse and healthy grip of his own, and Marston, wlio was perhaps less dangerous by his strength than by his versatility. Learning their intention, or at least that of Dekker, to wreak literary vengeance upon him, he seems to have sought to anticipate its effect by covering them with contemptuous ridicule beforehand. Zhe Poetaster (1601), which he states to have been completed fifteen weeks after the plot of it was first conceived, did not, however, silence his adversaries; it rather gave them the opportunity of the last word, which Dekker took in producing his Satiromastix, or the Untrussing of the Humorous Poct (1602). There was indeed an attempt at some more last words on Jonson's part; but on the whole he appears to have thouglit (and very wisely) that the time for a season of silence had arrived for him as a court poet. According to a statement by Overbury, early in 1603, " Ben Johnson, tha poet, now lives upon one Townesend" —who tlus genercus patron was we do not know— and scornes the world." That, however, he was not sulking in the friendly tent with which he had been accommodated is shown by the fact that in

this year (1603) was produced at the Globe the earlier of his two extant tragedies, Sejanus, —Shakespeare once more taking a part in the performance.

Meanwhile, in the year which dates the tragedy con- cerning the fall of the great favourite, there had begun a reign in England destined to be remembered as that of favourites hardly less hated than he: Adulatory loyalty seemed intent on showing that it had not exhausted itself at the feet of Gloriana, and Jonson's well-stored brain and ready pen had their share in devising and executing ingenious variations on the theme "Welcome—since we cannot do without thee!" It is very remarkable how promptly his genius, which it is sheer prejudice to describe as wanting in flexibility and lightness, suited itself to the sudden demands of the new taste for masks and enter- tainments—new of course in degree rather than in kind —introduced with the new reign. The pageant which on the 7th of May 1603 bade the king welcome to a eapital dissolved in joy was partly of Jongson's partly of

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Dekker's devising; and, having thus been prominently brought into notice, he was able to deepen and diversify the impression by the composition of masks presented to James I. when entertained at houses of the nobility. He was soon occasionally employed by the court itself,— already in 1606 in conjunction with Inigo Jones as re- sponsible for the "painting and carpentry,'—and thus speedily showed himself master in a species of composition to which he, more than any other of our poets before Milton, secured an enduring place in our national poetic literature. Personally, no doubt, he derived considerable material benefit from the new fashion, very valuable to poets in days when there were no monthly magazines,— more especially if his statement to Drummond was any- thing like correct, that out of his plays he had never gained a couple of hundred pounds.

Good humour seems to have come back with good fortune. Joint employment had reconciled him with Dekker ; and with Marston also he was again on good terms. When therefore, in 1604, the latter and Chapman (who, Jonson told Drummond, was loved of him, and whom

he had probably honoured as “Virgil” in The Poetaster) produced the excellent comedy of Zastward Ho, it appears to have contained some contributions by Jonson ; at all events, when the authors were arrested on account of one or more passages in the play which were deemed insulting to the Scotch, he voluntarily imprisoned himself with them. They were soon released, and a banquet at his expense, attended by Camden and Selden, terminated the incident. If Jonson is to be believed, there had been a report that the prisoners were to have their ears and noses cut, and, with reference apparently to this peril, “at the midst of the feast his old mother drank to him, and showed him a paper which slie had intended (if the sentence had taken execution) to have mixed in the prison among his drink, which was full of Insty strong poison ; and that she was no Guu.:,. ‘ld him, she minded first to have drunk of it herself.” Strange to say, in 1605 Jonson and Chapman, though the former, as he averred, had so ‘“attempered ” his style as to have “given no cause to any good man of grief,” were again in prison on account of “a play” ; but they appear to have been once more speedily set free, in consequence of the (very manly and dignified) letter addressed by Jonson to the earl of Salisbury. In the same year he played a part—which had till recently remained unknown, and is still in some measure obscure— in the mysterious history of the Gunpowder Plot. On November 7th, very soon after the discovery of the conspiracy, whose threads it became the immediate duty of the council to unravel, that body appears to have sent for Ben Jonson, at the advice no doubt of Salisbury, who (as has just been seen) knew of Jonson; indeed, the latter has been supposed to have given his support as a dramatist to the party headed by Robert Cecil before Queen Elizabeth’s death. Asa loyal Roman Catholic Jonson was asked, and undertook to give, lis good offices in inducing the priests to do something required by the council,—one hardly likes to conjecture it to have been some tampering with the secrets of confession. In any case, the negotia- tions fell throngh, because the priests declined to come forth out of their hiding-places to be negotiated with— greatly to the wrath of Ben Jonson, who declares in a letter to Lord Salisbury that “they are all so enweaved in it that it will make 500 gentlemen less of the religion within this week, if they carry their understanding about them.” Jonson himself, however, did not declare his separation from

the Church of Rome for five years longer, however much it might have been to his advantage to do so.

His powers as a dramatist were at their height during

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the earlier half of the reign of James I.; and by the year 1616 he had produced nearly all the plays which are worthy of hisgenius. They include the tragedy of Catzline (1611), which achieved only a doubtful success, and the comedies of Volpone or The Fox (acted 1605), Epicoene or The Silent Woman (1609), the Alchemist (1610), Bartholomew Fair (1614), and The Devilis an Ass (1616). During the same period he produced several masks, usually in connexion with Inigo Jones, with whom, however, he seems to have quarrelled already in this reign, though it is very doubtful whether the architect is really intended to be ridiculed in Bartholomew Fair under the character of Lanthorn Leatherhead. In 1616 a modest pension of 100 marks a year was conferred upon him; and possibly this mark of royal favour may have encouraged him to the publication of the first volume of the folio collected edition of lis works (1616).

He had other patrons more bountiful than the crown, and for a brief space of time (in 1613) had travelled to France as governor to the eldest son of Sir Walter Raleigh, then a state prisoner in the Tower, for whose society Jonson raay have gained a liking at the Mermaid Tavern in Cheap- side, but for whose moral character he, like so many of his contemporaries, seems to have had but smallesteem. Thus by the year 1616 Jonson seems to have made up his mind to cease writing for the stage, where neither his success nor his profits had equalled his merits and expectations. He continued to produce masks and entertainments when called upon; but he was attracted by many other literary pursuits, and had already accomplished enough to furnish plentiful materials for retrospective discourse over pipe or cup. . He was already entitled to lord it at the Mermaid, where his quick antagonist in earlier wit-combats no longer appeared even on a visit from his comfortable retreat at Stratford. That on the other hand Ben carried his wicked town habits into Warwickshire, and there, together with Drayton, made

Shakespeare drink so hard with them as to bring upon himself the fatal fever which ended his days, is a bit of petty scandal with which we may fairly refuse to load his memory.

It was in the year 1618 that Ben Jonson, like his great namesake a century and a half afterwards, resolved to have a real holiday for once, and about midsummer started for his ancestral country, Scotland. He had (very heroically for a man of his habits) determined to make the journey on foot ; and—imitation is the sincerest kind of flattery—was speedily followed by John Taylor, the water-poet, who still further handicapped himself by the condition that he would accomplish the pilgrimage without a penny in his pocket. Jonson (who put money in his good friend's purse when he came up with him at Leith) spent more than a year and a half in the hospitable Lowlands, being solemnly elected a burgess of Edinburgh, and on another occasion entertained at a public banquet there. But the best remembered hospitality which he enjoyed was that of the learned and refined Scottish poet Drummond of Hawthornden, to which we owe the so-called Conversations. In these famous jottings, the work of no extennating hand, Jonson lives for us to this day, delivering his censures freely in praise and blame, but by no means generously described in the postscript added by his exhausted host as "'a great lover and praiser of himself, a contemner and scorner of others." A poetical account of this journey, 'with all the adven- tures," was burnt with Jonson's library.

After his return to England Jonson appears to have resumed his former course of life. In 1619 his visits to the country seats of the nobility were varied by a sojourn at Oxford with Corbet at Christ Church, on which occasion a master's degree was conferred upon him by the univer- sity. He confessed about this time that he was or seemed

growing "'restive," 7.¢., lazy, though it was not long before he returned to the occasional composition of masks. The extremely spirited Gipsies Metamorphosed (1621) was thrice presented before the king, who was so pleased with it as to grant to the poet the reversion of the office of master of the revels, besides proposing to confer upon him

the honour of knighthood. This honour Jonson (hardly in deference to the memory of Sir Petronel Flash) declined, but there was no reason why he should not gratefully accept the increase in his pension, which was in the same year (1621) raised to 200 marks. Yet the close of king James I.'s reign found the foremost of the poets of the time in an anything but prosperous condition. It would be unjust to hold "The Sun," 'The Dog," "The Triple Tun," or the "Old Devil" with its Apollo club-room, where Ben's supremacy must by this time have become established, responsible for this result ; taverns were the clubs of that day, anda man of letters is not considered lost in our own because he "haunts" a smoking-room in Pall Mall. Disease had weakened the poet's strength, and the burning of lis library, as his Lxecration upon Vulcan sufficiently shows, must have been no mere transitory trouble to a poor man of letters. He thus thought it best to recur tu writing for the stage, and in 1625 produced, with no faint heart, but with a very clear anticipation of the comments which would be made upon the reappearance of the "huge, overgrown play-maker," The Staple of News, a comedy excellent in some respects, but little calculated to become popular. In 1628, on the death of Middleton, some interest obtained for him the appointment of city chronologer, with a salary of 100 nobles a year—an office of which he appears to have considered the duties as purely ornamental, inasmuch as in 1631 his salary was suspended until he should have presented some fruits of his labours in his place, or—as he more succinctly phrased it—"' yesterday the barbarous court of aldermen have withdrawn their chandlerly pension for verjuice and mustard, £33, 6s. 8d." After being in 1628 arrested by mistake on the utterly false charge of having written certain verses in approval of the assassination of Bucking- hain, he was soon allowed to return to Westminster, where it would appear from a letter of his "son and contiguous neighbour," James Howell, he was living in 1629, and about this time narrowly escaped another conflagration. In the same year (1629) he once more essayed the stage with the comedy of The New Inn, which was actually, and on its own merits not unjustly, damned on the first perform- ance. The epilogue dwelt not without dignity upon the neglect which the poet had experienced at the hands of "king and queen"; and it is honourable to King Charles I. that he should not only have immediately sent the unlucky author a gift of a

hundred pounds, but on receiving another more cheerful versified appeal in response, should have increased his standing salary to the same sum, with the addition of an annual tierce of canary,—henceforth the poet-laureate's customary royal gift. But though he after- wards composed one or two little entertainments, and even a comedy or two, there seemed little power left in his palsy-stricken hand. The patronage of kind friends like the earl of Newcastle was never wholly wanting to him, nor could he have ended in neglect. He was the acknow- ledged chief of English literature, both at the festive meetings where he ruled the roost among the younger authors whose pride it was to be "sealed of the tribe of Ben," and by the avowal of grave writers, old or young, not one of whom would have ventured to dispute his pre- eminence. Nor was he to the last unconscious of the claims upon him which his position brought with it. When death came upon him on August 6, 1637, he left behind him an unfinished work of great beauty, the pastoral drama

of Zhe Sad Shepherd. For forty years, he said in the prologue, he had feasted the public ; at first he could scarce hit its taste, but patience had at last enabled it to identify itself with the working of his pen.

We arc so accustomed to think of Ben Jonson presiding, attentive to his own applanse, over a circle of youthful followers and admirers, that we are apt to forget the hard struggle which he had passed through before gaining the crown now universally acknowledged to be his. Howell records, in the year before Ben's death, that at a solemn supper at the poet's own house, where the host had almost spoiled the relish of the feast by vilifying others and magnifying himself, "T. Ca." (Thomas Carew) buzzed in the writer's ear "that, though Ben had barrelled up a great deal of knowlcdge, yet it seemed he had not read the Ethics, which, among other precepts of morality, forbid self- commendation." Self-reliance is but too frequently coupled with self-consciousness, and for good and for evil self- confidence was no doubt the most prominent feature in the character of Ben Jonson. Hence the combativeness which involved him in so many quarrels in his earlier days, and whicli jarred

so harshly upon the gentler nature of Drum- mond. But lis quarrels do not appear to have entered deeply into his soul, or indced usually to have lasted long.! He was too exuberant in his vitupcrations to be bitter, and too outspoken to be malicious. He loved of all things to be called "honest," and there is every reason to suppose that he deserved the epithet. The old superstition, which may perhaps still linger here and there, hardly necds notice, according to which Jonson was filled with malignant envy of the greatest of his fellow-dramatists, and lost no opportunity of giving expression to it. Those who consider that Shakespeare was beyond the criticism of his contem- poraries—as he certainly very frequently is above that of posterity—may find blasphemy in the saying of Jonson that Shakespeare "wanted art." Occasional jesting allusions to particular plays of Shakespeare may be found in Jonson, among which should hardly be included the sneer at Pericles ; but these amount to nothing collectively, and to very little individually ; and against them have to be set, not only the many pleasant traditions concerning tlie long intimacy between the pair, but also the noble lines, as noble as they are judicious, dedicated by the survivor to "the star of poets." But if Gifford had rendered no otlier service to Jonson's fame, he must be allowed to have once for all vindicated him from the cruellest aspersion which has ever been cast upon it. Thatin general Ben Jonson was a man of strong likes and dislikes, and was wont to manifest the latter as vchemently as the former, it would be idle to deny. He was at least impartial in his censures, dealing them out freely to Puritan poets like Wither and princes of his church like Cardinal Duperron. And, if sensitive to attack, he seems to have been impervious to flattery—to judge from the candour with which he con- demned the foibles even of so entliusiastic au admirer as Beaumont. The personage that he disliked the most, and abused the most roundly to its face, was unfortunately one with many heads and a tongue to hiss in each,—no other than that 'general public" which it was the radical mistake of luis life to fancy he could " rail into approbation " before he had effectively secured its goodwill. And upon the whole it may be said that the admiration of the few, rather than the favour of the many, has kept green the fame of the most independent among all the masters of an art which, in more senses than one, must please to live.

1 With Inigo Jones, however, in quarrelling with whom, as Howell reminds Jousou, the poet was virtually quarrelling with his bread and butter, he seems to have found it impossible to live permanently at peace ; his satirical Lcpostulation against the architect was pub- lished as late as 1636,

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Jonson's learning and industry, which were alike ex- ceptional, by no mvutus exhausted themsclves in furnish- ing and elaborating the materials of his dramatic works. His encmics sneered at him as a translator—a title which ouly a gencration earlier would have been esteemed of all literary titles the most hononrable. But his classical scholarship shows itself not only in his translations from the Latin poets (the Ars Poetica in particular), in addition to which he appears to have written a version of Barclay's Argenis ; it was likewise the basis of his Haglish Grammar, of which nothing but the rough draft remains (the MS. itself having perished in the fire in his library), and in connexion with the subject of which he appears to have pursued other linguistic studies (Howell in 1629 is trying to procure him a Welsh grammar). And its effects are very visible in some of the most pleasing of his non-dramatic poems, which often display that combination of polish and simplicity hardly to be attained to—hardly even to be appreciated— without some measure of classical training.

Exclusively of the few lyrics in Jonson's dramas (which, with the exception of the stately choruses in Catiline, charm, and perliaps may surprise, by their lightness of touch), his non-dramatic works are comprised in tlie follow- ing collections. The book of "pigrams (published in the first folio of 1616) contained, in the poet's own words, the "ripest of his studies." His notion of an epigram was the ancient uot the restricted modern one—still less that of the critic (R. C., the author of the Z¢mes' IVhistle) in whose language, according to Jonson, "witty" was " obscene." On the whole, these epigrams excel more in encomiastic than in satiric touches, while the pathos of one or two epitaphs in the collection is of the truest kind. In the lyrics and epistles contained in the /orest (also in the first folio), Jonson shows greater

variety in the poctic styles adopted by him; but the theme of love, which Dryden considered conspicuous by its absence in the author's dramas, is similarly eschewed here. The Underdoods (which were not published collectively till the sccond and surreptitions folio) are a miscellaneous series, comprising, together with a few religious and a few amatory poems, a large number of epigrams, epitaphs, elegies, and " odes," including both the tributes to Shakespeare and scveral to royal and other patrons and friends, besides the Azecra- tion upon Vulcan, and the characteristic ode addressed, apparently in the earlier part of his career, by the poet to himself. 'To these pieces in verse should be added the Discovertes—an often highly interesting commouplace-book of aphorisms that occurred to the poet in his daily read- ings,—sclf-communings of a more tranquil and perhaps a more sober kind tlian the outpourings of the Conversations at Hawthornden.

The dramatic works of Ben Jonson fall into three or, if his fragmentary pastoral drama be considered to stand by itself, into fonr distinct divisions. His tragedies are only two in nuinber—Sejanus his Fall, and Catiline his Conspiracy.* Of thesc the earlier, as is worth noting, was produced at Shakespeare's theatre, in all probability before the first of Shakespeare's Roman dramas, and still contains a con- siderable admixture of rhyme in the dialoguc. Though perhaps less carefully elaborated in diction than its successor, Sejanus is at least equally impressive as a highly-wrought dramatic treatment of a complex historic theme. The character of Tiberius adds an element of curious psychologi- cal interest which is wanting in Catiline and lis surround-

a eee Se ee iC—="

2 Of The Fall of Mortimer Jvlinson 1cft only a few lines behind him ; bunt, as he also left the argument of the play, factious ingenuity coutrived to furbish up the relic into a libel against Queen Caroline and Sir Robert Walpole in 1731, and to revive the contrivance by way of an iusult to the princess dowager of Wales and Lord Bute in

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ings; but in both plays the action is powerfully conducted, aud the care bestowed by the dramatist upon the great variety of characters introduced eannot, as in some of his comedies, be said to distract the interest of the reader. Both these tragedies are noble works, though the relative popularity of the subject has perhaps secured the preference to Catiline. Yet this play and its predecessor were alike too manifestly intended by their author to court the good- will of what he calls the "extraordinary" reader. It is difficult to imagine that (with the aid of judicious shorten- ings) either eould altogether miss its effect on the stage ; but, while Shakespeare causes us to forget, Jonson seems to wish us to remember, his authorities. The half is often greater than the whole; and Jonson, like all drama- tists and, it might be said, all novelists, in similar cases, has had to pay the penalty incurred by too obvious a desire to underline the learning of the author.

Perversity—or would-be originality—alone eould declare Jonson's tragedy preferable to his comedy. Even if the revolution which he created in the latter branch of the drama had been mistaken in its principles or unsatisfactory in its results, it would be clear that the strength of his dramatic genius lay in the power of depicting a great variety of characters, and that in eomedy alonc he succeeded in finding a wide field for the exercise of this power. There may have been no very original or very profound discovery in the idea which he illustrated in Hvery Man in his Humour, and, as it were, technically elaborated in Fvery Man out of his lumour,—that in many mcn one quality is observable which so possesses them as to draw the whole of their individualities one way, and that this phenomenon "may be truly said to be a humour." But by refusing to apply this term to a mere peculiarity or affectation of manners, and restricting its use to actual or implied differ- ences or distinctions of eharacter, he broadened the whole basis of English comedy after his fashion, as Moliére at-a later date did that of French after his. It does not of course follow that Jonson's disciples, the Bromes and the Cartwrights, always adequately reproduced the master's conception of "humorous" comedy. Jonson's wide and various reading helped him to diversify the application of his theory, while perhaps at times it led him into too remote illustrations of it. Still, Captain Bobadil and Captain Tueca, Macilente and Fungoso,

Volpone and Mosca, and a goodly number of other eharacters commend themselves readily as well as distinctly enough to the memory of those who have once made their acquaintance. It is a very futile criticism to condemn Jonson's characters as a mere series of types of general ideas; on the other hand, it is a very sound eriticism to object, as Barry Cornwall does, to the "multitude of characters who throw no light upon the story, and lend no interest to it, occupying space that had better have been bestowed upon the principal agents of the plot."

In the construction of plots, as in most other respects, Jonson's at once eonscientious and vigorous mind led him in the direction of originality ; he depended to a far less degree than the greater part of his contemporaries (Shake- Speare with the rest) upon borrowed plots. But either his inventive character was occasionally at fault in this respect, or his devotion (so to speak) to his characters often diverted his attention from a brisk conduct of his plot. The writer just quoted has directed attention to the esscntial like- ness in the plot of two of Jonson's best eomedies, Volpone and The Alchemist, and another critic, unsur- passed in his delicate appreciation of the relatious between the drama and the stage,——Mr W. Bodham Donune,—has dwelt on the difficulty which, in Zhe Poetaster and clse- where, Ben Jonson seems to experience in sustaining the promise of his actions, Zhe Poetaster is, however, a play

sui generis, in which the real business can hardly be said to begin till the last act.

Dryden, when criticizing Ben Jonson's comedies in a superfine vein, which (to do him justice) he very rarely indulged, thought fit, while allowing the old master humour and incontestable " pleasantness," to deny him wit and those ornaments thereof which Quintilian reckons up under the terms urbana, salsa, faceta, and so forth. Such wit as Dryden has in view is the mere outward fashion or style of the day, the euphuism or " sheerwit" or chic which is the ereed of the Fastidious Brisks and of their crafty purveyors at any given moment. In this Ben Jonson was no doubt defective ; for he was too accurate an observer of

men and manners to be himself a man of fashion, literary or otherwise. But it would be an error to suppose him, as a comic dramatist, to have stood towards the world around him in the attitude of a philosopher, careless of mere transient externalisms. It is said that the scene of his very Man in his Humour was originally laid near Florence; and his Volpone, which is perhaps the darkest social picture ever drawn by him, plays at Venice. But the atmosphere of his comedies, wherever they may be supposed to play, is familiar enough to any one fairly acquainted with the native surroundings amidst which they were produced ; and Ben Jonson's times live for us in his men and women, his country gulls and town gulls, his alchemists and exorcists, his "skeldring" captains and whining Puritans, and the whole ragamuffin rout of his Bartholomew Fair, the eomedy par excellence of Elizabethan low life. After he had described the pastimes, fashionable and unfashionable, of his age, its feeble superstitions and its flaunting naughti- nesses, its vapouring affectations and its lying effronteries, with an odour as of "divine tabacco" pervading the whole,

little might seem to be left to describe for his "sons" and

successors. Enough, however, remained; cnly that his followers speedily again threw manners and "humours" into one undistinguishable medley.

The gift which both in his art and in his life Jonson lacked was that of exercising the influence or creating the effects which he wished to exercise or create without the appearance of consciousness. Instead of this, influenced no doubt by the example of the free relations between author and public permitted by Attic comedy, he resorted again and again, from Every ALan out of his Humour to The Magnetic Lady, to sundry devices of inductions and eom- mentatory intermezzos and appendices, which, though occasionally effective by the excellence of their exccution, are to be regretted as introducing into his dramas an exotic and often vexatious element. A man of letters to the very core, he never quite understood that there is and ought to be a wide difference between the world of letters and the world of the theatre.

The richness and versatility of Jonson's genius will never be fully appreciated by those who fail to acquaint them- selves with what is preserved to us of his "masks" and eognate entertainments. He was conscious enough of his Success in this dircction—" next himself," he said, " only Fletcher andChapman eould write a mask." He introduced, or at least established, the ingenious innovation of the anti- mask, which Schlegel has described as a species of ' parody added by the poet to his device, and usually prefixed to the serious entry," and which accordingly supplies a grotesque antidote to the often extravagantly imaginative main con- ception. Jonson's learning, creative power, and humorous ingenuity—combined, it should not be forgotten, with a genuine lyrical gift—all found abundant opportunities for displaying themselves in these productions. Though a growth of foreign origin, the mask was by him thoroughly domesticated in the high places of English literature. He lived long enough to see the species produce its poetic

masterpicce in Comus, after which it soon faded away in timcs too fierce to allow of its further cultivation.

The Sad Shepherd, of which Jonson left behind him three acts and a prologue, is distinguished among English pastoral dramas by its freshness of tone; and, though not altogether without either allegorical allusions or classical ornament, breathes something of the spirit of the greenwood, and is not unnatural even in its supernatural element. While this piece, with its charming love-scenes between Robin Hood and Maid Marion, remains a fragment, another pastoral by Jonson, Zhe May Lord, has been lost, and a third, of which Loch Lomond was intended to be the scene, probably remained unwritten.

Though Ben Jonson never altogether recognized the truth of the maxim that the dramatic art has properly speaking no didactic purpose, his long and laborious life was not wasted upon a barren endeavour. In tragedy he added two works of uncommon merit to our dramatic literature. In comedy his aim was higher, his effort more sustained, and

his success more solid, than were those of any of his fellows. In the subsidiary and hybrid species of the mask, he helped to open a new and attractive though undoubtedly devious path in the field of dramatic litera- ture. His intellectual endowments surpassed those of most of our great dramatists in richness and in breadth ; and in energy of application he probably surpassed them all. Yet it is less by these gifts or even by his power of hard work than by the true ring of his manliness that he is uniquely distinguished among his peers.

The date of the first folio volume of Jonson's Works (of which title his novel but characteristic usc in applying it to plays was at the time much ridiculed) has already been mentioned as 1616; the second is described by Gifford as "a wretched continuation of the first, printed from MSS. surreptitiously obtained during his life, or ignorantly hurried through the press after his death, and bearing a variety of dates from 1631 to 1641 inclusive." The whole works were reprinted in a single folio volume in 1692, and again in 6 vols. 8vo in 1715. Whalley's edition in 7 vols., with a life, appearcd in 1756, but was superseded in 1816 by Gifford's, in 9 vols. (of which the first includes a biographical memoir, and the famous essay on the " Proofs of Ben Jonson's Malignity, from the Commentators on Shakespeare"). A new edition of Gifford's excellent book was pub- lished in 9 vols. in 1875 by Colonel F. Cunningham, as well as a cheap reprint in 8 vols. in 1870. Both contain the " Conversations with Drummond," which were first printed in full by David Laing in the Shakespeare Society's Publications (1842), and the Jonsonus Virbius, a collection (unparalleled in number and variety of authors) of poetical tributes published about six months after Jonson's death by his friends and admirers. There is also a single-volume edition, with a very readable memoir, by Barry Cornwall (1838). Recently Every Man in his Humour has been edited, with an excellent brief biographical as well as special introduction, to which the present sketch owes some details, by H. B. Wheatley (1877). The criticisms of Jonson are too numerous to mention; but among many deserving to be overlooked should not be included that of Dryden in the preface to An Evening's Love, or the Mock Astrologer. (A. W. W.)

JOPLIN, a flourishing city of Jasper county, Missouri, U.S., chiefly engaged in smelting lead and zinc, of which very large quantities are turned out annually. The popula- tion in 1880 was 7038.

JOPPA, the Greek “Idamy, “Idry, Hebrew Jarno, and Arabic YAr4, incorrectly written Jarra, an ancient seaport of Palestine. It is mentioned in the lists of Thothmes IIT., and in an inscription of Sennacherib, but in the Bible pro- bably in no writing older than the exile. After the exile it was the harbour of Judzea (Ezra iii. 7; Strabo, xvi. 2), and as such appears as an important point in the Maccabee wars, when it was fortified by Simon. Strabo and Josephus speak of it as a haunt of pirates, and on this account it was destroyed by Vespasian in the Jewish war. The small bay south of the town, called Birket el Kamr (“Moonpool”), is possibly the old harbour, the present one being formed by a reef having a broad entrance on the north-west and a narrow passage in the middle. The coast being quite straight and unsheltered, the port possesses neither natural

nor artificial advantages. In the 5th, 6th, and 11th cen- turies bishops of Joppa are noticed, under the metropolitan of Jerusalem. In 1187 Saladin took the town, which was recovered by King Richard in 1191 and retaken by Malek el ‘Adil in 1196. In 1799 Napoleon stormed the city, then protected by walls. The fortifications were further inercascd at a later period by the English. The modern town, the seaport of Jerusalem, with which it is connected by a carriage road in very bad repair, is built ona rounded hillock rising 100 feet above the shore; to the north and south are sandhills; to the east are gardens of oranges, pomegranates, figs, and olives. Sweet water is derived from numerous wells, and palms and bananas occur in these orchards, which cover an area of 3 square miles. The walls of the town still remain standing ; the houses are of stone, well built, and the bazaars are good. The town is the seat of a caim-macami or lieutenant- governor. It contains English, French, German, and American consulates, and Latin and Greek monasteries. The trade consists of wheat, sesame, oranges and other fruit, olives, and soap ; the population is stated at 8000, the majority

being Moslems. A German colony estab- lished in 1869 has built two villages, one just outside the town on the north-east, the second (Saréna) at a distance of 2 miles. The colonists number about 300.

Joppa claimed to be the place where Andromeda was exposed. There her chains were shown (Jos., B. J., iii. 9, 18), and thence the a‘ of the monster was brought to Rome by Scaurus (Pliny, 1X. .

JORDAENS, Jacop (1593-1678), painter, was born at Antwerp in 1593, He studied, like Rubens, under Adam van Noort, and his marriage with his master’s daughter in 1616, the year after his admission to the guild of painters, prevented him from visiting Rome. Je was forced to content himself with studying such examples of the Italian masters as he found at home; but a far more potent influence was exerted upon his style by Rubens, who employed him sometimes to reproduce small sketches in large. Jordaens is second to Rubens only in their special department of the Flemish school. In both there is the same warmth of colour, truth to nature, mastery of chiaroscuro, and energy of expression; but Jordaens is wanting in dignity of conception, and is inferior in choice of forms, in the character of his heads, and in correctness of drawing. Not seldom he sins against good taste, and in some of his humorous pieces the coarseness is only atoned for by the animation. Of these last he seems in some cases to have painted several replicas, He employed his pencil also in Scriptural, mythological, historical, and allegorical subjects, and is well-known as a portrait painter. He also etched some plates, He died at Antwerp in 1675.

JORDAN (j7? “swift-flowing ”), the principal river of Palestine. The historical source of- this famous stream is the cave at Banids (Ceesarea Philippi), while the stream from Dan (Tell el Kady) is called Lesser Jordan by Josephus, although the larger of the two springs at the Tell is probably the largest fountain in Syria. A third affluent, which has a better geographical claim to be con- sidered the true Jordan, is the Nahr Hasbany, rising near Hasbeiya on Hermon. The stream from Banids joins that from Tell el Kady after a course of 5 miles, descending by cascades through thickets and cane brakes, and a little lower down the Nahr Hasbany, after a course of 15 miles, joius the

united stream from the other sources. The Banids source is about 1000 feet above the Mediterranean, and, after passing through the papyrus swamps, the river reaches the Huleh Lake (Merom or Semechonitis), falling 1000 feet in 12 miles. The Huleh is 4 miles long, and thence to the Sea of Galilee is 104 miles, with a fall of 682 feet. 'The second lake (see GaLiLEE) is 124 miles

long. The fall of the river after leaving it is at first 40 feet per mile, but on entering the plain of Beisdn it becomes only 10 or 12 feet per mile, and further south only 4 or 5 feet. The total length from Bdnids to the Dead Sea is 104 miles direct, and, as the level of the Dead Sea is 1292-5 below the Mediterranean, the total fall is nearly 2300 feet. Thus the Jordan is only half as long as the Thames, and the Sea of Galilee about equal in length to Windermere. The Ghér or valley of Jordan south of the Sea of Galilee varies in width from 4 to 14 miles east and west; the course of the river is extremely tortuous, and it is hidden by a dense jungle of cane, willow, and tamarisk, growing on the water's edge in the sunken ehannel called Zér, which is about a mile wide, with steep banks of white mar] 50 to 100 feet high. For thelast few miles the stream is free from jungle, flowing through a muddy flat. The average width is from 30 to 50 yards, but in february the river " overflows its banks" (Josh. iii. 15) and fills the Zor. The Arabs enumerate some forty fords, mostly passable in summer only. Of these the most important is "Abdrah near Beisin,—probably the Bethabara of Origen, the Onomastica, and the common text of John i. 28, where Bethany is the true reading. There is a ferry immediately south of the Sea of Galilee, and another on the road from Shechem toGilead ; the latter is called Ed Damieh, and has been conjectured to preserve the name of Adam (Josh. iii. 16) or Admah (Gen. x. 19). The ford of Hajlah, east of Jericho, is probably that of Josh. ili., and is the traditional site of Bethabara. The four main affluents of Jordan are the Hieromax (Yarmuk) and the Jabbok on the east, and on the west the Jalid passing Beisdn, and the Fari'a rising not far from Shechem. The supply of these and other perennial streams searcely, however, balances the loss from evaporation of the river. Salt springs flow to Jordan along the

greater part of its course south of Beisin. The valley, formed by a depression in the early Tertiary period, was once filled by a chain of lakes, and raised beaches have been found in various parts of the Ghor.

JORDAN, Camitte (1771-1821), French politician, was born in Lyons, January 11, 1771, of a well-to-do mercantile family. He was educated in Lyons, and from an early age was imbued with the royalist principles that distinguished his townsmen. He actively supported by voice, pen, and musket his native town in its gallant resistance to the Convention; and when Lyons fell, in October 1793, Jordan fled. From Switzerland he passed in six months to England, where he formed acquaintances with other French exiles and with prominent British states- men, and imbibed a lasting admiration for the English constitution. year he was sent by Lyons as a deputy to the council of five hundred. There his eloquence won him consideration. He earnestly supported what he felt to be true freedom, especially in matters of religious worship, though the energetic appeal on behalf of church bells in his Rapport sur la liberté des cultes procured him the sobriquet of Jordan-Cloche. Jordan would have been one of the vic- tims of the coup d'état of the 18th Fructidor (September 4, 1797) had he not eseaped to Basel. Thence he went to Germany, where he met Goethe, and probably laid the foundation of his affection for German literature, especially as represented by Klopstock. Back again in France by 1800, he boldly published in 1802 his Vrai Sens du Vote National pour le Consulat &@ Vie, in which he exposed the ambitious schemes of the First Consul. He was unmolested, however, and during the first empire lived in literary retirement at Lyons with his wife and family, producing for the Lyons Academy occasional papers on the Jnjluence réciproque de Eloquence sur la Révolution et de la Révolu- tion sur UEloquence; Etudes sur Klopstock, &c. At the

In 1796 he returned to France, and next'

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Restoration in 1814 he again emerged into public life. By Louis XVIII. he was ennobled aud named a councillor of state ; and from 1816 he sat in the chamber of deputies as representative of Ain. At first he

supported the ministry, but when they began to show signs of reaction he separated from them, and gradually came to be at the head of the constitutional opposition. His speeches in the chamber were always eloquent and powerful. Though warned by failing health to resign, Camille Jordan remained at his post till his death, May 19, 1821.

To his pen we owe Lettre & M. Lamourette, 1791; Histoire de la Conversion d'une Dame Parisienne, 1792; La Lot et la Religion Vengées, 1792; Adresse a ses Comimettants sur la Révolution du 4 Septembre 1797, 1797; Sur les Troubles de Lyon, 1818; La Session de 1817, 1818. His Discours were collected in 1818. The "Frag- ments Choisis," and translations from the German, were published in L' Abeille frangaise.

Besides the various histories of the time, see for further details, vol. x. of the Revue Encyclopédique; and a paper on Jordan and Madame de Staél, by Sainte- Beuve, in the Revue des Deux Mondes for Mareh 1868.

JORDANES, or JoRNANDES, the historian of the Gothic nation, flourished about the middle of the 6th century of the Christian era.! All that we certainly know about his life is contained in three sentences of his history of the Goths (cap. 50), from which, among other particulars as to the history of his family, we learn that his grandfather Peria was notary to Candace, the chief of a confederation of Alans and other tribes settled during the latter half of the 5th century on the south of the Danube in the provinees which are now Bulgaria and the Dobrudscha. Jordanes himself was a notary until he renounced his worldly calling and took the vows of a monk. This, according to the manner of speaking of that day, is the meaning of his words "ante conversionem meam," though it is quite possible that he may at the same time have renounced the Arian ereed of his forefathers, which it is clear that he no longer held when he wrote his Gothic history.

It is probable that the latter part at any rate of the life of Jordanes was spent in Italy. In some early editions of his works he is called " episcopus Ravennas," but the ample details which we possess as to the bishops of Ra- venna make it certain that he never occupied that see. He may have been a bishop, but the best authority for that assertion

(according to the statement in Muratori's Rerum Italicarum Scriptores, i. 189) is only Sigebert of tembloux, who lived five centuries later. Traces have been discovered of a certain Jordanes, bishop of Crotona, in 551, and a "Jordanes defensor eeclesize nostra" is mentioned in a letter of Pope Pelagius in 556.

We pass from the extremely shadowy personality of Jordanes to the more interesting question of his works,

1. The De Regnorum et Temporum Successione, or, as he himself called it, Breviatio Chronicorum, was probably com- posed in 550 or 551. It is a short and dry sketch of the history of the world from the creation, founded on the chronicles of Eusebius and Jerome. The book has no value, literary or historical, till the historian comes near to his own times; and here, from about 450 to 550, the De Regnorum Successione is sometimes a really important authority, owing to the extreme scarcity of other infor- mation as to this epoch."

2, The other work of Jordanes, De Rebus Geticis, as it is commonly ealled, was styled by himself De Origine Actuque Getice Gentis, and was probably written in the year 552. He informs us that while he was engaged upon eee eee

1 The evidence of MSS. is overwhelming against the form Jornandes adopted in the two earliest editions. Strictly speaking, the MSS. favour Jordanis; but this seems to be only an ineorreet spelling of Jordanes.

2 The terms of the dedication of this book to a certain Vigilius make it impossible that the pope of that name is meant.

the Breviatio a friend named Castalius invited him to com- press into one small treatise the twelve books—now lost— of the senator Cassiodorius, or Cassiodorus, on Zhe Origin and Actions of the Goths. Jordanes professes to have had the work of Cassiodorius in his hands for but three days, and to reproduce the sense, not the words ; but his book, short as it is, evidently contains long verbatim extracts from the

earlier author, and it may be suspected that the story of the "triduana lectio" and the apology " quamvis verba non recolo," possibly even the friendly invitation of Castalius, are mere blinds to cover his own entire want of originality. This suspicion is strengthened by the fact (discovered by Von Sybel) that even the very preface to his book is taken almost word for word from Rufinus's translation of Origen's commentary on the epistle to the Romans. There is no doubt, even on Jordanes's own state- ments, that his work is based upon that of Cassiodorius, and that any historical worth which it possesses is due to that fact. Cassiodorius was one of the very few men who, Roman by birth and sympathies, could yet appre- ciate the greatness of the barbarians by whom the empire was overthrown. The chief adviser of Theodoric, the East Gothic king in Italy, he accepted with ardour that monarch's great scheme, if iudeed le did not himself originally suggest it to his master, of welding Roman and Goth together into one harmonious state, which should

preserve the social refinemeut and the intellectual culture |

of the Latin-speaking races, without losing the hardy virtues of their Teutonic conquerors. To this aim everything in the political life of Cassiodorius was subservient, and this aim he evidently kept before him in his Gothic history. He translated into his somewhat stilted prose the sagas which were still sung by the Gothic warriors round their camp-fires,' telling of the past migrations and dangers of their people. He reduced into form the pedigree which traced the descent of the Amals, Theodorie's kingly house, from gods and heroes. In all this he worked on such lines as a modern historical inquirer would have him work on. Unfortunately, he also accepted the current theory of his age which identified the Goths with the Scythians, whose country Darius Hystaspis invaded, and with the Gete of Dacia whom Trajan conquered. This double identification enabled him to bring the favoured race in line with the people of classical antiquity, to inter-weave with their history stories about Hercules and the Amazons, to make them invade Egypt, to claim for them a share in the wisdom of the semi-mythical Scythian philosopher Zamolxis. He was thus able with some show of plausibility to represent the Goths as "wiser than all

the other barbarians and almost like the Greeks" (Jord., De Keb. Get., cap. v.), and to send a son of the Gothic king Telephus to fight at the siege of Troy, on the right side, in rank with the ancestors of the Romans, All this we can now perceive to have no relation to history, but at the time it may have made the subjugation of the Roman less bitter to feel that he was not after all bowiug down before a race of barbarian upstarts, but that his Amal sovereign was as firmly rooted iu classical antiquity as any Julius or Claudius who ever wore the purple A grateful king of the Goths, the young Athalaric, truly said of Cassiodorius, " Originem Gothicam historiam fecit esse Romanam, colligens quasi in unam coronam germen flori- dum, quod per librorum campos passim fuerat aute dis- persum " (Cassiod., Var. ix. 25).

Cassiodorius completed his history of the Goths probably about the year 534. In the eighteen years which elapsed between that date and the composition of the De Rebus

1 "Quemadmodum et in priseis eorum carminibus pene historico ritu in commune recolitur," De Reb. Get., iv.

Geticis of Jordanes, great events, and most disastrous for the Romano-Gothic monarchy of Theodoric, liad tran- spired. It was no longer possible to write as if the whole civilization of the Western world would sit down contentedly under the shadow of East Gothic dominion and Amal sovereignty. And moreover, the instincts of Jordanes, as churchman and Catholic, predis- posed lim to flatter the sacred majesty of Justinian, by whose victorious arms the overthrow of the barbarian king- dom in Italy had been effected. Hence we perceive two currents of tendency in the De Rebus Geticis. On the one hand, as a Goth himself and as a transcriber of the philo- Goth Cassiodorius, he magnifies the race of Alaric and Theodoric, and claims for them their full share, perhaps more than their full share, of glory in the past. On the other hand, he speaks of the great anti-Teuton emperor Justinian, and of his reversal of the German conquests of the 5th century, in language which would certainly have grated on the ears of Totila and

his heroes. Gelimer the Vandal is “overtaken by the revenge of Justinian,” and Africa “long subject to the Vandal yoke is recalled into the liberty of the Roman kingdom.” When Ravenna is taken, and Vitigis carried into captivity, Jordanes alinost exults in the fact that “the nobility of the Amals and the illustrious offspring of so many mighty men have surrendered to a yet more illustrious prince and a yet mightier general, whose fame shall not grow dim through all the centuries.”

This laudation, both of the Goths and of their Byzantine conquerors may perhaps help us to understand the political motive with which the De Rebus Geticis was written. In the year 551 Germanus, nephew of Justinian, accompanied by his bride, Matasuntha, granddaughter of Theodoric, set forth to reconquer Italy for the empire. His early death (in 552) prevented any schemes for a revived Romano- Gothic kingdom which may have been based on_his personality. His widow, however, bore a posthumous child, also named Germanus, of whom Jordanes speaks (cap. 60) as “blending the blood of the Anicii and the Amals, and furnishing a hope under the divine blessing of one day uniting their glories.” This younger Germanus did nothing in after life to realize these anticipations ; but the somewhat pointed way in which his name and his mother’s name are mentioned by Jordanes lends some probability to the idea that the De Rebus Geticis was put forth in the interests of a third party, Italian rather than Gothic or Byzantine, and possibly headed by Pope Vigilius, who may have wished to advocate the claims of this infant to an independent sovereignty in Italy.

The De Rebus Geticis falls naturally into four parts. The first (chaps. i. —xiii.) commences with a geographical description of the three quarters of the world, and in more detail of Britain and **Scanzia” (Sweden), from which the Goths under their king Berig migrated to the southern coast of the Baltic. Their migration across what has since been called Lithuania, to the shores of the Euxine, and their differentiation into Visigoths and Ostrogoths, follow. Chaps. v.~~xiii. contain au account of the intrusive Geto~~ Seythian clement before alluded to.

The second section (chaps. xiv.—xxiv.) returns to the true history of the Gothic nation, sets forth the genealogy of the Amal kings, and describes the inroads of the Goths into the Roman empire in the 3d century, with the foundation and the overthrow of the great but somewhat shadowy kingdom of Hermanric. The author here pro- bably rests to some extent on Orosius, Ammianus, and other Latin historians, but draws partially at least from native sources.

The third section (chaps. xxv.-xlvii.) traces the history of the West Goths from the Hunnish invasion to the downfall of the Gothic kingdom in Gaul under Alaric II. (376 to 507 ASD:): 4a best part of this section, and indeed of the whole book, is the seven chapters devoted to Attila's invasion of Gaul and the battle of the Manriac plains. Here we have in all probability a verbatim extract from Cassiodorins, who has interwoven with bis natrative large portions of the Gothic sagas. The celebrated expression "certaminis gaudia" assuredly came at first neither from the suave minister Cassiodorius nor from the small-souled

notary Jordanes, but is the translation of some thought which first found utterance through the lips of a Gothie minstrel.

The fourth seetion (chaps. xlviii.—Ix.) traces the history of the East Goths from the same Hunnish invasion to the first overthrow of the Gothic monarehy in Italy (376-539). In this fourth section are inserted, somewhat out of their proper place, some valuable details as to the Gothi Minores, 'an immense people dwelling in the region of Nicopolis, with their high priest and primate Vulfilas, who is said also to have taught them letters." The book closes with the allusion to Germanus and the panegyrie on Justinian as the conqueror of the Goths referred to above.

As to the style and literary character of Jordanes, every author who has used him speaks in terms of severe censure. When he is left to himself and not merely transcribing, he is sometimes seareely grammatical. 'There are awkward gaps in his narrative and statements

inconsistent with each other. He qnotes, as if he were familiarly aeqnainted with their writings, about twenty Greek and Roman writers, of whom it is almost certain that he had not read more than three or four. At the same tiine he does not quote the chronicler Marccllinus, from whom he has copied verbatim the his- tory of the deposition of Augustulus. All these faults make him a peculiarly unsatisfactory authority to depend upon where we can- not check his statements by those of other authors. Itmay, how- ever, be pleaded in extenuation that he is professedly a transcriber, and, if his story be correct, a transcriber under peculiarly unfavour- able circumstances. He has also himself suffered much from the inaccuraey of copyists. But nothing has really been more unfortu- nate for the reputation of Jordanes as a writer than the extreme preciousness of the information whiel he has preserved to us. The Teutonic tribes whose dim original he records have in the course of centuries attained to world-wide dominion. 'The battle in the Mauriac plains, of which he is really the sole historian, is now seen to have had at least as important bearings on the destinies of the world as Marathon or Waterloo. And thus the hasty pamphlet of a half-educated Gothic monk has been foreed into prominence, almost into rivalry with the finished productions of the great writers of classical antiquity. No wonder that it stands the comparison badly ; but with all its faults the De Rebus Geticis of Jordanes will probably ever retain its place side by side with the De Moribus Germanorwm of Tacitus, as a chief source of information respect- ing the history, institutions, and modes of thought of our Teutonic forefathers,

Manuscripts. —The chief MSS. of the De Rebus Geticis are one at Heidelberg of the 8th century and one at the Vatican of the ;10th, one at Milan, two of the llth and 12th eenturies at Vienna, and one of the 12th eentury at Munieh. Unfortunately the Heidelberg and Vienna MSS. perished in the fire at Prof. Mommsen's honse, but not before he had aecurately eollated them.

_ Editions.—The editio princeps of the De Rebus Geticis was published by Peu-

finger, at Augsburg, 1515. Two of the best known editions are those in Muratori's Rerum Italicarum Scriptores, vol. i. (whieh gives Garet's text collated by J. A. Saxe with the Ambrosian MS., and which also contains the De Regnorum Successione), and in Grotius's Ilistoria Gotthorum, Vandalorum, et Langobar- dorum, Amsterdam, 1655. A new edition is expeeted from Professor Mommsen.

Iiterature—tThe foregoing article is chiefly founded on Von Sybel's essay, De fontibus Jordanis (1838), Sehirren's De ratione que inter Jordanem et Cassio- dorum intercedat Commentatio, Dorpat, 1858; Kopke''s Die Anfdnge des Kénig- thums bet den Gothen, Bertin, 1859; Dahn's Die Koénige der Germanen, vol. ii., Munieh, 1861; Ebert's Geschichte der Christlich-Lateinischen Literatur,

Leipsie, 1874; and Wattenbach's Deutschland's Geschichtsquellen im Mittelalter, Berlin, 1877. (Cae)

JORTIN, Joun (1698-1770), a writer on theological subjects, was the son of a Protestant refugee from Brittany, and was born in London 23d October 1698. In his tenth year he entered Charterhouse school, and in 1715 he be- came a pensioner of Jesus College, Cambridge, where his reputation as a Greek scholar led the classical tutor of his college to select him to translate certain passages from Eustathius for the use of Pope in his translation of Homer. He graduated B.A. in 1719 and M.A. in 1722. In the latter year he published a small volume of Latin verse entitled Lusws Poetici. Having received priest's orders in 1724, he was in 1726 presented by his college to the vicarage of Swavesey in Cambridgeshire, an appointment which he resigned in 1730 to become preacher of a chapel in New Street, London. In 1731, along with some friends, he began a publication entitled Aiscellaneous Observa- tions on Authors Ancient and Modern, which appeared at intervals during two years. In 1737 he was presented to the vicarage of Eastwell in Kent, and in 1751 he became rector of St Dunstan's-in-the-East. Shortly after becoming chaplain to the bishop of London in 1762, he was appointed toa prebendal stall of St Paul's, and to the vicarage of Kensington, and in 1764 he was made archdeacon of London. He died at Kensington, September 5, 1770.

The principal works of Jortin are Discussions Concerning the Truth of the Christian Religion, 1746; Remarks on Licclesiastical History, 1751; Life of Erasmus, 2 vols., 1750, 1760, founded on the life by Le Clerc, but con- taining a large amount of new matter; aud Tracts Philolo- gical, Critical, and Miscellaneous, 1790. All his works dis- play great learning and some acnteness both of research and criticism, but though written ina livclystyle they do not bear that stamp of originality which confers permanent interest.

See Disney's Life of Jortin, 1792; and the " Aceount of his Life and Writings " prefixed to an edition of the Remarks on Ecelcsiastical History published in 1816.

JOSEPH, the most powerful tribe of northern Israel, occupied the centre of the land from the plain of Esdraelon to the mountain country of Benjamin and threw out colonies to Bashan and northern Gilead (see IsraEt, p. 397). Unlike the other sons of Jacob, Joseph is usually reckoned as two tribes, the younger but more numerous tribe of Ephraim, to which Joshua belonged, having the pre- eminence over the other—Manasseh. In Ephraim lay the city of Shechem with the tomb of the tribal ancestor, and the great sanctuary of Shiloh where the ark stood till the battle of Ebenezer destroyed for a time the hegemony of Joseph, till after the division of the kingdoms he again became '"'the crowned one of his brethren" (Gen. xlix. 26 ; Dent. xxxiii. 16). Along with the small tribe of Benjamin, which as its name indicates lay immediately to the south, the house of Joseph constituted the group known as sons of Rachel (the ewe), which with the sons of Leah (the antelope) claimed a higher ancestry than the other Hebrews (the sons of Jacob's concubines).

The name of Joseph, the tribal ancestor, is explained in Gen. xxx. 24, in accordance with the usnal speliing "PY, as meaning "he addeth" (hence in Ps. Ixxxi. 6 [E. V. 5] the resolved form 2%). Another hand in Gen. xxx. 23 takes the word from "DS, "he taketh away." 'he history of Joseph, Gen. xxxvii.-l., belongs almost wholly to the earliest strata of the Pentateuch, the narratives of the Jehovist and non-Levitical Elohist,

the larger share belonging to the latter author, himself probably a member of the house of Joseph.

The history of Joseph in Egypt displays remarkable familiarity with the circumstances and usages of that country (see Kbers, Acgyptenund die Biicher Mosis, Leipsic, 1868), but presents no data which enable us with certainty to eombine the Bibheal record with known eventsin Egyptiau history. Itisstill disputed whetherJoseph came to Egypt before, under, or afterthe Hyksos, The first opinion, which is supported by Bunsen and others, involves a considerable re- duetion in the period of five hundred and eleven years assigned to the Hyksos by Manetho, while on the other hand a date subsequent to the expulsion of the Semitie invaders (¢.g., under Sethi I. as Lepsius suggests) deinands a great shortening of the four hundred and thirty years of Exod. xii. 40, if the Pharaoh of the oppression was Sethii's successor, Rameses II. That the Israelites entered Egypt under the Hyksos is already mentioned as the current opinion of his time by George Syneellus, and is followed by many moderns, who observe that the promotion of a Hebrew appears most natural under a Semitic dynasty. See Ecypr, vol. vii. p. 741, and for Brugsch's supposed monumental reference to the seven years' famine, ibid., p. 736. The Egyptian tale of "The Two Brothers," which presents a remarkable parallel to the story of Joseph, is given in Records of the Past, vol. ii.

The name of Joseph was common among the later Jews ; of the Biblical personages by whom it was borne the best known are Joseph the husband of Mary, Joseph of Ari- mathxa, Joseph Barnabas, and Joseph Barsabas.

JOSEPH, the husband of Mary the mother of Jesus, was a descendant of the house of David, and followed the trade of a carpenter in the village of Nazareth. Of his personal history practically nothing is recorded in Scripture. It is probable that he had died before the beginning of the public ininistry of Christ; at least this scemsa fair inference from the fact that no mention of him is made in passages relating to this period where the mother and brethren of Jesus are introduced. From John xix. 26 it is clear

Ecclesiastical tradition, probably influenced by dogmatic prepossessions, has it that when married to Mary he was already eighty years of age and the father of four sons and two daughters, and that his first wife was named Salome, a connexion of the family of John the Baptist. In the Roman Catholic Church the 19th of March has since 1642 been a feast of obligation in his honour. the increase.

born in Vienna July 26,1678. In 1689 he received the crown of Hungary, in 1690 that of the king of the Romans ; and in 1705 he succeeded his father, Leopold L, as Holy Roman emperor. raging at the time of his acccssion to the imperial throne ; and it continued during the whole of his reign. Thanks to the genius of Marlborough and Eugene, Joseph was able to maintain in this struggle the greatest military traditions of the empire ; and, the French troops having been gradu- ally driven out of Italy and the Netherlands, Louis XIV. was compelled to ask several times for the conclusion of peace. The pope also gave evidence of the emperor's power by recognizing his brother Charles as king of Spain. In 1706 the electors of Cologne and Bavaria, and in 1708 the duke of Mantua, were put to the ban of the empire for supporting the enemy of their sovereign ; and tlle emperor not only seized Bavaria, but began to partition it. He was 'successful, too, in Hungary, where he put down a rebellion that had broken out in the time of his father. On the other hand, he found it prudent to manifest a conciliatory spirit in his relations to Charles XII. of Sweden, who in 1706 made his way from Poland to Saxony through Silesia. In 1707 the emperor concluded treaties with him, granting religious liberty to the Silesian Protestants, and restoring to them upwards of two hundred churches which had been seized by the Jesuits. 'These concessions were not unwill- ingly made by the emperor, who, although a sincere Catholic, was of a tolerant disposition. He showed his respect for the constitution and dignity of the empire by supporting the diet in the free exercise of its functions, by promoting the activity of the imperial chamber, aud by restoring Donauwérth, which had been mediatized by Bavaria, to the position of a free imperial city. He died of small-pox on the 17th of April 1711.

JOSEPH II. (1741-1790), Holy Roman emperor, born in Vienna March 13, 1741, was the son of the emperor Francis I. and Maria Theresa, Ie was made king of the Romans in 1764; and in 1765 he succeeded his father as Holy Roman emperor. Maria Theresa declared him co- regent of her hereditary states, but almost all real power she retained in herown hands. He received full authority only in the regulation of the military system, into which he introduced many changes, following in the main the example of Frederick the Great. Chiefiy by his advice Maria Theresa was induced to associate herself with Russia and Prussia in the partition of Poland; and in 1777 he persuaded her to force Turkey to surrender Bukowina. When the younger branch of the house of Wittelsbach died out in 1777, Joseph claimed a large part of its territory ; but Frederick the Great resisted his pretensions, and in 1779, after a nominal war, the emperor accepted the treaty of Teschen, by which he obtained only a small concession. Before this time he had sought to prepare himself for his future duties by extensive travels in his own states and in foreign countries ; and everywhere he had made a favour- able impression by his genial courtesy, In 1769 he had visited Frederick the Great, for whom he had at that time a warm admiration; and in the following year Frederick returned the visit, going back to Prussia with the convic- tion that it would be necessary "to keep his eye on that

His cultus is on | | of Hungary, and would not summon the Hungarian diet,

JOSEPH I. (1678-1711), Holy Roman emperor, was

The war of the Spanish succession was |

J OMS PH

that le was not alive at the time of the crucifixion. | young man."

On the death of Maria Theresa in 1780, Joseph became sole ruler of the Austrian states. He was penetrated by the characteristic ideas of the 18th century as to the duties of an absolute mouarch, and began at once to give effect to them in a fearless and almost revolutionary spirit. His

first step was to combine the various national- ities subject to him into a single state with thirteen administrative districts. He refused to be crowned king

insisting that the country should be governed as a province, and causing German to be used as the official language. Among other reforms he proclaimed the abolition of serf- dom, substituted various punishments for the capital penalty, established common tribunals, aud issued new codes based on the principle that all citizens are equal before the law. He transferred the censorship of books from the clergy to laymen of liberal sympathies, and granted complete freedom to journalism. He instituted public Hbraries and observatories, founded a medical college in Vienna, a university in Lemberg, and schools for the middle classes in various parts of the monarchy, and encouraged art by offering prizes in con- nexion with the academy of the plastic arts. Industry and trade he fostered by destroying many monopolies, by aiding in the establishment of new manufactures, by raising Fiume to the position of a ftee harbour, and by opening the Danube to his subjects from its source to the Black Sea. His ecclesiastical policy was of so bold a character that Pope Pius VI. went to Vienna for the purpose of cxpostulating with him, but found that the emperor was beyond the range of his influence. The hierarchy was furbidden to correspond with the Roman see without express permission ; and papal bulls were subjected to the Placetum Regium. In 1781 he issued au edict of tolera- tion, granting freedom of worship to all Protestants and to menibers of the Greek Church; and between 1782 and 1790 about seven hundred monasteries were closed, the members of religious orders being reduced from 63,000 to 27,000. All these changes were well-meaut, but the emperor, in the ardour of lis philanthropy, shot too far ahead of the prevailing sentiment of his people. Moreover, his good intentions were often rendered fruitless by nnskilful or unsympathetic subordinates. In nearly every part of the monarchy discontent soon manifested itself, and some of the inhabitants of Tyrol broke into open rebellion. The Hungarians bitterly resented the suppression of their ancient privileges, and in 1787 the emperor's new institu- tions led in several districts to a furious conflict between the peasantry and the nobles. The estates of the Austrian Netherlands persistently opposed

the execution of his schemes, the clergy being especially active in stirring up popular indignation; and when, in 1789, he altogether destroyed their constitution, they rebelled and were able for some months to maintain their independence. In Hungary there was so dangerous an agitation that in January 1790 Joseph had to undo almost everything he had attempted to accomplish in that country during the previous nine years; he succeeded only in maintaining the decrees by which he had abolished serfdom and established toleration. Thus his last days were rendcred miserable by the conviction that his career had been a failure. He was not more fortunate in his foreign policy than in his home government. Early in his reign, indeed, he gained some advantages over the Dutch, who were obliged to abandon their fortresses on the frontier of the Austrian Netherlands. And when they refused to open the Scheldt, they had_to compensate him (in 1785) by a payment of ten million florins. In the same year he renewed his claims on Bavarian territory, but was thwarted by Frederick the Great, who formed his famous league of princes for the

protection of the German states against Austrian ambition. After the conclusion of the treaty of Tesclien, Joseph made it one of the chief objects of his foreign policy to form an

enduring alliance between Austria and Russia; and in |

1788, iu association with Catherine IL, he declared war against Turkey. He did not live to see the end of this war, which brought him little honour.

been able to achieve so few of the objects with which he had begun his reign. He was twice married, first to the Princess Marie Louise of Parma, afterwards to the Princess Marie Josephe of Bavaria. His only daughter died in childhood, so that he was succeeded by his brother Leopold II. Notwithstanding the defeat of so many of his plans, his reign marked an epoch in the history of Austria; and the interest still excited by his name was shown by the enthusiasm with which the people of Austria celebrated in 1880 the centenary of his accession as

sole ruler. On the pedestal of his statue in Vienna, erected by Francis I. in

1807, are these words:—‘Josepho secundo, qui saluti

publics vixit non diu, sed totus.” (5. SI.) JOSEPHINE (1763-1814), empress of the French, was born at Trois-[lets, Martinique, on the 23d of June 1763, and was the eldest of three daughters born to Joseph Tascher de la Pagerie, lieutenant in the artillery, and his wife Rose-Claire Des Vergers de Sannois. She was educated at a local convent, from wliuch she was withdrawn in her fifteenth year, knowing how to dance, sing, and embroider, but little else. An aunt, resident in France, was godmother to the second son of the Marquis de Beauharnais, once the governor of Martinique ; and she suggested a marriage between her god-child and niece. After much negotiation between the families, in which the second and youngest daughters were both preferred to Joséphine, her father carried her to Havre in 1779, she being already described to her aunt and the Beauharnais as possessing a fine complexion, beautiful arms and eyes, and with a sweet voice and a remarkable taste for music—alto- gether “ trés-avancée et formée pour son age.” On the 13th of December she was married to the Vicomte Alexandre Beauharnais at Noisy-le-Grand. Her son Eugene was born at a time when her relations with her husband were embittered by jealousy ; and after the birth of her daughter Hortense-Eugénie he sought a separation, but, though he carried his request to the parliament, his petition was dismissed. Joséphine went back to her parents in June 1788, and was with them when the Revolution broke out. At the request of the vicomte she returned, however, to France in 1790. He was then a member of the constituent assembly, receiving at his house the chiefs of the constitu- tional party ; and Joséphine was admired by all of them for her dignity, simplicity, and sweetness. As the crisis became more acute, her husband thought it prudent to withdraw to Ferté-Beauharnais, in Sologne, where he left his family when he went to command the army of the Rhine. After his execution by order of the Convention, Joséphine was reduced to great straits, and not till the end of 1795 did regular remittances from Martinique begin again. She was living in the Rue Chautereine, Paris, in a house of her own, when she

paid ker first visit to Napoleon, to thank him for restoring the sword of her husband. She was in the full flower of her womanhood ; Napoleon was at once drawn to her; onthe 9th of March 1796 they were married. In twelve days he left her to take command of the army in Italy; but in June, at his earnest request, she joined him at Milan and went on to Brescia. After the peace of Léoben they lived at Monte- bello near Milan, and Joséphine was for some time the queen of a court frequented by great officers and diploma-

On the 20th of | February 1790 he died, deeply disappointed that he had |

at her house assembled the most distinguished men of the day. During the expedition to Egypt she moved between the capital and Plombiéres ; but she had her first quarrel with Napoleon on his return, because, by an oversight, she omitted meeting him. Social duties of the most brilliant and difficult sort began to accumulate round her during the consulate. At the palace of the Luxembourg and the Tuileries her drawing-room was again tlie centre of attraction in Paris; her receptions were ruled by the old traditions of regal ceremony, and there was an endless round of fétes, entertainments, and plays. Her beauty and amiability won upon everybody; and when she wanted rest she retired to Malmaison, a country seat she had bought, and amused herself with a variety of light studies in botany and natural history. Rumours now began to reach her that Napoleon, in despair of offspring, meant to sue for a divorce. She had long known that his relatives were trying to undermine her position ; and even when she knelt beside him at Notre Dame, and received the triple unction at the ceremony which crowned her empress, she knew it to be a concession wrung from him. After the coronation he gave her less and less of his society. It was not, however, until the winter of 1809 that he deliberately proposed to dissolve the connexion, He divorced her with much show of tenderness, and she retired to Malmaison with an anuual grant of two million francs for her establisliment. Her affection for Napoleon, and her anxiety for his success, remained strong to the hour

of her death, on May 24, 1814; and but for his inordinate ambition he would never have sought to live apart from her. She often provoked him by a certain mild duplicity in her character ; she was extravagant and super- stitious ; yet, to fulfil the high destiny-to which she was called, she brought much gentleness, courage, and sweet- ness, qualities which carried her through her reverses with admirable dignity.

See Aubenas, Histoire de ? Impératrice Joséphine, 1858-59.

JOSEPHUS, Fuavivs, the well-known historian of the Jews, was born at Jerusalem in the first year of the reign of Caligula; the precise date is uncertain, but it lies some- where between September 13, 37, and March 16, 38 a.p. His early advantages were very considerable. His father Matthias belonged to one of the best priestly families in the city, while on his mother's side he was descended from Jonathan, the first Hasmonean high priest. The position of his parents procured for him a careful education, and such was his progress (at least if his own account of himself is to be believed) that at the age of fourteen he was often consulted by the high priests and prominent citizens on difficult points of Jewish law. At sixteen he resolved upon an experimental study of the doctrines of the three leading sects, or schools of philosophy, as he prefers to consider them; and, hearing that Banus, a celebrated Essene, was living in the wilderness with the rigorous asceticism of a hermit, he joined him and remained under his teaching for three years. Returning to Jerusalem at the age of nineteen, he definitively joined the Pharisees, to whom he continued ever after to adhere. In 64 a.D. (xt. 26) he undertook a journey to Rome to intercede for some priests of his acquaintance whom Felix the procurator had sent thither as prisoners to be tried on some trifling charges. Landing safely at Puteoli after. a narrow escape from death by shipwreck in the Adriatic, he gained the friendship of Alityrus, a famous J ewish mime of the day, and a favourite of Nero; by this means he not only obtained the pardon of his friends, but was also loaded with many valuable gifts by the empress Poppa. On reaching Judea again he found his countrymen bent at all hazards on throwing off the Roman yoke ; knowing well

tists. Having visited Rome, she went back to Paris, and | the resources of Rome, and the hopelessness of successfully

resisting her power, he (according to his own account, which is not in itself very improbable) did his best to dissuade them from any such attempt. Ultimately, however, after the victory over Cestius Gallus, he yielded to the force of the current, and joined the revolutionary movement in 66, being entrusted with the task of governing and defending the province of Galilee, an appointment for which he was indebted to family influence rather than to any known military skill. Proceeding at once to his province, he set about the execution uf plans of political reorganization, at the same time fortifying various military positions, and getting together and drilling an army of 100,000 men. Very soon, however, lie had to encounter the opposition of a strong party, leaded by John of Giscala, and it was with difficulty that he averted an insurrection at Tarichez, and afterwards saved himself by flight from Tiberias. His enemies actually at one time had succeeded in obtaining his recall; but the act was afterwards cancelled, through the powerful influence he still possessed in Jerusalem.

Meanwhile Vespasian had assembled a large force at

Antioch, and in the spring of 67 threw a garrison into Sepphoris, wheuce (the troops of Josephus not waiting his attack) he made himself master of all Lower Galilee. Josephus hirnself falling back on Tiberias sent for large reinforcements from Jerusalem; these not being forth-coming, he in May shut himself up in Jotopata, the defence of which he maintained against all the efforts of the Romans for forty-seven days. At the end of that period the place was taken by storm, and such of the garrison as had not perished in the siege were put to death by the conquerors. The governor himself demanded to be led into the presence of the general, and, with great adroitness assuming the réle of a prophet, told his captor that he was no chance prisoner, but had been commissioned by heaven to predict that he was shortly to become the sole head of the Roman empire. The plan was so far successful that the prisoner's life was spared ; Vespasian, however, kept him in close

confinement for two years, but on attaining the purple liberatedhim. Thenceforward Josephus assumed the family name of his patron (Flavius). After having accompanied Vespasian to Alexandria, he attended Titus to Palestine, and remained in his train until the close of the war. At the risk of his life he was more than once sent to urge his countrymen to yield, but without success. After the fall of the city he accompanied Titus to Rome, where Vespasian assigned him a residence in what had once been his own house, conferred on him the citizenship, and gave him a yearly pension, to which was afterwards added an estate in Judea. Under Titus and Domitian he was confirmed in all his privileges, devoting the peaceful remainder of his days to those literary labours with which his name is now so exclusively associated. The precise date of his death is unknown; he must have survived the first century, for his autobiography mentions the death of Agrippa IT., which occurred in 100 a.p.

Ilis extant works are the following. (1) History of the Jewish War (ep) tod "lovdaixod roAduov), in seven books. It was origin- ally written in Aramaic for the benefit of the Jews dwelling beyond the Euphrates, but was afterwards translated by its author into the Greek, which alone we now possess. Books i.~~ii. 14 sketch the whole course of Jewish history from the period of the Maccabees to the beginning of the war. The remainder of the work gives a minute account of the entire struggle from 65 to its complete suppression in 73 A.D. On its completion the whole work was submitted to Vespasian, Titus, and Agrippa II., who, the author tells us, bore witness to its accuracy. Of its general trustworthi~~ ness there can be no reasonable doubt : Josephus had a considerable personal share in much of what he records ; and on other points he seems to have had access to direct documentary evidence. The speeches which he reports are not of course to be construcd by stricter rules than those which occur in the works of Livy or

Thucydides ; and apart from this some allowance also must be made for a tendency to exaggeration oy false accentuation wherever his

vanity judged such a thing to be desirable. (2) Antiquities of the Jews (lovdaikh apxatodoyia), in twenty books, a comprehensive Jewish history from the earliest times down to the outbreak of the warin 66. It was completed in the thirteenth year of Domitian (93-94 A.D.), long after the author's own interest in it had exhausted itself. For the first eleven books, covered by the Scripture narra- tive, his exclusive authority seems to have been the Bible itself, especially the LXX. translation. He frequently, however, omits or modifies points which seemed to him likely to give offence ; sometimes he supplements with current traditions or uses the works of his predecessors in the same field, Demetrius and Artapanns ; and occasionally he gives excerpts from profane writers. The remaining nine books are very unequal in merit. The period betwcen Alexander the Great and the Maccabees is almost an entire blank. For the Maccabean wars (xii. 5-xiii. 7) he had 1 Macc. to draw upon; for the reigns of the later Hasmoneans (xiii. 8-xiv.) he is dependent upon the historians Strabo and Nicolaus of Damas- cus. The last-named writer is also his chief authority for the portion of his narrative which relates to the times of Herod (xiv.— XVil.)s, but he appears to have had access to some original memoirs. The last three books (xvili.-xx.), relating to the times immediately subsequent to the death of Herod, are more meagre than might have been expected, and by the carelessness of their manner bear witness to the author's confessed fatigue. Book xviii. (chap. iii. sec. 3) contains a remarkable passage relating to Jesus Christ, which is twice cited by Eusebius as genuine (2. £., i. 11; Dem. Ev., iii. 3, 105-6), and which is met with in all the extant MSS. It is, how- ever, unanimously believed to be, in its present form at least, spurious, and those who contend even for its partial genuineness are decidedly in the minority. (8) Autobiography, in seventy-six chapters, all of which, however, exeept the first six and the last two relate to the occurrences in Galilee in which he had so large a share during 66-67 A.D., written in defence of himself against the repre- sentatious of a certain Justus of Tiberias. His narrative of these events cannot be regarded as an impartial onc, and that in some points at least he was led to sacrifice truth to self-interest can be conclusively shown by comparison even with his own carlier work, the History of the Jewish War. The Vita, which contains the allusion to the death of Agrippa II., must have been written at a date subsequent to 100 a.p. (4)

Against Apion, in two books. This is the usual but somewhat misleading title of a general apology for Judaism in which the polemic against Apion occupies only a subordinate place. Porphyry cites it by the title Mpbs tovs "EAAnvas, while Origen and Eusebius call it Mep) rs rav 'lovdalwy apxaidrnros. The date of its composition is later than that of the

The Greek text of the works of Josephus was first printed at Basel in 1544. The earliest critical editions were those of Hudson (Oxford, 1720) and Havercamp (Utrecht, 1726); the text of the latter is that given by Oberthiir (3 vols. 8vo., Leipsic, 1782-85) and by kichter (Leipsic, 1826-27). Further emendations occur in the edition of Dindorf (Paris, 1845-47), which is the basis of Bekker's edition (Leipsie, 1855-56). A new edition based upon fresh collation of MSS. is promised by Niese. The treatise Against Apion was scparately edited, with notes, by J. G. Miller, 1877. The translations of Josephus have been very numerons, and his writings are also the basis of the Bellum Judaicwm which bears the name of Egesippus (corrupted from Josippus), and of the medieval Hebrew history ascribed to Josippon beu Gorion. For the whole subject, biographical and literary, see Schiirer's NTliche Zeitgeschichte (1874) and his exhaustive article " Josephus" in Herzog-Plitt's Real-Encyel., vol. vii. (1880).

JOSHUA (YIM, or in later Heb. YW, Gr. "Tyoods, whence "Jesus" in the A. V. of Heb. iv. 8; ancther form of the name is Hoshea, Num. xiii. 8, 16), first the lieutenant and afterwards the successor of Moses, was the son of Nun, of the tribe of Ephraim, and left Egypt, along with the rest of the children of Israel, at the time of the exodus. In the Pentateuch he is first mentioned as being the victorious commander of the Tsraelites in their battle against the Amalekites at Rephidim (Ex. xvii. 9-13), and he is represented as having earned further distinction along with Caleb by his calm and courageous demeqnour jn tlie midst of the popular tumult

caused by the report of the spies (Num. xiv. 6-9, 38). On the death of Moses he assumed the leadership to which he had previously been

designated by his chief, and the book known by his name is entirely occupied with details of the manner in which he carried out the task thus laid to his hand,—that of taking possession of the land of Canaan. On the completion of the reconnaissance by the two spies, he left Shittim with his army, preceded by the priest-borne ark of the covenant. The Jordan having been miraculously crossed, his first encampment was at Gilgal. Jericho and Ai soon fell into his hands, and the people of Gibeon became vassals, In the neighbourhood of Gibeon the five kings of the Amorites were crushed in a decisive battle in which the very elements conspired to favour the invader, and (to use the poetical language of the book of Jashar) "the sun stood still and the moon stayed until the people had avenged themselves upon their enemies." The victorious arms of Israel were now directed northwards against a league of Canaanite potentates under the hegemony of Jabin, king of Hazor; anticipating the attack of the enemy, Joshua surprised and crushed them at the waters of Merom, Hazor itself being taken and burnt, Thus far the first twelve chapters of the book of Joshua; the remain- ing twelve describe the partition of the (conquered and unconquered) country among the twelve tribes, and conclude with a resumé of his parting exhortations At the age of one hundred and ten he died and was buried in this inheritance in Timnath-serah, in the territory of Ephraim. For the book of Joshua, an integral part of that part of the Old Testament sometimes spoken of as HMexateuch, the reader is referred to the heading PeNnTa- TEUCH.

Critical investigation has shown that the history or Joshua as now sketched is a composite narrative, made up mainly from the two Elohistic (or, as they are now generally called, the Elohistic and the Levitical) documents. Fragments of an account of the con- quest of Canaan older than either of these writings are preserved in the book of Judges, and it is generally recognized by recent inquirers that the progress of the Israelites was much slower and their action less united than appears on the face of the book of Joshua as we now read it, the statistics of the Levitical record in particular applying properly to a much later date. From this point of view Joshua appears rather as the leader of Ephraim than ofall Israel. He is for the north what Caleb was for the south. See IsraEL and JUDGES, and compare a paper by

Meyer in Stade's Zettsch. f. ATliche Wiss., vol. i. (1881). See also Ewald, Geschichte, vol. ii. The ouly extra-Biblical notice of Joshua is the inscription of more than doubtful genuineness given by Procopius (Vand., ii. 20), and mentioned also by Moses of Chorene (Hist. Arm., i. 18). It is said to have stood at Tingis in Mauretania, and to have borne that those who erected it had fled before "Ingots 6 Anorhs.

JOSIAH, the last but four of the kings of Judah, was the son of Amon, whom he succeeded when only eight years old, the people having declared in his favour against the conspirators who had murdered his unworthy father. The circumstances of the regency which must have existed during his minority are not recorded; it is not until his eighteenth year (for 2 Chr. xxxiv. 3 cannot be set against the explicit testimony of 2 Kings xxii, xxiii.) that he emerges into the light of history, when we find him interested in the repair of the temple at Jerusalem. The religious movement of which this was a symptom took more definite shape with the finding by Hilkiah the high priest of a copy of "the book of the law." The reasons for believing this to have been (substantially at least) the book of Deuteronomy cannot be detailed here. They were already appreciated by Jerome and Chrysostom, and no very careful examination is required to show that the effect of its perusal was to bring about a religious reformation, which in all its features was in accordance with the pre- scriptions and exhortations of that remarkable composition. The main features of the movement (which extended into

the adjoining kingdom of Samaria, at that time a loosely

governed Assyrian dependency) have already been sketched in the article Isrart. On the secular aspects of the reign of Josiah Scripture is almost wholly silent. Thus nothing is related of the great Scythian invasion, which as we know from Herodotus (i. 105) took place at this period, and must have approached Judah, being probably alluded to by Zephaniah and Jeremiah. The storm which shook the great world powers was favourable to the peace of Josiah's kingdom ; the power of Assyria was practically broken, and that of the Chaldeans had not yet

developed itself into the aggressive forms it afterwards assumed. But in his thirty-first year Josiah for some unexplained reason was rash enough to place himself in the path of Pharaoh Necho in his military expedition against the king of Assyria; a disastrous encounter took place at Megiddo, in which he lost at once his crown and life (zt. 39).

JOSIKA, Mixxés or Nicnoias, Baron (1794-1865), the greatest and, next to Jékai, most prolific Hungarian novelist, was born 28th April 1794, at Torda in Transyl- vania, of aristocratic and wealthy parents. After finishing the usual course of legal studies at Kolozsvar (Klausenburg), he in 1811 at the age of seventeen entered the army, joining a cavalry regiment, with which he subsequently took part in the Italian campaign. In 1813 he was promoted to the grade of sub-lieutenant, and on the battlefield of Mincio (February 8, 1814) to that of lieutenant. Elevated to the rank of captain, he served in the campaign against Napoleon, and was present at the entry of the allied troops into Paris (31st March 1814). In 1818 Josika resigned his commission in the army, returned to Hungary, and married his first wife Elizabeth Kallai. The union proving an unhappy one, Jésika parted from his wife, settled on his estate at Szurdok in Transylvania, and devoted himself to agricultural and literary pursuits. Drawn into the sphere of politics, he took part in the memorable Transylvanian diet of 1834. At about this period Jdsika first began to attract attention asa writer of fiction, In 1836 he brought out his Abafi, 2 vols., which laid the foundation of his literary reputation. He was soon afterwards elected member of the Hungarian Academy of Sciences and of the Kisfaludy Society; of the latter he became, in 1841, director, and in 1842 vice-president, In 1847 Jésika appeared at the Transylvanian diet as second deputy for the couuty of Szolnok, and zealously supported the move- ment for the union of Transylvania with Hungary proper. In the same year he was converted to Protestantism, was formally divorced from his wife, and married Baroness Julia Podmaniezky, with whom he continued to live happily until his death. So great was Jésika's literary activity that by the time of the revolution (1848) he had already produced about sixty volumes of romances and novels, besides numerous contributions to literary and political periodicals. Both as magnate of the upper house of the Hungarian diet and by his writings Jdésika aided the

revolutionary movement, with which he was soon personally identified, being chosen one of the members of the com- mittee of national defence. Consequently, after the capi- tulation at Vilagos (13th August 1849), he found it neces- sary to flee the country, and settled first at Dresden and then, in 1850, at Brussels, where he resumed his literary pursuits anonymously, In 1864 he removed to Dresden, in which city he died on the 27th February 1865. The romances of Jésika, written somewhat after the style of Sir Walter Scott, are chiefly of a historical and social- political character, his materials being drawn almost entirely from the annals of his own country. Among his more important works may be specially mentioned, besides Abafi —The Poet Zrinyi, 1843; The last of the Batoris, 1837 ; The Bohemians in IIungary, 1839; Esther, 1853 ; Francis Rékoczy II., 1861; and A Végvdériak, a tale of the time

of the Transylvanian prince Bethlen Gabor, 1864. Many of Jésika's novels have been translated into German, the earlier oues by Klein, Schwarz, Steinacker, and Kovacs, and the later by Jdésika's second wife Julia, herself an authoress of considerable merit.

See K. Moenich and 8. Vutkovich, Magyar Irék Névtéra, Buda- pest, 1876; M. Jékai, " Josika Miklés Emlékezete," A Kisfaludy- Tarsasdg Evlapjat, Uj folyam, vol. iii., Pest, 1869; G. W. Stein- acker, Ungarische Lyriker, Leipsic, 1874. Cf. also Jdsika's autobiography—Hmickirat, Pest, 1865, vol. iv.

JOSQUIN. See Depris, Josquin, vol. vii. p. 101, musical composer, ordinarily designated by the name Josquin.

JOST, Isaak Markus (1793-1860), historical writer, was born on February 22, 1793, at Bernburg, and studied at the gymnasium of Wolfenbiittel, whence he passed successively to the universities of Géttingen and Berlin. In Berlin he taught a school from 1826 till 1835, when he received the appointment of upper master in the Jewish

commercial school (called the Philanthropin) at Frankfort- on-the-Main. Here he remained until his death, 20th November 1860. The work by which he is chiefly known is a Geschichte der Israeliten, in 9 vols. (Berlin, 1820- 29), which was afterwards supplemented by Veuere Geschichte der Israeliten von 1815-45 (Berlin, 1846-47), and Geschichte des Judenthums u. seiner Sekten (Leipsic, 1857-59). He also published an abridgment of the Geschichte under the title Allgemeine Geschichte des jiidischen Volks (1831-32), and an edition of the Mishna with a German translation and notes (in 6 vols., 1832- 34). The Israelitische Annalen were edited by him from 1839 to 1841, and he contributed extensively on pedagogic and historical subjects to scientific journals.

JOUFFROY, THEeopore-Simon (1796-1842), a French philosopher, was born at Pontets, near Mouthe, department of Doubs, 1796. In his tenth year, his father, who was a taxgatherer, sent him toan uncle at Pontarlier, under whom he commenced his classical studies. At Dijon his composi- tions attracted the attention of an inspector who had him placed (1814) in the Normal School, Paris. He there came under the influence of Cousin, and in 1817 he was appointed assistant professor of philosophy at the Normal and Bourbon schools. Three years later, being thrown upon his own resources, he began a course of lectures in his own house, and formed literary connexions with Le Courrier Francais, Le Globe, L' Encyclopédie Moderne, and La Revue Euro-péenne. The variety of his pursuits at this time carried him over the whole field of ancient and modern literature. But he was chiefly attracted to the philosophical system represented by Reid and Stewart. The application of "common sense" to the problem of substance supplied a more satisfactory analytic for him than the scepticism of Hume which reached him through a study of Kant. He thus threw in his lot with the Scotch philosophy, and his first dissertations are, in their leading position, adaptations from The Inquiry. His tendency towards eclecticism makes his philosophical position undefinable, but his limpid style and capacity for generalizing historical movements are as distinct in his earlier asin his later works. In 1826 he wrote a preface to a translation of the Moral Philosophy of Stewart, demonstrating the possibility of a scientific statement of the laws of consciousness ; in 1828 he began a translation of the works of Reid, and in his preface esti-

mated the influence of Scotch criticism upon philosophy, giving a biographical account of the movement from Hutcheson onwards. In the same year he assisted Milon in ancient philosophy at the Faculty of Letters, and, while carrying on a course upon recent philosophy, he returned to the Normal School in 1830. Next year he was returned to parliament by the arrondissement of Pontarlier ; but the

work of legislation was ill-suited to his powers. Swift, practical decisions on questions demanding immediate settlement were repugnant to his habits of mind. He. tried to introduce a reform in the manner of considering petitions,—his sole suggestion of any weight during the years of his representation ; though he frequently spoke, he never gained any real influence. Yet he attended to his parliamentary duties conscientiously, and ultimately broke his health in their discharge. In 1833 he was appointed professor of Greek and Roman philosophy at the college of France and a member of the Academy of Sciences ; he then published the Jfélanges Philosophiques, a collection of fugitive papers in criticism and philosophy and history. In them is foreshadowed all that he after- wards worked out in metaphysics, psychology, ethics, and esthetics. He had already demonstrated in his prefaces the possibility of a psychology apart from physiology, of the science of the phenomena of consciousness distinct from the perceptions of sense. He now classified the mental faculties, premising that they must not be confounded with capacities or properties of mind. They were, according to his analysis, personal will, primitive instincts, voluntary movement, natural and artificial signs, sensibility and the faculties of intellect; on this analytic he founded his scheme of the universe. In 1835 he published a Cours de Droit Naturel, which, for precision of statement and logical coherence, is the most important of his works. Starting from the conception of a universal order in the universe, he reasons from it to a Supreme Being, who has created it and who has conferred upon every man in harmony with it the aim of his existence, leading to his highest good. As to the nature of good and evil, how is it to be judged? The good, he says, is the fulfilment of man's destiny, the evil the thwarting of it. Every man being organized in a

particular way has, of necessity, an aim, tke fulfilment of which is good; and he has faculties for accomplishing it, directed by reason. The aim is only good, however, when reason guides it for the benefit of the majority, but that is not absolute good, When reason rises to the conception of universal order, when actions are sub- mitted, by the exercise of a sympathy working necessarily and intuitively, to the idea of the universal order, the good bas been reached, the true good, good in itself, absolute good. But he does not follow his idea into the details of human duty, though he passes in review fatalism, mysticism, pantheism, scepticism, egotism, sentimentalism, and rationalism, In 1835 his health failed and he went to Italy, where he continued to translate the Scotch philo- sophers. On his return he became librarian to the uni- versity, and took the chair of recent philosophy at the Faculty of Letters. He died in Paris, 4th February 1842. After his death were published Vouveaua Mélanges Phalo- sophiques and Cours d'Esthétique. The former contributed nothing new to the system except a more emphatic statement of the distinction between psychology and physiology. The latter formulated his theory of beauty. The beautiful, by his analysis, is that which esthetically pleases, without con- sideration of interest. Utility being defined as the satis- faction of human wants, the beautiful may be useless. Order and proportion he takes to be the components of beauty,— an order and proportion not leading to the useful, but giving pleasure without consideration of the end. Unity and variety are the conditions of beauty ; it demands their coexistence, the former for the satisfaction of sensibility, the latter of intelligence. Jouffroy's claim to distinction rests upon his ability as an expositor of other men's ideas. He founded no system ; he contributed nothing of importance to philosophical science; he initiated nothing which has survived him. But his enthusiasm for mental science, aud his command over the language of popular expo-

sition, made him a great, international medium for the trans- fusion of ideas. He stood between Scotland and France and Germany and France ; and, though his expositions are vitiated by loose reading of the philosophers he interpreted, he did serviceable, even memorable work.

JOURDAIN, Atronsg, count of Toulouse, son of Count Raymond IV. by his third wife, Elvire de Castile, was born in 1103, in the castle of Mont-Pélerin, Tripoli. His father died when he was two years old, and he remained under the guardianship of the count of Cerdagne until he was five. He was then taken to Europe, and his brother gave him Rouergue ; in his tenth year he succeeded to the government of Narbonne, Toulouse, and Provence, but Toulouse was taken from him by the duke of Aquitaine while he was still in his minority. After the duke's death the inhabitants of Toulouse revolted and recalled Jourdain ; he returned in triumph in 1123. He, however, drew upon himself a sentence of excommunication by his treatment of the religious community of St Gilles, which had pre- viously thrown in its influence on the side of the duke of Aquitaine. He had next to fight for the sovereignty of Provence against Raymond Beranger IIL, and not till September 1125 did the war end in an amicable agreement. Under it Jourdain became absolute master of the regions lying between the Pyrenees and the Alps, Auvergne and the sea. His ascendency was an unmixed good to the country, for during a period of fourteen years art and industry were successfully prosecuted. Louis VIE, for some reason which has not appeared, besieged Toulouse in 1141, but without result. Next year Jourdain again incurred the displeasure of the church by siding with the rebels of Montpellier against their lord. A second time he was excommunicated. But his isolation from Rome did not suit his taste or policy ; so in the autumn of 1144 he took the cross at the meeting of Vézelay called by Louis VII., and three years later he embarked for the East. He lingered on the way in Italy, and probably in Constan- tinople ; but in 1148 he had arrived at Acre. Among his companions he had made enemies, and he was destined to take no share in the crusade he had joined. He was poisoned at Acre before hostilities commenced, either the wife of Louis or the mother of the king of Jerusalem suggesting the draught.

JOUVENET, Juan (1647-1717), born at Rouen in 1647, came of a family of painters, one of whom had had the honour of teaching Poussin. He early showed remarkable aptitude for his profession, and, on arriving in Paris, attracted the attention of Le Brun, by whom he was employed at Versailles, and under whose auspices, in 1675, he

became a member of the Royal Academy, of which he was elected professor in 1681, and one of the four perpetual rectors in 1707. The great mass of works that he exe- cuted, chiefly in Paris, many of which, including his cele- brated Miraculous Draught of Fishes (engraved by Audran ; also Landon, Aznales, i. p. 42), are now in the Louvre, show his fertility in invention and execution, and also that he possessed in a high degree that general dignity of arrangement and style which distinguished the school of Le Brun. Jouvenet died on April 5, 1717, having been forced by paralysis during the last four years of his life to work with his left hand. See Mém. Inéd. Acad. Roy. de P. et de Sc, 1854, and D'Argenville, Vies des Petntres,

JOVELLANOS, or Jove Lianos, GasparR MELcHOR DE (1744-1811), statesman and author, was born at Gijon in Asturias, Spain, January 5, 1744. Selecting law as his profession, he studied at Oviedo, Avila, and Alcala, and in 1767 became criminal judge at Seville. His integrity and ability were rewarded in 1778 by a judgeship in Madrid, and in 1780 by appointment to the council of

military orders. In the capital Jovellanos took a guod place in the literary and scientific societies ; for the society of Friends of the Country he wrote in 1787 his most valuable work, Informe sobre un proyecto de Ley Agraria. Involved in the disgrace of his friend, the brilliant French adventurer Cabarrus, Jovellanos spent the years 1790 to 1797 in a sort of banishment at Gijon, engaged in literary work and in founding the Asturian institution for agricul- tural, industrial, social, and educational reform throughout his native province. This institution continued his darling project up to the latest hours of his life. Summoned again to public life in 1797, Jovellanos refused the post of ambassador to Russia, but accepted that of minister of grace and justice, under "the Prince of the Peace," whose attention had been directed to him by Cabarrus, then afavourite of Godoy. Displeased with Godoy's policy and conduct, Jovellanos combined with his colleague Saavedra to procure his dismissal. They were but tem- porarily successful; Godoy returned to power in 1798; Jovellanos was again sent to Gijon, but in 1801 was thrown into prison in Majorca. The revolution of 1808, and the advance of the French into Spain, set him

once more at liberty. Joseph Bonaparte, on mounting the Spanish throne, made Jovellanos the most brilliant offers ; but the latter, sternly refusing them all, joined the patriotic party, became a member of the eentral junta, and contributed to reorganize the cortes. This accomplished, the junta at once fell under suspicion, and Jovellanos was involved in its fall. To expose the conduct of the cortes, and to defend the junta and himself were the last labours of his pen. In 1811 he was enthusiastically welcomed to Gijon ; but the approach of the French drove him forth again. The vessel in which he sailed was compelled by stress of weather to put in at Vega in Asturias, where, on November 27, 1811, Jovellanos died.

The poetical works of Jovellanos comprise a tragedy EZ Pelayo, the comedy El Delinewente Honrado, satires, and miscellaneous pieces, including a translation of the first book of Paradise Lost. His prose works, especially those on political and legislative economy, con- stitute his real title to literary fame. In them depth of thought and clear-sighted sagacity are couched in a certain Ciceronian elegance and classical purity of style. Besides the Ley agraria he wrote Elogios ; various political and other essays ; and Alemorias Politicas, 1801, suppressed in Spain, and translated into French, 1825. An edition of his complete works was published at Madrid, 1831-32, in 7 vols., and another at Barcelona, 1839.

See Noticias historicas de Don G. M. de Jovellanos, Palma, 1812, and Memortas para la vida del Seiior . . . Jovellanos, by J. A. C. Bermudez, Madrid, 1814, both reviewed in the Foreign Quarterly Review, No. x.

JOVIANUS, Fravius CLavupius, Roman emperor from June 27, 363, to February 17, 364, was the son of the brave general Varronianus, and was born at Singidunum in Meesia about 332. As captain of the guard (primus ordinis domesticorum) he accompanied Julian in his Persian expedition; and on the day after that emperor's death, when the aged Sallust declined the purple, the voices of the army beyond the Tigris were united in Jovian's favour. It was perhaps the absence of any very invidious ability, no less than his father's reputation, that set Jovian on the throne. The new emperor's first care was to con- tinue the retreat

begun by Julian; and he had with diffi- culty reached the rapid and well-nigh unpassable Tigris, when overtures of peace were made by the Persian king Sapor II., who had not ceased to harass the Roman march. Jovianus was not in a position to command easy terms ; the famished and exhausted state of his army compelled his assent to a humiliating treaty, which gave up to the Persians the provinces of Arzanene, Corduene, Mexoene, Rehimene, and Zabdicene, which had been conquered by Galerius in 297, and Nisibis and other cities. From this time the Greek and Christian influence dates its decline in the trans-Euphrates regions. Jovian was anxious to reach Constantinople in order to establish his power; but the

while still on the march through Asia Minor. After issuing a decree by which Christianity was restored as the state religion, though paganism was recognized, the emperor assumed the consulship at Ancyra, on January 1, 364, with his infant son as colleague. Within two months, on February 17, 364, Jovianus was found dead in his bed at Dadastana, a small town of Galatia. A surfeit of mush- rooms or the fumes of a charcoal fire have been assigned as the causes of death. The suspicion of foul play is unsupported by evidence. He was succeeded by Valen- tinian and Valens, after an interregnum of ten days.

Besides the ancient historians of the period, see Gibbon's Deeline and Fall; Le Beau's Bas-Empire; Finlay's Greeee under the Romans ; and the Abbé de la Bléterie's Histotre de Jovien, Amster- dam, 1740. In Syriac literature Jovian (Iobinianos) became the hero of a Christian romance, published by George Hoffmann (Julianus der Abtriinnige, 1880). Compare the account of this work by Néldeke, 7.D.M.G., vol. xxviii. :

JOVINIANUS, or Jovianus, a Roman monk and reputed heretic who flourished during the latter half of the 4th century. All our knowledge of him is derived from a passionately hostile polemic of Jerome (Adv, Jovini- anum Libri II.), written at Bethlehem, and without any personal acquaintance with the man assailed, in 393 A.D. According to this authority he in 388 was living at Rome the celibate life of an ascetic

monk, possessed a good acquaintance with Scripture, and was the author of several minor works, but, undergoing an heretical change of view, afterwards became a self-indulgent Epicurean and unrefined sensualist. The doctrinal heresies which had provoked the wrath of Jerome were mainly these :—(1) he held that in point of merit, so far as their domestic state was concerned, virgins, widows, and married persons who had been baptized into Christ were on a precisely equal footing ; (2) those who with full faith have been regenerated in baptism cannot be overthrown (or, according to another reading, tempted) of the devil; (3) to abstain from meats is not more praiseworthy than thankfully to enjoy them ; (4) all who have preserved their baptismal grace shall receive the game reward in the kingdom of heaven. Jerome's bitter polemic was chiefly provoked by those views of Jovinian as to fasting and marriage in which the entire Protestant world has declared itself substantially at one with the so- called heretic. He was, however, condemned by a Roman synod under Bishop Siricius in 390, and afterwards excom- municated by another at Milan under the presidency of Ambrose. The year of his death is unknown, but he is referred to as being no longer alive in Jerome's Contra Vigilantium, which was composed in 406.

JOVIUS, Pavxus, or Paoto Grovio (1483-1552), an Italian historian and biographer, was born of an ancient and noble family at Como, April 19, 1483. His father died when he was a child, and Giovio owed his education to his brother Benedetto. After studying the humanities, he applied himself to medicine and philosophy at his brother's request. He was Pomponazzi's pupil at Padua ; and afterwards he took a medical degree in the university of Pavia. But the attraction of literature proved irresistible for Giovio, and he was bent upon becoming the historian of his age. Some time, probably in or after 1516, he went to Rome, with a portion of his history already finished. This he presented to Leo X., who read the MS., and pro- nounced it superior in elegance to anything which had been produced since the decades of Livy. Giovio, encouraged by the success of his first step in authorship, took up his residence in Rome, and attached himself to the court of the cardinal Giulio de' Medici. The next pope, Adrian VI., gave him a canonry in his native

town of Como, on the condition, it is said, that Giovio should mention him with honour in his history. This patronage from a pontiff who

news of the loyalty of the western legions gladdened him |

was averse to the current tone of Italian humanism, proves that Giovio at this period passed for a man of sound learn- ing and sober manners. After Adrian's death, Clement VIL assigned him chambers in the Vatican, with main tenance for servants befitting a courtier of rank. In addition to other benefices, he finally, in 1528, bestowed on him the bishopric of Nocera. Giovio had now become in a special sense dependent on the Medici. He was employed by that family on several missions,—as when he accom- panied Ippolito to Bologna on the occasion of Charles V.'s coronation, and Caterina to Marseilles before her marriage to the duke of Orleans. During the siege of Rome in 1527 he attended Clement in his flight from the Vatican. While crossing the bridge which connected the palace with the castle of S. Angelo, Giovio threw his mantle over the pope's shoulders in order to disguise his master.

In the sack he suffered a serious literary loss if we may credit his own statement. The story ruus that he deposited the MS. of his history, together with some silver, in a box at S. Maria Sopra Minerva for safety. This box was discovered by two Spaniards, one of whom secured the silver, while the other, named Herrera, knowing who Giovio was, preferred to hold the MSS. for ransom. Herrera was so careless, however, as to throw away the sheets he found in paper, reserving only that portion of the work which was transcribed on parchment. This he subsequently sold to Giovio in exchange for a benefice at Cordova, which Clement VII. conceded to the Spaniard. Six books of the history were lost in this trans- action. Giovio contented himself with indicating their substance in a summary. Perhaps he was not unwilling that his work should resemble that of Livy, even in its imperfection. But doubt rests upon the whole of this story. Apostolo Zeno affirms that in the middle of the last century three of the missing books turned up among family papers in the possession of Count Giov. Batt. Giovio, who wrote

a panegyric on his ancestor. It is therefore not improbable that Giovio possessed his history intact, but pre- ferred to withhold those portions from publication which might have involved him in difficulties with living persons of importance. The omissions were afterwards made good by Curtio Marinello in the Italian edition, published at Venice in 1581. But whether Marinello was the author of these additions is not known.

After Clement's death Giovio found himself out of favour with the next pope, Paul III. The failure of his career is usually ascribed to the irregularity of the life he led in the literary society of Rome. We may also remember that Paul had special causes for animosity against the Medici, whose servant Giovio had been. Despairing of a cardinal's hat, Giovio retired to his estates at Como, where he spent the wealth he had acquired from donations and benefices in adorning his villa with curiosities, antiquities, and pictures. He died upon a visit to Florence in 1552.

Giovio's principal work was the History of his own Times, from the invasion of Charles VIII. to the year 1547. It was divided into two parts, containing altogether forty-five books. Of these, books v.~~xi..of part i. were said by him to have been lost in the sack of Rome, while books xix.—xxiv. of part ii., which should have embraced the period from the death of Leo to the sack, were never written. Giovio supplied the want of the latter six books by his lives of Leo, Adrian, Alphonso I. of Ferrara, and several other personages of importance. But he alleged that the history of that period was too painful to be written in full. His first published work, printed in 1524 at Rome, was a treatise De Piscibus Romans. After his retirement to Como he produced a valuable series of biographies, entitled Hlogia Virorum Tilustrium. They com~~ memorate men distinguished for letters and arms, selected from all periods, and are said to have been written in illustration of portraits collected by him for the museum of his villa at Como. Besides these books, we may mention a biographical history of the Visconti, lords of Milan ; an essay on mottoes and badges; a dissertation on the state of Turkey; a large collection of familiar epistles; together with descriptions of Britain, Muscovy, the Lake of Como, and Giovio's own

villa. The titles of these miscellanies will be found in the bibliographical note appended to this article.

Giovio preferred Latin in the composition of his more important works. Though contemporary with Machiavelli, Guicciardini, and Varchi, he adhered to humanistic usages, and cared more for the Latinity than for the matter of his histories. His style is fluent and sonorous, rather than pointed or grave. Partly owing to the rhetorical defects

inherent in this choice of Latin, when Italian had gained

the day, but more to his own untrustworthy and shallow

character, Giovio takes a lower rank as historian than the bulk and prestige of his writings would seem to warrant. He professed himself a flatterer and a lampooner. The old story that he said he kept a golden and an iron pen, to

to distinguish it from a smaller island, Jfas-a-Fuera, “more to sea,” 9 miles farther west. The aspect of Juan Fernandez is beautiful and striking; only 13 miles in

length by 4 in width, it consists of a series of precipitous

use according as people paid him, condenses the truth in |

epigram.

He had the faults of the elder humanists, in com- |

bination with that literary cynicism which reached its height |

in Aretino; and therefore his histories and biographical essays are not to be uséd as authorities, without corrobora- tion. Yet Giovio’s works, taken in their entirety and with proper reservation, have real value. To

the student of Italy they yield a lively picture of the manners and the feeling of the times in which he lived, and in which he played no obscure part. They abound in vivid sketches, telling anecdotes, fugitive comments, which unite a certain charm of autobiographical romance with the worldly wis- dom of an experienced courtier. A flavour of personality makes them not unpleasant reading. While we learn to despise and mistrust the man in Giovio, we appreciate the litterateur. It would not be too far-fetched to describe him as a sort of 16th century Horace Walpole. Bibliography.—The sources of Giovio's biography are —his own works ; Tiraboschi's History of Italian Literature; Litta's Genealogy of Illustrious Italian Families; and Giov. Batt. Giovio's Uomini illustri della Diocesi Comasca, Modena, 1784. Cicogna, in his Delle Inscrizioni Veneziane Raccolta (Venice, 1830), gives a list of Giovio's works, from which the following notices are extracted :— 1. Works in Latin:—(1) Pauli Jovit Historiarum sut temporis, Florence, 1550-52, the same translated into Italian by L. Domenichi, and first published at Florence, 1551, afterwards at Venice; (2} Leonis X., Hadriani VI., Pompei Colunnz Card., Vitz, Florence, 1548, translated by Domenichi, Florence, 1549; (8) Vitw XII. Vicecomitum Mediolani principum, Paris, 1549, translated by Domenichi, Venice, 1549; (4) Vita Sfortizw clariss. ducis, Romc, 1549, translated by Domenichi, Florence, 1549; (5) Vita Fr. Ferd. Davali, Florence, 1549, translated by Domenichi, 7did., 1551; (6) Vita magni Consalvi, tbid., 1549, translated by Dome- nichi, ibid., 1550; (7) Alfonsi Altestenst, &c., ibid., 1650, Italian translation by Giov. Batt. Gelli, Florence, 1553; (8) Elogia virorwm bellica virtute illustriwm, ibid., 1551, translated by Domenichi, ibid., 1554; (9) Elogia clarorum viroruin, &c., Venice, 1546 (these are biographies of men of letters), translated by Hippolito Orio of Ferrara, Florence, 1552; (10) Libellus de legatione Basilit Magni Principis Moscoviw, Rome, 1525; (11) Descriptio Larii Lacus, Venice, 1559; (12) Descriptio Britanniw, &c., Venice, 1548; (18) De Komanis Piscibus, Rome, 1524. 2. Works in Italian:—(1) Dialogo delle Imprese militart et amorose, Rome, 1555; (2) Lettere Volgart, Venice, 1560. Some minor works and numerous reprints of those cited have becn omitted from this list; and it should also be mentioned that some of the lives, with additional matter, are included in the Vitz [ilustrium Virorum, Basel, 1576. (J. A.S.)

JUANES, or Joanes, VICENTE (1523-1579), head of the Valencian school of painters, and often called “the Spanish Raphael,” was born at Fuente de la Higuera in the province of Valencia in 1523. Of his biography practically no authentic facts have been preserved. He is said to have studied his art for some time in Rome, with which school his affinities are closest, but the greater part of his profes- sional life was spent in the city of Valencia, where most of the extant examples of his work are nowto be found. All relate to religious subjects, and are characterized by dignity of conception, accuracy of drawing, truth and beauty of colour, and minuteness of finish. The best known are the Entombment, the Nativity, the Burial of 2 Monk, and the Martyrdom of St Agnes. His style is also seen to full advantage in the series on the life of St Stephen, originally painted for the church of San Esteban in Valencia, and now in the Museo at Madrid. He died at Bocairente (near Jativa) while engaged upon an altarpiece in the church there, on 21st December 1579.

JUAN FERNANDEZ, a small island in the South Pacific in 34° S. lat., 400 miles west of Valparaiso. The Spaniards also designate it Mas-a-Tierra, “more to land,”

rocks rudely piled into irregular blocks and pinnacles. The highest of these masses (about 3000 feet), a fine object from the anchorage, is called, from its massive form, Z/ Yunque, the Anvil; it appears to be inaccessible. Any attempt to scale the higher peaks of the island is dangerous ; the soil is very light and shallow, and the vegetation mostly a shrubby under growth, and on any attempt to pull oneself up by the help of this, the whole is apt to give way, and climber and shrubs are precipitated together down the cliffs. The rocks are trap-tuffs, basalts, and green- stones, and the island seems to date back to the older trappean series. There is a doubtful story of light having been seen emanating from one of the higher peaks; but it seems likely that, if Juan Fernandez was ever a subaerial volcanic cone, its fires have been long extinguished. Small indentations are found all round the island, but Cumber- land Bay on the north side is the only good anchorage, and even there, from the great depth of water, there is some difficulty and risk. :

A wide valley collecting streams from several of thie ravines on the north side of the island opens into Cumber- land Bay, and is partially enclosed and cultivated ; and the settlement, consisting of some thirty or forty dilapidated Chilian huts, faces the anchorage. As seen from the bay the mountains seem covered with foliage to the sky-line, except where precipitous faces of rock—basalt and green- stone—form a beautiful contrast to the luxuriant some- what pale vegetation so characteristic of an island in the warmer temperate zone.

The flora and fauna of Juan Fernandez are in most respects Chilian,—the opportunities of immigration from any other direction being specially difficult, for nearly con- stant currents set from the south-west, a direction in which there is no land nearer than the antarctic continent. There are few trees on the island, and these are chiefly in inac- cessible situations, the timber near the shore having been almost entirely cut down for firewood. Most of the valuable indigenous trees have been exterminated ; the sandal-wood, which the earlier navigators found one of the most valuable products of the island, is now confined to almost inacces- sible places, while the other prominent indigenous forms, a native palm (Ceroxylon australe) and two tree-ferns, may. be counted on the fingers as they raise their feathery heads over some overhanging crag or precipitous ravine. The steep paths up the hills are bordered by a thicket of flower- ing slirubs and herbs chiefly of South American origin. One of the most prominent of the latter (Gunnera chilensis) expands its gigantic rhubarb-like leaves to an enormous size, while the procumbent rhizomes creep along the ground, throwing up leaf-stalks § and 10 feet in height, and forming with the leaves, which frequently measure 15 feet across, a canopy under which one can ride easily on the small Chilian horses. There are twenty-four species of ferns on the island, and of these four are special to it; so great a prevalence of ferns gives quite a character to the island flora.

The fauna of Juan Fernandez is likewise fairly rich and very special. There are no indigenous land mammals on the island. Pigs, which have long since become wild and numerous, were left by the earlier navigators, and wild goats imported in the same fashion are now abundant, and their flesh is excellent, Sea-elephants and fur-seals were

at one time plentiful upon Juan Fernandez, and are still found in some numbers at Mas-a-Fuera. There are, besides the Accipitres and the Natatores, four land birds on Juan Fernandez (and four somewhat different on Mas-a-Fuera).

The four Juan Fernandez birds are a thrush, a tyrant, and | Anson found vegetables, of which the scurvy-struck crew of the

two humming-birds (Mustephanus fernandensis and L. galerites). The thrush and Lustephanus fernandensis are special to the island, and the latter has the great peculiarity of having the male of a bright cinnamon colour while the female is green. Both sexes are green in /. galerites. Of the shrubs in the jungle bordering the ravine, there seems scarcely a plant of myrtle, or of a bignoniaceous plant with long dark bells associated with the myrtle, which is not inhabited by a pair of humming birds, so that the whirring and buzzing of the brilliant flutterers over the flowers is singularly attractive.

Juan Fernandez was discovered by a Spanish pilot of that name (who was also the discoverer of the island of Mas-a-Fuera) in 1563. Fernandez obtained from the Spanish Government a grant of the islands, where he resided for some time, stocking them with goats and pigs. He soon, however, appears to have abandoned his possessions, whieh were afterwards for many years only visited occasionally by fishermen from the coasts of Chili and Peru, who found the sea round the island well stoeked with fish. In 1616 Le Maire and Schouten called at Juan Fernandez for water and fresh provisions. Pigs and goats were then abundant on the island, and the valleys coming down to the anchorage were filled with herbage and the sea with excellent fish. Sandal-wood was plentiful, and near the anchorage there was a grove of wild quince trees. The fleet under the command of Admiral l'Ermite next visited the island. Three soldiers and three gunners remained behind when the fleet left; what became of these is altogether unknown. In the year 1668 the buccaneer Sharp anchored off Juan Fernandez, at

first apparently on the south side of the island and afterwards in Cumberland Bay. At the time of his visit seals and sea-lions frequented the shores in large numbers, and pigs, the descendants of those originally imported by Fernandez, were so abundant that a hundred were salted down in addition to those killed for immediate use. At the end of 1687 five men voluntarily remained at Juan Fernandez from another buccanecr commanded by Captain Edward Davis. They remained on the island until October 1690, when the English ship " Welfare," Captain John Story, took them off.

In February 1700 Dampier called at Juan Fernandez, and whilst there Captain Straddling of the " Cinque Porte" galley quarrelled with his men, forty-two of whom deserted but were afterwards taken on board by Dampier; five seamen, however, remained on shore. In October 1704 the " Cinque Porte" returned and found two of these men, the others having been apparently captured by the French. On this occasion Captain Straddling had a disagreement with his master, Alexander Selkirk, who insisted upon being put on shore rather than serve longer with Straddling. Selkirk's desire was complicd with, and he was sent on shore with a few ordinary neeessaries. Before the ship left he begged to be readmitted ; but this was refused, with the curious result that, with little merit of his own, Selkirk has become a hero for all time, and " Robinson Crusoe's Island" the cynosure of all boys' cyes. It is extremely im- probable that Alexander Selkirk ever actually placed his journal in the hands of Defoe, but his story excited some public interest, and in catering for the public amusement that prince of raconteurs was most likely to have adopted Selkirk's tale for combination with other material in one of his wonderful " realistic novels." Many of the incidents in the Adventures of Robinson Crusoe are evi- dently inconsistent with the narrative of Selkirk, and are un- donbtcdly taken from other sources ; for example, the footprint on the sand, and the decidedly tropical description of " Robinson Crusoe's Island," would agree better with one of the outlying islands of the West Indies. Alexander Selkirk was relieved from what appcars to have been a by no means unbearable exile in 1709 by the ship "'"Duke," Captain Wood Rogers, and in 1868 the officers of H.M.S. "Topaze" erected a tablet at a point on the hill road called '*Selkirk's Look-out," just

where in a gap in the trap rock a magnificent view may be had of the whole island, and of the sea north and south, over which the exile must have often and eagerly watched for an approaching sail. It bears the following inscription :—"In memory of Alexander Selkirk, mariner, a native of Largo in the county of Fife, Scotland, who was on this island in complete solitude for four years and four months. He was landed from the 'Cinque Porte' galley, 96 tons, 16 guns, 1704 A.D., and was taken off in the ' Duke' privateer, 12th February 1709. He died lieutenant of the ' Weymouth,' 1723 A.D., aged forty-seven years. This tablet is erected near Selkirk's look-out by Commodore Powell and officers of H.M.S. 'Topaze,' 1868 A.D."

After Selkirk's relicf, visits, especially from buccaneers, to the island of Juan Fernandez became more frequent. In June 1741 Commodore Anson anchored in Cumberland Bay in the ' Uen- turion." During Anson's stay the "Trial" visited Mas-a-Fuera, and found the anchorage more exposed than at Juan Fernandez.

"Centurion " stood greatly in need, much as formerly, —the cabbage palm, celery, water-cresses, and radishes being abundant. After having added to the resources of the island by sowing the stones of fruit trees and garden seeds, some of which did well, Anson con- tinued his voyage in September. On Anson's return home it was proposed to form an English settlement on Juan Fernandez, but the Spaniards hearing that the matter had been mooted in England gave orders to occupy the island, and it was garrisoned accordingly in 1750. Carteret first observed this settlement in May, 1767, and on account of the hostility of the Spaniards preferred to put in at Mas-a-Fuera.

After the revolutionary wars Juan Fernandez passed into the possession of the Chilians, and has remained theirs ever since. Shortly after 1818 it was used as a state prison by the Chilian Government. In 1820 there appear to have been 300 convicts on the island, with 100 regular troops. In that year the island was swarming with wild horses, cattle, pigs, sheep, and goats, and vegetables and fruit were in abundance. In 1830 Juan Fernandez was visited by Captain King in H.M.S. " Adventure." There were then no convicts onthe island. There

was a small garrison of forty persons, and provisions were scarce. In 1833 Juan Fernandez was again used as a convict station by the Chilians. In 1835 the island appears to have been governed by a Mr Sutcliffe, an Englishman in the Chilian service. He was present when an earthquake took place on the 20th February of that year, of which he gives a description.

In November 1875 H.M.S. "Challenger," Captain F. T. Thomson, ee! at Juan Fernandez for two days, lying as usual in Cumberland

ay.

Shortly after 1835 Juan Fernandez was abandoned as a convict settlement, and since that time it has been leased by the Chilian Government to such as cared to oceupy it for the supply of whalers and other passing ships, and for such remains of sea-lion hunting and fur-sealing as still exist. The speculation does not appear to be very profitable; and the island is likely to be by and by left so far as may be in the busier world of to-day to its pristine solitude. (C. W. T.)

JUAREZ, Benito Pasio (1806-1872), president of Mexico, was born near Ixtlan, in the state of Oajaca, Mexico, March 21, 1806, of full Indian blood. Early left in poverty by the death of his father, he received from a charitable friar a good general education, and afterwards the means of studying law. Beginning to practise in 1834, Juarez speedily rose to professional distinction, and in the stormy political life of his time and country took a pro- mineut part as an exponent of liberal views. In 1832 he sat in the state legislature ; in 1846 he was one of a legis- lative triumvirate for his native state and a deputy to the republican congress, and from 1847 to 1852 he was governor of Oajaca. Banished in 1853 by Santa Anna, he returned to Mexico in 1855, and joined Alvarez, who, after Santa Anna's defeat, made him minister of justice. Under Comonfort, who succeeded Alvarez in December 1858, Juarez was made president of the supreme court of justice and minister of the interior; and, when Comonfort was unconstitutionally replaced by Zuloaga in 1858, the chief justice, in virtue of his office, claimed to be legal president of the republic. It was not, however, till the beginning of 1861 that he succeeded in finally

defeating the unconstitu- tional party and in being duly elected president by congress. His decree of July 1861, suspending for two years all pay- ments on public debts of every kind, led to the landing in Mexico of English, Spanish, and French troops. The first two powers were soon induced to withdraw their forces; but the French remained, declared war in 1862, placed Maximilian upon the throne as emperor, and drove Juarez and his adherents to the northern limits of the republic. Juarez maintained an obstinate resistance, which resulted in final success. In 1867 Maximilian was taken at Quaretero, and shot; and in August Juarez was once more elected president. His term of office was far from tranquil; discontented generals stirred up ceaseless revolts and insurrections ; and, though he was re-elected 1n 1871, his popularity seemed to be on the wane. He died of apoplexy in the city of Mexico, July 18, 1872. In him Mexico lost a statesman of integrity, ability, and deter-

mination, whose good qualities are too apt to be overlooked in consequence of his connexion with the unhappy fate of Maximilian.

JUBA L,, successor to his father Hiempsal on the throne of Numidia, owes his importance much more to the dis- tracted state of the Roman world during the struggle betwixt Czesar and Pompey than to his intrinsic merit. He embraced Pompey's cause, moved by ancient hereditary friendship to that general, as well as by personal enmity to Cesar, who had insulted him at Rome a few years before, and to Curio, Ceesar's general in Africa, who had openly proposed when tribune of the plebs in 50 B.c. that Numidia should be sold to colonists, and the king reduced to a private station. In 49 Bc. Juba marched against Curio, who was threatening Utica, and by a stratagem inflicted on the Casarean army a crushing defeat, in which Curio was slain. Juba's attention was momentarily dis- tracted by a counter invasion of his territories by Bocchus and Sitius; but, finding that his lieutenant Saburra was able to defend his interests, he rejoined Scipio with a large body of troops. With Scipio he shared the defeat at Thapsus. Fleeing from the field with the Roman general Petreius, the king wandered

about for some time as a fugitive, spurned even from the gates of his own city Zania, where he had prepared for a desperate siege. The fugitives at length resolved to die by mutual slaughter. Juba killed Petreius, and sought the aid of a slave in despatching himself (46 B.c.). Juba's character may be summed up in the word savage ; he was brave, treacherous, insolent, and cruel.

JUBA IL, king of Mauretania, was on the death of his father Juba I. in 46 B.c. carried to Rome, a mere infant, to grace Cesar's triumph. He seems to have received a good education under the care of Octavianus (afterwards Augustus), whom he accompanied later in his campaign against Antony. In 29 B.c, after Antony's death, Octavianus gave the young African the hand of Cleopatra Selene, daughter of Antony and Cleopatra, and placed him on his paternal throne. In 25 B.c., however, he transferred him from Numidia to the kingdoms formerly held by Bocchus and Boguas, viz., Mauretania Tingitana and Mauretania Czsariensis, to which was added a part of Geetulia. Juba fixed his royal residence at Jol, whose name he changed to Czsarea, and which is now identified with the modern Cherchel, about 72 miles west of Algiers. He seems to have reigned in considerable prosperity, though in 6 a.p. the Getulians rose in a revolt of sufficient importance to afford the surname Gzetulicus to Cornelius Cossus, the Roman general whose aid the king called in to suppress it. According to Josephus (Ant. xvii. 13, 1 and 4; B. J., ii. 7, 4), Juba married in second nuptials Gla- phyra, daughter of Archelaus of Cappadocia, and widow of Alexander, son of Herod the Great, afterwards wife of Alexander's brother, the Archelaus of the New Testament. The date of Juba's death is by no means certain; from the evidence of coins and certain allusions in Strabo, scholars have been led to place it in 19 or 20 ap.

Juba, to quote the words of Pliny, was more memorable for his writings than for his crown. He wrote many historical and geographical works, of which some seem to have been voluminous and of considerable value on account of the sources to which their author had access. Unfortunately they are known to us only from fragments imbedded in other writers. The list given by C. Miiller in his Fragmenta Historicorum Greeorum (vol. iii., Paris, 1849), is as follows:—(1)

‘Pwpaiih ictopia; (2)’Acoupiard; (8) AiBund ; (4) De Arabia sive De Expeditione Arabica 3 (5) Phystologa; (6) De Euphorbia herba; (7) Tlept émot; (8) Mep) ypadixjs (Mep) Cwypdpwv); (9) Gceatpixyn ioropia; (10) ‘Ouordrnres; (11) Mepl plopas A€zews ; (12) ’Emlypaypa. Miiller (Joc. cit.) has collected at the head of Juba’s fragments the scattered notices of the king from the writers of antiquity. See also Sevin in Mém. de Acad. des Inscriptions, vol. iv.

JUBBULPORE. See Jabatpur.

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JUBILEE, or Jupitr, THE YEAR or. In Ezek. xlvi. 16, 17, there is indication of a law according to which “ the prince” is at liberty to alienate in perpetuity any portion of his inheritance to his sons; but if he give a gift of his inheritance to any other of his subjects, then the change of ownership holds good only till “the year of liberty” (1773 NY), after which the alienated property returns: to its original possessor, the prince. This restriction upon the transfer of real property is applied to a greatly en- larged class of persons and cases in Lev. xxv. 8-55, which is by far the most important passage relating to this sub- ject. It is again referred to in Lev. xxvii. 17-25, and the only other allusion to it in the Pentateuch occurs in Numb. xxxvi. 4. According to Lev. xxv. 8-12, at the completion of seven sabbaths of years, the trumpet of the jubilee (AYN TW) is to be sounded “throughout the land,” on the tenth day of the seventh month, 7.¢., on the great day of atonement. The fiftieth year thus announced is to be “hallowed,” 7.e liberty (1177) is to be proclaimed everywhere to every one, and the people are to return “every man unto his possession and unto his family.” The year in other respects is to resemble the sabbatical year ; there is to be no sowing, nor reaping that which grows of itself, nor gathering of grapes. Coming to fuller detail,—as regards real property (Lev. xxv. 13-34), the law is that if any Hebrew under pressure of necessity shall alienate his property he is to get for it a sum of money reckoned according to the number of harvests to be reaped between the date of alienation and the first jubilee year ; should he or any relation desire to redeem the pro- perty before the jubilee, this can always be

done by repay- ing the value of the harvests between the redemption and the jubilee. The fundamental principle is that “the land shall not be sold so as to be quite cut off, for it is mine, and ye are strangers and sojourners with me.” The same rule applies to dwelling-houses of unwalled villages ; the case is different, however, as regards dwelling-houses in walled cities. These may be redeemed within a year after transfer, but if not redeemed within that period they con- tinue permanently in possession of the purchaser. An exception to this last rule is made for the houses of the Levites in the Levitical cities. As regards property in slaves (Lev. xxv. 35-55), the Hebrew whom necessity has compelled to sell himself into the service of his brother Hebrew is to be treated as a hired servant and a sojourner, and to be released absolutely at the jubilee ; non-Hebrew bondmen on the other hand are to be bondmen for ever. But the Hebrew who has sold himself to a stranger or sojourner is entitled to freedom at the year of jubilee, and further is at any time redeemable by any of his kindred,— the redemption price being regulated by the number of years to run. between the redemption and the jubilee, according to the ordinary wage of hired servants. So much for the Levitical law ; as regards its observance, the evidence of history is not voluminous, but Jer. xxxiv. 14: seems to show conclusively that in his time at least the law acknowledged by the prophets was that described in Deut. xv., according to which the rights of Hebrew slave-liolders over their compatriots were invariably to cease seven years after they had been acquired. After the exile the law of Lev. xxv. was also certainly disregarded ; the Talmudists and Rabbins are unanimous that although the jubilee years

| were “reckoned ” they were not observed.

As regards the meaning of the name “ jubilee” (2299 nv, or simply bai, eviauTds apécews or &peois, annus jubilzi or jubileus), authorities are not agreed. According to Josephus (Ant., iii. 12, 3), it means éAevOepia ; but the use of the word at in Exod. xix. 18,

Josh. vi. 5, makes it probable that the name is derived from the trumpet sound with which the jubilee was to be proclaimed ; and it is

not impossible that the old Jewish traditional view is right

which states 52° to mean a ram—for which there is a probable confirmation in Pheenician—and then, by abbreviation for ba PP, a trumpet of ram's horn. See Dillmann on Exod. xix. 13. If the law of the jubilec is pesterian to the time of Jeremiah and Ezekiel, and was not enforced after the exile, the practical difficulties of the institution, especially in its connexion with the sabbatical year, call for no remark. Older theologians, by whom all the Penta- -tenchal laws were regarded as homogeneous parts of a single practical scheme, spent much ingenuity on the explanation of the year of jubilee. Thus Scaliger and many others sought to identify it with the seventh sabbatical year, and so to avoid a succession of two years in which agriculture was suspended. The most ingenious form of this attempt is the theory of Franke (Nov. Syst. Chron. Fund., 1778), revived by Klostermann (Stud. u. Krit., 1880, p. 720 sq.), which compares the jubilee period with the Egyptian twenty-five year period, and connects it with the intercalation neces- sary to re-establish the correspondence of the lunar and solar years.

JUBILEE YEAR, in the Roman Catholic Church, is observed every twenty-fifth year, from Christmas to Christmas. During its continuance plenary indulgence is obtainable by all Catholics, on condition of their penitently confessing their sins and visiting certain churches a stated number of times, or doing an equivalent amount of meri- torious work. The institution does not go farther back than to the time of Boniface VIII., whose bull is dated April 22, 1300. The circumstances in which it was pro- inulgated are related by a contemporary authority, Jacobus Cajetanus, according to whose account (" Relatio de cen- tesimo s. jubilao anno" in the Libliotheca Patrum) it had its origin in a wide-spread popular belief then prevalent, which had taken practical shape in an enormous influx of pilgrims to Rome from the Ist of January onwards. The advance upon the recently formulated doctrine of in- dulgences (see INDULGENCE) was indeed a natural one. Originally the churches of St Peter and St Paul in Rome were the only jubilee

churches, but the privilege was after- wards extended to the Lateran Church and that of Sta Maria Maggiore, and it is now shared also for the year immediately following that of the Roman jubilee by a number of specified provincial churches. At the request of the Roman people, Clement VI. appointed that the jubilee should recur every fifty years instead of every hundred years as had been originally contemplated in the constitution of Boniface; Urban VI. reduced the interval still further to thirty-three years (the supposed duration of the earthly life of Christ); and by Paul II. it was finally fixed at twenty-five years. According to the special ritual prepared by Alexander VI. in 1500, the pope on the Christmas eve with which the jubilee commences goes in solemn procession to a particular walled-up door (‘ Porta aurea”) of St Peter’s and knock three times, using at the same time the words of Ps. exviii. 19 (“ Aperite mihi portas justitiz ”). The doors are then opened and sprinkled with holy water, and the pope passes through. A similar ceremony is conducted by cardinals at the other jubilee churches of the city. At the close of the jubilee, the special doorway is again built up with appropriate solemnities. The last ordinary jubilee was observed in 1875, “ Extra- ordinary” jubilees are sometimes appointed on special occasions.

JUBILEES, Boor or tue. TURE, vol. ii. p. 176.

JUDZA. See PALEsTINE.

JUDAH (17), Yehiida, ze. according to the etymo- logy given in Gen. xxix. 35, “ praised”), the name of one of the twelve tribes and of their eponymus the fourth son of Jacob by Leah. Except in the history of Joseph, the Biblical interest attaching to Judah belongs not to the individual but to the tribe; for in Gen. xxxviil. an etlinographical allegory appears transparently enough under the surface of the record. According to the usual form of

See APocaALYyprTic LITERA-

with the daughter of the Canaanite Shuah is to be referred to a union of the tribe with Canaanite elements. Er and Onan are extinct subdivisions of the mixed population, thougli a minor family of the former name appears as incorporated with Shelah, the third clan of this branch of the tribe (1 Chron. iv. 21). The details of the disappearance of these ancient stocks are obscure.! The stocks of Pharez and Zerah are represented as secondary. They are children of Judah and Tamar, but the former is their father in virtue of an extension of the levirate principle. As the author represents Tamar's conduct as justifiable under the circumstances, the narrative must have taken shape before the Jevirate law assumed the narrower form given in Deuteronomy.? An ingenious explanation of Tamar, Pharez, and Zerah is given by Lagarde, Orientalia, ii. (1880). He identifies Tamar (palm tree) with Phcenicia, and regards Zerah (M7}=Mtk&, indigena) as the old Canaanite element of the union which had to yield precedence to the younger Hebrew invaders (Pharez). In any case the narrative of Gen. xxxvili., with all its obscurities, indicates two of the most notable features in the early history of Judah, its mixed character and its long separation from the rest of Israel (ver. 1). The latter point receives further illustration in the book of Judges. Judah and Simeon seem to have broken off from Israel at Gilgal, and taken a separate course. In the song of Deborah the tribe is not named among the rest, and even in the time of David Judah and Israel are still more conscious of their separation than of their original unity. Indeed the two soon fell apart again at the division of the kingdom, but after the time of David the idea of unity was never lost ; and, while the prophets look for a restoration of the realm of the house of Jesse, Deut. xxxili. 7 (the work of a poet of Ephraim) prays for victory to Judah against his enemies and his ultimate restoration to his people, the greater Israel of the north, The blessing of Jacob, on the other hand, views Judah in the light of the Davidic sovereignty as holding the hegemony over his brethren until the coming of the Messiah,? Our most detailed information as to the tribal history of Judah is derived from 1 Chron. ii, 1l-iv. 23. It appears that the tribe absorbed a large element of non-Israelite origin, the Hezronites, or, as the Arabs would now say, the hadar, original nomads who had settled down in villages and towns. To these belonged not only the Jerahmeelites but the Calibbites in Hebron

and the southern steppes. It appears to have been the incorporation of these elements that raised Judah to the eminent place which it maintained from the time of David. The details of this important piece of history have been analysed by Well- hausen, De gentibus et familiis Judxorum (Gottingen,

1870).

JUDAS ISCARIOT (Iovédas "Ioxapusrys or 'loxapudd), the son of Simon Iscariot (John. vi. 71, xiii. 26), and one of the twelve apostles; he is always enumerated last, with special mention of the fact that he was the betrayer of Jesus. If the now generally accepted explanation of his surname (N'"7? W'S, ze, "man of Kerioth"; see Josh. xv. 25) be correct, he was the only original member of the apostolic band who was not a Galilean. (For other

1 Compare the Arabie ,} ye, Sahih, Bulak ed. vi. 147; Mowatta, Cairo ed., iii. 77. :

2 Compare Hupfeld, Ueber die heutige theosophische Theologie, 1861.

3 The oldest interpretation of Shiloh, as if it were pointed iby} (for yb wn) is perhaps the best, especially if with Wellhausen (Gesch.,

375) we delete the following yb}. The sense then is, " till he eomes to whom the people's obedience is due." Another explanation is given by Lagarde (Onom., ii. 95), who takes the word as equival-

ent to Toy, "he whom Judah prays for." At all events the con-

such statements in the Old Testament, Judah's marriage | text demands a Messianic interpretation.

suggested etymologies of the name see Winer's Dzvbi.

Realworterb., s. v.) The circumstances which led to his | admission into the apostolic circle are not stated ; according |

to the Fourth Gospel (vi. 64), his treachery had been fore- seen by Jesus from the very first, but this is not suggested by the synoptists. The motives by which he was actuated

in rendering to the Jewish authorities the petty and base. service of enabling them to arrest his Master without |

tumult have been analysed by scholars with very various degrees of subtlety and insight. According to some his sole object was to place Jesus in a position in which He should be compelled to make what had seemed to His followers the too tardy display of His Messianic power ; according to others (and their view seems the best supported by the narrative of the Gospels) he was simply an avaricious and dishonest man, who felt that his opportunities for petty peculation—as keeper of the common purse, John xii. 6, xiii, 29—were rapidly disappearing. As regards the effects of his subsequent remorse and the use to which his ill-gotten giins were put, the strikingly apparent discrepancies between the narratives of Matt. xxvii. 3-10 and Acts i. 18, 19 have continually attracted the attention of Biblical scholars ever since Papias, in his fourth book, of which a fragment has been preserved, discussed the subject ; the probability is that they simply represent divergent traditions, one of which has possibly been coloured by the history of Ahithophel. In ecclesiastical legend and in sacred art Judas Iscariot has taken a prominent place, being generally treated as the very incarnation of treachery, ingratitude, and impiety. The Middle Ages, after their fashion, have supplied the lacune in what they deemed his too meagre biography. According to the common form of their story, he belonged to the tribe of Reuben ;! before he was born his mother Cyborea had a dream that he was destined to murder his father, commit incest with his mother, and sell lis God. The attempts made by her and her husband to avert this curse simply led to its accomplishment. At his birth he was enclosed ina chest and flung into the sea; picked up on a foreign shore, he was educated at the court until an act of murder committed in a moment of passion compelled his flight. Coming to Juda, he entered the service of Pontius Pilate as page, and during this period committed the first two of the crimes which had been expressly foretold. Learning the secret of his birth, he, full of

remorse, seeks the prophet who, he has heard, has power on earth to forgive sins. He is accepted as a disciple and promoted to a position of trust, where avarice, the only vice in which he has hitherto been unpractised, gradually takes possession of his soul, and leads to the complete fulfilment of his evil destiny. This Judas legend, as given by Jacobus a Voragine, obtained no small popularity ; and it is to be found in various shapes in every important literature of Europe. For the history of its genesis and its diffusion the reader may consult D'Ancona, La leggenda di Vergognae la leggenda di Giuda, Bologna, 1869, and papers by W. Creizenach in Paul and Braune's Beitr. zur Gesch. der deutschen Sprache und Litera- tur, vol. ii., Halle, 1875, and Victor Diederich in Russiche Ttevue, St Petersburg, 1880. Cholevius, in his Geschichte der deutschen Poesie nach ihren antiken Elementen (Leipsic, 1854), pointed out the connexion of the legend with the Cidipus story. The popular hatred of Judas has found strange symbolical expression in various parts of Christen- dom. In Corfu, for instance, the people at a given signal on Easter eve throw vast quantities of crockery from their windows and roofs into the streets, and thus execute an imaginary stoning of Judas (see Kirkwall, Jonian Islands,

1 Other forms make him a Danite, and consider the passage in Genesis (xlix. 17) a prophecy of the traitor.

vol. ii, p. 47). At one time (according to Mustoxidi, Delle cose corcirest) the tradition prevailed that the traitor's house and country villa existed in the island, and that his descendants were to be found among the local Jews. Details in regard to some Judas legends and superstitions are given in Notes and Queries, 2d series, v., vi., and vii.; 3d ser., vil.; 5th ser., vi.

JUDAS MACCABAIUS. See IsraEt and MaccaBezs.

JUDAS TREE, the Cercis Siliquastrum of botanists, belongs to the section Cxsalpinex of the natural family Leguminose. It is a native of the south of France, Spain, Portugal, Italy, Greece, and Asia Minor,

and forms a hand- some low tree with a flat spreading head. In spring it is covered with a profusion of purplish pink flowers, which appear before the leaves. The flowers have an agreeable acid taste, and are eaten mixed with salad or made into fritters. The tree was one frequently figured by the older herbalists. One woodcut by Castor Durante is a copy of Lobel's cut, with the addition of the figure of Judas suspended from one of the branches, illustrating the popular tradition regarding this tree. A second species, C. canadensis, is common in North America from Canada to Virginia, and differs from the European species in its smaller size and pointed leaves. The flowers are also used in salads and for making pickles, while the branches are used to dye wool a nankeen colour.

JUDE. The writer of the epistle of St Jude (Iovdas) calls himself (ver. 1) "the brother of James." In primitive Christian times, among the Judzo-Christians to whom this epistle, from the nature of its contents, must have been addressed, there was but one James who could be thus spoken of without any further description, viz., James "the Lord's brother" (see JamEs). The writer of this cepistle, then, claims to be the Judas named among the brethren of the Lord in Matt. xiii. 55, Mark vi. 3. He seems himself to declare by implication that he was not an apostle (ver. 17), and with this agrees the statement (John vii. 5) that at a time not long before the crucifixion the brethren of Jesus did not believe on Him. And it is some confirmation of this position'that the writer of the epistle of St James in like manner does not claim to be an apostle. The brethren of the Lord are spoken of in Acts i. 14 as distinct from the apostolic body, and are placed last in the enumeration, as though latest included among the believers; and that their feeling towards Jesus should have been changed since His death and resurrection has been thought to be sufficiently explained by the assertion of St Paul (1 Cor. xv, 7) that the Lord had been "seen of James" on one special occasion after he had risen from the dead. We conclude therefore that the writer of the epistle was a different person from Jude the apostle, who appears also to have had the names Lebbzeus and Thaddeus (comp. Matt. x. 3, Mark iii. 18, with Luke vi. 16, Acts i. 13).

When we consider the brevity of St Jude's epistle we can hardly wonder that it did not receive more recognition from the early Christian writers than it has met with. Clemens Alexandrinus (165-220) quotes from this epistle or alludes to its language more than once, as does Ter- tullian (200), making express mention that the book of Enoch is quoted in it.2 Origen (186-253) gives several noticcs of it, and in the Latin translation of some portions of his works, of which the original has been lost, Jude is called an apostle. Nevertheless Eusebius classes the epistle amongst the évrteydueva, and its omission from the Syriac version shows us that in one branch of the Christian church it was either not known, or not received for canonical, when that version was made. Jerome in the 4th century

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2The book of Enoch (see vol. ii. p. 175) is cited in Jude 14, and allusions to it occur in 4,6, 138, Another apocalyptic work, the Assumption of Moses, is the source of Jude 9.

gives a reason for its non-acceptance, which perhaps ope- rated with many of the early Christians. He says (Cata- log. Scr. Eccl., 4), " Because in it Jude derives a testimony from the book of Enoch, which is apocryphal, it is rejected by most." Yet the canon of Muratori, the date of which is judged to be about 170 a.p., includes the epistle of St Jude among the canonical books, though Justin Martyr (140), Theophilus of Antioch (180), and Irenzeus (135-200) make no mention of it. It was early included among the acknowledged Christian writings, and was placed without question among the canonical books by the council of Laodicea.1

The persons to whom the epistle was addressed must have been for the most part Judeo-Christians. This is the reason why the writer styles himself 'brother of James," and the same is apparent from all the illustrations contained in the letter. The deliverance from Egypt, the fallen angels, the cities of the plain, the legend of Michael's con- tention with Satan, the references to Cain, Balaam, and Korah, as well as to the prophecy ascribed to Enoch, are all found in so brief a space, and are so touched upon ina manner that could be edifying to none save those who were familiar, not only with Old Testament Scripture, but also with Jewish traditions, that we cannot but conclude that we have here the work of a Jew writing for Jews, although the epistle is included among those called " catholic."

Fron the notices of the descendants of Jude, the brother of the Lord, preserved by Eusebius (//. Z., iii. 19, 20) from Hegesippus, we should conclude that they were resident in Palestine. It seems natural therefore to suppose that the epistle was written in Palestine, and, it may be, for the Jewish converts in some district of that country. But of this we can

have no certaiuty. If, as seems to be intimated by Hegesippus, Jude was dead in the time of Domitian, we perhaps shall not be far wrong in assigning the com- position of the epistle to about 80 a.p. All arguments for an earlier date, based on the assumption that in a letter of this character the writer would not have failed to men- tion the destruction of Jerusalem as an illustration, lad that event already taken place, must be disregarded. For the brevity of the letter is such as to deprive this reasoning of all force, while the very recentness of the overthrow of Jerusalem would prevent its destruction from entering as yet into such history as might be used for pointing a moral.

The epistle of St Jude appears to have been written after the second epistle of St Peter. Of those corrupt teachers about whom St Peter spoke in the future tense, "there shall be false teachers among you," St Jude speaks in the past, 'certain men are crept in unawares ;" and the like difference is observable throughout the respective letters wherever verbs occur to which it is possible to attach a definite notion of time. But, beside this, St Peter's letter represents all the corruption which he sees likely to break forth among the Christian community as the outcome of false teaching. Destructive heresies are abroad, and through them many shall be induced to follow lascivious doings, and the way of truth shall be evil spoken of. With a promise of liberty which sounds like a perverse employment of some of St Paul's language they will lead their followers astray. But in St Jude's picture the colours seem much darker, and all allusions to teaching, and to the idea that, by lessons such as we know from other sources

1 Many modern critics, following Luther, haye questioned the genuineness of the epistle. The libertines against whom it is directed display close affinity to the Carpocratians of the 2d century, of whose heresy Clemens Alexandrinus makes it a prophecy. Mayerhoff, Schen- kel, and Mangold suppose that it was written against that heresy not long before the middle of the 2d century. Itis also argued that the Muratorian canon seems to regard the epistle as pseudonymous in the same sense as the Wisdom of Solomon.

the Gnostics did give, these men were being beguiled into evil courses throngh what appeared to be the gate of greater knowledge, have disappeared. The sinners against whom this epistle is directed were avowed libertines and practical unbelievers ; they mocked at all sacred things; they were sensual, and had not the Spirit. But stronger than any other reason for believing in the later date of the present epistle is the direct quotation which is made in it from the 2d epistle of St Peter. In verses 17-18 St Jude writes, "But ye, beloved, remember ye the words which have been spoken before by the apostles of our Lord Jesus Christ, how that they said to you, In the last time there shall be mockers (é€uzatxrat) walking after their own ungodly lusts." The whole of what is here given as apostolic teaching corresponds very closely indeed with the words of 2 Peter iii. 2, while the word éyzratkrar is one that is found nowhere else in the New Testament until it is here quoted by St Jude.

Attempts have been made to prove that St Jude's epistle originally appeared in Aramaic, from which the Greek that we have is a translation. But there seems no sufficient evidence for such a conclusion. No doubt a Jew when writing Greek would not unfrequently give expression to his thoughts in a form more or less moulded after his mother tongue, but there are far more points in the epistle which are satisfactory Greek of the date of the New Testament than are the instances which, even after much ingenuity, can be shown to be renderings of Aramaic.

See Semler, Paraphrasis epp. Jacobi, Petri, et Judx, 1781; Augusti, Die Katholischen Briefe, 1801; Jessien, De authentia ep. Judz, 1821; Stier, Der Brief Judx, 1850; Wiesinger (in Olshausen's Bibelwerk), 1854; Hoffmann, Die Briefe Petri, Judd, und Jacobi, 1875 ; Reuss, Les Epittres Catholiques, 1878. (JR ES)

JUDGE, an officer appointed by the sovereign power in a state to administer the law. The duties of the judicial office, whether in a civil or a criminal matter, are to hear the statements on both sides in open court, to arrive at a con- clusion as to the truth of the facts submitted to him, or when a jury is engaged to dircct the jury to find sucha

conclusion, to apply to the facts so found the appropriate rules of law, and to certify by his judgment the relief to which the parties are entitled or the obligations or penalties which they have incurred. With the judgment the office of the judge is at an end, but the judgment sets in motion the executive forces of the state, whose duty it is to carry it into execution. Such is the typeof a judicial officer recog- nized by mature systems of law, but it is not to be accepted as the universal type, and the following qualifying cireum- stances should be noticed. 1. In primitive systems of law the judicial is not separated from the legislative and other governing functions. 2. Although the judge is assumed to take the law from the legislative authority, yet, as the exist- ing law never at any time contains provision for all cases, the judge may be obliged to inventor create principles applicable to the case. This is called by Bentham and the English jurists judge-made and judiciary law. 3. The separation of the function of judge and jury, and the exclusive charge of questions of law given to the judge, are more particularly characteristic of the English judicial system. During a considerable period in the history of Roman law an entirely different distribution of parts was observed. The adjudi- cation of a case was divided between the magéstratus and the judex, neither of whom corresponds to the English judge. The former was a public officer charged with the execution of the law; the latter was an arbitrator whom the magis- trates commissioned to hear and report upon a particular case. The following are points more specially characteristic of the English system and its kindred judicial systems. 1. Judges are absolntely protected from action for anything that they may do in the discharge of their judicial duties. This is true in the fullest sense of judges of the supreme

courts. ‘It is a principle of English law that no action will lie against a judge of one of the superior courts for a judicial act, though it be alleged to have been done maliciously and corruptly.” Other judicial officers are also protected, though not to the same extent, against actions. 2. The highest class of judges are irremovable except by what is in effect a special Act of Parliament, viz.,a resolution passed by both

Houses and assented to by the sovereign. The inferior judges and magistrates are removable for misconduct by the Lord Chancellor. 3. The judiciary in England is not a separate profession. The judges are chosen from the class of advocates, and almost entirely according to their eminence at the bar. 4. Judges are in England appointed for the most part by the crown. Ina few cases municipal corporations may appoint their own judicial officer, and the coroner is elected by the freeholders of the county.

In the United States judges of the supreme courts, as well as ambassadors and other public functionaries, are nominated and appointed by the president with the consent of the Senate, and hold their offices during good behaviour. In the separate States the practice varies, but the tendency is in favour of electing the judges and limiting their tenure of office. In the revised constitution of New York of 1846, the principle was established that all public officers, inclusive of the judges, should be chosen by popular election. 'The constitutional provision for making judges elective for short periods by universal suffrage is contagious, and every new constitutional reform or establishment tends that way" (Kent's Commentaries, 1. 295, where a summary of the practice will be found).

JUDGES, THE Book or, as we now read it, constitutes a sequel to the bock of Joshua, covering the period of history between the death of the son of Nun and the birth of Samuel. But it is well known that the present adjust- ment of the older historical books of the Old Testament to form a continuous record of events from the creation to the Babylonian exile is due to an editor, or rather to successive

redactors, who pieced together and reduced to a certain |

unity older memoirs of very different dates; and closer examination shows that the continuity of many parts of the narrative is more apparent than real. This is very clearly the case in the book of Judges.

We observe in the first place that the book has two commencements, each of which connects it directly with the book of Joshua (chap, i. 1; ii 6). But in i 1 the conuexion is merely apparent. The events related in

chap. i. are there said to have taken place after the death of Joshua, but in reality the chapter covers the same ground with the book of Joshua, giving a brief account of the conquest of Canaan, which in some particulars repeats the statements of the previous book, while in others it is quite independent. It is impossible to regard the warlike expeditions described in this chapter as supplementary campaigns undertaken after Joshua's death; they are plainly represented as the first efforts of the Israelites to gain a firm footing in the centre of the land (at Hebron, Debir, Bethel), in the very cities which Joshua in the book that bears his name is related to have subdued (Josh. x. 39). And this is confirmed by the circumstance that in Judges ii. 1 the "'angel of Jehovah," who, according to Exod. xiv. 24, xxiii. 20, xxxii. 34, xxxili. 2, 7 sq., must be viewed as having his local manifestation at the headquarters of the host of Israel, is still found at Gilgal and not at Shiloh (Josh. xviii. 1). Here then we have an account of the first settlement of Israel west of the Jordan which is parallel to the book of Joshua, but makes no mention of Joshua himself, and places the tribe of Judah in the front. The author of the chapter cannot have had Joshua or his history in his eye at all, and the passage,

| total are also mainly reckoned by forties.

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Josh. xv. 13-19, which corresponds to Judg. i. 10-15, 20, is either derived from our ehapter or from an earlier source common to both. It follows from these considerations that the words " Now after the days of Joshua" in Judg. i. 1 are from the hand of the editor, who desired to make the whole book of Judges, including chap. i, read con- tinuously with that which now precedes it in the canon of the earlier prophets.

There are other signs of morc than one pen having been engaged

on Judgesi. Compare, for example, ver. 8 with ver. 21, and see for the details, which are too complicated to be discusscd here, Graf,

; Der Stamm Simeon, 1866 ; Wellhansen-Bleck, Hinleitung, p. 182;

Wellhausen, Geschichte, i. 366; Meyer, ** Die Eroberung Palistina's" in Stade's Zeitschrift, 1881, Hft. i. The chapter was written after Israel had become strong enough to make the Canaanite cities tribu- tary (ver. 28), that is, in the time of the kingship. Meyer, follow- ing hints by Wellthausen, brings arguments to show that the original author is the Jahwist of the Pemtatench, of whose work there is but little trace among the sources of Joshua, though it cannot have closed without speaking of the conquest.

The second and main section of our book (chap. ii. 6—xvi.) stands on quite another footing. The opening verses ii. 6-9 repeat the closing words of Joshua's history (Josh. xxiv. 28-31), and so link what follows to the book of Joshua as strictly as the first words of Ezra connect that book with the last verses of Chronicles. According to Josh, xxiv. the people "served Jehovah" during the life- time of the great conqueror and his contemporaries. In Judg. ii. this statement is repeated, and the writer proceeds to explain that subsequent generations fell away from the faith, and served the gods of the nations among which they dwelt. The worship of other gods is represented, not as something which went on side by side with Jehovah worship (compare x. 6), but as a revolt against Jehovah, periodi- cally repeated and regularly chastised by foreign invasion. The history, therefore, falls into recurring eycles, each of which begins with religious corruption, followed by chastise- ment, which continues till Jehovah in answer to the groans of His oppressed people raises up a judge to deliver Israel, and recall them to the true faith. On the death of the judge, if not sooner, the corruption spreads anew and the same Vicissitudes follow. This religious explanation of the course of the history, formally expounded at the outset and repeated in more or less detail from chapter to chapter (most fully in chap. x.), determines the form of the whole narrative, which is grouped round six principal judges, Othniel, Ehud, Deborah, Gideon, Jephthah, and Samson. The intervals between the great judges are filled up by the history of Gideon's son Abimelech and of six minor heroes —Shamgar (following Ehud), Tola and Jair (following Abimelech), Ibzan, Elon, and Abdon (between Jephthah and Samson). The minor judges are not represented as having any immediate religious importance. The cycles of revolt, chastisement, aud deliverance are six, not twelve.

To the unity of religious pragmatism in the main stock of the book of Judges corresponds a unity of chronological scheme. The judges, in spite of the fact that most of them had clearly no more than a local influence, are all represented as successive rulers, and the history is dated by the years of each judgeship and those of the intervening periods of oppression. Here, however, a difficulty arises. The fourth year of Solomon is, according to 1 Kings vi. 1, the 480th from the exodus. These 480 years are 12 generations of 40 years each. The larger numbers which make up this Moses, Othniel, Ehud, Deborah, Gideon, and the Philistine oppression, in which, according to Judg. xv. 20, Samson's judgeship was but an incident, make up together 7 × 40 years. Again, David has 40 years, and Samuel (who arose to close the Philistine interregnum twenty years after the death of Eli, and continued in office till he was quite old) cannot have ruled much less than a normal generation. Finally Joshua,

who died at the age of 110, ruled 30 years, if in point of age he was a man of the same standing with Caleb (Josh. xiv. 10). Add to these 30 years 6 for Jephthah and 4 for Solomon and we get 10× 40. There remain but 80 years for the elders who outlived Joshua, tle interregna or times of oppression previous to the Philistine period, the minor judges, and Saul. But the interregna alone are 71 years, and the minor judges 70, or with Abimelech 73 or 74. It is plain that there is no room for both in the chronological scheme, and the two series correspond so nearly that they must be held to be alternative items in the reckoning, leav- ing a slightly different length for Saul's brief reign. But as a matter of fact the minor judges are not so placed in the narrative as to coincide with the periods of oppression. Thus the apparent consecutiveness of the narrative breaks down. The minor judges really lie outside of the chrono- logical scheme of the history as well as of the system of religious cycles ; and we infer that even the main stock of the book of Judges is not all constructed by one hand or on a uniform plan.!

The religious interpretation of the history corresponds with the prophetic teaching of the 8th century n.c. The use of Baal as a title peculiar to false deities as opposed to Jehovah hardly fits an earlier date than the time of Hosea, and the hostile attitude taken up towards the ashera (sacred tree or pole) was not shared by the religious leaders of the period of Jehu. Critics have spoken of chaps. ii. and x. as Deuteronomic, and no doubt the last hand that touched all the earlier historical books and reduced them to unity may be so named; but the main ideas are not necessarily so late, and are rather akin to the non-Levitical Elohist, tlie author of Josh. xxiv. In particular the wor- ship of the high places is not condemned, nor is it excused as is done in 1 Kings iii. 2.

But the sources of the narrative are obviously much older than the theological exposition of its lessons. The com- poser of the book has generally transcribed them with little change, so that in reading the story of each great deliverance vouchsafed to Israel we feel ourselves in living contact with the earliest strain of Hebrew patriotism and religion. In this respect the book of Judges is one of the most valuable and interesting in the Old Testament. The song of Deborah and the history of Abimelech carry us back to the beginnings of national life in Israel, when Judah lived outside the main current of the history—the tribe is not even named by Deborah—and whien Israelite and Canaanite populations existed side by side and struggled together for supremacy. In these chapters Israel is still in some sense a nation foreign to Canaan, and Jehovah Himself has His seat not on the mountains of Israel but beyond the fields of Edom on the southern heights of Sinai. The importance of such documents for the scientific historian lies not so much in the eveuts they record as in the unconscious witness they bear to the state of things in which the narrator or poet lived. From this point of view all parts of the book are by no means of equal value, and in some instances, particularly in the histories of Deborah and Gideon, critical analysis appears to show that two narra- tives of different age have been fused together, the older story giving more prominence to ordinary human motives and combinations, while the later version is coloured by religious reflexion, and shows the characteristic tendency of the Old Testament to retell the

fortunes of Israel in a form that lays ever increasing weight on the work of Jehovah for His people. The history of the minor judges is plainly not related from such lively and detailed remin-

1 The minor details of the chronology appear not to be derived throughout from tradition, but to be got by subdividing the round oe 40. See Wellhausen, op. cit., and Noldeke, Untersuchungen, p. 173 sq.

iscence as gives charm to the longer episodes of the book ; and some of the names, as Néldeke (op. cit.) and others have shown, are those of personified families or communi- ties rather than of individuals. This indeed is a charac- teristic feature of the earlier Hebrew history, which older expositors failed to recognize, but which modern science can no longer ignore.

The third and last part of the book embraces chaps. Xvii.~~xxi., and consists of two narratives independent of one another and of the main stock of the book, with which they are not brought into any chronological connexion. The first narrative, that of Micah and the Danites, belongs to the most primitive strata of the Old Testament history, and is of the highest interest both as a record of the state of religion and for the accurate picture it gives of the way in which one tribe passed from the condition of an invad~~ ing band into settled possession of land and city. The history of the Levite and the Benjamites is of quite another character, and presupposes a degree of unity of feeling and action among the tribes of Israel which it is not easy to reconcile with the rest of the book. In its present form this episode appears to be not very ancient; it resembles the book of Ruth in giving a good deal of curious archzo- logical detail (the feast at Shiloh) in a form which suggests that the usages referred to were already obsolete when tlie narrative was composed.

Literatwre.—On questions of introduction the latest and best in- vestigations are those of Wellhausen in Bleek's Hinleitung, 4th ed., Berlin, 1878, and in his Gesehiehte, chap. vii. For the historical questions compare also Ewald's Geschichte, vol. ii. The most useful

modern commentary is that of Studer, Bern, 1835. Later works are those of Bertheau, Leipsic, 1845; Keil, Leipsic, 1863, English translation, 1865 ; Cassel, in Lange's Bibelwerk, Bielefeld, 1865 ; in the Speaker's Commentary ; and in Reuss's Bible. On the song of Deborah see Ewald, Dichter, i. 1, p. 173; Bottcher, .4 Tliehe Bihnendichtungen, Leipsic, 1850; Kemink, De Carm. Deb., Utrecht, 1840; Meier, Deboralied, Tiibingen, 1859. (W. RB. 8.)

JUDGMENT is the last stage in an action, being the definitive order or sentence of the court or judge, enforceable by the appropriate mode of "execution" appointed by law. In English law the writ of execution remains in force only for one year unless renewed, but a writ of execution may be obtained at any time within six years of the judgement, and after six years the application may be made to the court by any person entitled to execution, and execu- tion may issue accordingly. Judgments by courts of au alien jurisdiction are not immediately enforceable as judgments in England, but they constitute a cause of action, and may be sued upon. They are in fact conclusive as be- tween the parties, although objections going to deny the jurisdiction of the court, or showing that the defendant had not been summoned and had never really been before it, would be a good defence. It has lately been held no defence to an action in a foreign judgment that it disclosed on the face of it a manifest misapprehension by the foreign court of a rule of English law.

JUDICATURE, JUDICATURE ACTS. The Judi- cature Acts are an importantseries of English statutes having for their object to simplify the system of judicature in its higher branches. They are the following : —36 & 37 Vict. c. 66; 37 & 38 Vict. c. 83; 38 & 39 Vict. c. 77; 39 & 40 Vict. c. 59 (the Appellate Jurisdiction Act) ; 40 & 41 Vieb..¢. 9.

The movement which ended in the Judicature Acts has been promoted by all the recent holders of the office of Lord Chancellor and by most of the leading judges, but 1t required a long time to bring it to a successful issue, on account of the difficulty always experienced in creating @ sufficient aniount of public interest in legal reform to over- come the obstacles to legislation. The principal Judicature Act is framed on the

basis-of a report by a commission which was appointed in 1867. It was carried in the

chancellorship of Lord Selborne, but his predecessor Lord Hatherley had in 1870 introduced a measure of the same character. The objects of the Act are threefold—first, to reduce the historically independent courts of common law and equity to one supreme court of judicature, consisting of two branches, a High Court of Justice and a Court of Appeal ; secondly, to establish for all divisions of the court a uniform system of pleading and procedure ; and, thirdly, to provide for the enforcement of the same rule of law in those eases where chancery and common law had _ hitherto recognized different rules. 'The Act does not fuse common law and equity in the sense in which that phrase has generally bee employed. The cliancery division still remains distinct from the common law division, having a certain range of legal questions under its exclusive control, and possessing to a certain extent a peculiar machinery of its own for carrying its decrees into execution. But all actions may now be brought in the High Court of Justice, and, subject to such special assignments of business as that alluded to, may be tried in any division thereof ; and all divisions must recognize the same principles. Further, the difficulties occasioned by mere technicalities of procedure have been to a great extent removed by a system of pleading, the inspiring principle of which is that each party should state his case in the simplest possible manner. It is in respect of the last point that the operation of the Judicature Act has been least satis- factory, and it is certain that a further simplification of pleading, possibly based on the practice of the Scotch courts, will follow very soon.!

The appellate part of the judicature has after some hesitation been finally settled thus. The House of Lords remains the last court of appeal, as before the first Judica- ture Act. That Act abolished the appellate jurisdiction of the Lords so far as the new court of judicature was con- cerned, leaving it still the appeals from Scotland and Ireland. A temporary Act allowed appeals to be brought from the new court,

and the Act 39 & 40 Vict. c. 59 made pro- visions for tlhe permanent hearing of appeals from all courts to the Lords. The judicial functions of the House of Lords have been virtually transferred to an appeal committec, consisting of the Lord Chancellor and other peers who have held high judicial office, and certain lords of appeal in ordinary created by the Act. No appeal is to be heard unless three of such persons shall be present, and the lords of appeal may sit for the despatch of judicial business during a prorogation of parliament, and even by order of the queen during a dissolution. The lords of appeal in ordinary are an entirely new creation. They hold office on the same conditions as other judges; they take rank as barons for life; but they are entitled to a writ of summons to attend and vote in the House only so long as they hold office, and their dignity does not descend to their heirs. Two are appointed in the first instance, but an arrangement is provided for by which the four head judges of the privy council may ultimately be the four lords of appeal in ordinary. When two of the privy council judges die or resign, a third lord of appeal may be appointed, and a fourth when the remaining two judges of the privy council cease to hold office. The judicial committee of the House of Lords and the judicial committee of the privy council will then be the same, and the two jurisdictions will be fused. The Court of Appeal, created by the Judicature Act of 1873, with intention of making it a final court, is now subject to an appeal to the House of Lords. It now consists of six judges, andsits in two divisions, which, roughly speaking, take respectively the chancery and common law

1 Pleading, it should be stated, to prevent a possible confusion, means the written statements of complaint and defence made by the parties before the case comes to trial.

business of the divisional courts, but the lords justices of appeal sit in either division according to convenience. This part of the rearrangement of the judicature may be pro- nounced entirely successful. A strong and stable court of appeal has been created, instead of the fluctuating tribunal of former times. ‘The same is true

generally of the re- distribution of judicial strength effected by the Acts, which has led to a marked improvement in the despatch of business.

The Irish Judicature Act (40 & 41 Vict. c. 57) follows the same lines as the English Acts. The pre-existing courts are consolidated into a supreme court of judicature, consisting of a High Court of Justice and a Court of Appeal. The Judicature Acts do not affect Scotch judicature, but the Appellate Jurisdiction Act includes the Court of Session among the courts from which an appeal lies to the House of Lords under the new conditions. (z. R.

JUDITH, Tue Boox or, one of the books of the Old Testament APocRYPHA (q.v.), takes its name from the heroine Judith (Tovdi6, "Iovdy0, ¢.¢., NYT," Jewess "), to whom the last nine of its sixteen chapters relate. In the Septuagint and Vulgate it immediately precedes Esther, and along with Tobit comes after Nehemiah; in the English Apocrypha it is placed between Tobit and the apocryphal additions to Esther. The argument of the book is briefly as follows. In thetwelfth year of his reign Nebuchadnezzar, who is described as king of Assyria, having his capital in Nineveh, makes war against Arphaxad (ze, the district Arrhapachitis), king of Media, and overcomes him in his seventeenth year. He then despatches his chief general Holofernes to take vengeance on the nations of the west who had withheld their assistance. This expedition has already succeeded in its main objects when Holofernes proceeds to attack Judza. The children of Israel, who are described as having newly returned from captivity, are apprehensive of a desecration of their sanctuary, and resolve on resistance to the uttermost. The inbabitants of Bethulia (Betylia) and Betomesthain in particular (neither place can be identified), directed by Joachim the high priest, guard the mountain passes near Dothaim, and place them- selves under God's protection. Holofernes now inquires of the chiefs who are with him about the Israelites, and is answered by Achior the leader of the Ammonites, who enters upon a long historical narrative showing the Israelites to be invincible except when they have offended God. For this Achior is punished by being handed over to the Israelites, who lead him to the governor of Bethulia. Next day the siege

begins, and after forty days the famished inhabitants urge the governor Ozias to surrender, which he consents to do unless relieved in five days. Judith, a beautiful and pious widow of the tribe of Simeon, now appears on the scene with a plan of deliverance. Wearing her rich attire, and accompanied by her maid, who carries a bag of provisions, she goes over to the hostile camp, where she is at once conducted to the general, whose suspicions are disarmed by the tales she invents. After four days Holofernes, suitten with her charms, at the close of a sumptuous entertainment invites her to remain within his tent over night. No sooner is he overcome with sleep than Judith, seizing his sword, strikes off his head and gives it to her maid; both now leave the camp (as they had previously been accustomed to do, ostensibly for prayer) and return to Bethulia, where the trophy is dis- played amid great rejoicings and thanksgivings. Achior now publicly professes Judaism, and at the instance of Judith the Israelites make a sudden onslaught on the enemy, who at once give way, leaving immense spoil in the hands of the victors. Judith now sings a song of praise, and all go up to Jcrusalem to worship with sacri- fice and rejoicing, The book concludes with a brief

notice of the closing years of the heroine, who returned to her native place and lived to the age of one hundred and five years.

Formerly the majority of interpreters were inclined to assign a strictly historical character to the foregoing narrative, although its historical, chronological, and even geographical difficulties were not overlooked; but this view has to a large extent been superseded by that of most recent critics, who, following Buddseus, regard it as a romance written with a patriotic and moral purpose by some imperfectly informed Jew of the Maccabwxan period who wished to raise the zeal of his compatriots to the fizhting point on behalf of their religion and worship against an overbearing enemy. Volkmar stands alone in treating it as a veiled account of the campaigns of Trajan and his generals against the Parthians and Jews.

According to Origen the book was unknown to the Jews, aud did not exist in Hebrew. The extant Greek text, however, which exists in three divergent recensions, shows unmistakable traces of a Hebrew original, even apart from certain expressions which can only be explained as ignorant mistranslations. But that original must have differed considerably from the Chaldee text which lay before Jerome, and was used by him for his new Latin version.

The first express reference to Judith occurs in Clement of Rome (1 Ad Cor., cap. 55); it is cited as Scripture by Clement of Alexandria, Tertullian, Ambrose, and Augustine, and was recognized as canonical by the council of Carthage, and by Innocent I. of Rome.

See Schiirer, NTliche Zeitgesch., and De Wette-Schrader, Einleitung ; in both works full bibliographies are given. The

most important commentary is that of Fritzsche in the Mxegetisches Handbuch (1853).

JUDSON, Aponrram (1788-1850), was born at Malden, Massachusetts, August 9, 1788. During his education at Andover theological seminary he formed the resolution to become a missionary, and in 1812 he was ordained a missionary to Burmah under the auspices of the Congre-gational Board of Foreign Missions. Having after his arrival in India adopted Baptist views, he was appointed to labour in Burmah by the American Baptist Missionary Union in 1814. His translations of the Bible into Burmese appeared in 1835, and his Burmese and English Dictionary in 1852. He died April 12, 1850. Both in his literary and his missionary labours he was greatly assisted by the three ladies whom he successively married, of whom as well as of Judson biographies have been published.

JUGURTHA. After the finat conquest of Carthage by |

the Romans in 146 3.c., the larger part of the north of Africa was practically under Roman control. The so-called province, indeed, of Africa, as then constituted, was but a small strip of territory, comprising the possessions retained by Carthage during the few years

previous to her downfall. It coincided with the north-eastern portion of Tunis. Around it, to the west, south, and east, was the region to which the Romans gave the name of Numidia, the country of the "Nomads," which stretched westwards to Mauretania, the river Malucha (Maliwi), which flows into the gulf of Melillah, being here roughly its boundary, and eastwards to the Great Syrtis, thus bordering on Cyrene and Egypt. We may say that Numidia corresponds with what is now Algiers, the south of Tunis, and Tripoli, including in addition a region of indefinite extent to the south. Over this extensive territory, parts of which were rich and populous, Masinissa had ruled for many years, and had rendered Rome substantial aid in her war with Carthage. On his death in 149 z.c. his sovereign power was divided under the direction of Scipio Africanus the younger, the conqueror of Carthage, between his three sons Micipsa, Gulussa, and Mastanabal. The actual government, how-

ever, was chiefly in the hands of an illegitimate son of Mastanabal, Jugurtha. The Numidian princes were by no means mere barbarous chiefs. Micipsa, though too weak to be a king, is said to have been imbued with a consider- able tincture of Greek philosophy, and Jugurtha's father too was a man of some literary culture. Jugurtha himself had many of the qualities which command success. He was strong and active; he had a handsome face and keen intelligence ; he was a skilful rider, and was a thorough adept in all warlike exercises. In fact, he was in many respects a very worthy grandson of Masinissa, and he inherited much of his political ability and adroitness, Micipsa was naturally rather afraid of him, and knowing his military tastes he sent him to Spain in command of a Numidian force,to serve underScipio, who was then engaged in the war with Numantia. Jugurtha soon won Scipio's good opinion, and he became a favourite with the Roman nobles serving in the camp, some of whom put into his head the idea of making himself the sole king of Numidia, hinting that at Rome anything could be done for money. There was truth in the hint, as subsequent events proved.

In 118 s.c. Micipsa died. He had thought it politic to adopt Jugurtha, and to provide by his will that he should be associated with his own two sons, Adherbal and Hiempsal, in the government of Numidia. Seipio had written to Micipsa a strong letter of recommendation in favour of Jugurtha; and to Scipio, accordingly, Micipsa entrusted the execution of his will. His testamentary arrangements thus had the Roman guarantee, but they utterly failed. The princes soon quarrelled ; and Jugurtha, who was thoroughly unscrupulous, claimed the entire kingdom. His cousin Hiempsal he contrived to have assassinated; and Adherbal he quickly drove out of Numidia by force of arms, compelling him to take refuge in the Roman province of Africa. He had next the audacity to send envoys to Rome to defend his usurpation. Hiempsal, they were to say, had been murdered by his subjects for his cruelty, and Adherbal, who was now at Rome to get redress, had been himself the aggressor. The senate decided that Numidia was to be divided between the two princes, and the division, which was arranged under the superintendence of Roman commissioners, gave the western, the richest and most populous half of the country, to Jugurtha, while the sands and deserts of the eastern half were left to Adherbal. Jugurtha's envoys appear to have found several of the Roman nobles and senators accessible to judicious bribery. So far, however, was he from being satisfied with having secured the best of the bargain that he at once began to molest Adherbal's dominions and to provoke him to a war of self-defence. He so completely defeated him, somewhere near, it would seem, the modern Philippeville, that Adherbal sought safety in Cirta (Con- stantina), the chief town of Numidia, and a very strong fortress. Here he was besieged by Jugurtha, who, notwith- standing the interposition of a Roman embassy headed by Marcus Scaurus, a leading Roman senator, ultimately forced the place to capitulate, and then treacherously massacred all the inhabitants, his cousin Adherbal among them, and 4 number of Italian merchants who had settled in the town. There was great wrath at Rome and throughout all Italy ; and the senate, a majority of which still clung to Jugurtha in spite of the proof they had just had of his atrocious treachery and cruelty, were persuaded in the same year, 111 B.C., on the motion of the tribune Caius Memmius, to allow a declaration of war against the Numidians. An army was despatched to Africa under the command of the newly

elected consul, Calpurnius Bestia, and several of the Numidian towns voluntarily surrendered, while Bocchus, the king of Mauretania, and Jugurtha's father-in-law, offered the Romans his alliance.

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Jugurtha was alarmed, but, having plenty of money at his | command out of the accumulated treasures of his grand- father Masinissa, he again acted on his experience of Roman venality, and he was successful in arranging for himself with the Roman general a peace which left him in undisturbed possession of the whole of Numidia. When the facts were known at Rome, the tribune Memmius insisted that Jugurtha should appear in person and be questioned as to the precise nature of the negotiations. Jugurtha indeed appeared under a safe conduct, but he had partisans who took care that his mouth should be closed. The treaty, however, was set aside, and war was again declared, Spurius Albinus, the new consul, having the command. The Roman army in Africa was thoroughly demoralized, and quite unfit to take the field. An unsuccess- ful attempt was made on a fortified town, Suthul, in which the royal treasures were deposited. Worse followed: the army was surprised by the enemy in a night attack, and the camp was taken and plundered. Jugurtha was master of the situation, and every Roman was driven out of Numidia. By this time the feeling at Rome and in Italy against the corruption and incapacity of the nobles had beconie so strong that prosecutions on a wholesale scale struck down a number of tlie senators, and Bestia and Albinus were sentenced to exile. The Numidian war was now entrusted to Quintus Metellus, an aristocrat indeed in sentiment, but at the same time an able soldier and a stern disciplinarian. With him was associated the famous Caius Marius, wlio had risen from the rank of a centurion. The army was soon in a condition to face the enemy, and from the year 109 b.c. to the close of the war in 106 the contest was carried on with credit to the Roman arms. Jugurtha was defeated in an action on the river Muthal, after an obstinate resistance and a display of much military skill. Once again he even succeeded in surprising the Roman camp and forcing Metellus into winter quarters. There were fresh negotiations, but Metellus insisted on the surrender of the king's person, and this Jugurtha

refused. Numidia on the whole seemed disposed to assert its independence, and Rome had before her an indefinite prospect of a long and troublesome guerilla war. The country was a parti- ~~cularly trying one for a regular army, and a victory seemed to lead to no substantial result. Nothing could be really accomplished unless Jugurtha himself could be secured; and to this end negotiations, reflecting little credit on the Romans, were set on foot with Bocchus, who for a time, as his interest seemed to dictate, played fast and loose with both parties. The war dragged on till in 106 3.c. Marius was called on by the vote of the Roman people to supersede Metellus. Marius found that he hada difficult work, and his army was once seriously imperilled on the borders of Mauretania, whither he had led them to overawe Bocchus, who had just made a friendly treaty with Jugurtha. Shortly afterwards this cunning and treacherous prince again offered his friendship to the Romans, and it was through his perfidy and not by Roman skill or valour that the war with Jugurtlia was ended. In the final negotia~~ tions Lucius Sulla, who was Marius's questor and com- Inanded the cavalry, had the honour, such as it was, of Winning over to the Roman side the king of Mauretania, and prevailing on him to sacrifice Jugurtha. The Numidian fell into an ambush through his father-in-law's treachery, and was conveyed a prisoner to Rome. 'Two years after- wards, in 104 B.c., he figured with his two sons in Marius's triumph, and in the subterranean prison beneath the Capitol, "the bath of ice," as he called it, he was either strangled or starved to death. The war had becn an inglorious one for Rome, and its end with all its attendant circumstances | was deplorably disgraceful.

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Jugurtha, though doubtless for a time regarded by his African and Numidian countrymen as their deliverer from the yoke of Rome, mainly owes his historical importance to the very full and minute account of him which we have from the hand of Sallust, himself afterwards governor of Numidia. The Jugurthine war too happened to coincide with a period of considerable political interest at Rome. The symptoms of revolution were beginning to make them- selves visible. The weakness and corruption of the govern- ment of the senate was

forcing itself on the notice of all men, and popular opinion was becoming too strong to be disregarded. One general after another had been super- seded and disgraced, and Marius, a man of the humblest origin, had been summoned by the public voice to put an end to a war in which the incapacity and disloyalty of consuls and senators had becn grievously exposed. Tlie names of both Marius and Sulla became famous for tlie first time in a struggle with a Numidian chief. The time was clearly at hand when the old system of Rome's govern- ment could sustain itself no longer.

The best modern account of Jugurtha and the Jugurthine war is to be found in Mommsen, /ist. of Rome, book iv. chap. v. (W. J.B.)

JUJUBE. Under this name the fruits of at least two species of Zizyphus are usually described, namely, Z. vulgaris of Lamark and Z. Jujuba of the same author. The species of Zrzyphus are for the most part small trees or shrubs, armed with sharp, straight, or hooked spines, having alternate leaves and fruits, which are in most of the species edible, and have an agreeable acid taste; this is especially the case with those of the two species mentioned above.

Z. vulgaris is a tree about 20 feet high, extensively cul- tivated in many parts of southern Europe, Asia, Spain, the south of France, and Italy, also in western Asia, China, and Japan. In India it extends from the Punjab to the western frontier, ascending in the Punjab Himalaya to a height of 6500 feet, and is found both in the wild and cultivated state. The plant is grown almost exclusively for the sake of its fruit, which both in size and shape resembles a moderate sized plum ; at first the fruits are green, but as they ripen they become of a reddish-brown colour on the outside and yellow within. They ripen in September, when they are gathered and preserved by storing in a dry place; after a time the pulp becomes much softer and sweeter than when fresh. Jujube fruits when carefully dried will keep for a long time, and retain their agreeable refreshing acid flavour, on account of which they are much valued in the countries of the Mediter- ranean region as a winter dessert fruit ; and, besides, they are nutritive anddemulcent. At one time a decoction was prepared from them and recommended in

pectoral complaints. A kind of thick paste, known as jujube paste, was also made of a composition of gum arabic and sugar dissolved in a decoction of jujube fruit evaporated to the proper consistency. The fruits of the Zzzyphus do not enter into the composition of the lozenges now known as jujubes.

The second species of Zizyphus referred to above, viz., Z. Jujuba, is a tree averaging from 30 to 50 feet high, found both wild and cultivated in many parts of tho tropics, as in China, Australia, the Malay archipelago, Ceylon, throughout India, and in tropical Africa. Many varieties of this tree are known to and cultivated by the Chinese, who distinguish them by the shape and size of their fruits, which are produced in abundance, and are not only much valued as dessert fruit in China, but are also occasionally exported to England.

As seen in commerce jujube fruits are about the size of a small filbert, having a reddish-brown, shining, some- what wrinkled exterior, and a yellow or gingerbread coloured pulp enclosing a hard elongated stone.

JUKES, Josepn Brrre (1811-1869), geologist, was born near Birmingham, October 10, 1811. Educated first at Wolverhampton grammar-school and afterwards at King Edward's School, Birmingham, he passed in 1830 to St John's College, Cambridge, where he graduated in 1836. At Cambridge he began the study of geology under Sedgwick, and in 1839, after three years of study, lecturing, and writing, le was appointed geological surveyor of Newfoundland. He returned to England at the end of 1840, and in April 1842 sailed as naturalist on board H.M.S. "Fly," despatched to survey Torres Strait, New Guinea, and the east coast of Australia. Jukes landed in England again in June 1846, and in August received all appointment to the geological survey of Great Britain. The district to which he was sent was North Wales. In 1850 he accepted the post of local director of the geological survey of Ireland. The exhausting nature of his work slowly but surely wore out even his robust constitution, and on July 29, 1869, he died. Immediately on leaving college, Jukes became a member of the London Geologi- cal Society, and in 1852 he was admitted to the Dublin

Geological Society, of which he was president in 1853 and 1854. He was also a Fellow of the Royal Society. For many years he lectured as professor of geology, first at the Royal Dublin Society's Museum of Irish Industry, and afterwards at the Royal College of Science in Dublin.

In addition to the reports of his various appointments, Jukes wrote very many papers and memoirs, to be found in the London and Dublin geological journals and other periodicals. While in Ireland he edited, and in great measure wrote, forty-two memoirs explanatory of the maps of the south, east, and west of Ireland, and prepared a geological map of Ireland on a scale of 8 miles to an inch. He was also the author of Excursions in and about New- foundland, 2 vols., 1842; Narrative of the Surveying Voyage of H.M.S. "Fly," 2vols., 1847; A Sketeh of the Physical Structure of Australia, 1848; Popular Physical Geology, 1853 ; On the Geology of Australia, 1853; Student's Manual of Geology, 1857 (later editions, 1862, 1872); the article GzoLocy, in the 8th edition of the Eneyclopx:lia Britannica, 1858; and School Manual of Geology, 1863. See Letters, &c., of J. Beete Jukes, edited, with connecting memorial notes, by his sister (C. A. Browne), 1871, to which is added a chronologieal list of Jukes's writings,

JULIAN (331-363), commonly called Julian the Apos- tate, was Roman emperor for about a year and eight months (361-363). His full name was Flavius Claudius Julianus. He was born at Constantinople in 331, being the son of Julius Constantius and his wife Basilina, and nephew of Constantine the Great, He was thus a mem- ber of the dynasty under whose auspices Christianity became the established religion of Rome.

Julian lost his mother not many months after he was born. He was only six when his imperial uncle Constan- tine died; and one of his earliest memories must have been the fearful massacre of his father and kinsfolk, in the interest and more or less at the instigation of the sons of Constantine. Only Julian and his elder brother Gallus were spared, as they were too young to excite the fear or justify the cruelty of the murderers. From this period till his twenty-fifth year Julian passed his life in the closest retirement, jealously watched by the reigning

emperor, often under immediate fear of death. He was carefully educated, however, under the supervision of the family eunuch Mardonius, and of Eusebius, bishop of Nicomedia, at Constantinople itself and at various places in Jonia and Bithynia, and afterwards for six years at Macellum, a remote and lonely castle in Cappadocia. He was trained to the profession of the Christian religion; but he became early attracted to the old faith, or rather to the idealized amalgam of paganism and philosophy which was current among his teachers, the rhetoricians. Cut off from all sympathy with the reigning belief by the terrible fate of his family, and with no prospect of a public career, he turned with all the eagerness of an enthusiastic temperament to the literary

and philosophic studies of the time. The old Hellenic world had an irresistible attraction for him. Love for its culture was in Julian's mind intimately associated with loyalty to its religion.

In the meantime the course of events had left as sole autocrat of the Roman empire his cousin Constantius, who felt himself unequal to the enormous task, and called Julian's brother Gallus to a share of power. The same turn of affairs brought a great improvement in the condition of Julian, who was permitted to pursue his studies at Nicomedia. Here he made the acquaintance of some of the most eminent rhetoricians of the time, and here it was that he became confirmed in his secret devotion to the pagan faith. But the downfall of Gallus (354) yet again exposed Julian to the greatest danger. By his rash and headstrong conduct Gallus had incurred the enmity of Constantius and the eunuchs, his confidential ministers, and was put to death. Julian fell under a like suspicion, and narrowly escaped the same fate, For some months he was confined at Milan, till at the intercession of the empress Eusebia, who always had a kindness for him, he was permitted to retire to Athens (355). The few months he spent here were probably the happiest of his life. Living at the ancient hearth of Grecian culture, and amid the companionship of congenial friends, he found his dearest ambition realized in the enthusiastic study of literature and philosophy.

But a member of the Roman imperial house could not thus be allowed to escape the public responsibilities con- nected with his birth. The emperor Constantius aud he were now the sole surviving male members of the family of Constantine; and, as the emperor again felt himself oppressed by the cares of government, there was no alter- native but tocall Julian to his assistance. At the instance of the empress he was summoned to Milan ; and there from Constantius, who had been chiefly concerned in the murder of his family, he received the hand of Helena, sister of the emperor, as also the title of Cesar and the government of Gaul. It was with extreme reluctance that Julian entered on his new dignities. Accustomed to a life of quiet study and retirement, he felt timid and awkward in the world of ceremony, suspicion, and intrigue to which he was now introduced. He knew well the danger to which he was exposed from the dark temper of the emperor and the arts of the eunuclis who were all-powerful at the court.

A task of extreme difficulty also awaited him beyond the Alps. During recent troubles the Alemanni and other German tribes had crossed the Rhine; they had burned Cologne, Treves, Strasburg, and many other flourishing cities, and extended their ravages far into the interior of Gaul. The internal government of the province had also fallen into great confusion, In spite of his inexperience, and by virtue of his native energy and ability, Julian quickly brought affairs into order. He completely over- threw the Alemanni in the great battle of Strasburg (357). The Frankish tribes which had settled on the western bank of the lower Rhine were reduced to submission. Five times in all he crossed the river to overawe the restless tribes beyond. In Gaul he rebuilt the cities which had been laid waste, re-established the administration on 4 just and secure footing, and as far as possible lightened the . taxes, which weighed so heavily on the poor provincials. Paris was the usual residence of Julian during his govern- ment of Gaul, and his name has become inseparably associated with the early history of the city.

The position and reputation of Julian were now estab- lished. He was general of a victorious army enthusiasti- cally attached to him, and governor of a province which he had saved from ruin; but he had also

become an object of fear and jealousy at the imperial court. It was accordingly

resolved to weaken his power. A threatened invasion of the Persians was made an excuse for withdrawing some of the best legions from the Gallic army. Julian recognized the covert purpose of this, yet proceeded to fulfil the commands of the emperor. A sudden movement of the legions themselves decided otherwise. At Paris, on the night of the parting banquet, they forced their way into Julian's tent, and, proclaiming him emperor, offered him the alternative either of accepting the lofty title or of instant death. Julian accepted the empire, and sent an embassy with a deferential message to Constantius. The message being contemptuously disregarded, both sides prepared for a decisive struggle. After a march of unexampled rapidity through the Black Forest and down the Danube, Julian reached Sirmium, and was on the way to Constantinople, when he received news of the death of Constantius at Mompsocrene in Cilicia (361). Without further trouble Julian found himself everywhere acknow- ledged the sole ruler of the Roman empire.

Julian had already made a public avowal of paganism, of which he had been a secret adherent from the age of twenty. It was no ordinary profession, but the expression of a strong and even enthusiastic conviction ; the restora- tion of the pagan worship was to be the great aim and controlling principle of his government. His reign was too short to show what precise form the pagan revival might ultimately have taken, how far his feelings might have become embittered by his conflict with the Christian faith, whether persecution, violence, and civil war might not have taken the place of the moral suasion which was the method he originally affected. He issued an edict of universal toleration; but in many respects he used his imperial influence unfairly to advance the work of restora- tion. In order to deprive the Christians of the advantages of culture, and discredit them as an ignorant sect, he forbade them to teach rhetoric. The symbols of paganism and of the imperial dignity were so artfully interwoven on the standards of the

legions that they could not pay the usual homage to the emperor without seeming to offer worship to the gods; and, when the soldiers came forward to receive the customary donative, they were required to throw a handful of incense on the altar. Without directly exclud- ing Christians from the high offices of state, he held that the worshippers of the gods ought to have the preference. In short, though there was no direct persecution, he exerted much more than a moral pressure to restore the power and prestige of the old faith.

Having spent the winter of 361-2 at Constantinople, Julian proceeded to Antioch to prepare for his great expedition against Persia. His stay there was a curious episode in his life. Strange to say, it is doubtful whether his pagan convictions or his ascetic life, after the fashion of an antique philosopher, gave most offence to the so-called Christians of the dissolute city. They soon grew heartily tired of each other, and Julian took up his winter quarters at Tarsus, from which in early spring he marched against Persia. At the head of a powerful and well-appointed army he advanced through Mesopotamia and Assyria as far as Ctesiphon, near which he crossed the Tigris, in face of a Persian army which he defeated. Misled by the treacher- ous advice of a Persian nobleman, he desisted from the siege of that great city, and set out to seek the main army of the enemy under King Sapor. After a long and useless march into the interior he was forced to retreat, when he found himself enveloped and harassed by the whole Persian army, in a waterless and desolate country, and at the hottest season of the year. The Romans repulsed the enemy in many an obstinate battle. In one of these, however, on the 26th of June 363, Julian, who was ever in the front, was mortally wounded. The same night he

died in his tent. In the most authentic historian of his reign, Ammianus Marcellinus, we find a noble speech, which, like Socrates in the prison, he is said to have addressed to his afflicted officers. Jovianus was chosen emperor by the army, which was extricated from its perilous situation only by a very disadvantageous treaty.

From Julian's unique position as the last champion of a dying polytheism, his character has ever excited interest and been the subject of debate. Authors such as Gregory of Nazianzus have heaped the fiercest anathemas upon him ; but a just and sympathetic criticism, like Neander's, has found many noble qualities in his character and ample excuse for his leanings to a philosophic paganism. In his childhood he had seen his nearest kinsmen massacred by the heads of the new Christian state; till the age of twenty-five he held his life on sufferance, and passed it in obscurity under the most rigid and suspicious surveillance. The only sympathetic friends he met were among the heathen rhetoricians and philosophers; and he found a suitable outlet for his restless and inquiring mind only in the studies of ancient Greece. In this way he was attracted to the old paganism ; but it was a paganism idealized by the philosophy of the time, and still further purified by the moral influence of the Christianity which it rejected.

In other respects Julian was no unworthy successor of the Antonines. Though brought up in a studious and pedantic solitude, he was no sooner called to tle government of Gaul than he displayed all the energy, the hardihood, and the practical sagacity of anold Roman. In temperance, self-control, and zeal for the public good, as he understood it, he was unsurpassed. To these Roman qualities he added the culture, literary instincts, and speculative curiosity of a Greek. One of the most remarkable features of his public life was the perfect ease and mastery with which he associated the cares of war aud statesmanship with the assiduous cultivation of literature and philosophy. Yet even his devotion to culture was not free from pedantry and dilettantism. His contemporaries observed in him a want of naturalness. He had not the moral health er the composed and reticent manhood of a Roman, or the un-self- conscious spontaneity of a Greek. He could never be at rest; he never could hold his tongue ; in the rapid torrent of his conversation he was apt to run himself out of breath ; his manner was jerky and spasmodic. He showed quite a deferential regard for the sophists and rhetoricians of the time, and advanced them to high offices of state; there was real cause for fear that he would introduce the govern- ment of pedants in the Roman empire. Last of all, his love for the old philosophy was sadly disfigured by his devotion to the old superstitions,

and in this respect he little pleased the taste of a judge like Gibbon. He was greatly given to divination ; he was noted for the number of his sacrificial victims. Wits applied to him the joke that had been passed on Marcus Aurelius: ‘The white cattle to Marcus Cesar, greeting. If you conquer, there is an end of us.”

Julian wrote several works, including—(1) Letters, eighty-three of which are preserved in the edition of Heyler, Mainz, 1828 (most of these are addressed to men of letters) ; (2) Orations, nine in num- ber ; (8) Kafoapes 4} Zuumrdotov, a satirical composition, in which the dead Ceesars appear at a banquet prepared in the heavens, and have to endure the caustic wit of old Silenus ; (4) ’Ayrioxixds 4 Misorarywy, a jeu d esprit on the inhabitants of Antioeh, in which also his own person and mode of life are jocularly handled. The most important of his works, the Karaé Xpiotiavav, has been lost, except the fragments preserved in the refutation by Cyril, latest edition by Neumann, 1881. The best edition of his entire works used to be that of Spanheim, Leipsic, 1696; the most reeent is that of Hertlein in the Teubner series, Leipsie, vol. i. in 1875,

Of the primary sourees for Julian’s life and character the most important are his own works; the trustworthy and impartial historian of the period, Ammianus Mareellinus, v. 8-xxv.; the letters and orations of Julian’s much esteemed friend Libanius ; and the orations of hls severest eritie, Gregory of Nazianzus. The impression which Julian’s eareer produced on the Christians of the East is

refleeted in two Syriac romanees published. by J. G. E. Moffmann (Julianos der Abtriinnige, Leyden, 1880). Compare Néldeke, in 7. D. Mf. G., 1874, vol. xxviii., p. 263 sq., 666 sg. Modern authorities are—Gibbon’s Decline and Fall, Neander, Der Kaiser Julian und sein Zeitalter, Leipsic, 1813, English translation by G. V. Cox; D. F. Strauss, Der Romantiker auf dem Throne der Caésaren oder Julian der Abtriinnig? (Gesam. Schriften, vol. i., Bonn, 1876); Semisch, Julian der

Abirin- nige; Rode, Geschichte der Reaction K. Jultans gegen die christliche Kirche; H, Adrien Naville, Julien ? Apostat, Paris, 1877; and the Hulsean essay for 1876, by G. H. Rendall. CT. K.

JULICH (Fr., Juliers), the chief town of a circle in the government district of Aachen, Prussia, and capital of the former duchy of Jiilich, situated on the right bank of the Roer, about 16 miles north-east of Aachen (Aix-la-Chapelle). It contains three churches, a progymnasium, and a military school, and has manufactures of leather, paper, and wood. The population in 1875 was 5111.

Jiilich (formerly also Giilch, Gulichc) is the Juliacum of the Antonini Itinerarium ; some have attributed its origin to Julius Cesar. From the 9th century it appcars scveral times in his- tory, generally as the scene of siege. Fron 1794 till 1815 it was in the hands of the French. Till 1860, when its works were demolished, Jiilich ranked as a fortress of the second class.

JULIEN, Noen (1797-1873), afterwards called Stan- ISLAS-AIGNAN JULIEN, was born at Orleans April 13, 1797. His father, who was a mechanic, being desirous of improv- ing the position of his son, destined the young Stanislas- Aignan for the priesthood, and in preparation for that calling sent him to the seminary iu his native town. Here his extraordinary talent for the acquisition of languages first displayed itself, and with his knowledge increased his repugnance to the profession marked out for him. His favourite study at this time was Greek literature, and so recognized did his schularship become that, when he went to Paris in 1821, he received the appointment of assistant professor of Greek at the Collége de France. In the same year he published a translation of the "EAés dpmayy of Coluthus, of which work he subsequently brought out a new edition, with a Latin version and notes. In later years he was in the habit of saying that it was as the author of this work that he would be best known by posterity,— another instance of the common inability of authors to judge correctly of the relative merits of their works. At this period his attention was drawn to the lectures being delivered by Abel Rémusat on the Chinese language, and being attracted to the study he placed him- self under the

tuition of that professor. In this new pursuit his progress was as marked and as rapid as formerly in Greek. From the first he, as if by intuition, thoroughly mastered the genius of the language ; and the complexity of the characters and the peculiarities of con- struction, which to others have always presented serious difficulties, at once yielded to his ability and diligence. In 1823 he published a translation in Latin of a part of the works of Mencius, one of the nine classical books of the Chinese, and, though this volume appeared within two years of his having taken up the study of the language, it justified its publication by its success. A year later he produced a translation of the modern Greek odes of Kalvos under the title of La Lyre patriotique dela Gréce. But such works were not profitable ina commercial sense, and, being without any patrimony, Julien was glad to accept the assistance of Sir William Drummond and others, until in 1827 he was appointed sub-librarian to the French Institute. In 1831 he was elected a member of L'Académie des Inscriptions et Belles-Lettres de l'Institut de France in the place of Saint-Martin, and in the following year he succeeded Rémusat as professor of Chinese at the Collége de France. For some years his studies had been directed towards the dramatic and lighter literature of the Chinese, and in rapid succession he now brought out translations of the /oei-lan-kt, or " L'histoire du cercle de craie," a drama in which occurs a curiously analogous scene to the judg- ment of Solomon; the Pih shay tsing ki; Blanche et Bleue, ou les deux couleuvres fées ; and the Lchao-cht kou eul, upon

which Voltaire subsequently founded his Orphelin de la Chine. With the versatility which belonged to his genius, he next turned, apparently without difficulty, to the very different style common to Taouist writings, and translated in 1835, for the Oriental Translation Fund, Le Lure des Récompenses et des Peines of Laou-tsze. About this time the cultivation of silk-worms was beginning to attract atten- tion in France, and by order of the minister of agriculture Julien compiled, in 1837, a Résumé des principaux traités Chinots sur la culture des mitriers, et [éducation des vers-a- sote, which was speedily translated into English, German, Italian, and Russian.

Nothing was more characteristic of his method of study- ing Chinese than his habit of collecting every peculiarity of idiom and expression which he met with iu his reading ; and, in order that others might reap the benefit of his experiences, he published in 1841 a work entitled Dos-cussions grammaticales sur certaines régles de position qut, en Chinois, jouent la méme role que les inflexons dans les autres langues, which he followed in 1842 by Lzercises pratiques d'analyse, de syntaue, et de leaigraphie Chinoise. Meanwliile in 1839 he had been appointed joint keeper of the Bibliothtque Royal, with the especial superintendence of the Chinese books, and shortly afterwards he was made Administrateur du Collége de France.

The facility with which he had learned Chinese, and the success which his proficiency commanded, naturally inclined other less gifted scholars to resent the impatience with which he regarded the mistakes into which they fell in their translations from this most difficult language, and at different times bitter controversies arose between Julien and his fellow Sinologues on the one subject which they hadin common. How envenomed were the disputes which thus arose may be gathered from the following title of a work published in 1842 by Julien, Simple exposé dun fait honorable odieusement dénaturé dans un libelle récent de M. Pauthier, suivi dela réfutation de sa dermeere réponse, du résumé analytique de plus de 600 fautes ql n'a pas su justifier, et de lewamen de certains passages a aide desquels tl a prétendu prouver que des Egyptiens ont porte en Chine Vinvention de Vécriture 2353 ans avant J. C. In the same year appeared from his busy pen a translation of the Tao te King, the celebrated work in which Laou-tsze attempted to explain his idea of the relation existing between the universe and something which he called Z'aou, and on which the religion of Taouism is based. From Taouism to Buddhism was a natural transition, and about this time Julien turned his attention to the Buddhist literature of China, and more especially to the travels of Buddhist pilgrims to India. In order that he might better under- stand the references to Indian institutions, and the tran- scriptions in Chinese of Sanskrit words and proper names, he began the study of Sanskrit, and in 1853 brought out his Voyages des Pélerins Bouddhistes, the value of which work is much enhanced by the fruits of this new instance of his extraordinary mental

enterprise. The same remark applies to the work which he published six year later entitled Les Avaddnas, contes et apologues Indiens inconnus jusqw a ce jour, suivis de poésies et de nouvelles Chinoises. Yor the benefit of future students he disclosed his system of deciphering Sanskrit words occur ring in Chinese books in his Méthode pour déchiffrer et transcrire les noms Sanscrits qua se rencontrent dans les livres Chinois (1861). This work, which contains much of interest and importance, falls short of the value which its author was accustomed to attach to it. It had escaped his obser- vation that, since the translations of Sanskrit works into Chinese were undertaken in different parts of the empire, the same Sanskrit words were of necessity differently represented in Chinese characters in accordance with the

dialectical variations. No hard and fast rule can therefore possibly be laid down for the decipherment of Chinese transcriptions of Sanskrit words, and the effect of this impossibility was felt though not recognized by Julien, who in order to make good his rule was occasionally obliged to suppose that wrong characters had by mistake been ‘troduced into the texts. His Indian studies led to a controversy with M. Reinaud, which was certainly not free from the gall of bitterness. Among the many subjects to which he turned his attention were the native industries of China, and his work on the Histoire et fabrication de la porcelaine Chinoise is still, and is likely to remain, a standard work on the subject. In another volume he also published an account of the Industries anciennes et modernes de Vempire Chinois (1869), translated from native authori- ties. In the intervals of more serious undertakings he translated the San tsew King, or “Le Livre des trois mots” ; Thesien tseu wen, or “ Le Livre de mille mots” ; “ Les deux cousines ” ; “‘ Nouvelles Chinoises ” ; the Ping chan ling yen, “Tes deux jeunes filles lettrées”; and the “ Dialoghi Cinesi,” Ji-tch’ang Reowt’cou-koa. The last work of importance which proceeded from his pen was his Syntaxe nouvelle de la langue Chinoise (1869). In these volumes le gives the results of his study of the language, and has collected in them a vast array of facts and of idiomatic expressions. A more scientific arrangement and treatment of his subject would have

added much to the value of this work, which, however, contains a mine of material which amply repays exploration. One great secret by which Julien acquired his grasp of the Chinese language was, as we have said, his methodical collection of phrases and idiomatic expressions. Whenever in the course of his reading he met with a new phrase or expression, he en- tered it on a card which took its place in regular order in a long series of boxes. At his death, which took place on the 20th February 1873, he left, it is said, 250,000 of such cards, about the fate of which, however, little seems to be known. In politics Julien was imn- perialist, and in 1863 he was made a commander of the legion of honour in recognition of the services he had rendered to literature during the empire. @ &.D.)

JULIERS. See JULicu. JULIUS L., pope from 337 to 352, was a native of Rome, and was chosen as successor of Marcus after the Roman see had been vacant four months. He is chiefly known by the part which he took in the Arian controversy. After the Eusebians had, at a synod held in Antioch in 341, renewed their deposition of Athanasius, they resolved to send delegates to Constans, emperor of the West, and also to Julius, setting forth the grounds on which they had proceeded. The latter, after expressing an opinion favour- able to Athanasius, adroitly invited both parties to lay the case before a synod to be presided over by himself. This proposal, however, the Eastern bishops declined to accept. On his second banishment from Alexandria, Athanasius came to Rome, and was recognized as a regular bishop by the synod held in 342. It was through the influence of Julius that, at a later date, the council of Sardica in Illyria was held, which was attended only by seventy-six Eastern bishops, who speedily withdrew to Philippopolis and deposed Julius, along with Athanasius and others. The three hundred Western bishops who remained con- firmed the previous decisions of the Roman synod ; and by its 3d, 4th and 5th decrees relating to the rights of revision claimed by Julius the council of Sardica perceptibly helped forward the pretensions of the papacy. Julius on his death in April 352 was succeeded by Tiberius.

JULIUS II., pope from 1503 to 1513, was born at Savona in 1443. He was the son of a brother of Sixtus IV., his original name being Giuliano

della Rovere. By his

Te

uncle, who took him under his special charge, he was educated among the Franciscans, and latterly sent to a con- vent in La Pérouse with the special purpose of obtaining a knowledge of the sciences. He does not appear, however, to have joined the order of St Francis, but to have remained one of the secular clergy until his elevation in 1471 to be bishop of Carpentras, shortly after his uncle succeeded to the papal chair. In the same year he was promoted to be cardinal, taking the same title as that formerly held by his uncle, St Peter ad Vincula. With his uncle he obtained very great influence, and in addition to the archbishopric of Avignon he held no fewer than eight bishoprics. In the capacity of papal legate he was sent in 1480 to France, where he remained four years, and acquitted himself with such ability that he soon acquired a paramount influence in the college of cardinals, an influence which rather increased than diminished during the pontificate of Innocent VIII. A rivalry had, however, gradually grown up between him and Roderigo Borgia, and on the death of Innocent in 1492 Borgia by means of a secret agreement with Ascanio Sforza succeeded in being elected over Della Rovere by a large majority, under the name of Alexander VL Della Rovere at once determined to take refuge at Ostia, and in a few months afterwards went to Paris, where he incited Charles VIII. to undertake the conquest of Naples. Accompanying the young king on his campaign, he entered Rome along with him, and endeavoured to instigate the convocation of a council to inquire into the conduct of the pope with a view to his deposition, but Alexander, having gained a friend in Charles's minister Brigonnet, by the offer of a cardinal's hat succeeded in counterworking the machinations of his enemy. On the death of Alexander in 1503 Della Rovere supported the candidature of Cardinal Piccolomini of Milan, who was consecrated under the name of Pius III., but was then suffering from an incurable malady, of which he died in little more than a month afterwards. Della Rovere then succeeded by dexterous diplomacy in winning the support of Cxsar Borgia, and was elected to the papal dignity by the unanimous vote of the cardinals. From the

beginning Julius II. set himself with a courage and deter- mination rarely equalled to rid himself of the various powers under which his temporal authority was almost overwhelmed. By a series of complicated stratagems he first succeeded in rendering it impossible for Borgia to remain in the papal states. He then used his influence to reconcile the two powerful houses of Orsini and Colonna, and, by decrees made in their interest, he also attached to himself the remainder of the nobility. Being thus secure in Rome and the surrounding country, he next set himself to oust the Venetians from Faenza, Rimini, and the other towns and fortresses of Italy which they occupied at the death of Alexander VI. Finding it impossible to succeed with the doge by remonstrance, he in 1504 brought about a union of the conflicting interests of France and Germany, and sacrificed temporarily to some extent the independence of Italy in order to conclude with them an offensive and defensive alliance against Venice. The combination was, however, at first little more than nominal, and was not immediately effective in compelling the Venetians to deliver up more than a few unimportant places in the Romagna ; but by a brilliant campaign Julius in 1506 succeeded in freeing Perugia and Bologna from their despots, and raised himself to such a height of influence as to render his friend- ship of prime importance both to the king of France and the emperor. Events also in other respects so favoured his plans that in 1508 he was able to conclude with Louis XIL., the emperor Maximilian, and Ferdinand of Aragon the famous league of Cambrai against the Venetian republic. In the spring of the following year the republic was placed

under an interdict. The results of the league soon out- stripped the primary intention of Julius. By the single battle of Agnadello the dominion of Venice in Italy was practically lost; but, as neither the king of France nor the emperor was satisfied with merely effecting the purposes of the pope, the latter found it necessary to enter into a com- bination with the Venetians to defend himself from those who immediately before had been his allies against them. The Venetians on making humble submission were absolved in the beginning of 1510, and

shortly afterwards France was placed under the papal ban. Attempts to bring about a rupture between France and England proved unsuccessful ; on the other hand, at a synod convened by Louis at Tours in September 1510 the French bishops withdrew from the papal obedience, and resolved, with Maximilian's co opera- tion, to seek the deposition of Julius. In November 1511 a council actually met for this object at Pisa. Julius here- upon entered into the Holy League with Ferdinand of Aragon and the Venetians against France, in which both Henry VIII. and the emperor ultimately joined. He also convened a general council (that afterwards known as the Fifth Lateran) to be held at Rome in 1512, which, accord- ing to an oath taken on his election, he had bound himself to summon, but which had been delayed, he affirmed, on account of the occupation of Italy by his enemies. In 1512 the Freuch were driven across the Alps, bat it was at the cost of the occupation of Italy by the other powers, and Julius, thoughhe had securely established the papal authority in the states immediately around Rome, was practically as far as ever from realizing his dream of an independent [talian kingdom when he died of fever iu February 1513.

The abilities and ambition of Julius were regal and military rather than in any sense ecclesiastical. He was more concerned for his own personal fame as a member of the family of Della Rovere than for the advancement of the influence and authority of the church. His dauntless spirit, his mastery of political stratagem, and his moral indifference in the choice of means rendered him the most prominent political figure of his time. While, however, his political and warlike achievements would alone entitle him to rank amongst the most remarkable of the occupants of the papal chair, his chief title to honour is to be found in his patron- age of art and literature. He did much to improve and beautify the city; in 1506 he laid the foundation stone of St Peter's; and he was the friend and patron of Bra- mante, Raphael, and Michelangelo. He was succeeded by Leo X. ;

See Dumesnil, Histotre de Jules IL, Paris, 1873; Broseh, Papst Julius If, Gotha, 1878.

JULIUS IIL, pope from 1550 to 1555, was born at Rome in 1487. He was of good family, his original name being Gian Maria del Monte. After attaining the dignity of archbishop of Siponto, he was in 1536 created cardinal by Paul JII., by whom he was employed on several important legations ; he was one of the presidents of the council of Trent during its session at Bologna in April 1547. In 1550 he was unanimously chosen successor of Paul III. He consented, at the request of the emperor Charles V., to the reopening of the council of Trent (in 1551), and he also entered into a league with him against the duke of Parma and Henry II. of France; but soon afterwards he deemed it advisable to make terms with his enemies, and in 1552 he again suspended the meetings of the council. From this time pope Julius seems to have lost interest both in political and ecclesiastical affairs ; formerly he had acquired a reputation for impetuous energy as well as austerity, but he now exchanged these qualities for a love of luxurious ease, comporting him- self at the entertainments given by him in his palace

in a manner fitted to shock preconceived ideas of eccle. siastical propriety. He also aroused much scandal by creating as his first cardinala youth of sixteen years of age, one of his pages, on account of the courage he had displayed when bitten by a monkey. The adornment of his palace and the laying out of its grounds occupied a large share of his attention, and have done more to make him remembered than his strictly pontifical procedure, Julius was a frieud of the Jesuits, to whom he granted a fresh confirmation in 1550. He was succeeded by Mar- cellus IT.

JULY, the seventh month in our present calendar, con- sists of thirty-one days. It was originally the fifth month of the year, and as such was called by the Romans Quine- telzs, The later name of Julius was given in honour of Julius Caesar (who was born in the month), and came into use in the year of his death. Our Anglo-Saxon ancestors called July Jfad-méndd, “ mead month,” from the meadows being then in their bloom; and Gftera Lida, “the latter mild month,” in contradistinction

to June, which they named “the former mild month.” The principal days now observed and noted in this month are the following :— July 3d, Dog Days begin; July 15th, St Swithin; and July 25th, St James.

JUMET, or JuMETz, a town and commune of Belgium, in the arrondissement of Charleroi and the province of Hainault, is situated about 4 miles north-east of Charleroi. Its manufactures include glass-bottles, knives, nails, and hats; and there are extensive coal-mines in the neighbourhood. The population of the commune in 1876 was 20,102.

JUMIEGES, or Juminazs, a village of France, in the department of Seine Inférieure and arrondissement of Rouen, about 16 miles south-west of Rouen, in one of the peninsulas formed by the winding of the Seine. The population was less than 2000 in 1876; but the place is famous for the imposing ruins of the abbey of Jumiéges (Latinized as Gemeticum, Gemedium, Gimegizx, Jumedica, &e.), one of the great establishments of the Benedictine order. The principal remains are those of the Church of the Virgin, which had a central tower, the magnitude of which may be judged by one of the sustaining arches still extant. Among the minor relics are the stone which once covered the grave of Agnes Sorel, and two recumbent statues of the 13th century, popularly known as the Hnervés, and explained by a baseless legend which makes them represent two sons of Clovis IL, who were punished for revolt against their father by having the tendons of their arms and legs cut through, and being set adrift in a boat on the Seine.

The foundation of the abbey of Jumiéges is generally assigned to St Philbert, 664 A.D., whose name is still to be read on gold and silver coins obtained from the site. It was to Jumieges that abbot Sturm of Fulda was relegated (760-62), and thither it was that Charlemagne sent Thassilo, the captive duke of Bavaria, and his son Theodo, The 9th century was a period of pillage and disaster for the abbcy, but the 11th and 12th centuries saw it raised to new splendour and greatness. One of its monks, Robert Champart, became, under Edward the Confessor, bishop of London and arch- bishop of Canterbury. Returning to die in his abbey (1052), he brought with him an Anglo-Saxon missal and

pontifical, which are still preserved in the public library of Rouen. For further details see Mabillon, Acta Sanct. ord. S. Benedicti, tom. ii. ; W. Calcul (a monk of Jumidges), Hist. Norm., apud Duchesne; Deshayes, Hist. de Vabbaye royale de Jumiéeges, Rouen, 1829 ; Langlois, Hssat sur les Enervés de Jumiéges, Rouen, 1888 ; Cochet, La Seine In-Jérteure, Paris, 1864. ;

JUMILLA, a town of Spain, in the province of Murcia, is situated 37 miles north-north-west of Murcia, at the foot of a hill whose summit is crowned bya citadel. The streets are regular, clean, and well-paved, and there are three squares. Jumilla possesses two parish churches of some architectural merit, the church of Santiago in the Corinthian

style being adorned with paintings of Rubens and other artists of fame, and with some beautiful frescoes. There is also a Franciscan convent and a hospital. The town is chiefly dependent on agriculture, but has corn and oil mills, brick-kilns, and manufactories of salt, coarse cloth, soap, and firearms. The population in 1877 was

13,886.

JUMNA, or Jamund, one of the large rivers of northern India, rises in the Himélayas in Garhwal state, about 5 miles north of Jamnotri hot springs, in 31° 3’ N. lat. and 78° 30’ E. long. The stream first flows south for 7 miles, then south-west for 32 miles, and afterwards due south for 96 miles, receiving several small tributaries in its course. It afterwards turns sharply to the west for 14 miles, when it is joined by the large river Tons from the north. The Jumna here emerges from the Himalayas into the valley of the Dun, and flows in a south-westerly direction for 22 miles, dividing the Kiarda Dun on the west from the Dehra Dun on the east. It then, in the 95th mile of its course, forces its way through the Siw4lik hills, and debouches upon the plains of India at Faizibad in Saharanpur district. By this time a large river, it gives off, near Faizibad, both the eastern and western Jumna canals, From Faizabid the river flows for 65 miles in a south-south-west direction, receiving the Maskarra stream from the east. Near Bidhauli, in

Muzaffarnagar district, it turns due south for 80 miles to Delhi city; thence south-east for 27 miles to near Dankaur, receiving the waters of the Katha-nadi and Hindan river on the east, and of the Sabi-nadi on the east. From Dankaur it resumes its southerly course for 100 miles to Mahdban near Muttra, where it turns eastwards for nearly 200 miles, passing the towns of Agra, Firozdbad, and Etdwah, receiving on its left bank the Karwan-nadi, and on its right the Utanghan. From Etdéwah it flows 140 miles south-east to Hamirpur, being joined by the Sengon on its north bank, and on the south by the great river Chambal from the west, and by the Sind. From Hamirpur, the Jumna flows nearly due east, until it enters Allahabad district and passes Allahdbad city, 3 miles below which it falls into the Ganges in 25° 25' N. lat. and 81° 55' E. long, In this last part of its course it receives the waters of the Betwa and the Ken,

The Jumna, after issuing from tlie hills, has a longer course through the North-Western Provinees than the Ganges, but it is not so large nor so important a river; and above Agra in the hot weather it dwindles to a small stream. 'This is no doubt partly caused by the eastern and western Jumna cauals,—of which the former was excavated in 1823-30, and in its course of 130 miles irrigated, in 1875-76, 195,846 acres of the districts of Saharanpur, Muzaffarnagar, and Meerut, in the North-Western Pro- vinces ; while the latter, consisting of the reopened channels of two canals dating from about 1350 and 1628 respectively, extends for 405 miles through the districts of Ambala, Karntl, Delhi, and Rohtak in the Punjab, irrigating (1872-73) 351,820 acres.

_ The trade on the Jumna is not now very considerable ; in its upper portion timber, and in the lower stone, grain, and cotton are the chief articles of commerce, carried in the clumsy barges which navigate its stream. Its waters are clear and blue, while those of the Ganges are yellow and muddy; the difference between the streams ean be discerned for some distance below the point at which they unite. Its banks are high and rugged, often attain- ing the proportions of cliffs, and the ravines which run into it are deeper and larger than those of the Ganges. It traverses the extreme edge of the alluvial plain of Hindustan, and in the latter part of its course it almost touches the

Bundelkhand offshoots of the Vindhy4 range of mountains. Its passage is therefore more tortuous, and

the scenery along its banks is more varied and pleasing, than is the case with the Ganges.

The Jumna at its source near Jamnotri is 10,849 feet above the sea-level; at Kotnur, 16 miles lower, it is only 5036 feet; so that, between these two places, it falls at the rate of 314 feet in a mile. At its junction with the Tons it is 1686 feet above the sea; at its junction with the Asan, 1470 feet; and at the point where it issues from the Siwalik hills into the plains, it is 1276 feet. The catch- ment area of the river is 118,000 square miles; its flood discharge at Allahdbad is estimated at 1,333,000 cubic feet per second. The Jumna is crossed by railway bridges at Delhi, Agra, and Allahéb4d, while bridges of boats are stationed at Etawah, Kalpi, Hamirpur, Muttra, Chillatara, and many other places.

JUNAGARH, a native state in Kathidwar, in the pro- vince of Guzerat, Bombay presidency, India, is situated between 20° 48’ and 21° 40’ N. lat., and between 69° 53’ and 71° 35’ E. long. The state, which comprises an estimated area of 3800 square miles, consists of a level plain, with the exception of the Girnar group of hills, sacred to Jainism, the highest peak of which rises to about 3500 feet above sea-level. The coast-line is well supplied with fair-weather harbours, of which the chief are Verawal, Nawabandar, and Sutrapora. The ruined but famous temple of Somnath is situated in the state. The estimated population in 1872 was 380,921, residing in eight hundred and ninety villages. The principal agricultural products are cotton (largely exported to Bombay for re-export), wheat, pulses and millets, oilseeds, and sugar-cane. The manufactures are oil and coarse cotton cloth. The esti- mated revenue is £200,000. Jundgarh town, the fortified capital of the state, situated in 21° 31’ N. lat., 70° 36’ 30” E. long., has an estimated population of 20,025.

Prior to 1746 Junagarh was a Rajput state ruled by chiefs of the Churasuma tribe, but in that year it was conquered by Sultan

Muhammad Begara of Ahmadabad. In Akbar's reign it be- came a dependency of the court of Delhi, under the immediate authority of the Mughal viceroy of Guzerat. About 1735, when the representative of the Mughals had lost his authority in Guzerat, Sher Khan Babi, a soldier of fortune under the viceroy, expelled the Mughal governor and established his own rule. Sher Khan's son, Salabat Khan, appointed his heir chief of Junagarh, assigning to his younger sons the lands of Bantwa. Though himn- self tributary to the gaekwar of Baroda and the British Govern- ment, the nawab of Junagarh receives yearly contributions, called zortalabi, from a large number of the petty chiefs in Kathiawar. This levy, which is collected and paid to the nawab by British officers of the Kathidwar agency, isa relic of the days of Mahometan supremacy. Jundgarh ranks as a first class state among the many chiefships of Kathiaw4r, and itsruler first entered into engagements with the British in 1807.

JUNE, the sixth month in our present calendar, consists of thirty days. Ovid, in his Fasté (vi. 25), makes Juno assert that the name was expressly given in her honour :—

" Ne tamen ignores vulgique errore traharis, Junius a nostro nomine nomen habet." In another part of the Fasti (vi. 87) he gives the derivation a junioribus, as May had been derived from Majores. Others connect the term with the gentile name Junius, or with the consulate of Junius Brutus. Pro- bably, however, it has an agricultural reference, and origin- ally denoted the month in which crops grow to ripeness. In the old Latin calendar June was the fourth month, and in the so-called year of Romulus it is said to have had thirty days; but at the time of the Julian reform of the ealendar its days were only twenty-nine. To these Cesar added the thirtieth, which it still retains. The Anglo-Saxons had several names for the month of June. They called it "the dry month," "midsummer month," and, in contradistinction to July, "the earlier mild month." The summer solstice occurs in June. The principal days now observed in this month are the following :—

June 11th, St Barnabas; June 24th, Midsummer Day (Nativity of St John the Baptist); and June 29th, St Peter.

JUNG, Jonann Hetnricu (1740-1817), best known by his assumed name of HrernricH STILLING, charcoal-burner, tailor, village schoolmaster, oculist, professor of political science, and mystic, was born in the village of Grund in the duchy of Nassau on the 12th September 1740. His father, Wilhelm Jung, schoolmaster and tailor, was the son of Eberhard Jung, charcoal-burner, and his mother was Dortchen or Dorothy Moritz, daughter of a poor clergyman. In the best of his books Stilling gives a charming descrip- tion of the patriarchal simplicity of his home, and draws the portrait of his grandfather especially with a loving and skilful hand. Stilling became, by his father's desire, school- master and tailor, but '"'to be always sitting at the needle and making clothes for people was highly repugnant to me," and "to be everlastingly instructing boys and girls in A B ©" was equally wearisome. Severe home discipline made Stilling glad to accept an appointment as school-master in a neighbouring village, where, however, he taught not with pleasure but from a sense of duty. He afterwards became tutor in the family of a merchant, and in 1768 went with "half a French dollar," as he himself tells us, to study medicine at the university of Strasburg. What he wanted in money he possessed in confidence in Divine aid ; and in after life he was wont to refute sceptical adversaries by recounting the many occasions on which his prayers were answered by providential messengers, for so he regarded them, who in the most unexpected way provided him with the money necessary not only for his studies but for his very existence. At Strasburg he met Goethe, who showed him much kindness, and introduced him to Herder. The acquaintance with Goethe ripened into friendship; and it was by his influence that Stilling's first and best work, Zhe Account of his Youth, was in 1777 given to the world. In 1772 he settled at Elberfeld as physician and oculist, and soon became celebrated for operations in cases of cataract. Surgery, however, was not much more to his taste than tailoring or teaching; and in 1778 he was glad to accept the appointment of lecturer on "agriculture, technology, commerce, and the veterinary art" (!) in the newly established academy at Kaiserslautern, In 1784 the academy was transferred to Heidelberg and

united with the university. In 1786, on the occasion of the anniversary of the fourth centenary of Heidelberg univer- sity, Stilling created immense enthusiasm by delivering his speech, the last of the day, in German, The other professors had used Latin. In 1787 Stilling was appointed professor of economical, financial, and statistical science in the university of Marburg. In 1803 he resigned his pro- fessorship and returned to Heidelberg, where he remained with no official appointment until 1806. In that year he received a pension from the grand-duke Charles Frederick of Baden, and removed to Carlsruhe, where he remained until his death on the 2d April 1817. He was married

three times, and left a numerous family. Of his engage- |

ment to his first wife he tells a most amusing story in his autobiography. Of his works this autobiography Heinrich Stillings Leben, from which he came to be known as Stilling, is the only one now of any interest, and, with the supple- ment by his son-in-law Dr Schwarz, is the chief authority for his life. A believer in dreams and apparitions, he was superstitious rather than mystical. His piety was fervent, but not austere; and his chief delight was in seeing others happy. Modest and affable, he endeared himself to all who came in contact with him. He hated nothing except sects, which, he says, are due merely to pride under the mask of piety. He numbered among his many friends Goethe and Kant and Lavater, the first of whom pays

him high tribute in the second part of Aus meinem Leben. |

A complete edition of his numerous works, in 14 vols. 8yvo, was published at Stuttgart in 1835-38. There are English translations by Sam. Jackson of the Leben, London, 1835, and of the Theorie der Geisterkunde, London, 1834, and New York, 1851; and of Theobald or the Fanatic, a religious romance, by the Rey. Sam. Schaeffer, Philadelphia, 1846.

JUNIPER. The junipers, of which there are about twenty-five species, are evergreen bushy shrubs or low columnar trees, with a more or less aromatic odour, inhabit- ing the whole of the cold and temperate northern hemi- sphere, but attaining their maximum development in the temperate zone in North America and Europe. The leaves are usually articulated at the base, spreading, sharp-pointed, and needle-like in form, destitute of oil-glands, and arranged in alternating whorls of three; but in some the leaves are minute and scale-like, closely adhering to the branclies, the apex only free, and furnished with an oil-gland on the back. Sometimes the same plant produces both kinds of leaves on different branches, or the young plants produce acicular leaves, while those of the older plants are squamiform. The male and female flowers are usually produced on separate plants ; the occurrence of both on the same plant is rare. 'Che male flowers are developed at the ends of short lateral branches, are rounded or oblong in form, and consist of several antheriferous scales in two or three rows, each scale bearing three or six almost splierical pollen-sacks on its under side. The female flower is a small bud-like cone situated at the apex of a small branch, and consists of two or three whorls of two or three scales. The scales of the upper or middle series each produce one lateral ovule. The mature cone is fleshy, with the succulent scales fused together and forming the fruit-like structure known to the older botanists as the galbulus, or berry of the juniper. The berries are red or purple in colour, varying in size from that of a pea to a nut. They differ considerably from the cones of other members of the order Coniferz, to which the junipers belong. The seeds are usually three in number, sometimes fewer (1), rarely more (8), and have the surface near the middle or base marked with large glands containing oil, The genus occurs in a fossil state, four species having been described from rocks of Tertiary age.

Bentham and Hooker divide the genus into three sec- tions, viz, Sabina, Oxycedrus, and Caryocedrus, Juniperus Sabina is the savin, an irregularly spreading much-branched shrub with scale-like glandular leaves, and emitting a disagreeable odour when bruised. The flesh and dried tops of savin are official in the British and United States pharmacopeias. The plant is poisonous, acting as 4 powerful local and

general stimulant, diaphoretic, emmen- agogue and anthelmintic; it is employed both internally and externally. Juniperus bermudiana, a tree about 40 or 50 feet in height, yields a fragrant red wood, which was used for the manufacture of "cedar" pencils. The tree is now very scarce in Bermuda, and the "red cedar," Juniperus virginiana, of North America is employed instead for pencils and cigar boxes. The red cedar 1s abundant in some parts of the United States, and in Virginia is a tree 50 feet in height. It is very widely dis- tributed from the great lakes to Florida and round the Gulf of Mexico, and extends as far west as the Rocky Mountains The wood is applied to many uses in the United States. The fine red fragrant heart-wood takes high polish, and is much used in cabinet work and inlay- ing, but the small size of the planks prevents its more extended use. The tops of the young branches are official in the United States pharmacopeia. The galls produced at the ends of the branches have also been used in mediciue, and the wood yields cedar-camphor and oil of cedar wood.

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The Juniperus thurifera is the incense juniper of Spain and Portugal, and J. phenicea (J. lycia) from the Medi- terranean district is stated by Loudon to be burned as incense.

Juniperus communis, the common juniper, and several other species, belong to the section Oxycedrus. The common juniper is a very widely distributed plant, occur- ring in the whole of northern Europe, central aud northern Asia to Kamchatka, and North America. It grows at considerable elevations in southern Europe, in the Alps, Apennines, Pyrenees, and Sierra Nevada (4000 to 9000 feet). It also grows in Asia Minor, Persia, and at great elevations on the Himalayas. In former times the juniper seems to have been a very well known plant, the name occurring almost unaltered in many languages. The dialectical names, chiefly in European languages, have been collected by Prince L. L. Bonaparte, and published in The Academy (July 17, 1880, No. 428, p. 45). The common juniper is official in the British pharmacopeia and in that of the United States, yielding the oil of juniper, a powerful diuretic, distilled from the unripe fruits. The wood is very aromatic, and is used

for ornamental purposes. In Lapland the bark is made into ropes. The fruits are used for flavouring gin (a name derived from junzper, through the French geniévre) ; and in some parts of France a kind of beer called Genévrette was made from them by the peasants. Juniperus Oxycedrus, from the Mediter- ranean district and Madeira, yields cedar oil which is official in most of the European pharmacopceias, but not in that of Britain.

The third section, Caryocedrus, consists of a single species, Juniperus drupacea of Asia Minor. The fruits are large and edible; they are known in the East by the name [Habhel.

JUNIUS. This is the signature of an unknown writer who, after exciting and baffling the curiosity of three or four generations of critics, has been allowed to take rank amongst English classics under a pseudonym. 'The first of the published letters with this signature was dated January 21, 1769; the last, January 21,1772. The eutire series appeared in the Public Advertiser, a popular newspaper edited by Woodfall, to whom a number of private letters were also addressed by the same writer. These are in- cluded in the collected and complete editions, as well as a number of letters attributed on varying grounds, more or less satisfactory, to Junius.

The first of the letters was a sweeping attack on the Government for the time being. Its spirit may be judged from the concluding sentence: "They (posterity) will not believe it possible that their ancestors could have survived or recovered from so desperate a condition while a duke of Grafton was prime minister, a Lord North chancellor of the exchequer, a Weymouth and a Hillsborough secretaries of state, a Granby commander-in-chief, and a Mansfield chief criminal judge of the kingdom." He does not con- descend to particulars, and the letter might have passed unnoticed if Sir William Draper, a man of considerable note, had not undertaken the defence of Lord Granby in answer to it. A bitter controversy ensued, which rapidly degenerated into an exchange of personalities, much to the disadvantage of Sir William. Then came letters to the duke of Grafton, the prime minister, directed more against his private character and conduct than his

policy, the main charge against his Grace being his abandonment of Wilkes, whom Junius treats throughout the letters as the champion of the constitution, to be supported against the Ministry and the crown. He takes Blackstone, the author of the Commentaries, severely to task for justifying the expulsion of Wilkes, whose cause he also espouses in an altercation with Horne Tooke ; and he omits no opportunity

T79 of denouncing Luttrell, the elect of Middlesex. The address to the king, the most celebrated of Junius's composi- tious, after recapitulating the familiar charges of personal pique and favouritism, calls upon his Majesty to summon his whole council without consulting his minister: " Lay aside the wretched formality of a king, and speak to your subjects with the spirit of a man and in the language of a gentleman. 'Tell them you have been fatally deceived." Many of the letters turn on topics which have no longer the slightest interest. A long letter is addressed to Lord Mansfield for bailing a man named Fyre. In another, equally elaborate, this learned lord is accused of tampering with the common law by an admixture of the civil law, which is now regarded as his highest praise ; Junius treats it as an attempt to undermine the liberties of England. He relies little on argument or proof. His force is in his style. He commonly assumes his victim to be what he wislies him to be thought, and produces the desired effect by irony, sarcasm, or polished invective. One of his happiest figures of speech is in the letter on the affair of the Falkland Islands: "Private credit is wealth ; public honour is security ; the feather that adorns the royal bird supports his flight; strip him of his plumage, and you fix him to the earth." Although an admirer of Lord Cliatham, Junius agreed with Mr Grenville as to the right of England to tax the colonies ; and, although an uncompromising sup- porter of popular rights, he was an advocate or apologist for rotten boroughs.

The sensation Junius created in the political world may be inferred from the manner in which the leading orators and statesmen of the day spoke of him. ' How comes this Junius," exclaimed Burke, addressing the Speaker, "to have broke through the cobwebs of the law, and to range uncontrolled, unpunished, through the land? The myr- midons of the court have been long, and are still, pursuing him in vain. They will

not spend their time upon me or you. No, sir, they disdain such vermin when the mighty boar of the forest who has broke through all their toils is before them. But what will all their efforts avail? No sooner has he wounded one than he lays down another dead at his feet. For my part, when I read his attack upon the king, I own my blood ran cold." . ... " Nor has he dreaded the terrors of your brow, but he has attacked even you—he has—and I believe you have no reason to triumph in the encounter. In short, after carrying away our royal eagle in his pounces and dashing him against a rock, he has laid you prostrate. King, lords, and commons are but the sport of his fury. Were he a member of this House, what might not be expected from his knowledge, his firmness, and integrity? He would be easily known by his contempt of all danger, by his pointed penetration and activity." Lord North spoke in the same strain: "Why should we wonder that the great boar of the wood, this mighty Junius, has broke through the toils and foiled the hunters ? Though there may be at present no spear that will reach him, yet he may be some time or other caught."

What added signally to his influence was the general belief of his contemporaries that he was a man of rank and position, familiar with what was passing behind the scenes in high places; and this belief arose not simply from the intimate knowledge he showed of things and persons about the court and the principal departments of the state, but from the lofty and independent tone that was habitual and seemed natural to him,—as when he tells Sir William Draper, "I should have hoped that even my name might carry some authority with it if I had not seen how very little weight or consideration a printed paper receives even from the respectable signature of Sir William Draper"; or when in private letters to the publisher, after waiving all right to the profits of the publication, he says: "As for

myself, be assured that Iam far above all pecuniary views." ... "You, I think, sir, may be satisfied that my rank and fortune place me above a common bribe."

In the preface to the second volume of Bohn's edition of 1855, no less than thirty-seven persons are enumerated to whom the authorship has been attributed. Contem- porary opinion strongly inclined to Burke, whose power of assuming or disguising style is proved by his Vendzca- tion of Natural Society; and, as his biographer Prior pointedly remarks, "contemporary opinion, as formed from a variety of minor circumstances which do not come within the knowledge of future inquirers, is perhaps, on such occasions, the truest." Dr Johnson, who had entered the lists against Junius, told Boswell: "'I should have believed Burke to be Junius, because I know no man but Burke who is capable of writing these letters ; but Burke spontaneously denied it to me." Burke told Reynolds that he knew Junius, and uniformly spoke of him as he would hardly have spoken of himself. A very strong case was made out for Lord George Sackville, on whom, after Burke's denial, Sir William Draper's suspicions permanently fixed. Fox used to say that, although he would not take Single- speech Hamilton against the field, he would back him against any single horse. Boyd is another candidate who did not lack supporters. A plausible claim was advanced for the American General Lee, backed by three experts who pre- tended to detect him by the handwriting. A famous expert, Imbert, gave a written certificate on the same ground in favour of Horne Tooke; and another, Nether- clift, declared that there was more of the Junius character in the handwriting of Mrs Dayrolles (the alleged amanuensis of Lord Chesterfield) than in any other specimen submitted to him asa possible performance by the great unknown. Other experts declared confidently for other claimants. But the identity remained an open question, and case after case was pronounced not proven, till the appearance of Mr Taylor's Junius Identified in 1816, when Sir Philip Francis immediately became tle favourite, and during the next half century the problem was pretty generally considered at an end.

Prior to the publication, Mr Taylor called on Sir Philip to intimate what was intended, and came away with the impression that he was rather pleased than displeased with the intimation. In fact, he had been already playing Junius, and he continued playing the part till his death in 1818. "His first gift," writes his second wife, whom he married in

1814, two years before Junius [dentefied, ‘was an edition of Junius, which he bade me take to my room and not let it be seen or speak upon the subject; and his posthumous present, which his son found in his bureau, was Junius Identified, sealed up and directed to me.” The real Junius might have bequeathed a much more conclusive legacy. He writes to Woodfall, December 17, 1771: ‘When the book is finished, let me have a sett (szc) bound in vellum, gilt, and lettered ‘Junius I. IL’ as handsomely as you can. The edges gilt, let the sheets be well dried before binding, I must also have two setts in blue paper covers. This is all the fee I shall ever require of you.” These were duly sent, and it would have been something to the purpose had Francis bequeathed one of them to his wife. Neither of them has turned up. The surviving son (by the first wife) likewise claimed the authorship for the father as a source of pride to the family, so that no evidence in their possession would have been kept back.

Pitt told Lord Aberdeen (the fourth earl) that he knew who Junius was, and that it was not Francis. On its being objected that the Franciscan theory had not been started till after Pitt’s death, Lord Aberdeen replied “ that’s stuff,” and proceeded to relate that he himself had once dined in

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company with Francis when proofs of his being Junius were adduced before him, that he had listened with evident pleasure, and at last exclaimed in a stilted theatri- cal manner, “God! if men force laurels on my head, I’ll wear them.” His immediate contemporaries remained unconvinced, Sir Fortunatus Dwarris states broadly that no one who knew, heard, or read Francis thought him capable of producing Junius. Lord Broughton confirmed this. Tierney said: “I> know no better reason for believing the fellow to be Junius than that he was always confoundedly proud of something, and no one could ever guess what it could be.”

Lord Stanhope, however, would admit no shadow of doubt upon the point, and Lord Macaulay declared that all reasoning from ecireumstantia] evidence was at an end unless Francis were admitted to

be Junius. Both these eminent authorities agree in resting their case on similarity of handwriting, on the internal evidence of style, and on five points which are summarily stated by Lord Macaulay in his essay on Warren Hastings. As regards similarity of handwriting, there is one plain test on which experts are agreed, namely, that 'it is impossible for a man, in order to disguise his writing, to write better than he does habitu- ally"; and the best penmanship of Junius is incompar- ably superior in fineness, delicacy, and grace to the best of Francis, who wrote a large, coarse, clerk-like hand. As regards style, the specimens culled from Francis's speeches and writings prove no more than that he, an assiduous imitator of Junius, succeeded occasionally in catching the mannerism, without any one of the distinctive merits, of his model. Lord Macaulay, not denying the inferiority, endeavours to weaken the argument drawn from it by re- marking that it may be urged with at least equal force against every claimant that has ever been mentioned, with the single exception of Burke. 'And what conclusion," he asks, "after all, can be drawn from mere inferiority? Every writer must produce his best work ; and the interval between his best and his second best work may be very wide indeed." This undeniable truth might have been urged with equal force by any pretender to a disputed authorship,—for example, by Theophilus Swift, the dean's cousin, when he claimed the authorship of the Zale of a Tub. Surely the strongest argument in favour of any given candidate is that (tested by his known writings) he alone was equal to the authorship, and the strongest argument against any given candidate that (tested in the same manner) he was unequal to it. Francis put forth his full powers in his controversy with Hastings, and his friend D'Oyly writes to him in 1778 that the public who had followed the controversy allowed both to be good writers ; "but, in their opinion, he (Hastings) takes the lead so decidedly as to admit of no comparison." '

The five points (which have been logically resolved into three) remained untouched till the publication of the memoirs of Sir Philip Francis by Parkes and Merivale in 1867. This book entirely changed the aspect of the con- troversy by showing that Francis's position, opinions, interests, manner of life, and tone during the Junian period were the reverse of what those of Junius might be supposed to have

been. During the whole of that period he was first clerk in the war office under Lord Barrington. Born in Dublin, October 22, 1740, he was in his thirtieth year when the famous letters commenced. He was the son of Dr Francis, the translator of Horace, but had married under his station, and was associating principally with his wife's relatives and connexions. 'The habits of his set may be collected from his letters, e.g.: ' January 4, 1769 : [am just returned from spending a riotous fortnight at Bath. Gravier and two others filled a post-coach, which was dragged with no small velocity by four horses. We

travelled like gentlemen, and lived like rakes." February 12, 1771: "Tilman dined with me yesterday, and swallowed a moiety of two bottles of claret."..... "We lead a jolly kind of life. This night to a concert, on Thursday to a ridotto, on Saturday the opera, and on Tuesday following a grand private ball at the London Tavern." July 26,1771: "To-morrow Godfrey, Tilman, another gent, and I set out upon a tour through Derby- shire, and propose to reach Manchester." They did not return till August 13, the day on which Junius's reply to

Horne Tooke appeared. On June 25, 1771, in the very

thick of the Junian correspondence, Francis writes to a friend abroad: "For the next three years I am likely

enough to remain in my present state of uninteresting

indolence." . There is no trace at this time of any connexion with the

newspapers, nor of any earnest or sustained literary occu-

pation. The only political personage we find him in com- munication with was Calcraft, to whom he occasionally supplied scraps of official news. By a startling coinci- dence, all the persons who had been kind or useful to him in promoting his advancement, including Wood (to whom he owed his clerkship), his chief (Lord Barrington), and Calcraft, were bitterly assailed by Junius. The predilec- tions of the pair, the substance

and the shadow, are as hard to reconcile as their antipathies, Junius had a high respect for Wilkes's judgment, and avows a liking for both the cause and the man. On November 8, 1771, he writes to Woodfall: "Show the dedication and preface of the letters to Mr Wilkes, and, if he has any material objec- tion, let me know." Francis, in his private correspondence, uniformly expresses the most unmitigated contempt for Wilkes. He writes like one of the general public about Junius. Thus on June 12, 1770, to his brother-in-law: "Junius is not known, and that circumstance is perhaps as curious as any of his writings. I have always suspected Burke; but, whoever he is, it is impossible he can ever dis- cover himself." Sir William Draper, Junius's first victim, was an old friend of the Francis family, and in a letter dated Bath, January 28, 1769, Dr Francis writes to Philip: "Give my love to Mr Calcraft. Tell him to expect a very spitited and exceeding honourable defence of L. G —y (Granby) against the virulent Junius, by our friend Sir W. D—r. [truly honour him for it." Again, February 11, 1769: "Poor Sir William! I am glad he is gone to Clifton, where he may eat his own heart in peace. When he repeated to me some passages of his letter, I bid him prepare his best philosophy for an answer. But who is this devil Junius, or rather legion of devils? Is it not B—rke's pen dipped in the gall of Sa—lle's heart? Poor Sir William !"

One of Lord Macaulay's five points is that Junius was "bound by some strong tie" to the first Lord Holland, the friend of Dr Francis and the early patron of Philip. Now, in a fragment of autobiography (included in the memoirs) it is stated that, long before the Junius letters, Dr Francis considered himself grossly ill used by Lord Holland, and 'was stung with the idea of having been so long the dupe of a scoundrel." 'In this," adds the son, 'T concurred with him heartily." Another poiut, and a most important one, is that Francis bitterly resented the appointment (over his head) of Mr Chamier to the place of deputy secretary- at-war, and that to the resentment thus aroused was owing the downright ferocity, the brutal abuse (as Mr Merivale calls it), with which Lord Barrington was assailed by Junius under the signature of Veteran. Laying out of the account the fact that Lord Barrington had been the object of Junius's unrelenting attacks for more than two years

before the appointment of Chamier, it is sufficient to refer to Francis's letter of January 24, 1772, to Major Baggs,

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in which he says: " You will have heard that Mr D'Oyly has resigned his employment (of deputy). He did it while I was at Bath. Immediately upon my return, my Lord Barrington was so good as to make me the offer with imany obliging and friendly expressions. I had, however, solid reasons for declining the offer, and Mr Anthony Chamier is appointed." He was obviously looking out for an Indian appointment, and left the war office in the March following, relying on Lord Barrington's aid in procuring one. After relating in the autobiography how he accident- ally heard that Cholwell, one of the intended commissioners for India, had declined the appointment, he proceeds: "It was the king's birthday, and Barrington was gone to court. I saw him the next morning; and, as soon as I had explained my views, he wrote the handsomest and strongest imaginable letter in my favour to Lord North. Other interests coutributed, but I owe my success to Lord Barrington." After his arrival in India, Francis was in the habit of writing long and confidential letters to Lord Barrington, who, in 1777, writes to express his gratification at the good understanding between Francis and Clavering. "T love you both so much that I cannot wish youto continue long in a situation so painful though so creditable to you." One of the first visits Francis paid on his return was to Lord Barrington at his country house. " It is the imputed folly," urge the opponents of the Franciscan theory, " not merely the imputed baseness of Francis that startles us. He is represented systematically writing against every friend, benefactor, and patron in succession, without a rational motive or an intelligible cause."

As if the embarrassments of his position were not enough, he must have gone out of his way to multiply them. 'he terms on which Junius stood with Sir William Draper are well known. Iu a letter dated February 14, 1770, he describes Sir John Burgoyne as "sitting down for the remainder of his life infamous and contented." On December 11, 1787, when Francis was attacked in the House of Commons for having

allowed himself to be included in the list of managers for the impeachment of Warren Hastings, his personal enemy, he rose and stated that the two persons whom he had consulted as the best judges of points of honour were Sir William Draper and Sir John Burgoyne. Draper was dead, but Burgoyne rose and handsomely responded to the appeal, which, if Francis was Junius, has been justly stigmatized as one of the strongest examples of gratuitous folly and brazen impudence on record.

That Earl Temple wrote or inspired Junius is a theory which has been maintained in two able essays, and it derives plausibility from Pitt's assertion that he knew who Junius was, as well as from the language of the Grenville family, which all points to Stowe as the seat of the mystery. The Right Hon. T. Grenville told the first duke of Buckingham, who thought he had discovered the secret, that it was no news to him, but for family reasons the secret must be kept. Ho also stated to other members of the family, subsequently to the publication of Junius Identified, that J unius was not either of the persons to whom the letters had been popularly ascribed. Lord Grenville told Lord Sidmouth that he (Lord G.) knew who Junius was. Lady Grenville told Sir Henry Holland and Dr James Ferguson that she had heard Lord Grenville state that he knew who Junius was, and that it was not Francis. The handwriting of Countess Temple (supposed to have acted as the amanuensis of her lord) comes far the nearest to the Junian hand of any that have been produced as similar to it, especially as regards powers of penmanship ; but evidence is altogether wanting that Earl Temple, or any one about him, possessed the required literary qualifications and capacity. The authorship of the letters, therefore, remains a mystery, and

Stat Nominis Umbra is still the befitting motto for the title- page.

See John Wade, Junius, including Letters by the same writer under other Signatures, &e., 2 vols., 1850 ; Parkes and Merivale, Afemozns of

Sir Philip Francis, K.C.B., with Correspondence and Journals, 2 vols., 1867 ; John Taylor, Junius Identified, 1816 ; A. Hayward, More about Junius, 1868; Charles Chabot, The Handwriting of Junius Professionally Investigated, with preface and collateral evidence by the Hon. E. Twisleton, 1871. (AR)

JUNIUS, Franciscus (1545-1602), in French Frangois du Jon, Huguenot divine and writer, was born of good family at Bourges, in France, May 1, 1545. He was a precocious child, and had studied law for two years under Donellus, when a place in the retinue of the French ambassador to Constantinople was procured for him in his fifteenth year. Before he reached Lyons, where he was to join the ambassador, the latter had departed; but Junius, scarcely disappointed, found ample consolation in the better opportunities for study to be found at Lyons. A religious tumult warned the young Huguenot back to Bourges, where the judicious piety of his father not only won him from certain atheistic principles that he had imbibed at Lyons, but also inspired him with the desire of entering the church. To that end he went to study at Geneva, where he was reduced to the direst straits of poverty by the failure of remittances from home, owing to civil war in France. His pride or independence allowed him to accept only the barest sustenance from a humble friend who had himself been a protégé of Junius's family at Bourges, and his health was permanently injured by the weakness to which he was reduced. The long-expected remittance from home was closely followed by the news of the brutal murder of his father at Issoudun; and Junius resolved to remain at Geneva, where his reputation for learning now enabled him to find support by teaching. In 1565, however, he was appointed minister of the Walloon congregation at Antwerp. His foreign birth excluded him from the privileges of the native Reformed pastors, and exposed him to the persecutions of Margaret of Parma, governess of the Netherlands. Several times he barely escaped arrest, and finally, after spending six months in preaching at Limburg, he was forced to retire to Heidel-berg in 1567. 'There he was welcomed by the elector Frederick, and temporarily settled in charge of a church at Schénau; but in 1568 his patron sent him as chaplain with the prince of Orange in his unfortunate expedition to the Netherlands. Junius escaped as soon as

he could from that post, and returning to his church remained there till 1573, From 1573 till 1578 he was at Heidelberg, assist- ing Tremellius in his Latin version of the Old Testament, which appeared at Frankfort in 1579 ; and after two and a half years distributed between Neustadt and Otterburg he was appointed to the chair of divinity at Heidelberg. Thence in a short time he was taken to France by the duke of Bouillon, and after an interview with Henry IV. was sent again to Germany on a mission. As he was returning to France, he was named professor of theology at Leyden. In that office, which he filled with success and popularity, he died October 13, 1602. Junins was a learned and pious man, and in that age of illiberal theo- logians was distinguished for his liberality. He was several times married; "quatuor uxores," he naively expresses himself in his autobiography, "duxi hactenus,"

He was a voluminous writer on theological subjects, and trans- lated and composed many exegetical works. He is best known from his own edition of the Latin Old Testament, slightly altered from the former joint edition, and with a version of the New Testament added (Geneva, 1590; Hanover, 1624), The Opera Theologica Francisct Junii Biturigis were published at Geneva, 2 vols., 1618, to which is prefixed his autobiography, written about 1592. The last had been published at Leyden, 1595, and is reprinted in the Miscellanea Groningana vol. i., along with a list of the author's other writings,

JUNIUS, Franciscus (1589-1677), son of the fore. going, was born at Heidelberg in 1589. Brought up at Leyden, his attention was diverted from military to theo- logical studies by the peace of 1609 between Spain and the Netherlands. In 1620 he went to England, where he became librarian to the earl of Arundel, and remained thirty years. He devoted himself to the study of Anglo- Saxon, and afterwards of the cognate old Teutonic lan- guages,—a branch of study in which he has high claims to honour, not only from his own valuable labours in a hitherto almost completely neglected field, but also from having directed the scholarly attention of others to it. In 1650 Junius returned to Holland, where he continued to study as zealously as ever. Jor two years he lived jin Friesland in order to study the peculiar old dialect. In

1675 he returned to England; in 1677 he went to live at Windsor with his nephew, Isaac Vossius, in whose house he died, November 19, 1677.

The uneventful life of Junius was eminently the life of a student; fourteen hours a day were spent at his desk ; and the results are seen in his books, and in the rich collection of ancient MSS., editcd and annotated by him, which he bequcathed to the univer- sity of Oxford. Junius published De Pictura Veterwm, 1687 (in English by the author, 1638; enlarged and improved edition, edited by Greevius, who prefixed a life of Junius, and with a catalogue of architects, painters, &c., and their works, Rotterdam, 1694) ; Odser- vationes tn Willeramt Abbatis Francicam Paraphwasin Cantici Canticorum, Amst., 1655; MSS. presented by Junius to Oxford; the most important are a version of the Ormulum, the version of Ceedmon, and 9 volumes containing Glos- sartum V. Linguarum Septentrionalium.

JUNO, one of the chief goddesses of the Roman state, was identified through the influence of Greek religion with the Hellenic goddess Hera. It is exceedingly unlikely that this identification is grounded on any real connexion between the two, as is the case with Zeus and Jupiter (see JUPITER); it was suggested solely by some superficial points of resemblance. There was a certain analogy in the relation which they respectively bore to the chief god; but it is probable that the marriage of Jupiter and Juno is not a native but a borrowed idea, In Latin and in modern literature the character of Juno is wholly that of the Greek Hera (see Hera). The opinion is general that Juno is not an Aryan goddess, but adopted from a non-Aryan race; if so, she must be Etruscan. One of the chief cults of Juno in Rome was that of Juno Regina on the Aventine. She had been brought thither by Camillus when Rome conquered the Etruscan city of Veii and adopted its patron goddess Juno. The Etruscan name is apparently Uni (see Deecke, Das Templum von Piacenza). Another great seat of the worship of Juno was Lanuvium. When that city was conquered, the cultus of Juno Sospita was carried to Rome and established on the Palatine hill. Had Juno been an Aryan goddess, we should certainly find a strong naturalistic element in her ; but in fact her sphere is almost entirely limited to human life and action. She must, therefore, have been adopted from

some civilized race, where the moral side of the divine conception had been developed, and the naturalistic element which originally belongs to all deities had lost prominence. At Veil, Lanuvium, and other places Juno was the protecting goddess of the state and of society, and in a similar way she had been worshipped at Rome from the earliest times under the epithets Curiatia and Populona.

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The great cultus of Juno at Rome was on the Capitol, where Tarquin had established her beside Jupiter to share with him the sovereignty of the state. Though she has nothing to correspond to the naturalistic side of Jupiter, she is readily associated with him in his moral character. She is the patroness and guardian of women, as he is of men. She watches over women from their birth onward. As Virginensis she protects maidenhood ; as Pronuba, Juga or Jugalis, Domiduca, Unxia, Cinxia, she ushers them through all the rites of marriage ; as Matrona she presides over their wedded life; as Lucina she helps them in child-birth, The Kalends were sacred to Juno, as the Ides belong to Jupiter ; and thus the two divide the month and the year between them. Geese were her favourite birds, and those which were kept in the Capitoline temple gave the garrison timely warning of the Gallic attack. The chief feast of Juno was the Matronalia, on the Kalends of March. Only maidens and wives of stainless character could participate in the procession which was made to the temple of Lucina on the Esquiline hill, On this the first day of the year, the women received presents from their husbands and relatives, and gave presents to theirslaves. The name Junones was also applied to the attendant spirits who belong to each woman, just as each man has his own genius. A woman swears by her Juno, a lover by the Juno of his mistress; hence the sarcasm of Juvenal, '" per Junonem domini jurante ministro." When Rome began to coin money in order to compete with the currency of the Greek states on the south coast, the mint was the temple of Juno Moneta; but this was probably due to Greek influence. The coinage was modelled on that of the cities of Magna Grecia, which it was designed to supplant; and these cities had their religious centre in the temple of Hera Lacinia

(see Curtius, “ Religious Character of Greek Coins,” Numism. Chron., 1870, p. 102).

JUNOT, Anpocue (1771-1813), Duc d’Abranteés, was born at Bussy-le-Grand, 23d October 1771. He went to school at Chatillon, and was known among his comrades as a blustering but loveable creature, with a pugnacious disposi- tion. He came under the special notice of Napoleon during the siege of Toulon, while serving as his secretary. It is related that as he was taking down a despatch, a shell bursting hard by and covering the paper with sand, he exclaimed “Bien! nous n’ avions pas de sable pour sécher Yencre! en voici!” He accompanied Napoleon to Italy in the capacity of aide-de-camp, and distinguished himself so much at the battle of Millesimo that he was selected to carry back the captnred colours to Paris. MReturning to Italy he went through the campaign with honour, but was badly wounded in the head at Lonato. From the effects of the wound he never completely recovered, and many rash incidents in his career may be directly traced to it. During the expedition to Egypt he acted as general of brigade, and went through fourtcen brilliant hours of fichting at Nazareth, putting 10,000 Turks to flight with 300 troopers. His devotion to Napoleon involved him ina duel with General Lanusse, in which he was again wounded. He had to be left in Egypt to recover, and in crossing to France was captured by English cruisers. On his return to France he was made commandant of Paris, and after- wards promoted general of division. He next served at Arras in command of the grenadiers of the army destined for the invasion of England, and made some alterations in the equipment of the troops which received the praise of the emperor. It was, however, a bitter mortification that he was not appointed a marshal of France when he received the cross of the legion of honour. He was sent to Lisbon instead, his entry into which city was something like a royal progress, though his vanity was disappointed by the Mission. He was so restless and dissatisfied in the

Portuguese capital that he set out, without leave, for the army of Napoleon, and at Austerlitz behaved with con- spicuous courage and

zeal. But he soon offended the emperor by his manner and his demands, and was sent to Parma to put down an insurrection and to be out of the way. In 1806 he was recalled and became governor of Paris. His extravagance and prodigality shocked the Government, and some rumours of an intrigue with Joséphine made it desirable again to send him away. He was, therefore, appointed to lead an invading force into Portugal. For the first time Junot had a great task to per- form, and only his own resources to fall back upon for its achievement. Early in November 1807 he set out from Salamanca, crossed the mountains of Beira, rallied his broken forces at Abrantés, and, with 1500 men, dashed upon Lisbon. The whole movement only took a month ; le was then invested with the governorship. Administra- tion was his weak point, aud in a short time, instead of consolidating the results of his victory, he had squandered them by a course of conduct like that of an Eastern monarch, After Wellesley encountered him at Vimiera he was obliged to withdraw from Portugal with all his forces. Napoleon disapproved, but sent him back to Spain, where, acting under Massena, he was once more setehy wounded. His last campaign was made in Russia, and he got more than a just share of the discredit which attached to it. Napoleon next appointed him to govern Illyria. On the 29th July 1813 he threw himself from a window at Montbard, in a fit of insanity.

JUNOT, Laure Permon (1784-1838), Duchesse d'Abrantts, was born at Montpellier, 6th November 1784. Her father was an army contractor, who allowed his wife to take his daughters to Paris in order that they might make good matches. They were lively, witty young ladies, and soon attracted to their hotel a mixed society of officers. Madame Junot declared that Napoleon wished to marry her niother; but there is no evidence for the truth of the story. But he gave Laure Permon 100,000 francs when she married Junot, and after the birth of her first child a house in the Champs-Elysées, with 100,000 francs to furnish it. Her husband had extravagant tastes; but she was extravagant to recklessness, contracting debts as rapidly as tradesmen would allow her to run them up. In 1805 she went with her husband to Lisbon, and, as she took it on her to represent 'female France," her train was more expensive than that of a queen. After she returned to Paris, she

renewed her extravagance, and, opening her drawing-room to the older families as well as to tlie new men of the empire, she fell under suspicion. With Junot she went through the Spanish campaign, and con- trived to give pleasant balls and to hold drawing-rooms all along the route. After her husband's death she was forbidden to return to Paris, bnt she ignored Napoleon's order, returned, opened her house again, aad attracted to it all the celebrities of the day. Her poverty compelled her to retire to L'Abbaye-aux-Bois when the empire ended ; but she devoted herself to literature with much zeal, She made social recollections from her own life her chief subject; her style was free and flowing ; and her articles, memoirs, and romances were widely read. She died at Paris, 7th June 1838.

JUPITER was the chief god of the Roman state. The great and constantly growing influence exerted from a very early period on Rome by the superior civilization of Greece not only caused a modification of the Roman god after the analogy of Zeus, the supreme deity of the Greeks, but led the Latin writers to identify the one with the other, and to attribute to Jupiter myths which were purely Greek and never belonged to actual Roman religion. The Jupiter of actual worship was a Roman god; the Jupiter of Latin

literature was more than half Greek. From the Latin this composite deity has passed into modern literature, and under the name of Jupiter is understood a god whose character is half Roman half Greek; while the legends, family history, and posterity attributed to him are wholly Greek. The identification was facilitated by the community of character which really belonged to Jupiter and Zeus as the Roman and Greek developments of the original Aryan conception of God; whereas the analogy between the non-Aryan Juno of Rome and the Aryan Hera of Greece was very slight. As we have in the two gods one original form differently developed by Roman and Greek genius, it is impossible to treat the one without frequent reference to the other; but it is equally necessary to treat them separately. The highest religious conceptions of each race are summed up in the characters of Jupiter and Zeus, and an

account of them must be in reality an outline of the growth of religious thought among Romans and Greeks.

Every influence which affected the growth of the Roman state affected also the religion; and along with the development of Rome out of many elements we have a development of the state god Jupiter out of the original Aryan deity. The state, beginning with a mixture of Latin and Sabine population, soon acquired also Etruscan colonists, who were for a time the ruling element in the state; and, although the dynasty was expelled, yet the Etruscan civilization exerted an immense influence on Roman religion. Jupiter, the Vedic dyaus pitar, invoked by the Greeks as Zed wérep, was the god both of Latins and Sabines. He was identified with the Etruscan Tina, and acquired something of his character. But another influence was felt at an early period. Greek civilization, spreading from Cum, revolutionized Etruscan art and modified Etruscan thought. The influence was strongly exerted in Rome also. Under such various influences grew the Roman religion, and it was completed as a national institu- tion when Tarquin, the same king that received into Rome the prophetic books of the Cumean Sibyl, enthroned Jupiter Optimus Maximus on the Capitoline hill as the guardian and protector of the fully formed Roman state. Many separate cults of Jupiter, originating from different sections of the mixed state, still continued, but were quite overshadowed by the great worship. Several of these worships puzzled the antiquarians of later Rome, and it became a question how far their objects were identical with or distinct from Jupiter. The ceremonial of these ancient cults, of Vejovis the Asylum-god on the Capitol, of Jupiter Stator on the Palatine, of Dius Fidius or Semo Sancus on the Aventine, of Consus the god of good counsel who ruled in the lower world in the Circus, and of many others, would throw much light on the beginnings of the Roman state ; but our information on the subject is very scanty. This being the case, we cannot assign to each influence its exact share in developing the Roman con- ception, though certain elements may be distinguished as more primitive than others. It is also impossible to distin- guish accurately the different cults of Jupiter.

The original naturalistic element, the Greeco-Italian god whose power is embodied in the phenomena and the cyclic changes of the heavens, never disappeared. Jupiter or Diespiter is under various epithets, Lucetius, Pluvius, &c., the god of clear and clouded sky, of light and darkness, of thunder and rain. By the proper ceremonies he can be drawn down in lightning to the earth, as Elicius and Indiges, to supply it with rain and springs. Every place which he strikes with the lightning is marked as his own, and is surrounded with a wall to keep off the profane from holy ground. As Averruncus and Depulsor, Jupiter protects men from the effects of the portents that he himself sends from heaven. Through such portents he also reveals

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his will to men, and proper interpretation of them wil] enable men to walk securely before heaven. There can be little doubt that this character as revealer of fate is almost wholly Etruscan, as all the rules of interpretation came from that people. A stone, the symbol of the thunderbolt, was the old symbol of the god, and never became wholly obsolete; hence the phrase per Jovem lapidem jurare, Among trees the oak, among birds the woodpecker, were originally sacred to him; but afterwards the eagle and other symbols were, under Greek influence, associated with Jupiter Capitolinus. The identity of many of these attributes with those of the Greek Zeus is obvious. Equally striking is the double character of god both among the dead and among the living which originally belonged to both gods, and was from different causes lost sight of in both cases. In Rome Etruscan influence changed the old views about the nature of the future world; and only some ceremonies, understood by neither priests nor people, preserved the original idea. In nothing was Etruscan influence more conspicuous at Rome than in the gloomy views of the future world that it introduced. 'The priest of Jupiter, flamen Dialis, might not touch a corpse; if his wife, the flaminica, died he lost his office. His life was complicated by a multitude of prohibitions: he must not touch a dog or a she-goat, nor see an army, nor take off his pointed cap, nor leave the city for a niglit,

and so on. Violation of any rule, even by accident, entailed impurity on himself and on the whole state, and in some cases made him forfeit his office.

A moral side in the Roman conception of God is apparent at a very early period, and probably was never wholly wanting. Jupiter is the fatherly ruler of mankind: he protects all the higher elements of human society, guards the sanctity of oaths, the rights of strangers and suppliants, the unity of the state, and the intercourse with other peoples. When a foreign state had injured Rome, it was forbidden to begin war without a formal declaration by the fetiales or heralds, the ministers of Jupiter. Headed by the pater patratus populi Romani, they appealed to Jupiter to witness that they had been wronged, and denounced ruin on the wrong-doers. Having thus through his representa- tive on earth solemnly warned the guilty, the god as Victor led his people to conquest. When the army returned, their entry was a religious ceremonial in honour of Jupiter. The general, as representative of Jove, was borne ou a gilded chariot drawn by four white horses through the Porta Triumphalis to the temple on the capitol, where he offered a solemn sacrifice to the god, and laid on his knees the victor's laurels.) In the ceremony the victorious general was invested with the purple toga, the tunica palmata, the sceptre and crown of gold, which belong to a god not to a man; while the four-horse chariot itself is the symbol of apotheosis. So the spolia opima were dedicated by the general who won them to Jupiter Feretrius in the Capitol. Also to Jupiter, as supreme god of the state, the consuls sacrificed when they assumed office, and the young men when they put on the toga virilis. The Ides of the month were always sacred to Jupiter.

The chief festivals celebrated in hononr of Jupiter were the Ludi Romani and the Ludi Magni, the Ludi Capitolint instituted in honour of the deliverance of Rome from the Gauls, and the Ludi Plebeii instituted to commemorate the reconciliation between the two orders in the state. In all of them there was included a feast of the magistrates and senators in the Capitol, to which the three deities, Jupiter, Juno, and Minerva, were invited, and places were left for them. Outside of Rome the chief cultus of Jupiter was that on the Alban mount, where

Jupiter Latiaris had been the god who guarded the league of the thirty Latin cities. When Rome destroyed, or rather absorbed, this

league, she kept up the worship that had hallowed it. The Feri Latins were celebrated every year by the consuls on a day appointed by themselves before they went forth to war. Accompanied by representatives of the Latin cities, they offered a sacrifice of white oxen to Jupiter. Other festivals of Jupiter show his old character as patron of agriculture, especially the different feasts called Vinalia ; in this character Liber, who was once only a form of Jupiter, had almost entirely supplanted him. The word liber, originally an epithet of the chief god, gradually acquired distinct personality, and became the name of a god who was assimilated to the Greek Dionysus.

The Romans had in themselves none of the anthropo- morphic Greek spirit: while Greek gods were concrete personal beings, Roman gods were almost pure abstractions. The personal element was not wholly wanting, for the gods were conceived as distinguished by sex, and as possessing names which must be concealed lest enemies should know and use them. But to the Roman the gods were little more than spiritual principles of earthly things ; each man had his genius, the wood had its Silvanus. There was no mythology,—no marriages and births of gods, no family relationships. But when Greek influence became powerful, and the Italian deities Saturnus and Ops had been identified with Cronos and Rhea, Jupiter like Zeus was called their son, and the Greek tales about the conduct of Zeus to his parents were applied to the Latin god. On the Capitol Jupiter was enthroned between Juno on the left and Minerva on theright. The two goddesses now became his wife and his daughter. In like manner the Roman poets attributed to Jupiter all the legends about Zeus, and invented new tales and new amours on Italian soil after the analogy of the Greek. The artistic rendering of the conception of Jupiter is wholly borrowed from the Greek, and can be dealt with only in treating of the Greek deity. The first temple on the Capitol was built after the Etruscan model; but, when it was destroyed in 83 B.c., it was rebuilt in Greek style. (w. M. RA.)

JURA. This range may be roughly described as the block of mountains rising between the Rhine and the Rhone, and forming the frontier between France and Switzerland. The gorges by which these two rivers force their way to the plains cut off the Jura from the Swabian and Franconian ranges to the north and those of Dauphiné to the south. But in very early days, before these gorges had been carved out, there were no openings in the Jura at all, and even now its three chief rivers— the Doubs, the Loue, and the Ain—flow down the western slope, which is both much longer and but half as steep as the eastern. Some geographers extend the name Jura to the Swabian and Franconian ranges between the Danube and the Neckar and the Main; but, though these are similar in point of composition and direction to the range to the south, it is most convenient to limit the name to the mountain ridges lying between France and Switzer- land, and this narrower sense will be adopted here.

The Jura has been aptly described as a huge plateau about 156 miles long and 38 miles broad, hewn into an oblong shape, and raised by internal forces to an average height of from 1950 to 2600 feet above the surrounding plains. The shock by which it was raised, and the vibra- tion caused by the elevation of the great chain of the Alps, produced many transverse gorges or "'cluses," while on the plateaus between these subaerial agencies have exer- cised their ordinary influence.

Geologically, the sedimentary rocks of the Jura belong to the Mesozoic age, and were deposited in a sea of variable depth, traces of which survive in the vast salt mines from which Salins and Lons-le-Saunier derive their names. The special name of these fossiliferous strata is Oolitic ;

they are also called Jurassic, from the fact that the Jura is entirely made up of such layers. They include sands, sandstones, marls, clays, and limestones; and the water that deposited these strata must have been highly charged with carbonate of lime, since calcareous rocks abound in the Jura. The action on these rocks of the carbonic acid

gas discharged by all animals has been to transform them

into bicarbonate of lime, a very soluble body, and hence tlie work of erosion has been much facilitated. The countless

blocks of gneiss, granite, and other crystalline formations

which are found in such numbers on the slopes of the Jura, and go by the name of "erratic blocks" (of which the best known instance—the Pierre 4 Bot—is 40 feet in diameter, and rests on the side of a hill 900 feet above the Lake of Neuchatel), have been transported thither from the Alps by ancient glaciers, which have left their mark on the Jura range itself in the shape of striations and moraines.

The general direction of the chain is from north-east to south-west, but a careful study reveals the fact that there were in reality two main lines of upheaval, viz. north to south and east to west, the former best seen in the southern part of the range and the latter in the northern ; and it was by the union of these two forces that the lines north- east to south-west (seen in the greater part of the chain),

and north-west to south-east (seen in the Villebois range at the south-west extremity of the chain), were produced.

This is best realized if we take Besangon as a centre; to

the north the ridges run east and west; to the south, north and south, while to the east the direction is north-east to south-west.

Before considering the topography of the interior of the Jura, it may be convenient to take a brief survey of its outer slopcs.

1. The northern face dominates on one side the famous *Trouée" (or Trench) of Belfort, one of the great geographical centres of Europe, whence routes run north down the Rhine to the North Sca, south-east to the Danube basin and Black Sea, and south-west into France and so to the Mediterranean basin. It is now so strongly fortified that it becomes a question of great strategical im- portance to prevent its

being turned by means of the great central plateau of the Jura, which, as we shall see, is a network of roads and railways. On the other side it overhangs the “ Trouée” of the Black Forest towns on the Rhine (Rheinfelden, Sackingen, Laufenburg, and Waldshut) through which the central plain of Switzerland is easily gained. On this north slope two openings offer routes into the interior of the chain,—the Ail of the Doubs belonging to France, and the valley of the Birs belonging to Swit- yerland, Belfort is the military, Miihlhausen the industrial, and Basel the commercial centre of this slope.

9. The castern and western faces offer many striking parallels. The plains through which flow the Aar and the Saédne have each been the bed of anancient lake, traees of which remain in the lakes of Neuchatel, Bienne, and Morat. The west face runs mainly north and south like its great river, and for a similar reason the east face runs north-east to south-west. Again, both slopes are pierced by many transverse gorges or “cluses” (due to fracture and not to erosion), by which access is gaincd to the great central plateau of Pontarlier, though these are seen more plainly on the east face than on the west; thus the gorges at the cxit from which Lons le Saunier, Poligny, Arbois, and Salins are built balance those of the Suze, of the Val de Ruz, of the Val de Travers, and of the Val d’Orbe, though on the east face there is but one city which commands all these important routes—Neuchatel. This town is thus marked out by nature as a great military and industrial centre, just as Besangon on the west, which has besides to defend the route from Belfort down the Doubs. These easy means of communicating with the Free County of Burgundy or Franche Comté accounts for the fact that the dialect of Neuch&tel is Burgundian, and that it was held generally by Burgundian nobles, though most of the country near it was in the hands of the house of Savoy until gradually annexed by Bern. The Chasseron (5286 feet) is the central point of the eastern face, commanding the two great railways which join Neu- chatel and Pontarlier. It is ina certain sense parallel to the valley of the Louc on the west face, which flows into the Doubs a little to the south of Déle, the only important town of the central portion of the Sadne basin. South of the Val d’Orbe the east face becomes a rocky wall crowned by all the highest summits of the chain—the Mont Tendre (5512 fect), the

Déle (5507 feet), the Recwlet (5643 feet), the Crét de la Neige (5658 feet), and the Grand Credo (5276

feet), the uniformity of level being as striking as on the west cdgc of the Jura, though there the absolute height is far less. The posi- tion of the Déle is similar to that of the Chasseron, as along the sides of it run the great roads of the Col de St Cergues (4159 feet) and the Col de la Faueille (4341 feet), the latter leading through the Vallée des Dappes, which was divided in 1862 between France and Switzerland, after many negotiations. The height of these roads shows that they are passages across the chain, rather than throngh natural depressions.

8. The southern face is supported by two great pillars—on the east by the Grand Credo and on the west by the ridge of Revermont (2529 feet) above Bourg en Bresse; between these a huge bastion (the district of Bugey) stretehes away to the south, forcing the Rhone to make a long détour. On the two sides of this bastion the plains in whieh Amberieu and Culoz stand balance onc another, and are the meeting points of the routes which cut through the bastion by means of deep gorges. On tho eastern side this great wedge is steep and rugged, ending in the Grand Colombier (5033 feet) above Culoz, and it sinks on tho western side to the valley of the Ain, the district of Bresse, and the plateau of Dombes. The junction of the Ain and the Surand at Pont d'Ain on the west balances that of the Valserino and the Rhoue at Bellegarde on the east.

The Jura thus dominates on the north one of the great highways of Europe, on the east and west divides the valleys of the Saéne and the Aar, and stretches out to the south so as nearly to joiu hands with the great mass of the Dauphiné Alps. It thercforo commands the routes from France into Germany, Switzerland, and Italy, and hence its enormous historical importance.

Let us now examine the topography of the interior of the range. This naturally falls into three divisions, each traversed by one of the three great rivers of the Jura—the Doubs, the Loue, and the Ain.

1. In the northern division it is the east and west line whieh prevails—the Lomont, the Mont Terrible, the defile of the Doubs from St Ursanne to St Hippolyte, and the “ Trouée” of the Black Forest towns. It thus bars access to the central plateau from the north, and this natural wall docs away with the necessity of artificial fortifications. This division falls again into two distinet portions.

(a) The first is the part east of the deep gorge of the Doubs after it turns south at St Hippolyte ; it is thus quite cut off on this side, and is naturally Swiss territory.

Aar, on which, at an average height of 2600 feet, are situated a number of towns, one of the most striking features of the Jura. These include Locle and La Chaux de Fonds, and are mainly oceu-

pied with watchmaking, an industry which does not require bulky |

machinery, and is therefore well fitted for a mountain district.

(6) The part west of the ‘* Cluse” of the Dowbs.—Of this, the district east of the river Dessoubre, isolated in the interior of the range (unlike the Locle plateau), is called the “ Haute Montagne,” and is given up to cheese making, curing of hams, saw mills, &c. But little watchmaking is carried on there, Besancon being the chief French centre of this industry, and being eonneeted with Geneva by a chain of places similarly occupied, whieh fringe the west plateau of the Jura. The part west of the Dessoubre, or the Moyenne Montagne, a luge plateau north of the Lone, is more cspe- cially devoted to agriculture, while along its north edge metal work- ing and manufacture of hardware are carricd on, particularly at Besangon and Audincourt.

2. The central division is remarkable for being without the deep gorges which are found so frequently in other parts of the range. It consists of the basin of which Pontarlier is the centre, through notehes in the rim of which routes converge from every direction ; this is the great characteristic of the middle region of the Jura. Henee its immense strategical and commercial importance. On the north-east roads run to Morteau and Locle, on the north-west to Besangon, on the west to

Salins, on the south-west to Déle and Lons- le-Saunier, on the east to the Swiss plain. The Pontarlier plateau is nearly horizontal, the slight indentations in it being due to erosion, ¢.g., by the river Drugeon. The keys to this important plateau are to the east the Fort de Joux, under the walls of which meet the two lines of railway from Neuchatel, and to the west Salins, the meeting place of the routes from the Col de la Faucille, from Besangon, and from the Freneh plain.

The Ain rises on the south edge of this plateau, and on a lower shelf or step, which it waters, are situated two points of great military importance—Nozeroy and Champagnole. The latter is specially important, since the road leading thence to Geneva traverses one after another, not far from thcir head, the chief valleys whieh run down into the South Jura, and thus eommands the southern routes as well as those by St Cergues and the Col de la Faucille from the Geneva region, and a branch route along the Orbe river from Jougne. The fort of Les Rowsses, near the foot of the Déle, serves as an advanced post to Champagnole, just as the Fort de Joux does to Pontarlier.

The above sketch will serve to show the character of the central Jura as the mecting place of routes from all sides, and the import-

It ineludes the basin of | the river Birs, and the great plateau between the Doubs and tho ©

of the South Jura are Lyons and Geneva.

JURA

ance to France of its being strongly fortified, lest an enemy ap- proaching from the north-east should try to turn the fortresses of the " Trouée de Belfort." It is in the western part of the eentral Jura that the north and south lines first appear strongly marked, There are said to be in this distriet no less than fifteen ridges run- ning parallel to each other, and it is these whieh force the Loue to the north, and thereby occasion its very eeeentrie course. The cultivation of wormwood wherewith to make the tonic " absinthe " has its headquarters at Pontarlier.

3. The southern division is by far the most complicated and en- tangled part of the Jura. The lofty ridge which bounds it to the east forces all its drainage to the west, and the result is a number of valleys of erosion (of which that of the Ain is the chief instance), quite distinct from the natural " eluses" or fissures of those of the Doubs and of the Loue. Another point of interest is the number of roads whieh intersect it, despite its extreme irregularity. This is due to the great "cluses " of Nantua and Virieu, which traverse it from east to west. The north and south line is very elearly seen in the eastern part of this division ; the north-east and south-west is entirely wanting, but in the Villebois range south of Ambérieu we have the principal example of the north-west to south-east line. The plateaus west of the Ain are eut through by the valleys of the Valouse and of the Surand, and like all the lowest terraces on the west slope do not possess any considerable towns. The Ain rceeeives three tributaries from the east:—

(a) The Bienne, which flows from the fort of Les Rousses by St Claude, the industrial eentre of the South Jura, famous for the manufacture of wooden toys, owing to the large quantity of box- wood in the neighbourhood. Septmioncel is busied with eutting of gems, and Morcz with watch and spectacle making. Cut off to the east by the great chain, the industrial prosperity of this valley is of recent origin.

(b) The Otgnon, which flows from south to north. It reccives the drainage of the lake of Nantua, a town noted for combs and silk weaving, and whieh communicates by the "eluse" of the Lae de Silan with the Valserine valley, and so with the Rhone at Belle- garde, and again with the various routes whieh meet under the walls of the fort of Les Rousses, while by the Val Romey and the Séran Culoz is easily gained.

(c) The Albarine, conneeted with Culoz by the "cluse" of Virieu, and by the Furan flowing south with Belley, the capital of the district of Bugey (the old name for the South Jura).

The "cluses" of Nantua and Virieu are now both traversed by important railways; and it is even truer than of old that the keys But of eourse the strategic importance of these gorges is less than appears at

first sight, beeause they ean be turned by following the Rhone in its great bend to the south.

The name Jura, which occurs in Cesar and in Strabo, is a form of a word which appears under many forms (¢.., Joux, Jorat, Jorasse, Juriens), and is a synonym for a wood or forest. The German name is Leberberg, Leber being a provincial word for a hill.

Politically the Jura is French (departments of the Doubs, Jura, and Ain) and Swiss (parts of the cantons of Geneva, Vaud, Neuchatel, Bern, Solothurn, and Basel) ; but at its north extremity it takes in a small bit of Alsace (Pfirt or Ferrette). In the Middle Ages the southern, western, and northern sides were parcelled out into a number of districts, all of which were gradually absorbed by the French crown, viz., Gex, Val Romey, Bresse, and Bugey (exchanged in 1601 by Savoy for the marquisate of Saluzzo), Franche Comté, or the Free County of Burgundy, an imperial fief till annexed in 1674, the county of Montbéliard (Miimpelgard), acquired in 1793, and the county of Ferrette (French 1648-1871). The northern part of the eastern side was held by the bishop of Basel as a fief of the empire, but was given to Bern in 1815 (as a recompense for its loss of Vaud), and now forms the Bernese Jura, 2 French-speaking district. The centre of the eastern slope formed the principality of Neuchatel and the county of Vallangin, which were generally held by Burgundian nobles, came by succession to the kings of Prussia in 1707, and were formed into a Swiss canton in 1815, though they did not become free from formal Prussian claims until 1857. The southern part of the eastern slope originally belonged to the house of Savoy, but was con- quered bit by bit by Bern, which was forced in 1815 to accept its subject district Vaud as a colleague and equal

in the Swiss Confederation. It was Charles the Bold’s defeats at Grandson and Morat which led to the annexa- tion by the Confederates of these portions of Savoyard territory.

See EK. F. Berlioux, Ze Jura, Paris, 1880; Adolphe Joanne, Jura et Alpes Frangaises, Paris, 1877 ; Id., Géographics Départe- mentales (the Doubs, Jura, and Ain volumes); Charles Sauria, Le Jura pittoresque. . (W. A. B.C.)

JURA, an eastern frontier department of France, formed of the southern portion of the old province of Franche- Comté, owes its name to the offshoots and plateaus of the Jura mountains, which occupy more than half its area. It is bounded N. by Doubs, Haute-Sadne, and Céte-d'Or ; E. by Doubs, Ain, and Switzerland; 8. by Ain; and W. by Sadne-et-Loire and Cote d'Or. Lying between 46° 15' and 47° 17' N. lat., and between 5° 15' 39" and 6° 8' 9" E. long., its greatest length from north to south is 143 miles, and its greatest breadth from east to west 83 miles. The department is divided by a not very broad zone of hills into a region of plain in the north and north-west, and a region of mountains in the south-east, increasing in height towards the Swiss frontier. The highest summit is Noir Mont (5085 feet). Jura belongs almost entirely to the basin of the Rhone,—its chief streams being the Oignon, Doubs, and Seille, affluents of the Saéne, and the Ain and Valserine, direct tributaries of the Rhone. The Doubs and Ain are navigable. There are numerous lakes; those of Rousses, Chalin, Chambly, and of the abbey of Grandvaux are noteworthy. The climate is, on the whole, cold; the temperature is subject to sudden and violent changes, and among the mountains winter lingers for nearly six months. The plain called the Bresse is rich in fruit trees, and in fields of wheat, rye, maize, and buckwheat ; the hill-region grows vines, barley, oats, maize, rape, walnuts, and fruits ; the mountains, which exhibit some of the grandest scencry of leaping torrent and silent tarn, are covered with forests or pastures. Jura is one of the most thickly wooded departments of France; a third of its surface is covered with forests, of which that of Chaux, with an area of about 75 square miles, is the largest. The commonest trees are oaks, beeches, hornbeams, aspens, birches, box-trees, and firs. Wolves and foxes are numerous in Jura; wild boars and deer lurk in the forests. The principal minerals are iron, salt, limestone, marble, sandstone, millstone, and clay. Peats are very abundant. Agriculture employs about three-fourths of the inhabitants, though the manufactures extend to wine, cheese (made in the mountain

dairies), watches, files, stationery, toys and fancy wooden-ware, machinery, candles, porcelain, basket-work, &c.; while some industry is maintained in wool-spinning, silk-weaving, and in brass, pottery, and tanning works. ‘The trade is mainly in wines, cheese, and wooden goods. The first are full-bodied, stout, and rather coarse-flavoured ; their chief market is Paris, where they form the basis of the win ordinaire of the wine-shops. The department of Jura embraces the arrondissements of Lons-le-Saunier, Déle, Poligny, and St Claude, with 32 cantons and 583 com- munes. Lons-le-Saunier isthe chief town. The total area Is about 1928 square miles; the population in 1866 was 298,477 ; in 1876, 288,823.

JURA, an island of the inner Hebrides, on the west coast of Argyllshire, Scotland, the fourth largest of the group, is situated between 55° 52’ and 56° 9’ N. lat., and 5° 43’ and 6° 8’ W. long. On the north it is separated from the island of Scarba by the whirlpool of Corry-vreckan, on the east from the mainland by Jura Sound, Which is 10 miles broad, and on the south and south- west from Islay by Islay Sound. ‘he area is about 160 Square miles, the greatest length about 27 miles, and the breadth about 6, A chain of rugged hills, rising into

eniinences called the Paps of Jura, the highest summit of which is 2500 fect, traverses the whole extent of the island, interrupted only by Tarbert Loch, an arm of the sea, which forms an indentation into the island of nearly 6 miles, and almost cuts it in two. Jura derived its name, meaning “deer island,’ from the red deer which abounded on it. On the pasturage a considerable number of black cattle are raised; and some corn and potatoes are cultivated along the eastern shore. Fishing is pro- secuted to a small extent. The population, which in 1851 was 1064, was 781 in 1881.

JURIEU, Pierre (1637-1713), a French Protestant theologian, was born in 1637 at Mer, in Orléanais, where his father was a Protestant pastor. He studied at Saumur and afterwards at Sedan under his maternal grandfather the famed theologian Pierre Dumoulin, who died about the time that Jurieu left Sedan. After completing his studies in England

under his maternal uncle Dumoulin, Juricu received episcopal ordination there, and returning to France succeeded his father as pastor of the church at Mer. In 1674 he accepted the chair of theology and Hebrew at Sedan, where he soon afterwards became also pastor. Both as preacher and professor he obtained a very high reputa- tion, but much of the legitimate influence of his talents was destroyed by the extreme warmth of his controversial temper, which frequently developed into an irritated fanaticism verging on insanity. On the suppression of the university of Sedan in 1681, Jurieu received an in- vitation to a church at Rouen, but, dreading persecution on account of a work he was about to publish, entitled La Politique du Clergé de France, he went to Holland and became soon after pastor of the Walloon church of Rotterdam, an office which he occupied till his death, 11th January 1713.

Deeply pained by the revocation of the Edict of Nantes Jurieu turned for consolation to the prophecies of the Apocalypse, aud succeeded in persuading himself that the overthrow of Antichrist would take place in 1689, and afterwards, when that year had passed without the fulfil- ment of the prophecy, in 1715. Jurieu defended the doctrines of Protestantism with great ability against the attacks of Arnauld and Bossuet, but was equally ready to enter into dispute with his fellow Protestant divines when their opinions differed from his own even on minor matters. The bittcrness and persistency of his attacks on his col- league Bayle led to the latter being deprived of his chair in 1693. Jn his favour it must, however, be mentioned that he was actuated in his controversies not by a mean jealousy of his opponents but by a sincere anxiety for truth. One of the most important works of Jurieu is Lettres Pastorales adressées aux Fidéles de France, 3 vols., Rotterdam, 1686 and 1687, which found its way into France notwithstanding the vigilance of the police, and produced a deep impression on the Protestant population. Besides his numerous other controversial writings, which deal with nearly every topic in regard to which difference of opinion was possible, Jurieu was the author of a Jrazté de la Dévotion, Rouen, 1679.

JURISPRUDENCE. See Law.

JURY. The essential features of trial by jury as practised in England and countries influenced by English ideas are the following. The jury are a body of laymen selected by lot to ascertain, under the guidance of a judge, the truth in questions of fact arising either in a civil litigation or in a criminal process. 'They are generally twelve in number, and their verdict, as a general rule, must be unanimous. Their province is strictly limited to questions of fact, and within that province they are still further restricted to the exclusive consideration of matters that have been proved by evidence in the course of the

trial. They must submit to the direction of the judge as to any rule or principle of law that may be applicable to the case; and, even in deliberating on the facts, they re- ceive, although they need not be bound by, the directions of the judge as to the weight, value, and materiality of the evidence submitted to them, Further, according to the general practice, they are selected from the inhabitants of the locality, whether county or city, within which the cause of action has arisen or the crime has been committed, so that they bring to the discharge of their duties a certain amount of independent local knowledge, an element in the institution which is by no means to be ignored. Such in general terms is the famous judicial institution the develop- ment of which is generally regarded as one of the greatest achievements of English jurisprudence.

What is the origin of this very remarkable and character- istic system? That is a question which has engaged the attention of many learned men. The fullest discussion of the subject is contained in Forsyth's 7rial by Jury, published in 1852, and more concise notices of the various theories that have been advanced will be found in Stubbs's Constitutional History, vol. i., and in Freeman's Vorman Conquest, vol. v. Until quite recently this, like all other institutions, was popularly regarded as the work of a single legislator, and in England it is one of the achievements usually assigned to Alfred. It is needless to say that there is no historical foundation whatever for such a supposition, nor is it much more correct to regard it as "copicd from this or that kindred

institution to be found in this or that German or Scandinavian land," or brought over ready made by Hengist or by William.! 'Many writers of authority," says Canon Stubbs, " have maintained that the entire jury system is indigenous in England, some deriving it from Celtic tradition based on the principles of Roman law, and adopted by the Anglo-Saxons and Normans from the people they had conquered. Others have regarded it asa product of that legal genius of the Anglo-Saxons of which Alfred is the mythic impersonation, or as derived by that nation from the customs of primitive Germany or from their intercourse with the Danes. Nor even when it is admitted that the system of recognition was introduced from Norniandy have legal writers agreed as to the source from which the Normans themselves derived it. One scholar maintains that it was brought by the Norsemen from Scandinavia; another that it was derived from the processes of the canon law; another that it was developed on Gallic soil from Roman principles; another that it came from Asia through the crusades," or was borrowed by the Angles and Saxons from their Slavonic neighbours in northern Europe. Tho true answer is that forms of trial resembling the jury system in various particulars are to be found in the primitive institutions of all nations. That which comes nearest in time and character to trial by jury is the system of recognition by sworn inquest, introduced into England by the Normans. '" That inquest," says Mr Stubbs, "is directly derived from the Frank capitularies, into which it may have been adopted from the fiscal regulations of the Theodosian code, and thus own some distant relationship with the Roman jurisprudence." However that may be, the system of recognition consisted in questions of fact, relating to fiscal or judicial business, being submitted by the officers of the crown to sworn Witnesses in the local courts. It is pointed out by Mr Freeman that the Norman rulers of England were obliged, more than native rulers would have been, to rely on this system for accurate information. They needed to have a clear and truthful account of disputed points set before them, and such an account was sought for in the oaths of

1 Freeman, Vorman Conquest, vol. v. p. 451.

the recognitors.2, The Norman Conquest, therefore, fostered the growth of those native germs common to England with other countries out of which the institution of juries grew. Recognition, as introduced by the Normans, is only, in this point of view, another form of the same principle which shows itself in the compurgators, in the frithbock, in every detail of the action of the popular courts before the Con- quest. Admitting with Mr Stubbs that the Norman recognition was the instrument which the lawyers in Eng- land ultimately shaped into trial by jury, Mr Freeman maintains none the less that the latter is a distinctively English thing. Mr Forsyth comes to substantially the same conclusion. Noting the jury germs of the Anglo- Saxon period, he shows how out of those elements, which continued in full force under the Anglo-Normans, was produced at last the institution of the jury. "As yet it was only implied in the requirement that disputed questions should be determined by the voice of sworn witnesses taken from the neighbourhood, and deposing to the truth of what they had seen or heard." What was wanting was to mould the procedure into shape, aud that it did not attain until a century after the Conquest.

The inquest by recognition, which was employed generally for the ascertainment of facts, as for example in assessing taxation, is exemplified in legal matters by the process known as the assize or the great assize, applicable to questions affecting freehold or status. Defendant in such an action was enabled by an enactment of Henry IL to decline the trial by combat and choose the trial by assize, which was conducted as follows. The sheriff summoned four knights of the neighbourhood, who being sworn chose twelve lawful knights who were niost cognizant of the facts, who should determine on their oaths which had the better right to the land. If they all knew the facts and were agreed as to their verdict, well and good; if some or all were ignorant, the fact was certified in court, and new knights were named, until twelve were found to be agreed. The same course was followed when the twelve were not unanimous. New jurors, as they may be called, were added until the twelve were agreed. This was called afforcing the assize. At this point the knowledge on which the jurors acted was their own personal knowledge, acquired independently of the trial. 'So entirely," says Forsyth, "did they proceed upon their own previously

formed view of the facts in dispute that they seem to have considered themselves at liberty to pay no attention to evidence offered in court, however clearly it might disprove the case which they were prepared to support." The use of recognition is prescribed by the constitutions of Clarendon for cases of dispute as to lay orclerical tenure. See Forsyth, p. 131; Stubbs, vol. i. p. 617.

In criminal cases there appears to be a more complete approximation to the jury in Anglo-Saxon times in the twelve senior thegns, who, according to an ordinance of /Mthelred II. were sworn in the county court that they would accuse no innocent man and acquit no guilty one. The twelve thegns were a jury of presentment or accusation, like the grand jury of later times, and the absolute guilt or innocence of those accused by them had to be determined by subsequent proceedings—by compurgation or the ordeal. Whether this is the actual origin of the grand jury or not, the assizes of Clarendon and Northampton establish the criminal jury on a definite basis. By the articles of visitation of 1194, four knights are to be chosen from the county who by their oath shall choose two lawful knights of each hundred or wapintake, or, if knights be wanting,

free and legal men, so that the twelve may answer for all A a OE

2 This fact would account for the remarkable development of the system on English ground, as contrasted with its decay and extinction in France.

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matters within the hundred, including, says Stubbs, "all the pleas of the crown, the trial of malefactors and their receivers, as well as a vast amount of civil business." This ig the historical grand jury. The petty jury, as it is called, which is the real jury of trial, appears to have arisen as an alternative to the trial by ordeal. A person accused by the inquest of the hundred was allowed to have the truth of the charge tried by another and differentjury.1 "There is," says Forsyth, "no possibility of assigning @ date to this alteration." "In the time of Bracton (middle of the 13th century) the usual mode of determining innocence or guilt was

by combat or appeal. But in most cases the appellant had the option of either fighting with his adversary or putting himself on his county for trial" —the exceptions being murder by secret poisoning, and certain circumstances presumed by the law to be conclusive of guilt. Some doubt has been expressed whether the twelve jurors who tried the crime were not identical with the accusing jurors, but the separation betwecn the two juries was at any rate complete in the reign of Edward III. (Forsyth, p. 206).' So far we have arrived at the establishment of the jury system in its modern form, alike in civil and in criminal proceedings ; and, whatever differences may be traceable in the history of the civil and criminal jury respectively, their subsequent development is one. And there is one great feature by which the jury at the stage we have now reached is distinguished from the jury of modern times. The jury still certify to the truth from their knowledge of the facts, however acquired. In other words, they still retain the character of witnesses. The complete withdrawal of that character from the jury is connected by Forsyth with the ancient rules of law as to proof of written instruments, and a peculiar mode of trial per sectam. Whena deed is attested by witnesses, you have a difference between the testimony of the witness, who deposes to the execution of the deed, and the verdict of the jury as to the fact of execution. It has been contended with much plausibility that in such cases the attesting witnesses formed part of the jury. Forsyth doubts that conclusion, although he admits that, as the jurors themselves were originally mere witnesses, there was no distinction in principle between them and the attesting witnesses, and that the attesting witnesses might be associated with the jury in the discharge of the function of giving a verdict. However that may be, in the reign of Edward III., although the witnesses are spoken of "as joined to the assize," they are distinguished from the jurors. 'The trial per sectam was used as an alternative to the assize or jury, and resembled in principle the system of compurgation. The claimant proved his case by vouching a certain number of witnesses (secta), who had seen the transaction in question, and the defendant rebutted the presumption thus created by vouching a larger number of witnesses on his own side. In cases in which this was allowed, the jury did not interpose at all, but in course of time the practice arose of the witnesses of the secta telling

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1 The distinction between the functions of the grand jury, which presents or accuses criminals, and the petty jury, which tries them, has suggested the theory that the system of compurgation is the origin of the jury system—the first jury representing the compurgators of the accuser, the second the compurgators of the accused.

***The number of the jury (twelve) is responsible for some un- founded theories of the origin of the system. 'This use of twelve is not confined to England, nor in England or elsewhere to judicial insti- tutions. "Its general prevalence," says Hallam (Middle Ages, chap. viii.), 'shows that in searching for the origin of trial by jury we cannot rely for a moment upon any analogy which the mere number affords." Ina Guide to English Juries, by a Person of Quality, 1682 (attributed to Lord Somers), the following passage occurs: "In analogy of late the jury is reduced to the number of twelve, like as the prophets were twelve to foretell the truth; the apostles twelve to preach the truth; the discoverers twelve, sent into Canaan to seek and report the truth; and the stones twelve that the heavenly Hierusalem is built on." Lord Coke indulged in similar speculations.**

their story to the jury. In these two instances we have the jury as judges of the facts sharply contrasted with the witnesses who testify to the facts; and, with the increasing use of juries and the development of rules of evidence, this was gradually established as the true principle of the system. In the reign of Henry IV. we find the judges declaring that the jury after they have been sworn should not see or take with them any other evidence than that which has been offered in open court. But the personal knowledge of the jurors was not as yet regarded as outside the evidence on which they might found a verdict, and the stress laid upon the selection of jurymen from the neigh- bourhood of the cause of the action shows that this element was counted on, and, in fact, deemed essential to a just cousideration of the case. Other examples of the same theory of the duties of the jury may be found in the language used by legal writers, Thus it has been said that the jury may return a verdict although no evidence at all be offered, and again, that the evidence

given in court is not binding on the jury, because they are assumed from their local connexion to be sufficiently informed of the facts to give a verdict without or in opposition to the oral evidence. A recorder of London, temp. Edward VI, says that, "if the witnesses ata trial do not agree with the jurors, the verdict of the twelve shall be taken and the witnesses shall be rejected." Forsyth suggests as a reason for the continuance of this theory that it allowed the jury an escape from the attaint, by which penalties might be imposed on them for delivering a false verdict. They could suggest that the verdict was according to the fact, though not according to the evidence. With the disuse of attaints, the contrary rule came in, and it was established that where a juryman is acquainted with material facts he should tell the court in order that he may be sworn as a witness; and it was clearly laid down by Lord Ellenborough that, if a judge directed the jury that they might be guided by their own knowledge of the facts independently of the evidence, such a direction would be wrong.

The ordinary jury in civil and criminal trials has now been traced down to the point at which its constitution became stereotyped. An important point still wants some historical explanation. The rule requiring a unanimous verdict has been variously accounted for, but Mr Forsyth's explanation appears conclusive. He regards the rule as intimately connected with the original character of the jury as a body of witnesses, and with the conception common in primitive society that safety is to be found in the number of witnesses, rather than the character of their testimony. The afforcing of the jury above described marks an inter- mediate stage in the development. Where the juries were not unanimous new jurors were added until twelve were found to be of the same opinion. From the unanimous twelve selected out of a larger number to the unanimous twelve constituting the whole jury was a natural step, which, however, was not taken without some hesitation. In some old cases we find that the verdict of eleven jurors out of twelve was accepted, but it was decided in the reign of Edward III. that the verdict must be the unanimous opinion of the whole jury. Diversity of opinion was taken to imply perversity of judgment, and the law sanctioned the application of the harshest methods to produce unanimity. The jurors were not allowed to eat or drink but by leave of

the justices; and they might be carried round the circuit in carts until they agreed. These rough enforcements of an unanimous verdict have bcen softened by later practice, but the rule itself remains.

We may now turn to the jury in actual operation. And let us notice first the various kinds of jury known to English law, |

1. Lhe Grand Jury.—The origin of this has been ex-

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plained above. This is the jury which presents indictments for trial by the petty or ordinary jury. The sheriff is directed to summon twenty-four or more persons, out of whom the jury may be chosen; but not more than twenty- three are to be chosen, so that twelve may be a majority.' The verdict of less than twelve, although a majority of the whole body, cannot be accepted, but the verdict of twelve is sufficient although the others may dissent. The grand jury, after a general charge from the judge, consider the bills of indictment in private, hearing such of the witnesses as they think fit. If they consider that a prima facie case is made out against the accused, they return the indictment into court as a true bill, which then becomes the foundation of the process before the petty jury. If they think other- wise they ignore the bill, or send it back into court torn up. They have thus a kind of veto on the cases submitted for trial. As these for the most part have been previously investigated by magistrates who have committed the accused for trial, the utility of the grand jury depends very much on the character of the justices' courts. As a review of the discretion of stipendiary magistrates in committing cases for trial, the judgment of the grand jury is admittedly superfluous ; and even when the committing justice ig an unlearned magistrate, it seems very doubtful if much is gained by subjecting his open decisions to the control of a secret tribunal. It used to be urged by the defenders of the system that it secures the attendance of the landed gentry and the county justices at

the assizes—a kind of argument which is no longer so cogent as it once was. Mr Forsyth thinks that the grand jury will often baffle “the attempts of malevolence” by ignoring a malicious and unfounded prosecution, but they may also defeat the ends of justice, and they have done so ere now, by shielding a criminal with whom they have strong political or social sympathies. The qualification of the grand jurymen is that they should be freeholders of the county,—to what amount appears to be uncertain.

2. The Coroner's Jury is undeterminate in number, but the finding must be that of twelve at least of the jurymen. Persons found guilty on this inquest may be put on trial before a petty jury at assizes.

3. Special and Common Juries. —This distinction belongs properly to civil trials. The practice of selecting special jurors to try important cases appears to have sprung up, without legislative enactment, in the procedure of the courts. Forsyth says that the first statutory recognition of it is so late as 3 Geo. IL. c. 25, and that in the oldest book of practice in existence (Powell's Attorney's Academy, 1623) there is no allusion to two classes of jurymen. The Acts, however, which regulate the practice allude to it as well established. The statute now in force (33 & 34 Vict. c. 7) defines the class of persons entitled and liable to serve on special juries thus :—every man whose name shall be on the juror's book for any county, &c., and who shall be legally entitled to be called an esquire, or shall be a person of higher degree, or a banker or merchant, or who shal] occupy a house of a certain rateable value (¢.g., £100 in a town of 20,000 inhabitants, £50 elsewhere), or a farm of £300, or other premises at £100.

1 Blackstone puts the principle as being that no man shall be con-

victed except by the unanimous voice of twenty-four of his equals or neighbours—twelve on the grand, and twelve on the petty jury.

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holder is rated at £30 In Middlesex or £20 in any other

county. See 6 Geo. IV. c. 50; and 33 & 34 Vict. c 77 (the Juries Act). A schedule to the last-cited Act contains a list of the numerous classes of persons exempted from service, which include members of the legislature and

judges, ministers of various denominations, and practising

lawyers of all grades. These are juries invariably em- ployed in the superior courts. In the county court the

jury consists of five.

Formerly aliens were entitled to be tried by a jury de medietate linguex —half being Englishmen and half foreign- ers, not necessarily of the same country as the accused. This privilege has been abolished by the Naturalization Act.

A jury of matrons is resorted to, in a writ de ventre inspiciendo, or when a female prisoner, condemned to death, pleads pregnancy in stay of execution.

From the beginning parties have been allowed to challenge the jury. In civil and criminal cases a challenge for cause is allowed ; in criminal cases only, a peremptory challenge is also allowed. In the former case the challenge may be either to the array, ¢.e., to the whole number of jurors returned, or to the polls, z.e., to the jurors individually. A challenge to the array is either a principal challenge (on the ground that the sheriff is a party to the cause, or related to one of the parties), or a challenge for favour (on the ground of circumstances implying "at least a probability of bias or favour in the sheriff"). A challenge to the polls is an exception to one or more jurymen on either of the following grounds :—(1) propter honoris respectum, as when a lord of parliament is summoned ; (2) propter defectum, for want of qualification ; (3) propter affectum, on suspicion of bias or partiality ; and (4) propter delictum, when the

juror has been convicted of an infamous offence. The

challenge propter affectum is, like the challenge to the array, either principal challenge or "to the favour." Prisoners in criminal trials were by common law entitled to a per- emptory challenge without cause shown to the number of thirty-five jurors; and so the law remains, after some fluctuation, in the case of treason. In other cases it is limited to twenty. The crown is no longer entitled toa peremptory challenge as at common law; but the cause of challenge need not be assigned by the

crown until the whole list has been gone through, or unless there remain no longer twelve jurors left to try the case, exclusive of those challenged—an arrangement which practically amounts to giving the crown the benefit of a peremptory challenge. One other special point remains to be mentioned. The province of the jury is to judge of facts; they have nothing to do with the law—which they must take from the presiding judge at the trial. The old decantatum assigns to each his own independent function :—‘ Ad questionem legis judices respondent, ad queestionem facti juratores.” But, while the jury are supposed in legal theory to be absolute masters of the questions of fact, in practice they are largely controlled by the judges. Not only does the judge at the trial decide as to the admissibility of questions, but he advises the jury as to the logical bearing of the answers on the issue. Further, after a jury has given 1ts verdict, it may be challenged in the courts on the ground that it is against the evidence, or on the ground that there was no evidence to go before the jury. A verdict is said to be against the evidence when the jury have completely misapprehended the facts proved,—when the logical con- clusion to be drawn from the facts is the opposite of that which the jury have drawn, The court will not disturb the verdict of a jury on this ground when the judge who presided at the trial is not dissatisfied with the verdict. And it bas been ruled emphatically that, when there is con-

| flicting testimony as to the point at issue, it is exclusively

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for the jury to say which side is to be believed, and the court will not interfere with the verdict. To upset a verdict on the ground that ““‘there was no evidence to go to the jury ” implies that the judge at the trial ought to have withdrawn the case. The meaning of the phrase “evidence to go before the jury” is nowhere definitely ascertained, and a consideration of decided cases makes the difficulty more apparent. The question arises most frequently perhaps in cases involving an imputation of negligence—e.g., in an action of damages against a railway company for injuries sustained ina collision. Juries are apt to infer negligence very easily, and the court has to say

whether, on the facts proved, there was any evidence of

the defendant's being guilty of negligence. This is by no

means the same thing as saying whether, in the opinion of

the court, they were so guilty. The court may be of opinion that on the facts they were not guilty, yet the facts themselves may be of such a nature as to be evidence of guilt to go before a jury. When the facts proved are such that a reasonable man might have come to the conclusion that there was negligence, then, although the court may wholly reject the conclusion in its own mind, it must admit that there is evidence to go before the jury. That perhaps is as near as we have yet got to an understanding of a phrase in daily use in the superior courts; but it scarcely determines what relation between the facts proved aud the conclusion to be established is necessary to make the facts evidence from which a jury may infer the conclusion. The true explanation is to be found in the principle of relevancy. Any fact which is relevant to the issue constitutes evidence to go before the jury, and any fact, roughly speaking, is relevant between which and the fact to be proved there may be a connexion as cause and effect. See Evipence. When the question is what damages the plaintiff has sustained, the court openly undertakes to review their decision on its merits—although this is as much a question of fact as any other. If the court deems the damages excessive, it will order a new trial to take place, —generally adding the condition that the verdict may stand if the plaintiff will accept a reduced sum for damages, which in effect amounts to the court itself finding a verdict.

The function of the jury in libel cases was in the last century the subject of a celebrated controversy which ended inthe passing of Fox's Libel Act in 1792. Lord Mansfield aud the judges held that the criminality or innocence of an act done, including any paper written, is matter of law and not matter of fact, an undeniable proposition then and since, They had also been in the habit of directing the jury to consider only the question of publication, telling them that its guilt or innocence was not for them to decide. Fox's Act declares and enacts that the jury may give a general verdict of guilty or not guilty in libel cases, and shall not be

required or directed by the court or judge to find a verdict of guilty on proof of publication and of the sense ascribed to it by the prosecution.

Of the merits of the institution little space is left to speak. The present English jury has at least one con- spicuous defect in the requirement of unanimity; yet, so far as that is concerned, in practice it produces hardly any appreciable evil. All that Bentham and others have urged against it—the application of a kind of torture to force conviction on the minds of jurors, the indifference to veracity which the concurrence of unconvinced minds must produce in the public mind, the probability that jurors will disagree and trials be rendered abortive, and the absence of any reasonable security in the unanimous verdict that would not exist in the verdict of a majority— all this is undeniably true. Yet we rarely hear of juries disagreeing or of jurors agreeing under compulsion. When civil juries were established in Scotland, this was one

of the arguments used against the experiment, but it has been stated by the judge, Mr Commissioner Adam, under whom the system was started, that he only knew of one instance of disagreement during a period of twenty years. English experience is much the same, and a reform which twenty or thirty years ago was pronounced absolutely necessary by conservative jurists is now hardly ever heard of. Practically juries have no difficulty in coming to a unanimous verdict; and, if a guess may be hazarded on so wide a subject, they have probably less difficulty now than ever. One cause of that result may be the deference which

juries invariably pay to the carefully suggested opinion of

the judge—arising no doubt from such perfect confidence in the bench as did not always exist, and would not always have been deserved if it had existed.

But, apart from any incidental defects, it may be doubted whether, as an instrument for the investigation of truth, the

jury deserves all the encomiums which have been passed

upon it. In criminal cases, especially of the graver kind, it is perhaps the best tribunal that could be devised. There the element of moral doubt enters largely into the con- sideration of the case, and that cau best be measured by a popular tribunal, Opinion in England is unanimously against subjecting a man to serious punishment as a result of conviction before a judge sitting without a jury, and the judges themselves would be the first to deprecate so great a responsibility. But in civil causes, where the issue must be determined one way or the other on the balance of probabilities, a single judge would probably be a better tribunal than the present combination of judge and jury. Even if it be assumed that he would on the whole come to the same conclusion as a jury deliberating under his directions, he would come to it more quickly. Time would be saved in taking evidence, summing up would be unnecessary, and the addresses of counsel would inevitably be shortened and concentrated on the real points at issue.

The Jury in Scotland.—According to the Regiam Majestatem, which is identical with the treatise of Glanvill on the law of Eng- land (but whether the original or only a copy of that work is a question which need not delay us), trial by Jury existed in Scot- land for civil and criminal eases from as early a date as in England, and there is reason to believe that at all events the system became established at a very early date. Its history was very different from that of the English jury system. In Scotland trial by jury survived for criminal trials, but became extinct in civil cases. In the criminal assize the jury has always consisted of fifteen persons chosen from the jury lists, general and speeial, drawn up by the sheriff, —one-third of the jury being chosen from the special, and two-thirds from the general list. The verdict is to be that of the majority of the jury, and formerly it had to be expressed in writing, but may now be deliv- ered viva voce by the chancellor or foreman. Besides the “ guilty” or “not guilty” to which the English jury is restricted, a Scoteh jury may bring in a verdict of ‘not proven,” which has legally the same effect as “not guilty ” in releasing the accused from further charge, while it practically inflicts upon him the stigma of moral guilt for the rest of his life.

The civil jury was reintroduced in Scotland by the Act 55 Geo. III. c. 42, mainly on account of the diffieulty which Scotch appeals turning on questions of fact presented to the House of Lords. Origin- ally the juries were appointed to try issues sent from the Court of Session under the direction of three lords commissioners, but after- wards the procedure by jury was united with the ordinary business of the court, and the special tribunal of commissioners was abolished. The jury was copied strictly from the English practice : the jurors are twelve in number, and their verdict must be unanimous. If they fail to agree within twelve (now six) hours, they must be discharged. This experiment was not at first popular, and it is doubtful if it has even now beeome assimilated to Seotch practice. :

United States.—Trial by jury according to the English system has been incorporated into the constitution of the United States. There was at one time some controversy as to whether the civil jury was included or not. The three articles (III., V., and VI.) in which allusion to trial by jury is made refer to criminal proceed- ings only, and, moreover, the supreme court 18 declared to have appellate jurisdiction both as to law and fact. It has accordingly been provided by one of the amendments to the constitution that, in suits at common law where the value in controversy shall exceed twenty dollars, the right of trial by Jury shall be preserved ;

and no fact tried by a jury shall be otherwise re-examined in any court of the United States than according to the rules of the common law. " Throughout the Union in all trials, whether civil or criminal, unanimity in the jury is essential" (Forsyth, 344).

In France there is no grand jury, and no civil jury. The jury in a criminal case find their verdict by a majority. (E. RB.)

JUSSIEU, Ds, the name of a distinguished French family, which came into prominent notice towards the close of the 16th century, and for a century and a half was illustrious for the botanists it produced. The following are its more eminent members.

J. ANTOINE DE Jussieu (1686-1758), born at Lyons in 1686, was the earliest in point of time of the line of dis- tinguished botanists of his name. He was the son of Christophe de Jussieu (or Dejussieu), an apothecary of some repute, who published a Vouveau traité de la thériaque, Trévoux, 1708. Antoine studied at the university of Montpellier, and travelled with his brother Bernard through Spain, Portugal, and southern France. He came to Paris in 1708, Tournefort, whom he succeeded, dying in that year. His own original publications are not of marked importance, but he edited an edition of Tournefort's Jnstztutiones rev herbarix, Paris, 1719, 3 vols. He performed a similar office for a posthumous work of Barrelier, Plantz per Galliam, LHispaniam, et Italiam observate, &c., Paris, 1714. He practised medicine, chiefly devoting himself to the very poor. He died at Paris, 22d April

1758.

II. BerNarD DE JussiEeu (1699-1777), a younger brother of the above, was also born at Lyons, in 1699. He was educated for the medical profession, took his doctor's degree at Montpellier, and commenced practice in 1720, but lis sensitive temperament hindered his prosecution of it, and on his brother's invitation he gladly joined him in Paris in 1722. He succeeded Vaillant as sub- demonstrator of plants in the Jardin du Roi, and his principal duties consisted in superintending the herbor- izations of the students. His knowledge of plants and even of non-botanical subjects was so great that he readily detected and named the component parts of made-up plants which were sometimes submitted to him. It is reported that at one of these excursions, whilst Linnzeus was his guest, the students having brought some such counterfeit to be named by the young Swede, his reply was "Aut Deus, aut D. de Jussieu." In 1725 he brought out a new edition of Tournefort's L/istoire des plantes qui nais- sent aux environs de Paris, in 2 vols., which was after- wards translated into English by John Martyn, —the original work being incomplete. In the same year he was admitted into the Académie des Sciences, and communicated several papers to that body. Long before Tremblay published lis Ilistoire des polypes @eau douce, he maintained the doctrine that these organisms were aninials, and not the flowers of marine plants, then the current

notion; and to confirm his views he made three journeys to the coast of Normandy. Singularly modest and retiring, he published very little, but in 1759 he arranged the plants in the royal garden of the Trianon at Versailles, according to his own scheme of classification. This arrangement is printed in his nephew's Genera, pp. lxiil.—lxx., and formed the basis of that work. He cared little for the credit of enunciating new discoveries, so long as the facts themselves were made public. On the death of his brother Antoine, he could not be induced to succeed him in his office, but prevailed upon Lemonnier to assume the higher position. He died at Paris, 6th November 1777.

Ill, Joseph bE Jussieu (1704-1779), brother of Antoine and Bernard, was born at Lyons 3d September 1704, Educated like the rest of the family for the medical profession, he accompanied La Condamine to Peru, in the expedition for measuring an are of meridian,

and remained in South America for thirty-six years, returning to Francein 1771. His health having previously failed, his works were never printed, and remain in manu- script. During his long absence, he was a member of the Académie des Sciences, although for thirty-five years he never came near the place where that body held its deliberations. Amongst the seeds he sent to Bernard were those of LZeliotropium peruvianum, Linn., then first intro- duced into Europe. He died at Paris, 11th April 1779,

TV. ANToINE LavRENT DE Jussieu (17 48-1836), nephew of the three preceding, was born at Lyons on 12th April 1748. Called to Paris by his uncle Bernard, and carefully trained by him for the pursuits of medicine and botany, he largely profited by the opportunities afforded him. Gifted with a tenacious memory, and the power of quickly grasping the salient points of subjects under obser- vation, he steadily worked at the improvement of that sys- tem of plant-arrangement which had been sketched out by his uncle. In 1789 was issued his Genera plantarum secun- dum ordines naturales disposita, juxta methodum in horto regio Parisiensi exaratam, anno MDCCLXXIV, Paris, 8vo. The influence of this volume is briefly noticed in the article

Borany, vol. iv. p. 80; it formed the foundation on which modern classification was afterwards built ; more than this, it is certain that Cuvier derived much help in his zoological classification from its perusal. Hardly had the last sheet passed through the press, when the French Revolution broke out, and the author was installed in charge of the hospitals of Paris. The Muséum d'Histoire Naturelle was organized on its present footing mainly by him in 1793, and he selected for its library everything relating to natural history from the vast materials obtained from the convents then broken up. He continued as professor of botany there from 1770 to 1826, when his son Adrien succeeded him. Besides the Genera, he produced nearly sixty memoirs on botanical topics. He died at Paris, 17th September 1836.

V. ADRIEN (LAURENT Henri) ve Jussieu (1797- 1853), son of Antoine Laurent, was born at Paris 23d December 1797. Although his youth was delicate, he displayed the qualities of his family in his thesis for the degree of M.D., De Euphorbiacearum generibus medicisque earundem viribus tentamen, Paris, 1824. He was also the author of valuable contributions to botanical literature on the Rutacex, Meliacex, and Malpighiacee respectively, of "Taxonomie" in the Dictionnaire universelle @histoire naturelle, aud of an introductory work styled simply Botar- qque, which reached nine editions, and has been translated into the principal languages of Europe. He also edited his father's Zntroductio in historiam plantarum, issued at Paris, without imprint or date, it being a fragment of the intended second edition of the Genera, which Antoine Laurent did not live to complete. He died at Paris, 29th _ June 1853, leaving two daughters, but no son, so that with him closed the brilliant botanical dynasty.

VI. Lavrent (PIERRE) DE Jussieu (1792-1866). This miscellaneous writer, nephew of Antoine Laurent, was born at Villeurbanne, 7th February 1792. Simon de Nantua, ou le marchand forain, Paris, 1818, reached fifteen editions, and has been translated into seven languages. He also wrote Simples notions de physique et @histowre naturelle, Paris, 1857, and a few geological papers. He died in

1866.

JUSTICE, in law, has long been the official title of the judges of two of the English superior courts of common law, and it is now extended to all the judges in the Supreme Court of Judicature—a judge in the High Court of Justice being styled Mr Justice, and in the Court of Appeal Lord Justice. Before the Judicature Act the Queen's Bench and the Common Pleas were each presided over by a lord chief

justice, and the lord chief justice of the Queen's Bench was nominal head of all the three courts, and held the title of Lord Chief Justice of England. 'The titles of Lord Chief Justice of the Common Pleas and Lord Chief Baron have recently been abolished, and all the common law divisions of the High Court are united into the Queen's Bench division, the president of which is the lord chief justice of England.

The lord chief justice of England or of the Queen's Bench traces his descent from the justiciar of the Norman kings. This officer appears first as the lieutenant or deputy of the king, exercising all the functions of the regal office in the absence of the sovereign. 'In this capacity William Fitz- Osbern, the steward of Normandy, and Odo of Bayeux, acted during the Conqueror's visit to the Continent in 1067; they were left, according to William of Poitiers, the former to govern the north of England, the latter to hold rule in Kent, vice sua; Florence of Worcester describes them as "custodes Anglix," and Ordericus Vitalis gives to their office the name of "preefectura." It would seem most pro- bable that William Fitz-Osbern at least was left in his character of steward, and that the Norman seneschalship was thus the origin of the English justiciarship," Stubbs's Constitutional History, vol. i. p. 346. The same authority observes that William of Warenne and Richard of Bien- faite, who were left in charge of England in 1074, are named by a writer in the next generation " praecipui Anglize justitiarii"; but he considers the name to have not yet been definitely attached to any particular office, and that there is no evidence to show that officers appointed to this trust exercised any functions at all when the king was at home, or in his absence exercised supreme judicial authority to the exclusion of other high officers of the court. The office became permanent in the

reign of William Rufus, and in the hands of Ranulf Flambard it became coextensive with the supreme powers of government. For some time, however, the title of justiciar seems not to have been definitely appropriated to this high minister. Judges of the curia regis were occasionally so named, and it was not till the reign of Henry II. that the chief officer of the crown acquired the exclusive right to the title of capztalis or totius Anglix justitiarius, Canon Stubbs considers that the English form of the office is to be accounted for by the king's desire to prevent the administration falling into the hands of an hereditary noble. The early justiciars were clerics, in whom the possession of power could not become hereditary. 'The justiciar continued to be the chief officer of state, next to the king, until the fall of Hubert de Burgh (in the reign of King John), described by Mr Stubbs as the last of the great justiciars. Henceforward, according to Mr Stubbs, the office may be regarded as virtually extinct, or it may be said to have survived only in the judicial functions, which were merely part of the official character of the chief justiciar. He was at the head of the curia regis, which was separating itself into the three historical courts of common law about the time when the justiciarship was falling from the supreme place. The chancellor took the place of the justiciar in council, the treasurer in the exchequer, while the two offshots from the curia regis, the Common Pleas and the Exchequer, received chiefs of their own. The Queen's Bench represented the original stock of the curia regis, and its chief justice the great justiciar. The justiciar may, therefore, be said to have become from a political a purely judicial officer. A similar development awaited his successful rival the chancellor.

The lord chief justice is, next to the lord chancellor, the highest judicial dignitary in the kingdom, The office is generally the prize of the chief law officer of the Govern- ment, and political considerations, therefore, enter largely into the appointment. But the chief justices have been

generally worthy of their great position, The list of them contains the names of some of the greatest masters of the common law, among whom pre-eminent rank must be as- signed to Hale, Coke, Holt,

Mansfield, and Cockburn. Lord Campbell has written the Lives of the Chief Justices, in 3 vols. A list of the lords chief justices will be found in Haydn's Book of Dignities, 1851. Robert de Brus, said by Fox to be the first judge who took the distinctive title of lord chief justice of the King's Bench (1268), was the grandfather of Robert the Bruce, king of Scotland.

In the United States the supreme court consists of a chief justice and eight associate justices, any five of whom make a quorum. 'The salary of the chief justice is $10,500, and that of the associates $10,000.

JUSTICE OF THE PEACE is an inferior magistrate appointed in England by special commission under the great seal to keep the peace within the county for which he is appointed. "The whole Christian world," said Lord Coke, "hath not the like office as justice of the peace if duly executed." Lord Cowper, on the other hand, describes them as " men sometimes illiterate and frequently bigoted and prejudiced." he truth is that the justices of the peace perform without any other reward than the consequence they acquire from their office a large amount of work indispensable to the administration of the law, and for the most part they discharge their duties with becoming good sense and impartiality. But being chosen from the limited class of country gentlemen in counties, they are sometimes exposed to the suspicion of the general public, particularly when they have to administer laws which are considered to confer special privileges on their own class. Further, as they do not generally possess a professional knowledge of the law, their decisions are occasionally inconsiderate and ill-informed. In great centres of population, when the judicial business of justices is heavy, it has been found necessary to appoint paid justices or stipendiary magistrates to do the work, and an extension of the system to the country districts has been often advocated.

The commission of the peace is addressed to all the justices of the county, and assigns to them the duty of keeping and causing to be kept all ordinances and statutes for the good of the peace and for preservation of the same, and for the quiet rule and government of the people, and further assigns "to you and every two or more of you (of

whom any one of the aforesaid A, B, C, D, &c., we will, shall be one) to inquire the truth more fully by the oath of good and lawful men of the county of all and all manner of felonies, poisonings, enchantments, sorceries, arts, magic, trespasses, forestallings, regratings, engrossings, and extor- tions whatever." This part of the commission is the authority for the jurisdiction of the justices in sessions. Justices named specially in the parenthetical clause are said to be on the quorum. Justices cannot act beyond the limits of the county for which they are appointed, and the warrant of a justice cannot be executed out of his county unless it be backed, that is, endorsed by a justice of the county in which it is to be carried into execution. A justice improperly refusing to act on his office, or acting partially and corruptly, may be proceeded against by a criminal information, and a justice refusing to act may be compelled to doso by the High Court of Justice. An action will lie against a justice for any act done by him in excess of his jurisdiction, and for any act within his jurisdiction which has been done wrongfully and with malice, and without reasonable or probable cause. But no action can be brought against a justice for a wrongful conviction until it has been quashed. By 18 Geo. II. c. 20 every justice for a county must have an estate of freehold, copyhold, or customary tenure in fee, for life or a given term, of the

yearly value of £100. The vast and multifarious duties of the justices cover some portion of every important head of the criminal law, and extend to a considerable number of matters relating to the civil law. A complete guide thereto is Burn's Justice of the Peace, in 5 large volumes, the thir- tieth edition of which was published in 1869.

In the United States these officers are sometimes ap- pointed by the executive, sometimes elected. "In some, perhaps all, of the United States, justices of the peace have jurisdiction in civil cases given to them by local regulations" (Bouvier's Law Dictionary).

JUSTICIARY, Hien Court or, in Scotland, is the supreme criminal court, and consists of five of the lords of session together with the lord justice-general and the lord justice-clerk as president and vice-

president respectively. The constitution of the court is settled by the Act 1672 c. 16. The lords of justiciary hold circuits regularly twice a year according to the ancient practice, which, however, had been allowed to fall into disuse until revived in 1748. The circuits are—the south, at the towns of Jedburgh, Dumfries, and Ayr; west (three times a year), at Glasgow, Inveraray, and Stirling; and north, Perth, Aberdeen, Dundee, and Inverness. By a recent order in council the number of circuit courts in future is to be doubled. Two judges generally go on circuit, and in Glasgow they are by special statute authorized to sit in separate courts. The High Court, sitting in Edinburgh, has, in addition to its general jurisdiction, an exclusive jurisdiction for districts not within the jurisdiction of the circuits—the three Lothians, and Orkney and Shetland. The High Court also takes up points of difficulty arising before the special courts, like the court for crown cases reserved in England. The court of justiciary has authority to try all crimes, unless when its jurisdiction has been excluded by special enactment of the legislature. It is also stated to have an inherent jurisdic- tion to punish all criminal acts, even if they have never before been treated as crimes. Its judgments are believed to be not subject to any appeal or review, but it may be doubted whether an appeal on a point of law would not lie to the House of Lords. The following crimes must be prosecuted in the court of justiciary :—treason, murder, robbery, rape, fire-raising, deforcement of messengers, breach of duty by magistrates, and all offences for which a statutory punishment higher than imprisonment is imposed.

JUSTIN, Martyr and Apologist as he is usually called, was an able and eloquent advocate of Christianity in the 2d century. Almost all we know about him is told us in his own writings. He was born in Palestine, at Flavia Neapolis (Apol., i. 1), the ancient Shechem, now Nabulus. The names of his father Priscus and grandfather Bacchius suggest that he was of Latin descent, and some passages in his writings seem to say that his parents were heathens. He relates his own conversion in two passages. In the one he says that he was drawn to Christianity because he saw the Christians dauntless in death (Apol., ii. 12); in the other he tells how chance intercourse with an aged stranger brought him to know the truth (Dial. c. Tryph., c. 2), but this passage may be

allegorical. In the intro- duction to the dialogue with Trypho, Justin describes various systems of pagan philosophy and his relation to them. At first he associated with the Stoics; from them he went to a Peripatetic, then to a Pythagorean ; and at length he embraced the doctrines of Platonism. His Platonism clung to him through life, and curiously coloured many of his Christian speculations. We know little about Justin's life after his conversion. It is very probable that he retained his philosopher's cloak, the distinctive badge of the wandering and professional teacher of philo- sophy, and went about from place to place discussing the truths of Christianity in the hope of bringing educated

pagans, as he himself had been brought, through philosophy to Christ. At Ephesus he held the famous disputation with Trypho the Jew, and in Rome he argued with Crescens the Cynic. If the Cohortatio be genuine, he also visited Alexandria and,Cume. His martyrdom is well authenticated. In his second Apology Justin declares that he expected martyrdom, and that he believed that his opponent Crescens, silenced in public by his arguments, would do his best to get him thrown into prison and condemned to death ; and this declaration is probably the reason why Eusebius, who often manufactures facts out of suppositions, asserts that Justin was slain through the plots of Crescens. An old martyrium, of unknown authorship, records the trial and death of a Justin, who is probably Justin Martyr, though there is no corroborative historical evidence. If the account can be accepted, Justin was brought before Rusticus, a Roman magistrate who was a Stoic; during his trial he was brave, quiet, and dignified; he professed his faith in the God of heaven and earth, and in His Son "the Master of Truth," and confidently expressed the conviction that after death he would share a blessed immortality. He was condemned and put to death on the same day. We cannot fix with any certainty the dates of Justin's birth and death. He was probably born near the beginning of the 2d century, and was martyred somewhere between 148 and 165. Justin was one of the earliest and ablest of the Christian Apologists, and it is as an apologist rather than as a theo- logian that he must be criticized, for his

Apologies did not lead him directly to exhibit and.defend the truths of Christianity. He was defending Christians not Christi- anity. Trajan had formally authorized the persecution of the Christians. Hadrian and Antoninus Pius had done nothing to put this decree in operation, but it hung over the Christian church, and might have been put in force at any moment. The Christians were legally proscribed. This was the state of matters which gave rise to Justin's Apologies. He wrote like a man full of Christianity ; it was his philosophy, his religion, his rule of daily life. And he wrote boldly, having nothing to fear and nothing to conceal, The argument of his first Apology, addressed to the emperor Antoninus Pius, may be thus condensed. "Tn the name of these unjustly hated and much abused men, I, Justin, one of themselves, present to you this discourse and petition. You are everywhere called the Pious, the guardian of justice, the friend of truth; your acts shall show whether you merit these titles. My design is neither to flatter you by this letter nor to win your favour. Judge us bya scrupulous and enlightened equity, not by mere presumption, nor in the name of superstition, nor by the persuasion of calumny;... . we fear no harm if we are not guilty of any crime. You can kill, you cannot injure us. All that we ask for is investigation; if the charges made against us are true, let us be punished… . Our duty is to make our deeds and doctrines fully known ; yours is to investigate our cause and to act as good judges." Justin then proceeds to set forth the iniquity of the summary modes of trial in use against the Christians, and goes on to state and deal with the charges brought against his brethren. These were three: the Christians were denounced as atheists, as rebels, and as evil-doers —faithless to God, the emperor, and society. Justin answers, "We are atheists, if it be atheism not to acknowledge your gods ; but we hold this glorious atheism in common with Socrates, who was martyred for it as we are; we are no atheists, for we worship the God of truth, the Father of righteousness, of wisdom, and of all virtues. We are no rebels: the kingdom founded by Jesus is purely spiritual, and need be no cause of alarm to the emperors; we worship God only, but with this exception we joyfully obey you and acknow-

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ledge you as our princes and governors. So far from our being rebels, our religion helps trueand good government ; men may always hope to elude human law, but they cannot hope to escape God, who sees and knows all things. We are no criminals: the Crucified Oue whom we worsluip is the Divine Word, living truth, and has enjoined us to live holy and pure lives." Justin contrasts pagan morals and the Christian life, the pagan deities and Jesus of Nazareth. The empire and Christianity were at war because of the persecuting edicts of the emperors, and Justin has no doubt that Christianity must in the end win the day. The Apology ends with solemn dignity: "If this doctrine appears true and reasonable give heed to it; if not, treat it as of no value. But do not condemn men to death who have done you no wrong; for we declare to you that you will not escape the judgment of God if you persist in injustice. For ourselves, we have but one cry—' The will of God be done.'" In the dialogue with Trypho, Justin endeavoured to show the truth of Christianity from the Old Testament Scriptures, and he described the New Testament as the new law which superseded, while it ful- filled, the old. It is not possible to coustruct a scheme of Christian dogmatic from the writings of Justin, but some ideas may be gathered from his Apologies. Christ is the centre of religion, and the exposition of Christian doctrine is to be grouped around a description of Christ. God is the God and Father of Jesus Christ. He is the only and the ove God in opposition to the polytheism of the heathen ; the unbegotten God, not born and reared like Dionysus the son of Semele or Apollo son of Leto ; the unspeakable God, because every thinking man knows that God's existence cannot be thought of or described. God is spiritual; He has indescribable glory and shape; He is omniscient and almighty ; He is creator; He has made the world for man, and cares for His creatures; He is full of mercy and good- ness. With Justin the great fact in Christianity is that Jesus Christ is the Son of God; he does not spend much time in thinking out what this means, but he is one of the earliest writers who unconsciously tries to explain the incarnation by the Platonic thought of the Logos. Justin, however, thinks of the Logos as a personal being. The begetting of the Logos is an act of the Father's; but we cannot say when the Logos was begotten, because He was before all creation, aud so before all time. The Logos is the instrument through whom God created and preserves the universe;

He is the instrument in the miraculous history of the Jews; He inspired the heathen sages; He is God; He became incarnate. Justin does not seem to distinguish between the divine and human uatures of Christ, but he believes Christ to be man and to be God. And so on with other doctrines. In Justin we see the earnest living Christianity of the 2d century firmly centred on Jesus Christ, very God and very man, trying to live again His life, taught by His Spirit. The faith rested in the great central facts of Christianity, but the power of defining doctrine had not become vigorous.

No ancient writer gives a complete list of Justin's writings ; the fullest is that of Rusebius (Hcel. Hist., iv. 18). 'The following, now extant, have been ascribed to him :—The two Apologies; Dia- logue with the Jew Trypho; A Speech to the Grecks; An Address to the Greeks; On the Sole Government of God ; An Epistle to Diognetus ; Fragments on the Resurreetion ; and other fragments. The follow- ing, now extant, and attributed to Justin, are dcemed spurious :— The Exposition of the True Faith; Epistle to Zenas and Serenus ; A Refutation of Certain Doctrincs of Aristotle ; Questions and Answers to the Orthodox ; Questions of Christians to Heathens ; Questions of Heathens to Christians.

The First Apology is undoubtedly genuine. It refers to the Jewish rebellion, 131-136, and was probably written 138-140 A.D. The Sceond Apology which has come down to us is probably not the second apology mentioncd by Euscbius, which has been lost, but a portion of the first. Thc authenticity of the Dialogue with Trypho has been disputed by Lange, Koch, Wettstein, &c.,

1593; Morell, Paris, 1615; Maran, Paris, 1742. is Otto's, 3d ed., Jena, 1876 and following years.

but their arguments are not convincing ; more interest attaches to the question whether it is historical or written in imita- tion of the dialogues of Plato; the greater weight of evidence lies on the side that it

is historical. The Speech to the Grecks is probably Justin's ; but the weight of evidence is against the authenticity of the remaining writings.

Editions. —Robert Stephanus, Paris, 1551; Sylburg, Heidelberg, The best edition

Good translations of Justin have appeared in the Oxford Library

of the Fathers, and in Clarke's Ante-Nicene Library.

Full information about Justin's history and views may be had

from Otto, De Justint Martyris Seriptis et Doctrina, Jena, 1841; and

from Donaldson's History of Christian Litcrature and Doctrine, London, 1866, vol. ii. For information about MSS., see Donald- son, p. 144, and Otto's prefaces. Otto refers, ii. p. XXVi, to a Codex Glascoviensis, but this isa mistake ; the MS. referred to cou- tains the orations of an Italian humanist Justiniani. (T. M. L.)

JUSTIN, Latin historian, called in one MS. Justinus Frontinus, in another M. Junianus Justinus, in others simply Justinus, is known from his Historiarwm Philippr- carum Libri XLIV., a work described by himself in his pre- face as a collection of the most important and interesting passages from the voluminous Historie Philippice et totius Mundi Origines et Terre Situs, written in the time of Augustus by Trogus Pompeius. Of Justin's personal history absolutely nothing is known. The passage in his preface on which was based the belief that he lived under Antoninus Pius is spurious ; but a reference to him by St Jerome fixes his date at some point before the 5th century. The work of Trogus is lost, probably helped into oblivion by the shorter compilation ; but the prologi, or arguments, of the forty-four books are extant, and a few fragments of the text are preserved by Pliny and other writers. rom the prologt we gather that, although the main theme of Trogus was the rise and history of the Macedonian monarchy, he yet permitted himself a freedom of digression that extended. very considerably the field of description, and makes it all the more to be regretted that Justinus chose to write a capricious anthology (breve velute slorum

corpusculum) instead of a regular epitome of the work. As it stands, however, Justin's history contains a large amount of valu- able information, which but for it we might never have possessed. The style, though far from perfect, has the merit of clearness, occasionally even of elegance.

The editio princeps of Justinus appeared at Venice, 1470, folio, from Jenson's press. An edition, folio, Rome, is referred to 1470 or 1471. The other chief editions are those of Sabellicus, Venice, folio, 1490, 1497, and 1507; Aldus, Venice, 8vo, 1522; Bongarsius, Paris, 8vo, 1581; Grevius, Leyden, 8vo, 1683; Hearne, Oxford, 8vo, 1705; Gronovius, Leyden, 1719 and 1760 (2d ed. in "Variorum " Classics); Frotscher, Leipsic, 8vo, 3 vols., 1827-30 ; Diibner, Leipsic, 8vo, 1831; and Dibner and Johanneau, Paris, 2 vols., 1838. Translations appeared very early in the chief European languages. There are English versions by Goldinge, 1564 ; Holland, 1606 ; Codrington, 1654; Browu, 1712; Bailey, 1732; Clarke, 1/32; Turnbull, 1746; and Watson, 1853.

JUSTIN I., the elder, Roman emperor of the East from 518 to 527, was originally a Dacian peasant ; but, enlisting under Leo I. he rose by his size and strength to be commander of the imperial guards of Anastasius. On the death of that emperor in 518, the wily Dacian, aged sixty-eight, used for his own election to the throne a sum of money that he had received for the support of another candidate. Though ignorant even of the rudiments of letters, Justin was sufficiently acute, and he was sensible enough to entrust the administration of state to his wise and faithful questor Proclus, though his own experience dictated several improvements in military affairs. An orthodox churchman himself, he effected in 519 a recon- ciliation of the Eastern and Western Churches, after a schism of thirty-five years (see Hormispas). 'The assassi- nation of the orthodox general Vitalian, and the virulence of the bloody conflicts of the "blue" and "green" factions that convulsed the capital towards the end of Justin's reign,

are attributed to the jealousy aud intrigues of the emperor's nephew and successor Justinian. In 522 a war broke out with Persia, in which

Belisarius made his first historical appearance ; it continued for some years without any defi- nite results. In 522 also Justin ceded to Theodoric, the Gothic king of Italy, the right of naming the consuls, and in 525 he received from that Arian monarch a deputation, of which the pope, John I., was compelled to be the leader, to deprecate an edict issued by Justin in 523 against all heretics. On April 1, 527, Justin, at the request of the senate, assumed Justinian as his colleague, and on the Ist of the following August he died. Justin bestowed much care on the repairing of public buildings throughout his empire, and contributed large sums to repair the damage caused by a destructive earthquake at Antioch.

JUSTIN IL, the younger, Roman emperor of the East from 565 to 578, was the nephew and successor of Jus- tinian I. He availed himself of his influence as master of the palace, and as husband of Sophia, the niece of the late empress Theodora, to secure a peaceful election. The first few days of his reign—when he paid his uncle's debts, administered justice in person, and proclaimed universal religious toleration—gave bright promise, realization of which was prevented either by his feebleness or his caprice. The most important event of his reign was the invasion of Italy by the Lombards, who, entering in 568 under Al- boin, in a few years made themselves masters of nearly the entire country. The common story that they were invited by the superseded and insulted exarch Narses, besides being inherently improbable, has but slender historical foundation. Modern historians see in the event only an evidence of the indifference of the Byzantine court to Italy, whence little revenue could be drawn. Justin's arrogance had insulted the embassies from the Persians and Avars, who had come to him in the first year of his reign ; and in 572 war broke out with the former, and in 573 with the latter. Although he formed alliances with the Turks of Central Asia and with the Ethiopians of Arabia in the one case, and with the Austrasian Franks in the other, the emperor's arms were unsuccessful in both wars. The temporary fits of insanity into which he fell warned him to name a colleague. Passing over his own relatives, he raised, ou the advice of Sophia, the brave general Tiberius to be Cesar in December 574, and withdrew for his remaining years into

retirement. ‘Tiberius was advanced to the dignity of Augustus on September 26, 578, and Justin died on the 5th of the following month.

JUSTINIAN I. (483-565), Flavius Anicius Jus- tinianus, surnamed the Great, the most famous of all the emperors of the Eastern Roman empire, was by birth a barbarian, native of a place called Tauresium in the dis trict of Dardania, a region of Illyricum,! and was born, most probably, on May 11, 483. His family has been variously conjectured, on the strength of the proper names which its members are stated to have borne, to have been Teutonic or Slavonic. The latter seems the more probable view. His own name was originally Uprauda. Justinianus was a Roman name which he took from his uncle Justin who adopted him, and to whom his advance- ment in life was due.? Of his early life we know nothing except that he came to Constantinople while still a young man, and received there an excellent education. Doubt- less he knew Latin before Greek; it is alleged that he always spoke Greek with a barbarian accent. When Justin

‘ It is commonly identified with the modern Giustendil, but Uskinb (the ancient Skupi) has also been suggested. See Tozer, Highlands of Kuropean Turkey, ii. p. 370. ;

- **“The name “ Upranda” itself is said to be derived from the word “‘prauda,” which in Old Slavic means “ jus,” “ justitia,” the prefix being simply a breathing frequently attached to Slavonic names.**

ascended the throne in 518 a.p., Justinian became at once a person of the first consequence, guiding, especially in church matters, the policy of his aged, childless, and ignoraut uncle, receiving high rank and office at his hands, and soon coming to be regarded as his destined successor, On Justin’s death in 527, having been a few months earlier associated with him as co-emperor, he succeeded without opposition to the throne.

His reign was filled with great events, both at home and abroad, both in peace and in war. They may be classed under four heads :—(1) his legal

reforms ; (2) his adminis- tration of the empire; (3) his ecclesiastical policy; and (4) his wars and foreign policy generally.

1, It is as a legislator and codifier of the law that Justinian's name is most familiar to the modern world; and it is therefore this department of his action that requires to be most fully dealt with here. He found the Jaw of the Roman empire in a state of great confusion. It consisted of two masses, which were usually distinguished as old law (jus vetus) and new law (jus novwm). The first of these comprised—(1) all such of the statutes (leges) passed under the republic and early empire as had not become obsolete ; (2) the decrees of the senate (senatus consulta) passed at the end of the republic and during the first two centuries of the empire; (3) the writings of the jurists of the later republic and of the empire, and more particularly of those jurists to whom the right of declaring the law with authority (jus respondendz) had been committed by the emperors. As these jurists had in their commentaries upon the leges, senatus consulta, and edicts of the magistrates practically incorporated all that was of importance in those documents, the books of the jurists may substantially be taken as including (1) and (2), These writings were of course very numerous, and formed a vast mass of hterature. Many of them had become exceedingly scarce,—many having of course been alto- gether lost. Some were of doubtful authenticity. They were so costly that no person of moderate means could hope to possess any large number ; even the public libraries had nothing approaching to a complete collection. More- over, as they proceeded from a large number of independ- ent authors, who wrote expressing their own opinions, they contained many discrepancies and contradictions, the dicta of one writer being controverted by another, while yet both writers might enjoy the same formal authority. A remedy had been attempted to be applied to this evil by a law of the emperors Theodosius II. and Valentinian ITI., which gave special weight to the writings of five eminent jurists (Papinian, Paulus, Ulpian, Modestinus, Gaius); but it was very far from removing it, As regards the jus vetus, therefore, the judges and practitioners of Justinian's time had two terrible difficulties to contend with,—first, the bulk of the law, which made it impos- sible for any one to be sure that he possessed any thing like the whole of the authorities bearing on the point in question,

so that he was always liable to find his opponent quoting agaiust him some authority for which he could not be prepared; and, secondly, the uncertainty of the law, there being a great many important points on which differing opinions of equal legal validity might be cited, so that the practising counsel could not advise, nor the judge decide, with any confidence that he was right, or that a superior court would uphold his view.

The new law (jus novum), which consisted of the ordinances of the emperors promulgated during the middle and later empire (edicta, rescripta, mandata, decreta, usually called by the general name of constitutiones), was in a con- dition not much better. These ordinances or constitutions were extremely numerous. No complete collection of them existed, for although two collections (Codex Gregorianus

and Codea Hermogenianus) had been made by two jurists ‘1 the 4th century, and a large supplementary collection published by the emperor Theodosius II. in 438 (Codex Theodosianus), these collections did not include all the constitutions, there were others which it was necessary to obtain separately, but many whereof it must have been impossible for a private person to procure. In this branch too of the law there existed some, though a less formidable, uncertainty ; for there were constitutions which practically, if not formally, repealed or superseded others without ex- pressly mentioning them, so that a man who relied on the words of one constitution might find that it had been varied or abrogated by another he had never heard of or on whose sense he had not putsuch a construction. It was therefore clearly necessary with regard to both the older and the newer law to take some steps to collect into one or more bodies or masses so much of the law as was to be regarded as binding, reducing it within a reasonable compass, and purging away the contradictions or inconsistencies which it contained. ‘The evil had been long felt, and reforms apparently often proposed, but nothing (except by the compilation of the Codex Theodosianus) had been done till Justinian’s time. Imnuediately after his accession, in 528, he appointed a conimission to deal with the

imperial con- stitutions (jus novum), this being the easier part of the problem. ‘The commissioners, ten in number, were directed to go through all the constitutions of which copies existed, to select such as were of practical value, to cut these down by retrenching all unnecessary matter, and gather them, arranged in order of date, into one volume, getting rid of any contradictions by omitting one or other of the conflict- ing passages.! These statute law commissioners, a8 one may call them, set to work forthwith, and completed their task in fourteen months, distributing the constitutions which they placed in the new collection into ten books, in general conformity with the order of the Perpetual Edict as settled by Salvius Julianus and enacted by Hadrian. By this means the bulk of the statute law was immensely reduced, its obscurities and internal dis- crepancies in great measure removed, its provisions adapted, by the abrogation of what was obsolete, to the circum- stances of Justinian’s own time. ‘This Codex Constitu- tionwm was formally promulgated and enacted as one great consolidating statute in 529, all imperial ordinances not included in it being repealed at one stroke.

The success of this first experiment encouraged the emperor to attempt the more difficult enterprise of simplify- ing and digesting the older law contained in the treatises of the jurists. Before entering on this, however, he wisely took the preliminary step of settling the more important of the legal questions as to which the older jurists had been divided in opinion, and which had therefore remained sources of difficulty, a difficulty aggravated by the general decline, during the last two centuries, of the level of forensic and judicial learning. This was accomplished by a series of constitutions known as the “ Fifty Decisions” (Quinqua- ginta Decisiones), along with which there were published other ordinances amending the law in a variety of points, in which old and now inconvenient rules had been suffered to subsist. Then in December 530 a new commission was appointed, consisting of sixteen eminent lawyers, of whom the president,the famous Tribonian (who had already served on the previous commission), was an exalted official (quexstor), four were professors of law, and the remaining eleven practising advocates. The instructions given to them by the

emperor were as follows :—_they were to pro- cure and peruse all the writings of all the authorized jurists

1 See, for an aceount of the instructions given to the commission, the

constitution Hee Que, prefixed to the revised Codéx in the Corpus Juris Civilis.

(those who had enjoyed the jus respondendt) ; were to extract from these writings whatever was of most permanent and substantial value, with power to change the expressions of the author wherever conciseness or clearness would be thereby promoted, or wherever such a change was needed in order to adapt his language to the condition of the law as it stood in Justinian's time; were to avoid repetitions and contradictions by giving only one statement of the law upon each point ; were to insert nothing at variance with any provision contained in the Codex Constitutionum ; and were to distribute the results of their labours into fifty books, subdividing each book into titles, and following generally the order of the Perpetual Edict?

These directions were carried out with a speed which is surprising when we remember not only that the work was interrupted by the terrible insurrection which broke out in Constantinople in January 532, and which led to the tem- porary retirement from office of Tribonian, but also that the mass of literature which had to be read through consisted of no less than two thousand treatises, comprising three millions of sentences. The commissioners, who had for greater despatch divided themselves into several commit- tees, presented their selection of extracts to the eiperor in 533, and he published it as an imperial statute on December 16th of that year, with two prefatory constitu- tions (those known as Omnem retpublice and Dedit nobis). It is the volume which we now call the Digest (Digesta) or Pandects (WdvSexrat), and which is by far the most precious monument of the legal genius of the Romans, and indeed, whether one regards the intrinsic merits of its substance or the prodigious influence it has exerted and still exerts, the most remarkable law-book that the world

has seen. The extracts comprised in it aro 9123 in number, taken from thirty-nine authors, and are of greatly varying length, mostly only a few lines long. About one-third (in quantity) come from Ulpian, a very copious writer ; Paulus stands next, To each extract there is prefixed the name of the author, and of the treatise whence it is taken. The worst thing about the Digest is its highly unscientific arrange- ment. The order of the Perpetual Edict, which appears to have been taken as a sort of model for the general scheme of books and titles, was doubtless convenient to the Roman lawyers from their familiarity with it, but was in itself rather accidental and historical than logical. The disposition of the extracts inside each title was still less rational; it has been shown by a modern jurist to have been the result of the way in which the committees of the commissioners worked through the books they liad to

eruse.¢ In enacting the Digest as a law book, J ustinian repealed all the other law contained in the treatises of the jurists (that jus vetus which has been already mentioned), 'and directed that those treatises should never be cited in future even by way of illustration ; and he of course at the same time abrogated all the older statutes, from the Twelve Tables downwards, which had formed a part of the jus vetus. This was a necessary incident of his scheme of reform. But he went too far, and indeed attempted what was impossible, when he forbade all commentaries upon the Digest. He was obliged to allow a Greek translation to bo made of it, but directed this translation to be exactly literal.

These two great enterprises had substantially despatched

2 See the constitution Deo Auctore (Cod. i. 17, 1). 3In the Middle Ages people used to cite passages by the initial words ; and the Germans do so still, giving, however, the number of the paragraph in the extract (if there are more para raphs than one), and appending the number of the book and title' We in Britain and America usually cite by the numbers of the book, the title, and the paragraph, without referring to the initial words.

See Bluhme, " Die Orduung der Fragmente in den Pandektentiteln." in Savigny's Zettschr. f. gesch. Rechtswissenschaft, vol. iv.

Justinian's work; however, he, or rather Tribonian, who seems to lave acted both as his adviser and as his chief executive officer in all legal affairs, conceived that a third book was needed, viz, an elementary manual for begin- ners which should present an outline of the law in a clear and simple form. The little work of Gaius, most of which we now possess under the title of Commentarii Institutionum, had served this purpose for nearly four centuries; but much of it had, owing to changes in the law, become inapplicable, so that a new manual seemed to be required. Justinian accordingly directed Tribonian, with two coadjutors, Theophilus, professor of law in thie university of Constantinople, and Dorotheus, professor in the great law school at Beyrout, to prepare an elementary text-book on the lines of Gaius. This they did while the Digest was in progress, and produced the useful little treatise which has ever since been the book with which students commonly begin their studies of Roman law, the Institutes of Justinian. It was published as a statute with full legal validity shortly befcre the Digest. Such merits as it possesses—simplicity of arrangement, clear- ness and conciseness of expression—belong rather to Gaius, who has been closely followed. wherever the alterations in the law had not made him obsolete, than to Tribonian. However, the spirit of that great legal classic seems to have in a measure dwelt with and inspired the inferior men who were recasting his work; the Jnstztutes is better both in Latinity and in substance than we should have expected from the condition of Latin letters at that epoch, better than the other laws which emanate from Justinian.

In the four years and a half which elapsed between the publication of the Codex and that of the Duogest, many important changes had been made in the law, notably by the publication of the " Fifty Decisions," which settled many questions that had exercised the legal mind and given occasion to intricate statutory provisions. It was therefore natural that the idea should present itself of revising the Codex, so as to introduce these changes into it, for by so doing, not only would it be

simplified, but the one volume would again be made to contain the whole statute law, whereas now it was necessary to read along with it the ordinances issued since its publication. Accord- iugly another commission was appointed, consisting of Tri-

bonian with four other coadjutors, full power being given |

them not only to incorporate the new constitutions with the Codex and make in it the requisite changes, but also to revise the Codex generally, cutting down or filling in wherever they thought it necessary to do so. This work was completed in a few months; and in November 534, the revised Codex (Codex repetitx prelectionis) was pro- mulgated with the force of law, prefaced by a constitution (Cordi nobis) which sets forth its history, and declares it to be alone authoritative, the former Codex being abro- gated. It is this revised Codex which has come down to the modern world, all copies of the earlier edition having disappeared.

The constitutions contained in it number 4652, the earliest dating from Hadrian, the latest being of course Justinian'sown.

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The emperor's scheme was now complete. All the Roman Jaw had becn gathered into two volumes of not immoderate size, and a satisfactory manual for beginners added. But, as the appetite comes with eating, Justinian and Tribonian had grown so fond of legislat- ing that they found it hard to leave off. Moreover, the very sim- plifications that had been so far effected brought into view with more clearness such anomalies or pieces of injustice as still continued to deform the law. Thus no sooner had the work been rounded off than fresh excrescences began to be createcd by the publication of new laws. Betwecn 534 and 565 Justinian issucd a great num- ber of ordinances, dealing with all sorts of subjects, and seriously altering the law on many points,—the majority appearing before the death of Tribonian, which happened in 545. These ordinances are called, by way of distinction, new constitutions, Novelle consti. tutiones post Codieem (veapat Siardte:s), Novels. Although the empcror had stated in publishing the Codex that all further statutes (if any) would be officially collected, this promisc

does not seem to have been redeemed. The three collections of the Novels which we possess are apparently private collections, nor do we even know how many such constitutions were promulgated. One of the three con- tains 168 (together with 13 Edicts), but some of these are by the empcrors Justin II. and Tiberius H. Another, the so-called Epitome of Julian, contains 125 Novels in Latin ; and the third, the Liber Authenticarum or Vulgata Versio, has 134, also in Latin. This last was the collection first known and chiefly used in the West during the Middle Ages; and of its 1384 only 97 have been written on by the glossatores or medieval commentators; these therefore alone have been received as binding in those countries which recog- nize and obey the Roman law,—according to the maxim Qutcquid non agnosett glossa, nee agnoscit curia. And, whereas Justinian's con- stitutions contained in the Codex were all issned in Latin, the rest of the book being in that tongue, these Novels were nearly all pub- lished in Greek, Latin translations being of course made for the use of the western provinces. They arc very bulky, and with the exception of a few, particularly the 116th and 118th, which intro- duce the most sweeping and laudable reforms into the law of intes- tate succession, are much more interesting as supplying materials for the history of the time, social, economical, and ecclesiastical, than in respect of any purely legal merits. They may be found printed in any edition of the Corpus Juris Civilis.

This Corpus Juris, which bears and immortalizes Justinian's name, consists of the four books described above :—(1) the authorized col- lection of imperial ordinances (Codex Constitutionwm); (2) the authorized collection of extracts from the great jurists (Digesta or Pandectx) ; (3) the elementary handbook (Lnstituéiones); (4) the unauthorized collection of constitutions subsequent to the Codex (Novellz).

From what las been already stated, the reader will per- ceive that Justinian did not, according to a strict use of terms, codify the Roman law. By a codification, we under- stand the reduction of the whole pre-existing body of law to a new form, the restating it in a series of propositions, scientifically ordered, which may or may not contain some new substance, but are at any rate new in form. If he had, so to

speak, thrown into one furnace all the law con- tained in the treatises of the jurists and in the imperial ordinances, fused them down, the gold of the one and the silver of the other, and run them out into new moulds, this would have been codification. What he did do was some- thing quite different. It was not codification but consoli- dation, not remoulding but abridging. He made extracts from the existing law, preserving the old words, and merely cutting out repetitions, removing contradictions, retrenching superfluities, so as immensely to reduce the bulk of the whole. And he made not one set of such extracts but two, one for the jurist law, the other for the statute law. He gave to posterity not one code but two digests or collec- tions of extracts, which are new only to this extent that they are arranged in a new order, having been previously altogether unconnected with one another, and that here and there their words have been modified in order to bring one extract into harmony with some other. Except for this, the matter is old in expression as well as In sub- stance. :

Thus regarded, and even omitting to remark that the Novels, never having been officially collected, much less incorporated with the Codex, mar the symmetry of the structure, Justinian's work may appear to entitle him and Tribonian to much less credit than they have usually

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received for it. But let it be observed, first, that to reduce the huge and confused mass of pre-existing law into the compass of these two collections was an immense practical benefit to the empire; secondly, that, whereas the work which he undertook was accomplished in seven years, the infinitely more difficult task of codification miglit probably have been left unfinished at Tribonian's death, or even at Justinian's own, and been abandoned by lis successor; thirdly, that in the extracts preserved in the Digest we have the opinions of the greatest legal luminaries given in their own admirably lucid, philosophical, and concise language, while in the extracts of which the Codex is composed we find valuable historical evidence bearing ou the administration and social condition of the later pagan and earlier Christian empire; fourthly, that Justinian's age, that is to say, the intellect of the men

whose services lie commanded, was quite unequal to so vast an undertak- ing as the fusing upon scientific principles into one new organic whole of the entire law of the empire. With sufficient time and labour, the work might no doubt have been done ; but what we possess of Justinian's own legisla- tion, and still more what we know of the general condition of literary and legal capacity in his time, makes it certain that it would not have been well done, and that the result would have been not more valuable to the Romans of that age, and much less valuable to the modern world, than are the results, preserved in the Digest and the Codex, of what he and Tribonian actually did.

To the merits of the work as actually performed some reference has already been made. The chief defect of the Digest is in point of scientific arrangement, a matter about which the Roman lawyers, perhaps one may say the ancients generally, cared very little. There are some re- petitions and some inconsistencies, but not more than may fairly be allowed for in a compilation of such magnitude executed so rapidly. Tribonian has been blamed for the insertions the compilers made in the sentences of the old jurists (the so-called Lmblemata Triboniant); but it was a part of Justinian's plan that such insertions should be made, so as to adapt those sentences to the law as settled in theemperor's time. On Justinian's own laws, contained in the Codex and in his Novels, a somewhat less favourable judgment must be pronounced. They, and especially the latter, are diffuse and often lax in expression, needlessly prolix, and pompously rhetorical. The policy of many, particularly of those which deal with ecclesiastical matters, may also be condemned; yet some gratitude is due to the legislator who put the law of intestate succession on that plain and rational footing whereon it has ever since continued to stand. It is somewhat remarkable that, although Justinian is so much more familiar to us by his legislation than by anything else, this sphere of his imperial labour is hardly referred to by any of the contemporary historians, and then only with censure. Procopius com- plains that he and Tribonian were always repealing old laws and enacting new ones, and aceuses them of venal motives for doing so.

The Corpus Juris of Justinian continued to be, with of course a few additions in the ordinances of succeeding emperors, the chief law-book

of the Roman world till the time of the Macedonian dynasty, when, towards the end of the 9th century, a new system was prepared and issued by those sovereigns, which we know as the Basilica, It is of course written in Greek, and consists of parts of the substance of the Codex and the Digest, thrown together and often altered in expression, together with some matter from the Novels and imperial ordinances posterior to Justinian. In the western provinces, which had been wholly severed from the empire before the publication of the Basilica, the law as settled by Justinian held its ground ; but copies of the Corpus Juris were extremely

ae nor did the study of it revive until the end of the 11th cen- ury.

The best edition of the Digest is that of Mommsen, Berlin, 1868-70, and of the Codex that of Krueger, Berlin, 1875-77.

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2, In his financial administration of the empire, Justinian is represented to us as being at once rapacious and extravagant. His unwearied activity and inordinate vanity led him to form all kinds of expensive projects, and under- take a great many costly public works, many of them, such as the erection of palaces and churches, unremunerative. The money needed for these, for his wars, and for buying off the barbarians who threatened the frontiers, had to be obtained by increasing the burdens of the people. They suffered, not only from the regular taxes, which were seldom remitted even after bad seasons, but also from monopolies ; and Procopius goes so far as to allege that the emperor made a practice of further recruiting his treasury by con- fiscating on slight or fictitious pretexts the property of persons who had displeased Theodora or himself. Fiscal severities were no doubt one cause of the insurrections which now and then broke out, and in the gravest of which, 532 a.p., thirty thousand persons are said to have perished in the capital. It is not always easy to discover, putting together the trustworthy evidence of Justinian’s own laws and the angry complaints of Procopius, what was the nature aud justification of the changes made in the civil administration. But the general conclusion seems to be that these changes were always in the direction

of further centralization, increasing the power of the chief ministers and their offices, bringing all more directly under the control of the crown, and in some cases limiting the pqwers and appropriating the funds of local municipalities, Financial necessities compelled retrenchment, so that a certain number of offices were suppressed altogether, much to the disgust of the office-holding class, which was numerous and wealthy, and had almost come to look on the civil service as its hereditary possession, The most remarkable instance of this policy was the discontinuance of the consulship. This great office had remained a dignity centuries after it had ceased to be a power; but it was a very costly dignity, the holder being expected to spend large sums in public displays. As these sums were provided by the state, Justinian saved something considerable by stopping the payment. He named no consul after Basilius, who was the name-giving consul of the year 541 A.p.

In a bureaucratic despotism the greatest merit of a sovereign is to choose capable and honest ministers. Justinian's selections were usually capable, but not so often honest ; probably it was hard to find thoroughly upright people; possibly they were not the people who would have been most serviceable in carrying out the imperial will, and especially in replenishing the imperial treasury. Even the great Tribonian labours under the reproach of corruption, while the fact that Justinian maintained John of Cappadocia in power long after his greed, his unscrupulousness, and | the excesses of his private life had excited the anger of the whole empire, reflects little credit on his own principles of government and sense of duty to his subjects. The department of administration in which he seems to have felt most personal interest was that of public works. He spent immense sums on buildings of all sorts, on quays aud harbours, on fortifications, repairing the walls of cities and erecting castles in Thrace to check the inroads of the barbarians, on aqueducts, on monasteries, above all, upon churches. Of these works only two remain perfect, St Sophia in Constantinople, now a mosque, and one of the architectural wonders of the world, and the church of SS. Sergius and Bacchus, now commonly called Little St Sophia, which stands about half a mile from the great church, and is in its way a very delicate and beautiful piece of work.

The church of San Vitale at Ravenna, though built in Justinian's reign, and containing mosaic pictures of him and Theodora, does not appear to have owed anything to his mind or purse.

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3. Justinian's ecclesiastical policy was so complex and varying that it is impossible within the limits of this article to do more than indicate its bare outlines. For many years before the accession of lis uncle Justin, the Eastern world had been vexed by the struggles of the Monophysite party, who recognized only one nature in Christ, against the view which then and ever since has maintained itself as orthodox, that the divine and human natures coexisted in Him. The latter doctrine had triumphed at the coun- cil of Chalcedon, and was held by the whole Western Church, but Egypt, great part of Syria and Asia Minor, and a considerable minority even in Constantinople clung to Monophysitism. The emperors Zeno and Anastasius had been strongly suspected of it, and the Roman bishops had refused to communicate with the patriarchs of Con- stantinople since 484, when they had condemned Acacius for accepting the formula of conciliation issued by Zeno. One of Justinian's first public acts was to put an end to this schism by inducing Justin to make tle then patri- arch renounce this formula and declare his full adhesion to the creed of Chalcedon. When he himself came to the throne he endeavoured to persuade the Monophysites to come in by summoning some of their leaders to a con- ference. This failing, he ejected suspected prelates, and occasionally persecuted them, though with far less severity than that applied to the heretics of a deeper dye, such as Montanists or even Arians. Not long afterwards, his atten- tion having been called to the spread of Origenistic opinions in Syria, he issued an edict condemning fourteen proposi- tions drawn from the writings of the great Alexandrian, and caused a synod to be held under the presidency of Mennas (whom he had named patriarch of Constantinople), which renewed the condemnation of the impugned doctrines and anathematized Origen himself. Still later, he was induced by the machinations of some of the prelates who haunted his court, and by the influence of Theodora, herself much interested in theological questions, and more than suspected of Monophysitism, to raise a

needless, mischievous, and pro- tracted controversy. The Monophysites sometimes alleged that they could not accept the decrees of the council of Chal- cedon because that council had not condemned, but (as they argued) virtually approved, three writers tainted with Nes- torian principles, viz., Theodore of Mopsuestia, Theodoret, and Ibas, bishop of Edessa. It was represented to the emperor, who was still pursued by the desire to bring back the schismatics, that a great step would have been taken towards reconciliation if a condemnation of these teachers, or rather of such of their books as were complained of, could be brought about, since then the Chalcedonian party would be purged from any appearance of sympathy with the errors of Nestorius. Not stopping to reflect that in the angry and suspicious state of men's minds he was sure to lose as much in one direction as he would gain in the other, Justinian entered into the idea, and put forth an edict exposing and denouncing the errors contained in the. writings of Theodore generally, in the treatise of Theodoret against Cyril of Alexandria, and in a letter of Bishop Ibas (a letter whose authenticity was doubted, but which passed under his name) to the Persian bishop Maris. This edict was circulated through the Christian world to be subscribed by the bishops, The four Eastern patriarchs, and the great majority of the Eastern prelates generally, subscribed, though reluctantly, for it was felt that a dangerous precedent was being set when dead authors were anathematized, and that this new movement could hardly fail to weaken the authority of the council of Chalcedon. Among the Western bishops, who were less disposed both to Monophysitism and to subservience, and especially by those of Africa, the edict was earnestly resisted. When it was found that Pope Vigilius did not

forthwith comply, he was summoned to Constantinople. Even there he resisted, not so much, it would seem, from any scruples of his own, for he was not a high-minded man, as because he knew that he dared not return to Italy if he gave way. Long disputes and negotiations followed, the end of which was that Justinian summoned a general council of the church, that which we reckon the Fifth, which condemned the impugned writings, and anathe- matized several other heretical

authors. Its decrees were received in the East, but long contested in the Western Church, where a schism arose that lasted for seventy years. This is the controversy known as that of the Three Chapters (Tria capitula, rpia xepddAara), apparently from the three propositions or condemnations contained in Justinian's original edict, one relating to Theodore's writings and person, the second to the incriminated treatise of Theodoret (whose person was not attacked), the third to the letter (if genuine) of Ibas (see Hefcle, Conciliengeschichte, ii, 777).

At the very end of his long career of theological dis- cussion, Justinian himself lapsed into heresy, by accepting the doctrine that the earthly body of Christ was incorrup- tible, insensible to the weaknesses of the flesh, a doctrine which had been advanced by Julian, bishop of Halicarnassus, and went by the name of Aphthartodocetism. According to his usual practice, he issued an edict enforcing this view, and requiring all patriarchs, metropolitans, and bishops to subscribe to it. Some, who not unnaturally held that it was rank Monophysitism, refused at once, and were deprived of their sees, among them Eutychius the eminent patriarch of Constantinople. Others submitted or temporized ; but, before there had been time enough for the matter to be carried throngh, the emperor died, having tarnished if not utterly forfeited by this last error the reputation won by a life devoted to the service of orthodoxy.

As no preceding sovereign had been so much interested in church affairs, so none seems to have shown so much activity as a persecutor both of heathens and of heretics. He renewed with additional stringency the laws against both these classes. The former embraced a large part of the rural population in certain secluded districts, such as parts of Asia Minor and Peloponnesus; and we are told that the efforts directed against them resulted in the forcible baptism of seventy thousand persons in Asia Minor alone. Heathenism, however, survived ; we find it in Laconia in the end of the 9th century, and in northern Syria it has lasted till our own times. There were also a good many crypto-pagans among the educated population of the capital. Procopius, for instance, if he was not actually a pagan, was certainly very little of a Christian. Inquiries made in the third year of Justinian's

reign drove nearly all of these persons into an outward conformity, and their offspring seem to have become ordinary Christians. At Athens, the philosophers who taught in the schools hallowed by memories of Plato still openly professed what passed for heathenism, though it was really a body of moral doctrine, strongly tinged with mysticism, in which there was far more of Christianity and of the speculative metaphysics of the East than of the old Olympian religion. Justinian, partly from religious motives, partly because he discoun- tenanced all rivals to the imperial university of Constant- nople, closed these Athenian schools (529). The pro- fessors sought refuge at the court of Chosroes, king of Persia, but were soon so much disgusted by the ideas and practices of the fire-worshippers that they returned to the empire, Chosroes having magnanimously obtained from Justinian a promise that they should be suffered to pass the rest of their days unmolested. Heresy proved more obstinate. The severities directed against the Montanists of Phrygia led to a furious war, in which most of the sectarles perished, while the doctrine was not extinguished. Harsh

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a head. pretext the murder of Queen Amalasontha, daughter of

laws provoked the Samaritans to a revolt, from whiose effects Palestine had not recovered when conquered by the Arabs in the following century. The Nestorians and the Eutychian Monophysites were not threatened with such severe civil penalties, although their worship was interdicted, and their bishops were sometimes banished ; but this vexa- tious treatment was quite enough to keep them disaffected, and the rapidity of the Mahometan conquests may be partly traced to that alienation of the bnlk of the Egyptian and a large part of the Syrian population which dates from Justinian's persecutions.!

4. Justinian was engaged in three great foreign wars, two of them of his own seeking, the third a legacy which nearly every emperor had come into for three centuries, the secular strife of Rome and Persia. The Sassanid kings of Persia ruled a dominion which extended from the confines of Syria to those of India, and from the straits of Oman to the Caucasus. The martial character of their population made them

formidable enemies to the Romans, whose troops were at this epoch mainly barbarians, the settled and civilized subjects of the empire being as a rule averse to war. When Justinian came to the throne, his troops were maintaining an unequal struggle on the Euphrates against the armies of Kobad. After some campaigns, in which the skill of Belisarius obtained considerable successes, a peace was concluded in 533 with Chosroes Anushirvan, who had succeeded Kobad two years before. This lasted till 539, when Chosroes declared war, alleging that Justinian had been secretly intriguing against him with the Ephtha- lite Huns, and doubtless moved by alarm and envy at the victories which the Romans lad been gaining in Italy. The emperor was too much occupied in the West to be able adequately to defend his eastern frontier. Chosroes advanced into Syria with little resistance, and in 540 captured Antioch, then the greatest city in Asia, carrying off its inhabitants into captivity. The war continued with varying fortunes for four years more in this quarter ; while in the meantime an even fiercer struggle had begun in the mountainous region inhabited by the Lazes at the south- eastern corner of the Black Sea. When after two and twenty years of fighting no substantial advantage had been gained by either party, Chosroes agreed in 562 to a peace which left Lazica to the Romans, but under the dishonour- able condition of their paying thirty thousand pieces of gold annually to the Persian king. Thus no result of permanent importance flowed from these Persian wars, except that they greatly weakened the Roman empire, increased Justinian's financial embarrassments, and prevented him from prosecut- ing with sufficient vigour his enterprises in the West.

These enterprises had begun in 533 with an attack on the Vandals, who were then reigning in Africa. Belisarius, despatched from Constantinople witha large fleet and army, landed without opposition, and destroyed the barbarian power in two engagements. North Africa from beyond the straits of Gibraltar to the Syrtes became again a Roman province, althongh the Moorish tribes of the interior maintained a species of independence ; and part of southern Spain was also recovered for the empire. The ease with which so important a conquest had been effected encouraged Justinian to attack the Ostrogoths of Italy, whose kingdom, though vast in extent, for it

included part of south-eastern Gaul, Rhetia, Dalmatia, and part of Pannonia, as well as Italy, Sicily, Sardinia, and Corsica, had been grievously weakened by the death first of the great Theodoric, and some years later of his grandson Athalaric, so that the Gothic nation was practically without

; 1 For a fuller account of the ecclesiastical policy of Justinian and its results the present writer ventures to refer to the article ‘ Jus- tinian” which he has contributed to the third volume of Dr Smith’s Dictionary of Christian Biography.

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Justinian began the war in 535, taking as his

Theodoric, who had placed herself under his protection, and alleging that the Ostrogothic kingdom had always owned a species of allegiance to the emperor at Constanti- nople. There was some foundation for this claim, although of course it could not have been made effective against Theodoric, who was more powerful than his supposed suzerain. Belisarius, who had been made commander of the Italian expedition, overran Sicily, reduced southern Italy, and in 536 occupied Rome. Here he was attacked in the following year by Vitigis, who had been chosen king by the Goths, with a greatly superior force, After a siege of more than a year, the energy, skill, and courage of Belisarius, and the sickness which was preying on his troops, obliged Vitigis to retire. Belisarius pursued his diminished army northwards, shut him up in Ravenna, and ultimately received the surrender of that impregnable city. Vitigis was sent prisoner to Constantinople, where Justinian treated him, as he had previously treated the captive Vandal king, with clemency. The imperial administration was established through Italy, but its rapacity soon began to excite discontent, and the kernel of the Gothic nation had not submitted. After two short and unfortunate reigns, the crown had been bestowed on Totila or Baduila, a warrior of distinguished abilities, who by degrees drove the imperial generals and governors out of Italy. Belisarius was sent against him, but with forces too small for the gravity of the situation. He moved from place to place during several years, but saw city after city captured by or open its

gates to Totila, till only Ravenna, Otranto, and Ancona remained. Justinian was occupied by the ecclesiastical controversy of the Three Chapters, and had not the money to fit out a proper army and fleet ; indeed, it may be doubted whether he would ever have roused himself to the necessary exertions but for the presence at Constantinople of a knot of Roman exiles, who kept urging him to reconquer Italy, representing that with their help and the sympathy of the people it would not be a difficult enterprise. The emperor at last complied, and in 552 a powerful army was despatched under Narses, an Armenian eunuch now advanced in life, but reputed the most skilful general of the age, as Belisarius was the hottest soldier. Ele marched along the coast of the Gulf of Venice, and encountered the army of Totila at Tagine, not far from Cesena. Totila was slain, and the Gothic cause irretrievably lost. The valiant remains of the nation made anotherstand under Teiason the Lactarian hillin Campania; after that they disappear from history. Italy was recovered for the empire, but it was an Italy terribly impoverished and depopulated, whose possession carried little strength with it. Justinian's policy both in the Vandalic and in the Gothic war stands condemned by the result. The resources of the state, which might better have been spent in defend- ing the northern frontier against Slavs and Huns.and the eastern frontier against Persians, were consumed in the conquest of two countries which had suffered too much to be of any substantial value, and which, separated by language as well as by intervening seas, could not be per- manently retained. However, Justinian must have been almost preternaturally wise to have foreseen this: his conduct was in the circumstances only what might have been expected from an ambitious prince who perceived an opportunity of recovering territories that had formerly belonged to the empire, and over which its rights were conceived to be only suspended.

Besides these three great foreign wars, Justinian's reign was troubled by a constant succession of border inroads, especially on the northern frontier, where the various Slavonic and Hunnish tribes who were established along

the lower Danube and on the north coast of the Black Sea niade frequent marauding expeditions into Thrace and Macedonia, sometimes penetrating as far as the walls of Constantinople in one direction and the isthmus of Corinth in another. Immense dimage was inflicted by these marauders on the subjects of the empire, who seem to have been mostly too peaceable to defend themselves, and whom the emperor conld not spare troops enough to protect. Fields were laid waste, villages burnt, large numbers of people carried into captivity; and on one occasion the capital was itself in danger.

It only remains to say something regarding Justinian's personal character and capacities, with regard to which a great diversity of opinion has existed among historians. The civilians, looking on him as a patriarch of their science, have as a rule extolled his wis- dom and virtues; while ecclesiastics of the Roman Church, from Cardinal Baronius downwards, have been offended by his arbitrary conduct towards the popes, and by his last lapse into heresy, and have therefore been disposed to accept the stories which ascribe to him perfidy, cruelty, rapacity, and cxtravagance. The difficulty of arriving at a fair conclusion is increased by the fact that Procopius, who is our chief authority for the events of his reigu, speaks with avery different voice in his seerct memoirs (the Azeedota) from that which ho has used in his published history, and that some of the

accusations contained in the former work are so rancorous and im-

probable that a certain measure of discredit attaches to everything which it contains. The truth seems to be that Justinian was not a great ruler in the higher sense of the word, that is to say, a man of large views, deep insight, a capacity for forming just such plans as the circumstances needed, and carrying them out by a skilful adaptation of means to ends. But le was a man of considerable abilitios, wonderful activity of mind, and admirable industry. He was interested in many things, and threw himself with ardour into whatever he took up; he contrived schemes quickly, and pnshed them on with an energy which usually made them succeed when no long time was needed, for, if a project was delayed, there was a risk of his tiring of it and dropping it.

Although vain and full of self- confidence, he was easily led by those who knew how to get at him, and particularly by his wife. She exercised over him that influence which a stronger character always exercises over a weaker, whatever their respective positions ; and unfortunately it was seldom a good influence, for Theodora seems to have been a woman who, with all her brilliant gifts of intelligence aud manner, hadno principles and no pity. Justinian was rather quick than strong or profound; his policy does not strike one as the result of deliberate and well-considered views, but dictated by the hopes and fancies of the moment. His activity was in so far a misfortune as it led him to attempt too many things at once, and engage in undertakings so costly that oppression became necessary to provide the funds forthem. Even his devotion to work, which excites our admiration in the centre of a luxurious court, was to a great extent unprofitable, for it was mainly given to theological controversies which neither he nor any one else could settle. Still, after making all deductions, it is plain that the man who accomplished so much, and kept the whole world so occupied, as Justinian did during the thirty-eight years of his reign, must have possessed no common abilities. He was affable and easy of approach to all his subjects, with a pleasant address ; nor does he seem to have been, like his wife, either cruel or revengeful. We hear several times of his sparing those who had conspired against him. But he was not scrupulous in the means he employed, and he was willing to maintain in power detestable ministers if only they served him efficiently and filled his coffers. Wis chief passion, after that for his own fame and glory, seems to have been for theology and religion ; it was in this field that his literary powers exerted them- selves (for he wrote controversial treatises and hymns), and his taste also, for among his numerous buildings the churches are those on which he spent most thought and money. Considering that his legal reforms are those by which his name is mainly known to posterity, it is curious that we should have hardly any information as to his legal knowledge, or the sharo which he took in those reforms. In person he was somewhat above the middle height, well-shaped, with plenty of fresh colour in his cheeks, and an extraordinary power of doing without food and slecp. He spent most of the night in reading or writing, and would sometimes go for a day with no food but a few green herbs. Two mosaic figures of him exist at

Ravenna, one in the apso of the church of S. Vitale, the other in the church of 8. Apollinare in Urbe ; but of course one cannot be sure how far in such a stiff material the portrait fairly represents the original, He had no children by his marriage with Theodora, and did not marry after her decease. On his death, which took place November 14, 565, the crown passed to his nephew Justin IT.

Authorities,—¥For the life of Justinian the chief authorities are Procopius (Historiv, De Adifieiis, Aneedota) and (from 552 A.D.)

-(2 vols., Paris, 1856).

the History of Agathias ; the Chronicle of Johannes Malalas is also of value. Occasional reference must be made to the writings of Jordanes and Marcellinus, and even to the late compilations of Cedrenus and Zonaras. The Vita Justiniani of Ludewig or Ludwig (Halle, 1731), a work of patient research, is frequently referred to by Gibbon in his important chapters relating to the reign of Justinian. There is a Vie de Justinien by Isambert (J. BR.)

JUSTINIAN IT, Rhinotmetus, Roman emperor of the East from 685 to 695, and from 704 to 711, succeeded his father Constantine IV., at the age of sixteen. His reign was unhappy both at home and abroad. He made a truce with the Arabs, which admitted them to the joint possession of Armenia, Iberia, and Cyprus, while by remov- ing 10,000 Christian Maronites from their native Lebanon, he gave the Arabs a command over Asia Minor of which they took advantage in 692 by conquering all Armenia. In 688 Justinian was defeated by the Bulgarians. Mean- while the bitter dissensions caused in the church by the emperor, his bloody persecution of the Manicheans, and the insatiable and cruel rapacity with which, through his creatures Stephanus and Theodatus, he extorted the means of gratifying his sumptuous tastes, maddened his sub- jects into rebellion. In 695 they rose under Leontius, and, after cutting off the emperor's nose (whence lis sur- name), banished him to Chersonin the Crimea. Leontius, after a reign of three years, was in turn dethroned and imprisoned by Tiberins

Absimarus, who next assumed the purple. Justinian meanwhile had escaped from Cherson and married Theodora, sister of Busirus, khan of the Khazars. Compelled, however, by the intriguesof Tiberius, to quit his new home, he fled to Terbelis, king of the Bulgarians. With anarmy of 15,000 horsemen Justinian suddenly pounced upon Constautinople, slew his rivals Leontius and Tiberius, with thousands of their partisans, and once more ascended the throne in 704. His second reign was marked by an unsuccessful war against Terbelis, by Arab victories in Asia Minor, by devastating expeditions sent against his own cities of Ravenna and Cherson, and by the same cruel rapacity towards his subjects. Con- spiracies again broke out; Bardanes, surnamed Philip- picus, assumed the purple; and Justinian, the last of the house of Heraclius, was assassinated in Asia Minor, December 711.

JUTE isa vegetable fibre which, notwithstanding the fact that it has come under the notice of manufacturing communities only within comparatively recent times, has advanced in importance with so rapid strides that it now occupies among vegetable fibres a position, in the mann- facturing scale, inferior only to cotton and flax. 'The term jute appears to have been first used by Dr Roxburgh in 1795, when he sent to the directors of the East India Company a bale of the fibre which he described as "the jute of the natives." Importations of the substance had been made at earlier times under the name of pét, an East Indian native term by which the fibre continued to be spoken of in England till the early years of the 19th century, when it was supplanted by the name it now bears. This modern name appears to be derived from jhot or jhout (Sanskrit, jhat), the vernacular name by which the substance is known in the Cuttack district, where the East India Company had extensive roperies at the time Dr Roxburgh first used the term.

The fibre is obtained from two species of Corchorus (nat. ord. Tiliacex), C. capsularis and C, olatorius, the products of both being so essentially alike that neither in commerce nor agriculture is there any distinction made between them. These and various other species of Corchorus are natives of Bengal, where they have been cultivated from very remote times for economic purposes, although there is reason to believe that the cultivation did

not originate in the northern parts of India. The two species cultivated for jute fibre are in all respects very similar to each other, except in their fructification and the relatively greater size attained by C. capsularis. The

Fic. 1.—Capsules of Jute Plants. a, Corchorus capsularis ; b, C. olitorius, capsules or seed-pods in the case of C. capsularis are globular, rough, and wrinkled, while in C. olttorius they are slender quill-like cylinders, a very marked distiuction,

Fia, 2.—Corchorus olitorius. as may be noted from fig. 1, in which a and 6 show the capsules of C. capsularis and C. olitorius respectively. Fig. 2 represents a flowering top of C. oldorius, The two plants are thus botanically defined :—

Corchorus capsularis.—Aunual ; 5-10 feet; calyx deeply 5-cleft ; petals 5; leaves alternate, oblong, acuminate, serrated, two lower serratures terminating in narrow filaments; peduncles short, flowers whitish-yellow, in clusters opposite the leaves; capsules globose, truncated, wrinkled, and muricated, 5-celled ; seeds few in each cell, without transverse partitions ; in addition to the 5-partite cells, there are other 5 alternating, smaller and empty.

Corchorus olitorius.—Annual; 5-6 feet; erect; leaves alternate, ovate-acuminated, serrated, the two lower serratures terminated by a slender filament ; peduncles 1-2 flowered ; calyx 5-sepalled ; petals 5; capsules nearly cylindrical, 10-ribbed, 5-celled, 5-valved ; seeds numerous, with nearly perfect transverse septa; flowers small, yellow.

Both species are cultivated in India, not only on account of their fibre, but also for the sake of their leaves, which are there extensively used as a pot-herb. The use of C. olitorius for the latter purpose dates from very ancient times, if it may be identified, as some suppose, with the mallows (m9) mentioned in Job xxx. 4, ‘Who cut up mallows by the

bushes.” It is certain that the Greeks used this plant as a pot-herb; and by many other nations around the shores of the Mediterranean this use of it was, and is still, common. Throughout Bengal the name by which the plants when used as edible vegetables are recognized is nalitaé; when on the other hand they are spoken of as fibre-producers it is generally under the name pdt. Both species are cultivated, on account of the fibre they yield, in the greater part of Bengal. The cultivation of C. capsularis is most prevalent in central and eastern Bengal, while in the neighbourhood of Calcutta, where, however, the area under cultivation is limited, C. olvtorvus is principally grown. In 1872, a year which showed an extraordinary development of the cultivation, there were returned 921,000 acres as under jute in Bengal, to which Pubna contributed 122,000, Dinajpur 117,000, and Rang- pur 100,000 acres respectively.

Hitherto jute lias not been cultivated to any considerable extent in lozalities other than Bengal. From remote times it has been grown in the Hankow district of China, but not largely. In the United States of America tlie cultiva- tion of the plants has also been introduced, but it has not made much progress, Recently considerable attention has been given to the culture of the plant in Egypt, and in the Dundee trade report of the 23d Marcli 1881 there occurs the following statement : —‘“ Some samples of jute grown in Egypt are being shown here. Reports on quality are varied, but, considering it is a first attempt, on the whole satisfactory. It proves beyond a doubt that Egypt is capable of producing this material, and for the trade of the district this is a matter of great importance, as having the fibre grown near at hand will enable our manufacturers to compete more successfully in all markets with the Indian mills.”

A hot moist climate with abundant rainfall and rich alluvial soil appear to be the conditions most favourable for the successful cultivation of the jute plants. The land requires to be well tilled and abundantly manured, and, the ground being so prepared, tlie general time of sowing the seed throughout northern and eastern Bengal extends from about the middle of March to the end of May. The

| seed is sown broadcast on the prepared ground, the young

plants are thinned out to 6 inches apart, and the ground carefully weeded. The stalks are ready for cutting down between the middle of August and the middle of October. As a rule the plants are cut down close to the root with a kind of bill-hook or sickle, and the fibre is obtained best in quality when the crop is secured in the flower. It is, however, conimon to allow the crop to run to seed and even to ripen seed before cutting, a practice which renders the resulting fibre hard and woody, thus intensifying one of the principal drawbacks of the jute fibre.

The fibre is separated from the stalks by the proccss

of retting practised in the case of flax, hemp, d&c. (see Fax, vol. ix. p. 294). In certain districts of Bengal it is the practice to stack the crop for a few days previous to retting, during which period the leaves drop off the stalks, and otherwise the stalks themselves are thereby brought into a condition for more rapid retting. The general practice, however, is to tie the crop into bundles sufficient for one man to carry, and to place these at once in water for the purpose of retting. Pools aud ponds of stagnant water are preferred for retting where such are available, but the process is also carried on in the water of running streams, The period necessary for the completion of the retting process varies much according to the temperature and condition of the water, and may be said to occupy from two or three days up to a month. The stalks are examined periodically to test the progress of the retting operation, and when it is found that the fibres peel off and separate readily from the woody portion of the stalk, the operation is complete, and the bundles are withdrawn. The following is a description of the method generally practised for separating the fibre from the stalks. “The proper point being attained, the native operator, standing up to his middle in water, takes as many of the stalks in his hands as he can grasp, aud, removing a small portion of the bark from the ends next to the roots, and grasping them together, he strips off the whole with a little management from end to end without either breaking stem or fibre.

Having prepared a certain quantity into this half state, he next proceeds to wash off: this is done by taking a large handful; swinging it round his head he dashes it repeatedly against the surface of the water, drawing it through towards lim so as to wash off the impurities, then with a dexterous throw he fans it out on the surface of the water and care- fully picks off all remaining black spots. It is now wrung out so as to remove aS much water as possible, and then hung up on lines prepared on the spot to dry in the sun." The separated fibre is then washed, sun-dried, and made up into hanks, and so is ready for the market. In favourable circumstances the produce of cleaned fibre amounts, on an average, to about 6 maunds per beegah (13 ewts. per acre), but official returns from various districts show differences ranging from 5 to 26 or even 30 cwts. per acre. The cost of cultivation also varies much in different localities. According to the official report of Hem Chunder Kerr, it is as much as Rs. 17 per beegah (about £2, 12s. per acre) in Chittagong, and as low as R. 1 (or 3s. per acre) in Manbhum; but such estimates are obviously of little value, as the cultivation is carried on by the ryots without the aid of hired labour, and forms generally only one among the various cultivated products of the land by which a livelihood is obtained. Jute, however, is certainly one of the most cheaply raised and prepared of all fibres ; and to this fact more than to any special excellency of character it possesses is due its now extensive employment as a manufacturing staple,

The characters by which qualities of jute are judged are principally colour, lustre, softness, strength, length, firmness, uniformity, and cleanness of fibre. The best qualities of jute are of a clear white yellowish colour, with a fine silky lustre, soft and smooth to the touch, and fine, long, and uniform in fibre. As a general rule the root ends are harsher and more woody than the middle and upper portions, but in fine jute this distinction is not so notice- able asin less valuable qualities. In length the fibre varies from 6 to 7 feet, but occasionally it is obtained to a length of 14 feet, and, generally speaking, in proportion to the length of the fibre is its fineness of quality. Inferior qualities of jute are brownish in colour and, especially at the root ends, harsh and woody, with much adhering dark cortical matter and other impurities. The fibre is decidedly

inferior to flax and hemp in strength and tenacity; and, owing to a peculiarity in its microscopic structure, by which the walls of the separate cells composing the fibre vary much in thickness at different points, the single strands of fibre are of unequal strength. Recently prepared fibre is always stronger, more lustrous, softer, and whiter than such as has been stored for some time,—age and exposure rendering it brown jn colour and harsh and brittle in quality. Jute, indeed, is much more woody in texture than either flax or hemp, a circumstance which may be easily demonstrated by its behaviour under appropriate reagents ; and to that fact is due the change in colour and character it undergoes on exposure to the air. The fibre bleaches with facility, up to a certain point, sufficient to enable it to take brilliant and delicate shades of dye colour, but it is with great difficulty brought to a pure white by bleaching. A very striking and remarkable fact, which has much practical interest, is its highly hygroscopic nature. While in a dry position and atmosphere it may not possess more than 10 per cent. of moisture, under damp conditions it will absorb up to 30 per cent. or thereby.

As already stated, its commercial distinction is based on the botanical species of plant from which the fibre is pre- paired; but in the Calcutta market a series of commercial staples are recognized based on the districts whence they are drawn, the values of which bear a pretty constant relation toeach other. These classes, in the order of quality, are :— (1) Uttariydé or northern jute, coming from Rangpur, Goalpara, Bogra, and the districts north of Sirajganj;— for length, colour, and fineness, this is unequalled; (2) Deswdl or Sirajganj jute, which is valued on account of its softness, bright colour, fineness, and strength, —in the last characteristic it is superior to Uttariy4 jute; (3) Des: jute comes from Hooghly, Bardwan, Jessore, and the 24 Parganas; (4) Deord jute is produced in Faridpur and Bakarganj,—it is a strong coarse dark and sooty fibre, used principally for rope-making. The other qualities recognized in Calcutta are—(5) Narainganji jute from Dacca, a strong soft long fibre, of inferior colour; (6) Bdkrdbadi jute from Dacca, of fine colour and softness; (7) Bhatial jute from Dacca,

very coarse but strong, and very suitable for rope-making; (8) Karimganji jute from the Mymensing district, a long, strong, and well-coloured staple; (9) Mirganjt jute, the produce of Rangpur, harsh and woody from over-ripeness of the stalks; and (10) Jangipuri jute of Patna, a short, weak, and foxy- coloured fibre of very inferior quality. In the European markets these distinctions are not much remarked, traders' marks and classification being the accepted standards of quality and condition. Moreover, it is only the finer qual- ities that are exported, the lower class jute being used locally for gunny bags, ropes, &c.

At Calcutta and various other centres the jute received from local traders is sorted, packed, and pressed into bales of 400 ib for shipment to the English and other markets. Woody and hard root ends, which will not press into bales, are cut off and sold separately under the name of " cuttings." "Jute," "cuttings," and "rejections" (the last the name of the low-class fibre) are the three heads under which Jute fibre is entered in the trade and import lists of Western countries. '

The Jute Trade of Calcutta.—The importation of jute into Europe commenced about the end of the last century, but so recently as that period it was confused with hemp. During the earlier years of the present century the imports slowly increased, but, as Hem Chunder Kerr says, "the shipments were so insignificant that little or no notice was taken of them by the custom house authorites." Since that time a great revolution has taken place. In 1829 the custom house assigned to jute a separate heading, in which

year we find the exports amounted to 496 maunds (364 ewt.). From that time the growth of the trade has been upon the whole steady and continuous, and marked by extraordinary progress, as will be evident from the following table of exports, which is compiled from official sources :—

Average of

Average of

Quantity. Value. Five Years' | Five Years' Quantity. Value. ewts. qrs. Ib cwlts.

1829 2 0 62 1830 250 417

1831 3) 00 DOD

1832 2 0 6,361 1833 2 18 6,577

1829-33 3 18 15,639 11,800 £3,127

1834-38 337,415 3 0 83,246 67,483 16,649 1839-43 585,238 0.0 119,604 117,047 23,920 1844-48 1,170,279 0 0 256,125 284,055 51,225 1849-53 1,196,750 0 0 649,165 439,350 129,833 1854-58 3,554,138 0 0 1,298,339 710,826 259,667, 1859-63 4,848.620 0 0 2,608,869 969,724 521,773

1864-68 | 13,140,550 0 0 6,129,590 2,628,110 1,225,918

1869 8,612,836 0 0 2,028,456 1870 3,439,475 0 0 2,030,678 1871 3,764,226 0 0 2,585,579 1872 6,218,579 0 0 4,170,435 1873 7,255,689 0 0 4,234,962

1869-73 | 24,290,805 0 0 15,050,110 4,858,161 8,010,022

1874 3,485,500 1875 3,245,000 1876 2,805,300 1877 2,664,900 1878 5,402,000 3,508,300

1874-78 | 26,809,000 15,659,000 5,861,800 3,131,800

1879 5,755,000 0 0 3,636,500 1880 6,316,000 0 0 4,119,200

Excepting a comparatively insignificant fraction, the whole of these exports of raw jute have been consigned to Great Britain, the United States of America being the only other country which bulks at all largely in the returns. Occasional shipments were made to America from 1829 onwards; but the quantities were small and very fluctuating till about 1850, up to which year frequently the total imports for a

year were under 1000 cwts. From 1850-51 onward a rapidly increasing but still fluctuating demand for raw jute has grown up in the United States, till in 1872-73 the American demand amounted to 307,718 cwts. of jute and 1,158,895 cwts. of cuttings and rejections. An importation of 3072 cwts. was made into France in 1836-37, but there was no steady demand for jute in that country till 1845-46, when 9708 cwts. were taken. Since that time there has been a varying but upon the whole increasing demand, and in 1872-73 there were imported 137,126 ewts. The only other considerable shipments are to East Indian ports; but, taken altogether, it may be said that quite ninetenths of the raw jute which leaves Calcutta is primarily disposed of in the British market.

Jute Manufacture.—Long before jute came to be known and to occupy a prominent place amongst the textile fibres of Europe, it was in extensive use and formed the raw material of a large and important industry throughout the regions of eastern Bengal, in which the plant was cultivated. Among the native Hindu population the spinning and weaving of jute was, and still is, in various districts, the most important domestic industry. The forms into which the material is worked among the Hindu population—for the Mussulmans do not use jute—are cordage, cloth, and paper. The cordage is twisted into all sizes, from the fine thread used for weaving up to strong ropes for the hawsers of native boats and for tying bales. The more important native application of jute is, however, in the manufacture of gunny cloth and gunny bags, used in extraordinary quantity and number throughout the world, for packing

and carrying all manner of goods and merchandise, and by |

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the natives themselves for clothing and numerous domestic purposes. The ordinary mode of weaving gunnies for bags and other coarse purposes is thus described :—‘“‘ Seven sticks or chattee weaving-posts, called tand pard or warp, are fixed upon the ground, occupying the length equal to the measure of the piece to be woven, and a sufficient number of twine or thread is wound on them as warp called tand. The warp is taken up and removed to the weaving machine. Two pieces of

wood are placed at two ends, which are tied to the ohari and okher or roller; they are made fast to the khott. The belut or treadle is put into the warp; next to that is the sarswl; a thin piece of wood is laid upon the warp, called chupart or regulator. There is no sley used in this, nor is a shuttle necessary ; in the room of the latter a stick covered with thread called s¢zga is thrown into the warp as woof, which is beaten in by a piece of plank called beyno, and as the cloth is woven it is wound up to the roller. Next to this is a piece of wood called khetone, which is used for smoothing and regulating the woof; a stick is fastened to the warp to keep the woof straiglit." Gunny cloth is woven of numerous qualities, according to the purpose to which it is devoted. Some kinds are made close and dense in texture, for carrying such seed as poppy or rape and sugar ; others less cloge are used for rice, pulses, and seeds of like size, and coarser and opener kinds again are woven for the outer cover of packages and for the sails of country boats. There is a thin close-woven cloth made and used as garments among the females of the aboriginal tribes near the foot of the Himalayas, and in various localities a cloth of pure jute or of jute mixed with cotton is used as a sheet to sleep on, as well as for wearing purposes, To indicate the variety of uses to which jute is applied, the following quotation may be cited from the official report of Hem Chunder Kerr as applying to Midnapur. "The articles manufactured from jute are principally (1) gunny bags ; (2) string, rope, and cord ; (3) kampa, anet-like bag for carrying wood or hay on bullocks ; (4) chat, a strip of stuff for tying bales of cotton or cloth ; (5) dola, a swing on which infants are rocked to sleep ; (6) sktka, a kind of hanging shelf for little earthen pots, &c.; (7) dulina, a floor cloth ; (8) beera, a small circular stand for wooden plates used particularly in poojahs ; (9) painter's brush and brush for white-washing ; (10) ghuns:, a waist-band worn next to the skin; (11) gockh-dari, a hair-band worn by women; (12) mukbar, a net bag used as muzzle for cattle ; (13) parchula, false hair worn by players ; (14) rakhi-bandhan, a slender arm-band worn at the Rakhi-poornima festival ; and (15) dhup, small incense sticks burned at poojahs." Raw jute fibre and old gunnies are also largely used throughout the presidency in thie manufacture of paper.

The introduction of jute factories on the European system into Bengal has had a considerable influence on thie domestic manufacture of jute, notwithstanding that a vast industry is still prosecuted in the ancient Hindu manner.

The following extracts from official tables will slow the extent of this particular branch of industry.

The number of gunny bags imported into Calcutta amounted in 1877-78 to 21,446,000, in 1878-79 to 26,380,000, and in 1879-80 to 20,488, 000.

The different districts which contributed chiefly to the trade during these three years are the following :—

Name of District. 1877-78. 1878-79. 1879-80. Number. Number. Number.

3,790,000 8,641,000 6,195,000

8,257,000 6,920,000 5,994,000

3,130,000 3,303,000 4,020,000

2,951,000 2,532,000 2,€58,000

tee 263,000 826,000

AB rnnandoctncenodecinae 494,000 547,000 260,000 AUVATIOMITE. ....cacceeceeeeees ae 381.000 484.000 204 000 LET ESS? pmoaacopsacooccacocun 117,000 512,000 169.000

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The gunny bags cxported from Calcutta in the year 1877-78 numbered 79,384,000 ; in 1878-79, 82,685,000; and in 1879-80,

92,284,000.

It will be seen that the exports of bags exceed the quantity sent into Calcutta by no less than 57,938,000 bags in 1877-78, 56,255,000 in 1878-79, and 71,796,000 in 1879-80. 'This is of course due to the large manufacture in Calcutta and the suburbs.

The import trade of Calcutta in gunny cloth during the three _

years referred to was in round numbers as follows :—51,000 pieces in 1877-78, 70,000 in 1878-79, and 88,000 in 1879-80.

Out of the total supply, that of power-loom manufacture was 43,000 pieces in 1879-80, as compared with 19,000 pieces in 1878-79. The haud-made pieces amounted to 45,000, as compared with 51,000 in 1878-79.

The export of gunny cloth by sca was consigned as follows :—

1878-79, 1879-80,

Power- |. Hand- Power- | Hand- Loom, Loom. Total. Loom. Loom. Total. Yards. Yards. Yards. Yards. Yards. | Yards. To foreign ports] 4,530,000 | 57,000 4,587,000 | 5,210,000 1,000 | 5,211,000 Indian ,, | 8,185,000 | 17,000 | 3,152,000 | 1,658,000 | 7,000 | 1,665,000 Motel. ...

Besides the registered supplics mentioned above, the returns show a large quantity of powcr-loom gunny cloth, amounting to 664,000 picces, sent up country from Calcutta mills without passing the port commissioners wharves. The gross total of gunny cloth exported from Calcutta was 54,731,000 yds, in 1878-79, and 61,468,000 yds. in 1879-80.

Formerly Amcrica was the largest customer for Indian jute manufactures, very large quantities of gunny having been consigned to the United States for packing cotton and other merchandise. That demand has, however, very largely fallen off, and now the Australian colonies and Burmah and the various Kast Indian ports are the principal places to which the manufactured articles arc sent from Calcutta.

European Trade and Manufacture.—The occasional parcels of jute which were sent to the European market by the East India Company previous to the year 1830 appear to have been principally used for the making of door mats

Jute Imported. Yarn Exported.

Quantity.

Cote. | “Price | Quantity, | Peelaved Cwts. £ $. tb. £

1865 | 2,108,942 | 1,774,992 | 16°88 | 4,944,230 | 82,141 1866 | 1,625,908 | 1,476,244 | 18:16 | 7,761,391 | 128,704 1867 | 1,582,611 | 1,414,821 | 17°87 | 7,520,911 | 117,028 1868 | 2,182,521 | 1,936,230 | 17°74 | 8,108,101 | 126,045 1869 | 2,467,817 | 2,143,100 | 17°37 | 8,041,082 | 126,691 1870 | 2,376,690 | 2,826,910 | 19°58 | 12,669,948 | 196,465 1871 | 3,434,120 | 3,729,735 | 21°60 | 13,710,957 | 262,057 1872 | 4,041,018 | 3,954,698 | 19°57 | 12,715,969 | 261,239 1873 | 4,624,918 | 3,619,989 | 15°65 | 12,263,805 | 206,521 1874 | 4,270,164 | 3,553,179 | 16°64 | 15,724,988 | 245,784 1375 | 3,416,617 | 2,575,512 | 15°08 | 15,942,618 | 225,836 1876 | 3,825,259 | 2,804,597 | 14°66 | 16,709,239 | 246,813 1877 | 3,649,877 | 2,929,965 | 16°06 | 14,997,659 | 217,424 1878 | 4,242,382 | 3,236,825 | 15°26 | 12,234,600 | 181,076 4,759,363 | 8,257,497 | 18°69 | 13,572,100 | 200,112

Manufacture.—In their general features the spinning and weaving of jute fabrics do not differ essentially as to machinery and processes from those employed in the inanufacture of hemp and heavy flax goods. Owing, how- ever, to the woody and brittle nature of the fibre, it has to undergo a preliminary treatment peculiar to itself. The pioneers of the jute industry, who did not understand this necessity, or rather who did not know how the woody and brittle character of the fibre could be remedied, were greatly perplexed by the difficulties they had to encounter, the fibre spinning badly into a hard, rough, and hairy yaru owing to the splitting and breaking of the fibre. This peculiarity of jute, coupled also with the fact that the machinery on which it was first spun, although quite suit- able for the stronger and more elastic fibres for which it

and similar purposes; but the whole quantity was at that: date, and, as will be seen by the table, p. 801, for several years thereafter, quite insignificant. Some part of these imports found their way to Abingdon in Oxfordshire, a town in which the manufacture of carpets, sacking, and cordage was extensively prosecuted, and to the manufac- turers of that town is due the credit of being the first in Great Britain to experiment with the fibre, making it into yarn and cloth. In 1833 a quantity of dyed yarn was sent from Abingdon to Dundee, then an important centre of the heavier flax manufactures, and there it attracted a good deal of attention. Consignments were soon thereafter received direct at Dundee and experimented with, but little or no real progress was made for a considerable time, for jute forms no exception to the general rule that the intro- duction of new textile fibres is attended with many diffi- culties before a successful issue is reached. The many unsuccessful attempts to convert it into yarn caused it to be disliked by the manufacturer, and the bad reputa- tion it had acquired as to strength and durability made it no favourite in public estimation. Indeed, so far was prejudice carried against it that some of the manufacturers banished the fibre entirely from their works, fearing it might prove prejudicial to their interests. Among the circumstances which added materially to the rapid develop- ment of the jute trade, lying outside its natural growth owing to cheapness and other causes, were the war with Russia in 1854-56, which temporarily cut: off the supplies of. Russian flax and hemp, and the cotton famine which re- sulted from the civil war in America in 1861-63, Leaving these circumstances out of account, however, the growth of the jute trade has been remarkable and steady, as will be seen by the following table, embracing a period of fifteen years from 1865 to 1880, during which no such cause as those alluded to above affected the trade.

Details of Inportation and Exportation of Jute into and from the United Kingdom, 1865-1879.

Manufaetures Exported. Jute Exported.

Average | Quantity. | Peelared | Ayorage | Quantity. | CVraue, d. Yds. £ d, Cwts. £ 3°99 15,400, 459 311,540 4°86 417,981 | 351,801 3°98 19,394,926 361,857 4°48 416,352 | 378,186 BOTS) 26,743,187 455,396 4:09 366, 793 327,057 Boe 43,081,322 706,966 3°94 415,266 368, 549 3°78 | 50,127,853 | 742,801 | 3°56 | 418,952 | 358,758 Sle 51,920,808 789,657 Seas 425,712 | 416,848 4°59 62,310,463 | 1,026,759 3°95 575,177 650,431 4°93 84,452,457 | 1,486,484 4°22 755,120 | 724,659 4:04 95,935,108 | 1,590,850 3°98 790,344 649, 880 3°75 112,810,415 | 1,679,766 Bay 716,631 608, 619 3°40 101,105,579 | 1,404,997 3°34 1,050,389 798,146 3°26 120,813,966 | 1,558,256 3°09 933,667 704,904 3°48 116,753,008 1,547,408 ll 968, 102 806, 792 3°55 122,961,200 | 1,588,901 3°10 1,013,497 792,176 3°54 164,054,600 | 1,963,153 esi 1,117,953 807,189

was designed, required certain modifications to suit it to the weaker jute, was the cause of many annoyances and failures in the early days of the trade.

Batching or Softening.—The introduction of this pre- liminary process constituted the first important step in the practical solution of the difficulties of jute spinning. The process, in a great measure, supplies artificially that m which jute is naturally deficient. The mode of batching originally adopted was to divide the rolls or heads, taken from the bale, into four or five parts, each being about what a hand could grasp. These divisions, called stricks, were doubled up with a slight turn at the centre, and laid out in the floor in double rows, the roots and crop ends of the stricks overlapping each other, in the centre of the batch ; each row when completed received a certain per

centage of whale oil and water, and, according to the ideas of the person superintending, 2 mixture of ashes or other ingredients, supposed to have a softening tendency. These batches, which generally contained from 4 to 5 tons each, were allowed to lie from twenty-four to forty-eight hours, at the end of which time a slight fermentation caused by the oil and water was induced, and the batch was then considered ready for the preparation process. The hand process has now, however,

been superseded by a more speedy and economical appliance. In order to get the fibre into that soft pliant condition so essential to the spinning operation, jute softeners or mangles have been introduced. Of these machines there are various types,

but in their general outline and principle they are closely .

allied to each other. The machine consists of a double row of fluted rollers, generally from twelve to eighteen pairs, the one placed on the top of the other, so that the flutes longitudinally intersect each other. The rollers, when the machine is in motion, have a rippling reciprocating action, by which means the material passing through is rendered soft and pliant. In connexion with this machine, and with the view of dispensing with the more cumbrous and expensive mode of batching already described, an apparatus is attached, and is so adjusted that the jute on passing through the rollers receives with great precision a proper allowance of oil and water. The quantity of oil used varies from half a gallon to one gallon per 400 tb bale, and the quantity of water, according as the atmo- sphere is dry or damp, is from 12 to 18 per cent. of the weight of material operated on.

Such qualities of jute as retain rough and hard root ends or " butts" require to undergo another preliminary process termed "snipping," by which these "butts" are combed out, and separated from the remainder of the fibre; these, being torn and split up into the form of tow, may be so used in the subsequent preparing and spinning operations. A good deal of jute is now prepared at Cal- eutta by the snipping process instead of by cutting, the butts being thereby secured in a more useful and valuable condition.

The material, after being softened, and, if necessary, snipped, is passed on to the assorters, whose duty is to select the different qualities for the special uses to which they may be applied.

Spinning.—All the subsequent processes through which jute passes are essentially the same as those employed in the corresponding heavy manufactures of flax (see Linen). As in the case of that fibre, there are two dis-

Factories. Spinning Spindles.

1861, | 1868. | 1874. | 1861. 1868. 1874.

England and Wales… 0 15 620 8,230 | 21,754

SHOT CTRL Ba mdenon-annocomunneougesc Ireland 2 1,824

32,982 oor 220,911

84 30,538 | 72,547 | 185,419

tinct processes of preparing yarn, viz., by “line” spinning and by “tow” spinning. If intended for line spinning, the long jute fibre is cut or rather broken into lengths of from 20 to 24 inches. It is then ready for hackling, spreading, drawing, and roving, just as in the parallel case of flax “line” spinning. Similarly: in the tow spinning the fibre is first submitted to the breaker card, then the finishing card, after which it passes through the drawing frames and the roving frame, and then, as “rove” or rovings, it is ready for the spinning frame ; but, in the case of some very heavy yarns, the material is spun direct on the roving frame.

The weights of jute yarn are estimated by the spindle of 14,400 yards, and the finest kinds spun are about “9 %b yarn,” ze, yarn weighing 2 tb per spindle. The minimum weight commonly found in the market is, how- ever, 7 ib, from which the yarn lists rise in sizes up to 40 Ib, or to very much heavier weights for special pur- poses. The ruling feature of jute is its cheapness, and the great demand for jute manufactures arises in connexion with rough and cheap fabrics, such as sacking and bagging, bale covers, hessians for upholstery purposes, &e., tarpaulings, linings, pocketings, and backing for floorcloths, for which purpose it is woven in webs from 6 to 8 yards wide. It takes dye colours readily, which, however, are fugitive, and as dyed yarn it is woven into carpets, rugs, &c.; and woven and printed curtain cloths and tapestries are also made from jute. The fibre, how- ever, is not worthy of being woven into elaborate and some- what costly fabrics ; and it is not likely that as a tapestry material it will take any permanent place. Jute also lends itself readily to the sophistication of more expensive fibrous

materials, and is said to be employed in the adulteration of woven silks, more especially in such as are used for cheap ribbons, scarfs, &c. It can also be prepared to imitate human hair with remarkable close- ness, and advantage of this is largely taken in making stage wigs.

Although a few jute factories have sprung up in sevcral localities other than Dundee throughout the United King- dom, notably in Glasgow, Aberdeen, and Barrow-in- Furness, and also in various parts of the Continent, Dundee is still the headquarters and controlling centre of the jute trade,—even many of the Bengal factories being owned by Dundee merchants. The following table shows the distribution of the trade and the number of persons finding employment in it for the United Kingdom at the respective dates mentioned :—

Doubling

Spindles. Power-Looms. Persons Employed.

1861. 1868. 1874.

428 ot 927 107 | 1,760 | 4,933 1,924 8,325 | 5,418 | 12,127 | 30,893 48 call 347 449 283 | 2,094

1868, | 1874.

i ne | a a | |

2,400 | 5,976 14,170 | 37,920

1 Exclusive of number of power-looms in one factory in Antrim.

Some of the Dundee factories are of enormous extent, that of Messrs Cox Brothers, for example, covering 22 acres, and giving employment to 5000 persons, while the annual output of jute fabrics measures as much as 15,500 miles. (J. PA.)

JUTERBOGK, Jtrerzoc, or Jiverpock, the chief town of the circle Jiiterbogk-Luckenwalde, in the govern- ment district of Potsdam and province of Brandenburg, Prussia, is situated on the Nuthe, 39 miles

south-west of Berlin, with which it is connected by rail. It contains four Protestant churches, of which that of St Nicholas, dating from the close of the 14th century. Jiiterbogk carries on

weaving and spinning both of flax and wool, and trades in the produce of those manufactures and in cattle. Vines are eultivated in the neighbourhood. Jiiterbogk appears in history as the scene of religious discussions in 1548 and 1575, of a treaty between Brandenburg and Saxony in 1611, and of the victory of the Swedes under Torstenson over the imperial troops under Gallas in 1644. Two miles south-west is the battlefield of Dennewitz, where Biilow defeated Ney and Oudinot, September 6, 1813. The population, including the garrison, was 6852 in 1875; with the immediately adjacent villages of Damm and Neumarkt it was 8427.

804

JUVENAL (Decimus Junius Juvenais) has been more read and admired in modern times than any other Latin poet, with the exception of Virgil, Horace, and perhaps Ovid. The attraction which he has had, not for scholars only, but for men of letters and men of the world, is probably due less to any intrinsic superiority of genius,—for in genius he is not the equal of Lucretius or Catullus,— but to a quality of his writing to which one of the most recent and best of his English editors has drawn attention. “In depicting character,” says Mr Lewis,! “in drawing scenes, even in turns of expression, he is, of all ancient authors, the most distinctly modern.” But besides this attraction, which is due to the fact that he wrote at a time when the interest in social life and manners had superseded that formerly felt in the commonwealth, he has his own peculiar value to students of antiquity. He closes the roll of the great writers of Rome, and is the last vital represen- tative of her national spirit and genius. It is mainly from lis representation that the picture of the social life of the imperial city during the first century of our era lives in the imagination of the world. He is the most effective satirist of Rome, not because he was the greatest writer who made satire his theme, but because the age in which he lived supplied the largest material for purely satiric representa- tion, and because his eye

was fixed on the more sombre aspects of his time to the exclusion of those happier or more genial aspects which are reflected in the pages of Statius, Martial, and Pliny. The first impression produced by the satire of Juvenal is more powerful than that produced by the satire of Horace, as the impression produced by the tragical aud sensational incidents of life is greater than that produced by its ordinary course and its lighter humours. The final verdict as to their relative excellence need not be in accordance with the first impres- sion, but will be determined by the abiding sense of truth and conformity with real life which each representation leaves upon us. But Juvenal does stand prominently out, not in ancient literature only, but in the literature of the world, as the typical example of a social satirist, writing with a serious purpose. The burning indignation to which he attributes the inspiration of his verse, and its not unfrequent accompaniment, the "censure of a sardonic laugh," are his distinguishing notes.

Nor is it only iu respect of subject-matter and the spirit in which that is treated, but also in respect of literary form and style, that poetical satire finds its typical representa- tive in Juvenal, The systematic treatment of some special topic, the sustained rhetorical pitch, so unlike the natural conversational manner of Horace, at which the treatment is maintained, the strongly-drawn scenes and portraits illustrative of the theme, the effort to make every line effective by point and emphasis, which distinguish some of the great products of modern poetical satire, have their prototypein Juvenal. The frank communicativeness,—the impulse to establish a confidential relation with the reader,

—which made the writings of Lucilius appear to a later |

generation like a "picture of his life" drawn by his own hand, and which gives to the satires of Horace all the charm of an autobiography, has altogether disappeared from the satire of Juvenal, and given place to an attitude almost as impersonal as that assumed in the letters of Junius. And this is the attitude which modern poetical satire for the most part maintains. It commands respect by the boldness and incisiveness of its assaults on classes and individuals, or it gains popularity by gratifying the natural love of detraction, but it leaves to

the prose essayist and the novelist the humaner part of acting on tlie reader through his sympathies.

1D, Junti Juvenalis Satire, with a literal English prose transia- tion and notes, by John Delaware Lewis, M.A.

JUVENAL

This absence from the writings of Juvenal of that personal element which played so large a part in the satires of Lucilius and Horace forces us to depend almost entirely on external evidence for our knowledge of his life. And our available external evidence is unfortunately very meagre and untrustworthy. After reviewing it all and reading it as far as possible by light derived from his own writings, we shall have to acknowledge that we know very little with certainty of his career, that the impression we form of his cliaracter and associations is indistinct and perhaps fallaci- ous, and that even the indications which seem to fix the date of the composition of various satires may be misleading. Still, in order to read his writings with full profit and pleasure, we must try to bring ourselves in thought as near to the writer as our knowledge admits of. The ideal presentation of human life and character in an epic poem or drama bears its own evidence of its truth. It either conforms to, or fails to conform to, what the imagination conceives of the capabilities of human nature. In read- ing the realistic representation of an exceptional phase of society, we wish to know whether the painter of it was, from his position, likely to have seen and understood it, whether his object was to describe it as he saw it, and whether he was a man capable of judging it reasonably and candidly.

A brief account of Juvenal's life, varying considerably in some of its details, is prefixed to the different MSS. of his works. But the original on which these various versions of the life are founded cannot be traced to Suetonius or to any competent authority, and some of the statements contained in it are intrinsically improbable. According to the form prefixed to the most valuable of the MSS., " Juvenal was the son or ward of a wealthy freedman ; he practised declamation till middle age, not as a professional teacher, but as an amateur, and made his first

essay in satire by writing the lines on Paris, the actor and favourite of Domitian, now found in the seventh satire (line 90 sq.) :—

2) ‘Quod non dant proceres, dabit histrio,’ &e. Encouraged by their success, he devoted himself diligently to this kind of composition, but refrained for a long time from either publicly reciting or publishing his verses. When at last he did come before the public, his recita- tions were attended by great crowds and received with the utmost favour. But the lines originally written on Paris, having been inserted in one of his new satires, excited the jealous anger of an actor of the time, who was a favourite of the emperor, and procured the poet’s banishment under the form of a military appointment to the extremity of Egypt. Being then eighty years of age, he died shortly afterwards of grief and vexation.” In one account the time of. his banishment is said to have been the last years of Domitian ; in another he is said to have been appointed to a command against the Scots by Trajan, in another to have died in exile in the reign of Antoninus Pius, and in another to have died of a broken heart on his return to Rome, because he found his friend Martial was no longer there. One account even makes Claudius the author of his banishment, In several Aquinum is mentioned as his birthplace, and in one he is said to have been born in the time of Claudius.

Some of these statements are so much in consonance with the indirect evidence afforded by the satires that they might almost be supposed to be a series of conjectures based upon them. The rare passages in which the poet speaks of his own position, as in satires xi. and xii., indicate that he was in comfortable but moderate circumstances. We should infer also that he was not dependent on any professional occupation, and that he was separated in social station, and probably too by tastes and manners, from the higher class to which Tacitus and Pliny belonged, as he

was by character from the new men whorose to wealth by servility under the empire. Juvenal is no organ of the pride and dignity, still less of the urbanity, of the cultivated representatives of the great families of

the republic. He is the champion of the more sober virtues and ideas, and perhaps the organ of the rancours and detraction, of an educated but depressed and embittered middle class. The literary representative of such a class might well be found in the heir of a well-to-do freedman, born and bred in a provincial town, too independent both in position and character to become permanently a hanger-on of the great, and perhaps too ungracious in manner and uncompromising in speech to mix easily with the class which inherited the aristocratic and courtly traditions of Roman literature. The statement that he was a trained and practised declaimer is confirmed both by his own words (i. 16) and by the rhetorical mould in which his thoughts and illustrations are cast. Theallusions which fix the dates when his satires first appeared, and the large experience of life which they imply, agree with the statement that. he did not come before the world as a professed satirist till after middle age.

The statement that he continued to write satires long before he gave them to the world accords well with the nature of their contents aud the elaborate character of their composition. They are not the expression of some passing impulse, but seem to sum up the experience of a lifetime. They have indeed the freshness of immediate impressions, but they are so combined as to show that they have been long brooded over before assuming their final form. And that he was known as a writer of satires for years before the publication of any of them in their present form might almost be inferred from the emphatic but yet guarded statement of Quintilian in his short summary of Roman literature. After speaking of the merits of Lucilius, Horace, and Persius as satirists, he adds, ‘“ There are, too, in our own day, distinguished writers of satire whose names will be heard of hereafter” (Znst. Or., x. 1, 94). There is no Roman writer of satire who could be mentioned along with those others by so judicious a critic, and whose names have been heard of in after times, except Juvenal.

The motive which a writer of satire must have had for secrecy under Domitian is sufficiently obvious; and the necessity of concealment and self-suppression thus imposed upon the writer may have permanently affected his whole manner of composition.

So far the various authors of these lives have followed a probable and consistent tradition. But when we come to the story of the poet's exile, they are at variance both with probability and with one another. Some apparent confirmation is given to the tradition by the lines of a poet of the 5th century, Sidonius Apollinaris :—

- **Nec qui consimili deinde casu**

Ad vulgi tenuem strepentis auram Irati fuit histrionis exul."

There is no reason to doubt that these lines refer to Juvenal, but they only prove that the original story from which all the varying lives are derived was generally believed before the middle of the 5th century of our era. If Juvenal was banished at the age of eighty, the author of his banishment could not have been the "' enraged actor " in reference to whom the original lines were written, as Paris was put to death in 83, and Juvenal was certainly Writing satires long after 100 a.p. The satire in which the lines now appear was probably first published soon after the accession of Hadrian, when Juvenal was not an octogenarian but in the maturity of his powers. The cause of the poet's banishment at that advanced age could not therefore have been either the original composition or the first publication of the lines. But it has been conjectured that the anger of another actor, a favourite of the emperor, may have

been excited by a later application of them on some public occasion, and that the poet was punished for this unfortu- nate revival of lines which had never been intended for the person who resented them. Against this conjecture, based on a number of confused, uncertain, and contradictory traditions, we have to weigh the intrinsic improbability of the story. An expression in sat. xv. 45 is quoted asa proof that Juvenal had visited Egypt. He may have done so a8 an exile or in a military command; but it seems hardly consistent with the importance which tle emperors attached to the security of Egypt, or with the concern which they took in the interests of the army, that these conditions were combined at an age so unfit for military employment. If any conjecture is warrantable on so obscure a subject, it is more likely that this temporary disgrace may have been inflicted on the poet by Domitian. Among the many victims of Juvenal's satire it is only against him and against one of the vilest instruments of his court, the Egyptian Crispinus, that the poet seems to be animated by personal hatred.! A sense of wrong suf- fered at their hands may perhaps have mingled with the detestation which he felt towards them on public grounds. But if he was banished under Domitian, it must have been either before or after the year 93 a.D., at which time, as we learn from an epigram of Martial, Juvenal was in Rome. The whole story may be ranked with the tradition of the love potion which is said to have maddened Lucretius, as one resting on such slight evidence as to admit neither of confirmation nor refutation.

More ancient and apparently more authentic evidence of the position filled by Juvenal during some period of his life has been recovered in recent times, in the form of an inscription found at Aquinum, recording, so far as it can be deciphered, the dedication of an altar to Ceres, by Junius Juvenalis, tribune of the first cohort of Dalmatians, ""'duumvir quinquennalis," and " flamen Divi Vespasiani." The terms of this inscription, when read aloug with one of the few passages in the satires in which Juvenal distinctly speaks of himself (iii, 318 sg.)—

- it quotiens te Roma tuo refici properantem reddet Aquino, Me quoque ad Helvinam Cererem vestramque Dianam

Converte a Cumis: satirarum ego, ni pudet illas, Auditor gelidos veniam caligatus in agros—”

leaves little doubt that the author of the inscription was either the poet himself or some niember of his family, of whose existence we have no other indication. If then, as is most probable, Juvenal is himself the author of it, we learn that he did hold, at one period of his life, a post of military rank, one of municipal importance in his native town, and a priesthood of the deified Vespasian. But to what period of his life does this tablet bear evidence? The fact that he filled the position of ‘“duumvir quinquen- nalis” shows that he was a man of influential position in the municipium, but the office was only held for a year,—the year apparently in which ‘the census was taken at Rome,—and its tenure does not imply any prolonged absence from the metropolis. The satires, though they indicate an occasional preference for the simpler life of the country towns, are the product not of leisure in the pro- vinces but of immediate and intimate familiarity with the life of the great city ; and an epigram of Martial, written at the time when Juvenal was most vigorously employed in their composition, speaks of him as settled in Rome. It is possible, but not likely, that he may have retired to his native town in the latter years of his life, and that the last book of his satires (xiii.—xvi.), which contains no im-

1 For the possible connexion of Crispinus with Juvenal’s banish- ment compare Mayor, vol. ii. p. 421.

mediate references to Rome, and is written in a less angry mood than the earlier ones, may be the work of this retire- ment, and that it may have been during that time that he filled this office. On the other hand, it was by Domitian that the worship of Vespasian was established with especial sanctity, and it may be doubted whether a priesthood instituted in his honour would be recorded as a title of dignity late on in the reign of Hadrian. The lines already quoted from satire iii. imply that during

his early career as a satirist Juvenal maintained his connexion with Aquinum, and that he had some special interest in the worship of the "Helvinian Ceres." Nor is the tribute to the national religion implied by the dedication of the altar to Ceres inconsistent with the beliefs and feelings expressed in the satires. While the fables of mythology are often treated: contemptuously or humorously by him, other passages in the satires clearly imply a conformity to and even a respect for the observances of the national religion.) The spirit of Juvenal, which sought for a standard of right action rather in the old Roman and Italian traditions than in the tenets of philosophy, would incline him to sympathize with the revival of religious observance and also of a kind of belief in divine agency on human affairs, which accompanied the establishment of the empire. The evidence as to the military post filled by him is curious, when taken in connexion with the confused tradition of his exile in a position of military importance'; and there appears to be some further evidence that the cohort of which he was tribune was quartered in Britain. But it cannot be said that the satires bear traces of military experience. 'The life described in them is such as would present itself to the eyes of a civilian, and would be talked about and commented on at the dinner tables and in the clubs, baths, theatres, and places of public resort in the great metropolis."

The only other contemporary evidence which affords a glimpse of his actual life is contained in three epigrams of Martial. Two of these (vii. 24 and 91) were written in the time of Domitian, the other (xii. 18) early in the reign of Trajan, after Martial had retired to his native Bilbilis. The first of these epigrams, addressed to some backbiter who had endeavoured to embroil the two friends with one another, attests the strong regard which Martial felt for him; but the subject of the epigram seems to hint that there may have been something suspicious or uneasy in the temper of the satirist, which made the maintenance of a steady friendship with him difficult. In the second of these epigrams, addressed to Juvenal himself, the epithet '"'facundus" is applied to him, one which might equally be employed whether he was best known at the time as a writer of poetic satires or as an eloquent rhetorician. In the last Martial imagines his friend wandering about dis- contentedly

(inquéetus) through the crowded streets of Rome, and undergoing all the discomforts incident to attendance on the levees of the great :—

‘¢ Dum per limina te potentiorum Sudatrix toga ventilat.”’

Two lines in the poem (22-3) suggest that the satirist, who has inveighed with just severity against the worst corruptions of Roman morals, was not too rigid a censor of the morals of his friend. ‘Indeed, his intimacy with Martial is a ground for not attributing to him exceptional strictness of life.

The additional information as to the poet’s life and cir- cumstances derivable from the satires themselves is not

1 See especially xiii. 3-16. 2 Comp. i. 145, “It nova nec tristis per cunctas fubula cenas”; xi. 3 sq.— “Omnis convictus, therme, stationes. omne theatrum De Rutilo.”

important. He tells us what might easily be inferred from the number of allusions to the Greek and Latin poets con- tained in his satires, that he had enjoyed the training which all educated men received in his day (i. 15); he indicates, as was mentioned above, his connexion with the old Volscian town Aquinum ; he speaks of his farm in the territory of Tibur (xi. 64), which furnished a young kid and moun- tain asparagus for a homely dinner to which he invites a friend during the festival of the Megalesiaca. In the satire in which this invitation is coutained, and in one or two more of the later ones, he seems partially to remove the mask which he wears in the earlier and more directly aggressive satires. From it we are able to form an idea of the style in which he habitually lived, and to think of him as enjoy- ing a hale and vigorous age (line 203), and also as a kindly master of a household (159 sg.). The negative evidence afforded in the account of his establishment, and the bitter tone in which his friend is reminded of his domestic un- happiness (186-9), suggest the inference that, like Lucilius and Horace, Juvenal had no personal experience of either the cares or the softening influence of family life. A comparison of this poem with the invitation of Horace to

Torquatus (Zp., i. 5) brings out strongly the differences not in urbanity only but in kindly feeling between the two satirists. It reminds us also of how much less we know of the one poet than of the other, and of how shadowy a personage the Persius of the one is as contrasted

‘with the Torquatus of the other.

An excellent, critic of Latin literature, M. Gaston Boissier, has drawn from the indications afforded of the career and character of the persons to whom the satires are addressed most unfavour- able conclusions as to the social circumstances and associations of Juvenal. If we believe that the Trebius, Postuinus, Ponticus, Nevolus, Persicus, of the satires were real people, with whom Juvenal lived in intimacy, we should conclude that he was most unfortunate in his associates, and that his own relations to them were marked rather by outspoken frankness than civility. But these personages seem to be more “‘nominis umbre” than real men; they serve the purpose of enabling the satirist to aim his blows at one particular object instead of declaiming at large. They have none of the individuality and traits of personal character discernible in the Damasippus or Trebatius of Horace’s satires, or the Julius Florus, the Torquatus, the Celsus, the Fuscus, the Bullatius, &c., of the epistles. It is noticeable that, while Juvenal writes of the poets and men of letters, Statius, Saleius Bassus, Quintilian, &c., of a somewhat earlier time, as if they were still living, he has no reference to the career or reputation of his friend Martial, and that he is equally silent about the two illustrious writers who wrote their works during the years of his own literary activity,—the younger Pliny and Tacitus. It is equally noticeable that among the many cultivated and estimable men and women who are brought before us in the correspondence of the former of these writers the name of Juvenal does not appear.

We feel on more certain ground in endeavouring to de- termine the times at which the satires were given to the world. But these do not in all cases coincide with those at which they were written and to which they immediately refer, Thus the manners and personages of the age of Domitian often supply the material of satiric representa- tion, and are spoken of as if they belonged to the actual life of the present,® while

allusions even In the earliest show that, as a finished literary composition, it belongs to the age of Trajan. The most probable explanation of these discrepancies is that already hinted at, viz. that in their present form the satires are the work of the last thirty years of the poet's life, while the first nine at least, the most powerful and most characteristic among them, not only reproduce the mm- pressions of his earlier manhood, but may have preserved with little change passages written and perhaps familiarly known in his own literary circles during this earlier time.

3 This is especially noticeable in the seventh satire, but it applies also to the mention of Crispinus, Latinus, the class of delatores, &e., in the first, to the notice of Veiento in the third, of Rubellius Blan- dus in the eighth, of Gallieus in the thirteenth, &c.

This seems more probable than that he should have used such famous names as those of Statius and Quintilian to signify some poet or rhetorical professor of a later time ; although probably like Horace he may have availed himself either of false names, or names belonging to a former time, for his satiric nomenclature. The combination of the impressions, and, perhaps of the actual compositions, of different periods also explains a certain want of unity and continuity found in some of them,

There is no reason to doubt that the sixteen satires which we possess were given to the world in the order in which we find them, and that they were divided, as they are referred to in the ancient grammarians, into five books. A minute examination of the various satires composing these books enables us to form at lcast a probable conjecture as to the intervals at which they appcared, and to con- ceive the changes of mood through which the poet passed during these intervals. Book I., embracing the first five satires, is written in the freshest vigour of the author's powers, and is animated with the strongest hatred of Domitian. 'The publication of this book belongs to the early years of Trajan. The mention of the exile of Marius (49) shows that it was not published before the year 100 A.D. In the second satire, the lines 29 sq.,

“Qualis erat nuper tragico pollutus adulter Concubitu,” show that the memory of one of the foulest scandals of the reign of Domitian was still fresh in the minds of men. The third satire, imitated by Johnson in his London, presents such a picture as Rome may have offered to the satirist at any time in the Ist century of our era; but it was under the worst emperors, Nero and Domitian, that the arts of flatterers and foreign adventurers were most success- ful, and that such scenes of violence as that described at 277 sq. werc most likely to occur ;! while the mention of Veiento (185) as still enjoying influence is a distinct reference to the court of Domitian. The fourth, which alone has any political significance, and reflects on the emperor as a frivolous trifler rather than as a monster of lust and cruelty, is the reproduction of a real or imaginary scene from the reign of Domitian, and is animated by the profoundest scorn and loathing both of the tyraut himself and of the worst instruments of his tyranny. The fifth is a social picture of the degradation to which poor guests were exposed at the banquets of the rich, but many of the epigrams of Martial and the mure sober evidence of one of Pliny’s letters show that the picture painted by Juvenal, though perhaps exaggerated in colouring, was drawn from a state of society prevalent during and immediately subsequent to the times of Domitian. The second book contains the most elaborate of the satires, that which by many critics is regarded as the poet’s masterpiece, the famous sixth satire, directed against the whole female sex, which shares with Domitian and his creatures the most cherished place in the poet’s antipathies. It shows certainly no diminution of vigour either in its representation or its invective. If it is desirable that such a subject should be treated in the spirit in which Juvenal has treated it, it may be regarded as fortunate that it has been done once for all with such power, with such free- dom from the restraints inrposed either by modesty or humanity, and with, apparently, such intimate knowledge, that no writer of later ages has attempted to rival it. The time at which this satire was composed cannot be fixed with certainty, but some allu- sions (lines 502, 407-11, 205, 555%) render it highly probable that it was given to the world in the later years of Trajan, and before the accession of Hadrian. The date of the publication of Book III., containing the seventh, eighth, and ninth satires, seems to be fixed by its opening line “Et spes et ratio studiorum in Cesare tantum,” to the

first years after the accession of Hadrian. If the seventh satire stood alone, we might, from the notices of Statius, Quintilian, &c., regard it as probably belonging to the age of Domitian ; nor is it unlikely that much of it was written then, and that the con- dition of poets and men of letters there described, with more of fellow-feeling than is apparent in most of his satires, is drawn from the life at Rome with which the poet was first familiar. But it is inconceivable that the complimentary language applied to " Cesar" in the opening lines could have been meant for Domitian ; and the new Hayes which are held out for the neglected race of poets would naturally be suggested by the change from thc rule of a great soldier, whose thoughts were chiefly bent on foreign conquest, to that of an accomplished lover of art, like Hadrian. In the eighth

satire another reference is made (line 120) to the misgovernment of.

Marius in Africa as a recent event (nuper), and at line 51 therc may be an allusion to the Eastern wars that occupied the last years

1 Cf. Tacitus, Annals, xiii, 25.

- **Pliny's remarks on the vulgarity as well as the ostentation of his host imply that he regarded such behaviour as exceptional, at least in the circle in which he himself lived (Zp., ii. 6).**

3 See Mr Lewis's edition, p. 817.

of Trajan's reign. The ninth has no allusion to detcrminc its date, but it is written with the same outspoken frecdom as the second and the sixth, and belongs to the period when the poet's power was most vigorous, and his exposure of vice most uncompromising. In the fourth book, comprising the famous tenth, the eleventh, and the twelfth satires, the author appcars more as a moralist than as a pure satirist. In the tenth, the theme of the " vanity of human wishes" is illustrated by great historic instances, rather than by pictures of the men and manners of the age; and, though the declamatory vigour and power of expression

in it are occasionally as great as in the earlier satires, and although touches of his saturnine humour, and especially of his misogyny, appear in all the satires of this book, yet their general tone shows that the white heat of his indigna- tion is abated ; and the lines of the eleventh, alrcady referred to (199 sq.), i "Spectent juvenes quos clamor et audax Sponsio, quos cultze decet assedisse puelle : Nostra bibat vernum contracta cuticula solem,"

leave no doubt that he was well advanced in years when they were written.

Two important dates are found in tho last book, comprising satires xiii.xvi. At xiii, 16 Juvenal speaks of his friend Calvinus "'as now past sixty years of age, having been born in the consul- ship of Fonteius."4 There was a ©. Fonteius Capito consul in 59 a.p., and L. Fonteius Capito in 67. If it is accepted that the different books of the satires appeared at different intervals, that the third book was given to the world after Hadrian's return to Rome (118 a.p.), and that some time must have elapsed between the appearance of the third and fourth books, and again between that of the fourth and fifth, the date referred to must be the latter of these, and thus the fifth and last book could not have been pub- lished till after the year 127 a.pD. Again at xv. 27 an event is said to have happened in Egypt "nuper consule Junco," for which some editions read "Junio." There was a Junius consul in 119 a.p. Even if he were the person referred to, the word nuper (as at ii. 29, viii. 120) might well indicate a date of some ten or twelve years earlier than that of the composition of the satire. Recent investi- gations, however, make out that there was a L. Amilius Juncus consul suffectus in 127 A.p. (see Mayor's note on the passage). The fifth book must therefore have been published some time after this date. More than the fourth, this book bears the marks of age, both in the milder tone of the sentiments expressed, and in the feebler power of composition exhibited. The last satire is left incomplete, and the authenticity both of it and of the fifteenth has been questioned, though on insufficient grounds.

The general conclusion arrived at is that the satires were published at different intervals, and for tle most part, composed, under Trajan and Hadrian, between the years 100 and 130 a.p., or a year or two later, but that the most powerful in feeling and vivid in conception among them deal with the experience and impressions of the reign of Domitian, occasionally recall the memories or traditions of the times of Nero and Claudius, and reproduce at least one startling page from the annals of Tiberius.®> The same overmastering feeling which constrained Tacitus (Agric., 2, 3), when the time of long endurance and silence was over, to recall the 'memory of the former oppression," acted upon Juvenal. There is no evidence that these two great writers, who lived and wrote at the same time, who were animated by the same hatred of the tyrant under whom tlie best years of their manhood were spent, and who both felt most deeply the degradation of their times, were even known to one another. They belonged to different social circles, Tacitus to that of the highest official and senatorial class, Juvenal apparently to the middle class and to that of the struggling men of letters ; and this difference in position had much influence in determining the different bent of their genius, and in forming one to be a great national historian, the other to be a great social satirist. If the view of the satirist is owing to this circumstance more limited in some directions, and his taste and temper less conformable to

4 Friedlinder supposes that, as Juvenal has hitherto addressed Calvinus in the second person, the "hic" refers to himself, and that in the words " Fonteio Consule natus" we have the date of the poet's own birth, But elsewhere we find the poet changing suddenly from the second to the third person when there can be no doubt that they both refer to the same individual, e.g. (v. 18)—

"Votorum summa! quid ultra Queris? habet Trebius, propter quod," &c. 5 x, 56-107.

the best ancient standards of propriety, he is also saved by it from prejudices to which the traditions of his class exposed the historian. But both writers are thoroughly national in sentiment, thoroughly

masculine in tone. No ancient authors express so strong a hatred of evil. None of the other contemporary writers share this feeling. Pliny has the natural repugnance of a gentleman and honourable man to coarseness and baseness ; but he liked to live with people of tastes and manners congenial to liis own, and to see as little as possible of the corruption which existed under the surface of society. Martial, as a foreigner living in Rome, endowed with a lively observation and a keen capacity for pleasure, enjoyed whatever was enjoyable in the life around him, found in its excesses and perversions materials for his wit, and, after flattering the worst of the emperors assidu- ously through all his career, was ready with impartial sycophancy to flatter one of the best. The peculiar greatness and value of both Juvenal and Tacitus is that they did not shut their eyes to the evil through which they had lived, but deeply resented it,—the one with a vehement aud burning passion, like the "seva indignatio" of Swift, the other with perhaps even deeper but more restrained emotions of mingled scorn and sorrow, like the scorn and sorrow of Milton when "fallen on evil days and evil tongues." The wickedness of the age brought out more strongly than at any previous time the opposition between good and evil. The idea of conscience, as the connecting bond between religion and morality, appears in greater prominence in Tacitus and Juvenal than in any other ancient writers.

There is a criticism of an eminent living writer! to the effect that the secret of Juvenal's concentrated power consisted in this, that he knew what he hated, and that what he did hate was despotism and democracy. But it would be hardly true to say that the animating motive of his satire was political. It is true that he finds the most typical examples of lust, cruelty, levity, and weakness in the emperors and their wives,—in Domitian, Otho, Nero, Claudius, and Messalina. It is true also that he shares in the traditional idolatry of Brutus, that he strikes at Augustus in his mention of the "three disciples of Sulla," and that he has no word of recognition for what even Tacitus acknowledges as the beneficent rule of Trajan, So too his scorn for the Roman populace of his time, who cared only for their dole of bread and the public games, is unqualified. But it is only in connexion with its indirect effects that he seems to think of despotism ; and he has no thought of democracy at all. It is not for the loss of liberty and of the senatorian

rule that he chafes, but for the loss of the old national manliness and self-respect, alike in the descendants of "the Latian boors"? and in the representatives of the Aumilii and the Fabii. There is no more grandly imaginative passage in all his satires than that in which he evokes the ghosts of those who died at Cremera and Cannz (ii. 153 sg.) to shame the degener- ate debauchees of his own time. While we feel that we know little or nothing of his career, while we may imagine that personal disappointment may have supplied some of the gall in which his pen is dipped, and may doubt whether his own life and associations would have justified him in acting as a severer censor on what most Romans regarded as permitted indulgences than Lucilius and Horace, we cannot doubt that both his intellect and character were of a most masculine strength, and that his hatred for all that corrupted the old national character and enfeebled the national intellect was sincere and consistent. This feeling explains his detestation of foreign manners and superstitions, his loathing not only of inhuman crimes and

1 Mr Swinburne. 2 Unde nefas tantum Latiis pastoribus? (ii, 127).

eruelties but of such derelictions from self-respect as the appearance of a Roman nobleman on the arena or even the more harmless indulgence of a taste for driving, his scorn of luxury and of art as ministering to luxury, his mockery of the poetry and of the stale and dilettante culture of his time, and perhaps, too, his indifference to the schools of philosophy and his readiness to identify all the professors of stoicism with the reserved and close-cropped puritans,— '* Rarus sermo illis et multa libido tacendi Adque supercilio brevior coma," §— who concealed the worst vices under an outward appearance of austerity. The great fault of his character, as it appears in his writings, is that he too exclusively indulged this mood. It is much more difficult to find what he loved and admired than what he hated. But it is characteristic of his strong nature that, where he does betray any sign of human sympathy or tenderness, it is for those who by their weakness aud position are dependent on others for their protection,—as for "the peasant boy with the little dog, his playfellow,"* or, for "the home-sick

lad from the Sabine highlands, who sighs for his mother whom he has not seen for a long time, and for the little hut and the familiar kids.” §

If Juvenal is to be ranked as a great moralist, it is not for his greatness and consistency as a thinker on moral questions. In the rhetorical exaggeration of the famous tenth satire, for instance, the highest energies of patriotism, —the gallant and desperate defence of great causes, by sword or speech,—are quoted as mere examples of dis-appointed ambition; and, in the indiscriminate condemna- tion of the arts by which men sought to gain a livelihood, he leaves no room for the legitimate pursuits of industry. His services to morals do not consist in any positive contri- butions to the notions of active duty, but in the strength with which he has realized and expressed the restraining influence of the old Roman and Italian ideal of character, and also of that religious conscience which was becoming a new power in the world. Though he disclaims any debt to philosophy (xiii. 121), yet he really owes more to the “Stoica dogmata,” then prevalent, than he is aware of. But his highest and rarest literary quality is his power of painting characters, scenes, incidents, and actions, whether from past history or from contemporary life. In this power, which is also the great power of Tacitus, he has few equals and perhaps no superior among ancient writers. The difference between Tacitus and Juvenal in power of representation is that the prose historian is more of an imaginative poet, the satirist more of a realist and a grotesque humorist. Hecan paint great historical pictures in all their detail—as in the famous representation of the fall of Sejanus,—or call them up with all their imaginative associations in a line or two, as for instance in these—

‘¢ Atque ideo postquam ad Cimbros stragemque volabant Qui nunquam attigerant majora cadavera corvi;” he can describe a character elaborately or hit it off with a single stroke; and in either case he fixes the impression which he desires to produce firmly in the mind. The picture drawn may be a caricature, or a misrepresentation of the fact, —as that of the father of Demosthenes, “‘blear-eyed with the soot of the glowing mass,” &c.,—but it is, with rare exceptions, realistically conceived, and, as is well said by Mr Lewis, it is brought before us with the vivid touches of a Defoe or a Swift. Still more

happily the same editor has illustrated Juvenal's power as a realistic painter 01 scenes from contemporary life,—and of scenes which gene- rally combine grotesque and humorous features with serious Faby COMMIS Shoe COE a

3 ii, 14 sg. 4 ¢¢ Meliusne hie rusticus infans Cum matre et casulis et conlusore catello," &c.—ix. 60. sot, WY, IUosh

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meaning,—by eomparing him with the great pictorial satirist of the last century, Hogarth.1 Yet even in this, his most characteristie talent, his proneness to exaggeration, the attraction which eoarse and repulsive images have for his mind, and the tendeney to sacrifice general effeet to minuteness of detail not unfrequently mar his best effects.

The difficulty is often felt of distinguishing between a powerful rhetorician and a genuine poet,—and there is no writer about whom it is more difficult to determine to whieh of the two elasses he belongs than akout Juvenal. He himself knew and has well described (vii. 53. sq.) the conditions under which a great poet could flourish ; and he felt that his own age was incapable of producing one. He has little sense of beauty either in human life or nature. Whenever such sense is evoked it is only asa momentary relief to his prevailing sense of the hideous- ness of contemporary life, or in protest to what he regarded as the enervating influenees of art. Even his references to the great poets of the past indicate rather a dlasé sense of indifferenee and weariness than a fresh enjoy- ment of them. Yet his power of touehing the springs of tragic awe and horror is a genuine poetical gift, of the same kind as that whieh is displayed by some of the early English dramatists. But he is, on the whole, more essen- tially a great rhetorician than a great poet. His training, the practical bent of his understanding, his strong but morose charaeter, the eireumstances of his time, and the materials available for his art, all fitted him to rebuke his own age and all after times in the tones of a powerful preacher, rather than to charm them with the art of an accomplished poet. The composition of his various satires shows no negligence, but rather the exeess of elaboration; but it produces the impression of mechanical contrivanee rather than of

organic growth. His movement is sustained and powerful, but there is no rise and fall in it. He seems to forget how much more telling indignation is when it is severely controlled, but allowed occasionally to break forth in blasting seorn and wrath, as it is in Tacitus, than when it shows itself as the habitual mood of the writer. The verse is most earefully constructed, and is also most effee- tive, but it is so with the rhetorical effectiveness of Luean, mot with the musical charm of Virgil. It was caleulated to bring down the applause of an excited audience, not to perpetuate its melody through all suceeeding times. So, too, the diction is full, even to excess, of meaning, point, and emphasis. Iew writers have added so muel: to the eurrency of quotation. But his style altogether wants the eharm of ease and simplicity. It wearies by the constant strain after effect, its mock-heroics, and allusive periphrasis. It excites distrust by its want of moderation. It makes us long to return to nature and to the apparently more eareless but really truer art and the lighter touch of the satirist of the Augustan age—

***¢ Parcentis viribus atque Extenuantis eas consulto."**

On the whole no one of the ten or twelve really great writers whom aneient Rome produced leaves on the mind so mixed an impression, both as a writer and as a man, as Juvenal. He has little, if anything at all, of the high imaginative mood—the mood of reverence and noble admiration—which made Ennius, Lueretius, and Virgil the truest poetical representatives of the genius of Rome. He has nothing of the wide humanity of Cicero, of the urbanity of Horaee, of the ease and grace of Catullus. Yet he represents another mood of ancient Rome, the mood natural to her before she was humanized by the lessons of Greek art and thought. If we could imagine the elder Cato living under Domitian, eut off from all share in publie

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1 Lewis, Introduction, p. 215.

life, and finding no sphere for his eombative and censorious energy exeept that of literature, we should perhaps under- stand the motives of Juvenal's satire and the place which is his due as a representative of the genius of his country. As a man he shows many of the strong qualities of the old Roman plebeian,—the aggressive boldness, the intoleranee of superiority and privilege, which animated the tribunes in their opposition to the senatorian rule. Even where we least like him we find uothing small or mean to alienate our respect from him. Though he loses no opportunity of being coarse, he is not lieentious ; thougli he is often trueu- lent, he eannot be called malignant. It is, indeed, impos- sible to say what motives of personal chagrin, of love of detraction, of the mere literary passion for effeetive writing, may have eontributed to the indignation whieh inspired his verse. Dut the prevailing impression we earry away after reading him is that, in all his early satires, he was animated by a sineere and manly detesta- tion of the tyranny and eruelty, the debauchery and luxury, the levity and effeminacy, the erimes and frauds, whieh we know from other sourees were rife in Rome in the century in whieh Christianity made its first converts there, and that a more serene wisdom and a happier frame of mind were attained by him when old age had somewhat allayed the fierce rage whieh vexed his manhood.

It would be impossible to enumerate here the various editions and works forming the literature connected with Juvenal which have sprung up ~~between the appearance of the editio princeps in 1470 and the present day. 'They occupy more than five pages of EE. Hiibner's Grundriss zw Vorlesungen tiber die Rimische Literatur~~ geschichte. Among the best critical editions of the text is that of O. Jahn, and among those which may be most recommended to students are the editions of Heinrich, Macleane, Mayor, and Lewis. The last is accompanied by a literal prose translation. The verse translations of Dryden and Gifford, and Johnson's imitations of the third and tenth satires in the London and Vanity of Human Wishes, will convey to readers ignorant of Latin a good impression of the power of the original. There is no better criticism of Juvenal as a writer than that contributed by the late Professor Ramsay to Dr Smith's Dictionary of Ancient Biography and Mythology. (W.Y.8.)

JUXON, Wrtu1am (1582-1663), archbishop of Canter- bury, was born at Chiehester in 1552. Through the in- terest of his father with the Company of Merehant Taylors he received an appointment to their school, after whieh he eutered St John's College, Oxford, where he was elected a fellow in 1598. In 1603 he became a student of Gray's Inn, but afterwards he took holy orders, and in 1609 had become viear of St Giles, Oxford, an appointment which he resigned for the rectorship of Somerton, Oxfordshire, in 1615. On the recommendation of Laud he sueceeded him in November 1621 as president of St John's College ; and in 1626 he beeame vice-chaneellor of the university. Having by the continued favour of Laud been promoted successively dean of Worcester, prebendary of Chichester, bishop of Hereford, and bishop of London, he attained finally a dignity outside the ordinary sphere of ecclesiastieal aspiration, by being appointed in 1625 to the offiee of lord high treasurer. The appointment, unusual in itself, was preposterously beyond Juxon's elaims, but his striet pro- bity, his prudence, and his quiet and eonciliating behaviour wou him the regard and goodwill even of those most opposed to him in politics. He resigned this office in 1641. Charles I. chose Juxon to administer to him the last eonsolations of religion. During the period of puritan aseendaney the bishop retired to his estate of Little Compton, Glouees tershire, where he kept a paek of hounds much famed in the district. At the Restoration he was, on September 20, 1660, promoted to the see of Canterbury. He died at Lambeth palace, June 4, 1663.

Juxon was the author of the Subjects' Sorrow, or Lamentations upon the Death of Britain's Josiah, King Charics, a Sermon, 1660,

and Some Considerations upon the Act of Uniformity, 1662. See Memoirs of Archbishop Juxon and his Times, Oxford, 1869.

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THE letter K has remained with singularly little

e change in form even from the Pheenician alphabet down to the present time. It represents the guttural momentary sound produced by raising the back of the tongue to the back of the palate; it is surd, correspond- ing to G, which is sonant ; and it has this value and no other in all modern alphabets in which it is found. In many alphabets, however, it is supplanted wholly or to a great extent by the symbol C. The reason of this has been already explained under the letters C and G. The substitution of C for K took place in Italy,—the original character surviving only in a few well-understood abbre- viations ; and in consequence of this those alphabets which have been derived from Italy naturally have the C; while those derived directly from the Greek, eg., the Gothic, which came through Ulfilas, and the diffcrent alphabets which trace back to Cyril (see ALPHABET), have only the K. In German we find K, with the exception of some words borrowed from other languages, e.g., Cabinet, Cardinal, Caprice, &c.; but even foreign words when thoroughly naturalized take the German spelling, «g., Karte, Kammer, Onkel, &c. In French, on the other hand, K is found only ina few foreign words, and even these are merely names of men or countries. In England the large admixture of French words in the Teutonic language has produced some irregularity in spelling ; but the K is not found (as might have been expected) in the Teutonic words, because the Roman alphabet was intro- duced by missionaries into England, and therefore the oldest English (or Anglo-Saxon) writings regularly have C and not K. The letter was introduced probably first in words borrowed from the German (thus in Alfred's version of Gregory's Pastoral we find "kyeglum" (p. 297, L. 1, ed. Sweet), the dative of the German " Kugel"), or through German influence, as for example in the Blickling Homilves of the 10th century, we find "kyning" (p. 163, 1. 23, ed.

Morris) beside the much more common "'cyning." It-

would have been very convenient both in English and in other languages of modern Europe if K could have been kept as the sole symbol for the pure sound and C as the symbol for a common corruption of it, now to be described.

This corruption is due to palatization; the middle instead of the back of the tongue is raised against the palatc, and the result is the difference of sound between, e.g., “kirk” and “church.” This corruption was common in Sanskrit, and a special symbol was assigned to the sound. It is found in late Latin, especially before an 2; and so it passed into Italian, where c is regularly sounded as our ch before eand ¢; in the words where the sound remained unchanged the symbol ch is employed to represent it, ¢.g., in “che.” In French the change was much greater; here ¢ passed into the sh-sound (denoted by ch) before a, ¢.g., in “chambre” from “camera,” “chaud” from ‘“calidus”; observe that the symbol ch has just the opposite value to the Italian one; while before e and ¢ the sound underwent a still greater change; it sank into the simple sibilant s, eg., “civitas””—pronounced in Latin ‘“‘kivitas”—became “cité,” whence our own sound; “certus” became “certein.” In English, palatization has been very extensive; thus Old English “cese” (sounded like German “kise”) became “cheese,” “‘cild” became “child,” &c.; here dialectic variation may often be seen, ¢.g., iu Alnwick but Norwich, Caistor but Chester.

Another still greater change of K has been called “ labia- lization”: this is the passage of the k-sound through an

intermediate kw into p. This was common in Greek, where, eg., we find éropat, tpérw, of which the root form as shown by other languages was SAK, TARK ; in Latin we have the transitional forms “sequ-or,” ‘“‘torqu-eo ” ; in the Italian dialects the change was complete, eg., Oscan “ pid” corresponded to Latin “quid,” and Umbrian “ pumpe” to “quomque.” This change arose from a slight rounding of the lips while the speech-organs were in the position for é-sound ; this produced a more or less distinct /w according to the amount of the rounding, passing finally into p, when the rounding amounted to absolute closing of the lips. For the intermcdiate sound the Latin employed the symbol Q, which is a slightly turned form of the original ? (Koppa) taken by the Greeks from the Phoenician, but not required by them, and therefore suffered to fall out except in numeration ; the Latin took it on, and, if it had consistently employed it alone to denote the slightly labialized 4, the result would have been good; but it regularly added w

to it (QU), so that the Q might as well have been written K. The superfluous letter passed on to the French and English languages.

There is reason for believing that this labializing tendency is very old, —as old indeed as the Indo-European language itself. Itis probable that that language had both the & pure and another with a slight «w sound following it. This appears from the fact (first thoroughly ascertained by Fick) that in one set of cognate words which had an original d:, we find ch in Sanskrit, x or 7 in Greek, ¢ or qu in Latin, k in Lithuanian and Sclavonic; in another set we find ¢ in Sanskrit, sz (which is onr sh-sound) in Lithuanian, s in Slavonic, but only & in Greek and c in Latin; that is, m one set we see the phenomenon of labialism, in the other assibilation but no touch of labialism ; from which we infer that the assibilated & in the derived languages traces back to & pure, the labialized & to a sound which in the original language was at least slightly modified from &. An instance of the assibilation may be seen in the correspond- ence of Sanskrit "catam," Lithuanian "szimtas," to Latin "centum," Greek éxaréy; neither in Greece nor in Italy is there any labialized form of this word.

KAABA, Ka'pa, or Kaanen, the sacred shrine of Mahometanism, containing the "black stone," in the middle of the great mosque at Mecca. See Arana, vol. li. p. 262, and MEcca.

KAADEN, chief town of a department in the circle of Eger, Bohemia, is situated on the Hger, about 60 miles north-west of Prague. The town lies about 2 miles E. of the station of Kaaden-Brunnersdorf, on the railway between Eger and Carlsbad, and consists of an old town, surrounded by a wall, and two suburbs. It contains two convents, a commercial school, and a school of agriculture. The chief buildings are the Late Gothic Franciscan church, and the town-house with a noteworthy tower. 'The mant- facturcs include gloves and beet-root sugar ; there 1s some trade in wood and grain; and mining for anthracite and a mineral colouring material, yielding Kaaden green, 8 carried on in the neighbourhood. Kaaden was founded about 820; in 1277 it became a free city ; and in 1534 it saw the conclusion of a peace

between Ferdinand I., king of the Romans, and Ulrich I., duke of Wiirtemberg. The population in 1869 was 5057.

KABBALAH is now used as the technical name for the system of theosophy which began to be developed among the Jews in the 10th century, and which has also played an important part in the Christian church since the Middle

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Ages. The term primarily denotes “ reception” and then “doctrines received by tradition.” In the older Jewish literature the name is applied to the whole body of received religious doctrine with the exception of the Pentateuch, thus including the Prophets and Hagiographa as well as the oral traditions ultimately embodied in the Mishnah. It is only since the 11th or 12th century that Kabbalali has become the exclusive appellation for the renowned system of theosophy which claims to have been transmitted uninterruptedly by the mouths of the patriarchs and prophets ever since the creation of the first man.

The cardinal doctrines of the Kabbalah embrace the nature of the Deity, the Divine emanations or Sephiroth, the cosmogony, the creation of angels and man, their destiny, and the import of the revealed law. According to this esoteric doctrine, God, whio is boundless and above everything, even above being and thinking, is called Ln Soph (dareipos) ; He is the space of the universe contain- ing ro wav, but the universe is not his space. In this boundlessness He could not be comprehended by the intellect or described in words, and as such the En Soph was in a certain sense Ayin, non-existent (Zohar, iii. 283). To make his existence known and comprehensible, the En Soph had to become active and creative. As creation involves intention, desire, thought, and work, and as these are properties which imply limit and belong to a finite being, and moreover as the imperfect and circumscribed nature of this creation precludes the idea of its being the direct work of the infinite and perfect, the En Soph had to become creative, through the medium of ten Sephiroth or intelligences, which emanated from him like rays proceed- ing from a luminary.

Now the wish to become manifest and known, and hence the idea of creation, is co-eternal with the inscrut- able Deity, and the first manifestation of this primordial will is called the first Sephira or emanation. This first Sephira, this spiritual sub- stance which existed in the En Soph from all eternity, contained nine other intelli- gences or Sephiroth. These again emanated one from the other, the second from the first, the third from | the second, and so on up to ten.

The ten Sephiroth, which form amoung themselves and with the En Soph a strict unity, and which simply represent dif- ferent aspects of one and the same being, are respectively de- nominated (1) the Crown, (2) Wisdom, (3) Intelligence, (4) Love, (5) Justice, (6) Beauty, (7) Firm- ness, (8) Splendour, (9) Foundation, and (10) Kingdom. Their evolution was as follows :

THE ENULESS

SPLENBOUR

**FIRMNES **

The Archetypal Man.

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form, he produced everything in the form of male and female, as things could not continue in any other form. Hence Wisdom, the second Sephira, and the beginning of development, when it proceeded from the Holy Aged (another name of the first Sephira) emanated in male and female, for Wisdom expanded, and Intelligence, the third Sephira, proceeded from it, and thus were obtained male and female, viz., Wisdom the father and Intelligence the mother, from whose union the other pairs of Sephiroth suc- cessively emanated ” (Zohar, ui. 290). These two opposite potencies, viz., the masculine Wisdom or Sephira No. 2 and the feminine Intelligence or Sephira No. 3 are joined together by the first potency, the Crown or Sephira No. 1; they yield the first triad of the Sephiric decade, and con- stitute the divine head of the archetypal man, as will be seen in the accompanying figure.

From the junction of Sephiroth No. 2 and 3 emanated the masculine potency Love or Mercy (4) and the feminine potency Justice (5), and from the junction of the latter two emanated again the uniting potency Beauty (6). Beauty, the sixth Sephira, constitutes the chest in the archetypal man, and unites Love (4) and Justice (5), which constitute the divine arms, thus yielding the second triad of the Sephirie decade. From this second conjunc- tion emanated again the masculine potency Firmness (7) and the feminine potency Splendour (8), which constitute the divine legs of the archetypal man ; and these sent forth Foundation (9), which is the genital organ and medium of union between them, thus yielding the third triad in the Sephiric decade. Kingdom (10), which emanated from the ninth Sephira, encircles all the other nine, inasmuch as it is the Shechina, or divine halo, which encompasses the whole by its all-glorious presence.

In their totality and unity the ten Sephiroth are not only denominated the World of Sephiroth, or the World of Emanations, but, owing to the above representation, are called the primordial or archetypal man (= zpwrdéyovos) and the heavenly man. It is this form which, as we are assured, the prophet. Ezekiel saw in the mysterious chariot (Ezek. i, 1-28), and of which the earthly man is a faint copy:

a the three triads respectively represent intellectual, moral, and physical qualities, the first is called the Intellectual, the second the Moral or Sensuous, and the third the Material World. In the figure of the arche- typal man it will be seen that the three Sephiroth on the right are masculine, and represent the principle of rigour, that the three on the left are feminine and represent the principle of mercy, and that the four central or uniting Sephiroth represent the principle of mildness. Hence the right is called “the Pillar of Judgment,” the left “the Pillar of Mercy,” and the centre “ the Middle Pillar.” The middle Sephiroth are synecdochically used to represent the worlds or triads of which they are the uniting potencies. Hence the Crown, the first Sephira, which unites Wisdom and Intelligence to constitute the first triad, is by itself denominated the Intellectual World. So Beauty is by itself described as the Sensuous World, and in this capacity is called the Sacred King or simply the King, whilst Kingdom, the tenth Sephira,

which unites all the nine Sephiroth, is used to denote the Material World, and as such is denominated the Queen or the Matron. Thus a trinity of units, viz., the Crown, Beauty, and Kingdom, is obtained within the trinity of triads. But further, each Sephira is as it were a trinity in itself. It (1) has its own absolute character, (2) receives from above, and (3) com- municates to what is below. " Just as the Sacred Aged is represented by the number three, so are all the other lights

"When | (Sephiroth) of a threefold nature" (Zohar, ili, 288). In

the Holy Aged, the concealed of all concealed, assumed a | this all-important doctrine of the Sephiroth, the Kabbalah

insists upon the fact that these potencies are not creations of the En Soph, which would be a diminution of strength ; that they form among themselves and with the En Soph a strict unity, and simply represent different aspects of the same being, just as the different rays which proceed from the light, and which appear different things to the eye, are only different manifestations of one and the same light; that for this reason they all alike partake of the perfections of the En Soph; and that as emanations from the Infinite, the Sephiroth are infinite and perfect like the En Soph, and yet constitute the first finite things. They are infinite and perfect when the En Soph imparts his ful- ness to them, and finite and imperfect when that fulness is withdrawn from them.

The conjunction of the Sephiroth, or, according to the language of the Kabbalah, the union of the crowned King and Queen, produced the universe in their own image. Worlds came into existence before the En Soph manifested himself in the human form of emanations, but they could not continue, and necessarily perished because the conditions of development which obtained with the sexual opposites of the Sephiroth did not exist. These worlds which perished are compared to sparks which fly out from a red-hot iron beateu by a hammer, and which are extin- guished according to the distance they are removed from the burning mass. Creation is not ex nihilo; it is simply a further expansion or evolution of the Sephiroth. The world reveals and ma'xss visible the

Boundiess and the concealed of the concealed. And, though it exhibits the Deity in less splendour than its Sephiric parents exhibit the En Soph, because it is farther removed from the primordial source of light than the Sephiroth, still, as it is God manifested, all the multifarious forms in the world point out the unity which they represent. Hence nothing in the whole universe can be annihilated. Everything, spirit as well as body, must return to the source whence it emanated (Zohar, ii. 218), The universe consists of four different worlds, each of which forms a separate Sephiric system of a decade of emanations. They were evolved in the following order. (1) The World of Emanations, also called the Image and the Heavenly or Archetypal Man, is, as we have seen, a direct emanation from the En Soph. Hence it is most intimately allied to the Deity, and is perfect and immutable. From the conjunction of the King and Queen (z.., these ten Sephiroth) is produced (2) the World of Creation, or the Briatic world, also called "the Throne." Its ten Sephiroth, being farther removed from the En Soph, are of a more limited and circumscribed potency, though the substances they comprise are of the purest nature and without any admixture of matter. The angel Metatron inhabits this world. He alone constitutes the world of pure spirit, and is the garment of Shaddai, z.e., the visible manifestation of the Deity. His name is numerically equivalent to that of the Lord (Zohar, 111. 231). He governs the visible world, preserves the harmony and guides the revolutions of all the spheres, and is the captain of all the myriads of angelic beings. This Briatic world again gave rise to (3) the World of Formation, or Yetziratic World. Its ten Sephiroth, being still farther removed from the Primordial Source, are of a less refined substance. Still they are yet without matter. It is the abode of the angels, who are wrapped in luminous garments, and who assume a sensuous form when they appear to men. The myriads of the angelic hosts who people this world are divided into ten ranks, answering to the ten Sephiroth, and each one of these numerous angels is set over a different part of the universe, and derives his name from the heavenly body or element which he guards (Zohar, i. 42). From this world finally emanated (4) the World of Action, also called the World of Matter, Its ten Sephiroth are made

up of the grosser elements of the former three worlds ; they consist of material substance limited by space and percep. tible to the senses in a multiplicity of forms. This world

_is subject to constant changes and corruption, and is the

dwelling of the evil spirits. These, the grossest and most deficient of all forms, are also divided into ten degrees, each lower than the other. The first two are nothing more than the absence of all visible form and organization ; the third degree is the abode of darkness; whilst the remaining seven are "the seven infernal halls," occupied by the demons, who are the incarnation of all human vices. 'These seven hells are subdivided into innumerable compartments corresponding to every species of sin, where tle demons torture the poor deluded human beings who have suffered themselves to be led astray whilst on earth, The prince of this region of darkness is Samael, the evil spirit, the serpent who seduced Eve. His wife is the Harlot or the Woman of Whoredom. The two are treated as one person, and are called "the Beast" (Zohar, it, 255-259, with i. 35).

The whole universe, however, was incomplete, and did not receive its finishing stroke till man was formed, who is the acme of the creation and the microcosm. "The heavenly Adam (i.e, the ten Sephiroth) who enamated from the highest primordial obscurity (¢.e., the En Soph) created the earthly Adam" (Zohar, ii. 70). '* Man is both the import and the highest degree of creation, for which reason he was formed on the sixth day. As soon as man was created everything was complete, including the upper and nether worlds, for everything is comprised in man. He unites in himself all forms" (Zohar, iii. 48). Each member of his body corresponds to a part of the visible universe. '" Just as we see in the firmament above, covering all things, different signs which are formed of the stars and the planets, and which contain secret things and profound mysteries studied by those who are wise and expert in these things ; so there are in the skin, which is the cover of the body of the son of man, and which is like the sky that covers all things above, signs and features which are the stars and planets of the skin, indicating secret things and profound mysteries whereby the wise are

attracted who understand the reading of the mysteries in the human face" (Zohar, ii. 76). The human form is shaped after the four letters which constitute the Tetragrammaton. The head is in the shape of *, the arms and the shoulders are like n, the breast like 4, and the two legs with the back again resemble 4 (Zohar, ii. 72). The souls of the whole human race pre-exist in the World of Emana- tions, and are all destined to inhabit human bodies. Like the Sephiroth from which it emanates, every soul has ten potencies, consisting of a trinity of triads. (1) The Spirit (22), which is the highest degree of being, corresponds to and is operated upon by the Crown, which is the highest triad in the Sephiroth, and is called the Intellectual World ; (2) the Soul (917), which is the seat of the moral qualities, corresponds to and is operated upon by Beauty, which is the second triad in the Sephiroth, and is called the Moral World ; and (3) the Cruder Soul (22), which is imme- diately connected with the body, and is the cause of its lower instincts and the animal life, corresponds to and 1s operated upon by Foundation, the third triad in the Sephiroth, called the Material World. Each soul, prior to its entering into this world, consists of male and female united into one being. When it descends on this earth the two parts are separated and animate two different bodies. "At the time of marriage the Holy One, blessed be he, who knows all souls and spirits, unites them again as they were before ; and they again constitute one body and one soul, forming as it were the right and the left of the individual, . . . This union, however, is influenced by the

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deeds of tle man and by the ways in which he walks. If the man is pure and his conduct is pleasing in the sight of God, he is united with that femile part of the soul which was his component part prior to his birth" (Zohar, i. 91). The soul's destiny upon earth is to develop those perfections the germs of which are eternally implanted in it, and it ultimately must return to the infinite source from which it emanated. Hence, if, after assntaing a body and sojourning upon earth, it becomes polluted by sin and fails to acquire the experience for which it descends from heaven, it must three times reinhabit a body, till it is able to ascend in a purified state through repeated trials. If, after its third

residence ina human body, it is still too weak to withstand the contamination of sin, it is united with another soul, in

order that by their combined efforts it may resist the |

pollution which by itself it was unable to conquer. When the whole pleroma of pre-existent souls in the world of the Sephiroth shall have descended and occupied human bodies and have passed their period of probation and have returned purified to the bosom of the infinite Source, then the soul of Messiah will descend from the region of souls ; then the great Jubilee will commence. There shall be no more sin, lo more temptation, no more suffering. Universal restora- tion will take place. Satan himself, "'the venomous Beast," will be restored to his angelic nature. Life will be an everlasting feast, a Sabbath without end. All souls will be united with the Highest Soul, and will supplement each other in the Holy of Holies of the Seven Halls (Zohar, i. 45, 168 ; ii. 97).

According to the Kabbalah all these esoteric doctrines are contained in the Hebrew Scriptures. The uninitiated cannot perceive them ; but they are plainly revealed to the spiritually minded, who discern the profound import of this theosophy beneath the surface of the letters and words of Holy Writ. "If the Jaw simply consists of ordinary expressions and narratives, such as the words of sau, Hagar, Laban, the ass of Balaam, or Balaam himself, why should it be called the law of truth, the perfect law, the true witness of God? Each word contains a sublime source, each narrative points, not only to the single instance in question, but also to generals" (Zohar, il. 149, cf 152),

To obtain these hcavenly mysterics, which alone make the Torah superior to profane codes, definite hermeneutical rules are cmployed, of which the following are the most important. (1) The words of several verses in the Hebrew Scriptures which are regarded as con- taining a recondite sense are placed over each othcr, and the letters are formed into new words by reading them vertically. (2) The words of the text are ranged in squarcs in such a manner as to be read either vertically or boustrophedon. (3) The words are joined together and redivided. (4) The initials and final lettcrs of several words are formed into separate words. (5) Every letter of a word is reduced to its numerical value, and

the word is cxplained by another of the same quantity. (6) Every letter of a word is taken to be the initial or abbreviation of a word. (7) The twenty-two letters of the alphabet are divided into two lialves ; one half is placed above the other; and the two letters which thus become associated are interchanged. By this permutation, Aleph, the first letter of the alphabet, becomes Lamed, the twelfth letter ; Beth becomes Mem, and so on. This cipher alphabet is called Alam, from the first interchangeable pairs. (8) The commutation of the twenty-two letters is effected by the last letter of the alphabet taking the placc of the first, the last but one the place of the second, and so forth. This cipher is called Atbash. Thesc hermeneutical canons are much older than the Kabbalah. They obtained in the synagogue from timc immemorial, and were used by the Christian fathers in the in- terpretation of Scripture. Thus Canon V., according to which a word is reduced to its numerical value and interpreted by another word of the same valuc, is recognized in the New Testament (comp. Rev. xiii. 18). Canon VI. is adopted by Irenzus, who tells us that, aecording to the learned among the Hebrews, the name Jesus con- tains two letters and a half, and signifies that Lord who contains heaven aud earth [W=Y~IN1 DY Ni] (Against Heresies, ii. Xxlv., vol. i. p. 205, cd. Clark). The cipher Atbash (Canon VI11.) is used in Jeremiah xxv. 26, li. 41, where Sheshach is written for Babel. In Jer. li. 1, 399 95, Leb-Kamai (A.V., "the midst of them that rise up against me"), is written for DIWD, Chaldea, by the same rule,

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It is necessary to advert to the relation between the Kabbalah and Christianity in order to account for the extraordinary part which this theosophy played in the Christian church, especially at the time of the Renaissance. We have already seen that the Sephiric decade, or the archetypal man, like Christ, is considered to be of a double nature, both infinite and finite, perfect and imperfect. More distinct, however, is the doctrine of the Trinity. On Deut. vi. 43, where Jehovah occurs first, then Elohéni, and then again Jehovah, we are told "The voice though one, consists of three elements, fire (i.e, warmth), air Gey breath), and water (7.e., humidity), yet all tliree are one in the mystery of the voice and can only be one. Thus also Jehovah, Elohéna, Jehovah, constitute

one—three forms which are one" (Zohar, ii. 43; compare iii. 65). Discussing the thrice holy in Isaiah vi. 3, one codex of thie Zohar had the following remark: "The first holy denotes the Holy Father, the second the Holy Son, and the third the Holy Ghost" (comp. Galatinus, De Arcanis Cathol., lib. ii « 3, p. 31; Wolf, Bibliotheca Hebraica, i. 1136). Still more distinct is the doctrine of the atonement. 'The Messiah invokes all the sufferings, pain, and afflictions of Israel to come upon Him. Now if He did not remove them thus and take them upon Himself, no mau could endure the sufferings of Israel, due as their punishment for trans- gressing the law; as it is written (Isa. lili. 4), Surely He hath borne our griefs and carried our sorrows" (Zohar, i, 12), These and similar statements favouring the doctrines of the New Testament have made many Kabbalists of the highest position in the synagogue embrace the Christian faith, and write elaborate books to win their Jewish brethren over to Christ. As early as 1450 a company of Jewish converts in Spain, at the head of which were Paul de Heredia, Vidal de Saragossa de Aragon, and Davila, published compilations of Kabbalistic treatises to prove from them the doctrines of Christianity. They were followed by Paul Rici, professor at Pavia, and physician to the emperor Maximilian I. Sharing the conviction of his fellow converts that the doctrines of the Kabbalah are the doctrines of Christianity, this eminent Hebraist trans- lated into Latin the Kabbalistic work entitled Zhe Gates of Light, which he dedicated to the emperor (1516). It was from this work that Pico de Mirandola and John Reuchlin learnt the true secrets of the Kabbalah. Prominent among the "nine hundred theses" which Mirandola had placarded in Rome, and which he undertook to defend in the presence of all European scholars, whom he invited to the Eternal City, promising to defray their travelling expenses, was the following: "No science yields greater proof of the divinity of Christ than magic and the Kabbalah." Mirandola so convinced Pope Sixtus of the paramount importance of the Kabbalah as an auxiliary to Christianity that his holiness exerted himself to have Kabbalistic writings translated into Latin for the use of divinity students. With equal zeal did Reuchlin act as the apostle of the Kabbalah. His treatises exercised au almost magic influence upon the greatest thinkers of the time. Pope Leo X. and the early Reformers were alike captivated by the charms of the Kabbalah as propounded by

Reuchlin, and not only divines, but statesmen and warriors, began to study the Oriental languages in order to be able to fathom the mysteries of Jewish theosophy.

Though the followers of this theosophy claim two works as their codes, viz., the Book of Creation and the Zohar, it is really only the latter which is the Bible of the Kabbalists. The renowned Zohar is written in Aramaic, and is a com- mentary on the Pentateuch, according to its division into fifty-two hebdomadal lessons. It derives its name "yy, z.e., Light, from the words "Let there be light" (Gen. i, 4), with the exposition of which it begins. Interspersed

throughout the Zohar, cither as parts of the text with distinct titles or in separate columns, are the following eleven dissertations :—(1) ' Additions and Supplements" ; (2) "The Mansions and Abodes," describing the structure of paradise and hell; (3) "The Mysteries of the Penta- teuch," describing the evolution of the Sephiroth, &ec.; (4) "The Hidden Interpretation," deducing esoteric doctrine from the narratives in the Pentateuch ; (5) "The Faithful Shepherd," recording discussions between Moses the faith- ful shepherd, the prophet Elijah, and R. Simon b, Yochi, the reputed compiler of the Zohar; (6) "The Secret of Secrets," a treatise on physiognomy and psychology; (7) "The Aged," a¢, the prophet Elijah, discoursing with h. Simon on the doctrine of transmigration as evolved from Exod, xxi. l-xxiv. 18; (8) ""'The Book of Secrets," discourses on cosmogony and demonology; (9) 'The Great Assembly," discourses of R. Simon to his numerous assembly of disciples on the form of the Deity and on pneumatology ; (10) "The Young Man," discourses by young men of superhuman origin on the mysteries of ablutions ; and (11) 'The Small Assembly," containing the discourses on the Scphiroth which R. Simon delivered to the small congregation of six surviving disciples.

The Zohar pretends to be a compilation made by R. Simon b. Yochi, who flourished about 70-110 a.v., of doctrines which God communicated to Adam in Paradise, and which have been received uninterruptedly from the mouths of the patriarchs and prophets.

Amongst the many facts, however, established by modern criticism which prove the Zohar to be a compilation of the 13th century, the following are the most prominent :—(1) the Zohar itself praises most fulsomcly R. Simon, its reputed author, and exalts him above Moses; (2) it mystically explains the Hebrew vowel points which did not obtain till 570; (3) tlie compiler borrows two verses from the celebrated hymn called "The Royal Diadem," written by Ibn Gebirol, who was born about 1021; (4) it mentions the capture of Jerusalem by the crusaders and the re- taking of the Holy City by the Saracens; (5) it speaks of the comet which appeared at Rome, July 15, 1264, under the pontificate of Urban IV.; (6) by a slip the Zohar assigns a rcason why its contents were not revealed before 5060-66 a.m., z.e., 1300-1306 a.p.; (7) the doctrine of the En Soph and the Sephiroth was not known before the 13th century; and (8) the very existence of the Zohar itself was not known prior to the 13th century. Hence it is now believed that Moses de Leon (0d. 1305), who first circulated and sold the Zohar as the production of R. Simon, was himself the author. That eminent scholars both in the synagogue and in the church should have been induced to believe in its antiquity is owing to the fact that the Zohar embodies many opinions and doctrines which obtained among the Jews prior to the time of Christ. The undoubted antiquity of these has served as a lever in the minds of these scholars to raise the late speculations about the En Soph, the Sephiroth, &c., to the same age.

Literature.—The Zohar, frequently published in 3 vols., the agination of which, like that of the Talmud, is always the same ; 3aron von Rosenroth's Kabbala Denudata, Sulzbach, 1677-78, Frankfort, 1684; Azariel, Commentary on the Doctrine of the Sephiroth, Warsaw, 1798, Berlin, 1850; Id., Commentary on the Song of Songs, Altona, 1763; Franck, La Kabbale, Paris, 1843 (trans. by Jellinek, Leipsic, 1844) ; Graetz, Geschichte der Juden, vol. vii. 449-459; art. "Cabbalah," in Smith's Dictionary of Christian Biography, &c. ; Ginsburg, The Kabbalah, its Doctrines, Develop- ment, and Literature, London, 1865. Ch IDL (Ge)

KABUL. See CaBuL.

KABYLES, or more correctly KapArt, a number of tribes in the Algerian region of northern Africa, of special interest to the politician from the peculiarity of their institutions and from the part they will probably play in the development of the French colony, and to the ethno-

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logist as the best known branch of the great Berber race. In 1864 it was estimated that they amounted to 2,200,000, The country which they inhabit is usually regarded as consisting of two divisions—Great Kabylia and Lesser Kabylia—the former being also known as the Kabylia of the Jurjura (also called Adrar Budfel, “ Mountain of Snow”). It is admitted on all hands that the Berbers form the main aboriginal element in the population of northern Africa, that at one time or other they have occupied the whole tract of country from Egypt in the east to the Canary Islands in the west, and that they are stil represented not only by the Tudreg (Amashir, &c.), who retain their native speech, but by many tribes that have become altogether Arab in language. In regard to their real ethnic relations, however, there has been much discussion and theory: Kaltbrunner includes the Berbers in the Mediterranean race in which Haeckel places the Semites, Iberians, &c.. M. G. Olivier! recognizes the Berbers as Aryans, and Faidherbe regards them as the indigenous Libyans mingled with a fair-skiuned people of European origin; while Pruner Bey and Duveyrier maintain the close rclation of the Berbers with the ancient Egyptians, and consider them as forming together the white African race.2 Be this as it may, the Kabyles are a Berber stock, aud more particularly correspond to that part of the race which was known to the Romans as Numidians. Physically they do not present any very prominent contrast to the Arabs of Algeria. Both Kabyle and Arab are white at birth, but rapidly grow brown through exposure to air and sunshine. Both have in general brown eyes and wavy hair of coarse quality, varying from dark brown to jet black. In stature there is perhaps a little difference in favour of the Kabyle, and he appears also to have a stouter trunk and bulkier muscles. Both are clearly dolichocephalic. Among the Kabyles, it is worthy of particular notice, there exists a varying pro- portion of

individuals with fair skins, ruddy complexions, and blue or grey eyes. As to the ethnic origin of this peculiar element many conjectures have been hazarded,— one theorist seeing in them the Vandals, another the Gallic mercenaries of Rome, another an aboriginal fair-skinned race, another the dolmen-building people from Europe. In the whole domain of life and character the contrasts between Arab and Kabyle are of the most radical and striking kind. The Kabyle lives in a house of stone or clay, forming part of a fixed village or hamlet ; the Arab's tent is moved from place to place. The Kabyle enjoys the individual proprictorship of his garden and his orchards ; with the Arab the ownership of the soil is an attribute of the tribe. While cereals alone are cultivated by the Arab, the Kabyle has his fig trees, olives, and vines, vegetables and tobacco. Active, energetic, and enterprising, the Kabyle is to be found far from home—as a soldier in the French army, as a workman in the towns, as a field labourer, or as a pedler or tradcr earning by steady effort the means of purchasing his bit of ground in his native village. Nor, however insignificant they may appear when measured by a high European. standard, are the native industries to be despised. Not only do they comprise the making of lime, tiles, woodwork for the houses, domestic utensils, and agricultural implements, but also the weaving and dyeing of several kinds of cloth, the tanning and dressing of leather, and the manufacture of oil and soap. Without the assistance of the wheel, the women turn out a variety of earthenware articles ; before it became a sort of proscribed industry the production of gunpowder was OT eee ee eee

1 '¢ Recherches sur Vorigine des Berbéres," Bull. de T Acad. d' Hippone, 1867, 1868. ; es

2 Sce Henri Duveyrier, " Les Progrés de la géographie en Algerie, 1868-71," Bull. de la Soe. Khediviale de Géogr., Cairo, 1876.

regularly carried on; the native jewellers make excellent ormmaments in silver, coral, and enamel; in some places wood carving has been brought to considerable perfection ; and native artists know how to engrave on metal both by etching and the burin. Like the Arabs of

Algeria, the Kabyles are Mahometans of the Sunnite branch and the Malekite rite, looking to Morocco as the nearer centre of their religion; but, whereas the Arabs are fatalistic and superstitious, the Kabyles show a more independent and rationalistic turn of mind. In spite of the Koran and its administrators the Kabyles are essentially democratic. In the words of Renan,! "the people is everything and suffices for everything ; government, police, administration of justice, cost nothing to the community. It is the ideal of democracy, the direct government of the people by the people." The political unit is the village or commune ; so many villages constitute a fraction, so many fractions 2 tribe ; and the tribes again are combined in the Kabaila or confederation. 'The governing authority in the com- mune is the Jemé'a or general gathering of the citizeus,— every man old enough to keep the fast of the Ramadhan having a right to take part in its proceedings. Its chief executive officer, the amin, is chosen by the goodwill of his fellows, receives no remuneration, and withdraws from his functions as soon as he loses the confidence of the electorate. Some of the Kabyles retain their vernacular speech, while others have more or less completely adopted Arabic, The best known dialect is that of the [gaouaouen, or Zouaoua,? who, at least from the time of Ibn Khaldoun, have been settled on the northern side of the Jurjura; it is the principal basis of Hanoteau's Lssav de Grammaire Kabyle (Paris, 1858), Unlike their southern brethren, the Kabyles have no alphabet, and their literature is still in the stage of oral transmission for the most part by pro- fessional reciters. Hanoteau's Poésies populaires de la Kabylie du Jurjura (Paris, 1867) gives the text and translation of a considerable number of historical pieces, proverbial couplets and quatrains, dancing songs, &c.

The best résumé of ascertained facts in regard to the Kabyles is the Jnstructions sur [Anthropologie de U Algérie, by General Faid- herbe and Dr Paul Topinard, Paris, 1874. See also Daumas, Le Sahara Algérien, Paris, 1845; De Slane's translation of Ibn Khaldoun's Zist. des Berbéres, Algiers, 1852; Aueapitaine, Les Kabyles et la Colon. del Algérie, Paris, 1864, and Les Bent M'zab, 1868; Hanoteau and Letourneaux, La Kabylie et les Coutwmnes Kabyles, Paris, 1878; a paper by Charmetant, the head of the Roman Catholic mission, in Jahrbiieher der Verbreitung des Glaubens, 1874; Dugas, La Kabylie et

le peuple Kabyle, Paris, 1878; Récoux, La démographie de l Algéric, Paris, 1880.

KADOM, a town of Russia, in the Temnikoff district of the Tamboff government, 169 miles north-north-east from Tamboff, near the Moksha, a navigable sub-tributary of the Volga. It lies for the most part in a low sandy plain, but the principal church and the Sorova convent are situated on a hill. The public, buildings are of no special note. The population was 7365 in 1861, and 7100 in 1870. A

considerable trade is fostered by the local fairs and markets.

Kadom is an ancient place ; it was purchased in 1381 along with the Meshtcher lordship by Demetrius of the Don. In modern times it has had a curious administrative history: incorporated with the Kazan government in 1708, it was assigned to the Azotf government in 1719, to the Shatsk provinee of the Voronezh government in 1725, and to Tamboff in 1779.

KADUR, or Capoor, a district of Mysore state, southern India, lying between 13° 12’ and 13° 58’ N. lat., and between 75° 8’ and 76° 25’ E. long., with an area of 2294 square miles. It is bounded on the N. by Shimoga, on thie E. by Chitaldrug, on the S. of Hassan,—all Mysore dis- tricts; on the W. the Western Ghats separate it from the

Bombay district of South Kanara.

1 “Tia société berbére,” Revue des Deux Mondes, 1873. 2 The Arabic Zouaoua (to use the French transliteration) has given rise to the well-known “ Zouaves”’ of the Freneh army.

The larger portion of the district consists of the Malnad or hill country, which contains some of the wildest mountain scenery in southern India. The western frontier is formed by the chain of the Ghats, of which the highest peaks are the Kuduremukh (6215 feet) and the Meruti Gudda (5451 feet). The centre of the district is occupied by the horse- shoe

range of the Baba Budans, containing the loftiest mountain in Mysore, Mulaingiri, 6317 feet. The Maidan or plain country lying beneath the amphitheatre formed by the Baba Budan hills is the most fertile portion of the district, well watered, and with the famous " black cotton soil," The principal rivers are the Tunga and Bhadra, which rise near each other in tle Ghats, and unite to form the Tungabhadra, a tributary of the Kistna. The eastern portion of the district is watered by the Vedavati. At the point wliere this river leaves the Baba Budan hills, it is embanked to form two extensive tanks, which irrigate the lower valley. From all the rivers water is drawn off into irrigation channels by means of anicuts or weirs. The chief natural wealth of Kadur is in its forests, which con- tain inexhaustible supplies of the finest timber, especially teak, and also furnish shelter for the coffee plantations. fron is found and smelted at the foot of the hills, and corundum exists in certain localities. Wild beasts and game are numerous, and fish are abundant.

The ecnsus of 1871 returned the population of the district at 332,381 (Hindus, 318,480; Mahometans, 12,017; Jains, 1316; Christians, 568). Only one town, Tarikere, contains over 5000 in- habitants, the population in 187] being 5302. Chikmagalur, the headquarters of the district, has only 2027 inhabitants, and Kadur, the old civil station, only 2738. The staple erop of the district is rice, chiefly grown on the hill slopes, where the natural rainfall is sufticient, or in the river valleys, where the fields ean be irrigated from tanks and artificial canals. The prineipal unirrigated erop is rdgé (Cynosurus coracanus), which is preferred as food by the natives to rice, as affording more sustenance. The principal agri- eultnral industry, however, is eoffee cultivation. The berry is stated to have been first introdneed by a Mahometan saint, Baba Budan, about two centuries ago, on his return from a pilgrimage to Meeea. uropean capital was not attraeted to the enterprise till about 1840, but there are now 60,000 aeres under coffee. The eocoa-nut and areca-nut palms flourish in the moist and sheltered valleys in the west. A Government einechona plantation has also been established on the Baba Budan hills. The local manufactures inelude the produetion of cotton eloth, rough blankets, and sugar, as well as oil-pressing, spirit-distilling, and iron-smelting. The annual value of the district exports is

estimated at £297,000, and the imports at £217,000. The revenue of the distriet in 1873-74, excluding forests, education, and public works, was £94,316. Government aided and inspected sehools numbered 176 in 1874, attended by 3027 pupils; unaided schools, 121, with 1235 pupils. The mean annual temperature at Chikmagalur, iy abont 78° F. During 1873 and 1874 the maximum recorded was 93°, and the lowest 69°. Inthe Malnad the temperature falls much lower, and the eold at night in Deeember and January is very sharp. The average rain- fall at Chikmagalur during the four years ending 1874 was only 36 inches; while on certain ecofiee plantations on the Malnad from 100 to 170 inehes have been registered. Jungle or malarious fevers are prevalent in the Malnad at certain seasons of the year, from which neither natives nor Europeans are exempt.

Lfistory.—As containing the hallowed sources of the Tungabhadra, Kadur distriet abounds with seenes associated with the legends of the Ldmdyana. Sringeri or Rishya-sringa-giri, on the Tunga river, takes preeedenee of all other places in its claims to mythical antiquity. Here, in historical times, was the home of Sankara Acharya, the great Sivaite reformer of the 8th century; and here at the present day resides the jagat-gurw or supreme high priest of the Smarta Brahmans. The most aneient sites econneeted with local history are the ruins of Ratnapuri and of Sak-ray-patna, both of which are described as the capitals of powerful kings before the rise of the Ballala dynasty. On the overthrow of the Ballalas by the Mahometans, the Vijayanagar empire established itself over southern India; but the feudatory chicfs were practically inde- pendent. Subsequently the greater part of the distriet was overrun by the Ikkeri or Bednur pdlegdy from the neighbouring district of Hassan, who was in his turn defeated in 1694 by the conquering Hindu rajas of Mysore. It was not until 1763 that Hyder Ali finally incorporated the whole eountry in the Mysore dominions, In 1799, after the death of Tipu, Kadur was restored to the Hindu kingdom then set up by the marquis of Wellesley. But in 1831 a general insurrection broke out, which overpowered the Mysore

Government, and necessitated the use of British troops before it was snppresscd. The inquiry that followed led to the assumption of the direct administration of the entire state of Mysore by the British. This administration was continued till March 1881, when the state was again handed over to its native rulcrs, on the repre- seutative of the ruling family attaining his majority.

KAEMPFER, EncrLBrecut (1651-1716), traveller and physieian, was born September 16, 1651, at Lemgo in Lippe-Detmold, Westphalia, where his father was a pastor. He studied at Hameln, Liineburg, Hamburg, and Libeck, and, after graduating as doctor of philosophy at Cracow, he spent four years at K6nigsberg in Prussia, in the study of medicine and the natural sciences. In 1681 he visited Upsala in Sweden, where he was offered inducements to settle ; but his desire for foreign travel led him eagerly to aceept the post of seeretary to the embassy whieh Charles XI. sent through Russia to Persia in 1683. When after a stay of two years the Swedish embassy prepared to return from Ispahan, Kaempfer entered the service of the Duteh East India Company, as chief surgeon of the fleet then in the Persian Gulf. A malignant fever whieh seized him at Gamron on the Gulf prevented his further travels for a long while; and he did not arrive at Batavia till September 1689. The following winter was spent by Kaempfer in studying the natural history of Java; and in May 1690 he set out for Japan as physician to the embassy sent yearly to that country by the- Dutch. 'The ship in which he sailed touched at Siem, and in September arrived at Nagasaki, the only Japanese port then open to foreigners. Kaempfer stayed two years in Japan, during whiel: he twice visited Yedo (now T6ki6), the eapital of the shdgun. His adroit- ness, insinuating manners, and medieal skill overeame the habitual jealousy and reticenee of the natives, and enabled him to elicit mueh valuable information, which he has embodied in his MZtstory of Japan. In November 1692 Kaempfer left Japan, and in October 1693 he landed at Amsterdam. Receiving the degree of doctor of medicine at Leyden, he settled down in his native city to edit and publish his travels and scientifie papers at his leisure ; but his appointment as physieian to the count of Lippe involved him in the cares of an extensive medical practice that hindered his literary labours. His health, already

impaired by his travels, gave way under various domestic troubles ; and he died at Lemgo, November 2, 1716, in his sixty- sixth year.

The only work Kaempfer lived to publish was Armenitatum Exoticarum Politico-physico-medicarum Fasciculi V. (Lemgo,1712), a selection from his papers giving most interesting results of his observations in Georgia, Persia, and Japan. At his death his unpublished manuscripts were purchased by Sir Hans Sloane, and conveycd to England. Among them was a History of Japan, which was translated from the manuscript into English by J. G. Scheuchzer and published at London, in 2 vols., in 1728. The original German has never been published, the extant German version being taken from the English. The interest and value of the work are very great. It not only contains a history, strictly so called, but also a description of the political, social, and physical state of the country in the 17th century. lor upwards of a hundred years it remained the chief, if not almost the only available source of information

about Japan for the general reader, and is still not wholly obsolete. A life of the author is prefixed to the Zstory.

KAFFA, a town in the Crimea. See THEODOSIA.

KAFFA, or Gomana, a little-known region to the south of Abyssinia in Afriea, forming a cool elevated tract between tlle basins of the Sobat on the west and the Juba on the east. Some of its mountain summits, among whieh is Mount Mata Gera, are believed to be over 12,000 feet high. Kaffa is held to be the native home of the coffee- plant, which grows in wild profusion on the mountain slopes. The chief town is Bonga, described as one of the largest towns in Ethiopia, in 7° 12’ N. lat. The inhabitants, largely belonging to the race of blaek Gallas, are said by Beke to be Christians, and to speak a language coguate with the Gonga tongue, spoken in a portion of

Damot, ou the northern side of the Abai. The French traveller Abbadie, who visited Kaffi in 1843, was the first European explorer. Dr Beke

gives a description of the habits of the people in the London Geographical Journal for 1843; as also does Dr Krapf in his Z'ravels, &c., in Eastern Africa (1860).

KAFFRARIA, KAFPFRES. The name Kaffraria or Kaffreland properly means the country of the Kaffres, and in this sense would embrace the whole region extend- ing from the river Keiskamma to Delagoa Bay, including at least British Kaffraria and Kaffraria Proper, Natal, Zululand, the Transvaal, and the Orange River Free State. The term, however, has usually been confined to the distriets popularly known as British Kaffraria and Kaffraria Proper. Neither term is now used officially. British Kaffraria was incorporated with Cape Colony in 1866, and now forms the two official districts of King William's Town and East London; Kaffraria Proper is now known officially as the Transkeian Territories, or simply the Transkei. But, as the two designations are still in popular use, and as they are in several respects eon- venient, it will be useful here to give some aecount of the geography and the more important events in the history of the two districts under the general heading.

The physical echaracteristies of the two Kaffrarias bear a general resemblanee to those of the Cape Colony, of whieh they are the north-east continuation. The country generally rises from the sea-level in a series of terraces to the lofty mountains forming the north-west boundary. British Kaffraria culminates in the Amatola mountains, rising in one part to upwards of 6000 feet. The features of Kaffraria Proper are much more varied, and exhibit some of the most picturesque seenery in South Africa, The rugged range of the Drakenberg forms its north-west boundary, rising at its north-eastern point toa height of 9657 feet. Between that range and the eoast-lands are many subsidiary ranges with fertile valleys through which the great rivers make their way to the Indian Ocean. The coast region is more broken than is the ease farther south. The prevalent roek along the coast of Kaffraria is the Old Sandstoue, nonfossiliferous rock, quartzite, in- tersccted occasionally with veins of white quartz rock, and often eapped with a dense mass of conglomerate; while the interior mountains are classed by Mr Dunn as the Stormberg coal-bearing

fossiliferous beds of the Triassic period. Kaffraria is watered by hundreds of rivers, most of them rising at no great distance from the eoast, but several of them of large dimensions. The chief, begin- ning at the south, are the Keiskamma, the Buffalo, the Kei, the Bashee, the Umtata, the St John's or Umzimvubu, with several large tributaries, and the Umtamvuna, which separates British Kaffraria from Natal. The rivers are of little use for navigation. d

Kaffraria forms one of the most naturally fertile regions in §. Africa. In British Kaffraria most of the cereals grow, and in the cloofs, and scattered over the country, are forests and clumps of valuable timber. The Transkei shows even greater possibilities of culture. The moun- tain gorges abound in fine trees; thick forest and bush cover the banks of the rivers; grass grows luxuriantly in the lower regions; and the lowlands and valleys are favourable to almost any kind of fruit, field, and garden cultivation. In the oceupied district cattle and sheep are numerous ; lions are still found in the interior, and a fair amount of the game characteristic of the inland districts

belonging to the Cape. The elimate generally resembles that of the eastern province of Cape Colony, but se lL

features more approaching to those of the tropics.

eoast districts are extremely hot in summer, the tempel> z oe

ature on an average varying from 70° to 90°, while 12

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winter the day temperature is seldom below 50°, though the nights are very cold. But the variation in altitude places climates of all grades within easy reach, from the burning coast to the snow-clad mountain, Thunder- storms are frequent in summer; rain mostly falls in spring and summer, and the winters are generally dry. On the whole the climate may be considered as extremely healthy.

British Kaffraria, on its incorporation with Cape Colony, was divided into King William's Town and East London, each with a capital of the same name, and forming the two most easterly divisions of the colony. King William's Town has an area of 1781 square miles, and a total popula- tion (1875) of 106,640, of whom 9012 are white; the population of the capital is 5169. The area of Hast London province is 1225 square miles, and the population 15,514, of whom 3773 are white. Its capital, East London (population, with the contiguous Panmure, 2134), at the mouth of the Buffalo river, is the port for British Kaffraria. The anchorage is exposed, but extensive harbour works are in operation (1881). In 1880, 135 foreign ships arrived of 134,753 tons, and coastwise 152 of 217,174 tons. It is connected by railway with King William's Town, the line going north-west as far as Queenstown, the capital of the province of that name. The imports of East London amounted in 1880 to £1,152,610, showing an increase of £72,488 over the previous year; and the exports to £303,991, being an increase over 1879 of £38,369. Sheep and goat rearing is extensively carried on; there are also large numbers of cattle. Wheat, maize, and millet are the staple agricultural products. The wool exported from East London in 1880 amounted to 5,253,650 tb. In both divisions are numerous German settlements.

Kaffraria Proper or the Transkeian Territories consist of the territories of various native tribes, most of which have been annexed (1875-80) to the Cape Colony, and are under the jurisdiction of magistrates. The area of Kaffraria Proper is about 18,000 square miles,—its extreme length being about 230 miles, and its breadth from the sea to the mountains bounding it on the north-west averaging about 120 miles. On the south-east it is washed by the Indian Ocean; the Drakenberg and Stormberg ranges bound it on the north-west; in the west and south-west are the Indwe and Kei rivers, and on the east and north-east the Umzimkulu and Umtamvuna. It is surrounded by Cape Colony, Basutoland, and Natal. The area and population of the various districts can only be given approximately ; the following is an official estimate of the present popula- tion :—

HM SOVATIG oe eceveces scores 45,000 | Tambookieland …..... 70,000 Idutwya Reserve ……..... 18,000 | Griqualand East…....

100,000 Gealekaland (Kreli's 60.000 ondoland t..csseens-00+ = 230,000

COWINEPY) .....025-.. a SS Bomvantland…..... 20,00 543,000

pasture and for cultivation. According to the latest return it had 4976 horses, 37,298 calves, 182,869 sheep, and 50,240 goats, the total value of its stock being £321,784. The revenue in 1879 was £5047, the expenditure £3286, 'There are many trading stations, and wool is largely exported. The annual value of the imports and exports is estimated at £150,000. Tambookieland or Tembuland is divided into Tambookieland Proper, the district of the Emigrant Tambookies, and Bomvaniland. The first is about 75 miles long and from 30 to 40 broad. The population is probably about 30,000. There are many trading stations, and large numbers of sheep and cattle. A bill for the annexation of Tambookieland

Proper passed the Cape Parliament in 1880, The revenue of the whole of Tambookieland was estimated at £12,500 for 1880. The magistracy is at Umtata on the river of that name. West of Tambookieland and Fingoland is the district of the Emigrant Tambookies, removed some years ago from Tambookieland over the Indwe. It is 85 miles long and 20 broad; population about 40,000, with (in 1875) 5348 horses, 38,749 cattle, 84,201 sheep, 47,300 goats, and many trading stations. The Idutwya Reserve is about 28 miles square, with (in 1874) 2514 horses, 17,698 cattle, 51,302 sheep, 14,909 goats; revenue about £1380, expenditure £2976. Gcalekaland, the country of the Gcalekas, or Ama-Xosa Kaffres under Kreli, is about 50 iniles long and 30 broad. 'Traders are settling in the country, and a small trade in wool is done. All these territories lie mainly between the Kei and Bashee rivers. Bomvaniland is about 30 miles by 20; it lies between the Bashee and Umtata rivers. On both sides of St John's river, and extending to the Natal boundary, is Pondoland; only that portion of it on the south side of the St John's river, known as St John's Territories (21,905 inhabitants), has been form- ally annexed, but the magistrate has jurisdiction on both sides. Pondoland is about 60 miles square. This district is noted for its fertility and beauty, and has mucli excellent pasture

land. The district between Pondoland, Natal, Basutoland, Wodehouse division, and Tambookieland, is now known as Griqualand East, inhabited by various tribes (upwards of 100,000 souls), about 125 miles long and 40 to75 miles wide.

Kafire Wars.—During the extension of the Dutch and English powers over South Africa, collisions with the natives were of course inevitable ; there are six contests which more especially came under the designation of Kaffre wars. In 1780 the Great Fish river was settled on as the boundary between the Kaffres and the colonists. For some time previous to 1811 the Kaffres in the Zuurveld broke the boundary, took possession of the neutral ground, and committed depredations on the colonists. In order to expel them from the Zuurveld, Colonel Graham took the field with a mixed force in December 1811, and in the end the Kaffres were driven beyond the Fish river. In 1817 Lord Charles Somerset, governor of the colony, entered into a treaty with a chief, Ngqika, in which he acknowledged that chief as head of all the Ama-Xosa Kaffres, and in which it was agreed that any kraal to which stolen cattle could be traced should be held accountable for compensation. 'This was a serious blunder, Ngqika being merely a subordinate chief, the para- mount chief of the Ama-Xosas being Hintza, the chief of the Ama-Gcalekas. Some stolen cattle having been traced to onc of the kraals of a chief Ndlambe, Major Fraser, with a small force, was sent to enforce restitution. On this, Ndlambe and his fellow-chiefs attacked Ngqika, who claimed and obtained help from the colonial

Government. The Kaffres were completely routed in 1818 by a force under Lientenant-Colonel Brereton. They rallied, however, and a great force suddenly poured into the colony in the early part of 1819, sweeping at first everything before them. On April 22 the prophet-chief, Makanna, attacked Grahamstown, which was garrisoned by a mere handful of troops, under Colonel Wiltshire. Assistance arrived, however, and the Kaffres were defeated with great slaughter. The principal chiefs were outlawed, the country between Koonap Kat and

the Great Fish river was added to the colony, and that between the latter river and the Keiskamma de- elared to be neutral territory; on this some of the Katfres were allowed to settle. Final peace, however, was far from being secured. One tribe or another was almost constantly on the move, causing disturbances in which the colonists could not but suffer. In 1828 the chief Ngqika or Gaika died, and during the minority of his infant son Sandili, the government of the tribe, now ealled Gaikas, devolved on Macomo, his elder half-brother, who had been permitted to occupy the valleys of the Kat river. On aecount of an attack on the Ama-Tembu Kaffres, le was removed from the settle- ment, as was also his brother Tyali (1833). Permitted to return, they were removed again, and this vacillating treatment had no doubt something to do with the next war. On December 11, 1834, another brother of Macomo, a chief of high rank, was killed while resisting a commando party. This set the whole of the Kafire tribes in a blaze. Under Macomo, Tyali, and Xexo a force of 10,000 fighting men swept across the frontier, spread over the country, pillaged and burned the homesteads, and murdered the farmers aud all who dared to resist. The fighting power of the colony was at the time scanty, bnt all available forces were mustered, under Colonel (afterwards Sir Harry) Smith, who reached Grahamstown on January 6, 1835, six days after news of the rising reached Cape Town. The enemy's territory was invaded, and after nine months' fighting the Kaffres were completely subdued, and a new treaty of peace concluded (September 17). By this treaty all the country as far as the river Kei was acknowledged to be British, and its inhabitants declared British subjects. A site for the seat of government was selected, and named King William's Town. All this, however, was undone by the honie Government, the secretary of state for the colonies at the time being Lord Glenelg. A policy of conciliation and mildness towards the Kaffres was adopted, a policy distasteful to the colonists, although laudable efforts seem to have been made to carry it out. The next war, known as the "War of the Axe," arose from the murder of a Hottentot, to whom an old Kaffre thief was manacled while being conveyed to Grahams- town for trial for stealing an axe. The escort was attacked by a party of Kaffres and the Hottentot killed. The surrender of the murderer was refused, and war was declared on March 11, 1846. The Gaikas were the chief tribe engaged in the war, assisted during the

course of it by the Tambookies. After some reverses the Kaffres were signally defeated on June 7 by General Somerset on the Gwangu, afew miles from Fort Peddie. Still the war went on, till at length Sandili, the chief of the Gaikas, surrendered, as also gradually did the other chiefs; and by the beginning of 1848 the Kaffres were again subdued, after twenty-one months' fighting. The country was declared under British rule, and was formed into the division of Victoria East and British Kaffraria, between the new colonial boundary and the Kei river,—the latter reserved for occupation by the Kaffres. The peace, however, was not to last long. About October 1850 it was reported that the Kaffres were preparing for war. Sir Harry Smith proceeded to the frontier, and summoned Sandili and the other ehiefs to an interview. Sandili refused obedience ; upon whieh,at an assembly of other chiefs, the governor declared him deposed from his chiefship, and appointed an English-man, Mr Lrownlee, a magistrate, to be chief of the Gaika tribe. This measure is said to have been the iinmediate cause of the ensuing outbreak; but there is no doubt that the Kaffres had already determined on war. On the 24th of December Colonel Mackinnon, being sent with a small farce to capture Sandili, was attacked in a narrow defile by a large body of Kaffres, and com- pelled to retreat with some loss. This was the signal for a general rising of the Gaika tribe. The settlers in the military villages, asseinbled in fancied security to celebrate Christmas day, were surprised by the treacherous foe, many of them murdered, and their houses given to the flames. Other disasters followed in quick succession. A small patrol of military was eut off toa man. The greater part of the Kaffre police deserted, many of them carrying off their arms and accoutrements. Flushed with success, the Kaffres in immense force surrounded and attaeked Fort Cox, where the governor was with an inconsiderable force. His situation was truly critical. More than one nnsuccessful attempt was inade to relieve him; but his dauntless spirit was equal to the occasion. At the head of one hundred and fifty mounted riflemen, accompanied by Colonel Mackinnon, he dashed out of the fort, and, through a heavy fire of the enemy, rode to King William's Town,—a distance of 12 miles. Meantime, a new enemy appeared. A large number of the Kat river Ifottentots, who had in former wars been firm allies of the British, rose in rebellion. This revolt was followed by that of the

Hottentots at other missionary stations; and part of the Hottentots of the Cape Mounted Rifles followed their example. We have only space to state the general results of the war. After the confusion caused by the sudden outbreak had subsided, and due preparations were made, Sir Harry Smith and his gallant force soon turned the tide of war against the Kaffres. The Amatola mountains were stormed ; and the paramonnt chief Kreli, who all along covertly assisted the Gaikas, was severely punished. In April 1852 Sir Harry Smith was recalled, and was sueceeded by Lieutenant- General Cathcart. reli was again attacked, and reduced to sub- mission, The Amatolas were finally cleared of Kaffres, and small forts erected among them to prevent their reoccupation. It was not till Mareh 23, 1853, that martial law was revoked, and the most sanguinary of Kaflre wars brought to a conclusion, with a loss of many hundred British soldiers. Shortly after, British Kaftraria was erected into a crown colony, which it remained till 1865, when it was incorporated with the Cape Colony. After a peace of twenty-five years, once more, in 1877, the Kaffres (of Kaffraria Proper) interrupted the progress of the country and caused considerable destruction and distress. In September of that year the hereditary enmity between the Fingocs and Gcalekas broke out into open hostility, the Government taking the part of the former, who were under its protection. At first the Gealekas were driven beyond the Bashee ; but collecting in foree again they recrossed, and got the Gaikas to join them about the end of December. After several months the governor called in the aid of the imperial troops, and soon effectually broke up and defeated the rebels. The war with the Zulu Kaffres will be described under ZULULAND.

See Theal’s Compendium of the Iistory and Geography of South Africa, 3878; Silver’s Handbook to South Africa, 1880; the General Directory and Guide-Book to the Cape of Good Hope and its Dependeneies, and other year-books and blue-books; Keith Johnston’s Africa, 1878; Stanford’s large map of the Cape of Good Hope and neighbonring territories, 1876; The Colonies, and The Colonies and India (passim); Blacks, Boers, and British, by F. R. Statham, IS8I;

Hall's South African Geography, 1866; The Story of Afissions in South-East Africa, by Rev. W. Shaw, 1866; Chase and Wilmot's [istory of the Colony of the Cape of Good Hope, 1871; Anthony Trollope's South Africa, 1878. (J. 8. K,)

The Kaffres.

The Kaffres, or Kafirs, a large South African race, form ethnically a well-marked variety of the Negro type, and linguistically a dis- tinct branch of the Bantufamily. There are no general or collective national names, and the various tribal divisions are mostly desig- nated by those of distinguished historical or legendary chiets, founders of dynasties. or hereditary chieftaincies. The name Kafir (a form which in popular usage designates the African race less frequently than the inhabitants of Kafiristan in Persia) is that applied by Mahometans to all who reject the faith of Islam. It was thus current along the east coast of Africa at the arrival of the Portuguese, and passed from them to the Dutch and English, and recently even to the natives themselves under the form Aafula, as in the expression ba-ng'ama Kafuia-nje, they are only Katirs. Of this race there are two main divisions, jointly occupying the south- east corner of the continent from the Lower Limpopo to the Great Fish river north and south, and from the escarpments of the central plateau to the Indian Ocean west and east. 'They thus impinge southwards on the Hottentot domain, westwards on the kindred Basuto and Bechiana nations, nortuwards on the Tekezas, Makuas, and others also of kindred stock occupying the region stretching from the Limpopo to the Zambesi and even beyond it to Lakes Nyassa and Tanganyika. Politically the Kaffre domain comprises the Portuguese possessions skirting Delagoa Bay, the semi-mde- pendent Zulu territory, the colony of Natal, and the ancient territory of Zanguana, which included that part of Cape Colony till recently known as British and Independent Kaffraria. Of the two branches, each split up into a multiplicity of tribal divisions, the representative nations are the Ama-Zulus in the north, and the Ama-Xosas, Ama-Tembu, and Ama-Mpondas or Kaffres Proper m the south, whence the compound term Zulu-Kafire now commonly applied in a collective sense to the whole race. Intermediate between the two were the Ama-Lala or Balala of

Natal, where they are still represented by the Ama-Ncolosi, and several broken Ama- Zulu tribes now collectively known to the Kaffres as Ama-Fengu, i.e, “poor” or “needy” people, from fenguza, to seek service. _—_— ee ee

1 The Ama-Fengus are regarded both by the Ama-Zulus and Ama-Xosas us slaves or out-eastes, without any right to the freedom and privileges of Usa 53 Kaffres. They are met with everywhere, not only in Fingoland between = Great Kei and Bashee rivers south of thé Ama-Xosa territory, but also in Naa Zululand, and north of it, as well as in the highlands of the interior. Yet : el ean searcely be said to have any reeognized territory of their own, apo Oe al the intervention of the British they would have long ago been everyw. bs redueed to a state of serfdom by the dominant tribes, Those who were Bae out of Zululand early in the present eentury fell into the hands of the ie from whom they were delivered in 1835 by Sir Benjamin D’Urban, ard y ae removed to the Fort Peddie distriet between the Fish and Kciskamma me Any tribes whieh become broken and mixed would probably be regarded as tat Fengus by the other Kaffres, Henee the multiplicity of elans, such as i ae Bele, Aba-Sembotweni, Ama-Zizi, Ama-Kuze, Aba-Sekunene, Ama-N we. Ama-Tetyeni, Aba-Shwawa, &e., all of whom are eolleetively grouped a en Fengu. Their position may be compared with that of the Laeomtan Helots, the low-caste tribes of India,

K&FEWRARIA

The numerous and politically important ramifications of the Kaffres Proper cannot be understood without reference to the national genealogies, most of the tribal names, as already stated, being those of real or reputed founders of dynasties. Thus the term Ama-Xosa itself means simply the “ people of Xosa,” a some- what mythical chicf supposed to have flourished about the year 1530. Ninth in descent from his son Toguh was Palo, who died about 1780, leaving two sons, Gcaleka and Rarabe (pronounced Kha-Kha-bé), from whom came the Ama-Gcalekas, Ama-Dhlambe (T’slambies), and the Ama-Ngquikas (Gaikas or Sandili’s people). The Ama-Mpondas do not descend from Xosa, but probably from an elder brother, while the Ama-Tembus

(Tambookies), though apparently representing a younger branch, are regarded by all the Kaffre tribes as the royal race. Hence the Gcaleka chief, who is lord paramount of all the Ama-Xosa tribes, always takes his first or '*great wife" from the Ama-Tembu royal family, and her issue alone have any claim to the succession. The subjoincd genealogical tree will help to place the mutual relations of all the Kaffre tribes in a clearcr light :—

Zuide (1500 ?), 2 founder of the nation.

| Tembu. Xosa (15807). Mpondo. —_

| Ama-Tembus Toguh, Ama-Mpondas, Ama-Mpondumisi.

(fambookics), | between river Tambookicland Palo (00. 17807), Umtata and Natal. Abelungu and Emigrant 10th in descent (dispersed ?) Tambookieland. from Xosa.

'

| Gealeka. Rarabe | (Khakhabe). Klanta. | | oe Omlao, hee ee ee Krehi Neqika. . Ama-Mbalus. Ama-Ndhlambes ——- Ama-Gwali. or 'T'slambies, Ama-Gealekas Macomo. Ama-Ntinde. between the (Galcka), Ama-Gqunukwebi. Keiskamma and between the Tyali. Ama-Velelo. Great Kei rivers. Bashee and Ama-Baxa. Umntata rivers. Sandili. Imi-Dange.

Imi-Dushane.

——

Ama-Neqikas

(Gaikas), Amatola highlands. — ———— — =); Ama-Khakhabes. a = a a) Ama- Xosas.

Here it will be scen that, as representing the eldcr branch, the Gcalekas stand quite apart from the rest of Xosa's descendants, whom they group collectively as Ama-Rarabe (Ama-Khakhabe), and whose

genealogics, except in the case of the Gaikas and Y'slambies, are very confused and uncertain. The Ama-Xosa country lics mainly between the Keiskamma and Umtata rivers.

The Ama-Zulus, so named by their Basuto neighbours, call themselves Abantu ba-Kwa- Zulu, 7.e., " people of Zulu's land," or briefly Bakwa-Zulu, from a legendary chief Zulu, founder of the royal dynasty. They were originally an obscure tribe betwcen the Bumbo and Omtukela mountains, but rose suddenly to formidable power under Chaka,'! who had been brought up among the neighbouring and powerful Umtetwas, and who succeeded the -chiefs of that tribe and of his own in the beginning of the present eentury. But the true mother tribe scems to have been the extinct Ama-Ntombela, whence the Ama-Tefulu, the U'ndwande, U'mlelas, U'intetwas, and many others, all absorbed or claiming to be true Zulus. But they are only so by political subjection, and the gradual adoption of the Zulu dress, usages, and speech. Hence in most cases the term Zulu implies political rather than_ blood relationship. This remark applies also to the followers of Umzele- katze, who, aftcr a fierce struggle with the Bechuanas, founded in 1830 a second Zulu state about the head watcrs of the Orange river. In 1837 most of them were driven northwards by the Boers, ane have become dispersed amongst the Makuas and Matcbele tribes. .

The origin of the Zulu-Kaffre race has given rise to much con- troversy. It is obvious that they are not the aborigines of their present domain, whence in comparatively recent times they have displaced the Hottentots and Bosjesmans of fundamentally distinct stock. On the other hand they are closely allied in specch and physique to the surrounding Basutos, Bechuanas, Matebeles, and other members of the great South African Negroid family. Hence no far-fetched theories are necded to account for their appearance in the south-east corner of the continent, where their presence is sufficiently explained by the gradual onward movement of the populations pressing southwards on the Hottentot and Bosjesman domain. 'he specific differences in specch and appearance by

1 Seventh in descent from Zulu, through Kumede, Makeba, Punga, Ndaba, Yama, and Tezengakona (Bleck, Zulu Legends).

which they are distinguished from the other branches of the family must in the same way be explained by the altered elimatic and other outward conditions of their new habitat. Hence it is that the further they have penetrated southwards the further have they become differentiated from the pure Negro type, from which at- tempts have even been made to scparate them altogether.? Thus the light and clear brown complexion prevalent amongst the southern Ama-Tembus becomes gradually darker as we proceed northwards, passing at last to the blue-black and sepia of the Ama- Swazis and Tekezas. Even many of the mixed Fengu tribes are of a polished ebony colour, like that of the Jolofis and other pure Senegainbian Negroes. The hair is uniformly of a woolly texture, not differing perceptibly from that of the ordinary native of Sudan, nor growing in separate tufts on the scalp, as is often erroncously asserted. 'This phenomenon of a tufted growth of hair, on which many anthropologists have bascd their classifications of the dark races, has absolutely no existence in nature. The Kaffre head also is dolichocephalic (index 72°54, as compared with the West African 73°40); but it is also high or long vertically (index 195°8, as compared with Negro 149°5),? and it is in this feature of hypsisteno- cephaly (height and length combined) that the Kaffre presents the most striking contrast with the pure Negro. But, the nose being gencrally rather broad' and the lips thick, the Kaffre facc, though somewhat oval, is never regular in the European sense, the devia- tions being normally in the direction of the Negro, with which race the peculiar odour of the skin again connects the Kaflres. In stature they rank next to the Patagonians, Polynesians, and West Africans, averaging from 5 ft. 9 in. to 5 ft. 11 in., and even 6 feet.° They are also slim, well-proportioned, and muscular ; but Fritsch's measurements have shown that they are far from attaining the standard of almost ideal beauty with which early observers credited them. Owing to the hard life to which they are doomed, the women are generally inferior in appearance to the men, exceyt amongst the Zulus, and especially the Tembus. Hence in the

matrimonial market, while the Ama-Xosa girl realizes no more than ten or twelvc head of cattle, the Ama-Tembu belle fetches as many as forty, and if specially fine even eighty. The syimnietrical and manly figures of the more warlike tribes are usually arrayed in leopard or ox-skins, of late years often replaced by European blankcts, with feather head-dresses, coral and metal ornaments, bead armlets, and necklaces. The Makuas and a few others practise tatooing, and the Ama-Xosas are fond of painting or smearing their bodies with red ochre. Their arms consist chiefly of ox-hide shields 4 to 6 fect long, the kerri or club, and the assegai, of which there are two kinds, one long with 9-inch narrow blade, for throwing, the other short with broad blade 12 to 18 inches long, for stabbing. The dwellings, like those of the Hottentots, are simple conical huts grouped in kraals or villages, mostly of a temporary character. For all the Kaffres are still semi- nomadic, and easily break up their homes in search of fresh pastures. But, although cattle form their chief wealth, and hunting and stock-brecding their main pursuits, many have in recent times turned to husbandry. The Zulus raise regular crops of " mealies" (maize), and the Ama-Mpondas cultivate a species of millet, tobacco, water melons, yams, and other vegetables. Milk, millet, and maize form the staples of food, and meat is seldom eaten except in time of war. Amongst some tribes the order to kill and eat their cattle is in fact equivalent to an order to prepare for some warlike undertaking. Mentally and morally the Kafires are on the whole superior to the average Negro. In all their social and political relations they display great tact and intelligence ; they are remarkably brave, warlike, and hospitable, and were naturally honest and truthful until through contact with the whites they become suspicious, revenzeful, and thievish, besides acquiring most European vices. Of religion as ordinarily understood thcy have very little, and have certainly never developed any mythologics or dogmatic systems. It is more than doubtful whether they had originally formed any notion of a Supreme Being; and such is the realistic bent of their minds that all such abstract conceptions, when interpreted to them by the missionarics, are immediately reduced to the grossest materialism. At the same a belief in a future state is implied by a faintly developed worship of ancestry, accompanied by a few superstitious rites. There

are no idols, sacrifices, or priests, but the prevalent belicf in witchcraft has naturally led to the evolution

2 Amongst others quite recently by Girard de Rialle, who, in Les Pcuples de V Afrique et de VAmérique, detaches the Kaffres from the Negroes, and treats: them as an independent division of the African races. These he groups in five divisions:—(1) Bosjesmans, (2) Hottentots, (3) Negroes, (4) Kaffres, (5) Nu- bians and Fallahs,—a classification which even on lingnistic grounds is untenable. J. Meyer also, notwithstanding their woolly hair, thick lips, high check bones, and dark complexion, maintains that their features are essentially '" Asiatic."

3 Topinard, Anthropology, p. 274.

4 'This feature varies considerably, 'in the T'slambie tribes being broader and more of the Negro shape than in the Gaikas or Gealekas, while among the Ama- Tembu and Ama-Mpondo it assumes more of the European character. In many of them the perfect Grecian and Roman noses are discernible" (Fleming's Kaffraria, p. 92).

5 Gustav Fritsch, a most accurate observer, gives the mean of the Ama-Xosas as 1:718 metres, less than that of the Guinea Negro (1724), but more than the English (1:708) and Seoteh (1:71).

of the "witeh-doctor"' or medieine-man, who often becomes an instrument of eruel oppression and injnstiee in the hands of un-sernpulous ehiefs. Cireumeision and polygamy are universal ; the former is sometimes attributed to Mahometan influences, but has really prevailed almost everywhere in East Africa from the remotest time.

Of the few industries the ehief are copper and iron smelting praetised by the Ama-T'embus, Zulus, and Swazis, who manufacture from the metal weapons, spoons, and agricultural implements, both for their own use and for trade. 'The Swazis display some taste in wood-earving, and others prepare a peeuliar water-tight vessel of grass, somewhat like

the wickerwork vases of the Siberian Yakuts. Characteristic of this race is their total ignorance or neglect of the art of navigation. Not the smallest boats are ever made for eross- ing the rivers, mueh less for venturing on the sea, except by the Makazana of Delagoa Bay and by the Zambesi people, who have canoes and flat-bottomed boats made of planks.

The Kaffre race has developed a distinct and apparently very old political system, which may be deseribed as a patriarchal monarchy limited by a powerful aristoeraey. Although the tribal state still prevails, the organization has thus acquired almost a feudal ehar- aeter. The nation is grouped in tribes, each under an hereditary tnkose or ehief, who administers his territory by means of officers ehosen by himself, and who is supreme legislator with absolute jurisdiction and power of lifeand death. If is deeisions are unjust, the nobles (that is, the foremost members of the tribe) protest in eouncil, and their deeisions form the traditional code of eommon law.

The Zuln-Kaffre language is probably the most typical member of the wide-spread Bantu family, standing in much the same relation to the other branehes of this stock as Sanskrit does to those of the Aryan group. _It is spoken with eonsiderable uniformity throughout the whole Kaffre domain, the Zulu or northern dialects differing rather in idiom and peculiar forms than in struetnre or phonetics from the Ama-Xosa and other southern varieties. In other respects Zulu is on the whole more primitive and conservative of the oldest forms, while Kaffre seems truer to the original meaning of words. Marked Zulu dialeets are the Tefula and Swazi, both widely eurrent in Zululand, the latter forming a transition between Zulu-Kaffre and the northern Tekeza group. The Kaffre, whieh presents no well- defined dialeets, is eurrent from the Keiskamma river to the southern frontier of Natal, and from the Quathlamba mountains to the sea.

The Zulu-Kaffre differs in its phoneties from most other Bantn tongues by the presenee of three “clicks” adopted from the Hottentots or Bosjesmans, the true aborigines of this region. These are the dental, usnally represented by ec, as in Ama-Gcalcka, the palatal (7), as in

Ama-Ggika, and the lateral (x), as in Ama- Xosa, uttered respectively by thrusting forward and then suddenly withdrawing the tongue from the front teeth, the palate, and the side teeth. Besides these there is a guttural, represented by 7, as in Rarabe, to be pronounced Khakhabe.' The language is in other respects extremely harmonious, the aecent falling generally on the penultimate, and all words ending in vowels, or oceasionally the liquids m and x. In its strueture it is very regular, with few exeep- tious or departures from the normal rules, which is the more sur- prising that its meehanism is extremely delicate and involved. The verb especially is highly inflected, presenting no less than two hundred and fifty ditferent forms, temporal, modal, positive, nega- tive, active, passive, causal, angmentative, &c. In this respeet it is probably unsurpassed even by the intricate verbal systems of the Finno-Tatar group.

But the characteristic feature of the Znlu-Kaffre and other Bantu languages is their peculiar alliterative structure, which finds no parallel in any other linguistie family, the Mande and Gor of West Afriea alone excepted. This prineiple of 'euphonie eoncord," as it has been ealled, is regulated-by the pronominal prefix inseparable from every noun, and repeated in a more or less modified form with the following adjeetives and other words in agreement with the sub- jeet. The nominal root itself is unehangeable, its various relations being expressed by modifications of the prefixed particle, or in- flex," as Colenso calls it. Hence the inflexion in these langnages na See

1 The r sound does not oeeur ; it is,replaeed, as in Chinese, by 7.

is mainly initial, not final, as in most other linguistic systems, on which aceonnt they have reeeived the name of " Pronominal Pre- fix Languages." Of the infleeting prefixes, of whieh there were sixteen in the prinritive Bantu speech, the ehief funetion is eoneord. ance and relationship. Thus the proper inflex of néw in the sense of man, person, being wm, pl. aba, we get from wm-ntu, man, aba- néw, men.* The inflex of kose, ehief, is i, pl. (irreg.) ama, whenee in-kose, a ehief, ama-kose, ehiefs. Then, the adjective " great" being Kulu, 'a great man" will

be wnu-ntu om-kulu, where the inflex wnew is repeated in the modified form om with the adjeetive kulu. But ‘a great elief” will be in-kose en-kulu, where the inflex tx is in the same way repeated in the modified fonu en with the following adjeetive Kulu. Here we see some resemblanee both to the principle of progressive vocalie harmony as developed in the Ural-Altaie group, in which the vowel of the root regulates those of all the following agglutinated formative elements, and to sueh Latin agreements as filius meus, filia mea, &c. In both eases, however, the resemblanee is more apparent than real. This surprisingly eom- plex and almost artificial prineiple of alliterative eoneordanee per- vading a vast number of languages spread over half a continent, and spoken exelusively by unlettered and barbarous raees, is one of the most astonishing phenomena in the history of human culture. The perfection to whieh the system is earried in the Zulu-Kafire group must always render that braneh of the Bantu family speeially interesting to the students of comparative philology.

See Gustav Fritseh, Die Etngeborenen Siid-Afrika’s, with atlas, 30 plates, and 120 typieal heads, Breslau, 1872; Lleck’s Comparative Grammar of the South African Languages, 1869; Hahn’s Grundztige einer Grammatik des Herero, Berlin, 1857; Appleyard’s Kafir Language, 1850; Schrieder’s Zulu Grammar in Danish, Christiania, 1850; Dr Colenso’s Grammar of the Zulu-Kafir Language, 1855 ; Rey. F. Fleming, Kaffraria and its Inhabitants, 1858; Girard de Rislle, Les Peuples de V Afrique et de U Amérique, Paris, 1880; Rev, J. Shooter, Kafir’s of Natal, 1857; Rev. L, Grout, Zululand, 1865; W. lloulden, Past and Future of the

Kare Races, London, 1867; C. J. Biithner, in Zeitschrift of the Berlin Geo. Soc., Mareh 1881, (AD HES)

KAFIRISTAN. This Persian term, signifying “the country of Kafiys,” or unbelievers (in Islam), has within the last hundred years become established in geography as the name of a mountain tract on the north of Afghanistan, occupied by tribes which have resisted conversion to the frith which prevails on every side. This faith has no doubt continually gained upon these tribes more or less, and with this

encroachment the limits of the Kafir country have shrunk; but the encroachment does not appear to have been large since the name became recognized in geography. Thus Baber (c. 1504) speaks of a certain place (Chaghanserai, in recent maps ‘“ Chegarserai”) as in the very jaws of Kafiristan, and this continued to apply forty years ago, if not now. Only it is clear that in his time the Kafirs occupied tracts about Bajaur, east of the Kuner river, which they do not pass now except on raids. The country has never been entered, and even the bordering Mahometan tracts have only here and there been touched, by any European, so that we know hardly anything of its internal geography, and not even the external geography with any precision. The northern boundary may be taken as that unvisited part of the watershed of Hindi Kash which lies between the Dorah Pass (71° 17’ E. long.) and the Khawak Pass (69° 53’ E. long.) leading into the Andarab valley of the province of Kunduz (see AFGHAN TURKESTAN, vol. it. 242). On the east it is limited by Chitral or Kashkar; on the south and west it is more difficult to define. But 35° N. lat. and 70° E. long. will mark these limits roughly, though the Kafir tribes seem still to extend south of the former line above Jalalabad, whilst their limits are

2 This word A bantu is generally used by the Kaffres in speaking of themselves as the “men” in a pre-eminent sense in opposition to the Ama-hlungi, or inferior white people. On this ground

_of the equator southwards to Cape Colony, and stretches right across

the continent from the Ogoway delta to Zanzibar. ,

3 The regular plural of the inflex im is iin, as in in-hlu, house, tzin-hlu, houses. But ama is extensively used instead of aba, azn, &e., in forming the plural, especially of personal nouns, nations, tribes, &e. Hence Ama-Nosa for Aba-Xosa froin um-Xosa, Ama-dfpondo trom u-Mpondo, Ama-Kose from in-Kose, &e. The northern and western Bantu nations preserve the aba under the forms ba, be, wa, whence Ba-suto, Be-chuana, Wa-nyamwesi, Wa-ganda, &c.

KAFIRISTAN

retracted north of the same line above Laghmfu. Indeed Kafir villages, though now deserted, exist within Darah Nfir, only 20 miles from Jalalabad. It is believed that the Kafir settlements on some points also pass to the north of Hindu Kush.

Tribes of Kafir kindred, subdued and converted by the Mahometans in comparatively recent times are known as Nimcha, or "half-and-half." Many of these are on good terms with the Kafirs, and trade is carricd on through their mnediation. A most interesting account by Licutenant- Colonel Tanner, of some tribes of this class, will be found in the Proc. Roy. Geog. Soc. quoted below.

The most important portion of the Kafir tribes apparently occupics the valleys which drain (by the Pech river) into the Kuner or Chitral river, below Chaghanscrai, in about 34° 49′ N. lat. The most easterly occupy the valley running south from the Dorah Pass, and joining the same river at Birkot, about 35° 15' N. lat. Others are on the headwaters of the Alingar and Alishang rivers, which join in Laghman, and the most westerly on the sources of the river of Tagao.

Surrounded by people professing Islam and cherishing slavery, the Kafirs are naturally objects of kidnapping incursions, aud these they revenge by sallies from their mountain fastnesses to plunder and kill. Wood, in 1838, found the valley of the Upper Kokcha in Badakhshan deserted on account of Kafir forays. The Lahori Pass from Dir into Chitral was within recent years so beset by Kafir robbers that many Mussulman wayfarers were annually killed, whose graves were marked by cairns and flags, and designated "The Tombs of the Martyrs." Hundreds of those dismal memorials lined the road and damped the traveller's spirits. Raverty mentions a savage invasion of Kafiristan madc some thirty years ago by the chicf of Bajaur from the south-east, in which villages were sacked and burnt, and the people carried off and sold. Faiz Bakhsh speaks of a like invasion from the north in 1870 by the prince of Badakhshan, which penetrated by the Dozakh Darah or " Hell-glen" to Katér (which he calls the Kafir capital), bringing back a large number of captives, whom he saw at Faizabad. Whatever difficulty from within prevents the exploration of the Kafir country is

due apparently to this atrocious treatment at the hands of their Moslem neighbours.

But the Kafir wars are far from being allexternal. Some of the tribes wage war with one another, so constant and deadly that Biddulph says their fights with their Mussulman neighbours are comparatively desultory and harmless. Kafirs are said, however, never to kill men of their own village.

The country is, as far as can be gathered, a land of lofty mountains, dizzy paths, and hair-rope bridges swinging over torrents, of narrow valleys laboriously terraced, but of wine, milk, and honcy rather than of agriculture; the valleys on the eastern side, however, are described as thickly wooded and very fertile. Though tvble-lands are spoken of, arable land is scanty. Over the greater part of the country the winter is severe ; hence the people depend much on dairy-produce, and consume vast quantities of cheese aud curd, besides meat, and fruit, fresh or dried.

The hill country of the Kafirs, and of kindred races long continu- ing in paganism, which extended from the north of Cabul to the borders of Kashmir, was known to medieval Asiatics, more or less loosely, as Bilaur, a name of ancient origin, which we find in Marco Polo as Bolor. Pashai also, from the name of one of those races now Mussulman, sceins to have' had a vague application to part of this region ; this name also occurs both in Marco Polo and in Ibn Batuta. Katér likewise has sometimes reccived a like vague extension.

The first distinct mention of Kafirs as a separate race seems to be in the history of Timur, When that prince, in March 1398,

arrived at Audarab on his way to invade India, he was met with a cry for help against the Katéor and Siah-posh (or " black-clothed 7)

Kafirs ; and he entered the country of the Katér from the upper part of the Panjhir valley. It was still winter in the highlands, and the

difficulties were great. Timur himself was let down the snows by glissade in a basket guided by ropes. The chief of the Kafirs was called the ruler of Katér, a title which is possibly pre- served in the title of the king of Chitral (see KAsnxKAn), besides surviving in the name of one of the greater Kafir tribes. Timur distinguishes between Katér and Siah-posh ; for he speaks of detaching 10,000 horse against the Siah-posh country, which lay to the left,—therefore, it would seem, to the north of the country entered by him. This detachment met with great disaster. Timur himself claims decided success, but probably found the country quite impracticable, for he specdily emerged again at Khawak. He speaks of tho abundant fruit trees, of the wine, of the langnage 'distinct from Turki, Persian, Hindi, and Kashmiri," of the weapons as arrows, swords, and slings. The ruler was styled 'Addlsha, his residence Jorkal, and another large place Shokal. Timor caused an inscription to be cut in the defiles of Kat6r record- ing his invasion and its route. Masson tells us that in the Kafir country, on tho Najil or Alishang river, there is a structure still known as Timur's castle.

We hear of the Kafirs again in tho Memoirs of Baber, of their raids in Panjhir, of their wine and fondness for it,—every man carrying slung round his neck a khig or leathern bottle. The occasional mentions of tho Kafirs in the Ain-t-Akbari secm borrowed from Baber, but this work contains another passage (Gladwin's translation, 1784, ii. 195) which probably originated a story about the Kafirs' descent from Greeks, not yet quite obsolete in Europe. In fact, however, the passage does not appear to refer to the " Kafirs"" at all, but to the claim to descent from Alexander of the princes reigning in Swat before the present Yuzufzai,—a claim remarkable enongh in itself, and maintained by many other princes of the hill states north of Hindu Kush.

Again, Benedict Goes, travelling from Peshawar to Cabul in 1603, heard of a city (or country) called Capperstam, into which no Mahometan might enter on pain of death. Hindu traders might enter, though not into the temples. The people were said never themselves to enter their temples except in black dresses. The country abounded in grapes; the natives drank wine, of which Goes tasted ; and all this was

so strange that he suspected the people might be Christians. Little or nothing is heard of the Kafirs after this till the publication of Rennell's Afemoir of a Map of Hindostan (1788),—followed twenty-six years later by Elphinstone's Caubul, in which a considerable amount of substantial information regarding the Kafirs was given by that admirable writer, of whom the Afghans believed, and with justice, that he had a telescope with which he could see what passed on the other side of a mountain.

The most favourable opportunity ever offercd for the exploration of Kafiristan was during the British occupation of Cabul in 1839-40; and a Kafir deputation invited a visit from those whom they had been Jed to regard as kindred. But they were coldly received, owing to the great jealousy of such intercourse shown by the Afghans.

Colonel Tanner of the Artillery made a spirited attempt to reach the country from Jalalabid in 1879, and spent some time among the Mahometans of Darah Ntr, whosc language and customs indicate affinity to their heathen neighbours. But he was carried away dangerously ill, on the very day when a Kafir party arrived at the village to escort him into their country. Similar invitations were brought to Major Biddulph in Chitral in 1878. This officer was unable to avail himself of these, but he had unusual opportunities of seeing and gaining information about the people, and his chapter on the Sidh-posh is the most authentic account yet available. But there are no doubt local differences, and we must not assume that to be untrue which varies from Biddulph's statements.

The Kafirs are in fact only an aggregation of tribes, probably belonging to one general race, but whose present close juxtaposition is the result of various accidents and invasions which have driven them, in part at least, from the lower countries, and concentrated them in this highland region. They have themselves vague stories to this effect, and (like the Karens of Burmah) one that they formerly possessed writing. . Elphinstone heard a Kafir story that brought them from Kandahar. This may have been a dim tradition, not of the place now so called, but

of the Kandahar of the older Arab geographers, Gandaritis of Ptolemy, and Gandhdra of the Hindu books, viz., the region

of Peshawar and Yusufzai. A clan of the now Moslem tribe of Safis is called Gandhdrat. The Kamoz tribe of Kafirs have been surmised to be living representatives of the Kambojas of early Sanskrit, whose name was borrowed by that region in the far Hast in whose forest depths religions of Indian origin reared weird and stupendous fanes, lately made kuown. In two other Kafir clans, Aspins and Ashkins, one is tempted to trace remnants of the Aspaswz and Assucent of Alexander's historians, whose seat was about Kuner, Bajaur, and Dir. |

The people are recognized from outside as Kdjirs ('* infidels"') or Sidh-posh ("black-clad""—compare the Iclanchleni of ancient Scythia); but they use no collective term as applieable to them- selves ; in many cases different tribes are unable to converse with eaeh other; and apparently they recognize no common tie of nationality. If hard pushed, or speaking with foreigners, they will thus cmploy the word Kappra (for Kajir), but so also a Hindu talking to an Englishman will sometiincs use the term Kdldé ddini (" black man ") collectively of his countrymen.

The variations in the catalogue of tribes given are endless ; indeed, Tanner says explicitly that he never found two people who agreed in the names of four ont of five, and the variation in actual lists is greater than this. Major Biddulph's information leads him to divide the whole body iuto three main tribes (or perhaps topo- graphical divisions) :— (1) Bashgalis, occupying the eastern valley adjoining Chitral, partially tributary to that state, their principal clan being divided into Kamoz and Kamtoz; (2) Waigalis, occupy- ing the Pecli valley and its upper waters; (3) Ramgalis or Lam- galis, on the upper waters of the streams descending towards Laghman (formerly Lamghdn) and Cabul, and also apparently extending north of the great watershed. But these great tribes are subdivided into numcrous clans, of which the Waigalis alone count eighteen. There are also broken clans, like the Kaldshas, adjoin- ing Chitral, a degraded race who are claimed by the Bashgalis as their

slaves, and the Avéttigalis, a small tribe near the watershed who are subject to Munjan, one of the highland cantons of Badakhshan.

More copious lists of tribes have been given by Elphinstone (three lists on different authorities), and by Raverty, Lumsden, Bellew, &c. We may notice that all lists give a prominent plaec to the Katér or Katdér (sce above). Other names that appear in several lists are Vai or IVdigal (already namcd from Biddulph) ; Kam, in various forms; Wdmah, and Sdnw, which, we learn from Tanner, are names for one great tribe; Pushd-gar or Pashd-gri, suggestive of connexion with the now Mahometanized Pashais of the Cabnl highlands, spoken of above; JAfunde-gal, Parwni, Traicgama, Gambir or Gimir, Ashkong or Askin, Ashpin or Ishpi, Nisha or Nishai, &c. The aflix gale or gali, whieh attaehes to several Kafir naines of place and tribe, is to be ascribed to a word gal signifying "country." The characteristies of some tribes were given to Tanner by their (2fmcha) neighbours the Chuginis, and ran thus: "In Kafir land are many langnages, many tribes with different tongues. The Katawas (Katérs?) are horsemen. The Parwnis have no guns, they kill men with elubs. The Majgalis are beautiful ; they have guns and are marksmen; they are men of the chase, very active and swift. The Mamas are the nicest of all. But the Katawas(Katérs ?) are chief before the amas. And the Nishai are fairer than the /Vamas."

In regard to the general aspect and complexion of the Kafirs, accounts have varied. Dr Trunipp, a learned mis- sionary, who examined three Kafirs at Peshawar, declares them to have been in all respects like natives of Upper India, with dark hair and eyes and swarthy colour, tinged with ruddiness due to wine. On the other hand Burnes, Atkinson, Wood, and Masson all speak of their blue eyes, nearly all of their brown hair. Bellew describes Faramorz Khan, an officer of Kafir birth in the Afghan service, as of fair, almost florid complexion, and light brown hair, hardly to be distinguished from an Englishman. And, unless their fairness were a general characteristic, one hardly sees how the story current aniong themselves of their kin to us could have found vogue. The fact seems to be, as Biddulph states, and as the Chugdni characterization quoted above implies, that they differ considerably in complexion, some of those living at high elevations being very fair. Iu

feature those whom he saw were pure Aryans of a high type,—-the women handsome (as all native reports make them), with brown hair and eyes, sometimes very fair. Indeed, Sir H. Rawlinson, who repeatedly saw Kafirs at

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Cabul in 1838-40, has stated that the most beautiful Oriental lady he ever had seen was a Kafir slave; by loosening her golden hair she could cover herself completely from head to foot as with a veil.

The current tale has always been like that told to Goes in 1603 that no Mussulman could enter their land and live, This is true of any one entering without warning ; but, on the eastern side at least, they receive visitors when passed in by one of themselves. Thus pedlers with wares from Peshawar enter; and Malometans from Chitral are occa- sionally allowed to enter the country for sport, and enjoy the hospitality for which the Kafirs are famed. The assurance that they would welcome the visits of Christians has been general, and the invitation often given. Two Afghans from Peshawar, Christian converts, on the invita- tion of a Kafir who had beena soldier in the Guides under Colonel (now Sir Harry) Lumsden, visited the Kafir country in 1864, and brought back a very interesting journal. They witnessed, soon after entering the country, the treacherous massacre by the Kafirs, in fulfilment of an old vendetta, of a large party of Mahometans who had becn invited across the border, but were themselves well treated.

The language of the Kafir tribes belongs, like their physical type, to the Aryan elass. On both northern and southern slopes of Hindu Kush are spoken a number of languages and dialects, all of whieh, with the striking exception of the Khaiuna or Burishki in Gilgit, belong to the class named, soinc of them leaning more to the Persie, some to the Indic (or Prakritic) type. To the first belong especially the dialects of the north known as Ghdlcha, spoken in Sirikol, Wakhan, Shighnén, and other cantons of the upper Oxus. To the seeond belong the Shina langnage of Dardistan, and other dialects, spoken on the Indus and west of it as far as Chitral. Major Biddulph considers the Kafir languages, of which the Khowar or Chitrali is a type, to stand between

the two classes, drawing on the whole nearest to the Indic side, but with a larger number of Persic roots than the Dard dialects. Vocabularies of Kafir or Siah- posh dialects have been published by various persons (¢.g., Leech, Burnes, Raverty, Lumsden, Trumpp, Norris, Leitner, Tanner, Biddulph). The most ample are by no means the most valuable ; and the data as yet, both as to eopiousness and ag to precision regarding the locality of the dialects represented, are scanty, though in these respects Major Biddulph's book marks a considerable step. The Hindi charaeter of the lists of numerals in some of the dialeets is very striking. They all seem toconfirm Elphinstone's statement that in all the Kafir dialects the numeration is by scores, as in the French "survival" of guatrevingt, quatrevingt-dix, Ke.

Biddulph regards the religion of the Kafirs as a crude form of the old Vedic worship. Jmbra is their chief god, a name suggcstive of Indra. Alani is spoken of as mediat- ing with Imbraon behalf of man. There are many inferior divinities, some acknowledged to have been mortals wor- shipped aftcr death, Names of some of these are given by Elphinstone and by Biddulph, and a large part of the two lists agree. Stones are set up as emblems of Imbra, but carved idols are not used, says Biddulph ; we must perliaps interpolate,—'" as representations of Imbra,"—for there is mucli evidence that images are set up. Deogan is a name which several accounts give as that of a chief god, —perhaps a generic word conncted with deo, div, deus, &c. Colonel Tanner's informants told him of a temple of Deogan among the Wamas, hung about with bright-coloured cloths and ornaments, whilst Deogan was represented by @ fierce image of wood, armed with club, knife, and gun. The temples are said to be stored with the accumulated spoils of ages. To all the deities cows are sacrificed, and cedar branches burned. On all occasions of slaughtering for food, some deity is invoked and sacrificial ceremonies observed. The Bashgalis showed Biddulph the sacrifice of a goat. 'The detail is most remarkable, as he points out, in its agreement, even in some of the minutiz (such as the ritual words used, sé#ich/ and hé-mach /), with the account given by Elphinstone after Mullah Najib,—thus attesting the authenticity of the latter's narrative.

Polygamy is practised, and according to the balance of

evidence woman's chastity is loose, and adultery slightly punished or easily compensated (but on these points the Afghan Christians give a strongly opposed statement). Female children are freely sold by the Bashgalis to their Mussulman neighbours, and the king of Chitral receives an annual tribute of children of both sexes (whom he sells doubtless). 'The black clothing, which has given the Kafirs a general name, varies in character. Tribes on the Cabul side wear entire goat's skins; the Bashgalis wear short-sleeved black tunics of woven goat's hair, with a broad red binding, and girt with a leather belt bearing a dagger. On their feet they wear rude sandals of wild-goat skin, with a tuft onthe instep. The women wear long sack-like garments of black woven goat's hair, with long loose sleeves, girt loosely at the waist, and with a coloured cotton scarf tightly bound over the shoulders. It is a general characteristic that men shave the whole head except a circular 3-inch patch on the crown, from which the hair hangs often to the waist. 'The Bashgalis at least wear no head covering. Women wear the hair plaited in many long thin tresses, coiled under their head-dress. The head- dress of the Bashgali women is remarkable, consisting, of a black cap with lappets and two horns about a foot long, made of wood wrapt with black cloth and fixed to the cap. Such a head-dress, with horns of greater length, is described by Chinese travellers of the 6th and 7th centuries as worn in the valley of the upper Oxus, then held by the Yetha or Ephthalites, an indication probably of kindred with or influence over the ancestors of this Kafir tribe, Among the Sanus, Wamas, or Red Kafirs, long, massive, silver chains presented by the tribe are worn over the shoulders by successful warriors, Their women tie up the hair with a silver band.

The Kafir arms are bows and arrows, battle-axe and dagger. The dagger is peculiar, of excellent fabric, with a deep X hilt of iron with brass studs, and slung in a triangular iron sheath. Their bows and arrows are short and weak-looking, but they make good practice up to 60 yards. Swords and matchlocks are spreading.

Among the notable and general customs are the copious use of wine, which at their feasts they drink from large silver cups which are among their most precious posses- sions ; their sitting habitually upon stools of wicker-work, whilst they find it as difficult as we do to adopt the cramped

for candles; the custom of recording the deeds of a warrior by a post beside his coffin, in which a peg is driven for every man he has slain. The Islamized Chugini people of Darah Nar also maintain this practice.

The people are fond of dancing. Men and women join. Biddulph witnessed a village dance, wild and strange,—the men brandishing arms, with whooping and whistling and discharge of guns. At times the whole would lock arms by pairs and revolve backwards and forwards in grotesque waltz, or following in order wind in figures of 8.

Their houses are ueat and clean, generally of more than one story (communicating by rough ladder beams), and sometimes of five or six on the declivity of a hill. They are much embellished with wood carving. We may assume Tanner's striking description of a large Chugani village to give a fairer idea of the Kafir towns than we have yet any direct means of gaining :-—

'It is built on the face of a very stcep slope, and the houses, of which there must be six hundred, are arranged in terraces one above another. From the roof of one of the lower ones I gazed with astonishment at a vast amphitheatre of carved wood—at thousands of carved veranda-posts, and at tens of thousands of carved panels, with which the upper story of each house is constructed, . . . The carving completely covered the woodwork of the upper story of every house. The lower story is of stone and wood, and double the extent of the upper, and this allows an open roof-space on which the inhabitants mostly pass their time in fine weather."

A newborn child is carried with its mother to a special house outside the village, where they remain secluded. After twenty days mother and child are bathed and brought back with music and dancing. The dead are placed in coffins, and, after much dancing and waking and sham

fighting, are carried to some lofty spot and there deposited,

but no grave is made.

The Sidh-posh dogs, cattle, sheep, fowls, and all their agricultural products are famous for quality, and much sought by their neighbours. Their cattle in appearance and size compare favourably with English breeds, but have large humps. The women are said to do much of the agricultural work,

On Kafirs, see Elphinstone's Casbul, ed. 1839, i, 873 sq; Burnes, Cubool, 1842, pp. 206 sq. and 381 sq.; Masson, Journeys, 1842, chap. xi.; Lumsden's Mission to Kandahar, Calcutta, 1860; Raverty, in Journ. As. Soe. Bengal, vols. Xxvill, and xxxiil.; Bellew, ' Lecture," in Journ. U. S. Inst. Ind,, No. 41, Simla, 1879; Leitner, ibid., No. 43, 1880; Biddulph, Tribes of Hindoo Koosh, Calcutta, 1880; Tanner, in Proce. Roy. Geog. Soc., May 1881; Church Missionary Intelligencer for 1865, reprinted in same for December 1878; also Chueh Missionary Intelligencer for Sep- tember 1874; Wood's Oxus; Terentyef, Russia and England im Central Asia, translated by Daukes, Calcutta, 1876, i. 298 sq. (this has some amount of nonsense, deducing the Kafirs from a Slav migration through Byzantium, &c.); Quarterly Review, April 1878, p. 534 sq.; Jour. Roy. As. Soe., vol. xix. p. 1 sq. | SUE Ye)

KAHLUR, also called BruAspur, one of the petty hill states in the Punjab, India, lying between 31° 12' 30° and 31° 35' 45" N. lat., and between 76° 26' and 76° 58' E. long. 'The area is 448-square miles, and the estimated population 60,000. The principal products are opium and grain ; woollen goods are manufactured. The estimated revenue is about £10,000. The Gurkhas overran the country in the early part of the century, and expelled the raja, who was, however, reinstated by the British in 1815.

K'ALFUNG FOO is the capital of the province of Honan in China, and is one of the most ancient cities in the empire. A city on the present site was first built by Duke Chwang (774-700 Bc.) to mark off (Hat) the boundary of his fief (funy); hence its name. It has, however, passed under several aliases in Chinese history. During the Chow, Suy, and

T’ang dynasties (557-907) it was known as P’een-chow. During the Woo-tai, or five dynasties (907-960), it was the Tung king, or eastern

capital. Under the Sung and Kin dynasties (960-1260) postures usual among Asiatics; their use of slips of pine |

it was called P’een-king. By the Yuen or Mongol dynasty (1260-1368), its name was again changed to P’een-leang, and on the return of the Chinese to power with the estab- lishment of the Ming dynasty (1368-1644), it was re- christened by its original name of K’ai-fung. The city is situated at the point where the last spur of the Kwan-lun mountain system melts away in the eastern plain, and a few miles south of the Yellow river. Its position, there- fore, lays it open to the destructive influences of the Hwang-ho. In 1642 it was totally destroyed by a flood caused by the dykes of that river bursting, and on several prior and subsequent occasions it has suffered injury from the same cause. The city is large and imposing-looking, with broad streets and handsome edifices, the most notice- able of which are a twelve-storied pagoda 600 feet high, and a watch tower from which, at a height of 200 feet, the inhabitants are able to observe the approach of the yellow waters of the river in times of flood. The city wall forms a substantial protection, and is pierced by five gates. The whole neighbourhood, which is the site of one of the earliest settlements of the Chinese in China, is full of historical associations, and it was in this city that the Jews who entered China in the reign of Ming-te (58-75 A.D.) first established a colony. For many ceuturies these people held themselves aloof from the natives, and practised the rites of their religion in a temple built and supported

by themselves. Of late years, however, they have fallen upon evil times, and in 1851, out of the seventy families which constituted the original colony, only seven remained. lor fifty years no rabbi had ministered to the wants of this remnant. Their temple was in ruins, and the people them- selves were reduced to the lowest extreme of poverty. In 1853 the city was attacked by the Tai-ping rebels, and, though at the first assault its defenders successfully re- sisted the enemy, it was subsequently taken. With the ruthlessness cominon to the Tai-pings the captors

looted and partially destroyed the town, which still retains traces of this its latest misfortune. Of the population, which is probably not far short of 100,000, it is estimated that two- thirds of the tradesmen, tavern keepers, educated classes, and attendants at the Government offices are Mahometans. The city, which is situated in 34° 52’ N, lat., and 114° 33’ Ii, long., forms also the district city of Seang-foo.

KAIRA, a British district in the province of Guzerat, Bombay, India, lying between 22° 26’ and 23° 6’ N. lat., and between 72° 33’ and 73° 21’ E. long., bounded on the N. by Ahmadabad district, on the E. and 8. by the river Mahi, and on the W. by Ahmadabad district and the state of Cambay, with an area of 1561 square miles. Except a small corner of hilly ground near its northern boundary, and in the south-east and south where the land along the Mahi is furrowed into deep ravines, Kaira district forms one unbroken plain, sloping gently towards the south- west. The north and north-east portions are dotted with patches of rich rice land, broken by untilled tracts of low brushwood. The centre of the district is very fertile and highly cultivated ; the luxuriant fields are surrounded by high growing hedges, and the whole country is clothed with clusters of large, shapely trees. To the west this belt of rich vegetation passes into a bare though well- cultivated tract of rice land, growing more barren and open till it reaches the maritime belt, whitened by a salt-like crust, along the Gulf of Cambay. The chief rivers are the Mahi on the south-cast and south, and the Sdbarmati on the western boundary. The former, owing to its deeply cut bed and sandbanks, is impracticable for either navigation or irrigation ; but the waters of the SAbarmati are largely utilized for the latter purpose. A smaller stream, the Khari, also waters a considerable area by means of canals and sluices.

Tho census of 1872 returned the population at 782,738 (419,142 males and 363,591 females). Hindus numbered 711,619 ; Musal- mans, 70,741; Parsis, 68; and Christians 305, of whom 243 are natives. Among the Hindus the most important classes are the Lewa and Kadwa Kumbis, numbering 144,639 ; they are the best cul- tivators in the district, sober, peaceful, and industrious. The Rajputs, with the exeeption of a few who with the title of thakur still retain landed

estates, have sunk into the inass of ordinary peasant proprie- tors. The Kolis number 281,252 ; idle and turbulent under native rule, they are now quiet, hard-working, and prosperous.. Among the Hindu low castes, numbering 61,834, the Dhers are distinguished for industry and good behaviour. They formerly lived in comfort by weaving coarse cotton cloth, but the competition of the Bombay and local steam mills is now shutting them out of the market. Of the Musalman population, about one-third represent the foreign conquerors of Guzerat ; the remainder are the descendants of con- verted Hindus. The first class, employed chiefly as cultivators, or in Government service as police and messengers, are for the most part poor ; the second class, who are artisans, chiefly weavers aud oil- pressers, are hard-working and well-to-do. Thirteen towns contain more than 5000 inhabitants each. Agriculture forms the support of upwards of two-thirds of the population. In 1876-77, 362,221 aeres, or 75 per cent. of the Government cultivable land, were under tillage, and 20,753 acres fallow or under grass. Food grains com- prise upwards of 88 per cent. of the crops ; pulses, 8 per cent. ; oil- seeds, 1 per cent. ; fibres, 1 per cent. ; the remainder being taken up by miscellaneous crops, chiefly tobaceo, which has the reputation of being the finest in western India. The manufactures comprise soapmaking, glassmaking, calico printing, and handloom weaving of coarse cloth. A steam spinning and weaving mill has been re- cently established. The exports are grain, tobacco, butter, oil, and the petals of the mahud tree; the imports, piece-goods, groceries,

molasses, and dye-stuffs. About 40 miles of the Bombay, Baroda and Central India Railway pass through the district. ;

The revenue administration of the district is conducted by a col- lector-inagistrate and three assistants , for judicial purposes Kaira is included within the jurisdiction of the judge of Ahmadabéd, The total imperial, local, and municipal revenue in 1875-76 was £249,314, of which £195,184 was derived from the land. Educa- tion was afforded in 1876-77 by 189 schools, attended by 14,720 pupils. Kaira possesses a public

library, and in 1876 published three vernacular newspapers. The prevailing diseases consist of fevers of a malarious type. The average rainfall during the five years ending 1876 was 30 inehes.

Kaira district has no independent history of its own. It is made up partly of lands acquired from the peshwa in 1802, and partly of territory acquired from the gaekwar o: Baroda in 1803 and 1817,

Kaira, chief town and headquarters of the above dis- trict, situated 5 miles south-west of Mehmadabdd railway station, in 22° 44' 30" N. lat., and 72° 44' 30" E. long. It is a very ancient city, having a legendary connexion with the Mahabharata, and is proved by the evidence of copperplate grants to have been known as early as the 5th century. Early in the 18th century it passed to the Babi family, with whom it remained till 1763, when it was taken by the Marhattds ; it was finally handed over to the British in 1803. It was a large military station till 1820, when the cantonnient was removed to Deesa. Population (1872), L260":

KAIRWAN, Kirwan, Kerovan (properly KarrawAy), the Mecca of northern Africa, is a city of the regency of Tunis, 30 miles inland from Susa, and about 80 miles due south from the capital. It is built in an open plain a little to the west of a stream which flows south to the Sidi el Heni lake. Of the luxuriant gardens and olive groves which form so prominent a feature in the early Arabic accounts of the place hardly a remnant has been left. The total circuit of the walls, according to Edward Rae, is about 3500 yards; and the population is variously estimated from 10,000 to 15,000. A little modification of the eastern wall would make the plan an irregular hexagon. Kairwan is emphatically a religious city: no Jew is permitted to enter within its gates, and it is only at rare intervals that access has been obtained by Christian travellers, though for them in ordinary circumstances the real danger is reduced toa minimum. The more important mosques are only six in number, but the variety of the lesser religious struc- tures is exceedingly great, and several parts of thie city are crowded with the tombs of saints and warriors of the Mahometan faith. In the northern quarter stands the great mosque founded by "Okba ibn Nafi el Fehri,

and con- taining within its sacred precincts the shrine of this great defender of the faith and the tombs of the kings of Tunis. It has a length of 140 yards, and the south-east and north- east ends measure respectively 85 and 75 yards, ‘To the outside it presents a heavy buttressed wall, with little of either grandeur or grace, but in the interior, in spite of whitewash and paint, it has that magnificence of marble columns which fitted it to be the prototype of the mosque of Cordova. As no European footstep has traversed its arcades, the number of the columns has not been asccr- tained, but there are at least upwards of 400 of them—a mingled spoil from the Roman ruins of the surrounding country. To the Mahometan mind the crowning distinc- tion of the building is that through Divine inspiration the founder was enabled to set it absolutely true to Mecca. In the central aisle are two pillars between which the people believe that no person with the guilt of mortal sin upon him can by any possibility pass. A unique collection of ancient armour is preserved in one of the chambers. Of greater external beauty than the great mosque is the mosque of the Three Gates. The shrine of Sidi Ibn ‘Isé ts worthy of note for the peculiar conjuring performances carried on every Friday by the followers of its founder; and that of

the Campanion (2.e. of the Prophet) outside of the walls is specially sacred as possessing three hairs of the Prophet’s beard. Formerly famous for its carpets and its oil of roses, Kairwan is now known in northern Africa rather for copper vessels, articles in morocco leather, potash, and saltpetre. In almost every respect it has greatly declined.

The Arabic historians relate the foundation of Kairwan by ‘Okba with miraculous circumstances (Tabary, ii 63; Yakut, iv. 213). The date is variously given (see Weil, Geseh. d. Chalifen, i. 283 sg.); according to Tabary it must have been before 670.

Sec Grenville T. Temple, Lzeursions in the Mediterranean, 1835; Edward Rae, The Country of the Moors, 1873; R. L. Playfair, Travels in the Footsteps of Bruee, 1877.

KAISARIEH. See Casares, vol. iv. p. 640.

KAISERSLAUTERN, the chief town of a circle in the government district of Rheinpfalz, Bavaria, is situated on the Lauter, in the hilly district of Westrich, about 40 miles west of Mannheim, and is one of the most important indus- trial towns of the Palatinate. It is the seat of the usual official bureaus, and counts among its educational institu- tions a gymnasium, a Protestant normal school, a com- mercial school, and an industrial museum. There are several churches, of which one owes its first foundation to Frederick Barbarossa, a hospital, and a large fruit-market. The house of correction occupies the site of Barbarossa's castle, built in 1153, and demolished by the French in 1713. The industries include cotton and wool spinning aud weaving, iron-founding, and the manufacture of beer, tobacco, and numerous other articles. There is some trade in fruit and in timber. Population in 1875, 22,699.

Kaiserslautern takes its name from the emperor (Kaiser) Frede- rick I., who presented to the place a wood worth 50,000 marks annually. In 1276 it became a town, and in 1357 passed to the Palatinate. In 1621 it was taken by the Spanish, in 1631 by the Swedish, in 1635 by the imperial, and in 1713 by the French troops. During 1793 and 1794 it was the scene of active fighting; and in the Franco-Prussian war of 1870 it was the base of operations of the second German army, under Prince Frederick Charles. It was one of the early stations of the Reformation, and in 1849 was a focus for the revolutionary spirit in the Palatinate.

KAISERSWERTH, an ancient town in the circle and government district of Diisseldorf, Prussia, is situated on the right bank of the Rhine, 6 miles below Diisseldorf. It contains an old Romanesque church of the 12th or 13th century, and has several benevolent institutions, of which the chief is the training-school for Protestant sisters of charity. This institution, founded by Pastor Fliedner in 1836, has more than 100 branches, some even in Asia and America; the head establishment at Kaiserswerth includes an orphanage, a lunatic asylum, and a Magdalen institution. The Roman Catholic hospital

occupies the former Fran- ciscan convent. The population in 1875 was 2135, chiefly eugaged in silk-weaving and tobacco manufacture.

In 710 Pippin of Heristal presented the site of the town to Bishop Suitbert, who built the Benedictinc monastery round which the town gradually formed. Until 1214 Kaiserswerth lay on an island, but in that year Count Adolphus V. of Berg, who was besieging it, dammed up effectually one arm of the Rhine. About the beginning of the 14th century Kaiserswerth was pawned by the empire to Jiilich, whence, after some vicissitudes, it finally passed into the possession of the princes of the Palatinate, whose rights, long disputed by the elector of Cologne, were legally settled in 1762. In 1702 the fortress was captured by the Austrians and Prussians, and the Kaiserburg, whence the young emperor Henry IV. was abducted by Archbishop Hanno in 1062, blown up.

KAITHAL, or Kytuat, an ancient town in Karnal district, Punjab, India, 29° 48’ 7” N. lat., 76° 26’ 26” E. long. It is said to have been founded by the mythical hero Tudishthira, and is connected by tradition with the monkey-god Hanuman. In 1767 it fell into the hands of the Sikh chieftain, Bhai Desu Sinh, whose descendants, the Bhais to Kaithal, ranked among the most important and powerful Cis-Sutlej chiefs. Their territories lapsed to the British in 1843. There is some trade in grain, sal-

ammoniac, live stock, and blankets; and saltpetre and lac ornaments and toys are manufactured. Population in

1868, 14,490.

KAKAPO, the Maori name, signifying “ Night- Parrot,” and frequently adopted by English writers, of a bird, com- monly called by British colonists in New Zealand the “‘Ground-Parrot ” or “ Owl-Parrot.” The existence of this singular form was first made known in 1843 by Dieffenbach (Travels in N. Zealand, ii. p. 194), from some of its tail-feathers obtained by him in the interior of that country, and he

suggested that it was one of the Cuculide, possibly belonging to the geuus Centropus, but he added that it was becoming scarce, and that no example had been seen for many years. The late Mr G. R. Gray, noticing it in June 1845 (Zool. Voy. “ Erebus” and “ Terror,” part 1x. p. 9), was able to say little more of it, but very soon after- wards a skin was received at the British Museum, of which, in the following September, he published a figure (G’en. Birds, part xvii.), naming it Strigeps! habroptilus, and rightly placing it among the Parrots, but he did not describe it technically for another eighteen months (Proc. Zool. Socvety, 1847, p. 61), by which time some further informa- tion concerning it had been furnished by Sir George Grey (Ann. Nat. History, xviii. p. 427) and the late Mr Strange (Proc. Zool. Society, 1847, p. 50); while in the same year Jules Verreaux sent an example, with an account of its habits, to the museum of Paris, which was published by Dr Pucheran (fev. Zoologique, 1847, p. 385). Various observers, among whom must be especially named Drs

Lyall (Proc. Zool. Society, 1852, p. 31) and Haast (Verh.

zool.~~bot. Gresellsch. Wien, 1863, p. 1115) supplied other particulars, and many specimens have now been received in Europe, so that it is represented in most museums, and at least half a dozen examples have reached England alive. Yet, though much has been written about it, there is no detailed description of its internal structure, which fact is the more to be regretted since the bird is cbviously doomed to early extinction, and the opportunity of solving several zoological problems of great interest, which a minute examination of its anatomy might afford, will be lost if some one does not speedily take the matter in hand. Few existing birds offer a better subject for a monographer, and it is to be hoped that, if perish the genus and species must, posterity will not have to lament the want of an exhaustive treatise on its many and wonderful character~~ istics.

In habits the Kakapo is almost wholly nocturnal,? hiding in holes (which in some instances it seems to make for itself) under the roots of trees or rocks during the day- time, and only issuing forth about sunset to seek its food, which is solely vegetable in kind, and consists of the

twigs, leaves, seeds, and fruits of trees, grass, and fern-roots— some observers say mosses also. It sometimes climbs trees, but generally remains on the ground, only using its com- paratively short wings to balance itself in running, or to break its fall when it drops from a tree —though not always then—being apparently quite incapable of real flight. It thus becomes an easy prey to the niarauding creatures—cats, rats, and so forth—which European colonists have let loose in New Zealand, so disastrously for its indigenous inhabit- ants. Sir G. Grey says it had been, within the memory of old people, abundaut in every part of that country, but (writing in 1854) was then found only in the unsettled districts. But as the latter are continually suffering from encroachment, so are the haunts of the Kakapo, and it is

1 This generic term was subsequently altered by Van der Hoeven, rather pedantically, to Stringops, a spelling now generally adopted.

2 Jt has, however, been occasionally observed abroad by day; and, in captivity, one example at least is said to have been just as active by day as by night.

to be remarked that, from some cause unknown to us, there are localities which, though unsettled, it does not seem to inhabit, and thus little hope can be entertained of its surviving much longer.

The Kakapo is about the size of a Raven, of a green or brownish-green colour, thickly freckled and irregularly barred with dark brown, and dashed here and there with longitudinal stripes of light yellow. Examples are subject to much variation in colour! and shade, and in some the lower parts are deeply tinged with yellow. Externally the most striking feature of the bird is its head, armed with a powerful beak, that it well knows how to use, and its face clothed with hairs and elongated feathers that sufficiently resemble the physiognomy of an Owl to justify the generic name bestowed upon it. Of its internal structure little has been described, and that not always correctly. Its furcula has been said (Proc. Zool. Society, 1874, p. 594) to be “lost,” whereas the clavicles, which in most birds unite to form that bone, are present, though they do not meet, while in like manner the bird has been declared (op. cit., 1867, p. 624, note) to furnish among the Carinate “the only apparent exception to the presence of a keel ” to the sternum, The keel, however, is undoubtedly there, as remarked by MM. Blanchard (Ann. Nat. Sec., Zoologie, ser. 4, xi. p. 83) and A, Milne Edwards (Ozs. Foss. de la France, il. p. 516), and, though much reduced in size, is nearly as much developed as in the Dopo and the WEKA (qq.v.). The aborted condition of this process can hardly be regarded but in connexion with the incapacity of the bird for flight, and may very likely be, as some have supposed, the result of disuse. There can be searcely any doubt as to the propriety of considering this genus the type of aseparate Family of Psettacc ; but whether it stands alone, or some other forms (Pezoporus or Geopsittacus, for example, which in

coloration and habits present some curious analogies) should be placed with it, must await future determination, In captivity the Kakapo is said to shew much intelligence, as well as an affectionate and playful disposition, soon attaching itself to its master and taking pleasure in caressing him and being caressed in turn. Unfortunately it does not seem to share the longevity characteristic of most Parrots, and none that have been held in confinement appear to have long survived, while many succumb speedily. For further details the reader may be referred to Gould's birds of Australia (ii. p. 247) and Handbook (ii. p. 539), Dr Finsch's Die Papageten (i. p. 241), and Mr Buller's Birds of New Zealand (p. 26)— in which last work nearly all the information hitherto recorded is to be found. (A. N.)

KALABAGH, or Kuzazacu, a town in Bannu district, Punjab, India, in 32° 57′ 57" N. lat., 71° 35' 37" E. long., picturesquely situated at the foot of the Salt Range, on the right bank of the Indus, where the river debouches from the hills, 105 miles below Attock. The houses nestle against the side of a precipitous hill of solid rock-salt, piled one upon another in successive tiers, the roof of each tier forming the street which passes in front of the row immediately above, and a cliff, also of pure rock-salt, towers above the town. The salt is quarried (about 2700 tons in 1871-72) at Mari, opposite the town, where it stands out in huge cliffs, practically inexhaustible. The similar out- crop at Kalabagh itself is not quarried. Alum also occurs in the neighbouring hills, and forms a considerable item of local trade. Iron implements are manufactured. Popula- tion in 1868, 6419,

A specimen in the British Museum (Zool. Voy. '* Erebus" and ** Terror," pt. xxii. pl. 7) has the prevailing green tint replaced by blue of several shades, and has been described asa distinct species, S. greyi; but it is obviously in an abnormal condition, and its specific dis- tinctness cannot be maintained without further evidence.

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KALAMATA, chief town of the modern Greek nomarchy of Messenia in the Morea, is situated on the left bank of the Nedon, about a mile from the sea. There is a suburh on the right bank of the stream. On a hill behind the town are the ruins of a medieval castle; but no ancient Greek remains have been discovered, although modern travellers have identified the site with that of the classical Pharee or Phere. It is the seat of a court of justice and of an archbishop. Kalamata is situated in a very fruitful district, of which it is the emporium. The roadsteads are safe in summer only; in the winter months the fishing craft take shelter in the haven of Armyro. The value of the chief exports in 1879 and 1880 was as follows :— currants, £111,750 and £109,200; figs, £112,730 and £87,186 ; olive oil, £21,340 and £12,789; silk, £34,230 and £31,215. The population in 1870 was 6327,

Phare, Phere, or Phere was founded, according to Pausanias, by Pharis, son of Hermes ; and the antiquity of its origin is still further assured by its mention in the /iad (v, 548, ix. 151), and the Odyssey (iil. 490, xvii. 186). When Messene was captured (182 B.¢.) by the Achzans, Phare became a distinct member of the Achean league. During the Middle Ages it was for atime a fief of the Ville- hardouins. In 1685 Kalamata was captured by the Venetians; in 1770, and again in 1821, it was the revolutionary headquarters in the Morea. In 1825 it was sacked by Ibrahim Pasha.

KALAMAZOO, the county seat of Kalamazoo county, Michigan, U.S., 40 miles east of Lake Michigan, and equi- distant from Chicago and Detroit, at the intersection of four railways, in the centre of one of the finest agricultural districts in the country. The public institutions include Kalamazoo College, the Michigan Female Seminary, and an asylum for theinsane. About one-third of all the wind- mills in the United States are made here. Agricultural implements, carriages, steel springs, paper and milling machinery are among the chief manufactures; and there are also extensive planing mills and flour mills. The popu- lation of the township in 1880 was 13,552, including the village population of 12,012.

KALATCH, a town of Russia, in the country of the Don Cossacks, on the left bank of the Don above the confluence of the Karpovka, in 48° 43’ N. lat. and 43° 30’ E. long. Previous to the opening of the railway to Tsaritsin on the Volga, it was a place of only 500 inhabitants, but since that date (1862) it has increased to more than 12,000 inhabitants; and its transit trade has received a great development.

KALBE, or CALBE, AN DER SAALE, chief town of a circle in the government district of Magdeburg, Prussia, is situated on the Saale, 3 miles from the Saale (Grizehne) station on the Leipsic and Magdeburg Railway. It con- tains a local court, a middle school, and several benevolent institutions. The industries of the place include wool-spinning, and the manufacture of cloth, oil, paper, bricks, beet-root sugar, and tobacco, Cucumbers and onions are largely cultivated in the neighbourhood ; and anthracite 1s excavated. In 1875 the population was 7982; with the adjacent Bernburger and Schlossvorstadt it was 11,119.

KALEIDOSCOPE. This, as the name implies, is an instrument by means of which beautiful forms may be seen. It was invented by Sir David Brewster about 1815,—the idea of the instrument having occurred to him some time before while he was engaged with experiments on the polari- zation of light by reflexion. When it first appeared it attracted almost universal attention. This arose from the extreme beauty of the forms which it presented, their end- less variety and perfect symmetry, as well as the readiness with which one beautiful form could be converted into another. The construction of the instrument was so simple, too, that almost any one could makeit; and, in conse quence, the patent originally taken out by Brewster was persistently evaded ; kaleidoscopes were made by the hun

dred, and sold in almost every toy-shop. Large cargoes

of them were sent abroad; and itis stated that no fewer

than two hundred thousand were sold in London and Paris in the space of three months. service in the art of the designer, the kaleidoscope consti- tutes a very useful piece of philosophical apparatus, as it illustrates, in a very beautiful way, the optical problem of the multiplication of images produced by reflexion when

the object is placed between two plane mirrors inclined to |

each other at a definite angle. The general principle of the instrument will be easily . understood from the following description and figures.

1. Let OA, OB (fig. 1) be the sections of two plane mirrors placed

perpendieular to the plane of the paper and inclined to each other ata right angle. Let P bea luminous point, or object, placed between them. According to the general law of the reflexion of light from plane mirrors, the image of P formed by the mirror OA will be as far behind OA as P is in front of it; that is, the image of P is Py, where PX=P,X, the line PP, being perpendicular to OA. Now P, may be regarded as a new objeet placed before the mirror OB, and hence the image of P, formed by OB will be P, where P}Y,=P,Y,. Similarly the image of P formed by OB will be P,', where PY=P'Y, and the image of P,' formed by Fig. 1. OA will also be at a point such that P;/X,=P,Xj, that is, the two last formed images will coincide. Hence we have three images placed symmetrically about O, constituting, with the object P, a symmetrical pattern of four luminous points placed at the corners of a rectangle.

2. Let the mirrors OA and OB (fig. 2) be inclined to each other at any angle a, and let P be the object placed between them. With centre O and radius OP describe a cirele. Evidently the images formed by successive reflexions from the mirrors will all lie on the circumference of this circle. We shall denote the images formed by a first reflexion at OA, second at OB, third at OA, and so on, by the symbols P,, Py, P, respectively ; and the images formed by a first reflexion at OB, second at OA, third at OB, and so on by Py', P,', Ps' respectively. Draw PP, perpendicular to OA, P,P, perpendicular to OB, P,P, perpendicular to AO pro- duced, and P,P, perpen- dieular to RO produced. Then P,, P,,

Ps, Py are the first set of images formed. Similarly draw the lines by Rds Fabs > Pe Pu'

then Py', F,', "P,), P,' are

Rig. 2.

the second set of images formed by a first reflexion at OB. Now, when any image falls within the angle vertically opposite to AOB, it is evident that no further reflexion can take'place, as it is behind

3?

both mirrors. Hence the number of images formed depends upon the size of the angle AOB and also upon the position of the point P in relation to the mirrors.

When a symmetrical picture is required, it is essential that the two last formed images, that is, P, and P,' in the figure, should coincide, and we must determine when this will be the case. We shall measure the distances of the several images from P by the arcual distances PP,, &c. Now it is evident that

P, PP,' =2PA + 2PB=2AB=2a.

P,PP,'= PP, + PP.' =PB+P,B+PA+P,/A =PB+PA+AB+P,A+AB+P,'B =4AB=4a,

PPPs = Ge.

PPP,' = 2na. Now, when the last formed images coincide, the arcual distance

between them must be a whole eireumferenee. Hence if P, and Pn' be the last formed coincident images, we have

PaPPn' =2na= 2m.

Besides being of essential

Hence a=-“-; that is, the mirrors must be inclined to each other n

at an angle which is an exact submultiple of two right angles, or, whieh is the same thing, an even submultiple of 360°.

3. Next suppose that, instead of a point, we puta line as an object in the angle between the mirrors ; and, first, let us suppose that the mirrors are inelined to each other at an angle whieh is an odd submultiple of 360° (as one-fifth of 360° in fig. 3). OA, OB are the mirrors, PQ the line placed between them. The image of PQ formed by OA is PQ,, that formed by OB is QP). The image of PQ, formed by OB is P,Q,, and the image of QP, formed by OA is Q,P, Now it is readily seen that the points P, and Q,will not, in general, coincide, and, hence, a sym- metrical picture of the line cannot in general be formed when the angle is an odd submultiple of 360°. If, however, the line OP=OQ, then the points P, and Q, : will coincide, and a sym- Fig. 3. metrical picture of five lines be formed. Secondly, let us suppose that the angle AOB is an even submultiple of 360°. By following the course of the images it will be seen that the last-formed images of the line coincide in all positions of PQ, and hence a symmetrical figure can, in all cases, be formed.

As the object of the kaleidoscope is to produce symmetrical figures from objects placed in any position between the mirrors, we are necessarily limited to angles which are even submultiples of 360°.

B A

The simple kaleidoscope consists essentially of two plane mirrors EOA and EOB (fig. 4) inclined to each other at an angle which is an even submultiple of 360°. A very common angle in practice is 60°. The mirrors are usually niade of two strips of thin flat glass,—the length of each being from 6 to 12 inches, and the greatest breadth from 1 to 3 inches. The mirrors are first fixed, in any convenient manner, at the proper angle, and then inserted into a cylindrical tube of brass or paper. At the one end of the tube is a small eye- hole opposite the point E, while the other end is closed by what is called the ** object box.”

This consists of a shallow cylindrical box, which fits on to the end of the tube, and contains the objects from whose reflexion the pattern is produced. These objects may consist of petals of differently coloured flowers, scraps of differently coloured paper, or, still better, pieces of coloured glass. Very often the objects consist of small glass tubes filled with differently coloured liquids and then hermetically sealed. These produce a very fine effect. The objects are placed in the box between two circles of thin glass which fit into the box, the one of which is transparent and the other obscured by grinding. When in position the transparent glass is close to the end of both mirrors and fills up the sector AOB, while the other, the obscured one, is fixed into the outer end of the object box. The distance between the two glasses is made as small as possible,—just room enough being left to allow the objects to fall freely by their own weight into any position between the glasses. Suppose now that the angle AOB is 60°, and that the eye is placed at E, a beautiful symmetrical picture of six equal and similar sectors will be seen round the point O; and, by simply turning the tube round, so as to allow the objects to fall into a new position, an endless variety of pictures can be produced.

It is important to notice the proper position of the eye. This should be, as nearly as possible, in the plane

A B

fe) Fig. 4.

of both mirrors,—first, because in that position only the direct and reflected sectors are all at the same distance from the eye, and, in consequence, no want of symmetry is introduced by the foreshortening of one sector more than another ; and, secondly, because in that position the maximum amount of light is reflected to the eye by the mirrors, and, in consequence, the various sectors appear as nearly as possible equally illuminated. Of course a certain amount of light is necessarily lost at each reflexion, and hence there is always a slight difference between the luminosity of the various sectors. However, this

is found not to introduce any serious want of symmetry when the instrument is properly constructed.

A modification of the simple kaleidoscope was introduced by Sir David Brewster, whereby the images of large and distant objects can be introduced into the picture. This is effected by removing the object box and replacing it by a tube carrying at its outer end a double convex lens, represented by LL in fig. 5. By a screw adjustment the lens can be so placed as to focus the distant object

exactly in the plane of the sector AOB, and so bring its image into the very best position for producing symmetrical patterns. When this instrument is directed towards a tree in full foliage, or towards an arrangement of flowers in full bloom, a very beautiful effect is produced, which can be varied by gradually moving the instrument. This form was called by Brewster the telescopic kaleidoscope.

Another form is called the polyangular kaleadoscope. (fig. 6). The only essential difference in it is that the mirrors are so ar- ranged that the angle between them can be varied at pleasure. This, being very use- ful for illustrating the theory of the instru- ment, is the form usually found in col- lections of philogophi- cal apparatus.

In all the instruments above described only two mirrors have been employed; but obvious- ly we may have more than two. Suppose we wish to employ three mirrors enclosing a tri- , angular opening, and Z that we also wish to produce perfectly sym- metrical pictures. We are here limited in our choice of angles by the following conditions—first, the sum of the three angles which the mirrors make with each other must be equal to 180°, and, secondly, each angle must be an even submultiple of 360°. By trial it is easily found that the only angles which satisfy these con- ditions are 60°, 60°, 60°; 90°, 60°, 80°; and 90°, 45°, 45°. Hence with three mirrors we must choose one or other of these three sets. The first is that usually chosen.

Suppose similarly we wish to use four mirrors; then, we must put them either in the form of a square, when all the mirrors are of equal breadth, or in the form of a rectangle, when the opposite mirrors are of

equal breadth. It is obvious that in these two cases only will the angle between each pair of mirrors be an even sub- multiple of 360°.

With more than four mirrors kaleidoscopes cannot be constructed

Fig. 6.

K A L—

K A L

so as to give symmetrical forms, since each of the interior angles of a regular polygon of more than four sides must exceed an even sub-multiple of 360°.

See Harris's Optics ; Wood's Optics ; Parkinson's Optics; Brew- ster's Z'reatise on the Kaleidoscope. The last-mentioned contains an account of the application of the instrument to the art of designing. (J. BL.)

KALGAN, or Coanc-KEA-Kow, a large city of China, in the province of Chih-li, with a population estimated at from 70,000 to 100,000. It lies in the line of the Great Wall, 137 miles north-west of Peking, " commanding one of the most important passes between China and Mongolia and the main road of the overland route between China and Russia" (Bushell). Fritsche gives its position as in

'40° 50 .N. lat. and 114° 54 E. long., and its height above the

sea as 2810 feet. The valley amid the mountains in which

'it is situated is under excellent cultivation, and thickly

studded with villages. Kalgan consists of a walled town or fortress and suburbs 3 miles long. The streets are wide, and excellent shops are abundant ; but the ordinary houses have rather an odd appearance, from the fact that, like those of Erzeroum, they are usually roofed with earth and become covered with green sward. Large quantities of soda are manufactured ; and the position of the town renders it the seat of a very extensive transit trade. In early autumn long lines of camels come

in from all quarters for the conveyance of the tea-chests from Kalgan to Kiakhta; and each caravan usually makes three journeys in the winter. There is an excellent inn in the town frequented by the Russian merchants, some of whom have permanent residences and warehouses just outside the gate. On the way to Peking the road passes over a beautiful bridge of seven arches, ornamented with marble figures of monkeys, lions, tigers, and other animals. The name Kalgan is Mongolian, and means a barrier or " gate-beam."

KALIDASA is the most illustrious naiae among the writers of the second epoch of Sanskrit literature, which, as contrasted with the age of the Vedic hymns, may be characterized as the period of artificial poetry. Owing to the utter absence of the historical sense in the Hindu race, it is impossible to fix with chronological exactness the life- time of either Kélid4ésa or any other Sanskrit author. Native tradition places him in the 1st century B.c. ; but the evidence on which this belief rests has been shown to be wholly worthless. The works of the poet have been found to contain no allusions by which their date can be directly determined ; yet the extremely corrupt form of the Prakrit or popular dialects spoken by the women and the subor- dinate characters in his plays, as compared with the Prakrit in inscriptions of ascertained age, has led the chief-authori- ties, Weber and Lassen, to agree in fixing on the 3d century of our era as the approximate period to which the writings of Kalidasa should be referred.

The richness of his creative fancy, his delicacy of senti ment, and his keen appreciation of the beauties of nature, combined with remarkable powers of description, which are conspicuous throughout his works, place Kélid4sa im the first rank of Oriental poets. The effect, however, of his productions as a whole is greatly marred by extreme artificiality of diction, which, though to a less extent than in other Hindu poets, not unfrequently takes the form of puerile conceits, and plays on words, the matter being treated merely as a means for displaying dexterity in the manipulation of the language. In this respect his writings contrast very unfavourably with the more genuine poetry of the Vedas. Though a true poet, he is wanting mm that artistic sense of proportion so characteristic of the Greek mind, which exactly adjusts the parts to the

whole, and combines form and matter into an inseparable poetic unity. Kéliddsa's fame rests chiefly on his dramas, but he is also distinguished as an epic and a lyric poet.

KAL—K AL

He wrote three plays, the plots of which all bear a general re- semblance to each other, inasmuch as they consist of love intrigues, whieh, after numerous and seemingly insurmountable impediments ofasimilar nature, are ultimately brought to a successful conclusion.

Of these, Cakuntald is that which has always justly enjoyed the greatest fame and popularity. The unqualified praise bestowed upon it by Goethe sufficiently guarantees its poetic merit. There are two recensions of the text in India, the Bengali and the Devana- gari, the latter being generally considered older and purer. Cakuntald was first translated into English by Sir William Jones (Calcutta, 1789), who used the Bengali recension. It was soon after translated into German by G. Forster (1791), and by Herder in 1803. An edition of the Sanskrit original, with French translation, was pnb- lished by Chézy at Paris in 1830. This formed the basis of a trans- lation by Hirzel (Zurich, 1830). Another edition of the Bengali recension was published hy Prema Chandra (Calcutta, 1860) for the use of European students. The Devanagari recension was first edited by Bohtlingk (Bonn, 1842), with a German translation. On this were based the successive. German translations of Meyer (Tiibingen, 1851) and Lobedanz (2d ed., Leipsic, 1861). The same recension has been edited by Dr C. Burkhard with a Sanskrit-Latin vocabulary and short Prakrit grammar (Breslau, 1872), and by Professor Monier Williams (Oxford, 2d ed., 1872). Another edition was published at Bombay in 1861.

The Vikramorvact, or Urvagt won by Valour, abounds with fine lyrical passages, and is of all Indian dramas second only to Cakuntald in poetic beauty. It was edited by Lenz (Bonn, 1833) and trans- lated into German by Hofer (Berlin, 1837), by Hirzel (1838), and by Lobedanz (Leipsic, 1861). The best edition is by Bollensen (Petersburg, 1845). There is also an English edition by Monier Williams, a metrical and

prose version by the late Professor H. H. dei and a literal prose translation by Professor E. B. Cowell

1851).

The third play, entitled Afdlavikdgnimitra, has considerable poetical and dramatic merit, but is confessedly inferior to the other two. It possesses the advantage, however, that its hero Agnimitra and its heroine Malavika are more ordinary and human characters than those of the other plays. It was edited by Dr Tullberg at Bonn, 1840, and more correetly by Shankar P. Pandit, with English ee o 1869, and ably translated into German by Professor Weber in 1856.

Two epic poems are also attributed to Kalidasa. The longer of these is entitled Raghwvanca, the subject of whieh is the same as that of the Rdmdyana, viz., the history of Rama, but beginning with a long account of his ancestors, the ancient rulers of Ayodhya (edited by Stenzler, London, 1832). The other epic is the Kumd- rasambhava, the theme of which is the birth of Kumara, otherwise called Karttikeya or Skanda, god of war (edited by Stenzler, London, 1888, and by the Rev. K. M. Banerjea, 3d ed., Calcutta, 1872). Though containing many fine passages, it is tame as a whole.

His lyrical poems are the Meghaduta and the Ritusamhdra. The Meghaduta, or the Cloud-Messenger, describes the complaint of an exiled lover, and the message he sends to his wife by acloud. It is full of deep feeling, and abounds with fine descriptions of the beauties of nature. It was edited with free English translation by H. H. Wilson (Calcutta, 1813), and by Gildemeister (Bonn, 1841) ; a German adaptation by M. Miiller appeared at Konigsberg (1847), and one by Schmitz at Bielefeld (1859). It was edited by Johnson, with vocabulary and Wilson's metrical translation (London, 1867). The Ritusamhdra, or Collection of the Seasons, is a short poem, of less importance, on the six seasons of the year. There is an edition by Bohlen, with prose Latin and metrieal German translation (Leipsic, 1840).

Another poem, entitled the Nalodaya, or Rise of Nala, edited by Benary (Berlin, 1830) and by Yates (Calcutta, 1844), which is a treatment of the

story of Nala and Damayanti, but describes especially the restoration of Nala to prosperity and power, has been ascribed to the celebrated Kalidasa, but was probably written by another poet of the same name. It is full of most absurd verbal conceits and metrical extravagances.

So many poems, partly of a very different stamp, are attributed to Kalidasa that it is scarcely possible to avoid the necessity of assuming the existence of more authors than one of that name. It is by no means improbable that there were three poets thus

named ; indeed modern native astronomers are so convinced of the

existence of a triad of authors of this name that they apply the term Kalidasa to designate the number three. (A. A. M.)

KALINGA, or Cauinaa, one of the nine kingdoms of southern India in ancient times. Its exact limits varied, but included the eastern Madras coast, from Pulicat to Chicacole, running inland from the Bay of Bengal to the Eastern Ghats. The name at one time had a wider and vaguer meaning, comprehending Orissa, and possibly extending to the Ganges valley. The Kalinga of Pliny

certainly included Orissa, but latterly it seems to have been confined to the Telugu-speaking country ; and in the time of Hwen Tsang (630 a.p.) it was distinguished on the south and west from Andlira, and on the north from Odra or Orissa. The language of the country is Telugu. Taranatha, the Tibetan historian, speaks of Kalinga as one division of the country of Telinga. Hwen Tsang speaks of Kalinga (“ Kie-ling-kia”) having its capital at what may now be identified with the site either of Rajamahendri (Rajahmundry) or Coringa. Both these towns, as well as Sinhapur, Kalingapatam, and Chicacole, share the honour of having been the chief cities of Kalinga at different eriods.

KALINGAPATAM, or Catincapatam, a town and port in Ganjam district, Madras, situated at the mouth of the Vamsadh4ra river, 18° 20’ 20” N. lat., 84° 9’ 50” E. long. Population (1871), 4676. It was the

capital of the ancient Hindu kingdom of Kalinga, and one of the early seats of the Mahometan power in the Telugu country. Signs of its ancient greatness are still visible in the ruins of many mosques and other large buildings. The place is again rising in importance as a harbour, being the only safe roadstead along 400 miles of coast, and now a regular port of call for steamers. The value of the imports in 1875-76 was £16,400 ; of the exports, chiefly rice, seeds, and sugar, £62,800. Kalingapatam yields a salt revenue to Government of from £40,000 to £50,000 a year.

KALISH (Polish, Kalisz), the chief town of a govern- ment of the same name in Russian Poland, is situated in 51° 46' N. lat. and 17° 7' E. long., 1385 miles due west of Warsaw on the banks of the Prosna, which there forms the boundary of Prussia. It is one of the oldest and finest cities of Poland, is the seat of a Roman Catholic bishop, and possesses 2 castle, a gymnasium, a teachers' institute, a theatre, and a large public park. The industrial estab- lishments comprise a brewery, cloth factories, a ribbon factory, and tanneries. In 1871 the population amounted

to 18,088, of whom more than 8000 were Jews.

Kalish is identified with the Calisia of Ptolemy, and its antiquity is indicated by the abundance of coins and other objects of aneient art which have been discovered on the site, as well as by the nume- rous grave mounds existing in the neighbourhood. In modern times it has been the scene of the decisive victory of Augustus the Strong over the Swedish general Mardefeld on 29th October 1706, of several minor conflicts in 1813, and of the friendly meeting of the Russian and the Prussian troops in 1835, in memory of whieh an iron obelisk was erected in the town by Nicholas I. in 1841. The treaty of 1813 between Russia and Prussia is dated from Kalish.

KALITVENSKAYA, a stanitsa or camp-village in the country of the Don Cossacks, on the left bank of the Donetz, 81 miles east of Novotcherkassk. The name is well known in southern Russia through the excellent building material obtained from the sandstone quarries of

the neighbourhood. The population increased from about 1500 in 1860 to 12,700 in 1872.

KALNA, or Cunna, a town in Bardwan district, Bengal, India, situated on the right bank of the Bhagirathi river, 23° 13’ 20” N. lat, 88° 24° 30” E. long, It is an im- portant river-side market town, with an extensive trade. The population in 1872 amounted to 27,336,—22,463 of them Hindus.

KALOCSA, a town of Hungary, and capital of the former county of Solt (now included in the county of Pest-Pilis-Solt-Kis-Kun), is situated in a marshy but highly productive district, 3 miles distant from a steam-packet station on the left bank of the Danube, and about 69 miles south of Budapest, 46° 31’ N. lat., 18° 58’ E. long Kalocsa is the see of the second of the four Roman Catholic archbishops of Hungary, and has a fine cathedral, a semi- nary for priests, a Roman Catholic (Jesuit) gymnasium, an observatory, and an archiepiscopal palace (formerly a for-

tress) containing a library of 80,000 volumes and a botanical

collection. The inhabitants of Kalocsa and its wide- spreading communal lands are for the most part employed in the cultivation of the vine, fruit, flax, hemp, and cereals, in the capture of water-fowl, and-in fishing. The population in 1880 amounted to 15,770, chiefly Magyars by nation- ality and Roman Catholics by creed.

Kalocsa is one of the oldest towns in Hungary. The present archbishopric is a development of a bishopric said to have been founded in the year 1000 by King Stephen the Saint. The town was once well fortified, and of far greater relative importance than at present. It suffered much during the 16th century from the desolat-

ing hordes of Ottomans who then ravaged the country. Kalocsa is much resorted to as an ecclesiastical centre.

KALPI, or Currze, a town in Jaldun district, North- Western Provinces, India, situated on the right bank of the Jumna, 26° 7 30” N. lat., 79° 47’ 15” E. long. Population (1872), 15,570, viz, 11,414 Hindus and 4156 Mahometans. It was founded, according to tradition, by Basdeo or Vasudeva, who ruled at Kambai from 330 to 400 ap. In 1196 it fell to Kutb-ud-din, the viceroy of Muhammad Ghori, and during the subsequent Mahometan period it played a large part in the annals of this part of India. About the middle of the last century it fell into the hands of the Marhattas. It was captured by the British in the campaign of 1803, and since 1806 has remained in British; possession. In May 1858 Sir Hugh Rose (Lord Strathnairn) defeated there a large force of about 10,000 rebels under the rani of Jhansi. Kalpi was formerly a place of far greater importance than at present. It had a mint for copper coinage in the reign of Akbar; and the East India Company made it one of their principal stations for providing the “commercial investment.” A bridge of boats on the Jhéns{ and Cawnpur road crosses the river during the summer months. Cotton and grain are exported to Cawnpur, Mirz4pur, and Calcutta ; and paper and sugar candy are manufactured.

KALUGA, a central government of European Russia, surrounded by those of Moscow, Smolensk, Orel (Orloff), and Tula. The area is estimated at 25,594 square miles, or according to the maps of the Kaluga surveying office 27,407. for the most part the surface is flat, and the culminating point of the government is a hill in the northern district of Meduin, 910 feet in height. In the north-west there is a considerable tract of peat-bog. The Oka, a main tributary of the Volga, and its confluents (the Zhizdra, the Ugra, &c.), drain all but a strip of country in the west, which is traversed by the Bolva, an affluent of the Dnieper. Strata of Carboniferous Limestone prevail except in the north, where Jurassic rocks take their place. The coal though common enough is of poor quality, and has been comparatively little worked. Clays from the southern districts are employed in the glass-works of Kaluga and the surrounding governments. Iron-ore is obtained in considerable abundance between the left-hand feeders of the Bolva and the upper course of the Zhizdra. According to the reports of the statistical committee for 1880 (Pam- yatnaya Knizhka, 1881) about 1,246,874

acres were covered with forest (pines, firs, birches), large tracts more especially existing in the Zhizdra district; 20,000 acres consisted of marsh land, 903,580 acres were under tillage, and 2,201,208 were devoted to pasturage. The soil in most parts of the government is composed of sand or clay; and it is only in certain portions of the districts of Peremuislil, Kozelsk, and Meshtchovsk that the famous "black earth " is found. Agriculture is in a comparatively low state in Kaluga, requiring a great increase in the outlay of capital, and especially the keeping of more live stock for the fattening of the soil.

Rye and oats are the principal crops, but the production is less

than the local demand. Buckwheat, potatoes, flax, and hemp are also grown. Manufacturing industries are ou the increase, the

cloth and cotton factories employing upwards of 2000 men, the iron-works more than 6000, the paper-mills about 1800, and the match-works more than 1500. The brecding of canaries, which are sent to all parts of Russia, was a source of livelihood to 350 persons in 1880, Railway lines from. Moscow to Orel, from Moseow to Smolensk, and fron: Smolensk to Orel enclose the government in a triangle, but none of them touch its territory. By means, how- ever, of the navigable streams, a good deal of traffic is carried on. The government is divided into eleven districts (wyezd) :—Kaluga, Mosalsk, Meshtchovsk, Likhvin, Kozelsk, Zhizdra, Peremuishl, Meduin, Borovsk, Maloyaroslavets, and Tarusa. The following are the towns of more than 5000 inhabitants, according to the returns for 1870 :—Kaluga, 38,600; Zhizdra, 11,700; Borovsk, 9500; Meduin, 7800; Kozelsk, 7350; Sukhinitchi, 6050; Meshtchovsk, 5450; Maloyaroslavets, 5150. The government had a population of 1,114,372 in 1880.

Katuea, the chief town of the above government, is situated 475 feet above the sea-level on the left bank of the Oka, at the confluence of the Yatchenka, 114 miles south-west of Moscow, in 54° 31' N. lat. and 36° 6' BE, long. Among the public buildings may be mentioned the cathedral of the Trinity (rebuilt in the present century in room of an older edifice

dating from 1687), two monastic establishments, a male and a female gymnasium, an eccle- siastical seminary (with 219 students in 1879), an infant asylum, an orphanage, a public hospital, a lunatic asylum, a hospital for incurables, and a house of correction. The principal articles of production are leather, oil, bast mats, wax candles, starch, and a particular kind of cake known in Russia by the name of the town. This last item alone counts for more than 1,000,000 roubles (£156,000) per annum in the local trade. Situated as it is on a navigable river, and at the junction of important roads, Kaluga is naturally the centre of no small commercial activity. Even in the beginning of the century its merchants and manufactures were known in Leipsic, Bremen, and Dantzie. Including the suburban villages of Yamskaya and Podsavalya the town had 36,880 inhabitants in 1870.

The first historical mention of Kaluga occurs in 1889, when Demetrius of the Don assigned it to his son; and its final in- corporation with the principality of Moscow belongs to the year 1518. In 1607 it was held by the pretender Bolotnikoff, and vainly besieged for four months by the forces of Shuiski; but in 1619 it fell into the hands of the Zaporogian hetman. Nor was it from war alone that Kaluga suffered. Two thirds of its inhabitants were carried off by a plague ; and in 1622 the whole place was laid waste by a conflagration. It recovered, however, and, in spite of several extensive conflagrations (especially in 1742 and 1754) has eontinued to flourish. The rank of chief town of a province was obtained in 1719. In 1784 the population numbered 13,788, and by 1785 had increased to 17,078. On several occasions Kaluga has been chosen as the residence of political prisoners ; among others, the famous Schamyl (sce Russkaya Starina, 1877) spent his exile there.

KALVARIYA, (7.e, Calvary), a district town in the government of Suvalki in Russian Poland, on the right

bank of the Shelupa, 40 miles sonth-west of Kovno, It

carries on a considerable trade, and manufactures needles, : linen, flannel, leather, and combs. The inhabitants, of whom more than two-thirds are Jews, amounted to 9400 in 1867, and to 10,200 in 1870.

KALW, or Catw, chief town of a circle in the govern- ment district of Schwarzwald, Wiirtemberg, is situated on the Nagold, about 34 miles south-west of Stuttgart by rail. It is the seat of local, civil, and criminal courts, and of @ chamber of commerce; and it contains a high school, a commercial gymnasium, and a missionary institution. The industries include a large variety of spinning and weaving operations in wool and cotton. Carpets, cigars, and wool- combs are also manufactured. The timber trade, chiefly carried on with the Netherlands, is important. The pre- valence of malaria renders the valley of the Nagold unhealthy. The population in 1875 was 4642.

The name of Kalw emerges as early as 1037. In the Middle Ages the town was under the dominion of an ancient and powerful family of counts, whose possessions finally passed to Wiirtemberg in 1845. In 1634 the town was taken by the Bavarians, and in 1692 by the French.

KAM—KAM

KAMALA, a red powder used in medicine as an anthelminthic. It is obtained from Jfallotus Philip- pinensis, Miill., a large shrub or small tree from 20 to 45 feet in height, widely distributed in Asia, from southern Arabia in the west to North Australia and the Philippines in the east. The fruit of this species, as of many other Euphorbiaceous plants, is covered with stellate hairs, among which are intermixed ruby-coloured glands, These are found also on other parts of the plant, especially among the down with which the under surface of the leaf is covered. Kamala is collected in many parts of India, and forms one of the lesser products of the Government forests in the Madras presidency at Naini Tal, where the Mallotus is found growing in immense quantities at the foot of the hills. According to Mr F. E. G. Matthews, numbers of people, chiefly women and children, are engaged in col- lecting the powder for exportation. A quantity of the berries is thrown into a large basket, and rubbed with the hand until the powder is removed and falls through the basket, as through a sieve, on a cloth spread below it to receive it.

The collection of k4mald begins in March, and lasts for about a month. The drug thus prepared contains, besides the glands, stellate hairs and

fragments of leaves. Some samples, however, are occasionally met with in commerce containing as much as 60 per cent. of earthy matter, which is easily detected by its sinking when the kamala is stirred up with water, or by the amount of ash left when thie powder is incinerated. In India k4mala has long been known, since it has several ancient Sanskrit names, one of which, kapila, signifies dusky or tawny red. Under the name of wars, kanbil, or qinbil, kamald appears to have been known to the Arabian physicians as a remedy for tapeworm and skin diseases as early as the 10th century, and indeed is mentioned by Paulus Adgineta in the 7th, but it did not attract any special attention in Europe as a medicine until experimented with by Mackinnon, a surgeon in the Bengal medical establishment, who tried it in numerous cases of tapeworm. Anderson and others in India, and Leared in London, confirmed the results obtained, and established the fact that kamala is an efficient tenifuge. It was soon after introduced into the British pharmacopeeia (1864).

Kamala floats on water, which scarcely acts on it even at a boiling heat, but it yields about 80 per cent. of a splendid red resin to alcohol, ether, chloroform, benzol, glacial acetic acid and bisulphide of carbon, When sprinkled over a flame it ignites with a flash like lycopod- ium, and yields after incineration about 1-7 per cent. of ash, Leube found that the resin consisted of two varieties, one more easily soluble, and fusing at 176° Fahr. (80° C.), and the other dissolving less readily, fusing at 375°8° Fahr. (191° C.), Anderson obtained a substance, named by him rottlerin, C,,H,,0,, by allowing a strong ethereal solution of kamald to stand for a few days, This when purified by recrystallization formed satiny minute tabular yellow crystals soluble in ether, sparingly soluble in cold and more so in hot alcohol, and insoluble in water.

Another kind of kamal4 under the Arabic name of wars is sometimes exported from Aden, where it is shipped from Harar on the east coast of Africa, and is also collected in southern Arabia and exported thence to the Persian Gulf and Bombay. The plant from which this variety is obtained is not known. It differs from true kamal4 in having a deep purple colour, in the greater coarseness of its particles, in yielding 12 per cent. of ash, in having long simple hairs mixed with it, and in

becoming quite black when heated to from 199°4° Fahr, (93° ©.) to 212° Fahr. (100°C.), at which temperature true kamala undergoes no change. The microscopic structure of the

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glands is also different, the resin cells being oblong instead of club-shaped, and the grains themselves cylindrical or subconical instead of irregularly spherical. It is to this variety of kamald that thename wars alone belongs, while kAmald, kanbil, and qinbil are restricted to the red powder collected in India. In 1875-76 there were exported from Aden 42,975 tb of wars. Dr Vaughan when residing in Aden in 1852 observed that under the name of wars kamala was also used as a dyestuff for silk (Pharmacographia, p.

373).

See Hanbury, Science Papers, p. 73; Pharmacographia, 2d ed., p. 572; Bentley and Trimen, Med. Plants, 236; Roxburgh, Plants of Coromandel, 1798, ii., tab. 168 ; Pharmaceutical Journal (2), vol. ix. p. 280; Hunter, Account of Aden, 1877, p. 187.

KAMCHATKA, or KamrcuatKa, a peninsular por- tion of eastern Siberia, Russia, stretching south between the Sea of Okhotsk on the west and Behring's Sea on the east, and finding its physical continuation first in the Kurile Islands (of which Shunshu is only 7 miles distant from the terminal Cape Lopatka) and then in the

NIZHNEKAMT

5: TROPAVLOVSK BOLSHERYETSKG Mi MEAL. of echt BolshayaR? Vilyutchings = ress Sy nd > AN ra . 3 Ayatch inskaya Vel. Yawino[e yi Kurile Straje Vc.LOPATEA an ‘ 0 Shumshnu I. 155, \ 60E

Map of Kamchatka,

larger islands of the empire of Japan. The area is estimated at 237,266 square miles. ‘The range of moun- tains which forms the backbone of

the peninsula opens up towards the middle into two distinct branches, and gives the whole the general outline of an oval leaf. The western branch is the higher of the two. Southwards from 57° N. lat. there are no fewer than twelve active and twenty-six extinct craters,—all, however, except five on

the eastern side of the peninsula. The active volcanoes are as follows :— Klyutchevskaya Sopka (15,040 feet in height), Shevelyutch (9898 feet), Bolshaya (ce. the Great) Tolbatcha (7800 feet), Kizimen, Uzon, Kishpinitch, the Great and the Little Semetchik, Zhupanova Sopka (8496 feet), Avatchinskaya (8360 feet), Asatcha, and Tchaokhtch. The eruptions of Klyutchevskaya are not unworthy of being compared with those of Mount Etna ; the most notable chronicled by Europcan observers are those of 1727-1731 (lasting four years), 1737, and 1854. More than twenty hot springs are known. 'The basis rocks are granite and porphyry, with metamorphic schists, basalts, trachytes, and other volcanic rocks. The sedimen- tary rocks are mainly of Tertiary and more particularly Eocene origin; those of the Quaternary period have a limited area. Native copper, magnetic iron, lignite, amber, mica, and sulphur are the chief minerals. Of the rivers the largest bears the same name as the peninsula; rising in the highest part of the central range, it flows north for about 310 miles, and falls into the Behring Sea. The valley of the Kamchatka forms the most fertile and most populous portion of the peninsula. For the meteorology of this portion of Asia the materials are of the scantiest ; Dr Wild even (Afet. Repertoriwm, suppl. vol., St Petersb., 1881) is obliged to have recourse to observations as far back as 1844. In January the mean temperature appears to be 19°4° Fahr. at the southern point of the peninsula, 17°6° at Petropavlovsk, and ~~5°8° at the northern ex~~ tremity. The western coast is very considerably colder in winter than the east, but the snowfall is much heavier in the east than in the west. Towards the south especially snow often lies so thick that the natives cannot keep reindeer. During summer the weather is very un- certain, with frequent rains and fogs; but in the centre of the peninsula especially there is a large amount of warmth. Vegetation, especially on soils of volcanic origin, is remarkably

luxuriant; the grass grows nearly 5 feet high, and may be cut thrce times. In the woods berries, mushrooms, and the Martagon lily abound, the bulbs of the last also furnishing food to the natives. Beyond the forests appear Mhododendron Kamtschaticum, Salix arctica, and other plants of an alpine type. The Kamchatkan nettle—with richly variegated foliage—is a familiar object in English greenhouses. Besides the Kamchadales proper there are Koryak and Lamut tribes within the limits of the peninsula. By themselves the Kamchadales are called Itelm,—the name by which they are usually known being a corruption of Konchal, their Koryak appellation. There are not in all more than 2000 Kamchadales, and the process of Russification is going on rapidly. They are a strong hardy people, inured to the severities of the climate, capable of any amount of toil in the way of walking. To their women they are affectionate, and even submissive. In winter they live in pits covered in with earth and turf, the interior being reached by means of a ladder. In the summer they occupy slight wooden sheds (bologans) raised on high props or stilts. The skill they display in the training of their sledge-dogs is not surpassed by any other people who practicc the same art. With their sledges (narts)—which measure from 5 to 10 feet in length—they travel 4 to 8 miles an hour. The Kamchadale language cannot be assigned to any known group; its vocabulary is extremely poor. The purity of the tongue is best preserved by the people of the Penzhinsk district on the west coast; many of the inhabitants of the Kamchatka valley speak a broken Russian. Mr Kennan compares the sound of the language to that of water running out of a narrow-mouthed jug. The total re of the peninsula were 7331 in 1853, and 5846 in 1870.

KAM~—~—KAM

The Russians made their first settlements in Kamchatka in the end of the 17th century; in 1696 Vladimir Atlasoff from Ana- duirsk founded Nizhne-Kamchatsk, and in 1704 Kobeleff founded Bolsheryetsk. About twelve years later the Russiaus came for the first time by sea from Okhotsk. 1n1720 a surveyof thepeninsula was undertaken ; in 1725-30 it was visited by Behring's expedition; and from 1733-45 it was the scene of the labours of the Krashenin- nikoff and Steller expedition.

Disturbance among the natives in 1731 led to the building of a fort at Tigilsk. The seat of the govern- ment is at Petropavlovsk. In 1855 the country was incorporated with tle Maritime Province.

See Krasheninnikoff, Opisanie Kamehatki, 1786, of which an English translation appeared at Gloucester, 1764, and a German translation at Leipsic, 1774; Lesseps, Reise durch Kamtschatka, Berlin, 1791; Erinan, feise, vol. iii.; Langsdorff, Bemerk. auf einer Reise wm die Welt, 1812; Tronson, Voyage to Japan, &e., London, 1859; Petermann's Muittheilwngen, 1860; Revue a? An- thropologie, 1872 ; Kennan, Tent Life in Siberia, New York, 1870; and the same author's paper in Journ. of Amer. Geogr. Soc., 1876.

KAMENETS (Polish, Kamieniec), usually distinguished as Podolian Kamenets to distinguish it from Lithuanian Kamenets in Grodno, is the chief town of the government of Podolia, Russia. It is situated in 48° 40' N. lat. and 26° 25' E. long., 982 miles south of St Petersburg, and occupies a high and rocky peninsula formed by the river Smotritch, a left-hand tributary of the Dniester. Round about the town lie quite a cluster of suburban villages, the Polish Folwark, the Russian Folwark, Zinkovtsui, Karvasarul, &c. ; aud on the opposite side of the river, and accessible bya wooden bridge, stands the fine old castle which so long frowned defiance across the Dniester to Khotin. Among the ecclesiastical buildings may be men- tioned the Roman Catholic cathedral of St Peter and St Paul, built in 1361, and distinguished by a minaret, which recalls the time when it was used as a mosque by the Turks; the Greek cathedral of John the Baptist, dating from the 16th century, but up to 1798 belonging to the Basilian monastery ; the Orthodox monastery of the Trinity ; the Catholic Armenian church, founded in 1398, and possessing among its treasures a missal of slightly earlier date and an image of the Virgin Mary that saw the Tartar invasion. The town contains further a Govern- ment gymnasium, Orthodox and Roman Catholic semin- aries, Jewish colleges, and an infirmary. The population was 20,699 (11,091 males) in 1863, comprising 9965 Jews, 4987 Catholics, 69 Armenians, and 56 Protestants. In 1870 the total was 22,611.

Kamenets appears to be first mentioned in the Russian chroniclers in the end of the 12th century, though there is some doubt whether it be the Podolian town that is meant. Laid waste in 1240 by the forces of Baty, the leader of the Golden Horde, it passes out of view for nearly a century. It afterwards appears frequently in the gen- eral history of the Podolian region ; and in 1484 it was made the chief town of the province of Podolia, instituted by Ladislaus H1., king of Poland. In the course of the 15th and 16th centuries it suffered frequently from the invasions of Tartars, Moldavians, and Turks ; and in 1672 the hetman Doroshenko, assisted by Mahomet IV., made himself master of the place. Restored to Poland by the peace of Carlowitz (1699), it passed with Podolia to Russia in 1795, and on the constitution of the Podolian government in the following year obtained the rank of government town.

KAMENZ, chief town of a department in the circle of Bautzen, Saxony, is situated on the Black Elster, about 21 miles north-east of Dresden. It is the seat of a local court, and has a handsome new town-house and a library. The hospital is dedicated to the memory of Lessing, who was born here in 1729. A colossal bust of the poet was placed opposite the Wend church in 1863; and a monument was raised to him on a neighbouring hill in 1864. 'The industries of Kamenz include wool-spinning, and the manufacture of cloth, crockery, and stoneware. In 1879 the inhabitants numbered 6785, including the garrison.

Till the 16th century Kamenz was known by the name Dreikret- cham. In 1818 it passed by purchase to the margrave of Branden- burg ; in 1819 it went to the king of Bohemia ; and in 1686, after suffering much in the Hussite and Thirty Years' wars, it came into

the possession of Saxony. In 1706 and 1842 it was visited by con- flagration. About 6 miles south-east is the Cistercian monastery of Marienstern. .

KAMES, Henry Home, Lorp (1696-1782), a philo- sopher and Scotch judge, was descended from an old Scotch family, and was the son of

George Home of Kames, in the county of Berwick, where he was born in 1696. After receiving a somewhat imperfect education from a private tutor, he was in 1712 bound by indenture to a writer to the signet in Edinburgh, but an accidental intro- duction to the comfortable and dignified leisure of Sir Hew Dalrymple, then president of the court of session, de- termined him to aspire to the higher position of advocate. He accordingly set himself with great diligence to remedy the defects of his early education, studying in private the various branches of literature and science which constituted the curriculum of arts in the Scottish universities, and with special interest those of metaphysics and moral philosophy. He was called to the bar in 1723, and, as he was unpossessed of those brilliant qualities which sometimes command im- mediate success, he employed his leisure in the compilation of a volume which he published in 1728 under the title Re- markable Decisions in the Court of Session from 1716 to 1728. This work having attracted attention to his abilities, his power of ingenious reasoning and mastery of law gradu- ally gained him a leading position at the bar. His profes- sional duties did not, however, prevent him devoting a large portion of his time to special studies, as well as to philo- sophy and literature, while his flow of animal spirits, his affectionate disposition, and his conversational gifts ren- dered him very partial to social intercourse, especially with persons of cultivated tastes In 1752 he was appointed a judge in the court of session under the title of Lord Kames, and in 1763 he was made one of the lords of jus- ticiary. Through his wife Agatha Drummond, whom he married in 1741, he in 1761 succeeded to the estate of Blair Drummond, Perthshire, where he put into practice a remarkably bold scheme of agricultural improvement, the removal of a stratum of peat on 1500 acres of land by floating it into the river Forth. He died at Edinburgh, 27th December 1782.

Whatever opinion may be formed of the literary qualities, the originality, or the intrinsic value of the publications of Lord Kames, there can be uo question as to the versatility of taste and incessant diligence which they imply. The extent and thoroughness of his legal knowledge is attested by a large number of separate works : Jus Tertii, &c., 1732; Dietionary of Decisions, 1741; Essays con- cerning British Autiquitics, 1747 ; Prineiples of the Law of Scotland, 1754; Statute Law

of Seotland abridged, 1757; Historical Law Traets, 1758; Prineiples of Equity, 1760 ; a second volume of Re- markable Decisions, 1766 ; Elucidations concerning the Commercial and Statute Law of Seotland, 1770; and Selected Decisions of the Court of Scssion, 1780. Lord Kames also took a special interest in the agricultural and commercial affairs of the country. In 1755 he was appointed a member of the board of trustees for encouragement of the fisheries, arts, and manvfactures of Scotland, and about the same time he was named one of the commissioners for the manage- ment of the forfeited estates annexed to the crown. One of his favouritc amusements was the embellishment of his cstate, in con- nexion with which he carried into exccutiona novel plan of a winter garden, On the subject of agriculture he wrote The Gentleman Farmer, 1776. In 1765 he published a small pamphlet Ou the Flax Husbandry of Scotland ; and, besides availing himself of his extensive acquaintance with the proprietors of Scotland to recommend the introduetion of manufactures, he took a prominent part in furthcring the project of the Forth and Clyde Canal. He was also one of the founders of the Physical and Literary Socicty, afterwards the Royal Society of Edinburgh. It is, however, as a writer on philosophy that Lord Kames is best known. In 1751 he published his Essays on the Principles of Morality and Natural Religion, in which he endeavoured to maintain the doctrine of innate ideas, but conceded to man an apparent but only apparent freedom of the will. His statement of the latter doctrine so aroused the alarm of certain clergymen of the Church of Scotland that he found it necessary to withdraw what was regarded as a serious error, and to attribute man's

delusive sense of freedom, not to an innate conviction implanted by God, but to the influence of the passions. An Introduction to the

architecture in the 16th and 17th centuries.

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Art of Thinking, which appeared in 1761, was followed in 1762 by Elements of Criticism, an ingenious and in some respects suggestive discussion of the principles of taste, but in many ways imperfect and unsatisfactory. In 1774 he published, in two volumes, Sketches of the

History of Man, a somewhat heterogeneous medley of opinions aud speculations on a great variety of subjects, but containing many shrewd suggestions and much curious observation. Kames as a whole are more reniarkable for superficial fertility and varied learning than for real originality, and his reasoning is clever aud ingenious rather than subtle and comprehensive. is loose, frequently incorrect and awkward in construction, aud abounds in expressions which border on slang.

The works of His style

See Life of Lord Kames, by A. F. Tytler, Lord Woodhouselee, in

2 vols., 1807

KAMMIN, or Camry, the chief town of a circle in the

government district of Stettin, Prussia, is situated 24 miles from the Baltic coast, on the Kamminsche Bodden, a lake connected with the sea by the Dievenow. local court.

It is the seat of a The veuerable cathedral and the church of St Mary are noteworthy. Portland cement aud knitted goods are produced in the town, which has also some fishing and shipping industry. There is daily steamer communication with Stettin, about 40 miles south-south-west. Kammin is of Wendish origin. From 1175 till 1628 it was the seat of a bishopric, which at the latter date became a secular principality, afterwards incorporated with Brandenburg. Population in 1875, 5499.

KAMPEN, a town of Holland, in the province of Overyssel, stretches for nearly a mile along the left bank of the Yssel, about 33 miles above the mouth of the river. It is connected by railway with Zwolle. The town is traversed in its whole length by a canal, and the old walls have been transformed into promenades and drives. Three of the town gates are good examples of the style of such Of the seven churches the most noteworthy is St Nicholas, which ranks with the cathedral of Utrecht and St John's of Bois-le-Duc as one of the three great medieval churches in the Nether- lands. The town-hall, dating partly from the 16th century and partly from the 18th, is of interest both from its

archii- tecture and decorations and for the value of the archives. There are a theological seminary, a gymnasium, an upper burgher school, and a municipal school of design ; among the beneficent foundations the most notable is the Great Orphanage. The pasture land of the vicinity fosters a considerable trade in dairy produce; and there are ship-yards, rope-walks, a tool factory, cigar factories, paper mills, &c. The inhabitants numbered 7760 in 1840, 11,903 in 1870, and 16,454 in 1876,

Kampen (variously Latinized as Campa, Campi, and Campania ad Isalam) appears as early as 1172, and soon acquired inunicipal rights. In the 14th century it was the seat of a flourishing cloth manufacture, and as a member of the Hanseatic League it developed a large trade with Denmark and various parts of the Low Countries and Germany. The town was vainly besieged by Duke John of Bavaria in 1400 and by Jan van Ens in 1493. During the great wars of the 16th century it was occupied by the forces of the States in August 1572, a little later captured by Don Frederiek, recovered for the States by Rennenberg in 1578, and attacked without suecess by Verdugo in 1584, The Munster party obtained possession of Kampen in 1672, but were expelled by the French in 1673.

Kampen is to the Dutch what Gotham is traditionally to the Eng- lish, or Schilda and Schéppenstadt to the Germans. See E, Moulin, Wistov. Kamper Kronijk ; Havard, Cities of the Zuyder Zee, 1876.

KAMPTULICON. See Fioor Crors,

KAMRUP, a district of Assam, India, extending along both banks of the Brahmaputra, between 25° 50’ and 26° 53 N. lat., and 90° 40’ and 92° 2’ E. long., bounded on the N. by Bhutan state, on the E. by Darrang and Nowgong districts, on the S. by the Khasi hills, and on the W. by Godalpara district.

The gencral physical characteristics of KAmrup are those common to the whole valley of Assam. In the immediate neighbourhood of the Brahmaputra the land is low, and exposed to annualinundation. In this marshy tract reeds

and canes flourish Iuxuriantly, and the only cultivation is that of rice. Ata comparatively short distance from the river banks, the ground begins to rise in undulating knolls towards the mountains of Bhutan on the north, and towards the Khasi territory on the south, The hills south of the Brahmaputra in some parts reach the height of 800 feet. It is on the slopes of these hills, amid the primeval jungle, that European planters have set out their trim tea-gardens. The general scenery of Kamrup is thus agreeably diversified ; and the villages are described as very picturesque. The Brahmaputra, which divides the district into two nearly equal portions, is navigable by river steamers and large cargo boats throughout the year, and receives several tributaries navigable by large native boats in the rainy season. The chief of these are the Manas, Chaul Khoya, and Barnadi on the north, and the Kulsi and Dibru on the south bank. Forests cover about 130 square miles of the district, of which 49 square miles have been reserved by the forest department. There is also a plantation reserve, where seedlings of teak, sdl, sissu, stim, and nahor are reared, and experiments are being made with the caoutchouc tree.

The census of 1871 returned a population of 561,781 (292,688 inales and 268,993 females), spread over an area of 3631 square miles. Hindus numbered 514,024; Mahometans, 45,823; Bud- dhists, 182; Christians, 204, of whom 120 are natives; and “others,” 448. Kamrup is the headquarters of a sect of Vishnu- vites, known as Mahapurtshias, who are described as extremely bigoted. The Mahometans are supposed to be the descendants of the carly invaders. The native Christian community is under the charge of the Ameriean Baptist Mission, which has a station at Gauhatt town. The population is entirely rural, the only town with upwards of 500) inhabitants being Gauhati, with 11,492. The temples of Hajo and Kamakhya attract many pilgrims from all quarters.

The staple erop of the district is rice, of which there are three crops. The state is the landlord, and the land settlement is made direetly with

the cultivators. The condition of the cultivators is high, and it is found difficult to obtain labourers for ordinary work. The indigenous manufactures are confined to the weaving of silk and cotton cloths for home use, and to the making of brass cups and plates. The cultivation and manufacture of tea are conducted alinost solely by European capital. In 1874 there were twenty-four plantations, with 2638 acres under tea, the ont-turn being 375,634 tb. 'The chief exports are rice, oilsceds, timber, and eotton; the imports are fine rice, salt, piece goods, sugar, betel nuts, cocoa nuts, and hardware. Edueation in 1872 was afforded by 146 schools, attended by 3969 pupils, including a high school and college in Gunhati town. The mean temperature is 76°, and the average annual rainfall 70°12 inches.

KAMTHI, or Kamprss, a large town and cantonment in Nagpur district, Central Provinces, India, 21° 13' 30" N. lat., 79° 14' 30″ E. long. Population (1877), 48,831. Considerable trade is carried on here in cattle, country cloth, salt, European piece goods, and timber. The town contains a large market-place, a dispensary, schools, travellers' rest-houses, a Protestant and a Roman Catholic church, five Mahometan mosques, and seventy Hindu temples. An extensive parade ground separates the cantonment from the town, which is built in broad and regular streets.

KAMUISHIN, or Kamysury, a town of Russia, in the Saratoff government, on the right bank of the Volga, 120 miles south-south-west of Saratoff, on the highway to Astrakhan. The inhabitants carry on a good river-trade in wood, tar, grain, fish, tallow, and garden produce,—the Kamuishin melons especially being sent to various parts of Russia, and forming the raw material for a kind of syrup (nardek) manufactured in the town. The popula- tion in 1861 was 8644; the St Petersburg calendar for 1873 gives the number as 15,698.

Kamuishin, it is said, was founded in 1668 on the left bank of the Kamuishinka, for the suppression of the brigandage carried on in the district. Pcter I., intending to make a canal from the stream to the Ilovyla, erected a fort on its right bank ; and in 1710 the inhabitants of the older sattlement removed to the same side,

and the town took the name of Dmitrievsk. The present name dates from 1780, when the place becaine the chief town of a district.

KANANUR, or Cannanorn, a town, seaport, and cantonment in Malabar district, Madras, India, 11° 51/19” N. lat., 75° 24’ 44” E. long., with a population in 1871 of 10,265. The sea-borne trade in 1875-76 amounted to £220,244 value of imports, and £115,248 of exports, Anglican, German, and Roman Catholic missions are estab- lished in the town. Kananur belonged to the Kalahasti or Cherakal rajas till the invasion of Malabar by Hyder Ali. In 1498 a Portuguese colony was planted there by Cabral, and seven years latera factory was established by Vasco da Gama. In 1656 the Dutch effected a settlement and built the present fort, which fell into the hands of the Mysore troops in 1766. In 1784 Kanantr was captured by the British, and the reigning princess became tributary to the Kast India Company. From 1791 it has been the prin- cipal British military station on the Malabar coast.

KANARA, or Canara, Norru, the most southerly of the coast districts of Bombay, India, lying between 13° 52’ and 15° 31’ N. lat, and between 74° 10’ and 75° 7’ F. long., bounded on the N. by Belgaum, E. by Dharwar and Mysore, 8S. by South Kanara, W. by the Arabian sea and N.W. by the Portuguese territory of Goa, with an area of 4235 square miles. The chief town is Karwar. The main feature in the physical geography of the district is the Sihyadri range of the Western Ghats, which, running from north to south, divides it into two parts, a lowland or coast strip (Payanghat), and an upland plateau (Balaghat). The coast-line is only broken by the Karwar headland in the north, and by the estuaries of four rivers and the mouths of many smaller streams, through which the salt water finds an entrance into numerous lagoons winding several miles inland. ‘The breadth of the lowlands varies from 5 to 15 miles. From this narrow belt rise a few smooth, flat-backed hills, from 200 to 300 feet high; and at places it is crossed by lofty, rugged, densely wooded spurs, which, starting from the main range of the Sahyddri hills, maintain almost to the coast a height of not less than 1000 feet. Among these hills lie well-tilled valleys of garden and rice

land. The plateau of the Baléghat is irregular, varying from 1500 to 2000 feet in height. In some parts the country rises into well-wooded knolls, in others it is studded by small, isolated, steep hills. Except on the banks of streams and in the more open glades, the whole is one broad waste of woodland and forest. The open spaces are dotted with hamlcts or parcelled out into rice clearings.

Of the rivers flowing eastward from the watershed of the Sahyadri hills the only one of importance is the Wardha, a tributary of the Tungabhadra. Of those that flow west- wards, the four principal ones, proceeding from north to south, are the Kali, Gungawali, Tadri, and Sharavati. The last of these, plunging over a cliff 825 feet in height, about 35 miles from Hondwar town, forms the famous Gersoppa falls. The mineral products of the district consist of iron, limestone, and building stone. Extensive forests clothe the Sahyddri hills, and are conserved under the rules of the forest department. During the ten years 1866-76 they yielded an average annual revenue of £39,307 to the state. Tigers, leopards, bears, deer, and wild hogs are numerous, and sinall game is plentiful. North Kanara formed part of Madras till 1861, when it was transferred to Bombay presidency.

The census of 1872 returned a population of 398,406 (206,417 males and 191,989 females), 94 to the square mile. The Hindus nunibered 364,402 ; Mahometans, 21,755; Parsts, 25; Christians, 12,189; and Jews, 34. Thc most noteworthy class among the Hindus

are the [avik Brahmans, who make their livelihood from spice an areca nut gardens. Besides the regular Mahometan population (de-

scendants from Hindu converts to Islam), there are two special classes of foreign Mahometans,—the Navayatas or seamen, repre- sentatives of early colonies of Arab merchants, and the Sidis or descendants of African slaves formerly owned by the Portuguese. The Christians are nearly all Roman Catholics, a few families of whom are of Portuguese extraction, though much mixed by inter- marriage with the natives ; the remainder consist of local converts or their descendants.

The area under cultivation is returned at 333,175 acres, or about 12 per cent. of the total area. Rice forms the staple crop, but rdgé, sugar-cane, and safflower are also grown to a considcrable extent ; aud cocoa-nuts, areca-nuts, cardamoms, and pepper are produced in gardens in large quantities for home consumption and for export. Cochineal is largely exported. Coffee is grown only to a small extent. Karwdr, Kumpta, Ankola, Bhatkal, and Honawar are the most important seaports. The total value of the trade at these in 1876 was £1,841,173, viz., £1,199,077 exports and £642,096 im- ports. Carving in sandal wood and ebony forms an important industrial art. Salt is largely manufactured under Government supervision. The total revenue of the district in 1876-77 was £165,597, of which the land tax yielded £82,862, and forests £34,281. There werc, in 1875-76, 88 schools, attended by 4425 pupils. Fever ofa severe type is the prevalent disease, and occa- sionally rages in an epidemic form. The average annual rainfall on the coast varies from 100 inches at Karwar to 163 at Kumpta ; in the uplands it averages about 72 inches.

KANARA, or Canara, Souty, a district on the western coast of the Madras presidency, India, bounded on the north by North Kanara (Bombay), E. by Mysore and Coorg, 8. by Malabar, and W. by the Indian Ocean, with an area of 3902 square miles) The chief town is Man- galore. The district is intersected with rivers, none of which exceed 100 miles in length. They all take their rise in the Western Ghats, and many of them are navig- able for boat traffic during the fair weather for from 15 to 25 miles from the coast. The chief of these streams are the Netravati, Gurpur, and Chendragiri. The general scenery of the district is varied and picturesque. Abundant vegetation, extensive forests, and numerous groves of cocoa- nut palms extend along the coast, and green rice-fields are seen in every valley. 'The Western Ghats, rising to a height of from 3000 to 6000 feet, fringe the eastern boundary of the district. Forest land of great extent and value exists, but most of it is private property. Jungle products (besides timber) consist of bamboo, cardamoms, wild arrowroot, gall-nuts, gamboge, catechu, fibrous bark, cinnamon, gums, resin, dyes, honey, and beeswax. The forests formerly abounded in game, which, however, is now rapidly decreas- ing under incessant shooting.

The census of 1871 returned a population of 919,518 (235 to the square mile), of whom 787,183 were Hindus, 82,803 Mahometans, 49,517 Christians, and 10 "others." The only towns with a popnlation excceding 2000 are Mulki, Udipi, Karikal, Bantwal, and Mangalore. The staple crop is rice. Cocoa-nut gardeus are numerous along the coast, and areca plantations in the interior. Gram, beans, hemp, vdgé, sugar-cane, tobacco, and cotton are also grown, but not to any great extent. The chief articles of import consist of piece goods, cotton twist, yarn, oils, and salt. The total value of imports in 1875-76 was £183,250, and the value of the exports £781,672, of which £400,000 represented coffec and £175,000 rice. The total revenue of the district in 1870-71 was £233,776, of which £116,189 was made up by land tax. Education was afforded in 1871 by 108 Government and inspected schools, attended by 4007 pupils.

KANAUJ, an ancient city in Farrukhabad district, North-Western Provinces, India, 27° 2' 30" N. lat., 79° 58' E. long., with a population in 1872 of 093, waz, 10,864 Hindus and 6229 Mahometans. Kanauj in early times formed the capital of a great Aryan kingdom, and the Gupta dynasty extended their sway over a large portion of Upper India. The prosperity of the city dates from a prehistoric period, and seems to have culminated about the 6th century. In 1018 it fell before Mahmud of Ghazni, and again in 1194 before Muhammad Ghori. The existing ruins extend over the lands of five villages, and occupy a semicircle fully 4 miles in diameter. Among the antiqui- ties the shrine of R4ja Jaipal ranks first in interest. The

great mosque, which bears the name of Sita's Kitchen, also dates back to Hindu times. Hinduism in Lower Bengal dates its legendary origin from a Brahman migration south- wards from this city, about 800 or 900. To this day all Brahmans in the lower provinces trace their descent from one or other of the five Brahman emigrants from Kanauj.

KANDAHAR, the largest city in Afghanistan, is situated in 31° 37' N. lat. and 65° 43' E. long., at a height of 3400 feet above the sea. It is 370 miles distant from Herat on the north-west, by Girishk and Farrah,—

Girishk being 75 miles, and Farrah 225 miles from Kandahar. From Cabul, on the north-east, it is distant 315 miles, by Khelat-i- Ghilzai and Ghazni,—Khelat-i-Ghilzai being 85 miles, and Ghazni 225 miles from Kandahar. 'To the Pishin valley the distance is about 110 miles, and from Pishin to India the three principal routes measure approximately as fol- lows :—by the Zhéb valley to Dera Ismail Khan, 300 miles; by the Béri valley to Dera Ghazi Khan, 275 miles ; by Quetta and the Bol4n to Dadur, 125 miles; and by Chappar and Nari (the proposed railway route) to Sibi, 120 miles. Sibit is connected by rail with the rest of India. Immediately round the city is a plain, highly cultivated and well populated to the south and west; but on the north-west this plain is barren, and is bounded bya double line of rough and precipitons hills, rising to about 1000 feet above its general level, and breaking its dull monotony with irregular lines of scarped precipices, crowned with fantastic pinnacles and peaks, 'To the north-west these hills form the watershed between the valleys of the Argandab and the Tarnak, until they are lost in the moun- tain masses of the Hazarajat,—a wild region inhabited by tribes of Tartar origin, which effectually shuts off Kandahar from communication with the north. On the south-west they lose themselves in the sandy desert of Registan, which wraps itself round the plain of Kandahar, and forms another impassable barrier.

But there is a break in these hills,—a gate, as it were, to the great high road between Herat and India; and it is this gate which the fortress of Kandahar so effectually guards, and to which it owes its strategic importance. Other routes there are, open to trade, between Herat and northern India, either following the banks of the Hari Rud, or, more circuitously, through the valley of the Helmand to Cabul; or the line of hills between the Argandab and the Tarnak may be crossed close to Khelat- i-Ghilzai; but of the two former it may be said that they are not ways open to the passage of Afghan armies owing to the hereditary bitterness of hostility existing between the Eimak and Hazara tribes and the Afghans generally, while the latter is not beyond striking distance from Kandahar, The one great high road from Herat and the Persian frontier to India is that which passes by Farrah and crosses the Helmand at Girishk. Between Kandahar and India new and feasible

means of communication are being discovered with every geographical search into the intermediate country. To the north-west, and parallel to the long ridges of the Tarnak watershed, stretches the great road to Cabul, the same which was traversed by Nott in 1842, and by Stewart and, more recently, by Roberts in 1880. Between this and the direct route to Pishin is a road, well known, though never yet traversed by a British force, which leads through Maruf to the Kundar river and the Guleri Pass into the plains of Hindustan at Dera Ismail Khan. This is the most direct route to northern India, but it involves the passage of some rough country, where lies the great watershed between the basins of the Helmand and the Indus. But the best known road from Kandahar to India is that which stretches across the series of open stony plains interspersed here and there with rocky hills of irregular formation leading to the foot of the pass across

the Kojak range, on the far side of which from Kandahar lies the valley of Pishin. The passage of the Kojak involves a rise and fall of some 2300 feet, but: an excellent road now crosses the pass, The proposed line of railway to Kandahar follows an easier but comparatively waterless route, turning the Kojak at Gwaja (about 25 miles south- west of the Kojak Pass), and involving no serious gradients. Between the Pishin valley and India are several routes, all more or less open to a force equipped for mountain war- fare, of which the best known are the Bol4n and the Chappar (or Nari) passes from the plateau of Afghanistan to the plains of Sind at Jacobabad; and the Zhob and the Béri valley routes leading through the Sulimani range to Dera Ismail and Dera Ghazi Khan respectively. The Bori valley was the line followed by Sir M. Biddulph in 1879, and it diverges but slightly from that known as the Thal-Chotiali route. Thus Kandahar becomes a sort of focus of all the direct routes converging from the wide-stretching western frontier of India towards Herat and Persia, and the fortress of Kandahar gives protection on the one hand to trade between Hindustan and Herat, and on the other it lends to Cabul security from Herat invasion.

Kandahar is approximately a square-built city, sur- rounded by a wall of about 3$ miles circuit, and from 25 to 30 feet high, with an average breadth of 15 feet. Out- side the wall is a ditch 10 feet deep. The city and its defences are entirely mud-built, with no pretensions to architectural beauty. There are four main streets crossing each other nearly at right angles, the central ‘“ chouk” being covered with a dome. These streets are wide and bordered with trees, and are flanked by shops with open fronts and verandahs much after the universal fashion of the East. There are no buildings of any great pretension in Kandahar, a few of the more wealthy Hindus occupying the best houses. The tomb of Ahmed Shahi is the only attempt at monumental architecture. This, with its rather handsome cupola, and the twelve minor tombs of Ahmed Shah’s children grouped around, contains a few good speci- mens of fretwork and of inlaid inscriptions. The four streets of the city divide it into convenient quarters for the accommodation of its mixed population of Duranis, Ghilzais, Parsiwans, and Kakuris, numbering in all some 30,000 souls. Of these the greater proportion are the Parsiwans (chiefly Kizilbashes).

It is reckoned that there are 1600 shops and 182 mosques in the city. The mullas of these mosques are generally men of considerable power. The walls of the city are pierced by the four principal gates of “Cabul,” “ Shikar- pur,” “Herat,” and the “Idgah,” opposite the four main streets, with two minor gates, called the Top Khana and the Bardurani respectively, in the western half of the city. The Idgah gate passes through the citadel, which is a square built enclosure with sides of about 260 yards in length. The flank defences of the main wall are insyfii- cient ; indeed there is no pretence at scientific structure about any part of the defences ; but the site of the city is well chosen for defence, and the water supply (drawn by canals from the Argandab or derived from wells) is good.

About 4 miles west of the present city, stretched along the slopes of a rocky ridge, and extending into the plains at its foot, are the ruins of the old city of Kandahar as it existed until it was sacked and plundered by Nadir Shah in 1738. From the top of the ridge a small citadel overlooks the half-buried ruins. On the north- east face of the hill forty

steps, cut out of solid Hmestone, Jead up- ward to a small, dome-roofed recess, which contains some interesting Persian inscriptions eut in relief on the rock, recording particulars of the history of Kandahar, and defining the vast extent of the kingdom of the emperor Baber. Popular belief ascribes the founda- tion of the old city to Alexander the Great.

Although Kandahar has long ceased to be the seat of government, it igs nevertheless by far the most important trade centre in Afghanistan, and the revenues of the Kandahar province assist

largely in supporting the chief power at Cabul. There are no manufactures or industries of any importance peculiar to Kandahar but the long lines of bazaars display goods from England, Russia, Hindustan, Persia, and Turkestan, embracing a trade area as large probably as that of any city in Asia. The customs and town dues together amount to a sum equal to the land revenue of the Kan- dahar province, which is of considerable extent, stretching to Pul-i- Sangin, 10 miles south of Khelat-i-Ghilzai on the Cabul side, to the Helmand on the west, and to the Hazara country on the north. Although Farrah has been governed from Kandahar since 1863, its revenues are not reckoned as a part of those of the province. The land revenue proper is assessed in grain, the salaries of Govern- ment officials, pay of soldiers, &c., beiug disbursed by " barats" or orders for grain at rates fixed by Government, usually about 20 per cent. above the city market prices. The land revenue for the year 1877-78 amounted to 640,000 rupees English. English goods imported from Kirrachee pay upwards of 18 per cent. on their value at Kandahar. By the time they are exposed for sale at Herat they pay upwards of 28 per cent. ad valorem. Nevertheless the greater part of the English goods sold at Herat are imported by Kurrachee and Kandahar—a fact which testifies to the great insecurity of trade between Meshhed and Herat. Some of the items included as town dues are curious. For instance, the tariff on aninials exposed for sale includes a charge of 5 per cent. ad valorem on slave girls, besides a charge of 1 rupec per head, The kidney fat of all sheep and the skins of all goats slanghtered in the publie yard are perquisites of Government,

the former being nsed for the manufacture of soap, whieh, with snuff, is a Government monopoly. ‘The imports consist chiefly of Enghsh goods, indigo, cloth, boots, leather, sugar, salt, iron, and copper, from Hindustan, and of shawls, carpets, “barak” (native woollen cloth), postins (coats nade of skins), shoes, silks, opium, and carpets from Meshhed, Herat, and Turkestan. The exports are wool, cotton, madder, cum- min seed, asafcetida, fruit, silk, and horses. The system of coinage is also curious: 105 English rupees are melted down, and the alloy extracted, leaving 100 rupecs worth of silver; 295 more English rnpees are then melted, and the molten metal mixed with the 100 rupees silver; and out of this 808 Kandahari rupees are coined. As the Kandahari rupee is worth about 8 annas (half an English rupee) the Government thus realizes a profit of 1 per cent. Govern- ment accounts are kept in “ Kham” rupees, the “ Kham” being worth about five-sixths of a Kandahari rupee; in other words, it about equals the frane, or tho Persian “keran.” Immediately to the south and west of Kandahar is a stretch of well-irrigated and highly cultivated country, but it is the valley of the Argandab that possesses the chief local wealth of agriculture, and which, from the luxuriant abundance of its orchards and vineyards, offers the most striking scenes of landscape beauty. The wide extent of the pomegranate fields forms a striking feature in the valley,—the pomegranates of Kandahar, with its “sirdar” melons and grapes, being unequalled in quality by any in the East. The vines are grown on artificial banks, probably for want of the necessary wood to trellis them,—the grapes being largely exported in a semi-dried state. Fruit, indecd, besides being largely exported, forms the chief staple of the food supply of the inhabitants throughout Afghanis- tan. The art of irrigation is so well understood that the water supply is at times exhausted, no river water being allowed to run to waste. The plains about Kandahar are chiefly watered by canals drawn from the Argandab near Baba-wali, and conducted through the same gap in the hills which admits the Herat road. The amount of irrigation and the number of water channels form a considerable impediment to the movement of troops, not only immediately about Kandahar, but in all districts where the main rivers and streamsare bordered by green bands of cultivation. Irrigation by “‘karez” 1s also largely resorted to. The karez is a system of underground channelling which usually taps a

sub-surface water supply at the foot of some of the many rugged and apparently waterless hills which cover the face of the country. The broad nullahs which seam their sides frequently possess a supply of water some distance below the! surface which can be tapped by boring. The water is not brought to the surface, but is carried over long distances by an underground channel or drain, which is constructed by sinking shafts at intervals along the required course, and connecting the shafts by tunnelling. The general agricultural products of the country are wheat, barley, pulse, fruit, madder, asafcetida, lucerne, clover, and tobacco. ‘

Of the mineral resources of the Kandahar district not much 1s known, but an abandoned gold mine exists about 2 miles north of the town. Some general idea of the resources of the Kandahar district may be gathered from the fact that it supplied the British troops with everything except luxuries during the entire period of occupation in 1879-81; and that, in spite of the great stra thrown on those resources by the presence of the two armies of Ayub Khan and of General Roberts, and after the total failure of the autumn crops and only a partial harvest the previous spring, the army was fed without great difficulty until the final evacua- tion, at one-third of the prices paid in Quetta for supplies drawn from India.

Kandahar hasa stormy history. Sultan Mahmud of Ghazni took it in the 11th century from the Afghans who then held it. In the beginning of the 13th century it was taken by Jenghiz Khan, and in the 14th by Timur. In 1507 it was captured by the emperor Baber, but shortly afterwards it fell again into Afghan hands, to be retaken by Baber in 1521. Baber’s son, Humaynn, agreed to cede Kandahar to Persia, but failed to keep his word, and the Persians besieged the place unsuccessfully, Thus it remained in the posses- sion of the Moghnils till 1625, when it was taken by Shah Abbas. Aurungzebe tried to take it in 1649 with 5000 men, but failed. Another attempt in 1652 was equally unsuccessful. Jt remained in Persian possession till 1709, when it was taken by the Afghans, but was retaken after a two years’ siege by Nadir

Shah. Nadir Shah was assassinated in 1749, and immediately on hearing the news of

his death Ahmed Shah (Abdalli) seized Nadir Shah's treasure at |

Kandahar, and proclaimed himself king, with the consent, not only of the Afghans, but, strange to say, of the Hazaras and Baluchis as well. He at once changed the site of the city to its present position, and thus founded the Afghan kingdom, with modern Kandahar as its capital. Ahmed Shah died in 1773, and was succecded by his son Taimur, who died in 1798, and left the throne to his son Zaman Shah. his prince was deposed by his half brother Mahmud, who was in his turn deposed by Shah Suja, the full brother of Zaman Shah. After a short rcign Shah Suja was compelled to abdicate from his inability to repress the rising power of Fattch Khan, a Barakzai chief, and he took refuge first with Runjit Singh, who then ruled the Punjab, and finally secured the protection of British power, Afghanistan was now practically dismembered. Mahmud was reinstated by Fatteh Khan, whom he appointed his vizier, and whose nephews, Dost Mahommed Khan and Kohn dil Khan, he placed respectively in the governments of Cabul and Kandahar. Fatteh Khan was barbarously murdered by Kamran (Mahmud's son) near Ghazni in 1818; and in retaliation Mahmud himself was driven from power, and the Barakzai clan secured the sovereignty of Afghanistan. While Dost Mahommed held Cabul, Kandahar became temporarily a sort of independent chiefship under two or three of his brothers. In 1839 the cause of Shah Suja was actively supported by the British. Kandahar was occupied, and Shah Suja reinstated on the throne of his ancestors. Dost Mahommed was defeated near Cabul, and after surrender to the British force, was deported into Hindustan. The British army of occupation in southern Afghanistan continued to oceupy Kandahar from 1839 till the autumn of 1842, when General Nott marched on Cabul to meet Pollock's advance from Jalalabad. The cantonments near the city, built by Nott's division, were repaired and again occupied by the British army in 1879, when Shere Ali was driven from power by the invasion of Afghanistan, nor were they finally evacuated till the spring of 1881. Guy Tat, Tule)

KANDI, a town in Murshidabdd district, Bengal, India, in 23° 58’ N. lat., 88° 5’ 1” E. long., with a population in 1872 of 12,016, viz., Hindus, 10, 452; Mahometans, 71516 ; “others,” 48. It is the residence of the rajas of Patkpara, a wealthy and devout Hindu family. The founder of this family was Gangé Govind Sinh, the ania of Warren Hastings, who was born at Kandi, and retired thither in his old age with an immense fortune. His name has acquired eelebrity for the most magnificent sraddha, or funeral obsequies, ever performed in Bengal, celebrated in honour of his mother, at a eost, it is said, of £200,000.

KANDY, a town of Ceylon, formerly the capital of a kingdom of the same name, situated towards the heart of the island, at a height of 1713 feet above the sea, 747 miles by rail from Colombo. It lies round the margin of an artifieial lake construeted by the last king of Kandy in 1806, and is beautifully surrounded by hills. ‘The most striking objects of interest are the temples (of which twelve are Buddhist and four Brahman), the tombs of the Kandian kings, and the various buildings of the royal residence, partly allowed to fall into disrepair, partly utilized by the Government. Of the temples the Dalada Malagawa is worthy of particular mention ; it claims, as the name indi- cates, to be in possession ‘of a Buddha tooth. Kandy is the seat of a Government agent and of a district judge, and regular sessions of the criminal court are held in the town. As a municipality (constituted in 1865, and divided into five wards in 1871) it is governed by a body of eight coun- eillors. Among the publie buildings and institutions are the Government house or pavilion, erected in 1824, the planters’ association, two libraries, an industrial school, aud

Trinity College, established in 1857, and reopened in 1871 after being closed for six years. The Church Missionary Society, to which the college owed its existence, began its labours in 1818.

Kandy was oceupied by the Portuguese in the 1éth century and by the Dutch in 1768 ; but in both instances the native kings sue- ceeded in shaking off the foreign yoke. The British got possession of the place in 1803, but the garrison afterwards capitulated and were massacred, and

it was not till 1814-15 that the king was defeated and dethroned. The British authority was formally estab- lished by the convention of March 2, 1815. In 1848, owing to an attempt at rebellion, the town was for a time under martial law.

KANE, Exisua Kent (1820-1857), American traveller, scientist, and arctic explorer, was born in Philadelphia, on February 3, 1820, the eldest of seven children. His father was judge of. the eastern district of Philadelphia, and through both parents he inherited a mixture of Irish, English, Scotch, and Dutch blood. In his boyhood, in spite of feebleness of body, he was remarkable for his activity, vivacity, and energy. While still at school he showed a fondness for out-door pastime and enterprise, and a decided leaning towards scientific pursuits. Having chosen civil engineering as a profession, he entered the university of Virginia, where he continued to show his taste for science, especially chemistry, mineralogy, and physical geography. A violent attack of heart disease, however, which stuck to him to the end of his life, indueed him to abandon engineering and devote himself to the study of medicine. He obtained his doctor's degree in 1842, having already acquired a reputation in physiological research, In 1843 Kane entered the U.S. navy as surgeon, and was appointed to the ' Brandywine," commissioned to earry Mr Webster as U.S. minister to China. While the vessel remained at Rio Janeiro the restless and eager Kane made a journey to the skirts of the Andes and explored their geology. Leaving the ship again at Bombay, he indulged his irrepressible exploring proclivities by a Journey up country, rejoining his ship at Ceylon. On his arrival at his destination, Maeao, he provided a substitute for his post in the embassy, erossed and explored the island of Luzon, visited the mysterious voleano of Tael, and, amid many

| difficulties, descended its steep crater, bringing up with.

hiin specimens of its lava. Finally resigning his position on the embassy, he practised for a time at Whampoa, where he was stricken down by rite fever. In August 1844 he left China, apd, returning by India (where he visited the Himalayas), Persia, Syria, Egypt, Greece, Austria, Germany, and Switzerland, reached home in 1846. In May of that year

he was ordered to the west eoast of Africa, where he visited the kingdom of Dahomey, and caught the African fever, which told severely on his constitution. On his re- turn in April 1847, he exchanged the naval for the inilitary service, and was sent to join the U.S. army in Mexico, where he had some extraordinary adventures in endeavour- ing to reach his destination, and where he was again laid down with fever. In February 1849 he was presented with a sword by the city of Philadelphia, and in the same year inade a visit to the Mediterranean and afterwards to the West Indies. On the fitting out of the first Grinnell ex- pedition, in 1850, to search for Sir John Franklin, Kane was appointed surgeon and naturalist under Lieutenant De Haaven, who commanded the two ships, the " Advance " and "Rescue." The expedition left New York on May 22d; and after an absence of sixteen months, during nine of which the ships were ice-bound, they returned without having found any trace of the missing vessels. Kane was in feeble health, but worked on at his narrative of the expedition, which was published in 1854, under the title of The U.S. Grinnell Expedition in Search of Sir John Franklin. Ye also read a paper at the American Geo- graphieal Society on an "Open Polar Sea," a chimera

which was to play so important and delusive a réle in sub- sequent Arctic explorations. Kane was determined not to give up the search for Franklin, but Government refused all help. In spite of feeble health, he travelled through the States lecturing to obtain funds, and gave up his pay for twenty months. Mr Grinnell again came to the rescue, with the brig " Advance," which was equipped with the help of Mr Peabody and some of the learned societies. It sailed in the end of June 1853, and on August 23d reached 78° 41' in Rensselaer Bay, off the coast of Greenland, where it remained fast during the whole time the expedition was out. During the first winter a sledge party was sent out, and reached 79° 50', though at the expense of terrible sufferings. During the second winter the expedition suf- fered greatly from want of food and fuel, as well as from scurvy. Still Kane carried on with incessant diligence bis scientific observations—magnetic, meteorological, astrono- mical, and tidal ; and the results were afterwards published in

the Smithsonian Contributions to Knowledge, vols. x.~~xiii., 1858. One of the most notable incidents of this expedi~~ tion was the journey made by Morton, one of the staff, up Kennedy Channel, as far as Cape Independence, in 81° 22’ N. lat., whence he saw what he and Kane firmly believed to be an “open polar sea.” No doubt a large area of open water was seen, but a permanent open sea in this direction has long ago been proved a myth, though doubt- less the constant shiftings of the ice often leave considerable areas of water uncovered at continually shifting points. After the endurance of the greatest hardships, it was finally resolved to abandon the ship, which was done on May 17, 1855, Upernivik being reached after many difficulties on Angust 5. Kane reached home in October in good health, and set himself at once to write the narrative of his expe- dition, which was published in 1856. In October of the same year he left Philadelphia for England in search of health. From England he went to Cuba, where he died at Havana on February 16, 1857, at the early age of thirty- seven. Between his first and second arctic voyages, Kane made the acquaintance of the Fox family, the celebrated spiritualists. With one of the daughters, Margaret Fox, he carried on a lengthened correspondence, which was afterwards published by the lady, who declares that they were privately married before Kane left for England. Not- withstanding his weak health, Kane was a man of restless activity and high intelligence, but much of that activity appears to have been wasted. He certainly did a vast amount of work during his short life, but will be re- membered mainly for his chivalrous and _self-sacrificing but fruitless search for Franklin, during which he ap- preciably advanced our knovledge of the Arctic area, and nade important contributions to physics and biology.

See, besides the works mentioned above, Biography of BE. K. Kane, by William Elder, 1858; Life of BE. K. Kane and other American Explorers, by 8. M. Smucker; The Love-Life of Dr Kane, containing the Correspondence and a History of the Engagement and Secret Marriage between E. K. Kane and Margaret For, New York, 1866; *‘ Discoveries of Dr Kane,” in Jour. of the Roy. Geog. Soc., vol. xxvili., reprinted in R. G. S Arctic Papers of 1875.

KANEFF, or Kanmmrr, a town of Russia, in the Kieff government, on the Dnieper, 141 miles south-east of Kieff. The population, which in 1863 was returned as 6838, was about 8000 in 1879; but neither the trade nor the in- dustry of the place is of importance.

Vsevolod of Kieff founded a church at Kanieff in 1144, and in the latter part of the same century the place was the annual rendezvous of the forees collected to give protection to the merchant ships returning from Greece. In 1880 Poniatoffski, to whom it had passed from Stanislaus Augustus, gave the revenues of the town and the site of the royal court to the prior of the Basilians, who assigned them to the Kaneff schools of the brotherhood. The ad-

ministration of the Boguslaff district was transferred to Kaneff in 1837, and in 1844 the district took the name of that town.

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KANGAROO, When Captain Cook, during his first memorable voyage of discovery, was detained, for the purpose of refitting his ship at Endeavour river, on the north-east coast of Australia, a strange-looking animal, entirely unknown to them, was frequently seen by the ship's company; and it is recorded in the annals of the voyage that, on the 14th of July 1770, " Mr Gore, who went out this day with his gun, had the good fortune to kill one of the animals which had been so much the subject of our speculation, . . . and which is called by the natives kanguroo,"! a name which, though it does not appear to be now known to any of the aboriginal tribes of the country, has been adopted for this animal in all European languages, with only slight modifications of spelling, With the exception of a passing glimpse in the beginning of the same century by the Dutch traveller Bruyn of some living examples of an allied species, to be referred to presently, this was the first introduction to the civilized world of any member of a group of animals now so familiar, The affinities of the species, skins of which were brought home by Captain Cook and subsequent voyagers, were recognized by Schreber as nearer to the American opossums (then the

only known marsupials) than to any other mammals with which zoologists were acquainted, and consequently it was placed by him, in his great work on the Mammalia, then in the course of publication, in the genus Didelphis, with gigantea for a specific designation,—the latter having been

Fia. 1.—Kangaroo (A/acropus giganteus).

bestowed upon it by Zimmerman under the impression that it was a huge species of jerboa. Soon afterwards (1791) Dr Shaw very properly formed a new genus for its recep- tion, which he named Afacropus, in allusion to the peculiar length of its hind foot. By the name thus formed, Macropus giganteus, this kind of kangaroo has ever since been known in zoological literature.

Further explorations in Australia and the neighbouring islands have led to the discovery of a very considerable number of species, which are now included in the family Macropodide, one of the subdivisions of the order Marsu- pialia, for the characters of which see MAMMALIA.

The Macropodidx, or kangaroos, taken as a whole, form a very well marked family, easily distinguished from the remaining members of the order by their general conforma- tion, and by peculiarities in the structure of their limbs, teeth, and other organs. They vary in size from that of a sheep down to a small rabbit. The head, especially in the larger species, is small, compared with the rest of the body,

1 Hawkesworth, Collection of Voyages, vol. iii. p. 577 (1778).

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and tapers forward tothe muzzle. The shoulders and fore limbs are feebly developed, and the hind limbs of dispro- portionate strength and magnitude, which

gives them a peculiarly awkward appear- Vines ance when moving about on all fours, ¥

as they. occasionally do when feeding. Rapid progression is, however, performed only by the powerful hind limbs, the ani- lS mal covering the ground by a series of ~~¢ fy immense bounds, during which the fore part of the body is inclined forwards, and balanced by the long, strong, and tapering ¥ tail, which is carried horizontally back~~ } wards. When not moving they often

assume a perfectly upright position, the tail aiding the two hind legs to form a sort of supporting tripod, and the front limbs dangling by the side of the chest. This position gives full scope for the senses of sight, hearing, and smell to warn of the approach of enemies, from which they save themselves by their bounding flight. The fore paws have five distinct digits, each armed with a strong, curved claw. The foot of the hind limb is quite different, and very peculiar in construction, being extremely long and narrow, and (with only one, lately discovered, exception) without any hallux or great toe. Jt consists mainly of one very large and strong toe, corresponding to the fourth of the human or other typically developed foot, ending in a strong curved and pointed claw. Close Fia. 2.—Skeleton to the outer side of this lies a smaller fifth of hind foot of digit, and to the inner side two excessively “®sator slender toes (the second and third), bound together almost to the extremity in a common integument. ‘The two little claws of these toes, projecting together from the skin, may be of use in scratching and cleaning the fur of the animal, but the toes must have quite lost all connexion with the functions of support or progression.

The dental formula, when completely developed, is incisors #, canines 4, premolars $, molars + on each side, giving a total of thirty-four teeth. The three incisors of the upper jaw are arranged in a continuous arched series,

P me 3 } te i om ah? m? m*

Fic. 3.—Skull and teeth of Bennett’s Kangaroo (JMacropus ben- nettii). i, a2, 2, first, second, and third upper incisors ; pm, second or posterior premolar (the first having been already shed); m’, m, m3, m4, the four true molars. The last, not fully developed, is nearly concealed by the ascending ramus of the Jaw.

and have crowns with broad cutting edges; the first or middle incisor is often larger than the others. Corre- sponding to these in the lower jaw is but one tvoth on each side, but it is of great size, procumbent or directed

horizontally forwards, narrow, lanceolate, pointed, and with sharp edges. Owing to the laxity of the union of the two rami of the lower jaw at the symphysis, in many species the two lower incisors can be made to work together like the blades of a pair of scissors, a very remark- able arrangement not known to occur in other mammals. The canines are absent vor rudimentary, always so in the lower jaw, and often deciduous at an early age in the upper jaw. The premolars are compressed, with cutting longi- tudinal edges, the anterior one is always deciduous, being lost about the time the second one replaces the milk molar, so that both premolars are never found in place and use in the same individual. The true molars have quadrate crowns, provided with two strong transverse ridges, or with four obtuse cusps. In Macropus giganteus and its im- mediate allies, both premolars and one or two of the anterior true molars are shed during the lifetime of the animal, so that in old examples only the two posterior molars and the incisors are found in place. The milk dentition, as in other marsupials, is confined to a single molar tooth on each side of each jaw, the other molars and incisors being never changed. The dentition of the kangaroos, functionally considered, thus consists of sharp-edged incisors, most fully developed near the median line of the mouth, for the pur- pose of cropping the various kinds of herbage on which they feed, and ridged and tuberculated molars for crushing it, there being no tusks or canines for offensive or defensive purposes.

The number of vertebre is—in the cervical region 7, dorsal 13, lumbar 6, sacral 2, caudal varying according to the length of the tail, but generally from 21 to 25. In the fore limb the clavicle and the radius and ulna are well developed, allowing of considerable freedom of motion of the hand. The pelvis has large epipubic or “ marsupial ” bones. The femur is short, and the tibia and fibula of great length, as is the foot,

the whole of which is applied to the ground when the animal is at rest in the upright position.

The stomach is of large size, and very complex, its walls being puckered up by longitudinal muscular bands into a great number of sacculi, like those of the human colon, The alimentary canal is long, and the caecum well developed. All the species have a marsupium or pouch formed by a fold of the skin of the abdomen, covering the mammary glands with their four nipples. In this pouch the young (which, as in other marsupials, leave the uterus in an extremely small and imperfect condition) are placed as soon as they are born; there their growth and develop- ment proceeds; and to it they resort temporarily for the purpose of shelter, concealment, or transport, for some time after they are able to run and jump about the ground and feed upon the same herbage which forms the nourishment of the parent. During the early period of their sojourn in the pouch, the blind, naked, helpless young creatures (which in the great kangaroo scarcely exceed an inch in length) are attached by their mouths to the nipple of the mother, and are fed by milk injected into their stomach by the contraction of the muscle covering the mammary gland. In this stage of their existence the respiratory organs are modified much as they are per- manently in the Cefacea, the elongated upper part of the larynx projecting into the posterior nares, and so maintain- ing a free communication between the lungs and the external surface, independently of the mouth and gullet, thus averting all danger of suffocation while the milk is passing down the latter passage.

The kangaroos are all vegetable feeders, browsing on grass and various kinds of herbage, the smaller species also eating roots. They are naturally timid, inoffensive creatures, but the larger ones when hard pressed will turn

and defend themselves, sometimes killing a dog by grasping it in their fore paws, and inflicting terrible wounds with the sharp claws of their powerful hind legs, sustaining themselves meanwhile upon the tail. The

great majority are inhubitants of Australia and Tasmania, forming one of the most prominent and characteristic features of the fauna

of these lands, and in the scenery of the country, as well:

as the economy of nature, performing the part of the deer and antelopes of other parts of the world, which are entirely wanting in Australia. They were very important sources of food-supply to the natives, and are hunted by the colonists, both for sport and with a view to their destruc- tion, on account of the damage they naturally do in con- suming the grass, now required for feeding cattle and sheep. Notwithstanding this, they have in some districts increased in numbers, owing to the suppression of their former enemies, the aborigines and the dingo or native dog.

The Macropodidex are divided into two well-marked sections—(1) the true kangaroos (Macropoding), and (2) a group consisting of smaller auimals, commonly called rat-kangaroos, or (improperly) '* kangaroo-rats," or sometimes potoroos,

I. In the Macropoding (see fig. 3) the cutting edges of the upper incisors are nearly level, or the first pair but slightly longer than the others, The canines are rudimentary and often wanting. The pre- molars are usually not longer (from before backwards) than the true molars, and less compressed than in the next section. The crowns of the molars have always two prominent transverse ridges. The fore limbs are small with subequal toes, armed with strong, mode- ritely long, curved claws. Hind limbs very long and strongly made. Head small, with more or less clongated muzzle. Ears generally rather long and ovate.

Upwards of thirty species of this group have been described, and many attempts have been made to subdivide it into smaller groups or genera for the convenience of arrangement and description, but these have generally been based upon sucli trivial characters that it is preferable to speak of most of them as sections of the genus Macropus, reserving generic rank only to two forms somewhat aberrant both in structure and geographical distribution. Accord- ing to this arrangement the genera will be as follows :—

1. Macropus, Shaw, divided into the following sections or sub- genera. A. Macropus proper, of which the type is Jf. gigantcus, spoken of at the beginning of this article as having been discovered in 1770 by the first English explorers of Australia, It is the common great kangaroo, called " boomer," 'forrester," or " old man" by the colonists, and frequents the open grassy plains of the greater part of eastern Australia and Tasmania. Some closely allied species or perhaps local varieties, Mf. ocydromus, M. fuliginosus, and M. mclanops, are found in southern and western Australia. B, Os- phrantcr, Gould, distinguished from the above by the naked muffle, includes some very large and handsome specics, which principally dwell in rocky mountain ranges, as the great red kangaroo, Jf, rufus, M. antilopinus, and M. robustus. C. Halmaturus, F. Cuv. The kangaroos of this section have also the mufile naked, but they are rather smaller species, frequenters of forests and dense impenetrable brushes and scrubs, and hence often called brush kangaroos, though a native name "wallaby" is now generally applied to them. There are many species, of which Af. bennettii, M. ruficollis, M. ualabatus, M. dorsalis, M. agilis, M. derbianus, M. thetidis, M. billardicri are the best known. Af. brachyurus is remarkable for its comparatively short and slender tail and small ears. The carlicst known species of kangaroo, referred to before, M. brunii (Schreber), may perhaps belong to this section. Several examples were seen by Bruyn in 1711 living in captivity in the garden of the Dutch governor of Batavia, and described and figured in the account of his travels (Retzen over Moskovic, &c.) under the name of " Filander." It was quite lost sight of, and its name even transferred by S. Miiller to another species (now known as Dorcopsis miilleri, Schlegel) until rediscovered in 1865 by Rosenberg, who sent a serics of specimens to the Leyden Museum from the islands of Aru and Great Key, thus determining its true habitat. Quite recently three other species of true kangaroo have been discovered out of Australia:—Jf. papuanus, Peters, from the castern extremity of New Guinea, near Yule Island; Jf. crassipes, Pierson-Ramsay, from near Port Moresby ; and Jf. browni, Pierson-Ramsay, from New Ireland. D. Onychoyalea, Gould, with a hairy muftle and long and slender tail, furnished with a horny nail-like organ at the apex. Af. unguifer, M. frenatus, and M. lwaatus. E. Lagorchestes,

Gould, hare-kangaroos, a group of small hare-like animals, great leapers

KANGAROO

and swift runners, which mostly affeet the open grassy ridges, particularly those of a stony character, sleeping in forms or seats like the common hare. Their limbs are comparatively small, their claws sharp aud slender, and their muffle clothed with velvet-like hairs. M. fasctatus, M. icporoides, M. hirsutus, M. conspicitlatus, &e. F, Pctrogale, Gray. 'These differ from all the others in having the tail cylindrical and bushy towards the apex instead of tapering. The muffle is naked, the hind foot comparatively short and stout, and denscly clothed with coarse hairs, the nails short. These are the "rock kangaroos," making their retreats in caverns and crevices, leaping with surprising agility from one narrow ledge to another, and browsing upon the scanty herbage that the neighbour- hood of such situations affords. Jf, xanthopus, AM. penicillatus, M. lateralis, M. concinnus, M. brachyotus, M. inornatus, &c,

2. Dendrolagus, Sal. Muller.—A genus formed for the reception of two species, D. ursinus and D. inustus, commonly known as '* tree kangaroos," both inhabitants of New Guinea, and which differ greatly from all the foregoing in being chiefly arboreal in their habits, climbing with facility among the branches of large trees, and feeding on the bark, leaves, and fruit. In accordance with this habit their hinder limbs are comparatively shorter than in the true kangaroos, and their fore limbs are longer and more robust, and have very stron curved and pointed claws. These differ from all the preceding, an agree with the next genus, in some details of the structure of the molar teeth, and in the circumstance that the fur of the back of the neck is directed forwards or in a reverse position to that of the remainder of the coat.

3. Dorcopsis, S. Miiller.—Of this genus two species are at pre- sent known, both froin New Guinea, D. miillert, and another lately discovered by D'Albertis, D. letuosa. In some respects they re- semble the last, but they differ from them and alithe other Macropo- ding, and

agree with the next section, in the great size and peculiar form of the premolar teeth.

II. The second section or sub-family, the Hypsiprymning (see fig. 4), have the first upper incisor narrow, curved, and much exceed – ing the others in length. Upper canines always persistent, flattened, blunt, and slightly curved. Premolars of both jaws always with large, simple, compressed crowns, with a nearly straight or slightly

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Fic. 4.—Skull and teeth of Gray’s Rat Kangaroo (Bettongia grayit). c, upper canine tooth. The other letters as in fig. 3.

concave free cutting edge, both outer and inner surfaces usually marked by a series of parallel, vertical grooves and ridges. Molars with quadrate crowns, having a blunt, conical cusp at each corner, the fourth notably smaller than the third, sometimes rudimentary or absent. Fore feet narrow; three middle toes considerably ex- ceeding the first and fifth in length ; their claws long, compressed, and but slightly curved. Hind feet as in Aacropus. Tail long, sometimes partially prehensile, being used for carrying bundles of grass with which they build their nests. .

‘The potoroos or rat-kangaroos are all small animals, none of them exceeding a common rabbit in size. They inhabit Australia and Tasmania, are nocturnal, and feed on the leaves of various kinds of grasses and other plants, as well as roots and bulbs, which they dig up with their fore paws. About ten species are known, agen ing a considcrable range of diversity i minor characters, an

admitting of being grouped in four principal sections, which may perhaps be allowed the rank of genera. These are ; 1. Hypsiprymnus, Uliger.—Head long and slender. Auditory

bull somewhat inflated. Ridges on premolars few and perpen- dicular. Large palatine foramina. Tarsus short. Muffle naked. H. murinus, H. apicalis, H. gilberti, H. platyops. .

2. Bettongia, Gray. Head comparatively short and broad. Auditory bulle much inflated. Tarsus long. Large palatine = mina. Ridges on premolars numerous and oblique. ; Muffie naked. B. penicillatus, B. cuniculus, B. gaimordii, B. ogilbyt, B. gray B. campestris, &c. cm

3. oaeegnas, Garrod. —Head short and broad. Ange bulle not inflated. No palatine foramina. Tarsus long. Mufile hairy. 4%. rufescens.

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4. [ypsiprymnodon, Pierson-Ramsay.—Distinguished from all other members of the family by possessing a small prehensile hallux or first toe, without nail. It is, therefore, a form of great interest, as showing a structure of foot connecting that of the kangaroos with that of the phalangers. The single known species, H. mos- chatis, Ramsay, has been lately discovered in north-east Australia. It was described almost simultaneously by Owen under the name of Pleopus nudicaudatus.

In seeking among the other marsupials for the nearest allies to the kangaroos, using this word in the comprehen- sive sense as above, two most striking points in their organization must be borne in mind, the structure of the hind foot and the dentition. Of the former the essential peculiarity is the great predominance of the fourth digit, and the remarkable character of the second and third, which while retaining a considerable length, are of extreme tenuity, and buried up to the claws in a common integu- ment. Such a structure of foot is quite unknown ont of the marsupial order, but in that order it is found in the Phalangistidez in a very modified form, associated with a large opposable hallux, and a broad sole of the foot, appropriate for climbing trees; and again, in almost the same form as in the kangaroos, in the ground-dwelling Peramelidex, which in their dentition and digestive organs are so widely different. The Australian carnivorous marsupials, Dasyuride, and the American opossums or Didelphidx, show no trace of this singular conformation. It is therefore only with the former

families, the Phalan- gistide and the Perameldx, that the kangarvos are allied by this character.

The chief pecnliarity of the dentition consists in the presence of three pairs of incisors in the upper jaw, the first or middle one of which is generally the largest, opposed to a single pair in the lower jaw, strong, sharp, and pro- cumbent. 'These are followed by an interval, in which may be, in the upper jaw only, a canine, but always so small, as to be of little functional importance. The premolars are compressed and cutting, and the true molars ridged or tuberculated. Such a dentition is found among the Phalangistide alone of existing marsupials. In this respect the Peramelidz are completely separated from thie kangaroos, their numerous small incisors, large canines, and cuspidated molars resembling those of the Dasyuride and Didelphidz. On the whole then, the kangaroos and the phalangers are groups most nearly allied in essential char- acters, having both dentition and extremities formed upon the same fundamental type, though with modifications of the latter to suit their respective terrestrial and arboreal habits.

Remains of numerous extinct species of true kangaroos, many of them of much larger size than any now existing, are abundant in the Pleistocene deposits of Australia, and have been described and figured by Professor Owen in the Philosophical Transactions. Hitherto they have been found in no other part of the world. Other animals of gigantic size, the Deprotodon, as large as a rhinoceros, and the Nototheriwm, but little inferior, with dentition of the same general type, but the structure of whose feet is not yet known, lived with these kangaroos in the same land. An extraordinary modification of the Hypsiprymnus type, with the great premolar characteristic of that genus immensely exaggerated in size, and the-true molars equally reduced, misnamed Thylacoleo carnifex, was another con- temporary. Beyond these, which all belong to the most recent geological epoch, we have no knowledge of any extinct auimals which can be said to be nearly allied to kangaroos, or to connect them with any other forms of mammals. The only marsupials discovered in European Tertiaries resemble the existing opossums of America, and except in. their common marsupial characters have no affinities with the kangaroos.

It is, however, a most remarkable fact that in the Pur-

beck beds of the newer Oolitic series, not only in England, bnt also in deposits of corresponding age in America, lower jaws of small mammals (to which Dr Falconer gave the name of Plagiaulax), with a type of dentition showing a considerable resemblance to that described above as peculiar to the kangaroos and their existing allies, have been dis- covered. Unfortunately no part of the skull or upper teeth, or of the limbs of any of these is as yet known; so whether the resemblance was fully carried out, even in the dentition, is uncertain, and it is almost too great a stretch of the imagination to assume that the modern " diprot- odont" marsupials have derived their special type of tooth- structure from such remote ancestry. The evidence of the affinity of the still more ancient //ypsiprymnopsis (Boyd Dawkins), founded upon a single and much worn tooth, having some resemblance to one of the large premolars of Hypsiprymnus, found in the infra-Liassic beds of Watchet in Somersetshiire, is based on still slighter foundation ; but, if it should eventually turn out to be well-grounded, it would carry back the type to an extraordinary antiquity.

Literature.—G. KR. Waterhouse, Nat. Hist. of the Mammalia, vol. i, " Marsupiata," 1846; J. Gould, Mammals of Australia; R. Owen, article " Marsupialia" in Cyclop. of Anatomy and Physio- logy; various memoirs "On Extinct Mammals of Australia " in Philosophical Transactions; '* Mesozoic Mammalia," Palzwonto- graphical Soctcty, 1871; H. Falconer, 'On Plagiaulax," Quart. Journ. Geol. Soc., August 1857 and November 1862; W. H. Flower, "On the Development and Succession of the Teeth in the Marsupialia," Phil. Trans., 1867; "On the Affinities and Probable Habits of Thylacoleo," Quart. Journ. Geol. Soc., August, 1868; A. H. Garrod, "On Dorcopsis luctwosa and its Affinities," Proc. Zool. Soc., 1875, p. 48. (Wiig)

KANGRA, a district in the lieutenant-governorship of the Punjab, India, lying between 31° 20' and 33° N., lat., and between 75° 39' and 78° 55' E. long., bounded on the N.W. by Gurdaspur district and Chamba state, on the N.E. by the Himalaya mountains, on the 8.E. by

the states of Bashahr, Mandi, and Bilaspur, and on the S.W. by Hoshiarpur district, with an area of 8988 square miles. Kangra district comprises a vast tract, extending east- ward from the plain country of the Bari and Jalandhar Doabs, across two distinct Himalayan ranges, far into the heart of Thibet. It naturally falls into three parts—the sub-Himalayan country of KAngra proper, the central valleys of Kullu and Bangdhal, and the rugged outer region of the Tibetan slope. It consists almost entirely of immense mountain ranges, whose three parallel lines, with a trans- verse ridge, form four main basins, in eacli of which a great river takes its rise—the Beas (Bids), Spiti, Clientb, and Ravi. From the great variety of the different tracts included in the district by modern arrangements, it is impossible to assign any general physical peculiarities to the whole beyond their common characteristic as moun-tainous regions, intersected by snowy chains and scored by deep river valleys. The western portion, abutting on the Punjab plains, admits of cultivation, and supports a comparatively dense population ; while the bare and sterile eastern glens are sparsely inhabited by a Tibetan race.

The census of 1868 disclosed a population of 748,882 (398,571 males and 350,811 females),-——83 to the square mile. The Hindus numbered 698,505; Maliometans, 48,613; Sikhs, 1814; Christians, 277; and "others," 178. The six municipal towns with their population are—Nurpur, 7151; Kangra, 6344; Haripur, 3839 ; Sujanpur Tira, 3398; Jawala-mukhi, 2847; Dharmsala, 2024. The famous Hindu temple of Nagarkot at Kangra town is one of the oldest and most wealthy shrines in India, and twice exposcd the district to the plunder of the Mahometans.

The cultivated arca of the district is returned at 681 square miles, or less than one-thirteenth of the entire surface. The staple crops include wheat and barley for the spring, and rice and maize for the autumn harvest. Rice is the piincipal crop of the upper valleys, while maize composes the ordinary food of the upland people for six months of the year. Sugar-cane covers a large area in the neighbourhood of Kangra town. Tea cultivation has taken root as an important industry, both in Kangra proper and in

Kullu. In 1872-73 the district contained twenty-eight planta- tions, producing a gross out-turn of 428,655 Ib of tea, valued at £65,000. Potatoes also constitute a considerable erop. In Lahul

and Spiti barley is the agricultural staple; but the former tract |

does not grow a sufficient quantity of grain for its own consump- tion, being largely supplied by importations from Kullu.

Agricultural produce forms the staple of the export trade; the imports consist of grain, eotton, tobacco, and European piece goods. The Palampur fair, established by Government with a view to fostering commerce with Central Asia, draws together a small eonecourse of Yarkandi merchants. The Lahulis carry on an enterprising trade with Ladakh and countries beyond the frontier, by means of pack sheep and goats. The total imperial revenue in 1872-73 amounted to £71,434, of which the land-tax contri- buted £62,443. Crime is rare, but education is still in a very backward state, only 2936 children being under instruction in 1872-73. he endemie diseases of the distriet include fever and goitre, but scurvy also prevails to a large extent. The widespread cultivation of rice, by which the whole Kangra valley is converted into a swamp, has a very prejudicial effect upon the general health. The average annual rainfall varies from 148 inches at Dharmsala to 76 at Kangra, 52 at Hamirpur, and 108 at Palampur. The mean temperature in the Himalayan station of Dharmsala in 1874-75 was 70°35 in May, 73°°5in July, and 52°°85 in December.

KANIZSA, Nacy (ze, “Great”), a market-town of Hungary, in the trans-Danubian county of Zala, lies 31 miles north-north-east of Kopreinitz, and at the junction of the lines of railway from Sopron (Oedenburg) and Székesfehérvar (Stuhlweissenburg), 46° 28’ N. lat. 17° 0° E. long. Among the public and other buildings are a fine Roman Catholic church, a Franciscan monastery, a Piarist gymnasium, a town-hall, royal and magisterial courts of law, and the usual Government

offices. In the neighibour- hood are distilleries and brick-making factories. The markets periodically held in the town are much frequented, and the trade in grain, horned cattle, and pigs is generally brisk. The population at the end of 1880 was 18,393.

Nagy-Kanizsa once ranked as the second fortress of Hungary, and consequently played an important part during the wars with the Turks, who, having gained possession of it in 1600, held it until uear the elose of the 17th eentury. In 1690, after a siege of two years, it was recovered by the Austrian and Hungarian forees. Its reversion to Hungary was ratified by the treaty of Carlowitz (1699).

In 1702 the fortifications were destroyed, and there are now but few traces of their former existence.

KANKAKEE, the chief city and county seat of Kan- kakee county, Illinois, U.S., is situated on the north bank of the Kankakee river, 56 miles south of Chicago. It is the centre of a very rich and fertile farming district, and has a large trade in agricultural produce. It has fine water-power, and, being within easy reach of extensive coal-fields and deposits of bog-iron ore, does a large manu- facturing business. The population of the city and town- ship in 1880 was 5652.

KANO, a town of central Africa, at the head of a | province of the kingdom of Sokoto, about 230 miles east |

of Sokoto and 360 miles west of Kuka. The circuit of the walls is upwards of 15 English miles; but little more than a third of the enclosed area was actually occupied at the time of Barth's visit. The oldest part of the town is that which lies at the foot of the lull Dald (120 feet), and

from this the inhabited portion stretches south for 24 miles _ To the south of the great market-place lies a —

to the walls. deep pond, Jakara, upwards of a mile and a half in length.

Two kinds of dwelling-houses are common—square-shaped |

clay-built structures with flat roofs, and round huts with conical tops. The population, estimated at 30,000, consists of Fellatah, Kanuri (Bornuese), Houssas, and Nupe. Commerce and manufactures go hand in hand, and every family has its share in each. Cotton cloth, woven and dyed in the town, forms a chief article of trade; and to this may be added sandals and shoes, twisted leather straps, and jebiras (purses of a peculiar make), kola-nuts, and slaves. About 20,000 loads of natron pass through the town in a year from Bornu to Nupe.

K AN—KAWN

See Clapperton's Travels, vol. ii.; and Barth, Travels in North Sa Central Africa, vol ii. The latter gives a sketch plan of Kano,

KANSAS, the central State of the American Union, lies Plate X11'

between 37° and 40° N. lat. and between 94° 38' and 102° W. long. It is bounded on the N. by Nebraska, on the E. by Missouri, on the 8. by Indian territory, and on the W. by Colorado, The State is nearly rectangular in shape, with a breadth of about 210 miles from north to south, and a length of 406 miles from east to west. It con- tains an area of 81,318 square miles, or 52,043,520 acres.

Kansas is an undulating plain, gently sloping from west to east, at an average of nearly 7 feet per mile. There is also an inclination from north to south, as indicated by the course of the rivers, which flow southerly as well as easterly, but never northerly or westerly, except for short distances from local causes. The mouth of the Kansas river, at the east line of the State, is 750 feet above thie sea-level; the average altitude of the western boundary is about 3500 feet. The broad prairie surface is diversified by an endless succession of valleys and woodlands. The great central valley is traversed by the Kansas or Kaw river, which, inclusive of the Smokyhill branch, extends the entire length of the State. Lateral valleys on the north are formed by the Saline, Solomon, Republican, and Blue rivers, and other smaller streams. Another broad valley is formed in the southern half of the State by the Arkansas river, with lateral valleys on the north, traversed by the Walnut, Little Arkansas, Pawnee Fork, and other streams. The south-eastern portion contains the important Neosho valley, and the smaller valleys of the Osage and Verdigris. In the extreme south-west and along the southern boundary are the valley of the Cimarron, and a network of the southern tributaries of the Arkansas. Numerous small afiluents of the Missouri enrich and diversify the north-eastern quarter of the State. The streams of Kansas are usually fed by perennial springs, and, as a rule, the eastern and middle portions of the State are well watered. The western part is more elevated, and water is less abundant.

Geology and Minerals.—The surface presents three distinct geological sections. The eastern portion of the State belongs to the Carboniferous system, in which are found inexhaustible beds of valuable bituminous coal, often at shallow depths or cropping out on the surface. The central portion belongs to the Triassic formation, with magnesian limestone, ferruginous sandstone, and gypsum as the representative rocks. Magnesian limestone, known as dolomite, is especially plentiful along the Blue, Republican, and Neosho rivers and their tributaries. This beautiful stone, resembling white, grey, and cream-coloured marble, is exceedingly useful for building purposes. It crops out in the bluffs in endless quantities, and is easily worked. The western portion of the State belongs to the Cretaceous formation, in which chalks and a species of native quicklime are very prominent in the river blufis. The white and cream-coloured chalks are much used for building purposes, but the blue is usually too soft for exposure to the weather. The quicklime as quarried from the bluffs slakes perfectly, and with sand makes a fairly good mortar, without calcination or other previous prepara tions, Lead-mines are extensively worked in the gouth- eastern portion of the State, and prosperous towns al cities are growing up in connexion with these mines. In the central region, salt is produced from wells, and appears in occasional marshes. Salt industries are carried on at Solomon City, near the mouth of the Solomon river, and an excellent brine is obtained at Junction City. The salt of the south-west is found in beds and dry incrustations, varying in thickness from a few inches to 2 feet. The salts of Kansas are remarkably free from lime and other 1n-

purities. Gypsum is found in beautiful crystalline form in extensive quarries, but it has not been much utilized. The lignite found near the Colorado line makes a valuable domestic fuel.

Climate.—The climate of Kansas is exceptionally salubrious. Extremes of heat and cold occur, as in all open prairie countries, but as a rule the winters are dry

and mild, while the summer heats are tempered by the

perpetual prairie breezes. The summer nights are invari- ably cool and refreshing, The mean annual temperature at Fort Riley fur twenty-three years ending December 1874 has been 53°. The highest temperature there during the same period was 98° and the lowest 12° below zero. The average aunual rainfall at the city of Lawrence for six years (1875-1880) was 32°68 inches, the heaviest rainfalls occurring in May, June, July, and August, the lightest in November, December, J anuary, and February.

Soil.—The soil of the upland prairies is generally a deep rich clay loam, of a dark colour. The bottom lands near the streams are a black sandy loam ; and the intermediate lands, or "second bottoms," show a rich and deep black loam, containing very little sand. These soils are all easily cultivated, free from stones, and exceedingly productive. There are exceptional spots on the upland prairies composed of stiff clay, not as easily cultivated, but very productive when properly managed and enriched. In the early history of the country the prairies were covered with the short "buffalo grass," very nutritious for pasturage, on which immense herds of buffalo and other animals subsisted, but utterly unfit for hay. With the disappearance of the buffalo, and as the country is settled and cultivated, the short buffalo grass gives place to the tall blue stem and other bladed grasses valuable alike for pasture and for hay. Timber is abundant along the streams in the eastern section of the State, but is less plentiful in the central portion, and very scarce in some parts of the west. The varieties of timber embrace oak, elm, black walnut, cottonwood, mul- berry, box, elder, willow, hickory, sycamore, white ash, and other hard and soft woods,

Agriculturc.—The farm products of 1880 were as follows :— Indian corn, 101,420,718 bushels; winter wheat, 23,507,223 spring wheat, 1,772,661; rye, 676,507 ; oats, 11,483,796 ; barley, 287,057; buckwheat, 43,455; Irish potatoes, 4,919,227; sweet potatoes, 391,196 ; castor beans, 558,974; flax seed, 1,245,279; sorghum syrup, 3,787,585 gallons; cotton, 142,517 tb; hemp, 635,872 Ib; millet and Hungarian hay, 629,084 tons; Timothy hay, 79,634 tons; hay from wild or native grasses, 798,707 tons; clover pasture, 5927 acres; blue grass pasture,

38,259 acres; native grass pasture, 901,125 acres; produce of market gardens to the value of $449,797.

The bright climate and pure atmosphere are admirably adapted to the growth of the apple, pear, peach, plum, grape, and cherry. The smaller fruits also, with scarce an exception, flourish finely. Trees never suffer from sodden or water-soaked roots, and very seldom from the winter's cold, when reasonable judgment and care have been exercised in selecting and managing the grounds. Ata national exhibition in Philadelphia in 1869 the great gold medal of the National Pomological Society was awarded to Kansas "for a collection of fruits unsurpassed for size, perfection, and flavour;"' and similar awards have been made to Kansas fruits at later exhibi- tious. In November 1872 the American Institute, at its great show, awarded a diploma for 190 varieties of apples grown in Kan- sas, as the largest and handsomest exhibited. At the International Exhibition at Philadelphia in 1876, Kansas exhibited ninety-six varieties of apples, and received the diploma of the centennial commission. Estimates based on the tables of 1877 indicate that the number of bearing trees now in the State (1881) is about as follows :—2,500,000 apple, 100,000 pear, 8,000,000 peach, 200,000 plum, and 1,000,000 cherry trees. The planting of trees is still on the increase, and the older orchards are very profitable. The same is true of vineyards and plantations of small fruits.

Live Stock.—The wide prairies, with their nutritious grasses for hay aud grazing and their never-failing springs of pure water, make the State a very paradise to the herdsman and stock-raiser. The following are the statistics for 1880 :—horses, 367 ,589 ; mules and asses, 58,303 ; milch cows, 366,640 ; other horned cattle,748,672 ; shcep, 426,492 ; swine, 1,281,630; value of animals slaughtered

and sold for slaughter, $12,700,045 ; valuc of poultry and cggs sold, $531,550 ; wool (clip of 1878), 289,644 ib; wool (1879), 1,194,453 tb; honey (produce of 1879), 370,398 Tb; wax (1879), 10,949 tb. The great herds of buffalo which formerly overran the plains have disappeared, the elk is gone, and deer and other gaine arc less plentiful than

formerly. There remain, however, the rabbit, hare, turkey, prairie hen, quail, and the nsual variety of migratory water-fowl, to gratify the sportsman. The numerous streams are well supplied with fish of choice varieties and of unusually large size.

Manufacturcs.—Thcre is perhaps no tract of country of equal extent better supplied with available water power than Kausas. The streams are fed by living springs, and the inclination of the country insures uniformly rapid currents. Most of the streanis maintain a good flow of water in the driest seasons, and in case of heavy rains many of them " underflow" the adjacent bottom lands, saturating the permeable substratum of the country with the surplus water, which in time drains out and feeds the subsiding streams. This feature is particularly true of the Saline, Solomon, and Smokyhill rivers. The Smokyhill river has not risen above the banks of its deep channel at Junction City since 1869, while at the lowest stages it is capable of driving large flouring-mills, hav- ing half a dozen sets of burrs. Adam on the Kansas river at Lawrence supplies a water-power capable of developing a great manufacturing centre. In 1870 there were one hundred and ten improvements of water-power in the state. Estimates based on the latest statistics now place the number of utilized mill sites at about three hundred, where flouring-mills, saw-mills, planing-mills, and woollen-mills run the entire year, with very little hindrance from either high or low water. In the eastern section of the State, where coal is plentiful, steam-power is much used, especially in the manu- facture of iron. At Leavenworth there are manufactories of iron bridges, engines, boilers, stoves, railroad iron, and mincrs' tools. There are also manufactories of waggons, carriages, carpets, soaps, paints, and cement, at Leavenworth, Fort Scott, Lawrence, Coluin- bus, Ottawa, and other places. At Topeka, Parsons, Armstrong, and Argentine there are rolling mills and railroad repair shops, while planing-mills, tanneries, cheese factorics, and pork-packing establishments are found in various loealities.

Transport and Tradc.—There are numerous railroads in the State, with an aggregate length of completed track of 3104 miles, The central branch in the north and the Union Pacific (Kansas division) near the

centre traverse the northern half of the State from east to west, in nearly parallel lines, —the latter extending by its connexions to San Francisco. The Atchison, Topeka, and Santa Fe line passcs from the north-east to the south-west, extending through to the Pacifie coast; and the Missouri Pacific (Kansas division), by uniting with the Texas Central, conneets the richest portion of Kansas with the Gulf of Mexico at Galveston. Other lines in connexion with these facilitate the internal commerce of the State. Kansas has an eastern front of 150 miles on the Missouri river, which is navigable for steamboats of all sizes. The internal rivers of the State are not ntilized for commercial purposes, though the Kansas was formerly considered navigable to Fort Riley, near the mouth of the Republican river, and steamboats have ascended the Smokyhill to the mouth of the Saline, about 50 miles farther west. By means of these railroads and the Missouri river immense quantities of wheat, corn, cattle, and swine are sent from Kansas to the eastern markets ; flour is sent south, south-west, and west, and butter, poultry, and eggs, with large quantities of vegetables, hay, and garden produce, to the western mining regions.

Liducation.—The public schools are liberally endowed and sup- ported. Two sections of land (1280 acres) are set apart in each congressional district for school fund purposes. There are in the State 5242 public school buildings, and the value of 'pnblic school property is $4,633,044 The teachers employed number 6707. The pupils of school age are estimated from statistics of 1875 at 230,000, about half of whom are in actual attendance. The annual ex- penditure for school purposes, estimated from statistics of 1875, is 1,500,000. The State supports a university at Lawrence, and a normal school at Emporia; and the agricultural college at Man- hattan is endowed by the general Government. There are also State institutions for the education of the blind, and the deaf and dumb, and for the care of the insane. A reform school for juvenile offenders is being built at the State capital.

ficligion.—All the usual religious denominations are represented, owning church property to the amount of $2,511,520.

Administration.—In Kansas, as in all the States of the American Union, the government is vested in three departments, legislative, executive, and judicial. The governor is elected for a term of two years. The legislature consists of a senate and honse of representa- tives. The members of the house are elected for two years, and members of the senate for four. The judiciary consists of a State supreme court and subordinate district courts. The judges are all elected by a direct vote of the people.

Population.—The following table gives the population at the last three census enumerations, with the number of inhabitants per square mile at each period :—~

844

Total. Males. Females. Per Sq. Mile.

107,206 48,028 1:3 864,399 162,175 45 995,966 459,241 12-2

The State is divided into 104 counties. The following are the largest towns, with population in 1880 :—Leavenworth, 16,550 ; Topeka, 15,451; Atchison, 15,106; Lawrence, 8511; Wyandotte, 6149; Fort Scott, 5872; Wichita, 4911; Emporia, 4632 ; Parsons, 4196; Ottawa, 4032. Topeka, the State capital, is advantageously situated, and is one of the most flourishing towns in the State.

History.—Kansas belongs to that immense tract of country, pur- chased by the American Government from France in 1803, known as the Louisiana purchase. Prior to 1854 it was in the hands of various Indian tribes, some native, and others which had been re- moved from the older States. It was organized and opened for settlement as a territory by Act of Congress in May 1854, in the midst of a heated contest on the slavery question. The slave- holders and the friends of freedom at once began a vigorous con- test for the occupancy and control of the new territory, and thus it was that Kansas became the vanguard in the great struggle which resulted in the overthrow of slavery in the United States. Before the formal beginning of the war, societics were organized by the rival settlers and their friends in the States on both sides of the slavery

question, and even rival legislatures were elected and convened. The discussions frequently resulted in personal violence, and the greatest excitement prevailed till the breaking out of the civil war. Kansas was admitted into the Union as a State in January 1861, and took an active part in furnishing troops for the suppression of the rebellion. The State was frequently invaded, and the city of Lawrence was sacked and burned in August 1863. Since the overthrow of slavery, Kansas has shared fully in the general progress of the country. (J. D.t)

KANSAS CITY, in Jackson county, Missouri, U.S., the second city in size and importance in the State, is situated on the right bank of the Missouri immediately below the mouth of the Kansas river, 235 miles west by north of St Louis. It is a large railroad centre, several important lines meeting there, and giving the city large facilities for commanding the trade of western Missouri, Kansas, northern Texas, and part of Colorado and New Mexico. The Missouri at this point is crossed by a bridge 1387 feet long, resting on seven piers. 'The business in agricultural products is very large, and is constantly increasing, that of packing beef and pork being especially great, and growing with remarkable rapidity. The city was laid out in 1830, but its growth may be said to date from 1860, when its population numbered 4418. In 1870 the population had increased to 32,290, and in 1880 it was 55,787.

KANT, Immanvet (1724-1804). So far as changes of external fortune are concerned, the life of the greatest philosopher of the 18th century presents little or nothing of interest. Born in humble circumstances, he passed a quict and almost undisturbed existence within the narrow limits of his native place. Education, both of school and university, he obtained at Kénigsberg, and during a pro- longed academic activity in that retired Prussian town he gave forth the works which have exercised such influence on European thought that, in the estimation of the best historical judges, they may be placed on a level with the great events of the French Revolution as the most important factors in determining the characteristic features of 19th century culture. A biography of Kant can be little more than a record of the successive phases of his literary activity. :

The family of Kant was of Scotch extraction, the grand- father of the philosopher having been an emigrant from Scotland who had settled, first at Memel, and afterwards at Tilsit. The name Cant, as it was originally spelled, is not uncommon in the north of Scotland, whence the family is said to have come, and it is not perhaps mere fancy to trace in some of the ethical doctrines of the critical philosophy and in the personal character of its author some of the prominent features of Scottish nationality. The father of the philosopher carried on the business of a saddler in Koénigsberg, and in that town, on the 22d April

1724, was born Immanuel, the fourth of a large family, most of whom died at an early age. Kdénigsberg was then somewhat noted as a stronghold of what is known as Pietism, a pliase of religious thought and life which had in Germany, as elsewhere, too much that was unpleas- ing, but which nevertheless was capable of exercising a powerful influence for good on the development of a really strong and ample character. "Say what you will of Pietism," writes Kant to his friend Rink, "no one can deny the real worth of the characters which it formed ; they possessed the highest that man can possess —a peace, a cheerfulness, an inner harmony with self, which was disturbed by no passion." To influences of this kind Kant was subjected in his early years, partly from his mother, for whose memory he ever cherished the warmest affection and regard, partly from his excellent friend and patron, Schulz, the dircctor of the Collegium Fredericianum in Kénigsberg, and afterwards professor of theology in the university. At the Collegium Frederici- anum Kant was entered in his tenth year, with the definite view of proceeding to the theological courses of the university. His inclination at this time, determined probably by the high character of his teachers, was towards classics, and he was recognized, with his schoolfellow, the afterwards celebrated David Ruhnken, as among the most competent and promising classical scholars of the college. His taste for the greatcr Latin authors, particularly Lucretius, was never lost, and he acquired through his school training an unusual facility in Latin composition. With Greek authors he does not appear to have been equally familiar.

During his university course, which began in 1740, Kant was principally attracted towards mathematics and physics, doubtless through the influence of Knutzen, who then, as extraordinary professor, lectured on most branches of mathematics and also on philosophy. The lectures on classics do not scem to have satisfied Kant, and, though he attended Schulz's courses on theology, and even preached on one or two occasions, he appears finally to have given up the intention of entering the church. The last years of his university studies were much disturbed by the straitened means of his family, and he was compelled to have recourse to private teaching of the humblest kind. The death of his father, in 1746, destroyed his hopes of remaining at the university until he should have obtained some sub- ordinate academic post. Much against his inclination he undertook the office of private tutor, and for nine years acted in this capacity in various families in the immediate neighbourhood of Kénigsberg. Although the life was not one which Kant would have chosen, and one for which he was not specially qualified—as he used to say regarding the excellent precepts of his Padagogics, he was never able to apply them—yet it gave him an extended knowledge of the world, and added to his other accomplishments the grace and polish of refined society, which he displayed ever afterwards to a degree somewhat unusual in a philosopher by profession.

In 1755 Kant returned to Kénigsberg as tutor in the family of Count Kayserling. By the kindness of a friend named Richter, he was enabled again to take up his univer- sity career, and in autumn of that year he graduated as doctor and qualified as " Privatdocent." Two of the theses publicly defended on the occasion are printed in his works ; an address, on the easier and harder styles of philosophical exposition, has not been published. For fifteen years he continued to labour in this subordinate position, his fame as writer and lecturer steadily increasing. On two occasions he was disappointed in the hope of obtaining a professor- ship in his own university, but during this time, as in later years, he refused all offers that would have withdrawn him

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from Koénigsberg. The only academic preferment received by him during the lengthy probation was the post of under- librarian, to which he was appointed in 1766. His lectures, at first mainly upon physics, gradually expanded until nearly all descriptions of philosophy were included under them. A most interesting programme of his courses on metaphysics, logic, ethics, and physical geography for the session 1765-66 has been printed in his works (i. 289- 299). 'The history of his literary activity during this period will be given in connexion with the notice of his writings.

In 1770 he obtained the chair of logic and metaphysics at K6nigsberg, and delivered as his inaugural address the dissertation De Mundi Sensibilis et Intelligibilis Forma et Princapus. Eleven years later appeared the Kritik of Pure Keason, the work towards which he had been steadily advancing, and of which all his later writings are developments.

In 1783 he published the Prologomena, intended as an introduction to the Xritiék, which had been found to stand in need of some explanatory comment. A second edition of the Aritik, with some modifications, appeared in 1787, after which it remained unaltered.

In spite of its frequent obscurity, its novel terminology, and its declared opposition to prevailing systems, the Kantian philosophy made rapid progress in Germany. In the course of ten or twelve years from the publication of the Aritik of Pure Reason, it was expounded in all the leading universities, and it even penetrated into the schools of the Church of Rome. Such men as Schulze in Kénigs- berg, Kiesewetter in Berlin, Jakob in Halle, Born and Heydenreich in Leipsic, Reinhold and Schmid in Jena, Buhle in Gottingen, Tennemann in Marburg, and Snell in Giessen, with many others, made it the basis of their philo- sophical teaching, while theologians like Tieftrunk, Stiiudlin, and Ammon eagerly applied it to Christian doctrine and morality. Young men flocked to Kénigsberg as to a shrine of philosophy. The Prussian Government even undertook the expense of their support. Kant was hailed by some as a second Messiah. He was consulted as an oracle on all questions of casuistry,—as, for example, on the lawful- ness of

inoculation for the small-pox. This universal homage for a long time left Kant unaffected; it was only in his later years that he spoke of his system as the limit of philosophy, and resented all further progress. He still pursued his quiet round of lecturing and authorship, and contributed from time to time papers to the literary journals. Of these, among the most remarkable was his review of Herder's Philosophy of History, which greatly exasperated that author, and led to a violent act of retalia- tion some years after in his Metakritik of Pure Reason. Schiller at this period in vain sought to engage Kant upon his Horen. He remained true to the Berlin Journal, in which most of his criticisms appeared,

In 1792 Kant, in the full height of his reputation, was involved in a painful collision with the Government on the question of his religious doctrines. Wd6llner had replaced Von Zedlitz as minister of spiritual affairs, and, in an age peculiarly lax and heterodox, an unwise attempt was mado to apply a rigid censorship to works of philosophical theo- logy. It was not wonderful that the philosophy of Kant had excited the declared opposition of all adherents of historical Christianity, since its plain tendency was towards a moral rationalism, and it could not by any process of interpretation be reconciled to the literal doctrines of the Lutheran Church. It would have been much better to permit his exposition of the philosophy of religion to enjoy the same literary rights as his earlier works, since Kant could not be interdicted without first silencing a multitude of theologians who were at least equally separated from positive Christianity. The Government, however, judged

otherwise; and after the first part of liis book, On Religion within the Limits of Reason alone, had appeared in the Berlin Journal, the publication of the remainder, which treats in a more rationalizing style of the peculiarities of Christianity, was forbidden. Kant, thus shut out from Berlin, availed himself of his local privilege, and, with the sanction of the theological faculty of his own university, published the full work in Kénigsberg. The Government, who were probably as much influenced by hatred and fear of the French Revolution, of which Kant

was supposed to be a partisan, as by love of orthodoxy, resented the act; and a secret cabinet order was received by him intimating the displeasure of the king, Frederick William IL, and exacting from him a pledge not to lecture or write at all on religious subjects in future. With this mandate Kant, after a struggle, complied, and kept his engagement till 1797, when the death of the king, according to his con. struction of his promise, set him free. This incident, how- ever, produced a very unfavourable effect on his spirits. He withdrew in 1794 from society ; next year he gave up all his classes but one public lecture on logic or metaphysics ; and in 1797, before the removal of the interdict on his theological teaching, he ceased altogether his public labours, after an academic course of forty-two years. He previously, in the same year, finished his treatises on the Afetaphysics of Ethies, which, with his Anthropology, completed in 1798, were the last considerable works that he revised with his own hand. His Lectures on Logic, on Physical Geography, on Pedagogics, were edited during his lifetime by his friends and pupils. By way of asserting his right to resume theological disquisition, he also issued in 1798 his Strife of the Faculties, in which all the strongest points of his work on religion were urged afresh, and the correspond- ence that had passed between himself and his censors was given to the world.

From the date of his retirement from the chair Kant declined in strength, and gave tokens of intellectual decay. His memory began to fail, and a large work at which he wrought night and day, on the connexion between physics and nfetaphysics, was found to be only a repetition of his already published doctrines, After 1802, finding himself attacked with a weakness in the limbs, attended with frequent fits of falling, he mitigated a little the Spartan severity of his life, and also consented to receive medical advice. A constant restlessness oppressed him ; his sight gave way; his conversation became an extraordinary. mixture of metaphors; and it was only at intervals that gleams of his former power broke out, especially when some old chord of association was struck in natural science or physical geography. A few days before his decease, with a great effort he thanked his medical attendant for his visits in the words, “I have not yet lost my feeling for

humanity," On the 12th of February 1804, he breathed his last, having almost completed the eightieth year of his age.

It is superfluous to characterize the genius of Kant; but a few words may be added as to his personal appearance and habits of life, study, and teaching. His stature was small, and his appearance feeble. He was little more than 5 feet high; his breast was almost concave, and, like Schleiermacher, he was deformed in the right shoulder. His hair was light, his complexion fresh, his forehead high and square, while his eye of light blue showed an ex- pression of unusual depth and power. His senses were quick and delicate; and, though of weak constitution, lie escaped, by strict regimen, all serious illness till the close of life.

His life was arranged with mechanical regularity ; and, as he never married, he kept the habits of his studious youth to old age. His man-servant awoke him summer

and winter at five o'clock; and, on being appealed to on one occasion, testified that Kant had not once failed in thirty years to respond to the call. After rising he studied for two hours, then lectured other two, and spent the rest of the forenoon, till one, at his desk. He then dined at a restaurant, which he frequently changed, to avoid the influx of strangers, who crowded to see and hear himn— till in later years his growing means enabled him to invite a friend or two daily to his own home. This was his only regular meal; and, as he loved the ducere canam of the Romans, he often prolonged the conversation till late in the afternoon. He then walked out for at least an hour in all weathers, and spent the evening in lighter reading, except an hour or two devoted to the preparation of his next day's lectures, after which he retired between nine and ten to rest. The furniture of his house was of the simplest character ; and, though he left a considerable sum, the produce of his writings, to his relatives, he indulged in no luxury, and was a pattern of that superiority to fashion and appearance so often met within the literary life of Germany. In his earlier years he often spent his evenings in general society, where his overflowing know- ledge and conversational talents made him the life of every party. He was

especially intimate with the families of two English merchants of the name of Green and Motherby, where he found many opportunities of meetingship-captains, and other travelled persons, and thus gratifying his passion for physical geography. This social circle included also the celebrated Hamann—the Magus or Wizard of the North—the friend of Herder and Jacobi, who was tlus a mediator between Kant and these philosophical adversaries.

Kant's reading was of the most extensive and miscel- laneous kind. He cared comparatively little for the history of speculation, being in this department more a discoverer thana scholar. But his acquaintance with books of science, general history, travels, and belles lettres was boundless. He was well versed in English literature, chiefly of the age of Queen Anne, and had read English philosophy from Locke to Hume, and the Scottish school. He was at home in Voltaire and Rousseau, but had little or no acquaintance with the French sensational philosophy. He was familiar with all German literature up to the date of his Kritik, but ceased to follow it in its great development by Goethe and Schiller. It was his habit to obtain books in sheets from his publishers Kanter and Nicolovius; and he read over for many years all the new works in their catalogue, in order to keep abreast of universal knowledge. He was excessively fond of newspapers and works on politics ; and this was the only kind of reading that could interrupt his studies in philosophy.

As a lecturer, Kant avoided altogether that rigid style in which his books were written, and which was only meant for thinkers by profession. He sat behind a low desk, with a few jottings on slips of paper, or text-books marked on the margin, before him, and delivered an extemporaneous address, opening up the subject by partial glimpses, and with many digressions and interspersed anecdotes or familiar illustrations, till a complete idea of it was presented. His voice was extremely weak, but sometimes rose into eloquence, and always commanded perfect silence. Like Adam Smith, he fixed his eye on one student, and marked by his countenance whether the lecture was understood. The least irregularity in the appearance or dress of this selected hearer disconcerted him; and the story is well known of the missing button, which defeated a lecture. Though kind to his students,

he refused on principle to remit their fees, as this, he thought, would discourage independence. It was another principle that his chief exertions should be bestowed on the intermediate class of talent, as the geniuses would help themselves, and the

dunces were beyond remedy. Hence he never delivered his deeper doctrines, such as are found in his Kritih, from the chair. His other avocations allowed him little personal intercourse with his numerous hearers, and he often complained of the want of lively sympathy and ascertained progress inseparable from such a system.

Simple, honourable, truthful, kind-hearted, and high- minded as Kant was in all moral respects, he was somewhat deficient in the region of sentiment. He had little enthusiasm for the beauties of nature, and indeed never sailed out into the Baltic, or travelled more than 40 miles from K6nigsberg. Music he disregarded, and all poetry that was more than sententious prose. His ethics have been reproached with some justice as setting up too low an ideal for the female sex. Though faithful in a high degree to the duties of friendship, he could not bear to visit his friends in sickness, and after their death he repressed all allusion to their memory. His engrossing intellectual labours no doubt tended somewhat to harden his character; and in his zeal for rectitude of purpose he forgot the part which affection and sentiment must ever play in the human constitution. Those who count these defects most grave will yet find much to admire in the lofty tone of his character, and in the benevolence which could thus express itself; “ Whoever will suggest to me a good action left undone, him will I thank, though he suggest it even in my last hour!”

This brief notice of his life may appropriately close with Herder’s beautiful sketch of Kant’s character, all the more interesting that it was written in 1795, after their quarrel: —‘“T have had the good fortune to know a philosopher who was my teacher. In the vigour of life he had the same youthful gaiety of heart that now follows him I believe into old age. His open forehead, built for thought, was the seat of imperturbable cheerfulness and joy; the most pregnant discourse flowed from his lips;

wit, humour, and raillery came to him at will, and his instructions had all the charm of an entertainment. With the same easy mastery with which he tested the doctrines of Leibnitz, Wolf, Baumgarten, Crusius, and Hume, or pursued the discoveries of Newton, Kepler, and other lights of science, he also took up the current writings of Rousseau, such as the Emile or fléloise, or any new phenomenon of the natural world, and from the criticism of each came back to the impartial study of nature, and to the enforcement of the dignity of man. History in all its branches, natural science, physics, mathematics, and experience were the materials that gave interest to his lectures and his conversation; nothing worthy of study was to him indifferent; no faction or sect, no selfishness or vanity, had for him the least attraction, compared with the extension and elucidation of truth. He excited and pleasantly impelled us to mental independence ; despotism was foreign to his nature. This man, whom I name with the deepest gratitude and respect, is Tmmanuel Kant ; his image rises before me surrounded with pleasing recollections ! ”

The Writings of Kant.

From the preceding sketch of Kant’s academic activity it must be evident that he combined in a quite unusual degree knowledge of physical science with speculative acuteness and devotion to the special work of philosophy. No other thinker of modern times has been throughout his work so penetrated with the fundamental conceptions of physical science ; no other has been able to hold with such firmness the balance between empirical and speculative ideas. Beyond all question much of the influence which the critical philosophy has exercised and continues to exercise must be ascribed to this characteristic feature 1n the training of its great author. :

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The early writings of Kant are almost without exception on questions of physical science. It was only by degrees that philosophical problems began to engage his attention, and that the main portion of his literary activity was turned towards them. It will be convenient, therefore, in

enumerating the varied writings of Kant, to place in a separate group those which bear directly on physical

science. The following are the most important in this group :—

1. Thoughts on the True Estimate of Vis Viva, 1747: an essay dealing with the famous dispute between the Cartesians and Leibnitzians regarding the expression for the amount of a force, According to the Cartesians, this quantity was directly proportional to velocity ; according to their opponents, it varied with the square of the velocity. The dispute has now lost its interest, for physieists have learned to distinguish aceurately the two quantities which are vaguely ineluded under the expression amount of force,and consc- quently have been able to show in what each party was correct and in what it wasinerror. Kant's essay, with some fallacious explana- tions and divisions, criticizes aeutely the arguments of the Leibnitzians, and concludes with an attempt to show that both modes of expression are correct when correctly limited and interpreted.

2. Whether the Earth in its Revolution has experienced some Change since the Earliest Times, 1754. In this brief essay Kant throws out a notion which has sinee been earried out, in ignorance of Kant's priority, by Delaunay (1865) and Adams. He points out that the action of the moon in raising the waters of the earth must have a secondary effeet in the slight retardation of the earth's motion, and refers to a similar cause the fact that the moon turns always the same face to the earth.

3. General History and Theory of the Heavens (' Allgemeine Natur-Geschichte und Theorie des Himmels"), published anonyniously in 1755. In this remarkable work Kant, proceeding from the Newtonian conception of the solar system, extends his consideration to the entire sidereal system, points out how the whole may be mechanieally regarded, and throws out the important speculation which has sinee received the title of the nebular hypothesis. In some details, such, e.g., as the regarding of the motion of the entire solar system as portion of the general cosmical mechanism, he had predecessors, among others J. Wright of Durham, but the work as a whole contains a wonderfully

aeute anticipation of much that was afterwards carried out by Herschel and Laplace. The hypothesis of the original nebular condition of the system, with the consequent explanation of the great phenomena of planetary formations and movements of the satellites and rings, is unquestionably to be assigned to Kant.

4. Brief Accountof some Thoughts on Fire ("Meditationum quarundam de Igne suceineta delineatio"), 1755: an inaugural dissertation, containing little beyond the notion that bodies operate on one another through the medium of a uniformly diffused, elastie, and subtle matter (ether) which is the underlying substance of heat and light. Both heat and light are regarded as vibrations of this diffused ether.

5. On the Causes of Earthquakes, 1755 ; Description of the Earthquake of 1755, 1756 ; Consideration of some Recently Experienced Earthquakes, 1756.

6. Explanatory Remarks on the Theory of the Winds, 1756. In this brief traet, Kant, apparently in entire ignorance of the explana- tion given in 1735 by Hadley, points out how the varying velocity of rotation of the suecessive zones of the earth's surface furnishes a key to the phenomena of periodic winds. His theory is in almost entire agreement with that now received. See the parallel statements from Kant's tract and Dove's essay on the influence of the rotation of the earth on the flow of its atmosphere, 1835, given in Zéllner's work, Ueber die Natur der Cometen, pp. 477-482.

7. On the Different Races of Men, 1775; Determination of the Notion of a Human Race, 1785; Conjectural Beginning of Human History, 1786: three traets containing some points of interest as regards the empirieal grounds for Kant's doctrine of teleology. Reference will be made to them in the notice of the Kritik of Judgment.

8. On the Volcanoes in the Moon, 1785 ; On the Influence of the Moon on the Weather, 1794. The second of these eontains a remarkable diseussion of the relation between the centre of the moon's figure and its centre of gravity. From the difference between these Kant is led to conjecture that the elimatie conditions of the side of the moon turned

from us must be altogether unlike those of the face presented to us. His views have been restated by Hansen.

9. Lectures on Physical Geography, 1822 : published from notes of Kant's leetures, with the approval of the author.

Consideration of these works is sufficient to show that Kant's mastery of the seience of his tine was complete and thorough, and that his philosophy is to be dealt with as having throughout a reference to general scientific conceptions. For more detailed treatment of his importance in science, reference may be made to

Zolner's essay on "Kant and his Merits on Natural Science" contained in the work on the Nature of Comets (pp. 426-484) ; to Dietrich, Kant and Newton; to Schultze, Kant and Darwin ; and to Reuselile's careful analysis of the scientific works in tho Deutsche VierteYahrs-schrift, 1868.

The notice of the philosophical writings of Kant need not be more than bibliographical, as in the account of his philosophy it will be necessary to consider at some length the successive stages in the development of bis thouglit. Arranged chronologically these works are as follows :—

1755. Principiorum Primorum cognitionis Metaphysice nova Dilucidatio. :

1756. Metaphysice cum geometria juncte usus in philosophia naturalt, cujus Specimen I. continet Monadologiam Physicam.

1762. Die falsche Spitzfindigkeit der vier syllogistischen Figuren, "The False Subtlety of the Four Sylogistie Figures."

1763. Versuch den Begriff der negativen Grissen in die Welt- weishett einzufiihren, " Attempt to introduce the Notion of Nega- tive Quantities into Philosophy."

1763. Der einzig migliche Beweisgrund zu einer Demonstration des Daseins Gottes, “The only possible Foundation for a Demon- stration of the Existence of God.”

1768. Untersuchung iiber die Deutlichkeit der Grundsétze der natiirlichen Theologie und Moral, “ Essay on the Evidence (Clear- ness) of the Fundamental Propositions of Natural Theology and Ethies.”

1766. Trdume eines Geisterschers, erléutert durch Trdéume der Metaphysik, “ Dreams of a Ghost-seer (or Clairvoyant), explained by the Dreams of Metaphysie.”

1768. Vou dem ersten Grunde des Unterschiedes der Gegenden im Réwme, ‘* Foundation for the Distinetion of Positions in Space.”

The above may all be regarded as belonging to the precritical period of Kant’s development. The following introduce the notions and principles characteristic of the critieal philosophy.

1770. De Mundi Sensibilis et Intelligibilis forma et principtis,

1781. Kritik der reinen Vernunft, ‘* Kritik of Pure Reason.”

1783. Prolegomena zu einer jeden kiinftigen Mctaphysik die als Wissenschaft wird auftreten kinnen, “Prolegomena to all Future Metaphysie which may present itself as Seience.”

1784. Idee zw einer allgemeinen Geschichte im weltbiirgerlicher Absicht, ‘* Notion of a Universal History ina Cosmopolitan Sense. ” With this may be coupled the review of Herder in 1785.

1785. Grundlegung der Metaphysik der Sitten, ‘Foundations of the Metaphysie of Ethies.”

1786. AMetaphysische Anfangsgriinde der Naturwissenschaft, ‘Metaphysical Elements of Natural Science.”

1788. Ueber den Gebrauch telcologischer Principien in der Philo- sophie, “On the Employment of Teleologieal Principles in Philosophy.”

1788. Kritik der praktischen Vernunft, “ Kritik of Practical Reason.”

1790. Kritik der Urtheilskraft, ‘* Kritik of Judgment.”

1790. Ueber eine Entdeckung, nach der alle neue Kritik der reinen Vernunft durch eine dltere entbehrlich gemacht werden soll, ‘On a Diseovery by which all the recent Critique of Pure Reason is superseded by a more ancient (d.¢., by Leibnitz’s philosophy).”

1791. Ueber die wirklichen Fortschitte der Metaphysik seit Lethnitz und Wolff, “On the Real Advanees of Metaphysies sinee Leibnitz and Wolff.”

1794. Die Religion innerhalb der Grenzen der dblossen Vernunft, “ Religion within the Bounds of Reason only.”

1794, Ueber Philosophie tiberhaupt, ‘On Philosophy generally.”

1797. Metaphysische Anfangsgriinde der Reehtslehre, and Meta-

physische Anfangsgriinde der Tugendlehre.

1798. Der Streit der Fucultéten, “ Contest of the Faculties.” 1798. Anthropologie.

The Kantian Philosophy.

Historians are aecustomed to divide the general current of speculation into epoehs or periods marked by the dominance of some single philosophie conception with its systematic evolution. Per- haps in no ease is the charaeter of an epoch more clearly apparent than in that of the eritieal philosophy. The great work of Kant absolutely closed the lines of speculation along which the philosophi- eal literature of the 18th century had proceeded, and substituted for them a new and more comprehensive method of regarding the essen- tial problems of thought, a method which has preseribed the course of philosophic

speculation in the present age. The critical system has thus a twofold aspect. It takes up into itself what had charaeterized the previous efforts of modern thought, shows the imperfect nature of the fundamental notions therein employed, and offers a new solution of the problems to which these notions had been applied. It opens up a new series of questions upon whieli subsequent philosophic reflexion has been directed, and gives to them the fori, under which it is possible that they should be

fruitfully regarded. making.

In any complete account of the Kantian system it is therefore necessary that there should be constant reference, on the one hand, to the peculiar character of the preceding 18th century philosophy, and, on the other hand, to the problems left for renewed treatment to more modern thought. Fortunately the development of the Kantian system itself furnishes such treatment as is necessary of the former reference. For the critical philosophy was a work of slow growth. In the early writings of Kant we are able to trace with great definiteness the successive stages through which he passed from the notions of the preceding philosophy to the new and com- prehensive method which gives its special character to the critieal work. Scarcely any great mind, it has been said with justice, ever matured so slowly. Inthe early essays we find the principles of the current philosophies, those of Leibnitz and English empiricism, applied in various directions to those problems which serve as tests of their truth and completeness; we note the appearance of the difficulties or contradictions which manifest the one-sidedness or imperfeetion of the principle applied ; and we can trace the gradual growth of the new conceptions which were destined, in the completed system, to take the place of the earlier method. To understand the Kantian work it is indispensable to trace the history of its growth in the mind of its author.

Of the two preceding stages of modern philosophy, only the second, that of Locke and Leibnitz, seems to have influenced practi- eally the course of Kant's speculation. With the Cartesian move- ment asa whole

he shows little acquaintance and no sympathy, and his own philosophic conception is never brought into relation with the systematic treatment of metaphysical problems characteristic of the Cartesian method. The fundamental question for philosophic reflexion presented itself to him in the form which it had assumed in the hands of Locke and his successors in England, of Leibnitz and the Leibnitzian school in Germany. The transition from the Cartesian movement to this second stage of modern thought had doubtless been natural and indeed necessary. Nevertheless the full bearings of the philosophic question were somewhat obscured by the comparatively limited fashion in which it was then regarded. The tendency towards what may be technically called subjectivism, a tendency which differentiates the modern from the ancient method of speculation, is expressed in Locke and Leibnitz in a definite and peculiar fashion. However widely the two systems differ in details, they are at one in a certain fundamental conception which dominates the wholecourse of their philosophic construction. Theyare through- out individualist, 7.¢., they accept as given fact the existence of the concrete, thinking subject, and endeavour to show how this subject, as an individual conscious being, is related to the wider universe of which he forms part. In dealing with such a problem, there are evidently two lines along which investigation may proceed. It may be asked how the individual mind comes to know himself and the system of things with which he is connected, how the varied contents of his experience are to be accounted for, and what certainty attaches to his subjective consciousness of things. Regarded from the individualist point of view, this line of inquiry becomes purely psychological, and the answer may be presented, as it was presented by Locke, in the fashion of a natural history of the growth of con- scious experience in the mind of the subject. Or, it may be further asked, how is the individnal really connected with the system of things apparently disclosed to him in conscious experience ? what is the precise significance of the existence which he ascribes both to himself and to the objects of experience? what is the nature of the relation between himself as one part of the system, and the system as a whole? This second inquiry is specifically metaphysical in bearing, and the kind of answer furnished to it by Leibnitz on the one hand, by Berkeley on the other, is in fact prescribed or deter- mined beforehand by the fundamental conception of the

indivi- dualist method with which both begin their investigations. So soon as we make clear to ourselves the essential nature of this method, we are able to discern the specific difficulties or perplexities arising in the attempt to carry it out systematically, and thus to note with precision the special problems presented to Kant at the outset of his philosophic reflexions.

Consider, first, the application of the method on its psycho- logical side, as it appears in Locke. Starting with the assumption of conscious expericnce as the content or filling-in of the individual mind, Locke proceeds to explain its genesis and nature by reference to the real universe of things and its mechanical operation upon the mind. The result of the interaction of mind, 7.¢., the individual mind, and the system of things, is conscions experience, consisting of ideas, which may be variously compounded, divided, compared, or dealt with by the subjective faculties or powers with which the entity, Mind, is supposed to be cndowed. Matter of fact and matter of knowledge are thus at a stroke dissevered. The very notion of relation between mind and things leads at once to the counter notion of the absolute restriction of mind to its own subjective nature. That Locke was unable to reconcile thes? opposed notions is not sur- prising ; that the difficulties and obscuritics of the Essay arisc from

A work of this kind is essentially cpoch-

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the impossibility of reconciling them is evident on the slightest consideration of the main positions of that work. Of these difficul- ties the philosophies of Berkeley and Hume are systematic treat- ments. In Berkeley we find the resolute determination to accept only the one notion, that of mind as restricted to its own conscious experience, and to attempt by this means to explain the nature of the external reality to which obscure reference is made. Any success in the attempt is due only to the fact that Berkeley introduces alougside of his individualist notion a totally new conception, that of mind itself as not in the same way one of the matters of conscious experience, but as capable of reflexion upon the whole of experience and of reference to the supreme mind as the

ground of all reality. It is only in Hume that we have definitely and completely the evolution of the individualist notion as groundwork of a theory of knowledge ; and it is in his writings, therefore, that we may expect to find the fundamental difficulty of that notion clearly apparent. It is not a little remarkable that we should find in Hume, not only the sceptical dissolution of all fixity of cognition, which is the inevitable result of the individualist method, but also the clearest consciousness of the very root of the difficulty. The systematic application of the doctrine that conscious expcrience consists only of isolated objects of knowledge, impressions or ideas, leads Hume to distinguish between truths reached by analysis and truths which involve real connexion of the objects of knowledge. The first he is willing to accept without further inquiry, though it is an error to supposc, as Kant seems to have supposed, that he regarded mathematical propositions as coming under this head (see Humz) ; with respect to the second, he finds himself, and confesses that he finds himself, hopelessly at fault. No real connexions between isolated objects of experience are perceived by us. No single matter of fact necessarily implies the existence of any other. In short, if the difficulty be put in its ultimate form, no existence thought asa distinct individual can transcend itself, or imply relation to any other existence. If the parts of conscious experience are regarded as so many distinct things, there is no possibility of connecting them other than contingently, if at all. If the individual mind be really thought as individual, it is impossible to explain how it should have knowledge or eonsciousness at all, "In short," says Hume, " there arc two principles which I eannot render consistent, nor is it in my power to renounce either of them, viz., that all our distinet pereeptions are distinet existences, and that the mind never perceives any real connexion among distinet existenees. Did our per- ceptions either inhere in something simple or individual, or did the mind perceive sone real connexion among them, there would be no difficulty in the case" (App. to Treatise of Human Nature). Thus, on the one hand, the individualist conception, when carried out to its full extent, leads to the total negation of all real eognition. If the real system of things, to which conscious experi- ence has reference, be regarded as standing in causal relation to this experience, there is no conceivable ground for the extension to reality of the notions which somehow are

involved in thought. The same result is apparent, on the other hand, when we consider the theory of knowledge implied in the Leibnitzian individualism. The metaphysical .conception of the monads, each of whieh is the uni- verse in nwee, presents insuperable difficulties when the connexion or interdependence of the monads is in question, and these difficulties obtrude themselves when the attempt is made to work out a consist- ent doctrine of cognition. For the whole mass of cognizable fact, the mundus intelligibilis, is contained tmplieiter in each monad, and the several modes of apprehension can only be regarded as so many stages in the developing consciousness of the monad. Sense and understanding, real connexion of facts and analysis of notions, are not, therefore, distinct in kind, but differ only in degree. The same fundamental axioms, the logical principles of identity and sufficient reason, are applicable in explanation of all given propost- tions. Itis true that Leibnitz himselt did not work out any complete doctrine of knowledge, but in the hands of his successors the theory took definite shape in the principle that the whole work of cognition is in essence analytical. The process of analysis might be complete or incomplete. For finite intclligences there was an inevitable in- completeness so far as knowledge of matters of fact was concerned. In respect to them, the final result was found in a series of irre- ducible notions or categories, the prima possibilia, the analysis and elucidation of which was specifically the business of philosophy or metaphysics. a It will be observed that, in the Leibnitzian as in the empirical individualism, the fundamental notion is still that of the abstract separation of the thinking subject from the materials of conscious experience. From this separation arise all the difficulties in the effort to devclop the notion systematically, and in tracing the his- tory of Kant's philosophical progress we are able to discern the gradual perception on his part that here was to be found the ultimate cause of the perplexities which became apparent in considering the subordinate doctrinesofthesystem. The successive essays whichhave already been enumerated as composing Kant's precritical work are not to be regarded as so many imperfect sketches of the doctrines of the Kritik, nor are we to look in them for anticipations of the

critical view. They are essentially tentative, and exhibit with

unusual clearness the manner in which the difficulties of a received theory force on a wider and more comprehensive view. There can be no doubt that some of the special features of the Kritik are to be found in these precritical essays, e. g-, the doctrine of the Acsthetik

is certainly foreshadowed in the Dissertation of 1770 ; the Kritik,

however, is no patchwork, and what appears in the Dissertation

takes an altogether new form when it is wrought into the more comprehensive conception of the later treatise. The particular

of notions and knowledge of matters of fact? Kant seems never to have been satisfied with the Wolffian identification of logical' axioms and of the principle of sufficient reason. The tract on the False

Subtlety of the Four Syllogistic Figures, in which the view of

thought or reason as analytic is clearly expressed, closes with the significant division of judgments into those which rest upon the logical axioms of which no logical ground can be shown. indemonstrable judgments, it is said, abound in our experience. They are, in fact, as Kant prescntly perceived, the foundations for all judgments regarding real existence. It was impossible that the question regarding their nature and legitimaey and their distinc- tion from analytie judgments should not present itself tohim. The three tracts belonging to the years 1763-64 bring forward in the

sharpest fashion the essential opposition between the two classes of

judgments, In the Essay on Negative Quantities, the fundamental thought is the total distinction in kind between logical opposition (the contradictoriness of notions, which Kant always viewed as formed, definite products of thought) and real opposition. For the one the adequate explanation is found in the logical axiom of ana- lytical thinking ; for the other no such explanation is to be had. Logical

ground and real ground are totally distinct. ‘TI can undcr- stand perfectly well,” says Kant, ‘how a consequence follows from its reason according to the law of identity, since it is discoverable by mere analysis of the notion contained in it… . But how something follows from another thing and not according to the law of identity, this I should gladly have made clear to me. . .. How shall I com. prehend that, since something is, something else should be ?”” Real things, in short, are distinct existences, and, as distinet, not neces- sarily or logically connected in thought. “I have,” he proceeds, ‘reflected on the nature of our knowledge in relation to our judg- ments of reason and consequent, and I intend to expound fully the result of my reflexions. It follows from them that the relation of a real ground to that which is thereby posited or denied cannotbe ex- pessed by a judgment but only by means of a notion, whieh by analysis may certainly be reduced to yet simpler notions of real grounds, but yet in such a way that the final resort of all our cogni- tion in this regard must be found in simple and irreducible notions of real grounds, the relation of which to their consequents cannot be made clear.”

The striking similarity between Kant’s expressions in this Essay and the remarks with which Hume introduces his analysis of the

notion of cause has led to the supposition that at this period of his philosophical eareer Kant was definitely under the influence of

the earlier empirical thinker. Consideration of the whole passage is quite sufficient to show the groundlessness of this supposition. The difficulty with which Kant is presented was one arising in- evitably from reflexion upon the Leibnitzian theory of knowledge, and the solution does not in any way go beyond that theory. It is a solution, in fact, which must have been impossible had the purport of Hume’s empirical doctrine been present to Kant’s mind. He is here at the point at which he remained for many years, accepting without any criticism certain fundamental notions as re- quired for real eognition. His ideal of metaphysie is still that of complete analysis of given notions. No glimmering of the further question, Whence come these notions and with what right do we apply them in cognition? is yet apparent. Any

direct influence from Hume must be referred to a later period in his career.

The prize essay On the Principles of Notural Theology and Morals brings forward the same fundamental opposition,—though in a special form. Here, for the first time, appears definitely the dis- tinction between synthesis and analysis, and in the distinction is found the reason for the superior certainty and clearness of mathematics as opposed to philosophy. Mathematics, Kant thinks, proceeds synthetically, for in it the notions are constructed. Metaphysics, on the other hand, is analytical in method ; in it the notions are given, and by analysis thcy are cleared up. _Itis to be observed that the description of mathematics as synthetic is not an anticipation of the critical doctrine on the same subject. Kant does not, in this place, raise the question as to the reason for assum- ing that the arbitrary syntheses of mathematical construction have any reference to reality. The deeper significance of synthesis has not yet become apparent.

In the Only Possible Ground of Proof for the Existence of God, the

problem which gave the occasion to the first of the precritical writings is, in an imperfect or particular fashion, the fundamental question to which the Kritik is an answer. Whatis the nature of the distinetion between knowledge gained by analysis

identity and contradiction and those for Such immediate or

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argument, though largely Leibnitzian, advances onc step further towards the ultimate inquiry. For there Kant states as precisely as in the eritique of speculative theology his fundamental doctrine that real existence is not a predicate to be added in thought to the conception of a possible subject. So far as subjective thought is concerned, possibility, not real existence, is contained in any judg- ment.

The year 1765 was marked by the publication of Leibnitz's post- humous Nouveaux Essais, in which his theory of knowledge is more

fully stated than in any of his previous tracts. In all probability Kant gave some attention to this work, though no special reference to it occurs in his writings, and it may have assisted to give additional precision to his doctrine. In the curious essay, Dreams of a Clairvoyant, published 1766, he emphasizes his previously reached conclusion that connexions of real fact are mediated in our thought by ultimate notions, but adds that the significance and warrant for such notions can be furnished only by experience. He is inclined, therefore, to regard as the function of metaphysics the complete statement of these ultimate, indemonstrable notions, and therefore the determination of the limits to knowledge by their means. Even at this point, where he approximates more elosely to Hume than to any other thinker, the difficulty raised by Hume docs not seem to occur to him. He still appears to think 'that experi- ence does warrant the employment of such notions, and when there is taken into account his correspondence with Lambert during the next few years, one would be inclined to say that the Architekto- nik of the latter represents most eompletcly Kant's idea of philo- sophy.

On another side Kant had been shaking himself free from the principles of the Leibnitzian philosophy. According to Leibnitz, space, the order of coexisting things, resulted from the relations of monads to one another. But Kant began to see that such a con- ception did not accord with the manner in which we determine directions or positions in space. In the curious little essay, On the Ground of distinguishing Particular Divisions in Space, he pointed out that the idea of space as a whole is not deducible from the €X- pericnee of particular spaces, or particular relations of objects in space, that we only eognize relations in space by reference to space as a whole, and finally that definite positions involve refcrence to space as a given whole.

The whole development of Kant's thought up to this point is in- telligible when regarded from the Leibnitzian point of view, with which he started. There appears no reason to conclude that Hume at this time exerciscd any direct influence. One may go still further, and add that even in the Dissertation of 1770, generally regarded as more than foreshadowing the Kritik, the really criti- cal question isnot involved. A

brief notice of the contents of this tract will suffice to show how far removed Kant yet was from the methods and principles of the critical or transcendental philosophy. Sense and understanding, according to the Dissertation, are the two sources of knowledge. The objects of the one are things of sense or phenomena; the objects of the other are noumena. These are absolutely distinct, and are not to be regarded as differing only in degree. In phenomena we distinguish matter, which is given by sense, and form, which is the law of the order of sensations. Such form is twofold—the order of space and time. Sensations formed by space and time eompose the world of appearance, and this when treated by the understanding, aecording to logical rules, is capert- ence. But the logical use of the understanding is not its only use. Much more important is the real use, by which are produced the pure notions whereby we think things as they are. These pure notions are the laws of the operation of the intellect ; they are leges intellectus.

Apart, then, from the expanded treatment of space and time as subjective forms, we find in the Déssertation little more than the very precise and definite formulation of the slowly growing oppo- sition to the Leibnitzian doctrines. That the pure intellectual notions should be defended as springing from the nature of intel- lect is not out of harmony with the statement of the Trdume eines Geistersehers, for there the pure notions were allowed to exist, but were not held to have validity for actual things except on grounds of expcrience. Here they are supposed to exist, dissevered from experience, and are allowed validity as detcrminations of things in themselves,

The stage which Kant had now reached in his philosophical de- velopment was one of great significance. The doctrine of know- ledge expressed in the Dissertation was the final form whieh: the Wolffian rationalism could assume for him, and, though many of the elements of the Kritik are contained therein, it was not really in advanee of the Wolffian theory. The doctrine of space and time as forms of sense- pereeption, the reference of both Space and time and the pure intellectual notions to the laws of the activity of mind itself, the distinction between sense and understanding as one of kind, not of degree, with the correlative distinction between phenomena and

noumena,—all of these reappcar, though changed and modified, in the Kritch. But, despite this resemblance, it secms clear that, so far -as the Dissertation is concerned, the way

had only been prepared for the true critical inquiry, and that the real import of Hume's sceptical problem had not yet dawned upon Kant. From the manner, however, in which the doctrine of knowledge had been stated in the Dissertation, the further inquiry had been rendered inevitable. It had become quite impossible for Kant to remain longer satisfied with the ambiguous position assigned to a fundamental element of his doctrine of knowledge, the so-called pure intellectual notions. These notions, according to the Disserta- dion, had no function save in relation to things-in-theniselves, 7.¢., to objects which are not directly or immediately brought into relation to our faculty of cognition. They did not serve as the connecting links of formed experience; on the contrary, they were supposed to be absolutely dissevered from all experience which was possible for intelligence like ours. In his previous essays, Kant, while like- wise maintaining that such pure, irreducible notions existed, had asserted in general terms that they applied ta experience, and that their applicability or justification rested on experience itself, but had not raised the question as to the ground of such justification, Now, from another side, the supreme difficulty was presented—how could such notions have application to any objects whatsoever ? For some time the correlative difficulty, how objects of sense-per- ception were possible, does not seem to have suggested itself to Kant. In the Dissertation sense-perception had been taken as receptivity of representations of objects, and experience as the pro- duct of the treatment of such representations by the logical or analytical processes of understanding. Some traces of this confused fashion of regarding sense-perceptions are left even in the Aritik, specially perhaps in the Aesthetik, and they give rise to much of the ambiguity which unfortunately attaches to the more developed theory of cognition. So soon, however, as the critical question

was put, on what rests the reference of representations in us to the object or thing? in other words, how do we come to have knowledge of objects at all? it became apparent that the problem was one of perfect generality, and applied, not only to cognition through the pure notions, but to sense-perceptions likewise. It is in the state- ment of this general problem that we find the new and characteristic feature of Kant's work,

There is thus na reason to doubt the substantial accuracy of Kant's reference to the particular occasion or cause of the critical inquiry. Upto the stage indicated by the Dissertation, he had beenattempting, in various ways, to unite two radically divergent modes of explain- ing cognition—that which would account for the content of experi- ence by reference to affection from things without us, and that which viewed the intellect itself as somehow furnished with the ineans of pure, rational cognition. He now discovered that Huine's sceptical analysis of the notion of cause was really the treatment of one typical or crucial instance of the much more general problem. If experience, says Hume, consists solely of states of mind somehow given to us, each of which cxists as an effect, and therefore as dis- tinct from others, with what right do we make the common assump- tion that parts of experience are necessarily connected? The only possible answer, drawn from the prenises laid down, must be that there is no warrant for such an assuinption. Necessity for thought, as Kant had been willing to admit and as Hume also held, involves or implies something more than is given in experience—for that which is given is contingent—and rests pon an priori or pure notion. But priori notions, did they exist, could tae no claim to regulate experience. Hume, therefore, for his part, rejected entirely the notion of cause as being fictitious and delusive, and professed to account for the habit of regarding experience as neces: sarily connected by reference to arbitrarily formed custom of think- ing. Experience, as given, contingent material, had a certain uni- formity, and recurring uniformities generated in us the habit of regarding things as necessarily connected. That such a resort to experience for explanation could lead to no valid conclusion has been already noted as evident to Hume himself.

The dogmatic or individualist conception of experience had thus proved itself inadequate to the solution of Hume's difficulty re- garding the nation of cause,—a difficulty which Kant, erroneously, had thought to be the only case contemplated by his predecessor. The perception of its inadequacy in this respect, and the conse- quent generalization of Hume's problem, are the essential features of the new critical method. For Kant was now prepared to form- ulate his general inquiry in a definite fashion. His long-continued reflexion on the Wolffian doctrine of knowledge had made clear to him that synthetic connexion, the essence of real cognition, was not contained in the products of thinking as a formal activity of mind operating on material otherwise supplied. On theother hand, Hume's analysis enabled him to see that synthetic connexion was not contained in experience regarded as given material. Thus neither the formal nor the material aspect of conscious expericnce, when regarded from the individualist point of view, supplied any foundation for real knowledge, whether @ priori or empirical. An absolutely new conception of expericnec was necessary, if the fact of cognition was to be explained at all, and the various modes in which Kant expresses the business of his eritical philosophy were merely different fashions of stating the oncultimate problem, differ-

ing according to the particular aspect of knowledge which he happened to have in view. To inquire how synthetic @ priori judgments are possible, or how far eognition extends, or what worth attaches to metaphysical propositions, is simply to ask, in a specific form, what elements are necessarily involved in experi- ence of which the subject is conscious. How is it possible for the individual thinking subject to connect together the parts of his experience in the mode we call cognition ?

The problem of the critical philosophy is, therefore, the com- plete analysis of experience from the point of view of the conditions under which such experience jis possible for the conscious subject. The central ideas are thus self-consciousness, as the supreme con- dition under which experience is subjectively possible, and the manifold

details of experience as a varied and complex whole. The solution of the problem demanded the utmost care in keeping the due balance between these ideas; and it can hardly be said that Kant was perfectly successful. He is frequently untrue to the more com-

rehensive conception which dominates his work as a whole. The influence of his previous philosophical training, nay, even the unconscious influence of terminology, frequently induces in_ his statements a certain laxity and want of clearness. He selects definitely for his starting point neither the idea of self-consciousness nor the details of experience, but in his actual procedure passes frem one to the other, rarely, if ever, taking into full consideration the weighty question of their relation to one another. Above all, he is continuously under the influence of the individualist notion which he had done so much to explode. The conception of conscious experience, which is the net result of the A7vitik, is indefinitely pro- founder and richer than that which had ruled the 18th century philosophizing, but for Kant such experience still appears as some- how the arbitrary product of the relation between the individual conscious subject and the realm of real facts. When he is actually analysing the conditions of knowledge, the influence of the indivi- dualist conception is not prominent ; the conditions are stated as quite general, as conditionsof knowledge. But so soon as the deeper, metaphysical problems present themselves, the shadow of the old doctrine reappears. Knowledge is regarded asa mechanical product, part furnished by the subject, part given to the subject, and is thus viewed as mechanically divisible into @ prior{ and a postertort, into pure and empirical, necessary and contingent. The individual as an agent, conscious of universal moral law, is yet regarded as in a measure opposed to experience, and the Kantian ethical code remains purely formal. The ultimate relation between intelligence and natural fact, expressed in the notion of end, is thought as proble- matic or contingent. The difficulties or obscurities of the Kantian system, of which the above are merely the more prominent, may all be traced to the one source, the false or at least inadequate idea of the individual. The more thorough explanation of the relation between experience as critically conceived and the individual sub- ject, was the problem left by Kant for his successors.

In any detailed exposition of the critical system it would be requisite in the first placc to state with some fulness the precise nature of the problems immediately before Kant, and in the second place to follow with some closeness the successive stages of the system as prescnted in the three main works, the Kritik of Pure Reason, the Kritik of Praetieal Reason, and the Kritik of Judgment, with the more important of the minor works, the AMctaphysie of Nature and the Metaphysic of Ethies. 1t would be necessary, also, in any such expanded treatment, to bring out clearly the Kantian classification of the philosophical sciences, and to indicate the rela- tion between the critical or transcendental investigation of the several faculties and the more developed sciences to which that investigation serves as introduction. As any detailed statement of the critical system, however compressed, would be beyond the limits of the present article, it is proposed here to select only the more salient doctrines, and to point out in connexion with them what advance had been effected by Kant, and what remained for subse- quent efforts at complete solution of the problems raised by him. Much that is of interest and valuc must necessarily be omitted in any sketch of so elaborate a system, and for all points of special in- terpretation reference must needs be made to the many elaborate dissertations on or about the Kantian philosophy,

The doctrine from which Kant starts in his critical or tran- scendental investigation of knowledge is that to which the slow development of his thought had led him. The essence of cognition or knowledge was a synthetic act, an act of combining in thought the detached elements of experience. Now synthesis was explicable neither by reference to pure thought, the logical or elaborative faculty, which in Kant's view remained analytic in function, nor by reference to the effects of external real things upon our faculties of cognition. For, on the one hand, analysis or logical treatment applied only to objects of knowledge as already given in synthetic forms, and, on the other hand, real things could yield only isolated effects and not the combination of these effects in the forms of cognitive experience. If experience is to be matter of knowledge for the conscious subject, it must be regarded as the conjoint pro- duct of given material and synthetic combination. Form and mattcr

may indeed be regarded separably and dealt with in isolation for purposes of critical inquiry, but in experience they are necessarily and inseparably united. The problem of the Arittk thus becomes for Kant the complete statement of the elements necessarily involved in synthesis, and of the subjective processes by which these elements are realized in our individual consciousness. He is not asking, with Locke, whence the details of experience arise ; he is not attempting a natural history of the growth of experience in the individual mind ; but he is endeavouring to state exhaustively what conditions are necessarily involved in any faet of knowledge, ¢.¢., in any synthetic combination of parts of experience by the conscious subject.

So far as the elements necessarily involved in conscious experience are concerned, these may be enumerated briefly thus :—given data of sense, inner or outer; the forms of perception, é.¢., space and time; the forms of thought, ¢.¢., the categories; the ultimate condition of knowledge, the identity of the pure ego or self. The ego or self is the central unity in reference to which alone is any part of experi- ence cognizable. But the consciousness of self is the foundation of knowledge only when related to given material. The ego has not in itself the element of difference, and the essence of knowledge is the consciousness of unity in difference, For knowledge, therefore, it is necessary that difference should be given to the ego. The modes under which it is possible for such given difference to beeome portion of the conscious experience of the ego, the modes under which the isolated data ean be syuthetically combined so as to form a cognizable whole, make up the form of cognition, and upon this form rests the possibility of any @ priori or rational knowledge.

The notion of the ego as a purely logical unity, containing in itself no element of difference, and having only analytic identity, is fundamental in the critical system, and lies at the root of all its diffi- culties and perplexities. To say that the ego as an individual docs not prodwee the world of experience is by no means the same as to say that the ego is pure unity without element of difference. In the one case we are

treating the ego as one of the objects of experi- ence and denying of it productive efficacy ; in the second case we are dealing with the unity of the ego as a condition of knowledge, of any experience whatsoever. In this second sense, it is wholly wrong to assert that the ego is pure identity, pure unity. The unity and identity of the ego, so regarded, are taken in abstraction, 7.¢., as dissevered from the more complex whole of which they are lecessary elements. When the ego is taken as a condition of knowledge, its unity is not more important than the difference necessarily eorrelated with it. That the ego asa thing should not produce difference is quite beside the mark. The consequences of the abstract separation which Kant so draws between the ego and the world of experience are apparent throughout his whole system. Assuming at the outset an opposition between the two, self and matter of knowledge, he is driven by the exigencies of the problem of reeoneiliation to insert term after term as means of bringing thein together, but never sne- ceeds in attaining a junction which iy more than mechanical. 'To the end, the ego remains, partly the pure logical ego, partly the con- crete individual spirit, and no explanation is afforded of the relation between them. It is for this reason that the system of forms of per- ception aud categories appears so contingent and haphazard. No attempt is made to show how or why the difference supplied for the pure logieal ego should present itself necessarily under these forms. They are regarded rather as portions of the subjective mechanism of the individual consciousness. The mind or self appears as though it were endowed with a complex machinery by which alone it could act upon the material supplied to it. Sueh a crude concep- tion is far, indeed, from doing justice to Kant's view, but it undoubtedly represents the underlying assumption of many of his cardinal doctrines. The philosophy of Fichte is historically in- teresting as that in which the deficiencies of Kant's fundamental position were first discerned and the attempt made to remedy them.

Unfortunately for the consistency of the Kritik, Kant does not attempt to work out systematically the elements involved in knowledge before considering the subjective processes by which knowledge is realized in consciousness. He mixes up the two inquiries, and in the general division of his work depends rather upon the results of previous

psychology than upon the lines pre- scribed by his own new conception of experience. He treats the elements of cognition separately in connexion with the several sub- jective processes involved in knowledge, viz., sense and under- standing. Great ambiguity is the natural result of this procedure. For it was not possible for Kant to avoid the misleading eonnotation of the terms employed by him. In strictness sense, understanding, imagination, and reason ought to have had their functions defined in close relation to the elements of knowledge with whieh they are severally connected, and as these elements have no existence as separate facts, but only as factors in the eomplex organic whole, it might have been possible to avoid the error of supposing that each subjective process furnished a distinct, separately cognizable portion of a mechanical whole. But the use of separate terms, such as sense and understanding, almost unavoidably led to phraseology only interpretable as signifying that each furnished a specific kind of

knowledge, and all Kant's previous training contributed to strengthen this erroneous view. Especially noteworthy is this in the case of the categories. Kant insists upon treating these as Begriffe, notions, and assigns to them certain characteristies of notions. But it is readily seen, and in the Logit Kant shows hiin- self fully aware of the fact, that these pure connective links of experience, general aspects of objects of intelligible experience, do not resemble concepts formed by the so-called logical or elaborative processes from representations of completed objects. Nothing but harm can follow from any attempt to identify two products which differ so entirely. So, again, the Aesthetik is rendercd extremely obscure and difficult by the prevalence of the view, already noted as obtaining in the Dissertation, that sense is a faculty receiving representations of objects. Kant was anxious to avoid the error of Leibnitz, who had taken sense and understanding to differ in degree only, not in kind; but in avoiding the one error he fell into another of no less importance.

The consideration of the several elements which in combin- ation make up the fact of eognition, or pereeption, as it may be called, contains little or nothing bearing on the origin and nature of the given data of sense, inner or outer. The manifold of sense, which plays so important a part in the critical theory of knowledge, is left in an obscure and perplexed position. So much is clear, however, that according to Kant sense is not to be regarded as receptive of representations of objects. The data of sense are mere stimuli, not partial or confused representations. The sense-mani- fold is not to be conceived as having, per se, any of the qualities of objects as aetually cognized ; its parts are not cognizable per se, nor ean it with propriety be said to be received successively or simul- taneously, When we apply predicates to the sense-manifold re- garded in isolation, we make that which is only a factor in the experience of objects into a separate, independent object, and use our predicates trauscendently. Kant is not always in his language faithful to his view of the sense-manifold, but the theory as a whole, together with his own express definitions, is unmistakable. Ou the origin of the data of sense, Kant's remarks are few and little satisfactory. He very commonly employs the term affection of the faculty of sense as expressing the mode of origin, but offers no further explanation of a term which has significance only when interpreted after a somewhat meehanical fashion. Unquestionably certain of ltis remarks indicate the view that the origin is to be sought in things-in-themselves, but against hasty niisinterpre- tations of such remarks there are certain cautions to be borne in mind, The relation between phenomena and noumena in the Kantian system does not in the least resemble that whieh plays so important a part in modern psychology—between the subjective results of sense affeetion and the eharacter of the objective conditions of such affeetion. Kant has pointedly declared that it would be a gross absurdity to suppose that in his view scparate, distinct things-in-themselves existed eorresponding to the several objects of perception. And, finally, it is not at all difficult to understand why Kant shonld say that the affection of sense origin- ated in the action of things-in-themsclves, wheu we consider what was the thing-in-itself to which he was referring. The thing-in- itself to which the empirical order and relations of sense-experience are referred is the divine order, which is not matter of knowledge, but involved in our

practieal or moral beliefs. Critics who limit their view to the Kritik of Pure Reason, and there, in all probability, to the first or constructive portion of the work, must necessarily fail to interpret the doctrines of the Kantian system, which do not become clear or definite till the system has been developed. Reason was, for Kant, an organic whole ; the speculative and moral aspects are never severed ; and the solution of problems which appear at first sight to belong solely to the region of speculative thought may be found ultimately to depend upon eertain characteristics of our nature as practical.

Data of sense-affection do not contain in themselves synthetic combination. The first conditions of such combination are found by Kant in the universal forms under which alone sense-phenomena manifest themselves in experience. These universal forms of per- ception, space and time, are necessary, @ priort, and in character- istic features resembling intuitions, not notions. They occupy, therefore, a peculiar position, and one section of the Kritik, the Aesthetik, is entirely devoted to the consideration of them. It is important to observe that it is only through the a priori character of these perceptive forms that rational science of nature is at all possible. Kant is here able to resume, with fresh insight, his pre- vious discussions regarding the synthetie character of mathematical propositions. In his early essays he had rightly drawn the distine- tion between mathematical demonstration and philosophic proof, referring the certainty of the first to the fact that the constructions were synthetic in eharacter and entirely determined by the action of constructive imagination. It had not then occurred to him to ask, With what right do we assume that the conclusions arrived at from arbitrary constructions in mathematical matter have applica- bility to objects of experience ? Might not mathematics be a purely imaginary science? 'I'o this question he is now enabled to return an

answer. Space and time, the two essential conditions of sense- pereeption, are not data given by things, but universal forms of intelleet into which all data of sense must be received. Henee, whatever is true of

space and time regarded by imagination as objects, z.¢., quantitative constructions, must be truc of the objects making up our sense-experience. The same forms and the same constructive activity of imagination are involved in mathematieal synthesis and in the constitution of objects of sense-experience. The foundation for pure or rational mathematics, there being included under this the pure science of movement, is thus laid in the critical doctrine of space and time. The Aesthetik isolates sense perception, and considers its forms as though it were an independent, complete faculty. A certain con- fusion, arising from this, is noticeable in the Analytik when the necessity for justifying the position of the categories is under dis- eussion, but the real diffieulty in which Kant was involved by his doctrine of space and time has its roots even deeper than the erroneous isolation of sensibility. He has not in any way

"deduced" space and time, but, proceeding from the ordinary

eurrent view of sense-experience, has found these remaining as residunm after analysis, The relation in which they stand to the eategories or pure notions is ambiguous ; and, when Kant has to con-

sider the fashion in which category and data of sense are to be.

brought together, he merely places side by side as a priori elements the pure connective notions and the pure forms of perception, and finds it, apparently, only a matter of contingent convenience that they should harmonize with one another and so render cognition possible. 'Io this point also Fichte was the first to eall attention.

Affeetion of sense, even when received into the pure forms of pereeption, is not matter of knowledge. For cognition there is reqnisite synthetie combination, and the intellectual function through which such combination takes place. The forms of in- tellectual function Kant proeeeds to enumerate with the aid of the commonly received logical doctrines. For this reference to logic he has been severely blamed, but the precise nature of the debt due to the commonly accepted logical elassifieation is very generally misconceived. Synthetic combination, Kant points out, is formally expressed in a Judgment, which is the act

of uniting representations. At the foundation of the judgments which ex- press the types of synthetic combination, throngh which knowledge is possible, lie the pure general notions, the abstract aspect of the conditions under which objects are cognizable in experience. General logic has also to deal with the union of representations, though its unity is analytic merely, not synthetic. But the same intellectual function which serves to give unity in the analytic judgments of formal logie serves to give unity to the synthetic combinations of real pereeption. It appeared evident, then, to Kant that in the forms of judgment, as they are stated in the com- mon logic, there must be found the analogues of the types of judg- ment which are involved in transeendental logie, or in the theory of real eognition. His view of the ordinary logic was wide and eom- prehensive, though in his restriction of the science to pure form one can trace the influenee of his earlier training, and it is no small part of the value of the critical philosophy that it has revived the study of logic and prepared the way for a more thorough consideration of logical doctrines. 'The position assigned to logie by Kant is not, in all probability, one which ean be defended ; indeed, it is hard to see how Kant himself, in consisteney with the eritieal doctrine of knowledge, could have retained many of the older logical theorems, but the precision with which the position was stated, and the sharpness with which logie was marked off from cognate philosophie disciplines, prepared the way for the more thoughtful treatment of the whole question.

Formal logic thus yields to Kant the list of the general notions, pure intelleetual predicates, or categories, through which alone experienee is possible for a conscious subject. It has already been noted how serious was the error involved in the description of these as notions, without further attempt to clear up their precise significanee. Kant, indeed, was mainly influenced by his strong opposition to the Leibnitzian rationalism, and therefore assigns the eategories to understanding, the logical faculty, without considera- tion of the question,—whieh might have been suggested by the previous statements of the Déssertation,—what relation these categories held to the empirical notions formed by comparison, abstraction, and generalization when directed upon representations of objects. But when the eategories are described as

notions, 7.¢., formed products of thought, there rises of necessity the problem whieh had presented itself to Kant at every stage of his pre-critical thinking, —with what right ean we assume that these notions apply to objects of experience? The answer which he proceeds to give altogether explodes the definition of the categories as formed produets of thought, and enables us to see more clearly the nature of the new eoneeption of experience which lies in the background of all the critical work.

The unity of the ego, which has been already noted as an element entering into the synthesis of cognition, is a unity of a quite distinet aud peculiar kind. That the ego to which different

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parts of experience are presented must be the same ego, if there ig to be cognition at all, is analytically evident ; but the peculiarity is that the ego must be conscious of its own unity and identity, and this unity of self-consciousness is only' possible in relation to difference not contained in the ego but given toit. The unity of apperception, then, as Kant ealls it, is only possible in relation to synthetic unity of experience itself, and the forms of this synthetic unity, the categories, are, therefore, on the one hand, necessary as forms in whieh self-consciousness is realized, and, on the other hand, restricted in their application and validity to the data of given sense, or the particular clement of experience. Thus expericnee presents itself as the organie combination of the particular of sense with the individual unity of the ego through the universal forms of the categories. Reference of representations to the unity of the object, synthetie unity of appereeption, and subsumption of data of sense under the categories, are thus three sides or aspects of the one fundamental fact.

In this deduetion of the eategories, as Kant calls it, there appears for the first time an endeavour to connect together into one organie whole the several-elements entering into experience. It is evident, however, that much was wanting before this essential task eonld be regarded as complete. Kant has certainly brought together self-consciousness, the system of the eategories and data of sense. He has shown that the

eonditions of self-consciousness are the conditions of possible experience. But he has not shown, nor did he attempt to show, how it was that the conditions of self-consci- ousness are the very eategories arrived at by consideration of the system of logical judgments. He does endeavour to show, but with small suecess, how the junction of category and data of sense is brought about, for aceording to his scheme these stood, to a certain extent at least, apart from and independent of one another. Tho failure to effect an organic combination of the several elements was the natural consequence of the false start which had been made.

The mode in which Kant endeavours to show how the several portions of eognition are subjectively realized brings into the clearest light the ineonsistencies and imperfections of his doctrine. Sense had been assumed as furnishing the particular of knowledge, understanding as furnishing the universal; and it had been expressly declared that the partienlar was cognizable only in and through the universal. Still, each was conceived as somehow in itself complete and finished. Sense and understanding had distinct functions, and thero was wanting some common term, some inter- mediary which should bring them into conjunction. Data of sense as purely particular could have nothing in common with the eategories as purely universal. Bunt data of sense had at least one universal aspect, their aspeet as the particular of the general forms, space and time. Categories were in themselves abstract and value- less, serviceable only when restricted to possible objeets of ex- perience. There was thus a common ground on which eategory and intuition were united in one, and an intermediate proeess whereby the universal of the category might be so far individualized as to comprehend the particular of sense. This intermediate process — — which is really the junction of understanding and sense—Kant calls productive imagination, and it is only through productive imagination that knowledge or experience is aetually realized in our subjective consciousness. 'The specifie forms of productive imagina- tion are called schemata, and upon the nature of the schema Kant gives much that has proved of extreme value for subsequent thought.

Productive imagination is thus the econerete element of know- ledge, and its general modes are the abstract expression of the @ priori laws of all possible experience. The categories are restricted in their applicability to the schema, z.c., to the pure forms of con- junction of the manifold in time, and in the modes of combination of schemata and categories we have the foundation for the rational sciences of mathematics and physies. Pereeption or real cognition is thus conceived as a complex fact, involving data of sense and pure perceptive forms, determined by the category and realized through productive imagination in the schema. The system cf principles which may be deduced from the consideration of the mode in which understanding and sense are united by productive imagination is the positive result of the eritieal theory of knowledge, and some of its features are remarkable enough to deserve attention. According to his usual plan, Kant arranges these principles in conformity with the table of the categories, dividing the four elasses, however, into two main groups, the mathematical and the dynamical. The mathematical principles are the abstract expression of the necessary mode in which data of sense are détermined by the category in the form of intuitions or representations of objects ; the dynamical are the abstract expression of the modes in which the existence of objects of intuition is determined. The mathematical principles are constitutive, 7.¢., express determinations of the objects themselves ; the dynamieal are regulative, 2.¢., express the eonditions under which objects can form parts of real experience. Under the mathematical principles come the general rules which furnish the ground for the applieation of quantitative reasoning to real facts of experience. For as data of sense are only possiblo

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objects when received in the forms of space and time, and as space and time are only cognized when determined in definite fashion by the understanding through the schema of number (quantity) or degree (quality), all intuitions are extensive quantities and contain a real element, that of sense, which has degree. Under the dynamical principles, the general modes in which the existence of objects are determined, fall the analogies of experience, or general rules according

to which the existence of objects in relation to one another can be determined, and the postulates of experience, the general rules according to which the existence of objects for us or our own subjective existence can be determined. The analogies of experience rest upon the order of pereeptions in time, ze, their permanence, succession, or coexistence, and the principles are respectively those of substance, causality, and reciprocity. It is to be observed that Kant in the expression of these analogies reaches the final solution of the difficulty which had so long pressed upon him, the difficulty as to the relation of the pure connective notions to experience. These notions are not directly applicable to experi- ence, nor do we find in experience anything corresponding to the pure intellectual notions of substance, cause, and reciprocity. But experience is for us the combination of data of sense in the forms of productive imagination, forms determined by the pure intellectual notions, and accordingly experience is possible for us only as in modes corresponding to the notions. The permanent in time is substance in any possible experience, and uo experience is possible save through the determination of all changes as in rolation to a permanent in time. Determined sequence is the causal relation in any possible experience, and no experience is possible save through the determinatiou of perceived changes as in relation to a determined order in time. So with coexistence and reciprocity.

The postulates of experience are general expressions of the siguifi- cance of existence in the experience of a conscious subject. The element of reality in such experience must always be given by intuition, and, so far as determination of existence is assumed, external intuition is a necessary condition of inner intuition. The existence of external things is as certain as the existence of the concrete subject, and the subject cannot cognize himself as exist- ing save in relation to the world of facts of external perception. Inner and outer reality are strictly correlative elements in thc experience of the conscious subject. ’

Throughout the positive portion of his theory of cognition, Kant has been beset by the doctrine that the categories, as finished, complete notions, have an import or significance transcending the bounds of possible experience. Moreover, the manner in whicli space and time lad

been treated made it possible for him to regard these as contingent forms, necessary for intelligences like ours, but not to be viewed as absolutely necessary. The real meaning of these peculiarities is hardly ever expressed by him, though it is clear that the solution of the matter is to be found in the inadequacy of the positive theory to mect the demands of reason for completed explanation. But the conclusion to which he was led was one of the greatest importance for the after development of his system. Cognition is necessarily limited. The categories are restricted in their application to elements of possible experience to that which is presented in intuition, and all intuition is for the ego contingent. But to assert that cognition is limited and its matter contingent is to form the idea of an intelligence for whom cognition would not be limite] and for whom the data of intuition would not be given, contingent facts, but necessarily produced along with the pure categories. This idea of an iutuitive understanding is the detinite expression for the completed explanation which reason demands, and it involves the conception of a realm of objects for such au understanding, a realm of objects which, in opposition to the phenomena of our relative and limited experience, may be called nowmena or things-in-themselves. The nowmenon, therefore, is in one way the object of a non-sensuous intuition, but more correctly is the expression of the imited and partial character of our know- ledge. The idea of a noumenon is thus a limiting notion.

Assuredly, the difficult section of the Kritik, on the ground of the distinction between phenomena and noumeua, would not have led to so much misconception as it has done, had Kant then brought forward what lies at the root of the distinction, his doctrine of reason and its functions, Understanding, as has been seen, is the faculty of cognition strictly so called ; and within its realm, that of space, time, and inatter, positive knowledge is attainable. But the ultimate conception of understanding, that of the world of objects, quantitatively determined, and standing in relation of mutual reciprocity to one anothzr, is not a final ground of explana- tion. We arc still able and necessitated to reflect upon the whole world of phenomena as thus cognized, and driven to inquire after its significance. In our reflexion we necessarily treat the objects, not as phenomena, as matters of positive, scientific

knowledge, but as things-in-themselves, as noumena. The distinction between phenomena and uoumena is, therefore, nothing but the expression of the distinction between understanding and reason, a distinction which, according to Kant, is merely subjective.

The specific function of reason is the effort after completed cx-

planation of the experience presented in cognition. But in such cffort there are no notions to be employed other than the categorics, and these, as has already been seen, have validity only in reference to objects of possible experience. We may expect, then, to find the transcendent cmploynient of the categorics leading into various difficulties and inconsistencies. he criticism of reason in its specific aspect throws fresh light on the limits to human know- ledge and the significance of experience.

kxperience has presented itself as the complex result of relation between the ego or subject and the world of phenomena. Reason may therefore attempt a completed explanation either of the ego or of the world of phenomena or of the total relation between them. The three inquiries correspond to the subjects of the three ancient metaphysical sciences, rational psychology, rational cosmology, rational theology. It is readily seen, in regard to the first of them, that all attempts to determine the nature of the ego as a simple, perdurable, immaterial substance rest upon a confusion between the ego as pure logical unity and the ego as object of intuition, and involve a transcendent use of the categories of experience. It profits not to apply such categories to the soul, for no intuition corresponding to them is or can be given. 'The idca of the soul must be regarded as transcendent. So too when we endcavour, with the help of the categories of quantity, quality, relation, and modality, to determine the nature and relation of parts of the world, we find that reason is landed in a peculiar difficnlty. Any solution that can be given is too narrow for the demands of reason and too wide for the restrictions of understanding. The transcendent employment of the categories leads to antinomy, or equally balanced statements of apparently contradictory results. Due attention to

the relation between understanding and reason enables us to solve

the antinomics and to discover their precise origin and significance. Finally, the endeavour to find in the conception of God, as the supreme reality, the explanation of experience, is scen to lead to no valid conclusion. There is not any intuition given whereby we might show the reality of our idea of a Supreme Being. So far as knowledge is concerned, God remains a transcendental ideal.

The criticism of the transecndcntal ideas, which is also the examination of the claims of metaphysic to rank as a science, yields a definite and intelligible result. These ideas, the expression of the various modes in which unity of rcason may be souglit, have no objects corresponding to them in the sphere of cognition. They have not, therefore, like the categories, any constitutive value, and all attempts at metaphysical construction with the notions or categories of science must be resigned as of necessity hopeless. But the idcas are uot, on that account, destitute of all value. They are supremely significant, as indicating the very essence of the function of reason. The limits of scientific cognition become intelligible, only when the sphere of understanding is subjected to critical reflexion and com- pared with the possible sphere of reason, that is, the sphere of rationally complete cognition. The ideas, therefore, in relation to knowledge strictly so called, have regulative value, for they furnish the general precepts for cxtension and completion of knowledge, and, at the same time, since they spring from reason itself, they have a real value in relation to reason as the very inmost nature of intclligence. Self-cousciousness cannot be regarded as merely a mechanically determined result. Freo reflexion upon the whole system of knowledge is sufficient to indicate that the sphere of intuition, with its rational principles, does not exhanst conscious experience. There still remains, over and above the realm of nature, tho realm of free, self-conscious spirit ; and, within this sphere, it may be anticipated that the ideas will acquire a significance richer and deeper than the merely regulative import which they possess in reference to cognition.

Where, then, are we to look for this realm of free self-conscious- ness? Not in the sphere of cognition, where objects are mechani- cally deterntined, but in that of will or of reason as practical. That reason is practical or prescribes ends for itself is sufficiently manifest from tho mere fact of the existence of the conception of noorality or duty, a conception which can have no corresponding object within the sphere of intuition, and which is theoretically, or in accordance with the categories of understanding, incognizable. The presence of this conception is the datum upon which may Le founded a special investigation of the conditions of reason as practical, a Kritik of pure practical reason, and the analysis of it yields the statement of the formal prescripts of morality.

The realization of duty is impossible for any beiug which is not thought as free, 7.e., capable of self-detcrmination. Freedom, it is true, is theoretically not an object of cognition, but its impossibility is not thereby demonstrated. The theoretical proof rather serves as useful aid towards the more exact determination of the nature and province of self-dctcrmination, and of its relation to the whole concrete nature of humanity. For in man sclf-determination and mechanical determination by empirical motives coexist, and only in so far as he belongs and is conscious of belonging both to the sphere of sense and to the sphere of reason does moral obligation become possible for him. The supreme end prescribed by reason in its practical aspect, namely, the complete subordination of the empirical

side of nature to the prescripts of morality, demands, as conditions of its possible realization, the permanence of ethical progress in the 'moral agent, the certainty of freedom in self-determination, and the necessary harmonizing of the spheres of sense and reason through the intelligent author or ground of both. These conditions, the postulates of practical reason, are the concrete expressions of the three transcendental ideas, and in them we have the full significance of the ideas for reason. Immortality of the soul, positive freedom of will, and the existence of an intelligent ground of things are specu- lative ideas

practically warranted, though theoretically neither demonstrable nor comprehensible.

Thus reason as self-determining supplies notions of freedom ; reason as determined supplies categories of understanding. Uniou between the two spheres, which seem at first sight disparate, is found in the necessary postulate that reason shall be realized, for its realization is only possible in the sphere of sense. But such a union, when regarded in abstracto, rests upon, or involves, a notion of

quite a new order, that of the adaptation of nature to reason, or, as

it may be expressed, that of end in nature. Understanding and reason thus coalesce in the faculty of judgment, which mediates between, or brings together, the universal and particular elements in conscious experience. Judgment is here merely reflective; that is to say, the particular element is given, so determined as to be possible material of knowledge, while the universal, not necessary for cognition, is supplied by reason itself. The empirical details of nature, which are not determined by the categories of understanding, are judged as being arranged or ordered by intelligence, for in no other fashion could nature, in its particular, contingent aspect, be thought as forming a complete, consistent, intelligible whole.

The investigation of the conditions under which adaptation of nature to intelligence is conceivable and possible makes up the subject of the third great Kritik, the Kritik of Judgment, a work presenting unusual difficulties to the interpreter of the Kantian system. 'The general principle of the adaptation of nature to our faculties of cognition has two specific applications, with the second of which it is more closely connected than with the first. In the first place, the adaptation may be merely subjective, when tho empirical condition for the exercise of judgment is furnished by the fecling of pleasure or pain ; such adaptation is esthetic. In the second place, the adaptation may be objective or logical, when empirical facts are given of such akind that their possibility can be conceived only through the notion of the end realized in them ; such adaptation is tcleological, and the empirical facts in question arc organisms.

Asthetics, or the scientific consideration of the judgments resting on the feelings of pleasure and pain arising from the harmony or want of harmony between the particular of experience and the laws of understanding, is the special subject of the Kritik of Judgment, but the doctrine of teleology there unfolded is the more important for the complete view of the critical system. For the analysis of the teleological judgment and of the consequences flowing from it leads to the final statement of the nature of expcricnce as conceived by Kant. The phenomena of organic production furnish data for a special kind of judgment, which, however, involves or rests upon a qnite general principle, that of the contingency of the particular element in nature and its subjectively necessary adaptation to our faculty of cognition. The notion of contingency arises, according to Kant, from the fact that understanding and sense are distinct, that understanding does not determine the particular of sense, and, consequently, that the principle of the adaptation of the particular

to our understanding is merely supplied by reason on account of the peculiarity or limited character of understanding. End in nature, therefore, is a subjective or problematic conception, implying the limits of understanding, and consequently resting upon the idea of an understanding constituted unlike ours,—of an intuitive under- standing in which particular and universal should be given together.

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Editions of Kant’s Works,—The standard collective editions are (1) that by Rosenkranz and Schubert, 12 vols., 1888-42, containing in vol. ii. the Life by Schubert, and in vol. xii. a History of the Kantian Philosophy by Rosenkranz ; (2) that by Harteustein, in 10 vols., 1888-39; (3) a second edition by Hartenstein, in 8 vols., 1867-69, in which the arrangement is strictly chronological ; (4) that by Kirchmann, in 8 vols., 1868. Convenient editions of the three Kritiks have been published by Kehrbach, and critical editious of the Prolegomena and Kritik d. r. Vernunft by B. Erdmann, whose treatise Kants Kriticismus in d. ersten und zweiten Auflage d. Kr. d. r, Vernunft, 1878, and pamphlet, Naehtrdge zu K. Kr. d. 7. Vernunft, 1881, contain much interesting matter.

Of works upon the Kantian philosophy the nuniber is very great. A brief notice of them is given in the bibliographical references in Ueberweg’s Gesch. d. Philosophie, Bd. iii., §§ 18-20. A very comprehensive survey is contained in the recent work by H. Vaihinger, Commentar zu Kants Kritik der reinen Vernunft, 1881, where the older and more recent literature is elaborately classified and briefly characterized. (R. AD.)

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ends in this world of intelligences, which, although as mere nature it is to be called only the world of sense, can yet as a systcm of frecdom be called an intelligible, z.e., moral world (regnum gratiz), leads inevitably to the teleogical unity of all things which consti- tute this great whole according to universal natural laws, just as the unity of the former is according to universal and necessary moral laws, and unites the practical with the speculative reason. The world must be represented as having originated from an idea, if it is to harmonize with that use of reason without which we should hold ourselves unworthy of reason—viz., the moral use, which

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ENCYCLOPADIA BRITANNICA

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DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XIV

EDINBURGH: ADAM AND CHARLES BLACK

MDCCCLXXXII

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ENCYCLOPEDIA BRITANNICA.

KAOLIN

aaters , a name applied to the pure white clay which forms an important ingredient in the manufacture of porcelain, and which is, therefore, known also as china clay. Large quantities are raised in Cornwall, whence it is frequently termed Cornish clay. The name kaolin is said to be derived from a hill near King-tih-chin, in China, named: Kao-ling or “lofty ridge.” The clay from this locality was first sent to Europe, under the name of kaolin, by the Pére d’ Entrecolles, a Jesuit missionary who resided at King-tih-chin in the early part of the last century. A similar white clay was soon afterwards

found at Aue, near Schneeberg in Saxony, and was used by Béttcher in the manufacture of porcelain, thus laying the foundation of the factory at Meissen for producing the famous Dresden china. In England kaolin was first detected in Cornwall by William Cookworthy of Plymouth about 1755, a dis- covery which resulted in the manufacture of hard paste china at Plymouth and Bristol. In Cookworthy's writings the clay is called "caulin." Kaolin is found in Nebraska, and in several of the eastern States of the American Union. Certain clays, when examined under the microscope, are seen to contain crystalline pearly scales of a mineral which Messrs Johnson and Blake have described as kaolinite (American Journal: of Science, ser. ii. vol. xliii., 1867, p. 351). They regard this crystalline substance as a distinct mineral species, a hydrated silicate of aluminium, forming the basis of pure kaolin. Its composition appears to agree with Forchhammer's formula for true kaolin, viz., Al,O,.2Si0,+2H,O. Mr J. H. Collins regards the crystal- line scales which are associated with the Cornish kaolin, not as kaolinite, but as a white lithia-mica or lepidolite. Kaolin is almost invariably a product of the alteration of felspar, and is therefore always found in association with felspathic rocks, usually granite. The china-clay rocks of Cornwall and Devon are simply granites in which the orthoclase-felspar has become decomposed or kaolinized. Such rocks are termed by Mr Collins carclazite, after the Carclaze mine, near St Austell, where typical varieties occur. The production of kaolin from felspar is rather difficult to explain, inasmuch as the alteration is sometimes observed under conditions which appear to preclude the operation of atmospheric agencies It is not simply the effect of water charged with carbonic acid, whereby the

felspar might be decomposed and its alkaline silicate removed as a soluble carbonate, while the silicate of aluminium remained behind,'in a hydrated condition, as kaolin or china clay. Many chemists have been inclined to attribute the decomposition to the effect of water or watery vapour at a high temperature, charged with hydrofluoric and boric acids. It is certain that minerals containing fluorine and boron—such as fluor spar, lepidolite, and schorl —are common associates of kaolin.

The localities from which kaolin is obtained in Britain are all situated in Cornwall and Devon; in the former county the workings are principally in the neighbourhood of St Austell, St Stephen's, and Breague, while in Devon

they are situated at Lee Moor and Meavy, on the south of Dartmoor. In working the clay the “overburden” or superficial deposit is first removed, in order to reach the clay-bearing rock. The rock is broken up by the pick, and water is introduced to wash out the clay. A quantity of sand is left behind, and requires to be constantly removed. The water containing the clay in suspension ig either pumped to the surface up a shaft, or, if the working be upon a hill-side, is run out at an adit level. This clay- water is led into channels called “drags,” where the sand and coarser flakes of mica are deposited. From the drags the liquid passes into another set of channels called “micas,” in which further deposition of suspended matter occurs, Thus purified, the clay-water is conducted into a series of pits and tanks, where the finely-divided particles of clay slowly subside. In the tanks it is allowed to settle until it acquires a thick creamy consistency, when it is transferred to the drying house or “dry.” Formerly the clay was dried naturally by exposure to sun and air, but it is now always artificially dried by means of heated flues, and the preparation of the clay is thus greatly facilitated.

China clay is not only used in the manufacture of pottery, but is also extensively employed by the paper- maker and by the calico-bleacher. It is likewise used to a sinall extent in the manufacture of alum, artificial ultra-marine, and some other chemical products, In 1880 the quantity of china clay raised in Cornwall amounted to 278,572 tons, and in Devon to 25,370 tons.

See J. H. Collins, in Journal of the Society of Arts, May 5, 1876 ; and Treatise on China Clay, by D. Cock, wow?

KAPURTHALA, or KopurtTHeLa, a native state in the Punjab, India, lying between 31° 9’ and 31° 39’ 30” N. lat., and between 73° 3’ 15” and 75° 38’ 30” E. long. Area, 800 square miles; estimated population, 250,000. The Kapurthadla family at one time held possessions on both sides of the Sutlej, and also in the Bari Dodb. The cis-Sutlej] estates and scattered possessions in the Bari Doab were escheated owing to the hostility of the chief in the

first Sikh war, but the latter possessions were after- wards restored to the family in recognition of the loyalty of Rajé Randhir Sinh during the mutiny of 1857, when he led a contingent to Oudh which did good service. He also received a grant of estates in Oudh, 850 square miles in extent, and with an estimated population of 220,000. In these tracts, however, he exercises no sovereign powers, occupying the status only of a large landholder. His total revenue is estimated at £170,000, subject to a charge of £13,000 payable to the British Government in commuta- tion of military service.

KARACHI See Kurracuer.

KARA-HISSAR is the name of several towns in Asiatic Turkey. (1) Arium Kara Hissar has been already noticed, vol. i p. 244. (2) Esxr Kara Hissar, lies 10 miles to the north of Afium. It is identified with the ancient Synnada, which in the time of Pliny was the chief town of a considerable district. The quarries of Docimia, which furnished the famous Synnadic or Docimitic marble, are about 24 miles distant, and in the town numerous traces have been found of ancient sculpture in various stages of execution (see Hamilton's Asia Minor, i. 461, ii, 177; and Texier, Asie Mineurc). (3) The eastern Kara-Hissar, usually distinguished by the prefix Shabin (i.e, alum"), is situated in the vilayet of Siwas, about 70 miles east of Niksar, on a northern tributary of the Lycus. It is the seat of a mutasarrif or vice-governor,

and on a hill to the east there is an old castle which |

must at one time have been of military importance. The population is estimated at 11,000, mainly Mohammedans, though Armenians also form an important element. The district is rich in mineral products—silver, lead, copper, and iron; but only the alum mines, yielding from 120 to 250 tons per annum, are worked. The remains of the citadel, the ruins of a Byzantine church, traces of Roman brickwork, ancient coins, and a few Greek and Latin inscriptions, all go to show that Kara-Hissar has passed through many vicissitudes. The old town was evidently built not at the foot but up the steep slope of the hill, tier above tier. In 1473 Kara-Hissar made voluntary sub- mission to Sultan Mohammed IL A full description, with a plan of the town and neighbourhood, is given by Barth in Petermann's Mittheilungen,

Ergdnzungsheft, 1860. See also Taylor’s “ Journal,” &c., in Journ. Roy. Geogr. Soc., 1868.

KARAITES, or Canaries, a Jewish sect of the Middle Ages, claiming to be distinguished by adherence to Scripture as contrasted with oral tradition, whence the name (from Nop, as if readers,” scripturarid; sometimes also 87”) *32). They have frequently been identified with the Sadducees or with the Samaritans, with neither of whom have they any historical connexion or much spiritual affinity. The schism arose at Baghdad about the middle of the 8th century, when the hereditary claims of Anan, a learned Talmudist, to the office of Resh Galutha were set aside by the Gaonim or heads of rabbinical schools at Sura and Pumbeditha because he was believed to undervalue the authority of the Talmud. An appeal by Anan to the caliph proved unsuccessful, and he appears even to have been imprisoned for some time; but ultimately he was permitted to migrate along with his followers to Palestine,

where they erected in Jerusalem a synagogue which con- | according to Chinese authority, by Buku, khan of the

tinued to be maintained until the time of the crusades. From this centre the sect diffused itself thinly over Syria, spread into Egypt, and ultimately reached south-eastern Europe. Anan, who is said to have died in 765 a.p., was the author of a commentary on the Pentateuch and other works in Talmudic Hebrew and Arabic,—all of which unfortunately are lost; for our knowledge of the dis- tinctive principles maintained by him we are thus left entirely dependent on the hostile indications of opponents. In general we know that he showed great bitterness against the Talmud and its upholders (the “ Rabbanites ”) for their falsification of the written law by arbitrary additions and subtractions, but there is nothing to indicate that he him- self had the insight or the fervour by which he could have become the pioneer of any really great reformation in religion or morals. The questions in dispute appear to have turned entirely on points of very minute detail. Several of them related to the regulation of the calendar, the new moon, for example, being fixed by the Karaites by direct observation, not by astronomical calculation, and the intercalary year also being determined empirically ; others related to paschal and pentecostal ritual, such as the

precise hour for killing the lamb or for burning its remains. The differences which affected social life most deeply were those relating to Sabbath observance and the forbidden degrees of marriage, the Karaites not recognizing any distinction between relationships of consanguinity and those of affinity, while in their zeal to avoid all risk of infringement of the sacredness of the day of rest they pro- hibited the burning of any light at all in their houses from sunset to sunset. Little information as to the Karaites can be derived from their liturgies, which are comparatively modern; though differing from those used by the Rabbinical Jews, they are not characterizetl by any marked divergence in principle. The controversies as to the rule of faith which so deeply divided the Christian church in the 16th century gave to this obscure sect an

| illusory and passiug importance, the Catholics frequently

hurling the epithet Karei, in token of contempt, at the Protestants, who in their turn willingly accepted it as sufficiently descriptive of their attitude towards Scripture. The Karaites never have been numerous ; the present coni- munity in Jerusalem numbers only about ten families. They occur in Constantinople and elsewhere in Turkey, but are chiefly met with in southern Russia, and especially in the Crimea, where in 1874 they numbered some 6000, chiefly in Eupatoria, Theodosia, and Sebastopol. In the Crimea their historical capital and chief synagogue was formerly the “ Jews’ Castle” (Tshufut-Kale), near Bakh- chisarai. The place is now deserted ; its cemetery was the seat of Firkowitsch’s notorious forgeries (inscriptions of Ist century), by which he sought to establish a fabulous antiquity for his sect. According to Strack (A. Pirko- witsch uw. seine Entdeckungen, 1876) the oldest tombstones do not go back beyond the 14th century. The modern Karaites are generally well spoken of for their honesty, perseverance, and simple habits of life; but their enslave- ment to tradition is quite as complete as that of any Tal- mudist could possibly be.

Among the older authorities may be mentioned Morinus, Hwercit. Bibl., lib. ii. ex. 7, 1669; and Triglandius, Diatribe de Seeta Karzorum, 1708. See Gritz, Gesch. der Juden, especially in vol. v., 1860; and Fiirst, Gesch. des Karderthums, 1865.

KARAKORUM, or Karaxoram, a name applied to a city, a mountain range, and a mountain pass in Central Asia. For the range and pass see Kury-tun. The ancient city or rather camping-ground of Karakorum (the Caracaron of Marco Polo), was situated near the upper course of the Orkhon, a tributary of the Selenga. Founded,

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Uigurs, in the 8th century, it was at the time of Jenghiz the chief seat of Togrul Wang, Marco Polo's Prester John, and under Jenghiz's successor Okkodai it became what it continued to be till 1256, the capital of the Mongolian power. It was visited by Carpini (1246) and Rubruquis (1253). Some ruins of earthworks are still to be traced.

See Rémusat, Rech. sur la ville de Karakorum; Yule, Marco Polo; Geographical Magazine, 1874.

KARAMZIN, Nixotat Mixwaitovicy (1765-1826), Russian historian, critic, novelist, and poet, was born at the village of Mikhailovka, in the government of Oren- burg, and not at Simbirsk as many of his English and Ger- man biographers incorrectly state, on the Ist of December (old style) 1765. His father, an officer in the Russian army, of Tartar extraction, was anxious that his son should follow his own profession. The idea was not, how- ever, persevered in, and the future author was sent to Moscow to study under Professor Schaden, whence he after- wards removed to St Petersburg, where he made the acquaintance of Dmitrieff, a Russian poet of some merit, and occupied himself with translating essays by foreign writers into his native language. After residing some time at St Petersburg, he went to Simbirsk, where he lived in retirement till induced by a friend to revisit Moscow. There, finding himself in the midst of the society of learned men, he again betook himself to literary work. In 1789 he resolved to travel, and visited Germany, France, Switzer- land, and England. On his return he published his Letters of a Russian Traveller, which met with great success. They are elegantly written, and show the feeling of a poet for the scenery of the countries through which he passed, but to many readers of the present day they will appear insipidly sentimental. These letters were first printed in the Moscow Journal, but were afterwards collected and issued in 6 vols. (1797-1801). In the same periodical Karamzin also pub- lished translations

of some of the tales of Marmontel, whose sickly elegance was then in fashion, and some of his own original stories, among which may be mentioned Poor Lnza and Natalia the Boyar's Daughter. To judge by the cheap editions which are continually appearing, these tales still find readers in Russia. The best of them is Marfa the Posadnitza of Novgorod, but all are more or less dis- figured by the sentimentalism already referred to. In 1794 and 1795 Karamsin abandoned his literary journal, and published a miscellany in two volumes, entitled Aglaza, in which appeared, among other things, "The Island of Bornholm" and "Ilia Mourometz," a story based upon the adventures of the well-known hero of many a Russian legend. In 1797-99 he issued another miscellany or poetical almanac, The Aonides, in conjunction with Der- zhavin and Dmitrieff. In 1798 he compiled the Pantheon, a collection of pieces from the works of the most celebrated authors ancient and modern, translated into Russian. Many of his lighter productions were subsequently printed by him in a volume entitled My Trifles. In 1802 and 1803 Karamzin edited the journal Zhe European Mes- senger. It was not till after the publication of this work that he realized where his strength lay, and commenced his History of the Russian Empire. In order to accomplish the task, he secluded himself for some years; and, on the cause of his retirement becoming known to the emperor Alexander, Karamzin was invited to Tver, where he read to the em- peror the first eight volumes of his history. In 1816 he removed to St Petersburg, where he spent the happiest days of his life, enjoying the favour of Alexander, and sub- mitting to him the sheets of his great work, which the emperor read over with him in the gardens of the palace of Tzarskoé Selo. He did not, however, live to carry his work further than the eleventh volume, terminating it at the accession of Michael Romanoff in 1613. In 1825 the

health of Karamzin began to decline, and the emperor Nicholas, who had succeeded to the throne in that year, and continued the favours which his brother had bestowed on the historian, ordered a frigate to be got ready, that he night visit a warmer climate to recruit his failing powers. It was, however, too late; on the 22d of May (old style) 1826, Karamzin died in the Taurida palace. A monument was erected to his memory at Simbirsk in the year 1845,

As an historian Karamsin has deservedly a very high reputation. Till the appearance of his work little had been done in this direction in Russia. The preceding attempt of Tatistcheff was merely a rongh sketch, inelegant in style, and without the true spirit of criticism. Karamzin was most industrious in accumulating materials, and the notes to his volumes are mines of curious information. The style of his history is elegant and flowing, modelled rather upon the easy sentences of the French prose writcrs than the long periodical paragraphs of the old Slavonic school. Perhaps Karamzin may justly be censured for the false gloss and romantic air thrown over the early Russian annals, conccaling the coarseness and cruelty of the native manners; in this respect he reminds us of Sir Walter Scott, whose writings were at this time creating a great scnsation throughout Europe, and probably had their influence upon our author. Karamzin appears openly as the panegyrist of the auto- cracy ; indeed, his work has been styled the ‘‘ Epic of Despotism.” He does not hesitate to avow his admiration of Ivan the Terrible, and considers him and his grandfather Ivan III. as the builders up of Russian grcatness, a glory which in his earlicr writings, per- haps at that time more under the influence of Westcrn ideas, he had assigned to Peter the Great. In the battle-pieces (¢.g., the description of the field of Koulikovo, the taking of Kazan, &c.) we find considerable powers of description ; and the characters of many of the chief personages in the Russian annals are drawn in firm and bold lines. The study of ethnology and historical criticism has advanced so much since the daysof Karamzin that some of his work has necessarily become obsolete, but it will always be read with pleasure and advantage. No translation into English of this opus magnum has appeared, although even modern Greek boasts its version, Of the French translation by MM. Saint Thomas and Jauffret Karamzin himself had a mean opinion ; he declared that the average number of mistakes in each of the many volumes was two hundred. As a critic Karamzin was of great service to his country ; in fact he may be regarded as the founder of the review and essay (in the Western stylc) among the Russians. He had read extensively, and modelled himself upon Addison and others of our best writers. As a novelist and writer of tales he imitated the sentimental school then in vogue throughout Kurope. As a poet he occupies a subordinate place, but his productions are above mediocrity. Many of his lyrics are graceful and mclodious, and the sentiments

expressed are those of a benevolent and healthy- minded man. The little poem entitled The Grave deserves special mention.

KARASU-BAZAR, a town of Russia, in the govern- ment of Taurida, near the rivers Tunas and Karasu, in 45° 3’ N. lat. and 34° 26’ E. long., 27 miles from Sim- pheropol on the road to Theodosia. The site is low, but it is surrounded by hills, one of which, the Ak-Kaya or White Rock, not only affords protection from the north wind, but so reflects the sunshine upon the town that it enjoys a much milder climate than the surrounding region. The dirty streets full of petty traders, the gloomy bazaar with its multitude of small shops, the market squares, the blind alleys, the little gates in the dead court-yard walls, all give the place the stamp of a Tartar or Turkish town, and remind the visitor that here was after 1763 the seat of the Crimean khans. In 1861 there were twenty-four mosques, but several have fallen into decay ; in one of them is the tomb of Yakubaga-Rudzvitch, the founder of the well-known Crimean family. Of the nume- rous caravanserais, the Tash-Khan is the most notable —a strong half-fortified building erected in 1656. Placed on the high road between Simpheropol and Kertch, and in the midst of a country rich in corn-land, vineyards, and gardens, Karasu-Bazar used to be a chief seat of commer- cial activity in the Crimea; but it is gradually declining in importance. The population consists of Armenians, Greeks, Jews, Tartars, and (in smaller numbers) Russians. The bulk of the trade is in the hands of the Armenians, and they are also the owners of the great proportion of

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the buildings in the town. About 2000 of the Jews are what are kuown as Krimtchaks, or sometimes as Con- stantinopolitan Jews. From the ordinary “rabbinical Jews” of Russia they differ by wearing the Tartar costume and by the use of the Tartar tongue, instead of the German jargon. They are engaged in making leather, Tartar knives, Tartar embroidery, and similar articles The population of Karasu-Bazar is given by the St Petersburg Calendar for 1874 as 14,397. Round about the town lie cemeteries of unusual extent.

By Thunman and others Karasu-Bazar has been identified with the Greek town of Mauron-Kastron, but Professor Bruhn thinks that, as there las never

apparently been any fortress at Karasu-Bazar, the site of the ‘‘ Black Castle” is more probably at Mangup-Kale. The caves of Akkaya, however, give evidence of early occupation of the spot. When in 1786 Khan Feta Ghirei was driven by the Russians from Bakhchisarai he settled at Karasu-Bazar, but next year the town was captured, plundered, and burned by General Douglas, In1784it was the temporary seat of the Russian adminis- tration of the Crimea.

KARATCHEFF, a town of Russia, in the government of Orel, near the river Snezheti, 59 miles north-west from Orel on the railway to Smolensk. The population is given in the St Petersburg Calendar for 1874 at 10,023. A

yearly fair is held in the adjoining village of Berezhka, and |

a good trade is carried on in agricultural produce, as well as in the oil, wax candles, ropes, &c., furnished by the local industry.

Karatcheff is mentioned as early as 1146. In the 17th century it was one of the frontier or ‘‘ watch” towns of Russia towards the Crimea, and sent out its scouts as far as Kursk. About half the inhabitants perished of the plague in 1654. Only since 1778 has the town been at the head of a district in Orel; it formerly belonged to the governments of Kieff (1708) and Biclgorod (1782).

KARATEGIN, a country of Central Asia, now subject to Bokhara, consisting of a highland district between the Hissar and the Darwaz chains. It is bounded on the N. by

Kashgar, on the 8. by independent Darwaz, and on the W. by Hissar and other Bokharian provinces. The plateau is traversed by the Surkhab or Kyzyl Su, a right-hand tribu-

tary of the Oxus, which rises in the Alai mountains, and | for the first 132 miles of its course “runs through gorges |

of extreme wildness.” Below the hamlet of Khantia-hota (according to Abramof), the valley widens considerably, and at Sar-i-pul, the only point where it is crossed by a bridge, the river has a depth of 7 feet. With the

neigh- bouring lands Karategin has no communication except during summer, that is, from May to September. The

winter climate is extremely severe even in the more popv- |

lous districts ; the snow begins to fall in October, and it is May before it disappears. During the warmer months, how- ever, the mountain sides are richly clothed with the foliage of maple, mountain ash, apple, pear, and walnut trees; the orchards furnish, not only apples and pears, but peaches, cherries, mulberries, and apricots ; and the farmers grow so much corn that the surplus is a regular article of export to the neighbouring states, Every householder has a portion of the soil which he can call his own; but if he leave it fallow for more than three years in succession, he runs the risk of having it confiscated by the Government. Some proprietors possess as much as from 300 to 500 acres, and keep from ten to twelve yoke of work oxen and from six to twelve labourers. The necessity of storing fodder to last for five months tends to keep low the number of domestic cattle. Both cattle and horses are of a small and hardy breed. ‘The wild animals—bears, wolves, foxes, jackals, lynxes, martens, otters, d&c.—are of no small economic im- portance ; but the hunters and trappers are obliged to sell their pelts to the Government at half the market price. Rough woollen cloth and mohair are woven by the natives during their long winter; and they make excellent fire-

arms and other weapons. Trade is still carried on by barter, there being neither coinage nor fixed market-place in the country, Foreign wares—iron, cotton, silk, combs, mirrors, soap, .c.—are introduced by merchants from Kashgar and Hissar, who receive in exchange mainly cattle, hides, and skins. Gold, however, is found in various places, more particularly at Sarym Saly (according to Abramof) ; and there are salt-pits in the mountains near Langar-sha, The chief town, Harm or Gharm, is a place of some eight hundred houses (Arandarenko says three hundred and forty) situated on a hill on the right bank of the Surkhab. With the exception of about five thousand tents of nomadizing Kirghiz, the inhabitants of Kara- tegin are understood to be Galtchas—by some identified with, by others distinguished from the Tadjiks. They speak a Persian dialect and profess the

Mohammedan faith. Schuyler, who met with some of them at Khokand, de- scribes the Karateginese as swarthy, thickset, good-natured fellows, who, gathered in a circle, would after prayers and supper tell tale after tale and legend after legend till they dropped off to sleep. It is calculated that the settled popu- lation of Karategin may amount to about 382,000 souls, the number of households being 36,672, distributed among four hundred settlements.

Karategin has hardly been touched by European exploration (the first expedition was that of Oshanin in 1878); and of its his- tory almost nothing is known. The native princes or shahs, who claimed to be descended from Alexander the Great, were till 1868 practically a and kept up a considerable degree of state. Their allegiance was indeed claimed in an ineffective way by Khokand, but eventually Bokhara took advantage of intestine feuds to secure their real submission. Some geographers (Kiepert, for example) lave been disposed to recognize in Karategin the Pareetaceni of Alexander's historians, and Colonel Yule has con- jecturally identified it with the Holumo (Garma ?) of Hwen Tsang.

See Abramof in Journ. Roy. Geogr. Soc., 1871; Arandarenko's

| paper in the Russische Revue, epitomized in Das Ausland, 1878 ; the Russian province of Ferghana (Khokand), on the E. by |

and letters from Oshanin in Globus, 1878. See also Colonel Yule's essay prefixed to Wood's Journey to the Source of the River Oxus,

1872.

KARAULIT, or Kerow y, a native state in Rajputana, India, lying between 26° 3' and 26° 49' N. lat., and between 76° 35' and 77° 26' E. long. It is entirely surrounded by neighbouring states, and has an area of

_ about 1260 miles, and an estimated population of 140,000.

Almost the entire territory is composed of hills and broken ground, but there are no lofty peaks, the highest having an elevation of less than 1400 feet above sea-level. The Chambal river flows along the south-east

boundary of the state. Iron ore and building stone comprise the mineral resources of Karauli. The prevailing agricultural products are bdjra and jodr, which form the staple food of the people. The only manufactures consist of a little weaving, dyeing, wood-turning, and stone-cutting. The principal imports are piece goods, salt, sugar, cotton, buf- faloes, and bullocks; the exports rice and goats. The Brahmans form the most numerous class of the population. The Minas, who come next, make up the bulk of the culti- vating class. The Rajputs, although numerically few, con- stitute the most important section. These belong almost entirely to the Jadu clan; they make good soldiers, but are indifferent agriculturists. The feudal aristocracy of the state consists entirely of Jadu thakirs connected with the ruling house. They pay a tribute in lieu of constant military service, but in case of emergency or on occasions of state display they are bound to attend on the chief with their retainers. The mahardaja is the head of the clan, which claims descent from Krishna.

KARAULI, or KEROWLY, the capital of the above state, is situated in 26° 30’ N. lat. and 77° 4’ E. long. The town, which is fortified, is surrounded by a wall of sand- stone, and is also protected on the north and east by deep

winding ravines. The streets are narrow and irregular, and almost impassable for wheeled conveyances ; there are, however, many costly houses and handsome temples, the sole building material being sandstone. The population is estimated at 28,000.

KARCZAG, or Karpszac, a corporate town of Hungary, and formerly the capital of the district of Great Cumania (now included in the county of Jasz-Nagy-Kun-Szolnok), lies about 88 miles east-south-east of Budapest, with which city it is connected by railway, in 47° 19’ N. lat., 20° 56’ E. long. Karczag is a large straggling town, and contains Roman Catholic, Greek Orthodox, and Protestant churches, royal and magisterial courts of law, and tax and post offices. The soil of the surrounding country is exceedingly humid and fertile, and enormous quantities of melons, fruit, grapes, wheat, maize, rape-seed, and mangcorn are grown. In the more marshy places water-fowl and tortoises are caught in large numbers. 1880, 15,962, almost exclusively Magyars.

KARIKAL, a French town and settlement in India,

of 52 square miles, and a population of 92,516. The site was purchased by the French from the Tanjore raj& in 1738.

It was captured by the English in 1760, restored in 1765, Sinh, appropriated the fort of Kdithal, which had been built during

again taken in 1768, and finally restored in 1816. It formed the base of Lally's operations against Tanjore. The town is neatly built on one of the mouths of the Kaveri (Cauvery), and carries on a brisk trade with Ceylon, Europe, and the French colonies, exporting rice, and importing chiefly European articles and timber. A, chef de l'administration, subordinate to the government at Pondicherri, is in charge of the settlement.

KARMATHIANS. See Arasta, vol. ii, p. 259, and MoHAMMEDANISM.

KARNAK. See Arcuitecturs, vol. ii. p. 390, and Heyer, vol. vii. p. 777.

KARNAL, a district in the lieutenant-governorship of

the Punjab, India, lying between 29° 9' and 30°11' N. | lat.,and between 76° 13' and 77° 15' 30" E. long., bounded |

on the N. by Umballa (Ambala) and the Patiala state, W. by Patidla and Jind states and by Rohtak district, 8. by Delhi district, and E, by the Jumna river, The area is 2351 square miles. Karnal forms a portion of the low dividing ridge which separates the watersheds of the Indus and the Jumna. The district falls naturally into two divisions—the bdngar, or upland plain, and the khdédar, or low-lying land, which skirts the valley of the great river. The banks of the larger streams are fringed with magnificent forest trees, and groves of mangoes mark the neighbourhood of every temple or homestead. Irrigation is afforded by the western Jumna canal. As a whole, Karnal is better supplied with trees than most of the plain country of the Punjab. The Jumna itself here presents the usual characteristics of the upper part of its course. Sandbanks shift from one side to the other of the main channel, and from time to time the whole stream suddenly changes its bed, transferring half a dozen villages together from Muzaf- farnagar to Karnal,

or vice versa. The district is famous for its sport. The population in 1868 amounted to 610,927 (330,763 males and 280,164 females)—Hindus, 356,305; Mohammedans, 151,723; and ‘others,” 93,604. Jats numbered 74,840, representing the chief agricultural element ; Brahmans, 52,396, most of them engaged in tillage ; Rajputs, 47,860, chiefly Mohammedans; Chamars, the land- less labouring class, 37,053 ; pastoral Guijars, 20,857, about one-third o them Mohammedans. Five towns have a population exceeding 5000, viz., Karnal, 27,022; Panipat, 25,276; Kaithal, 14,940; Sewan, 6206; and Kunjpurah, 5163, The area under cultivation is 645,120 acres, the uncultivated arca 860,800 acres, of which 578,027 are

cultivable. The principal spring crop is wheat ; the autumn harvest consists of rice, cotton, and sugar-cane, besides millets and pulses

Population in |

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for home consumption. The growth of the more lucrative crops is on the increase. Grain and raw materials are exported to Umballa, Hissar, and Delhi,—the return trade consisting of Euro- pean piece goods, salt, and refined sugar. A considerable quantity of cotton is woven for local use. Sal-ammoniac is obtained from the clay of Kaithal and Gula tahsils to the value of £3450 per annum. Karnal town has a few blanket factories, and ornainental glass-ware is made at Panipat. The Grand Trunk Road connects Karnal with Delhi and Umballa. The district is administered by a deputy commissioner. In 1872-73 the revenue was £78,847, of which £67,048 was derived from the land ; and education was afforded by 99 schools, with 2541 pupils.

No district of India can boast of a more ancient history than Karnal, as almost cvery town or stream is connected with the legends of the Mahdbhdrata. The city of Karnal itself is said to owe its foundation to Raji Karna, the mythical champion of the Kauravas in the great war which forms the theme of the national epic. Panipat, in the south of the district, is said to have been one of the pledges demanded from Duryodhana by Yudisthira as the price of peace in that famous conflict. In historical times the plains of Panipat have three times proved the theatre of battles which decided the fate

of Upper India. It was here that Ibrahim Lodi and his vast host were defeated in 1526 by the veteran army of Baber ; in 1556 Akbar reasserted the claiins of his family on the

‘ ne a | same battlefield against the Hindu general of the house of Sher situated on the south-east coast, within the limits of Tanjore | 4 ‘

district, 10° 55’ 10” N. lat., 79° 52’ E. long., with an area |

Shah, which had driven the heirs of Baber from the throne for a brief interval ; and at Panipat too, on the 7th of J anuary 1761, the Marhatta confederation was defeated by Ahmed Shah Durdani. During the troublous period which ensued, the Sikhs managed to introduce themselves, and in‘1767 one of their chieftains, Desu

the reign of Akbar. His descendants, the Bhais of Kaithal, were reckoned amongst the most important cis-Sutlej princes. Different portions of this district have lapsed from time to time into tlie hands of the British. The towns are not generally in a flourishing condition, but the district possesses considerable commerce and great agricultural resources.

KARNAL, a niunicipal town, the headquarters of the above district, 29° 42’ 17” N. lat., 77° 1’ 45” E. long., with a population in 1868 of 27,022. The civil station stretches to the west of the town. The Government main- tains a large studfarm. There is a brisk trade with Delhi and Umballa; country cloth is manufactured for local consumption, and blankets for export, the latter trade en1- ploying about one hundred looms.

KARNUL, a district in Madras, India, bounded on the N. by the Tungabhadra and Kistna rivers and by Kistna district, 8. by Cuddapah and Bellary, E. by Nellore and Kistna, and W. by Bellary, lies between 14° 54’ and 16° 14’ N. lat., and between 77° 46’ and 79° 15’ E, long., with an area of 7151 square nuiles.

Two long mountain ranges, the Nallamalais and the Yellamalais, extend in parallel lines, north and south, through the centre of the district. The principal heights of the Nallamalai range are Biranikonda (3149 feet), Gundlabrahmeswaram (3055 feet), and Durugapukonda (3086 feet). .The

Yellamalai is a low range, generally flat-topped with scarped sides; the highest point is about 2000 feet. Several low ridges run parallel to the Nallamalais, broken here and there by gorges, through which mountain streams take their course. Several of these gaps were dammed across under native rule, and tanks formed for purposes of cultivation. One of these is the magnificent Cumbum Tank, closed in by a dam across the Gundlakamma river. It covers an area of nearly 15 square miles. The principal rivers are the Tun- gabhadra and Kistna, which bound the district on the north. When in flood, the Tungabhadra averages 900 yards broad and 15 feet deep. In 1860 an anicut or weir was built across the river at Sunkesala, 18 miles above Karnul town, and a canal dug for irrigation and navigation. The Kistna flows here chiefly through un- inhabited jungles, sometimes in long smooth reaches, with intervening shingly rapids. The Bhavandsi rises on the Nallamalais, and falls into the Kistna at Sun- gameswaram, a place of pilgrimage. Below their junc- tion is a whirlpool which is regarded as holy by the

native pilgrims. There are three recognized forest divi- sions in the district —the Nallamalai, the Vellikonda, and the Yellamalai. The first two are conserved by the forest department. The chief timber-trees are teak and yept. In the northern parts, where the jungle is poor, there are extensive level grassy lands, which afford pasture to numerous herds of cattle. The jungle products consist of gall-nuts, honey, wax, tamarinds, stick-lac, and bamboo rice. Tigers are numerous in the Nallamalais, and commit great havoc among the herds of cattle pastured in the jungles. The other animals include cheetahs, wolves, hyenas, foxes, bears, spotted deer, wild goats, several varieties of antelopes, bison, porcupines, and pigs.

The population in 1871 numbered 914,432, of whom 819,453 were Hindus, 60,579 Mohammedans, and about 3844 Christians, chiefly Roman Catholics, whose principal station is at Polur. The Catholics originally belonged to the Kapu caste, and their conver- sion to’ Christianity has not made any material change in their manners and customs. They eat and drink with Hindus, and in several cases intermarry with them. The Protestant converts are almost entirely low-caste natives in rural tracts. The wild tribes

or Chenchus live on the Nallamalais in small communities called gudems, Each gudem includes several tribes, and has a portion of the hills allotted to it by common consent. The Chenchus are unwilling to cultivate, but are sometimes employed by the villagers in the plains to watch their fields during the harvest, and some of them are employed as road watchmen. During the hill festival they collect fees from pilgrims. Some of them also enjoy free lands for guarding the jungles. The principal towns are Karniul (population in 1871, 25,579), Nandial (9378), Cumbum (7137), Gudur (5825), Meddikera (8586), Kodumnir (6064), and Paikali

5076).

The chief crops are rice, wheat, and other cereals, gram, cotton, tobacco, indigo, sugar-cane, betel, chillies, &e. The staple of the district is cholam (Sorghum vulgare). The total area under cultiva- tion in 1877 was 2,089,689 acres, area uncultivated but capable of cultivation 1,017,389 acres, and uncultivable waste 1,396,602 acres. There is not much waste land in the plains, but there is a good deal in the Nallamalais, which was cultivated in ancient times, but is now overgrown with jungle. The main canal of the Madras Irrigation Company, intended for both irrigation and navigation, runs 142 miles within Karnul; the extent actually irrigated in 1875-76 was 10,479 acres. Both Karnul and the neighbouring district of Bellary suffer from droughts at periodic intervals ; and, the mass of the population being small landowners, with no reserve capital, the failure of a single monsoon involves general distress; 1804, 1810, 1824, 1838, 1854, 1866, and 1876 were all years of drought and consequent scarcity. In the famine of 1876-77 nearly £600,000 was spent on relief works, yet the number of deaths recorded from 1st October 1876 to 30th June 1877 was 48,000, as compared with 19,974 in the corresponding period of the previous year. The chief manufacture in Karnul is weaving. Iron is worked at the foot of the Nallamalais. Of late years this industry has greatly diminished, native iron being superseded for agricultural implements by imported iron. Diamond mines have becn worked from early times in the quartzite beds of the Yellamalai hills, which are now rented out by Government for about £20 a year. Quarry- ing stones is an important industry. manufactured. Weekly markets are held in most of the towns and important villages. There is little or no export of grain. Salt is imported from the eastern coast, but earth salt

is largely manu- factured. Cotton, indigo, tobacco, and hides, with cotton carpets and cotton cloth, are the chief exports. European piece goods, areca-nut, cocoa-nut, and various dry condiments required for native houseliolds are the chief imports. The total net revenue of the district in 1870-71 was £196,468, the total civil expenditure £46,998 ; the land revenue was £135,929. Edncation is backward, only 4 per cent. of the population in 1871 being returned as able to read and write. In 1875 there were altogether 263 schools, with 5781 pupils. The climate is on the whole healthy. The prevailing

winds are west and north-east, and the mean temperature is about | and the population within the walls amounts to 25,000.

85° Fahr. The total annual rainfall is about 35 inches. In the villages along the foot of the Nallamalais, a severe type of fever prevails, accompanied by enlargement of the spleen.

Karntt, the headquarters of the above district, in 15° 49’ 58” N, lat. and 78° 5’ 29” E. long., had a popu- lation in 1871 of 25,579. It is a hot unpleasant town,

built on rocky soil at the junction of the Hindri and ,

Tungabhadra rivers. The old Hindu fort was levelled in 1865, with the exception of one of the gates, which was preserved as a specimen of ancient architecture, and in some measure restored. In the famine of 1877-78 Karnul

Indigo and sugar are also.

and the surrounding country suffered terribly, owing to their isolated position. The nearest railway station is Gooty, 80 miles distant ; and it was only by extraordinary efforts that food was conveyed to the town. The popula- tion is half Hindu and half Moslem, this unusual propor- tion marking the long rule of the Pathan nawabs.

KARS, a fortified town of Armenia, formerly at the head of a sandjak in the Turkish vilayet of Erzeroum, but since 1878 the centre of a territory attached to the Russian governor-generalship of the Caucasus. It: is situated in 40° 36’ 52” N. lat. and 43° 5’ 76” FE. long,, 30 miles south-west of Alexandropol (Gumri) and 130 miles north-east of Erzeroum, on the eastern end of a spur of the Soghanli Dagh, the site of the town proper being cut off from the rest of the range by the Kars Tchai, a sub-tributary of the Araxes. There are three considerable suburbs—Orta Kapi to the south, Bairam Pasha to the east, and Timur Pasha on the western side of the river. To the south-eastward opens up a vast plain. Owing to the

| bareness of the dark basalt hills, and the sombre colour of

the buildings, a touch of melancholy mingles with the picturesqueness of the view. At the north-west corner of the town, overhanging the river, rises the ancient citadel (the Itch Kaleh of the Turks), which in earlier times was a strong military post, but is now of almost no moment in a regular siege, being commanded completely by several of the surrounding eminences. The value of the position depends on the line of forts, and even this is greatly diminished by the fact that they are disposed in a circuit of about 10 miles round the town. Of chief importance are the works on the Kara Dagh heights to the north-east and the line on the heights above the left bank of the river. The population of Kars was at one time estimated at 40,000; but, according to Baron von Seidlitz, it had in 1878 only 8672 inhabitants (including 7330 Turks, 1191 Armenians, 138 Greeks).

Though during the 9th and 10th centuries the seat of an inde-

endent Armenian principality, Kars has nothing to boast of beyond its military fame. The citadel, it would appear, was built by Amurath III. during the war with Persia, in the close of the 16th century. It was strong enough to stand a siege by Nadir Shah in 1731, and in 1807 it successfully resisted the Russians. After a brave defence it surrendered on 23d June 1828 to the Russian general Paskievitch, 11,000 men becoming prisoners of war. During the Crimean war the Turkish garrison, guided and stimu- lated by General Williams (afterwards knighted as Sir W. Fenwick Williams of Kars) and other foreign officers, kept the Russians gallantly at bay during a protracted siege; but, after the garrison had been devastated by cholera, and

food had utterly failed, nothing was left but to capitulate (November 1855). The fortress was again stormed by the Russians in the war of 1877-78.

See Kmety, Zhe Defence of Kars, 1856, translated from the German; Lake, Kars and our Captivity in Russia, 1856, and Narrative of the Defence of Kars, 1857; Dr Sandwith, The Siege of Kars, 1856; C. B. Norman, Armenia and the Campaign of 1877, 1878; Greene, Russian Army and its Campaigns in Turkey,

1879,

KARSHI, an important town of Central Asia, the centre of a begship dependent on Bokhara. It is situated about 85 miles south-south-west of Samarkand, in a vast plain at the junction of two of the main confluents of the Kashkadarya, a river which, though fed by numer- ous mountain streams, soon loses itself in the sands. It isa large and straggling place, with a circuit of 5 miles,

There are three colleges, with accommodation for upwards of three hundred studeuts. The Biki mosque is a fine building inlaid with blue and white tiles. All the ordinary houses are built of clay, but they are often two stories high. Along the river stretches’a fine public promenade sheltered by clumps of poplars. Round the town lie gardens and fields watered from wells. Poppies and tobacco are both largely grown, the tobacco being deemed the best in Central Asia. There is also a considerable trade in grain ; but the commercial prosperity of Karshi is mainly due to

the fact that it is a meeting point for the roads from Samarkand, Bokhara, Hissar, Balkh, and Maimene, and serves as the mercantile centre for the surrounding steppes, the market where horses are obtained for the caravans, and where the Turkomans and Uzbegs dispose of the products of their camps (carpets, seats, dc.). The knives and weapons manufactured in Karshi are known as far as Persia and Arabia, and its coppersmiths turn out excellent work.

KaRWaR, or Carwak, the chief town and headquarters station of North Kanara district, Bombay, 50 miles south- east of Goa, 14° 50’ N. lat., 74° 14’ E. long. It was once an important place of commerce ; the East India Company had a factory there in the year 1663. It is the only safe harbour all the year round between Bombay and Cochin. In the bay is a cluster of islets called the Oyster Rocks, on the largest of which is a lighthouse. There are two smaller islands in the bay, which afford good shelter to native craft and small vessels during the strong north-west winds that prevail from February to April. The average annual value of the imports at Karwar port during the five years ending 1873-74 was £244,469, of the exports £310,884. Population in 1872, 13,263.

KASAN. See Kazan.

KASANLIK, or KezantyxK, a town of Roumelia, in the vilayet of Adrianople, is situated at the foot of the Balkans, about 5 miles south of the Shipka Pass, in a highly fertile plain watered by the Tundja and its nume- rous tributaries. sive fields of roses grown for the manufacture of attar of roses, which is exported largely to western Europe. Maize isalso grown ; and cattle and sheep are reared in consider- able numbers. of walnut trees. The Russo-Turkish war of 1877-78 has done serious injury to the prosperity of the whole region, and has told on the production of attar of roses, which formerly was estimated at about 200 gallons for the Kasanlik district. The population is variously esti- mated at from 10,000 to 12,000. Two-thirds of these are Bulgarians and Christians ; the remainder are Turks.

KASCHAU (Hung., Kassa; Lat., Cassovia), an ancient royal free town, and capital of the cis-Tisian county of Abauj, Hungary, is pleasantly situated on the right bank of the Herndd, ina valley surrounded by sloping vineyards, about 130 miles north-east from Budapest, with which city, as also with Cracow, Lemberg, and other centres, it is connected by railway, 48° 42’ N. lat., 21° 17’ E. long. Kaschau is the see of a Roman Catholic bishop suffragan of Eger (Erlau), the headquarters of the general adminis- tration for the county, and has royal and magisterial courts of law, as well as boards of assay, finance, and postal direction, and the supervision of the tobacco manufacture. Kaschau is one of the best built towns in Hungary, and consists of the inner town, intersected by the Csermel, which forms an

island and is crossed by several bridges, and three suburbs (upper, middle, and lower) approached by a broad glacis. The most remarkable edifice, considered the grandest masterpiece of architectural skill in Hungary, is the cathedral of St Elizabeth, situated in the great square, and built in a faultless Gothic style. Commenced about 1270 by Stephen V., the structure was continued 1324-82 by Queen Elizabeth, wife of Charles I., and her son Louis I., and finished about 1468, in the reign of Matthias I. (Corvinus). The interior was transformed in the 18th century to the Renaissance style, and restored in 1859-65. The church of St Michael and the Franciscan or Garrison church date from the 13th century. The royal law academy, founded in 1659, and sanctioned by golden bull of King Leopold I. in 1660, has an extensive library ; there are also a museum, a Roman Catholic upper

Throughout the plain there are exten-_

The town is surrounded by valuable woods |

‘are but of hard clay, and are much out of repair.

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and benevolent institutions. Kaschau is the centre of the trade for the surrounding counties in wine, gall-nuts, salt, and most descriptions of grain, and from its com- mercial importance forms a kind of provincial capital. About 3 miles north-west of the town are the baths of Banké, with alkaline and ferruginous springs. The popu- lation of Kaschau in 1880 amounted to 26,422 (in 1870 it was 21,742), consisting of Magyars, Germans, Slovaks, and Ruthens. The majority are Roman Catholics.

Kaschau consisted originally of two villages, Upper and Lower Kassa, of whieh the latter was created a town and granted special privileges by Béla IV. (12385). Under Stephen VY. (1270) the two separate portious were united, and raised to the rank of a royal free town. In 1290 it was surrounded with walls. The subsequent history presents a long record of revolts, sieges, and disastrous conflagrations. In 1430 the plague carried off a great number of the inhabitants, In 1458 the right of minting money

according to the pattern and value of the Buda coinage was granted.to the municipality by King Matthias J. The bishopric was established in 1804. In the revolutionary war of 1848-49 the Hungarians were twice defeated before the walls of Kaschau by the Austrians under General Sehlick, and the town was held successively by the Austrians, Hungarians, and Russians.

KASHGAR, or KAsHauar, an important city of eastern Turkestan, in 39° 24° 26” N. lat., 76° 6’ 47” I. long, 4043 English feet above the sea-level. It consists of two towns, Kuhna Shahr or “old city,” and Yangi Shahr or “new city,’ about 5 miles apart, and separated from one another by the Kizil Su, a tributary of the Tarim river, which receives and deposits in the distant lake Lob Nor the drainage of the vast semi-desert plain included between the Kuen-lun, Thian Shan, and Pamir mountains. Situated at the junction of routes from the valley of the Oxus, from Khokand and Samarkand, Almati, Aksu, and Khotan, the last two leading from China and India, Kashgar has been noted from very early times as a political and commercial centre. Like all other cities of Central Asia, it has changed hands repeatedly, but its greatest modern prominence is probably due to its having formed a few years ago the seat of government of the Amir Yakub Beg, surnamed the Atalik Ghazi, who established and for a brief period ruled with remarkable success a Mohammedan state comprising the chief cities of the Tarim basin from Turfan round along the skirt of the mountains to Khotan. During his rule both Russian and British missions visited Kashgar, and it is chiefly to this circumstance that we are indebted for a full and tolerably recent knowledge thereof. KuhnaShahr is a small fortified city on high ground overlooking the river Tuman. Its walls are lofty and supported by buttress bastions with loopholed turrets at intervals; the fortifications, however, The city contains about 2500 houses. Beyond the bridge, a little way off, are the ruins of ancient Kashgar, which once covered a large extent of country on both sides of the Tuman, and the walls of which even now are 12 feet wide at the top and twice that in height. This city—Aski Shahr as it is now called —was destroyed in 1514 by Mirza Ababakar on the approach of Sultan Said Khan’s invading army. About 2 miles to the north beyond the river is the shrine of Hazrat Afak, the saint king of the country, who died and was buried here in 1693. It is a handsome mausoleum faced with blue and white glazed tiles, standing under the shade of some magni- ficent silver poplars. About it Yakub Beg erected a com- modious college, mosque, and

monastery, the whole being surrounded by rich orchards, fruit gardens, and vineyards. The Yangi Shahr of Kashgar is, as its name implies, quite modern, having been built in 1838. It is of oblong shape running north and south, and is entered by a single gatc- way. The walls are lofty and massive, and topped by

gymnasium and seminary for priests, and other schools | turrets, while on each side is a projecting bastion to protect

the curtains by a flank fire. The whole is surrounded by a deep and wide ditch, which can be filled from the river, at the risk, however, of bringing down the whole structure, for the walls are of mud, and stand upon a porous sandy soil. In the time of the Chinese, before Yakub Beg's sway, Yangi Shahr held a garrison of six thousand men, and was the residence of the amban or governor. Yakub erected his orda or palace on the site of the amban's residence, and two hundred ladies of his harem occupied a commodious enclosure hard by. The mixture of the various types seen in the markets of Kashgar has struck more than one traveller. A square-faced flat-nosed Calmuck, with high cheek bones and a ruddy hairless countenance, stands next to an Afghan of gigantic proportions, with nut-brown complexion, handsome features, and glossy black beard, while one's eye rests next on the fair, full face and Dutch built frame of the Andijani, who is jostled in turn by the familiar black-skinned and oily-faced Hindustani Mussul- man, the muddy-complexioned opium-smoking Chinaman, and the brown-skinned bewhiskered and gentle-looking Badakshi, with high full forehead, long arched finely carved nose and oval face of the true Aryan stamp. The population of Kashgar at the time of the visit of Sir Douglas Forsyth's mission in 1873 was about 112,000. With the overthrow of the Chinese rule in 1865 the manufacturing industries of Kashgar declined, and in the case of some of the profitable arts altogether disappeared. Silk culture and carpet manufacture have flourished for ages at Khotan, and the products always find a ready sale at Kashgar. Other manufactures consist of a strong coarse cotton cloth called 'ham (which forms the dress of the common people, and for winter wear is padded with cotton and quilted), boots and shoes, saddlery, felts, furs and sheep skins made up into cloaks,

and various articles of domestic use. A curious street sight in Kashgar is pre- sented by the hawkers of meat pies, pastry, and sweet- meats, which they trundle about on hand-barrows just as their counterparts do in Europe; while the knife-grinder's cart, and the vegetable seller with his tray or basket on his head, recall exactly similar itinerant traders further west. The earliest mention of Kashgar of which we have any authen- tic record is during the second period of ascendency of the Han dynasty, when the Chinese general Pan-Shan conquered and wrested from the hands of their masters the Hiungnu, Yutien (Khotan), Sulei (Kashgar), and a group of states in the Tarim basin almost up to the foot of the Thian Shan mountains. This happened in 76 B.C., about the time that the Chinese and Roman empires attained their furthest expansion of dominion westward and eastward respec- tively, and were separated only by the breadth of the Caspian. Kashgar Tics in the country which Ptolemy calls Scythia beyond the Imaus ; in this he has a Kasta Regio, possibly exhibiting the name whence Kashgar is formed. Next ensues a long epoch of obscurity. The Chinese lost their hold over the western provinces, and Ptolemy found no successor to continue his investigations into the countries of the far East. In 634 Tai-tsung re-established Chinese sway over eastern Turkestan and Sulei (Kashgar), and other places were converted into garrison towns. It was shortly after this that Hwen Tsang passed through Kashgar (which he calls Kie-sha) on his return journey from India toChina. The Buddhist religion, then fast decaying in India, was working its way to a new growth in China, and contemporaneously the Nestorian Christians were establishing bishoprics at Herat, Merv, and Samarkand, whence they subsequently proceeded to Kashgar, and finally to China itself. In the 8th century came the Arab invasion from the west, and we find Kashgar and Turkestan lending assistance to the reigning queen of Bokhara, to enable her to repel theenemy. But although the Mohammedan religion from the very commencement sustained checks, it nevertheless madc its weight felt upon the independent states of Turkestan to the north and east, and thus acquired a steadily growing influence, which, aided as it was through the chan- nels of trade, facilitated the spread of the faith, and brought it into serions collision with the Chinese religion, a struggle which has en- dured down to our day, and can by no means be said to be unlikely to recur. It was not, however, till the close of the 10th century that Islam was established at Kashgar, when a prince of the here- ditary family of Bughra Khan becaine a

convert thereto, and en- forced it upon his subjects at the point of the sword. After an

interval, during which the Kara Khitai, a nomad race from the north-east under rulers called the Gur Khans, became suzerains of Kashgar, the growing power of Jenghiz Khan began to overspread the Kashgar borders. This great conqueror in the space of six years overran the entire country from Azerbijan on the west to the Indus on the east, and from the steppes of Kipchak on the north to Scis- tan on the south, laying waste and butchering with a ferocity which is said to have left its traces for centuries after. The invasion of Jcenghiz Khan had given a decided check to the progress of the Mohammedan creed, but on his death, and during the rule of the Chaghatai Khans, who became converts to that faith, Islam began to reassert its ascendency. In 1889-90 Timur the Mughal under- took a campaign for the conquest of Moghulistan, and one of his armies ravaged Kashgar, Andijan, and the intervening country. Moghulistan was at this time under the governorship of Khudadad, a beneficent and popular ruler, who at a later date entertained the famous embassy sent from Shah Rukh to the emperor of China. Kashgar next passed through a troublous time, and in 1514, on the invasion of the Khan Sultan Said, was destroyed by Mirza Ababakar, who with the aid of ten thousand men built the new fort with massive defences higher up on the banks of the Tuman. The dynasty of the Chaghatai Khans collapsed in 1572 by the dis- memberment of the country between rival representatives; and soon after two powerful Khojah factions, the White and Black Moun- taineers (Ak and Kara Taghluk), arose, whose dissensions and war- fares, with the intervention of the Calmucks of Zungaria, fill up the history till 1759, when a Chinese army from Ili invaded the country, and, after perpetrating wholesale massacres, finally con- solidated their authority by settling therein Chinese emigrants, together with a Manchu garrison. The Chinese had thoughts of pushing their conquests towards western Turkestan and Samarkand, the chiefs of which sent to ask assistance of the Afghan king Ahmed Shah. This monarch despatched an embassy to Peking to demand the restitution of the Mohammedan states of Central Asia, but the embassy was not well received, and Ahmed Shah was too inuch engaged with the Sikhs to attempt to enforce his demands by arms. The Chinese continued to hold Kashgar, with sundry interruptions from Mohammedan revolts,—one of the most serious occurring in 1827, when the territory was

invaded and the city taken by Jahanghir Khojah ; Chang-lung, however, the Chinese general of Ili, recovered possession of Kashgar and the other revolted cities in 1828, A revolt in 1829 under Mohammed Ali Khan and Yusuf, brother of Jahanghir, was more successful, and resulted in the concession of several important trade privileges to the Mohammedans of the district of Alty Shahr (the ‘‘six cities’’), as it was then named. Until 1846 the country enjoyed peace under the just and liberal rule of Zahir-ud-din, the Chinese governor, but in that ycar a fresh Khojah revolt under Kath Tora led to his making himself master of the city, with circumstances of unbridled licence and oppression. His reign was, however, brief, for at the end of seventy-five days, on the approach of the Chinese, he fled back to Khokand amid the jcers of the inhabitants. The last of the Khojah revolts (1857) was of about equal duration with the previous one, and took place under Wali-Khan, a degraded debauchee, and the murderer of the lamented traveller Adolf Schlagintweit. The great Tungani revolt, or insur- rection of the Chinese Mohammcdans, which broke out in 1862 in Kansuh, spread rapidly to Zungaria and through the line of towns in the Tarim basin. The Tungani troops in Yarkand rose, and (10th August 1863) massacred some seven thousand Chinese, while the inhabitants of Kashgar, rising in their turn against their masters, invoked the aid of Sadik Beg, a Kirghiz chief, who was reinforced by Buzurg Khan, the heir of Jahanghir, and Yakub Beg, his general, these being despatched at Sadik’s request by the ruler of Khokand to raise what troops they could to aid his Mohammedan friends in Kashgar. Sadik Beg soon repented of having asked for a Khojah, and eventually marched against Kashgar, which by this time had succumbed to Buzurg Khan and Yakub Beg, but was de- feated and driven back to Khokand. Buzurg Khan delivered him- self up to indolence and debauchery, but Yakub Beg, with singular energy and perseverance, madc himself master of Yangi Shahr, Yangi- Hissar, Yarkand, and other towns, and eventually became sole master of the country, Buzurg Khan proving himself totally unfitted for the post of ruler. Kashgar and the other cities of the Tarim basin remained under Yakub Beg’s rule until 1877, when the Chinese regained possession of their ancient dominions after a campaign which, originally organized years before, and conducted in the most leisurely fashion, was characteristic of the measured tenacity and resolution with which this nation follow up a settled policy. Since the rcoccupation of the country by the Chinese, trade has much declined, especially with India, this

traffic being regarded as illegal by the Chinese authorities. Heavy exactions are made for mnilitary purposes, and considerable emigration has taken place to Ladak and India. (C. E. D. B.)

KASHI, the name given to the glazed and coloured ornamentation of Mohammedan buildings in parts of Persia and India, and to the art of making it. The work is of

two kinds—on clay (bricks or tiles), and on cakes of lime mortar. For surfaces of one colour, domes, &c., both kinds are used, differing only in the shape of the tiles or mortar-cakes. Figured patterns are differently treated with the different materials. On clay tiles, the designs with their several colours are laid on by stencilling, and the tile then glazed. Designs in coloured mortar work have each separate piece of colour on a separate cake of hardened mortar, cut to the required shape; and these, glazed separately, are afterwards cemented together on the walls of the building, or first made up into complete panels, which are then set in their place on the walls. The designs are commonly foliage and flowers, or geometrical figures and interlacing arabesques, and inscriptions' in Arabic and Persian characters, and are, many of them, very beautiful.

The colours chiefly used are blue, green, yellow, purple, brown, and white. A tile is first painted over with a very fine clay paste, to make a smooth surface on which to apply the colour; and similarly the little mortar cakes . are first painted, on the side to be coloured, with a thin liquid glass. It is perhaps owing to defect in this part of the process, or to imperfect burning, that the tile figured work on some old buildings, particularly on the south side, has flaked off. The glazed work on mortar, and on tiles of one colour, is generally more permanent.

The best specimens of kashi work in India are at Tatta and Hyderabad in Sind, and at Multan and Lahore in the Punjab. There are also buildings thus ornamented, chiefly of the time of Akbar and Jahangir (16th and 17th centuries), at Delhi, Agra, Gwalior, aud some other places, but the best and most numerous are in the western provinces above named, particularly at Lahore and at Tatta) The buildings at Lahore having the finest figured kash{

work are the mosque of Wazir Khan, the gateways of certain old pleasure gardens, and the Gola Sarai. There is a tomb at the same place (the tomb of Abd' ur Razzdk) built in the early part of the 16th century, which bears the name of the blue dome, its covering being of clay bricks coloured blue on the narrow exposed face. Another, built about fifty years later (the tomb of Shahi Musa), is known as the green dome. It is covered with little mortar blocks, in shape half cylinders, coloured and glazed on the flat face, and with two deep nicks on the rounded back to give a hold on the plaster in which they are set.

The art is now carried on at Tatta, at Hala, a village 30 mniles north of Hyderabad, and at a few other places.

KASHIN, a district town of Russia, in the government of Tver, 125 miles north-east of the government town, near the Kashinka, a subtributary of the Volga. A consider- able trade is carried on in the despatch of grain to St Petersburg. The chief buildings are the cathedral and three monastic establishments. Kashin, first mentioned about 1238, was in the 14th century a separate principality which contended with Tver for pre-eminence in the region. There are still some remains of the defences erected in 1661. Population, according to St Petersburg Calendar for 1874, 7346.

KASHKAR, also called Currra, from the residence of the prince, a high-lying Mohammedan state among the spurs of Hindu Kush, has been already spoken of under Hinpu Kusa (vol. xi. p. 838). Since that was published, a work (T'ribes of the ITindoo Koosh, Calcutta, 1880) has

| come from the pen of Major Biddulph, the only European known to have visited the state, and we here enter a very | few corrections or new particulars from his work. The | geographical position of Kashkar is likely to give it great interest in the future. A considerable part of Upper Kashkar belongs to Yassin, in the Gilgit basin (see Grier, vol. x. p. 597). Indeed the left bank of the Chitral river, down to within 20 miles of Chitral itself, belongs to Yassin. The chief place of this Upper Kashkar is Mastfj (vol. x. p. 596). The rulers of the two states are of the same blood, sprung from a Khorasani adventurer who im- migrated hither about the first half of the

17th century, and are respectively descended from two brothers of his family, Shah Katér and Shah Khifishwakt, who lived a century later. The two royal families are hence known as Katéré and Khiishwakté respectively; they generally act in concert, though neither is dependent on the other. We know not the origin of the former name, but most probably it is connected with an ancient tribal name in KAriristan (g.v.). The ruler of Chitral is known both as Mvhtar, or “Prince,” and by the pretentious title of Bddshth. Te has five viziers, of whom the chief, or Dewan-begi, has charge of the king’s slave-agency, an important part of the reigning system. Under this the rulers of Chitral have come to regard the sale of their subjects as a legitimate and ordinary supplement to their revenue. But of late the market has become circumscribed. The population of the kingdom is estimated at 200,000, not including the tributary tribe of Bashgali Kafirs, wlio occupy a nearly parallel valley on the west, confluent with that of Kashkaér. The ethnology of Kashkar is very intricate. The largest, and probably aboriginal, population are called Kho. Their language, Khowdr, is closely allied to the dialects of the Kafir tribes. There are also tribes in a depressed position, immigrants from the other side of the watershed, and speaking the language of Munjan, a hill canton of the Oxus valley, calling themselves Yidghdh. In the lower part of the valley is a race, also with a peculiar language, called Gabar (mentioned by Sultan Baber), and some broken tribes of Siahposh, &c. All these constitute the lower or ryot class, who alone pay regular revenue, cannot hold slaves, and are styled fakir mushkin (“ poor beggars”). Above them are several privileged classes, descended from the founders of the reigning family, or from older ruling families also of foreign blood. We may add

that Chitral is identical with the Shang-mi of Hwen Tsang (644 a.p.), see J, R. As. Soc., new ser., vol. vii p. 114. A somewhat later Chinese record gives, as an alternative name of Shang-mi, KAiw-wet, which evidently contains the Kho just mentioned. In this Xho also we have probably an element of Choaspes, the Greek name of the Chitral river. A singular point in Chitral history is the fact that it was invaded by a Chinese army about the middle of last century, probably in 1759-60, and continued to send occasional tribute to China at least to 1769, ze, twelve years after the battle of Plassy. This was brouglit to notice by the preseut writer in 1872 (J. &. G.S., xiii. 477), when tracing the curious history of the name Bolov. And

now Major Biddulph has found in the country itself the memory of the Chinese invasion, and thus entire corroboration of the identification of the Chinese Poloeul

or Bolor with Kashkar. (@. %) KASHMIR, or CasumMeErz, an elevated and enclosed valley in the Himalaya mountains, north of the Punjab. It is surrounded by lofty hills, with one opening on the west, by which flows out from the valley the river Jhelum. The enclosing hills on the north and east belong to the Bara Lacha chain, and on their outer side is the broad mountainous region which holds the valley of the upper Indus, and which, beyond the i culminates in iy. — 2

the great parallel range of Karakorum or Mustagh. On the west and south, the hill boundary, which joins the other half of the enclosure at the south-east end of the valley, is the Panjal or Panchal range, which on its outer side sends down its branches southward, through the Jamu territory, to the plains of the Punjab. The length of the Kashmir valley, including the inner slopes of its surrounding hills, is about 120 miles from north-west to south-east. Its greatest width is about 75 miles. The low and comparatively level floor of the basin is 84 miles long and 20 to 24 miles broad. Its lowest part is 5200 feet above the sea, and its mean height 6000 feet.

This valley is but a small portion, in area, of the dominions of the mahardjé of Kashmir, which, in addition to the Jamu territory on the south (the: previous posses- sion of the present mahar4ja’s father, Ghulab Singh, before he acquired Kashmir), include Baltistén and Gilgit on the north, and Kishtwar and Ladak on the east. On the west Kashmir is separated from the valley of Khagan by a con- tinuous range of high hills, and from the British district of Hazara by the river Jhelum.

Jamu, to which Kashmir was annexed in 1846, occupies the southern slopes of the Panjal range, with a strip of plain country at their foot, and extends about 220 miles from east to west, with a greatest direct breadth, north to south, of about 75 miles. All the rest of the maharaja’s dominions is hill country.

The hills forming the northern half-circuit of the Kashmir valley, and running beyond, include many lofty mountain masses and peaks, the most conspicuous of which, a little outside the confines of Kashmir, is Nanga Parbat, a grand hill (35° 15’ N., 74° 35’ E.), rising 26,629 feet above the sea, with an extensive area of glacier on its eastern face. ‘The great ridge which is thrown off to the south-west by Nanga Parbat rises, at a distance of 12 miles, to another summit 20,740 feet in height, from which run south-west and south-east the ridges which are the northern watershed boundary of Kashmir. The former range, after running 70 miles south-west, between the valleys of the Kishanganga and the Kunhar or Nain-sikh, turns south-ward, closely pressing the river Jhelum, after it has received the Kishanganga, with a break a few miles further south which admits the Kunhar. This range presents several prominent summits, the two highest 16,487 and 15,544 feet above the sea. The range which runs south-east from the junction peak above-mentioned divides the valley of the Kishanganga from that of the Astor and other tribu- taries of the Indus’) The highest points on this range, where it skirts Kashmir, are 16,795, 16,930, and 17,202 feet above the sea. For a distance of more than 50 miles from Nanga Parbat there are no glaciers on this range ; thence eastward they increase ; one, near the Zdji-l4 Pass, is only 10,850 feet above the sea. The mountains at the east end of the valley, running nearly north and south, drain inwards to the Jhelum, and on theother side to the Wardwan, a tributary of the Chenatb. The highest part of this eastern boundary is 14,700 feet. There are no glaciers. The highest point on the Panjal range, which forms the south aud south-west boundary, is 15,523 feet above the sea.

The river Jhelum or Behat (Sanskrit Vitasta)—the Hydaspes of Greek historians and geographers—flows north-westward through the middle of the valley. After a slow and winding course it expands, about 25 miles below Srinagar, over a slight depression in the plain, and forms the Wilar lake and marsh, which is of ill-defined extent, but may be called about 10 miles long and 6 broad. The hills which this lake touches at its north end give it a more defined margin on that side. Leaving the lake on the south-west side, near the town of Sdpur, the river pursues its sluggish course south-westward, about 18 miles,

to the gorge at Baramula. From this point the stream is more rapid through the narrow valley which conducts it westward 75 miles to Muzaffirdbad, where it turns sharply south, joined by the Kishanganga. At Islamabad, about 40 miles above Srinagar, the river is 5400 feet above sea- level, and at Srinagar 5235 feet. It has thus a fall of about 4 feet per mile in this part of its course. For the next 24 miles to the Wular lake, and thence to Baramula, its fall is only about 2} feet in the mile. On the 80 miles of the river in the flat valley between Islamabad and Bara- mula there is much boat traffic; but none below Baramiula, till the river comes out into the plains.

On the north-east side of this low narrow plain of the Jhelum is a broad hilly tract between which and the higher boundary range runs the Kishanganga river. Near the east end of this interior hilly tract, and connected with the higher range, is one summit 17,839 feet. Around this peak and between the ridges which run from it are many small glaciers. These heights look down on one side into the beautiful valley of the Sind river, and on another into the valley of the Lidar, which join the Jhelum. Among the hills north of Srinagar rises one conspicuous mountain mass, 16,903 feet in height, from which on its north side descend tributaries of the Kishanganga, and on the south the Wangat river, which flows into the Sind. By these rivers and their numerous affluents the whole valley of Kashmir is watered abundantly.

Around the foot of many spurs of the hills which run down on the Kashmir plain are pieces of low table-land, which are called karéwa. These terraces vary in height at different parts of the valley from 100 to 300 feet above the alluvial plain. Those which are near each other are mostly about the same level, and separated by deep ravines.

The level plain in the middle of the Kashmir valley is fine clay and sand, with water-worn pebbles. The karéwas consist of horizontal beds of clay and sand, the lacustrine nature of which is shown by the shells which they contain. The hills surrounding the valley are chiefly gneiss and schists. In the Lidar valley are slate and sandstones of the Carboniferous period over green slate of a period corresponding to Silurian. The irregular ridges of the Panjal range are granite and gneiss, with schists and slates. Limestone is found in parts of the east and west ends of the valley, and in the hills upon

the Manas Bal lake. In various places are marks of glacial action, down toa height of about 500 feet above the level part of the basin. From the plain rise isolated hills of trap; among these are the Hari Parbat and the Takht-i-Suliman at Srinagar, on the former of which stands the fort, and on the latter a con- spicuous and well known ancient Hindu temple. No fossils have been found in Kashmir below the rocks of the Carboniferous period. The chief mineral resources of the maharaja's dominions are outside the Kashmir valley, specially in Ladak.

In the hills of the north boundary are two passes, the Burzil (13,500 feet) and the Kamri (18,200). By the former is the direct route between Srinagar and Iskardo. It is usually practicable only between 15th July and 15th September. The road from Srinagar to Lé in Ladak goes by the Zoji-la Pass (11,300 feet), near the north-east corner of the valley. Only a short piece of the road, where snow accumulates, prevents this pass being used all the year. At the south-east end of the valley are three passes, the Murgil (11,600 feet), the Hoksar (13,315), and the Murbul (11,550), all leading over to the valleys of the Chendb and the Ravi. South of Isl4mdbdd, on the direct route to Jamu aud Sidlkét, is the Banihdl Pass (9200 feet). Further west on the Panjal range is the Pir Panjal or Panchal Pass (11,400 feet), with a second pass, the Rattan Pir (8200 feet), across a second ridge about 15 miles south-

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west of the other. Between the two passes is the beauti- fully situated fort of Badramgali and a well-known rest- house for travellers. This place is in the domain of Raja Moti Singh of Punch, cousin and tributary of the maharaja of Kashmir. At Rajdori, south of these passes, the road divides: one line leads to Bhimbar and Gujrat, the other to Jamu and Sidlkédt by Aknutr. Next, south-west of Baramula, is the Hajji Pir Pass (8500 feet), by which crosses the road to Punch. From Punch one road leads down to the plains at the town of Jhelum, another east- ward through the hills to the Rattan Pir Pass and Rajaori. Lastly there is the river pass of the Jhelum, which is the easy route from the valley westward, having two ways down to the plains, one by Muzaffarabéd and the Hazara valley to Hassan Abdal, the other by the British hill station of Marri (Murree) to Rawal Pindt.

The valley of Kashmir, sheltered from the south-west monsoon by the Panjal range, has not the periodical rains of India. Its rainfall is irregular, greatest in the spring months. Occasional heavy storms in the monsoon pass over the crests of the Panjal and give heavy rain on the elevated plateaus on the Kashmir side. And again clouds

pass over the valley and are arrested by the higher hills |

on the north-east side, on which they pour themselves. Snow falls on the surrounding hills at intervals from October to March, and sometimes in great quantity. In the valley the first snow generally falls about the end of December, and never to any great amount. The highest monthly average of temperature from May to October, at Srinagar, is 89° in the shade at noon. regular winter register ; but the temperature is never very low.

For all crops except rice, which is irrigated, the rain is ordinarily sufficient. Barley, sown in November, ripens in June, wheat in July. Rice, sown in May and June, ripens in October. Millet, maize, and buckwheat, also turnips, pease, and mustard, are grown in cousiderable quantity.

There is no natural forest in the level parts of the valley. Of the cultivated trees the finest is the plane (chindr), which grows to a large size, and is of great beauty. The principal other trees of the valley are the poplar, willow, cypress, walnut, apple, pear, quince, apricot, cherry, mul- berry. Vines are grown extensively, commonly trained up poplar trees. There are many kinds of grape. hills around are deodar, Pinus excelsa and Gerardiana, Picea Webbiana, hazel, birch, viburnum, juniper, rose, &ec. The herbaceous plants and flowers are very numerous. The umbelliferous plant called prangos, growing on the drier hills, is much valued as winter food for sheep. In spring the bright orange-coloured colchicum shows itself in great quantity ; and in autumn are seen many acres of saffron with its beautiful light purple flowers, grown in large fields divided into small square beds. Saffron was among the articles of annual tribute to the Mughal emperors. The Dal lake at Srinagar is full of reeds and water plants, Potamogeton, Nymphea, Nelumbium, &e. On this lake there are floating gardens: a shallow layer of soil on sheets of the great leaves of water lilies is made to grow quantities of vegetables. The curious singhara, or horned water nut (Trapa bispinosa), which grows in great quantity in all the lakes, is much

used for food, pre- pared in various ways. Since 1874 hops have been grown experimentally for the Murree Brewery Company, with fair success, in five different parts of the valley.

Much has been said and written about the beauty of the vale of Kashmir. Spring encircles a fresh, green, smiling valley with a noble belt of glistening snow-capped ridges ; autumn fills the eye with the wonderful richness of the many-coloured foliage. At all times flows on the quiet glassy river, showing back the groves and avenues upon its

There has been no |

On the |

banks, the strange tall shadowy wooden houses, and the craggy hills. There is no place or season which has not something to show of real beauty. The rapturous praises of Mohammedan writers may be often extravagant ; and it is with some of their materials, reproduced with more modern additions, that Moore has built up great part of his romance ; still few will really think that here extravagance and fiction have left truth much too far behind.

Many Englishmen every year resort to Kashmir for shooting. The game is in consequence now only to be found within reduced areas of the more secluded little valleys and more difficult hill sides, and many sportsmen now cross over into Liddk. The animals chiefly sought in both countries are the Ovis ammon, Ovis poli, antelope, ibex, mdr-khér or wild goat, musk deer, Tibetan stag, brown and black bear, and leopard. In various parts of Kashmir are to be found the fox, lynx, weasel, marmot, and hare. The black and grey monkey (/angiér) is common on the Panjal range. Kashmir has the snow pheasant, snow owl, wild goose, duck, and teal; and the eagle is also found.

The Kashmir valley has a large number of old buildings of the Hindu period, interesting from their style, which is peculiar to Kashmir, and from the traces which many of them bear of Greek art. Their ruinous condition is ascribed partly to Sikandar the idol-breaker, partly to earthquakes, which

are frequent in Kashmir. The most ancient of these buildings (about 220 B.c.) is the temple of Shankar Acharya (or, as it was formerly called, of Jaiasht Iswar), on the hill at Srinagar, known as Takht-i-Suliman, or Solomon's Throne,—a designation thought to be a Mo- hammedan adaptation of the name of Raj4 Sandhaman, who repaired or rebuilt the temple. The other Hindu buildings mostly belong to the time from the 5th to the 10th century. The chief points which distinguish them from Hindu buildings in India are the trefoil-headed door- ways and recesses, high pediments, high straight-lined pyramidal roofs, and fluted pillars.

The temple of the sun at Marttand or Matan has been one of the finest. It occupies a very striking position on a karéwa or natural terrace about 3 miles from Islamabad, and commands a splendid view of the valley of the Jhelum. Of the others the most worthy of notice are the remains of two of the four temples at Avantiptir, 15 miles south- east of Srinagar; the temple of Bhumzo near Marttand, built in a cave; Pdyach, on the karéwa of Naunagar near Avantipur, a small temple, the whole superstructure built of six stones; Pandrétan, 3 miles south-east of Srinagar, standing with its floor below the water, in a tank ; Bhaniar (Bhaw4nidr) and Kutrui, a few miles west of Baramula, both backed by fine wooded cliffs crowned with deodars. A mound, with masonry in and about it, at the village of Ushkara near Baramula, is supposed to be the remains of a Buddhist tope (stépa), the place taking its name from Hushka, one of the Tartar kings of Kashintr.

Srinagar, the capital (34° 4' 6" N., 74° 48' 5" E.), said to have been founded by Pravara Sén, in the beginning of the 6th century, is built on both banks of the Jhelun. It is a somewhat confused mass of houses, many of them built of wood, with balconies and carved lattice windows, and projecting upper stories propped on poles, and overhanging the narrow streets or the little canals which in some parts are the streets. The city has seven bridges across the river, built of beams laid on stone and timber piers. In the fort on the south side of the river is the palace. There are several small Hindu temples in the town. The two chief mosques are the Jami' mosque and that of Shah Hamadan, the latter one of the most conspicuous buildings, with walls of stone and timber, low sloping wooden roof, and little wooden spire. On the shores of the Dal lake are the old pleasure-gardens of the Mughals.

The people of Kashmir are now mostly Mohammedan. Physically of fine form, a large proportion of the town- people are enfeebled by poverty and sedentary occupation in close rooms. A few years ago the shawl weavers of Srinagar were reckoned to be about 22 per cent. of the inhabitants. The proportion is now less, owing to the reduced demand for Kashmir shawls, both loom-made and hand-sewn. ‘The mahardj4 has endeavoured to meet the depression of the shawl trade by extension of silk manu- factures; silk is successfully worked, and well dyed. The chief demand for shawls has generally been from France, and French patterns have somewhat interfered with native art. At Islamabid also many hands are employed in shawl and blanket weaving. A kind of coarse chintz is also made there. Embroidery on fine woollen cloths is the employment of many Kashmiris, both in their own country aud in their Indian settlements, Amritsar, Nurpur, and Ludhiana. The manufacture of a variety of articles in papier maché and ornamental painted wood-work employs a number of people in Srinagar. The silversmiths do a good deal of business in ornamental vases, goblets, flower- holders, &c., silver and silver gilt, Engraved and em- bossed copper work employs a smaller number of people ; also the manufacture of ornamental vessels of tinned copper, and some other minor kinds of work. A very good kind of paper is made in Kashmir. A museum of Kashmir products and manufactures was established at Srinagar in 1875. The people of the. country, with more healthful occupations and surroundings than those of the towns, especially Srinagar, are robust and of active habits. The Kashmiris, both men and women, wear commonly a kind of loose gown with sleeves, called phéran (Pers., patrdhan, “a robe”). In cold weather they are in the habit of carrying, under this loose dress, a small portable brazier with heated charcoal. ‘The country people and boatmen use a more close-fitting costume. The mountaineers, like those of neighbouring hill countries, bandage the legs from the knee to the foot for protection in walking.

According to areport prepared by order of the maharaja in 1878, the population of the valley at that time was nearly 492,000. Of these about 64,000 were Hindus and the rest Moslems, about 4 per cent. of the latter being Shiites. The estimated population of Jamu was 861,000, of Punch 77,500, of Ladak, Iskardo, and Gilgit, 104,500; total about 1,535,000 :—

Hindus, 507,000; Moslems, 919,000; Buddhists, 20,000; and “ miscellaneous,” 89,000. Of Srinagar the estimated population was about 132,000, of which number nearly 40,000 were Hindus. A great diminution, caused by deaths and emigration, has followed the famine of 1878. It was said that the towns of Isl4mé4- bad and Sopur lost nearly two-thirds of their inhabitants. The rice crop of 1879 was abundant, and the rains of the next year seasonable and plentiful. The shawl-weaving and carpet-making trades revived in 1880, and numbers of people who had left the country during the famine re- turned.

The langnage of Kashmir (which is spoken only in the valley itself, and in the few outlying settlements of Kash- miris in the neighbouring hills and in northern India) is of the Aryan family. It is allied to the Hindi, Sindi, and Punjabi, and also to the current Urdt of India (Hindvu- stani). It uses a form of the Sanskrit character like the Nagari of the Punjab. It may be said to possess no litera- ture, though Kashmir has produced many literary men. The Urdu is now very generally understood in Kashmtr, among the better educated people and more intelligent artisans. .

The chief articles of export from Kashmir are shawls and other woollen fabrics, rice, saffron, fruits. The chief imports are shawl wool, English piece goods, Indian cloths,

metals, precious stones, skins, felts, dye-stuffs, tea, charas (hemp juice), groceries, and salt. The imports into Kashmir from British India are much below those into Jamu, except tea (of which the Kashmiris are extremely fond), indigo, and earthenware. Kashmir imports annually a very large amount of rock salt from the Punjab. The gross annual value of the imports is about £210,000, and of the exports about £172,000. This latter amount is less than formerly, owing chiefly to the reduced demand for shawls. The import duties, which used to be very heavy, were modified in 1864 ; the duty on piece goods was limited to 8 per cent. and on other imports to 12} per cent. In April 1870 a commercial treaty was entered into with the British Government for developing trade with eastern Turkestan, in which, among other things, the mahardja agreed to abolish all transit duties. Joint commissioners were appointed, on the part of the two Governments, to reside at Leh.

The gross annual revenue of Kashmir is believed to be about £550,000, and of the mahar4ja's whole territories a little over £800,000. The chief source of income is the land revenue. Of this there is now a cash settlement in place of the annual valuation of crops which was the practice till lately. The Government ordinarily takes one-half the gross produce. Grain is stored in public granaries, and sold at fixed rates to the army and the civil officials. Much grain is also purchased from the zamindars, and stored by Hindu merchants in Srinagar.

The mahardja's military force numbers 25,600 infantry (including police), 1400 cavalry, and 1200 artillery, with 78 field guns and 80 other pieces.

At Srinagar and elsewhere the maharajé has established dispensaries, with native medical men educated in India ; and he has built at his own cost a large hospital for the medical mission at Srinagar.

The current rupee of Kashmir, called chilhké ("glittering"), has varied in value at different times from one-half to five- eighths of the rupee of British India. The latest issued bears the latter value.

The admission of British visitors to Kashmir each season is limited. To military officers, up to a fixed number, permission is granted by the commander-in-chief or by the Government of India. Others do not require previous permission, but must intimate their intention of going to Kashmir, and obtain a copy of therules. In like manner, more than eight centuries ago, as we learn from the Arabic historian Al Birtni, the passes used to be watched, and few outsiders admitted. Connected with this long-cherished ex- clusiveness has been the general badness of the roads. A really improved road has been made by the present maharaj4 from Kohala to Baramula, the easiest and best entrance to the valley. The author just referred to men- tions the covered litters, in which people in Kashmir used to be carried, raised on men's shoulders. veyances are inusenow. To the present day there are no wheeled conveyances in Kashmir. For English visitors four routes are authorized by the Government of India, one by the Pir Panj4l Pass and three by Baramula,—from Punch, from Murree, and from MuzaffarAbad.

In the government of his own territories the “ mahardaja of Jummoo and Kashmir” is independent. His relations with other states are subject to the supreme authority of the Government of India. The Government of India has no resident at either of the mahardja’s capitals, but annually an “officer on special duty,” as he is officially termed, is sent to Kashmir during the season from March to Novem- ber. A native news-writer, employed by the British Govern- ment, remains in Kashmir. The annual tribute of the maharaja, presented in token of the supremacy of the British Government, in accordance with Act X. of the

The same con-:

treaty of March 1846, is “one horse, twelve perfect shawl goats of approved breed (six male and six female), and three pairs of Kashmir shawls.” The mahardaja receives in British territory a salute of nineteen guns.

History.—The metrical history of the kings of Kashmir, called Rijé Tarangint, was pronounced by Professor H. H. Wilson (1825) to be the only Sanskrit composition yet discovered to which the title of history can with any propriety be applied. It first beeame known to the Mohammedans when, on Akbar’s invasion of Kashmir in 1588, a copy was presented to the emperor. A translation into Persian was made by his order, and a summary of its contents, from this Persian translation, is given by Abu’l Fazl in the .4’in-i-Akbari. The Rdjd Tarangint isa series of four histories. The first of the series, by Pandit Kathana, was written about the middle of the 12th eentury. His work, in six books, which bears the name afterwards given to the whole, makes use of earlier writings now lost. Com- mencing with traditional history of very early times, it comes down to the reign of Sangraimma Déva, 1006 ; and two more books attri- buted to the same author bring the history to the reign of Singha Déva (called Jai Singh in Abu’l Fazl’s summary) about 1156. The seeond work, called Adjé Vali, by Juna Raja, takes up the history in continuation of Kalhana’s, and, entering the Mohammedan period, gives an account of the reigns down to that of Zain-ul-ab- ad-din, 1412. Then follows the Sri Juina Rdjd Tarangint, by Pandit Sri Vara, to the accession of Fattah Shah, 1477. And the fourth work, called Rajé Vali Pataka, by Prajnia Bhatta, com- pletes the history to the

time of the incorporation of Kashmir in the dominions of the Mughal emperor, 1588.

In the earliest of the four histories it is stated that the valley of Kashmir was formerly a lake, and that it was drained by the great rishi or sage, Kasyapa, son of Mariehi, son of Brahma, by cutting the gap in the hills at Baramula (Vardha-imtla). When Kashmir had been drained, he brought in the Brahmans to oecupy it. This is still the loeal tradition, and in the existing physieal condition of the eountry we may see some ground for the story whieh has taken this form. Bernier suggested that earthquakes may have rent the gorge at Baramula. M. Troyer considers it to have been the work of man, taking advantage of facilities pointed out by nature. It is possible that the river, having at one time flowed with more even fall than at present, may have been choked by land slips at the Baranula gorge. The Jhelum, stopped at Baramtla, would spread over the low wide valley with very slow and yuiet rise, till, over- topping the barrier, the water would escape with a great descent to its old channel, having meantime raised the bed of the lake, by slow accumulation of deposit, to a nearly uniform high level. The name of Kasyapa, however, is by history and tradition con- nected with the draining of the lake, and the chief town or collec- tion of dwellings in the valley was called Kasyapa-pir—a name which has been plausibly identified with the Kaomdmupos of Heeatzeus (Steph. Byz., s.v.) and Kaomdrupos of Herodotus (iii. 102, iv. 44). Kashmir is the country inecant also by Ptolemy’s Kaorjpia. The ancient name Kasyapa-pir was applied to the kingdoin of Kashmir when it comprehended great part of the Punjab aud extended beyond the Indus. In the 7th century Kashmir is said by the Chinese traveller Hwen Tsang to have included Cabul and the Punjab, and the hill region of Gandhata, the country of the Gandare of elassical geography. Then, under the Mughals, after the annexation of Kashmir to their empire in the end of the 16th century, the name of this newer possession was, for adminis- trative purposes, extended over a much larger area in Afghanistan, to which again it became united; and at one time Ghazni, at another time Cabul, was made the capital of the province of Kashmir.

At an early date the Sanskrit name of the country became Kds- mir. The earliest inhabitants, according to the Réjé Tarangint, were the people ealled

Naga, a word which signifies ‘‘ snake.” The history shows the prevalence in early times of tree and serpent worship, of whieh some sculptured stones found in Kashmir still retain the memorials. The town of Islamabad is called also by its ancieut name Anant-ndg (eternal snake). The source of the Jhelum is at Vir-ndg (the powerful snake), &c. The other races mentioned as inhabiting this country and the neighbouring hills are Gandhara, Khasa, and Darada. © The Khasa people are sup- posed to have given thename Kasmir. Inthe Mahabharata the Kas- uiraand Darada are named together among the Kshattriya races of northern India. The question whether, in the immigration of the Aryans into India, Kashmir was taken on the way, or entered after- wards by that people after they had reached the Punjab from the north-west, appears to require an answer in favour of the latter view (see vol. u. of Dr J. Muir’s Sanskrit Texts). The Aryan races of Kashmir and surrounding hills, which have at the present time sepa- rate geographieal distribution, are given by Mr Drew as Kashmiri (mostly Mohammedan), in the Kashmir basin and a few seattered places outside; Dard (mostly Mohammedan) in Gilgit and hills north of Kashmir ; Dogra (Hindu) in Jami; Dogra (Mohammedan, called Chibdli) in Puneh and hill country west of Kashmir; Pahdri or

mountaineers (Hindu) in Kishtwar, east of Kashmir, and hills about the valley of the Chenab.

In the time of Asdéka, about 245 B.c., one of the Indian Buddhist missions was sent to Kashmir and Gandhara. After his death Brahmanism revived. Then in the time of the threc Tartar prinees, Hushka, Jushka, and Kanishka, who reigned in Kashmir immedi- ately before, and in the beginning of, the Christian era, Buddhism was to a great extent restored. The kingdom of Kanishka (called also Kanerkes) ineluded the Punjab and Cabul as well as Kashmir. Buddliism again declined, though for several centuries the two religions existed together in Kashmir, Hinduism predominating. Yet Kashmir, when Buddhisin was gradually losing its hold, con- tinued to send out its Buddhist teachers to other lands. In this Hindu-Buddhist period, and chiefly between the 5th and 10th cen- turies of our era, were erected the Hindu temples in Kashmir. In the 6th and 7th ecnturies Kashmir was visited

by some of the Chinese Buddhist pilgrims to India. The country is ealled Shie-mi in the narrative of To Yeng and Sung Yan (578). One of the Chinese travellers of the next century was for a time an elephant-tamer to the king of Kashmir. Hwen Tsang speut two years (631-633) in Kashmir (Ata-chi-ini-lo). He eutered by Baramiula and left by the Pir Panjal Pass. He describes the hill-girt valley, and the abund- auce of flowers and fruits, and he meutions the tradition about the lake. He found in Kashmir many Buddhists as well as Hindus. In the following century the kings of Kashmir appear to have paid homage and tribute to China, though this is not alluded to in the Kashmir history. Hindu kings continued to reign till about 1294, when Udiana Déva was put to death by his Mohammedan vizier, Amir Shah, who ascended the throne, taking the name of Shams-ud-din. Two Hindus who reigned afterwards for a short time were the last kings of that race in Kashmir. The notiees of Kashmir by Mareo Polo belong to a time near the close of the Hindu rule, when the people were nostly Hindus and Buddhists.

Of the Mohammedan rulers mentioned in the second of the Sanskrit histories, one, who reigned about the close of the 14th century, has made his name prominent by his active opposition to the Hindu religion, and his destruction of the temples. This was Sikandar, known as But-shikan, or the ‘‘idol-breaker.” It was in his time that India was invaded by Timur, to whom Sikandar made submission and paid tribute. The country fell into the hands of the Mughals in 1588. In the time of Alamgir it fell to Ahmed Shah Abdali, on his third invasion of India (1756) ; and from that time it remained in the hands of Afghans till it was wrested from them by Ranjit wee the Sikh monarch of the Punjab, in 1819. Eight Hindu and Sikh governors under Ranjit Singh and his suc- cessors were followed by two Mohammedans similarly appointed, the second of whom, Shékh Im4m-ud-din, was in charge when the battles of the Sutlej, 1845-46, brought about new relations between the British Government and the Sikhs, involving a change in the government of Kashmir.

Ghulab Singh, a Dogra Rajput, had from a huinble position been raised to high office by Ranjit Singh, who conferred on him the small principality of Jamu. On the final defeat of the Sikhs at Sobraon (February 1846), Ghulab Singh was ealled to take a leading part in arranging conditions of peace.

The treaty of Lahore (March 9, 1846) sets forth that, the British Government having demanded, in addition to a certain assignment of territory, a payment of a crore anda half of rupees (14 millions sterling), and the Sikh Govern- iment being unable to pay the whole, the maharajé (Dhalip Singh) cedes, as equivalent for one erore, the hill country belonging to the Punjab between the Bias and the Indus, inelnding Kashmir and Hazara. The governor-general, Sir Henry Hardinge, considered it expedient to make over Kashmir to the Jamu elief, securing lis friendship while the British Government was administering the Punjab on behalf of the young maharaja. Ghulab Singh was well prepared to make up the payment in defect of which Kashmir was eeded to the British; and so, in consideration of his services in restor- ing peace, his independent sovereignty of the country made over to him was recognized, aud he was admitted to a separate treaty. Ghulab Singh had already, after several extensions of territory east and west of Jamu, conquered Ladak (a Buddhist country, and till then subject to Lassa), and had then annexed Iskardo, which was under independent Mohammedan rulers. He had thus by degrees half encircled Kashmir, and by this last addition his pos- sessions attained nearly their present form and extent. Ghulab Singh died in 1857, and was succeeded by his son, Ranbir Singh.

See Asiatic Researches, vol. xv.; Rdjd Tarangini (Sanskrit text, Caleutta, 1835; text and translation of the books of Kalhana, by A. Troyer, Paris, 1840, 1852); A'in-i-Akbaré (translated by Gladwin, Caleutta, 1783); History of India told by tts own ITistorians, from posthumous papers of Sic H. M. Elliot, by Professor Dowson ; Fred. Drew, Jummoo and Kashmir Territories; Voyages de Frangots Bernier; H. H. Wilson, Ariana Antiqua; William Mooreroft and George Trebeck, Travels in Ladiék and Kashmir; J. Martin Honig- berger, Thirty-Five Years in the East; Dr T. Thomson, /Vestern Himalaya and Tibet ; Hiigel, Travels in Kashmir and the Punjab ; A. Cunningham, Anetent Geography of India; Id., Ldddk;

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KASIMBAZAR, or Cosstmpazar, a decayed town in Murshidaébad district, Bengal, 24° 7' 40" N. lat., 88° 19' E. long. Long before the days of Murshid Kuli Khan, who founded and gave his name to the city of Murshidabad, the trade of Bengal was centred at Kasimbazdr. The different European nations who traded to India had fac- tories there from very early times. An English commer- cial agent was appointed to Kasimbazér in 1658 ; and at the close of the century it had become the leading English commercial agency in Beugal. The decay of the town dates from the beginning of the present century, when its climate, which had previously been celebrated for its salubrity, underwent an unexplained change for the worse; and its ruin was completed in 1813 by a sudden change in the course of the Bhagirathi, on which it stood. The site is now a swamp, marked by a few ruins.

KASIMOFF, a town of Russia, in the Ryazan govern- ment, situated in 54° 56' N. lat. and 41° 3' E. long., 90 miles east-north-east of the government town, on the left bank of the Oka, a tributary of the Volga. It pos- sesses a cathedral, and a mosque supposed to have been built by Kasim. Near the mosque stands a mausoleum built by Shah Ali in 1555. Lying on the direct road from Astrakhan to Moscow and Nizhni Novgorod, Kasimoff is a busy place, with numerous industrial establishments. Of special note are the Kasimoff bells, whose jingle may be heard on the post-horses throughout the country. The waiters in the best hotels of St Petersburg are mostly Kasimoff Tartars. Population, according to St Petersburg Calendar for 1874, 12,027.

Kasimoff existed in the 14th eentury under the name of the Meshtehersk Gorodets or Gorodok (from the Meshtcheryaks, a Turko- Finnish tribe). It was laid completely waste by the Mongolians in 1376, but shortly afterwards rebuilt on a newsite. About 1452 the placc was bestowed by

Basil the Dark on the Tartar prinee Kasim who had come to assist him in his wars, and thus beeame the seat of a Tartar prineipality or kingdom, which lasted till 1677. The last of the line of Kasim accepted Christian baptism, and re- eeived the name of Jaeob. On his death the prineipality was in- eorporated with the empire; and Peter I. sent a number of the Tartar inhabitants to Voronezh.

KASSA. See Kascnav.

KASTAMUNT, sometimes CosTamMBong, the chief town of a Turkish vilayet of the same name in Asia Minor, is situated on the Gok Irmak, about 250 miles east of Constantinople. It is the seat of a commercial court, consisting of two Moliammedan and two Christian members. The mosques are said to number thirty-six, and there are four dervish monasteries. Situated as it is in the Angora goat district, Kastamuni has a large trade in goat's hair (about 980,000 ib annually), and carries on the manu- facture of mohair cloth. Copper is obtained in the neigh- bourhood, and the copper wares of Kastamuni are well- known in Asia Minor. Coal was for a time worked close to the town, but, the people objecting, it is said, to the smoke, the governor closed the mines. The population is estimated at 40,000. Kastamuni is the Castamon fre- quently mentioned by the Byzantine lustorians.

KASTORIA, a town of European Turkey, in the vilayet of Monastir and sandjak of Prisrend, about 33 miles south of Monastir (Bitolia), on the western banks of a lake (6 miles long and 4 broad) which drains into the Indjeh, Karasu, or Bistritza. It is the seat of a caimmacam, and

the inhabitants carry on a good trade. Of the twelve quarters of the town three are occupied by Turks, two by Jews, and the rest by Christians. Kastoria is the ancient Celetrum, captured by Sulpicius during the first Macedonian campaign, 200 B.c., and better known for the defence main- tained by Bryennius against Alexis I. in 1084 (see Anna Comnena's Alexas), A Byzantine wall with round towers runs across the peninsula on which part of the town is built. Population, 8000.

KATER, Henry (1777-1835), a distinguished physicist of remarkable experimental skill, was born at Bristol, April 16, 1777. At first he purposed

studying law; but this he abandoned on his father's death in 1794, and entered the army, obtaining a commission in the 12th regiment of foot, then stationed in India, where he rendered valuable assistance in the great trigonometrical survey. Failing health, however, obliged him to return to England ; and in 1808, being then a lieutenant, he entered on a distinguished student career in the senior department of the Royal Military College at Sandhurst, Shortly after he was promoted to the rank of captain. In 1814 he retired on half-pay, and devoted the remainder of his life to scientific research. He died at London, April 26, 1835.

His first important contribution to scientific knowledge was the comparison of the merits of the Cassegrainian and Gregorian telescopes, from which (Philosophical Transac- toons, 1813 and 1814) he deduced that the illuminating power of the former exceeded that of the latter in the proportion of 5: 2. This inferiority of the Gregorian he explained as being probably due to the mutual interference of the rays as they crossed at the principal focus before reflexion at the second mirror. His most valuable work, however, was the determination of the length of the second's pendulum, first at London and subsequently at various stations throughout the country (Phal. Z'rans., 1818,1819). In these researches he skilfully took advantage of the well-known property of reciprocity between the centres of suspension and oscillation of an oscillating body, so as to determine experimentally the precise position of the centre of oscillation; the distance between these centres was then the length of the ideal simple pendulum having the same time of oscillation, As the inventor of the floating collimator, Captain Kater rendered a great service to practical astronomy (Phzl. Trans., 1825, 1828). He also published memoirs (Phil. Trans., 1821, 1831) on British standards of length and mass; and in 1832 he published au account of his labours in verifying the Russian standards of length. or his services to Russia in this respect he received in 1814 the decoration of the order of St Anne; and the same year he was elected a fellow of the Royal Society. His attention was also turned to the subject of compass needles, his Bakerian lecture "On the Best Kind of Steel and Form for a Compass Needle" (Phil. Trans., 1821) containing the resulis of many interesting and valuable experiments. The treatise on '' Mechanics" in Lardner's Cyclopedia was partly written by him and partly by Dr Lardner; and his interest in more purely astro: nomical questions was evidenced by two

communications to the Astronomical Society's JZemozrsfor 1831-33—the one on an observation of Saturn's outer ring, the other on a method of determining longitude by means of lunar eclipses.

KATHIAWAR, or Karrywar, also SuRASHTRA, a peninsula forming a collection of native states in Guzerat, western India, lying between 20° 41' and 23° 8' N. lat, and 68° 56' and 72° 20' E. long. It is bounded on the N. by the Runn or Gulf of Cutch, on the E. by Ahmedadbdd district and the Gulf of Cambay, and on the S. and W. by the Arabian Sea; the extreme length is 220 miles, the greatest breadth about 165 miles, the area about 22,000 square miles, and the estimated population 2,500,000.

It is divided into one hundred and eighty-eight separate states, large and small, of which thirteen pay no tribute, ninety-six are tributary to the British Government, and seventy to the gdekwar as the representative of the Mar- hattas, while of these three classes of states one hundred and thirty-two pay a tax called zortalabi to the nawab of Jundgarh. The states are arranged in seven classes: the chiefs of the first and second classes exercise plenary juris- diction, both civil and criminal ; the judicial powers of the lesser chiefs are graded in a diminishing scale, the residuary jurisdiction being vested in four British officers, each superintending a group of states. The political agent controls the whole. As a rule, no appeal lies from the decision of a chief; but on presumption of maladministra- tion his proceedings may be called for and reviewed. During the past twenty years the states have established civil and crimiual courts and written codes. Justice is

administered by the political officers on the non-regulation | | OF | structure, whose erection is popularly assigned to Abu

system over 2058 square miles, or about one-tenth of tlie whole area. Outlawry, political and predatory, has been suppressed, and life and property are as safe as in British districts. A village police has been established, and muni- cipal funds are voted by the states. In 1878 there were 488 schools, with 28,171 scholars; while at the Rajkumar College, and three high schools many of the chiefs receive a liberal education during

their minority. way communication with Wadhwdén, and an extension is in progress to Dhoraji and Bhaunagar, while a network of good roads extend from Rajkot, the headquarters of the agency, over the greater part of the province. is divided for administrative purposes into four prants or districts, —Jhalawar, Halldr, Sorath, and GohelwAr; but the old territorial prants are ten, viz., Jhalawér in the north, containing about fifty states; Machhukanta ; Halldr, with

Barad4 or Jaitwdr, also known as Porbandar; Sordth; Babridwar; Kathid4war; Und-Sarviya; and Gohelwér. The

last-named comprises the Gogo district, belonging to the

Ahmedabad collectorate ; Bhaunagar, probably the fore- most state in Kathidwdr; and many others.

lating, with low ranges running in very irregular directions ; with the exception of the Tanghdé and Mandhav hills, in the west of Jhaléwdr, and some unimportant hills in Hallar, the northern portion of the country is flat; but in the south, from near Gogo, the Gir range runs nearly parallel with the coast, and at a distance of about 20 miles from it; along the north of Babriawdér and Sorath, to the neighbourhood of Girndr. Opposite this latter mountain is the solitary Osam hill, and then still farther west is the Baradd group, between Halldér and Barada, running about 20 miles north and south from Gumti to Randwan. The Girnar clump of mountains is an important granitic mass, the highest peak of which rises to 3500 feet. The prin- cipal river is the Bhédar, which rises in the Mandhav hills, and flowing south-west falls into the sea at Navi-Bandar,

There is rail- |

Kathidwar |

/ near it zinc and anthracite mines,

in Baradé ; it is everywhere marked by highly cultivated |

lands adjoining its course of about 115 miles. Other

markable for wild and romantic scenery. Four of the

old races, the Jditwas, Churdsamas, Solunkis, and Walds

are now existing as proprietors of the soil who exercised Sovereignty in the country prior to the immigration of the Jhalas, Jarejas, Purmars, Kathis, Gohels, J dts, Moham- medans, and Marhattds, between whom the country is now chiefly portioned out.

The principal agricultural products consist of cotton, bdjrd, and

Jjodr, and in some parts sugar-cane, turmeric, and indigo. Horse | and sheep breeding is carried on to a great extent—these animals, |

together with food grains, raw eotton,and wool,

forming the chief ex- Ports.

The principal imports are cotton manufactures, metals, and

sugar. Iron is found in many parts of Baradd and Hallar. Many iron-mines have, however, had to be abandoned of late years owing to the scareity of fuel for smelting the ore. The principal towns are Jamnagar, Bhaunagar, Junagarh, Rajkot, Porbandar, and Mangrol. The last two, as also Verawal, are thriving seaport towns. Kathiawar has many notable antiquities, comprising rock inserip- tions of Asoka, Buddhist caves, and fine Jain temples on the sacred hill of Gtrnar, and at Palitana.

KATIF, or Ex Karty, a town of Arabia, in the maritime region which skirts the northern part of the Persian Gulf on the low muddy shore of the northmost of the secondary bays that break the outline of the Bay of Bahrein, in 26° 29’ N. lat. and 50° E. long. Town and district are some- times considered as part of E] Hasa, sometimes as an independent province. The town lies embosomed amid

luxuriant palm groves and gardens, but, according to

Palgrave, is “crowded, damp, and dirty.” As the sea- port of Nejd, it has a considerable trade. ‘Che principal building is the fortress or palace,—a strong and spacious

Sa‘id el Jannaby el Karmaty, the founder of the Karma-

_thians. Katif was the chief seat of the Karmathian power.

About the middle of the 18th century we find it, along with E] Hasa, in the hands of Ibn Muflik, whose influence was paramount throughout Nejd. In 1791 it was cap- tured by Sa‘tid, the leader of the Wahhaby revolution. In 1871 it was attacked, and according to their own account subjugated, by the Turks from Baghdad. The population of the town and district is given as from 90,000 to 100,000. Katif is not far from the probable site of the ancient Gerrha, which was inhabited by Chaldzan exiles from Babylon (Strabo, xvi. 766); in more modern times the population has been recruited from Persia.

See Captain G. F. Sadlier, in Trans. Lit. Soc. Bombay, 1828 ; Pelly, in Journ. Roy. Geogr. Soc., 1865; Palgrave, Central and

: : | Eastern Arabia, 1873; Zehme, Arabien und die Araber, Halle, twenty-sixty states; Okhamandal, belonging to Baroda;

1875.

KATSENA, Kasstna, or Kasuna, a town of Central Africa, situated about 170 miles to the east of Sokoto, the capital of the state to which it now pays tribute. The walls have a circuit of between 13 and 14 English miles,

| but at the time of Barth's visit only the north-western Generally speaking, the surface of the country is undu-

quarter was inhabited, and he estimated the population at not more than 7000 or 8000. In the 17th and 18th centuries it appears to have been the largest town in the whole region, and its inhabitants cannot have numbered less than 100,000. The date of its foundation must be comparatively modern, for at the time of Leo Africanus there was no place of any considerable size in the province which bore the name now applied to the town. In the

_ beginning of the present century it fell into the hands of _ the Fellatah, but only after a protracted and heroic defence.

KATTOWITZ, chief town of a circle in the govern- ment district of Oppeln and province of Silesia, Prussia, is situated on the Rawa, in a busy mining and manu- facturing region near the Polish border. There are large iron-works, foundries, and machine shops in the town, and The growth of Kat-towitz, like that of many villages in the same circle, has

: es | been very rapid, owing to the development of the mineral Yivers are the Aji, Machhu, and Satrinji—the last re- |

resources of the district. In 1815 it was a mere village, in 1865 it became a town, and in 1875 it had a population of 11,352.

KATWA, or Curwa, a town in BardwAn district, Bengal, India, situated at the confluence of the Bhagirathi and Ajai rivers, 23° 38' 55" N. lat., 88° 10' 40" E. long. It is one of the principal seats of district trade, and the

residence of many wealthy native merchants. Nowa purely commer- cial town, it was formerly regarded as the key to Murshida- bad. The old fort, of which scarcely a vestige now remains, is noted as the scene of the defeat of the Marhattas by Alf Vardi Khan. Population in 1872, 7963.

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KAUFBEUREN, an ancient town in the government district of Swabia and Neuburg, Bavaria, is situated on the Wertach, about 55 miles south-west of Munich by rail. The chief industry is cotton spinning and weaving, and there is a tolerably active trade in cotton-stuffs and cheese. The population in 1875 was 5553.

Kaufbeuren is said to have been built in 842, and to have become a free imperial city by purchase in 1286 or 1288. In 1803 it passed

to Bavaria. It was formerlya resort of pilgrims ; and Roman coins have been found in the vicinity.

KAUFFMAN, or Kaurrmann, ANGELICA (1740-1807). This once popular artist and Royal Academician was born at Coire in the Grisons, October 39, 1740 or 1741. Her baptismal name was Maria-Anne-Angelica-Catharine. Her father, John Joseph Kauffmann, was a poor man and mediocre painter, but apparently very successful in teach- ing his precocious daughter. She rapidly acquired several languages, read incessantly, and showed marked talents as a musician. Her greatest progress, however, was in paint- ing ; and in her twelfth year she had become a notability, with bishops and nobles for her sitters. In 1754 her father took her to Milan, where she diligently studied the great masters. Later visits to Italy of long duration appear to have succeeded this excursion, and in 1763 she visited Rome, returning to it again in 1764. From Rome she passed to Bologna and Venice, being every- where féted and caressed, as much for her talents as for her personal charms. Writing from Rome in August 1764 to his friend Franke, Winckelmann refers to her ex- ceptional popularity. She was then painting his picture, a half length, of which she also made an etching. She spoke Italian as well as German, he says; and she also expressed herself with facility in French and English,— one result of the last-named accomplishment being that she painted all the English visitors to the Eternal

City. “She may be styled beautiful,” he adds, ‘and in singing may vie with our best virtuosi.” While at Venice, she was induced by Lady Wentworth, the wife of the English ambassador, to accompany her to London, where she ap- peared in 1765. One of her first works was a portrait of Garrick, exhibited in the year of her arrival at “ Mr Moreing’s great room in Maiden Lane.” Therank of Lady Wentworth opened society to her, and she was everywhere well received, the royal family especially showing her great favour.

Her firmest friend, however, was Reynolds. In his pocket-book her name as “Miss Angelica” or ‘‘ Miss Angel” appears frequently, and in 1766 he painted her, a compliment which she returned by the Portrait of Sir Joshua Reynolds, stat. 46, which was exhibited by Lord Morley at the “Old Masters” in 1876. Another instance of her intimacy with Reynolds is to be found in the varia- tion of Guercino’s “Et in Arcadia ego” produced by her at this date, a subject which Reynolds repeated a few years later in his portrait of Mrs Bouverie and Mrs Crewe. When, in 1768 or thereabouts, she was entrapped into a marriage with an adventurer who passed for a Swedish count, Reynolds‘befriended her, and it was doubtless owing to his good offices that her name is found among the signi- taries to the famous petition to the king for the establish- ment of the Royal Academy. In its first catalogue of 1769 she appears with “R.A.” after her name (an honour which she shared with another lady and compatriot, Mary Moser) ; and she contributed the Interview of Hector and Andromache, and three other classical compositions. From this time until 1782 she was an annual exhibitor, sending sometimes as many as seven pictures, generally classic or allegorical subjects. One of the most notable of her per- formances was the Leonardo expiring in the Arms of Francis the First, which belongs to the year 1778. In 1773 she

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was appointed by the Academy with others to decorate St Paul’s, and it was she who, with Biaggio Rebecca, painted the Academy’s old lecture room at

Somerset House. It is probable that her popularity declined a little in consequence of her unfortunate marriage ; but after her first husband's death (she had been long separated from him) she married Antonio Zucchi, a Venetian artist, then resident in England. This was in 1781. Shortly afterwards she retired to Rome, where she lived for twenty-five years with much of her old prestige. In 1782 she lost her father; and in 1795—the year in which she painted the picture of Lady Hamilton now at South Kensington—her husband. She continued at intervals to contribute to the Academy, her last exhibit being in 1797. After this she produced but little, and in November 1807 she died, being honoured by a splendid funeral under the direction of Canova, The entire Academy of St Luke, with numerous ecclesiastics and virtuosi, followed her to her tomb in St Andrea delle Frate, and, as at the burial of Raphael, two of her best pictures were carried in processiou.

Popular as they were during her lifetime, the works of Angelica Kauffman have not retained their reputation. She had a certain gift of grace, and considerable skill in composition. But her draw- ing is weak and faulty ; her figures lack variety and expression ; and her men are masculine women. Her colouring, however, is fairly enough defined by Waagen's term ''cheerful." Rooms decorated by her brush are still to be seen in various quarters. At Hampton Court is a portrait of the duchess of Brunswick; in the National Gallery an allegorical composition of Religion attended by the Virtues. There are other pictures by her at Paris, at Dresden, in the Hermitage at St Petersburg, and in the Pinako- thek at Munich. The Munich example is a portrait of herself; there is a second in the Uffizi at Florence, and a third in the National Portrait Gallery, South Kensington. A few of her works in private collections have also been exhibited among the ''Old Masters" at Burlington House. But she is perhaps best known by the numerous engravings from her designs by Schiavonetti, Bartolozzi, and others. Those by Bartolozzi especially still find considerable favour with collectors. Her life was written in 1810 by Giovanni de Rossi. It has also been used as the basis of a romance by Léon de Wailly, 1838; and it prompted the charming novelette contributed by Mrs Richmond Ritchie to the Cornhill Magazine in 1875 under the title of '' Miss Angel." (A. D.)

KAULBACH, Wituetm von (1805-74), an acknow- ledged leader in modern art, was born in Westphalia 15th October 1805. His parentage was humble, and his father, – who was poor, combined painting with the goldsmith’s trade, but means were found to place Wilhelm, a youth of seventeen, in the art academy of Diisseldorf, then re- organized, and becoming renowned under the directorship of Peter von Cornelius. Young Kaulbach at the outset had to fight a hard battle: his circumstances were neces- sitous ; he contended against hardships, even hunger. But his courage never failed ; and, uniting genius with industry,

he was ere long found foremost among the young national

party which resolved that the arts of Germany should see a great revival. ory «

Munich is the city most closely identified with Kaulbach. The large and ambitious works by which Louis I. sought to transform the capital of Bavaria into a German Athens afforded to the young painter an appropriate sphere. Cornelius had for some years been commissioned to execute the enormous frescoes in the Glyptothek, and his custom was in the winters with the aid of Kaulbach and others to com- plete the cartoons at Diisseldorf, and then in the sumimers, accompanied by his best scholars, to carry out the designs in colour on the museum walls in Munich. But in 1824 Cornelius became director of the Bavarian academy. Kaulbach, not yet twenty, followed, took up his permanent residence in Munich, laboured hard on the public works, executed independent commissions, and rose to such dis- tinction that in 1849, when Cornelius left for Berlin, he succeeded to the directorship of the academy, an office which he held for a quarter of a century, up to the day

of his death. The training, experience, and opportunity of Kaulbach had been extraordinary ; he became a prime mover in one of the most signal of art manifestations known in modern times; he matured, after the example of the masters of the Middle Ages, the practice of mural or monumental decoration ; he once more conjoined paint- ing with architecture, and

displayed a creative fertility and readiness of resource scarcely found since the era of Raphael and Michelangelo.

Early in the series of his multitudinous works came the famous Narrenhaus, the appalling memories of a certain inadhouse near Diisseldorf; the composition. all the more deserves mention for points of contact with Hogarth. Somewhat to the same category belong the renowned illustrations to Reineke Fuchs. These, together with oc- casional figures or passages in complex pictorial dramas, show how dominant and irrepressible were the artist's sense of satire and enjoyment of fun; character in its breadth and sharpness is depicted with keenest relish, and at times the sardonic smile bursts into the loudest laugh regardless of the propriety and solemnity appropriate to high art. Thus occasionally the grotesque degenerates into the vulgar, the grand into the ridiculous, as in the satire on

"the Pigtail Age" in a fresco outside the New Pinakothek. .

Yet the genius of Kaulbach was far too transcendent to be marred by these exceptional extravagances : such exaggera- tions came not of weakness but from excess of power ; they are as the sturdy traits and lawless forces of the Teutonic and northern races whence the Westphalian painter had sprung. Kaulbach tried hard to become Grecian and Italian ; but he never reached Phidias or Raphael; in short the blood of Diirer, Holbein, and Martin Schéngauer ran strong in his veins. The art products in Munich during the middle of this century were of a quantity to preclude first-rate quality, and Kaulbach contracted a fatal facility in covering wall and canvas by theacre. He painted in the Hofgarten, the Odeon, the Palace, and on the external walls of the New Pinakothek. His perspicuous and showy manner also gained him abundant occupation as a book-illustrator : in the pages of the poets his fancy revelled; he was glad to take inspiration from Wieland, Goethe, even Klopstock ; among his engraved designs are the Shakespeare gallery, the Goethe gallery, and a folio edition of the Gospels. All these signal examples of what may be called 'the Munich school," though by the many applauded to the skies, were yet subjected to censorious criticism. Ina volume entitled Social Life in Munich it was with some show of reason urged that Kaulbach had been unfortunate alike in having found Cornelius for a master and King Louis for a patron, that he attempted "subjects far

beyond him, believing that his admiration for them was the same as inspiration ” ; the lack of real imagination he supplied by ‘‘a compound of intellect and fancy”; he “ thinks his feelings,” and his creations are but “the triumph of intellect.”

Nevertheless no one appreciating at their worth such master compositions as the Destruction of Jerusalem and the Battle of the Huns can deny to Kaulbach creative imagination. Asa dramatic poet he tells the story, depicts character, seizes on action and situation, and thus as it were takes the spectator by storm. The manner may be occasionally noisy and ranting, but the effect after its kind is tremendous. Within the whole range of modern art no finer composition can be named than the Battle of the Huns, no bolder conception than the fierce fight in mid air between the spirits of the warriors slain in combat. The drawing, the foreshortening, the grouping and lines of com- position, are almost as a matter of course masterly. The cartoon, which, as usual in modern German art, is superior to the ultimate picture, was executed in the artist’s prime at the age of thirty. At this period, as here seen, the

uF knowledge was little short of absolute ; subtle is the sense of beauty ; playful, delicate, firm, the touch; the whole treatment artistic.

Ten or more years were devoted to what the Germans term a “cyclus,”’—that is, a series of pictures which, as successive chapters or essays, illustrate one theme, as Raphael in the Vatican gave pictorial exposition to universal knowledge under the distinctive titles of Theology, Philo- sophy, Jurisprudence, and Poetry. The fundamental idea whereon Kaulbach discoursed was civilization or the pro- gress of the human race as displayed in the following historic epochs :—the Tower of Babel, the Age of Homer, the Destruction of Jerusalem, the Battle of the Huns, the Crusades, and the Reformation. ‘These major tableaux, severally 30 feet long, and each comprising over one hundred figures above life-size, are surrounded by minor compositions making more than twenty in all) The idea is to congregate around the world’s historic dramas the prime agents of civilization; thus here are assembled allegoric figures of Architecture and other arts, of Science and other kingdoms of knowledge, together with lawgivers from the time of Moses, not forgetting Frederick the Great. The

chosen situation for this imposing didactic and theatric display is the Treppenhaus or grand staircase in the new museum, Berlin; the surface is a granulated, absorbent wall, specially prepared; the technical method is that known as “ water-glass,” or “liquid flint,” the infusion of silica securing permanence. The same medium was adopted in the later wall-pictures in the Houses of Parlia- ment, Westminster.

The painter’s last period brings no new departure ; his ultimate works stand conspicuous by exaggerations of early characteristics. The series of designs illustrative of Goethe, which had an immense success, were melodramatic and pandered to popular taste. The vast canvas, more than 30 feet long, the Sea Fight at Salamis, painted for the Maximilianeum, Munich, evinces wonted imagination and facility in composition ; the handling also retains its large- ness and vigour; but in this astounding scenic uproar moderation and the simplicity of nature are thrown to the winds, and the whole atmosphere is hot and feverish. The painter verily had within him a fire which burnt fiercely ; and, when past the age of sixty he received visitors within his spacious studio, he looked the perfect impersonation of his art. On the walls, upon easels, even on the floor, were large cartoons, rolls of canvas, piles of drawings—fruits of a restless and inexhaustible intellect. Kaulbach in the midst moved to and fro impulsively and discoursed volubly on the creations he was about to call out of chaos. But his career was drawing to a close; seized by the cholera, he died in 1874, at the age of sixty-nine.

Kaulbach can scarcely be counted among religious painters ; yet the range of his thought is most lofty. Whatever is noblest in humanity, whatever has raised the human race, freed or enlightened the mind, given dignity and beauty to life, or reared the body into godlike frame, falls within the province of his art. Nothing small or mean finds a place ; the accidents and crudities of common nature are cast out ; typical forms are selected and matured; and all is brought into harmony with beauty. Kaulbach’s was indeed a beauty-loving art. He isnot supreme asa colourist ; he belongs in fact to a school that holds colour in subordination ; but he laid, in common with the great masters, the sure foundation of his art in form and composition. Indeed, the seience of composition has seldom if ever been so clearly understood or worked out with equal complexity and exactitude ; the

constituent lines, the relation of the parts to the whole, are brought into absolute agreement; in modern Germany painting and music have trodden parallel paths, and Kaulbach is musical in the melody and harmony of hiseom- | positions. His narrative too is lucid, and moves as a stately march or royal triumph; the sequence of the figures is unbroken ; the arrangement of the groups accords with even literary form ; the picture falls into incident, episode, dialogue, action, plot, as a

drama. The style is cclectie; in the Age of Homer the types and the treatment are derived from Greek marbles and vases ; tlicn

in the Tower of Babel the severity of the antique gives place to the suavity of the Italian renaissance; while in the Crusades the eomposition is let loose into modern romanticism, and so the mauner descends into the midst of the 19theentury. And yet this scholastieally compounded art is so nicely adjusted and smoothly blended that it easts off all ineongruity and becomes homogeneous as the issue of one mind. Buta fickle publie craved for ehange ; and so the great master in later years waned in favour, and had to witness, not without inquietude, the rise of an opposing party of naturalism and realism. Yet few men have had a brighter career, or enjoyed a reward better earned. Kaulbach's works are monu- mental, and will be handed down to future ages as the highest produets of the renaissance of the arts in modern Germany. (J. B. A.)

KAUNITZ, Wenzex Anton (1711-1794), count of Rietberg, Austrian statesman, was born at Vienna, Feb- ruary 2, 1711. As the fifth and youngest son of an Austrian count, he was destined at first for the church, but on the death of his brothers he turned his attention to statesmanship. He was sent by Maria Theresa on em- bassies to Rome and Florence, and was engaged at Turin in strengthening the alliance between Austria, Sardinia, and Great Britain against the Bourbons. In the meantime he had acquired the countship of Rietberg by marriage. In 1744 he was sent as minister to the court of the duke of Lorraine, governor-general of the Austrian Netherlands. During the duke's absence, Kaunitz administered affairs ably ;

and, when the French besieged Brussels in 1746, he secured a free retreat for the Austrian troops to Antwerp. After a brief retirement on account of his health, Kaunitz reappeared on the political stage at the congress of Aix-la- Chapelle in 1748, where he laid the foundation of his reputation, and earned the rank of minister of state. During his stay as ambassador at Paris, from 1750 to 1752, he concluded a secret alliance between Austria and France, a diplomatic stroke which involved the complete reversal of the former hostile attitude of the two powers, and which was rewarded by his appointment as chancellor of state or prime minister. In 1756 he was made chancellor of the Netherlands and of Italy. For nearly forty years he continued in this capacity to direct the affairs of Austria, steadily cultivating the French and Russian alliances, and jealously watching the rising power of Prussia, against which he formed the coalition of 1756. At the partition of Poland in 1772 he secured Galicia for Austria ; and it was during his ministry also that Bukowina (1776) and the so-called “Inn quarter” came under the Austrian crown. He enjoyed the unbounded confidence of Maria Theresa, and was an active agent in furthering the reforms under her and her son Joseph IT, He showed himself a liberal patron of education and art, as well as an accom- plished statesman. Under Joseph II. and Leopold II. his influence waned, and he resigned all his offices at the accession of Francis II. in 1792. In 1764 he was created a prince of the empire. He died June 27, 1794.

See the life by Hormayr in the Oesterretiehischer Plutareh, and Denkschriften des Fitrsten Kaunitz, Vienna, 1872, by Beer.

KAVA, an intoxicating drink used in the islands of the South Pacific from the Sandwich Islands to Fiji. In Hawaii it is called “kawa”; in the Marquesas “kava kava” ; “ava,” “ava-ava,” and “evava” in Tahiti; and in Fiji ‘““yaquona.” It is made from the roots or leaves of Piper methysticum, Miq., a species of pepper indigenous in these islands ; several varieties are also cultivated by the natives, those growing in a dry soil being considered to be the most active. To prepare the liquid the fresh roots or leaves, after being chewed by young girls or boys, with good teeth, clean mouths, and free from colds, are placed ina large wooden bowl (‘‘umete”) on three legs made of the wood of the vesi (Afzelia bijuga, Gray), and water or cocoa-nut

milk poured over the mass. The liquid is then stirred up, and the woody matter of the root is removed by repeatedly drawing through the infusion

long fibres prepared by crushing the green stems of the vau (Hibiscus, sp.), and passing them frequently between

‘two pieces of wood. By this means a muddy-looking liquid

resembling café au lait in appearance, or of a greenish hue if made from the leaves, is left in the bowl, a quantity of fecula remaining suspended in the fluid. The drink is then distributed into cups made of plantain leaves, by dipping some of the vau fibre into it and squeezing the liquid into the cups, which are handed to the individuals present. As the process of infusion only takes about twenty minutes, it is obvious that no fermentation can take place. The taste of the liquid is at first sweet and then pungent and acrid. The usual dose is half a cupful, equal to about two mouthfuls of the root. Intoxication follows in about twenty minutes, or immediately if twice the usual quantity be taken.

The drunkenness produced by kava differs from that of alcohol in being of a melancholy, silent, and drowsy character, accompanied, if the drink be made from roots growing ina damp soil, with great irritability at the slightest noise. The fit lasts for about two hours, but in persons who only take it occasionally it may continue for six or twelve hours. At Nukahiva kava is said to be used as a daily beverage, probably in small quantities,—its use, how- ever, being forbidden to women and children. In many of the Pacific islands kava is given at official receptions, being the offered and accepted token of hospitality. Formerly the drinking of it preceded warlike enterprises and religious festivals.

The daily use of the drug is sometimes followed by a kind of skin disease, called in Tahiti “arevareva.” The effect on those who are addicted to the use of kava for any length of time is to produce obscurity of vision, red con-junctiva, and yellow coloration of the teeth, while the skin where thick becomes dry, scaly, cracked, and ulcerated, and the body becomes

emaciated and decrepit. In Nukahiva it is given as a medicine in phthisis and in bronchitis, a small dose being taken before going to bed.

Mr Collie, surgeon to the ship “ Blossom,” states that he observed the infusion of the root to be useful in certain skin diseases (Beachy, Voyage of the “ Blossom,” vol. ii. p. 120). Some years ago it was introduced into France as a remedy for various diseases of the mucous membranes (Annal. de Thérap., 1857, p. 61), and it has also been recommended in gout (Med. Times and Gazette, 1856, p.

591).

ns root contains an essential oil of a yellow colour and agreeable odour, 2 per cent. of a balsamic resin called kawin, and about 49 per cent. of starch, also a neutral crystalline principle discovered in 1844 by Mr J. R. N. Morson, and called kavahine, or by Gobley methysticin. It is readily soluble in boiling alcohol, crystallizing out on cooling. Hydrochloric acid colours it red, this colour changing to yellow on exposure on the air; concentrated sulphuric acid changes it to a rich purple violet, which on exposure to the air gradually becomes green, or immediately if diluted with water. These tests distinguish it from cubebin and piperin.

See Pharm. Journ., (1) iii. 474, (2) iv. 85, (2) ix. 219, (8) vii. 149; Comptes Rendus, 1. 436, 598, lii. 206; and Journ. de Pharm., 1860, p. 20, and 1862, p. 218; Seemann, Flora Vitiensis, p. 260.

KAVALA, or Cavatto, a walled town of European Turkey in the vilayet of Saloniki, situated on a promontory stretching southwards into the bay of Kavala, opposite the island of Thaso. Numerous Roman remains have been found in the neighbourhood, of which the chief is the large aqueduct on two tiers of arches, which still serves to supply the town and dilapidated citadel with water from Mount Pangeus. Kavala has a port on each side of its promon- tory, and exports cotton and tobacco. The Turkish college

was founded by Mehemet Ali, pasha of Egypt, who was porn in the town in 1769. The population is about 5000.

Kavala has been identified with Neapolis, at which St Paul landed on his way from Samothrace to Philippi, 10 miles to the north (Acts xvi. 11). Neapolis was the port of Philippi, as Kavala now is of Seres ; and in the bay on. which it stands the fleet of Brutus and Cassius was moored during the battle of Philippi. Some authorities identify Neapolis with Datum (Adrov), mentioned by Herodotus as famous for its gold mines.

KAVANAGH, Jutta (1824-1877), novelist, was born at Thurles in Tipperary, Ireland, in 1824. She was the daughter of Morgan Kavanagh, author of various philo- logical works, and she spent several years of her early life with her parents in Normandy, laying there the founda- tion of a perfect mastery of the French language and practical insight into French modes of thought, which was perfected by her later frequent and long residences in France. Miss Kavanagh's literary career began with her arrival in London about her twentieth year, and, beyond the publication of her successive works, ler uneventful life with her widowed mother affords few incidents to the chronicler. On the outbreak of the Franco-German war the two ladies removed from Paris, where they were living, to Rouen. Thence they subsequently passed to Nice, where on October 28, 1877, Julia Kavanagh died, in her fifty- fourth year. She is described as having been in person extremely small, with large, luminous, brown eyes, and a wealth of splendid hair. She was a devout Ronan Catholic.

Julia Kavanagh's first book was 7hree Paths, 1847, a story for the young; but her first work to attract notice was Madeleine, a tale of Auvergne, 1848. A Summer and Winter in the Two Sicilies, 2 vols., 1858, was the fruit of a journey made about 1853 to France, Switzerland, and Italy. French Women of Letters, 2 vols., 1862, and English Women of Letters, 2 vols., 1868, are collections of slight biographical essays on lady novelists, She wrote also Woman in Franee during the 18th century, 2 vols., 1850, and Women of Christianity, 1852. But Miss Kavanagh is better known by her numerous novels and tales contributed to various magazines. The scenes of these are almost always laid in France, and the authoress handles her French themes with fidelity and skill. Her style is simple and pleasing rather than striking ; her characters are interesting without being strongly individualized ; and the paucity of incident in the unravelling of her plots sometimes seems to threaten monotony. Her most popular novels are perhaps Adéle, 1857;

Queen Mab, 1863; aud John Dorrien, 1875. Others are Nathalie, 1850; Daisy Burns, 1853; Grace Lee, 1855; Rachel Gray, 1855 ; Seven Years, &c., 1859; Beatrice, 1865 ; Sibyl's Second Love, 1867; Dora, 1868; Silvia, 1870; Bessic, 1872, The Pearl Fountain, &c. (written along with her mother), 1876; and 7wo Lilies, ce Forget-me-nots, 2 volumes of shorter tales, appearcd after her eatn,

KAVERI, or Cauvery, a great river of southern India, famous for its traditional sanctity, its picturesque scenery, and its utility for irrigation. Rising in Coorg, high up amid the Western Ghats, in 12° 25' N. lat. and 75° 34' E. long., it flows with a generally south-eastern direction across the plateau of Mysore, and finally pours itself into the Bay of Bengal through two principal mouths in Tanjore district. Its total length is about 475 miles; the estimated area of its basin, 28,000 square miles. It is known to devout Hindus as Dakshini Ganga, or the Ganges of the South, and the whole of its course is holy ground. According to the legend there was once born upon earth a girl named Vishnumayé or Lop4mudra, the daughter of Brahma; but her divine father permitted her to be regarded as the child of a mortal, called Kadvera-muni. In order to obtain beatitude for her adoptive father, she resolved to become a river whose waters should purify from all sin. Hence it is that even the holy Ganges resorts underground once in the year to the source of the Kaveri, to purge herself from the pollution contracted from the crowd of sinners who have bathed in her waters. The course of the Kaveri in Coorg 1s very tortuous. Its bed is generally rocky; its banks are high and covered with luxuriant vegetation. On entering Mysore it passes through a narrow gorge, but pre-

sently widens to an average breadth of from 300 to 400 yards. Its bed continues rocky, so as to forbid all naviga- tion; but its banks are here bordered with a rich strip of cultivation. In its course through Mysore, the channel is interrupted by twelve anicuts or dams for the purpose of irrigation. From the most important of these, known as the Madadkatte, an artificial channel is led to a distance of 72 miles, irrigating au area of 10,000 acres, yielding a revenue of £7000, and ultimately bringing a water-supply into the town of Mysore. In Mysore state the Kaveri forms the two

islands of Seringapatam and Sivasamudram, which vie in sanctity with the island of Srirangam lower down in Trichinopoli district. Around the island of Sivasamudram are the celebrated falls of the Kaveri, un- rivalled' for romantic beauty. The river here branches into two channels, each of which makes a descent of about 200 miles in a succession of rapids and broken cascades. After entering the Madras presidency, the Kaveri forms the boundary between the Coimbatore and Salem districts, until it strikes into Trichinopoli district. Sweeping past the historic rock of Trichinopoli, it breaks at the island of Srirangam into two chanuels, which enclose between then the delta of Tanjore, the garden of southern India. The northern channel is called the Coleroon (Kolidam) ; the other preserves the name of Kaveri. On the seaward face of its delta are the open roadsteads of Negapatam and French Karikal. The only navigation on any portion of its course is carried on in boats of basket-work. It is in the delta that the real value of the river for irrigation be- comes conspicuous. The most ancient irrigation work is a massive dam of unhewn stone, 1080 feet long, and from 40 to 60 feet broad, across the stream of the Kaveri proper, which is supposed to date back to the 4th century, is still in excellent repair, and has supplied a model to British engineers. The chief modern work is the anicut across the Coleroon, 2250 feet long, constructed by Sir Arthur Cotton between 1836 and 1838.

KAY, Joun (1742-1826), Scottish caricaturist, was born in April 1742, near Dalkeith, where his father was a mason. At thirteen he was apprenticed toa barber, whom he served for six years. He then went to Edinburgh, where in 1771 he obtained the freedom of the city by join- ing the corporation of barber-surgeons. For some years he practised his craft with success; but in 1785, induced by the favour which greeted certain attempts of his to etch in aquafortis, he took down his barber's pole and opened a small print shop in Parliament Square. There he con- tinued to flourish, painting miniatures, and publishing at short intervals his sketches and caricatures of local cele- brities and oddities, who abounded at that period in Edin- burgh society. He died on February 21, 1826. Kay's portraits were collected by Hugh Paton and published under the title A Series of Original Portraits and Caricature Etchings by the late John Kay, with Biographical Sketches and Illustrative Anecdotes (Kdin., 2 vols. 4to, 1838; 8vo ed., 4 vols., 1842; new 4to ed., with additional plates, 2 vols., 1877), forming a unique record of the social

life and popular habits of Edinburgh at its most interesting epoch. The caricatures have little strictly artistic merit, beyond their graphic power; the drawing is always stiff and often false; but they are admitted to have been accu- rate likenesses, and they possess the evident recommenda- tion of abundant and sly humour.

KAYE, Sir Jonn Wii11am (1814-1876), historian, was born in 1814, the son of a solicitor. Educated at Eton and Addiscombe Royal Military College, he served as an officer in the Bengal artillery till 1841, when he exchanged his sword for the pen. In 1856 he entered the service of the East India Company in England ; and, when next year the crown assumed the government of India, Kaye suc-

ceeded John Stuart Mill as secretary in the political and secret department of the India office. In 1871 he was created a knight of the Star of India. In 1874 his failing health warned him to resign his post ; and he died in London, July 24, 1876, To his historical and biogra- phical writings Sir John Kaye brought an_ historical sagacity, an honesty of purpose, and a military knowledge that make them at once valuable and interesting.

His best known works are his History of the Sepoy War, 8 vols., 1864; History of the War in Affghanistan, 2 vols., 1851 ; and his Life of Lord Metealfe, 2 vols., 1854. He was the author also of Peregrine Puliney (1844) and Long Engagements (1861), two Indian novels ; History of the Administration of the East India Company, 18538; Life of Henry Tucker, 1854; Life of Sir John Maleoln, 2 vols., 1856; History of Christianity in India, 1859; Lives of Indian Officers, 2 vols., 1867 ; Essays of an Optimist, 1870 ; and numerous contributions to periodicals.

KAZALA, or Kazatinsk, a fort and town, at the point where the Kazala falls into the Jaxartes, about 47 miles from its mouth. It is situated in 45° 45’ N. lat. and 62° 7’ E. long., “at the junction,” to quote Schuyler’s description, “of all the trade routes in Central Asia, as the road from Orenburg meets here with the Khivan, Bukharan, and Tashkent roads”; and thus, besides carry- ing on a lively local trade with the Kirghiz of the sur- rounding country, it is a point of growing importance in the general current of

commerce. In other respects the position of the place is far from attractive: the floods on the river make it an island in the spring; in summer it is parched by the sun and hot winds, and hardly a tree can be got to grow. The streets are wide, but the houses, as well as the fairly strong fort known as Fort No. 1, are built of mud bricks. The population, stated at 5000, is on the increase.

KAZAN, a government of European Russia, belonging to the basin of the Volga, and conterminous with the governments of Nizhni Novgorod, Vyatka, Orenburg, Samara, and Simbirsk. The area, according to the govern- ment survey, is 23,998 square miles. By the Volga and its tributary the Kama the surface of the government is divided into three regions of differing aspect: the first, to the right of the main river, is traversed by deep ravines sloping to the north-east and by two ranges of hills, one of which, keeping company with the river, has a height of 300 to 500 feet; the second, between the left bank of the Volga and the left bank of the Kama, is an open steppe; and the third, between the left bank of the Volga and the right bank of the Kama, resembles in its eastern part the first region, and in its western part is covered with forest. Marls, limestones, and sandstones, Permian or Triassic, are the main rocks ; the Jurassic formation appears in a small part of the Tetyushi district ; and Tertiary rocks stretch along the left bank of the Volga. There are no minerals of importance; but mineral springs (iron, sulphur, and naphtha) exist in several places. The Volga is navigable in all the 198 miles of its course through Kazan, as well as the Kama (120 miles); and the Vyatka, the Kazanka, the Rutka, the Tsivil, the Greater Kotshaga, the Ilet, and the Bezdna are not without value as waterways. About four hundred small lakes are enumerated within the govern- ment ; the Upper and Lower Kaban supply the city of Kazan with water.

About 7,123,610 acres (more than 46 per cent. of the surface) are arable, upwards of 1,324,900 acres (over 8 per cent.) are meadow land, and 5,190,960 acres (nearly 34 per cent.) are under forest. tye and oats form the principal crops; barley, wheat, buckwheat, and potatoes are also grown. In 1879 the official returns gave 1,048,092 as the number of sheep in the government, aud of these 13,748 were of fine woolled brceds; the horned cattle amounted to 359,362, the horses to 426,564, the swine to 192,190, and the goats to 45,822. No fewer than 8066 persons were engaged in

beekeeping, and the produce of this department was valued at £29,945. Industrial activity is on the increase; the number of the smaller

manufacturing establishments is diminishing, but those which reinain (272 in 1879, employing 8399 hands) are greatly increasing in production. The total value of their manufacture in 1879 was £2,034,137. Apart from the regular factories, there is a large in- dustrial activity. The weaving and dyeing of linen and hemp goods gave employment in 1879 to 18,485 men; wool-combing, &c., to 3428; flour and malt making to 3680, and the forest industries, wood-cutting, tar-boiling, &c., to 10,428. The aggregate commerce of the towns is estimated at £3,695,000. Of the seventy-six annual fairs, the chief are the timber fair of Kozmodemyansk, and those of Tchistopol and Tcheboksarui. Administratively Kazan is divided into twelve districts :—Kazan, Sviyazhsk, Tcheboksarui, Tsivilsk, Yadrin, Kozmodemyansk, Tsarevokokshaisk, Mamaduish, Tchis- topol, Laisheff, Spassk, Tetyushi. Besides the city of Kazan, the following are the largest towns :—Tchistopol (20,293 inhabitants in 1879), Laisheff (5098), Tcheboksarui (4560), Kozmodemyansk (4508), Mamaduish (4068). The total population of the government in 1879 was 1,872,487 (194,343 in the towns, 1,678,094 in the country districts). The males in the former case numbered 109,915, and the females 84,428; and in the latter the males 820,144, and females 857,950. Anincreasc of 267,732 has taken place since 1862. More than half of the inhabitants are of non-Slavonic origin; and the Mohammedans number over half a million.

The formation of the Kazan government dates from the year 1708 ; at first it contained a large portion of south-eastern Russia, but in 1781 the present limits were determined. The division into twelve districts was made in 1802.

Kazan, chief town of the above government, is situated in 55° 48’ N. lat. and 49° 26’ E. long., 528 miles east of Moscow and 970 miles from St Petersburg. The summer course of the Volga lies several miles to the south-west, and is gradually increasing its distance ; but when the river is at its height in spring the intervening space is laid under water, and the steamers, which at other times stop at the mouth of the Kazanka, are able to approach

the town. Though the hill on which the citadel stands is only about 40 feet high, it forms a striking relief to the level country in front. Contrary to what might be expected from its history, the town is almost completely destitute of Oriental colouring ; but the number and brightness of the Greek churches helps to relieve the general air of modern and commonplace regularity. The cathedral of the Annunciation was founded in 1562 by Gury, the first bishop of the diocese of Kazan ; and the Bogoroditskii convent was erected in 1579 for the reception of the “Black Virgin of Kazan,” which was removed in 1821 to the famous Kazan cathedral in St Petersburg. Of pre-Russian buildings there is hardly a trace; the red brick Sumbek tower, 245 feet high, is an object of great veneration to the Tartars, who consider it as the burial-place of one of their saints; but its similarity to the towers of Moscow proves its Muscovite origin. As an intellectual centre Kazan is the most important city of eastern Russia in Europe. The gymnasium, founded in 1750, was the third national institution for secondary edu- cation established in the empire; and the university, which dates from 1801, has become a great seat of Oriental scholarship. It has four faculties, with fifty-six teachers and about seven hundred students. The library contains about 85,000 volumes ; but the most valuable part of its manu. script collection has been removed to St Petersburg. There is an astronomical observatory ; and from the university press are issued a learned journal (Zzvyestiya i Zapiski) and a very considerable number of works, especially in Oriental philology. The ecclesiastical academy founded in 1846 contains the old library of the Solovki monastery, of import- ance for the history of Russian sects. Schools are main- tained by the Tartar population, which still occupies some of the suburbs ; and Tartar text-books (by Radloff) after the European type have been introduced. Asa seat of com- merce and industry Kazan holds a respectable place. Its leather goods, especially those of the finer qualities, are in repute ; and it also manufactures alcohol, flour, cotton and hemp goods, starch, stearine, tallow, and albumen. The trade connexion of the Tartar merchants more particularly is a very extensive and important one. The population

of the town, which was 63,084 in 1868, had increased in 1879 to 134,434, of whom 13,635 are Tartars.

The present government of Kazan was the centre of a great Bulgarian kingdom, the first historical monarchy of north-eastern Russia. On the ruins of this kingdom the Mongolian (Tartar) “kingdom of Kazan” was founded in the 15th century by Ulu- Mahmet, whose descendants continued to rule till the destruction of their city by Ivan the Terrible in 1552. Of the town of Kazan the early notices are of doubtful interpretation ; but according to §. M. Shpilevski the Kazan mentioned in 13876 must be Bulgar (the present Bolgarui in the district of Spassk), the ‘‘Great Town” of the Bulgarians, the ruins of which are among the most notable in the Kazan region; and the Kazan of even some of the later chronicles is to be identified with Koshan on the Kama. Nor is the present the original of Kazan proper ; on the banks of the Kazanka are extensive remains of Zski (Tartar for ‘‘Old”) Kazan, near a modern village of the same name. Kazan was laid waste by Pugatcheff, and the conflagrations of 1815 and 1825 were especially destructive. During the French invasion the Moscow university took asylum in the town.

The name of Kazan Tartars is given, not only to those of the government of Kazan, but to those of Ufa, Samara, Vyatka, Saratoff, Penza, Nizhni Novgorod, Orenburg, and Tamboff. In 1870 they ainounted altogether to 1,050,000. In many ways they differ con- siderably from those of Astrakhan, the Crimea, &c. They have pretty certainly incorporated a good deal of Bulgarian blood.

The history of Kazan has been written by Turncrelli (1841), Lepteff, Kurbski, and others. The evidence of Arabic, Tartar, and Russian writers in regard to the antiquities of town and government has been collected by Shpilevski (Izv. i Zap. Iny. Kaz. Un., 1877, pp. 1-585).

KAZINCZY, Ferencz or Francis (1759-1831), an Hungarian author, known as the most indefatigable agent in the regeneration of the Magyar language and literature at the end of the 18th and beginning of the 19th century, was born 27th October 1759, at Er-Semlyén, in the county of Bihar, Hungary. After passing through the gymnasium of Sdros-Patak, he studied law at Kassa and Eperies, and in Pest, where he also obtained a thorough knowledge of French and German literature, and made the acquaintance of Gideon Raday, who allowed him the use of his library, and encouraged him

in literary pursuits. In 1784 Kazinezy became subnotary for the county of Abavj; and in 1786 he was nominated inspector of schools at Kassa, There he began to devote himself to the restoration of the Magyar language and literature by translations from classical foreign works, and by the augmentation of the native vocabulary from ancient Magyar sources. In 1788, with the assist- ance of Bardéti Szabé and John Bacsdnyi, he startéd at Kassa the first Magyar literary magazine, Magyar Muzeum ; the Orpheus, which succeeded it in 1790, was of his own creation. Although, upon the accession of Leopold IL, Kazinezy, as a non-Catholic, was obliged to resign his post at Kassa, his literary activity in no way decreased, and he not only assisted Gideon Raday in the establishment and direction of the first Magyar dramatic society, but also enriched the repertoire with several translations from foreign authors. His Hamlet, which first appeared at Kassa in 1790, is a rendering from the German version of Schréder. Having become implicated in the democratic conspiracy of the abbot Martinovics, Kazinczy was arrested on the 14th December 1794, conveyed to Buda, tried, and con- demned to death; but the sentence was commuted to imprisonment. He was released in 1801, and shortly afterwards married Sophia Térék, daughter of his former patron, and retired to his small estate at Széphalom or “Fairhill,” near Sdtor-Ujhely, in the county of Zemplén. In 1828 he took an active part in the conferences held for the establishment of the Hungarian academy, in the historical section of which he became the first correspond- ing member. He died of Asiatic cholera, at Széphalom,

on the 22d August 1831, in the seventy-second year of his age.

Kazinezy, although possessing great beauty of style, cannot be regarded asa powerful and original thinker ; his fame is chiefly due to the felicity of his translations from the masterpieces of Lessing, Goethe, Wieland, Klopstock, Ossian, La Rochefoucauld, Marmontel, Moliére, Metastasio, Shakespeare, Sterne, Cicero, Sallust, Anacreon, and many others. He also edited the works of Bardezy (Pest, 1812, 8 vols.) and of the poet Zrinyi (1817, 2 vols.), and the poems of Dayka (1813, 3 vols.) and of John Kis (1815, 3 vols.). A collective edition of his works, consisting for the most part of translations, was published at Pest, 1814-1816, in 9 vols. His original

produc- tions, largely made up of letters, were cdited by Joseph Bajza and Francis Toldy at Pest, 1836-45, in 5 vols. Editions of his poeins appeared in 1858 and in 1868.. See HunGary, vol. xii. p. 377.

KEAN, Cuaries Joun (1811-1868), tragedian, son of Edmund Kean noticed below, was born at Waterford, Ireland, 18th January 1811. In his fourteenth year he was sent to Eton College, where he remained three years. The name of Kean secured him an engagement at Drury Lane Theatre, where he made his debut Ist October 1827, in the character of Norval, but failed to create a very favourable impression, his talents being such as required long practice and careful study for their development ; and his continued failure to achieve popularity led him to leave London in the spring of 1828 for the provinces. After a visit to America in 1830, where he was received with much favour, he in 1833 appeared at Covent Garden as Sir Edmund Mortimer, but his success was not pronounced enough to encourage him to remain long in London, espe- cially as he had already in the provinces won a high position. In January 1838 he returned to Drury Lane, and played Hamlet with a success which gave him a place among the principal tragedians of his time. After his marriage with the actress Miss Ellen Tree in 1842, he paid a second visit to America. Returning to England in 1847, he entered on a successful engagement at the Haymarket, and in 1850, along with Mr Kelly, he became lessee of the Princess Theatre. The most noteworthy feature of his management was a series of gorgeous Shakespearean re- vivals. Charles Kean cannot be called a great tragic actor. He did all that could be done by the persevering cultivation of his powers, and in many ways manifested the possession of high intelligence and refined taste, but his defects of person and voice made it impossible for him to give a representation at all adequate of the varying and subtle emotions characteristic of pure tragedy. In melodramatic parts such as Louis XI. and the Corsican Brothers his success was unequivocal and complete. From his “tour round the world” Kean returned in 1866 in broken health, and he died at London, January 22, 1868.

The Life and Theatrical Times of Charles Kean, by Johu William Cole, appeared in 1860 in two volumes.

KEAN, Epmounp (1787-1833), an English actor, chiefly celebrated as the impersonator of Shakespearean characters, was born at Chancery Lane, London, November 4, 1787. His reputed father was Aaron Kean, stage carpenter, and his mother was a strolling actress, Ann Carey, grand-daughter of Henry Carey, the author of the National Anthem, and the natural son of George Savile, marquis of Halifax. When only in his fourth year Kean made his first appearance on the stage as Cupid in one of Noverre's ballets at the opera-house. His fine black eyes, his bright vivacity and cleverness, and his ready affection to those who treated him with kindness, made him in childhood a universal favourite, but the harsh cir-cumstances of his lot, and the want of proper restraint, while they developed strong self-reliance, fostered way- ward tendencies. About 1794 a few persons benevolently provided the means of sending him to school, where he mastered his tasks with remarkable ease and rapidity ; but finding its restraint intolerably irksome, he shipped himself as a cabin boy at Portsmouth. Soon discovering that he had only escaped to a more rigorous bondage, he

counterfeited both deafness and lameness with a histrionic mastery which deceived even the physicians at Madeira. On his return to England he sought the protection of his uncle Moses Kean, mimic, ventriloquist, aud general enter- tainer, who, besides continuing his pantomimic studies, introduced him to the study of Shakespeare. At the same time Miss Tidswell, an actress who had been speci- ally kind to him from infancy, taught him the principles of acting. On the death of his uncle he was taken charge of by Miss Tidswell, and under her direction he began the systematic study of the principal Shakespearean characters, displaying even at this early period the peculiar originality of his genius by interpretations entirely different from those of Kemble. His brilliant talents and interesting countenance induced a Mrs Clarke of Guildford Street, Russell Square, to adopt him, but the unlucky remark of a visitor so touched his sensitive pride that he suddenly left her house and went back to his old surroundings. In his fourteenth year he obtained an engagement to play leading characters for twenty nights in York Theatre, appearing as Hamlet, Hastings, and Cato. Shortly after- wards, while he was in the strolling troupe of Richardson, the

rumour of his abilities reached the ear of King George IIL, who commanded him to recite at Windsor Castle. It is affirmed that this incident led some gentlemen to send him to Eton College; but the next three years of his life, from 1803 to 1806, are without authentic record. In 1807 he played leading parts in the Belfast theatre along with Mrs Siddons, who said that he “played very very well,” but that “there was too little of him to make a great actor.” An engagement in 1808 to play leading characters in Beverley’s provincial troupe was brought to an abrupt close by his marriage with Miss Ghambers, the leading actress, and for several years after his prospects were so dark that, when contemplating the possibility of a debut in London, he was in the habit of exclaiming, “If I succeed I shall go mad.” In 1814, however, the committee of Drnry Lane theatre, the fortunes of which were then so low that bank- ruptcy seemed inevitable, resolved to give him a chance among the “experiments” they were making to win a re- turn of popularity. His debut there on the 26th January as Shylock roused the audience to almost uncontrollable enthusiasm, and successive appearances in Richard IIL., Hamlet, Othello, Macbeth, and Lear only served to demon- strate to the fullest the greatness of his powers and his complete mastery of the whole range of tragic emotion.

Probably the irregular habits of Kean, even from the period when he became famous, were prejudicial to the refinement of his taste, and latterly they tended to exag- gerate his special defects and mannerisms. The adverse decision in the divorce case Cox v. Kean, and his conse- quent separation from his wife, roused against him such bitter feeling as almost compelled him to retire perma- nently into private life. Ultimately he was received with all the old favour, but the contest by its effects both on his bodily health and on his feelings had made him so dependent on the use of stimulants that the gradual de- terioration of his gifts was inevitable. Still, even in their decay his great powers triumphed during the moments of his inspiration over the absolute wreck of his physical faculties, and compelled admiration when his gait had degenerated into a weak hobble, when the lightning bril- liancy of his eyes had become dull and bloodshot, and the tones of his matchless voice were marred by rough and grating hoarseness. His last appearance on the stage was at Covent Garden, on the 25th March 1833, when he played Othello to his son’s Iago. At the words “ Villain, be

sure” in scene 3 of act iii. he suddenly broke down, and fell insensible into his son’s arms. He died at Rich- mond, 15th May 1833,

It was especially in the impersonation of the great creations of Shakespeare’s genius that the varied beauty and grandeur of the act- ing of Kean were displayed in their highest form, although probably his most powerful character was Sir Giles Overreach, the effect of his first impersonation of which was such that the pit rose en masse, and even the actors and actresses themselves were overcome by the terrific dramatic illusion. His only personal disadvantage as an actor was his small stature. His countenance was strikingly interesting and unusually mobile ; he had a matchless command of facial elocution ; his fine eyes scintillated even the slightest shades of emotion and thought ; his voice, though weak and harsh in the upper register, possessed in its lower range tones of pene- trating and resistless power, and a thrilling sweetness like the witchery of the finest music ; above all, in the grander moments of his passion, his intellect and soul seemed to rise beyond material barriers and to glorify physical defects with their own greatness. Kean specially excelled as the exponent of passion. In Othello, Iago, Shylock, and Richard III., characters utterly different from each other, but in which the predominant element is some form of passion, his identification with the personality, as he had conceived it, was as nearly as possible perfect, and each isolated phase and aspect of the plot was elaborated with the minutest attention to de- tails, and yet with an absolute subordination of these to the distinct individuality he was endeavouring to portray. If the range of character in which Kean attained supreme excellence was narrow, no one except Garrick has been so successful in so many great imper- sonations. Unlike Garrick, he had no true talent for comedy, but in the expression of biting and saturnine wit, of grim and ghostly gaiety, he was unsurpassed.

See Procter’s Life of Kean, but especially the Life of Edmund K ean, by F. W.

Hawkins, 2 vols., 1869, and the authorities therein mentioned. Some interesting details will also be found in Edward Stirling’s Old Drury Lane, 1881,

KEATS, Jou, born October 29, 1795, published his first volume of verse in 187, his second in the following year, his third in 1820, and died of consumption at Rome, February 23, 1821, in the fourth menth of his twenty-sixth year. In his first book there was little foretaste of anything greatly or even genuinely good; but between the marshy and sandy flats of sterile or futile verse there were undoubtedly some few purple patches of floral promise. The style was frequently detestable—a mixture of sham Spenserian and mock Wordsworthian, alternately florid and arid. His

| second book, Hndymion, rises in its best passages to the

highest level of Barnfield and of Lodge, the two previous poets with whom, had he published nothing more, he might most properly have been classed ; and this, among minor minstrels, is no unenviable place. His third book raised

| him at once to a foremost rank in the highest class of

English poets. Never was any one of them but Shelley so little of a marvellous boy and so suddenly revealed as a marvellous man. Never has any poet.suffered so much from the chaotic misarrangement of his poems in every collected edition. The rawest and the rankest rubbish of his fitful spring is bound up in one sheaf with the ripest ears, flung into one basket with the richest fruits, of his

sudden and splendid summer. The Ode to a Nightingale, . one of the final masterpieces of human work in all time

and for all ages, is immediately preceded in all editions now current by some of the most vulgar and fulsome dog- grel ever whimpered by a vapid and effeminate rhymester in the sickly stage of whelphood. Shelley, up to twenty, had written little or nothing that would have done credit to a boy of ten; and of Keats also it may be said that the merit of his work at twenty-five was hardly by comparison

| more wonderful than its demerit at twenty-two. His first | book fell as flat as it deserved to fall; the reception of . his second, though. less considerate than on the whole it

deserved, was not more contemptuous than that of im- measurably better books published about the same time by Coleridge, Landor, and Shelley. A critic of exceptional carefulness and candour might have noted in the first book so singular an example of a stork among the cranes as the famous and noble sonnet on Chapman's Homer; a just judge would have indicated, a partial advocate might have exaggerated, the value of such golden grain amid a garish harvest of tares as the hymn to Pan and the translation

into verse of Titian's Bacchanal which glorify the weedy wilderness of Hndymion. But the hardest thing said of that poem by the Quarterly reviewer was unconsciously echoed by the future author of Adonais,—that it was all but absolutely impossible to read through; and the obscener insolence of the " Blackguard's Magazine," as Landor after- wards very justly labelled it, is explicable though certainly not excusable if we glance back at such a passage as that where Endymion exchanges fulsome and liquorish endear- ments with the "known unknown from whom his being sips such darling (/) essence." Such nauseous and pitiful

phrases as these, and certain passages in his correspondence, :

make us understand the source of the most offensive impu- tations or insinuations levelled against the writer's man- hood ; and, while admitting that neither his love-letters, nor the last piteous outcries of his wailing and shrieking agony, would ever have been made public by merciful or respectful editors, we must also admit that, if they ought never to have been published, it is no less certain that they ought never to have been written; that a manful kind of man or even a manly sort of boy, in his love-making or in his suffering, will not howl and snivel after such a lamentable fashion, One thing hitherto inexplicable a very slight and rapid glance at his amatory correspondence will amply suffice to explain: how it came to pass that the woman so passionately beloved by so great a poet should have thought it the hopeless attempt of a mistaken kind- ness to revive the memory of a man for whom the best that could be wished was complete and compassionate oblivion. For the side of the man's nature presented to her inspection, this probably was all that charity or reason could have desired. But that there was a finer side to the man, even if considered apart from the

poet, his correspond- ence with his friends and their general evidence to his character give more sufficient proof than perhaps we might have derived from the general impression left on us by his works ; though indeed the preface to Hndymion itself, however illogical in its obviously implied suggestion that the poem published was undeniably unworthy of publica- tion, gave proof or hint at least that after all its author was something of aman. And the eighteenth of his letters to Miss Brawne stands out in bright and brave contrast with such as seem incompatible with the traditions of his character on its manlier side. But if it must be said that he lived long enough only to give promise of being a man, it must also be said that he lived long enough to give assurance of being a poet who was not born to come short of the first rank. Not even a hint of such a probability could have been gathered from his first or even from his second appearance; after the publication of his third volume it was no longer a matter of possible debate among judges of tolerable competence that this improbability had become a certainty. Two or three phrases cancelled, two or three lines erased, would have left us in Zamza one of the most faultless as surely as one of the most glorious jewels in the crown of English poetry. Jsabella, feeble and awkward in narrative to a degree almost incredible in a student of Dryden and a pupil of Leigh Hunt, is over- charged with episodical effects of splendid and pathetic expression beyond the reach of either. The Hve of St Agnes, aiming at no doubtful success, succeeds in evading all casual difficulty in the line of narrative ; with no shadow of pretence to such interest as may be derived from stress of incident or depth of sentiment, it stands out among all other famous poems as a perfect and unsurpassable study in pure colour and clear melody—a study in which the figure of Madeline brings back upon the mind’s eye, if only as moonlight recalls a sense of sunshine, the nuptial picture of Marlowe’s Hero and the sleeping presence of Shakespeare’s Imogen. Beside this poem should always be placed the

less famous but not less precious Eve of St Mark, a fragment unexcelled for the simple perfection of its perfect simplicity, exquisite alike in suggestion and in accomplishment. The triumph of Hyperion is as nearly complete as the failure of Endymion ; yet Keats never gave such proof of a manly

devotion and rational sense of duty to his art as in his resolution to leave this great poem unfinished ; not, as we may gather from his correspondence on the subject, for the pitiful reason assigned by his publishers, that of discourage- ment at the reception given to his former work, but on the solid and reasonable ground that a Miltonic study had something in its very scheme and nature too artificial, too studious of a foreign influence, to be carried on and carried out at such length as was implied by his original design. Fortified and purified as it had been on a first revision, when much introductory allegory and much tentative effusion of sonorous and superfluous verse had been rigorously clipped down or pruned away, it could not long have retained spirit enough to support or inform the shadowy body of a subject so little charged with tangible significance. The faculty of assimilation as distinguished from imitation, than which there can be no surer or stronger sign of strong and sure original genius, is not more evident in the most Miltonic passages of the revised Hyperion than in the more Shake- spearean passages of the unrevised tragedy which no radical correction could have left other than radically incorrigible. It is no conventional exaggeration, no hyperbolical phrase of flattery with more sound than sense in it, to say that in this chaotic and puerile play of Otho the Great there are such verses as Shakespeare might not without pride have signed at the age when he wrote and even at the age when he rewrote the tragedy of Romeo and Juliet. The dramatic fragment of King Stephen shows far more power of hand and gives far more promise of success than does that of Shelley's Charles the First. Yet we cannot say with any confidence that even this far from extravagant promisc would certainly or probably have been kept; it is certain only that Keats in these attempts did at least succeed in showing a possibility of future excellence as a tragic or at least a romantic dramatist. In every other line of high and serious poetry his triumph was actual and consummate ; here only was it no more than potential or incomplete. As a ballad of the more lyrical order, La belle Dame sans Merci is not less absolutely excellent, less triumphantly perfect in force and clearness of impression, than as a narra- tive poem is Lamia. In his lines on Robin Hood, and in one or two other less noticeable studies of the kind, he has shown thorough and easy mastery of the beautiful metre inherited by Fletcher from Barnfield and by Milton from Fletcher. The simple force of spirit and style which dis- tinguishes the genuine ballad manner from all spurious attempts at an artificial simplicity was once more

at least achieved in his verses on the crowning creation of Scott's humaner and manlier genius—Meg Merrilies. No little injustice has been done to Keats by such devotees as fix their mind's eye only on the more salient and distinctive notes of a genius which in fact was very much more various and tentative, less limited and peculiar, than would be in- ferred from an exclusive study of his more specially charac- teristic work. But within the limits of that work must we look of course for the genuine credentials of his fame ; and highest among them we must rate his unequalled and unrivalled odes. Of these perhaps the two nearest to absolute perfection, to the triumphant achievement and accomplishment of the very utmost beauty possible to human words, may be that to Autumn and that on a Grecian Urn; the most radiant, fervent, and musical is that to a Nightingale; the most pictorial and perhaps the tenderest in its ardour of passionate fancy is that to Psyche ; the subtlest in sweetness of thought and feeling is that on

Melancholy. Greater lyrical poetry the world may have seen than any that is in these; lovelier it surely has never seen, nor ever can it possibly see. From the divine frag- ment of an unfinished ode to Maia we can but guess that if completed it would have been worthy of a place beside the highest. His remaining lyrics have many beauties about them, but none perhaps can be called thoroughly beautiful. He has certainly left us one perfect sonnet of the first rank ; and as certainly he has left us but one. Keats, on high and recent authority, has been promoted to a place beside Shakespeare; and it was long since remarked by some earlier critic of less note that asa painter of flowers his touch had almost a Shakespearean felicity,— recalling, a writer in our own day might have added, the hand of M. Fantin on canvass. The faultless force and the profound subtlety of this deep and cunning instinct for the absolute expression of absolute natural beauty can hardly be questioned or overlooked; and this is doubtless the one main distinctive gift or power which denotes him as a poet among all his equals, and gives him right toa rank for ever beside Coleridge and Shelley. As a man, the two admirers who have done best service to his memory are, first and far foremost, Lord Houghton, and secondly Mr Matthew Arnold. These alone, among all who have written of him without the disadvantage or advantage of a personal acquaintance, have clearly seen and shown us the manhood of

theman. That ridiculous and degrading legend which imposed so strangely on the generous tenderness of Shelley, while evoking the very natural and allowable laughter of Byron, fell to dust at once for ever on the appearance of that admirable and unsurpassed biography which gave perfect proof to all time that “men have died and worms have eaten them,” but not for fear of critics or through suffering inflicted by reviews. Somewhat too sensually sensitive he may have been in either capacity, but the nature of the man was as far as was the quality of the poet above the pitiful level of a creature whose soul could “let itself be snuffed out by an article”; and in fact, owing doubtless to the accident of a death which followed so fast on his early appearance aud his dubious reception as a poet, the insolence and injustice of his reviewers in general have been comparatively and even considerably exaggerated. Except from the chief fountain- head of professional ribaldry then open in the world of literary journalism, no reek of personal insult arose to offend his nostrils; and then as now the tactics of such unwashed malignants were inevitably suicidal; the references to his brief experiment of apprenticeship to a surgeon which are quoted from Blackwood in the shorter as well as in the longer memoir by Lord Houghton could leave no bad odour behind them save what might hang about men’s yet briefer recollection of his assailant’s un- memorable existence. The false Keats, therefore, whom Shelley pitied and Byron despised would have been, had he ever existed, a thing beneath compassion or contempt. That such a man could have had such a genius is almost evidently impossible ; and yet more evident is the proof which remains on everlasting record that none was ever further from the chance of decline to such degradation than the real and actual man who made that name immortal. (&. CiMss) Subjoined are the most important facts in the life of Keats. He was born, as already stated, in London on October 29, 1795. At an early age he was sent to school at Enfield, and in 1810 he was apprenticed to a surgeon at Edmonton. On the completion of his apprenticeship, in 1815, he removed to London for the purpose of walking the hospitals, and soon made the acquaintance of Leigh Hunt, and subsequently that of Haydon, Hazlitt, Shelley, and others. After having published some sonnets in the Examiner, of which Hunt was at that time editor, he was encouraged by the praise of his friends to give to the world a volume of Poems in 1817, and a second, entitled Endymion, a Poetic Romance, in the

following year. Meanwhile, symptoms of hereditary lung-disease having shown themselves, he spent some months in visiting the English lake district and portions of Scotland and Ireland, but with- out re-establishing his failing health ; on his return to London the despondency which had fallen upon him on this account was deep- ened by the death of his younger brother. Soon after this event he first became acquainted with Miss Brawne, and the friendship rapidly grew into a passion which combined with straitened cir- cumstances and the steady progress of disease to give a tragical cast to all that remained of his brief carecr. In 1820 the results of his literary activity during the two preceding years were published in Lamia, Isabella, the Eve of St Agnes, and other Poems. In autumn of the same year, having been advised to winter in a more genial climate, he sailed forItaly. The voyage proved of little advantage, and after some months of suffering he died at Rome on February 23, 1821. The Life, Letters, and Literary Remains of Keats were published in two volumes by R. Monckton Milnes in 1848; The Letters of John Keats to Fanny Brawne, with introduction and notes by Harry Buxton Forman, appeared in 1878.

KEBLE, Joun (1792-1866), the poet of the Christian Year, was born on St Mark’s Day (April 25), 1792, at Fairford, Gloucestershire. He was the second child and eldest son of the Rev. John Keble and Sarah Maule; three sisters and one brother completed the family circle. Descended from a family which had attained some legal eminence in the time of the Commonwealth, John Keble, the father of the poet, was vicar of Coln St Aldwyn, but lived at Fairford, about 3 miles distant from his cure. He was a clergyman of the old High Church school, whose adherents, untouched by the influence of the Wesleys, had moulded their piety on the doctrines of the non-jurors and the old Anglican divines. Himself a good scholar, he did not send his son to any school, but educated him and his brother at home so well that both obtained scholar- ships at Corpus Christi College, Oxford. John was elected scholar of Corpus in his fifteenth, and fellow of Oriel in his nineteenth year, April 1811. In Easter term 1810 he had obtained double first class honours, a distinction which had been obtained only once before, and that by Sir Robert Peel. After his election to the Oriel fellowship, Keble gained the University prizes, both for the English essay and also for the Latin essay. But he was more remarkable for the rare beauty of his character than even for academic distinctions. Sir John Taylor Coleridge, his fellow

scholar at Corpus and his life-long friend, says of him, looking back on his youth, after their friendship of five and fifty years had closed, “It was the singular happiness of his nature, remarkable even in his under- graduate days, that love for him was always sanctified by reverence—reverence that did not make the love less tender, and love that did but add intensity to the reverence.” Oriel College was, at the time when Keble entered it, the centre of all the finest ability in Oxford. Copleston, Davison, Whately, were among the fellows who elected Keble ; Arnold, Pusey, Newman, were soon after added to the society. In 1815 Keble was ordained deacon, and priest in 1816. His real bent and choice were towards a pastoral cure in a country parish; but he remained in Oxford, acting first as public examiner in the schools, then as tutor in Oriel, till 1823. In summer he some- times took clerical work, sometimes made tours on foot through various English counties, during which he was composing poems, which afterwards took their place in the Christian Year. He had a rare power of attracting to himself the finest spirits, a power which lay not so much in his ability or his genius as in his character, so simple, so humble, so pure, so unworldly, yet wanting not that severity which can stand by principle and maintain what he holds to be the truth. In 1823 he left Oxford, and returned to Fairford, there to assist his father, and with his brother to serve one or two small and poorly endowed curacies in the neighbourhood of Coln. He had made a quiet but deep impression on all who came within his influence in Oxford,

and during his five years of college tutorship had won the affection of his pupils, some of whom afterwards rose to emi- nence. But it was to pastoral work, and not to academic duty, that he thenceforth devoted himself, associating with it, and scarcely placing on a lower level, the affectionate discharge of his duties as a son and brother. Filial piety influenced in a quite unusual degree his feelings and his action all life through. It was in 1827, a few years after he settled at Fairford, that he published the Christian Year. The poems which make up that book had been the silent gathering of years. Keble had purposed in his own mind to keep them beside him, correcting and improving them, as long as he lived, and to leave them to be published only “ when he was fairly out of the way.” This resolution was at length overcome by the importunities of his friends, and above all by the strong

desire of his father to see his son's poems in print before he died. Accordingly they were printed in two small volumes in Oxford, and given to the world in June 1827, but with no name on the title page. The book continued to be published anonymously, but the name of the author soon transpired. Probably no book of poetry in this century has had a wider circu- lation. Between 1827 and 1872 one hundred and fifty- eight editions had issued from the press, and since the latter date it has been largely reprinted both by the original publishers and by others. The author, so far from taking pride in this widespread reputation, seemed all his life long to wish to disconnect his name with the book, and "as if he would rather it had been the work of some one else than himself." This feeling arose from no false modesty. [t was because he knew that in these poems he had painted his own heart, the best part of it; and he doubted whether it was right thus to exhibit himself, and by the revelation of only his better self, to win the good opinion of the world, on which he knew that a woe had been pronounced.

Towards the close of 1831 Keble was elected to fill the chair of the poetry professorship in Oxford, as successor to his friend and admirer, Dean Milman. This chair he oc- cupied for ten years, probably the most eventful ten years which Oxford has seen since the Reformation. The pro- fessor is required by statute to deliver at least one lecture during each of the three terms that make up the academic year; and during Keble's tenure these lectures were still required to be in Latin. In the course of his professorship he delivered a series of lectures, clothed in excellent idiomatic Latin, in which he expounded a theory of poetry which was original and suggestive, and which grew naturally out of his own character and habits of mind. He looked on poetry as a vent for overcharged feeling, or a full imagination, or some imaginative regret, which had not found their natural outlet in life and action. It was a relief provided for those feelings which are apt to fill the mind too full, and to overburden the heart. This suggested to him a distinction between what he called primary and secondary poets,—the first employing poetry to relieve their own hearts, the second, poetic artists, composing poetry from some other and less impulsive motive. Of the former kind were Homer, Lucretius, Burns, Scott; of the latter were Euripides, Dryden, Milton. This view is set forth in an article contributed to the British Critic in 1838 on the life of Scott, and was more fully developed in two volumes of Prelectiones Academice,

His regular visits to Oxford kept him in intercourse with his old friends in Oriel common room, and made him familiar with the currents of feeling which swayed the university. Catholic emancipation and the Reform Bill had deeply stirred, not only the political spirit of Oxford, but also the church feeling which had long been stagnant. Cardinal Newman writes, “On Sunday July 14, 1833, Mr Keble preached the assize sermon in the University pulpit.

It was published under the title of National Apostasy. I have ever considered and kept the day as the start of the religious movement of 1833.” The occasion of this sermon was the suppression, by Earl Grey’s Reform ministry, of ten Irish bishoprics. Against the spirit which would treat the church as the mere creature of the state Keble had long chafed inwardly, and now he made his outward protest, asserting the claim of the church to a heavenly origin and a divine prerogative. About the same time, and partly stimulated by Keble’s sermon, some leading spirits in Oxford and elsewhere began a concerted and systematic course of action to revive High Church principles and the ancient patristic theology, and by these means both to defend the church against the assaults of its enemies, and also to raise to a higher tone the standard of Christian life in England. This design embodied itself in what is known as the Tractarian movement, a name it received from the once famous Zracts for the Times, which were the vehicle for promulgating the new doctrines. If Keble is to be reckoned, as Dr Newman would have it, as the primary author of the movement, it was from Dr Pusey that it received one of its best known names, and in Dr Newman that it soon found its genuine leader. To the tracts, which did so much to spread High Church views, Keble made only four contributions :—No. 4, containing an argument, in the manner of Bishop Butler, to show that adherence to apostolical succession is the safest course ; No. 13, which explains the principle on which the Sunday lessons in the church service are selected; No. 40, on marriage with one who is unbaptized; No. 89, on the mysticism attributed to the early fathers of the church. Besides these contributions from his own pen, he did much for the series by suggesting subjects, by reviewing tracts written by others, and by lending to their circulation the weight of his personal influence.

In 1835 Keble’s father died at the age of ninety, and soon after this his son married Miss Clarke, left Fairford, and settled at Hursley vicarage in Hampshire, a living to which he had been presented by his friend and attached pupil, Sir William Heathcote, and which continued to be Keble’s home and cure for the remainder of his life.

In 1841 the tracts were brought to an abrupt termina- tion by the publication of Newman’s tract No. 90. All the Protestantism of England was in arms against the author of the obnoxious tract. Keble came forward at the time, desirous to share the responsibility and the blame, if there was any; for he had seen the tract before it was published, and approved of it. The same year in which burst this ecclesiastical storm saw the close of Keble’s tenure of the professorship of poetry, and thence- forward he was seen but rarely in Oxford. No other public event ever effected Keble so deeply as the secession of his friend Mr Newman to the Church of Rome in 1845. It was to him both a public and a private sorrow, which nothing could repair. But he did not lose heart; at once he threw himself into the double duty, which now devolved on himself and Dr Pusey, of counselling the many who had hitherto followed the movement, and who, now in their per- plexity, might be tempted to follow their leader’s example, and at the same time of maintaining the rights of the church against what he held to be the encroachments of the state, as seen in such public acts as the Gorham judgment, and the decision on Zssays and Reviews. In all the ecclesiastical contests of the twenty years which followed 1845, Keble took a part, not loud or obtrusive, but firm and resolute, in maintaining those High Anglican principles with which his life had been identified. These ab- sorbing duties, added to his parochial work, left little time for literature. But in 1846 he published the Lyra Jnno- centvum ; and in 1863 he completed a ‘? = Bishop Wilson.

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In the late autumn of the latter year, Keble left Hursley for the sake of his wife’s health, and sought the milder climate of Bournemouth. There he had an attack of para- lysis, from which he died on the 29th March 1866. He

was buried in his own churchyard at Hursley; and in little more than a month his wife was laid by her husband's side.

It is as a poet that Keble was best known during his life, and it is as a poet that he will be remembered. His poetical works are the Christian Year (1827), A Metrical Version of the Psalter (1839), Lyra Innocentium (1846), and a volume of poems published posthumously.

Keble, though himself childless, was a special lover of children ; and the Lyra Jnnocentiwm expresses this characteristic. It isa book ''about ehildren, their ways, and privileges." It begins with their baptism, follows them through their cradle life and infancy, their childhood sports, troubles, encouragements, warnings, the lessons taught them by nature, those taught them by grace, dwells on their sicknesses, and their deaths. It is a book for parents, especially for mothers. The range of subjects is too limited, and the turn of thought often too subtle, to allow it to be widely popular. But Judge Coleridge pronounced it, if not equal to the Ohuristian Year as a whole, yet more than equal to it in parts; and Dean Stanley thinks that ''it has more of the true fire of genius, more of the true rush of poetic diction.'' However this may be, it is by the Christian Year that Keble won the ear of the religious world, and will retain it. It wasa happy thought that dictated the plan of the book, to furnish a meditative religious lyric for each Sunday of the year, and for each saint's day and festival of the English Church. The sub- ject of each poo is generally suggested by some part of the lessons or the gospel or the epistle for the day. One thing which gives these poems their strangely unique power is the sentiment to which they appeal, and the saintly character of the poet who makes the appeal, Ulumining more or less every poem, That to which the Christian Year appeals is the religious and devotional sentiment which, however hidden, exists more or less in most men. In the words of Sir J. T. Coleridge, ''to this feeling it makes its unceasing appeal, with a voice so earnest, so sincere, so sad in its hopefulness, so unpretending as to the speaker, yet so authoritative and confident as to the cause it pleads, that for the time it seems irresistible."

The preface begins with observing how important is ''a sober standard of feeling in matters of practical religion," and indicates that the object of the book is to calm excitement, and to exhibit the soothing tendency which

pervades the Book of Common Prayer. The motto on the title page, ‘‘ In quietness and confidence shall be your strength,” is the keynote to which the whole book is set. The main characteristics which go to make up the charm of this small volume are these :—

1. The peculiar tone of religious feeling that pervades it, at once deep, pure, and tender, sober and severely self-denying. The undertone of the book comes out in verses like this—

‘The eye in smiles may wander round, Caught by earth’s shadows as they flect,

But for the soul no help is found, Saye Him who made it, meet.”

Closcly connected with this there is a morc personal feeling towards our Lord, in His whole nature at once human and divine, than had ever before appeared in English poetry, even in that of Charles Wesley or Cowper. This runs through all the poems; it comes out especially in such verses as these

“* Our Saviour’s face benign, Bent on us with transforming power, ‘ Till we, too, faintly shine ;” and again, ‘© Who loves the Lord aright No soul of man can worthless find; All will be precious in his sight, Since Christ on all hath shined: But chiefly Christian souls; for they, Though worn and soiled with sinful clay, Are yet, to eyes that read them true, All glistening with baptismal dew.”

2. A second note of the Christian Year is reverence for the church, and for the pastoral office within it,—a solemn sense of its dignity and its awful responsibility.

3. A third note is the strong and tender affection for home and friends, the filial and fraternal piety, which everywhere pervades it. This appears notably in the poem for St Andrew’s Day, in the two opening stanzas of the poem on Whit Monday, in some verses of the poem for the 4th Sunday in Advent, and in many more.

4. A prevailing spirit of modesty and of delicate reserve, very unlike the vanity with which poets are often credited. Combined with this is a special

tenderness for those persons and things which the world thinks least of—for those who pine forgotten in hidden nooks, for the downtrodden and the despised. These sympathies appear at every turn of the book,—especially, perhaps, in such

poems as that for the 4th Sunday in Lent, that for Visitation of the Sick, and in two well-known stanzas in the poem for St Matthew's Day, not to mention many other like passages.

5. Besides these qualities of Keble's heart as a man, there are others which belong to him especially as a poet. Prominent among these is his love of nature, particularly for the more ordinary and unnoticed features of English landscape. In these he seemed most to delight, as interwoven with home thoughts and sentiments, and because, as he expresses it,

'* Homely seenes and simple views Lowly thoughts may best infuse."

Many a scene from the neighbourhood of Fairford and Oxford, many a fleeting image caught there in casual walks, has been inwrought, naturally and beautifully, into the web of his devout meditations.

6. The intimacy with the Bible which is manifest in the pages of the Christian Year, and the unobtrusive felicity with which Biblical sentiments and language are introduced, have done much to endear these poems to all Bible readers; nor this only, but the fidelity with which Biblical scenery is rendered. ''The exactness of the descriptions of Palestine, which Keble had never visited, have been noted, and verified on the spot," by Dean Stanley. He points to features of the lake of Gennesareth, which were first touched in the Christian Year ; and he observes that throughout the book ''the Biblical scenery is treated graphically as real scenery, and the Biblical history and poetry as real history and poetry."

As to its style, the Christian Year is calm and grave in tone, and subdued in colour, as beseems its subjects aud sentiments. The contemporary poets whom Keble most admired were Scott, Wordsworth, and, we may add, Southey ; and of their influence traces are visible in his diction. Yet he hasa

style of language and a cadence of his own, which steal into the heart with strangely soothing power. Some of the poems are faultless, after their kind, flowing from the first verse to the last, lucid in thought, vivid in diction, harmonious in their pensive melody. In others there are imperfections in rhythm, conventionalities of language, obscurities or over-subtleties of thought, which mar the reader's enjoyment. Yet even the most defective poems commonly have, at least, a single verse, expressing some profound thought or tender shade of feeling,

for which the sympathetic reader willingly pardons artistic imper-

fections in the rest.

The real power of the Christian Year lies in this, that it brings home to the readers, as few poetic works have ever done, a heart of rare and saintly beauty. We may well believe that ages must elapse ere another such character shall again concur with a poetic gift and power of expression, which, if not of the highest, are still of a high order,

Keble's life was written by his life-long friend the late Mr Justice Coleridge. The following is a complete list of his writings:—(1) Works published in Keble's lifetime :—Christian Year, 1827; Psalter, 1839; Prelectiones Academicex, 1844; Lyra Innocentium, 1846; Sermons Academical, 1848; Argument against Repeal of Marriage Law, and Sequel, 1857; Lucharistical Adoration, 1857; Life of Bishop Wilson, 1863 ; Sermons Occasional and Parochial, 1867. (2) Posthumous publica- tions :—Village Sermons on the Baptismal Service, 1868; Miscellaneous Poems, 1869; Letters of Spiritual Counsel, 1870; Sermons for the Christian Year, &e., 11 vols., 1875-80; Occasional Papers and Reviews, 1877; Studia Sacra, 1877 ; Outlines of Instruction or Meditation, 1880, (J.C. S.)

KECSKEMET (Lat. Egopolis), a royal free town in the county of Pest-Pilis-Solt-Kis-Kun, Hungary, is situated in an extensive plain, on the railway between Szeged (Szegedin) and Budapest, 52 miles south-east of the latter, in 46° 54' N. lat., 19° 44' E. long. Keeskemét is a poorly built and straggling town. It contains Roman Catholic, Lutheran, and Calvinist churches, as also a synagogue. Among the educational and other establishments are a Calvinist upper gymnasium (since 1860) and juridical

lyceum (1862), possessing a library and collection of pictures, a Roman Catholic (Piarist) upper gymnasium, founded in 1714, a Government technical school dating from 1874, monasteries belonging to the Piarist and Franciscan orders, a royal court of law, a hospital, orphan asylum, and theatre. The soil of the surrounding district, known as the Kecskemét heath, though generally arenaceous, is rendered productive by careful tillage. Soap is manufactured ; and trade, pro- moted by the periodical fairs, is generally thriving. Joseph Katona, the author of the famous historical drama Bank Ban, was born at Kecskemét in 1792. The population in 1880 was 46,505, chiefly Magyars by nationality.

KEELING ISLANDS, or Cocos Istanps, also called by Horsburgh the Borneo Coral Islands, a group in the Indian Ocean, about 600 miles south of the coast of Sumatra, in 12° 5’S. lat. and 90° 55’ E. long., well known

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as having furnished Mr Darwin with the typical example of an atoll or lagoon island.!_ There are altogether twenty- three small islands, 94 miles being the greatest width of the whole atoll.2 The lagoon is very shallow, and the passages between many of the islands of such trifling depth that it is possible to “walk at low tide with some slight wading all the way from Direction island to. West island.” An opening on the northern side of the reef permits the entrance of vessels into the northern part of the lagoon, which forms a good harbour known as Port Refuge or Port Albion. Since Mr Darwin’s visit some of the minor passages have become completely filled up.

The cocoa-nut (as the name Cocos Islands indicates) is the char- acteristic production, and is cultivated on all the islands. There are a few other trees (Sir E. Owen described seven kinds in 1830) and lesser plants ; but the whole flora, exclusive of recent introduc- tions, comprises less than thirty species. Of the twenty species, however, represented in Mr Darwin’s collection, ‘‘ nineteen belonged to different genera, and these again to no less than sixteen families.” With the exception of man and the domestic pig, the rat appears to be the only mammal in the islands; and there are no true

land birds, except domestic poultry. One of the commonest living creatures is a monstrous crab which lives on the cocoa-nuts; and in some places also there are great colonies of the pomegranate crab, which, to quote Mr Forbes, is ‘‘labouring assiduously to make the soft pure white calcareous mud into tree-inhabitable land.” The climate is temperate and extremely healthy. Terrific storms sometimes break over the island; and it has becn more than once visited by earthquakes. The inhabitants ‘‘are well developed, strong, and of a wonderfully healthy appearance” ; they belong originally to various parts of the Indian archipelago, Borneo, Sumatra, Celebes, &c.

The Kecling Islands were discovered in 1609 by William Keeling on his way home from the Moluccas.? In 1823 Alexander Hare, an English adventurer, settled on the southmost island with a number of Fives, Some two or three years after, a Scotchman, J. Ross, who had commanded a brig during the English occupation of Java, settled with his family on Direction Island, and his little colon was goon eee ee by Hare’s runaway slaves. The Dutc Government had in an informal way claimed the possession of the islands since 1829; but they refused to allow Ross to hoist the Dutch flag, and accordingly the place was taken under British protection in 1856. In 1878 it was attached to the government of Ceylon.

Besides Mr Darwin’s Journal of the Voyages of the Beagle (1860) and the work already mentioned, see Henry 0. Forbes in Proc. Roy. Geog. Soc., December 1879 (with a good map); Koner in Proc. Roy. Geog. Soc., 1881; A. van der Jagt in Verh. Bat. Gen. van K. en W., xiii.; J. J. Duintjer in Tindal and Swaart’s Zeewezen, iv., Voyage of Swedish Frigate’ Eugenie” (Berlin, 1856), and Bleeker’s papers on ichthyology in Vatuurk. Tijdschr. van Ned, Ind., vii., viii., xv., &,

KEFF, more correctly El-Keff (El Kaf), a town of the regency of Tunis, about 95 miles south-west from the capital, and 75 miles south-east of Béne in Algeria, ‘‘on the western declivities of a rocky range of bold hills,” 5 or 6 miles to the east of the course of the Wady Medjardak. tis considered the third in importance of the Tunisian towus, ranking after Tunis and KairwAén 3 and, though distant some twenty-two miles from the Algerian frontier, it is practically a frontier post, and its walls and citadel are kept in a

state of defence. Keff is identified with the ancient Roman colony of Sicca Veneria, which appears from the character of its Venus worship (Val. Max., ii. 6, §15) to have been a Pheenician settlement. Remains of ancient buildings (as, for example, of a temple of Hercules), and a considerable number of ancient Latin Inscriptions tend to confirm the identification. Population about 12,000.

See Barth, Dic Kiistenlainder des Mittelmeeres, 1849; Corpus

Inscript. Lat., vol. viii.; Sombrun in Bull. de la Soc. de Géog. de Bordeaux, 1878.

eet Observations on Coral Reefs, London, 1851; new ed.,

- The names of the more important are as follows :—Horsburgh or North Island (the most northern of the group); Direction Island or in Malay Pulu Tikus (Mouse Island) ; Prison Island ; Rice (Rijst) or Water Island, in Malay Pulu Tuwan ; South Island (Selima or Pairlee) ; Long, West, or Ross Island.

His narrative is given by Purchas, and epitomized in Astley's Col- ton,

27

KEIGHLEY, locally Keithley, anciently Keigheley, a market and manufacturing town in the northern division of the West Riding of Yorkshire, is beautifully situated in a deep valley near the junction of the Worth with the Aire, By the Midland Railway it is 95 miles south-east of Carlisle and 222 north of London. A canal between Liverpool and Hull affords it water communication with both west and east coasts. The town is rather irre- gularly built, and a considerable portion of it consists of workmen's cottages. Its growth has of late years been very rapid. Large reservoirs have been constructed for supplying water to the town. The principal buildings are the parish church of St Andrew in the late Perpendicular (dating from the time of Henry I., modernized in 1710, rebuilt with the exception of the tower in 1805, and again rebuilt in 1878), the Craven bank, the court-house, the mechanics' institute and school of art, the theatre (in the Gothic style, completed in 1870, at a cost of £5000), the

baths, the union workhouse, aud the Liberal and Conservative clubs. The educational institutions are the Drake and Tonson's school for girls, the trade school for boys, the national schools, and several board schools. The manufactures consist chiefly of worsted and woollen goods, machinery, machine tools, and sewing and wringing machines. Iron-founding is also extensively carried on. The population of the local board district in 1871 was 19,775, and in 1881 had increased to 25,245.

Henry Kigheley, who in the reign of Edward I. possessed the manor of Keighley, obtained for it from that monarch the privilege

of a market, a fair, and a free warren. The town in 1645 was the scene of a skirmish between the royal and parliamentary troops.

KEI ISLANDS, a group in the East Indian archipelago, consisting of one large and several smaller islands, situated about 5°30' 8. lat. and 133° E. long., some 90 miles to the south of the western end of New Guinea, and between the southern Moluccas and the Aru islands. The name, which appears in a great variety of spellings—Kee, Ke, Key, Ki, &c.—has been in use among Europeans from the days of Valentijn downwards, and may be the Spanish Cayo, a rocky island. The natives call the group Evar, the chief island Iut.

The Kei islands have been very frequently visited, but in such a cursory fashion for the most part that there is considerable doubt in regard even to their general carto- graphy. Of Great Kei the outline and extent are known, but as to the other islands—often lumped together under the name of Lesser Kei—even the number of the more important has yet to be determined. Cape Borang, the northern point of Great Kei, lies in 5° 17'. Dullah- Darat, Dullah-Laut, Letman, and Hodjan are believed to be separate islands, though Dullah-Darat and Letman are parted only by a very narrow passage, and Letman and Hodjan may possibly be one. The seat of the rajah recognized by the Dutch Government as the chief authority in the group is Dullah on the west coast of Dullah-Darat.

The inhabitants of the Kei islands are supposed to number 18,000 or 20,000. A certain proportion of them (dis- tinguished by the use of a special language and by the pro- fession of Mohammedanism) are known to be

descendants of natives of the Banda islands who had fled eastward before the encroachments of the Dutch. The great bulk of the people are still pagan, with rude statues of local deities and places of sacrifice indicated by flat-topped cairns. In physique the Kei islander is like the Aru islander, but more strongly built.

Cocoa-nuts, sago, fish, limestone, trepang, and timber are the chief productions of the islands. At Eli, on the east coast of Great Kei, there are extensive potteries which furnish earthenware for export as well as for local use.

The native proas are well built, after the shape of a whale-boat.

See C. Bosscher in Tijdschr. van het Bat. Gen., iv.; J. B. J. van Doren in Bijdr. tot de Taelkundc, &c., van N. L., new series, iv.; C. B. H. von Rosenberg, Reis naar de Zuidooster-eilanden ; Guido Cora's Cosmos, vol. iii. ; Veth, ‘‘ Geogr. Anteek.” (with map), in Tijdschr. van het. Aardr. Gen., ii., 1876.

KEIM, Turopor (1825-1878), a prominent German theologian of the “mediation” school, was born December 17, 1825, at Stuttgart, where he attended the gymnasium, proceeding in 1843 to Tiibingen, at which university be continued to study until 1848, F. C. Baur being the teacher who exercised the greatest influence over his thinking. For some time he held a private tutorial appointment, and in 1850 he attended classes at Bonn, returning in 1851 to his alma mater as “repetent.” In 1857 he became diaconus at Esslingen, and two years afterwards rose to the rank of archdeacon. From 1860 to 1873 he held the office of professor ordinarius of theology in Ziirich, and from 1873 until shortly before his death in November 1878 he occupied a similar post at Giessen.

He wrote Reformationsgeschichte der Reichsstadt Ulm, 1851; Schwibische Reformationsgeschichte bis zum.Reichstage von Augsburg, 1855 ; Reformationsblatter der Reichsstadt Esslingen, 1860 ; Am- brosius Blarer, der Schwiéibische Reformator, 1860; Der Uebertritt Konstantin's d. Gr. zwm Christenthum, 1862 ; two volumes of ser- mons entitled

Freundesworte zur Gemeinde, 1861-62; and Celsus' wahres Wort, 1873. But the works to which he owes the consider- able celebrity he possesses among Protestant theologians even out- side of Germany are those in which he has investigated, with much patience of independent research and acuteness of discernment as well as with unusual power of noble appreciation, the narrative of the life of Christ contained in the gospels. Die menschliche Ent- wickelung Jesu Christi (1861), Die geschichtliche Wiirde Jesu (1864), and Der geschichtliche Christus were followed by what without exaggeration may be called the truly great work, Geschichte Jesu von Nazara (3 vols., 1867-72 ; English translation, 1873-77), of which the Geschichte Jesu nach den Ergebnissen heutiger Wisscnschaft, fiir weitere Kreise iibersichtlich erzahlt, 1873, is a popular abridgment.

KEITH, an old Scotch family which takes its name from the barony of Keith in East Lothian, bestowed, it is said, by Malcolm II. on a member of the house along with the office of hereditary grand marischal in reward of bravery shown in a battle against the Danes. The importance of the family was increased by a grant in 1320 of part of the forfeited estates of the earl of Buchan to Sir Robert Keith for his valour in support of the cause of Robert the Bruce, and by the inheritance in the next century of the lands of the Frasers of Kincardineshire through the marriage of Sir William Keith, who in 1458 was created Lord Keith and Earl Marischal of Scotland. William, earl marischal, great grandson of the first of the line, distinguished himself at the battle of Pinkie in 1547, and was a member of the council of the kingdom during the minority of Queen Mary. By his marriage with his cousin Margaret, daughter of Sir William Keith of Inverugie, he nearly doubled his estates, but, becoming involved in money embarrassments, he lived for some time in seclusion in his castle of Dun- nottar, obtaining on that account the sobriquet of "William that kept the tower." He was succeeded in 1581 by his grandson George, fifth earl, who, besides having studied under the direction of Beza at Geneva, had acquired a comprehensive knowledge of the politics and customs of most of the courts of Europe. Pro- bably for this reason he was chosen by King James to negotiate his marriage with Queen Anne of Denmark and bring her to Scotland. Throughout life he showed a keen interest in the advancement of learning. He was one of the commissioners appointed in 1582 to inquire into the management of King's College, Aberdeen, and out of his own

private fortune he founded and endowed Marischal College in that city, which received a charterin 1593. He died at Dunnottar, April 5, 1623. The estates of the Keiths were forfeited on account of the part taken by

George Keith, tenth earl, and his brother Francis (see next article) in the rebellion of 1715. Through the influ- ence of his brother with Frederick the Great, the earl became governor of Neufchatel. After the reversal of the attainder he returned to Scotland, but soon made his way back to Berlin, where he died in April 1788. Through his death without issue the male line of the house became extinct. From the female line descended the Keith Elphinstones, one of whom, Sir George, was on account of his brilliant naval services created an Irish peer with the title of Baron Keith of Stonehaven Marischal. Sir John Keith, third son of the sixth earl marischal, was created Earl Kintore and Lord Keith of Inverurie and Keith Hall, on account of the part he was supposed to have taken in saving the regalia of Scotland when Dunnottar Castle, where they were deposited, was be- sieged by Cromwell.

See Account of the Ancient and Noble Family of Keith, by P. Buchan, 1828 ; and Douglas's Scotch Peerage.

KEITH, Francis Epwarp James (1696-1758), gene- rally known as Marshal Keith, son of William the ninth earl marischal (see last article), was the most notable member of the house of Keith. Through his careful education under Bishop Keith, and his subsequent uni- versity curriculum at Edinburgh in preparation for the legal profession, he acquired that taste for literature which afterwards secured him the esteem of the most distin- guished savants of Europe ; but at an early period his pre- ference for a soldier's career was decided and enthusiastic. The rebellion of 1715, in which he displayed qualities that gave some augury of his future eminence, compelled him to seek safety on the Continent. After spending two years in Paris, chiefly in studying at the university, he in 1719 took part in the ill- starred expedition of the Pretender to the Highlands of Scotland. He then passed some time at Paris and Madrid in obscurity and poverty, until he obtained the pay of a colonel from the king of Spain. Finding his Protestantism a barrier to promotion, he obtained from the king of Spain a

recommendation to the emperor Peter II. of Russia, from whom he received the command of a regiment of the guards. In several Russian campaigns the calm, intelligent, and watchful valour which was his chief characteristic was displayed to such advantage that he obtained the rank of general and the reputation of being one of the ablest officers in the Russian service. Judging, however, that his rewards were not commensurate with his merits, he in 1747 offered his services to king Frederick of Prussia, who at once gave him the rank of field marshal, and gradually came to cherish towards him a strong personal affection and regard. In the subsequent wars of Frederick he displayed conspicuous ability, manifesting in critical contingencies a remarkable union of circumspection and promptitude. He was killed, 14th October 1758, at the battle of Hochkirch. Keith is described by Carlyle as " sagacious, skilful, imperturbable, without fear and without noise, a man quietly ever ready" ; and also as "not given to talk unless there is something to be said, but well capable of it then."

See Varnhagen von Ense, Leben des Feldmarschalls Jakob Keith, 1844 ; Fragment of a Memoir of Field Marshal James Keith, written

by himself, 1714-1734, edited by Thomas Constable for the Spalding club, 1843; and Carlyle's Frederick the Great.

KEJ, the capital of the province of Mekran (the Gedrosia of the Greeks) in Baluchistan, is situated in 26° N. lat. and 62° 50' E. long. There exists really no town, but a number of small villages dominated by a fort built upon a rock, on the eastern bank of the Kej river. This fort, like many others similarly placed throughout the country, is supposed to be impregnable, but is in fact of no strength except against the matchlocks of the surrounding tribes.

K KE L—

Kej in former days was considered of very great importance by the rulers of Khelat, who have at various times marched large armies into the province with a view to maintaining their supremacy. At the commencement of the present century it had the reputation of being a town of consider- able commercial importance, trading through Panjgur with Kandahar, with Kurrachee wa Beyla, and with Muscat and the Persian Gulf by the seaport

of Guader, distant about 80 miles. The present ruler of Khelat is able to exert but a feeble sway over this portion of his dominion, although he appoints a governor to the province. The principal tribe residing around Kej is that of the Gitchki, who claim to be of Rajput origin, and to have settled in Mekran during the 17th century, having been driven out of Rajputana. There are numerous other tribes having very curious traditions as to the time and manner of their settling in the country. The climate during summer is almost unbearable for Europeans. During winter, how- ever, it is temperate. The principal exports consist of dates, which are considered of the finest quality. There is little chance of Kej resuming its former prosperity.

KELAT. See KHELAT.

KELLERMANN, Francois CuristorHeE (1735-1820), duke of Valmy and marshal of France, was born near Rothenburg, in Bavaria, in May 1735. He entered the French army as a volunteer, and served in the Seven Years' War and in Louis XV.'s Polish expedition of 1771. By 1785 he had attained the rank of maréchal-de-camp. In 1789 Kellermann enthusiastically embraced the cause of the Revolution, and in 1791 he became general of the army in Alsace. In August 1792 he received command of the army of the centre, with orders to effect a junction with Dumouriez in Champagne. The day after he had succeeded in this operation (September 20), he was forced to give battle to the allies on the heights of Valmy. General Kellermann's dash and bravery led his troops to a decisive victory, whose moral effects were of the utmost importance. Transferred next to the army on the Moselle, Kellermann was accused by General Custine of neglecting to support his operations on the Rhine; but from this, as from a similar charge in 1793, he was acquitted at the bar of the Convention in Paris, and was placed at the head of the army of the Alps and of Italy. Shortly afterwards he received instructions to reduce Lyons, then in open revolt against the Convention. The hesitation he displayed in executing that order brought him again into suspicion ; and he was imprisoned in Paris for thirteen months. Once more honourably acquitted, he was reinstated in his command, and did good service in maintaining the south- eastern border against the Austrians. When Napoleon came to power Kellermann was named successively senator, marshal of France, and duke of Valmy. In 1814 he voted for the

deposition of the emperor, and became a peer under the royal government. After the “ Hundred Days” he sat in the high chamber and voted with the Liberals. He died September 12, 1820.

KELLGREN, Jonan Henrik (1751-95), Swedish poet and critic, was born at Floby in West Gothland, December 1, 1751. He studied at the university of Abo, and had already some reputation as a poet when in 1774 he there became a “docent” in esthetics. Three years after this he removed to Stockholm, where in conjunction with Lenngren he began in 1778 the publication of the journal Stockholmsposten, whose chief contributor he con- tinued to be almost throughout the remainder of his life. Kellgren was private librarian to Gustavus III. from 1780, and from 1785 his private secretary. Ou the institution of the Swedish Academy in 1786 he was appointed by the king one of its first members. He died at Stockholm after a severe illness of two years, April 20, 1795. Early

familiar with the models of the French school of Voltaire, Kellgren did not till late in life awake to a sense of the value of the works of Lessing and Goethe. His strong satiric tendency led him into numerous controversies, the chief that with Thorild, against whom he directed his satire Nyt forsbk till oremmad vers, where he sneers at the “raving of Shakespeare” and “the convulsions of Goethe.” His lack of humour detracts from the interest of his polemical writings. His poetical works are partly lyrical partly dramatic, but of the latter only the versification belongs to him, all the rest being due to Gustavus III, The songs interspersed in the four operas which they produced in common, viz., Gustaf Vasa, Gustaf Adolf och Ebba Brahe, 4ineas + Kartago, and Drottning Kristina, are wholly the work of Kellgren. From about the year 1788 a higher and graver feeling pervades Kellgren’s verses, partly owing to his increased knowledge of the newer German and English literature, but probably more directly due to his controversy with Thorild. Of his minor poems written before that date the most important are the charming spring-song Vinterns vdlde lyktar, and the satirical Mina léjen and Man eger ej snille fir det man ar galen. The best productions of what is called his later period are the satire Ljusets fiender, the comic poem Dumboms lefverne, the warmly patriotic Kantat d. 1 jan. 1789, the ode Tull

Kristina, the fragment Sigwart och Hilma, and the beauti- ful song Nya skapelsen, both in thought and form the finest of all his works. Among the lyrics of Kellgren are the choicest fruits of the Gustavian age of Swedish letters. His earlier efforts, indeed, express with great completeness the superficial doubt and pert frivolousness characteristic of his time; but in the works of his riper years he is no mere “ poet of pleasure,” as Thorild contemptuously styled him, but a worthy exponent of earnest moral feeling and wide human sympathies in the most felicitous and melo- dious verse. His Samlade skrifter (3 vols., 4th ed., Orebro, 1860), revised by himself, were, in accordance with his own direction, published by his friends after his death. His prose works were translated into German by Lappe (Neustrelitz, 1801).

See Wiesclgren, Sveriges skina literatwr, 1833-49; Attcrbom, Svenska siare och skalder, 1841-55; C. W. Bottiger in Transactions of the Swedish Academy, xlv. 107 sg., 1870; and Gustaf Ljung- gren’s Kellgren, Leopold, och Thorild, and his Svenska vitterhetens hafder, 1873, 1877.

KELLS, a merket and municipal town of Meath county, Ireland, is situated on the Blackwater and on the Dublin and Meath Railway, 39 miles north-west of Dublin. The prosperity of the town depends chiefly upon its interesting antiquarian remains, The most notable is St Columba’s house, originally an oratory, but afterwards converted into a church, the chancel of which was in existence in 1752. The present church is modern, with the exception of the bell-tower, rebuilt in 1578. Near the church there is a very perfect specimen of the ancient round tower, and there are also several ancient crosses, one being situated in the market-place.

Kells was originally a royal residence, whence its ancient name Ceanannus, meaning the dun or circular northern fort, in which the king resided, and the intermediate name Kenlis, meaning head fort. The other places in Ireland named Kells are probably derived from Cealla, signifying church. In the 6th century Kells, it is said, was granted to St Columba. The statement that he founded a monastery at it is probably incorrect ; at any rate the town owes its ecclesiastical importance to the bishopric founded about 807, and united to Meath in the 18th century. Until the Act of Union Kells returned two members to parliament. Population of urban sanitary district in 1881, 2820.

KELP (Fr., varech) is produced by the incineration of various kinds of sea-weed (Alge) obtainable in great abundance on the west coasts of Ireland and Scotland, and the coast of Brittany in France. It is prepared from the deep-sea tangle (Laminaria digitata), sugar wrack (LZ.

saccharina), knobbed wrack (Fucus nodosus), black wrack (F. serratus), and bladder wrack (/. vesiculosus). The Laminarias yield what is termed drift-weed kelp, obtain- able only when cast up on the coasts by storms or other causes, The species of Mucus, on the other hand, growing within the tidal range, are cut from the rocks at low water, and are therefore known as cut-weeds, In the preparation of kelp, the weeds are first dried in the sun, and are then collected into shallow pits on the ground and burned till they form a fused mass, which while still hot is sprinkled with water in order to break it up into convenient pieces. A ton of kelp is obtained from 20 to 22 tons of wet sea-weed. The average com- position may vary as follows :—sulphate of potash, 10 to 12 per cent. ; potassium chloride, 20 to 25 per cent. ; sodium carbonate, 5 per cent.; other soda and magnesia salts, 15 to 20 per cent.; and insoluble ash from 40 to 50 per cent. The relative richness in iodine of different samples varies largely, good drift kelp yielding as much as 10 to 15 bb per ton of 224 ewts., whilst cut-weed kelp will not give more than 3 to 4 Ib. The rude manner in which kelp is prepared causes much of the iodine to be vola- tilized; but Mr E. C. C. Stanford has successfully in-troduced a process for treating sea-weeds by destructive distillation, whereby the whole of that valuable body is saved. See IopINE.

Previous to the introduction of the Leblanc process for the manufacture of sodium carbonate, kelp was the principal source of that substance, as well as a source of potassium salts, and consequently was a raw material of much import- ance in chemical industries. About the beginning of the 19th century the value of the kelp prepared on the coast and islands of the west of Scotland was not less than £400,000 per annum, representing 20,000 tons of kelp. With the gradual introduction and improvement of the Leblanc process, and the reduction of the duty on salt and other causes, the value of kelp decreased from £20 and upwards to about £2 a ton, a price altogether unremunerative. Towards the middle of the century, however, a new

impetus was given to the trade by the rise of the manufacture of iodine, of which kelp was at first the only commercial source. The introduction of Chili saltpetre (caliche) as a source of iodine, and the de- velopment of the Stassfurth salt-mines for the production of potash salts, have in their turn had a depressing influence on the kelp manufacture, and it is only by the most careful utilization of all the salts contained in the kelp, and the use of most approved methods of preparing the material, that the industry is continued as a remunerative undertak- ing. The production of kelp in the British Islands varies greatly from year to year. It may be stated to average about 7000 tons, at a value of about £4 perton. Two- thirds of this quantity is produced in Ireland, and the remainder on the Scottish coast and islands. The quantity produced in France is probably now somewhat less than the British yield.

KELSO, a burgh of barony and market-town of Roxburghshire, Scotland, is situated on the north side of the Tweed near its junction with the Teviot, 45 miles south-east of Edinburgh and 23 south-west of Berwick by rail. The town is embosomed atnong woods in a pleasantly undulating and fine agricultural country. The principal streets branch out in four directions from the spacious square, where are the principal shops and hotels. From the bridge of five arches, designed by Rennie, a fine view is obtained of the course of the river. Near it stand the picturesque ruins of the ancient abbey church, founded by David I., but demolished by the English in 1545, one of the finest extant examples in Scotland of the Early Norman style. A mile west of Kelso, on the north bank of the

river, is Floors Castle, the seat of the duke of Roxburghe, nearly opposite which, on the south bank, stand the ruins of the old fortress of Roxburgh Castle. Kelso possesses a town-hall, a corn exchange, an auction mart, and a collegiate school, About a mile north of the town there is a race course ; the fine cemetery and the spacious public park also deserve mention. The trade of the town is chiefly connected with agriculture. There are large nurseries, corn-mills, manure works, coach works, a foundry, and two

engineering shops. Kelso was made a burgh of barony in 1634. It is now under the General Public Act. The population in 1881 was 4563.

KEMBLE, Cuartzs (1775-1854), a younger brother of John Philip Kemble noticed below, was born at Brecknock, Like his brother he

was educated at Douai. After returning to England in

| 1792, he obtained a situation in the post-office, but this he

soon resigned for the stage, making his debut at Sheffield as Orlando in As You Like It. During the early period of his career as an actor, chiefly on account of the great

| abilities of his sister and brother, he made his way only

slowly to public favour. For a considerable time he played along with them, chiefly in secondary parts, and this with a grace and finish which received scant justice from the critics. Ultimately he won independent fame, especially in comédie larmoyante. His gifts had been disciplined to the utmost degree of perfection of which they were capable, by his Jiberal mental culture and by refined social inter- course ; and such characters as Archer, Doricourt, Charles Surface, and Ranger he played with an airy grace and

| polished humour that have never been excelled; while he

had sufficient fire and energy to give adequate effect to romantic passion and pathos. In genteel comedy he was ably supported by his wife Miss De Camp, whom he married in 1806. His imposing person, classical countenance, and tuneful voice also enabled him to be highly successful in historical drama, some of his principal parts being Alcibiades, Antony, Henry V., and Orestes. The latter period of his career was clouded by money embarrassments in connexion with his joint proprietorship in Covent Garden Theatre. He formally retired from the stage in December 1836, but his final appearance was on April 10, 1840. For some time he held the office of examiner of plays. He died November 12, 1854.

See Gentleman’s Magazine, January 1855; and Records of a Girl- hood, by his daughter Frances Ann Kemble, who has achieved distinetion both as a tragedienne and an authoress,

KEMBLE, Jonn Mircuet (1807-1857), Anglo-Saxon scholar and historian, eldest son of Charles Kemble noticed above, was born in 1807. He received his education partly from Dr Richardson, author of the Dictionary of the English Language, and partly at the grammar school of Bury St Edmunds, where he obtained in 1826 an exhibition to Trinity College, Cambridge. At school he was distinguished for his miscellaneous knowledge, and at the university his essays on historical subjects gained him high reputation. The historical bent of his studies was confirmed and turned more especially towards the Anglo-Saxon period through the influence of the brothers Grimm, under whom he studied at Gottingen. His thorough knowledge of the Teutonic speeches was shown in his Beowulf (1833-37), Ueber die Stammtafel der West- sachsen (1836), Codex Diplomaticus Avi Saxonici (1839), and in many contributions to reviews; while his History of the Saxons in England (1849) was the first attempt at a thorough examination of the original sources of the early period of English history. He was also for some time editor of the Foreign Quarterly Review. In 1857 he published State Papers and Correspondence illustrative of the Social and Political State of Europe from the Revolution

to the Accession of the House of Hanover. He died at Dublin 26th March 1857. His Hore Ferales, or Studies in the Archxology of Northern Nations, was completed by Dr Latham, and published in 1864.

KEMBLE, Joun Puiuip (1757-1823), tragedian, was the second child of Roger Kemble, a strolling player, and his wife Sarah Ward, the eldest child being Sarah, known as Mrs Siddons. He was born at Prescot, Lancashire, February 1, 1757. In his eleventh year he became an inmate of Sedgely Park Catholic seminary, near Wolver- hamptun, and after remaining there four years entered the college of Douai with the view of becoming a priest. At the conclusion of the course, however, he discovered that he had no vocation for the priesthood, and, arriving in England in the end of 1775, he joined the theatrical company of Crump and Chamberlain, his first appear-

ance being in the character of Theodosius at Wolver- hampton, 8th January 1776. Various stories more or less apocryphal are told of his early hardships, until in 1778 he joined the York company of Wilkinson, where he appeared in Hamlet and other leading parts, besides contributing a drama of his own on the subject of Belisarius. In 1781 he made a decided step in advance, obtaining a “star” engagement in Smock Alley Theatre, Dublin, and achieved astonishing success in the Count of Narbonne by Captain Jephson. Gradually he won for himself a high reputation as a careful and finished actor, and this, combined with the greater fame of his sister Mrs Siddons, led to an engagement in Drury Lane Theatre, where he made his debut 30th September 1783, in the part of Hamlet. His appearance was successful, but rather by awakening interest and discussion than enthusiastic approval. His reading of the part, though highly intel- lectual and elaborated with the most minute care, was stiff and laboured, especially until he acquired the familiarity with the personation obtainable by repetition. In Edward the Black Prince, Richard III., King John, Sir Giles Over- reach, and other characters he did not materially advance his reputation. His first decided success was in the char- acter of Macboth for his own benefit, when he shared in the enthusiasm aroused by Mrs Siddons, and established for himself a reputation among living actors second to hers only. In December 1787 he married Mrs Brereton, the widow of a young actor. His appointment as manager of the theatre in October of the following year gave him full opportunity to experiment with whatever parts might strike his fancy, and of this he took advantage with greater courage than discretion. His smile, as was wittily said, “ resembled the plating on a coffin,” and it was only in cases where his gravity gave a certain piquancy to the character that his comedy parts were redeemed from failure, notwithstanding his clever mastery of smart repartee. In Coriolanus, however, which was revived during his first season, the character of the “noble Roman” was so exactly suited to his powers that he not only played it with a perfection that has never been approached, but, it is said, unconsciously allowed its influence to colour his private manner and modes of speech. His tall and imposing person, noble countenance, and solemn and grave de- meanour were uniquely adapted for the Roman characters in Shakespeare’s plays ; and, when in addition he had to depict the gradual growth and development of one absorb- ing passion, his representation gathered a momentum and majestic force that were irresistible. His defect

was in flexibility, variety, rapidity; the characteristic of his style was method, regularity, precision, elaboration even of the minutest details, founded on a thorough psychological Study of the special personality he had to represent. His elocutionary art, his fine sense of rhythm and em- phasis, enabled him to excel in declamation, but physically

| he was incapable of giving expression to impetuous vehemence and searching pathos. In Coriolanus and Cato he was beyond praise, and possibly he may have been superior to both Garrick and Kean in Macbeth, although it must be remembered that in it part of his inspiration must have been caught from Mrs Siddons. In all the other great Shakespearean characters he was, according to the best critics, inferior to them, least so in Lear and Hamlet, and most so in Shylock and Richard III. On account of the eccentricities of Sheridan, the pro- prietor of Drury Lane Theatre, Kemble withdrew from the management, and, although he resumed his duties at the beginning of the season 1800-1, he at the close of 1802 finally resigned connexion with it. In 1803 he became manager of Covent Garden, of which he was also part proprietor. The theatre was burned down in 1808, and the raising of the prices after the opening of the new theatre in 1809 led to a persevering succession of riots, which practically suspended the performances for three months. Kemble took his final leave of the stage in the part of Coriolanus, June 23, 1817, his retire- ment being probably hastened by the increasing popu- larity of Kean. The remaining years of his life were spent chiefly abroad, first at Toulouse, and after a short stay in London at Lausanne, where he died February 20,

1823.

See Boaden’s Life of John Philip Kemble, 1825; Fitzgerald, The Kembles, 1871.

KEMPIS, Tomas a (c. 1380-1471), is the name by which Thomas Hammerken (Hammerchen, Malleolus) is commonly known. He was born in 1379 or 1380 in the town of Kempen, lying about 15 miles north-west of Diisseldorf, in one of the many patches of territory between the Meuse aud the Rhine belonging to the archiepiscopal principality of Cologne. “Ego

Thomas Kempis," he says in his chronicle of the monastery of Mount St Agnes, "scholaris Daventriensis, ex diocesi Coloniensi natus." His father was a poor hard-worked peasant ; his mother 'ad custodiam rei domestice attenta, in opere alacris, in victu sobria, in potu abstemia, in verbo pauca, in factis pudica," as her son fondly says, kept a dame's school for the younger children of the town. John and Gertrude Hammerken had two sons, John and Thomas, both of whom fonnd their way to Deventer, and thence to Zwolle and to the convent of Mount St Agnes. Thomas reached Deventer when he was barely twelve years old, was taught by a dame the beginnings of his learning, and in a few months to his great joy entered the classes of Florentius Radewyn. After the fashion of the time he was called Thomas from Kempen, and the school title, as was often the case then, pushed aside the family name. Thomas Hammerken was forgotten ; Thomas a Kempis has become known to the whole Chris- tian world,

This school at Deventer had become famous long before Thomas a Kempis was admitted to its classes. It had been founded by Gerhard Groot, a wealthy burgher (see Groot), who had been won to pious living mainly through the influence of Ruysbroeck, the Flemish mystic. It was at Deventer, in the midst of this mystical theology and hearty practical benevolence, that Thomas a Kempis was trained. Gerhard Groot was his saintly ideal. Florentius Radewyn and Gerhard's other early disciples were his heroes ; their presence was his atmosphere, the measure of their lives his horizon. But he was not like them; he was not an educa- tional reformer like Radewyn, nor a man of affairs like Gerhard. He liked books and quiet corners all his days, he says; and so, when conviction of sin and visions of God's grace came to him in the medieval fashion of a dream of the anger and forgiveness of the Virgin, Florentins

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told him that a monk's life would suit him best, advised him to join the Augustinian order, and sent him to Zwolle to the new convent of Mount St Agnes, where his brother John was prior. Thomas was received there in 1399, he professed the vows in 1407, received priest's orders in 1413, became sub-prior in 1425, and died on the 8th of August 1471, being ninety-one years old.

The convent of Mount St Agnes was poor, and most of the monks had to earn money to support their household by copying MSS. Thomas was a most laborious copyist : missals, books of devotion, and a famous MS, Bible were written by him; and the weightiest argument of those who deny that he is the author of the Imitatio Christi is that he was a copyist. He also wrote a large number of original writings, most of them relating to the convent life, which was the only life he knew. He wrote a chronicle of the monastery and several biographies—the life of Gerhard Groot, of Florentius Radewyn, of a Flemish lady St Louise, of Groot's original disciples; a number of tracts on the monastic life—Zhe Monk's Alphabet, The Discipline of Cloisters, A Dialogue of Novices, The Life of the Good Monk, The Monk's Epitaph, Sermons to Novices, Sermons to Monks, The Solitary Life, On Silence, On Poverty, Humility, and Patience; two tracts for young people— A Manual of Doctrine for the Young, and A Manual for Children; and books for edification—On True Com- punction, The Garden of Roses, The Valley of Lnhes, The Consolation of the Poor and the Sick, The Faithful Dispenser, The Soul's Soliloquy, The Hospital of the Poor. He has also left behind him three collections of sermons, a number of letters, some hymns, and the Imztatco Christi, if that be his. These writings help us to see the man and his surroundings, and contemporary pious records make him something more than a shadow. We see a real man, but a man helpless anywhere save in the study or in the convent,—a little fresh-coloured man, with soft brown eyes, who had a habit of stealing away to his cubiculum whenever the conversation became too lively; somewhat bent, for it is on record that he stood upright when the psalms were chanted, and even rose on his tiptoes with his face turned upwards; genial, if shy, and occasionally given to punning, as when he said that he preferred Psalmi to Salmones; a man who perhaps led the most placid uneventful life of all men who ever wrote a book or scribbled letters. It was not that he lived in uneventful times: it is impossible to select a stormier period of European history, or a period when the stir of the times made its way so well into the obscurest corners. Bohemia, Huss leading, was ablaze in revolt at one end of Europe; France and England, then France and Burgundy, were at death-grips at the other. Two popes anathematized each other from Avignon and from Rome, and zealous churchmen were at their wit's end to concoct ways aud means, by general councils of Constance and Basel and otherwise, to restore peace to a distracted church, and to discipline the clergy into decent living. But

Thomas knew nothing about all this. He was intent on his copying, ou his little books, and on his quiet conversations. His very biographies are colourless. He had not even the common interest in the little world coming up to the convent gate which most monks may be supposed to have. His brethren made him ceconomiz prefectus, but he was too “simple in worldly affairs” and too absent-minded for the post, and so they deposed him and made him sub-prior once more. And yet it is this placid kindly fresh-coloured old man who is commonly said to be the author of that book the Jmztatvon of Christ, which has been translated into more languages than any other book save the Bible, and which has moved the hearts of so many men of all nations, characters, and conditions of life.

KEMPIS

Did Thomas a Kempis write the Imitation of Christ? Had it not been for his connexion with this famous little book, Thomas would have been no better known than Gerhard Groot, Florentius Radewyn, or Jan van Ruysbroeck. The problem of authorship has given rise to the most interminable controversy the history of litcra- ture has ever seen, and one which seems to be still as fresh as it was in the 17th century. It arose in this way. The author of the Imitatio sent it forth anonymously. If Thomas was the author he must have written it when he was about forty-five years of age, and it must have found its way into England and France within a very short space of time. Then Thomas was a copyist, a man who spent his life in copying for sale books which he had not composed. These are the only presumptions which make it likely that the Imitatio Christi had another author. But down till the beginning of the 17th century Thomas was almost universally esteemed the author of the Jmitatio. Some MSS. undoubtedly bore the name of St Bernard, and others that of John Gersou ; but the great majority of MSS. testificd to the authorship of Thomas. In 1604, however, a Spanish student of the Imitatio found a sentence from it quoted in what was believed to be a sermon of Bonaventura, who died in 1278, long before either Gerson or Thomas was born. It was after- wards proved that the sermon was not by Bonaventura, but belonged to the end of the 15th century ; still for the time it was supposed that Thomas could not have written the Jmitatio, and learncd mcu looked anxiously for a clue to an earlier author. Just then, in 1605, Bernardin Rossignoli, superior of the Jesuit college at Arona,

discovered in the college library a MS. of the Jmitatio without date, and bearing the title Incipiunt capitula primi libri Abbatis Johannis Gersen, De Imitatione Christi. ‘The college had formerly belonged to the Benedictines, and it was supposed, wrongly as it turned out, that the MS. had been in the old Benedictine library, aud was therefore ancient. Hcre then was an author, Gersen, aud a MS. of the date required. The facts were, however, that the MS. was of the beginning of the 16th century, and had been brought to Arona from Genoa in 1579. Constantine Cajetan, famous for his insane devotion to the order of St. Benediet, got the Arona MS. printed at Rome, declaring that the author was John Gersen, an abbot of the order of St Benedict. Cajetan next discovered in a copy of the printed Venice edition of the Jmitatio of 1501 a note in an unknown

and: ‘*This book was not written by John Gerson, but by John, abbot of Vercelli.” He also found an MS. bearing the name of John of Canabaco, Weaving these unconnected details together, Cajctan declared that the author of the Imitation of Christ was John Gerson of Canabaco, Benedictine abbot of Vercelli. Thus began the famous controversy. It has been a controversy really between the supporters of Thomas a Kempis and the Benedictines, who advocate the claims of John Gersen, a mythical personage whose very existence has been taken for granted and never proved. But, while this is the crux of the dispute, the authorship has been claimed for a great variety of writers:—John Scotus Erigena, Bernard of Clairvaux, Giovauni Gerso (an Italian monk and philan- thropist of the close of the 12th century), Pope Innocent III., Scoto Giovanni and Thomas Gallus, both abbots of Vercelli, David of Augsburg, Bonaventura, Ubertin of Cassalis, Peter de Corbario, Ludolf of Saxony, Kalkar, Humbert, Martinus Carthus, Giovanni Michele, Joannes Paumerii (the last four probably trauscribers— their names are appended to single MSS. in an early printed edi- tion), John Gerson a brother of the famous chancellor of Paris, John Gerson the famous chancellor himself, John Gersen the supposed Benedictine abbot, Walter Hilton an English monk, Thomas a Kempis, John a Kempis the elder brother of Thomas, and John of Canabaco, probably John of Tambacho, a professor in the university of Prague. It will be sufficient to examine the claims of four of these candidates.

Walter Hilton, a monk of Schene (Shcen) in Surrey, who wrote several devotional books, notably Scala Perfcctionis Christiane, is said by Bale (Illustri. Maj. Brit. Summarium, published in 1559) to have written a treatise called De Musica Ecclesiastica, and this is confirmed by Pits, who wrote much later. The earlier MSS. of the De Imitatione are called De Musica Ecclesiastica, and the earliest English MS., now in Magdalen College, Oxford, and dated 1438, bears that title. The inference has been drawn that Hilton wrote the first three books of the Jmitation in England, and that Thomas copied them and added the fourth book (see Notcs and Queries, March 1881). We have no contemporary evidence, however, that Hilton did write a treatise called De Musica Ecclesiastica, and this work may have been attributed to him because the MS. copies have been found in volumes also containing some of his devotional writings.

John Gerson, chancellor of Paris (1868-1429, see GERSON), is called the author of the Imitation in several undated MSS., and more especially in two MSS. dated 1441 and 1460. His claims have been supported on the ground of MS. evidence, the presence of Gallicanisms in the Latin of the treatise, and tle common tradi- tion in France. The evidence to the coutrary is so strong, how- ever, that his cause has been given up by all save by Frenchmen who, like Vert, consider it patriotic to declare themselves “ pour Gerson, Gerson, et pour la France.”

KEM—KEN

John Gersen, abbot of Vercelli, is supported by the Benedictine order and by others. The first requisite here is to show that such a man ever lived, and this in spite of the pains taken has not yet been done.! In all probability Gersen is a mistake of early copyists for Gerson. The MS. evidence is as follows. The earliest dated MS. claimed for Gersen gives the author J. Gers., and is dated 1441; the second gives the author’s name in the same contracted fashion, J. Gers., and is dated 1464 ; while two of the earlier undated MSS., those of Florence and Padoliroue, call the author J. Gersen, chancellor of Paris. The other MSS. which write the autlor’s name J. Gersen are all late or undated. In short, there is not a vestige of early evidence to connect the Jmitatio with a John Gersen, and there is no contemporary evidence whatever. Gersen is a creation of Cajetan’s for the renown of the

Benedictine order, and the motive which has prompted Gersen's supporters fiuds fitting

expression in the dedication to St Benedict of the latest contribu-.

tion to the controversy, that of Wolfsgrnber (Angsburg, 1880).

Thomas a Kempis is acknowledged to be the author by most of the earliest dated MSS., by most of the earliest printed editions of the book, by a great mass of contemporary evidence, and by a great deal of internal evidence, some of a most interesting kind. Of MSS. may be mentioned the Kirchheim MS. of 1425, the autograph of Thomas (1441), the MS. of Innersdorf (1441), and that of Liége (1444). Twenty-two printed editions in the 15th century attributed the Jmitatio to Thomas. The contemporary witnesses are numerous and convincing. John Buschius of the canons regular of Windes-heim, scarcely a league from Mount St Agnes, who had met and conversed with Thomas, calls him the author of the Jmitation. Brother Herman, living in a monastery of the canons regular near Halle, who had met Thomas at Windesheim, declared that Thomas was the author of the Jmitatio. Similar testimony is borne by Matthias Farinator, a transcriber of the book, by Peter Schott, by Johann Lambert, either during the lifetime of Thomas or a few years after his death. And Hirsche has produced a new contem- porary witness from an old Belgian chronicle (" Chronique de Jean Brandon, avec les additions d'Adrien de But," p. 547, published in Colleet.. de Chroniques Belges tnédites), which says that Thomas wrote the Qui sequitur mein metre. The proof from internal evi- dence has been set on quite a fresh basis by the studies of Carl Hirsche, who has discovered from a careful examination of the MS. of 1441 (Bibliothéque de Bourgogne, Brussels, Nos. 5855 and 5861) that the Imitation was written and ponies for the purpose of chanting. This discovery has enabled him to compare the book with other writings of Thomas as to punctuation, rhythm, and rhymes, with the result that he has incontestably proved the great similarity between the Jmitation aud the undisputed works of Thomas.

The Imitatio Christi is commonly classed among the mystical writings of the 15th century, and in the opinion of writers of the most opposite schools of thought it sums up all that is best of that side of Latin Christianity which includes the theology of the Victorines, of Bernard and Bonaventura, of

Eckhart, Tauler, and Ruysbroeck. Medisval Christianity shows two ideas of the Christian life struggling for the mastery, each with the common watchword of separation from the world. The one was modelled on Augustine's City of God, and was fulfilled in Hildebrand's conception of a spiritual empire to be raised on the ruirfs of political society ; the other came to light in the aspirations of Francis of Assisi, and the assiinilation of Anselm's maxim that sinners can appropriate the benefits won for them by Christ by imitating the Saviour. Francis's idea of imitation was rudely picturesque. The Bible shows Christ obedient, poor, unmarried ; we can imitate the Master by keeping the vows of obedience, poverty, and chastity. Thiscrass idea of an imitation of Christ gave new force to the monastic movement, and put new meaning into its vows, and it spread in various ways through Fratricelli, Spirituales, Wycliffe's poor preachers, &c., far beyond the Franciscan order. This idea of imitation by ''evan- gelical poverty" was almost spent by the 14th century, and was succeeded by the more refined conception of imitation by ''renun- ciation," the watchword of the mystical movement of the 14th and 15th centuries. But by this time the conflict of the Franciscan ideal of the Christian life with Hildebrand's ideal had thoroughly rent medixval Christendom, and there were two Christianitics facing each other, a religious and a political, The breach became wider by the degradation of the papacy, and by the great schism. The "universal" of the church was lost, and had not been discovered again. The new idea of obedience was not obedience to ecclesiasti- cal superiors, but the subordination of the lower part of man's nature to the higher, and of the whole to God. This ''renuncia- tion," cut off from practical sympathy with the visible church, feeding itself on a vague idea of union with Christ, might easily have fallen a prey to Buddhist and Averroist notions floating in the European atmosphere (some of the mystics did so fall away) had it not been saved by its clinging to the sacraments, the one medixval

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This mythical personage has been photographed, see Auteurs pré- sumés de U Imitation, by Abbé Delaunay.

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means of grace, and by its contact with practical Christian work. And gradually out of Eckhart through Tanler two schools arose, both of which use ‘‘renunciation” as their watchword—imitation by renunciation. The one school, that of Henry Suso, saw Christ’s renunciation best exhibited in His passion, and therefore held that men can imitate by suffering ; they too have a body to mortify. The other, that of Ruysbroeck, saw Christ’s renunciation in His incarnation ; so that men can renounce by contemplation, which gives us initiation into the incarnation. Ruysbroeck was Groot’s teacher, and Groot taught Thomas, in whom we see the gathered wisdom of that idea of a quest for pardon by imitation of Christ which began with Anselm and came down through Franciscan revivals and mystical movements to him in the 15th century. But Thomas is far more than Ruysbroeck or Groot. He is wider and more sympathetic. He includes Ruysbroeck, Tauler, Eckhart, Bona- ventura, the Franciscans, and even the old Victorines. He sums up in his little book the hcart religion of Latin Christianity

For the life of Thomas a Kempis see the Nuremberg edition of 1494, Opera et libri vite Thome a Kempis; Heribertus Rosweide, Vita Thomza Kempis, 1616. The best edition of the eolleeted works is that of Sommalius, Ven. Viri Thome Malleoli a Kempis .. . Opera Omnia… in tres tomos distributa, 1759. The best edition of the Jmitatio is that of Hirsche, Berlin, 1874. A very eomplete list of the principal writers in the eontroversy may be found in Wolfsgruber, Giovanni Gersen, sein Leben und sein Werk de Imitatione Christi, 1880, p. 254 sq. For authorship by Gerson, see G. Ch. Vert, Cause de l’Jmitation de Jésus-Christ, réplique et conclusions, Toulouse, 1861. For Thomas as author, see Malou, Recherches historiques et critiques sur le véritable auteur du livre de UJmtiation de Jésus-Christ, Tournay, 8d ed., 1858; Carl Hirsche, Prolegomena zu einer neuen Ausgabe der Imitatio, Berlin, 1873; and Samuel Kettlewell, The Author- ship of the De Imitatione Christi, London, 1877. (T. M. L.)

KEMPTEN, a town in the government district of Swabia and Neuburg, Bavaria, is situated on the Iller, about 65 miles south-west of Munich. It is the seat of numerous local and special tribunals, and contains a castle, a gymna- sium and a grammar school, two hospitals, and other educational and benevolent institutions. There is a hand- some town-house, and the aqueduct is noteworthy. The industries include wool spinning and weaving

on a large scale, and the manufacture of paper, beer, machines, hosiery, matches, and wooden wares. As a commercial centre of the Algau, Kempten carries on active trade in linen, timber, and dairy produce. In 1875 the popula- tion, including the garrison, was 12,681.

Kempten, identified with the Roman Campodunum, consisted in early times of two towns, the old and the new. The continual hostility that existed between these was intensified by the welcome given by the old town to the Reformed doctrines,—the new town, built round the Benedictine abbey erected in the 8th century, keep- ing the old faith. The abbot in 1360 had been promoted to the

dignity of a prince of the empire by the emperor Charles IV., and the princely abbacy only passed to Bavaria in 1803.

KEN, Tuomas (1637-1711), the most eminent of the non-juring bishops, and one of the fathers of modern English hymnology, was born at Little Berkhampstead, Herts, in 1637. He was the son of Thomas Ken of Furnival's Inn, who belonged to an ancient stock,—that of the Kens of Ken Place, in Somersetshire; his mother was a daughter of the now forgotten poet, John Chalkhill, who is called by Walton an "acquaintant and friend of Edmund Spenser." It may be mentioned that Ken's step- sister, Anne, was married to Izaak Walton in 1646, a connexion which brought Ken from his boyhood under the refining influence of this gentle and devout man. In 1652 he entered Winchester College, and in 1656 became a student of Hart Hall, Oxford. He gained a fellowship at New College in 1657, and proceeded B.A. in 1661 and M.A. in 1664. He was for some time tutor of his college ; but the most characteristic reminiscence of his university life is the mention made by Anthony Wood that in the musical gatherings of the time " Thomas Ken of New College, a junior, would be sometimes among them, and sing his part." Ordained in 1662, when he was twenty- five years old, he successively held the livings of Little Easton in Essex, Brighstone (sometimes called Brixton) in the Isle of Wight, and East Woodhay in Hampshire ; in 1672 he resigned the last of these, and returned to Winchester, being by this time a prebendary of the cathedral, and chaplain to the bishop, as well as a fellow of Win-

chester College. He remained there for several years, AIV. — 5

acting as curate in one of the lowest districts, and fulfilling other duties in the city, but, above all, preparing his Manual of Prayers for the use of the Scholars of Winchester College, which was first published in 1674, and composing hymns. It was at this time that he wrote, primarily for the same body as his prayers, his morning, evening, and midnight hymns, the first two of which, beginning " Awake, my soul, and with the sun" and "Glory to Thee, my God, this night," are now household words wherever the English tongue is spoken. The latter is often made to begin with the line " All praise

to Thee, my God, this night," but in the earlier editions over which Ken had control, the line is given as above! In 1674 Ken paid a visit to Rome in company with young Izaak Walton, and this journey seems mainly to have resulted in confirming his regard for the Anglican communion. In 1679 he was appointed by Charles II. chaplain to the Princess Mary, wife of William of Orange. While with the court at the Hague, he incurred the displeasure of William by insisting that a promise of marriage, made to an English lady of high birth by ao relative of the prince, should be kept; and he therefore gladly returned to England in 1680, when he was immedi- ately appointed one of the kiug's chaplains. He was once Inore residing at Winchester in 1683 when Charles came to the city with his doubtfully composed court, and his residence was chosen as the home of Nell Gwynne; but Ken stontly objected to this arrangement, and succeeded in making the favourite find quarters elsewhere. We find him in August of this same year accompanying Lord Dartmouth to Tangiers as chaplain to the fleet, and Pepys, who was one of the company, has left on record some quaint and kindly reminiscences of him and of his services on board. The fleet returned in April 1684, and a few months after, upon a vacancy occurring in the see of Bath and Wells, Ken, now Dr Ken, was appointed bishop. It is said that, upon the occurrence of the vacancy, Charles, mindful of the high and pure spirit he had shown at Winchester, exclaimed, "' Where is the good little man that refused his lodging to poor Nell?" and determined that no other should be bishop. The consecration took place at Lambeth, January 25, 1685; and one of Ken's first duties was to attend the death-bed of Charles, where his wise and faithful ministrations won the admiration of every- body except Bishop Burnet. In this year he published his Huposetion on the Church Catechism, which is perhaps better known by its sub-title, Zhe Practice of Divine Love. His public life as bishop is mainly remembered from the stand he took upon two memorable occasions. In 1688, when James reissued his " Declaration of Indulgence," Ken was one of the "seven bishops" who refused to publish it. He was probably influenced by two con- siderations :—first, by his profound aversion to Roman Catholicism, to which he felt he would be giving some episcopal recognition by compliance; but, second and more especially, by the feeling that James by his arbitrary action was compromising the spiritual freedom of the church. Along with his six brethren, Ken was committed to the Tower, June 8, 1688, on a charge of high misdemeanour ; the trial, which took place on the 29th

and 30th of the month, and which resulted in a verdict of acquittal, is matter of history. With the revolution which speedily followed this impolitic trial, new troubles encountered Ken ; for, having sworn allegiance to James, he thought himself thereby precluded from taking the oath to William of Orange. Accordingly, he took his place among the non-jurors, and, as he stood firm to his

1 The fact, however, that in 1712—only a year after Ken's death— his publisher, Brome, published the hymn with the opening words " All praise" has been deemed by such a high authority as Lord Sel- borne sufficient evidence that the alteration had Ken's authority.

refnsal, he was, in August 1691, superseded in his bishopric by Dr Kidder, dean of Peterborough. From this time he lived mostly in retirement, finding a congenial home with Lord Weymouth, his friend from college days, at Longleat in Somersetshire ; and, though pressed to resume his diocese in 1703, upon the death of Bishop Kidder, he declined, partly on the ground of growing weakness, but partly no doubt from his love for the quiet life of devotion which he was able to lead at Longleat. His death took place there upon the 19th of March 1711.

Although Ken wrote much poetry, besides his hymns, he cannot be called a great poet; but he had that fine combination of spiritual insight and feeling with poetic taste which marks all great hymn- writers. Asa hymn-writer he has had few equals in England ; it can scarcely be said that even Keble, though possessed of much rarer poetic gifts, surpassed him in his own sphere (see Hymns,' vol. xii. p. 592). In his own day he took high rank as a pulpit orator, and even royalty had to beg fora seat amongst his audiences; but his sermons are now forgotten. He lives in history, apart from his three hymns, mainly as a man of unstained purity and invincible fidelity to conscience, weak only in a certain narrowness of view which is a frequent attribute of the intense character which he pos- ey As an ecclesiastic he was a High Churchman of the old school,

Ken's poetical works were published in collected form by W. Hawkins, his relative and executor, in 1721, and extended to four volumes ; his prose

works were issued in 1838 in one volume, under the editorship of J. T. Round, A brief memoir was prefixed by Hawkins to a selection from Ken's works which he published in 1713; and a life, in two volumes, by the Rev. W. L. Bowles, appeared in 1830. But the standard biography of Ken is that of J. Lavicount Anderdon (Zhe Life of Thomas Ken, Bishop of Bath and Wells, by a Layman, 1851; 2d ed., 1854).

KENDAL, Kirxpy-Kenpat, or Kirkpy-In-Kenpat, a market-town and parliamentary and municipal borough of Westmoreland, is picturesquely situated in a pleasant valley on the east bank of the Kent or Ken, 44 miles south of Carlisle (50 by rail), and 241 miles from London. The town, which is the largest and most populous in the county, is very irregularly built, but the white-walled houses with their blue-slated roofs, and the numerous trees, give it a very attractive appearance. There are four leading streets, two of which together form a spacious thoroughfare a mile in length. The church of the Holy Trinity, whose oldest part dates from about 1200, is a Gothic edifice with five aisles and a square tower 72 feet high. Kendal contains numerous other churches, a town-hall, a mechanics' institu- tion, a literary and scientific institution, a museum, and a chamber of commerce. Its charities include a hospital (founded 1870), an old maids' hospital, a girls' orphanage, almshouses, &c. The free grammar school is well endowed ; and there are also in the town a well-endowed blue-coat school and hospital, a large national school, a school of science and art, and several Sunday schools, among whicli is the Greencoat Sunday school, founded in 1813. Onan eminence to the east of the town are the ruins of Kendal Custle, attributed to the first barous of Kendal. It was the birthplace of Catherine Parr, Henry VIII.'s last queen. On the Castle-law-hill, an obelisk was raised in 1788 in memory of the revolution of 1688, The woollen manu- factures of Kendal have been noted since the 14th century, when Edward III. established a colony of Flemish weavers in the town; and, although the coarse cloth known to Shakespeare as "Kendal green" is no longer made, its place is more than supplied by active manufactures of tweeds, linsey-wolsey, railway rugs, horse clothing, knitted woollen caps and jackets, worsted and woollen yarns, and similar goods. Other manufactures of Kendal are machine- made boots and shoes, cards for wool and cotton, agricul- tural and other machinery, paper, and, in the neighbour- hood, gunpowder. There are also important marble-works. There is a large weekly

market for grain, and annual horse and cattle fairs. The population in 1881 was 13,696, an increase of only 250 from 1871.

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Kendal was the head of a barony given by William the Conqucror to Ivode Talbois. It has given the title of earl to various royal aud other personages of English history. The town received its charter from Queen Elizabeth in 1575. A second, granted by Charles L., and confirmed by Charles II., was superseded by the Municipal Act of 1835, according to which the town is governed by six aldermen and eighteen councillors, who select a mayor from among themselves. Quarter sessions are held alternately at Appleby and Kendal. The Reform Act of 1832 assigned one member of parliament to Kendal.

KENILWORTH, a small town of Warwickshire, is pleasantly situated on a tributary of the Avon, on the railway from Coventry to Leamington, 5 miles distant from both towns, and 99 miles north from London. The town is only of importance from its antiquarian interest and the magnificent ruins of its old castle. The most probable derivation of its name, which in Domesday is written Chinewrde, is from Cenwulf, king of the Mercians, and werthe, a dwelling-place. The old royal residence of the Saxon kings was destroyed in the wars between Edward and Canute. The manor of Kenilworth was bestowed by Henry I. on Geoffrey de Clinton, afterwards lord chief- justice, who erected the earlier portion of the present castle. By his grandson Henry de Clinton it was given to King John, and it remained a royal residence until the time of Henry III., who granted it to Simon de Montfort, earl of Leicester. After the battle of Evesham, 14th August 1265, at which Simon de Montfort was slain, the rebel forces rallied at the castle, when it sustained a siege of six months, but finally capitulated to Henry IIL, who bestowed it on his son Edmund. After being used as the prison of Edward II. previous to his removal to Berkeley, it came into the possession of John of Gaunt, by whom it was greatly enlarged. On his son becoming king as Henry IV., it was made a royal residence, and it remained in the possession of the crown until Queen Elizabeth in 1562 granted it to Robert Dudley, earl of Leicester, who spent a large sum in restoring it, and whose splendid

entertainments there to Elizabeth are described in Scott's novel of Kenilworth. During the civil war it was dis- mantled by the soldiers of Cromwell, and it was thenceforth abandoned to decay. Since the Restoration it has belonged tothe house of Clarendon. The walls of the castle originally enclosed an area of 7 acres. The principal portions of the building still remaining are the gatehouse, now used as a dwelling-house ; Czesar's tower, the only portion built by Geoffrey de Clinton now extant, with massive walls 16 feet thick; the Merwyn's tower of the novel of Kendlworth; the great hall built by John of Gaunt with windows of very beautiful design; and the Leicester buildings, which are in @ very ruinous condition. Not far from the castle are the remains of an Augustinian monastery founded in 1122, and afterwards made an abbey. Adjoining the abbey is the parish church of St Nicholas, restored in 1865, an old structure of mixed architecture, and containing a fine Norman doorway, which is supposed to have been the entrance of the former abbey church. The town, which possesses large tanneries, is under the government of.a local board. Population in 1871, 3880 ; in 1881, 4150.

KENNEDY, Tuomas Francis (1788-1879), a distin- guished Scottish Liberal politician, was born near Ayr in 1788. He studied for the bar and passed advocate in 1811. But, having been elected M.P. for the Ayr burghs in 1818, he devoted the greater part of his life to the promotion of those political reforms which the long mis- government of Scotland by the Tory party had rendered necessary. In this patriotic work he was greatly assisted by Lord Cockburn, then Mr Henry Cockburn, and a volume of correspondence published by Kennedy in 1874 forms @ curious and interesting record of the consultations of the two friends on measures which they regarded as requisite for the political regeneration of their native country. One

of the first measures of improvement to which he directed his attention was the withdrawal of the power of nominat- ing juries from the judges, and the imparting of a right of peremptory challenge to prisoners. It cost Kennedy several years of persistent urgency upon the legislature before this most reasonable demand was conceded, but at length his energy and

perseverance succeeded. Among other subjects he directed his attention to the improve- ment of the parish schools, of pauper administration, and of several of the corrupt forms of legal procedure which then prevailed. To him also was in a great measure due the freedom which the Scottish people obtained from the domination of certain aristocratic families which had long proved a dead weight on the progress of Liberal principles in Scotland. In the construction of the Scottish Reform Act Kennedy took a very prominent part, and indeed he and Lord Cockburn may almost be regarded as its authors. After the accession of the Whigs to office in 1832 he held various important offices in the ministry, and most of the measures of reform for Scotland, such as burgh reform, the improvements in the law of entail, and the reform of the sheriff courts, owed much to his sagacity and energy. In 1837 he went to Ireland as pay- master of civil services there, and immediately set himself with his accustomed energy to the promotion of various measures of reform. One or two of the blue books pub- lished during the period of his administration exhibit with an amusing vividness the sleuth-hound-like keenness and tenacity, characteristic of the man, with which he hunted out several of the abuses and scoundrelisms that he found prevailing. Kennedy retired from public life in 1854, but he never ceased to take the keenest interest in political affairs, and up to the time of his death took a great part in both county and parish business. One of the chief features of his character was a strong, almost stern, love of justice, and a determined hatred of every thing savouring of jobbery or dishonesty. All through his career he preserved tlle simple straightforwardness and unselfishness of the earlier Liberalism. He died in 1879, having attained the almost patriarchal age of ninety-one. He had married in 1820 the only daughter of Sir Samuel Romilly. KENNET, Wurre (1660-1728), bishop of Peterborough, a theological writer and learned antiquarian, was born at Dover in 1660. He was educated at Westminster school and at Oxford, where, while still an undergraduate, he published several translations of Latin works, including Erasmus On Folly, Pliny’s Trajan, and Cornelius Nepos. About the year 1685 he became vicar of Amersden. A few years afterwards he returned to Oxford as tutor and vice-principal of St Edmund’s Hall, where he gave considerable impetus to the study of antiquities. In 1695 he published Parochial Antiquities. In 1700 he resigned the vicarage of Amersden to take charge of the parish of St Botolph, Aldgate, London, and in the following year he was preferred to the archdeaconry of

Huntingdon. On account of his eulogisticsermon on the duke of Devonshire he was in 1707 recommended to the deanery of Peter- borough. Although he afterwards changed to the Low Church party, strenuously opposed the Sacheverel move- ment, and in the Bangorian controversy supported with great zeal and considerable bitterness the side of Bishop Hoadly, his intimacy with the bishop of Norwich, who was high in favour with the king, secured him in 1718 promotion to the bishopric of Peterborough. He died at Westminster in September 1728. Kennet published in 1698 an edition of Sir Henry Spelman's History of Sacrilege, and he was the author of as many as fifty-seven printed works, chiefly tracts and sermons. His principal publica- tion was a Compleat History of England, 3 vols., 1706 (enlarged edition, 3 vols., 1719), chiefly a compilation from

other authors, but the part from Charles I. to Queen Anne was written by himself.

The Life of Bishop White Kennet, by the Rev. William Kennet, appeared in 1730. See also Nicol's Literary Anecdotes, Dibdiu's Quarrels of Authors, and Disraeli's Calamities of Authors.

KENNICOTT, Bensamin (1718-1783), an eminent Hebraist, was born at Totnes, Devonshire, on April 4, 1718. His father was parish clerk and master of a charity school, in which latter situation Benjamin was chosen to succeed him at an early age. His talents and acquirements interested some rich friends in his behalf, and by their liberality he was provided with the means of studying at Oxford. Entering himself of Wadham College in 1744, he soon distinguished himself in Hebrew and divinity; and while still an undergraduate published two dissertations, On the Tree of Life in Paradise, with some Observations on the Fall of Man, and On the Obdlations of Cain and Abel, which came to a second edition in 1747, and procured him the honour of a bachelor's degree before the statutable time. Shortly afterwards he was elected fellow of Exeter College, and in 1750 he took his degree of M.A. In 1767 he was appointed keeper of the Radcliffe library, and made D.D. He was also canon of Christ Church and rector of Culham in Oxfordshire, and was subsequently presented to the living of Mynhenyote, Cornwall, which however, being unable to visit it, he resigned two years

before his death, He died of a lingering illness at Oxford, on September 18, 1783.

The great work with which his name continues to be associated in the annals of Biblical scholarship is the Vetus Testamentwm Hebraicum cum variis Lectionibus, 2 vols. fol., Oxford, 1776-80. The course of the studies which resulted in it may be gathered from the nature of the publications by which it was preceded. Two dis- sertations entitled The State of the Printed Hebrew Text of the Old Testament considered, published respectively in 1753 and 1759, were expressly designed to combat the then current ideas as to the ‘‘ abso- lute integrity”’ of the received Hebrew text. The first contains ‘‘a comparison of 1 Chron. xi. with 2 Sam. v. and xxiii., and observa- tions on seventy MSS., with an extract of mistakes and various readings” ; the second defends the claims of the Samaritan Penta- teuch, assails the correctness of the priuted copies of the Chaldee paraphrase, gives an account of Hebrew MSS. of the Bible known to be extant, and catalogues one hundred MSS. preserved in the British Museum and in the libraries of Oxford and Cambridge. His labours provoked severe animadversion in some quarters, and even from such men as Warburton and Horne; but they at least had the effect of drawing public attention to the subject to which they related, and in 1760 he issued his proposals for collecting all Hebrew MSS. of date prior to the invention ef printing which could be dis- covered cither at home or abroad. Subscriptions to the amount of nearly £10,000 were obtained, and mauy learned men addressed themselves to the workof collation, Bruns of Helmstadt making him- self specially useful as regarded MSS. in Germany, Switzerland, and Italy. Between 1760 and 1769 ten ‘‘ annual accounts” of the pro- gress of the work were given; in its course six hundred and fifteen MSS. and fifty-two printed editions of the Bible were either wholly or partially collated, and use wasalso madc (but often very perfunctorily) of the quotations in the Talmud. The materials thus collected, when properly arranged and made ready for the press, extended to 30 vols. fol. The text finally followed in printing was that of Van der Hooght,—unprinted however, the points having been disre- garded in collation,—and the various readings were printed at the foot of the page. The Samaritan Pentateuch stands alongside the Hebrew in parallel columns. The Disseriatio Generalis, appended to the second volume, contains an account of the MSS. and other authorities collated, and also a review of the Hebrew

text, divided into periods, and beginning with the formation of the Hebrew canon after the return of the Jews from the exile. Kennicott's greatswork was in one sense a failure. It yielded no materials of value for the emendation of the received text, and by disregarding the vowel points overlooked the one thing in which some result (gram- matical if not critical) might have been derived from collation of Massorctic MSS. But the negative result of the publication and of the Variz Leetiones of De Rossi, published some years later, was im- portant. It showed that the Hebrew text can be amended only by the use of the versions aided by conjecture.

KENOSHA, chief city of Kenosha county, Wisconsin, U.S., is situated in a fertile district on Lake Michigan, about 30 miles south of Milwaukee, with which it is connected

by rail. It contains numerous schools, and carries on the manufacture of hardware, wooden wares, machines, and carriages. There are also in the city breweries, foundries, tanneries, planing mills, and other industrial establishments, It possesses a good harbour, and carries on trade in its manufactures and in country produce. The population in. 1880 was 5039.

KENSINGTON, a western suburb of London in the parish of Kensington, parliamentary borough of Chelsea, and county of Middlesex, a mile and a half west of Hyde Park Corner. The parish includes the suburbs of Brompton, Earl's Court, part of Little Chelsea, the Gravel Pits, Not- ting Hill, and part of Kensal Green. Kensington palace and Kensington gardens, however, lie in the parish of St Margaret's, Westminster. The suburb of Kensington, which has developed out of the village of Kensington, lies to the west of Kensington gardens, and consists principally of a long and in places narrow street, the modern improve- ments of which with the surrounding additions have almost entirely obliterated all traces of the "old court suburb" associated with the distinguished personages of former times. From the High street others branch off at intervals, and the elevated ground to the north is almost wholly occu- pied with villas embosomed in woods. To the south of the High street is Kensington square, where at one time were the residences of many of the principal attendants on the court. The principal public buildings in the suburb are the parish church in the

Decorated style, erected in 1869 at a cost of £35,000, the elegant new town-hall, the vestry- © hall, the grammar school, the Roman Catholic college, opened in 1874, several monasteries and convents, and various schools and charities. The site of Old Gore House, at one time the residence of Mr Wilberforce and afterwards of the Countess of Blessington, is now occupied by the Royal Albert Hall and the gardens of the Horticultural Society. These as well as Kensington gardens and the South Kensington museum with its national training schools fall to be noticed under the article Lonpon. Kensington palace, a plain and irregular brick structure, originally surrounded by grounds extending to about 350 acres, was at one time the residence of Lord Chancellor Finch, afterwards earl of Nottingham, of whom it was bought by William ITI. Additions were made to it by William IIL, George I, George II., and the duke of Sussex. The palace was the birthplace of Queen Victoria. Kensington house, which stood near the palace gate, and was at one time the residence of the duchess of Portsmouth, mistress of Charles II., was pulled down in 1873 to make way for the mansion of Baron Albert Grant. The popu- lation of the registration subdistrict in 1871 was 91,664, which in 1881 had increased to 120,125. The population of the parish in 1881 was 162,924.

The manor of Kensington, which is written in Domesday book Chenesitun, has an areaof 1140 acres. Some trace the origin of the word to the old Saxon name for king, others to a family of the name of Chenesi, others to ‘‘ Cacn,” the old name for wood. The manor was originally occupied by the great Middlesex forest, the trees of which were abundant in the tine of Henry VIII. In Domesday it is mentioned as being held by Aubrey de Vere of the bishop of Coutances. Soon after this it became the absolute pro- perty of the De Veres, who were afterwards created earls of Oxford. In the reign of Elizabeth it passed into the possession of the Argylls, by whoin it was sold to Sir Walter Cope, whose daughter married Henry Rich, earl of Holland. Holland House, in the Elizabethan style, the original mansion of the manor of Kensington, was erected by Sir Walter Cope in 1697, and enlarged and adorned by the third Lord Holland (see vol. xii. p. 100). The manor is at present held by Lord Kensington. See Faulkner, History and Antiquities of Kensington, 1820; Leigh Hunt, The Old Court Suburb.

KENT, a maritime cotinty in the south-eastern corner Plate!

of England, lies between 50° 54’ and 51° 31’ N. lat., and between 0° 3’ W. long. and 1° 27’ E, long. It is bounded on the N. by the estuary and mouth of the Thames, E.

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and S.E. by the English Channel, 8.W. by Sussex, and W. by Surrey. Its greatest breadth north and south from Sheerness to Dungeness is 35 miles, its length north-west to south-east from London to Dungeness about 60 miles, and its length west to east from Surrey to North Foreland in Thanet 65 miles. ‘The area is 1,004,984 acres, or 1570 square miles.

Coast Line. —About two-thirds of the boundary line of Kent is formed by tidal water. The estuary of the Thames may be said to stretch from London Bridge to Sheerness in the Isle of Sheppey, to the nortli-west of which the estuary of the Medway cuts off a tongue of land whose extremity is termed the Isle of Grain. Along the banks of the Thames the coast is low and marshy, embankments being in several places necessary to prevent inundation. In the estuary of the Medway there are a number of low marshy islands, but Sheppey presents to the sea a range of chalk cliffs from 80 to 90 feet in height. The marshes extend along the estuary of the Swale to Whitstable, whence stretches a low line of clay and sandstone cliffs, succeeded at the Isle of Thanet by the white chalk cliffs which extend southwards to Pegwell Bay. ‘The coast from Sheppey round to the South Foreland is skirted by numerous flats and sands, the most extensive of which, the Goodwin sands, forming the breakwater of the well-known anchorage of the Downs, are said to have formed part of the estate of Earl Godwine, and to have been submerged as late as 1097. From Pegwell Bay to near Deal the outline of the coast is flat, but thence it rises again into chalk cliffs, which continue round the South Foreland to Folkestone, where they are succeeded by the flat shingly shore bordering Romney Marsh. A considerable portion of Romney Marsh has been reclaimed from the sea since the time of Julius Cesar, but in nearly every other portion of the coast the sea has been gaining on the land.

Surface and Geology.—Kent abounds in beautiful and finely-wooded valleys with undulating and picturesque up- lands. A tract from 7 to 8 miles broad lying to the south of the estuary of the Thames, and extending

eastwards as far as Thanet, belongs to the London Tertiary basin, and is formed chiefly either of London or of plastic clay. The London Clay occupies the tongue of land between the estuaries of the Thames and Medway, as well as Sheppey and a district of country about 8 miles wide stretching southwards from Whitstable to Canterbury, and extending eastwards to the Isle of Thanet. It reappears at Pegwell Bay, and in the neighbourhood of London it rises above the plastic clay into the elevation of Shooter's Hill, with a height of about 450 feet, and a number of smaller emi- nences. The thickness of the formation near London is about 400 feet, and at Sheppey it reaches 480 feet. At Sheppey it is rich in various kinds of fossil fish and shells. The plastic clay, which rests chiefly on chalk, occupies the remainder of the estuary of the Thames, but at several places it is broken through by outcrops of chalk, which in some instances run northwards to the banks of the river. The Lower Tertiaries are represented by three different formations known as the Thanet beds, the Woolwich and Reading beds, and the Oldhaven and Blackheath beds. The Thanet beds resting on chalk form a narrow outcrop rising into cliffs at Pegwell Bay and Reculvers, and consist (1) of a constant base bed of clayey greenish sand, seldom more than 5 feet in thickness ; (2) of a thin and local bed composed of alternations of brown clay and loam; (3) of a bed of fine light buff sand, which in West Kent attains a thickness of more than 60 feet; (4) of bluish grey sandy marl containing fossils, and almost entirely confined to East Kent, the thickness of the formation being more than 60 feet ; and (5) of fine light grey sand of an equal thickness, also fossiliferous. The middle seriesof the Lower Tertiaries,

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known as the Woolwich and Reading beds, rests either on the Thanet beds or on chalk, and consists chiefly of irregular alternations of clay and sand of very various colours, the former often containing estuarine and oyster shells and the latter flint pebbles. The thickness of the formation varies from 15 to 80 feet, but most commonly it is from 25 to 40 feet. The highest and most local series of the Lower Tertiaries is the Oldhaven and Blackheath beds lying between the London Clay and the Woolwich beds. They consist chiefly of flint pebbles or of light-coloured quartzose sand, the thickness being from 20 to 30 feet, and are best seen at Oldhaven and Blackheath. To

the south the London basin is succeeded by the North Downs, an ele- vated ridge of country consisting of an outcrop of chalk which near Westerham on the borders of Surrey reaches an elevation of 812 feet above sea-level, and at several other places more than 600 feet. It extends from Wes- terham to Folkestone, with an irregular breadth generally of from 3 to 6 miles, but expanding to nearly 12 miles at Dartford and Gravesend and also to the north of Folke- stone. After dipping below the London Clay at Canterbury, . it sends out an outcrop which forms the greater part of Thanet, and towards the sea is often broken off into pre- cipitous escarpments. ‘To the south of the Downs there is a narrow valley formed by the Gault, a fossiliferous blue clay. This is succeeded by an outcrop of the Lower Greensand, which extends across the country from west to east with a breadth of from 2 to 7 miles, and rises into the picturesque elevations of the Ragstone hills. These in several cases reach a height of over 600 feet, and have a steep slope southwards, overlooking the valley which extends from the borders of Sussex to Hythe. This low ground is occupied chiefly by the Weald clays, which con- tain a considerable number of marine and freshwater fossils. Along the borders of Sussex there is a narrow strip of country consisting of picturesque sandy hills, whose highest elevation is nearly 400 feet ; and the south-west corner of the county is occupied by Romney Marsh, which within a comparatively recent period has been recovered from the sea.

The London Clay is much used for bricks, coarse pottery, and Roman cement. Lime is obtained from the Chalk and Greensand formations. Ironstone is found in the Wealden clays and calcareous ironstone in the Ashdown sand, but the industry has long been discontinued. The last Wealden furnace was put out in 1828.

Rwers.— The Thames, which forms the northern boundary of the county, receives the Ravensbourne at Deptford, and the Darent or Dart, which has a course of 18 miles, and becomes navigable at Dartford. The Medway, which has a course of over 50 miles, and with its tributaries drains a basin having an area of 680 square miles, is formed of several streams that rise in the neighbourhood of Tunbridge Wells, and of East Grinstead in Sussex. After passing Ashurst and Penshurst it receives the Eden from the west, and at Yalding in the Weald the Teise and Beult. At Chatham it widens into an estuary, the greater portion of its waters ultimately joining the Thames at

Sheerness, and the other portion passing southwards to the sea through the Swale Channel. The river is tidal as high as Maidstone. The Stour, which has a course of nearly 50 miles, and with its tributary the Little Stour drains an area of about 380 square miles, has its origin in several streams which spring from the Lower Greensand and the Chalk, the two main branches, which have their source near Lenham and near Hythe respectively, uniting at Ashford, At Sarre the Stour separates into two branches which insulate the Isle of Thanet, the smaller portion flowing northward to the sea near Reculver, the other and main portion flowing eastward to Pegwell Bay. The streain is tidal and uavig-

able to Fordwich, near Canterbury. The Little Stour rises in the Lower Chalk near Lyminge, and joins at Stourmouth that branch of the Stour which falls into the sea at Pegwell Bay. The Dour, a small stream which gives its name to Dover, has a course of little more than 3 miles from Ewell to the sea. The Rother, which has its source in Sussex, forms for some distance the boundary between that county and Kent, and along with several of its branches insulates the Isle of Oxney.

The only canals at all in use are that which runs along the borders of Romney Marsh, connecting the Rother with the sea at Hythe, but now partly filled up; and that between Gravesend and Rochester, which is partly occupied by a line of railway.

Climate, Soil, and Agriculture—The insalubrity of certain portions of the county caused by extensive marshes has been almost wholly removed by draining. In the north-eastern districts the climate is a little uncertain, and damage is often done to early fruit blossoms and vegetation by cold easterly winds. In the large portion of the county sheltered by the Downs the climate is milder and more equable, and vegetation is somewhat earlier. The soil is very various in character, but on the whole rich and under high cultivation. The methods of culture and the kinds of crop produced are perhaps more widely diversified than those of any other county in England. Upon the London Clay the land is generally heavy and stiff, but very fruitful when properly manured and cultivated. The marsh lands along the banks of the Thames, Medway, Stour, and Swale con- sist chiefly of rich chalk alluvium.

The Chalk formation is in some cases overlaid by London Clay, alluvium, or brick- earth, but in the higher chalk districts the soil is often poor and thin, and in some places much mixed with flints. In the Isle of Thanet a light mould predominates, which has been much enriched by fish manure. The valley of the Medway, especially the district round Maidstone, which has been called the garden of England, is the most fertile part of the county, the soil being a deep loam with a sub- soil of brick-earth. On the ragstone the soil is occasionally

ean A TB ts me te 50 to 100 Acres. | 100 to 300 Acres. | 300 to 500 Acres. |500 to 1000 Acres,| 1900 Acres and

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MEMS: ccccsresssevescoscvecese-s| ml To 1880. 1875, 1880. 1875. 1880. ING Gleer scents. a8 6,760 1-355 | aeeSOr 1,814] 1,848 Area in ACT@S ….cessssseee 92,657 | 98,228 | 92,758 | 93,511

About two-thirds of the holdings are less than 50 acres in extent, Lut the largest area—about two-fifths of the whole—is in farms between 100 and 300 acres.

The number of horses in 1881 was 29,450, an average of 3°9 to every 100 acres under cultivation, the average for England and also for Great Britain being 4-4. The number of horses used for agri- cultural purposes was 24,177. The total number of cattle in 1881 was 73,409, an average of 19-9 (England 16°9, Great Britain 18°4) to every 100 acres under cultivation. The number of cows in milk or in calf was 29,485, and of other cattle 43,924. Cattle are grazed in large numbers on the marsh lands along the estuaries of the rivers, and of course dairy farms are very numerous in the ueighbourhood of London. The number of sheep in 1881 was 952,311, an average of 128-9 (England 62 ‘4, Great Britain 76°3) to every 100 acres under cultivation. The number one year old and upwards was 627,124, and below one year 325,187. A breed of sheep peculiar to the district, known as Kents, is grazed on Romney Marsh, but Southdowns are the principal breed

raised on the uplands. Pigs in 1881 numbered 55,896, or an average of 7°5 (England 7, Great Britain 6°6) to every 100 acres under cultivation.

According to the landowners' return, 1872-78, the land, exclusive of that in the metropolis, was divided – between 34,683 proprie- tors, and its gross annual value was £3,357,057. Of the owners, 26,925, or more than 77 per cent., possessed less than 1 aere, and the average value per acre over all was £3, 10s. 73d. There were four proprietors possessing above 10,000 acres each, viz., Viscount Holmsdale, 15,162 acres; Lord Sondes, 14,446; Sir H. Tufton, 13,639 ; and the Ecclesiastical Commissioners, Whitehall, 10,591. Other seventeen possessed more than 5000 acres each.

Manufactures and Trade.—At onc time there were extensive iron- works in the Weald of Kent, and woollen cloth was also largely

311,188 | 320,974 | 186,379 | 142,269 | 76,545

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thin and much mixed with small portions of sand and stone ; but in some situations the ragstone has a thick covering of clay loam, which is most suitable for the pro- duction of hops and fruits. In the district of the Weald marl prevails, with a substratum of clay. The soil of Romney Marsh is a clay alluvium.

According to the agricultural returns for 1881, the total area under crops comprehended 745,215 acres, a percentage of 73°9 instead of 71°7 in 1870; corn crops had an arca of 224,211 acres, a percentage of 22°3 instead of 251 in 1870; green crops 85,614 acres, a percent- age of 8°5 instead of 7°4; rotation grasses 53,421 acres, a percentage of 5'3 instead of 6°2 ; permanent pasture 327,079 acres, a percentage of 31°8 instead of 28°2. The area under permanent pasture thus exceeds that under corn crops by nearly a third. The area under woods in 1881 was 82,849 acres, under orchards 16,678, undcr mar- ket gardens 4221, and under nursery grounds 670. Of the corn crops the most largely grown is wheat, which in 1881 occupied 84,388 acres, oats coming next with 52,177 acres, and barley and bere ovcu- pying only a little less, 50,010 acres. Beans and pease were grown on 17,453 and 19,762 acres respectively, and rye on only 421 acres. In Thanct

mustard, spinach, canary seed and a variety of other seeds are raised. Of green crops, turnips and swedes were grown on 27,254 acres, vetches and similar crops on 22,179 acres, potatoes 17,815, mangolds 12,070, cabbage 5843, and carrots 452. Part of the area under green crops is occupied by market gardens, which are very numerous in the neighbourhood of London. The principal orchard districts are the valleys of the Darent and Med- way, and the Tertiary soils overlying the Chalk, between Rochester and Canterbury. The county is specially famed for cherries and filberts, but apples, pears, plums, gooseberries, and currants are also largely cultivated. In some cases apples, cherries, filberts, and hops—the special crop of the cout aee grown in altcrnate rows. 41,476 acres were under hops in Kent in 1881, and in the United Kingdom only 64,943 acres. The principal hop districts are the country in East Kent lying between Canterbury and Faversham, the valley of the Medway in Mid Kent, and the district of the Weald. The area. under hops in these several dis- tricts in 1881 was 11,718, 17,353, and 11,986 acres respectively, — other districts contributing only 419 acres. Much of the Weald, which originally was occupied by a forest, is still densely wooded. There are many fine woods scattered throughout the county, especially in the valley of the Medway, oak and beech being the trees principally grown. A large extent of woodland is ash and chestnut plantations—maintained for the growth of hop-poles.

The following table gives a classification of holdings according to size as returned on the 25th June 1875 and the 4th June 1880, with the acreage of each class of holding for these years:—

upwards.

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1875. 1880.

368 375

1875. 1880, 1875. 1880, 1875,

119 108 15

70,646 | 18,587

13 | 10,361″

10,926 18,920

728,114 | 744)548

manufactured, but the former industry is now wholly extinct, and the latter is only prosecuted to a very small extent. Next to the occupations connected with the Government establishments at Dept- ford, Woolwich, Chatham, and Sheerness (see Dockyarps, vol. vii. p. 310), the most important industry of the county is that of paper, which is carried on on the banks of the Cray, Darent, Medway, and other streams in the west of the county. Shipbuilding by private firms is also prosecuted at Greenwich, Gravesend, Dover, one fleet, and Ramsgate. At Greenwich there are engineering works, soap works, and chemical works ; and the carriage and engine works of the South-Eastern Railway are situated at Ashford. ~Manufac- tories of silk, cotton, linen, wool, and ribbous give employment in various towns and villages. Bricks, tiles, pottery, and cement are fabricated, especially on the banks of the Swale and Medway. Lime-burning aud whiting-making are also carried on. There are powder-mills at Dartford, Faversham, and Tunbridge. The principal ports besides those on the Thames and Mcdway are Whitstable, Herne Bay, Margate, Broadstairs, Ramsgate, Sand- wich, Deal, Dover, and Folkestone. The watering-places are Erith, Greenhithe, Northfleet, Gravesend, Herne Bay, Margate, Westgate, Broadstairs, Ramsgate, Deal, Dover, Folkestone, and Sandgate. Tunbridge Wells is a favourite spa.

Fishing.—Deep-sea fishing is largely prosecuted all round the coast of Kent. Shrimps, soles, and flounders are caught in great numbers in the estuaries of the Thames and Medway and along the coast of Whitstable and Margate as well as at Ramsgate. The prin- cipal oyster beds are at Queenborough, Rochester, Milton, Faver- sham, and Whitstable, and whitebait frequent the Thames in iminense shoals below Greenwich.

Lailways.—As the main pathway of communication between London and the Continent lies through Kent to Dover, the county

at a very early period enjoyed the advantage of railway intercourse ; and it is now very completely intersected with railway lines.

Administration.—Kent is divided into five lathes—a partition peculiar to the county, and dating from Anglo-Saxon times. The lathes are St Augustine, Shepway, Scray, Aylesford, and Sutton- at-Hone. The county comprises 61 hundreds, the lowey of Tun- bridge, the franchise and barony of Bircholt, the liberty of the Isle of Sheppey, the liberty of New Romney ; two cities, Canterbury (21,701) and Rochester (21,590), which are also municipal and parliamentary boroughs; one parliamentary borough, Chatham (46,806); five boroughs which are both municipal and parliamen- tary, viz., Dover (28,486), Gravesend (m. 23,375, p. 31,355), Hythe (m. 4069, p. 28,066), Maidstone (m. 29,638, p. 39,662), Sandwich (m. 2846, p. 15,566) ; part of the parliamentary borough of Green- wich and five municipal boroughs, viz., Deal (8422), Faversham (8627), Folkestone (18,887), Margate (15,889), and Tenterden (3620). The liberty of New Romney and all the municipal boroughs except Gravesend and Maidstone are included among the Cinque Ports. The Cinque Port districts in Kent are those of Sandwich, partly in Essex, Dover, Hythe, New Romney, and a portion of Rye, namely, Tenterden (see C1nQuE Ports, vol. v. p. 786). Until 1867 Kent was for parliamentary purposes formed into only two divisions, Hast and West Kent, but by the Reform Act of that year West Kent was divided into West and Mid Kent. The city of Canterbury, which returns two members, Dover and Sandwich, which return two members each, and Hythe, which returns one member, are included in Kast Kent, which returns in all ninemembers. In Mid Kent are included the city of Rochester, returning two members, Maidstone, returning two members, and Chatham and Gravesend, returning one member each; it returns in all eight members. West Kent, which returns two members, in- cludes part of the borough of Greenwich, which returns two mem- bers. The total representation of the county, including Greenwich, is thus twenty-one members. The county has one court of general sessions and two of quarter sessions; the number of sessional divisions is sixteen, exclusive of the liberty of Romney Marsh, which has petty and general sessions under its charters. The central criminal court has jurisdiction over certain parishes in the county. The city of

Canterbury (a county in itself), the city of Rochester, and the boroughs of Gravesend and Maidstone have commissions of the peace and separate courts of quarter sessions, as have also the ports and boronghs of Deal, Dover, Faversham, Folkestone, Hythe, Margate, Sandwich, and Tenterden. The ancient borough of Queenborough, governed by an old charter, has a recorder and a court of quarter sessions with a separate juris- diction limited to misdemeanours. Summary cascs are dealt with by the mayor and magistrates in petty sessions. With the excep- tion of the portion included in the metropolitan police district, the shire for judicial purposes belongs to the south-eastern cir- cuit, and for police purposes is divided into twelve districts, which are generally identical with the petty sessional divisions. The cities of Canterbury and Rochester, the boroughs of Deal, Dover, Faversham, Folkestone, Gravesend, Hythe, Maidstone, Margate, Sandwich, and Tenterden, and the towns of Ramsgate (22,605) and Tunbridge Wells (24,309) have their own police. LEcclesiastically, with the exception of portions of two parishes, Kent is within the dioceses of Canterbury and Rochester; and it contains thirty- seven civil parishes or places, as well as parts of other parishes extending into adjoining counties.

Population.—Since 1801, when it numbered 308,667, the popula- tion has been rapidly and uninterruptedly increasing. In 1821 it was 427,224, and in 1841 it had increased to 549,353, in 1861 to 738,881, in 1871 to 848,294, and in 1881 to 977,585, of whom 477,715 were males and 499,870 females.

History and Antiquities.—A tribe of the Belge from Gaul had before the time of Cesar’s invasion taken possession of a large por- tion of southern Britain, including Kent. The remarkable crom- lech, Kit’s Coity House, near Aylesford, belongs to this early period, as do numerous earthworks, encampments, stone circles, and excava- tions on the coast which are now generally regarded as ancicnt chalk pits. The spot of Cesar’s landing was probably either some part of the coast between Walmer and Thanct—the neighbourhood of Deal finding most supporters—or the Portus Lemanisin Romney Marsh, which is identical with the town of Lymne. In his first invasion he did not penetrate farther than Kent, and the absence of lapidary inscriptions is regarded as evidence that its conquest was easily effected. The principal Roman road was the Watling Street, between Dubris (Dover) and London, which had much the same course as the present highway. This

road was joined at Durovernwm (Canterbury) by two others, one from the Portus Lemanis (Lymne) and the other from Regulbium (Reculver). The traces of the road from the Portus Lemanis are still well marked throughont its whole extent, but agricultural operations have almost wholly obliterated the traces of that from Regulbium. Of two other Roman stations, Durolevwm and Vagniacx, the site cannot be absolutely determined, but most probably the former was near Faversham, and for the latter, which was somewhere between

Rochester and London, most opinions favour Springhead near Gravesend. There are still important reinains of Roman fortresses at Dover, Richborough, Reculver, and Lymne; many traces of Roman villas have also been discovered ; and portions of Roman structures have frequently been utilized in the construction of churches and other buildings. A great variety of Roman relics have been discovered in nearly every part of the county. .The most remarkable are profuse traces of extensive potteries of purple or black ware at Upchurch on the south bank of the Medway, leaden coffins elaborately ornamented, and glass and bronze vessels in various Roman cemeteries. The earliest Teutonic settlement, under Hengest and Horsa, took place in Kent ; and, on the arrival of Augustine in 597, Canterbury became the Christian metropolis of the island. Separate kings appear to have occasionally ruled in East and West Kent ; and a bishopric was established at Rochester, in West Kent, as well as at Canterbury. Of this period of Kentish history the principal antiquarian remains are the cemeteries ; from those at Sarre and Osengal in Thanet, and at Bifrons, Barham, Bishopsbourne, Gilton, and Sittingbourne, a large number of relics of various kinds have been obtained. Some old customs belonging to this period, including that of gavelkind in cases of intestacy, are still extant. Kent in 823 was united by Egbert to the kingdom of the West Saxons. In the 9th, 10th, and 11th centuries it suf- fered greatly from the ravages of the Danes. After the Conqnest the earldom of Kent, which had been held by Godwine and after- wards by Harold, was bestowed by William on his brother Odo bishop of Bayeux. Among other events of historic importance the following may be mentioned :—the capture of Rochester by William Rufus in 1088, an incident connected with the rebellion of Odo, which was

subdued in the same year; the murder of Thomas & Becket at Canterbury in 1170 ; the submission of King John to the pope's legate at Dover in 1215; the capture of Rochester Castle by King John in the same year, and of the same castle by the dauphin of France in 1216, the greater part of Kent formally submitting to him with the exception of Dover Castle; Wat Tyler's insurrection in 1381 and that of Jack Cade in 1450 ; the encaimp- ment of Cornish insurgents at Blackheath in 1497, where they were surprised by Henry VII.; the insurrection of Sir Thomas Wyatt, which was commenced at Maidstone in 1554; the suppres- sion of the Kentish insurrection by Fairfax at Maidstone, June 1, 1648; and the burning of certain ships at Chatham by the Dutch fleet under De Ruyter in 1667 after the fort of Shecrness had been levelled by his guns.

As was to be expected from its connexion with the early history of England, and from its beauty and fertility, Kent possessed a larger than average number of monastic fonndations. 'he earliest were the priory of Christ's Church and the abbey of St Peter and St Paul now called St Augustine's, both at Canterbury, founded by Augustine and the monks who accompanied him to England. In the time of Henry VIII. the other principal religious houses were a priory at Rochester founded in 1089, a priory founded at Folke- stone in 1100 on the site of a nunnery originally founded in 6380, a nunnery of St Sepulchre at Canterbury, founded about 1100, a nunnery at Minster in Sheppey built in 1130 on the site of a nunnery which was founded in 675, but destroyed by the Danes, St Martin's Priory at Dover established in 1140 in place of one founded in 696 but afterwards dissolved, an abbey at Favershain founded in 1147, and nunneries at Lillechurch in Higham founded before 1151, at Davington founded in 1153, and at Malling founded in the time of William Rufus; the Black Canons possessed a priory at Leeds founded in 1119, an abbey at Westwood in the parish of Erith founded in 1178, a priory at Combwell in Goudherst founded in the reign of Henry II., a priory at Tunbridge founded in the same century, a priory at Bilsingtou founded in 1253, St Gregory's Priory at Canterbury, changed in the time of Henry I. from one of secular priests, originally founded in 1084; the White Canons had St Radegund's Abbey near Dover, founded in 1193, and an abbey at West Langdon, founded in 1192; houses belonging to the Carmelites existed at Aylesford,and Newenden, both founded in 1240, and at Sandwich founded in 1272; one belonging to the

Dominicans was founded at Canterbury in 1221, the Franciscans having one at the same city founded in 1225, and the Eremite Friars also one at the same city founded in the time of Edward I. or Edward II.; an abbey of Cistercian monks was founded at Boxley in 1146, a preceptory of Knights Templars at Swingfield near Dover some time before 1190, a priory of Trinitarian Friars at Mottenden in the parish of Headcorn in 1224, a nunnery of the order of St Augustine at Dartford about 1355, a cell of Cluniac monks at Monks Horton in the time of Henry II., and a _pre-ceptory belonging to the knights of St John of Jerusalem at West Peckham in the time of Henry IV. Of the monastic buildings the principal remains are those of the Benedictine monastery of St Augustine at Canterbury, the priory of Christ's Church, Canter- bury, adjoining the cathedral, the Dominican convent, Canter- bury, St Radegund's Abbey near Dover, St Martin's Priory, Dover, Horton Priory, Malling Abbey, Aylesford Friary, and the abbeys of Minster in Sheppey and Minstcr in Thanet. In addition to

the cathedrals of Rochester and Canterbury, the churches of special interest are those of Darenth, partly Old English ; Lyminge, of very great antiquity; Barfreston, a small but unique specimen of enriched Late Norman work; Patricksbourne, a very beautiful example of Norman; St Margarets-at-Cliffe, with many portions of very rich Norman, the west doorway being one of the finest examples of Norman work in England; New Romney, with the finest Norman tower in Kent; Folkestone, Early English, with some portions almost Norman; St Martin's Church, Canterbury ; Brabourne, with some singular Norman work, and possessing several brasses; St Clement's, Sandwich, partly Early English, with en- riched Norman tower; Minster in Sheppey, Norman and Early English, with brass of date about 1330; Minster in Thanet, Norman tower and nave, with Early English chancel ; Lydd, partly Early English and possessing several brasses ; Cobham, Early English, with the finest collection of brasses in England ; Hythe, with plain exterior, but possessing a chancel whose interior is one of the finest specimens of Karly English work extant; Stone, Early English to Decorated, and in style resembling Lincoln cathedral ; Chartham, a fine specimen of the Decorated, and possessing several brasses, one of the date 1306;

Ashford, Decorated and Perpendicular, with brass of 1375, and onc of the finest towers in Kent.

The principal secular buildings of interest, in addition to the Roman ruins already referred to, are the Norman keeps of Malling, Canterbury, Rochester, Dover, Chilham, and Tunbridge; the castles of Sandown, Deal, and Walmer, built by Henry VIJJ. for defensive purposes; Hever Castle, the seat of the Boleyns, and the scene of the courtship of Anne Boleyn and Henry VIII. ; Allington Castle near Maidstone, the birthplace of Sir Thomas Wyatt ; the banquetting hall and gateway of the Royal Palace at Eltham ; the castellated mansion of Leeds Castle near Maidstone; Penshurst Castle, the seat of the Sidneys; Knole House near Sevenoaks, formerly one of the palaces attached to the archbishopric of Canterbury, and once the seat of the dukes of Dorset, now of Lord Sackville ; the Mote, at Ightham ; and Cobham Hall.

A full account of the geology of Kent is comprehended in Topley's Geology of the Weald, and Whitaker's Geology of the London Basin, forming part of the memoirs of the Gcvlogical Survey of the United Kingdom. Among the more ancient books on Kent are Lambard's Perambulation, written in 1570, 1st ed. 1576, latest 1826; Kilburne's Brief Survey, 1657; and Philipot's Villare Cantianum, 1659. The principal histories are those of Harris (1719), Hasted (1778-99), Seymour (1776), Henshall (1798), Ireland (1828-30), Collings (1834), and Dunkin (1856-77). Among the many works treating on Kentish antiquities may be men- tioned Somner, Treatise on the Roman Ports and Forts of Kent, 1693; Nichols, Antiquities in Kent, 1782-83; Parsons, Monuments of Kent, 1794; Sandys, Con- suetudines Kancizw, 1851; Husscy, Notes on the Churches of Kent, 1852; F. H. Appach, C. J. Cxsar's British Expeditions from Boulogne to the Bay of Apuldore, 1868; Larking, Facsimile of Domesday Book relating to Kent, 1869; Furley, A History of the Weald of Kent, 1871-74; Scott-Robertson, Kentish Archzxology, 1877-81; Glynne, Notes on Churches of Kent, 1877. See also Frost, Jn Kent with Charles Dickens, 1880. A very full bibliography of works relating to Kent and its several towns is given in Smith's Bibliotheca Cantiana, 1837; sec also Anderson's British Topography, 1881. The Archxologia Cantiana, a periodical publication of the Keut Archeological Socicty, contains accounts of the latest antiquarian discoveries.

KENT, James (1763-1847), American jurist, was born at Philippi in New York State, July 31, 1763. He graduated at Yale College in 1781, and began to practise law at Poughkeepsie, in 1785 as an attorney, and in 1787 at the bar. In 1790 and 1792 Kent was chosen to represent Dutchess county in the State legislature. In 1793 he removed to New York, where Governor Jay, to whom the young lawyer's Federalist sympathies were a strong recommendation, appointed him a master in chancery for the city. The year 1796 saw Kent again a member of the legislature and professor of law in Columbia College. In 1797 he became recorder of New York, in 1798 judge of the supreme court of the State, in 1804 chief justice, and in 1814 chancellor of New York. In 1822 he became a member of the convention to revise the State constitution. Next year, having attained the age of sixty, Chancellor Kent resigned his office, and was re-elected to his former chair. Out of the lectures he now delivered grew the Commentaries on American Law (4 vols., 1826-30), which by their learning, range, and lucidity of style, have won for him a high and permanent place in the estimation of both English and American jurists. Kent rendered most essential service to American jurisprudence while serving as chancellor. Chancery law had been very unpopular during the colonial period, and had received down to his time but little development, and no decisions had been published. His judgments of this class (see Johnsou's Chancery Reports, 7 vols., 1816-24) cover a wide range of topics, and are so thoroughly considered and developed as unquestion-

ably to form the basis of Aimerican equity jurisprudence. Kent was a man of great purity of character, of singular simplicity and guilelessness in his ways, and is altogether a conspicuous and remarkable figure in American annals. He died in New York, December 12, 1847.

To Kent we owe several other works (including a Commentary on.

International Law) of less importance than the Commentaries. These have passed through twelve editions, the most recent (1873) being annotated by O. W. Holmes, jun. See Duer's Discourse on the Life, Character, and Publie Services of James Kent, 1848 ; and The National Portrait Gallery of Distinguished Americans, vol. ii.,

1852.

KENT, Witi1am (1685-1748), “painter, architect, and the father of modern gardening,” as Horace Walpole in his Anecdotes of Painting describes him, was born in Yorkshire in 1685. Apprenticed to a coach-painter, his ambition soon led him to London, where he began life as a portrait and historical painter. He was fortunate enough to fallin with kind patrons, who sent him in 1710 to study in Italy; andat Rome he made other friends, among them Lord Burlington, with whom he returned to England in 1719. Under that nobleman’s roof Kent chiefly resided till his death on April 12, 1748,—enjoying through his patron’s influence abundant commissions in all departments of his art, as well as various court appointments which brought him an income of £600 a year. Walpole flatly says that Kent was below mediocrity in painting. He had some little taste and skill in architecture, of which Holkham palace is perhaps the most favourable example. The mediocre statue of Shakespeare in Westminster Abbey sufficiently stamps his powers as a sculptor. His merit in landscape gardening is greater. In Walpole’s stilted language, Kent “was painter enough to taste the charms of landscape, bold and opinionative enough to dare and to

dictate, and born witha genius to strike out a great system –

from the twilight of imperfect essays.” In short, he was the first in English gardening to vindicate the natural against the artificial, Banishing all the clipped monstrosi- ties of the topiary art in yew, box, or holly, releasing the streams from the conventional canal and marble basin, and rejecting the mathematical symmetry of ground plan then in vogue for gardens, Kent endeavoured to. imitate the variety of nature, with due regard to the principles of light and shade and perspective. Sometimes he carried his imitation too far, as when he planted dead trees in Kensington gardens to give a greater air of truth to the scene, though he himself was one of the first to detect the folly of such an extreme. Kent’s plans were designed rather with a view to immediate effect over a comparatively small area than with regard to any broader or subsequent results,—doubtless from landscape gardening being then but in its infancy.

KENTIGERN, Sr (c. 516-603), popularly known as St Mungo, the apostle of Strathclyde and the restorer of Christianity among the Cumbrians, was,

according to Jocelyn of Furness, the son of “the daughter of a certain king most pagan in his creed who ruled in the northern parts of Britannia.” His mother, probably a nun, was, it is said, when with child sentenced to be thrown from one of the precipices of Dunpelder (Traprain Law, formerly Dumpender Law, in Haddington), but miraculously eseaping was exposed in a boat to the mercy of the sea and landed on the sand at Culenross (Culross), where she gave birth to the child. On the spot where the boat reached land there was at one time a small chapel dedicated to St Kentigern. According to the tradition, St Servanus (who, however, lived two hundred years after Kentigern) took special care of the mother and child, calling the mother Taneu (Thanew) and the child Kentigern, ‘head master or lord.” Afterwards he also named him, on account of his intelligence and the graces of his character, Munghu

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(Mungo), “ dearest friend.” As, however, the favour with which he was regarded by Servanus had awakened the animosity of his fellow pupils, he secretly made his escape, and ultimately found his way to Cathures (Glasgow), near a cemetery which had been long consecrated by St Ninian. There he dwelt for some time with two brothers named Telleyr and Anguen, when on account of the fame of his manner of life and his miraculous deeds the king and clergy of Cumbria, in order to restore the religion of Christianity to its former influence, called over a bishop from Ireland and caused Kentigern to be consecrated bishop. His cathe- dra] seat he named Glasgu, “the dear family,” where he collected a number of friends and disciples who practised continence and lived after the manner of the primitive church. On his life being threatened, he journeyed to Menevia (St David’s) in South Wales, where he founded the monastery of Llanelwy, afterwards St Asaph’s. When Roderick ascended the throne of Cumbria, Kentigern returned, and after establishing his see for some time at Hoddam, Dumfriesshire, he settled finally at Glasgow. He is said to have died on a Sunday, and as his saint’s day is the 13th January, he probably died in 603.

The fragment of a life of St Kentigern, composed at the instance of Herbert, bishop of Glasgow, who died in 1164, and made use of by John of Fordun,

is preserved in a manuscript of the British Museum. It was first printed by Cosmo Innes in the Registrwm Episcopatus Glasguensis. A life written by Jocelyn, a monk of Furness, about 1180, exists in two MSS., one in the British Museum, the other in the public library of the archbishop of Dublin bound along with a life of St Servanus in a small quarto volume. An abridgment of the life by Jocelyn was published by Capgrave in Nova Legenda Angliz. The British Museum MS. was pnblished by Pinkerton in the Vitex Antique Sanctorum Scotiz. The second MS. has been published along with the anonymous fragment, and with translations of both, accompanied with learned notes by Bishop Forbes of Brechin, in vol. v. of The Historians of Scotland, 1874. Principally on the earlier fragment have been founded the legends of St Kentigern and his friends and disciples in the Aberdeen Breviary, which have been published with translations and notes by Rev. William Stevenson, 1874. See also Skene's Celtic Scotland, vol. ii., and Montalembert's Monks of the West.

KENTUCKY Copyright, 1882, by John R. Procter.

ENTUCKY, one of the central States of the United States of America, is situated between 36° 30' and 39° 6' N. lat., and 82° and 89° 38' W. long., and is bounded on the N. by Ohio, Indiana, and Illinois, on the W. by Missouri, on the S. by Tennessee and Virginia, and on the E. by Virginia and West Virginia. It extends from east to west 458 miles, and its greatest width from north to

south is 171 miles.

The area of the State has been variously estimated at from 37,000 to 40,000 square miles. The surface is an elevated plateau sloping from the great Appalachian uplift on the south-east, to the Ohio and Mississippi rivers on the north and west. Only that portion of the State including and lying between the Pine or Laurel Mountain and the Cumberland range may be said to partake of the mountain structure. These parallel ranges have an elevation of from 2009 to 3000 feet above sea-level, whilst the mountains in the Cumberland valley between these ranges have an elevation of 3500 feet. The Cumberland river, near where it passes through a break in Pine Mountain, is at low-water mark 960 feet above the sea. Some of the hills immediately to the north are as high as Pine Mountain, gradually decreasing

in height to the western edge of the Appalachian coal-field, where the greatest elevation is less than 1600 feet above the sea. The topography can be understood by reference to the accompanying sketch map of the geology of the State. The eastern coal-field, with an area over 10,000 square miles, has an elevation of 650 On the Ohio river to 1400 feet on the south-western

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edge on the Tennessee line, and 3500 feet on the south- eastern border of the State. The great central or “Blue Grass region” (Lower Silurian on map) has an area of about 10,000 square miles, and an elevation of from 800 to 1150 feet. Although elevated several hundred feet above the drainage level, the surface is that of a gently undulating plateau, with a pleasing topography. The Upper Silurian and Devonian, with an area of about 2500 square miles, have an elevation of 450 on the north-west and 800 on the north-eastern end to 1100 feet where these formations curve around the Lower Silurian on the south- west. In this region are wide stretches of very level country, often with insufficient drainage. Around this central region extends from the mouth of Salt river to the mouth of the Scioto a continuous ridge known as Muldrows Hill, King’s Mountain, Big Hill, and other local names, having an abrupt escarpment on its inner circle, and sloping away from the central uplifted dome of the Blue Grass region, as a broken plateau on the east, and an almost level plateau on the west where the subcarboni- ferous limestone determines the topography. This range of hills is one of the prominent features in the State. The subcarboniferous has an area of about 10,000 square miles, with an elevation of from 350 to 600 feet on the south-western to 950 in the central region. In the

Quaternary MEE Carboniferous Subcarboniferous Devonian SSS) Upper Silurian

Lower Silurian

Geological Map of Kentucky.

eastern portion of this formation the streams have cut deep gorges in the limestone, but in its central part only the larger streams are open to daylight, and most of the drainage is subterraneous, which gives to that region a

peculiar topography,—the surface being a series of slight round or oval depressions, through which the surface water

escapes to the streams below. Whenever the small passage way leading downwards from one of these sinks becomes closed, a “pond” is formed. In this formation are the numerous caverns for which this State is noted. The western coal-field has an area of about 4000 square miles and an elevation of from 400 feet along the Ohio river to 850 feet in its south-eastern portion. The Quaternary, with an area of about 2500 square miles, has an elevation of about 280 feet on the river bottom lands and from 350 to 450 on the uplands. The average elevation for the entire State is over 1000 feet above the sea, and the numer- ous streams penetrating all portions have cut their chan- nels deep enough to secure ample drainage, and exemption from the dangers of floods, with the exception of very limited areas.

Rivers.—The State has a river boundary of 813 miles of navigable streams : —the Chatterawha or Big Sandy on the east for 120 miles, the Ohio on the north for 643 miles, and the Mississippi on the west for 50 miles. The Chatterawha, Licking, Kentucky, Cumberland, and Ten- nessee rivers have their sources in the Appalachian coal- field, and flow through the State to the Ohio river. The Green and Tradewater rivers drain the western coal-field. Kentucky has many hundred miles of lane rivers,

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connecting with the Mississippi system, and furnishing a most advantageous means of cheap transport for coal, timber, &c. A system of river improvement, begun by the State some years ago, by which the Green and Barren rivers from Bowling Green downwards, and also the lower portion of the Kentucky river, were made continuously navigable, is being prosecuted still further by the United States Government. It is now possible to float down logs, rafts, flat boats, &c., from almost the fountain heads of the rivers.

Climate.—The climate is very mild and salubrious. The mean annual temperature ranges in different parts of the State from 50 to 55° Fahr. The

extreme range is less than in the States north and west. The lowest record at the United States Signal Service Station during the exceptionally cold months of December 1880 and Janu- ary 1881 was —8°. During the very hot summer of 1881 the maxi- mum temperature was greater as far north as Chicago than in Ken- tucky. Cattle remain upon pasture during the entire winter, with but little additional food, and there is seldom a day, winter or sum- mer, when a man may not performa full day's work in the open air. The healthfulness of the climate is attested by the low death-rate and by the strength and vigour of the population. The tabulated measurements of the United States volunteers during the civil war show that the soldiers born in Kentucky and Tennessee exceeded all others in height, weight, circumference of head, circumference of chest, and ratio of weight to stature. The speed and endurance of the Kentucky horse, and the superior development of all kinds of domestic animals, are well known. The annual rainfall ranges in various parts of the State from 45 to £0 inches, and is probably still higher in the Cumberland Mountains.

Geology.—With the exception of the more recent formations in the portion of the State west of the Tennessec river and along the valleys of some of the streams, Kentucky is composed entirely of Paleozoic strata, having present all of the various groups found in the Ohio valley, from the calciferous sandrock (3a of Dana's Table of Formations) to and including the carboniferous, The united thickness of the various groups is not great in Kentucky, —probably not aggregating over 5000 feet. The entire State is included within the area of the great Appalachian uplift. In the south-east the dis- turbance is greater, the strata often being inclined at a high angle, the successive undulations gradually diminishing toward the north- west. This disturbance in the south-cast is emphasized by the Great Pinc Mountain fault, extending parallel to the axis of the Appa- lachian uplift, entirely through the south-eastern portion of the State, and bringing to the surfacc in the Coal-measures rocks as low as the Clinton group of the Upper Silurian. The axis of the greatest geo- logical elevation in the State is parallel to the above, and passes in a north-easterly and south-westerly direction through the counties of Montgomery, Clark, Madison, Garrard, Jessamine, and Boyle, shown on the map by the deflexion of the Kentucky river from its general course towards the Ohio river. This uplift brings to the surface the lowest rocks exposed in the State,—the " bird's eye" limestone

of the Trenton (4a of Dana), and the dolomite, known as ‘¢ Kentucky river marble,” including what is probably the equiva- lent of the calciferous sandrock of the New York section. These lower rocks of the Kentucky section form a triangular area having its depressed apex north-west of Frankfort, and its elevated base in the counties named above. Through these formations, having a thickness of over 400 feet, the picturesque gorge of the Kentucky river has been cut. Next in ascending order we have 150 feet of bluc, fossiliferous limestone, containing characteristic forms of the Trenton of New York, and 800 feet of limestone and shales con- taining the fossils of the Hudson river or Cincinnati groups (4¢ of Dana). These groups make up the well-known ‘‘ Blue Grass ” region of Kentucky, celebrated for fertility of soil, high agricultural de- velopment, and superiority of the horses and other domestic ani- mals produced. The soils of the most fertile portion of this region are derived from the 150 feet immediately above the bird’s eye lime- stone. These rocks are very rich in phosphate of lime, and with careful tillage and proper rotation of crops the lands are not ex- hausted by cultivation. The blue limestones of central Kentucky are very prolific in fossil forms.

_ Surrounding this central region are the rocks of the Upper Silur- ian, averaging in thickness about 100 feet. East of Louisville this formation is about 25 miles wide, and in eastern central Kentucky about 10 miles wide, decreasing in thiekness and in superficial extent toward the south-western portion. The rocks are mostly magnesian limestone rich in fossil forms, of which the most charac- teristic are the beautiful chain corals. The soils of this formation are less fertile than those derived from the blue shell limestone and marly shales of the Lower Silurian. Above the latter formation, and forming the outer portion of the semicircle or irregular triangle extending around the great central uplift, arc the corniferous lime- stones of the Devonian (9c of Dana). The principal exposure is

geen at the falls of the Ohio below Louisville, at low water pre- senting probably the most beautiful and extensive natural cabinet of corals in the world,—a reef of corals, perfectly preserved in minutest structure, and of exquisite beauty. The soils derived from these rocks are of almost equal fertility to the best soils of the blue limestone, and the topography is equally pleasing to the eye. The next formation in order is the black shale (10c of

Dana) of the Devonian, with a thickness of about 150 feet in the north-cast, and decreasing gradually to the south and west. This formation is peculiar from the high percentage of petroleum contained in the shale. Before the discovery of oil-wells oil was distilled from these shales, and the oil in the productive wells of Kentucky is derived from the same source. Where this shale determines the topography the lands are generally flat, often with insufficient drainage, and are not so productive as analyses would seem to warrant. Doubt- less underdraining will increase the yield.

The Subcarboniferous rocks, consisting of the several groups identified by fossil remaius with the Waverly, Keokuk, Warsaw, St Louis, and Chester groups (18a, 138), and 18¢ of Dana), com- posed of sandstones, shales, and limestones, with a total thickness of over 1000 feet, cannot here be described in detail. Muldrows Hill, representing the retreating escarpment of formations which formerly extended over the central Blue Grass region, is composed of these rocks, capped at Big Hill in Madison county with the carboniferous conglomerate. The subcarbonifcrous limestone region of western and southern Kentucky, drained by the Grecn and Cumberland rivers, is characterized for the most part by an excellent soil, well adapted to the growth of Indian corn, wheat, barley, and other cereals, pro- ducing a very fine quality of tobacco, and certain grasses in great perfection. This formation is noted for the numerous caverns of large size and great beauty, —the best known being the celebrated Mammoth Cave in Edmonson county, which is the largest known cavern in the world. Here many miles of subterranean passages have been excavated by the eroding action of water charged with carbonic acid, assisted in places by the action of the atmosphere. The caverns are beautified by columns and stalagmites formed by the deposition of carbonate of lime from the percolating waters, and by exfoliation of sulphate of lime, taking the form of flowers, rosettes, and other shapes, rendered more beautiful by their power of refiec- ting light. See Mammoru CAVE.

The detailed survey of the Carboniferous strata of Kentucky is not yet completed, but enough is known to justify the assertion that the total area in the State is over 14,000 square miles, —10,000 square miles of the Appalachian coal-field and 4000 square miles of the western or Illinois

coal-field. In the eastern field two work- able coals are found below and twelve above the carboniferous

conglomerate. The eastern field is remarkable for the thickness of.

some of the coal strata and the purity of coals, for the large area of excellent cannel coals, and for the ease with which the coals may be mined, being mostly clevated above the drainage level. The thickest portion of the measures is in the synclinal trough between the Pine and Cumberland Mountains,—there being a vertical thickness of over 2200 feet of Coal-measure rocks above the drainage level. Inthe south-eastern portion of the eastcrn field an excellent coking coal has becn traced overa wide area. This coal ranges from 4 feet to 8 feet in thickness, can be mined cheaply, and has a very low percentage of ash and sulphur. The western coal-field is a broad synclinal, its axis almost pavallel to the general direction of Green river, crossed by undulations the axes of which extend from north- east to south-west. No workable coal has been opened below the con- glomerate, which is thinner than in eastern Kentucky. Twelve coals are present in the measures above the conglomerate. Some of these coals are of excclllent quality, although the percentage of sulphur is larger than in the best of the castern Kentucky coals. The soils of the Coal-measures are variable in quality. Some of the most pro- ductive lands in the State are in the western coal-field. In the eastern field are very fertile valleys, and the uplands in the Cum- berland valley are quite productive. Even the poorest of the Coal-measure soils are well adapted to certain grasses and fruits, and will yield good returns from intelligent culture.

There only remain to be noticed the Quaternary strata. The region west of the Tennessce river, and the level plains bordering the principal rivers and above high-water level, are composed of a homogeneous buff-coloured _silicious loam known as the “bluff” or loess formation (20b of Dana). This is, with the exception of the alluvial ‘‘ bottoms” along the rivers, the most recent forma- tion in Kentucky. The deposit has a thickness of from 40 to 50 feet. Owing partly to the presence of numerous land and freshwater shells (Helix, Cyclostoma, Pupa, Cyclas, &c.), this for- mation is highly calcareous, giving from an average sample 9°6 per cent. of lime, and the soils are of marked fertility. This bluff loam rests upon a coarse gravel,

varying in thickness from a few inches to 30 feet, composed mainly of water-worn pebbles from the carboniferous conglomerate, and slightly water-worn angular pebbles of chert and hornstone from the lower subcarboniferous and corniferous groups, and coarse angular sand. Intermingled throughout are silicified fragments of many of the Palxozoic fossils

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to be found in the Ohio valley. In descending order are beds of white sand and clay and shales of the Eocene (Tertiary), only slightly exposed in the extreme western part of the State, where the streams have cut deepest. Nowhere in the State have evi- dences of glacial action been found. Over the uplifted Blue Grass region are often thick deposits of what has been called drift material; but such deposits are composed altogether of silivified remains from the several formations above the Lower Silurian, and the evidences are conclusive that they are the remains of rocks decomposed in situ.

Minerals.—No precious metals have been discovered in Kentucky. The amount of coal hitherto mined has not been as large as the quantity and quality in the State would justify, but the increased facilities of transport have stimulated production, and the out- put will increase from year to year. In 1870 the amount mined was 150,582 tons, and in 1880 1,050,095 tons, a larger percentage of inereasc than in any other State in the Union. Iron ores of good quality abound in various parts of the State. In Bath county is a large deposit of Clinton ore similar to the red fossil ore occurring in this formation from New York to Alabama. The same ore pro- bably is in position along the western base of Pine Mountain. Along the south-eastern border of the State it extends for many miles in Tennessee and Virginia with a thickness of from 18 inches to 7 feet, where the very near proximity to the excellent coking coal of Kentucky renders it of peculiar value in determining the future development of that portion of the State. In the Cumber- land valley of western Kentucky a high grade limonite is abundant in the subcarboniferous limestone, and in eastern Kentucky a superior iron-ore rests upon the top of tle St Louis group of this formation. Excellent carbonates and limonites abound in the eastern Coal-measures, and have

been mined extensively in the north-eastern part of the State. In the Lower Coal-measures of western Kentucky are a number of iron-ore strata ranging in thick- ness from a few inches to 5 feet.

Galena associated with sulphate of baryta occurs in veins in the lower members of the blue limestone of central Keutucky, and also in the subcarboniferous strata in the lower Cumberland valley, where it is associated with valuable deposits of fluor-spar.

Petroleum has been produced from wells in Barren county for a number of years. The oil is here derived from the Devonian black shale. Heavy lubricating oil is produced from the same forma- tion in Wayne county. There is a wide area in the State where petroleum may be obtained by boring.

Salt-brine is obtained from wells in the eastern coal-field, and in the subcarboniferous limestone of western Kentucky.

Fire and pottery clays abound in the Coal-measures; pottery clays occur in the surface deposits in valleys of central Kentucky, and in the flat lands where the soil is derived from the decomposi- tion of the Devonian black shale, and the argillaceous shales of the Waverly group. In the Tertiary shalos, below the gravel bed west of the Tennessee river, are pottery-clays, and fire-clays occur in great abundance.

Building stones of great variety abound in almost every sec- tion.

Forests.—Probably two-thirds of the State is yet covercd by virgin forests of valuable timbers. At the time of the settlement of the State by the whites it was covered by forests excepting a por- tion of the south-western part known as the ‘‘ Barrens,” which was a prairie covered by tall grass known as ‘‘barren-grass.” Here only the roots of certain hardy trees had withstood the annual burning of the dry grasses ; from these roots ‘‘sprouts” grew every year, only to be destroyed by fire, and the roots or base grew hori- zontally under the soil, When the country was settled and the fires checked, the saplings springing from these roots soon grew into trees, and the region was specdily covered with a dense growth,—the prevailing timbers being black-jack oak (Quercus nigra), post oak (Q. obtusiloba), and black oak (Q.

tinctoria). The outlinc of these barrens was almost identical with the outline of the cavernous group of the subcarboniferous limestone. On the lower limestones and shales of the Subcarboniferous, the most valuable timbers remaining are yellow poplar (Liriodendron tulipifera), white oak (Q, alba), the hickories, and some black walnut (Juglans nigra). The several divisions of the Lower Silurian are characterized by a variation in the forest growth. On the lower rocks the most characteristic timbers are over-cup oak (Q. macrocarpa), white oak, shell bark hickory (Carya alba), black walnut, and black ash (Fraxinus sambucifolia). “The pre- valent timbers on the best soils of this region are—sugar maple (Acer saccharinum), blue ash (Fr. quadrangulata), black wal- nut, pig-nut hickory (C, glabra), hackberry (Célt’s occidentalis), mulberry (Aforus rubra), buckeye (sculus glabra), honey-locust (Gleditschia triacanthos), box elder (Negundo accroidcs), and Ken- tucky coffee-tree (Gymnocladus). On the soils derived from the silicious member of the Cincinnati group, the prevalent timbers are yellow poplar, beech, white and red oak, and hickory. White oak is the prevailing timber on the upper portion. Onthe Upper

Silurian lands the timbers are mainly white oak, of superior

quality, sweet gum (Ligquidambar styraciflua), and water maple (A. rubrum). The growth on the corniferous limestone is very similar to that on the best soils of the blue limestone, with the exception that beeches and yellow poplars are more numerous. On the black shale of the Devonian are over-cup oak, black oak, sweet gum, beech, and elm, and, in places where the soil is well drained, yellow poplar, wild cherry, and black walnut. The growth on the flat lands of the Waverly is elm, beech, sweet gum, and white oak; on the uplands chestnut, oak (Q. Prinus), and small hickories, and on the thin uplands the above timbers and yellow pine (Pinus mitis). The great stores of valuable timbers are in the Coal-measures. In eastern Kentucky there is an area of 10,000 square miles of virgin forests of white oak, ash, hickory, wild cherry, and other valuable timbers. On the outcrop of the conglomerate sandstone, on the western edge of the coal-field, and on the top and eastern slope of Pine Mountain, and the western slope of Cumber- land Mountain, the prevailing timbers are chestnut, oak, and yellow pine,

and hemlock (Abies canadensis) where the streains have cut deep in the rocks, with an undergrowth of rhododendrons and kalmias, and on the drier slopes azaleas. The above is also the growth where the conglomerate is thick on the eastern outcrop of the western coal-field. In the valley of Red river, on the con- glomerate series, there is an area of about 40,000 acres where the prevalent timber is white pine (P. strobus). There are fine forests remaining on the Quaternary west of the Tennessee river. On the lowlands are forests of large cypress (Taxodium distychum). In this region the Catalpa speciosa and pecan (Carya oliveformis) abound, and cotton-wood (Populus angulata) on the banks of streams. Many valuable timbers, in addition to the above, are to be had in various parts of the State. Owing to the large demands for timber on the treeless prairies, and the rapid exhaustion of tim- bers in the States north of the Ohio river, the extensive forests of Kentucky have an especial value.

Soils and Agriculture.—With the exception of the area west of the Tennessee river, all the soils are derived from the decomposi- tion of rocks in situ. The soils over an area of about 22,000 square miles are derived from the decomposition of limestones of various geological horizons. The soils of the Blue Grass region, derived from the decomposition of phosphatic limestone and shales, and the soils of a portion of the subcarboniferous limestone groups, are of great fertility, and are easily restored by a judicious rotation with clover and grasses.

The State was peopled almost exclusively with agriculturists from Virginia and Maryland, and agriculture has remained the favourite occupation. Out of a total population of 1,321,011 in 1870 only 44,197 were engaged in manufacturing, mechanical, and miniug industries. The peculiarity of Kentucky agriculture is its great diversity. It will be seen from the United States census that in cach decade fron 1810 to the present time the State ranked first in the production of one or more staple articles. Thus in 1840, though sixth in rank of population, it was the first in the produc- tion of wheat and hemp, and the second in the production of swine, Indian corn, and tobacco. In 1850 it ranked first in the produc- tion of Indian corn, flax, and hemp, and second in swine, mules, and tobacco. In 1870, when it was the eighth State in population, and the eighth in the total value of agricultural products (notwithstand- ing over one-half the area of the State

was in virgin forests), it ranked first in the production of hemp and tobacco, sixth in Indian corn, and eighth in wheat. In 1880 it ranked first in the production of hemp and tobacco, and seventh in Indian corn and rye. The decline in the relative position in the production of Indian corn and wheat was not caused by a decreased production, but by the increased production of those cereals by States in the west where these are almost the exclusive crops. In Kentucky a more diversi- fied agriculture is found to be more profitable. Especial care has been devoted to the importation and improvement of domestic animals, until the State has become the great centre for fine stock of all kinds. In arriving at this pre-eminence, the breeders have doubtless been assisted by the climate, the water, and the perfection of pasturage. The blue grass (Poa pratensis) attains perfection in this region, making a beautiful turf; it grows in the shade of woodlands, and affords an excellent winter pasture. Virginia, in early times, imported choice horses from England (when the breeders there paid attention to endurance). The Kentucky breeders have kept those strains pure, and have from time to time added by importations from England, until a race horse having endurance and speed isthe result. Probably over 75 per cent. of the winnings on the American turf is by Kentucky-bred horses. The attention of many of the Kentucky stock breeders of late years has bcen turned to breeding trotting horses, with very marked results. The production of the very fleet trotting horses of Kentucky is the result of intelligent breeding, under favourable conditions. :

Kentucky is the principal tobacco-growing State in the Union. In 1870, of the total of 262,735,371 Ib produced in the United States, Kentucky produced 105,305,869 Ib; and in 1880, out of the total of 473,107,573 tb, Kentucky produced 171,121,134 tb. The ten prin- cipal tobacco-growing counties are: —

4-4

ib

12,577,574

COMMIS PT, sonenanesneneencensocdoes BTACROM Gc scosssecsecssasscsssaceses 6,126,635 FRG MA CHBOM s

cisicsccesesesseccecene OSE MG OT MICO certscsscsccecscesesnacresce 6,039,983 PRBS hereon eeearestcrerrcrceces ss) MOAI LOOM ss essesestccucctersssscornncnecses 5,808,425 GURUS re cccsscsscesecescerescescs. QUOTES MOWCN: re scccessccssocccreessevessccon 5,765,351 MMR GIRS sheer tele sccssicccevsee: 6,261,385 | Trigg soateteasce {GON IAS

The production of the principal cereals in Kentucky was as follows in 1870 and 1880 :—

1870. 1880.

INGE NTEU ete ice ecveceseivetercsssseseates 50,091,006 73,977,829

De oes asscesesesssoanntes 5,728,704 11,355,340

Oats . 6,620,103 4,582, 968

: 238,486

: 676,245

1,108,933

Hemp, since the early settlement of the State, has been a favour- ite crop, more especially in the Blue Grass region, contrary to an accepted opinion it has not here proved an exhausting crop where retted upon the land. Wheat succeeds almost as well after hempas after clover sod. The yield of hemp for the year 1880 was about 15,000 tons. Cotton is grown only to a limited extent west of the Tennessee river, the total production amounting in 1880 to 1367 bales. The total number of farms in 1870 was 118,422, the average size being 158 acres. In 1850 the average size of farms was 227 acres, and in 1860 211 acres. Over 60 per cent. of the area returned as farms was unimproved or in timber. The area returned as improved or under fence was less than one- third the area of the State.

Manufactures.— Before the freeing of the slaves, domestic manu- facturing on the farm was carried on to a large extent, and as late as 1870 the State

ranked second in the value of domestic or home manufactures. The total value of manufactures was in 1850 $21,712,210; in 1860, $37,931,240; and in 1870, $54,625,809. The inerease since 1870 has been larger than before, and the State will soon rank high as a manufacturing State. There has been a great increase in the manufacture of corn whisky in the past few years. The total production for the year ending June 30, 1881, was 81,869,047 gallons. The amount of iron manufactured was 86,732 tons in 1870, and 123,751 tons in 1880.

Government, Taxation, &ec.—The State government was modelled after that of Virginia. The governor is elected for four years, and cannot be his own successor. One-half of the senate is elected every two years, and the members of the lower house are elected for two years. There are 117 counties, each presided over by a judge and a board of magistrates. The gross receipts for the fiscal year end- ing October 10, 1880, were $2,445,404, and the gross expenditure $2,379,343. About one million dollars per annum is given to pub- lic schools, which amount can be suppleinented by local taxation in counties or school distriets. The State tax is 454 cents on each $100 worth of property, and as property is rated at a low valuation taxes are light. Of the above amount 25 cents are for the purposes of revenue, 20 cents for the public schools, and 4 cent for the State agricultural and mechanical college. The State is practically free from debt, owing but $180,000, and having on deposit an amount more than enough to pay that sum when the State bounds may fall due. The State has in addition about $750,000 worth of productive assets.

The population in 1880 was 1,648,708 (832,616 males, 815,983 females), and of this number 59,468 were foreign born. There were 41 persons to the square mile. The following table shows the population at each census, 1790-1880 :—

Free

Whites. Coloured.

Slaves.

61,133 179,873 324,287 434,644 517,787 590,253 761,413 919,484

78,677 220,955 406,511 564,135 687,917 779,828 982,405

1,155,684 1,321,011 1,648,708

114 739 1,713 2,759 4,917 7,817 10,011 10,684 222,210 271,5211

12,430 40,343 80,561

126,732

165,213

182,258

210,981

225,483

1,098,692 1,377,187

The following cities had in 1880 a population exceeding 5000 :—

LOISVIN eC… cecseeeeeeeeeeeecseeeees 123,645 | Paducah …….....,cesssesesseees 8,376 WOVE OM arse eencsececcsscsssserseeees 29,720 | Frankfort (State CAPITAN) Ceccsesaeaee 6,958 N ewport Ribvcstsisesvescasceses essence 20,433 | Maysville…...cccccccccscscceee 5,220 UCR EON sess cen) vssiscseascsessees’s i ii ;

Railways. —In 1831-35 a railway was made from Frankfort to Lexington, being one of the earliest lines constructed west of the Alleghanies. On January I, 1881, there were 1598 miles of rail- way in operation in the State. The number of miles constructed sinee 1870 has been greater than before for the same length of time aud many new roads are projected. i

eS 1 Including 10 Chinese and 50 Indians.

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History.—The region now known as Kentucky was embraced in the grant to the colony of Virginia by the British crown, and in the early part of the last eentury was an unknown region ‘‘ beyond the mountains,” included in Augusta county, Virginia. This region was in 1776 formed into a separate county called Kentucky county. Previous to this the land had been somewhat explored by adventurous hunters, the most notable being Daniel Boone, who led a small party from North Carolina in 1769. Virginia had given bounties of lands to her troops for services in the French Indian wars, and the glowing aceounts brought from beyond the moun- tains indueed many expeditions for surveying and locating lands. Kentucky was at this time a favourite hunting ground for the various tribes of Indians of the north and south, and the occupation by the whites was resisted by all the means known to Indian warfare. The first settlement was made at Harrod’s station, now Harrodsburg, in1774. In the year following Boone and party built a group of rude block houses, called a fort, on the banks of the Kentueky river, at Boonesboro’, and in 1776 other ‘‘ stations” were built in central Kentucky, and the work of clearing and cultivating the land began. In the midst of Indian forays and border wars, the traditions of law prevailed, and a court of quarter sessions was established at Harrodsburg in 1776. Col. G. Rogers Clark, the hero of early Kentucky, planned an expedition in 1778 against the British forts in the north-west ; marching swiftly, with less than 200 men, through miles of wilderness, he captured Kaskaskia and Vincennes, and secured to Virginia the imperial territory of Illinois.

Separated by several hundred miles of uninhabited forest from the ‘* settlements” in Virginia, and feeling the necessity of a govern- ment that would enable them to make a vigorous defence against the Indians, the people held many conventions and petitioned for a separate government, which was granted by Virginia, and in 1792 Kentucky was admitted as a State into the Federal Union. Vir- ginia had granted large bounties of land to her soldiers of the war for independence, and also treasury land warrants in redemption for her depreciated currency. The lands were located in Kentucky, and a large emigration from Virginia and Maryland was the result. The population in 1790 was 73,667, of whoni 61,133 were white, 114 free coloured, and 12,480 slaves. From 1790 to 1800 the popu- lation increased 300 per cent. In the second war with England, which broke out in 1812, the Kentuckians marched to the defence of the north-west, and

suffered heavy loss in the reverse at the river Rasin ; but afterwards 4000 volunteers, under Governor Shelby, participated in the victory on the banks of the Thames. As early as 1827 the State began a system of internal improvements under which many miles of maeadamized roads were made, and the navi- gation of the rivers improved. The State expenditure for these purposes, independent of the county and individual subscriptions, amounted to more than $5,000,000.

On the outbreak of the war with Mexico in 1846, the governor of Kentucky called for 5000 men, and 13,700 quickly answered the eall. In that war the Kentucky troops bore a conspicuous and hon- ourable part. The finding of gold in California, the granting of lands in the west, the aid in the construction of railways, and the consequent fever for speculation in western lands, were a severe drain on the productiveness of the State. The lines of railway connect- ing the sea-board cities with the great west crossed the mountains north of Kentucky. This and the disineclination to compete with slave labour carried the great tide of immigration and ecommerce north of Kentucky. When the great civil war began in 1861, Kentucky was a slave State; most of the productions of the State found remunerative markets in the eotton-growing States, and there were many business and social ties binding the State with the south. Whilst sympathizing with the Southern States, the majority of the people loved tho Union, and the State determined to assume a position of armed neutrality, and if possible aet as a mediator between the sections. The governor of the State refused (April 1861) to furnish the quota of men demanded by the Federal Government, a refusal approved by the State legislature by an almost unanimous vote. Arms were sent into Kentucky by the Federal Government, and camps established. The Confederate forees moved into the State on September 3, and the Federal on September 7. The governor, in obedience to a resolution of the legislature, demanded the withdrawal of the Confederates, as violators of the neutrality of the State. Their refusal to do so except on condition that the Federals should also withdraw, led to an outbreak of hostilities, in whieh the people of the State were divided, many joining both armies. The Federal forces held the State almost continuously during the war, and 91,900 men were recruited in it for the Union armies, ineluding 8704 home guards or militia called into active service, and about 11,000 coloured volunteers. On the other hand, about 40,000 Kentuckians went

south and joined the Confederate forces. When the war ended, and the Kentucky soldiers from the two armies returned to their homes, laws passed under the exeitement of civil war were repealed ; fraternal peace followed quickly, and the people of the State, accepting the new conditions, entered upon a new era, with hope for a peaceful and prospcrous future. (Glo 1a; 185)

KEN—KEP

KENYON, Luoyp Kenyon, Lorp (1732-1802), an English lawyer and lord chief-justice of England, was de- scended by his father's side from an old Lancashire family, and his mother was the daughter of a small proprietor in Wales. He was born at Gredington, Flintshire, 5th October 1732. After studying five years at Ruthin gram- mar school, he was in his fifteenth year articled to an attorney at Nantwich, Cheshire. In 1750 he was entered a student of Lincoln's Inn, London, and in 1756 was called to the bar. As for several years he was left almost un- employed, he utilized his leisure in taking notes of the cases argued in the court of Queen's Bench, which he after- wards published. Through answering the cases of his friend John Dunning, afterwards Lord Ashburton, he gradually became known to the attorneys, after which his success was so rapid that in 1780 he was made king's counsel, his promotion being assisted to some extent through his friendship with Thurlow. He manifested conspicuous ability in the cross-examination of the witnesses at the trial of Lord George Gordon, but his speech was so deficient in tact that the verdict of acquittal was solely due to the extraordinary and brilliant effort of Erskine, the junior counsel, Through the influence of Lord Thurlow, Kenyon in September 1780 entered the House of Commons as member for Hindon, and in April 1782 he was, through the same friendship, appointed attorney-general in Lord Buckingham's administration, an office which he also con- tinued to hold under Pitt. In 1784 he received the master- ship of the rolls, and was created a baronet. His position at the bar had been achieved chiefly by hard work, a good knowledge of law, and several lucky friendships. As an advocate he was not only deficient in manner and in ability of statement, but frequently made striking blunders from want of tact. As his rough and irritable temper had also gained him several enemies, his elevation in 1788 to the lord chief-justiceship as successor to Lord Mansfield was by no means popular with

the bar. The same year he was raised to the peerage as Baron Kenyon of Gredington. On the bench he not unfrequently displayed a capricious and choleric temper towards both the pleaders and his brother judges. Still he proved himself, not only an able lawyer, but a judge of rare and inflexible impartiality. The de- cisions of no other judge in the court of Queen's Bench have been more seldom overruled, but, as they were accom- panied with only a very imperfect and short statement of his reasons, his judgments are of little value as expositions of the principles of law. He died at Bath, 4th April 1802. See Life by Hon. G. T. Kenyon, 1873.

KEOK UK, chief city of Lee county, Iowa, U.S., occupies a lofty site on the west bank of the Mississippi, 2 miles above the mouth of the Des Moines tributary, and about 200 miles above St Louis. It is situated in the extreme south-east corner of the State (whence its name "gate city ") ; its streets are spacious, and its houses handsome, although mostly of brick. Keokuk contains several churches, a medical college (founded in 1849), a good system of public schools, and a public library. Pork-packing, iron-founding, and smaller industries are carried on. The city is at the junction of seven railways, which, with its advantages of water communication, bring it an important trade. A canal, 9 miles in length, round the lower rapids of the Mississippi, which formerly obstructed the navigation, has been constructed by the United States Government at a cost of $8,000,000. Keokuk has been a port of entry since 1854. Population in 1880, 12,117.

KEPLER, Joun (1571-1630), one of the founders of modern astronomy, was born, December 27, 1571, at Weil, in the duchy of Wiirtemberg, of which town his grandfather was burgomaster. He was the eldest child of an ill-assorted and ill-starred union. His father, Henry Kepler, was a

reckless soldier of fortune; his mother, Catherine Gulden- mann, the daughter of a small proprietor of Leonberg, had a violent temper, unmitigated by even the rudiments of culture. Under these circumstances her husband found campaigning in Flanders under Alva a welcome relief from domestic life ; and, after having lost his fortune by a for- feited security and tried without success the trade of tavern-keeping in the village of Elmendingen, he finally, in 1589, severed an irksome tie by the desertion

of his family. The misfortune and misconduct of his parents were not the only troubles of young Kepler's childhood. He recovered from small-pox in his fourth year with crippled hands and eyesight permanently impaired ; and a constitution enfeebled by premature birth had to withstand successive shocks of severe illness, His schooling began at Leonberg in 1577—the year, as he himself tells us, of a great comet; domestic bankruptcy, however, occasioned his transference to field-work, in which he was exclusively employed for several years. Bodily infirmity, combined with mental aptitude, were eventually considered to indi- cate a theological vocation ; he was accordingly, in 1584, placed at the seminary of Adelberg, and thence removed, two years later, to that of Maulbronn. A brilliant exami- nation for the degree of bachelor procured him, in 1588, admittance on the foundation to the university of Tiibingen, where he laid upa copious store of classical erudition, and imbibed Copernican principles from the private instructions of his teacher and life-long friend, Michael Maestlin. As yet, however, he had little knowledge of, and less inclina- tion for, astronomy ; and it was with extreme reluctance that he turned aside from the more proniising career of the ministry to accept, early in 1594, the vacant chair of that science at Gratz, placed at the disposal of the Tiibingen professors by the Lutheran states of Styria.

The best-recognized function of German astronomers in that day was the construction of prophesying almanacs, greedily bought by a credulous public, and quickly belied by the future they pretended to disclose. Kepler thus found that the first duties required of him were of an astrological nature, and set himself with characteristic alacrity to master the rules of the art as laid down by Ptolemy and Cardan. He, moreover, sought in the events of his own life a verification of the theory of planetary influences ; and it is to this practice that we owe the sum- mary record of each year's occurrences which, continued almost to his death, affords for his biography a slight but sure foundation. His thoughts, however, were already working in a higher sphere. He early attained to the settled conviction that for the actual disposition of the solar system some abstract intelligible reason must exist, and this, after much meditation, he believed himself to have found in an imaginary relation between the "five regular solids " and the number and distances of the planets. He notes with exultation July 9, 1595, as the date of the pseudo-discovery, the publication of which in Prodromus

Dissertationum Cosmographicarum seu Mysterium Closmo- graphicum (Tiibingen, 1596) procured him much fame, and a friendly correspondence with the two most eminent astronomers of the time, Tycho Brahe and Galileo.

Soon after his arrival at Gratz, Kepler contracted an engagement with Barbara von Miihleck, a wealthy Styrian heiress, who, at the age of twenty-three, had already survived one husband and been divorced from another. Before her relatives could be brought to countenance his pretensions, Kepler was obliged to undertake a journey to Wiirtemberg to obtain documentary evidence of the some- what obscure nobility of his family, and it was thus not until April 27, 1597, that the marriage was celebrated. In the following year the archduke Ferdinand, on assuming the government of his hereditary dominions, issued an edict

of banishment against Protestant preachers and professors. | astronomy, in which physical cause should replace arbitrary

Kepler immediately fied to the Hungarian frontier, but, by the favour of the Jesuits, was recalled and reinstated in his post. The gymnasium, however, was deserted; the nobles of Styria began to murmur at subsidizing a teacher without pupils; and he found it prudent to look elsewhere for employment. He first turned to his native country ; but his refusal to subscribe unconditionally to the rigid formula of belief adopted by the theologians of Tiibingen permanently closed against him the gates of his alma mater. His embarrassment was relieved by a letter from Tycho Brahe offering him the position of assistant in his obser- vatory near Prague, which, after a preliminary visit of four months, he accepted. ‘The arrangement was made just in time ; for on August 7, 1600, he received definitive notice to leave Gratz, and, having leased his wife’s property, departed with his family for Prague, September 30. His relations with Tycho were not of an entirely agreeable character. The Danish astronomer, though benevolent, was haughty and overbearing ; Kepler’s natural irritability was aggravated by prolonged fever, by pecuniary anxieties, and by domestic mismanagement.

Nevertheless, after one violent quarrel, smoothed over by mutual concessions, they maintained an amicable intercourse, unexpectedly terminated by Tycho's death, October 24, 1601,

A brilliant and prosperous career seemed by this event to be thrown open to Kepler. The emperor Rudolph IL. immediately appointed him to succeed his patron as imperial mathematician, although at a reduced salary of 500 florins; the invaluable treasure of Tycho's observations was, after some futile opposition on the part of his heirs, placed at his disposal; and the laborious but congenial task was entrusted to him of completing the tables to which the grateful Dane had already affixed the title of Rudolphine. The first works executed by him at Prague were, however, 2 homage to the astrological proclivities of the emperor. In De fundamentis astrologix certioribus (Prague, 1602) he declared his purpose of preserving and purifying the grain of truth which he believed the science to contain. Indeed, the doctrine of "aspects" and "influences" fitted excellently with his mystical concep- tion of the universe, and enabled him to discharge with a semblance of sincerity the most lucrative part of his pro- fessional duties. Although he strictly limited his prophetic pretensions to the estimate of tendencies and probabilities, his forecasts were none the less in demand. Shrewd sense and considerable knowledge of the world came to the aid of stellar lore in the preparation of " prognostics" which, not unfrequently hitting off the event, earned him as much credit with the vulgar as his cosmical speculations with the learned. He drew the horoscopes of the emperor and Wallenstein, as well as of a host of lesser magnates; but, though keenly alive to the unworthy character of such a trade, he made necessity his excuse for a compromise with superstition. "Nature," he wrote, "which has conferred upon every animal the means of subsistence, has given astrology as an adjunct and ally to astronomy." He dedicated to the emperor in 1603 a treatise on the " great conjunction" of that year (Judicium de trigono igneo) ; and he published his observations on a brilliant star which appeared suddenly, September 30, 1604, and remaincd visible for seventeen months, in De stella nove in pede Serpentaru (Prague, 1606). While sharing the opinion of Tycho as to the origin of such bodies by condensation of nebulous matter from the Milky Way, he attached a mystical signification to the coincidence in time and place of the sidereal apparition with a triple conjunction of Mars, Jupiter, and Saturn.

The main task of his life was not meanwhile neglected. This was nothing less than the foundation of a new

hypothesis. A preliminary study of optics led to the publication, in 1604, of his Astronomiz pars optica, con- taining important discoveries in the theory of vision, and a notable approximation towards the true law of refraction. But it was not until 1609 that, the “great Martian labour” being at length completed, he was able, in his own figura- tive language, to lead the captive planet to the foot of the imperial throne. From the time of his first introduction to Tycho he had devoted himself to the investigation of the orbit of Mars, which, on account of its relatively large eccentricity, had always been especially recalcitrant to theory, and the results appeared in Astronomia nova aitwoAoynros, seu Physica ceelestis tradita commentariis de motibus stelle Martis (Prague, 1609). In this, the most memorable of Kepler’s multifarious writings, two of the cardinal principles of modern astronomy—the laws of elliptical orbits and of equal areas—were established ;1! important truths relating to gravity were enunciated, and the tides ascribed to the influence of lunar attraction ; while an attempt to explain the planetary revolutions in the then backward condition of mechanical knowledge pro- duced a theory of vortices closely resembling that after- wards adopted by Descartes. Having been provided, in August 1610, by Ernest, archbishop of Cologne, with one of the new Galilean instruments, Kepler began, with unspeakable delight, to observe the wonders revealed by it. He had welcomed with a little essay called Dissertatio cum Nuncio Stdereo Galileo’s first announcement of celestial novelties; he now, in his Dioptrice (Augsburg, 1611), expounded the theory of refraction by lenses, and suggested the principle of the “astronomical” or inverting telescope, Indeed the work may be said to have founded the branch of science to which it gave its name.

The year 1611 was marked by Kepler as the most disastrous of his life, The death by small-pox of his favourite child was followed by that of his wife, who, long a prey to melancholy, was at last, July 3, carried off by typhus. In his review of their conjugal life, remorse for frequent outbursts of impatience towards his shiftless though well-meaning helpmate took the place of regret for her loss, Public calamity was added to private bereave- ment. On the 23d of May 1611 Matthias, brother of the emperor, assumed

the Bohemian crown in Prague, compel- ling Rudolph to take refuge in the citadel, where he died on the 20th of January following. Kepler’s fidelity in remaining with him to the last did not deprive him of the favour of his successor. Payment of arrears, now amount- ing to upwards of 4000 florins, was not, however, in the desperate condition of the imperial finances, to be hoped for; and he was glad, while retaining his position as court astronomer, to accept (in 1612) the office of mathematician to the states of Upper Austria. His residence at Linz was troubled by the harsh conduct of the pastor Hitzler, in excluding him from the rites of his church on the ground of supposed Calvinistic leanings—a decision con- firmed, with the addition of an insulting reprimand, on his appeal to Wiirtemberg. In 1613 he appeared with the emperor Matthias before the diet of Ratisbon as the advo- cate of the introduction into Germany of the Gregorian calendar; but the attempt was for the time frustrated by anti-papal prejudice. The attention devoted by him to chronological subjects is evidenced by the publication about this period of several essays in which he sought to prove that the birth of Christ took place five years earlier than the commonly accepted date.

Kepler’s second courtship forms the subject of a highly characteristic letter addressed by him to Baron Stralendorf,

1 See ASTRONOMY, vol. ii. p. 752.

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in which he reviews the qualifications of eleven candidates for his hand, and explains the reasons which decided his choice in favour of a portionless orphan girl named Susanna Reutlinger. The marriage was celebrated at Linz, October 30, 1613, and seems to have proved a happy and suitable one. Theabundant vintage of that year drew his attention to the defective methods in use for estimating the cubical contents of vessels, and his essay un the subject (Nova Stereometria Doliorum, Linz, 1613) entitles him to rank among those who prepared the discovery of the infinitesimal calculus. His observations on the three comets of 1618 were published in De Comets, contemporaneously with the Harmonice Mundi (Augsburg, 1619), of which the first lineaments had been traced twenty years previously at Gratz. This extraordinary production is memorable as having announced the discovery

of the “third law ”—that of the sesquiplicate ratio between the planetary periods and distances. But the main purport of the treatise was the exposition of an elaborate system of celestial harmonies depending on the various and varying velocities of the several planets, of which the sentient soul animating the sun was the solitary auditor. The work exhibiting this fantastic emulation of extravagance with genius was dedi- cated to James I. of England, and the compliment was acknowledged with an invitation to that island, conveyed through Sir Henry Wotton. Notwithstanding the dis- tracted state of his own country, however, he refused to abandon it, as he had previously, in 1617, declined the post of successor to Magini in the mathematical chair of Bologna.

The insurmountable difficulties presented by the lunar theory forced Kepler, after an enormous amount of fruitless labour, to abandon his design of comprehending the whole scheme of the heavens in one great work to be called ITipparchus, and he then threw a portion of his materials into the form of a dialogue intended for the instruction of general readers. The Hpitome Astronomix Copernicane (Linz and Frankfort, 1618-21), alucid and attractive text- book of Copernican science, was remarkable for the pro- minence given to “ physical astronomy,” as well as for the extension to the Jovian system of the laws recently dis- covered to regulate the motions of the planets. ‘The first of a series of ephemerides, calculated on these principles, was published by him at Linz in 1617; and in that for 1620, dedicated to Napier, he for the first time employed logarithms. This important invention was eagerly wel- comed by him, and its theory formed the subject of a treatise entitled Chilias Logarithmorum, printed in 1624, but circulated in manuscript three years earlier, which largely contributed to bring the new method into general use in Germany.

His studies, were, however, interrupted by a painful family trouble. The restless disposition and unbridled tongue of Catherine Kepler his mother created for her numerous enemies in the little town of Leonberg; while her unguarded conduct exposed her toa species of calumny at that time but too readily circulated and believed. As early as 1615 suspicions of sorcery began to be spread against her, which she, with more spirit than prudence, met with an action for libel. The suit was, by the con- nivance of the judicial authorities, purposely protracted, and at length, August 5, 1620, the

unhappy woman, then in her seventy-fourth year, was arrested on a formal charge of witchcraft. Kepler immediately hastened to Wirtem- berg, and devoted a whole year to the zealous advocacy of her cause. It was owing to his indefatigable exertions that, contrary to general expectation, she was acquitted after having suffered thirteen months' imprisonment, and endured with undaunted courage the formidable ordeal of "territion," or examination under the imminent threat of

torture. She survived her release only a few months, dying April 13, 1622.

Kepler's whole attention was now devoted to the produc- tion of the new tables. ''Germany," he wrote, "does not long for peace more anxiously than I do for their publica- tion." Financial difficulties, however, combined with civil and religious convulsions, long delayed the accomplishment of his desires. From June 24 to August 29, 1626, Linz

was besieged, and its inhabitants reduced to the utmost

straits by bands of insurgent peasants. The pursuit of science needed a more tranquil shelter; and accordingly, on the raising of the blockade, Kepler obtained permission to transfer his types to Ulm, where, in September 1627, the Leudolphine Tables were at length given to the world. Although by no means free from errors, their value appears from the fact that they ranked for a century as the best aid to astronomy. Appended were tables of logarithms and of refraction, together with Tycho's catalogue of 777 stars, enlarged by Kepler to 1005.

The work of Kepler's life was now virtually completed, but not so its vicissitudes. His claims upon the insolvent imperial exchequer amounted by this time to 12,000 florins. The emperor Ferdinand II., too happy to transfer the burden, countenanced an arrangement by which Kepler entered the service of the duke of Friedland (Wallenstein), who assumed the full responsibility of the debt. In July 1628 Kepler accordingly arrived with his family at Sagan in Silesia, where he applied himself to the printing of his ephemerides up to the year 1636, and whence he issued, in 1629, a Notice to the Curious in Things Celestial, warning astronomers of approaching

transits. That of Mercury was actually seen by Gassendi in Paris, November 7, 1631 (being the first passage of a planet across the sun ever ob- served) ; that of Venus, predicted for the 6th of December following, was invisible in western Europe. Wallen stein's promises to Kepler were but imperfectly fulfilled. In lieu of the sums due, he offered him a professorship at Rostock, which Kepler declined, being unwilling to com- promise his claim. An expedition to Ratisbon, undertaken for the purpose of representing his case to the Diet, termi- nated his life. Shaken by the journey, which he had per- formed entirely on horseback, he was attacked with fever, and died at Ratishon, November 15 (N. 8.), 1630, in the fifty-ninth year of his age. An inventory of his effects found among his papers showed him to have been possessed of no inconsiderable property at the time of his death. It is true that he had often been severely straitened ; but there is reason to believe that his complaints on the subject were to some extent exaggerated. By his first wife he had five, and by his second seven children, of whom only two, a son and a daughter, reached maturity.

The character of Kepler's genius was one of whieh it is especially difficult to arrive at a just estimate. His irresistible tendency towards mystical speculation formed a not less fundamental quality of his mind than its strong grasp of positive scientific truth. Without assigning to each element its due value, no sound compre- hension of his modes of thought can be attained. His idea of the universe was essentially Pythagorean and Platonic. He started with the conviction that the arrangement of its parts must correspond with certain abstract conceptions of the beautiful and harmonious, His imagination, thus kindled, animated him to those severe labours of which his great discoveries were the fruit. His demonstra- tion that the planes of all the planetary orbits pass through the centre of the sun, coupled with his clear recognition of the sun as the moving power of the system, entitles him to rank as the founder of physical astronomy. But the fantastic relations imagined by him of planetary movements and distances to musica] intervals and geoinetrical constructions scemed to himself discoveries no less admirable than the achievements which have seeured his lasting fame. Outside the boundaries of the solar system, the metaphysical side of his genius, no longer held in check by experience, fully asserted itself. The Keplerian like the Pythagorean cosmos was threefold, consisting

of the centre, or sun, the surfaee, being the sphere of the fixed stars, and the intermediate space, filled with

ethereal matter. It is a mistake to suppose that he regarded the stars asso many suns. He quotes indeed the opinion of Giordano Bruno to that effect, but with dissent. Among his happy conjec- tures may be mentioned that of the sun's axial rotation, postulated by him as the physical cause of the revolutions of the planets, and soon after confirmed by the discovery of sun-spots ; the suggestion of a periodical variation in the obliquity of the ecliptic; and the explanation as an effect of a solar atmosphere of the radiance observed to surround the totally eclipsed sun.

It is impossible to consider without surprise the colossal amount of work accomplished by Kepler under numerous disadvantages. His health was uncertain, his powers of calculation indifferent, his interruptions numerous, his cares at times overwhelming. But his iron industry counted no obstacles, and secured for him the highest triumph of genius, that of having given to mankind the best that was in him. In private character he was amiable and affectionate ; his generosity in recognizing the merits of others secured him against the worst shafts of envy ; and a life marked by numerous disquietudes was cheered and ennobled by sentiments of sincere piety. ;

Kepler's extensive literary remains, purchased by the empress Catherine II. in 1724 from some Frankfort merchants, and long inaccessibly deposited in the observatory of Pulkowa, have at length been completely brought to light, under the able editorship of Dr Ch. Frisch, in the first complete edition of Kepler's works. This important publication (Joannis Keplert opera omnia, Frankfort, 1858-71, 8 vols. 8vo) contains, besides the works already enumerated and several minor treatises, a posthumous scientific satire entitled Joh. Keppleri Somnium (first printed in 1634), anda vast mass of his correspondence. A careful biography is appended, founded mainly on his private notes and other authentic documents.

The reader may also usefully consult Reuschle, Kepler und die Astronomie, Frankfort, 1871; Goebel, Ueber Kepler's astronomische Anschauungen, Halle, 1871; Apelt, Johann Kepler's astronomische Weltansicht, Leipsic,

1849; Breit- schwert, Johann Kepler's Leben und Wirken, Stuttgart, 1831; W. Forster, Johann Kepler und die Harmonie der Sphdren, Berlin, 1862; R. Wolt, Geschichte der Astronomie, Munich, 1877. (A. M. C.)

KERAK, a town of Syria, situated about 10 miles east of the southern end of the Dead Sea, on the summit of a rocky hill some 3000 feet above sea-level. It stands upon a platform forming an irregular triangle with sides of 800 to 1000 yards in length, and separated by deep ravines from the higher encircling ranges on all sides except one, where a narrow neck connects it with a neigh- bouring hill. The whole place was formerly surrounded by a wall with five towers, with only two entrances through tunnels in the side of the cliff. The town is an irregular mass of about six hundred flat mud-roofed houses. The Christian quarter contains the Greek church of St George; and the present mosque still bears marks of its Christian origin. On the north-west is the tower or castle of Bibars (see vol. vii. p. 755), with an inscription bearing his name. The great castle at the southern angle was built as a crusad- ing fortress about 1131. Relics of the Roman occupation of Kerak have been found. The inhabitants are estimated at 8000, of whom about one-fourth are Greek Christians. They are fierce and truculent ; and, though they were for- merly renowned for hospitality, their rapacious treatment of their European visitors has brought them into very bad repute.

Kerak is the ancient Kir-Hareseth or Kir-Moab (2 Kings iii. 25; Isa. xv. 1, xvi. 7). The name Kerak (Syriac Kark4, fortress) is as old as 2 Macc. xii. 17. In crusading times Kerak was a highly important point. In 1188 it was captured by Saladin (vol. vii. p- 753), and under his dynasty the town prospered. In the early part of the present century Kerak was governed by a powerful sheikh, paying nominal homage to the Wahhaby kingdom ; it is now the residence of a Turkish official and garrison under the waly of Jerusalem, but the authority of the government is weak. A considerable trade is carried on by merchants from Hebron.

See Burekhardt's Syria, 1822, p. 377 sq.; Tristram's Zand of a 1873; Badcker-Socin's Handbook ; Le Quien, Or. Chr., iii.

KERBELA, or MEsuuep-Hosern, a town of Asiatic Turkey, in the vilayet of Baghdad, is situated in a fertile and well-cultivated district about 60 miles south-south-west of Baghdad, and about 20 miles west of the Euphrates,

from which a very ancient canal extends toit. It is sur- rounded by a dilapidated brick wall 24 feet high, and con- tains a fine market-place, with one broad street leading to

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the governor’s residence. The other streets are narrow and dirty. Of the five mosques in the town the largest is the mosque of Hosein with a large gilded dome and minarets ; it contains the tomb of Hosein, son of the caliph ‘Aly (see ARABIA, Vol. ii p. 258), whose sanctity makes Kerbela in the eyes of Shiites less sacred only than Mecca. Some 200,000 pilgrims from all parts of Islam journey annually to Kerbela, many of them carrying the bones of their relatives to be buried in its sacred soil. The moullahs, who fix the burial fees, derive an enormous revenue from the faithful. At one time Kerbela was an inviolable sanctuary for criminals, but it has ceased to be so since 1843, when the inhabitants revolted against the Turks, and were reduced with great slaughter. The enormous influx of pilgrims naturally creates brisk trade in Kerbela and the towns on the route thither,—a fact which makes the Turkish Govern- nient anxious not to divert the stream elsewhere, as some years ago was partially done by sanitary and other regula- tions. The population, necessarily fluctuating, was esti- mated in 1878 at 60,000; Mr Clements Markhan, writing in 1874, put it at 20,000.

KERGUELEN’S LAND, Kercueten IsLanp, or DeEsoLaTIon IsLAND, an island in the Southern Ocean, to the south-east of the Cape of Good Hope and south-west of Australia, and nearly half-way between them. To the south is Heard Island, and west-north-west the Orozets and the Marion Group. Kerguelen lies between 48° 39’ and 49° 44’S. lat., and 68° 42’ and 70° 35’ E. long. Its extreme length is about 85 miles, and its extreme breadth 79, but the area is only about 2050 square miles. The island is throughout mountainous, presenting from the sea in some directions the appearance of a series of jagged peaks. The various ridges and mountain masses are separated by steep- sided valleys, which run down to the sea, forming deep fjords, so that no part of the interior is more than 12 miles from the sea. The chief mountain peaks are Mount Ross (6120 feet), Mount Richards (4000), Mount Crozier, (3258), Mount Wyville Thomson (3160),

Mount Hooker (2600), Mount Moseley (2400), The coast-line is extremely irregular, many of the fjords being bounded by long, steep rocky promontories. These, at least on the north, east, and south, form a series of well-sheltered harbours ; as the prevailing winds are westerly, the safest anchoring ground is on the north-east. Christmas Harbour on the north and Royal Sound on the south are noble harbours, the latter with a labyrinth of islets interspersed over upwards of 20 miles of landlocked waters. The scenery is generally magnificent, and often singularly picturesque. A district of considerable extent in the centre of the island is occupied by snowfields, whence glaciers descend east and west to the sea. The whole island, exclusive of the snowfields, abounds in freshwater lakes and pools in the hills and lower ground. Hidden deep mudholes are frequent.

Kerguelen's Land is of undoubted volcanic origin, the prevailing rock being basalt, sometimes intersected by trap, and indeed an active voleano and hot springs arc said to exist on the south-west of the island. Judging from the abundant fossil remains of trees, the island must at one time have been thickly clothed with woods and other vegetation, of which it has no doubt been denuded by volcanic action and submergence, and possibly by change of climate. It presents evidences of having at one time been subjected to powerful elaciation, and to subsequent immersion and immense denudation. The soundings made by the ‘‘ Challenger" and ‘‘ Gazelle," and the affinities which in certain respects exist between the islands, seem to point to the existence at one time of an extensive land in this quarter, of which Kerguelen, Prince Edward's Islands, the Crozets, St Paul, and Amsterdam are the remains. The Kerguelen plateau rises in many parts to within 1500 fathoms of the surface of the sea. Beds of coal and of red earth are found at some places. The sum- mits of the flat-topped hills about Betsy Cove, in the south-east of the island, are formed of caps of basalt. Sir J. D. Hooker points out that the vegetation of Kerguelen's Land must be of great antiquity, and may have originally reached it from the American continent ; it has no affinities with Africa, Tle present climate is not favoural le

to permanent vegetation : the island lies within the belt of rain of all scasons of the year, and is reached by no drying winds ; its tem- perature is kept

down by the surrounding vast expanse of sea; and it lies within the line of the cold Antarctic drift. The tempera- ture is, however, very equable. During the transit expedition, the lowest winter temperature was seldom less than 82°, while the summer temperature occasionally approached 70°. Tempests and squalls are frequent, and the weather is rarely calm. On the lower slopes of the mountains-a rank vegetation exists, which, from the conditions just mentioned, is constantly saturated with moisture. A rank grass, Mestuea Cookit, grows thickly in places up to 300 feet, with Azorella, Cotula plumosa, &c. Sir J. D. Hooker enumerates twenty- one species of flowering plants, and seven of ferns, lycopods, and Char- acex; at least seventy-four species of mosses, twenty-five of Hepatiex, and sixty-one of lichens are known, and there are probably many more. Several of the marine and many species of freshwater algxe are peculiar to the island. The characteristic feature of the vege- tation, however, is the Kerguelen cabbage (Pringlea antiscorbutica), a perennial cruciferous plant, in appearance somewhat like the rden cabbage. This cabbage and Azorella are found growing at a fight of 1000 feet, while on the higher rocks a very handsome con- spicuous lichen (Neuropogon Taylori), of a mingled bright sulphur-yellow and black colour, is found abundantly. Fur seals are still found in Kerguelen, though their numbers have been greatly reduced by reckless slaughter. One of the most characteristic ani- mals of the island is the sea elephant (Maerorhinus leoninus), which is found in considerable abundance even far up the streams that flow into the fjords. The sea-leopard (Ogmorrhinus teptonyx) is retty abundant on the coasts. All parts of the coast aud even the ower slopes are covered with penguins of various species, mainly the Johnny penguin (Pygoscelis texniata), rock-hopper (Zudyptes saltator), and king penguin (Aptenodytes longirostris). A teal (Querquedula Hatont) peculiar to Kerguelen and the Crozets is also found in considerable numbers, and crowds of petrels, especi- ally the giant petrel (Ossifraga gigantea), Halobena cerulea, and Prion desolatus frequent the island, as also skuas, gulls, sheath- bills (Chionis minor), albatross, terns (Sterna virgata ?), cormorants (Phalacroeorax verrucosus), and Cape pigcons. ‘The island shelters a considerable variety of insects, many of them with remarkable peculiarities of structure, and with a predominance of forms in- capable of flying. The island is frequented by sealers and whalers, but has no permanent inhabitants. Kerguelen’s Land was dis- covered by i French navigator Kerguelen Tremarec (born 1745, dicd 1797), on February

13, 1772, and partly surveyed by him in the following year. It was subsequently visited by Captain Cook, and also by Sir James C. Ross in 1840 in the ‘‘ Erebus” and ‘‘Terror.” It has occasionally formed a refuge for shipwrecked sailors. The ** Challenger” spent some time at the island, and its staff visited and surveyed various parts of it in January 1874. Later in the same year it was occupied for several months (October 1874 to February 1875) by the expeditions sent from England, Germany, and the United States to observe the transit of Venus. Still the interior is all but unexplored, and we have only vague notions of a con- siderable part of the coast. The Admiralty chart is based chiefly on mining surveys and information obtained from whalers. Literature.—Narratives of the voyages of Kerguelen, Cook, and Sir James Ross; Narrative of the Wreck of the‘ Favourite” on the Island of Desolation, edited by W. B. Clarke, M.D.; Hooker’s Flora Antarctica ; Phil. Trans., vol. 168, con- taining account of the collections made in Kerguelen by the English transit of Venus expedition in 1874-75; articles by Sir Wyville Thomson in Good Words, November and December 1874; H. N. Moseley’s Notes by a Naturalist in the “ Challenger”; Lord George Campbell’s Log Letters from the “ Challenger”; W.

J.J. Spry’s Cruise of the “ Challenger”; Rev. S. J. Perry’s Notes of a Voyage to Kerguelen.

KERKUK, or Kerxoox, a town of Asiatic Turkey, in the vilayet of Baghdad, is situated on the right bank of the Khasa Tshai, about 140 miles north of the city of Baghdad. A suburb, Mahalle, on the left bank of the stream, which is spanned by a bridge, contains the residence of the pasha. The citadel stands east of the river upon an artificial mound, 130 feet high, which in Niebuhr’s time was still surrounded by an earthen rampart. The citadel hill is the residence of the old Nestorians, now adherents of the Church of Rome. Round the foot of this hill run the dirty, crooked, and narrow streets of the lower town, with their flat-roofed, ugly houses, built partly of wood and partly of stone. The only large building is occupied by the bazaar, with passages one hundred paces long. Owing to its position at the junction of several routes, Kerkik has a brisk transit trade in hides, Persian silks and cottons, colouring materials, fruit, and timber, on the way from Suleimanich to the north. The natural warm springs at Kerkik are used

to supply baths. The surrounding country is fertile and well-cultivated ; the petroleum and

naphtha spriugs near the town are its most valuable com- mercial resource. ‘Till lately the petroleum was used as fuel by the Turkish steamers on the Tigris; but English coal has now superseded it. The official designation of Kerkuk is Shahr Zul. The inhabitants, from twelve to fifteen thousand in number, are chiefly Mohammedan Kurds; there is a Jewish quarter beneath the citadel. The reputed sarcophagi of Daniel and the Hebrew children are shown in one of the mosques.

Kerkuk is the ancient metropolitan city Karka a’ Beth Slék (‘‘ fortress of the house of Seleucia ”’).

See G. Hoffmann, Syr. Akten Pers. Martyrer, Leips., 1880.

KERMAN. See Kirmdn.

KERMANSHAH. See KirmAnsHAnAn.

KERMES (Arabic, kirmis), a crimson dye, now super- seded by cochineal, obtained from Coccus dlicis, L. (Coccus vermilio, G. Planchon), an hemipterous insect found in Spain, Italy, the south of France, and other parts of the Mediterranean region, feeding on Quercus coccifera, a small shrub from 2 to 5 feet high. The discovery of the animal nature of kermes is due to Eméric, Garidel, and Cestoni. Until the year 1714 it was thought to be a gall or ex- crescence.

Like other members of the group to which it belongs, the female kermes insect is wingless, and furnished with a beak or sucker attached to its breast, by which it fixes itself immovably on its food plant, and through which it draws its nourishment. The male insect is unknown, two insects mistaken for it being, according to Planchon, para- sitic hymenoptera of the chalcidian group, living in the kermes grains. In the month of May, when full grown, the insects are globose, 6 to 7 millim. in diameter, of a reddish-brown colour, and covered with an ash-coloured powder, They are found

attached to the twigs or buds by a circular lower surface 2 millim. in diameter, and sur- rounded by a narrow zone of white cottony down. At this time there are concealed under a cavity, formed by the approach of the abdominal wall of the insect to the dorsal one, thousands of eggs of a lively red colour, and smaller than poppy seed, which are protruded and ranged regularly beneath the insect. At the end of May or the beginning of June the young escape by a small orifice, near the point of attachment of the parent. They are then of a fine red colour, elliptic and convex in shape, but rounded at the two extremities, and bear two threads half as long as their body at their posterior extremity. At this period they are extremely active, and swarm with extraordinary rapidity all over the food plant, and in the course of two or three days attach themselves to fissures in the bark or buds, but rarely to the leaves. In warm and dry summers the insects breed again in the months of August and September, according to Eméric, and then they are more frequently found attached to the leaves. Usually, however, they remain immovable and apparently unaltered until the end of the succeeding March, when their bodies become gradually distended and lose all trace of abdominal rings. They then ae ag full of a reddish juice resembling discoloured blood. In this state, or when the eggs are ready to be extruded, the insects are collected. In some cases the insects from which the young are ready to escape are dried in the sun on linen cloths—care being taken to prevent the escape of the young from the cloths until they are dead. The young insects are then sifted from the shells, made into a paste with vinegar, and dried on skins exposed to the sun, and the paste packed in skins is then ready for exportation to the East under the name of “ pate d’écarlate.”

In the pharmacopveia of the ancients kermes triturated with vinegar was used as an outward application, espe- cially in wounds of the nerves. From ee — to the 16th

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century this insect formed an ingredient in the “‘ confectio alkermes,” a well known medicine, at one time official in the London pharmacopeeia as an astringent and corroborant in doses of 20 to 60 grains or more. Syrup of

kermes was also prepared. Both these preparations have now fallen into disuse, the latter being replaced by the syrup of cochineal.

To dye spun worsted with kermes, the material is first boiled for half an hour with bran in water, and then for two hours in a fresh bath containing one-fifth of Roman alum and one-fifth of tartar, to which “sour water” is commonly added. It is then taken out and laid in a linen bag for some days in a cool place. In order to obtain a full colour it is then put in a warm bath as at the first boiling, the bath containing as much kermes as is equal to three-fourths or even the whole weight of the worsted used. For cloth one-fourth less of the salt and kermes was required. The colour imparted by kermes has much less bloom than the scarlet made with cochineal, hence the former has fallen into disuse.

Mineral kermes is an amorphous tersulphide of antimony, prepared by a variety of processes, and containing a variable proportion of teroxide of antimony and sometimes a little alkaline antimonite. The oldest method consists in boiling the finely powdered sulphide with a solution of an alkaline carbonate and leaving the hot filtered solution to cool, the kermes being deposited on cooling. In another method dilute nitric acid was added to the alkaline solution to precipitate the kermes mineral. Mineral kermes is a brown red powder becoming blackish-grey when washed with boiling water. By fusion and slow cooling it is converted into a clay-like mass devoid of crystalline structure, in which it differs essentially from the pure amorphous sul-

hide.

See G. Planchon, Le Kermes du Chéne, Montpellier, 1864 ; Watts’s Dictionary of Chemistry, i. p. 830-38, iii. p. 446; Gmelin, Mand- book of Chemistry, iv. p. 840-49; Lewis, dMfateria Medica, 1784, pp. 71, 865; Memorias sobre la grana Kermes de Espatia, Madrid, 1788; Adams, Paulus Afgineta, ili. 180; Beckmann, History of Inwentions.

KERNER, Justinus Anpreas (1786-1862), a German poet and medical writer, was born in Ludwigsburg, Wiir- temberg, on the 18th of September 1786. He received his early education in the Latin school of Ludwigsburg and in the cloister school of Maulbronn. After the death of his father, who

was an upper bailiff and government councillor in Ludwigsburg, Kerner was obliged to accept a position in a cloth manufactory ; but in 1804, aided by Pastor Conz, who had some reputation as a poet, he was able to enter the university of Tiibingen, where he studied medicine. At Tiibingen he made the acquaintance of Uhland, who was about his own age; and the two young men éncouraged each other in their first efforts in poetry. Having completed his studies in 1809, Kerner spent some time in travel. In 1815 he received a medical appointment in Gaildorf, and in 1819 was transferred to Weinsberg, where he spent the rest of his life. Weinsberg is a pretty little town in Wiirtemberg, and was formerly a free imperial city. Here the emperor Conrad ITI. is said to have besieged the castle of Count Welf; and, according to the well-known legend, the women, having obtained permission to retire with their most valuable possessions, stumbled out, each with her husband on her back. Kerner built a house under the shadow of the castle (“ Weibertreue”); and through his exertions measures were taken for the preserva- tion of the ruins and the laying out of the surrounding grounds in public gardens. He also occupied himself with the history of the town, and published a work in two volumes describing Zhe Storming of Weinsberg in 1525. He was troubled with an affection of the eyes, and becom- ing almost blind he resigned his office and medical practice

in 1851. He died on the 21stof February 1862. Kerner takes rank as one of the best of the Swabian school of poets, who had in some respects a close affinity to the Romantic school, but aimed at greater simplicity and clearness.

He attracted attention by his Reiseschatten von dem Schattenspieler Lux (1811), and co-operated with Uhland, Schwab, and other writers in producing the Poetiseher Almanach (1812) and the Deutseher Diehterwald (1813). In 1826 he issued a collection of his poems, to which he added many new lyrics in subsequent editions. He also published two other volumes of poetry, Der letzte Bliitenstrauss (1852) and Winterbliiten (1859). His lyrics are remarkable for the intermingling of quaint humour

and delicate pathos, while in his ballads, which are written with great spirit and in a thoroughly popular tone, he prefers to represent such scenes of horror and mystery as the romantic school delighted in. He devoted much study to abnormal conditious of the brain, and wrote several popular works on animal magnetism and kindred subjects. Of morc importance than these labours were his investigations on the in- fluence of sebacie acid on animal organisms, and his work Das Wildbad im Kénigreich Wiirtemberg. In his Bilderbueh aus meiner Knabenzett he gave a vivid and interesting description of the circumstances of his youth. See K, Mayer in the Albwm Schwib- ischer Dichter, and D. Strauss, Kleine Sehriften.

KERRY, a maritime county of Ireland, in the province of Munster, between 51° 41’ and 52° 23’ N. lat., and between 9° 7’ and 10° 30’ W. long,, bounded on the W. by the Atlantic Ocean, N. by the estuary of the Shannon, which separates it from Clare, E. by Limerick and Cork, and S.E. by Cork. Its greatest length from north to south is 60 miles, and its greatest breadth from east to west 58 miles. The area comprises 1,159,358 acres, or 1811 square miles.

Geology.—Kerry, with its combination of mountain, sea, and plain, possesses some of the finest scenery of the British Isiands. ‘The portion of the county south of Dingle Bay consists of mountain masses intersected by valleys formed by narrow bands of carboniferous rocks. These masses are composed chiefly of red and green sandstones, grits, and slates, with beds of conglomerate in which are some- times found pebbles of bright red jasper. ‘The formation is almost entirely unfossiliferous, but on the Geological Survey maps it is marked as Old Red Sandstone. At one time the mountains were covered by a great forest of fir, birch, and yew, which was nearly all cut down to be made use of in smelting iron, and the constant pasturage of cattle prevents the growth of young trees. In the north-east, towards Killarney, the formation rises abruptly from the Carboniferous Limestone rocks into the rugged range of Macgillicuddy’s Reeks, the highest summit of which, Carntual, has a height of 3414 feet. The next highest summit to Carntual is Caper, 3200 feet, and several others are over 2500 feet. Lying between the precipitous sides of the Tomies, the Purple Mountains, and the Reeks is the famous gap of Dunloe. A small portion of country at the south-west of the Dingle promontory is occupied by Upper

Silurian strata, which in the middle of the promontory are covered by vast strata of grits, slates, and sandstones known as the Dingle beds, but of unknown age. This formation attains at Brandon Hill a height of 3127 feet. Resting unconformably on these beds are the Old Red Sandstone strata which occupy the remainder of the pro- montory and also a small tract of country at Kerry Head. The remainder of Kerry is occupied by the Coal-measures which are separated from the mountain masses of Old Red Sandstone by a narrow and irregular band of Carboniferous Limestone or Carboniferous Slate, which abounds in fossils. The Coal-measures, which rest conformably on the Carboni- ferous Limestone, form a succession of undulating hills rising sometimes to a height of over 1000 feet. All the three measures of coal are represented, but the seams of coal are very thin, and the workable portions are outside the limits of the county. In the upper part of the Kenmare valley

some copper veins occur in the Old Red Sandstone, but they are workable only when they enter the limestone. Silver with zinc and lead with zinc are found in a few places. In the coal formation there are some veins both of iron and lead. The Valentia flags and slates are largely exported to England. Amethysts were at one time obtained near Kerry Head.

Coast Line.—The sea-coast, which for the most part is wild and mountainous, is much indented by inlets, the largest of which, Tralee Bay, Dingle Bay, and Kenmare River, lie in synclinal troughs, the anticlinal folds of the rocks forming extensive promontories. Between Kenmare River and Dingle Bay the land is separated by mountain ridges into three valleys. The extremity of the peninsula between Dingle Bay and Tralee Bay is very precipitous, and Mount Brandon, rising abruptly from the ocean, is skirted at its base by a road from which magnificent views are obtained. From near the village of Ballybunion to Kilconey Point near the Shannon there is a remarkable succession of caves, which have evidently been excavated by the sea. The principal islands are the picturesque Skelligs, Valentia Island, and the Blasquet Islands.

Rivers and Lakes,—The principal rivers are the Black- water, which, rising in the Dunkerran mountains, forms for a few miles the boundary line between Kerry and Cork, and falls into the Kenmare River; the Ruaughty, which with a course resembling the arc of a circle falls into the head of the Kenmare River; the Inny and Ferta, which flow westward, the one into Ballinskellig Bay and the other into Valentia Harbour; the Flesk, which flows northward through the lower lake of Killarney, after which it takes the name of the Laune, and flows north-westward to Dingle Bay; the Cara, which rises in the mountains of Dunkerran, and after forming several lakes falls into Castlemaine Harbour ; the Maine, which flows from Castle Island south- westwards to the sea at Castlemaine Harbour, receiving in its course the northern Flesk, which rises in the mountains that divide Cork from Kerry; and the Feale, Gale, and Brick, the junction of which forms the Cashin, a short tidal river which flows into the estuary of the Shannon.

The lakes of Kerry are not numerous, and none of them’

are of great size, but those of Killarney form one of the most important features in the striking and picturesque mountain scenery amidst which they are situated. (See Kinarney.) The other principal lakes in the county are Lough Currane near Ballinskellig, and Lough Cara near Castlemaine Harbour. Near the summit of Mangerton Mountain an accumulation of water in a deep hollow forms what is known as the Devil’s Punchbowl, the surplus water, after making a succession of cataracts, flowing into Lough

Kittane at the foot of the mountain. There are chalybeate mineral springs near Killarney, near Valentia Island, and near the mouth of the Inny ; sulphurous chalybeate springs near Dingle, Castlemaine, and Tralee ; and a saline spring at Magherybeg in Corkaguiney, which bursts out of clear white sand a little below high water mark.

Climate and Agriculture,—Owing to the vicinity of the sca and the height of the mountains, the climate is very moist and unsuit- able for the growth of cereals, but it is so mild even in winter that the pasturage on the mountains retains perpetual greenness. Arbutus and other trees indigenous to warm climates grow in the open air, and several flowering plants are found which are unknown in Eng- land. In the northern parts of the county the land is generally coarse and poor, except in the valleys, where a rich soil has been formed by rocky deposits. In the Old Red Sandstone valleys there are many very fertile regions, and several extensive districts now covered by bog admit of easy reclamation so as toform very fruitful soil, but other tracts of boggy land searcely promise a profitable return for labour expended on their reclamation. The lower slopes of the mountains afford a very rich pasturage for cattle even in

Bee, while large flocks of sheep and goats graze on the upper ilges,

According to the classified summary of owners for 1876 there were

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no fewer than twenty-cight proprietors who possessed upwards of 10,000 acres, and ten possessed upwards of 20,000 acres, viz., Francis C, Bland, 25,576; Sir Edward Denny, Baronet, 21,479; Robert Drummond, 29,780; Edward Bouchier Hartopp, 24,222 ; Henry A. Herbert, 47,238 ; earl of Kenmare, 91,080; marquisof Lansdowne, 94,983 ; earl of Listowel, 25,964; Richard Mahoney, 26,178 ; Lord Ventry, 93,629. Altogether the number of owners was 1116, possessing 1,158,373 acres, at an annual valuation of £283,198. Of the owners 637, or 57 per cent., possessed less than 1 acre, the total possessed by these owners being only 172 acres. The average annual valuation was 4s, 10d. per acre.

The following table shows the number of the various classes of holdings in 1850 and 1880 :—

Between | Between | Between | 30 Acres

and Total. upwards.

9,508 18,617

10,058 18,747

In some of the larger farms the best modern systems of agricul- ture are practised, but especially on the small farms the primitive fori of lazy-bed culture is that almost wholly in use, with alternate crops of oats and potatoes. The total area under crops in 1881 was 165,568 acres, 14°2 per cent. of the acreage of the county. In 1880 there were 586,600 acres (50°6 per cent.) under grass, 18,348 were woods, 105,884 bogs, 248,808 mountain, and 39,392 water, roads, aud fences. There has been an increase in the area under erops since 1850 of 16,694 acres, but this is wholly due to an increase of 37,906 in the area under meadow and clover, which in 1881 was 90,068, while between 1851 and 1880 the area under grass increased by 138,489, or more than a fourth. The area under cereals in 1881 was 33,169 acres, a decline of 18,849, or more than a third sinee 1850, wheat declining from 4502 to 1082, and oats from 80,190 to 27,538. Between 1850 and 1880 the diminution has been very slight in the area under green crop, from 48,129 acres to 41,968, that under potatoes increasing from 30,968 to 31,179, but that under turnips declining from 10,484 to 5723. Flax occupied 300 acres in 1850, and only 39 in 1881.

Horses have increased from 13,129 in 1850 to 15,367 in 1881. The number of horses used for agricultural purposes in 1881 was 11,159. Mules between 1850 and 1881 increased from 1871 to 2311, while asses increased from 3417 to 8765. Cattle in 1850 numbered 147,748, and in 1881 had increascd to 209,733. Cows numbcred 104,971, dairy farming being very largely followed. The Kerry breed of cattle—small finely-shaped animals, black or red in colour, with small upturned horns—are famed for the quality both of their flesh and milk, and are now in considerable demand for the parks surrounding mansion houses. The “dexter,” a cross between the Kerry and

an unknown breed, is larger but without its fine qualities. Sheep between 1850 and 1871 had risen from 59,931 to 129,618, but in 1881 they had declined to 82,929. Little regard is paid to the breed, but those in most common use have been crossed with a merino breed from Spain. Goats, which share with sheep the sweet pasturage of the higher mountain ridges, have increased between 1850 and 1881 from 17,382 to 28,442. Pigs since 1850 have increased from 36,246 to 45,630. Poultry have more than doubled in num- bers, Increasing from 183,115 to 485,076.

Fere Naturz.—As may be supposed from the wild and moun- tainous character of a great part of Kerry, foxes are numerous, and otters and badgers are not uncommon. The alpine hare is very abundant. The red deer inhabits the mountains round Killarney. The golden eagle was at one time frequently seen in the higher mountain regions, but is now rarely met with. The sea eagle haunts the lofty marine cliffs, the mountains, and the rocky islets. The osprey is occasionally seen, and also the peregrine falcon. The merlin is common. The comnion owl is indigenous, the long-eared owl resident, and the short-eared owl a regular winter visitor. Rock pigeons breed on the sea-cliffs, and the turtle dove is an occasional visitant. The common quail is becoming rare. The great grey scal is found in Brandon and Dingle Bays.

Manufactures.—At the beginning of the century there was a con- siderable linen trade in Kerry, but this is now nearly cxtinct, the chief manufacture being that of coarse woollens and linens for hoine use. At Killarney a variety of articles are made from the wood of the arbutus. A considerable trade in agricnltural produce is carricd on at Tralce, Dingle, and Kenmare, and in slate and stone at Valentia.

Fisheries.—The number of vessels engaged in the deep sea and coast fisheries is about 600, employing about 2500 men and boys. From the passing of the Act 87 and 38 Vict. up to 31st December 1880 the total amount of money advanced on loan for fishery pur- poses in Kerry has been £10,872, and up to the same date the repay- ments have amounted to £6879. The loans during the year 1880 amounted to £2146. The sum advanced for Kerry fisheries is more than one-third of the whole sum advanced for Ireland. Perhaps on no part of the coast are the fishing localities so nume-

rous, or such fish as herring, pilchards, cod, hake, and ling so abundant. There is, however, a great want of boats, tackle, and nets, although the stations of Dingle and Kenmare are prosperous and well provided. Fine salmon are obtained in the rivers and in some of the larger lakes. The shellfish are large and abundant. —

Railways.—A branch of the great southern and western line passes by Killarney to Tralee.

Administration. —The county comprises nine baronics, and con- tains eighty-five civil parishes and two parts of parishes, and 2682 townlands. There are six poor-law unions wholly within the county, viz., Cahirciveen, Dingle, Kenmare, Killarney, Listowel, and Tralee, and part of one, namely Glin, the remaining portion beingin Limerick. The county includes one parliamentary borough, Tralee, which in 1881 had a population of 9664, the township of Killarney, and the towns of Dingle and Listowel. There are in the county twenty-four petty sessions districts and one part of a petty sessions district. Assizes are held at Tralee, and quarter sessions are held in the towns of Dingle, Kenmare, Killarney, Lis- towel, and Tralee. The county is within the Cork military district, and there is a barrack station at Tralee. The headquarters of the constabulary force is at Tralec, and subinspectors are stationed at Cahirciveen, Dingle, Kenmare, Killarney, and Listowel. Previous to the Union the county returned eight members to parliament, two for the county, and two for each of the boroughs of Tralee, Dingle, and Ardfert. At the Union the number was reduced to three, two for the county and one for the borough of Tralee.

Population. —At the census of 1659 the population of Kerry was 8390, of whom 7824 were Irish and 566 English. De Burgo esti- mates it at 56,628 in 1760, and the census of 1821 gives it as 216,185. In 1841 it had increased to 294,095, but in 1851 had diminished to 238,619, in 1861 to 201,800, and in 1871 to 196,586. The increase to 200,448 in 1881, notwithstanding that Kerry has suffered severely from agricultural distress, is sufficiently accounted for by an increase in the number of the smaller class of holdings. The number of males in 1881 was 100,715, and of females 99,733. The annual rate of marriages in 1880 to every 1000 of estimated population was

2°4, of births 27°5, of deaths 175, and of emigration 26°4. The total number who emigrated from 1st May 1851 to 31st December 1880 was 121,826. The number of persons not of Irish birth in Kerry at the census of 1841 was 615, and in 1871 it was 1194. The number in 1871 who could speak Irish only was 1209, and the number who could speak Irish and English 69,959. The number of Roman Catholics in 1881 was 193,917, of Protestant Episcopalians 5767, of Presbyterians 224, of Methodists 271, and of all other persuasions 264.

History.—The county is said to have derived its name from Ciar, who, along with his tribe the Ciarraidhe, is stated to have inhabited about the beginning of the present era the territory lying between Tralee and the Shannon. That portion lying south of the Maine was at a later period included in the kingdom of Desmond. Kerry suffered frequently from invasions of the Danes in the 9th and 10th centuries, until they were finally overthrown at the battle of Clontarf in 1014. In 1172 Dermot MacCarthy, king of Cork and Desmond, made submission to Henry IJ. on certain conditions, but was never- theless gradually compelled to retire within the limits of Kerry, which was made shire ground in 1210. An English adventurer Raymond le Gros received from this MacCarthy a large portion of the county round Lixnaw. Thomas, grandson of Raymond, and king's sheriff in the counties of Cork, Waterford, and Kerry, was in 1295 made lord chief-justice of Ireland. Of his two sons John the eldest was created carl of Kildare, and Maurice in 1829 became earl of Desmond, and with certain exceptions received all the royal liberties which the king had in the county of Kerry. After the attainder of Thomas, carl of Desmond, in 1467, his kinsmen took up arms against the English, until at last the king was glad to guaran- tec the earl's elder son the full possession of his father's privileges. In consequence, however, of the rebellion of Gerald the sixteenth earl, the estates of the Desmonds, 574,628 acres in extent, were in 1583 forfeited to the crown, and 1 Soba into manors and seignories of 12,000, 8000, 6000, and 4000 acres, which were divided among English noblemen and gentlemen. 'The Irish took advantage of the disturbed state of England at the time of the Puritan revolution to 'attempt the overthrow of the English rule in Kerry, and ultimately obtained possession of Tralec, but in 1652 the rebellion was com- pletely subdued, and a large number of estates were afterwards confiscated.

Antiquities. —There are remains of a round tower at Aghadoe near Killarney, another, a small cell at Lough Currane, and a third, one of the finest and most perfect specimens of the round tower in Treland, at Rattoo, not far from Ballybunion. On the summit of a hill to the north of Kenmare River is the remarkable stone fortress known as Staigue Fort. There are several stone cells in the principal Skellig island, where at one time there were monastic remains which have now been swept away by the sea. The princi- pal groups of sepulchral stones are those on the summits of the Tomie mountains, a remarkable stone fort at Cahircivecn, a circle of stones with cromlech in the parish of Tuosist, and others with

inscriptions near Dingle. The most notable monastic ruins are those of Innisfallen, founded by St Finian, a disciple of St Columba, and the fine remains of Muckross Abbey, founded by the Franciscans, but there are also monastic remains at Ardfert, Castlemaine, Derrynane, Kilcoleman, Lislaghtin, and O'Dorney. Among old ruined churches of interest may be mentioned those of Aghadoe, Kilcrohane, Lough Currane, Derrynane, Kilmakilloge, and Muckross. The cathedral of Ardfert, founded probably in 1258, was partly destroyed during the Cromwellian wars, but was restored in 1831. Some interesting portions of the old building still remain. There are a large number of old feudal castles.

See Smith, Ancient and Present State of the Counties of Cork, Waterford, and Kerry, Dublin, 1746-56; Cusack, History of the Kingdom of Kerry, 1871

KERTCH, the ancient Panticapzeon, a seaport town of Russia in the government of Taurida, situated at the eastern extremity of the Crimea, on the Cimmerian Bosphorus (Strait of Yenikale or Strait of Kertch). It is 133 miles north-east of Simpheropol and 50 miles from Theodosia, in 45° 21' N. lat. and 36° 30' E. long. Like most towns built by ancient Greek colonists, it occupies a beautiful situation clustering round the foot and climbing the sides of the hill (now named after Mithradates) on which stood the ancient acropolis In 1876 it contained twelve churches (including one Catholic and one Armenian), two synagogues, and a mosque, a local bank, two hospitals (one at Yenikale), three prisons, two gymnasiums, and a

“noble maidens’ institute.” The church of John the Baptist, which, according to an inscription, was founded in 717 A.D., presents a good example of the purely Byzantine style of architecture The church of Alexander Nevski was formerly the famous Kertch museum of local anti- quities, founded in 1825. The more valuable objects were afterwards removed to the Hermitage at St Petersburg, and those which remained were wantonly scattered during the English occupation of the town. The present “museum” is a small collection in a private house. Among the products of local industry are leather, tobacco, cement, beer, aerated waters, lime, candles, and soap. Fish-curing is carried on, and there are steam saw-mills and flour-mills. Previous to the deepening of the Strait of Yenikale so as to admit vessels drawing 17 feet of water (1876), the harbour was visited by a large number of vessels which now pass on to the Azoff ports. The imports comprise coal, wines, olive oil, &c.; and grain, fish, linseed, rapeseed, wool, and hides are exported. The harbour was improved by dredging at the same time as the strait. A promenade extends along the sea-wall, and beyond the town lie public gardens. About 6 miles to the north-east is the town and old Turkish fortress of Yenikale, which is united with Kertch to form a separate administrative circle or mayoralty, including, according to the surveys of 1843-44, an area of 42,103 acres. In 1876 the population of Kertch, exclusive of the temporary garrison of 13,745, amounted to 21,211.

The Greek colony of Panticapeon was founded about the middle of the 6th century B.c., by the people of Miletus. From about 438 .C. till the conquest of this region by Mithradates the Great about 100 B.c., the town and territory formed the so-called kingdom of the Bosphorus, ruled over by an independent dynasty. Phanacer, the son of Mithradates, became the founder of a new line under the protection of the Romans, which continued to exist till the middle of the 4th century A.D., and extended their power over the maritime parts of the Tauris. After this time the town—which had already begun to be known as Bosphora or Bospora—passed into the hands of the Eastern empire, of the Khazars, and of various barbarian tribes. In 1818 the Tartars, who had come into possession in the previous century, ceded the town to the Genoese, who soon raised it into new importance as a commercial centre. They usually called the place Cerchio, by a corruption of the Russian name K’rtcheff (whence Kertch), which appears in the 11th century in- scription of Tmutorokansk. Under the Turks, whose rule dates

from the end of the 15th centnry, Kertch was a military port ; and as such it plays a part in the Russo-Turkish wars. Captured by the Russians under Dolgorakoff in 1771, it was ceded to them along with Yenikale by the peace of Kertchuk-Kainardji, and it became a great centre of Russian naval activity. Its importance

was greatly impaired by the rise of Odessa and Taganrog ; and in 1820 the fortress was dismantled. Opened to foreign commerce and made a quarantine station, it attained a certain degree of prosperity, but again suffered severely during the Crimean War.

Archeologically Kertch is of particular interest, the kurgans or sepulchral mounds of the town and vicinity having yielded a rich variety of the most beautiful works of art. Since 1825 (the date of Blaramberg's discoveries) a large number of tombs have been opened. In the so-called Zolotai (7.¢., Golden) kurgan, or Abtrim- oba, was found a great stone vault similar in style to an Egyptian pyramid ; and within, among many objects of minor note, were golden dishes adorned with griffins and beautiful arabesques. In the Kul-oba, or Mound of Cinders (opened in 1880-31 by Dubrux), was a similar tomb, in which were found what would appear to be remains of one of the kings of the Bosphorus, of his queen, lis horse, and his groom. The ornaments and furniture were of the most costly kind ; the king's bow and buckler were of gold; his very whip intertwined with gold; the queen had golden diadems, necklace, and breast-jewels, aud at her feet lay a golden vase. In the Pavlovskoi kurgan (opened in 1858) was the tomb of a Greek lady, containing among other articles of dress and decoration a pair of fine leather boots (a unique discovery) and a beautiful vase on which is painted the return of Persephone from Hades and the setting out of Triptolemus for Attica. In a neighbouring tomb was what is believed to be " the oldest Greek mural painting which has come down to us," dating probably from the 4th century p.c. Among the minor objects discovered in the kurgans perhaps the most noteworthy are the fragments of engraved boxwood, tlic only examples known of the art tauglit by the Sicyonian painter Pamphilus.

See Seymour's Russia on the Black Sea and Sea of Azoff, 1855; Telfer, The Crimea, 1876; Bruhn, Tchernomore, 1852-77, Odessa, 1878 ; Sosnogorotf,

Putevo- ditel po Kruimu (“ Guide to the Crimea”), Odessa, 1880 ; Gilles, Antiquités du Bosphore Cimmerien, 1854; Maepherson, Antiqutttes of Kertch, 1857; Compte rendu de la Commission Imp. Archéologique, St Petersburg; L. Stephani, Die ‘Alterthiimer vom Kertsch, 1880; C. T. Newton, Zssays on Art and Archeology,

1880

KESMARK, or Kasmarx, an ancient town in the cis- Tisian county of Szepes (Zips), Hungary, is situated on the Poprad, 11 miles north-west of Lécse (Leutschau), in 49° 8’ N. lat., 20° 28’ E. long. The trade is chiefly in linen, wine, and cereals. Owing to the vicinity of the Carpathians the rainfall is high, and the climate frequently tempestuous and inclement. At the end of 1880 the population amounted to 4477, chiefly Germans and Slovaks.

Késmark (Latin Forwm Caseorum) is probably a Magyarized form of the German Késemarkt. In 1880, during the reign of Louis I., it was raised to the dignity of a royal free town. As the most important of the Saxon settlements in the north of Hungary, Késmark in 1440 became the seat of the counts of Szepes (Zips). In 1464 King Matthias Corvinus granted the town the so-called jus gladii, its civic blazon, and the right of holding weekly markets. In 1580 Késmark fell into the power of John Zapolya, and later it suffered much at the hands of the Polish leader Hieronymus Lasky, aud from Sebastian Tokoli. In 1655 the town was re-established by the empcror Ferdinand III. in all its ancient rights; and it remained a royal free town until the recent administrative changes of 1876. An international exhibition of linen goods was held at Késmark in the summer of 1881.

KESTREL (French Cresserelle or Crégerelle, Old French Quercerelle and Quercelle, in Burgundy Crusted), the English name! for one of the smaller Falcons, originat- ing probably from its peevish and languid cry. This bird, though in the form of its bill and length of its wings one of the true Falcons, and by many ornithologists placed among them under its Linnzan name of Falco tinnunculus, is by others referred to a distinct genus 7innunculus as 7’. alaudarius—the last being an epithet wholly inappropriate. We have here a case in which the propriety of the custom which requires the establishment of a genus on structural characters may seem open to

question. The differences of structure which separate Zinnunculus from Falco are of the slightest, and, if insisted upon, in the way some systematists have done, must lead to including in the former birds which obviously differ from Kestrels in all but a few characters arbitrarily chosen; and yet, if

1 Other English names are Windhover and Standgale (the last often corrupted into Stonegale and Stannell), from a habit to be presently mentioned.

structural characters be set aside, the Kestrels form an assemblage readily distinguishable by several peculiarities from all other Malconidx, and an assemblage that the instinct of real ornithologists (though this is treading upon dangerous ground) does not hesitate to separate from the true Falcons of the genus (alco, with its subsidiary groups salon, Hypotriorchis, and the rest (see Faucon, vol. ix. p. 2). Scarcely any one outside the walls of an orni- thological museum or library would doubt for a moment whether any bird shewn to him were a Kestrel or not; and Mr Gurney believes (/dzs, 1881, p. 277) that the aggre- gation of species placed by Mr Sharpe (Cat. Birds Brit. Museum, i. pp. 423-448) under the generic designation of Cerchneis (which should properly be Z%nnwnculus) in- cludes “three natural groups sufficiently distinct to be treated as at least separate subgenera, bearing the name of Dissodectes, Tinnunculus, and Hrythropus.” Of these we may say that the first and last are not at all Kestrels; but are perhaps rather related to the Hobbies (Hypotriorchis).

The ordinary Kestrel of Europe, alco tinnunculus or Tinnunculus alaudarius, is by far the commonest bird of prey in the British Islands, and is too common and well- known a bird to need any description. It is almost entirely a summer migrant, coming from the south in early spring and departing in autumn, thougli examples (which are nearly always found to be birds of the year) occasionally occur in winter, some arriving on the eastern coast in autumn. It is most often observed while practising its habit of hanging in the air for a minute or two in the same spot, by means of short and rapid beats of its wings, as, with head pointing to windward and expanded tail, it is look- ing out for prey,—which consists chiefly of mice,

but it will at times take a small bird, and the remains of frogs, insects, and even earth-worms have been found in its crop. It generally breeds in the deserted nest of a Crow or Pie, but frequently in rocks, ruins, or even in hollow trees— laying four or five eggs, mottled all over with dark brownish- red, sometimes tinged with orange and at other times with purple. Though it may occasionally snatch up a young Partridge or Pheasant,? the Kestrel is quite the most harm- less bird-of-prey, if it be not, from its destruction of mice and cockchafers, a most beneficial species. It is a species of very wide range, extending over nearly the whole of Europe from 68° N. lat., and the greater part of Asia— though the form which inhabits Japan and is abundant in north-eastern China has been by some writers deemed distinct and called Z. japonicus—and it also pervades the greater part of Africa, becoming, however, scarce in southern latitudes, and unknown beyond Fantee on the west and Mombasa on the east coast (J6zs, 1881, p. 457). The southern countries of Europe have also another and smaller species of Kestrel, 7’. tennenewoides (the 7. cenchris and 7’. naumanni of some writers), which is widely spread in Africa and Asia, though specimens from India and China are distinguished as 7’. pekinenszvs.

Three other species are found in Africa as well—Z’. rupicola, 7’. rupicoloides, and 7’. alopea—the first of which is a common bird in the Cape Colony, while the others occur in the interior. Some of the islands of the Ethiopian region have peculiar species of Kestrel, as the Z. newtont of Madagascar, 7’. punctatus of Mauritius, and 7’. gracilis of the Seychelles ; while, on the opposite side, the Kestrel of the Cape Verd Islands has been separated as 7’. neglec- tus.

2 When what are called ‘‘ tame ” Pheasants are bred, a Kestrel will often contract the bad habit of infesting the coops and carrying off the young birds. This evil may easily be stopped, but it should not lead to the relentless persecution of the species, especially when it is remem- bered that the Kestrel is in the first place attracted to the spot by the presence of the ntice which come to eat the Pheasants’ food.

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The next species deserving of notice is that of America, LT. sparverius, commonly known in Canada and the United States as the “ Sparrow-Hawk ”—a beautiful little bird, though not more courageous than the rest of its relations. Various attempts have been made to recognize several species, more or less in accordance with locality, but the majority of ornithologists seem unable to accept the distinctions which have been elaborated chiefly by Mr Sharpe (ut supra) and Mr Ridgway (North American Birds, iii, pp. 159-175), the former of whom recognizes six species, while the latter now admits but three, 7’ sparverius, T leucophrys, and T. sparverioides, with five geographical races of the first, viz., the typical Z. sparverius from the continent of North America, except the coast of the Gulf of Mexico; 7. australis from the continent of South America, except the North Atlantic and Caribbean coasts ; 7’. isabellinus, inhabiting continental America from Florida to Cayenne; 7’. dominicensis from the Lesser Antilles as far northwards as St Thomas; and lastly 7. cinnamominus from Chili and western Brazil. 7’. leucophrys is said to be from Hispaniola and Cuba; and 7. sparverioides peculiar to Cuba only. This last has been generally allowed to be

a good species, though Dr Gundlach, the best authority on | the birds of that island, in his latest work, published in 1876 (Contribucion & la Ornitologia Cubana, p. 48) will |

not allow its validity. More recently it has been found (bis, 1881, pp. 547-564) that 7. australis and 7’. cinna- mominus cannot be separated, that Mr Ridgway’s 7’. leuco- phrys should properly be called 7’. dominicensis, and his T. dominicensis 7’. antillarum, while that gentleman has recorded the supposed occurrence of Z. sparverioides in Florida. Of other Kestrels it remains to say that 7’. moluccensis is widely spread throughout the islands of the Malay archipelago, while 7’. cenchroides seems to inhabit the whole of Australia, and has occurred in Tasmania (Proc. Roy. Soc. Tasmania, 1875, pp. 7, 8). No Kestrel is found in New Zealand, but an approach to the form is made by the very peculiar Hieracidea (or Harpe) nove-zelandix (of which a second race or species has been described, H. brunnea or H. ferox) the “ Sparrow-Hawk,” “ Quail-Hawk,” and “ Bush-Hawk ” of the colonists —a bird of much higher courage than any Kestrel, and perhaps exhibiting the more generalized and ancestral type from which both Kestrels and

Falcons may have descended. A. N.) KESWICK, a market-town of Cumberland, is situated on the left bank of the Greta, close to Derwentwater or Keswick Lake, about 30 miles south of Carlisle, and 300 miles from. London by rail. It is one of the centres for visitors to the Cumberland lakes, and is the point whence the ascent of Skiddaw is usually begun. In the parish church of Crosthwaite, three quarters of a mile off, there isa monument to the poet Southey, whose residence for many years, Greta Hall, stands at the end of the main street, close by the river. Keswick was formerly noted for its manufacture of lead pencils; and the plumbago (locally wad) used to be supplied by the mines in Borrow- dale. Lead is still found in the neighbouring hills. Char, caught in the neighbouring lakes, are potted at Keswick in large quantities during the season, and sent to all parts of England. The population in 1881 was 3220. KESZTHELY, a market-town in the trans-Danubian county of Zala, Hungary, is picturesquely situated near the western extremity of Lake Balaton, about 97 miles south of Pozsony (Pressburg), in 46° 47’ N, lat., 17° 1 E. long. Keszthely is chiefly noted for its well-organized agricultural institute, founded by Count George Festetics, and known as the “Georgicon.” At the source of the

1 The absence of any species of Kestrel from Jamaica is a most curious fact, considering the abundance of the former in other parts of the West Indies.

Héviz brook there is a warm sulphur spring. The trade is principally in grain, fruit, and wine. The population at the end of 1880 was 5341, mostly Magyars by nationality, and Roman Catholics by creed.

KETCHUP, a sauce or relish prepared principally from the juice of mushrooms and of many other species of edible fungi, salted for preservation and variously spiced. The term ketchup, written also catsup and katchup, is said to be of Japanese origin. The following may be taken as a typical example of the ingredients and method of preparation of ordinary ketchup. Freshly gathered mush- rooms are placed in a wooden vessel and sprinkled with salt. They are left for two or three days, during which time they are repeatedly stirred and turned over. The

juice is then squeezed out, and to every gallon of the _ juice there is added of crushed cloves and mustard seed

half an ounce each, and of black pepper, ginger, and all- spice each an ounce. The mixture is boiled gently, decanted, and left to macerate for about two weeks, after which it is strained off and bottled. Should it show any tendency to putrefaction it is again boiled with the addition of salt and spices. It is of the utmost consequence to avoid copper, lead, and pewter vessels or implements in the preparation of ketchup ; as far as possible glazed earthen- ware vessels alone should be used. The juices of various fruits, such as cucumbers, tomatoes, and especially green walnuts, are used as a basis of ketchup, and shell-fish ketchup, from oysters, mussels, and cockles, is also made ; but in general the term is restricted to sauces having the juice of edible fungi as their basis.

KETI, a town and port in Kurrachee district, Sind, India, situated on the Haj4mro branch of the Indus, in 24° 8’ 30” N. lat., 67° 28’ 30” E. long. Population (1872), 3199. The town is a large seat of river trade, and ranks next to Kurrachee among the ports of Sind. The sea-going

| exports comprise grain, pulses, oilseeds, wool, cotton, drugs,

dyes, saltpetre, and firewood. The imports include cocoa- nuts, cotton piece goods, metals, sugar, spices, coir, and shells.

KETTERING, a market-town of Northamptonshire, is built on a slope near the Ise, a tributary of the Nen, 14 niiles north-east of Northampton, and 75 miles north-west of London. The principal buildings are the church of SS. Peter and Paul, a good specimen of the Perpendicular style, with a tower and spire; the church of St Andrew, built in 1870, in the Decorated style ; the town-hall and corn- exchange ; the temperance hall; and the union workhouse. The water-works were erected in 1872 at a cost of £12,000.

| The chief manufactures of Kettering are boots, shoes,

brushes, stays, clothing, and agricultural implements, There are iron-works in the immediate neighbourhood. The privilege of market was granted in 1227 by a charter of Henry III. The population in 1881 was 11,093.

KEUNJHAR, or Keunsur, a petty state in Orissa, India, lying between 21° 1’ and 22° 9’ 30” N. lat., and 85° 14’ and 86° 24’ 35” E. long, with an area of 3096 square miles, and a population in 1872 of 181,871. The state originally formed part of Morbhanj; but about two hundred years ago the tribes of this part, finding it a great hardship to travel through the perilous forests of Morbhanj to obtain justice from their prince, separated themselves, and set up the brother of the Morbhanj raja as their independent ruler. The last prince rendered good service during the Kol rebellion in 1857, and was rewarded with the title mahardj4. A Government elephant establish- ment is maintained at Keunjhar.

KEUNTHAL, a petty hill state in the Punjab, India, between 30° 55’30” and 31° 6’ N. lat., and 77° 10’ and 77° 26’ E. long., with an area of 116 square miles, and an estimated population of 50,000. The chief, a Rajput,

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received the title of raj4 in 1857. After the Gurkha war, a portion of Keunthal, which had been occupied by the Gurkhas, was sold to the maharajé of Patidla, the remainder being restored to its own chief. In considera- tion of this, no tribute is paid by the Keunthal raja. In 1823 the district of Pundr was added to the Keunthal state. The raj4 exercises rights of lordship over the petty states of Kothi, Theog, Madhan, and Ratesh.

KEW, a village and parish in the county of Surrey, England. ‘The village is pleasantly situated on the south bank of the Thames, 6 miles by road west-south-west of Hyde Park corner. It has communication with London by steamer and by several railway routes. By a stone bridge of seven arches, erected in 1789, it is connected with Brentford on the other side of the river. The village consists chiefly of a row of houses with gardens attached, situated on the north side of a green, to the south of which is the church and churchyard, and at the west the principal entrance to Kew gardens. In the vicinity there are many fine villas. From remains found in the bed of the river near Kew bridge it has been conjectured that the village is an old

British settlement. The name first occurs in a document of the reign of Henry VII., where it is spelt Kayhough. The free school originally endowed by Lady Capel in 1721 received special benefactions from George [V., and the title of “the king’s free school.”

The estate of Kew House about the end of the 17th century came into the possession of Lord Capel of Tewkes- bury, and in 1721 of Samuel Molyneux, secretary to the prince of Wales, afterwards George II. After his death it was leased by Frederick, prince of Wales, son of George Ii., and it continued to be the residence of members of the royal family until the estate was purchased about 1789 by George III, who devoted his chief leisure to its improve- ment. The old house was pulled down in 1802. Dutch House, adjoining Kew House, afterwards sold by Robert Dudley, earl of Leicester, to Sir Hugh Portman, a Dutch merchant, was purchased by George III. as a nursery for the royal children, It is a plain brick structure, and is now known as Kew Palace. The Royal Botanic Gardens of Kew originated in the exotic garden formed by Lord Capel and greatly extended by the princess dowager, widow of Frederick, prinee of Wales, and by George III., aided by the skill of the Aitons and of Sir Joseph Banks. In 1840 the gardens were adopted as a national establishment, and transferred to the departnient of woods and forests. The gardens proper, which originally contained only about 11 acres, have been increased to 75 acres, and the pleasure grounds or arboretum adjoining extend to 270 acres.

A catalogue of the plants in the exotic garden of Kew was pub- lished by Dr Hill in 1768, 2d ed. 1769; and in 1789 William Aiton published Hortus Kewensis, in 3 vols. 8vo. See Oliver’s Guide to the Royal Botanic Gardens and Pleasure Grounds, Kew, 26th edition, 1881.

KEW-KEANG FOO, a prefecture and prefectural city in the province of Keang-se, China. The city, which is situated on the south bank of the Yang-tsze Keang, 15 miles above the point where the Kan Keang flows into that river from the Po-yang lake, stands in 29° 42’ N. lat. and 116° 8’ E. long. The north face of the city is separated from the river by only the width of a roadway, and two large lakes lie on its west and sonth fronts. The walls are from 5 to 6 miles in circumference, and are more than usually strong and broad. As is generally the case with old cities in China, Kew-Keang has

repeatedly changed its name. Under the Tsin dynasty (265-420 a.p.) it was known as Sin-Yang, under the Leang dynasty (502- 557) as Keang Chow, under the Suy dynasty (589-618) as Kew-Keang, under the Sung dynasty (960-1127) as Ting-Keang, and under the Ming dynasty (1368-1644) it assumed the name it at present bears. Kew-Keang has

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played its part in the history of the empire, and has been repeatedly besieged and sometimes taken. The last time this worst fate overtook it was in February 1853, when the Tai-ping rebels gained possession of the city. After their manner they looted and utterly destroyed it, leaving only the remains of a single street to represent the once flourishing town. The position of Kew-Keang on the Yang-tsze Keang and its proximity to the channels of internal communication through the Po-yang lake, more especially to those leading to the green-tea-producing districts of the provinces of Keang-se and Gan-lwuy, induced Lord Elgin to choose it as one of the treaty ports to be opened under the terms of his treaty (1861). Unfortunately, however, it stands above instead of below the outlet of the Po-yang lake, and the 15 miles which separate it from that channel form one of the swiftest parts of the lower Yang-tsze Keang. This has proved to bea decided drawback to its success as a commercial port, but nevertheless the customs returns show a steady annual increase in the trade carried on, The immediate effect of opening the town to foreign trade was to raise the popula- tion in one year from 10,000 to 40,000, and at the present time the census declares it to be peopled by 48,000 souls. The foreign settlement extends westward from the city, along the bank of the Yang-tsze Keang, and is bounded on its extreme west by the P’un river, which there runs into the Yang-tsze. The bund, which is 500 yards long, was erected by the foreign community at a cost of 1700 taels. The climate is considered to be good, and thougli hot in the summer months is invariably cold and bracing in the winter. According to the latest customs returns the value of foreign imports into Kew-Keang in 1878 was 2,514,302 taels as against 2,954,286 in 1880; during the same period native imports showed an increase from 649,109 taels to 962,364 taels; aid the value of exports declined from 8,924,436 taels to 8,824,966 taels. 1653 piculs of opium were imported in 1878, and 2290 in 1880, and the revenue returns show that while the duties levied in 1872

amounted to 585,883 taels, in 1880 the sum received from the same source was 764,571 taels.

KEY WEST (Spanish, Cayo Hueso, Bone Reef), a coral island, 7 miles long, from 1 to 2 miles broad, and 11 feet above sea-level, lies 60 miles south of Cape Sable, the most southerly point of the mainland of Florida. It belongs to Monroe county, Florida, and forms one of the Florida Keys. The soil is thin, but supports a tolerably dense tropical vegetation, including various fruits. In the absence of fresh springs, the water supply is derived from rain and distillation. The healthy climate attracts an annually increasing number of invalids from the north. The inhabitants are chiefly of Cuban and Bahaman extrac- tion, and speak a Spanish patois.

Kry West, chief city of Monroe county, covers nearly one-half of Key West island. It has broad streets, arranged on the rectangular plan ; and the houses, almost all wooden, are picturesquely surrounded by tropical shrubs and plants. The chief buildings are the Government naval and judicial edifices, the masonic hall, and the opera house. There is also a convent, and several churches and schools. The position of Key West in relation to Cuba, the Gulf of Mexico, and the coast of the United States gives it com- mercial advantages that are seconded by the possession of one of the finest harbours in the Union south of the Chesapeake. Key West shows much the largest tonnage in Florida of vessels clearing and entering; and it has frequent and good steam communication with the main- land. Described as being “to Cuba what Gibraltar is to Ceuta, to the Gulf of Mexico what Gibraltar is to the Mediterranean,” Key West is one of the chief naval stations of the United States, and is strongly fortified. The

principal manufacture is that of cigars, begun in 1867, and steadily prospering. Previous to 1874, when a hurricane destroyed the works, 30,000 bushels of salt were annually produced on the island by solar evaporation. Fishing, sponge-gathering, and turtle-catching occupy many of the inhabitants; and a large number of small vessels are employed in “ wrecking,” ¢.¢., in saving goods and rendering assistance to vessels that have failed to clear the dangerous Florida reef. The population of the city in 1880 was 9890.

KHABAROVKA, the chief town of the Maritime Pro- vince, in eastern Siberia, is situated on high crags, on the right bank of the Amoor, amidst wide forests and marshes, at the confluence of the Ussuri. It was but a poor settle- ment with 700 inhabitants when it took the place of Niko- laievsk as the seat of the military administration of the Maritime Province and of the various establishments connected with the Amoor fleet. Since its foundation in 1857 it has always been the chief centre for the trade in sables, purchased yearly from the aborigines to the average amount of 20,000 pieces, and sent to Irkutsk and to Russia.

KHAIRABAD, or Kuyrazab, the chief town of Sitapur district, Oudh, India, situated 5 miles south of Sitdpur civil station and cantonment, 27° 31’ 30” N. lat., 80° 47’ 35” E. long. It is the fifth largest town in Oudh, with a population in 1869 of 15,677, made up of Hindus and Mohammedans in about equal numbers. tains forty mosques and thirty Hindu temples, besides a beautiful group of sacred Mohammedan buildings. A large fair is held here in January, lasting ten days, and attended by an average of 60,000 persons. A second fair is held at the Dasahdra festival, attended by about 15,000 persons. The annual value of bdézdr sales is about £34,000.

KHAIRPUR, or Kuyrpoor, a native state in Sind, India, lying between 26° 10’ and 27° 46’ N. lat., and 68° 14’ and 70° 13’ E. long., bounded on the N. by Shikarpur district, S. by Jdisalmir state, E. by Hyderabad district, and W. by the Indus river, with an area of 6109 square miles. Like other parts of Sind, Khairpur consists of a great alluvial plain, very rich and fertile in the neighbour- hood of the Indus and the irrigation canals, the remaining area being a continuous series of sand-hill ridges covered with a stunted brushwood, where cultivation is altogether impossible. A small ridge of limestone hills passes through the northern part of the state, being a continuation of a ridge known as the Ghar, running southwards from Rohri, The state is watered by five canals drawn off from the Indus, besides the Eastern Nara, a canal which follows an old bed of the Indus. In the desert tracts are pits of natron, forming a source of revenue to the chief; as many as a thousand camel loads are annually exported to northern and central India, as well as to the seaboard, each load being taxed at 5s.

A census taken in 1872 returned the population at 130,350, or 21 per square mile. The Moslems chiefly belong to the Rajur tribe. The Hindus are principally Rajputs of the Soda Thakur elan, who inhabit the extreme eastern part of the state. They are a well- built and sturdy race, of nomadic habits, their wealth consist- ing in herds of camels, oxen, sheep, and goats. The principal food grain erops ate jodr (Holcus sorghwm), bdjrd (Holcus spicatus), wheat, gram, and pulses. Indigo is largely cultivated, and eotton to a less extent. Fruits consist of the mango, mulberry, apple, pomegranate, date, &. Several varieties of forest trees are grown in the mir's game preserves. The annual value of the export trade is estimated at about £52,000, and the imports at £25,000. Cotton and silk fabrics, silver warc, lacquered wood-work, boots, shoes, horse trappings, swords, matchloeks, and pottery are the chief manufactures. A small quantity of salt and saltpetre is also manufacturcd. The revenue of the state, which is collected in kind, the mir reeciving one-third of the produce, is estimated to amount to about £50,000. The climate is agreeable during about four months of the year, and fiercely hot during the remaining

cight. The principal diseases are fevcr, ophthalmia, and eutaneous affections.

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The chief or mir of Khairpur belongs to a Baluchi family, known as the Talpur, which rose on the fall of the Kalhora dynasty of Sind. About 1818, during the troubles in Cabul ineidental to the – establishment of the Barakzai dynasty, the mirs were able to refuse the tribute which up to that date had been somewhat irregularly paid to the rulers of Afghanistan. In 1832 the individuality of the Khairpur state was rceognized by the British Government in a treaty, under which the use of the river Indus and the roads of Sind were seeured. When the first Cabul expedition was decided on, the mir of Khairpur, Ali Murad, cordially supported the British policy ; and the result was that, after the battles of Miani and Daba had put the whole of Sind at the disposal of the British, Khairpur was the only statc allowed to retain its political existence under the protection of the paramount power.

KHAMGAON, a town in Akola district, Berar, India, in 20° 42' 30" N. lat., 76° 37' 30" E long., with a popu- lation in 1867 of 9432. The cotton market

—the largest in the province—was established about 1820. A branch line of 8 miles, opened in 1870, connects Khamgdon with the Great Indian Peninsula Railway. In fair seasons above 100,000 bullock-loads of cotton are brought into Khamgéon on the weekly market day. ‘To the east of the town is a large enclosed cotton-market. The factories of the Berar Ginning Company and the Mofussil Pressing Company possess steam machinery for full-pressing cotton.

KHANDESH, or Canpetsn, a district of Bombay Pre- sidency, India, lying between 20° 15’ and 22° N. lat., and 73° 37’ and 76° 24’ E. long., bounded on the N. by the

The town con- | Sétpura hills, E. by Berar, S. by the Satmdla or Ajanta

hills, S.W. by Nasik district, and W. by Baroda territory, with an area of 10,162 square miles, The chief town is Dhulia. The principal natural feature is the Tapti river, which enters at the south-east corner of the district, and flows in a north-westerly direction, dividing Khandesh into two unequal parts. Of these the larger lies towards the south, and is drained by the river Girna. North- wards beyond the alluvial plain, which contains some of the richest tracts in Khandesh, the land rises towards the Satpura hills, In the centre and east the country is level, save for some low ranges of barren hills, and has in general an arid, unfertile appearance. Towards the north and west, the plain rises into a difficult and rugged country, thickly wooded, and inhabited by wild tribes of Bhils, who chiefly support themselves on the fruits of the forests and by the profits of wood-cutting. The drainage of the district centres in the Tapti, which receives thirteen principal tributaries in its course through Khandesh. None of the rivers are navigable, and the Tapti flows in too deep a bed to be made use of for irrigation, The district on the whole, however, is fairly well supplied with surface water. Khandesh is not rich in minerals. A large area is under forest ; but the jungles have been robbed of most of their valuable timber. Wild beasts are numerous. As late as 1858 tigers abounded ; but since then they have been very closely hunted, and driven almost entirely out of the plains into the rough hilly country.

The census of 1872 returned the population at 1,028,642 (males 530,610, and females 498,032),—Hindus, 948,279; Musalmans, 79,359 ; Parsis, 61;

Christians, 517 ; Jews, 36; Sikhs, 59; ‘‘ others,” 331. Of the aboriginal tribes the Bhils arc the most important. They number 122,092, and formerly were a wild and lawless robber tribe. Sinee the introduction of British rule, the efforts made by kindly treatment, and by the offer of suitable employment, to win the Bhils from their disorderly life have been most successful. Many of them are now employed in police duties and as village watchmen. The total arca of Government cultivable land is returned at 3,453,549 aeres, of which 2,218,355 acres were under cultivation in 1875-76. Food grains take up 52 per ecnt.; pulses, 5% per cent.; fibres, 28 per cent. ; oil seeds, 11 per cent.; miscellaneous crops, 3} per cent. of the eultivated area. Irrigation is more extensively practised in Khandesh than in the Deecan and the southern Marhatta eountry. Owing to the liability of the district to river-floods, almost every year is marked by some failure of the crops. The chief exports are food grains, oil seeds, butter, indigo, wax, and honey ; and the imports salt, spices, metal, piecc goods, cotton yarn, and sugar. There are ten steam cotton presses, and one steam spinning and

weaving factory. Many Bombay mercantile houses have established agencies in the district ; and towards the east, in the rich Tapti valley, Jalgaon and Bhusawal are rising intv important centres of trade. ‘The trunk road from Bombay to Agra and the Great Indian Peninsula Railway intersect the district, and of late years roads have been made all along the chief lines of traffic. The total revenue in 1876-77 amounted to £422,291, of which £308,706 was made up of the laud tax. The same year there were 272 schools, with 16,249 pupils. The average annual rainfall for the five years ending 1875-76 was 25 inches. Fevers and cutaneous affections are the prevailing diseases.

KHANDPARA, a petty state in Orissa, India, lying between 20° 11’ and 20° 25’N. lat., and 85° 1’ and 85° 25’ E. long., with an area of 244 square miles, and a popu- lation in 1872 of 60,877, mostly Hindus. Khandpdra originally formed a part of the neighbouring state of Naydgarh, and was separated from it about two hundred years ago by a brother of the Naydgarh r4ja, who estab- lished his independence. The present chief, a Rajput by caste, is the eighth in descent from the founder. The country forms a very

valuable territory, and is one of the best cultivated of the Orissa states. Fine sd/ timber abounds in the hilly parts, and magnificent banian and mango trees stud the plain. It is intersected by the Kuarid and Dauka rivers, small tributaries of the Mahanadi. The estimated annual revenue of the chief is £2258; tribute to the British government, £421. ~KHANDWA, or Cunpwau, the chief town and head- quarters station of Nimar district, Central Provinces, India, 21° 50’ N. lat., 76° 23’ E. long. Population (1877), 14,119. Khandwa is perhaps the most rising town in the Central Provinces. It is the station on the Great Indian Peninsula Railway, where the whole traffic of Central India towards Bombay meets the line. It has entirely superseded Burhanpur, the ancient centre of trade between Malw4, the Nerbudda valley, and the Deccan. Extensive barracks have been built for the relays of troops which pass through in the cold season, and there is also a good travellers’ bungalow with a spacious sardi or native rest- house.

The Arabian geographer, Al Birtni (circa 1000 A.D.), mentions Khandwa ; and a century later, it was a great seat of Jain worship. The mound on which the town stands has supplied many finely carved pillars, cornices, and other remains of the old Jain buildings, which have been built into Bréhmanical temples, the walls of the Marhatta fort, and other structures. It also formed a quarry for the Sivaite temples surrounding the four kunds or water reservoirs, one of which is on cach side of the town, that on the west side bearing the date 1182 a.p.

KHARKOFF, a government of European Russia, sur- rounded by those of Kursk, Poltava, Ekaterinoslaff, and Voronezh, and belonging partly to the basin of the Don and partly to that of the Dnieper. The area is estimated at 21,035 square miles. In general terms the government may be described as a table-land with an elevation of from 300 to 460 feet traversed by deep-cut river valleys. The soil is for the most part of high fertility, about 47 per cent. of the surface being arable land and 30 per cent. natural pasture ; and though the winter is rather severe the summer heat is sufficient for the ripening of grapes and melons in the open air. The bulk of the population Is engaged in agricultural pursuits, and the breeding of Sheep, cattle, and horses, though various manufacturing industries have also received a rapid development, more especially since the middle of the present century. The ordinary cereals, maize, buckwheat, millet, hemp, flax, tobacco, poppies,

and beetroot are all grown, and bee keeping and silk-worm rearing are of considerable import- ance. In 1879 the horses numbered 258,711, the cattle 475,217, the sheep 1,059,596, of which 376,777 were of fine-fleeced varieties. Beetroot sugar factories, cotton mills, woollen factories, iron-works, and tanneries are the leading industrial establishments ; their whole production

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in 1879. was estimated at 23,939,147 roubles (about £3,790,000). The mass of the people are Little Russians, but there are also Great Russians, Calmucks, Germans, Jews, and Gipsies. In 1867 the total population was 1,681,486, and in 1879 2,036,949—4119 of these being Raskolniks (dissidents), 1960 Roman Catholics, 2732 Protestants, and 3079 Jews. The government is divided into eleven districts—Kharkoff, Akhtuirka, Bogodukhoff, Izyum, Kupyansk, Lebedyin, Zmieff, Starobyelsk, Sumui, Valki, and Voltchansk. In 1879 there were eight towns with populations above 5000—Kharkoff, Izyum (15,741), Starobyelsk (12,581), -Voltchansk (11,107), Slavansk (10,558), Tchugueff (9418), Valki (7001), Zolotcheff (5038). Ecclesiastically the government is a separate eparchy or diocese of the Greek Chureh. The Roman Catholics are subject to the bishop of Tiraspol in Kherson. ;

KuarkorFrr, the chief town of the above government, is situated in 56° 37’ N. lat. and 25° 5’ E. long,, in the valley of the Donets, 462 miles from Moscow and 137 miles from Kursk. It has railway communication north-ward by Kursk and southward to Mariupol on the Sea of Azoff and to Odessa by Poltava and Balta. The four annual fairs are among the busiest in Russia, more especi- ally the Krestchenskaya or Epiphany fair, which is opened on the 6th (18th) January. The turn-over is estimated at from £3,000,000 to £4,000,000. Thousands of horses are bought and sold. At the Trinity (Troitsa) fair in June an extensive business (£800,000) is done in wool. A great variety of manufactured goods are produced in the town—linen, felt, sugar (especially from beetroot), tobacco, brandy, soap, candles, cast-iron. Besides a flourishing university, instituted in 1805, and attended in 1879 by 720 male and 163 female students, Kharkoff possesses an observatory, a large veterinary college, a botanical garden, a theological

seminary, and several important institutions of beneficence. The university building was formerly a royal palace. The library contained in 1878 98,000 volumes; and the zoological collections are especially rich in the birds and fishes of southern Russia. Extensive: barracks are maintained in the town. Public gardens occupy the site of the ancient military works; and the Government has a model farm in the neighbourhood. Of the Orthodox churches one has the rank of cathedral. The population of Kharkoff was 59,968 in 1867, and 101,175 in 1879.

The foundation of Kharkoff is assigned to the year 1650, and the name is at least popularly connected with that of Khariton, the Cossack originator of the settlement; but there is archxological evidence of a much earlier occupation of the district, if not of the site. The Cossacks of Kharkoff remained faithful to the czar dur- ing the rebellions of the latter part of the 17th century ; in return they received a variety of privileges, and continued to be a strong advance guard of the Russian power, till the final subjugation of all the southern region. Along with other military settlements Kharkoff was placed on a new footing in 1765; and at the same time it became the administrative centre of the Ukraine. It has been the government town from the establishment of the government in 1780. For plan sec Reclus, Géographie Universelle, vol. v. p. 807.

KHARPUT (officially Ma‘wurat-gL-‘Aziz), a town of Armenia, the seat of a mutasarrif, is situated about 60 miles north of Diarbekir on the highway to Siwas, and occupies a peculiarly picturesque position on a rocky eminence rising above the great plain through which the waters of the eastern Euphrates describe a devious pas- sage. Besides the imposing ruins of the castle on the height, it possesses an ancient Jacobite church and con- vent, and is the seat of an important American missionary college and schools. The population may be estimated at 25,000 or rather more, as there are 5000 households in the town (70 Jacobite, 500 Armenian, and the rest Turkish).

There is epigraphic evidence for the existence of a town on this | the plains, they form rapids and cascades, and many of them site in the time of Nero (see Mordtmann in Hermes, 1880), and by | pass through narrow gorges of wild beauty. From time

some it is identified with Carcathiocerta, the capital of the province of Sophene. Kharput (Armenian, Kharpert, 7.e., Castle Rock ; Xdpmwore of Cedrenus; Arabic, Khartabirt) appears in the older Arabic literature as Hisn Ziyad. It is the Quart Piert or Quart Pierre of William of Tyre, the scene of the tragical story of the imprisonment of Baldwin II. by the emir Balak. See Tozer, Turkish Armenia, &c., London, 1881.

KHARTUM or Kuartoum (erroneously Kartum), the chief town of the Egyptian Sudan, situated in 15° 37° N. lat., and 22° 54’ E. long., on the peninsula formed by the junction of the White and the Blue Nile. The level of the stream just below the town is 1240 feet. The principal landing-place and the dockyards are on the Blue river. The surrounding country is flat and open, the forest de- scribed by the first European visitors having disappeared for a considerable distance up the river, but there are many gardens within and around the town planted with date- palms, fig and orange trees, &c. The town, though con- sisting chiefly of mean mud-built huts, has a considerable number of substantial modern buildings, the most imposing of which is the stone-faced palace of the governor. As the centre of the great caravan routes from the interior of Africa, Khartim carries on a good legitimate trade, but the inhabitants have always shown a preference for slave traffic when the governor has proved indulgent or inefficient. Khartim is the seat of a Roman Catholic mission founded by Pope Gregory XVI. in 1846, and long conducted by Dr Ignaz Knoblecher, of Protestant missions, and of several European consulates. The British consulate, established in 1849, and latterly held by Petherick, was abolished in 1864 under circumstances which gave rise to much com- ment. The population amounts to 50,000, including in addition to the natives the usual medley elements of an Egyptian town.

Khartim was founded by Mohammed Aly in 1828. In 1859 the population was estimated at 40,000. In 1869-70 the disturbed state of the country had

brought the number down to 15,000, but since then the recovery has been rapid.

See Lord Prudhoe in Journ. R. Geog. Soc. 1832; G. Melly, Khartoum, &c., 1851; Heuglin, Reise n. Abessinien, 1868 ; Schwein- furth, Heart of Africa, 1873; Hansal, Briefe aus Chartwm, 1856 and 1880. Details regarding the Roman Catholic mission will be found in the last work; in Jahresberichte of the Marienverein , and in Zeitschr. f. allg. Erdk., 1858 and 1861.

KHASI AND JAINTIA HILLS, a district in Assam, India, lying between 25° 1’ and 26° 14’ N. lat., and 90° 47’ and 92° 52’ E. long., and bounded on the N. by Kamrip and Nowgong districts, E. by Cachar and the Ndgé Hills, 8. by Sylhet, and W. by the Garo Hills. Its approximate area is 6157 square miles,

The district consists of a succession of steep ridges running east and west, with elevated table-lands between. On the southern side, towards Sylhet, the mountains rise precipitously from the valley of the Barak. The first plateau is about 4000 feet above sea-level. Farther north is another plateau, on which is situated the station of Shillong, 4900 feet above the sea; behind lies the Shillong range, of which the highest peak rises to 6449 feet. On the north side, towards K4mriup, are two similar plateaus of lower elevation. The general appearance of all these table-lands is that of undulating downs, covered with grass, but destitute of large timber. At 3000 feet elevation the indigenous pine predominates over all other vegetation, and forms almost pure pine forests. The highest ridges are clothed with magnificent clumps of timber trees, which superstition has preserved from the axe of the woodcutter. The characteristic trees in these sacred groves chiefly con- sist of oaks, chestnuts, magnolias, &c. Beneath the shade grow rare orchids, rhododendrons, and wild cinnamon. The streams are merely mountain torrents. As they approach

immemorial, Lower Bengal has drawn its supply of lime from the Khasi Hills, and the quarries along their southern slope are literally inexhaustible. Coal of excellent quality crops out at several places, but has not yet been remune- ratively worked, Ironstone exists in abundance, and in former days the Khasias were renowned as smelters of iron. Among other natural products may be mentioned beeswax, lac, and caoutchouc. Wild animals

abound, including the elephant, rhinoceros, tiger, buffalo, mithun or wild cow, and many varieties of deer.

Both as regards history and administration the Khasi (Khasia or Cossya) and Jaintia or Jayntiya Hills constitute two separate tracts. The Khasi Hills are occupied by a collection of petty states, each governed by an elective ruler. The chiefs have not been brought completely under British administration, and still retain marks of semi-independence. The headquarters of the British political agent for the Khasi Hills is at Chara Punji (Cherra Poonjee). The Jaintia Hills, on the other hand, are purely British territory. The inhabi- tants call themselves Syntengs, and first became British subjects in 1835 (see JArntrIA HILLs, vol xiii. p. 554).

An enumeration in 1872 disclosed a total population in the Khasi and Jaintia Hills of 141,838—aboriginal tribes, 141,283 ; Hindus, 365; Mohammedans, 62; Christians, 128. The two races of Khasias and Syntengs have succeeded in preserving to the present day their primitive isolation, free from the interference of Hinduism. They have only given way somewhat to Hindu prejudices as regards purity of food. The Khasias have no written character or literature, nor even any traditions of theirown. The most curious of their social customs is the importance attached to female descent and female authority. The husband marries into the wife's family, the wife or her mother is regarded as the head of the household, and all property descends in the female line—a survival of the polyan- dric institutions still kept up in full force by the Nairs, and other non-Aryan tribes of India. The ashes of the dead are buried under cromlechs consisting of four upright slabs of stone, covered over by a fifth slab. The only places in the Khasi and Jaintia Hills above the rank of hamlets are Shillong, the headquarters station, Jowai, and Chara Punji.

The principal cercal crop is rice, but even of this they do not

grow sufficient for their own consumption. Sugar cane, cotton, and potatoes are also grown; and fruits such as oranges, limes, and pine-apples are raised in large quantities for export to Calcutta. The land is the absolute property of the cultivators, who pay no rent or revenuc either to the British Government or to their own chiefs. Blights, floods, and droughts are almost unknown. Of a total area of 6157 square miles, only 286 are estimated as

under cultivation, but other 3898 are returned as available for tillage. The trade of the hills is considerable. The estimated exports in 1876-77 were valued at £160,000, chiefly potatoes, limestone, cotton, stick-lac, bay leaves, oranges, and betel nuts. The im- ports were valued at £157,000. By far the greater portion of the trade is conducted at a row of markets along the southern foot of the hills, of which Chhatak in Sylhet district is the most important. – The Khasi and Jaintia Hills constitute a politieal agency, independent of the ordinary jurisdiction. The Khasi petty states, twenty- five in number, are presided over by elective chiefs, having jurisdic- tion over their own subjects in all cases except homicide. The British Government undertakes the management of the natural pro- ducts of the country, such as lime, coal, timber, and elephants, and pays over to the chiefs a half share of the profits. Their other sources of revenue are market dues, court fines, and various cesses. Their aggregate income is approximately estimated at £5000, of which £2300 is derived from lime quarries. The total revenue of the district to the British Government in 1875 was £13,383, of whieh the larger portion came from royalties on lime quarries and the house tax ; the expenditure was £9692. Education is conducted through the agency of the Welsh Calvinistic mission, and in 1874-75 there were seventy-three schools open, attended by 1666 pupils. Female education is making progress among. the Khasias. The climate of the district is mild and equable, though in some parts excessively humid. At Shillong the thermometer rarely exceeds 80° Fahr., and falls as low as 38°. Shallow water occasionally freezes, but snow never falls. The rainfall at Chara Punji is the heaviest recorded in the world. The average during the three years ending 1876 is returned at 68°41 inches ; and 805 inches are said to have fallen in 1861, including 366 inches in the single month of July. At Shillong the annual rainfall declines to about 85 inches; and at Jowai, which occupies an intermediate position, the average is 150 inches. The district is liable to shocks of earthquake. Generally speaking, the climate is healthy, both for natives and Europeans. Cholera never prevails, unless directly imported from the plains.

KHATMANDU, the capital of the kingdom of Nepdl, | whilst Ahmed ibn Fadlan, who passed through Khazaria on a

India, situated on the bank of the Vishnumati river at its junction with the Baghmati, 27° 36’ N. lat., 85° 24’ E. long. The town, which is said to have been founded by Raj4 Gunak4madeva about 723, now contains a population estimated at about 50,000, occupying 5000 houses made of brick, and usually from two to four stories high. Many of the houses have large projecting wooden windows or balconies, richly carved. The mahardja’s palace, a huge, rambling, ungainly building, stands in the centre of the city, which also contains numerous handsome temples. The streets are extremely narrow, and the whole town very dirty. A British resident, with a small staff and escort, is stationed about a mile to the north of the city.

KHAZARS. This vanished people, who appear also as Chozars, as “Axdéripor or Xdfapor in Byzantine writers, as Khazirs in Armenian and Khwalisses in Russian chronicles, Ugri Bielii in Nestor, and Kosa (2) in Chinese, occupied a prominent place amongst the secondary powers of the Byzantine state-system. In the epic of Firdousi “ Khazar” is the representative name for all the northern foes of Persia, and legendary invasions long before the Christian era are vaguely attributed to them. But the Khazars are an historic figure upon the borderland of Europe and Asia for at least nine hundred years (190-1100 a.v.). The three hundred and fifty years 600-950 a.v. mark the epoch of their greatness, but their rise can be traced for four centuries before, and their decline for one hundred and fifty years to follow. Their home was in the spurs of the Caucasus and along the shores of the Caspian—the “sea of the Khazars”; and their cities, all of them popu- lous and civilized commercial centres, were J¢z/, the capital, upon the delta of the Volga, the “river of the Khazars,” Semender (Tarkhu), the older capital, Khamlidje or Khal- endsch, Belendscher, the outpost towards Armenia, and Sarkel on the Don. They were the Venetians of the Caspian and the Euxine, the organizers of the transit between the two basins, the universal carriers between East and West; and Itil was the meeting-place of the commerce of Persia, of Byzantium, of Armenia, of Russia, and of the Bulgarians of the middle Volga. The tide of their dominion ebbed and flowed repeatedly during their history, but the normal

Khazaria may be taken as the territory included between the Caucasus, the Volga, and the Don, with the outlying province of the Crimea or “Little Khazaria.” The southern boundary never greatly altered ; it did at times reach the Cyrus and the Araxes, but on that side the Khazars were confronted by the great powers of Byzantium and Persia, and were for the most part restrained within the passes of the Caucasus by the fortifications of Dariel. Amongst the nomadic Ugrians and agricultural Slavs of the north their frontier fluctuated widely, and in its zenith Khazaria extended from the Dnieper to Bolgari upon the middle Volga, and along the eastern shore of the Caspian to Asterabad.

Ethnology.—Few points have been more disputed than the origin of this interesting people ; and there is still no consent amongst authorities upon the subject. They are assigned to the Turkish stock by Latham and Howorth, to the Ugrian by Klaproth and Vivien St Martin, and have even been claimed as Jews on account of their use of the Hebrew character and the profession of the Hebrew faith amongst them. But their geographical position, their history, and the contemporary witness we have as to their physical character, their language, and their own national tradition, may be accepted as conclusive proof that the Khazars were an indigenous people of the Caucasus, and near akin to the Armenians and the Georgians.

Their king Joseph, in answer to the inquiry of the Rabbi Chasdai Ibn-Shafrfit of Cordova (cire. 958) stated that his pcople sprang from Thogarmah, grandson of J aphet, and the supposed ancestor of the other peoples of the Caucasus. The Arab geographers who knew the Khazars best connect them either with the Georgians (Ibn el Athir) or with the Armenians (Dimishqy, ed. Mehren, p. 263) ;

mission from the caliph Moktadir (921 a.p.), ositively asserts that the Khazar tongue differed not only from ie Turkish, but from that of the bordering nations, which were Ugrian.

Nevertheless there are many points connected with the Khazars which indicate a close connexion with Ugriau or Turkish peoples. The official titles recorded by Ibn Fadlan are those in use amongst the Tartar nations of that age, whether Huns, Bulgarians, Turks, or Mongols. The names of their cities can be explained only by refer- ence to Turkish or Ugrian dialects

(Klaproth, Mém. sur les Khazars 3 Howorth, Khazars). Some too amongst the medieval authori- ties (Ibn Haukal and Istakhry) note a resemblance between the speech in use amongst the Khazars and the Bulgarians; and the modern Magyar—a Ugrian dialect—can be traced back to a tribe which in the 9th century formed part of the Khazar kingdom. These characteristics, however, are accounted for by the fact that the Khazars were at one time subject to the Huns (448 .p. et seq.), at another to the Turks (circ. 580), which would sufficiently.explain the signs of Tartar influence in their polity, and also by the testimony of all observers, Greeks, Arabs, and Russians, that there was a double strain within the Khazar nation. There were Khazars and Kara (black) Khazars. The ‘“ Khazars” were fair-skinned, black-haired, and of a remarkable beauty and stature ; their women indeed were sought as wives equally at Byzantium and Baghdad; while the “Kara Khazars” were ugly, short, and were reported by the Arabs almost as dark as Indians. The latter were indubitably the Ugrian nomads of the steppe, akin to the Tartar invaders of Europe, Huns, Bul- garians, and Hungarians, who filled the armies and convoyed the caravans of the ruling caste. But the Khazars proper were a civic commercial people, the founders of cities, remarkable for somewhat elaborate political institutions, for persistence, and for good faith— all qualities foreign to the Hunnic character.

They are identified with good reason (by Zeuss, V. St Martin, Howorth, Latham) with the “Axdr¢ipo: (perhaps Ak-Khazari, ‘“White Khazars”) who appear upon the lower Volga in the Byzantine annals, and thence they have been deduced, though with less convincing proof, either from the ’Ayd@vpoo: or the Karfapor of Herodotus, iv. 104 (Latham, V. St Martin). There was throughout historic times a close connexion which eventually amounted to political identity between the Khazars and the Barsilcens (the Passils of Moses of Chorene) who occupicd the delta of the Volga; and the Barsileens can be traced through the pages of Ptolemy (Geog., v. 9), of Pliny (iv. 26), of Strabo (vii. p. 306), and of Pormponius Mela (ii. c. 1, p. 119) to the so-called Royal Scyths, Sxv@o1 Bactafes, who were known to the Greek colonies upon the Euxine, and whose political superiority and commercial enterprise led to this rendering of their name. Such points, however, necd not here be further pur- sued than to establish the presence of this white race (‘‘ La Race Blonde ” of Klaproth) around the Caspian and the Euxine through- out historic times. They appear in European history as

White Huns (Ephthalites), White Ugrians (Sar-ogours), White Bulgarians. They were the carriers between Europe and the farthest East. Owing to climatic causes (see Asta) the tract they occupied was slowly drying up. They were the outposts of civilization towards the encroaching desert, and the Tartar nomadism that advanced with it. They held in precarious subjection the hordes whom the conditions of the climate and the soil made it impossible to supplant. They bore the brunt of each of the great waves of Tartar conquests, and were even- tually overwhelmed.

History.—¥rom out of the mass of this white race of the steppe the Khazars can be first historically distinguished at the end of the 2d century of our era. They burst into Armenia with the Barsileens, 198 A.D. They were repulsed and attacked in turn, but thenceforth Khazar wars occupy a prominent place in the Armenian annals for eight hundred years. The pressure of the nomads of the steppe, the quest of plunder or revenge, these seem the only motives of these early expeditions ; but in the long struggle between the Roman and Persian empires, of which Armenia was not seldom the battlefield, and eventually the prize, the attitude of this powerful people of the Caucasus assumed political importance. Armenia inclined to the civilization and cre long to the Christianity of Rome, whilst her Arsacid princes maintained an inveterate feud with the Sassanids of Persia. It became therefore the policy of the Persian kings to call in the Khazars to neutralize or to chastize the efforts of the Armenians in every collision with the empire (200-350). During the 4th century, however, the growing power of Persia culminated in the annexation of eastern Armenia. The Khazars, endangered by so powerful a neighbour, passed from under Persian influence into that remote alliance with Byzantium which thenceforth characterized their policy, and they aided Julian in his invasion of Persia (368). Simultaneously with the approach of Persia to the Caucasus the terrible empire of the Huns sprang up among the Ugrians of the northern steppes. The Khazars straitened on every side remained passive till the danger culminated in the accession of Attila (434). The emperor Theodosius, with reason terrified for civilization, sent envoys to bribe the Khazars (‘And7 (pot) to divert the Huns from the empire by an attack upon their

flank. But there was a Hunnic party amongst the Khazar chiefs. The design was betrayed to Attila ; and he extinguished the independence of the nation in a moment. Khazaria became the appanage of his eldest son, and_the centre of government amongst the eastern subjects of the Hun (448). Even the iron rule of Attila was preferable to the time of anarchy that succeeded it. Upon his death (454) the wild immigration which he had arrested revived. The Khazars and the Sarogours (7.¢., White Ogors, possibly the Barsileens of the Volga delta) were swept along in a flood of mixed Tartar peoples which the conquests of the Jouan Jouan (the Avars) had set in motion. The Khazars and their com- panions broke through the Persian defences of the Caucasus. They appropriated the territory up to the Cyrus and the Araxes, and roamed at large through Iberia, Georgia, and Armcnia. The Persian king, deeming the floodgates of the steppes opened, implored the emperor Leo I. to help him defend Asia Minor at the Caucasus (457), but Rome was herself too hard pressed, nor was 1t for fifty years that the Khazars were driven back, and the pass of Derbend fortified against them (circ. 507). ‘

Throughout the 6th century Khazaria was the mere highway for the wild hordes to whom the Huns had opened the passage into Europe, and the Khazars took refuge (like the Venetians from Attila) amongst the seventy mouths of the Volga. The rise of the first Turk empire in Asia (554) precipitated the Avars upon the West. The conquering Turks followed in their footsteps (560-580). They beat down all opposition, wrested even Bosphorus in the Crimea from the empire, and by the annihilation of the Ephthalites completed the ruin of the White Race of the plains from the Oxus to the Don. The empires of Turks and Avars, however, ran swiftly their barbaric course, and the Khazars arose out of the chaos to more than their ancient renown. They issued from the land of Barsilia, and extended their rule over the Bulgarian hordes left masterless by the Turks, compelling the more stubborn to migrate to the Danube (641). The agricultural Slavs of the Dnieper and the Oka were reduced to tributc, and before the end of the 7th century the Khazars had annexed also the Crimea, had won com- plete command of the Sea of Azoff, and, seizing upon the narrow neck which separates the Volga from the Don, had organized the portage which has continued since an important link in the traffic between Asia and Europe. The alliance with Byzantium was revived. Simultaneously and, we cannot

doubt, in concert with the Byzantine campaign against Persia (589), the Khazars had re- appeared in Armenia, though it was not till 625 that this people, long known to Persians and Armenians as Khazirs and to the Ronians as Akatzirs, take thcir place as Khazars in the Byzantine annals. They are then described as ‘Turks from the Kast,” a powerful nation which held the coasts of the Caspian and the Euxine, and took tribute of the Viatitsh, the Severians, and the Polyane. The khakan, enticed by the promise of an imperial princess, fur- nished Heraclius with 40,000 men for his Persian war, who shared in the victory over Chosroes at Nineveh.

Meanwhile a power had arisen which transformed the whole course of Eastern politics and committed the Khazars to a struggle for life which lasted two hundred years. Mohammed had proclaimed

his faith, and the Saracens were advancing to enforce it. The Persian empire was struck down (637), and the Moslems poured into Armenia. The khakan had defied the summons seut him by

the invaders, and he now aidcd the Byzantine patrician in the defence of Armenia. The allies were defeated ; and ere long the Moslems undertook the subjugation of Khazaria (651). It was the beginning of eiglity years of ceaseless, obstinate, ineffectual warfare. Ten great invasions of Khazaria through the pass of Derbend are recorded, and many a retributive raid upon the Moslems ; but in the end their fanaticism and enormous superiority in numbers pre- vailed. The khakan and his chieftains were captured and compelled to embrace Islam (787), and till the decay of the Mohammedan empire Khazaria with all the other countries of the Caucasus paid an annual tribute of children and of corn (737-861). Nevertheless, though overpowered in the end, the Khazars had protected the plains of Europe from the Mohammedans, and made the Caucasus the limit of their conquests.

In the interval between the decline of the Mohammedan empire and the rise of Russia the Khazars reached the zenith of their power. The merchants of Byzantium, Armenia, and Baghdad met in the markets of Itil (whither since the raids of the Mohammedans the capital had been transferred from Semender), and traded for the wax, furs, leather, and honey that came down the Volga. ‘So important was this traffic held at Constantinople that, when

the portage to the Don was endangered by the irruption of a fresh horde of Turks (the Pctchenegs), the emperor Theophilus himself despatched the materials and the workmen to build for the Khazars a fortress impregnable to their forays (834). Famous as the one stone structure is in that stoneless region, the post became known far and wide amongst the hordes of the steppe as Sar-kel or the White Abode. Merchants from every nation found protection justice, and perfect good faith in the Khazar cities. The Jews, expelled from Constantinople, sought a home amongst them, de-

veloped the Khazar trade, and contended with Mohammedans and Christians for the theological allegiance of the pagan people. The dynasty aecepted J udaism (circ. 740), but there was equal tolerance for all, and each man was held amenable to the authorized code and to the official judges of the faith which he professed. At the Byzantine court the khakan was held in high honour, The emperor Justinian Rhinotmetus took refuge with him during his exile and married his daughter, 702. Justinian's rival Bardanes in turn sought an asylum in Khazaria, and in Leo IV. (775) the grandson of a Khazar sovereign ascended the Byzantine throne. Khazar troops were amongst the bodyguard of the imperial court ; they fought for Leo VI. against Simon of Bulgaria (888); and the khakan was honoured in diplomatic intercourse with the seal of three solidi, which marked him as a potentate of the first rank, above even the pope and the Carlovingian monarchs. Indeed his dominion became an object of uneasiness to the jealous statecraft of Byzantium, and Constantine Porphyrogenitus, writing for his son's instruction in the government, carefully enumerates the Alans, the Petchenegs, the Uzes, and the Bulgarians as the forccs he must rely on to restrain it.

It was, however, from a power that Constantine did not consider that the overthrow of the Khazars came. Long before, when a band of Slav prisoners was brought into the Khazar camp, a sage had prophesied—" These men's swords have two edges ; ours have but one. We conquer now; but some day they will conquer us." The arrival of the Varangians amidst the scattered Slavs (862) had now united them into a nation and launched them upon that career of conquest which within a hundred years carried the

Russian arms to the Balkans and the Caucasus. The advance of the Petchenegs from the East gave the Russians their opportunity. Before the onset of those fierce invaders the precarious suzerainty of the khakan broke up. By calling in the Uzes, the Khazars did indeed dislodge the Petchenegs from the ig they had seized in the heart of the kingdom between the Volga and the Don, but only to drive them inwards to the Dnieper. The Hungarians, severed from their kindred and their rulers, migrated to the Car- pathians, whilst Oleg, the Russ prince of Kieff, i. through the Slav tribes of the Dnieper basin with the cry ‘‘ Pay nothing to the Khazars” (884). The kingdom dwindled rapidly to its ancient limits between the Caucasus, the Volga, and the Don, whilst the Russian traders of Novgorod and Kietf supplanted the Khazars as the carriers between Constantinople and the north. When Ibn Fadlan visited Khazaria forty years later, Itil was even yet a great city, with baths and market-places and thirty mosques. But there was no domestic product nor manufacture ; the kingdom depended solely upon the now precarious transit dues ; and the king or great khakan was a roi fainéant hidden from the sight of men, the actual adininistration being in the hands of a major domus also called khakan. At the assault of Swiatoslav of Kieff the rotten fabric crumbled into dust. His troops were equally at home on land and water. Sarkel, Itil, and Scmender surrendered to him (965-969). He pushed his conquests to the Caucasus, and established Russian colonies upon the Sea of Azoff. The principality of Tmoutorakan, founded by his grandson Mstislav (988), replaced the kingdom of Khazaria, the last trace of which was extinguished by a joint expedi- tion of Russians and Byzantines (1016). The last of the khakans, George Tzula, was taken prisoner. A remnant of the nation took refuge in an island of the Caspian (Siahcouyé¢); others retired to the Caucasus ; part emigrated to the district of Kasakhi in Georgia, and appear for the last time joining with Georgia in her successful effort to throw off the yoke of the Seljuk Turks (1089). But the name is thought to survive in ‘‘ Kadzaria,” the Georgian title for Mingrelia, and in ‘‘ Kadzaro,” the Turkish word for the Lazes, Till the 13th century the Crimea was known to European travellers as ‘‘Gazaria” ; the ‘‘ ramparts of the Khazars” are still distinguished in the Ukraine; and the record of their dominion survives in the names of Kazarek, Kazaritshi, Kazarinovod, Kozar-owka, Kozari, and Kazan (Schafarik, ii. 65).

Authorities. —Khazar: The letter of King Joseph to R. Chasdai Ibn Shafrfit, first published by J. Akrish, Kol Mebasser, Coustantinople, 1577, and often reprinted in editions of Jelhuda hal-Levy's Kuzart. German translations by Zedner (Berlin, 1840) and Cassel, Magyar. Alterth., Berlin, 1848; French by Carmoly, Rev. Or, (1841). Comp. Harkavy, Russische Revue, iv. 69; Graetz, Geschichte, v. 864; and Carmoly, /tineraires de la Terre Sainte, Brusscls, 1847. Armenian: Moses of Chorene; comp. Saint-Martin, Mémoires Historiques et Géographiques sur ' Armenie, Paris, 1818, Arabic: The account of Ibn Fadlin (921) is preserved by Yakft, ii. 486 sg. See also Istakhry (ed. de Goeje, p. 220 sq.), Mas'tidy, chap. xvii. 406 sq. of Sprenger's translation ; on Haukal (ed. de Goeje, p. 279 sg.), and the histories of Ibn el Athir and Tabary. Much of the Arabic material has been collected and translated by Fraehn, '' Veteres Memorix Cha- sarorum," in Mém. de St Pet., 1822; Dorn (from the Persian Tabary), Mém. de St Pet., 1844; Dufrémery, Journ. As., 1849. See also D'Ohsson's imaginary Voyage @Abul Cassim, based on these sourccs. Byzantine Historians: The relative passages are collected in Stritter's Memori# Populorum, St Petersburg, 1778, Russian: The Chronicle ascribed to Nestor.

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tudes de Géog. Ancienne, Paris, 1850; Id., Recherches sur les populations au Caucase, 1847; Id.,"*Sur les Khazars," in Nouvelles Ann, des Voyages, 1851; D'Ohsson, Peuples du Caucase, Paris, 1826. @. L. G.)

KHE—KH EE

KHELAT, the capital of Baluchistan, and the residence of the reigning khan, is situated, at an elevation of 6800 feet above the sea, in 29° N. lat., and 66° 40' E, long., in a narrow valley, which is bounded to the east by the mountain ranges extending to the province of Cutch Gundava; to the west is the Sha Mirdan, on the northern slope of which hill the town is built; to the south the valley is closed by low hills, while to the north it is of sufficient breadth to allow space for two or three small villages. Through the centre of this valley runs a mountain torrelt, which is generally dry, but after heavy

rain pours down a considerable body of water. The town is surrounded by a mud wall about 30 feet in height, which is pierced by three gateways. The houses are built of mud, and number from three to four hundred; the streets are narrow and tortuous; it possesses a tolerably well supplied bazaar. A iniri or citadel, having an imposing appearance, dominates the town, and contains within its walls the palace of the khan, Jt was in an upper room of this residence that Merab Khan, then ruler of Baluchistan, was killed during the storming of the town and citadel by the British troops at the close of the first Afghan war in 1839. The suburbs of Khelat are comparatively extensive, and contain from 10,000 to 12,000 inhabitants, which number, however, fluctuates according to the season, as well as with the political events passing in the country. There are to be found both in the town and suburbs residents representing inany of the countries of Asia, viz., Hindus, Brahoes, Dehwars, Babé, Afghans, Persians, and Baluchis. The Hindu community forms the principal trading class, a fair proportion of which, however, includes the Babé tribe, while agriculture is almost entirely in the hands of the Dehwar tribe. The town is well supplied with excellent water, principally from a spring situated in the eastern side of the valley ; this water is also used for irrigating the numerous enclosed gardens studded about, in which are grown most of the fruit trees to be found in European climates, including the vine, apricot, apple, and mulberry ; vegetables of all descriptions thrive to perfection. The climate of Khelat is peculiarly dry and pure, nor is there heat during the summer months that can be called oppressive. The citadel, although offering an imposing appear- ance, has in reality no military value, and could offer no resistance to the artillery in use at the present day. It is quite impossible to give an idea of the period of the building of Khelat, though there can be no doubt that it is of very ancient origin, long prior to the Mohammedan era ; but, as political events have now brought England into close friendly relations with the Baluch state, we may look forward to the unravelling of many traditions which now surround and obscure the history of Baluchistan and its capital.

KHERI, a district of Oudh, India, lying between 27° 41’ and 28° 42’ N. lat., and 80° 4’ 30” and 81° 23’ E. long., bounded on the N. by the river Mohan, separating it from Nepal, E. by the Kauridla river, separating it from Bhardich district, S. by Sitapur district, and W. by Shahjahénpur district in the North-Western Provinces, with an area of 2963 square miles.

Kheri district consists of a series of fairly elevated plateaus, separated by rivers flowing from the north-west, each of which is bordered by a belt of alluvial land. The rivers are, commencing from the east, the Kauridla, Suheli, Dahiwar, Chauka, Ul, Jamwari, Kathna, Gumti, and Sukheta. North of the Ul, the country is considered very Unhealthy. This tract probably formed in ancient times the bed of a lake, through which flow two rivers, the Kauridla and Chauka, changing their courses constantly, So that the whole surface is seamed with deserted river beds much below the level of the surrounding country.

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The vegetation is very dense, and the stagnant waters are the cause of endemic fevers. The people reside in the neighbourhood of the low ground, as the soil is more fertile and less expensive to cultivate than the forest-covered uplands. South of the Ul, the scene changes. Between every two rivers or tributaries stretches a plain, considerably less elevated than the tract to the north. There is very little slope in any of these plains for many miles, and marshes are formed, from which emerge the head-waters of many secondary streams, which in the rains become dangerous torrents, and frequently cause devastat- ing floods. The general drainage of the country is from north-west to south-east. Several large lakes exist, some formed by the ancient channels of the northera rivers being fine sheets of water, from 10 to 20 feet deep and from 3 to 4 miles long ; in places they are fringed with magnificent groves. In the south there are some other large natural lakes. The whole north of the district is covered with vast forests—occupying an area of 650 square miles, of which 423 square miles are now Government reserves. Sdl occu- pies about two-thirds of the whole forest area. Kankar (nodular limestone) of good quality is met with, and salt- petre is manufactured in large quantities. The wild animals include tigers, leopards, black buck, spotted deer, hogdeer, and nilgdz.

At the census of 1869 the population was returned at 746,350 (males 403,837, females 842,518)—Hindus, 671,686; Mohammedans, 74,307 ; Christians, 96; “others,” 261. Allowing for recent transfers, the latest return (based on the above census) gives the population at 739,283. All the towns now existing are of recent foundation, none dating earlier than the 16th

century. Of their origin, one common tale is told. The Musalman or Rajput founder came through tho woods and marshes, and seized upon the slight hills or hammocks upon which some Pasi or Ahir patriarcli ruled over a few mud huts. The rightful owner fled deeper into the forest, and the intruder built a block house or a brick fort to guard against his return. Only three towns in 1869 contained upwards vf 5000 inhabitants, namely, Kheri, Muhamdi, and Oel, with an aggregate population of 19,087. Lakhimpur, the civil station, is the only municipality in the district. The area under the chief agricultural products is re- turned as follows:—rice, 166,811 acres; wheat, 135,081; other food grains, 851,133; oil-seeds, 29,380; sugar-cane, 41,065; cotton, 6739 ; tobacco, 8265 ; vegetables, 6644; fibres, 419 acres. Poppy and indigo are also cultivated. District manufactures are con- fined to weaving and cotton printing for local requirements. Grain of all kinds is exported, as also are turmeric, tobacco, timber, sugar, syrup, hides, bullocks, and ght. Catechu is made in large quan- tities throughout the north of the district, from the khair treo (Acacia Catechu), the heart-wood of which is chopped out and boiled down by a caste called Khairis. Khaskhas (Andropogon muricatum), the roots of which are used for matting tatti screens, is exported in large quantities to Benares and Patna. Two great annual religious trading fairs are held at Gola Gokarannath—one in January attended by about 50,000 people, and the other in February, lasting about fifteen days, at which 150,000 persons are said to assemble. This great fair is incrcasing rapidly in importance, goods to the value of about £15,000 being sold annually by traders from all parts of India. The inrports, which consist mainly of cotton, salt, country cloth, and English piece goods, considerably exceed the exports in value. The district revenue in 1870 amounted to £74,132, of which £62,471 was derived froin the land-tax. In respect of education, Kheri is the most backward district in Oudh. The mean annual temperature is about 79° Fahr.; the mean rainfall during the eleven years ending 1874 was 47°3 inches.

The present district only dates its history as an administrative unit from 1858. At the time of the mutiny of 1857 it was divided between the districts of Muhamdi and Mallapur, and was not con- stituted a separate district till the reorganization of the province on the pacification of the country.

KHERSON, a government of European Russia, on the borders of the Black Sea, and conterminous with Bess- arabia, Podolia, Kieff, Ekaterinoslaff, and Taurida, The area is estimated at 27,455 square miles. Especially in the south the general aspect of the country is that of an open steppe, and almost the whole government is destitute of forest. The Dniester masks the western and the Dnieper the eastern boundary, and the Bug, the Ingul, and several minor streams traverse the intermediate

territory. Along the shore lie a number of extensive lagoons. Chalk, saltpetre, salt, sandstone, and a lime- stone conglomerate largely used for building are the principal minerals. Besides the ordinary cereals, maize, hemp, flax, tobacco, and mustard are pretty commonly grown; the fruit trees of general cultivation include the cherry, the plum, the peach, and the mulberry; and gardening receives a large amount of attention. The agricultural condition of the government has been greatly improved by the presence of numerous German colonies. Cattle-breeding, horse-breeding, and sheep farming are pursued on a large scale. Some of the sheep farmers have as many as 30,000 or 40,000 merinos, and only a very small proportion of the 2,500,000 sheep in the govern- ment are of unimproved varieties. The value of the total industrial production has been estimated at upwards of £2,500,000,—the more important departments being the manufacture of wool, hemp, leather, and flour. The ports of Khergon, Otchakoff, Nikolaieff, and more especially Odessa are among the great outlets of Russian commerce ; and Berislaff, Alexandriya, Elizabethgrad, Voznesensk, Olviopol, and Tiraspol play an important part in the inland trafic. In 1871 the total population of the government was 1,661,892; and besides Great and Little Russians it comprised Roumanians, Servians, Poles, Greeks, Germans, Gipsies, while no fewer than 44,107 were returned as Roman Catholics, 48,902 as Protestants, 3183 as Arme- nians, and 128,312 as Jews. There are six administrative districts—Alexandriya, Ananieff, Elizabethgrad, Kherson, Odessa, and Tiraspol. The towns with more than 5000 inhabitants are Odessa (184,820 in 1873), Nikolaieff (82,800), Elizabethgrad (35,200), Tiraspol (16,700), Ananieff (16,000), Alexandriya (10,520), Novo-Georgievsk or Kruiloff (10,225), Voznesensk

(9450), Berislaff (8080), Bobrinetz (7150), Gregoriopol, Dubosarui, Novo-Mirgorod, Olviopol, and Otchakoff.

Kuerson, the chief town of the above government, is situated on the right bank of the Dnieper, about 19 miles from its mouth. Founded by Prince Potemkin in 1778 as a naval station and seaport, it had become by 1786 a place of 10,000 inhabitants, and, although its progress was checked by the rise of Odessa and the removal (in 1794) of the naval establishments to Nicolaieff, it has still a popu- lation of more than 46,000. The Dnieper at this point breaks up into several arms, forming islands overgrown with reeds and bushes; it is difficult to maintain a deep navigable channel, and vessels of burden must anchor at Stanislavskoe Selo, a good way down the stream. Of the traffic on the river the largest share is due to the timber trade, and wool-dressing is the only extensive local in- dustry. Kherson is a substantial and regular town. The cathedral is interesting as the burial-place of Potemkin, and near the church of the Assumption lie the remains of John Howard, the English philanthropist. The fortifications have fallen into decay. The name Kherson was given to the town from the supposition that the site had formerly been that of Chersonesus Heracleotica, the famous Greek city founded by the Dorians of Heraclea.

KHIVA, an indepeudent Uzbeg khanate of Turkestan, which occupies the fertile oasis stretching in a band of varying width along fhe left bank of the lower Oxus between Pitniak and the Sea of Aral. The inhabited dis- trict, which lies between 41° and 43° N. lat., and 59° and 61° 30’ E. long., and practically forms the limits of the khanate, is about 200 nuiles in length and has an average breadth of 25 to 30 miles-—an area therefore of some 5000 to 6000 square miles.

This tract of territory is but a meagre relic of the great kingdom which under the name of Chorasmia, Kharezm

(Khwérizm), or Urgentch held the keys of the mightiest

KHE—KHtI

river in Central Asia, and formed in consequence a precious jewel for rivalry among Eastern potentates from an early period of the world’s

history. Great alterations, geogra- phically and politically, have taken place since those times. The Oxus has changed its outlet, and no longer forms a water-way to the Caspian and thence to Europe. A great European power has arisen which has made gradual but important encroachments in Asia, and between this power on the north and the independent Turcoman tribes on the south the authority of the khan of Khiva has been dwarfed and circumscribed within the narrow limits above indicated.

From the establishment of the Russians on the lower Jaxartes in 1847 dates the decline in power of the khan of Khiva. Prior to that year the khan claimed sovereignty from the Caspian on the west to the confines of Khokand and Bokhara on the east, and from the northern margin of the Ust Urt and the Jaxartes on the north to the mountain range forming the Persian frontier on the south, including Merv. Within these limits his authority was recognized, although towards the extremities this was merely nominal. Since that year the Russians have annexed the country between the lower Jaxartes and Oxus, established the large trans-Caspian military district on the east shore of the Caspian, and conquered the Akhal Tekke country, thereby hemming in the Khivans onall sides. The Russians have, moreover, by imposing a large indemnity (two millions of roubles) for the campaign of 1873, so crippled the finances of the state that the khan, though nominally independent, is in reality a vassal and in a state of complete subjection to his more powerful neighbours. A Russian military force now watches the khanate from Forts Petro-Alexandrovsk and Nukus on the right bank of the Oxus, the former fort being within 35 miles of the capital.

History.—It would be impossible to trace here, even in the briefest manner, the changes through which Kharezm lias passed, under the successive waves of migration and conquest which have swept across the eountry in ancient and historic times. The present insignificance and the eventual disappearance of the khanate from the map of Turkestan in the near future being intimately connected with the extension eastward of Russia, it will be more profitable to trace its history after its first connexion with that power.

Russia commenced her relations with Khiva in the 17th century. The warlike Cossacks of the Yaik during their raids across the Caspian learnt of the existenee of the rich territory of Khiva, and made an expedition to the

chief town, Urgentch, at a time when the khan and his troops were absent. They carried off a large number of women and a rich booty, but were overtaken on their road home by the Khivans and killed to a man. Two subsequent expeditions under Atamans Nechai and Shemai proved equally disastrous to the Cossacks. These three expedi- tions were simply the raids of freebooters. In 1717, how- ever, Peter the Great, having heard of the presence of auriferous sand in the bed of the Oxus, and desiring also to "open mercantile relations with India through Turan" and to release from slavery some Russian subjects, sent a properly equipped military force to Khiva. The com- mand of the expedition, which consisted of 3300 men and six guns, with three months' provisions, was entrusted to Prince Bekovitch Tcherkassky. After establishing a forti- fied base of operations on the east shore of the Caspian, Bekovitch collected his forces at the mouth of the Ural and thence marched across the Ust Urt into Khivan territory. When within 100 miles of the capital he was encountered by the forces of the khan. The battle lasted three days, and ended in victory for the Russian arms. The Khivans, however, induced the victors to break up their force into small detachments in order to facilitate supply,

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and then treacherously aunihilated them in detail. This disaster did not prevent the Russians from sending embassies from time to time to the khan, but the representations of the envoys did not induce him to desist from enslaving Russian subjects or even to free those already in bondage. The Persian campaign which subsequently followed, the designs in other parts of Central Asia, and the constant embroilment of Russia in European wars caused Khivan affairs to recede temporarily to the background, and it was not until the third decade of the 19th century that the attention of the Muscovite Government was again directed to the khanate. In 1839 a force under General Perovsky, consisting of three and a half battalions, three Cossack regiments, and twenty-two guns, in all 4500 men, with a large train of camels, moved from Orenburg across the Ust Urt to the Khivan frontiers, in order to occupy the khanate, liberate the captives, and open the way for trade. This expedition likewise terminated in disaster. The inaccessi- bility of _Khiva was once more her safeguard. Before the force reached half-way towards its destination it was forced to return, in consequence of the

severity of the weather and the loss of life among the men and animals. These expeditions had convineed the Russians that for the effec- tive control of the relations of Khiva a nearer position must be sought. In 1847 they founded the Raiin fort at the mouth of the Jaxartes. As this advance deprived the Khivans not only of territory, but of a large number of tax-paying Kirghiz, while the establishment of a fort gave the Russians a base for further operations, a collision became sooner or later inevitable. For the next few years, however, the attention of the Russians was taken up with Khokand, their operations on that side culminating in the capture of Tashkend in 1865. Free in this quarter, they directed their thoughts once more to Khiva. In 1869 Krasnovodsk on the east shore of the Caspian was founded, and in 1871-72 the country leading to Khiva from dif- erent parts of Russian Turkestan was thoroughly explored and surveyed. In 1873 an expedition to Khiva was care- fully organized on a large scale, The forces placed at the disposal of General v. Kaufmann started from three different bases of operation—Krasnovodsk, Orenburg, and Tashkend. The whole force consisted of more than 10,000 men. Khiva was occupied by the Russians almost without opposition. All the territory (35,700 square miles, and 110,000 souls) on the right bank of the Oxus was annexed to Russia and formed into the Amu Daria sub-district, while a heavy war indemnity was imposed upon the khanate. The difficult position financially in which the khan is thereby placed has more than once impelled him to beg the Russians to take the country under their administra- tion. Russia, however, prefers the present arrangement of maintaining Khiva semi-independent instead of in complete subjection, for, not only does the collection of the indemnity fall upon the Khivan authorities, but the country shields the Russian possessions on the Oxus from the attacks of the Turcomans, which if made must first come in contact with the intervening territory of Khiva.

Topography.—The Khivan oasis is indebted for its fertil- ity to the waters of the Oxus, which by means of irrigating canals and ditches penetrate into what was at one time barren steppe. Where this water reaches the land teams with life; where it ends all is death and a waste. The area of sandy desert reclaimed by the Oxus is estimated by the late Major Wood, Madras Engineers, at 14 millions of acres. The soil of the khanate is a tenacious clay of a red and grey colour, more or less impregnated with sand, —the detritus brought down by the river. Black earth is seldom seen ; but earth

strongly impregnated with salt is frequently found. The oasis is generally level, except Some unimportant heights and sand-hills.

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That part of the Oxus which waters the khanate has at Pitniak a north-west direction, and flows within a single bed. Below Kipchak it bends sharply to the west, and, after describing part of a semicircle to Hodjeili and giving off the Laudan, which with the Usboi forms the ancient course of the Oxus, resumes its north-west course to Kun- grad. There it takes a north direction, dividing into two branches, the Taldyk and Ulkun, the latter the principal arm, and ultimately disembogues by many channels into the Sea of Aral. The banks of the river are generally low, and in midsummer do not stand more than 6 to 20 feet above the level of the water. The river is in flood three or four times a year, the chief periods being in April and May, when it overflows its banks and does much damage to the canal dams. The average velocity is about 3 miles an hour, but at times of inundation the current becomes much more rapid. The breadth of the river at ordinary times varies from } to ? mile, but inereases to 3 or more miles at inundations. There are no obstacles to navigation in the shape of rapids, but the shifting of the sand banks acts as an impediment. The water of the Oxus is whole- some, although of a yellowish-brown colour, which is due to particles in suspension. These particles are gritty, and unlike the mud of the Nile do not fertilize the ground. The deposit from the water when dried is used by the Khivans to form their dams. In consequence of the large body of matter brought down, the irrigating canals require constant clearing. These canals vary from 20 to 150 feet in breadth, and from 10 to 20 feet in depth, and are some- times as much as 80 miles long. They have a current of about 2 miles an hour, and are mostly navigable by boats. The direction of the canals is west and north-west, from which it may be concluded that the left bank of the river has a natural slope towards the Caspian. By actual measure- ment it has been found that the fall of the ancient bed is 400 feet from the point near Kipchak where it had its origin to Balkhan Bay in the Caspian,—a distance of 500 miles.

From the statement of Abulghazi Khan and other proofs there can be little doubt that two hundred and fifty years ago the Oxus flowed into the

Caspian through the Usboi, which was connected with the present channel by at any rate three arms—Daudan, Daryalik, and Lauzan or Laudan. The alteration in the course of the river was probably due to the gradual elevation of the land where the old bed passed, from which naturally resulted a diminution in the velocity of the stream, and at the same time a silting of the channel. From this cause the waters of the Oxus found for themselves another outlet. Whether the Russians will be able to carry out their scheme of forcing the Oxus to resume its old course to the Caspian it would be premature to offer an opinion, but the surveys at present are not favourable. The advantages to Russia would be great, as she would have a continuous waterway from the Volga to Afghanistan.

The khanate has numerous lakes, especially towards the Aral, connected together by affluents and canals. They are usually covered with reeds. Lake Aibugir, once a large inlet of the Aral, is now dry.

The means of communication in the khanate is by road and by water. ‘The roads are usually narrow, but some are as much as 70 feet wide. In spring and autumn, at the time of inundations, they are in bad order. Internal trade is carried on by camels and by carts.

Government.—The government is an absolute despotism, and, subject to a certain moral control exercised by the proximity of the Russians, is entirely in the hands of the khan. The chief secular officials are (1) the kush-begz or vizier, prime minister; (2) mehter, chancellor of the ex- chequer ; (3) ¢nakh, four in number, local governors ; (4)

metch-mehrem and batchman, controller and collector of customs respectively ; (5) by, the khan’s supporter in battle ; (6) minbashi, yuzbasht, and onbasht, belonging to the military class, now fast disappearing. The ulema or priests, of whom the nakib is the chief, are subdivided as follows : —(1) kazi kelan and kazi, judicial functionaries ; (2) alem, chief of the five muftis ; (3) reis, mufti, and akhond. The acknowledged religion is the Suni form of Mohammedanism. Justice is administered in the mosques and in the private dwellings of the cadis and muftis, but every Khivan subject has the right to prefer his complaint before the governor or even before the khan.

Revenue..—The khan’s revenue is derived from (1) the land-tax, paid in coin by all sedentary Khivan subjects, and in cattle (24 per cent.) by nomads; (2) a customs due on all incoming and outgoing caravans, and on the sale of cattle—2} per cent. ad valorem ; (3) the rent of crown lands. The revenue of certain districts is set aside for the support of the relatives of the reigning khan, and of the rest the greater part is exhausted in paying the large indem- nity imposed by the Russians after the campaign of 1873.

Population.—The inhabitants are partly sedentary and partly nomad. They include Uzbegs, Karakalpaks, Turco- mans, Sarts, Kizilbashes, and Arabs—the first three of Mongol origin, the rest of Aryan descent. The Uzbegs come from a Turk stock, and constitute the dominant class. Some few live in towns, but the bulk reside on their farms, where they occupy themselves in agriculture, gardening, silk cultivation, and fishing. Very few engage in trade. They are divided into tribes. The Karakalpaks, or ‘‘black- hats,” are supposed to be a clan of Uzbegs. They inhabit the lower part of the Oxus, and are mostly stock-breeders ; they are divided into tribes, and are nearly all nomadic. The Turcomans are of similar origin to the Uzbegs, and are divided into tribes, of which the chief are the Yomud, Karadashli, Goklen, Ersari, Chaudor, and Imrali. They are all engaged in breeding horses and stock and in agri- culture. Some are sedentary, while others migrate to the steppe in summer. The Sarts or Tajiks, who were probably the original inhabitants of the country, live chiefly in the large towns and are engaged in trade or in handicrafts, some in agriculture and silk cultivation. The Kizilbashes are liberated Persian slaves, and are distributed over the khanate, but more particularly inhabit the Tashauz district. Of the Semitic race we find Arabs in small numbers at Shavat. They form the living monuments of the Arab conquest.

Owing to the absence of any census it is impossible to give more than a very rough estimate of the population of the Khivan oasis. Major Wood, a competent observer, estimated it in 1875 at 300,000 souls, of whom two-thirds are Uzbegs and Tajiks. Liberated Persians and other slaves make up 50,000, while the remainder is composed of sedentary Turcomans who occupy cultivated lands or who nomadize about the western borders of the khanate.

There is no marked division of the people into castes or classes. A Khivan may be a merchant, an agriculturist, or craftsman as he pleases; he may possess land or other real property, but for this privilege he must fulfil his obli- gation to the state, pay taxes, and furnish labourers for digging or repairing canals, upon which the life of the oasis may be said to depend. Only the military class, the priest- hood, and the khodjas are exempt from the payment of taxes. The khodjas consider themselves descendants of the prophet ; they pay no taxes and render no military service, nor do they furnish canal labour. They are derived from the same stock as the khodjas of Turkestan, and according to tradition came to Khiva six hundred years ago. Agri- culture, trade, and handicrafts constitute their chief em- ployment.

Towns.—Khivan towns are nothing more than agglo- merations of houses without plan or regularity ; the streets are so crooked and narrow that two carts can only pass with difficulty or not at all. The towns are usually sur- rounded by a defensive wall, in a more or less dilapidated state; sometimes there is also a wet ditch. Outside the walls stretches an extensive suburb. Each town con- tains usually a bazaar, a caravanserai, and one or more medresses (ecclesiastical colleges) and mosques. The popu- lation consists of government officials, shopkeepers, me- chanics, and a very few agriculturists. There are no villages as we understand the term,—only farmsteads dotted at intervals along the banks of the canals. The security against Turcoman raids which is given to the townspeople by the wall and ditch is replaced in the case of the farming class by small round guard- houses (karachi-khane) constructed along the same canals where the farmsteads are placed.

The chief towns are Khiva (the present capital and residence of the khan); Khazarasp, spoken of by the Arab geographers as a strong place in the 10th century, a reputa- tion it still maintains; New Urgentch, the chief trading town ; Tashauz, another strong place; Gurlen, Hazavat, Ilalli, Kipchak, Khanka, Hodjeili, Kungrad, Pitniak, Kunia Urgentch (once the capital, but destroyed first by J enghiz Khan, and afterwards by Timur), and Kiat,

which up to the 15th century was the capital of Kharezm, but is now a place of little importance.

Climate.—The climate is quite continental, but is healthy, and the people are long-lived. The prevailing ailments are small-pox, inflammation of the eyes, and ague. Cholera is a rare visitant. Winter begins in November and lasts until February. At this season the thermometer sometimes falls to 20° Fahr., and the Oxus freezes to a depth of 6 to 12 inches, At the end of March the vine, pomegranate, and fig commence to bud, and in the first days of April are covered with green. Wheat harvesting commences early in July ; about this time apricots and plums ripen. Leaves begin to grow yellow and fall in the first half of November. The west wind is distinguished by its violence, but it only rages in spring. At this season the north wind also blows strongly. When the wind is in these quarters dews are abundant. Severe storms and earthquakes are of rare oc- currence ; and, gencrally speaking, there is little rain, snow, or hail.

Products.—The chief agricultural products are wheat, jugara, rice, sesamum, millet, chigin (a variety of millet), barley, mash (a pulse), linseed, cotton, hemp, lucerne, to- bacco, poppy, and madder. The gardens furnish the melon, cucumber, pumpkin, capsicum, garlic, onion, beet, radish, carrot, turnip, potato, and cabbage. Of frnits the mul- berry, apple, pear, cherry, plum, date, peach, pomegranate, and grape are in abundance. Of trees we find in small quantities the poplar, black poplar, plane, elm, willow, karaman (a sort of elm), and narvan (a species of oak). Saksaul (Holoxylon ammodendron) is found in quantities, and furnishes excellent fuel. Shrubs of various kinds are indigenous, and the reed grass, in the absence of meadow- land, affords good fodder for cattle.

Khiva furnishes no metals, but sulphur and salt are present in sufficient quantities to satisfy home demands.

The domestic quadrupeds are camels, horses, asses, horned cattle, sheep, and goats. Of wild animals are found the hog, giraffe, panther, jackal, fox, wolf, and hare. The feathered tribe is represented by the wild goose, swan, crane, pelican, duck, moorhen, bustard, pheasant, quail, snipe, partridge, magpie, crow, sparrow, nightingale (in large numbers), and lark, besides

domestic fowls and pigeons. The fish include sturgeon, sterlet, bream, pike, carp, and sandre.

Trade and Industry.—The trade of Khiva, in the Middle

Ages very considerable, has in the present day declined to insignificant proportions. At the epoch when Arab trade flourished, and in the time of Jenghiz Khan, Kharezm possessed important trade routes. Along these routes were dug deep stone-lined wells, and they were moreover dotted at intervals with caravanserais ; so that, in the words of a historian of the 14th century, the traveller from Khiva to the Crimea need make no provision for his journey, for all that was needful could be procured from caravanserais on the way. In this latter half of the 19th century the trade is unimportant, and even the ruins of the caravanserais and wells are to be detected with difficulty. The merchants of New Urgentch, it is true, take their wares as far as the great Russian fair of Nijni-Novgorod on the west, to Bok- hara on the east, and to Persia on the south, but the cara- vans are small and money is scarce. The chief articles of trade are horned cattle, camels, horses, sheep, cereals, khalats, silk and cotton cloth, clothing, gunpowder, arms, agricultural implements, two-wheeled carts, saddlery, har- ness, boats, wood, potash, salt, &c. These wares are some- times bartered, sometimes sold for money. Dried fish is also an article of export for the Bokhara market. The cotton is of excellent quality, and the silk of Khazarasp is renowned in Central Asia.

Of manufactures there are none in the true sense of the word. The Khivans weave in their hand-looms cotton and silk cloth sufficient to satisfy their home necessities. In handicraft they are specially clever as armourers, smiths, and founders. The fuel used is saksaul.

Currency. —The money of the country is the gold tilla, the silver tenghe, and the copper pul. The tilla is worth 28 to 35 tenghe, or from sixteen shillings to a pound, ac- cording to the exchange ; while the tenghe, value about sevenpence, is equivalent to about 35 to 50 puls. Russian, Persian, and Bokharian money are also in circulation.

Kuiva, a fortified city, capital of the kbanate of the same name, situated between two canals derived from the Oxus, and in the midst of green fields, orchards, and high poplars. It lies in 41° 22’ 30” N. lat. and 60° 25’ E. long., about 400 miles east of. Krasnovodsk on the Caspian, 350 miles north of Meshhed in Persia, and 700 miles north-north-west of Kandahar. The city is girt with two mud walls) The inner wall, which surrounds the main town, is built on a low eminence, and forms a tolerably regular parallelogram with four towers at the angles. This wall is about 24 feet high, and has a perimeter of some 2500 yards. ‘Three gates lead into the inner town. The outer wall, 10 feet high, was built in 1842 to enclose a former suburb, and ‘has an irregular perimeter of 7200 yards, Twelve gates pierce this outer wall. In the main or inner town are two palaces of mean appearance, seven- teen mosques, twenty-two educational seminaries, a cara- vanserai, a covered bazaar of some one hundred and twenty shops, and two hundred and sixty other shops distributed over the place. The principal mosques are those erected in honour of the saints Polvan Ata and Seid Bai. (Fc. 4. Cc.)

KHOI, a town and district in the province of Azerbijan, Persia, towards the extreme north-west frontier, between Lake Urumiyah and the river Aras. The town lies in 38° 37’ N, lat., 45° 15’ E. long., 77 miles north-west of Tabriz on the great trade route between the Euxine and Persia, and on the Kotura, a tributary of the Aras, crossed here by a seven-arched bridge. The fortifications, which are in a ruinous state, consist of an outer line of bastions, redans, glacis, ditch and covered way, and an inner high wall flanked with towers, the intervening space being occupied with gardens and mud hovels. But the central part forms one of the best laid out towns in Persia, cool Streams and lines of willows running along its broad regular streets, Here are a few good buildings, including the

governor’s palace, several mosques, a large brick bazaar second only to those of Shiraz, and a fine caravanserai. There is a large transit trade, and considerable local traftic across the Turkish border. Ophthalmia is very prevalent, about 10 per cent. of the inhabitants suffering from inflammation of the eyes. The chief manufactures are copper wares and worsted socks.

Here the Turks under Selim I. gained a great victory over the Persians in 1514, but with such heavy losses to themselves that the battle was long after known as the “day of doom.” In Septem- ber 1881 Khoi was visited by a series of violent earth- quakes, the seismic waves running north-west and south- east in the direction of the main mountain ranges. The population numbers about 30,000, including many Ar- menians, who occupy a separate quarter. The district consists of an elevated plateau 60 miles by 10 to 15, highly cultivated by a skilful system of drainage and irrigation, producing a series of fertile oases laid out in meadows, gardens, and tillage, and yielding rich crops of wheat and barley, besides apples, pears, cherries, walnuts, chestnuts, and unrivalled mulberries.

KHOJEND, or Hopsent, chief town of the Khojend and Jizak district in the province of Sir Daria, in Russian Turkestan, is situated on the left bank of the Sir Daria or Jaxartes, 96 miles south-east from Tashkend, and on the direct road from Bokhara to Khokand. The Russian quarter lies between the river and the native town. Near the river is the old citadel, built on the top of an artificial square mound, about 100 feet high, which Mr Schuyler suspected to be a mere hollow wooden framework, only half filled in with earth. The bazaar of Khojend is very large in proportion to the size of the town. There is a wooden bridge over the Jaxartes, whose banks at this point are so high as to make the river useless to the town in the absence of pumping gear; so that when the little stream Khoja Bakargan dries up in summer, there is much suffering from want of water. The great heat intensifies the distress. There is now no very great trade in Khojend. Formerly the entire commerce between the khanates of Bokhara and Khokand passed through it, but since thie Russian occupation much of that has been diverted. Silk worms are reared, and silk goods are manufactured in the town. A coarse sort of ware is made in imitation of the Chinese porcelain. Lignite is carried to Tashkend from the neighbourhood of Khojend. The surrounding district is tolerably well cultivated ; immediately about the town the ground is taken up with cotton plantations aud vine-yards. The majority of the inhabitants are Tajiks. They are sociable and pleasure-loving, and the whole air of the town is agreeable. The population for 1873 is put down by Mr Schuyler at 30,000.

Khojend has always been a bone of contention between Khokand and Bokhara ; and, although belonging from very ancient times to the former, it has often been seized by the latter. When the ameer of Bokhara assisted Khudayer Khan to regain his throne in 1864,

he kept possession of Khojend. In 1806 it was stormed by the Russians ; and during the war with Khokand in 1875 it played an

‘important part.

KHOKAND, a city of Turkestan, was, previous to the Russian conquest, the capital of an independent khan, but, owing mainly to the fact that those who reside in it are subject to goitre, it has not been made the administrative centre of the Russian province (FERGHANA,q.v.). The town is situated on the skirts of the Kashgar Devan ridge, which separates Kashgar from Ferghana, and it is traversed by three mountain gullies which send their scanty waters to the Jaxartes. Dating only from the reign of Saur Khan, about the early part of the 18th century, Khokand has within the 10 miles circuit of its mud walls a greater amount of space to spare than is to be found in any other city of Central Asia; some of the = are of

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great extent, and the bazaar is built on a more handsome scale than that even of Tashkend. The palace erected by the last khan is after the style of the palace at Samarkand, and rivals it in the rich colouring of its enamels and the general effect of its relief. The audience chamber now serves as a Russian church and the women’s apartments are occupied by the Russian governor of the fortress. The mosques, according to native exaggeration, number 600, and there are fifteen colleges. The gardens, especially those of the palace, are conspicuous for their rich foliage. Silk weaving and papermaking are the chief industries. Coins bearing the inscription “ Khokand the Charming,” and known as khokands, have a wide currency. Population about 75,000.

See Schuyler’s Twrkistan, 1876 ; Khoroshkin’s narrative trans- lated in Recucil d’itinérarics et de voyages dans l’ Asie Centrale, Paris, 1878 ; Ujfalvy, ‘‘ L’Asie Centrale,” in Tour du Monde, 1850.

KHONSAR, a town in the province of Irak-Adjemi, Persia, 92 miles north-west of Ispahan on the Hamadan route, in a gorge of the hills, which here approach so close that all the intervening space is occupied by the houses and their garden plots. The town straggles some 6 miles along the gorge, with a mean breadth of scarcely half a mile. There is good water from the hills, and a great profusion of fruits, the apples yielding a kind of cider, which does not keep. The climate is cool in summer but excessively cold in winter. Population 2500 families, or about 12,500 souls.

KHORAMABAD, a town and fortress of Persia, capital of the province of Luristan, in 33° 32’ N, lat., 47° 43’ E. long., 138 miles west-north-west of Ispahan, 117 south-east of Kirmdnshéhan. The fort is perched on an isolated steep rock in the middle of a difficult pass, and is 1000 yards in circuit. The modern town lies at the south-west foot of the fort in a narrow valley watered by the broad but shallow and rapid river Kashgan. A rich plain stretching thence southwards yields abundance of supplies. Popula- tion about 6000.

KHORASAN, «ze. “land of the sun,” a geographical term originally applied to the eastern quarter of the four, named from the cardinal points, into which the ancient monarchy of the Sassanians was divided! After the Arabic conquests the name was retained both as the desig- nation of a definite province and in a loosersense. Under the new Persian empire the expression has gradually be- come restricted to the north-eastern portion of Persia proper, of which it now forms the largest province. The boundaries of this vast region have scarcely anywhere been accurately determined, and have constantly fluctuated, especially towards the north and east. Speaking generally, however, the province is conterminous on the east with Afghanistan and Sistan, north with Astrabad and the re- recently organized Russian trans-Caspian territory, north- east with the Turkoman country, west with Mazandaran and Irak-Adjemi, south with Farsistan and Kirman. It lies mainly within 33° 30’-38° 30’ N. lat. and 53°-61° E, long., extending 500 miles north-west and south-east and 300 north and south, with total

area of about 150,000 square miles, and a population estimated at from 800,000 to over 1,000,000,

The surface in the north, south-west, and partly in the east is distinctly mountainous to a far greater extent than is commonly supposed. ‘The ranges generally run in two or more parallel ridges, enclosing extensive longitudinal valleys, and running in the normal direction from north- west to south-east. The whole of the north is occupied by an extensive highland system forming a continuation of the Hindu Kush and Paropamisus, and stretching from the A ——————E eee

1 See Néldeke’s translation of Tabari, p. 155.

Herat valley between the Iranian plateau and the Turkestan depression north-west to the south-east corner of the Caspian. This system, for which there is no general name, but which is now sometimes spoken of collectively as the Kuren-Dagh or Kopet-Dagh, from its chief sections, forms in the east three ranges, the Hazar-Masjid, Binalud-Kuh, and Jagatai, enclosing the Meshhed-Kuchan valley and the Jagatai plain. The former is watered by the Kashaf-rud, or river of Meshhed, flowing east to the Hari-rud, their junction forming the Tejend, which sweeps round the Daman-i-Kob, or northern skirt of the outer range in the direction of the Caspian or Usboi (old bed of the Oxus), but now losing itself in the desert long before reaching them, The Jagatai plain is watered by the Kal-Mura river, formed by the junction of the Kara-su and several other head streams, and flowing south-west to the Great Salt Desert. In the west the northern highlands also develop three branches, the Kuren-Dagh stretching through the Great and Little Balkans to the Caspian at Krasnovodsk Bay, the Ala-Dagh forming a continuation of the Binalud- Kuh and the Astrabad mountains merging south-westwards in the Elburz system. The Kuren and Ala Daghs enclose the valley of the Atrek, which flows mainly west to the Caspian at Hasan Kuli bay. The western offshoots of the Ala Dagh and the Astrabad mountains enclose in the same way the valley of the Gurgan, which also flows westwards to the south-east corner of the Caspian. The: outer range has probably a mean altitude of 8000 feet, the highest known summits being the Hazar-Masjid (10,500 feet) and the Kara-Dagh (9800); it is crossed by the Maidan-Kuni and Allaho-Akhbar (4200 feet) passes leading from

Kuchan north to the Daragez district. The central range seems to be still higher, culminating with the Shah Jahan Kuh (11,000 feet), the Kuh Ala Dagh (12,300), and Kuh Khorkhud (12,500). The southern ridges, although generally much lower, have the highest point of the whole system in the Shah-Kuh (13,000 feet) at the junction of the Astrabad and Elburz ranges.

Another system runs diagonally right across the province from Yezd in the south-west to the Hari-rud valley in the north-east, throwing off the Kuh Shorab, Kuh Shutari (10,000 feet), and Kuh Nastanji (8000 feet) in the Tabbas district. Towards Sistan the country is also very moun- tainous, with several nearly parallel ridges stretching from near Tun south-east to the Hamun lake or swamp.

Beyond the Atrek and others watering the northern valleys there are scarcely any rivers, and most of these are brackish and intermittent, losing themselves in the Dasht-i-Kavir or Great Salt Desert, which occupies the central and western parts of the province, and which is separated by the diagonal range from the more sandy and drier desert of Lut in the south. The true character of the kavir, which forms the distinctive feature of east Persia, has scarcely yet been determined, some regarding

-itas the bed of a dried-up sea, others as developed by the

saline streams draining to it from the surrounding highlands,

Collecting in the central depressions, which have a mean —

elevation of scarcely more than 500 feet above the Caspian, the water of these streams is supposed to form a saline efflorescence with a thin whitish crust beneath which the moisture is retained for a considerable time, thus producing those dangerous and slimy quagmires which in winter are covered with brine, in summer with a thick incrustation of salt. ‘The waters of all springs and rivers contain salts in minute quantities, but the rivers of Persia are often so salt as to be undrinkable. The salts brought down by the rivers are deposited in the marsh, which thus gets sulter year by year. It dries up during the fierce summer heats, to become a marsh again when the winter floods occur. This process is repeated for ages, and in the course of time

the whole soil over which the marsh extends becomes encrusted with salt.”

The surface of Khorasan thus consists mainly of high- lands, saline swampy deserts, and fertile well-watered upland valleys. Of the last, occurring mainly in the north, the chief are the longitudinal valley stretching from near the Herat frontier through Meshhed, Kuchan, and Shirvan to Bunjurd, and the Daragez district, which lies on the northern skirt of the outer range projecting into the Akhal Tekke domain, now Russian territory. These fertile tracts produce rice and other cereals, some cotton, tobacco, saffron, and especially melons and other fruits in great profusion, 45 fb of splendid grapes being sold in Daragez for ninepence. Other products are manna, gums, and great quantities of asafcetida, which is not used by the natives but exported to India. The chief manufactures are the

famous Khorasan sabres, firearms, stoneware, armour, fine –

carpets and rugs, velvets, woollens, cottons, and sheepskin pelisses.

The population is far from homogeneous, consisting of Iranians (Tajiks, Kurds, and Baluchis), Mongols, Tatars, and Arabs, as under :—

Races. District. Population. Speech.

: ‘Towns and Tajiks (Persians)..... agricultural] 400,000) Persian. districts.
, SME SN se ss

1,160,000

The Persians proper have always represented the settled, industrial, and trading elements, and to them the Kurds (removed to the north by Shah Ismail) and the Arabs have become largely assimilated. Even many of the Tatar nomad tribes, collectively called Tiat,* have become Shahr- nishin, t.e., “townsfolk,” or settled. But all the Baluchis are not only still Sahra-nishin, ¢.e., “country or desert folk,” but have lately resumed their old predatory habits, covering incredible distances on their swift camels, and harassing the country as far west as the Yezd

district. On the other hand the raids of the Turkoman marauders have almost entirely ceased since the reduction of the Akhal Tekke Turkomans by the Russians in the spring of 1881. In religion great uniformity prevails, all except the Baluchis and Turkomans having conformed to the national Shiah sect.

The administrative divisions of the province seem to be Daragez, Kuchan, Turshiz, Tabbas, Ghayn, Khaf, Meshhed, Nishapur, Shahrud, and Damgan. The chief towns are Meshhed, Kuchan, Mohammadabad, Shirvan, Bostan, Turshiz, Tin, Tabbas, Khaf, and Ghayn. VA. HK.)

KHOSRU. See Persta.

1 Colonel C. E. Stewart, in Proc. Roy. Geog. Soc., September 1881. This traveller visited the north frontier of Persia in 1880-81, disguised as an Armenian horse-dealer from Calcutta.

2 The Kajars are the royal tribe to which the present dynasty belongs; hence the reigning shah's title, NAsir ed-din Shah Kajar. But Nadir Shah, though commonly called a Kajar, was an Afshar.

e Some travellers have stated that the Khorasan Arabs still speak Arabic as well as Persian—a mistake due probably to the fluency with which they repeat passages from the Koran, The great bulk of them have long been " Parsivan" or ' Persian-speaking."

- Iliat (plural of ~~Ili) simply means "tribes," and is applied indiffer~~ ently to all the nomads of Persia, whatever their affinities may be.

KHOTAN, a city and district of eastern Turkestan, lying between the northern slopes of the Kuenlun mountains and the eastern portion of the Gobi (Takla Makan) desert. The district is well watered by a number of rivers, the most important of which, the Karakash and the Khotan Daria, meet to the north of the city. Both soil and climate are excellent, and the vegetation is charac- terized at once by variety and luxuriance. Indian corn, barley, jowar, buckwheat, rice, olives, pears,

peaches, apricots, mulberries, grapes, currants, melons, the charas plant, the cotton plant, are all produced in abundance. Willows, poplars, and tamarisks are the ordinary trees; in some parts they form extensive forests. Of the mineral wealth of the country glowing accounts are given,—gold, copper, iron, antimony, salt, sulphur, coal, jade, and a variety of precious stones being the principal items. Upwards of twenty gold mines are known to exist, and those of Sorghak and Kappa are worked by 4000 and 3000 men respectively. Jade is obtained, more especially in the Karakash district. Among the wild animals are goats, wolves, jackals, foxes, and hares; and the Khotanese keep camels, horses, mules, asses, goats, sheep, geese, ducks, and fowls (the goats and the fowls being particularly numer- ous). The total number of the inhabitants is variously estimated at from 130,000 to 250,000, and the country is capable of maintaining a much denser population. Females preponderate to as much as 25 per cent. There are six districts, each with a town of its name—Khotan or Ilchi (42,000), Karakash (7000), Yurung Kush (7000), Tchira (28,000), Kiria (28,000), and Naya (3500). The city of Khotan (in Chinese Hu-tan, locally Ilchi) is situated 150 miles south-east of Yarkand and 90 miles due east of Sanju, and is only 6 miles distant from the borders of the desert. It has long been celebrated as a great industrial centre, silks, felts, righ carpets (of either silk or wool), paper, and articles in jade being the chief productions ; and its traders maintain an active traffic with Tibet.

As early as the 1st century the town contained (according to Chinese authorities) 3300 families. Cotan, ashe calls it, was one of the places visited by Marco Polo. In modern times the first European who reached the city was Mr Johnson in 1865. At that time it was governed by a local khan, the Chinese having been expelled by their Mohammedan subjects, in 1863; and since then it has been subjugated by Yakub Khan of Kashgar (who perpetrated a terrible massacre at his capture of the place), and again recovered by the Chinese forces.

See Johnson, J. R. G. S., 1867; Sir T. D. Forsyth, Mission to Yarkund, Cal- cutta, 1875.

KHOTIN, or Kuorsen (this is the Russian form of the name, which appears in a great variety of disguises—partly dialectal—such as Khotchim, Chotchim, Choczim, and Chocim), a fortified town of 21,000 inhabitants, in the government of Bessarabia, Russia, situated in 48° 30’ N. lat. and 26° 30’ E. long., on the right bank of the Dniester, near the Austrian (Galician) frontier, and opposite Podolian Kamenetz. Though it possesses a few manufactures and carries on a considerable trade both legitimate and contra- band, Khotin has all through its history been of importance mainly as a military post. In the Middle Ages it was the seat of a Genoese colony; and it has passed through periods of Polish, Turkish, and Austrian possession. The chief facts in its annals as a fortress are the defeat of the Turks in 1621 by Ladislaus IV., in 1673 by John Sobieski, and in 1739 by the Russians under Miinnich; the defeat of the Russians by the Turks in 1768; the capture by the Russians in 1769; and the occupation by the Russians in 1806. It finally passed to Russia along with Bessarabia in 1812 by the peace of Bucharest.

KHULNA, or Cutna, a town in Jessor district, Bengal, India, situated at the point where the Bhairab river de- bouches on the Sundarban delta, in 22° 49’ N. lat., 89° 57’ E. long., may be described as the capital of the Sundar-

bans, and for the last hundred years at least has been a place of considerable importance. It was the headquarters of the salt department under the Hast Indian Company. | The whole boat traffic from the east and north-east passes | here on its way to Calcutta; from Calcutta the principal cargo is Liverpool salt, the trade in which is very consider- able. There are numerous sugar refineries. ; KHURJA, an important trading town and station on the East Indian Railway in Bulandshahr district, North- Western Provinces, India, 28° 15’ N. lat., ria 54’ E. long. The population in 1872 was 26,858—15,543 Hindus and 11,315 Mohammedans. A large business In raw cotton is carried on, of which about 70,000 cwts. are annually ex- ported to Cawnpur, Mirz4pur, and Calcutta ; eight cotton | presses are at work in the town. There is a

local trade in cotton, safflower, indigo, sugar, molasses, grain, Tice, and

hi.

3 KHUSHAB, or Kosnavs, a town in Shabpur district, Punjab, India, situated on the river Jhelum, 32° 18’N. lat., 72° 24’ B. long. ; population (1868) 8509. A flourishing trade is carried on with Mooltan, Sakkar, Afghanistan, and the Derdjat. The exports consist of grain, cotton, wool, ght, and country cloth; and the imports of English piece goods, metal, dried fruits, sugar, and molasses. It is the chief mart for the trade of the Salt Range. Coarse cloth and cotton scarfs are manufactured ; there are six hundred weaving establishments.

KHUZISTAN, a province of West Persia, bounded N. and N.E. by Luristan, S.E. by Fars, S. by the Persian Gulf, W. by Turkey, lies mainly within 30°-33° N. lat. and 47°— 51° B. long., stretching about 200 miles north and south, ° with a mean breadth of 80 to 100 miles, and an area of 25,677 square miles. In the south is the rich alluvial lowland tract of Arabistan, “the most extensive and fertile plain in Persia.” Elsewhere the surface is very

mountainous, being traversed by tho lofty Bakhtiari |

ranges, which form a south-eastern continuation of the Pusht-i-Koh highlands, and which preserve a remarkable parallelism throughout their entire length, while increasing in elevation from 8000 to 16,000 feet as they advance inland to the Kuh-Dindr, They are broken by several deep and romantic gorges, through which the Karkhah, Karan, Jarahi, and Tab rivers escape to the Euphrates délta or to the coast, watering several fertile upland valleys on their winding course seawards. The climate on the coast is excessively hot, and in some low-lying swampy districts very unhealthy; in the highlands severe winters and hot summers are followed by genial springs and autumns; the prevailing winds are north-west and south-east, the latter bearing much moisture from the Indian Ocean. The lowlands take the name of Arabistan from the Arabs, who form the bulk of their population. Many of the Ka‘b Arabs have been assimilated in speech and religion

to the Persians ; but most of the great Beni-Lam nation, compris- ing in Khuzistén and Baghdad 17 branches, 85 septs, and 30,000 families, are still in the nomad state. The high- lands are mainly oceupied by the Feili, Bakhtiari, Kohgelu, Mamaseni, and other Luri tribes of Kurd stock and speech, also nomads and addicted to brigandage. The staples of food are dates and fish in the south, elsewhere the produce of the herds and flocks. The chief products are rice, tobacco, cotton, indigo, silk, maize, barley; the trade is mainly with Baghdad and Bussorah, The manufactures include coarse woollens, cottons, tents, red cloth. Dyeing is extensively carried on in Dizful, which, besides Shaster and Mohammrah, is the only place worthy the name of town.

Khizistan is the Biblical Exam (q.v.), the classical Susiana. The name appears in the great inscription of Darius as Uvaja, corre- sponding to the Uxii of classical writers. The transition to the

modern Khiz, Khizistan, appears in the name Beth Khfzayé, t by Syriac writers of the Sassanian period. ee ee

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KHYRPOOR. See KHAIRPUR.

KIACHTA, or Krakuta, a mercantile town of Siberia, and one of the chief centres of trade between Russia and China, is situated upon the Kiachta, an affluent of the Selenga, and on an elevated and barren expanse of country surrounded by mountains, in the Russian government of Transbaikal, about 280 miles south-west of the capital Tchita, and close to the Chinese frontier, in 50° 20’ N. lat., 106° 40’ E. long. Besides the lower town or Kiachta proper, the municipal jurisdiction comprises the fortified upper town of Troitskosavsk, about 2 miles to the north, and the settlement of Ust-Kiachta, 10 miles further distant. The upper town, which is substantially built, contains the public offices, barracks, a stone church, and many large warehouses, &c., and is the headquarters of the command- ant of the Transbaikal Cossacks. The lower town, lying directly opposite to the Chinese emporium of Maimaichin, consists of several stores and about a hundred houses inhabited mostly by merchants, Prior to 1727 the trade of Kiachta was a Government monopoly, but from that year it was open to private merchants, and continued to improve until 1860, when the right of commercial inter- course was extended along the whole Russian Chinese frontier in conformity with the treaty of Pekin. The annual December fairs for which Kiachta was formerly famous, and which were resorted to by merchants from a great distance, and also the regular commercial traffic passing through the town, have considerably fallen off since that date. The Russians exchange here leather, sheep-skins, furs, horns, woollen cloths, coarse linens, aud cattle for teas, porcelain, rhubarb, manufactured silks, nankeens, and other Chinese produce. In 1873 the popu- lation, including Ust-Kiachta, was 9050.

KIDDERMINSTER, a market-town and municipal and parliamentary borough of Worcestershire, England, is situated in the north-west corner of the county, on the Stour, near its junction with the Severn, on the Stafford- shire and Worcestershire canal, and on the West Midland branch of the Great Western Railway, 14 miles north from Worcester and 18 miles south-west from Birmingham. The streets are rather irregular, and the houses for the most part small and mean in appearance, but of late years great improvements have been made by

the paving and widen- ing of the streets and the construction of shops and houses of a better class. A new system of drainage has also been completed, and the town is now well supplied with water. Besides the churches, the principal buildings of Kidderminster are the corporation buildings, the infir- mary, the town hall in the Renaissance style, erected in 1876, the masonic hall and club, and the buildings of the school of art. The parish church of St Mary, a fine old structure in the Perpendicular style, containing several ancient monuments, was lately extensively repaired. The town is adorned by a statue erected in 1875 to Richard Baxter, who was for some time minister in Kidderminster, and another to Sir Rowland Hill, completed in 1881, and by a beautiful drinking fountain. There is a free grammar school founded in 1637, besides board schools and others connected with some of the churches. A new cemetery for the town was opened in 1878, At an early period Kidderminster had a large manufacture of broad-clothis, but it is now chiefly celebrated for its carpets (see CARPETS, vol. v. p. 129), the manufacture of which was introduced about the year 1735. At first Scotch carpets were the only variety made, but in 1745 the manufacture of Wilton and Brussels carpets was commenced, and since that period the carpets manufactured at Kidderminster, on account of the permanency of their colour, due it is supposed to peculiar properties of the water of the Stour, have retained an exceptional reputation. Worsted spinning

and dyeing are also carried on extensively, and there are iron foundries, tinplate works, breweries, malthouses, tanneries, flour-mills, and a paper-mill. The population of the municipal borough in 1871 was 19,473, and that of the parliamentary borough 20,814; in 1881 the corre- sponding numbers were 24,270 and 25,634.

The ancient name of Kidderminster was Chiderminster, that is, the minster or church on the brow of the hill. From the time of the Conquest until the time of Henry II. it was a royal manor. Among the private owners who subsequently lield possession of it was the poet Waller. Kidderminster returned a member to parlia- nient in the reign

of Edward I., but the privilege was subsequently lost. In the 12th year of Charles I. it received a charter of incor- poration, and by the Reform Act of 1832 it again obtained the privilege of returning a member to parliament. Itis now governed according to the Municipal Act of 1835.

KIDNAPPING is defined by Blackstone as the forcible abduction or stealing away of a man, woman, or child from their own country and sending them into another. The term is, however, more commonly applied to the offence of taking away children from the possession of their parents. By 24 and 25 Vict. c. 100, "' whosoever shall unlawfully, by force or fraud, lead or take away or decoy or entice away or detain any child under the age of fourteen years with intent to deprive any parent, guardian, or other person having the lawful care or charge of such child of the posses- sion of such child, or with intent to steal any article upon or about the person of such child, to whomsoever such article may belong, and whosoever shall with any such intent receive or harbour any such child, &c.," shall be guilty of felony. The abduction or unlawfully taking away al unmarried girl under the age of sixteen years out of the possession and against the will of her father or mother, or any other person having the lawful care or charge of her, is a misdemeanour under the same Act. The term is used in much the same sense in the laws of the United States. Bishop states the more correct acceptation of the word to be false imprisonment aggravated by the intent to carry the person away to another place, but not necessarily to another country.

KIEFF, Kiverr, or Kiev, a south-western government of European Russia, conterminous with those of Minsk, Poltava, Tchernigoff, Podolia, Kherson, and Volhynia. The area is estimated at 31,664 square miles. In the north we find a low-lying district characterized by marsh and wood- land; in the east a series of hills keeps company with the Dnieper; and in the west are several outliers from the Carpathian system. The central region is a kind of steppe, It is only ina very few places that the altitude exceeds 900 feet. Granite with underlying syenite is the prevailing rock in the west and south-west of the government ; in the east there are various Eocene formations. JIron-ore, fire- clay, sandstone, and lignite are among the useful minerals.

Towards the southern and the central parts the surface is covered by a deep rich “black earth.” Nearly the whole of the government belongs to the basin of the Dnieper, that river forming part of its eastern beundary. Inthe south- west are a few small tributaries of the Bug. Besides the Dnieper the only navigable stream is its confluent the Pripyat, but two or three of the rest are available for rafts. About a fourth of the surface is occupied by woods, very unequally distributed throughout the territory. Rye is the commonest of the cereals ; and next follow oats and wheat. In the growing of beetroot the government is the first in Russia, and its factories for the production of beetroot sugar are the largest in the empire. The whole industrial activity of the district has rapidly developed since about the middle of the century: in 1879 there were 602 estab- lishments, with 35,306 workmen, and a production worth £10,000,000. In the 75 sugar factories large numbers of Tartars from Tamboff and Penza find employment; and next in importance are the flour-mills, leather works, and

tobacco factories. The population of the government has increased from 2,017,262 in 1862 to 2,266,000 in 1875. Little Russians form 80 per cent. of the aggregate; Jews, 13 per cent. ; Poles, 4 per cent.; White Russians, 24 per cent.; and there area few thousand Great Russians. There are twelve districts :—Radomuisl, Kieff, Kaneff, Tcherkasui, Tchigirin, Vasilkoff, Berditcheff, Lipovets, Skvira, Tarash- tcha, Uman, Zvenigorodka. Besides the government town the following have upwards of 5000 inhabitants :—Berdi- tcheff, 52,560; Vasilkoff, 16,597 ; Uman, 15,393; Tcher- kasui, 13,914 ; Tarashtcha, 11,420 ; Zvenigorodka, 11,375; Skvira, 10,061 ; Tchigirin, 9677 ; Kaneff, 7418 ; Lipovets, 6710; Radomuisl, 5905, to which may be added the large Jewish village of Zlatopol, 10,000. The exarchate or dio- cese of Kieff and Galitsch is the oldest in Russia, and com- prises 1421 churches, 12 cathedrals, and 30 monasteries.

In 1708 a Kieff government was founded which included tlic whole eastern Ukraine and an extensive region in Central Russia con- taining thirty-six towns—Orel, Kursk, &c. The Kieff lieutenant ship, founded

in 1782, consisted of parts of the present governments of Kieff, Poltava, and Tchernigoff. In 1796 the present govern- ment was practically constituted, though several slight changes in regard to the district towns have since taken place.

Krerr, capital of the above province, the ‘‘ mother city” and Canterbury of Russia, is situated on the right or western bank of the Dnieper, in 50° 26’ N. lat. and 30° 37’ E. long., 800 miles from St Petersburg, and 566 miles from Moscow on the highway between Moscow and Odessa. By railway it is connected on the ong hand with Kursk and on the other hand with Odessa. The site of the greater part of the town consists of a succession of hills or bluffs separated from each other by ravines and hollows, the elevation of the central portions being from 350 to 365 feet above the ordinary level of the Dnieper. On the opposite side of the river the country spreads out low and level like a sea. Having by this time received all its important tributaries, the Dnieper is a large and navigable stream ; but as it approaches the town it breaks up into two currents and forms a low grassy island of considerable extent called Tukhanoff. During the spring floods there isa rise of 16 or even 20 feet, and not only the whole island but the country along the left bank and the lower grounds on the right bank are laid under water. The bed of the river is sandy and shifting, and it is only by costly engineering works that the main stream has been kept from returning to the more eastern channel which it formerly occupied, Opposite the southern part of the town, where the currents have again united, the river is crossed by a wrought-iron bar-chain suspension bridge, which at the time of its erection (1851) was the largest enterprise of the kind in Europe. It is about half a mile in length and 524 feet in breadth, and the four principal spans are each 440 feet. The bridge was designed by Mr Vignoles, and the whole of the iron (3500 tons) employed in the con- struction was prepared in England. The cost was about £400,000.!

Owing to the natural character of the site, Kieff is broken up into several distinct portions; and from no point is it possible to get a view of the city as a whole. Upto 1837 the town proper consisted of the Old Town, Petchersk, and Podol; but in that year three districts were added,

and in 1879 the limits were extended so as to include Kurenevka, Lukyanovka, Shulyavka, and Solomenka, and the whole was divided into eight districts. The administrative area of the town, as thus defined, is about 12,404 acres, or 18 square miles; but these figures give a very exaggerated notion of the place, as there are extensive suburbs and large intervals of unoccupied ground. Wood is still the most

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1 Views of the bridge will be found in Official Catalogue of the Great Exhibition, 1851, vol. i. p. 321.

ildi erial : no less than 64°68 per cent. of the | 118 feet, while its breadth is 173 feet. But if the plan — eons were of wood a ge 14°75 per | shows no imitation of the great Byzantine church, the de- cent. of wood and stone. The number of clay huts is no | corations of the interior (pictures, mosaics, &e,) indicate less than 8°57 per cent. direct Byzantine influence. During the occupation of the The Old Town or Old Kieff quarter (Starokievskaya church by the Uniats in the 17th century these were covered Tchast) occupies the highest of the range of hills. It is | with a coating of whitewash, and a thorough-going restora- here that the houses are the niost closely built, and that | tlon was rendered a matter of necessity; but the chapel of stone structures are most abundant. In some of the prin- the Three Pontiffs has been left untouched to show how cipal streets—as Vladimir's, Vasiltchikoff's— buildings of carefully the old style has been preserved or copied. Among three to five stories, a comparatively rare thing in Russia, | the mosaics is a colossal representation of the Virgin, 15 have been erected. In the llth century the area was | feet in_ height, which, like _the so-called "indestructible enclosed by earthen ramparts, with bastions and gateways; | wall" in which it is inlaid, dates from the time of but of these the only remnant is the so-called Golden Gate. Yaroslaff. It was this prince who founded the church in In the centre of the Old Town stands the cathedral of | 1037 in gratitude for his victory over the Petchenegs. His St Sophia, the oldest cathedral in the Russian

empire. sarcophagus, curiously sculptured with palins, fishes, &c., The statement frequently repeated that it was a copy of | is still preserved. The church of St Andrew occupies the spot where, according to Russian tradition, the apostle

stood when as yet Kieff

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Tukhanaff Island \ Plan of Kieff.

would become the site of a great city. The present build- | whom there is no accommodation is often very great,— ing dates only from 1744-1767. The church of the Tithes, | 72,000, for example, were counted lying under the open restored in 1842, was originally founded in the close of the sky on tho night of 15th August 1872. Of the ten or 10th century by Vladimir in honour of two martyrs whom | twelve conventual churches the chief is that of the Assump- he had put to death; and the monastery of St Michael (or | tion. There are four distinct quarters in the monastery, of the Golden Heads—so called from the fifteen gilded | each under a superior, subject to the archimandrite: the cupolas of the original church) claims to have been

built | Laura proper or New Monastery, that of the Infirmary, in 1108 by Svyatopolk IL., and restored in 1655 by Bogdan | and those of the Nearer and the Further Caves. These Khmelnitski. caves or catacombs are the most striking characteristic of

Up to 1820 the south-eastern district of Petchersk was | the place ; the name Petchersk, indeed, is connected with

moo ceo o

the industrial and commercial quarter; but it has been | the Russian peshtchera, a cave. The first series of these

-books of the conventual inns it is shown that shelter is

greatly altered in carrying out fortifications commenced in caves, dedicated to St Antony, contains about eighty that year by Nicholas I. Most of the houses are small and | saints' tombs ; the second, dedicated to St Theodosius, old-fashioned. The monastery—the Kievo-Petcherskaya | about forty-five. The bodies were formerly exposed to —is the chief establishment of its kind in Russia; it is | view ; but the pilgrims who now pass through the gloomy visited every year by about 350,000 pilgrims. From the galleries, candle in hand, see nothing but the draperies and ; : the inscriptions. Among the more notable names are given to 150,000 persons per annum ; and the numbers for | those of Nestor the chronicler, and Ilia of Murom, the Old

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Cossack of the Russian epics. The foundation of the monastery is ascribed to two saints of tle 11th century— Antony of Lynbeth, and Hilarion, metropolitan of Kieff. By the middle of the 12th century it had become wealthy and beautiful, but, completely ruined by Batu in 1240, it remained deserted for more than two centuries. Prince Simeon Oblkovitch was the first to start the restoration. A conflagration laid the buildings waste in 1716, and their present aspect is largely due to Peter I. The monastery contains a school of picture-makers of ancient origin, whose productions are widely diffused throughout the empire,

and a printing press from which have issued a variety of liturgical and religious works, the oldest known examples bearing the date 1616.

The Podol quarter, as the name indicates, lies on the low ground at the foot of the bluffs. It is the industrial and trading quarter of the town, and the seat of the great fair of the “ Contracts,” the transference of which from Dubno in 1797 largely stimulated the commercial prosperity of the city. The present regular arrangement of its streets arose after the great fire of 1811. Lepki district (from the lepki or lime trees, destroyed in 1833) is of recent origin, and is mainly inhabited by the well-to-do classes. It is sometimes called the palace quarter, from the royal palace erected between 1868 and 1870, on the site of the older structure dating from the time of Elizabeth. Gardens and parks abound ; the palace garden is exceptionally fine, and in the same neighbourhood are the public gardens with the place of amusement known as tlie Chateau de Fleurs.

In the New Buildings, or the Luibed quarter, are the university and the botanical gardens. The Ploskaya Tchast (Flat quarter) or Obolon contains the lunatic asylum; the Lukyanovka Tchast, the penitentiary and the camp and barracks; and the Bulvarnaya Tchast, the military gym- nasium of St Vladimir and the railway station.

Kieff is the seat of the governor-general of the three provinces of Kieff, Podolia, and Volhynia, and as such possesses a large number of administrative institutions. In 1862 it was made the head- quarters of a great military district including the same provinces. As a centre of intellectual activity it ranks among the principal cities of Russia. The university of St Vladimir, transferred from Vilna after the Polish insurrection of 1881, possessed 94 professors in 1878, and was attended by 771 students; and the library con- tained 150,000 volumes. The theological academy and theological seminary are large institutions; and the ordinary educational establishments include three male and four female gymnasiums. A daily paper, founded in 1864, and nine other periodicals are pub- lished in the town. Of the learned societies the more important are the medical (1840), the naturalists’ (1869), the juridical (1876), the historical of Nestor the chronicler

(1872), the horticultural (1875), and the dramatical (1879), the archeological commission (1848), and the society of church archeology. There are three considerable theatres.

In 1862 the population of Kieff was returned as 70,341; of this number 8604 were Roman Catholics, 1411 Jews, and 976 Protestants. In 1874 the total was given as 127,251,—77°43 per cent. being members of the Greek Church, 10°85 per cent. Jews, 8°18 per cent. Catholics, and 2°45 per cent. Protestants. The clergy— regular and secular— amounted to no less than 3505. Russian and its dialects were spoken by four-fifths of the inhabitants. For 1881 the total population is estimated at 165,000.

The history of Kieff cannot be satisfactorily severcd from that of Russia. According to Nestor's well-known legend it was founded in 864 by three brothers Ke, Shtchek, and Khoriff. It was in the waters of the Dnieper opposite the town that Vladimir, the first saint of the Russian Church, caused his people to be baptized; and Kicff became the seat of the first Christian church, of the first Christian school, and of the first library in Russia. For three hundred and seventy-six years it was an independent Russian city ; for eighty years it was subject to the Tartars ; for two hundred and forty-nine years it belonged to the Lithuanian principality; and for ninety- eight years to Poland. It was finally united to the Russian empire in 1667. In 1832 the headquarters of the first army corps, with all the departments of the general staff, were transferred to Kieff from Mogileff. The Magdeburg rights, which the city had previously enjoyed, were abolished in 1835, and the ordinary form of town government introduced; and in 1840 it was made subject to the common civil law of the empire.

A long list of works relating to Kieff will be found in Semenoff, Slov. Ross. Imp. Of more recent publication are the following:—Rambaud's La Russie épique, Paris, 1876; Avenarius, Aniga o Kievskikh Bogatuiryakh, St Petersburg, 1876, dealing with the early Kieff herocs ; Zakrevski, Opisante Kieva, 1868 ; the materials issued by the temporary commission for the investigation of the ancient records of the city; Taranovskii, Gorod Kieff, Kieff, 1481. See also Ram- baud in,

Rev. de Deux Mondes, 1874. The standard geological map of the govern- ment is Theophilaktoff's (see Bull. Soc. imp, de Nat. de Moscow, 1872).

KIEL, the chicf town of the province of Schleswig- Holstein in Prussia, is picturesquely situated at the southern end of the Kieler Féhrde, about 66 miles north-east of Hamburg by rail. It consists of a somewhat cramped old town and a better built and more spacious newer part, increased since 1869 by the inclusion of Brunswiek and Diisternbrook. In the old town stands the palace, built in the 13th century, and enlarged by Catherine II. of Russia in the 18th; it contains the university library of 150,000 volumes, and a small collection of casts of antique sculpture and of Thorwaldsen's works. Other interesting buildings are the church of St Nicholas, dating from 1240, with a lofty tower; the old town-house; the prison and court-house ; the observatory; the theatre; the Government naval offices; and the Thaulaw museum, opened in 1877. The university, founded in 1665 by Christian Albert, duke of Schleswig, and named after him Christiana Albertina, had in 1881 a teaching-staff of 69, with 380 students. The new university buildings were completed in 1876. A naval academy was opened in 1875.. Among the public charities there are three hospitals, a blind asylum, an orphanage, an idiot asylum, and a large institution for poor citizens and their widows. Kiel is the most important naval har- bour of Germany, and the station of the German Baltic fleet ; the port and its approaches are very strongly fortified. The land defences, not yet completed, are to consist of eleven forts, completely encircling the town. The imperial dockyards on the east side of the haven include two large basins (one 235 yards square, the other 271 yards by 235 yards), connected by a canal 70 yards long, four dry docks (each 100 to 120 yards long by 24 or 25 yards wide), and a wet dock. Near them are the yards of a large shipbuilding company. The excellence and safety of Kiel harbour, whose only drawback is that it is frozen in winter, have made the town one of the principal ports of the Baltic. It carrics on a very active trade with the Danish islands as well as with the Continent. The chief imports are grain, coal, timber, and cattle; the chief exports, timber, coal, fish, and agri- cultural produce. Iron-founding and the manufacture of

machinery, wooden wares, carpets, tobacco, and oil form the leading industries after the shipping trade. In 1879 there entered at Kiel 3074 ships, representing 279,099 tons ; 3021 cleared, representing 275,600 tons. Near the town are large steam corn-mills. Kiel possesses a sea-bathing establishment, and is surrounded by fine scenery. The population in 1875, including the garrison, was 37,246.

The name of Kiel appears as early as the 10th century in the form Kyl. Kiel is mentioned as a city in the next century ; in 1242 it received the Liibeck rights; in the 14th century it acquired other privileges, and in 1363 entered the Hanseatic league. It suffered much from neighbouring barons; and in the wars in which Schleswig was involved Kiel had its share of siege and capture. In recent times the name of Kiel has been associated with the peace concluded in 1814 between Great Britain and Denmark, aud Sweden and Denmark, by which Norway was ceded to Sweden.

KIELCE, the chief town of a government in Russian Poland, is situated about 50 miles north-east of Cracow, in the mountainous district of the Lysa Gora. The copper- mines which were in the 16th century the main support of the place are no longer worked ; but it has iron-works and sugar factories of considerable importance. The principal buildings are the cathedral, the bishop’s palace, and a nunnery in which is an ancient statue of St Barbara fashioned out of a single piece of galena. In 1873 the population was 7838, Bishop Gedcow of Cracow is said to have founded Kielce in 1173,

KIERKEGAARD, S6ren (1813-1855), the greatest philosophical writer that Scandinavia has produced, was born at Copenhagen, May 5, 1813, and was the seventh child of a respectable Jutland hosier. He was a very serious and precocious boy, weak in health, morbid in character. Of his mother, singularly enough, he has said no word in his copious autobiographical remains, although he was in his twenty-second year when she died ; she had been his father’s servant. Kierkegaard became a student at the university of Copenhagen, and took up theology as a profession, but never became a priest. He lived

in great retirement, deeply oppressed with melancholy and physical suffering, and was at first very little known to his contem- poraries. In 1838 he published his first volume, Papers of a Still Living Man, a very poor attempt to characterize Hans Andersen. Two years later he took his degree, with a treatise On Irony, which contains the germs of his later speculations. In 1840 he engaged himself toa young lady, and shortly after broke off the engagement, an extraordinary step for which he has given many extraordinary reasons. It was not until 1842 that he began the composition of his greatest work, Ynten—Lller (“ Either—Or ”), on which his reputation mainly rests; this appeared in 1843, and was immediately followed by a rapid succession of philosophical works, which formed at once an epoch in the history of Danish literature. From 1849 to 1854, however, he was silent as an author. In the last-mentioned year he pub- lished a polemical tract against Bishop Martensen, and the short remainder of his life was spent in a feverish agitation against the theology and practice of the statechurch. But his health, which had always been miserable, was growing worse and worse. In October 1855 he took up his abode in one of the chief hospitals of Copenhagen, where he died, on the 11th of November, at the age of forty-two. His life has been written, with great skill and brilliance, by Dr Georg Brandes (1877). Kierkegaard published about thirty distinct books during his lifetime, and left at his death about an equal amount of MS.; a competent analysis of these multifarious labours is given in Brandes’s admirable biography.

KILDARE, an inland county of Ireland, in the province of Leinster, is situated between 52°51’ and 53° 26’ N. lat., and between 6° 28’ and 7° 11’ W. long., and is bounded on the W. by Queen’s county and King’s county, N. by Meath, E. by Dnblin and Wicklow, and S. by Carlow. The area is 418,497 acres, or 654 square miles.

Geology.—The greater part of Kildare belongs to the carboniferous plain which occupies the central portion of Ireland. In the east of the county this plain is bounded by elevations belonging to the clay slate formations border- ing on the granite mountains of Dublin and Wicklow; in the south it is encroached upon by the granite formations of Carlow; and in the centre it is interrupted by an elevated plateau

terminated on the south by the hills of Dunmurry, consisting chiefly of grauwacke and clay slates, and on the north by the Hill of Allen, a conical rock of porphyry and greenstone, which rises abruptly from the Bog of Allen to the height of 300 feet. Marble of very fine quality is obtained in the quarries to the west of the town of Kildare, and copper ore is said to have been found in the hills of Dunmurry.

__ Ltivers.—The principal rivers are the Boyne, which with its tributary the Blackwater rises in the north part of the county, but soon passes into Meath; the Barrow, which forms the boundary of Kildare with Queen's county, and receives the Greese and the Lane shortly after entering Kildare ; the Lesser Barrow, which flows southward from the Bog of Allen to near Rathangan; and the Liffey which enters the county near Ballymore Eustace, and flowing north-west and then north-east quits it at Leixlip, having

received the Morrel between Celbridge and Clane, and the Ryewater at Leixlip. The northern border of the county is traversed by the Royal Canal, which connects Dublin with the Shannon at Cloondara. Further south the Grand Canal, which connects Dublin with the Shannon at Shannon Harbour, occupies the valley of the Liffey until at Sallins it enters the Bog of Allen, passing into King's county near the source of the river Boyne. Several branch canals connected with it afford communication with the southern districts of the county.

Climate and Agriculture—Owing in a considerable degree to the large extent of bog, the climate of the northern districts is very moist, and fogs are frequent, but the eastern portion is drier, and the climate of the Liffey valley is very mild and salubrious. The soil, whether resting on the limestone or on the clay slate, is principally a rich deep loam inclining occasionally to clay, easily cultivated and very fertile if properly drained, which too often is not the case. About 40,000 acres in the northern part of the county are included in the Bog of Allen, which is, however, intersected in many places by elevated tracts of firm ground. To the south of the town of Kildare is the Curragh, an undulating down of about 8000 acres in extent, and presenting to the

eye a beautiful sward of vivid green unbroken by a single tree or shrub. The common is the property of the crown, and is occupied as a sheep walk, while a portion of it forms the principal race-course of Ireland. It is now also the headquarters of a military division. The most fertile and highly cultivated districts of Kildare are the valleys of the Liffey and a tract in the south watered by the Greese. The demesne lands along the valley of the Liffey are finely wooded. More attention is paid to drainage and the use of manures on the larger farms than is done in many other parts of Ireland, but the small farms are mostly cultivated in the usual slovenly manner. The pastures which are not subjected to the

plough are generally very rich and fattening.

The following table gives a classification of holdings according to 1880, as contained in the agricultural returns :—

size in 1850 an

1 and 30 and 1 Acre, under 5. | under 15. | under 80. | upwards, —

1850 1,295 2,513 3,854 10,346 1880 1,414 1,764 2,931 8,957

The total area under crop in 1881 was 120,958 acres, or 29 per cent. of the whole acreage of the county. In 1880 239,406 acres, a percentage of 57°2, were under grass, 360 acres lay fallow, 7332 were woods, 87,540 bog and marsh, 988 barren mountain land, and 15,404 water, roads, and fences. The area under crop in 1850 was 147,507 acres, the diminution in 1881 being more than accounted for by a fall of 34,932 in the area under cercals. On the other hand, the area under grass increased between 1850 and 1881 by 47,156 acres. Between 1850 and 1881 the area under wheat, for which the rich deep soil in the valley of the Liffey is well suited, declined from 22,737 to 4120, and that under oats from 45,791 to 23,761, or nearly one-half, while the area under barley was nearly doubled, being 13,883 in 1881. The area under potatoes declined from 12,158 acres in 1850 to 9848 acres in 1881, and, notwithstanding a large increase in pasturage and in the number of cattle, the area under turnips only increased from 9622 to 11,501.

Horses have increased from 18,521 in 1855 to 18,795 in 1881. The number used for agricultural purposes was 8205. _ Little atten- tion is paid tothe breed, and the supply is obtained chiefly outside the limits of the county. Cattle in 1855 numbered 74,480, and in 1881 had increased to 92,252. Milch cows numbered only 12,578, and have diminished since 1855 by 3612. There has been great im- provement in the breeds of cattle, crosses with the shorthorned or the Durham being now the most common. Sheep numbered 127,614 in 1855, 133,996 in 1880, and 117,760 in 1881. They are grazed chiefly on the Curragh, and are now principally Leicesters or crosses with that breed. Pigs have diminished since 1855 from 15,998 to 12,936. Goats in 1881 numbered 3835, and poultry 224,310.

According to the corrected summary of the return of owners of land in Ireland, 1878, the county in 1878 was divided among 1768 owners, possessing altogether 412,490 acres, with a rateable valuation of £838,233. Of the owners 848, or 48 per cent., possessed 1 acre and upwards and the average ratcable valuation all over was

16s. 44d. The duke of Leinster owned 67,227 acres ; the marquis of Drogheda, 16,609; Sir G. G. Ayliner, 15,396; Jolin La Touche 11,282 ; and seven other estates exceeded 5000 acres.

Manufactures. —Though possessing a good supply of water-power, the county is almost wholly destitute of manufactures ; but there are a few small cotton, woollen, and paper mills, as well as breweries and distilleries, and severalcorn mills. Large quantities of turf are exported to Dublin by the canal. ! ‘

Railways.—The Great Western line crosses the county at its northern boundary ‘wear Leixlip, Maynooth, Kilcoek, and Enfield, and the Great Southern and Western passes through nearly its whole extent by Naas, Newbridge, Kildare, Monasterevan, and Athy.

Administration.—The county comprises fourteen baronies, and contains 107 civil parishes, five parts of parishes, and 1240 town-

lands. Judicially it is within the home circuit, and is divided into fourtecn petty sessions districts and three parts of petty sessions districts. Assizes are held at Naas, and quarter sessions at Athy, Kildare, Maynooth, and Naas. The county contains portions of the six poor-law unions of Athy, Baltinglass, Carlow, Celbridge, Eden- derry, and Naas. The military stations at Newbridge and the Curragh constitute the Curragh military district, and the barracks at Athy and Naas are included in the Dublin military district. There are three townships—Athy, Naas, and Newbridge. The principal other towns are Maynooth (which is the seat of a Roman Catholic college), Celbridge, Kildare, Monasterevan, Kilcullen, Leixlip, Kileock, Castledermot, Ballymore Eustace, and Rathangan. Previous to the Union Kildare returned ten members to parlia- ment, of whom eight represented boroughs ; but now it sends only two, who sit as members for the county.

Population.—According to the census return of 1659 the popu- lation amounted to only 13,825, of whom 796 were English and 18,029 Irish. In 1760 it was estimated at 51,726. According to the parliamentary return of 1821 it was 99,065, and by 1841 it had in- creased to 115,190, but in 1851 had diminished to 96,495, in 1861 to 90,946, in 1871 to 83,614, and in 1881 to 76, 102,of wliom 40,859 were males and 35,243 females. In several other counties there is an excess of males over females, but it is much larger in Kildare than in any other, which is the more remarkable that between 1851 and 1880 there has been also an excess of male emigrants, the total number of emigrants being 18,651 males and 11,765 females, or 27°9 per cent. of the apeenan. of 1861. The rate of marriages in 1880 to every 1000 of the population was 3°6, of births 22:0, and of deaths 16:9, the rates for Ireland being 3°8, 24:0, and 19°83. The number of natives of England and Wales residing in the county in 1841 was 406, and in 1871 they had increased to 5270; of natives of Scot- land there were 151 in 1841 and 574 in 1871. The number of Roman Catholics in 1881 was 66,184; of Protestant Episcopalians, 8616; of Presbyterians, 754; of Methodists, 344. In 1871 there were none who spoke Irish only, but 554 spoke Irish and English. Tho nuinber who could read and write in

1871 was 43,783 ; 11,472 could read but could not write, and 28,359 could neither read nor write.

History.—The early inhabitants of the county are perhaps to he identified with Ptolemy's Coriondi. Afterwards it formed part of the district of Caellan or Galen, which also included portions of Wicklow and Carlow, the principal chieftain being a representa- tive of the family of Hy Caellan or M'Kelly, who had their residence at the moat of Ardscull near Naas. According to a tale in the Book of Leinster the original name of Kildare was Druim Criaidh (Drumeree), which it retained until the time of St Brigit, after which it was changed to Cil/dara, the church of the oak, from a very old oak under whose shadow the saint had constructed her cell. For soine centuries it was under the government of the Macmurroughs, kings of Leinster, but along with the remainder of Leinster it was granted by Henry II. to Strongbow. On the division of the palatinate of Leinster among the five granddaughters of Strongbow, Kildare fell to Sibilla, the fourth daughter, who married William de Ferrars, earl of Derby. Through the marriage of the only daughter of William de Ferrars it passed to William de Vesey—who, when challenged to single combat by John Fitz Thomas, baron of Offaly, for accusing him of treason, fled to France. His lands were there- upon in 1297 bestowed on Fitz Thomas, who in 1316 was created earl of Kildare, and in 1817 was appointed sheriff of Kildare, the office remaining in the family until the attainder of Gerald, the ninth earl, in the reign of Henry VIII. Kildare wasa liberty of Dublin until 1296, when an Act was passed constituting it a separate county.

Antiquities.—In the county there are several old gigantic pillar stones, the principal being those at Punchestown, Harristown, Jigginstown, and Mullamast. Among the more remarkable earth- works are the raths at Mullamast, Knockeaellagh near Kilcullen, Ardscull near Naas, and elsewhere, and the numerous sepulchral moundsinthe Curragh. Of the round towers the finest is that of Kildare, which is 130 fect high ; there are remains of others at Taghadoe, Kileullen, Oughterard, and Castledermot. At one time there were an immense number of religious houses in the county.

here are remains of a Franciscan abbey at Castledermot. At Graney there are the ruins of an Augustinian nunnery and also portions of a building said to have belonged to the Knights

Templars. The town of Kildare has ruins of no less than four monastic buildings, among others the nunnery founded by St Brigit. The site of a monastery at Old Kilcullen, said to date from the time of St Patrick, is inarked by two stone erosses, one of which is curiously sculptured. The fine abbey of Monasterevan is now the seat of the marquis of Drogheda. On the Liffey are the remains of Great Connel Abbey near Celbridge, of St Wolstan's near Celbridge, and of New Abbey. At Moone, where there was at one time a Franciscan monastery, there are the remains of a very old cross with curious seulpturings. Among the old castles may be mentioned those of Athy and Castledermot, built about the time of the Anglo-Norman invasion ; Maynooth Castle, built by the Fitzgeralds ; Kilkea, originally built by the seventh earl of Kildare, and restored within the present century; and Timolin, erected in the reign of King John.

KILIA, a seaport town of Roumania, formerly in the province of Moldavia, situated on the northern bank of the northern arm of the lower Danube, 20 miles from its mouth. The inhabitants, between 6000 and 7000 in number, are mainly engaged in the river trade and fisheries. Kilia was occupied by the Russians in 1790, and bombarded by the English and French in 1854. Old Kilia is on the opposite side of the river. A plan of the present town will be found in the maps published by the European Commission of the Danube.

KILIAN, Sz, the apostle of Franconia, was, according to Hrabanus Maurus, a native of Ireland, whence along with his companions he went to eastern Franconia. After having preached the gospel in Wiirzburg, the whole party were put to death by the orders of an unjust judge of the name of Gozbert. Notker Balbulus (c. 912) relates that Kilian's mission emanated from the pope, and that Gozbert was the duke of Franconia, who, after receiving baptism, had been persuaded to put away his wife (Geila) because she was his brother's widow.

Geila in revenga caused Kilian and his comrades, Coloman and Totman, to be secretly put to death. Later accounts assign the mis- sion to the time of Conon (686). In the Martyrologies Saints Kilian (Kyllena, Chilianus), Coloman, and Totman are commemorated on July 8. Their relics lie in the cathedral (St Kiliansmiinster) at Wiirzburg.

KILIMANJARO, a great snow-topped mountain in eastern Africa, in 3° 5’S, lat. and 37° 22’ E. long., has a height of 18,715 feet, and is believed to be the loftiest eminence of the whole continent. It stands completely apart from all the neighbouring heights, but is only “one of many summits that crown the eastern edge of the great plateau of equatorial Africa.” At a distance of 100 miles to the north, across the wide expanse of the Kaptei and Kikuyu plains, lie the less known mountains Kenia and Lemeru ; and due west, at a distance of about 30 or 40 miles, rises the noble mass of Mount Meru.

As the natives believe that the summit of Kilimanjaro is composed of silver, it is possible that Aristotle’s reference to ‘the so-ealled Silver Mountain ” from which the Nile flows was based on indistinct reports about this mountain ; but the real discovery of its existence was made only in 1848 by Mr Rebman of the Church Missionary Society (Church Missionary Intelligencer, 1849). His account, though fully borne out by Dr Krapf, was at first received with great incredulity by professional geographers. The matter has been finally set at rest by the visits paid to the mountain by Von der Decken (1861 and 1862) and Mr Charles New (1867), the latter of whom reached the lower edge of the snow. Kilimanjaro has two principal summits. The eastern, Kibo or Bareni,,is a magnificent dome with a sniooth and regular outline; the other, Kimawenzi, is a dark and rugged peak; and between the two stretches a saddle-like ridge several miles in extent. Trachytes, basalt, and obsidian were obtained by Von der Decken from the upper part of the mountain. Mr New distinguished six clearly marked zones of vegetation. The first was the region of the banana and maize, the surface, when not under cultivation, being clothed with a close turf execedingly rich in clover; above this lay a belt of jungle ; the jungle was succeeded by a forest of gigantic trees with a dense and varied

undergrowth, and an extraordinary profusion of moss both on the ground and on the stems and branches ; beyond tho trees was a region of hills covered with rich grass and clover; beyond the grass eame heath; and this gradually dwindled away into a region of bare wind-swept rocks. Among the fifty species of plants col-

lected on the mountain Dr Hooker found only a few of those European forms which are known to exist in the Cameroons and the Abyssinian mountains.

From the southern slopes of Kilimanjaro descend a great many streams —the Weri-Wari, the Rau, the Ganu, &c.—which, uniting with the Jipe from Lake Jipe, ultimately form the Rufu or Pangani, an important river reaching the Indian Ocean about 5° 30’S. lat. The hilly country round the southern skirts is occupied by the Jaggas or Chaggas, who cultivate maize, millet, and pulse, and keep cattle. Their chief villages are Kilema and Moche.

See R. Thornton (the geologist of Von der Decken’s party) in Proc. of Roy. Geog. Soc., 1861-62; Krapf, Travels in Hast Africa, 1860 ; New, Life .. in East Africa, 1873; Hooker in Journal of Linnean Society, 1875; and for further literature, Petermann’s Jfittheilungen, 1866, pp. 75-76,

KILKENNY, an inland county of Ireland, in the province of Leinster, is situated between 52° 14’ and 52° 52’ N. lat., and between 6° 56’ and 7° 38’ W. long. It is bounded on the N. by Queen’s county, E. by Carlow and Wexford, S. by Waterford, and W. by Waterford and Tipperary. Its greatest length from north to south is about 45 miles, and its greatest breadth from east to west about 25 miles. The area is 507,254 acres, or about 793 square miles.

The greater part of Kilkenny is a continuation forming the south-eastern extremity of the Carboniferous Limestone plain of Ireland, but

in the south-east this is bounded partly by the Cambro-Silurian rocks which run into the county from Wexford, and partly by a continuation of the granite mountains of Wicklow and Carlow, and it is inter- rupted in the north by an extensive hilly region forming part of the Castlecomer coal-field, which extends also into Queen's county and Tipperary. The field lies in the form of a broad basin, and rests on flagstone and black shale. The coal is anthracite, and the most productive portions of the bed are in the centre of the basin at Castlecomer. Besides a large number of fossil plants, crustaceans of a rare species and also several peculiar reptilian remains have been found in the measures. The field is believed to contain nearly 80,000,000 tons of workable coal, and at present the annual yield is about 80,000 tons,—the annual yield of Ireland being only about 130,000 tons. On the granite the limestone has the form of a bedded dolomite, and this is also principally the form of the central division to the north-west of Kilkenny. In other places the limestones are bluish or black, the latter being the best quality for burning, and are often associated with shales of a consider- able thickness. Cherty beds frequently occur between the limestone and the Coal-measures. Hematitic iron of a rich quality is found in the Cambro-Silurian rocks at several places. Tradition has it that silver shields were made about 850 3.c. at Argetros or Silverwood on the Nore, and at Ballygunnion there were very ancient mines associated with the lead. The shelly black marble obtained near the town of Kilkenny has gained wide fame, and is used for tomb- stones, chimney-pieces, and picture frames. Manganese is obtained in some of the limestone quarries, and also near the Barrow. Marl is abundant in various districts. Pipeclay and potter's clay are found, and also yellow ochre. Copper occurs near Knocktopher.

ftwers.—The principal rivers, the Suir, the Barrow, and the Nore, have all their origin in the Slieve Bloom mountains, and after a widely divergent course southwards discharge their waters into Waterford Harbour. The Suir forms the boundary of the county with Waterford, and igs navigable for sloops to Carrick. The N ore, which is navigable to Innistioge, enters the county at its north- western boundary, and flows by Kilkenny to the Barrow, 9 miles above Ross, having received

in its course the King's river at Jerpoint and the Argula near Innistioge. The Barrow, which is navigable beyond the limits of Kilkenny into Kildare, forms the eastern boundary of the county from near New Bridge. There are no lakes of any extent,

but turloughs are occasionally formed by the bursting up of underground streams, '

KIL—KIL

Climate and Agricultwre-—On account of the slope of the country and the nature of the soil, the surface occupied by bog or wet land is very small, and the air is dry and very salubrious. So temperate is it in winter that the myrtle and arbutus grow in the open air. There is less rain than at Dublin, and vegetation is earlier than in the adjacent counties. Along the banks of the Suir, Nore, and Barrow a very rich soil has been formed by alluvial deposits. Above the Coal-measures in the northern part of the county there is a moorish tract devoted chiefly to pasturage. The soil above the limestone is for the most part a deep and rich loam admirably adapted for the growth of wheat. The heath-covered hills afford honey with a flavour of peculiar excellence.

The following table gives a classification of holdings according to size in 1850 and in 1880, as contained in the agricultural returus :-—

5,206 5,325

The total area under crops in 1881 was 159,304 acres, a percentage of 31°4 of the whole acreage of the country. In 1880, 298,252 acres, a percentage of 57°8, were under grass, 2196 fallow, 10,799 wood, 10,746 bog, 13,515 mountain, and 21,661 water, roads, and fences. The area under crops in 1850 was 195,928. The arca under cereals declined from 112,220 acres in 1850 to 65,282 in 1881, wheat decreasing from 47,343 acres to 11,843, and oats from 52, 236 to 35,878, while in other cereals, of which the chief is barley, there has been an increase from 12,641 acres to 17,511. Between 1851 and 1880 the area uuder grass increased by 40,530 acres. Almost nothing has been done to improve the pasturage of the hilly districts, which are still largely

covered with heath. The area under meadow and clover, which includes a large portion of rich soil on the banks of the Nore and Suir, increased from 42,482 acres in 1850 to 62,079 in 1881. Green crops diminished in area from 41,189 acres in 1850 to 31,993 in 1881, potatoes from 26,321 acres to 18,269, and turnips from 11,613 to 9929. Horses since 1850 declined from 17,161 to 16,933. The number in 1881 used for agricultural purposes was 11,606. Mules since 1850 have increased from 687 to 1054, and asses from 3355 to 5345. Cattle in 1850 numbered 72,998, and in 1881 had increased to 120,594. Cows numbered 37,695, or about a third of the total number of cattle, dairy-farming being largely followed, especially in the hilly districts to the south. The most common species of cattle is a cross between the old Irish brecd and the longhorn, but Kerry cows are considerably in demand for dairies. For winter-feeding pounded furze tops are frequently used, but in many cases the cattle graze outside in winter. Sheep, the breed of which has been much improved by crossing, increased from 40,450 in 1850 to 85,393 in 1881. Pigs have declined in numbers from 45,763 to 39,777, while goats have increased from 5958 to 6376, and poultry from 197,955 to 410,524.

According to the corrected summary of owners of land, 1878, the land in 1873, exclusive of the county of the city of Kilkenny, was divided among 1150 proprietors, of whom 827 possessed less than lacre. The annual rateable valuation is stated in the return of 1876 as £340,696, giving an average value of 13s. 9d. per acre. There were forty-seven owners who possessed upwards of 2000 acres, twelve who possessed upwards of 5000 acres, and six upwards of 10,000 acres, viz., Viscount Clifden, 35,288 ; Earl of Bessborough, 23,967 ; Charles Wandesforde, 22,232; Col. W. F. Tighe, 11,970 ; Marquis of Ormonde, 11,960 ; and Viscount Mountgarret, 11,919.

Manufactures.—The linen manufacture introduced into the county in the 17th century by the duke of Ormonde to supersede the woollen manufacture gradually became extinct, and the woollen manufacture now carried on is also verysinall. There are, however, breweries, distilleries, tanneries, and fiour-mills, as well as marble polishing works.

Ratlways.—The county is intersected from north to south by the Maryborough and Waterford line, which is joined near Kilkenny by the South-Eastern Railway from Carlow. The Great Southern and Western Railway skirts the south-western boundary of the county.

Administration.—The county comprises 10 baronies, 124 civil parishes and 15 parts of parishes, and 1601 town-lands. The county of the city contains one parish and four parts of parishes. There are three poor-law unions wholly within the county, viz., Castlecomer, Kilkenny, and Thomastown, and portions of five, viz., Callan, Carrick-on-Suir, New Ross, Urlingford, and Waterford. The county includes the parliamentary borough of Kilkenny, part of that of New Ross, and the township of Callan. There are in the county and city sixteen petty sessions districts. Assizes are heldat Kilkenny, and quarter sessions at Kilkenny, Pilltown, Urlingford, Castlecomer,

Grace's Old Castle, Callan, and Thomastown. The county is within the Cork military district, and there are barrack stations at Kilkenny and Casticeomer. Previous to the Union Kilkenny re- turned sixteen members to Parliament, two representing the county. Since that period two members have been returned for the county, one for the city of Kilkenny, and one for New Ross, which, however, is situated chiefly in Wexford.

Population.—Ac:ording to the census of 1659, the total popula- tion of the county was 18,427, of whom 1442 were English and 16,985 Irish. In 1760 it was estimated at 62,832. In 1821 it had increased to 158,716, and in 1841 to 202,746, but in 1851 it had diminished to 159,514, in 1871 to 109,379, and in 1881 to 99,064, of whom 48,682 were males and 50,382 females. The total number of emigrants from Ist May 1851 to 31st December 1880 was 55,402, or 44°5 per cent. of the population in 1861. The marriage rate in 1880 to every 1000 of the population was 3-2, the birth-rate 22°1, and the death rate 20°0. In 1881 the Roman Catholics numbered 93,699; Protestaut Episcopalians, 4963 ; Presbyterians, 197 ; Methodists, 131; and all other denominations, 74. There were resident in 1871 in the county 805

natives of England and 160 of Scotland. In 1871 the number of persons who spoke Irish only was 316, while 6424 conld speak Irish and English. 44,779 could read and write, 15 369 could read but could not write, and 36,521 could neither read nor write.

History.—Kilkenny received its name from St Cannech or Canice, abbot of Aghaboe in Queen's county, who died in 598, and whose see was removed to Kilkenny in the beginning of the 11th century. In the time of Ptolemy the county was inhabited by the Brigantes and the Cauci. Afterwards it formed part of the kingdom of Uisrai- gagh, modernized into Ossory, which was tributary sometimes to Leinster and sometimes to Munster. In 1210 Kilkenny was formed into a county by King Jolin. During the Revolution it was held by the Irish, and it also strongly adhered to the cause of James II. against William ITI.

Antiquities.—Circular groups of stones of very ancient origin are to be seen on the summits of Slieve Grian and the hill of Clogh- manta, There is a remarkable cromlech at Kilmogue and a large number of cromlcchs as well as raths in various parts of the county. Besides numerous forts and mounds there are five round towers, one adjoining the cathedral of Kilkenny, and others at Tulloherin, Kilree, Fertagh, and Aghaviller respectively. The monastic remains in the city of Kilkenny are mentioned under the notice of the town. There are interesting remains of a Cistercian monastery at Jerpoint, said to have been founded by Dunnough, king of Ossory, and of another belonging to the same order at Graig, founded by the earl of Pembroke in 1212.. The Dominicans had an abbey at Rosbercon founded in 1267, and another at Thomastown, of which there are still some remains. The Carmelites had a monastery at Kuock- topher. There was an Augustinian monastery at Innistioge, and priories at Callan and Kells, of all of which there are still some remains. Of the old castles the most remarkable is Graney or Grandison Castle in Iverk, which is supposed to have been founded by the eighth earl of Ormonde in 1521, and of which three towers and the walls stillremain. See Robertson, Antiquities and Scenery of the County of Kilkenny, 1851.

Kinkenny, the chief town of the above county, a market-town, county of a city, and parliamentary borough, is finely situated on the Nore, and on the Great Southern and Western Railway, 73 miles south-west of Dublin and 32 north of Waterford. It consists of two distinct portions, Englishtown or Kilkenny proper and Irishtown, separated froni each other by a small rivulet, but although Irishtown still retains its name it is now included in the corporation of Kilkenny. The city is irregularly built, but possesses several spacious streets with many good houses, while its beautiful environs and several imposing ancient structures give it an unusually interesting and picturesque appearance. The Nore is crossed by two handsome bridges erected towards the close of last century. The old cathedral of St Canice, from whom the town takes its name, dates from 1052, and with the exception of the cathedral of St Patrick in Dublin is the largest ecclesiastical building in Ireland, having a length from east to west of 226 feet, and a breadth along the transepts from north to south of 123 feet. It occupies a commanding position on an eminence at the western extremity of Irishtown. It is a cruciform structure in the Early English style, with a low massive tower supported on clustered columns of the black marble peculiar to the district. The building was lately restored at a cost of £15,000. It contains a large number of old sepulchral

monuments. On the eastern side of the north transept is the parish church, and a short distance from the south transept are the remains of a round tower, rising to the height of 100 feet. The episcopal palace near the east end of the cathedral was erected in the time of Edward IIL. and enlarged in 1735. Besides the old cathedral, the principal other churches are the Episcopal church of St Mary, a plain cruciform structure; that of St John, containing a portion of the old abbey of St John; and the Roman Catholic cathedral, erected in 1857 at a cost of £30,000, a cruciform structure in the late First Pointed style, with a massive central tower 186 feet in height. There are important remains of three old monasteries—the preceptory of St John’s, founded in 1211; the Dominican abbey, founded in 1225, and now used asa Roman Catholic church ; and the Franciscan abbey on the banks of the

Nore, founded about 1230. But, among the ancient buildings, that next in importance and interest to the cathedral is the castle, occupying a commanding position on the summit of a precipice above the river Nore. It was originally built by Strongbow, but rebuilt by William le Mareschal in 1175, and again restored in the present

century, and transformed into the princely residence of

the marquis of Ormonde. The grammar school or college, which was originally founded by Pierce, earl of Ormonde, and re-endowed in 1684 by the duke of Ormonde, stands on the banks of the river opposite the castle. In it Swift, Farquhar, Congreve, and Bishop Berkeley received part of their education. Adjoining the city is the Roman Catholic college of St Kyran, a Gothic building completed about 1840 at a cost of £20,000, The other principal public buildings are the new court-house, ‘the tholsel or city court, the city and county prison, the barracks, and the county infirmary. There is still a small manufacture of coarse woollens and linens, In the neighbourhood there are large collieries, as well as quarries for marble, the manufactures connected with which are an important industry of the town. It also possesses corn-mills, brew- eries, and a tannery. The population of the county of the city of Kilkenny in 1851 was 19,973, of the town proper 15,808 ; in 1871 the numbers were 15,748 and 12,710; and in 188] they were 14,964 and 12,182.

The town of Kilkenny proper owes its origin to an English settlement which took place in the time of Strongbow, aud it received a charter from William le Mareschal, who married — Strongbow’s danghter. This charter was confirmed by Edward IIL, and from Edward LV. Irishtown received the privilege of choosing a portrieve independent of Kilkenny. By Elizabeth the boroughs, while retaining their distinct rights, were constituted one corpora- tion, which in 1608 was made a free borough by James I., and in the following year a free city. From James II. the citizens received a new charter, constituting the city and liberties a distinct county, to be styled the county of the city of Kilkenny, the burgesses of Irishtown continuing, however, to elect a portrieve until the passing of the Municipal Reform Act. Frequent

parliaments were held at Kilkenny in the 14th century, and so late as the reign of Henry VIII. it was the occasional residence of the lord-lieutenant. In 1642 it was the meeting-placc of the assembly of confederate Catholics. In 1648 Cromwell in the hope, by means of a plot, of obtaining possession of the town, advanced towards it, but before his arrival the plot was discovered. In 1650 it was, however, compelled to surrender after a long and resolute defence. At a very early period Kilkenny and Irishtown returned each two members to par- liament, but since the Union one member only has been returned for the city of Kilkenny.

KILLARNEY, a market-town of Ireland, county of Kerry, is situated on a branch line of the Dublin and Cork Railway, 180 miles south-west from Dublin and 47 miles north from Cork. On account of the beautiful scenery in the neighbourhood, the town is much frequented by tourists. Within late years it has been greatly improved in appearance, and the streets are now spacious and well- paved, while many good houses and several imposing public buildings have been erected. The principal buildings are

the court-house, the Roman Catholic cathedral and bishop’s palace, designed by Pugin, the episcopal church lately rebuilt, the lunatic asylum, erected at a cost of £30,000, and the railway hotel. Adjoining the town is the fine mansion of the earl of Kenmare. The only manufacture of any importance now carried on at Killarney is that of fancy articles from the wood of the arbutus ; but it owed its origin to iron-smelting works, for which abundant fuel was obtained from the neighbouring forests. ;

The lakes of Killarney, about a mile and a half distant from the town, are situated in a basin between several lofty mountain groups, some rising abruptly from the water’s edge, und all clothed with trees and shrubbery almost to their summits. The lower lake, or Lough Leane, which has an area of 5001 acres, is studded with finely wooded islands, on the largest of which, Ross Island, are the ruins of Ross castle, an old fortress of the O’Donoghues; and on another island, the

“sweet Innisfallen” of Moore, are the picturesque ruins of an abbey founded by St Finian the leper at the close of the 6th century. Between the lower lake and the middle or Tore lake, which is 680 acres in extent, stands Muckross Abbey, built by the Franciscans about 1440. With the upper lake, which is 430 acres in extent, thickly studded with islands, and closely shut in by mountains, the lower and middle lakes are conuected by the Long Range, a winding and finely wooded channel, 24 miles in length, and commanding magnificent views of the mountains. Midway in its course is a famous echo caused by the Eagle’s Nest, a lofty pyramidal rock. The population of the urban sanitary district in 1881 was

6546.

KILLDEER, a common and well-known American Plover, so called in imitation of its whistling cry, the Charadrius vociferus of Linnzeus, and the Zyialitis vocyfera of modern ornithologists. About the size of a Snipe, it is mostly sooty-brown above, but showing a bright buff on the tail coverts, and in flight a white bar on the wings; beneath it is pure white except two pectoral bands of deep black. It is one of the finest as well as the largest of the group commonly known as Ringed Plovers or Ring Doterels,’ forming the genus dgialitis of Boie. Mostly wintering in the south or only on the sea-shore of tlie more uorthern States, in spring it spreads widely over the interior, breeding on the newly-ploughed lands or on open grass-fields. The nest is made in a slight hollow of the ground, and is often surrounded with small pebbles and fragments of shells. Here the hen lays her pear-shaped, stone-coloured eggs, four in number, and always arranged with their pointed ends touching each other, as is indeed the custom of most Limicoline birds. The parents exhibit the greatest anxiety for their offspring on the approach of an intruder: the hen runs off with drooping wings and plaintive cries, while the cock sweeps around, gesticulating with loud and angry vociferations. It is the best-known bird of its Family in the United States, throughout which it is found in all suitable districts, but less abundantly in the north-east than further south or west. In Canada it does not range further to the northward than 56° N. lat., and it is not known to occur in Greenland, or hardly in Labrador, though it is a

passenger in Newfoundland every spring and autumn,? In winter it finds its way to Bermuda and to some of the Antilles, but it is not recorded from any of the islands to the windward of Porto Rico. However

1 The word Doterel see i ing i only, the Charadrius ips ct iden caren oh onece osteological characters, may be fitly regarded as the type of a distinct genus, Hudromias. Whether any other species agree with it in the peculiarity alluded to is at present uncertain.

? A single example is said to have been shot near Chri tchurch, i Hampshire, in April 1857 (Ibis, 1862, p. 276), oe ae

travelling down the Isthmus of Panama and the west coast of South America to Peru. The Killdeer has several other congeners in America, amoug which may be noticed @. semipalmata, so curiously resembling the ordinary Ringed Plover of the Old World, &. heatecula, except that it has its toes connected by a web at the base; and . nzvosa, a bird inhabiting the western parts of both the American continents, which in the opinion of some authors is only a local form of the widely-spread , alexandrina or cantiana, best known by its English name of Kentish Plover, from its discovery near Sandwich towards the end of the last century, though it is far more abundant in many other parts of the Old World. The common Ringed Plover, &. hiaticula, has many of the habits of the Killdeer, but is much less often found away from the sea-shore, though a few colonies may be found in dry warrens in certain parts of England many miles from the coast, and in Lapland at a still greater distance. In such localities it has the curious

| habit of paving its nest with small stones (whence it is

locally known by the name of “Stone-hatch”), a habit almost unaccountable unless regarded as an inherited instinct from shingle-haunting ancestors.

About thirty species all apparently referable with pro- priety to the genus Mgialitis have been described, but probably so many do not exist. Some, as the Kentish Plover above named, have a very extended distribution, for that, letting alone its supposed American habitat, certainly occurs in greater or less numbers on the coasts of China, India, and Africa generally. On the other hand there is one, the 4. sanctx-helenz, which seems to be restricted to the island whence it takes its scientific name, and where it is called the " Wire-bird" (Jbis, 1873, p. 260). Nearly allied to Mgialitis are two genera peculiar to the New Zealand subregion—Z'hinornis, which does not call for any particular remark, and the extraordinary Anarhynchus, which deserves a few words. Of this there is but one species, 47. frontalis, the Wrybill, so called from its bill being congenitally bent in the middle and diverted to the right side—a formation supposed to give the bird greater facility in seeking its food, chiefly arthropods that lurk under stones, round which it may be seen running from left to right. Mr Buller (2. New Zealand, p. 219) con- nects with this habit the curious fact that the black pectoral band worn by the bird is "narrower and of a less decided colour on the left side of the breast," whence he infers that '"'the law of natural selection has operated to lessen the colouring on the side of the bird more exposed to Hawks and other enemies while the Anarhynchus is hunting for its daily food." Be that as it may, it does not detract from the wonderful nature of this asymmetry of the bill, which is comparable indeed with that found in so large a number of Cetaceans among mammals, but with nothing known among birds, for in the CrossBILis (¢.v.) the bones of the mandibles are not affected, and in certain Owls (Nyctala) the distortion of the ear-bones is not externally visible. (A. N.

KILULIZ, or Krxis, a town of Syria, in the Turkish vilayet of Aleppo, in 37° 2' N. lat. and 37° 2' E. long., 60 miles north of the city of Aleppo. It is situated in an extremely fertile plain or plateau, completely surrounded with olive groves, the produce of which is reckoned the finest oil of all Syria; and its position on the regular route from Birejik on the Euphrates to southern Caramania gives it considerable traffic. The bazaars are unusually fine, aud gunmaking is

a common craft in the town. The popula- tion, variously estimated at 12,000 and 6000, consists

‘largely of Arabs, the town lying just on the northern rim

of the Arab territory. KILMARNOCK, a market-town, and parliamentary and municipal burgh, in the district of Cunningham,

Ayrsbire, Scotland, is situated on both sides of the Kilmarnock water, near its junction with the Irvine, 21 miles south-west of Glasgow by rail. The town is long and narrow, but its principal streets are well-built and spacious. Among the chief buildings are the town-house, the court-house, the corn exchange buildings (including the Albert tower, 110 feet high, and various public offices), the observatory, and the academy, built in 1876 at a cost of £5000 to accommodate six hundred children. Kilmarnock also possesses the endowed Kay schools, an industrial school in the once famous Kilmarnock House, a school of art, an atheneum, a public library, an opera-house, and an in- firmary. In the Kay park of 40? acres, purchased from the duke of Portland for £9000 (with a legacy left by a native of the town in 1866), stands the Burns Monument, inau- gurated in August 1879. Kilmarnock rose into importance in the 17th century by its production of striped woollen “ Kilmarnock cowls” and broad blue bonnets. Knitted woollen bonnets are still manufactured to an annual value of about £25,000, but by far the most important textile industry is carpet-weaving. When trade is good, the annual turn out of Brussels and Scotch carpets is valued at about £100,000. There are several spinning mills in connexion with the carpet factories. Tweeds, blankets, shawls, and tartans are produced to a limited but rapidly increasing extent; the manufacture of wincey is larger. Calico-printing, once important, has dwindled. The boot and shoe trade is prosperous ; and there are very extensive iron and engineering works in the town. Situated in a highly cultivated region, Kilmarnock is famous for its dairy produce; and the largest cheese-show in Scotland is held there annually. The neighbourhood abounds in freestone and coal. The burgh is governed by a provost, six bailies, and eighteen councillors. It unites with Dumbarton, Port- Glasgow,

Renfrew, and Rutherglen in returning one member to parliament. The population in 1881 was 23,901.

KILSYTH, a burgh of barony in Stirlingshire, Scotland, is situated about 12 miles north-east of Glasgow. It is ill built and dingy. On August 15, 1645, the Covenanters under Baillie were defeated at Kilsyth by Montrose with great slaughter. Kilsyth is further interesting as the centre of remarkable religious revivals in 1742-43 and 1839. The present village dates from the middle of the 17th century. It became a burgh of barony in 1826 by charter from George IV. The inhabitants are chiefly engaged in the neighbouring coal and iron works; but weaving and paper-making are also carried on. The population in 1881 was 5402.

KILWINNING, a market-town in Cunningham district, Ayrshire, Scotland, is situated on the right bank of the Garnock, 26 miles south-west of Glasgow by rail. The houses are neat, but somewhat straggling. The chief buildings are the parish church (with a handsome detached Gothic tower erected in 1815 in place of an older one, 103 feet high, which fell in 1814), the Free church, and the board school. The greatest interest of the place centres in its ruined abbey, originally one of the richest in Scot. land. Founded about 1140 by Hugh de Morville, lord of Cunningham, it was dedicated to St Winning, who lived on the spot during the 8th century, and has given his name to the town. This beautiful specimen of Early English was destroyed in 1561; and its lands were granted to the earl of Eglinton and others. Kilwinning is the traditional birthplace of Scottish freemasonry; and Kil- winning lodge, said to have been founded by the foreign architects and masons who came to build the abbey, is still looked up to as the mother-lodge in Scotland. The royal company of archers of Kilwinning —dating, it is said, as far back as 1488—used till recently to meet annually to shoot at the papingo, or popivjay, in the manner described

in Scott’s Old Mortality ; and in 1881 an attempt has been made to revive the custom. The former industry in weav- ing shawls and lighter fabrics has quite died out. The large iron, coal, and fire-clay works in

the neighbourhood employ most of the working inhabitants. A woollen-mill, with sixty hands, but capable of employing three hundred, was opened in 1881. The population of the parish in 1881 was 7037 ; of the town, 3469. About a mile from Kilwinning is Eglinton Castle, the principal seat of the earl of Eglinton, where the famous Eglinton tournament was held in 1839.

KIMBERLEY, formerly called New Rush, one of the mining towns of the diamond district of South Africa, situated in Griqualand West, to the east of the Orange river, 520 miles north-east of Cape Town. Though it dates only from 1872, and has much of the temporary character to be expected from the conditions that gave it existence, it bids fair to be a permanent settlement, having a number of buildings of stone and brick, a market-place, banks, churches, &c., and publishing a Diamond News. Although in 1874 the population left almost ex masse for the gold- mines of Leydenberg (in Transvaal), the town was estimated in 1881 to have something like 10,000 inhabitants, besides a floating native population about equal in number. See Holub, Seven Years in South Africa, 1881. :

KIMHI. ReDaK, 7.¢., Rabbi David Kimhi or Kimehi,!

-was born at Narbonne after 1155, and died probably in

the same city about 1235, His father Rabbi Yoseph, or his grandfather Rabbi Isaac (Yishak) Ibn Kimhi, had immigrated into Provence from Spain, where Arab fanati- cism had compelled the Jews to flee from the sword of tyranny. In Provence the family took-the Gentile surname of Petet.2 Rabbi David lost his father (who was himself a grammarian, Bible commentator, and poet of no mean order) very early ; but his elder and only brother, Rabbi Mosheh (a fair scholar, but famous chiefly through his younger brother), was his principal oral teacher. The valuable literary treasures of his father, however, falling into his hands, Redak grew strong by studying them, and, as we know, eclipsed them completely, although he lacked his father’s originality. But, if Rabbi David lacked originality, he had abundance of instinct for finding out the best in the works of his predecessors, and abundance of genius for digesting and assimilating it till it became his own ina

peculiar way. Although preceded by Hayyuj, Ibn Janah, and others, and succeeded by Abraham de Balmes, Elias Levita, and others, Kimhi has maintained the position of the greatest Jewish grammarian and lexicographer for six hundred and fifty years. And, although much inferior as a Biblical scholar and talmudist to Rashi, and as a critic and philosopher to Abraham Ibn Ezra, he has outstripped both in the eyes, not only of the Christians, but to some extent even of the Jews, and thus reigned supreme for more than half a millennium, as a commentator on the Bible, The fact is, he united in his own person the child- like simplicity of Rashi and the incisive criticism of [bn Ezra. Add to this that he was master of the Targums and Aggadoth as few before or after him, that he had Hebrew, Arabic, and Greek philosophy at his fingers' ends, and that he was endowed with a truly poetical soul, and the mystery is explained how the merely reproductive scholar could cause original scholars of the highest eminence, but who were one-sided, to be all but forgotten. Not only have his works, in whatever field they are to be found, been printed and reprinted, but the most important of them are translated

1 Not Kamchi. Horayoth, iii. 2. ;

2 From these circumstances Kimhi is known as Iassephardt (the Spaniard), as Jbn Kimhi, or as Maistre Petit. Petit is, to a certain extent, an equivalent of Kimhi (from MDP, grain ground small).

Compare MNO in the Talmud Yerushalmi,

into Latin,! into Judo-German,? and even into English.' The following is a list of Kimhi's works, which, however,

lays no claim to perfection :— ,

GRAMMAR. —byb5n, part i.:—(1) Constantinople, 1532-34, folio ; (2) Constantinople, 1532-34, 8vo; (3) with Latin translation by Agathius Guidacerius, Paris, 1540, 8vo; (4) with additamenta by Elias Levita, Venice, 1544, 8vo,* and again (5) 1545, folio; (6) with the

same additions, Venice, 1545, 8vo; (7) with the same additions and commentary by Mosheh D’3yn (Hechingen?), Fiirth, 1793, 8vo; (8) with additions from MSS. by Rittenberg, Lyck, 1862, 8vo. In addition to these have appeared Compendia from this grammar by Pagninus, Paris, 1549, 4to; and by Baynus, Paris, 1554, 4to.

LEXICON. —biyb5n, part ii.:—(1) without place and date, but before 1480, folio ; (2) with a Biblical index on the margin, Naples, 1490, folio; (3) with a Biblical index inserted, Naples, 1491, folio; (4) without pagination, Constantinople, 1513, folio ; (5) Venice, 1529, folio ; (6) with corrections from MSS., Salonika, 1532-38, folio ; (7) Venice, 1546, folio; (8) with notes by Elias Levita, Venice, 1546-48, folio; (9) with Latin translation of the roots, Venice, 1546-48, folio; (10) the text revised from three MSS., Berlin, 1847, 4to.

CoMMENTARIES,—(1) On the Greater Part of Genesis,® Pressburg, 1842, 8vo. (2) On the Prophets and the Psalms, in the first Rab- binie Bible, Venice, 1517, folio. (8) On the Prophets and the Chronicles, in the third and all subsequent Rabbinic Bibles, Venice, 1548, 1568, 1617-19; Basel, 1618-19; Amsterdam, 1724; Warsaw, 1860-68 ; 1866-76. (4) On the Former Prophets, Jeremiah and Ezekiel, in the second Rabbinic Bible, Venice, 1524-25, folio. (5) On the Former Prophets, Soncino, 1485; Leiria, 1494; Pesaro, 1511; Salonika, 1535, all in folio. (6) On the Latter Prophets, Guada- laxara, 1482 ; Soncino, 1485-86; Pesaro, 1515, all in folio. (7) On Isaiah and Jeremiah, Lisbon, 1492, folio. (8) On the Minor Pro- phets, Paris, 1539-40, 4to. (9) On Hosca, Joel, Amos, Obadiah, and Jonah, Paris, 1556, 4to. (10) On Hosea, with the Latin translation of Mercier abridged by Coddeus, Leyden, 1621, 4to; with the sacred text, Helmstidt, 1702-3, 4to; by Hermann von der Hardt, Gottingen, 1775, 4to. (11) On Jocl and Malachi, by Miinster, Basel, 1570, 12mo. (12) On Joel and Obadiah, Utrecht, 1657, 8vo. (13) On Amos, with a letter by Elias Levita, Basel, 1531, 8vo. (14) On Obadiah, Bremen, 1673, 4to; Jena, 1678, 8vo. (15) On Jonah, Utrecht, 1656, 8vo ; Leipsic, 1683, 8vo; Utrecht, 1692, 8vo ; Frankfort-on-the-Main, 1697, 4to. (16) On Haggai, Zechariah, and Malacht, by Thomas Neale, Paris, 1557, 4to. (17) On Malachi, Basel, 1530, 8vo ; Rostock, 1637, 4to ; Leipsie, 1679, 8vo. Besides these editions it ought to be

mentioned that the Haphtaroth, or ‘* Prophetic Portions,” read on sabbaths, festivals, &c., are to be found attached to the Pentateuch, Constance, 1505, folio; Venice, 1516, folio ; Constance, 1522, folio ; Cremona, 1566, folio; Venice, 1568, folio; Cracow, 1588, folio ; Basel, 1618, folio; Berlin, 1705, folio; Wilmersdorf, 1713, folio; Amsterdam, 1726, folio; Frankfort- on-the-Main, 1730, folio; Metz, 1766, 4to. (18) On the Psalms without place (but, no doubt, Bologna), 1477, folio ; in the Hagio- grapha, Naples, 1486-87, folio; in the first Rabbinic Bible, as above ; Salonika, 1522, folio; Isny, 1541, folio; Cremona, 1561, 8vo; Venice, 1566, 8vo; Venico, 1596; Amsterdam, 1681, Ato ; Zolkiew, 1696, 4to; Frankfort-on-the-Main, 1712, 8vo; Dyhern- furt, 1714, 4to; Amsterdam, 1765, 4to; Berlin, 1767, 4to; Amster- dam, 1777, 16mo; as part of prayer-book, Amsterdam, 1796, 18mo; Ainstcrdam, 1816, 8vo ; a part of a Bible, Fiirth, 1842-47, 8vo; Zitomir, 1867, 16mo. In addition to these there ought to be mentioned The First Ten Psalms, &c., Constance, 1544, folio, and An Extract from Kimcht_on the Psalms, &c., Wilmersdorf, 1725, 4to.

MIscELLANEOUS Worxks.—(1) Et Sopher on the Massoreth and the Accents, Lyck, 1864, 8vo. (2) Antichristiana:—(a) in the Mulchemcth Chobah, Constantinople, 1710, 8vo; and (6) in the Nitzzachon, Nuremberg, 1644, 4to ; Amsterdam, 1709, 16mo; Am- sterdam, 1711, 16mo ; Amsterdam, 1827, 16mo ; Konigsberg, 1848-

1 As, e.g., the commentary On Isaiah, by Malanimeus, Florence, 1774, 4to; On Hosea, by Mercier, Leyden, 1621, 4to ; On Joel, by Leusden, Utrecht, 1657, 8vo; On Obadiah, by Crocius, Bremen, 1673, 4to; On Obadiah, by Bedwell, London, 1601, 4to; On Jonah, by Leusden’ Utrecht, 1656, 8vo; On Haggai, Zechariah, and Malachi, by Neale, Paris, 1557, 4to; On Malachi, by Bohl, Rostock, 1637, 4to : On the Psalms, by Janvier, Paris, 1666, 4to; On Psalms i-x., by Fagius, Constance, 1544, folio, and with Janvier’s translation in Reland’s Analecta Rabbiniea, Utrecht, 1723, 8vo ; On Psalm iv., by Bourdelot Paris, 1619, 4to ; and on Psalm xix., by Philipp. d’ Aquino, 1629 8vo,

? That, for instance, On Isaiah, Cracow, 1586, 4to. , ak?

3 As that On Zechariah, by M‘Caul, London, 1887, 8vo,

house, with the remarkable date on the title-page—710} pny

rndywa5 (sic), 1.€., 1544 of our redemption, showing that the editor was a baptized Jew. Of this edition no other copy is known to us. ® This was, no doubt, Kinthi's last production.

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50, 24mo. The ''Antichristiana" contained in the Witzzachon are the '* Answers to the Christians," from the author's com. mentary on the Psalms, which are omitted in most of the editions. (3) Religious Philosophy.—The "explanation of the Merkabah (first ehapter of Ezekiel) in a mystic way," is, although attached to the author's commentary on Ezekiel, a separate essay. In all the editions it is to be found after that commentary.

KIMPULUNG, a town of Roumania, in that part of the country formerly known as Great Wallachia, is situated at the foot of the Transylvanian Alps on the banks of one of the left hand tributaries of the Danube, about 80 miles north-west of Bucharest. Its position near the Térzburg pass gives it a considerable share of the trade between Hungary and Roumania. Population about 9000.

KINCARDINE, or Tue Mearns, a maritime county in the east of Scotland, is situated between 56° 46' and 57° 9' N. lat., and between 2° 3' and 2° 47' W. long." It is bounded on the E. by the German Ocean, on the N.W. by Aberdeenshire, and on the §8.W. by Forfarshire. Its length along the coast from the mouth of the North Esk to that of the Dee is 31 miles, and its breadth east to west from Dunnottar to Mount Battock 22 miles. The total area is 248,284 acres, or about 388 square miles.

Geology.—The Grampian range of mountains intersects the county from east to west, and occupies a breadth of about 8 miles in the western and north-western districts, terminating in the north-eastern corner in the promontory of Girdleness. To the north the county slopes

into the picturesque and finely wooded valley of the Dee, and towards the south into the “ How (or hollow) of the Mearns,” a continuation of the valley of Strathmore, but it rises again into smaller eminences towards the coast. The highest summit of the Grampians in Kincardineshire is Mount Battock, 2465 feet, but a considerable number range from 1500 to a little above 2000 feet. The southern part of the coast from the North Esk is rocky but low, with considerable stretches of sand; from Bervie to Stonehaven it rises into an almost unbroken line of perpendicular cliffs ranging from 100 to 250 feet in height ; from Stonehaven to the mouth of the Dee it is still more bold and rocky, but at the same time more frequently interrupted by creeks and bays, which form natural harbours for a number of fish- ing villages. The greater part of the county belongs to the Upper Silurian strata of the Highlands, consisting chiefly of gneiss, but towards the west there is a large eruption of granite, and the southern half of the county belongs to the upper strata of Old Red Sandstone. Conglomerate occurs on the coast, and porphyry, sandstone, and whinstone in the southern part of the county. Lime is found, but not in amount sufficient to meet agricultural wants, and large quantities are imported.

Rivers and Lakes.—The principal rivers are the Dee,

. Which skirts the northern boundary of the county, and

receives the Feugh at Banchory, where are the beautiful falls of Feugh; the North Esk, which after entering it from Forfarshire, receives the tributary of the Luther, and forms a portion of the south-western boundary of the shire ; the Bervie, which rises in the Grampians, and after flowing south-eastwards for about 10 miles, falls into the sea at Bervie; and the Carron and Cowie, whiich flow the one eastward and the other south-eastward to the sea at Stone- haven. The principal lakes are the Loch of Drum, lately reduced from 300 to 100 acres, and Loirston Loch, 27 acres.

Climate, Soil, and Agricultuwre.—The climate is healthy, but, except on the north side of the Dee, often cold even on the low grounds, owing both to exposure to east winds, especially near the sea-coast, and to the proximity of bleak and chilly uplands. It has, however, been

greatly im- proved by extensive drainage of the marshes. The meat annual is 45° Fabr., that of summer being 58°, and of winter

37°. A great part of the mountainous district is unsuitable for either pasturage or tillage, and is occupied chiefly by deer forests and grouse moors ; but the land in the valley of the Dee, in the "‘ How," and along the coast is very pro- ductive, and is cultivated according to the most advanced methods. A considerable portion of the " How" is, how- ever, on account of the difficulty of drainage, still occupied by moor and moss. The land in this district is richer and stronger than that in the valley of the Dee, but the most fertile region is that. along the sea- coast, the soil consisting nore generally of a deep loam resting on clay, although in some places it is poor and thin, or stiff and cold.

According to the agricultural returns for 1881, the total area under crops was 120,631 acres, a percentage of 48°6, that for 1870 being 47°1. The area under corn crops was 44,803; under green erops, 22,476; under rotation grasses, 46,645; under permanent pasture, 6552 acres. The area under woods was 27,880 acres, while 12 acres were under nursery grounds, and 23 under market gardens. About two-thirds of the area under corn crops is occupied by oats, which in 1881 covered 31,430 acres, while 12,120 acres were under barley, and 577 acres, chiefly in the neighbourhood of the sea-coast, were under wheat, the area of which has been rapidly declining, 55 under rye, 581 under beans, and 40 under pease. Of green crops

50 Acres and under,

From 50 to 100 Acres,

From 100 to 300 Acres,

No. Acres,

1,200 1,081

Acres. No. Acres.

60,730 63,333

15,604 14,705

22,583 | 362 23,113 | 370

It will thus be seen that about three-fifths of the holdings are under 50 acres in extent, but that their number has within recent years been diminishing. According to the Owners of Lands and Heritages Return, 1872-78, the land was divided among 1384 pro- prietors, possessing 244,585 acres, with a gress annual value of £253,393. Of the owners, 1189 possessed less than 1 acre, and the average value per acre was £1, Os. 64d. Sir Thomas Gladstone owned 45,062 acres; Earl of Kintore, 17,370; James Young, 16,659; Viscount Arbuthnott, 13,560; Sir J. H. Burnett, 12,025 ; R. W. Duff, 8722 ; Mrs Badenoch Nicolson, 8481 ; W. N. Forbes, 6528. A comprehensive account of the agricultnre of Kincardine- shire, by James Macdonald, is contained in the Transactions of the Highland and Agricultural Soeiety for 1881.

Manufactwres.— Woollen manufactures are carried on at Stone- haven, and flax-spinning and weaving at Bervie, Laurencekirk, and afew other placcs. There are several breweries, tanneries, and distilleries. Fishing gives employment to a number of persons in the sea-coast villages. The rental of the salmon fishings on the coast is £7000, and of those on the rivers £1250 perannum. ‘There is some shipping at Stonehaven.

Railways.—The Caledonian Railway traverses the county from Marykirk to the mouth of the Dee, and a branch line runs along the sea-coast as far north as Bervie.

Administration.—The county comprises eighteen parishes and three parts of parishes; one royal burgh, Bervie, which received its constitution from David II. in return for the hospitality of the inhabitants when he landed there through stress of weather; and one burgh of barony, Stonehaven, which, since 1600, has been the capital

of the county, the former capital, Kincardine, in the parish of Fordoun, at which there was at one time a royal castle, having now declined to the position of a mere hamlet. The county is now joined to the sheriffdom of Aberdeen, weekly courts being held at Stonehaven. One member of parliament is returned for the county, and Bervie is united with the Montrose district of burghs, which returns one member.

Population.—The population between 1801 and 1851 increased from 26,349 to 34,598. In 1871 it was 34,466, and in 1881 it was 34,460, of whom 16,972 were males and 17,488 females. The population of Stonehaven in 1871 was 3396, and in 1881 it was 3948. Laurencekirk in 1881 had a population of 1454, Johns- haven 1039, and Bervie 1094.

History and Antiquities.—Anciently Kincardine belonged to the district of Pictavia. Cairns and stone circles are frequent in nearly every part of the shire, and there are numerous traces of Roman camps. According to some the county received the name Mearns from having been granted to Mernia, a Scottish king, brother of the Angus who received the neighbouring county of Forfar, The only old building of special interest is Dunnottar Castle near Stone- haven, the old seat of the Keiths, earl marischals of Scotland. The eastle stands on a high projecting rock about 150 feet above the Sea, by which it is nearly surrounded, and was formerly an extensive fortress of great strength. In the reign of James IJ. it was used as @ prison for Nonconformists. Among the eminent persons con-

From 300 to 500 Acres.

about four-fifths of the area is under tnrnips and swedes, which in 1881 occupied 18,304 acres, 3696 being occupied by potatoes, 450 by vetches and similar crops, 17 by carrots, and 8 by cabbage. Flax occupied 1 acre, and there were 184 acres fallow. Great improvements have lately been effected in regard to farm buildings and drainage.

The total number of horses, many of which are well-bred Clydes- dales, in 1881 was 4798. Of these, 3893 are stated to be used solely for agricultural purposes, and 905 to be kept solely for breeding purposes. Cattle in 1881 numbered 25,013, or an average of 21 to every 100 acres under cultivation, the average for Scotland being 23°9. Mueh attention is paid to the rearing of stock, and cattle feeding is carried on according to the most advanced methods. The most common breed is the shorthorn, which are bought in for feeding from Ireland, but a few Canadian cattle have also lately been bought. The more common home-bred stock is a cross be- tween shorthorned and polled; but there are also many valuable herds of the pure polled breed. Sheep in 1881 numbered 24,966, an average of 20°7 to every 100 acres under cultivation, the average for Scotland being 141°3. Blackfaced sheep are of course those chiefly kept on the hill pastures, but on the lowland farms Cheviots ora cross with Leicesters are not uncommon. The number of pigs in 1881 was 1967.

The following table gives a classification of holdings according to size in 1875 and 1880, with the total area under each class of holding :—

From 500 to 1000

Acres. Total.

Above 1000 Acres.

Acres. Acres, No.

6,281 4,489

Acres, Acres.

15,254

120,452 14,692

120,332

nected with Kincardine may be mentioned John of Fordoun the historian, George Wishart, Robert Barclay the Quaker, Bishop Burnet, Dr John Arbuthnott, Dr James Beattie, Dr Thomas Reid, and Lord Monboddo.

See the History and Traditions of the Lands of the Lindsays, 1853 ; History and Antiquities of the Mearns, 1858; and Memo- rials of Angus and the Mearns, 1861,—all by A. Jervise.

KINDERGARTEN, a German word meaning “garden of children,” is the name given by Friedrich Froebel (see FROEBEL) to a kind of “play-school” invented by him for furthering the physical, moral, and intellectual growth of children between the ages of three and seven. Froebel’s observation of the development of organisms and _ his fondness for analogies drawn from trees and plants made him attach especial importance to our earliest years, years in which, as he said, lies the tap-root of much of the thought and feeling of after life. Although the analogies of nature had constantly been referred to before Froebel’s days (“‘ First the blade, then the ear, then the full corn in ear”), and Bacon, speaking of education, had said that the gardener bestows the greatest care on the young plants, the Renaissance left the imparting theory of education so firmly fixed on the mind of Europe that for two hundred years the developing theory could hardly get a hearing, and little was done to reduce it to practice before the attempt of Pestalozzi. Pestalozzi and other great thinkers (notably Comenius), who attached much importance to the first years of life, looked to the mother as the sole educator. But in the case of the poor the mother might not have time to attend to her children ; so towards the end of the last century Pestalozzi planned and Oberlin formed day- asylums for young children, the benefit of which was intended no less for the mother than the child. Schools of this kind took in the Netherlands the name of “ play school,” and in England, where they have especially thriven, of “infant schools.” But Froebel’s idea of the “Kindergarten” differed essentially from that of the infant schools. He maintained that there was something to do for young children which even the ideal mother in the ideal family could not do. The child required to be prepared for society by being early associated with its equals; and

young children thus brought together might have their employments, especially their chief employment, play, so organized for them as to draw out their capacities

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of feeling and thinking, and even of inventing and creat- ing.

“According to the development theory all education must be based on study of the nature to be developed. Froebel’s study of the nature of children showed him that their great characteristic was restlessness. — This was, first, rest- lessness of body, delight in mere motion of the limbs ; and, secondly, restlessness of mind, a constant curiosity about whatever came within the range of the senses, and especially a desire to examine with the hand every unknown object within reach. Children’s fondness for using their hands was specially noted by Froebel, and he found that they delighted, not merely in examining by touch, but also in altering whatever they could alter, and further that they endeavoured to imitate known forms whether by drawing or by modelling in putty or clay. Besides remarking in

them these various activities, he saw.that children were

sociable and needed the sympathy of companions. There was, too, in them a growing moral nature, passions, affections, and conscience, which needed to be controlled, responded to, cultivated. Both the restraints and the opportunities incident to a well-organized community would be beneficial to their moral nature, and prove a cure for selfishness.

Froebel held that the essence of all education was to be found in rightly directed but spontaneous action. So the children must be employed; and at that age their most natural employment is play, especially, as Wordsworth has pointed out, games in which they imitate and “con the parts” they themselves will have to fill in after years, Froebel agreed with Montaigne that the games of children were “their most serious occupations,” and with Locke that “all the plays and diversions of children should be directed towards good and useful

habits, or else they will introduce ill ones" (Z'houghts concerning Education, § 130). So he invented a course of occupations, most of which are social games. Many of the games are connected with the ''eifts," as he called the series of simple playthings provided for the children, the first being the ball, "the type of unity." The "gifts" are chiefly not mere playthings but materials which the children work up in their own way,

thus gaining scope for their power of doing and invent- |

ing and creating. The artistic faculty was much thought of by Froebel, and, as in the education of the ancients, the sense of rhythm in sound and motion was cultivated by music and poetry introduced in the games. Much care was to be given to the training of the senses, especially those of sight, sound, and touch. Intuition or first-hand experience (Anschauung) was to be recog- nized as the true basis of knowledge, and though stories were to be told, and there was to be much intercourse in the way of social chat, instruction of the imparting and "Jearning-up" kind was to be excluded. Froebel sought to teach the children not what to think but how to think, in this following in the steps of Pestalozzi, who had done for the child what Bacon nearly two hundred years before had done for the philosopher. Where possible the children

were to be much in the open air, and were each to cultivate a little garden.

'To judge by all appearances at the present date (1881), the kindergarten will be an important institution in the education of the future. The first kindergarten was opened at Blankenburg near Rudolstadt, in 1840, but after a needy existence of eight years was closed for want of funds. In 1851 the Prussian Government declared that 'schools founded on Froebel's principles or principles like them could not be allowed." But the idea had far too much vitality to be starved or frowned down. Although its progress has not been rapid, it has been constant. As carly as 1854 it was introduced into England by the then famous Ronges, and Henry Barnard reported on it that is was '' by far the most original, attrac- tive, and philosophical form of infant

devclopment the world has yet sccn” (Report to Governor of Connecticut, 1854). – But the

attempt failed, and though there are now a Froebel Society, an institution for training young women to conduct kindergartens, and also some good kindergartens, Froebel’s idea has hardiy yet found a home in Britain. The great propagandist of Froebelism, the Baroness Marenholtz-Biilow, drew the attention of the French to the kindergarten from the year 1855, and Michelet declared that Froebel had ‘‘solved the problem of human education.” In the department of the Seine the ‘Salles d’asile”’ now consist of a class for children from two to four years old, and a ‘‘ Froebel class” of children from four to six. In Italy the kindergarten has been introduced by Madame Salis-Schwabe, and is uscd in the education of the poor. In Austria it is recognized and regulated by the government, though the Volks-Kindergirten are not numerous. But by far the greatest developments of the kindergarten system are in the United States and in Belgium. Dr William T. Harris, assisted by Miss Blow, tried the experiment of making the kinder- garten a part of the public education in St Louis eight years ago, and there are now no less than 8000 children, all over five ycars of age, in the St Louis public kindergartens. In Belgium the mistresscs of the ‘Ecoles gardiennes ” have for some time been instructed in the ‘idea of the kindergarten” and ‘‘ Froebel’s method,” and in 1880 the minister of public instruction, Van Humbeeck, issued a pro- gramme for the ‘Ecoles Gardiennes Communales,” which is both in fact and in profession a kindergarten manual. This programme attributes the improvement in infant schools to ‘‘le soufile puissant de Froebel” ; and, after explaining that the method to be adopted is based on the laws which govern the development of the child, the minister continues: ‘‘ In its great principles as well as in its main applications this method is that created by the genius of Froebel.” This estimate of Froebel’s principles contrasts strangely with the Prussian minister’s thirty years earlier.

Literature.—Henry Barnard's volume, Froebel's Kindergarten, Hartford, U.S.A., 1881, contains a large collection of papers on the subject, original and translated ; W. T. Harris's Reports give full accounts of the adaptation of the Kindergarten to public education at St Louis. Kindergartens in Germany are described in Joseph Payne's Visit to German Schools, 1876. Practical guides published in England are J. and B. Ronge's, 8d cd., 1855; E. Wiebe's Paradise of Children ;

and Miss Lyschinska's, 1880. Other literature is cited in Steiger's Cyclopedia of Education; and in L. Walter's Die Frdébelliteratur, 1881. (R. H. Q.)

KINEMATICS. See Mecuanics.

KING, Wint1am (1650-1729), a political and religious writer, and successively bishop of Derry and archbishop of Dublin, was born at Antrim in 1650. He was educated at Trinity College, Dublin, and after being presented to the parish of St Werburgh, Dublin, in 1679, was elected dean of St Patrick's, Dublin, in 1688, bishop of Derry in 1691, and archbishop of Dublin in 1702. He died in 1729. King was the author of Zhe State of the Protestants in Ireland under King James's Government, 1691, but is best known by his De Origine Mali, 1702 (English translation, 1731), an endeavour to reconcile the presence of evil with the existence and gooduess of an Omnipotent Being, which was deemed worthy of a reply by Bayle and Leibnitz. He also published a sermon entitled Dwwine Predestination and Foreknowledge consistent with the Freedom of Man's Will, 1709, and various other small treatises.

KING-BIRD, the Lantus tyrannus of Linnzeus, and the Tyrannus carolinensis or 7. pipira of most later writers, a common and characteristic inhabitant of North America, ranging as high as 57° N. lat. or further, and westward to the Rocky Mountains, beyond which it goes to Oregon, Washington Territory, and British Columbia, though apparently not occurring in California. In Canada and the northern States of the Union it is a summer visitor, wintering in the south, but also reaching Cuba; and, passing through Central America, it has been found in Bolivia and eastern Peru. Both the scientific and common

names of this species are taken from the way in which the cock will at times assume despotic authority over other birds, attacking them furiously as they fly, and forcing them to divert or altogether desist from their course. Yet it is love of his mate or his young that prompts this belli- cose behaviour, for it is only in the breeding season that he indulges in it; but then almost every large bird that approaches his nest, from an Eagle downwards, is assaulted, and those alone that possess greater command of flight can

| escape from his repeated charges, which are accompanied

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by loud and shrill cries. On these occasions it may be that the King-bird displays the emblem of his dignity, which is commonly concealed ; for, being otherwise rather plainly coloured—dark ashy-grey above and white beneath —the erectile feathers of the crown of the head, on being parted, form as it were a deep furrow, and reveal their base, which is of a bright golden-orange in front, deepening into scarlet, and then passing into silvery-white. This species seems to live entirely on insects, which it captures on the wing, and is in bad repute with bee-masters,} though, according to Dr Coues, it “destroys a thousand noxious insects for every bee it eats.” It builds, often in an exposed situation, a rather large nest, coarsely con- structed outside, but neatly lined with fine roots or grasses, and lays five or six eggs of a pale salmon colour, beautifully marked with blotches and spots of purple, brown, and orange, generally disposed in a zone near the larger end.

King-Bird.

Nearly akin to the King-bird is the Chicheree, so called from its loud and petulant cry, 7’. dominicensis, or T. griseus, one of the most characteristic and conspicuous birds of the West Indies, and the earliest to give notice of the break of day. In habits, except that it eats a good many berries, it is the very counterpart of its congener, and is possibly even more jealous of any intruder. At all events its pugnacity extends to animals from which it could not possibly receive any harm, and is hardly limited to any season of the year.

In several respects both of these birds, with several of their allies, resemble some of the Shrikes; but it must be clearly understood that the likeness is but of analogy, and that there is no near affinity between the two Families Lanude and Tyrannidex, which belong to wholly distinct sections of the great Passerine Order; and, while the former is a comparatively homogeneous group, much diversity of form and habits is found among the latter. Similarly many of the smaller Zyrannidx bear some analogy to certain Muscicapidx, with which they were at one time confounded (see Frycarcuer, vol. ix. p. 351) ; but the difference between them is deep seated.? Nor is

1 It is called in some parts the Bee-Martin.

ty This is not the place to dwell upon the essential nature of the difference ; but two easy modes of discriminating thein externally may be mentioned. All the Laniidw and Muscicapide have but nine primary guides in their wings, and their tarsi are covered with scales

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this all, for out of the seventy genera, or thereabouts, into which the Tyrannidx have been divided, comprehending perhaps three hundred and fifty species, all of which are peculiar to the New World, a series of forms can be selected which find a kind of parallel to a series of forms to be found in the other group of Passeres; and the genus Tyrannus, though that from which the Family is named, is by no means a fair representative of it; but it would be hard to say which genus should be so accounted. The birds of the genus M/uscisaxicola have the habits and almost the appearance of Wheatears; the genus Alectorurus calls to mind a Water-Wagtail; Zuscarthmus may suggest a Titmouse, H/ainea perhaps a Willow-Wren ; but the greatest number of forms have no analogous bird of the Old World with which they can be compared; and, while the com- bination of delicate beauty and peculiar external form possibly attains its utmost in the long-tailed Afilvulus, the glory of the Family may be said to culminate in the king of King-birds, Muscivora regia. (A. N.)

KINGFISHER— Konigsfischer, Germ.?; Roi-péheux (=pécheur), Walloon—the Alcedo tspida of ornithologists, one of the most beautiful and well-known of European birds, being found, though nowhere very abundantly, in every country of this quarter of the globe, as well as in North Africa and South-Western Asia as far as Sindh. Its blue-green back and rich chestnut breast render it con- spicuous as it frequents the streams and ponds whence it procures its food, by plunging almost perpendicularly into the water, and emerging a moment after with the prey— whether a small fish, a crustacean, or an aquatic insect—it has captured. In hard frosts it resorts to the sea-shore, but a severe winter is sure to occasion a great mortality in the species, for many of its individuals seem unable to reach the tidal waters where only in such a season they could obtain sustenance ; and to this cause rather than any other (though, on account of its beauty and the utility of its feathers in making artificial flies, it is shot and netted in great numbers) is perhaps to be ascribed its general scarcity. Very early in the year it prepares its nest, which is at the end of a tunnel bored by itself in a bank, and tlierein the six or eight white, glossy, translucent eggs are laid, sometimes on the bare soil, but often on the fish- bones which, being indigestible, are thrown up in pellets by the birds ; and, in any case, before incubation is completed these rejectamenta accumulate so as to form a pretty cup- shaped structure that increases in bulk after the young are liatched, but, mixed with their fluid excretions and with decaying fishes brought for their support, soon becomes a dripping fetid mass.

The Kingfisher is the subject of a variety of legends and superstitions, both classical and medieval. Of the latter one of the most curious is that having been originally a plain grey bird it acquired its present bright colours by flying towards the sun on its liberation from Noali’s ark, when its upper surface assumed the hue of the sky above it and its lower plumage was scorched by the heat of the setting orb to the tint it now bears. More than this, the Kingfisher was supposed to possess many virtues. Its dried body would avert thunderbolts, and if kept in a wardrobe would preserve from moths the woollen stuffs

in front only ; while in the Tyrannid# there are ten primaries, and the tarsal scales extend the whole way round. The more recondite distinction in the structure of the trachea seems to have been first detected by Macgillivray, who wrote the anatomical descriptions published in 1889 by Audubon (Orn. Biography, v. pp. 421, 422); but its value was not appreciated till the publication of Johannes Miiller's classical treatise on the vocal organs of Passerine Birds (Abhandl. k. Akad. Wissensch. Berlin, 1845, pp. 321, 405). ;

3 But more commonly called Hisvogel, which finds its counterpart in the Anglo-Saxon Jsern or sen.

4 Rolland, Faune populaire de la France, ii. fi 74.

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therein laid, or hung by a thread to the ceiling of a chamber would point with its bill to the quarter whence the wind blew. Allreaders of Ovid (Metam., bk. xi.) know how the faithful but unfortunate Ceyx and Alcyone were changed into Kingfishers—birds which bred at the winter solstice, when through the influence of Solus, the wind-god and father of the fond wife, all gales were hushed and the sea calmed so that their floating nest might ride uninjured over the waves during the seven proverbial " Halcyon Days" ; while a variant or further development of the fable assigned to the Halcyon itself the power of quelling storms.1 é The common Kingfisher of Europe is the representative of a well-marked Family of birds, the Alcedinide or Halcyonidz of ornithologists, which is considered by some authorities? to be closely related to the Bucerotide (see Horneitn, vol. xii p. 169); but the affinity can scarcely be said as yet to be proved; and to the present writer there seems to be at least some ground for believ- ing that a nearer alliance is to be found in the Galbulidz (see JACAMAR, Vol. xiii p. 531), Momotide (Mormot, ¢.v.), Meropide, and perhaps some other Families—though all inay possibly be discovered to belong to one and the same larger group. Be thatas it may, the present Family forms the subject of a work by Mr Sharpe,' which, though still

incomplete as regards their anatomy,* is certainly one of the best of its class, and reflects infinite credit on its then youthful author, whose treatment of his subject was most successful. Herein are described one hundred and twenty- five species, nearly all of them being beautifully figured by Mr Keulemans, and that number may be taken even now as approximately correct ; for, while the validity of a few has been denied by some eminent men, nearly as many have since been made known, and it seems likely that two or three more described by older writers may yet be rediscovered. These one hundred and twenty-five species Mr Sharpe groups in nineteen genera, and divides into two Sub-families, Alcedinine and Daceloning,® the one contain- ing five and the other fourteen genera, With existing materials perhaps no better arrangement could have been made, but in the absence of anatomical knowledge it is certainly not to be deemed conclusive, and indeed the method since published by Sundevall (Zentamen, pp. 95, 96) differs from it not inconsiderably. Here, however, it will be convenient to follow that of Mr Sharpe. Externally, which is almost all we can at present say, Kingfishers present a great uniformity of structure. One of their most remarkable features is the feebleness of their feet, and the union (syndactylism) of the third and fourth digits for the greater part of their length ; while, as if still further to show the comparatively functionless character of these members, in two of the genera, Alcyone and Ceya, the second digit is aborted, and the birds have but three toes. In most forms the bill does not differ much from that of the common Alcedo ispida, but in Syma its edges are serrated, while in Carcineutes, Dacelo, and Melidora the maxilla is prolonged, becoming in the last a very pronounced hook. Generally the wings are short and rounded, and ae a ee Ree 1 Tn many of the islands of the Pacific Ocean fisher is the object of much veneration, ke er gene og 1850, p. 80; Wallace, Ann. » ALVSLOTY, Ser. 2, X 9 5 a J Sovety, 1887, p. 67 VuL, pp 1, 205 ; and Huxley, Proc. Zool. ” A Monograph of the Alcedinida ; y R. a Sharpe, io, attinn “Merri Family of the Kingfishers, by ome important anatomi i i i Gren ie (Pave. pk Aras, BON le Mi * The name of this latter Sub-family as constituted by Mr Sharpe would seem to be more correctly Ceycinz—the genus Ceyx, founded in 1801 by Lacépéde, being the oldest included in it, The word Dacelo invented by Leach in 1815, is simply an anagram of Alcedo, and,

though of course without any etymological meaning, h; generally adopted. S) ng, has been very

the prevalent King-

the tail is in many forms inconspicuous ; but in T'anysi- ptera, one of the most beautiful groups, the middle pair of feathers is greatly elongated and spatulate, while this genus possesses only ten rectrices, all the rest having twelve. Sundevall relies on a character not noticed by Mr Sharpe, and makes his principal divisions depend on the size of the scapulars, which in one form a mantle, and in the other are so small as not to cover the back. The Alcedinide are a cosmopolitan Family, but only one genus, Ceryle, is found in America, and that extends as well over a great part of the Old World, though not into the Australian Region, which affords by far the greater number both of genera and species, having no fewer than ten of the former and fifty-nine of the latter peculiar to it.®

In habits Kingfishers display considerable diversity, though all, it would seem, have it in common to sit at times motionless on the watch for their prey, and on its appearance to dart upon it, seize it as they fly or dive, and return to a perch where it may be conveniently swallowed. But some species, and especially that which is the type of the Family, are not always content to await at rest their victim's showing itself. They will hover likea Hawk over the waters that conceal it, and, in the manner already described, precipitate themselves upon it. This is particularly the way with those that are fishers in fact as well as in name; but no inconsiderable number live almost entirely in forests, feeding on insects, while reptiles furnish the chief sustenance of others. The last is characteristic of at least one Australian form, which manages to thrive in the driest districts of that country, where not a drop of water is to be found for miles, and the air is at times heated to a degree that is insupportable by most animals. The limits of this article forbid an entrance upon details of much interest, but the Belted Kingfisher of North America, Ceryle alcyon, is too characteristic a bird of that country to be passed in silence, though its habits greatly resemble

those of the European species before described ; and the so-called ‘*‘ Laughing Jackass” of New South Wales and South Australia, Dacelo gigas—with its kindred forms, D. leacht, D. cervina, and D. occidentalis, from other parts of the country—likewise requires special notice. Attention must also be called to the speculations of Mr Sharpe (op. cit., pp. xliv.-xlvii.) on the genetic affinity of the various forms of Alcedinidz, and it is to be regretted that hitherto no light has been shed by paleontologists on this interesting subject, for the only fossil referred to the neighbourhood of the Family is the Halcyornis toliapicus of Professor Owen (Br. Foss. Mamm. and Birds, p. 554) from the Eocene of Sheppey—the very specimen said to have been previously placed by Konig (Icon. foss. sectiles, fig. 153) in the genus Larus. (A. N.)

KINGLET, a name applied in many books to the bird called by Linnzus Jfotacilla regulus, and by most modern ornithologists Regulus cristatus, the Golden-crested or Golden-crowned Wren of ordinary persons. This species is the type of a small group which has been generally placed among the Sylvizdez or true Warblers, but by certain systematists it is referred to the Titmouse-Family, Paride. That the Kinglets possess many of the habits and actions of the latter is undeniable, but on the other hand they are not known to differ in any important points of organization or appearance from the former—the chief distinction being that the nostril is covered by a single bristly feather directed forwards. The Golden-crested Wren is the smallest of British birds, its whole length being about 3 inches and a half, and its wing measuring only 2 inches from the carpal joint. Generally of an olive-green colour, the top of its head is bright yellow, deepening into orange, and bounded on either side by a black line, while the wing

SCf. Wallace, Geog. Distr, Animals, ii, p, 315.

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coverts are dull black, and some of them tipped with white, forming a somewhat conspicuous bar. The cock has a plea- sant but weak song. The nest isa beautiful object, thickly felted of the softest moss, wool, and spiders’ webs, lined with feathers, and usually built under and near

the end of the branch of a yew, fir, or cedar, supported by the inter-weaving of two or three laterally diverging and pendent twigs, and sheltered by the rest. The eggs are from six to ten in number, of a dull white sometimes finely freckled with reddish-brown. The species is particularly social, living for the most of the year in family-parties, and often joining bands of any species of Titmouse in a common search for food. Though to be met with in Britain at all seasons, the bird in autumn visits the east coast in enormous flocks, apparently emigrants from Scandinavia, while hundreds perish in crossing the North Sea, where they are well known to the fishermen as "' Woodcock's Pilots." A second and more local European species is the Fire-crested Wren, &. ignicaprllus, easily recognizable by the black streak on each side of the liead, before and behind the eye, as well as by the deeper colour of its crown. A third species, 2. maderensis, inhabits the Madeiras, to which it is peculiar ; and examples from the Himalayas and Japan have been differentiated as 22. himalayensis and R. japonicus. North America has two well-known species, 2. satrapa, very like the European &. cgnicapillus, and the Ruby- crowned Wren, &. calendula, which is remarkable for a loud song that has been compared to that of a Canary-bird or a Sky-lark, and for having the characteristic nasal feather in a rudimentary or aborted condition. Under the name of L. modestus, or " Dalmatian Regulus" of many English authors, two very distinct species are now known to have been confounded, both belonging really to the group of Willow-Wrens, and having nothing to do with Regulus. One, which has occurred in Britain, is the Motacilla super-cutosa of old or Phylloscopus superciliosus of modern authors, and is a native of northern Asia, visiting Europe nearly every year, and the other, also of Asiatic origin, is the Motacilla or Phylloscopus proregulus. (a. N.) KINGS, Tue First anp Seconp Booxs of, which form the last part of the series of Old Testament histories known as the Karlier Prophets, were originally reckoned as a single book (Josephus; Orig. ap. Eus, ZH. £., vi. 25; Peshito; Talmud), though modern Hebrew Bibles follow the biparti- tion which we have derived from the Septuagint. In that version they are called the third and fourth books of king- doms (Bac.Aeov), the first and second being our books of Samuel, The division into two books is not felicitous, and even the old Hebrew separation between Kings and Samuel must not be taken to

mean that the history from the birth of Samuel to the exile was treated by two distinct authors in independent volumes. We cannot speak of the author of Kings or Samuel, but only of an editor or successive editors whose main work was to arrange in a continuous form extracts or abstracts from earlier books, The intro- duction of a chronological scheme and of a series of editorial comments and additions, chiefly designed to enforce the religious meaning of the history, gives a kind of unity to the book of Kings as we now read it; but beneath this we can still distinguish a variety of documents, which, though sometimes mutilated in the process of piecing them together, retain sufficient individuality of style and colour to prove their original independence. Of these documents one of the best defined is the vivid and exact picture of David's court at Jerusalem (2 Sam. ix.-xx.), of which the first two chapters of 1 Kings are manifestly an integral part! As it would be unreasonable to suppose that the editor of the

1 See this proved in detail, Wellhausen-Bleek, Hin/., § 114. The verses 1 Kings ii. 1-12 have no connexion with the rest of the chapter, and are due to a later hand.

history of David closed his work abruptly before the death of the king, breaking off in the middle of a valuable memoir which lay before him, this observation leads us to conclude that the books of Samuel and Kings are not independent histories. They have at least one source in common, and a single editorial hand was at work on both. But the division which makes the commence- ment of Solomon's reign the beginning of a new book is certainly ancient; it must be older than the insertion of the appendix 2 Sam. xxi.—-xxiv., which now breaks the continuity of the original history of David's court. From an historical point of view the division is very convenient. The subject of the book of Samuel is the creation of a united Israel by Samuel, Saul, and David. Under Solomon the creative impulse has already died away ; the kingship is divorced from the sympathies of the nation; and the way is prepared for the formation of the two kingdoms of Ephraim and Judah, the fortunes of which up to their extinction by the great empires

of the East form the main subject of the book of Kings. It is probable, however, that the editor who made the division had another reason for disconnecting Solomon from David and treating his reign as a new departure. The most notable feature in the extant redaction of the book is the strong interest shown in the Deuteronomic " Law of Moses," and especially in the centralization of worship in the temple on Zion as prescribed in Deuteronomy and enforced by Josiah. This interest did not exist in ancient Israel, and is quite foreign to the older memoirs incorporated in the book ; amidst the great variety in style and manner which marks the several parts of the history it is always expressed in the same stereotyped phrases and unvarying style; in brief, it belongs to the editorial comments, not to the original sources of the history. To the Deuteronomistic editor, then, the foundation of the temple, which is treated as the central event of Solomon's reign, is a religious epoch of prime importance (see especially his remarks in 1 Kings ili. 2 sq.), and on this ground alone he would naturally make Solomon's reign commence a new book-—the history of Israel under the one true sanctuary."

When we say in geueral that the book of Kings was thrown into its present form by a Deuteronomistic redactor we do not affirm that he was the first who digested the sources of the history into a continuous work. Indeed the selection of materials, especially in the earlier parts of the narrative, has been thought to point to an opposite conclu- sion. Nor, on the other hand, must we ascribe absolute finality to his work. He gave the book a definite shape and character, but the recognized methods of Hebrew literature left it open to additions and modifications by later hands. Even the redaction in the spirit of Deutero- nomy seems itself to have had more than one stage, as Ewald and other critics recognize. The book was not closed till far on in the exile, after the death of Nebuchad- nezzar and Jehoiachin (2 Kings xxv. 27 seq.) ; and the fall of the kingdom of Judah is presupposed in such passages as 2 Kings xvii. 19, 20, xxiii, 26,27. But these passages are mere interjected remarks, which seem to be added to adapt the context to the situation of the Jews in captivity. The main redaction, though subsequent to the reformation of Josiah, which forms the standard with which all previous kings are compared ("the high places

were not removed ”), does not point to the time of the captivity. Thus, for example, the words “unto this day,” 2 Kings viii. 22, xiv. 7, xvi. 6, are part of the “epitome” composed by the main redactor (see below), and imply that he wrote before the destruction of the Judzean state.

? With this it agrees that the later appendix 2 Sam. xxi.—xxiv. docs

not seem to have passed under the hand of the Deuteronomic redaction. See Wellhausen-Bleek, § 134.

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Even the second redaction did not absolutely fix a single authoritative recension of the book, as appears 1n detail by comparison of the LXX, version with the Hebrew text.

The LXX. of Kings is not a corrupt reproduction of ee Hebrew receptus, but represents another recension of the text. Neither re- cension can claim absolute superiority. The defects of the LAX. lie on the surface, and are greatly aggravated by the eondition of the Greck text, which has suffered much in transmission, and particu- larly has in many places been corrected after the later Greek ver- sions that express the Hebrew receptus of the 2d century of our era. Yet the LXX. not only preserves many good readings in detail, but throws much light on the long-continued process of redaction at the hand of successive editors or copyists of which the extant Hebrew of Kings is the outcome. Even the false readings of the Greek are instructive, for both recensions were exposed to corrupting influences of precisely the same kind. The following examples will serve to illustrate the treatment through which the book has passed.

1. Minor detached notices such as we should put in footnotes or appendices are inserted so as to disturb the natural context. — Thus 1 Kings iv. 27 (Heb., v. 7) must be taken continuously with iv. 19, and so the LXX. actually reads. In like manner the LXX. omits 1 Kings vi. 11-14, which breaks the context of the description of the temple. Again, in the LXX., 1 Kings ix. 26 follows on ver. 14, so that Solomon's dealings with Hiram are continuously recorded. The notices intervening in vers. 15-25 (in a very unnatural order) belong to a class of floating notes about Solomon and his kingdom which seem to have got stranded almost by chance at diflerent points in the two recensions. ro

2. There are direct or indirect indications of transpositions and insertions on a larger scale. Thus in the LXX. the history of Naboth (1 Kings xxi.) precedes chap. xx. And in fact chaps. xx. and xxii. are parts of one narrative, obviously quite distinct from the history of Elijah. Again the story of Abijal's sickness and Ahijah's prophecy (1 Kings xiv.) is not found in the LXX.,' but another ver- sion of the same narrative appears at xii. 24, in which there is no reference to a previous promise to Jeroboam through Ahijah, but the prophet is introduced as a new character. This version, which places the prophecy of the destruction of Jeroboam's house between his return from Egypt and his elevation to the throne, is no doubt a mere legend, but it gocs to prove that there was once a version of the history of Jeroboam in which chap. xi. 29-39 had no place. In truth, after xi. 26-28 there must once have stood some account of a rebellion in which Jeroboam "' lifted up his hand" against King Solomon. To such an account, not to the incident of Ahijali and the cloak related in vers. 29-39, ver. 40 is the natural sequel. Thus all that is related of Ahijah falls under suspicion of being foreign to the original history, and it is noteworthy that in a passage peculiar to the LXX. the incident of the tearing of the cloak is related of Shemaiah and placed at the convention at pele showing how much fluctuation there was in the tradition.

These instances show that there was a certain want of definiteness about the redaction. The mass of disjointed materials, not always free

from inconsistencies, which lay before the editor in separate documents or in excerpts already partially arranged by an earlier hand, could not have been reduced to real uni ty without criti- cal sifting, and an entire reeasting of the narrative in a way foreign to the ideas and literary habits of the Hebrews. The unity which the editor aimed at was limited to chronological continuity in the events recorded and a certain uniformity in the treatment of the religious meaning of the narrative. ven this could not be per- fectly attained under the circumstances, and the links of the history were uot firmly enough rivetted to prevent disarrangement or re- arrangement of details by later scribes.

_ 8. The continued efforts of successive redactors can be traced in the chronology of the book. The chronological method of the narrative appears inost, clearly in the history after Solomon, where the events of each king's reign are thrown intoa kind of stereotyped framework on this type: —‘‘ In the twentieth year of Jeroboam, king of Israel, Asa began to reign over Judah, and reigned in Jerusalem forty-one years.” . . . ‘‘In the third year of Asa, king of Judah, Baahsa began to reign over Israel in Tirzah twenty-four years.” The history moves between Judah and Israel according to the date of cach accession ; as soon asa new king has been introduced everything that happened in his reign is discussed, and wound up by another stereotyped formula as to the death and burial of the sovereion ; and jae eal arrangement the natural connexion of events is often sacrificed. In this scheme the elaborate synchronisms between contemporary monarchs of the north and south give an aspect of great precision to the chronology. But in reality the data for Judah and Israel do not agree, and Wellhausen, following Ewald, has shown that the syuchronisins were not in the sources, but were calculated from the list of the years of each king (Jahrb. f. D. Theol., 1875).

l1In the Alex. and other MSS. it is added from the version of Aquila.

It appears further that these latter data are not all derived from historical tradition, but are in part due to conjectural subdivision of the cycle 480 (twelve generations of forty years) which appears in 1 Kings

vi. 1 as the period from the Exodus to the foundation of the temple, and according to the Judean list of kings as the period from the foundation of the temple to the end of the captivity (536 B.c.).2. In the early part of the Judean history the first dates not accessions are connected with the temple, and apparently derived from temple records. Of these the most important is the twenty- third year of Joash, which the chronological scheme makes the one hundred and sixty-first year of the temple, trisecting the four hundred and eighty years ¢ycle. Other one hundred and sixty years bring us to the death of Hezekiah, and the last third of the cycle begins with the accession of Manasseh, whose sins are treated as the decisive eause of the exile. Within these limits a few dates were given by the sources ; the rest, as can easily be shown, were filled in with reference to a unit of forty years.? Again the duration of the kingdom of Isracl, according to the northern lists, was two hundred and forty completed years, viz., eighty years before the first expedition of Benhadad, eighty years of Syrian wars, forty of prosperity under the victorious Jeroboam II., whose first year belongs to the period of war, and forty years of decline. The trisections in each case and the round numbers of 480 and 240 point strongly to a systematization of the chronology on the basis of a small nuinber of given dates, and the proof that it is so is completed when we learn from the exactly kept lists of Assyrian clironology that the siege of Samaria fell in 722, whereas the system dates the captivity from 737 (535 + 480 — 37 — 241),

The key to the chronology is 1 Kings vi. 1, which, as Wellhausen has shown, was not found in the original LXX., and contains inter- nal evidence of post-Babylonian date. In fact the system as a whole is necessarily later than 535 B.c., the fixed point from which it counts back.

4, Another aspect in the redaction may be called theological. Its characteristic is the application to the old history of a standard belonging to later developments of the Old Testament religion. Thus, as we have already seen, the redactor in 1 Kings iii. regards worship in high places as sinful after the building of the temple, though he knows that the best kings before Hezekiah made no attempt to suppress these

shrines. So too his unfavourable judg- ment on the whole religion of the northern kingdom was manifestly not shared by Elijah and Elisha, nor by the original narrator of the history of these prophets. This feature in the redaction displays itself, not only in occasional comments or homiletical excursuses, but in that part of the narrative in which all ancient historians allowed themselves free scope for the development of their reflexions—the speeches placed in the mouths of actors in the history. Here also there is textual evidence that the theological element is somewhat loosely attached to the earlier narrative, and underwent successive additions. We have seen that the LXX. omits 1 Kings vi. 11-14, and that both prophecies of Ahijah belong to the least certain part of the textual tradition. So too an indication that the long prayer of Solomon, 1 Kings viii. 14-53, the Deuteronomie colour of which is recognized by all critics, did not stand in the oldest account of the dedication of the temple is preserved in the fact that the ancient frag- ment, vers. 12, 13, whicli in the Hebrew text is imperfect, appears in the LXX. after ver. 53 in completer form and with a reference to the book of Jashar as source (fiBAloy Tis @dfs=73wW IDD= PD wn). The redactional insertion displaced it in one recension and led to its mutilation in the other. The older parts of this chapter have also been retouched in conformity with later (even post-exile) ritual and law. The Levites who appearat ver. 4 in contrast to the priests, in a way unknown to the pre-exile history, are not named in the LXX., and the post-exile ‘‘ congregation ” (‘édah) at ver. 5 is also wanting. The processes illustrated by these cxamples were doubtless at work in many places where external evidence fails us, and may often be detected by a careful use of internal evidence alone. Sce especialiy Wellhausen’s detailed analysis in the last edition of Bleek’s Hinleitung.

To gain an exacter idea of the main redaction of Kings and of the nature of the original sources, we may divide the history into three sections :—(1) the conclusion of the “court history,” 1 Kings i. ii., the further consideration of which belongs to the criticism of SAMUEL (¢.v.); (2) Solomon, 1 Kings iii.-xi. ; (3) the kingdoms of Ephraim and Judah. For (2) the main source, as we learn from 1 Kings xi. 41, was a book called Acts of Solomon, This work can hardly have been a

regular chronicle, for the history founded on it contains no continuous narrative. All that is related of Solomon's reign is grouped round the description of the

2 Compare Krey's investigations in Z. f. w. Th., 1877, p. 404 sq. 3 See the detailsin an article by W. R. Smith, Journal of Philology, vol. x. No. 20.

royal buildings, particularly of the temple, and the account of the dedication of the house (chaps. vi.~~ix. 9); and the greater part of the latter account is either due to the redactor or largely rewritten. The whole section is descrip~~ tive rather than narrative, and the accurate details might have been got by actual observation of the temple at a date long subsequent to Solomon. In fact, they are not all due to a single hand. Thus we can still reconstruct a shorter text of vi. 17-21, which says only that "the house before the oracle was forty cubits long, and the oracle in the midst of the house within where the ark of Jehovah's covenant was to be placed was twenty cubits in length, breadth, and height; and he overlaid it with gold and made an altar of cedar [the table of shewbread] before the oracle and overlaid it with gold." The original author used the book of Jashar for the account of the dedication, and had access to some exact particulars as to dates, the artist Hiram, dc., which may have been contained in the temple re- cords. The immediate environment of this section, if we set aside the floating elements in chap. ix. already referred to, is occupied with Solomon's dealings with King Hiram, who aided him in his architectural schemes and in the com- mercial enterprises which procured the funds for such costly works (chap. v. [Heb., v. 15-32] and ch. ix. 10 sq.) On each side of this context lies a complex of various narra- tives and notices illustrating Solomon's wisdom and great- ness, but also, in chap. xi. his weakness and the incipient decay of his kingdom. It is evident that the rise of the adversaries who, according to xi. 25, troubled Solomon through all his reign cannot originally have been related as the punishment of the sins of his oldage. The

pragmatism as usual belongs to the redactor (xi. 4). We have seen that there was once another version of the history of Jeroboam.

In the history of the divided kingdom the redactor, as we have seen, follows a fixed scheme determined by the order of accessions, and gives a short epitome of the chief facts about each king, with an estimate of his religious character, which for the schismatic north is always unfavourable. The epitome, as the religious standpoint shows, belongs to the same hand throughout, ze, to the Deuteronomistic redactor; but so much of it as relates to Judah is plainly based on good written sources, which from the nature of the particulars recorded may be identified with the book of Royal Chronicles referred to under each reign, which seems to have been a digest of official notices.

A similar chronicle is named for the kings of Israel, but if it actually lay before the editor he at least did not make such excerpts from it as we find in the Judean history, for the epitome for Ephraim is very bare of concrete details. Besides the epitome, however, and the short excerpts from the Judzean chronicles which go with it, the history includes a variety of longer narratives, which alike in their subject-matter and their treatment are plaiuly distinct from the somewhat dry bones of the official records. The northern narratives are all distinguished in a greater or less degree by the prominence assigned to prophets. In the southern Kingdom we hear less of the prophets, with the great exception of Isaiah; but the temple occupies a very prominent place.

The history of the man of God from Judah (1 Kings xiii.) is indubitably of Judean origin. Its attitude to the altar at Bethel—the golden calf does not appear as the ground of offence—is not only diverse from that of Elijah and Elisha, but even from that of Hosea! The other nar-

1 The expression ‘‘ cities of Samaria” (ver. 32) reappears only after the deportation of Ephraim (2 Kings xvii. 24, 26), and seems to have come in here from 2 Kings xxiii. 19. Even in that passage the last clause of ver. 18, which alone refers to details. of the history of 1 Kings xiii., is clearly erroneous ; the old prophet did not come from

Samaria. Another and later Jewish prophet foretold the fall of the altar of Bethel, viz., Amos of Tekoa.

ratives that deal with the history of Ephraim are all by northern authors (see, for example, 1 Kings xix. 3; 2 Kings ix. 6), and have their centre in the events of the Syrian wars and the persons of Elijah and Elisha. But they are not all of one origin, as appears most clearly by comparing the account of the death of Naboth in the his- tory of Elijah, 1 Kings xxi. and the history of Elisha and Jehu, 2 Kingsix. In the latter narrative Naboth's " field" lies a little way from Jezreel, in the former it is close to Ahab's palace (query, in Samaria /—see ver. 18 and variants of LXX. in ver. 1), and is described as a vineyard. The "burden" quoted by Jehu is not in the words of 1 Kings xxi., and mentions the additional fact that Naboth's sons were killed.2 In other words, the history of Jehu pre- supposes events recorded in the extant accounts of Elijah, but not these accounts themselves. And the narrative in 2 Kings seems to be the more accurate ; it contains precise details lacking in the other.

Now it is plain that 1 Kings xxi. belongs to the same history of Elijah with chaps. xvii.—xix. The figure of the prophet is displayed in the same weird grandeur, and his words (omitting the addition already noted in verses 20b sg.) have the same original and impressive force. That history, a work of the highest literary art, has come down tous as a fragment. For in 1 Kings xix. 15 Elijah is commanded to take the desert route to Damascus, 7.¢., the route east of the Jordan. He could not, therefore, reach Abel Meholah in the Jordan valley, near Bethshean, when he "'departed thence " (ver. 19), if "thence" means from Horeb. The journey to Damascus, the anointing of Hazael and Jehu, must once have intervened ; hut they have been omitted because another account ascribed these acts to Elisha (2 Kings viii. ix.). Now there is no question that we possess an accurate historical account of the anointing of Jehu. Elisha, long in opposition to the reigning dynasty (2 Kings iii), and always keeping alive the remembrance of the murder of Naboth and his sons (vi. 32), waited his moment to

effect a revolution. It is true that the prime impulse in this revolution came froin Elijah ; but, when the history in 1 Kings represents Elijah as per- sonally commissioned to inaugurate it by anointing Jehu and Hazael as well as Elisha, we see that the author's design is to gather up the whole contest between Jehovah and Baal in an ideal picture of Elijah and his work. In doing this he also places Ahab in a different light from that in which he appears in the other extant histories. Had we only his account we might suppose that Ahab had altogether rejected Jehovah and aimed at introducing a new national worship. But, in fact, we learn from the other records that, while like Solomon before him he gave countenance to his wife's religion, Ahab still regarded Jehovah as tlie God of Israel, consulted His prophets, and gave to his sons names expressive of devotion to the old faith. The idcal delineation of Elijah conveys a vivid picture of his imposing personality and permanent influence; but it records the impression he left behind him rather than the literal details of his life, and is no doubt of younger date than the more photographic picture of the accession of Jehu, though prior to the rise of the new prophecy under Amos and Hosea.'

2 The standing phrases eominon to 1 Kings xxi. 20b sg., 2 Kings ix. 7-10a, belong to the redaction, as is plain in the latter ease from 16 ae

3 Some expressions that point to a later date are eertainly added by another hand, e.g., the last part of xviii. 18. In old Israel, up to the time of Hosea, the Baalim (pl.) are the golden ealves, which have no place in this context. A late insertion also is the definition of time by the stated oblation in the temple at Jerusalem, xviii. 29, 36. At ver. 36 this is lacking in the LXX. ; at ver. 29 the longer insertion of the LXX. reveals the motive for the interpolation, viz., to assimilate El ijah's sacrifiee to the legal service. The true text says that, when noon was

The episode of Elijah and Ahaziah, 2 Kings i, is certainly by a different hand, as is seen even from the uew feature of revelation through an angel; and the ascension of Elijah, 2 Kings ii. is related as the introduction to the prophetic work of Elisha.

The narratives about Elisha are not all by one hand ; for example, iv. 1-7 is separated from the immediately subsequent history by a sharply marked grammatical peculiarity (the suffix ‘3); moreover, the order is not chronological, for vi. 24 cannot be the sequel to vi. 23; and in general those narratives in which the prophet appears as on friendly terms with the king, and possessed of influence at court (e.g., iv. 13, vi. 9, vi. 21 compared with xiii. 14), plainly belong to the time of Jehu’s dynasty, though they are related before the fall of the house of Omri. In this disorder we can distinguish portions of an historical narrative which speaks of Elisha in connexion with events of public interest, without making him the central figure, and a series of anecdotes of properly biographical character. The historical narrative embraced 2 Kings iii., vi. 24—-vii. 20, ix. 1-x. 28, in fact, the whole account of the reign of Joram and the revolution under Jehu; and, as 2 Kings iii. has much affinity to the history of Ahab and Jehoshaphat in 1 Kings xxii., we may add the earlier history of the Syrian wars (1 Kings xx., xxii.) to the series. The evidence of style is hardly sufficient to assign all these chapters to a single hand (for example, 335 is a single chariot in the history of Jehu, but in 1 Kings xx. a collective, the single chariot being m257») ; but they are all full of fresh detail and vivid description, and their sympathy with the prophets of the opposition, Micaiah and Elisha, and with the king of Judah, who takes the prophets’ part, does not exclude a genuine interest in Ahab and Joram, who are painted in very human colours, and excite our pity and respect. To the historian these chapters are the most valuable part of the northern history ; and the most surprising details have received striking verification from modern research. The stone of Mesha supplies details to 2 Kings iii. 5 ; the method of obtaining water suggested by Elisha (iii. 16, 17) is that which still gives its name to W. el-Has4 at the southern end of the Dead Sea (see Wetzstein in Delitzsch, Gen., 4th ed., p. 567) ; and the sudden retreat of the Syrians in 2 Kings x. is very intelligible when we know that they were already at that time pressed by the Assyrians (see on all these points Wellhausen, op, cit.).

In the more biographical narratives about Elisha we may distinguish one circle connected with Gilgal, Jericho, and the Jordan valley to

which Abel-meholah belongs (iv. 1-71, 38-44; ch. v.41; vi. 1-7). Here Elisha appears as the head of the prophetic guilds, having his fixed residence at Gilgal. Auother circle, which presupposes the accession of the house of Jehu, places him at Dothan or Carmel, and represents him as a personage of almost superhuman dignity. Here there is an obvious parallelism with the history of Elijah, especially with his ascension (compare 2 Kings vi. 17 with ii. 11; xiii. 14 with ii 2): and it is to this group of narratives that the ascension of Elijah forms the introduction.

Of the Judean narratives there is none to rival the

past and there was no answer to the prophets of Baal, Elijah inter- vened. Thus we get time for the events which as the text stands could not have all happened the same evening. In 2 Kings iii. 20 for 797 read 4qw 7.

- The Gilgal of Elisha is near the J ordan—comp. vi. 1 with iv. 38 yoad D'aws,—and cannot be other than the great sanctuary 2 miles from Jericho, the local holiness of which is still attested in the Onomastica. It is true that in 2 Kings ii. 1 Bethel seems to lie between Gilgal and Jericho; but ver. 25 shows that Gilgal was not originally represented as Elisha's residence in this narrative, which belongs to the Carmel-Dothan scrics. Hence Robinson's Gilgal (Jiljilia) seems not to be Biblical. .

northern histories in picturesque and popular power. The history of Joash, 2 Kings xi., xii., of Ahaz's innovations, xvi. 10 sg., and of Josiah's reformation, xxii. 3-xxiii. 27, have their common centre in the temple on Zion, and may with great probability be referred to a single source. The details suggest that this source was based on official docu- ments. Besides these we have a full history of Hezekiah and Sennacherib and of Hezekiah's sickness, xviii. 13—xx. 19, repeated in a soinewhat varying text in Isa. xxxvi.— xxxix. (compare ISRAEL, vol. xili. p. 413 sq.). The history of Amaziah and Joash in 2 Kings xiv., with the character- istic parable from vegetable life, may possibly be of northern origin.

When we survey these narratives as a whole we receive an increased impression of the merely mechanical character of the redaction by which they are united. Though editors have added something of their own in almost every chapter, generally from the standpoint of religious pragma- tism, there is not the least attempt to work the materials into a history in our sense of the word ; and in particular the northern and southern histories are practically inde- pendent, being merely pieced together in a sort of mosaic in consonance with the chronological system, which we have seen to be really later than the main redaction. It is very possible that the order of the pieces was considerably readjusted by the author of the chronology ; of this indeed the LXX. still shows traces. But with all its imperfec- tions, as judged from a modern standpoint, the redaction has the great merit of preserving the older narratives in their original colour, and bringing us much nearer to the actual life of the old kingdom than any history written throughout from the standpoint of the exile could possibly have done.

Literature.—Since Ewald's History, vols. i. and iii., and Kuenen's Onderzock, the most thorough and original investigation of the struc- ture of the book is that in Wellhausen's edition of Bleck's Hinleit- ung (1878), with which the corresponding section of his Geschichte (1878) should be compared. There are modern commentaries b Thenius (Leipsic, 1849, 2d cd. 1873) and Keil (2d ed. 1876, English translation, 1872); by Bahr in Lange's Bibelwerk (1868, English translation, 1877); by Rawlinson in the Speaker's Commentary; and in Reuss's Bible. The Assyrian material, which is of the highest value, but requires to be still further sifted, is collected in Schrader's Keilinsehriften und altes Testament (Giessen, 1872), Smith's Assyrian Eponym Canon, and other works. Translations of the chief inscrip- tions are given in Records of the Past, London, v.y. (W. B.S.)

KING'S COUNTY, an inland county in the province of Leinster, Ireland, is situated between 52° 50' and 53° 25' N. lat., and between 6° 59' and 8° 1' W. long., and is bounded on the N. by Meath and Westmeath, on the W. by Roscommon, Galway, and Tipperary, on the S. by Tipperary and Queen's county, and on the E. by Kildare. It is oblong in shape, but of very irregular outline. Its greatest breadth from

north to south is 39 miles, and its greatest length from east to west 45 miles. The area is 493,019 acres, or about 770 square miles.

Geology.—The greater part of the county is occupied by the limestone strata of the central plain. In the south- east the Slieve Bloom mountains, composed of clay-slate surrounded by sandstone, form the boundary between King's county and Queen's county, and run into the former county from south-west to north-east for a distance of about 20 miles, consisting of a mass of lofty and pre- cipitous crags through which there are two narrow passes, the Black Gap and the Gap of Glandine. In the north- east Croghan Hill, a beautiful green eminence consisting of trap conglomerate, rises to the height of over 700 feet. The remainder of the county is flat, but a range of low limestone hills crosses its north-eastern division to the north of the Barrow. In the centre of the county from east to west a large portion is occupied by the Bog of Allen. Along the Slieve Bloom mountains iron is found in small

quantities, and also manganese, ochre, chalk, and potter's clay. Excellent clay-slate tlags are quarried. In several places there are bands of foliated limestone, of a greenish hue and granular in texture, which forms a very useful manure.

Rivers,—The county shares in the advantage of the navigation of the Shannon, which skirts its western side and forms its boundary line with Roscommon and Galway. The Brosna, which issues from Loch: Ennell in West Meath, enters the county near the town of Clara, and flowing south-westwards across its north-west corner, discharges itself into the Shannon after receiving the Clodagh and the Broughill. A small portion of the north-eastern extremity is skirted by the Boyne. The Barrow forms the south-eastern boundary with Queen's county. The Little Brosna, which rises in the Slieve Bloom mountains, forms the boundary of King's county with Tipperary, and falls into the Shannon.

Climate, Soil, and Agriculture.—Notwithstanding the large area occupied by bogs, the climate is generally salubrious, and it is less moist than that of several neighbouring districts. The soil naturally is not of great fertility except in special cases, but is capable of being rendered so by the judicious application of bog and lime manures according to its special defects. It is generally either a deep bog or a shallow gravelly loam. On the former soil corn crops are late in ripening during wet seasons, which on the other hand are specially suitable for the gravelly soils. On the borders of the Slieve Bloom

mountains there are some very rich and fertile pastures,

and there are also extensive grazing districts on the borders of West Meath, which are chiefly occupied by sheep. Along the banks of the Shannon there are some fine tracts of meadow land. With the exception of the tract occupied by the Bog of Allen, the remainder of the county is nearly all under tillage, the most productive portion being that to the north-west of the Hill of Croghan.

The following table gives a classification of holdings according to size in 1850 and 1880 :—

15 to 30 |30 Acres and upwards. Total.

Acres.

2,476 2,075

3,078 3,333

The total area under crops in 1881 was 119,751 acres—24°2 per

eent. of the total acreage of the county. In 1880 288,667 acres (48°4 per cent.) were under grass, 424 fallow, 8551 woods, 108,773 (the large percentage of 22°1) bog, 6048 mountain, and 16,327 water, roads, and fences. The area under corps in 1850 was 188,538 acres, or 24,314 more than in 1880 and 18,787 more than in 1881. ‘I’he area under cereals declined between 1850 and 1881 from 70,668 to 40,263,

that under wheat decreasing from 20,410 to only 1436, that under oats from 38,787 to 23,082; but that under other cereals, of which nearly the whole acreage is under barley, inereased from 11,471 to 15,745. Between 1851 and 1880 the area under grass increased by 46,427 acres, a change due in a consider- able degree to reclamation. The area under meadow and clover only Increased from 40,348 to 44,765 acres. ‘The area under green crops between 1851 and 1881 diminished from 30,561 to 29,178 acres, that under potatoes diminishing from 17,907 to 15,762, while that under turnips increased from 9418 to 9863. Aneiently nearly the whole of the county was covered by a vast forest, and on the borders of Tipperary it is still richly wooded. _ Horses, which are a much better breed than the average of Ireland, Increased froin 12,990 in 1850 to 13,505 in 1881. The number in 1881 used for agricultural purposes was 8889. Mules increased from 817 to 1209, and asses from 4212 to 6221. Cattle in 1850 numbered 47,978, and in 1881 had increased to 68,165. Cows in 1881 numbered 14,749. Dairies are numerous in the northern part of the county on the borders of Meath, but in other districts cattle- feeding is more largely prosecuted than dairy farming. Sheep, which are pastured chiefly on the hilly districts, and have been much improved by crossing, in 1850 numbered 68,552, and in 1880 had increased to 97,570. Goats since 1850 have deelined in numbers from 4032 to 3910. Pigs have increased from 15,450 to 20,526, and poultry froin 158,154 to 271,873.

According to the corrected summary for 1878 of the landowners

return, the land in 1873 was divided among 1140 owners, of whom 358, or 31 per cent., possessed less than 1 acre. The annual rate- able valuation was £243,204, giving an average value per aere of 9s. 11d. Forty-six proprietors possessed more than 2000 acres, thirteen had upwards of 5000 aeres, and five upwards of 10,000 aeres, viz., Lord Digby, 29,722; Earl of Rosse, 22,513; Earl of Charleville, 20,632 ; Marquis of Downshire, 13,679 ; and Col. T. Bernard, 13,153.

Railways, &c.—A branch of the Great South-Western Railway traverses the county by Portarlington, Clara, and Banagher, and there is also a branch of the same line from Roscrea to Parsonstown. The Grand Canal traverses the county from Edenderry in the east to the Shannon in the west.

Admimstration,—The county comprises twelve baronies, forty- two civil parishes and nine parts of parishes, and 1160 townlands. It contains portions of five poor-law unions, viz., Edenderry, Mountmellick, Parsonstown, Roserea, and Tullamore. The county ineludes part of the parliamentary borough of Portarlington (the remainder being in Queen's county), and two townships, Parsons-town and Tullamore. Assizes are held at Tullamore and quarter-sessions at Parsonstown, Philipstown, and Tullamore. King's county is in the Dublin military district, and there are barrack stations at Parsonstown, Banagher, Philipstown, Shannon Bridge, and Tulla-more. Previous to the Union, King's county returned six members to parliament, two for the county, and two for each of the boroughs of Philipstown and Banagher, but since then only the two county members have been returned.

Population.—The total population of the county in 1659 was 8310, of whom 7085 were Irish and 1225 English. 'he estimate of De Burgo in 1760 made it 45,618. In 1821 it had increased to 131,088 and in 1841 to 147,551, but in 1851 it had diminished to 112,798, in 1871 to 75,900, and in 1881 to 72,668, of whom 36,942 were males and 35,726 were females. The number of emigrants from 1st May 1851 to 31st December 1880 was 41,798, or 46°4 per eent. of the population in 1861, 21,487 being males and 20,361 females. The marriage rate in 1880 to every 1000 of the estimated population was 3°9, 'Me birth rate 23°5, and the death rate 182. In 1881 the Roman Catholies numbered 64,984, the Protestant Episcopalians 6750, the Presbyterians 285, the Methodists 421, and all other denominations 228. The number of natives of England and Wales in the county in 1841 was 298, which had inereased in 1871 to 1087; the natives of Scotland in the same years were 109 and 203. The number in 1871 who eould speak Irish and English was 245, and in 1861 it was 396. In 1871 there were

34,360 per- sons who could read and write, 18,157 who eould read but could not write, and 28,383 who could neither read nor write.

ITistory.—King's eounty, with portions of Tipperary, Queen's county, and Kildare, at an early period formed one kingdom under the name of Hy Falgia or Offalia, a title which it retained after the landing of the English. Subsequently it was known as Glenmallery, Western Glenmallery pretty nearly corresponding to the present King's county, and Eastern Gleninallery to Queen's eounty. The principal septs of the district were the O'Counors and the O'Carrolls, whose estates and those of the other leading families were forfeited about the middle of the 16th century. By a statute of 1557 the western distriet was constituted a shire under the name of King's county in honour of Philip —the principal town, formerly the seat of the O'Connors, being called Philipstown ; and the eastern district at the sane time received the name of Qneen's county in honourof Mary. 'The subjugation of King's county was, however, not completely accomplished till about the beginning of the 17th eentury, when the O'Connors and their followers were totally routed and dispersed by Sir Oliver Lambert. After the Cromwellian wars a large number of estates were forfeited on account of the insurrectionary action taken by the leading gentry.

Antiguities.—Perhaps the oldest antiquarian relic is the large pyramid of white stones in the Slieve Bloom mountains called the Temple of the Sun or the White Obelisk. There are a considerable number of Danish raths, and a chain of moats commanding the passes of the bogs extended throughout the county. The most important eeclesiastical ruins are those of the seven churches of Clonmacnoise on the Shannon in the north-west of the county, where an abbey was founded by St Kieran in 548. Afterwards it was formed into a see, which was united with that of Meath in 1568. Within the old walls there are several small chapels ecreeted over the graves of ancient chieftains, and also one or two richly orna- mented crosses. Adjoining the ecclesiastical ruins are the remains of round towers and of an old castle. Amongst the more famous religious houses in addition to Clonmacnoise were Durrow Abbey, founded by St Columba in 550; Monasteroris, founded in the 14th century by John Bermingham, carl of Louth ; and Seirkyran

Abbey, founded in the beginning of the 5th century. The principal old castles are Rathmore, probably the most ancient in the county ; Banagher, commanding an important pass on the Shannon; Leap Castle, in the Slieve Bloom mountains ; and Birr or Parsonstown, now the seat of the earl of Rosse, whose father erected there the well-known great telescope.

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KINGSLEY, Cuarzus (1819-1875), an English clergy- man, poet, and novelist, was born on the 12th June 1819, at Holne vicarage, Dartmoor, Devon. His early years were spent at his father's living in the Fen country, and afterwards in North Devon. The scenery of both made a great impression on his mind, and was afterwards described with singular vividness in his writings. He was educated at private schools and at King's College, London, after his father's promotion to the rectory of Chelsea. In 1838 he entered Magdalene College, Cambridge, where he took his degree in 1842, first-class in classics, and senior optime in mathematics. In the same year he was ordained to the curacy of Eversley in Hampshire, to the rectory of which he was not long afterwards presented, and this was his home for the remaining thirty-three years of his life, although his residence there was much broken by various domestic circumstances as well as, in later years, by promotion to other offices in the church.

In 1844 he married Fanny, daughter of Pascoe Grenfell, and in 1848, when aged twenty-nine, he published his first volume, Zhe Saint's Tragedy. In 1860 he was appointed to the professorship of modern history in the university of Cambridge, which he resigned in 1869, and was soon after appointed to a canonry at Chester. In 1873 this was exchanged for a canonry at Westminster. He died at Eversley, after a short illness, on the 23d January 1875.

It will be seen that his life had but few incidents. With the exception of occasional changes of residence in England, generally for the sake of his wife's health, one or two short holiday trips abroad, a tour in the West Indies, and another in America to visit his eldest son settled there as an engineer, his life was spent in the peaceful, if active, occupations

of a clergyman who did his duty earnestly, and of a vigorous and prolific writer. But in spite of this outward peace he was for many years one of the most prominent men of his time, who both personally and by his works had no hittle influence on the thought of his generation. Though at no time profoundly learned, he was a man of wide and various information, whose interests and sympathies embraced almost all branches of human knowledge as well as speculations on subjects on which men but slowly learn that speculation avails them nothing. Gifted with great powers of language, both written and in conversation, with a keen wit, and a fund of knowledge far above the average, there were few sub- jects in which he did not shine, and many in which he excelled. The inherited peculiarities of his opinions and temperament, which made him seemingly though not really inconsistent, excited curiosity, and were in part the reason of his great attractiveness. Sprung on the father's side from an old English race of country squires, and on his mother's side from a good West Indian family who had been slaveholders for generations, he had the keen love of sport and the exceeding sympathy with country folk often fostered by such pursuits, while he had at the same time much of the aristocratic scorn for lower races to be found | aoe: those who have been in a dominant position among them.

With the sympathetic organization which made him keenly sensible of the wants of the poor, he threw himself heartily into the movement known as Christian Socialism, of which Mr Maurice was the recognized leader, and for many years he was considered as an extreme radical in a profession which holds as a rule but few such. While in this phase of mind he wrote his novels Yeast and Alton Locke, in which, though he pointed out unsparingly the folly of extremes, his sympathies were unmistakably shown to be, not only with the poor as in their strife against the rich, but with much that was done and said by

the leaders in the Chartist movement. Yet even then he considered that the true leaders of the people were a peer and a dean, and there was no

real inconsistency in the fact that at a later period he was among the most strenuous defenders of Governor Eyre in the measures adopted by him to put down the Jamaican disturbances. In politics he might therefore have been described as a Tory aristocrat tempered by sympathy, or as a Radical tempered by hereditary scorn of subject races. The like seeming but not real inconsistencies were to be found in his attitude as a clergyman. He was a man of earnest piety, and lived so near in his own mind to the great realities of the unseen world that he could even afford to speak of serious sub- jects in a way which in one less reverent than he would have seemed to lack reverence; and, while he held in many respects what would be called a liberal theology, the church, its organization, its creed, its dogma, had ever an increasing hold upon him. Although at one period he certainly shrunk from reciting the Athanasian creed in church, he was towards the close of his life found ready to join an association for the defence of this symbol. With these two influences at work in his mind, it was not un- natural that the more orthodox and conservative should gain the upper hand as time went on, but the careful students of him and his writings will find a deep conser- vatism underlying all the most radical utterances of his earlier years, while a passionate sympathy for the poor, the afflicted, and the weak held possession of him till the last hour of his life.

Both as a writer and in his personal intercourse with men Kingsley was a thoroughly stimulating teacher. He would not probably have wished to found a school, and most certainly never did so. As with his own teacher Mr Maurice, his influence on other men rather consisted in the fact of his inducing them to think for themselves than that he led them to adopt his own views. Perhaps these were at no time quite definite enough to have been reduced to such system as is demanded for one who would make his disciples think as himself. But his healthy and stimu- lating influence went far beyond the boundaries of his parish, his canonries, and his wide circle of friends, and was largely attributable to the fact that he gave utterance to the thoughts which were stirring in many minds during the time of his own most vigorous life. His originality, which was great, lay rather in his manner of crystallizing the current thoughts of men, and giving them apt expres-

sion, than in any new discoveries in the matters of which he treated. Just because he was completely the product and the mouthpiece of his own time, it may be doubted whether his influence on the future will be very great, and it is possible that men who may read his works by chance some years hence will fail to understand how wide was the influence he exercised.

As a preacher he was vivid, eager, and earnest, equally plain-spoken and uncompromising when preaching to a courtly congregation or to his own village poor. One of the very best of his writings is a sermon called The Message of the Church to Working Men; but asa rule his sermons cannot be read with the interest with which they were heard, aud none of his later published sermons equal the little volume of Twenty-five Village Sermons which he preached in the early years of his Eversley life.

As a novelist his chief power lay in his descriptive faculties. Yeast and Alton Locke were written out of the heat of strong conviction, and dealt in a brilliant manner with great social questions, but the later novels seem to have been written rather because he wished to say something than because he had something to say, and in spite of new and ever new editions it may be doubted whether the real interest felt in these works is considerable. Few persons

read them twice, although it is fair to say that this may partially arise from the fact that the story is so vividly told that it is not forgotten, and therefore needs no second reading. But the descriptions of South American scenery in Westward Ho, of the Egyptian desert in Hypatia, of the North Devon scenery in Z'wo Years Ago, are among the most brilliant pieces of word-painting in English prose writing, and the American scenery is even more vividly and more truthfully described when he had seen it only by the eye of his imagination than in his work A¢ Last, which was written after he had visited the tropics.

As a poet he wrote but little, but that little he wrote with singular facility, and there are passages in the Saint's Tragedy, and many

isolated lyrics, which ought to take their place in all future standard collections of English literature. Andromeda is a very successful attempt at naturalizing the hexameter as a form of English verse, and reproduces with great skill the sonorous roll of the Greek original.

In person Charles Kingsley was tall and spare, sinewy rather than powerful, and of a restless excitable tempera- ment. His complexion was swarthy, his hair dark, and his eye bright and piercing. His temper was hot, kept under rigid control, his disposition tender, gentle, and loving as that of a woman, with flashing scorn and indig- nation against all that was ignoble and impure; he was a good husband, father, and friend.

Kingsley's life has been written by his widow, in two vol- umes, entitled Charles Kingsley, his Letters and Memories of his Life, and presents a very touching and beautiful picture of her husband, but perhaps hardly does justice to his humour, his wit, his overflowing vitality and boyish fun.

The following is a list of Kingsley's writings :—Saznt's Tragedy, a drama, 1848; Alton Locke, a novel, 1849; Yeast, a novel, 1849; Twenty-five Village Sermons, 1849; Phaeton, or Loose Thoughts for Loose Thinkers, 1852; Sermons on National Subjects, 1st series, 1852; Hypatia, a novel, 1853; Glawcus, or the Wonders of the Shore, 1854 ; Sermons on National Subjects, 2d series, 1854; Alexandria and her Schools, 1854 ; Westward Ho/ a novel, 1855 ; Sermons for the Times, 1855 ; The Herocs, Greek fairy tales, 1856; Two Years Ago, a novel, 1857 ; Andromeda and other Poems, 1858 ; The Good News of God, sermons, 1859 ; Afiscellanics, 1859 ; Limits of Kauact Science applied to History (Inaugural Lectures), 1860 ; Town and Country Sermons, 1861 ; Sermons on the Pentateuch, 1863; Water- babies, 1863; The Roman and the Teuton, 1864; David and other Sermons, 1866; Hereward the Wake, a novel, 1866; The Ancient Régime (Lectures at the Royal Institution), 1867 ; Water of Life and other Scrmons, 1867 ; The Hermits, 1869; Madam How and Lady Why, 1869; At Last, 1871; Town Geology, 1872; Discipline and other Sermons, 1872; Prose Idylls, 1873 ; Plays and Puritans, 1873 ; Health and Education, 1874;

Westminster Sermons, 1874 ; Lectures delivered in America, 1875. He was a large contributor to periodical literature; many of his essays are included in Prose Jdylis and other works in the above list. But no collection has been made of some of his more characteristic writings in the Christian Socialist and Politics for the People, many of them signed by the pseudonym he then assumed, ‘‘ Parson Lot.” (C. K. P.)

KINGSTON, the chief city of Ulster county, New York, United States, is situated on the west bank of the Hudson, about 90 miles north of New York. Its harbour is formed by the navigable portion of Rondout Creek. Among the chief buildings are the city hall, the music-hall, the almshouses, and the county buildings. Kingston is a very busy shipping centre, with 4 miles of wharfage, and steam and other shipping representing a considerable aggregate tonnage, As the centre of the blue stone region, Kingston ships an immense quantity of that mineral ; and, possessing the largest cement factory in the country, its out-turn of that material together with bricks, ice, lime, timber, and other goods swells the amount of its exports to upwards of a quarter of a million tons per annum. The manufactures of the town include salt, tobacco, glue, carriages, beer, boats, and bricks. The population in 1880 was 18,342.

Kingston city was incorporated in 1872. The first settlement on the spot was made about 1665. At Kingston was framed the first

Constitution of New York State, in 1777. In September 1777 the British, under Sir Henry Clinton, scattered the State legislature which had met at Kingston, and in October burned the village.

KINGSTON, the chief city of Frontenac county, Ontario, Canada, is situated at the north-eastern extremity of Lake Ontario, at the point where the St Lawrence issues from it, and at the mouth of the Cataraqui Creek, about 160 miles east of Toronto by the Grand Trunk Railway. Of the many fine buildings the chief are the city-hall, the market, the custom-house, the court-house and jail, the post-office, and the university. Among the charities are a hospital, an orphanage, a

combined hospital and orphanage, a house of industry, and a house of refuge. The peniten- tiary and the lunatic asylum are at a little distance from the city. Kingston is the seat of Queen's university and college, and of a medical college affiliated to the university. The Roman Catholic Regiopolis college has been closed since 1869. .The royal military college of the Dominion is at Kingston. The harbour is deep, spacious, and sheltered, and brisk trade is carried on. Asa naval station Kingston occupies an important position, It commands the entrance to the Rideau Canal, and is strongly fortified. Shipbuilding, iron-founding, and the manufacture of locomotives, steam- engines, and machinery, leather, soap and candles, boots and shoes, cotton, and wooden goods are carried on by the inhabitants. Kingston is the seat of an Anglican and of a Roman Catholic bishop. The population in 1881 was

14,093.

Kingston occupies the site of the old French fort Frontenac. It received its present name after it was taken by the British in 1762. For three years (1841-44) it was the capital of Canada,

KINGSTON, the capital of Jamaica. See JAMAICA.

KINGSTON-ON-THAMES, a municipal borough and market-town of England, county of Surrey, extends for about a mile and a half along the right bank of the Thames, and is distant from London about 20 miles by the river and 12 miles by rail and road. The ancient wooden bridge over the river, which was in existence as early as 1224, was superseded by a structure of stone in 1827. The town is irregularly built, but its suburbs con- tain many fine houses and villas embosomed in trees, and of late years it has been rapidly increasing. Public walks and gardens have been constructed along the river. The parish church of All Saints, chiefly Perpendicular in style, contains several brasses of the 15th century; the gram- mar school, rebuilt in 1878, was originally founded as a chantry by Edward Lovekyn in 1305, and converted into a school by Queen Elizabeth. Near the parish church stood until 1779 the chapel of St Mary, where, it is alleged, the Saxon kings were crowned. The ancient stone said to have been used as a throne at these

coronations was removed to the market-place in 1850. A town-hall in the Italian style was erected in 1840, the former building having been a very ancient structure, There are several foundation schools and a large number of charities. The growth of the town has been owing chiefly to the in- creasing number of London business men who have made it their residence, its proximity to Richmond park and Hampton Court no doubt aiding its popularity. There are large market gardens in the neighbourhood, and the town possesses oil-mills, flour-mills, breweries, and brick and tile works, A little distance up the river are the works of several London water companies. An annual cattle fair is held in November, and county assizes are heldat Lent, The population of the municipal borough in 1881 was 19,875.

Kingston doubtless derived its name from ‘the fact that at an early period it was a royal demesne. On digging the foundation for the new bridge a large number of important Roman remains were discovered, and on this account many believe that it was at this spot that Czsar crossed the Thames when in pursuit of Cassivelaunus. In 838 it was the seat of a witenagemot convened

by King Egbert. From Edwin in 901 to Ethelred in 978 it was the place where the Anglo-Saxon kings were crowned. King- ston returned members to parliament from the 4th of Edward II. to the 47th of Edward III. It received a charter of incorporation from King John, which was confirmed and extended by several subsequent monarchs. In 1264 the castle of Kingston, no trace of which now remains, was taken by Henry [II. In 1648 it was made the rendezvous of forces designed for the release of Charles I. from the Isle of Wight, but in the skirmish near the town the Royalists were defeated, and Lord Francis Villiers was killed.

See Roots, Charters of the Town of Kingston, 1797, and the histories of the town by Anderson, 1818, and Biden, 1852.

KINGSTON-UPON-HULL. See Hutt, vol. xii. p.

340.1!

KINGSTON, Witi1am Henry Gitus (1814-1880), boys' novelist, was born in London, February 28, 1814. Much of his youth was spent at Oporto, where his father was a merchant, but when he joined his father in business, and afterwards when he carried on business for himself, he lived chiefly in London. In 1844 his first book, Zhe Circassian Chief, appeared, and its success led to the publication in 1845 of The Prime Minister, a Story of the Days of the Great Marquis of Pombal. The Lusitanian Sketches that appeared soon after describe Kingston's travels in Portugal. In 1851 Peter the Whaler, his first book for boys, came out. That and its immediate successors were received with such unequivocal popularity that Kingston retired from business, and devoted himself to the production of tales of adventure for boys. Within thirty years he wrote upwards of one hundred and thirty such books. He travelled at various times in many of the countries of Europe, and lived for a while in Portugal during the civil war there. His Western Wanderings, published in 1856, describes a tour in Canada. In all philanthropic schemes Kingston took deep interest; he was the promoter of the mission to seamen; and he acted as secretary of a society for promoting an improved system of emigration. He was a supporter of the volunteer moveinent in England from the first. For his services in bringing about a commercial treaty between Portugal and Britain he was knighted by the queen of Portugal; and his literary merits were recognized at home by a grant from his own sovereign. He died at Willesden, August 5, 1880.

Kingston's boyish ambition had been to enter the navy, and he always kept his affection for the sea. As he advanced in life he had opportunities of cruising in men- of-war, besides sailing in merchantmen and his own yacht ; and it was thus that he gained the knowledge of practical seamanship that he used so graphically in his books. Most of his stories are stories of the sea; and he generally laid his plots in the old romantic days before England's wooden walls had given place to iron-clads. He wasa master of the simple romance in

which boys delight, and knew well how to draw the peculiar compound of valour and magnanimity that forms the hero to healthy boyhood. He had great assimilative power in using the accounts of travellers in countries where he had never been; and his imagination supplied him abundantly with gallant adventures, thrilling dangers, and hairsbreadth escapes. His books are useful in insinuating knowledge whilst they are giving pleasure, and they are valuable inasmuch as their whole tone is pure, wholesome, and manly. Characteristic specimens of his works are The Three Midshipmen ; The Three Lieutenants ‘ The Three Commanders; and The Three Admirals. Occasionally his books were not in the form of a story ; and some of them are designed for adult readers, :

KINGSTOWN, a seaport town of Ireland, in the county of Dublin, is situated at the south-eastern extremity of Dublin Bay, 6 miles south-east from Dublin by railway. = Se eee eee

1 The population of the municipal borough amounted in 1881 to 154,250, and that of the parliamentary borough of Hull to 161,519.

It is a large seaport and favourite watering-place, and possesses several fine streets and terraces commanding picturesque sea views. The original name of Kingstown was Dunleary, which was exchanged for the present designation after the embarkation of George IV. at the port on his return from Ireland in 1821, an event which is also commemorated by a granite obelisk erected near the harbour. The town was a mere fishing village until the construction of an extensive harbour, begun in 1817 from designs by Rennie, and finally completed in 1859, at a cost of £825,000. The eastern pier has a length of 3500 feet, and the western of 4950 feet, the total area enclosed being about 250 acres, with a varying depth of from 15 to 27 feet. Kingstown is the station of the mail packets to Holyhead in connexion with the London and North-Western Railway. It has a large export and import trade both with Great Britain and foreign countries, but as its shipping returns are now included in those of the port of Dublin, it isimpossible to give accurate details. The principal exports are cattle, and the principal

imports corn and provisions. The harbour revenue exceeds £2000 annually. By the Towns' Improvement Act of 1854, Kingstown, with several surrounding districts, was formed into a township, having an area of 1450 acres, The popu- lation in 1861 was 14,257, which in 1871 had increased to 16,378, and in 1881 to 18,230.

KING-TIH CHIN, a town near Foo-leang Heen in the province of Keang-se, China, and the principal seat of the porcelain manufacture in that empire. Being situated on the south bank of the river Chang, it was in ancient times known as Chang-nan Chin, or "town on the south of the river Chang." It is unwalled, and stretches along the bank of the river in a somewhat straggling way. The streets are narrow, and crowded with a population which is reckoned at a million, the vast majority of whom find employment at the porcelain factories. Since the Clin dynasty (557-589) this has been the great trade of the place, which was then called by its earlier name. In the reign of King-tih of the Sung dynasty (1004-1007) a manufactory was founded there for making vases and objects of art for the use of the emperor. Hence its adoption of its present title. Since the time of the Ming dynasty a magistrate has been specially appointed to superintend the factories and to despatch at regulated intervals the imperial porcelain to Peking. The town is situated on a vast plain surrounded by mountains, and boasts of three thousand porcelain furnaces. These constantly burning fires are the causes of frequent conflagrations, and at night give the city the appearance of a place on fire. The people are asa rule orderly, though they have on several occasions shown a hostile bearing towards foreign visitors. This is probably to be accounted for bya desire to keep their art as far as possible a mystery, and is after all only an extreme interpretation of the law which forbids strangers to lodge in the town. This feeling appears less unreasonable when it is remembered that the two kinds of earth of which the porcelain is made are not found at King-tih Chin, but are bronght from K'i-mun in the neighbouring province of Gan-hwuy, and that there is therefore no reason why the trade should be necessarily maintained at that place. The two kinds of earth are known at pih-tun-tsze, which is a fine fusible quartz powder, and kaou-lin, which is not fusible, and which it is said gives strength to the ware (see Kaotin). Both materials are prepared in the shape of

bricks at K’i-mun, and are brought down the Chang to the seat of the manufacture.

KINO, an astringent drug introduced into European medicine in 1757 by Fothergill, an eminent physician and patron of economic botany. When described by him it was believed to have been brought from the river Gambia

in West Africa. According to Moore (1733), a factor to the Royal African Company, the tree yielding the drug is known in the Mandingo language as “‘ kano.” When first imported, however, it was sold in England as Gummi rubrum astringens Gambiense. It was introduced into the Edinburgh pharmacopeeia in 1776 under the above name, and into the Loudon pharmacopeeia in 1787 under the name of Resina kino. Specimens of the plant sent home by Mungo Park in 1805 were recognized as identical with Pterocarpus erinaceus, Poiret. In 1811 the African drug was no longer to be met with in English commerce, its place being supplied by several other kinds.

The drug which is at present recognized as the legiti- mate kind is East Indian, Malabar, or Amboyua kino, and is obtained from Pterocarpus Marsupium, Roxb. (Legu- minosz). It is collected in the Government forests of the Malabar coast, the collectors being required to pay a small fee for the privilege, and to perform the tapping carefully and without injuring the timber. The mode of obtaining the kino is by making a perpendicular incision, with lateral ones leading into it, in the trunk, a vessel being placed at the foot of the incision to receive the juice. When exud- ing it resembles red currant jelly,! but hardens in a few hours after exposure to the air and sun. When sufficiently dried it is packed into wooden boxes for exportation. When these are opened it breaks up into angular brittle fragments of a blackish-red colour and shining surface. In cold water it is only partially dissolved, leaving a pale flocculent residue, which is soluble in boiling water, but deposited again oncooling. In spirit of wine, sp. gr. ‘838, ‘it is entirely soluble, affording a solution having an acid reaction, but the liquid by long keeping assumes a gela- tinous condition. It is also soluble in caustic

alkalis and to a large extent in a saturated solution of sugar, but is wholly insoluble in ether. In chemical composition kino appears to be nearly allied to Pegu catechu, but differs from it in not yielding catechin when exhausted by ether, but only a minute quantity of scaly prismatic crystals of a substance which is soluble in cold water, and thus more nearly resembles pyrocatechin. Pyrocatechin is, however, not present in the fresh bark or wood of the tree. Etti (1878) states that he has obtained kinoin, C,,H,,0,, from Malabar kino, while Hanbury and Fluckiger failed to obtain it from that drug, but found it in Australian kino. According to Bentley, kino-tannic acid, catechin (or pro- bably pyrocatechin), and kino red are the essential consti- tuents of Malabar kino, The first of these is precipitated from an aqueous solution of the drug by dilute mineral acids, and the last by boiling an aqueous solution of kino-tannic acid for some time, when it separates as a red precipitate. The chemical constitution of Malabar kino is therefore only imperfectly known. The quantity of kino collected in Madras is comparatively small, and is supposed not to exceed a ton or two annually, but it is often shipped from Cochin.

Bengal, Butea, or Palas kino—obtained from Butea fron- dosa, Roxb. (Leguminose), a native of India and Burmah, well known under the name of the Palas or Dhak tree, and remarkable for its large orange papilionaceous flowers —also finds its way occasionally into British commerce. A portion is also obtained from Butea superba, Roxb., and Butea parviflora, Roxb. Butea kino does not stick to the teeth when chewed like ordinary kino, although like the latter it gives a red tinge to the saliva. It is usually more or less mixed with small fragments of bark. It is almost completely soluble in water, and to the extent of 46 per cent. in boiling alcohol, but different specimens vary in solubility. It is believed to contain about half its weight

1 African kino is very liquid and of an extremely pale red colour when it first flows out, but soon coagulates and becomes of a deep blood-red hue.

of kino-tannic acid, the remainder consisting of a soluble mucilaginous substance, and a minute quantity of pyro- catechin, which can be extracted by ether. In India Butea kino is used instead of the Malabar kino, and is called by the Hindus kueni or kuenee.

Botany Bay, Australian, or Eucalyptus kino is a more or less resinous astringent exudation obtained from several species of Hucalyptus. It is found in flattened cavities in the trunks, and is mostly collected by sawyers and wood- splitters. It frequently comes into the London market, and the best variety, probably the product of #. corymbosa, Sm., is used under the name of “red gum” in the pre- paration of astringent lozenges for sore throat. Accord- ing to Wiesner of Vienna, Australian kino contains a little catechin (a statement doubted by Fluckiger) and pyro- catechin, no pectinous matter, but a gum nearly allied to that of acacia. Fluckiger also obtained from it kinoin, C,,H,,0,, which he regards as the methylated gallic ether of pyrocatechuic acid, viz., C;H,(OCH,)C,H,0;.

Between 1808 and 1820 a substance was met with in French commerce under the name of Jamaica kino, which is said to have been prepared by inspissating the juice of the seaside grape, Coccoloba wifera, L. (Polygonacez). When powdered it has a somewhat bituminous odour and an astringent slightly bitter taste. It is but little soluble in cold water or alcoliol, but dissolves almost entirely in boiling water, and to the extent of about 75 per cent. in hotalcohol. In thin laminez it is only semi-transparent, the fragments usually met with in commerce being quite opaque. In 1835 an article appeared in French commerce under the name of “kino. de la Colombie,” which is stated in J/%s- toire des Drogues to be in all probability an extract of the bark of Rhizophora Mangle, L. A liquid kino is obtained from Pterocarpus indicus, which does not harden like that obtained from P. Marsupiwm. Although used in India it is not imported into Europe. Other varieties of kino are mentioned inthe same work, but they must be regarded rather in the light of curiosities than as articles of com- merce.

Kino is used in medicine as an astringent, chiefly in the form of tincture; but, owing to its tendency to gelatinize, that preparation is

much less used than formerly.

See D. Fothergill, Afed. Obs., 1757, p. 358; F. Moore, Travels into the Inland Parts of Africa, 1737, p. 160, 209, 267; Histoire des Drogues, 7th ed., tom. ili. p. 426-439 ; Lewis, Materia Medica, 1784, p. 866; Daniell, Pharmaceutical Journal, (1) xiv. p. 55; Pharmacographia, 2d ed., p. 195; Pereira, Mat. Med., 4th ed., vol. ii, pt. ii, p. 325; Bentley and Trimen, Medicinal Plants, Nos. 79-81.

KINROSS, a small inland county of Scotland, is situ- ated between 56° 8’ and 56° 18’ N. lat., and 3° 14’ and 3° 35’ W. long. It is of an irregular circular form, and in outline somewhat resembles a toothed wheel, lying between Perthshire on the north-west and Fife on the south-east. Its breadth from west to east is about 12 miles, and its length from north to south about 10 miles ; the area is 49,812 acres, or about 78 square miles. Next to Clackmannan it is the smallest county in Scotland.

The surface consists principally of an oval and level plain, which is bounded on the N.W. by the Ochils, on the E. by Bishop Hill and the Lomonds, on the 8. by Benarty Hill, and on the 8.W. by the Cleish Hills. This plain opens out on the west along the Devon valley towards Stirling, on the north-east towards the valley of the Eden, and more narrowly on the south between the Cleish Hills and Benarty. Kinross is touched by the river Devon at the Crook of Devon, not far from the Rumbling Bridge ; and the river Leven, which has its source in the loch of that name, flows for about half a mile in Kinross before entering Fife. Of the streams which flow into Lochleven the prin- cipal are the Gairney, the South Queich, and the North

Queich. Lochleven,

by extensive reclamation works undertaken in 1826, has still a surface of 3406 acres, and its trout fishing is the best of any loch in Scotland. The loch contains several islands, the principal being Queen Mary’s

Island, 8 acres in extent, Reed Bowers, 1 acre, and the island of St Serf, 80 acres.

Geology and Agriculture. —The greater part of the county belongs to the upper strata of the Old Red Sandstone, but a portion in the north-west to the porphyry formation of the Ochils, while on the east there is a narrow boundary of the Coal-measure slightly interrupted by trap. Coal is wrought in the southern part of the county, but only to a

From 100 to 300 Acres.

From 50 to 100 Acres.

50 Acres and under.

No. Acres. Acres. Acres.

the area of which has been lessened | small extent; limestone is very abundant, and sandstone

is obtained for building purposes. |

The lower part of the courty is generally well sheltered, and suitable for all kinds of crops. In this region the soil is generally of a mossy character, but when well drained and cultivated is very fertile. The eminences are devoted chiefly to the pasturage of sheep and the rearing of cattle. Much land has been reclaimed within recent years, and the methods of farming are now quite equal to those of the most advanced districts of Scotland.

A great proportion of the land is held in fee by small proprietors

who farm their own properties. The following table gives a classi-fication of holdings according to size in 1880 and 1875 :—

From 300 to 500 From 500 to 1000

18,680 21,556

7,823 2,074

136 143

1,068 1,543

According to the agricultural returns for 1881, the total area under erops was 81,459 acres, of which 7296 acres were under corn crops, 3698 under green crops, 11,348 under rotation grasses, 9100 permanent pasture, and 17 fallow. 2576 acres were under woods. ‘The percentage of cultivated area in 1870 was 67°9, and in 1880 it was 63°0. The area under permanent pasture has increased very much of late years, while there is an unusually large percentage under rotation grasses. 5801 acres, or more than two-tlurds of the area under corn crops, is occupied by barley and berc, while oats had 1850 and wheat only 112 acres. Nearly the whole area under green crops was occupied either by turnips and swedes or potatoes, turnips and swedes having 2663 and potatoes 957 acres.

The total number of horses in 1881 was 1039. Of these 699 were used solely for agricultural purposes, and 340, a very large pro- portion, were unbroken horses or mares kept solely for breeding. Cattle in 1881 numbered 5555. Milch cows numbcred 984, less than one-fifth of the whole. A considerable number of cattle are pastured on the lowland farms. They are chiefly a native breed, which has been much improved by crossing. Sheep in 1881 numbered 26,530. They are chiefly pastured on the hills, but a considerable number are also wintered on the lowland farms. Pigs in 1881 numbered 504.

In 1872-73 the land was divided between 728 proprietors, and its .

gross annual value was £64,671, 14s. Of the owners, 468 or 64°38 per cent. possessed less than 1 acre, and the average value per acre was £1, 8s. 10$d. There were nine proprietors who held more than 1000 acres, the largest estates being those of the Right Hon. W. P. Adam, 2869 acres, and Sir Graham Montgomery, 2336.

Manufactures and Trade.—Tartan plaids, shawls, and other woollen goods are manufactured at Kinross, which also possesses corn-mills and a brewery, There is a large linen factory at Mil- nathort, as well as manufactories for woollen goods.

Administration.—The county sheriff courts are held weekly or fortnightly. Kinross is now joined with Clackmannan and Lin- lithgow in one sheriffdom, and quarter sessions are held on the first Tuesday of March, July, August, and October. The county unites with Claeckmannan in returning a member to parliament.

_ Population.—Kinross has the smallest population of any county in Scotland. From 6725 in 1801 it rose toa maximum of 9072 in 1831, from which it fell in 1841 to 8763, and, although in 1851 it rose to 8924, it gradually diminished till in 1871 it was 7198, while in 1881 it was 6699, of whom 3112 were males and 3587 females. The principal villages are Kinross (population in 1881, 1960), the capital of the county and a market-town; Milna- thort (1269), with linen and woollen manufactures; Kinness- re (250); and a portion of Kelty, the remainder being in ife.

_ History and Antiquitics.—The early history of Kinross-shire is given in the artiele Fire. There are traces of an ancient fort or camp on the top of the hill of Dumglow in the parish of Cleish, and a remarkable cairn called Cairn-a-vain ona hill on the northern boundary of the parish of Orwell, in the centre of which a rude stone cist was discovered with an urn full of bones and charcoal In 1857 a hoard of seven hundred Roman coins was dug up in the vicinity of the county town. The priory of Portmoak, properly situ- ated on the island of St Serf in Lochleven, although the prior and canons often residedat Kinnesswood, was originally the oldest Culdee establishment in Scotland,—being a gift of the Pictish kings after their conversion. Some time before 961 it was made over to the bishop of St Andrews, and shortly after 1144 a body of canons regular was established in it in connexion with the priory of canons regular established in that year at St Andrews. The castle of Lochleven was a royal residence as far back as 1257. Init Archi-

Riceoet Gres Above 1000 Acres. Total. Acres. Acres. No. Acres. No. Acres.

2,361 1,445 293 31,377 9,307 530 816 35,010

bald, carl of Douglas, was imprisoned in 1429, and Qucen Mary from June 16th 1567 to May 2d 1568. A short distance north-east of Kinross stands the ruined castle of Burleigh.

KINSALE, a parliamentary borough and seaport town of Ireland, in the county of Cork, is situated on the estuary of the Bandon, 24 miles south from Cork by rail. The town occupies chiefly the acclivity of Compass Hill, and, while possessing a striking and picturesque appearance, is built in a very irregular manner, the streets being narrow and so precipitous that in many instances convey- ances have to take a very circuitous course. The principal buildings are the castle fort, completed by the duke of Ormonde ata cost of £70,000, and captured by the earl of Marlborough in 1690; the parish church, an ancient but inelegant structure erected as a conventual church about the 14th century ; the assembly-rooms, the barracks, the Carmelite friary, and the convent of the sisters of mercy. Kinsale is much frequented by summer visitors, and is also an important fishery station, the number of boats employed in the division of which it is the principal port being about 350, employing over 1700 men and boys. It possesses also a commodious harbour, but the trade has become almost extinct owing to the proximity of Cork. The population in 1881 was 4976.

Kinsale is said to derive its name from cean taile, the headland in the sea. Atan early period the town belonged to the De Courceys, a representative of whom was created baron of Kinsale in 1181. It received a charter of incorporation from Edward III., having previ- ously been a borough by prescription, and its privileges were con- firmed and extended by various subsequent sovereigns. For several centuries previous to the Union it returned two members to parlia- ment, but since then it has returned only one. It was the scene of an engagement between the French and English fleets in 1380, was forcibly entered by the English in 1488, was partly consumed by fire in 1594, was captured by the Spaniards and retaken by the English in

1601, was entered by the English in 1641, who expelled the Irish inhabitants, was the scene of the landing of James II. and of the French army sent to his assistance in 1689, and was taken by the English in the following year.

KIOTO, Kryéto, Mraxko, or Saixkto, the ancient sacred capital of Japan, is situated on the main island of the Japanese archipelago. It occupies the level bottom of a valley between the ridges Hujei-zan and Higushiyama ou the east, and of Tenno-san on the west, and is so girt by the streams Kamogawa and Kalunagawa as to have an almost insular position. With T6kid, to the north-east, it is connected by two highways, the Tékaid6, 307 miles long, and the Nakasendé, 323 miles long. To Ozaka on the coast a railway line was openedin 1877. Kidto is regularly and compactly built on the rectangular system, the immense number of Shintd and Buddhist shrines and temples being almost entirely beyond the city proper. The large suburb beyond the Kamogawa, which is crossed by many bridges, is the finest in respect of inns and temples. The houses,

chiefly of wood, are small, and are further dwarfed by the great width of the streets. Tea-houses and pleasure- – gardens abound, and the whole air of the city is pleasant, “With its schools, hospitals, lunatic asylum, prisons, dispensaries, alms-houses, fountains, public-parks, and gardens, exquisitely beautiful cemeteries, and streets of almost painful cleanliness, Kiyédto is the best-arranged and best-managed city in Japan.”! The chief building is, of course, the imperial palace surrounded by beautiful gardens. Formerly forbidden to even most natives, it is now occupied as a museum of Japanese arts and manu-factures. Among the other buildings are the former residences of the taikun and of the mikado’s nobility, the various normal training and other schools for both sexes and all ages, the hospital, &c. Under the city government of Kidto there was founded in 1870 an industrial depart- ment to foster the industries of the place. There are divisions for the encouragement of gardening, shoe-making, silk and other weaving, paper-making, leather-making, the manufacture of mineral

waters, and many other branches of industry. Kidto supports also a pauper colony. The silk-factories, though on a small scale, are numerous. Crape, bronze goods, and porcelain (largely for the English market) are also produced in the city. The population in 1870 was estimated at 370,000.

Kiéto is much ,the oldest of the three great cities of Japan, but both Tokio and Ozaka have far outstripped it in importance. In the reign of the emperor Kuwammu, towards the end of the 8th century, Nara was superseded as the capital by Kudzuno, afterwards called Kiéto, and sometimes Miako; and this last town became identified with the mikado, as Yedo was with the shégun. It was the scene of the first contests of the Taira and Minumoto clans. In the 16th century Xavier preached in its streets; and in the 17th Kaempfer twice visited it. In 1864 a fierce contest, followed by a conflagration, resulted from an attack upon it by the Chésiu clan and Kiheitai. After the revolution in 1869 the mikado and his court migrated to Yedo, thenceforth called Tékio or eastern capital. Kidto also received an alternative name,—Saikio, or western capital; but it is never used. Kidto is not a treaty port; and foreigners are not allowed to reside in it unless they are in Japanese employ.

KIPPIS, Anprew (1725-1795), a learned and laborious compiler, was born at Nottingham, March 28, 1725. From school at Sleaford in Lincolnshire he passed at the age of sixteen to spend a five years' course in the Dissenting academy at Northampton, of which Dr Doddridge was then president. In 1746 Kippis became minister of a church at Boston; in 1750 he removed to Dorking in Surrey; and in 1753 he became pastor of a dissenting congregation at Westminster, where he remained till his death on 8th October 1795. Kippis took a prominent part in the affairs of the body with which he was connected. From 1763 till 1784 he was classical and philological tutor in Coward's training college ; and when another institution of the same kind was opened at Hackney he was prevailed upon, some- what against his will, to serve as tutor there for a few years. In 1767 he received the degree of D.D. from Edinburgh university ; in 1778 he was elected a fellow of the Antiquarian Society, and a fellow of the

Royal Society in 1779. He left a reputation for piety, learning, and active virtue.

Kippis was a very voluminous writer. He contributed largely to Zhe Gentleman's Magazine, The Monthly Review, and The Library ; and he had a good deal to do with the establishment and conduct of The New Annual Register. He published also a number of sermons and occasional pamphlets ; and he prefixed a life of the author to a collected edition of Dr Nathaniel Lardner's Works (Git vols. 8vo, 1788). He wrote a life of Dr Doddridge, also, which is prefixed to Doddridge's Exposition of the New Testament (6 vols. 8vo, 1792). His chief work is his edition of the Biographia Britannica, of which, however, he only lived to publish 5 vols. (folio, 1778-1793). Many new lives were inserted, written for the

most part by the editor himself ; and extensive additions and corrections were made. These last were given in the form of footnotes to

1 Miss Bird, Unbeaten Tracks in Japan, vol. ii. p. 252.

the original text,—a plan which often gives the work the air of a long controversy, and swelled it beyond reasonable bounds. As a monument of the painstaking erudition of the editor the work is interesting ; and as a mere storehouse of facts it possesses a genuine value. Kippis's Life and Voyages of Captain James Cook was reprinted from this book, 4to, 1788. See notice by A. Rees, JD). i Dey in The New Annual Register for 1795.

KIRBY, Wit1iam (1759-1850), entomologist, was born at Witnesham in Suffolk, September 19, 1759. From the village school of Witnesham he passed to Ipswich grammar school, and thence to Caius College, Cambridge, where he graduated B.A. in 1781, not becoming M.A. till 1815. Taking orders in 1782, he spent his entire life in the peace- ful seclusion of an English country parsonage, till 1796 as curate, afterwards as rector, of Barham in Suffolk. Although Kirby was once and again induced to use his pen against the spirit of free-thinking then

reacting from France upon England, he had little taste for controversy. His favourite study was natural history; and eventually entomology engrossed all his leisure. His first work of importance was his Monographia Apum Angliz (2 vols. 8vo, 1802), which as the first scientific treatise on its subject brought him into notice with the leading entomologists of his own and foreign countries. Latreille, Fabricius, Illiger, and Walckenaer were among lis corre- spondents; and his opinion and advice were sought by many less illustrious. The practical result of a friendship formed in 1805 with Mr Spence, a scientific gentleman of Hull, was the jointly written Introduction to Entomology (4 vols. 8vo, 1815-26, 7th ed. 1856), one of the most popular books of science that have ever appeared, and still highly valuable. In 1830 Kirby was chosen to write one of the Bridgewater Treatises, his subject being The History, Habits, and Instincts of Animals. This, published in 2 vols. in 1835, undeniably fell short of his earlier works in point of scientific value. On July 4, 1850, William Kirby died, after a long life of piety, benevolence, and diligence. He was an original member of the Linnean Society; and his name was on the rolls of all the chief scientific associa- tions in England and abroad,

Besides the books already mentioned, Kirby was the author of many papers in The Transactions of the Linnean Society, The Zoo- logical Journal, and other periodicals ; of Strictuwres on Sir James Sinith's Hypothesis respeeting the Lilies of the Field of our Saviour and the Acanthus of Virgil, 1819; of Seven Sermons on our Lord's Temptations, &e., 1829; and of the sections on insects in the Aecount of the Animals seen by the late Northern Expedition while within the Aretie Cirele, 1821, and in Fauna Boreali-Americana, 1837. The Life of the Rev. William Kirby, M.A., by Rev. John Freeman, was published in 1852. It contains a list of Kirby's works.

KIRCHER, Aruanastus (1602-1680), a learned scholar and accomplished mathematician, was born May 2, 1602, at Geisa near Fulda, was educated at the Jesuit college of Fulda, and entered upon his noviciate in that order at Mainz in 1618. After continuing his studies at Paderborn, Miinster, Cologne, Coblenz, and Mainz, he became professor of philosophy, mathematics, and Oriental languages

at Wirzburg, whence he was driven (1631) by the troubles of the Thirty Years' War to Avignon. Through the influence of Cardinal Barberini he next (1635) settled in Rome, where for eight years he taught mathematics in the Collegio Romano, but ultimately resigned this appointment in order that he might devote the closing years of his life entirely to the study of hieroglyphics and other archzolo- gical subjects. He died November 28, 1680.

Kircher was a man of wide and varied learning, but singularly devoid of judgment and critical discernment. His voluminous writings in philology, natural history, physics, and mathematics often accordingly have a good decal of: the historical interest which attaches to pioneering work, howevcr imperfectly performed ; other- wise they now take rank as curiositics of literature merely. They include Ars Magnesia, 1631; Magnes, sive de arte magnetica opus tripartitum, 1640 ; and Magneticum naturex regnum, 1667; Prodro- mus Coptus, 1636; Lingua Afgyptiaca restituta, 1648 ; Obeliseus

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Pamphilius, 1650; and G@dipus Afgyptiacus, hoc est wniversalis doctrinw hicroglyphice instawratio, 1652-55,—works which may claim the merit of having first called the attention of the learned to the Egyptian hieroglyphics; Ars magna lucis et umbre wm mundo, 1645-46 ; Musurgia universalis, sive ars magna consont et dissoni, 1650; Polygraphia, seu artificium linguarum quo cum omnibus mundi populis potcrit quis respondere, 1663 ; Mundus subterrancus, quo subterrestris mundi opificium, universe denique nature: divitie, abditorum effectuum cause demonstrantur, 1665-78; China illustrata, 1667 ; Ars magna seiendi, 1669 ; and Latium, 1669, a work which may still be consulted with advantage. The Specula Melitensis Encyclica (1638) gives an account of what may be described as a kind of calculating machine of his invention. The valuable collection of antiquities which he bequeathed to the Collegio Romano has been described by Buonanni (Museum Kir- cherianwm, 1709 ; republished by Battara in 1773).

KIRCHHEIM-UNTER-TECK, chief town of a district in the Danube circle of Wiirtemberg, is prettily situated on the Lauter, uot far from the Teck, and about 15 miles south-east of Stuttgart. Its castle was built in 1538. The manufactures include cotton goods, damask, piano-fortes, machinery, lanterns, chemicals, cement, &c. The town also has wool-spinning establishments and breweries, and a corn exchange. It is the most important wool market in South Germany, the annual turn-over averag- ing about 1,650,000 ib. The population in 1875 was

6197.

KIRGHIZ, a large and wide-spread division of the Mongolo-Tatar family, of which there are two main branches, the Kara-Kirghiz of the uplands and the Kirghiz-Kazaks of the steppe. To the same group belong the Kipchaks, forming a connecting link between the nomad and settled Turki peoples of Ferghana and Bokhara, and the Kara-Kalpaks on the south-east side of the Aral Sea, who are intermediate between the Kazaks and Uzbegs. The Kirghiz jointly number about 3,000,000, and occupy an area of perhaps the same number of square miles, stretching from Kulja westwards to the lower Volga, and from the head streams of the Ob southwards to the Pamir and the Turkoman country. In the Mongolo-Tatar family their position is peculiar, they being closely allied ethnically to the Mongolians and in speech to the Tatars, To under- stand this phenomenon, it should be remembered that both Mongols and Tatars belonged themselves originally to one racial stock, of which the former still remain the typical representatives, but from which the latter have mostly departed and become largely assimilated to the regular “Caucasian” type. But the Kirghiz have either remained nearly altogether unmixed, as in the uplands, or else have intermingled in the steppe mainly with the Volga Calmucks in the west, and with the Zungarian nomads in the east, all alike of Mongol stock. Hence they have everywhere to a large extent preserved the common Mongolian features, while retaining their primitive Tatar speech. Physically they are a middle-sized, square-built race, inclined to stoutness, especially in the steppe, mostly with long black hair, scant beard or none, small, black, and oblique eyes, though blue or grey also occur in the south, broad Mongoloid features, high cheek bones, broad,

flat nose, small mouth, brachycephalous head, very small hands and feet, dirty brown or swarthy complexion, often yellowish, but also occasionally fair. These characteristics, while affiliating them directly to the Mongol stock, also betray an admixture of foreign elements, probably due to Finnish or Chudic influences in the north, and Tajik or Iranian blood in the south. Their speech also, while purely Turkic in structure, possesses, not only many Mongolian and a few Persian and even Arabic words, but also some terms unknown to the other branches of the Mongolo- Tatar linguistic family, and which should perhaps be traced to the Kiang-Kuan, Wu-sun, Ting-ling, and other extinct Chudic peoples of South Siberia partly absorbed by them. These relations to the surrounding Asiatic races

will be made clearer in the subjoined detailed account of the Kara-Kirghiz and Kirghiz-Kazaks.

The Kara-Kirghiz.— The Kara or “Black” Kirghiz, so called from the colour of their tents, are known to the Russians either as Chernyie (‘‘ Black”) or Dikokammenyie (“ Wild Stone” or “ Rocky”) Kirghiz, and are the Block Kirghiz of some English writers. They are on the whole the purest and best representatives of the race, and so true is this that, properly speaking, to them alone belongs the distinctive national name Kirghiz or Krghiz. This term is commonly traced to a legendary chief, Kirghiz, sprung of Oghnz-Khan, ninth in descent from Japhet. It occurs in its present form for the first time in the account of the embassy sent in 569 by Justin II. to the Uighur Khan, Dugla-Ditubulu, where it is stated that this prince presented a slave of the “Kerghiz” tribe to Zemark, head of the mission. In the Chinese chronicles the word assumes the form Ki-li-ki-tz’, and the writers of the Yuan dynasty (1280 —1367) place the territory of these people 10,000 li north- west of Pekin, about the head streams of the Yenisei. In the records of the Thang dynasty (618-907) they are spoken of under the name of Kha-kia-tz’ (pronounced Khaka, and sometimes transliterated Haka), and it is mentioned that these Khakas were of the same speech as the Khoei-khu. From this it follows that they were of Mongolo-Tatar

stock, and are wrongly identified by some ethnologists with the Kiang-Kuan, Wu-sun, or Ting-ling, all of whom are described as tall, with red hair, “ green” or grey eyes, and fair complexion, and must therefore have been of Finnish stock, akin to the present Soyotes of the upper Yenisei.

The Kara-Kirghiz are by the Chinese and Mongolians called Burut, where ut is the Mongolian plural ending, as in Tangut, Yakut, modified to yat in Buryat, the collective name of the Siberian Mongolians of the Baikal district. Thus the term Bur is the common Mongolian designation both of the Baikal Mongols and of the Kara-Kirghiz, who occupied this very region and the upper Yenisei valley generally till comparatively recent times. For the original home of their ancestors, the Khakas, layin the south of the present governments of Yeniseisk and Tomsk, stretching thence southwards beyond the Sayan range to the Tannu- ola hills in Chinese territory. Here the Russians first met them in the 17th century, and by the aid of the Kazaks exterminated all those east of the Irtish, driving the rest further west and south-westwards. Most of them took refuge with their kinsmen, the Kara-Kirghiz nomad highlanders, whose homes, at least since the 13th century, have been the Ala-tau range, the Issik-kul basin, the Tekes, Chu, and Talass river valleys, the Tian-shan range, the uplands draining both to the Tarim and to the Jaxartes and Oxus, including Khokand, Karategin, and Shignan southwards to the Pamir table-land, visited by them in summer. They thus occupy most of the uplands along the Russo-Chinese frontier, between 35° and 50° N. lat. and between 70° and 85° E. long., where they have been recently joined by some Chiliks, Kipchaks, Naimans, and Kitars from Andijan and the Kazak steppes.

The Kara-Kirghiz are all grouped in two main sections—the On or “ Right ” in the east, with seven branches (Bogu, Sary-Bagishch, Son-Bagishch, Sultu or Solye, Cherik, Sayak, Bassinz), and the Sol or “ Left” in the west, with four branches (Kokche or Ktchy, Soru, Mundus, Kitai or Kintai). The Sol section occupies the region between the Talass and Oxus head streams in Ferghana (Khokand) and Bokhara, where they come in contact with the Galchas or Highland Tajiks. The

On section lies on both sides of the Tian-shan, about Lake Issik-kul, and in the Chu, Tekes, and Narin (upper Jaxartes) valleys.

Each of the On tribes comprises a number of stocks or septs, which are further divided into auls or families, of which, however, the lists are complete for the Bogu and Sary-Bagishch alone. Of

the Bogu there are six stocks, with 11,000 tents, and numbering 55,000 to 60,000 souls. Of the Sary-Bagishch there are four stocks,

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with 16,500 tents, or 80,000 to 90,000 souls. The Sayak numbers 10,000 tents, or about 50,000 souls, making a total of 200,000 in Russian territory. The Sol seetion, with the independent On tribes, are roughly estimated at about 200,000, making 400,006 Kara-Kirghiz altogether.

All are essentially nomads, oeeupied mainly with stock breed- ing, ehiefly horses of a small but hardy breed, sheep of the fat- tailed speeies, oxen used both for riding and as pack animals, some goats, and eamels of both species. Agriculture is limited chiefly to the cultivation of wheat, barley, and millet, from the last of which a coarse vodka or brandy is distilled. Trade is carried on ehiefly by barter, cattle being taken by the dealers from China, Turkestan, and Russia in exehange for manufactured goods.

The Kara-Kirghiz are governed by the ‘‘ manaps,”’ or tribal rulers, who enjoy almost unlimited authority, and may even sell or kill their subjeets. In religious matters they differ little from the Kazaks, whose praetices are deseribed below. Although generally recognizing Russian sovereignty since 1864, they pay no taxes, and merely furnish certain raw products to the Russian troops on their passage through the eountry.

The Kazaks.—Though not unknown to them, the term Kirghiz is never used by the steppe nomads, who always call themselves simply Kazaks, that is, “riders,” as the word is commonly interpreted. The

first authentic reference to this name is by Firdousi (1020), who speaks of the Kazak tribes as much dreaded steppe marauders, all mounted and armed with lances. From this circumstance the term Kazak came to be gradually applied to all free- booters similarly equipped, and it thus spread from the Aralo-Caspian basin to South Russia, where it still survives under the form of ‘‘ Kossak.” Hence though Kazak and Cossack are originally the same word, the former now designates a Mongolo-Tatar nomad race, the latter various members of the Great and Little Russian Slav family. No satisfactory explanation of its origin has been given. Since the 18th century the Russians have used the compound expression Kirghiz-Kazak, chiefly in order to distinguish them from their own Cossacks, at that time overrunning Siberia. Herbertstein (1520) is the first European who mentions them by name, and it is notewortliy that he speaks of them as ‘‘Tartars,” that is, a people rather of Turki than Mongolian stock. In their present homes, the so- called ‘“‘ Kirghiz steppes,” they are far more numerous and wide-spread than their Kara-Kirghiz kinsmen, stretching almost uninterruptedly from Lake Balkash round the Aral aud Caspian Seas westwards to the lower Volga, and from the river Irtish southwards to the lower Oxus and Ust-Urt plateau. Their domain, which is nearly 2,000,000 square miles in extent, thus lies mainly between 45° and 55° N. lat. and from 45° to 80° E. long. Here they came under the sway of Jenghiz Khan, after whose death they fell to the share of his son Juchi, head of the Golden Horde, but continued to retain their own khans. When the Usbegs acquired the ascendency, many of the former subjects of the Juchi and Jagatai hordes fell off and joined the Kazaks. Thus were formed about 1500 two powerful states in the Kipchak and Cheteh steppes, the Moghul- Uluss and the Kazak, the latter of whom, under their khan Arslane, are said by Sultan Baber to have had as many as 400,000 fighting men. Their numbers continued to be swollen by voluntary or enforced accessions from the fragments of the Golden Horde, such as the Kipchaks, Naimans, Konrats, Jalairs, Kankly, whose names are still preserved in the tribal divisions of the Kazaks. And as some of these peoples were undoubtedly of true Mongolian stock, their names have given a colour to the statement that all the Kazaks were rather of Mongol than of Turki origin, But the universal prevalence of a nearly pure variety of the Turki speech throughout the

Kazak steppes is almost alone sufficient to show that the Tatar element must at all times have been in the ascendant.

The Kirghiz-Kazaks have long been grouped in three large “ hordes ” or encampments, further subdivided into a number of so-called “races,” which are again grouped in

tribes, and these in sections, branches, and auls, or com- munities of from five to fifteen tents. The division into hordes has been traditionally referred to a powerful khan, who divided his states amongst his three sons, the eldest of whom became the founder of the Ulu-Yuz, or Great Horde, the second of the Urta-Yuz, or Middle Horde, and the third of the Kachi-Yuz, or Little Horde. The last two under their common khan Abulkhair voluntarily submitted in 1730 to the czarina Anne. Most of the Great Horde were subdued by Yunus, khan of Ferghana, in 1798, and all the still independent tribes finally accepted Russian sovereignty in 1819. The races, range, and numerical strength of these hordes are shown in the following table :—

Range. Tents. Souls, __| (Chiefly south of Lake ae ; eo Balkash and near the fo Sitcen Tian-Shan; between 85,000 | 450,000 avert gan, Semipalatinsk ont : Semiryechensk.

(Chiefly on the low) hilly watershed be- tween the Ob and

MrppiLe Horpe. | | Aralo-Caspian basins,

—Arghyne,

Naiman, Kip- from Aral Sea to }| 175,000 /1,100,000 chak, Uvak-

Ghiret. ernments of Semipa-

Lake Balkash ; gov- latinsk and Akmo-

linsk, West Siberia.

L From Kara-Kum de- sert to lower Volga, north of Aral Sea, and in governments }| 170,000 |1,000,000 of Orenburg, Uralsk, | L

LitTLeE Horpe. —Alimuly, Baiuly, Jetir-

urug. Turgay, and Astra-

khan.

Since 1801 a fourth division, known as the Inner or Bukeyevskaya Horde, from the name of their first khan, Bukei, has been settled in the Orenburg steppe. It is estimated at 40,000 tents or 200,000 souls, giving for all the Kazaks 470,000 tents and 2,750,000 souls.

But these divisions affect the common people alone, all the higher orders and ruling families being broadly classed as White and Black Kost or Bones. The White Bones comprise only the khans and their descendants, besides the issue of the khojas or Moslem “saints.” The Black Bones include all the rest, except the 7Z’elengut or servants of the khans, and the Av or slaves.

The Kazaks are an honest and trustworthy people, but heavy, sluggish, sullen, and unfriendly. Even the hospitality enjoined by the Koran is displayed only towards the ‘‘faithful,” that is, exelusively to the members of the orthodox Sunnite sect. So essentially nomadic are all the tribes that they eannot adopt a settled life without losing the very sentiment of their nationality, and beeoming rapidly absorbed in the Slav population. They dwell exelusively in the kibitka or yurt, a semi-cireular tent consisting of a light wooden framework, and red eloth or felt covering, with an opening above for light and ventilation. It is usually furnished with a large family elothes chest, felt carpet, wooden bedstead, leather bottles for kumis (fermented mare’s milk), a tea service, and a few domestic utensils. Yet it may easily be pitehed or struck in half an hour, and is rapidly transported on eamels across the steppe. The eamp life of the Kazaks seems almost unendurable to Enropeans in winter, when they are confined altogether to the tent, and exposed to endless discomforts. In summer the day is spent mostly in sleep or drinking kumis, followed at night by feasting and the reeital of

tales, varied with songs aeeompanied by the musie of the flute and balalaika. But horsemanship is the great amusement of al] true Kazaks, who may almost be said to be born in the saddle. Henee, though excellent riders, they are bad walkers, and, though hardy and long-lived, uneleanly in their habits and often decimated by small-pox and Siberian plague. They have no fixed meals, and live mainly on mutton and goat and horse flesh, and instead of bread use the so-called balamyk, a mess of flour fried in dripping and diluted in water. The universal drink is kumis, whieh is wholesome, nourishing, and a speeifie against all chest diseases. .

The dress consists of the chapan, a flowing robe of which one or

two are worn in summer and several in winter, fastened with a silk or leather girdle, in which are stuck a knife, tobacco pouch, seal, and a few other trinkets. Broad silk or cloth pantaloons are often worn over the clhapfin, which is of velvet, silk, cotton, or felt, according to the rank of the wearer. Large black or red leather boots, with round white felt pointed caps, complete the costume, which is much the same for both sexes. ; ,

Like the Kara-Kirghiz, the Kazaks are nominally Sunnites, but Shamanists at heart, worshipping, besides the Kudai or. good divinity, the Shaitan or bad spirit. Their faith is strong in the talchi or soothsayer and other charlatans, who know everything, can do everything, and heal all disorders at pleasure. But they are not fanatics, though holding the abstract doctrine that the ‘‘ Kafir may be lawfully oppressed, including in this category, not only Buddhists and Christians, but even Mohammedans of the Shiah sect. There are no fasts or ablutions, mosques or mollahs, or regular prayers. Although Mussulmans since the beginning of the 16th century, they have scarcely yet found their way to Mecca, their pilgrims visiting instead the more convenient shrines of the ‘‘saints scattered over eastern Turkestan. Unlike the Mongolians, the “Kazaks treat their dead with great respect, and the low steppe hills are often entirely covered with monuments raised above their graves.

Letters are neglected to such an extent that whoever can merely write is regarded as a savant, while he becomes a prodigy of learn- ing if able to read the Koran in the original. Yet the Kazaks are naturally both musical and poetical, and possess a considerable number of national songs, which are usually repeated with variations from mouth to mouth.

The Kazaks still choose their own khans, who, though confirmed by the Russian Government, possess little authority beyond their respective tribes. The real rulers are the elders or umpires and sultans, all appointed by public election. Brigandage and the barantas or raids arising out of tribal feuds, which were formerly recognized institutions, are now severely punished, sometimes even with death. Capital punishment, usually by hanging or strangling, is inflicted for murder and adultery, while three, nine, or twenty- seven times the value of the stolen property is exacted for theft.

The domestic animals, daily pursuits, and industries of the Kazaks differ but slightly from those of the Kara-Kirghiz. Some of the wealthy steppe nomads own as many as 20,000 of the large fat-tailed sheep. Goatsare kept chiefly as guides for these flocks; and the horses, though small, are hardy, swift, light-footed, and capable of covering from 50 to 60 miles at a stretch. The total live-stock was thus estimated in 1872 by Tillo :—camels, 120,000; horses, 1,720,000 ; oxen, 600,000; sheep, 2,000,000; goats, 180,000. Amongst the Kazaks there are a few workers in silver, copper, and iron, the chief arts besides being skin dressing, wool spinning and dyeing, carpet and felt weaving. ‘Trade is confined mainly to an exchange of live stock for woven and other goods from Russia, China, and Turkestan.

Since their subjection to Russia, the Kazaks have become less lawless, but scarcely less nomadic. A change of habit in this respect is opposed alike to their tastes and to the climatic and other outward conditions. Hence the progress of culture can here lead only to the depopulation of the steppe wherever incapable of being irrigated, and to the gradual extinction or absorption of the Kirghiz-Kazaks by their Slav rulers.

Literature.—Alexis Levshin, Description des Hordes et des Steppes des Kirghiz. Kazaks, translated from the Russian by Ferry de Cigny, 1840; Radloff, Proben der Volksliteratur der Tiirkischen Stémme Siidsiberiens: Ch. de Ujfalvy, Le Kohistan, le Ferghanah, et Kouldja ; also Bul. de la Soc. de Géo., 1878-79 ; Semenoff, paper in Petermann's Mittheilungen, 1859, No.3; Valikhanov's Travels in 1858-59 5

Madame de Ujfalvy, papers in Tour du Monde, 1874; Vambéry, Die primtti e Cultur des Turko-Tatarischen Volkes. : ‘ a (AH. kK).

KIRIN, Guirty, or in Chinese Cuwen-Cuang, the chief town of the province of Central Manchuria or Kirin, is situated at the foot of the Lau-Ye-Ling mountains, at tlie edge of a wide and well-wooded plain, and on the left bank of the Girin-ula or Sungari, there 300 yards in breadth. The situation is one of exceptional beauty ; but the streets are narrow and irregular. Tobacco is the principal article of trade, the kind grown in the province being greatly prized throughout the Chinese empire under the name of “Manchu leaf.” Formerly ginseng was also an important staple, but the supply from this quarter of the country has been exhausted. Outside of the town lies a plain “thickly covered with open coffins containing the dead bodies of Chinese emigrants exposed for identification and removal by their friends; if no claim is made during ten years the remains are buried on the spot.” Kirin was chosen by the emperor Kanghi as a military post during the wars with the Eleuts; and it owes its Chinese name of Chwen-chang, ¢.¢., Naval Yard, to his building there the

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vessels for the transport of his troops. The population was estimated at 300,000 in 1812; at present it is about

120,000.

See Palladius, ‘‘ Expedition through Manchuria,” in Journ. Roy. Geog. Soc., 1872; Williamson, Journeys in North China.

KIRKCALDY, a royal and parliamentary burgh and seaport on the south-east coast of Fifeshire, Scotland, 12 miles north from Edinburgh. The chief topographical feature of the town is its length, which is nearly 4 miles within the municipal boundary, as extended by Act of Parliament in 1876. Formerly there was little besides one main street with lanes and shorter streets branching from it, but during the last five-and-twenty years a large number of new streets and villas have been built along the high ground to the north. The parish, however, is a very small one, the landward part (now Abbotshall) having been disjoined in 1650. In population and most other statistical respects Kirkcaldy is the principal town in the county, and the tenth in Scotland, ranking next after Perth and Kilmarnock. The valuation of the burgh in 188], includ- ing railways, was £87,622, and the census of the same year showed a population of 23,632. Besides some importations of flax, timber, whiting, &c., the chief regular trade of the port is that carried on by means of coasting vessels with Leith, Glasgow, and London. The annual harbour revenue is about £2000, and that of the custom- house £52,000.

The linen manufacture, begun in the early part of the 18th century, has long been the staple industry, the town being one of the chief centres of the trade in Scotland. The spinning of flax by machinery was introduced into the district in 1792, and in 1807 steam was added as a motive power. At present there are six mills with 18,830 spindles, employing when in full operation about 1450 persons. There is also an extensive net factory. Twelve power-loom factories, with an aggregate of 2100 looms, broad and narrow, employ fully that number of operatives. In these, as in the spinning mills, a large proportion of the workers, about 80 per cent., are females. Hand-loom weaving has almost entirely disappeared. The principal fabrics manufactured are sheetings, ticks, hollands, towel- lings, diapers, dowlas, &c. ; and one or two firms are now making cotton goods to some extent. There are three bleachfields, with 180 workpeople. Next in importance to the various branches of the linen manufacture are the floor-cloth works. First introduced by the late Mr Michael Nairn, the production of floor-cloth at Kirkcaldy has for some years been the largest in the world. There are six factories employing about 930 workpeople. The linoleum

manufacture has also been successfully established. In 1877 the Messrs Nairn built the first factory in Scotland for this branch of industry, and its success has resulted in the formation of other two companies. The three firms employ an aggregate of nearly 450 hands. A large amount of machinery, including steam-engines, boilers, sugar-mills, rice-mills, and the like, is also manufactured in Kirkcaldy. There are eight works in operation, several of them exteusive, and about 800 men and lads are employed. Among miscellaneous works may be noted two potteries (one of them including a tile-work with 400 operatives), malting barns, flour-mills, several dye-works, a brewery, and a large printing and lithographic business.

The educational, ecclesiastical, and literary institutions of Kirkcaldy are numerous. There are seven public schools, with 3490 children on the roll, and nearly as many private and ladies' schools, with about 350 in attendance. In addition there are three schools belonging to Philp's trust, at which 500 children receive gratuitous education and clothing ; the revenue of the trust for the purposes of these three schools was £2115 in 1880. There are

twenty-six churches,— the finest architecturally being St Brycedale Free church. The town has two public libraries, one of them with nearly 10,000 volumes; and there are three weekly newspapers.

For much of its recent prosperity Kirkcaldy is indebted to the water scheme, for which an Act was obtained in 1867, and an Amendment Act in 1870. The sum author- ized to be expended by these bills was £53,000, but an Extension Act was passed in 1881 giving power to raise £40,000 additional when required. An extensive system of drainage is also in process. A sheriff-substitute has recently been appointed for the Kirkcaldy district.

Kirkcaldy, with Dysart, Kinghorn, and Burntisland, returns one member to parliament. ;

An Ecclesia de Kirkcaldie is mentioned in the list printed by Sibbald of the churches in the county of Fife in the year 1176. In 1240 it was bestowed by David, bishop of St Andrews, on the abbey of Dunfermline. The name of Kirkcaldy also occurs in the map of the civil divisions of Scotland in the 13th century prefixed to Pro- fessor Cosmo Innes's Scotland in the Middle Ages. In 1334 the town, with its harbour, was given by David II. to the abbey of Dunfermline, and in 1450 it was ''disponed" by Richard, abbot of Dunfermline, to the bailies and council of Kirkcaldy.

The commerce of the place has suffered many fluctuations. In 1578, as we learn from the Register of the Privy Council, the district of Kirkcaldy had the largest manufacture of salt in Scotland, and about 1650 it was assessed as the sixth town inthe kingdom. About 1644 there were one hundred ships belonging to the port, in 1760 only three, in 1792 the number had risen to twenty-nine, and in 1843 to ninety-one. Since then, chiefly owing to the abandonment of the whale-fishing, and the insufficiency of the harbour to admit large vessels, the trade of the port has considerably declined. The number of vessels belonging to it may be stated at twenty-seven. A considerable extension of the present harbour is among the possi- bilities of the future.

Adain Smith, whose great work The Wealth of Nations formed an erain the history of political economy ; James Oswald of Dunnikier, a schoolfellow of Adam Smith, and a statesman of much promise ; George Gillespie, a leading member of the Westminster Assembly ; and Balnaves of Halhill, a lord of session in the time of Queen Mary, were natives of Kirkcaldy. Michael Scot, of wizard fame, was born about a mile from the burgh boundary. (Ts Fis)

KIRKCUDBRIGHT, a maritime county of Scotland, known as the "Stewartry of Kirkcudbright," and also as East Galloway, is situated between 54° 43' and 55° 19' N. lat., and between 3° 33' and 4° 34' W. long., and is bounded on the N. and N.W. by Ayr, E. and N.E. by Dumfries, S. by the Solway Firth and the Irish Sea, and W. by Wigtownshire and Wigtown Bay. Its extreme length from north-west to

south-east is about 45 miles, and its breadth varies from 21 to 31 miles. The total area comprises 610,343 acres, or about 954 square miles,

The larger half of the county in the north-west direction consists of a rugged and mountainous table-land, with lofty summits of every variety of aspect, intersected often by deep glens. The scenery of this region is for the most part wild and bleak, its solitary desolation being heightened by the presence of many small lochs and tarns, but almost totally unrelieved by a single tree or shrub, although the peat deposits give evidence that the district was at one tinie covered by an extensive forest. The most elevated regions are generally covered with heath, but at the northern boundary there is a range of grassy hills. Many of the mountains have an elevation of over 2000 feet, the highest summits being Mearroch (2762 feet) in the parish of Minnigaff, and Corserine (2668), Carlin's Cairn (2650), and Cairnsmure in Carsphairn (2612)—all in the parish of Carsphairn. The south-eastern half of the county is for the most part level but undulating, its uniformity being broken by frequent rocky knolls or small rounded hills, and in the south-eastern corner rising into several elevated summits, the highest of which is Criffel, 1867 feet. The greater part of this district is finely wooded, and abounds In picturesque scenery, especially towards the sea-coast and in the neighbourhood of the rivers aud numerous lochs,

The southern coast is usually bold and rocky, and is much indented by the estuaries of various rivers, which form a number of natural harbours. Owing to the shallowness of the sea-bed, large stretches of sand are ex- posed in the Solway Firth at ebbtide, and the rapid flow of the tide has often occasioned loss of life to the unwary.

Geology.—Geologically Kirkcudbright forms part of the Silurian belt of the south of Scotland, but this formation is interrupted in the county by several upheavals of granite, one in the north-west south of Loch Doon, another near the centre immediately west of Loch Ken, and a third round Criffel on the shores of the Solway Firth. The lofty table-land is supposed to have been at one time the seat of an immense ice-bed (see paper by W. Jolly, in Trans. Edin. Geol. Soc., 1868), whose

action has doubtless in part created the isolated round-backed ridges of granite in the valley of the Urr, the finest example in Scotland of the Jtoches moutonnées, which con- stitute a peculiar feature in alpine scenery (A. Somervail in Zrans. Edin. Geol. Soc., 1879). A more striking result of the glacial action was the dispersion of Kirkcud- brightshire granite to Cumberland, to North Wales, and even so far south as the neighbourhood of Wolverhampton (D. Mackintosh in Quart. Journ. Geol. Soc., 1879). The Silurian strata are for the most part of a slaty character, but in some places are composed of a species of red sand- stone. Especially in the neighbourhood of the granite the strata are very much contorted, and give evidence of having at one time been subjected to the action of immense heat. The granite is principally of a pale grey resembling that of Aberdeen, but a red variety also occurs. The principal quarries are at Dalbeattie and Creetown. Strata of lead are believed to stretch between Minnigaff and the Leadhills in Dumfriesshire, but the metal is very little worked. Iron ore exists in different parts of the county, but from the absence of coal is almost wholly unutilized. Copper and barytes are also found, especially in the parish of Urr. Marl is obtained in large quantities from a num- ber of the lochs.

Rivers.—The Nith, which rises in Ayrshire and flows through Dumfriesshire, forms for about 12 miles the boundary between Dumfries and Kirkcudbright, an equal distance of boundary to the north-west being formed by its tributary the Cluden water. The Urr, which rises in Loch Urr on the borders of Dumfriesshire, flows south-eastward by Dalbeattie to the Solway Firth, where it forms a small bay. The Ken rises in Dumfriesshire, and after being joined from the west by the Deugh water flows south-east into Loch Ken, the stream that issues from the loch taking the name of the Dee, and after a beautiful course south- westwards falling into the Solway Firth. The Fleet, which rises in Loch Fleet, after a course of about 7 miles, falls into Wigtown Bay, where it forms an estuary. The Cree, which has its origin in two streams in Ayrshire, and forms the boundary of Kirkcudbright with Ayrshire and after- wards with Wigtownshire, flows south-east by Minnigaff and Newton Stewart, and falls into Wigtown Bay at Creetown.

Agriculture.—A considerable proportion of the land in the higher regions of Kirkcudbright is unsuitable for tillage, and yiclds a very small return as pasturage. In many cases also the soil is very marshy. In the lower regions it is generally dry but rocky. Much has been done of late years to increase the value of the laud by draining the swamps, by the removal of stones, and by deepening the soil and enriching it with manures. Generally the climate and soil are not adapted for the rearing of grain, but are specially suited for grass and green crops.

According to the agricultural returns for 1881 the area under crops was 179,237 acres, or 29 per cent. of the whole area. The area under corn crops was 32,349 acres ; under green crops, 18,091; under rotation grasses, 71,091; under permanent pasture, 57,471 acres. The area under woods was 19,741 acres. The system of cropping is generally as follows :—first year, in-breaking up from

pasture, barley or more generally oats; second year, green crop ; third year, wheat, oats, or barley ; fourth year, hay or pasture, which is generally continued for three additional years. It is now be- coming a very common practice to sow out in grass after turnips without taking a corn erop, the soil being also frequently allowed the advantage of the manure of the sheep which have eaten the turnips on the ground. Of corn nearly the whole area Is under oats, which in 1881 occupied 31,061 aeres, while only 933 were under barley and bere, and 146 under wheat. Of green crops the area under turnips and swedes in 1881 was 14,596 acres, under potatoes 2847, mangolds 91, carrots 38, cabbage, kohl-rabi, and rape 402, and vetches 117.

The total number of horses in 1881 was 5895. Of these 3789 are stated to be used solely for agricultural purposes, and 1606 to be unbroken horses and mares kept solely for breeding. The breeding of Clydesdale horses has of late years been increasing. Cattle in 1881 numbered 40,737. The Ayrshire breed of cattle was intro- duced into Galloway about the beginning of the century, and has risen rapidly in favour,

being now the principal stock in West Galloway. Polled or Galloway cattle is a common breed in East

From 100 to 800 Acres.

From 50 to 100 Acres.

50 Acres and under.

From 300 to 500 Acres.

KTRERCUDBRAGHT

Galloway, especially on inferior farms, and is still preferred for dairy purposes on many low country farms. The number of cows in 1881 was 12,071, of other cattle above two years of age 14,002, and of cattle under two years of age 14,664. The number of cattle to every 100 acres under cultivation was 22°8, the average for Scot- land being 28. Within recent years the increase in the nuniber of cows has been very great, cheese-making, in which much progress has been made, now occupying the chief attention of the farmer. Cattle feeding is also largely practised, and for this purpose large quantities of lean cattle are imported from Ireland. Sheep in 1881 numbered 362,289, an average of 202°1 to every 100 acres under cultivation, the average for Scotland being 141°3. Blackfaced sheep are the most common on the high grounds, and even on the lower arts the Cheviot breed is decreasing owing to the low price of wool. n some districts crosses of a Leicester tup with a blackfaced or Cheviot ewe are common. Pigs, which are kept principally on dairy farms, are generally fed on whey and Indian corn. In 1881 they numbered 5667. The following table gives a classification of holdings according to size in 1875 and 1880 :—

From 500 to 1000 Acres.

Above 1000 Acres. Total.

| RR | RT

Acres. Acres. Acres,

mi ff |

11,377 11,458

19,874 19,481

75,218 82,601

In 1872-73 the land was divided among 23886 proprietors, and amounted to 571,950 acres, with a gross annual value of £360,960. Of the owners 1908, or 79 per cent., possessed less than 1 acre, and the average value was 12s. 8d. per acre. There were three pro- prietors who possessed upwards of 40,000 acres, viz., the earl of Galloway, 55,981; H. G. Murray Stewart, 45,367; and William Forbes, 40,445. Other eight possesscd upwards of 10,000 acres.

Manufactures.—The principa] ports are Kirkcudbright, Creetown, and Gatehouse. Linen, woollen, and cotton goods are manufactured in the towns and villages, and there are also breweries, distilleries, tanneries, and papcr-mills. Shipbuilding is carried on to a small extent at Kirkcudbright. Lead is obtained at Woodhead and Minni- gaff ; there are extensive granite works at Dalbeattie and Creetown; and at Dalbeattie there are brick and tile works. Deep-sea fishing is prosecuted in the Solway, and salmon fisheries at the mouths of the rivers.

Railways.—A line trom Dumfries to Castle Douglas is continued by Gatehouse and Creetown to Newton Stewart, and a branch line runs south from Castle Douglas to Kirkcudbright.

Administration.—The county includes twenty-eight parishes. Quarter sessious are held on the first Tuesday of March, May, and August, and the last Tuesday of October; and justice of peace small debt courts are held at Kirkcudbright, New Galloway, Castle Douglas, Maxwelltown, Gatehouse of Flect, and Creebridge. The county forms a portion of the sheriffdom of Dumfries and Galloway. A sheriff court is held twice a week. A sheriff circuit small debt court is held at Castle Douglas, Maxwelltown, New Galloway, aud Creetown, and a small debt conrt for the whole stewartry at Kirk- cudbright. The county returns one member to parliament, and the burgh of Kirkcudbright unites with Annan, Dumfrics, and Lochmaben in returning another, New Galloway uniting with Wigtown, Stranraer, and Whithorn in returning a third, while Max- welltown, a portion of which is in the county, forms part of the burgh of Dumfries.

Population.—From 29,211 in 1801 the population gradually in- creased till it was 43,121 in 1851. Since then it decreased in 1861 to 42,495 and in 1871 to 41,859, but in 1881 it was 42,126, of whom 19,796 were males and 22,330 females. None of the towns exceed 3000 in population. Kirkcudbright, a royal and parliamentary burgh, has a population of 2571. New Galloway, Maxwelltown, Castle Douglas, Dalbeattie, and Gatehouse are police burghs. The principal

villages are Auchencairn, Creetown, Crossmichacl Dalry, Haugh of Urr, Kirkpatrick-Durham, and New Abbey. ‘

History and Antiquities. —Aneiently Kirkeudbrightshire formed part of the kingdom of Strathclyde, being occupied partly by the Novante, who held the whole of Galloway westward from the Dee and partly by the Selgove, whose territory stretched eastward from the Dee to Northumbria. One of the towns of the Selgove, Car- bantorigum, in all probability occupied the site of the stronghold called the Moat of Urr. In 79 B.c. Agricola landed on the shores of the Solway Firth and overrau Strathelyde, but the district was not completely subjugated by the Romans till the building of the wall of Severus in 208. Many traces of Roman camps are still to be seen and a very perfect one exists at Pulcree in the parish of Anwoth. Some suppose that the important indications of human occupation in the caves on the coast were due to the fact that some of the inhabitants betook themselves to these during the Roman occupa- tion (see ‘‘ Accounts of the Exploration of the Borness Cave” in Proc. Soc. Antig. Scot., 1874, 1875, 1877). The Pictish tribe which,

Acres. Acres. Acres,

43,049 18,453 169,985 45,699 15,844 177,105

according to Bede, inhabited Galloway in 608, is supposed by Skene to have been the original Novantx#,—a tribe, he thinks, of Gaedel or Gaelic Ficlits who retained their independence because of the isolated position of the country. In the 7th century the region was invaded by the Angles, but their rule over it ceased about the end of the 8th century. In 740 Alpin, king of the Scots of Dalraida, was slain in battle, probably near the site of the pre- sent town of Kirkcudbright. The name Galloway, by which the country occupied by Kirkcudbright and Wigtownshire is now known, seems first to have been applied to it while it formed part of the Anglian kingdom of Northumbria, the word Galwetha being formed from Galwyddel the Welsh equivalent of Gallgaidhel, the word meaning the Gaels under the dominion of foreigners. Of thie ancient inhabitants of Galloway there are in Kirkcudbrightshire a large number of relics. In several of the lochs

crannogs or lake dwellings as well as canoes and a variety of implements and other remains have been found. Drnidical circles are very common, and among the numcrous cairns may be mentioned that of Drumlawhinnie on the moor of Barclay in Minnigaff parish, which is 891 feet in circumference. Of the Pictish kilns there are several specimens in tlle parish of Minnigaff and in other places. The most notable old forts are a very ancient one on a sea-cliff near Borgue, an old Pictish tower at Rattra in the same parish, a circular fort with vitrified walls at Castle Gower, parish of Buittle, and others on the hill of Halfarne, Crossmichael, the hill of Dunguile, Kelton, and on Ben-arty hill. An old wall known as the Devil's dyke, supposed to have been built previous to the Roman invasion, passed through Galloway from Lochryan into Dumfriesshire. In the 9th century the district was invaded by the Danes, and so much harassed that many of the inhabitants emigrated to Walcs. In the following century Galloway along with Strathclyde was subdued by Edmund and brought under the rule of Malcolm I. of Scotland. Some time in the 11th century it was subdued by the Danes and the Norwegians, but in the beginning of the 12th century they were overpowered by a Celtic chief Fergus, who founded a line of lords of Galloway, some of whom asserted their independence of the Scotch crown. The line became extinct in the male branch in 1234, after which Galloway was for some time under the rule of Edward I. of England. The lordship in the female line became divided between two families, one of whose representatives, John Baliol, laid claim to the crown of Scotland, but in 1308 the district was freed of the English and brought under allegiance to Robert Bruce, after which the lordship of Galloway was conferred upon Edward Bruce. Later in the 14th century Galloway again espoused the pretensions of the Baliols to the throne of Scotland, but the district was finally completely sub- jugated in 1353 by Sir William Douglas, whose descendant Archibald received from the crown in 1871-72 the lordship of Galloway. After the forfeiture of the estates of the Baliols, Kirkcudbright was placed undcr the immediate rule of the crown, and was governed by the royal steward, whence it has still the name of the ‘‘ stewartry,” but it appears that the stewardship was afterwards transferred to the Douglases, and was not restored to the crown until the for- feiture of their estates in 1455.

The principal old castles are Threave Castle on the Dee, the seat of the Douglases, for the reduction of which during the siege of 1455 it is said that the famous cannon Mons Meg was manufactured ; Cardross Castle, on the west side of the Fleet; and the castle of Kirkendbright, which belonged to the lords of Galloway, and was frequently the residence of royalty.

The principal monastic buildings were the Cistercian abbey of Dundrennan, founded in 1142; Tongland Abbey, founded by the Prenionstratensians under the auspices of Fergus in the reign of David I.; the priory of St Mary's Isle, founded also by Fergus, and subsequently united as a dependent cell to the abbey of Holyrood ; the New Abbey founded for Cistercian monks in 1275; the priory of Lincluden, founded by Uchtred, lord of Galloway, for Benedictine nuns ; a convent for Franciscans or Greyfriars, founded at Kirkcud- bright in the reign of Alexander II. ; and a nunnery in the parish of Kirkcudbright.

See Symson, 4 Large Description of Galloway, 1684, new ed. 1828; Murray, Literary History of Galloway, 1822; and the His- tories of Galloway by Mackenzie, 1841, and Mackerlie, 1870-78.

KIRKI, or Krrxzx, a town and military cantonment in Poona district, Bombay, India, 18° 33' N. lat., 73° 54' E. long. The town, with its adjoining suburbs and the mili- tary cantonments, contains a total population of upwards of 31,000 inhabitants.

KIRKINTILLOCH, a burgh of barony and market- town of Dumbartonshire, Scotland, about 7 miles north of Glasgow. The town is rather irregularly built. The cruciform parish church dates from 1644. The Broomhill honse for incurables is situated near the town. 'Traces of the wall of Antoninus are to be discerned behind the church. The inhabitants are chiefly employed in the chemical and iron-works on the banks of the Forth and Clyde Canal, and in coal-mining, which is being rapidly developed in the district. Weaving to a small extent is also carried on. Kirkintilloch became a burgh of barony by grant of

William the Lion. Since 18¥1 it has been under the General Police Act of 1862. The popula- tion in 1881 was 10,582.

KIRK-KILISSIA, or Kirx-Kinisseu, a town in the vilayet of Adrianople, Turkey, is situated on a feeder of

the Erkene, which is an affluent of the Maritza, about 35 miles east of Adrianople. It has its chief importance from its position at the southern outlet of the Fakhi defile over the Strandja mountains, through which passes the shortest road from Shumla to Constantinople. It contains six inosques, several Greek churches, and a large bazaar. A special kind of confection is made at Kirk-Kilissia ; and a considerable quantity of butter and clieese is sent thence to Constantinople. The population is estimated at about

16,000.

KIRKWALL, a royal and parliamentary burgh of Scotland, and the chief town of the Orkney Islands, is situated uear the centre of the island group, at the south- east corner of a well-sheltered bay on the east side of the island of Pomona, 240 miles north of Edinburgh by steamer, 58 north of Wick, and 54 north of Thurso. It consists principally of an irregular street about a mile in length running along the margin of the bay, and so narrow that carts and similar vehicles in many places cannot pass each other. The houses are generally substantially built, with the gables facing the street nearly as frequently as the fronts. In courts leading from the main street there are many ancient buildings, formerly occupied during winter by the leading families of the islands. The more modern portion of the town is built with great regularity, and in the suburbs there are several good villas surrounded by gardens. The most prominent feature of the town is the cathedral, dedicated to St Magnus, the patron saint of Orkney, a stately cruciform structure with a length of 226 feet from east to west and a breadth of 56 feet. It was founded by Earl Ronald in 1137, and the older portion, embracing the greater part of the present building, is in the Norman style of architecture. The choir was lengthened by Bishop Stewart in 1511, and the western extremity of the nave was completed by Bishop Reid, who succeeded to the bishopric in 1540. The building

has undergone ex- tensive repairs during the present century. The choir is used as the parish church. The bells were presented by

Bishop Maxwell, the predecessor of Bishop Reid, but the larger or tenor bell was recast in 1862. The cathedral contains a number of old monuments. Adjoining it are the ruins of the bishop's palace, where King Haco died in 1263, and also the earl's palace, which after the forfeiture of the earl of Orkney was given to the bishops for their residence. . There isa grammar school, which was endowed by Bishop Reid, and also several charitable institutions. The town has no manufactures of importance, and its pro- sperity depends chiefly on its being the capital and principal port of the islands. It is often touched by ships passing to Norway and the Baltic. The harbour is amply sufficieut for the shipping of the port, and a fine iron pier was erected in 1867. 'There is regular steam communication with Ler- wick, and with Leith by Aberdeen and Wick. Kirkwall (a name derived from kirk, church, and vdgr or vaag, bay), was a place of some size when the islands were in the pos- session of the Norsemen, and by James III. it was created a royal burgh. It unites with the other burghs in the Wick district in returning a member to parliament, The popula- tion of the parliamentary burgh in 1881 was 3923. KIRMAN, the ancient Karmania, a province of south Persia, bounded on the E. by Sist4n and Baltchistdn, on the W. by Farsistan, N. by Khérdsdin, on the S. by Laristan, Makran, and the Strait of Ormuz. It is of very irregular shape, expanding in the north towards Khorasan, and gradually contracting in the south to the narrow coast district of Mogistan; the extreme length between Sistan and Fars east and west is 400 miles; the greatest breadth from south of Yezd to the coast at Bandar-Abbas is 300 miles ; and the total area is estimated at 55,000 to 60,000 square miles. It is generally described as consisting of two parts, an uninhabitable desert region in the north, and a habitable mountainous region in the south. But the recent explorations of Khanikoff, Goldsmid, Lovett, St John, and others require this view to be considerably modified. There are mountains and desert tracts in all parts, while much of what appears on the maps as forming the western portion of the great Kirman desert

consists of the fertile upland plateau of the Kuh-Banan, stretching along the eastern base of the lofty range which runs from Yezd south-east to Khabis. West of and parallel to this range are two others, one culminating north of Bam in the Kuh-Hazar, 14,550 feet, the other continued at about the same elevation under the name of the Jamal Baris south- eastwards to the Kohistaén highlands on the Makran frontier. These chains traverse the fertile Nurmanshahr district, dividing it into several longitudinal valleys of considerable length, but not averaging more than 12 miles in width. Snow lies on their slopes to a great depth for the better part of the year, feeding the springs and "karez " or underground irrigation rills, by means of which large tracts in this almost rainless region in summer are kept under cultivation. Still further west the Kuh- Dinar range is continued from Farsistén also in a south- easterly direction to the valley of the Mindb, which is the only river worthy of the name in the whole province. Between the south-western highlands and the Jamal Baris there is much arid and unproductive land. But the true desert of Kirmdn lies mainly in the north and north- east, where it merges northwards in the desert of Lut,! which stretches far into Khérdsan. These southern deserts differ from the Great Kavir, or Salt Desert of North Khorasan, mainly in three respects :—they are far less saline, are more sandy and drier, and present in some places tracts of from 80 to 100 miles almost absolutely destitute of vegetation. Yet they are crossed by a well-known track

1 The term Jut means simply arid, waterless, and has nothing to do with the Lot of Holy Writ, as some have supposed.

running from Kirman north-eastwards to Herat, which is traversed by couriers at great risk in about eighteen days. It appears from recent observation that these sandy wastes are continually encroaching on the fertile districts, and this is the case even in Nurmanshahr, which is being invaded by the sands of the desolate plains stretching thence westwards to Bam, 'There are also some "kafeh" or salt swamps, answering to the kavir of Khérdsdn, but occurring only in isolated depressions, and nowhere of any great extent, The desert of Kirm4n

lies about 500 or 600 feet above the sea, apparently on nearly the same level as the desert of Lut, from which it cannot be geographically separated. ;

The climate, which varies much with the relief of the land, has the reputation of being the most unhealthy in Persia, the fever-stricken districts of the Caspian alone excepted. The cool air from the snowy ranges 1s usually attended by chills and agues, so that the people on the whole prefer the sultry heat of the plains. Still some of the sheltered upland valleys in Nurmanshahr and elsewhere enjoy a genial-climate like that of Shiraz.

The chief products are cotton, wheat, barley, gums, dates of almost unrivalled flavour from Mogistan, and wool both of sheep and goats (turk) noted for its extreme soft- ness. This wool is used in the manufacture of the Kirman shawls, which yield in delicacy of texture only to those of Kashmir, while often surpassing them in design, colour, and finish. A shawl of the finer quality, 3 yards long, is sold on the spot for from £20 to £24. Spinning and dyeing are also practised, so that the province completes the manufacture of its own raw material. Its carpets and felts are also unsurpassed for richness of texture and durability. Besides these woven goods it exports mainly cotton, grain, and dates, receiving in return from India chintzes, muslins, indigo, tea, gold-cloth, china, glass, sugar; from Turkestan madder, rhubarb, drugs, gums, furs, silks, Bokhara furs, steel, copper, tea. Bandar- Abbas is the natural outport; but, since shipping las shown a preference for Bnshire further north, the trade of Kirman has greatly fallen off.

The inhabitants, numbering altogether about 500,000, cousist of Tajiks in the towns and agricultural districts, some Turki, Rind, and Baluchi nomads in the east and south-east, and numerous Kurd tribes, here called Leks. Shiel gives a list (incomplete) of twenty-one of these Lek tribes, dwelling partly in houses partly in tents, and numbering altogether about 200,000 souls.

The chief towns are Kirman (the capital), Regan, Kruk, Kum, Bam, Khabis, Khanu, and Bandar-Abbas.

KIRMANSHAHAN, or Kermansnan (Arabic, Kar- misin), a town aud district of west Persia, lying between Ardelan and Luristan north and south. The town is the chief place in what is known as Persian Kurdistan, an expression, however, which has no administrative significance. It lies in 34° 18’N, lat. and 46° 37’ E. long., on a rising ground connected with the Zagros hills, which stretch south-eastwards to the Bakhtiari range. Here it occupies an important strategical position near the right bank of the river Kernah, 250 miles south-west of Tehran, 262 north-west of Ispahan, 220 north-east of Baghdad, and 280 south of Tabriz. Although surrounded by fortifications with five gates and 3 miles in circuit, it is now practically an open town, for the walls are in ruins and the moat choked with rubbish. During Muhammad Ali Mirza’s administration it was a very flourishing place, with a population of 35,000 and a large local and transit trade between Baghdad and Tehran. Since then it has suffered more than most towns in Persia from misgovernment, under which its few buildings have gone to decay, its bazaars have become empty, and its trade reduced to a local traffic in the excel-

lent fruits produced in the surrounding gardens and orchards, ‘The rich and beautiful carpets and rugs for which it was formerly noted are no longer to be had, and the population has fallen to about 12,000, exclusive of a garrison of 5000 usually maintwined at this important frontier station.

Kirmanshahan is governed by a royal prince, with jurisdiction over the district, which occupies an extensive tract between Mount Elwend and the Turkish border. Here the plains are well watered and very fertile, whilé the hills are covered with rich pastures which support large flocks of sheep and goats, besides horses of a good breed crossed with Arab blood. About 70,000 sheep are yearly taken to Tehran by the Kurd shepherds, who form the vast majority of the inhabitants of the district, residing some in houses some in tents, and nuinbering altogether about 180,000.

KIRRIEMUIR, a burgh of barony and market-town of Forfarshire, Scotland, is beautifully situated on an eminence, above the glen through which the Gairie flows. It lies about 5 miles north-west of Forfar, and about 62 miles north of Edinburgh. The town, consisting of several narrow diverging streets, is tolerably well built. Its educa- tional advantages are good ; by the Henry bequest a number of boys are maintained at the public school; and by the Webster bequest a school has been endowed and erected. The special industry of the town is linen-weaving, for which large power-loom factories have recently been built. The population in 1881 was 6588.

KIRSANOFF, a town of Russia, in the government of Tamboff, 61 miles east of the government town, near the junction of the Pursavka with the Vorona, with a station on the railway between Saratoff and Kozloff. The popula- tion, which increased from 5699 in 1862 to 7200 in 1872, is mainly engaged in agriculture and trade, the only manv- factures of importance being those of wax and _ tallow. There is a nunnery with nearly one hundred nuns in the town. Kirsanoff owes its origin to the opening of iron- works in 1733. It became a district town in 1779.

KISFALUDY, KArozy or Caries (1788-1830), one of the most genial, prolific, and gifted poets of Hungary, and especially celebrated as the regenerator of the national drama, was born on the 6th of February 1788, at Tét, in the county of Gyér. His birth cost his mother her life, which unfortunate circumstance preyed upon the father’s mind and caused him to view the child with feelings akin to aversion. The austerity of his father and the loss of his mother were, however, in a great measure made amends for to Karoly by the love of his elder sister Teréz, who tended him during his early years with maternal care, and remained devoted to him through his whole life. In 1799 he was sent to the gymnasium at Gyér (Raab), where he made only moderate progress in his studies, whilst the impetuosity of his disposition often involved him in trouble. Placed as a cadet in Duke Eszterhdzy’s regiment in 1804, he saw a good deal of service, rising to the rank of captain. In 1811 he quitted the army with the intention of marrying. Offended at this step, his father withdrew from him all support, and his

affianced bride rejected him upon finding him at variance with his father. His sister, then the wife of Captain Gabor Farkas, offered him an asylum in her home, where he remained during the winter of 1811-12 ; but, unwilling to eat the bread of dependence, Karoly removed to Pest and afterwards to Vienna, where he tried to live by his skill in painting. He at this time began assiduously to study the works of Shakespeare, Schiller, and Lessing, became a frequent visitor at the Vienna theatre, and made the acquaintance of its official poet Theodore Korner, whose drama Zrinyt was written at Kisfaludy's suggestion. Rendered impatient by ill success, he soon left Vienna, and

for over four years wandered, mostly on foot, through Germany, Switzerland, France, and Italy as far as Rome, obtaining as before a precarious livelihood as an artist. At length subdued by misfortune, and longing for his home and a more honourable career, he in 1817 sought by the aid of his sister reconciliation with his father, who, though still hard to be entreated, allowed him a slight pecuniary assistance. Although not without friends at Pest, where he now took up his abode, he continued to support himself by his brush until the spring of 1819. It was on the 3d of May in this year that the successful performance at Pest of his national drama, in five acts, Zhe Tatars in Hungary, placed the name of Karoly Kisfaludy on the roll of literary fame. It was rapidly followed by other dramas, all of which met with popular favour. Not only was he now adniired by his own countrymen, but by means of the German translations of Gaal in the Theater der Magyaren (Briinn, 1820) he soon became known abroad. Freed from pecuniary embarrassment, Karoly Kisfaludy was ulow able to devote his best energies to literature, poetry, and the drama. In 1822 he started an annual under the name of Awrora, which he continued to edit until the year of his death. Although its success was great and his popularity continued to increase, he became ever more and more critical with regard to his own pro- ductions ; and, if his earlier pieces must be regarded rather as the outcome of natural talent than as the result of matured consideration, his later productions bear evidence to the high culture of his mental powers. In recognition of his exceptional literary

merit, he was in 1826 rewarded with the prize of the Marczibényi foundation; about this time also he came into possession of the estate at Tét through the death of his father. Towards the close of

1829 his health began to fail, and, though he rallied for a' time, consumption, accelerated by the news of his sister's :

death, brought his career to a close on the 21st November 1830, at the early age of forty-two, while his friends were rejoicing at the tidings of his election as a member of the Hungarian academy of sciences. The first edition of his collected works was published by Toldy in 10 vols. (Buda, 1831). To the Kisfaludy Kdroly élete, prefixed to the Pest edition of 1872, we are indebted for many of the foregoing particulars.

KISFALUDY, SAnpor or ALEXANDER (1772-1844), elder brother of Karoly Kisfaludy, whom he excels as a lyric poet though not as a dramatist, was born on the 27th of September 1772 at Siimeg in the county of Zala, Hungary. Choosing the career of a soldier, he entered the army in 1793, and was soon appointed to a lieutenancy in the Hungarian life guards at Vienna. There he employed his spare time in literary pursuits, and especially in the study of Italian poets. Upon the death of his patron Prince Anton Eszterhdézy, Kisfaludy was sent back to Hungary. Soon after this, at a vintage festival in Badacsony, he made the acquaintance of Rozalia Szegedy, whom, not- withstanding a subsequent long estrangement, he eventu- ally married, and who under the name of Liza is the subject of his Himfy. During the Italian campaign of 1796 Kisfaludy was stationed at Milan, and upon the surrender of that city he was sent as a prisoner of war to Vaucluse, where he began to write the series of love sonnets for which he afterwards became so famous, and which were suggested to his mind by the songs of Petrarch. After his release at the peace of Campo Formio (17th October 1797), Kisfaludy was posted as captain in a regiment quartered at Wiirtemberg, and in 1799 he took part in the battles of Stockach, Winterthur, and Ziirich, In 1800 he left the army, and stayed for five years at Kam in the county of Vas, subsequently removing to his native place Siimeg, where he devoted himself to agricultural and literary

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pursuits. By this time Kisfaludy had gained the highest reputation as a lyric poet by his Loves of Himfy, the first part of which, published anonymously at Buda in 1801, was received with such applause as had never before been accorded to any Magyar work. The second part appeared under his own name in 1807. On the “insurrectio,” or general rising of the Hungarian nobles against Napoleon, in 1809, Kisfaludy accepted the post of major of cavalry, and was also nominated by the palatine one of his adjutants. After his return to private life Kisfaludy wrote several dramatic pieces, and from 1820 contributed largely to his brother’s annual Aurora. In 1818 he gained the Marczibanyi prize for his Ballads (2d edition, Buda, 1818), which work was translated into German by Gaal (Vienna, 1820); and in 1831 he was elected member of the Hungarian academy of sciences, in the formation of which he had taken an active part. He died on the 28th of October 1844, at the age of seventy-two. His collective works, in 6 vols., were published at Pest in 1847 by Toldy. Exquisite metrical English renderings of several verses from the Himfy will be found in Sir John Bowring’s Poetry of the Magyars (London, 1830).

See J. Ferenczy, Magyar Irék. Eletrajz-Gyiijtemény, Pest, 1856.

KISH, or Kats (the first form is Persian and the second Arabic), an island in the Persian Gulf, which rose to im- portance in the 12th and 13th centuries, and flourished on the fall of Siraf as a chief station of the Indian trade with the West. Edrisf in the 12th century describes it as the capital of a pirate chief who had acquired great wealtli and power, and ravaged the coasts far and wide. He also drew a tribute from the pearl fisheries of the gulf. In the following century Yakut

describes it from personal observa- tion as a beautiful and flourishing island, the seat of the lord of ‘Oman, sovereign of those seas, and the station for ships trading between India and Farsistén. The lord of Kish was respected even in India for his wealth and mari- time power. According to Ibn el Athir he was at constant war with the sovereign of Hormuz, and the rise of the latter port seems to have been fatal to the importance of Kish (Ibn Batuta, i, 244, and note in Paris edition; Kazwini, ed. Wiistenf., ii, 161). The island is generally identified with the modern Kenn and the Kataia of Arrian. See Vincent, Voyage de Néarque; Ouseley’s Travels, i. 169 sq.

KISHANGARH, or KrisHNaGARH, a native state in Rajputana, India, lying between 26° 17’ and 26° 59’ N. lat., 74° 43’ and 75° 13’ E. long., with an area of about 724 square miles, and an estimated population of 105,000. It was founded in the reign of the emperor Akbar, by a younger son of the raj4 of Jodhpur. In 1818 Kishangarh first came into direct relations with the British Government, by entering into a treaty together with the other Rajput states, having for its object the suppression of the Pindari marauders by whom the country was at that time overrun. The estimated revenue in 1875 was £30,000.

KISHINEFF, the Kishlanow of the Moldavians, a town of Russia, capital of the province of Bessarabia, on the right bank of the Byk, a tributary of the Dniester, situated on the railway between Odessa and Jassy in Roumania, 118 miles north-west from the former. At the beginning of this century it was but a poor village, and in 1812, when it was acquired by Russia from Moldavia, it had but 7000 inhabitants; twenty years later its population numbered 35,000, while in 1862 it had, with suburbs, 92,000 inhabi- tants, and now its population is more than 110,000, composed of the most varied nationalities—Moldavians, Wallachs, Russians, Jews, Bulgarians, Tartars, Germans, and Tsigans. The town consists of two parts—the old or lower town, on the banks of the Byk, and the new or high town, situated on high crags, 450 to 500 feet above the level of

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the river. The wide suburbs are remarkable for their gardens, which occupy about 12,000 acres, and produce great quantities of fruits (especially plums, which are dried aud exported), tobacco, and wine. The buildings of the town are, liowever, very plain, and the streets remain mostly unpaved. Kishineff is the seat of the archbishop of Bessarabia, and has an ecclesiastical seminary with 800 students, a college, and several secondary and primary schools. There are several tallow-melting houses, steam flour-mills, candle and soap works, distilleries, and tobacco factories. The trade is very active and yearly becomes more important, Kishineff being now a centre for the whole Bessarabian trade in grain, wine, tobacco, tallow, wool, and skins, exported to Austria and to Odessa. The fairs, which are held twice a week, are very animated, and their yearly return is estimated at £300,000. The town played an important part in the late war between Russia and Turkey, as the chief centre of the Russian invasion.

KISHM, or Tawtnan (i.e, Long Island), an island at the mouth of the Persian Gulf, separated from the coast of the Persian province of Kirmdén by Clarence Strait, which at its narrowest point has a breadth of less than 2 miles. The island has a length of about 55 miles, its main axis running north-east and south-west ; and the area is estimated at 640 square miles. A range of hills from 300 to 600 feet in height, and with strongly marked escarpments, runs nearly parallel to the southern coast ; they are largely composed, like those of Hormuz and the neighbouring mainland, of rock salt, which is regularly excavated in one or two places, and forms one of the chief products of the islaud, finding its way first to Muscat and thence to India and Africa. The rest of the island consists of sandstones and marls. In its general aspect it is parched and barren-looking, like the south of Persia, but it contains fertile portions which produce grain, dates, grapes, melons, &c. Naphtha springs exist near the village of Saluk on the south coast. Kishm, the largest of the towns, lies at the eastern extremity of the island; Bassidore, the next in importance, at the western extremity; and

Lafit (Luft, Leit) about midway along the northern coast. The town of Leit was reduced bya British fleetin 1809. Politically the island belongs to Persia, but the shah has long farmed it to the sultan of Muscat. The inhabitants are reckoned at 5000 or 6000.

Kishm is the ancient Oaracta, or Uorochtha, a name said to sur- vive in a village called Brokt. The old Arabic word is Barkawan or Bany-Kawan. Mas‘udy (ch. x.), who mentions its capture by ‘Amr ibn el ‘As, says that it also bore the name of Lafit.

See Wellsted’s Travels to the City of the Caliphs, 1840, vol. i. p- 65 sg.; Pelly, in Jowrn. Roy. Geog. Soc., 1864; Sprenger, Alte Geog. Arabiens, p. 119 sq.; and Ouseley’s Travels, i. 162.

KISSINGEN, the chief town of a department in the government district of Lower Franconia and Aschaffenburg, Bavaria, is situated on the Franconian Saale, 656 feet above sea-level, and about 62 miles east of Frankfort-on- the-Main. Its streets are regular, and its houses attractive. A stone bridge spans the Saale at the town. It has a local court, a commercial school, a theatre, and various benevolent institutions, besides all the usual buildings for the lodging, cure, and amusement of the 10,000 annual visitors who are attracted to this, the most popular watering-place in Bavaria. In the Kurgarten, a tree-shaded expanse between the Kurhaus and the handsome colonnaded Conversations-Saal, are the three principal springs, Rakoczi, Pandur, and Maxbrunnen, of which the first two, strongly impregnated with iron and salt, have a temperature of 51°26 Fahr.; and the last (50°-72), is like Selters or Seltzer water. At short distances from the town are the intermittent artesian spring Soolensprudel, the Schoubirn- sprudel, and the Theresienquelle ; and in the same valley as Kissingen are the minor spas of Bocklet and Briickenau.

The waters of Kissingen are prescribed for both internal and external use in a great variety of diseases, such as chronic catarrh, rheumatism, scrofula, affections of the bowels, of the lungs, and also of the eyes and ears. They are all highly charged with salt, and productive

Government salt- works were at one time stationed near Kissingen. The

‘manufactures of the town, chiefly carriages and furniture,

are upimportaut. The population in 1875 was 3471.

The salt springs were known in the 9th century, and their medi- cinal properties were recognized in the 16th, but it was only within the first half of the 19th century that Kissingen became a popular resort. On July 10, 1866, the Prussians defeated the Bavarians with great slaughter near Kissingen. The town was the scene of the attempted assassination of Prince Bismarck by Kullman, July

138, 1874.

KISTNA, or KrisHna, a district in the Madras Presi- dency, India, lying between 15° 35’ and 17° 10’N, lat., and between 79° 14’ and 81° 34’ E, long., and bounded on the N. by Godavari, on the E. by the Bay of Berigal, on the S. by Nellore, and on the W. by the Nizim’s Dominions and Karnul. Kistna is, speaking generally, a flat country, but the interior is broken by a few low hills, the highest being 1857 feet above sea-level. The principal rivers are the Kistna, which cuts the district into two portions known as the Masulipatam and Ganttr divisions, and the Munyeru, Paleru, and Naguleru (tributaries of the Gundlakamma and the Kistna) ; the last only is navigable. The Kolar Lake, which covers an area of 21 by 14 miles, and the Romparu swamp are natural receptacles for the drainage on the north and south sides of the Kistna respectively. Iron and copper exist, and at one time the mines were worked ; but the smelting of copper is now a thing of the past, and that of iron is also dying out. Diamond mines are still worked, to a very slight extent, in five villages belonging to the niz4m; and at other places there are traces of mines which were abandoned long ago. Garnets and small rubies are also found. There are no forests in the district. Every variety of the game birds of India, except the pheasant, woodcock, and hill partridge, abounds. The most deadly of poisonous snakes, the Russell viper, is com- mon about Masulipatam.

The cobra, carpet snake, and one kind of bangaras (Arcuatus) are also met with.

The census of 1871 returned the population of Kistna district at 1,452,374 (1,373,089 Hindus, 78,937 Mohammedans, 90 Europeans, 218 Eurasians, and 36 “ others”). Asa whole the people are poor, except in the fertile Godavari delta. The cultivated area, exclu- sive of zaminddri estates, in 1875-76, was returned at 1,907,213 acres, cultivable but not under tillage 981,377 acres, and waste 1,215,858 acres. The principal agricultural products are rice, maize, ragt, pulses, hemp, flax, cotton, tobacco, gingelly, oil-seeds, chilies, wheat, garlic, indigo. The delta is irrigated by the Kistna river, which in 1875 watered 218,029 acres. A considerable trade is carried on in dressed hides at Bezwara. The inland villages carry on weaving from native hand-made cotton or silk thread. The chief exports are cotton and indigo. The total revenue in 1870-71 amounted to £548,469, of which £359,172 was derived from the land. The number of cultivators’ holdings in 1871 was 187,880, owned by 169,036 proprietors or coparcencrs,

The early history of Kistna is inseparable from that of the northern Circars and Godavari district. Dhardnikoté and the adjacent town of Amaravati were the seats of early Hindu and Buddhist Governments; and the more modern Rajamahcndri (Rajahmundry) owed its importance to later dynasties. The Chalukyas here gave place to the Ganapatis, who in turn were ousted by the Reddi chiefs, who flourished during the 14th century, and built the forts of Bellamkonda, Kondavir, and Kondapalli. On the death of one of these, at the commencement of the 15th cen- tury, Deva Rayalu, of the Vijayanagar dynasty, scized the country and held it until Mohammed II. (1468-86), a Moslem king of the Bahmani line, wrested this portion of his kingdom from him. The power of the Bahmani dynasty failed towards the end of the 15th century. Kuli Kutab Shah became king of Golconda about 1512 A.D., and his kingdom included the whole of what is now the Masulipatam portion of Kistna district. On the other side of the Kistna, Narasinha Deva Rayalu ruled at this time. His territory, which

included Gantur, was annexed to Golconda by Kutab Shah's great-grandson, about 1600. This line of kings ended with Tanisha,

who was dethroned by Aurangzeb in 1687. Meantime the English had, in 1622, established a small factory at Masulipatam, where they traded with varying fortune till 1750, when the French took possession of it. From 1759, when it was recaptured by Colonel Forde, with a force sent by Lord Clive from Calcutta, the power of the English in the greater part of the district was complete. In 1765 the entire administration was assumed by the Company;

but the absolute right of sovereignty was not obtained until.

1823.

KISTNA, or Krisuna, a large river of southern India, stretching almost across the entire peninsula from west to east. It rises near the Bombay sanatarium of Mahabalesh- war in the Western Ghats, only about 40 miles from the Arabian Sea. Its source is held sacred, and is frequented by pilgrims in large numbers. From Mahdbaleshwar the Kistna runs southwards in a rapid course into the Nizam's Dominions, then turns to the east, and ultimately falls into the sea by two principal mouths. Along this part of the coast runs an extensive strip of land, which has been en- tirely formed by the detritus washed down by the Kistna and Godavari. The river chanuel is throughout too rocky aud the stream too rapid to allow even of small native craft. In utility for irrigation the Kistna is also inferior to its two sister streams, the Godavari and Kaveri (Cauvery). By far the greatest of its irrigation works is the Bezwara anicut, commenced in 1852. Bezwdra is a small town at the entrance of the gorge by which the Kistna bursts through the Eastern Ghats, and immediately spreads over the alluvial plain. The channel there is 1300 yards wide. During the dry season the depth of water is barely 6 feet, but sometimes it rises to as much as 36 feet, the maximum flood discharge being calculated at 1,188,000 cubic feet per second. Of the two main canals connected with the dam, that on the left bank breaks into two branches, the one running 39 miles to Ellore,

the other 49 miles to Masulipatam. The canal on the right bank proceeds nearly parallel to the river, and also sends off two prin- cipal branches, to Nizimpatam and Comamur. The total length of the main channel is 254 miles, and the total irrigated area 226,000 acres, yielding a revenue of £89,000.

KIT-CAT-CLUB, a convivial association of Whig wits, painters, politicians, and men of letters, founded in the reign of James II. The name, according to Defoe, was derived from the keeper of the house in which the club met, Christopher Catt, a pastry cook in Shire Lane, which now no longer exists, but formerly ran parallel with Chancery Lane near Temple Bar. The pies of Christopher were the principal dish of the club, and the Spectator (No. 9) derives the name, not from the maker of the pies, but from the pies themselves, which were of a species generally known as " kit-cats." According to another authority, the meeting place of the club was at the sign of the Cat and Fiddle in Gray's Inn Lane, kept by a person of the name of Christopher. The locale of the club was afterwards changed to the Fountain tavern in the Strand, and latterly to a room specially built for the purpose at Barn Elms, the residence of the secretary, Jacob Tonson. In summer the club met at the Upper Flask, Hampstead Heath. The club consisted of thirty-nine noblemen and gentlemen, and included among other distinguished men the duke of Marl- borough, Lords Halifax and Somers, Sir Robert Walpole, Vanbrugh, Congreve, Steele, and Addison. The portraits of many of the members were painted by Sir Godfrey Kneller, himself also a member, of a uniform size, less than half length, which is known as the kit-cat size. The club was dissolved about 1720.

KITE,! Anglo-Saxon Cyta, the Falco milvus of Linneus and Milvus ictinus of modern ornithologists, once perhaps the most familiar bird-of-prey in Great Britain, and now one of the rarest. Three or four hundred years ago

1 Glede, cognate with glide, is also another English name.

foreigners were struck with its abundance in the streets of London, and the evidence of two of them, one being the eminent naturalist Belon, has been already given (Birps, vol. iii. p. 736, note). It was doubtless the scavenger in ordinary of that and other large towns (as a kindred species now is in Eastern lands), except where its place was taken by the Raven; for Sir Thomas Browne (circa 1662) wrote of the latter at Norwich—‘“‘in good plentie about the citty which makes so few Kites to be seen hereabout.” Wolley has well remarked of the modern Londoners that few “ who see the paper toys hovering over the parks in fine days of summer, have any idea that the bird from which they derive their name used to float all day in hot weather high over the heads of their ancestors.” Even at the beginning of the present century the

‘* Kites that swim sublime In still repeated circles, screaming loud,”

formed a feature of many a rural landscape in England, as they had done in the days of Cowper. But an evil time soon came upon the species. It must have been always hated by the henwife, but the resources of civiliza- tion in the shape of the gun and the gin were denied to her. They were, however, employed with fatal zeal by the gamekeeper ; for the Kite, which had long afforded the supremest sport to the falconer, was now left friendless,? and in a very few years it seems to have been exterminated throughout the greater part of England, certain woods in Huntingdonshire and Lincolnshire and in the Western Midlands, as well as Wales, excepted. In these latter a small remnant still exists; but the well-wisliers of this beautiful species are naturally chary of giving information that might lead to its further persecution. In Scotland there is no reason to suppose that its numbers suffered much diminution until about 1835 or even later, when the systematic destruction of “vermin” on so many moors was begun. In that kingdom, however, it is now as much restricted to certain districts as in England or Wales, and those districts it would be most inexpedient to in- dicate.

The Kite is, according to its sex, from 25 to 27 inches in length, about one half of which is made up by its deeply- forked tail, capable of

great expansion, and therefore a powerful rudder, enabling the bird while soaring on its wide wings, more than 5 feet in extent, to direct its cir- cling course with scarcely a movement that is apparent to the spectator below. Its general colour is pale reddish- brown or cinnamon, the head being greyish-white, but almost each feather has the shaft dark. The tail-feathers are broad, of a light red, barred with deep brown, and furnish the salmon-fisher with one of the choicest materials of his “flies.” The nest, nearly always built in the crotch

2 George, third earl of Orford, died in 1791, and Colonel Thornton, who with him had been the latest follower of this highest branch of the art of falconry, broke up his hawking establishment not many years after. There is no evidence that the pursuit of the Kite was in this or any other country reserved to kings or privileged persons, but the taking of it was quite beyond the powers of the ordinary trained Falcons, and in older days practically became limited to those of the sovereign. Hence the Kite had attached to it, especially in France, the epithet of ‘*royal,” which has still survived in the specific appellation of regalis applied to it by many ornithologists. The scandalons work of Sir Antony Weldon (Court and Character of King James, p. 104) bears wit- ness to the excellence of the Kite as a quarry in an amusing story of the “* British Solomon,” whose Master-Falconer, Sir Thomas Monson, being determined to outdo the performance of the French king’s falconer, who, when sent to England to show sport, “could not kill one Kite, ours being more magnanimous then the French Kite,” at last succeeded, after an outlay of £1000, in getting a cast of Hawks that took nine Kitcs runuing— never missed one.’ On the strength of this, James was induced to witness a flight at Royston, “but the Kite went to such a mountee as all the field lost sight of Kite and Hawke and all, and neither Kite nor Hawke were either scen or heard of to this pre- sent.”

of a large tree, is formed of sticks intermixed with many strange substances collected as chance may offer, but among them rags! seem always to have a place. The eggs, three or four in number, are of a dull

white, spotted and blotched with several shades of brown, and often lilac. It is especi- ally mentioned by old authors that in Great Britain the Kite was resident throughout the year; whereas on the Continent it is one of the most regular and marked migrants, stretching its wings towards the south in autumn, winter- ing in Africa, and returning in spring to the land of its birth.

There isa second European species, not distantly related, the Milvus migrans or M. ater of most authors," smaller in size, with a general dull blackish-brown plumage and a less forked tail. In some districts this is much commoner than the red Kite, and on one occasion it has appeared in England. Its habits are very like those of the species already described, but it seems to be more addicted to fish- ing. Nearly allied to this Black Kite are the M. xgyptius of Africa, the Jf govinda (the Pariah Kite of India), the M. melanotis of Eastern Asia, and the M. affins and M. isurus; the last is by some authors removed to another genus or sub-genus as Lophoictinia, and is peculiar to Australia, while M. afinis also occurs in Ceylon, Burmah, and some of the Malay countries as well. All these may be considered true Kites, while those next to be mentioned are more aberrant forms. First there is Hlanus, the type of which is #. ceruleus, a beautiful little bird, the Black-winged Kite of English authors, that comes to the south of Europe from Africa, and has several congeners—J. axillaris and £. scriptus of Australia being most worthy of notice. An extreme development of this form is found in the African Nauclerus riocourit, as well as in Hlanozdes furcatus, the Swallow-tailed Kite, a widely-ranging bird in America, and remarkable for its length of wing and tail, which gives it a marvellous power of flight, and serves to explain the unquestionable fact of its having twice appeared in Great Britain. To Zlanus also Ictinia, another American form, is allied, though perhaps more remotely, and it is re- presented by J. mississippiensis, the Mississippi Kite, which is by some considered to be but the northern race of the Neotropical J. plumbea. Gampsonyx, Rostrhamus, and Cymindis, all belonging to the Neotropical Region, com- plete the series of forms that seem to compose the sub- family Milne, though there may be doubt about the last, and some systematists would thereto add the Perns or Honey-Buzzards, Pernine.' (A. N.)

KITTO, Joun (1804-1854), the author of various works connected with Biblical literature, was the son of a mason at Plymouth, where he was born December 4th, 1804. In childhood he was weak and sickly, and he received only a very meagre school education ; but his untoward and miserable circumstances did not prevent the growth of a passionate love of books and an eager thirst for learning. By a fall sustained while assisting his father in his trade he received severe general injuries and lost permanently the sense of hearing. No longer able to support himself by manual labour, he endeavoured to do so by preparing rude drawings and coloured cards in large capital letters, but at last in November 1819 he found it necessary to seek refuge in the workhouse, where he was employed in making

— SS SS ee ee eee ee 1 Thus justifying the advice of Autolycus (Winter's Tale. act j sc. 3)—'' When the Kite builds, look to lesser — ”__very he no doubt to the laundresses of former days when the bird commonly “oe their drying grounds.

Mr Sharpe (Cat. Birds Brit. Musewm, i. p. 322) calls i cor. schun ; but the figure of S. G. Gmelin's oe hee em the name is taken, unquestionably represents the Moor-Buzzard, Circus xruginosus. F

3 The Brahminy Kite of India, Haliastur indus, seems to be rather a fishing Eagle.

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list shoes. In 1821 he was bound apprentice to a shoe- maker in Plymouth, who, however, treated him with such oppressive tyranny that he appealed to the magistrates, and got his indenture cancelled, upon which he again obtained admission to the workhouse. Not long afterwards a fund was raised in his behalf, and in 1823 he was sent to board with the clerk of the guardians, having his time at his own disposal, and the privilege of making use of a public library. After preparing a small volume of miscellanies, which was published by subscription, he became a pupil of Mr Groves, a dentist in Exeter, and

in this art rapidly acquired pro- ficiency. Through the same gentleman he in 1825 obtained more congenial employment in the printing office of the Church Missionary Society at Islington, from which lhe was after two years transferred to the same society's establishment at Malta. There he remained only six mouths, but shortly after his return to England he accom- panied Mr Groves in the capacity of tutor to his two sons on a Christian mission to Baghdad, where he obtained that personal knowledge of Oriental life and habits which he afterwards applied with such tact and skill in the illustra- tion of Biblical scenes and incidents. On account of the ravages of the plague the missionary establishment was broken up, and in 1832 Kitto returned to England. On arriving in London he was engaged in the preparation of various serial publications of the Society for the Diffusion of Useful Knowledge, the most important of which were the Pictorial History of Palestine and the Pictorial Bible. Henceforth his life was one of congenial but incessant literary labour. The Cyclopedia of Biblical Literature, edited under his superintendence, appeared in two volumes, 1843-45, and has passed through three editions ; and his Daily Bible Illustrations (8 vols., 1849-53) still retain a wide popularity among general readers. On the morning after he had finished the last volume of this work Kitto was seized with a paralytic stroke, and from that time he was incapacitated for literary work. In 1850 he had received an annuity of £100 from the royal civil list ; and on his illness an additional fund was raised on his behalf. In the autumn of 1854 he removed with his family to Cannstatt on the Neckar, where on the 25th November lhe was seized with an attack which in a few hours proved fatal.

See Dr Kitto's own work The Lost Senses, 1845; Ryland's Afemoirs of Kitto, 1856 ; and Eadie's Life of Kitto, 1857.

KITZINGEN, a town in the government district of Lower Franconia and Aschaffenburg, Bavaria, is situated on the Main, 95 miles south-east of Frankfort by rail A bridge, 950 yards long, connects it with its suburb Etwashausen on the left bank of the river.

KIUNG-CHOU-FOO. See Hainan.

KIWI, or Krw1-Krw1, the Maori name—first apparently introduced to zoological literature by Lesson in 1828 (Man. d' Ornithologie, ii. p. 210, or Voy. de la " Coquille," Zoologie, p. 418), and now very generally adopted in English—of one of the most characteristic forms of New Zealand birds, the Apteryx of scientific writers. This remarkable bird was unknown till Shaw, as almost his latest labour, very fairly described and figured it in 1813 (Nat. Miscellany, pls. 1057, 1058) from a specimen brought to him from the southern coast of that country by Captain

Barcley of the ship " Providence." At Shaw's death, in the same year, it passed into the possession of the then Lord Stanley, afterwards thirteenth Lord Derby, and president of the Zoological Society, and it is now with the rest of his collection in the Liverpool Museum. Consider- ing the state of systematic ornithology at the time, Shaw's assignment of a position to this new and strange bird, of which he had but the skin, does him great credit, for he said it seemed "to approach more nearly to the Struthious and Gallinaceous tribes than to any other." And his credit is still greater when we find the venerable Latham, who is said to have examined the specimen with Shaw, placing it some years later among the Penguins (Gen. Hist. Birds, x. p. 394), being apparently led to that conclusion through its functionless wings and the backward situation of its legs. In this false allocation Stephens also in 1826 acquiesced (Gen. Zoology, xiii. p. 70). Meanwhile in 1820 Temminck, who had never seen a specimen, had assorted it with the Dodo in an Order to which he applied the name of Inertes (Man. d'Ornithologie, i. p. cxiv.). In 1831 Lesson, who had previously (/oc. cit.) made some blunders about it, placed it (Traité d'Ornithologie, p. 12), though only, as he says, "par analogie et a priori," in his first

division of Birds, ' Oiseaux Anomaux," which is equivalent to what we now call Ratitz, making of it a separate Family "Nullipennes." At that time uo second example was known, and some doubt was felt,

especially on the Continent, as to the very existence of such a bird'—though Lesson had himself when in the Bay of Islands in April 1824 (Voy. "Coquille," ut supra) heard of it; and a few years later Dumont d'Urville had seen its skin, which the naturalists of his expedition procured, worn as a tippet by a Maori chief at Tolaga Bay (Houa-houa),? and in 1830 gave what proves to be on the whole very accurate information concerning it (Voy. " Astrolabe," ii. p. 107). To put all suspicion at rest, Lord Derby sent his unique specimen for exhibition at a meeting of the Zoological Society, 12th February 1833 (Proc. Zool. Society, 1833, p. 24), and a few months later (tom, cit., p. 80) Yarrell communicated to that body a complete description of it, which was afterwards published in full with an excellent portrait (Z'rans. Zool. Society, i. p. 71, pl. 10). Herein the systematic place of the species, as akin to the Struthious birds, was placed beyond cavil, and the author called upon all interested in

; 4 Cuvier in the second edition of his Régne Animal only. referred to it in a footnote (i. p. 498).

2 Cruise in 1822 (Journ. Residence in New Zealand, p. 313) had spoken of an '*' Emeu " found in that island, which must of course have been an Apteryx.

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zoology to aid in further research as to this singular form. In consequence of this appeala legless skin was within two years sent to the society (Proceedings, 1835, p. 61) obtained by Mr W. Yate of Waimate, who said it was the second he had seen, and that he had kept the bird alive for nearly a fortnight, while in less than another couple of years additional information (op. cit., 1837, p. 24) came from Mr T. K. Short to the effect that he had seen two living, and that all Yarrell had said was substantially cor- rect, except underrating its progressive powers. Not long afterwards Lord Derby received and in March 1838 transmitted to the same society the trunk and viscera of an Apteryx, which, being eutrusted to Professor Owen, furnished that eminent anatomist, in conjunction with other specimens of the same kind received from Drs Lyon and George Bennett, with the materials of the

masterly monograph laid before the society in instalments, and ultimately printed in its Z'ransactions (ii. p. 257, iii. p. 277). From this time tbe whole structure of the Kiwi has certainly been far better known than that of nearly any other bird, and by degrees other examples found their way to England, some of which were distributed to the various museums of the Continent and of America.®

In 1847 much interest was excited by the reported discovery of another species of the genus (Proceedings, 1847, p. 51), and though the story was not confirmed, a second species was really soon after made known by Gould (tom. cit., p. 93; Transactions, iii. p. 379, pl. 57) uuder the name of Apteryx oweni—a just tribute to the great master who had so minutely explained the anatomy of the group. Three years later Mr Bartlett drew attention to the manifest difference existing among certain examples, all of which had hitherto been regarded as specimens of A. australis, and the examination of a large series led him to conclude that under that name two distinct species were confounded. To the second of these, the third of the genus (according to his views), he gave the name of A. mantelli (Proceedings, 1850, p. 274), and it soon turned out that to this new form the majority of the specimens already obtained belonged. In 1851 the first Kiwi known to have reached England alive was presented to the Zoological Society by Mr Eyre, then lieutenaut-governor of New Zealand. This was found to belong to the newly described A. mantelli, and some careful observations on its habits in captivity were published by Wolley and another (Zoologist, pp. 3409, 3605).4 Subsequently the society has received several other live examples of this form, besides one of the real A. australis (Proceedings, 1872, p. 861), some of A. owent, and one of a supposed fourth species, A. haastz, characterized in 1871 by Mr Potts (Jbis, 1872, p. 35; Trans. N. Zeal. Institute, iv. p. 204; v. p. 195).5

The Kiwis form a group of the Subclass Ratite to which the rank of an Order may fitly be assigned, as they differ in many important particulars from any of the other existing forms of Ratite birds) The most obvious feature the Apteryges afford is the presence of a back toe, while the

3 In 1842, according to Broderip (Penny Cyclopedia, xxiii. p. 146), two had been presented to the Zoological Society by the New Zealand Company, and two more obtained by Lord Derby, one of which he had given to Gould. In 1844 the British Museum possessed three, and the sale catalogue of the Rivoli Collection, which passed in 1846 to the Academy of Natural Sciences at Philadelphia, includes a single specimen—probably the first taken to America.

4 This bird in 1859 laid an egg, and afterwards continued to lay one or two more every. year. In 1865 a male of the same species was introduced, but though a strong disposition to breed was shown on the part of both, and the eggs, after the custom of the Ratitw, were incubated by him, no progeny was hatched (Proceedings, 1868, p. 329).

5 A fine series of figures of all these supposed species is given by Rowley (Orn. Miscellany, i. pls. 1-6). Some others, as A. maxvma, A. mollis, and A. fusca have also been indicated, but proof of their validity has yet to be adduced.

extremely aborted condition of the wings, the position of the nostrils—almost at the tip of the maxilla—and the absence of an after-shaft in the feathers, are characters nearly as manifest, and others not less determinative though more recondite will be found on examination. The Kiwis are peculiar to New Zealand, and it is believed that A. mantelli is the representative in the North Island of the southern A. australis, both being of a dark reddish-brown, longitudinally striped with light yellowish-brown, while A. oweni, of a light greyish-brown transversely barred with black, is said to occur in both islands. About the size of a large domestic Fowl, they are birds of nocturnal habit, sleeping, or at least inactive, by day, feeding mostly on earth-worms, but occasionally swallowing berries, though in captivity they will eat fiesh suitably minced. Mr Buller writes (B. New Zealand, p. 362) :—

‘“‘The Kiwi is ‘in some measure compensated for the absence of wings by its swiftness of foot. When running it makes wide strides and carries the body in an oblique position, with the neck stretched to its full extent and inclined forwards. In the twilight it moves about cautiously and as noiselessly as a rat, to which, in- deed, at this time it bears some outwardresemblauce. Ina quiescent posture, the body generally assumes a perfectly rotund appearance ; and it sometimes, but only-rarely, supports itself by resting the point of its bill on the ground. It often yawns when disturbed in the daytime, gaping its mandibles in a very grotesque manner. When provoked it erects the body, and, raising the foot to the breast, strikes downwards with considerable force and rapidity, thus using its sharp and powerful claws as weapons of defence. . . . While hunt- ing for its food the bird makes a continual sniffing sound through the nostrils, which are placed at the extremity of the upper mandible. Whether it is guided as much by touch as by smell I cannot safely say; but it appears to me that both senses are used in the avtion. That the sense of touch is highly developed seems quite certain, because the bird, although it may not be audibly sniffing, will always first touch an object with the point of its bill, whether in the act of feeding or of surveying the ground ; and when shut upina cage or confined in _a room it may be heard, all through the night, tapping softly at the walls. ... It is interesting to watch the bird, in a state of freedom, foraging for worms, which constitute its principal food : it moves about with a slow action of the body ; and the long, flexible bill is driven into the soft ground, generally home to the very root, and is either immediately withdrawn with a worm held at the extreme tip of the mandibles, or it is gently moved to and fro, by an action of the head and neck, the body of the bird being perfectly steady. It is amusing to observe the extreme care and deliberation with which the bird draws the worm from its hiding-place, coaxing it out as it were by degrees, instead of pulling roughly or breaking it. On getting the worm fairly out

EA ground, it throws up its head with a jerk, and swallows it whole.”

The foregoing extract refers to A. mantelli, but there is little doubt of the remarks being equally applicable to A. australis, and probably also

to A. oweni, though the different proportion of the bill in the last points to some diversity in the mode of feeding. Did space allow much niore should be said of the Kiwis—perhaps to ornithologists the most interesting group of birds now existing, and the more interesting in regard to the melancholy doom of extine- tion which almost inevitably awaits them. (A. N.)

_ KIZLIAR, Kiztyar, or Kiznar, a town of Russia in the government of Stavropol, 325 miles east of the government town, in the low-lying delta of the river Terek about 35 miles from the shores of the Caspian. It lies to the left of the main stream between two of the larger secondary branches, and the whole is subject to flooding. The town proper, which spreads out round the citadel. has its Tartar, Georgian, and Armenian quarters ; the Russians for the most part live in the soldiers' "sloboda" or village. Of the public buildings it is sufficient to mention the Greek cathedral, dating from 1786; the Greek nunnery of the Elevation of the Cross, founded by the Georgian chief Daniel in 1736; the Armenian church of SS. Peter and Paul, remarkable for its size and riches. The population which has increased from 8309 in 1861 +

by canals fed by the river. A Government vineyard and school of viticulture are situated 34 miles from the town. About 1,200,000 gallons of Kizliar wine are sold annually at the fair of Nizhni Novgorod. Kizliar is mentioned as early as 1616, but the most notable accession of inhabitants (Armenians, Georgians, and Persians) took place in 1715 ; and its importance as a fortress dates from 1736, when it received the garrison formerly stationed at Sv. Kresta on the Sulak in Daghestan. In 1785 it was made a district town. The incursion of Kazni Mulla in 1821, and the inundation in 1863, are the chief facts of more recent note. The fortress is no longer kept in repair.

KLADNO, a mining town in the district of Smichov, Bohemia, lies about 15 miles west-north-west of Prague, with which it is connected by the Buschtierad line of rail- way. There are few buildings of special interest, and the importance of the town is mainly due to the wealth of

its iron-mines and coal-fields, which afford employment for some three thousand men. The average annual yield of iron is from 25,000 to 30,000 tons, and of coal 300,000 tons. About 2 miles to the north is the imperial chateau of Buschtierad. Population in 1880, 14,085.

KLAGENFURT, capital of the duchy of Carinthia, Austria, and seat of the provincial administration, financial direction, and court of appeal, is situated upon a plain at an elevation of 1450 feet above the sea-level, and about 40 niles north-north-west of Laibach, with which, as with Vienna, Gratz, Innsbruck, and other centres, it is connected by railway, in 46° 37’ N. lat, 14°19’ E. long. Klagenfurt is for the most part well and symmetrically built, and comprises an inner town quadrangular in form, and four suburbs—St Veit (north), Viktring (south), Volkermarkt (east), and Villach (west), the last communicating with Lake Worth by means of the Lend Canal. Among the more noteworthy edifices are the parish church of St Aigidius (erected 1709), with a tower 298 feet in height ; the cathedral of SS. Peter and Paul (1582-93, burnt 1723, restored 1725) ; the churches of the Benedictines (1613), of the Capuchins (1646), aud of the order of St Elizabeth (1710); and the fine structure standing in the Villach suburb, aud belonging to the Protestant community. To these must be added the palace of the prince bishop of Gurk, originally built for the sisters of the emperor Joseph If., and containing in its chapel some fine fresco paintings completed in 1798 by the Carinthian artist Joseph von Pichler ; the municipal hospital; the lunatic asylum ; the burg or castle, existing in its present form since 1777 ; and the Landhaus or house of assembly, dating from the end of the 14th century, and containing a museum of natural history, and the Klagenfurt Historical Society’s library, and collection of minerals, antiquities, seals, paintings, and sculptures. The most interesting public monument is the great Lindwurm or Dragon, standing in the principal square (1590). Among the many educational establishments of Klagenfurt are an upper and lower gymnasium with public library ; a theological seminary for priests; mon- astic and conventual houses; agricultural, industrial, technical, and mining schools; and an asylum for the instruction of the deafand dumb. The industrial establish- ments comprise factories for the preparation of white lead, tobacco, woollen cloth, muslins, silk

fabrics, and leather; also machine and iron foundries. Klagenfurt possesses, moreover, several banks, a chamber of industry and commerce, a central board of mining control, and a few scientific associations. The transit trade, which is con- siderable owing to the wealth of the mineral products of the province, is much facilitated by the position of Klagen- furt at a junction of the Crown-Prince-Rudolph and

o 9176 in 1872, | Austrian Southern Railways. The civil population in 1880

is mainly supported by the gardens and vineyards irrigated | was 16,592; with the military, it was 18,749.

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Upon the Zollfeld to the north of the city once stood the ancient | Roman town of Virunum. In the middle of the 7th century the surrounding country was overrun by the Avars. During the Middle Ages Klageufurt became the property of the crown, but by a patent of Maximilian I. of the 24th April 1518, it was conceded to the Carinthian estates, and has since then taken the place of St Veit as capital of Carinthia. In 1535, 1636, 1723, and 1796 Klagenfurt suffere from destructive fires, and in 1690 from the effects of an earthquake. On March 29, 1797, the French took the city, and upon the following day it was occupied by Napoleon as his headquarters. The fortifications constructed in 1580 were de- stroyed by the French in‘1809, and the ground that they formerly . occupied is now laid out as a public promenade.

See Amthor und Jabornegg-Gamsenegg, Karntnerfiihrer, Gera, 1874; G. von

Ankershofen, Handbuch der Geschichte des Herzogthums Karnten, Klagenfurt, 1857-74, bd. i-iv.; Umgebungskarte von Klagenfurt, Vienna, 1873.

KLAPROTH, Hernricn Junius von (1783-1835), one of the founders of Oriental scholarship in Europe, was born at Berlin, October 11, 1783. His father, Martin Heinrich Klaproth (1743-1817), not only desired him to pursue the chemical studies by which he had himself attained to position and fame, but did all in his power to frown away what he deemed a foolish attachment to a profitless subject. But the boy-philologist received from a more indulgent or wiser mother the means of secretly satisfying his natural instinct, and by the time that in ordinary course he ought to have passed the gymnasial examination he was able to retort, when upbraided with ignorance of the usual subjects, that at least he knew Chinese. He was still in his teens when he published his Asiatisches Magazin (Weimar, 1802); and immediately after he was called to St Petersburg as an adjunct to the academy of Oriental languages. In 1805 he accompanied Count Golowin's embassy to China; and though the travellers were stopped at the frontier he had a splendid opportunity of becoming acquainted with the tribes and languages of southern Asiatic Russia. On his return he was despatched by the academy to the Caucasus for the purpose of ethnographical and linguistic exploration (1807-1808), and when this mission was completed he was employed for several years in connexion with the academy's Oriental publications. In 1811 he came to Berlin; but in 1815 he settled in Paris, and in 1816 W. von Humboldt procured him from the king of Prussia the title and salary of pro- fessor of Asiatic languages and literature, with permission to remain in Paris as long as was requisite for the pub- lication of his works. He died in that city August 23,

1835.

The principal feature of Klaproth's erudition was the vastness of the field which it embraced. To enormous industry he joined a somewhat reckless intellectual aggressiveness, and where more solid footing failed was ready to bridge the chasm by adventurous hypo- thesis. His great work Asia polyglotta (Paris, 1823, with Sprach- atlas) not only served as a resumé of all that was known on the subject, but formed a new departure for the classification of the Eastern languages, more especially of the Russian empire. To a great extent, however, his work

is now superseded. That he was sometimes not over-scrupulous in the use he made of his crudition is matter of more than suspicion. The Jtinerary of a Chinese Traveller, which he published in 1821, a series of documents in the military archives of St Petersburg purporting to be the travels of George Ludwig von , and a similar series obtained from him in the London Foreign Office, are all judged to be spurious ; and the learning displayed in the forgery was possessed by no one but himself.

A list of Klaproth's works will be found in Nowv. Journ. Asiat., vol. xvii., and in Quérard, La France littéraire, vol. vi. Compare M. C. Landresse's " Notice" in Nowv. Journ. Asiat., 1835.

KLATTAU (Latin, Clatovia ; Bohemian, Klatovy), chief town of a district of the same name in Bohemia, lies about 70 miles south-west of Prague, and on the railway between Pilsen and Eisenstein, in 49° 23' N. lat., 13° 22' E. long. Klattau has six churches, an upper gymnasium, two hospitals, a large steam brewery, and an old-fashioned town-hall dating from the 16th century, and containing in its tower a bell weighing over 5 tons. Population 8067. |

Klattau was an ancient Bohemian fortress, and afterwards becanie a royal free town. In 1421 it was desolated by the Bohemian leader Ziska. Having refused to assist the emperor Ferdinand L., it was in 1546 deprived of many of its privileges. In 1620 it was taken by the emperor Maximilian. Until the early part of the 17th century it was a thriving place; but the depredations com- mitted by the Swedes in 1641, 1645, and 1648, and the many conflagrations which from time to time ravaged it, so seriously affected the town that it has never recovered its former prosperity.

KLAUSENBURG, or CLausensure (Hungarian, Kol- ozsvdr ; Latin, Claudiopolis), a royal free town of Hungary, the capital of the county of Kolozs, and also of the whole Transylvanian circle, is situated in a picturesque valley on the banks of the Little Szamos, and on the Hun- garian eastern railway, 72 miles north-north-west of Her- mannstadt, in 46° 44' 8" N. lat., 23° 34' 51" E, long. Klausenburg is the seat of a Unitarian bishop, of the superintendent of the Calvinists forthe

Transylvanian circle, of a royal court of justice, of a chamber of commerce, and of the county administration, as also the headquarters of the honvéd (militia) and regular infantry regiments of the military district. Klausenburg consists of an inner town (quadrangular in form, and divided into the old and new towns) and five suburbs now united with it in consequence of the removal of the old walls. With the exception of the old quarter, Klausenburg is generally well laid out, and contains many broad and fine streets, several of which diverge at right angles from the principal square or market-place, where stands a fine old Roman Catholic church, often described as a cathedral (Gothic style), dedicated to St Michael, and founded by king Sigismond in the year 1414. Besides several other Roman Catholic, Calvinist, Lutheran, Unitarian, Greek Catholic, and Greek Orthodox churches, and a Jewish synagogue, Klausenburg comprises among its public edifices a national museum, county and town halls, a national theatre, several hospitals, a workhouse, and barracks. The educational establish- ments include the university (with four faculties, founded in 1872), the Unitarian college (with seminary), Calvinist and Roman Catholic upper gymnasia, training institutes, and many others. A special feature of Klausenburg is the large number of elegant private mansions belonging to the Transylvanian nobles who reside here during the win- termonths. The greater part of the town lies on the right bank of the river, while upon the other side is the so-called “ Bridge Suburb” and the citadel. Klausenburg bears in general more the character of a seat of learning than of a business centre; but there are factories for the preparation of woollen and linen eloth, paper, tobacco, candles, and bone dust, as well as breweries, distilleries, oil mills, and beetroot sugar refineries; and furrying, and hat, cap, and boot making are largely carried on. The fairs are well attended, especially for the purchase of horses, and prepared skins, dressed furs, felt goods, delf, and crockery ware. The chief agricultural products of the neighbour- hood are wheat, beetroot, and forage. On the more elevated portions of the communal lands are extensive vineyards and woods. At the end of 1880 the civil. popu- lation amounted to 29,929 (with military it was 30,869) ; by far the greater majority were Magyars by nationality, the remainder being composed of Roumanians, Germans, Armenians, and

Jews. Outside the town, upon the slope of the citadel hill, there is a Gipsy quarter.

Klausenburg is believed to occupy the site of a Roman settlement named Claudia, whence its modern Latin appellation of Claudiopolis. Colonized by Saxons in 1178, it then reccived its German name of Klausenburg from the old word Klause, signifying a ‘‘ mountain pass.” In 1443 Matthias Corvinus, king of Hungary, was born here. Subsequent to the defeat of the Hungarians by the Turks at Mohdcs (1526), Transylvania came under the protection of the Porte, and owing to the trade from the East passing through the princi-

pality to Dantzic, the prosperity of Klausenburg much increased. Between the years 1545 and 1570 large numbcrs of the Saxon

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population left the town in consequence of the introduetion of Unitarian doctrines. In 1603 it fell into the hands of the usurper Moses Székely, but was soon regained by the imperialists under General Basta. In 1662 it was ineffectually besieged by the Transylvanian prinee Michael Apaffi I., but two years later it eame into his power. The burg or citadel was ereeted between 1715-23, during the reign of King Charles III. (as emperor, Charles VI.). In 1798 the town was toa great extent destroyed by fire. As eapital of Transylvania and the seat of the Tran- sylvanian diets, Klausenburg from 1830-48 became the centre of the national movement in the grand prineipality ; and in Deeember 1848 it was taken and garrisoned by the Hungarians under the Polish General Bem. After the eonelusion of the war 1t was de-graded from its position as capital of Transylvania, and subordinated to Nagyszeben (Hermannstadt), but in 1861 1t was reinstated in its former rank. ‘The official name is Kolozsvar.

KLAUSTHAL, or CLavstHat, in the circle of Zellerfeld and the district of Hildesheim, Prussia, is the chief town and mining centre of the Upper Harz. It is situated on a bleak plateau, 1860 feet above sea-

level, and unites to form one town with Zellerfeld on the opposite bank of the Zellbach. The streets are broad, opportunity for improve- ment having been given by fires in 1844 and 1854; the houses are mostly of wood. Klausthal has a famous mining college, with a mineralogical museum, and a mine- surveying and a mining school. There is also a disused mint. The men of the town are mainly employed in the neighbouring mines and smelting works; of the latter the most important is the Frankenscharner silver smelting house, where American as well as German ore is worked. The population in 1875 was 8539; including Zellerfeld, it was 12,799.

Klausthal was founded about the middle of the 16th century, after the erection of the Benedietine monastery at Cella. Mining was earricd on by the monks, and more energetically by the dukes of Brunswick, who brought miners from Franeonia.

KLEBER, Jean Barrisre (1753-1800), was born at Strasburg in 1753 or 1754, where his father was a builder. He was meant to be an architect, but his opportune assist- ance to two German nobles in a tavern brawl obtained for him a nomination to the military school of Munich. He soon obtained a commission, but resigned it in 1783 on finding his humble birth in the way of his promotion. On returning to France he was appointed inspector of public buildings at Belfort, where he studied fortification and military science. In 1792 he enlisted in the Haut-Rhin volunteers, and was from his military knowledge at once elected adjutant. At the siege of Mainz under Merlin de Thionville, he so distinguished himself that he was made general of brigade in July 1793. In that capacity he commanded in the Vendean war, and was instru- mental in winning the victories of Torfou, Chollet, Le Mans, and Savenay. For openly expressing his opinion that lenient measures ought to be pursued towards the Vendeans he was recalled ; but in April 1794 he was made general of division, and sent to the army of the North. Under Jourdan he commanded the left wing at Fleurus, June 26, 1794, and Aldenhaven, October 2, and took Maestricht after a short siege on November 8. During the winter of 1794-95 he besieged Mainz, and on June 4, 1796, gained the victory of Altenkirchen over the prince of Wiirtemberg. Kléber now considered he had a fair claim

to a command in chief, and, not receiving one in the spring of 1797, he resigned his division in disgust, and retired to Paris. There he allied himself with the reactionary party, and, according to Mathieu Dumas even offered to command any forces that could be raised against the coup d'état of Fructidor 1797, but there were no forces tocommand. He gladly accepted a division in the expedition to Egypt under Bonaparte, but was wounded in the head at Alexandria in the very first engagement, which prevented his taking any further part in the campaign of the Pyramids, and caused him to be appointed governor of Alexandria. In the

Syrian campaign of 1799, however, he commanded the vanguard, took El-Arish, Gaza, and Jaffa, and bore the brunt of the battle of Mount 'labor, April 15, 1799. Being left by Bonaparte in command of the army in Egypt, he made the convention of El-Arish, and, when Lord Keith refused to ratify the terms, attacked the Turks at Heliopolis, though with but 10,000 men against 60,000, and utterly defeated them on March 20,1800. He then retook Cairo, which had revolted from the French, and was assassinated there by a fanatic on June 14, 1800, the very day on which Desaix fell at Marengo. Kléber was undoubtedly one of the greatest generals of the French revolutionary epoch, but hardly had a chance of showing his powers against a capable adversary; Napoleon's ejaculation on hearing of his death was 'Eh bien; a rival the less." Ernouf, the grandson of Jourdan's ehief of the staff, published in 1867 a valuable biography of Kléber. See also Reynaud's Life of

Merlin de Thionville, Ney's Memoirs, Dumas's Souvenirs, Napoleon's Memoirs, dictated at St Helena, and Martha-Beeker's Desaix.

KLEIN, Jurius Lzoporp (1804-1876), a German writer of Jewish origin, was born at Miscolez, in Hungary, in 1804. He was educated at the gymnasium in Pest, and studied medicine in Vienna and Berlin. After travelling in Italy and Greece, he settled as a man of letters in Berlin, where he remained until his death in 1876. He was the author of many dramatic works, among others the historical tragedies Maria von Medici, Luines, Zenobia, Moreto,

Maria, Strafford, and Heliodora, and the comedies Die.

Lerzogin, Ein Schiiteling, and Voltaire. These plays were published between 1841 and 1867. The tendency of Klein as a dramatist was to become bombastic and obscure, but many of his characters are vigorously conceived, and in nearly all his tragedies there are passages of brilliant rhetoric. He is chiefly known as the author of an elaborate

Geschichte des Dramas (1865-1876), in which he undertook

to record the history of the drama both in ancient and in modern times. He died when about to enter upon the Elizabethan period, to the treatment of which he had looked forward as the chief part of his task. The work, which is

in 12 bulky volumes, gives proof of immense learning, but |

is marred by many eccentricities of style.

KLINTZY, a town in Russia, situated in the govern- ment of Tchernigoff, 203 miles north-east of the capital of the province. It is one of the most important industrial centres in Little Russia. Its 8000 inhabitants are engaged in the manufacture of woollen cloth and knitted woollen goods (to the value of more than £100,000 per annum), morocco-leather, leather, aud cast-iron wares.

KLOPSTOCK, Frieprich Gottiies (1724-1803), German poet, was born at Quedlinburg on the 2d of July 1724. He was educated partly at the gymnasium of his native town, partly at Schulpforta. After studying theology for a short time at Jena, he went in 1746 to the university of Leipsic, where he made the acquaintance of Cramer, Schlegel, Rabener, and other young men of letters, who were conducting the Bremische Beitrdge. At Schulpforta Klopstock had become couscious of a talent for poetry, and had resolved to write a great epic. His original intention was to make Henry the Fowler his hero, but this was soon abandoned in favour of the scheme to which he devoted the best years of his life. The first three cantos of The Messiah, which were planned in prose in Jena, he finished in Leipsic; and they were

published anonymously in the Bremische Beitrdége in 1748. The name of the author was soon known, and Klopstock suddenly found himself the most popular poet of his generation. In 1748 he accepted the position of tutor to a private family in Langensalza, and in 1750 he went to Ziirich, whither he was invited by Bodmer, the translator of Paradise Lost, who had been deeply impressed by the carly cantos of The

Messiah. In Ziirich Klopstock received from Frederick V. of Denmark, on the recommendation of his minister Count Bernstorff, an invitation to settle in Copenhagen with a pension of 400 thalers. The invitation was accepted ; and on his way to the Danish capital he met at Hamburg the lady who, in 1754, became his wife—Margarethe (Meta) Moller, an enthusiastic admirer of his poetry. She died in 1758 ; and after her death Klopstock edited her writings, which give evidence of a tender, sensitive, and deeply religious spirit. In 1771 Klopstock left Copenhagen, and followed his friend Count Bernstorff to Hamburg, where, in 1773, he issued the last five cantos of Zhe Messiah. After spending about a year at the court of the margrave of Baden in Carlsruhe, he returned to Hamburg with the title of hofrath and a pension, which he retained along with the pension of the king of Denmark. During the rest of his life he remained in Hamburg, where in 1792 he married Johanna Elizabeth von Winthem, a widow who had been for many years one of his most intimate friends. He died on the 14th of March 1803, and was buried beside his first wife in the village of Ottensen, near Hamburg. Besides Zhe Messiah he wrote many odes; and in several dramas he celebrated the deeds of the ancient German hero, Arminius, while in others he dealt with the earliest narratives of the Old Testament. He was also the author of Fragmente tiber Sprache und Dichtkunst, Grammatische Gespriche, and a book entitled Gelehrtenrepublik. In these works he made important contributions to philology and to the history of German poetry. Klopstock’s dramatic writings are without value; many of his odes, especially those on subjects taken from northern mythology, are so vague as to be hardly intelligible; and Zhe Afessiah lacks plastic force, unity of conception,

and precision of style. His best odes, however, and many passages of Zhe Messiah are still admitted to be marked by lyrical genius of a high order ; and all German critics recognize that he exercised a salutary influence on the literature of his age by helping to deliver it from slavish adherence to foreign models.

An edition of his works in 12 octavo volumes was published in Leipsic, 1798-1817 ; and among later editions may be mentioned one in 12 velumes, 1823-26, another in 9 vols., 1839, and a third in 11 vols., 1844-45. Klopstock's writings are included in Hempel's Nationalbibliothek, and there is a new edition, with notes, by Bock (Stuttgart, 1876). Sce K. F. Cramer, Klopstock, er und 'ber

thn ; and Klopstock's Jugendgeschichte in the Kleine Schriften of D, F. Strauss.

KLOSTERNEUBURG, a town in the official] district of Hernals, Austria, is situated on the right bank of the Danube, 54 miles north-west of Vienna. It is divided by a small stream into an upper and a lower town, in the former of which are the ruins of a medieval fortress. The 'town has a local court, a hospital, an asylum for the insane, and a convent of Mekhitarists ; among the schools is an academy of wine and fruit cultivation. As an important pioneer station, it has various military buildings and stores. On a hill rising directly from the banks of the Danube, stand the magnificent buildings (erected 1730- 1834) of the Augustine canonry, founded in 1106 by Margrave Leopold the Holy. This foundation is the oldest and richest of the kind in Austria; it owns much of the land upon which the north-western suburbs of Vienna stand. Among the points of interest within it are the old chapel of 1318, with Leopold's tomb and the altar of Verdun, the treasury and relic-chamber, the library with 30,000 volumes and many MSS., the picture gallery, the collection of coins, the theological hall, and the wine-cellar, containing an immense tun like that at Heidelberg. The inhabitants of Klosterneuburg are mainly occupied in making wine, of excellent quality. There is a large cement factory outside the town. The population in

castle of Citium stood in the region of Klosterneuburg. The town was founded by Charlemagne.

KNARESBOROUGH, a market-town and parliamentary borough in the West Riding of Yorkshire, is finely situated on a rocky elevation on the left bank of the Nidd, 17 miles west by north of York and 207 north of London. It is a station ‘on the North-Eastern Railway, which crosses the valley near the town by a lofty viaduct. The town is built chiefly of stone, and contains several good streets and a spacious market-place. The parish church of St Jolin is an old cruciform structure chiefly Perpendicular in style, restored in 1872 ; the free grammar school was founded in 1616. Knaresborough Castle, now in ruins, but originally of great strength, was founded in 1170 by Serlo de Burgh. After the battle of Marston Moor it was taken by Fairfax, and in 1648 it was ordered to be dismantled. To the south of the castle is St Robert’s chapel, an excavation in the rock constructed into an ecclesiastical edifice in the reign of Richard I. A little further down the river is St Robert’s cave, which is supposed to have been the residence of the hermit, aud in 1744 was the scene of the murder of Daniel Clarke by Eugene Aram. Opposite the castle is a petrifying spring called the “ Dropping Well.” Before the rise of Harrogate Knaresborough was a favourite watering-place, but it is now dependent chiefly on its manufacture of towels, sheetings, and similar linen fabrics, and of wool rugs. There are also flour-mills and a considerable trade in corn. From the first year of the reign of Mary until 1867 Knaresborough returned two members to parliament, but since then it has returned only one. The area of the parliamentary borough and local board district, which includes part of Scriven with Tentergate, is 481 acres, and the population, which in 1871 was 5205, was exactly 5000 in 1881.

KNELLER, Sir Goprrey (1648-1723), a portrait painter whose celebrity belongs chiefly to England, was born in Liibéck in the duchy of Holstein, of an ancient

| family, on August 8, 1648. He -was at first intended for

the army, and was sent to Leyden to learn mathematics and fortification. Showing, however, a marked preference for the fine arts,

he studied in the school of Rembrandt, and under Ferdinand Bol in Amsterdam. In 1672 he removed to Italy, directing his chief attention to Titian and the Caracci; Carlo Maratti gave him some guidance and encouragement. In Rome, and more especially in Venice, Kneller earned considerable reputation, by histori¢al paintings as well as portraits. He next went to Hamburg, painting with still increasing snecess. In 1674 he came over to England. at the invitation of the duke of Mon- mouth, was introduced to Charles II., and painted that sovereign, much to his satisfaction, several times. Charles also sent him to Paris, to take the portrait of Louis XIV. When Lely died in 1680, Kneller, who produced in England little or nothing in the historical department, remained without a rival in the ranks of portrait painting ; there was no native-born competition worth speaking of. Charles appointed him court painter; and he continued to hold the same post into the days of George I, Under William IIT. (1692) he was made a knight, under George I. (1715) a baronet, and by order of the emperor Leopold [a knight of the Roman empire. Not only his court favour but his general fame likewise was large: he was lauded by Dryden, Addison, Steele, Prior, Tickell, and Pope. Kneller’s gains also were very considerable, aided by habits of frugality which approached stinginess : he left property yielding an annual income of £2000. His industry was maintained till the last. His studio had at first been in Covent Garden, but in his closing years he lived in Kneller Hall, Twickenham. He died of fever, the

1869 was 5330, but has increased. In Roman times the | date being generally given as 7th November 1723, though

some accounts say 1726. He was buried in Twickenham church, and has a monument in Westminster Abbey. An elder brother, John Zachary Kneller, an ornamental painter, had accompanied Godfrey to England, and had died in 1702. The style of Kneller as a portrait painter repre- sented the decline of the art as practised by Vandyck ; Lely marks the first grade of descent, and Kneller the second. His works have much freedom, and are well drawn and coloured ; but they

are essentially slight in manner, and to a great extent monotonous, this arising partly from the habit which he had of lengthening the oval of all -his heads. The colouring may be called brilliant rather than true. He indulged much in the commonplaces of allegory ; and, though he had a quality of dignified elegance not unallied with simplicity, genuine simple nature is seldom to be traced in his works. His fame has greatly declined now, and could not but do so after the advent of Reynolds. Among Kneller's principal paintings are the Forty-three Celebrities of the Kit-Cat Club, and the Ten Beauties of the Court of William IIL, now at Hampton court; these were painted by order of the queen; they match, but match unequally, the Beauties of the Court of Charles IL, painted by Lely. He executed altogether the likenesses of ten sovereigns. It is said that Kneller's own favourite performance was the portrait of the Converted Chinese in Windsor Castle. His works are confined almost entirely to England, not more than two or three specimens having gone abroad after he had settled there.

KNIGHT, Cartes (1791-1873), publisher and author, was the son of a bookseller and printer at Windsor, where he was born 15th March 1791. After acquiring some knowledge of Latin and French at a common day school, he was sent at the age of twelve to the classical school of Dr Nicholas of Ealing. There, according to his own account, he imbibed such a tincture of learning as made him desirous to be a scholar; and it was very much in opposition to his wishes that in 1805 he was withdrawn from school to be bound apprentice to his father. In editing Zhe Windsor and Kton Express, commenced by his father in 1812, some gratification was afforded to his literary ambition, and this received additional stimulus when he became the publisher of Zhe Htonian, edited by Praed, with Macaulay, Moultrie, and Derwent and Nelson

Coleridge as principal contributors. After editing The Guardian from 1820 to 1822, Knight was induced by the Etonians already mentioned, now undergraduates at Cambridge, to set up in business at Pall-Mall East, and to become for them editor of Knight's Quarterly Magazne.

As far as the magazine was concerned the venture was unsuccessful, for it was brought to a close with its sixth number, but it initiated for Knight a literary career as publisher and author which extended over forty years, and the unselfish enterprise of which conferred lasting intellectual benefit on the general mass of his fellow countrymen. In 1827 Knight became the superintendent of the publications of the Society for the Diffusion of Useful Knowledge, for whom he projected and edited The British Almanac and Companion, commenced in 1828. In 1829 he began the publication of The Library of Lntertain- ing Knowledge, he himself writing several volumes of the series. 1832 and 1833 saw respectively the commencement of The Penny Magazine and The Penny Cyclopedia, two literary ventures which so far as circulation was concerned were highly satisfactory in their results, but the latter of which, on account of the heavy excise duty, was completed at a great pecuniary sacrifice. Besides a considerable number of illustrated editions of other standard works, Knight completed in 1842 The Pictorial Shakespeare, which, although now superseded in regard to critical scholarship, is still valued for the research and taste displayed in its illustrations. Zhe Pictorial Shakespeare was followed by various other editions of the same author. The energy of Knight also found scope in the compilation of a variety of illustrated series, such as Old Hngland and The Land We Live in. In 1853 he became editor of The English Cyclopxdia, and conjointly with the multi- farious duties of such an office he was also engaged in writing his Popular History of England, published in eight volumes, 1854-61. In 1864 he withdrew from the business of publisher, but he continued his active literary career nearly to the close of his long life, publishing Zhe Shadows of the Old Booksellers (1865), an autobiography under the title Passages of a Working Life During Half a Century (3 vols., 1864-65), an historical novel Begg’d at Court (1868) and subsequently various papers in The British Almanac and Companion. He died at Addlestone, Surrey, March 9, 1873.

KNIGHTHOOD

K* IGHTHOOD and CHIVALRY are two words which

are nearly but not quite synonymous ; that is, they may often, although they cannot always, be used precisely in the same way and exactly in the same sense. What we mean by the order of knighthood is to all intents and pur- poses what we mean by the order of chivalry. But in some of the more special applications of the several terms diversi- ties in their respective significations manifest themselves. We could not, for example, say of anybody that he had received the honour of chivalry, or that he had lived in the age of knighthood. Again, we should speak of lands as held in chivalry not in knighthood, and of the rank or degree of knighthood not of chivalry. But taken together the two words knighthood and chivalry designate a single subject of inquiry, which presents itself under three dif- ferent although connected and in a measure intermingled aspects. It may be regarded in the first place as a mode or variety of feudal tenure, in the second place as a personal attribute or dignity, and in the third place as a scheme of manners or social arrangements. It is under these three general aspects that the subject is to be dealt with here. For the more important religious as distinguished from the military orders of knighthood or chivalry the reader is

referred to the headings St Jonw (KNIGHTS oF), TEUTONIC Knicuts, and TEMPLARS.

Our words knight and knighthood are merely the modern Deriva- | forms of the Anglo-Saxon or Old English enzht and cnihthdd. tion of

Of these the primary signification of the first was a boy or youth, and of the second that period of life which intervenes between childhood and manhood. But some time before the middle of the 12th century they had acquired the mean- ing they still retain of the French chevalier and chevalerce. In a secondary sense cxiht meant a servant or attendant answering to the German Knecht, and in the Anglo-Saxon Gospels a disciple is described as a leorning cniht. In a tertiary sense the word appears to have been occasionally employed as equivalent to the Latin mz/es—usually trans- lated by thegn—which in the earlier Middle Ages was used as the designation of the domestic as well as of the martial officers or retainers of sovereigns and princes or great per-

knight.

sonages.! Sharon Turner suggests that cniht from meaning The

an attendant simply may have come to mean more especially

a military attendant, and that in this sense it may have ™

gradually superseded the word thegn.? But the word thegn

1 Du Cange, Gloss., s.v. ‘‘ Miles.” 2 History of England, vol. iii. chap. 12.

Saxon

tht.

K NIGH

itself, that is, when it was used as the description of an attendant of the king, appears to have meant more espe- cially a military attendant. As Dr Stubbs says, “the thegn seems to be primarily the warrior gesith”—the gesithas forming the chosen band of companions (comites) of the German chiefs (principes) noticed by Tacitus—“ he is pro- bably the gesith who had a particular military duty in his master’s service”; and he adds that from the reign of Athelstan “the gesith is lost sight of except very occasion- ally, the more important class having become thegns, and the lesser sort sinking into the rank of mere servants of the king.”! It is pretty clear, therefore, that the word ceniht could never have superseded the word thegn in the sense of a military attendant, at all events of the king. But besides the king, the ealdormen, bishops, and king’s thegns themselves had their thegns, and to these it is more than probable that the name of cniht was applied. Under the singular system of joint responsibility and suretyship which was characteristic of the Anglo-Saxon government, the practice of commendation had attained to extraordinary dimensions. He who was unattached to some superior—the lordless man—was indeed regarded as a kind of outlaw; and, if he refused or neglected to choose a lord for himself, his kindred

were bound to present him to the county court and select a lord for him. Hence a relation which was for the most part merely personal, but which only required the addition of land holding—an ad- dition, it can scarcely be doubted, sometimes made—to render it in all respects feudal, was widely and firmly established in England long before the Norman Conquest. The mutual rights and obligations of lord and man, in a far more advanced condition than they appear as between hlaford and gesith at an earlier period, were perfectly familiar to the Anglo-Saxons, and it was only in part due to the influence of the Normans that they were subse- quently transformed into the mutual rights and obligations of lord and tenant. Around the Anglo-Saxon magnates were collected a crowd of retainers and dependants of all ranks and conditions; and there is evidence enough to show that among them were some called enzhtas who were not always the humblest or least considerable of their number.?. The testimony of Domesday also establishes the existence in the reign of Edward the Confessor of what Dr Stubbs describes as a “ large class” of landholders who had commended themselves to some lord, and he regards itas doubtful whether their tenure had not already assumed a really feudal character. But in any event it is manifest that their condition was in many respects similar to that of a vast number of unquestionably feudal and military tenants who made their appearance after the Norman Con- quest. If consequently the former were called enihtas under the Anglo-Saxon régime, it seems sufficiently pro- bable that the appellation should have been continued to the latter—practically their successors —under the Anglo- Norman régime. And if the designation of knights was first applied to the military tenants of the earls, bishops, and barons—who although they held their lands of mesne lords owed their services to the king—the extension of that designation to the whole body of military tenants need not have been a very violent or prolonged process. Assuming, however, that knight was originally used to describe the military tenant of a noble person, as cniht had sometimes been used to describe the thegn of a noble person, it would, to begin with, have defined rather his social status than the nature of his services. But those whom the English called knights the Normans called chevaliers, by which term the nature of their services was defined, while their social status was left out of considera-

’ Stubbs, Constitutional History, vol. i. p. 156. * Stubbs, vol. i. pp. 156, 866; Turner, vol. iii. pp. 125-129.

tion. And at first chevalier in its general and honorary signification seems to have been rendered not by knight but by rider, as may be inferred from the Saxon Chronicle, wherein it is recorded under the year 1085 that William the Conqueror “dubbade his sunu Henric to ridere.”3 But, as Mr Freeman says, “no such title is heard of in the earlier days of England. The thegn, the ealdorman, the king himself, fought on foot ; the horse might bear him to the field, but when the fighting itself came he stood on his native earth to receive the onslaught of her enemies.”4 In this perhaps we may behold one of the most ancient of British insular prejudices, for on the Continent the importance of cavalry in warfare was already abundantly understood. It was by means of their horsemen that the Austrasian Franks established their superiority over their neighbours, and in time created the Western empire anew, while from the word caballarius, which occurs in the Capitularies in the reign of Charlemagne, came the words for knight in all the Romance languages.5 In Germany the chevalier was called fitter, but neither rider nor chevalier prevailed against knight among ourselves. And it was long after knighthood had acquired its present mean- ing with us that chivalry was incorporated into our lan- guage. It may be remarked too in passing that in official Latin, not only in England but all over Europe, miles held its own against both egues and caballarius.

Concerning the origin of knighthood vr chivalry as it Origin of existed in the Middle Ages,—implying as it did a forma] medieval

assumption of and initiation into the profession of arms,— nothing beyond more or less probable conjecture is possible. The medizval knights had nothing to do in the way of derivation with the “ equites ” of Rome, the knights of King Arthur’s Round Table, or the Paladins of Charlemagne. But there are grounds for believing that some of the rudiments of chivalry are to be detected in early Teutonic customs, and that they may have made some advance among the Franks of Gaul. We

know from Tacitus that the German tribes in his day were wont to celebrate the admission of their young men into the ranks of their warriors with much circumstance and ceremony. The people of the district to which the candidate belonged were called together ; ‘his qualifications for the privileges about to be conferred upon liim were inquired into; and, if he were deemed fitted and worthy to receive them, his chief, his father, or one of his near kinsmen presented him with a shield and a lance. Another custom apparently common to the Gotlis and the Franks was the ceremony of adoption by arms. By means of a solemn investiture with warlike weapons, the two parties to the formality or rite thenceforth acquired the artificial characters of father and son, not, as in the Roman practice of adoption, for any purpose of succession or in- heritance, but in a purely honorary and complimentary manner. Selden and Du Cange concur in tracing the cere- mony of “dubbing to knighthood” directly to the ceremony of the “adoptio per arma.” Among the Lombards the sons of their kings were forbidden to sit at the tables of their fathers until they had been invested with arms, and this, it is further said, by some foreign prince or potentate.® But among the Franks we find, from the authorities cited by Du Cange, Charlemagne girding his son Louis the Pious, and Louis the Pious girding his son Charles the Bald with the sword, when they arrived at manhood.’ These cases can hardly be referred, as the Lombard usages may, to the “adoptio per arma.” Yet itis indisputable that in the investiture of Louis and Charles with the sword some ceremony was observed which was deemed worthy of record,

3 Ingram’s edition, p. 290. 4 Comparative Politics, p. 74. 5 Baluze, Capitularia Regum Francorum, vol. ii. pp. 794, 1069.

§ Mills, History of Chivalry, vol. i. p. 36.

7 Gloss., s.v. ‘* Arma.”

Knight- hood in England.

not for its novelty, but as a thing of recognized importance. It does not follow that a similar ceremony extended to personages less exalted than the sons of kings and emperors. But if it did we must naturally suppose that it applied in the first instance to the mounted warriors who formed the most formidable portion of the warlike array of the Franks. It was among the Franks indeed, and possibly through their experiences in war with the Saracens, that cavalry first acquired the pre-eminent place which it long main- tained in every European country. In early society, where the army is not a. paid force but the armed nation, the cavalry must necessarily consist of the noble and wealthy, and cavalry and chivalry, as Mr Freeman observes,' will be the same, Since then we discover in the Capitularies of Charlemagne actual mention of "caballarii" as a class of warriors, it may reasonably be concluded that formal investiture with arms applied to the "caballarii," if it was a usage extending beyond the sovereign and his heir ap- parent, "But," as Hallam says, "he who fought on horseback and had been invested with peculiar arms in a solemn manner wanted nothing more to render him a knight ;" aud so he concludes, in view of the verbal identity of "chevalier" and "caballarius," that "'we may refer chivalry in a general sense to the age of Charlemagne." ? Yet, if the "caballarii" of the Clapztularies are really the precursors of the later knights, it remains a difficulty that the Latin name for a knight is "miles," although " cabal- larius " became in various forms the vernacular designation.

Before it was known that the chronicle ascribed to Ingulf of Croyland is really a fiction of the 13th or 14th century, the knighting of Heward or Hereward by Brand, abbot of Burgh (now Peterborough), was accepted from Selden to Hallam as an historical fact, and knighthood was supposed, not only to have been known among the Anglo-Saxons, but to have had a distinctively religious character which was contemned by the Norman invaders. The genuine evidence at our command altogether fails to support this view. When William of Malmesbury describes the knighting of Athel- stan by his grandfather Alfred the Great, that is, his investiture " with a purple garment set with gems and a Saxon sword with a golden sheath," there is no hint of any religious observance. In spite of the silence of our records, Dr

Stubbs thinks that kings so well acquainted with foreign usages as Ethelred, Canute, and Edward the Confessor could hardly have failed to introduce into England the institution of chivalry then springing up in every country of Europe ; and he is supported in this opinion by the circumstance that it is nowhere mentioned as a Norman innovation. Yet the fact that Harold received knighthood from William of Normandy? makes it clear either that Harold was not yet a knight, which in the case of so tried a warrior would imply that “dubbing to knighthood” was not yet known in England even under Edward the Confessor, or, as Mr Freeman thinks, that in the middle of the 11th century the custom had grown in Normandy into “ some- thing of a more special meaning” than it bore in England. William of Normandy was knighted by his overlord Henry I. of France, and of the Conqueror’s sons he himself, as we have already seen, knighted Henry Beauclerc,* while William Rufus was knighted by Archbishop Lanfrane.5

1 Freeman, Comparative Politics, p. 738.

2 Hallam, Middle Ages, vol. iii. p. 392. F

3 Freeman, History of the Norman Conquest, vol. v. p. 484.

4 The Saxon Chronicle so records. But Ordericus Vitalis says that he received his arms from’ Lanfranc, and: Dr Stubbs seems to think that both statements may be true (Const. Hist., vol. i. p. 367).

5 William of Malmesbury is the authority for the knighting of William Rufus by Archbishop Lanfranc,. ‘‘ Accessit etiam favori ejus Maximum rernm momentum archiepiscopus Lanfrancus eo quod eum nutrierat et militem fecerat, quo auctore et annitente die Sanctorum Cosme et Damiani coronatus.”—Gesta Regum Anglorum, lib, iv.

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It was under William Rufus, according to Mr Freeman, that the chivalrous and financial sides of feudalism sprang together into sudden prominence in England—the first ay represented by the Red King, and

the second as represented by his minister Ranulf Flambard.® In one sense tenure in chivalry was practically co- |

extensive with European feudalism, while in another sense it was strictly speaking peculiar to England after the Norman Conquest, and Ireland after the English Conquest. We have no earlier information of the details of the feudal organization of Normandy than we have of the feudal organization of England, and therefore it is impossible to say how far the second was copied from the first, or the first assimilated to the second. But at all periods there was apparently sufficient difference between the Norman “fief de hauberc” and the English knight’s fee to prevent the one from being pronounced in the proper meaning of the term the counterpart of the other. Into Ireland, however, the English system of tenures was imported without change of conditions.’ But the process of feudalization commenced in England under William I. was only completed under Henry IL., and at the time of the subjugation of Ireland there was already established a distinction between the feudal arrangements which had been made before and after the death of Henry I., as the “old” and the “new” feoffments, That Henry II.’s method of dealing with the conquered lands of Ireland was an exact imitation of William I.’s method of dealing with the conquered lands

in England cannot therefore be assumed. But both kings Knights had at their disposal a large extent of territory which they

granted to their vassals on terms necessarily very similar. | In the reign of Henry II. the knight’s fee was what may | be called the “unit” of the system of tenures which had grown up in England since the Norman Conquest. In the Modus Tenendi Parliamenii,® for instance, a treatise which pretended to date from the 11th and which really dates from the 14th century, it is laid down that an earldom consisted of twenty knights’ fees, and that a barony consisted of thirteen and a third knights’ fees, a statement which seems to have been accepted without misgiving until it was refuted by Selden? It is, how- ever, beyond question that some, although not all, of the feudal services and obligations of the tenants of earl- doms and baronies were determined by the number of the knights’ fees which they comprised: It was

certainly not a fixed number, for it varied in every or nearly every recorded example.!® But it was in each instance a specified number, by which the earl's or baron's military contribution to the king's army was settled and the amerciaments payable in the event of its being absent or incomplete were computed.!! Hallam is inclined to attribute the invention of what he terms the "reasonable and convenient" principle of the knight's fee to the administrative genius of William the Conqueror.12_ But Domesday proves that at the time when the survey was made nothing approaching to a regular distribution of the couttry into knights' fees had been attempted. On two occasions indeed the expression "servitium unius militis," which was afterwards the technical designation of a knight's fee in legal phraseology, 1s

sec. 305. Dr Stubbs notices, in this connexion, that abbots were forbidden to make knights in the Council of London in 1102, He adds that ''Thomas Becket knighted the count of Guisnes, and William, bishop of Ely, knighted Ralph Beauchamp as late as 1191" (Const. Hist., vol. i. p. 367).

§ Norman Conquest, vol. v. p. 485.

7 Madox, Baronia Anglica, p. 29.

§ Stubbs, Select Charters, p. 502.

°. Titles of Honor, pp. 611, 612.

10 Madox, Baronia Anglica, p. 91 sg.; and Selden, ut supra.

1 Madox, ib. cit., p. 115 sq.

2 Hallam, Middle Ages, vol. i. p. 171.

employed. But even the word "miles" had not as yet acquired the special meaning which was subsequently assigned to it Among the ''milites" of Domesday are persons of very various conditions, from

ordinary soldiers and the inferior tenants of manors to Hamo the sheriff – and the earl of Eu.) But when the returns contained in the Black Book of the Exchequer were made in the reign of Henry II., both the principle and system of knights' fees were fully and definitively established. Hence this change must have been effected in the interval between the compilation of these two records. It cannot be supposed that the numerous grants of land made by William I. to his adherents were exempt from military obligation of one kind or another. But no original grant of his or of either of his immediate successors to any lay vassal is in existence to inform us what the exact nature of those military obligations was ; and, arguing from the grants to various ecclesiasti- cal vassals, Dr Stubbs regards it-as- unlikely that such gifts were made on any expressed condition or accepted with a distinct pledge to provide a certain contingent of knights for the king's service. Before the Norman Conquest, he contends, all landholders having been bound to the duty of national defence, and a certain quantity of land having customarily furnished a fully armed man, the old rate of military obligation was in all probability continued in the case of the new grantees after the Conquest. Nothing in Domesday implies that the conditions of military service differed under the old and the new monarchy, and hence Dr Stubbs concludes that "the form in which knights' fees appear when called on by Henry II. for scutage was most probably the result of a series of compositions by which the great vassals relieved their lands from a general burden by carving out particular estates the holders of which performed the services due from the whole; it was a matter of convenience and not of tyrannical pressure." And, although Selden, and Madox after him, adhere to the common and ancient tradition that William the Conqueror made his grants conditional on the service of some particular number of knights in every case, they substanti- ally agree in regarding the knight's fee in its special meaning as the consequence of subinfeudation. From the reign of Henry II. to the reign of Edward I., indeed, what may be called grants in gross from the king and grants in detail from the mesne lords were the ordinary methods of erecting knights' fees and providing for the discharge of the personal and pecuniary obligations with which they were burdened.

Although the feudal services and incidents of a knight's fee appear to have been ascertained with perfect clearness, the exact nature of a knight's fee itself—what it was or in what it consisted—has been the subject of a great deal of controversy. As the demands both personal and pecuniary

1 Ellis, General Introduction to Domesday, vol. i. p. 58 sqg., where examples are noticed. ‘‘ There is no ground," says Mr Freeman, "for thinking that William directly or systematically introduced any new kind of tenure into the holding of English lands. There is nothing to suggest any such belief either in the chronicles of his reign, in the survey which is his greatest monument, in the genuine, or even in the spurious, remains of his legislation. The code of laws which bears William's name, but which is assuredly none of his enacting, is in all but a very few points a mere confirmation of the old English law. And the few points of innovation have nothing to do with feudal tenures, But when we come to the reign next but one we are met by a document which shows us that within thirteen years after the Conqueror's death not only the military tenures but the worst abuses of the inilitary tenures were in full force in England. The great charter of Henry I., the groundwork of the greater charter of J ohn, and thereby the groundwork of all later English legislation, is filled with promises to abolish the very same class of abuses which were at last swept away by the famous statute of Charles II." (Freeman, Norm. Cong., vol. v. p. 372 sq.; Palgrave, Normandy and Hingland, vol. iii. p. 609 sq.; Digby, History of the Law of Real Property, p. 31).

- Stubbs, Con. Hist., vol. i. p. 261 sg.

which were made on the holder of each knight's fee were uniform, it is reasonable to conclude that all such fees were in some way eqnivalent to oneanother. But whether their equivalence was inferred from the quantity of land they contained or from the amount of revenue derived from them has been much debated, and cannot be said to be even now finally settled. Selden, indeed, roundly affirms that "the legal value of knights' fees was never in truth estimable either by any certain number

of acres or quantity of revenue (though some have erroneously determined them by both), but only by the services or number of knights reserved,”3 But if this were the case it is difficult to uuderstand how parts of a knight’s fee such as a half or a third could have been held, as they unquestionably were held, under reduced burdens calculated in proportion to the full burdens of a whole knight’s fee. According to the analogies of the Anglo-Norman policy in other departments of its manifestation, it might have been expected with some degree of confidence that the knight’s fee would have been a combination of the property qualification of the thegn and the feudal attributes of the “fief de hauberc,” that is, of the latter superinduced upon the former. Before the Norman Conquest the property qualification of a thegn was five hides of land, for which a fully equipped warrior was to be furnished for the national defence in the king’s host or “fyrd”; and there is no evidence to rebut the presumption that after the Norman Conquest a similar rate of military obligation was continued. It is not, however, without hesitation that Dr Stubbs arrives at what seems to be rather a provisional than a final determination on the sub- ject. In one passage he observes that “the name of thegn covers the whole class which after the Conquest appears under the name of kniglits, with the same qualification in land and nearly the same obligations.”4 In another passage, on the contrary, he says that “it cannot even be granted that a definite area of land was necessary to con- stitute a knight’s fee ; for although at a later period and in local computations we may find four or five hides adopted as a basis of calculation, where the particular knight’s fee is given exactly, it affords no ground for such a con- clusion.” 5 On the whole he thinks it must be held that its extent was determined not by acreage but by rent or valuation, and that “the common quantity was really expressed in the twenty librates, the twenty pounds’ worth of annual value, which until the reign of Edward I. was the qualification for knighthood.” That this was the established appraisement of the knight’s fee very soon after the Norman Conquest Dr Stubbs infers from the circumstance that Archbishop Lanfranc maintained ten knights to answer for the military service due from the convent of Christ Church in consideration of land worth two hundred pounds a year which on that account was assigned to him.® But, although, as Coke says, the annual

value of a knight's fee was twenty pounds at the enactment of both Magna Charta and the statute "' De Militibus," he cites various writs for distraint of knight- hood which, if indeed some of them were not merely writs of array, would show that it varied irregularly from ten to forty pounds in amount between the reigns of Edward I. and Henry VI.' It was computed at forty ponds in the reign of Elizabeth, and again when Charles I. resorted to "knight-money " as a means of raising a revenue. The aggregate number of knights' fees throughout England in feudal times is very variously stated by tradition. The assertion of Ordericus Vitalis in the reign of Stephen that the Conqueror settled his military fiefs so as to pro- vidé 60,000 knights for his service was accepted, not only

3 Titles of Honor, p. 618.

4 Stubbs, Con. Iist., vol. i. p. 156. 5 Ibid., p. 264 sq.

SOGrd aap: e262. 7 Coke, Second: Institute, p. 596, ed. 1669. XIV. — 15

Knizht- service.

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popularly and in an uncritical age, but by writers of weight from Selden to Hallam. But 60,000 knights' fees at £20 a year gives about twelve times the whole national income from land as it appears in Domesday ; or, if the knight's fee is reckoned at five hides, the aggregate amounts to thirty millions of acres, leaving something more than two millions for royal demesnes, all other tenures, forests, waste, and the rest.1 The Red Book of the Exchequer, which dates from the first third of the 13th century, mentions a tradition, which the compiler himself rejects as unsupported by evidence, that William I. created not 60,000 but 32,000 knights' fees.2 According to the Black Book of the Exchequer the number of knights furnished at the date of its compilation by the tenants in chief of twenty counties taken at random was 3991, and of the ten counties south of the Thames and Avon 2047.3 As it is probable that these ten counties contained about a

fourth of the population, and as the proportion of knights' fees is not very materially departed from in the twenty unselected counties, we should not be far wrong in assuming perhaps that the entire number of knights' fees in the kingdom was between eight and nine thousand.* All tenure in chivalry was founded on homage and fealty, to which were added the various services and liabilities under which the different fiefs or tenements were held. Homage consisted in the mutual acknowledgment by the lord and tenant that the latter was the vassal or mau of the former, accompanied as evidence thereof by certain solemn acts of obeisance on the one hand and of accept- ance and patronage on the other. Hence homage could be done only by the tenant in person to the lord in person. Connected with and following on homage was fealty, which was an undertaking or oath on the part of the tenant that he would be true and faithful to his lord in consideration of the lands which he held of him, and that he would duly and fully observe the several conditions of his tenure, which declaration might be received on behalf of the lord hy anybody whom he might appoint for the purpose. Every tenant in chivalry owed service to his lord in peace as well as in war, and was bound to attend him in his court not less than in the field. The civil obligations of tenants by knight-service were to assist their lords in the adminis- tration of justice and to support them on occasions of ceremony and display. The chief vassals of the king, the earls and barons, were the homagers and peers of the great court-baron of the kingdom, and in turn their under-tenants were the homagers and peers of their palatine and baronial courts. The military obligations of tenants by knight- service were discharged either in the king's armies or in the castles of the king and his principal feudatories. In the first case the holder of a knight's fee was bound to serve in the royal host fully equipped and on horseback at his own expense for forty days in every year when called upon,—a tenant in chief serving under the direct command of the sovereign or his officers, and an under tenant in the martial retinue of his immediate lord. But in the second case the duties of the tenant were not defined by any general rule or custom, and the terms of his service of "castle guard" depended on the special stipulations of his grant or feoffment.> Besides all this, however, tenants by knight-service were subjected to various other

burdens which in course of time became the most important incidents of their tenure. On the death of a tenant, his

1 Pearson, arly and Middle Ages, vol. ii. p. 496.

2 Madox, Baronia Anglica, p. 80.

3 Pearson, lb. cit., vol. ii. 209 sq.

eae lib. cit., vol. i. p. 875. Stubbs, Const. Hist., vol. ii. p 264.

> Magna Carta, sect. 29; Stubbs, Select Charters, p. 800; Selden, Titles of Honor, p. 611. °

heir, if he was of full age, was compelled on taking up his inheritance to pay a fine to his lord. This was called a relief if he was an under tenant, or “ primer seisin” if he was a tenant in chief, and amounted in the first instance to one quarter’s profits, and in the second to one whole year’s profits, of his estate.° The tenant was also liable to render what were called aids to his lord for three purposes, namely, to ransom him from captivity, to make his eldest son a knight, and to provide a portion for his eldest daughter on her marriage. Of these three aids ransom was only a very rare and exceptional demand, while those “pur faire fitz chivaler” and “ pur file marier” were of course of frequent and ordinary occurrence. Wardship and marriage, however, were the main incidents of tenure by knight-service after the military obligations which formed its essential characteristic, and they were always the most unpopular and oppressive of them. When on the death of the tenant the heir was under the age of twenty-one or the heiress under the age of fourteen, the lord became the “ guardian in chivalry” of his or her person and lands until he reached the age of twenty-one or she reached the age of sixteen, when on the payment of half a year’s income of their estate in lieu of all reliefs and “primer seisins ” the wards were entitled to sue out their livery or “ ouster- lemain.” In the meantime the lord had all the profits of the lands, and was not bound to render any account of them, while he was at liberty to assign or sell his

guardian- ship with its attendant rights and immunities unimpaired. Moreover, he was entitled to dispose of his male, as well as his female, wards in marriage to any person of equal or similar rank to their own, and if they rejected the match recommended by him, or married without his consent, they incurred the forfeiture to him of a sum of money equivalent to what was termed the value of their marriage, that is, the price which was to have been given or might have been reasonably expected to be given for it. Nor could the tenant by knight-service part with his lands without the payment of a fine on alienation to his lord, to whom they

altogether passed on his neglect to fulfil his feudal obli-

gations or on the extinction of his heirs. Again, whether he was an under tenant or a tenant in chief, his lands escheated to the king if he was convicted of treason, while if he was convicted of any other felony they escheated to his immediate lord, the king—if he were not the imme-

‘diate lord —entering into possession of them for a year and

a day. Ithad also become customary from a comparatively early period to compel the tenants of knights’ fees to take upon themselves the honorary distinction of knighthood, and it is remarkable that this appears to have been most systematically insisted on after the actual render of military service had been universally commuted to a money equi- valent, and when even that money equivalent itself under its original name of escuage or scutage was passing or had passed away.’ Neglect or refusal to be knighted by any

6 Magna Carta, sect. 2.

7 “Yn the nineteenth of Henry III, all the sheriffs of England were commanded by close writs under the great seal to make proclamation that all they who held of the king in chief one knight’s fee or more and were not as yet knighted should get themselves knighted before the ensuing Christmas, as they loved the tenements and fees they held of the king. Two years before the king had seized the lands and chattels of

Roger de Sumery, including the honour of Dudley, because he did not come to the king to be girded with the belt of knighthood"' (Madox, Baronia Anglica, p. 180). "There can be no doubt," Dr Stubbs says, "that this practice was one of the influences which blended the minor tenants-in-chief with the general body of the free holders; possibly it led also to the development of the military spirit which in the following century [he is speaking of the reign of Edward I.] sus- tained the extravagant designs of Edward III. , and was glorified under the name of chivalry" (Const. Hist., vol. ii. p. 282). The statute "De Militibus " was passed in the reign of Edward II., just at the period when scutage was being abandoned as a special mode of taxation (Stubbs, Const. Hist., vol. ii. p. 522).

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tenant in chivalry who was thereunto commanded by the king's writ subjected the offender, if he was capable of bearing arms, and between the ages of twenty-one and sixty, to a fine. And thus in the progress of events knight-service tended to become more and more divorced froin its primary uses and intentions, and to survive merely as a series of oppressive exactions and idle ceremonies. During the centuries which followed the enactment of the statute of "' Quia Emptores," the king gradually added the character of immediate lord over nearly all the lands held in chivalry within the realm to the character of lord para- mount which had been his from the beginning. When feudalism was as firmly established and as fully developed as it ever was in England, a single officer in each county, called the king's escheator, who was appointed annually by the lord treasurer, was considered sufficient to watch over the royal "droits of seignory" and to prevent the evasion of them. But when nothing save the name and the hard- ships of feudalism remained, the Court of Wards and Liveries was erected, and the scandals and abuses to which its juris- diction gave rise under the Tudors and the first two Stuarts speedily assumed the proportions of an almost intolerable grievance. Towards the end of the reign of James I. the general discontent resulted in an attempt to abolish tenures in

chivalry altogether, compensation being proposed to the king and the mesne lords in the form of a fixed rent in the place of their feudal dues, “which motion, though it proceeded not to effect,” says Coke, ‘‘ yet we thought it well to remember, hoping that so gooda motion . . . will some time or other . . . take effect and be established.”! This hope was in part realized by the Long Parliament, which by resolution of both Houses in 1645 put an end to the Court of Wards and Liveries, and converted all tenures in chivalry into free and common soccage. But it was not until eleven years later that, by an Act of the Commonwealth in 1656, legislative sanction was conferred on these ordinances. Their substance, how- ever, had been embodied in one of the articles of the treaty of Newport between Charles I. and the Parliamentarians, and the king was then to have been indemnified by means of a revenue charged on the lands relieved, amounting to a hundred thousand pounds a year. At the Restoration a tax on lands held in chivalry was proposed in place of knight-service, but an alternative scheme for an excise on beer and some other liquors received the preference. It was not, however, until the abolition of purveyance as well as knight-service had been included in the measure, since known as the 12th Charles II. cap. 24, by way of concession to the claims of the yeomanry and peasantry, that it was permitted to pass, and then only amid vigorous protests from many quarters.

Regarded as a method of military organization, the feudal system of tenures was always far better adapted to the purposes of defensive than of offensive warfare. Against invasion it furnished a permanent provision both in men- at-arms and strongholds ; nor was it unsuited for the cam- paigns of neighbouring counts and barons which lasted for only a few weeks, and extended over only a few leagues. But when kings and kingdoms were in conflict, and distant and prolonged expeditions became necessary, it was speedily discovered that the unassisted resources of feudalism were altogether inadequate. The barons and knights who fought on horseback were in their own country attended by the yeomen and townsmen who fought on foot. But in foreign wars the feudal cavalry alone were available, and the infantry were nearly all aud always mercenary troops. Again, although the

period for which the holders of fiefs were bound to military service had originally been

1 Fustitutes 4, vol. iii. p. 208.

uncertain and unlimited, it gradually became an estab- lished rule, to which the exceptions were everywhere trifling and rare, that it should be restricted in various countries to from forty to sixty days in each year." Hence warlike operations on anything like an extended scale would have been impossible if the terms of the feudal engagement had been strictly observed. In these circumstances it became customary to retain the feudal tenants under arms as stipendiaries after their ordinary and legitimate obligations had been fulfilled. But this arrangement was exceedingly inconvenient in practice to sovereigns and their feudatories alike. It implied to the former the expenditure of large sums of money, then very difficult to raise, on what was frequently an inferior com- modity, and to the latter the neglect of their estates and of all their peaceful duties and diversions. It became therefore the manifest interest of both parties that personal services should be commuted into pecuniary payments. In the early times of feudalism the refusal or omission to discharge the military obligations attached to a fief entailed immediate forfeiture. But the usage of fining the delin- quents in such cases, at first arbitrarily and afterwards in a fixed amount, grew up all over Europe, while in England from the reign of Henry II. to the reign of Edward II. escuage or scutage was regularly levied, originally as an amerciament and subsequently as an ordinary war-tax on tenants by knight-service.2 In this way funds for war were placed at the free disposal of sovereigns, and, although the feudatories and their retainers still formed the most considerable portion of their armies, the conditions under which they served were altogether changed. Their military service was now the result of special agreement, by which they undertook in consideration of certain payments to themselves and their followers, with whom they had entered into similar arrangements, to attend in a particular war or campaign with a retinue of stipulated composition and strength. In the reign of Edward I1., whose warlike enterprises after he was king were confined within the four seas, this alteration does not seem to have proceeded very far, and Scotland and Wales were subjugated by what was in the main if not exclusively a feudal militia raised as of old by

writ to the earls and barons and the sheriffs. But the armies of Edward III., Henry V., and Henry VI. during the. century of intermittent warfare between England and France were recruited and sustained entirely on the principle of contract. On the Continent the systematic employment of mercenaries was both an early and a common practice. But the transition from the feudal régime to the régime of standing armies was every- where sudden and abrupt as compared with the same process among ourselves.

Besides consideration for the mutual convenience of The sovereigns and their feudatories, there were other causes crusades.

which materially contributed towards bringing about the changes in the military system of Europe which were finally accomplished in the 13th and 14th centuries. During the crusades vast armies were set on foot in which feudal rights and obligatious had no place, and it was

2 Du Cange, Gloss., s.v. ‘‘Hostis”; Brussel, Usage Général des Fiefs, p. 162 sq.

3 Henry II. adopted the knight’s fee instead of the hide as the basis of rating (in levying taxes) for the knights and barons, and under him escuage or scutage became ‘‘an honourable commutation for personal service.” Littleton defines knight-service as tenure by “homage, fealty, and escuage”; and, although scutage may have been the nanie for the personal service represented by the tax, it had of course long been replaced by the tax itself when he wrote in the reign of Henry Vi. See Coke-Littleton, bk. ii. chap. 4, sect. 103; Madox, Baronia Anglica, pp. 216-226 ; Pearson, Early and Middle Ages, vol. i. p. 591; Stubbs, Constitutional History, vol. i. pp. 581-590.

4 Stubbs, Const. Hist., vol. ii. p. 278; also compare Grose, Military Antiquities, vol. i. p. 65 sg.

Knight- hood in- depend- ent of feudal- ism.

seen that the volunteers who flocked to the standards of the various commanders were not less but even more effi- cient in the field than the vassals they had hitherto been accustomed to lead. It was thus established that pay, the love of enterprise, and the prospect of plunder, —if we leave zeal for the sacred cause which they had espoused for the moment out of sight,—were quite as useful for the purpose of enlisting troops and keeping them together as the tenuré of land and the solemnities of homage and fealty. Moreover, the crusaders who survived the difficulties and dangers of an expedition to Palestine were seasoned and experienced although frequently im- poverished and landless soldiers, ready to hire themselves to the highest bidder, and well worth the wages they received. Again, it was owing to the crusades that the church took the profession of arms under her peculiar protection, and thenceforward the ceremonies of initiation into it assumed a religious as well as a martial character. Nor was this by any means a merely gratuitous patronage of bloodshed on her part. In the ages of faith and chivalry, magic and sorcery were the terrors alike of the pious and the brave, and the blessings of the priest on the warrior, his weapons, and his armour were always regarded as the surest safeguards against the influence of hostile spells and enchantments. ‘To distinguished soldiers of the cross the honours and benefits of knighthood could hardly be refused on the ground that they did not possess a sufficient property qualification,—of which perhaps they had in fact denuded themselves in order to their own and their retinue’s equipment for the Holy War. And thus the conception of knighthood as of something wholly distinct from and independent of feudalism both as a social condition and a personal dignity arose and rapidly gained ground. It was then that the analogy was first detected which was after- wards more fully developed between the order of knight- hood and the order of priesthood, and that an actual union of monachism and chivalry was effected by the establishment of the religious orders of which the Knights Templars and the Knights Hospitallers were the most eminent examples. As comprehensive in their polity as the Benedictines or Franciscans, they gathered their members from, and soon scattered their possessions over, every country in Europe. And in their indifference to the distinctions of race and nationality they merely accommodated themselves to the spirit which had become

characteristic of chivalry itself, already recognized, like the church, as a universal institution which comprised and knit together the whole warrior caste of Christendom into one great fraternity irrespective alike of feudal sub- ordination and territorial boundaries. Somewhat later the adoption of hereditary surnames and armorial bearings marked the existence of a large and noble class who either from the subdivision of fiefs or from the effects of the custom of primogeniture were very insufficiently provided for. To them only two callings were generally open, that of the churchman and that of the soldier, and the latter as a rule offered greater attractions than the former in an era of much licence and little learning. Hence the favourite expedient for men of birth, although not of fortune, was to attach themselves to some prince or magnate in whose military service they were sure of an adequate maintenance, and might hope for even a rich reward in the shape of booty or of ransom.! It is probably to this period and these circumstances that we must look for at all events the rudimentary beginnings of the military as well as the religious orders of chivalry. Of the existence of any regularly constituted companionships of the first kind there is no trustworthy evidence until between two and three

1 Sainte Palaye, Mémoires sur lAncienne Chevalerie, vol. i. pp. 363, 364, ed. 1781.

centuries after fraternities of the second kind had been organized. Soon after the greater crusading societies had been formed similar orders, such as those of St James of Compostella, Calatrava, and Alcantara, were established to fight the Moors in Spain instead of the Saracens in the Holy Land. But the members of these orders were not less monks than knights, their statutes embodied the rules of the cloister, and they were bound by the ecclesiastical vows of celibacy, poverty, and obedience. From a very early stage in the development of chivalry, however, we meet with the singular institution of brotherhood in arms ; and from it the ultimate origin if not of the religious frater- nities at any rate of the military companionships is usually derived.2 By this institution a relation was created between two or more knights by

voluntary agreement which was regarded as of far more intimacy and stringency than any which the mere accident of consanguinity implied. Brothers in arms were supposed to be partners in all things save the affections of their “lady-loves.” They shared in every danger and every success, and each was ex- pected to vindicate the honour of another as promptly and zealously as his own. Their engagements usually lasted through life, but sometimes only for a specified period or during the continuance of specified circumstances, and they were always ratified by oath, occasionally reduced to writing in the shape of a solemn bond and often sanctified by their reception of the eucharist together. Romance and tradition speak of strange rites—-the mingling and even the drinking of blood—as having in remote and rude ages marked the inception of these martial and fraternal associations.? But in later and less barbarous times they were generally evidenced and celebrated by a formal and reciprocal exchange of weapons and armour. In warfare it was customary for knights who were thus allied to appear similarly accoutred and bearing the same badges or cognizances, to the end that their enemies might not know with which of them they were in conflict, and that their friends might be unable to accord more applause to one than to another for his prowess in the field. It seems likely enough therefore that, at or soon after the period when the crusades had initiated the transformation of feudalism into chivalry as a military system, bodies banded together by engagements of fidelity, although free from monastic obligations, wearing a uniform or livery, and naming them- selves after some special symbol or some patron saint of their adoption, were neither unknown nor even uncommon. And such bodies raised by or placed under the command of a sovereign or grand master, regulated by statutes, and enriched by ecclesiastical endowments would have been precisely what in after times such orders as the Garter in England, the Golden Fleece in Burgundy, the Annunciation in Savoy, and the St Michael and Holy Ghost in France actually were.t The knight too who had “ won his spurs ” was very differently esteemed from the knight who succeeded to them as an incident of his feudal tenure. In rank and the external ensigns of rank under the sumptuary regula- tions of the age they were equal. But it was the first and not the second who was welcomed in court and camp, who was invited to the “round tables” which the

Arthurian romances brought into fashion among the potentates of medieval Europe, and nore particularly Edward III. and Philip VI. And thus it became the ambition of every aspirant to knighthood to gain it by his exploits rather than to claim it merely as his right by virtue of his position and estate. But there was one qualification for knighthood se eee ae 2 Du Cange, Dissertation sur Joinville, xxi. ; Sainte Palaye, Mémoires, vol. i, p. 272; Beltz, Memorials of the Order of the Garter, p. xxvii.

3 5 é : Du Cange, Dissertation, xxi., and Lancelot du Lac, among other romances,

- Anstis, Register of the Order of the Garter, vol. i. p. 63.

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Grades of knight- hood.

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which was theoretically exacted even in England, and which was rigorously exacted abroad. Nobody could be legitimately created a knight who was not a gentleman of “ name and arms,” that is, who was not descended on both sides at the least from grandparents who were entitled to armorial bearings. And this condition is embodied in the statutes of every order of knighthood, religious or military, which can trace its origin to a period when chivalry was a social institution.+

During the 14th and 15th centuries, as well as some- what earlier and later, the general arrangements of a Euro- pean army were always and everywhere pretty much the same.? Under the sovereign the constable and the marshal or marshals held the chief commands, their authority being partly joint and partly several. Attendant on them were the heralds, who were the officers of their military court, wherein offences committed in the camp and field were tried and adjudged, and among whose duties it was to carry orders and messages, to deliver challenges and call truces, and to identify and number the wounded and the slain. The main divisions of the army were distributed under the royal and

other principal standards, smaller divisions under the banners of some of the greater nobility or of knights banneret, and smaller divisions still under the penuons of knights or, as in distinction from knights banneret they came to be called, knights bachelors. All knights whether bachelors or bannerets were escorted by their squires. But the banner of the banneret always implied a more or less extensive command, while every knight was entitled to bear a pennon and every squire a pencel. All three flags were of such a size as to be conveniently attached to and carried on a lance, and were emblazoned with the arms or some portion of the bearings of their owners. But while the banner was square the pennon, which resembled it in other respects, was either pointed or forked at its extremity, and the pencel, which was considerably less than the others, always terminated in a single tail or streamer.? As we have already indicated, it became the custom from the time of the crusades to seek out and as far as possible to establish analogies be- tween the institutions of chivalry and the church. In the military grades of the squire, the knight, and the banneret, therefore, were of course seen the representatives of the

1 Being made to “ride the barriers” was the penalty for anybody

who attempted to take part in a tournament without the qualification of name and arms. Hence the importance of the descents in geometrical progression commonly referred to as “sixteen quarters,” be- ginning with ‘‘three descents” in England, “four lines” in France, ‘four quarters” in the empire, and ‘‘ four branches” in Scotland. The books where this subject may be pursued are far too numerous to mention. Guillim (Display of Heraldry, p. 66) and Nisbet (System of Heraldry, vol. ii. p. 147) speak of it as concerning England and Scotland. See also Ashmole’s Order of the Garter, p. 284. But in England knighthood has always been conferred to a great extent independently of these considerations. At almost every period there have been men of obscure and illegitimate birth who have been knighted. Ashmole cites Sandars’s Ilandria Illustrata to the effect that “the degree of knighthood is of so great splendour and fame that it bestows gentility not only upon a man meanly born but also upon his descendants, and very much increaseth the honour of those who are well descended.” And he adds

that “it is a maxim laid down by a learned civilian (Tiraquel, De Nobilitate) that knight- hood ennobles,insomuch that whosoever is a knight it necessarily follows that he is also a gentleman (Militia nobilitat ut quisquis est Miles is quoque continuo sit nobilis), for, when a king gives the dignity to an ignoble person whose merit he would thereby recompense, le is under- stood to have conferred whatsoever is requisite for the completing of that which he bestows.” By the common law, if a villain were made a knight he was thereby enfranchised and accounted a gentleman, and if a person under age and in wardship were knighted both his minority and wardship terminated. —Order of the Garter, p. 48; Nicolas, British Orders of Knighthood, vol. i. p. v.

“Grose, Military Antig., vol. i. p. 207 sq.; Stubbs, Const. Wist., vol. ii. p. 276 sq., and vol. iii. p. 278 sq.

- Grose’s Military Antiquities, vol. ii. p. 256.

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clerical grades of the deacon, the priest, and the bishop. But despite that the ceremonies of ordination were unques- tionably imitated in the ceremonies of knighting, there is no reason for supposing that the resemblance, such as it was, which obtained between the chivalrous and the eccle- siastical series of degrees was otherwise than accidental. Moreover, it failed in at least two material respects, namely, that squirehood although the usual was not the necessary preliminary to knighthood, and that in all the attributes of knighthood as knighthood a knight bachelor was as fully and completely a knight as a knight banneret. If indeed we look at the scale of chivalric subordination from another point of view, it seems to be more properly divisible into four than into three stages, of which two may be called provisional and two final, The bachelor and the banneret were both equally knights, only the one was of greater distinction and authority than the other. In like manner the squire and the page were both in training for knighthood, but the first had advanced further in the process than the second. It is true that the squire was a combatant while the page was not, and that many squires voluntarily served as squires all their lives owing to the

insufficiency of their fortunes to support the costs and charges of knighthood. But in the ordinary course of a chivalrous education the successive conditions of page and squire were passed through in boyhood and youth, and the condition of knighthood was reached in early manhood. Every feudal court and castle was in fact a school of chivalry in which the sons of the sovereign and his vassals, or of the feudatory and his vassals, together commonly with those of some of their allies or friends, were reared in its principles and habituated to its customs and observances. And, although princes and great personages were rarely actually pages or squires, the moral and physical discipline through which they passed was not in any important particular different from that to which less exalted eandi- dates for knighthood were subjected.> The page, or, as he was more anciently and more correctly called, the " valet " or "damoiseau," commenced his service and instruction when he was between seven and eight years old, and the initial phase continued for seven or eight years longer. He acted as the constant personal attendant of both his master and mistress. He waited on them in their hall and. accompanied them in the chase, served the lady in her bower and followed the lord to the camp.6 From the chaplain and his mistress and her damsels he learnt the rudiments of religion, of rectitude, and of love ;7 from his master and his squires the elements of military exercise, to cast a spear or dart, to sustain a shield, and to march with the measured tread of a soldier ; and from his master and his huntsmen and falconers the "mysteries of the

4 The same analogy may be drawn between bachelors, masters, and doctors; barristers, serjeants, and judges; or pursuivants, heralds, and kings of arms.

5 Sainte Palaye, Mémozres, vol. i. p. 36; Froissart, bk. iii. chap. 9.

§ Sainte Palaye, Mémoires, part i.; and Mills, History of Chivalry, vol. i. chap. 2.

7 "Te petit Jehan de Sainutré" is the great example on this point, especially the homily addressed to him by La Dame des Belles-Cousines. Therein she instructs him how he ought to love par amours. But Sir Walter Scott says that ''so pure was the nature of the flame

which she recommended that she maintained it to be incon- sistent even with the seventh sin of chambering and wantonness to which it might seem too nearly allied. The least dishonest thought or action was, according to her doctrine, sufficient to forfeit the chivalrous lover the favour of his lady. It seems, however, that the greater part of her charges concerning incontinence is levelled against such as haunted the receptacles of open vice, and that she reserved an exception (of which in the course of the history she made liberal use) in favour of the intercourse which in all love, honour, and secrecy might take place when the favoured and faithful knight had obtained by long ser- vice the boon of amorous mercy from the lady whom he loved par amours" (article CHIVALRY in 7th and 8th editions of the Hncyclo- pedia Britannica).

woods and rivers," or in other words the rules and prac- tices of hunting and hawking. When he was between fifteen and sixteen he became a squire. But no sudden or great alteration was made in his mode of life. He con- tinued to wait at dinner with the pages, although in a manner more dignified according to the notions of the age. He not only served but carved and helped the dishes, proffered the first or principal cup of wine to his master and his guests, and carried to them the basin, ewer, or napkin when they washed their hands before and after meat. He assisted in clearing the hall for dancing or minstrelsy, and laid the tables for chess or draughts, and he also shared in the pastimes for which he had made preparation. He brought his master the "vin de coucher' at night, and made his early refection ready for him in the morning. But his military exercises and athletic sports occupied an always increasing portion of the day. He accustomed himself to ride the " great horse," to tilt at the quintain, to wield the sword and battle-axe, to swim and climb, to run and leap, and to bear the weight and overcome the embarrassments of armour. He inured him- self to the vicissitudes of heat and cold, and voluntarily suffered the pains or inconveniences of hunger and thirst, fatigue, and sleeplessness. It was then too that he chose his "lady-love," whom he was expected to regard with an adoration at once earnest, respectful,

and the more meri- torious if concealed. And when it was considered that he had made sufficient advancement in his military accom- plishments, he took his sword to the priest, who laid it on the altar, blessed it, and returned it to him.! Afterwards he either remained with his early master, relegating most of his domestic duties to his younger companions, or he entered the service of some valiant and adventurous lord or knight of his own selection. He now became a “squire of the body,” and truly an “armiger” or “‘scutifer,” for he bore the shield and armour of his leader to the field, and, what was a task of no small difficulty and hazard, cased and secured him in his panoply of war before assisting him to mount his courser or charger. It was his function also to display and guard in battle the banner of the baron or banneret or the pennon of the knight he served, to raise him from the ground if he were unhorsed, to supply him with another or his own horse if his was disabled or killed, to receive and keep any prisoners he might take, to fight by his side if he was unequally matched, to rescue him if captured, to bear him to a place of safety if wounded, and to bury him honourably when dead. And after he had worthily and bravely borne himself for six or seven years as a squire, the time came when it was fitting that he should be made a knight.

Modes of Two modes of conferring knighthood appear to have

confer- prevailed from a very early period in all countries where

relates .

knight Chivalry was known. In both of them the essential

hood. portion seems to have been the accolade. But while in the one the accolade constituted the whole or nearly the whole of the ceremony, in the other it was surrounded with many additional observances. As soon as we have any historical evidence of their separate and distinct existence, we discover them as severally appropriated, the first to time of war and the second to time of peace.”

1 Sainte Palaye, Mémoires, vol. i. p. 11 sq. :—**C’est peut-étre a cette cérémonie et non 4 celles de la chevalerie qu’on doit rapporter ce qui

se lit dans nos historiens de la premidre et de la seconde race au sujet des premiéres armes que les Rois et les Princes remettoient avec solemnité au jeunes Princes leurs enfans.”

? There are several obscure points as to the relation of the longer and shorter ceremonies, as well as the origin and original relation of their several parts. There is nothing to show whence came ‘‘ dubbing” or the “accolade.” It seems certain that the word ‘‘dub” means to strike, and the usage is as old as the knighting of Henry by William the Conqueror (supra, pp. 111, 112). So, too, in the empire a dubbed

In one of the oldest records of chivalry quoted by Selden, under the heading of ‘Comment on doit faire et creer ung Chivalier,” it is stated that, ‘‘quant ung Escuier que a longement voyage et este en plusiers faicts d’armes et que ade quoy entretenir son estate et quil est de grant maison et rich et qu’il se trouve en un battaile on recounter il doit adviser le chiefe de l’armé ou vaillant chivalier. Alors doit venir devant luy et demander ‘chivalier au nom de Dieu et de Sainct George donnez moy le ordre’ et le dit chivalier ou chiefe de guerre doit tirer l’espee nue vers le dict demaundeur et doit dire en frappant trois fois sur iceuly : ‘Je te fais chivalier au nom de Dieu et de mon seigneur Sainct George, pour la foy et justice loyalment garder et l’eglise, femes, vesves, et orphelins defender.” ° But the words of creation were various as well as the words of the exhortation. Sometimes the first were “ avancez chevalier au nom de Dieu,” or “au nom de Dieu, Saint Michel, et Saint George je te fais chevalier”; and the secoud “soyez preux, hardi, et loyal,” “be a good knight in the name of God”; or “ soyez bon chevalier,” or “be a good knight,” merely. In this form a number of knights were made before and after almost every battle between the 11th and the 16th centuries, and its advantages on the score of both convenience and economy gradually led to its general adoption both in time of peace and time of war. On extraordinary occasions indeed the more elaborate ritual continued to be observed. But recourse was had to it so rarely that among us about the beginning of the 15th century it came to be exclusively appropriated to a special kind of knighthood. When Segar, garter king of arms, wrote in the reign of Queen Elizabeth, this had been accomplished with such

completeness that he does not even mention that there were two ways of creating knights bachelors. “He that is to be made a knight,” he says, “is striken by the prince with a sword drawn upon his back or shoulder, the prince saying, ‘Soys Chevalier,’ and in times past was added ‘Saint George.’ And when the knight rises the prince sayeth ‘Avencez.’ This is the manner of dubbing knights at this present, and that term ‘dubbing’ was the old term in this point, not ‘ creating.’ This sort of knights are by the heralds called knights bachelors.”* In our days when a knight is personally made he kneels before the sovereign, who lays a sword drawn, ordinarily the sword of state, on either of his shoulders, and says, “ Rise,” calling him by his Christian name with the addition of “Sir” before it.5

Very different were the solemnities which attended the creation of a knight when the complete procedure was observed. “The ceremonies and circumstances at the giving this dignity,” says Selden, “‘in the elder time were of two kinds especially, which we may call courtly and sacred. The courtly were the feasts held at the creation, giving of robes, arms, spurs, and the like, whence in the stories of other nations so in those of ours ‘armis militaribus donare’ or ‘ cingulo militari,’ and such more phrases are the same with ‘ militem facere’ or to make a knight. The sacred were the holy devotions and

knight is ‘‘ ritter geschlagen.” The ‘‘ accolade” may etymologically refer to the embrace, accompanied by a blow with the hand, characteristic of the longer form of knighting. The derivation of ‘‘adoubcr,”’ corresponding to ‘‘dub,” from ‘‘ adoptare,’’ which is given by Du Cange, and would connect the ceremony with ‘‘adoptio per arma,” is certainly inaccurate. he investiture with arms, which formed a part of the longer form of knighting, and which we have seen to rest on very ancient usage, may originally have had a distinct meaning. We have observed that Lanfranc invested Henry J. with arms, while William “dubbed him to rider.” If there was a difference in the meaning of the two ceremonies, the difficulty as to the knighting of Earl Harold (supra, p. 112) is at least partly removed,

3 Titles of Honor, p. 455 ; 7b., 365.

= Segar, Honor Civil and Military, p. 74.

5 Nicolas, British Orders of Knighthood, p. vii.

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what else was used in the church at or before the re- ceiving of the dignity, whence also ‘consecrare militem’ was to make a knight. Those of the first kind are various in the memories that preserve them, and yet they were rarely or never without the girding with a sword until in the later ages wherein only the stroke on the neck or shoulder according to the use at this day hath most commonly supplied it.”! Of these “ceremonies and circumstances” Selden gives several examples, especially those of the knighting of Geoffrey of Anjou by Henry L, of Alexander III. of Scotland by Henry III. of England, and of Edward Prince of Wales (afterwards Edward I.) by his father Edward I. But the leading authority on the subject is au ancient tract written in French, which will be found at length either in the original or translated by Segar, Dugdale, Byshe, and Nicolas, among other English writers.? Daniel explains his reasons for transcribing it, “tant a cause du detail que de la naiveté du stile et encore plus de la bisarrerie des ceremonies que se faisoient pourtant alors fort serieusement,” while he adds that these ceremonies were essentially identical in England, France, Germany, Spain, and Italy.

The process of inauguration was commenced in the evening by the placing of the candidate under the care of two ‘‘esquircs of honour grave and well seen in courtship and nurture and also in the feats of chivalry,” who were to be ‘‘governors in all things relating to him.” Under their direction, to begin with, a barber shaved him and cut his hair. He was then conducted by them to his appointed chamber, where a bath was prepared hung within and without with linen and covered with rich cloths, into which after they had undressed him hcentered. While he was in the bath two ‘ancient and grave knights” attended him ‘‘to inform, instruct, and counsel him touching the order and feats of chivalry,” and when they had fulfilled their mission they poured some

of the water of the bath over his shoulders, signing the left shoulder with the cross, and retired? He was then taken from the bath and put into a plain bed without hangings, in which he remained until his body was dry, when the two esquires put on him a white shirt and over that ‘‘a robe of russet with long slecves having a hood thereto like unto that of an hermit.” Then the ‘‘two ancient and grave knights” returned and led him to the chapel, the csquires going before them ‘‘sporting and dancing” with ‘“‘the minstrels making melody.” And when they had been served with wines and spices they went away leaving only the candidate, the esquires, ‘‘ the priest, the chandler, and the watch” who kept the vigil of arms until sunrise, the candidate passing the night ‘‘ bestowing himself in orisons and prayers.” At daybreak he confessed to the priest, heard matins, and communicated in the mass, offering a tapcr and a piece of money stuck in it as near the lighted end as possible, the first ‘‘ to the honour of God” and the second ‘‘to the honour of the person that makes him a knight.” Afterwards he was taken back to his chamber, and remained in bed until the knights, esquires,

1Selden, Titles of Honor, p. 689.

- Daniel, Histoire de la Milice Francoise, vol. i. pp. 99-104; Byshe’s Upton, De Studio Militari, pp. 21-24; Dugdale, Warwick-shire, vol. ii. pp. 708-710; Segar, Honor Civil and Military, p. 69 sq.; and Nicolas, Orders of Knighthood, vol. ii. (Order of the Bath), p. 19 sg. It is given as “ the order and manner of creating Knights of the Bath in time of peace according to the custom of England,” and consequently dates from a period when the full ceremony of creating knights bachelors generally had gone out of fashion. But as Ashmole, speaking of Knights of the Bath, says, “ if the ceremonies and circum- stances of their creation be well considered, it will appear that this king [Henry IV.] did not institute but rather restore the ancient manner of making knights, and consequently that the Knights of the Bath are in truth no other than knights bachelors, that is to say, such as are created with those ceremonies wherewith knights bachelors were formerly created” (Ashmole, Order of the Garter, p. 15). It is Singular that

Dugdale in his translation of this ancient formulary has accidentally omitted the actual dubbing or accolade. See also Selden, of Honor, p. 678 ; and the Archeological Journal, vol. v. p. sq.

. In another formulary in the Cotton MSS. (Tib. E. viii. f. 72), which is printed in full in the Archeological Journal, vol. v. p. 267 sg., the shoulders of the candidate are to be signed with the sign of the cross, and in still another formulary among the Astley MSS. the cross was to be signed on the candidate's left shoulder only by the senior of the ancient and grave knights ''in nomine patris," &c. In both, however, the cross is to be kissed by the officiating knight after he had signed it with the water.

and minstrels went to him and aroused him. The knights then dressed him in distinctive garments, and they then mounted their horses and rode to the hall where the candidate was to receive knighthood ; his future squire was to ride before him bareheaded bearing his sword by the point in its seabbard with his spurs hang- ing from its hilt. And when everything was prepared the prince or subject who was to knight him came into the hall, and, the candidate's sword and spurs having been presented to him, he delivered the right spur to the ''most noble and gentle" knight present, and directed him to fasten it on the candidate's right heel, which he kneeling on one knee and putting the candidate's right foot on his knee accordingly did, signing the candidate's knee with the cross, and in like manner by another ''noble and gentle" knight the left spur was fastened to his left heel. And then he who was to create the knight took the sword and girded him with it, and then embracing him he lifted his right hand and smote him on the neck or shoulder, saying, '' Be thoua good knight," and kissed him. When this was done they all went to the chapel with much music, and the new knight laying his right hand on the altar pro- mised to support and defend the church, and ungirding his sword offered it on the altar. And as he came out from the chapel the master cook awaited him at the door and claimed his spurs as his fee, and said, '' If you do

anything contrary.to the order of chivalry (which God forbid), I shall hack the spurs from your heels.”

As may be gathered from Selden, Favyn, La Colombiers, Menestrier, and Sainte Palaye, there were several differ- ences of detail in the ceremony at different times and in different places) But in the main it was everywhere the saine both in its military and its ecclesiastical elements. In the Pontzjficale Romanum, the old Ordo Romanus, and the manual or Common Prayer Book in use in England before the Reformation forms for the blessing or consecra- tion of new knights are included, and of these the first and the last are quoted by Selden.* But the full solemnities for conferring knighthood seem to have been so largely and so early superseded by the practice of dubbing or giving the accolade alone that in England it became at last restricted to such knights as were made at coronations and some other occasions of state. And to them the particular name of knights of the bath was assigued, while knights made in the ordinary way were called in distinction from then knights of the sword, as they were also called knights bachelors in distinction from knights banneret.5 It is usually supposed that the first creation of Kniglits of the Bath under that designation was at the coronation of Henry IV.; and before the Order of the Bath as a com- panionship or capitular body was instituted the last creation of them was at the coronation of Charles II. But all knights were also knights of the spur or “ equites aurati,” because their spurs were golden or gilt, —the spurs of squires being of silver or white metal,—and these became their peculiar badge in popular estimation and proverbial speech. In the form of their solemn inauguration too, as we have noticed, the spurs together with the sword were always employed as the leading and most characteristic ensigns of knighthood.®

With regard to knights banneret various opinions have been entertained as to both the nature of their dignity and the qualifications they were required to possess for receiv- ing it at different periods and in different countries. On the Continent the distinction which is commonly but in- correctly made by us between the nobility and the gentry has never arisen, and it was unknown here while chivalry

existed and heraldry was understood. Here, as elsewhere in the old time, a nobleman and a gentleman meant the

4 Titles of Honor, pp. 369 aud 648. See also p. 867 for the ceremonies observed at the knighting of William, count of Holland, when he was elected king of the Romans in 1247, and Selden's remarks and authorities with respect to the disuse of the ancicnt form of investiture with arms in the empire.

5 Selden, Titles of Honor, p. 678; Ashmole, Order of the Garter, p. 15; Favyn, Thédtre dTonneur, vol. ii. p. 1035.

6 "Tf we sum up the principal ensigns of knighthood, ancient and modern, we shall find they have been or are a horse, gold ring, shield and lance, a belt and sword, gilt spurs, and a gold chain or collar. — Ashmnnole, Order of the Garter, pp. 12, 18.

same thing, namely, a man who under certain conditions of descent was entitled to armorial bearings. Hence Du Cange divides the medieval nobility of France and Spain into three classes :—first, barons or ricos hombres ; secondly, chevaliers or caballeros; and thirdly, écuyers or infanzons; and to the first, who with their several special titles constituted the greater nobility of either country, he limits the designation of banneret and the right of leading their followers to war under a banner, otherwise a '"drapeau quarré" or square flag.1 Selden mentions as an instance of "the nearness and sometimes community of the title of banneret and baron" the "bannerherr" or " dominus vexillifer" of the empire. And he also shows especially from the parliament rolls that the term banneret has been occasionally employed in England as equivalent to baron, where, for example, in the reign of Richard II. among "divers other earls and barons there mentioned by name 'plusiers autres barons et bannerets esteants au dit parlament assemblez'" are referred to.? In Scotland even as late as the reign of James VI., lords of parliament were always created bannerets as well as barons at their investi- ture, "part of the ceremony consisting in the display of a banner, and such ' barones majores' were thereby

entitled to the privilege of having one borne by a retainer before them to the field of a quadrilateral form.”* In Scotland, too, lords of parliament and bannerets were also called bannerents, banrents, or baronets, and in England ban- neret was often corrupted to baronet. ‘‘ Even in a patent passed to Sir Ralph Fane, knight under Edward VI., he is called ‘baronettus’ for ‘bannerettus.’”* In this man- ner it is not improbable that the title of baronet may have been suggested to the advisers of James J. when the Order of Baronets was originally created by him, for it was a question whether the recipients of the new dignity should be designated by that or some other name.® But there is no doubt that as previously used it was merely a corrupt synonym for banneret, and not the name of any separate dignity. On the Continent, however, there are several re- corded examples of bannerets who had an hereditary claim to that honour and its attendant privileges on the ground of the nature of their feudal tenure. And generally, at any rate to commence with, it seems probable that bannerets were in every country merely the more important class of feudatories, the “ricos hombres” in contrast to the knights bachelors, who in France in the time of St Louis were known as ‘‘pauvres hommes.” In England all the barons or greater nobility were entitled to bear banners, and there- fore Du Cange’s observations would apply to them as well as to the barons or greater nobility of France and Spain. But it is clear that from a comparatively early period ban- nerets whose claims were founded on personal distinction rather than on feudal tenure gradually came to the front, and much the same process of substitution appears to have gone on iu their case as that which we have marked in the case of simple knights. According to the Sallade and the

Division du Monde, as cited by Selden, bannerets were |

clearly in the beginning feudal tenants of a certain magni- tude and importance and nothing more, and different forms for their creation are given in time of peace and in time $$ ES

1 On the banner see Grose, Military Antiquities, vol. ii. Bilas Nicolas, British Orders of Knighthood. i ie 1 Xxxvii, eeainiiaa

2 Titles of Honor, pp. 356 and 608. See also Hallam, Afiddile Ages, vol. iii. p. 126 sg., and Stubbs, Const. Hist., vol. iii. p. 440 sq.

a Riddell's Law and Practice in Scottish Peerages, p. 578. Also Nisbet's System of Heraldry, vol. ii. p. 49; and Selden's Titles of Honor, p. 702. "Selden, Titles of Honor, pp. 608 and 657.

5 See " Project concerninge the conferinge of the title of vidom." wherein it is said that 'the title of vidom (vicedominus) was an ancient title used in this kingdom of England both before and since the Norman Conquest " (State Papers, Janes I. Domestic Series, vol. lxiii. p. 150 B, probable date April 1611).

8 Selden, Titles of Honor, p. 452 sq.

of war.' But in the French Gesta Romanorum the warlike form alone is given, and it is quoted by both Selden and Du Cange. From the latter a more modern version of it is given by Daniel as the only one generally in force. "Quand un bachelier," says the ceremonial in question, "a grandement servi et suivi la guerre et que ila terre assez et qu'il puisse avoir gentilshommes ses hommes et pour accom- pagner sa banniére il peut licitement lever banniére et non autrement; car nul homme ne doit lever banniére en bataille sil n'a du moins cinquante hommes d'armes, tous ses hommes, et les archiers et les arbelestriers qui y appartien- nent, et s'il les a, il doit & la premiére bataille ou il se trouvera apporter un pennon de ses armes et doit venir au connetable ou aux maréchaux ou a celui qui sera lieu- tenant de l'ost pour le prince et requirir qu'il porte ban- niére, et s'il lui octroyent doit sommer les herauts pour temoignage et doivent couper la queue du pennon."§ The earliest contemporary mention of knights banneret is in France, Daniel says, in the reign of Philip Augustus, and in England, Selden says, in the reign of Edward I. But in neither case is reference made to them in such a manner as to suggest that the dignity was then regarded as new or even uncommon, and it seems pretty certain that its existence on one side could not have long pre- ceded its existence on the other side of the Channel. Sir Alan Plokenet, Sir Ralph Daubeney, and Sir Philip Daubeney are entered as bannerets on the roll of the garrison of Caermarthen castle in 1282, and the roll of Carlaveroeck records the

names and arms of eighty-five bannerets who accompanied Edward I. in his expedition into Scotland in 1300. Selden quotes some and refers to many of the wardrobe accounts of Edward II. in which contracts with and payments to bannerets are mentioned, observing that “under these bannerets divers knights bachelors and esquires usually served, and according to the number of them the bannerets received wages.” ® What the exact contingent was which they were expected to supply to the royal host isdoubtful. In the authorities collected by Selden, Du Cange, and Daniel it varies from ten and twenty-five to fifty men-at-arms with their attend- ants. Grose seems to prefer the medium estimate of a hundred mounted combatants in all, that number forming a square of ten in each face, and being the lowest equi- valent of the more modern squadron.!° But, however this may be, in the reign of Edward III. and afterwards bannerets appear as the commanders of a military force raised by themselves and marshalled under their banners — although paid through them by the sovereign—who were moreover always persons of property and soldiers of dis- tinction. At the same time their status and their rela- tions both to the crown and their followers were the conse- quences of voluntary contract not of feudal tenure. It is from the reigns of Edward IIL and Richard IT. also that the two best descriptions we possess of the actual creation of a banneret have been transmitted tous. During Edward the Black Prince’s expedition of 1367 into Spain, Sir John Chandos, one of the founder Knights of the Garter, was made a banneret on the morning of the day on which the battle of Navarrete was fought. When the troops were drawn up in order before the action commenced, “ Sir John Chandos,” says Froissart, “advanced in front of the bat- talions with his banner uncased in hishand. He presented it to the prince, saying, ‘My lord, here is my vanner; I present it to you that I may display it in whatever manner shall be most agreeable to you; for, thanks to God, I have

7 Selden, Titles of Honor, p. 449 sq.

8 Du Cange, Dissertation [X.; Selden, Titles of Honor, p. 452; Daniel, Milice Frangoisc, vol. i. p. 86.

® Selden, Titles of Honor, p. 656.

10 Military Antiquities, vol. ii. p. 206.

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now sufficient lands to enable me to do so and maintain the rank which it ought to hold.’ The prince, Don Pedro,

being present took the banner in his hands, which was |

blazoned with a sharp stake gules on a field argent; after having cut off the tail to make it square, he displayed it, and returning it to him by the handle said, ‘Sir John, I return you your banner ; God give you strength and honour to preserve it.’ Upon this Sir John left the prince, went back to his men with the banner in his hand, and said to them, ‘Gentlemen, behold my banner and yours; you will therefore guard it as it becomes you.’ His companions taking the banner replied with much cheerfulness that ‘ if it pleased God and St George they would defend it well and act worthily of it to the utmost of their abilities.’ ”} At a later period some distinction appears to have been made between bannerets who were created under the royal standard, the king himself being present with his army in open war, and bannerets who were created only by the king’s lieutenants, as Sir John Chandos and Sir Thomas Trivet were created. But no such distinction seems to have existed in the reigns of Edward III. and Richard IL.; and, although it was doubtless of more ancient origin, the earliest contemporary evidence of its existence is of the reign of James J., when bannerets whether of one or two classes had practically disappeared. Sir Thomas Smith, writing towards the end of the 16th century, says, after noticing the conditions to be observed in the creation of bannerets, ‘‘ but this order is almost grown out of use in England ;”? and during the controversy which arose be- tween the new order of baronets and the crown early in the 17th century respecting their precedence? it was alleged without contradiction in an argument on behalf of the baronets before the privy council that ‘“‘there are not bannerets now in being, peradventure never shall be.” 4 Sir Ralph Fane, Sir Francis Bryan, and Sir Ralph Sadler were created bannerets by the Lord Protector

Somerset after the battle of Pinkie in 1547, and the better opinion is that this was the last occasion on which the dignity was conferred. It has been stated indeed that Charles I. created Sir John Smith a banneret after the battle of Edgehill in 1642 for having rescued the royal standard from the enemy. But of this there is no sufficient proof. It was also supposed that George III. had created several naval officers bannerets towards the end of the last cen- tury, because he knighted them on board ship under the royal standard displayed.5 This, however, is unquestion- ably an error. Knights bannerets were not distinguished from knights bachelors merely because they were created under the standard or banner of the sovereign, but further because their own pennons were converted into or exchanged for banners.

On the Continent the degree of knight bachelor disap-

1 Froissart, bk. i. chap. 241. The other case is that of Sir Thomas Trivet in 1380 (Froissart, bk. ii. chap. 53).

- Commonwealth of England, p. 48, ed. 1640.

3 By the decree of 1612 on the precedence of baronets they are placed after the younger sons of viscounts and barons, who came next to “ bannerets made by the sovereign in person under the royal stand- ard displayed in an army royal in open war,’’ and immediately before ““bannerets not made by the sovereign in person,” and are still so ranked in all the “Tables of Precedence” (see Selden, Titles of Honor, p. 749, 750).

4 State Papers, Domestic Series, James the First, vol. Ixvii. p. 119.

5 “Thursday, June 24th: His Majesty was pleased to confer the honour of knights banneret on the following flag officers and commanders under the royal standard, who kneeling kissed hands on the occasion; Admirals Pye and Sprye, Captains Knight, Bickerton, and Vernon” (Gentleman’s Magazine, vol. xliii. p. 299, 1773). Sir Harris Nicolas remarks on these and the other cases (British Orders of Knighthood, p. xliii.), and Sir William Fitzherbert published anony- mously a

pamphlet on the subject, A Short Inquiry into the Nature of the Titles conferred at Portsmouth, &c., which is very scarce, but 1s to be found under the name of “ Fitzherbert” in the catalogue of the British Museum Library.

peared with the military system which had given rise to it. Existing It is now therefore peculiar to the United Kingdom, where, orders of although very frequently conferred by letters patent, it is yet knight- the only dignity which is still even occasionally created— a

as every dignity was formerly created—by means of a cere- mony in which the sovereign and the subject personally take part. Everywhere else dubbing or the accolade seems to have become obsolete, and no other species of knighthood, if knighthood it can be called, is known except that which is dependent on admission to some particular order. It is a common error to suppose that baronets are hereditary knights. Baronets are not knights unless they are knighted like anybody else; and, so far from being knights because they are baronets, one of the privileges granted to them shortly after the institution of their dignity was that they, not being knights, and their successors and their eldest sons and heirs apparent should, when they attained their majority, be entitled if they desired to receive knighthood.® It is a maxim of the law indeed that, as Coke says, “the knight is by creation and not by descent,” and, although we hear of such designations as the “ knight of Kerry” or the “knight of Glin,” they are no more than traditional nick- names, and do not by any means imply that the persons to whom they are applied are knights in a legitimate sense. Notwithstanding, however, that simple knighthood has gone out of use abroad, there are innumerable grand crosses, commanders, and companions of a formidable assortment of orders in almost every part of the world,’ from that of the Golden Fleece of Spain and Austria to those of St Charles of Monaco and of King Kamehameha of the Sandwich Islands. But, with the exception of the orders of the Golden Fleece founded by Philip II., duke of Burgundy, in 1429, and of the Annunciation founded by Charles III., duke of Savoy, in 1518—now that the orders of St

Michael founded by Louis XI. and of the Holy Ghost founded by Henry III. of France, in 1469 and 1578, are either extinct or in abeyance—none of the foreign military as distin- guished from the religious orders of knighthood have any actual historical connexion with chivalry. The orders of the Genet of France and the Oak of Navarre of course are to be classed as mere fictions with the order of the Round Table of Britain. But the pretensions of almost every other foreign order to extreme antiquity, as for example of the Elephant and Danneborg of Denmark, the White Eagle of Poland, or the Seraphim of Sweden, if they are less obviously extravagant, are not more susceptible of verification. It has nearly always been the practice even in modern days to represent the establishment as the revival or reorganization of an order. We ourselves have seven orders of knighthood, the Garter, the Thistle, St Patrick, the Bath, the Star of India, St Michael and St George, and the Indian Empire; and, while the first is undoubtedly the oldest as well as the most illustrious anywhere existing, a fictitious antiquity has been claimed

6 «¢SirHenry Ferrers, Baronet, was indicted by the name of Sir Henry Ferrers, Knight, for the murther of one Stone whom one Nightingale feloniously murthered, and that the said Sir Henry was present aid- ing and abetting, &c. Upon this indictment Sir Henry Ferrers being arraigned said he never was knighted, which being confessed, the in- dictment was held not to be sufficient, wherefore he was indicted de novo by the name of Sir Henry Ferrers, Baronet.” Brydall, Jus Imaginis apud Anglos, or the Law of England relating to the Nobility and Gentry, p. 50, London, 1675. After the dispute between the baronets and the younger sons of viscounts and barons for pre- cedence in 1612, it was declared by James I., among other con- cessions to them, that ‘‘ his Majesty is pleased to knight the present baronets that are no knights,’”’ and that for the future all baronets and their eldest sons and heirs apparent should be knighted if they pleased to apply for knighthood when they came or were of age.—Datent Rolls, 10 Jac. I., part x. No. 18; Selden, Titles of Honor, p. 687.

7 Louis XIV. introduced the practice of dividing the members of mili- tary orders into several degrces when he established the order of St

Louis in 1693.

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Order of the Garter.

and is even still frequently conceded to the second and fourth, although the third, fifth, sixth, and seventh appear to be as contentedly as they are unquestionably recent.

It is, however, certain that the “most noble” Order of the Garter at least was instituted in the middle of the 14th century, when, to use Hallam’s words, the court of England “was the sun as it were of that system which embraced the valour and nobility of the Christian world,” when “ chivalry was in its zenith, and in all the virtues which adorned the knightly character none were so conspicuous as Edward III. and the Black Prince.” But in what particular year this event occurred is and has been the subject of much difference of opinion. All the original records of the order until after 1416 have perished, and consequently the question depends for its settlement not on direct testimony but on inference from circumstances. The dates which have been selected vary from 1344 to 1351, and it is a matter of some historical interest and importance to determine so far as it is practi- cable which of them is probably accurate, since Dr Stubbs cites the fact of “ Edward III. celebrating his great feast on the institution of the Order of the Garter in the midst of the Black Death” as a “typical illustration” of the heartlessness and want of sympathy between classes which he holds to have been characteristic of the age! The Biack Death made its appearance on the coast early in August 1348, reached the capital in the following Novem- ber, and spreading over the country raged until the end of September 1349. Hence Dr Stubbs apparently agrees with Ashmole (who based his opinion on the preamble to the two earliest but evidently not contemporary copies of the statutes) in referring the institution of the order and the accompanying feast to St George’s Day in the April of the second of these two years.2 Mr Longman thinks that the order was “finally established” in 1347,3 Mr Beltz contends that it

was founded in 1344, as Froissart, who wrote in the reign of Edward III. and Richard II., affirms, while Sir Harris Nicolas maintains that, although it is not impossible that Edward III. may have determined to found an order of knighthood in 1344, when he invited knights of all countries to jousts at Windsor and revived the feast of the Round Table, of which Froissart speaks, yet “the details of the Order of the Garter were not settled (even if the institution itself was contemplated), the companions appointed, nor the name or ensigns established until the latter part of 1347 or early in 1348.”4 And, without going fully into the evidence, which may be examined at length in Nicolas and Beltz, it is indisputable that in the wardrobe account from September 1347 to January 1349, the 21st and 23d Edward III., the issue of certain habits with garters and the motto embroidered on them is marked for St George’s Day, that similar vestments for the king and others on occasions not connected with the order are re- corded as having been delivered in 1347 at the Christmas games at Guildford and the tournaments at Bury, Windsor Lichfield, and Eltham, that the letters patent relating to the preparation of the royal chapel of Windsor are dated in August 1348, and that in the treasury accounts of the Prince of Wales there is an entry in November 1348 of the gift by him of “twenty-four garters to the knights of the Society of the Garter.”® Bunt that the order, although from this manifestly already fully constituted in the

1 Const. Hist., vol. ii. p. 624.

? Ashmole, Order of the Garter, p. 187; Anstis, Order of the Garter, vol. i. p. 92. Selden, in the first edition of Titles of Honor, gives 1347, and in the last edition 1844. Barnes in his Life of Edward Ii., and Beltz in his Memorials, p. xxx., collect the various older authorities. 3 Life of Edward Ill, vol. i. p. 298.

4 Orders of Knighthood, vol, i, p. Ixxi. and pp. 9-16. 5 Beltz, Memorials, p. 385.

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autumn of 1348, was not in existence before the summer of 1346 Sir Harris Nicolas holds on the ground that nobody who was not a knight could under its statutes have been admitted to it, and that neither the Prince of Wales nor several others of the original companions were knighted until the middle of that year. Mr Beltz, following a suggestion of Anstis, had endeavoured to overcome this difficulty by assuming that the Black Prince had been knighted in his infancy, and that he was made a banneret at the age of fifteen. But, although it was not unusual for the sons of sovereigns and great' feudatories to be knighted when they were children, and even at their bap- tism, it is beyond question, as Sir Harris Nicolas points out, that in England only commoners could be formally created bannerets. All knights of or above the rank of a baron were at once entitled to bear their banners in the field. And that the Prince of Wales was knighted on the landing of Edward III.'s expedition against France at La Hogue in July 1346 there can be no doubt. It seems pretty clear, however, that the Order of the Garter was in- stituted and the great feast celebrated, not in the midst of the Black Death, but at any rate some months before its ravages commenced. Regarding the occasion there has been almost as much controversy as regarding the date of its foundation. The "vulgar and more general story," as Ashmole calls it, is that of the countess of Salisbury's garter. But commentators are not at one as to which countess of Salisbury was the heroine of the adventure, whether she was Katherine Montacute or Joan the Fair Maid of Kent, while Heylyn rejects the legend as "a vain and idle romance derogatory both to the founder and the order, first published by Polydor Vergil, a stranger to the affairs of England, and by him taken upon no better ground than fama vulgi, the tradition of the common people, too trifling a foundation for so great a building," and Anstis says that "it is now no more credited than the absurd, ridiculous relation of Micheli Marquez that this order, termed from the Greek language Periscelidis Ordo, was erected to the memory of one Periscelide, a true fairy queen, or the whimsical dream of Mr Joshua Barnes in his far-fetched derivation of it from the Cabiri among the Samothracians."6 Ashmole, however, while denying that any such accident became the principal cause of creating the order, will not altogether repudiate the alle- gation that ''the king may have picked up a garter at some solemn ball or

festivity,”—the queen’s garter, as some have said,—while she and not he made use of the memo- rable words ‘‘ Honisoit qui mal y pense.”” Another legend is that contained in the preface to the Register or Black Book of the order, compiled in the reign of Henry VIII, by what authority supported is unknown, that Richard IL, while his forces were employed against Cyprus and Acre, had been inspired through the instrumentality of St George with renewed courage and the means of animating his fatigued soldiers by the device of tying about the legs of a chosen number of knights a leathern thong or garter, to the end that being thereby reminded of the honour of their enterprise they might be encouraged to redoubled efforts for victory. This was supposed to have been in the mind of Edward III. when he fixed on the garter as the emblem of the order, and it was stated so to have been by Taylor, master of the rolls, in his address to Francis I. of France on his investiture in 1527.8 According to Ashmole the true account of the matter is that, “King Edward having given forth his own garter as the signal for a battle which sped fortunately (which with Du Chesne we conceive to be that of Cressy, fought almost three years after the setting

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° Heylyn, Cosmographie and History of the Whole World, book i. p. od ; Anstis, Order of the Garter, vol. i. p. 62. Order of the Garter, p. 182. 8 Beltz, Memortals, p. xlvi.

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up of the Round Table at Windsor, rather than with the author of the ‘Nouveau Théditre du Monde’ that of Poictiers, which happened above seven years ,after the foundation of the order and whereat King Edward was not present), the victory, we say, being happily gained, he thence took occasion to institute this order, and gave the garter (assumed by him for the symbol of unity and society) pre- eminence among the ensigns of it, whence that select number whom he incorporated into a fraternity are fre- quently styled ‘equites aurez periscelidis’ and vulgarly knights of the garter.”! Ashmole and Beltz also see in the order a reference to the king’s French claims, and

remark that the colour of the garter is the tincture of the field of the French arms. But, as Sir Harris Nicolas points out, —although Ashmole is not open to the correction, — this hypothesis rests for its plausibility on the assump- tion that the order was established before the invasion of France in 1346. And he further observes that “a great variety of devices and mottoes were used by Edward IIL ; they were chosen from the most trivial causes and were of an amorous rather than of a military character. Nothing,” he adds, “is more likely than that in a crowded assembly a lady should accidentally have dropped her garter ; that the circumstance should have caused a smile in the bystanders ; and that on its being taken up by Edward he should have reproved the levity of his courtiers by so happy and chivalrous an exclamation, placing the garter at the same time on his own knee, as ‘ Dishonoured be he who thinks ill of it. Such a circumstance occurring at a time of general festivity, when devices, mottoes, and conceits of all kinds were adopted as ornaments or badges of the habits worn at jousts and tournaments, would naturally have been commemorated as other royal expressions seem to have been by its conversion into a device and motto for the dresses at an approaching hastilude.”? Moreover, Sir Harris Nicolas contends that the order had no loftier immediate origin than a joust or tournament. It con- sisted of the king and the Black Prince, and twenty-four knights divided into two bands of twelve like the tilters in a hastilude —at the head of the one being the first, and of the other the second ; and to the companions belonging to each, when the order had superseded the Round Table and had become a pernianent institution, were assigned stalls either on the sovereign’s or the prince’s side of St George’s Chapel That Sir Harris Nicolas is accurate in this con- jecture seems probable from the selection which was made of the “founder knights.” As Mr Beltz observes, the fame of Sir Reginald Cobham, Sir Walter Manny, and the earls of Northampton, Hereford, and Suffolk was already estab- lished by their warlike exploits, and they would certainly have been among the original companions had the order been then regarded as the reward of military merit only. But, although these eminent warriors were subsequently elected as vacancies occurred, their admission was post- poned to that of several very young and in actual war- fare comparatively unknown knights, whose claims to the honour may be

most rationally explained on the assumption that they had excelled in the particnlar feats of arms which preceded the institution of the order. The order was dedicated to St George of Cappadocia and St Edward the Confessor, and its feast or solemn annual convention was kept at Windsor on St George's Day, the 23d of April, with little interruption from the reign of Edward III. to the reign of Queen Elizabeth. But a few years after the Restoration the celebration was altogether discontinued. The original companionship had consisted of the sovereign and twenty-five knights, and no change was made in this respect until 1786, when the sons of George IIL and his

1 Order of the Garter, p. 188. 2 Orders of Knighthood, vol. i. p. 1xxxiii.

successors were made eligible notwithstanding that the chapter might be complete. In 1805 another alteration was effected by the provision that the lineal descendants of George II. should be eligible in the same manner, except the Prince of Wales for the time being, who was declared to be "a constituent part of the original institu- tion"; and again in 1831 it was further ordained that the privilege accorded to the lineal descendants of George IT. should extend to the lineal descendants of George I. The power of making and modifying the statutes of the order as exemplified in these innovations had from the begin- ning belonged to the whole fraternity, and it was only in the reign of Charles II. that it was surrendered to the sovereign. But the knights still continued at any rate formally to elect their companions, and the gorgeous and elaborate ceremonies of installation were still regarded as requisite to the full reception of knights elect. Since the beginning of the reign of George ITI., however, both chapters and installations became more and more occasional, and it is now the established custom for the sovereign altogether to dispense with them. Although, as Sir Harris Nicolas observes, nothing is now known of the form of admitting ladies into the order, the description applied to thein in the records during the 14th and 15th centuries leaves no doubt that they were regularly received into it. The queen consort, the wives and

daughters of knights, and some other women of exalted position, were designated ‘Dames de la Fraternité de St George,” and entries of the delivery of robes and garters to them are found at intervals in the Wardrobe Accounts from the 50th Edward ITT. (1376) to the 10th of Henry VIT. (1495), the first being Isabel, countess of Bedford, the daughter of the one king, and the last being Margaret and Elizabeth, the daughters of the other king. The effigies of Margaret Byron, wife of Sir Robert Harcourt, K.G., at Stanton Harcourt, and of Alice Chaucer, wife of William de la Pole, duke of Suffolk, K.G., at Ewelme, which date from the reigns of Henry VI. and Edward IV., have garters on their left arms. At a chapter in 1637 an attempt was made to revive the practice of issuing the ensigns of the order to ladies. Sir James Palmer, acting as deputy for Sir Thomas Rowe, the chan- cellor of the order, moved the sovereign that the wives of the knights companions might have the privilege of wearing ‘“‘a garter of the order about their arms and an upper robe at festival times, according to ancient usage.” ‘The matter was referred by Charles I. to the queen, and another chapter was appointed for the purpose of taking it into final con- sideration. But owing to the civil war nothing further was done in the matter. At present the officers of the order are five—the prelate, chancellor, register, king of arms, and usher—the first, third, and fifth having been attached to it from the commencement, while the fourth was added by Henry V. and the second by Edward IV. The prelate has always been the bishop of Winchester ; the chancellor was formerly the bishop of Salisbury, but is now the bishop of Oxford ; the registership and the deanery of Windsor have been united since the reign of Charles I.; the king of arms, whose duties were in the beginning discharged by Windsor herald is garter principal king of arms; and the usher is the gentleman usher of the Black Rod.

The other orders of knighthood subsisting in the British Other empire must be spoken of more briefly. The “most ancient” British

Order of the Thistle was founded by James II. in 1687, and dedicated to St Andrew. It consisted of the sovereign and eight knights companions, and fell into abeyance at the Revolution of 1688. In 1703 it was revived by Queen Anne, when it was ordained to consist of the

sovereign and twelve knights companions, the number being increased to sixteen by statute in 1827. The “ most illustrious” Order

of St Patrick was instituted by George III. in 1788, to consist of the sovereign, the lord lieutenant of Ireland as grand master, and fifteen knights companions, enlarged to twenty-two in 1833. The “most honourable” Order of the Bath was established by George I. in 1725, to consist of the sovereign, a grand master, and thirty-six knights companions. This was a pretended revival of an order supposed to have been created by Henry TV. at his coronation in 1399. But, as we have before shown, no such order existed. Knights of the Bath, although they were allowed precedence before knights bachelors, were merely knights bachelors who were knighted with more elaborate ceremonies than others and on certain great occasions. After the so-called revival the grand mastership merged in the crown on the death of John, duke of Mon- tagu, the first tenant of the office in 1749, and in 1815 and again in 1847 the constitution of the order was remodelled. Exclusive of the sovereign, royal princes, and distinguished foreigners, it is limited to fifty military and twenty-five civil knights grand crosses, one hundred and twenty-three mili- tary and eighty civil knights commanders, and six hundred and ninety military and two hundred and fifty civil com- panions, The “ most distinguished ” Order of St Michael and St George was founded by the prince regent, after- wards George IV., in 1818, in commemoration of the British protectorate of the Ionian Islands, “for natives of the Ionian Islands and of the island of Malta and its depend- encies, and for such other subjects of his majesty as may hold high and confidential situations in the Mediter- ranean.” By statute of 1832 the lord high cominissioner of the Ionian Islands was to be the grand master, and the order was directed to consist of fifteen knights grand crosses, twenty knights commanders, and twenty-five cavaliers or companions. After the repudiation of the British protectorate of the Ionian Islands, the order was placed on a new basis, and by letters patent of 1868 and 1877 it was extended and provided for such of “the natural born subjects of the crown of the United Kingdom as may have held or shall

hold high and confidential offices within her Majesty's colonial possessions, and in reward for services rendered to the crown in relation to the foreign affairs of the empire." It is now limited to fifty knights grand crosses, of whom the first or principal is grand master, exclusive of extra and honorary members, of one hundred and fifty knights companions, and two hundred and sixty companions. It ranks between the "most exalted" Order of the Star of India and the Order of the Indian Empire, of both of which the viceroy of India for the time being is ex officio grand master. Of these the first was instituted in 1861 and enlarged in 1876, and the second was established in 1878 in commemoration of the Queen's assumption of the imperial style and title of the empress of India. Of the Star of India there may be thirty knights grand commanders, seventy-two knights commanders, and one hundred and fifty-four companions, while of the Indian Empire there may be an unlimited number of companions, among whom the councillors of her majesty for her Indian-empire are included by virtue of their office and for life. Persons _ It has been the general opinion, as expressed by Sainte em- Palaye and Mills, that formerly all knights were qualified to confer knighthood.!_ But it may be questioned whether . the privilege was thus indiscriminately enjoyed even in the hood. earlier days of chivalry. It is true that as much might be inferred from the testimony of the romance writers; historical evidence, however, tends to limit the proposition, and the sounder conclusion appears to be, as Sir Harris Nicolas says, that the right was always restricted in opera- 1 Mémoires, vol. i. p. 67, vol. i. p. 22; History of Chivalry ; Gibbon, Decline and Fall, vol. vii. p. 200.

tion to sovereign princes, to those acting under their authority or sanction, and to a few other personages of exalted rank and station.? In several of the writs for dis- traint of knighthood from Henry III. to Edward III. a distinction is drawn between those who are to be knighted by the king himself or by the sheriffs of counties respect- ively, and we have seen that bishops and abbots could make knights in the 11th and 12th centuries.? At all periods the commanders of the royal armies had the power of conferring knighthood ; as late as the reign of Elizabeth it was exercised among others by Sir Henry Sidney in 1583, and Robert, earl of Essex, in 1595, while under James J. an

ordinance of 1622, confirmed by a proclamation of 1623, for the registration of knights in the college of arms, is rendered applicable to all who should receive knighthood from either the king or any of his lieutenants. Many sovereigns, too, both of England and of France, have been knighted after their accession to the throne by their own subjects, as, for instance, Edward III. by Henry, earl of Lancaster, Edward VI. by the Lord Protector Somerset, Louis IX. by Philip, duke of Burgundy, and Francis I. by the Chevalier Bayard. But when in 1543 Henry VIII. appointed Sir John Wallop to be captain of Guisnes, it was considered necessary that he should be authorized in express terms to confer knight- hood, which was also done by Edward VI. in his own case when he received knighthood from the duke of Somerset. ° In like manner Henry, earl of Arundel, under special commission from the queen, created the Knights of the Bath and other knights at the coronation of Elizabeth in 1559, and in the patent from James II. nominating Christopher, duke of Albemarle, governor of Jamaica in 1686 he is empowered to confer knighthood on any persons “not exceeding six in number within the said island whom he may think deserving of the same in the king’s service.”® But at present the only subject to whom the right of conferring knighthood belongs is the lord-lieutenant of Ireland, and to him it belongs merely by long usage and established custom. It was called in question in 1821 by the Lords of the Admiralty on the occasion of Earl Talbot knighting Sir John Phillimore, a captain in the navy, and the point, having been submitted to the law officers of the crown in England and Ireland, was the subject of contradictory opinions from them. In 1823, however, it was referred by order in council to the English judges, who unanimously reported in favour of the lord- lieutenant of Ireland’s claims.’ But, by whomsoever con- ferred, knighthood at one time endowed the recipient with the same status and attributes in every country wherein chivalry was recognized. In the Middle Ages it was a common practice for sovereigns and princes to dub each ovher knights much as they were afterwards, and are now, in the habit of exchanging the stars and ribands of their orders. Henry II. was knighted by his great-uncle David I. of Scotland, Alexander III. of Scotland by Henry IIL, Edward I. when he was prince by Alphonso X. of Castile, and Ferdinand of Portugal by Edmund of Langley, earl of Cambridge. And, long after

the military importance of knighthood had practically disappeared, what may be called its cosmopolitan character was maintained. Writing in the 17th century, Mr Justice Doddridge lays it down as a principle of law in which he is supported by all the older

2 Orders of Knighthood, vol. i. p. xi. 3 Selden, Titles of Honor, p. 638. : Harleian MS. 6063 ; Hargrave MS. 325. Patent Rolls, 35th Hen. VIII., part xvi., No. 24; Burnet, Hist. of Reformation, vol. i. p. 15. oe Ledera, vol. xv. p. 497; Patent Rolls, 4th Jac. I1., part VapNon 20! : Nicolas, Orders of Knighthood, vol. i. p. xiv. – Spelman, “ De Milite Dissertatio,” Posthumous Works, p. 181.

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Degrada- tion.

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authorities that “the highest and the lowest dignities are universal, for if the king of a foreign nation come into England by leave of the king of this realm (as it ought to be), in this case he shall sue and be sued by the name of a king, so shall he sue and be sued by the name of a knight wheresoever he received that degree of dignity, but other- wise it is as of a duke, marquess, earl, or other title of honour given by any foreign king.”! The well-known story told by Camden about Queen Elizabeth and Sir Thomas Arundel afterwards Lord Arundel of Wardour, and her disinclination that ‘her sheep should bear a stranger’s mark,” and “dance after the whistle of every foreigner,” had reference to a countship of the empire, and not to knighthood or an order of chivalry. Even to the end of the last century indeed any knight duly dubbed abroad was fully accepted as a knight in England. Hence when in 1792, at the request of the king of Sweden, George IIL. invested Sir Sidney Smith with the grand cross and collar of the Swedish Order of the Sword, it was ex- pressly announced that he “was not knighted on this occasion, that ceremony having been performed by his late Swedish majesty.”? By certain regulations, however, made in 1823, and repeated and enlarged in 1855, not only is it provided that the sovereign’s permission by royal warrant shall be necessary for the

reception by a British subject of any foreign order of knighthood, but further that such permission shall not authorize “the assumption of any style, appellation, rank, precedence, or privilege appertaining to a knight bachelor of the United Kingdom.” Moreover, no permission of the kind will be granted ‘“‘unless the foreign order shall have been conferred in consequence of active and distinguished service before the enemy either at sea or in the field,” or unless the person receiving it shall have been “actually and entirely ” em- ployed beyond the British dominions “in the service of the foreign sovereign by whom the order is conferred.” ?

Since knighthood was accorded either by actual investi- ture or its equivalent, a counter process of degradation was regarded as necessary for the purpose of depriving anybody who had once received it of the rank and condition it im- plied. And in this respect there can be no doubt that the order of chivalry was designedly assimilated to the order of priesthood.* Hence, as Selden points out, “as by the canon laws the ceremony of degradation from any degree of any order is by the solemn taking away those things from the clerk wherewith he was so invested at his taking the order from which he is to be degraded, so the ceremonies of degra- dation of a knight were in ancient times such as that the sword with which he was girt at his knighting and the spurs that were put on him were to be publicly taken off from him, and some other solemnities were sometimes in it.”® The cases in which a knight has been formally de- graded in England are exceedingly few, so few indeed that two only are mentioned by Segar, writing in 1602, and Dallaway says that only three were on record in the College of Arms when he wrote in 1793. But in illustration of the statement of Coke that “when a knight is degraded one of his punishments is ‘quod clypeus suus gentilicius reversus erit,’ and how his arms be reversed that he beareth none,” Sir Harris Nicolas states that in an illuminated copy of Matthew Paris’s Historia Major, among the royal manuscripts in the British Museum, there is a representa- tion of Sir William de Marisco, who was convicted of treason in the reign of Henry III., with his sword and

1 Law of Nobility, p. 129. 2 London Gazette, May 19, 1792.

3 London Gazette, December 6, 1823, and May 15, 1855.

40On the Continent very elaborate ceremonies, partly heraldic and partly religious, were observed in the degradation of a knight, which are described by Sainte Palaye, Mémoires, vol. i. p. 316 sq., and after him by Mills, History of Chivalry, vol. i. p. 60 sq.

® Titles of Honor, p. 653.

a TO © D 125

the staff of his banner broken and his shield hewn asynder.® With this exception, however, the earliest known example of degradation from knighthood is that of Sir Andrew Harclay, who was created earl of Carlisle by Edward II., and was attainted of high treason in the year following his creation. He was tried and condemned at Carlisle in 1323 by special commission under Edmund of Woodstock, earl of Kent, the king's half-brother. A part of his sentence, as preserved in the record, was in the following words: 'que vous soietz degrade, que vous perdetz noun de count pur vous et pur vous heirs a touts jours que vous soietz deceynt del espée que vous esporeuns d'orrees soient coupez de talouns," which having been done, according to Holingshed, Sir Anthony Lucy, the sheriff of Cumberland, said to him, " Andrew, thou art no knight, but thou art a knave," when judgment for treason was pronounced on him, and he was immediately beheaded.' The next case was that of Sir Ralph Grey, which occurred in the reign of Edward IV. He was tried and convicted of treason, before John Tiptoft, earl of Worcester, constable of England in 1468, but the sentence as preserved by Stowe seems to indicate that the ceremonies of degrada- tion were to be remitted. The last case was that of Sir Francis Michell in 1621, whose spurs were hacked from his heels, his sword belt cut, and his sword broken over his head by the heralds in Westminster Hall. The ceremony of de- grading a knight who is a companion of an order which as a capitular body has a chapel assigned to it applies to his achievements therein displayed more markedly than to him in person. On the degradation of a Knight of the Garter, indeed, a deputation of the companions are (Ashmole says) to go to him, attended by Garter king of arms, who "in a solemn manner first takes from him his

George and riband and then his garter.”!° But the principal observances are that his banner, helm, and armoria] plate are torn down from above and from off his stall by the officers of arms, and are by them spurned or kicked out of the building! From the Order of the Garter William Lord Paget, who was subsequently rein- stated, was degraded in 1552, “chiefly,” according to the diary of Edward VI., “because he was no gentleman of blood neither of father’s side or mother’s side.” 12 The degradation in due form of James, duke of Monmouth, and of James, duke of Ormond, for treason occurred severally in 1685 and 1716. Thomas Lord Cochrane and Sir Eyre Coote were similarly degraded from the Order of the Bath in 1814 and 1816. But in all these cases the knights retained their knighthood, although they were expelled from the orders to which they had belonged.

Roughly speaking, the age of chivalry properly so called Decline

may be said to have extended from the beginning of the of crusades to the end of the Wars of the Roses. limits of that period, which comprised about four hundred years, all that was peculiarly characteristic of it arose, at- tained to maturity, and fell into decay. It is true that some of its spirit and many of its external forms lingered on throughout the greater part of the 16th century. But the chivalry of Francis I. and Charles V. bore much the same relation to the chivalry of Edward III. and the Black Prince that the romance of Don Quixote bears to the romance of Amadis de Gaul. As a practical mili- tary system chivalry was entirely at an end. The revolu-

8 Nicolas, British Orders of Knighthood, p. xxviii.

7 Selden, Titles of Honor, p. 654.

8 Nicolas, Orders of Knighthood, p. xxvii. ; Selden, Titles of Honor, p. 655.

° Dallaway’s Heraldry, p. 308. 10 Order of the Garter, p. 621.

ll Warrants for taking down the achievements and for the degra- dation of John Dudley, duke of Northumberland, and Edward Stafford, duke of Buckingham, are given by Ashmole, Appendices clxxxili. and elxxxiv. 12 Beltz, Memorials, p. Xcvi.

Within the chivalry.

Its merits and defects.

tion in the mode of warfare which had commenced under Edward III. was completed under Henry VIII., and it was ov their infantry and artillery rather than on their cavalry that commanders had come principally to rely. Knights still disported themselves in the lists as bravely and gallantly as of old, but neither their arms nor their armour availed them aught against the cannon and muskets they were compelled to encounter in the field. And even in the way of pageantry and martial exercise chivalry was not destined to be of long continuance. In England tilts and tourneys, in which her father had so much excelled, were patronized to the last by Queen Elizabeth, and were even occasionally held until after the death of Henry, Prince of Wales. But on the Continent the Comte de Montgomerie's lance proved as fatal to them as it did to the Frencli king Henry at Paris. By that time, however, chivalry had ceased to exist as a social institution as well as a military régime. Its standard of conduct, the code of honour, indeed remained as it in some measure still remains, the test of propriety and the guide of manners in the higher ranks of society all over Europe. But the order of knighthood as an order formally and particularly dedicated to the service of " God and the Ladies,"—'"I blush," says Gibbon, "to unite such discordant names,"—and bound by solemn and express engagements to vindicate justice, to avenge wrong, and to defend the weak, the unprotected, and the oppressed, had disappeared. It was under this shape, however, that chivalry manifested itself during the earlier and more vigorous stages of its development, and played its part among the chief and certainly among the most remarkable of those influences which moulded the form and directed the course of Western civilization in medizeval times. The common

offspring of feudalism and the church, it derived its resources and its sanctions from each of its parents in turn, and stood forth as at ounce the spiritual representative of the one and the temporal representative of the other. Whatever may have been its inherent vices and defects, it is at any rate indis- putable that it embodied some of the noblest sentiments and engendered many of the worthiest actions of contemporary mankind. It animated poetry and art; it created romance and heraldry; it determined individual ethics, modified the policy of states, and generally inspired the energies while it controlled the destinies of all those na- tions, especially England and France, which were then as they now are the most enlightened as well as the most powerful in the world. Under ecclesiastical teaching war came to be regarded from a judicial standpoint as, to use the words of Bacon, 'the highest trial of right when princes and states that acknowledge no superior on earth shall put themselves upon the justice of God for the deciding of their controversies by such success as it please Him to give on either side." Battles were commenced with religious celebrations, and armies esteemed themselves happy if they marched beneath a consecrated standard. Even in the field and while engaged in mortal conflict Christian knights acknowledged the duties and courtesies of their order. And if they were taken prisoner they could count on consideration from their captors, and on their freedom when they paid their stipulated ransom. Moreover, when they took prisoners they knew that they could safely release them on parole to raise their ransom, and that they would return to captivity if their ransom could not be raised.2 It is indeed from the customs of chivalry that the best and most humane portions of the laws of war in so far as actual combatants are concerned have their origin. But

1 "Observations on a Libel,"' Works, vol. v. p. 384.

? Sainte Palaye, Mémoires, vol. i. pp. 309 and 364; Mills, History of Chivalry, vol. i. p. 186; Grose, Military Antiquities, vol. ii. p. 343 sq.

war, although it was the principal, was not the exclusive or the continuous occupation of medieval knighthood. When not in the camp

the home of the knight was in the court or the castle, and it was there that his prowess in the past campaign or present tournament was rewarded, often it might be rather generously than discreetly by the ladies in whose cause he was partly enrolled. Hence, although at no period were wonien held in greater outward respect by men, it is probable that at no period did more licence in the association of the sexes prevail; and it is a strange comment on the manners of the times that the single word “gallantry” should have grown to signify both bravery and illicit love? But, if chastity was not among the car- dinal virtues of chivalry, the catalogue of them included valour, loyalty, courtesy, and munificence ; and, had they been practised with the zeal with which they were inculcated, they would have gonefar towards redeeming thedissoluteness of private manners with which they were connected. Valour was of course the primary qualification of a knight, and the imputationof cowardicethe most damaging that could be cast upon him. But loyalty, which implied the strictest fidelity to all his engagements to his sovereign or lord, his “lady- love,” and his friends and foes alike, was only second to it in importance. Next came courtesy, which meant not only ceremonious politeness but also spontaneous modesty of carriage, self-denial, and careful respect for the feelings of others. And last came munificence, a disdain for money, readiness to relieve want and reward services, hospitality, and liberality in all things. In a celebrated passage Burke describes chivalry as “‘the unbought grace of life, the cheap defence of nations, the nurse of manly sen- timent and heroic enterprise.” ‘Never never more,” he says, “shall we behold that generous loyalty to rank and sex, that proud submission, that dignified obedience, that subordination of the heart which kept alive even in ser- vitude itself the spirit of an exalted freedom ;” and, he adds, “that sensibility of principle, that chastity of honour which felt a stain like a wound, which inspired courage whilst it mitigated ferocity, which ennobled what- ever it touched, and under which vice itself lost half its evil by losing all its grossness.”* A very different estimate of chivalry is expressed by Mr Freeman. “The chivalrous spirit,” he contends, “is above all things a class spirit. The good knight is bound to endless fantastic courtesies towards men and still more towards women of a certain rank ; he may treat all below that rank with any degree of scorn and cruelty. The spirit of chivalry

implies the arbitrary choice of one or two virtues to be practised in such an exaggerated degree as to become vices, while the ordinary laws of right and wrong are forgotten. The false code of honour supplants the laws of the commonwealth, the law of God, and the eternal principles of right. Chivalry again in its military aspect not only encourages the love of war for its own sake without regard to the cause for which war is waged, it encourages also an extra- vagant regard for a fantastic show of personal daring which cannot in any way advance the objects of the siege or campaign which is going on. Chivalry in short is in morals very much what feudalism is in law: each substi- tutes purely personal obligations, obligations devised in the interests of an exclusive class, for the more homely duties of an honest man and a good citizen.”® Between these two views,—which, indeed, may be taken to represent the extremes of praise and of depreciation,—it may be assumed that at all events an approximation to the truth concerning

the ethical effects of chivalry or knighthood is somewhere to be found. (F. DR.)

: Hallam, Middle Ages, vol. iii. p. 398. ’ Burke, French Revolution, p. 118, ed. 1790. Freeman, Vorman Conquest, vol. v. p. 482.

K NI—KWNO

KNITTING is the art of forming looped fabrics or tex- tures with the use of needles or wires and a single con- tinuous thread. Crochet is an analogous art, differing from knitting in the fact that the separate loops are thrown off and finished successively, whereas in knitting the whole series of loops which go to form one length or round of the fabric are retained on one or more needles while a new series is being formed from them on a separate needle. The origin and history of the art of knitting are referred to under the heading Hosiery, vol. xii. p. 299. The wires, needles, or pins used are of different lengths and gauges, according to the work for which they are intended, and are made either of steel, ivory, bone, or wood. Some are headed, to prevent loops from slipping over their ends, but on these can be woven only flat pieces of work; others are pointed at both ends, and with the use of three or more of these circular webs can be made, The materials used in

knitting are specially twisted for the purpose, and consist of twines, threads, cotton, silk, wools, and worsteds, the latter being the most important and largely used substance. Ordinary stockings and socks, which are the staple hand- knit articles, are worked in “lambswool,” “ fingering,” and _ “wheeling” worsteds respectively, these differing in size and fineness of quality ; and for other articles of under- clothing and fancy knitting the worsteds most commonly used are “‘fleecy,” “Berlin,” and “‘Lady Betty” wool. Shet- land wool is a thin hairy undyed and very tenacious and strong worsted, spun in the Shetland Islands from the wool of the native sheep, and very extensively used in the knit- ting of fine shawls, veils, scarfs, and small articles by the islanders, among whom the industry is of much local con- sequence. ‘“*Crewels” are closely twisted coloured worsteds of the same size as Shetland wool, and capable consequently of being knit into the same fabric. Much spun silk is also knit into patterns and articles similar in form and appear- ance to Shetland wool goods. In Ayrshire the hand-knitting of Scotch caps is extensively prosecuted as a domestic industry, the knit work being collected and “ waulked ” or felted and otherwise finished in factories. The methods by which, with plain knitting, “ purling,” “slipping” loops, “taking up” and “casting off,” &c., materials can be shaped and worked into varied and varie- gated forms are endless, and patterns and directions for working are to be found in all magazines and papers devoted to ladies’ work, as well as in numerous special cheap publications.

Standard works, from which many of the patterns and directions in smaller manuals are copied, are Mrs Gaugain’s Knitting and Crochet Work, and Esther Copley’s Comprehensive Knitting Book, London, 1849.

KNOLLES, Ricwarp (c. 1545-1610), author of the History of the Turks, was a native of Northamptonshire, -and was born about 1545. In 1560 he entered Lincoln’s College, Oxford, of which four years later he was elected fellow. After graduating M.A. he left Oxford to become master of the free school at Sandwich in Kent, where he died in 1610.

In 1603 Knolles published 4 General History of the Turks, a second edition of which appeared in 1610. The work was continued up to date in several editions subsequently published, the best known being that by Sir Paul Rycaut, 1687-1700, who gives a con- tinuation to 1699. The history of Knolles was highly praised by Dr Johnson, and, though now entirely superseded, it has for the time in which it was written considerable merits at least as regards style and arrangement. Knolles also published a translation of Bodin's Respublica in 1606, but the Grammatice Latinz, Greex, et Hebroice Compendium, and the Rudiments of Hebrew Grammar, attributed to him by Anthony Wood and in most works of refer- ence, were, as is shown in the Atheneum of August 6th, 1881, the works of the Rev. Hanserd Knollys; a Baptist minister.

KNOT. In the scientific sense, a knot is an endless physical line which cannot be deformed into a circle. A

physical line is flexible and inextensible, and cannot be cut,—so that no lap of it can be drawn through another.

The founder of the theory of knots is undoubtedly Listing. In his " Vorstudien zur Topologie" (Géttinger Studien, 1847), a work in many respects of startling originality, a few pages only are devoted to the subject. He treats knots from the elementary notion of twisting one physical line (or thread) round another, and shows that from the projection of a knot on a surface we can thus ob- tain a notion of the relative situation of its coils. He dis- tinguishes "reduced" from "reducible" forms, the number of crossings in the reduced knot being the smallest possible. The simplest form of re- duced knot is of two species, as in figs. 1 and 2. Listing points out that these are formed, the first by right-handed, the second by left-handed twisting. In fact, if three half twists be given to a long strip of paper, and the ends be then pasted together, the two edges become one line, which is the knot in question. We may free it by slitting the paper along its middle line ; and then we have the juggler's trick of putting a knot on an endless unknotted band. One of the above forms can- not be deformed into the

other. The one is, in Listing's language, the "perversion" of the other, ¢.¢., its image in a plane mirror. He gives a method of symbolizing reduced knots, but shows that in this method the same knot may, in certain cases, be represented by different symbols. It is clear that the brief notice he has published contains a mere sketch of his investigations.

The most extensive dissertation on the properties of knots is that of Tait (Zrans. Roy. Soc. Edin., 1876-7). It was for the most part written in ignorance of the work of Listing, and was suggested by an inquiry concerning vortex atoms (see ATom). 'Tait starts with the almost self-evident proposition that, if any plane closed curve have double points only, in passing continuously along the curve from one of these to the same again an even number of double points has been passed through. Hence the crossings may be taken alternately over and under. On this he bases Fig. 3. Fig. 4.

a scheme for the representation of knots of every kind, and employs it to find all the distinct forms of knots which have, in their simplest projections, 3, 4, 5, 6, and 7 crossings only. Their numbers are shown to be 1, 1, 2, 4, and 8. The unique knot of three cross- ings has been already given as drawn by Listing. The unique knot of four crossings merits a few words, because its properties lead to a very singular conclusion. It can be deformed into any of the four forms—figs. 3 and 4 and their perversions. Knots which can be deformed into their own perversion Tait calls 'amphi- cheiral," and he has shown that there is at least one knot of this kind for every even number of crossings. He shows also that "links" (in which two endless physical lines are linked together) possess a similar property] and he then points out that there is a third mode of making a complex figure of endless physical lines, without either knotting or linking. This may be called ''lacing" or "locking." Its nature is obvious from fig. 5, in which it will be seen that no one of the three lines is knotted, no

Fig. 1. Fig. 2.

Fig. 6.

two are linked, and yet the three are inseparably fastened together.

The rest of Tait's paper deals chiefly with numerical characteristics of knots, such as their " knottiness," " be- knottedness," and " knotfulness." He also shows that any knot, however complex, can be fully represented by three closed plane curves, none of which has double points, and no two of which intersect. It may be stated here that the notion of beknottedness is founded on a remark of Gauss, who in 1833 considered the problem of the number of inter- linkings of two closed circuits, and expressed it by the electrodynamic measure of the work required to carry a unit magnetic pole round one of the interlinked curves, while a unit electric current is kept circulating in the other. This original suggestion has been developed at considerable length by Boeddicker (Zrweiterung der Gauss schen Theorte der Verschlingungen,

Stuttgart, 1876). This author treats also of the connexion of kuots with Rie- mann's surfaces.

It is to be noticed that, although every knot in which the crossings are alternately Fig. 6. over and under is irreducible, the converse is not generally true. Thisis obvious at once fron fig. 6, which is merely the three-crossing knot with a doubled string— what Listing calls '" paradromic."

Klein, in the Mathematische Annalen, ix. 478, has proved the remarkable proposition that knots cannot exist in space of four dimensions.

Sartors' Knots.—The knots used by sailors are of many kinds. The following are the most useful :-—

ed Knot (fig. 7).—Take the end a of the rope round the end 6.

Reef Knot (figs. 8, 9).—Form an overhand knot as above. Then take the end a over the end 6 and through the bight. Ifthe end a

a a b a Fig. 7. Fig. 8. Fig. 9. were taken under the end 6 a granny would be formed. This knot is so named from being used in tying the reef-points of a sail.

Bowline (figs. 10-12).—Lay the end a of a rope over the standing part b. Form with ba bight e¢ over a. Takea round behind 6 and

b

Fig. 10. Fig. 11. down through the bight c.

Fig. 12. This is a most useful knot empl to form a loop which will not slip. eet Half Hitch (fig. 13).—Pass the end a of the rope round the standing part 6 and through the bight. Clove Hitch (figs. 14, 15).—Pass the end @ round a spar and cross

it over 6. Pass it round the spar again and put the end a through the second bight.

Blackwall Hitch (fig. 16).—Form a bight at the end of a rope, and put the hook ofa tackle through the bight so that the end of the rope may be jammed between the standing part and the back of the hook.

Timber Hitch (fig. 17). —Take the end a of a rope round a spar, then round the standing part 6, then several times round its own part c.

O T

Fisherman’s Bend (fig. 18).—Take two turns round a spar, then a half hitch round the standing part and between the spar and the turns, lastly a half hitch round the standing part.

Fig. 13 Fig. 14 Fig. 16

6

a c Fig. 16. Fig. 17. Fig. 18.

Carrick Bend (fig. 19).—Lay the end of one rope over its own standing part so as to form a bight. Put the end of the other rope through this bight, under the standing part, over the end beyond the bight, under the standing part beyond the bight, and down through the bight over its own standing part.

Shect Bend (fig. 20).—Pass the end of one rope through the bight of another, round both parts of the other, and under its own stauding part.

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Fig. 19. Fig. 20. Fig. 21. Fig. 22.

Single Wall Knot (fig. 21).—Unlay the end of a rope, and with the strand a form a bight. Take the next strand 6 round the end ofa. ‘Take the last strand ¢ round the end of 6 and through the bight made by a. Haul the ends taut.

Single Wall Crowned (fig. 22).—Form a single wall, and lay one of the ends, a, over the knot. Lay 0 over a, and ¢ over b and through the bight of a. Haul the ends taut.

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Fig. 238. Fig. 24. Fig. 25.

Double Wall and Double Crown (fig. 23).—Form a single wall crowned ; then let the ends follow their own parts round until all the parts appear double. Put the ends down through the knot.

Matthew Walker (figs. 24, 25).—Unlay the end of a rope. Take the first strand round the rope and through its own bight; the

second strand round the rope, through the bight of the first, and through its own bight ; the third through all three bights. Haul the ends taut.

See Nares, Seamanship, 4th ed., 1868; Dana, Scaman's Manual, 9th ed., 1863; A. H. Alston, Scamanship, Portsmouth, 1871 ; Kipping, Masting and Rigging, 9th ed., 1864; Yachtsand Yachting, by ‘‘ Vanderdecken” (William Cooper), 1873; Book of Knots, by ‘¢Tom Bowling” (J. Bonwick), 1866.

KNOT, a Limicoline bird very abundant at certain seasons on the shores of Britain and many countries of the northern hemisphere. Camden in the edition of his Britannia published in 1607 (p. 408) inserted a passage not found in the earlier issues of that work, connecting the name with that of King Canute, and this account of its origin has been usually received. But no other evidence in its favour is forthcoming, and Camden's statement is merely the expression of an opinion,! so that there is perhaps ground for believing him to have been mistaken, and that the clue afforded by Sir Thomas Browne, who (circa 1672) wrote the name “Gnatts or Knots,” may be the true one.” Still the statement was so determinedly repeated by successive authors that Linnzeus followed them in calling the species Z'ringa canutus, and so it remains with nearly all modern ornithologists. Rather larger than a Snipe, but with a short, Plover-like bill and légs, the Knot visits the coasts of some parts of Europe, Asia, and North America at times in vast flocks ; and, though in temperate climates a good many remain throughout the winter, these are nothing in proportion to those that arrive towards the end of spring, in England generally about the 15th of May, and after staying a few days pass northward to their summer quarters, while early in autumn the young of the year throng to the same places in still greater numbers, being followed a little later by their parents. Jn winter the plumage is ashy-grey above (save the rump, which is white) and white beneath. In summer the feathers of the back are black, broadly margined with light orange-red, mixed with white, those of the rump white, more or less tinged with red, and the lower parts are of a nearly uui- form deep bay or chestnut. The birds which winter in temperate climates seldom attain the brilliancy of colour exhibited by those which arrive from the south; the luxuriance generated by the heat of a tropical sun seems needed to develop the full richness of hue. The young when they come from their birthplace are clothed in ashy-grey above, each feather banded with dull black

and ochreous, while the breast is more or less deeply tinged with warm buff. Much curiosity has long existed among zoologists as to the egg of the Knot, of which not a single identified or authenticated specimen is known to exist in collections, Yet more than sixty years ago the species was found breeding abundantly on the North Georgian (now commonly called the Parry) Islands by Parry's memorable expedition, as well as soon after on Melville Peninsula by Captain Lyons, and again during the recent voyage of Sir

1 His words are simply ‘‘ Knotts, i. Canutt aues, vt opinor e Dania enim aduolare creduntur.” In the margin the name is spelt ‘* Cnotts,” and he possibly thought it had to do with a well-known story of that king. Knots undoubtedly frequent the sea-shore, whcre Canute is said On one occasion to have taken up his station, but they generally retreat, and that nimbly, before the advancing surf, which he is said in the story not to have done.

2 In this connexion we may compare the French maringouin, ordinarily a gnat or mosquito, but also, among the French Creoles of America, a small shore-bird, either a Tringa or an Aigialitis, accord- to Descourtilz (Voyage, ii, p. 249). See also Littré's Dictionnaire, sub voce.

3 There are few of the Limicolz, to which group the Knot belongs, that present greater changes of plumage according to age or season, and hence before these phases were understood the species became encumbered with many synonyms, as Tringa cinerea, ferruginea, grisea, islandica, nevia, andso forth. The confusion thus caused was mainly cleared away by Montagu and Temminck,

George Nares on the northern coast of Grinnell Land and the shores of Smith Sound, where Major Feilden obtained examples of the newly-hatched young (Zdis, 1877, p. 407), and observed that the parents fed largely on the buds of Saxtfraga oppositifolia. These are the only localities in which this species is known to breed, for on none of the arctic lands lying to the north of Europe or Asia has it been unquestionably observed. In winter its wanderings are very extensive, as it is recorded from Surinam, Brazil, Walvisch Bay in South Africa,

China, Queensland, and New Zealand. Formerly this species was extensively netted in England, and the birds fattened for the table, where they were esteemed a great delicacy, as witness the entries in the Northumberland and Le Strange Household Books ; and the British Museum contains an old treatise on the subject— The maner of kepyng of knotts, after Sir William Askew and my Lady, given to my Lord Darcy, 25 Hen. VIII.” (M288. Sloane, 1592, 8 cat. 663). (A. N.)
KNOWLES, James SuErmpan (1784-1862), dramatic author, was born at Cork, 21st May 1784. His father was the lexicographer James Knowles, cousin-german of Richard Brinsley Sheridan. Not long after the removal of the family to London in 1798, young Knowles began his dramatic career by composing a play which was performed by himself and his juvenile companions, At the age of fourteen he published a ballad entitled The Welsh Harper, which was set to music and obtained great popularity ; and about the same time his precocious talents secured him the friendship of Hazlitt, through whom he also formed an intimacy with Lamb and Coleridge. Of his early career little else is known except that for some time he served in the Wilts and afterwards in the Tower Hamlets militia, and that he left the latter corps to become pupil of Dr Willan the physician, through whom he was appointed vaccinator to the Jennerian Society. Although, however, he was generously offered by Dr Willan a share in his practice, he resolved to forsake medicine for the stage, making his debut at the Crow Theatre, Dublin. At Wexford he in October 1809 married Maria Charteris, an actress from the Edinburgh Theatre. About this time he wrote Leo, which was played at Waterford with great success by Edmund Kean; but, although another piece, Brian Boroithme, which he wrote for the Belfast Theatre also drew crowded houses, his labours as an actor and author secured him so little pecuniary return that he found it advisable to become assistant to his father at the Belfast Academical Institution. In 1817 he removed from Belfast to Glasgow, where, besides conducting a flourishing school, he continued his dramatic authorship. His first important dramatic success was Caius Gracchus, produced at Belfast in 1815 ; and by Virginius, written for Edmund Kean, and first performed in 1820, he obtained a very high place among the dramatic authors of the century. Besides William Tell, in which Macready performed one of his most successful parts, the

other principal plays of Knowles are Zhe LHunchback, Love, and The Wife. In some of his own pieces he acted with a just appreciation of the character and with considerable vigour and fire, but he failed in the power of personation. He achieved some suc- cess, however, as a lecturer on elocution. In his later years he forsook the stage for the pulpit, and as a Baptist preacher attracted large audiences at Exeter Hall and else- where, while he also entered the field of polemical theology, publishing two works,—the Rock of Rome, and the Ldol Demolished by tts own Priests,—in both of which ho combated the special doctrines of the Romish Church. Knowles was for some years in the receipt of an annual

4 The Tringa canutus of Payer's expcdition seems morc likely to have been 7. maritima, which species is not named among the birds of Franz Josef Land, though it can hardly fail to occur there.

pension of £200, bestowed by Sir Robert Peel. He died at Torquay, November 30, 1862

A full list of the works of Knowles and of the various notices of him will be found in his Life, by his son Richard Brinsley Knowles, of which twenty-five copies were printed privately.

KNOX, Joun (1505-1572), the great Reformer of Scot- land, was born at Haddington, the county town of East Lothian, in the year 1505.1 His father was William Knox, commonly said to have been descended from the Knoxes of Ranfurly in Renfrewshire, but there is no ev1- dence to prove what rests solely upon the authority of David Buchanan. The name of his mother was Sinclair, and some of his letters, written in seasons of danger, were signed "John Sinclair." Whatever might be their lineage, Knox's relations were in such circumstances as secured for him a liberal education in the grammar school of his native town; and, when about sixteen years of age, he was sent to pursue his studies at the university of Glasgow, where Dr

John Mair or Major was principal regent, or professor of philosophy and divinity. Owing to some undiscovered cause he left the university without qualifying himself to take the degree of master of arts. It has been usual to state that from Glasgow Knox proceeded to St Andrews and there taught philosophy and theology, but no evidence can be adduced to show that he was officially connected in any way whatever with the university of that city. Not having qualified himself by taking his degree, he would be excluded from acting as a regent or professor, so that if he taught it can only have been in the way of private tuition. In truth, for some years about this time the course of life pursued by Knox is involved in obscurity. The probability is that he took orders in the Church of Rome as a secular priest about 1530, and was connected for upwards of ten years with one of the religious establishments in the neigh- bourhood of Haddington. In the Protocol books of that town the name of Johu Knox occurs among the witnesses to deeds of the years 1540, 1541, and 1542, in one deed under the style of Schir, that being the designation of priests who had not attained the higher academical degree of Magister; and as late as March 27, 1543, he pens and signs a notarial instrument as an apostolic notary, describing himself as “sacri altaris minister, Sanctiandra dioceseos, auctoritate appostolica notarius.”

The martyrdom of Wishart in 1546 was the turning point in the spiritual life of Knox, determining him to renounce scholastic theology and to profess his adherence to the Protestant faith. As this subjected him to suspicion and trouble, he resolved to leave Scotland and visit the schools of Germany; but Douglas of Longniddrie and Cockburn of Ormiston, to whose sons Knox had for some time been acting as private tutor, prevailed on him

1 Founding upon the designation “‘ Giffordiensis ” applied to him by Beza in his Zcones of 1580, and the statement of Spottiswood in his ITistory (1627) that Knox ‘‘was born in Gifford in the Lothians,” later writers, beginning with David Buchanan, have given Gifford “a village a few miles to the south of Haddington, as the birthplace of Knox. On the other hand two contemporary Romanist writers— Arehibald Hamilton (1577) and James Laing (1581)—assign to Had- dington

itself the honour in question: ‘‘Presbyter Joannes Knoxeus natus in Hadintona oppido in Laudonia”’; ‘‘Joannes Knox natus prope Hadintonam, que est urbs in Laudonia.” In 1785 the Rev. Dr Barelay of Haddington direeted attention to Giffordgate, one of the suburbs of Haddington, as the locality which popular tradition has uniformly maintained to have been the spot where the Reformer was born, and which, with the grounds adjoining, is called ‘‘Knox’s Walls” in a charter of 1607. Recent investigations prove that no village of the name of Gifford was in existence until the latter half of the 17th century, whereas in the Geneva Register of 1558, when Knox was admitted a burgess of Geneva, his name is thus entered: ‘‘ Jehan filz de Guillaume Cnoxe, natif de Hedington en Escosse.” David Laing, who in 1846 followed M‘Crie in preferring Gifford, in 1864 gives his verdict in favour of the-Giffordgate, stating that a visit to the locality led him to the conclusion that the question now admits of no dispute.

to relinquish his design, aud, along with his pupils, to enter the castle of St Andrews as a place of safety from the Romish clergy. It was there that Knox received a public call to the ministry, ‘“‘whairat,” to use his own graphic description of the scene in the great church, “the said Johnne abashed, byrst furth in moist abundand tearis, and withdrew him self to his chalmer.”

In June of the same year (1547) the Catholics of Scot- land and France joined their forces to avenge the death of Cardinal Beaton by capturing the Protestant garrison of St Andrews, the French fleet appeared in the bay, and the castle surrendered. It was stipulated that the lives of the refugees should be spared, that they should be removed to France, and that such of them as declined entering into the French service should be conveyed to any other country except Scotland. Knox, sharing the fate of his companions, was conveyed on board one of the French ships to Rouen; but the terms of the capitulation were grossly violated, and the captives were treated as prisoners of war. Knox and some others were sent on board the galleys, and, after being loaded with chains, were compelled to labour at the oar. Here they were subjected to many indignities and much suffering; but, in spite of every hardship and every threat, not one of their number renounced his faith. During

the ensuing winter the galley in which he was confined lay in the Loire; and in the summer of 1548 it sailed for Scotland, and cruised off the east coast. The hardships to which he was now subjected produced a very serious effect upon his health: he was seized with a violent fever, and no hope was entertained of his recovery. He, however, regained his strength, and during his captivity had sufficient energy of mind to engage in literary work. In the winter of 1548 Henry Balnaves of Halhill, who remained a prisoner in the old palace of Rouen, had sent to Knox a treatise on the doctrine of justification by faith, With this work Knox was so much pleased that, having revised it carefully, divided the contents into chapters, and added a brief summary of the book, he sent it to Scotland for publication with an epistle addressed by "the bound Servant of Jesus Christ unto his best beloved Brethren of the Congregation of the Castle of St Andrewes, and to all Professours of Christs true Evangell" (Works of John Knox, vol. iii.), As the old copy of this epistle bears the title of 'The Confession of Faith," this work may have been the "confession of his faith, containing the substance of what he had taught at St Andrews," which "he found means to convey to his religious acquaint- ances in Scotland," and which, Dr M'Crie thinks, 'appears to have been lost." If so, leaving out of view the notices of his first sermon and of his disputation with Friar Arbuckle in St Leonard's Yards, contained in his HZistorze, this epistle will rank as the earliest specimen of the Reformer's composition that has been preserved.

After an imprisonment of eighteen or nineteen months Knox obtained his release from the French galleys in February or March 1549. As he probably owed his freedom to the intercession of Edward VI. or the English Govern- ment, he came to London on obtaining his liberty, and was favourably received by Archbishop Cranmer and the lords of council. Of the English section of his life, extending over five years, Knox himself disposes in few words: 'The said Johne was first appointed preachar to Berwik, then to Newcastell ; last he was called to London, and to the sowth partes of England, whar he remaned to the death of King Edward the Sext" (Historie, book i). At Berwick, where he laboured for two years, he preached with his characteristic fervour and zeal, exposing the errors of Romanism with unsparing severity.

The tendency of his zeal was not, however, calculated to recommend him to the bishop of the diocese, Dr Cuthbert Tunstall or Tonstall,

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who was strongly attached to the old faith, Having been accused of asserting that the sacrifice of the mass is idolatrous, the preacher was cited to appear before the bishop, and to give an account of his preaching. Accord- ingly, on the 4th of April 1550, Knox entered into a full defence of his opinions, and with the utmost boldness proceeded to argue that the mass is a superstitious and idolatrous substitute for the sacrament of the Lord's Supper. The bishop did not venture to pronounce any ecclesiastical censure; and the fame of the obnoxious preacher was extended by this feeble attempt to restrain the boldness of his attacks on the doctrines of Rome. 'The confession or vindication of his doctrine made by Knox on this occasion will be found in vol. iii. of his collected Works—"A Vindication of the Doctrine that the Sacrifice of the Mass is Idolatry," 1550.

Upon Knox's reforming work while a preacher at Berwick 'some interesting light has recently been thrown by the late Dr Lorimer's John Knox and the Church of England, 1875. When looking through the " Morrice" collection of manuscripts in Dr Williams's library, London, Dr Lorimer came upon four papers never before published. One of these is a letter from "Johne Knokks to the Congregatioun of Bervik," and another is " The practice of the Lord's Supper used in Berwick by John Knox, 1550." With this "practice," which is nothing more than a fragment, Dr Lorimer associates "* A Summary, according to the Holy Scriptures, of the Sacrament of the Lord's Supper" to be found in the third volume of the Works, and to which Dr Laing has assigned the date 1550. Founding upon these documents, Dr Lorimer maintains that the very beginning of Puritan practice in the Church of England in the administration of the Lord's Supper is to be found in the order followed by Knox at Berwick, inasmuch as he not only substituted common bread for "'wafer-breads," thus anticipating by several years the substitution as authorized by Edward's second Prayer- Book, published in 1552, but gave the first example of the

substitution of sitting instead of kneeling in the act of communion, which has ever since continued to be a char- acteristic Puritan practice. At the close of 1550, or early in 1551, Knox was transferred to Newcastle-upon-Tyne, where he remained, with occasional absences in London, till the spring of 1553. In the closing month of 1551 he was appointed one of six chaplains to Edward VL, and in virtue of this appointment he was consulted in the preparation of the formularies of the Church of England. A book of forty-five articles of religion, forming the basis of the thirty-nine articles of the Anglican Church, drawn up by Cranmer, was submitted to the royal chaplains for their opinion. An original copy of these articles is preserved in H.M. State Paper Office with the autographs of the chaplains, the sixth being “Jo. Knox.” Shortly after this the duke of Northumberland originated a proposal to make Knox a bishop. The letters bearing upon the proposal, not known to Dr M‘Crie, were discovered by the late Mr Tytler, and published by him in his Hxgland under the Reigns of Edward and Mary, vol. ii. The duke’s wish was that the king would ‘‘appoint. Mr Knocks to the office of Rochester Bishoprick.” When, however, the Scotch chaplain was informed of what was in contemplation, and was instructed to wait upon Northumberland, the latter did not find the man he thought to benefit eager to grasp at promotion, and the matter ultimately came to nothing by default of Knox himself. The last year of work in England was spent mainly in London and the southern counties. As royal chaplain Knox preached in turn before the conrt, and found favour with his royal hearer ; but he was twice summoned before the privy council, first to answer complaints made by his would-be ducal patron, and

then to vindicate his declinature of the vacant living of All Hallows in London.

Edward VI. having died in July 1553, and, the Marian persecutions having shortly afterwards broken out, Knox was persuaded to withdraw from England, and sailed for Dieppe, landing at that town in January 1554. The en- forced leisure of exile gave the refugee an

opportunity of completing and publishing several treatises during two sojourns in the same year at Dieppe. “An Exposition upon the Sixth Psalm of David,” addressed to Mrs Bowes, “A Godly Letter of Warning or Admonition to the Faithful in London, Neweastle, and Berwick,” “Two Comfortable Epistles to his afflicted Brethren in England,” and “A Faithful Admonition to the Professors of God’s Truth in England,” all belong to the year 1554. After visiting the churches of France and Switzerland, Knox accepted an invitation to become one of the pastors of the English congregation at Frankfort-on-the-Main, and repaired thither in November of the same year. Soon after his settlement dissensions arose in the congregation in regard to the use of the surplice, the omission of the litany, the audible responses, aud kneeling at the com- munion (see the letters and extracts from ~~the “ Brief Discourse of the Troubles at Frankfort” given by Dr Laing in vol. iv. of Knox’s Works). A party in the congregation, clamorous for a strict adherence to the English Book of Prayer, lodged information with the magistrates that Knox, in his “ Faithful Admonition,” had used treasonable language in speaking of the emperor, the queen of England, and her husband Philip II. Not wishing to increase the troubles, the maligned preacher relinquished his charge on the 26th March 1555, and re~~ tired to Geneva. The closing months of that yearand the opening ones of the year following form an important period in the public labonrs and the private life of the Reformer; for he then visited his native country, preached in Edinburgh, in West Lothian, and in Ayrshire, and dis- pensed the communion privately in several places. Before his visit came to a close he addressed a letter to the queen regent, in the hope that she might be persuaded to extend her protection to the Reformed preachers, or at least listen favourably to their doctrine. This letter, “augmented and explained by the author,” and reprinted in 1558, “An Exposition upon Matthew iv., concerning the temptation of Christ in the wilderness,” and “A letter of wholesome counsel, addressed to his Brethren in Scotland,” belong to the year 1556. In visiting Scotland at that time, however, Knox was influenced by other considerations than those bearing simply on the public weal. For as far back as his Berwick ministry he had become acquainted with the family of Richard Bowes, and formed an attachment for the fifth daughter, Marjory. Dr M‘Crie represents the

marriage as having taken place in 1553 before Knox left England ; and in support of his view it falls to be said that after that date Knox addresses Mrs Bowes as ‘‘ Dearly Beloved Mother,” and that he speaks of Marjory as his “‘ wife,” his “ dearest spouse.” But, considering the strong opposition to the union on the part of Richard Bowes and other relatives, as also the very uncertain and precarious position of the reformer at the time, there is good reason to think, with Dr Laing, that then the parties had only formally pledged themselves to one another “ before witnesses,” and that the actual marriage took place when Knox visited Scotland in

1555.

At the urgent solicitation of the English congregation at Geneva, consisting largely of those who had withdrawn from Frankfort, Knox left Scotland in the summer of 1556 ; and in the “Livre des Anglois 4 Genéve,” on the 13th September of that year, the names of “John Knox, Marjory, his wife, Elizabeth, her mother, James (blank),

his servant, and Patrick, his puple,” are entered as members of the English congregation. In Geneva the Scotch Reformer laboured with voice and pen till 1559. The literary works of that period, in addition to ten Famdzar Epistles, include Letters to his Brethren and the Lords pro- fessing the truth in Scotland, three in number, 1557; An Apology for the Protestants who are holden i prison at Paris, 1557 ; The Appellation from the Sentence pronounced by the bishops and clergy, 1558 ; A letter addressed to the Commonality of Scotland, 1558 ; An Epistle to the whabit- ants in Newcastle and Berwick, 1558 ; and A brief exhorta- tion to England for the speedy embracing of the Gospel, 1559. Judged by the excitement it created, the most outstanding writing of this period is The Mirst Blast of the Trumpet against the Monstrous Regiment of Women ; and it cannot be denied that this publication was un- seasonable, and might be expected to expose the author to the resentment of two queens during whose reign it was his lot to live. Indeed the sounder of the Mirst Blast would seem to have realized that it was “blown out of season,” for, whereas his purpose

was “thrice to blow the trumpet in the same matter, if God so permit,” and on the last occasion to reveal his name, the intention was never carried into effect. The resentment to which his blast against feminine government gave rise in queenly breasts did not soon subside ; one immediate effect was that, when Knox resolved to return to Scotland, and applied to the English Government for permission to pass through the sister kingdom, the application was refused. Impatient of delay he sailed from Dieppe direct for Leith, and, landing at that port in safety, reached Edinburgh on 2d May 1559.

From this time to the close of his life the biography of the Reformer becomes inseparably connected with the history of Scotland. Within a few days of his arrival in Scotland, through the representations of the Romanist clergy to the queen-regent, Knox was proclaimed au outlaw and a rebel; but, undeterred by considerations of personal danger, he lost no time in joining the leaders of the Protestant party then assembled in Dundee. From Dundee he went with them to Perth, where his preaching was the antecedent though not the cause of a tumult which resulted in the altar, images, and other ornaments of the church being torn down, and the houses of the grey and black friars being laid in ruins. St Andrews is the next place of importance at which Knox joined the Protestants, at this time called the congregation, the lay leaders of the party, mostly noblemen, being known as the lords of the congregation. Here Knox announced his intention to preach in the cathedral church; and, undismayed by the threats of the archbishop, unmoved by the remonstrances of his friends, he carried his purpose into effect, preaching on four successive days, and with such signal effect that the provost, bailies, and inhabitants agreed to set up the Reformed worship in the town, stripped the church of images and pictures, and pulled duwn the monasteries. By the end of June Knox was again in Edinburgh, preaching in St Giles’s and the abbey church; and on the 7th July he was elected minister of Edinburgh.

When the army of the queen-regent took possession of the capital, and the lords of the congregation agreed to leave it, they took their minister with them from a regard alike to the danger to which he would be

exposed if left behind and the service it was in his power to render the Protestant cause. The result abundantly verified the wisdom of the step, for, set free from city labours, Knox travelled over a great part of Scotland, and visited the towns of Kelso, Jedburgh, Dumfries, Ayr, Stirling, Perth, Brechin, Montrose, Dundee, and St Andrews, with marked results in the diffusing of knowledge and the strengthening of the hands of fellow Protestants. By the end of April

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1560 we find him once niore in Edinburgh, having rendered important service to the Protestant leaders in their negotia- tions to procure aid from En zland, and, of necessity rather than from choice, acting the part of a politico-ecclesiastic. The most elaborate theological writing of the Scottish Reformer, although written before his final return to Scotland, was published in this year, 1560, at Geneva. It is An Answer to the Cavillations of an Adversary respect- ing the doctrine of Predestination.

The event of greatest political importance in this same year 1560 was the assembling of the Scottish parliament at Edinburgh, on 1st August. A petition having been presented by the Protestants of the country, craving the abolition of Popish doctrine, the restoration of purity of worship and discipline, and the appropriating of ecclesias- tical revenues to the support of the ministry, the promotion of education, and the relief of the poor, the ministers and barons were required to lay before parliament a summary of Reformed dectrines. ‘ Within foure dayis” this was done. The confession was read before the whole parliament, and after reasoning and voting was ratified by Act of Parliament, and the Protestant religion formally established. The Con- fessioun of faith professit and belevit be the Protestants within the Realme of Scotland, &c., in the composing of which no small share must have fallen tothe minister of Edinburgh, is inserted by him at length in book iii. of his Hzstorve. Between the dissolution of parliament and the first meeting of the General Assembly of the Church of Scotland on the 20th December, Knox and three other ministers were engaged in drawing up the plan of ecclesiastical

government known as the Book of Policy, or First Book of Discipline. This standard document, approved by the General Assembly and subscribed by a majority of the members of privy council, is also incorporated in Knox's Historve.

The youthful, widowed, and fair Queen Mary, having arrived in Scotland in August 1561, lost no time in send- ing for Knox to the palace of Holyrood, in order that she might hold with him the first of those four or five dialogues which historians have rendered with dramatic effect not always consistent with historical accuracy. The charge brought against the Reformer of treating his sovereign with rudeness and disrespect in the course of those interviews has been thoroughly disproved by his biographer giving the details of what passed as furnished by one of the parties in his Historie, and is quite discredited by such a judge as Thomas Carlyle.

In the following year Knox found a more congenial sphere for the exercise of his logical and dialectic skill in a disputation with Quintine Kennedy, abbot of Crossrag- well, in the neighbourhood of Maybole, Ayrshire. The abbot had set forth a number of articles respecting the mass, purgatory, praying to saints, the use of images, and other points which he declared his intention to open up more fully in his chapel at Kirkoswald. But when

| Knox, who happened to be in the vicinity, appeared on the

Sabbath specified, the abbot deemed it prudent to absent himself, and Knox preached in his stead. 'This led. to correspondence which resulted in arrangements for a disputation taking place. The disputants met at Maybole on the 28th September 1562 and the two following days at 8 a.m., in the house of the provost. Forty persous on each side were admitted as witnesses of the dispute, " with so many mo as the house may goodly hold, be the sight of my lord of Cassilis" (nephew of Kennedy). As usually is the case in such contentious, both sides claimed to be vic- torious ; but, to counteract the one-sided reports circulated by the abbot and his friends, Knox published, in 1563, an account of the dispute taken from the records of the

notaries present, to which he added a prologue and short marginal notes.

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Queen Mary, having failed to influence the Reformer by |; shock caused by the removal of the nobleman in whom he

her “many salt tears” or her flattery, endeavoured to get him into her power by movingthe privy council to pronounce him guilty of treason on the ground that he had written a circular letter to leading Protestants in reference to the trial of two persons indicted for a riot in the Chapel Royal. Knox’s trial took place at a special meeting of council in December 1562, at which the queen was present and acted an unseemly part as prosecutrix. To the uncoucealed chagrin and intense displeasure of his sovereign, Knox was by a majority of the noblemen present absolved from all blame and commended for his judicious defence.

Before he was required to appear a second time at a privy council meeting, Knox, who had been a widower for three years, was married to his second wife Margaret Stewart, daughter of “the good” Lord Ochiltree ; and in Ochiltree House, an ancient baronial residence, the room is still pointed out where, in March 1564, the marrjage was celebrated. The occasion of his second appearance before the privy council was the preaching of a sermon in St Giles’s about a month after the marriage of Queen Mary and Lord Darnley in July 1565. On the day the sermon was preached the young king made an imposing appearance, sitting on a throne prepared for his reception. Enraged by what he regarded as passages having a reference to himself in the discourse of the preacher, Darnley returned to the palace with the determination not to taste food till the offender had been punished. Knox was accordingly called before the council, “from my bed,” as he tells us. Informed that he had offended the king, and that he must desist from preaching so long as their majesties remained in Edinburgh, Knox made reply that he had spoken nothing but according to his text (Isa. xxvi. 13-21), and, if the church should command him either to speak or abstain, he would obey, so far as the word of God

would permit him. In regard to the sermon he deemed it necessary for his own exoneration to write out in full what he had spoken, and publish it with a preface dated at “ Edingbrough, the 19th of September 1565.” This sermon is the only specimen of Knox’s pulpit discourses handed down to us. Dr M‘Crie is of opinion that the prohibition was of a very temporary nature; but it does not appear that Knox resumed his usual minis- trations in Edinburgh, unless at occasional intervals, till after Mary had been deprived of her authority in 1567. During this period of absence from his charge, however, the inhibited preacher was far from idle. In 1566 he drew up the most considerable portion of his Historie of the Iteformatioun, having made a commencement in 1559 or 1560, and he wrote at the request of the Assembly various public letters. He also visited churches in the south of Scotland, and made a journey to England, in order to see his two sons, who had been there for education since the death of their mother Marjory Bowes.

On the 29th July 1567 the infant James VI. was crowned in the parish church of Stirling, and on that occasion Knox reappeared in public and preached the coronation sermon. He also preached at the opening of parliament in December of the same year, when the Confession of Faith formed and approved by parliament in 1560, with various Acts in favour of the Reformed religion, was solemnly ratified. When James Stuart, earl of Murray and regent of Scotland, was assassinated and died at Linlithgow, 23d January 1569, the event caused anguish and anxiety to the Reformer, who poured out the sorrows of his heart in the sermon and the prayers of the day on which the tidings reached the capital, and who thereafter preached the funeral Sermon in the presence of three thousand persons gathered to witness the interment in the south aisle of the collegiate church of St Giles. The strain to which body and mind alike had been subjected for many years back, aud the

placed the greatest confidence, affected the Reformer’s health, and in the month of October 1570 he had a stroke of apoplexy. Although he so far rallied as to have the use of speech restored to him and to

resume preaching, he never entirely recovered from the debility which the stroke pro- duced.

Resolved to take no prominent part in public affairs, and confining himself to preaching in the forenoon of the Lord's day, Knox might have spent what little of life on earth remained for him in the house assigned him by the provost and town council of Edinburgh, had he not become personally obnoxious to Kirkcaldy of Grange. This and the troubles which agitated the country induced Knox, "sore against his will, being compellit be the Brethren of the Kirk and Town," to quit the metropolis and retire to St Andrews. During his stay there of fifteen months the many infirmities of age did not prevent him engaging in his two favourite employments of preaching and writing. How he preached James Melville, then a student, after- wards minister of Anstruther, has described in an often- quoted passage of his " Diary." The latest publication of Knox in his life time was "imprentit at Sanctandrois be Robert Lekpreuik, Anno Do. 1572." It is a tract in the form of an answer to a letter written by James Tyrie, a Scottish Jesuit.

By the end of July the adherents of the queen's party abandoned Edinburgh, and so enabled the banished citizens to return to their homes. One of their first acts was to send for Knox, who, travelling slowly because of weakness, reached the capital (for the last time) on the 23d August 1572. Only two more public appearances were to be made by him. The first of these was when in September tidings came to Edinburgh of the St Bartholomew massacre. Being assisted to reach the pulpit, and summoning up the remainder of his strength, he thundered out the vengeance of heaven against "that cruel murderer and false traitor, the king of France," and desired the French ambassador to tell his master that sentence was pronounced against him in Scotland, that the Divine vengeance would never depart from him nor from his house if repentance did not ensue, but that his name would remain an execration to posterity, and none proceeding from his loins should enjoy his kingdom in peace. The other occasion on which the debilitated Reformer appeared in public was the induction of Lawson, sub-principal of King's College, Aberdeen, as his successor,

which took place on the 9th November. After taking a leading and solemn part in the services, he crept down the street leaning upon his staff and the arm of his attendant, and entered his house never to leave it alive.

Interesting details of his last illness and death-bed exercises are furnished in two contemporary narratives— Richard Bannatyne's ‘‘ Account of Knox's Last Illness and Death" given in his Journal of the Transactions in Scotland 1570-1573, and the "Eximii viri Joannis Knoxii Scoti- cane Ecclesiz instauratoris vera extreme vite & obitus Historia" of Thomas Smeton, principal of the university of Glasgow, at the end of his Responsto ad Hamiltonii Dialogum, 1579. Both narratives are inserted by Dr Laing in his edition of the Works, vol. vi. part ii. Attended by his wife and friends, Knox died on Monday the 24th of November 1572, in the sixty-seventh year of his age. The funeral took place on the Wednesday following, when the body was brought from the house in the Netherbow Port by the newly-appointed regent, the earl of Morton, and other noblemen, and interred in the burying-ground connected with the church of St Giles. "When the body was laid in the grave," says Calderwood, "'the earl of Morton uttered these words:—'Here lieth a man, who in his life never feared the face of man; who hath

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been often threatened with dagge and dagger, but yet hath euded his days in peace and honour." If any stone ever marked the precise spot where Knox was buried—said by tradition to be in the Parliament Square, a few feet to the west of the pedestal of Charles II.'s statue—it must have been destroyed in 1633, when the burying-ground was wholly obliterated by buildings. As in the case of his illustrious contemporary and friend Calvin, no tombstone

inarks the place where he was interred.

Knox’s family consisted of five children—two sons and three daughters. His two sons were born to him by his first wife Marjory Bowes. Nathanacl and Eleazer Knox were both born in Geneva, entered as students of the university of Cambridge, and became fellows of St John’s College. Both died at an early age, and by their deaths the family of the Reformer became extinct inthe male line. The three daughters of Knox were Martha, Margaret, and Elizabeth. Martha was married to Alexander Fairlie of Braid, in the neighbourhood of Edinburgh, a tradition that she became the first wife of James Fleming, father of Robert Fleming, author of The Fulfilling of the Scriptures, having been disproved by Dr Laing (Works, vol. vi., part 2, lxix.) ; Margaret Knox married Zachary Pont, for several years minister of St Cuthbert’s, Edinburgh ; aud Elizabeth married John Welch, or Welsh, or Welsch, minister succes- sively of Sclkirk, Kirkeudbright, and Ayr, and, when transported, of the French Protestant Chureh,. Dr Laing considers it improbable that any lineal descendants of these daughters still cxist. ,

Of Knox no original painting is known to exist, Several like- nesses have been frequently reproduced. 1. A woodeut portrait of the Reformer ocenrs in Beza’s Jcones, published at Geneva in 1580, which has often been reproduced. 2. A French translation of the Zeones, by Siinon Gaulart, appeared in 1581 with a totally dif- ferent portrait substituted in place of that of Knox, which is now believed to represent William Tyndale, the translator of the Bible. 38. In 1602 Verhciden, a Dutch theologian, published at the Hague his Prestantiwm aliquot Theologorum LEfigies, and in that work a head engraved on copper by Hondius is given as that of Knox. ‘There is every reason to suppose that this is merely an improved copy from Beza, and not taken from an original painting. 4, The Torphichen portrait of Knoxis at Calder House. It has on the back of the canvas the inscription, in a handwriting less than a ecntury old—“ Rev. Mr John Knox. The first sacrament of the Supper given in Scotland after the Reformation was dispensed by him in this hall.” Itis a harsh disagreeable likeness, painted at least a century after Knox’s death, with Beza’s woodcut for model. 5. In 1836 the Society for the Diffusion of Useful Knowledge published an engraving of a portrait of Knox which now goes by the

name of the Somerville portrait. This painting belonged to the Somerville family, and hung on the walls of their London residenee till the peerage became extinct. The tradition in the family is that it was brought into their possession by James, the thirteenth baron, in the latter half of the 18th century ; and the supposition of those who regard this as a veritable likeness of the reformer is that Baron Somerville had fallen in with an excellent portrait seemingly by some distinguished artist of Knox's time (presumably Francis Porbus, who painted a likeness of George Buchanan), and had a copy of it painted for his mansion of Drum, uear Kdinburgh. Engravings of Beza's and Verheiden's portraits will be found in Knox's Works, vols. i. and vi.; of the Torphichen portrait in the Life of Knox, 1st edition ; and of all the five like- uesses in The Portraits of John Knox, by Thomas Carlyle, whose verdict is in favour of the Somerville portrait as ‘‘ the only probable likeness anywhere known to exist."

Literature.—The Works of John Knox, eolleeted and edited by David Laing, 6 vols., Edinburgh, 1846-64 ; M‘Crie, The Life of John Knox, 1st ed., 1811, 7th ed., 1855; Lorimer, John Knox and the Church of England, London, 1875 ; T. Carlyle, An Essay on the Portraits of John Knox, published in eollected works along with The Early Kings of Norway, London, 1875. The life and labours, eharaeter and influenee, of Knox are dealt with more generally in the following works :—Hill Burton's History of Scotland 3 J. A. Froude's History of England; Carlyle's Heroes and Hero Worship; Moncreiff, The Influence of Knox and the Scottish Reformation on. England, London, 1860; Froude, The Influence of the Reformation on the Scot- tish Character, Edinburgh, 1865. (C. G. MC.)

; KNOXVILLE, chief city of Knox county and of East Tennessee, United States, is situated on the right bank of the Tennessee river, which is navigable up to this point, four miles below the confluence of the Holston and French Broad rivers, and about 165 miles east of Nashville. By recent statistics it is shown to be one of the six healthiest cities in the United States; the elevation is 1000 feet, mean temperature 58° Fahr., average rainfall 54:5 inches. Among its numerous handsome buildings are the United States custom-louse and post-office, the

university of Ten- nessee, and the public schools. There is a free library in

the city. The university, which includes the State college

of agriculture and the mechanic arts, was founded in 1807, the latter departments being added in 1869. It has a good library, and geological, mineralogical, and zoological collec- tions. In 1881 there were 398 students. Knoxville is a busy industrial and commercial centre. Its manufactures include iron in all its forms, railway and other carriages, paper, furniture, sashes and blinds, tobacco, flour, leather and harness, pottery, &c. ; and it has a brisk trade in these articles, as well as in boots and shoes, hardware, and dry- goods. Marble and coal of excellent quality are found in vast quantities near the city. Knoxville was settled in 1789, and laid out as a town in 1791, when it was named after General Henry Knox, at that time Washington's minister of war. From 1794 till 1817 it was the capital of Tennessee. During the civil war it was an important position, passing into the possession of the Union forces in 1863. The population of the city in 1880 was 9693, or, including directly connected suburbs, 15,450.

KOBELYAKI, a town of Russia, in the government of Poltava, 40 miles south-west of the government town, with a station on the railway between Kharkoff and Kremen- tchug. The town proper is situated on the right bank of the Vorskla, but a suburb of some size, known simply as Zaryetchya or ' Beyond the River," lies on the other side. Of the 13,000 inhabitants more than half are occupied exclusively with agriculture ; but weaving, introduced by German colonists, is beginning to be a considerable in- dustry in the town. Kobelyaki was founded by the Polish nobleman Nemirovitch, and is mentioned as a town iu 1647. In the neighbourhood lies the village of Ferevo- lotchna, where the Swedish forces under Charles XII. laid down their arms.

KOBRIN, a town of Russia, in the government of Grodno, 12 miles east of Brest-Litovsk and 4 miles from the Tevli station of the railway between Minsk and Brest- Litovsk. It lies in the midst of a marshy country, to the east of which are extensive forests ; although situated on the Mukhavetz river, which enters into the system of canals uniting

the Dnieper and Bug, it enjoys but little prosperity. Its 8000 inhabitants are chiefly engaged in agriculture ; there is also some trade in grain, salt, timber, and bones. Kobrin was until the 16th century the capital of a principality of the same name.

KOCK, Cuarzes Pau DE (1794-1871), novelist, was born at Passy on the 21st of May 1794, and died at Paris on the 29th of August 1871. He was a posthumous child,

| his father, who was a banker of Dutch extraction, having

been one of the numerous victims of the Terror, and dying on the scaffold with Hebert and Clootz, not as an extreme republican, but as "suspect" of foreign relations. The family was one of some rank in the Netherlands, and an uncle of the novelist attained to the position of minister of the interior in his native country. Paul de Kock, however, remained all his life a citizen of France. He began life as a banker's clerk, which occupation he soon quitted for literature. But his natural taste, or the memory of his father's death, kept him far apart from the republican party, and he was perhaps the most remarkable literary continuator of the ancien régime as far as light novels were concerned. His life was almost entirely uneventful, its chief incident being a burglary which was committed at his country house at Romainville in his later days. For the most part he resided on the Boulevard St Martin, and was one of the most inveterate of Parisians.

Paul de Kock began to write very early, and continued to produce novels almost until the end of his long life. But his period of greatest and most successful activity was the Restoration and the early days of Louis Philippe. The comparative " patavinity" of his style, and the fact of his standing aloof from the whole innovating movement in

literature as in politics, made him relatively less popular in France itself than abroad, where he was considered as the special painter of life in Paris. Major Pendennis's remark that he had read nothing of the novel kind for thirty years except Paul de Kock, "who certainly made him laugh," is likely to remain one of the most durable of his testimonials, with as a companion the legendary ques- tion of a foreign sovereign to a Frenchman who was paying his respects, "Vous venez de Paris et vous devez savoir des nouvelles. Comment se porte Paul de Kock?" The disappearance of the grisette and of the cheap dis- sipation which Murger pathetically laments in more than one of his works practically made Paul de Kock obsolete, and his want of style affected him as unfavourably as it did his dramatic analogue Scribe. But to the student of manners his vivid and by all accounts truthful por- traiture of low and middle class life in the first half of the 18th century at Paris

will never lose its value, and, though he can hardly be said to hold a high place in literature, he is a remarkable follower of Restif de la Bretonne, and may be said to be in a sense the iast of the 18th century school of novelists.

It has been said that the works of Paul de Kock are very numerous. in the fullest list that we have seen they amount to about a hundred, some of them being decidedly voluminous. With the exception of a few not very felicit- ous excursions into the historical romance, they are all stories of middle class Parisian life, of guinguettes and cabarets and equivocal adventures of one sort or another. The most famous of all is Ze Barbier de Paris, which has been translated into almost every European language. Of equal literary merit, and, considering the style, of singular freedom from objectionable characteristics, is André le Savoyard, a remarkable story, full of narrative power, and one of the happiest examples of the working up of simple and commonplace details into an interesting whole. A certain sameness pervades most of Paul de Kock's work. It is almost untouched by the influences of the romantic movement, and has none of the strong sentiments of the school which derived from the author's contemporary Balzac. But there is a good deal of human nature in it, a good deal of accurate observation, and an almost total absence of the revolting and the preposterous. Paul de Kock was the Charles de Bernard of low life, and greater praise of its kind could hardly be given to any writer. ;

KODUNGALUR, or CrancANnorz, a town in Cochin state, Southern India, 10° 13' 50" N. lat., 76° 14' 50" E, long., with a population (1876) of 9475.

Though now a place of little importance, its historical interest is considerable. Tradition assigns to it the double honour of hay- ing been the first field of St Thomas's labours (52 A.p.) in India and the seat of Cheruman Perumal's government (841). The visit of St Thomas is generally considered mythical; but it is certain that the Syrian Church was firmly established here before the 9th eentury (Burnell), and probably the Jews' settlement was still earlier, The latter, in fact, claim to hold grants dated 378 A.D. The cruelty of the Portuguese drove

most of the Jews to Cochin. Upto 1314, when the Vypin harbour was formed, the only opening in the Cochin backwater, and outlet for the Periyar, was at Kodun- galur, which must then have been the best harbour on the coast. In 1502 the Syrian Christians invoked the protection of the Portu- guese. In 1523 the latter built their first fort there, and in 1565 enlargedit. In 1661 the Dutch took the fort, the possession of which for the next forty years was contested between this nation, the Zamorin, and the raja of Kodungalttr. In 1776 Tipu (Tippoo) seized the stronghold. The Dutch reeaptured it two years later, and, having ceded it to Tipt in 1784, sold it to the Travancore Taja, and again in 1789 to Tipt, who destroyed and left it in the following year.

KOHAT, a district in the lieutenant-governorship of the Punjab, India, is situated between 32° 47’ and 33° 53’ N. lat., and between 70° 34’ and 72° 17’ E. long., and is bounded on the N. by Peshawar, on the E, by the Indus

river, on the 8. by Bannu district, and on the W. by the Kuram river and the Waziri hills. It consists chiefly of a bare and intricate mountain region, deeply scored with river valleys and ravines, but enclosing a few scattered patches of cultivated lowland. The eastern or Khatak country especially comprises a perfect labyrinth of ranges, which fall, however, into two principal groups, to the north and south of the Teri Toi river. The Miranzai valley, in the extreme west, appears by comparison a rich and fertile tract. In its small but carefully tilled glens, the plane, palm, fig, and many orchard trees flourish luxuriantly ; while a brushwood of wild olive, mimosa, and other thorny bushes clothes the rugged ravines upon the upper slopes. Occasional grassy glades upon their sides form favourite pasture grounds for the Waziri tribes. The Teri Toi, rising on the eastern limit of Upper Miranzai, runs due eastward to the Indus, which it joins 12 miles north of Makhad, dividing the district into two main portious. The drainage from the northern half flows southward into the Teri Toi itself, and northward into the parallel stream of the Kohat Toi. That of the southern tract falls north- wards also into the Teri Toi, and southwards towards the Kuram and the Indus. The frontier mountains, continua- tions of the

Safed Koh system, attain in places a consider- able elevation, the two principal peaks, Dupa Sir and Mazeo Garh, just beyond the British frontier, being 8260 and 7940 feet above the sea respectively. The Waziri hills, on the south, extend like a wedge between the boundaries of Bannu and Kohat, with a general elevation of less than 4000 feet. The salt mines are situated in the low line of hills crossing the valley of the Teri Toi, and extending along both banks of that river. The deposit has a width of a quarter of a mile, with a thickness of 1000 feet ; it sometimes forms hills 200 feet in height, almost entirely composed of solid rock-salt, and may pro- bably rank as one of the largest veins of its kind in the world. The most extensive exposure occurs at Bahadur Khel, on the south bank of the Teri Toi. Petroleuin springs exude from a rock at Panoba, 23 miles east of Kohat ; and sulphur abounds in the northern range.

The census of 1868 extended ‘over an area of 2838 square miles, and diselosed a total population of 145,419 (males, 79,328 ; females, 66,096). The Mohammedans numbered 136,565, as against 6544 Hindus, 1837 Sikhs, and 473 ‘‘ others.” The Hindus chiefly belong to the trading castes. Among the Moham- medans, 6313 rank as Sayyids; but the Pathans form by far the largest division. Only one town, Kohat, eontains a population exceeding 5000 inhabitants. Sinee the annexation of the Punjab, cultivation has extended from 64,772 acres in 1848 to 168,015 acres in 1873-74. The agricultural staples include wheat and barley for the spring harvest, with riee, millet, Indian corn, and pulses for the autumn crops. Tobaeeo, mustard, and oil-seeds also cover small areas, and cotton of inferior quality is grown in favourable years. The area under wheat in 1873-74 was returned as 36,600 acres; barley, 17,070; millets, 28,705 ; Indian corn, 12,050; riee, 4710 acres, Cultivation has now nearly reached its utmost limit. The principal industry of the district is centred iu the salt mines. Of these five are now open, from whieh 294,680 cwts. of salt-were quarried in 1870-71. Gun barrels mannfactured near Kohat town have a considerable reputation along the north-western frontier. Coloured scarfs, woollen carpets, eountry cloth, and pottery are also turned out at Kohat, Hangu, and Teri. The frontier military road forms the ehief channel of communication, practicable through- out for wheeled conveyanees and

artillery. The district has alto- gether 249 miles of road, all unmetalled, and in many cases mere tracks, passable at best by camels, and sometiines only by bullocks or ponies. The total imperial revenue raised in the district in 1851-52 amounted to £9824, which in 1872-73 had risen to £19,448, of which the land-tax contributed £8951, and salt £8556. Education remains in a very backward stage. Jour Govern- ment or aided schools and forty-three indigenous schools had a total roll of only 745 pupils in 1872-73. Fromits proximity to the hills, the temperature of the district is comparatively cool, except during the summer months.

Kont, the chief town and cantonment of the above district, situated in 33° 35’ N. lat. and 71° 29’ 43” EL

long., near the north bank of the Kohat Toi river, and 2 miles from the southern base of the Afridi Hills. The population in 1868, including the cantonment, was 11,274, The town is built on undulating ground, within an amphitheatre of hills, and is surrounded by a slight wall, 12 feet in height. Its principal manufacture is that of gun barrels, The cantonment and civil station lie to the east and north-east of the native city. The canton- ment has accommodation for about 3000 troops.

KOHL, Jonann Georg (1808-1878), traveller and author, was born at Bremen, April 28, 1808. He studied law at Géttingen, Heidelberg, and Munich, and for six years was a private tutor in Courland, In 1838, after travelling through parts of Russia, he settled at Dresden. The success of four books, which he published in 1841, describing his Russian experiences, decided his choice of literature as a profession. Travels in Europe and America supplied ample material, and book after book appeared. In 1854 he undertook to prepare an historical coast survey of the United States, in the service of Government, In 1858 he returned to Bremen, where in 1863 he was made city librarian, In that post he died, October 28, 1878.

Kohl was a prolific author, and his books, both in the original and in English translations, have enjoyed considerable popularity. His style is

agreeable and lively, and not without humour ; his observation was acute, and not more superficial than was inevitable from the mode in which he amassed his materials. Besides the books on Russia, Kohl published works on Austria~Hungary (1842), Eng- land, Scotland, and Ireland (1844), the Alps (1849-51), Denmark and the Northern Duchies (1846-47), south-eastern Germany (1852), the Netherlands (1850), Istria, Montenegro, &c. (1851), the Danube (1854), Canada and New England (1857), the north-west of the United States (1859), Lake Superior (* Kitchi-Gami") (1859). Among his historical, geographical, and miscellaneous writings are the following :—Der Rhein, 2 vols., 1851; Aus meinen Hiitten, 3_vols., 1850; Geschichte der Entdceckung Amerika's, 1861; Das Hans Scefahrt xu Bremen, 1862 ; Nordwestdcutsche Skizzen, 1864 ; History of the Discovery of Maine, 1869; Dic Vélker Europa's, 2 vols,, 1872; Kleine Essays, 1875.

KOLABA, a district of the Bombay Presidency, India, lying between 17° 52' and 18° 50' N, lat., and between 73° 7' and 73° 42' E. long. It is bounded on the N. by Bombay harbour and Thana district, on the E, by Poona and Satara, on the 8. by Ratnagiri and Janjira state, and on the W. by the Arabian Sea. Lying between the Sahyadri range and the sea, Koldba district abounds in hills, some being spurs of considerable regularity and height, running at right angles to the main range, whilst others are isolated peaks or lofty detached ridges. The sea frontage, of about 20 miles, is throughout the greater part of its length fringed by a belt of cocoanut and betel-nut palms. Behind this belt lies a stretch of flat country devoted to rice cultivation. In many places along the banks of the salt-water creeks there are extensive tracts of salt marsh land, some of them reclaimed, some still subject to tidal inundation, and others set apart for the manufac- ture of salt, The district is traversed by a few small streams. Tidal inlets, of which the principal are the N&gothna on the north, the Roha or Chaul in the west, and the Bankot creek in the south, run inland for 30 or 40 miles, forming highways for a brisk trade in rice, salt, firewood, and dried fish. Near the coast especially, the district is well supplied with reservoirs. The Sahyédri range has two remarkable peaks,—Raigarh, where Sivaj{ built his capital, and Mirddongar. 'There are extensive teak and black wood forests, of which the value is increased by. their proximity to Bombay.

The Kolaba teak has been pronounced the best grown in the Concan, and inferior only to that of Calicut. In 1875-76 the forest revenue amounted to £3634. Tigers and leopards are found all over the district, and bears on the Sahyddri range. Hyzenas and jackals abound. Bison, sémbhar, and cheetah have been shot, but are very rare. i

Koléba district, with the exception of Alibagh sub- division, formed part of the dominions of the peshwa, annexed by the Bombay Government in 1818, Alibagh lapsed to the paramount power in 1839,

. The population in 1872 was 350,405—Hindus, 330,914 ; Mohammedans, 17,194; Parsis, 25; Jews, 1940 ; and Christians, 208. Of the Hindus the most important class are the Brahmans, who own large gardens and palm groves along the coast. Another important class are the Bhandaras, or toddy-drawers and cocoa-nut cultivators. The Beni-Israel (see vol. xiii. p. 685) are chiefly found in the sea- board tracts. A considerable number of them enlist in the native army, and are highly esteemed as soldiers. They also monopolize the work of oil-pressing to so great an extent that they are generally known as oilmen or felis. The total area of Government cultivable land in 1876-77 was returned at 468,646 acres, of which upwards of 98 per cent. was taken up for cultivation. Rice forms the staple produce, and is thechief export of the district. The inferior grains are nachnt (Hleusine coracana), wart (Panicum miliaceum), and harik (Paspalum frumentaceum) ; and these form the chief food supply of the people. The estimated value of the exports (rice, salt, timber, vegetables, and fruit) is £438,249; of the imports (grain, piece goods, oil, butter, and sugar), £170,816. The local industries are salt manufacture and silk-weaving. The total imperial, local, and municipal revenue in 1876-77 was £106,893, of which £72, 462 was contributed by the land tax. There are seventy-one Government or aided schools attended by 8644 pupils. “The average ri” aaa is 75 inches, The chief town of the district ig i

KOLAR, or Conag, a district of Mysore state, Southern India, lying between 12° 46’ and 13° 36’ N. lat, and 78° 5’ and 78° 35’ E. long. It occupies that portion of the Mysore table-land immediately bordering

the Eastern Ghats. The principal watershed lies in the north-west, around the hill of Nandidrug (4810 feet), from which rivers radiate in all directions; and the whole country is broken by numerous hill ranges. The chief rivers are the Palir, the South Pindkini or Pennar, the North Pinakini, and the Paépaghni, which are industriously utilized for irrigation by means of anicuts and tanks, The rocks of the district are mostly syenite or granite, with a small admixture of mica and felspar. The soil in the valleys consists of a fertile loam; and in the higher levels sand and gravel are found, The hills are covered with scrub, jungle, and brushwood. The only tract where the trees attain any size isin the neighbourhood of Nandidrug, where an area of 7 square miles has been reserved by the forest department.

The population in 1871 was 618,954, spread over an area of 2577 square miles—Hindus numbering 592,652; Mohammedans, 25,038 ; Jains, 651; and Christians, 613. Four towns contain up- wards of 5000 inhabitants, namely, Koldr, 9924; Chikballapur, 9882 ; Sidlghata, 7009; and Hosur, 5711. The staple agricultural products are rice, ragi, and jour. Pulses, oil-seeds, vegetables, and tobacco are also grown on limited areas. Cattle breeding has recently been fostered by the British Government, and large cattle fairs are held annually. The manufactures of the district com- prise sugar, silk and cotton weaving, and oil-pressing. Iron ore is smelted in considerable quantities, The principal exports are sugar, rice, ragi, vegetables, cotton cloth, betel leaf, opium, and ght; the imports are European piece goods and salt. The total revenue of the district in 1873-74 amounted to £119,446, of which £97,470 was derived from the land and paid by 78,247 proprietors of 678 separate estates. The Government aided and inspected schools in 1874 numbered 233, attended by 5547 pupils; in addition there were also 102 unaided schools. The district bears a good reputation for healthiness, the mean annual temperature being 76°, and the average annual rainfall 29°17 inches.

The early history of the district is enshrouded in the usual Hindu legends, chiefly localized at the village of Avani, which is still a lean place of pilgrimage, as containing a linga set up by Rama

imself. The earliest authentic evidence shows that Kolar in primitive times formed part of the kingdom of the Pallavas, a dynasty overthrown by the Cholds, to whom is assigned the foundation of Kolér town. After the Cholds came the Ballila kings, who in their turn gave way to the powerful monarch of Vijayanagar, in the early part of the 14th century. About this period arose the Gauda family, whose chiefs appear to have submitted successively to every conqueror until they were swept away by Hyder Ali. The first Mohammedans to invade this tract were the Bijapur kings, whose general was the Marhatté Shahji, the father of Sivaji the Great, In 1639 Shahji obtained Kolar as a fief, which he transmitted to his son Venkoji or Ekoji, the

founder of the Tanjore line. Subsequently Kolar was overrun by the Mughals. In 1761 it was formally ceded by the nizam to Hyder Ali, who was a native of the state, having been born at the little village of Budikot ; and after the fall of Tipu in 1799 it was incorporated in the Hindu state of Mysore. The chief historical interest of modern times centres round the hill fort of Nandidrug (Nundydroog), which was stormed by the British in 1791, after a bombardment of twenty-one days. Kolar, which with the rest of Mysore had been under British administration since 1835, was restored to its native chief in March 1881.

KOLOSEY, Frrencz or Francis (1790-1838), a dis- tinguished Hungarian poet, critic, and orator, was born at Szédemeter, in Transylvania, on the 8th of August 1790. His parents both died during his childhood, leaving him to the care of a trusted female servant. At an early age Kélesey was sent to the Calvinistic school at Debreczen, where he acquired a sound knowledge of the Latin and Greek classics, as also of the leading Hungarian and German poets. In his fifteenth year he made the acquaintance of Kazincezy, and zealously adopted his linguistic reforms. In 1809 Kélesey went to Pest with the intention of following the legal profession, and became a “notary to the royal board.” The public career of a lawyer, however, proving distasteful to him, he soon left the city, and, secluding himself at Cseke in Szatmar

county, devoted his time to esthetical study, poetry, criticism, and the defence of the theories of Kazinczy. Kdélesey's early metrical pieces contri- buted to the Z'ransylvanian Museum did not attract much attention, whilst his severe criticisms of Csokonai, Kis, and especially Berzsenyi, published in 1817, rendered him very unpopular. From 1821 to 1826 he published many separate poems of great beauty in the Aurora, LHebe, Aspasia, and other niagazines of polite literature. Having by these means again risen in the estimation of the literary public, he was induced by Paul Szemere to join him in the production of a new periodical, styled let és Literatura ("Life and Literature"), which appeared from 1826 to 1829, in 4 vols., and gained for Kélesey the highest reputation as a critical writer. About this time his powers as an orator began to be displayed in his capacity of upper notary to the county of Szatmar. From 1832 to 1835 he sat in the Hungarian diet, where his extreme liberal views and his singular eloquence soon rendered him famous as a parliamentary leader. In the meantime he had not been inactive as a literary savant. Elected on the 17th November 1830 a member of the Hungarian Academy of Sciences, he took part in its first grand meeting; in 1832 he delivered his famous oration on Kazinczy, and in 1836 that on his former opponent Daniel Berzsenyi. When in 1838 Baron Wesselényi was unjustly thrown into prison upon a charge of treason, Kélcsey eloquently though unsuccessfully conducted his defence; aud he died about a week afterwards (24th of August) from internal inflamma- tion. His collected works, in 6 vols., were published at Pest, 1840-48, and his journal of the diet of 1832-36 appeared in 1848. A monument erected to the memory of Kélesey was unveiled at Szatmar-Németi on the 25th of September 1864.

See G. Steinacker, Ungartsche Lyriker, Leipsic and Pest, 1874 ; F. Toldy, Magyar Koltok élete, 2 vols., Pest, 1871; J. Ferenczy and J. Danielik, Magyar Irok, 2 vols., Pest, 1856-58.

KOLDING, a town in the district of Veile, Denmark, is situated on the east coast of the province of Jutland, on the Koldingfjord, an inlet of the Little Belt. It has some little shipping, but its harbour is not deep. A little to the north-west is the splendid ruin of the royal castle Kolding-

huus, formerly called Oernsborg or Arensborg. It was begun by Duke Abel in 1248; in 1808 it was burned. The large square tower was built by Christian IV. (1588- 1648), and was surmounted by colossal statues, of which one is still standing. The name of Kolding occurs in the 10th century ; but its earliest known town-rights date from

‘tobacco, cotton, safflower, and vegetables.

1321. In 1644 it was the scene of a Danish victory over the Swedish, and in 1849 of a Danish defeat by the Schleswig-Holstein troops. The population in 1870 was

5400.

KOLHAPUR, a native state in the Bombay Presidency, India, lying between 15° 58° and 17° 11’ N. lat., and between 73° 45’ and 74° 24’ E. long. ; it is bounded on the N. by Satara district, on the E. and S. by the states of Sangli, Miraj, and Kurunchwad, and on the W. and S.W. by Sawantwari state and Ratnagiri district. The area is 3184 square miles. Kolhapur state stretches from the heart of the Sahyadri range eastwards into the plain of the Deccan. Along the spurs of the main chain of the Sahyaddri hills lie wild and picturesque hill slopes and valleys, pro- ducing little but timber, and till recently covered with rich forests. The centre of the state is crossed by several lines of low hills running at right angles from the main Sahyédri range. In the east the country becomes more open, aud presents the unpicturesque uniformity of a well-cultivated and treeless plain, broken only by an occasional river. Among the western hills are the ancient Marhatté strong- holds of Panhdla, Vishalgarh, Baura, and Rungna. The rivers, though navigable during the rains by boats of 2 tons burthen, are all fordable during the hot months. Iron ore is found in the Sahyddri range, and smelting was formerly carried on to a considerable extent ; but now the Kolhapur mineral cannot compete with that imported from Europe. There are several good stone quarries. The principal agricultural products are rice, millet, sugar-cane, The population of the state, including feudatories, was 802,691 in 1872, Hindus amounting

to 954 per cent., and Mohammedans to 4 per cent. Pottery, hardware, and coarse cotton and woollen cloth are the principal manufactures. The chief exports are coarse sugar, tobacco, cotton, and grain; piece goods, salt, silk, sulphur, and spices are imported.

The rajas of Kolhapur trace their descent from Raji Ram, a younger son of Sivaji the Great, the founder of the Marhatta power. The prevalence of piracy causcd the British Government to send expeditions against Kolhapur in 1765 and 1792; and in the early years of this century the misgovernment of tlie chief compelled the British to resort to military operations, and ultimately to appoint an officer to manage the state. In 1862 a treaty was concluded with Sivaji III. The revenue of the state is estimated at £304,000. The military force consists of 1618 men. Exclusive of a few mis-

sionary institutions, there are in all 104 schools, attended by 5105 pupils. The climate is on the whole temperate.

Korudpur, the capital of the above state, is situated in 16° 42’ N. lat. and 74° 16’E. long., 128 miles south by east of Poona. It is a picturesque, flourishing trading town, adorned with many handsome buildings. Population in

1872, 39,621.

KOLIN (Boh., Novy Kolin, t.e., New Kolin), a town in the circle of Kaurzim, Bohemia, is situated on the Elbe, about 35 miles east of Prague, with which city as also with Briinn it is connected by the Austrian State Railway, here intersected by the north-western line, in 50° 4’ N. lat., 15° 14’ E. long. Among the many noteworthy buildings in Kolin may be specially mentioned the church of St Bartholomew (Early Gothic style), erected during the latter half of the 14th century, the castle, and the town-hall. The educational and industrial establishments comprise collegiate institutes for both sexes, a commercial school, religious houses, several sugar refineries and oil-mills, a spirit distillery, and an artificial manure factory. Popula- tion of commune 9473, of town 9199. Kolin is chiefly famous on account of

the battle of Chotzemitz or Kolin, 18th June 1757, when the Prussians under Frederick the Great were defeated by the Austrians under Daun.

KOLOMEA, or KotomyiA, a town and district in the Austrian province of Galicia, lies on the right bank of the Pruth and on the railway from eS, to a

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about 105 miles south-south-east of the latter, in 48° 31’ N. lat., 25° 1’ E. long. Kolomea is the seat of the adminis- trative, military, and judicial authorities of the district, and has Roman Catholic churches, synagogues, a lower gymna- sium, and manufactories of earthenware. More than a third of the inhabitants are Jews, who carry on the greater part both of the wholesale and retail trade. The Ruthenian or native population of the town and neighbourhood are mostly employed in agricultural pursuits, and in the pastur- ing of horses, oxen, and sheep. In 1881 the population aniounted to 23,109.

KOLOMNA, a district town of Russia, in the govern- ment of Ryazan, situated on the railway between Moscow and Ryazan, 67 miles south-east of Moscow, at the con- fluence of the Moskva river with the Kolomenka. It is an old town mentioned in annals in 1177, and until the 14th century the capital of the Ryazan principality. It suffered greatly from the invasions of the Tartars, who destroyed it four times, as well as from the wars of the 17th century ; but it always recovered, and never has lost its commercial importance. During this century it became a centre of manufactures of silks, cottons, and leather ; there are also several smaller manufactures. The merchants of Kolomna carry on an active trade in cattle brought from southern provinces, and in grain, cattle, tallow, skins, salt, and timber purchased in the governments of Ryazan and Tula, and sent to Moscow, either by rail, or by boat down the Moskva river. Population 19,000.

KOMORN, or Comorn (Hungarian, Rév-Komdrom), a royal free town of Hungary, and capital of the trans- Danubian county of Komarom,

lies at the eastern extremity of the island of Csallék6z or Schiitt, and at the confluence of the Waag with the Danube, 48 miles west-north-west from Budapest, with which city as also with Vienna it is directly connected by railway, in 47° 46’ N. lat., 18° 7’ E. long. Komorn is celebrated chiefly for its fortifications, which, owing to their favourable position and extended line of tétes-de-pont, are believed to be impregnable, and are capable of holding a force of some 30,000 defenders. The town is the seat of the county administration, and of a royal court of law, and has Roman Catholic, Greek Ortho- dox, Lutheran, and Calvinist churches, a Jewish synagogue, Roman Catholic and Protestant gymnasia, county and town halls, a military hospital, two savings banks, and a shipping agency. The streets are for the most part narrow, irregular, and gloomy. The commercial relations of Komorn with the chief towns on the Danube are facilitated by its im- portant steam-packet station. The inhabitants carry on a brisk trade in grain, timber, wine, flour, and fish. The civil population at the end of 1880 amounted to 13,108, mostly Magyars and Germans by nationality.

The walls of the fortifications of Komorn were commenced from the land side in 1272. They were much strengthened and extended two hundred years later by King Matthias (Corvinus). The new fort was begun by Ferdinand I. about 1547, and received additions in 1673 under Leopold I. In 1543, 1594, 1598, and 1663 Komorn was beleaguered by the Turks. It was raised to the dignity of a royal free town in 1751. In 1767, 1768, September 1848, and April 1854 it suffered severely from fire, and in 1763, 1822, and 1851 from earthquakes. The fortifications, having been neglected during the latter half of the 18th century, were enlarged and to a great extent reconstructed between 1805 and 1809. During the revolu- tionary war of 1848-49 Komorn was a principal point of military operations, and was long unsuccessfully besieged by the Austrians who on the 11th July 1849 were defeated there by General Gorgei, and on the 3d August by General Klapka. On the 27th September the fortress capitulated to the Austrians upon honourable terms and on the 3d and 4th October was evacuated by the Hungarian troops. The treasure of the Austrian national bank was removed

here from Vienna in 1866, when that city was threatened by the Prussians.

KOMOTAU, atown and district of Bohemia, at the foot of the Erzgebirge, and at the junction of the Buschtiehrad, Dux-Bodenbach, and Aussig-Teplitz lines of railway, about

10 miles north-north-west of Saaz, in 50° 27’ N. lat., 13° 26’ E. long. An old but thriving town, Komotau is the seat of the military and judicial authorities of the district, as also of boardsof mining and of customs. The industrial establishments comprise manufactories of woollen cloth, linen, and paper, dyeing houses, breweries, distilleries, and vinegar works, a sugar of lead manufactory, and an iron foundry. The amount of beer delivered in 1880 was 535,583 gallons. Ligniteis worked in the neighbourhood. At the end of 1880 the population was 10,111.

KONGSBERG, a mining town in the district of Buskerud, Norway, is situated on the Laagen, 500 feet above the sea, and about 60 miles south-west of Christiania by rail. With the exception of the church and the town- house, the buildings are mostly of wood. The origin and whole industry of the town are connected with the Govern- ment silver-mines in the neighbourhood. Their first discovery was made by a peasant in 1623, since which time they have been worked with varying success. Over a hundred mines have been opened, but of these only three are now of any importance. The annual profit averages about £22,000. During last century Kongsberg was much more important than it now is, and contained more than double its present population. Dr Clarke in his Z’ravels (1823) gives a good description of the place, and mentions a mass of native silver, nearly 600 tb in weight, found there, which is preserved in the museum at Copenhagen. Within the town of Kongsberg are situated the smelting- works, the mint, and a Government weapon factory. The population of the town in 1875 was 4311.

KONIGGRATZ (Bohemian, Krdlové Hradec), a fortified town and episcopal seat in Bohemia, at the confluence of the Adler with the upper Elbe, and at the junction of the Reichenberg-Pardubitz and

North-Western lines of railway, in 50° 10’ N. lat., 15° 49’ E. long. Wax candles, gloves, shoes, woollen cloths, and musical (wind) instruments are manufactured. The population in 1880 was 6173. The place is chiefly notable from the battle of Koniggritz or Sadowa fought in its neighbourhood on 3d July 1866, when the defeat of the Austrians under Benedek decided the German supremacy of Prussia, and led to the acquisition of Venice by Italy and the constitutional independence of Hungary. See Jahns, Die Schlacht ber Komggratz,

1876.

KONIGINHOF (in Czech, Duur Kralové), chief town of a department in the north-east of Bohemia, is situated on the left bank of the Elbe, about 80 miles north-east of Prague. In the tower of one of the churches Hanka dis- covered the Kéniginhof MSS. in 1817 (see vol. xi. p. 440). The Zaboj monument in the market-place commemorates the discovery. Cotton-weaving, yarn-spinning, and brew- ing are the leading industries. In 1421 Kéniginhof was stormed by the Hussites. On June 29, 1866, it was the scene of a Prussian victory over the Austrians. The population in 1869 was 6222.

KONIGSBERG (in Polish Krolewiec), chief town of a government district in the province of East Prussia, and since 1843 a fortress of the first rank, is situated on the Pregel, 44 miles from its mouth in the Frische Haff, 25 miles from the sea-coast, and 397 miles north-east of Berlin, in 54° 43’ N. lat. and 20° 30’ EB. long. It con- sists of three formerly independent parts—the Altstadt (old town) to the west, Lobenicht to the east, and the island Kneiphof, together with numerous suburbs, embraced in a circuit of 9} miles. The Pregel, spanned by many bridges, flows through the town in two branches, which unite below the Green Bridge. Its greatest breadth within the town is from 8C to 90 yards. It is frozen from November to March, Although an old town, Konigsberg does not retain many marks of antiquity. The Altstadt has long

and narrow streets, but the Kneiphof quarter is roomier. Of the seven market-places only that in the Altstadt retains something of its former appearance. Among the more interesting buildings are the schloss, a long rectangle begun in 1255 and added to later, with a Gothic tower

277 feet high, and the chapel (built 1592) in which

Frederick I. placed the Prussian crown on his own head in 1701; and the cathedral, begun in 1322, restored in 1856, a Gothic building with a tower 164 feet high. Behind the schloss is the parade-ground, with the statue of Frederick William III. by Kiss. To the east is the Schlossteich, a long narrow ornamental lake covering 12 acres, with beautifully laid out tree-shaded bauks. The north-west side of the parade-ground is occupied by the new university buildings, completed in 1873; along with the new exchange on the south side of the Pregel, they are the finest architectural feature of the town. The univer- sity was founded in 1544 by Albert L, duke of Prussia;

Plan of Kénigsberg.

1. Observatory. 8. Post-Office. 16. Library. 2. Zoological Museum. 9. Kant’s House. 17. Roman Catholic Ch. 3. Polish Church. 10. Statue of Kant, 18. Hospital, 4. New Univ. Buildings. 11. Schloss. 19 Bank. 5. Theatre. 12. Statue of Frederick I. | 20. Old University Build- 6. Statue of Frederick | 13. Reformed Church. ings. William III. 14. Academy of Painting. | 21. Cathedral 7. New Altstadt Chureh. | 15. Town Museum. 22. Exchange,

it possesses a library of 200,000 volumes. Among its famous professors have been Kant (born in Kénigsberg in 1724), to whom a monument was erected in 1864, Herder, Herbart, Bessel, Voigt, K. E. von Baer, F. Neu- mann, and others. In the summer session of 1880 it had a teaching staff of 88; in the winter session 1880-81 its students numbered 808. Konigsberg has also four gymnasia, two commercial schools of the first rank, an academy of painting with a public picture gallery, and a school of music, besides other educational establishments. The hospitals and benevolent institutions are numerous. The protected position of its harbour has made Kénigsberg

one of the important trading cities of Germany. Ships of more than 1500 tons have to discharge cargo at Pillau, at the entrance to the Haff, connected with Ko6nigsberg by rail; and the grain trade with the interior is carried on by barges. The chief imports and exports of Kénigs- berg are grain, spirits, colonial wares (especially tea),

petroleum, coal, iron, herrings, flax, hemp, and wood. The: exports by sea for the third quarter of 188] amounted to 46,508 tons, and the imports from Russia alone to 42,479 tons The number of ships that entered Kénigsberg and Pillau in 1879 was 1653 (278,000 tons); the number that cleared was 1656 (299,000 tons). The corresponding figures for 1880 were not so large. The manufactures of Kénigsberg are not very important. They include iron, machinery, beer, spirits, sail-cloth, cloth, oil, flour, leather, and its specialty “marchpane.” There is also yarn-spinning, cloth-printing, dyeing, tanning, and tobacco manufacture. The population, in 1858 only 83,000, was 140,896 in 1880.

The Altstadt of Konigsberg grew up around the castle built in 1255 by the Teutonic Order, to restrain the neighbouring heathens, Its first site was near the fishing village of Steindamm, but after its destruction by the Prussians in 1263 it was rebuilt in its present es By 1327 all three parts, which were only united in 1724

y Frederick William I., had acquired city rights. In 1840 Konigsberg entered the Hanseatic League ; and in 1361 it was in direct alliance with England. From 1457 it was the residence of the grand master of the Teutonic Order, and from 1525 till 1618 of the dukes of Prussia. The trade of Kénigsberg was much hindered by the constant shifting and silting up of the channels leading to its harbour ; and the great northern wars did it immense harm. By the end of the 17th century it had almost recovered; and dur- ing the 19th century the opening of the railway system in East Prussia and Russia gave its commerce a new departure, making it the principal outlet for the Russian staples—grain, seeds, flax, and hemp. It has now regular steam communication with Memel, Stettin, Kiel, Amsterdam, and Hull. The local shipping is unim- portant.

KONIGSHUTTE, a town in the circle of Beuthen in the government district of Oppeln, Prussia, is situated in the middle of the Upper Silesian coal and iron district, about 55 miles south-west of Oppeln. In 1869 it was incorporated with various neighbouring villages, and raised to the dignity of a town. The largest iron-work in Silesia is situated at Konigshiitte, and includes puddling works, rolling-mills, and zinc-works. Founded in 1797, it was formerly in the hands of Government; but it is now carried on by a company. In 1877 it employed about 3000 hands, and turned out about 54,000 tons of raw iron, 41,700 tons bar-iron, &c., 750 tons raw zinc, and 19,600 tons of steel goods for railways, &c. In the neighbourhood of the town there are coal-mines, chalk- quarries, and brick-fields. The population in 1852 was 4495; in 1875 it was 26,040.

KONITZ, or K6n1tTz, a town of the German empire, in the Marienwerder district of the province of West Prussia, situated near the railway, about 68 miles south-west of Dantzic. It was the first fortified post established in Prussia by Balk, the grand master of the Teutonic Order, and it continued for a long time to be a place of mili- tary importance. Wool and iron are the chief objects of the local industry. The inhabitants numbered 8046 in 1875; about 3000 are Roman Catholics and 550 Jews, There is a history of the town by Uppenkamp (Konitz,

1873).

KONOTOP, a district town of Russia, in the government of Tchernigoff, 137 miles north-east of Kieff, on the railway from this town to Kursk. Its 10,000 inhabitants live by agriculture, boat-building, and trade. Situated in a district which produces a good deal of corn and is also engaged in cattle and sheep breeding, it has a brisk and rapidly increasing trade in agricultural produce. The town was founded in 1635 by the Poles, who built a strong citadel, the ruins of which still exist. In 1648 it was taken by the Cossacks of Khmelnitzky, and in 1659, during Vigovsky’s insurrection,. Russian troops besieged it.

KOPENIOCK, or Cépnicx, a town in the circle of Teltow in the government district of Potsdam, Prussia, is situated on an island at the influx of the Dahmie into the Spree,

8 miles S.E. of Berlin. Two bridges connect it with the mainland. It has a royal palace, with a ritter-saal and a chapel, and a normal school (in the palace). Silk- weaving, calico-printing, iron-rolling, and the manufacture of sugar, shoddy, glass, chemicals, gold-leaf, &c., are the chief industries. There are also steam saw-mills, and some little shipping. Képenick was the residence of the heathen prince Jaczo, and later of the electors of Brandenburg. It was at Koépenick that Frederick the Great was tried by court martial, when crown-prince. The population in 1875 was 7113.

KOPREINITZ, an ancient royal free town of Hungary, in the province of Croatia and Slavonia and county of Kérés, is situated about 16 miles north-east of the county town Korés (Kreutz), and on the Zakdny-Zagrab line of the Hungarian state railway, in 46° 13’ N. lat., 16°50’ E. long. The most interesting building is the old castle or fort, still in a good state of preservation, and now used as barracks. There are also in the town Roman Catholic and Greek Orthodox churches, a Jewish synagogue, a town-hall, and a municipal savings bank, besides the usual Government offices. Both the weekly and occasional fairs are well attended, but the trade is chiefly confined to the agricultural products of the neighbourhood. The communal lands, extending principally over a level plain, yield large quantities of grapes, fruit, beans, timber, and grain, especially maize. Population in 1880, 6049.

KOPRILI, Kruprini, or Ks6PrtLv, a town in the vilayet of Prisrend, Macedonia, Turkey, is situated on both sides of the Vardar, the ancient Axius. Its Christian inhabitants call it Velesa, probably a corruption of Byla- zora, described by Polybius as the chief city of Psonia. Owing to the position of the town on sloping hills, the streets are steep ; there are, however, numerous well-built houses. A wooden bridge crosses the river at this point. Mulberry trees and maize are grown in the

neighbourhood, The population of Koprili, which has given its name to a celebrated family of viziers, is about 15,000.

KORAN. See Monammen.

KORAT, a small territory, tributary to Siam, is situated to the north-east of Bangkok, on the borders of Siam and Cambodia. The approach to it from Bangkok is through an extensive malarious forest, called by the natives, on account of its fatal character, Deng Phya Phai, the forest of the king of fire. The chief mountainis named Khasjai, and from it flows the river Mahot. The productions and exports from Korat comprise stags' and panthers' skins, raw silk, manufactured silk and cotton, peacocks' tails, ivory, elephants' bones, and a small quantity of sugar. The copper-mines of Korat are said to be rich; silk of rather inferior quality is brought from Laos, Ubone, and Bassac. Elephants, buffaloes, and oxen are abundant in the province. Korat is governed by a ruler who has absolute power of life and death. It pays a tribute of gold, silver, and silk to Siam, and has to furnish a large levy of men when required. Sir John Bowring estimates the population of the whole district at 60,000. Korat the chief town, lies about 170 miles north-east of Bangkok. It is surrounded by a wall, and stands on a stream whose banks are bordered with little plantations of betel and cocoa-nut trees. Outside the town proper is the Chinese quarter, consisting of sixty or seventy houses surrounded by a strong palisade 9 feet high. The Chinese number about 600, and are the industrious trading element in the population. The native name of Korat is Nakhon ae Sema, or frontier town. The population is 5000 or

6000.

KORDOFAN, a province of the Egyptian Sudan, which, though marked off from the surrounding territory by no very definite confines, may be said to lie between 12° and

16° N. lat. and between 29° 30' and 32° 30' E. long. On the east it does not reach the Nile, and on the west it is usually held to be

separated fom Darfur by a neutral strip of country. It consists for the most part of a rolling steppe in which a hill of 50 feet is a landmark for a day's journey; but towards the west there are a few isolated peaks such as Jebel Abu Senun and Jebel Kordofan, which rise to a height of 150 to 800 feet above the plain, and in the north-west there are two considerable groups, Jebel Katul and Jebel Kagga. The general elevation of the country above sea-level is given as from 1410 to 1840 feet. A granitic sand with abundance of mica and felspar forms the upper stratum throughout the greater part of the area ; but an admixture of clay, which is observable in the north, becomes strongly marked in the south, where there are also stretches of black vegetable monld. Beneath there appears to unfold itself an unbroken surface of mica schist. River or stream there is really none, though a few tempo- rary watercourses or khérs exist in the rainy season ; and the only permanent lakes are El Birkeh, El Rahad, and Shirkeleh, which are formed by the great Khor Abu Hable in the south. During the rainy season the water collects in myriads of little depressions, but owing partly to rapid evaporation and partly to the porous character of the soil the surface of the country is soon as dry as before. The water which has found its way through the granitic sand flows over the surface of the mica schist and settles in the hollows. Wells consequently sunk so as to reach the solid rock obtain a supply of water more or less abundant accord- ing to the spot which they happen to strike ; and it is the existence of these which renders human life possible in Kordofan. It is estimated that (apart from those in a few areas of depression—Cagmar, Abu Haraze, Bara, and Mulbes—where the sand stratum is very thin and water is reached at the depth of a few feet) there are about 900 of these wells. They are narrow shafts going down from 75 to 150 or 200 feet, and supported "from the bottom to a little above the water-level" by the long roots of the mimosa, wound round so as to form a complete casing. The water is raised by rope and bucket at the cost of enormous labour, and none is available for irrigation. The very cattle are trained to go a long time without drinking. Entire villages migrate after harvest to the neighbourhood of some plentiful well; and in El Obeyd water becomes a regular article of trade soon after the close of the rains. As there is no highland area draining into Kordofan, the under- ground reservoirs are dependent on

the local rainfall, and a large number of the wells are dry during many months. The rainy season lasts from June to September, rain falling every three or four days in brief but violent showers. The wind during that period is from the south or south- west ; the air is extremely oppressive ; and fevers prevail among the foreign residents. In September the north winds begin to take their turn, and from the middle of October they blow steadily throughout the winter, and produce what Europeans consider a delightful climate. With March begins the dry and sultry summer. The settled population of Kordofan is estimated at 164,740, the nomadic at 114,000. The former, who are scattered over the country in about eight hundred and sixty villages, are of very mingled blood, especially in the neighbourhood of the capital, but the Ghodiat, Gilledat, and Gowanieh appear to be the original stock. Of the nomadic tribes the most noteworthy are the Hasanieh, the Kababish, and the Bagara. The last-mentioned—who roam about the southern parts of the country—are a dark red-bronze race remarkable for their magnificent physique. The staple crop in Kordofan is the dokhn or Penicillaria typhoides. Eaten both uncooked and in various culinary conditions, it forms the main food of nine-tenths of the population, and

furnishes the raw material for the sweetish Kordofan beer or merissa. Cattle are largely bred by the Bagara, and camels by the Kababish ; and horses, goats, donkeys, and sheep are kept in small numbers. Since the ostrich has been almost hunted out of the country the chief article of importance for trade is the gum yielded by the many mimosa trees, which along with the hijlij, the tamarisk, and the talh tend to relieve the monotony of the steppe. Salt and iron ore exist within the province, but they have not become of any practical value.

Of the movements by which the present composite ethnology of Kordofan was attained little record is recoverable. In 1790 Sheikh Nasib of Sennaar subjugated the district ; and under his rule the inhabitants prospered. But, piqued by his ncighbour’s success, Ibn Fadhl of Darfur invaded Kordofan with a powerful army num- bering

no less than 12,000 or 14,000 camels, and completely defeated the Sennaar governor Melek il Hashma. The Darfur supremacy continued till 1821 when Mohammed Aly undertook the conquest of Nubia and Sennaar. The defterdar, Mohammed Aly's son-in-law, subjugated Kordofan, and continued to rule it with worse than a rod of iron till he was recalled on account of his cruelties.

See the Travels of Sultan Teima (1821), Ruppell (1824), Holroyd (1837), Rus- seger (1837), Pallme (1844), Brehm (1848), Graf von Schlieffen (1853) ; Petherick, Egypt, the Sudan, and Central Africa, London, 1861; Major H. G. Prout, General Report on Province of Kordofan, Cairo, 1877; Marno, Reise in der egypt. Equat. Provinz, Vienna, 1879. 'The Italian travellers Matteucci and Massari traversed Kordofan in 188v, in their great journey across the continent. nomenclature is still in many cases uncertain.

KOREA, a petty native state in Chutié Nagpur, Bengal, India, situated between 22° 55' 50" and 23° 49' 15" N. lat., and between 81° 58' 15" and 82° 48' 15" E. long., and having an area of 1631 square miles. The state consists of an elevated table-land of coarse sandstone, varying from 2477 to 3370 feet above sea-level. Large forest tracts of sad timber exist. Iron is found throughout the state, and a tribe of Kols, called Agarids from their occupation, are largely engaged in iron-smelting. The field crops consist of rice, wheat, barley, Indian corn, marud, pulses, oil-seeds, cotton, &c., while the jungle produces stick lacand resin. The population in 1872 was returned at 21,127, viz., 11,093 males and 10,034 females (Hindus, 10,807 ; Mohammedans, 140 ; "others," 10,180). Of aboriginal tribes, the most numerous and influential are (3s Gonds (4644); next in importance are the Cheros

3009).

Rajputs, and claim descent from a chief of that clan, who conquered Korea six hundred years ago.

KORITSA, Goritsa, GrortcHa, or GHIORGHIA, a town of Albania, in the Turkish vilayet of Janina, situated in a spacious plain 45 miles east of Berat and 30 miles west of Kastoria. It is a place of about 10,000

inhabitants, containing a considerable number of well-built houses scattered among its cottages of unbaked mud. To its position on the route between the Adriatic and the Archi- pelago it is indebted for a flourishing trade. The metro- politan church is a large edifice richly adorned in the interior with paintings and statues.

KORNER, Kart Turopor (1791-1813), German patriot and poet, was born at Dresden, September 23, 1791. His father, a prosperous lawyer, made his house in Dresden a centre of literary, musical, and artistic society, and was an intimate friend of Schiller; and his mother, a daughter of the copper-plate engraver Stock of Leipsic, enjoyed Goethe's friendship through life, and in her later years claimed it for her son. Theodor Kérner was at first so delicate a child that his parents made the paternal vine- yard—the same in which Schiller sat and wrote Don Carlos a few years before—his summer schoolroom. They pre- scribed for lessons, gymnastics, riding, swimming, fencing, and the like, till the delicate boy grew into a young athlete, with a joyous, affectionate disposition which won the hearts of all who knew him. Partly at the Kreuzschule in Dresden, but chiefly with private tutors at home, Korner now studied languages, history, and mathematics, He was an adept at

The geographical

The chief's family call themselves Chauhan –

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various kinds of fine wood-turning, could sketch, and play the guitar; but his happiest hours were spent over the volumes of Goethe and Schiller—the household gods ; and under their influence the boy began to write verses which his parents forbore to praise, but which displayed, even then, much of the facility and grace of his later poems. At the age of seventeen he went to the school of mines in Freiberg, and worked enthusiastically for two years at mathematics, mineralogy, and chemistry. The poems he wrote during this period were collected and published under the title Knospen. From Freiberg Korner went to the university of Leipsic, where for some months he studied philosophy,

history, and anatomy. He founded there a poetical association, and became a member of the “ Macaria” and more than one student club ; but he was unfortunately drawn into the hostilities then rife between two parties in the university, and, after fighting several party duels, was at last forced to leave the town to escape the results of a street fray in which he took part. From Leipsic he went to Berlin, and then to Vienna, with letters to his father’s old friends, the Prussian ambassador Von Humboldt and Friedrich Schlegel. Two little pieces which he wrote for the stage, Die Braut and Der griine Domino, were acted at the Vienna Court Theatre in July 1812 with great success ; and, with the consent of his parents, he gave up all his former plans, with the hope of being able to make a living by literature alone. His other works followed with astonishing rapidity. In some fifteen months appeared some dozen dramatic pieces and the librettos of a few operas (Das Fischermddchen, Der vierjahrige Posten, and Die Bergknappen), besides many short poems. One after the other all his plays were received at the Vienna Theatre with applause. Zriny, founded on an heroic incident in Hungarian history, was the favourite with the public; but Goethe praised Die Braut, Der griine Domino, and Die Stihve. In January 1813, at the age of one and twenty, Korner was appointed poet to the court theatre in Vienna. With the preparation of the libretto of an opera, Die httickkehr des Ulysses, for Beethoven, and with the writing, printing, and stage preparation of his plays, the young poet’s hands were now full; very busy and very happy he describes himself in his letters. His betrothal to a young Viennese lady, known now only as the “Toni” of his correspondence, was another source of happiness; but this bright career came suddenly to an end. In the early spring of 1813 there was published the Yatherland’s Call to Arms in the Struggle for Lnberation, and Korner was one of the first to answer the summons. He left Vienna in March, and at Breslau joined the Prussian free-corps then forming under the command of Liitzow. When the corps was solemnly consecrated in the village church at. Rogau a few days later, the service was opened with a chorale, set to Korner’s words, ‘‘Dem Herrn Allein die Ehre”; and almost immediately afterwards, when Peters- dorf was sent on a mission to Dresden, to try to unite the Saxons in the common cause, the young poet was sent with him, and on this occasion published his spirited prose Address to the People of

Saxony. Here Korner saw his parents and friends forthe last time. In April he was made lieutenant by the vote of his comrades; and a little later, having left the infantry, he was made adjutant to Liitzow himself. At Kitzen, near Leipsic, during the three weeks' armistice, he was severely wounded through the treachery of the eneiny, but after several adventures escaped to Carlsbad, where he remained till he was well enough to resume his former post. Liitzow's free-corps was in almost daily action when the young adjutant was welcomed back. His cheerful zeal and self-denying helpfulness had endeared him to all his comrades, and it was his wild war songs, sung by many voices to old national melodies round the camp

fires at night, that helped to spread that fervour in the corps which made it peculiarly terrible to the enemy. The poems written by him at this time are published under the title Leyer und Schwert. They include the lines " Abschied vom Leben," which were composed during the night when he lay wounded in the wood by Kitzen. Thee letters written by Kérner to his parents at this time are tender and thoughtful—often aflame with patriotic fervour, but with now and then a ring of intense sadness which forebodes the end. This was very near. His last poem, 'Das Schwertlied," was scribbled in his pocket-book at dawn on the 26th of August, when the corps was prepared for action; and he was reading it to a friend when tlie order to attack was given. It is the wildest of all his war-

songs, a love-rhapsody to his sword,—the soldier's bride ; |

and it was this poem that suggested the refrain of Mrs Hemans's beautiful verses to his memory. In the engage- ment that followed, on the high road between Gadebusch and Schwerin, Korner, as adjutant, fought at Liitzow's side. The French were in great force, but were overcome and fled. Among the hottest in pursuit was Korner, who was mortally wounded, as he rode through a wood, by a shot from one of the fugitive ¢2azllewrs who lay hidden there. He was buried with full military honours under an old oak on the road from Liihelow to

Dreikrug, by the village of Wobbelin, where there is now a monument to his memory.

Kérner's position in the literature of his country is a peculiar one. He was not quite two and twenty when he died, and his works are necessarily but first-fruits—might all be included in the modest title Knospen—plentiful indeed, and full of promise of flowers to come. His earlier poems were hardly more than graceful and piecing, and even his popular dramas scarcely entitle him to a

igh place in the literature of his country. It was with the war that Korner's true inspiration came. Had he lived a life- time, he could never have excelled the productions of those few impassioned weeks ; but the homage which all Germany paid, and still pays, to the young poet's memory is due, not to his lyric genius alone, but to his bright youth also, and heroic death. His works have cm through many editions. That published in one volume, with a preface by Karl Streckfuss (Berlin, 1879), includes a sketch of his life, extracts from his letters, a few English transla- tions of his poems, and stanzas to his memory by German and English poets, of which last Felicia Hemans is the chief. There is an indifferent English translation of the life of Korner by his father, with selections from his works, by G. F. Richardson, 2 vols., 1827. (F. M.)

KOROTCHA, a district town, in the government of Kursk, Russia, 100 miles south of Kursk, on the Korotcha river. Its 7000 inhabitants live by gardening, exporting great quantities of dried cherries, by making candles and leather, and by trade; the merchants purchase cattle, grain, and salt in the south, and send them to Moscow. Founded in 1638, Korotcha formerly was a small fort erected against the invasions of Tartars.

KOROTOYAK, a town of Russia, in the government of Voronezh, on the right bank of the Don, 6 miles from the Davydovka railway station, and 47 miles south of Voronezh. It was founded in 1642 by emigrants from interior pro- vinces of Russia, and had a small wooden fort. Owing to the proximity of Ostrogojsk, which is a trading place of

some importance, its trade is insignificant, and its 9000 inhabitants live by agriculture aud some trade in grain,

KOSCIUSKO, or KoscziusKo, Tuappevs (1746-1817) Polish patriot, was descended from an old family of small proprietors in the province of Lithuania, and was born in 1746. From his father he inherited a taste for music, and in the other branches of education he showed such marked aptitude at the cadet school of Warsaw that along with some other youths he was sent at the expense of the state to complete his education at Versailles, Brest, and Paris, On his return to Poland he was appointed captain of artillery, but on account of the unfortunate result of his attachment to the daughter of a nobleman hein 1777 went

to Paris, whence he sailed with the Frencli fleet to aid the North American States in their war of independence. Under Washington he displayed great firmness and intre- pidity-in various trying circumstances, and rose to be general of a brigade. In 1786 he returned to his native country, where he lived in retirement until the reorganiza- tion of the army in 1789, when he was appointed major- general. In the war with Russia which followed the adoption of the new constitution of 1791 he conducted himself with conspicuous valour and skill, and at Dubienka, with a force of only 4000 men, held an army of 20,000 Russians at bay. All his efforts were, however, rendered fruitless by the pusillanimity of King Stanislaus, who in March 1792 agreed to a humiliating peace, upon which Kosciusko along with several other leading officers resigned his commission. A second. partition of Poland was con- summated in August 1793, but a spirit of resistance gradually gathered force and culminated in the insurrec- tion of 1794, when Kosciusko was recalled to Cracow and appointed generalissimo and dictator. With an army of 5000 he marched to meet the Russians, who were advancing upon Cracow in greatly superior numbers, and after a strenuous conflict of four hours’ duration completely defeated them. On receipt of the intelligence Warsaw rose against the Russian authorities, putting 7000 persons to death ; and after instituting a new government Kosciusko went in pursuit of the enemy, who retired

towards the Prussian frontiers. But for the interposition of Prussia the emanci- pation of Poland would have been accomplished. King Frederick William, however, advanced against Warsaw with an army cf 40,000 men, to which Kosciusko could oppose only 15,000. He was defeated at Szezekocin, but retreated in good order upon Warsaw, which he defended with stub- born persistence, until the diversion of an insurrection in Great Poland caused them to raise the siege. Meantime an iminense force of Russians was advancing against War- saw in two divisions, the one under Suwaroff and the other under Fersen. Kosciusko resolved to attack Fersen before his junction with Suwaroff, but, as he had only 4000 men to meet the 14,000 Russians, his small army was in a few moments completely enveloped by superior numbers, and he himself fighting desperately fell pierced with several wounds. A tradition that as he fell he gave utterance to the words “Finis Polonia” found currency several years afterwards, but when it came to his know- ledge he indignantly denied it. For two years he re- mained a prisoner at St Petersburg, but, gaining his liberty after the accession of Paul I., he went to England and then to America. Returning to France in 1798, he took up his residence at Fontainebleau. In 1806 he refused to allow Napoleon, whose professions he rated at their proper value, to use his name to incite a rising in Poland against Russia; and the forged address put forth by Napoleon in his name was never accepted by his country- men as genuine, although Kosciusko was unable to dis- avow it until eight years after it was issued. In 1814, when the Russian army entered France on the fall of Napoleon, Kosciusko lad a long interview with the emperor Alexander of Russia, who, it is said, promised to him to restore to Poland its ancient boundaries. In 1815 he settled in Switzerland, devoting himself chiefly to agri- cultural pursuits. His death, October 17, 1817, was the result of an accidental fall from his horse. If as a statesman Kosciusko was more ardent than sagacious, he manifested a skill and daring as a soldier which but for the overwhelming nature of his task would have gained him a place among the most renowned generals of his time, while his noble and chivalrous patriotism, untainted by any desiro after self-glorification, has secured him the world’s universal admiration and esteem.

See the lives by Falkenstein (1827, 2d ed. 1834), Chodzko (1837), and Paszkowski (1872), and also Pologne et Russie, légende de Kosciusko, by Jules Michelet (1851), reprinted in La Pologne martyr by the same author (1863).

KOSI, a town in Muttra (Mathura) district, North- Western Provinces, India, in 27° 47’ N. lat., 77° 28’ E. long., with a population in 1872 of 12,770.

KOSLIN, or Costin, chief town of a circle and govern- ment district in the province of Pomerania, Prussia, is situated at the foot of the Gollenberg, 5 miles from the Baltic coast, and about 86 miles north-east of Stettin (105 by rail). It is regularly built, and is the seat ofa local court. Jn the large market-place is the statue of Frederick William J., erected in 1824, The industries include the manufacture of soap, tobacco, iron, paper, bricks and tiles, beer, and other goods. Population in 1875, 14,814.

Késlin was built in 1188 by the Saxons, and made a town in 1266. In 1532 it embraced the Reformation. It was severely tried in the Thirty Years’ War, and in the Seven Years’ War. In 1720 it was burned. On the Gollenberg stands a monument to the memory of the Pomeranians who fell in the war of 1813-15. The town formerly possessed a mint of its own.

KOSLOFF, or Koztov, a town in the government of Tamboff, Russia, on the railway between Ryajsk and Sara- toff, 45 miles west of Tamboff, on tlie Lesnoy Voronezh river. It had its origin in a small monastery, which was founded in the forest in 1627; nine years later, an earthwork was raised close by, for the protection of the Russian frontier against the Tartars. Situated in a very fertile country, on the highway to Astrakhan and at the head of the water communication with the Don, the town soon became a centre for the trade with these countries ; as the junction of the railways leading to the Sea of Azoff, to Tsaritsin on the lower Volga, to Saratoff, and to Orel, its importance has recently been still further increased. Large transactions in grain,

and also in horses and tallow, are effected in the rich agricultural district of Kosloff, as well as in those of Lipetsk and Borisoglebsk, for the Moscow market, or for western Europe, wa Orel; manufactured wares are imported for the supply of the neighbouring districts. There are also in the town and district several tallow-melting houses, one manufactory of woollen cloth, and several distilleries. The town is built of wood, and its unpaved streets are dirty. Population, 27,000.

KOSTENDIL, Grustenpit, or DsvusTENDIL, a town in the extreme south of the principality of Bulgaria, Turkey, is situated on the Strouma, the ancient Strymon. It is fortified and contains several factories. The surrounding district is fertile, and gold and silver mining is carried on. Population about 8000.

KOSTER, or Coster, Laurens (13701-1440), the first Dutch printer, whose claims to be considered at least one of the inventors of the art (see Printine) have been recognized by many investigators. His real name was Laurens Janssoen,—Koster (ze, sacristan) being merely the title which he bore as an official of the great parish church of Haarlem. We find him mentioned several times between 1417 and 1434 as a member of the great council, as an assessor (scabinus), and as the city treasurer. He probably perished in the plague that visited Haarlem in 1439-40 ; his widow is mentioned in the latter year. His descendants through his daughter Lucia can be traced down to 1724.

See Peter Scriver, Beschryvinge der Stad Harlem, Haarlem, 1628 ; Scheltema, Levensschets van Laurens d. Koster, Haarlem, 1834 ; Van der Linde, De Haarlemsche Costerlegende, Hague, 1870.

KOSTROMA, a central government of Russia in Europe, surrounded by those of Vologda, Vyatka, Nijni-Novgorod, Vladimir, and Yaroslav, lies mostly on the left bank of the

“Upper Volga, and has an estimated area of 32,700 square

miles. Its surface is generally undulating, with hilly tracts

on the right bank of the Volga, and extensive flat and marshy districts in its eastern parts. The rocks belong chiefly to the Permian system, a small tract being occupied by representatives of the Jurassic, and both being deeply covered with Quaternary clays. The soil in the east is for the most part sand or a sandy clay ; a few patches are covered with fertile black earth. Immense forests, yield- ing excellent timber for shipbuilding, and in many cases still untouched, occupy no less than 70 per cent. of the surface of the government (13,230,000 acres in 1870). The export of timber is greatly facilitated by a series of navigable tributaries of the Volga, such as the Kostroma, Unzha, Neya, and Vyksa, and many others of less im- portance. The climate is severe; frosts of — 22° Fahr. are common in January, and the mean temperature of the year is but 3°:1 (summer, 64°°5 ; winter, ~13°°3). The popu- lation, which numbered 1,176,000 in 1870, is Russian, with some Meryas,—the indigenes of this part of Russia,— Tcheremisses, and Tartars. Agriculture is in a low state of development ; only 4,000,000 acres are under crops, with a return (1,415,000 quarters of corn in 1877) unequal to the wants of the population. Flax is cultivated to some extent, and exported. Stock-breeding has steadily decreased since 1861; in 1870 there were only 394,500 horned cattle

(against 420,000 in 1857), and the number has since much decreased. Bee keeping is an important branch of

industry in some districts. The chief articles of commerce are timber, fuel, pitch, tar, mushrooms (yearly value upwards of £5000), and various kinds of wooden wares for building and household purposes, which are largely manufactured by the peasantry in villages, and exported to the steppe provinces of the lower Volga and Don. Boat-building for river traffic is also carried on. Some other small industries, such as the manufacture of silver and copper wares, leather wares, &c., are also prosecuted in the villages ; but the trade in linen aud towelling, formerly the staple, is now declining. There are now several cotton factories, spinning mills, and engineering and chemical works. The government of Kostroma is divided into twelve districts :— Kostroma, Nerekhta, Kineshma, Maka- rieff, Yurievets, Galitch, Tchukhloma, Soligalitch, Boui, Kologriv, Vetluga, and Varnavin.

Kostroma, a town of Russia, capital of the govern- ment of the same name, 230 miles north-east of Moscow and 55 miles from Yaroslav, It is situated on the left bank of the Volga, at the mouth of the navigable Kostroma river, with suburbs on the opposite side of the Volga. It is one of the oldest towns of Russia, having been founded by Youri Dolgorouky in 1152. Its fort was often the refuge of the great princes of Moscow during war, but the town was plundered more than once by Tartars, The cathedral, built in the 13th century, and situated in the Areml, or former citadel, isa fine monument of old Russian architec- ture. Kostroma has been renowned since the 16th century for its linen, which was exported to Holland, and the manufacture of linen and linen-yarn is still carried to some extent, flax being purchased in the governments of Kostroma and of Pskoff. There are also in the town and in its pro- vince several important cotton-mills, tanneries, saw-mills, an iron-foundry, and a machine factory. Owing to its situation on the Volga, and at the mouth of a navigable river, Kostroma carries on an active trade—importing grain and exporting linen, linen-yarn, leather, and espe- cially timber and wooden wares. Population, 30,000.

KOTAH, a native state in RAjputana, India, situated between 24° 30’ and 25° 51’ N, lat., and 74° 40’ and 76° 59’ E. long. It is entirely surrounded by native territory, being bounded on the N. by Bundi, on the E. by Gwalior and Tonk, on the S. by Jhalawdr, and on the W. by Udaipur. The area is 3797 square miles, with an estimated

population of 310,000. Kotah slopes gently northwards from the high table-land of Malwé, and is drained by the Chambal with its tributaries, all flowing in a northerly or north-easterly direction. The Mokandarra range, from 1200 to 1600 feet above sea-level, runs from south-east to north-west, forming the southern border of Kotah, and separating it from Jhalawér. The Mokandarra Pass through these hills, in the neighbourhood of the highest peak (1671 feet), has been rendered memorable by the passage of Colonel Monson’s army on its disastrous retreat in 1804. The defile is strikingly picturesque, and forms one of the chief outlets between the Deccan and northern India.

There are extensive game preserves, chiefly covered with grass, In addition to the usual Indian grains, wheat, cotton, opium, and a little tobacco of good quality are cultivated. The manufactures are very limited. Cotton fabrics are woven, but are being rapidly superseded by the cheap products of Bombay and Manchester. Articles of wooden furniture are also constructed. The chief articles of export are opium and grain; salt, cotton, and woollen cloth are imported.

Kotah is an offshoot from Bundi state, having been bestowed upon a younger son of the Bundi raja by the emperor Shah Jahan in return for services rendered him when the latter was in rebellion against his father Jahangir. The affairs of the state havin fallen into confusion, the administration is now superintended by a British political officer. Many of the state nobility hold lands ona semi-feudal tenure. The estimated gross revenue of the state in 1876 was £253,275, of which the land yielded over £170,000. Tribute of £38,472 (including maintenance of a contingent known as the Deoli Irregular Force) is paid to the British Government, and £1439 to Jeypore. Theclimate is very sultry during the prevalence of the hot winds at the commencement of summer, and is considered

unhealthy during the rainy season. Endemic fevers invariably appear after the close of the rains.

KOTHEN, or CérHEN, chief town of a circle in the duchy of Anhalt, Germany, is situated on the Ziethe, at the junction of several railway lines, about 42 miles north- west of Leipsic by rail. It consists of an old and a new town with four suburbs. It has two palaces, one of which in the old town contains various scientific collections and a library of 20,000 volumes. The industries include iron- founding and the manufacture of agricultural and other machinery, malt, beet-root sugar, leather, spirits, &c.; a tolerably active trade is carried on in grain, wool, potatoes, and vegetables. In 1875 the population, including the garrison, was 14,403.

Said to have been an important Wendish city, Kothen was captured and destroyed by Henry I. in 927. In 1800 it was burned by the margrave of Meissen. In 1547 it was presented by the emperor to General Ladron,

from whoni it soon passed by pur- chase to its old possessors. Hahnemann, the founder of homeo- pathy, lived and worked in Kothen, and a homeopathic establish- ment still exists in the town. Till 1858 Kéthen was the capital of the duchy of Anhalt-Kothen.

KOTRI, a town in Karachi (Kurrachee) district, Sind, India, situated on the right bank of the Indus, in 25° 22′ N. lat. and 68° 22’ E. long. The population in 1872, including the neighbouring hamlets of Khanpur and Midne Multani, was 7949—namely, 5166 Mohammedans 2455 Hindus, 304 Christians, and 24 Parsis, Kotri is the northern terminus of the Sind Railway, which com- municates with the seaport of Kurrachee (106 miles). The principal buildings, besides the Protestant and Roman Catholic churches, are the civil hospital, court-house, sub- ordinate jail, post-office, Government and other schools and travellers’ bungalow. The Indus Steam Flotilla maintains an extensive establishment, having its offices in the old fort, with workshops for the repair of steamers and barges. ‘There is a large transit traffic in beer, wine and spirits, metals, railway materials, piece goods, silk, wool, cotton, grain, oil-seeds, indigo, ghi, oil, saltpetre, and sugar. Water from Kotri is forwarded to Kurrachee, especially for the manufacture of ice and for drinking

purposes. In 1878 the Indus Valley State Railway was opened from Kotri to Sukkur, by which the import- ance of Kotri as a place of transshipment has been greatly diminished.

KOTTBUS, or Corrsus, chief town of a circle in the government district of Frankfort, Prussia, is situated on the Spree, about 72 miles south-east of Berlin by rail, and at the intersection of several important railway lines. It contains a medieval castle, and is the seat of a chamber of commerce. The chief industries of the busy little town are wool-spinning and the manufacture of cloth. Cotton- spinning, and the manufacture of tobacco, machinery, beer, brandy, &c., are also carried on, while its trade is active. In 1875 the population, including the garrison, was 22,612. At one time Kottbus formed a private lordship, but in 1462 it passed by the treaty of Guben to Brandenburg.

KOTZEBUE, Avcust Frreprich FERDINAND VON (1761-1819), German dramatist, was born on the 3d of May 1761, at Weimar, where his father was a councillor of legation. Having attended the gymnasium of Weimar, he went in his sixteenth year to the university of Jena, and afterwards studied about a year in Duisburg, In 1780 he completed his legal studies, and was admitted an advocate. Through the influence of Count Gortz, Prussian ambassador at the Russian court, he became secretary at St Petersburg to the governor-general Von Baur, by whom he was recommended to the empress. In 1783 he received the appointment of assessor to the high court of appeal in Revel, where he married a daughter of lieutenant-general Von Essen. He was ennobled in 1785, and became president of the magistracy of the province of Esthonia. Before leaving Germany he had published some unimportant writings; in Revel he acquired a considerable reputation by his Lecden der Ortenbergischen Familie (1785), his Kleine Gesammelte Schriften (1787-91), and his two plays, Menschenhass und Reue and Die Indianer in England (1789). The good impression produced by these works was almost effaced by a cynical book, Doctor Bahrdt mit der eisernen Stirn, which appeared with the name of Knigge on the title page. After the death of his first wife Kotzebue retired from the Russian service, and resided for some time in a country house which he had built near Narva. At this time he manifested extraordinary literary activity, publishing within a few years, besides Dre jringste Kinder meiner Laune (in 5 volumes), upwards of twenty plays. In 1798 he accepted the office of dramatist to the court theatre of Vienna, resigning it in about two years with a pension of 1000 florins. On his way to St Petersburg, where his sons were being educated, he was arrested in April 1800, and sent to Siberia. Fortunately he had written a comedy which flattered the vanity of Paul I ; and a translation of this play so delighted the emperor that Kotzebue was brought back, received an estate from the crown lands in Livonia, and was made director of the German theatre in St Petersburg. He returned to Germany when the emperor Paul died, and in 1802 was admitted into the Academy of Sciences at Berlin. Here, in association with Merkel, he edited Der Freimiithige, and began his Almanach dramatischer Spiele, which he continued to issue until his death. He also wrote several plays in Berlin, and made some enemies

by the bitterness with which he attacked Goethe. Towards the end of 1806 he was again settled in Russia, and in the security of his estate in Esthonia wrote many satirical articles against Napoleon in Die Biene and Die Grille. As councillor of state he was attached in 1816 to the department for foreign affairs in St Petersburg, and in 1817 he went to Germany as a sort of spy in the service of Russia, with a salary of 15,000 roubles. In his weekly journal (the Literarasches Wochenblatt) he scoffed at the pretensions of those Germans

who demanded free institutions, and became an object of such general dislike that he was obliged to leave Weimar for Mannheim. He was especially detested by young enthusiasts for liberty; and one of them, Karl Ludwig Sand, a theological student, formed a deliberate resolution to kill him. On the 23d of March 1819 Sand called at Kotzebue's house in Mannheim, and stabbed him to the heart, crying, " Here, thou betrayer of the Fatherland !" The assassin was executed, and the Government of Germany made his crime an excuse for placing the universities under strict supervision. Besides his plays and the other works already mentioned, Kotzebue wrote a history of the German empire and a book on the ancient history of Prussia, neither of which has solid merit. He was also the author of Lrinnerungen aus LParis (1804), and Erinnerungen von einer Reise aus Livland nach Rom und Neapel (1805). He wrote more than one hundred plays, the majority of which are now forgotten. Although destitute of poetic insight, he had remarkable facility in the invention of effective situations; and a respectable place in German literature is secured for some of his comedies by the liveliness with which their characters are portrayed, and by the sprightliness of their dialogue. There is a complete edition of his dramatic works in 28 volumes (1797-1823), another in 44 volumes (1827-29), and a third in 40 volumes (1840-41).

KOTZEBUE, Orro von (1787-1846), Russian navi- gator, son of the subject of last notice, was born at Revel on December 19, 1787. After being educated at the St Petersburg school of cadets, he accompanied Krusenstern on his voyage of 1803-6. After his promotion to lieu-

tenant, Kotzebue was placed in command of an expedition fitted out at the expense of the imperial chancellor, Count Rumantsoff, in the brig Murick. In this vessel, with only twenty-seven men, Kotzebue set out on July 30, 1815, to find a passage across the Arctic Ocean, and explore the less known parts of Oceania. Proceeding by Cape Horn, he reached on April 16, 1816, Schouten and Lemaire's Isle of Dogs. After cruising about the Pacific for some time, and discovering various islands and groups,—as the Krusenstern group, and the Kutusoff and Suwaroff Islands in the east of the Caroline archipelago, —Kotzebue made for Kamchatka, and on June 29 reached New Archangel. In the middle of July he proceeded northwards, coasting along the north-west coast of America, discovering and naming Kotzebue Gulf or Sound and Krusenstern Cape. Returning by the coast of Asia, he again sailed to the south, sojourned for three weeks at the Sandwich Islands, and on January 1, 1817, dis- covered New Year Island. After some further cruising in the Pacific he again proceeded north, but, a severe attack of illness compelling him to return to Europe, he reached the Neva on August 3, 1818, bringing ome with him a large collection of previously unknown plants and much new ethnological information. In 1823 Kotzebue, now a captain, was entrusted with the command of a new ex- pedition, in two ships of war, the main object of which was to take reinforcements to Kamchatka. There was, however, a staff of scientific men on board, who collected much valuable information and material in geography, ethnography, and natural history. The expedition left Cronstadt on August 23, and, proceeding by Cape Horn, visited the Radak and Society Islands, reaching Petro- pavlovsk in July 1824. Many positions along the coast were rectified, the Navigator Islands visited, and several discoveries made. The expedition returned by the Mariannes, Philippines, New California, and Sandwich Islands, reaching Cronstadt on July 10, 1826. There are English translations of both Kotzebue's narratives : —A Voyage for the Purpose of Exploring a North-East

Passage, undertaken in the years 1815-18, 3 vols. (1821); and A New Voyage Round the World in the years 1823-26 (1830). The narrative of the second voyage is generally considered to be rather highly coloured, while in the first Kotzebue animadverts in strong terms on the conduct

of the English missionaries in the: Society and Sandwich Islands, who, however, were defended both by Ellis and Mr Charles Darwin. Three years after his return from his second voyage, Kotzebue retired to his estate in Esthonia, where he died February 15, 1846.

KOUSSO, Kosso, or Cusso, a drug recently introduced into English medicine as a remedy for tapeworm. It consists of the flowers of Jagenia abyssinica, Willd. (Brayera anthelminthica, Kunth.), a handsome rosaceous tree 60 feet high, growing throughout the table-land of Abyssinia, at an elevation of 3000 to 8000 feet above the sea-level. The drug as imported is in the form of cylin- drical rolls, about 18 inches in length and 2 inches in diameter, and comprises the entire inflorescence or panicle kept in form by a band wound transversely round it. The flowers have a light brown hue, or in the case of the female flower a reddish tinge, for which reason the latter is some-times distinguished as red kousso. The active principle of kousso is stated by Fliickiger to be kosin, C,,H,,04) ; it is supposed to be a compound ether of isobutyric acid, since it gives off the odour of this substance when its solution in concentrated sulphuric acid is diluted with water. Kosin appears to have been first obtained as a definite crystalline substance by Merck, who prepared it in the form of tasteless yellowish rhombic needles or prisms, soluble in chloroform, ether, benzol, and bisulphide of carbon, very soluble in boiling but only sparingly so in cold alcohol. It is not decomposed by boiling dilute acids. The koussin of Bedall appears to be an impure substance con- taining variable quantities of crystalline kosin, Kousso yields on distillation a stearoptene-like oil having the odour of the drug, also traces of valerianic and acetic acids. The medicinal properties of kousso were first investigated in 1822 by Brayer, a French physician of Constantinople, but the drug did not come into use in Europe until 1850 ; in 1864 it was introduced into the British pharmacopceia. In medicine it is used in the form of an unstrained in- fusion of + to 4 oz. of the coarsely powdered flowers, which are swallowed with the liquid. Administered in this form it sometimes causes vonliting; hence an extract of the flowers, prepared by percolating them with castor oil to dissolve out the active principle, has been introduced. Kousso is con- sidered to be an effectual vermifuge for both Z’enia soliwm and

Bothriocephalus latus. In its anthelminthic action it is nearly allied to male fern.

See Bruce, Travels, v. p. 738, 1790; Brayer, Notice sur wne nouvelle plante de la famille des Rosacées employée contre le Tenia,

1822; Pharmaceutical Journal, x. p. 15; Pharmacographia, 2d ed., p. 256-259 ; Bulletin de Thérapeutique, 1876, p. 556.

KOVNO, a north-western province of European Russia, is bounded on the N.E. and 8.E. by the provinces of Cour- land and Vilna, and on the S. and 8.W. by Russian Poland and by Prussia, a narrow strip touching the Baltic near Memel. It has an estimated area of 23,680 square miles. The level uniformity of its surface is broken only by two low ridges which nowhere rise above 800 feet. The geological character is varied, the Silurian, the Devonian, the Jurassic, and the Tertiary systems being all represented ; the Devonian is that which occurs most frequently, and all are covered with Quaternary boulder-clays. The soil is either a sandy clay or a more fertile kind of black earth. The government is well watered by the Niemen, the Windau, the Courland Aa, and the Duna, which have navigable tributaries. In the flat depressions covered with boulder-clays there are many lakes and marshes, whilst

forests, now greatly reduced, still cover about 18 per cent. of the surface of the government. The climate is com- paratively mild, the mean temperature at Kovno being 44° Fahr. The population (1,156,040 in 1870) is very varied, consisting of Lithuanians proper and Zhmuds, Jews, Slavs, and Germans ; 82 per cent. are Catholics, 13 Jews, 3 Protestants, and 2 belong to the Greek Church. The Poles number only 3000, aud the Russians (White, Little, and Great) 182,000. The chief occupation of the inhabitants is agriculture, 60 per cent. of the whole surface being under crops; both grain and potatoes are exported. The yield of corn (2,270,000 quarters prior to 1857) is now about 2,879,000 quarters per annum. Flax is also cultivated, and the linseed

is exported. Stock-breeding is not carried on to any considerable extent; but, owing to the number of lakes, the fishing industry has some im- portance. The manufacturing industries, if distillation be left out of account, are trifling. Trade, especially the transit trade, is brisk, from the situation of the government on the Prussian frontier, the custom honses of Yurburg and Taurogen being among the most important in Russia. Kovno has seven districts :—Kovno, Novoalexandrovsk, Ponevyezh, Rossieny, Shavli, Telshi, and Vilkomir. The principal towns are Kovno (32,050 inhabitants), Shavli (15,400), Vilkomir (11,150), Rossieny (10,700), and Novoalexandrovsk (8250).

The territory which now constitutes the government of Kovno was formerly part of Lithuania, During the 13th, 14th, and 15th centuries the Livonian and Teutonic knights continually invaded and plundered it, especially the western part which was peopled with Zhmuds. In 1569 it was annexed, along with the rest of the grand principality of Lithuania, to Poland; and it suffered very much from the wars of Russia with Sweden and Poland, and from the invasion of Charles XI]. in 1701. In 1795 the principality of Lithuania was annexed to Russia, and until 1872, when the govern- ment of Kovno was constituted, the territory now forming it was a part of the government of Vilna.

Kovno, the Kaune of the Lithuanians, capital of the above governnient, is situated on the railway between St Petersburg and Berlin, 503 miles south-west from the former. It consists of two parts, the new town, built on the right bank of the Niemen, and an old town, situated on the left bank of the Vilia which here joins the Niemen. By its situation at the confluence of two navigable rivers, some few miles above the mouth of the Nevyaja, and close to a place where the Niemen sharply changes its northern direction into a western one, Kovno, which is supposed to have been built in the 11th century, soon acquired import- ance both as a fortified place and as a centre for trade. In its early history it often suffered from the attacks of the crusaders, and fell alternately under their dominion and under that of Lithuanians. Its citadel was destroyed in 1400, and from that time it became the centre of an active trade, being visited by German and English merchants. In the 16th, 17th, and 18th centuries it was the chief emporium for trade

with Lithuania, and rivalled Kénigs- berg. Henry of Valois said it was the best jewel of the kingdom. But continuous wars destroyed this commerce, and, when Kovno became a Russian town, in 1795, it was already a very poor place, which numbered in 1817 but two hundred houses. Owing to its advantageous situation, it has again acquired commercial importance. It has several remarkable old churches, two of which have been transferred to the Greek confession, and a beautiful old guild-hall now transformed into an imperial palace. Its population (33,050) is most varied; one half are Jews engaged in petty trades and commerce. Salt, salted fish, coal, and various manufactured wares are brought here from Prussia on vessels which return with cargoes of corn, linseed, timber, rags, bones, and wool, pur- chased in the governments of Vilna, Minsk, Grodno, and Tchernigoff.

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KOVROFF, a town in Russia, situated in the govern- ment of Vladimir, on the railway between Moscow and Nijni Novgorod, 40 miles east-north-east of the capital of the province, on the right bank of the Klazma river. It has become, of late years, an important manufacturing centre, —cottons, machinery, and railway carriages being the principal items. It also carries on an active trade in the export of wooden wares and in the import of grain, salt, and fish, brought from the Volga provinces for the use of the government of Vladimir. Population 5000.

KOZELSK, a district town of the government of Kaluga in European Russia, situated 43 miles south-west of Kaluga, on the left bank of the river Zhizdra. The principal build- ing is the cathedral, erected in 1700, and rebuilt by Catherine II. after the fire of 1777. In the first half of the present century sailcloth was largely manufactured in the town; but this industry has declined, and, though there are oil-mills, tanneries, rope-walks, and breweries, many of the working classes have to seek employment elsewhere. Population in 1870, 13,400.

Kozelsk emerges in the middle of the 12th century. Jn 1238 it was utterly destroyed, and all its inhabitants put to the sword by the Tartar invaders. During the 15th century it formed a bone of contention between the Lithuanian princes and the grand-dukes of Moscow. Ivan the Terrible surrounded it with a wooden pali-

sade. Captured by Dolgorukoff in 1607, it withstood a heavy siege at the hands of Ismailoff.

KRAFFT, or Krart, Apa (c. 1455-1507), sculptor of the Nuremberg school, was born, probably at Nuremberg, about the middle of the 15th century, and died, some say in the hospital, at Schwabach, about 1507. Of his life few particulars are known beyond the dates of several of his works. He seems to have emerged as sculptor about 1490, the date of the seven reliefs of scenes from the life of Christ, which, like alinost every .other specimen of his work, are at Nuremberg. The date of his last work, an Entombment, with fifteen life-size figures, in the Holz-schuher chapel of the St John's cemetery, is 1507.

Besides these, Krafft's chief works are several monumental reliefs in the various churches of Nuremberg ; the alto-rilievo intombment outside St Sebald's church ; Christ Bearing the Cross, above the altar of the same church ; and various works made for public and private buildings, as the relicf over the door of the Wagehaus, a St George and the Dragon, several Madonnas, and some purely decorative picces, as coats of arms. His masterpiece is perhaps the magnificent tabernacle, 62 feet high, in the church of St Laurence, 1493-1500. See Wanderer's 4ddam Kraft und seine Schule, 1869.

KRAJOVA, or Cragova, a town in the circle of Dolschi, Roumania, is situated near the Schyl, a tributary of the Danube, about 110 miles west of Bucharest. There are prosperous salt-works situated in the town; and from its position at the junction of the Carpathian high-roads with the route from Bucharest to Widdin its trade (largely in the hands of Jews) is important. In 1873 its popula- tion was 22,764.

Krajova was the former capital of Little Wallachia. In 1897 it was the scene of a victory of the waiwode Marcea over the Turkish sultan

Bajazet ; and there, in October 1853, a fight between the Russians and Turks took place.

KRANTZ, or Crantz, ALBERT (c. 1450-1517), German historian, was a native of Hamburg. He studied law, theology, and history at Rostock and Cologne, and after travelling through western and southern Europe was ap- pointed professor, first of philosophy and subsequently of theology, in the university of Rostock, of which he was rector in 1482. In 1492 he returned to Hamburg as theo- logical lecturer, canon, and prebendary in the cathedral. By the senate of Hamburg he was employed on more than one diplomatic mission abroad, and in 1500 he was chosen by the king of Denmark and the duke of Holstein as arbiter in their dispute regarding the province of Dithmarschen. As dean of the cathedral chapter, to which office he was appointed in 1508, Krantz applied himself with zeal to the reform of ecclesiastical abuses, but, though opposed to

various corruptions connected with church discipline, he had little sympathy with the drastic measures of Wickliffe or Huss. A deathbed utterance of his, somewhat despond- ing in its tone, with reference to Luther and his ninety-five theses has occasionally, but unfairly, been interpreted as a summary condemnation of that Reformer. Krantz died December 7, 1517.

Krantz was the author of a number of historical works which for the period when they were written are characterized by exceptional impartiality and research. The principal of these are Chronicon

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regynorum aquilonarium Danizx, Suecix, et Norvegiz, Strasburg, 1545; Vandalia, sive historia de Vandalorum vera origine, &c., Cologne, 1519 ; Sawonia, 1520; and Metropolis sive Historia eeclesize in Saxonia, 1548. See life by N. Wilckens, Hainburg, 1722.

KRASNOYARSK, a town of eastern Siberia, capital of the extensive province of Yeniseisk, which stretches as a long strip from the Chinese frontier formed by the Sayan mountains to the shores of the Arctic Ocean. It is situated on the left bank of Yenisei river, at its con- fluence with the Katcha, and on the highway from Moscow to Irkutsk, 662 miles west-north-west from the latter. It was founded by Cossacks in 1628, and during the early years of its existence it was more than once besieged by the Tartars and Kirghiz. It became the capital of the province in 1822, and is now the seat of the provincial administra- tion. Its commercial importance depends entirely upon the gold-washings of the Yeniseisk district, supplies for which are sent from Krasnoyarsk. The climate is very cold, but dry, so that in the steppe which surrounds the town there is but little snow, even in mid-winter. The Yenisei river is frozen for one hundred and sixty days at Krasnoyarsk. Population, 13,000.

KREMENETZ, a district town of Russia, in the govern- ment of Volhynia, in the high valley of the Ikva, one of the tributaries of the basin of the Pripat, situated 30 miles east from Radziviloff, the great custom-house on the railway between Kieff and Lvoff. It is a poor place, the 11,800 inhabitants of which follow agriculture, raise tobacco, and excavate flint. But the Jews, who are numerous in the town, carry on a brisk trade in grain, which is stored here for export to Galicia and Odessa. The picturesque ruins of an old castle on a crag close by the town, are usually known under the name of the castle of Queen Bona; it was built, however, but in the 8th or 9th century. The hordes of Batyi vainly besieged it in 1241 and 1255. From that time Kremenetz was alternately under the dominion of Lithuania and Poland, till 1648, when it was taken by the Zaporojtzi Cossacks. During the years 1805 to 1832 its Polish lyceum was the centre of superior instruction for the western provinces of Little Russia; but after the Polish insurrection of 1831 the lyceum was transferred to Kieff, and is now the university of that town.

KREMENTCHUG, a Russian town in the govern- ment of Poltava, situated 74 miles by rail to the south- west of the government town, on the railway between Kharkoff and Nicolaieff, and on the left bank

(here flat and sandy) of the Dnieper. It is supposed to have been founded in 1571; byits situation at the southern terminus of the navigable course of the Dnieper, and on the highway from Moscow to Odessa, it early acquired a great com- mercial importance, which it still retains ; by 1655 it was a wealthy town. In 1765 it became capital of “New Russia.” It now has a suburb, Kryukoff, on the right bank of the Dnieper, united with the town by a railway bridge. Nearly all commercial transactions in salt with White Russia are effected at Krementchug, the salt being deposited in large storehouses in Kryukoff, and then sent by boat to the north-west. The town is also a centre of the tallow trade with Warsaw ; considerable quantities of timber, too, are floated down to this place and thence sent to the neighbouring provinces. Nearly all the trade in the

brandy manufactured in the government of Kharkoff and destined for the governments of Ekaterinoslaff and Taurida is concentrated here, as also is the trade in linseed between the districts situated on the left affluents of the Dnieper and the southern ports. Other articles of commerce are rye, rye-flour, wheat, oats, and sarrasine, which are sent, partly up the Dnieper to Pinsk, partly by land to Odessa and Berislaff, but principally to Ekaterinoslaff, on light boats floated down during the spring floods. Although thus busily employed, the town does not wear the aspect of a commercial place, the linseed being mostly warehoused in the houses of the Jews who carry on this trade, and the important banking operations being also chiefly in the hands of Jews. The Dnieper is crossed at Krementchug by a remarkable tubular bridge 1081 yards long, over which passes the railway from Kharkoff to Balta; there is also a bridge of boats. The manufactures consist of carriages, agricultural machinery, and tobacco. Population, 31,000.

KREMNITZ (Hungarian, Kérméczbdnya), a mining town in the cis-Danubian county of Bars, Hungary, lies in a deep valley, and on the Hungarian state railway, 82 miles north of Budapest, in 48° 42’ N. lat., 18° 46’ E. long. It is the seat of a board of mining control, and of the management of the mint, and has an office of woods aud forests. As noteworthy buildings may be mentioned the castle, several Roman Catholic and the Lutheran churches, a Franciscan monastery (founded

1634), the town-hall, and the mint where the celebrated Kremnitz gold ducats are struck. The great bulk of the inhabitants find employment in connexion with the gold and silver mines, which, though far less productive than formerly, still yield considerable quantities of ore. By means of a tunnel 9 miles in length, constructed in 1851-52, the water is drained off from the mines into the Garam or Gran. In 1880 the population was 8552, mostly Germans.

According to tradition Kremnitz was founded in the 8th century by Saxons. In 1100 it was raised to the dignity of a royal free town. In the middle of the 12th century the population was much aug- mented by German colonists, and in 1328 the commune received special privileges at the hands of Charles Robert of Anjou. From 1424 to 1433 the town was frequently at the mercy of the Hussites. After the catastrophe at Mohacs (1526) it suffered repeatedly from the Turks, and during the 17th century both from the forces of successive Transylvanian princes and from Ottoman hordes.

KREMSIER (in Czech, Aromeriz), chief town of a district in Moravia, Austria, is situated in the fertile region of Hanna on the March, about 25 miles south-west of Olmiitz. It is the seat of several local courts, and is the summer residence of the bishop of Olmiitz, whose palace, surrounded by a fine park and gardens, and containing a picture gallery, library, and various collections, forms the chief object of interest. Kremsier has both a German and a Slav upper-gymnasium, a higher commercial school, a convent, and a hospitat. Its industries include printing, and the manufacture of sugar, malt, and pottery. In 1870 the population was 9918.

In 1131 Kremsicr was the seat of a bishopric. It suffered con- siderably during the Hussite war; and in 1643 it was taken and burned by the Swedes. After the rising of 1848, the Austrian congress met in the palace at Kremsier from November 1848 till March 1849.

KREUTZER, Conrapin (1782-1849), German musical composer, owes his permanent fame almost exclusively to one opera, Das Nachtlager von Granada, which has kept the stage for nearly half a century in spite of the changes of taste. It is written in the style of Weber, and is

remarkable especially for its flow of genuine melody and depth of feeling. The same qualities are found in Kreutzer's part songs for men's voices, which at one time were extremely popular in Germany, and are still listened to with pleasure. Amongst these Der Z'ag des Herrn ("The Lord's Day") may be named as the most excellent. It is

indeed a masterpiece of its kind. Kreutzer was a prolific composer, and wrote a number of operas which have dis- appeared from the stage and are not likely to be revived. His life also is devoid of interesting features, and may be summed up in few words. He was born November 22, 1782, at Misskirch in Baden, and received his musical training from Albrechtsberger, the famous contrapuntist of Vienna. For the theatre of that city he composed most of his operas, including Das Nachtlager von Granada, pro- duced in 1834. For a time (1812-1816) he was chapel- master to the king of Wiirtemberg, and later on (1840) became conductor of the opera at Cologne. He died December 14, 1849, at Riga, where he had accompanied his daughter Cecilia Kreutzer, a singer of some renown.

KREUZNACH, or Creuznacu, chief town of a circle in the government district of Coblentz, Prussia, is situated on the Nahe, a tributary of the Rhine, about 40 miles south-east of Coblentz. It consists of the old town on the right bank of the river, the new town on the left, and the island Badewérth, all of which are connected by a fine stone bridge. There is an iron bridge between the island and the right bank. Kreuznach is the seat of a local court, and it has a gymnasium, a business-school, and a hospital. On the Badewérth is the kurhaus, built in 1872, with baths and gardens, and also the chief spring, the Elisabethquelle, impregnated with iodine and bromine, and prescribed for scrofulous and various other affections. The climate is mild, moderately damp, and on the whole equable. The chief industries of the town are marble- polishing and the manufacture of leather and tobacco, and various knick-knacks in agate. Vines are grown on the neighbouring hills. The population in 1875 was 13,772.

The earliest mention of the springs of Kreuznach occurs in 1478 ; but it was only in the early half of the 19th century that Dr Pricger (whose marblestatue adorns the town) brought them into prominence. Now the annual number of visitors is about seven thousand. In the 9th century Kreuzberg was known as Cruciniacnm. In 1065 it was presented by Henry IV. to the bishop of Spires, from whom it passed (after becoming a town in the early part of the 13th cen- tury) to the counts of Sponheim and the Palatinate. In 1814 it became Prussian. During the 17th century Kreuznach was more than once taken and plundered ; and in 1689 the French reduced the strong castle of Kauzenberg to the rnin which still surmounts the Schlossberg to the north-west of the town.

KRILOFP, Krutitorr, or Krytorr, Ivan ANDREEVITCH (1768-1844), the great national fabulist of Russia, was born Febrnary 14, 1768, at Moscow, but his early years were spent at Orenburg and Tver. His father, a distin- guished military officer, died in 1779; and young Kriloff was left with no richer patrimony than a chest of old books, to be brought up by the exertions of an heroic mother. In the course of a few years his mother removed to St Peters- burg, in the hope of securing a Government pension ; and there Kriloff obtained a post in the civil service, but he gave it up immediately after his mother’s death in 1788. Already in 1783 he had sold to a bookseller a comedy of his own composition, and by this means had procured for himself the works of Moliére, Racine, Boileau; and now probably under the influence of these writers, he produced Philomela and Cleopatra, which gave him access to the dramatic circle of Knyazhin. Several attempts he made to start a literary magazine followed each other with little success ; but, along with his plays, they served to make the author known to the polite society of the capital. For about four years (1797-1801) Kriloff lived at the country seats of the prince Sergius Galitzin, and when the prince was appointed military governor of Livonia he accom- panied him as official secretary. About the years which follow his resignation of this post very doubtful informa- tion has been preserved, the common opinion being that he wandered from town to town under the influence of a

passion for card-playing. Before long he found his place | in 1875 was 8034.

as a fabulist, the first collection of his ables, twenty-three in number, appearing in 1809. From 1812 to 1841 he held a congenial appointment in the Imperial Public Library—first as assistant, and then as head of the Russian books department. His death took place November 21, 1844, His statue in the Summer Garden is one of the finest monunients in St Petersburg.

Kriloff's success as a fabulist was as rapid as it has been enduring. Honours were showered upon him while he yet lived: the Academy of Sciences admitted him a member in 1811, and bestowed upon him the same gold medal which was accorded to Karamzin for his [story of the Russian People; in 1838 a great festival was held under imperial sanction to celebrate the jubilee of his first appearance as an author ; and the emperor assigned him a handsome pension. Before his death about 77,000 copies of his Hables had found sale in Russia; and his wisdom and humour had become the common possession of the many. Nor is the reason far to seek. He was at once poet and sage. In spite of a superficial indifference to political matters, he observed everything with keen and collected interest. His fables for the most part struck root in some actual event, and they told at once by their grip and by their beauty. Though he began as a trans- lator and imitator, he soon showed himself a master of invention, who found abundant material in the life of his native land. To the Russian ear his verse is of matchless quality ; while word and phrase are direct, simple, and emi- nently idiomatic, colour and cadence vary with the theme. This perfection was the result of sustained elaboration, for, though physically indolent, Kriloff was a hard intellectual worker, and had an infinite faculty of taking pains. Of his carelessness in dress, absence of mind, and general irreverence towards etiquette, the stories told are many.

A collected edition of Kriloff's works appeared at St Petersburg, 1844. Of the numerons editions of his ables, which have been often translated, may be mentioned that illustrated by Trutovski, 1872.

‘Theauthor’s life has been written in Russian by Pletneff, by Lebanoff, and by Grot, Liter. zhizn Krutlova. ‘‘ Materials” for his life are published in vol. vi. of the Sbornik Statet of the literary department of the Academy of Sciences. W. R. 8. Ralston has prefixed an excellent sketch to his English prose version of the Fables, 1868, 2d ed. 1871.

KRISHNAGAR, town and headquarters of Nadiyd district, Bengal, India, situated on the left bank of the Jalangti river, 23° 23’ N. lat., 88° 32’ E. long. The muni- cipal limits comprise an area of 7 square miles and a population in 1872 of 26,750 persons—Hindus, 18,114 ; Mohammedans, 8076 ; Christians, 560. Besides the usual Government offices and courts, Krishnagar is also a station of the Church Missionary Society and of a Roman Catholic mission, each body having its own church and schools. The town is a seat of considerable trade, and is noted for its manufacture of coloured clay figures, carried on by a few artists of the kumbhar or potter caste.

KROLEVETZ, a district town of Russia, in the govern- ment of Tchernigoff, 108 miles east of the government town. Its 14,000 inhabitants live by agriculture and gardening, by linen manufactures, and by trading in agri- cultural produce and salted fish imported from the province of Ekaterinoslaff, and in manufactured wares. There are two important fairs, one for horses and manufactured wares, and the other for cattle.

KROTOSCHIN (in Polish, Krotoszyn), chief town of a circle in the government district of Posen, Prussia, is situated about 32 miles south-west of Posen. It has a local court, three churches, a synagogue, steam saw-mills, and a steam brewery, and carries on trade in grain and seeds. The neighbouring castle of Krotoschin is the chief place of a mediatized principality of the prince of Thurn and Taxis, which was formed in 1819. The population of Krotoschin

KRU—KLU

KRUDENER, BarBaRA JULIANA VON WIETINGHOFF, Baroness von (1766-1824), authoress of the romance of Valérie, but better known by the religious fervour and pious mysticism of her later years,

was born of noble and wealthy parents at Riga, November 21, 1766. Her educa- tion, which was an elaborate one, was received partly in her father's house and partly in Paris. While still very young she was married to the Baron von Kriidener, a Russian diplomatist twenty years her senior, whom she accompanied to Copenhagen and subsequently to Venice ; the uuion did not prove a very happy one, and for some years the couple lived apart. It is understood that Vadérve, published by Madame Kriidener in 1804, is to a consider- able extent an autobiography of this period of her life; if this be so, it is impossible to exonerate her of all blame for the domestic misfortunes which befel her. After the death of her husband she resided for some time in Paris, mingling freely with a large and brilliant social circle, but afterwards she retired to her property in Livonia, where her sense of the vanity of earthly things gradually deepened, and religious yearnings were quickeued which ultimately found satisfac- tion in the doctrine and worship of the Moravian com- munity. In 1808 she saw much of Jung Stilling at Carlsruhe and of Oberlin in Steinthal; and the religious convictions now formed were held by her with such earncst- uess that she felt constrained to adopt the vocation of an itinerant preacher. Her obvious sincerity, her culture and refinement, her social standing, enabled her to attract con- siderable notice throughout Baden, in Strasburg, and in Switzerland, especially in Geneva; and at Heilbronn in 1815 she could reckon even an emperor (Alexander [. of Russia) among her attentive hearers. Her activity, how- ever, which was hardly favourable to established church order, soon became distasteful to the authorities, and, after being invited to withdraw from more than one German state, she again retired into private life on her estate in 1818. Led by her enthusiasm of humanity to St Peters- burg, she was dismissed by the emperor for having declared her sympathy for the struggling cause of Greece. Ill health now came upon her, and she was advised by her physicians to seek a warmer climate. On the southward journey she died at Karasu-Bazar on December 25, 1824. Her life has been written by Eynard (Vie de Madame de Kriidener, 2 vols., Paris, 1849).

KRUMEN, Croomen, Krus, or Croos, a negro people on the west coast. of Africa. The name is properly Kra or Krao, though the corrupt

form Crew-men has sometimes been put forward as the original. Ethnographically it ought to be confined to the tribes settled in the neighbour- hood of the Sinoe in the republic of Liberia, where their chief towns are known as Settra Kru, Little Kru, and Nana Kru; but, as they were the first west African people who ventured to take service on board European vessels, it is now generally applied to about a score of tribes living along 200 miles of coast who in this respect have followed their example. In spite of the fact that the Krus have come into close connexion with Europeans for a long series of years, the information in regard to them is of the scantiest description. They are an independent as well as an enterprising people, and keep themselves very much apart from other tribes. It is said that they have never furnished even a nominal convert to Christianity. They are now mainly engaged as traders or agents; and com- paratively few of the Krumen proper are to be found serving as boatmen or sailors. As soon as they have amassed a competency they return to their native country. They keep no slaves themselves, and they are never found in slavery abroad. The men are tall, strong, and well- proportioned, with bluish-black complexion, woolly and abundant hair, and a greater frequency of beard than is

common among negroes, They appear to be dolichocephalic and prognathic. Their women are of a lighter shade than negro women generally, and in several respects come much nearer to a European standard. Tribal or clan marks are worn on the face: the Krumen examined by Schlagin- tweit, for example, had a blue vertical stroke on the brow; those seen by Wittstein at’ Monrovia had a black stroke and an arrow directed from the ear to the eye. Dr Bleek classifies the Kru language with the Mandingo family, and in this he is followed by Latham; Dr Koelle, who published a Kru grammar (1854), considers it as distinct.

Further details will be found in Quatrefages and Hamy, Crania Ethnica, part ix., 1878-79, p. 363 ; Schlagintweit-Sakunlunski, in the

Sitzungsbericht of the a at Munich, 1875; Nicolas, in Bull. de la Soc. d Anthrop., Paris, 1872.

KRUMMACHER. Three members of this family have attained some popularity as religious writers in Germany and indeed throughout Reformed Protestant Christendom.

]. FriepRicu ApoLF KRuMMACHER was born July 13, 1768, at Tecklenburg, Westphalia, studied theology at Lingen and Halle, and became successively rector of the grammar school at Mors, professor of theology at Duisburg, preacher at Crefeld and afterwards at Kettwich, consisto- rialrath and superintendent in Bernburg, and pastor of the Ansgariuskirche in Bremen (1824), where he died on 14th April 1845. He was the author of numerous religious works, but is best known by his Parabeln, first published in 1805, which have gone through numerous German editions (9th ed., Essen, 1876), and have been translated into English and other European languages.

2. GotTrRieED DANIEL KRUMMACHER, born at Tecklen- burg, April 1, 1774, was pastor successively in Barl, Wulfrath, and Elberfeld. He was the leader of the “ pietists” of Wupperthal, and published several volumes of sermons, including one entitled Israel’s Wanderings. His death occurred on January 30, 1837.

3. FRIEDRICH WILHELM KrumMMACHER, son of Friedrich Adolf, was born at Mors, January 28, 1796, studied theology at Halle and Jena, and became pastor successively at Ruhrort (1823) and Gemarke, near Barmen (1825). In 1847 he received an appointment to the Dreifaltigkeitskirche in Berlin, and in 1853 he became court preacher at Potsdam. He died December 10, 1868. F. W. Krummacher was an influential promoter of the Evangelical Alliance. His best known works are Hlias der Thishiter (1828-33 ; 6th ed. 1874), well known to English readers, and Hlisa (1837), also translated, but much less popular both in England and Germany than its predecessor. He published several volumes of sermons, and an Autubiography appeared in

1869.

KRUSENSTERN, Apam Joun (1770-1846), Russian navigator, hydrographer, and admiral, was born in Eisthonia on November 8, 1770. In 1785 he entered the corps of naval cadets, after leaving which, in 1788, with the grade of midshipman, he served in the war against Sweden. Having been appointed to serve in the English fleet for several years (1793-99), he visited America, India, and China, Having published a paper pointing out the advan- tages of direct communication between Russia and China by Cape Horn and the Cape of Good Hope, he was appointed by the emperor Alexander to make a voyage to the east coast of Asia to endeavour to carry out the project. Two English ships were bought, Krusenstern commanding the one and Lisiansky the other. Leaving Cronstadt in August 1803, Krusenstern proceeded by Cape Horn and the Sand- wich Islands to Kamchatka, and thence to Japan. Re- turning to Europe by the Cape of Good Hope, after an extended series of cxplorations, Kruseustern reached Kron- stadt in August 1806, his being the first Russian expedition

to circumnavigate theworld. The emperor conferred several lionours upon him, and he ultimately became admiral. As director of the Russian naval school Krusenstern did a great deal to improve the education and the position of the cadets, and in other ways the Russian navy was much indebted to his enlightened exertions. He was also a member of the scientific committee of the marine, and his contrivance for counteracting the influence the iron in vessels has on the compass was adopted in the navy. He died at Revel, August 24, 1846.

Krusenstern’s Voyage Rownd the World in 1808 was published at St Petersburg in 1810-14 in 3 vols., with folio atlas of 104 plates and maps (English edition, 2 vols., 1813; French edition, 2 vols., and atlas of 30 plates, 1820). His narrative contains a good many important discoveries and rectifications, especially in the region of Japan, and the contributions made by the various savants were of inuch scientific importance. A work of permanent value is Krusen- stern’s Atlas of the Pacific Ocean, with its accompanying Recueil des Mémoires

Hydrographiques, 3 vols,, St Petersburg, 1824-35. See Memoir by his daughter Madame Bernhardi, translated by Sir John Ross, 1856.

KUBA, or Kuptat-Kaba, a town of the Caucasus, in the government of Baku, Russia, 120 miles north-west from Baku, and 25 miles west of the Caspian. Its situation at the foot of the highlands of Caucasus, on a plain watered by the numberless branches into which the Kubinka river and other smaller streams divide at their issue from the mountain valleys, makes the neighbourhood very suitable for gardening, which is the chief occupation of the 11,300 inhabitants of Kuba, mostly Mussulman Shiites. They also make carpets with very bright colours, and some silks, which are exported to Transcaucasia and Russia ; whilst Jews, who are numerous, carry on an active trade in rough silk, madder, and silk and woollen goods, exported to Russia and Persia. The town, which formerly was a Persian fort, and still is protected on one side by brick walls, is badly built and dirty; it suffers very much from fever. An unsuccessful attempt was made by the military authorities in 1825 to transport the town to New Kuba, 8 miles distant ; the new settlement did not increase, and the settlers returned to Kuba.

KUBAN, a Russian district and government at the north-west extremity of the Caucasus, comprising the entire basin of the river of that name. It is bounded on the N. by the lands of the Don Cossacks and the steppes of Stavropol, E. by the watershed of the river basins of the Caspian and sea of Azoff, 8. and S.W. by the Caucasian Alps, and W. by the Black Sea and Straits of Kertch. Its area comprises 27,728 square miles, Ekaterinodar, the chief town (population 30,000), is the residence of the governor, who, being also ataman in chief of the Kuban Cossacks, is invested with military and civil power. Climate varies greatly, the highest temperature reaching 104° Fahr., the lowest seldom falling below 10° Fahr. The country is very healthy, except in the lowlands, where fever prevails, The soil is of extreme fertility, yielding an abundance of wheat, maize, and tobacco. Fruit, such as apples, pears, cherries, is plentiful, and the vine is cultivated with success near Temrouk and Taman. ‘The upper valleys are richly covered with forests abounding in fir, oak, ash, beech, hornbeam, &c. ; the lower parts consist of extensive pasture landsand swamps. The

animals include the stag, roe-deer, bear, wild boar, wolf, fox, ibex, and chamois, also the bison (which, however, is very rare) in the virgin forests of the Teberda; numerous water-fowl, such as ducks, geese, swans, pelicans, also the pheasant, partridge, bustard, and moun- tain turkey. The rivers and lakes are plentifully supplied with fish, trout abounding in the mountain streams and the sturgeon at the delta of the river Kuban. The mineral wealth consists of coal, salt, petroleum, and ozokerite. The river Kuban (the ancient Hypanis, see Caucasus, vol. v. p. 204) is navigable in flat-bottomed boats over a distance

of 100 miles between Temrouk and Ekaterinodar. The delta comprises several lakes.

It is on the upper banks of the Kuban that the Ass or Osses, and the enigmatic corner of Asia Propria, are belicved to have been located. The history of the original settlements of the various native tribes named below, and their language and worship before the introduction of Mohammedanism, remain a blank page in the legends of the Caucasus. The peninsula of Taman, a land teeming with relics of ancient Greek colonists, has becn occupied successively by the Cimmetians, Sarmatians, Khazars, Mongols, and other nations. The Genoese, who had established an extensive trade in the 13th century, were expelled by the Turks in 1484, and in 1784 Russia obtained by treaty the entire peninsula and the terri- tory on the right bank of the Kubau,—the latter being granted by Catherine II. in 1792 to the Cossacks of the Dnieper. Then com- menced the bloody struggle with the Circassians which continued for morc than half a century. The mountaineers were finally sub- dued in 1864, and 400,000 of their number expatriated. Those, however, who elected to remain have become more prosperous than they had ever been. The population of Kuban, 862,473, em- braces 510,038 Cossacks, 108,346 settlers of Russian origin, 4280 foreiguers, and 95,602 natives. Cossack villages are military settle- ments, the men carrying arms as well as following the plough. They are exempt from the poll-tax (3 to 4 roubles) to which the others are subjected, but military service is compulsory, as is gratuitous labour in the construction and repair of roads, bridges, &c. Not only domestic but even field work is conducted mostly by women,

remarkable for physical strength and endurance. Corn grow- ing, the rearing of cattle, and fishing are the most profitable occupa- tions. The native mountaineers, known under the general name of Circassians, but locally distinguished as the Karatchai, Abadsikh, Khakoutchy, Shapsough, have greatly altered their mode of life since the pacification of the Caucasus, still, however, maintaining Mohammedanism, speaking their vernacular, and strictly observing the customs of their ancestors. When during the late Russo-Turkish war insurrections broke out amongst the natives on the Terek, in Dagestan, and Abkhasia, thesc tribes remained pcaceful and perfectly loyal. Their villages, especially those of the Karatchai, are striking examples of human industry, poverty being quite unknown ; for the general emancipation in 1867 put an end to intestine strife, the predatory expeditions of former times, and the parasitic existence of numerous chiefs on the forced labour of serfs. The native popula, tion, as well as the Cossacks, enjoy certain rights of self-govern- ment, and are allowed to hold meetings to that end. Exports include wheat, tobacco, leather, wool, petroleum, and live cattle ; imports dry goods, grocery, and hardware. Local industry is limited to a few tanneries, petroleum refineries, and spirit distilleries ; but Russian and foreign capitalists have of late obtained concessions for exploring the petroleum region stretching between Khadaji and Taman, and the coal-mines of Khumarinsky in the upper valley of the Kuban.

KUBLAI KHAN (or Kaan, as the supreme ruler de- scended from Jenghiz was usually distinctively termed in the 13th century) (1216-1294) was the most eminent of the successors of Jenghiz (Chinghiz), and the founder of the Mongol dynasty in China, He was the second son of Tuli, youngest of the four sons of Jenghiz by his favourite wife. Jenghiz was succeeded in the khanship by his third son Okkodai, or Ogdai (1229), he by his son Kuyuk (1246), and Kuyuk by Mangku, eldest son of Tuli (1252), Kublai was born in 1216, and, young as he was, took part with his younger brother Hulaku (afterwards conqueror of the caliph and founder of the Mongol dynasty in Persia) in the last campaign of Jenghiz (1226-27). The Mongol poetical chronicler, Sanang Setzen, records a tradition that Jenghiz himself on his deathbed discerned young Kublai’s promise and predicted his distinction.

Northern China, Cathay as it was called (vol. v. p. 627), had been partially conquered by Jenghiz himself, and the conquest had been followed up till the Kin or “ golden” dynasty of Tartars, reigning at Kai-fung-fu on the Yellow River, were completely subjugated (1234). But China south of the Great Kiang remained many years later subject to the native dynasty of Sung, reigning at the great city of Linggan, or Kinsai (Kéng-s2’, “ capital”), now known as Hang-chow-fu. Operations to subdue this region had commenced in 1235, but languished till Mangku’s accession. Kublai was then named his brother’s lieutenant in Cathay, and operations were resumed. By what seems avast and risky strategy, of which the motives are not

quite clear, the first campaign of Kublai was directed to the subjugation of the remote western province of Yunnan. After the capture of Talifu (well known in recent years as the capital of a Mohammedan insurgent sultan) Kublai returned north, leaving the war in Yunnan to a trusted general. Some years later (1257) the khan Mangku himself entered on a campaign in west China, and died there, before Ho-chow in Sz’chuen (1259).

Kublai assumed the succession, but it was disputed by his brother Arikbugha, and by his cousin Kaidu, and wars with these retarded the prosecution of the southern con- quest. Doubtless, however, this was constantly before Kublai as a great task to be accomplished, and its fulfil- ment was in his mind when he selected as the future capital of his empire the Chinese city that we now know as Peking. Here, in 1264, to the north-east of the old city, which under the name of Yenking had been an occa- sional residence of the Kin sovereigns, he founded his new capital, a great rectangular plot of 18 miles incircuit. The (so-called) “Tartar city” of modern Peking is the city of Kublai, with about one-third at the north cut off, but Kublai’s walls are also on this retrenched portion still traceable.

The new city, officially termed Tai-tu (“great court”), but known among the Mongols and western people as Kaan-baligh (“city of the khan”; see vol. iv. p. 722), was finished in 1267. The next year war against the Sung empire was resumed, but was long retarded by the strenu- ous defence of the twin cities of Siang-yang and Fan-ching, on opposite sides of the river Han, and commanding two great lines of approach to the basin of the Great Kiang. The siege occupied nearly five years. After this Bayan, Kublai’s best lieutenant, a man of high military genius and noble character, took command. It was not, however, till 1276 that the Sung capital surrendered, and Bayan rode into the city (then probably the greatest in the world) as its conqueror. The young emperor, with his mother, was sent prisoner to Kaan-baligh ; but two younger princes had been despatched to the south before the fall of the city, and these successively were proclaimed emperor by the adherents of the native throne. An attempt to maintain their cause was made in Fuh-keen, and afterwards in Canton province; but in 1279 these efforts were finally extin- guished, and the faithful minister who had inspired them terminated the struggle by jumping with his young lord into the sea.

Even under the degenerate Sung dynasty the conquest of southern China had occupied the Mongols during intermittent campaigns of half a century. But at last Kublai was ruler of all China, and probably the sovereign (at least nominally) of a greater population than had ever acknowledged one man’s supremacy. For, though his rule was disputed by the princes of his house in Turkestan, it was acknowledged by those on the Volga, whose rule reached to the frontier of Poland, and by the family of his brother Hulaku, whose dominion extended from the Oxus to the Arabian desert. For the first time in history the name and character of an emperor of China were familiar as far west as the Black Sea, and not unknown in Europe. The Chinese seals which Kublai conferred on his kinsmen reigning at Tabriz are stamped upon their letters to the kings of France, and survive in the archives of Paris. Adventurers from Turkestan, Persia, Armenia, Byzantium, even from Venice, served him as ministers, generals, governors, envoys, astronomers, or physicians; soldiers from all Asia to the Caucasus fought his battles in the South of China. Once in his old age (1287)

Kublai was compelled to take the field in person against a serious revolt, raised by Nayan, a prince of his family, who held a vast domain on the borders of Manchuria. Nayan was

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taken and executed. The revolt had been stirred up by Kaidu, who survived his imperial rival, and died in 1301. Kublai himself died in 1294, at the age of seventy-eight.

Though a great figure in Asiatic history, and far from deserving a niche in the long gallery of Asiatic tyrants, Kublai misses a record in the short list of the good rulers. His historical locus was a happy one, for, whilst he was the first of his race to rise above the innate barbarism of the Mongols, he retained the force and warlike character-of his ancestors, which vanished utterly in the effeminacy of those who came after him. He had great intelligence and keen desire of knowledge, with apparently a good deal of natural benevolence and magnanimity. But his love of splendour, and his fruitless expeditions beyond sea, created enormous demands for noney, and he shut his eyes to the character and methods of those whom he employed to raise it. A remarkable narrative of the oppressions of one of these, Ahmed of Fendket, and of the revolt which they provoked, is given by Marco Polo, in substantial accordance with the Chinese annals.

Kublai patronized Chinese literature and culture gene- rally. Of the great astronomical instruments which he caused to be made specimens are still preserved at Peking, which are truly splendid as works of art, and not con- temptible as works of science. Though he put hardly any Chinese into the first ranks of his administration, he attached many to his confidence, and was personally popular among them. Had his endeavour to procure European priests for the instruction of his people, of which we know through Marco Polo, prospered, the Roman Catholic Church, which did gain some ground under his successors, might have taken stronger root in China. Failing this momentary effort, Kublai probably saw in the organized force of Tibetan Buddhism the readiest instru- meut in the civilization of his countrymen, and that system received his special countenance. An early act of his reign had

been to constitute a young lama of intelligence and learning the head of the Lamaite church, and eventually also prince of Tibet, an act which may be regarded asa precursory form of the rule of the “ grand lamas ” of Lassa. The same ecclesiastic, Mati Dhwaja, was employed by Kublai to devise a special alphabet for use with the Mongol language. It was chiefly based on Tibetan forms of Nagari; some coins and inscriptions in it are extant; but it had no great vogue, and soon perished. Of the splendour of his court and entertainments, of his palaces, summer and winter, of his great hunting expeditions, of his revenues and extraordinary paper currency, of his elaborate system of posts and much else, an account is given in the book of Marco Polo, who passed many years in Kublai’s service.

We have alluded to his foreign expeditions, which were almost all disastrous. Nearly all arose out of a hankering for the nominal extension of his empire by claiming sub- mission and tribute. Expeditions against Japan were several times repeated; the last, in 1281, on an immense scale, met with huge discomfiture. Kublai’s preparations to avenge it were abandoned owing to the intense discontent which they created. In 1278 he made a claim of submission upon Champa, an ancient state representing what we now call Cochin China. This eventually led to an attempt to invade the country through Tongking, and to a war with the latter state, in which the Mongols had much the worst of it. War with Burmah (or Mien, as the Chinese called it) was provoked in very similar fashion, but the result was more favourable to Kublai’s arms. The country was overrun as far as the Irawaddy delta; the ancient capital Pagdn, with its magnificent temples, destroyed, and the old royal dynasty overthrown. The last attempt of the kind was against Java, and occurred in the last year of the old khan’s reign. The envoy whom he

had commissioned to claim homage was sent back with ignominy. A great armament was equipped in the ports of Fuh-keen to avenge this insult; but after some temporary success the force was compelled to re-

embark with a loss of 3000 men. The death of Kublai prevented further action.

Some other expeditions, in which force was not used, gratified the khan's vanity by bringing back professions of homage, with presents, and with the curious reports of foreign countries in which Kublai delighted. Such ex- peditions extended to the states of southern India, to eastern Africa, and even to Madagascar.

Of Kublai's twelve legitimate sons, Chingkim, the favourite and designated successor, died in 1284-85 ; and Teimur, the son of Chingkim, took his place. No great king arose in the dynasty after Kublai. He had in all nine successors of his house on the throne of Kaan-baligh, but the long and imbecile reign of the ninth, Toghon Teimur, ended (1368) in disgrace and expulsion, and the native dynasty of Ming reigned in their stead. H. Y.)

KUCHAN (a contracted form of Kabushdn), a walled town and also a district of Persia, province Khérdsdn, enclosed north and south by the Hazar-Mazjid and Ala- Dagh mountains. The town lies at the north foot of the Shah Jahan Kuh (11,000 feet), 3300 feet above the sea, in 37° 10' N. lat., 58° 25' BE. long., about 80 miles north- west of Meshhed on the route to Shirvén. Itis an important place, seat of a district governor, and surrounded by exten- sive gardens and vineyards yielding excellent fruits and grapes from which a superior wine is made. Population

20,000.

The district forms the western section of the longi- tudinal valley stretching between the above-mentioned ranges from Meshhed to Shirvan and communicating by the Allaho-Akbar Pass (4200 feet) northwards with the Dara- Gez country on the frontier of the new Russian Trans- Caspian Territory. It is very fertile, largely cultivated, and well watered by the upper Atrek river, which has its furthest source in an intermittent torrent just south of the pass. The whole valley is thickly dotted over with villages, while the slopes of the hills afford good pasture to the numerous flocks and herds of the warlike

Zafaranlu Kurds, who guarded the frontier against the Akhal Tekke Turkomans until these marauders were reduced by the Russians in the spring of 1881. Of this region little was known until the explorations of Baker, Gill, O'Donovan, and Stewart (1874-81).

KUCH BEHAR, or Coosh Brnar, a native state in Bengal, India, lying between 25° 57' and 26° 32' N. lat., and 88° 48' and 89°55' E. long. It is entirely surrounded by British territory, being bounded on the N. by Jalpdigurt, on the E. by Godlpara, on the 8. by Rangpur, and on the W. by Purniah districts. The state forms a level plain of triangular shape, intersected by numerous rivers. The greater portion is fertile and well cultivated, but tracts of jungle are to be seen in the north-east corner, which abuts upon Assam, The soil is uniform in character throughout, consisting of a light, friable loam, varying in depth from 6 inches to 3 feet, superimposed upon a deep bed of sand. The whole is detritus, washed down by torrents from the neighbouring Himélayas. The rivers all pass through the state from north to south, to join the mainstream of the Brahmaputra. Some half dozen are navigable for small trading boats throughout the year, and are nowhere ford- able; and there are about twenty minor streams which become navigable only during the rainy season. The streams have a tendency to cut new channels for them- selves after every annual flood, and they communicate with one another by cross-country water-courses. There are no embankments or artificial canals, nor are any mineral pro- ducts known to exist.

The population in 1872 was 532,565, distributed over an area of 1307 square miles. The Hindus numbered 127,928 ; the Mohamme- dans, 48,086. The Koch or Rajbansi tribe numbered 111,125 adult males, or 63 per cent. of the whole. This is a widely spread tribe, evidently of aboriginal descent, which is found throughout all northern Bengal, from Purniah district to the Assam valley. They are akin to the Indo-Chinese races of the north-east frontier; but they have now become largely Hinduized, especially in their own home, where the appellation ''Koch" has come to be used as a term of reproach. Kuch Behar town, which contains the palace of the raja, and has 7132 inhabitants, is the

only populous place in the state. Even villages, in the ordinary sense of the word, are un- known, each well-to-do family living apart in its own homestead. Rice is grown on three-fourths of the total cultivated area. Jute and tobacco are largely grown for exportation over an increasing area year by year. The only special industries are the weaving of a strong silk from worms fed on the castor-oil plant, and of a coarse jute cloth, used for screens and bedding. The external trade is chiefly in the hands of Marwari immigrants from Upper India. The chief exports are jute, tobacco, oil, timber; salt, sugar, and piece goods are imported. The net revenue in 1870-71 amounted to £112,093, of which £25,719 was derived from zaminddrt estates in British territory. The climate is damp and malarious, but not so hot as in other parts of Bengal. The average annual rainfall is 123 inches,

As in the case of many other small native states, the royal family of Kuch Behar lays claim to a divine origin in order to conceal an impure aboriginal descent. The greatest monarch of the dynasty was Nar Narayan, the son of Visu Sinh, who began to reign about 1550. He conquered the whole of Kamrip, built temples in Assam, of which ruins still exist bearing inscriptions with his name, and extended his power southwards over what is now part of the British districts of Rangpur and Purniah. To his reign also is attributed the introduction of the well-known Nardyant currency, the privilege of coining which has not yet been entirely abolished. His son, Lakshmi Narayan, who succeeded him in Kuch Behar, became tributary to the Mughal empire. In 1772 a competitor for the throne, having been driven out of the country by his rivals, applied for assistance to Warren Hastings. A detachment of sepoys was accordingly marched into the state; the Bhutids, whose inter- ference had led to this intervention, were expelled, and forced to sue for peace through the mediation of the lama of Tibet. By the treaty made on this occasion, April 1778, the raja acknowledged subjection to the Company, and made over to it one half of his annual revenues. But, though the Bhutias were driven out, the rivalry of domestic faction continued. In 1868, on the death of the raja, leaving a son and heir only ten months old, a British commissioner was appointed to undertake the direct management of affairs during the

minority of the prince, and many important reforms have thus been successfully introduced.

KUEN-LUN, or Kovzn-tun, the name given to the mountains between western Tibet and the plains of eastern Turkestan ; it is derived from the Chinese geographers, aud is probably a corruption of some Turkish or Tibetan word ; it appears to be unknown locally. The name hav- ing been adopted, chiefly on the initiative of Humboldt, before any correct geographical knowledge had been ob- tained of the region to which it was applied, it has been used with inconvenient want of precision, and this has encouraged erroneous conceptions. Little precise informa- tion is yet available on the subject, but there is no reason to doubt that, within the limits to which actual exploration has gone, the mountains designated as Kuen-lun form the northern border of the high lands of Tibet, descending to the central Asian plain, just as those commonly spoken of under the name of Himalaya constitute the broad moun- tainous slope which descends to the lower levels of India.

Nothing can be said with confidence of the northern border of Tibet east of 82° E. long., but from this point westward, to about the 75th meridian, it consists of a series of mountain ranges ona scale of magnitude quite analogous to that of the higher ranges of the Himalaya, and beyond the last-named meridian merges into the Thian-Shan moun- tains. A line of demarcation between the summit of the Tibetan plateau and its northern flank can, in the present condition of our knowledge, only be fixed in an arbitrary manner, and it may for convenience be regarded as follow- ing the watershed line from which the streams flow north- ward to the plain of eastern Turkestan. Using the name

Kuen-lun in the sense thus explained, the zone it includes will be seen to abut at its north-western extremity on the series of elevated plateaus known under the name of Pamir, which extend over a distance of nearly 200 miles to a little beyond 39° N. lat. Here the width of the zone is about 100 miles. To the eastward it becomes broader, and on the 79th meridian is nearly 150 miles across. In this region the chief

ranges appear to be laid out, generally, in a north-west and south-east direction, like those of western Tibet, with transverse ridges at irregular intervals. The transverse direction would seem to predominate in the outer portion of the zone nearest to the plain of Turkestan, but the geographical details are too little known to permit us to say more on this point. Of the longitudinal ranges two are of conspicuous magnitude, running approximately parallel to one another about 60 or 70 miles apart; the more northern or outer may be spoken of as the main Kuen- lun; the other, which separates tlle waters of the Indus, which run off to the south-west, from those of the streams which pass down to the plains of Khotan, Yarkand, and Kashgar, constitutes the watershed before referred to, and has been called the Muztagh or Karakorum range from two of the best known passes across it. The latter of these great lines of elevation, from which the Kuen-lun slope of the Tibetan plateau may be said to commence, is of very considerable altitude throughout, its summits rising more than 28,000 feet above sea-level, and few of the passes falling below 18,000 or even 19,000 feet over a length of some 400 miles. Its flanks are covered with enormous glaciers, some of them being continuous for distances of 60 or 70 miles. The main Kuen-lun is not much inferior in magnitude, one of its peaks rising above 25,000 feet, while the points between that elevation aud 20,000 feet are numerous. The passes lie between 18,000 feet on the east and 13,000 feet on the west. The valleys between these ranges vary in elevation from about 15,000 feet to 10,000 feet, the drainage in some cases collecting in small lakes, in others forming streams which, after flowing for some distance parallel to the separating ridges, suddenly change their direction and run off to the north-east through deep transverse lines of rupture, in a manner analogous to that observed on the border of the Himalayan mountain slope.

The whole of the region is described as remarkable for its general barren character. The mountain sides are naked aud the valleys for the most part narrow and steep. There is a complete absence of forest, and trees of any sort are only found at the lower levels bordering on the northern plain,—walnuts, poplars, and willows alone being mentioned, besides a few fruit trees. The vegetation is scanty and botanically poor,

brushwood being found along soine of the rivers, and pastures in the bottoms of the deep valleys among the higher ranges. Among the shrubs are species common in Tibet, such as tamarisk, juniper, astragalus, willow, rose, barberry, and clematis. The animal life also appears to be mainly that found in the neighbouring parts of Tibet.

Some facts of interest relating to the geological structure of these mountains may be gathered from the fragmentary reports of Dr Stoliczka, the accomplished geologist who so prematurcly died from the results of exposure in these inhospitable regions. The summit of the Karakorum Pass is of Triassic age, and cretaceous beds are found in some of the ranges on the north of the Kuen-lun main range, associated with Paleozoic deposits supposed to be Carboni- ferous and Silurian. For the greater portion of the ycar the climate

is very rigorous, The extremes of temperature are great, and the rainfall little.

The population is small. The fixed settlements are confined to the outer valleys ; few villages or hamlets are found above 6000 feet of altitude, and hardly any over 8000 feet. The upper valleys are occupied by a nomadic population, wholly pastoral in their habits.

The tract may be regarded as appertaining politically to the sove- reigns for the time being of the principalities lying in the plain below it. But from the nature of the case any recognized authority hardly extends beyond the permanently inhabited region. (R. 8.)

1 For information as to the geographical details which have been collected reference may be made to the map published in the Royal Geog. Soc. Journal, vol. xlviii., accompanying Captain Trotter's ac- count of the results of Sir T. D. Forsyth's mission to Kashghar.

KUKA, or Kuxawa, the capital of the kingdom of Bornu in Central Africa, is situated in 12° 55' N. lat. and 13° 25' E. long., 44 miles from the western shores of Lake Tsad or Chad,? in the midst of an extensive and for the most part uncultivated plain. The soil of the whole district consists of a layer of sand resting on clay, beneath which are found

sand and lime. At a depth of 40 or 50 feet water is reached, usually sweet, but sometimes brackish. Irom a distance Kuka presents a very dead and monotonous appearance, there being no minarets or lofty buildings of any sort. The walls, built of earth, are about 20 feet in height. There are two distinct towns, separated by more than half a mile. The western town or Billa Futebe is the larger of tle two, measuring from west to east about a mile and a half, and rather less from north to south. The plan is rectangular, and there is a gate in each of the four sides. From west to east runs the main thoroughfare known as the Dendal, which widens out to the west into the market place. About the middle of the Dendal stands the sheikh's secondary palace. The eastern town or Billa Gedibe is somewhat longer and narrower than the western. The Dendal continues from its western gate till closed at the east end of the town by the great palace of the sheikh, gradually widening out into a large open square. The larger dwelling-houses of Kuka are of mud or earth, with windowless walls and flat roofs; the poorer houses are mere huts of straw or reeds, varying in shape from that of a bell to that of a sugar-loaf. In almost every courtyard there is at least one large shady tree, whose branches are tenanted by storks, herons, or a variety of lesser birds ; and the whiole place is vocal with song. Kuka is a wealthy town. It always contains a large number of strangers— merchants, pilgrims, and adventurers— attracted even from Mecca, Medina, Morocco, Egypt, Tunis, Tripoli, by the fame of the sheikh's liberality. The town enjoys the rare advantage of being absolutely free from all taxation of trade or industry. In the Monday market, which is held outside the western gate, there are often more than 10,000 buyers and sellers. It is at once a fair for horses, cattle, camels, and other live stock, a fruit, grain, and vegetable market, a meat market, and a slave market. The currency consists mainly of Maria Theresa dollars and cowries. For the Mohammedans, not only of Bornu but of the neighbouring countries, Kuka serves as a kind of university town. In its streets are to be seen bands of mendicant students, wlio spend the day in collecting alms from the people, and after supper gather round the fires which they kindle in the public squares, and noisily and mechanically recite the verses of the Koran far into the night. A less cheerful feature of the street life is the unusual number of blind beggars. The population is estimated at 60,000.

Kuka was founded by Sheikh Mohammedal Aminel Kanemi. It received its name from a kuka or monkey bread tree (Adansonia digitata), which attracted the attention of the settlers as a rare thing in the district. In 1840 the town was laid waste by King Mohamuined Sherif of Wadai ; and when it was restored by Sheikh Omar he gave it the present double form. It is probably from this feature of the place that the plural Kukawa has become the ordi- nary designation of the town in Kano and throughout the Sudan ; though the local inhabitants generally use the singular Awka. Kuka has been visited by Denham and Clapperton, Beurmann, Vogel, Barth, Rohlfs, and Nachtigal.

For further details see Barth, Travels in Central Africa, London, 1858; Rohlfs, Quer durch Afrika, Leipsic, 1874; Nachtigal, Sahara und Siddn, Berlin, 1879, vol. i. p. 581-748. The last is the most elaborate account.

KUKU KHOTO, in Chinese KWEI-HWA-TCHENG oF GUI-HUA-TCHENG, a city of the Chinese province of Shan-se, situated to the north of the Great Wall, in 40° 50’ N. lat. and 111° 45’ E. long., about 160 miles west of Kalgan. It lies in the valley of a small river which joins the Hoang-ho

2 The fear lest the town should be submerged by the lake led the sheikh to found (1873) a new residence (Kherwa) on a range of sand hills about two hours north of Kuka.

50 miles to the south. There are two distinct walled towns in Kuku Khoto, at an interval of a mile and a half; the one is the seat of the civil governor and is surrounded by the trading town, and the other is the seat of the mili- tary governor, and stands in the open country. In the first or old town more especially there are strong traces of western Asiatic influence; the houses are not in the Chinese style, being built all round with brick or stone and having flat roofs, while a large number of the people are still Mohammedans, and, there is little doubt,

descended from western settlers) The town at the same time 1s a great seat of Buddhism,—the lamasseries containing, it is said, no less than 20,000 persons devoted to a religious life. As the southern terminus of the routes across the desert of Gobi from Uliassutai and the Thian Shan, Kuku Khoto has a large trade, exporting flour, millet, and manu- factured goods, and importing the raw products of Mongolia. A Catholic mission and a Protestant mission are maintained in the town.

Early notices of Kuku Khoto will be found in Gerbillon (1688- 1698), in Du Halde (vol. ii, English edition), and in Astley's Col- lection (vol. iv.). Recent travellers who have visited it are Elias (Journ. Roy. Geog. Soc., 1873) and Peftsoff.

KULDJA, the name of two towns in the valley of the Tli in Central Asia, situated about 25 miles apart.

I. Oty Kunpsa, the present capital of the Kuldja terri- tory, restored to China by Russia in 1881, otherwise known as Tartar Kulja, Nin Yuan, or Kuren, lies about 4 mile to the north of the river, in 43° 58' N. lat. and 81° 25' FE. long. The walled town is nearly square, each side being about a mile in length ; and the walls are not only 30 feet high but broad enough on the top to serve as a carriage drive. Two broad streets cut the enclosed area into four nearly equal sections. Since 1870 a Russian suburb has been laid out on a wide scale. The houses of Kuldja are almost all clay-built and flat-roofed, and except in the special Chinese quarter in the eastern end of the town it is only a few public buildings that show the influence of Chinese architecture. Of these the most noteworthy are the Tarantchi and Dungan mosques, both with turned up roofs, and the latter with a pagoda-looking minaret. The population is mainly Mohammedan, and there are only two Buddhist pagodas. A small Chinese Roman Catholic church has maintained its existence through all the vicissi- tudes of modern times. Paper and vermicelli are manu- factured with rude appliances in the town. The outskirts are richly cultivated with wheat, barley, lucerne, and poppies. Schuyler estimated the population, which in- cludes Tarantchis, Dungans, Sarts, Chinese, Calmucks, and Russians, at 10,000 in 1873; it has since increased.

II. New Kutpsa, Manchu Kuldja, or Ila, which lies lower down the valley on the same side of the stream, has been a pile of ruins whitened with bleaching bones since the terrible massacre of all its inhabitants by the insurgent Dungans in 1868. It was previously the seat of the Chinese Government for the province, with a large

penal establishment and strong garrison; its population was about 70,000.

See Schuyler, Lurkistan, London, 1876; Dilke in Proc. Roy. Geog. Soc., 1874; Ujfalvy in Towr du Monde, 1879 ; E. D. Morgan in Proc. Roy. Geog. Soc., 1881 ; and Int, vol. xii. p. 702.

KULLU, a valley and subdivision of Kangra district, Punjab, India, situated between 31° 20’ and 32° 26’ N. lat., and 76° 58’ and 77° 50’ E. long. It is bounded on the N. by the central Himalayan range, on the S. by the Sutlej river, on the S.W. by the Dhdoladar or Outer Himé-laya, Bias river, and the states of Suket and Mandi, and on the W. by Bara Bangahal hills. The Sainj, which joins the Bias at Largi, divides the tract into two portions, Kullu Proper and Sioraj. Kullu Proper, north of the

Sainj, together with Inner Seordj, forms a great basin or depression in the midst of the Himalayan systems, having the narrow gorge of the Bias at Sargi as the only outlet for its waters. North and east the Bara Bangahdl and Mid-Himdlayan ranges rise to a mean elevation of 18,000 feet, while southward the Jalori and Dhaoladhar ridges attain a height of 11,000 feet. The greater portion of Kullu must thus ever remain an utter wilderness. The higher villages staud 9000 feet above the sea; and even the cultivated tracts have probably an average elevation of 5000 feet. The houses consist of four-storied chalets in little groups, huddled closely together on the ledges or slopes of the valleys, picturesquely built with projecting eaves and carved wooden verandahs. The Bias, which, with its tributaries, drains the entire basin, rises at the crest of the Rohtang Pass, 13,326 feet above the sea, and has an average fall of 125 feet per mile. Its course presents a succession of magnificent scenery, including cataracts, gorges,

precipitous cliffs, and mountains clad with forests of deodar, towering above the tiers of pine on the lower rocky ledges. Great mineral wealth exists, but the difficulty of transport and labour will probably always prevent its proper development. Hot springs occur at three localities, much resorted to as places of pilgrimage.

The census of 1872 disclosed a population of 90,318, spread over an area of 1926 square miles—Hindus numbering 90,206; Mohammedans, 100; and Christians, 7. The character of the hillmen resembles that of most other mountaineers in its mixture of simplicity, independence, and superstition. Tibetan polyandry still prevails in Seoraj, but has almost died out elsewhere. The temples are dedi- cated rather to local deities than to the greater gods of the Hindu pantheon. Out ofa total of 799,834 acres, only 32,884 are returned as actually under cultivation. The staple spring crops include wheat, barley, poppy, tobacco, and oil-seeds ; the autumn crops are maize, rice, pulses, and millets. Tea cultivation has recently becn intro- duced into the valley. Rice, wheat, opium, tobacco, tea, and honey are exported. Manufactures are almost unknown. The climate is not healthy. Intermittent fevers and bowel complaints are endemic, while epidemics of virulent contagious fever and cholera break out from time to time. Goitre and cretinism also occur. The average

annual rainfall ranges from 45 to 50 inches. The mean tempera- ture in August is 78° Fahr., in November 55°.

KULM (in Polish, Chelmo), chief town of a circle in the government district of Marienwerder, Prussia, is situated on the high banks of the Vistula, about 24 miles north- west of Thorn. It is regularly built, and contains an old- fashioned town-house, a gymnasium, a high school, and a cadets' institution founded in 1775 by Frederick II. It carries on trade in grain and has some shipping. The population in 1875 was 9628.

Kulm gives name to the oldest bishopric in Prussia, although the bishop resides at Pelplin. It was taken about 1220 by Duke Conrad of Masovia. Frederick II. pledged it in 1226 to the Teutonic Order, from whom it passed by the second peace of Thorn in 1466 to Poland; and it

was annexed to Prussia in 1772. It joined the Hanseatic League, and used to carry on very extensive manufac- tures of cloth. The battle of Kulm, won August 30, 1818, over the French by the Prussians and Russians, took place at the village of Kulm in Bohemia, about 3 miles north-east of Teplitz.

KULMBACH, or Cunmpacu, a town in the administra- tive district of Upper Franconia, Bavaria, is picturesquely situated on the White Main, and on the Bamberg-Hof line of the Bavarian State Railway, about 11 miles north-west from Baireuth, in 50° 6’ N. lat, 11° 28’ E. long. The town has several linen manufactories and a large cotton spinnery, but is chiefly famed for its many extensive breweries, the latest returns showing an annual production of 4,115,637 gallons of beer, of which 3,719,478 gallons were exported. On an eminence near the town stands the former fortress of Plassenburg, which during the 15th and 16th centuries was the residence of the margraves of Brandenburg-Kulmbach. It was dismantled in 1807, and 18 now used as a prison. The population in November 1881 was officially estimated at 6000.

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KUM, a walled city of Persia, in the province of Trak- Adjemi, in a hilly district at t’:e western edge of the Great Salt Desert, 85 miles south of Teheran on the main route to Ispahan, and at the northern extremity of the lofty Kuru-Kuh range, which runs thence for over 600 miles south-east to the Bam highlands. It is a long, straggling, half-ruined place, with empty bazaars, and neglected streets full of holes and pitfalls. Yet it ranks second to Meshhed in sanctity, thanks to the famous shrine of Masuma Fatima, sister of the im4m Riza, which also contains the remains of ten kings and four hundred and forty-four “saints,” and whose gilded copper dome has been completed by the present shah. Like Kerbela, Kum is a favourite place of interment for the faithful, and is yearly visited by thousands of devout Shiah pilgrims. At one time it is said to have contained 100,000 inhabitants, and its former greatness is still attested by the surrounding ruins, of

which Sir Thomas Herbert quaintly remarks that they "' may gaine beliefe to the inhabitants, who say it was once comparable in pride and greatness to mightie Babylon." Even in that traveller's time it was still a flourishing place, with well-built houses "sweet and wel-furnished, her streets wide, her bazzar faire and her mosque of most honourable esteem." the neighbourhood now presents the aspect of a vast necropolis, while not more than 4000 of its 20,000 houses are occupied. Cotton of good quality and the castor-oil plant are extensively cultivated in the district, which is watered by the Gonsir and a few otlier intermittent streams draining east to the great desert. Population estimated at 20,000.

KUMAUDN, a district in the North-Western Provinces of India, lying between 28° 55' and 30° 50' N. lat., and 78° 52' and 80° 56' E. long. It consists of two distinct tracts—the sub-Himalayan ranges, and the bhdébhar or waterless forest, averaging from 10 to 15 miles in breadth, which stretches between the forests and the Tarai. See Himauaya, vol. xi. p. 824, Of the entire area of the highlands, only 500 square miles are returned as cultivated and 100 square miles as cultivable. The southern or bhdbhar portion was up to 1850 an almost impenetrable forest, given up to wild animals; but since then the nume- rous clearings have attracted a large population from thie hills, who cultivate the rich soil during the hot and cold seasons, returning to the hills in the rains. The rest of Kumaun is a maze of mountains, some of which are among the loftiest known. In fact, in a tract not more than 140 miles in length and 40 in breadth, there are over thirty peaks rising to elevations exceeding 18,000 feet (see vol. xi. p. 825). The rivers rise chiefly in the southern slope of the Tibetan watershed north of the loftiest peaks, amongst which they make their way down valleys of rapid declivity and extraordinary depth. The principal are the Kali or Gogra, and the Pindar and Kailganga, whose waters join the Alaknanda. The valuable timber of the yet uncleared forest tracts in Kumdun is now under official supervision. The chief trees are the chir or three-leaved Himalayan pine, the cypress, fir, alder, sé/ or iron-wood, and saindan. Limestone, sandstone, slate, gneiss, and granite constitute the principal geological formations of the district. Mines of

iron, copper, gypsum, lead, asbestos, and coral exist; but they are not thoroughly worked,

The census of 1872 disclosed a population of 433,314, of whom 425,963 were returned as Hindus and 5569 as Mohammedans. The Kumaunis are a tolerably fair, good-looking race, active, cheerful, honest, and industrious. Polyandry is unknown, but polygamy is frequent. The 4606 villages of the district are scattered about the hillsides, the houses being built of stone laid in mud, and roofed with slates, or with planks or thatch. The only native town is Almora. There are large bazaars at the European stations of Naini Tal and Ranikhet. The area available for cultivation is small ; but wherever possible the hill sides have been terraced. The soil except m some of the valleys is poor and stony, and requires much manure.

| out the mountain tract.

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On the better kinds of land rice, wheat, and tobacco are grown ; on the others wheat, barley, mustard, vetches, flax, Indian corn, millcts, pulses, sugar-cane, cotton, oil-seeds, &. The staple food of the peasantry is mandua (Hleusine ecorocana). Potatoes are becoming eommon. Fruit is very plentiful, and the oranges are of excellent quality. The tea plantations form now an important and valuable feature in the district, but are almost entirely in the hands of European owners. In 1876-77 the gardens eovercd an area of 2222 acres, yielding 261,060 tb of tea. The only other manufacture is the weaving of coarse woollen clothing. The imports from Tibct include beasts of burden, salt, coarse cloths, and Chinese silk. The exports to Tibet are grain, cotton goods, broadcloth, quilts, hard- ware, tobacco, sugar, spices, dyes, tea, and timber. ‘‘o the plains of India Kumaun sends grain, clarified butter, tea, ginger, turmeric, red pepper, drugs, spices, bark, honey, wax, alittle iron and copper, timber, and wild jungle produce. The roads in the hills are for the

| most part only bridle-paths, more or less well laid out, but all now | well bridged. Except in the bhdbhar and deep valleys, the climate

is mild. The rainfall of the outer Himalayan range, which is first struck by the monsoon, is double that of the central hills, in the average proportion of 80 inches to 40. No winter passes without snow on the higher ridges, and in some years it is universal through- Frosts, especially in the valleys, are often severe. Kumaun is occasionally visited by epidemic cholera. Leprosy is most prevalent in the east of the district. Goitre and eretinism afflict a small proportion of the inhabitants. The hill fevers at times exhibit the rapid and malignant features of plague. The mahdmart pestilence, which was formerly confined to Garhwal, has of late years extended its ravages to Kumaun.

KUMPTA, or Coompran, a town and port in North Kaénara district, Bombay, India, 14° 26’ N. lat., 74° 27’ E. long., with a population in 1872 of 10,932. It is the chief commercial town in the district. The average annual value of its trade, which consists chiefly of cotton, spices, and grain, the first coming from Dharwar district and the rest from the upland country of Kanara, is returned for the five years ending 1873-74 at £481,811 of import and £868,049 of export.

KUNCH, a town in the North-Western Provinces of India, in 25° 59’ N. lat. and 79° 12’ E. long., with a popu- lation in 1872 of 14,448 (11,956 Hindus and 2492 Moham- medans). It has markets for cotton and wheat, for molasses, rice, and tobacco, and for salt. The bazaar ways are narrow, tortuous, unmade, undrained, with poor-looking and often ruinous shops ; both trade and population are declining.

KUNGUR, a district town of Russia, in the government of Perm, 58 miles south-south-east of the capital of the government, on the Sylva, a tributary of the Tchusovaya. Formerly a blockhouse erected to protect the Russian settlements against the Tartars, it has acquired commercial importance by manufacturing of boots, which are exported in great quantities to the mines of the Ural mountains and to the furthest gold-washings of western and eastern Siberia ; more than 1500 men are engaged in this trade. There are also several tallow-melting houses, candle, soap, and glue works, tanneries, and a yard where steamers are

made for the navigation of the Kama and its tributaries. The leather of Kungur, which is renowned for its quality, is sold in the eastern provinces of Russia, and reaclies Orenburg and Irbit, whilst the tallow is sent to St Peters- burg. The wharf on the Sylva is one of the most im- portant in the basin of the Kama. Population, 10,800.

KURDISTAN, or Kuropisrdn,! is a convenient geo- graphical designation for the lands inhabited by the Kurds, but the name is not used in the country in this general sense, nor indeed would it be technically correct, for in a very small portion only of the region in question is the population exclusively Kurdish.

Geography.—The furthest point to which the Kurds extend north-westward is the junction of the two arms of the Euphrates near Kharput, in about 39° N. lat. and 39° E. long., while their south-eastern limit may be defined

1 With reference to the uw sound in this group of words it is to be observed that Kurd is always to be pronounced like the English gourd, not as in curds and whey.

as the frontier of Luristan, south of Kirmanshdhan, in | about 34° N, lat. and 47° E. long. ‘The whole of this space, which is roughly calculated to embrace an area of at least 60,000 square miles, is niountainous, being in fact a section of the great chain which, known in antiquity at one ex- tremity as Taurus and at the other as Zagrus, bisects Asia Minor from west to east, and then turning to the south-east buttresses the great Persian plateau in a series of ranges rising step over step above the valley of the Tigris. Kurdistan thus defined may be divided, according to its physical features, into three separate sections. The first section, stretching from Kharput to the Persian frontier,

has been thus described by Consul Taylor, who resided for

many years in the country. ‘“«The general features,” he says, ‘‘of this tract are high moun- tains, enclosing fertile valleys and an undulating

upland, bounded

on the south-west by the Tigris, and interseeted at several points by numerous streams having their rise in the northern districts of the Diarbekir pashalic, and emptying themselves into that river. The seenery in the highlands yields to no other portion of Turkey for variety and romantie beauty, while the numerous rivers and streams flow through charming landseapes and thickly wooded valleys, bathing in their course the bases of castles and towns famous in profane and ecclesiastical history.”

To supplement Mr Taylor’s general description, it may be enough to say that there are three principal ranges running from west to east through this portion of Kurdistan :—(1) The Dujik and Mezoor Dagh (Paryadres and Abus of antiquity, and Mount Simus of Armenian history), a lofty, rugged, and inaccessible range which fills up the entire space between the two arms of the Euphrates, being connected with Anti-Taurus to the westward, and culminating far to the east in the isolated peaks of the greater and lesser Ararat; (2) The Mudikan range, south of the Mur4d-si, which is a continuation of the true Taurus, and which is prolonged under the names of Nimrud Dagh, Sipan Dagh, and Ald Dagh, till it reaches the Persian frontier to the north-east of Lake Van (in this range all the headwaters of the Tigris rise, flowing south under the names of Debeneh-su, Ambar-su, Batman-st, and the rivers of Arzen and Bohtan, and joining the main stream between Diarbekir and Jezireh); and (3) Mount Masius, or Jebel-Tur, an inferior range, sonth of the Tigris, which divides Kurdistan from the great Mesopotamian desert.

The secoud or central division of Kurdistan, which may be regarded as extending north and south from Lake Van to Sulimanieh, is of a more exclusively mountainous character. With the exception indeed of the districts of Amadieh, Shekelabad, and Koi-Sanjak on the immediate skirts of the Tigris basin, and the open country of Azerbijén beyond the great range to the south-west of Lake Urumieh, where the Kurds of the mountains have overflowed into Persia, there is hardly a square mile of level land anywhere to be found. The ranges of this division,

which preserve a general direction of north-north-west and south-south- east, are throughout much broken up by transverse ridges, and seem to be tossed about in inextricable disorder, a few peaks, such as the Jebel-Jud{ above Amadieh (which almost certainly represents the Ararat of the Bible) and the Gawaér (or Jawar) Dagh near Julamerik in the Hakkéri country, rising to a stupendous height, and thus dominating the surrounding mountains, while several large rivers, and especially the Khabur and the Upper and Lower Zab, run- ning in narrow and precipitous beds, burst at riclt angles through the gorges of the chain, and descend “upon ‘the Tigris valley in a series of cataracts amid scenery of the wildest and most impressive grandeur. The usual elevation of the hills in this part of Kurdistan is not less than 10,000 feet above the level of the sea, while some of the highest peaks reach probably to an altitude of 14,000 or even 15,000 feet.

KURDIisT AW

In the third or southern division of Kurdistan, which inelndes the Turkish pashalic of Sulimanifeh and the Persian provinces of Ardelan and Kirmdénshahan, the mountain chain diminishes both in height and breadth. The average height of the hills is here only about 5000 or 6000 feet, and the loftiest range, that of the Bend-i-Nuh, or Noah’s Hill, which forms the southern barrier of the gates of Zagrus,! and upon which, according to the tradition of Babylonia, as opposed to the tradition of Assyria, the ark is supposed to have rested, does not exceed an elevation of 8000 feet. The pass also which traverses the range at this poiut, and conducts from the lowlands of Holwan to the upper plain of Kirrend, is only 10 miles in length. At the foot of the great range on the western side are the fertile plains of Shahrizor, Zoh4b, and Ghulan, where rice is extensively cultivated, while on the Persian side, though rocky ridges run out to the eastward both in Ardelan and Kirmanshahan, the general character of the country is open, and cereals are everywhere produced in extraordinary abundance.

Population.—There are uo means of calculating the total Kurd population with even approximate accuracy, for neither in Turkey nor

in Persia has a Government census ever been attempted, and the revenue tables which regulate taxation and conscription, and ought therefore to guide inquiry, are wilfully distorted for political purposes to such an extent as to be quite unreliable. From the meterials, however, which have been recently ~~collected by the British consular officers employed in Asia Minor, with a view of testing the relative strength of the Mohammedan and Christian populations, it seems pretty clear that the Turkish Kurds exceed one million and a half in number, while the estimates of travellers who have resided in Persian Kurdistan give about 750,000 souls for the aggregate of the tribesmen and sedentary Kurds dwelling along the mountains from Ararat to Kirmdnshahan, to~~ gether with the scattered colonies of the interior. The following rough table, then, has been compiled from the above sources,

Turkey. Pashalie of Erzeroum, including sanjaks of Erzingain,

Baiburt, and Bayazid, with Deyrsim mountains…..... 350,000 Pashalic of Diarbekir, with sanjaks of Malatich and Mardin and dependent tribes …..... SUNS itboooce mean: , 820,000 Pashalie of Betlis, with sanjaks of Mush and Sa’ert, and distriets of Mudikan, Sastin, Shirwan, and Northern 1S {01 ihe!) PROBE pre eeInn caoadaoc cso 0nbecuthe oo ddonoseivocangamoaancn 08 130,000 Pashalie of Van, with sanjak of Hakkari and, nomad tribes of the Arab and Persian frontiér….....2c00000 170,000 Pashalie of Kharptt, with part of Deyrsim ….....566 180,000 Pashalie of Mosul, including sanjaks of Southern Bohtan, Amadieh, Rowandiz, and Koi-Sanjak, with tribes of Bilbogas, Wail, (ies. .caiaiaastuaieaspreda asain ailee «i eT 250,000 Pashalic of Sulimanteh, with dependencies to Baghdad [HRDVa\La (Sa epee enoae cena nodaae aaccoond podduamoeseamabeoncaas gaccousy, LOOSO00 Total of Turkish Kurds …..... +++ 1,500,000 Persia. Kurds of Azerbijan, including Mikris of Sauj-Bolak, Bilbass of Lahijan, Zerzas of Ushnei, Shekaks, Hyder- anli, Jelali, and frontier tribes from Ararat to Sardasht 250,000 Kurdistan Proper or Sinna-Ardelan …....:.scccseseeseereees 120,000 Province of Kirmanshahan, including tribes of Guran, Kallir, Zenpeneh, &¢. .....ccscsecessescenssesesensanenecnpe 230,000 Kurds of Khorasan,

at Bujnurd and Kuchan, and scat- Fered/comMmMuUnmcres elim Rares seeececceteleaineteeete seers 150,000 Notalvor IRErstaneWUrds tse… ccs 00. 750,000

1 Tt is this range, and not the Jebel-Judi, as is generally supposed, that represents the Nisir of the cuneiform inscriptions, where the ark is said to have rested in the Chaldean account of the flood; and the same tradition is to be traced in the belief which universally prevailed in Babylonia almost to modern tinies, that the waters of the great deluge penetrated no farther to the castward than the ‘‘ peak of Holwan.”’ See Sachau’s Birunt, p. 28. .

Attempts have been made to classify this Kurdish population as sedentary and nomad, and in connexion with the classification to distinguish between tribal and non-tribal communities; but all such divisions are arbitrary and fallacious, and ought not to be admitted ina statistical account of the nation. No doubt the original Kurdish organization was tribal, and the prevailing habits of the tribes have always been nomadic and pastoral; but such habits are ever liable to be modified by local circumstances, and at the present day it is quite incorrect to suppose that the tribal Kurds are universally pastoral aud migratory, while the non-tribal Kurds are sedentary and agricultural, In reality the distinction between living in villages as cultivators and living in tents as shepherds mainly depends on the localities where the tribes happen to be established. The Deyrsimlis, for instance, who inhabit the ranges of Dujik and Mezoor between the two arms of the Euphrates, and who number, according to Consul Taylor’s estimate, above 200,000 souls, reside almost exclusively in villages, owing to the severity of their northern climate, while they follow agricultural and pastoral pursuits indifferently. But, on the other hand, the tribes to the south who have easy access to the Mesopotamian plains, prefer a nomadic life, sheltering their flocks and herds in the warm pastures beyond the Tigris during the winter, and driving them up in the summer to feed on the rich herbage of the mountain sides; and the same rule may be held to apply generally throughout Kurdistan, the

tribesmen, whose natural instincts lead them to migrate between summer and winter quarters, becoming sedentary only when obstacles, either political or geographical, are placed in the way of their movements. With regard also to the distinction that is sometimes drawn between tribal and non-tribal Kurds, the hypothesis being that the latter, who live in villages and cultivate the soil, are the descendants of the aboriginal peasantry, while the former, who live in tents and support themselves with their flocks, are conquering invaders, the explanation will certainly not hold good. There is in reality no ethnic distinction between the two classes. Tribal Kurds who settle in villages very soon lose their distinctive name, and mix with the peasantry of the neighbourhood, while it constantly happens that a chief of village extraction, either by his individual character or through Government suppert, founds a new tribe and takes his place among the aristocracy of the nation. Itmay be added that in respect to the relative importance of the two classes the sedentary Kurds greatly outnumber the nomads, but that they are not so wealthy, ner so independent, nor do they stand nearly so high in popular estimation.

Character.—The Kurds generally bear a very indifferent

reputation, a worse reputation, perhaps, than they really deserve. Being aliens tothe Turks in language and to the Persians in religion, they are everywhere treated with mistrust, and live as it were in a state of chronic warfare with the powers that be. Such a condition is not of course favourable to the development of the better qualities of human nature. The Kurds are thus wild and lawless; they are much given to brigandage; they oppress and frequently maltreat the Christian populations with whom they are brought in contact, —these populations being the Armenians in Diarbekir, Erzeroum, and Van, the Jacobites and Syrians in the Jebel-Tur, and the Nestorians and Chaldzeans in the Hakkari conntry,—but they are not as a general rule either fanatical orcrnel. In the Hakkdri country, indeed, they live under ordinary circumstances in perfect amity with the Nestorians, from whom in outward appearance they are hardly distinguishable. It must be added, too, that they are naturally brave and hospitable, and in

common with many other Asiatic races possess certain rude but strict feelings of honour. Perhaps the

most distinguishing characteristic of the Kurdish chief is pride of ancestry. This feeling is in many cases exagge- rated, for in reality the present tribal organization does not date from any great antiquity. In the list indeed of eighteen principal tribes of the nation which was drawn up by the Arabian historian Massouydi, in the 10th century, only two or three names are to be recognized at the present day. A 14th century list, however, translated by Quatre- mére,! presents a great number of identical names, and there seems no reason to doubt that certain families both in Bohtén and Hakkari, which are extant at the present day, can really trace their descent from the Ommeyide caliphs, while the Babdn chief of Sulimanfeh, representing the old Sohrans, and the Ardeldn chief of Sinna,? who also represents an elder branch of the Gurdns, eacli claim an ancestry of at least five hundred years. There was up to a recent period no more picturesque or interesting scene to be witnessed in the East than the court of one of these great Kurdish chiefs, where, like another Saladin, the bey ruled in patriarchal state, surrounded by an _ hereditary nobility, regarded by his clansmen with reverence and affection, and attended by a bodyguard of young Kurdish warriors, clad in chain armour, with flaunting silken scarfs, and bearing javelin, lance, and sword as in the time of the crusades.

Language and Religion.—The present Kurdish language which is called Kermanji—a title difficult to explain—is an old Persian patois, intermixed to the north with Chaldzan words aud to the south with acertain Turanian element which may not improbably have come down from Baby- lonian times. Several peculiar dialects are spoken in secluded districts in the mountains, but the only varieties which, from their extensive use, require to be spccified are the Zaza and the Guran. The Zaza is spoken throughout the western portion of the Deyrsim country, and is said to be unintelligible to the Kermanji-speaking Kurds. It is largely intermingled with Armenian, and may contain some trace of the old Cappadocian, but is no doubt of the same Aryan stock as the standard Kurdish. The Gurdn dialect again, which is

spoken throughout Ardela4n and Kirman- shdhan® chiefly differs from the northern Kurdish in being

1 See Notices et Hxtraits des MSS., vol. xiii. p. 805. Of the tribes enumerated in this work of the 14th century who still retain a leading place among the Kurds, the following names may be quoted :— Gurdnieh of Dartang, modern Gurans ; Zengeneh, in Hamadan hills, now in Kirmanshahan ; Hasnani of Kerkuk and Arbil, now in the Deyrsim mountains, having originally come from Khorasan according to tradition ; Sohrieh of Shekelabad and Tel-Haftun, modern Sohran, from whom descend the Baban of Sulimanieh ; Zerzart of Hinjarin mountains, modern Zerzas of Ushnei (cuneiform pillars of Kel-i-shin and Sidek noticed by author); Jalamerkieh, modern Julamerik, said to be descended from the caliph Merwan-ibn-Hakam; MHakkarieh, Hakkari inhabiting Zuzan of Arab geography; Bokftieh, modern Bohtan. The Rowadi, to whom Saladin belonged, are probably modern Rewendi, as they held the fortress of Arbil. Some twenty other names are mentioned, but the orthography is so doubtful that it is useless to try to identify them.

2 The Sheref-nameh,.a history of the Kurds dating from the 16th centnry, tells us that ‘‘towards the close of the reign of the Jen-ghizians, a man named Baba Ardilan, a descendant of the governors of Diarbekir, and related to the famous Ahmed-ibn-Merwan, after remaining for some time among the Gurans, gained possession of the country of Shahrizor”; and the Ardelan family history, with the gradual extension of their power over Persian Kurdistan, is then traced down to the Saffavean period.

3 The Guran are mentioned in the Afesaitk-el-Absér as the dominant tribe in southern Kurdistan in the 14th century, occupying very much the same seats as at present, from the Hamadan frontier to Shahrizor. Their name probably signifies merely ‘‘the monntaineers,” being derived from gur or giri, “a mountain,” which is also found in Zagrus, i.e€., za-giri, ** beyond the mountain,” or Pusht-<-koh, as the name is translated in Persian. ‘They are a fine, active, and hardy race, indi-vidually brave, and make excellent soldiers, though in appearance very

inferior to the tribal Kurds of the northern districts. These latter indeed delight in gay colours, while the Gurdns dress in the most homely costume, wearing coarse blue cotton vests, with felt caps and

entirely free from any Semitic intermixture. It is thus somewhat nearer to the Persian than the Kermanji dialect, but is essentially the same language. It is a mistake to suppose that there is no Kurdish literature. Many of the popular Persian poets have been translated into Kurdish, and there are also books relating to the religious mysteries of the Ali-Ollahis in the hands of the Deyrsimlis to the north and of the Gurans of Kirmdnshéhén to the south. Euro- pean scholars too have been assiduous of late years in inves- tigating the various Kurdish dialects. The New Testament in Kurdish was printed at Constantinople in 1857. The Rey. Samuel Rhea published a grammar and vocabulary of the Hakkari dialect in 1872. Lerch, Brugsch, Chodzko, Beresine, Blau, and many others have discussed different branches of the subject in the scientific magazines of the Continent ; and quite recently (1879) there has appeared under the auspices of the Imperial Academy of St Peters- burg a French-Kurdish dictionary compiled originally by Mons. Jaba, many years Russian consul at Erzeroum, but completed by Ferdinand Justi by the help of a rich assort- ment of Kurdish tales and ballads, collected by Messrs Socin and Pryne in Assyria, Justi's preface to the dic- tionary gives a good account of the present state of Kurdish studies in Europe and Asia.

The religion of the Kurds also furnishes a very curious subject of inquiry. The great body of the nation, in Persia as well as in Turkey, are Sunnis of the Shafe'i sect, but in the recesses of the Deyrsim to the north and of Zagrus to the south, there are large half-pagan communities, who are called indifferently Ali-Ollahi and Kizzil-bash, and who hold tenets of some obscurity, but of considerable interest. Qutwardly professing to be Shi'ahs or " followers of Ali," they observe secret ceremonies and hold esoteric doctrines which have probably descended to them from very early ages, and of which the essential condition is that there must always be upon the earth a visible

manifestation of the Deity. While paying reverence to the supposed incarnations of ancient days, to Moses, David, Christ, Ali and his tutor Salmdn-el-Farsi, and several of the Shi'ah imams and saints, they have thus usually some recent local celebrity at whose shrine they worship and make vows; and there is, moreover, in every community of Ali-Ollahis some living personage, not necessarily ascetic, to whom, as representing the Godhead, the superstitious tribesmen pay almost idolatrous honours. Among the Gurdns of the south the shrine of Baba Yadgar, in a gorge of the hills above the old city of Holwdn, is thus regarded with a supreme veneration, while in the family of a certain Syed who resides in the neighbourhood the attributes of divinity are supposed to be hereditary. Similar institutions are also found in other parts of the mountains, which may be com- pared with the tenets of the Druses and Ansaris in Syria and the Ismaelis in Persia. j

Climate, Productions, Fauna, &c.—In a country like Kurdistan, which extends over five or six degrees of latitude, and ranges in altitude from 1500 to 15,000 feet above tle sea, there is of course every variety of climate and produce. In the northern part of this region the hills are covered with pine forest, while the valleys abound with walnuts, sycamores, and planes, and all sorts of fruit trees, and in summer the hillsides and uplands are covered with a luxuriant herbage. The winters are here very rigorous, and the tribes, as far as they can, migrate at that season to the plains. In central Kurdistan the pine forests cease and give way to dwarf oak and elms, the mastic, holly, é&c., ee coats. The Gurans have for a long period abandoned nomadic habits, and are now almost universally congregated in villages and occupied With the cultivation of the soil, so that in a great part of Kurdistan

the name Guran has become synonymous with an agricultural peasantry, as opposed to the migratory shephcrds.

while further to the south large trees almost disappear, and a rough scrub takes their place. A succinct and graphic description of Turkish Kurdistan is given by Consul Taylor in his notes of travel published in the Geographical Journal for 1865.

‘*The modern Turkish province of Kurdistan,” he says, ‘‘ watered by an infinity of noble streams, with a salubrious climate and rich soil, yields to no other province in the empire for the varicty and richness of its vegetable and animal produce, while its numerous mountain chains abound in mineral wealth. Among its natural vegctable productions, galls, gum-tragacanth, madder-roots, and the pistachio-nut, from which the natives extract a fine oil uscd in making soap, are the most important,—the annual value of the export of the former alone being upwards of £35,000. Oleaginous seeds and olive ojl are produced in large quantities, and the quality of the former is so superior that it tinds its way to many of the northern governments. Sheep’a wool was exported in 1863 to the value of £70,000; and mohair, the produce of the Angorah goats, that thrive so wonderfully in the neighbourhood of Jezireh, was eagerly sought after and bought up by native traders from Kaiserich and Constantinople in the same period to the amount of £20,000.

‘*The manufacture of native cotton cloths, shallees made from mohair, and short woollen cloaks is actively pursued; and the shallee, for texture and variety of colour and pattern, shows the extraordinary natural intelligence of the Kurdish workman. Diarbekir is famous itself for its sitk piece-goods, similar to those of Aleppo and other parts of Syria, but, from its greatcr cheapness and durability, more in request among the poorer classes of the mountains between Diarbekir and the Black Sea. Sheep are exported in large quantitics from the mountains and desert to Aleppo, Damascus, and Beyrout, and camels, purchased from the Arabs, to Kaiserieh and other parts of Asia Minor. The uplands and hills abound in several species of polecat, martin, foxes, and wolves, whose furs add considerably in value to the sum total of the export list. A beautiful species of spotted lynx may be included among the former, although it is far more scarce than those enumerated. A rough estimate of the whole annual value of the animal and vegetable produce of the pashalic, whether consumed at home or exported (exclusive of food), will amount to more than £700,000 sterling.”

This account is generally applicable to central and southern Kurdistan as well as to the pashalics of Diarbekir and Erzeroum, but it requires to be supple- mented in some particulars. The rice and corn which are grown by the Kurds of the Tigris basin and the Persian plains form a very important staple of export, while the hill forests supply charcoal, wild silk, manna, and gum- mastic, in addition to the produce noticed in Consul Taylor's list, to a very large extent; and it may be further noted that along the whole range of mountains from Jezireh to Susa there is an outer ridge of low gypsum hills, which abounds throughout its whole extent with petroleum and naphtha springs. Mineral oils are not at present much appreciated by either Turks or Persians, but in the future of Kurdistan this important source of wealth cannot be left out of account.

With regard to the fauna of Kurdistan afew words must suffice. Neither lions nor tigers are ever found in the mountains, though the former frequent the banks of the Tigris and the latter are common in the Caspian forests. The wild animals of Kurdistan are the leopard and lynx, the wild cat, bear, hyzena, wild boar, wolf, jackal, and fox, the mardi (or red deer), the roe and hog deer (and fallow deer and antelope on the skirts of the hills), the wild goat (or ibex), the wild sheep (or moufflon), together with badgers, hares, many varieties of the polecat or martin, and the ordinary smaller animals. Of game birds the most remarkable are the Xebk-i-Derv (or large partridge, first brought to the notice of naturalists by Consul Brandt), the grey and red-legged partridge, the 7%hoo, quail, woodcock, and snipe, three varieties of bustard, the grey crane, and wild geese and ducks in abundance.

It has not been found possible to compute the amount of revenue which is raised from the Kurds. Consul Trotter remarks on this subject :—

"The Turkish Kurds are found in almost every possible stage, from that of thorough subjection to the Government (as in many of

the Diarbekir and Erzerowm villages, where they pay all the regular taxes and are also drawn for the conscription) up to the semi-independent Kurds of Bohtau, of Mudikan, and of the Deyrsim, who never pay taxes exeept at the rare intervals that the Govern- ment is able to occupy their country with a military force, and who have never hitherto, except on very rare occasions, supplied soldiers to the army either regular or irregular."

And, if this uncertain liability to taxation is true of the Kurds of Erzeroum and Diarbekir, it applies equally to the districts of Hakkdri and Rowandiz, and to the great tribes such as the Herki, Hartushi, and Hyderdanli, who migrate between Persia and Turkey. In Sulimanieh, on the other hand, as well as in the Persian provinces of Azerbijan, Ardelan, and Kirmanshdahan, the revenue derived from the Kurdish population is fixed, and may be estimated at £1 per house instead of the £1, 6s. which is the usual Osmanli rate.

Antiquities. —Kurdistan abounds in antiquities of the most varied and interesting character. There is in the first place a series of roek-cut cuneiform inscriptions, extending from Malatieh on the west to Miyandab (in Persia) on the east, and from the banks of the Arras on the north to Rowandiz on the south, which record the glories of a Turanian dynasty, who ruled the country of Nairi dur- ing the 8th and 7th centuries 3.c., contemporaneously with the lower Assyrian empire. Intermingled with these are a few genu- ine Assyrian inscriptions of an earlier date ; and in one instanee, at Van, a later tablet of Xerxes brings the reeord down to the period of Grecian history. The most ancient monuments of this elass, how- ever, are to be found at Holwan and in the neighbourhood, where the sculptures and inscriptions belong probably to the Guti and Luli tribes, and date from the early Babylonian period. Excava- tions at this spot or in the mounds along the course of the Diydleh, which is the great river of southern Kurdistan, or more especially at Yassin Tepeh, the site of the ancient city of Shahrizor, would probably lead to the discovery of relics cognate with those which have been found in the palaces of Nineveh and Babylon.

Information has also been recently received that a cemetery full of inscribed sepulchral urns has been laid bare by a landslip in the mountains between Sulimanieh and Kirmanshahan, and the description is calculated to arouse the liveliest interest, though until the spot has been visited by some European seholar no definite opinion can be given as to the character and antiquity of the remains.

In the northern Kurdish distriets whieh represent the Arzanene, Intilene, Anzitene, Zabdicene, and Moxuene of the ancients, there are also many interesting remains of Roman cities, well worth ex- amining. Arzen, Miyafarikin(ancient Martyropolis), and Sisauronon have already been reported on by Consul Taylor, but there is still abundant room for researeh, and attention should be especially direeted to the ruins of Dunisir near Dara, which Sachau the great Orientalist has recently identified with the Armenian capital of Tigranocerta, a city that has long been the despair of comparative geographers. Of the Macedonian and Parthian periods there are re-

mains both sculptured and inscribed at several points in Kurdistan:

at Bisitun, in a cave at Amadieh, at the Mithraic temple of Kereftu, on the rocks at Sir Pul-i-Zohab near the ruins of Holwan, and pro- bably in some other loealities, such as the Balik country between Lahijan and Koi-Sanjak, which have never been visited by Euro- peans ; but the most interesting site in all Kurdistan, perhaps in all western Asia, is the ruined fire temple of Pai Kuli on the southern frontier of Sulimanieh, a spot that has been hurriedly visited by two or three European travellers, but never thoroughly examined. Among the debris of this temple, which are scattered over a bare hillside, are to be found above one hundred slabs, inscribed with Parthian and Pehlevi characters, the fragments of a wall which formerly supported the eastern face of the edifice, and bore a bilingual legend of great length, dating from the Sassanian period. Not more than half of the inscribed slabs have as yet been copied, time and labour being requircd to clear out the other slabs which lie embedded in the earth on the slope of the hill down which they have rolled, and the locality, moreover, being one that cannot be easily examined or even visited, owing to its exposed position among

the brigand tribes of the frontier, but it is to be earnestly hoped that, when an opportunity does offer, every fragment of inscription may be recovered, so that it may be possible to reconstruct the entire legend, which, independent of its historical interest, is of special im- portance as the longest and latest specimen of the lapidary Pehlevi writing. There are also remarkable Sassanian remains in other parts of Kurdistan, —at Salmus to the north, and at Kirmanshahdn and Kasr-i-Shirin on the Turkish frontier to the south; and it is prob- able that an active search among the hills would discover many similar objects of interest. It may indeed be asserted that there is no region of the Kast at the present day which deserves a more eare- ful scrutiny and promises a richer harvest to the antiquarian explorer

than the lands inhabited by the Kurds from Erzeroum to Kirman-shahan. Dr Schultz in former times and Consul Taylor more recently have done much to illustrate northern Kurdistan between Van and Diarbekir, but the inner mountains of Bohtan, Hakkari, Rowandiz, and the Balik country are still almost a “terra incognita,” and require eareful examination.

History.—With regard to the origin of the Kurds, it was formerly considered sufficient to deseribe them as the deseendants of the Carduehi, who opposed the retreat of the Ten Thousand through the mountains, but modern research ascends far beyond the period of the Greeks. We now find that at the dawn of history the mountains overhanging Assyria were held by a people named Gti, a title whieh signified ‘‘a warrior,” and which was rendered in Assyrian by the synonym of Gardu or Kardu, the precise term quoted by Strabo to explain the name of the Cardaces (Kapdares). These Grit were a Turanian tribe of such power as to be placed in the early cuneiform records on an equality with the other nations of western Asia, that is, with the Syrians and Hittites, the Susians, Elymzans, and Accadians of Babylonia ; and during the whole period of the Assyrian empire they seem to have preserved a more or less inde- pendent political position. After the fall of Nineveh they coalesced with the Medes, and, in

common with all the nations inhabiting the high plateaus of Asia Minor, Armenia, and Persia, became gradually Aryanized, owing to the immigration at this period of history of tribes in overwhelming numbers which, from whatever quarter they may have sprung, belonged certainly to the Aryan family.

The Guté or Kirdu were reduced to subjection by Cyrus before he descended upon Babylon, and furnished a contingent of fighting men to his successors, being thus mentioned under the names of Saspirians and Alarodians in the muster roll of the army of Xerxes whieh was preserved by Herodotus.

In later times they passed successively under the sway of the Maeedonians, the Parthians, and Sassanians, being especially be-friended, if we may judge from tradition as well as from the remains still existing in the country, by the Arsacian monarels, who were probably of a eognatc race. Gotarzes indeed, whose name may per-haps be translated ‘‘ chief of the Gvitz,” was traditionally believed to be the founder of the Gurans, the principal tribe of southern Kurdistan,! and his name and titles are still preserved in a Greek inscription at Bisitun near the Kurdish capital of Kirmanshahan. Under the caliphs of Baghdad the Kurds were always giving trouble in one quarter or another. In 224 a.p., and again in 298, there were formidable insurrections in northern Kurdistan ; and a third time, in 309, the Boide amir, Azad-ad-Dowleh, was obliged to lead the forces of the caliphate against the southern Kurds, capturing the famous fortress of Sermaj, of which the ruins are to be seen at the present day near Bisitun, and reducing the province of Shahrizor with its capital city now marked by the great mound of Yassin Teppeh. The most flourishing period of Kurdish power was probably during the 12th century of our era, when the great Saladin, who belonged to the Rewendi branch of the Hadabani tribe, founded the Ayubite dynasty of Syria, and Kurdish chiefships were estab- lished, not only to the cast and west of the Kurdistan mountains, but as far as Khorasan upon one side and Egypt and Yemen on the other. During the Mongol and Tartar domination of western Asia the Kurds in the mountains remained for tlhe most part passive, yielding a reluctant obedience to the provincial governors of

the plains, and for the last three or four centuries they have been divided in their allegianee between the Turkish and Persian crowns. After Sultan Selim in 1514 had defeated the army of Shah Ismael, the founder of the Saffavean dynasty,he employed one of his generals, Sultan Hussein Beg of Amadieh, to recover Shahrizor and its de- pendeneies from Persia; and from that time to the present day the political status has not been materially disturbed. The frontier line indeed bisecting Kurdistan from north to south, which was agreed upon in 1047 A.H., between Sultan Murad IV. and Shah Safii, after the recovery of Baghdad by the former sovereign, is substan- tially the same linc that was adopted by the Russian and British commissioners who were employed in 1840-42 to mediate between the two Asiatic powers and delimit their respective territories. But in the meantime changes of some moment have occurred in the interior organization of Kurdistan. Both in Turkey and in Persia the independent power of the Kurds has been much curtailed. In Turkey the pashas of Kharput, rzcroum, and Diarbekir have been invested with larger powers of control, while the authority of the sultan has been further strengthened by the establishment of Turkish

1 “The Kalhur tribe are traditionally deseended from Gudarz-ibn- Gio, whose son Roham was sent by Bahman Keiani to destroy Jerusalem and bring the Jews into captivity. This Roham is the individual usually called Bokht-i-nasser (Nebuchadnezzar), and he ultimately suceeeded to the throne. The neighbouring country has ever since remained in the hands of his descendants, who are called Gurdus ” (Sheref-Nameh, Persian MS.). The same popular tradition still exists in the country, and PATAPZHC TEOMO@POS is found on the rock at Bisitun, showing that Gudarz-ibu-Gio was really an historie personage. See Journ. Roy. Geog. Soc., vol. ix. p. 114,

goveruors at Bayazid, Van, Betlis, Amadieh, and Sulimanieh, in succession to the old hereditary Kurdish chiefs. With the tortuous policy, it is true, which is characteristic of the Osmanli race, the Porte has not unfrequently of late years encouraged the develop- ment of

native strength in various parts of Kurdistan for a time and for certain special purposes; but, when the position of the local magnate has anywhere become one of political danger, the central Government has stepped in and without difficulty has re- asserted its supreme authority. :

In 1834, for instance, the famous Reshid Mohammed Pasha chas- tised the Kurds, who had everywhere broken loose from Siwas to Rowandiz, and adopted severe measures of repression, which are still remembered and dreaded. In 1843 again, Beder Khan Beg, who from his patrimonial government of Bohtan had extended his sway over the whole mountain range, and had sworn to exterminate the Nestorian Christians, was crushed immediately that the Porte put forth its strength against him; but the most notable instance of sudden Kurdish aggrandizement and collapse has occurred during the year 1881. Sheikh Obeidullah, chief of the small tribe of

Oramar, who resided in a village of the mountains south of Lake.

Van, had acquired great local influence, owing to the sanctity of his family, but more especially from his own ascetic habits and his personal character. He seems to have really entertained the idea at one time of establishing an independent Kurdish kingdom, con- centrating under his own individual authority all the scattered remnants of his race both in Persia and in Turkey. At any rate, having collected a very considerable force of Kurds in the summer of 1880, he suddenly burst in upon the plains of Persia and ravaged Azerbijan to the south of Lake Urumieh, sweeping the country up to the walls of Maragha on one side of the lake and of Urumieh upon the other. Having been joined by the Zerzas, the Mikris, the Bilbass, and all the tribes of the Persian frontier, it is considered certain that he might have marched on and pillaged Tabriz had he taken full advantage of the panic which followed on the first in- vasion ; but, he having faltered and thus given time for the arrival of Persian reinforcements, the movenient, which was at one time most serious, collapsed, and he retired to the mountains. Now the Turkish Government had unquestionably in the first instance encouraged Sheikh Obeidullah’s increasing power and

aspirations, not with a view of hostility to Persia, but in the hope that the establishment of a fanatical and great independent Kurdish principality about Lake Van would paralyse any moveinent of the Armenian nation towards the recovery of its liberty. The Porte indeed in all probability still cherishes the idea of thus controlling the action of its Christian subjects, though it has been compelled by the pressure of the European powers, and under the threat of re- prisals from Persia, to arrest Sheikh Obeidullah and keep him under surveillance at Constantinople, while measures have been taken to prevent any immediate renewal of disturbances on the frontier. The policy of the Persian Government towards its Kurdish sub- jects has been not very dissimilar to the Turkish programme. Aware of the military efficiency of the tribes, the Persian crown as long ago as the time of Nadir Shah transferred a large colony of Shadillu and Zafferanlu Kurds to the Khorasan frontier, where, enjoying the rich lands of Bujnird and Kuchan, and strengthened by a line of fortresses, they have ever since been engaged in unceasing conflict with the Turkomans of the Attock, and from whence they afforded invaluable assistance, both in carriage and supplies, to the Russian columns in their late advance into the country of the Akhals. Persia has also raised several regiments of regular infantry from the Kurdish Shekaks of the north, as well as from the Gurans and Kalhiurs of the south, while the shah has also placed Persian governors over the Kurdish districts south of Lake Urumieh, and has appointed princes of the blood to administer the more distant and unruly Kurdish provinces of Ardeldn and Kir- manshahan. At present perhaps the only communities among whom a spirit of Kurdish nationality may be said to flourish free from the taint, be it for good or be it for bad, of foreign influence,

are the Deyrsimlis of the upper Euphrates and the Hakkaris of central Kurdistan. (H. C. RB.)

KURGAN, a district town of western Siberia, in the government of Tobolsk, 352 miles south-south-west of the capital of the province, on the left bank of the Tobol river. It has its name from a lofty tumulus (kurgan), close by which a wooden fort was erected in the 17th century. It is situated in a wide steppe, covered with numerous lakes,

the inhabitants of which are active in agriculture, cattle- breeding, and cattle grazing, cattle being purchased in the Kirghiz steppe. It is now the chief centre of the region for trade in cattle, tallow, skins, and salt. Population,

6500.

KURILE ISLANDS, a chain of islands to the north- east of Asia, extending for about 795 miles from the

southern extremity of the peninsula of Kamchatka to the northern extremity of Yezo, and forming the boundary between the Sea of Okhotsk and the outer ocean. Till 1875 the Little or Northern Kuriles belonged to Russia, aud the Great or Southern Kuriles to Japan, but by the treaty of that date they were all recognized as Japanese. The principal islands, beginning at the north, are Shumshu (226 square miles), Paramushir (1135), Onekotan (244), Kharimkotan, Si Musir (161), Matua, Urup (563), Iturup (2656), and Kunashir. Like the peninsula of Kamchatka, the whole chain is of volcanic origin, and several of the islands—Yekarma, Musir, Raikoke, Matua, Iturup—are still centres of volcanic activity. Mr Milne, who cruised among the islands in 1878, counted fifty-two well-defined volcanic peaks, and at least seventeen are known to give off steam. ‘The peak of the island of Alaid, estimated to have an altitude of at least 12,000 feet, had two great eruptions in 1770 and 1793. None of the other eminences exceed 5000 feet in height. As the slopes are for the most part exceedingly regular, the production of the vol- canoes must be assigned to a comparatively recent period; and the absence of stratification seems to indicate a con- tinuity of action. The forces at work must have been enornious if, as appears probable, the chain was built up from the bed of the sea. To the east of the islands the “Challenger” expedition found a depth of 27,930 feet. The flora of the Kuriles is poor, especially towards the north; in the southern islands it is similar to that of Yezo. In Kunashir, Urup, and Iturup there are well-wooded por- tions. Sea-otters, wolves, and foxes are among the wild animals hunted for their skins. Many of the islands are altogether uninhabited, and none have more than the scantiest population. In 1868-70 Knipping estimated the

total at from 200 to 300 persons, and since the treaty of 1875 a large number have removed to Saghalien and other parts of Russian territory. Ethnographically the people

of the Kuriles are in the main identical with the Ainos of

Yezo, those of the northern islands showing the influence of intercourse with Kamchatka. They are quiet, timorous, and well-behaved, do not practise polygamy, and carefully avoid intermarriage between blood relations. The poorer people burn their dead, the wealthier embalm them. Once a year in autumn they hold a great feast. Of a supreme deity they have some indistinct idea, but they sacrifice to the sun, the moon, and the sea, and worship the bear.

The Kurile Islands were discovered in 1634 by the Dutch navi- gator De Vrees. The Russians first learned about them from Japanese traders who visited Kamchatka in 1711; in the following year two Cossacks, Antsuiphoroff and Kozuirevskii, crossed over to Shumshu ; and in 1766-67 a voyage was made among the islands to collect a fur tax. In 1795 a factory of the Russian American Company was established on Urup. Captain Golovnin was taken prisoner by the Japanese on Kunashir in 1811.

See Krasheninikoff, Kamtchatka, Gloucester, 1764; the Voyages of Krusenstern and Lapérouse ; and Milne's paper in Geol. Mag., 1880.

KURRACHEE, or KarAcut, a district in Sind, India, lying between 23° 34' and 26° 57' N. lat., and between 66° 41' 30" and 68° 49' E. long., bounded on the N. by Shikérpur, on the E. by the Indus river and Hyderabad district, on the S. by the sea, and on the W. by Baluchistan. The area is 14,091 square miles; and the population in 1872 was 426,722. The district consists of an immense tract of land stretching from the mouth of the Indus to the Baluchi boundary. It differs in general appearance from the rest of Sind, having a rugged, mountainous tract along its western border. The country gradually slopes away to the south-east, till in the extreme south the Indus delta presents a broad expanse of low, flat, and unpic- turesque alluvium. Besides the Indus and its mouths, the only river in the district is the

Habb, forming the boundary between Sind and Baluchistan. The Manchhar Lake in Sehwdn subdivision forms the only considerable

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sheet of water in Sind. The hot springs at Pir Mangho are 6 or 7 miles north of Kurrachee town.

In 1872 the population was 426,722 (males 242,516, and females 184,206)—the Hindus numbering 73,304, and the Mohammedans 348,586. Eight towns had a population exceeding 2000:—Kur- rachee, 56,753 ; Kotri, 7949 ; Sehwan, 4296; Bubak, 5703 ; Dadu, 3307 ; Tatta, 7951 ; Mirpur Batoro, 2846 ; and Keti-Bandar, 2199.

In Kurrachee subdivision cultivation exists only on a few isolated spots, and depends upon wells, springs, or natural rainfall. Here the chief crops are jodr, béjra, barley, and sugar-cane. In Jerruck and Shah-bandar, where numerous canals carry the waters of the Indus through the alluvial flats, rice forms the staple crop; but wheat, sugar-cane, millets, cotton, and tobacco are also grown. In the barren hills of Kohistan, agriculture is practically unknown; and the nomad population devotes itself almost entirely to grazing cattle in the southern plains. The district trade is centred in Kurrachee town, the staple exports consisting of cotton, wool, and grain. Ex- tensive salt deposits of the purest description occur on the Sirganda creek, a branch of the Indus. Sea fisheries form an important in- dustry. The pearl oyster is found at several places along the coast, but the pearls are of inferior size and quality. The Indus valley line of the Sind, Punjab, and Delhi Railway runs from Kurrachee to Kotri within the district a distance of 106 miles. The adminis- tration is conducted by a collector-magistrate, assisted by several deputies. The total imperial revenue in 1873-74 amounted to £139,079, exclusive of £52,222 derived from the canals. Educa- tion in 1873-74 was afforded by forty-ninc schools, attended by 3167 pupils. Kurrachee town and neighbourhood, being open to the sea-breeze, are said to possess the healthiest climate in Sind. Fevers prevail at the setting in of the cold season, and in the hot

weather external inflammations, ulcers, and skin discases are very trouble- some. Cholera occasionally appears in an epidemic form. The rain- fall is slight and fluctuating, the average hardly exceeding 5 inches per annum.

KURRACHEE, or KarAcut, the chief town of Sind, India, and a large seaport, situated at the extreme northern end of the Indus delta, in 24° 51’ N. lat. and 67° 4’ E. long. The city is almost entirely a creation of British rule, its ex- tensive commerce, splendid harbour works, and numerous flourishing institutions having all sprung up since the intro- duction of settled institutions ; and the architecture of the town is essentially modern and Anglo-Indian. Before 1725 no town whatever appears to have existed on its site ; but about that time some little trade began to centre upon the convenient harbour, and the silting up of Shahbandar, the ancient port of Sind, shortly afterwards drove much of its former trade and population to the rising village. Under the Kalhora princes, the khan of Khelat obtained a grant of the town, but in 1795 it was captured by the Talpur Mirs, who built the fort at Manora, at the entrance to the harbour. They also made considerable efforts to increase the trade of the port, and at the time of the British acquisition of the province the town and suburbs contained a population of 14,000.

_ The census of 1872 returned the inhabitants of Kurrachee, includ- ing the cantonment, at 56,753, viz., Mohammedans, 29,156; Hindus, 23,404; Christians, 3397; and ‘‘others,” 796. The municipal revenue of the town in 1874 amounted to £22,596, and the expendi- ture to £20,142. Trade has immensely devcloped of late years. In 1843-44 the total value of the trade was returned at £122,160, that of the exports being only £1010. In 1873-74 the value of the trade amounted to £3,507,684, viz,, imports £1,481,765 and cxports £2,025, 919. Up to 1851 only one English sailing ship had entered Kurrachec harbour, steamers and large vessels having to anchor outside and discharge by lighters. In 1853 the construction of the Napier Mole or causeway, 3 miles long, connecting the town with Kiaméari island, and the subsequent extensive harbour improve- ments carried out between 1869 and 1873, at a cost of £450,000, have enabled vesscls of any size to enter the harbour. In 1847-48 the number of vessels which entered

the harbour was 891, all native craft, of a total burthen of 30,509 tons. In 1873-74 the vessels Visiting the harbour numbered 918, of a total burthen of 161,284

tons.

KURSK, a government of European Russia conterminous With those of Tchernigoff, Orel, Voronezh, Poltava, and Kharkoff, and estimated to have an area of 17,417 square miles. The surface is irregular and even hilly, but the highest point (near the town of Tim) does not exceed 1016 feet of absolute elevation. Cretaceous and Eocene yocks

prevail, and chalk, iron-stone, mill-stones, potter's clay, and tripoli are among the economic minerals. The rich black earth of the government makes it one of the best agricul- tural districts of the country. No fewer than four hundred streams are counted within its borders, but none of them are of any service as waterways. To the Dnieper system be- long the Seim, the Vorskla, the Psel, and the Tuskor; to the Don the Northern Donets and its tributaries. Besides oats, which form the staple crop, wheat, rye, potatoes, and buck- wheat are largely grown. Beeswax is sent in considerable quantities to Moscow. Horse, cattle, and sheep breeding is on the decline. The manufacturing industries—wool dressing, distillation, tanning, linen weaving—are gaining ground. Wool-spinning and the making of woollen sashes are so generally carried on by the peasant women as to be matter of commercial importance.

The government is divided into fifteen districts—Kursk, Byelgorod, Graivoron, Dmitrieff, Korotcha, Lgoff, Novuii Oskol, Oboyan, Putivl, Ruilsk, Staruii Oskol, Sudzha, Tim, Phatezh, Shtchigrui. The places with more than 5000 inhabitants are Kursk, Borisovka (30,000), Sudzha (with suburbs, 18,000), Byelgorod (16,097), Miropole (10,754), Kholka Mikhaielovka (10,000), Ruilsk (9445), Staruii Oskol (7091), Putivl (7046), Oboyan (6322), Korotoha, and Phatezh. The population of the government was 1,954,807 in 1870, chiefly Great Russians, but consider- ably modified by the Little Russian element. About 17 miles from the chief town, in a thickly-peopled district, is the site of the Korennaya fair, formerly the greatest of those in South

Russia, and still with an annual trade valued at £900,000. It takes its name from an image of the virgin found at the root (koren) of a tree, and yearly carried in solemn procession from Kursk to the spot of its discovery. The Kursk district contains more than sixty old town sites; and barrows (kurgans) are extremely abundant. Of the latter many have been destroyed to furnish manure for the soil, but not a few have been ex- amined by such investigators as Professor Zamokvasoff (see the publications of the Statistical Committee of Kursk).

Kursk, the chief town of theabove government, is situated 333 miles south of Moscow, at the confluence of the Kur with the Tuskor, and forms the meeting place of the railways from Moscow, Kieff, and Kharkoff. The inhabitants num- ber more than 30,000, or including the suburbs 45,000. Orchards and nursery gardens are among their chief means of subsistence, and gardeners from Kursk are numerous in the neighbouring governments. The leather works are the most extensive of the industrial establishments. Though many of the public buildings of the town are constructed on a large scale, it is enough to mention the cathedral of the Resurrection, dating from 1733, the cathedral of St Sergius (1762), and the Bogoroditskii monastery.

Kursk was already in existence in 1032. The defence of the town from an incursion of the Polovtsi is celebrated in The Triwmph of Igor, an epic which forms one of the most valuable relies of early Russian literature. Down to the close of the 18th century the citadel, defended by the two rivers aud a ditch, was a placc of considerable strength ; the remains are now comparatively few. The rank of government town was bestowed on Kursk in 1779.

KUSTENDJE, or Ktstenps1z, a seaport of Roumania on the coast of the Black Sea, 140 miles east of Bucharest, the terminus of the railway from Tchernavoda on the Danube, and the principal outlet for the produce of the Dobrudja. The harbour is well defended from the north winds, but those from the south, south-east, and south- west prove sometimes highly dangerous. Of the exports (valued at £217,828 in 1880) the chief are cereals, wool, skins, and cattle. Since the

incorporation of the Dobrudja with Roumania in 1878 Kustendje gives its name to a province.

Kustendje is the Constantiana which was founded in honour of Constantia, sister of Constantine the Great. It lies at the seaward end of the Great Wall of ‘Trajan, and has evidently been sur- rounded by fortifications of its own. In spite of damage done by railway contractors (see Henry C. Barkley, Between the Danube

and the Black Sea, 1876) there are considerable remains of ancicnt masonry—walls, pillars, &c. A number of inscriptions have been found in the town and its vicinity which show that Tomi, the place of Ovid’s banishment, must have been only a little way an regard to the Kustendje inscriptions in general, sce Allad, La Bulgarie Orientale, Paris, 1866 ; Desjardins in Ann. dell’ tstit. dt corr. arch., 1868; Corpus inscript. lat., vol. iii.; and a paper on Weickum’s collection in Sitewngsberieht of the Munich Acadeniy,

1875.

KUSTRIN, or Césrrry, a town and fortress of the first rank in the circle of Kénigsberg-in-der-Neumark, in the government district of Frankfort, Prussia, is situated at the confluence of the Oder and Warthe, about 51 miles north- east of Berlin by rail. It consists of the town proper within the strong fortifications, a suburb on the left bank of the Oder, and one on the right bank of the Warthe. There are bridges over both rivers. CKiistrin carries on several minor manufactures, and there is some shipping in the rivers. The population in 1875 (including the garrison) was 11,227.

About 1250 a town was erected on the site of Kiistrin, where a fishing village originally stood. From 1535 till 1571 it was the residence of the margrave of Brandenburg-Kiistrin, who died without heirs. Kiistrin

was the prison of Frederick the Great when crown-prince, and the scene of the execution of his friend Katte.

KUTAIAH, Kutaya, or Kruranta, the chief town of a sandjak in the vilayet of Khudavendikiar, Asia Minor, is situated on the Pursak, an affluent of the Sakaria, the ancient Sangarius. The town lies at an important point of the great road across Asia Minor from Constantinople to Aleppo. It has a busy trade, and a population variously estimated at from 40,000 to 60,000. Kutaiah has been identified with Cotiseum.

KUTAIS, a town of the Caucasus, Russia, capital of the province of same name, 60 miles east from Poti, and 4 miles from the Rion station of the railway be- tween Poti and Tiflis. It is one of the oldest towns of the Caucasus ; Procopius mentions it under the name of Kotatision. Persians, Mongolians, Turks, and Russians have again and again destroyed the town and its fortress. In 1810 it became Russian. It is situated now on both banks of the Rion river, which is spanned by an iron bridge. Its most remarkable building is the ruined cathedral, erected in the 11th century by the Bagratides, which is the most important representative of Georgian architecture. The fort Uhimerion, mentioned by Procopius, is now but a heap of ruins. During recent years Kutais has acquired some importance, and its population is rapidly increasing ; it is now 12,000. The inhabitants make hats and silks, and trade in agricultural produce and wine. On the right bank of the Rion is a Government model-garden, with a model-farm for promoting the improvement of gardening, for which the warm and moist district of Imeritia is well adapted.

KUTTEN BERG (in Czech, Kutndé Hora), chief town of an official district in central Bohemia, Austria, is situated on a small stream in a fertile region, about 180 miles north-west of Vienna by rail. It consists of the town and four suburbs, and among its buildings rich in historical and architectural interest are the Gothic five-naved church of St Barbara, begun in 1368 and not yet finished, several] other churches, the Walscher Hof, formerly a royal resi- dence and mint, the seminary, formerly a bishop’s seat, and the Gothic town-house. The

manufactures include starch, rape-seed oil, beer, sugar, brandy, and liqueurs ; and there are various mills, and calico printing and wool-spin- ning establishments. The mines in the neighbourhood,

discovered in 1237, used formerly to yield silver; now they give only copper and lead. The population in 1870 was 12,747.

KUTY, a municipal town in the Austrian province of Galicia, lies 20 miles south-east of Kolomea, and on the left bank of the Czeremosz, which here forms the boundary between Galicia and Bukowina, in 48° 16’ N. lat., 25° 10’ E. long. The trade, especially in prepared leather, is chiefly with Hungary and the northern or Moldavian portion of Roumania. The neighbourhood of Kuty is picturesque and mountainous, and has productive salt springs. Population 8579, mostly of Armenian, Ruthenian, Polish, and Jewish extraction. Kuty formerly belonged to the old province of Ruthenia, in the kingdom of Poland.

KUZNETSK, a district town of Russia, in the govern- ment of Samara, situated on the railway between Samara and Penza, 158 miles west of the former. In the 18th century it was but a village peopled by smiths (whence its name), and it is through this trade that it has acquired its importance. The majority of its 15,000 inhabitants are engaged in the manufacture of agricultural implements, exported to a large amount, whilst others are employed in tanneries,—the black sheep-skins of Kuznetsk being widely renowned in Russia,—and in the manufacture ‘of leather and wooden wares, which last are largely exported to the southern steppe provinces and to the Caucasus.

KYOUK-HPYU, a district in British Burmah, lying between 18° 55’ and 19° 22’ N. lat., and 93° 25’ and 94° E. long. It consists of, first, a strip of mainland along the Bay of Bengal, extending from the An Pass, across the main range, to the Ma-i river, and, secondly, the large islands of Ramri and Man-oung, with many others to the south, lying off the coast of Sandoway. The mainland in the north and east is highly mountainous and forest-clad, and the lower portion is cut up into numerous islands by a network of tidal creeks. Between the mainland and Ramri lies a group of islands separated by deep, narrow, salt-water inlets, forming the north-eastern shore of Kyouk-hpyu harbour, which

extends for nearly 30 miles along Ramri in a south-easterly direction, and has an average breadth of 3 miles. The principal mountains are the Arakan Yomas, which send out spurs and sub-spurs almost to the sea-coast. The An Pass, an important trade route, rises to a height of 4664 feet above sea-level. The Dha-let and the An are navigable by large boats 25 and 45 miles respectively. Above these distances they are mere mountain torrents. Large forests of valuable timber cover an area of about 650 square miles. Kyouk-hpyt contains numerous " mud volcanoes," from which marsh gas is frequently discharged, with occasional issues of flame. The largest of these is situated in the centre of Cheduba Island. Larth-oil wells exist in several places in the district. The oil when brought to the surface has the appearance of a whitish-blue water, which gives out brilliant straw-coloured rays, and emits a strong pungent colour. Limestone, iron, and coal are also found.

In 1872 the population was 144,177 (males 73,056 and females 71,121) :—Buddhists, 129,702; Mohammedans, 3920; Hindus, 185; Christians, 47; "others," 10,323. The largest town is Ramri, with a population in 1877 of 4028. Kjouk-hpyu, the headquarters, situated on Ramri Island, has 2620. Out of a total area of 4309 square miles, no less than 3740 are returned as absolutely uncul- tivable, and in 1876-77 only 165 square miles were under tillage. The principal crops are rice, sugar-cane, dhani, and tobacco. The manufactures consist of silk and cotton cloth, indigo, salt, pottery, coarse sugar, and sesamum oil. The total imperial and provincial revenue in 1876-77 was £43,454, besides a local revenue derived from port and municipal funds, &e.

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represents probably the same sound in all alphabets. That sound used to be called a "liquid," in which class m, n, and 7 were included. This arrangement was unsatisfactory so far as m and n are concerned, for they have nothing common in their formation with the others. But 7 and / are very closely akin. They are both dentals —or more accurately

front palatals—produced by raising the point of the tongue to the front part of the palate, immediately behind the gums. They differ in this: for r a small aperture is left over the tip of the tongue by which the air escapes; but for / the tongue reaches the top of the palate, but does not rest (as for 7) against the sides of the mouth, and the voice escapes laterally by these side-apertures. The slightness of the difference in the posi- tions of the mouth for these two sounds explains their ex-changeableness. Perhaps the most remarkable variation of the 2 sound is that which is heard in Welsh and denoted by li, in such words as Llanberis, Llangollen, &c. An English- man commonly sounds this as thl, which is certainly not right. But the best authorities on phonetics are not agreed as to the precise nature of the sound. Mr Ellis thinks that it is produced by laying the left side of the tongue against the whole of the palate, and then forcibly ejecting the breath along the right side. But he admits that the sound thus produced differs very little from a voiceless or surd / (the common / is sonant), which stands therefore to / in the same relation as f does to v, or wh (really hw) tow. A simpler modification of the 2 sound is that heard in the Ttalian “ gli” or in the Spanish “llano”; it is formed by raising the middle part of the tongue to the roof of the mouth, not the point against the front part of the palate, as for the ordinary J.

The peculiar nature of the 7 sound renders it apt to fall out before consonants with which it is inconsistent; this is specially seen in French plurals, such as “ chevaux ” from “cheval.” It is also common, but sporadic, in English ; ég., in “walk,” “talk,” “palm,” “ alms,” “half,” “would,” &c. Asis frequently the case with such vanishing sounds, it has sometimes intruded through false analogy in words with which it has nothing to do, e.g., in “ could” (Old Eng- lish “coude”), and rather strangely in some words of Latin origin, ¢.g., participle, principle. The form of the letter L has varied slightly, but has always consisted of two straight lines at an angle. In Greek the form was generally A; and this has been preserved in the Cyrillic and Russian alphabets. But in the western Greek alphabet the form was generally Z ; and this appears in old Roman inscrip- tions, passing by degrees into the right angle with which we are familiar.

LA BADIE, LABADISTS. Jean de la Badie, a noted Pietist leader in the 17th century, was the son of Jean Charles de la Badie, governor of Guyenne; he was born in the town of Bourg not far from Bordeaux, on the 13th of February 1610, and died in Altona, on the 13th of February 1674. He was sent along with two brothers to the Jesuit school at Bordeaux, where his talents attracted the attention of his teachers, and they secured him for their order against the wishes of his parents. In 1626 he began to study philosophy and theology, and in due time made his profession. From a study of the Bible, of Augustine, Bernard, and the mystics, he was led to hold somewhat extreme views about the efficacy of prayer and the direct influence of the Holy Spirit upon believers, and adopted Augustinian views about grace, free will, and predestination, which brought him into collision with his order. The

result was that he resigned and was separated from the Jesuits on the plea of ill health, He then became a preacher to the people, and was encouraged by his bishop to devote himself to this work. The study of Calvin's Institutes, however, taught him that he had more in com- mon with the Reformed than with the Roman Catholic Church, and after various adventures he joined the Reformed Church of France at Montauban in 1650. His fame had preceded him, and his accession to the ranks of the Protestants was deemed a great triumph ; no such man since Calvin himself, it was said, had left the Roman Catholic Church. He was called to the pastorate of the church at Orange on the Rhone, and at once became noted for the severity of the discipline he exercised. He set his face zealously against dancing, card-playing, and worldly entertainments. The unsettled state of the country, recently annexed to France, compelled him to leave Orange. He accepted a call to the French church in London, but did not stay there long; and after various wanderings he at length settled at Middelburg, where he was called to be pastor to the French-speaking congrega- tion. His peculiar opinions were by this time (1666) well known, and his congregation and himself at once found themselves in conflict with the ecclesiastical authorities. Various "classes" and synods met and discussed the " sedi- tious sermons and new and erroneous doctrine which De la Badie had

preached in various of our churches before he had been inducted at Middelburg," and the result was the establishment of a separate church by De la Badie and his followers. He had gathered round him some enthusi- astic disciples, Peter Yvon at Montauban, Peter Dulignon, Francis Menuret, and more important than auy Anna Maria v. Schiirman, whose book Lucleria is perhaps the best exposition of the tenets of her master. At Middel- burg, at the head of his separatist congregation, De la Badie developed his views for a reformation of the Reformed Churches :—the church is a communion of holy people who have been born again from sin; baptism is the sigu and seal of this regeneration, and is to be administered only to believers ; the Holy Spirit guides the regenerate into all truth, and the church possesses throughout all time those gifts of prophecy which it had in the ancient days ; the community at Jerusalem is the continual type of every Christian congregation, therefore there should be a com- munity of goods, the disciples should live together, eat together, dance together; marriage is a holy ordinance between two believers, and the children of the regenerate are born without original sin; marriage with an unregene- rate person is not binding. The life and separatism of the community brought them into frequent collision with their neighbours and with the magistrates of Middelburg, and in 1670 they accepted the invitation of the princess Elizabeth, abbess of Herford in Westphalia, to take up their abode within her territories, and settled down in Herford to the number of about fifty. Not finding the rest they expected,

however, they migrated to Altona in 1672, where they

were dispersed on the death of the leaders. Small com- munities also existed in the Rhineland, and a missionary

| settlement was established in New York.

Sce H. van Berkum, De Labadic en de Labadisten, Sneek, 1851 ; Gocbel, Gesch. d. Christl. Lebens in der rheinisch-westphdlischen Kirche, Coblentz, 1852; Heppe, Geschichte des Pictismus, Leyden, 1879; Ritschl, Geschichte des Pietismus, vol. i., Bonn, 1880 ; and especially Petcr Yvon, Abrégé précis de la vie ct de la conduite et des

vrais sentiments de few Mr de Labadic, and Anna Maria v, Schiirman, Eucleria, Altona, 1673, 1678.

LABARUM, the sacred military standard of the early Christian Roman emperors, was first adopted by Con- stantine the Great after his miraculous vision in 312, although, according to Gibbon, he did not exhibit it to the army till 323. ‘The name seems to have been known before, and the banner itself was simply a Christianized form of the Roman cavalry standard. Eusebius (Life of Const., i. 31) describes the first labarum minutely as con- sisting of a long gilded spear, crossed at the top by a bar from which hung a square purple cloth, richly jewelled. At the upper extremity of the spear was fixed a golden wreath encircling the sacred monogram, formed of the first two letters of the name of Christ. In later banners the monogram was sometimes embroidered on the cloth. A special guard of fifty soldiers was appointed to protect the sacred standard. The derivation of the word labarum is disputed; modern scholarship inclines to recognize its etymon in the Basque Jabarva, signifying standard. An illustration of a labarum is given under the heading Fiac (vol. ix. p. 278, fig. 5, A).

LABEO, Marcus Antistius (cir. 50 3.c.—-18 A.D.), was the son of Pacuvius Antistius Labeo, a jurist of minor note, who caused himself to be slain after the defeat of his party at Philippi. A member of the plebeian nobility, and in easy circumstances, the younger Labeo entered early upon public life, and soon rose to the pretorship ; but his undisguised antipathy to the new régime, and the somewhat brusque manner in which in the senate he occasionally gave expression to his republican sympathies—what Taci- tus (Anu. ili. 75) calls his incorrupta hbertas—proved an obstacle to his advancement, and his rival; Ateius Capito, who had unreservedly given in his adhesion to the ruling powers, was unfairly promoted by Augustus to the con- sulate, when, in ordinary course, the appointment should have fallen to Labeo; the result was that, smarting under the wrong that was done him, he declined to accept the office when it was offered to him in a subsequent year (Tac., Ann. ii, 75; Pompon. in fr. 47, Dig. i. 2). From

this time he seems to have abandoned politics, and devoted his whole time to jurisprudence, with which his name is much more prominently connected. His training in the science had been derived principally from Trebatius Testa, although he had also diligently attended the public audiences of most of the more eminent lawyers of the later years of the republic. To a profound knowledge of the law as he had received it from them he added a wide general culture, devoting his attention specially to dialectics, philology (grammatica), and antiquities, as valuable aids in the exposition, expansion, and application of legal doctrine (Gell., xiii. 10). Capito, in a letter preserved by Gellius (xiii, 12), says of him " nihil haberet nisi quod justum sanctumque esse in Romanis antiquitatibus legisset ;" and this has sometimes been thought irreconcil- able with the statement of Pomponius (fr. 47, Dignis 2) that in law he was an innovator. But the observations of Capito refer to what he calls Labeo's absurd craze for freedom—his horror of anything out of the old current of constitutional practice (which had led him, as Capito relates, into the ridiculous extreme of indignantly resenting as unauthorized, the courtesy of a tribune who had ordered an officer simply to summon him to answer to a complaint, instead of apprehending him). In_ his jurisprudential teaching and advising there was none of this dogged indisposition to deviate from the paths of his predecessors, It was the characteristic of his rival Capito to stand as much as possible within the old lines,—« in his, que ei tradita fuerunt, perseverabat " (Pomp. in fr. 47, Dig. i 2); that of Labeo was, with the aid of his dialectic, philology, and antiquities, to dissect a received doctrine so as to reach its innermost ratio, and from this to start afresh, and give

the doctrine a more accurate expression and a variety of new developments. His success in this new method is attested by the position he took among his contemporaries, and the reputation in which he was held by his successors, Down to the time of Hadrian his was probably the name of greatest authority; and the fact that several of his works were abridged and annotated by later hands testifies to the estimation in which they were held by practitioners. While Capito is hardly ever referred to, the dicta of Labeo are of constant recurrence in the writings of the classical jurists, such as Gaius, Ulpian, and Paul;

and no inconsiderable number of them were thought worthy of preservation in Justinian's Digest. Labeo gets the credit of being the founder of the Proculian sect or school, while Capito is spoken of as the founder of the rival Sabinian one (Pomponius in fr. 47, Dig. i. 2). It is doubtful whether this statement is quite accurate. Labeo certainly taught in some way or other ; for it is recorded of him that he devoted six months of the year to giving professional advice and instructing his pupils in Rome, while the other six he spent in literary work at his country seat. But the lecturing stdtzones of which Gellius speaks (xiii. 13) had not by that time been established, and it is probable that the real founders of the two schole were Proculus and Sabinus, followers respectively of the methods of Labeo and Capito. Such conjunctions (in reference to peculiar doctrines of the schools), as "Proculus et Pegasus," "Sabinus et Cassius," are very frequeut ; but the name of Labeo or Capito in conjunction with another is of the rarest occurrence. There is not a single case in the texts in which the latter is credited with the introduction of a doctrine of the Sabinians, and only one or two in which Labeo is spoken of as the author of a doctrine of the other school.

Labeo's most important literary work was the Libri Posteriorum, so called because published only after his death. So far as can be judged, they contained a systematic exposition of the common law in at least forty books, after the order of the commentaries of Q. Mucius Scevola, They scem to have been epitomized by Javolcuus, who was a leader of the Sabinian school ; and numerous excerpts from them, some from the original, others from the epitome, are preserved in Justinian's Digest.. His Libri ad Edictum, frequently referred to by Ulpian and Paul, as well as by earlier writers, embraced a commentary, not only on the edicts of the urban and peregrine pretors, but also on that of the curulc ediles, His Probabiliwm (mibavév) Lib. VITI.,a collection of definitions and axiomatic legal propositions, seem to have been one of his most characteristic productions ; they were abridged and annotated by Paul, and occasionally criticized by him with some severity. Amongst the writings of Labeo which we know only by report were Commentarii de jure pontificio, Commentarit ad XII. Tabulas, Libri Epistolarum, and Libri Responsorum. Sce Van Eck, "De vita, moribus,

et studiis M. Ant. Labconis," Franeker, 1692, in Oelrichs's Thes. Nov., vol. i.; Mascovius, De Sectis Sabinianor. et Proculianor., 1728; Dirksen, " Ucber die Schulen der Rom. Juristen," in his Beitrige zur Kunde des Rim. Rechts, 1825; Pernice, M. Antistius Labeo,—Das Rim. Privatrecht im ersten Jahrhunderte der Kaiserzeit, Ist and 2d vols., 1878 and 1878.

LABERIUS, Dzcimus (105-43 3.c.), a Roman knight and a prolific writer of mzmz, or farces, was born about 105 Bc. Of his life we know little; but from the scattered notices of him in the old writers we can gather that he was a man of caustic wit, who wrote his pieces for his own pleasure, and enjoyed some consideration among his contemporaries, In 45 pc. Julius Cesar, promising him 500,000 sesterces, ordered him to appear in one of his own mimi in a public contest with the actor Publius or Publilius Syrus. Laberius pronounced a dignified pro- logue on the degradation thus thrust on his sixty years, and in the course of his acting directed several sharp allusions against the dictator. Ccsar awarded the victory to Syrus, but restored Laberius to his equestrian rank, which he had forfeited by appearing asa mimus. La- berius died at Puteoli in January 43 pc. He was the

chief of those who introduced the mimus into Latin literature towards the close of the republican period. He seems to have been a man of learning and culture, but his pieces did not escape the coarseness inherent to the class of literature to which they belonged; and Aulus Gellius (xvi. 7, 1) accuses him of extravagance in the coin- ing of new words. The titles of forty-four of his mimi have been preserved; and what fragments remain have been collected by Ribbeck in his Comicorum Latinorum Reliquiz, 1855, 2d ed. 1873.

LABIENUS, Trrvus, Julius Cesar's propretor in Gaul, first attracted his leader's favour in a civil capacity. In 63 B,c. he appeared at Czesar's instigation as the prosecutor of Rabirius for perduellio; and in the same year, being tribune of the plebs, he carried a plebiscitum that indirectly secured for Ceesar the dignity of pontifex maximus. The military talent of Labienus was respectable, though not brilliant ; but

of all the officers trained under Ceesar in his Gallic campaigns he was the most trusted. His chief exploits in Gaul were the defeat of the Treviri under Indutiomarus in 54 B.c., his expedition against Lutetia (Paris) in 52 B.c., and his victory over Camologenus and the Audui in the same year. In 50 Bc. he was left in command of Gallia Cisalpina, while Cesar returned to the north; but, on the outbreak next year of the civil war between Caesar and Pompey, Labienus was one of the first to desert Cesar. His motive is perhaps to be looked for, not so much in a deliberate calculation of chances, as in an overweening sense of his own importance, not adequately recognized by Czsar. He was rapturously welcomed on the Pompeian side ; but he brought no great strength with him. The veterans remained true to Cesar, and even the town of Cingulum, on which Labienus had lavished much of his wealth, opened its gates to the future dictator. The ill fortune of Labienus under Pompey was as marked as his success had been under Ozsar's auspices. From the defeat at Pharsalia to which he had contributed by affecting to despise his late comrades, he fled to Africa. There, indeed, he was able by mere force of numbers to inflict a slight check upon Czesar at Ruspina in 45 B.c.; but when the defeat at Thapsus ruined the Pompeian party in Africa, Labienus withdrew to join the younger Pompey in Spain. At Munda, on March 17, 45 3B.c., he again met Cesar, and in the ensuing defeat of his party fell sword in hand.

See the authorities referred to under Caesar; and Baron Carra de Vaux, Expédition de Labienus contre Lutéce, Paris, 1876.

LABOUR anp LABOUR LAWS. With some excep- tions in the case of labour imposed as a punishment for crime or as a test or condition of aid to the poor under the poor laws, the labour here to be spoken of is labour by freemen,—that is to say, labour by persons having the primary right to choose whether they will labour or not, and to choose the terms on which they will consent to labour, if labour be their choice. Further, although voluntary labour of men is undertaken from various motives,—for their own profit, for self-preservation, for love, from public or private duty apart from the prospect of immediate gain, —the labour now treated of relates especially to that rendered to others

for pecuniary reward, for money or money's worth,—in other words, for wages. This class of persons consists of all those who serve their employers by hand labour, whether rude or skilled, in any branch of productive industry or manufacture, including agriculture, mining, and the like, as well as the processes by which skilled artisans elaborate raw material to its final destination and use. Purely domestic service and the service of shopmen and clerks, as well as the work of contractors for the service of others, who do not work with their own hands, is excluded from specific notice here. The labourers falling within the class thus popularly de-

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scribed comprise upwards of a moiety of the present adult male population of the British Isles.

Although this article deals with free labour, the present position of the free labourer cannot be rightly understood without a glance at past history, and some attention to the distinction between voluntary and forced labour.

In every age and country, until times comparatively recent, compulsory personal servitude appears to have been the lot of a large, perhaps the greater, portion of mankind,! The slave was a man who had been captured in war or procured by purchase, or who had surrendered himself to the dominion of another as the alternative of starvation or in discharge of a debt, and it was his hands that tilled the soil, dug the mine, wove the cloth, and built the walls in ancient Greece and Italy. It has been asserted that in the early state of Rome the proportion of slaves, who were valued as property, was more considerable than that of hired servants, who could be computed only as an expense. It was thought more for the interest of the merchant or manufacturer to purchase than to hire his workmen, and in the country slaves were employed as the cheapest and most laborious instruments ofagriculture. On the other hand, it has been inferred from our scanty materials that, as the Roman empire extended, the agricultural labourer and the citizen in Spain, Gaul, and Britain, in Syria and Egypt, maintained himself, as in the present day, by his own labour and that of

his household, without the aid of any slave; but this is probably too favourable a picture. In the decline of the Roman empire, Roman captives were taken home by the northern conquerors. The useful craftsmen—smiths, carpenters, workmen in the metals, shoemakers, tailors, dyers, and others—employed their skill for the use or profit of their masters; while those who were destitute of art but capable of labour were condemned, without regard to their former rank, to tend the cattle and cultivate the lands of the victors. This, however, was only turning the tables on the Romans, for capture in war forms one of the principal sources of supply of slaves wherever slavery exists.

The Germans, in their primitive settlements, were accustomed to the notion of slavery, incurred, not only by captivity, but by crimes, by debt, and the wager of personal liberty in gaming. In the glimpses we get of the conditions of labour elsewhere the same essential features are discernible. In the changes of time and of geographical area of observation the harsher word slave may disappear ; yet the thing not only survived the introduction of Christianity but was long regarded as not inconsistent with it, and was recognized as a national institution in civilized Europe. Whether under the name of slavery or of serfdom, or without either name, north, south, east, and west, an absolute right, apart from contract, to earnings and to the person of the labourer was accepted, if not openly vin- dicated. In looking at the present day at the vestiges of man's former and most permanent handiwork, it is instructive to regard them with an eye to the distinctions between periods of forced and voluntary labour. The pyramids of Egypt and the wall of China are monuments of slave labour ; and the same is the case with the classic remains at Athens and Rome, so far at least as relates to the labour involved in the quarrying and hewing of stone, and the making of bricks and placing them in position. As regards Britain, our knowledge is too slight, and the conjectures as to the origin and objects of such structures as Stonehenge and Avebury are too varied, to aliow of positive assertion; but it seems legitimate to conclude that the labour was forced. British and Roman camps

1 "The simple wish to use the bodily powers of another person as & means of ministering to ome's own ease or pleasure is doubtless the

foundation of slavery, and as old as human nature’ (Maine).

and earthworks for military purposes probably exhibit the result of organized military labour combined with the forced labour of the inhabitants of the district. In this aspect the fortresses and defences destined for use conse- quent on the campaigns of a Cesar or a Napoleon, of an Alexander or a Clive, do not materially differ. The remains still to be seen of Agricola’s works on the line between the Firths of Clyde and Forth, as well as of the Roman walls and roads throughout England, and the later but ruder gigantic earth work of the Mercian king between England and Wales, may be regarded as fruits of slave labour. The stupendous aqueducts of Roman brickwork in various parts of southern Europe are naturally compared with the viaducts of the present age. The comparison may well extend to the accompanying conditions of labour.

Passing over the general effect of serfdom throughout northern Europe, and of the gradual manumission of toilers, as only a minute part of a very large subject, and directing our attention to the conditions of ordinary daily labour in the earliest period of the history of the British islands, we find it necessary to classify labour in relation to its particular application.

At the present day the most obvious natural distinction to be observed in this connexion is that between the labour of the husbandman on the one hand and the labour of the mechanic and artisan on the other, a distinction to some extent parallel with a division into rural and urban labour. In an attempted division of labour in this country recorded in writing, which, although not in its present form earlier than the 15th century, and distorted by a fanciful notion of adapting everything to triads, probably gives us a knowledge of a very primitive people, the following divisions of labour are found:—(1) domestic art, with its three primary branches—husbandry or cultivation of land, pastoral cares, and weaving ; and (2) mechanical arts—smith craft, carpentry, and stone-masonry (Ancient Laws, de., of Wales, 1841).

The social status of these various labourers is a very difficult question. It seems clear that the heads of departments of labour, although working for the lord or chief, were freemen. The authority just cited expressly says that smiths, stone-masons, and carpenters had equal privileges, and every one following those trades was entitled, besides his maintenance and firing, to a fixed measure of land for cultivation, independently' of what he might have by birthright. It is clear that there must have been subdivisions, as in the present day, between craftsmen and labourers engaged in the same trade, as between a mason and his labourer, between a ploughman and the driver of the team, and between the shepherd responsible for the flock aud the cowherd who merely drove cattle to and from the pasture; a freeman might perform 'one branch of duty and an absolute slave or serf another on the same land, and for the same chief or head. It cannot be denied that slavery in the strictest sense was au institution among the Saxons in England, and that in the earliest English laws such slaves are found, but the true slave class was a small one, and it has been doubted whether the labour of an ordinary serf was practically more severe, or the remuneration in one form or another much less, than that of an agricultural labourer in some parts of England at this day. On the other hand a fully qualified freeman might be a simple husbandman. –

Of the main conditions of labour at an early period in English towns we have no details. With the gradual development of urban populations around the castle of the lord, it is improbable that in any great number of cases the inhabitants long continued in the condition of personal serfage. The city populations of this island had not the habit and use of slavery. Serfs and oppressed labourers

from adjacent estates may have been glad to take refuge from taskmasters more than ordinarily severe, but there is no doubt that freemen gradually united with them under the lord's protection, that strangers engaged in trade sojourned among them, and that a race of artisans gradually grew up in which original class feelings were greatly modified. From these and other causes the distinctions between agricultural labourers and mechanics and artisans grew and became permanent.

Proceeding to notice the legislation of England on the subject of labour, we observe, in passing, that the pro- visions of Magna Charta were not in the interests of labour. The stipulations against the forced building of new bridges and embankments, and for removing all weirs in rivers, were not by way of protest against involuntary labour, but in relief of a higher class. Direct legislation on labour dates as far back as the twenty-third year of the reign of Edward ITl., when the first Statute of Labourers was passed. The population had been much reduced by pestilence, and the demand for labour naturally led working classes to insist on higher wages, and there were “some rather willing to beg in idleness than by labour to get their living.” The statute reciting these facts, and the “lusts especially of ploughinen and such labourers, ” enacted that “every man and woman of our realm of England, of what condition he be, free or bond, able in body, and within the age of threescore years, not living in merchandise, nor exercising any craft, not having of his own whereof to live, nor land about whose tillage he might employ himself, nor serving any other,” should be bound to serve if he is in convenient service, his estate considered, at the wages accustomed to be given in the twentieth year of that reign, or five or six years before. If he refused, he was to be com- mitted to jail till he found surety to enter into the service. No persons were to pay more than the old wages, upon pain of forfeiting double what they paid. If the lords of the towns or manors presumed to infringe the law, they were to be sued for treble the sum paid or promised by them or their servants. Artificers and worknien were put under the same restrictions, upon pain of imprisonment for taking more. This statute is remarkable as the first in which any notice occurs of the free labourer for hire, for the necessity of a statute to force him to work at fixed wages recognizes his otherwise free state.

A statute passed two years later (25 Edward IIL), reciting that the earlier ordinance was disobeyed, contained minute regulations as to wages. If labourers or artificers left their work and went into another county, process was to be issued to the sheriff to arrest and bring them back. In 1360 (34 Edward III.) the former Statute of Labourers was confirmed, except that labourers were not to be punished by fine and ransom. Instead thereof, the lords of towns (sezgnewrs des villes)

might take and im- prison them for fifteen days if they would not do as required by law, and then send them to the next jail, “there to abide without bail till they will do so according to the statute.” The statute enacted that “ all alliances and covins of masons and carpenters, and congregations, chapters, ordinances, and oaths betwixt them made, or to be made, shall from henceforth be void and wholly annulled, so that every mason and carpenter, of what condition soever he be, shall be compelled by his master to whom he serveth to do every work that to him pertaineth to do, either of free stone or of rough stone, and also every carpenter in his degree. But it shall be lawful to every lord or other to bargain and covenant for their works in gross with such labourers and artificers when it pleaseth them, so that they perform such works well and lawfully, according to the bargain and covenant with them thereof made.” A workman absenting himself from his service,

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and going to another town or county, was to be proceeded against under the previous statute, to outlawry, to be followed by imprisonment till he did as required by law, and made satisfaction to the party ; nevertheless he was to be burnt in the forehead with the letter F, ‘“‘in token of the falsity,” if the party aggrieved so required, and if the justices should so advise. ight years later, in the same reign (1368, 42 Edward III.), the statute and ordinance con- cerning labourers was confirmed, and commissions directed to justices to hear and determine matters concerning it.

Indubitable records still exist, proving that before the passing of those statutes, and down to the 15th century, workmen of various descriptions were pressed by writs addressed to sheriffs to work for their king at wages, regardless of their will as to the terms and place of work. Diggers and hewers of stone, masons, and car- penters, as well as ordinary labourers, were so impressed, and by services thus obtained the buildings at Windsor for the Knights of the Round Table, on the institution of the order of the Garter, were erected. In this case the sheriffs were commanded to take security from the workmen not to

depart from Windsor without the per- mission of William of Wykeham, the king's surveyor. Notwithstanding these precautions, many workmen, so impressed, secretly left, in order to work for other persons at higher wages, and writs were directed to the sheriffs of London, commanding them to make proclamation pro- hibiting any person from employing or retaining any of the workmen on pain of forfeiting all their goods, and, as regards the workmen, commanding their arrest and im- prisonment.!

An Act was passed in the reign of Richard II. (1388, 12 Richard II.) by which no servant or labourer, whether man or woman, could depart out of the hundred to serve elsewhere, unless bearing a letter patent under the king's seal, expressing the cause of going and the time of return. Wages were fixed in a way that shows the classification of agricultural labour. The " bailiff for husbandry " stands first. The "master hine," the carter, and the shepherd are on an equality; the ploughman follows; after him the oxherd and cowherd, then the swineherd, the dairy- maid and other women receiving equal wages, and every other labourer and servant according to his degree; no ser- vant of artificers is to take more than the servants and labourers above named after their estate. The givers and takers forfeited the excess, or double or treble if at- tainted before; "'and, if the taker so attainted have nothing whereof to pay the said excess, he shall have forty days imprisonment." This was followed by a re- markable clause: 'also it is ordained and assented that he or she which useth to labour at the plough and cart, or other labour or service of husbandry, till they be of the age of twelve years, shall from thenceforth abide at the said labour, without being put to any trade or handi- craft ; and, if any covenant or bond of apprenticeship be from henceforth made to the contrary, the same shall be holden for none." By a statute of the following year (13 Richard II.), the justices were to settle and proclaim be- tween Easter and Michaelmas what should be the wages of day labourers.

These proceedings were no doubt founded on notious of the royal prerogative, of which the impressment of seamen affords a more recent illustration. This forcing men to work for the king at low wages may be contrasted with proceedings within the present reigu. Workmen

employed in building the Queen's Palace at Westminster (the Houses of Parliament) struck for wages in the winter of 1841, and, having nothing to do, availed themselves of vacant seats in the Court of Queen's Bench, where her Majesty was constructively present. Here they were seen from day to day enjoying the comfortable temperature, undisturbed by

any fear of writs or other compulsory process to force them to return to their work,

Early in the 15th century we have a glimpse of something beyond this continued legislation interfering with freedom of labour, in a reservation in favour of children being sent to school, An Act of 7 Henry IV., putting a property qualification on apprenticeship and requiring children to be put to such labour as their fathers or mothers are of, or as their estates require, on penalty of one year's imprisonment, fine, and ransom, and of one hundred shillings for receiving such apprentices, has this sentence: "' But any person may send their children to school to learn literature." Labourers and artificers are to be sworn to observe the statutes in force or be put in the stocks, and a penalty is imposed on towns neglect- ing to have stocks. In 1414, by a statute (2 Henry V.) reciting that the servants and labourers of the shires of the realm flee from county to county because they would not conform to the law, and because the law was not put in force in every county, the former Acts were confirmed and directed to be put in force and proclaimed by the sheriff. Justices of the peace were empowered to send writs to the sheriffs for fugitive labourers in like manner as the justices have power to send to every sheriff for the felons or thieves before they are indicted, and to examine all kinds of labourers, servants, and their mastcrs as well as artificers, and to punish them upon confession in accordance with the statutes.

Early in the following reign (2 Henry VI, 1423) further power was given to justices to compel by process an appearance before them of masters as well as servants for examination'as to the execution of the statute of Henry V., and to give offenders a month's imprisonment.

Four years later (1427) the conclusion was drawn that the statutes of Richard IL. were faulty,—that of 12 Richard IT. because it was too hard upon the masters, that of 13 Richard II. because no penalty was attached to its breach; and, besides remedying the defects, it was enacted (6 Henry VI. c. 3) that justices should fix and make proclamation of wages. Two years earlier (1425) legis- lation had been directed against meetings of masons. The statute 3 Henry VI.c. 1 recites that, “by the annual con- gregations and confederacies made by masons in their general chapters assembled, the good courses and effect of the Statutes of Labourers are publicly violated and broken, in subversion of the law, and grievous damage of all the commonalty”; and such chapters and con- gregations were forbidden. It was made felony to cause them to be assembled and held, and masons attending them were to be punished by imprisonment and fine. In 1444 (23 Henry VI.) a scale of wages in agriculture and trade was fixed (including freemasons and “rough ” masons, master carpenters and mesne carpenters, and master tilers and slaters), and a servant in husbandry was required before departing to give half a year’s warning or else to serve his master the year following. Persons refusing to serve or labour were to be committed to jail, there to remain until they found sufficient surety to serve, and masters were entitled to a fixed fine on such.

A statute towards the close of the 15th century (1495, 11 Henry VIL.) referring to previous statutes, especially to the 23 Henry VI., and complaining of their inadequacy or imperfect execution, proceeds to fix the wages of artificers and labourers with great minuteness. This Act contained a remarkable clause against unlawful con- spiracy by workmen engaged in building ; if such artificers or labourers ‘‘make or cause to be made any assembly to assault, harm, or hurt any person assigned to control and oversee them in their working, that he or they so offending have imprisonment for a year without letting to bail or mainprise, and further to make fine at the king’s will.” It is not surprising that even with so very limited

knowledge of principles a short time sufficed to show how ineffectual minute legislation was to control wages. The statute was repealed in the following year, “for divers and many reasonable considerations and causes, the king’s highness moving, and for the common wealth of the poor artificers, as freemasons, carpenters, aud other persons necessary and convenient for the reparations and buildings, and other labourers and servants of husbandry.” But what is surprising is that (although the first legislation of the 16th century was in favour of masters!) we find in 1514 a statute regulating wages and hours of work and even the summer day sleep of artificers and labourers, and in fact a re-enactment of the law of 1495.2 The London workmen could not endure this restriction as to wages, and in the following year were allowed to take the previous rate when working within the city or its liberties ; the king’s works were, however, excepted. ar

At this point it is necessary to refer to the provisions made against vagrancy in the 16th century, these being closely connected with compulsory labour. The great social revolution caused by the suppression of the monas- teries, and by the consequent withdrawal of the support which those institutions afforded to the indigent, and too often to the idle, had led to the dispersion over the face of the country of a multitude of beggars, many of whom were able to work but preferred idleness, often add- ing theft and robbery to mcndicancy. Under these circum- stances harsh and cruel statutes were passed in the reigns of Henry VIIL, Edward VL, and Elizabeth.

In 1530 (22 Henry VIIL) any person, being whole and mighty in body and able to labour, found begging or being vagrant, and giving no satisfactory account how he lawfully obtained his living, might be arrested by a constable, and a justice might, in his discretion, cause every such idle person to be taken to the nearest town and there tied to the end of a cart naked, and to be beaten with whips throughout the town “till his body be bloody by reason of such whipping.” He was then required to take an oath to return to his home “and put himself to labour as a true man ought to do.” The whipping was to be repeated as often as he made default; but five years later the punish- ment for “ruftlers, sturdy vagabonds, and valiant beggars ” persisting in not

working after a whipping was increased to having the upper part of the gristle of his right ear clean cut off. If still persistent he was to be tried, and executed as a felon.

On the accession of Edward VI. a law was passed by which a serving man wanting a master, or loitering or wandering, and not applying himself to honest labour, might on conviction be marked with the letter V, and adjudged to be the slave for two years of the person buying him, giving him only bread and water or small drink, and such refuse of meat as the master should think fit, and causing him to work by beating, chaining, or otherwise. If he ran away he might not only be punished by his master in the same way, but the justices, on conviction, were to have him marked on the fore- head or ball of the cheek with an hot iron with the letter 8, and adjudge him to be the master's slave for life. If he again ran away the offence became felony, and he was to suffer the pains of death "as other felons ought to do." Any child of a vagabond, above the age of five and under fourteen, might be adjudged the servant or apprentice of any person willing to take it until the age of twenty-four ifa male and twenty if a female; if it ran SS a Sr rr re

1 In 1512 (4 Hen. VIII.) the penalties for giving of wages contrary

to the statute 12 Rich. II. were repealed so far and only so far as re- lates to the masters.

2 Miners and workers for tin, lead, iron, or silver, colliers for sea coal, and glass makers were excepted.

away slavery followed for life. The master might put a ring of iron about the neck, arm, or leg of his slave to prevent his running away, with a penalty on any person helping him to take it off, and if the slave resisted correc- tion he was to be executed as a felon, The slave might be sold or devised by will as other goods and chattels. This statute was repealed three years after, but it remains on the rolls of parliament, and nothing can obliterate the fact and the consequent disgrace attaching for all time to the parliament that could pass such a law, and to the country that could endure it for a day. This reintroduc- tion of slavery

in England by name, and in its worst form, is memorable, and serves to mark the alteration of opinion and feeling that has since taken place, much more than any contrast between freedom of labour and wages in the sense of the political economist.

Early in the reign of Elizabeth (5 Elizabeth, 1562) the statute commonly called “the Statute of Labourers” repealed all former statutes relating to labourers in husbandry and artificers or labourers engaged in particular trades, and consolidated and amended many former pro- visions. Its chief object was to provide a new rate of wages, and, in addition, to regulate in many respects the terms of employment as between the employer and the employed. This Act admits that the wages laid down by former statutes are in divers places too small in view of

the general rise of prices, but approves of the principle –

and aims of previous legislation, the substance of which it seeks to digest into a single statute. The statute draws a main distinction between artificers and labourers in husbandry. The former may not be hired for a less term than a year, and any unemployed person brought up in a craft or who had practised it for more than three years was bound, on pain of imprisonment, to accept service if required “by any person using the art or mystery wherein he has been exercised,” unless he had a farm in tillage, an estate worth 40 shillings a year, or goods to the yearly value of £10. Similar provision was made in respect of service in husbandry. Every person between the ages of twelve and sixty was in like manner bound to serve in husbandry unless possessed of property of specified amount, or employed as a fisherman or mariner, or in mining, or in any of the arts or sciences previously mentioned, or unless born a gentleman, or unless a member of a university or school. Minute regulations were made wiih reference to the rights and obligations both of master and servant. No person retained in hus- bandry or trade was to go out of the county or shire where he last served, to serve in any other, without a testimonial, No person leaving his service could be taken into another without showing such testimonial to the authorities of the place in which he was about

to serve. If he broke this regulation he was to be imprisoned till he could procure a testimonial, and unless he did so within twenty-one days he was to be whipped. Every person retaining a servant without the latter showing such testimonial forfeited £5. Besides empowering justices in session to make a rate of wages, the statute fixed with great minuteness the hours of labour. In the time of harvest, justices or constables or other head officers might require artificers and persons meet for labour to serve by the day in mowing, reaping, shearing, getting, or turning of corn, grain, or hay, accord- ing to the skill and quality of the person, and upon refusal might put him in the stocks for two days and a night. Even single women between the ages of twelve and forty might be compelled to serve in such employment as the justices might direct, under pain of imprisonment. Amended provision was made towards the close of the reign for justices yearly fixing the rate of wages.

It will be seen by the preceding summary how great

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were the restraints still placed by the legislature on the free action of labour. After this mass of uuwholesome legislation it is instructive to notice the state of the labour- ing classes in England in the 16th century, as recorded by Harrison. After dividing English people into four sorts— gentlemen, citizens or burgesses, yeomen, and artificers and labourers—and describing the first three classes, he says :-—

‘The fourth and last sort of people in England are day labourers, poor husbandmen, and some retailers (whieh have no free land), eopyholders, and all artificers, as tailors, shoemakers, earpenters, brickmakers, masons, &e. As for slaves and bondmen, we have none; nay, such is the privilege of our country, by the especial grace of God

and bounty of our prinees, that, if any come hither from other realms, so soon as they set foot on land they become so free of eondition as their masters… . This fourth and last sort of people have neither voice nor authority in the common wealth, but are to be ruled, and uot to rule others; yet they are not altogether neglected, for in cities and corporate towus, for default of yeomen, they are fain to make up their inquests of such manner of people, and in villages they are com- monly made churchwardens, sidemen, ale conners, now and then constables, and many times enjoy the name of headboroughs. Unto this sort also may our great swarms of idle serving-meu be referred, of whom there runneth a proverb, Young serving-men, old beggars, because serviec is none heritage…. This, furthermore, ainong other things I have to say of our husbandmen and artificers, that they were never so excellent in their trades as at this present. But, as the workmanship of the latter sort was never more fine and curious to the eye, so was it never less strong and substantial for continu- ance and benefit of the buyers. Neither is there anything that hurteth the common sort of our artificers more than haste, and a barbarous or slavish desire to turn the penny, aud by ridding their work to make speedy utterance of their wares; which enforceth them to bungle up and despatch many things they care not how so they be out of their hands, gc the buyer is often sore defrauded, and findeth to his cost that haste maketh waste, accord- ing to the proverb. Oh, how many traders and handicrafts are now in England whereof the commonwealth hath no need! How many needful commodities have we which are perfected with great cost, &c., and yet may with far niore ease aud less cost be provided from other countries if we could use the means! I will not speak of iron, glass, and such like, which spoil much wood, and yet are brought from other countries better cheap than we can make them here at home. I could exemplify also in many others,”

Notwithstanding compulsory legislation, and the forcing of labour for the sovereign already noticed, it is evident that the condition of the labourer, even when employed on royal property, was undergoing amelioration. In a remarkable but apparently unpublished letter of Humphrey Mitchell, surveyor of the queen’s works at Windsor (and for some time member of parliament for that borough), to Lord

Burghley, written in 1575, he says— ‘ At my first entry into this charge I could scarce get workmen by commission ; since, with monthly ‘ payes,’ impressing through the mayor those contumacious in work, rewarding the diligent, and thrusting out the evil where I perceive them loitering, I have brought them into such an obedience and a desire to work here that where I have one I can have twenty to serve her Majesty; and when at the first entry into the works, they had their breakfast at eight of the clock in the morning, and drinking at three in the afternoon, I have taken that idle custom from them, and have only allowed them two hours at noon, and, as necessity serveth, some- times but one, with their contentation ; and for that also I would have them they must know their duty, I bring them to the lecture at the college [Windsor] twice every week, losing no hour’s work thereby, for those days they Test at twelve. I suffer not a swearer nor filthy talker in the works to my knowledge, by all which means I think her Majesty hath her work done as diligently as any other private man hath.”

_ Light is thrown on the arrangement of hours by a clause In the above-mentioned Statute of Labourers of the fifth year of the Queen’s reign. It enacted that—

‘All artificers and labourers being hired for wages by the day or week shall, betwixt the midst of the mouths of March and Septem-

ber, be and continue at their work at or before five of the clock in the morning, and continue at work and not depart until betwixt seven and eight o’elock at night (except it be in the time of breakfast, dinner, or drinking), the which time at the most shall not exceed above two hours and a half in a day, that is to say, at every drink- ing one half hour, for his dinner one hour, and for his sleep when he is allowed to sleep, the which is from the midst of May to the midst of August, half an hour at the most, and at every breakfast one half hour; and all the said artificers and labourers betwixt the midst of September and the midst of March shall be and continue at their work from the spring of the day in the morning until the night of the same day, except it be in time afore appointed for breakfast and dinner, upon pain to lose and for- feit

one penny for every hour's absence, to be deducted and de- Jaulked out of his wages that shall so offend."

In the first parliament after the accession of James an attempt made towards the close of the previous reign to enforce the rating of wages and the payment of the rated amounts was renewed, 'The Act recites, in the same terms as were used only two years before, that the Act of 1562 "hath not, according to the true meaning thereof, been duly put in execution," and, in order to remove a doubt as to the application of the principle of assessing wages, expressly extends it "to rate wages of any labourers, weavers, spinsters, or workmen whatsoever, either working by the day, week, month, year, or taking any work at any person or persons' hand whatsoever, to be done in great or otherwise." The giving or receiving more or less than the proclaimed price was expressly declared to be an offence.

In Scotland we: find complaints in the 16th century by masters of salt-pans of the great rise in wages, and early in the 17th century (1617) justices were directed to fix at quarter sessions the ordinary rate of hire and wages of workmen, labourers, and servants, and to imprison those who refused to serve for the appointed hire. At the same time, "that servants may be the more willing to obey the ordinance," power was given to the justices to compel pay- ment of wages. This law was re-enacted in 1661. Some years previously (1606) any one hiring a collier or salter without a sufficient testimonial from his last master was com-pelled to deliver him upif demanded; and colliers and salters were empowered to apprehend vagabonds and sturdy beggars and force them tolabour. In 1621, in consequence of " the great straits and necessities that the poor labourers of tlie ground" were driven to by the "fraud and malice " of servants who either refused to be hired without the promise of great wages, or else hired themselves from Martinmas to Whitsunday, then "casting them loose" on purpose to make their gain and advantage by extraordinary works, such as casting and winning peats or turfs, building fold dykes, and shearing in the harvest, hired servants were forbidden to leave unless upon proof to a justice of the peace that they were hired to another. If it was found that a servant was not so hired, his master was em- powered to detain him at the

previous rate of wages. Power was given to apprehend a servant “who broke loose,” and to deliver him to a constable or justice, and a power to all persons to apprehend loose and masterless men and women found within their own bounds; and the justices and constables were empowered to compel them to serve for competent hire and wages. ‘Twenty years later servants in manufactories were compelled to work at reasonable rates, and not to hire without their previous master’s consent. Houses of correction were erected for disobedient servants, and in 1672 masters of correction houses were empowered to receive such servants and to force them to work, and to correct them according to their demerits. These later laws of Scotland were accompanied by others directed against vagrancy.

Passing over legislation which either affected only particular trades (although denoting the growth of manu-

facturing industry), or related rather to the poor laws than XIV. — 22

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directly to the subject of this article, and arriving at the middle of the 18th century, we find the legislature no longer employed in compelling labourers or artisans to enter into involuntary service, but regulating the summary jurisdiction

of justices in the matter of disputes between employers and >

employed, in relation to contracts and agreements, express or implied, presumed to have been entered into voluntarily on both sides.

The statute 20 Geo. II. c. 19 (passed in 1746) provided that all complaints, differences, and disputes arising between masters and servants in husbandry hired for one year or longer (extended by a subsequent statute of the same reign to those hired for less than a year), or arising between masters and artificers, handicraftsmen, and miners (applied in 1829 to labourers of every sort), were to be determined by one or more justices, who, upon complaint of the servant, might determine any dispute as to wages and order payment of

any sum found to be due, not exceeding £10 in case of a servant in husbandry, and £5 in case of artificers and other labourers, and, in the event of non-payment, might levy the same by distress on the goods of the master. In case of complaint by the master, the authority of the justice was still larger. He had power to entertain a complaint of “any misdemeanour, mis- carriage, or ill behaviour of the servant in his or her service or employment,” and to hear, examine, and determine the same. If the decision was adverse to the servant, the justice might either abate some part of the wages due to such servant, or discharge him from the service, or he might punish the offender by committing him to the house of correction, “there to be corrected,” which term was held to mean correction by whipping and holding to hard labour for a reasonable time, not exceeding a month.

A statute of 1823 (4 Geo. IV. c, 34), the next general statute on this subject, took a somewhat wider scope, dealing with breaches of contract on the part of the servant in not entering into the agreed service at all, as well as in quitting it before the term agreed on had expired, and subjecting these breaches as well as any misdemeanour or misconduct while in the service to the jurisdiction of the justice, who might adjudge the offender to be imprisoned in the house of correction for a term not exceeding three months (but without any power to order corporal punishment), abating a proportional part of his wages in the future, or adjudging him to lose the whole or part of his wages already earned ; or, he might dismiss him from the service.

Thus stood the statute law until 1867. In consequence of considerable dissatisfaction on the part of workmen with the adjudication of justices, a select committee of the House of Commons was appointed in the previous year to inquire into the state of the law as regards contracts of service between master and servant, and as to the expediency of amending it. That committee reported—

1, That the law as it then existed was objectionable.

2. That all cases arising under the law of master and servant should be publicly tried in England and Iveland before two or more magistrates,

or before a stipendiary magistratc, and in Scot- land before two or more magistrates, or the sheriff.

3. That procedure should be by summons in England and Ire- land, and warrant to cite in Scotland, and, failing appearance of dcfendant in answer to snmmons or citation, the court should have power to grant warrant to apprehend.

_4, That punishment should be by fine, and failing payment by cette or a

5. That the court should have power when snch is deemed advisable to order the dtendant to fulfil the cnaaee, ane also, if necessary, to compel him to find security that he will do so.

6. That in aggravated cases of breach of contract, causing injury to person or property, the magistrate or sheriff should have the power of awarding punishment by imprisonment instead of fine.

LABOUR

7. That the arrest of wages in Scotland in payment of fines should be abolished.

The Master and Servant Act 1867, sometimes called Lord Elcho's Act, was framed upon the report of the committee, and embodied most of the recommendations. As regards simple breaches of contract, the position of servants was considerably improved. Imprisonment, which, under the former Acts, the magistrate was authorized to impose in the first instance as a punishment for a breach of the contract, was taken away, except as auxiliary to the juris- diction, as the consequence of disobedience to the order of the court; and wherever imprisonment might, under the former Acts, have been accompanied by hard labour, the power to order hard labour was taken away. Lord Elcho's Act did not, however, remove the dissatisfaction felt on the part of workmen, and the events of a few years rendered it desirable to reconsider the whole law, with reference not only to breaches of contract but to other

special legislation of a criminal kind, and to the general law of conspiracy affecting the relation of employer and employed.

Commissioners reported in 1875 recommending, so far as relates to the scope of .this article, that the proceedings should be altogether divested of a penal character and assume that of a civil proceeding for specific performance or recovery of damages, and that, to effect the main object, Lord Elcho's Act should be amended or a new Act framed in clearer language. Within a few months of the presentation of the report, Mr Cross, then secretary of state, introduced two bills, the one an "Employers and — Workmen Bill," and the other a "Conspiracy and Protec- tion of Property Bill," and these bills, after undergoing considerable discussion and alteration in their different stages, were passed and came into operation on the Ist September 1875. This article only deals with the former Act. While carrying out the recommendation of the commissioners regarding Lord Elcho's Act, and placing all provisions of a penal character in a separate Act ("Conspiracy aud Protection of Property"), the legisla- ture thought fit to go further and take away the right of enforcing performance of contracts of labour (although that is a very important branch of civil procedure in relation to various matters of contract), and make it a mere question of recovery of damages, unless both parties agree that security for performance of the contract shall be given instead of damages. Adjudication can be by courts of summary jurisdiction.?

Neither this Act nor its predecessor takes away the right of parties to sue in the ordinary civil tribunals of the country; but the Act puts county courts (in Scotland the ordinary sheriff court of the county, in Ireland the civil bill court) practically on the same footing with courts of summary jurisdiction,—the jurisdiction of magistrates being simply because the county courts in most places do not sit sufficiently often for the practical adjudication of these differences. The title of the Act, 'to enlarge the powers of county courts in respect of disputes between employers and workmen, and to give other courts a limited civil jurisdiction in respect of such disputes, " indicates its general scope, which is borne out by its provisions. It

1 In England such courts are a police or stipendiary magistrate, or, where there is no such magistrate, two or more justices sitting at some place appointed for holding petty sessions, or, in the city of London, the lord mayor or an alderman sitting at the Mansion House or Guildhall. In Scotland the court of summary jurisdiction is the small debt court of the sheriff of the county. In Ireland the court is constituted of one or more of the divisional justices of the police district of Dublin metropolis, and elsewhere in Ireland of two or more justices of the peace in petty sessions, sitting at a place appointed for holding petty sessions. These courts are, for the purposes of the Act, civil courts.

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extends to "'any dispute between an employer and a workman arising out of or incidental to their relation as such." The expression ' workman" does not include a domestic or menial servant, but means any person who, being a labourer, servant in husbandry, journeyman, artificer, handicraftsman, miner, or otherwise engaged in manual labour, whether under the age of twenty-one years or above that age, has entered into or works under a contract with an employer, whether the contract be made before or after the passing of the Act, be express or implied, oral or in writing, and be a contract of service or a contract personally to execute any work or labour. Pay- ment of damages and debts under the Act, as in other cases of judgment debts, is enforceable by imprisonment for a term not exceeding six weeks, only on proof of ability and neglect to pay, whether the proceedings be in the county court or in the court of summary jurisdiction.

Two circumstances show the rapid strides made in a few years in the position of labour in relation to legislation. Lord Elcho's Act in 1867 received the title of " The Master and Servant Act." In eight years that title is silently dropped, and " Employers and Workmen" substituted. In 1867 the prime minister spoke in high terms of eulogy of Lord Elcho's Act as securing valuable rights for workmen. In 1875 the same prime minister, speaking a few weeks after the passing of the Act of

that year, remarked that for the first time in the history of the country the employer and employed sat under equal laws.

Although the general tendency of colonial legislation is to follow that of the parent country, where it can be applied, that is not the case in some important British colonies in relation to the enforce- ment of labour contracts.

In New South Wales, servants, including artificers, journeymen, and handicraftsmen, and all agricultural labourers, as well as domestic servants, are dealt with under a colonial Act of 1857. For not fulfilling a contract, whether by deserting or not entering upon the service, or for other misconduct or ill behaviour, justices upon conviction may impose a fine not exceeding £10, In default of distress, imprisonment, not excceding fourteen days, or forfeiture of wages then due may follow. Obtaining advances of money after entering into a contract and refusing to go to the place of service, or refusing to perform work to the extent of the advance without reasonable cause, is punishable by direct imprisonment with or without hard labour for any term not exceeding three months. Persons knowingly concealing or employing absconding or absent- ing servants or persuading them to violate agreements are liable to a penalty not exceeding £10, and in default imprisonment for four- teen days. On the other hand wages not exceeding £50 and full costs may be recovered by distress, and in default imprisonment for fourteen days ; masters are also liable to a penalty for with- holding property of their servants. Independently of these pro- visions, justices may hear and determine in a summary manner any complaint, difference, or dispute between a servant and his inaster, and the award may be enforced by cancelling an agreement or imposing a fine, and in default of distress by imprisonment not exceeding fourteen days. The power of imprisonment under the Act does not extend to women.

In South Australia, by an Act of 1878 (following in the main the tenor of Lord Elcho’s Act, rather than the legislation of 1875), when- ever the employer or employed neglects or refuses to fulfil any con- tract, or the employed neglects or refuses to enter or continue his service or

absents himself, or whenever any dispute arises between the partics, the case may be summarily decided by justices, wlio may order an abatement of wages due, or direct the fulfilment of the contract, with a direction to the party complained against to find security by recognizance or bond with or without suretics ; or the contract may be annulled and the amount of wages or compen- sation apportioned ; or, where pecuniary compensation will not, in the opinion of the justices, meet the circumstances of the case, they may impose a fine not exceeding £20. The neglect or refusal to find security for performance of contract may be enforced by im- prisonment not exceeding three months.

The Victorian statutes relating to master and servant were con- solidated in 1864. Under that Act all agricultural and other labourers and workmen and artisans, as well as domestic servants, werc made liable on summary conviction to imprisonment uot ex- ceeding three months, or abatement of wages, for breaches of con- tract or for disobedience or other misconduct or misdemeanour. The like imprisonment was provided for obtaining advances of wages and refusing to scrve, and also for wilful or negligent acts

ryt involving a destruction of work or materials committed to the workman's charge, in default of payment of damages (limited to £10). Wages and amends for ill-treatment were made recoverable by order.

It is impossible within the limits of this article to follow the different provisions in various colonies affecting the relation of employer and employed. To render a summary of practical value, local peculiarities and exegencies must be borne in mind. Where native or foreign races form a material part of the industrial popu- lation, or where changes have occurred in their condition, the facts must be taken into account; for example, the legislation of Jamaica, although now constituted an ordinary British colony, must be considcred in relation to the former existence of slavery and to the intermediate status of apprenticeship before its abolition. So in British Guiana, the large number of emigrants from the East Indies, many of them working on the estates under indentures, must not be lost sight of.

With regard to India, that vast area cannot be dealt with as if the industrial population consisted of Europeans, manufacturing in its cities. Although natives are increasingly sharing in the labour and ownership involved in the production of manufactures, the cultivation of the soil forms the basis of the support of two-thirds of the population. The true view of India is that as a whole it is divided into a vast number of independent self-acting organized groups, cultivating, trading, and manufacturing, governed by law made up to a great extent of local usages and customs, and where caste is often merely a name for trade or occupation,—the village communities comprising families who are hereditary weavers, pot- ters, blacksmiths, harness makers, and so forth.

The condition of the law in European states at the present time with regard to the enforcement of labour contracts is this. In France contracts of work and service stand on the same footing as other contracts. The breach of such contracts is regarded as a private matter, as the subject of a claim for damages, but not of the application of the criminal law. The recovery of damages is regulated by the Code Napoléon, The juge de paix decides the amount when the sum claimed is under 200 francs, when above that amount the tribunal of first instance. So in Belgium there is no criminal penalty attaching to the breach of a contract of labour ; such a contract entitles the aggricved party, as a gencral rule, only to pecuniary damages ; and the same is the case in the Nether- lands, Austria Hungary, Italy, Portugal, Sweden, Norway, and Russia. In Switzerland there is no criminal liability, provided the dereliction of duty involves no conscquences injurious to the public welfare or to the life or health of other persons. The performance of contracts, however, in the larger works in Switzerland is secured by the system of ‘‘décomptc,” or portion of wages retained as security by the employer. In Prussia, although in 1869 all the penal regulations previously existing against breaches of contract and wrongful cessation of work on the part of workmen in mills, mines, and metallurgical establishments and in underground quar- ries and pits were repealed, police laws are, it seems, still capable of being enforced by way of fine, and, in default, by a short

imprison- ment in some provinces, against agricultural labourers, and against boatmen or workmen engaged in special field or forest work.

Of the United States, the English representative wrote thus to the Foreign Office in 1869:—‘‘ There are few countries in which the working man is held in such regard as in the Unitcd States of America. The labouring classes may be said to embrace the entire American nation. Every man works for a living, follows a profes- sion, or is engaged either in mercantile or industrial pursuits.” As might be expected, it may be said that, as to both parties to a con- tract for labour and service, they stand upon the mere footing of contract, and such contract is not distinguished from any other con- tract. The matter does not belong to the province of federal legis- lation, but to the regulation of each particular State. There has been uo legislation, however, making the breach of a contract for labour or services the subject of criminal liability. Contracts of apprenticeship are, nevertheless, enforced by statutory provisions.

We have hitherto dealt with the mode of enforcing con- tracts of labour. It remains to speak of the extent to which the contracts themselves are controlled.

With reference to the period of service, there is no law directly limiting it. A right even to perpetual service founded on a contract may not perhaps be illegal and void ; for, if a 1nan can contract to serve for one year, there seems to be no reason to prevent his contracting to serve for one hundred years if he should so long live,—though the courts would be inclined to consider it an improvident engage- ment, and would not be very strict in enforcing it (Christian). No such perpetual contracts, however, exist 1n actual practice, and where no time is expressly stipulated or implied the contract is generally construed to endure

until determined by a reasonable notice on either side, to be construed by the general usage in relation to thie particular employment. If atime is expressed or implied, the silent continuing in the service after its expiration draws with it in general a renewal of the same terms as were

originally stipulated for. In agriculture the general engagement, express or implied, is for a year. In manufac- ture it is seldom so long, and in journeyman handicrafts it is sometimes by the hour, but the usage to calculate earn- ings and the time of payment by the hour or day is often of course quite distinct from the duration of the contract. Payment by measure or quantity (piece work) is very general, and so far as the calculation of earnings is con- cerned supersedes reference to time. Nevertheless the obligation to serve may be conditional on the employer finding a reasonable quantity of work, or may expressly or implicitly endure until a reasonable notice is given on either side. In the pottery manufacture in North Staffordshire most of the workmen in the different branches of tle trade are paid by the quantity according to a price list, the engagement being by usage, from Martinmas to Martinmas ; and in this and in most other manufactures where the artisan works on the material and in the manufactory or the workshop of the employer he is subject to the usual hours of work, although only paid by the quantity.

Most workmen of all classes and descriptions of labour are paid weekly, in whatever way their earnings accrue or are calculated. The contracts of infants (see Inrant) for their personal services as necessary for their maintenance are enforceable, for unless they could make such contracts they might starve. As long as these contracts were enforceable by imprisonment the courts looked closely into them, refusing to enforce them unless they were mutual, that is, capable of being enforced against the employer as well as against the servant. If there were an agreeinent to serve under circumstances which involved no obligation to employ, the courts would not enforce the contract, and young servants were not unfrequently discharged from custody on the ground that no obligation to serve existed by reason of the onesidedness. Contracts of APPRENTICE- SHIP (q.v.) are beyond the limits of this article.

The will of the parties is not interfered with as regards the description of labour or the adequacy of the remunera- tion agreed upon. In the absence of any verbal or written stipulation, the performance of labour upon an express or implied request in general involves an implied

agreement to pay the value of it in the current coin of the realm; and wherever a mutuality of agreement can be implied, that is to say, where it is not onesided, it can be enforced. As the employer and employed are free, they would primarily have a right to stipulate that the remuneration for service should be for something else than money, as for articles of value, or for an exchange of labour ; but the primary right of employer and employed to make their own arrangements as to the mode of remuneration is

so-called Truck Act, 1 and 2 Will. IV. c. 37, applying to all persons employed in the manufacture of iron from rais- ing the stone to the completion of the making of the pro-

ducts of iron and steel, and the manufacture of all other |

hardware and cutlery, and the getting of coal, stone and slate,

salt and clay, and the manufacture of weaving, preparation, and dyeing of woollen, worsted, cotton cloth, and silk. The object of the statute is to compel payment of wages in money. For this purpose it

prohibits agreements for paying wages otherwise, and pro- |

hibits paying them in goods or money's worth. To insure

obedience, it enables the artificer to repudiate a contract

and payment contrary to its provisions, and, however fairly he may have been dealt with, to enforce payment in such

case over again. open to two most important objections :—(1) it interferes with that freedom of contract and conduct which is universally recognized as of the greatest benefit; (2) it enables an artificer who may have requested and received payment otherwise than in money, and who may have benefited thereby and been most justly and kindly treated, to commit a great dishonesty by enforcing payment

again. But, grave as these objections are, the legislature has deemed it necessary to face them, in order to guard against the mischiefs of a system under which the workman may receive directly from his employer, or indirectly, as through ‘‘tommyshops” in which the employer has an interest, articles not a real equivalent of the wages; so that but for the statute an employer might engage a man to work for him with a promise of payment in goods, and cheat him by giving him goods of inferior quality or over- charged, or engaging him with a promise of money and then cheating him by a pressure to take goods, or by supplying the man with goods beyond his wages, get him into his debt, and then exercise an injurious control over him. It is in vain to say that the master would cheat in cases where money wages were agreed for, by withholding money agreed to be paid, and that the law would redress the one wrong as readily as the other. The answer is that such a cheat is too barefaced, and would certainly be successfully resisted ; while more or less of inferiority in the quality or value of goods might be endured, or, if contested, would give rise to more doubtful inquiries. Whether these mischiefs are worth the remedy, or whether the remedy is the best, is not the question to be discussed or deterrnined in this article.

As servants in husbandry are often remunerated in part in other ways than by money, as by land or its produce, or by house room, and in a variety of ways, the Truck Act especially exempts them. Domestic servants are also specially exempted. Moreover, by express provision, the Act does not prevent any employer of any artificer or agent of such employer from supplying or contracting to supply medicine or medical attendance, or any fuel, or any materials, tools, or implements employed by the artificer in his trade or occupation if employed in mining, or any hay, corn, or other provender for horses or other beasts of burden employed by such artificer in his trade or occupa- tion, nor from letting any tenement at a rental to any artificer, workman, or labourer within the Act, nor from supplying or contracting to supply to any artificer any victuals dressed or prepared under the roof of the employer and there to be consumed by such artificer, nor from making deductions or stoppages, or advancing money for any of these purposes, provided that only the real value is charged, and that the

agreement for any such stoppage or deduction isin writing. Employers are not prevented from advancing money to an artificer for his contributions to a friendly

F ee ‘ society or to a savings bank, or for his relief in sickness, interfered with in England by legislation, especially by the |

or for the education of his children, or from making deduc- tions for such education, if the agreement for such deduction is in writing. The interpretation of the Truck Act has exercised the most subtle intellects. It has been deter- mined by the majority of judges that the obligation to

Tender services personally is necessary to make the Act pottery, and the |

applicable. The circumstances under which stoppages and deductions may be made, and other exceptions from the

operation of the prohibitory clauses of the Act, have also

been the subject of divergent opinions. A custom having prevailed among the employers of artificers in the hosiery manufactures of letting out frames and machinery to the artificers employed by them, in 1874 contracts to stop wages for frames were declared illegal, and the stoppage of wages made unlawful. By a provision of the Employers

It is obvious that such a provision is .

tomer ae

and Workmen Act 1875, forfeitures on tle ground of absence or leaving work cannot, in the case of a child, young person, or woman subject to the provisions of the Factory Acts, be deducted from or set off against a claim for wages or other sum due for work done before such absence or leaving work, except to the amount of the damage (if any) which the employer sustained by reason of such absence or leaving work.

Great evils having arisen in Scotland through the arrestnient of wages for debts of labourers, manufacturers, artificers, and other work people, the power to arrest wages earned there not exceeding twenty shillings a-weck was in 1870 taken away, and limited in amount where the wages are above that sum. A provision of a statute of the reign of George ITL., “to prevent oppression of the labourers and workmen

employed in any respect in or about making or manufacturing of gloves, breeches, boots, shoes, slippers, wares or goods of that sort," requires the true weight, quantity, or tale to be declared of goods and materials delivered out to be wrought up in those manufactures,

The system of the "livret" (still the law in some European states, although fallen into disuse as no longer in harmony with the direction of modern views), by which it isa condition precedent to a workman entering into a contract, or being engaged by a fresh employer, to produce a document certifying that he has fulfilled his previous engagements, is unknown now in England. The former system of rules stood much on the same footing, and there is something closely resembling it introduced into the rules regulating the employment of drivers of public vehicles in the metropolis. It is only in relation to domestic service that a new employer concerns himself with the antecedents of a servant or with anything beyond the capacity to work; and the former employer in whose interests " livrets"" were imposed does not in general deem it worth while, with the present abundance of labour in every field of work, to impose any restraint on the departure of a dissatisfied workman. The practical ground of complaint is not so much a workman exchanging employers, as a neglect of work while remaining in service.

The legal remedies at present in existence for breaches of contract have been necessarily stated in the outline of the last statute on the subject of employer and employed. The weak point is the absence in England of any mode by which the performance of contracts of labour can be enforced, as contracts of other kinds can be where damages do not afford a remedy. Lord Elcho's Act of 1867 purposely gave a remedy in the nature of specific per- formance, and where carefully applied was found to work very well. The commission of 1875 expressly recom- mended the retention of this power as quite distinct from criminal punishment. Provision for compelling the per- formance of a contract exists in many countries where any application of criminal law is repudiated. Nevertheless, not so much from any objection on the part of the framers to compulsory performance as from fear of its abuse by the heavy hand (the bane of administrative

legislature as of inventive genius), the power is gone. The result is un-doubted hardship to employers, particularly to those (and there are many of them) who are themselves workers and entirely dependent on the due perforthance of contracts by their fellow-workers. That home legislation is defective in this respect may be inferred from the fact that subsequent colonial legislation has given the means of getting labour contracts performed without trenching on the domain of criminal law. As, however, there is little probability of an amendment of home law in the direction indicated, it is to be hoped that compensation for diminished legal remedy

a be found in an increased sense of moral responsi- ility.

ju Ua 8 173 | Arbitration is frequently employed to settle differences between masters and workmen.

The institution of "'conseils de prud'hommes" is known by name as in force in most of the manufacturing districts of France and Belgium and other Continental countries, The council is a recognized tribunal consisting of equal numbers of employers and employed. All disputes between master and workmen, whether as to quality of work or rate of wages, are first submitted to a committee, which sits privately, to endeavour to settle tle question amicably and at a noniinal expense ; failing this, the case is referred to the council, which sits in public once a month, or oftener if required. Though the right of appeal to the regular courts exists, it is seldom resorted to.

In Austria a law of 1869 instituted arbitration courts of this description in every important manufacturing town and district, to settle all disputes respecting wages, continuance of work, fulfilment of contracts, and claims on benefit clubs and relicf funds and matters of that kind. Each court of arbitration must be composed of at least twelve and at most twenty-four members,—one half of them employers elected by employers, and the other half workmen elected by workmen, each class voting separately. Workmen sitting on cases judged by these courts are paid by the commune for every day's sitting. In the case of the minor trades, which cannot maintain regular arbitration courts, the trade laws assign the adjudication of all disputes

between masters and men in the first instance to the representatives of the trade in which such disputes arise, and, in places where the necessary quorum for that purpose cannot be made up by the local representatives of any particular trade, the deficiency is supplied by a certain number of workmen temporarily appointed by the municipal authorities from amongst the most respectable and intelligent members of their class to act as arbitrators in such cases. Disputes which cannot be settled in this way must be decided by the common law courts; and it is only a court of law which can take cognizance of a claim raised thirty days after the expiration of a contract to which it refers.

In England no such compulsory legislation exists. The old guilds acted as arbitration courts, and, although their decision was practically binding, the guilds were only adapted to deal with small craftsmen acting singly. In modern times the law has been very reluctant to give effect even to voluntary agreements for referring disputes to arbitration, on a notion that to take away the jurisdiction of the ordinary tribunals and to set up another was contrary to settled principles. There are now several statutes, how- ever, for giving legal effect to the awards of arbitrators in trade disputes voluntarily referred to arbitration and ‘sitting in the way pointed out. The most successful arbitrations betwecn employers and employed appear to be under voluntary submissions, in accordance with rules pre- viously agreed to by employers and employed, in particular manufactures, tlie decisions being acted upon independently of any legislative aid.

Applied to the one pre-eminently important—probably the only great —question, the rate of wages, reference to arbitration is full of difficulties. The difference relates to the future, not to the past. It is an erroneous notion that strikes and lock-outs involve any breach of contract. In former days it may have been that employer and employed refused to carry out a contract on the ground that the other side had first failed in the performance of some condition precedent to the right to call on the other to perform work or to pay for it, as the case might be ; but in the present day the disturbance of the previous relationship of employer and employed generally occurs without any such

allegation on one side or the other. Thus, in a strike terminated while this article is in the press, the contracts

between employers and employed in the pottery trade of North Staffordshire were previously at an end by lapse of time. The question in such cases is on what terms the parties will agree for the future relationship of employer and employed, there being no such relationship when the strike began, and of course none while it is pending. This goes to the root of the whole matter, although it may seem.a technical mode of looking at it. But if no such obstacle existed, there are difficulties of another kind. In such cases a board of conciliation is inevitably equally divided, and reference to an umpire becomes necessary. To give confidence, he must not be an employer or employed in the trade. In general, therefore, he must know nothing previously of the subject he has undertaken to settle. He

must deal with it on such imperfect knowledge as he can |

acquire in the arbitration, aud apply such general principles as may occur to him. Nevertheless much good has been done by a good-tempered calm inquiry in which both sides learn perhaps for the first time the grounds on which the demand is made or resisted.

A recent important Act of Parliament, the Employers' Liability Act 1880, must be noticed. To render its pro- visions intelligible, it is necessary to state the general law on the subject of civil liability for negligence. A person who causes injury to the person or property of another is liable in damages to that person, and if the injury has resulted in death the right of action is ex- tended to the representatives, on belialf of the widow or children, independently of any criminal liability incurred by the negligence. Ifthe person who committed the negligent act is in the service of another, and the negligent act was committed in the course of the discharge of his duty, the civil liability extends to the master. This liability of the master is important to the injured person, because the servant is in most cases a much poorer person than the master. If they were equally able to pay damages,

nothing would be gained by resorting to the master. Bnt the lia- bility of the latter was not, before 1880, extended to make the master responsible in damages if the person injured and the negligent servant were both in his service and both were performing the same kind of duty, a “common employment” as it has been termed, and if the master, so far from being guilty of any actual negligence himself, had employed a generally competent person, and had provided him with the means of properly performing his duty. No vindication of the then law seems necessary, for, whether the liability of an employer to strangers is just or not, there is an obvious distinction between such a liability and responsibility where all parties are “rowing in the same boat,” to adopt an expression used in one case, whether the injured person be a servant or guest of the master. Both are volunteers, and both know that the master will not personally intervene. There does not appear to be any injustice in such a case in confining the liability to that of the servant personally guilty of the negligence, although a poor man. However, some apparently hard cases, especially arising out of accidents on railways, where, while a passenger could sue the company for negligence, an engine-driver or a guard’s remedy was limited to the person actually guilty of the negligence, led to the attention of parliament being called to the subject. In 1877 a com- mittee of the House of Commons, pointing out that the development of modern industry has created large numbers of employing bodies, such as corporations and public com- panies, to whom it is not possible to bring home personal default, and that there are other cases in which masters leave the whole conduct of their business to agents and managers, themselves taking no personal part whatever either in the supply of materials or in the choice of sub- ordinate servants, reported thus :—

LABOUR

‘Your eommittee are of opinion that in eases such as these, that is, where the aetual employers cannot personally discharge the duties of masters, or where they deliberately abdicate their funetions and delegate them to agents, the aets or defaults of the agents who thns diseharge the duties and fulfil the functions of masters should be

eonsidered as the personal acts or defaults of the principals and enrployers, and should impose the same liability on such principals and employers as they would have been subject to had they been aeting personally in tho eonduet of their business, notwithstanding that such agents are technieally in the employ- ment of the prineipals. would have to be established in each ease, but this wonld not be a matter of diffienlty. Your eommittee are further of opinion that the doctrine of eommon employment has been earried too far when workmen employed by a eontraetor and workmen employed by a person or eompany who has employed sueh eontractor are eon- sidered as being in the same common employment."

Three years afterwards the Act in question was passed. By sect. 1, where personal injury is caused to a workman—

'*(1) By reason of any defeet in the eondition of the ways, works, machinery, or plant eonnccted with or used in the business of the employer ; or (2) by reason of the negligenee of any person in the serviee of the employer, who has any superintendence en- trusted to him, whilst in the exereise of snch snperintendenee ; or (8) by reason of the neghigenee of any person in the serviee of the euployer to whose orders or direetions the workmen at the time of the injury was bound to conform and did eonform, where sueh in- jury resulted from his having so conformed; or (4) by reason of the aet or omission of any person in the service of the employer done or made in obedienee to the rules or bye-laws of the employer, or in obedienee to particular instructions given by any person delegated with the authority of the employer in that behalf ; or (5) by reason of the negligenee of any person in the service of the employer who has the eharge or eontrol of any signal, points, locomotive engine, or train upon a railway,—the workman, or in ease the injury results in death the legal personal representatives of the workman, and any persons entitled in ease of death, shall have the same right of compensation and remedies against the employer as if the work- man had not been a workman of nor in the service of the employer, nor engaged in his work."

Section 2 provides that a workman shall not be entitled under the Act to any right of compensation or remedy against the employer in any of the following cases :—

(1) Under subseetion 1 of section 1, unless the defeet therein mentioned arose from, or had not been discovered or remedied owing to, the negligence of the employer, or of some person in the serviee of the employer, and entrusted by him with the duty of seeing that the ways, works, maelinery, or plant were in proper eon- dition ; (2) under subsection 4 of section 1, unless the injury resulted from some impropriety or defeets in the rules, bye-laws, or instructions therein mentioned ; provided that, when a rule or bye- law has been approved or has been accepted as a proper rule or bye- law by one of her Majesty's prineipal seerctaries of state, or by the Board of Trade, or any other department of the Government, under or by virtue of any Act of Parliament, it shall not be deemed for the purposes of this Act to be an improper or defective rule or bye-law; (8) in any ease where the workman knew of the defeet or negli- gence whieh eaused his injury and failed within a reasonable time to give, or eanse ta be given, information thereof to the employer or some person superior to himself in the service of the employer, un- less he was aware that the employer or such superior knew of the said defect or negligenee."

Compensation under this Act (which extends to a rail- way servant and any person to whom the Employers and Workmen Act 1875, already noticed, applies) is enforced by action in the county court (in Scotland the sheriff's court, in Ireland the civil bill court) after notice within six weeks of the nature and particulars of the claim (unless there was reasonable excuse for the want of notice in the case of death). The compensation is limited to three years' earnings, and the action must be commenced within six months from the occurrence of the accident, or in case of death within twelve months from the time of death.

Neither in the United Kingdom nor abroad does the right to damages for breach of contracts override the general law as to offences, so that, if any of the parties do anything amounting to a criminal offence, a prosecution may follow although a breach of contract is involved for

which breach damages may be recovered. ‘There are moreover a variety of Acts of Parliament from the reign of Anne still in force

The fact of such a delegation of authority |

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for securing employers from the frauds of workmen employed in various trades in working up materials, not only as regards the misappropriation of property entrusted to them, but also in relation to fraudulent contrivances for misrepresenting the amount of work done. For such offences fine or imprisonment may be inflicted.

Apart from the legislation already mentioned, there are a great number of Acts of parliament directly or indirectly affecting labour. The general direction of all such legisla- tion is to ameliorate the condition of workmen.

The legislation regulating the hours of labour of young persons, originating in the benevolent exertions of the earl of Shaftesbury, and extended by Lord Aberdare as secretary of state for the home department and others, is most im- portant (see Factory Acts). The indirect effects of those provisions in causing better order in the conduct of manufacturing industries cannot be overlooked. The

Agricultural Gangs Act 1867, arising out of the practice.in |

the east of England of persons known as gang masters

hiring children, young persons, and women, with a view to |

contracting with farmers and others for agricultural work is a recent illustration of the direct objects of such legisla- tion. The fencing of machinery, the careful working of coal and metalliferous mines, and the like, have been the subject of minute legislative provisions, which,

as well as the Explosives Act 1875, intimately affect the wellbeing of the labouring community and the general safety.

The wants of servants are considered in the preference shown to claims for wages in the case of death and bankruptcy, and the general need of all classes of workmen is kept in view in the provisions relating to workmen's dwellings, and the obligation of railway companies to afford facilities for their conveyance at a lowrate. Less directly they are considered in the legislation relating to friendly and provident societies; of equivocal effect was the legisla- tion respecting small loans, intended to facilitate the pur- chase of tools, but taken advantage of to form loan societies of doubtful general benefit to the community. We cannot notice here the effect of the laws regulating the land and sea forces on contracts relating to labour by persons entering the army or navy. (3. E. D.)

LABRADOR, in the widest acceptation of the word, is the peninsular portion of North America bounded on three sides by the Gulf of St Lawrence, the North Atlantic, Hudson's Straits, and Hudson's Bay, and vaguely defined towards the south-west by Rupert's river, the Mistassini river, and the Bersiamits river. It extends from about 49° to 63° N. lat., and from the 55th to the 79th meridian. Its greatest length from the Straits of Belle Isle, which separate it from Newfoundland, to Cape Wolstenholme, its most northern extremity, is 1100 miles; its greatest breadth is about 700 miles. The area is approximately 420,000 square miles, equal to the united areas of the British Isles, France, and Prussia. As a permanent abode of civilized man, Labrador is on the whole one of the most uninviting regions on the face of the earth. The Atlantic coast is the edge of a vast solitude of rocky hills, split and blasted by frosts and beaten by the waves. A vast table- land, in one region 2240 feet above the sea-level, occupies niuch of the interior. This plateau, says Professor Hind, "is pre-eminently sterile, and, where the country is not burned, caribou moss covers the rocks, with stunted spruce, birch, and aspen in the hollows and deep ravines, The whole of the table-land is strewed with an infinite number of boulders, sometimes three and four deep ; these singular erratics are perched on the summit of every mountain and hill, often on the edges of cliffs, and

they vary in size from 1 foot to 20 feet in diameter. Language fails to paint

the awful desolation of the table-land of the Labrador peninsula,”

The interior of Labrador has been but very partially explored, and even the course of the main rivers is largely matter of conjecture. The largest is probably the Ashwanipi or Hamilton river, which rises in the rear of the Seven Islands, drains a portion of the vast table-land, and falls into Hamilton Inlet, on the Atlantic coast. At its mouth it is nearly a mile and a half in width. One hundred miles from its mouth are the great falls and rapids which extend over 20 miles, and involve fifteen portages. The valley of this river is well wooded, some of the trees, which are chiefly spruce, white birch, and poplar, being of considerable size, and tracts of loamy soil being found at intervals along its banks. The Kenamou and the Nasquapee or North-West river also fall into Hamilton Inlet. The Eagle river, the West and East. rivers, all famous for salmon and trout, discharge their waters into Sandwich Bay. Of the rivers falling into Ungava Bay the largest is Koksoak or South river, which is 3 miles wide at its mouth, and has its source in Lake Kaniapuscaw, 70 miles long and 20 broad, which occupies the very centre of the peninsula, being equidistant from the St Lawrence, Ungava, and Hamilton Inlet, and 350 miles from each. George’s river and Whale river also fall into Ungava Bay. ‘The aspect of the country drained by these rivers is forbidding in the extreme, bleak and barren rocks, with a few stunted trees at the months of the rivers or around the lakes, being the most marked features. In a few sheltered spots, however, on the margins of the rivers, timber of fair size is to be found. The rivers discharging into Hud- son’s Bay are Rupert’s river, East Main, and Great and Little Whale rivers. The Moisie river, 250 miles in length, the Mingan, and the Ounaneme fall into the Gulf of St Lawrence. The St Augustine falls into a fine bay of the same name, and has its source in the lakes and marshes of the table-land. The country through which these rivers flow is rugged and mountainous, swamps and innumerable lakes occupying the lower grounds.

By far the most important portion of Labrador is the Atlantic seaboard. The coast itself is rugged, but is deeply indented with bays and inlets, and has many fine harbours. The scenery is grand and impressive. Dark and yellow headlands towering over the waters are ever in sight, some grim and naked, others clad in the pale green of mosses and dwarf shrubbery. With miles on miles of rocky precipices alternate lengthened sea slopes, tame aud monotonous, or fantastic and picturesque in form, with stony vales winding alway among the blue hillsof the interior. Battle Harbour at the northern extremity of the straits of Belle Isle, is a busy fishing settlement with a narrow sheltered roadstead about half a mile in length between Battle Islands and Great Caribou Island. The water is of great depth in this neighbourhood, and is noted for its wonderful ground swell, which at times rolls in without wind from the eastward into St Lewis Sound, “bursting,” as Admiral Bayfield describes it, “ with fury over islets 30 feet high, or send- ing sheets of foam and spray sparkling in the sunbeams 50 feet up the sides of precipices.” By far the greatest of the numerous inlets which indent the coast is Eskimo Bay or Ivuktoke or Hamilton Inlet, 250 miles north of the straits of Belle Isle. This inlet is 30 miles wide at the entrance, but at Port Rigolette, 50 miles from the sea, it narrows toa mile. On both sides of these narrows hills tower to the height of 1000 feet, wooded with spruce from base to summit. At the termination of this gorge the inlet again expands and forms Lake Melville, 30 miles in length and 20 in breadth. After narrowing again it forms another lake (Goose Bay) 7 miles wide and 20 long, and at its extremity the head of the great inlet is reached, 150 miles from the sea. The scenery along the shores of Hamilton Inlet is wild and rugged, and above Nigolette

becomes very grand. Along the south shore of Melville lake are the volcanic peaks of the Mealy Mountains, 1500 feet in height. This range commences 100 miles to the south of Hamilton Inlet, running nearly parallel to the coast; and after skirting Lake Melville it strikes westerly and is lost in the hilly regions of the interior.

Northern Labrador, from Cape Webeck to Cape Chudleigh, is the proper home of the Eskimo of this region, who are now about 1400 in number.! By the labours of the Moravian Brethren, commenced in 1770, nearly the whole of them have been brought under Christian training. The Brethren have four stations—Hopedale, (55° 25’ N. lat.), Nain (56° 25’), Okkak (57° 33’), and Hebron, (58° 50’). Each station has a ehurch, store, dwelling-house for the missionaries, and workshops for the native tradesmen. ‘The mis- sionaries number about twenty.

The white inhabitants of the St Lawrence eoast of Labrador are ehiefly of Acadian or Canadian origin, with a few settled fishermen from France. On the Atlantic coast of Labrador many of the white inhabitants are British sailors and thcir descendants. Salmon and cod fishing are their main occupations ; and the products of their industries are exchanged with traders on the spot for such commodities as they require. The winter is passed in trapping fur- bearing animals. ‘here are nine places of worship—four of the Chureh of England, three of the Church of Rome, and two Wesleyan. During the fishing season a steamer carrying mails and passengers plies fortnightly on the coast, connecting with the Newfoundland coastal steamer at Battle Harbour.

he Indians inhabiting the interior of Labrador are now greatly reducedin numbers. The returns of the Hudson’s Bay Company show that about four thousand of these Indians frequent the conipany’s posts throughout the whole of Labrador ; and this account probably includes nearly their whole strength. Nineteex-tweatieths of them are nominally Roman Catholics. The early Jesuit missions in Canada extended to Labrador; and of late years Roman Catholic missions have been resumed and are now systematically carried on. Game of all kinds is every pa becoming scarcer, and in many parts has almost disappeared. Fires have destroyed the forests, berry-bearing shrubs, mosses, and lichens, and converted whole dis- tricts into hopeless deserts, The savage tribes wander over a vast extent of conntry, and have established routes along certain rivers and lakes, by which periodically they make their way to the sea- eoast, to exchange the produets of the chase for firearms, clothing, and other necessaries.

It is only in the interior valleys of the rivers, at some distance from the coast, that any extent of forest appears; but there sufli- eient tiniber for fuel and building purposes can almost always be found. The trees are chiefly larch, birch, aspen, silver fir, black, white, and red spruce, willow, cherry, and mountain ash. Among the wild animals may be enumerated reindeer, black and white bears, wolves, foxes, martens, lynxes, otters, minks, beavers, musk- rats, hares, rabbits, moles. The birds are represented by the hawk, falcon, cagle, owl, raven, ptarmigan, spruce partridge, curlew, grey plover, sandpipers and other waders, geese, ducks, gulls, divers, swallows, martins, snipe, pigeons. Berry-bearing plants abound in many regions—whortleberries, raspberries, cranberries, partridge berries, bake appleberries, wild currants, and wild gooseberries. In summer, where there are sheltered spots, mosses of every hue, wild flowers of the most delicate colours, ferns, and tall grasses diversify the scene.

Though Labrador is detached from Arctic lands, and though much of it lies between the same parallels of latitude as Great

3ritain, the elimate is rigorous in the extreme, owing mainly to the ice-laden Arctie eurrent which washes its shores. Snow lies from September or October till June. In winter the whole coast is blockaded by ice-fields drifting from Baffin’s Bay and other outlets of the Arctic Occan; while in summer icebergs, stranded or floating, impart a stern grandeur to the frowning shores. At N ain the mean annual temperature is 22°52° Fahr., at Okkak, 27°86°, and at Hopedale, 27:82°. In summer the thermometer sometimes reaches 75°; spirits freeze in the intense cold of winter, and 30° below zero is not uncommon ; but, owing to the dryness of the air and the absence of high winds, such a temperature is not felt as uncomfortable. The winter is one continued stretch of cold dry frosty weather, and is felt to be bracing by those accustomed to it. Travelling is performed by sledges drawn by dogs, sometimes at the rate of 100 miles a day, over the frozen snow.

The total permanent population of Labrador is about 12.500, and is distributed as follows :— ——

On the St Lawrence coast from Port Neuf to Blanc Sablon Seshesenes SeHlil On the Atlantic coast—white population :

39 m4 Tretans Ofte TOtCHION,.....60sccc0csscnecceeeesesss

1 The dialect of the Labrador Eskimo is treated of in Kleinschmidt, Gram, d. grénland. Sprache, Berlin, 1851.

ADOR

Tourists in search of the picturesque, invalids, sportsmen, and anglers are finding their way, of late years, in increasing numbers to Labrador during its brief but lovely summer ; and in the fishing season from the end of June to the first or second week of October the migratory population from Newfoundland, Nova Scotia, Canada, and the United States numbers between 20,000 and

25,000.

But little is known of the geology of Labrador. It has been ascertained, however, that the Laurentian formation constitutes the great framework of the peninsula, and that Lower Silurian beds, principally Potsdam, rest on the Laurentian at various points along the coast. On the north side of the Straits of Belle Isle there isa large development of Lower Silurian rocks, corresponding to those on the Newfoundland side opposite. The Potsdam rocks here arc grey and reddish sandstones, 230 feet in thickness, overlaid by 140 feet of limestone, with some shale. These limestones and sandstones extend about 80 miles along the coast, and about 10 miles back from the shore. All over the country gneiss ranges of mountains and hills and gneiss boulders in eount- less multitudes are everywhere met with. ‘‘The rocks of this formation,” says Sir Wilham Logan, ‘‘are the most ancient known on the American continent, and correspond probably to the oldest gneiss of Finland and Seandinavia, and to some similar rocks in the north of Scotland.” The system is made up of crystallized rocks, and may be considered as an alternation of crystalline schists, quartzites, limestones, and serpentines. Copper ore has been dis- eovered at various points along the coast; also silver, lead, and mica, as well as gold.

The southern portion of the Labrador coast, as far north as Sandwich Bay, has been frequented as a fishing ground for more than acentury. Since about 1850 large numbers of fishermen have extended their operations as far north as Cape Harrison or Webeck. From about 1870 Newfoundland cod-fishers have ventured as far north as Cape Mugford ; and the probability is that they will soon be attracted still farther, to Cape Chudleigh, at the entrance of Hudson's Straits, by the reports of the amazing quantity of fish. From Cape Harrison to Cape Mugford the coast, like that of Nor- way, is deeply serrated by a succession of narrow fiords stretching from 30 to 50 miles into the interior. As far as Frecstone Point, 120 miles north of Cape Harrison, the heads of many of these fiords contain timber fit for the construction of fishing craft and all ordinary building purposes. The elimate and soil of these sheltered spots also permit the cultivation of potatoes and garden vegetables. According to Professor Hind, ''it is fringed with a vast multitude of islands forming a continuous archipelago from Cape Aillik to Cape Mugford, averaging 20 miles in depth seawards. Outside these islands, and about 15 miles seawards from them, are numerous banks and shoals which form the summer feeding ground of large cod, and a second range of banks, outside the shoals, whieh are probably their winter feeding grounds." This island-studded area, exclusive of the banks and shoals, from Cape Harrison to Cape Mugford, he estimates at 5200 square miles, furnishing a boat fisting ground for cod (which as yet has hardly been touched) nearly as large as the combined areas of the English and French boat fishing ground on the coasts of Newfoundland. The Arctic current which washes the coast of Labrador exerts a most im- portant influence on the fish life of those regions, as well as on that of the seas around Newfoundland, Canada, and the United States, forming, in many places, ''a living mass, a vast oeean of living slime ;" and this slime ''accumulates on the banks of northern Labrador, and renders the existence possible of all those forms of marine life which contribute to the support of the great shoals of cod which also find their home there" (Hind). The same current whieh brings the slime and multitudes of minute erustaeeans also carries on its bosom innumerable cod ova, and distributes them far and wide.

The principal fisheries are those of cod, herrings, salmon, and seals. The following table is compiled from the Newfoundland customs returns for the year ending July 31, 1880 :—

Exported by Newfoundiand Houses From Labrador direct.

Exported by Houses not connected uith Newfoundland,

893,456 quintals dried codfish $1,180,308 | 14,000 quintals dried codfish … $42,000 144 do. green do. 144 MOQYS@HU SISTHS Yaerssessecsressess 110 T,jQD6 Sea WaKInGn, Jiscccccsssxcerexs 1,096 D4 WS SCAN OI… .c.cscccscees a2 50) fans Seal Ol] ....5…:.05.00 6,400 GOO: COCs… sccswseccess 7,260

iG “dOP COM Ollusarssrcsccsess 10,032 ecm TCLs crisereresrsrcass ss 28

I do: ofheriotlscr….:.c.ss 108 1 GOsmDIUDVEL sccscsescncaves 210 I/GO., DIEDOCH: cess. -cecees 236 400 tierees pickled salmon… 5,600 592 tierces pickled salmon 8,288 | 30,000 Ib salmon in tins …..... 8,000 16,970 barrels pickled herrings 50,910 700 barrels pickled herrings 2,190 14 do. do. trout’... 98 do. GO) Btrouts.c… 280 459 do. do. mackerel 1,376 200 do. do. mackerel 600 68 do. dricd capelin…. 29 180 do. dricd capelin…... 80

1,259,025 63,060

The estimated value of exports by traders being 19,950, this gives for the total exports $1,342,035, or £279,590 sterling.

To these direct exportations must be added the fish of various kinds taken at Labrador and sent to Newfoundland for shipment, amounting to about a third of the whole; also the quantities

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taken by American and Canadian fishermen of which no returns can be obtained, but which are estimated to be about an eighth of the quautities taken by Newfoundland fishermen. These last can work the fisherics more successfully than those coming from a distance, and are gradually absorbing the trade. The total catch by Newfoundlanders, Canadians, Americans, and Eskimo on the Atlantic and St Lawrence coasts of Labrador may be valued at £1,000,000 sterling per annum, and is increasing steadily. The number of vesscls employed annually is estimated at from 1100 to

1200.

Labrador as well as Newfoundland was discovered by John Cabot in 1497 ; the recent discovery of a map made by or under the direction of Sebastian Cabot proves that it must surrender the honour of being his ‘‘ Prima tierra vista” to the present island of Cape Breton. Cabot does not appear to have given any name to Labrador; tradition has it that a Basque whaler, called ‘‘Labrador,” penetrated as far as Labrador Bay (now Bradore Bay), and that, as this bay was in process of time much frequented by Basque fishermen, the name was extended to the whole coast. The Basques were the successors of the Norsemen. After them, about the year 1520, came the Bretons, who founded the town of Brest in Bradore Bay, about 3 miles from Blanc Sablon Harbour, whicli at one time contained upwards of one thousand permanent residents. The ruins and terraces of this old town are still Visible. For a lengthened period extensive fisheries (to which they attached the greatest importance) were carried on by the French on the Labrador coast, near the Straits of Belle Isle. After the British conquest of Canada the whole fisheries along the southern and eastern shores of Labrador were placed under the government of Quebec, and they continued so till 1763, when the Atlantic coast was annexed to the government of Newfoundland, the boundary between the two jurisdictions being fixed at Blanc Sablon. In 1773, owing to difficulties arising out of grants made to a few persons, under French rule, the eastern coast was restored to the government of Quebec ; but since 1809 it has been again attached to Newfoundland. In 1824 the governor of Newfoundland was empowered to institute a court of civil jurisdiction

on the coast of Labrador. At present the civil and criminal court of Labrador is presided over by one judge appointed by the governor in council. All goods landed are subjected to the duties imposed on like goods in any part of the island of Newfoundland. The extent of the jurisdiction of the government of Newfoundland in Labrador is thus defined (Letters-Patent, 28th March 1876); ‘‘all the coast of Labrador from the entrance of Hudson’s Straits to a line to be drawn due north and south from Anse Sablon on the said coast to the fifty-second degree of north latitude, and all the islands adjacent to that part of the said coast of Labrador.” The north- western portion, or that which drains into Hudson’s Bay and Hudson’s Straits, now forms the North-East Territory of the Dominion of Canada, and the southern portion, draining into the Gulf of St Lawrence, is incorporated with the province of Quebec. An undefined area of what is now the North-East Territory was formerly known as East Main.

See Cartwright, Sixteen Fears on the Coast of Labrador, Newark, 1792; Hind, Explorations of the Labrador Peninsula, 1863; Chimmo, in Journ. Roy. Geog. Soc., 1868; Bell, in Report of the Geol. Survey of Canada, 1879. (I. H.)

LA BRUYERE, Jzan px (1645-1696), essayist and moralist, was born at Paris in August 1645, and not, as has more commonly been asserted, at Dourdan (Seine-et- Oise) in 1639. His family was of the middle class, and his reference to a certain Geoffroy de la Bruyére, a crusader, is only a satirical illustration of a method of self- ennoblement common in France as in some other couutries. Indeed he himself always signed the name Delabruyére in one word, thus avowing his voture. His progenitors, however, were of respectable position, and he could trace them back at least as far as his great-grandfather, who had been a strong Leaguer. La Bruyére’s own father held a municipal appointment in the capital, and seems as well as his son to have been in easy circumstances. The son was educated by the Oratorians, and at the university of Orleans; he was called to the bar, and in 1673 bought a post in the revenue department at Caen, which gave the status of noblesse and a certain income. He afterwards in 1687 sold this office. His predecessor in it was a relation of Bossuet, and it is thought that

the transaction was the cause of La Bruyére's introduction to the great orator. Bossuet, who from the date of his own preceptorship of the dauphin, was a kind of agent-general for tutorships in the royal family, introduced him in 1683 or 1684 to the houseliold of the great Condé, whose grandson Henri Jules

de Bourbon he was charged to educate. 'The rest of his life was passed in the household of the prince or else at court, and he seems to have profited by the inclination which all the Condé family had for the society of men of letters without suffering from the capricious and tyrannical temper which was also one of the characteristics of the house. Very little is known of the events of this part or indeed of any part of his life. Although he certainly mixed freely in society at a time when more gossip was committed to paper than at almost any other, the notices of him are very few, though they are almost always favourable. The inipression derived from them is of a silent observant but somewhat awkward man, resembling in manners our own Addison, whose master in literature La Bruyére undoubtedly was. Yet despite the numerous enemies which his book raised up for him, most of the few personal notices we have are, as has been said, favour- able—notably that of St Simon, an acute judge and one bitterly prejudiced against roturiers generally. There is a curious passage in a letter from Boileau to Racine in which he regrets that "nature has not made La Bruyére as agreeable as he would like to be," which, as he at the same time calls him a "fort honnéte homme," and says that he would lack nothing were it not for the conduct of nature in this respect, can only refer to the want of manner just noticed. His Caractéres appeared in 1688, and at once, as Malezieu had predicted, brought him "bien des lecteurs et bien des ennemis." At the head of these were Thomas Corneille, Fontenelle, and Benserade, who were pretty clearly aimed at in the book, as well as innumerable other persons, men and women of letters as well as of society, on whom the cap of La Bruyére's fancy-portraits was fitted by manuscript "keys" which were at once compiled by the scribblers of the day. The friendship of Bossuet and still more the protection of the Condés defended the author quite sufficiently, and he continued to insert fresh portraits of his contemporaries in each new edition of his book. Those, however, whom he had attacked were

powerful in the Academy, and numerous defeats awaited La Bruyére before he could make his way into that guarded hold. He was defeated thrice in 1691, and on one memorable occasion he had but seven votes, five of which were those of Bossuet, Boileau, Racine, Pelisson, and Bussy-Rabutin. It was not till 1695 that he was elected, and even then an epigram, which, considering his admitted insignificance in conversa-

tion, was not of the worst, hesit latert :—

‘* Quand la Bruyére se présente

Pourquoi faut il crier haro ?

Pour faire un nombre de quarante Ne falloit il pas un zéro ?”

His unpopularity was, however, chiefly confined to the subjects of his sarcastic portraiture, and to the hack writers of the time, of whom he was wont to speak with a disdain only surpassed by that of Pope. His description of the leading newspaper of the day as “immédiatement au dessous du rien” is the best remembered specimen of these unwise attacks which, both in France and England, retarded the establishment of an independent profession of letters for many years. La Bruyére’s discourse of admission at the Academy was, like his admission itself, severely criticized, yet it is certainly one of the best of its kind. With the Caractéres, the translation of Theophrastus, and a few letters, it completes the list of his literary work, with the exception of a curious and much-disputed posthumous treatise. La Bruyére died very suddenly, and not long after his admission to the Academy. He is said to have become suddenly deaf in an assembly of his friends, and, being carried home to the Hétel de Condé, to have expired of apoplexy a day or two afterwards. It is not surprising that, considering the recent panic about poisoning, the

bitter personal enmities which he had excited, and the peculiar circumstances of his death, suspicions of foul play should have been entertained, but there seems to be no foundation for them. Two years after his death appeared certain Dialogues sur le Quiétisme, alleged to have been found among his papers incomplete, and to have been completed by the editor, As these dialogues are far inferior in literary merit to La Bruyére's other works, their genuineness has been denied. But the straightforward and circumstantial account of their appearance given by their editor, the Abbé Dupin, a man of acknowledged probity, the intimacy of La Bruyére with Bossuet, whose views in his contest with Fénelon these dialogues are designed to further, and the entire absence at so short a time after the alleged author's death of the least protest on the part of his friends and representatives, seem to be decisive in their favour.

Although for reasons to be given shortly it is permissible to doubt whether the value of the Caractéres has not been somewhat exaggerated by traditional French criticism, they deserve beyond all question a high place among the great works of French literature. The plan of the book is thoroughly original, if that term may be accorded to a novel and skilful combination of existing elements. That the little treatise of Theophrastus may have furnished the first idea of it is doubtless true, but only a very small part of the Frenchman's work is due to the Greek. With the ethical generalizations and social Dutch painting of Theophrastus La Bruyére combined the peculiarities of the Montaigne essay, of the Pensées and Maximes of which Pascal and La Rochefoucauld are the masters respectively, and lastly of that peculiar 17th century product, the portrait or elaborate literary picture of the personal and mental characteristics of an individual. The result was quite unlike anything that had been before seen, and it has not been exactly reproduced since, though the essay of Addison and Steele resembles it very closely, especially in the introduction of fancy portraits. In the titles of his work and in its extreme desultoriness La Bruyére reminds the reader of Montaigne, but he aimed too much at sententi- ousness to attempt even the apparent continuity of the great essayist. 'The short paragraphs of which his chapters consist are made up of maxims proper, of criticisms literary and ethical, and above all of

the celebrated sketches of individuals baptized with names taken from the plays and romances of the time. These last are undoubtedly the great feature of the work, and that which gave it its immediate if not its enduring popularity. They are wonderfully piquant, extraordinarily life-like in a certain sense, and must have given great pleasure or more frequently exquisite pain to the originals, who were in many cases unmistakable and in most recognizable by a society which held to the full Madame de Sévigné's views of the usefulness of "le prochain" as a butt for satirical observation. But there is something wanting in them. The criticism of Charpentier, who received La Bruyére at the Academy, and who was of the opposite faction, has usually been dismissed as one-sided, but it is in fact "fully justified as far as it goes. La Bruyére literally "est [trop] descendu dans le particulier." He has neither like Moliére embodied abstract peculiarities in a single life-like type, nor has he like Shakespeare made the individual pass sub speciem externitatis, and serve as a type while re- taining his individuality. He is a photographer rather than an artist in his portraiture. So too his maxims admirably as they are expressed, and exact as their truth often is, are on a lower level than those of La Rochefou- cauld, which, rather unwisely, they sometimes follow very closely. Beside the sculpturesque precision, the Roman brevity, the profoundness of ethical intuition " piercing

to the accepted hells beneath," of the great Frondeur, La Bruyére has the air of a literary petzt-mattre dressing up superficial observation in the finery of esprit. It is indeed only by comparison that he loses, but then it is by comparison that he is usually praised. There is no doubt that his abundant wit and his personal " malice" have done much to give him his rank in French literature, but much must also be allowed to his purely literary merits. With Racine and Massillon le is probably the very best writer of what is somewhat arbitrarily styled classical French. He is hardly ever incorrect—the highest merit in the eyes of a French academic critic. He is always well- bred, never obscure, rarely though sometimes " precious" in the turns and niceties of language in which he delights to indulge, in his avowed design of attracting readers by form now that in point of matter "tout est dit." It ought to be added to his credit that he was sensible of the folly of impoverishing French

by ejecting old words. His chapter on “ Les ouvrages de l’esprit” contains much good criticism, though it shows that, like most of his contem- poraries except Fénelon, he was lamentably ignorant of the literature of his own tongue.

Ihe editions of La Bruyére, both partial and eomplete, have been extremely numerous. Les Caractéres de Théophraste traduits du Gree, avec les Caractércs ct les Mewrs de ce Siecle, appeared for the first time in 1688, being published by Miehallet, to whose little daughter, aeeording to tradition, La Bruyére gave the profits of the book. Two other editions, little altered, were published in the same year. In the following year, and in each year until 1694, with the exeeption of 1698, a fresh edition appeared, and, in all these five, additions, omissions, and alterations were largely made. A ninth edition, not mueh altered, was put forth in the year of the author’s death. The Aeademy speech appeared in the eighth edition. The Quietist dialogues were published in 1698 ; most of the letters, in- eluding those addressed to Condé, not till 1867. In the last thirty or forty years numerous editions of the complete works have a ar notably those of Walekenaer (1845), Servois (1867), Asselineau (a seholarly reprint of the last original edition, 1872), and finally Chassang (1876); the last is one of the most generally useful, as the editor has colleeted almost everything of value in his predeeessors. The literature of “ keys” to La Bruyére is extensive and apocryphal. Almost everything that ean be done in this direetion and in that of general illustration was done by the late M. Edouard Fournier in his learned and amusing Comédic de La Bruyerc. (G. SA.)

LABUAN, or Lasunay, an island of the East Indian Archipelago, which has been a British possession since 1846. It lies about 6 miles off the north-west coast of Borneo, opposite the northern end of the great bay of Brunei. Rudely triangular in shape, it measures about 7 miles across the base, and has a length of 11 miles from north to south. The general flatness of the surface is broken by a number of undulating hills, none of which, however, exceed 90 feet in height. At the time of the first settlement most of the ground was occupied by virgin forest, in which camphor trees of noble proportions were

conspicuous; but nearly the whole of this has been destroyed either by human effort or by jungle fires. The soil is very poor, except in the valleys of the larger streams. Of the total area, estimated at over 45 square miles, or 29,350 acres, 21,000 acres are supposed to be capable of cultivation; but of this not more than 1500 acres are sown with rice, the only crop attempted on a large scale in the island. The cocoa-nut flourishes to no small profit on the little island of Daat; and the African oil palm promises well. At the time of its occupation a brilliant future was prophesied for Labuan: its harbour was to make it a second Singapore, and its coal beds were to prove an unfailing source of wealth. Such anticipations are far from having been realized. Though the workable coal in the island has been estimated at no less than 400,000,000 tons, the mines have commercially proved an utter failure. The Scottish Oriental Coal Company— the fourth of its kind— came to an untimely end in 1880; from 1868 it had raised 53,741 tons of clean coal, each

ton costing about 72s. and selling for not more than 25s. or 30s. The want of machinery strong enough to keep the workings dry is assigned as one of the chief reasons of the collapse. The coal, which appears to be of Tertiary formation, is of good quality; the mines are on the north end of the island near the village of Lubok Tamiang. The general trade of Labuan consists mainly of the importation and re-exportation of Bornean produce ; and most of the Labuan merchants are from Singapore houses. ‘There are several factories for the preparation of sago flour. The total burden of the vessels entering the port in 1879 was only 10,787 tons, of which 8516 was due to steam ships. The population, which in 1861 was 2373 (1627 males, 701 females), was 5731 (3414 males, 2317 females) in 1881. It includes Chinese, Klings, chiefly from Karikal in French India, Malay fishermen, and Kudayans and Tutongs from Borneo. Port Victoria, the principal settle- ment, has no municipal government.

The colony is now self-supporting. The Chinese have schools for their own children ; and Sir Henry Bulwer established in 1872 a school for

the teaching of Malay and English. The temporary diocese of Labuan includes, not only Sarawak in Borneo, but also Singapore (which is 770 miles distant); and the church of St Andrews in that city is the cathedral of the see. Convicts have been sent to Labuan from the Straits settlements since 1866.

See Keppel, Visit to Indian Archipelago, London, 1853; Mundy, Narrative of Events in Borneo, London, 1848; Burbidge, Gardens of the Sun, London, 1880.

LABURNUM is the specific name of a familiar tree of the genus Cytisus, Dec., of the pea family or Leguminose. It is a native of the mountains of France, Switzerland, southern Germany, northern Italy, &c, has long been cultivated as an ornamental tree throughout Europe, and was introduced into north-east America by the European colonists. Gerard records it as growing in his garden in 1596 under the names of anagyris, laburnum, or beane trefoyle (Historie of Plants, p. 1239), but the date of its introduction into England appears to be unknown. France it is called l'aubour—a corruption from laburnum according to Du Hamel—as also arbois, z.e., arc-bois, 'the wood having been used by the ancient Gauls for bows. It is still so employed in some parts of the Maconnois, where the bows are found to preserve their strength and elasticity for half a century" (Loudon, Arboretum, ii. p. 590).

Several varieties of this well-known tree are cultivated, differing in the size of the flowers, in the form of the foliage, &c., such as the "'oak-leafed" (querctfolium), pendulum, crispum, &c. One of the most remarkable

forms is C. Adami, Poir. (C. purpurascens, Hort.), which |

bears three kinds of blossoms, viz., racemes of pure yellow flowers, others of a purple colour, and others of an inter- mediate brick-red tint —all three kinds being borne by one and the same tree. The last are hybrid blossoms, and are sterile, with malformed ovules, though, curiously enough, the pollen appears to be good. The yellow and purple "reversions" are fertile. It originated in Paris in 1828 by M. Adam, who inserted a "shield " of the bark of C. puz- pureus, Scop.,

into a stock of C. Laburnum, L. A vigorous shoot from this bud was subsequently propagated. Hence it would appear that the two distinct species mentioned above became united by their cambium layers, and the trees propagated therefrom subsequently reverted to their respective parentages in bearing both yellow and purple flowers, but produce as well blossoms of an intermediate or hybrid character. Such a result, Mr Darwin observes, may be called a “ graft-hybrid.” Darwin’s Animals and Plants under Domestication.

_ The laburnum has highly poisonous properties. A case 1s recorded of nearly fatal results to several boys who masticated the roots on finding they tasted like liquorice, which is a member of the sarne family as the laburnum. It has proved fatal to cattle, though hares and rabbits eat the bark of it with avidity (Gardener’s Chronicle, 1881,

In |

For full details see |

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vol. xvi. p. 666). ‘The seeds also are highly poisonous, possessing emetic as well as narcotico-acrid principles, especially in a green state. Gerard (Joc. cit.) alludes to the powerful effect produced on the system by taking the bruised leaves medicinally. Pliny records that bees will not visit the flowers (WV. ZZ, xvi. 31), but this may be an error, for Mr Darwin found by experiment that insects play an important part iu the fertilization of the laburnum. The heart wood of the laburnum is of a dark reddish- brown colour, hard and durable, and takes a good polish. Hence it is much prized by turners, and used with other coloured woods for inlaying purposes. The laburnum has been called false ebony from this character of its wood. The roots are subject to a

peculiar disease, not at all uncommon in other members of the Leguminosex, the fine rootlets swelling into minute club-shaped processes called exostoses, resembling coral-branches in shape. Large masses of such, one or two inches in diameter, may be found at the extremities of the roots of old laburnum trees. They are apparently caused by a fungus which appears to be

| ubiquitous, as the disease is rarely, if ever, known to be _ absent, though it does not seem to cause much if any injury

to the health of the plants it attacks. See Studier dfver Leguminosernas rotknolér, 1874, by Dr Jacob Erikssen ; also Glardener's Chronicle, 1879, xi. p. 209, and xii. p. 112.

LABYRINTH. I. The legendary labyrinth is one of the clearest examples of the close relation between mythology and the early stages of the industrial arts. The word AaBvpwhos is derived from the Aavpa: or passages of a mine ; the digamma before the p has become in the latter a vowel, while in the former it retains its consonantal value. The mines of Greece, like those of Thrace and the Augean Islands, were probably first worked by the Pheenician traders; and the simple-minded natives regarded the strange holes in the ground with wonder and awe. To the natural fear of darkness was added the invariable tendency of the uneducated to regard as supernatural the power conferred by superior knowledge ; moreover, the god of the riches of the lower world was also the god of death and the dead. Their fear expressed itself in tales of the extraordinary ramifications of the dark passages and of the danger to which any heedless intruder into them was exposed. The maze of passages was called a labyrinth ; the word became a proper name and gained a life and meaning of its own in legend, quite unconnected with its original application. It retained a more antique form, as proper names frequently do, whereas the mining term Aavpa lost the older character of the digamma. It must have been comparatively late before the word labyrinth acquired this new independence and connotation. The best-known instance of its mythic character is found in the legends of Crete. It was interwoven with the tales, partly founded on historical events and partly derived from

ancient religion, which clustered round the name of Minos. The skilful workman, Deedalus, who sums up all the legendary conceptions of skill in handicraft, made for King Minos a labyrinth, in the centre of which the Minotaur was placed. No one who entered this labyrinth could find his way out again; he became the prey of the monster. The seven youtlis and seven maidens sent regularly by the Athenians as tribute were thus devoured, until Theseus slew the Minotaur, and escaped out of the labyrinth by the help of the clue which Ariadne had given him.

Pliny says that there had been in Crete a building called the labyrinth, of which no remains existed in his time ; but Hoek has proved quite certainly from the discrepancies and contradictions in accounts and in representations on coins that it had never a real existence. The rocks of Crete are full of winding caves, and these gave the first hint of the legendary labyrinth. This labyrinth 1s, by the

older writers, placed beside Cnossus, and is figured on coins of that city. Late writers, such as Claudian, represent it as being beside Gortyna, and there is a wonderful set of winding passages and chambers in the rocks near that place, which is still pointed out as the labyrinth. When the name had once acquired this meaning, it was applied to several real buildings, of which the following are the most famous. 1. The Egyptian labyrinth, beside the town of Arsinoe or Crocodilopolis, was in two stories, one of them underground, and contained three thousand rooms. Strabo thinks it was built as a common place of meeting for the people of the various nomes ; Herodotus and Diodorus say that it was the burial place of the twelve kings who ruled Egypt about 700 pc. Miiller (Hist. Greek Art, § 50-2) also thinks the object of such buildings must have been sepulchral. 2. The Samian labyrinth was built by Theo- dorus, one of the Samian school of sculptors, for the tyrant Polycrates. It had a hundred and fifty columns, and Pliny says that some scanty remains of it existed in his time. 3. The Lemnian labyrinth,- mentioned by Pliny, seems to be a confusion with the Samian (cf Pliny, xxxvi. 19, 3 with 83). 4. The

Italian labyrinth was a series of chambers in the lower part of the grave of Porsenna at Clusium. Some maintain that this tomb has been found in the mound named Poggio Gajella near Chiusi.

See Herod. ii. 148; Str. p. 811; Plin. xxxvi. 13 and 19; Miiller, Etrusker ; Dennis, Cities and Cemeteries of Etruria ; Hoek, Kreta. Cockerell (7’ravels), and Prokesch (Denkwurdigkeiten) describe the so-called labyrinth of Gortyna.

II. In gardening, a labyrinth or maze means an intricate network of pathways enclosed by hedges or plantations, so that those who enter become bewildered in their efforts to find the centre or make their exit. It is a remnant of the old geometrical style of gardening, but is yet occasionally introduced into pleasure grounds. There are two methods of forming it. That which is perhaps the more common consists of walks, or alleys as they were formerly called, laid out and kept to an equal width or nearly so by parallel hedges, which should be kept so close and thick that the eye cannot readily penetrate through therh. The task is to get to the centre, which is often raised, and generally contains a covered seat, a fountain, a statue, or even a small group of trees. After reaching this point the next thing is to return to the entrance, when it is found that egress is as difficult as ingress. To every design of this sort there should be a key, but even those who know the key are apt to be perplexed. Sometimes the design con- sists of alleys only, as in fig. 1, published in 1706 by

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reached, there only remains to travel back again. Of a more pretentious character was a design published by Switzer in 1742. This is of octagonal form, with very numerous parallel hedges and paths, and “six different entrances, whereof there is but one that leads to the centre,

LABYRINTH

and that is attended with some difficulties and a great many stops.” Some of the older designs for labyrinths, on the other hand, avoid this close parallelism of the alleys, which, though equally involved and intricate in their

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Fig. 2.—Labyrinth of Batty Langley. windings, are carried through blocks of thick planting, as

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Fic. 8.—Labyrinth at Versailles. wildernesses. To this latter class belongs the celebrated labyrinth at Versailles (fig. 3), of which Switzer observes,

that it “is allowed by all to be the noblest of its kind in the world.”

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Whatever style be adopted, it is essential that there should be a thick healthy growth of the hedges or shrubberies that eonfine the wanderer. ‘The trees used should be impenetrable to the eye, and go tall that no one can look over them; and the paths should be of gravel and well kept. The trees chiefly used for the hedges, and the best for the purpose, are the hornbeam among deciduous trees, or the yew among evergreens. The beech might be used instead of the hornbeam on suitable soil. The green holly might be planted

Fic. 4.—Maze at Hampton Court.

as an evergreen with very good results, and so might the American arbor vite if the natural soil presented no obstacle. The ground must be well prepared, so as to give the trees a good start, and a mulching of manure during the early years of their growth would be of much advantage to them. They must be kept trimmed in or clipped, especially in their carlier stages; trimming with the knife is much to be preferred to clipping with shears. It is not advis- able to allow the

hedge to run up too quickly or irregularly, so that any plants getting much in advance of the rest should be

_ topped, aud the whole kept to some 4 feet or 5 feet in height until

the lower parts are well thickened, when it may be allowed to acquire the allotted height by moderate annual inerements, In cutting, the hedge (as indeed all hedges) should be kept broadest at the base and narrowed upwards, which prevents it from getting thin and bare below by the stronger growth being drawn to the tops. The maze ip the gardens at Hampton Court Palace (fig. 4) is con- sidered to be one of the finest examples in England. It was planted in the early part of the reign of William III., though it has been supposed that a maze had existed there since the time of Henry VIII. It is constructed on the hedge and alley system, and was, we believe, originally planted with hornbeam, but many of the plants have died out, and been replaced by hollies, yews, &c., so that the vegetation ismixed. The walks are about half a mile in length, and the extent of ground occupied is a little over a quarterof an acre. The centre contains two large trees, with a scat beneath each, The key to reach this resting place is to keep the right hand continuously in contaet with the hedge from first to last, going round all the stops.

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The maze in the gardens at Somerleyton Hall, near Lowestoft (fig. 5), was designed by Mr John Thomas. The hedges are of English yew, and are in very fine condition, without a break or flaw. They are about 64 feet high, and have been planted a little over thirty years. In the centre is a grass mound, which is raised to the height of the hedges, and on this mound is erected a pagoda, which is approached by a curved grass path. At the two corners on the Western side are banks of laurels some

15 or 16 feet high, which are kept trimmed with the knife. On each side of the hedges throughout the labyrinth is a small strip of grass.

here was also a labyrinth at Theobald's Park, near Cheshunt,

when this place passed from the earl of Salisbury into the possession

of James I. Another is said to have existed at Wimbledon House, the seat of Earl Spencer, which was probably laid out by Brown in the last century. There is an interesting labyrinth, somewhat after the plan of fig. 2, at Mistley Place, Manningtree, the seat of the Rey. C. F. Norman.

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Fic. 6.—Labyrinth in Horticultural Society's Garden,

When the gardens of the Royal Horticultural Society at South Kensington were being planned, the Prince Consort, the president of the soeiety, especially desired that there should be a maze formed in the ante-garden, which was made in the form shown in fig. 6. This labyrinth, which was designed by the late Lieut. W. A. Nesfield, was for many years the chief point of attraction to the younger class of visitors to the gardens; but at last it was allowed to go to ruin, and had to be destroyed. {T. MO.)

LAC is a compound resinous and tinctorial incrustation formed on the twigs and young branches of various trees by an insect, Coccus lacca (Carterva lacca of Signoret), which infests them. The species of trees upon which it is prin- cipally obtained include Uvostigma religiosa, U. indica, Croton laccifera, C. sanguifera, Aleurites laccifera, Carissa spinarum, Mimosa cinerea, Erythrina indica, Inga dulcis, Butea frondosa, Zizyphus Jujuba, Vismia laccifera, Feroniu elephantum, and Vatica laccifera. Lac is a product of the East Indies, coming especially from Bengal, Pegu, Siam, and Assam. The insect which yields it is closely allied to the cochineal insect, Coccus cacti, kermes, C. dicts, and Polish grains, C. polonicus, all of which, like the lac insect, yield a red dye colour. The term lac (Laksha, Sanskrit; Zakh, Hindi) is the

same as the numeral lakh—a hundred thousand—and is indicative of the countless hosts of insects which make their appearance with every successive generation. Two evolutions of the young of the lac coccus make their appearance annually, one about the beginning of July and the other early in December. As soon as the minute larval insects make their appearance they fasten in myriads on the young shoots, and, inserting their long proboscides into the bark, draw their nutriment from the sap of the plant. The insects begin at once to exude the resinous secrction over their entire bodies, which forms in effect a cocoon, and, the separate exudations coalescing, a continuous hard resinous layer regularly honeycombed with small cavities is deposited

over and arvund the twig. From this living tomb the female insects, which form the great bulk of the whole, never escape. After their impregnation, which takes place on the liberation of the males, about three months from their first appearance, the females develop into a singularly amorphous-like organism consisting in its main features of a large smooth shining crimson-coloured sac—the ovary— with a beak stuck into the bark, and a few papillary processes projected above the resinous surface, The red fluid in the ovary is the substance which forms the lac dye of commerce, and, when the young are allowed to hatch out, the greater part of this colouring matter is lost, and only a dead resinous substance remains on the twig. To obtain the largest amount of both resin and dye-stuff therefore it is necessary to gather the twigs with their living inhabitants in or near June and November. Lac encrusting the twigs as gathered is known in commerce as “stick lac’; the resin crushed to small fragments and washed free from colouring matter constitutes “seed lac”; when melted, strained through thick canvas, and spread out into thin layers, this is known as “shell lac,” and it is in this last form that the resin is usually brought to European markets. Shell lac, which varies in colour from a dark amber to an almost pure black appearance, may be bleached by dissolv- ing in a boiling lye of caustic potash and passing chlorine through the solution till all the resin is precipitated. Bleached lac takes light delicate shades of colour, and dyed a golden yellow it is much used in

the East Indies for working into chain ornaments for the head and for other personal adornments. Lac is a principal ingredient in sealing wax, and forms the basis of some of the most valuable varnishes, besides being useful in various cements, &e. (see Lacquer). Average stick lac contains about 68 per cent. of resin, 10 of lac dye, and 6 of a waxy substance. The resin of lac is a composite body, whose constituents behave differently in presence of chemical reagents.

Lac dye, which is separated by washing stick lac in hot or cold water or in a weak alkaline solution, and dried either by exposure over a fire or in the sun, comes into commerce in the form of small square cakes. It is in many respects similar to, although not identical with, cochineal, and will dye less brilliant shades than that colour. It contains about 50 per cent. of colouring matter,

with 25 per cent. of resin and 22 per cent. of earthy |

admixture, &c. It is used for dyeing silk and wool, for which purposes it is dissolved in dilute sulphuric acid or somewhat stronger hydrochloric acid ; and the substance to be dyed is prepared with a mordant of strong lac spirit, which consists of a solution of stannous chloride. Lac dye has been used from time immemorial in the East, but the knowledge of the substance in the West is comparatively recent. It was first brought to Europe by the East India Company as a substitute for cochineal. “The best lac dye comes from Calcutta. Lac lake is an alumina lake con- taining about 50 per cent. of colouring matter, 40 per cent. of resin, and 9 or 10 per cent. of alumina.

LACAILLE, Nicotas Louts pz (1713-17 62), a zealous and successful astronomer, was born at Rumigny, near Rheims, March 15, 1713. Left destitute by the death of his father, who held a post in the household of the duchess of Vendéme, his theological studies at the Collége de Lisieux in Paris were prosecuted at the expense of the duke of Bourbon. After he had taken deacon’s orders, however he devoted himself exclusively to science, and, through the patronage of Cassini, obtained employment, first in survey- ing the coast from Nantes to Bayonne, then, in 1739, in remeasuring the French arc of the meridian. . The success of this difficult operation, which occupied two years, and

achieved the correction of the anomalous result obtained by the elder Cassini in 1684, was mainly due to Lacaille's

iudustry and skill. He was rewarded by admission to the Academy, and the appointment of mathematical professor in Mazarin college, where he worked diligently for some years in a small observatory fitted up for his use. His desire to observe the southern heavens led him to propose, in 1750, an astronomical expedition to the Cape of Good Hope, which was officially sanctioned,. and fortunately executed (see AsTRONOMY, vol. ii. p. 757). On his return in 1754 he was distressed to find himself an object of public attention, and withdrew to his former retreat in Mazarin college, where he died, March 21, 1762, of an attack of gout aggravated by unremitting toil. Lalande said of him that, during a comparatively short life, he had made more observations and calculations than all the astronomers of his time put together. And, his carefulness equalling his rapidity, the quality of his work rivalled its quantity. The rectitude of his moral character earned him universal respect, and his career ranks, if not amongst the most brilliant, amongst the most useful and honourable in the annals of science.

His principal works are—Astronomixe Fundamenta, 1757; Tabule Solares, 1758, giving, for the first time, corrections for planetary perturbations ; Celwm australe stelliferwm, 1763, a catalogue of 10,035 southern stars ; Observations sur 515 étoiles dw Zodiaque, 1763; Lecons élémentaires de Mathématiques, 1741, frequently reprinted ; ditto de Mécanique, 1743, &c.; ditto d' Astronomie, 1746, 4th edition augmented by Lalande, 1779; ditto d'Optique, 1750, &c. Calculations by him of eclipses for eighteen hundred years were inserted in L'art de verifier les dates, 1750 ; he communi- cated to the Academy in 1755 a classed catalogue of forty-two southern nebule, and gave in vol. ii. of his Ephémérides, 1754, practical rules for the employment of the lunar method of longi- tudes, proposing in his additions to Bouguer's Tratté de Naviga- tion, 1760, the model of a nautical almanac.

LA CALLE, or La Cata, a seaport town of Algeria, in the province of Constantine, the centre of the Algerian and Tunisian coral fisheries. It

lies 40 miles east of Bone and 10 miles from the Tunisian frontiers. The harbour is small and inconvenient, but it is proposed to construct a military port and harbour of refuge a little to the west. La Calle proper, or the old fortified town, is built on a ridge of rocks about 400 yards long, connected with the main- land by a bank of sand; but a new town has grown up along the coast. Besides the coral fisheries the curing of sardines is largely carried on. The population, without the garrison, was 3308 in 1871.

La Calle is mentioned as Mersa cl Kharez by El Bekri (see Journ. Asiat., 1859), and was even then the residence of coral merchants. In the early part of the 18th century it was the seat of an English trading factory, but on the failure of the company the French- African Company moved their factory from Bastion de la France to La Calle. The company was suppressed in 1794. In 1806 Mr Blanckley, British consul-general at Algiers, obtained the right of occupying Bone and La Calle for an annual rent of £11,000; but though the money was paid for several ycars no practical effect was given to the agreement. The French regained possession in 1817, were expelled during the wars of 1827, but returned and rebuilt the place in 1836.

See Abbé Poiret, Voyage en Barbarie, Paris, 1787; Broughton, Six Years in Algeria; and Playfair, Travels in the Footsteps of Bruce.

LACCADIVES, a group of coral reefs and islands in the Indian Ocean, lying between 10° and 12° 20’ N. lat. and 71° 40’ and 74° E. long. The name Laccadives (laksha dwipa, the “hundred thousand isles’) is that given by the people of the continent, and was probably meant to include the myriad Maldives ; they are called by the natives simply Divi, “islands,” or Amendivi, from the chief island. There are about nineteen separate reefs, con- taining, however, only thirteen islands, and of these only eight are inhabited. The islands have in nearly all cases emerged from the eastern and protected side of the reef, and have gradually extended towards the west over the shallow lagoon of which the rest of the space within the barrier-reef consists. The islands are small, none exceeding a mile in breadth, and lie so low that they would be hardly

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discernible but for the cocoa-nut groves with which they are thickly covered. The soil is light coral sand, beneath which, a few feet down, lies a stratum of coral stretching over the whole of theisland. This coral, which is generally a foot to a foot and a half in thickness, has been in the principal islands wholly excavated, whereby the underlying damp sand is rendered available for cereals. These excavations—a work of vast labour—were made at a remote period, and according to the native tradition by giants. In these spaces [totam =“ garden ”] are cultivated coarse grain, pulse, bananas, and vegetables; cocoa-nuts grow abundantly everywhere, and for rice the natives depend upon the mainland. Population and T’rade.—Of the eight Laccadive islands, four are directly under British rule and form part of the South Kanara collectorate in the Madras presidency. The other four (together with Minicoy, noticed below) form part of the estate of the bibi of Cannanore. The following are the names of the islands, with population in 1881:—

British Islands. Cannanore Islands.

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making a total for all the islands of 11,287, a dense population for so small an area. Amini, Kalpeni, Androt, and Kawrati are the principal or ¢arwat islands, and in them only do the high caste natives reside. The others are called melacherz, or low caste islands. The people are Moplas, ¢.e., of mixed Hindu and Arab descent, and are Mohammedans. Their manners and customs are similar to those of the coast Moplas; but they maintain their own ancient caste distinctions. ‘The language spoken is Mala- yala, but it is written in the Arabic

character. Reading and writing are common accomplishments among the men. The chief industries are the manufactures of coir and jaggery, the Laccadive coir being esteemed the best in India; the various processes are entrusted to the women. The men employ themselves with boat-building and iu conveying the island produce to the coast—in the case of the English islands to Mangalore, and in that of the bibi's islands to Cannanore. In each case the coir is taken by the ruling Government at lower than market rates, and the natives are not subject to any other taxation. At Mangalore they are paid partly in money and partly in rice, and the rates are not altered for many years. On the other hand the varying and oppressive tariff imposed upon the Cannanore islands has led to a diminished and inferior manufacture of coir, and to frequent complaints. This monopoly system, however fairly worked by the British Government, interferes with the trading capabilities of the natives, and puts them at considerable disadvantage with their rivals of Minicoy and the Maldives. The exports from the Laccadives are of the annual value of £17,000. History and Government.—No data exist for determining at what period the Laccadives were first colonized. The earliest mention of thein as distinguished from the Maldives seems to be by Albirani (cire. 1030), who divides the whole archipelago (Dibajdt) into the Divah Kiizah or Cowrie Islands (the Maldives), and the Divah Kanbar or Coir Islands (the Laccadives). See Journ. Asiat., September 1844, p. 265. According to native tradition, the islands were first occupied about a thousand years ago. The early polity, according to Mr Robinson, was patriarchal, conducted by a modatal, or chief inhabitant, and the heads of the principal families. Each island was independent. This kind of internal ee, seems to have lasted until the advent of the Portuguese. ue their independence the islanders were converted to Islam i. oe Arab apostle named Mumba Mulyaka, whose grave at " rot still imparts a peculiar sanctity to that island. The azee of Androt was in 1847 still a member of his family, and was

ee to be the twenty-second who had held the office in direct line rom the saint. This gives colour to the tradition that the conver-

sion took place about 1250. _ It is also further corroborated by the story given by Ibn Batuta of the conversion of the Maldives, which occurred, as he heard, four generations (say one hundred and twenty years) before his visit to these islands in 1342. The Portuguese discovered the Laccadives in 1499, and built forts upon them, but about 1545 the natives rose upon their oppressors, and with the aid of the raja of Cherical exterminated them. For this aid the raja obtained the suzerainty of the group, but he afterwards conferred them upon the head of the Cannanore moplas for an annual tribute. The Cannanore raja ceased to pay this tribute about the middle of the 18th century. In 1784 the Amini islands threw off the yoke, and put themselves under the protection of Tippoo, from whom, at the fall of Seringapatam in 1799, they passed to the Kast India Conipany. The remaining islands had already in 1791 fallen into the power of the Company by the storming of Cannanore, but by the peace of Seringapatam (1792) were permitted to remain under the management of the bibi at a yearly tribute. This has becn often in arrear, and on this account these islands have becn seques- trated by the British Government since 1877, to the general satis- faction of the inhabitants. Sce Mr Robinson's Report, Madras, 1874; Mr Hume in Stray Feathers, vol. iv., 1876, Calcutta.

Minicoy (called Malikw by the natives), a small island 5: miles in length, 108 miles southof Kalpéni and 68 miles north of the Maldives, belongs politically to the Laccadives in so far as it forms part of the estate of the bibi of Cannanore. The natives, however, are of the same race and speak the same language as the Maldivians. The population in 1881 was 3915. The people are well behaved, but of a very independent character ; they are active and enterprising sailors, and lazy cultivators. They are divided into four classes, viz., midlikans, the aristocracy, maluwmnies, the pilots and mates of vessels, klasics, smaller landed proprietors and sailors, and mela- cheries, toddy drawers. Minicoy anciently formed part of the Maldive realm, but, probably in the 16th century, was given by a Maldive sultan to his brother. In 1607, when it was visited by Pyrard, it was governed by a lady who for greater security held it of the raja of Cannanore (Pyrard's Voyage, chap. xxiii.). The island has never been restored to the Maldive kings.

LACE! is the name applied to an ornamental open work of threads of flax, cotton, silk, gold, or silver, and occasion- ally of mohair or aloe fibre. Such threads may be either looped or plaited or twisted together in one of three ways:— (1) with a needle, when the work is distinctively known as “needlepoint lace”; (2) with bobbins, pins, and a pillow or cushion, when the work is known as “ pillow lace”; and (3) by machinery, when imitations of both needlepoint and pillow lace patterns are produced.

History.—Special patterns for needlepoint and pillow laces date from the beginning of the 16th century. Before that period such works as might now be classified as laces consisted of small cords of plaited and twisted threads fastened in loops (or “ purls”) along the edges of costumes, of darning work done upon a net ground, and of drawn and cut embroidery. From these classes of earlier work lace is descended. Pillow lace can be distinctly traced up to the “merletti a piombini” of the 16th century. At a very early period embroidery of geometrical patterns in coloured silk, &c., on a network of small square meshes was known and made throughout Europe. This in the 13th and 14th centuries was known in ecclesiastical circles as “opus filatorium” or “opus araneum” (spider work), and exaniples dating from the 13th century still exist in public collections. The productions of this art, which has some analogy to weaving, in the early part of the 16th ceutury came to be known as “ punto a maglia quadra” in Italy and as “lacis” in France—the patterns, stiff and geometrical, being sometimes cut out of linen or separately sewed and applied to the meshed surface; but more fre- quently they were darned in, the stitches being counted as in tapestry, and hence it was known as “ point conté” or darned netting. With the development of the renaissance of art, free flowing patterns and figure subjects were 1n- troduced and worked in lacis. ‘

Drawn and cut works were ancient forms of embroidery

1 Italian, merletto, trina ; Genoese, pizzo ; German, Spitzen ; French, dentelle ; Dutch, kanten ; Spanish, encaje. The English word is the Fr. lassis or lacis, connected with the Latin lagueus, Early F rench laces were also called passements (‘‘ insertions”).

 which directly developed into point lace. The methods of producing them were various. A common way was to fasten on a light frame a reticulation of threads, under which was fastened, by gum or otherwise, a piece of fine lawn. Then along these threads the pattern to be formed was stitched to the lawn background in button-hole stitching, and the superfluous parts of the lawn were afterwards drawn or cut away,—whence the names ‘‘punto a reti- cella” and “punto tagliato.” In other cases no cloth at all was used, and the pattern, consisting of an interlacing framework of threads, was simply sewed over with button- hole stitches. This was “punto in aria.” The early geo- metrical patterns of the “punto a reticella” or “punto tagliato” and “punto in aria” were probably derived from the Ionian Islands and Greece, and the cut-work itself was indeed also known as Greek lace. The close connexion of the proud and powerful Venetian republic with Greece and the eastern islands, and its commercial relations with the East, sufficiently explain the early transplanting of these arts into Venice. Once fairly established, they quickly grew in beauty and variety of pattern, complexity of stitch, and delicacy of execution, until Venetian lace attained an artistic grace and perfection which bafile all description. The making of the principal and most important variety of Venetian needlepoint lace, the “punto in aria,” began to be practised in the middle of the 16th century.!

It is a noteworthy circumstance that the two widely distant regions of Europe where pictorial art first flourished and attained a high perfection, North Italy and Flanders, were precisely the localities where lace-making first took root, and became an industry of importance both from an artistic and from a commercial point of view. The inven- tion of pillow lace is generally credited to the Flemings ; but there is no distinct trace of the time or the locality. In a picture said to exist in the church of St Gammar at Lierre, and sometimes attributed to Quentin Matsys (1495), is introduced a girl working lace with pillow, bobbins, &c., which are somewhat similar to the implements in use in more recent times.? From the very infancy of Flemish art an active intercourse was maintained between the Low Countries and the great centres of Italianart; and it is therefore only what might be expected that the wonderful examples of the art and handiwork of

Venice in lace-making should soon have come to be known to and rivalled among the equally industrious, thriving, and artistic Flemings. And so we find that, at the end of the 16th century, lacis and needlepoint lace were also known and made in Flanders, and pattern-books were issued having the same general character as those published for the instruction of the Venetians and other Italians. In Italy, under the name of ‘merletti a piombini,” the art of twisting and plaiting threads by means of bobbins or fuxii was early practised ; and in later times fine scrolls in great widths for altar frontals were made in Italy on the pillow.

France and England were not far behind Venice and

broidery during the 16th centur books then published. In Ve

in the above-mentioned sorts of em- y 1s marked by the number of pattern-

Venice an early work of this class was issued by Alessandro Pagannino in 1527 ; another of a similar nature,

printed by Pierre Quinty, appeared in the same year at Cologne 3 and La fleur de la science de pourtraicture et patrons de broderie facon arabicque et ytalique, was published at Paris in 1530. From these early dates until the beginning of the 17th century pattern-books for embroidery in Italy, France, Germany, and England were produced and published in great abundance, The designs contained in many of those dating from the early 16th century were to be worked for cos- tumes and hangings, and consisted of scrolls, arabesques, birds animals, flowers, foliage, herbs, and grasses. So far, however, as their reproduction as laces might be concerned, the execution of complicated work was involved which none but practised lace-workers, such as those who arose a century later, could be expected to overcome.

2 The picture, however, as Seguin has pointed out, was probably painted some thirty years later, and by Jean Matsys,

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Flanders in adopting lace. Henry ILE. of France (1574-1589) appointed a Venetian, Frederic Vinciolo, to be pattern maker for varieties of linen needle works and laces to his court. Through the influence of this fertile designer the seeds of a taste for lace in France were principally sown. But the event which par excel- lence would seem to have fostered the art of lace making there was the aid and patronage officially given it in the following century by Louis XIV., acting on the advice of his minister Colbert. Intrigue and diplomacy were put into action to secure the services of Venetian lace-workers ; and by an edict dated 1665 lace-making centres were founded at Alengon, Quesnoy, Arras, Rheims, Sedan, Chateau Thierry, Loudun, and elsewhere. The state made a contribution of 36,000 francs in aid of a company to carry out the organization of these establishments; and at the same time the importation of Venetian, Flemish, and other laces was strictly forbidden. The edict contained instructions that the lace-makers should produce all sorts of thread work, such as those done on a pillow or cushion and with the needle, in the style of the laces made at Venice, Genoa, Ragusa, and other places; these French imitations were to be called “points de France.” By 1671 the Italian ambassador at Paris writes, ‘ Gallantly is the minister Colbert on his way to bring the ‘lavori d’aria’ to perfection.” Six years later an Italian, Domenigo Contarini, alludes to the “punto in aria,” “which the French can now do to admiration.” The styles of design which emanated from the chief of the French lace centres, Alengon, were more fanciful and floral than the Venetian, and it is quite evident that the Flemish lace-makers adopted many of these French patterns for their own use. The importance of the French designs, which owe so much to the state patronage they enjoyed, was noticed early in the 18th century by Bishop Berkeley. How,” he asks, “could France and Flanders have drawn so much money from other countries for figured silk, lace, and tapestry, if they had not had their academies of design ?”

The humble endeavours of peasantry in England (which could boast of no schools of design), Germany, Sweden, Russia, and Spain could not result in work of high artistic pretension. Lace making is said to have been promoted in Russia through the patronage of the court there, after the visit of Peter the Great to Paris in the early days of the 18th century. In Germany, Barbara Uttmann, a native of Nuremberg, instructed peasants of the Harz mountains to twist and plait threads in 1561. She was assisted in this by certain refugees from Flanders. A sort of “purling” or imitation of the Italian “ merletti a piombini” was the style of work produced here. It did not develop in any important way, nor have German laces acquired great artistic reputation. Spain has been con- sidered to have been a lace-making country, and no doubt a good deal of lace, having, however, no distinctive charac- ter, was made in Spanish conventual establishments. The ‘point d’Espagne,” however, appears to have been a com- mercial name given by French manufacturers of a class of lace greatly esteemed by Spaniards in the 17th century. No lace pattern books have been found to have been published in Spain. The point laces which came out of Spanish monasteries in 1830, when these institutions were dissolved, were not distinguishable from similar Venetian needle-made laces. The lace vestments pre- served at the cathedral at Granada hitherto presumed to ee A

3 See the poetical skit Revolte des Passements et Broderies, written by Mademoselle de la Tousse, cousin of Madame de Sévigné, in the middle of the 17th century, which marks the favour which foreign laces at that time commanded amongst the leaders of French fashion. It is fairly evident too that the French laces themselves, known as ** bisette,” ‘ gueuse,” ‘ campane,” and ‘*mignonette,” were small and comparatively insignificant works, without pretence to design.

be of Spanish work are Flemish of the 17th century. The industry is not alluded to in Spanish ordinances of the 15th, 16th, or 17th centuries, Much Flemish lace was imported into Spain from Spanish Flanders. The black and white silk pillow laces, or “ blondes,” date from the

18th century. They were made in considerable quantity in the neighbourhood of Chantilly, and imported by Spain for mantillas, Although after the 18th century the making of silk laces has more or less ceased at Chantilly and the neighbourhood, the craft is now carried on in Nor- mandy—at Bayeux and Caen—as well as in Auvergne. Silk pillow lace making is carried on in Spain, especially at Barcelona. The patterns are almost entirely imitations from the French. Malta is noted for producing a thick pillow lace of black, white, and red threads, chiefly of geometric pattern, in which circles, wheels, and radiations of shapes resembling grains of wheat are a principal feature. This characteristic of design, appearing in laces of similar make which have been identified as Genoese pillow laces of the early 17th century, reappears* in Spanish and Paraguayan work. Pillow lace in imitation of Maltese, Buckinghamshire, and Devonshire laces is made in Ceylon, and in different parts of India where attempts have been made to introduce European arts to native labour.

At present the chief sources of hand-made lace are Belgium, England, and France, but a successful effort has also been made to re-establish the industry in the island of Burano near Venice, and much fine work of good design is now (1882) made there. Russian peasants in the districts of Vologda, Balakhua (Nijni-Novgorod), Bieletf (Tula), and Mzensk (Orel) make pillow laces of simple patterns. But by far the greatest amount of lace now made is that which issuesfrom machinesin England and France.! Thetotal num- ber of persons employed in the lace industry in England in 1871 was 49,370; and according to official returns of the year 1873, 240,000 women were similarly employed in France.

The early history of the lace-making machine coincides with that of the stocking-frame, that machine having been adapted about the year 1768 for producing open-looped stitches, which had a net-like appearance. In the years 1808 and 1809 John Heathcoat of Nottingham obtained patents for machines for making bobbin net, which form the real foundation of machine making of lace. These machines were improved on in 1813 by John Leavers, whose lace-making machines are in use at the present time. The application of the celebrated

Jacquard apparatus to these net machines has enabled manufacturers to pro- duce all sorts of patterns in thread work in imitation of the patterns for hand-made lace. The latest improvement in machinery for lace making has resulted in a French machine called the “dentelli¢re” (see La Nature for 3d March 1881). The work produced by this machine is plaited. That pro- duced by the English and by other French machines is of twisted threads. At present, however, the expense attend- ing the production of plaited lace by the “ dentelliére ” is as great as that of pillow lace made by the hand.

Before considering technical details in processes of Making lace, the principal parts of a piece of lace may be named. A prominent feature is the ornament or pattern. This may be so designed that the different parts may touch one another, and so be fastened together, no ground-work of any sort being required. Ground works are useful to set off the pattern, and either consist of links or tyes, which give an open effect to the pattern, or else of a series of meshes like net. Sometimes the pattern is outlined with a thread or cord line, or more strongly marked by means of a raised edge of button-hole stitched or plaited work,

Fanciful devices are sometimes inserted into various por- tions of the pattern. In some of the heavy laces, which resemble delicate carving in ivory, little clusters of small loops are distributed about the pattern. French terms are frequently used in speaking of details in laces. Thus the pattern is called the todé or gimp, the links or tyes are called brides, the meshed grounds are called réseaux (retiola), the outline to the edges of a pattern is called cordonnet, the insertions of fanciful devices modes, the little loops picots. These terms are applicable to the various portions of all laces made with the needle, on the pillow, or by the machine.

The history of patterns in lace is roughly as follows. From about 1540 to 1590 the forms were geontetric, chiefly common, without brides or réseaux. From 1590 to 1630 may be dated the introduction of floral and human forms and slender scrolls held together by brides. At this time lace makers enriched their works with insertions of modes. To the

period extending from 1620 to 1670 belongs the development of scrolls and elaboration of details like the cordonnet with massings of picots. Much heavy raised lace enriched with fillings in of modes was made at this time. About 1660 réseaux came into use. From 1650 to 1720 the scroll patterns gave way to arrangements of detached ornamental details which were frequently filled in with elaborate modes. A closer imitation of all sorts of subjects was attempted in lace patterns. Pictorial representations of figures, incidents, persons, arose. The purely conventional scrolls were succeeded by naturalistic renderings of garlands, flowers, birds, and such like. The use of meshed grounds extended, and grounds composed entirely of varieties of modes were made. From 1720 to 1780 small details of bouquets, sprays of flowers, single flowers, leaves, buds, spots, and such like were adopted, and sprinkled over meshed grounds. Since that time down to the present day all these styles of pattern have been used as fashion has required.

Needlepoint Lace.—The way in which the early Vene- tian ‘punto in aria,” as already described, was made appears to correspond precisely with the elementary prin- ciples upon which needlepoint lace is now worked. The pattern is first drawn upon a piece of parchment. The parchment is then stitched to a stout bit of linen. Upon

the leading lines drawn on the parch- ment threads are

laid, which are here and there fastenedi¢ through to the parch-° ment and linen by means of stitches.

Fig. 2.

When the skeleton thread pattern is completed, a compact covering of thread in button-hole stitches is cast upon it (fig. 1). The portions which may be required to be represented as close linen work or tozlé

Higue 2.

are worked as indicated in the enlarged diagram (fig. 2). Be- Sam tween the leading lines of the baSeeté pattern may be inserted tyes est

(links) or meshes, so that the yeeitegsh& cere pattern is held together. When Ragea@ees its all is finished, a knife is passed BrpAees – between the parchment and the f é stout linen, cutting the stitches @ e which have passed through the py¢, 3,—Part of a Border of parchment and linen, and so re- Needlepoint Lace, geome- leasing the lace itself from its tric design, About 1550. pattern parchment. For about sixty years the laces thus made were chiefly geometric in pattern (fig. 3). They were used both for insertions between seams and for

1 See Felkin's Machine-wrought Hosiery and Lace Manufactures. \ borders. Following closely upon eo geoinetric laces

came laces of a freer style of design, and towards the end of the 16th century designs for scrolls with the introduction of all kinds of odd figures and leaves and blossoms were pro- duced (fig. 4). Links or tyes —brides—came to be inter-

Fie. 4.—Italian Needle- point Scallop.

spersed between the various details of the patterns (fig. 5). The work was of a flat character. Some large and elaborate specimens of this flat point lace were made at this time The lace workers occasionally used gold thread with the white thread. The nomenclature of these earlier needle- made laces is somewhat modern. At the present time the different sorts of early Venetian point laces are

Fia. 5.—Needlepoint Lace, showing use of tyes or ‘‘ brides.”

called “flat Venetian point,” “rose (raised) point,” ‘¢ caterpillar point,” “bone point,” &c; and works of

bold design done in relief are called “gros point de Venise.” Lace of this latter class (figs. 6, 7) was used for altar cloths, flounces, and heavily trimmed jabots or neckcloths which hung beneath the chin

over the breast. Zablvers and ladies’ aprons were also made of such lace. The laces which have hitherto been referred to are laces ; in which no regular Fic. 6.—Venetian Needlepoint Lace. ground was used. All sorts of minute embellishments, like little knots, stars, and loops or picots, were worked on to the

irregularly arranged brides or tyes holding the main patterns together, and these de-

vices as a rule gave a | rich effect to the lace work. Following this style of treatment came laces with groundworks; and grounds of brides or tyes arranged in a honey- comb pattern were, it appears, first used early in the 17th century (fig. 8). To them succeeded a lighter sort of lace, one in which the rich and

Fie. 7.—Venetian Needlepoint Lace. compact relief gave place to much flatter work with a ground

of meshes. The needle-made meshes were sometimes of single and sometimes of double threads. A diagram is given of an ordinary method of making such meshes (fig. 9). The delicate Venetian point lace made with a

ground of meshes is usually known as “point de Venise & réseau.” It was contemporary with the famed needle- made French laces of Alengon and Argentan. “ Point d’Argentan” has been thought to be especially distinguished on account of its ground of hexagonally arranged brides. But this has been noticed as a peculiarity in certain Venetian point laces of earlier date! Often intermixed with this stiff hexa- gonal brides ground is the fine-meshed ground or réseau, which has been held to be distinctive of “point d’Alengon” (fig. 10). But, apart from the ~~assuniedly distinctive grounds, the styles of patterns and the methods of work~~ ing them, with rich variety of insertions or modes, with raised but- ton-hole-stitched edg- ings or cordonnets, are precisely alike in the two classes of Argentan and Alengon needle-

made laces. Besides the hexagonal brides ground and the ground of meshes there was §

another variety of grounding used in * the Alengon laces, which was exten- sively used and forms a third class. This ground consisted of button-hole- stitched skeleton hexagons within each of which was worked a small solid hexagon connected with the outer surrounding hexagon by means of six little tyes or brides (see fig. 11). Lace with this particular ground has been called “ Argen- tella,” and some writers on lace have thought that it was a specialty of Genoese or Venetian work. The character of the work and the style of the floral patterns worked upon such grounds are those of Alengon laces, and specimens of this “ Argen- tella” often contain insertions of the Argentan brides and the Alengon fine meshes.

There are very slight indications respecting the establishment of a lace manufactory at Argentan, where- % as those regarding Alengon are nu- 3) merous. A family of thread and iS)= linen dealers, inhabitants of Alengon, L by name Monthuley, are credited & een with the establishment of a branch “”””) manufactory or succursale for lace at Argentan. In the course of business, the Monthuleys assisted the interchange of lace patterns between Argentan and Alengon, which are distant one from another about 10 miles. Thus if a piece of lace was produced at Alengon it was called “ point d’Alengon,” and if at Argentan “ point d’Argentan,” though both works might have been made

Fia. 8.—Venetian Needlepoint Lace.

> a % a Fie. 10.—French Needlepoint Lace.

1 The lace workers at Alencgon and its neighbourhood produced work of a daintier kind than that chiefly made by the Venetians. Asa rule the hexagonal bride grounds of Alencon laces are smaller than similar details in Venetian laces. The average size of a diagonal taken from angle to angle in an Alengon (or so-called Argentan) hexagon was about one-sixth of an inch, and each side of the hexagon was about one- tenth of aninch. An idea of the minuteness of the work can be

formed from the fact that a side of a hexagon would be overcast with some nine or ten button-hole stitches.

from one design. From about 1670 to 1780 a great deal of point lace was made at Alet:gon and in the neighbouring villages. The styles of patterns varied, as has been stated. Point d'Alengon is still made.

In Belgium, Brussels has acquired some celebrity for needle-made laces. These, however, are chiefly in imitation of those made at Alengon. Brussels needlepoint lace is often worked into meshed grounds made on a pillow. The Brussels needle-lace workers used a plain thread as a cordonnet for their patterns instead of a thread overcast with button-hole stitches asin the Venetian and French needlepoint laces.

This kind of lace has also been produced in England. Whilst the character of English design in needlepoint laces of the early 17th century (fig. 12) is simpler than that of

Fie. 12,—English Point Lace.

the contemporary Italian, the method of workmanship is virtually the same. Specimens of needle-made work done by English school children may be met with in samplers of the 17th and 18th centuries. Point lace is successfully made in Irish convents. In all great towns like London, Paris, Brussels, Vienna, lace dealers undertake to supply demands for finely executed modern imitations of old needle-made lace. At Burano the lace-making school lately established there produces hand-made laces which are, to a great extent, careful reproductions of the more celebrated classes of point laces, such as " punto in aria," "rose point de Venise," " point de Venise 4 réseau," ' point d'Alengon," "point d'Argentan," and others, A weaving of threads with a needle into a foundation of net—very distinctive, and different from the "punto a maglia" or "lacis"—has been done for a long time in Spain. Its leading characteristic is the pattern of repeated squares, filled up with star figures) When fine thread is used the effect

of heavy cobwebs is produced. Work of this de- scription has been made in Paraguay, where a coarse “torchon ” pillow lace is also produced.

Pillow-made Lace.—Pillow-made lace is built upon no substructure, like a skeleton thread pattern, such as is used for needlepoint lace. It is the representation of a pattern obtained by twisting and plaiting threads. The only pre- existing analogue of pillow laces is to be found in the primitive twistings and plaitings of fibres and threads. The English word “lace” in the 15th century was employed to describe fine cords and braids. In a Harleian MS. of the time of Henry VI. and Edward IV., about 1471, direc- tions are given for the making of “lace Bascon, lace indented, lace bordered, lace covert, a brode lace, a round lace, a thynne lace, an open lace, lace for hattys,” é&c. The MS. opens with an illuminated capital letter, in which is the figure of a woman making these articles. Her im- plements are not those with which pillow lace of orna- mental quality from the middle of the 16th century and onwards has been made. The MS. supplies a clear de- Scription how threads in combinations of twos, threes, fours, fives, to tens and fifteens, were to be twisted and plaited together. Instead of the pillow, bobbins, and pins with which pillow lace is made, the hands were used.

Each finger of a hand served as a peg. The writer of the MS. says that it shall be understood that the first finger next the thumb shall be called A, the next B, and so on. According to the sort of twisted cord or braid which had to be made, so each of the four fingers A, B, C, D might be called upon to act like a reel, and to hold a “ bowys” or “ bow,” or little ball of thread. Each ball might be of different colour from the other.

Pillow lace making was never so strictly confined to geometric patterns as point lace making. Curved forms, almost at its outset, seem to have been found easy of execu-

Fia. 13.—Cuff trimmed with Plaited and Twisted Thread Work in Points, or Scallops. Late 16th century.

tion (fig. 13). One reason for this no doubt is that the twisted and plaited work was not constrained by a founda- tion of any sort. The plaitings and twist- ings gave the workers a greater freedom in reproducing designs. At the same time, little speciality of pattern seems to fix have been produced for the pillow lace By workers, and so laces worked on the pillow, particularly those of higher pretence to artistic design, were similar in pattern to those worked with the needle. The early wiry-looking twisted and plaited thread Fic. 14.—Plaited

laces were soon succeeded by laces in which @nd ar flattened and broader lines occupy a pro- ao, oer. minent position (fig. 14). Tape was also jetti a Piom- sometimes used for the broad lines. The on About

weaving of tape appears to have been begun in Flanders about the end of the 16th or the be- ginning of the 17th century. In England it dates no farther back than 1747, when two Dutchmen of the name of Lanfort were invited by an Eng- lish firm to set up tape looms in Manchester and give instructions in the method of weaving tape. The process by which lace has been made on the pillow from about the middle of the 17th cen- tury is very roughly and briefly as follows. A pattern is first drawn upon a piece of paper or parchment. It is then pricked with holes by a skilled “pattern pricker,” who deter- mines where the principal pins shall be stuck for guiding the threads. This pricked pattern is then fastened to the

Fic. 15.—Diagram showing six Bobbins in use.

pillow. ‘The pillow or cushion varies in shape in different countries. Some lace makers use a circular pad, backed with a flat board, in order that it may be placed upon a table and easily moved as the worker may wish. Other lace workers use a well-stuffed round pillow or short bolster, flattened at the two ends, so that they may hold it between their knees. , On the upper part of the pattern are fastened the. ends of the threads from the bobbins.

Fig 16. The bobbins thus hang across the pattern. Fig. 15 shows the commencement of a double set of

three-thread plaitings. The compact portion in a pillow lace has a woven appearance (fig. 16). _ In the 17th century pillow lace in imitation of the scroll patterns of point lace was made. This sort of work, pro- duced chiefly in Flanders, went under the name of “ point d’Angleterre” (fig. 17). Into Spain and France much lace from Venice and Flanders was imported as well as into England, where from the 16th century the mann- facture of “bone lace” by peasants in the midland and southern counties was carried ou. This bone lace consisted chiefly of borders done in imitation of the Venetian ‘“‘ merletti a piombini.” ture was of sufficient im- portance to demand par- liamentary attention. The trade was threatened with extinction by the more artistic and finer Flemish laces, Theimportation of the latter was prohibited. Flemish lace workers sought to evade the pro- hibitions by calling certain of their laces ‘‘ puint d’ Angleterre.” Butthe dif- } ficulties which attended | the smuggling into Eng- land of these “ points d’Angleterre” appear t9 Fyq, 17.—Pillow-made Lace “Abrides.” have stimulated English © Flemish. 17th century. Sometimes dealers in lace anxious to called ‘“ Point d’Angleterre.” supply the demands of fashion to obtain the services of Flemish lace makers and to induce them to settle in Eng- land. Itis from some such cause that English pillow lace closely resembles in character of design pillow laces of Brussels, Mechlin, and Valenciennes.

Fig. 18 gives three sorts of Buckinghamshire pillow laces, the patterns of which have been in use since the middle of the 18th century. In (a) is a variety of fillings- in, which give the name of “trolly” to such specimens. It is an adaptation of Mechlin “trolle kant” or sampler lace, sent round to dealers and purchasers to show the variety of patterns which the lace makers happened to be at work upon. Specimens (5) and © are both in the style of certain 18th century Mechlin laces © being also like laces made at Lille and Arras.

As skill in making lace developed, patterns and particu- lar plaitings came to be identified with certain localities, Mechliu enjoyed a high

reputation for her production, which was in the 17th century poetically styled the « queen of laces.” The chief features of this pillow lace are the plaiting of the meshes, and the outlining of the pattern or toilé with athread. The ordinary Mechlin mesh is hexagonal in shape Four of the sides are of double twisted threads, two are of four threads plaited three times (fig. 19). The mesh of Brussels pillow lace is also hexagonal. Four of the sides are of double-twisted threads, two are of four threads plaited four times (fig. 20). The finer specimens of Brussels lace are remarkable for the fidelity and grace

In Charles IL.’s time its manufac-

LACH

with which floral compositions are rendered. Many of these compositions are either reproductions or adaptations of designs for point d’Alengon, and in such patterns the soft quality of fine pillow-1ade lace contrasts with the harder and more crisp appearance of needlepoint lace. In

Fie, 18.—English Pillow Laces. 18th century. the Brussels pillow lace (fig. 21) much realistic effect is

_ obtained by the delicate modelling imparted to the flowers @ | by means of a bone instrument used to give concave shapes

to petals and leaves, the edges of which are often marked

Frc. 20,—Enlargement of Mesh of Brussels ground, showing the four-twisted and two- plaited sides in each mesh.

Fic. 21.—Pillow Lace. $,

18th century. Fig. 22. by a flattened and slightly raised cordonnet of plaited work. Honiton pillow lace resembles Brussels lace. As a rule it is made with a coarser thread, and the designs lack the careful drawing and composition which may be seen in Brussels pillow laces. In Valenciennes lace there are no

Brussels.

LACE

twisted sides to the mesh; all are closely plaited (fig. 22), and as a rule the shape of the mesh is diamond. No outline or

Fic. 23.—Peasant Lace from Crete. cordonnet is used in Valenciennes lace.. Besides these dis- tinctive classes of pillow-like laces, there are others in which

Fia. 24,—German Pillow-made Lace. 18th century.

equal ingenuity is displayed, though the character of the design remains primitive, as for instance in peasant laces from Crete (fig. 23), Russia, and Germany. Pillow lace z making in Crete would seem to have arisen in consequence i

of Venetian intercourse with & the island. said to be extinct. The lace were chiefly made of silk The patterns in many speci mens are outlined with one, two, or three bright-coloured } silken threads. As a rule’ the motives of the Cretan ; lace patterns are traceable to orderly arrangement and balance of simple symmetri- cal and geometrical details, such as diamonds, triangles, and odd polygonal figures. Wniformity in character of

Fie. 25.—Russian Pillow Laces, 19th century.

design may be observed in many of Russian laces, especially in respect of

the German and patterns like that shown in fig. 24 and fig. 25a. This sort of pattern is used in peasant laces of Sweden, in common French “ tor- chon” laces, and in a lace made at Ripon in Yorkshire. The meshed § grounds (réseaux) of the Chantilly silk laces were generally simple in character, as shown in fig. 26.

Guipure.—This name, often applied to needlepoint and pillow laces, pro- perly designates a kind of lace or “passement” made with “cartisane ”

Fig. 26. «passe and twisted silk. Cartisane” is a little strip of thin parchment or vellum, Which was covered with silk, gold, or silver thread. Guipure is also made with fine wires whipped round with silk, and with cotton thread similarly treated. These stiff threads, formed into a pattern, were held together by

stitches worked with the needle. Such work, which is very much dependent upon the ductile characteristics of the

materials employed, is now called gimp work. Gold and silver thread laces were usually made on the pillow. Machine-made Lace.—We have already seen that a technical peculiarity in making needlepoint lace is that a single thread and needle are alone used to form the pattern, and that the button-hole stitch and other loopings which can be worked by meaus of a needle and thread mark a dis- tinction between lace made in this manner and lace made on the pillow. For the process of pillow lace making a series of threads are in constant employment, plaited and twisted the one with another. A button-hole stitch is not producible by it. The machine does not attempt to make either a button-hole stitch or a regular plait. Up to the present, however ingenious may be the counterfeits of design of all sorts of lace produced by the machine, an essential principle of the machine-made work is that the threads are merely twisted together. The only ex- ception which could be made to this statement would be as regards the plaited lace made by the ‘“‘dentellitre” already mentioned. The Leavers lace machine is that which is gene- rally in use at Nottingham and Calais. French ingenuity has developed improvements in this machine whereby laces of delicate thread are made; but as fast as France makes an improvement. England follows with another, and both countries virtually maintain an equal position in this branch of industry. The number of threads brought into operation in a Leavers machine is regulated by the pattcrn to be produced, the threads being

of two sorts, beam or warp threads and bobbin or weft threads. Upwards of 8880 are sometimes used, sixty pieces of lace being made simultaneously, each piece requiring 148 threads—100 beam threads and 48 bobbin threads. The ends of both sets of threads are fixed to a cylinder upon which as the manufacture pro- cecds the lace be- comes wound. The supply of the beam or warp threads is held upon reels,and that of the bobbins or weft threads is held in bobbins, The beam or warp thread reels are ar- ranged in frames or trays beneath the stage, above which and between it and

the cylinder the twisting of the bobbin or weft with beam or

warp threads takes place. The bob- bins containing the bobbin or weft Fig. 27. threads are flattened in shape so as to pass conveniently between the stretched beam or warp threads. Each bobbin can contain about 120 yards of thread. By most ingenious mechanism varying degrees of tension can be imparted to warp and weft threads as required. The bobbins of the weft threads as they pass like pendulums betweenthe warp threads are made to oscillate, and through this oscillation the threads twist themselvesor become twisted withthe warp threads. As the twistings take place, combs passing through both warp and weft threads compress the twistings. Thus the usual machine-made lace may generally be detected by its com- pressed twisted threads. Figs. 27 and 28 are intended

to show effects obtained by varying the tensions of weft and warp threads. For instance, if the weft, as threads b, 6, 6, & in fig. 27, be tight and the warp thread slack, the

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Fia. 29.—Section of Lace Machine. warp thread @ will be twisted upon the weft threads. But if the warp thread a be tight and the weft threads 6, 6, 6, 6 be slack, as in fig. 28, then the weft threads will

Fic. 30.—Pillow-made Lace. Mechlin. Early 18th century.

be twisted on the warp thread. At the same time the twisting in both these cases arises from the conjunction of movements given to the two sets of threads, namely, a movement from side to side of the beam or warp threads,

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and the swinging or pendulum-like oscillations of the bobbin or weft threads between the warp threads. Fig. 29 represents a section of part of a lace machine. E is the cylinder or beam upon which the lace is rolled as made, and upon which the ends of both warp and weft threads are fastened at starting. Beneath are w, w, w, a series of trays or beams, one above the other, containing the reels of the supplies of warp threads; c,c¢ represent the slide bars for the passage of the bobbin 6 with its

Fic. 831.—Machine-made Imitation of Mechlin Pillow Lace.

thread from & to k, the landing bars, one on each side of the rank of warp threads; s,¢ are the combs which take it in turns to press together the twistings as they are made. The combs are so regulated that they come away clear from the threads as soon as they have pressed them together and fall into positions ready to perform their pressing operations again. The contrivances for giving each thread a particular tension and movement at a certain time are connected with an adaptation of the Jacquard

Fra. 32.—Venetian Point Lace, & réseau. 17th century.

system of pierced cards. The machine lace pattern drafter has to calculate how many holes shall be punched ina card, and to determine the position of such holes. Each hole regulates the mechanism for

giving movement to a thread. Fig. 30 is a specimen of a Flemish pillow lace of the early 18th century. The meshes of the ground are variegated in appearance. A thread outlines the pattern. In fig. 31 it will be seen that the manufacturer has merely attempted to reproduce the pattern of the foregoing. His meshes are regular. No outlining thread marks the pattern, which, instead of being filmy, like cambric, is ribbed. This speci-

men, recently made at Calais with a Leavers machine, is produced ata cost of 1s. 2d. a yard, whilst the value of the original hand-made pillow lace is at least £1, 5s. a yard. Fig. 32is taken from a piece of fine needle-made lace (point de Venise & réseau). The flat and even appearance in the close portions (the toi/é) of the pattern, the slight thread (cordonnet) outlining the pattern, and the delicate fillings-in or modes of tracery work may be noted for comparison

Fic. 33.—Machine-made Imitation of Venetian Point Lace, 4 réseau.

with corresponding details in the machine-made imitation (fig. 33). In this the close portions are ribbed, the cor- donnet is stouter and stands in relief, and the tracery modes are simpler in composition.

Literatwre.—The literature of the art of lace making is consider- able. The series of 16th and 17th century lace pattern-books, of which the more important are perhaps those by F. Vinciolo (Paris, 1587), Cesare Vecellio (Venice, 1592), and Isabetta Catanea Parasole (Venice, 1600), not to mention several kindred works of earlier and later date published in Germany and the Netherlands, supplies a large field for exploration. Recently Signor Ongania of Venice has published a limited number of facsimiles of the majority of such works. M. Alvin of Brussels issued a brochure in 1863 upon these patterns, and in the same year the Marquis Girolamo d’Adda contributed two bibliographical essays upon the same subject to the Gazette des Beaux Arts (vol. xv. p. 842 sg., and vol. xvii. p. 421 sq.). In 1864 Cavaliere A. Merli wrote a pamphlet (with illustra- tions) entitled Origine ed uso delle Trine a filo di refe; Mons F. de Fertiault compiled a brief and

rather fanciful Histoire de la Dentelle in 1843, in which he reproduced statements to be found in Diderot's Encyclopédie, subsequently quoted by Roland de la Platiére. The first Report of the Department of Practical Art, 1858, contains a ‘‘Report on Cotton Print Works and Lace Making” by Octavius Hudson, and in the first Report of the Department of Science and Art are some ‘‘ Observations on Lace,” with magnified representations of details showing stitches and plaits used in various laces. Mr Hudson delivered two lectures ‘‘On Lace made by Hand” in 1853. Reports upon the International Exhibitions of 1851 (London) and 1867 (Paris), by M. Aubry, Mrs Palliser, and others, contain informa- tion concerning lace making. But the most important work first issued upon the history of lace making is that by the late Mrs Bury Palliser (History of Lace, 1869; latest edition, 1875). In this work the history is treated rather from an antiquarian than a technical point of view; and wardrobe accounts, inventories, state papers, fashionable journals, diaries, plays, poems, have been laid under contribution with surprising diligence. The Queen Lace Book, an historical and descriptive account of the hand-made laces of all countries, published in London in 1874, relies for much of its data upon Mrs Palliser's book, and contains some illustrations of ex- cellent specimens of work. In 1875 the Arundel Society brought out a folio volume of permanently printed photographs taken from some of the finest specimens of ancient lace which were collected for the International Exhibition of 1874. These were accompanied by a brief history of lace, written from the technical aspect of the art, by Mr Alan S. Cole. At the same time appeared a bulky Imperial 4to volume by M. Seguin, entitled La Dentelle, which is illustrated with woodcuts and fifty photo-typographical plates. M.

Seguin divides his work into four sections. The first of these is devoted to a sketch of the origin of lacis; the second deals with pillow laces, bibliography of lace, and a review of sumptuary edicts; the third relates to needle-made lace ; and the fourth contains an account of places where lace has been and is made, remarks upon commerce in lace, and upon the industry of lace makers. This method of treating the

subject entails the repetition of numerous facts and observations. Without sufficient conclusive evidence M. Seguin accords to France the palm for having excelled in producing the richer sorts of laces, which both before and since the publication of his otherwise valuable work have been identified as being Italian in origin. Descriptive catalogues are issued of the lace collections at South Kensington Museum, at the Science and Art Museum, Dublin, and at the Industrial Museum, Nuremberg. In 1881 a series of four Cantor Lectures on the art of lace making were delivered before the Society of Arts by Mr Alan 8. Cole, and have since been extracted from the journal of the society, and published in'a pamphlet form, with illustrations. The latest work on the sub- ject isa Technical History of the Manufacture of Venctian Laces, by G. M. Urbani de Gheltof, with plates, translated by Lady Layard, and published at Venice by Signor Ongania. The History of Machine-wrought Hosiery and Lace Manufacture (London, 1867), by Felkin, has already been referred to. There is also a technological essay upon lace made by machinery, with diagrams of lace stitches and patterns (Zechnologische Studien im Stichsischen Erzgebirge, Leipsic, 1878), by Hugo Fischer. . C.) LACED/EMON. See Laconia and Sparta. LACEPEDE, BernarD GERMAIN ETIENNE DE LA VittE, Comte pe (1756-1825), French naturalist, was born at Agen in Guyenne, December 26, 1756. His educa- tion was carefully conducted by his father, and the early perusal of Buffon's Natural History awakened an interest in that branch of study, which for the remainder of his life absorbed his chief attention. His leisure he devoted to music, in which, besides becoming a good performer on the piano and organ, he acquired considerable mastery of composition, two of his operas, which, however, were never published, meeting with the high approval of Gluck ; and in 1781-85 he also brought out in two volumes his Poétique dela Musique. Meantime he wrote two treatises, Hssaz surl Hlectricité (1781) and Physique générale et particuliére (1782-84), which gained him the friendship of Buffon, who in 1785 appointed him sub-demonstrator in the Jardin du Roi, and proposed to him to become the continuator of his Histoire Naturelle. This continuation was published under the titles Histoire des Quadrupédes ovipares et des Serpents (2 vols., 1788-89) and Z/istoire Naturelle des Reptiles (1789). After the Revolution Lacépéde became a member of

the legislative assembly, but during the Reign of Terror he deemed it advisable to leave Paris, his life having become endangered by his disapproval of the massacres. When the Jardin du Roi was reorganized as the Jardin des Plantes Lacépéde was appointed to the chair set apart to the history of reptiles and fishes, which he conducted with such success that in 1796 he was chosen a member of the Institute. Two years afterwards he published the first volume of Histoire Naturelle des Poissons, the 5th volume appearing in 1803; and in 1804 appeared Histovre des Cétacés. From this period till his death the part he took in politics prevented him from making any further contribution of importance to science. In 1799 he became a senator, in 1801 president of the senate, in 1803 grand chancellor of the legion of honour, in 1804 minister of state, and at the Restoration in 1819 he was created a peer of France. He died at Epinay, October 6, 1825. Dur- ing the latter period of his life he wrote Hustovre générale physique et civile de l' Europe, which was published posthu- mously in 18 vols., 1826. A collected edition of his works on natural history was published in the same year, and has been frequently reprinted. See IonTHyoLocy, vol. xu.

. 633.

3 LA CHALOTAIS, Lovis René DE CARADEUC DE (1701-1785), representative of the French provincial parliaments in their struggles with Louis XV., was born at Rennes in Brittany, March 6, 1701. He entered with

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keen vigour into the question of the suppression of the Jesuits, which began to be most openly mooted after the affair of Martinique ; and as procureur général of the parliament of Brittany he submitted to the parliament in 1761 and 1762—the very heat of the conflict—two Comptes Rendus des Constitutions des Jésuites, which dealt the society some of the most powerful blows it had received since Pascal, and undoubtedly contributed largely to secure the edict of suppression in 1764. In the friends of the Jesuits La Chalotais had thus prepared for himself bitter enemies, and he was to feel their power in the events of

the quarrel between the court and the parliaments. The breach between the estates of Brittany and the king, in which La Chalotais was more immediately concerned, originated in an order passed by Government that the voices of two of the three estates should bind the other, that is, that the clergy and citizens should control the landed proprietors. To this order, designed to secure the registration of certain fiscal edicts in spite of the proprietors, who formed a majority in the estates, and upon whom the taxes would fall most heavily, the opposition was marked by all the obstinacy of the Breton character. Ja Chalotais endeavoured to carry through a compromise, but at the same time animadverted somewhat acrimoniously upon the coercive efforts of the Duc d'Aiguillon, governor of Brittany, who already, as a supporter of the Jesuits, regarded the procureur with animosity. When the estates, therefore, absolutely refused to register the edicts, the court chose to regard La Chalotais as the moving spirit in the opposition ; and in November 1765 he was arrested on a charge of having written certain anonymous and seditious letters to the king. No attention was paid to his protestations of innocence ; and, when the parliament of Rennes tried to force matters to a crisis by resigning in a body, Louis merely appointed commissioners to sit as a new parliament and to try La Chalotais, with his son and some other magistrates who had been arrested at the same time. But the question had spread beyond Brittany ; other provincial parliaments, and even the parliament of Paris, took it up; and the strife began to assume the ominous significance of one between the people and the crown. No lower tribunal ventured to pass sentence upon La Chalotais, and in 1769 the king, calling the case before himself in council, attempted to settle it in his own autocratic way: silence was imposed as to the future, oblivion as to the past ; the innocence of the accused was acknowledged, but they were exiled from their province. Such a decision was no settlement. The parliament, now restored, accused the Duc d'Aiguillon of having snborned witnesses against La Chalotais, and, when he published memoirs retorting the charge, caused them to be burned by the hand of the common hangman. Maupeou, minister of the king, after vainly endeavouring to enforce the royal edict of silence, summoned the case before the parliament of Paris in 1770. That body, how- ever, gave such unequivocal signs of favour to La Chalotais that the king

interfered and quashed the whole proceedings by a “bed of justice.” The entire matter thus lay over so far as it affected the procureur, till the death of the king in 1774 allowed him to return to his official duties La eget on at Rennes, July 12, 1785. esides the Comptes Rendus an ificati, 1766-67), Whiten ia prison, La Cuie on ee aes ad’ Education Nationale (1763), a work extravagantly praised b Voltaire. It was written in view of the disorganization in tio educational that would follow the expected expulsion of the Jesuits from France. ;

LACHISH (232), a town in the low country of Judah (Josh. xv. 39), and one of the strong fortresses that offered an obstinate resistance to Nebuchadnezzar (Jer. xxxiv. (oy It was to Lachish that Amaziah fled from the conspiracy

raised against him at Jerusalem, and there he was killed (2 Kings xiv. 19), From an obscure allusion in Micah i, 13 it would appear that the place was a chariot city. For this it was doubtless recommended by its position in the rich low country, and the same reason, together with the fact that it commanded the line of advance from Egypt, is sufficient to explain why it was the headquarters of Sennacherib during part of his Judean campaign (2 Kings xvill, 14; Isa, xxxvii. 8). The name of Lachish occurs on the monuments of Sennacherib, and a bas-relief now in the British Museum, representing the king receiving its spoils, is given in G. Smith’s History of Sennacherib (1878), Lachish was reoccupied by the Jews after the captivity (Neh. xi. 30), and the Onomastica place it 7 miles from Eleutheropolis on the southern road. The site has not been identified. Umm Lakis does not agree with the statement of the Onomastica, and the name (‘“ Mother of Itch”) has no connexion with the Hebrew, while El Hasy, suggested by Conder, has still less to recommend it. As the cities in this district were built of brick, the ruins may probably have all but disappeared.

LACHMANN, Kari Konrap Frizprich WILHELM (1793-1851), a highly distinguished philologist and critic, was born March 4, 1793, at Brunswick, where his father held an appointment as preacher in the Andreas Kirche. In his eighth year he entered the Katharineum of his

native town, where the strong bent of his vigorous mind towards philology and literature soon made itself unmistak- ably evident. In 1809 he passed to the university of Leipsic as a student of philology and theology ; in the same year he transferred himself to Gottingen, where, under the influence of Heyne, his enthusiasm for philo- logical pursuits almost completely extinguished his interest in theology; the pagan classics and particularly the Roman poets became his absorbing study. Stronger even than that of Heyne was the influence of Dissen over the young and rising scholar, who found additional intellectual stimulus in the companionship of such fellow students as C. K. J. Bunsen, Ernst Schulze, and C. A. Brandis. Under G. F. Benecke he also devoted himself to Italian and English, and ultimately to Old German. In 1815 he was led by the stirring political events of the day to interrupt his studious life and join the Prussian army as a volunteer chasseur; in this capacity he accompanied his detachment to Paris, but to his great regret never encountered the enemy. The regiment being disbanded he went to Berlin, where he became an assistant master in the Friedrich Werder gymnasium, and in the spring of 1816 he “ habilitated ” at the university. His thesis was published immediately afterwards, the subject being ‘‘ The original form of the Nibelungennoth.” Almost simultaneously appeared his edition of Propertius. The same summer he became one of the principal masters in the Fridericianum of Koénigs- berg, where he assisted his colleague Karl Kopke with his edition of Rudolf von Monfort’s Barlaam und Josaphat (1818), and also took part inthe researches of his friend towards an edition of the works of Walther von der Vogelweide. In January 1818 he became professor extra- ordinarius of classical philology in the university of K6nigsberg, where Lobeck also was; he at the same time began to lecture on Old German grammar and the Middle High German poets. In connexion with this task he devoted himself during the following seven years to an extraordinarily minute study of all that could be found, whether in print or in manuscript, relating to these subjects, and in the summer of 1824 he obtained leave of absence in order that he might search the libraries of Middle and South Germany for further materials. In February 1825 Lachmann was nominated extraordinary professor of classical and German philology in the university of Berlin ;

in June 1827 he was promoted to the ordinary professor- ship in the same department ; and in 1830 he was admitted a member of the Academy of Sciences. The remainder of his laborious and fruitful life as an author and a teacher presents no episode requiring special record. In January 1851 he was seized with an inflammatory affection of the left foot, to which he ultimately succumbed on March 13, 1851. See Hertz, Karl Lachmann, eine Biographie (Berlin, 1851).

Lachmann, who was the translator of the first volume of P. E. Miiller's Sagaenbibliothek des Skandinavischen Alterthums, published at Berlin in 1816, is a figure of considerable importance in the his- tory of German philology (sce Rudolf von Raumer, Gesch. d. ger- manischen Philologic, 1870). In his ‘‘ habilitationsschrift”’ on the Nibelungennoth, and still more in his review of Hagen's Nibelungen and Benecke's Bonerius, contributed in 1817 to the Jenaische Titeraturzeitwng, he had already laid down the rules of text criticism and elucidated the phonetic and metrical principles of Middle High German in a manner which marked a very distinct advance in that branch of learned investigation. The rigidly scientific character of his method becomes increasingly apparent in the 4us- wahl aus den Hochdeutschen Dichtern des dreizehnten Jahrhunderts (dedicated to Benecke, 1820), in the edition of Hartmann's Jwein (the text being Lachmann's special care, while the explanatory notes are by Benecke, 1827), in those of Walther von der Vogelweide (1827) and Wolfram von Eschenbach (1883), in the papers ‘‘ Ueber das Hildebrandslied,” ‘ Ueber althochdeutsche Betonung und Verskunst,” “ Ueber den Hingang des Parzivals,” and ‘* Ueber drei Bruchstiicke niederrheinischer Gedichte” published in the Abhandlungen of the Berlin Academy, and in Der Nibelungen Not mit der Klage in der diltesten Gestalt mit den Abweichungen der gemeinen Lesart (1826), which was followed by a critical commentary in 1886. Lachmann's ‘‘ Betrachtungen tiber die Ilias,” first pub- lished in the Abhandiungen of the Berlin Academy in 1837 and 1841, in which he sought to show that the J7iad consists of sixteen independent ‘‘lays’’ variously enlarged and interpolated, have had considerable influence on modern Homeric

criticism. See HoMEn. His smaller edition of the New Testament appeared in 1831, 3d ed. 1846; the larger, in two volumes, in 1842-50 (Novum Testa- mentum Grace et Latine: Carolus Lachmannus recensuit, Philippus Butimannus Grace lectionis auctoritates apposuit) The plan of Lachmarn's edition, wbich has been explained by himself in the Stud. u. Krit. of 1830, is a modification of the unaccomplished project of Bentley. It seeks to restore the most ancient reading current in Eastern MSS., using the consent of the Latin authorities (Old Latin and Greek Western Uncials) as the main proof of anti- quity of a reading where the oldest Eastern authorities differ. Be- sides Propertius, Lachmann edited Catullus, 1829 ; Tibullus, 1829; Genesius, 1834; Terentianus Maurus, 1836; Babrius, 1845; Avianus, 1845; Gaius, 1841-42; the Agrimensores Romani, 1848-52 ; and Lucretius, 1850. The last, which was the main occupation of the closing years of his life, from 1845, was perhaps his greatest achieve- ment, and has been characterized by Monro as ''a work which will be a landmark for scholars as long as the Latin language continues to be studied."

LA CONDAMINE, Caartzts Marte pe (1701-1774), French geographer and mathematician, born at Paris, January 28, 1701, was trained for the military profession, but turned his attention to science and geographical ex- ploration. He was a member with Godin and Bouguer of the expedition sent to Peru in 1735 to determine the length of a degree of the meridian in the neighbourhood of the equator (see vol. vii. 598), and on his homeward route made the first scientific exploration of the river Amazon. He returned to Paris in 1745, and published the results of his measurements and travels with a map of the Amazon in Mém. de V Académie des Sciences, 1745 (English translation 1745-47). La Condamine continued to interest himself in metrical problems, and on a visit to Rome made careful measurements of the ancient buildings with a view to a precise determination of the length of the Roman foot. The journal of his voyage to the equator was published at Paris in 1751. He also wrote in favour of inoculation, He died February 4, 1774.

LACONIA, the Greek Aakwvix7#, is the name generally applied in modern times to the cuuntry which occupied the south-eastern corner of the Peloponnesus, often called Lace- demon, AaxeSaiuwv, which is the only name used in Homer. The history of the district has already been given (see

GREECE), and it only remains to give a slight sketch of its physical features. These are very peculiar, and had great influence in producing the marked and distinctive character of the section of the Dorian race which occupied Laconia throughout the historical period. The country is a deep valley almost completely surrounded by mountains, and it is the general opinion that both names, Laconia and Lacedemon, refer to this hollow sunken character, being connected with lacus, AXdxxos,&c, The mountains of Arcadia shut in this valley on the north, and from them two parallel chains of mountains stretch due south bounding the valley on the east and on the west. The eastern chain bore in ancient times the name Taygetus, the western, Parnon ; both ridges stretched far out into the sea, forming respect- ively the promontories of Taenarus and Malea. Taygetus, now called Pentedaktylon, is a splendid unbroken chain of lofty peaks, well deserving its Homeric epithet wepiyyxeros ; the highest point is the ancient Taleton, now St Elias, 7900 feet high. Mount Parnon is not such a fine ridge, but still forms a strong barrier along the sea-coast. Through the whole length of the valley from north to south flows the river Eurotas, which has only one tributary of any consequence, the Oenus. The soil was not remarkably fertile, except in the low ground towards the sea; but the sides of Taygetus were covered with dense forests which afforded excellent sport to the inhabitants of the plain. The people were thus inured to the hardy life of moun- taineers ; they were so securely defended by nature against invasion that the victorious Epaminondas hesitated to attack the country; while with command of the passes they could at any time invade the neighbouring countries. Over Mount Taygetus there was hardly any pass prac- ticable for an army; from Arcadia there were only two entrances, both easily defended, one by the course of the Oenus, the other by the

Eurotas. Mount Parnon stretched along the east coast, which offered no harbour, hardly even a landing place, for foreign ships) While adding to the security of the country, the same causes isolated it greatly from intercourse with other peoples, tended to keep the inhabitants backward and to prevent education, and led to that jealous and exclusive character which distinguished the Lacedzemonians,

LACORDAIRE, Jean Baptiste Henri (1802-1861), French orator, was born at Recey-sur Ource, Céte d'Or, 12th March 1802. He was the second of a family of four, the eldest of whom travelled a great deal in his youth, and subsequently occupied the chair of comparative anatomy at Liége, from which he contributed some valuable treatises on entomology. For several years Lacordaire studied at Dijon, showing a marked talent for rhetoric ; this naturally led him to the pursuit of law, and in the local debates of the advocates he attained a high celebrity. At Paris he for a time thought of going on the stage, but was induced to finish the course, and, having done so with credit, ap- plied himself for eighteen months with much success to the consideration of briefs. Meanwhile a great change was passing over his convictions. Lamennais had published his Essai sur 'Indifférence,—a passionate vindication of belief as against the tolerant contempt of a generation which regarded truth and falsehood in every department of life with equal complaisance, a demonstration of the weakness of individual reason and an assertion of the rightful supremacy of a central religious authority. La- cordaire read and was convinced. His ardent and believ- ing nature was weary of the theological negations of the Encyclopedists. He was impelled towards a deistical ex- planation of the universe, from which in turn he went on to Catholicism as the only faith calculated to keep society from disintegration. In 1823 he became a theological

student at the seminary of Saint Sulpice; four years later XIV. — 25

he was ordained and became almoner of the college of Henry IV. He was called from it to co-operate with La- mennais in the editorship of L' Avenir, a journal established for the purpose of advocating the union

of the democratic principle with ultramontanism. To be a Catholic was to be a royalist in the popular definition ; Lacordaire strove to show that Catholicism was not bound up with the idea of dynasty, and definitely allied it with a well-defined liberty, equality, and fraternity. But the new propagand- ism was denounced from Rome in an encyclical. ieantime Lacordaire and Montalembert, believing that, under the charter of 1830, they were entitled to liberty of instruction, opened an independent free school and began to teach in it. It was closed in two days, and the teachers fined before the court of peers, These reverses Lacordaire accepted with quiet dignity; but they brought his relation- ship with Lamennais to a close. He now began the course of Christian conférences at the Collége Stanislas, which attracted the art and intellect of Paris; thence he went to Notre Dame, and for two years his sermons were the delight of the capital. His presence was dignified, his voice capable of indefinite modulation, and his gestures animated and attractive. He still preached the gospel of the people's sovereignty in civil life and the pope's supre- macy in religion, but brought to his propagandism the full resources of a mind familiar with philosophy, history, and literature, and indeed led the reaction against Voltairean scepticism. He was asked to edit the Univers, to take a chair in the university of Louvain, but declined both ap- pointments, and in 1836 set out for Rome, revolving a great scheme for Christianizing France by restoring the old order of St Dominic. At Rome he prepared himself for the life of the new brotherhood, donning the habit of the preaching friar and joining the monastery of Minerva. His Mémoire pour le rétablissement en France de Vordre des fréres précheurs wag then prepared and dedicated to his country; at the same time he collected the materials for the life of his avowed master, St Dominic. But he did not return to France until 1841, when he resumed his preaching at Notre Dame, and was successful in re- establishing the order of which he ever afterwards called himself monk. His funeral orations are the most notable in their kind of any delivered during his time, those de- voted to the death of Drouot and O'Connell being espe- cially predominant in the qualities of point and clearness. He next thought that his presence in the Assembly would be of use to his cause; but he remained there only a short while, finding the true field of his influence to be the pulpit. Many popular

movements he advocated with the fervour of high conviction. In 1850 he went back to tome and was made provincial of the order, and for four years laboured to make the Dominicans a religious power. In 1854 he retired to Soréze to become director of a private lyceum, and remained there in self-chosen obscurity until he died, 22d November 1861.

LACQUER, or Lackzr, in general terms may be said to be coloured and frequently opaque varnishes applied to certain metallic objects and to wood. ‘The term is derived from the resin lac, which substance is the basis of lacquers properly so called. Technically, among Western nations, lacquering is restricted to the coating of polished metals or metallic surfaces, such as brass, pewter, and tin, with prepared varnishes which will give them a golden, bronze- like, or other lustre as desired. Cf the numerous recipes for the preparation of the various lacquers, the following for a gold lacquer for brass work may be taken as a sample :—shell-lac 8 oz., sandarach 2 oz., turmeric 8 oz, arnotto 2 oz., dragon’s blood 4 oz, dissolved in 1 gallon of rectified spirit. Throughout the East Indies the lacquer- ing of wooden surfaces is universally practised, large articles

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of household furniture, as well as small boxes, trays, toys, and papier maché objects, being decorated with bright- coloured and variegated lacquer. The lacquer used in the East is, in general, variously coloured sealing-wax, applied, smoothed, and polished in a heated condition ; and by various devices intricate marbled, streaked, and mottled designs are produced. Quite distinct from these, and from all other forms of lacquer, is the lacquer work of Japan. The source and nature of the raw material of Japanese lacquer has been referred to under JAPANNING, and there also will be found some allusion to its extraordinary durability and resistance to all ordinary solvents. Not less extraordinary is the manipulative skill shown by the Japanese in this kind of work, and the variety and exquisite perfection of its decorative treatment, which all go to place Japanese lacquer of high quality among the rarest and most prized treasures of decorative art. In the

preparation of Japanese lacquer work the wooden object to be treated is first coated with several layers of raw lacquer mixed with brick dust, &c., which, when hardened, are smoothed with gritty stone A few layers of common or inferior varnish of the colour desired in the finished object are then successively added. After each coating the objects are placed to dry in an enclosed box, the sides of which are kept moist with water, so that hardening takes place in a dark damp atmosphere. The final coating is composed of the best quality of lacquer, and it is smoothed with great care and polished with powdered deer horn. The brilliant smooth polish of plain black lacquer is brought up by repeated thin rubbings over with uncoloured lacquer and polishings with deer horn. Such are the elaborate processes used for entirely unornamented lacquer; but most Japanese work is enriched with decorations which introduce an endless variety of treatment and much more complex, tedious, and costly processes of operation. Flat work, variously coloured and speckled, ornamented with gilt patterns, is among the simplest of the artistic lacquer productions of Japan. Relief or raised lacquer work, on the other hand, is a most elaborate and costly production, the labour of months and even years being expended on the preparation of fine high-relief examples. The raised designs are produced with a mixture of red oxide of iron and lacquer repeatedly applied till the desired elevation is attained, the form of the raised surface being carefully modelled and controlled between successive applications by rubbing and grinding with charcoal powder. Metallic powders—gold, silver, bronze, &c.—are applied with the final coat while the work is still in a viscous condition, and these sinking into the lacquer produce a strongly adherent surface with a fine subdued metallic lustre. Other methods of ornamental treatment consist of inlaying and incrusting the lacquer with mother of pearl, ivory, gold, bronze, or tinfoil. A great variety of decorative effect may be thus produced, but lacquers so treated are not held in the same high esteem as the raised or even the flat varieties. Thin sections of the substance to be inlaid are placed on the surface of a freshly coated and yet “tacky” object, and imbedded by the repeated applications of additional coatings ; the surface is then rubbed and reduced till the inlay and lacquer form one smooth continuous surface. Relief incrustations are managed in an analogous manner, the lacquer being

smoothed and polished around the incrusted object or pattern. Lacquer is also ornamented by carving, a style mostly applied to red lacquer, although it is also occasionally done in black and other dark colours. This method of treatment has been introduced from China, where red carved lac or Peking lac is a characteristic ornamental substance,

LACRETELLE, Cuarius pe (1766-1855), historian and journalist, was born at Metz Shortly before the

Revolution he was introduced to some of the constitution- alist leaders, and soon joined the staff of the AMoniteur and the Débats; then he became secretary to the Duc de la Rochefoucauld-Liancourt. He returned to journalism and joined Chénier and Roucher on the Journal de Paris. The triumph of the Jacobins was not without danger for him, and to avoid it he enlisted in the army, but after Thermidor returned once more to Paris and to newspaper work. The 13th Vendémiaire again drove him from both, and he took to serious composition. He had more than one fluctuation of fortune of the same kind still to undergo, and was actu- ally imprisoned for a considerable time, but continued his historical work, to which after the establishment of Napoleon's power he wholly devoted himself. He became a member of the Academy in 1811, and professor of history in the Parisian faculty of literature next year. The Restoration pleased him from the constitutional point of view, and after it the July monarchy. In 1848 he retired to Macon, where he died seven years later. Lacretelle's chief work is a series of histories of the 18th century, the Revolution, and its sequel (Highteenth Century, 1808; Revolution, 1821-26; Consulate and Empire, 1840; Restoration, 1846). He had previously given a Précis Historique of the Revolution (1801-6). Mr Carlyle's sarcastic remark on Lacretelle's [Zistory of the Revolution that it "exists but does not profit much" is partly true of all his books. The author was a moderate and fair-minded man, but possessed neither great powers of style, nor strik- ing historical insight, nor the special historian's power of uniting minute accuracy of detail with breadth of view. If his history of the 18th century deserves to be singled out from his other books, it is

chiefly because no exact successor to it has appeared. Besides the works mentioned, he also wrote a L/tstory of the Religious Wars, some sketches of his personal adventures in the Revolution, &c. Asa journalist, if not as an historian, Lacretelle was not scrupulous about absolute accuracy. The legend of the Abbé Edgeworth's last words to Louis XVI. has been traced to him. LACROSSE is the national ball game of Canada, as cricket is of England and base ball of the United States of America. The aborigines had the game before the dis- covery of the New World, and different Indian tribes played it in different manners, generally with much roughness and violence. The present name was given it by French Canadians, owing to the resemblance of the curved netted stick, the chief implement used in the pastime, to a bishop's crozier or crosse. As white men gradually took up the game it became more refined. In 1867 the National Lacrosse Association of Canada was formed, and drew up a recognized code of rules. Lacrosse cannot be aptly compared to hockey or football, since striking or even touching the ball with the hands or feet is inadmissible. The crosse somewhat resembles a racket bat. It is a stick with one end curved, and the hook so formed is fitted with network, which must not bag, The ball is of indiarubber, from 8 to 9 inches in circumference. The other requisites are a level piece of turf, about 200 by 100 yards, and the goals. These may be any distance apart, according to agreement and the space available. Each goal is composed of two flag posts, 6 feet high and a like distance apart. The usual number of players is twelve on each side, and the captains station them somewhat as in football. A game is scored by one side driving the ball between their opponents' goal posts, and a match is three games out of five. There is no "off side" as in football, and the chief feat of the player is to catch the ball on the network of the crosse, dodge his opponents by running as far as practicable, and then throw the ball to one of his own side who is nearer the enemy's goal. A game is commenced by the ball being placed on the ground midway

between the two goals and a player from each side " facing " for it with the crosse till one of them succeeds in sending it on the way to the

opposite goal. After each game goals are changed. During winter the game is played by skaters on the ice, or on the snow with the aid of snow shoes. A native Indian team introduced the pastime into England in 1867; several amateur clubs were formed ; and a set of rules was drawn up by an English Lacrosse Association on February 12,1868, They differ somewhat from the Canadian regulations,—the goal posts being 7 feet apart with a tape across the top, and a match being decided by the number of goals won during a specified time. The pastime, however, never took deep root in England, so many other old established games of ball being more popular, and is now but little practised.

LA CROSSE, chief city of La Crosse county, Wisconsin, United States, is situated on the east bank of the Mississippi, at the confluence of the Black and La Crosse rivers, 196 miles by rail west-north-west of Milwaukee. La Crosse is the second commercial city and the fourth in the scale of population in the State. An extensive lumbering trade is carried on by means of the Black river. The city contains foundries, machine-shops, saw-mills, flour- mills, shipbuilding yards, and manufactories of agricultural implements, beer, and leather. It has 3 English dailies and 5 weekly newspapers (2 English, 2 Norwegian, 1 German), 20 churches, and a public library containing 3300 volumes. La Crosse became a city in 1856, The population in 1880 was 14,505.

LACRYMATORY, a modern word employed to describe a class of small vessels of terra-cotta, or, more frequently, of glass, found in Roman and late Greek tombs, and fanci- fully supposed to have been bottles into which mourners dropped their tears. They were used to contain unguents, and it is to the need of unguents at funeral ceremonies that the finding of so many of these vessels in tombs is due. They are shaped like a spindle, or a flask with o long small neck and a body in the form of a bulb.

LACTANTIUS FIRMIANUS, also called Lucius Cecilius or Lucius Celius Lactantius Firmianus, was a Christian writer who from the beauty of his style has been called the “ Christian Cicero.” His history is very obscure, His very name is doubtful ; his birthplace, whether in

Italy or in Africa, is uncertain ; it is impossible to say with any accuracy when his writings were published ; and the date of his death is unknown. His parents were heathens; he was a pupil of Arnobius in Sicca in Africa; he went to Nicomedia in Bithynia while Diocletian was emperor to teach rhetoric, but found little work to do in that Greek- speaking city; he became a convert to Christianity, probably late in life; and about ten or twelve years before his death (312-318) he went to Gaul on the invitation of Constantine the Great, and became tutor to his eldest son Crispus. These facts, with his writings, are all that is known about Lactantius. His chief work Divinarum Institutionum Inbri Septem is a long introduction to Christianity, written in exquisite Latin, but displaying such ignorance as to have incurred the charge of favouring the Arian and Manichzan heresies. The date of publica- tion has been variously given from 302 to 323 a.pD. sentence seems to say that a persecution, which can scarcely be any other than the Diocletian, was raging while the book was being written (v. 17, 5); whilst in the first, second, fourth, and fifths books Constantine is addressed as emperor. Those who assert the earlier date of publication point out that the references to Constantine are omitted in several MSS. Others adopt the conjecture of Baluze that an early edition was published in Nicomedia and a later twenty years afterwards (of. Ebert, Ueber den Verfasser des Buches De Mort. Persecut., p. 129 sq.). The seven books

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of the institutions have separate titles given to them either by the author or by a later editor. The first, De Falsa Religione, and the second, De Origine Hrroris, attack the polytheism of heathendom, show the unity of the God of creation and providence, and try to explain how men have wandered from truth into polytheistic error. The third book, De Falsa Sapientia, describes and criticizes the various systems of prevalent philosophy, showing how baseless and contradictory they are. The fourth book, De Vera Sapientia et Religione, insists upon the inseparable union of true wisdom and true

religion, and maintains that this union is made real in the person of Christ. The fifth book, De Justitia, maintains that true righteousness is not to be found apart from Christianity, and that it springs from piety which consists in the knowledge of God. The sixth book, De Vero Cultu, describes the true worship of God, which is righteousness, and consists chiefly in the exercise of Christian love towards God and man. The seventh book, De Vita Beata, discusses, among a variety of subjects, the chief good, immortality, the second advent, and the resurrection. Jerome tells us that Lactantius wrote an epitome of these Jnstitutions, and such a work was discovered in the royal library at Turin in 1712 by C. M. Pfaff; it is doubtful, however, whether this MS. is the epitome of Lactantius. Besides the Jnstitutions, Lactantius wrote a treatise, De Jra Det, addressed to one Donatus and directed against the Epicurean philosophy; an argument for the wisdom and goodness of God as exhibited in the creation and preservation of the world, De Opificto Det sive de Formatione Hominis; and a very celebrated treatise De Mortibus Persecutorum, which describes God's judgments on the persecutors of his church from Nero to Diocletian, and has served as a model for numberless subsequent writings of a like nature. De Mort. Persecut. is not included in the earlier editions of Lactantius; it was discovered and printed by Baluze in 1679. Many critics do not believe it to be the work of our author, and ascribe it to an unknown Lucius Cecilius (see the work of Ebert above quoted). Jerome speaks of Lactantius as a poet, and several poems have been attributed to him :—De Phenice, Symposium, De Pascha ad Felicem Episcopum, and De Passtone Domini. It is extremely probable that all these are the productions of a much later age.

MSS. of Lactantius are very numerous ; a very complete catalogue of these and of the earlier printed editions will be found in Le Brun and Lenglet Dufresnoy's edition, 2 vols. Paris, 1748. The best editions besides Dufresnoy's are those of Walch, Leipsic, 1715 ;

of Biinemann, Leipsic, 1739; and in Migne's Patrologia Latina, vols. vi. and vii. A new edition is promised in the Vienna Corpus Script. Eccles. Latin.

LACTIC ACID, a chemical term, which, though origin- ally invented to designate the particular acid contained in sour milk, has now, through the discovery of other acids isomeric with and very similar to that acid, acquired a generic, in addition to its original specific, meaning.

1. Lactic Acid properly so called, Fermentation Lactéc Acad, Hthylidene Lactic Acid.—Scheelo (Transactions of Stockholm Acad., 1780) was the first to isolate this acid (from sour milk) and establish its individuality. About twenty-four years later Bouillon Lagrange, and, independ- ently of him, also Fourcroy and Vauquelin maintained that Scheele's new acid was nothing but impure acetic. But this notion was combated by Berzelius, and finally refuted (in 1832) by Liebig and Mitscherlich, who by the elementary analyses of lactates proved the existence of this as a distinct acid.

In the article FERMENTATION (vol. ix. p. 97) it is explained how lactic acid is produced from milk-sugar and from ordinary glucose by ''lactic fermentation." The most convenient process for the preparation of the acid is Bensch's. A solution of ' invert- sugar" (see vol. ix. p. 96) is produced by dissolving 6 parts of cane-sugar and y},th part of tartaric acid in 35 parts of boiling

water and allowing to stand for two days. There is then added qisth part of foul cheese, 8 parts of sour milk, and 24 parts of carbonate of zinc, and the mixture kept at 40° to 45° C. for eight to tendays. The sugar, C,H),.0,, ferments into lactic acid, C3H,03, which, by the carbonate present, is converted into lactate of zinc. But part of the lactate is invariably lost through '' butyric fermentation" with evolution of hydrogen, which latter converts part of the sugar into mannite, CgH,,0,. The fermented liquid is heated to boiling, strained clear, and allowed to cool, when the lactate of zinc separates out in crystalline crusts, which are purified by recrystallization from hot water. The free acid is obtained by decom- posing the hot aqueous solution of the salt with sulphuretted hydro- gen and filtering off the sulphide of zinc. The filtrate is evaporated on a water bath to a syrup,

which is treated with ether. Mannite and other impurities remain, and the acid passes into the filtrate, from which the ether is easily expelled by distillation,and subsequent evaporation in an open basin. What ultimately remains is a thick colourless syrup, which, in ordinary chemical parlance, goes as lactic acid, although it is at best only an approximation to the hydrate, C;H,03.H,O. The extra H,O is easily enough removed by continued evaporation, but no portion of it can be thus got rid of without the acid C3H,O, itself suffering dehydration into lactic anhydride, C,H ,)0;, and lactide, CgH,O,, by successive subtractions of H,O from 2C,H,03.

The behaviour of lactic acid solution to basic reagents and of the acid itself to alcohols (in the presence of dehy- drators) is strictly that of a monobasic acid C,;H,O,; ae, so much lactic is strictly equivalent to one molecule of acetic acid, and as the latter is proved to be CH,.COOH, lactic acid mnst be assumed to be (C,H,O) COOH. But the radicle C,H,;O (unlike the CH, of acetic acid) still contains one hydrogen atom, which, although not replace- able by metals, can be replaced by acid radicles such as acetyl C,H,O or, conjointly with the oxygen atom, by Cl,Br,I. Thus, for instance, lactic ether, (C,H,0)COOC,H,, when treated with chloride of acetyl, C,H,O.Cl, gets con- verted into acetyl-lactic ether,[C,H,(C,H,0)0]COO, with formation of hydrochloric acid. By the action of hydriodic acid the same H conjointly with the O of the radicle is replaced by iodine with formation of water, In a word, lactic acid, besides being an acid analogous to, for instance, acetic acid, CH,COOH, is at the same time an alcohol analogous to ordinary spirit of wine, C,H,.OH, as shown by the formula HO—C,H,—COOH. This two- fold character of our substance explains the readiness with which it passes into anhydrides. Lactic acid the acid acts upon lactic acid the alcohol; the replaceable H in the former unites with the OH of the latter, and the two rests combine into an ether which is lactic anhydride. Thus :—

(C,H,OH)—COO | H~_ (C,H,COOH)— | O0H— Lactic anhydride. Water.

The slanting lines show the mode of combination after the reaction. The anhydride, as we see, still contains an OH and COOH, and a repetition of the group within its molecule leads to lactide, C,H,O, This latter body could be presumed to be formed from one molecule of lactic acid :

HO(C,H,)COOH =(C,H,)COO +H.OH ; but the vapour density determination proves the molecular weight to be in accordance with the larger formula C,H,O,.

Admitting, as well we may, that lactic acid isa compound of COOH and OH with C,H,, what is this C,H, itself? This question has been satisfactorily answered. When lactic acid is distilled

Tapidly, it breaks up into formic acid, H.COOH, and aldehyde,

(CHs)(CO)H. Conversely when aldehyde is treated with hydro- cyanic acid and muriatic acid it is converted into lactic acid, in two steps, thus: (1) the C=O in the aldehyde combines with the (NC)H, the H going to the O and the (NC) by its C to the ©, to form the group (NC) —C—O—H ; and (2) the NC of this group, by the action of the water, gets converted into a COOH, with formation of NH;, which combines with the muriatic acid. N C+2H,0= NH,+COOH. The (CH,) and H in the original aldehyde retain their places, so that what we obtain ultimately must be

(CH,)—(OH)

and this consequently is the structure of lactic acid. The radicle

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(CH,)(CH) is called ethylidene, to distinguish it from ‘‘ ethylene,” which is (CH,)(CH,).

9. Paralactic or Sarcolactic Acid.—This acid was dis- covered by Berzelius in the juices of flesh. It is almost identical with ordinary lactic, but differs from it in this that it (and its salts) turn the plane of

polarized light, and also in this that the sarcolactates in general are more readily soluble than ordinary lactates, and contain dif- ferent proportions of crystal water from these. Thus, for instance, we have for the zinc salts

Ordinary. %n(CsH,03). . 3H,0.

Soluble in 60 parts of cold and in 6 parts of boiling water.

The isomerism of the two acids used to be explained by assuming that the sarco-acid contained ethylene in lieu of the ethylidene of the ordinary acid, thus :

(OH)—(CH,)—(CH,)—COOH, i.¢., that the OH and COOH were attached to different carbon atoms. But this has been proved by Erlenmeyer to be a mistake. The sarco-acid has precisely the same struc- ture as ordinary lactic acid. It is a case of absolute (i.e., of unexplained) isomerism.

3. Hydracrylic Acid.—From glyceric acid by the action of hydriodic acid we obtain B-iodopropionic, which, when treated with water and oxide of silver, exchanges its iodine for OH:

Sarco-. Zn(C,H;0,) . 2H,0.

Soluble in 17 parts of cold water.

I. H,C—CH,—COOH

gives

(OH). H,C—CH,—COOH,

which is hydracrylic, an ethylene-lactic acid. That this really is so was proved by Erlenmeyer, who obtained it by the action of water (+HCl) on undoubted ethylene- cyanhydrine (OH)—(C,H,)—-(CN). As suggested by the formula, it differs markedly in its reactions from the two more properly so-called lactic acids.

All lactic acids, when heated with hydriodic acid in sealed- up tubes, pass ultimately into (the same) propionic acid, (CH,)—(CH,)—COOH. (w. D.)

LADAK anp BALTI. The name Ladak (pronounced in Tibetan Lata) belongs primarily to the broad valley of the upper Indus in West Tibet, but includes several sur- rounding districts in political connexion with it; the present limits are between 75° 40’ and 80° 30’ E. long., and between 32° 25’ and 36° N. lat. It is bounded N. by the Kuen- lun range and the slopes of the Karakorum, N.W. and W. by the Mussulman state of Balti or Little Tibet, S.W. by Kashmir, 8. by British Himalayan territory, and E. by the Chinese Tibetan provinces of Ngari and Rudék.! The whole region lies very high, the valleys of Rukshu in the south-east being 15,000 feet, and the Indus near Lé 11,000 feet, while the average height of the surrounding ranges is 19,000 feet. The proportion of arable and even possible pasture land to barren rock and gravel is very small.

The natural features of the country may be best explained by reference to two native terms, under one or other of which every part is included, viz., changtang, 1.c., “northern, or high plain,” where the amount of level ground is considerable, and the hills proportionally further apart ; and rong, z.e., “deep valley,” where the contrary condition prevails. The former predominates in the east, diminishing gradually westwards. There, although the vast alluvial deposits which once filled the valley to a remarkably uniform height of about 15,000 feet have lett their traces on the mountain sides, they have undergone immense denudation, and their débris now forms secondary eS ett al eine cada alana

t Geographically the east boundary is a mountain ridge some way within Chinese territory, which, running north, is the watershed between East and West Tibet, and from the north part of which the Indus, from the south the Sutlej, take their rise.

deposits, flat bottoms, or shelving slopes, the only spots available for cultivation or pasture. These masses of alluvium are often found either metamorphosed to a sub- crystalline rock still showing the composition of the strata, or simply consolidated by lime.

Grand scenery is exceptional, for the valleys are confined, and from the higher points the view is generally of a con- fused mass of brown or yellow absolutely barren hills, of no great apparent height. ‘The parallelism characteristic of the Himalayan ranges continues here, the direction being north-west and south-east. A central range divides the Indus valley, here 4 to 8 miles wide, from that of its north branch the Shayok, which with its fertile tributary valley of Nubra is again bounded on the north by the Karakorum. This central ridge is mostly syenitic gneiss, and north-east from it are found, successively, Silurian slates, Carboniferous shales, and Triassic limestones, the gneiss recurring at the Turkestan frontier. The Indus lies along the line which separates the crystalline rocks from the Eocene sandstones and shales of the lower range of hills on the left bank, the lofty mountains behind them consisting of parallel bands of rocks from Silurian to Cretaceous.”

There are several lakes in the east districts at about 14,000 feet. They have evidently been of much greater extent, and connected with the river systems of the country, but they are now mostly without outlet, saline, and in process of desiccation.

The climate is intensely dry, practically rainless, the little snow which falls soon disappearing ;? above a certain height no dew is deposited. The alternations of tempera- ture are great; the sun’s direct rays are hotter than in the Indian plains,+ while the afternoon winds are piercingly cold; except in summer it freezes every night, even in the lower districts, and nightly throughout the year at 15,000 feet.

Vegetation therefore is confined to valleys and sheltered spots, where a stunted growth of tamarisk and Afyricaria, Hippophae and Hlzagnus, furze, and the roots of burtsz, a salsolaceous plant, supply the traveller with much-needed firewood. The trees are the pencil cedar (Juniperus excelsa), the poplar and willow (both extensively planted, the latter

sometimes wild), apple, mulberry, apricot, and walnut. Agriculture depends on irrigation, which is skil- fully managed, the principal products being wheat, common and naked barley (from which the returns are usually small), millet, buckwheat, pease, beans, and turnips. Lucerne and prangos (an umbelliferous plant) are used as fodder.

Among domestic animals are the famous shawl goat, two kinds of sheep, of which the larger (hunzya) is used for carrying burthens, and is a principal source of wealth, the yak, and the dso, a valuable hybrid between the yak and common cow. Among wild animals are the kyang or wild ass, ibex, markhor, antelope, Ovis Poli, marmot, hare, and other Tibetan fauna.

The capital, Lé (population 4000), lies 4 miles from the river ou the right bank, 11,540 feet above the sea, at the southern base of a spur from the central range,— a terraced slope, with scattered hamlets, extending thence to the Indus. It contains the palace of the old gyalpos, an imposing structure seven stories high, and a wide bazaar where polo is played. It is surrounded by poplar planta- tions, with manis® and ch'hordtens ® beyond. The houses

2 Here, in the Zanskar, as the name implies, copper is found.

3 The average height of the snow-line is about 19,000 feet. ;

4 Gerard records 158° in.Rupshu, 7.e., only 27° below boiling point at that altitude.

5 '<< Mani," a long stone wall, several feet wide, running along the roadside, covered with loose stones deposited by the passers-by, in- scribed with the prayer or ejaculation, '' Om mani padme hom.

6 ** Ch'hordten," the monumental tomb of a lama.

are usually two-storied, with flat roofs and balconies to the south or west, the doors and shutters striped red and white.

The numerous monasteries are built (as the houses used to be, for defence) in lofty and picturesque situations, and would be strategically strong but for the absence of water. They are supported partly by their own lands, but chiefly by liberal gifts from the peasantry, with whose interests the lamas identify themselves. The latter are hospitable, and their superiors often refined, intelligent, and genial.

The religion is Buddhist, chiefly of the Dukpa or Red sect, but traces of an older faith linger, to which the masked dances of the monks may possibly be referred. Mohammedanism, previously on the increase, is discour- aged by the Kashmir Government, its Hindu influence tending, as Hinduism has done in Nepal, to introduce caste ideas. P

Polyandry is general, except aniong the rich.

The home trade is worth little over £4000; the chief exports are wool, dried fruits, salt, and small quantities of gold, borax, and sulphur; the chief imports, provisions, hardware, and tea; but the transit trade is relatively very important, the chief routes from the Punjab, Afghanistan, and Kashmir into Eastern Turkestan and Chinese Tibet all passing through Lé} It is carried by coolies, or on ponies, sheep, or yaks, over difficult passes often 18,000 feet high, and is further hampered by the exclusive policy of China and Russia, The mechanical and _ political obstacles have long engaged the attention of the Indian Government,

History. —The earliest notice of Ladak is by the Chinese pilgrim Fa-hian, 400 A.p., who, travelling in search of a purer faith, found Buddhism flourishing there, the only novelty to him a the

rayer-cylinder, the efficacy of which he declares is incredible.

adak formed part of the Tibetan empire until its disruption in the 10th century, and since then has continued ecclesiastically sub- ject, and sometimes tributary, to Lhasa. Its inaccessibility saved it from any Mussulman invasion until 1531, when Sultan Said of Kashgar marched an army across the Karakorum, one division fight- ing its way into

Kashmir and wintering there. Next year they invaded eastern Tibet, where nearly all perished from the effects of the climate,

Early in the 17th century Ladak was invaded by its Moham- medan neighbours of Balti, who plundered and destroyed the temples and monasteries; and again, in 1685-88, by the Sokpa or Calmucks, who were expelled only by the aid of the lieutenant of Aurangzeb in Kashmir, Ladak thereafter becoming tributary. The gyalpo or king then made a nominal profession of Islam, and allowed a mosque to be founded at Lé, and the Kashmiris have ever since addressed his successors by a Mohammedan title. When the Sikhs took Kashmir, Ladak, dreading their approach, offered allegiance to Great Britain. It was, however, conquered and annexed in 1834-41 by Ghulab Singh of Jamu—the unwarlike Ladakis, even with nature fighting on their side, and against indifferent generalship, being no match for the Dogra troops. These next turned their arms successfully against the Baltis (who in the 18th century were subject. to the Mogul), and were then tempted to revive the claims of Ladak to the Chinese provinces of Radok and Ngari. This, however, brought down an army from Lhasa, and after a three days' fight the Indian force was almost annihilated—chiefly indeed by frostbite and other sufferings, for the battle was fought in mid-winter, 15,000 feet above the sca. The Chinese then marched on Lé, bnt were soon driven out again, and peace was finally made on the basis of the old frontier. The wide- — SS ae i China is curiously illustrated by the fact that

ribute, though disguised as a present, is pai by the maharaja ta teats a ne ee ee

The adjoining territory of Balti—possibly the Bylte of Ptolemy—forms the west extremity of the vast region known as Tibet, whose natural limits here are the Indus from its abrupt southward bend in 74° 45' E, long., and the mountains to the north and west, separating a com- paratively peaceful Tibetan population from the fiercer

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1 The trade registered at Lé, chiefly between India and Eastern Turkestan, averages £134,000, the principal exports from India being cotton goods, value £29,200 ; silk ditto, £6000 ; skins, £3600; and tea, £3500 ; aud from Eastern Turkestan—raw silk, £14,100; silver £29,700 ; gold, £7000 ; charas, £6400; horses, £3200. ;

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Aryan tribes beyond. Mohammedan writers about the 16th century speak of Balti as “ Little Tibet,” and of Ladak as ‘‘ Creat Tibet,” thus ignoring the really Great Tibet altogether. The Balti people call Gilghit “a Tibet,” and Dr Leitner says that the Chilasi, a Dard people west of the Indus, call themselves Boté, or Tibetans ;? but, although these districts may have been, like Kashmir, overrun by the Tibetans, or have received rulers of that race, the ethnological frontier coincides with the geogra- phical one here given. Balti is a mass of lofty mountains, the prevailing formation being gneiss. In the north is the Baltoro glacier, the largest out of the arctic regions, 35 miles long, contained between two ridges whose highest peaks to the south are 25,000 and to the north 28,265 feet. ‘The Indus, as in Lowcr Ladak, runs in a narrow gorge, widening for nearly 20 miles after receiving the Shayok. The capital, Skardo, a scattered collection of houses, stands here, perched on a rock 7740 feet above the sea. The house roofs are flat, occupied only in part by a second story, the remaining space being devoted to drying apricots, the chief staple of the main valley, which supports little cultivation. But the rapid slope westwards is seen generally in the vegetation. Birch, plane, spruce, and Pinus excelsa appear; the fruits are finer, including pomegranate, pear, peach, vinc, and melon, and where irrigation is available, as in the North Shigar, and at the deltas of the tributary valleys, the crops are more luxuriant and varied.

Population.—The JLadakis, numbering about 21,000, are Tibetan, with a slight Caucasian admixture, and there are numerous Baltis and Dards (the latter superficially Buddhist) in the western districts. The Changpa, «e., “ mountaineers,” in the east are also Tibetan. They are singularly hardy, good-humoured, not stupid though simple and

clumsy, dirty (washing, it is said, once a year, but not regularly), fond of social gatherings. The national drink, chang, is a sort of beer made from barley. The Balti type contains a much larger Aryan element, the isolated Dard (or Shin) communities being probably relics of an early Aryan population, subsequently overlaid by a Tibetan. The cross is a good one, the Baltis being more intelligent, if less genial, than the Ladakis, and equally industrious. They are taller, less beardless, and their noses less flat. They eschew pigtails. Polo is played more generally, and with more spirit, than in Lad&k. The two languages are mutually intelligible. Like many Tajik and other moun- tain tribes westwards, the Baltis are Shiah Mohammedans. The women are thus more secluded than in Laddk, where they are particularly independent. Thcy have abandoned polyandry, and (possibly in consequence) their numbers— some 58,000 in Balti‘and western Ladik—are larger than the country can support. Many emigrate to Kashmir and to British territory, where they do well. In the west the Dards are numerous, and a Dard element is especially observable in the families of the chiefs, some of whom, as in Ladd4k, were semi-independent before the annexation.

The principal works consulted have been Mr F. Drew’s excellent book on The Jummoo and Kashmir Territories; a valuable paper by General H. Strachey ‘‘ On the Physical Geography of Western Tibet,” in the Roy. Geog. Soc. Jowrn., vol. xxiii.; Cunningham’s Ladak; The Tribes of the Hindoo Koosh, by Major J. Biddulph; the travels of Vigne, and of Moorcroft and Trebeck; papers by R. Lydekker, in Records of the Geological Survey of India, vols. xiii. and xiv., and by Dr F, Stolicza, in Report of Sir T. D. Forsyth’s mission to Yarkand. ~ UC. ES)

LA DIXMERIE, Nicotas Bricatre DE (1730-1791), French man of letters, was a native of Champagne, and was born about 1730. While still young he removed to Paris, where the rest of his life was spent in considerable

- This, however, it has been said, is only taken from the name of former ruling family.

LA D—LAD

literary activity. He died suddenly on November 26, 1791. His numerous works include Contes Philosophiques et Moraux (1765), characterized by Sabatier as “less agree- able than those of Marmontel, but more moral, more varied, and showing a keener sensibility ;” Les deux dges du Gout et du Génie sous Lous XIV. et sous Louis XV., a parallel and contrast, in which the decision is given in favour of the latter ; LZ’ Hspagne littéraire (1774) ; Eloge de Voltaire (1779) and Lloge de Montaigne (1781).

LADOGA, formerly NEvo, a lake of northern Russia, situated between 59° 56’ and 61° 46’ N, lat., and 29° 53’ and 32° 50’ E. long., surrounded by the governments of St Petersburg, Olonetz, and Wiborg. It has the form of a quadrilateral, elongated from north-west to south-east. Its eastern and southern shores are flat and marshy, whilst the north-western margin is craggy and fringed by numerous small rocky islands, the largest of which are Valaam and Konevetz, and which occupy altogether an area of 223 square miles, Lake Ladoga is 7000 square miles in area, that is, thirty-one times as large as the Lake of Geneva; but, its depth being less, it contains only nineteen times as much water as the great lake of Switzerland. The greatest depth, 244 yards, is in a cavity situated in the north-western part of the lake, the average depth not exceeding 100 yards. The level of Lake Ladoga is 55 feet above the Gulf of Finland, but it rises and falls about 7 feet according to atmospherical conditions. The western and eastern shores consist of boulder clay, as well as a narrow strip on the southern shore, south of which runs a ridge of crags of Silurian sandstones ; the hills of the north- western shore afford a variety of granites and crystalline slates of the Laurentian system, whilst the Valaam island is made up of a rock which Russian geologists describe as orthoclastic hypersthenite. The granite and marble of Serdobol, and the sandstone of Poutilovo, are much used for buildings at St Petersburg; copper and tin from the Pitkaranda mine are exported. No less than sixty rivers enter Lake Ladoga, pouring into it the waters of number- less smaller lakes which lie at higher levels around it. The Volkhov, which conveys the waters of Lake Ilmen, is the largest; Lake Onega discharges its waters by the Svir; and the Saima system of lakes of eastern Finland contributes the Wuoxen and Taipala rivers; the Syass brings the waters from the

smaller lakes and marshes of the Valdai plateau. Lake Ladoga discharges its surplus water by means of the Neva, which flows from its south- western corner into the Gulf of Finland, rolling down its broad channel 104,000 cubic feet of water per second. The water of Lake Ladoga is very pure and cold; in May its temperature on the surface does not exceed 36° Fahr., and even in August it reaches only 50° and 53°, the average yearly temperature of the air at Valaam being 36°83. The lake begins to freeze in October, but it is only about the end of December that it is frozen in its deeper parts; and it remains under the ice covering until the end of March, whilst wide icefields continue to float in the middle of the lake until they are broken up by gales and scattered on the shores, Only a small part of the Ladoga ice is discharged by the Neva; but it is enough to produce in the middle of June a return of cold in the northern capital. The thickness of the ice does not exceed 3 or 4 feet; but during the alternations of cold and warm weather, with strong gales, in winter, heaps of ice, 7 O and 80 feet high, are raised on the banks and on the icefields. The water of the lake is in continuous rotatory motion, being carried along the western shore from north to south, and along the eastern from south to north. The vegetation on the shores is poor ; immense forests, which formerly covered them, are now mostly destroyed ; but the fauna of the lake is somewhat rich ;

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a species of seal which inhabits its waters, as well as several arctic species of crustaceans, recall its former connexion with the Arctic Ocean. The great variety of sweet water Diatomacez which are found in the ooze of the deepest parts of the lake has also an arctic character. Fishing is very extensively carried on. WNavi- gation on the lake, which is practicable for only one hundred and eighty days in the year, is rather difficult owing to fogs and gales, which are often accompanied, even in April and September, with snow storms. The prevailing winds are north-west and south-west; north- east winds cause the water to rise in the south-western part of the lake, sometimes from 3 to 5 feet. A pheno- menon very similar to the seiches of the Lake of Geneva is observed in connexion with the rise and fall of the

barometer. Steamers ply regularly in two directions from St Petersburg —to the monasteries of Konevetz and Valaam, and to the mouth of the Svir, whence they go up that river to Lake Onega and Petrozavodsk ; and no less than from 600 to 800 small vessels transport timber, fire-wood, planks, iron, kaolin, granite, marble, fish, hay, and various small wares from the northern shore to Schliissel- burg, and thence to St Petersburg. The rivers Volkhov, Syass, and Svir being parts of the three great systems of canals which unite the upper Volga with the Gulf of Fin- land, and the navigation on Lake Ladoga being too danger- ous for small craft, three canals with an aggregate length of 70 miles were dug along the southern shore of Lake Ladoga, uniting the mouths of these three rivers with the Neva at Schliisselburg ; thousands of vessels pass yearly along them on their way to St Petersburg. The popula- tion on the shores of the lake is sparse, and the towns Scliliisselburg, with 6000 inhabitants, New Ladoga (4500), Kexholm (1000), and Serdobol (800) are poor; many small villages are situated on the southern, north-eastern, and western shores, but the total population of the shores of Lake Ladoga does not exceed 35,000. The monasteries of Valaam, founded in 960, on the island of same name, and Konevskiy, on the Konevetz island, founded in 1398, are highly venerated, and are visited every year by many thousands of pilgrims.

LADRONE or MARIANA ISLANDS, a chain of fif- teen islands in the North Pacific Ocean, situated to the north of the Carolines, and between 13° and 21° N. lat., and 144° and 146° E. long. The name Islas de los Ladrones, or “Tslands of the Thieves,” was given them by the ship’s crew of Magellan on account of the thieving propensity of the inhabitants. Magellan himself styled them Islas de las Velas Latinas, or “Islands of the Lateen Sails.” San Lazarus archipelago, Jardines, and Prazeres are among the names applied to them by later navigators. They received their present recognized official appellation “Las Marianas” in 1668 in honour of Maria Anna of Austria, widow of king Philip IV. of Spain, and they still form a Spanish colony under the general government of the Philippines. A broad channel divides the Ladrones into two groups, containing a total area of about 417 square miles. The northern group (Gani) consists of ten islands, now unin-habited ; five islands, of which four are inhabited, form the southern

group, viz., Guahan (Guam, Spanish Guajan, the San Juan of old Spanish charts), Rota, Aguigan, Tinian, and Saypan. On Guahan, the largest and southern- most of the group, is the only town in the colony, San Ignacio de Agaiia, and the fortified harbour of Umata. —

The general surface of the southern islands is far inferior in elevation to that of the northern group, which is mountainous, though the altitudes do not exceed 2600 to 2700 feet. The predominant rock in the southern group 1s madreporic limestone, but in some instances, and especially at Guahan, volcanic formations occur. The northern

islands are entirely of igneous origin, and on Pagan and Uraceas are smoking craters. The coasts of the southern islands are in many instances surrounded by reefs. All the islands except Farallon de Medinilla and Mangs (in the northern group) are more or less densely wooded, and the vegetation is luxuriant, much resembling that of the Philippines, whence many species of plants have been introduced. Owing to the humidity of the soil cryptogams are very numerous, as also most kinds of grasses. Among the useful vegetable products may be mentioned areca and cocoa-nut palms, rice, maize, sugar, tobacco, cotton, indigo, breadfruit, bananas, and castor oil. In consequence of the laziness of the native population, agriculture is almost entirely neglected, in spite of the exceptional advantages offered by the climate and soil, On most of the islands there is a plentiful supply of water; at Guahan, however, the partial clearing away of the woods has caused several full streams to dwindle to mere brooks.

The fauna of the Ladrones, though inferior in number and variety, is similar in character to that of the Carolines, and certain species are indigenous to both colonies. Swine and oxen are allowed to run wild, and are hunted when required: the former were known to the earlier inhabit- ants ; the latter with most other domestic animals were introduced by the Spaniards. The roe was imported from the Philippines.

The climate of the Ladrones, though humid, is salubri- ous, whilst the heat, being tempered by the trade winds, is milder than that of the

Philippines. The yearly mean temperature at Guahan is about 81° Fahr. August and September are the warmest months, but the variations of temperature are not great. The year may be divided into a wet and dry season, though even in the latter rain often falls. From October to May the general winds are north-easterly ; during the other four months they are often north-westerly and south-westerly, the latter being accompanied by much rain.

The present population of the Ladrones consists of descendants from the original inhabitants, called by the Spaniards Chamorros, of Tagal settlers from the Philippines, and of a mixed race formed by the union of Spaniards and Chamorros. On the island of Saypan there is a colony from the Carolines. With the exception of the last- mentioned settlers, who are very active, and have founded the village of Garapan, the inhabitants are generally wanting in energy, of indifferent moral character, and miserably poor. Little has yet been done for the improve- ment of their intellectual and social condition, with the exception of the establishment of a few schools, now mostly fallen into decay, The number of the original inhabitants previous to the subjection of the islands by the Spaniards in 1668 has been variously estimated at from 40,000 to 60,000. The Spanish conquest and the forcible suppres- sion of the protracted opposition of the natives reduced their numbers to such an extent that in 1741 the population was only 1816. From that date, however, owing to the introduction of new colonists from the Philippines, the population began to increase, and in 1856 was 9500. In the last year a severe epidemic carried off more than a third of the inhabitants. Since 1871 the total population of the Ladrones has been roughly estimated at 8000. All the inhabitants understand and are able to speak Spanish, which is gradually supplanting the native language, a Micronesian dialect nearly allied to that used by the Tagals of the Philippines. The residence of the governor is at Agafia in Guahan. Spain gains no revenue by the pos- session of these islands.

The honour of the discovery of this archipelago, the first found by Europeans in the Pacific, is due to Magellan, who upon the 6th of

March 1521 observed the two southernmost islands, and sailed between them (O. Peschel, Geschichte des Zettalters der Entdech. ungen, Stuttgart, 1877, p. 500). Modern research in the archipelago began with the visit of Commodore Anson, who in August 1742 landed upon the island of Tinian, where he found extensive ruins (Anson's Voyage, bk. iii). The Ladrones were visited by Byron in 1765, Wallis in 1767, and Crozet in 1772: Great additions to our knowledge of the islands were made in the present century by Freycinet, in 1829 (Voyage autour du monde, part histor. ii.), and the Spanish captain Sanchez y Zayas, in 1865.

Besides works above mentioned, see especially C. E. Meinicke, Die Inseln des Stillen Oceans, Leipsic, 1875-76, part ii., 'The Marianas Islands," in the Nautical Magazine, vols. xxxiv., xxxy., London, 1865, 1866; and P. A. Lesson, Les Polynésiens, leur origine, &c., Paris, 1880. (E. D. B.)

LADY DAY, the Feast of the Annunciation of the Virgin Mary. See ANNUNCIATION.

LAENNEC, René Tatopore Hyactnrus (1781-1826), inventor of the stethoscope, was born at Quimper in Britanny, February 17, 1781. Early trained to medicine under his uncle at Nantes, he completed his medical studies at Paris, where he received the degree of doctor in 1804. He specially distinguished himself by his researches in pathological anatomy, and was regarded as one of the first practitioners of the capital when in 1816 he was appointed physician at the Necker hospital. There he continued those researches which resulted in the discovery of the stethoscope in the manner already fully described under AUscULTATION (vol. iii. p. 100). Laennee himself fell a victim to phthisis, the disease which, of all others, he had specially studied. For a few years he was able to occupy a medical chair in the Collége de France; but he died on

August 13, 1826.

Laennec’s chief work is the Traité de ? Auscultation médiate, 1819, in which he announced his discovery. It has been translated into various languages. He was the author also of Propositions sur la doctrine médicale d’ Hippocrate, 1804; of Mémoires sur les vers vési- ewlacres, 1804 ; and of articles in the Dict. des Sciences Médicales, and other publications,

LAER, or Laar, Pisrer van (1613-1675), painter, was born at Laaren in Holland in 1613. The influence of a long stay in Rome begun at an early age is to be traced in his landscape and backgrounds, but in his subjects he remained true to the Dutch tradition, choosing generally lively scenes from peasant life, as markets, feasts, bowling scenes, farriers’ shops, robbers, hunting scenes, peasants with cattle, and the like. From this taste, or from his personal deformity, he was nicknamed Bamboccio by the Italians. On his return to Holland about 1639, he lived chiefly at Amsterdam and Haarlem, in which latter city he died in 1674 or 1675. Pieter van Laer’s pictures are marked by skilful composition and good drawing; he was especially careful in perspective. His colouring, according to Crowe, is “generally of a warm brownish tone, sometimes very clear, but oftener heavy, and his execution broad and spirited.” Certain etched plates are also attributed to him.

LASTRYGONES, a mythic race of giants, mentioned in the Odyssey. After leaving the island of olus, Ulysses reached in six days the coast of the Lestry- gonians and the city of Lamus, where the paths of day and night approach so close that a sleepless man might make double wages by herding continuously, watching one flock while the other rested. This feature of the tale obviously contains some hint of the long nightless summer in the Arctic regions, which perhaps penetrated to the Greeks with the merchants who fetched amber from the Baltic coasts. The Lestrygonians were cannibals; and, when three sailors sent as scouts incautiously entered the city, the king Antiphates ate one and the people pursued the others to the ships. As the vessels tried to escape from the harbour, the giants pelted them with masses of rock, and sunk all except the one in which Ulysses was. The Lestrygonians

must be a mythic multiplication of the one ultimate demonic being who is called their king, just

as the kindred race of the Cyclopes is a multiplication of the single one-eyed sun-god Polyphemus, the Cyclops par excellence. The name Antiphates is a fanciful one, but the other name Lamus takes us into a religious world where we can trace the origin of the legend, and observe the god of an older religion becoming the subject of fairy tales in a later period (see Lamra). Among the Greeks it was usual to place the country of the Leestrygones in Sicily, either beside Etna or towards the north-west promontory of the island ; but, on the other hand, Horace and other Latin authors speak of them as living in southern Latium, near Formie.

LA FARINA, Gruseprr (1815-1863), Italian author and politician, was born at Messina in 1815. On account of tlie part taken by him in the insurrection of 1837 he found it necessary to quit Sicily, but returning in 1839 he conducted various newspapers of liberal tendencies, until his efforts were completely interdicted, when he removed to Florence. In 1840 he had published Messina ed ¢ suot Monumenti, and after his removal to Florence he brought out La Germania coi suot Monumenti, 1842; L'Italia cot suot Monumenti, 1842; La Svizzera Storica ed Artistica,

1842-43; La China, 4 vols, 1843-47; and Storia |

CItalia, 7 vols., 1846-54. He also in 1847 established a democratic journal Z'A/ba in the interests of Italian freedom and unity, but on the outbreak of the revolution in Sicily in 1848 he returned thither and was elected one of the committee of war.

new constitution. ment, in which La Farina was minister successively of public instruction, of public works, and of the interior, resolved, notwithstanding his strong advocacy of resistance, to submit to the royal authority, and he removed to France. In 1850 he published Jstoria della Rivoluzione Siciliana, and in 1851-52, in 6 vols., Storia d'Italia

dal 1815 al 1850. He also began in 1851 Rivista Lnciclo- pedica Italiana, and in 1856 Piccolo Corriere d'Italia, an organ which had great influence in propagating the political sentiments of tlie Societa Nazionale Italiana, of which he ultimately was chosen president. During the remainder of his life le was a devoted supporter of Victor Emmanuel, and in 1860 he was chosen a member of the first Italian parliament. He died 5th September 1863. See Franchi's Epistolario de Giuseppe La Farina, 2 vols., 1869.

LA FAYETTE, the capital of Tippecanoe county, Indiana, U.S., is situated at the head of navigation on the Wabash river, and near the battle-ground of Tippecanoe, where, in 1811, General Harrison, afterwards president, defeated a large force of Indians. The city—which is much the largest of the twenty-four towns in the United States named in honour of General La Fayette—is beauti- fully situated in the centre of a rich agricultural region and amid an amphitheatre of hills, which are covered with suburban homes. La Fayette has eight lines of railway

communication and ten graded turnpikes extending in The La Fayette car-works employ.

various directions. eight hundred men. 'There are four national banks, three daily and nine weekly newspapers, five large boot and shoe manufactories, four breweries, one distillery, four large cooperage establishments, a paper mill, porkhouses for summer and winter curing, a horning mill, iron-works, together with numerous foundries and smaller manufactur- ing enterprises. The city is supplied with gas and water- works, and sulphur water, valuable for drinking and bathing purposes, flows from an artesian well in the public square. It is the seat of Purdue university, an agricultural college, richly endowed by a congressional land grant, and named in honour of John Purdue, who gave it $150,000. Population in 1880, 14,860.

In the following year he was. chosen to represent Messina in parliament, where he moved — the deposition of King Ferdinand and the adoption of a_ In April 1849 the provisional govern-—

LA FAYETTE

Copyright, 1882, by John Bigelow. ARIE JEAN PAUL ROCH YVES GILBERT MOTIER, MARQUIS DE LA FAYETTE (1757-1834), was born at the chateau of Chavagniac in Auvergne, France, September 6, 1757. Left an orphan with a princely fortune at the tender age of thirteen, he married at sixteen a daughter of the Duc d'Ayen and granddaughter of the Duc de Noailles, then one of the most influential families in the kingdom. In selecting a career, the choice of a young man of his rank in France at that time was practically limited to the court or the camp. He chose to follow the career of his father, and entered the Guards,

'La Fayette was nineteen years of age and a captain of dragoons when the English colonies in America proclaimed their independence. 'At the first news of this quarrel," he afterwards wrote in his memoirs, "my heart was enrolled in it." The count de Broglie, whom he consulted, discour- aged his zeal for the cause of liberty. 'I have seen your uncle die in the wars of Italy ; I witnessed your father's death at the battle of Minden; and I will not be accessory to the ruin of the only remaining branch of the family." Finding his purposé unchangeable, however, the count presented the young enthusiast to the Baron de Kalb, who was also seeking service in America, and through Deane, an American agent in Paris, an arrangement was concluded, December 7, 1776, by which La Fayette was to enter the American service as major-general. At this critical moment the news arrived of a series of grave disasters to the American arms, includ- ing the evacuation of New York. La Fayette's friends again advised him to abandon his purpose. Even the American envoys, Franklin and Lee, who had superseded Deane the very day after the contract was signed, and who did not feel authorized to confirm his engagements, deemed it their duty to withhold any further encouragement of the plans of the marquis, and the king himself forbade his leav- ing. So far from being discouraged by these difticulties La Fayette proceeded to purchase a ship on his own account, and to invite such of his friends as were willing to share

his fortunes. The British ambassador at Versailles remonstrated, and at his instance orders were issued to seize the ship then fitting out at Bordeaux, and La Fayette him- self was arrested. But the ship was sent from Bordeaux to the neighbouring port of Pasajes in Spain, La Fayette escaped from the custody of his guards in disguise, and before a second lettre de cachet could reach him he was afloat with eleven chosen companions. Though two British cruisers had been sent in pursuit of him, he effected a safe landing near Georgetown in South Carolina, after a tedious voyage of nearly two months, and hastened to Philadelphia, then the seat of government of the colonies.

When this lad of nineteen, with the command of ouly what little English he had been able to pick up on his voyage, presented himself to the Congress of the Revolu- tion, then sitting in Philadelphia, with Deane's authority to demand a commission of the highest rank after the commander-in-chief, it is not surprising that his reception seemed to him a little chilly. Nor did he then know all the disadvantages under which he presented himself. Deane's contracts were so numerous, and for officers of such high rank, that it was quite impossible for Congress to ratify them without injustice to Americans who had become entitled by their service to promotion. La Fayette appreciated the situation as soon as it was explained to him, and immediately addressed a note to the president of Congress, in which he expressed his desire to be permitted to serve in the American army upon two conditions, —that he should receive no pay, and that he should act as a

volunteer, 'These terms were so different from those made XIV. — 26

by other foreigners, they had been attended with such substantial sacrifices, and they promised such substantial indirect advantages, that Congress had no hesitation in passing a resolution, on the 31st of July 1777, "that his services be accepted, aud that, in consideration of his zeal, illustrious family, and connexions, he have the rank and commission of major-general of the United States." Next day La Fayette met Washington, who invited him to make the quarters of the commander-in-chief his own, and_ to consider himself at all times as

one of his family. This invitation, as useful as it was flattering to the young officer, was joyfully accepted, and thus commenced a friendship which only death terminated. La Fayette was now anxious to have active employment, but it appeared that Congress intended his appointment as purely honorary, and the question of giving him a command was left entirely to Washington's discretion. At the time La Fayette went into camp the British commander was trying to secure possession of Philadelphia and the line of the Hudson from the Canadian frontier to New York, which, if accomplished, might prove fatal to the American cause. By the capture of Burgoyne at Saratoga, on the 17th of October LiT7, that portion of the scheme was effectually spoiled. In the southern campaign the British arms were more for- tunate. The fall of Philadelphia was one of the immediate results of the battle of Brandywine on the 11th of Sep- tember. 'This was the first battle in which La Fayette was engaged, and in an attempt to rally his troops in their retreat he had the good fortune to receive a musket ball in his leg. We say good fortune, for it doubtless secured him what of all things in the world he most desired, the command of a division—the immediate result of a com- munication from Washington to Congress of November 1, 1777, in which among other things he said :—

'The Marquis de la Fayette is extremely solicitous of having a command equal to his rank. I do not know in what light Congress will view the matter, but it appears to me, from a consideration of his illustrious and important connexions, the attachment which he has manifested for our cause, and the consequences which his return in disgust might produce, that it will be advisable to gratify his wishes, and the more so as several gentlemen from France who came over under some assurances have gone back disappointed in their expectations. His conduct with respect to them stands in a favourable point of view,—having interested himself to remove their uneasiness and urged the impropriety of their making any unfavour- able representations upon their arrival at home. Besides, he is sensible, discreet in his manners, has made great proficiency in our language, and from the disposition he discovered at the battle of Brandywine possesses a large share of bravery and military ardour."

The recommendation of Washington was conclusive, and La Fayette's happiness was now complete. Barely twenty years of age, he found himself invested with a most honour- able rank, purchased by his blood in fighting at once to secure the independence of a strange people and to punish the enemies of his own, He had justified the boyish rash- ness which his friends deplored and his sovereign resented, and had already acquired a place in history.

Of La Fayette's military career in the United States there is not much to be said. Though the commander of a division, he never had the command of many troops, and whatever military talents he possessed were not of the kind which appeared to conspicuous advantage on the theatre to which his wealth and family 'influence rather than his soldierly gifts had called him. He fought at the battle of Monmouth in 1778, and received from Congress a formal recognition of his services in the field, and of his probably more valuable exertions in healing dissensions between the French and native officers. His retreat from Barren Hill was also commended as masterly.

The treaty of commerce and defensive alliance, signed by the insurgents and France on the 6th of February 1778, was promptly followed by a declaration of war by England against the latter, and La Fayette felt it to be his duty to

ask leave to revisit France and consult his king as to the farther direction of his services. 'This leave was readily granted ; it was not difficult for Washington to replace the major-general, but it was impossible to find another equally competent, influential, and devoted champion of the American cause near the court of Louis XVI. In fact, he went on a mission rather than a visit. He embarked in January 1779, and on the 4th of March following Franklin wrote to the president of Congress: ''The Marquis de la Fayette, who during his stay in France has been extremely zealous on all occasions, returns again to fight for it. He is infinitely esteemed and beloved here, and I am persuaded will do everything in his power to merit a continuance of the same affection from America."

La Fayette was absent trom America about six months, and his return was the occasion of a complimentary resolu- tion of Congress. From this time until October 1781 he was charged with the defence of Virginia, in which Washington gave him the credit of doing all that was possible with the forces at his disposal; and he showed his zeal by borrowing money from the bankers in Balti- more on his own account to provide his soldiers with necessaries. The battle of Yorktown, in which La Fayette bore an honourable if not a distinguished part, was the last serious trouble of the war, and terminated his military career in the United States. He immediately sought and obtained leave to return to France, where it was supposed he might be useful in the negotiations looking to a general peace, of which prospects had begun to dawn. He was also much occupied in the preparations for a combined French and Spanish expedition against some of the British West India Islands, of which he had been appointed chief of staff, and a formidable fleet had already assembled at Cadiz, when, on the 30th of November 1782, the preli- minary treaties of peace between the several belligerents put an end to the war. To La Fayette was accorded the grateful privilege of first communicating this welcome intelligence to Congress. He returned to his native land one of the heroes of a noble conflict, and fortified with the most flattering testimonials from his commander-in-chief and from the Government he had served, which were crowned by a notification from the French minister of war that he should have the same rank in the army of his sovereign that he had held in America, his commission to date from the surrender of Cornwallis at Yorktown. He visited the United States again in 1784, to gratify his curiosity as well as his affections, and while he remained— some five months— was the guest of the nation, and received every mark of public and private consideration whicli his hosts supposed would be acceptable.

La Fayette did not appear again in public life until 1787, when he took his seat in the Assembly of Notables. From this time till near the close of the Revolution he was a conspicuous figure in the history of France, and almost the only one who, at no stage of that cycle of horrors, seems to have lost his reason or his humanity.

When the States-General, convened after the Assembly of Notables had proved wholly unequal to its task, met at Versailles in May 1789 the throne was occupied by a shadow. The royal authority was gone. France was already, though few if any, and least of all the sovereign, suspected it, in full revolution. On the 11th of July 1789 La Fayette presented to the National Assembly, into which the States-General had been fused, a declaration of rights, modelled on Jefferson's Declaration of Inde- pendence in 1776. The struggle between the expiring monarchy and popular sovereignty was already big with the horrors of the French Revolution. The palace and the assembly were guarded by troops; a national guard was organized, which soon embraced the whole kingdom, and

nuinbered over three millions of men, the command of which was confided to La Fayette. For the succeeding three years, until the end of the constitutional monarchy in 1792, his history is largely the history of France. His life was beset with inconceivable responsibility and perils, for he was ever the minister of humanity and order among a frenzied people who had come to regard order and humanity as phases of treason. He rescued the queen from the murderous hands of the populace on the 5th and 6th of October 1789, not to speak of multitudes of humbler victims who had been devoted to death. He risked his life in many unsuccessful attempts to rescue others. He was obliged to witness the butchery of Foulon, and the reeking heart of Berthier torn from his lifeless body and held up intriumph beforehim. Disgusted with enormities which he was powerless to prevent and could not counte- nance, he resigned his commission ; but so impossible was it to replace him that he was induced to resume it. In the Constituent Assembly, of which he was a member, his influence was always felt in favour of Republican principles, for the abolition of arbitrary imprisonment, for religious tolerance, for popular representation, for the establishment of trial by jury, for the gradual emancipation of slaves, for the freedom of the press, for the abolition of titles of nobility, and the suppression of privileged orders. When the Constitution was proclaimed, on the 14th of July 1790, the first

anniversary of the destruction of the Bastille, he again and definitively resigned his command, and retired to private life. Shortly after his resignation he was invited by the friends of liberty with order to stand for the office of mayor of Paris. By a strange madness the remnants of the royal party supported his competitor Péthion, the most rancorous of Jacobins, and were for the royal family but too fatally successful.

The royalist party, and certain members of the royal family who had taken refuge in frontier states, were already intriguing with the Austrian Government to march an army into France and restore absolutism, while the king, after an unsuccessful attempt to escape from France, was reduced to the humiliating necessity of declaring war against Austria and her allies. Three armies of 50,000 each were levied. Of one of these the command was given to La Fayette. But it was with sad misgivings that the general left his country retreat to take this command. As he passed through Paris the president of the Assembly said to him in full session that “the nation would oppose to its enemies the constitution and La Fayette”; but what was to be expected of a war conducted by a king in secret league with the nation’s enemies, or of a legislature con- spiring to destroy the king and constitution to which they had only just sworn allegiance and support? La Fayette’s loyalty to his king, to his constitution, and to his country seemed only to strengthen as the situation grew desperate. Four days before the outrages which occurred at the Tuileries on the 16th June 1792 he publicly denounced the Jacobin Club, and called upon the Assembly to sup- press them. Henceforth he became the special object of Jacobin rage. On the 8th of August a motion was made to have him arrested, and tried as an enemy of his country. Though the motion was defeated by 446 votes against 224, scarce two days elapsed before the palace was stormed, and the king and queen were sent to the prison from which they passed to the scaffold.

With the destruction of the constitution, the monarchy, and the Government, La Fayette’s occupation as the priest of liberty, humanity, and order was gone. He would have marched to Paris to defend the constitution, but his troops were too generally infected with the

sentiments Which triumphed in the disorders of the 10th of August. He was compelled to take refuge in the neutral territory of

Liége, where he was taken by the Austrians and held as a prisoner of state for five years, first in Prussian and after- wards in Austrian prisons, in spite of the intercession of America and the pleadings of his wife. Napoleon, how- ever, who called him a “noodle,” stipulated for his release, 19th September 1797. He was not allowed to return to France by the Directory; when he did, it was to vote against the life consulate of Napoleon, as he, later on, voted against the imperial title. Many years of his life were then spent in retirement at the castle of La Grange. He was called from it to become vice-president of the Assembly, under Louis XVIII., before the battle of Waterloo. He afterwards sat for Meaux and became a frequent speaker upon foreign politics and military economy. But his early influence was gone, except in America, to which he returned in 1824, to be overwhelmed with popular applause and to be voted the sum of $200,000 and a township of land. During the Revolution of 1830 he again took command of the National Guard and pursued the same lineof conduct, with equal want of success, as in the first Revolution. In 1834 he made his last speech,—on political refugees. He died at Paris, May 20, 1834.

Few men have owed more of their success and usefulness in the world to their family rank than La Fayette, and still fewer have abused it less. He never achieved distinction in the field, and his political career proved him to be incapable of ruling a great national movement; but he had strong convictions which always impelled him to study the interests of humanity, and a pertinacity in maintaining them, which, in all the marvellous vicissitudes of his singu- larly eventful life, secured him a very unusual measure of public respect. No citizen of a foreign country has ever had so many and such warm admirers in America, nor does any statesman in France appear to have ever possessed uninterruptedly for so many years so large a measure of popular influence and respect. He had what Jefferson called a “canine appetite” for popularity and fame, but in him the appetite only seemed to make

him more anxious to merit the fame which he enjoyed. He was brave even to rashness; his life was one of constant personal peril, and yet he never shrank from any danger or responsibility if he saw the way open to spare life or suffering, to protect the defenceless, to sustain the law and preserve order.

See AMémoires historiques et pieces authentiques sur M. de La Fayette pour servir a U histoire des révolutions, Paris, l'an second de la liberté francaise ; La Fuyette et la Révolution de 1880, histoire des choses et des hommes de Juillet, by B. Sarrans, Paris, 1882; Mémoires et Manuscrits de La Fayette, published by his family, 6 vols., Paris, 1837-88; and numerous eulogies and monographs in French and English. (J. BI.)

LA FLECHE, chief town of an arrondissement in the department of Sarthe, France, is situated on the right bank of the Loir, about 24 miles south-west of Le Mans. The chief buildings are the military academy (Prytanée), originally a college founded in 1607 by Henry IV., the church of St Thomas, the prison, and the hospital. Near the bridge are the ruins of an ancient castle. La Fléche carries on manufactures of cloth, gloves, hosiery, candles, and glue, besides wax bleaching, tanning, and paper-making. It has the usual country trade, managed mainly by means of fairs. The population in 1876 was 7468.

LA FONTAINE, Jean pve (1621-1695), one of the most popular and original of French poets, was born at Chateau Thierry in Champagne, probably on the 8th of July 1621, and died at Paris on the 13th of April 1695. His father was Charles de La Fontaine, " mattre des eaux et foréts'—a kind of deputy-ranger—of the duchy of Chateau Thierry ; his mother was Frangoise Pidoux. | On both sides his family was of the highest provincial middle class, but was not noble; his father was also fairly wealthy. Jean, who was the eldest child of his parents, was educated

at the collége (grammar-school) of his native town, and at the end of his school days he had, singularly enough, an idea of taking orders, He

entered the Oratory in May 1641, and the seminary of St Magloire in October of the same year; but a very short sojourn proved to him that he had mistaken his vocation. He then apparently studied law, and is said to have been admitted as avocat, though there does not seem to be actual proof of this. He was, however, settled in life, or at least might have been so, somewhat early. In 1647 his father resigned his rangership in his favour, and arranged a marriage for him with Marie Héricart, a young girl of sixteen, who brought him twenty thousand livres, and expectations. She seems to have been both handsome and intelligent, but the two did not get on well together. There appears to be absolutely no ground for the vague scandal as to her conduct, which was, for the most part long afterwards, raised by gossips or personal enemies of La Fontaine. All that is positively said against her is that she was a negligent housewife and an inveterate novel reader; La Fontaine on the other hand was con- stantly away from home, was certainly uot strict in point of conjugal fidelity, and was so bad a man of business that lis affairs became involved in hopeless difficulty, and a séparation de biens had to take place in 1658. This was for the benefit of the family, and was a perfectly amicable transaction; by degrees, however, the pair, still without any actual quarrel, ceased to live together, and for the greater part of the last forty years of La Fontaine's life he himself lived in Paris while his wife dwelt at Chateau Thierry, which, however, he frequently visited. One son was born to them in 1653, and was educated and taken care of wholly by his mother.

Even in the earlier years of his marriage La Fontaine seems to have been much at Paris, but it was not till about 1656 that he became a regular visitor to the capital. The duties of his office, which were only occasional, were compatible with this non-residence, and he continued to hold it till 1672. It was not till he was past thirty that his literary career began, for he was by no means a precocious writer. The reading of Malherbe, it is said, first awoke poetical fancies in him, but for some time he attempted nothing but trifles in the fashion of the time—epigrams, ballades, rondeaux, &c. His first serious work was a translation or adaptation of the Hunuchus of Terence (1654), At this time the Mzcenas of French letters was the superintendant Fouquet, to whom La Fontaine was introduced by Jacques Jannart, a connexion of

his wife’s. Few people who had paid their court to Fouquet. went away empty-handed, and La Fontaine soon received a pension of 1000 livres (1659), in repayment possibly of the poem of Adonis which in 1658 he had, in manuscript, dedicated to the financier. He began too a medley of prose and poetry, entitled Le Songe de Vaux, on Fouquet’s famous country house. It was about this time, as has been said, that his wife’s property had to be separately secured to her, and he seems by degrees to have had to sell every- thing of his own ; but, as he never lacked powerful and generous patrons, this was of small importance to him, especially as he had no establishment to maintain. In the same year he wrote a ballet, Les Riewrs du Beau-Richard, and this was followed by many small pieces of occasional poetry addressed to various personages great and small, from the king downwards. Fouquet soon incurred the royal displeasure, but La Fontaine, like most of his literary protégés, was not unfaithful to him, the well-known elegy Pleurez, Nymphes de Vaux, being by no means the only proof of his devotion. Indeed it is thought not improbable that a journey to Limoges which he took in 1663 in company with Jannart, and of which we have an account written to his. wife, was not wholly spontaneous, as it

affairs did not look promising, had assumed the title of esquire, to which they were not strictly entitled, and, some old edicts on the subject having

Chapelle was also a kind of outsider in the coterie.

‘for the worse. apparently had to give up his rangership, probably selling ‘it to pay debts.

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certainly was not on Jannart’s part. Just at this time his His father and himself

been put in force by the king, an informer procured a

sentence against the poet fining him 2000: livres, which

from what is known of the state of his private affairs it was probably impossible for him to pay. He found, however, a new protector in the duke and still more in

‘the duchess of Bouillon, his feudal superiors at Chateau ‘ Thierry, and nothing more is heard of the fine. | La Fontaine’s liveliest verses are addressed to the duchess, , Anne Mancini, the youngest of Mazarin’s nieces, and it is: even probable that the taste of the duke and duchess for

Some of

Ariosto had something to do with the writing of his first

work of real importance, the first book of the Contes, which appeared in 1664. He was then, let it be remembered, forty-three years old, and his previous printed productions had been comparatively trivial, though, as was the habit }of the time, much of his work was handed about in | manuscript long before it was regularly published. It was

about this time that the quartette of the Rue du Vieux Colombier, so famous in French literary history, was formed, It consisted of La Fontaine, Racine, Boileau,

/and Moliére, the last of whom was almost of the same

age as La Fontaine, the other two considerably younger. There are many anecdotes, some of which are pretty obviously apocryphal, about these meetings. The most characteristic of these is perhaps that which asserts that a copy of Chapelain's unlucky Pucelle always lay on the table, a certain number of lines of which was the appointed punishment for offences against the company. The coterie furnished under feigned names the personages of La Fontaine's version of the Cupid and Psyche story, which, however, with Adonis, was not printed till 1669. Mean- while the poet continued to find friends. In 1664 he was regularly commissioned and sworn in as gentleman to the

duchess dowager of Orleans, and was installed in the | Luxembourg. / 1666 we have something like a reprimand from Colbert suggesting that he should look into some malpractices at

He still retained his rangership, and in

Chateau Thierry. In the same year appeared the second

book of the Contes, and in 1668 the first six books of the

Fables, with more of both kinds in 1671. In this latter year a curious instance of the docility with which the poet lent himself to any influence was afforded by his officiating at the instauce of the Port-Royalists as editor of a volume of sacred poetry dedicated to the Prince de Conti. A year

'afterwards his situation, which had for some time been

decidedly flourishing, showed signs of changing very much The duchess of Orleans died, and he

But there was always a providence for La Fontaine. Madame de la Sabliére, a woman of great beauty, of considerable intellectual power, and of high character, invited him to make his home in her house, where he lived for some twenty years. He seems to have

had no trouble whatever about his affairs thenceforward ;

he was free to amuse himself or to work as he liked, and as a matter of fact he worked steadily at his two different lines of poetry. Besides these he yentured on a third, in which he met and indeed deserved much less success,—that of theatrical composition.

The next event of importance in La Fontaine's life, apart from the publication of his works, did not occur till after nearly ten years. In 1682 he was a manof more than sixty years old, recognized as one of the first men of letters of France. Madame de Sévigné, one of the soundest literary critics of the time, and by no means given to praise

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other things ; but he did not survive Madame de la Sabliére 'much more than two years, dying on the 13th of April 1695, at the age of seventy-three.

mere novelties, had spoken of his second collection of Hables

published in the winter of 1678 as divine ; and it is pretty certain that this was the general opinion. It was not unreasonable therefore that he should present himself to the Academy, and, though the subjects of his Contes were searcely calculated to propitiate that decorous assembly,

representative of the old Frondeur party made him suspect to Colbert and the king, most of the members were his personal friends. He was first proposed in 1682, but was rejected for Dangeau. The next year Colbert died and La Fontaine was again nominated. Boileau was also a candi- date, but the first ballot gave the fabulist sixteen votes against seven only for the critic. The king, whose assent was necessary, not merely for election but for a second ballot in case of the failure of an absolute majority, was ill-pleased, and the election was left pending, Another vacancy occurred, however, some months later, and to this Boileau was elected. The king hastened to approve the choice effusively, adding, " Vous pouvez incessamient rece- voir La Fontaine, il a promis d'étre sage." His admission was indirectly the cause of the

only serious literary quarrel of his life. A dispute, into the particulars of which there is no need to enter here, took place between the Academy and one of its members, Furetiére, on the subject of the latter's French dictionary, which was decided to be a breach of the Academy's corporate privileges. Fureti¢re, a man of no small ability, bitterly assailed those whom he considered to be his enemies, and among them La Fontaine, whose fault probably was not so much that he was a principal offender as that the unlucky Contes made him peculiarly vulnerable. His second collection of these tales hag been actually the subject of a police condemnation, of which, as may be supposed, Furetiére did not fail to make the most. The death of the author of the Roman Bourgeois, however, put an end to this quarrel. Shortly afterwards La Fontaine had a share in a still more famous affair, the celebrated ancient-and-modern squabble in which Boileau and Perrault were the chiefs, and in which La Fontaine (though he had been specially singled out by Perrault for favourable com- parison with /Zsop and Pheedrus) took the aucient side. About the same time (1685-87) he made the acquaintance of the last of his many hosts and protectors, Monsieur and Madame d'Hervart, and fell in love with a certain Madame Ulrich, a lady of some position but of doubtful character. This acquaintance was accompanied by a great familiarity with Vendéme, Chaulieu, and the rest of the libertine coterie of the Temple ; but, though Madame de la Sablitre had long given herself up almost entirely to good works and religious exercises, La Fontaine continued an inmate of her house until her death in 1693. What followed is told in one of the best known of the many stories bearing on his childlike nature. Hervart on hearing of the death, had set out at once to find La Fontaine. He met him in the street in great sorrow, and begged him to make his home at his house. 'J' y allais" was La Fontaine's answer. He had already undergone the process of conversion during a severe illness which befell him the year before. An energetic young priest, M. Poucet, had brought him, not indeed to understand, but to acknowledge the impropriety of the Contes, and it is said that the destruction of a new play of some merit was demanded and submitted to asa proof of repentance. A pleasant story is told of the young duke of Burgundy, Fénelon's pupil, who was then only eleven years old, sending 50 louis to La Fontaine as a present of his

own motion. But though La Fontaine recovered for the time he was quite broken by age and infirmity, and his new hosts had to nurse rather than to entertain him, which they did very carefully and kindly. He did a little more work, completing his Fables among

| 18th century finally accepted it.

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He was buried in the

cemetery of the Holy Innocents. His wife survived him

nearly fifteen years, and his posterity lasted until the _ present century,

while his attachment to Fouquet and to more than one | of some other men of letters, has been enshrined in a kind ‘ of myth or legend by literary tradition.

The curious personal character of La Fontaine, like that

At an early age his absence of mind and indifference to business gave a subject to Tallemant des Réaux, the most indefatigable and least scrupulous (at best the least critical) of gossips. His later contemporaries helped to swell the tale, and the We have neither space nor desire to recount the anecdotes of his meeting his son, being told who he was, and remarking, “ Ah, yes, I thonght T had seen him somewhere!” of his insisting on fighting a duel with a supposed admirer of his wife, and then imploring him to visit at his house just as before ; of his going into company with his stockings wrong side out, &c. Tt may be taken for granted that much of this is apocryphal, and the companion anecdotes of his awkwardness and silence, if not positive rudeness, in company are still more doubtful. It ought to be rememberсd, as a comment on the unfavourable description which La Bruyere gives or is supposed to give of his social abilities, that La Fontaine was @ special friend and ally of Benserade, La Bruyére’s chief literary enemy, who long prevented the author of the Caractéres from entering the Academy. But after all deductions much will remain,

especially when it is remem- bered that one of the chief authorities for such anecdotes is Louis Racine, a man who possessed intelligence and moral worth, and who received them from his father, La Fontaine's attached friend for more than thirty years. Perhaps the best worth recording of all these stories is one of the Vieux Colombier quartette, which tells how Moliére, while Racine and Boileau were exercising their wits upon "le bonhomme" or "le bon" (by both which titles La Fontaine was familarly known), remarked to a bystander "nos beaux esprits ont beau faire, ils n'effaceront pas le bonhomme." 'They have not effaced him and will not do so, and the half contemptuous term "nos beaux esprits" marks well enough the sound judgment of the greatest of the four as to the merits of his companions.

The works of La Fontaine, the total bulk of which is consider- able, fall no less naturally than traditionally into three divisions, the Fables, the Contes, and the miscellaneous works. Of these the first may be said to be known universally, the second to be known to all lovers of French literature, the third to be witha few exceptions practically forgotten. This distribution of the judgment ot pos- terity is as usual just in the main, but not wholly. There are excellent things in the @uvres Diver'scs, but their excellence is only occasional, and it is not at the best equal to that of the Fables or the Contes. It was thought by contemporary judges who were both competent and friendly that La Fontaine attempted too many styles, and there is something in the criticism. His dramatic efforts are especially weak, and indeed it is evident that his forte lay neither in the dramatic delineation of character nor in the arrangement of dramatic action. The best pieces usually published under his name—Ragotin, Le Florentin, La Coupe Enchantée, were not originally fathered by him but by Champmeslé, the husband of the famous actress who captivated Racine and Charles de Sévigné. His avowed work was chiefly in the form of opera, a form of no great value at its best. Psyche has all the advantages of its charm- ing story and of La Fontaine's style, but it is perhaps principally interesting nowadays because of the framework of personal conver- sation already alluded to. The mingled prose and verse of the Songe de Vauz is not uninteresting, but its best things, such as the description of night—

‘¢ Laissant tomber les flenrs et ne les semant pas,”

which has enchanted French critics, are little more than conceits, though as in this case sometimes very beautiful conceits. ie elegies, the epistles, the epigrams, the ballades, contain many things which would be very creditable to a minor poet or a writer of vers de société, but even if they- be taken according to the wise

rule of modern criticism, each in its kind, and judged simply according to their rank in that kind, they fall far below the merits of the two great collections of verse narratives which have assured La Fontaine’s immortality. ;

Between the actual literary merits of the two there is not much to choose, but the change of manners and the altered standard of literary decency has thrown the Contes into the shade. These tales are identical in general character with those which amused Europe from the days of the early fadliaw writers through the period of the great Italian novelliert to that of the second great group of French tale-tellers ranging from Antoine de la Salle to Béroalde de Verville. Light love, the misfortunes of husbands, the cunning of wives, the breach of their vows by ecclesiastics, constitute the staple of their subject. In some respects La Fontaine is the best of such tale-tellers, while he is certainly the latest who deserves such excuse as may be claimed by a writer who does not choose indecent subjects from a deliberate knowledge that they are considered indecent and with a deliberate desire to pander to a vicious taste. No one who followed him in the style can claim this excuse ; he can, and the way in which contemporaries of stainless virtue such as Madame de Sévigné speak of his work shows that though the new public opinion was growing up it was not finally accepted. In the Contes La Fontaine for the most part attempts little originality of theme. He takes his stories (varying them it is true in detail not a little) from Boccaecio, from Marguerite, from the Cent Nowvelles Nowvelles, &e. He applies to them his marvellous power of easy sparkling narration, and his hardly less marvellous faculty of saying more or less outragcous things in the most polite and

gentlemanly manner. These Contes have indeed certain drawbacks. They are not penetrated by the half pagan ardour for physical beauty and the delights of seuse which animates and excnscs the early Italian Renaissance. They have not the subtle mixture of passion and sensuality, of poetry and appetite, which distinguishes the work of Marguerite and of the Pléiade. They are emphatically contes pour rire, a genuine expression of the esprit gaulozs of the fabliau writers and of Rabelais, destitute of the grossness of envelope which had formerly covered that spirit. A comparison of ‘‘La Fianeée du Roi de Garbe ” with its original in Boccaccio (especially if the reader takes M. Emile Montégut’s admirable essay as a commentary) will illustrate better than anything else what they have and what they have not. Some writers have pleaded hard for the admission of actual passion of the poetical sort in such picces as ‘‘ La Courtisane Amioureuse,” but as a whole it must be admitted to be absent.

The Fables, with hardly less animation and narrative art than the Contes, are free from disadvantages (according to modern notions) of subject, and exhibit the versatility and fecundity of the author’s talent perhaps even more fully. La Fontaine had of course many predecessors in the fable and especially in the beast fable. In his first issue, comprising what are now called the first six books, he adhered to the path of these predecessors with some closeness; but in the later collections he allowed himself far more liberty, and it is in these parts that his genius is most fully manifested. The boldness of the politics is as much to be considered as the ingenuity of the moralizing, as the intimate knowledge of human nature dis- played in the substance of the narratives, or as the artistic mastery shown in their form. It has sometimes been objected that the view of human character which La Fontaine expresses is unduly dark, and resembles too much that of La Rochefoucauld, for whom the poet had certainly a profound admiration. The discussion of this point would lead us too far here. It may only be said that satire (and La Fontaine is eminently a satirist) necessarily concerns itself with the dark rather more than with the lighter shades, Indeed the objection has become pretty nearly obsolete with the obsolescence of what may be called the sentimental-ethical school of criticism. Its last overt expression was made some thirty

years ago, 1n a curious outburst of Lamartine's, excellently answered by Sainte-Beuve. Exception has also been taken to the Fables on more purely literary grounds by Lessing, but, as this exception depends on differences inevitable between those who would shape all literature on miles derived from the study of Greek models and those who with the highest respect for those models rank them only among and not above others, it is equally needless to enter into it. Perhaps the best criticism ever passed upon La Fon- taine's Fubles is that of Silvestre de Sacy, to the effect that they supply three several delights to three several ages: the child re- Joices in the freshness and vividness of the story, the eager studeut of literature in the consummate art with which it is told, the ex- perieneed man of the world in the subtle reflexions on character and life which it conveys. Nor has any one, with the exception of a few paradoxers like Rousseau anda few sentimentalists like Lamartine, denied that the moral tone of the whole is as fresh and healthy as its literary interest is vivid. The book has therefore naturally become the standard reading book of French both at home and abroad, a position which it shares in verse with the Télémaque of Fénelon in prose. It is no small testimony to its merit that not even this use or misuse has interfered with its popu- larity among French men of letters, who, with hardly an exception,

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speak as affectionately of it as if they had never been kept in on a suinmer's day to learn La Cigale et la Fourmt.

The general literary character of La Fontaine is, with allowance made for the difference of subject, visible equally in the Fables and in the Contes, and it is necessary to say a few words as to the nature of this character. Perhaps one of the hardest sayings in Freneh literature for an English student is the dictum of Joubert to the effect that ''Ily a dans La Fontaine une plénitude de poésie qu'on ne trouve nulle part dans les autres anteurs Frangais." Most English critics would probably admit at onee La Fontaine's claim to a position in the first class of writers, but would demur to his admission to the first class of poets. The difference arises from the ambiguity of the terms. In

Jonbert’stime, and perhapsa good deal later, inventiveness of fancy and diligent observation of the rules of art were held to complete the poetical differentia, and in both these La Fontaine deserves if not the first almost the first place among French poets. As to the first point there is hardly any dispute ; few writers either in French or any other language have ever cqualled him in this respect. In his hands the oldest story becomes novel, the most haekneyed moral piquant, the most commonplace details fresh and appropriate. As to the second point there has not been such unanimous agreement. It used to be considered that La Fon- taine’s ceaseless diversity of metre, his archaisms, his licences in rhyme and orthography, were merely ingenious devices for the sake of easy writing, intended to evade the trammels of the stately coup- let and rimes difficiles enjoined by Boileau. Lamartine in the attack already mentioned affects contempt of the ‘‘ vers boiteux, disloqués, inégaux, sans symmétrie ni dans Jl’oreille ni sur la page.” This opinion may be said to have becn finally exploded by the most accurate metrical critic and one of the most skilful metri- cal practitioners that France has ever had, M. Théodore de Banville; and it is only surprising that it should ever have been entertained by any professional maker of verse. There can be little doubt that La Fontaine saw the drawbacks of the ‘‘ Alexandrine prison,” as it has been called, but in freeing himself from it he by no means took refuge in merely pedestrian verse. His irregularities are strictly regulated, his cadences carefully arranged, and the whole effect may be said to be (though of course in a light and tripping measure in- stead of a stately one) similar to that of the stanzas of the English pindaric ode in the hands of Dryden or Collins. There is there- fore nothing against La Fontaine on the score of invention and nothing on the score of art. Butsomething more, atleast according to English standards, is wanted to = up a ‘‘plenitude of poesy,” and this something more La Fontaine seldom or never exhibits. In words used by Joubert himself elsewhere, he never “transports.” The faculty of transporting is of course possessed and used in very different manners by different poets. In some it takes the form of passion, in some of half mystical enthusiasm for nature, in some of commanding eloquence, in sone of moral fervour. La Fontaine has none of these things: he is always ainusing, always sensible, always clever, sometimes even affecting, but at the same time always

more or less prosaic, were it not for his admirable ver- sification. The few passages which may be cited to the contrary are doubtfully admissible, and cannot in any case suffice to leaven so great a mass of other work. Itis needless to say that thisis no dis- credit to him. A man can but be the very best in his own special line, and that very best La Fontaine assuredly is. He is not a great poet, and a deficieney very similar to that which deprives him of this name deprives him of the name of a great humorist ; but he is the most admirable teller of light tales in verse that has ever existed in any time or country ; and he has established in his verse-tale a model which is never likely to be surpassed, and which has enriched literature with much delightful work.

La Fontaine did not during his life issue any complete edition of his works, nor even of the two greatest and most important divisions of them. The most remarkable of his separate publications have already been noticed. Others were the Poéme de la Captivité de St Male (1673), one of the pieces inspired by the Port-Royalists, the Potme du Quinquina (1602), a piece of task work also, though of a very different kind, anda number of pieces published either in small pamphlets or with the works of other men. Among the latter may be singled out the pieces published by the poet with the works of his friend Mancroix (1685). The year after his death some post- humous works appeared, and some years after his son’s death the scattered poems, letters, &c., with the addition of some unpublished work bonght from the family in manuscript, were carefully edited and published as G@uvres Diverses (1729). During the 18th cen- tury two of the most magnificent illustrated editions ever published of any poet reproduced the two chief works of La Fontaine. The Fables were illustrated by Ondry (1755-59), the Contes by Eisen (1762). This latter under the title of ‘‘ Edition des Fermiers- Généraux” fetches a high price. During the first thirty years of the present century Walckenaer, a great student of French 17th cen- tury classics, published for the house of Didot three successive editions of La Fontaine, the last (1826-27) being perhaps entitled to the rank of the standard cdition. More recently the editions of M. Marty-Laveaux in the Bibliotheque Elzévirenne, A. Panly in the

Collection des Classiques Francaises of M. Lemerre, and L. Moland in that of M. Garnier supply in different forms all that ean be wished. The second is the handsomest, the third, which is complete, perhaps the most generally useful. Editions, sclections, transla- tions, &c., of the Fables, especially for school use, are innumerable ; but an illustrated edition published by the Librairie des Bibliophiles (1874) deserves to be mentioned as not unworthy of its 18th cen- tury predecessors. (G. SA.)

LAFOSSE, Cuarues pt, (1640-1716), Frencli painter, was one of the most noted and least servile pupils of Lebrun, under whose direction he shared in the chief of the great decorative works undertaken in the reign of Louis XIV. He was born at Paris in 1640, and left France for Italy in 1662. He then spent two years in Rome and three in Venice, and the influence of his prolonged studies of Veronese is évident in his Finding of Moses (Louvre), and in his Rape of Proserpine (Louvre), which he presented to the Academy as his diploma picture in 1673. He was at once named assistant professor, and in 1674 the full responsibilities of the office devolved on him, but his engagements did not prevent his accepting in 1689 the invitation of Lord Montagu to decorate Montagu House, He visited London twice, reniaining on the second occasion—together with Rousseau and Monnoyer—more than two years. William III. vainly strove to detain him in England by the pro- posal that he should decorate Hampton Court, for Lebrun was dead, and Mansart pressed Lafosse to return to Paris to take in hand the cupola of the Invalides. The decora- tions of Montagu House are destroyed, those of Versailles are restored, and the dome of the Invalides (engraved, Picart and Cochin)—for to his vexation the rest of the surface fell into other hands—is now the only work existing which gives a full measure of his talent. During his latter years Lafosse executed many other important decorations in public buildings and private houses, notably in that of Crozat, under whose roof he died on 13th December 1716.

LAGO MAGGIORE. See Maceiors.

LAGOS, a town in the district of Faro, which is coexten- sive with the province of Algarve, in Portugal, is situated on the south coast of the kingdom, on a bay which forms its harbour. The town is fairly well built; but beyond one or two churches, the batteries that defend the port, and an aqueduct 800 yards long, it has no special features of interest. It holds the formal rank of city, and enjoys a respectable historical position from its connexion with Prince Henry the Navigator, whose caravels generally sailed from its harbour. ‘The material prosperity of the town was injured by an earthquake that laid it in ruins in 1755. The inhabitants are engaged in the tunny fishery and in vine raising. The population in 1878 was 7881. Lagos is held to be situated on or near the site of the Roman colony Lacobriga.

LAGOS, a British settlement on the west coast of Africa, united since 1876 with the Gold Coast colony, and by the terms of the charter comprising all British possessions between the second and fifth degrees of east longitude. The actual settlement is situated ona low island within the mouth of the so-called Lagos river, which is really a lagoon of considerable extent, into which the Ogun and several other rivers discharge. The seaward entrance is about 3 miles wide, but it requires skilful pilotage to take a vessel across the bar into the smooth and deep water. Lagos was formerly the chief seat of the slave trade in the Bight of Benin. In 1851 it was captured by the British, and in 1861 the “king” Docemo was practically constrained to give up his territorial jurisdiction, and accept a pension of 1200 bags of cowries, or about £1030. There is now a flourishing settlement. The mangrove swamp has been cleared away from a large part of the island ; a well-kept road runs for a mile along the shore in front of the European quarter ; wooden wharves have been built; marshy spots

have been turned into gardens, aud among the houses are a number of bright stucco-fronted villas.

Immediately after the proclamation of the British anncxation, c steady current of immigration from the mainland set in, and ir 1871 the population of Lagos proper was 13,520 males and 14,998 females.

Within the Lagos district are Badagry (1148 males, 1343 females), Palma (814), and Leke (165), making a total for the settle- ment of 31,998. Besides the local tribes the population contains Sierra-Leonians, Krumen, and Fanti, as well as from 4000 to 6000 Brazilian emaneipados. The trade of Lagos consists mainly in the exportation of palm oil and palm kernels, and the importation of liquors, tobacco, and cotton goods. Most of the business is in the hands of German and French houses. The average value of imports for 1875-1879 was £512,857, and of exports £620,644. In 1879 the Church of England had 13 churches in the settlement, the Wesleyans 7, the Roman Catholics (who are largely recruited by the Brazilian immigrants) 2, and the Baptists 1. The schools num- bered 28, several being subsidized by the Government. The 8000 Mohammedans have 27 mosques and about 37 small Koran schools. During the five years from 1875 to 1879 the aggregate revenue of the settlement was £253,445, the aggregate expenditure £227,523.

LAGRANGE, JosrpH Louis (1736-1813), a mathie- matician of the highest rank, was born at Turin, January 25, 1736. He was of French extraction, his great grand- father, a cavalry captain, having passed from the service of France to that of Sardinia, and settled in Turin under Emmanuel II. His father, Joseph Louis Lagrange, married Maria Theresa Gros, only daughter of a rich physician at Cambiano, and had by her eleven children, of whom only the eldest (the subject of this notice) and the youngest survived infancy. From his post as treasurer at war, as well as through his wife, he derived ample means, whicli he, however, lost by rash speculations, a circumstance regarded by his son as the prelude to his own good fortune ; for had he been rich, he used to say, he might never have known mathematics.

The genius of Lagrange did not at once take its true bent. His earliest tastes were literary rather than scientific, and he learned the rudiments of geometry during his first year at the college of Turin, without difficulty, but without distinction. The perusal of a tract by Halley (Phil. Trans., vol. xviii. p. 960) roused his enthusiasm for the analytical method, of which he was destined to develop the utmost capabilities. He now entered, without aid or guidance save those afforded by lis

own unerring tact and vivid apprehension, upon a course of study which, in two years, placed him on a level with the greatest of his contemporaries. At the age of nineteen he communicated to the celebrated Euler his idea of a general method of dealing with "'isoperimetrical" problems, known later as the Calculus of Variations. It was eagerly welcomed by the Berlin mathematician, who had the generosity to with- hold from publication his own further researches on the subject, until his youthful correspondent should have had time to complete and opportunity to claim the invention. This prosperous opening gave the key-note to Lagrange's career. Appointed, in 1754, professor of geometry in the royal school of artillery, he formed with some of his pupils—for the most part his seniors—friendships based on community of scientific ardour. With the aid of the Marquis de Saluces and the enlinent anatomist Cigna, he founded in 1758 a society which rose later to the dignity of the Turin Academy of Sciences. The first volume of its memoirs, published in the following year, contained a paper by Lagrange entitled [Recherches sur la nature et la propagation du son, in which the power of his analysis and his address in its application were equally conspicuous. Without assumption, but without hesitation, he made his first appearance in public as the critic of Newton, and the arbiter between D'Alembert and Euler. By considering only the particles of air found in a right line, he reduced the problem of the propagation of sound to the solution of the same partial differential equations that include the

motions of vibrating strings, and demonstrated the insuffi- ciency of the methods employed by both his great contem- poraries in dealing with the latter subject. He further treated in a masterly manner of echoes and the mixture of sounds, and explained the phenomenon of grave harmonics as due to the occurrence of beats so rapid as to generate a musical note. This was followed, in the second volume of the Miscellanea Taurinensia (1762) by his " Essai d'une nouvelle méthode pour déterminer les maxima et les minima des formules intégrales indéfinies," together with the application of this important development of analysis to the solution of several dynamical problems,

as well as to the demonstration of the mechanical principle of “least action.” The essential point in his advance on Euler’s mode of investigating curves of maximum or minimum consisted in his pnrely analytical conception of the subject. He not only freed it from all trammels of geometrical construction, but by the introduction of the symbol 5 gave it the efficacy of a new calculus. He is thus justly regarded as the inventor of the “method of variations ”— a name supplied by Euler in 1766.

By these performances Lagrange found himself, at the age of twenty-six, on the summit of European fame. But such a height had not been reached without cost. Intense application during early youth had checked his growth, and weakened a constitution never robust. Accesses of feverish exaltation culminated, in the spring of 1761, in an attack of bilious hypochondria, which permanently lowered the tone of his nervous system, and rendered him liable, throughout his life, to recurrences of the same complaint at the same time of year. Rest and exercise, however, temporarily restored his health, and he gave proof of the undiminished vigour of his powers by carrying off, in 1764, the prize offered by the Paris Academy of Sciences for the best essay on the libration of the moon. His treatise was remarkable, not only as offering a satis- factory explanation of the coincidence between the lunar periods of rotation and revolution, but as containing the first employment of his radical formula of mechanics, obtained by combining with the principle of D’Alembert that of virtual velocities. His success encouraged the Academy to propose, in 1766, as a theme for competition, the hitherto unattempted theory of the Jovian system. The prizo was again awarded to Lagrange; and he subsequently earned the same distinction with essays on the problem of three bodies in 1772, on the secular equation of the moon in 1774, and in 1778 on the theory of cometary perturba- tions.

He had in the meantime gratified a long felt desire by a visit to Paris, where he enjoyed the keen and stimulating delight of conversing with such mathematicians as Clairaut, D’Alembert, Condorcet, and the Abbé Marie. An attack of illness frustrated his design of extending his journey to London, and he returned, though not for long, to the

comparative isolation of the Piedmontese capital The post of director of the mathematical department of the Berlin Academy (of which he had been a member since 1759) becoming vacant by the removal of Euler to St Petersburg, both he and D'Alembert united, by unpremeditated concert, to recommend Lagrange as his successor. Euler's eulogium was enhanced by his desire to quit Berlin D'Alembert's by his dread of a royal command to repair thither ; and the result was that an invitation, conveying the wish of the ''greatest king in Europe" to have the "oreatest mathematician" at his court, was sent to Turin. On November 6, 1766, Lagrange was installed in his new position, with a salary of 6000 francs, ample leisure for scientific research, and an amount of royal favour sufficient to secure him respect without exciting envy. The national jealousy of foreigners, it is true, was at first a source of

annoyance to him; but such prejudices were gradually disarmed by the mild inoffensiveness of his demeanour, and by his strict adherence to a policy of non-intervention outside his own immediate domain. We are told that the universal example of his colleagnes, rather than any desire for female society, impelled him to matrimony ; an excess of homesickness, however, probably directed lis choice towards a lady of the Conti family (related to his own by a previous alliance), who, by his request, joined him at Berlin. The experiment was cut short by a lingering illness, during which he devoted all his time, and a considerable store of medical knowledge, to the care of the dying woman.

The long series of memoirs—some of them complete treatises of great moment in the history of science— communicated by Lagrange tothe Berlin Academy between the years 1767 and 1787 were not the only fruits of his exile on the banks of the Spree. His Alécanique Analytique, the production in which his genius most fully and characteristically displayed itself, was due to the same period. This great work was the perfect realization of a design present to the-mind of its author almost from boy- hood, and of which he had given a clear though concise sketch in his first published essay.1 Its scope may be

briefly described as the reduction of the theory of mechanics to certain general formule, from the simple development of which should be derived the equations necessary for the solution of each separate problem.? From the fundamental principle of virtual velocities, which thus acquired a new significance, Lagrange deduced, with the aid of the calculus of variations, the whole system of mechanical truths, by processes so elegant, lucid, and harmonious as to constitute, in Sir William Hamilton's words, "a kind of scientific poem." This unification of method was one of matter also. By his mode of régarding a liquid as a material system characterized by the unshackled mobility of its minutest parts, the separation between the mechanics of matter in different forms of aggregation finally disappeared, and the fundamental equation of forces was for the first time extended to hydrostatics and hydrodynamics? Thus a universal science of matter and motion was derived, by an unbroken sequence of deduction, from one radical principle ; and analytical mechanics assumed the clear and complete form of logical perfection which it now wears.

A publisher having with some difficulty been found, the book appeared in Paris, under the supervision of Legendre, in 1788. But before that time Lagrange himself was on the spot. After the death of Frederick the Great, his presence was competed for by the courts of France, Spain, and Naples, and a residence in Berlin having ceased to possess any attraction for him, he removed to Paris in 1787. His reception was most flattering. Marie Antoinette warmly patronized him. He was lodged in the Louvre, received the grant of an income equal to that hitherto enjoyed by him, and, with the title of " veteran pensioner " in lieu of that of "foreign associate " (conferred in 1772), the right of voting at the deliberations of the Academy. In the midst of these distinctions, a profound inelancholy seized upon him. His mathematical enthu- siasm, hitherto the happiness of his life, was for the time completely quenched, and during two years the printed volume of his Jfécanique, which he had seen only in manuseript, lay unopened beside him. He relieved his dejection with miscellaneous studies, especially with that of chemistry, which, in the new form given to it by Lavoisier, he found "ais¢ée comme Valgébre." The dis-
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1 Gwvres, i, p. 15. 2 Méc. An., Advertisement to Ist ed.

3 Dithring, Kritische Gesch. der Mechanik, pp. 220, 367; Lagrange, Méc, An., i. pp. 166-72, 3d ed.

astrous crisis of the Revolution roused him once more to |

activity and cheerfulness. Curiosity impelled him to remain and watch the progress of such a novel pheno- menon; but curiosity was changed into dismay as the terrific character of the phenomenon unfolded itself. He now bitterly regretted his temerity in braving the danger. “Tuy las voulu ” he would repeat self-reproachfully. Even from revolutionary tribunals, however, the name of Lagrange uniformly commanded respect. His pension was continued by the National Assembly, and he was partially indemnified for the depreciation of the currency by remunerative appointments. Nominated president of the Academical commission for the reform of weights and measures, his services were retained when its “ purification ” by the Jacobins removed his most distinguished colleagues. He again sat on the commission of 1799 for the actual construction of the metrical system, and by his zealous advocacy of the decimal principle of subdivision largely contributed to its adoption.

The interval had, however, been marked by some of the most considerable events in the placid life of our mathema- tician. On the 3lst of May 1792 he married Mademoiselle Lemonnier, daughter of the astronomer of that name, a young and beautiful girl, whose devotion ignored disparity of years, and formed the one tie with life which Lagrange found it hard to break. He had no children by either marriage, and never regretted their absence. Although specially exempted from the operation of the decree of October 1793, imposing banishment on foreign residents, he took alarm at the fate of Bailly and Lavoisier, and pre- pared to resume his former situation in Berlin. His design was frustrated by the establishment of and his official connexion with the Ecole Normale, and’ then the Ecole Polytechnique. The former institution had an ephemeral existence, and his lectures

there were consequently few and elementary ; but amongst the benefits derived from the foundation of the Ecole Polytechnique one of the greatest, it has been observed,! was the restoration of Lagrange to mathematics. The remembrance of his teachings was long treasured by such of his auditors—amongst whom were Delambre and Lacroix—as were capable of appreciating them. In expounding the principles of the differential calculus, he started, as it were, from the level of his pupils, and ascended with them by almost insensible gradations from elementary to abstruse conceptions, He seemed, not a professor amongst students, but a learner amongst learners; pauses for thought alternated with luminous exposition ; invention accompanied demonstra- tion; and thus originated his 7héorde des fonctions analy- tugues (Paris, 1797), The leading idea of this remarkable work was contained in a paper published in the Berlin AMemours for 1772.2 Its object was the elimination of the to some minds unsatisfactory conception of the infinite from the metaphysics of the higher mathematics, and the substitution for the differential and integral calculus of an analogous method depending wholly on the serial develop- ment of algebraical functions. By means of this “calculus of derived functions” Lagrange hoped to give to the solu- tion of all analytical problems the utmost “rigour of the demonstrations of the ancients” ;3 but it cannot be said that the attempt was successful. The validity of his funda- mental position was impaired by the absence of a well- constituted theory of series; the notation employed was Inconvenient, and was abandoned by its inventor in the second edition of his Mécanique; while his scruples as to the admission into analytical investigations of the idea of imits or vanishing ratios have long since been laid aside as idle. Nowhere, however, were the keenness and clear-

1 Notice by Delambre, Zuvres de Lagrange, i. p. xiii.

- Huvres, iii, p. 441. 3 Théorie des Fonctions, p. 6.

ness of his intellect more conspicuous than in this brilliant effort, which, if it failed in its immediate object, was highly effective in

secondary results. His purely abstract mode of regarding functions, apart from any mechanical or geometrical considerations, led the way to a new and sharply characterized development of the higher analysis in the hands of Cauchy, Jacobi, and others. The Vhéorce des fonctions is divided into three parts, of which the first explains the general doctrine of functions, the second deals with its application to geometry, and the third with its bearings on mechanics.

On the establishment of the Institute, Lagrange was placed at the head of the section of geometry ; he was one of the first members of the Bureau des Longitudes; and his name appeared in 1791 on the list of foreign members of the Royal Society. On the annexation of Piedmont to France in 1796, a touching compliment was paid to him in the person of his aged father. By direction of Talleyrand, then minister for foreign affairs, the French commissary repaired in state to the old man's residence in Turin, to congratulate him on the merits of his son, whom they declared "to have done honour to mankind by his genius, and whom Piedmont was proud to have produced, and France to possess." Bonaparte, who styled him "la haute pyramide des sciences mathématiques," loaded him with personal favours and official distinctions. He became a senator, a count of the empire, a grand officer of the legion of honour, and just before his death received the grand cross of the order of reunion.

The preparation of a new edition of his Afécanique, to which he devoted himself with extraordinary zeal, exhausted his already failing powers. Frequent fainting fits gave presage of a speedy end, and on the 8th of April 1813 he had a final interview with his friends Lacépéde, Monge, and Chaptal. He spoke with the utmost calm of his approaching death ; ''c'est une derniére fonction," he said, "qui n'est ni pénible ni désagréable." He, however, looked forward to a future meeting, when he promised to complete the autobiographical details which weakness obliged him ;to interrupt. They remained untold, for he died two days later, April 10, at the age of seventy-seven, and was buried in the Pantheon, the funeral oration being pronounced by Laplace and Lacépéde.

Lagrange would never allow his portrait to be painted, holding that a man's works, not his features, deserve remembrance. From a sketch, however, obtained by stealth at a meeting of the Institute, coupled with the descriptions of those who knew him, we can, in some sort, construct an image of his mild and venerable aspect. He was of the middle height, with a slight, well-proportioned figure. His head was finely formed, though not massive ; his features strongly marked, with a stamp of grave and noble beauty; eyes ashy blue, habitually cast down in meditation, but when raised, clear and penetrating ; complexion pale and faded. The whole physiognomy was more expressive of benignity than of strength, and his social attitude was one of deprecation rather than of self. assertion. He was timid and affable in conversation, slow to give his opinion, though frequently betraying, by his remarks even on subjects alien to his habitual studies, unexpected stores of information and depths of thought. The phrase "Je ne sais pas" became habitual with him, serving to express his sense of failure in the search for words to fit accurately with ideas always precise. Of music he used to say "Je l'aime, parce qu'elle m' isole " ; and his most abstruse reasonings were frequently pursued under its soothing influence. The sight of suffering was intolerable to him; he abhorred controversy, tolerated—

4 Suter, Geschichte der math. Wiss., ii. pp. 2295238 ' XIV. — 27

perhaps unduly—what he could not approve, aud was emphatically, in his own phrase, " philosophe sans crier." The delicacy of his health demanded precautions ex- aggerated, under the influence of nervous anxiety, into minute watchfulness. He observed a scrupulous regimen, living mainly on fruit and vegetables, and his temperance doubtless helped to keep his faculties unimpaired to the last. By self-imposed rules of study, he regulated his vast

capability of work as strictly as if it had been a machine entrusted to his care. It was one of his maxims that the mind gains full command over its powers only by exercise and discipline. He had learned from Frederick the Great always to do the same things at the same hours,

assigning the most difficult tothe morning. Each day he set himself a task for the next, and from the first aimed at mastering certain points of his subject, with a view to inventing improvements. He always read with a pen in his hand, developing the methods of his author as he proceeded; and his own works were so profoundly meditated that they

were usually written without erasures. Amongst the brilliant group of mathematicians whose magnani- mous rivalry contributed to accomplish the task of generalization and deduction reserved for the 18th century Lagrange occupies aul eminent place. It is, however, by no means easy to distinguish and apportion the respective merits of the competitors. This is especially the case between Lagrange and Eulcr on the one side, and between Lagrange and Laplace on the other. The calculus of varia- tions lay undeveloped in Euler's mode of treating isoperimetrical problems. The fruitful method, again, of the variation of elements was introduced by Euler, but adopted and perfected by Lagrange, who first recognized its supreme importance to the analytical investigation of the planetary movements. Finally, of the grand series of researches by which the stability of the solar system was ascertained the glory must be almost equally divided between Lagrange and Laplace. In analytical invention, and mastery over the ealculus, the Turin mathematician was admittedly unrivalled. Laplace owned that he had despaired of effecting the integration of the differential equations relative to secular inequalities until Lagrange showed him the way. On the other hand, Laplace unquestionably surpassed his rival in practical sagacity, and the intuition of physical truth. Lagrange saw in the problems of nature so many occasions for analytical triumphs; Laplace regarded analytical triumphs as the means of solving the problems of nature. One mind seemed, as it were, the complement of the other; and both united in honourable rivalry formed an instrument of unexampled perfection for the investigation of the celestial machinery. What may be called Lagrange's first period of research into planetary perturbations extended from 1774 to 1784 (scc AsTRONOMY, vol. ii. p. 761). The remarkable group of treatises communicated, 1781-84, to the Berlin Academy was designed, but did not prove, to be his final contribution to the theory of the planets. After an interval of twenty-four years the subject, having been reopened by

Poisson in a paper read June 20, 1808, was once more attacked by Lagrange with all his pristine vigour and fertility of invention. Resuming the inquiry into the invariability of mean motions, Poisson carried the approximation, with Lagrange's formule, as far as the squares of the disturbing forces, hitherto neglected, with the same result as to the stability of the system. He had not, however, attempted to include in his calculations the orbital variations of the disturbing bodies; but Lagrange, by the happy artifice of transferring the origin of coordinates from the eentre of the sun to the centre of gravity of the sun and planets, obtained a simplification of the formule, by which the same analysis was rendered equally applicable to each of the planets severally. It deserves to be recorded as one of the numerous coincidences of discovery that Laplace, on being made acquainted by Lagrange with his new method, produced analogous expressions, to which his independent rescarches had led him. The final achieve- ment of Lagrange in this direction was the extension of the method of the variation of arbitrary constants, successfully used by him in the investigation of pcriodical as well as of secular inequalities, to any system whatever of mutually interacting bodies.1 "Not without astonishment," even to himself, regard being had to the great generality of the differential equations, he reached a result so wide as to include, asa particular case, the solution of the planetary problem recently obtained by him.- He proposed to apply the same principles to the calculation of the disturbances produced in the rotation of the planets by external action on their equatorial pro- tuberances, but was anticipated by Poisson, who gave formule for the variation of the elements of rotation strictly corresponding with those found by Lagrange for the variation of the elements of revolu-

1 Guvres, vi. p. 771.

tion. The revision of the Afécanique Analytique was undertaken mainly for the purpose of embodying in it these new methods and final results, but was interrupted, when two-thirds completed, by the death of its author.

In the advancement of almost every branch of pure mathematics Lagrange took a conspicuous part. The calculus of variations is indissolubly associated with his name. In the theory of numbers he furnished solutions of many of Fermat's theorems, and added gome of his own. In algebra he discoveréd the method of approxi- mating to the real roots of an equation by means of continued frac- tions, and imagined a general process of solving algcbraical equations of every degrec. 'The method indecd fails for equations of an order above the fourth, because it then involves the solution of an eqna- tion of higher dimensions than the proposed. _It possesses, however, the great and characteristic merit of gencralizing the solutions of his predecessors, exhibiting them all as modifications of one prin- ciple. To Lagrange, perhaps more than to any other, the theory of differential equations is indebted for its position as a science, rather than a collection of ingenious artifices for the solution of particular problems. To the calculus of finite differences he contributed the beautiful formula of interpolation which bears his name ; although substantially the same result seemed to have been previously obtained by Euler. But it was in the application to mechanical questions of the instrument which he thus helped to form that his singular merit lay. It was his just boast to have transformed mechanics (defined by him asa '' geometry of four dimensions') into a branch of analysis, and to have exhibited the so-called mechanical '' principles" as simple results of the calculus. 'The method of ''gencralized coordinates," as it is now called,? by which he attained this result, is the most brilliant achievement of the analytical method. – Instead of following the motion of each indi- vidual part of a material system, he showed that, if we determine its configuration by a sufficient number of variables, whose number is that of the degrees of freedom to move (there being as many equations as the system has degrees of freedom), the kinetic and potential energies of the system can be expressed in terms of these, and the differential equations of motion thence deduced by simple differentiation. Besides this most important contribution to the gencral fabrie of dynamical sciencc, we owe to Lagrange several minor theorems of great elegance—among which may be mentioned his theorem that the kinetic energy imparted by given impulses to a material system under given constraints isa maximum. To this entire branch of knowledge, in short, he

successfully imparted that character of generality and completeness towards which his labours invariably tended.

His share in the gigantie task of verifying the Newtonian theory would alone suffice to immortalize his name, His co-operation was indeed inore indispensable than at first sight appears. Much as was done by him, what was done through him was still more import- ant. Some of his brilliant rival's most conspicuous discoveries were implicitly contained in his writings, and wanted but one step for completion. But that one step, from the abstract to the concrete, was precisely that which the character of Lagrange's mind indis- posed him to make. As notable instances may be mentioned Laplace's discoveries relating to the velocity of sound and the secular acceleration of the moon, both of which were led close up to by Lagrange's analytical demonstrations. In the Berlin Afemoirs for 1778 and 1783 Lagrange gave the first direct and theoreti- cally perfect method of determining cometary orbits. It has not indeed proved practically available; but his system of calcu- lating cometary perturbations by means of ''imechanical quadra- tures" has formed the starting-point of all subsequent researclics on the subject. His determination? of maximum and minimum valucs for the slowly varying planetary eccentricities was the earliest attempt to deal with the problem. Without a more accurate knowledge of the masses of the planets than was then possessed a satisfactory solution was indeed impossible; but the upper limits assigned by him agreed closely with those obtained later by Leverrier.4 As a mathematical writer Lagrange has per- haps never been surpassed. His treatises are not only storehouses of ingenious methods, but models of symmetrical form. The clear- ness, elegance, and originality of his mode of presentation give lucidity to what is obscure, novelty to what is familiar, and sim- plicity to what is abstruse. His genius was one of generalization and abstraction ; and the aspirations of the time towards unity ani perfection received, by his serene labours, an embodiment denied to them in the troubled world of politics.

Lagrange's numerous scattered memoirs have been collected and published in seven handsome 4to volumes, under the title @uvres de Lagrange, publiées sous les soins de M. J. A. Serret, Paris, 1867-77.

The first, second, and third sections of this important publication comprise respectively the papers communicated by him to the Academies of Sciences of Turin, Berlin, and Paris; the fourth includes his miscellaneous contributions to other scientific collections, together

with his additions to Euler's Algebra, and his Legons Elémentaires at the Ecole Normale in 1795. Delambre's notice of his life, extracted from the Afém. de

2 We use the modern terms by which the functions introduced by Lagrange are now denoted. 3 Hurres, v. p. 211 £9. * Grant, History of Physical Astronomy, p. 117.

Institut, 1812, is prefixed to the first volume. Besides the separate works already named are [ésolution des Equations Numériques, 1798 (2d ed. 1808, 3a ed. 1826), and Legons sur le Calcul des Fonctions, 1805 (2d ed. 1806), designed as a commentary and supplement to the first part of the Théorie des Fonctions. The first volume of the enlarged edition of the Mécanique appeared in 1811, the second, of which the revision was completed by MM. Prony and Binet, in 1815. A third edition, in 2 vols. 4to, was issued in 1853-55, and a second of the Théorie des Fonctions in 1813. See also Virey and Potel, Precis Historique, 1813; Thomson's Annals of Philosophy, 1818-20, vols. ii, and iv.; Suter, Geschichte der Math. Wiss.. 1873; Diihring, Aritische Gesch. der allgemeinen Princtpien der Mechanik, 1877 (2d ed.); Gantier, Essai Historique sur le Probleme des trois Corps, 1817; Grant, Mistory of Physical Astronomy, &c. (AG MSC.)

LAGRENEE, Lovis Jean Francois (1724-1805), French painter, was a pupil of Carle Vanloo. Born at Paris 30th December 1724, in 1755 he became a member of the Academy, presenting as his diploma picture the Rape of Deianira (Louvre). He visited St Petersburg at the call of the empress Elizabeth, and on his return was named in 1781 director of the French Academy at Rome ; he there painted the Indian Widow, one

of his best-known works. His pictures, which have nearly all been engraved, are frequently to be met with out of France. In 1804 Napoleon conferred on him the cross of the legion of honour, and on 19th June 1805 he died in the Louvre, of which he was honorary keeper.

LAHIRE, Laurent ve (1606-1656), French painter, was born at Paris on 27th February 1606. He became a pupil of Lallemand, studied the works of Primaticcio at Fontainebleau, but never visited Italy, and belongs wholly to that transition period which preceded the school of Simon Vouet. His picture of Nicolas V. opening the crypt in which he discovers the corpse of St Francis of Assisi standing (Louvre) was executed in 1630 for the Capuchins of the Marais ; it shows a gravity and sobriety of character which marked Lahire's best work, and seems not to have been without influence on Le Sueur. The Louvre contains eight other works, and paintings by Lahire may also be found in the museums of Strasburg, Rouen and Mans. His drawings, of which the British Museum possesses a fine example, Presentation of the Virgin in the Temple, are treated as seriously as his paintings, and sometimes show simplicity and dignity of effect. The example of the Capuchins, for whom he executed several other works in Paris, Rouen, and Fécamp, was followed by the goldsmiths' company, for whom he produced in 1635 St Peter healing the Sick (Louvre) and the Conversion of St Paul in 1637. In 1646 he shared with eleven other artists the honour of founding the French Royal Academy of Painting and Sculpture. Richelieu called Lahire to the Palais Royal ; Chancellor Séguier, Tallemant de Réaux, and many others entrusted him with important works of decoration ; for the Gobelins he designed a series of large compositions. Lahire painted also a great number of portraits, and in 1654 united in one work for the town-hall of Paris those of the principal dignitaries of the municipality. Two years later, 28th December 1656, he died. His works have been frequently engraved by his own pupil Chauveau, and by Lasne, Boulanger, De la Court, Rousselet, and Faithorne.

LAHORE, or Lanodr, capital of the Punjab, India, gives its name to a civil division of the British territory in that province, and to the

headquarters district of the division.

LanoreE Diviston.—This division, the most central of the ten into which British Panjéb is divided, is fourth in order of size, 8961 square miles, and fifth in respect of population, 1,889,495 (by the census of 1868), averaging 211 to the square mile. The Lahore division has three districts—Lahore, Firézptr, Gujranwala. The whole area is alluvial plain, for the most part devoid of trees, except such as have been planted since British occupation. It is intersected by the rivers Ravi and Sutlej, and the Bari Doab canal drawn from the Ravi at the foot of the hills; also by the old bed of the Bids river deserted about the

middle of last century. The Chenab river is the boundary on the north-west, between the Lahore and the Rawal Pindi divisions. Of the towns in the division there are five which have over 10,000 inhabitants, namely, Lahore, Kastir, Gujranwala, Wazirdbad, Firézpir. The common language of the rural population and of artisans is Punjabi. Urdu (Hindustani) is the language of the better educated classes, and is everywhere becoming more generally under- stood and used. In Government schools Punjabi is not taught.

So far from the seaboard, the range between extremes of winter and summer temperature is great. The mean temperature in the shade in June is about 92°, in January about 50°. In midsummer the thermometer sometimes rises to 115° in the shade, and remains (on rare occasions) as high as 105° throughout the night. In winter the morning temperature has sometimes been as low as 20°. The rainfall is uncertain as well as scanty: the annual average is about 15 inches; it is sometimes as low as 8°; a total of 25° is exceptionally high. The harvests are greatly dependent on irrigation. The prevailing winds are westerly (N.W. and S.W.) in the hot weather, and easterly (i. and N.E.) in the cold season. The Lahore division became British territory in March 1849, on the annexation of the part of the Punjab west of the Bids river, at the close of the second Sikh war.

Lanore District has an area of 3648 square miles, with a population of 789,666 (438,335 males and 351,331 females ;—Sikhs, 119,268; Hindus, 116,287 ; Mohamme- dans, 470,216; others, 83,895). Ofthis number about 3000 are Europeans and Eurasians, residing chiefly at Lahore and its cantonment of Midn Mir. The district contains 1455 villages, with an agricultural population of 354,012. The gross revenue is £110,518—£74,353 being derived from the land. Of the area 1,165,440 acres are under cultiva- tion, 811,520 uncultivated, and 357,760 uncultivable. Of the uncultivated area nearly 237,000 acres are unappro- priated cultivable waste land, the property of the Govern- ment. Irrigation is supplied to upwards of 180,000 acres by the Bari Doab canal and three inundation canals from the Sutlej (filled for a certain time each year by the rise of the river), which are Government works, and about 267,000 acres are watered by private wells.

The chief crops are—wheat, about 486,000 acres ; gram (chick- pea, for cattle), 230,000 ; barley, 58,000; maize, 25,000; rice, 18,000; various food grains, 85,000 ; sugar eane, 2500; vegetables, 7000 ; capsicum, 1500; tobacco, 5000; poppy, 1000; cotton, 40,000 ; oil seeds, 15,000. Indigo, now only grown on asmall scale in this part of India, was formerly one of the important products of the country round Lahore, whieh had the reputation of great fer- tility. The traders on the part of the East India Company in the 17th century paid much attention to the indigo of Lahore, The court minutes of the Company, July 19, 1614, notice the proposal of Captain Newport at Surat for ‘‘a voyage to the river Syndus, whenee the Lahore indigo comes.” Captain Downton, writing to the Company in November of the same year regarding the opposi- tion which the English merchants met with at Surat, expresses a wish that they had some hope of being able ‘‘to transport their goods by that fair river of Sinde to and from that goodly country round Lahore.” And another trader speaks in 1615 of the great store of indigo to be had both at Ahmadabad and at Lahore. No doubt what was reckoned Lahore indigo may have been in great part indigo from elsewhere, passing through Lahore as the trade centre of that part of India,—just as, at the present day, the roek salt of the Punjab is in other provinces commonly ealled Lahor?, though it comes from the salt hills west of the Jhelum. The importance of Lahore as a centre of

trade at the time above referred to, is shown also in some of Sir T. Roe’s letters. Lahore now receives indigo from Bengal. The rent per aere of good wheat land in the Lahore district is about 5 rupees. ‘The selling price of wheat in ordinary years is about 26 scers (52 tb) for a rupee. The water- level in the neighbourhood of Lahore is at a depth of 30 to 36 feet from the surface of the ground. In the traet between the Ravi and the Chenab it is from 15 to 30 feet. In the south and south-west parts of the district, between the Ravi and the Sutlej, the depth is from 40 to 70 feet, except in some strips of low land,

After the opening of the Bari Doab canal, the water-level in wells of village lands on both sides of the canal was permanently raised, in some cases as much as 12 feet. The Lahore district has 107 miles of metalled ene! and = miles unmetalled, 97 miles of rad and 104 miles of navigable rivers.

ig Crry lies in 31° 34’ N. lat. and 74° 21’E. long., on the left bank of the river Ravi, about 900 feet above the sea-level. Itis a walled town, about 1} miles in length from west to east, and about 3 mile in breadth from north to south. The intramural population is 98,924; with the suburbs Anarkali, Muzang, and Ichra, the number is 128,441, The city walls, rebuilt in the time of Akbar, towards the end of the 16th century, were of great height, in some parts upwards of 36 feet, and higher at the gate- ways and parts adjoining, Ranjit Singh added a deep ditch, with a broad faussebraie (rawnt) between the ditch and the walls, and large outworks, shielding with a massive The fort or citadel, in

| 3 uN Z%\ I Pui Plan of Lahore.

Cee Roshndi or bright gate, leads into the small enclosure, called the Huziri Bagh or Court Garden, from which on the one side rises the great flight of steps to the terrace of the imperial mosque, and on the other the ascent through a fine gateway (now closed) to the palace in the fort. The fort and palace, with the conspicuous Saman Burj (pro-perly musamman, octagonal tower; it is a half octagon), present a striking appearance viewed from the open plain on the north.

The site of the present city has been occupied from early times, and much of it stands high above the level of the country outside, raised on the remains of many successive series of former habitations. Some of the old buildings which have been preserved when changes were going on. around, stand now below the surface of the ground about them. This is well seen in the mosque now called Masjid Niwin (or sunken), built 1560, the mosque of Mullah Rahmat, 7 feet below, and the Shivdla (Hindu temple), a very old building near the revenue office, about 12 feet below the surrounding ground. The houses are of brick, irregular in construction, three and more stories in height, many of them with projecting balconies and lattice win- dows ornamented with varietics of carved woodwork. The

| Dodb canal.

LAHORE

streets, narrow and winding, were, under the Sikh Govern- ment, and at the time of the first British occupation of the city in 1846, extremely unregulated and dirty. The water supply, from numerous wells throughout the city, was for the most part exceedingly impure. A cleansing and draining of the strects had to be taken in hand at once, when the city was held by British troops. The governor-gencral of India, Lord Hardinge, having, after the defeat of the Sikh army at Sabrdon, advanced to Lahore and concluded a treaty with the Sikh Government, a British force was left, to hold Lahore for that year (1846), the fort being reserved for the maharaja. But the occu- pation of Lahore was prolonged. A British resident was appointed, and barracks were built for the troops in the Anarkali suburb. After the annexation of the Panjab in 1849 the government of the country was placed in the hands of a board of administration. The fort was held by the British troops, the rest of the force assigned to Lahore being quartered outside the city in the cantonment of Anarkali. Subsequently a site for a permanent cantonment was selected at Mian Mfr, about five miles south-east of the city; and all the troops, British and native, are now quartered there, except the small garrison of the fort.

In 1852 the lofty walls, which greatly impeded the free airing of the interior of the city, were reduced to a height of from 14 to 20 feet, and the whole of the massive out- works were removed. In 1863 the ditch was filled in and the faussebraie levelled; and on this broad strip of new land immediately outside the city walls public gardens were laid out, and supplied with a watercourse from the Bari This work of improvement was carried out under the immediate direction of the native gentlemen of

_ the Lahore municipal committee.

The municipality now includes within its limits the greater part of the civil station of Lahore, which covers, in addition to the

| ground occupied by the old Anarkali cantonment, a large area

south and south-east of the city. All new public buildings have been erected in this civil station outside the walls. The principal of these are the deputy commissioner's court-house, the Government college, the Mayo hospital, the senate hall of the Punjab Uni- versity College (the gift of the nawab of Bahawalpur). The Lahore Industrial and Antiquarian Museum is in the building erected for the " Punjab Exhibition" of 1864. A building for the school of art in connexion with the museum is in progress. The medical school, at first held in a disused barrack of the Anarkali canton- ment, and then in hired houses, is now about to be provided with a suitable building at the Mayo hospital. The block of buildings erected for the British residency and offices, and used for this pur- pose up to the time of annexation, is now occupied by the chief court, the Government secretariat offices, civil and military, and the offices of the financial commissioner of the Punjab, and of the commissioner of the Lahore division. A new building for the chief court is about to be erected. A large building for the Government telegraph department has lately been finished. The post-office occupies one of the barracks of the old cantonment, and others of

them continue to be occupied by the offices of various Govern- |

ment departments—public works, public instruction, prisons, &e. The central jail stands on the site of the British camp of 1846; and in the large public grounds which contain the botanical and zoological gardens stand the John Lawrence Hall and the Mont- gomery Hall, erected in honour of the first two lieutenant-governors of the Punjab. Of native buildings applied to new ag ty there are, in the palace (1630-1640) the Diwan-i-am (or hall of audience), serving as a barrack for the fort garrison ; the two buildings called Khwéb-gah (or sleeping apartments), used as the Protestant and Roman Catholic places of worship for the troops in the fort ; the vaults of the Kala Burj and Lal Burj (black and red towers) used as commissariat store-rooms ; the A/6ti Masjid (pearl mosqne), which Ranjit Singh made his treasury, still nsed for the same purpose. The armoury, in an adjoining building, contains an interesting col- lection of arms and armour of the Mughal and Sikh times.

In the city, the mansion of Raja Dhyan Singh, Ranjit's prime minister (which was the British artillery mess house in 1846), con- tains the Government district school, the Oriental college, and the hall of the Anjuman-t-Panjad, an active literary and educational society. The quadrangle of the Huztiri Bagh (or royal garden) contains the Government normal school. In the Rang Mahal is the large high school of the American Presbyterian mission.

Outside the city, half way between the civil and military

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stations, is Government ITouse, the official residence of the licuten- ant-governor of the Punjab, formerly the house of the Jamadar Khush- hal Singh, a Brahman who, with varied fortunes, held high offices under Ranjit Singh. The original building round which the present large house was erected was the tomb of Sayid Nur-ud-din, called also Nur-ul-Alam, of Bokhara (1616), which is the lofty square apartment in the middle of the present building. The tomb of Nadirah Begam was fitted up in the early days of British rule as the station church, and continues to be used for this purpose. (A large new church has been commenced, which will now be the cathedral of the lately constituted

diocese of Lahore.) The tomb of Shah Chiragh (1660 a.D.) is, with large additions made from time to time, the office of the accountant-general of the province. The béradari or summer-house (commonly called chaz-burji, the build- ing with four turrets) of Nawab Wazir Khan (1631), long occupied by the museum, is now the station library and reading room,

Educational and other Institutions.—The Punjab University College, established in 1869 to give special encouragement to the cul- tivation of Oriental learning, and instruction in European science through the vernacular languages, is supported with much zeal by the chiefs and native gentlemen of the Punjab. It is now about to be raised to the status of a university, with power to confer degrees, The other educational institutions of Lahore are the Government college, the normal school, the Oriental college, the dis- trict Anglo-vernacular school, the high school for boys of European parentage, the Anarkali school for girls, another girls' school of the same class near the railway station, chiefly for the children of the railway employés, St James's orphanage and free school, for poorer children, European and Eurasian. The large and prosperous school of the American Presbyterian mission in the city has been mentioned above. The medical school, established in 1860, gives a five years' course, in the English language, qualifying for a diploma as licenti- ate in medicine, and for employment in the Government service in the grade of assistant-surgeon. A three years' course, in the Urdu language, trains a lower class of students for the grade of hospital assistant or native doctor. The number of students in the upper class is between fifty and sixty, in the lower from eighty to one hundred. The Mayo school of industrial art has in view mainly the cultivation of Oriental art as applied to decoration and manufactures, and, in aid of this purpose, instruction in drawing, modelling, &. Among other works on which the trained pupils have been employed is the production of plaster casts of the Buddhist sculptures in the museum, obtained froin explorations in the north-west districts of the Punjab. St John's Divinity College (Church Missionary Society) gives theological instruction, in the Urdu language, to native Christian students, ten of

whom are now pastors of native congregations in different parts of northern India.

There is a Government book depot for the sale of educational and other books; and from the depository of the Punjab Religious Book Society there is a largo and increasing sale of books of religious and general literature in English and in the vernacular languages. A large number of books in the native languages are issued annually from the local presses. Nine newspapers in Indian languages are published at Lahore—seven in Urdu, one in Hindi, and one in Arabic. One of the Lahore Urdu papers has the largest circulation of any native paper published out of Bengal. There is one daily English paper, and one under native editorship and management in the English language.

In the Lahore central jail, which is capable of receiving 2000 inmates, many useful manufactures are carried on by the prisoners, For the carpets made in this jail there isa large demand in the English market. Besides the two smaller jails, the district jail and the female jail, there is a Thaggi jail and school of industry, in which the few remaining Thags (or Thugs—highway stranglers and robbers) are taught useful work, chiefly tent making. A large lunatic asylum occupies the enclosed buildings of one of the old Sikh cantonments.

Trade.—The Lahore municipality has an annual income of nearly 170,000 rupees, the chief source of which is the octroi. Lahore imports from other parts of the Punjab, and the hill countrics beyond, tobacco, dyes, bamboos, hides, Kashmir paper, felts, and silk fabrics; from Ben gal and the southern provinces, indigo, spices, English piece goods, and other foreign products and manufactures; from Baittbag, metals and metal work, cutlery, &c., and drugs. The chief manufactures of Lahore—but they are none of them on a great scale— are woollen and silk fabrics for clothing, carpets (cotton and woollen), embroidery on leather, ivory carving, toys, pottery, turnery, metal work of various kinds, arms, jewellery, &c. Lahore has long been noted for its carpets. One of the travelling agents of the East India Company in 1617, writing from Agra, reports the purchase of various articles, including thirty Lahore carpets. Soon after he writes from the same

place, ‘‘It requires a long time to get well chosen carpets. True Lahore carpets are not suddenly to be gotten.” Two years later, December 1619, another, writing from Sirhind about carpets, says, ‘“‘ Lahore is the chief place for that com- modity.” A little later in the same century it is observed that

from Lahore were obtained fine muslins, flowercd and embroidered silks, woollen drapery, and all sorts of carpets.

Health.—The general health of Lahore is good, but the city and civil station, as well as the cantonment of Mian Mir, have suffered from occasional severe visitations of cholera and fever, as well as of small-pox. A large amount of rain within a short space of time, though the total of the ycar may be under the average, is usually followed by malarious fever, while a larger rainfall, more distri- buted, is healthy. Of much importance to the health of Lahore is the large work which the municipality has executed for the supply of water to the city and suburbs. The water is pumped from wells in the bed of the river Ravi to a covered reservoir in a high part of the city, from which it is distributed. A scheme of drainage and sewerage works, dependent on this supply of water, is about to be carried out. For the military station of Mian Mir water has been brought in by a cut from the Bari Doab canal.

Communication.—Lahore is in railway communication with the most important places in the Punjab, and with the other provinces of India. Its distance from Delhi is 323 miles (Sind, Punjab, and Delhi Railway) ; from Calcutta, 1277 miles (East India Railway); from Bombay by Delhi and Allahabad (East India Railway and Great Indian Peninsular), 1558 miles ; from Bombay by Delhi and Ajmir (Rajputana State Railway), 1280 ; from Multan (Sind, Pun- jab, and Delhi Railway), 207 ; from Kurrachee, the nearest point on the sea-coast (Sind, Punjab, and Delhi Railway and Indus Valley State Railway), 814; and from the Afghan frontier at Peshawar (Punjab Northern State Railway), 271 miles. This last line still wants, to complete it, the great bridge across the Indus at Attok, now in course of construction. A narrow-gauge

branch, from this line, for the salt traffic, is open to the bank of the Jhelum river, opposite Pind Dadan Khan. At Lahore there is one central railway station for all the lines, a short distance east of the Delhi gate.

History and Antigqwities.—To this account of Lahore under British rule will now be added a short sketch of its previous his- tory, and the works of former days which still remain.

ies is said to have been founded by Ldva or Loh, onc of the sons of Rama ; and it has borne the names Lavaptir, Loh-pir, Léh- kot, Lohawar, Lahawar. Tho city of Lava is probably the Laulaha of the Raja Tarangint, or history of the kings of Kashmir. ‘To Kashmir belonged for a long time the country (Lavana or Lavanya) as far south as Lahore, and beyond. Lavana, which also means salt, may have taken its name from the salt region west of Jhelum. Captain Wilford (As, Res., ix. 53) recognized Lahore in the Adfara and AdBorada of Ptolemy. Labaka is placed in the country of the Pandts about the Jhelum, and Labokla in Kashmir territory, which in reality embraced the other. Cunningham (Ancient Geo- graphy of India) suggests that Labokla should be read Labolka= Lava-laha or Lava-lok. There appears to be no mention of Lahore by the historians of Alexander ; it used to be supposed that it was Sangala or Sagala, in the country of the Cathe, but this placc is better represented by the hil] still called Sangala, to the west of Lahore, between the Ravi and the Chenab.

At the time of the first Mohammedan invasion of India, in the 7th century, Lahore was in the possession of a Chauhdn Rajput prince of Ajmir. Towards the ond: of the 10th: century Raja Jaipal, the ruler of the Lahore territory, was driven back after an encounter, on the frontier (978), with Sabaktagin, who had just risen to the throne of Ghazni. In 1001 Jaipal hed to meet the first incursion of Sabaktagin’s son Mahmud. In his third invasion of the Punjab Mahmud advanced as far as Bhera on the Jhelum, which used to be the raja’s place of residence alternately with Lahore, and which had been for a time the Hindu capital. The sixth time Mahmud came (1008), a great battle was fonght near the Indus with the raja of Lahore, Anangpal, the successor of

Jaipal. At length, ou his fourteenth invasion of India (1023), Mahmud took possession of Lahore, and appointed a governor, the raja, Jaipal Il., having fled to Ajmir.

Under Mahmud and seven successors Lahore continued to be tuled by governors appointed by them. When the kings of Ghazni were fully occupied in war with the Seljiks, their Indian subjects were roused to revolt, and, with the aid of the raja of Delhi, attacked Lahore. But the city was successfully held against them, and in the reign of Masaud II., the eighth from Mahmud, it was for a time made the seat of the government (1110). His successor Bahram went back to Ghazni; but his son, Khusrii Shah, after repeated defeats by the prince of Ghor, was driven to take refuge in the Punjab, and again made Lahore the capital. When Ghaias-ud-din and Shahab-ud-din of Ghor were ruling jointly at Ghazni, the latter proceeded to follow up the defeat of their Ghaznavi predecessors by an invasion of the Punjab, and, capturing Khusri Malik, son of Khusri Shah, took possession of Lahore (1186). It was next seized by the Gakkars, an ancient tribe of the hill country in the north-west of the Punjab. Shahab-ud-din succeeded in expelling them, but they murdered him on his way back to Ghazni, in 1206. Kutb-ud-din, a Turki slave originally, who had held the chief command in India during these troubled times of his late master’s reign, succecded to the sovereignty of the

Indian provinces, which ceased from this time to be dependcnt on Ghazni. He had to fight for the possession of Lahore, which had been scized by a rival, and the seat of government was then trans- ferred from Lahore to Delhi. =.

The buildings at Lahore of the Hindu times, and of this first Mohammedan period, are few in number. To the former probably belongs the Shivala or temple of Shiva in the middle of the city, now sturounded by more modern additions. It is aseribed to the time of Loh, the founder of the city. The temple of Bhairava (a form of Shiva), about a mile south of Lahore, 1s generally ascribed to a later period, but Lahore is said by the author of the Raja Tarangini to have been

addieted in early times to the worship of Bhairava. ‘To the Ghaznavi times belongs the tomb of Malik Ayaz, governor of Lahore. It is in the heart of the city, and was built about 1046. Hazrat Ganj Bakhsh, who also came with Mahmud to Lahore, is buried outside the Bhati gate, and at his tomb (built 1073) a weekly fair is now held, resorted to by Hindus as well as Mohammedans. About the same time were built the tomb of Pir Ali Makhdtim of Baghdad, and the tomb of Saiad Ishak, near Wazir Khan’s mosque in the eity. , :

The Mughal army sent into India by Jenghiz Khan in 1224 and subsequent years swept over the middle of the Punjab and in 1241 eaptured the old capital, Bhera, and laid waste Lahore and Multan. In 1269 the king of Delhi, Ghaids-ud-din Balban, visited Lahore, and rebuilt the fort which the Mughal invaders had destroyed. His eldest son Muhammad Sultan, the khan of Multan, came to Lahore in 1285, to oppose another invasion under Samiar, one of the Mughal generals. ‘he fight in which the young prince fell at Lahore is further memorable from the capture of his friend Amir Khusri, the Persian poet.

After more than a hundred years, during whieh the history of Lahore is comparatively unimportant, though it was not untroubled, it suffered like other wealthy places in North India from Timur’s invasion in the end of the 14th century. On his return from the sack of Delhi, Timur sent a force to Lahore, with instructions to raise a large contribution there, to which was afterwards added an order for the plunder of the city and the country around. And then Lahore had a time of repose. In 1450, when Bahldl, the first of the Lédi dynasty, had been raised to the sovereignty at Delhi, and the charge of the several divisions of his territory was assigned to different officers, Lahore was reserved for himself.

The 14th and 15th centuries have left no known buildings at Lahore, though some of the following century are marked by the Pathan style belonging to the earlier period.

The next change in the fortunes of Lahore was a great and im- portant one. In 1522 it passed into the hands of Timwu’s descend- ant Baber (Babar), the first of a line of new masters who were to give it new life,

though it gained little under Baber himself. Invited by the governor of Lahore, who had become disaffected to the Lodi king, Baber came on with an army, and, having defeated the Lodi forces, he gave up the city to plunder. Ou his departure for Cabul in 1524 he left Lahore in eharge of his relative Abd'ul Aziz. Baber lived oecasionally at Lahore, but his reign of frequent eontests gave him little rest at any permanent seat of government. Humaytn, who sueceeded his father Baber in 1530, did not long retain Lahore undisturbed. His brother Kamran, governor of Kandahar and Cabul, who laid claim to the Indian sovereignty, eame to Lahore, and by artifice sueeeeded in gaining the city with- out bloodshed. Five years later Kamran had to march to the relief of Kandahar, and during his absence an attempt was made upon Lahore, which was defeated by his rapid return. In 1540 the Afghans made auother endeavour to recover power in India under Shir Shah Sur, who took possession of Lahore and of Bhéra, the other old eapital, which still retained some importance.

Kamran lived long enough at Lahore to make his mark there in three pieces of work of which there are still remains, but altered and added to by others sinee, so that of his part there is not much to be seen. One of these was the béradari or summer house of the Dil-Kusha gardeu on the bank of the Ravi opposite Lahore, on whieh now stands the house built over it by Ranjit Singh. Kdmrdn's garden of Shalamar was the beginning of the grander work com- pleted by Shah Jahan. Of his palace at Naulakka, east of the city only the gateway now remains. Other buildings at Lahore of this earliest Mughal period are the tomb of Khojah Salar Khan and the Khojah Masjid, the mosque now called Niwin, and the Shiran- walt Masjid.

In the time of Humayun's son and successor, Akbar (1556-1605), Lahore rose to a condition of prosperity unknown at any previous time. 'To his reign belongs the commencement of its architectural greatness, which increased in the two following reigns. He made the eity the royal residence, rebuilt the fort, and began the palace buildings. He rebuilt also the walls which, altered and added to by his suecessors and now reduced, still surround the city. To this time belong many of the well-known buildings now to be seen at Lahore. The mosque near the

Masti gate (opposite the Poor House of the present day) is said to have been built by the emperor’s mother. Of the same date arc the tombs of Abd’ul Ishak at Muzang,

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of Kasim Khan, of Mauj Darya (a saint whose prayers procured Akbar’s suecess in his attack on Chitér), and of Shah Musa. This last, called Sabz Gumbaz, is the earliest of the Lahore buildings coloured with the glazed tile-work eonmonly called kdsh?. he tomb of Nadirah Bégam, called also Sharif-un-nissa, a slave of Akbar’s, whom he named Anarkali, was built about the end of his reign; it is the building now used as the station ehurch. To this period belongs also the mosque of Mullah Rahmat as well as the earliest work of the Sikhs in the city. The bdoli or masonry tank in the middle of the eity was built in 1584 by Ram Das, the gurt or spiritual leader of the Sikhs, fourth in order from Nanak the founder of the seet,

A eurious and special interest attaches to Lahore in the time of Akbar, in eonnexion with the first teaching of Christianity in northern India by the Jesuit missionaries whom the emperor had invited to Lahore from Goa, after reeeiving the visit of Antony Capral at Agra in 1578. They were first Rodolph Aquaviva, An- tony Manserrat, and Francis Heneric. Afterwards eame Edward Leighton and Christopher Vega in 1589. Wheu they, like the others, had gone away disappointed, and the emperor’s invitation was repeated, two others were scnt,—Jerome Xavier (nephew of Francis) and Emanuel Pinnero. Akbar built a church for them in Lahore. He then for a time shut up the Lahore mosques. The chureh of the Jesuits was thronged with Mohammedans. On the day of Penteeost 1599 a number of converts walked in procession through the streets of Lahore to the chureh, and were publicly baptized by Pinnero. Benediet Goes passed through Lahore in 1603, on his journey to solve the question of the identity of China and Cathay, and was kindly reeeived and helped by Akbar. Lastly, a new missionary, Father D’Acosta, came to Lahore soon after the beginning of Jahangir’s reign. The marks of Christian work and suceess at Lahore at this period remained on some of the bnildings there when the men

who had been brought under its influence passed away and no traces remained with their children. De Laet says that in 1630 (three years after Jahdngir's death) he saw over one of the palace gates at Lahore figures of our Saviour and of the Virgin. They are described also by Thevenot, who visited Lahore in 1666 ; he says they had been put up by Jahangir to please the Portu- guese. Remains of the Jesuit chureh also were to be seen when Thevenot was at Lahore. Some traces of Christian art are still to be seen, which may be referred to the same period,—the winged heads on the principal gate of the fort and of the Gola sarai (1622).

When Jahangir suceeeded to the throne of Akbar, Lahore was immediately the scene of ove of those family contests which so often inarked the Mughal reigns. His son Khusri aimed at power, and attempted, unsuccessfully, to obtain possession of the eity. Among those on whom the emperor's displeasure fell was the Sikh leader, Arjun Mal, fifth gwrw, eompiler of the Adi Granth, who liad succeeded his father Ram Das in 1581. Having offered up prayers for Khusri_ he was imprisoned by Jahangir, and diced the same year, 1606. His little tomb stands Just outside the fort.

The buildings at Lahore of Jahangir's time are numerous. The most important and the best preserved are—the Saman Burj, and some other parts of the palace in the fort, built during several suc- cessive years (1606, &e.) ; the sarai at Shahdara (1612); the tomb of Saiad Nur-ud-din, Nur ul Alam, Bukhari (1616), now Government House ; the tomb of Shah Abu'l Maali, and the mosque beside it (1616); the masjid of Dai Sadhu-wali (1621); the tomb, near Shala- mar, of Madhu Lal Hussein, a converted Hindu (1621); the little tomb, covered with many coloured kdshi, of Farid Pakkiwala, a pupil of Mauj Darya (1621); and the Gola sarai (1622), which re- tains some fine specimens of the same kind of ornamentation.

Shah Jahan's reign was, at Lahore as elsewhere, the greatest and most vigorous period of Mughal arehitecture. Lahore as well as Delhi testifies, though in a minor degree, to the power and taste which seem to have inspired others besides the emperor to raise the many

monuments that still remain of the grandeur of his time. The first place is due to the splendid tomb of Jahangir, erected by his widow Nur Jahan, at Shahdara, on the bank of the Ravi oppo- site Lahore (1630), near whieh was afterwards built (1632) the tomb of her brother Asaf Khan, Jahangir's commander-in-chief, and then (1650) that of the widowed queen herself. Before these, in order of time, were the gate and ascent called hdthi pdon to the fort (1 629), and then, in 1630 and following years, the series of fine palace build- ings within the fort, which have sinee been altered and added to by the emperor's Mughal successors and by Ranjit Singh.

Two of Shah Jahan's principal officers of state were his chief supporters and followers in the construction of the great works of his time at Lahore. One of these was Ali Mardan Khan, a Persian, formerly governor of Kandahar, then suecessively gover- nor of Kashmir and of the Punjab, who was also an eminent engineer and architeet. The other was the court physician and afterwards prime minister, Hakim Alam-ud-din, better known as the Nawab Wazir Khan. Ali Mardan Khan built, under Shah Jahan's orders, the finest of the great sardis for travellers on the imperial road from Delhi to Lahore and Lahore to Kashmir. He proposed and carried out (1639) the canal from the Ravi at the foot

of the hills, which was called the Lahore canal. Other canals of the same kind he executed elsewhere. His chief work at Lahore is the tomb of his mother (1627), where he himsclf also was buried (1657), and which is known as the tomb of Ali Mardan Khan. Wazir Khan's chief works at Lahore are his own baradari or summer house (1631), the sarai and hanvmdm (baths) in the street now called Hira Mandi (1635), the Rang Mahal or painted palace (1635), and the Part Alahal or fairy palace (1638). Prince Dara Shiko, the empcror's son, who made Lahore his place of residence, built (1640) the tomb of Mian Mir, his religious teacher. Of the other works at Lahore of Shah Jahan's time the principal are the tombs of Nawab Jafar Khan (1631), of Shah Bilawal (1636), of Abw Hassan Khan (1641), of Shah Jamal (1651),

and of the emperor's son, Prince Parviz (1651),—also the tombs of two notable literary men, Muhammad Salah, author of Bahdr Dédnish, and Sheikh Indyat-Ullah, author of the historical work called Shah-jahdén-ndémah. The mosque in the city called Wazir Khan's was built (1641) by the emperor in honour of his faithful servant whose name it bears. It is faced with beautiful kdsht work of various colours, a kind of ornamentation largely used in the buildings of this time at Lahore. Decorated in the same manner is the gateway of the Guldbi Bagh made by Sultan Beg, the emperor's son-in-law. The Shalamar garden, restored and largcly extended by Shah Jahan (1640), is one of the finest works at Lahore of his time. During Shah Jahan's reign Lahore was visited (1626) by two English travellers Mr Crowther and Mr Still; in 1688 by Mandelslo, a member of the Holstein embassy to Persia; and three years later by Manriquez, a Spaniard.

Aurangzib (1658-1707), though he lived little at Lahore, contri- buted to it one of the largest and most important of the existing buildings, the Bddshahi Masjid, or imperial mosque, built 1673-80. Two buildings at Lahore are connected with the name of Aurang- aib's daughter, Zib-un-nissa, authoress of a book of poems called the Diwan-i-Makhfi. One is the gateway of her garden (1665) called Chau-burjt (four towercd) and now Sv-burjt (three towered), one of the corner minarets having been cut away by the water of a neigh- bouring nullah. The other is her tomb, built 1670. The tombs of Shah Chiragh (1658), of Sultana Begam, daughter of Shah Jahan, wife of Sultan Beg (1660),and of Abd'ur Rizak, Makki (1673), which is known as the lila gumbaz, or blue dome,—are the.best of the other remains at Lahore of the work of Aurangzib's reign.

From the reign of Aurangzib's successor, Bahadur Shah (Shah Alam J.), Lahore has little to show except two small buildings of 1710, one Hindu and one Mohammedan—the Chaubara, or hall, of Chajjt Bhagat, and the tomb of Pir Ain-ul-Kamal. One of the city gates bears the name of Shah Alam. In the reign of Mohammed Shah, the third from Shah Alam (1719-48), Lahore caine in the path of another of the ruthless invaders from the west, Nadir Kuli Khan, better known as Nadir Shah (1737), who rapidly swept over the plains of the Punjab to

the chief city. He was met but not actively resisted by the governor of Lahore, and Nadir's army en- camped fora time at Shalamar. Again, in the repeated invasions of Ahmad Shah Abdali (1748-1767), in the reigns of his namesake Ahmad Shah and of Alamgir I]., Lahore had to take its part, with varied fortunes, but with no important permanent result. To the reign of Ahmad Shah (1748-54) belongs one little building which makes some show in the city, the Masjid Z%ldd, or golden (now commonly called Swnahri which has the same meaning), having its domes covered with gilt plates of copper (1750). This is the latest work of the kind at Lahore before the Mohammedan power in the Punjab was subverted by the Sikhs, who obtaincd temporary pos- session of the city cight years later, and, with rapidly growing influence as well as numbers, soon became a formidable enemy of the nominal rulers, till, finally, they became masters of Lahore, under Ranjit Singh. Lahore was conferred npon Ranjit in the end of last century by the last of the invaders of India from the west, Zaman Shah, when the last of the reigning Mughals, Shah Alam II., had lost al] real hold of this northern part of his empire. The long, vigorous, and expansive rule of Ranjit Singh brings Lahore Within the general history of the Sikhs and of the Punjab, and con- nects the Punjab directly with the history of British India.

Except the additions which Ranjit Singh made to the defences of the city little work of usefulness or adornment was done in his days at Lahore which did not owe somcthing very directly to works of earlicr times. Ranjit built a large summer house, which he called Tar-ghar, on the remains of prince Kamran's Dil-kausha, or country palace, on the bank of the Ravi opposite Lahore. The fine marble béradari which he sect up in the middle of the Huztri Bagh was taken from Jahangir's tomb at Shahdara.

Lahore in the time of Ranjit Singh has been the subject of many descriptions and narratives from many pens. Very interesting are the accounts in Victor Jacquemont's Letters and Sir Henry Law- rence's Adventurer in the Punjab. The pictures of Ranjit's court at Lahore introduce also the figures of men whose names became very familiar to English ears in the later days of Ranjit's reign: the Hindu brothers

Dhydn Singh and Ghulab Singh, the men of action and intrigue ; the Mussulman brothers Aziz-ud-din and Nur-ud-din

(of the Fakir family as it is called), the men of business ; the sagacious counsellor Dina Nath; the French military officers Allard, Ventura, Court ; and others. But the great figure always in these Lahore pictures is the small, one-eyed maharaja himself. Unedu- eated, but full of knowledge, which was power,—of a feeble frame worse enfeebled by himself, but of astonishing energy and indomi- table will,—he made the whole Punjab his own, and created for his own use an army the most powerful and best organized that Britain has ever encountered in India. Ranjit Singh died in 1839, leaving to his successors this dangerous legacy, consisting of sixty regiments of regular infantry and a larger force of irregulars, numbering in all 92,000; cavalry, 31,800 ; artillery, 171 garrison guns and 384 field pieces.

Immediately after the close of his life began the wild anarchy and bloodshed of which Lahore was the constant scene for years follow- ing. Within four months Ranjit's son and successor Kharak Singh was removed by death, in what way is not clearly known, The reign of Nan Nihal Singh, who came after him, lasted a few days only. A longer time of power was enjoyed by Shir Singh, who at length was murdered in 1843. After a time of worse confusion, constant fighting, and more murders, Dhalip Singh, a young son of Ranjit, beeame maharaja,—the government, such as it was, being in the hands of his mother, and of the vizier Lal Singh. Seven years after Ranjit Singh's death a great part of his great army, which had come to feel its strength and make it felt, when no longer held in the iron grasp of its only: master, crossed the Sutlej into British territory, and took thus the first step towards its own destruction. The result, after four great conflicts, one of them a conflict of unexampled peril to the British power in India, was the first occupation of Lahore by English troops in March 1846, Of Lahore in British hands an account has been given above.

The tomb of Ranjit Singh, a building of no great architectural merit, which stands just outside the Roshnai gatc, was in progress when the

city was taken possession of in 1846, and was completed after the annexation of the Punjab in 1849.

See A'‘in-t-Akbart; Elliot, Wistorians of India; Calcutta Review, vols. i., ii., vi., vili., ix., xxvi., &e.; Lahore, by T. H. Thornton and J. L. Kipling; Bernier's Travels; D. J. Martin Honigberger, Thirty-Five Years in the East; Thevenot's Travels; Joannes de Laet, De Imperio Magni Mogolis; Manouehi, General Wistory of the Mogul Emptre; Vietor Jaequemont, Journey in India; Adventurer

in the Punjab (republished as Adventures of Bellasis); Annual Administration Reports of the Punjab, &e. (R. M‘D.*)

LAHR, chief town of an official district in the circle of Offenburg, Baden, is situated on the Schutter, about 9 miles south of Offenburg. As one of the busiest towns in Baden, it carries on manufactures of tobacco and cigars, woollen goods, chicory, leather, pasteboard, hats, and nume- rous other articles, and has besides considerable trade. The population in 1875 was 8491.

LAIBACH, or Laysacu (Slovenian, Ljubljana), capital of the duchy of Carniola, Austria, is situated on the Laibach near its influx into the Save, and on the Crown Prince Rudolph and Austrian Southern Railways, 45 miles north-east of Trieste, in 46° 3' N. lat., 14° 31'E. long. It consists of the town proper and eight suburbs, and pos- sesses a cathedral in the Italian style,-ten churches, the palaces of the prince and count of Auersperg, an ancient castle on the Schlossberg now used as a military depot and prison, besides the usual public buildings and educational establishments of a provincial capital and episcopal see. There are manufactories of earthenware, linen and woollen cloth, silk, fire-hose, and cigars; oil, paper, and chicory mills ; a sugar refinery, and a bell-foundry. On the 31st December 1880 the civil population was 24,618 (11,185 males, 13,433 females); together with the military it was 26,284. The native language is Slovenian, but the educated classes speak German or Italian.

Laibach occupies the site of the ancient Emona or Aimona. In 388 A.D. Emona was visited by the emperor Theodosius ; in 400 it was

besieged by Alaric ; and in 451 it was desolated by the Huns. In 900 Laibach suffered much from the Magyars, who were, how- ever, defeated there in 914. In the 12th century the town passed into the hands of the dukes of Carinthia ; in 1270 it was taken by Ottocar of Bohemia; and in 1277 it came under the sway of the Hapsburgs. In the early part of the 15th century the town was several times besieged by the Turks. The bishopric was founded in 1461. On the 17th March 1797 and again 3d June 1809 Laibach was taken by the French, and from 1809 to 1813 it became the seat of their general government of the Illyrian provinces. From 1816 to 1849 Laibach was the capital of the kingdom of Illyria. For the congress of Laibach (January to May 1821) sec vol. xiii. p. 485.

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LAING, AtexanpEer Gorpon (1793-1826), an African explorer, was born at Edinburgh 27th December 1793. At first it seemed that he would follow his father's profes- sion, that of a teacher of the classics; but, his fancy being fired with the military ardour of the time, he set out for Barbados, where his maternal uncle Colonel Gordon was then stationed. Here he met with Sir George Beckwith, who procured him a commission in the York light in- fantry. His career as a traveller began in 1822, when he was sent on a mission to the country of the Sulimas and advanced as far as the sources of the Rokelle. By ascer- taining that the source of the Quorra or Niger was not more than 1600 feet above the sea, he dispelled the idea that it was connected with the Nile. The further elucida- tion of the other questions that were then connected with this great river formed the principal object of his next journey, undertaken in 1825 under the auspices of Lord Bathurst. From a letter sent May 10, 1826, from Blad Sidi Mohammed to Consul Warrington at Tripoli we know that he had barely escaped with his life from an attack in which he had received twenty-four wounds. He managed to reach Timbuctoo by August 18th, but shortly afterwards fell a victim to the treachery of hig servant. The history of the vain attempt to recover the traveller's journals will be found in the Quarterly Review, vol. xlii. (1830). The narrative of his first journey was published in 1825.

LAING, Davin (1793-1878), a distinguished Scottish antiquary, especially eminent for his bibliographical know- ledge, was the son of William Laing, a bookseller in Edinburgh, and was born in that city in 1793. He was brouglit up to his father's business, and continued for many years in partnership with him. Shortly after the death of the latter, however, a vacancy having occurred in the librarianship of the Signet Library, Laing was elected to that office in 1837, and continued to hold it till the time of his death. In addition to, it is believed, an almost unexampled knowledge of the titles and value of books, Laing possessed an intimate acquaintance with the early literary history of Scotland. His knowledge of Scottish art was also very extensive; and the ecclesiastical history of his native country, particularly during the 16th and 17th centuries, had long been the subject of his profound investigation, It is perhaps to be regretted that with all this knowledge he never produced any large inde- pendent work, but confined himself to the editing of the works of others. Of these, the chief are—Dundar's Works, 2 vols., 1834, with a supplement added in 1865 ; Robert Baillie's Letters and Journals, 3 vols., 1841-42 f John Knox's Works, 6 vols., 1846-64 ; Poems and Fables of Robert Henryson, 1865 ; Andrew of Wyntoun's Orygynale Cronykil of Scotland, 3 vols. 1872-79 3 Sir David Lyndsay's Poetical Works, 3 vols., 1879. Laing was for more than fifty years an active member of the Society of Antiquaries of Scotland, and during that period he contributed upwards of a hundred separate papers to their Proceedings. He was also for more than forty years secretary to the Bannatyne Club, many of the publications of which were carefully edited by him, and few of them we believe failed to benefit by his assistance. A complete list of his 'productions would occupy many pages. His literary activity ended only with his life. He was struck with paralysis when attending to his duties in the Signet Library, and it is touchingly recorded of him that, on awakening out of the fit, he looked about him and asked if a proof of Wyntoun had been sent up from the printers, He died a few days afterwards, on October 18, 1878, at the age of eighty-six years, Perhaps few men who ever lived possessed so much recondite knowledge on subjects connected with Scottish history and literature, and no one could be more ready to communicate whatever he knew to

those who were engaged in investigations similar to his own. In 1864 the university of Edinburgh conferred on him the degree of LL.D. In the course of his long life Laing had collected an immense library, a large portion of the books being illustrative of the literature or history of Scotland, and many of them being of extraordinary rarity. It was dispersed by auction in London soon after his death, and the enormous prices obtained for many of the books were such as had hardly ever been known even in the most celebrated of previous book sales. A valuable collec- tion of MSS., chiefly relating to Scotland, was bequeathed by him to the library of Edinburgh university.

LAING, Maucozm (1762-1818), a Scottish historian, was born at his paternal estate on the Mainland of Orkney in 1762. Having studied at the grammar school of Kirkwall and the university of Edinburgh, he was called to the bar in 1785, but never obtained an extensive practice as advocate. In 1793 he completed the last volume of Henry's History of Great Britain, the portion which he wrote being, in its strongly liberal tone, at signal variance with the preceding tenor of the work. In 1800 he published a History of Scotland from the Accession of James VI. to the Reign of Queen Anne, a work of considerable research. Ina dissertation prefixed to an edition of his History published in 1804 he endeavoured to prove the participation of Queen Mary in the murder of Darnley. In the same year he published an edition of the Historie and Life of King James the Sext. His only other publica- tion is an edition of the Poems of Ossian. For a short period in 1807 Laing represented his native county in parliament, He died in November 1818,

LALYANG, a city in the Chinese province of Shan-tung, situated in 37° N, lat. and 120° 55' E. long., about the middle of the eastern peninsula, on the highway running south from Che-foo to Kin-Kea or Teng-tsi harbour. It is surrounded by well-kept walls of great antiquity, and its main streets are spanned by large pailows or monumental arches, some of which date from the time of the emperor Tai-ting-te of the Yuen dynasty (1324). 'There are ex- tensive suburbs both in the north and south, and the total population is estimated at 50,000. The

so-called Ailanthus silk produced by Saturnia cynthia is woven at Lai-yang into a strong fabric; and the manufacture of the peculiar kind of wax obtained from the la-shoo or wax-tree insect is largely carried on in the vicinity.

LAKE, When a stream in its course meets with a depression in the land it flows into it and tends to fill it up to the lip of its lowest exit. Whether it succeeds in doing this or not depends on the climate. In the British Islands, and in most temperate and equatorial regions, the stream would fill the depression and run over, and the surplus water would flow on towards the sea. Such a depression, with its contents of practically stagnant water, constitutes a lake, and its water would be fresh. In warm dry regions, however, such as are frequently met with in tropical latitudes, it might easily happen that the evaporation from the surface of the depression, supposed filled with water, might be greater than the supply from the feeding stream and from rain falling on its surface. The level of the waters in the depression would then stand at such a height that the evaporation from its surface would exactly balance the supply from streams and rain. We should have as the result a lake whose waters would be salt. Lakes of the first kind may be considered as en- largements of rivers, those of the second kind as isolated portions of the ocean ; indeed, salt lakes are very frequently called seas, as the Caspian Sea and the Dead Sea. The occurrence of freshwater lakes and salt lakes in the same drainage system is not uncommon. In this case the salt lake forms the termination. Well-known examples of this

LAKE

are Lake Titicaca and the Desguadero in South America, and Lake Tiberias and the Dead Sea on the Jordan.

Distribution of Lakes.—Although there are few countries where lakes are entirely absent, still it requires little study to see that they are much more thickly grouped in some places thanin others. Of the larger lakes, for instance, we have the remarkable group in North America, which together form the greatest extent of fresh water in the world. A similar group of immense lakes is found in Central Africa:—Lakes Victoria

Nyanza and Albert Nyanza, whose overflow waters go to form the Nile; Lake Tanganyika, at the source of the Congo; and Lake Nyassa, on a tributary to the Zambesi. In Asia the largest fresh- water lake is Lake Baikal, on the upper waters of the Lena. All these freshwater lakes of great size are at the sources of large and important rivers ; the salt lakes in which Asia also abounds are at the mouths of large rivers, as the Caspian at the mouth of the Volga, and Aral Sea at the mouth of the Oxus.

Passing from the consideration of these larger lakes, which from their size may be considered inland oceans, and which therefore necessarily occur in small number, we find large numbers of lakes of comparatively small dimen- sions, and when we consider them attentively we find that they are reducible to a small number of species, and, as in the case of plants and animals, the distribution of these species is regulated chiefly by climate, but also by geolo- gical conditions. Perhaps the most important and remark- able species of lakes is that to which the Scottish lakes belong. They are generally characterized by occupying long narrow depressions in the valleys of a mountainous country in the neighbourhood of the sea, and in a temperate climate. On the sea-coast, lakes of this character are found in Norway, Scotland, Newfoundland, Canada, the southern extremity of South America, and the south end of the middle island of New Zealand; somewhat removed from the sea we have the Alpine lakes of Switzerland and Tyrol, and the great Italian lakes, all of which display the same features as those of Scotland or of Norway. In many flat countries lakes are extraordinarily abundant, as for instance in the north part of Russia and Finland, in the southern part of Sweden, in the northern parts of Canada, and on a small scale in the Hebrides.

Lagoons, found on all low sandy coasts, owe their origin to the shifting of the sand under the influence of the wind and tide. They are found at the mouths of large rivers, as on the Baltic and at the mouth of the Garonne.

In volcanic regions lakes are not uncommon, generally of a more or less circular form, and either occupying the site of extinct craters or

due to subsidences consequent on volcanic eruptions; such are the Maare of the Eifel in Germany, and many lakes in Italy and in the Azores.

Lakes are not only widely distributed in latitude and longitude, they also occur at all elevations. Indeed, as a certain elevation above the sea produces an effect as regards climate equivalent to a certain increase of latitude, we find lakes existing in the centre of continents, and on high plateaus and mountain ranges, in latitudes where they Would be speedily dried up if at the level of the sea. Many of the lakes in Scotland (as Lochs Lomond, Morar, Coruisk), of Norway, of British Columbia, and of southern Chili are raised only by a few feet above the level of the Sea, and are separated from it often by only a few hundred yards of land, while in the Cordilleras of South America we have Lake Titicaca 12,500 feet, and in Asia Lake Kokonor 10,500 feet above the sea. Many lakes whose surface is raised high above the level of the sea are so – that their bottom reaches considerably below that

evel,

Dimensions of Lakes.—The principal measurements con-

ya | nected with a number of lakes in different parts of the world, presented in the following table, will give a more

precise idea of the size of the lakes than could be given by description alone :—

Mean ig | SA | o- | Height in Feet | Tempera- Name of Lake. eis fo | ox rs ¥ above the Sea of | ture of tude. g | LH |az a Lae at eN et | (ese ~ | Surface.| Bottom.} Bottom. Miles.| Miles.| Feet. Superior ….....47°45’N,| 350 | 100 978 WACHICAN ...c0ses<06 44° N.| 820 80 840 594 BE) ClaiVecccass sacs: ss 42°30'N.| 18 22 20 570

HUDICUCAN .occcsrecease 16° 30’S.| 90 30 924 | 12,500 Kokonor ….....\87 NJ 91 42 aes 10,500 BAKA] ceecccsseces:,.180 Nii 380 40 14,080 1,360 Balkash. .....[46° | N.| 280 25 Caspian ….-ceceee./4 Dead Sca 2°5

8-7 8 394 1,300

cf 630 25 1°5 | 1,020 30

13) 774 50

x 480 93

08) 480 864

AON OAC OCRRECHIOEBOS 4°5 1 450 390 Rannoch Ss 9°4 5 378 668 Ericht…. e 14°5 0-8] 330 1,153 Tummcel . panic ro) 2°5 0°5| 120 GALTY: coececsesasaess: 2°5] O83] 102 1,330

From this table it will be seen that by far the largest continuous sheet of fresh water is the group of North American lakes, and of these Lake Superior is more than double the size of any of the others; this is principally due to its great breadth, as it is very little longer than Lake Michigan. Lake Superior communicates with Lakes Michigan and Huron, which are really branches of one and the same lake, by the St Mary's river, the fall being 49 feet from Superior to Huron. Huron empties itself into Erie by the St Clair river, Lake St Clair, and finally the Detroit river. Lake Erie overflows by the Niagara river and falls into Lake Ontario, whence the water finally is conveyed to the sea by the St Lawrence. The area of the lakes together is in round numbers 100,000 square miles, and, if that of the St Lawrence and its estuary be added, the water area will be about 150,000 square miles, while the whole drainage area is only 537,000 square miles. Hence of the water conveyed by the St Lawrence to the gea, rather more than one-fourth falls on the surface of the water itself. Looking to their great extent, we should have suspected them to be much deeper than is found to be the case. The deepest, Lake Superior, is no deeper than Loch Morar in Inverness-shire. Comparatively shallow, however, as they are, the bottoms of them all, with the exception of Erie, are several hundred feet below the level of the sea. It has been supposed that in former times this chain of lakes formed an arm of the sea similar to the Baltic in Europe, and in support of this view we have the fact of the discovery of marine forms in Lake Michigan.

In Asia Lake Baikal is in every way comparable to the great Canadian lakes as regards size. Its area of over 9000 square miles makes it about equal to Erie in super- ficial extent, while its enormous depth of over 4000 feet makes the volume of its waters almost equal to that of Lake Superior. Although its surface is 1360 feet above the sea-level, its bottom is 2720 feet below it. A former connexion with the ocean has been claimed for this lake, owing to the fact that seals inhabit its waters. Other large lakes in Asia are mostly salt, and some lie wholly below the level of the sea. Thus the Caspian lies 85 feet below the Black Sea, and the bottom at its greatest depth is 3600 feet deeper. The Dead Sea is over 1300 feet deep, and its surface is 1272 feet below the Mediterranean, so that its bottom is 2580 feet below the level of the sea. In the Caspian seals are found. A former connexion with the Red Sea has been claimed for ee ei se this

is disallowed by Peschel and others. The Jordan valley, with the Sea of Tiberias and the Dead Sea, lie on the line of an extensive fault, and it is claimed that this depression in the surface occurred with the production of the fault. Further evidence in support of the statement that the Dead Sea was never connected with the sea is of a negative character, and consists chiefly in the fact that marine forms have not been found in the waters of the Jordan or of Lake Tiberias, and that silver is absent from the waters of the Dead Sea.

A former connexion with the ocean is claimed for a number of the Swiss’and Italian lakes by Dr Forel and Professor Pavesi, and the Norwegian lakes by Loven and Sars, on the ground of the occurrence of marine forms of the crustaceans and other classes. For a summarized account of these researches see Pavesi, Arch. de G’enéve, SEO; Ti. 7.

Temperature of Lakes.—The earliest reliable temperature observations in lakes or seas are those of Saussure, and they are to be found in his charming Voyage dans les Alpes. Te was the first to obtain thoroughly trustworthy observations in the deeper waters of the lakes. He used for this purpose an ordinary thermometer whose bulb was covered over

with several thicknesses of cloth and wax, so as to render it very slowly conducting. He was in the habit of leaving it down fourteen hours, and then bringing it up as quickly as possible and immediately reading the temperature. He did not, however, trust to his thermo- meter not changing its reading while being brought up, but by an elaborate series of experiments he obtained cor- rections, to be applied when the thermometer had to be drawn through more or less water of higher temperature. His observations are collected in the following table along with those of Jardine in some of the Scottish lakes, at the beginning of the century :—

a Temperature of Height Name of Lake. Date. si oe | Depth. | fabeve Surface.| Bottom. Sea. °F; ae Fect. Feet February. 42°1 416 1,013 1,230 -....| 17th July. 73°7 414 346 | 1,304

October 1784. 64:0 421 256 oe .| 14th May 1780. | 57°99 | 42-1 174 | 1,426

...| 25th July 1784. | 64:6 | 39°6 394 | 1,250

...| 28th July, 68-4 | 40°8 640 | 1,380

7th July 1783. | 66:2 | 41:0 373 | 1,896 8th July 1783, | 68:0 | 405 533 os

19th July 1783.| 781 | 441 | 3857 | |. IMGMONO sc. ccccsonceserere 8th Sept. 1812. 59°5 41°5 600 25 ee. 7th Sept.1812. | 57°3 | 41:0 | 480 | 364 Katrine a4 3d Sept.1814. | 564 | 413 |... oe

An exceedingly important and valuable series of observations was made by Fischer and Brunner! in the Lake of Thun throughout the course of a whole year (March 1848 to February 1849), They used, after Saussure’s method, thermometers protected by non-conduct- ing envelopes, which were pulled up as quickly as possible. The depth of the water where they observed was 540 feet, and they made a series of observations of the temperature at that depth, at the surface, and at eleven intermediate depths, and repeated the series of observations at eight different dates over the year. From these series, which afford the

first information of the yearly march of tem- perature at different depths, we learn that the lake as a whole gains heat till the end of September, then loses it until the month of February, when it begins to warm again, though slowly. The maximum temperature occurs in October at depths from the surface to 70 feet. in November at depths from 70 to 120 feet, in December from 120 to 200 feet, and in February at 500 feet. As the whole yearly variation of the temperature at 200 feet

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1 Mém. Soc. Phys. Genéve, xii. p. 255.

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is less than a degree, the epoch at which the greater depths attain their maximum and minimum temperatures cannot be certainly deduced from one year's observations. The minimum temperature of depths from the surface to 89 feet is attained in the month of February, at greater depths in the month of March. During the course of the whole year the temperature at the bottom varied between 40°:7 and 40°°9 Fahr., and in the month of February the whole of the water from the surface to the bottom was between 40°7 and 41° Fahr.

These and other observations showed that, from depths of 400 feet, the variation of temperature with increasing depth is quite insignificant, so that even though the lake might be 1000 feet deep the temperature at 400 feet is only one or two tenths of a degree different from that of the bottom ; further, on many of the thermometers recently used, it is impossible to distinguish with certainty tem- peratures differing by less than half a degree, consequently it was not difficult to believe that in all deep lakes there is a considerable stratum of water which remains constantly at the same temperature, all the year and every year, and that in winter this stratum thickens so as often to fill the lake, and gets thinner again in summer. By the improvement of the instruments both of these suppositions have been shown to be erroneous. In summer and in temperate latitudes, however deep the lake may be, its temperature falls as the depth increases, first rapidly and then very slowly, and the

bottom temperature observed in any summer depends on the nature of the winter which preceded it, and may vary from year to year by one to two degrees. It was also believed that the deep water of a lake preserved constantly the mean winter temperature or the mean temperature of the six coldest months of the year in the locality. This was deduced from some obser- vations by Sir Robert Christison in Loch Lomond, who found the bottom temperature at Tarbet to be 41°-4 Fahr., agreeing with the mean of the six winter months as ob- served at Balloch Castle, which, however, is about 15 miles distant. Although the theorem may be accidentally true for Loch Lomond, it has been proved not to hold for other lakes. Thus Simony (Wien. Sitz. Ber., 1875, lxxi.

435) gives the following table, comparing the tem- perature of the bottom water in the Gmiinder Sce with the winter (October to March) air temperature :?—

Winter Period. Betton Date of Mean Temperature. Temp., Observation of

ee Gmiinder Bottom Oct.-Mar. | Dec.-Feb. See. Temperature.

0 Saki. eae

1867-68 37°5 32°9 40°5 6th Oct. 1868, 1868-89 40°1 36°8 40°5 1st Oct. 1869. 1869-70 35°0 29°3 40°2 26th Sept. 1870. 1871-72 35°2 27°8 40°0 3d Oct, 1872. 1872-73 41°0 35°0 40°5 5th Oct. 1878. 1873-74 390 32°7 1874 40°4 25th Sept. 1874. 1874-75 33°8 28°2 500 39°1 10th April 1875.

It will be seen that, with the exception of the end of 1872, the mean winter temperature is below that of the bottom water, and generally very markedly so.

During 1877-81 observations have been made by the present writer on the distribution of temperature in lakes forming part of the Caledonian Canal. The monthly mean temperatures at Culloden and at Corran Ferry lighthouse, which cannot differ much in climate from Loch Ness

and Loch Lochy respectively, have been supplied by Mr Buchan of the Scottish Meteorological Society. The bottom tem- peratures are those observed in the deepest part of the lakes, namely, 120 fathoms in Loch Ness, and 80 fathoms in Loch Lochy. The connexion between bottom tempera-

2 These air temperatures are those of the observatory at Vienna, corrected for difference of level.

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ture (as observed in the second week of August) and winter temperature can be judged of from the following table, where the mean temperatures of October to March, and also of November to April, are given :—

Culloden. Oct. to

Corran.

Loch Ness. Loch Lochy.

Oct. to | Noy. to

Surfacc.} Bottom. Nov. to Surface.} Bottom.

March. } April. March. | April. 42°3 40°38 42:7 42°5 38°9 37°5 41°9

38°7

From this tableit isapparent that the bottom temperature, even of lakes as deep as Loch Ness, is subject to considerable variation from year to year, that it depends on the tem- perature of the previous winter, and that it is usually

higher than that temperature. The difference between the bottom temperature and the mean winter temperature is greater the lower the

winter temperature is. It is further interesting to notice that the mean winter temperature of 1878-79 was about one degree higher than that of 1880-81, yet the bottom temperatures were 0°°25 lower in 1879 than in 1881, and this is no doubt due to the fact that the cold of 1878-79 was more continuous than that of 1880-81, when the actual temperatures observed were much lower. The temperature of the bottom water de- pends not only on the temperature of the previous winter, and on the depth of the lake; it also depends on the nature of the country where it lies, and especially on its exposure to winds. Winds drive the surface water before them, and if there were no return current it would be heaped up at the further end. The effect is to accumulate surface water at one end, and to draw on deeper water to make up the deficiency at the other end. Hence the prevailing direction of the wind impresses itself on the distribution of temperature in the water ; and this is well shown in the distribution of temperature as determined from observa- tions at five stations on the same day in Loch Ness ina summer after a warm winter, and in one after a cold winter. In Scotland, warm weather is associated with southerly and westerly winds, and cold weather with northerly and easterly winds. In the warm years we have accumulation of surface water at the north-eastern end, and of bottom water at the south-western end, producing in summer a higher mean temperature of water at the north-east, and a lower mean temperature of water at the south-west end. In cold years the reverse isobserved. Thusin 1879, after a cold winter, the mean temperature of the first 300 feet of water at the south-west end of Loch Ness was 48°‘8, and at the north-east end 44°96, a difference of nearly four degrees. In 1880, after a comparatively mild winter, it was 48°°13 at the south-west end, and 47°°95 at the north-east end, or nearly identical temperatures. Even at stations a few hundred yards from each other, great differences are often observed in the temperatures observed at the same depth, and it is evident that the difference of density so produced must cause a certain amount of circulation. There can be but little doubt that, under the influence of the varying temperature of the seasons, and of the winds, the water of a lake is thoroughly mixed once a year. In lakes which do not consist of a single long trough like Loch Ness, but of several basins as Loch Lomond, the bottom temperature is different in the different basins, even when the

depth is the same. Loch Lomond consists of three principal basins of very unequal depth :—the large expanse of water studded with islands at the lower end, the Balloch basin; the middle or Luss basin; and the upper and deepest or Tarbet basin, In the last we have 600 feet of water, in the Luss basin 200 feet, and in the Balloch basin a maximum of

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72 feet of water. On 23d September 1876 the bottom temperature in the Tarbet basin was 41°-4, and in the Luss basin 46°°4. Loch Tummel, a much smaller lake, consists of three basins, each of them being from 100 to 120 feet deep, and in them we have bottom temperatures of 46°:3, 46°:9, and 45°:2, the lowest temperature being nearest the outlet.

It might have been expected that the bottom temperature in lakes similar as regards size and depth would be lower at greater elevations and higher nearer the sea-level. This does not, however, hold universally; thus Lochs Tummel and Garry are very similar in size and depth ; they are only 12 miles from each other, but Loch Tummel is 450 feet and Loch Garry 1330 feet above the sea; yet at 102 feet in Loch Garry the temperature on the 18th August 1876 was 53°°9, and in Loch Tummel at the same depth on the 16th August 1876 it was 45° °4. The difference of elevation is nearly 900 feet, and, instead of the higher lake holding the colder water, its water is 8°°5 warmer than that of the lower one. Similarly in Loch Ericht, 1153 feet above the sea, the bottom temperature at 324 feet was 44°°7, and in Loch Rannoch, 668 feet above sea, at the same depth it was 44°°0, These examples will suffice to show that many circumstances concur in determining the temperatures of the waters of lakes. There is one factor which is often neglected, namely, the amount of change of water. This depends on the drainage area of its tributary streams, and necessarily varies greatly.

In comparing the bottom temperature in lakes with the mean temperatures of the coldest half of the year, we find that the two approach each other more nearly the higher these temperatures are. When the temperature of the air falls for a lengthened period below the

temperature of maximum density of water (39°‘2 Fahr.), then the mechanical effect produced is much the same as if the tem- perature had been raised. For, in virtue of the cooling above, the water will have no tendency to sink; it will rather tend to float as a cold layer on the surface of the warmer and denser water below. Were a lake comparable with a glass of water, that is, were its depth equal to or greater than its length or breadth, it would be possible to realize this ideal condition of things, which, until recently, was supposed to represent what really takes place when a lake is covered with ice, namely, that after the water has all been cooled to a uniform temperature of 39°-2 Fahr. further cooling affects only a small surface layer, which consequently rapidly freezes. If this were the case, we should expect to find the temperature of the water below the ice of a frozen lake increasing rapidly from 32° where it is in contact with the ice to 39°:2 at a short distance from it, and we should expect to find the remainder of the water down to the bottom at the same temperature. In fact, however, the depth of even the deepest lakes bears an insignificant proportion to their superficial dimensions, and temperature observations in summer show that the effective climate, that is, the climate in so far as it is effective for the purpose under consideration, varies much over the surface of even very small lakes. The variations in distribution of temperature produce variations in density which of themselves are sufficient to produce convection currents. Then, asa factor of climate, there are the winds, which are the main mixing agents, and also the movement in the waters caused by the inflow of water at different points and the removal of the excess at one point. The effect of these mechanical agents, winds and currents, 1s to propagate the air temperature at the surface toa greater depth than would otherwise be the case. At the same time it must be remembered that in seasons of great cold there is rarely much wind. If we reflect, however, on what must take place when there is a large expanse of

open water in the middle of a country covered with snow, and exposed to the rigours of a winter night, we see that the air in contact with the surface of the water must get warmed and form an ascending current,

its place being taken by fresh air drafted from the cold land surface, which not only cools the water but forces it out towards the middle, thus establishing a circulation consisting in broad lines of a surface movement from the sides to the middle of the lake, and a movement in the opposite direc- tion below the surface. Even if the current of air were not sufficient of itself to produce a surface current in the water, it would do it indirectly. For, as it first strikes the water at the edges, the water there would get cooled most rapidly, and under suitable circumstances would form a fringe of ice ; the water so cooled would be lighter than the warmer water farther out, and would have a tendency to flow off towards the middle, or with the current of air. Now, although, when compared with other seasons, there is in a hard frosty winter not much wind, still, even in the calmest weather there is almost always sufficient motion in the atmosphere to enable the meteorologist to state that the wind is from a particular quarter; this will assist the circulation which has just been described as taking place in a calm lake, though it will somewhat distort its effects. It will produce excessive cooling at the side nearest the wind, and, when the lake freezes, it will have a tendency to begin at the windward side.

The extent to which this circulation affects the deeper waters of a lake depends on local circumstances, and generally we may say that the more confined a lake is the more easily will it freeze, and the higher will be the mean temperature of its waters. In the very cold winter 1878-79 the writer was able to make observations on the temperature of the water under the ice in Linlithgow Loch and in Loch Lomond. In the following winter, which, though mild in Scotland, was excessively severe in Switzerland, Dr Forel made observations in the Lakes of Morat and Ziirich, confirming the writer’s observations of the unexpectedly low temperature of the water, The freezing of so deep a lake as that of Ziirich was a fortunate circumstance, because in it the bottom is actually at the temperature of maximum density. The majority of the lakes which freeze are so shallow as to admit of the whole of their water being cooled considerably below the temper- ature of maximum density.

The distribution of temperature in frozen lakes will be apparent from the table given below. Of the Lakes of Ziirich and Morat and Loch Lomond the mean temperatures are in the order of their depth. Linlithgow is altogether peeuliar. Its high temperature, which increased steadily all the time it was covered with ice, was due to chemical action amongst the filth which has becn allowed to accumulate at its bottom. When the ice broke up the dead fish were taken away in carts.

Dr Forel gives the following particulars about the frozen Swiss lakes. ‘‘ The Lake of Morat has a surface of 27°4 square kilometres and a maximum depth of 45 metres (147 feet); it is 1425 feet above the sea ; and its mean latitude is 49°56’ N. The ice overspread its whole surface suddenly in the night of the 17th to the 18th Decem- ber, and it remained frozen till the 8th March. The Lake of Ziirich has a superficies of 87°8 square kilometres, a maximum depth of 468 fect and altitude of 1338 feet, and a mean latitude of 47°16’ N. Its congelation was gradual, and not sudden like that of the Lake of Morat. First the upper part of the lake was covered with ice between Mannedorf and Widensweil. At the end of December the 28th, the ice covered it entirely, but only for a single day. On the 29th it thawed, and the lake remained partially free of ice until the middle of January. It froze over completely on the 22d January, and on the 25th the ice was 4 inches thick in the centre of the lake.” Of the larger Swiss lakes, Morat, Ziirich, Zug, Neu- chatel, Constance, and Annecy were frozen in 1880; Thun is known to have been frozen four times, namely, in 1863, 1435, 1685, and 1695 ; Brienz has only once been frozen, in 1363 ; Lucerne freezes partially in very severe winters, and Geneva in its western and shallower part, whilst Wallenstadt and Bourget are not known to have ever been frozen.

Table of Temperatures in Frozen Lakes.

Temperature in Degrees Fahr.

Depth Morat, | Lomond, Linlithgow. (in feet), 23d Dec, | 29th Jan,

1879, 1879.

3 33°00 36:00 6 ‘es 33°50 36°80 18 35°06 33-95 37°80 (Bottom) 48 36°14 35°20 42°05 (Bottom) 65 36°30 36°30 re: 00 26°68 son

(Bottom) 150

200

800

(Bottom) 4385

37°04

Mean: 0

For further information on the tempcraturc of frozen lakes, see Buchanan, Natwre, March 6, 1879; Forel, Arch. de Genéve, 1880, iv. 1; Nichols, Proc. Boston Soc. of Nat. Hist., 1881, xxi. p. 58.

Changes of Level.—As the water supply of lakes depends on the rainfall, and as this varies much with the season, and from year to year, we should expect, and indeed we find, fluctuation of level in all lakes, There are, however, other changes of level which are independent of the water supply, and which resemble tides in their rhythmic periods. They have long been known and observed in Switzerland, and especially on the Lake of Geneva, where they are known by the name of “seiches.” The level of the lake is observed to rise slowly during twenty or thirty minutes to a height which varies from a few centimetres to as many decimetres ; it then falls again slowly to a corresponding depth, and rises again slowly, and soon. These

movements were observed and much studied at the end of last century by Jallabert, Bertrand, and Saussure, and at the beginning of this century they formed the subject of an instructive memoir by Vaucher, who enunciated the following law connecting the seiches with the movements of the barometer. ‘The amplitude of seiches is small when the atmosphere is at rest; the seiches are greater the more variable is the atmosphere’s pressure ; they are the greatest when the barometer is falling.” Vaucher recognized the existence of seiches in the Lakes of Geneva, Neuchatel, Ziirich, Constance, Annecy, and Lugano, and Dr Forel of Morges, from whose papers, published principally in the Bibliotheque Universelle et Revue Suisse during the last five years, the facts regarding the seiches have been taken, has observed them in every lake where he had looked for them. It is in every way likely that they are to be found in all lakes of notable extent and depth. They have been studied principally on the Lake of Geneva, where Dr Forel, at Morges, about the middle of the lake on the north shore, and M. Plantamour, at Sécheron, about a mile from Geneva on the north shore, have had self-registering tide gauges in operation for a number of years. In the writings of the Swiss observers the seiche is the complete movement of rise above and fall below the mean level, the amplitude is the extreme difference of level so produced, and the duration of the seiche is the time in seconds measured from the moment when the water is at the mean level until it is again at the mean level, after having risen to the crest and sunk to the trough of the wave. The amplitude of the seiches is very variable. At the same station and on the same day successive seiches are similar. When the seiches are small they are all small, when they are large they are all large. At the same station and on different days the amplitudes of the seiches may vary enormously. For instance, at Geneva, where the highest seiches have been observed, they are usually of such a size as to be imperceptible without special instruments ; yet on the 3d August 1763 Saussure measured seiches of 1-48 metres, and on the 2d and 3d October 1841 the seiches observed by Vénié were as much as 2°15 metres.

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They are greater at the extremities than at tle middle of lakes, at the head of long gulfs whose sides converge gently than at stations in the middle of a long straight coast, and in shallow as compared with deep lakes or parts of a lake. They also appear to increase with the size of the lake. The duration of the seiches is found to vary considerably, but the mean deduced from a sufficient number of obser- vations is fairly constant at the same locality. Thus, for Morges, Dr Forel has found it to be for the half seiche 315+9 seconds. At different stations, however, on the same lake and on different lakes it varies considerably. Thus on the Lake of Geneva it is, for the complete seiche, 630 seconds at Morges, and 1783 seconds at Veytaux; on Lake Neuchatel it is 2840 seconds at Yverdon, and 264 at Saint Aubin.

The curves traced by the gauge at Geneva have been subjected to a preliminary harmonic analysis by Professor Soret, and he has decomposed them into two undulations, the one with a period, from crest to crest, of seventy-two minutes, and the other with a period of thirty-five minutes, or a little less than half the larger period. As the amplitudes of the composing curves vary much, there is great variety in the resultant curves. Besides these two principal components, there are others which have not yet been investigated.

With regard to the cause of the phenomenon, Dr Forel attributes the ordinary seiches to local variations of atmospheric pressure, giving an impulse the effect of which would be apparent for a long time as a series of oscillations. The greater seiches, such as those of 1’°5 metres, he attributed to earthquake shocks; but, as a very sensible earthquake passed over Switzerland quite recently without leaving the slightest trace on the gauge, he has abandoned this explanation, and is inclined to attribute them to pulsation set agoing by violent downward gusts of wind, especially at the upper end of the lake. M. Plantamour, who has devoted much attention to the same subject, assured the writer, in the summer of 1881, that he was completely at a loss for a satisfactory explanation of them.

Seiches have not been observed on the Scottish lakes, though there is little doubt that they would be found if sought for. There are, however,

records of disturbances of some of tlie lakes, especially in Perthshire, of which the following may be cited as an instance.

A violent disturbance of the level of Loch Tay is reported in the Statistical Account of Scotland (1796), xvii. p. 458, to have occurred at Kenmore on 12th September 1784, continuing in a modified degree for four days, and again on 18th July 1794. Ken- more lies at the north-eastern end of the lake, where the river Tay issues from it. It lies at the end of a shallow bay. ‘At the ex- tremity of this bay the water was observed to retire about 5 yards within its ordinary boundary, and in four or five minutes to flow out again. In this manner it ebbed and flowed successively three or four times during the space of a quarter of an hour, when all at once the water rushed from the east and west in opposite currents, ~~... rose in the form of a great wave, to the height of 5 feet above the ordinary level, leaving the bottom of the bay dry to the distance of between 90 and 100 yards from its natural boundary. When the opposite currents met they made a clashing noise and foamed ; and, the stronger impulse being from the east, the wave after rising to its greatest height, rolled westward, but slowly diminishing as it went, for the space of five minutes, when it wholly disappeared. Asthe wave subsided it flowed back with some force, and exceeded its original boundary 4 or 5 yards; then it cbbed again about 10 yards, and again returned, and continued to ebb and flow in this manner for the space of two hours, the ebbings succeed~~ ing each other, at the distance of about seven minutes, and gradu- ally lessening, till the water settled into its ordinary level. During the whole time that this phenomenon was observed the weather was calm. On the next and four succeeding days an ebbing and flowing Was observed nearly about the same time and for the same length of time, but not at all in the same degree as on the first day.”

_ Theabove is the account given by the Rev. Thomas Fleming, at the time minister of Kenmore, who was an eye witness, It resembles in

not heard (although J have made particular inquiry) that any motion of the earth was felt in this neighbourhood, or that the agitation of the

wave was observed anywhere but about the village of Kenmore." It is well known that there were great seismic movements observed in Perthshire at the time of the Lisbon earthquake, and there is a tradition in the neighbourhood that Loch Lubnaig near Callander be largely increased in extent by the dislocations which tvok piace. ;

In all lakes there are changes of level corresponding with periods of rain and of drought. They are the more considerable the greater the extent of country draining into them, and the more constrained the outflow. In the great American lakes, which occupy nearly one-third of their drainage area, the fluctuations of level are quite insignifi- cant ; in Lake Michigan the U.S. surveyors give as the maximum and minimum yearly range 1°64 and 0-65 feet. In the Lake of Geneva the mean annual oscillation is 5 feet, and the difference between the highest and the lowest waters of this century is 9°3 feet. The most rapid rise has been 3°23 inches (82 mm.) in twenty-four hours. A very remarkable exception to the rule that large freshwater lakes are subject to small variations of level is furnished by Lake Tanganyika in Central Africa. Since its discovery travellers have been much perplexed by the evidence and reports of considerable oscillations of level of uncertain period, and also by the apparent absence of visible outlet, while the freshness of its waters was of itself con- vineing evidence of the existence of an outlet. By the careful observations of successive explorers the nature of this phenomenon has been fully explained, and is very instructive. It has recently been visited by Captain Hore of the London Missionary Society, and it appears from his reports that the peculiar phenomena observed depend on the fact that the area of country draining into the lake is very limited, so that in the dry seasons the streams run- ning into it dry up altogether, and its outlet gets choked by the rapid growth of vegetation in an equatorial climate. A dam or dyke is thus formed which is not broken down until the waters of the lake have risen to a consider- able height. A catastrophe of this kind happened whilst Captain Hore was in the neighbourhood, and he noted the height of the water at different times near his station at Ujiji, and observed it fall 2 feet in two months, It con- tinued to fall until in seventeen months it had fallen over 10 feet. Taking the length of the lake at 330 miles, and the mean breadth at 30 miles, its surface is 9900

square nautical miles. If this surface be reduced 2 feet in sixty days, the water will have to escape at the rate of 137,500 cubic feet per second. The mean rate of discharge of the Danube is 207,000 cubic feet per second. Hence, without taking into account water which would be brought into the lake by tributaries during the two months, we require for outlet a river at least two-thirds of the size of the Danube, and in the Lukuga such a river is found. When Stanley visited it the Lukuga was quite stopped up with dense growth, and no water was issuing; the lake was then rising ; when Captain Hore visited it the lake was falling rapidly, and the Lukuga was a rapid river of great volume. One of the chief affluents to the lake was found to be discharg- ing at the rate of 18,750 cubic feet of water per second ; a few inonths later it was dry and the mouth closed with vegetation. During the dry season too the lake, with its 10,000 square miles of surface, is exposed to the evaporat- ing action of the south-east trade wind, and when the supply is so insignificant this must be sufficient of itself to sensibly lower the level. Ordinarily then we might expect the lake to be subject to a yearly ebb and flow correspond- ing to the periods of drought and rains; and, from what we learn of the great fluctuations of rainfall one year with

all essential particulars the descriptions of waves which accompany | another, we should expect that during a series of dry years

actual earthquakes, yet in his account he goes on to say—‘* I have

the obstructions to the outflow would gain such a head

that the rains of several wet seasons would have to | itis to be hoped that before long we shall have sufficient accumulate before forcing a passage. The result would be | soundings to give a general idea of the size of their basins,

a tide of a period corresponding to the recurrence of series of wet or dry years. Were the lake situated at or near the level of the ocean, its equatorial position would give it such a preponderance of rain over the

whole year as to keep its outlet constantly open; but its actual position, 2700 feet above the sea, produces an alteration in climate, equi- valent to an increase of latitude, which would place it in the trade wind region rather than in that of equatorial calmsand rains, That such is actually the effect is shown by the range of temperature, which is moderate (59° to 83° Fahr.),and the rainfall (27 to 30 inches), which is almost exactly that of London. ‘The Central African lakes, from their immense size and from their equatorial position, possess a peculiar interest for the physical geographer, and

Caspian Sea. Urumich Sea. | Dead Sea. Van Sea. pera Karabugas. 2 1:26217 1°17500 one 1:01800 28°5 22°28 22°13 1:73

Kokonor Sea. Aral Sea. Open. MSPOCINC DVAVILY csecesssoverecccccesccsesescers 1:00907 ct, 101106 Percentage Of Salt..cccccescccccecssescesses 111 1:09 130 Name of Salt. Bicarbonate Of LIME ...cccccccceccessecseeses 0°6804 02185 0°1123 3 99 AVON .ccosvessceccssscesesses 00053 ae 0°0014 5 5; PXIARNESIA .cc.,cceosccrsned 06598 ie Carbonate of soda…. Ong oon see Ace Phosphate of lime. 0°0028 see 00021 Sulphate of lime… ay coe 1°3499 09004 “ magnesia oe 09324 2°9799 8°0855 ” WOU ctscscccceresereererccarrerrs 17241 Ot eas ” POLAT esdencsseccs=scqsesinesnsces “or nce aaa Chloride Of SOdIUM ,.....cccreeseeeesseeeers 6:9008 62356 81163 7 DOUMSSINTD aver osseecsssveesseod 0°2209 071145 01539 noc 0:0055 noe 0°0034 oor 0:0003 0°6115 0:0045 a 0-0081 0°0098 oe 0°0024 Total solid matter .,.....-..000+ 11°1463 10°8987 12:9773

This table embraccs examples of several types of salt lake. In the Kokonor, Aral, and open Caspian seas we have cxamples of the moderately salt, non-saturated waters. In the Karabugas, a branch gulf of the Caspian, the Urumieh, and the Dead Sea we have examples of saturated waters containing principally chlorides. The Van Sea is an example of the alkaline seas which also occur in Egypt, Hungary, and other countries. Their peculiarity consists in the quantity of carbonate of soda dissolved in their waters, which is collected by the inhabitants for domestic and for commercial purposes. The chemical reader will

be struck by the quantity of magnesia salt dissolved in water which contaius so much carbonate of soda. The analysis in the table is by Abich, quoted by Schmidt in his interesting ‘Etudes Hydrologiques,” published in the Bulletin de V Académie de St Petersbourg. Another analysis by De Chancourt, quoted by Bischof, omits all mention of sulphate of magnesia, but inserts the carbonate.

The limits of this article do not admit of the discussion of the many interesting phenomena connected with salt lakes. With regard, however, to a former connexion of the Caspian with the Black Sea, which has been so often suggested, it seems improbable, both on chemical and on physical grounds, that they were ever con- nected as scas, that is, in the same way as the Black Sea is con- nected with the Mediterranean ; but, if we consider the topography of the Caucasus district, we see that the lowest summit level of the land between the two seas is in the Manytsch valley, 86 feet above the Black Sea. Were the climate of the Caspian to change only very slightly for the moister, its waters might easily rise the 196 feet which would enable it to overflow towards the Mediter- ranean, While a relapse towards dryness would be followed by the retreat of the waters, which would be then confined as they are now to the basin of the sea. It is important, therefore, to bear in mind that no terrestrial dislocations are required to produce enor- mous changes in the level of salt lakes; we require only changes of climate, and these very slight. There can be little doubt that, if the climate of the Black Sea extended across the isthmus to the Caspian, the latter would now stand 200 feet higher, would be fresh, and would overflow into the Sea of Azoff.

For other aspects of the subject see GroLocy. OB.)

LAKE DWELLINGS, as their name implies, are habitations constructed, not on the dry land, but within the inargins of lakes or creeks at some distance from the shore. The villages of the Quajiros in the Gulf of Maracaibo are

Grammes Salt in 1000 Grammes Water.

and also temperature observations to show the effect of a vertical sun on large bodies of water at a moderate eleva- tion, and removed from the disturbing influence of oceanic circulation, °

As might be expected, in salt lakes which have no overflow, the yearly rise and fall is often considerable. In the Great Salt Lake in Utah, the greatest depth of which is 56 feet, changes of level are accompanied by great changes in water surface, and also in saltness of water, In the rainy season the Dead Sea stands 10 or 12 feat higher than in the dry season, The following table shows the chemical composition of the waters of various salt lakes, that of the sea-water in the Suez Canal being added for comparison :-—

0°4031 5°3976 oa8 0°7570 tae 61-9350 13°5460 02595 one eee 2°5673 one eee 558 0°5363 eee 832840 192°4100 76°5000 80500 40°4336 99560 ose 23°3000 see 0°6231 0°2510 ose see 0°0265 129°3770 15-4610 95°6000 4°7632 cor 05990 22°4500 eee 0°1930 tes 2°3100 15 0:0779 ee 0°2400 0:0761 0:0027 2849960 222°7730 221°2600 17-2899 5170264

described by Goering as composed of houses with low sloping roofs perched on lofty piles and connected with each other by bridges of planks. Each house consisted of two apartments; the floor was formed of split stems of trees set close together and covered with mats; they were reached from the shore by dug-out canoes poled over the shallow waters; a notched tree trunk served as a ladder ; and the piles were so firmly driven that no shakiness was perceptible even when the houses were crowded with people. In such a climate the advantages of dwelling in houses so situated are obvious. ‘The custom is common both in the Gulf of Maracaibo and in the estuaries of the Orinoco and Amazon; indeed the name of the province of Venezuela was given to it from the prevalence of these pile-dwellings along its shores. A similar system prevails in New Guinea. D’Urville describes four such villages in the Bay of Dorei, containing from eight to fifteen blocks or clusters of houses, each block separately built on piles, and consisting of a row of distinct dwellings accommodating a number of families. Cameron describes three villages thus built on piles in Lake Mohrya in Central

Africa, the motive here being to prevent surprise by bands of slave-catchers. Similar con- structions have been described by travellers, among the Dyaks of Borneo, in Celebes, in the Caroline Islands, on the Gold Coast of Africa, and in other places. Historians have referred to the former existence of the custom in Europe and Asia. Hippocrates, writing in the 5th century B.c., says of the people of the Phasis that their country is hot and marshy and subject to frequent inundations, and that they live in houses of timber and reeds constructed in the midst of the waters, and use boats of a single tree trunk. Herodotus, writing also in the 5th century B.c., describes the people of Lake Prasias as living in houses constructed on platforms supported on piles in the middle of the lake, which are approached from the land by a single narrow

bridge. Abulfeda the geographer, writing in the 13th century, notices the fact that part of the Apamzan Lake was then called the Lake of the Christians, because it was inhabited by Christian fishermen who lived on the lake in wooden huts built on piles. Fishermen's huts roughly constructed of branches of trees and supported on piles placed saltire-wise existed in the shallows of the bays on the European side of the Bosphorus not many years ago, and Sir John Lubbock mentions that the Roumelian fisher- men on Lake Prasias "still inhabit wooden cottages built over the water, as in the time of Herodotus." The records of the wars in Ireland in the 16th century show that the petty chieftains of that time had their defensive strongholds constructed in the "freshwater lochs" of the country, and there is record evidence of a similar system in the western parts of Scotland. The archeological researches of the past few years have shown that such artificial construc- tions in lakes were used as defensive dwellings by the Celtic people of post-Roman and medizval times (see Crannocs). Similar researches on the Continent have also established the fact that in pre-historic times nearly all the shallow lakes of Switzerland, and many in the adjoining countries—in Savoy and the north of Italy, in Austria and Hungary, and in Mecklenburg and Pomerania—were peopled, so to speak, by lake-dwelling communities, living in villages constructed on

platforms supported by piles, at varying distances from the shores. The principal groups are those in the Lakes of Bourgct, Geneva, Neuchatel, Bienne, Zurich, and Constance lying to the north of the Alps, and in the Lakes Maggiore, Varese, Iseo, and Garda lying to the south of that mountain range. Many smaller lakes, however, contain them, and they are also found in peat moors on the sites of ancient lakes now drained or silted up. In some of the larger lakes the number of settlements has been very great. Fifty are enumerated in the Lake of Neuchatel, thirty-two in the Lake of Constance, twenty- four in the Lake of Geneva, and twenty in the Lake of Bienne. Some of these settlements have been of con- siderable size. The site of the lake dwelling of Wangen, in the Untersee, Lake of Constance, forms a parallelogram more than 700 paces in length by about 120 paces in breadth. The settlement at Morges, which is one of the largest in the Lake of Geneva, is 1200 feet long by 150 feet in breadth. The settlement of Sutz, one of the largest in the Lake of Bienne, extends over an area of 6 English acres, and was connected with the shore by a gangway nearly 100 yards long and about 40 feet wide. The sub- structure which supported the platforms on which the dwellings were placed was most frequently of piles driven into the bottom of the lake. Less frequently it consisted of a stack of brushwood or fascines built up from the bottom and strengthened by stakes penetrating the mass so as to keep it from spreading. When piles were used they were simply the rough stems of trees of a length pro- portioned to the depth of the water, sharpened some- times by fire and at other times chopped toa point by hatchets. On their level tops the beams supporting the platforms were laid and fastened by wooden pins, or inserted in mortices cut in the heads of the piles. In some cases the whole construction was furthersteadied and strengthened by cross beams, notched into the piles below the supports of the platform. The platform itself was usually composed of rough layers of unbarked stems, but occasionally it was formed more regularly of boards split from larger stems. When the mud was too soft to afford foothold for the piles they were mortised into a framework of tree trunks placed horizontally on the bottom of the lake. On the other hand, when the bottom was rocky so that the piles could not be driven, they were steadied at their bases by being enveloped in a mound of loose stones, deposited

around and among them, exactly in the nianner in which the foundations of piers and breakwaters are now con- structed. In cases where piles have not been used, as at Niederwyl and Wauwyl, the substructure is a mass of fascines or faggots Jaid parallel and crosswise upon one another with layers of brushwood or of clay and gravel separating the beds of the wooden material, which is steadied and kept in position by upright stakes not driven into the lake bottom,—a few piles here and. there being occasionally fixed throughout the mass to serve as guides or stays. At Niederwyl the platform was formed of split boards, many of which were 2 feet broad aud 2 or 3 inches in thickness. On these substructures were placed the groups of huts composing the settlement; for the peculiarity of these lake dwellings is that they were pile villages, or clusters of huts occupying a common platform. The huts themselves were quadrilateral in form. ‘The size of each separate dwelling is in some cases marked by boards rest- ing edgeways on the platform, like the skirting boards over the flooring of the rooms ina modern house. The walls, which were supported by posts, or by piles of greater length, were formed of wattle-work, coated with clay. The floors were of clay, and in each floor there was a hearth constructed of flat slabs of stone. The roofs were thatched with bark, straw, reeds, or rushes. As the superstructures are in all cases gone, there is no evidence as to the position and form of the doorways, or the size, number, and position of the windows, if there were any. In some cases the remains of the gangways or bridges connecting the settle- ments with the shore have been discovered, but in others the village appears to have been practically insular and accessible only by canoes. Several of these single-tree canoes have been found, one of which is 43 feet in length and 4 feet 4 inches in its greatest width. It is impossible to estimate with any degree of certainty the number of separate dwellings of which any of these villages may have consisted, but at Niederwyl they stood almost contiguously on the platform, the space between them not exceeding 3 feet in width. The size of the huts also varicd consider- ably. At Niederwyl they were 20 feet long and 12 feet wide, while at Robenhausen they were about 27 feet long by about 22 feet wide. The character of the relics associated with the sites of the various settlements dis- closes the fact that in some cases they have been the dwellings of a people using no materials but stone, bone, and

wood for their implements, ornaments, and weapons ; in others, of a people using bronze as well as stone and bone ; and in others again iron and bronze were used. But, though the character of the associated relics is thus changed, there is no corresponding change in the construction and arrangements of the dwellings. The settlement in the Lake of Moosseedorf, near Bern, affords the most perfect example of a lake dwelling of the Stone age. It was a parallelo- gram 70 feet long by 50 feet wide, supported on piles, and having a gaugway built on faggots connecting it with the land. The superstructure had been destroyed by fire. The implements found in the relic bed under it were celts or axe-heads of stone, with their haftings of stag's horn and wood ; a flint saw, set in a handle of fir wood and fastened with asphalt; flint flakes and arrow-heads ; harpoons of stag's horn with barbs; awls, needles, chisels, fish-hooks, and other implements of bone ; a comb of yew wood 5 inches long; and a skate made out of the leg bone of a horse. The pottery consisted chiefly of roughly-made vessels, some of which were of large size, others had holes under the rims for suspension, and many were covered with an encrustation of soot, the result of their use as culinary vessels, Burnt wheat, barley, and linseed, with many varieties of seeds and fruits, were plentifully mingled with the bones of the stag, the ox, the swine, the sheep, and

the goat, representing the ordinary food of the inhabitants, while remains of the beaver, the fox, the hare, the dog, the bear, the horse, the elk, and the bison were also found. The settlement of Robenhausen, in the moor which was formerly the bed of the ancient Lake of Pfaffikon, seems to have continued in occupation after the introduction of bronze. The site covers an area of nearly 3 acres, and is estimated to have contained 100,000 piles. In some parts three distinct successions of inhabited platforms have been traced. The first had been destroyed by fire. It is repre- sented at the bottom of the lake by a layer of charcoal mixed with implements of stone and bone, and other relics highly carbonized. The second is represented above the bottom by a series of piles with burnt heads, and in the bottom by a layer of charcoal mixed with corn, apples, cloth, bones, pottery, and

implements of stone and bone, separated from the first layer of charcoal by 3 feet of peaty sediment inter- mixed with relics of the occupation of the platform. The piles of the third settlement do not reach down to the shell marl, but are fixed in the layers representing the first and second settlements. They are formed of split oak trunks, while those of the two first settlements are round stems chiefly of soft wood, The huts of this last settlement appear to have had cattle stalls placed between them, the droppings and litter forming heaps at the lake bottom. The bones of the animals consumed as food at this station were found in such numbers that 5 tons were collected in the construction of a watercourse which crossed the site. Among the wooden objects recovered from the relic beds were tubs, plates, ladles, and spoons, a flail for threshing corn, a last for stretching shoes of hide, celt handles, clubs, long-bows of yew, floats, and implements of fishing, and a dug-out canoe 12 feet long. No spindle-whorls were found, but there were many varieties of cloth, platted and woven, bundles of yarn, and balls of string. Among the tools of bone and stag's horn were awls, needles, harpoons, scraping tools, and haftings for stone axe-heads. The implements of stone were chiefly axe-heads and arrow-heads. Of clay and earthenware there were many varieties of domestic dishes, cups and pipkins, and crucibles or melting pots made of clay and horse dung and still retaining the drossy coating of the melted metal. No bronze objects have yet been found at Robenhausen, although the presence of the crucibles attests the fact of the use of that metal. The settlement of Auvernier in the Lake of Neuchatel is the richest and most considerable station of the Bronze age. It has yielded four bronze swords, ten socketed spear-heads, forty celts or axe-heads and sickles, fifty knives, twenty socketed chisels, four hammers and an anvil, sixty rings for the arms and legs, several highly ornate torques or twisted neck rings, and upwards of two hundred hair pins of various sizes up to 16 inches in length, some having spherical heads in which plates of gold were set. Moulds for sickles, lance-heads, and bracelets were found cut in stone or made in baked clay. From four to five hundred vessels of pottery finely made and elegantly shaped are indicated by the fragments recovered from the relic bed at this station. In the settlement at Marin in the Lake of Neuchatel iron takes the place of whatever in the older lake dwellings

was made either of stone, bone, or bronze. The swords are well forged, of a peculiarly fibrous iron, and furnished with iron sheaths. The spear-heads are large, sometimes as much as 18} inches in length, with blades indented by segmental curves. Shield mountings, horse trappings, and personal ornaments such as fibulee are here made of iron instead of bronze, and Roman and Gallic eoins found in the relic bed bring the occupation of the settlement distinctly within the historic period. The antiquity of the earlier settlements of the Stone and Bronze ages is not capable of being deduced from existing

evidence. “We may venture to place them,” says Dr Keller, ‘‘in an age when iron and bronze had been long known, but had not come into our districts in such plenty as to be used for the common purposes of household life, at a time when amber had already taken its place as an ornament and had become an object of traffic.” It is now established that the people who erected the lake dwellings in Switzerland were also the people who were spread over the mainland. The forms and the ornamentation of the implements and weapons of stone and bronze which are found in the lake dwellings are the same as those of the implements and weapons in these materials which are found in the soil of the adjacent regions, and both groups of relics must therefore be ascribed to the industry of one and the same people. Whether dwelling on the land or dwelling in the lake, they have exhibited so many indica- tions of capacity, intelligence, industry, and social organi-zation that they cannot be considered as presenting, even in their Stone age, a low condition of culture or civilization. Their axes were made of tough stones, sawn from the block by flint, and ground to the fitting shape. They were fixed by the butt in a socket of stag’s horn, mortised into a handle of wood. Their knives and saws of flint were mounted in wooden handles and fixed with asphalt. They made and used an endless variety of bone tools. Their pottery, though roughly finished, is well made, the vessels often of large size and capable of standing the fire as cook- ing utensils. For domestic dishes they also made wooden tubs, plates, spoons, ladles, and the like. The industries of spinning and weaving were largely practised. They made nets and fishing lines, and

used canoes. They practised agriculture, cultivating several varieties of wheat and barley, besides millet and flax. They kept horses, cattle, sheep, goats, and swine. Their clothing was partly of linen and partly of woollen fabrics and the skins of their beasts. Their food was nutritious and varied, their dwellings neither unhealthy nor incommodious. They lived in the security and comfort obtained by social organi- zation, and were apparently intelligent, industrious, and prosperous communities.

The materials for the investigation of this singular phase of pre-historic life were first collected and systematized by the late Dr Ferdinand Keller, who died at Ziirich, July 21, 1881, in the eighty- first year of his age. They were submitted in a series of seven suc- cessive reports to the Society of Antiquaries of Ziirich, of which he was president, and printed in the Society's Transactions, Mittheil- ungen der Antiquarischen Gesellschaft in Zitrich, vols. i.-xix., 4to, 1855-76. The substance of these reports has also been issued as a separate workin England, The Lake Dwellings of Switzerlandand other parts of Europe, by Dr Ferdinand Keller, trauslated and arranged by John Edward Lee, 2d ed., 2 vols. 8vo, London, 1878. Other works on the same subject are Frédéric Troyon, Habitations Laecustres des temps aneiens et modernes, 8vo, Lausanne, 1860; E. Desor, Les Palafittes ow Constructions Lacustres du Lac de Neuchatel, 8vo, Paris, 1865; E. Desor and L. Favre, Le Bel Age du Bronze Laeustre en Swisse, folio, Paris, 1874; A. Perrin, Etude préhistorique sur la Savoie speeialement a Tépoque lacustre (Les Palayittes du Lae de Bourget), 4to, Paris, 1870; Ernest Chantre, Les Palafittes ou Con- structions Laeustres du Lae de Paladru, folio, Chambery, 1871; Bartolomeo Gastaldi, Lake Habitations and prehistorie Remains in the Turbaries and Marl-beds of Northern and Central Haly, traus- lated by C. H. Chambers, 8vo, London, 1865 ; Sir John Lubbock, Prehistorie Times, 4th ed., 8vo, London, 1878. (J. AN.)

LAKHIMPUR, or Lucximpoor, a British district in the extreme east of the province of Assam, extending from 26°

51' to 27° 54' N. lat., and from 93° 49' to 96° 4' E. long.

It lies along both banks of the Brahmaputra, which belongs to the district for about 400 miles of its course; and it is bounded N. by the Daphla, Miri, Abar, and Mishmi hills, E. by the Mishmi and Singpho hills, S. by the watershed of the Patkai range and the Lohit branch of the Brahma- putra, and W. by the districts of Darrang and Sibsagar. To the north and north-east the frontier is undefined. The Brahmaputra is navigable for steamers in all seasons as far

as Dibrugarh, in the rainy season as far as Sadiya; its navigable tributaries within the district are the Subansiri, Dibru, and Buri Dihing. The greater part of the area (11,500 square miles) is sparsely occupied by independent hill tribes, and only 3200 square nuiles are directly under British administration. The elephant, rhinoceros, bear, buffalo, wild cattle, and deer are abundant; the captur- ing of elephants is a Government monopoly worth from £3000 to £4500 annually. Coal and petroleum (both worked for a short time about 1866), building stone, lime- stone, and ironclay exist in the district ; and gold has been washed in the hill streams from time immemorial. Rice was grown on 39,460 acres in 187]. Tea is grown with European capital and under European supervision, and has in recent years made great progress, the plantations in 1874 covering 89,370 acres. Silk cloth is made from the cocoons of the mugdé worm (Saturnia assamungis), which feeds on the sam tree; but the manufacture. has greatly fallen off. A thousand cocoons yield 6 or 8 oz. of thread, worth 10s. to lls. per pound. The exports of Lakhimpur are tea, muga silk, india-rubber, beeswax, ivory, and mustard seed ; the imports rice, opium, tobacco, salt, oil, and cotton cloth. The annual fair established by the Government at Sadiya is less of commercial than of political importance.

The population of the settled district in 1871-72 was 121,267, residing in 125 villages, and including 28,388 aborigines, 68,388 semi-Hinduized aborigines, 19,748 caste Hindus, 3826 Moham- inedans. The most numerous Hindu easte was the Kolitd (3406), the former priests of the aboriginal kings of Assam; they have now taken to agriculture, and rank as pure Stdras. Of the semi- Hinduized aborigines

the most numerous tribe is the Aham, the former rulers of the country (48,942). The hill tribes of the unsettled district are broadly distinguished into a Shan group (Khamtis and Singphos) and an Indo-Chinese group (Mishmis, Abars, Miris, Daphlas, &c.). Most, if not all of them, have sent out little colonies who settle on the borders of the plains. There are no towns in the Lakhimpur district. Dibrugarh, on the Dibru, a few miles above its junction with the Brahmaputra, is the chief civil station, with a population of 3870 in 1872. Lakhimpur figures largely in the annals of Assam as the region where succcs- sive invaders from the east first reached the Brahmaputra. The Bara Bhuiyas, originally from the western provinees of India, were driven out by the Chutias (a Shan race), and these in their turn gave place to their more powerful brethren, the Ahams, in the 13th century. The Burmese, who had ruined the native kingdoms, were expelled by the British in 1825; but it was not till 1839 that the country was taken under direet British management.

LALANDE, Joseru Jiréme Lerrangais pe (1732- 1807), a noted astronomer, was born at Bourg (department of Ain), July 11, 1732. His parents, who were in easy circumstances, sent him to Paris to study the law; but the accident of lodging in the Hétel Cluny, where Delisle had his observatory, determined his astronomical vocation, and he became the zealous and favoured pupil of both Delisle and Lenionnier. He, however, completed his legal studies, and was on the point of returning to Bourg to practise there as an advocate, when Lemonnier obtained permission to send him, in his own place, to Berlin, for the purpose of making observations on the lunar parallax in concert with those of Lacaille at the Cape of Good Hope. The success- ful execution of his task procured for him, before he was twenty-one, admission to the Academy of Berlin, and the post of adjunct astronomer to that of Paris. He now devoted himself to the improvement of the planetary theory, publishing in 1759 a corrected edition of Halley’s tables, with a history of the celebrated comet whose return In that year he had aided Clairaut to calculate. In 1762, Delisle resigned in his favour the chair of astronomy in the Collége de France, the duties of which were discharged by Lalande with éclat during forty-six years. His house became an astronomical seminary, and amongst his pupils Were

Delambre, Piazzi, Mechain, and his own nephew, Michel Lalande. By his publications in connexion with the transit of 1769 he won great and, in some respects,

deserved fame. But his love of notoriety fully equalled his scientific zeal, and earned for him as much ridicule as his impetuous temper did hostility. These faults were partially outweighed by his generosity and benevolence. A strict adherence to hygienic rules long preserved his health, but eventually shortened his life. He died April 4, 1807, of consumption aggravated by systematic exposure to cold.

Although his investigations were conducted with diligence rather than genius, the career of Lalande must be regarded as of eminent service to astronomy. By his talents as a lecturer and writer he gave to the science unexampled popularity ; his planetary tables, into which he introduced corrections for mutual perturbations, were the best available up to the end of the last century; and the Lalande prize, instituted by him in 1802 for the chief astronomical performance of each year, still testifies to his enthusiasm for his favourite pursuit. Amongst his voluminous works are Z'ratté @ Astronomie, 2 vols. 4to, 1764 (enlarged edition, 4 vols., 1771-81, 3d edition, 3 vols., 1792) ; Histoire céleste Frangaise, 1801, giving the places of 50,000 stars ; Bibliographic astronomique, 1808, with a history of astronomy from 1781 to 1802; Astronomie des Dames, 1785 ; Abrégé de Navigation, 1793 ; Voyage d'un Francois en Italie, 1769, a valuable record of his travels in 1765-66. He communicated above one hundred and fifty papers to the Paris Academy of Sciences, edited the Connotssance des T'emps,'1759-1774, and again 1794- 1807, and wrote the concluding 2vols. of the 2d edition of Montucla's Histoire des Mathématiques, 1802.

LALITPUR, or Luxiirpoor, a British district in the lieutenant-governorship of the North-Western Provinces, India, extending from 24° 9' to 25° 14' N. lat., and from 78° 12' to 79° 2' KE. long., with an area of 1947 square miles. It is bounded N. and W. by the river Betwa, 8. W. by the Narayan, 8. by the Vindhyachal Ghats and the Sagar

(Saugor) district of the Central Provinces, S.E. and E. by Orchha state and the Dhasan. The district is an undulating plain about 1500 feet on an average above the sea-level, in the hill country of Bundelkhand, sloping gradually northwards from the Vindhya range to the Betwa and Jumna. It is drained by several important tributaries of the Jumna, and an immense number of smaller streams ; but their rapid and frequently swollen currents, instead of fertilizing, impoverish the land and sweep away embank- ments and bridges. The general condition of the district is far from prosperous. A large proportion of the area is covered with jungle, and the poor-looking villages are few and far between. Only 366 square miles were under tillage in 1872; the food stuffs (mainly wheat, grain, barley, and millet) are never produced in much greater quantity than is necessary for local consumption, and a bad year results in scarcity, if not famine. As but little is done in the way of irrigation, the spring harvest is a very poor one; and if the rainfall sinks much below its average of 40 inches the autumn harvest is also scanty.

In 1865 the population was 248,146; in 1872 it was only 212,661, while the number of villages had fallen from 750 to 646. About 98 per cent. (207,788) of the inhabitants in 1872 were Hindus—the Brahmans numbering 20,657, Rajputs 20,985, Banias 11,356. The Rajput Bundelas are the most important socially, the Banias coin- mercially. A few Gonds are found in the south, and about 10,000 Sahariyas, a degraded body of savages known to the police through- out India as professional thieves, are scattered throughout the jungle. The district is administered on the non-regulation system bya deputy-commissioner. The only municipality is Lalitpur town (population 8976 in 1872). The Gonds are the earliest known in- habitants of Lalitpur ; they have left traces of their ultimate high state of civilization in temples and reservoirs. They were succeeGea by the Chandel princes of Mahoba, who in their turn gave place to a number of petty independent rulers. In the 14th century the Bundelas invaded the country, and Lalitpur finally became a part of the state of Chanderi, which eontinued for the most part prac- tically independent till the beginning of the 19th century, when Sindhia, provoked by raids into Gwalior, sent Colonel Baptiste against Lalitpur, and took the government under his direct control. In 1829 two-thirds of his territory was restored to the Chandert

sovereign. The remainder of the country, whieh was retained by Sindhia, was in 1844 made over to the British Government. The Bundela chiefs of Lalitpur were among those who most euety joined the mutiny, and it was only after a severe struggle that the district was again pacified. .

LALLY, Tuomas Arruur, Baron Ds TotLEenpat, Count pE (1702-1766), French general, descended from an old Irish family who emigrated to France along with the Stuarts, was born in Dauphiné in January 1702. His father, colonel in an Irish-French regiment, familiarized him with active service from his boyhood, and he rose step by step in a career distinguished for bravery and conduct till in 1744 he was created a brigadier by Louis XV. on the field of Fontenoy. Previous to this he had been engaged in several plots for the restoration of the Stuarts, and in 1745 he accompanied Charles Edward to Scotland, serving as aide-de-camp at the battle of Falkirk. Escaping in dis- guise to France, he joined the army of Marshal Saxe in the Low Countries, and for his conduct at the capture of Maestricht in 1748 received the grade of marshal of the camp. When the French in 1756 resolved to fit out an expediton to recover their power in India, Lally was appointed to the chief command. Arriving at Pondicherri in 1758, he alarmed the English by his first successes, and even laid siege to Madras. But he was ill supported by his countrymen, his military chest was empty, and his bravery and zeal were not combined with the qualities necessary for success in Indian administration. Madras was relieved by a British fleet, and the English under Coote assumed the offensive, and inflicted a severe defeat on Lally at Wandiwash. He still made a long and stubborn resistance, but was ultimately besieged in Pondicherri and compelled to surrender in January 1761. Returning to France on parole, he was thrown into prison, Popular indignation at the collapse of French power in India demanded a victim, and the parliament of Paris sentenced him to death on a vague and frivolous accusa- tion, The judicial murder of Lally (9th May 1766) was

exposed by Voltaire, and his son Lally-Tollendal obtained in 1778 the formal reversal of the sentence,

LAMAISM is partly religious, partly political. Religi- ously it is the corrupt form of Buddhism prevalent in Tibet and Mongolia. It stands in a relationship to primitive Buddhism similar to that in which Roman Catholicism, so long as the temporal power of the pope was still in existence, stood to primitive Christianity. The ethical and metaphysical ideas most conspicuous in the doctrines of Lamaism are not confined to the highlands of Central Asia, they are accepted in great measure also in Japan and China. It is the union of these ideas with a hierarchical system, and with the temporal sovereignty of the head of that system in Tibet, which constitutes what is distinctively understood by the term Lamaism. Lamiaism is hardly calculated to attract much attention for its own sake, Tibetan superstitions and Tibetan politics are alike repug- nant to Western minds. But, as so many unfounded beliefs and curious customs have a special value of their own to the student of folklore, so Lamaism has acquired a special a the ah at of comparative history through the instructive parallel which its histor a ee y presents to that of

The central point of primitive Buddhism was the doctrine of "Arahatship,"—asystem of ethicaland mental self-culture, in which deliverance was found from all the mysteries and sorrows of life in a change of heart to be reached here on earth. This doctrine seems to have been held very nearly in its original points from the time when it was propounded by Gotama in the 5th century Bc. down to the period in which northern India was invaded and conquered by the Huns at about the commencement of the Christian era. At that time there had arisen a school of Buddhist teachers who called their doctrine the "Great Vehicle." It was not in any contradiction to the older doctrine, which they contemptu- ously called the "Little Vehicle," but included it all, and was based upon it. The distinguishing characteristic of the

newer school was the importance which it attached to ‘“‘Bodisatship." The older school had taught that Gotama, who had propounded the

doctrine of Arahatship, was a Buddha, that only a Buddha is capable of discovering that doctrine, and tliat a Buddha is a man who by self-denying efforts, continued through many hundreds of different births, has acquired the so-called Ten Paramitas or cardinal virtues in such perfection that he is able, when sin and ignorance have gained the upper hand throughout the world, to save the human race from impending ruin.} But until the process of perfection has been completed, until the moment when at last the sage, sitting under thie Bo tree, acquires that particular insight or wisdom which is called Enlightenment or Buddhahood, he is still only a Bodisat. And the link of connexion between the various Bodisats in the future Buddha's successive births is not a soul which is transferred from body to body, but the karma, or character, which each successive Bodisat inherits from his predecessors in the long chain of existences. Now the older school also held, in the first place, that, when a man had, in this life, attained to Arahatship, his karma would not pass on to any other individual in another life,—or in other words, that after Arahatship there would be no rebirth ; and, secondly, that four thousand years after the Buddha had proclaimed the Dhamma or doctrine of Arahatship, his teaching would have died away, wicked- ness and ignorance would have increased in the world, and another Buddha would be required to bring mankind once more to a knowledge of the truth. The leaders of the Great Vehicle urged their followers to seek to attain, not so much to Arahatship, which would involve only their own salvation, but to Bodisatship, by the attainment of which they would be conferring the blessings of the Dhamma upon countless multitudes in the long ages of the future. By thus laying stress upon Bodisatsbip, rather than upon Arahatship, the new school, though they doubtless merely thought themselves to be carrying the older orthodox doctrines to their logical conclusion, were really changing the central point of Buddhism, and were altering the direction of their mental vision. It was of no avail that they adhered in other respects in the main to the older teaching, that they professed to hold to the same ethical system, that they adhered, except in a few unim- portant details, to the old regulations of the order of the Buddist mendicant recluses. The ancient books, still preserved to us in the Pali Pitakas, being mainly occupied with the details of Arahatship, lost their exclusive value in the eyes of

those whose attention was being directed to the details of Bodisatship. And the opinion that every leader in their religious circles, every teacher distinguished among them for his sanctity of life, or for his extensive learning, was a Bodisat, who might have and who probably had inherited the karma of some great teacher of old, opened the door to a flood of superstitious fancies,

It is worthy of note that the new school found its earliest professors and its greatest expounders in a part of India which lay outside the districts to which the personal influence of Gotama himself and of his immediate followers had been confined. The home of early Buddhism was round about Kosala and Magadha ; in the district, that is to say, north afd south of the Ganges between where Allahabad now lies on the west, and Rajgir on the east. The home of the Great Vehicle was, at first, in the countries farther to the north and west. Buddhism arose in countries, subject indeed to Brahman influence, but where the sacred language of the Brahmans was never more than a learned tongue, and where the exclusive

xl Hc for instance, the Buddhist Birth Stories, pp. 19-27 and

claims of the Brahmans had never been universally admitted. The Great Vehicle arose in the very stronghold of Brahmanism, and among a people to whom Sanskrit was a familiar tongue. The new literature therefore, which the new movement called forth, was written, and hag been preserved, in Sanskrit,—its principal books of Dharma, or doctrine, being the following nine :—(1) Prajid-paramita ; (2) Ganda-vyiiha ; (3) Dasa-bhiimes- vara; (4) Samddhi-rdja; (5) Laikdvatara; (6) Sad- dharma-pundarika ; (7) Tathagata-guhyaka ; (8) Lalita- vistara; (9) Suvarna-prabhdsa, The date of none of these works is known with any certainty, but it is highly improbable that any one of them is older than the 6th century after the death of Gotama. Copies of all of them were brought to Europe by Mr B. H. Hodgson, and other copies have been received since then; but none of them have as yet been published in Europe (the Lalita Vistara has been published by Rajendra Lal Mitra in Calcutta), and only two have been translated into any European

language. These are the Lalita Vistara, translated into French, through the Tibetan, by M. Foucaux, and the Saddharma Pundarika, translated into French by M. Eugéne Burnouf, The former of these two is a legendary work, partly in verse, ou the life of Gotama, the historical Buddha; and the latter, also partly in verse, is devoted to proving the essential identity of the Great and the Little Vehicle and the equal authenticity of both as doctrines enunciated by the master himself.

Of the authors of these nine works, as indeed of all the older Buddhist works with one or two exceptions, nothing has as yet been ascertained. The founder of the system of the Great Vehicle is, however, often referred to under the name of Nagarjuna or Nagasena, a personage cele- brated even in the countries to which the Greater Vehicle has never penetrated as the contemporary and religious instructor of the Yavana king Milinda, and as the answerer of the famous Questions of Milinda, a work still preserved in its Pali form.) As Milinda may with all probability be identified with the Greek king Menander, who was one of the followers of Alexander the Great in Bactria, this tradition would imply that the origin of the Great Vehicle must be assigned to as early a date as the 2d century B.c. But the work itself was probably composed at least some centuries afterwards ; and it would be hazardous to attach too much importance to any chronological data drawn from it. We must be content at present to settle a certain his- torical sequence in the principal doctrines of the system which developed into Lamaism, without pretending to fix any actual dates.

Together with Nagasena, other early teachers of the Great Vehicle whose names are known to us are Vasumitra or Vasubandhu, Aryadeva, Dharmapala, and Gunamati—all of whom were looked upon as Bodisats. As the newer school did not venture so far as to claim as Bodisats the disciples stated in the older books to have been the contem- poraries of Gotama (they being precisely the persons known as Arahats), they attempted to give the appearance of age to the Bodisat theory by representing the Buddha as being surrounded, not only by his human companions the Arahats, but also by fabulous beings, whom they repre- sented as the Bodisats existing at that time. In the open- ing words of each Mahay4na treatise a list is given of

such Bodisats, who were beginning, together with the historical Bodisats, to occupy a position in the Buddhist church of those times similar to that occupied by the saints in the corresponding period of the history of Christianity in the Church of Rome. And these lists of fabulous Bodisats have now a distinct historical importance. For they grow

1 Edited by Dr V. Trenckner, London, 1880.

in length in the later works; and it is often possible by comparing them one with another to fix, not the date, but the comparative age of the books in which they occur. Thus it is a fair inference to draw from the shortness of the list in the opening words of the Lalita Vistara, as compared with that in the first sections of the Saddharma Pundarika, that the latter work is much the younger of the two, a conclusion supported also by other considerations.

Among the Bodisats mentioned in the Saddharma Pundarika, and not mentioned in the Lalita Vistara, as attendant on tlie Buddha are Manju-sri and Avalokitesvara. Thatthese saints were already acknowledged by the followers of the Great Vehicle at the beginning of the 5th century is clear from the fact that Fa Hian, who visited India about that time, says that “men of the Great Vehicle” were then worshipping them at Mathura, not far from Delhi (F. H., chap. xvi.). These were supposed to be celestial beings who, inspired by love of the human race, had taken the so-called Great Resolve to become future Buddhas, and who therefore, very naturally, descended from heaven when the actual Buddha was on earth, to pay reverence to him, and to learn of him. The belief in them probably arose out of the doctrine of the older school, which did not deny the existence of the various creations of Brahmanical mythology and speculation, but allowed of their actual existetice as spiritual beings, and only deprived them of all power over the lives of men, and declared them to be temporary beings liable like men to sin and ignorance, and requiring like men the salvation of Arahatship. Among them the later Buddhists seem to have placed their numerous Bodisats ; and to have paid especial reverence to Manju-sri as the personification of wisdom, and to Avalokiteswara as the

personification of overruling love. The latter indeed occupies in the Mahayana very much the position which the old Brahmanical god Brahma, the First Cause of the Brahmanical speculation, had been allowed to retain in primitive Buddhism. The former was afterwards identified with the mythical first Buddhist missionary, who is supposed in the legend to have introduced civilization into Tibet' about two hundred and fifty years after the death of the Buddha.

The way was now open to arapid fall from the simplicity of early Buddhism, in which men's attention was directed to the various parts of the system of self-culture which men could themselves practise, to a belief in a whole pantheon of saints or angels, which appealed more strongly to the half- civilized races among whom the Great Vehicle was now professed. A theory sprang up which was supposed to explain the marvellous powers of the Buddhas by represent- ing them as only the outward appearance, the reflexion, as it were, or emanation, of ethereal Buddhas dwelling in the skies. These were called Dhydnut Buddhas, and their nuinber was supposed to be, like that of the Buddhas, innumerable. Only five of them, however, occupied any space in the speculative world in which the ideas of the later Buddhists had now begun to move. But, being Buddhas, they were supposed of course to have their Bodisats ; and thus out of the five last Buddhas of the earlier teaching there grew up five mystic trinities, each group consisting of one of these five Buddhas, his prototype in heaven the Dhyani Buddha, and his celestial Bodisat. Among these hypothetical beings, the creations of a sickly scholasticism, hollow abstractions without life or reality, the particular trinity in which the historical Gotama was assigned a subordinate place naturally occupied the most exalted rank. Amitabha, the Dhyani-Buddha of this trinity, soon began to fill the largest place in the minds of the new school; and Avalokiteswara, his Bodisat, was looked upon with a reverence somewhat less than his former glory. It is needless to add that, undor the overpowering

influence of these vain imaginations, the earnest moral teachings of Gotama became more and more hid from view. The imaginary saints grew and flourished. Each new creation, each new step in the theory, demanded another, until the whole sky was filled with forgeries of the brain, and the nobler and simpler lessons of the founder of the religion were hidden beneath the glittering stream of metaphysical subtleties.

Still worse results followed on the change of the earlier point of view. The acute minds of the Buddhist pandits, no longer occupied with the practical lessons of Arahat- ship, turned their attention, as far as it was not engaged upon their hierarchy of mythological beings, to questions of philosophical speculation, which, in the earliest Buddhism, are not only discouraged but forbidden. We find long treatises on the nature of being, idealistic dreams which have as little to do with the Bodisatship that is concerned with the salvation of the world as with the Arahatship that is concerned with the perfect life. Only one lower step was possible, and that was not long in being taken. The animism common alike to the untaught Huns and to their Hindu conquerors, but condemned in early Bnd- dhism, was allowed to revive. As the stronger side of Gotama's teaching was neglected, the debasing belief in rites and ceremonies, and charms and incantations, which had been the especial object of his scorn, began to live again, and to grow vigorously, and to spread like the Birana weed warmed by a tropical sun in marsh and muddy soil. As in India, after the expulsion of Buddhism, the degrading worship of Siva and his dusky bride had been incorporated into Brahmanism from the wild and savage devil worship of Aryan and of non-Aryan tribes, so, as pure Buddhism died away in the north, the Zantra system, a mixture of magic and witchcraft and sorcery, was incorporated into the corrupted Buddhism.

The founder of this system seems to have been Asanga, an influential monk of Peshawar, in the Punjab, who lived and wrote the first text-book of the creed, the Yogdchchara Bhiimi Sastra, about the 6th century of our era. Hwen Tsang, who travelled in the first half of the 7th, found the monastery where Asanga had lived in ruins, and says that he had lived one thousand years after the Buddha.} He managed with great dexterity to reconcile the two opposing systems by placing a

number of Saivite gods or devils, both male and female, in the inferior heavens of the then prevalent Buddhism, and by representing them as worshippers and supporters of the Buddha and of Avalokitesvara. He thus made it possible for the half- converted and rude tribes to remain Buddhists while they brought offerings, and even bloody offerings, to these more congenial shrines, and while their practical belief had no relation at all to the Truths or the Noble Eightfold Path, but busied itself almost wholly with obtaining magic powers (Stddhi), by means of magic phrases (Dharani), and magic circles (Jfandala). Asanga's happy idea bore but too ample fruit. In his own country and Nepal the new wine, sweet and luscious to the taste of savages, com- pletely disqualified them from enjoying any purer drink ; and now in both countries Saivism ig supreme, and Buddhism is even nominally extinct, except in some outlying districts of Nepal. But this full effect has only been worked out in the lapse of ages ; the Tantra literature has also had its growth and its development, and some unhappy scholar of a future age may have to trace its loathsome history. The nauseous taste repelled even the self-sacrificing industry of Burnouf, when he found the later Tantra books to be as immoral as they are absurd.

1 Rémusat's translation, Mémoires sur les Contrécs Occidentales, p. 270; and La Vie de Hiouen Thsang, p. 94.

"The pen," he says, 'refuses to transcribe doctrines as miserable in respect of form as they are odious and degrading in respect of meaning."

Such had been the decline and fall of Buddhism con- sidered as an ethical system before its introduction into Tibet. The manner in which its order of mendicant re- cluses, at first founded to afford better opportunities to those who wished to carry out that system in practical life, developed at last into a hierarchical monarchy will best be understood by a sketch of the history of Tibet.

In Tibet as elsewhere the beginnings of the accounts found in the old historians are merely a recapitulation of legends in which popular

tradition has explained by miraculous and mythological fancies the origins of its civilization, Its real history commences with Srong Tsan Gampo, who was born a little after 600 a.D., and who is said in the Chinese chronicles to have entered, in 634 after Christ, into diplomatic relationship with Thai Tsung, one of the emperors of the Thung dynasty. He was the fouuder of the present capital of Tibet, now known as Lhasa; and in the year 622 (the same year as that in which Mohammed fled from Mecca) he began the formal introduction of Buddhism into Tibet. For this purpose he sent the minister Thumi Sambhota, afterwards looked upon as an incarnation of Maiiju-sri, to India, there to collect the sacred books, and to learn and translate them. Thumi Sambhota accordingly invented an alphabet for the Tibetan language on the model of the Indian alphabets then in use. And, aided by the king himself, who is represented to have been an industrious student and translator, he wrote the first books by which Buddhism became known in his native land. The most famous of all the works ascribed to him isthe Mani Kambum, “the Myriad of Precious Words,”—a treatise chiefly on religion, but which also contains an account of the introduction of Buddhism into Tibet, and of the closing part of the life of king Srong Tsan Gampo. He is also very probably the author of another very ancient standard work of Tibetan Buddhism, the Samatog, a short digest of Buddhist morality, on which the civil laws of

Tibet have been founded. Itis said inthe Afant Kambum |

to have fallen down from heaven in a casket (Tibetan, samatog), and, like the last-mentioned work, is unfortun- ately only known to us in meagre abstract.

King Srong Tsan Gampo’s zeal for Buddhism was shared and supported by his two queens, the one named Bribsun, a princess from Nepal, the other named Wen Ching, a princess from China. They are related in the chronicles to have brought with them sacred relics, books, and pictures, for whose better preservation and honour two large mona- steries were erected, and opened and dedicated with much ceremony. These are the cloisters of La Brang and Ra Mochay, still,

though much changed and enlarged, the most famous and sacred abbeys in Tibet, and the glory of Lhasa. In after times the two queens have become semi- divine personages, and are worshipped under the name of the two Dara-Eke, the *‘ glorious mothers,” being regarded as incarnations of the wife of Siva, representing respectively two of the qualities which she personifies, divine vengeance and divine love. The former of the two is worshipped by the Mongolians as Okkin Tengri, “the Virgin Goddess ;” but in Tibet and China the réle of the divine virgin is filled by Kwan Yin, a personification of Avalokitesvara as the heavenly word, who is often represented with a child in her arms, Srong Tsan Gampo has also become a saint, being looked upon as an incarnation of Avalokitesvara ; and the description in the ecclesiastical historians of the measures he took for the welfare of his subjects do great credit to their ideal of the perfect Buddhist king. He is

2 Introduction, &c., p. 558.

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said to have spent his long reign in the building of reservoirs, bridges, aud canals; in the promotion of agri- culture, horticulture, and manufaetures; in the establish- ment of schools and eolleges; and in the maintenance of justice, and the encouragement of virtue. But the degree of his suecess must have been slight. For after the death of himself and of his wives Buddhism gradually decayed, and was subjected by suceeceding kings to eruel persecu- tions; and it was not till more than half a century after- wards, under King Kir Song de Tsan, who reigned 740-786, that true religion is aeknowledged by the ecclesiastical historians to have become firmly established in the land.

This monarch again sent to India to replace the sacred books that had been lost, and to invite Buddhist pandits to translate them. The most distinguished of those who came were Santa Rakshita, Padma Sambhava, and Kamala Sila, for whom, and for their companions, the king built a splendid monastery still existing, at Samje, about three days’ journey south-east of Lhasa. It was to them that the Tibetans owed the great collection of what are still regarded as their sacred books—the Kandjur. It consists of 100 volumes containing no less than

689 works, of which there are two or three complete sets in Europe, one of them in the India Office Library. A detailed analysis of these Scriptures has been published by the celebrated Hungarian scholar Csoma de Korés, whose authoritative work has lately been republished in French with complete indices and very useful notes by M. Léon Feer. These volumes contain about a dozen works of the oldest school of Buddhism, the Hinayana, and about 300 works, mostly very short, belonging to the Tantra school. But the great bulk of the collection consists of Mahayana books, belonging to all the previously existing varieties of that widely extended Buddhist sect; and, as the Sanskrit originals of many of these writings are now lost without hope of recovery, the Tibetan translations will be of great value, not only for the history of Limaism, but also for the history of the later forms of Indian Buddhism.

The last king's seeond son, Lang Darma, concluded in May 822 a treaty with the then emperor of China (the twelfth of the Thang dynasty), a record of which was engraved on a stone put up in the above mentioned great eonvent of La Brang, and is still to be seen there! He is deseribed in the church chronicles as an incarnation of tle evil spirit, and is said to have tried his best to overthrow religion, and to have succeeded in suppressing Buddhism throughout the greater part of the land. The period from Srong Tsan Gampo down to the death of Lang Darma, who was eventually murdered about 850 a.p., in a civil war, is called in the Buddhist books 'the first introduction of religion." It was followed by more than a eentury of civil disorder and wars, during which the exiled Buddhist monks attempted unsuccessfully again and again to return. Many are the stories of martyrs and eonfessors who are believed to have lived in these troublous times, and their efforts were at last crowned with success, for in the century com- mencing with the reign of Bilamgur in 971 there took place "the second introduction of religion" into Tibet, more especially under the guidance of the Pandita Atisha, who came to Tibet in 1041, and of his famous native pupil and follower Brom Ston. The long period of depres- sion seems not to have been without a beneficial influence on the persecuted Buddhist Church, for these teachers are

reported to have placed the Tantra system more in the background, and to have adhered more strongly to the

purer forms of the Mahayana development of the ancient faith,

1 Published with facsimile and translation and notes in the Journal of the Royal Asiatic Society for 1879-80, vol. xii.

For about three hundred years the Buddhist Church of Tibet was then left in peace, subjecting the country more and more completely to its control, and growing in power and in wealth. During this time it achieved its greatest victory, and underwent the most important change in its eliaracter and organization. After the reintroduction of Buddhism into the “ kingdom of snow,” the ancient dynasty never recovered its power. Its representatives continued for some time to claim the sovereignty ; but the country was practically very much in the condition of Germany at about the same time—chieftains of almost independent power ruled from their castles on the hill tops over the adjacent valleys, engaged in petty wars, and conducted plundering expeditions against the neighbouring tenants, whilst the great abbeys were places of refuge for the studious or religious, and their heads were the only rivals to the barons in social state, and in many respects the only protectors and friends of the people. Meanwhile Jenghiz Khan had founded the Mougol empire, and his grandson Kublai Khan, who ruled over the greatest empire which has ever owned the sway of a single nian, became a convert to the Buddhism of the Tibetan Lamas. He granted to the abbot of the Sakya monastery in southern Tibet the title of tributary sovereign of the eountry, head of thie Buddhist Church, and overlord over the numerous barons and abbots, and in return was officially erowned by the abbot as ruler over the extensive domain of the Mongol empire. Thus was the foundation laid at one and the same time of the temporal sovereignty of the Lamas of Tibet, and of the suzerainty over Tibet of the emperors of China. One of the first acts of the “head of the church” was the printing of a carefully revised edition of the Tibetan Scriptures,—an undertaking which oceupied altogether nearly thirty years, and was not completed till 1306.

Under Kublai's successors in China the Buddhist cause flourished greatly, and the Sakya Lamas extended their power both at home and abroad. The dignity of abbot at Sakya became hereditary, the abbots breaking so far the Buddhist rule of celibacy that they remained married until they had begotten a son and heir. Dut rather more than half a eentury afterwards their power was threatened by a formidable rival at home, a Buddhist reformer.

Tsongkapa, the Luther of Tibet, was born about 1357 on the spot where the famous monastery of Kunbum now stands. He very early entered the order, and studied at Sakya, Brigung, and other monasteries. He then spent eight years as a hermit in Takpo in southern Tibet, where the comparatively purer teaching of Atisha (referred to above) was still prevalent. About 1390 he appeared as a public teacher aud reformer in Lhasa itself, and before his death in 1419 there were three huge monasteries there containing 30,000 of his disciples, besides others in other parts of the country. His voluminous works, of which the most famous are the Sumbun and the Lam Nim T'shenpo, exist in printed Tibetan copies in Europe, but lave not as yet been translated or analysed. But the principal lines on which his reformation proceeded are sufficiently well attested. He insisted in the first place on the complete earrying out of the ancient rules of the order as to the eelibacy of its members, and as to simplicity in dress. One result of the second of these two reforms was to make it necessary for every monk openly to declare himself either in favour of or against the new views. For Tsongkapa and his followers wore the yellow or orange-coloured garments which had been the distinguishing mark of the order in the lifetime of its founder, and in support of the ancient rules Tsongkapa reinstated the fortnightly rehearsal of the Patimokkha or "disburdenment" in regular assemblies of the order at Lhasa—a practice which had fallen into desuetude. He also restored the custom of the

first disciples to hold the so-called Vassa or yearly retirc- ment, and the public meeting of the order at its close. In all these respects he was

simply following the directions of the Vinaya, or regulations of the order, as established probably in the time of Gotama himself, and as certainly handed down from the earliest times in the pitakas or sacred books. Further, he set his face against the Tantra system, and against the whole crowd of animistic super- stitions which had been allowed to creep into life again among the more ignorant of the monks and the people. He laid stress on the self-culture involved in the practice of the paramitas or cardinal virtues, and established an annual national fast or week of prayer to be held during the first days of each year. This last institution indeed is not found in the ancient Vinaya, but was almost certainly modelled on the traditional account of the similar assemblies convoked by Asoka and other Buddhist sovereigns in India every fifth year. Laymen as well as monks take part in the proceedings, the details of which are entirely unknown to us except from the accounts of the Catholic missionaries, —Fathers Huc and Gabet,—who describe the principal ceremonial as, in outward appearance, wonderfully like the high mass. In doctrine the great Tibetan teacher, who had no access to the Pali Pitakas, adhered in the main to the purer forms of the Mahayana scliool; in questions of churchi government lic took little part, and did not dispute the titular supremacy of the Sakya Lamas, tliough in other matters he had raised the standard of revolt, But the effects of his teaching weakened their power. The “ orange-hoods,” as his followers were called, rapidly gained in numbers and influence, until they so overshadowed the “ red-hoods,” as the followers of the older sect were called, that in the middle of the 15th century the emperor of China acknowledged the two leaders of the new sect at that time as the titular overlords of the church and tribu- tary rulers over the realm of Tibet. These two leaders were then known as the Dalai Lama and the Pantshen Lama, and were the abbots of the great monasteries at Gedun Dubpa, near Lhasa, and at Krashis Lunpo, in

Further Tibet, respectively. Since that time the abbots |

of these monasteries have continued to exercise the sove-

reignty over Tibet,—their pretensions being supported, in:

the few cases in which an attempt has been made to dis- pute it, by the power of Mongolia and China.

As there has been no further change in the doctrine, and no further reformation in discipline, we may leave the

ecclesiastical history of Lamaism since that date unnoticed, |

and devote our little remaining space to the consideration | SETS 5 Sea Lat, gree, ge ae ee Sllas

of some principal points in the constitution of the Lamaism of to-day. And first as to the mode of electing successors to the two Great Lamas. It will have been noticed above that it was an old idea of the northern Buddhists to look upon distinguished members of the order as incarnations of Avalokitesvara, of Maiiju-sri, or of Amitabha. These beings were supposed to possess the power, whilst they themselves continued to live in heaven, of appearing also on earth in a Nirmana-kaya, or apparitional body. In the same way the Pantshen Lama is looked upon as an incarnation, the Nirmana-kaya, of Amitabha, who had previously appeared in that way under the outward form of Tshonkapa himself; and the Dalai Lama is looked upon as an incarnation of Avalokitesvara. Theoretically, there-

teacher and also of Amitabha, who occupies the higher place in the mythology of the Great Vehicle,, would be

superior to the latter, as the spiritual representative of |

Avalokitesvara. But practically the Dalai Lama, owing to his position in the capital, has the political supremacy, and is actually called the Gyalpo Rinpotshe, “the glorious king,”—his companion being content with the title Pantshen

. of the Shandugol. fore, the former, as the spiritual successor of the great |

Rinpotshe, “the glorious teacher.” When either of. them dies it is necessary for the other to ascertain in whose body the celestial being whose outward forin has been dissolved has been pleased again to incarnate himself. For that purpose the names of all male children born just after the death of the deceased Great Lima arc laid before his survivor. He chooses three out of the whole number; their names are thrown into a golden casket provided for that purpose by a former emperor of China. The Chutuktus, or abbots of the grcat monasteries, then assemble, and after a week of prayer, the lots are drawn in their presence and in presence of the surviving Great Lama and of the Chinese political resident. The child whose name is first drawn is the future Great Lama; the other two receive each of them 500 pieces of silver. The Chutuktus just mentioned correspond in many respects to the Roman cardinals. Like the Great Lamas, they bear the title of Rinpotsiie or Glorious, and are looked upon as incarnations of one or other of the celestial Bodisats of the Great Vehicle mythology. Their number varies from ten to a hundred ; and it is uncertain whether the honour is inherent in the abbacy of certain of the greatest cloisters, or whether the Dalai Lama exercises the right of choosing them. Under thesc high officials of the Tibetan hierarchy there come the Chubil Khans, who fill the post of abbot to the lesser monasteries, and are also incarnations. Their number is very large ; and there are but few monasteries in Tibet or in Mongolia who do not claim to possess one of these living Buddhas. Besides these mystical persons there are in the Tibetan Church a number of other ranks and degrees, corresponding to the deacon, full priest, dean, and doctor of divinity in the West. At the great yearly festival at Lhasa they make in the cathedral an imposing. array, not much less magnificent than that of the clergy in Rome; for the ancient simplicity of dress has quite disappeared in tho growing differences of rank, and each division of the spiritual army is distinguished in Tibet, as in the West, by a special uniform. The political authority of the Dalai Lama is confined to Tibet itself, but he is the acknowledged head also of the Buddhist Church throughout Mongolia and China. He has no supremacy over his co-religionists in Japan, and even in China there are many Buddhists who are not practically under his control or influence.

The principal authorities for the history of Buddhism have

already been given at the close of the article BuppHism. To these may now be added T. W. Rhys Davids's Buddhism, London,

from the Pali, Oxford, 1881 ; and Hibbert Lectures, London, 1881 ; also Bushell, ‘‘ The Early History of Tibet,” in the Journal of the Royal Asiatic Society, 1879-80, vol. xii. ; Sanang Setsen's History of the East Mongols in Mongolian, translated into German by J. Schmidt (Geschichte der Ost-Mongolen); ‘‘ Analyse du Kandjur,” by M. Léon Feer, in Annales du Musée Gatmet, 1881; Schott, Ueber den Buddhismus in Hoch-Asien; Gutzlaff, Geschichte des Chinestsehen Reitches; Hue and Gabet, Souvenirs d'un Voyage dans la Tartaric, le Tibet, et la Chine, Paris, 1858; Pallas's Samm- lung historisecher Nachrichten tiber die Mongolischen Vilkerschaften; and Babu Sarat Chunder Das's ‘‘ Contributions on the Religion and History of Tibet,” in the Journal of the Bengal Asiatie Society, 1881. (T. W. RB. D.)
LAMA-MIAU, or Dotanor, one of the chief cities of Inner Mongolia, is situated 150 miles north of Peking, in a barren sandy plain watercd by the Urtingol, a tributary The town proper, almost exclusively occupied by Chinese, is about a mile in length by half a mile in breadth, has narrow and dirty streets, and contains a large population for its extent. Unlike the ordinary Chinese town of the same rank, it is not walled. A busy trade is carried on between the Chinese and the Mongolians, who bring in their cattle, sheep, camels, hides, and wool to barter for tea, tobacco, cotton, and silk. At somie distance from the Chinese town lies the Mongolian quarter, with

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two groups of lama temples and villages occupied by 2300 | priests. Dr Williamson (Journeys in North China) de- scribes the chief temple as a huge oblong building with an interior not unlike a Gothic church. Lama-miau is the seat of a manufactory of bronze idols and other articles of ritual, which find their way to all parts of Mongolia and Tibet. The craftsmen work in their own houses. See Prejevalsky, Jfongolia, 1876.

LAMARCK, Jean Baptiste PIERRE ANTOINE DE Monet, CHEVALIER DE (1744-1829), a celebrated French naturalist, was born lst August 1744, at Bazantin, a village of Picardy. He was an eleventh child; and his father, lord of the manor and of old family, but of limited mieans, having already placed three sous in the army, destined this one for the church, and sent him to the Jesuits at Amiens, where he continued till his father's death. After this he would remain with the Jesuits no longer, and, not yet seventeen years of age, started for the seat of war at Bergen-op-Zoom, before which place one of his brothers had already been killed. Mounted on an old horse, with a boy from the village as attendant, and furnished by a lady with a letter of introduction to a colonel, he reached his destination on the evening before a battle, Next morning the colonel found that the new and very diminutive volunteer had posted himself in the front rank of a body of grenadiers, and could not be induced to quit the position. In the battle, the company which he had joined became exposed to the fire of the enemy's artillery, and in the confusion of retreat was forgotten. All the officers and subalterns were killed, and not more than fourteen men were left, when the oldest grenadier seeing there were no more French in sight proposed to the young volunteer so soon become commandant to withdraw his men. This he refused to do without orders, These at last arrived ; and for his bravery he was made an officer on the spot, and soon after was named to a lieutenancy.

After the peace, the regiment was sent to Monaco. There it happened that one of his comrades playfully lifted him by the head, and to this it was imputed that he was seized with disease of the glands of the neck, so severe as to necessitite grave surgical interference, and put a stop to his military career.

The courage of Lamarck, so early exhibited, was in future to be shown by the maintenance of his opinions in the absence of any friendly support, and by fortitude amid many adversities ; while his activity was to be displayed, not only in manifold speculation, but in copious and varied scientific work. He went to Paris and began the study of medicine, supporting himself by working in a banker's office. He early became interested in meteorology and in physical and chemical

speculations of a chimerical kind, but happily threw his main strength into botany, and in 1778 published his More francaise, a work in which by a dichotomons system of contrasting characters he enabled the student with facility to determine species. This work, which went through several editions and long kept the field, gained for its author immediate popularity as well as the honour of admission to the Academy of Sciences.

In 1781 and 1782, under the title of botanist to the king, an appointment obtained for him by Buffon, whose son accompanied hirn, he travelled through various countries of Europe, extending his knowledge of natural history ; and on his return he began those elaborate contributions to botany on which his reputation in that science principally rests, namely, the Dictionnaire de Botanique and the Lllustrations de Genres, voluminous works contributed to the Lneyclopédie Méthodique (1785). In 1793, when he was already forty-nine years of age, in consequence of changes In the organization of the natural history department at the Jardin du Roi, where he had held a botanical appoiut-

raent since 1788, Lamarck was presented to a zoological chair, and called on to lecture on the Znsecta and Vermes of Liauzus, the animals for which he introduced the term Jn- vertebrata, still employed. Thus driven, comparatively late in life, to devote his principal attention to zoology instead of botany, he had the misfortune soon after to suffer from impaired vision ; and the malady progressing resulted subsequently in total blindness. Yet his greatest zoological work, the L/zstoire Naturelle des Animaux sans Vertébres, was published from 1815 to 1822, with the assistance, in the last two volumes, of his eldest daughter and of M. Latreille. A volume of plates of the fossil shells of the neighbourhood of Paris was collected in 1823 from his memoirs in the Annales des Muséum. The later years of his blind old age were spent in straitened circumstances and accumulating infirmities, solaced, however, by the devotion of bis family, and particularly of his eldest daugliter, of whom Cuvier records that she never left the house

from the time that lie was confined to his room. He died 18th December 1829,

The cliaracter of Lamarck as a naturalist is remarkable alike for its excellences and its defects. His excellences were width of scope, fertility of ideas, and a pre-eminent faculty of precise description, arising not only from a singularly terse style, but from a clear insight into both the distinctive features and the resemblances of forms. That part of his zoological work which still finds a large and important place in the science of the present day, and constitutes lis solid claim to the highest honour as a zoologist, is to be found in his extensive and detailed labours in the departments of living and fossil Znrvertebrata. His endeavours at classification of the great groups were necessarily defective on account of the imperfect knowledge possessed in his time in regard to many of them, ey., echinoderms, ascidians, and intestinal worms ; yet they are not without interest, particularly on account of the comn- prehensive attempt to unite in one great division as Articulata all those groups that appeared to present a segmented construction. Moreover, Lamarck was the first to distinguish vertebrate from invertebrate animals by tle presence of a vertebral column, and among the Invertebrata to found the groups Crustacea, Arachnida, aud Annelida. In 1785 (Mist. de ? Acad.) he evinced his appreciation of the necessity of natural orders in botany by an attempt at the classification of plants, interesting, though crude and falling immeasurably short of the system which grew in the hands of his intimate friend Jussieu. The prublem of taxonomy has never been put more philosophically than he subsequently put it in his Animaux sans Vertebres :— “What arrangement must be given to the general distri- bution of animals to make it conformable to the order of nature in the production of these beings?”

The most prominent defect in Lamarck must be admitted, quite apart from all consideration of the famous hypothesis which bears his name, to have been want of control in speculation. Doubtless the speculative tendency furnished a powerful incentive to work, but it outran the legitimate deductions from observation, and led him into the production of volumes of worthless chemistry without experimental

basis, as well as into spending much time on fruitless meteorological predictions. His Annuaires Alétéorologiques were published yearly from 1800 to 1810, and were not discontinued until after an unnecessarily public and brutal tirade from Napoleon, administered on the occasion of being presented with one of his works on natural history.

To the general reader the name of Lamarck is chiefly interesting on account of his theory of the origin of life and of the diversities of animal forms. The idea, which appears to have been favonred by Buffon before him, that species were not through all time unalterable, and that the more complex might have been developed

from pre-existent simpler forms, became with Lamarck a belief or, as he imagined a demonstration. Spontaneous generation, he con-

sidered, might be easily conceived as resulting from such agencies as heat and electricity causing in small gelatinous bodies an utricular structure, and inducing a ‘singular tension,” a kind of ‘‘éréthisme ” or ‘‘orgasme”’; and, having thus accounted for the first appearance of life, he explained the whole organization of animals and forma- tion of different organs by fourlaws:— .

‘1. Life by its proper forces tends continually to increase the volume of every body possessing it, and to enlarge its parts, up to a limit which it brings about.

‘2, The production of a new organ in an animal body results from the supervention of a new want (besoin) continuing to make itself felt, and a new movement which this want gives birth to and encourages.

‘¢3, The development of organs and their force of action are con- stantly in ratio to the employment of these organs. ,

‘4. All which has been acquired, laid down, or changed in the organization of individuals in the cotrse of their life is conserved by

generation and transmitted to the new individuals which pro- ceed from those which have undergone those changes.”

It is the second law which has been principally associated with Lamarck’s name, and is often referred to as his hypothesis of the evolution of organs in animals by appctence or longing, although Lamarck does not teach that the animal’s desires affect its conformation directly, but that altered wants lead to altered habits, which result in the formation of new organs as well as in modification, growth, or dwindling of those previously existing. Thus, he suggests that, ruminants being pursued by carnivora, their legs have grown slender; aud, their legs being ouly fit for support, while their jaws are weak, they have made attack with the crown of the head, and the determination of fluids thither has led to the growth of horns. So also the stretching of the giraffe’s neck to reach the foliage he supposes to have led to its elongation ; and the kangaroo, sitting upright to support the young in its pouch, he imagines to have had its fore-limbs dwarfed by disuse, and its hind legs and tail exaggerated by using them in leaping. The length to which he carried such notions can be fairly estimated by the illustration which, long after the publication of his Philosophie Zoologigque, he selected in the introduction to the Hist. Nat. des Anim. sans Vert. ‘*T conceive that a gastcropod mollusc, which, as it crawls along, finds the need of touching the bodies in front of it, makes efforts to touch those bodies with some of the forentost parts of its head, and sends to these every time quantities of nervous fluids, as well as other liquids. I conceive, I say, that it must result from this reiterated afflux towards the points in question that the nerves which abut at these points will, by slow degrees, be extended. Now, as in the same circumstances other fluids of the animal flow also to the same places, and especially nourishing fluids, it must follow that two or more tentacles will appear and develop insensibly in those circumstances on the points referred to.”

However absurd this may seem, it must be admitted that, unlimited time having been once granted for organs to be developed in series of generations, the objections to their being formed in the way here imagined are only such as equally apply to the theory of their origin by

natural selection. Thus, for example, neither theory considers that it has to deal, not with crude heaps of mere functional organs, but with exquisitely orderly forms, nor accounts for the symmetrical first sppedtance of parts or for sex; nor, though La- marck tried hard, has he or any later writer reduced to hysical law the rise of consciousness in association with structures Mil in their physical relations are mere mechanisms capable of reflex actions,

In judging the reasonableness of the second law of Lamarck as compared with more modern and now widely received theories, it must be observed that it is only an extension of his third law 3 and that third law is a fact. The strengthening of the blacksmith's arm by use is proverbially notorious. It is, therefore, only the sufficiency of the Lamarckian hypothesis to explain the first com- Mencement of new organs which is in question, if evolution by the mere operation of forces acting in the inorganic world be granted ; and surely the Darwinian theory is equally helpless to account for wee of auee gory ele it demands as imperatively

every stage in the assume: redi oe Hone ve ae ereditary development of an organ

Furthermore, to no writer more recent than La attributed the credit of first pointing attention to pier : acquired variations in the progeny, or the idea of weaving that fact into a theory of the origin of species, His words are :—" Every- thing which nature has caused individuals to acquire or lose by the influence of the circumstances to which their race is long exposed and consequently by the influence of the predominant employment of such organ, or its constant disuse, she preserves by generation to the new individuals proceeding from them, provided that the changes are common to the two sexes, or to those which have produced these new individuals" (Phil, Zool., i. 285). It is interesting to note in this passage that he hesitated to believe that peculiarities could become permanent unless possessed by both parents,

Notwithstanding his attempt to evolve al vital action from the forces at work in the inorganic world, Lamarck made a broad dis-

tinction between the ‘‘ power of life,” to which he attributed the production of ‘‘areal progression in the composition of the organiza- tion of animals,” and the modifying effects of external circumstances, The existence of such a progression cannot now be doubted, and constitutes evolution in the only sense in which it is universally admitted. Lamarck, equally with Darwin, teaches the more speculative doctrine that the complex forms are descended from simpler ancestors. In the modus operandi by which they hold this to have been accomplished both have admitted the action of a variety of modifying circumstances. Lamarck gave great import- ance to the influence of new wants acting indirectly by stimulating growth and use. Darwin has given like importance to the effects of accidental variations acting indirectly by giving advantage in the. struggle for existence. The speculative writings of Darwin have, however, becn interwoven with a vast number of beautiful experi- ments and observations bearing on his speculations, thongh by no means proving his theory of evolution ; while the speculations of Lamarck lie apart from his wonderful descriptive labours, unrelieved by intermixture with other matters capable of attracting the nume- rous class who, provided they have new facts set before them, are not careful to limit themselves to the conclusions strictly deducible therefrom. But those who read the Philosophie Zoologique will find how many truths often supposed to be far more modern are stated with abundant clearness in its pages. (J. CL.)

LAMARTINE, AtrHonse Mari Lovis pe PRatT DE (1790-1869), poet, historian, and statesman, was born at Macon on the 21st of October 1790, and died at Passy on the Ist of March 1869. The family of Lamartine was good, and the title of Prat was taken from an estate in Franche Comté, His father was imprisoned during the Terror, and only released owing to the events of the 9th Thermidor. Subsequently the family returned to the country. Lamartine’s early education was received from his mother. He was sent to school at Lyons in 1805, but not being happy there was transferred to the care of the Peres de la Foi at Belley, where he remained until 1809. For some time afterwards he

lived at home, reading romantic and poetical literature, but in 1811, being then twenty years old, he set out on his travels for Italy, where he seems to have sojourned for nearly two years. His family having been steady royalists, he entered the Gardes du corps at the return of the Bourbons, and during the Hundred Days he sought refuge first in Switzerland and then at Aix en Savoie, where he fell in love, with abundant results of tlie poetical kind. After Waterloo he returned to Paris, and mixed a good deal in society. In 1818-19 he revisited Switzerland, Savoy, and Italy, the death of his beloved affording him new subjects for verse. He had now got together a considerable body of poetry, and after some difficulties he got his first book, the J/ éditations, published (1820). It was exceedingly popular, and helped him to make a position. He had left the army for some time, and he now entered the diplomatic service and was appointed secretary to the embassy at Naples. On his way to his post he married at Geneva a young English lady, Marianne Birch, who had both money and beauty (1823), and in the same year his Nouvelles Méditations appeared. In 1824 he was transferred from Naples to Florence, where he remained for five years. His Last Canto of Childe Harold appeared in 1825, and he had to fight a duel with an Italian officer, Colonel Pepe, in consequence of a phrase in it. The Harmonies Politiques et Religieuses appeared in 1829, when he had left Florence. Having refused an appointment at Paris under the Polignac ministry (destined to be fatal to legitimism), he went on a special mission to Prince Leopold of Saxe-Coburg, who was not yet king of the Belgians, but was talked of as king of Greece. The next year he was elected to the Academy. lLamartine was in Switzerland, not in Paris, at the time of the Revolution of July, and, though he put forth a pamphlet on Rational Policy, he did not take any active part in politics. In 1832 he set out with his wife and daughter for Palestine, having been unsuccessful in his candidature for a seat in the chamber. His daughter Julia died at Beyrout, and

before long le received the news of his election by a coustituency (Bergues) in the department of the Nord. He returned through Turkey

and Germany, and made his first speech shortly after the beginning of 1834. Thereafter he spoke constantly, and acquired considerable reputation as an orator,—bringing out, moreover, many books in prose and verse. His Eastern travels (Souvenirs d Orient) appeared in 1835, his Jocelyn in 1836, his Chute d'un Ange in 1838, and his Jtecueillements, the last remarkable volume of his poetry, in 1839. As the reign of Louis Philippe went on, Lamartine, who had previously been a liberal royalist, something after the fashion of Chateau- briand, became more and more democratic in his opinions. He set about his greatest prose work, the ZZistoire des Girondins, which at first appeared periodically, and was published as a whole in 1847. Like many other French histories, it was a pamplilet as well as a chronicle, and the subjects of Lamartine's pen became his models in politics, At the revolution of February Lamartine at once became one of the most. important personages in France. He was one of the first to declare for a provisional government, and became a member of it himself, with the post of minister for foreign affairs. He was elected for the new constituent assembly in ten different departments, and was chosen one of the five members of the Executive Committee. Fora few montlis indeed Lamartine, who for nearly sixty years had been a distinguished man of letters, an official of inferior rank in diplomacy, and an eloquent but unpractical speaker in parliament, became one of the foremost men in Europe. His own inexperience in the routine work of government, the utterly unpractical nature of his colleagues and of the constitution which they endeavoured to carry out, and the turbulence of the Parisian mob proved fatal to hischances. During his brief tenure of office Lamartine gave some proofs of statesmanlike ability, notably in his reply to the deputation of United Irishmen who visited him in the hope that the new French democracy would take up the old hatred of the republic against England ; aud his eloquence was repeatedly called into requisition to pacify the Parisians. But no one can permanently carry on the government of a great country by speeches from the balcony of a house in the eapital, and Lamartine found himself in a dilemma. So long as he held aloof from Ledru-Rollin and the more radical of his colleagues, the disunion resulting weakened the Government; as soon as he effected an approximation to them, the middle classes, who more in France than any where else were and are

tlie arbiters of Governmenits, fell off from him. The quelling of the insurrection of the 15th May was his last successful act. A month later the renewal of active disturbances brought on the fighting of June, and Lamartine's influence was extinguished in favour of Cavaignac. There is hardly another instance on record of so sudden an elevation and so rapid a fall. Before February in 1848 Lamartine was, as has been said, a private person of talent and reputation ; after June in the same year he was once more the same, except that his chance of political pre-eminence was gone. He had been tried and found wanting, having neither the virtues nor the vices of his situation. In January 1849, though he was nominated for the presidency, only a few thousand votes were given to him, and three months later he was not even elected to the legislative assembly.

The remaining story of Lamartine's life is somewhat melancholy. He had never been a rich man, nor had he been a saving one, and during his period of popularity and office he had incurred great expenses. He now set to work to repair his fortune by unremitting literary labour. He brought out in the Presse a series of Conjidences, and somewhat later a kind of autobiography, entitled Raphael, which treated his own experiences in romantic fashion.

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He began and finished several historical works of more or less importance, the History of the Revolution of 1848, The History of the Restoration, The History of Turkey, The History of Iussia, besides a very large number of small biographical and miscellaneous works. In 1858 a sub- scription was opened for his benefit. Two years afterwards, following the example of Chateaubriand, he supervised an elaborate edition of his own works in forty-one volumes. This occupied five years, aud while he was engaged on it lus wife died (1863). He was now a man of more than seventy years old; lis powers had deserted him, and even if they had not the public taste had entirely changed, and was no longer disposed to welcome or enjoy his sentimental fashion of handling prose and poetry. His efforts had not succeeded in placing him in a position of comfort and independence;

and at last, in 1867, the Government of the empire (from which he had perforce stood aloof, though he never considered it necessary to adopt the active protesting attitude of Quinet and Victor Hugo) came forward to his assistance, a vote of twenty thousand pounds being proposed in April of that year for his benefit by M. Emile Ollivier. In no other country than France would this have been anything but creditable to both parties, for Lamartine, both as a distinguished man of letters and as a past servant of the state, had every claim to the bounty of his country. But the bitter party feeling which animated the later years of the reign of Napoleon ITI. made the grant something of a party matter, and Lamartine was reproached for accepting it by the extreme republicans and irreconcilables. He did not enjoy it long, dying, as has been said, on the lst of March 1869, two years before the collapse of the empire.

As a statesman Lamartine was placed during his brief tenure of office in a position from which it would have been almost impos- sible for any man who was not prepared and able to play the dictator to emerge with credit. At uo time in history, not even in the great revolution of sixty years earlier, were unpractical erotchets so rife in the heads of men as in 1848, and at no time was there such an absence of what may be called backbone in a nation as then in France. But Lamartine could hardly have guided the ship of state safely even in much calmer weather. Personally he was amiable and even estimable, the chief fault of his character being vanity and an incurable tendency towards theatrical effect, which makes his travels, memoirs, and other personal records as well as his historical works radically untrustworthy. Nor dves it appear that he had any settled politieal ideas. He was first an ardent legiti- mist, then a liberal royalist, then a constitutionalist of an indefinite type, then a republican ; and it does not appear that any of these phases was the result of reasoned conviction, but rather of a vague kind of sentiment and of the contagion of popular and prevalent ideas. In regard to money he was entirely disinterested, never obtaining or seeking any lucrative office. That he was quite so disinterested in the matter of personal vanity and ambition cannot perhaps be safely affirmed. He did good by moderating the revolutionary and destructive ardour of the Parisian populace in 1848 ;

but he had been perhaps more responsible than any other single person for bringing about the events of that year by the vague and frothy republican declamation of his Histoire des Giron- dins. Altogether little more can be said of his political career than that he was the most striking if not the most successful instance of the French system, which has prevailed since the downfall of the first empire, of making literary success a direct road to political eminence.

More must be said of his literary position. Lamartine had the ad- vantage of coming at a time when the literary field, at least in the departments of belles lettres, was almost empty. The feeble school of descriptive writers, epic poets of the extreme decadence, fabulists, and miscellaneous verse-makers which the empire had nourished could satisfy no one, though its members still continued with unceasing fidelity to copy themselves and their models. Madame de Stael was dead; Chateaubriand, though alive, was something of a classic, and had not effected a full revolution. Lamartine did not hinself go the complete length of the romantic revival, but he went far in that direction. He availed himself of the reviving interest 1n legitimism and Catholicism which was represented by Bonald and Joseph de Maistre, of the nature worship of Rousseau and Bernardin de St Pierre, of the sentimentalism of Madame de Stael, of the medievalism and the romance of Chateaubriand and Scott, of the maladie du siécle of Chateaubriand and Byron. Perhaps if his

matter be very closely analysed it will be found that he added hardly anything of his own. but if the parts of the mixture were

like other things the mixture itself was not. It seemed indeed to the .

immediate generation so original that tradition has it that the Méditations were refused by a publisher because they were In none of the accepted styles. They appeared, as has been said, in 1820, that is to say, when Lamartine was nearly thirty years old. The best of them and

the best thing that Lamartine ever did is the famous Lac, deseribing his return to the little mountain tarn of Le Bourget after the death of his mistress, with whom he had visited it in other days. The verse is exquisitely harmonious, the sentiments conven- tional but refined and delicate, the imagery well chosen and grace- fully expressed. There is indeed an unquestionable want of vigour, but to readers of that day the want of vigour was entirely compen- gated by the presence of freshness and grace. Lamartine's chief misfortune in poetry was that not only was his note a somewhat weak one, but that he could strike but one. The four volumes of the Méditations, the Harmonies, and the Recueillements, which con- tained the prime of his verse, are perhaps the most monotonous reading to be found anywhere in work of equal bulk by a poet of equal talent. They contain nothing but meditative lyrical pieces, almost any one of which is typical of the whole, though there is of course considerable variation of merit. The two narrative poems which succeeded the early lyrics, Jocelyn and the Chute d'un Ange, were, according to Lamartine's original plan, parts of a vast ‘‘ Epic of the Ages," some further fragments of which survive, especially one of not a little merit which was published four years after the author's death in company with some youthful attempts at the classical tragedy and a few miscellanea. Jocelyn had at one time more popularity in England than most French verse. La Chute d'un Ange, in which the Byronic influence is more obvious than in any other of Lamartine's works, is more ambitious in theme and less regulated by scrupulous conditions of delicacy in handling than most of its author's poctry. It does, however, little more than prove that such audacities were not for him.

As a prose writer Lamartine was, as may be seen from what has been said (and many of his works have not been mentioned), very fertile. His characteristics in his prose fiction and descriptive work are not very different from those of his poetry. He is always and everywhere sentimental, though very frequently, as in his shorter prose tales (The Stone Mason of St Point, Graztella, &c.), he is grace- ful as well as sentimental. In his histories, the style being one for which he was radically unfitted, the effect is worse. It has been hinted that Lamartine's personal narratives are doubtfully trust- worthy; indeed

with regard to his Eastern travels some of the episodes were stigmatized as mere inventions by persons who had every reason to be well informed and none to bear false witness. In his histories proper the special motive for embellishment—falsification would be too rough a word—for the most part disappears, but the habit of inaccuracy remains. Lamartine as an historian belongs exclusively to the rhetorical school as distinguished from the philosophical on the one hand and the documentary on the other.

It is not surprising when these characteristics of Lamartine's work are appreciated to find that his fame has declined with singular rapidity in France. As a poet indeed he had lost his reputation many years before he died. He was entirely eclipsed by the brilliant and vigorous school who succeeded him with Victor Hugo at their head. It is possible that the Chute d'un Ange was an effort to compete with them on their own ground ; if so, it was an entire failure. Lamartine's power of initiative in poetry was very small, and the range of poetic ground which he could cover strictly limited. He did not attempt the great task of the day, the freeing of the Alexandrine from the restraints imposed upon it, and the devis- ing or reviving of new lyric metres to refresh and invigorate French poetic style. He could only carry the picturesque sentimentalism of Rousseau, Bernardin de St Pierre, and Chateaubriand a little further, and clothe it in language and verse a little less antiquated than that of Chénedollé and Millevoye. He has been said to be a French Cowper, and the parallel holds good in respect of versification and of his relative position to the more daringly innovating school that followed, though not inrespect of individual peculiarities. Lamartine in short occupied a kind of half-way house between the 18th century and the Romantic movement, and he never got any further. Whena living English critic questioned his importance in conversation with Sainte-Beuve, the answer was, ‘‘ Heis important to ws," and it was a true answer ; but his importance is now chiefly historical, even to Frenchmen. ,

The already mentioned edition is the most complete one of Lamartine, but there are many issues of his separate works. Since his death, besides the poems already mentioned, some Mémoires Inédits of his

youth have been published, and also two volumes of correspondence. (G. SA.)

LAMB, Cuartezs (1775-1834), an original and delight- ful English essayist and critic, was born in Crown Office Row, Inner Temple, London, February 10, 1775. His father, John Lamb, a Lincolnshire man, who filled the

situation of clerk and servant companion to Mr Salt, one of the benchers of the Inner Temple, was successful in obtaining for Charles, the youngest of three children, a presentation to Christ's Hospital, where the boy remained from his eighth to his fifteenth year (1752-1789). Here he was fortunate enough to have for a schoolfellow the afterwards famous Samuel Taylor Coleridge, his senior by rather more than two years, and a close and tender life-long friendship began which had a singularly great influence on the whole of his after career. When the time came for leaving school, where he had learned some Greek and acquired considerable facility in Latin composition, Lamb, after a brief stay at home (spent, as his school holidays had often been, over old English authors in the library of Mr Salt), was condemned to the labours of the desk,—an * unconquerable impediment" in his speech disqualifying him for a'school exhibition, and thus depriving him of the only means by which he could have obtained a university education. For a short time he held a clerkship in the South Sea House under his elder brother John, and in 1792 he entered the accountant's office in the East India House, where during the next three and thirty years the hundred folios of what he used to call his true " works" were produced. A dreadful calamity soon came upon him, which seemed to blight all his prospects in the very morning of life. There was insanity in the family, which in his twenty-first year had led to his own confinement for some weeks in a lunatic asylum ; and, a few months afterwards, on the 22d of September 1796, his sister Mary, " worn down to a state of extreme nervous misery by attention to needlework by day and to her mother by night," was suddenly seized with acute mania, in which she stabbed her mother tothe heart. The calm self-

mastery and loving self-renunciation which Charles Lamb, by constitution excitable, nervous, and timid, displayed at this crisis in his own history and in that of those nearest him, will ever give him an imperishable claim to the reverence and affec- tion of all who are capable of appreciating the heroisms of common life. His sister was of course immediately placed in confinement, and with the speedy return of comparative health came the knowledge of her fatal deed ; himself calm and collected, he knew how to speak the words of soothing and comfort. With the help of friends he succeeded in ob- taining her release from the life-long restraint to which she would otherwise have been doomed, on the express condition that he himself should undertake the responsibility for her safe keeping. It proved no light charge; for, though no one was capable of affording a more intelligent or affec- tionate companionship than Mary Lamb during her long periods of health, there was ever present the apprehension of the recurrence of her malady ; and, when from time to time the premonitory symptoms had become unmistakable, there was no alternative but her removal, which took place in quietness and tears. How deeply the whole course of Lamb's domestic life must have been affected by his singular loyalty as a brother need not be pointed out; for one thing, it rendered impossible his union with Alice Winterton, whom he appears to have truly loved, and to whom such touching reference was made long afterwards in Dream Children, a Reverie.

Lamb's first appearance as an author was made in the year of the great tragedy of his life (1796), when there were published in the volume of Poems on Various Subjects by Coleridge four sonnets by " Mr Charles Lamb of the India House." In the following year he also contributed along with Charles Lloyd some pieces in blank verse to Coleridge's new volume of Poems. In 1798 he published a short and pathetic prose tale entitled Rosamund Gray, and in 1799 he was associated with Coleridge and Southey in the publication of the Annual Anthology, to which he had

coutributed a short religious poem in blank verse entitled “Living without God in the World”; the company in which he was thus found brought upon him the irrelevant and pointless ridicule of Canning and Gillray. His next public appearance was not more fortunate. His John Woodvil (1801), a slight dramatic piece written in the style of the earlier Elizabethan period, and containing some genuine poetry and happy delineation of the gentler emotions, but as a whole deficient in plot, vigour, and character, was held up to ridicule by the Ldinburgh Review as a specimen of the rudest condition of the drama, a work by “a man of the age of Thespis.” The dramatic spirit, however, was not thus easily quenched in Lamb. His next effort (1806) was a farce, named Afr ZZ, the point of which lay in the hero’s anxiety to conceal his name, “ Hogsflesh ” ; it has recently been put upon the boards with success in America, but in London it did not survive the first night of its appearance. Its author bore the failure with rare equanimity and good humour, and soon struck into new and more successful fields of literary exertion. In 1807 appeared 7’ales founded on the Plays of Shakespeare, written hy Charles and Mary Lamb; and in 1808 Specimens of English Dramatic Poets who lived about the time of Shake- speare, with short but felicitous critical notes. Inthe same year Mary Lamb, assisted by her brother, also published Poetry for Children and a collection of short school-girl tales under the title Mrs Leicester’s School ; and to the same date belongs the Adventures of Ulysses, designed by Lamb as a companion to the Adventures of Telemachus. In 1810 began to appear Leigh Hunt’s quarterly periodical, Zhe Reflector, in which Lamb published much (including the essays on the tragedies of Shakespeare and on Hogarth) that subse- quently appeared in the first collective edition of his Works (2 vols. 12mo), which appeared in 1818. The establish- inent of the Lordon Magazine in 1820 stimulated him to the production of a series of new essays which rose into instant popularity, and may be said to form the chief corner-stone in the small but classic temple of his fame. The first of these, as it fell out, was a description of the old South Sea House, with which Lamb happened to have associated the name of a ‘‘gay light-hearted foreigner ” called Elia, who had frequented it in the days of his service there. The pseudonym adopted on this occasion was retained for the subsequent contributions which appeared collectively

in a post 8vo volume of Hssays in 1823. After a brief career of five years the London Magazine came to an end ; and about the same period Lamb's long connexion with the India House terminated, a pension of about £450 having been assigned to him. The increased leisure, however, for which he had long sighed, did not prove favourable to literary production, which henceforth was limited to a few trifling contributions to the Vew Monthly and other serials. The malady of his sister, which con- tinued to increase with ever shortening intervals of relief, broke in painfully on his lettered ease and comfort ; and it is unfortunately impossible to ignore the deteriorating effects of an over-free indulgence in the use of tobacco and alcohol on a temperament such as his. His removal on account of his sister to the quiet of the country, by tending to withdraw him from the stimulating society of the large circle of literary friends who had helped to make his Wednesday evening "at homes" so remarkable, doubtless also tended to intensify his listlessness and helplessness. One of the brightest elements in the closing years of his life was the friendship and companionship of Emma Isola, whom he and his sister had adopted, and whose marriage in 1833 to Mr Moxon, though a source of unselfish joy to Lamb, left him more than ever alone. While living at Edmonton, he was overtaken by an attack of erysipelas brought on by an accidental fall as he was walking on the London road ;

after a few days' illness he painlessly passed away on December 27, 1834. The sudden death of one so widely known, admired, and beloved as Charles Lamb fell on the public, as well as on his own attached circle, with all the poignancy of a personal calamity and a private grief. His memory wanted no tribute that affection could bestow, and Wordsworth has commemorated in simple and solemn verse the genius, virtues, and fraternal devotion of his early friend.

In depth of thought and splendour of genius Charles Lamb was surpassed by not a few of his contemporaries, but as an essayist he is entitled to a place beside Montaigne, Sir Thomas Browne, Steele, and Addison. He unites many of the characteristics of each of these writers,

—refined wit, exquisite humour, a genuine and cordial vein of pleasantry, and heart-touching pathos. His fancy as an essayist is distinguished by great delicacy and tenderness ; and even his conceits are imbued with human feeling and passion. He had an extreme and almost exclusive partiality for our earlier prose writers, particularly for Fuller, Browne, and Burton, as well as for the dramatists of Shakespeare's time ; and the care with which he studied them is apparent in all he ever wrote. It shines out conspicuously in his style, which has an antique air, and is redolent of the peculiarities of the 17th century. Its quaintness lias subjected the author to the charge of affectation, but there is nothing really affected in his writings. His style is not so much an imitation as a reflexion of the older writers; for in spirit he made himself their contemporary. A confirmed habit of studying them in preference to modern literature had made something of their style natural to him; and long experience had rendered it not only easy and familiar but habitual. It was not a masquerade dress he wore, but the costume which showed the man to most advantage. With thought and meaning, often profound, though clothed in simple language, every sentence of his essays is pregnant, and in this respect he bears a strong resemblance to the writers already named. If he had their manner, he possessed their spirit likewise. To some of his essays and specimens we are considerably indebted for the revival of the dramatic writers of the Shakespearian age ; for he preceded Gifford and others in wiping the dust of ages from the works of these authors. In his brief comments on each specimen he displays exquisite powers of discriii- nation; his discernment of the true meaning of his author is almost infallible. As a poet Lamb is not entitled to so high a place as that which can be claimed for the essayist and critic. His dependence on Elizabethan models is here also manifest, but in such a way as to bring into all the greater prominence his native deficiency in "the accom- plishment of verse." Yet it is impossible, once having read, ever to forget the tenderness and grace of such verses as those to Hester Savory and on "The Old Familiar Faces," or the quaint humour of " A Farewell to Tobacco." As a letter writer also Lamb is entitled to rank very high.

The Letters of Charles Lamb, with a sketch of his life by one of his exccutors, Sir Thomas Noon Talfourd, appeared in 2 vols. in 1837, and Final Memorials of Charles Lamb, by the same hand, were published in 1848. Supplementary to these is the Memoir by another personal friend B. W. Procter (Barry Cornwall) published in 1866. See also Fitzgerald's Charles Lamb, his Friends, his Haunts, and his Books, 1866 ; Cradock's Charles Lamb, 1867 ; and Carew Hazlitt's Mary and Charles Lamb; Poems, Letters, and Remains, 1874. There have been several complete editions of the Works of Lamb ; of these the fullest as well as most recent is that of Fitzgerald (Life, Letters, and Writings of Charles Lamb, 6 vols.,

1870-76).

LAMBALLE, Marre Tutrise LovisE pe Savorz- CaRiGNaN, Princesse DE (1749-1792), daughter of Louis Victor of Carignan, was born at Turin, 8th September 1 (4g; In 1767 she was married to Stanislaus, prince of Lamballe, and son of the duke of Penthiévre. After his death in

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the following year an unsuccessful attempt was made to arrange a marriage between her and Louis XV. She then retired from the court; but, having accidentally made the acquaintance of Marie-Antoinette, she was after the acces- sion of Louis XVI. appointed by the queen superintendent of the royal household, and enjoyed her closest intimacy aud friendship. In 1792 she shared for a week her imprisonment in the Temple, but on the 19th August she was transferred to La Force, and, having refused the oath against the monarchy, she was on September 3d delivered over to the fury of the populace, after which her head was placed on a pike and carried before the windows of the imprisoned queen.

See Lescure, La Princesse de Lamballe, 1869 ; and Fassy, Louise de Savoie-Carignan, Princesse de Lamballe, et la Prison de La Foree,

1868.

LAMBERT, Jowann Heryricu (1728-1777), physicist and mathematician, was born at Mulhausen, Alsace, August 29,1728. He was the son of a tailor; and the slight elementary instruction he obtained at the small free school of his native town was supplemented altogether by his own private reading. Having cultivated a good style of penmanship, he became book-keeper at Montbéliard ironworks, and subsequently (1745) secretary to Professor Iselin, the editor of a newspaper at Basel, who three years later recommended him as private tutor to the family of President A. von Salis of Coire. Coming thus into virtual possession of a good library, Lambert had peculiar opportunities for improving himself in his literary and scientific studies. In 1759, after completing with his pupils a lengthened tour of two years' duration through Gottingen, Utrecht, Paris, Marseilles, and Turin, he resigned his tutorship and settled at Augsburg. Munich, Erlangen, Coire, and Leipsic became for brief successive inter- vals his home. Finally in 1764 he removed to Berlin, where he received many favours at the hand of Frederick, was elected a member of the Royal Academy of Sciences, and ultimately (1774) undertook the editing of the astronomical almanac. On Septeinber 25, 1777, he died of consumption, the natural result of a life spent in excessive application to all kinds of mental labour. Seventeen hours daily were devoted by him to reading and writing; and, as might have been expected in the case of one who wrote so much, many of his numerous publications are of little permanent interest. Not a few, however, are very valuable, and show him to have been a man of original and active mind with a singular facility in applying mathematics to practical questions.

Lambert's most important work, Pyrometrie (Berlin, 1779), is a systematic treatise on heat, containing the records and full discus- sion of many of his own experiments. . Worthy of special notice also are Photometria, Augsburg, 1760; Insigniores orbite Come- tarum proprietates, Augsburg, 1761; and Beitrdge zwm Gebrauche der Mathematik und deren Anwendung, 4 vols., Berlin, 1765-72.

The Afemoirs of the Berlin Academy from 1761 to 1784 contain many of his papers, which treat of such subjects as resistance of fluids, magnetism, comets, probabilities, the problem of three bodies

meteorology, &c.. In the Acta Helvetica (1752-60) and in the Nova Acta Evrudita (1763-69) several of his contributions appear. In Bode's Jahrbuch (1776-80) he discusses nutation, aberration of light, Saturn's rings, and comets ; in the Nova Acta Helvetica (1787) he has a long paper ''Sur le Son des Corps Elastiques" ; in Bernoulli and Hindenburg's Magazin (1787-88) he treats of 'the roots of equations and of parallel lines; and in Hindenburg's Archives (1798-99) he writes on optics and perspective. Many of these pieces were found among his effects after his death, and pub- lished posthumously. Recognized as among the first mathematicians of his day, he was also widely known for the universality and depth of his philological and philosophical knowledge. "The most valuable of his logical and philosophical memoirs were published

collectively in 2 vols., 1782. See Huber's Lambert s Leben und Wirken. moert nach seinen

LAMBERT, Joun (1619-1694), was born in 1619 at Calton Hall in the parish of Kirkby Malham, in the West Riding of Yorkshire. His family was of ancient lineage,

and long settled in the county. He studied at the Inns of Court, but without making the law his profession. In 1640 he married Frances, daughter of Sir William Lister. He was present at the great meeting of the Yorkshire gentry on Heyworth Moor (3d Juue 1642), and in September was appointed a captain of horse under Lieutenant-Colonel Fairfax. He did good service at the siege of Hull (11th October 1642), at Bradford (5th March 1644), and at the important engagement at Selby (10th April 1644). At Marston Moor (2d July 1644) he commanded part of Sir Thomas Fairfax's cavalry on the right wing. He was sent into York to arrange terms for the surrender of the city, which took place July 16, 1644. When the " New Model" army was formed in the beginning of 1645, Colonel Lambert was appointed commissary- general of the army in the north. He beat the royalists at Keighley and Ferrybridge, and took several strong places. He followed Fairfax's campaign in the west of England in 1646, and was a

commissioner with Cromwell and others for the surrender of Oxford in the same year.

When the quarrel between the army and the parliament began, Lambert threw himself warmly into the army's cause. He is said by Clarendon to have assisted Ireton in drawing up the several addresses and remonstrances issued by the army, both men having had some experience in the law, and being "of a subtle and working brain." In August 1647 Lambert was sent as major-general by Fairfax to take charge of the forces in the northern counties. His wise and jnst managing of affairs in those parts is com- mended by Whiteloeke. He displayed personal courage in suppressing a mutiny among his troops, kept strict disci- pline, and showed much diligence in hunting down tlie moss- troopers who infested the moorland country.

When the Scotch army under the marquis of Hamilton invaded England in the summer of 1648, Lambert was obliged to retreat till Cromwell came up from Wales, and joining him destroyed the Scotch army in three days' fighting from Preston to Warrington. Lambert pressed Hamilton with the cavalry, and took him prisoner at Uttoxeter, a few days after tle battle. He then marched back into Scotland, where he was left in charge of the troops. In December 1648 he sat down before Pontefract Castle, which held out till March 1649. Lambert was thus absent from London at the time of the violence put upon the parliament by Colonel Pride, and the other measures which led to the king's death.

Cromwell, when appointed to the command of the war in Scotland (26th July 1650), took Lambert with him as major-general. He was wounded at Musselburgh, but was with Cromwell at Dunbar on the 2d of September, when the soldiers begged that Lambert might lead them the next day, and Cromwell willingly gave his consent. He defeated the '" Protesters" or '' Western Whigs" at Hamil- ton, on the 1st of December 1650. In the following July he was sent over into Fife to get a position in the rear and flank of the Scotch army near Falkirk, and force theni to decisive action by cutting off their supplies from Perth. A battle fought at Inverkeithing, with heavy loss to the Scots, in which

Lambert behaved with great gallantry, gave him the position he required, and he improved it by taking Inchgarvie and Durntisland. Charles now (as Lambert had foreseen) made for England. Lambert with the cavalry was ordered to harass his march down the western shires, while Cromwell followed through Yorkshire and the Mid- lands. In the action at Warrington Bridge Lambert again distinguished himself by his personal courage, and at Wor- cester also (83d September 1651), where he commanded the forces on the eastern bank of the Severn, and had his horse shot under him. Parliament now conferred on him a grant of lands in Scotland worth £1000 per annum.

In November 1651 he was made a commissioner to settle the affairs of Scotland, and on the death of Ireton he was appointed lord deputy of Ireland in February 1652. He accepted the office with pleasure ; but his magnificent pre- parations offended the Commons, whio limited his office to the term of six months. Lambert hereupon resigued the deputyship without entering on its duties.

Notwithstanding this affront Lambert took part with Cromwell in the expulsion of the Rump (20th April 1653) and its council of state. He was joined to tlie lord-general and two others as additional members of the little parlia- ment of nominees, making up the number to one hundred and forty-four. He presented the act of resignation of that assembly, and was principally concerned in drawing up the address requesting Cromwell to assume the protec- torate, and the Instrument of Government, which was the constitution of the Protectoral rule. At the installation of Cromwell he bore a prominent part. In the parliament of 1654, and again in 1656, Lambert (or Lord Lambert as he is now generally called) sat as member for the West Riding of Yorkshire. When the proposal to declare Oliver king was started in parliament (February 1657) he at once declared strongly against it. A hundred officers headed by Fleetwood and Lambert waited on the Protector, and begged him to put a stop to the proceedings. Lambert was not convinced by Cromwell’s arguments, and Cromwell and he henceforward never spoke to each other as friends. On his refusal to

take the official oath of allegiance to the Protector, Cromwell deprived him of his commissions, giving him, however, a pension of £2000 a year. He retired to his house and garden at Wimbledon, and appeared no more in public during Oliver Cromwell's lifetime. .

On the accession of Richard he seems to have expected the first place in the army, but was not unwilling to be second to Fleetwood. The Protector was between two parties—the court party, who wished to hold to the '"' Peti- tion and Advice," and the army party or Wallingford House party, who, whilst supporting Richard as Protector, wished to put the control of the army into stronger hands. Richard saw that to deliver up the power of the sword was to abdi- cate, and refused to make Fleetwood general, Jambert was elected for Pontefract in Richard's parliament, and took part with the republican malcontents who soon com- bined with Wallingford House. Councils of officers were held, which Lambert, though holding no commission, was invited to attend. They determined to stand by the " good old cause" and to demand the dissolution of the parliament as being too full of monarchical and Presbyterian notions —in fact, to put the civil power aside and set up a military government in its stead. The Protector dissolved parlia- ment (22d April 1659). The officers, unable to rule with- out a parliament, restored the Rump as representing the Commonwealth (7th May 1659). Richard's Protectorate had practically ended with his parliament, and he now laid down the show of royalty. Sir George Booth and Sir Thomas Middleton headed a royalist rising in Cheshire, which Lambert put down after a sharp encounter near Chester. He promoted a petition from his army that Fleetwood might be made lord-general and himself major- general. The republican party in the house took offence. The Commons (12th October 1659) cashiered Lambert, Desborough, and other officers, and retained Fleetwood's commission as chief of a military council of seven, re- publicans of the old sort. Lenthall, the speaker, was to give his orders to the army. On the next day (13th October) Lambert caused the doors of the House to be shut and the members kept out. On the 26th a "com- mittee of safety" was appointed, of which Lambert was a member. He was also appointed major-general of all

the forces in England and Scotland, Fleetwood being general. Lambert was now sent with a large force to meet Monk, who was in command of the English forces in Scotland, and either negotiate with him or force him to terms. Monk, however, declared for the liberty and authority of parliament, and set his army in motion south- ward. The committee of safety was obeyed no more than the Rump had been. The soldiers themselves cried out for the. restoration of parliament, and on the 26th of December the Rump was recalled to restore some appear- ance of lawful authority.

Meanwhile the bulk of Lambert's army was dissolved by the mere appearance of Lord Fairfax in arms on Marston Moor, and he was kept in suspense by Monk's deceits and delays, till his whole army fell from him, and he came back to town almost alone. Monk marched unopposed to London, and declared for a "free parliament." The "excluded" Presbyterian members were recalled. Lam- bert was sent to the Tower (3d March 1660), from which he escaped a month later (9th April 1660). He tried to rekindle the civil war in favour of the Commonwealth, but was speedily recaptured, and sent back to the Tower (24th April). On the Restoration he, along with Vane, was exempted from danger of life by an address of both Houses to the king. The next parliament (1662) brought a charge of high treason against them. Vane was belieaded, but Lambert was spared, and remained in custody in thie island of Guernsey for the remainder of his life. He died at the age of seventy-five, in 1694.

Lambert would have left a better name in history if he had been a Cavalier. His genial, ardent, and excitable nature, easily raised and easily depressed, was more akin to the royalist than the puritan spirit. Vain and sometimes overbearing, as well as ambitious, he believed that Crom- well could not stand without him, and, when Cromwell was dead, he imagined himself equal to succeed him, aud thought that the first place must be his by right. Yet his ambition was less selfish than that of Monk. Lambert is accused of no ill faith, no want of generosity, no cold and calculating policy. Lambert was not merely a soldier. He

was an able writer and speaker, and an accomplished negotiator, and took pleasure in quiet and domestic pursuits. He learnt his love of gardening from Lord Fairfax, who was also his master in the art of war. He painted flowers, besides cultivating them, and incurred the blame of Mrs Hutchinson by “dressing his flowers in his garden and working at the needle with his wife and his maids.” He made no special profession of religion; but no imputation is cast upon his moral character by his detractors. It has been said that he became a Roman Catholic before his death, (F. Wa”)

LAMBESE, or Lampessa, the ancient Lambexsa and the Tazzut or Tezzulet of the natives, is situated in the French province of Constantine in Algeria, about 6 miles east of Batna. The modern village is well known for its great convict establishment (founded about 1850); and the remains of the Roman town, and more especially of the Roman camp, in spite of the wanton vandalism to which they have been more than once subjected since their discovery, are among the most interesting in northern Africa. The ruins of the town are situated on the lower terraces of the Jebel Aures, and consist of triumphal arches, temples, aqueducts, and an immense quantity of ordinary masonry evidently belonging to private houses. To the north and east lie extensive cemeteries with the stones still standing in their original alignments; to the west is a similar area from which, however, the stones have been largely removed for building the modern village. Of the temples the most noteworthy are those to Aisculapius and Health (Salus), and to Isis and Serapis. About two-thirds

of a mile from the town on the level ground of the plain of Batna standsthe camp. It measures 1640 feet from north to south by 1476 feet from east to west, and in the middle rise the ruins of a pretorium. This noble building is 92 feet long by 66 feet broad and 49 feet high ; its southern facade has a splendid peristyle half the height of the wall, consisting of a front row of massive Ionic columns and an engaged row of Corinthian pilasters. The ruins of both city and camp have yielded a rich harvest of inscriptions (Renier edited 1500, and there are

4185 in the Corpus Inscr. Lat., vol. viii.); and, though a very large proportion are epitaphs of the barest kind, the more important pieces supply a fair outline of the history of the place.

Lambesa was emphatically a military foundation. The camp of the third legion (Legio III. Augusta), to which it owes its origin, appears to have been established between 123 and 129 a.D., in the time of Hadrian, whose address to his soldiers was found inscribed on a pillar ina second camp to the west of the great camp still extant. By 166 mention is made of the decurions of a vicus, 10 uri of which are known by name; and the vicus became a muni- cipium probably at the time when it was made the capital of the newly founded province of Numidia. The legion was reinoved by Gordianus, but restored by Valerianus and Gallienus ; and its final departure did not take place till after 392. The town soon after- wards declined. It never became the seat of a bishop, and no Christian inscriptions have been fourid among the ruins.

See Bruce; Peysonnel; L. Renier, Znscriptions romaines de l’ Algérie, Paris, 1855; Gustav Wilmann, “Die Rim. Lagerstadt Afrikas,” in Comentationes phil. tn honorem Th. Mommsent, Berlin, 1877 ; Playfair, Travels tn the Footsteps of Bruce, London, 1877. A ground plan of the ruins is given in Jfém. des Antig. de France, tom. xxi.

LAMBETH. , See Lonpon.

LAMECH, 122, is a name which appears in each of the antediluvian genealogies, Gen. iv. 16-24 and Gen. v. In the first he is a descendant of Cain, and through his three sons father of the several avocations of early civilization ; in the latter he is father of Noah. In each case, though in different senses, he marks the close of the first epoch of the world’s history. Since the publication of Buttmann’s Mythologus it has come to be generally recognized that the two genealogies terminating in Lamech are divergent forms of a single list. The parallelism of the two is not confined to the identical names, Lamech and Enoch. Methuselah (Maovcada) not Methusael is the true reading of the LXX. in Gen. iv. 18, and there are some textual grounds for thinking that in the same verse Mehujael has displaced an older reading Mahalaleel.

Kainan again is closely akin to Cain, and there is also a less close resem- blance between Jared and Irad, while Enos (Enosh) and Adam both mean man. Thus the two series beginning with Enosh and Adam and ending in Lamech do not vary more than is often the case with different recensions of ancient name lists. See especially Lagarde, Orientalia, ii. 33 sg. Again it has been pointed out, especially by Wellhausen, Jahrb. f. D. Theol., 1876, p. 400 sg., that Gen. iv. 16-24 is in its original conception quite distinct from the history of the curse of Cain (Gen. iv. 1-15), and offers the history of the beginnings of existing civilization. (verse 20 sq.), not of a civilization extinguished by the flood ; and the continuation of this narrative is plausibly sought in the history of the tower of Babel, according to which the human race entered Babylonia from the east (comp. iv. 16 with xi. 2), whereas the movements of the sons of Noah start from Ararat. On this view we are to suppose that the oldest literary source of the Hebrew history of the origins of our race ignored the flood, and traced the beginnings of city life to a land east of Eden (Nod), which has no place in later geography, and of which Cain was the first settler. Lamech is a descendant of Cain, under whose sons the different special avocations of a very primi- tive civilization differentiate themselves. The mass of the people are tent dwellers and shepherds, their “father” or the patron of their occupation being Jabal; but the arts are also developed in two branches, the “ father” of minstrelsy

being Jubal, while the art of metallurgy is traced back to Tubal Cain (LXX. simply @ofeA). The etymologies of the proper names throw little light on this interesting concep- tion ; that of Lamech is quite obscure,! and the names of the sons, if they are Semitic, may be all derived from the root 53’, expressing the notion of “ offspring.” It is indeed conceivable that some of the names are of non-Semitic origin ; ¢épdél in Persian and Turkish means bronze, and the nation of Tubal was known to the Hebrews for bronze- work (Ezek. xxvii. 13), which would go well enough with the fact that Kayn in Arabic means a smith. But on the other hand the wives and daugliters of Lamech, as well as the other two sons, have names that point naturally to Hebrew roots, so that it is very doubtful how far one is entitled to press these

foreign analogies in explaining what is certainly one of the oldest Hebrew traditions.

What we read in Genesis of Lamech and his race seems to be a mere fragment of an older and more copious tradi- tion. He has two wives—Adah (JY, “ornament” ?), a name which reappears in Gen. xxxvi. in the genealogy of the Edomites, and Zillah (ny, “shadow”). Ewald gives to these names a mythological colour by making Adah mean “aurora” (Arabic ghaddt) in contrast to Zillah, “shadow”; but in that case we should expect the LXX. to transcribe the word by Tada not Ada, as Irad is rendered Tadad. At the same time the unquestionable occurrence of names of gods in the Edomite genealogy where Adah recurs favours the view that something of the same sort may be found in Gen. iv. 16 sg. On the other hand it is certainly important that the sons of Lamech form two brotherhoods (verse 21) divided by their maternal descent. The fathers of pastoral life and minstrelsy stand apart from the father of metallurgy and his sister Naamah. Handicraft especially in metals is generally practised by foreigners among the Semitic nomads, so that Tubal Cain may very well represent another race, such as the non-Semitic people which introduced metallurgy in Chaldzea according to Assyriologists. The name Naamali (“gracious”) is so plainly akin to the divine name Naaman (Noman, Adonis) that we can scarcely refuse to compare what is said of her brother with the Phoenician legend in Philo Byblius (Euseb., Pr. #v,, I. x. 9) of two brothers, inventors of iron and iron-working, of whom one named Chrysor was skilled in sayings, incantations, and divina- tion, and was worshipped as a sort of Pheenician Hephestus. The details of Phcenician legend, however, in this as in other cases, are widely divergent from the Bible story.

The savage “sword song” of Lamech is unique in the Bible, and breathes the true spirit of the desert :—

Adah and Zillah, hear my voice;

Ye wives of Lamech, give ear unto my speech. I slay a man for a wound,

A young man for a stroke;

For Cain’s vengeance is sevenfold,

But Lamech’s seventyfold and seven.

In the other form of the genealogy the line of Lamech is dissociated from the guilty Cain and leads up to Noah. This form of the tradition is much more recent, belonging to the Levitical or priestly narrator. Its chief importance is that it shows how inseparably Lamech and his genealogy were connected with the ancestry of the Hebrew race.

LAMEGO, a town in the district of Vizeu in the pro- vince of Beira, Portugal, is situated 6 miles south of the Douro, and about 50 miles east of Oporto. As the seat of a bishop, it contains a Gothic cathedral, a part of which is referred to the 14th century. One of the churches was

1 The conjectures and supposed parallels offered by Ewald (Geschichte, i. 382, 891; Jahrb. vi. 2) and Movers (i. 476 sq.) offer no safe basis for speculation. G. Smith (Chaldzan Genesis, ch, xvii.) proposes to identify the name with the Accadian Dumugu and Lamga,

moon.”

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formerly a Mvorisl mosque, and, though intrinsically cora- monplace, enjoyed for a long time an undeserved fame as the meeting place of the cortes said to have been convened in 1143 or 1144 by Alphonso Henriquez, the first king of Portugal, to settle the royal succession and to determine the laws of the country. But within the last forty years it has been pretty clearly demonstrated that no such cortes ever met. To archeologists the ancient bath preserved at Lamego will afford more interest than the old Moorish castle, which crowns the hill on which the city stands. Numbers of swine are reared in the neighbourhood, which furnish the well-known Lisbon hams. The old name of Lamego

was Lama or Lamacceni. Under the Moors, who were driven out in 1038 by Ferdinand of Castile, it was a leading city. The population in 1878 was 8383.

LAMENNAIS, Hucues Fauicrri Rozert pe (1782- 1854), French theologian, philosopher, and political writer, was born at St Malo in Britanny. His father, Pierre Louis Robert, merchant and shipowner, had been ennobled by Louis XVI. because of aid to royal naval armaments and for importing and selling corn at easy prices in a time of public distress. His property of La Mennaig, with the feudal prefix De, gave him a new surname. His wife was as noted for her saintly temper as her humane husband for scepticism. The death of his mother and his father's bankruptcy deprived young Lamennais early of regular education. An eccentric uncle got charge of him, and for years the freedom of this uncle's library was all his training. His elder brother Jean, priest, educationist, and author, had taught him the elements of Latin, and by his own further efforts he comprehended Livy at ten. Well read in Rousseau at twelve, he criticized religion so adroitly with the parish priest that he could not be admitted to communion. In 1796 he sent a discourse combating modern philosophy to @ provincial academy. He visited Paris with his father next year, where he wrote democratic letters to the news- papers. On his return he joined his brother for study at a house near Dinan called La Chenaie, built by their maternal grandfather. Greek, Latin, Hebrew, modern languages, the church fathers, the controversialists, and historians occupied him. Religious struggle, and an intense melancholy, aided it may be by the madheureuse passion which he is said to have suffered from, account for the fact that he was twenty-two before taking his first communion, though in direct preparation for the clerical life.

In 1808 his hand found its proper work. His Reflexions on the State of the Church during the 18th Century and on the Actual Sttwation, published anonymously at Paris, was the first important theological stand made against the materialistic philosophy which had its apotheosis in im- perialism. Napoleon's police seized the book as dangerously ideological, with its eager recommendation of religious revival and active clerical organization. It awoke the ultra- montane

spirit which has played so great a part since in the politics of churches and states. But Lamennais was not yet ready for the contest. Pious exaltation of spirit was his prevailing mood, as is shown by his translation next year of the Spiritual Guide of the ascetic Blosius. Indeed, to the end of his life ‘there is recurrence to what may be called poetic religious feelin g, one of his latest reliefs from the storms of political struggle being a translation of the Gospels. In 1811 he took the tonsure, but shortly after became teacher of mathematics in the seminary founded by his brother at St Malo. Theological politics had large discussion after the concordat of 1802, by which the Gal- lican Church was re-established ; and the brothers’ joint work, Tradition upon the Institution of Bishops, which was published a few days after the restoration, condemns the Gallican principle which allowed bishops to be created lrespective of the pope’s sanction.

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The revival of the Bourbon monarchy drew Lamennais to Paris, and the Hundred Days sent him to exile. The abbé Caron gave him work in his school for French exiles in London ; and he also became tutor at the house of Lady Jerningham, whose first impression of him as an imbecile changed into friendship. In 1815 he returned with the abbé to Paris, where his seeming fatuity cost him much misery as a seminarist of St Sulpice ; but with Caron’s aid, whom he called his spiritual father, he took full sacerdotal ordination next year, though with reluctance, as a letter to his sister shows. He enjoyed much peace with his friend at tle Maison des Feuillantes, and finished there the first volume of his great work, the Lssay on Indifference in the Matter of [eligion. Published in 1817, it affected Europe like a spell. Since Bossuet no clergyman wielded such power as he gained at a blow. He denounced tolera- tion, and advocated a Catholic restoration to belief. The right of private judgment, introduced by Descartes and Leibnitz into philosophy and science, by Luther into religion, and by Rousseau and the Encyclepedists into politics and society, had, he contended, terminated in prac- tical atheism and spiritual death. Ecclesiastical authority, founded on the absolute revelation delivered to the Jewish people, but supported by the universal tradition of all nations, he

proclaimed to be the sole hope of regenerating the European communities. In 1824 the fourth volume completed the work, and the Defence of the same date indi- cates the violent opposition he met with, not only from his natural enemies, the lovers of personal freedom in thought, science, and politics, sacred or civil, but from the Gallican bishops and monarchists, because he argued thatall authority rests in the Holy See, and from his ultramontane friends, because le dared to support the Christian revelation by an analysis of human, or, as they considered, profane tradition.

Meanwhile Lamennais had become journalist on the Conservateur, with Chateaubriand, De Bonald, and De Villéle for his fellows in essentially political work. When in 1820 De Villéle became the chief of the ultras, or friends of absolute monarchy, Lamennais, who was not the mon- archist they thought him, left the Conservateur with other contributors, named ‘the incorruptibles,” and in the Drapeau Blanc and in the Mémorial Catholique he opposed his previous comrade. His principles compelled him to draw a firm line as to the divine right of even legitimate kings, especially in connexion with church supremacies. In 1823 he was before the tribunals for an article in the Drapeau Blane. He went to Rome in 1824, and Pope Leo. XII., his admirer, offered him the cardinal’s hat, which he refused. On his return he published Religion in tts Relations to Civil and Political Order, the first volume of which wasa picture of the religious state of France, and the second an attack on the competence of the assembly of the clergy in 1682 to decree the liberties of the Gallican Church. The law accepting these liberties, Lamennais was summoned before the state courts, and with all France keenly interested was condemned to paya fine. From this time he broke with the legitimists and the liberals, and Rome became to him the only seat of the social problem. His ideal was a pure theocracy.

But in the Progress of the Revolution and War against the Church the element of popular political liberty began to appear, modifying such infallibility of the head of the church as deposing of princes aud dispensing with oaths of allegiance taken by their subjects implied. The revolution of 1830 increased his popular leanings, and in the

journal L’ Avenir, which he founded in September with the mottoes ‘God and Liberty,” “The Pope and the People,” theories strange to ultramontanism were broached. With Lacor- daire, Montalembert, Gerbet, and other disciples, he de- manded rights of local administration, enlarged suffrage,

universal and equal freedom of conscience, of instruction, of | from the necessities and aspirations of the temple, stands

meeting, and of the press. Methods of worship were to be criticized, improved, or abolished, and all in absolute submission to papal spiritual but not temporal authority. The Jesuits and the prelates grew alarmed, and “the modern Savonarola” was denounced to Gregory XVI. On their spiritual obedience the writers of Z’ Avenir were ordered to suspend the journal, which they did (1831), and Lamennais, Lacordaire, and Montalembert set out for Rome to get the papal pardon and blessing. They were not received, and “ Catiline departed,” to be overtaken by a bitter encyclical letter at Munich from the pope condemning the new doc- trines. So interested was Gregory in the questions raised that under an assumed name he published a work of refu- tation. To his demand of submission Lamennais signed obedience, with a saving clause as to his country and humanity. wounded he retired tv La Chenaie, the scene of his youth- ful inquiries and memories. His genins had turned the entire Christian church against him, and those whom he fought for so long, the ultramontanes, were the fiercest of all his opponents. The famous Words of a Belvever appeared in 1834, and his final rupture with the church took place. ‘Small in size but immense in its perversity,” was the pope’s criticism in a new encyclical letter. A tractate of aphorisms, it has the vigour and sacred breathing of a Hebrew prophet.

Henceforth Lamennais is the apostle of the people alone. The Affuirs of Rome and the Ills of the Church and Society came from old habit of religious discussions rather than from his real mind of 1837, or at most

it was but a last word. JAlodern Slavery, I'he Book of the People, Politics for the People, two volumes of articles from the journal of the extreme democracy, Le Monde, are titles of works which show that he has arrived among the missionaries of liberty, equality, and fraternity, and he soon gets a share of their martyrdom. Zhe Country and the Government caused him a year's imprisonment in Ste Pélagie. He struggled through difficulties of lost friendships, limited means, and personal illnesses, faithful to the last to his hardly won dogma of the sovereignty of the people, and, to judge by his contribution to Louis Blane's Review of Political Pro- gress, was ready for something like communism. He was named president of the "Société de la Solidarité repub-

licaine," which counted half a million adherents in fifteen

days. The Revolution of 1848 had his sympathies, and he started Le Peuple Constituant, but was compelled to stop it on 10th July, complaining that silence was for the poor; but again he was at the head of La Révolution Democratiyzue et Sociale, which also succumbed. He managed his own publications ; and pamphlets without number, and at intervals volumes of Afélanges, kept his influence fresh and his republican aims to the front as much as possible. In the constituent assembly he sat on the left till the coup détat of Napoleon IIL. in 1851 put an end to all hopes of popular freedom. While deputy he drew up a constitution, but it was rejected as too radical, A translation of Dante chiefly occupied him till his death in the fourth year of the second empire. He refused to be recouciled to the church, and was buried at Pére La Chaise without funeral rites, according to his own directions, mourned for by a countless concourse of democratic and other admirers.

During the most difficult time of his republican period he had one resource by which to find solace for his intellect from the noise of daily politics. From 1841 till 1846 he was engaged on the work which will remain longest as evidence of his thinking power and of his clear brilliant style, his Sketch of a Philosophy. Of the four volumes, the third, which is an exposition of art as development

The iron had entered his soul, and deeply |

pre-eminent. The rest of the work somewhat answers to the modest title of the book. Some papers which he wished to be published intact after his death were kept back by the religious zeal of his brother and sister, but in 1855 and afterwards till 1859 six volumes appeared under the care of Emile Forgues. Blaize, the nephew of Lamennais, disputed various rights with Forgues, and in his biography of his uncle he questions facts in the account of the life prefixed by the editor to the Posthumous Works. But the whole matter is of private rather than public interest, affecting the position of Lameunais in little degree.

The complete works have been published twice at Paris, in 12 volumes, 1836-37, and in 11 volumes by Pagnerre, 1844 sg. Neither edition is anything like complete, but that of Pagnerre is the more so. Besides the biographical matter given by Forgues and Blaizo as preface—the former to the Posthwmous Works, the latter to the Unedited Works, Sainte-Beuve has Lamenuais as one of his skilful Portraits Contemporains, Castille has him among the Portraits politiques aw dix-neuvieme siéele, and George Sand's thoughts of '*the Breton" can be read in French Authors at Home. Robinet, Gerbet, and Regnault may be selected from many others who give personal details. Querard's Les Supereheries Littéraires Devoilées, article ''La Mennais," will give ample introduction to all that is known of the author's works, and of the works connected with him. (T. SI.)

LAMENTATIONS, Boox or. The Old Testament book of Lamentations bears in Hebrew Bibles the superscription ns, "Ah how!" the opening word of the first chapter, and also of chaps. ii, and iv. The Talmud, however, and Jewish writers in general call it the book of M3", ''elegies" or "dirges,"+ of which the Septuagint title @pyvor and the Latin Lamentationes or Lamenta are translations, The fuller title Lamentationes Jeremix Prophete, Lamentations of Jeremiah, expresses the ancient tradition as to the authorship of the book. It is found in the Syriac and in some MSS. of the LXX., ¢.g., in x, but not in A and B; and the shorter anonymous form is undoubtedly older.

The dirges which make up the book are five in number, and the first four are alphabetical acrostics,—successive verses in chaps. i., ii., iv., or successive sets of three verses in the case of chap. iii., beginning with successive letters of the alphabet. The last chapter has twenty-two verses, like chaps i., ii, and iv., but is not an acrostic.

It is noteworthy that in chaps. ii., iii., and iv. the letter Pe (5) precedes ‘Ayin (Y), eontrary to the ancient and established order common to the Hebrew alphabet with its Greek and Latin deriva- tives, in which O stands for ¥. The sense shows that this irregu- larity is not due to a transposition of the original order of the verses, while the fact that the same transposition occurs three times makes it plain that the deviation.from the eommon order is not due to want of skill to make the acrostic perfect, but rests on a variation in the order of the alphabet as used by the author. Thus it has not unnaturally been argued by Thenius that chap. i., whicli takes the alphabet in the common order, must have a different author from ehaps ii.-iv. ; but it is quite as probable that in chap. i., as Ewald suggests in the 2d ed. of his Dichter, p. 326, ver. 16 originally followed ver. 17, and was transposed to reduce the acrostic to the usual form. In the other chapters the sense forbade such transposition.

The subject of the five dirges is not the death of an individual; they refer to a national calamity—the widow- hood of Jerusalem and the overthrow of the Judean state by the Chaldeans. But the examples of Amos v. 1, 2, Jer. ix. 19 [18], Ezek. xix., show that they are not less pro- perly called dirges on that account; the lamentations of Israel over the desolation of Zion, the agonies of the last desperate struggle and the extinction of national existence, appropriately took a form modelled on the death-wail sung by “cunning women” (Jerem. ix. 17) and poets “skilful of lamentation” (Amos v. 16) at the wake (28) of the illustrious dead. Among the Hebrews, as among other primitive peoples, this type of poetry was much cultivated,

1 This name, as will appear below, is perhaps as old as the book of Chronicles, and is the Hebrew title known to Jerome (Prol. @al.).

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baw wT

and reached great artistic perfection at an early date, as appears from David's elegy on Saul and Jonathan; and as it was practised by persons of special skill, whose services were engaged by the relatives of the dead, it naturally assumed a certain formal and even artificial character. This accounts for the use in our book of the elaborate acrostic form, which to our minds seems little suited for such composition. We are not to think of these dirges as an unstudied effusion of natural feeling, but as carefully elaborated poems in which every element of pity and terror which the subject supplied is brought forward with conscious art to stir the minds of the hearers. It is far from improbable that the Lamentations were originally composed, as Ewald suggests, for a solemn act of mourning in which the captive or fugitive Israelites united, and we know that they ultimately took their place in the ritual of the great day of mourning, the 9th of Ab, when the synagogue still celebrates the fall of the temple. The fast or weeping of the fifth month (Ab) was already an old usage in the time of Zechariah (vii. 3), and it is quite possible that the ritual use of the book of Lamentations goes back to the early days of this ancient custom, Such considerations meet the difficulty which has sometimes been felt in supposing a single author to have written a whole series of elegies on the fallof Jerusalem. Ina solemnand formal ceremony of mourning the repetition of the same theme in successive songs of lamentation is only natural. These observations do not of course prove the unity of the book, but they add force to the arguments for unity derived from the plan and language of the whole, and urged by critics, like Ewald and Nagelsbach, who are not influenced by the tradition which makes Jeremiah the author. _ The evidence for unity of authorship, it may be at once ob- served, applies most forcibly to the first four chapters, which are also connected by their acrostic form, and espe- cially by the peculiarity in the order of the alphabet already alluded to as still found in chaps. ii, iii, and iv., and perhaps at one time found even in chap. i.

The first elegy commences with a picture of the distress of Zion during and after the siege (i. 1-11), Jerusalem, or the people of Judah, being

figured as a widowed and dishonoured princess. Then in the latter half of the poem sho hersclf takes up the lamentation, describes her grievous sorrow, confesses the righteousness of Jehovah's anger, and invokes retribution on her enemies. In the second chapter the desolation of the city and the horrors of the slege are again rehearsed and made morc bitter by allusion to the joy of the enemies of Israel. The cause of the calamity is national sin, which false prophets failed to denounce while repentance was still possible, and now no hope remains save in tears and supplication to stir the compassion of Jehovah for the terrible fate of his people. The third elegy takes a personal turn, and describes the affliction of the individual Israelite or of the nation under the type of a single individual under the sense of Jehovah's just but terrible indignation, But even this affliction is a wholesome discipline. It draws the heart of the singer nearer to his God in penitent self-examination, sustained by trust in Jehovah's unfailing mercy, which shows itself in the continued preservation of His people through all their woes. From the lowest pit the voice of faith calls to the Redeemer, and hears a voice that says, ‘‘ Fear not.” Jehovah will yet plead the cause of His people, and so in the closing verses the accents of humble entreaty pass into a tone of confident appeal for just vengeance against the oppressor. In the fourth acrostic the bitter sorrow again bursts forth in passionate wailing. The images of horror imprinted on the poet's soul during the last months of Jerusalem's death-struggle and in the flight that followed are pees with more ghastly detail than in the previous chapters, and the climax is reached when the singer describes the capture of the king, ‘‘the breath of our nostrils, the anointed of Jehovah, of whom, we said, ‘ Under his shadow we shall live among the nations.’” The cup of Israel's sorrow is filled up. The very completeness of the calamity is a proof that the iniquity of Zion has met with full recompense. The day of captivity is over, and the wrath of Jehovah is now ready to pass from His people to visit the sins of Edom, the most merciless of its foes.

Thus far there is both unity and progress in the thought.

: See Mas. Sépherim, chap. xviii., and the notes in Miiller's edition, Leipsic, 1878.

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Behind the division into four acrostics lies a larger grouping in three sections, each of which begins with the elegiac N3°S, followed by a representation in increasing detail of the great calamity, and passes on through the thought of Jehovah's righteousness to hope, which, as in Psalm exxxvii., finds its characteristic culmination and point of rest in the assurance of righteous vengeance. The central section (chaps. ii. and iii.) is the most subdued in tone, and sounds the profoundest depths of religious feeling, while the opening sec- tion presents the theme in its broadest unity, under the form of personification, and is balanced in chap. iv. by the surging flood of an anguish which pours itself forth all the more unreservedly that it contains the seeds of hope.

The fifth chapter, which takes the form of a prayer, does not follow the scheme common to the three foregoing sections. The elegy proper must begin with the utterance of grief for its own sake, Here on the contrary the first words are a petition, and the picture of Israel's woes comes in to support the prayer. The point of rest too is changed, and the chapter closes under the sense of con- tinued wrath. The centre of the singer's feeling no longer lies in the recollection of the last days of Jerusalem, but in the long con- tinuance of a divine indignation which seems to lay a measureless interval between the present afflicted state of Israel and those happy days of old which are so fresh in the recollection of the poet in the first four chapters. The details too are drawn less from one crown- ing misfortune than from a continued state of bondage to the servants of the foreign tyrant (ver. 8), and a continued series of insults and miserics. And with this goes a change in the conscious- ness of sin: 'Our fathers have sinned, and are not; and we have borne their iniquities" (ver. 7; compare Zech. i. 2-6, and similar complaints in very late psalms). These differences, combined with the absence of the acrostic form, suggest that the chapter may be

a later addition. It may be noted also that in ver. 6 the community which joins in the prayer has humiliating relations to Assyria (Syria ?) on the one hand and to Egypt on the other, which seems to imply that it dwells in Palestine,—a situation to which the com- plaint that strangers possess its land and houses, that the weak remnant of Israel is in constant danger from Bedouin incursions (ver. 9), and the picture of the foxes that walk among the ruins of Zion, may also point. Moreover, the fact that the book has fivo parts, like tho Psalterand the Pentatcuch, makes it very conceivable that it received its present form after the Pentateuch was complete, that is, after the time of Ezra. The linguistic arguments for the unity of the book (most fully stated by Nigelsbach, p. xvi.) secm to break down as regards chap. v.

According to a tradition which passed unquestioned among Jews and Christians till recent times, the author of the whole book is the prophet Jeremiah. ‘T’o estimate tho value of this tradition, we must trace it back as far as possible. A note prefixed to the Septuagint translation says that, ‘‘after Israel was taken captive and Jerusalem laid waste, Jeremiah sat down and wept, and sang this elegy over Jerusalem.” This note may very possibly have stood in the Hebrew copy of the translator, but it certainly cannot be regarded as part of the original text, and it does not bring the tradition within three hundred years of the age of Jeremiah. Another argument bearing on the authority of the tradition has regard to the original place of the book in the Old Testament canon. In Hebrew Bibles the Lamentations stand among the Hagiographa, forming one of the five Megilloth or small books written on separate rolls for liturgical use on separate occasions. In the common order of printed Hebrew Bibles the book stands third among the Megilloth, because in the order of the ecclesiastical year the solemnity of the 9th of Ab was the third annual occasion at which a Megillah was used (see CANTICLES, vol. v. p. 32). In the Septuagint and Syriac, on the other hand, the Lamentations are attached to the book of Jeremiah, Baruch intervening in the former version ; and it has been often supposed that this was the older arrangement,—that is, that even in Hebrew copies the book originally formed an appendix to Jeremiah, and was afterwards separated for liturgical reasons. The argument for this view turns on the fact that side by side with the

Talmudic enumeration of twenty-four Old Testament books, agreeably to the present Hebrew arrangement, there was another enumeration which gave twenty-two books, taking Ruth with Judges and Lamentations with Jeremiah (Jerome, Prol. Gal.). This seems to be the reckoning

adopted by Josephus, but the evidence that it had an established place among the Jews of Palestine at or even after his time is scanty and precarious. At any rate the artificial scheme which accommodates the number of sacred books to the number of the twenty-two Hebrew letters 1s one that can hardly be original. It first appears about the time of the labours of the rabbins in the last days of the Jewish state to give final form to the canon.

Here then there is nothing to carry us beyond the evidence of the Septuagint, and Néldeke has pointed out that there is some reason to suspect that the Septuagint translation of Lamentations is not by the same hand with that of Jeremiah, which goes to prove that even in the Greek the two books (which are in fact separated by the Apocryphal Baruch) were not originally one. Certainly the book of Lamentations has not shared the very peculiar history of the text of Jeremiah, the Greek of the former agreeing with the Hebrew so closely as to make it probable that the text was early established by frequent liturgical use, while the prophecies underwent many variations in transmission. There is, however, one piece of evidence in the Hebrew canon itself which ancient writers accepted as connecting the name of Jeremiah with our book. In 2 Chron. xxxv. 25 we read that Jeremiah pronounced a dirge over Josiah, and that the death of Josiah was still referred to according to stated usage in the dirges used by singing men and women in the author’s day, and collected in a volume of n}2p—the ordinary Jewish name of our book. Josephus says that the dirge of Jeremiah on this occasion was extant in his days (Ant, x. 5, 1), and no doubt means by this the canonical Lamentations. Jerome on Zech. xii. 11 understands the passage iu Chronicles in the same sense ; but

modern writers have generally assumed that, as our book was certainly written after the fall of Jerusalem, the dirges alluded to in Chronicles must be a separate collection. This, however, is far from clear. The ny3’p of the Chronicler had, according to his statement, acquired a fixed and statutory place in Israel, and were connected with the name of a prophet. In other words, they were canonical as far as any book outside the Pentateuch could be so called at that age. Moreover, the allusion to the king, the anointed of Jehovah, in Lam. iv. 20, though it really applies to Zedekiah, speaks of him with a warm sympathy which later ages would not feel for any king later than Josiah, The Chronicler in particular recognizes only thoroughly good kings (of whom Josiah was the last), and kings altogether bad, for whom he had nothing but con- demnation, and with whom he certainly could not imagine a prophet to sympathize.? It thus seems highly probable that in the time of the Chronicles, that is, about the close of the Persian period, the book of Lamentations had a recognized liturgical use in the hands of a guild of singers, and was already connected with the name of Jeremiah, though the passage in Chronicles does not make it apparent that the whole official collection of dirges was ascribed to him. But even this testimony is some two centuries and a half later than the events which the book of Lamentations bewails, and is connected with an undoubted error, though a natural one, as to the reference of the book. We cannot therefore feel sure that the tradition current in the guild of singers was authentic and continuous 3 the general subject of the Lamentations, and particularly the obvious applicability to the personal circumstances of Jeremiah of

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1 The supposed testimony of Origen (Eus., H. E., vi. 25) breaks down, for if it applied to the Hebrew Bible it would also prove, what we know to be false, that the epistle of Jeremiah stood in the Hebrew canon. Origen, Jerome, and other Christian writers were probably influenced by the statement of Josephus. The testimony of the Book of Jubilees, as cited by Syncellus and Cedrenus, is very doubtful (Rénsch, B. der Jub., p. 527 sq).

- See Nuldeke, A TZliche Literatur, p. 144.

such passages as iii, 14, 55 (comp. Jer. xx. 7; xxxviii,), made it natural or even inevitable to think of him as author, if any attempt was made to connect the book, as the later Jews sought to connect all books, with some known name. Nor can we lay special weight on the acceptance of the tradition by an author who transfers post-exile Psalms to the Davidic age (1 Chron. xvi. 7 sq.).

When we proceed to test the internal probability of the tradition we find it to be surrounded by grave difficulties, The language, as Ewald observes, and Nigelsbach (p. xi. sg.) has shown with great completeness, is very remote from that of Jeremiah, aud even if we separate out chap. v., in which the features already pointed out make it peculiarly difficult to think of him as author, the standpoint of the book corresponds very imperfectly with that of the prophet. Jeremiah, through all his life, was a man standing by himself, isolated from his people. At the taking of the city the Chaldeans themselves acknowledged this and treated him with favour. He was carried into Egypt against his will, still counselling patient submission to the foreign rule, and there he continued in opposition to the mass of the fugitives as decidedly as before. The Lamentations, on the contrary, show us a poet in sympathy with the old life of the nation, whose attitude tothe temple services, and especially to the king, is far more popular than Jeremiah's. Nor could Jeremiah speak of the calamity as involving the cessation of revelation and tle silence of prophecy (il. 9); for the Divine word in his breast was as clear aud strong after the catastrophe as before it. The judgment, terrible as it was, had far less painful significance to Jeremiah than to the nation at large (Jer. xxiv. 1 sq., xlii. 9 sg.). To this it may be objected that in chap. iii., where the singer's complaint takes a more personal turn, Jeremiah himself is pictured in his isolation from Israel at large. A closer examination shows, however, that this interpretation turns on a single word in iii. 14. The addition of a final 0, not always written in old times, changes "all my people" into "all peoples," restores the harmony between iii. 14 and verses 61-63, and makes the singer of chap. ili., as the general

argument of the chapter requires, a representative of Israel among the heathen, not an isolated figure among unsympathetic countrymen.

Thus viewed, the Lamentations are the earliest evidence of the great national repentance wrought by the fall of the Jewish state. We have here for the first time a genuine expression of popular feeling fully penetrated by those convictions of Israel's sin and Jehovah's righteousness which the people of Judah had long resisted, mocking and persecuting the divine messengers who had sought to force them on the conscience of their countrymen. This cry of deepest anguish from the depths of a nation's despair, chastened by a sense of sin, and rising at length into an attitude of sublime faith in the confident appeal to the righteousness and love of Jehovah, contains the germ of the new life of the Israel of the restoration, and may be taken as the starting point of a fresh epoch in the Old Testament development. It is not probable that these new thoughts and new hopes found so clear and perfect literary expression in the very first days of the exile. Several passages, especially ii. 14 compared with Ezek. xill. (2an) N)Y), appear to indicate acquaintance with the book of Ezekiel, whichis, as Nagelsbach points out, another argument against authorship by Jeremiah, and combines with the expression in ii. 9 to point to the time when the study of the written ward, so characteristic of the age of the exile, had begun to supply the lack of con- tinuous oral revelation. It is hardly possible to give a more exact determination of the place and time of writing. Ewald argues for an origin among the fugitives in Egypt ; but the passages to which he appeals (i. 3; iv. 18 sq; v.

4 sg.) do not bear out this conclusion, and our scanty historical knowledge of the period points to the eastern

captivity as the more probable seat of the spiritual move-

ment to which the book belongs.

Literature.—The older literature is fully given by Néagelsbach,

. xvii. Among recent commentaries may be noticed those of Kalkar (in Latin), 1836 ; Ewald in his Dichter, vol. i. pt. ii. (2d ed., 1866); Thenius in Kurzgef. Handb., 1855, who ascribes chaps. ii. and iv. to Jeremiah (comp. Budde in Z. f. ATliche Wiss., 1882, . 45); Vaihinger, 1857; Neumann, 1858; Engelhardt, 1867 ; iaeslebech, 1868 (English translation, 1871) ; Keil, 1872 (English translation, 1874); Payne Smith in the Speaker's Commentary ; and Reuss, La Bible: Poésie Lyrique, 1879. (W. R. 8.)

LAMETTRIE, Jurien Orrray DE (1709-1751), one of the creators of the French illumination, and the earliest exponent of that system of materialism which was after- wards elaborated by Holbach and Cabanis, was born at St Malo on December 25, 1709. After for some years study- ing theology in the Jansenist schools with the intention of entering the church, he suddenly changed his career and threw himself with characteristic energy into the profession of medicine. In 1733 he went to Leyden to study under Boerhaave, then in the zenith of his fame, and in 1742 returned to Paris, where he obtained the appointment of surgeon to the guards. During an attack of fever he made some observations on himself with reference to the action of quickened circulation upon thought, which led him to the conclusion that psychical phenomena were to be ac- counted for as the effects of organic changes in the brain and nervous system. This conclusion he worked out in his, earliest philosophical work, the Histoire Naturelle de l'Ame, which appeared about 1745. So great was the outery caused by its publication that Lamettrie was forced to betake himself to Leyden, where he developed' his doctrines still more boldly and completely, and with great originality, in his books JJomme Machine and Homme Plante, treatises based upon principles of the most con- sistently materialistic character. The ethics of these principles were worked out in the subsequent volumes, Discours sur le Bonheur, La Volupté, and L' Art de Joutr, in which the end of life is found in the pleasures of the senses, and virtue is reduced to self-love. So strong was the feel- ing against Lamettrie that in 1748 he was compelled to quit Holland for Berlin, where Frederick the Great not only allowed him to practise as a physician, but appointed him court reader. He died in 1751, when his position as a philosopher was publicly recognized in

an address written by the king himself, and read before the Berlin Academy. His collected Quvres Philosophiques appeared after his death in several editions, published in London, Berlin, and Amsterdam respectively. ‘The best account of his system is that given in A. Lange’s Geschichte des Materialismus.

LAMIA was a female demon, whose name was used by Greek mothers to frighten their children; from the Greek she passed into Roman demonology. She was also known asa sort of fiend, the prototype of the modern vampire, who in the form of a beautiful woman enticed young men to her embraces, in order that she might feed on their life and heart’s blood. In this form the tale has been used by Goethe as the subject of one of his most powerful poems, Die Braut von Corinth. The name Lamia is clearly the feminine form of Lamus, king of the LastryGonss (q.2.). Both are called in some forms of the legends children of Poseidon ; and the analogy of other myths makes it probable that they are ultimately a pair of deities, male and female. At some early period, or in some districts, Lamus and Lamia were worshipped as gods; but the names did not attain general currency. ‘Their worship disappeared, and they preserved an existence only in legend. They have gained a worse character than any other of the old divine forms which persist in Greek legend ; but their history is

remarkably like that of the malignant class of demons in Germanic and Celtic folklore. Both names occur in the geographical nomenclature of Greece and Asia Minor ; and this makes it probable that the deities belong to that religion which spread from Asia Minor over Thrace into Greece.

LAMMERGEYER (ie, Lamb-Vulture), or Bearded Vulture, the Falco barbatus of Linneus and the Gypaetus barbatus of modern ornithologists, one of the grandest birds-of-prey of the Palzarctic Region—inhabiting lofty mountain chains from Portugal to the borders of China, though within historic times, if not within living memory, it has been exterminated in several of its ancient haunts. Its northern range in Europe does not seem to have extended further than the southern frontier of Bavaria, or the neighbourhood of Salzburg ;1 but

in Asia it formerly reached a higher latitude, having been found even so lately as 1830 in Dauuria (see Brrps, vol. iii, p. 736, note 3), where according to Herr Radde (Beitr. Kenntn. Russ. Reichs, xxiii. p. 467) it has now left but its name. It is not uncommon on many parts of the Himalayas, where it breeds, and on the mountains of Kumaon and the Punjab, and is the “Golden Eagle” of most Anglo-Indians, Re- turning westward, it is found also in Persia, Palestine, Crete and Greece, the Italian Alps, Sicily, Sardinia, and Mauritania.

In some external characters the Lammergeyer is obviously intermediate between the Families Vulturide and Falconide, and the opinion of systematists has from time to time varied as to its proper position ; but as this ought to depend on the decision of anatomists, who have not yet delivered their verdict, it must be still left in doubt; and there would be little advantage in recounting how one author has referred it to the former group and another to the latter, since nobody seems to have applied the only sure test—that afforded by characters which are not snperficial.? It will suffice to say that most writers have deemed its Vulturine affinity the strongest (relying apparently on the form of the beak, which can scarcely be said to be either Aquiline or Falconine), in spite of its well-feathered head and tarsi. The whole length of the bird is from 43 to 46 inches, of which, however, about 20 are due to the long cuneiform tail, while the pointed wings measure more than 30 inches from the carpal joint to the tip. The coloration of the plumage is very peculiar: the top of the head is white, bounded by black, which, beginning in stiff bristly feathers turned forwards over the base of the beak, proceeds on either side of the face in a well-defined band to the eye, where it bifurcates into two narrow stripes, of which the upper one passes above and beyond that feature till just in front of the scalp it suddenly turns upwards across the head and meets the corresponding stripe from the opposite side, enclosing the white forehead already mentioned, while the lower stripe extends beneath the eye about as far backwards and then suddenly stops. A tuft of black, bristly feathers projects beardlike from the base of the mandible, and gives the bird one of its commonest epithets in many languages, as well as an appearance almost unique among the whole Class Aves. The rest of the head, the neck, throat, and lower parts generally are clothed

with lanceolate feathers of a pale tawny colour—sometimes so pale as to be nearly white beneath ;* while the scapulars,

1 Dr Girtanner has a valuable paper on this bird in Switzerland (Verhandl. St.-Gall. naturw. Gesellschaft, 1869-70, pp. 147-244),

2 Professor Huxley's labours have unfortunately not been directed to this particular point, and therefore throw Hittle or no light on it. He puts the Vulturide and Falconidw together under the name of G'yp-aetidx, very properly separating from them the American Vultures as Cathartidz. .

3 Herr Meves (Ofvers. Vet. Akad. Férhandlingar, 1860, p. 487) asserts that in some cases, as proved by chemical tests, the red colour- ing is due to a superficial deposit of oxide of iron on the feathers, and

back, and wing-coverts generally, are of a glossy greyish- black, most of the feathers having a white shaft and a median tawny line. The quill-feathers, both of the wings and tail, are of a dark blackish-grey. The irides are of a light orange, and the sclerotic tunics,—equivalent to the "white of the eye" in most animals,—which in few birds are visible, are in this very conspicuous and of a deep crimson, giving it an air of great ferocity. In the young of the year the whole head, neck, and throat are clothed in dull black, and most of the feathers of the mantle and wing-coverts are broadly tipped and mesially streaked with tawny or lightish grey.

The Limmergeyer breeds early in the year. The nest is of large size, built of sticks, lined with soft material, and placed on a ledge of rock—a spot being chosen, and often occupied for many years, which is nearly always difficult of access, and not unfrequently quite inaccessible, to man, from the precipitous or overhanging configuration of the cliffs. Here in the month of February a single egg is usually laid. This is more than 3 inches in length by nearly 2} in breadth, of a pale but lively brownish-orange. The young when in the nest are clad in down of a dirty white, varied with grey on the head and

neck, and with ochraceous in the iliac region. How long the eggs take in hatching, or how long the young remain nestlings, seems to be unknown. Equally unknown is the length of time that elapses before the latter assume the adult plumage, but it is probable that this period must at least exceed a twelvemonth.

There is much discrepancy as to the ordinary food of the Limmergeyer, some observers maintaining that it lives almost entirely on carrion, offal, and the most disgusting garbage; but there is no question of its frequently taking living prey, and it is reasonable to suppose that this bird, like so many others, is not everywhere uniform in its habits. Its very name shews it to be the reputed enemy of shepherds, and it is in some measure owing to their hostility that it has been exterminated in so many parts of its European range. The usual mode of proceeding is said to be by suddenly rushing at the animal, especially if it be young, when in a somewhat dangerous position, so startling it as to make it lose its foothold and fall down the precipice.' But the Limmergeyer has also a great partiality for bones, which when small enough it swallows and slowly digests. When they are too large, it is said to soar with them to a great height and drop them on a rock or stone that they may be broken into pieces of convenient size. Hence its name Ossifrage,2 by which the Hebrew Peres is rightly translated in the Authorized Version of the Bible (Lev. xi. 13; Deut. xiv. 12)—a word corrupted into OspREY (q.v.), and applied to a bird which has no habit of the kind.

The Liémmergeyer of north-eastern and south Africa is deemed by systematists to be specifically distinct, and is known as Gypaetus meridionalis or G. nudipes. In habits it seems closely to resemble the northern bird, from which that the colouring-matter on the eggs (to be presently described) also arises from the same cause, This opinion has, however, been denied by several other naturalists, though none of them seem to have tried the experiment ; while Mr Hume, who has (Scrap Book, p. 46), con- firms Herr Meves's statement. In confinement, moreover, the bird has been observed always to lose or not to acquire its tawny tint.

1 Stories are told of its attacking human beings under such circum- stances, and the present writer is not disinclined to believe that some of such stories may be true, though he is unable to refer to any that rest on testimony sufficient to dispel all doubt.

2 Among other crimes attributed to the species is that, according to Pliny (Hist. Nat., x. cap. 3), of having caused the death of the poet Aischylus, by dropping a tortoise on his bald head! In the Atlas range the food of this bird is said to consist chiefly of the Testudo mauritanica, which ‘‘it carries to some height in the air, and lets fall on a stone to break the shell” (Zbis, 1859, p. 177). It was the &pry and phvy of Greek classical writers.

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it differs in little more than wanting the black stripe below the eye and having the lower part of the tarsus bare of feathers. It is the ‘ Golden Eagle” of Bruce’s 7’ravels, and has been beautifully figured by Mr Wolf in Dr Riippell’s Syst. Uebers. der Vogel Nord-Ost-Afrika’s (Taf. 1), (a.N.)

LAMONT, Jonann von (1805-1879), was born at Braemar, Aberdeenshire, on December 13, 1805. He was sent at the age of twelve to be educated at the Scottish monastery in Ratisbon, and apparently never afterwards returned to his native country,—so that he became to all intents and purposes a German. After passing through the gymnasium and lyceum, he devoted himself to theology ; but his strong bent for scientific studies was recognized by the head of the monastery, P. Deasson, and on his recom- mendation he was admitted to the then new observatory of Bogenhausen (near Munich), where he worked under Soldener, latterly as his assistant. After the death of his chief in 1835 he was, on Schumacher’s recommendation, (Steinheil, supported by Bessel, also competing for the office), appointed to succeed him as conservator of the observatory. In 1852 he became professor of astronomy at the university of Munich. He held both these posts till his death, which took place on the 6th August 1879. Though

by no means a man of commanding genius, Lamont occupied a very important place among the scientific men of his day. As evidence of the universal respect in which he was held, it may be mentioned that he was a member of the Academies of Brussels, Upsala, and Prague, of the Royal Society of Edinburgh, of the Cambridge Philosophi- cal Society, and of many other learned corporations. His work bore for the most part on astronomy and magnetism. Among his contributions to the former may be noted his great star catalogue, and his determination of the mass of Uranus from observations of its satellites (Mem. Astron. Soc., 1838). His Handbuch des Erdmagnetismus (Berlin, 1849) is a standard work on the subject,

For fuller details concerning his published work the specialist

may be referred to Poggendorff's Biographisch«Literarisches Hand-woérterbuch, or to the Royal Society's Catalogue of Scientific Memoirs.

LA MOTTE FOUQUE. See Fovavt.

LAMP. Technically a lamp is an apparatus in which to burn fluid combustible substances. Lamps are mostly intended for yielding light; but there are also special forms the purpose of which is to afford highly concentrated heat in a convenient and portable form. The substances used in lamps for lighting are of two classes—(1) fixed oils, and (2) fluid hydrocarbons obtained from the distillation of bituminous shales, &c. (paraffin oil), petroleum, and essential oils. The latter class may be distinguished as mineral oils. 'Till very recently fixed oils were almost exclusively used for lamps; but since the introduction of the cheaper and more convenient mineral oils, in the second half of the 19th century, the use of fixed oils has steadily decreased in all parts of the world,

There is scarcely any fixed or fatty oil which has not been used, more or less, for burning. Many oils are so used in the districts which produce them, although they hardly enter into ordinary commerce under the name of burning oils) The so-called fish oils (sperm, whale, and seal) were, in recent times, principal burning oils, and to a limited

extent are still so employed. Of the vegetable oils of commerce, colza oil is the most extensively used as an illuminant, and after it come other rape oils, poppy oil, the lower qualities of olive oil, sesamum or gingelly oil, candle-nut oil, and ground-nut oil, all of which, however, are local or restricted in consumption. The suitability of fixed oils for burning purposes depends on their purity or freedom from foreign matters, and on their limpidity, or, what is in effect the same thing, the temperature at which they solidify. Thus cocoa-nut fat is consumed in ordinary

lamps in tropical regions, although in temperate latitudes it isa permanent solid. In the combustion of a fixed oil in lamps, the oil undergoes destructive distillation, and at the burning point is resolved into a gaseous mixture. The comparative viscosity of all fixed oils renders it neces- sary to adopt some device supplementary to the capillary action of the wick for maintaining at the level of the burner a supply of oil sufficient to support uniform com- bustion. Again, the lubricant properties of fixed oils make it practicable to adopt various mechanical devices to regulate the supply of fuel to the burner, and otherwise control illumination.

The mineral oils, on the other hand, are, as sold, mixtures of various volatile hydrocarbons which give oft inflammable vapours at comparatively low temperatures, and in consumption in lamps they come to the burning point in the condition of vapour. With highly volatile oils, and the use of imperfectly fitted lamps, though not with proper oil and fittings, there is some danger of explo- sion; there is also a risk that with imperfect combustion deleterious gases may be diffused through an apartment. Mineral oils possess such a high degree of limpidity that the suction of the wick alone is generally sufficient to bring the necessary supply of fuel to the burner.

The qualities of a lamp are judged of by the brilliance, steadiness, and uniformity of light it yields in proportion

to the quantity of oil it consumes; by the convenient |

position of the light in relation to the equal illumination of the space it has to light; by the form, portability, and convenience of the lamp itself; and by the simplicity and economy of its construction, regard being had to efficiency. The chief points to consider in connexion with the structure of lamps are (1) the means of supplying oil to the burter and of regulating that supply, (2) the form and arrangement of the wick or medium over which the flame is supported, (3) the regulation and control of the currents of air in the lamp which support combustion, and (4) the position of the oil reservoir in relation to the dissemination of the light and the stability of the lamp itself.

The simple form which was used down to the end of the 18th century, and which as a “ cruisie” continued in com- mon use in Scotland till the middle of this century, illustrates the most elementary and most imperfect arrangement of a lamp. Here, as in the lamps of antiquity, the oil vessel lies immediately behind the burning point of the wick, with which the oil is about level when the reservoir is full. The wick is a round soft cord or fibrous mass. Such a lamp has no merit but simplicity. The light is thrown only forward and to the sides, the back being entirely in shadow. The wick, being a round solid mass, takes up oil equally at the centre and circumference ; but to the outer edges of the flame only is there any access of air; conse- quently combustion in the centre is imperfect, resulting in a smoky unsteady flame, and a discharge into the atmosphere of the acrid products of destructive distillation. Further, as the level of the oil sinks in the reservoir, the wick has to feed the flame froma greater distance by mere capillary force, and, the supply thus diminishing, the light decreases In proportion.

Since the time when inventors first began to better the primitive lamp, just one hundred years ago, the improve- ments in lamp construction have been enormous ; the forms and modifications of invention bearing on lamps have been innumerable, and many excellent devices which did good service have been superseded by others simpler and more efficient. Notice can here be taken only of such inventions as developed new principles and features of originality.

The first improvement was in wicks and burners, In 1783 Leger of Paris devised a flat band or ribbon wick and burner, which produced a broad thin flame with no

core, so that all parts of the oil supply were brought into intimate contact with the air, and perfect combustion and a steady flame were secured. The deficiencies of the flat wick flame were that the light was comparatively thin and impoverished, and that the parts of a room facing the thin ends of the flame were badly illuminated. To some extent these evils were overcome by the adoption of a curved form of burner, which in the end led up to the burner invented by Ami Argand of Paris, and patented in England in 1784, In its simplest form the Argand burner consists of two concentric tubes or cylinders, between which the tubular wick is contained. The inner tube is open throughout, and to it a current of air passes from below, and, being carried upwards by the draught of the flame, atmospheric oxygen for combustion is supplied as well to the iuner circumference as to the outer side of the flame, whence the name ‘double current burner ” which it frequently receives, An adequate and controllable flow of air to the interior of the Argand burner having been secured, it remained to devise some means by which the current supplied to the outer circumference of the flame could be strengthened and regulated. This Argand secured by means of a chimney, which was made at first of sheet iron and suspended over the flame; but that device was quickly abandoned in favour of a glass chimney which rested on a perforated gallery placed a little below the level of the burner. Sub- sequent experience suggested the formation of a shoulder or constriction on the chinney at a point a little above the level of the flame, whereby the air current is directed inward against the external surface of the flame, thus materially improving the combustion. Argand’s original burner is the parent form of innumerable modifications all more or less complex in their adaptations.

A typical example of the burner and chimney is represented in fig. 1, in which the burner is composed of three tubes, d, f, g. The tube g is soldered to the bottom of the tube d, just above o, and the interval between the outer surface of the tube g and the inner surface of the

tube d is an annular cylindrical cavity closed at bottom, containing the cylindrical cotton wick immersed in oil. The wick is fixed to the wick tube Xi, which is capable of being moved spirally ; within the annular cavity is also the tube f, which is capable of being moved round, and serves to elevate and depress the wick. P is a cup that screws on the bottom of the tube d, and serves to receive the superfluous oil that drops down from the wick along the inner surface of the tube g. The air enters through the holes 0, 0, and passes up through the tube g to maintain the com- bustion in the interior of the circular flame. The air which maintains the combustion on the exterior part of the wick enters through the holes m, with which rv is perforated. When == the air in the chimney is rarefied by = the heat of the flame, the surround- ing heavier air, entering the lower part of the chimney, passes upward with a rapid current, to restore the equilibrium. RG is the cylindrical glass chimney with a shoulder or constriction at R, G. The oil flows from a side reservoir, and occupies the cavity between the tubes g and d. The part ki is a short tube, which receives the cirenlar wick, and slides spirally on the tube g, by means of a pin working in the 2 hollow spiral groove on the exterior Fic. 1 surface of g. The wick-tube has also sag a catch, which works in a perpendicular slit in the tube /; and, by turning the tube f, the wick-tube will be raised or lowered, for which purpose a ring, or gallery, rn, fits on the tube d, and re- ceives the glass chimney RG; a wire 8 is attached to the tube f,

and, bending over, descends along the outside of d. The part ra, that supports the glass chimney, is connected by four other wires with the ring g, which surrounds the tube d, and can be moved round. When rn is turned round, it carries with it the ring q, the wire S, and the tube f, and thereby produces elevation or de- pression of the wick.

A device in the form of a small metallic disk or button, known as the Liverpool button from having been first adopted in the so-called Liverpool lamp, effects for the current of air passing up the interior of the Argand burner the same object as the constriction of the ehimney RG secures in the case of the external tube. The button fixed on the

end of a wire is placed right above the burner tube g, and throws out equally all round against the flame the current of air which passes up through g. The result of these expedients, when properly applied, is the production of an exceedingly solid brilliant white light, absolutely smokeless, this showing that the combustion of the oil is perfectly accomplished. my

The means by which a uniformly regulated supply of oil is brought to the burner varies of course with the position of the oil reservoir. In some lamps, not now in use, by ring-formed reser- voirs and other expedients, the whole of the oil was kept as nearly as possible at the level of the burner. In what are termed fountain, reading, or study lamps, the principal reservoir is above the burner level, and various means are adopted for maintaining a supply from them at the level of the burner. But the most convenient position for the oil reservoir in lamps for general use is directly under the burner, and in this cage the stand of the lamp itself is utilized as the oil vessel. In the ease of fixed oils it is necessary with such lamps to introduce some appliance for forcing a supply of oil to the burner, and very many methods of effecting this have been de- vised, most of which were ultimately superseded by the moderator lamp. The Carcel or pump lamp, invented by Carcel in 1800, is still to some extent used in France. It consisted of a double piston or pump, forcing the oil through a tube to the burner, worked by ingenious clockwork arranged to go a certain number of hours.

An example of a form of reading lamp still in general use is seen in section in fig. 2. The lamp is mounted on a standard on which it can be raised or lowered at will, and fixed by a thumb screw. The oil reservoir is in two parts, the upper ac being an inverted flask which fits into bb, from which the burner is directly fed through the tube d; his an overflow cup for any oil that escapes at the burner, and it is pierced with air-holes for admitting the current of air to the centre tube of the Argand burner. The lamp is filled with oil by withdrawing the flask ac, filling it, and inverting it into its place. The under reservoir bb fills from it to the burner level ee, on a line with the mouth of ac. So soon as that level falls below the mouth of ac,a bubble of air gets access to

the upper reservoir, and oil again fills up 6d to the level . : ee, and so on it goes as long as Fic. 2.—Section of Reading Lamp. combustion eontinues and the supply of oil in ac endures. The principle 1s susceptible of numerous modifications.

The moderator lamp (fig. 3), invented by M. Franchot about 1836, from the simplicity and efficiency of its arrangements rapidly superseded almost all other forms of mechanical lamp. The two essential features of the moderator lamp are (1) the strong spiral spring which, acting on a piston within the cylindrical reservoir of the lam : serves to propel the oil to the burner, and (2) the ascending tube C through which the oil passes upwards to the burner. The latter consist of two sections, the lower fixed to and passing through the piston A into the oil reservoir, and the upper attached to the burner. The lower or piston section moves within the upper, which forms a sheath enclosing nearly its whole length when the spring is full wound up. Down the centre of the upper tube passes a wire, ‘ the moderator,” G, and it is by this wire that the supply of oil to iis burner is regulated. The spring exerts its greatest force on the oj] in the reservoir when it is fully wound up, and in proportion as it expands and descends its power decreases. “But when ie a pat is wound up the wire passing down the upper tube extends aes h- out the whole length of the lower and narrower piston tube, ob- structing to a certain extent the free flow of the oil. In pro nor kien as the spring uncoils, the length of the wire within the Date tube is decreased ; the upward ove of oil is facilitated in the same ratio as the force urging it upwards is weakened. In all mechani- cal lamps the flow is in excess of the consuming capacity of the burner, and in the moderator the surplus oil, flowing over the wick,

falls back into the reservoir above the piston, whence along with new supply oil it descends into the lower side by means of leather valves a, a 3B represents the rack which, with the pinion D, winds up the spiral spring hard against EK when the lamp is prepared for use. The moderator wire is seen separately in GG; and FGC illustrates the arrangement of thesheath- ing tubes, in the upper section of which the mo- derator is fixed.

Lamps for Mineral Oils. — At an early period numerous at- tempts were made to utilize the highly in- flammable volatile hy- drocarbons and _alco- hols, which from their cheapness and abund- ance offered some hope of competing with the fixed oils then in uni- |} _- versal use for illumi- 7 [f nating purposes. These lamps had little success, and no small danger A prec oe geste: Ben Fic. 3.—Section of Moderator Lamp. lamp of Young, introduced in 1834 for burning spirit ot turpentine under the name of camphine, procured a smoke- less flame by means of the Argand burner, constricted chimney, and Liverpool button, with the access of abundant air. It was not, however, till the introduction of paraffin oils and petroleum that mineral oil lamps became of great importance. Lamp makers had not to direct their attention to mechanical arrangements, for ntineral oils rise abundantly by capillarity alone; the problem was to produce a sufli- ciently powerful current of air to ensure complete and smokeless combustion of these richly carbonaceous com- pounds, and, in view of the highly volatile nature of the liquids dealt with, to prevent their exposure to the air, and more particularly to prevent the heating of the oil reservoir which would generate explosive mixtures, or vapours of dangerous tension.

Mineral oil lamps, like those for fixed oils, are constructed with both circular or tubular and flat-wick burners. In the case of the latter a cone or brass cap is placed over the burner, having a slit or opening a little longer and wider than the wick-holder itself. This cone serves to direct the whole current of air which enters below against the surface of the flame, and mingling with the vapour of the oil pro- duces perfect combustion, with a white flame which rises over the slit in the cone. The cool air current entering under the cone is also beneficially utilized in preventing the undue heating of the oil reservoir and the metallic wick-holder which passes down into it.

These flat wick lamps are simple in construction, cheap, and, so far as they go, economical light producers, but their flame is thin, and it is not practicable to compensate for the thinness by increased breadth of wick, because in such a case the edges of the light come so near the chimney that at these points the glass becomes rapidly heated, causing

unequal expansion and destruction of the chimney. In 1865 Messrs James & Joseph Hinks of Birmingham secured a patent for improvements in the burners of mineral oil lamps, “ whereby two or more flat flames or one circular or nearly circular flame may be produced by the use of two or more single flat wicks.” Under this patent was manufactured their well-known duplex lamp, which has gone far to supersede all other forms.

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An improved form of their lamp is shown in fig. 4, in which a portion of the cone B is removed to show the two parallel flat wicks A, A, which have each a separate slit or opening in the cone. C is the coincident winder for raising or lowering the wicks in the tubes, by which the wicks can be moved separately or simm]- taneously as desired. D is a lever for raising the extinguishers E, whereby not only is the light instantly extinguished, but the wicks are also covered and protected from dirt, while all evaporation by the wick-holder is prevented. Messrs Hinks & Son have further devised an automatic lighting attachment which obviates the ne- cessity of raising the glass chimney for lighting the lamp.

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Fic. 5.—Conical Burner.

Messrs Hinks claimed in their 1865 patent the use of “‘ two or more flat flames,” and since that period numerous burners have been produced in foreign countries in which more than two flat wicks are used, The crown burner of Briinner in Vienna contains no less than six flat wicks. There are triplex burners, too, in which the wicks are arranged as a triangle ; a most valuable lamp of this con-, struction is the ‘‘ Hesperus” of Messrs Jones & Willis of Bir- mingham. Another form, the triplexicon, has three burners so closely placed together that the flames coalesce into a solid flame about half an inch in thickness,

Further, there are star-shaped and cruciform burners, and others of little practical value.

The circular or tubular burners for mineral oils have been much simplified from the forms necessary in the case of colza, &. A tubular wick is no longer required; a simple flat wick of a size that will allow its edges exactly to meet round the upper edge of the burner ring is used instead. In the form shown in fig. 5 the wick- holder and burner consists of a hollow truncated cone, with a vertical conical section removed from its side. The flat wick passes up through this cone, its edges meeting and forming in effect a circular wick at the top, while the central current of air gets ready access to the tube by the conical opening formed in its side, and the outer current passes up within the chimney walls asusnal. This form also is easily susceptible of numerous modifications, (J. PA.)

Ancient Lamps.—Though Athenzus states (xv. 700) that the lamp (Avxvos) was not an ancient invention in Greece, it had come into general use there for domestic purposes by the 4th century B.c., and no doubt had long before been employed for temples or other places where a permanent light was required in room of the torch of Homeric times. Herodotus (ii. 62) sees nothing strange in the “festival of lamps,” Lychnokaie, which was held at Sais in Egypt, except in the vast number of them. Each was filled with oil so as to burn the whole night. Again he speaks of evening as the time of lamps (zrepi Avyvuv, vii. 215). Still, the scarcity of lamps in a style anything like that ((of an early period, ‘ compared _ with the immensenum- ber of them from the late Greek me, t and Roman age, seems to justify the remark of Athencus. The commonest sort of domestic lamps were of terra-cotta and of the shape seen in figs. 6 and 7, with a spout or nozzle (uvxryp) in which the wick (OpvaAXis) burned, a round hole on the top to pour in oil by, and a handle to

Fic, 4,—Duplex Burner.

carry the lamp with. A lamp with two or more spouts was diuvgos, tpinvgos, &e., but these terms would not apply strictly to the large class of lamps with numerous holes for wicks but without noz- zles. | Decora- tion was con- fined to the front of the handle, or more commonly to the circular space on the top of the lamp, and it consisted almost always of a design in relief, taken from mythology or legend, from objects of daily life or scenes such as displays of gladiators or chariot races, from animals and the chase. A lamp in the British Museum has a view of the interior of a Roman circus with spectators looking on at a chariot race. In other cases the lamp is made altogether of a fantastic shape, as in the form of an animal, a bull's head, or a human foot. Naturally colour was excluded from the ornamentation except in the form of a red or black glaze, which would resist the heat. The typical form of hand lamp (figs. 6, 7) is a combination of the flatness necessary for carrying steady and remaining steady when set down, with the roundness evolved from the working in clay and characteristic of vessels in that material. In the bronze lamps this same type is retained, though the roundness was less in keeping with metal. Fanciful shapes are equally common in bronze. The standard form of handle consists of a ring for the fore finger and above it a kind of palmette for the thumb to press on to keep the lamp steady. Instead of the palmette is some- times a crescent, no doubt in allusion to the moon. It would only be with bronze lamps that the cover protecting the flame from the wind could be used, as was the case out of doors in Athens. Such a lamp was in fact a lantern. Apparently it was to the lantern that the Greek word lampas, a torch, was first transferred, probably frum a custom of having guards to protect the torches also. Afterwards it came to be employed for the lamp itself (Avxvos, lucerna). When Juvenal (Sat., iii. 277) speaks of the aenea lampas, he may mean a torch with a bronze handle, but more probably either a lamp or a lantern. Lamps used for suspension were mostly of bronze, and in such cases the decoration was necessarily on the under part, so as to be seen from below. Of this the best example is the lamp at Cortona, found there in 1840 (engraved, Monumenti d. Inst. Arch., iii. pls. 41, 42, and in Dennis, Cities and Cemeteries of Ltruria, 2d ed., ii. p. 408).

Fig. 7.

Fig. 8. It is set round with sixteen nozzles ornamented alter- nately with a siren and a satyr playing on a double flute. Between each pair of nozzles is a head of a river god, and on the bottom of the lamp is a large mask of Medusa,

surrounded by bands of animals. These designs are in relief, and the workmanship, which appears to belong to the beginning of the 5th century B.c., justifies the esteem in which Etruscan lamps were held in antiquity (Athenzeus,

xv. 700). Of a later but still excellent style is a bronze lamp in the British Museum found in the baths of Julian in Paris (figs. 8, 9, 10). The chain is attached by means of two dolphins very artistically combined. Under the

nozzles are heads of Pan (fig. 8); and from the sides ‘¢

Fic. 9.—Bronze Lamp in British Museum.

project the foreparts of lions (fig. 10). ‘To what extent lamps may have been used in temples is unknown. Pro- bably the Erechtheum on the acropolis of Athens was an exception in having a gold one kept burning day and night, just as this lamp itself must have been an exception in its artistic merits. It was the work of the sculptor Calli- machus, and was made ap- ;

parently for the newly rebuilt temple a little before 400 B.C. When once filled with oil and lit it burned con- tinuously for a whole year. The wick was of a fine flax called Carpasian (now under- stood to have been a kind of cotton), which proved to be the least combustible of all flax (Pausanias, i 26, 7). Above the lamp a palm tree of bronze rose to the roof for the purpose of carrying off the fumes.

Fig. 10.

se 0 But how this was managed it is not easy to determine unless the palm be supposed to have been inverted and to have hung above the lamp spread out like a reflector, for which purpose the

polished bronze would have served fairly well. The stem if left hollow would collect the fumes and carry them out through the roof. This lamp was refilled on exactly the same day each year, so that there seems to have been an idea of measuring time by it, such as may also have been the case in regard to the lamp stand (Avyvewy) capable of holding as many lamps as there were days of the year, which Dionysius the Sicilian tyrant placed in the Prytaneum

of Tarentum. At Phare in Achaia there was in the market-place an oracular statue of Hermes with a marble altar before it to which bronze lamps were attached by means of lead. Whoever desired to consult the statue went there in the evening and first filled the lamps and lit them, placing also a bronze coin on the altar. A similar custom prevailed at the oracle of Apis in Egypt, Pausanias adds (vii. 22, 2). At Argos he speaks of a chasm into which it was a local custom continued to his time to let down burning lamps, with some reference to the goddess of the lower world, Persephone (ii. 22, 4). At Cnidus a large number of terra-cotta lamps were found crowded in one place a little distance below the surface, and it was conjectured that there must have been there some statue or altar at which it had been a custom to leave lamps burning at night (Newton, Discoveries at Halicarnassus, &e., ii. p. 394). These lamps are of terra-cotta, but with little ornamentation, and so like each other in workmanship that they must all have come from one pottery, and may have been all brought to the spot where they were found on one occasion, probably the funeral of a person with many friends, or the celebration of a festival in his honour, such as the parentalia among the Romans, to maintain which it was a common custom to bequeath property. For example, a marble slab in the British Museum has a Latin inscription describing the property which had keen left to provide among other things that a lighted lamp with incense on it should be placed at the tomb of the deceased on the kalends, nones, and ides of each month (Mus. Marbles, v., pl. 8, fig. 2). For birthday presents terra- cotta lamps appear to have been frequently

employed, the device generally being that of two figures of victory holding between them a disk inscribed with a good wish for the new year:—ANNV NOV FAVSTV FELIX. This is the in- scription on a lamp in the British Museum, which besides the victories has among other symbols a disk with the head of Janus. As the torch gave way to the lamp in fact, so also it gave way in mythology. In the earlier myths, as in that of Demeter, it is a torch with which she goes forth to search for her daughter, but in the late myth of Cupid and Psyche it is an oil lamp which Psyche carries, and from which to her grief a drop of hot oil falls on Cupid and awakes him. Terra-cotta lamps have very frequently the name of the maker stamped on the foot. Clay moulds from which the Jamps were made exist in considerable numbers. (A. S. M.) LAMP-BLACK isa deep black pigment consisting of carbon in a very fine state of division, obtained by the imperfect combustion of highly carbonaceous substances, which, producing a smoky flame, forms a deposit of soot or lamp-black. It is manufactured from scraps of resin and pitch refuse and inferior oils and fats, and other similar combustible bodies rich incarbon. For making lamp-black from resinous bodies a cylindrical stone chamber into which the flow of air can be easily regulated by openings at its lower part is used. Within the chamber is suspended a cone of sheet-iron fitting closely to the circumference of the chamber. The iron cone, which has an opening at the top, serves for a chimney, and can be raised or lowered in the chamber at will. The resinous material to be burned is placed in a cast-iron pot, and heated till it gives off vapours, when it is placed in the chamber and set on fire. The access of air is regulated to produce the maximum of smoke consistent with the maintenance of combustion. The abundant deposit of lamp-black on the walls of the chamber and cone is at the end of the operation collected by allow- ing the cone to sink, thus scraping the walls and carrying the whole deposit with it. Some manufacturers employ a series of small chambers communicating with each other, a stove tube leading into the first. These chambers have

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an opening below by which the deposit of lamp-black is removed, and in the last of the series the best quality is obtained. The finest lamp-black is procured by the com- bustion of oil in a special form of lamp, the deposit from this being finely divided and lustrous in hue. Lamp-black so collected contains traces of oil, which may be removed by heating to redness in a covered crucible. The oil present, however, is not detrimental to its employment for printing ink and as a pigment for oil painting, which are its principal uses. Further, lamp-black is largely used for “ebonizing” cabinet-work, and in the waxing and lacquering of leather. It is the principal constituent of China ink, and it has numerous other applications. LAMPEDUSA, a small island in the Mediterranean, about 90 miles east of Mahadia in Tunis, and 100 miles west of Malta, in 35° 28’ N. lat. and 12° 25’ E. long. Situated on the edge of the submarine platform which extends along the eastern coast of Tunis, it must be con- sidered asattaching itself physically to the African continent, but politically it belongs to the kingdom of Italy, and forms part of the commune of Licata in Sicily. In its 19 miles of coast it presents a great number of bays, of which the largest serves as a harbour, and is capable of admitting vessels of from 300 to 400 tons burden. The highest point of the island is about 330 feet above the sea. are no springs, and the water obtained from the artificial wells is usually brackish. The soil is mostly calcareous ; beds of marl occur here and there on the surface. Vines, fig-trees, carob-trees, and sumach are successfully grown, and the wild olive flourishes luxuriantly. Firewood used to be obtained from the island for Malta. Rabbits swarm in all directions. The population in 1871 was 946. Lampedusa is the Lopadussa of Strabo. In 1555 Andrew Doria anchored the vessels of Charles V. at Lampedusa, after an engage- ment with the Turks. Alphonso of Aragon made the island a fief of one of his courtiers, who sold it in 1677 to the prince Ferdi- nand Tommasi. But no permanent settlement seems to have becn effected ; the place, according to popular belief, was too terribly haunted by apparitions. Sir Kenelm Digby relates (1628) that his men told him ‘‘ there dwelt no persons in Lampcdusa, but there is a lamp perpetually burning. The Turks have great reverence to the place, and always leave oil or bread or something behind them through devotion, but they know not for whom, and it hath proved very fatal to carry away anything from

thence as well to Christians as to Turks.” Dumont, who personally visited the island, mentions a ‘‘little chapel dedicated to the Virgin, in which there is an altar with a turban laid upon it, which is usually called Mohammced’s tomb,” and adds the popular belief that any one attempting to carry off the gifts would be miraculously prevented escaping the island. The earl of Sandwich (1737) found Lampedusa with but a solitary inhabitant; and Captain Smyth states that about 1815 it was leased by an Englishman, Fernandez, who lived alone with his family. Ferdinand II. of Bourbon claimed it as Government property, and from 1848 attempts were made to establish a regular colony at the national expense. About £17,000 per annum was expended on the project, but the result was far from satisfactory. The population, introduced from Sicily, remained stationary during twenty years. Catherine II. at one time proposed to purchasc Lampedusa for the purpose of making it a Russian naval station. If it could be shown that Shakespeare derived the material of The Tempest from an Italian original, Lampedusa would have very strong claims to be considered the first prototype of the enchanted isle. It is the Lipadosa of Orlando Furioso, the scene of the ship- wreck of Roger of Sicily and of his conversion by the hermit. A Sicilian legend which forms the subject of Wieland’s poem Klelia und Sinibald, oder die Bevélkerung von Lampeduse, tells how two ladies of Palermo were cast ashore on the island, and found there two hermits who fell so deeply in love with them as to renounce their ascetic life. In Sicilian the ‘‘ hermit of Lampedusa” corre- sponds to the English Vicar of Bray, lighting up the chapel near his cell with equal readiness for the Crescent or the Cross. See Crusius, Turco-Grecia, Basel, 1584; Dighy, Journal of a Voyage into the Mediterranean, Camden Society, 1868; Dumont, Nouvelle Voyage au Levant, The

Hague, 1694, London, 1702; Captain Smyth, Aemoi Descriptive of the Resources of Sicily, 1824; Joseph Uunter, Vew Illustrations of Shakspeare, vol. i., 1845.

LAMPREY, a fish belonging to the family Petromyzon- tide (from zérpos and pvtw ; literally, stone-snckers), which with the hag-fishes

or Afyxinidx forms a distinct subclass of fishes, the Cyclostomata, distinguished by the low

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organization of their skeleton, which is cartilaginous, without vertebral segmentation, without ribs or real jaws, and without limbs. The lampreys are readily recognized by their long, eel-like, scaleless body, terminating anteriorly in the circular, suctorial mouth which is characteristic of the whole subclass. On each side, behind the head, there is a row of seven branchial openings, through which the water is conveyed to and from the gills. Py means of their mouth they fasten themselves to stones, boats, &c., as well as to other fishes, their object being to obtain a resting place on the former, whilst they attach themselves to the latter for the purpose of deriving nourishment from them. The inner surface of their cup-shaped mouth is armed with pointed teeth, with which they perforate the integumcnts of the fish attacked, scraping off particles of the flesh and sucking the blood. Mackerel, cod, pollack, and flat-fishes are the kinds most frequently attacked by them in the sea ; of river-fish the migratory Salmonide and the shad are sometimes found with the marks of the teeth of the lamprey, or with the fish actually attached to them. About ten species are known from the coasts and rivers of tlie temperate regions of the northern and southern hemispheres. In Great Britain and Europe generally, three species occur, of which the two larger, if not all three, are met with also in North America, viz., the large spotted Sea-lamprey (Petromyzon marinus); the River-lamprey or Lampern (P. fluviatilis); and the Small Lampern or “Pride” or ‘“‘Sand-Piper” (P. branchialis), The first two are migratory, entering rivers in the spring to spawn; of the river-lamprey, however, specimens are met with in fresh water all the year round. Lampreys, especially the sea- lamprey, are esteemed as food, and were formerly even more so than at present; but their flesh is not easy of digestion. Henry I. is said to have fallen a victim to this, his favourite dish. The species of greatest use is the river-lamprey, which as bait is preferred to all others in the cod and turbot fisheries of the North Sea. Yarrell states that formerly the Thames alone supplied from 1,000,000 to 1,200,000 lamperns

annually, but their number has so much fallen off that, for instance, in 1876 only 40,000 were sold to the cod-fishers. That year, however, was an unusually bad year; the lamperns, from their scarcity, fetched £8, 10s. a thousand, whilst in ordinary years £5 is considered a fair price. The season for catching lamperns closes in the Thames about the middle of March. The origin of the name lamprey is obscure ; its Latinized form Lampetra, which occurs in all ichthyological works of the Middle Ages, was unknown in classical times ; and its derivation from lambere petras is a specimen of etymological ingenuity. The development of lampreys has received much attention on the part of naturalists, since Aug. Miiller discovered that they undergo a metamorphosis, and that the minute worm-like lamperns previously known under the name of Ammoceetes, and abundant in the sand and mud of many streams, were nothing but the undeveloped young of the river-lampreys and small lamperns. See IcHTHY- OLOGY.

LAMPRIDIUS, AXLIUvs. vol. iii. p. 74.

LAMPSACUS, an ancient Greek colony in Mysia, Asia Minor, known as Pityusa or Pityussa before its colonization by Ionian Greeks from Phocza and Miletus, was situated on the Hellespont, opposite Callipolis in Thrace. It possessed a good harbour; and the neighbourhood was famous for its wine, so that, having fallen into the hands of the Persians during the Ionian revolt, it was assigned by their king to Themistocles to provide him with wine, as Percote did with meat, and Magnesia with bread. After the battle of Mycale (479 3.c.), Lampsacus joined the Athenians, but, having revolted from eo afterwards,

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See AucusTan HIsTory,

Plate Ill.

had to be reduced by force. In the Roman wars against Antiochus of Syria, its inhabitants were received as allies of Rome. Lampsacus was the chief seatof the worship of Priapus; and it is related that Alexander the Great was with difficulty restrained from destroying the city on account of the immorality fostered by the obscene rites of that god. The modern Lamsaki is probably not on the site of Lampsacus, but must be near it.

LANARK, an inland county of Scotland, lies between 55° 15’ and 55° 57’ N. lat., and between 3° 20’ and 4° 23° W. long., and is bounded N. by Dumbarton and Stirling, E. by Stirling, Linlithgow, Midlothian, and Peebles, 8. by Dumfries, and W. by Ayr, Renfrew, and Dumbarton. _ Its greatest length north-west to south-east is over 50 miles, and its greatest breadth from east to west over 30 miles. The total area comprises 568,868 acres, or 888 square miles. Though only the twelfth as regards extent, it stands far above all the other Scottish counties in point of population, having 904,405 inhabitants in 1881, or only 18,909 less than the aggregate of the three counties that rank next to it.

The greater part of the county to the east and south, included in what is known as the upper ward, consists of high moorlands frequently rising into lofty rounded hills, in many cases more than 2000 feet above sea-level, the highest summits being Coulter Fell (2456) and Tinto (2350) in Carmichael parish, and Green Louther (2403), Five Cairn Louther (2377), Queensberry Hill (2285), Sergeant Law (2257), and several others in Crawford parish, which consists chiefly of a cluster of mountains. The highest inhabited land in Scotland is at Leadhills, a village in the southern extremity of the county, which is about 1300 feet above sea-level. The remainder of the county to the north-west of Tinto softens down to gentle undulations, never rising to an elevation of more than 700 feet, and gradually opening out into the fertile vale of Clyde.

The principal river is the Clyde, which is formed of several streams rising among the mountains that separate Lanark from Peebles and Dumfries near to the sources of the Tweed and Annan, the chief of these streams being the Crook Burn, Powtrail Water, and Elvan Water.

Run- ning almost north, the river is joined by the Glengouner Burn, the Duneaton Water, and other streams; after receiving the Medwyn near Carstairs it flows south-west, and then, on being joined by the Douglas Water, it turns abruptly to the north-west—its general direction for the rest of its course. At Bonnington, the first of the famous falls of Clyde, the banks slope gently downwards, and are adorned with lofty trees and leafy shrubbery. The river widens as it reaches the fall, and its course remains un- interrupted until it suddenly descends a precipice 27 feet in height in a broad and unbroken stream. From this point it rolls turbulently along between lofty and precipitous banks of sandstone rocks beautified with wood until it reaches the magnificent fall of Corra, where it rushes over a precipice 85 feet in height into the deep abyss of the linn. Through a deep ravine it reaches a small fall called Dundaff Linn, and after passing a singular piece of rock called ‘‘ Wallace’s Chair,” skirts New Lanark and the county town of Lanark. Shortly afterwards it receives the Mouse, which, dashing and foaming from the split rocks of Cartland Crags, adds to the volume of the stream and contributes at the precipice of Stonebyres to form the fourth fall of Clyde. Near the ruins of Craignethan Castle it receives the Nethan, and a little further on the Avon, and then sweeps through the richly wooded haughs of Hamilton past Bothwell to Glasgow, where it becomes navigable. ‘The lochs are few and small, the principal being Bishop Loch between the parishes of Cadder and Old Monkland, Black Loch in New Monkland, and Johnston Loch in Cadder. The Hillend

reservoir for supplying the Forth and Clyde and the Monkland Canals has an area of 307 acres. The Forth and Clyde Canal traverses the north-west corner of the county ; the ,.Monkland Canal connects Glasgow with the southern extremity of Old Monkland parish; and the Ardrossan Canal passes by Govan to Renfrew and Ayr.

Geology and Mnerals.—Lanarkshire is nearly wholly occupied by the Carboniferous strata forming the coal-field of the Clyde basin. This is almost entirely confined to the county, but portions of it extend into

Dumbartonshire, Ren- frewshire, and Stirlingshire. The formation rests on traps and ashes associated with the Lower Calciferous Sandstones, which towards the east separate the coal-field from that of the Lothians, and in tle west from that of Ayr. The middle portion of the formation, which contains the best coal-seams with blackband and other iroustones, is without limestone, and apparently of freshwater origin, although a bed of marine fossils has been detected in the series near Glasgow. Towards the border on all sides a lower marine series with encrinal and coralline limestones crops out. It also contains many valuable coal-seams and veins of iron- stone, and, while affording a great variety of marine fossils, possesses a few interpolated beds of estuarine or freshwater origin. The line of junction between this lower series and the Old Red Sandstone occurs in the vicinity of the Falls of Clyde, Lanark, and Carstairs. Besides the older trap rocks, which bound the field to the east and west, others, probably of the same age as the Upper Carboniferous series, rise through and disturb the strata of the interior in many places; and numerous basaltic dykes, which, however, are generally unconnected with faults in the strata, extend through the area of the coal-field in an easterly direction. These, like the other erupted masses, usually alter the strata with which they come into contact, converting coal into coke and clay into jasper, and highly indurating the shales and sandstones. The isolated coal-field of Lesmahagow, about 7 miles square, is nearly surrounded by Old Red Sandstones, upon which also the coal rests.

The amount of coal available in the Lanark coal-field is estimated at 2,044,090,216 tons, slightly less than that in the Midlothian coal- field, and less than a fourth of that available in Scotland. The mines lie scattered over a considerable area, but the principal coal- pits are in the districts between Glasgow, Hamilton, and Airdrie. The coal-field is perhaps best developed in the neighbourhood of Hamilton, the seam being rich and easily reached ; and the famous Wishaw ‘‘ell coal” is there found in its best state. There is a valuable seam of gas coal at Lesmahagow ; this is also frequently associated with blackband ironstone. The number of shafts or pits from which minerals were raised in 1880 was 452, and con- nected with these 25,882 persons were employed underground and 5355 on the surface. The gross

amount of minerals raised was 11,071,054 tons, nearly one-half of the whole amount raised in Scotland. The total amount of coals raised was 10,026,999 tons, of ironstone 757,291, of fireclay 195,419, of oil shale 28,830, of lime- stone 59,419, of lead ore 1801, and of gannister 1295. The lead-mines are at Leadhills in the parish of Crawford. From the ore silver to the extent of 6 to 12 oz. to the ton is obtained. Copper- ore is found in the mines, and also antimony, but the quantity does not repay the cost of mining. The gold-mines are said to have been discovered in the reign of James IV., and it is stated that in 1542 as many as 300 persons were employed in connexion with the industry, and that upwards of £100,000 sterling value was collected. The gold-field extends over an area of 25 miles by 12, but it is only in the neighbourhood of the lead-mines that gold is found in considerable quantity. It does not, however, repay the labour of search and washing. Freestone and sandstone are abundant.

Agriculture.—The upper ward of Lanarkshire consists principally of moorland, even where the land is not too elevated to admit of successful tillage. The climate of this district is variable, and the rainfall considerable. Wheat is grown in the lower valleys, but the cereals best adapted for those portions of the district where grain is cultivated are oats and barley. In the higher grounds potatoes and Scotch kail are almost the only vegetables grown. Some

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portions of this district, on the borders of the Clyde, are however, very fruitful. The feeding of cattle and dairy and sheep farming are largely followed. Generally twenty- five to thirty cows are kept, but on some farms most attention is directed to the rearing of cattle or sheep. Several large sheep farms are occasionally held by one tenant. In the middle ward the land is generally strong clay, with the exception of the alluvial deposits on the banks of the Clyde. A large portion of it is occupied by peat, and the presence of coal-pits has in many instances deteriorated the soil. In this district oats and barley are

From 100 to 300, Acres.

50 Acres and under. | From 50 to 100 Acres.

the principal crop. The banks of the Clyde have been occupied with orchards since the days of the Venerable Bede. Apples, pears, and plums are largely grown, but of late years more attention has been paid to gooseberries, currants, and strawberries. The district of the lower ward is much exposed to westerly breezes, but though humid is warm, severe frosts being seldom of long dura- tion. It is very highly cultivated, its proximity to

Glasgow having greatly stimulated improvements.

eo following table gives a classification of holdings in 1875 and

° | —— a ee

Acres.

713 684

854

1875 | 1,463

830

1880 | 1,406

22,624 23,351

54,245 52,384

134,006 132,262

The largest farms are in the upper ward, where they generally vary from 100 to 500 acres, although the largest number are between 100 and 200 acres.

According to the agricultural returns for 1881 the total area under crops was 247,777 acres, a percentage of 43°5, the percentage

in 1870 being 41‘8. The area under corn crops was 50,975 acres ; under green crops, 19,578; rotation grasses, 63,361; permanent pasture, 113,407. The area under woods was 18,780 acres; orchards, 581; market gardens, 310; and nursery grounds, 39. Of corn more than four-fifths of the area was under oats, which in 1881 occupied 44,982 acres, while only 3790 were under wheat, 1408 beans, and 682 barley. Potatoes were grown on 9427 acres, turnips and swedes on 8552, and vetches on 1321.

The total number of horses in 1881 was 7755, of which 5611 are stated to be used solcly for purposes of agriculture, and 2144 to be unbroken horses and mares kept for breeding po rugess. The cele- brated Clydesdale dranght horses are supposed to have been bred from Flanders horses, imported in the 17th century by one of the dukes of Hamilton. The number of cows in 1881 was 33,730, of other cattle two years of age and above 10,989, and under two years of age 19,557. The average number of cattle to every 100 acres under cultivation was 25°9, the average for Scotland being 28. The cows are principally the Ayrshire breed, but there is also a cross between the Ayrshire and the improved Lanark. The best cheese is made in the Carnwath and Lesmahagow districts. Sheep in 1881 numbered 208,632, an average of 84°2 to every 100 acres under cultivation, the average for Scotland being 141°3. Pigs, which are largely kept by the coal-miners, numbered 5796.

According to the owners and heritages return, 1872-73, the land was divided among 9717 proprietors, and amounted to 553,097 acres, with a gross annua! value, including minerals, of £1,736,268. Of the owners 7927, or 81 per cent., possessed less than 1 acre, and the average value per acre was £3, 2s. 9d. There were seven proprietors who owned upwards of 10,000 acres, viz., the countess of Home, 61,948 acres; the duke of Hamilton, 45,731 acres; Sir Simon Macdonald Lockhart, 31,556; Sir Thomas E. Colebrooke, 29,604; the earl of Hopetoun, 19,180; Sir Windham Anstruther, 13,624 ; and A. D. R. W. Baillie

Cochrane (now Lord Lamington), 10,833. The duke of Buccleuch possessed 9091 acres, and Colonel Buchanan

8549.

Manufactres.—In 1879 there were 314 iron-works, 5149 puddling furnaces, and 846 rolling mills. These are chiefly situated in the neighbourhood of Airdrie, Coatbridge, Wishaw, Lesmahagow, and Glasgow. The principal other manufactures—cotton, flax, and silk—are connected chiefly with Guascow, to which article the fet is also referred for dctails regarding shipping and ship-

uiiding,

Railways, —Both the North British and the Caledonian systems have numerous liues and branches, both for general traffic and for minerals, supplying the county generally with ample railway com- munication.

_ Population.—Owing to the rapid development of the manufactur- Ing and mining industries of the county, and especially to the fact that a great portion of Glasgow is included within its limits, the Increase of the population since the beginning of the century has been very great. From 147,692 in 1801 it had increased in 1831 to 316,819, in 1851 to 530,169, in 1871 to 765,389, and in 1881 to 904,405, of whom 449,192 were males and 455,218 females. The county includes the greater part of the parliamentary burgh of Glasgow (population in 1881, 487,948), and the parliamentary burghs of Airdrie (18,363), Hamilton (13,997), Lanark (4908), and Ruther- glen (11,265). Glasgow, Lanark, and Rutherglen are also royal burghs, and in addition to Airdrie and Hamilton the police burghs are Biggar (1556) in the upper ward ; Wishaw (13,112) and Mother- well (12,911) in the middle ward; and Govan (49,448), Hillhead

| A eR | | | | | | I | me | meet Se | rere | merce perenemensemneten |

Acres, Total. Acres No. No. Acres. 64 23,825 12 8,107 | 244,572 28,783 | 18 8,010] 247,141

(6683), Maryhill (12,916), Partick (27,396), and Govanhill (9634) in the lower ward immediately adjoining Glasgow. The other towns are Bailieston, Bellshill, part of Busby, Calderbank, Cambuslang, Carluke, Coatbridge (population 18,425), Holytown, Larkhall, Lesmahagow, Newmiains, Shettleston, Stonehouse, Strathaven, and Whifflet. There are also over seventy villages, the majority num- bering over 500 inhabitants, and very many over 1000.

Administration.—The county comprises forty-nine parishes and two parts of parishes. or purposes of county taxation it is divided into an upper, a middle, and a lower ward, and the middle ward has also been lately divided into two districts for police purposes. The county is represented in parliament by two members, one for the northern division and one for the southern division.! The city of Glasgow returns three members, while Lanark, Hamilton, and Airdrie are included in the Falkirk district of burghs, and Ruther- glen in the Kilmarnock district. A sheriff ordinary court is held at Glasgow, and sheriff courts are held at Lanark, Airdrie, and Hamilton.

History and Antiquities.—Lanarkshire at an early pcriod was inhabited bya Celtic tribe, the Damnii, whose territory was divided by the Roman wall of Antonine between the Forth and Clyde, but none of whom were ever fully subdued by the Romans. Traccs of these early inhabitants are still to be seen in remains of fortifica- tions, mounds, and circles ; and numerous stone axes, bronze celts, hand-mills, and urns belonging to the same period have also been dug up. Two Roman roads entered the county from Dumfriesshire, and after their junction near Crawford proceeded by Biggar, Carstairs, and Carluke, being joined at several points by others. Along the route of the roads there are many traces of camps and fortifications, and coins and other relics are frequently found. After the departure of the Romans, a district of conntry which included Lanarkshire was united into the kingdom of Strathclyde, which in the 7th century was subdued by the Saxons of Northum- berland, large numbers, however, of the Celtic population

migrat- ing to Wales. Formerly Lanarkshire included a portion of Renfrew, but this was disjoined in the time of Robert III. Lanark at the same time was divided into two wards, the over and the nether, with Lanark and Rutherglen as the chief towns in each ward. The division into three wards—upper, middle, and lower— took place in the last century. Among the more important events of later history connected with the county are the battles of Drumclog in the parish of Avondale, 1st June 1679, in which the Covenanters defeated Graham of Claverhousc, and of Bothwell Bridge at Bothwell near Hamilton on the 22d June of the same year, in which the Covenanters were defeated by the duke of Mon- mouth with great slaughter. The principal buildings of interest besides those noticed in the separate articles on particular towns, are the ruins of Blantyre Priory, the remains of the ancient Douglas Castle, Craignethan Castle (the Tullietudlem of Sir Walter Scott, where Mary Queen of Scots found refuge after her escape from Lochleven), and Bothwell Castle. See Irving's History of the Upper Ward of Lanarkshire, 3 vols., 1864.

1 The parishes comprised in North Lanarkshire are the following :— Lower Ward: Barony, Cadder, Carmunnock, Cathcart (part), city parish of Glasgow, Govan (part), and Rutherglen ; Middle Ward: Avondale, Blantyre, Bothwell, Cambuslang, Dalziel, East Kilbride, Glassford, Hamilton, New Monkland, and Old Monkland. The following parishes constitute South Lanarkshire :—AMiddle W ard: Cambusnethan, Dalserf, Shotts, and Stonehouse ; Upper Ward: Biggar, Carluke, Carmichael, Carnwath, Carstairs, Covington and Thankerton, Crawford, Crawfordjohn, Culter (part), Dolphinton, Douglas, Dunsyre, Lanark, Lesmahagow, Liberton, Moffat ar Pettinain, Symington, Walston, Wandell and Lamington, and Wiston and Roberton.

Plate IV.

LaNakK, a royal and parliamentary burgh, the chief town of the above county, is situated on a slight eminence near the Clyde, 32 miles south-west of Edinburgh, and 25 south-east of Glasgow. It consists principally of one main street, which is spacious and well-paved. The

in- dustries are hand-loom weaving and nail making. In the neighbourhood there are extensive oil-works. The county buildings, in the Grecian style, were erected in 1836, and the assembly-rooms, erected in 1827, occupy the site of an old Franciscan monastery. The population of the town in 1871 was 5099, and in 1881 it was 4908.

A parliament was held by Kenneth III. at Lanark in 978, and occasionally it was the residence of the Scottish kings. Its charter is said to have been bestowed by Alexander I. It was more than once the scene of the exploits of William Wallace. New Lanark, a manufacturing village situated on the Clyde about a mile distant, is famous from its connexion with the communistic projects of Robert Owen.

LANCASHIRE, or County or LANcasTER, a maritime county in the north-west of England, lies between 54° 40’ and 55° 33’N. lat., and between 3° 15’ and 1° 58’ W. long. A detached portion in the north, known as Furness, is situated between Cumberland and Westmore- land. The remainder of the county, separated from Furness by Morecambe Bay, is bounded N. by Westmore- land, E. by Yorkshire, 8. by Cheshire, and W. by the Irish Sea, which forms also the southern boundary of Furness. The outline of the county is irregular. Its greatest length is 76 miles ; south of the Ribble the average breadth is about 40 miles, while to the north it is only about 10 miles. The totalarea is 1,207,926 acres, or 1887 square miles. With the exception of a narrow tract of country along the south coast, the Furness division consists of hilly moorlands, a continuation of the Cumberland mountains, intersected by deep valleys. The highest summits of this region are Coniston Old Man (2633 feet) and Seathwaite Fells (2537 feet), A similar elevated dis- trict, forming part of a mountainous chain stretching from the Scottish border, runs along the whole eastern boundary of the main portion of the county, and to the south of the Ribble occupies more than half the area, stretching west nearly to Liverpool, The moorlands in the southern dis- tricts are covered chiefly with heather. Towards the north the scenery is frequently picturesque and beautiful, the green rounded elevated ridges being separated by pleasant cultivated valleys variegated by woods and

watered by rivers. None of the summits of the range within the boundaries of Lancashire attain an elevation of 2000 feet, the highest being Blackstone Edge (1323 feet), Pendle Hill (1831 feet), and Boalsworth Hill (1700 feet).

Along the sea-coast from the Mersey to Lancaster there is a continuous plain occupied at one time by peat mosses, many of which have, however, been reclaimed. The largest is Chat Moss between Liverpool and Manchester. In some instances these mosses have exhibited the phenomenon of a moving bog. A large district in the north belonging to the duchy of Lancaster was at one time occupied by forests, but these have wholly disappeared. The coast is very irregular in outline, the principal inlets being the estuaries of the Mersey and Ribble, Lancaster Bay, and Morecambe Bay. To the south of Furness, between Morecambe Bay and the estuary of the Duddon, there is a small group of islands, the largest of which is Walney, 9 miles long, and with a breadth varying from a quarter to three-quarters of a mile. The principal river is the Mersey, which divides the county from Cheshire, and flowing by Stockport and Warrington opens into a fine estuary before reaching the sea at Liverpool. It drains an area of 580 square miles, and receives on its north bank the Irwell and the Sankey. For large vessels it is navigable to Warrington, and for smaller vessels to Stockport, the Irwell being navigable to

Manchester. The Ribble, which rises in the mountains of the West Riding, forms for a few miles the boundary be- tween Lancashire and Yorkshire, and then flows south-west to Preston, receiving tlle Hodder from the north and the Calder and Darwen from the south. The Wyre enters Morecambe Bay at Fleetwood. The Lune rises in West-moreland, and falls into the sea at Lancaster Bay. The Winster separating Lancashireand Westmoreland, the Leven from Lake Windermere, the Crake from Lake Coniston, all flow south into Morecambe Bay ; and the Duddon forming the boundary of the county with Westmoreland enters the Irish Channel. Windermere, the largest and most beauti- ful of English lakes, is partly included in the county.

Some miles to the west and parallel with Windermere is Coniston Lake, 5} miles long and 2 miles broad; and between the two larger lakes is Esthwaite Water, 12 miles in length by half a mile in breadth,

About the middle of last century the Sankey Canal, 10 miles long, the first in Britain, was constructed to bring coals from St Helens to Liverpool. Shortly afterwards the duke of Bridgewater projected the great canal, completed in 1761, from Manchester across the Irwell to Worsley. The Leeds and Liverpool Canal, begun in 1770, connects Liverpool and other important towns with Leeds by a circuitous route of 130 miles) The other principal canals are the Rochdale Canal, the Manchester Canal, between Manchester and Huddersfield, the Lancaster Canal, and the Ulverstone Canal.

Geology and Minerals.—The greater part of Furness is occupied by slaty Silurian rocks belonging to the mountain formations of Cumberland and Westmoreland. This is mingled occasionally with Carboniferous Limestone, and in the lower region along the coast there is an Old Red Sand- stone district and also a very rich deposit of iron ore. To the north of the Lune the country is occupied with Carboniferous Limestone. Near tlie sea are some low Old Red Saudstone cliffs, and the formation is also seen on the borders of Westmoreland, near Kirkby Lonsdale. South of the Lune the greater part of the higher ground is formed of Millstone Grit. Along the valley of the Mersey there is an extensive bed of New Red Sandstone, containing rock- salt, and the same formation occurs along the western boundaries of the county, but it is covered for the most part by the glacial drift deposits, which occupy nearly all the low ground, and in some cases fill up the valleys between the mountains. The coal-field of Lancashire occupies an irregular area of 217 square miles lying between the Ribble and the Mersey, its length being about 30 miles and its average breadth about 7 miles. The field extends into Clieshire and North Wales, and is separated from the Yorkshire field by the Millstone Grit which crops out beneath the Coal-measures. To the south of the Lune, near Ingleton, there is also a small coal-field which extends into Yorkshire. The upper Coal-measures consist chiefly of shales, sandstones, and limestones, with a bed of blackband ironstone. The middle measures

contain a considerable variety of workable seams, the lowest being very valuable, and there is an important mine of cannel coal. The lower measure consists of flags, shales, and thin seams of coal, with gannister floors and roofs of slate. This coal is extensively mined in the mountain districts. to the north- east of the bed. The coal district is traversed by immense dislocations which divide the field into several belts, Nearly all the marine fossils obtained are molluscs allied to Anthracosia, with the exception of a remarkable series

obtained on the banks of the Tame near Ashton-under- Lyne.

The available coal supply of Lancashire is estimated at 5,165,000, 000 tons. The amount raised in 1852 was 8,225,000 tons; in 1871 it was 18,851,000 tons, but for several years it

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has exceeded 18,000,000 tons, and in 1880 reached 19,120,294 tons. The amount of coal carried from Lancashire is about 11,000,000 tons, of which about 7,000,000 tons are shipped. The produce of the West Lancashire coal-field in 1880 was—coal 9,600,436 tons, fireclay 18,960 tons, and iron 1540 tons, the latter being obtained from the rubbish sent out of the pits. The coal is produced in the neighbourhood of Wigan, St Helens, and Prescot, and the fireclay in the St Helens district. In the North and East Lancashire district 9,519,858 tons of coal were raised, 110,379 tons of fireclay, 4830 of alum shale, and 579 of copperas lumps. Through the kindness of Mr Joseph Dickinson, inspector of mines for this district, we are enabled to give the produce of the field in seven principal divisions, viz.:—(1)the small wetached ficld of Lunedale (lower series of ineasures), coal 410 tons; (2) the Burn- ley coal-field (lower and mriddle series), coal 1,036,015, fireclay 15,279; (8) an adjoining field lying south-east of a line drawn from Chorley to Blackburn (lower series), coal 388,274, fireclay 45,749; (4) a group lying further south-east and extending to Bacup, Rochdale, and Littleborough (lower series), coal 309,888, fireclay 18,298 ; (5) the part west of Chorley and southwards adjoining the

Wigan coal-field (lower series), coal 2,030,027, copperas lumps 579 ; (6) the part east of the former division (middle and upper series), coal 4,789,495, fireclay 19,217 ; (7) the extreme south-east part, south of Rochdale, and east of the city of Manchester (lower and middle series), coal 966,249, fireclay 16,836, alum shale 4830. Rich red hematitic iron is obtained in great abundance in the dis- trict of Furness, the quantity raised in 1871 being 931,048 tons, and in 1880 it was 1,188,543 tons. Only a small quantity of sulphur- ore is raised, 2000 tons in 1879, valued at £900. Some copper is obtained in the Furness district, but the total quantity of ore raised in 1880 was only 442 tons. There are in various districts of the county large quarries for freestone and flagstone, the quantity raised in 1880 being 2404 tons. A fine blue slate is obtained in Furness. As much as 2978 tons of hydraulic limestone was in 1880

dug out of the Ardwick mine near Manchester. There is a mine of native oxide of iron at Warton, near Carnforth, from which, in 1880, 189 tons were obtained. Lead-ore and zinc-ore ate being explored between Clitheroe and Chatburn, and rocksalt at Preesal near Fleetwood.

Climate and Agriculture——The climate in the hilly districts is frequently cold, but in the more sheltered parts lying to the south and west it is mild and genial. From its westerly situation and the attraction of the mountains there is a very high rainfall, an average of nearly 50 inches annually being reached in the mountainous districts, while the average for the other districts is about 35. The soil after reclamation and drainage is fertile ; but, as it is for the most part a strong clayey loam, it requires a large amount of labour. In some districts it is more of a peaty nature, and in the Old Red Sandstone districts of the Mersey there is a tract of light sandy loam, which is easily worked, and well adapted for wheat and potatoes, A considerable portion of country is still under peat, but the reclamations within late years have been very large, and at the same time great advances have been made in the

methods of culture. In some districts the ground has been rendered unfit for agricultural operations by the rubbish from coal- pits.

The following table gives a classification of holdings according to size in 1875 and 1880 :—

50 Acres and under,

50 to 100 Acres. 100 to 300 Acres,

Years,

800 to 500 Acres,

500 to 1000 Acres. | Above 1000 Acres, Total,

No. Arca, No, Area. No.

os

1875 |18,210} 299,109 | 2,873 |-, 202,619 | 1,468 1880 |17,423 | 286,009 | 3,077] 219,412

225,184

1,552 | 235,174

Nearly all the yearly tenants are subject to two ycars' notice to quit. Great freedom is allowed in regard to rotation and to sale of produce, and it is a frequent custom to sell hay and straw, and to purchase artificial manure for the meadow lands to about one- third of the value sold. According to the agricultural returns for 1881 the total cultivated area was 787,732 acres, a percentage of 65°2 instead of 60 in 1870. The area under corn crops was 101,651 acres; under green crops, 59,971; rotation grasses, 63,387; and permanent pasture, 560,148, more than two-thirds of the whole under cultivation. Only 2578 acres were fallow. Of the area under corn crops 59,373 acres, or considerably more than the half, were occupied with oats, wheat coming next with 26,492 acres, while barley occupied 11,559. The

large area of 42.809 acres was under potatoes, turnips and swedes occupying only 10,867 acres.

The total number of horses in 1881 was 38,484, of which 24,567 were used solely for agricultural purposes. Cattle numbered 222,988 (122,683 being cows), an average of 18°5 to every 100 acres under cultivation. They are mostly polled Suffolks, red York~ shires, and Leicesters. Sheep nuinbered 284,317, au average of 23°6 to every 100 acres under cultivation, the average for England being 62‘4. Cheviots are kept on the higher grounds, on the low grounds Southdowns and Leicesters. Pigs in 1881 numbered 37,700.

The county in 1872-73 was divided among 88,735 proprietors, possessing 1,011,769 acres, with an annual valuation of £13,878,277. Of the owners 76,177, or 87 per cent., possessed less than 1 acre, and the average value, including minerals, was £18, 14s. 4d. per acre. Nineteen proprietors owned upwards of 5000 acres, the largest proprietor being the earl of Derby, who possessed 47,269 acres, with a rental of £156,735. Among other large proprietors are the duke of Bridgewater’s trustees, the duke of Devonshire, the Marquis de Casteja, the earl of Stamford and Warrington, the earl of Wilton, the earl of Sefton, Lord Lilford, and Lord Skelmersdale.

Manufactures.—Lancashire is the principal seat of the cotton manufacture, not only in England, but in-the world. The history of the industry in the county, and statistical details regarding it, will be found in the article Corron, vol. vi. 489 sg. In 1879 the total number of factories was close on 2000, and the number of persons employed in these was nearly 370,000. The centre of the industry is Manchester and the neighbouring towns, especially Old- ham. Previous to the American war it employed neariy 100,000 more persons than at present. The woollen, silk, and linen manu- factures employed in 1879 about 50,000 persons. There are a great variety of industries dependent on these staple manufactures, such as bobbin making, the preparation of dyes, calico printing, and the manufacture of machinery and of steam engines. Barrow-in-Fur-

Arca, | No. Area.

74 a 12 | 8,070 | 1

1

04°] 31,555} 13 | 8,582 | 1 | 2,726 |22,170| 783,408

No, Area, No. Area. No. Area,

2,195 |22,638] 764,005

ness is noted for the manufacture of iron and steel. Warring- ton has a large trade in sole leather. St Helens is celebrated for its crown, sheet, and plate glass, and Prescot for its watches. Chemicals are largely manufactured in several towns. The principal seaports are Liverpool, Barrow, Ulverstone, Lancaster, Fleetwood, and Preston, to the separate articles on which the reader is referred for particulars regarding shipping, trade, and shipbuilding. The principal watering-places are Blackpool, Lytham, Morecambe, and Southport.

Railways,—The London and North-Western, Midland, and Lan- cashire and Yorkshire Railways pass through the county, and it is intersected in al] directions by a network of branch lines.

Population and Administration.—The population in 1881 was more than five times as great as in 1801. In that year it was 673,486, or only a little more than the population of Liverpool at the present time. In 1861 it amounted to 2,429,440, in 1871 to 2,819,495, and in 1881 to 3,454,225, of whom 1,667,979 were males and 1,786,246 females. The population of the northern parliamen- tary division was 273,417, of the north-eastern division 238,544, of the south-eastern 534,963, and of the south-western division 482,148, —the population outside the limits of parliamentary boroughs being thus 1,529,072, and that of the parliamentary boroughs 1,925,153. Liverpool (552,425) is represented by three members, Manchester (population of municipal borough 841,508, of parliamentary 393,676) by three members, Salford (176,233) by two, Oldham (mun. 111,348, parl. 152,511) by two, Bolton (mun, 105,422, par. 105,973) by two, Preston (mun. 96,532, parl. 93,707) by two, Blackburn (mun. 104,012, parl. 100,618) by two,

Wigan (48,196) by two, Burnley (mun. 58,882, parl. 63,502) by one, Rochdale (68,865) by one, Bury (mun. 51,582, parl. 49,746) by one, Ashton- under-Lyne (mun. 37,027, parl. 43,389) by one, Warrington (mun. 41,456, parl. 45,257) by one, and Clitheroe (mun. 10,177, parl. 14,463) by one. As each division of the county has also two members, the total representation for the county is thirty-two members. The parliamentary boroughs of Staleybridge and Stock- port are chiefly in Cheshire. The other principal municipal boroughs are Accrington (31,435), Barrow-in-Furness (47,111), Blackpool (14,448), Bootle-cum-Linacre (27,112), Heywood (23,050), Lancaster (20,724), Over Darwen (29,747), St Helens (57,234), Southport (32,191), Swinton and Pendlebury (18,108), and Tod- morden, chiefly in Yorkshire (23,861). There are besides a large number of other towns of over 10,000 inhabitants. The county palatine comprises six hundreds. It is attached to the duchy of Lancaster and so to the crown. It is in the northern circuit, and assizes are held for North Lancashire at Lancaster, and for South

Lancashire at Liverpool and Manchester. The county has one court of quarter sessions, and is divided into twenty sessional divisions. The city of Manchester and the boroughs of Bolton, Liverpool, and Wigan have commissions of the peace and separate courts of quarter sessions; and the boroughs of Asliton-under- Lyne, Blackburn, Bromley, Lancastcr, Oldham, Preston, Rochdale, Salford, and Warrington have commissions of the peace. There are ten police divisions. Most of the municipal borouglis have their own police. The county is chiefly in the diocese of Manchester, formed in 1847; but the northern portion of Furness isin Carlisle, a portion formerly in Chester is now part of the newly formed diocese of Liverpool, and a small portion adjoining Yorkshire isin Ripon. The chancery of the duchy of Lancaster, still a crown office, was at one time a court of appeal for the chancery of the county palatine, but now even its jurisdiction in regard to the estates of the duchy 1s merely nominal. The chancery of the county palatine has con- current jurisdiction with the High Court of Chancery in all

matters of equity within the county palatine, and independent jurisdiction in regard to a variety of other matters. ; ,

History and Antiquities. —Before the Roman invasion Lancashire formed part of the extensive northern province of the Brigantes, of whose occupation a few names and earthworks are the chief remains. The Romans held the district for three centuries and a half, and erected various camps or stations at Manchester, Ribchester, Lan- caster, Colne, &c. They also constructed various roads, one enter- ing the county at Warrington, and passing almost north to Carlisle. Manchester appears to have been the chief centre of this district, as the roads branched out thence in every direction, —into Cheshire by Stockport, by Stretford, and by Warrington, to Yorkshire by Little- borough or by Overborough near Colne, by Ribchester to Lancaster, by Kirkham to the Wyre, and by Westhaughton and Blackrod to Preston. The Roman remains found within the county are thus summarized by Mr W. T. Watkin in'the T''ransactions of the Historic Society of Lancashire and Cheshire for 1880, p. 89:—

" Excluding perhaps Northumberland, I doubt whether any English county has produced so many elaborate articles in the precious metals and in bronze of the Roman period, The silver arm from Littleborough, the gold bull from Manchester and Overborough, the gold rings from Standish, the silver cup from Emmott, the rich 'find' of silver articles from Walmersley, the bronze shield awmbo from Kirkham, and the beautiful helmet from Ribchester, with the gold cup from the same place, form an almost unequalled eollection of Britanno- Roman works of art."

After the departure of the Romans Lancashire was included in the kingdom of Strathclyde, which for some time retained its independ- ence; but, although King Arthur, according to some authorities, fought several battles against them on the banks of the Douglas at Wigan, the Saxons gradually occupied the whole county, and during the Heptarchy it formed part of the kingdom of Northumbria. How extensive was tlicir occupation may be judged of from the Saxon names of towns and villages remaining tothe present day. Towards the

end of the 9th century, however, the Danes invaded and per- manently settled in the Furness district, and also in the south-west coast of the county, and in the opposite peninsula of Wirral in Cheshire, in all which places many Danish names of villages are still found.

In Domesday the portion of Lancashire between the Ribble and the Mersey was included in Cheshire and the remainder in York- shire. III. granted it to his younger son Edmund Crouchback, and with it the earldom of the county. (See LaNcasTER, House oF.) In 1351 the county became a palatinate, and again, after sixteen years abeyance, in 1377. Henry IV., soon after ascending the throne, passed an Act declaring that the inheritance and titles of the duchy of Lancaster should remain to him and his heirs for ever a distinct and separate inheritance from the Iands and possessions of the crown; and from the reign of Henry V. the sovereigns of England have held the duchy, as well out of as within the county palatine. At the Reformation most of the leading families of the couuty adhered to the Catholic faith, and a few, as the Blundels of Little Crosby and the Harringtons of Huyton, never left it. Dur- ing the civil wars they were ardeut supporters of the royalist cause especially the Derby family, and the county was frequently the scene of sieges, as at Manchester, Liverpool, Warrington, Lathom House &c., and of battles, as at Atherton Moor, Wigan, Preston, and Winwick. :

The Cistercian abbey of Furness is perhaps one of the finest and most extensive ecclesiastical ruins in England. Whalley abbey first founded at Stanlawe in Cheshire in 1178, and removed in 1296, belonged to the same order. There was a priory of Black Canons at Burscough, founded in the time of Richard I., one at Conishead dating from Henry II.’s reign, and one at Lancaster. A convent of Augustinian friars was founded at Cartmel in 1188, and one at War-

rington about 1280. There are some remains of the Benedictine priory of Upholland, changed from a college of secular priests in 1318; and the same order had a priory at Lancaster founded in 1094, a cell at Lytham, of the reign of Richard I, and a priory at Penwortham, founded shortly after the time of the Conqueror. The

Premonstratensians had Cockersand Abbey, changed in 1190 from a hospital founded in the reign of Henry IL, of which the chapter-house remains. At Kersal, near Manchester, there was a cell of Cluniac monks founded in the reign of John, while at Lan- caster there were convents of Dominicaus and Franciscans, and at Preston a priory of Grey Friars built by Edmund, earl of Lancaster, son of Henry III.

Besides the churches mentioned under the several towns, the more interesting are those of Aldingham, Norman doorway ; Aughton ; Cartmel priory church, with choir and transepts of the Transition between Norman and Early English, south chapel Decorated, and nave and windows Perpendicular ; Hawkshead; Heysham, Norman with traces of Saxon ; Hoole ; Huyton ; Kirk- by, rebuilt, with very ancient font ; Kirkby Ireleth, late Perpen- dicular, with Norman doorway; Leyland; Melling (in Lonsdale), Perpendicular, with stained glass windows ; Middleton, rebuilt in 1524, but containing part of the old Norman church and several monuments; Ormskirk, Perpendicular with traces of Norman, hav- ing two towers one of which is detached and surmounted by a spire; Overton, with Norman doorway; Radcliffe, Norman; Sefton, Perpendicular, with fine brass and recumbent figures of the Moly- neux family, also a screen exquisitely carved; Stidd, near Rib- chester, Norman arch and old monuments ; Tunstall, late Perpen- dicular ; Upholland priory church, Early English, with low massy tower; Urswick, Norman, with embattled tower and several old. monuments ; Walton, anciently the parish church of Liverpool ; Walton-le-Dale; Warton, with old font; Whalley abbey church, Decorated and Perpendicular, with Runic stone monuments.

The principal old castles are those of Lancaster, noticed below ; Dalton, a small rude tower occupying the site of an older building ; two towers of Gleaston Castle, built by the lords of Aldingham in the 14th century ; the ruins of Greenhalgh Castle, built by the first earl of Derby, and demolished after a siege by order of parliament in 1649; the ruins of Fouldrey in Peel Island near the entrance to Barrow, erected in the reign of Edward III., now a most dilapi- dated ruin, but “ massive, great, and impressively solemn.” There are many old timber

houses aud mansions of special interest, as well a3 numerous modern seats.

The principal histories of Laneashire are those by Edward Baines (1824, 2d ed. 1836, edited by Harland, 1868-70) and by Thomas Baines (1868-69). Many interesting papers on special subjects will be found in the 110 volumes issued by the Chetham Socioty, instituted at Manehester in 1843, and in the 82 volumes of Transactions of the Lancashire and Cheshire Historic Society; also in the Pala- tine Note-Book for 1881. For a fuller list of the bibliography of the county and its several towns see Fishwick, Lancashire Library, 1877; Sutton, Lancashire Author's, 1876; and Anderson, Topography of the United Kingdom, 1881.

LANCASTER, a municipal borough and seaport town, the capital of Lancashire, England, is situated on the left bank of the river Lune, about 7 miles from its mouth, 'and on the London and North-Western Railway, 52 miles north-west of Manchester. It is built on the slope of an eminence crowned by the old castle and church, and com- manding fine views of the river and surrounding country. The older portion of the town is irregularly built, but of late years it has been much improved by the formation of new streets; and the sanitary and other arrangements are complete and satisfactory. The Lune is crossed by a bridge of five arches erected in 1788, and to the north of the town the Lancaster Canal is conveyed over the river by a handsome aqueduct. 'The ancient castle occupies the site of a Roman castrum. The Saxon foundations of a yet older structure still remain, and the tower at the south-west corner is supposed to have been erected during the reign of the emperor Hadrian. The Dungeon Tower, also supposed to be of Roman origin, was taken down in 1818. The greater part of the old portion of the present structure was built by Roger de Poictou, who, however, utilized some of the old Roman towers and the old walls in its erection. In 1322 much damage was done to the castle by Robert Bruce, whose attack it successfully resisted, but it was restored and strengthened by John of Gaunt, who added the greater part of the Gateway Tower as well as turrets to the Lungess Tower, which on that account has been named "John o' Gaunt's Chair." During the wars of

the Commonwealth the castle was captured by Cromwell. Shortly afterwards it was converted into the county jail,

and the building now includes the governor's house and the crown and nisi prius courts. To the north-east of the castle is the church of St Mary, in the Early English style, originally erected by Roger de Poictou, but partly rebuilt in 1759, when the present lofty tower was added. The church contains several old monuments and brasses. A large Gothic Roman Catholic church, with a convent and schools adjoining, was erected in 1859, and there are also several other churches and chapels of some architectural pretensions. There is a grammar school, completed in 1853. Among the charitable institutions are the county lunatic asylum, the Ripley orphan hospital, opened in 1864, erected and endowed at a cost of £100,000, the dispensary and infirmary instituted in 1781, and the Royal Albert asylum for idiots and imbeciles) The town possesses a large market and a handsome town-hall, The principal industries of the town are cotton and silk spin- ning, cabinetmaking, and the manufacture of oil-cloth table- covers ; and there are also iron-foundries, marble-polishing works, and a manufactory for railway carriages and waggons. The bulk of the shipping is engaged in the coasting trade, and large vessels require to unload at Glasson, 5 miles down the river, the cargoes being carried up to the town by lighters. The population of the municipal borough in 1871 was 17,245, and in 1881 it was 20,724.

From discoverics of cclts, flint arrow-hcads, and other similar remains, it is probable that Lancaster was an old British town. Its Roman name is unknown, but inscribed Roman altars, tombstones, Samian ware, and other pottcry, and the remains of the old fortress preceding the castle, and of other buildings, leave no doubt that it was a Roman station of great importance. It was constituted a borough in the fourth year of Richard I., and it first returned mem- bers to parliament in the twenty-third year of Edward I. The privilege was withdrawn for some years before 1547, but from that time was enjoyed without interruption until 1867, when it was dis- franchised for corrupt practices. The town

was plundered and burned by the Scots in 1329 and 1389, was nearly depopulated during the Wars of the Roses, was captured by the Parliamentary forces in 1643, and retaken by the Royalists under the ear! of Derby in the same year, was held by the Parliamentary troops in 1648, and was partly destroyed by fire in 1698. It was entered by the rebels in 1715, and again by a larger force of them in 1745.

See Clarke, Lancaster, 1807, 2d ed. 1811; Lancaster Records, 1869; Hall, Zan- oaster Castle, 1843; Simpson, History and Antiquities of Lancaster, 1852; and a paper on ‘‘ Roman Lancaster,” by W. Thompson Watkin, in Transactions of the Historic Society of Lancashire and Cheshire, 1876.

LANCASTER, the shire city of Lancaster county, Pennsylvania, U.S., is situated on the Conestoga river, 68 miles west of Philadelphia by rail. It was founded in 1730 and incorporated as a borough in 1742, was the State capital from 1799 to 1812, and in 1812 became a city. It is laid out on the rectangular plan, and is un- usually well built. The city is the seat of numerous charitable and educational institutions, Among the latter is Franklin and Marshall College, the chief educational establishment of the Reformed Church, which also main- tains a theological seminary in connexion with it. The court-house is an imposing edifice, erected in 1853 at a cost of $166,000. The county jail is a massive sandstone structure, with a tower 110 feet high, built at a cost of $110,000 in 1851. Lancaster is the centre of one of the Wealthiest agricultural regions in the United States. Its cotton, iron, and other mills are numerous and large, and it contains one of the most extensive watch factories in the country. Its tobacco trade requires nearly 100 large Warehouses for its accommodation. A valuable trade in coal, lumber, leather, and grain is also carried on. James Buchanan, the fifteenth president of the United States, lived in Lancaster, and is buried there. The population in 1880 numbered 25,846,

LANCASTER, the chief city in Fairfield county, Ohio, United States, is situated on the Hocking river, about 30 miles south-east of Columbus. It is a well-built little

manufacturing town, busy with foundries, flouring-mills, and various manufactures, such as agricultural implements and machinery. The court-house cost $150,000; and the city hall and public schools are also fine buildings. The neighbouring country is fertile, being especially noted for its grain, live stock, and vineyards. ‘The population in 1880 was 6803.

LANCASTER, Hovssz or, The name House of Lan- caster is commonly used to designate the line of kings immediately descended from John of Gaunt, fourth son of Edward III. But the history of the family and of the title goes back a whole century further to the reign of Henry III., who created his second son, Edmund, earl of Lan- caster, in 1267. This Edmund received in his own day the surname of Crouchback, not, as was afterwards supposed, from a personal deformity, but from having worn a cross upon his back in token of a crusading vow. He is not a person of much importance in history except in relation to a strange theory raised in a later age about his birth, which we shall notice presently. His son Thomas who inherited the title, took the lead among the nobles of Edward II.’s time in opposition to Piers Gaveston and the Spensers, and was beheaded for treason at Pontefract. At the com- mencement of the following reign his attainder was reversed and his brother Henry restored to the earldom, who, being appointed guardian to the young king Edward IIL, assisted him to throw off the yoke of Mortimer. On this Henry’s death in 1345 he was succeeded by a son of the same name, sometimes known as Henry Tort-Col or Wryneck, a very valiant commander in the French wars, whom the king, for his greater honour, advanced to the dignity of a duke. The title was new in those days, for only one duke had ever been created in England before, and that was fourteen years previously, when the king’s son Edward, so well known in history as the Black Prince, was made duke of Cornwall. This Henry Wryneck died in 1361 without heir male. Of his two daughters, Maud, the elder, was twice married, but died childless little more than a year after her father. The second, Blanche, be- came the wife of John of Gaunt, who thus succeeded to the duke’s inheritance in her right; and on the 13th November 1362, when King Edward attained the age of fifty, he was created duke of Lancaster, his elder brother, Lionel, being

at the same time created duke of Clarence. It was from these two dukes that the rival houses of Lancaster and York derived their respective claims to the crown. As Clarence was King Edward's third son, while John of Gaunt was only his fourth, it ought to have followed in ordinary course that on the failure of the elder line the issue of Clarence should have taken precedence of that of Lancaster in the succession. But the rights of Clarence were conveyed in the first instance to an only daughter, and the ambition and policy of the house of Lancaster, profiting by advantageous cir- cumstances, enabled them not only to gain possession of the throne but to miaintain themselves in it for three generations before they were dispossessed by the repre- sentatives of the elder brother.

As for John of Gaunt himself, it can hardly be said that this sort of politic wisdom is very conspicuous in him. His ambition was generally more manifest than his discretion ; but fortune favoured his ambition, even as to himself some- what beyond expectation, and still more in his posterity. Before the death of his father he had become the greatest subject in England, his three elder brothers having all died before him. He had even added to his other dignities the title of king of Castile, having married, after his first wife's death, the daughter of Peter the Cruel. The title, however, was an empty one, the throne of Castile being actually in the possession of Henry of Trastamara, whom

the English had vainly eudeavoured to set aside. His military and naval enterprises were for the most part disastrous failures, and in England he was exceedingly unpopular. Nevertheless during the later years of his father's reign the weakness of the king and the declining health of the Black Prince naturally threw the govern- ment very much into his hands. He even aimed, or was suspected of aiming, at the succession to the crown; but in this hope he was disappointed by the action of the Good Parliament a year before Edward's death, in which it was settled that Richard the son of the Black Prince should be king after his grandfather. Nevertheless the suspicion with which he was regarded was not altogether quieted when Richard came to the throne, a boy in

the eleventh year of his age. The duke himself complained in parliament of the way he was spoken of out of doors, and at the outbreak of Wat Tyler's insurrection the peasants stopped pilgrims on the road to Canterbury and made them swear never to accept a king of the name of John. On gaining possession of London they gave still more emphatic proof of their dislike to him by burning his magnificent palace of the Savoy. The young king himself shared the general feeling, and after a few years John of Gaunt ceased for a time to have much influence. Richard found a convenient way to get rid of him by sending him to Castile to make good his barren title, and on this expedition he was away three years. He succeeded, however, so far as to make a treaty with his rival, King John, son of Henry of Trastamara, for the succession, by virtue of which his daughter Catherine became queen of Castile some years later. After his return the king seems to have regarded him with greater favour, created him duke of Aquitaine, and employed him in repeated embassies to France, which at length resulted in a treaty of peace, and Richard's marriage to the French king's daughter.

Another marked incident of his public life was the support which he gave on one occasion to the Reformer Wycliffe. How far this was due to religious and how far to mere political considerations may be a question ; but it is certain that, in one way or another, not only John of Gauut but his immediate descendants, the three kings of the house of Lancaster, all took deep interest in the religious movements of the times. A reaction against Lollardy, however, had already begun in the days of Henry IV., and both he and his son were obliged to discountenance opinions which were believed to be politically and theologically dangerous. .

Accusations had been made against John of Gaunt more than once during the earlier part of Richard TI.'s reign of entertaining designs to supplant his nephew on the throne. But these Richard never seems to have wholly credited, and during his three years' absence his younger brother, Thomas of Woodstock, duke of Gloucester, showed himself a far more dangerous intriguer. Five confederate lords with Gloucester at their head took up arms against the king's favourite ministers, and the

Wonderful Parliament put to death without remorse almost every agent of his former administration that had not fled the country. Gloucester even contemplated the dethronement of the king but found that in this matter he could not rely on the support of his associates, one of whom was Henry, earl of Derby, the duke of Lancaster's son. Richard soon after- wards, by declaring himself of age, shook off his uncle's control, and within ten years the acts of the Wonderful Parliament were reversed by a parliament no less arbitrary. Gloucester and his allies were then brought to severe account ; but the earl of Derby and Thomas Mowbray, earl of Nottingham, were taken into favour as having opposed the more violent proceedings of their associates. As if to show his entire confidence in both these noblemen, the king

created the former duke of Hereford and the latter duke of Norfolk. But within three months after the one duke accused the other of treason, and the truth of the charge, after much consideration, was referred to trial by battle according to the laws of chivalry. But when the combat was about to commence it was interrupted by the king, who, to preserve the peace of the kingdom, decreed by his own mere authority that the duke of Hereford should be banished for ten years—a term which was immediately after reduced to five—and the duke of Norfolk for life.

This arbitrary sentence was obeyed in the first instance by both parties, and Norfolk never returned. But Henry, duke of Hereford, whose milder sentence was doubtless owing to the fact that he was the popular favourite, came back within a year, having been furnished with a very fair pretext for doing so by a new act of injustice on the part of Richard. His father, John of Gaunt, had died in the interval, and the king, troubled with a rebellion in Ireland, aud sorely in want of money, had seized the duchy of Lancaster as forfeited property. Henry at once sailed for England, and Janding in Yorkshire while King Richard was in Ireland, gave out that he came only to recover his inheritance. He at once received the support 'of tle northern lords, and as he marched southwards his followers became more numerous at every turn. The whole kingdom was soon practically at his command, and Richard, by the

time he had recrossed the channel to Wales, discovered that –

his cause was altogether lost. He was conveyed from Chester to London, and forced to execute a deed by which he resigned his crown. This was recited in parliament, and he was formally deposed. The duke of Lancaster then stepped forward and claimed the kingdom as due to himself by virtue of his descent from Henry III.

The claim which he put forward involved, to all ap- pearance, a strange falsification of history, for it seemed to rest upon the supposition that Edmund of Lancaster, and not Edward I., was the eldest son of Henry III. A story had gone about, even in the days of John of Gaunt, who, if we may trust the rhymer Hardyng (Chronicle, pp. 290, 291), had artfully got it inserted in chronicles deposited in various monasteries, that this Edmund, sur- named Crouchback, was really hump-backed, and that he was set aside in favour of his younger brother Edward ou account of his deformity. No chronicle, however, is known to exist which actually states that Edmund Crouchback was thus set aside; and in point of fact he had no deformity at all, while Edward was six years his senior. Hardyng's testimony is, moreover, suspicious as reflecting the pre- judices of the Percys after they had turned against Henry IV., for Hardyng himself expressly says that the earl of Northumberland was the source of his information (see note, p. 353 of his chronicle), But a statement in the continuation of the Chronicle called the Hulogium (vol. iti. pp. 369, 370) corroborates Hardyng to some extent; for we are told that John of Gaunt had once desired in parlia- ment that his son should be recognized on this flimsy plea as heir to the crown; and, when the earl of March denied the story and insisted on his own claim as descended from Lionel, duke of Clarence, Richard put an end to the dis- cussion and imposed silence on both parties. However this may be, it is certain that this story, though not directly asserted to be true, was indirectly pointed at by Henry when he put forward his claim, and no one was then bold enough to challenge it.

This was partly due, no doubt, to the fact that the true lineal heir after Richard was then a child, who had just succeeded his father as earl of

March. Another circum- stance was unfavourable to the house of Mortimer—that it derived its title through a woman. No case precisely similar had as yet arisen, and, notwithstanding the pre-

cedent of Henry IT., it might be doubted whether succes- sion through a female was favoured by the constitution. If not, Henry could say with truth that he was the direct heir of his grandfather, Edward III. If, on the other hand, succession through females was valid, he could trace his descent through his mother from Henry III. by a very illustrious line of ancestors. And, in the words by which he formally made his claim, he ventured to say no more than that he was descended from the king just mentioned “ by right line of the blood.” In what particular way that “right line ” was to be traced he did not venture to indicate.

It is unnecessary in this article to relate the history of the three successive kings belonging to the house of Lancaster (Henry IV., V., and VI.), as a brief epitome of their reigns will be found elsewhere (see vol. xi. pp. 659-

662). With the death of the last-named sovereign the direct male line of John of Gaunt became extinct, But by his daughters he became the ancestor of more than one line of foreign kings, while his descendants by his third wife, Catherine Swynford, conveyed the crown of England to the house of Tudor. It is true that his children by this lady were born before he married her ; but they were made legitimate by act of parliament, and, though Henry IV. in confirming the privilege thus granted to them endeavoured to debar them from the succession to the crown, it is now ascertained that there was no such reservation in the original Act, and the title claimed by Henry VII. was probably better than he himself supposed.

We subjoin a pedigree of the royal and illustrious houses that traced their descent from John of Gaunt :-—

TABLE OF THE PRINCIPAL DESCENDANTS OF JOHN OF GAWUNT.

John: of Gaunt, duke of Lancaster, = titular king of Castile.

Blanche, daughter and heiress of = Heury, duke of Lancaster (first wife).

| Elizabeth, married first

Constance, the elder of the = Catherine, daughter of

two daughters and heiresses Sir Payne Roet, widow of Peter, king of Castile of Sir Owen Swynford and Lean (sccond wife). (third wife).

Philippa, Henry {V., = Mary de Bohun, Joan, daughter Catherine, John Henry Thomas Joan Beaufort, married to king of daughter and of Charles the to John Holland,duke marriedto Beaufort, Beaufort, Beaufort, wife of Ralph John L., England, co-heir of Hum- Bad, king of of Exeter, who was Prince Henry, earlof cardinal, duke of Nevill, first king of phrey de Bohun, Navarre beheaded by Henry1V.; afterwards Somerset. Exeter. earl of West- Portugal. earl of Hereford (second wife). afterwards to Sir Jolin Henry lll. moreland, by { aud Essex (first No issue. Cornwall, created of Castile. | whom she Edward, wife). Baron Fanhope. | llenry John became an king of John If., Beaufort, Beaufort, ancestor of Portugal. jf | | | | king of earl of earl, Edward IV., | Henry V.,== Catherine, Thomas, John, Humphrey, Blanche, Philippa, Castile. Somerset. afterwards Richard 111., | | king of daughter dukeof dnkeof dukeof duchess married to | duke, of | Warwick the Alphonso Ferdinand, England. | of Charles Clarence. Bedford. Gloucester. of Ba- Eric Vll.of [sabella Somerset, King Maker, V. of duke of VI. of varia. Denmark Of Castile, and many Portu- Viseu. France, and X1I1T. _quecn of Edmund, = Margaret noble families, gal. afterwards ef Sweden. Ferdinand earl of Beaufort, | _ Emmanuel, married to of Aragon ; Richmond, John lI. king of Sir Owen whose de- son of of Por- Portugal; Tudor. scendants Sir Owen tugal. whose de- were kings of Tudor by scendants. He Vi. > Spain till the Catherine, have reigned coming in of widow of inthatcountry

Edward, prince the Bourbons Henry V. ever since. of Wales. in 1700, Henry VII, king of England. | | | Henry Vill. Margaret. = James 1V., king of Mary, = Charles Brandon, Scotland. j duke of Suffolk. | | James V., king of = l Edward Vl. Mary, quecn _ Elizabeth, Scotland. Henry, earl = Frances, wifeof Eleanor, wife of England. queen of , of Lincoln. Henry, ear! of of Henry, England. Mary Stnart. Dorset, created second earl | duke of Suffolk. of Cumber- James VI. of Scotland | land. and 1. of England, whose Lady Jane Grey descendants have reigned and others. in Great Britain ever since. @uGA.)

LANCASTER, Sir James, an eminent English seaman of the Elizabethan period. In his early years he was in Portugal as soldier and merchant; in 1591 he made a voyage on his own account to the East Indies ; in 1594-95 he had command of an expedition which made an attack on Pernambuco; and in 1600 he was placed at the head of the first fleet sent out by the newly-founded East India Company. During his later years he acted as one of the directors of the company. He died in 1620.

The original journals of Lancaster's principal voyage, during which he visited Java and Sumatra, have unfortunately been lost ;

and we only possess the narrative drawn up from them with |

questionable perspicacity by Purchas. The various portions of Hakluyt and Purchas relating to Lancaster have been edited for the Hakluyt Society by C. R. Markham (1879). The name of Lan- caster Sound was bestowed by Baffin in honour of Sir James, on the strait trending westward from Baffin's Bay.

LANCASTER, Josepn (1778-1838), was born in Southwark in 1778, and was the son of a Chelsea pen- sioner. He had few opportunities of regular instruction, but he very early showed unusual seriousness and desire for learning. At sixteen he looked forward to the dissent- Ing ministry; but soon after his religious views altered, and he attached himself to the Society of Friends, with which he remained associated for many years, until long afterwards he was disowned by that body. At the age of

twenty he began to gather a few poor children under his father's roof and to give them the rudiments of instruc- tion, without a fee, except in cases in which the parent was willing to pay a trifle. Soon a thousand children were assembled in the Borough Road ; and, the attention of the duke of Bedford, Mr Whitbread, and others having been directed to his efforts, he was provided with means for building a schoolroom, and supplying needful mate- rials. The main features of his plan were the employment of older scholars as monitors, and an elaborate system of mechanical drill, by means of which these young teachers were made to impart the rudiments of reading, writing, and arithmetic to large numbers at the same time. The material appliances for teaching were very scanty—a few leaves torn out of spelling-books and pasted on boards, some slates, and a desk spread with sand, on which the children wrote with their fingers. The order and cheer- fulness of the school and the military precision of the children's movements were very striking, and began to attract much public observation at a time when the education of the poor was almost entirely neglected. Lancaster had the skill which gains the loyalty of sub- ordinates, and he succeeded in inspiring his young monitors with fondness for their work and with pride in the institu- tion of which they formed a part. As these youths became XIV. — 33

more trustworthy, he found himself at leisure to accept some of the numerous invitations which crowded upon him, and to expound what he called "his system" by lectures in various towns. In this way many new schools were established, and placed under the care of young men whom he had trained. In a memorable interview with George III., Lancaster was encouraged by the expression of the king's wish that every poor child in his dominions should be taught to read the Bible. Royal patronage brought in its train resources, fame, and public responsi- bility, which proved to be beyond Lancaster's own powers to sustain or control. He was vain, reckless, and improvident. In 1808 a few noblemen and gentlemen came to his rescue, paid his debts, became his trustees, and founded the society which was at first called the Royal Lancasterian Institution, but was afterwards more widely

known as the British and Foreign School Society. With the strongest wish to retain his services and to treat him with liberality, they soon found that he was impatient of control, and that his wild impulses and heedless extrava- gance made it impossible to work with him. He quarrelled with the committee, set up a private school at Tooting, became bankrupt, and in 1818 emigrated to America. There he met at first with a warm reception, gave several courses of lectures which were well attended, and wrote to friends at home letters full of enthusiasm and of high hopes for future usefulness, not unmingled with bitter denunciations of what he called the ingratitude and treachery of those who had been associated with him in England. But his fame was short-lived. The miseries of debt and disappointment were aggravated by sickness, and he settled for a time in the warmer climate of Caracas. He afterwards visited St Thomas and Santa Cruz, and at length returned to New York, the corporation of which city made him a public grant of 500 dollars in pity for the misfortunes which had by this time reduced him to lamentable poverty. He afterwards visited Canada, where for a time his prospects brightened. He gave lectures at Montreal, and was encouraged to open a school which enjoyed an ephemeral success, but was soon abandoned. A small annuity provided by his friends in England was his only means of support. He formed a plan, however, for returning home and giving a new impetus to his “ system,” by which he declared it would be possible “to teach ten thousand children in different schools, not knowing their letters, all to read fluently in three weeks to three months.” But these visions were never realized. He was run over by a carriage in the streets of New York in October 1838, and was so much injured that he died in a few hours.

As one of the two rival inventors of what was called the ‘‘ moni- torial” or ‘‘ mutual” method of instruction, his name was prominent for many years in educational eoutroversy. Dr ANDREW BELL (q.v.) had in 1797 published an account of his experiments in teaching ; and Lancaster in his first pamphlet, published in 1808, frankly pi ap his debt to Bell for some useful hints. The two worked independently, but Lancaster was the first to apply the sys-

ater : iPPLY UNSrSyi tem of monitorial teaching on a large scale. As an economical ex- periment his school at the Borough Road was a signal success. He had one thousand scholars under discipline, and taught them to read, write, and work simple sumsat a yearly cost of less than 5s. a head. His tract Improvements in Education described the grada- tion of ranks, the system of signals and orders, the functions of the monitors, the method of counting and of spelling, and the curious devices he adopted for punishing offenders. Bell's educational aims were humbler, as he feared to ''elevate above their station those who were doomed to the drudgery of daily labour," and therefore did not desire to teach even writing and ciphering to the lower classes. The main difference between them was that the system of the one was adopted by ecclesiastics and Conservatives, —the '' National Society for the Education of the Poor in the principles of the Established Church" having been founded in 1811 for its propagation ; while Lancaster's method was patronized by the Edinburgh Review, by Whig statesmen, by a few liberal Church- men, and by Nonconformists generally. It was the design of Lancaster and his friends to make national education Christian,

but not sectarian,—to cause the Scriptures to be read, explained, and reverenced in the schools, without seeking by catechisms or otherwise to attract the children to any particular church or sect. This principle, since almost universally adopted by the school boards of England, was at first vehemently denounced as deistic and mischievous, and as especially hostile to the Established Church. To do them justice, it must be owned that the rival claims and merits of Bell and Lancaster were urged with more passion and un- fairness by their friends than by themselves. Yet neither is entitled to hold a.very high place among the world's teachers. Bell was cold, shrewd, and self-seeking. Lancaster had more enthusiasm, a

enuine and abounding love for children, and some ingenuity in doviaing plans both for teaching and governing. But he was shift- less, wayward, and unmethodical, and incapable of sustained and high-principled personal effort. His writings were not numerous. They consist mainly of short pamphlets descriptive of the suc- cesses he attained at the Borough Road. His last publication, An Epitome of the Chief Events and Transactions of his Own Life, appeared in America in 1833, and is characterized, even more strongly than his former writings, by looseness and incoherency of style, by egotism, and by a curious incapacity for judging fairly the motives either of his friends or his foes,

Subsequent experience has not justified the sanguine estimate of the Edinburgh Reviewer, who so early as 1810 described Lancaster's method as ''a beautiful andinestimable discovery, a plan now brought very near to perfection, by which education could be placed within the reach of all classes." We have since come to believe that intelli-

ent teaching requires skill and previous training, and that even the

umblest rudiments are not to be well taught by those who have only just acquired them for themselves, or to be attained by mere mechanical drill. Butin the early stages of national education the

monitorial method served a valuable purpose. It brought large numbers of hitherto neglected children under discipline, and gave them elementary instruction at a very cheap rate. Moreover, the educational results attained were in no sense contemptible. The little monitors were often found to make up in brightness, tracta- bility, and energy for their lack of experience, and to teach the arts of reading, writing, and computing with surprising success. And one eardinal principle of Bell and Lancaster is of prime importance. They regarded a school, not merely as a place to which individual pupils should come for guidance from teachers, but as an organized community whose members have much to learn from each other. They sought to place their scholars from the first in helpful mutual relations, and to make them feel the need of common efforts towards the attainment of common ends. (J. G. F.)

LANCELET (Branchiostoma [or Amphiorus] lanceo- latum). This creature, the lowest in the scale of fishes, with which class it is generally associated, lacks se many characteristics of vertebrates generally that some naturalists regard it as the type of a separate division. It is of small size (about 3 inches long), compressed, semi-

Lancelet (Branchiostoma lanceolatum). a, mouth; 6, abdominal porus ; c, vent. transparent, pointed at both ends, without limbs, but with a low fold of the skin, representing the median fin of

fishes. The mouth, surrounded by tentacles, is situated below the anterior end of the body, the vent at a short distance from the opposite end. The water which has been

‘received through the mouth for the respiratory function, as

well as the spawn, are expelled by another opening in front of the vent (porus abdominalis). The skeleton is extremely rudimentary, and consists almost wholly of a simple notochord ; neither skull nor ribs or limbs are developed. The lancelet possesses no brain or organ of hearing, and no kidneys. The heart retains the embryonic condition of vertebrates, is tubular and without chambers; the blood is colourless. Thus the lancelet shows unmistakable ana- logies to invertebrates,

among which, indeed, it was placed by its first describer, Pallas; and as, besides, the earliest stages of its development are almost identical with those of invertebrate animals, it may well be regarded as a form intermediate between the two great divisions of the animal kingdom, viz., the vertebrates and invertebrates.

The lancelet has been found in numerous localities of

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the temperate and tropical zones, sometimes in deep water, |

but more frequently in shallow sandy places of the coast ; probably it is much more common than is generally supposed, but easily escapes observation on account of the transparency of its body, and the rapidity with which it buries itself in the sand. It is noteworthy that the first two specimens from which the species became known, although discovered at an interval of more than fifty years, were found on the Cornish coast. The first fell into the hands of the Russian naturalist Pallas, who took it to be a slug, and described it in 1774 under the name of Limax lanceolatus. ‘The second was found by Couch in 1831, who recognized it as a fish and sent it to Yarrell. Since then it has been met with on other parts of the British coast, in North America, the West Indies, Brazil, Peru, Tasmania, Australia, and Borneo. For further details of its organization we refer to the article IcuTHyoLocy.
LANCEWOOD is a straight-grained, tough, light, elastic wood obtained from the West Indies and Guiana. It is brought into commerce in the form of taper poles of about 20 feet in length and from 6 to 8 inches in diameter at the thickest end. Lancewood is principally used by carriage-builders for shafts; but since the practice of employing curved shafts has come largely into use it is not in so great demand as formerly. The smaller wood is used for whip-handles, for the tops of fishing rods, and for various minor purposes where even grained elastic wood isa desideratum. The wood is obtained from two species of Guatteria, a genus belonging to the natural order Anonacex. The black lancewood or carisiri of Guiana (Guatteria virgata) is a tree

which grows to a height of 50 feet, of remarkably slender form, and seldom yields wood of more than 8 inches diameter. The yellow lancewood tree (yari-yari of Guiana) is of similar dimensions, found in tolerable abundance throughout Guiana, and used by the Indians for arrow-points, as well as for spars, beams, &c. LAN-CHOW-FOO, the chief town of the Chinese pro- vince of Kan-sul, and one of the most important cities of the interior part of the empire, stands on the right bank of the Yellow River. The population is estimated by Gustay Kreitner (Bela Szechenyi expedition) at half a million in 1878. The houses, with very few exceptions, are built of wood, but the streets are paved with blocks of granite and marble. Silks, wood carvings, silver and jade ornaments, tin and copper wares, fruits, and tobacco are the chief articles of the local trade. Tobacco is very exten- sively cultivated in the vicinity. Since the occupation of Kashgar by the Chinese, the provincial governor resides three years at Su-chow and three years at Lan-chow-foo. LANCIANO, the chief town of a circle in the province

present site was occupied by a town, as the oldest of the bridges on which the cathedral stands was erected by the senate and people of Anxanum, under Diocletian. During the Middle Ages Lanciano was of considerable importance, and enjoyed various privileges, chiefly of a commercial nature.

LANCRET, Nicozas (1660-1743), was born in Paris on 22d January 1660, and became a brilliant painter of light comedy, but of light comedy which reflected the tastes and manners of French society under the regent Orleans. His first master was Pierre d’Ulin, but his acquaintance with and admiration for Watteau induced him to leave D’Ulin for Gillot, whose pupil Watteau had been. ‘Two pictures painted by Lancret and exhibited on the Place Dauphine had a great success, which laid the foundation of his for- tune, and, it is said, estranged Watteau, who had been complimented as their author. lLancret’s work cannot now, however, be taken for that of Watteau, for loth in drawing aud in painting his touch, although intelligent, is dry, hard, and wanting in that quality which distin- guished his great model; these characteristics are due possibly in part to the fact that he had been for some time in training under an engraver. In 1719 he was

received as Academician, and became councillor in 1735; in 1741 he married a grandchild of Boursault, author of sop at Court, but he survived his marriage only two years, dying, in his eighty-fourth year, on 14th September 1743.

The number of his paintings (of which over eighty have been engraved) is immense ; he executed a few portraits and attempted historical composition, but his favourite subjects were balls, fairs, village weddings, &c. The British Museum possesses an admir- able series of studies by Lancret in red chalk, and the London National Gallery shows four paintings—the Four Ages of Man (engraved by Desplaces and L'Armessin), which have been cited by D'Argenville amongst the principal works of Lancret. See D'Argenville, Vies des Peintres ; and Ballot, Eloge de M. Lancret.

LAND, in the sense in which it will be used in this article, which treats especially of its possession and tenure, includes that portion of the earth of which industry has rendered either the surface or the mineral riches under- neath available for human requirements. it forms thus the storehouse from which nearly all human wealth is drawn, since it nourishes the animals and plants which supply mankind with food and clothing, and yields the stone, the coal, and the metals which make existence possible and progressive. The history of its use is therefore a main element in the history of our race, and the manner of its tenure and employment lies at the root of political and economic science. In the present article it is proposed to sketch in outline the historical development of the ideas relating to land, and briefly to point out the leading prin- ciples which influence its tenure and beneficial employment under present circumstances.

of Chieti, Italy, is situated on three hills, about 5 miles The history of land commences with the division of men Develop- from the Adriatic coast. It is one of the most beautiful | into tribes, for the division of tribes involves distinction of ment of cities in the Abruzzi Citeriore, and has broad regular streets, | territory. The earliest age, when men lived solely on wild = ten- and several fine buildings. The cathedral, an imposing | fruits or on the produce of the chase, may still be pictured '

structure with a fine clock-tower, is built upon bridges | to usin the habits of the North American Indians, while the a that span the gorge of the Feltrino, and is dedicated to | second or pastoral stage is represented in modern times by tion.

_ temples, and the theatre, also deserve notice.

our Lady of the Bridge. The churches of Santa Lucia and Santa Maria Maggiore, built on the sites of heathen Although the industry and trade of the town have declined, a con- siderable miscellany of manufactures is still carried on. The textile industry, dealing with flax, hemp, silk, wool, and cotton, is the leading one ; iron-working, rope-making, and the manufacture of wax, soap, cream of tartar, &c., follow. There are four yearly fairs. In 1872 the popu- lation was 8758 ; including the suburbs it was 15,342, or, embracing the commune, 17,340.

Lanciano claims a respectable antiquity, for, although Pliny's

Anxia or Anxa Frentanorum is to be placed about a mile from the present town, there is no doubt that under the early empire the

the life of the Tartars of the Asian steppes. In both these conditions an immense tract of country is absorbed in the support of a small population, but the hardships of existence, aided sometimes by organized systems of child-murder, serve to keep the inhabitants within the limits of subsistence. Under such circumstances each tribe jealously guards its own territory from intrusion by others, but within its range all members of the community have equal and unrestricted rights of use. Among civilized nations the principle still survives. Each modern nation claims a special ownership in the fisheries within a certain distance of its coasts; but among the inhabitants of these coasts there is a common right to fish in the waters thus reserved. So also each modern state recognizes the shores as far as high water

Village tenure.

Private

mark, and the estuaries with their harvests of wild fowl, as the common property of its subjects. Even inland game is still not individual property, and in countries where legal rights are so ancient or so modern as in the Channel Islands and the United States of America, the local law is alike liberal in allowing to every one the right of sporting over his neighbour's ground, except in so far as modified by express and recent legislation.

But the higher races very early discovered an ampler means of industrial existence than the natural produce of the earth affords. At what period in human history the artificial cultivation of plants was discovered it is impossible to say. We know that it was posterior to the division of the Aryan eurrents that flowed towards Hindustan and towards Europe, but before the subdivision of the latter; for the words denoting a field, a plough, and some species of grain have a common root in the Greek, the Latin, and the Germanic dialects, but not in the Sanskrit. But so soon as agricul- ture began it involved of necessity an approach to more settled habits. This change in the manner of life would combine with the fuller and more regular supply of food to promote a rapid increase of population. So long, however, as this did not exceed the resources of the territory belong- ing to the tribe, it would not of itself involve any change in the idea that its use was common toall. A certain portion of ground would be devoted to tillage, a certain number of the tribe would be appointed to perform the acts of cultivation, and the produce would be stored in the general barn, We have at the present day examples of such a system in some of the allmends of the Swiss canton of Valais, where a portion of the lands of the village is culti- vated by joint labour, and the produce devoted to joint feasting. But it appears that in general this stage rapidly progressed to one of apportionment of the land in separate and smaller districts. and perhaps in extent of territory, subdivided itself into

villages, and each village exercised a tolerably independent |

rule over its own district. Within this range it still main- tained a community of the forest and pasture, but the

- special skill and toil demanded by husbandry in most cases ’

soon led to the appropriation to each family of a portion

of the arable land in exclusive property. Still, however, | the principle of common right prevailed so far that the |

village rulers changed every year the lots assigned for culture, so that one year of crop, followed by a relapse

into natural growth for a succession of years, was the |

normal rotation. It is one which modern science cannot condemn, for where space is ample and the use of manure is unknown, there is no sounder method of cultivation. It is still, according to M. Laveleye, exemplified in the Ardennes region of Belgium.

It is at this stage that contemporary observers first de-

gl scribe the tenure of land in ancient times, and illustrations

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of its survival in modern periods grow abundant. These will be hereafter pointed out. But except in special circum- stances it is obvious that progress could not stop here. As population increased in each district, the available hunting grounds would diminish, and at the same time the necessity of more extensive and more frequent cultivation of crops would increase. By this process, in the absence of manure, the land would inevitably become less productive. But just as it demanded more labour it would become more definitely appropriated to a single family, for those who laboured most would not willingly give place to those who had been less active. A stage would then be reached in which community of possession would be limited to the pasture lands of the village, and the arable lands would be possessed in permanence by each family. There generally was, indeed, while the territory still sufficed, a recognition of the right of each individual to an allotment from the

The tribe, augmenting in numbers ,

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common land. Butat last the period would come in which this could be no longer afforded, and when either the tribe must migrate ina body, or cast off a swarm to seek its fortunes elsewhere, or leave a certain number of its members without the privilege of landed possession, to obtain subsistence in services to the rest, or in trades, When the two former alternatives become impracticable, the third is the inevitable course. Private property in land becomes then established, and we have thenceforward anew system, involving consequences for good and evil which legislation seeks to regulate.

With this general notion of the course of development Histori-

it will now be convenient to trace, in some instances which cal

have most affected the world's progress, the history and the 'ketch.

results of the use and appropriation of land.

In primitive Rome each household formed an absolute Primi-
despotism, of which the father was the despot ; households tive

were united into gentes by derivation from a common ancestor, and the state consisted in a combination of gentes. To each household there was originally assigned a small portion (2 jugera, 1} acres) of land to be held in perpetuity as private property (herediwm), and it may be assumed that on the death of a paterfamilias each son would be entitled to a like amount from the common lands of the gens. These common lands formed the main posses- sion of the gentes, and it appears that they were to some degree cultivated in common, as well as used for pasturage. The state, however, also held common lands, partly original, partly derived from cession by each conquered neighbour, and these were let for rent (vectiga/) in so far as not parti- tioned out. Cicero (De Rep., ii. 9, 14) says that Numa was the first who divided the conquered lands into private shares, but it is certain that the example was only

partially followed. But by the time of Servius Tullius the original private portion of many households must have been greatly but unequally enlarged, for his new military organization was based on the obligation of service imposed on the free- holders (assiduz) as distinguished from the mere labourers and breeders of children (proletarit), The ‘“classes” of

the assidui were five, those who possessed 20 jugera (124 –

acres), and who were specially denominated classici, and those who possessed respectively 15, 10, 5, and 24 jugera. The first class, or classici, were about the half of the whole number of assidui, the second, third, and fourth classes comprised each about one-eighth of the entire number, and the fifth class was slightly more numerous. The equites formed a separate order, based on the possession of a still larger extent of land. At the same time a register of land was established, in which each owner was required to enter his property, and which was revised every four years, and sales were directed to be made before two witnesses. These arrangements show that even at this epoch the system of separate private property was in full operation, and that the difference of wealth which it engenders had already reached an advanced stage,

The progress of conquest, which at once enlarged the territory, brought in tribute, and furnished slaves, rapidly increased such inequalities. Trade, which followed con- quest, and in which capitalists made large fortunes, tended in the same direction. Very early in Roman legal history we come upon tenancy-at-will, under the name of precarium, which of itself showed that there must have been large estates capable of subdivision. But besides tenants, each extensive landowner had a household of retainers, clients, freedmen, and latterly slaves, who tilled his ground for his personal profit. Thus there would be little demand for free labour, and the petty husbandman, whose small inheritance was inadequate for a growing family, fell necessarily into debt. His land would then be seized under the strict Roman law of bankruptcy, and he himself

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would sink into slavery, or at best into the already over- crowded class of labourers for insufficient hire. At the same time the conquered lands, which by theory were the property of the state, and to which every citizen had an equal right, were largely portioned out to the existing landowners, who held the chief posts and influence in the government. farmed out to capitalists, and the taxes on the public were augmented in consequence of the permitted frauds of the collectors. At last came the crisis. The army, no longer representing the wealth of the state, but rather the pro- letariat, mutinied, and from the Mons Sacer menaced thie city. It was the commencement of the long struggle of which the successive AGRARIAN Laws (q.v.) were the land- mark and remedies.

The object of these laws was well illustrated by the Licinian proposal (387 a.v.c.), nearly one hundred years after the first outbreak of discontent. should hold more than 500 jugera of the public lands, that

uo one should graze more than one hundred oxen and five |

hundred sheep on the common lands, and that every land- owner should be obliged to employ a number of free labourers proportioned to that of his slaves. But this, as all other laws proposed on behalf of the people, was coupled with political changes of which the main object was to open up new fields of ambition to those of the plebeians who were already opulent. When that object was attained, the agrarian remedies were suffered to fall into desuetude. The successful wars waged in the 6th and 7th centuries

A,U.C. gave a temporary outlet to labour in the formation of |

agricultural colonies. But it at the same time immensely increased the number of slaves, who were treated as mere beasts of toil, to be worked out or sold off when no longer profitable. The free population, on the testimony of Cato and Polybius, diminished ; the slave

population increased, and became in many districts an organized danger to public safety. A century later the Gracchi again endeavoured to restore health to the body politic by a distribution of the state lands among the proletariat.

in blood, but the necessity of the measure was proved by

Ancient Ger- many,

the fact that a full generation later Caius Julius Czesar carried out the same reform,

The time for remedy was, however, past. The great estates (Jatifundia) had already been created; they were respected by the reformers, alike popular and imperial ; and their inevitable growth swallowed up the small farms of new creation, and ultimately destroyed Rome. For its manhood was gone; the wealth of millionaires could not purchase back honesty or courage; and the defence of mercenaries failed to form any barrier against the wars of hardy northern invaders. Pliny's words " latifundia perdi- dere Italiam " embrace the truth, yet more fully made clear in many a generation after he wrote.

We shall now examine the systems prevalent in the nations by which the Roman empire was overthrown. Two great Roman writers, Cesar and Tacitus, have given us a vivid picture of the German customs showing us the tenure of land in its earliest forms. Czesar (De Bell. Gall., vi.) says of the Germans of his time :—.

"They are not much given to agriculture, but live chiefly on milk, cheese, and flesh. No one has a fixed quantity of land or boundaries

of his property, but the magistrates and chiefs every year assign to the communities and families who live together as much land and in

such spots as they think suitable, and require them in the following |

year to remove to another allotment. Many reasons for this custom are suggestcd : one is that they should not be led by permanence of

Tesidence to renounce the pursuits of war for agriculture, another that the desire of extensive possession should not induce the more powerful to seize the land of the weaker, another that they should not construct their houses with greater care to kecp out heat and cold, another that the love of money should not create parties and disputes, and lastly that the mass of the people might remain con-

The revenues drawn from tribute were also

It enacted that no citizen |

The attempt was stifled |

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tented with the justice of an arrangement under which every one saw his position as comfortable as that of the most powerful. As to the tribes themselves, their chief glory is to have their territory surrounded with as wide a belt as possible of desolated waste. They deem it not only a special mark of valour that every neighbouring tribe should be driven to a distance, and no stranger should dare to reside in their vicinity, but at the same time they view it as a measure of precaution against the risk of sudden attacks."

A hundred years later the description of Tacitus shows that a certain modification of habit had been induced. Bringing together the leading particulars, we find le speaks of Germany as "covered with woods and morasses, the land fairly fertile but unsuited for fruit trees, well adapted for pasture, and carrying numerous herds of small sized polled cattle, in which the chief wealth of the natives consisted." But they seem no longer to have changed their actual dwellings every year, but to have

'¢ Built them with a certain rough solidity, and in villages, though the houses were not contiguous, but each was surrounded by a space of itsown. The right of succession by children was recognized, and in default of children brothers and uncles took, but there was no right of making a will. They preferred to acquire property by war rather than

by industry. Interest on loans was unknown. ‘The land was apportioned (to villages apparently) according to the num- ber of cultivators, and divided among them according to their rank, there being ample room for all. Every year they changed the arable land, which formed only a portion of the whole, not atteinpt- ing to make labour vie with the natural fertility and abundance of the soil by planting orchards or setting out gardens and fields, but content with a single crop. Their food consisted chiefly of wild fruits, freshly killed game, and curds; their drink was a liquor pre- pared from barley or wheat, fermented like wine. Their slaves were not kept in the housc, but each had a scparate dwelling and an allowance of food, and they were treated with humanity, as servants or tenants.”

These institutions were then obviously based on the existence of an ample supply of unenclosed and common land. But the natural increase of population, combined with the pressure put on the Germanic tribes from the east by the Slavs, made their territories too small for their ambition, if not for their maintenance, and five or six succeeding centuries were marked in the history of Europe chiefly by successive Germanic conquest and occupation of western and southern territory. The enormous increase of power and possession made it impossible for the original tribal government to survive ; the great generals developed into kings and emperors, and their lieutenants, more or less independent according to individual capacity and distance from the capital, became dukes and counts. Gradually military authority, embracing the old idea of the land being the property of the state, evolved the new notion of feudal- ism. The sovereigu represented the state ; to him in that capacity land conquered from the enemy, or forfeited by unsuccessful rebellion, became subject ; and he granted it to his followers on condition of faithful service in war. They promised to be “his men,” and from their own tenants they exacted in turn the like promise on the like conditions. The general insecurity made even free owners willing to buy the support of the sovereign on similar terms. Thus by degrees, less by derivation from the ideas of Roman law, to which it is sometimes attributed, than by the mere necessity of the times, and as a consequence of the incessant state of warfare in which mankind existed, there came to be established the

feudal doctrine that all land was held of the sovereign on condition of suit and service, and that each immediate tenant of the sovereign was entitled to sub-infeudate his possession on the same principles. Gradually the further attributes of property were added ; service in war was commuted into rent, and the peaceful service of tilling the lord's reserved domain. The right of hereditary succession became grafted on the personal grant; the power of sale and devise followed. Local usages still had influence, but it may be said broadly that from about the 10th century private property, subject to feudal

India.

Slavonic peoples.

Russia.

conditions, became the principle of the tenure of land in Europe.

There are, however, some nations in which feudalism has struck no root, or at least has not succeeded in seriously modifying the original type of common possession. It will be best to advert to somie of them before proceeding further with the history of feudalism in its modern development.

The Indian branch of the Aryan stock has preserved with great fidelity the original notion of the possession of land. The village, consisting of detached houses and surrounded with the district belonging to it, forms still a self-regulating community. It is a legal person, to which the state looks for its rights, but which when performing them is free from internal state interference. It holds the forest and pasture ground in common property, allowing their use to each person entitled to the village rights. To each family is further apportioned a measure of arable land, but the stage is in general passed at which this portion is changed in successive years, and it is therefore the hereditary property of the family. But it is not in strictness subject cither to will, to mortgage, or to sale. It is divisible on the death of the lead of the

family among his children, any of whom may transfer their shares to another member of the village, but not, except with its leave, to a stranger.

These ancient customs have to some extent been modified

by the introduction of English law, which, among other things, has subjected the villagers to the grinding exactions of the money-lenders, by giving creditors the security of an English mortgage. It cannot but be regretted that the desire to act justly which has led to the change should have been misled by the idea that whatever institution exists in England is necessarily and everywhere else equally equitable and necessary.

In Europe the Slav peoples, the latest arrival of Aryan stock in Europe, have preserved best the ancient charac- teristics of land tenure. Checked in their advance to the south-east, they have formed a narrow borderland in Bulgaria, Servia, Croatia, and Dalmatia, between the Germans on the one side and the Turks on the other. Here, therefore, we have the case of a population growing within a restricted area, under circumstances which pre- vented the development of extensive military sway, and its consequent feudalism. Accordingly we find prevailing a system midway between the ancient communism of the Germanic tribes and the institution of private property. The tribes have become broken up into families. Common lands, except where there is mountain or forest, have been partitioned into the separate ownership of families. But within the families there is still a strong sentiment of community. In the Servian and Bulgarian villages each family household consists of probably several generations, all housed under the same roof or within the same curtilage. The head of the family is judge rather than master; any member of the family may depart, but in so doing he abandons his claim to the family property, a claim, however, which in some cases may revive should he return to the paternal home. All who remain work in common at their appointed duties, and share in common the produce. The family possessions are inalienable; the share of each member is untransferable.

To the north and east the faculty of unlimited emigra- tion to the unoccupied lands of the steppe permitted or enforced the preservation of a still earlier type of common property. When the Russian village found its lands in- adequate to its growing population, it threw off a swarm. The emigrants travelled in a compact body till they passed beyond the limits of present cultivation, and then took up their position on such lands as pleased them. For their protection against the aboriginal hunters who still roamed

of an enclosed village, and tle same reason concurred with native habit to induce them to maintain the system of common pasturage, and of united cultivation of the land apportioned to cropping. When the central government became strong enough to assert its sway over the scattered settlements, it levied its tax on the mur, or village comniunity, aud the community apportioned the amount per capita among its members. But, as land was ample in extent for all, it gave to each male, from the moment even of birth, a right to a share. When the shares became inadequate a fresh migration took place.

Serfdom took its rise in the prohibition of these migra- tions. Forbidden to depart to new lands, tle peasants were compelled to submit to the demands for their labour either of the Government, where it held estates in the neighbourhood of a village, or of nobles to whom grants of land had been made by the czar. Generally they were thus forced to give half their time to labour for their master. But they still continued possessors of their share in the village lands, and entitled to apply the other half of their time to its cultivation.

When emancipation came, their rights were regulated on the same basis. The village was maintained as an industrial and fiscal organization. But each peasant was declared to be entitled to a certain fixed minimum of land for his own property, varying according to the district, but on an average about 12 acres. For this, in so far as being in excess of tlie village lands it had to be made up from the land of adjoining owners, he is required to pay either services, to the extent of forty days in the year, or rent, at an average rate of about 2s. 4d. per

acre. Such provisions can only be temporary. They resemble much those which prevailed in Germany prior to the modern reforms iu tenure. They subject the peasant, untaught and unaccustomed to habits of individual energy, to a tax which he is not able to meet, and the suffering and complaints which are the consequence are at present general throughout Russia.

In Switzerland also there has survived a system only Switzer- slightly altered from that of the original communities. For !@nd.

here also conquest with its attendant feudalism was stayed, and freemen and free institutions survived the wreck which war made throughout western Europe. In the forest cantons especially there still exists an essential community of land right. ‘The inhabitants possess separately and by ordinary rules of inheritance certain portions of land. But in several cantons the bulk of the land, both arable, forest, and pastoral, forms the allmend of the state, or of the com- mune,—the common property, to which every descendant of the original inhabitants has a right. This common land is either partitioned out by lot to each person entitled, or is let for a rent, which is applied to the common benefit, or is made the subject of common labour, and the produce of bread and wine is devoted to common merry-makings. When the arable land is divided among cultivators, the period allowed before repartition is from five to nine years, and it is stated that so strong is the feeling of common interest that the shortness of the time does not interfere with the highest cultivation by each successive occupant. In some districts it furnishes farms of 20 acres to each family, in others it only suffices for allotments of a few perches.

In France the custom of village proprietary survived in France.

many districts down to the middle of the 17th century. But previous to the middle of the 18th century nearly the whole of the soil had passed into the hands of great land- owners. ‘The tenants and peasants were ground down with heavy exactions, not only in the form of rent, but of state taxation, and in services, or corvées, to be rendered to the lord or to the state. The artificial life of the nobles

over the plains they built their houses on the uniform plan | at court destroyed all sympathy between them and the

Modern Ger- mnany.

be

cultivators, and brought them to look on their dependants as little more than beasts of burden, valuable only for the profit that might be made of them. ‘The feeling engendered on the other side broke out in the Revolution. The country estates, from which the emzgrés had fled, were sold in portions, and in many cases bought in fee simple for a trifle by the former tenants of the farms. The law of equal division among children continued the process of sub- division. It proceeds in an augmenting ratio, and though a few large properties still subsist, the bulk of the land in France is now held in small properties. It is not, however, ulliversally cultivated by the owner. There is a large proportion of tenants, holding generally under leases not exceeding nine years; and there is no doubt that the shortness of the term impairs production. Another evil is the mercellement caused by the law of compulsory division on inheritance, but this must not be understood as objected to chiefly on the ground of the small extent of ground held by each proprietor. The real disadvantage complained of by French writers on agriculture is that through successive family divisions each man’s total property consists of a nuinber of small plots scattered up and down; and the remedy desired is not an interference with the present law of succession, but only an enactment to facilitate exchange and consolidation of plots, so as to give to each cultivator his whole property within one boundary.

In France there are now about 2,000,000 properties under 12 acres, and 1,000,000 between 12 and 25 acres, while there are only 150,000 above 100 acres. Of the whole population there are 1,750,000 who cultivate their own land with their own hands, and who are not tenants, 850,000 who cultivate as tenants, and only 57,000 who cultivate by aid of a foreman or steward. Of farm Jabourers there are only 870,000. Belgium, Switzerland, Denmark, Norway, Sweden, and great portions

of Italy are similarly divided into small holdings cultivated in general by the owner and his family.

In Germany, although feudalism was fully developed as a legal system and as the foundation of the aristocracy, it did not succeed in extirpating entirely the ancient rights of the people. A large portion of the land was held always as peasant properties, entirely free from any dues of service. Among these, in certain districts, there survived an organization essentially identical with that described by Tacitus. The village had its domain or mark, subdivided into the arable, the pasture, and the forest. In some cases the first of these was partitioned into individual and permanent properties, but in all the pasture and forest remained the joint property of the village. Instances, however, were not wanting even in our own days where the arable portion was subject to annual or less frequent repartition, and to apportionment by lot to each cultivator for the time which custom ordained. But even where this usage did not prevail, it was incumbent on all the villagers (as in Russia) to cultivate their several portions of the arable mark with the same crops and at the same seasons, for as soon as the crops were removed the whole community enjoyed a right of pasturage on the stubble. The rotation was, therefore, of the simplest, consisting in general of a triennial succession of wheat or rye as winter-sown grain, followed by oats and barley as spring-sown crop, and then fallow. It differed for the worse from that of the ancient Germans in that the circumscribed limits of each village domain made it now impossible to allow to the whole arable mark a period of rest under pasturage.

But intermixed everywhere with the relics of the free village institutions the tree of feudalism struck its roots, and carried with it a species of serfage. None who were not noble could as a rule purchase land. On the lands of the nobles the tenants were bound to give to their lord a

noble enjoyed to become a landowner.

portion of their time in gratuitous labour. They held, however, their farms under conditions of permanency, subject to this tax of labour, and to a variety of small and irregular exactions of the nature of rent. On this state of things in Prussia the Stein aud Hardenberg reforms took effect. They gave to every peasant the same power as the Between the nobles and their tenants they partitioned the land in absolute property, the landlord retaining one-third, the tenant receiving two-thirds, Common rights, and rents, were made purchaseable by the owner of the soil at twenty years' purchase of their estimated value. And Jaws of 1821 and 1850 sanctioned the division of common lands among all who previously had an interest inthem. To aid the peasantry in purchasing up the dues still payable to their former landlords, land credit banks were introduced in 1850. These institutions advanced to the peasant owner the sum necessary for the purchase of the old rights over his property, commuted as they had already been to a definite sum. The advance thus made constituted a first charge on the land, and was represented by debenture bonds for small amounts. The owner might pay to their credit, at whatever time and in whatever sums he was able, instalments towards their redemption, but lhe was bound to redeem them fully within fifty years.

These reforms have converted large parts of Germany into the property of small owners residing on and tilling their own land, free from obligation to any other person. There do not seem to be data for judging of the economic result, because statistics do not distinguish between the produce of small properties and that of the large properties intermixed with them. But the most careful observers

-agree that the social results are similar in Germany to

what they are elsewhere. The peasants, attached to their holdings, form the most stable element in the common- wealth. Their love of the land shows itself in the high prices given for it, and, as we shall see elsewhere, in the tendency to borrow in order to purchase more. It can at least be said that, whatever be the hardships of their lot, they would not exchange it for any other.

The tenure of land in Great Britain may be traced with Great sufficient accuracy from the character of the elements of Britain.

which the nation is composed. Under the Celtic tribes there can be no doubt that the ideas which we know prevailed among the ancient Irisl and among the Scottish clans down to modern times formed the universal rule. The land was the possession of the clan; the chief was the leader but not the owner. The temporary and partial occupation by the Romans may have introduced the notion of absolute private property, and we may assume that it was at least asserted by such of the conquerors as cared to cultivate estates taken from the barbarians. But the with- drawal of the Romans, followed by the Saxon invasion, must have re-established the principle of common village ownership which formed the basis of both Celtic and German tenure. In the later Saxon period, however, there is no doubt that private ownership became gradually more extended. Then the feudal idea began to make progress in England, as it did at the same period on the Continent. It received an immense impulse from the Norman Conquest. William may not have claimed the whole land of England as his own, but the vast tracts which fell into his hands through confiscation of rights of so-called rebels were granted by him in the character of lord to such of the Saxons as he could trust, and to those of his own followers whom he desired to reward. When law began to form a system, the early Norman lawyers took this principle as the basis of their system. Thenceforth it became the un- disputed maxim of English law, as well as of Scottish (with the exception of some isolated remains of “udal

rights in Orkney), that the sovereign was supreme lord of all the land, and that every one held under him as tenant in England, vassal in Scotland, names which have survived in legal theory and language down to the present day. They expressed then as now the unquestionable legal rule that there is no such thing in our system as an absolute private right of property in land, but that the state alone is vested with that right and concedes to the individual possessor only a

strictly defined subordinate right, subject to conditions from time to time enacted by the community.

Within Scotland the feudal system has been preserved in remarkable purity. The majority of the larger estates, as well as many small ones, are still nominally held of the crown, and pay an annual rent, or '"feu-duty," along with certain fines on succession or alienation, nor is the title of any heir or vendee complete till he has received the written acknowledgment of the sovereign. But each owner who holds of the sovereign may grant a subordinate estate to be held of himself as "superior" or lord, on such terms as he thinks fit, and the "vassal" thus constituted must in future obtain recognition of his title from his immediate superior, just as if he held directly of the crown. It is only within the last few years that the subordinate vassals thus holding have been allowed the means of commuting the services they had bound themselves to pay to the "subject superior," and of converting themselves into direct vassals of the crown, which forms the nearest approach to private property permitted by the law of Scotland.

In England feudal forms became partially obliterated at an earlier period. In 18 Edward I. parliament had put an end to subinfeudation. The services due by the crown's tenants were by a statute of Charles II. reduced to a form which left them merely nominal. But at a very remote period there had sprung up a tenure which in many respects was equivalent to feudal tenure. The serfs who cultivated the lord's lands, although at first subject to his absolute pleasure, yet, being left undisturbed for a consider- able series of years, fell under the doctrine of English jurisprudence which recognizes custom as having the force of law. They gained thus a right of occupation in per- manence, paying only such rents or services as were entered in the copy of the rolls of the manorial court, from which their tenure came to be designated copyholds. By degrees they obtained manumission from servitude, and with it the right of alienating or bequeathing the land they thus held. There were therefore two principal classes of property in England, freeholds, holding in general directly of the crown, and copyholds, holding of a lord of the manor, but both with indefeasible title subject to trifling services ascertained by custom or by statute. It would seem

that in these two forms a very large number of those whom we now should call yeomen or peasant proprietors were estab- lished throughout the country. But in addition to these there were on the large estates a great number of those whom we should now properly call tenants-at-will, renting lands of the lord, and not established for a sufficient length of time to have acquired the status of copyholders. ‘

About the middle of the 14th century English wool was found to be peculiarly well adapted to the use of the weavers of the Low Countries, and brought ahigh price. This led the owners of the large estates to substitute pasturage for tillage, and by consequence many of the cultivating tenants- at-will were evicted. Hence arose complaints precisely similar in motive and language to those which in our own times have been excited by the clearings in Ireland and the Highlands for the purpose of substituting sheep farming in place of husbandry by cottars and crofters. During the 15th ceutury, probably for the same reason, the extensive wastes which covered a large part of England began to be

enclosed, to the consequent disturbance of a number of squatters (called at the time “ champions,” from champs) who had settled on them, and derived a not very sufficient subsistence from feeding a few aniinals on the commons. It is noticeable that both Fitzherbert and Tusser, the earliest English agricultural writers, and the latter himself one of the people, commend the enclosures, on the ground that the land so reduced to separate ownership produced much more than it had done as commons. But these causes, combining with the breaking up of the monasteries, and the absorption of church lands into the estates of the adjoining landowners, gave rise to much disorder and misery. Parliament attempted to deal with the causes and effects by enactments directed by turns against the high rate of wages, against the destruction of farm houses and cottages, and against the idle or unemployed tramps who roamed over the country. It was a period of disloca- tion of social relations, of which we are not now in a position to judge accurately. But undoubtedly the ulti- mate result was a considerable

increase in the magnitude of the larger estates and farms, gained by a proportionate decrease in the number of both of smaller size. It is from this period that we must date the diminution of the class of yeomen which has been the theme of lamentation with economists and historians down to our own times.

Contemporaueously with these changes the law was receiving those adjustments which tended to preserve the large estates undiminished in the possession of their here- ditary owners. Entails were sanctioned by statute (De donis, 13 Edw. L), but broken down some two centuries later by the ingenious judicial devices of fines and recoveries. ‘Trusts were invented by the churchmen, but attacked by parliament, only to be re-established under the technical name of trusts upon uses. Lastly, estates for life were invented ; and, being skilfully combined with so much of the principle of entails as the courts had sanctioned, they have formed the still existing method by which family estates are preserved from dispersion. The rule of law is that all persons living at the date of a settlement may be restricted to mere estates for their own lives, instead of taking the fee simple with full right of alienation. In this way each son when he succeeds finds himself merely a tenant for life, and as such possessed of no power to pre- vent his own son from becoming owner in fee simple when he in turn shall succeed. But a father so situated is little inclined to leave to his son powers of which he himself is deprived, while his son is generally willing to barter his future liberty for a present liberal allowance. Thus father and son strike a bargain ; the father buys the son’s surrender of his future right, and the son, for a price, agrees to sub- mit himself to the restraints of being merely tenant for life when his father shall dia The process repeated from generation to generation has re-established in practice the system of entails which the courts had abrogated as con- trary to public policy, and wltich every writer from Bacon downwards has denounced as hurtful to the nation.

Similar rules prevailed in Scotland. But, as entails were there of later introduction, so they were much more strict, and from 1680 to 1848 land might be settled in an end- less succession of inconvertible life estates. In the latter year an Act was passed which, with a good deal of

com- plication, substantially limits the right of creating life estates to one generation as in England. In 1875 another Act introduced the useful principle that the owner of a life estate might in certain circumstances buy up and extinguish some of the contingent interests in succession to his own at their present value, ascertained by computa- tion based on the expectation of life.

The system of entails, or of creation of estates for life only, which has thus prevailed for several centuries in the

United Kingdom, is sufficient to account for the fact that the large estates have continually augmented, in size and number, by the corresponding absorption of the small pro- perties of yeomen. These small properties are seldom sub- jected to strict settlement, The owners occasionally fall into difficulties, and then their land is sold to pay their debts. They are frequently moved by natural affection either to divide their estates among children, or to subject them to charges for children other than the heir, and this also tends to bring them into.the market for sale. But the large adjoining properties, the owners of which have been induced by family pride to limit their right to mere life interests, are not liable to besold fordebt. The immediate possessor may be crippled during his life, but his heir will succeed to the estate free from incumbrance by any prior possessor. In the same way the powers of each successive owner to charge the estate for younger children, and the liability to sale for payment of such charges, is restricted within narrow limits. These properties therefore continue undiminished ; and, when a small adjoining freehold cones into the market, it is seldom that the owner of the larger estate cannot find the money to effect its purchase. Once obtained, it is included in the next settlement of the larger estate, and thus permanently withdrawn from the operation of natural processes of disintegration. On the whole, it follows that large estates tend to grow, and in precisely the same proportion small ones tend to disappear.

It may be further observed that this tendency is materi- ally aided by an absurdly bad and expensive conveyancing system, and by the law

of mortgage. The costs of transfer

26d

Of tenant farmers there are in Great Britain 561,000, in Ireland 600,000. About 400,000 of those in Great Britain, but above 500,000 of those in Ireland, occupy less than 15 acres of cultivated soil, the average size of the remaining holdings being in Great Britain about 160 acres, in Ireland 75 acres.

In the countries which have been colonized from England British the system of small properties rather than large has been colonies.

generally adopted. The first settlers in New England carried with them the idea of the village community. They decreed that grants of land should be made to each house- holder to the extent of 20 acres, but the rest of the land apportioned to each village was to be held in common.

This system has been now expanded into the homestead United law (see HomeEsTEAD), prevailing over the whole United States.

States, in virtue of which a citizen of the States is entitled to a free grant of 160 acres (4 square mile) on condition of bringing it into cultivation within five years. The influ- ence of slavery in the Southern States tended, as in Rome, to create large estates, but its abolition has arrested this course. On the whole, with exception of a very few gigantic farms in the extreme west, it may be said that both the United States and Canada are countries of small farms, seldom exceeding 150 to 300 acres, and almost universally cultivated by the owner. The pastoral lands of Australia and New Zealand are still held in “runs” of immense extent, but whenever cultivation makes way there is a growing movement in the direction of opening them up to purchase in small farms,

of land are so enormous in England that they form a very large percentage on the price of small properties, and pre- clude any one from purchasing them with the motive of making a living uponthem.

Soalso the insecurity of title, which is greatest. on the smaller properties, because they

The above sketch, imperfect as the limits of space have Leading | compelled it to be, of the history of land tenure throughout prin- the world shows that it has pursued one unvarying course. “Pes 0 ° : : ° affecting Commencing in community of tribal possession, land has j3nq everywhere by degrees been appropriated to the villagers, tenure.

have been dealt with less carefully, compels any owner who needs an advance to pay usurious interest, by which his ruin is speedily effected, and the property brought to sale. On the other hand a large property changes hands at less comparative expense, and the necessity of a sale to meet temporary difficulties is at less cost obviated by mortgage, which permits the owner to hold on till some windfall of legacy or marriage once more reinstates him in easy circumstances, and enables him to take advantage of his poorer neighbour’s necessities. This does not mean that he cheats the small proprietor in the bargain. On the contrary, the desire of the rich to augment their estates induces them to give more than the real worth for the smaller properties. But this concurrence of circumstances tends steadily in the direction of increasing large estates and diminishing from age to age those that are small. The practical result is easily shown by a few figures. The cultivated land of the United Kingdom (including parks and permanent pastures, but not mountain or waste) amounted in 1880 to 47,515,747 acres. The total acreage is 77,635,301 acres. By the Domesday Book of 1875 it appeared that one-fourth of the total acreage (excluding plots under 1 acre) is held by 1200 owners, at an average for each of 16,200 acres; another fourth by 6200 persons, at an average of 3150 acres; another fourth is held by 50,770 persons, averaging 380 acres each ; and the remain- ing fourth by 261,830 persons, averaging 70 acres each (Caird). Peers, in number about six hundred, hold rather more than one-fifth of all the land in the kingdom. Thus one-half of the whole territory is in the hands of only 7400 individuals; the other half is divided among 312,500 individuals. The total population of the United Kingdom (not including Channel Islands and Isle of Man) in

1881 was 35,100,000, so that barely one in a hundred owns more than an acre of soil.

to the family, and at last to the individual. But in every stage the conditions of its enjoyment and use have been absolutely regulated by the community in reference to the general welfare. A history so uniform would seem to rest on principles of human nature, and to be incapable of reversal. Nevertheless in the present age two opposite parties have impugned its lessons. The one would revert to the almost prehistoric times when community of pro- perty, of labour, and of wealth formed the rule of existence. The other speaks of individual property, especially in land, as a sacred and indefeasible principle, and denounces every restraint or modification introduced by the state as spolia- tion. Between these extremes an infinite variety of ideas for more or less making land or its produce public property, or more or less restricting the right of the personal owner, have been put forward, and are, with some confusion, strenuously advocated. A brief attempt will now be made to discriminate between what in these ideas is sound and what is impracticable.

The principles of communism have unquestionably struck Com-

deep root in the minds of large classes of the public, chiefly munistic . principle.

in Germany, but to no inconsiderable extent in othe countries andeven in England. Nor can they be dismissed as merely criminal and worthy of no answer but repression. The answer must rather be that they are based on hopes and beliefs in the capability of human nature for self-sacrifice, which we have no warrant in yet accepting as our practical guide. A golden age may yet return, in which all shall be for the country and no one for himself, and we may even imagine that each successive age shows its nearer approach. But at least it has as yet not come. In every community there are found a large number of individuals who would not work honestly except under the compulsion of self-interest or of close superintendence. No socialistic scheme has yet been devised which copes with this tendency. XIV. — 34

In all of them a vast hierarchy of official inspectorship | where in some cases labour may, owing to climate or a would be demanded, which, even if adequate, would eat | lower standard of living, be cheaper. Such a rivalry is

up the profits. In all of them red-tapeism of regulation | already visible in America, in India, and in Russia. If would forbid the progress derived from freedom to | through these causes the manufactures should decay, and experiment. For the case of the culture of land, an art | the artisans be driven to emigrate, certainly the depopulated involving such variety of method applied to such variety of | fields of Great Britain would be unable to maintain her in circumstance, it seems, as yet, impossible to conceive | her present rank among nations.

arrangements by which joint possession could result in An entirely opposite school has, however, stated re! of beneficial production. We know it even among families to | principle, which, though not applied by it to the question icing be at present a hindrance and source of loss. Nor has any | of the tenure of land, would if true be hostile to the appli- secu! definite scheme been yet proposed by socialists to show | cation of further capital to the soil. Political economists tion.

how it could be worked by the state. Till its advocates at least do this, and permit us to judge as men of business of the practical effect of their system in a given area and with given machinery, it were waste of time to discuss their aspirations and their imaginary results. Doctrine Those who, at the opposite pole, refuse to admit the of supre- right of the state to impose such conditions on private

stivte. Property as it deems for the general benefit may be Talia, dismissed even more briefly. Not only do they show

entire ignorance of the history of land tenure at all times, but they belie the daily action of British legis- lation. Parliament seldom lets a session pass without making laws which assert the right of the state to take possession of property for public or private benefit, to tax it, and

to restrain or regulate the rights of its owners over it. Nor is there any theory of the basis of property which does not tacitly admit that it is subject to the authority of the community. If derived from occupation, it owes its title to the agreement of the community to support that title. If derived from labour, it is valid only for the life of the labourer, and whoever succeeds to him must take it, not as a gift from a dead man whose rights end with the grave, but as a gift from the state, which deems that there is advantage in encouraging labour by the certainty of transmitting its produce. In every view it must be admitted that the state, by whose regulations and force property is maintained, must have an unqualified right to prescribe the conditions under which it will confer its gifts on private individuals.

The general object of supporting private property in land is to increase its produce, by inducing the owner, through motives of self-interest and affection for his family, to bestow on it the greatest amount of labour. It is agreed by all practical authorities that the soil of Great Britain might be rendered greatly more productive by the increased expenditure of capital, which when explained means in one shape or other the larger employment of labour, both in effecting permanent improvements and in conducting the arts of cultivation. The interest of the public in strengthen- ing the motives which may lead to such additional pro- duction is unquestionable. The soil is the support of the nation, furnishing to it primarily both its subsistence, its clothing, its fuel, and the raw materials of its trade with other countries. Some indeed argue that freedom of trade with other countries, permitting unrestricted import of all these articles, has rendered the profitable use of the soil at home comparatively unimportant. But this is inaccurate for several reasons. First, importation involves at all events the expense of all that labour which is devoted to the carrying trade. Secondly, it involves dependence on other nations for other articles than food, to an extent which may easily become fatal. If, for instance, agriculture in England were to employ less labour, because it was more profitable to import wheat for subsistence and cotton on which to employ labourers, there is not only the risk, sufficiently grave, that both may be stopped by war, but the ever present probability that manufacturing industry may be displaced by competition from

countries where its raw material can be obtained without the cost of carriage, and

(see, e.g., Mill, bk. i. chap. xii.) have asserted that every successive application of capital to cultivation must be less profitable than the first. This is called the “law of diminishing production from land,” and it has been said to be “the most important proposition in political economy.” But the fact is that it is true only if the qualification be added “in the existing state of knowledge.” That is to say, it is true that, if a given amount of labour applied in raising wheat, for example, will raise 16 bushels on an ordinary soil, twice the amount of labour will not, per se, raise 32 bushels on the same soil, or even 16 bushels on a very inferior soil. But chemistry and experiment tell us that if, instead of spending the second quantity of labour in merely ploughing twice instead of once, we spend it in purchasing and applying nitrogen, phosphoric acid, and potash in proper proportions to the soil, either directly as artificial manures, or still more cheaply as manure from animals whose food has contained these elements, we do get a return considerably more than double for the double amount of labour which the application involves. This is exemplified in the fact that rents rose about 20 per cent. in England when these appliances came into use, in spite of a stationary range of prices, showing that the additional capital thus devoted to agriculture gave a higher return than the capital that had been previously employed.

A further illustration may be found in the fact that the capital that has been expended by the Improvement Companies in England, under the supervision of the Inclosure Commissioners, has yielded on an average a return of 15 per cent. of increased rental on the expendi- ture, over and above the profit made by the tenant farmer (Caird). Since this average includes a few cases in which defective knowledge has led to loss, it is evident that, when capital is applied to agriculture with reasonable scientific knowledge and skill, it is capable of still yielding returns at a full average rate, even after payment of the salaries earned by the scientific and practical education which has directed its employment. Nor is there any reason to believe that the process has come, or nearly come, to an end, It certainly does not follow that soil is

capable of unlimited production ; for it is quite certain that its powers in this respect are sharply defined by the amount of light and heat which in any given situation the plants growing on it can receive. Butit is becoming daily more probable that up to that limit advancing science and _ practical skill will tend to equalize the cost of production, making the application of labour to inferior soils as profitable as to superior, and making capital as productive when approach- ing the limit of its useful application as when it is, in the form of rude labour, applied to soils newly brought under cultivation.

But, on the other hand, the doctrine that the land can Nation- be made more productive by the application of more capital, alization

and that the state has a strong interest in increasing pro- duction, is fatal to all that variety of proposals which have been made for what is called, in rather uncouth and exceed- ingly vague phrase, ‘nationalization of the land.” All of these start with the suggestion that the land of the country, being the property of the community, should be resumed

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by it for a new arrangement or distribution. In some schemes it is proposed that the state shall buy out the present owners, paying them the full value of the fee simple ; in others itis proposed that the state shall simply resume the land on the death of the present owners, with- out paying any compensation to their heirs. Conceding the abstract justice of both propositions, it admits of little doubt that they would not be for the public benefit. Under the first the state would make a very bad bargain. Land, on account of its attractions as a subject of private property, brings a market price nearly 30 per cent. above its actual value. It sells usually at a rate computed to yield a clear return of not more than 3 per cent. But in order to bring this return the owner is obliged to lay out, in maintenance of buildings, drains, roads, fences, and other incidents, sums which on an average are not much less than a third of the net produce. If then the state is to buy at the rate of 3 per cent. what actually yields only 2 per cent., it is clear that the public will be a loser on the transaction. On the other hand, if the state is to

take possession of land on the death of the present owners, either without compensation or with a compensation less than the market value, the result would be at once to stop all further improvement by the actual possessors. No one would spend money on that which was to pass, not to his own heirs, but to the public, and the land when it reverted to the state would be in a condition requiring enormous outlay to restore its exhausted fertility, and to remedy the general decay into which its appliances would have been suffered to fall. If again it be urged that the state might obviate this evil by offering compensation for the actual value of improvements which might be made, it can only be answered that private landlords and tenants have not yet found a method of satisfactorily ascertaining such value; that even when the principle is accepted tenants frequently prefer, when certain of not obtaining a renewal of their lease, to exhaust the land rather than trust to arbitration giving them an equivalent; and that this tendency would be enhanced when the state became the landlord and the valuers were appointed by it.

Supposing, however, the operation to be accomplished, and the state to have become the universal landowner, the next question is, What it is to do with the land? On this there is a still greater variety of suggestion. Some would have the land let by the state on lease merely, and would apply the rental to extinguish taxation. Others would have the state to sell in fee simple. But in both cases there arises the further question, To whom shall the advantage of a lease or a sale be given? Here there breaks out the dispute between the advocates of large and small estates and of large and small farms. Some would offer the priority of choice to the existing tenants ; but, as this would result in the creation of a large proportion of estates or farms extending to hundreds or even thousands of acres, its superiority over the present system can only be considered as partial. Others would break up the whole land of the country into peasant properties, and even go so far as to furnish each with a house. But, con- sidering that this scheme would further involve the abandonment of most of the existing farm houses and farm buildings, which would be quite useless to peasant proprietors, it would impose a heavy financial loss on the nation.

It must be further kept in view that there are only 47 millions of cultivable acres to be divided among 35 millions of persons, and that the acres are of every conceivable difference of value, dependent not merely on soil but on situation, climate, cropping, capability for improvement, and a thousand other circumstances. To divide these into plots of equal value would be a task of enormous expense,

and perhaps scarcely possible to be accomplished. But, if the plots are to be of larger size and unequal value, it must be again asked, How is the state to be guided in selecting the individuals to whom its special favours are to be given ? And if it be said that the state would exact a rent propor- tioned to the value, and thus confer no favour, there would then arise the further question whether the rent is to be fixed in perpetuity, which means a gift to the lessees of all capability of improvement in the land, or whether it is to be adjustable by valuation at intervals, which merely leaves the lessees in the same position as the present lessees are. In the latter case nothing would be gained except that some would be dispossessed in order that others might be put in possession.

It is, however, insisted that in any case the state would have the advantage of drawing the rental of the land, and it is argued that this would do no wrong to the lessees, because it would be only the rental derived from the original value of the soil, and would not affect their profits from the capital and labour they employ on it. This principle, if sound, might, however, be applied with equal force to every other species of material wealth. The state would be quite as fully entitled to acquire, by purchase or by annexation on death of the owner, factories and consols, as it is to acquire land for which it has suffered the former owner to pay a price. But there is a greater disadvantage in the state becoming the universal landlord. A farm is dependent not only on the soil but on the seasons and the markets, and its profits cannot be guaranteed. A rent for the use of the mere soil may be fair on an average of years, but occasionally there comes a series of years in which no rent at all can be paid without bankruptcy of the tenant.

Private landlords can and do meet these bad times by con- cession and agreement, but the state can only act by laws, and in justice to the community it must be hard to its debtors. It is in fact the system which has been tried to be carried out in India, with a considerable variety of method, but with uniformity of failure,—a failure to be attributed mainly to the fact that state taxation, necessarily inelastic, is disastrous when applied to income so fluctuating as that from land must be. In fact a tenant, paying full value for the unimproved land to the state, would be in precisely the position occupied at present by an owner who is mortgaged up to the ears; and, since the rent is to be in perpetuity also, he would be unable ever to redeem himself from the burden. An occupant so situated is the most unhappy of men, and the worst of cultivators, and that the state should hold the mortgage over him would only make his position the harder.

These considerations apply also to the recommendations The un-’ which have been made that the land tax should be increased earned

and that the “unearned increment in the value of land” ane

should be appropriated by the state. Including tithe and local rates, land is taxed at present to an average of about 30 per cent. on its net profits An additional tax on land would operate to prevent investment of capital on its improvement, since capital will not be invested where its returns are below the average. The “‘ unearned increment in value of land” is often strikingly apparent in and near towns; but it does not exist in the bulk of agricultural districts. Corn has not risen in price within the last hundred years, and, if meat has, so has the cost of raising and importing the food of cattle. The rise in the value of agricultural land generally is not on the whole more than a fair return for the capital that has been invested in improvements, and for the immense sums that have been lost in the experiments out of which the improvements have sprung. The cases in which it is more than this would be incapable of being discriminated, and would not be worth the trouble if it were possible. The idea would probably

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not have been started had it not been for the spectacle of the enormous fortunes accruing to those who have had the good luck to inherit or to purchase land useful for building purposes. If limited to such cases, the principle of the right of the community to resume the benefit arising from its own concentration in particular spots may be supported by different and very good reasons, due regard being had to the reimbursement to the private owner of all sums actually expended by him in purchase or building.

The right of the public to mineral wealth under the soil stands on as clear afooting. By the common law gold and silver mines belong to the crown, no mattcr who is the owner of the soil, The principle obviously applies equally to all minerals. They are a part of the country itself, not merely material from which profit can be extracted, and when they are gone they cannot be replaced. As the law forbids the selling of land to foreigners, it might with equal justice forbid the selling of coal for foreign exporta- tion. The discovery of valuable minerals is often due to mere accident, and they resemble treasure-trove, which by law belongs to the crown. Nor would difficulty arise in working mines by crown lessees or under crown superin- tendence. Where they already are worked it would be right to pay the estimated value to the private owner, since hitherto they have been deemed subject of private property, but all future increase or all new discoveries might justly be held to belong to the nation, without compensation to the owner of the surface who had no knowledge of their existence.

or half a horse. These very small machines are slightly more wasteful of coal for the power they give out; but on a small scale this is quite inappreciable, and is far more than balanced by the greater economy induced by their being driven by the owner himself. A very elementary resort to combination among small cultivators affords them in any case the same advantages as the large cultivator. Their energy and aptitude

are not less, and with the advance of education may bedirected with the same knowledge. Most persons connected with land know of many instances in which even at present the small cultivator is as advanced in his scientific practice as the larger. It is generally admitted that during the recent disastrous seasons the smaller farmers have been better able to meet their engagements than the larger. The reason is, not merely that their outlay is smaller in cost of labour, but that by close attention and the power of availing themselves of every opportunity they have suffered less actual loss than the farmer on a more extensive scale.

It is of course understood that, to enable a farmer of a small acreage to produce the same result asa larger holder, he must have the same advantages provided to him by investment of owner's capital. He needs the same buildings for farm purposes, the same drains and fences, in proportion to his extent of farm. But he does not need more ; and, as his own house is only an equivalent for the labourer's cottage, which must in any case be provided, there is the saving of the more expensive residence which a farmer cultivating several hundred acres thinks himself entitled to. Again, the tenant's capital invested must also be as

Regulae Approaching now the question how the state without

tion of actual resumption of the land may so regulate its possession | much in the one case as in the other. The small tenant

distribu- as to encourage the maximum production from it, we are in | ought to have as much and as good stock on the farm in

be of the beginning met with the dispute between the advocates | proportion to its extent as the large. But he saves much

' of large and small estates, the former cultivated by | capital in the item of wages, because, till profits come in,.

tenants, the latter by the owners. But we may first | his own labour costs him only his own food, and even the disembarrass this question

from one source of confusion. | rent of his house is postponed, so that it is probable that Large estates are never cultivated in a block. They are | he will be able to spend on the land a capital larger in invariably broken up into farms, sometimes indeed extend- | proportion than the extensive farmer at a greatly less ing to several thousand acres, but far more generally | actual outlay of money, Those who argue that the capital ranging between the limits of 500 and 50 acres. Below | invested by the larger tenants is greater than that invested 100 acres the tenant is usually himself the cultivator, with | by the small cultivator forget that capital in agriculture more or less assistance, and below 50 acres he will seldom | must be measured not solely by expenditure of money but require any assistance outside his own family. Now, as | in a great measure by expenditure of labour to which a there is no advantage accruing from one landlord holding | whole family may cheaply but effectively contribute. a number of such farms, we may state the question as The importance of encouraging investment of capital Joint regards cultivation as not being between large and small | forms perhaps the main argument in favour of the system interests estates, but as being between farms of which the tenant | of cultivation by the joint interests of landlord and tenant. of Jand- does the work and those in which he only superintends the | In this combination the landlord furnishes the land and so “ work of others. (in Scotland always, in England frequently) the buildings, “”””

Advan- Thus stated, the answer admits of no dispute. It has | &c. The tenant’s capital is therefore limited in its applica-

ae been already discussed in the article AcricuLTURE; but it | tion to operations of tillage and manuring. The landlord’s

farms, ‘22Y suffice to advert here to the conclusive argument | contribution is commonly estimated at five-sixths, the

derived from the superior efficacy and therefore cheapness and productiveness of the labour given by a man in working entirely for his own behoof, as compared with that which he pays others to do for him. It would scarcely be too much to say that capital in the form of personal labour will yield twice the return of capital employed in hired

labour. It applies not merely to the man but to his wife, sons, and daughters, and not only to the actual amount of work done, but to the zeal and care with which it is directed.

Against this advantage on the part of the small cultivator there is only to be set in favour of the large that he can better employ machinery. But, though he may be the first, he is not necessarily the only one to employ machinery, Reaping and mowing machines may be (and often are) employed on the smallest holdings; threshing machines are how made to be worked by hand or by one or two horses ; even steam-engines are made with power down to one horse

tenant's at one-sixth of the total capital employed, and while the landlord's yields less than 3 per cent. interest, the tenant's has, by Mr Caird, been estimated as bringing in 10 percent. perannum. 'This, however, on an average of years and of farmers is probably too high an estimate. The conclu- sion, however, is drawn that the system is beneficial to the farmer beeause the capital required for permanent invest- ment is advanced by the landlord at a low rate of interest, while the whole of the tenant's capital is invested at a high rate of interest. Butin this argument it seems to be for- gotten that the tenant's 10 per cent. includes not merely interest on capital subject to risk, but salary for time and skill, and is, therefore, not really 10 per cent. on capital. Now, undoubtedly, if any one desires to risk his whole capital in trade, he is entitled to at least 10 per cent. on it, and he makes, while prosperous, a large income. But if he prefers to invest five-sixths of it in a secure invest- ment, yielding only 3 per cent., and to risk only one-sixth,

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while at the same time giving his personal labour and skill, his income may be considerably sinaller, but it will be to the same extent the more secure. It is entirely a question for each person to solve for himself, and it would be no national loss if a certain number of farmers were to elect

necessary for full development of the capacity of the land and the adoption of tlie results of modern science.

The history of land tenure in Ireland illustrates these Mlustra- principles, and they in turn afford a standard by which to tionfrom judge recent legislation. Leaving out of view a certain Jveland.

to purchase farms of only one-sixth the extent of those which they occupy as tenants, and to cultivate them with their own labour. Or, if the present tenants should be reluctant to’exchange their higher incomes, subject to the greater risk, for smaller but more secure incomes, it cannot be said that there is any national gain in their occupying land which in the hands of small owners would yield crops as large and at no greater cost, though with a different distribution of profits.

What is true in the argument appears to be this. It would be a distinct loss to the nation if landlords were to withdraw their capital from the land before other persons are prepared to put as much in. At present tenants in general cannot put in more capital, because they have not got more. They could not, there- fore, buy their present farms. But they could buy farms of smaller extent, and on these raise crops fully as good. And if there were enough of other persons prepared to buy the remainder of the land, and to cultivate it themselves with equal skill, there would be equal advantage in their doing so. But, since skill in farming needs both education and practice, there are not enough of persons as yet possessed of these qualifications and also of the needful capital. Hence any sudden break in the present system of tenure by landlord and tenant would be hurtful to the country, leading to abstraction of capital, and worse culti-

number of estates on which the landlord supplied, in addition to the land, the capital represented by build- ings, drains, é&c., in the greater part of Ireland he sup- plied nothing. The tenant, under a general custom of: permanence of holding, in many cases did a great deal ; but, as the custom was not enforced by law, the occasional seizure of his improvements caused a sentiment of alarm and distrust which seriously limited them. The Act of 1870 aimed at giving him

additional security by not merely recognizing his right to compensation for his own outlay if he should be removed, but by imposing a fine on the landlord if he should evict a tenant. But, as it avoided to prohibit the landlord from raising the rent, the insecurity was just as great as before, while the introduction of a legal relation between the two parties led many landlords to restrict more than ever their expenditure on improve- ments. The Act of 1881, therefore, proceeded to the necessary consequence of fixing the rent, by mcans of a court of valuation, and of giving to the tenant a positive right to permanent occupancy, subject to a revaluation every fifteen years. But it is obvious that this scheme also, though valuable as an immediate palliative, fails to have the elements of a permanent settlement. The landlord will be less and less inclined to spend on improvements; and even if he desired to do so the tenant can, and in nearly every case will, prevent him, for the plain reason that he

Owners vation and less produce. But a gradual process of change, | will not desire the landlord's share in the joint property to should permitting all persons who had capital (however small) and | be increased. Yet the tenant will on his part be impeded be culti- ; c . : :

vators, 2Ptitude, to become owners and cultivators, would be a | from full confidence in making improvements, even when

national benefit, since it would not diminish the capital employed, but would render it on the contrary more pro- ductive through the stimulus of being applied wholly for the benefit of the cultivator himself.

There is no doubt that the system of division of capital and rights between landlord and tenant is intrinsically bad, Neither is full owner, nor can do even with his own share exactly what is best for himself and the public. The landlord is generally short of means with which to make permanent improvements; in any case he can make none without the tenant's sanction, and of course he makes none unless the tenant agrees to pay him at least 3 but more often 5 per cent. The tenant, on the other hand, having only a temporary interest, spends nothing except when he sees a certainty of being repaid before the end of his term. Land, however, yields only slow returns, and much is thus left

undone because the full profit cannot be reaped till after a lapse of years, The system of leases, universal in Scotland, palliates but does not remedy the mischief. It is recognized that the tenancy, usually of nineteen years, is in practice divided into three equal portions. The first is spent in restoring the exhaustion of the soil by the preced- ing tenant, the second gives a full profit, the third is (if no renewal of lease be expected) devoted to the gradual with- drawal of capital, with corresponding reduction of fertility. Compensation for unexhausted outlay is an excellent prin- ciple; but it has not yet been found so trustworthy in application as to afford sufficient security to induce the continuous application of capital till the end of the lease. It is very doubtful whether any form of legislative inter- ference, passing beyond a mere enactment of cquitable presumptions in absence of express contract, would improve the relation between the two parties, because such enact- ments when not agreeable to both parties can always be indirectly broken through. It is only cultivation by the actual owners that gives at once the freedom and security

he has the means, lest at the next valuation his own outlay may be valued against him. The interests are no longer joint but conflicting. Thus far the remedial legislation has only succeeded in reaching the stage in which Prussia stood before the reforms of Stein and Hardenberg were proposed, when nobles and serfs had both certain legal rights, which neither could attack, but which neither could convert into independent property. But the Prussian method of reform by apportioning the land to each party in absolute property, but in fractions representing their respective intercsts, could not be applied in Ireland, both because the holdings are in general too small to bear partition, and because the landlords have not, as in Prussia, been in the habit. of cultivating their own domain, and they would, therefore, again introduce the vicious system of letting to tenants even that part which might be assigned to them in unencumbered fee. The state will, therefore, have to become the intermediary of transfer, but the better course would probably have been that it should at the first have assumed this function on the over-rented and ill-managed estates, leaving those which were fairly rented and liberally managed unaffected by legislation which they did not need.

The legal basis of the recent land legislation in Ireland is, however, as it was in Prussia, the recognition that pre- scriptive possession, even under a title of mere tenancy, confers a right to continuance of such possession. The same principle formed the basis of the conversion of copy- holds in Englend from being tenancies at will into ten- ancies in perpetuity. It might justly be applied still in cases in Great Britain in which tenancies have continued without change for a long period. Especially it might be applied to check the system of " clearances" in the High- lands, where the right of the crofters to continue in pos- session rests on the original community of possession by the tribe, and is fortificd by an almost immemorial con- tinuance of possession by each family.

Mort- gages objec- tionable.

Life in- terests objec- tionable.

Devotion

of land to pur- poses of luxury.

In any view of ownership, however, whether on a large or small scale, it is obviously of prime importance that the owner should be possessed of cash sufficient to make the improvements required. This is a situation in which an owner who is already in debt cannot possibly be. To hold land subject to a mortgage is, therefore, to hold it under conditions disadvantageous to the owner, the tenant, and the nation. The evil is intensified by the fact that an owner so burdened possesses an apparent estate far in excess of his real means, and occupies a social station involving an expenditure that exhausts his resources in every way. It would be greatly for his pecuuiary advantage if the law were such as would compel him to sell sufficient land to pay off his debts, for he would thus relieve himself of interest at the rate of 4 to 5 per cent. by selling property which gives only 2 or 2} per cent. on the price that would be obtained. His net income would then not only be greater, but as his apparent estate would be smaller he would not be tempted to

live in so expensive a style, and he would thus have the means of gaining larger returns from his property by improving it. It has, therefore, been proposed to abolish mortgages by prohibiting land from being made security for special debts. It would then fourm part of the general assets of the owner, liable equally for all his debts ; and any one who desired to raise money would practically be obliged to do it by sale instead of by pledge. Land would be confined to its proper purpose as a means of production, instead of being injured for that purpose by being used as a means of credit.

The same principle forbids that life interests in land should be permitted. The mere tenant for life or holder under settlement or entail has actually in frequent instances a motive against cultivating his estate to the best advantage. If he is not on good terms with the next in succession, or if, as so often happens, the next successor is a distant relative, while the present tenant has only daughters, his motive, and often indeed his duty, must be to impoverisl the estate in order to save money for those whom he loves best. Ina less degree, if he has a large family, he must save money out of the rents of the estate to provide for his younger children, and he is correspond- ingly disinclined to lay out money on improvements which inust accrue only to the benefit of his eldest son.

All these considerations are equally applicable to small as to large estates in land. It is as injurious to the peasant cultivator as to the extensive landowner to be hampered by a burden of debt, or to be deprived of the power of directing who shall be his successor. In France, in Germany, in Switzerland, in America, and in India, indebtedness is the great curse of the small farmer. The money-lender is a far harder master than the landlord, for he has less mercy and less interest in being merciful.

It has been assumed throughout these observations that land is to be applied to its natural use, the production of the materials of food and clothing. In the hands of rich persons it is, however, sometimes devoted to purposes of luxury and enjoyment, such as the formation of large parks, game preserves, and deer forests. Within moderate limits

such purposes may be defended on the pleathat man does not live by bread alone but by all the enjoyments which he is framed for appreciating, and which in modera- tion contribute to mental health. But they are most defensible when open to the most general enjoyment, and it is peculiarly to the credit of many of the English nobility that they open their parks to the resort of the neighbouring villagers and townspeople, often at some inconvenience to the owners themselves. On the other hand, the conversion of large tracts of ground to the object of preserving game, which implies at the same time exclusion of the public, and diminution of production of food, for the sole recreation

of one or two individuals, is a use of national resources which has, since the formation of the New Forest by William the Conqueror, been generally reprobated. The latest phase of its development has been in the conversion of immense areas of the Highlands of Scotland into grouse shootings and deer forests, a process which involves the removal of the small tenantry, and even, in the case of deer forests, the ceasing to graze cattle and sheep. The landowners find that the game rents are much more profit- able to them than the farming rents, but it is at the cost of the nation, which suffers a diminution in the employment of labour and in the production of food, and which con- sequently must see its inhabitants emigrate and pay for imported grain, wool, and meat grown by foreign labour. The ultimate remedy of this abuse will probably be found in measures tending to break up large estates into small ones, for the system requires the reservation of extensive areas free from the presence of man, and the interposition of small cultivated holdings would effectually destroy it.

It may, however, be well to notice here an argument which has been sometimes pushed to excess. It has been urged that even grazing should be prohibited on the ground that from the same area a much larger production of food can be obtained in the shape of corn than of meat. The difference is indeed very striking. An acre of good land will yield 40 bushels of wheat, weighing 2500 ib, while in grass it would

yield only 250 tb of meat, and it is still more striking if we deduct the water from each, when we have 2200 fb of dry grain against 188 tb of dry flesh and fat. But man being semi-carnivorous must have a proportion of flesh, and the value he assigns to meat as compared with corn shows very correctly its relative importance in the human economy. ‘The fact is that the test of market prices, which are now regulated by the production and demand of the whole world, assigns to dry meat and fat a value just about twelve times as great as that of corn, and consequently an acre of grass land gives a profit quite equal to that of an acre of wheat. Nor could the equality be impaired even if we were all to become vegetarians. For the most ardent disciples of that faith admit the necessity of using milk, and about 2 pints of milk is a necessary addition to a daily allowance of 2 ib of grain for health and the performance of work. But to furnish this quantity of milk throughout the year nearly an acre of ordinary land would be required, or as much as would give about half a pound of meat per day, so that there are no means by which we can dispense with the use of a considerable extent of land for the feeding of animals, by which its produce is converted into the proximate products demanded by the human constitution; and the amount to be so used is best determined by the deinand of the public.

The conclusion to be drawn from the review of the whole questions relating to tenure of land is that they are best solved by freedom of action of individual owners, guided by self-interest and family affection, and only restrained by law when the special circumstances of a high civiliza- tion introduce abnormal conditions. Since these motives operate most fully and healthily when land is held in small estates, it only remains to glance at the methods which in different countries and by different authorities have been suggested to encourage subdivision.

The most general method is that of equal division of the inheritance among children. It is compulsory in the Channel Islands, in France, and several other European countries, and it forms the rule of intestacy under the law of gavelkind in Kent, in most of the British colonies, and in the United States. To its existence in the latter form no reasonable

objection can be taken. ‘To its compulsory enforcement there applies, though in a modified degree, the same objections that apply to a compulsory rule of

Grazing.

Methods of sub- division.

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primogeniture, with the additional objection that it tends to limit the growth of population. Parents who are com- pelled to give an equal portion to every child avoid the risk of subdivision by not having many children, a course which, if commendable when the Old World seemed in peril of over-population, is a source of national impoverishment when the world affords profitable employment for hundreds of millions more than exist. Among the children them- selves the certainty of succession abates the sentiment of filial duty, and the desire to bestow a special bounty on one child who is favoured above the rest may sometimes induce the parents to spend less than they otherwise would in the improvement of the whole estate.

Subdivision of property may, however, be gradually effected by prohibiting excessive bequests. It has always been recognized that the state has an unquestionable right to deal with property at the moment of its transmission from the dead to the living, and no objection could be made to a rule that no one should leave by will or through intestacy more than a certain sum, or land of equivalent value, to one individual. This would not generally affect the desire during life to amass and improve property, because the improved value would still be available for division among all whom the owner wished to benefit. But it would in one generation reduce all estates of abnormal size to properties of such dimension as in the opinion of parliament would be most serviceable for cultivation, and consequently most conducive to national benefit.

The abolition of the right to raise money by mortgage of land would also teud to promote its subdivision, since an owner in debt would be

obliged to sell a portion of his estate in order to pay his debts. The improvement of conveyancing, which would follow from the general aboli- tion of all interests in land except that of simple and absolute ownership, would also facilitate the sale of land. The leading principle which should guide legislation is in short that land should be made capable of the easiest trans- mission from one owner to another, and of the fullest use by him to whom for the time it belongs. The ordinary motives of human nature will then concur in transferring it from those who are least to those who are most capable of making it productive, and of inducing each successive owner to bestow on it the labour and outlay by which the maximum of beneficial production will be secured.

See Mommsen, History of Rome; Von Maurer, Geschichte der Markenverfassung in Deutschland ; Id., Geschichte der Dorfverfas- sung; Id., Geschichte der Stédteverfassung; Id., Gesehichte der Frohnhife, der Bauerhife, und der Hofverfassung; Nasse, Ueber die Mittelalterliche Feldgemcinschaft in England ; Landau, Die Territorien in Bezug auf thre Bilding; Von Haxthausen, Ueber die Agrarverfassung in Nordeutschland ; Laveleye, Primitive Pro- perty; Maine, Village Communities in the Kast and West; Cobden Club, Systems of Land Tenure ; Reports of H.M. Representatives on Tenure of Land, Parl. Papers, 1860—1 ; Statistique de la Franee; Marx, Das Capital ; Herbert Spencer, Social Statics ; George, Pro- gress and Poverty; Brodrick, Land in England; Boyd Kinnear, Principles of Property in Land.

LANDAU, the chief town of an official district in the Palatinate of the Rhine, Bavaria, is situated on the Queich, about 18 miles north-west of Carlsruhe. Among its various interesting buildings are the Gothic church, dating from 1235, and the monastery, founded in 1276, and now con- verted into a brewery. ‘There is a considerable trade, and some manufacture. The population in 1875 was 7579.

Landau was taken no less than seven times in the Thirty Years’ War. At the peace of Westphalia it was ceded to the French, and was generally held by France till 1815, when it was restored

to Germany ; in 1816 it was annexed to Bavaria, In 1871 its forti- fications were finally destroyed.

LANDEN, Jouy, a distinguished mathematician of the 18th century, was born at Peakirk near Peterborough in Northamptonshire in 1719, and died 15th January 1790 at Milton in the same county. Most of his time was spent

in the pursuits of active life, but he early showed a strong talent for mathematical study, which he eagerly cultivated in his leisure hours. In 1762 he was appointed agent to the Earl Fitzwilliam, and held that office to within two years of his death. He lived a very retired life, and saw little or nothing of society ; when he did mingle in it, his dogmatism and pugnacity caused him to be generally shunned. He was first known as a mathematician by his essays in the Ladies' Diary for 1744. In 1766 he was elected a Fellow of the Royal Society. He was well acquainted and aw courant with the works of the mathe- maticians of his own time, and has been called the English D'Alembert. In his Discourse on the '"' Residual Analysis," in which he proposes to substitute for the method of fluxions a purely algebraical method, he says, '"'It is by means of the following theorem, viz.,

2" —y"

ao 8

™m _

1 ; »\2 =" x1424(2) . . . (m terms) % x

m

m as =14(2)° +(4) oe (n terms) 2 a

(where m and n are integers), that we are able to perform all the principal operations in our said analysis ; and I ain not a little surprised

that a theorem so obvious, and of such vast use, should so long escape the notice of algebraists." The idea is of course a perfectly legitimate one, and may be compared with that of Lagrange's Calcul des Fonctions. His memoir (1775) on the rotatory motion of a body contains (as the author was aware) conclusions at variance with those arrived at by D'Alembert and Euler in their researches on the same subject. He reproduces and further develops and defends his own views in his Mathematical Memoirs, and in his paper in the Philosophical Transactions for 1785. But Landen's capital discovery is that of the theorem known by his name (obtained in its complete form in the memoir of 1775, and reproduced in the first volume of the Mathematical Memoirs) for the expression of the arc of an hyperbola in terms of two elliptic arcs. To find this, he integrates a differential equation derived from the equation

2 2

N° — 2

coe rf 2 2? m* — gx

interpreting geometrically in an ingenious and elegant manner three integrals which present themselves. Ifin the foregoing equation we write m=1, g=*, and instead of ¢ consider the new variable y=¢+(1—Z'), then

1 — ka?'

which is the form known as Landen's transformation in the theory of elliptic functions ; but his investigation does not lead him to obtain the equivalent of the resulting differential equation

y=(1+k')e

ee ee a V1 = y2.1-a2y? VST — 2.1 ka?' 1+k'

due it would appear to Legendre, and which (over and above Landen's own beautiful result) gives importance to the theorem as leading

directly to the quadric transforma- tion of an elliptic integral in regard to the modulus.

The list of his writings is as follows :—Ladics' Diary, various com- munications, 1744-1760 ; papers in the Phil. Trans., 1754, 1760, 1768, 1771, 1775, 1777, 1785 ; Mathematical Lucubrations, 1755 ; A Discourse conecrning the Residual Analysis, 1758 ; The Residual Analysis, book i., 1764 ; Animadversions on Dr Stewart's Method of computing the Sun's Distance from the Earth, 1771 ; Mathematical Memoirs, 1780, 1789.

LANDER, Ricwarp (1804-1834) and Joun (1807- 1839), two brothers, African explorers, were natives of Cornwall. Richard Lander accompanied the Niger expedi- tion of 1825-27 as Clapperton's attendant, and on the death of his master at Sokoto on the Niger in Apmil 1827,

returned to England, and published an account of the expedition in 1830. He exhibited such capacity for the work of African exploration that the British Government decided to send him out to determine the course of the lower Niger, which was then unknown. In the expedition he was accompanied by his brother John, who was better educated then Richard, and who went as an unsalaried volunteer. Leaving England in January 1830, the brothers landed at Badagry on the Guinea coast on March 22. They then travelled north-east to Boosa on the Niger, and after a trip north as far as Yaoorie they proceeded down the river in canoes. At Kirree they were taken prisoners by the natives, and after some delay were con- veyed down the river and managed to escape in a brig, the river journey lasting about five months, The Landers were thus able to lay down with approximate correctness the lower course of the Niger, and to prove that it discharged by a delta into the Gulf of Guinea. They lost many of their records at Kirree, but published a detailed narrative of their exploration in three volumes, in 1832 (Journal of an Expedition to explore the Course and Termination of the Niger, by John and Richard Lander). In 1832 Richard went out again at the head of a well-equipped expedition, organized by Liverpool merchants for the purpose of open- ing up trade in the Niger, and founding a commercial settlement at the junction of the Binué with the main river. After making several successful journeys, he was again on his way up the river in January 1834, when on the 20th the party were attacked by natives, and Lander was wounded. He died of his wounds at Fernando Po on February 6. John Lander died November 16, 1839.

LANDES, a department in the south-west of France, formed of portions of the ancient provinces of Guyenne, Béarn, and Gascony, lies between 43° 30’ and 44° 32’ N. lat., and 0° 8’ E. and 1° 30’ W. long., and is bounded on the N. by Gironde ; on the E. by Lot-et-Garonne and Gers ; on the §. by the Basses Pyrénées ; and on the W. (for 68 niles) by the Bay of Biscay. Its greatest length, from the mouth of the Adour in the south-west to Arx on the border of Lot-et-Garonne in the north-east is 89 miles ; its greatest breadth from east to west is about 62 miles, and the area 3599 square miles. The department takes its

namefrom the landes, sandy plains formerly covered by the sea, which occupy its greatest portion, and extend into the depart- ments of Gironde and Lot-et-Garonne. South of the Adour, the chief river of the department, the country changes in character, and is called La Chalosse,—a hilly region, which the various rivers coming down from the Pyrenees intersect like the rays of a fan. The Gabas, Luy, and Gave de Pau are the principal tributaries of the Adour on the left. On the right it is joined by the Midouze, formed by the junction of the Douze and the Midou. North of the Adour the plain of Landes slopes gently to the north-west, and empties its waters partly by the Leyre which flows into the Arcachon basin, partly by brooks which run into the lakes at the foot of the dunes which fringe the coast. The soil of this plain is naturally sterile. It is composed of a mixture of sand, clay, and organic debris, and rests on a subsoil of tufa (alos) which is impermeable to water; for three-quarters of the year, consequently, the waters, settling on the almost level surface and unable to filter through, transform the country into marshes and morasses, while in summer the heat of the sun, drying up the marshes, produces malarious fevers, But during the last twenty-five years much labour has been expended in draining operations. More than 1350 miles of ditches have been dug, and of the 1,112,000 acres which were uncultivated in 1850 two-thirds have now been re- claimed, or planted with forest trees. The coast, for a breadth of about 4 miles, is bordered by a succession of

dunes or sand hills, in several ranges parallel to the shore, and from 150 to 300 feet in height. Driven by the west wind, which is most frequent in these parts, the dunes were slowly advancing year by year towards the east, bury- ing the cultivated lands and even the houses. Bremontier, towards the end of the last century, devised the plan of arresting this scourge by planting the dunes with mari- time pines. At the present time upwards of 98,000 acres have been thus treated, and the forests already supply some fine timber to the navy. In the south-west, cork trees take the place of the pines. On the eastern side of the dunes is a series of lakes (Cazau or Sanguinet, Biscarosse, Aureilhan, St Julien, Léon, and Soustons), which have been separated from the

sea by the heaping up ofthe sand. The salt water has escaped by defiltration, and they now are quite fresh. The climate of Landes is the Girondine, which prevails from the Loire to the Pyrenées. Snow is almost unknown, even in winter; the spring is rainy, the summer warm and stormy. ‘The prevailing wind is the south-west, and the mean temperature of the year is 53°°6 Fahr., the thermometer hardly ever rising above 82° or falling below 14° Fahr. The annual rainfall in the south of the department in the neighbourhood of the sea reaches 55 inches, but diminishes by more than half as we proceed to the north-east. Most of the department is still in the condition of landes, traversed by flocks of sheep, which are kept by shepherds perched upon stilts. These landes are gradually giving place to forests, and in extent of forest land this department occupies the first place in France. In the Chalosse, the richest portion of the department, the vine, maize, wheat, millet, tobacco, vegetables, hemp, and flax are cultivated ; yet, small though the population is, the department does not produce corn enough for its own consumption. ‘The exploitation of the forests forms the chief industry. The resin obtained from the maritime pine furnishes by distillation essence of turpentine, and from the residue we have various qualities of resin, which serve to make varnish, tapers, sealing-wax, and lubricants. Tar, and an excellent charcoal for smelting purposes, are also obtained from the pine-wood. From the numerous iron furnaces in the department there was, in 1878, an output of 17,000 tons smelted with charcoal, and 8139 tons during the first six months of 1881. The cultivation of the cork tree is also very important ; its produce is much sought after both by French and by foreign manufacturers. There are also a number of brick and tile works, and potteries. The department has several mineral springs, the most important being those of Dax, which were frequented even in the time of the Romans. The population of Landes in 1876 was 303,508, or 84 inhabitants to the square mile. In 1801 the population was only 224,272. The department includes three arrondissements (Mont-de-Marsan, Dax, and St Sever), 28 cantons, and 333 communes. Mont-de-Marsan is the capital of the department. It is noticeable that in its long extent of coast it has no considerable port. Opposite Cape Breton, however, where the Adour formerly entered the sea, there is, close to land, a deep channel where there is safe anchorage. It was from this

once important harbour of Cape Breton that the discoverers of the Canadian island of that name set out.

LANDLORD AND TENANT. It has been explained in the article Lanp that in the United Kingdom no such thing as the absolute private ownership of land is recognized. The absolute and ultimate owner of all lands is the crown, and the highest interest that a subject can hold therein is atenancy. The largest estate known to the law, that in fee simple, is after all only a holding in which the owner of the fee stands to the lord in the relation of a tenant. All estates in land would therefore fall under this heading, but on the present occasion, as in common parlance, it is

LANDLORD

restricted to those holdings which amount to the hiring of land. ‘That tenure has nowhere the same importance as in the British Isles,! where practically the whole agricul- tural land of the community is cultivated by persons who merely hire it for a limited time from the owners. The social and political bearing of this fact does not fall within the scope of the present article, but it shows the important application of the rules of law which we proceed to state.

Dismissing ‘the tenant character of the landlord, and regarding him as owner pure and simple, we have to deal with him as contracting to give up the occupation of his land to another person, the tenant, fora consideration. In Roman law, the tenure of emphyteusis (a kind of perpetual lease originally used by corporations but afterwards by private owners), and precarium (or tenancy-at-will) occu- pied to some extent the place of the law of landlord and tenant in our system. The proper contract of letting and hiring (locatio-conductio) as applied to land had the follow- ing incidents. The conductor (tenant) was not technically regarded as possessor; ze. he had not the aid of the interdicts in case of eviction either by the landlord or by strangers. The locator alone could sue in respect of the land, but the conductor had a personal action against the locator on the contract. The landlord was bound to make delivery to the tenant and permit him to occupy for the term agreed upon, and to keep the premises in proper repair. The

landlord was answerable for any injury arising to the tenant from the defective condition of the premises. Finally, “the landlord must permit the tenant to carry away not only movables but even fixtures placed by the tenant, provided the tenant did not injure the house. A tenant of land was entitled to compensation for unexhausted improvements except such as he had specially agreed to execute in consideration of a lower rent” (see Hunter’s Introduction to Roman Law, p. 121). On the other hand, the conductor had to pay the rent subject to deductions for the total or partial loss of the crops, to exercise due care during his term, and give up possession at its expiration.

In English law the following terms are of fundamental importance. The landlord so contracting is said to demise his lands, and the instrument by which the contract is expressed would be a demise or lease, The word lease is very generally limited to the writing in which the agreement to let is expressed, but any contract of letting is as on the side of the landlord a demise, and as between the parties a lease. A lease or demise means a grant of the exclusive possession of the thing in question for a definite time; permission merely to use the thing for a particular purpose or on a particular occasion is a licence and not a lease. A lease further implies that the lessor intends to give up possession to the defendant for a deter- minate time, no matter haw it may be expressed, and is so distinguishable from a mere agreement contemplating that the parties shall an some future occasion enter into the relations which.a lease creates. The consideration promised by the tenant or lessee is termed the vent. Tho period of occupation prescribed is the term.

The Statute of Frauds (29 Car. II. ¢, 3) enacts that “all

1 In the United States the law is substantially the same as in Eng: land. The remedy by distress is said to be ‘* becoming unpopular in the United States, as giving an undue advantage to landlords over other creditors. In New England the law of attachment on mesne proccss has superseded the law of distress. In New York, North Carolina, Georgia, Ohio, Alabama, Tennessee, Mississippi, and Louisiana, it is modified or abolished (see Bouvier’s Law Dictionary, art. ‘‘ Distress’). On the

other land, a speedier remedy than ejectment has been pro- vided for landlords, by which they may be ‘‘ reinstated, upon notice of a day or two, in cases where a tenant abandons the premises before the end of the term without surrendering the lease, leaving rent in arrear, continues to hold over after the expiration of his term, or has become unable or unwilling to pay for the use of the premises ” (Bouvier, art. ‘‘ Landlord and Tenant”),

leases, estates, interests of freehold, or terms of years, not put in writing by the parties so making or creating the same or their agents thereunto lawfully authorized by writing, shall have the effect of leases or estates at will,”—~ except leases for a term not exceeding three years, whereon the reserved rent amounts to two-thirds of the improved value. When rent is accepted by the landlord, the tenancy-at-will is enlarged into a tenancy from year to year. By a later Act, 8 & 9 Vict. c. 106, a lease required by law to be in writing must now be made by deed.

A lease, like other written contracts, should clearly indicate the parties to and the effect of the contract. A date is not necessary, and, in the absence of a date, it will take effect from the day of delivery. But it must contain the names or other sufficient description of the parties, a description of the premises to be demised, words appropri- ately expressing the fact of a present demise (demise or lease being the usual words), the date at which the term is to begin and end, and the rent. The rent or other services created in favour of the landlord by the lease are said to be reserved, And when things that would otherwise belong to the tenant under the lease, as woods, timber, trees, minerals, &c., are expressly withheld, they are said to be excepted. But these expressions do not apply to conditions giving to the landlord the right of shooting, fishing, and so on over the land, or any right of way or other easement thereon. That can be vested in the landlord only by a re-grant from the tenant, no matter by what expression the right is created. Such grant must be by deed; and, where a lease of the land would be effectual without a deed, a reservation of such rights as we

have mentioned would not. There is a good deal of misconception on this point, for landlords are not generally understocd to hold their right to game on grant from their tenants.

In point of length of term tenancies are distinguishable as being either at sufferance, or at will, or from year to year, or for aterm of years. A tenancy by sufferance exists where a person having obtained possession on a lawful title holds over after the title has determined, e.g., a tenant on lease for a term of years after the expiration of the lease. It has been said that this is not an estate at all but a fiction to prevent the continued possession being regarded as a trespass. It is not created by contract, but arises by implication of law ; it is not assignable; and possession of the land can be resumed without previous demand to the so-called tenant. A tenancy-at-will exists when the tenant holds by agreement with thé landlord, determinable at the will of either. Any signification of a desire to terminate the tenancy, whether expressed as “notice” or not, will bring it to an end. A tenancy from year to year is a tenancy for one year certain, and is determinable only by a six months’ notice to quit, such notice terminating on an anniversary of the date of the beginning of the tenancy. A tenancy from year to year must last at least one year, but may be determined then, if a six months’ notice have been given ; if not so determined it must endure for another year, again determinable in like manner, and it will so endure until terminated by such a notice, Apart from express agreement, it will be implied in law when, for example, the landlord accepts rent yearly or by parts (e.g., quarters) of a year. Similarly monthly tenancies, chiefly of furnished houses or lodgings, would be implied from the fact of rent being paid once a month. But thatis a matter of presumption only. If it were proved that the parties agreed to a tenancy-at-will only, payment of rent by the quarter or any other period would not enlarge the nature of the tenancy. Lastly, a lease may be for a specified term, and the tenancy in that case comes to an end by the lapse of time, without notice to quit or any other formality.

These are the agreements by which the relations of

landlord and tenant, as the phrase is generally understood, are created, and they are the agreements under which most of the buildings and nearly the whole of the agricultural land are held by their occupiers. There are tenancies, however, in which the granter would not be spoken of as the landlord. Such is the position of the person to whom land is granted for his own life, or, it may be, for the life of another, called in technical language tenant for life and tenant pur autre vie. These are not cases of letting and hiring—to which the relation of landlord and tenant is confined—but are modes of holding property. The same may be said of the terms for long periods of years created for carrying out trusts in the settlement of estates. The tenant in such cases is the person who, when we come to the agreement of letting and hiring, stands in the place of the landlord. It may be observed that the law-books dis- tinguish in point of dignity between estates for life, the lowest kind of freehold estates, and estates for any term of years however long, which are only leasehold estates.

Reverting to the agreement of letting and hiring, it may be laid down that any person having an interest in land may, to the extent of that interest, create a valid tenancy, A tenant for years or even from year to year only may stand in his turn as landlord to another tenant. If he profess to create a tenancy for a period longer than that to which his own interest extends, he does not thereby give to his tenant an interest available against the reversioner or remainder man. The subtenant’s interest will expire with the interest of the person who created it. But as between the subtenant and his immediate lessor the tenancy will be good ; and, should the interest of that lessor become greater than it was when the subtenancy was created, the subtenant will have the benefit of it. In the same way, as between lessor and lessee—landlord and tenant—the latter has no right to look beyond the grant of the former so as to call in question his title. Be that title what it may, the tenant, by accepting that position, is estopped from denying that it is good. It may be notoriously bad, but that is nothing to him. The landlord is not obliged to prove his title as against the tenaut or any person claiming through his tenant. In an action of ejectment (for the recovery of land)

the person claiming possession must in general prove his own title—mere possession being a prima facie sufficient defence, until a better title be shown. But a landlord seeking to secure possession of land from his tenant is not obliged to prove anything, except his right to resume pos- session under the agreement. The tenant, however, may, without disputing the validity of the title under which he entered, show that it has since been determined by lapse of time or by operation of law.

A large portion of the land of the country being held under settlements whereby the person in possession for the time being had only the legal interest of a tenant for life, there were until recently great difficulties in the way of letting such land advantageously. The Leases and Sales of Settled Estates Act, 1856, now empowers any person eutitled to the rents and profits of a settled estate to demise the same by deed for any term not exceeding twenty-one years to take effect in possession and at the best rent obtainable. Settlements containing express directions to the contrary will, however, avoid the statute ; and on the other hand a settlement may contain powers to the tenant for life to grant leases for even longer terms.

The legal rights and duties of landlord and tenant respectively are in most cases defined by the contract of tenancy. The policy of the law has hitherto been to allow the landlord, who is virtually if not technically absolute owner of the laud, to do as he pleases with it. The contract of tenancy has hitherto been a free contract, and, although in the absence of contract the law itself defines

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the rights of the parties, there is hardly one of these which may not be displaced or modified by the agreement. his, it may be said in passing, is the seat of the very widespread dissatisfaction that exists in all the three kingdoms with what are vaguely termed the land laws. A small class has been allowed to acquire absolute dominion over the land of the country, and may impose what terms it pleases on the rest of the community for the right to use the land. The law governing the devolution of land is intricate and per- plexing no doubt, and by

making conveyances expensive hinders the free distribution of the land among a larger class of owners. But that is not the real root of the present discontent. Its real root is the absolute dominion of the class of owners who are not cultivators, but who, having the monopoly of the land, may load the cultivators with what burdens they please. As for the law of land- lord and tenant, it is still greater misconception to suppose that to be in fault. It is what the landlord or tenant choose to make it. There is very little of it, independently of contract, and what little there is may be altered as the parties please. No law can be better than one which allows men to make their own contracts and limits itself to enforcing them. That is what the law of landlord and tenant does. If its effects are bad, it must be because the original conditions of the contracting parties are other than they ought to be. We shall have to show that practical evils have led to a demand for an alteration on the law of landlord and tenant in the direction of limiting the power of the landlord to impose terms on the tenant.

One privilege imposed by the law on the landlord must be excepted from what has just been said. The right to distrain for rent is a special interference of the law for the protection of the landlord. Besides suing for his rent as a man may for any other right, besides taking advantage of whatever covenants he may have made for entry on default of payment, a landlord may enter upon the demise premises and help himself to whatever articles of personal property he may find there, to an amount sufficient to satisfy his claim. Distress as a general rule extends to all movable property found on the premises, whether belonging to the tenant or not; but there are certain well-defined exemptions, as, for example, goods sent to a man publicly carrying on a trade to be worked at or dealt with in the way of his trade. And some things have the benefit of a conditional exemption, as horses employed to work the ground, which should not be taken so long as there is any other property to satisfy the distress. This privilege is an injurious interference with the property and rights of third persons. It exposes persons dealing with the tenant to the danger of losing whatever property of their own they may permit to be on his premises, and of having their claims against him postponed to those of tbe landlord. This is a wide departure from the general principle of the law, which is

to leave the parties alone; but even here the right to distress may be expressly abolished in the contract of tenancy if the parties please.

Again, the land, on the expiration of the tenancy, becomes the absolute property of the landlord, no matter how it may have been altered or improved during the occupation. In certain cases the law has discriminated between the contending claims of landlord and tenant. (1) In respect of jivtwres (which may be shortly defined as movables so affixed to the soil as to become part thereof), the tenant may sometimes remove them, ¢.g., when they have been brought on the premises for the purpose of being used in business. This, it is said, is done by way of encouraging trade, but it is curious that no similar principle has been admitted for the encouragement of agriculture. (2) In respect of emblements, i.¢., the profits of sown land, a tenant may be entitled to these whose term

comes to an end by the happening of an uncertain contin- gency. (3) A similar right is very generally recognized by custom in tenants whose term expires in the ordinary way. The custom of the district, in the absence of stipulations between the parties, would be imported into their contract —the tenant going out on the same conditions as he came in. But with these exceptions the land in its improved condition passes over to the landlord. The tenant may have added to its value by buildings, by labour applied to the land, or by the use of fertilizing manures, but, whatever be the amount of the additional value, he is not entitled to any compensation whatever. This again is a matter which the parties may, if they please, regulate for themselves. As a matter of fact, landlords never allow a compensa- tion clause to be inserted in their leases.

The Agricultural Holdings Act, 1875, attempts to remedy this injustice by enacting that compensation shall be paid to tenants for improvements the benefit of which has not been exhausted at the end of the lease. These are of three classes :—(1) Drainage of land, erection or enlargement of buildings, laying down permanent pasture, making and planting osier beds, making water meadows or works of

irrigation, making gardens, roads, or bridges, water-courses, ponds, wells, or reservoirs, making fences, planting hops, planting orchards, reclaiming waste lands, and warping land. The tenant to establish a claim for compensation must have the landlord's consent in writing to the improvements. The compensation is a sum equal to the amount originally expended, less one-twentieth for every year that has elapsed since, and the whole benefit of the improvement is taken to be exhausted in twenty years. (2) Boning lands with undissolved bones, chalking land, clay burning, claying, liming, and marling land, after notice in writing given to the landlord. They are deemed to be exhausted at the end of seven years, and the compensation is the sum expended, less one-seventh for every year. (3) Artificial or other purchased manure applied to the land, and cake or other feeding stuff consumed thereon by cattle, &c. Exhausted in two years, compensation to be a sum representing its fair value to an incoming tenant. The Act, however, has no application if the parties agree in writing, either on the contract of tenancy or otherwise, that it shall not apply. In point of fact, landlords insist upon the renunciation of the Act as a condition of granting a lease. The Act has accordingly been a dead letter.

The mutual rights of the parties are, as we have already said, regulated to a large extent by special provisions or covenants in the lease. The most usual of these are the following :—(1) The landlord covenants that the tenant shall have quiet enjoyment of the premises for the time agreed upon, and in the absence of such a proviso a covenant to this effect will be implied from the fact of letting. The obligation makes the landlord responsible for any lawful eviction of the tenant during the term, but not for wrongful eviction unless he is himself the wrongdoer, or has expressly made himself responsible for evictions of all kinds. (2) The tenant is presumed to undertake to use the property in a reasonable manner according to the purposes for which it was let, and to do reasonable repairs. The landlord is not presumed to have undertaken to put the premises in repair, nor to execute repairs. But the respective obligations of parties where repairs are, as they always are in leases for years, the subject of express covenant may vary indefinitely. The obligation is generally imposed on the tenant to keep

the premises in “good con- dition” or ‘“tenant-like repair,” and it will be construed with reference to the character of the premises demised, their age, and their condition. A covenant to repair, unless limited specially, makes the tenant liable to rebuild houses destroyed by accident. A covenant to keep in repair

requires the tenant to put the premises in repair if they are out of repair, and to maintain them in that condition up to and at the end of the tenancy. A breach of the covenant gives the landlord an action for damages, which will be measured by estimated injury to the reversion if the action be brought during the tenancy, and by the sum necessary to execute the repairs if the action be brought later. (3) The improper user of the premises to the injury of the reversioner is waste. Voluntary waste is when the tenant by some positive act of his own has injured the pre- mises ; permissive waste is when the injury is caused by some omission. Tenants-at-will or from year to year are not liable for the latter. What is or is not waste is in some instances dependent on the custom of the country, but in general anything which damages the freehold or alters its nature is waste. Even the erection of new buildings would, strictly speaking, be waste unless the lease could be construed as authorizing them. Besides these general conditions implied in law, the use of the premises may be restricted indefinitely by special provisos. Covenants against using the premises for the carrying on of particular trades or businesses are the most usual. In this category may be placed the rules as to cultivation to be found in agricultural leases, in which also an obligation to cultivate in conformity with the custom of the district would be implied. (4) Cove- nants by the tenant to insure and keep insured the premises are also common, and if the premises are left uninsured for the smallest portion of the term, although there may be no damage by fire, the covenant is broken. (5) The rates and taxes are generally the subject of special covenants. One tax, the property tax, is specially excepted. It must be paid by the landlord, and if the tenant should pay it the landlord must deduct it from the rent. The parties cannot by contract make any different arrangement. Another charge on lands—the rent-charge fixed

under the Tithe Commutation Acts in lieu of tithes —is not a personal charge against either landlord or tenant, but is leviable by distress. Apart from agreement, the charge, if paid by the tenant, may be deducted from the rent. Other rates and charges, whether primarily imposed on landlord or tenant, may be imposed by the contract upon one or other as the parties may agree. (6) The incidents of rént—its amount, whether fixed or fluctu- ating, its nature, whether in money or otherwise, time and mode of payment, &c.—are fixed by the agreement of the parties. When the land has been occupied without a letting, the owner has an action against the occupier for compensation for use and occupation, an undertaking to pay being implied from the fact of occupation. But in other cases the rent due is a matter of agreement between the parties, the law interpreting the terms when necessary. Thus an agreement to pay a rent of £100, no times of payment being mentioned, would be construed as an agree- ment to pay that rent annually. Rent is said to be dwe at the first moment of the day appointed for payment, and in arrear at the first moment of the day following. It has already been said that, in addition to the right of action as for an ordinary debt, the landlord has a special right of distress. The covenant may also give him tho right to enter and eject the tenant on non-payment. Covenants are said to “run with the land” when the liabilities and rights created by them pass to the assignees of the original parties. At common law it was said that covenants “ran with the land” but not with the reversion, the assignee of the reversioner not having the rights of the original lessor. But the assignees of both parties have been on the same footing since the statute 32 Henry VIII. c. 34. The following covenants “run with the land ”:— (1) all implied covenants ; (2) all express covenants con- cerning something in being at the time of the covenant

and “parcel of the demise”; (3) covenants relating to things not in being but to be built or done on the premises, if the covenant be for the covenantor himself and “his assigns.” But things merely collateral do not bind the assigns even if they be named.

The right of the tenant to assign his lease—as well as his right to make an underlease—may itself be restricted by agreement, and covenants to that effect are not un- common. Sometimes the tenant covenants not to assign or underlet without consent, and it may be provided that such consent will not be refused except on reasonable grounds. The lessee is not discharged from liability by the assignment unless the landlord accepts the assignee as his tenant, and even then the original lessor will remain liable on his own express covenants.

The term may be forfeited either for breach of some condition on which the lease was granted, or in virtue of a specific provision for re-entry on breach of any covenant. Such a proviso is generally attached to the covenants, and the effect of a breach of a covenant so protected is to make the lease voidable at the option of the landlord. The tenant cannot take advantage of his own default to terminate the tenancy. The landlord must signify his intention to avoid the lease by some specific act. If he accepts rent, or, it seems, if he even asks for it after notice of an act of forfeiture, he waives any breach of covenant up to that time, but not forfeiture for future or continuing breaches. The condition of forfeiture on breach may be attached to any covenants the parties choose to make, and may therefore in many cases press hardly on the tenant, who for a trifling default may lose the whole value of his term. The courts in some few instances will relieve a tenant from forfeiture. Thus they may relieve once against a forfeiture for breach of covenant to insure, when no damage has occurred and an insurance is in effect at the time of application, Relief will also be given for forfeiture by non-payment of rent, if the arrears be paid up. And on the ground of fraud, accident, or mistake forfeitures may be relieved against in other cases. The determination of a lease by forfeiture has the same effect as its determina- tion in any other way, in destroying subtenancies or other rights created under it.

It will be seen that with a few insignificant exceptions the contract is left by law to be regulated by the parties. In one particular an important change has been made by arecent Act. The right to the game, as we have already pointed out, can only be taken out of the tenant by an express grant made by him, The Ground Game Act, 1880,

enacts that “any occupier of land shall have as incident to and inseparable from his occupation of the land the right to killand take ground game thereon, concur- rently with any other person who may be entitled to kill and take ground game on the same land,”—subject to certain conditions which need not be recounted here. And “ every agreement, condition, or arrangement which purports to divest or alienate the right of the occupier, so declared, given, and reserved to him by this Act, or which gives to such occupier any advantage in consideration of his forbearing to exercise such right, or imposes upon him any disadvantage in consequence of his exercising such right, shall be void.” Another clause provides that, when the right to kill and take ground game is at the padi f

, go the Act vested in any person other than the occupier, under a bona fide contract, the occupier’s rights under the Act shall not come into existence until the determination of that contract. “Ground game” means “hares and rabbits,”

Scotland. —In Scotch law, ‘‘ the contract of location is consensual and in its own nature merely personal ; but by statute it is made real against singular successors” (¢.¢., purchasers), A lease for any

greater term than one year must be in writing. The lessor and his representatives are bound by a written lease which is ‘“‘authenti-

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cated in terms of the statutes and delivered, or fortified by rez in- terventus,! or sanctioned by homologation,” or which is an offer, followed by real evidence of aceeptance, or written artieles or eonditions proved by written evidenee to have been adopted by the parties, or even a written obligation to grant a lease. The singular suceessors of the lessor will be bound where he is bound, provided (1) that the lease is definite as to subject, rent, and term of duration, and (2) that possession shall have followed as a badge of real right under the statute (1449, c.17). Thus, while a lease of any duration will be good against the lessor and his heirs, as against singular successors it must in general have a definite term of dura- tion, unless it be specially

warranted and homologated. The usual term in agricultural leases is nineteen years, and longer terms are common for building and mining leases, but there appears to be some uncertainty as to whether any and what limit must be imposed on the length of a term. So, as to rent, it may be as against the grantor a merely nominal sum, or may be retained by the lessee for debt ; but as against singular successors it must stand payable. Rent, it is said, may be cither in money, grain, or service, but it must not be elusory. Rent in money is generally payable at the '"legal terms" Whitsunday and Martinmas. The obligation to pay rent is extinguished by the destruction of the subject, and this principle appears to have been applied to the partial destruction of the subject occasioned by the disastrous failure of a particular season. '* When the destruction is partial, the point is more doubtful ; and the distinction seems to be that, if it be permanent though partial, the failure of the subject let will give relief by entitling the tenant to renounce the lease unless a deduction be allowed, but, that if it be merely temporary and occasional, it will not entitle the tenant to relief. In the decisions, however, relief has been given to a greater extent than that distinction would authorize ; thus devasta- tion of the crop by storms, &c., if plus quam tolerabile, has been adinitted as aground of abatement ; but as the tenant takes the risk of the seasous it must at least be some extraordinary event that will justify such a decision" (Bell's Principles). And it would appear that the tenant has no relief against such partial destruction of the subjeet let as may be oeeasioned by a subsequent law, as for cx- ample in the ease of a fishing lease, by an Act extending the close time. Rent may be recovered either by personal action or by the equivalent of distress, viz., hypothec. (But see Hyporurc.) In Scotch law there is not, asin English, a prima facie right in the tenant to assign the lease or sublet the premises. On the principle of delectus persone, the landlord is presumed to have excluded all save those whom he has expressly admitted, at least in ordinary leases, though a different rule prevails in longer leases. Even the heirs of tenants were at one time excluded, but they now sueceed to the lease. The obligations of the parties as to mode of cultiva- tion, amount of rent, length of term, repair, and so on are for the most part regulated as in England by the express provisions of the lease. The tenant is bound to give up the premises at the expira- tion of the term

without compensation for any permanent or unex- hausted improvement thereon. ‘‘It is implied,” says Bell, ‘‘in the contract of lease that any buildings, fences, or improvements which the tenant may spontaneously make are made in contemplation of his own interest and for his own use only. And so he has no claim for such meliorations at the end of his lease without special stipulation. But, if the tenant’s possession be terminated abruptly and prematurely, he ought in equity to be entitled to recompense.”

Jreland.—The law of landlord and tenant has been until recently substantially the same as that whieh has already been described for England, and it will only be necessary to notice here the more import- ant changes that have been made in Ireland by legislation. It may be pointed out, without touching at all on the vexed Irish land question, that the inconvenience of the situation in which a limited class own the soil, and let it out on hire on what terms they please to cultivators, has been felt with particular force in Ireland. Agriculture is the one industry of the eountry, and that industry was carried on under conditions which made it all but impossible. The Irish tenant was, equally with the English tenant, at the mercy of his landlord. If he made improvements he did so at the risk of losing them by eviction or by being taxed for them by an in- ereased rent. The insecurity of his tenure gave him the alternative of doing nothing to better his farm or bettering his farm without bettering himself. At the same time there existed in Ireland, in consequence of circumstances peculiar to the people, an excessive competition for land such as has never been paralleled in England. The natural outcome of this condition of things was a demand for some change in the law which could give tenants a rcasonable security for their industry. And the way was paved for such changes by the existence in Ulster of a local custom having virtually the force of law, which did provide such a security. This was not a custom of which the courts could take judicial notice, and any landlord who chose to do so might insist upon

1 This is inferred from the faet that the grantor has knowingly per-

mitted acts ‘‘not unimportant to be done by the lessor on the faith of the eontraet,”

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ignoring it in his dealings with his tenants. Nor was the custom in itself everywhere clear or uniform. ‘‘It isa strange thing to say,” says Mr Butt, ‘“‘but it would be impossible to frame any statement as to the nature and meaning of the custom which would be universally accepted as a correct description of its char- acter.”1 The Ulster custom had, however, two main features— fixity of tenure, and free right of sale by the tenant of his interest. “So long as the tenant pays his rent the landlord wil not use his legal powers to put an end to the tenancy,” says Judge Longfield, describing the system, and the same authority adds that ‘‘ the sale by an outgoing tenant of his tenant right is to be with the approba- tion of the landlord. This approbation is not to be capriciously refused, but on the other hand the tenant is not at liberty to select any substitute that he thinks proper irrespective of his character and

ossession of sufficient means for the efficient cultivation of the and.’’? The strength of the custom may be estimated froma state- ment made by one of the witnesses before the Devon commission :— ‘‘Tf systematic attempts were made amongst the proprietors of Ulster to invade tenant right, I do not believe there is a force at the dis- posal of the Horse Guards sufficient to keep the peace of the pro- vince.” And Mr Butt estimates that the sum which tenants under the Ulster custom would receive on the sale of their tenant right would amount to more than £20,000,000.

The Landlord and Tenant(Irveland) Act, 1870, enacts, section 1, that “the usages prevalent in the province of Ulster (in this Act intended ‘to be included under the denomination of the Ulster tenant right custom) are hereby declared to be legal, and shall in the case of any holding in the province of Ulster proved to be subject thereto be enforced in the manner provided by this Act.” By section 2 like usages elsewhere thanin Ulster are in like manner legalized: Anda tenant who is not entitled to compensation under sections I and 2 is nevertheless

declared to be entitled to the following rights:—(1) if holding under a tenancy created after the passing of the Act he is disturbed in his holding by the landlord, he shall be entitled to com- pensation for the loss which the court shall find to have been incurred by him, subject to a scale of maximum amounts varying from. seven years' rent on holdings of the annual value of £10 and under to one year's rent on holdings of the value of £100 and over, and in no case exceeding £250 ; and (2) he may, on quitting his hold- ing, claim compensation in respect of improvements made by hiniself or his predecessors in title, subject to certain considerable cxcep- tions, as regards tenancies and improvements. The second part of the Act contains clauses to facilitate the purchase by tenants of the fee simple of their holdings, and the third part authorizes the com- missioners of public works in Ireland to advance moneys both to landlords for payment of compensation for improvements and to tenants for the purchase of thcir holdings. Section 44 enacts that the board, if they are satisfied with the security, may advance to any tenant for the purpose of purchasing his holding, in pursuance of the Act, any sum not exceeding two-thirds of the price of such hold- ing, and upon an order being made by the board such holding shall be deemed to be charged with an annuity of five pounds for every one hundred oo of such advance, and so in proportion for any less sum, such annuity to be limited in favour of the board, and to be declared to be repayable in the term of thirty-five years. Section 46 requires the Landed Estates Court on the sale of estates to afford as far as may be consistent with the interests of the persons concerned facilities for such purchases by tenants, whether by selling the estate in suitable lots or otherwise. The principle of transfer- ring the occupying tenants into peasant proprietors which these clauses are intended to carry out is associated with the name of Mr Bright. The Bright clauses have not had the practical success that was hoped for,—a result which is attributed to the unfitness of the Landed Estates Court for working them.? And it may be added that the Act of 1870 failed to satisfy the wishes of the Irish people, rackrenting and eviction being still possible, and the process for obtainiug compensation being tedious and expensive.

The Land Law (Ireland) Act, 1881, was accordingly passed. Sec- tion 1 provides that the tenant for the time being of every holding not specially excepted may sell his tenancy for the best price that can be obtained, subject to certain conditions and provisions specified in sixteen subsections. A tenant from year to year is not permitted to subdivide or sublet his holding without permission of the landlord. A person to whom a tenant has bequeathed the tenancy is in the same position as a purchaser after sale. When a landlord demands an increase of rent from a present or future tenant, then (1), if the tenant subniits, his tenancy shall become a statutory tenancy, sub- ject to statutory conditions for the period of fifteen years ; (2) a future tenant not accepting increase but selling shall be entitled to receive such amount as a court may fix for depreciation of the sell- ing value by the increased rent; (8) a tenant, not accepting but not

1 Practical Treatise on the Law of Compensation to Tenants in Ireland, by Isaac Butt, Q.C., Dublin, 1871.

2 An excellent account of the origin and results of the Ulster custom will be oe De Irish Land Question from 1829 to 1869, by R. Barry O'Brien,

ndon, E

3 See O'Brien's Jrish Land Question, chap. vii.

selling, is entitled to compensation as for disturbance ; (4) and a present tenant may apply to the eourt to have a rent fixed. A tenant during a statutory term shall not be compelled to pay a higher rent than the rent payable at the commencement, and shall not be compelled to quit except on breach of the statutory conditions, some of which are as follows:—the tenant must pay rent at the appointed time, must not commit persistent waste, must not sub- divide or sublet or erect a dwelling house otherwise than is provided inthe Act. Agistment, or letting for pasture, and letting on conacre for growing potatoes or other green crop are not within this pro- hibition. The landlord retains the

right to enter for the purpose of taking minerals, stone, timber, making roads, hunting, shooting, fishing, and so on. The tenant may not open a public house without the landlord's consent. The section is not to prejudice any eject- ment for non-payment of rent in respect of rent accrucd due for a holding before the commencement of the statutory term.

Sections 6 and 7 amend the lawas to compensation for disturbance and compensation for improvements as contained in the Act of 1870. Section 8 authorizes the court (to be created by the Act) to fix a fair rent on the application of either party, and such judicial rent shall be the rent of the tenancy for the statutory term of fifteen years as above described. The court is to determine what is a fair rent after hearing partics, having a due regard to their respective interests and to the circumstances of the case, holding, and district. A new statn- tory term shall not begin until the expiration of a preceding one, and an alteration of judicial rent shall not take place at less intervals than fifteen years. Two important subsections deserve to be specially noticed. It is provided (subsection 2) that the court may disallow the tenant's application if it be satisfied that ''the per- inanent improvements" on the holding, which if executed by the tenant would have entitled him to compensation under the Acts of 1870 and 1881, have been made and maintained by the land- lord and his predecessors in title and not made or acquired by the tenant or his predecessors. On the other hand, no rent shall be allowed or m9 payable in respect of improvements made by the tenant or his predecessors in title for which, in the opinion of the court, they shall not have been paid by the landlord or his prede- cessors in title. When application is madc to the court to fix a judicial rent on a holding not subject to the Ulster tenant right or other analogous custom, the parties by agreement or the court may fix a value on the tenancy; and, if during the term the tenant should give notice to the landlord of his intention to sell, the landlord may purchase the tenancy at the value so fixed, subject to addition for subsequent improvements and deduction for dilapi- dations. Subsection 10 provides that ''the amount of money or money's worth that may have been paid or given for the tenancy of any holding by a tenant or his predecessors in title, otherwise than to the landlord or his

predecessors in title, shall not of itself, apart from other considerations, be a ground for reducing or increasing the rent of such holding.”

The Act may be excluded by agreement as follows. The landlord and tenant may agree to a ‘‘ judicial lease” for thirty-one years and upwards, which if approved by the court will take effect, and the holding will be regulated by the lease and not be deemed subject to the Act. The parties may agree toa ‘‘fixed tenancy,” which shall not be deemed subject to the Act, which shall be held upon such condi- tions as parties may agree upon, and with reference to which the court shall consider the interest of persons entitled to an estate or interest after a present limited owner. In such a case the tenant shall pay a fee farm rent, which may or may not be subject to revaluation by the court, and shall not be compelled to quit his holding except on breach of some of the conditions previously declared to be statutory.

These are the main provisions of the Act, establishing more or less completely what are known as the threc F’s—“ fair rents,” ‘*fixed tenure,” and ‘‘ free sale.’ Miscellaneous provisions supple- mental to these cau only be briefly noticed. Section 20 enacts that the ‘‘ tenancies to which the Act applies shall be deemed to have determined whenever the landlord has resumed possession of the hold- ing either on the occasion of a purchase by him of the tenancy or default of the tenant in selling, or by operation of law or reverter or otherwise.” But a tenant holding under an Ulster or other analo- gous custom shall be entitled to the benefit of such custom, notwith- standing the determination of his tenancy by breach of a statu- tory condition. Section 21 deals with existing leases, which are to remain in force, but at the expiration of such leases the tenants shall be deemed to be tenants of ‘‘ present ordinary tenancies from year to year,” and therefore subject to the Act. Section 22 allowsa tenant whose holding is of the annual value of £150 to contract himself out of this or the previous Act, and there is a special clause dealing with the case in which a landlord has before the Act purchased the Ulster tenant right ; but otherwise any provision contained in any leasc or contract of tenancy inconsistent with the provisions of the Act shall be void. Part 5 relates to the acquisi- ee ea ae

i j X dlords 4 The right of ejectment for non-payment of rent was conferred on Jan by special feggsntion, It is unknown to English law, where ye ag we gives aright of re-entry if protected by a special proviso to that effect in the lease.

tion of land by tenants, reclamation of land, and emigration. Part 6 describes the form of proceedings to be taken under the Act. In addition to the civil bill court of the county which has ‘‘jurisdiction in respect of all disputes arising between landlord and tenant under the Act,” a special land commission has been constituted, in which proceedings may be commenced or to which if commenced in the civil bill court they may be transferred. Three commissioners are named in the Act, and an indefinite number of assistant commissioners is authorized. The land commission is vested with the general powers of the Act; but it is directed to grant an appeal to the court of appeal, in proper cases, not including decisions as to fair rent or other matters left to the discretion of the commissioners. ‘ (E. R.)

LANDON, Cuartes Pavut (1760-1826), French painter and art-author, was born at Nonant in 1760, entered the studio of Regnault, and carried off the first prize of the Academy in 1792. After his return from Italy, disturbed by the Revolution, he seems to have abandoned painting for letters, but he began to exhibit in 1795, and con- tinued to do so at various intervals up to 1814. His Leda obtained an award of merit in 1801, and is now in the Louvre. His Mother’s Lesson, Paul and Virginia Bathing, and Dedalus and Icarus have been engraved ; but his works on painting and painters, which reach nearly one hundred volumes, now form his chief title to be remembered. In spite of a complete want of critical accuracy, an extreme carelessness in the biographical de- tails, and the feebleness of the line engravings by which they are illustrated, Landon’s Annales du Musée, in 33 vols., form a vast repertory of compositions by masters of every age and school, which will always have value for the writer on art. Besides this work and many others of less importance, Landon published Lives of Cele- brated Painters, in 22 vols.; An Historical Description of Paris, 2

vols.; a Description of London, with 42 plates ; and descriptions of the Luxembourg, of the Giustiniani collection, and of the gallery of the Duchesse de Berry. He died at Paris in 1826.

LANDON, Lerirra Exizasers (1802-1838), a writer of poetry and fiction, better known by her initials L. E. L. than as Miss Landon or Mrs Maclean, was descended from an old Herefordshire family, and was born at Chelsea, 14th August 1802. Her father, an army agent, succeeded in amassing a large property, which he lost by speculation shortly before his death. By this time the daughter by her contributions to the Literary Gazette and to various Christmas annuals, as well as by some volumes of verse, hid acquired a wide literary fame. Probably her position in society contributed to the interest they awakened, but the gentle melancholy and romantic sentiment her writings embodied would in any case have secured her the sympathy and approval of a wide class of readers. Though deficient in condensation and finish, they occasionally display a richness of fancy and an aptness of language which might have ripened, by more sedulous culture, into true poetical worth. In June 1838 she married George Maclean, governor of Cape Coast Castle, but she only survived her marriage a few months, dying from an overdose of prussic acid, which, it is supposed, was taken accidentally,

For some time L. E. L. was joint editor of the Literary Gazette. Her first volume of poetry appeared in 1820 under the title The Fate of Adelaide, and was followed by other collections of verses with similar titles. She also wrote several] novels. Various editions of her Poetical Works have been published since her death, the last being that with an introductory memoir by W. B. Scott, 1880. The Life and Literary Remains of Letitia Klizabeth Landon, by Laman Blanchard, appeared in 1841, and a second edition in 1855.

LANDOR, Watrer Savace (1775-1864), born at Warwick, January 30, 1775, died at Florence, September 17, 1864. In the course of this long life he had won for himself such a double crown of glory in verse and in prose as has been won by no other Englishman but Milton. And with that special object of his lifelong veneration he

had likewise in common other claims upon our reverence to which no third competitor among English poets can equally pretend. He had the same constancy to the same principles, the same devotion to the same ideal of civic and heroic life; the same love, the same loyalty, the same wrath, scorn, and hatred, for the same several objects respectively ; the same affection and kinship to the spirit of the Romans, the same natural enjoyment and mastery of their tongue. Not accident merely but attraction must in any case have drawn them to enlist in the ranks and serve under the standard of the ancient Latin army of patriots and poets. But to Landor even more than to Milton the service of the Roman Muse was a natural and necessary expression of his genius, a spontaneous and just direction of its full and exuberant forces. At the age of twenty he published an eloquent and elegant vindication of her claims upon the service and devotion of modern writers,—the first sketch or suggestion of a longer essay, to be published in its final form just fifty-two years later. In 1795 appeared ina small volume, divided into three books, The Poems of Walter Savage Landor, and, in pamphlet form of nineteen pages, an anonymous Moral Epistle, respectfully dedicated to Karl Stanhope. No poet at the age of twenty ever had more vigour of style and fluency of verse ; nor perhaps has any ever shown such masterly command of epigram and satire, made vivid and vital by the purest enthusiasm and most generous indignation. Three years later appeared the first edition of the first great work which was to inscribe his name for ever among the great names in English poetry. The second edition of Gebtr appeared in 1803, with a text corrected of grave errors and improved by magnificeut additions. About the same time the whole poem was also published in a Latin form, which for might and melody of line, for power and perfection of language, must always dispute the palm of precedence with the English version. In 1808, under an impulse not less heroic than that which was afterwards to lead Byron to a glorious death in redemption of Greece and his own good fame, Landor, then aged thirty-three, left England for Spain as a volunteer to serve in the

national army against Napoleon at the head of a regiment raised and supported at his sole expense. After some three months' campaigning came the affair of Cintra and its disasters ; "his troop," in the words of his biographer, "dispersed or melted away, and he came back to England in as great a hurry as he had left it," but bringing with him the honourable recollection of a brave design unselfishly attempted, and the material in his memory for the sublimest poem published in our language between the last master- piece of Milton and the first masterpiece of Shelley—one equally worthy to stand unchallenged beside either for poetic perfection as well as moral majesty—the lofty tragedy of Count Julian, which appeared in 1812, without the name of its author. No comparable work is to be found in English poetry between the date of Samson Agonistes and the date of Prometheus Unbound ; and with both these great works it has some points of greatness in common. The superhuman isolation of agony and endurance which encircles and exalts the hero is in each case expressed with equally appropriate magnificence of effect. The style of Count Julian, if somewhat deficient in dramatic ease and the fluency of natural dialogue, has such might and purity and majesty of speech as elsewhere we find only in Milton so long and so steadily sustained.

In May 1811 Landor had suddenly married Miss Julia Thuillier, with whose looks he had fallen in love at first sight in a ball-room at Bath; and in June they settled for awhile at Llanthony Abbey in Wales, from whence he was worried in three years' time by the combined vexation of neighbours and tenants, lawyers and lords-lieutenant ; not

before much toil and money had been nobly wasted on attempts to improve the sterility of the land, to relieve the wretchedness and raise the condition of the peasantry. He left England for France at first, but after a brief residence at Tours took up his abode for three years at Como; 'and three more wandering years he passed," says his biographer, "between Pisa and Pistoja, before he pitched his tent in Florence in 1821." In 1824 appeared the first seriés of his Imaginary Conversations, in 1826 'the second edition, corrected and enlarged"; a

supple- mentary third volume was added in 1828; and in 1829 the second series was given to the world. Not until 1846 was a fresh instalment added, in the second volume of his collected and selected works. During the interval he had published his three other most famous and greatest books in prose: The Citation and Examination of William Shakespeare, 1834; Pericles and Aspasia, 1836; The Pentameron, 1837. To the last of these was originally appended The Pentalogia, containing five of the very finest among his shorter studies in dramatic poetry. In 1847 he published his most important Latin work, Poemata et Inscriptiones, comprising, with large additions, the main contents of two former volumes of idyllic, satiric, elegiac, and lyric verse ; and in the same golden year of his poetic life appeared the very crown and flower of its manifold labours, Zhe Hellenics of Walter Savage Landor, enlarged and completed. Twelve years later this book was reissued, with additions of more or less value, with alterations generally to be regretted, and with omissions invariably to be deplored. In 1853 he put forth The Last Fruit of an Old Tree, containing fresh conversations, critical and con- troversial essays, miscellaneous epigrams, lyrics, and occa- sional poems of various kind and merit, closing with Jive Scenes on the martyrdom of Beatrice Cenci, unsurpassed even by their author himself for noble and heroic pathos, for subtle and genial, tragic and profound, ardent and compassionate insight into character, with consummate mastery of dramatic and spiritual truth. In 1856 he pub- lished Antony and Octavius—=Scenes for the Study, twelve consecutive poems in dialogue which alone would suffice to place him high among the few great masters of historic drama. In 1858 appeared a metrical miscellany bearing the title of Dry Sticks Fagoted by W. S. Landor, and con- taining among other things graver and lighter certain epigrammatic and satirical attacks which reinvolved him in the troubles of an action for libel; and in July of the same year he returned for the last six years of his life to Italy, which he had left for England in 1835. Embittered and distracted by domestic dissensions, if brightened and relieved by the affection and veneration of friends and strangers, this final period of his troubled and splendid career came at last to a quiet end on the 17th of September 1864. In the preceding year he had published a last volume of Herove Idyls, with additional poems, English and Latin,—the better part of

them well worthy to be indeed the “last fruit” of a genius which after a life of eighty-eight years had lost nothing of its majestic and pathetic power, its exquisite and exalted loveliness.

A complete list of Landor’s writings, published or privately printed, in English, Latin, and Italian, including pamphlets, fly-sheets, and occasional newspaper correspond- euce on political or literary questions, it would be difficult to give anywhere and impossible to give here. From nineteen almost to ninety his intellectual and literary activity was indefatigably incessant; but, herein at least like Charles Lamb, whose cordial admiration he so cordially returned, he could not write a note of three lines which did not bear the mark of his ‘‘Roman hand” in its matchless and inimitable command of a style at once the most powerful and the purest of his age. The one charge which

can ever seriously be brought and maintained against it is that of such occasional obscurity or difficulty as may arise from excessive strictness in condensation of phrase and expurgation of matter not always superfluous, and some- times almost indispensable. His English prose and his Latin verse are perhaps more frequently and more gravely liable to this charge than either his English verse or his Latin prose. At times it is well nigh impossible for an eye less keen and swift, a scholarship less exquisite and ready than his own, to catch the precise direction and follow the perfect course of his rapid thought and radiant utterance. This apparently studious pursuit and preference of the most terse and elliptic expression which could be found for anything he might have to say could not but occasionally make even so sovereign a master of two great languages appear “dark with excess of light”; but from no former master of either tongue in prose or verse was ever the quality of real obscurity, of loose and nebulous incertitude, more utterly alien or more naturally remote. There is nothing of cloud or fog about the path on which he leads us ; but we feel now and then the want of a bridge or a handrail; we have to leap from point to point of narrative or argument without the usual help of a connect- ing plank. Even in his dramatic works, where least of all it

should have been found, this lack of visible connexion or sequenee in details of thought or action is too often a source of sensible perplexity. In his noble trilogy on the history of Giovanna queen of Naples it is sometimes actually difficult to realize on a first reading what has happened or is happening, or how, or why, or by what agency,—a defect alone sufficient, but unhappily sufficient in itself, to explain the too general ignorance of a work so rich in subtle and noble treatment of character, so sure and strong in its grasp and rendering of "' high actions and high passions," so rich in humour and in pathos, so royally serene in its commanding power upon the tragic mainsprings of terror and of pity. As a poet, he may be said on the whole to stand midway between Byron and Shelley,—about as far above the former as below the latter. If we except Catullus and Simonides, it might be hard to match and it would be impossible to overmatch the flawless and blame- less yet living and breathing beauty of his most perfect elegies, epigrams, or epitaphs. As truly as prettily was he likened by Leigh Hunt "to a stormy mountain pine which should produce lilies." His passionate compassion, his bitter and burning pity for all wrongs endured in all the world, found only their natural and inevitable outlet in his lifelong defence or advocacy of tyrannicide as the last resource of baffled justice, the last discharge of heroic duty. His tender and ardent love of children, of animals, and of flowers, makes fragrant alike the pages of his writing and the records of his life. He was as surely the most gentle and generous as the most headstrong and hot-headed of heroes or of men. Nor ever was any man's best work more thoroughly imbued and informed with evidence of his noblest qualities. His loyalty and liberality of heart were as inexhaustible as his bounty and beneficence of hand. Praise and encouragement, deserved or undeserved, came yet more readily to his lips than challenge or de- fiance. Reviled and ridiculed by Lord Byron, he retorted on the offender living less readily and less warmly than he lamented and extolled him dead. On the noble dramatic works of his brother Robert he lavished a magnificence of sympathetic praise which his utmost self-estimate would never have exacted for his own. Age and the lapse of time could neither heighten nor lessen the fulness of this rich and ready generosity. To the poets of his own and of the next generation he was not readier to do honour than to those of a later

growth, and not seldom of deserts far lower and far lesser claims than theirs. That he was not

unconscious of his own, and avowed it with the frank simplicity of nobler times, is not more evident or more certain than that in comparison with his friends and fellows he was liable rather to undervalue than to overrate himself. He was a classic, and no formalist ; the wide range of his just and loyal admiration had room for a genius so far from classical as Blake's. Nor in his own highest mood or method of creative as of critical work was he a classic only, in any narrow or exclusive sense of the term. On either side, immediately or hardly below his mighty masterpiece of Pericles and Aspasia, stand the two scarcely less beautt- ful and vivid studies of medisval Italy and Shakespearean England. 'The very finest flower of his immortal dialogues is probably to be found in the single volume comprising only "Imaginary Conversations of Greeks and Romans ad his utmost command of passion and pathos may be tested by its transcendent success in the distilled aud concentrated tragedy of Tiberius and Vipsania, where for once he shows a quality more proper to romantic than classical imagina- tion,—the subtle and sublime and terrible power to enter the dark vestibule of distraction, to throw the whole force of his fancy, the whole fire of his spirit, into the "shadowing passion" (as Shakespeare calls it) of gradually imminent insanity. Yet, if this and all other studies from ancient history or legend could be subtracted from the volume of his work, enough would be left whereon to rest the foundation of a fame which time could not sensibly impair. (A. ©. 8.)

LANDSBERG-AN-DER-WARTHE, chief town of a circle in the government district of Frankfort, in the pro- vince of Brandenburg, Prussia, is situated at the confluence of the Warthe and Kladow, 80 miles north-east of Berlin by rail. It has a gymnasium of the first class, a hospital, and a poorhouse, besides the other ordinary educational, charitable, and administrative provisions. The productive industry of Landsberg centres in the engine and boiler works and iron-foundries;

but the other manufactures include a considerable miscellany, whose chief items are tobacco, cloth, carriages, wools, and spirits. An active trade is carried on in the manufactures of the town, and in the produce of the surrounding country, Landsberg dates its origin from about the middle of the 13th century. In 1875 its population was 21,379.

LANDSEER, Sir Epwin Henry (1802-1873), third. son of John Landseer, A.R.A., a well-known engraver and able writer on art, was born in London, March 7, 1802. His mother was Miss Potts, who sat to Reynolds as the gleaner, with a sheaf of corn on her head, in Macklin's Family Picture, or the Cottagers} Edwin Henry Landseer began his artistic education under his father so successfully that in his fifth year he drew fairly well, and was acquainted with animal characters and passions. Etchings of his, at South Kensington, dated by his father, attest that he drew excellently at eight years of age; at ten he was an admirable draughtsman, and his etchings show consider- able sense of humour. At thirteen he drew a majestic St Bernard dog so finely that his brother Thomas engraved and published the work, At this date (1815) he sent two pictures to the Academy, and was described in the catalogue as "Master E. Landseer, 33 Foley Street." Youth forbade his being reckoned as an artist in full, and caused him to be considered as the " Honorary Exhibitor " of " No. 443, Portrait of a Mule," and "No, 584, Portraits

1 John Landseer died February 29, 1852, aged ninety-one. Sir Edwin's eldest brother Thomas, an A.R.A. and a famous engraver whose interpretations of his junior's pictures have made them known throughout the world, and will represent them when they have perished was born in 1796, and died January 20, 1880. Charles Landseer, R.A., and Keeper of the Royal Academy, the second brother, was born in 1799, and died July 22, 1879. John Landseer's brother Henry Was a painter of some reputation, who emigrated to Australia.

of a Pointer Bitch and Puppy." Adopting the advice of Haydon, whose pupil he was not otherwise, he studied the Elgin Marbles, the ‘‘ Wild Beasts" in the Tower and Exeter Change, and dissected every animal

whiose carcase he could obtain. In 1816. in which year he exhibited with the Society of Painters in Oil and Water Colours, Landseer was admitted a student of the Royal Academy. In 1817 he sent to the Academy a portrait of Old Brutus, a much- favoured dog, which, as well as his son, another Brutus, often appeared in subsequent pictures, Even at this date Landseer enjoyed considerable reputation, and had more work than he could readily perform, because his renown had been zealously fostered by his father in Elmes's Annals of Art. At the Academy he was a diligent student and a favourite of Fuseli's, who would look about the crowded antique school and ask, " Where is my little dog boy?" The prices of his pictures at this time were comparatively small; ten guineas was, in 1818, considered enough for a whole length figure of a horse on a canvas of 27 by 35 inches, which now belongs to Lady C. Wellesley.

In 1818 Landseer exhibited at Spring Gardens Fighting Dogs getting Wind, a picture from which his future might have been predicted. The sale of this work to Sir G. Beaumont vastly enhanced the fame of the painter, who became "the fashion" in a way disclosed by Haydon's account of his own and Wilkie's positions under similar circumstances nearly at the same date. This picture is now at Coleorton, and it illustrates the culmination of the studies of Landseer's youth and the prime strength of his earlier style. Unlike the productions of his later life, this masterpiece of his boyhood exhibits not an iota of sentiment ; but it is, in its way, a proof of astonishing vigour in design, and richer in animal character than anything produced since the death of Snyders. Perfectly drawn, solidly and minutely finished, bold in tone, and carefully composed, the execution of this picture attested the skill that. had been acquired during ten years' studies from nature, and the learning with which diligent observa- tion of the best antiques and of Raphael had endowed the painter. Looking at the work as a whole, and valuing it on technical grounds, the critic feels that Landseer never produced anything better or so manly. On this level he stood until 1824, when he removed from his father's resi- dence, and set up for himself in the house No. 1 (after- wards 18) St John's Wood Road, where he lived nearly fifty years, and in which he died. In 1818 it was little more than a cottage, with a barn attached, which was con- verted

into a studio. Between 1818 and 1825 Landseer did a great deal of work, but on the whole gained little besides facility of technical expression, a greater zest for humour, and a larger style, The work of this stage ended with the production of Lord Essex's painting called the Cat's Paw, which is well known by an engraving. It was the price of this picture, £100, that enabled Landseer to set up for himself. He had to borrow a second hundred pounds to pay a premium for the house, and repaid this sum by twenty pounds at a time. Between 1818 and 1825 Landseer's pictures were such as proved the severity of his studies; among them the principal were the Cat Disturbed, which was lately in the possession of Sir P. de Malpas Grey Egerton; Alpine Mastiffs reanimating a Distressed Traveller, a famous work engraved by John Landseer; the Ratcatchers, which is now at Lambton Castle ; Pointers to be ; the Larder invaded ; and Neptune, the head and shoulders of a Newfoundland dog. The Cat's Paw was sent to the British Institution in 1824, and made an enornious sensation. In this year Landseer and C. R. Leslie made a journey to the Highlands,—a momentous visit for the former, who thenceforward rarely

| failed annually to repeat. it in search of studies and subjects,

In 1826 Landseer was elected an A.R.A. In 1827 appeared the Monkey who had seen the World, a picture which marked the growth of a taste for humorous subjects in the mind of the painter, and had been evoked by the success of the Cat's Paw. Taking a Buck, 1825, was the painter's first Scottish picture. Its execution marked a change in his style which, in increase of largeness, was a great improvement. In other respects there was a de- crease of solid qualities ; finish, searching modelling, and elaborate draughtsmanship rarely appeared in Landseer's work after 1823. The subject, as such, soon after this time became a very distinct element in his pictures; ulti- mately it dominated, and in effect the popularity of the artist was extended in a greater degree than technical judgment justified. Sentiment gave new charms to his works, which had previously depended on the expression of animal passion and character, and the exhibition of noble qualities

of draughtsmanship. Sentimentality ruled in not a few pictures of later dates, and guast human humour, or pathos, superseded that masculine animalism which rioted in its energy, and enabled the artist to rival Snyders, if not Velazquez, as a painter of beasts. After High Life and Low Life, pictures of 1831, now in the National Gallery, Landseer's dogs, and even his lions and birds, were more than half civilized. It was not that these later pictures were less true to nature than their forerunners, but the models were chosen from different grades of animal society. As Landseer prospered he kept finer company, and his new patrons did not care about rat-catching and dog-fighting, however vigorously and learnedly those subjects might be depicted. It cannot be said that the world lost much when, in exchange for the Cat Disturbed and Fighting Dogs getting Wind, came Jack in Office, the Highland Shepherd's Chief Mourner, and the Swannery invaded by Sea-Eagles, three pictures which are types of as many diverse moods of Landseer's art, and each a noble one.

Four years after his election as A.R.A. Landseer was chosen an R.A. (1830). Chevy Chase (1826), which is at Woburn, and the Illicit Whiskey Still (1829), appeared in the interval, and were followed by High Life and Low Life (1831), and Spaniels of King Charles's Breed (1832) ; the last is a wonder of brush handling. lLandseer had by this time attained such amazing mastery that he painted Spaniel and Rabbit in two hours and a half, and Rabbits, which was at the British Institution, in three-quarters of an hour; and the fine dog-picture Odin (1836) was the work of one sitting, ¢.¢, painted within twelve hours. He began and finished a whole-length, life-size study of a fallow deer while Mr Wells of Redleaf was at church. A more remarkable feat consisted in drawing, simultaneously, a stag's head with one hand and a head of a horse with the other. Harvest in the Highlands, and that masterpiece of humour, Jack in Office, were exhibited in 1833. In 1834 a noble work of sentiment was given to the world in Suspense, which is now at South Kensington, and shows a dog watching at the closed door of his wounded master. Many think this to be Landseer's finest work, others prefer the Highland Shepherd's Chief Mourner (1837). The over-praised and unfortunate Bolton Abbey, a group of portraits in character, was shown in the same year, and was the first

picture for which the painter received £400. A few years later he sold Peace and War for £1500, and for the copyrights alone obtained £6000. Man Proposes (1864) was resold in 1881 for 6300 guineas, and a cartoon for 5000 guineas. A Distinguished Member of the Hu- mane Society, a dog reclining on a quay wall (1838), was succeeded by Dignity and Impudence (1839). The Lion Dog of Malta, and Laying down the Law appeared in 1840. The Defeat of Comus was painted in the summer-

house of Buckingham Palace garden in 1842. In this year was finished the capital Highland Shepherd's Home (Sheep- shanks Gift), together with the beautiful Eos, a portrait of Prince Albert's most graceful of greyhounds, to which Thomas Landseer added an ineffable charm and solidity not in the painting, The Challenge, and Coming Events cast their Shadows before, were accompanied (1844) by Shoeing (Bell Gift), and followed by Peace, and War, and the Stag at Bay (1846). Alexander and Diogenes, and a Random Shot, a kid dead on snow, came forth in 1848. This year Landseer received a national commission to paint in the Houses of Parliament three subjects connected with the chase. Although they would have been worth three times as much money, the House of Commons refused to grant £1500 for these pictures, and the matter fell through, more to the artist's profit than the nation's gain. The Sanctuary, and Night and Morning, romantic and pathetic deer subjects, came in due order. For the latter a French jury of experts awarded to the artist the great gold medal of the Exposition Universelle, Paris, 1855.

The Dialogue at Waterloo (1850) commemorated Land- seer's first visit to the continent, and showed how he, like nearly all English artists of original power and considerable fertility, owed nothing to French or Italian training. In the same year he received the honour of knighthood. The Monarch of the Glen (1851) was succeeded by Geneva, a group of asses, a mule, and a bull; Titania and Bottom, which comprises a charming queen of the fairies; and the dramatic design of the Combat, or Night and Morning, as above. Then came the

Children of the Mist (1853), Deer in Repose, Saved (1856), Braemar, a noble stag, Rough and Ready, Uncle Tom and his Wife for Sale (1857). The Maid and the Magpie, the extraordinarily large cartoon called Deer Browsing, the Twa Dogs, and one or two minor paintings, were equal if not superior to any pre- viously produced by the artist. Nevertheless, signs of breaking health were remarked in Doubtful Crumbs, and a Kind Star (1859). The immense and profoundly dra- matic picture called a Flood in the Highlands (1860) more than reinstated the painter before the public, but friends still saw ground for uneasiness. Extreme nervous excita- bility manifested itself in many ways, and in the choice (1864) of the dreadful subject of Man Proposes God Dis- poses, bears clumsily clambering among relics of Sir John Franklin's party, there was occult pathos, which some of the artist's intimates suspected, but did not avow. In 1862 and 1863 Landseer produced nothing; but with Man Proposes came a Piper and a Pair of Nutcrackers. The last triumph of Landseer's career was the Swannery in- vaded by Sea Eagles (1869). After four years more, mainly of broken art and shattered mental powers, he died 1st October 1873. He was buried in St Paul's. See Sir EL. Landseer, by ¥. G. Stephens, 1880. (F. G. 8.)

LANDSHUT, chief town of a government district in Lower Bavaria, is situated on the right bank of the Isar, about 40 miles north-east of Munich. As the seat of government for the district, it contains all the appropriate administrative offices, and it is well supplied with educational and charitable institutions, besides having a convent and several nunneries. Of its numerous ecclesiastical buildings the most interesting are the churches of St Martin (with a spire 463 feet high), St Iodocus, and the Holy Ghost, all begun before 1411, and the old Dominican convent, now used as Government offices. The town-house, the former provincial buildings, and the palace are also noteworthy. On a hill commanding the town is the castle of Trausnitz, an ancient stronghold of the dukes of Lower Bavaria. The original castle was built in the 12th century, but the oldest part now extant dates from about 1304. In 1872-73 the

upper part was put into habitable order by the king of —— : XIV. — 36

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Bavaria. The manufactures of Landshut are not important; they include. beer, cloth, and tobacco. Market gardening and, to a really considerable extent, trade in grain are carried on. From 1800 to 1826, when the university, formerly at Ingolstadt and now at Munich, was located at Landshut, the town woke up to a temporary importance. The name Dreihelm Stadt is sometimes given to Landshut from the three helmets that formits arms. The population in 1875 was 14,780.

LANDSKRONA, one of the principal seaport and garrison towns in Sweden, is situated in the district of Malmé (in Skania) on the Sound (Oresund), about 55 miles west of Christianstad and 15 miles by water from Copen- hagen. It is connected by a branch line with the south Swedish railway system. The harbour, protected by the island of Gren, is the deepest and best on the Skanian coast, and possesses excellent quays. A Swedish line of steamers runs regularly to Liibeck. Wood, grain, and clay are largely exported. In 1880 the number of foreign vessels entering the port was 1954, with a total burden of 135,894 register tons. Landskrona is one of the chief industrial towns of Sweden, the largest manufacture being sugar re- fining. The population was 7323 in 1868, and 9913 in

1880.

Landskrona, originally called Landora or Landér, owes its first importance to King Erik XIII., who introduced a body of Carmelite monks from Germany in 1410, and bestowed on the place the same

rivileges as those enjoyed by Malmo. In 1428 it was plundered a the forces of the Wendish towns, and during the wars of the 16th and 17th centuries it played too conspicuous a part for its own prosperity. Horn took the town by storm in 1644; Ruyter blockaded the Swedish fleet in its harbour in 1657 ; and in 1676

was fought in the neighbourhood the great battle of Landskrona, which saved Sweden from the Danish invaders.

LANE, Epwarp Witu1am (1801-1876), one of the greatest of European Arabists, was the son of Dr Theophilus Lane, a prebendary of Hereford. He lost his father in boyhood, and his character was mainly formed by the influence of his mother, a woman of strong and beautiful nature, He was designed for Cambridge and the church, and became proficient in mathematics, but, abandoning the purpose of proceeding to the university, gave himself for some time to the study of engraving. Weak health, aggravated by intense application to Eastern study, com- pelled him to throw aside the burin, and in 1825 he started for Egypt, where he spent three years, twice ascended the Nile, proceeding as far as the second cataract, and composed a complete description of Egypt, with a portfolio of one hundred and one drawings. This work was never pub- lished, but the account of the modern Egyptians, which formed a part of it, was accepted for separate publication by the Society for the Diffusion of Useful Knowledge. To perfect this work Lane again visited Egypt in 1833-35, residing mainly in Cairo, but retiring to Luxor during the plague of 1835. An interesting journal of this visit to Egypt is included in the memoir by his grand-nephew pre- fixed to the sixth part of his great Lexicon. Perfected by the additional observations collected during these years, the Modern Egyptians appeared in 1836, and at once took the place which it has never lost as the best description of Eastern life and an Eastern country ever written. In accuracy, completeness, and graphic simplicity of descrip- tion the book approaches ideal perfection. It was followed from 1838 to 1840 bya translation of the Arabian Nights with a mass of valuable notes and illustrations, designed to make the book a sort of encyclopedia of Eastern manners, and rivalling the merit of his first work. The translation itself is an admirable proof of scholarship, but is characterized by a somewhat stilted mannerism, which is not equally appropriate to all parts of the motley-coloured original. The character of some of the tales, and the tedious repetitions of the same theme which are found in

the Arabic collection, induced Lane to leave considerable parts of the work untranslated. In 1840 Lane married a Greek lady. A useful volume of Selections from the Kur-dn was published in 1843, but before it passed through the press the indefatigable author was again in Egypt, where he spent seven years (1842-49) collecting materials for a great Arabic lexicon, which the munificence of Lord Prudhoe (afterwards duke of Northumberland) enabled him to under- take. The most important of the materials amassed during this sojourn (in which he was accompanied by his wife and by his sister, Mrs Poole, authoress of the Englishwoman in Egypt, with her two sons, afterwards well known in Easteru letters) was a copy in 24 thick quarto volumes of Sheikh Murtada's great lexicon, the Tdj et "Aris, which, though itself a compilation, is so extensive and exact that it formed the main basis of Lane's subsequent work. The author, who lived in Egypt in last century, used more than a hundred sources, interweaving what he learned from them. with the Kdmds of Firuzabédy in the form of a commentary. By far the larger part of this commentary was derived from the Lisén el "Arab of Ibn Mokarram, a work of the 13th century, which Lane was also able to use while in Cairo,

Returning to England in the year 1849, Lane devoted the whole remainder of his life to the task of digesting and translating his Arabfc material in the form of a great thesaurus of the lexicographical knowledge of the Arabs. In spite of weak health he continued this arduous task with unflagging diligence till a few days before his death, which took place at Worthing 10th August 1876. The work remains unfinished ; five parts appeared during his lifetime (1863-1874), aud two smaller parts have since been published from his papers. Even in its imperfect state the Lewxicon is an enduring monument, the complete- ness and finished scholarship with which it is executed making each article an exhaustive monograph. All Lane's work has the stamp of masterly perfection. He produced no occasional writings, and two essays contributed to the magazine of the German Oriental Society complete the record of his publications. Lane was not an original mind ; his powers were those of observation, industry, and sound judgment. He had singular tact in accommodating himself to the Eastern character; he lived in the East as an Oriental ; and his familiarity with

Eastern life and ways of thought was unique. His personal character was elevated and pure, his strong sense of religious and moral duty being of the type that characterized the best circles of English evangelicalism in the early part of this century.

LANFRANC (c. 1005-1089), thirty-fourth archbishop of Canterbury, and first after the Conquest, one of the ablest churchmen and scholars of his time, was the son of Hambald or Hanbald, one of the principal citizens of Pavia, and was born there about the year 1005. Deprived of his father at an early age, he seems to have been educated at Pavia with a view to taking his hereditary place in the governing class, but to have developed a love of learning for its own sake, which induced him to visit other schools ; on his return, after a long absence, he became teacher of jurisprudence in his native town. About 1039, driven from home by the disturbances then prevalent in Italy, and attracted by what he had heard of the need and demand for a supply of competent scholars in Normandy, he with some learned companions migrated thither and set up a school at Avranches, which met with great success. Some three years afterwards (1042), having formed the resolution to become a monk, he suddenly withdrew from his promis- ing career as a secular teacher. The causes which led to this change in the plan of his life are not known. Hook thinks it was suggested by the death of his wife, which

there is some reason to believe happened about this time ; but, however it may have been occasioned, the fact that a man of his energy and strength of will should, although somewhat late in life, have transferred himself to a career which not only was universally supposed to involve great spiritual advantages, but must also have been seen to offer a peculiarly favourable field for the exercise of his special talents and acquirements, need cause no surprise. After a lengthened novitiate of ascetic humiliation and seclusion in the Benedictine monastery of Bec, then under the presidency of abbot Herluin, Lanfranc was at last called upon to resume the work of teaching ; his fame speedily attracted numerous pupils, and it became

necessary to enlarge the conventual buildings. He now became prior, with full control of the internal discipline of the establishment (1046). Among those who became his pupils about this time are mentioned Witmund (afterwards bishop of Aversa), Anselm of Aosta (afterwards of Canterbury), and Anselm of Lucca (after- wards Pope Alexander II.). It was during his priorship at Bec that Lanfranc began to figure somewhat promineutly in the eucharistic controversy associated with the name of Berengarius of Tours. This able but unfortunate contro- versialist, while maintaining the doctrine of a real presence of Christ in the Eucharist, had denied that presence to be one of essence, or the change effected to be one of sub- stance. In doing so he had placed himself in an attitude of opposition not so much to the lately formulated theory of Paschasius Radbertus as to the entire current of ecclesiastical opinion then prevalent. The earliest extant letter of Berengarius to Lanfranc implies a previous friend- ship, but is written in a tone of remonstrance, beseeching the latter not to treat as heretics those wha had Scripture on their side and could also claim the support of Ambrose, Augustine, and Jerome. It is to be regretted that we are not in possession of more of the correspondence, and especially that we are left entirely to conjecture with regard to the circumstances which occasioned it. It seems to have been somewhat compromising to Lanfranc, for at the Easter synod held at Rome in 1050, which he had been summoned to attend, the prior of Bec was, after the con- demnation of the absent Berengarius, called upon to vindicate his own orthodoxy by a public confession of his faith. He had no difficulty, however, in thus purging himself of all suspicion of heretical pravity, and was after- wards present in September, by special request, at the synod of Vercelli, where Berengarius, again absent, was excommunicated. A personal controversy was renewed by Berengarius from time to time, but, so far as we know, Lanfranc’s share in it carne to an end with the composition (probably some time between 1063 and 1069) of his Leber de Corpore et Sanguine Domini Nostri contra Berengarium. Other events of much more exciting and absorbing personal interest to him had meanwhile intervened. In 1053 William of Normandy, in spite of the express prohibition of the council of Rheims (1049), had married his cousin Matilda, daughter of Baldwin, duke of Flanders,—a defiance of ecclesiastical authority which involved the

highest ecclesiastical censures. The now powerful prior of Bec was not slow to express his condemnation, which he further accentuated by his contemptuous treatment of Herfast, the duke's chaplain, who had been sent on some errand of conciliation. Peremptorily ordered to leave the duchy, Lanfranc, when setting out on his journey into exile on an excessively lame horse, whether by accident or design came across the path of William; some genial touch of humanity and good humour suddenly converted them (such is the import of the Chronicles) into firm friends; the prior accompanied the duke to his castle, and shortly afterwards undertook a mission to Rome for a papal dispensation which should legalize the obnoxious

marriage. This was obtained in 1059; Lanfranc's influence with William and Matilda steadily increased, and soon the abbeys of St Stephen and of the Holy Trinity at Caen— part of the price of the papal grace—began to rise. In 1062 the former building was sufficiently far advanced to be fit for use, and, at the urgent request of the founder, Lanfranc became its first abbot. In this position he was one of the most intimate advisers of William during the auxious times which immediately preceded and followed the Conquest. Already destined for the more splendid if more arduous see of Canterbury, he, doubtless with the royal approval, declined that of Rouen, which had been put within his reach in 1067. In 1070 he was, at the Whitsungemot held at Windsor, chosen to the primacy of England, vacant by the deposition of Stigand; and, at a synod in Normandy where the legates of the pope were present, he was constrained to accept, vainly pleading 'his weakness and unworthiness, his ignorance of a foreign tongue, and the barbarism of the nations he was thus compelled to visit." His consecration took place on August 29, 1070, in a temporary structure raised on the site of the cathedral which had been destroyed by fire three years before; and in the following year he went to Rome to receive the pallium from his former pupil Alexander IJ. The pope received him with great cordiality, giving him a second pallium for old friendship's sake ; but he did not thereby succeed in attaching the new archbishop to the ultramontane policy; during the

nineteen years of the primacy of the brilliant Lombard it became ever more apparent that neither Hildebrand's, nor Lanfranc's, but William's was the master mind in England. Lanfranc ably seconded the Conqueror in the line of action which resulted in the subordination of York to Canterbury, and also in the gradual removal from power of all English prelates and abbots, and their replacement by foreigners, until at last Wolfstan of Worcester was the only Anglo-Saxon left undisturbed ; but, if these measures were fitted in some ways to denationalize the. English Church, and bring it into closer relation with the central authority at Rome, any such tendency was more than counterbalanced by the legislation, also supported by Lanfranc, which placed the royal supremacy on a footing which it had never before attained. 'Thus it was enacted that bishops, like barons, were to pay homage to the crown, and the clergy were to acknowledge no one as pope until the royal consent had first been obtained ; that no letters from Rome were to be published till approved by the king; that no council was to pass laws or canons except such as should be agreeable to the king's pleasure; that no bishop was to implead or punish any of the king's vassals without the king's pre- cept; and that no ecclesiastic was to leave the country with- out leave obtained. As regarded church discipline the Hildebrandine reforms were followed, but with wisdom and moderation; thus strict regulations against simony were enforced, but with respect to clerical celibacy a distinction was drawn between the parochial and the capitular clergy, the former being permitted to retain their wives, A striking illustration of the recognized ecclesias- tical independence of England under William and his able minister is furnished in the fact that, in the very year (1076) of the synod of Winchester at which so important a modification of the decrees of a Roman council had been resolved on, Lanfranc along with Thomas of York and Remigius of Dorchester presented themselves at the holy see in a mission from the king to seek a confirmation of certain ancient privileges, and that they were successful in their application. No less eloquent is the fact that, after William's rejection of Gregory's demand for his homage, Lanfranc had the courage to refuse the papal summons to appear at the threshold of the apostles. After his return

from Rome in 1076 and the consecration of the new buildings at Bec in which he took part in 1077, he does not appear to have again left England As regards his administration of his own diocese, Lanfranc's principal achievements were the rapid rebuilding of the metropolitan church (1072-79), the reforms he introduced among the monks of Christ Church, and his successful recovery of the estates of the see, which had been encroached on by the king's brother bishop Odo, earl of Kent. Lanfranc died at Canterbury in May 1089.

The extant works of Lanfranc are not voluminous. The L£pis- tularum Liber contains fifty-five of his own letters, many of them of considerable interest and importance, as well as some of those of his distinguished correspondents,—Berengarius, William, Popes Alexander Il. and Gregory VI. The short Oratioin concilio habita represents his argument before the synod of Winchester in 1072 in support of his claims to the primacy. Statuta pro ordine Benedicti are an adaptation and expansion of the ordinary Benedictine rules, written, when he was primate, especially for his own monks; Sermo sive Scntentiz also relates to the duties of monks. Libellus de celanda confessione has no special interest. Commentarius in B. Pauli epistolas seems rather to be a collection of some student's notes than to have been prepared for publication by himself. Elucidarium sive dialogus de summa totius Christiane theologiz, the most voluminous of all the works assigned to him, is of more than doubtful genuineness, but it certainly is an adequate sketch of the scholastic theology in its infantile stage. Most important is the Tractatus de Corpore et Sanguine Domini, a vigorous and even violent defence of the dogma of transubstantiation, for which it helped to secure currency and permanency, but it adds little to what had already been said by Paschasius Radbertus.

The Benedictine edition of the works of Lanfranc by D'Achery, in one folio volume (Paris, 1648), was reprinted at Lyons in 1677. A new edition by Giles appeared at Oxford in two octavo volumes in 1844, The authorities for the life and times of Lanfranc are the Chronicon Beccense, and Vita Abbatum Beccensium (which are printed in both editions of the Opera), and the Historia Ecclesiastica of Ordericus

Vitalis. See Hook, Lives of the Archbishops of Canterbury, vol. Ibi and Freeman’s Vor’man Conquest, vols. ii.-v. ot

LANFREY, Prerre (1828-1877), the historian who has done the most to destroy the Napoleonic legend of M. Thiers, was born at Chambéry, the capital of Savoy, on the 26th October 1828. His father came of a warlike race, which had been noble for four centuries, and had himself served in the army of Napoleon as a captain of hussars. On the fall of Napoleon he had left the French army, and retired to Chambéry, where he married a milliner, When young Pierre was but six years old, his father died, cursing the priest who came to bring him consolation, and his education was left to his mother, She sent him first to the Jesuit college of Chambéry, from which he was ex- pelled for writing an attack on the Jesuits, then to another ecclesiastical seminary, which equally disgusted him, and at last to the Lycée Bourbon at Paris. After completing his studies at Paris he went to Grevioble in 1847 to study law, and while there took the keenest interest in the Revolution of 1848 at Paris. Even at that age he shows in his letters the hatred of democracy which was always to characterize his sincere love of liberty, and above all his tense feeling that Paris should not always dominate the provinces. His law studies finished at Grenoble, he went to Turin, and qualified himself to act as avocat in his native country 3 but, on the news of the coup d’état, his passion to go to Paris and take his part in the inevitable struggle which he saw mustarise between the second empire and the spirit of liberty was not to be restrained, and in 1853 he once more took up his abode in Paris. He at first tried in vain to get work on various newspapers, and then to get his first book which had been sketched out for some years, published. No publisher was to be found, and L’Hglise et les Philo- sophes au XVIITiéme Siécle was printed eventually at his own expense. It appeared in 1855, and at once achieved a great success, and introduced its author to some of the best literary society in Paris. It was followed in 1857 b an Hissar sur la Révolution francaise, and in 1860 by the Histoire politique des Papes, and the Lettres @ Everard. The latter are a revelation of what Lanfrey thought and

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felt at this time, of his despair that France would ever get free from the enervating rule of the second empire, of his disgust at the literary sterility of the time in confin- ing itself to vague philosophy and vaguer criticism ; and through them he first became known outside the literary world. He had hitherto been intimate with such choice spirits as Ary Scheffer, Gleyre, and the Comtesse d'Agoult, better known as Daniel Stern, but the Lettres d' Everard introduced him to the most fashionable Parisian society of the time, and the position he held in it is bestto be found in the description of him contained in the souvenirs of his friend, Madame Clara Jaubert. In 1860 also he was appointed by M. Charpentier editor of the new Revue National, in which he wrote the fortnightly chronicle of affairs for four years, besides various articles and reviews, collected in 1864 under the title of Htudes et Portraits politiques. After resigning his editorship in 1864 he set to work on his great Histoire de Napoléon I., in which he intended to overthrow the monument M. Thiers had erected to Napoleon in his Histoire du Consulat et de Empire, and to show the demigod uncle of Napoleon III. to have been but an immoral man and bad politician. The fourth volume of his history had not been published three months when the war of 1870 broke out. At first Lanfrey knew not what view to take, but on the defeats of the French, and the declaration of the republic, he enlisted as a simple volunteer, and marched to Lyons with his bat- talion. While there he heard first that his vigorous opposition in the press to the powerful influence of M. Gambetta had lost him his election to the Constituent Assembly in his native province, and next that he had been elected by the department of the Bouches du Rhdne, in which he had never set foot. In the Assembly he warmly supported the Government of M. Thiers, and op- posed the radical party as vehemently as he had opposed the empire, saying that both savoured of tyranny. In 1871 M. Thiers appointed him French minister in Switzerland, where he remained till 1874, when he insisted on his resig- nation being accepted by the Duc de Broglie, and once more took his seat asa moderate republican. In 1875 he published the fifth volume of his Hestoire de Napoléon, and in 1876 was elected a life senator; but his strength was fast failing, and, before he could give his

sixth volume the careful revision he considered indispensable, he died at Pau on the 16th November 1877.

The first predominant idea of Lanfrey, both as a politician and an historian, was a love of liberty which was perpetually putting him in opposition to all parties in turn. In his first book he attacked the church, not because of its doctrines so much as because of its attempts to stifle liberty of thought. In his Essaz sur la Révolu- tion, on the other hand, he assailed Robespijerre and the democrats because they defended attempts on individual liberty with the assertion that they were necessary for liberty in general. His second leading idea was a belief in strictest morality in polities ; by this standard in his Ftudes he condemns M. Thiers for slurring over the political immorality of Napoleon, Daunou for giving up his old Girondin standpoint to defend the concordat, and Carnot for putting his name to measures of the committee of public safety which he abhorred, in order to maintain himself in power. These two ideas, love of liberty, involving a hatred alike of despotism and democracy, and a stern standard of political morality, are to be seen throughout Lanfrey's great work on Napoleon. No military success ever to him seems to compensate for immoral means to gain an end; no glamour is for him cast over evil actions by glory or fine words; no sareasm is too severe for the man who cared not for truth but only for effect. Before such a judge Napoleon appears but a small man; and, if at times the judgment seems almost too severe, it must be remembered that the author lived through a time when an emperor ruled entirely owing to the influence that the great deeds of his uncle had thrown over the minds of the French people, and that he wrote with the intention of for ever breaking down that influence by exhibiting the naked truth, and destroying for ever the N apoleonic legend.

For Lanfrey's life consult three articles by the Comte d'Haussonville in the Revue des Deux Mondes for September, October, and November 1880; the bio-

graphical notice of M, de Pressensé, prefixed to the last edition of his works; and the numerous letters from him contained in the Souvenirs

of Madame Jaubert.

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LANGENSALZA, chief town of a circle in the govern- ment district of Erfurt, in the province of Saxony, Prussia, is situated on the Salza, about 20 miles north-east of Erfurt. It has an old castle, several schools of various grades, and three hospitals; and near it are the remains of the old monastery of Homburg. The manufacture of cloth is the chief industry, but lace, starch, and chemicals are also produced. The population of the town in 1875 numbered 9855. ‘There is a sulphur bath in the neigh- bourhood. Near Langensalza the Prussians and Han- overians had a long and bloody engagement, June 27-29, 1866, which ultimately resulted in the capitulation of the latter.

LANGLAND, or Lanetey, WILLIAM, the author of a remarkable poem belonging to the close of the 14th century, of which the full title is—TZhe Vision of William concerning Piers the Plowman, together with Vita de Do-wel, Do-bet, et Do-best, secundum Wit et Resoun.+

The author’s name is not quite certain, and the facts concerning his life arefew and scanty. As to his Christian name we are sure, from various allusions in the poem itself, and the title Visto Willelmi, &c., in many MSS.; and we may at once reject the suggestion that his name may have been Robert. In no less than three MSS. occurs the following colophon: “ Explicit visio Willelmi W. de Petro le Plowman.” What is here meant by W. it is difficult to conjecture ; but it is just possible that it may represent Wychwood (of which more presently), or Wigorniensis, 7.c., of Worcester. As to the surname, we find the note that “Robert or William Langland made pers ploughman,” in a handwriting of the 15th century, on the fly-leaf of a MS. copy belonging to Lord Ashburnham; and in a Dublin MS., is the note: “ Memorandum, quod Stacy de Rokayle, pater Willielmi de Langlond, qui Stacius fuit generosus, et morabatur in Schiptone-under-Whicwode, tenens domini le Spenser in comitatu Oxon., qui predictus Willielmus fecit librum qui vocatur Perys Ploughman.” Nevertheless, it would seem that Langland should rather be Langley, since there is no trace of any Langland family in the midland counties, while the

Langley family were wardens of Wychwood forest in Oxfordshire between the years 1278 and 1362. The question has been fully discussed by Professor Pearson in the North British Review, April 1870,

244, According to Bale, our author was born at Cleobury Mortimer, which is quite consistent with the supposition that his father may have removed from that place to Shipton in Oxfordshire, as there seems to have been a real connexion between the families in those places. It must not be omitted that in the parish of Shipton-under- Wychwood there is a hamlet named Langley, from which he may have received his name.

The internal evidence concerning the author is fuller and more satisfactory. By piecing together the various hints concerning himself which the poet gives us, we may compile the following account. His name was William (and probably Langley), and he was born about 1332 perhaps at Cleobury Mortimer in Shropshire. His father, who was doubtless a franklin or farmer, and his other friends put him to school, made a “clerk” or scholar of him, and taught him what Holy Writ meant. In 1362, at the age of about thirty, he found himself wandering upon the Malvern hills, and fell asleep beside a stream, and saw in a vision a field full of folk, i.e. this present world, and many other remarkable sights which he duly records. From this supposed circumstance he named his poem The Vision of William, though it is really a succession of visions, since he mentions several occasions on which he awoke, and

1 The title is usually given in Latin as Visio Willelmi de Petro Plowman, &c., and the whole work is sometimes briefly described as Liber de Petro Plowman.

afterwards again fell asleep; and he even tells us of some adventures which befel him in his waking moments. In some of these visions there is no mention of Piers the Plowman, but in others he describes him as being the coming reformer who was to remedy all abuses, and restore

the world to a right condition. It is remarkable that his conception of this reformer changes from time to time, and becomes more exalted as the poem advances. At first he was no more than a ploughman, one of the true and honest labourers who are the salt of the earth; but at last he is identified with the great reformer who has come already, the regenerator of the world in the person of Jesus Christ. We may, in fact, consider Piers the Plowman as represent- ing Christ himself, or, in the author's own phrase—" Petrus est Christus." If this be borne in mind, it will not be possible to make the mistake into which so many have fallen, of speaking of Piers the Plowman as being the author, not the subject, of the poem. The author may best be called William, or we may even give him the nickname of Long Will, which, as he himself tell us, was bestowed upon him from his tallness of stature,—just as the poet Gascoigne was familiarly called Long George. Though there is mention of the Malvern hills more than once near the beginning of the poem, it is abundantly clear that the poet lived for " many years in Cornhill (London), with his wife Kitte and his daughter Calote." He seems to have come to London not long after the date of the first com- mencement of his work, and to have long continued there. 'He describes himself as being a tall man, one who was loath to reverence lords or ladies or persons in gay apparel, and not deigning to say 'God save you" to the sergeants whom he met in the street, insomuch that many people took him to be a fool. He was very poor, wore long robes, and had a shaven crown, having received the clerical tonsure, But he seems only to have taken minor orders, and earned a precarious living by singing the placebo, dirige, and seven psalms for the good of men's souls. The fact that he was married may explain why he never rose in the church. But he had another source of livelihood in his ability to write out legal documents, and he was extremely familiar with the law courts at Westminster. His leisure time must have been entirely occupied with his devotion to his poem, which was essentially the work of his lifetime. He was not satisfied with rewriting it once, but he actually rewrote it twice; and from the abundance of the MSS. which still exist we can see its development from the earliest draught, written about 1362, to its latest form, written after 1390, It is remarkable that the intermediate form, written later than 1370, is perhaps, taken upon the whole, the best of the three.

In 1399, just before the deposition of Richard II., appeared a poem addressed to the king, who is designated as “ Richard the Redeles,” 2.¢., devoid of counsel. This poem, occurring in only one MS., in which it is incomplete, breaking off abruptly in the middle of a page, may safely be attributed to the same author, who was, at the time, passing through Bristol. As he was then abont sixty-seven years of age, we may be sure that he did not long survive the accession of Henry IV. It may here be observed that the well-known poem entitled Pierce Ploughman’s Crede, though excellently written, is certainly an imitation by another hand, viz., by the anonymous author of Zhe Plowman’s Tale, which is inserted in the black-letter editions of Chaucer, though it is none of his. The Pierce Ploughman of the Crede is very different in con¢eption from the subject of William’s vision. ;

As regards the poem itself, it has been already said that it exists in three forms. If we denote these by the names of A-text, B-text, and C-text, we find, of the first, twelve MSS. ; of the second, six-

teen; and of the third, also sixteen MSS. A few of these show confusion between the different types, but they may roughly be

classed as above; and it will be seen that we thus have abundance of material, a circumstance which proves the great popularity of the poem in former times. Owing to the frequent expressions which indicate a desire for reformation in religion, it was, in the time of Edward VI., considered worthy of being printed. Three impres- sions were printed by Robert Crowley in 1550 ; and one of these was badly reprinted by Owen Rogers in 1561. In 1813 the best MS. of the C-text was printed by Dr Whitaker in an expensive form. In 1842 Mr Thomas Wright printed an edition from an excellent MS. of the B-text in the library of ‘Trinity College, Cambridge (second edition, 1856). A complete edition of all three texts was undertaken, for the Early English Text Society, by the Rev. W. W. Skeat, but is not yet finished (1881). Vols.i., i, and iii., containing the three texts, and the poem of Richard the Redeles, appeared in 1866, 1869, and 18738 respectively, and a part of vol. iv., containing full notes to all three texts, with some indexes, in

1877. / :

The general contents of the poem may be inferred from a brief description of the latest text. This is divided into twenty-three passus, nominally comprising four parts, called respectively Visio de Petro Plowman, Visio de Do-wel, Visio de Do-bet, and Visio de Do- best. Here Do-bet signifies ‘‘do better” in miodern English; and the author’s own explanation of the names is that he who does a kind action does well, he who teaches others to act kindly does better, but he who combines both practice and theory, both doing good himself and teaching others to do the same, does best. But the visions by uo means closely correspond to these descriptions ; the poet really gives us a set of eleven visions, which may be thus enumerated :—(1) Vision of the Field Full of Folk, of Holy Church, and of the Lady Meed (passus i—v.); (2) Vision of the Seven Deadly Sins, and of Piers the Plowman (pass. vi.—x.); (3) Wit, Study, Clergy, and Scripture (pass. xi., xii.) ; (4) Fortune, Nature, Recklessuess, and Reason (pass. xiii., xiv.) ; (5) Vision of Imagina- tive (pass. xv.) ; (6) Conscience, Patience, and Activa-Vita (pass. xvi., xvii.); (7) Free-will, and the Tree of Charity (pass. xviii., xix.) ; (8) Faith, Hope, and Charity (pass. xx.); (9) The Triumph of Piers the Plowman, 7.¢., the Crucifixion, Burial, and Resurrection of Jesus Christ (pass. xxi.) ; (10) The Vision of Grace (pass. xxii.) ; (11) The Vision of Antichrist (pass. xxiii.).

This bare outline gives but little idca of the real nature of the poem. The general plan of it is slight and somewhat vague, but the execution is vivid and remarkable. The author’s object was to afford himself opportunities by the way (of which he has amply availed himself) of describing the life and manners of the poorer classes; of inveighing against clerical abuses and the rapacity of the friars; of representing the miserics caused by the great pesti- lences then female and by the hasty and ill-advised marriages consequent thereupon ; and of denouncing lazy workmen and sham beggars, the corruption and bribery then too common in the law- courts, and all the numerous forms of falsehood which are at all times the fit subjects for satire and indignant exposure. In describ- ing, for example, the scven dcadly sins, he gives so exact a description of Glutton and Sloth that the readers fcel that these are no

mere abstractions, but drawn from the life, and it becomes hardly more difficult to realize Glutton than it is to realize Sir John Falstaff. The numerous allegorical personages so frequently in- troduced, such as Scripture, Clergy, Conscience, Patience, and the like, are all mouthpieces of the author himself, uttering for the most part his owu sentiments, but sometimes speaking in accordance with the character which each is supposed to represent. The theo- logical disquisitions which are occasionally introduced are somewhat dull and tedious, but the earnestness of the author's purpose and his energy of language tend to relieve them, and there are not may

assages which might have been omitted without loss. The poem 1s essentially one of those which improve on a second reading, aud as a linguistic monument it is of very high value. Mere extracts from the pocm, even if rather numerous and of some length, fail to give a fair ideaof it. The whole deserves, and will repay, a careful study ; indeed, there are not many single works from which a student of English literature and of the En derive more substantial benefit.

The metre is alliterative, and destitute of final rhyme. It is not very regular, as the author's earnestness led him to use the fittest words rather than those which merely served the purpose of rhythm The chief rule is that, in general, the same letter or combination AE letters should begin three emphatie syllables in the same line. as for example, in the line which may be modernized thus: 'Of all manner of men, the mean and the rich." Sometimes cher are but two such rhyme-letters, ag: '' fight of the commons made him to pan pg Toe are four, as: "In a summer season, when soft was the sun." 'There is invariably a pause a dis. tinct, in the middle of each line. tie

See the editions already referred to; The Deposition of Richard Wright (Camden Society), which is the same poem ee ees Warton, Hist. of Eng. Poetry; Milman, Mist. of Latin Christianity ; Marsh, Lectures on English; H. Morley, English Writers, &c. Along and careful sum- mary of the whole poem js giyen in Hlusérations of English Religion, by H. Morley, ch. iii. (CW. W.S.)

glish language may

LANGRES, a town in the department of Haute-Marne, France, 186 miles south-east from Paris, stands at a height of some 1550 feet, upon a jutting promontory of the table- land to which it gives its name (Plateau de Langres), and overlooks, eastward and westward respectively, the valleys of the Marne and its tributary the Bonnelle. Its situa- tion involves a rigorous climate, but also gives it strategic importance. ‘The citadel stands to the south of the town, where it joius the table-land. From the ramparts and the cathedral tower there is an exteusive view over the valley of the Marne, the Vosges, and the Céte d’Or; and in clear weather Mont Blanc (160 miles distant) is visible. Several detached forts and numerous batteries make Langres one of the strongest fortified camps of the country. The cathedral, the choir and nave of which date from the 12th and 13th centuries, possesses some fine features, but has been debased by a front in the style of the 17th century. The church of St Martin possesses a Christ, which is one of the finest wood-carvings known. The Gallo-Roman gate, one of four entrances to the town in the time of the Romans, is conjectured to have been intended as a triumphal arch to some victorious emperor, perhaps Marcus Aurelius. The gate “des moulins” is now the most note- worthy in the town. Langres possesses an antiquarian museum and a rather important library, as well as a picture gallery. The cutlery which bears the name of Langres is manufactured in the neighbourhood. Population, 10,375.

The town takes its name from the Lingones, who occupied it in the time of Cesar. Under the Capets its bishop was an ecclesiastical peer of the kingdom, and held the sceptre at royal coronations.

LANGTON, StrerHen (c. 1150-1228), cardinal, forty- fourth archbishop of Canterbury, was born about the middle of the 12th century; the place of his birth is unknown, but his family almost certainly belonged to Yorkshire. He had already been made a prebendary of York, most probably at an early age, when he went to France and entered the university of Paris; there he soon rose to distinction alike in philosophy and theology, and ultimately, it is said,

became chancellor or at least attained high rank in the governing body. One of his fellow students and intimate friends in Paris was Lothario, the nephew of Clement III., who when he in 1198 succeeded Celestine IIT. as Innocent III. forthwith appointed Langtou to a post in his household. In 1206 he became cardinal priest of St Chrysogonus, a promotion on which he received the written congratulations of his sovereign King John. It was shortly after this that he first became involved in the great constitutional struggles with which his name is so honourably associated. In 1205 Hubert Walter of Canter- bury had died, and there were urged at Rome the claims of two rival candidates for the vacant see,—Reginald the subprior of Christ Church, Canterbury, who had been the sudden and unauthorized choice of a majority of the monks, and John de Gray, bishop of Norwich, whom the dissenting minority had subsequently elected with the royal sanction. Setting aside both claims, and also the appeal of the suffragans of Canterbury with the chapter, who maintained that the right of election was theirs, Innocent commanded the monks then present in Rome to proceed to a new election in his presence, Langton being the candidate set before them. Elected he accordingly was, and afterwards consecrated by the pope himself at Viterbo in June 1207. John immediately retaliated by banishing the monks of Canterbury, afterwards writing an angry and threatening letter to the pope. Innocent replied with firmness, but, finding John immovable, ultimatelydeclared his resolution to enforce submission to his will by laying England under an interdict, a resolution which was carried into effect in March 1208. For the next few years, all negotiations for his admission to his see having failed, Langton had his

home in the Cistercian monastery of Pontigny near Sens in France, which thus became a principal resort of English malcontents and refugees. In the summer of 1212 he accompanied the bishops of London and Ely to Rome, and it was in consequence of their representations that deposi- tion was passed upon John; the same prelates were also present at the great assembly of Soissons (April 1213), where a crusade against the king of England was set on foot,

under the leadership of Philip of France. In the following May John made his peace, agreeing to recognize Langton, receive the exiled clergy, and restore the property which he had confiscated. Langton did not actually reach England till July, when (July 20, 1213) he performed his first episcopal act by pronouncing the absolution of the excommunicated John, who swore that all the laws of his grandfather Henry I. should be kept by all throughout the kingdom, and that all unjust laws should be utterly abolished. This oath the king was held by the archbishop to have violated almost immediately in levying war irregu- larly against the barons who had, not illegally, deserted him at Portsmouth ; and at the meeting held in St Paul's, London, on August 25, 1214, it was Langton who produced the old charter of Henry L, and suggested the deniand for its renewal, a suggestion which in the following year issued in the concession of Magna Charta at Runnymede. Soon afterwards tlie archbishop left England for Rome to attend the fourth Lateran council, but not before he had by the commissioners of the pope been pronounced contumacious, and declared to be suspended for his refusal to publish the excommunication of the English barons who had joined in obtaining the great charter. At Rome, where the sentence of his suspension was confirmed, he remained from November 1215 till May 1218; in September of the latter year he presided in the council held at London, where Magna Charta was solemnly confirmed ; and on May 17, 1220, he officiated at the re-coronation of Henry IIT. In the same year the "translation" of St Thomas of Can- terbury took place. Among the fragmentary notices we possess of the remainder of Langton's life are mentioned his demand in name of the barons for royal confirmation of the charter at London in 1223. He died at Slindon on July 9, 1228.

The principal authority for the events of the life of Langton is the Chronicle of Roger of Wendover. See Hook's Lives of the Arch- bishops of Cantcrbury, vol. ii.; Pearson's History of England, vol. aa se" continuation of Lappenberg's Geschichte von Eng- and, vol. iii.

LANGUAGE. See Puinorocy.

LANGUEDOO, a province of France, which lay be- tween the Garonne on the west and the Rhone on the east, with the Pyrenees and the Mediterranean on the south. It was divided into the thrce sénéchaussées of Toulouse, Carcassonne, and Beaucaire; and it comprised, besides the province proper, the districts of Gevaudan, Vellai, Vivarez, Cevennes, and Foix. It contained the important cities of Toulouse, Carcassonne, Narbonne, Montpellier, Nismes, Cette, Viviers, Alby, and Foix. The south-western spurs of the Cevennes run across the pro- vince from the north-east to meet the first slopes of the Pyrenees. In spring and early summer no part of France possesses a more delightful climate than Languedoc, while Montpellier and its neighbourhood, in spite of the mistral, was up to recent times considered as an excellent retreat for consuniptive patients. The Roman remains of Nismes, the lagoons and decayed towns of the Gulf of Lyons, the historical associations of Montpellier, the fine medizxval fortress of Carcassonne, the old towers and the hétel de ville of Narbonne, the little known scenery of the eastern Pyrenees, with the castles of Foix and Tarascon, and Toulouse with its churches, fairs, floral games, and winding streets, make the country one of the most interesting in the

whole of France. Here maystill be heard the soft accents of the Langue d'Oc, a language which has not, even yet, spoken its last word in the poetry of the world.

Gallia Narbonensis, one of the seventeen provinces into which the empire was divided at the death of Augustus, occupied nearly the same extent as the province of Languedoc. It was rich and flourishing, crowded with great towns, densely populated, with schools of rhetoric and poetry, theatres, amphitheatres, and splendid temples. From Narbo Martius came the rhetorician and poet Montanus, who was exiled by Tiberius to Majorca; from Nismes came Doniitius Afer; and the emperors Carinus and Numerianus were also natives of Narbonne. The planting of Christianity, though doubtless the Greeks of Massilia heard of it before, was accomplished, accord- ing to tradition, by St

Trophimus of Arles, St Paul of Beziers, and Saint Saturnin of Toulouse. It is char- acteristic of the country that its ecclesiastical historians lament even in the earliest ages a tendency to heresy among its people. At the break up of the Roman empirc the Visigoths founded the kingdom of Toulouse (412 4.p.), and in a few years spread their conquests over Narbonensis, Novempopulana (Gascony), and Aquitania in France, as well as over the whole of the Spanish peninsula. They were driven out of France by Clovis, but retained "Septimania," the country of the seven cities—Narbonne, Carcassonne, Elne, Beziers, Maguelonne, Lodéve, and Agde—that is, very nearly the arca occupicd later by the province of Languedoc. At the council of Narbonne (589) five sorts of people are mentioned as living in the pro- vince:—the Visigoths, then the ruling race, Romans, Jews, of whom there were a great many, Syrians, and Greeks. It was not until the year 759, when Pippin took their chief town, Narbonne, that the Visigoths were forced across the Pyrenees, and the country became part of the great empire bequeathed by Pippin to his great son Charles. Septimania became part of the kingdom of Aquitaine, but was separated from it and constituted a special duchy in the year 817. Two or more invasions of the Saracens took place in the 9th century, and the Normans made a descent upon the coast in the year 859. Early in the 10th century we find the whole province in the power of the counts of Toulouse, and one of the great fiefs of the crown of France. While the Normans were ravaging the north of France and laying siege to Paris, the Saracens from the mouths of the Rhonc were plundering and harrying the county of Toulouse. Neither in the south nor in the north of the country was there during the terrible 10th and 11th centuries any peace or comfort. A frightful pestilence desolated Aquitaine and Toulouse in the year 1000; and in 1032 a famine began which lasted for three years. Yet the court of Toulouse was already remarkable for its "luxury," as the ecclesiastical writers call it,—rather for its love of art and literature, combined with extravagance of dress and fashions. Constance, wife of King Robert, and daugliter of the count of Toulouse, gave great offence to the monks by her following of gallant countrymen. They owed their tastes, not only to their Roman blood and the survival of their old love for rhetoric and poetry, but also to their intercourse with the Saracens, their neighbours and enemies, and

their friends when they were not fighting. On the preaching of the crusade, no part of France responded with greater enthusiasm than the south. A hundred thousand men followed Raymond de Saint Gilles. A century later their own country was to be the scene of another crusade even more bloody than that against the Saracen.

The heresies which were the cause of so much blood- shed may, perliaps, be said to have begun with Peter de Brueys, who preached in Languedoc for twenty years, until he was silenced by the usual method. He denied

infant baptism, respect for churches, the worship of the cross, transubstantiation, and prayers for the dead. His follower, Henry the Deacon, most eloquent of preachers, denied a great deal more. Wherever he taught he left deserted churches and contempt for the clergy. Although Bernard himself was invited to lend his persuasive powers to restore the cause of the church, he succeeded for a time only. Toulouse, for instance, was brought back to ortho- doxy ; yet when the great preacher went away the citizens relapsed. Again, there were the poor men of Lyons, the followers of Peter Waldo, of whom there were many in Languedoc ; and there were the Manichzaus, under the name of Puritans, Paterines, or Populars. In Languedoc and Provence the ground was ready for the seed of heresy. The towns were wealthy and free, the people had been in continual intercourse with Saracens of Palestine aud Moors in Spain; they had never entirely rid themselves of pagan customs ; their poetry taught the joys of life rather than the fear of death; their restless inquiring minds prompted them to ask whether there were any other solution of the problem of life than that offered by the church. The whole province—the county of Toulouse, with its fiefs of Narbonne, Beziers, Foix, Montpellier, and Quercy—was in open and scornful secession. It seems incredible, but it is doubtless true, that the churches were universally deserted, sacraments denied, and clergy despised. The history of the crusade, in the reign of Raymond VL, against the heretics of Languedoc contains every element of cruelty and horror. The count made haste to submit, but it

was of no avail. Bishops, papal legates, and ecclesiastics of all ranks headed the vast armies which were gathered together against the freethinkers. All the cities, one after the other, the castles, and the strongholds of Languedoc were taken by the crusaders. Raymond was made to submit to the lowest abasement; the country was wasted ; the people were destroyed by fire and sword. When all was over, wlien Raymond and Simon de Montfort were dead, and King Louis VIII. had led a vast army of conquest through the country, the council of Toulouse was held, in order to subject the people to total spiritual submission. They chose the method, which seems so easy but is so difficult, of universal espionage and delation. They succeeded in enforcing apparent submission; but the spirit of religious freedom lingered among the people, and yet survives, for nearly half the Protestants in France belong to the south. The pacification of Languedoc was completed by the annexation of the county to the crown of France. In 1229 Count Raymond VII. renounced his claim to seven provinces, and swore fealty to the king.

Languedoc had, for two centuries, no other history apart from that of France. The long wars with the English affected the country little The province, comparatively safe from war, continued to increase and prosper in wealth. When it begins again to havea history of its own, it appears to be the home of the most bigoted orthodoxy. The university of Toulouse burns a professor, Caturce, for supposed heresy, and exiles a scholar, Dolet, for daring to sympathize with him, At the east of the province, how- ever, Rabelais, who carries with him an atmosphere of free thought, is lecturing and dissecting; and in the west of the province Gerard Roussel is already preaching the doctrines of a purer faith. In the wars of religion, the great recruiting ground of Coligny was in those southern provinces against which Simon de Montfort had led his crusade. The insurrection of the Camisards belongs to the history of Languedoc, but the struggle was confined to the north part of the province. The pacification by Villars and the duke of Berwick, the horrible cruelties practised upon the people, and the singular story of Cavalier are noticed elsewhere.

A special interest attaches to the history of two towns, at least, of Languedoc. Both Montpellier and Toulouse present very remarkable features of interest to the student of municipal histories. The literature of the country is the literature called after its neighbour Provence (g.v.). Probably no great future remains for the literature of a dialect slowly dying out, yet examples have not been wanting of late to prove that there is still vitality in the language of the people. (W. BE.)

LANGUET, Huperr (1518-1581), diplomatist, and one of tlie boldest political writers of the 16th century, was born in 1518 at Viteaux, near Autun in Burgundy, where his father held a good official position. He early manifested an inclination for study, and his tastes were encouraged by able masters; at Poitiers he devoted him- self not only to law but also to natural science, history, politics, and theology. On leaving that university, after a sojourn at Leipsic, where he became the friend of Canierarius, he visited Padua and Bologna, and saw many other parts of Italy. Having been introduced in the course of his Italian journey to the Loct Theologict of Melanchthon, he in 1549 set out for Wittenberg to make the acquaintance of that author, and thus originated a friendship which terminated only with the death of the latter in 1560. Between 1551 and 1557 Languet travelled extensively in Germany, Denmark, Sweden, Finland, and Lapland, and in 1559 he entered the diplomatic service of the elector of Saxony, where he remained until his death. During the greater part of this period he was employed chiefly in negotiations with France and in the interest of the Huguenots. He was present in Parison St Bartholomew's Day (1572), and was the means of saving his friends Wechel the printer, and Duplessis-Mornay ; but his efforts drew on him the attention of the mob, and he himself in turn became indebted for his life to the chancellor Morvilliers. From 1573 to 1576 his mission lay chiefly at the imperial court; here he gained the acquaintance and ultimately the close friendship of Sir Philip Sidney. About 1578 he went to Ghent on the invitation of John Casimir, whom he accompanied to England, and the rest of his days he spent chiefly in the Low Countries, watch- ing the course of political events. There seems to be no ground, however, for the assertion that in 1577 he had resigned his connexion with the

court of Saxony, and formally attached himself to the prince of Orange. Lan- guet died at Antwerp on September 30, 1581.

His correspondence with Augustus of Saxony (three hundred and twenty-nine letters, from November 17, 1565 to September 8, 1581) and with Mordeisen, the chancellor of the duchy (one hundred and eleven letters, from November1559 to the summer of 1565), were published by Ludovicus at Halle in 1699 under the title Arcana sxcult XVI. Huberti Langueti Epistolez politice et historice ad Philip. Sydnxum (ninety-six letters, from April 22, 1573 to October 28, 1580) appeared at Frankfort in 1633, and have since been reprinted. Langucti Epistole ad Joach. Camcrariwm, patrem et filium (one hundred and eight letters) were published by L. Camerarius at Groningen in 1646. The Historica Descriptio of the siege and capture (1567) of Gotha appeared in 1568. The work by which Languet is best known is pseudonymous, and its authorship has not been undisputed. It is entitled Vindiciz contra tyrannos, sive de principis in populum populique in principem legitima potestate, Stephano Junio Bruto Celta auctorc, and bears to have been published at Edinburgh in 1579. By Edinburgh is most probably to be understood Basel. A French translation appeared in 1581 ; the original has been frequently reprinted, most recently at Leipsic in 1846. The work, which dis- cusses with much freedom various points connected with the then familiar doctrine of passive obedience, attracted much attention, but its author was very successful in concealing the somewhat dan- gerous secret of his identity. It has been attributed to Beza, Hotman, Casaubon, and Duplessis-Mornay, by divers writers on various grounds—to the last-named on the very respectable autho- rity of Grotius. The grounds on which Bayle (who has been followed almost unanimously by later writers) assigned it to Languet will be found in the form of a supplement to the Dictionnaire. The Apologie cu défence de Guillaume, Prince d’ Orange, contre le ban et

Pédit du rot d’ Espagne (Antwerp, 1581) is sometimes attributed to Languet. There seems little doubt, however, that it was really the work

of the prince himself, with the help aue ef Pierre de Villiers (see Motley, Mise of Dutch Republic) or of Languet (Groen van Prinsterer, Archives).

LANNES, Jean (1769-1809), marshal of France, was born at Lectoure, 11th April 1769. He was the son of a livery stables keeper, and was himself in early life appren- ticed to a dyer. He had had but little education, but not- withstanding this his great strength and proficiency in all manly sports caused him in 1792 to be elected sergeant- major of the battalion of volunteers of Gers, which he had joined on the breaking out of the war between Spain and the French republic. He served through the cam- paigns in the Pyrenees in 1793 and 1794, and in the latter year was elected chef de brigade. However, in 1795, on the reform of the army introduced by the Thermidorians, he was dismissed from his rank. Not discouraged by this check, he re-enlisted as a simple volunteer in the army of Italy. In the famous campaign of 1796 he again fouglit his way up to high rank, being eventually made once more chef de brigade by Bonaparte. He was distinguished in every battle, and was wounded at Arcola. He was chosen by Bonaparte to accompany him to Egypt as general of one of Kléber's brigades, in which capacity he greatly distinguished himself, especially on the retreat from Syria. He went with Bonaparte to France, assisted at the 18th Brumaire, and was appointed general of division, and commandant of the consular guard. He commanded the advanced guard in the 'crossing of the Alps in 1800, was instrumental in winning the battle of Montebello, from which he afterwards took his title, and bore the brunt of the battle of Marengo. In 1801 Napoleon tried his favourite general as a diplo- matist, and sent him as ambassador to Portugal. Opinions differ as to his merits in this capacity, but it may be presumed that Napoleon did not believe in them, as he never made such use of him again. On the establishment of the empire he was created a marshal of France, and commanded once more the advanced guard of a great French army in the campaign of Austerlitz. At Austerlitz he commanded the left, at Jena the centre, and at Fried- land the centre of the French army, showing himself a general of division of the greatest merit, carrying out the orders given him to the letter, and never thinking them impossible. He was now to be tried as a

commander- in-chief, for Napoleon took him to Spain in 1808, and gave him a corps d'armée, with which he won a victory over Castafios on November 22. In January 1809 he was sent to attempt the capture of Saragossa, and by February 21 was in possession of the place. Napoleon then created him Duc de Montebello, and once more, for the last time, gave him the command of the advanced guard of an army of invasion. At Aspern he was ordered with two divisions to cut the Austrian army under the archduke Charles in half; he succeeded entirely, though under a heavy fire, but finding himself unsupported by Napoleon, who had been thrown into confusion by the news that his bridges over the Danube had been broken, he had to retreat. During the retreat he exposed himself as usual to the hottest fire, and received a mortal wound, As he was being carried from the field to die at Vienna, he is said to have met and reproached his old general for his ambition; but this, to say the least, is a contested statement. Napoleon said of him that "he had found him a pigmy, and made him a giant"; and there can be no doubt of his marvellous ability on the field, and his extra-ordinary courage. His eldest son was made a peer of France by Louis XVIIL

A Vie militaire de J. Lannes was published in 1809 by René Pcie but details can be found in all the military histories of the ime,

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LA NOUE, Francois pe (1531-1591), surnamed Bras-de-Fer, one of the gallant Huguenot captains of the 16th century, was born near Nantes in 1531, of an honour- able and ancient Breton family. His first exploit was the capture of Orleans at the head of only fifteen cavaliers in 1567, during the second Huguenot war. At the battles of Jarnac in March 1569 and of Moncontour in the following October, La Noue was taken prisoner; but he was exchanged on the latter occasion in time to resume the governorship of Poitou, and inflict a signal defeat on the royalist troops before Rochefort. At the siege of Fontenay (1570) his left arm was shattered by a bullet; and the iron limb that replaced it won him from his soldiers the sobriquet of Iron- Arm.

When peace was made in France in the sane year, La Noue carried his sword against the Spaniards in the Netherlands, but was taken at the recapture of Mons by the Spanish in 1572. Permitted to return to France, he was commissioned by Charles IX. to attempt to reconcile the inhabitants of La Rochelle, the great stronghold of the Huguenots, to the king. But the Rochellois were too much alarmed by the recent massacre of St Bartholomew to come to any terms; and La Noue, perceiving that war was imminent, and knowing that his post was on the Huguenot side, gave up his royal commission, and from 1574 till 1578 acted as general of La Rochelle. When peace was again concluded, La Noue once more went to aid the Protestant estates of the Netherlands. Holding a high rank in their army, he took several towns and captured Count Egmont in 1580; but a few weeks afterwards he himself fell into the hands of the Spaniards. Thrust into a loathsome prison at Limburg, La Noue, the admiration of all, of whatever faith, for his gallantry, honour, and purity of character, was kept confined for five years by a powerful nation, whose reluctance to set him free is one of the sincerest tributes to his reputation. At length, in June 1585, La Noue was exchanged for Egmont and other prisoners of consideration, while a heavy ransom and a pledge not to bear arms against his Catholic majesty were also exacted from him. Till 1589 La Noue took no part in public matters, but in that year he joined Henry of Navarre and Henry III. against the Leaguers. He was present at both sieges of Paris, and at several of the chief battles; but at the siege of Lamballe in Brittany he received the wound of which he died some days later at Moncontour, August 4, 1591.

Bentivoglio exaggerates in saying that La Noue wasas famous by his pen as by his sword. What writings he has left are of value enough, but it is not by them that he is remembered. He was the author of Discowrs Politiques et Militaires, 1587 ; Déclaration pour prise @armes et la défense de Sedan et Jamets, 1588 ; Observations sur U Histoire de Guiccrardini, 2 vols., 1592; and notes on Plutarch’s Lives, which have not been published. His Correspondance was published in 1854. See La Vie de Frangois, scigneur de La Noue, by Moyse Amirault, Leyden, 1661 ; Brantéme’s Vics des Capitaines Francais; C. Vincen’s Les

Héros de la Réforme: Fr. de La Nowe (1875) ; and Haag, La France Protestante.

LANSDOWNE, Witt1am Petry FItzZMAURICE, FIRST Marquis or (1737-1805), better known as a statesman while earl of Shelburne, was born at Dublin, May 20, 1737. He was a descendant of the lords of Kerry, and his grand- father, who was created earl of Kerry, married a daughter of Sir William Petty. On the death without issue of Sir William Petty's son, the first earl of Shelburne, the estates passed to his nephew John Fitzmaurice (afterwards ad- vanced to the earldom of Shelburne), the father of the subject of the present notice. The latter spent his child- hood "in the remotest parts of the south of Ireland," and, according to his own account, when at the age of sixteen he entered Christ Church, Oxford, he had both "every- thing to learn and everything to unlearn." From a tutor whom he describes as "narrow-minded" he received advantageous guidance in his studies, but he attributes

his improvement in manners aud in knowledge of the world chiefly to the fact, that, as was his " fate through life," he fell in '' with clever but unpopular connexions." Shortly after leaving the university he served as an officer in Wolfe's regiment during the Seven Years' War, and so distinguished himself at Minden and Kloster-Kampen that he was raised to the rank of colonel and appointed aide-de-camp to the king. Being thus brought into near communication with Lord Bute, he was in 1761 em- ployed by that nobleman to negotiate for the support of Charles Fox. For a few months in the same year he sat in the House of Commons as member of Wycombe, until he succeeded his father as earl of Shelburne in the Irish peerage, and Baron Wycombe in the peerage of Great Britain. Though he declined to take office under Bute he undertook negotiations to induce Fox to gain the consent of the Commons to the peace of 1763. Fox affirmed that he had been duped by the terms offered, and, although Shelburne always asserted that he had acted in thorough good faith, Bute spoke of the affair as a "pious

fraud.” Shelburne joined the Grenville ministry in 1763 as presi- dent of the Board of Trade, but, failing in his efforts to replace Pitt in the cabinet, he in a few months resigned office. Having moreover on account of his support of Pitt on the question of Wilke’s expulsion from the House of Commons incurred the serious displeasure of the king, he retired for a time to his estate. After Pitt’s return to power in 1766 he became secretary of state, but during Pitt’s ill- ness his conciliatory policy towards America was completely thwarted by his colleagues and the king, and in 1768 he was dismissed from office, In 1782 he consented to take office under the marquis of Rockingham on condition that the king would agree to recognize the United States, and on the death of Lord Rockingham in the same year, he became premier; but the secession of Fox and his sup- porters led to the famous coalition of Fox with North, which caused his resignation in the following February, his fall being perhaps hastened by his proposed plans for the reform of the public service. He had also in contempla- tion a bill to promote free commercial intercourse between England and the United States. When Pitt acceded to office in 1784, Shelburne, instead of receiving a place in the cabinet, was created marquis of Lansdowne. Though giving a general support to the policy of Pitt, he from this time ceased to take an active part in public affairs. He died May 7, 1805.

During his lifetime the marquis of Lansdowne was blamed for insincerity and duplicity, but the accusations came chiefly from those who were dissatisfied with his preference of principles to party, and it is beyond doubt that, if he had had a more unscrupulous regard to his personal ambition, his career as a statesman would have had more outward success. His autobiography indicates that he was cynical in his estimates of character, but no statesman of his time possessed more enlightened political views, while his friendship with those of his contemporaries eminent in science and literature must be allowed consider- able weight in qualifying our estimate of the moral defects with which he has been credited. See Fitzmaurice Infe of William, Earl of Shelburne, 3 vols., London, 1875-76.

LANSIN G, a city in Ingham county, Michigan, U.S., and capital of the State, is situated at the confluence of the Grand and Cedar rivers, 85 miles W.N.W. of Detroit, In 1847, when it was made the seat of government, forests covered the site. The city has broad streets, arranged in the regular rectangular system; and seven iron and three wooden bridges connect the parts of the city, which lies on both sides of the rivers above mentioned. Lansing is the seat of the State reform school, the school for the blind, and the State agricultural college. The last-named,

opened in 1857, received 240,000 acres granted by Con- gress for the endowment of a college of agriculture and the mechanical arts; and its income is derived from the interest of the price of part of the land, and from an annual grant from the State legislature. In 1880-81 it had a faculty of 23 members and 221 students. A graded system of public schools and a State library of 40,000 volumes are among the other educational resources of the city. Its most conspicuous building is the new State capitol, erected at a cost of one and a half million dollars. The leading manufacture is of agricultural implements ; but there are extensive manufactories of carriages, waggons, wheelbarrows, and steam-engines, and four large flouring- mills. Good water-power is afforded by the Grand river, and four lines of railway offer ample shipping facilities. The city was incorporated in 1859, and in 1880 had a population of 8317.

LANSINGBURGH, a village in Rensselaer county, New York, U.S., is situated on the east bank of the Hudson, close to Troy, and nearly opposite Waterford, to which a bridge extends. The village was organized in 1774. Its staple product is brushes, known all over the States; but oil-cloth and crackers are also made. The population in 1880 was 7437.

LANTARA, Stmon Matruvurin (1729-1778), French landscape painter, was born at Oncy, 24th March 1729. His father was a weaver, and he himself began life as a herdboy ; but, having attracted the notice of M, Gille de Reumont, a son of his master, he was taken by

him to Paris, and placed under a painter at Versailles.) Endowed with great facility and real talent, his powers found ready recog- nition ; he might have amassed fortune and earned distinc- tion, but he could not divest himself of the habits acquired in early childhood. He found the constraint of a regular life and the society of educated people unbearably tiresome ; he painted to please himself, and as long as the proceeds of the last sale lasted lived careless of the future in the com- pany of obscure workmen with whom he had made friends. Rich amateurs more than once attracted him to their houses, only to find that in ease and high living Lantara could produce nothing. Fatal sickness came upon him when in extreme indigence ; he entered the hospital of La Charité—in which he had previously been the object of the kindliest cares—on the morning of 22d December 1778, and six hours after he was dead. His works, now much prized, are not numerous; the Louvre has one landscape, Morning, signed and dated 1761. As he was not a member of the Academy, his pictures were not admitted to its exhi- bitions, and notices of his works by his contemporaries are rare. Bernard, Joseph Vernet, and others are said to have added figures to his landscapes and sea-pieces. Ingravings after Lantara will be found in the works of Lebas, Piquenot, Duret, Mouchy, and others. In 1809 a comedy called Lantara, or the Painter in the Pothouse, was brought out at the Vaudeville with great success.

See E. Bellier dela Chavignerie, Recherches sur le peintre Lantara, Paris, 1852.

LANTERN-FLY, a name ‘applied to certain insects belonging to the Homopterous division of the order Hemiptera, which may be broadly placed in the genus Fulgora, although this is now subdivided into many genera. They are mostly large insects, and gaily coloured, remark- able for the forehead being produced into the semblance of a snout or muzzle (often upturned at the tip), the so-called “lantern.” This snout is hollow, and is merely an inflated production of the head. Much interest, as wellas mystery, has surrounded these insects, originating in a statement by Madame Merian in her work on the insects of Surinam (Metamorphosis insectorum Surinamensium, &c.), of which the first edition appears to have been published in 1705,

but which subsequently passed through many editions with varying titles and in several languages. Madame Merian stated that the common South American species, now known as Fulgora laternaria, L., was highly luminous at night, so much so that she was enabled to read by the light of one only, and that when several were confined together the interior of the box appeared all ablaze. No one doubted these statements, and the illustrious Linnzus used the words “Prominente fronte noctu lucem vivacissimam spargit” in diagnosing the insect in his Systema Nature. Moreover, it was believed that, because one species had been asserted to. be luminous, others allied thereto must possess the same power; the specific names used by Linneus, such as candelaria, phosphorea, noctivida, lucernaria, and flammea, may be adduced as instances. Of these one only, the F. candelaria of China, has become (with the original laternaria) a subject of controversy, for it also was asserted to be luminous. As time wore on many intelligent naturalists and other travellers visited both South America and China, and they concluded that the light must be produced only under very exceptional conditions, or that the original statement was an error, for they could not detect any luminosity, nor, as a rule, was such a property believed in by the natives of the regions. Quite recently many naturalists of undoubted authority have resided for years in the districts where these insects occur without having personally detected luminosity (though directly in search of it), and without obtaining any indications of the existence of such a belief in the minds of the natives, On the other hand, there have been a few travellers who have professed to be able to confirm Madame Merian’s statements, both from personal observation and from information derived from native sources. Possibly the last of these was within the last twenty years, and his assertion concerned /. candelaria, and upon his statement an entomologist of repute, lately deceased, maintained to the last his belief in the luminous powers. With him all faith in this direction has probably passed away. It is not for us to attempt to define the reasons for Madame Merian’s positive and circumstantial statements. The preponderance of negative testimony is so crushingly

great that Mulgora may be regarded as eliminated from the category of luminous insects.

LANTHANUM. _Ié will be convenient to notice under this heading the group of closely allied metals—Lan- THANUM, CERIUM, and DIDYMIUM.

In an abandoned copper mine at Riddarhyttan, West- manland, in Sweden, there occurs a heavy compact mineral, which, though pretty abundant there, is hardly met with anywhere else. This mineral was long mistaken for tungsten (syn. scheelite), until Klaproth of Berlin in 1803 found in it a peculiar earth, which he called ochrovte earth, as it becomes yellow when heated in air. About the same time Berzelius and Hisinger made the same discovery ; and, (rightly) presuming the new earth to be an oxide of a new metal, they called the latter ceriwm (after the planet Ceres, the then latest discovery in astronomy) and the mineral cerite, which names have been retained to this day. Only the name “cerium” now has a more specific meaning, it having been shown by Mosander (in 1839-41) that Berzelius’s cerium is a mixture of three metallic radicles, namely, cerium proper, lanthanum (from Aav@érew, “to be concealed”), and didymium (from SéSupos, “ twin”). These metals are very closely related to one another in their chemical character, and may be conveniently treated together. The extraction from cerite, of the oxide group, offers no difficulty. According to Marignao (Ann. Chim. Phys. {3], vol. xxvii.), the powdered mineral is made into

a thick paste with oil of vitriol, and the reaction which sets

in allowed to accomplish itself. The remaining dry white powder is placed ina crucible, and kept there for a long time at a temperature below redness, but sufficient to chase away the bulk of the free sulphuric acid. The residue is

added in small instalments to a quantity of cold water, and

the gangue (ferruginous silica) filtered off. The solution

is boiled, when the greater part of the cerite-oides comes

down in the form of sulphate almost free from foreign

oxides. The sulphates can be purified by redissolving them in the least quantity of water at 5° to 6° C., filtering, and reprecipitating by boiling. What remains in the mother-liquors is recovered by precipitation with sulphate of potash (which must be added as a solid and in sufficient

quantity to saturate the solution) as an alum-like double

sulphate. The purified sulphates are dissolved in cold water, precipitated as oxalates by means of oxalate of ammonia, and the washed oxalates ignited, when the pure cerite-oxide mixture remains. one another offers very great difficulties. easy is the extraction of approximately pure oxide of cerium—by Berzelius's method. Dissolve the mixed oxide

The separation of the three oxides from Comparatively

(which must be free of sulphate if the method is to succeed)

in nitric acid, evaporate to dryness, ignite the residue, and treat it with nitric acid diluted with one hundred times its ; weight of water. impure binoxide of cerium (CeO,) remaining, which can be further purified by treatment with more concentrated nitric acid, which, however, besides the lanthanum and didymium, dissolves a good deal of the cerium itself.

Only lanthanum and didymium dissolve,

This method (like any of the rest) is founded upon the fact that salts

| of sesquioxide of cerium (Ce,O,) are readily oxidized into salts of the feebly basic binoxide CeO, under circumstances | which effect no higher oxidation in La,O, or Di,O3.

For the preparation of the oxides of lanthanum and.

didymium we may utilize the nitric mother-liquors obtained in the extraction of cerium-oxide. to dryness, the residue is ignited, and treated with very dilute nitric acid, which dissolves the lanthanum and /didymium with only little cerium (Mosander, Marignac).

These are evaporated

A more complete elimination of the cerium is effected

| (Bunsen) by converting the nitrates into sulphates (by

evaporation with sulphuric acid to dryness, and igniting the residue), dissolving these in sulphuric acid water, and boiling with powdered magnesite (MgCO,). From the filtrate the lanthanum and didymium are precipitated (after acidulation by muriatic) with oxalic acid, and the oxalates filtered off, washed, and ignited. By repeating the magnesia

and oxalic acid process two or three times, the oxides are

obtained cerium-free. They are then made into anhydrous,

‘neutral sulphates; these are dissolved in a minimum of

water at 0° to 5° C., and the solution is heated to 30° to 35° C., when lanthanum sulphate chiefly separates out in small crystals, which are filtered off with the help of a filter-pump. A relatively lanthanum-free didymium sul- phate remains dissolved (Mosander).

The metals were known only in a powdery form up to 1876, when Hillebrand and Norton succeeded in preparing them in a compact form by the electrolysis of the fused chlorides. The three metals are very similar to one

another ; they are steel-grey ductile true metals, melting

at a somewhat lower temperature than silver. Specific gravities range from 6°1 to 6°6. They are more readily inflammable than magnesium.

The atomic weights of the three elements are now (1 882) quoted as Ce=141, La=139, Di= 147.

Oxides and Salts.—Cerium has long been known to form two oxides, namely, a lower (‘‘cerous”’) oxide, which is a pretty strong, and a higher (‘‘ ceric’’) oxide, which is a feeble base. 16 (=O) parts of oxygen are combined, in the former with 92 (=‘‘F”) parts, in the latter with 3F parts of metal. Formerly F was looked upon as, the atomic weight, and the oxides formulated as FO and F,0, respec-

tively. But Mendelejeff on theoretical grounds insisted that the lower oxide must be looked upon as a sesquioxide Ce,0,, where Ce, = 3F or Ce = $F, and the higher (accordingly) as a binoxide, Ce,0, or rather CeO,. And he asserted the same in regard to the reputed monoxides of lanthanum and didymium. These remarks were little heeded even by the specialists until Hillebrand (partly in conjunc- tion with Norton) succeeded in obtaining the three metals as such, and in a truly metallic condition, which admitted of an exact deter- mination of the specific heats. The specific heats were found to be— for Ce ‘04479, for La ~~04485, for Di °04563; and these numbers must be multiplied with Mendelejeff’s atomic weight to produce ‘‘atomic heats” (6°6 ; 6°23 ; 6°6), approximating to values obtain~~ ing for other metals of established atomic weight. Hence Mendelejeff was right. : ;

Cerous oxide, Ce,0;,is obtained by heating the oxalate in an atmosphere of hydrogen, asa bluish-grey powdcr. The higher oxide CeO, is obtained when any certain salt of a volatile acid (e.g., nitric) is ignited in air ; it is a white powder, which when cold has only a slight touch of yellow in it, but at high temperatures assumes a deep orange-red colour. Cerous cliloride, CeCl,, is obtained by heating the metal, or a mixture of either oxide and charcoal, in dry chlorine gas, as a yellowish-white sublimate, uniting with water into in- distinct crystals Ce,Clg+5H,0. The cerous sulphate, Ce,(SO4)s, separates out when its solution is heated. It is soluble in 6 parts of cold, and in about 60 of hot water, and forms a difficultly soluble double salt with sulphate of potash. To obtain the ceric sulphate, when the dioxide is treated with

cold concentrated sulphuric acid, and the solution formed by addition of water allowed to evaporate, the salt Ce,(SO,),(ous) + 20e(SO,),(ic) + 25H,O separates out in red crystals looking like bichromate of potash. The mother-liquor yields yellow crystals of =Ce(SO,), + 4H,0.

The most characteristic test for cerium salts is that the colourless cerous solutions, on addition of hypochlorite of soda, give a red precipitate of a ceric hydrate.

Didymium (Di,0;) solutions have an astringent sweetish taste and a rose-red or violet colour. But their most characteristic property is their beautiful absorption-spectrum, which cones out distinctly with as little as half an inch deep of a solution containing rooth of a per cent. of the oxide (Gladstone).

Lanthanum (La,O0;) solutions have a similar taste to those of didymium salts. They are colourless. The chloride when volatilized between the poles of an induction coil yields a highly characteristic rich line-spectrum, by means of which the least traces of the metal can be detected (Bunsen).

Of higher oxides of lanthanum or didymium we had hitherto only indications ; but quite lately Dr Brauner (Chem. News for 1881, December 23), in Roscoe’s laboratory, succeeded in preparing a definite pentoxide, Di,O,, of didymium, and also a hydrate of it, Di,0;.3H,0.

Sources.—Cerite, though the most abundant, is not the only native source of cerium, lanthanum, and didymium. A. Cossa has found traces of the metals in the ashes of numerous plants, and even in the human body. But it is more important to state that there are a number of rare minerals, of which the chief are known by the names of gadolinite, euxenite, samarskite, which, along with more or less of cerite-metals, contain other rarer earth-metals similar to these.

elements have, during the last few years, been searchingly analysed by Marignac, M. Delafontaine, L. F. Nilson, P. T. Cleve, J. L. Smith, and others, and under their hands resolved themselves into } ° } The rare

earth-metals in fact bid fair to multiply like the little planets in astronomy; and, although in chemistry no firmly established fact can justly be called unim-

I the meantime, are of no general interest, even to the general chemist,

. D.) LANZI, Luter (1732-1810), a writer on Etruscan anti-

quities and on the history of Italian painting, was born in 1732, and educated as a priest. In 1773 he was appointed keeper of the galleries of Florence, from which time his attention seems to have been divided between the study of Italian painting and the study of Etruscan antiquities and language. In the one field his labours are represented by his Storia Pittorica della Italia, the first portion of which containing the Florentine, Sienese, Roman, and Neapolitan schools, appeared in 1792, the rest in 1796. The work is translated by Roscoe. In archeology his great achieve- ment was the work entitled Saggio di lingua Etrusca, 1789,

rightly perceived their Greek origin and characters.

followed by Saggio delle lingue Ital. Antiche, 1806. In his memoir on the so-called Etruscan vases (Dei vast

antichi dipints volgarmente chiamati Ktruschi, 1806) Lanzi What was true of the antiquities would be true also, he argued, of the Etruscan language, and the object of the Saggio di lingua Litrusca was to prove that this language must be related to that of the neighbouring peoples —Romans, Umbrians, Oscans, and Greeks. It is admitted that he was wanting in critical method after a certain point, though at the same time much of the impulse he gave to study arose from his general niethod of inquiry. It is a sign of the recognition he re- ceived that he was allied with E. Q. Visconti in his great but never accomplished plan of illustrating antiquity alto- gether from existing literature and monuments. His notices of ancient sculpture and its various styles appeared as an appendix to the Saggio di lingua Etrusca, and arose out

of his careful and minute study of the treasures then added to the Florentine collection from the Villa Medici. The abuse he has often met with from modern writers in the Etruscan language led Corssen (Sprache der Etrusker, i. p. vi.) to protest in the name of his real services to philology and archeology. Among his latest produc- tions may be mentioned his edition of Hesiod's Works and Days, with valuable notes, and a translation in terza ruma. It had been begun as far back as 1785, but was recast and completed in 1808. The list of his works closes with his Opere Sacre, a series of treatises on spiritual subjects. Lanzi died of apoplexy, March 30, 1810, in the seventy-eighth year of his age, He was buried in the church of the Santa Croce at Florence, by the side of Michelangelo.

LAOCOON, in Greek legend, was a brother of Anchises, and had been a priest of Apollo, but having married against the will of the god he and the two sons of this marriage were attacked by serpents while preparing to sacrifice a bull at the altar of Poseidon, in whose service Laocoon was then acting as priest. An additional motive for his punish- ment consisted in his having warned the Trojans against the wooden horse left by the Greeks. But, whatever his crime may have been, the punishment stands out even among the tragedies of Greek legend as marked by its horror—particularly so as it comes to us in Virgil (Zneid, ii. 199 sq.), and as it is represented in the marble group in the Vatican (see Plate V,). In the oldest existing version of the legend—that of Arctinus of Miletus, which has so far been preserved in the excerpts of Proclus—the calamity is lessened by the fact that only one of the two sons is killed; and this, as has been pointed out (Arch. Zeitung, 1879, p. 167), agrees with the interpretation which Goethe in his Propylxa had put on the marble group without reference to the literary tradition. He says; "The younger son struggles and is powerless, and is alarmed; the father struggles ineffectively, indeed his efforts only increase the opposition ; the elder son is least of all injured, he feels neither anguish nor pain, but he is horrified at what he sees happening to his father; and he screams while he pushes the coils of the serpent off from his legs. He is thus an observer, witness, and participant in the incident, and the work is then complete." Again, "the gradation of the incident is this: the father has become powerless

among the coils of the serpent ; the younger son has still strength for resistance but is wounded ; the elder has a prospect of escape." Lessing, on the other hand, maintained the view that the marble group illustrated the version of the legend given by Virgil, with such differences as were necessary from the different limits of representation imposed on the arts of sculpture and of poetry. These limits required a new definition, and this he undertook in his still famous work, Laokoon (see the edition of Hugo Bliimner, Berlin,

1876, in which the subsequent criticism is collected). The marble group in the Vatican was found in 1506 near the baths of Titus, and there is no question of its being the same which Pliny (Wat. Hist., xxxvi. c. 5) speaks of as in the palace of Titus, and as the work of three Rhodian sculptors Agesander, Polydorus, and Athenodorus. 'They made it, he says, de consiliz sententia, which, according to the highest Latin authorities, must refer not to a standing imperial council but to a council selected ad hoc. This suits the theory of the sculpture being a work of the time of Titus—not an original concep- tion of that time, but a variant of a conception more or less familiar to Greek art since the time of Alexander, such as may be seen in marble reliefs, on gems, in a painting found at Pompeii (see Bliimner's Laokoon, pls. 2, 3), and on a terra cotta Etruscan urn in the British Museum. The names of Agesander and Athenodorus have been found repeatedly on bases of sculptures in Italy, and the date of the writing is that of the time of Titus. Still the opinion is very generally held that the Vatican group is altogether a work of the Rhodian school during its supremacy after the death of Alexander, and that the artists named by Pliny had lived then, aud were apparently a futher and two sons, for which reason Pliny may have thought it necessary to add de consti sententia, in the sense of "according to the decision of their combined thoughts," to prevent any one supposing that the artists had each made one of the figures, selecting them possibly in accord- ance with their own relationship to each other, the father taking Laocoon, and the sons taking respectively the sons of Laocoon. As yet, however, the characteristics of the Rhodian school are not sufficiently known for a final set- tlement of

this long standing question. In Plate V. the right arm of Laocoon with the coils of the serpent which he holds up is restored, as is also the right arm of the younger son. (A. 8S. M.)

LAODICEA (Greek Aaodixeia) is the name of at least eight cities, founded or renovated in the later Hellenic period. Most of them were founded by the Seleucid kings of Syria. Seleucus, founder of the dynasty, is said by Appian to have named five cities after his mother Laodice. Many other women of the family bore the same name, which also passed by marriage into the family of the Pontic kings. The victories of Alexander introduced Greek civilization over Asia; the organizing and city-building energy of his successors established and consolidated it. They either founded new cities in favourable situations or reorganized native cities after the Greek model: thus over the immense realm of the Seleucid from the Agean Sea to the borders of India we find numberless cities called Seleucia, Laodicea, &c. So long as Greek civilization held its ground, these were the great commercial and social centres of the country. We find a Laodicea ad Lycum in the Meander valley, on the borders of Phrygia, Caria, and Lydia; another surnamed Combusta on the borders of Phrygia, Lycaonia, and Pisidia; a third in Pontus; a fourth, ad mare, on the coast of Syria; a fifth, ad Libanum, beside the Lebanon mountains ; and three others in the far east—Media, Persia, and the lower Tigris valley. In the latter countries Greek civilization was overwhelmed in Orientalism after a century or two, and the last three cities disappeared ; the other five continued great tlirough- out the Greek and Roman period, and the second, third, and fourth retain to the present day the ancient name under the pronunciation Ladik, Ladikiyeh, or Latakia (see Laraxta).

Laodicea ad Lycum was founded probably by Antiochus Il. Theos (261-46 n.c.), and named after his wife Laodice. Tts site, called by the Turks ski Hissar, “the old castle,” 18 now solitary and deserted ; but it retains an undying

‘described.

interest as one of the oldest homes of Christianity and the seat of one of the seven churches of the Apocalypse. Pliny tells us (v. 29) that the town was called in older times Diospolis and Rhoas; but it is certain that at an early period Colosse, a few miles to the east, and Hierapolis, six miles to the north, were the great cities of the neigh- bourhood, and that Laodicea was a place of no importance till the Seleucid foundation (Str., p.578). A favourable site was found on some low hills of alluvial formation, about 2 miles south of the river Lycus (Churuk Su) and 9 miles east of the confluence of the Lycus and Meander. Smaller rivers of the neighbourhood are the Asopus, Caprus, and Cadmus, the last named after the lofty range of Mount Cadmus (Baba Dagh), which overhangs the Mander valley on the south. The great trade route from the Euphrates and the interior passed through Apamea to Laodicea. There it forked, one branch going straight down the Meander valley to Magnesia and thence north to Ephesus, a distance of about 90 miles, and the other branch crossing the mountains by an easy pass to Philadelphia and the Hermus valley, Sardis, Thyatira, and at last Pergamus. St Paul (Col. iv. 15) alludes to the situation of Laodicea beside Colossz and Hierapolis ; and the order in which the last five churches of the Apucalypse are enumerated (Rev. i. 11) is explained by their position on the road just Placed in this important situation, in the centre of a very fertile district, Laodicea became a rich city. It was famous for its money transactions (Cic., Ad Fam., ii. 17; iii. 5), and for the beautiful soft wool grown by the sheep of the country (Str., 578). Both points are referred to in the message to the church (Rev, ii. 17, 18).

Little is known of the history of the town. It suffered greatly from a siege in the Mithridatic war, but soon recovered its pro- sperity undcr the Roman empire. The Zeus of Laodicea, with the curious epithet Azeus or Azeis, is a frequent symbol on the city coins, aud is one of the widest-known deities of western Asia Minor. He is represented standing, holding in the extended right hand an eagle, in the left a spear, the hasta pura. Not far from the city was the temple of Men Karou, with a great medical school ; while Laodicea itself produced some famous Sceptic philosophers, and gave origin to the royal family of Polemon and Zenon, whose curious history has been illustrated in

recent times (Waddington, Mélanges de Numism., ser. ii.; Mommsen, Lphem. Epigraph., i. and ii.; Rayet, Milet et le Golfe Latmique, chap. v.). The coinage of Laodicea continues in a rich unbroken series to the time of the empcror Diocletian. Under the Byzantine rule its greatness reinained, but finally the city fell into decay in the frontier wars with the Turkish invaders. Its ruins are of wide extent, but not of great beauty or interest ; there is no doubt, however, that much has been buried beneath the surface by the frequent earthquakes to which the district is exposed (Str., 580; Tac., dun., xiv. 27). For an account of the ruins seg the works of Leake, Hamilton, Arundel, Texier, &c., and especjally the beautiful drawings of Cockercll in the Antiquities of Ionia, vol. iii. pl. 47-51,

LAON, capital of the department of Aisne, France, is situated 87 miles N.E. of Paris, on an isolated and singu- larly buttressed hill, which rises some 330 feet above the surrounding plain and the little river of Ardon, which flows into the Lette, a tributary of the Oise. From the railway station, which is situated in the plain to the north, a straight staircase of several hundred steps leads up to the gate of the town, but all the roads connecting Laon with the surrounding district are cut in zigzags on the steep slopes, which are crowned by the old and partly ruinous ramparts. At the eastern extremity of the hill rises the citadel ; at the other end is a parade-ground, and on the south stands the ancient abbey of St Vincent. Between the latter and the town is the Cuve St Vincent, the slopes of which are covered with trees, vegetable gardens, and vineyards. From the promenade along the line of the ramparts there is an extensive view northward to beyond St Quentin, westward to the forest of St Gobain, and southward over the wooded hills of the Laonnais and Soissonnais.

The cathedral of Laon is one of the most important creations of the art of the 12th and 13th centuries. It took the place of the old cathedral, burned at the beginning of the communal struggles mentioned below. The building is cruciform, and the choir, instead of being apsidal, terminates in a straight wall. Each of the three facades formerly had

two towers with spires, and there was also a great central tower. Of these only four remain, and, being without spires, they give the building the aspect of a strong castle. The west front ranks next to that of Notre Dame at Paris in purity. The chapter house and the cloister contain beautiful specimens of the architecture of the beginning of the 13th century. The old episcopal palace, contiguous to the cathedral, is now used as a court-house. The front, flanked by turrets, 1s pierced by great Pointed windows. There is also a Gothic cloister and an old chapel of two stories, of a date anterior to the cathedral. The church of St Martin dates from the middle of the 12th century. The old abbey buildings of the same foundation are now used as the hospital. The old 12th century chapel of the Templars now forms part of the establishment of the Brothers of Christian Doctrine. The church of the suburb of Vaux near the railway station dates from the 11th century. Numerous cellars of two or three stories have taken the place of the old quarries in the hill-side. the 13th century gates of Ardon, Royer, and Chenizelles have been preserved. The Société Académique of Laon has collected in its museum of arts and antiquities many archeological treasures, among others a striking Roman mosaic of the 2d century, representing Orpheus charming the animals by his lyre, and some Roman ewers, noticeable for quality of metal and purity of form. The communal library contains 30,000 volumes, mostly from the neigh-bouring convents ; it has also interesting manuscripts and autographs, the most ancient of which, signed by Lothair, bears date 972. Laon owes its rank as capital of the department to its central position and to its age; it numbers only 12,000 inhabitants, and has hardly any trade. The surrounding district produces vegetables and beet-root ; the latter crop supplies the sugar-works, which come close to the foot of the hill; but in the town itself the only industries are coopering and the manufacture of blankets and common woollen stuffs.

In virtue of its geographical position, the hilly district of Laon has always had some strategic importance. Even in the time of Cesar there was a Gallic village where the Remi (inhabitants of the country round Rheims) had to meet the onsct of the confederated Belgi. Whatever may have been the precise locality of that battle- field, Laon was fortified by the Romans, and successively checked the invasions of the

Franks, Burgundians, Vandals, Alani, and Huns. St Remigius, the famous archbishop of Rheims who bap- tized Clovis, was born in the Laonnais, and it was he who instituted the bishopric of the town. Thenceforward Laon was one of tho principal towns of the kingdom of the Franks, and the possession of it was often disputed. Charles the Bald had cnriched its church with the gift of very numerous domains. After the fall of the Car- lovingians Laon took the part of Charles of Lorraine, their heir, and Hugh Capet only succeeded in making himself inaster of the town by the connivance of the bishop, who, in return for this ser- vice, was made second ccclcsiastical pcer ot the kingdom. Early in the 12th century the communes of France set about emancipating themselves, and the history of the commune of Laon is one of the richest and most varied. The citizens had profited by a temporary absence of Bishop Gaudri to secure for themselves from his repre- sentatives a communal charter, but he, on his return, purchased from the king of France the revocation of this document, and re-commenced his oppressions. The consequence was arevolt, in which the episcopal palace was burnt and several of his partisans were put to death. The fire spread to the cathedral, and reduced it to ashes. Uneasy at the result of their victory, the rioters went into hiding outside the town, which was anew pillaged by the people of the neighbonrhood, eager to avenge the death of their bishop. The king alternately interfered in favour of the bishop and of the inhabit- ants till 1239. After that date tle liberties of Laon were no more

The old ramparts have been demolished, but –

LAO—LAO

Hundred Years' War it was attacked and taken by the Burgundians, wlio gave it up to the English, to be retaken by the French after the consecration of Charles VII. Under the League Laon took the part of the Leaguers, and was taken by Henry IV. During the campaign of 1814 Napoleon tried in vain to dislodge Bliicher from it. In 1870 an engineer blew up the powder magazine of the citadel at the moment when the German troops were enter- ing the town. Many lives were lost; and the cathedral and the old episcopal palace were damaged by the cxplosion. At the Revolution Laon permanently lost its rank as a bishopric.

LAOS, or Lawa, a large Indo-Chinese nation, occupying the northern and eastern provinces of Siam known as the Laos states, mainly between 15° and 24° N. lat., 98° and 106° E. long. There are two main divisions—the Lau-pang- kah, or '" White Paunch" Laos, and the Lau-pang-dun, or "Black Paunch" Laos, the former between the Deng-Phya-Phai range and the river Mekong, the latter about the middle and upper course of the river Menam, and so called from the habit of tattooing a black pattern about the navel. The Laos are closely related in physique and speech to the Siamese proper, and are by some writers regarded as the primitive stock of that race. They are an historical people who were formerly constituted in an ancient and powerful kingdom, whose capital Vinh-khianh (Vien-shan) was taken and destroyed by the Siamese about the year 1828. Since then they have been entirely subject to Siam, and are governed partly by khiao, or native hereditary princes, partly by mandarins or governors directly nomi- nated by the Bangkok authorities. The present khiao of the province of Bassak north of Camboja is the last sur- viving descendant of the ancient Lao dynasty. The khiao are invested by means of the gold dish, betel-box, spittoon, and teapot which are sent from Bangkok, and returned at their death or deposition. Of all the khiao the most powerful is the prince of Ubon (15° N., 105° E.), whose

jurisdiction extends nearly from Bassak on the Mekong northwards to the great southern bend of that river.

The many contradictory accounts of the Laos that have been published by travellers are due to the fact that quite three-fourths of the race have become mixed with the sur. rounding Khas or aboriginal inhabitants of the peninsula. The half-castes that have thus sprung from alliances with the Bolovens, Théhs, Redehs, Sui, and other wild tribes of Caucasic stock present every variety between that type and the Mongolian. But those that have preserved the purity of their blood are still distinguished by the high cheek bones, small flat nose, oblique eyes, wide mouth, black lank hair, sparse beard, and yellow complexion of the Tai and other branches of the Mongol family. These are also a semi-civilized people with a knowledge of letters, followers of the Buddhist teachings, settled in small towns and villages, and engaged chiefly in agriculture. They have domesticated the elephant and buffalo, and are peace- ful and industrious, being skilled in the production of lacquered wares, and silk and cotton fabrics for local use. Trading relations have also long been established with China, Siam, Burmah, and Camboja, with which countries their ivory, gold dust, tin, gums, lac, benzoin, raw silk, skins, and sapanwood are bartered for cotton cloth, chintzes, silks, opium, hardware, and porcelain. At present a large portion of this trade is in the hands of itinerant Burmese dealers and hawkers, who are met everywhere between the Trawadi and Mekong valleys, organized in small caravans with a headman and porters all well armed, like the Povindahs of Afghanistan.

The civilized Laos have long been addicted to slave hunting, not only with the sanction but even with the co- operation of the authorities. When times are hard and tribute cannot otherwise be raised, “the Lao mandarins organize regular expeditions against the wild tribes. On

contested. But it retained its strategic importance, and during the | some slight pretext a favourable camping ground is chosen,

whence attacks are made in all directions on villages, which they hope to surround or surprise. The savages live only in small hamlets consisting of a few huts, and they are powerless to resist the attacks of men armed with guns. These razzias are usually made only against the independ- ent savages who reject the authority of the Lao princes and refuse to pay tribute. But I have noticed that the compact by which the savages consent to surrender a part of their independence, in order to preserve their wives, children, and themselves, is far from being always respected ; and the unfortunate Gnia-heuns, for example, who dwell within a few leagues of Bassak, are in the greatest terror of the prince, refusing on any consideration to leave their forests or inaccessible villages.”1 The con- voys of slaves, purchased chiefly by Chinese and Malay

dealers from Camboja, are forwarded mainly to Bangkok, |

Korat, and Phnom-penh, the present capital of Camboja. This organized slave trade is the great curse of the nation, and tends more than all other causes combined to retard the natural development of the Lao country.

The mixed Lao peoples are distinguished from the pure stock chiefly by their more regular features, tall stature, lighter complexion, sub-dolichocephalic crania, and gene- rally lower social condition. Most of them, although nominal Buddhists, are in reality still nature-worshippers, who make offerings of sticks and stones to the local genii, and guard their homes against evil spirits by means of brooms, cotton threads, bunches of herbage, and other curious devices. Some of them are quite as savage as the wild tribes, and, although acquainted with the use of fire- arms, still use the characteristic crossbow, a formidable weapon, which in skilled hands will kill a buffalo with a simple bamboo arrow at considerable distances. In some parts the confusion of types and usages is so great that the true Khas can be distinguished from the Laos only by the lobe of the ear, which is pierced for the insertion of large bone, ivory, or wooden ornaments like those worn by many of the Oceanic races.

Apart from the passions associated with the infamous slave trade, encouraged by their rulers, the Laos are an inoffensive, unwarlike, and peace-loving race, fond of music, and living chiefly on a diet of rice, vegetables, fruits, fish, and poultry. Pure and mixed, they number altogether perhaps some 1,500,000.

LAO-TSZE, or Laovu-tszz, the designation of the author of the celebrated treatise called Tdéo Teh King, and the reputed foynder of the religion called Zdotsm. The Chinese characters composing the designation may mean either “the Old Son,” which commonly assumes with foreigners the form of ‘‘the Old Boy,” or “the Old Philosopher.” The latter significance is attached to them by the Rev. Dr Chalmers in his translation of the treatise published in 1868 under the title of The Speculations on Metaphysics, Polity, and Morality of “the Old Philosopher,” Ldo-tsze. The former is derived from a fabulous account of Liéo-tsze which appeared in the Shdn Hsien Chwan, “The Account of Spirits and Immortals,” of Ko Hung, in our 4th cen- tury. According to this, his mother, after a supernatural conception, carried him in her womb sixty-two years (or seventy-two, or eighty-one—ten years more or fewer are of little importance in such a case), so that, when he was born at last, his hair was white as with age, and people might well call him “the old boy.” The other mean- ing of the designation rests on better authority. We find it in the Kid Yu, or “Narratives of the Confucian School,” compiled in our 3d century from documents said to have been preserved among the descendants of Con- fucius, and also in the brief history of Lao-tzse given in

1 Dr Harmand, Tour du Monde, July 5, 1879.

the historical records of Sze-ma Ch’ien (about 100 Be). In the latter instance the designation is used by Confucius, and possibly it originated with him. It should be regarded more as an epithet of respect than of years, and is equiva- lent to ‘‘the Venerable Philosopher.”

All that Ch’ien tells us about L&o-tsze goes into small compass. His surname was Li, and his name Urh. He was a native of the state of Ch’i, and was born in a hamlet, which we must place not far from the present prefectural city of Kwei-teh in Ho-nan province. What is of more importance, he was one of the recorders or historiographers at the court of Chau, his special depart- ment being the charge of the whole or a portion of the royal library. He must thus have been able to make himself acquainted with all the history of his country and of the men who had played the most distinguished part in its affairs. Ch’ien does not mention the year of his birth, which is often said, though on what Chinese authority does not appear, to have taken place in the third year of King Phing, corresponding to 604 B.c. That date cannot be far from the truth. That he was contemporary with Confucius is established by the concurrent testimony of the Zi A? and the Ava Yu on the Confucian side, and of Chwang-tsze and Sze-ma Ch’ien on the Taoist. The two men whose influence has been so great on all the subse- quent generations of the Chinese people, and whose views are now more attentively studied by thinking men of other nations than ever they were before—Khung-tsze and Lao- tsze—had at least one interview, in 517 3B.c., when the former was in his thirty-fifth year. The conversation between them was interesting. Lao was in a mocking mood; Khung appears to the greater advantage.

If it be true that Confucius, when he was fifty-one years old, visited Lio-tsze, as Chwang-tsze says (in the Zhien Yun, the fourteenth of his treatises), to ask about the To, they must have had more than one interview. Dr Chalmers, however, has pointed out that both Chwang-tsze and Lieh-tsze (a still earlier Taoist writer) produce Con. fucius in their writings, as the lords of the Philistines did the captive Samson on their festive occasions, “to make sport for them.” Their testimony is valueless as to any matter of fact. There may have been several meetings between the two in 517 B.c., but we have no evidence that they were together in the same place after that time. Clr’ien adds :—“ Lio-tsze cultivated the 7’éo and virtue, his chief aim in his studies being how to keep himself concealed and unknown. He resided at (the capital of) Chiu; but after a long time, seeing the decay of the dynasty, he left it, and went away to the Gate (leading from the royal domain

into the regions beyond,—at the entrance of the pass of Han-kfi, in the north-west of Ho-nan). Yin Hsi, the warden of the gate, said to him, ‘You are about to withdraw yourself out of sight ; I pray you to compose for me a book (before you go).’ On this Lio-tsze made a writing, setting forth his views on the ¢déo and virtue, in two sections, containing more than 5000 characters. He then went away, and it is not known where he died.” The historian then mentions the names of two other men whom some regarded as the true Lao-tsze. One of them was a Lio Lai, a contemporary of Confucius, who wrote fifteen treatises (or sections) on the practices of the school of Zéo. Subjoined to the notice of him is the remark that Lio-tsze was more than one hundred and sixty years old, or, as some say, more than two hundred, because by the cultivation of the 7Go he nourished his longevity. The other was ‘‘a grand historiographer” of Chau, called Tan, one hundred and twenty-nine (? one hundred and nine- teen) years after the death of Confucius. The introduction of these disjointed notices detracts from the verisimilitude of the whole narrative in which they occur.

Finally, Ch’ien makes the remark that ‘“ Lao-tsze was a superior man, who liked to keep in obscurity,” traces the line of his posterity down to the 2d century B.c., and con- cludes with this important statement :—“ Those who attach themselves to the doctrine of LAo-tsze condemn that of the

literati, and the literati on their part condemn Lao-tsze, |

thus verifying the saying, ‘ Parties whose principles are different cannot take counsel together.’ Li Urh taught that transformation follows, as a matter of course, the doing nothing (to bring it about), and rectification ensues in the same way from being pure and still.”

Leaving these scanty historical notes, and accepting the Téo Teh King as the veritable work of Lao-tsze, we must now try to give the reader some idea of its contents. Consisting, it has been seen, of not more than between five and six thousand characters, it is but a short treatise, —not half the size of our Gospel of St Mark. The nature of the subject,

however, the want of any progress of thought or of logical connexion between its different parts, and the condensed style, with the mystic tendencies and poetical temperament of the author, make its meaning extraordi- narily obscure,—as native scholars and Sinologists have found to their cost. Divided at first into two parts, it has subsequently and conveniently been subdivided into chapters. One of the oldest, and the most common, of these arrangements makes the chapters eighty-two.

Some Roman Catholic missionaries, nearly two cen- turies ago, fancied that they found a wonderful harmony between many passages and the teaching of our sacred Scriptures. Montucci of Berlin, who had adopted their views, ventured to say in 1808 :—“ Many things about a ‘Triune God are so clearly expressed that no one who has read this book can doubt that the mystery of the Holy Trinity was revealed to the Chinese five centuries before the coming of Jesus Christ.” Even Remusat, the first occupant of a Chinese chair in Europe, published at Paris in 1823 his Mémoire sur la Vie et les Opinions de Ldo-tsze, to vindicate the view that the Hebrew name Jehovah was phonetically represented in the fourteenth chapter by Chinese characters. These fancies were exploded by the late Stanislas Julien, when he issued in 1842 his translation of the whole treatise as Le Livre de la Vovre et de la Vertu.

The most important thing is to determine what we are to understand by the Zdéo, for Teh is merely its outcome, especially in man, and is rightly translated by our word “virtue.” Julien, we have just seen, translated 7’do by “Ja voice.” Chalmers leaves it untranslated. ‘‘ No English word,” he says (p. xi.), ‘is its exact equivalent. Three terms suggest themselves—the way, reason, and the word ; but they are all liable to objection. Were we guided by etymology, ‘the way’ would come nearest the original, and in one or two passages the idea of a way seems to be in the term ; but this is too materialistic to serve the purpose of a translation. ‘Reason,’ again, seems to be more like a quality or attribute of some conscious being than 7’do is. I would translate it by ‘the Word,’ in the sense of the Logos, but this would be like settling the question which I wish to leave open, viz, what

resemblance there is between the Logos of the New Testament and this Chinese Tao.” Latterly some Sinologues in China have employed “nature” as our best analogue of the term. Thus Watters (Ldo-tsze, A Study in Chinese Philosophy, p. 45) says :— “Yn the Zéo Teh King the originator of the universe is referred to under the names Non-Existence, Existence, Nature (7do), and various designations,—all which, how- ever, represent one idea in various manifestations. It is in all cases Nature (7’@o) which is meant.” This view has been skilfully worked out; but it only hides from us the scope of “ the Venerable Philosopher.” “ Nature ” cannot

be accepted as a translation of Tdéo. That character was, primarily, the symbol of a way, road, or path; and then, figuratively, it was used, as we also use way, in the senses of means and method,—the cowrse that we pursue in passing from one thing or concept to another as its end or result. It is the name of a quality. Professor Douglas has well said (Confucianism and Taoism, p. 189) :— If we were compelled to adopt a single word to represent the 7’do of Lao-tsze, we should prefer the sense in which it is used by Confucius, ‘ the way,’ that is, péodos.”’

What then was the quality which Lao-tsze had in view, and which he thought of as the 7’éo,—there in the library of Chau, at the pass of the valley of Han, and where he met the end of his life beyond the limits of the civilized state ? It was the simplicity of spontaneity, action (which might be called non-action) without motive, free from all selfish purpose, resting in nothing but its own accomplishment. This is found in the phenomena of the material world. * All things spring up without a word spoken, and grow without a claim for their production. They go through their processes without any display of pride in them ; and the results are realized without any assumption of owner- ship. It is owing to the absence of such assumption that the results and their processes do not disappear” (chap. ii.). It only needs the same quality in the arrangements and measures of government to make society beautiful and happy. ‘“ A government conducted by sages would free the hearts of the people from inordinate desires, fill their bellies, keep

their ambitions feeble, and strengthen their bones. They would constantly keep the people without

knowledge and free from desires ; and, where there were

those who had knowledge, they would have them so that they would not dare to put it in practice" (chap. iii), A corresponding course observed by individual man in his government of himself becoming again " as a little child" (chaps. x. and xxviii.) will have corresponding results. '"' His constant virtue will be complete, and he will return to the primitive simplicity " (chap. xxviii.).

Such is the subject matter of the Z'déo Teh King,—the operation of this method or Z'do, " without striving or cry- ing," in nature, in society, and in the individual. Much that is very beautiful and practical is inculcated in connexion with its working in the individual character. The writer seems to feel that he cannot say enough on the virtue of humility (chap. viii, &c), There were three things which he prized and held fast,—gentle compassion, economy, and the not presuming to take precedence in the world (chap. Ixvii.). His teaching rises to its highest point in chap. Ixiii. :—"It is the way of Z'do not to act from any personal motive, to conduct affairs without feeling the trouble of them, to taste without being aware of the flavour, to account the great as small and the small as great, to recompense injury with kindness." This last and noblest characteristic of the 7'do, the requiting " good for evil," is not touched on again in the treatise; but we know that it excited general attention at the time, and was the subject of conversation between Confucius and his disciples (Confucian Analects, xiv. 36).

What is said in the 7'éo on government is not, all of it, so satisfactory. The writer shows, indeed, the benevolence of his heart. He seems to condemn the infliction of capital punishment (chaps. Ixxiii, and Ixxiv.), and he deplores the practice of war (chap. lxix.); but he had no sympathy with the progress of society or with the culture and arts of life. He says (chap. Ixv.):—''Those who anciently were skilful in practising the 7'do did not use it to enlighten the people; their object rather was to keep them simple. The difficulty in governing the people

arises from their having too much knowledge, and therefore he who tries to govern a state by wisdom is a scourge to it,

while he who does not try to govern thereby is a blessing.” The last chapter but one is the following :—“In a small state with a few inhabitants, [would so order it that the people, though supplied with all kinds of implements, would not (care to) use them ; I would give them cause to look on death as a most grievous thing, while yet they would not go away to a distance to escape from it. Though they had boats and carriages, they should have no occasion to ride in them. Though they had buff-coats and sharp weapons, they should not don or use them. I would make them return to the use of knotted cords (instead of written characters). They should think their coarse food sweet, their plain clothing beautiful, their poor houses places of rest, and their common simple ways sources of enjoyment. There should be a neighbouring state within sight, and the sound of the fowls and dogs should be heard from it to us without interruption, but I would make the people to old age, even to death, have no intercourse with it.”

On reading these sentimcnts, we must judge of Lao-tsze that, with all his power of thought, he was only a dreamer. But thus far there is no difficulty arising from his language in regard to the 7éo. It is simply a quality, descriptive of the style of character and action, which the individual should seek to attain in himself, and the ruler to impress on his administration. The language about the Zdo in nature is by no means so clear. While Professor Douglas says that “the way” would be the best translation of 7’do, he immediately adds :—‘‘ But Zdo is more than the way. It is the way and the way-goer. It is an eternal road ; along it all beings and things walk; but no being made it, for it is being itself; it is everything, and nothing, and the cause and effect of all. All things originate from Tdo, conform to Z’Go, and to 7’do at last they return.”

Some of these representations require modification ; but no thoughtful reader of the treatise can fail to be often puzzled by what is said on the point in hand. Julien, indeed, says with truth (p. xiii.) that “it is

impossible to take Zdo for the primordial Reason, for the sublime Intelligence, which has created and governs the world” ; but the fact is that many of Lao-tsze’s statements are unthinkable if there be not behind the 7’do the unexpressed recognition of a personal creator and ruler. Granted that he does not affirm positively the existence of such a Being, yet certainly he does not deny it, and his language even implies it. It has been said, indeed, that he denies it, and we are referred in proof to the fourth chapter :—“ 7Go is like the emptiness of a vessel; and the use of it, we may say, must be free from all self-sufficiency. How deep and mysterious it is, as if it were the author of all things! We should make our sharpness blunt, and unravel the com- plications of things; we should attemper our brightness, and assimilate ourselves to the obscurity caused by dust. How still and clear is Zo, a phantasm with the semblance of permanence! Ido not know whose son it is. It might appear to have been before God (7Z%).”

The reader will not overlook the cautious and dubious manner in which the predicates of 7’éo are stated in this remarkable passage. The author does not say that it was before God, but that “it might appear” to have been so. Nowhere else in his treatise does the nature of 7’do as a method or style of action come out more clearly. It has no positive existence of itself; it is but like the emptiness of a vessel, and the manifestation of it by men requires that they endeavour to free themselves from all self-suffi- ciency. Whence came it? It does not shock Lio-tsze to suppose that it had a father, but he cannot tell whose son itis. And, as the feeling of its mysteriousness grows on him, he ventures to say that “it might appear to have been before God.”

There is here no denial but express recognition of the

existence of God, so far as it is implied in the name 7%, which is the personal name for the concept of heaven as the ruling power, by means of which the fathers of the Chinese people rose in prehistoric time to the idea of God. Again and again Lao-tsze speaks of heaven just as “‘ we do when we mean thereby the Deity who presides over heaven and earth.” These last words are taken from Watters (p. 81); and, though he adds, ‘‘ We must not forget that this heaven is inferior and subsequent

to the mysterious 7’do, and was in fact produced by it,” it has been shown how rash and unwarranted is the ascription of such a sentiment to “the Venerable Philosopher.” He makes the Z7do prior to heaven and earth, which is a phrase denoting what we often call “nature,” but he does not make it prior to heaven in the higher and immaterial usage of that name. The last sentence of his treatise is :—‘‘It is the 7déo—the way—of Heaven to benefit and not injure ; it is the Zdo— the way—of the sage to do and not strive.”

It is impossible to go, in the present article, into an exposition of the Téo Teh King at greater length. Since Julien laid it fairly open to Western readers in 1842, there has been, it appears to the writer, a tendency to overestimate rather than to underestimate its value as a scheme of thought and a discipline for the individual and society. There are in it, indeed, lessons of unsurpassed value, such as the inculcation of simplicity, humility, and self-abnegation, and especially the brief enunciation of the divine duty of returning good for ill; but there are on the other hand the regretful represen- tations of a primitive society when men were ignorant of the rudi- ments of culture, and the longings for its return.

When it was thought that the treatise made known the doctrine of the Trinity, and even gave a phonetic representation of the Hebrew name Jchovah, it was natural, even necessary, to believe that its author had had communication with more western parts of Asia, and there was no end of speculation about visits to India and Judea, and even to Greece. The necessity for assuming such travels has passed away, and they have ceased to be thought of. If we can receive Sze-m& Ch’ien’s histories as reliable, Lio-tsze might have heard, in the states of Chiu and among the wild tribes adjacent to them, views about society and government very like his own. Ch’ion relates how an envoy came in 624 B.o.—twenty years, that is, before the date assigned to the birth of Lao-tsze—to the court of Duke Mf of Ch’in, sent by the king of some rude hordes on the west. The duke told him of the histories, poems, codes of rites, music, and laws which they had in the middle states, while yet rebellion and disorder were of frequent occurrence, and asked how good order was secured at all among the wild people, who

had none of those appliances. The envoy smiled, and replied that the troubles of China were occasioned by: those very things of which the duke vaunted, and that there had been a gradual lescnenitien in the condition of its states, as their professed civilization had in- creased, ever since the days of the ancients age, Hwang Ti, whereas in the land he came from, where there was nothing but the primitive simplicity, their princes showed a pure virtue in their treatment of the people, who responded to them with loyalty and good faith. ‘‘The government of a state,” said he in conclusion, “ig like a man’s ruling his own single person. He rules it, and does not know how he does so; and this was indeed the method of the sages.” LAo-tsze did not need to go further aficld to find all that he has said about government.

We have confined ourselves to the Taoism of the Tdo Teh King without touching on the religion Taoism now existing in China, but which did not take shape until more than five hundred years after the death of Lao-tsze, though he now occupies the second place in its trinity of ‘*The three Pure or Holy Ones.” There is hardly a word in his treatise that savours either of superstition orreligion. In the works of Lich-tsze and Chwang-tsze, his earliest followers of notc, we find abundance of grotesque superstitions; but their beliefs (ifindeed we can say that they had beliefs) had not become embodied in any religious institutions. When we come to the Ch’in dynasty (221- 206 B.0.), we meet with a Taoism in the shape of a search for the fairy islands of the eastern sea, where the herb of immortality might be gathered. In our first century a magician, called Chang TAo-ling, comes before us as the chief professor and controller of this TAoism, preparing in retirement “ the pill” which renewed his youth, supreme over all spirits, and destroying millions of demons by a stroke of his pencil. He left his books, talismans, and charms, with his sword and seal, to his descendants, and one of them, professing to be animated by his soul, dwells at this day on the Lung-hfi mountain in Keang-se, the acknowledged head or pope of Taoism. But even then the system was not yet @ gens with temples or monasteries, liturgies, and forms of public worship. It borrowed all these from Buddhism, which first obtained public

recognition in China between 65 and 70 a.D., though at lcast a couple of centuries passed before it could be said to have free course in the country. ;

Even still, with the form of a religion, Taoism is in reality a conglomeration of base and dangerous superstitions. Alchemy, eomancy, and spiritualism have dwelt and dwell under ‘its shadow. ach of its ‘‘ three Holy Ones” has the title of Thien Tsun, ‘‘ the Heavenly and Honoured,” taken from Buddhism, and also of Shang T% or God, taken from the old religion of the country. The most popular deity, however, is not one of them, but has the title of Ya Wang Shang Tt, ‘‘God, the Perfect King.” But it would take long to tell of all its ‘‘celestial gods,” ‘‘great gods,” ‘‘divine rulers,” and others. It has been doubted, we have said, whether Lao-tsze acknowledged the existence of God at all, but the Taoism of the present day is a system of the wildest polytheism. The science and religion of the West will meet from it a most determined opposition. The ‘‘ Venerable Philosopher” himself would not have welcomed them. The shrieking of our steam-engines, the bustle of our commerce, and the onward march of our various enterprises would have nearly driven him mad; but he ought not to bear the obloquy of being the founder of the Taoist religion. (J. LE.)

LA PAZ, officially since 1825 La Paz pE Ayacucuo, in

memory of the battle of Bolivian independence, is the capital of Bolivia, at the head of a department of its own name, It lies in 16° 30’S. lat. and 68° W. long., at the height of 11,970 feet above the sea, in the valley of the Chuquiapo or Rio de la Paz, at the base of the Cordillera Real, which rises with imposing cliffs another thousand feet above it. About 40 miles to the east of Lake Titicaca, La Paz has regular coach and steamer communication with Puno, and so with

Mollendo on the Pacific. Commercially the town is of very considerable importance as the centre of the Bolivian trade in cuca and cinchona. Among the public buildings are the cathedral founded by Pope Paul V. in 1605, and ranking as one of the finest in South America, the church of San Francisco erected by the Jesuits, the university (San Andres), and the president's palace. The population, which consists largely of Aymaras, is estimated at between 70,000 and 80,000. The city dates from 1548, and the name Pueblo Nuevo de N. Sefiora de la Paz was given by its founder, Alonzo de Mendozo in honour of the reconciliation between Pizarro and Almagro. In 1605 it was made a bishopric.

LA PEROUSE, J EAN-FRANGOIS GALAUP DE (1741- c. 1788), a French navigator, was born near Albi, August 22,1741. His family name was Galaup, and La Pérouse or La Peyrouse was an addition adopted by himself from a small family estate. Asalad of eighteen, he was wounded and made prisoner on board the "Formidable" when it was captured by Admiral Hawke in 1759; and during the war with England between 1778 and 1783 he served with distinction in various parts of the world, more particularly on the eastern coasts of Canada. His celebrity, however, is rather due to the expedition fitted out by the French Government in 1785 for the discovery of the North-West Passage, and the verification of various matters left doubt- ful by previous circumnavigators. La Pérouse was placed in command of the " Boussole," and his chief assistant De Langle in command of the " Astrolabe." They sailed from Brest, August 1, 17 85, and reached Mount St Elias, on the coast of Alaska, June 23, 1786. From the search for the North-West Passage they were deterred by the same storms which had proved too much for earlier adventurers ; and, though they visited the Sandwich Islands, Macao, and the Philippines, it was not till they reached the coasts of north-western Asia that they really broke new ground. There the discovery of Sangar Strait and La Pérouse Strait showed that Saghalien and Yezo were each an independent island. _The explorers were well received by the Russian authorities in Kamchatka, and M. Lesseps was sent home overland with the records of the expedition, In December 1787, De Langle, Lamonon the

naturalist, and ten of the crew of the “Astrolabe” were massacred on one of the Navigator Islands; and, after reaching Botany Bay in

safety, the rest of the expedition was not again heard of. It was not till,1825 that Captain Dillon found the wreck- age of what must have been the “ Boussole” and the “ Astrolabe ” on the reefs of Vanikoro, an island to the north of the New Hebrides,

See Milet Mureau, Voyage de la Pérouse autour du Monde, Paris, 1797, 4 vols.; Peter Dillon, Narrative… . of a Voyage in the South Seas, London, 1829.

LAPIDARY (lapidarius, from lapis, a stone), one who cuts, grinds, polishes, and engraves small pieces of stone, especially gems. The prehistoric stone implements found in cave deposits, peat-mosses, river-gravels, dc., may be regarded as the earliest examples of the chipping and grinding of stone. Small cylinders of serpentine and other soft stones, on which figures and inscriptions were engraved, were fabricated in very early times by the Assyrians. Similar cylinders were afterwards made in rock-crystal, chalcedony, hematite, &c., and these harder substances were engraved by means of drills charged with the powder of still harder minerals, The use of such drills is said to date as far back as the year 730 Bc. These cylinders were perforated by round holes, and were strung as necklaces. The stone scarabei and other amulets of the Egyptians were carved or chiselled, and, according to King (Handbook of Engraved Gems, 1866), these people do not appear to have followed the Ninevites and Babylonians in the use of the drill. This tool was, however, largely employed by the Etruscan lapidaries, who also used a diamond point in finishing their work. Signets were used by the Greeks as early as 600 B.c, and in the time of Alexander gems of all kinds were cut and engraved, with the exception of the diamond, The art of cutting diamonds was probably known to the Hindus and the Chinese in very early times, but it was unknown in Europe until nearly the close of the 15th century, the diamond cut and polished for Charles the Bold, duke of Burgundy, in 1475 being the first recorded example, The diamond point was extensively used in

engraving the gems of the 16th, 17th, and early part of the 18th centuries, when skilful imitations of the antique gems were fabricated, and the employment of this tool is already spoken of by Pliny (Z. W., xxxviii. 15) and Solinus, c. 52. The drills used by the ancients were worked either by hand or with a bow. Holes are now drilled in stone by means of an iron or copper tube, fed with diamond dust and oil (fig. 1).

The small tools used for engraving stones are set in a horizontal position, and are worked by vertical driving Fis. 1.

gear (fig. 2).

Fig. 3. They are of various forms, some of which are shown in fig. 5, and are made of soft iron and charged

with diamond dust and oil. Any substance finely pul- verized, and of greater hardness than the material operated upon, may be used for cutting and grinding stone, but diamond dust is preferred as it can be used sparingly by the employment of very thin slitting disks, into the edges of which it is imbedded by the application of an agate or glass roller, the dust being previously worked into a paste with oil. Oil of brick or soft soap is used freely as a lubricant during the- process of cutting. The diamond powder is procured by finely pulverizing imperfect stones, usually the coarse variety termed bort or carbonado, in a steel mortar; or it is ground between flat iron slabs with oil of brick.

The iron slicing disk in common use is 8 or 9 inches in

diameter and about 33, inch in thickness. Such disks with their driving gear are termed slitting-mills. When leaden laps charged with emery mud are substituted the arrange- ment is called a roughing-mill, and when leaden or pewter laps charged with rotten-stone are used it is known as a polishing-mill, The mills are sometimes worked by steam power, sometimes by hand. In the ordinary pattern of a lapidary’s

bench the handle turns in a horizontal plane, as shown in fig. 4, where W is the driving-wheel turned by

Fie, 4,—Lapidary’s Mill.

the handle A, and working the pulley P by means of a strap. The pulley is fixed on a vertical spindle, which carries M the disk for slitting or the leaden lap for rough- ing or polishing. The upper end of this spindle is conical, and rotates in a socket drilled in a horizontal arm of iron which projects from a vertical wooden rod D. A block of wood C fits on to the end of an iron support termed the gim-peg or germ-peg. This support is used to steady the operator’s arm when grinding the edges of small stones, and the wooden block, which is fixed by a wedge, is em- ployed for cutting facets at any desired angle, the stone being cemented to the end of a stick S, which is fixed at the requisite angle in one of the holes or notches made in the sides of the socket C. In slicing stones it is necessary not to bring any sharp edge of the stone against the disk, but to commence upon a moderately flat or smooth surface, otherwise the charge of diamond dust or seasoning, which should last for several hours, will be stripped off during the first revolu- tion.

Another form of lapidary’s mill consists of a strong framework of oak, 8 or 9 feet long by 6 or 7 feet in height, and with a breadth of about 2 feet. It is formed of four square uprights, mortised into a couple of Fie. 5.

—Part of Lapi- sole-bars, and braced together by dary’s Mill. A, jonny

eight cross-bars at top and bottom, summer (cut through); which, like all the other parts of the 38, lower summer (cut

frame, are mortised and strongly pee Gee uy a 2 ra >

bolted together. Half way up the table (cut through); frame a strong board or table is fixed, g, g, wooden blocks, and above and below this table stout ®djusted by means of wooden bars or summers run the Weds

leugth of the frame. In each of these summers are two square holes through which slide short oaken rods having Square sections and: bored out conically at the ends to re-

ceive the upper and lower extremities of the iron spindles which carry the laps or slicers (fig. 5). The remainder of the working parts are very similar to those already described, except that the driving-wheels are very large and the lower-extremities of their axletrees, which are conical, rest upon sockets fixed to the floor, while their upper ends revolve in holes in a beam. The driving-wheels drop over pegs which project from the upper sides of collets, imme- diately beneath which the axle has a crank. The crank is connected with an arm composed of three flat iron bars, which are fixed together at suitable lengths by square rings. The other end of the crank bar is provided with a stud by which it is attached to a pivoted wooden arm carrying two upright pegs, which serve as handles for the operator, who imparts a backward and forward motion to the arm.

A very important substitute for the gim-peg-socket, already described, is the dial, by means of which facets cau be cut with great precision. One of the improved forms of the lapidary's dial consists of two jaws a, a (fig. 6), in each of which a hemispherical cavity is ground, and within this cavity a brass ball 5 is contained by the jaws when they are clamped together. A brass tube is attached to this ball, and carries a circular dial d at its upper end. Into the lower end of the tube 9 is tightly inserted the cement-rod, which is fixed by a set-screw p carrying at its lower Fia, 6,—Lapidary's Dial. A, section ; end ¢ the stone to be B, side elevation; a, a, jaws; 6, ball; cut. Atitsupperend, «, tube; d, dial; e, cement rod; /, in- which is squared, and ex; g, quadrant. projects above the dial, a small index / is fitted. Upon the side of one of the jaws is a divided quadrant g, with the centre of which the centre of the brass ball coincides. The tube bearing the dial can therefore be inclined at any angle corresponding with the divisions on the exposed face of the quadrant, while, by turning the cement-stick and its index, the stone can be easily set, so that a range of facets may be cut with great accuracy.

Where practicable, the lapidary avails himself of the natural cleavages in the mineral upon which he is going to operate, and these are constant in direction in any one Species, but are more easily avail- able in certain

are in others. When no satisfac- tory cleavage planes exist, the mineral may be sawn into slices by a thin wire charged with dia- mond dust. The diamond is cut and polished upon a lap of cast-iron fed with diamond dust and olive oil. Gems having a hardness o D of 8 and 9 (Mohs's a scale) are cut on — copper disks, simi- Fic. 7.—Cut Gems. A, brilliant ; B, rose ; larly primed, and C, goute de suif ; D, en cabochon.

are afterwards polished with tripoli and water. Stones of inferior hardness are ground upon a leaden lap with emery and water, and are polished on tin disks with tripoli, or on zinc disks with putty-powder and water. In grinding very

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fragile or soft stones disks of hardwood are employed, Precious stones are cut in forms known as brilliants and roses, and the several parts are designated as shown in fig. 7 (side-elevations). Turquoise, opal, cats-eye, car- buncle, asteria, and a few other stones are cut en cabochon.

Prior to engraving on a stone, the polish is removed with emery from the surface to be engraved, and the device marked on it with a brass point ; the outline is then sharply incised, and the work continued by means of small drills, the diamond point, &c. ,

Within the last few years a great advance has been made in our knowledge of the minute structure and mineral con- stitution of rocks

by cutting and grinding small slices of them so thin that they readily transmit light, and can then be examined under the microscope, and the optical proper- ties of their constituent minerals conveniently studied. Sections suitable for this purpose may be prepared by grinding thin flakes or splinters of a rock or mineral upon a cast-iron plate smeared with emery powder and water. The emery employed for the first grinding should not be very fine, that of medium grain being best suited for the purpose. The fragment is pressed by the fingers against the slab, and ground uniformly over all parts of the plate with a circular motion, When a flat surface is obtained, the fragment should be carefully washed from all traces of the emery mud, and a finer face should be imparted to it by a second grinding with the finest flour-emery and water, smeared upon a slab of plate-glass or a smoothly-planed brass slab. When thoroughly cleaned, the smooth face of the chip is warmed and cemented to a small piece of plate- glass with Canada balsam (fig 8). The older and drier the balsam the better it answers this STONE purpose. A little should be placed ——— on the piece of glass and warmed until it liquefies (it must not boil).

The smooth surface of the stone is me &.

then laid upon the balsam and pressed tightly against the glass ; when the balsam has hardened, the grinding process is renewed, the piece of glass serving as a handle, and the flour-emery should generally be employed as soon as the fragment is thin enough to transmit light. When finished, the glass and section are cleaned, the glass is warmed, and the section is pushed off with a blunt needle or wire into a saucer of turpentine, which should be gently warmed, and all traces of dirt should be removed with a camel’s hair brush. The section is then lifted from its bath by means of a needle and allowed to subside gently upon a drop of fluid Canada balsam placed on a clean glass slip which has been previously warmed. A thin covering-glass is then slightly warmed and placed over the preparation, care being taken not to include any air-bubbles. The process of grinding sections by hand is necessarily a rather slow one, and, although in the finishing it cannot well be superseded by other methods, still the rough grinding may be much more expeditiously done by means of various machines which

have been devised for this purpose. Some of these are worked by hand, others by a treadle. Among the latter, the apparatus devised by Mr J. B. Jordan, and manufactured by Messrs Cotton & Johnstone of Grafton Street, Soho,! and that made by Fuess of Berlin are those in most general use. These machines are provided with slitting disks for cutting thin slices with diamond dust. This saves much grinding, but presents some difficulties to the novice. The grinding laps with which the machines are supplied are generally cast in lead or pewter, while occasionally prepared corundum disks are employed, and disks of hard wood are now and then used for imparting a final polish. (F. R.)

SS ete A * Described and figured in The Study of Rocks (Longman's Text- Books of Science).

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LAPIS LAZULI, a mineral possessing usually a fine blue colour, whence it is much prized for decorative purposes. From the large number of Egyptian ornaments in this material, which have been preserved from the time of the Pharaohs, it is evident that it was a favourite stone with the ancient Egyptians. A few Assyrian seal-cylinders in lapis lazuli are also known. It appears to have been the Greek sapphire; thus, Theophrastus describes the camqetpos as sprinkled with gold-dust, a description which is utterly inappropriate to any variety of our modern sapphire, but which applies with much force to the lapis lazuli, inasmuch as this stone frequently contains disseminated particles of iron pyrites, which by their colour and lustre may readily be mistaken for such a metal. In like manner, Pliny refers to one variety of the sapphirus as being spotted with gold. An allusion to the same quality is perhaps found in Job xxviii. 6.

It is but rarely that the lapis lazuli exhibits anything approaching to distinct crystallization. Usually it occurs in compact masses, which break with an uneven fracture ; but occasionally it presents an imperfect cleavage parallel to the faces of a rhombic dodecahedron, and still more rarely offers distinct faces of this form. Its specific gravity is about 2°5, and its degree of hardness between 5 and 6; it therefore scratches glass, and is capable of receiving a fair polish.

Although the colour is generally a fine azure, or rich Berlin blue, some varieties exhibit violet, green, or even red tints, or are altogether colourless. The mineral is always opaque, with only slight translucency at the edges. Microscopic sections reveal a want of homogeneity in the constitution of the substance, bluish particles being disseminated through a white matrix.

The lapis lazuliis a silicate of aluminium, calcium, and sodium; but the published analyses are rather discordant. All agree, how- ever, in recording the presence of sulphur, and it is generally sup- posed that this element exists as a sulphide of iron and sodium, and that it is upon the presence of such a compound that the blue colour depends. The following is an analysis of the South Ameri- can variety:—silica, 45°7 ; alumina, 25°34; soda, 10°55; potash, 1°35; lime, 7°48; ferric oxide, 1°30 ; sulphur, 3°96; and sulphuric acid, 4°32. By the action of hydrochloric acid the mineral is de- composed, with separation of gelatinous silica and evolution of sul-

huretted hydrogen. Before the blowpipe it fuses readily, with oss of colour.-

The lapis lazuli is usually found in crystalline limestone or in

eissose rocks, but its occurrence is confined to very limited

ocalities. It is foundin Persia, Tartary, Tibet, and China, and in the neighbourhood of Lake Baikal in Siberia. Fine masses occur in the Andes of Chili and Peru. In Europe it has been found at Ditro in Transylvania, and in the ejected blocks of Monte Somma.

In addition to its use as an ornamental stone, the lapis lazuli was formerly employed, to a large extent, in the preparation of the beautiful blue pigment called ultramarine. For this purpose the mineral was ground, calcined, and carefully levigated in water. Of late years, however, artificial ultramarine has been prepared which claims to be of equal beauty and permanency with the natural pigment. Artists, however, still regard the natural colour as superior.

LAPITHAL, a mythic race whose contest with the Centaurs is one of the most famous events in Greek mythology and one of the most favourite subjects of Greek art. The home of the legend is the district round Mount Pelion in Thessaly ; it is not found in the other places where the Centaur legend has its home—Pholoe in Arcadia, and the river Evenus in Aitolia. It is impossible to write of the Lapithz without including also their adversaries the Centaurs and the great battle at the marriage of Pirithous and Deidamia. The outlines of the legend have already been given under CeNTAUR; here we shall merely attempt to distinguish between earlier and later elements in the myth, and thus trace its growth. By the Greek sculptors of the school of Phidias the battle of Lapithe with Centaurs was conceived as a struggle between mankind and mischievous monsters, and symbolical of the great conflict between Greeks and Persians. There can be no

doubt that such a moralized view is of later growth, and inconsistent with the original character of mythology ; though the battle is certainly conceived under this form from an early time, and universally throughout the historical period. But on the other hand the genealogies given of the Lapithz make them a brother race with the Centaurs. Pirithous, king of the Lapithe, was son of Ixion ; so were the Centaurs. Various other accounts lead to the same result. Ultimately then the battle of Lapithe with Centaurs is a contest of the physical powers of nature; and the excellent discussion of Professor 8. Colvin (Journ. Hell. Stud., i. p. 164) leaves little room for doubt that the Centaurs represent the power—dangerous, yet sometimes beneficent—of mountain floods, and that the battle is the mythic expression of the terrible effects of swollen waters. No satisfactory derivation of the word Lapithes has yet been found, but some of the names of individual Lapithe, such as Dryas, Charaxus, Caineus son of Elate, &c., refer us to the trees and ravines of the mountains,

Beside the article of Professor Colvin, and the numerous works on Greek mythology, see Welcker, K7. Schr., vol. ii.

LAPLACE, Prerre Simon, Marquis DE (1749-1827), one of the greatest mathematicians and physical astronomers who ever lived, was born at Beaumont-en-Auge in Normandy, March 28, 1749. His early years have remained in the obscurity with which poverty and some ignoble shame of poverty combined to cover them. It is known, however, that his father was a small farmer, and that he owed his education to the interest excited by his lively parts in some persons of position. His first dis- tinctions are said, singularly enough, to have been gained in theological controversy, but at an early age he became mathematical teacher in the military school of Beaumont, the classes of which he had attended as an extern. He was not more than eighteen when, armed with letters of recommendation, he approached D'Alembert, then at the height of his fame and influence, in the hope of finding a career in Paris. The letters remained unnoticed, but Laplace was not a man to be crushed by the first rebuff of fortune. He wrote to the great geometer a letter on the principles of mechanics, which evoked an immediate and enthusiastic response. ' You," said D'Alembert to him, "needed no introduction ; you have recommended yourself ; my support is your due." He accordingly obtained for him an appointment as professor of mathematics in the Ecole Militaire of Paris, and continued to forward his interests with zeal and constancy.

The future of the young mathematician was now assured, and his scientific vocation finally determined. He had not yet completed his twenty-fourth year when he entered upon the course of discovery which has earned him the title of "the Newton of France." Having, in his first published paper,! shown his mastery of analysis, he immediately proceeded to apply the powerful instrument at his command to the great outstanding problems in the application of the law of gravitation to the celestial motions. Of these the most conspicuous was offered by the opposite inequalities of Jupiter and Saturn, which the emulous efforts of Euler and Lagrange had failed to bring within the bounds of theory. The discordance of their results incited Laplace to a searching examination of the whole subject of planetary perturbations, and his maiden effort was rewarded with a discovery which constituted, when developed and completely demonstrated by his own further labours and those of his illustrious

rival Lagrange, the most important advance made in physical astronomy

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- “Recherches sur le calcul intégral,” Mélanges de la Soc. Roy. de Turin, 1766-69.

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since the time of Newton. In a paper read before the Academy of Sciences, February 10, 1773 (Jlém. présentés par divers Savans, tom. vii., 1776), Laplace announced his celebrated conclusion of the invariability of planetary mean motions, carrying the proof as far as the cubes of the eccentricities and inclinations. This was the first and most important step in the establishment of the stability of the solar system. It was followed up by a series of profound investigations, in which Lagrange and Laplace alternately surpassed and supplemented each other in assigning limits of variation to the several elements of the planetary orbits. The analytical tournament closed with the communication to the Academy by Laplace, in 1787, of an entire group of remarkable discoveries. It would be difficult, in the whole range of scientific literature, to point to a memoir of equal brilliancy with that published (divided into three parts) in the volumes of the Academy for 1784, 1785, and 1786. The long-sought cause of the “great inequality” of Jupiter and Saturn was found in the near approach to commensurability of their mean motions; it was demonstrated in two elegant theorems (see ASTRONOMY, vol. ii. p. 781), independently of any except the most general considerations as to mass, that the mutual action of the planets could never largely affect the eccentricities and inclinations of their orbits; and the singular peculiarities detected by him in the Jovian system were expressed in the so-called “laws of Laplace” (Astronomy, p. 810). He completed the theory of these bodies in a treatise contained amongst the Paris Memoirs for 1788 and 1789; and the tables computed by Delambre from the data there supplied served, by their striking superiority to those hitherto available, to mark the profit derived from the investigation by practical astronomy. The year 1787 was rendered

further memorable by Laplace's announcement, November 19 (Afemoirs, 1786), of the dependence of lunar acceleration upon the secular changes in the eccentricity of the earth's orbit. The last apparent anomaly, and the last threat of instability, thus disappeared from the solar system.

With these brilliant performances the first period of Laplace's scientific career may be said to have closed. If he made no more striking discoveries in celestial mechanics, it was rather their subject matter than his powers that failed. The general working of the great machine was now laid bare, and it needed a further advance of knowledge to render a fresh set of problems accessible to investigation. The time had come when the results obtained in the development and application of the law of gravitation by three generations of illustrious mathematicians might be collected in a single work, and presented from a single point of view. It was to this task that the second period of Laplace's activity was devoted. As a monument of mathematical genius applied to the celestial revolutions the Mécanique Céleste ranks second only to the Principia of Newton.

The declared aim of the author? was to offer a complete solution of the great mechanical problem presented by the solar system, and to bring theory to coincide so closely with observation that empirical equations should no longer find a place in astronomical tables. His success in both respects fell but little short of his lofty ideal. Tho first part of the work (2 vols. 4to, Paris, 1799) contains methods for calculating the movements of translation and rotation of the heavenly bodies, for determining their figures, and resolving tidal problems ; the second, especially dedicated to the improvement of tables, exhibits in the third and fourth volumes (1802 and 1805) the application of these formule ; while a fifth volume, published in three instalments, 1823-25, comprises the results of Laplace's latest researches, together with a valuable history of progress in

each separate branch of his subject. In the delicate task of apportioning his own large share of merit, he certainly does not err on

2 Grant, History of Physical Astronomy, p. 96. 3 * Plan de ’Ouvrage,” Guvres, tom. i. p. 1.

the side of modesty ; but it would perhaps be as difficult to pro- duce an instance of injustice, as of generosity, in his estimate of others. Far more serious blame attaches to his all but total sup- pression in the body of the work—and the fault pervades the whole of his writings—of the names of his predecessors and contemporaries. Theorems and formule are appropriated wholesale without acknow- ledgment, and a production which may be described as the organized result of a century of patient toil presents itself to the world as the offspring of a single brain. The Mécanique Céleste is, even to those most conversant with analytical methods, by no means easy reading. The late M. Biot, who had the privilege of assisting in the correction of its proof sheets, remarks that it would have extended, had the demonstrations been fully developed, to eight or ten instead of five volumes ; and he saw at times the author himself obliged to devote an hour’s labour to recovering the dropped links in the chain of reasoning covered by the recurring formula, ‘‘ Il est aise & voir,’’}

The Exposition du Systeme du Monde (Paris, 1796) has been styled by Arago “the Mécanique Céleste disembarrassed of its analytical paraphernalia.” Not only the conclusions reached by geometers are stated, but the methods followed by them are indicated. The integuments, so to speak, of a popular dissertation clothe and conceal the skeleton of an analytical treatise. The style is lucid and masterly, and the summary of astronomical history with which it terminates has been reckoned amongst the masterpieces of the language. To this linguistic excellence the writer owed the place aceorded to him in 1816 amongst the “forty” of the French Academy, of which institution he became president in the following year. The famous “nebular hypothesis” of Laplace makes its appearance in the Systéme du Monde. Although relegated to a note (vii), and propounded ‘‘ Avec la défiance que doit inspirer tout ce qui n’est point un résultat de l’observation ou du calcul,” it is plain, from the complacency with

which he recurs to it? at the lapse of above a quarter of a century, that he regarded the speculation with considerable interest. That it formed the starting-point, and has remained the model, of thought on the subject of planetary origin is due to the simplicity of its assumptions, and the clearness of the mechanical principles involved, rather than to any cogent evidence of its truth. It is curious that Laplace, while bestowing more attention than they deserved on the crude conjectures of Buffon, seems to have been unaware that he had been, to some extent, anticipated by Kant, who had put forward in 1755, in his Allgemeine Naturgeschichte, a true nebular cosmogony, though one in which the primitive reign of chaos was little likely to terminate.

The career of Laplace was one of scarcely interrupted prosperity. Admitted to the Academy of Sciences as an associate in 1773, he became a member in 1785, having, about a year previously, succeeded Bezout as examiner to the royal artillery. During a temporary access of revolu- tionary suspicion, he was removed from the commission of weights and measures; but tho slight was quickly effaced by new honours. . He was one of the first members, and became president, of the Bureau of Longitudes, took a prominent place at the Institute (founded in 1796), professed analysis at the Ecole N ormale, and aided in the organization of the decimal system. The publication of the Mécanique Céleste gained him world-wide celebrity, and his name appeared on the lists of all the principal scientific associations of Europe, including the Royal Society. But merely scientific distinctions by no means satisfied his ambition. He aspired to the réle of a politician, and has left a memorable example of genius degraded to servility for the sake of a riband and a title. The ardour of his republican principles gave place, after the 18th Brumaire to devotion towards the first consul, a sentiment promptly rewarded with the post of minister of the interior. His a EE ee

1 Journal des Savants, 1850. 2 Méc. Cél., tom. v. p. 346.

incapacity for affairs was, however, so flagrant that it became necessary to supersede him at the end of six weeks, when Lucien

Bonaparte became his successor. ‘He brought into the administration,” according to the dictum of the future emperor, “the spirit of the infinitesimals.” His failure was consoled by elevation to the senate, of which body he became chancellor in September 1803. He was at the same time named grand officer of the Legion of Honour, and obtained in 1813 the same rank in the new order of Reunion. The title of count he had previously acquired on the creation of the empire. Nevertheless he cheerfully gave his voice in 1814 for the dethronement of his patron, and his “suppleness” merited a seat in the chamber of peers, and, in 1817, the dignity of a marquisate. The memory of these tergiversations is perpetuated in his writings. The first edition of the Systéme du Monde was inscribed to the Council of Five Hundred; to the third volume of the Mécanique Céleste (1802) was prefixed the declaration that, of all the truths contained in the work, that most precious to the author was the expression of his gratitude and devotion towards the “pacificator of Europe”; upon which noteworthy protestation the sup- pression, in the editions of the Théorie des Probabilités subsequent to the restoration, of the original dedication to the emperor formed a fitting commentary.

During the later years of his life, Laplace lived much at Arcueil, where he had a country-place adjoining that of his friend Berthollet. With his co-operation the Société d’Arcueil was formed, and he occasionally contributed to its Memoirs. In this peaceful retirement he pursued his studies with unabated ardour, and received with uniform courtesy distinguished visitors from all parts of the world. Here, too, he died, attended to the last by his physician Dr Majendie, and his mathematical coadjutor Bouvard, March 5, 1827, having nearly completed his seventy-eighth year. His last words were: ‘Ce que nous connaissons est peu de chose, ce que nous ignorons est immense.”

Although commonly believed to have held atheistical opinions, Laplace refrained from giving any direct ex- pression to them in his writings. His character, not- withstanding the vanity and egotism by which it was disfigured, had an amiable and engaging side. Young men of science found in him an active benefactor. His relations with these ‘‘adopted children of his thought” possessed a singular charm of

affectionate simplicity ; their intellectual progress and material interests were objects of equal solicitude to him, and he demanded in return only diligence in the pursuit of knowledge. M. Biot relates that, when he himself was beginning his career, Laplace introduced him at the Institute.for the purpose of explain- ing his supposed discovery of equations of mixed differences, and afterwards showed him, under a strict pledge of secrecy, the papers, then yellow with age, in which he had long before obtained the same results, but which he had laid aside with a view to future development. This instance of abnegation is the more worthy of record that it formed a marked exception to Laplace's usual-course. Between him and Legendre there was a feeling of " more than coldness," owing to his appropriation, with scant acknowledgment, of the fruits of the other's labours; and our celebrated countryman, Dr Thomas Young, counted himself, rightly or wrongly, amongst the number of those similarly aggrieved by him. With Lagrange, on the other hand, he always remained on the best of terms.

The extreme abstemiousness of his life, joined to a naturally good constitution, preserved Laplace from most of the infirmities incidental to old age. He was indeed obliged to use his eyes with precaution ; but his power- ful memory remained unimpaired, and it was not until within two years of his death that his health began to

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suffer from his severe application. He married a beautiful and amiable woman, and left a son, born in 1789, who succeeded to his title, and rose to the rank of general in the

artillery.

It might be said that Laplace was a great mathematician by the original structure of his mind, and became a great discoverer through the sentiment which animated it. The regulated and persistent enthusiasm with which he regarded the system of nature was with him from first to

last. It can be traced in his earliest essay, and it dictated the rav- ings of his final illness. By it his extraordinary analytical powers became strictly subordinated to physical investiga- tions. To this lofty quality of mind he added a rare sagacity in perceiving analogies, and in detecting the new truths that lay concealed in his formule, and a tenacity of mental grip, by which problems, once seized, were held fast, year after year, until they yielded up their solutions. In every branch of physical astronomy, accordingly, deep traces of his work are visible. ‘ He would have completed the science of the skies,” Fourier remarks, “had the science been capable of completion.” —

For a fuller account of the results achieved by him, the article ASTRONOMY, Vol. ii. p. 761, may be consulted; it need only be added that he first examined the conditions of stability of the system formed by Saturn’s rings, pointed out the necessity for their rota- tion, and fixed for it a period (105 33™) differing by little more than a minute from that established by the observations of Herschel ; that he detected the existence in the solar system of an invariable plane such that the sum of the products of the planetary masses by the projections upon it of the areas described by their radii vectores in a given time is always a maximum, made notable advances in the theory of astronomical refraction (A/éc. Cél., tom. iv. p. 258), and coustructed formule, agreeing remarkably with observation, for the barometrical determination of heights (Afée. Cél., tom. iv. p. 324). His removal of the considerable discrepancy between the actual and Newtonian velocities of sound,! by taking into aecount the increase of elasticity due to the heat of compression, would alone have sufficed to illustrate a lesser name. Molecular physics also engaged a large share of his attention, and he announced in 1824 his purpose of treating the subject ina separate work. With Lavoisier he made an important serics of experiments on specific heat (1782-84), in the course of which the ‘‘ice calorimeter” was discovered; and they contributed jointly to the Memoirs of the Academy (1781) a paper on the development of electricity by evaporation. Laplace was, moreover, the first to offer a complete analysis of capillary action based upon a definite hypothesis —that of forces ‘‘ sensible only at insensible distances”; and he made strenuous but unsuc- cessful efforts to explain the phenomena of light

on an identical principle. It was a favourite idea of his that chemical affinity and capillary attraction would eventually be included under the same law, and it was perhaps as much because it threatened an inroad on a cherished generalization as because it seemed to him little capable of mathematical treatment that the undulatory theory of light was distasteful to him.

The investigation of the figure of cquilibrium of a rotating fluid mass engaged the attention of Laplace during the greater part of his long life. His first memoir was communicated to the Academy in 1778, when he was only twenty-four years of age, his last in 1817, when he was sixty-eight. The results of his many papers on this subject—characterized by him as ‘‘ un des points les plus intéressans du systeme du monde”—are embodied in the Mécanique Céleste, and furnish one of the most remarkable proofs of his analytical genius. Maclaurin, Legendre, and D’Alembert had furnished partial solutions of the problem, confining their attention to the possible figures which would satisfy the conditions of equilibrium. Laplace treated the subject from the point of view of the gradual aggregation and cooling of a mass of matter, and demonstrated that the form which such a mass would ultimately assume must be an ellipsoid of revolution whose equator was determined by the primitive plane of maximum areas.

The honour of having brought almost to perfection the closely related problem of the attraction of spheroids must also be accorded tohim. All the powers of analysis in the hands of its greatest masters replaced the old geometrical methods, and their superiority Was soon evidenced by a succession of remarkable discoveries. Legendre, in 1783, extended Maclaurin’s theorem concerning ellip- soids of revolution to the case of any spheroid of revolution where the attracted point, instead of being limited to the axis or equator, occupied any position in space; and Laplace, in his treatise Théorie du Mouvement et dela Figure Elliptique des Planetes (pub- ee a ee eee

Annales de Chimie et de Physique, 1816, tom. iii. p. 238.

lished in 1784), effected a still further generalization by proving, what had been suspected by Legendre, that the theorem was equally true for

any confocal ellipsoids. Finally, in a celebrated memoir, Z’héorie des Attractions des Sphéroides et de la Figure des Planétes, published in 1785 among the Paris Memoirs for the year 1782, written, however, after the treatise of 1784, Laplace treated exhaustively the general problem of the attraction of any spheroid upon a particle situated outside or upon its surface.

The researches of Laplace and Legendre on the subject of attrac- tions derive additional interest and importance from having intro- duced two powerful engines of analysis for the treatment of physical problems, Laplace’s Coefficients and the Potential Function. The expressions for the attraction of an ellipsoid involved integrations which presented insuperable difficulties; it was, therefore, with pardonable exultation that Laplace announced his discovery that the attracting force in any direction could be obtained by the direct process of differentiating a single function. He thereby translated the forces of nature into the language of analysis, and laid the foundations of the mathematical sciences of heat, electricity, and magnetism. This function, V, which received the name of potential from Green in 1828, and independently from Gauss in 1840, is defincd as the sum of the masses of the molecules of the attracting body divided by their respective distances from the attraeted point ; or, in mathematieal language—

v= fff___eaeduda__ MI eye ea ;

p being the density of the body at the point x, y, 2; a, B, y, the coordinates of the attracted point; and the limits of integration being determined by the form of the attracting mass. V is thus a function of a, B, y, that is to say, depends for its value on the position of the point, and its several differentials with respect to these coordinates furnish the components of the attractive force. The integrations, however, could not in general be effected so as to express V in finite terms ; but Laplace showed that V satisfied the partial differential equation

GY ON ay da® dp exdy* which is still known as Laplace’s equation. It is worthy of remark that it was not in this symmetrical form that the equation was

discovered, but in the complicated shape which it assumes when expressed in polar coordinates :—

a = eee ee

a}0-w ty aw @uvy du Tt dat dre?

where » is substituted for eos 6. This differential equation forms the basis of all Laplace's researches in attractions, and makes its appearance in every branch of physical science. ;

'The expressions which are known as Laplace's coefficients, a name first given to them by Dr Whewell,? occupy a distinguished place in modern analysis. They were first introduced in their generality by Laplace in the memoir on attraetions, 1785, above referred to, which is, to a great extent, reprinted in the third book of the Mécanique Céleste; but Legendre, in a celebrated paper entitled Recherches sur Vattraction des Sphéroides homogénes, printed in the tenth volume of the Divers Savans, 1788, had previously made use of them, and proved some of their properties, in the simplified form which they assume with one instead of two variables. They may be defined as follows. If two points in space are determined by their polar coordinates, 7, 6, w, and 2", 6', w', T the reciprocal of the distance between them is expressed in terms of those coordinates

by

PCY) _

: —_— lc 78 [92 2re!{ wy! + V1 = pEN 1 — ni eos (w — 0!) } +7 | ;

where » and yw' are written for cos @ and cos 6' respectively. This expression may be expanded in a series of the form

yt Part… |. de

where Py, P, . . . Pyare Laplace's coefficients of the orders 0, 1

. t. They are rational integral functions of pw, /1-p? cosa, and «/1—y? sinw, and are precisely the same functions Ory V1 p? cos w’. and J/1-y” sin w,; or, in other words, of the rect- angular co-ordinates of the two points divided by their distances from the origin. The general coefficient P, is of ¢ dimensions in these quantitics, and its maximum value can be shown to be unity, so that the above written series will be convergent if 7’ is greater i eee

i r r S[Pot 4 P ete t oe @

2 See Monthly Notices of the Astronomical Society, xxvii. 18 211. They are also included in the more general expression | Spherical harmonics’? (“‘ Fonctions sphériques,” ‘‘ Kugelfunctioncn)s

than r. It can be easily proved that T satisfies Laplace’s differ- ential equation— ial

aT aja-met du. *i-2 da ar? ; and if for T we substitute the expanded form, we obtain the general differential equation of which Laplace’s coefficients are particular integrals ;— ,

a{rT) _

dP; a (1 — p?)—— du ee Pee —” du 1-,? , aga HOt Es .

Expressions which satisfy this equation ’ are referred to as Laplace’s functions; they include as a particular case the coefficients, which are, as we have seen, certain definite functions of the spherical sur- face coordinates of the two points. If = py + V1 —_ went = we cos (w cod w’),

the coefficients become functions of x alone, and it was in this form that Legendre first introduced them. One of the fundamental properties of Laplace’s functions, known as. Laplace 8 theorem, is that, if Y;and Z; be two such functions, ¢ and ?@ being whole numbers and not identical, then c

1 Qa re es Y;Zi’dudw=0. —l/0

Again, if Y/ is the same function of py’ and #’, that Y; is of » and w, we have the important relation

. 1 Qi Y/= pe

But the property on which their utility in physical researches chiefly depends is that every function of the coordinates of a point on a sphere can be expanded in a series of Laplace’s functions.?

In the figure of the earth, the theory of attractions, and the sciences of electricity and magnetism this powerful calculus occupies a prominent place. Gauss in particular has employed it in the calculation of the magnetic potential of the earth, and it has recently received new light from Professor Clerk Maxwell’s inter- pretation of harmonics with reference to poles on the sphere.

Laplace, always profound rather than elegant, nowhere displays the massiveness of his genius so conspicuously as in the theory of

robabilities. The science which Pascal and Fermat had initiated

e brought very nearly to perfection ; but the demonstrations are soinvolved, and the omissions in the chain of reasoning so frequent, that the Théorie Analytique is to the best mathematicians a work reqniring the most arduous study. The theory of probabilities, which Laplace describes as common sense expressed in mathematical language, first attracted his attention from its importance in physics and astronomy; and he applies his theory, not only to the ordinary problems of chauces, but also to the inquiry into the causes of phenomena, vital statistics, and future events.

The device known as the method of least squares, for reducing numerous equations of condition to the number of unknown quantities to be determined, had been adopted as a practically con- venient rule by Gauss and Legendre ; hut Laplace first treated it as a problem in probabilities, and proved by an intricate and diffi- cult course of

reasoning that it was also the most advantageous, the mean of the probabilities of error in the determination of the elements being thereby reduced to a minimum,

The method of generating functions, the foundation of his theory of probabilities, Laplace published in 1779; and the first part of his Théorie Analytique is devoted to the exposition of its principles, which in their simplest form consist in treating the successive values of any function as the coefficients in the expansion of another function with reference to a different variable. The latter is therefore called the generating function of the former. A direct and an inverse zalculus:is thus created, the object of the former being to determine the coefficients from the generating function, of the latter to discover the generating function from the coefficients. The one is a problem of interpolation, the other a step towards the solution of an equation in finite differences. The method, how-

1 This equation was first integrated by Mr Hargreave, Phi i Transactions, 1841, p. 75, and it has since eae sandler at ee a — and Dub. Math. Journ., vol. i. p: 10; and Professor Donkin, Phil. Trans., 1857, p. 43. ‘s Dita ential Equations, 3d ed., p. 433, , ules Mle honda aa

2 The proof of this theorem in its full generality has given rise to much controversy ; where, however, the form of the function is rational and integral—the only case of practical importance—no difficulty is experienced. The reader is referred to two papers by Ivory in the Phil. Trans., 1812 and 1822; Poisson, Théorie Mathématique de la Chaleur ; L. Dirichlet, in Crelle’s Journal, vol. xvii.; and 0. Bonnet in Liouville’s Journal, vol. xvii. é

ever, is now obsolete from the more extended facilities afforded by the calculus of operations.

The first formal proofof Lagrange’s theorem for the development in a series of an implicit function was furnished by Laplace, who gave to it

an extended generality. He also showed that every equation of an even degree must have at least one real quadratic factor, reduced the solution of linear differential equations to definite integrals, and furnished an elegant method by which the linear partial differential equation of the second order might be solved. He was also the first to consider the difficult problems involved in equations of mixed differences, and to prove that an equation in finite differences of the first degree and the sccond order might always be converted into a continued fraction.

In 1842, the works of Laplace being nearly out of print, his widow was about to sell a farm in order to procure funds for a new impression, when the Government of Louis Philippe took the matter in hand. A grant of 40,000 francs having been obtained from the chamber, a national edition was issued in seven 4to vols., bearing the title Hwvres de Laplace, 1843-47. The Mécanique Céleste with its four supplements occupies the first 5 vols., the 6th contains the Systeme du Monde, and the 7th the 7h. des Probabilités, to which the more popular Essai Philosophique forms an introduction. Of the four supplements added by the author, 1816-25, he tells us that the problems in the last were contributed by his son. An enumeration of Laplace's memoirs and papers (about one hundred in number) is rendered superfluous by their embodiment in his prin- cipal works. The 7h. des Prob, was first published in 1812, the Essai in 1814; and both works as well as the Systéme du Monde went through repeated editions. Laplace's first separate work, Théorie du Mouvement et de la Figure Elliptique des Planétes, 1784, was published at the expense of President Bochard de Saron. The Précis de 1 Histoire de l' Astronomie, 1821, formed the fifth book of the 5th edition of the Systémedu Monde. An English translation, with copious elucidatory notes, of the first 4 vols. of the Mécanique Céleste, by Dr Bowditch, was published at Boston, U.S., 1829-39, in 4 vols. 4to ; a compendium of certain portions of the same work by Mrs Somerville appeared in 1831, and a German version of the first 2 vols. by Burckhardt at Berlin in 180]. English translations of the Systéme du Monde by Mr Pond and Mr Harte were published, the first in 1809, the second in 1830. An edition entitled Zes Giuvres Completes de Laplace, 1878, &c., which is to include the whole of his

memoirs, is now in course of publication under the auspices of the Academy of Sciences. The four 4to vols. which have already appeared comprise the first ten books of the Mécanique Céleste.

Scanty notices of Laplace's life will be found in Fourier's Eloge, ' June 15, 1829, in the funeral oration of Poisson, and Arago's Report, 1842, translated amongst his Biographies by Admiral Smyth and Mr Grant, His astronomical work is treated of in Gautier's Pro- bléeme des trois Corps and Grant's Hist. of Astronomy, For Laplace's functions see Dr EK. Heine, Handbuch der Kugelfwnetionen, Berlin, 1861; John H. Pratt, 4 Treatise on Attractions, 1865; Todhunter's Elementary Treatise on Laplace's Functions, 1875, and History of the Mathematical Theories of Attraction, 1873; N. M. Ferrers's Elementary Treatise on Spherical Harmonics, 1877; and L. Schlafli, Die zwei Heine'schen Kugelfunctionem, 1881. Consult also Thomson and Tait, Treatise on Natural Philosophy, 1879, p. 141; Clerk Maxwell, Treatise on Electricity, chap. ix ; Professor Niven in Phil. Trans., 1879, p. 379 ; Dirichlet in Crelle, xvi. p. 35; and Jacobi, vol. ii. p. 228, xxvi. p. 82. Some of Laplace's results in the theory of probabilities are simplified in Lacroix's Traité élémentaire du Calcul des Probabilités and De Morgan's Essay, published in Lardner's Cabinet Cyclopedia. For the history of the subject sce A History of the Mathematical Theory of Probability, by Isaac Todhunter, 1865. (A. M. C.)

LAPLAND, or Lappianp, is the north-west portion of the continent of Europe, bounded W., N., and E. by the North Atlantic, the Arctic Ocean, and the White Sea, and S. partly by the White Sea, but mainly by a conventional line. It includes the northern parts of Norway, Sweden, and Finland, and the western part of the Russian government of Archangel. A line drawn from the mouth of the Salten Fjord on the Norwegian coast to the mouth of the Ponoi on the White Sea, practically identical with the 61st parallel of north latitude, measures 700 miles. Of Russian Lapland only a very small portion lies outside of the Arctic circle ; but in Swedish. Lapland the southern confines descend as low as 64° According to Frijs (in Peter- mann's Mitth., 1870), the total area of Lapland may be estimated at 153,200 square

miles, of which 16,073 miles belong to Norway, 48,898 to Sweden, 26,575 to Finland, and 61,654 to Russia.

Lapland is merely the land of the Lapps or Laps, and does

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not constitute a geographical unity. The Scandinavian portion presents the usual characteristics of the mountain plateau of that peninsula,—on one side the bold headlands, fjords, deep-grooved valleys, and glaciers of Norway, on the other the long mountain lakes and lake-fed rivers of Sweden. On the Swedish side the Lapp borders only come down to within from 30 to 40 miles of the coast, where the rivers begin to lose the character of mountain streams. With the exception of Torne Lappmark, which is really part of Scandinavia, Finnish and Russian Lapland may be gene- rally described as comparatively low country, broken by detached hills and ridges, one of which, the Umbdek Dunder, attains an elevation of 2500 feet. Rivers and lakes abound. In the north of the Finnish region lies the great Enare or Inara (formerly Upper Imandra) Lake, with an area of 1147 square miles; and the south is traversed by the countless head-waters of the Kemi, which falls into the Gulf of Bothnia to the east of the Swedish frontier. The largest of the rivers of Russian Lapland— or, as it is often called, the Kola peninsula—is the Tulom, which falls into the Arctic Ocean ; and others of importance are the Pasvig, the Ponoi, and the Varsuga. Lake Imandra, or Inandra (in Lappish Aver), is about 65 miles long by 8 or 9 broad ; Lake Nuoljaure is 35 miles by 7 ; and Guolle- jaure, Umbozero, Kontojarvi, and Paajarvi are all of con- siderable extent. An opinion was long prevalent that there was a natural boundary of the most striking kind between the Arctic coast of Norwegian and that of Russian Lapland,—that to the east of Jacob’s river the harbours or fjords were ice-bound for six months of the year, while the influence of the Gulf Stream never allowed those to the west to be frozen. This, however, is not the case. The principal harbours on the Murman coast eastward to the mouth of the White Sea remain open like those of Norway.

Though Lapland contains vast stretches of desolate tundra and dreary swamp, the country as a whole has a certain quiet beauty, and in the wilder districts the scenery is wonderfully various in colour and form, ‘It is hardly possible,” says Lieutenant Temple in Proc. Roy. Geog. Soc., 1880, ‘to conceive a greater contrast to the ice-bound regions which lie between the same parallels in the western hemisphere.” And, though it gives little scope for hus- bandry, Lapland is richly furnished with much that is ser- viceable to man. Not to mention the iron and copper mines, it still possesses great store of timber, pine and spruce and birch ; though fruit trees yield no fruit, there is abundance of edible berries ; the rivers and Jakes abound with salmon, trout, perch, and pike; myriads of water-fowl, ptarmigan, partridges, and capercailzie breed within its borders ; and the cod, herring, holibut, and Greenland sharks of its seas give occupation to thousands of fishermen.

The chief characteristic of Lapland is its Arctic climate and the distribution of daylight and darkness, In the northern parts the longest day and the longest night last for three months each, and through the greater part of the country the sun does not set at midsummer or rise at midwinter.

The following calendar of the climate after Lestadius relates more particularly to the northern districts of Swedish Lapland, but is more or less applicable to a large part of the country :—January : cold and clear ; no day-light ; about 4 o’clock the ‘‘rose of dawn ”; mean temperature, 0°°50 Fahr. February: cold ; snow and wind ; day-light from 6-7 A.M. to 5-6 P.M; mean temperature, ~1°-4. Mareh: heat of the sun begins to modify the cold ; steady snow- fall; swans begin to appear; mean temperature, 11°°5. April : weather variable ; snow and wind; birds of passage, crows, and snow sparrows appear ; snows melt from the branches ; mean tem- perature, 26°°6. Afay : the finest month in the year ; spring flowers in blossom; bird life abundant; sowing season; temperature often reaches 68° during the day ; seed is often ‘‘ brairded ” eight days after it is sown ; mean temperature, 36°°5. June: ice breaks up on lakes and rivers; woods rush into leaf; about the 20th

continual day ; mean temperature, 49° to 50°. July: quite warm ; mountain floods ; grain shoots into ear ; fishing and hunting ; mos-

quitoes ; cloudberries ripe; mean temperature, 59°. August : much rain; harvest; by the 10th strong frosts at night; mean. temperature, 56°. September: short days; rain, wind, sleet; raspberries, strawberries, bilberries, &c., ripe ; fall of the leaf; mean temperature, 41°. October: ‘‘golden pudding time”; slaughter of reindeer and laying up of meat store for winter; mean tem- perature, 27°°50. November : full winter ; lakes frozen over ; fish- ing still prosecuted with ice-nets; mean temperature, 12°°24. December : much like January; hunting of bears, wolves, &c. : mean temperature, 1°.

The population of Lapland has been considerably re- eruited in modern times by immigrants from the south ; but the country is still very sparsely peopled, and the Lapps still predominate. There are no towns, and the villages are not only few and insignificant, but often hardly less nomadic than the people, being shifted according to exigencies of fodder or fuel. Hammerfest, the ‘ most northern town of the European continent,” has only 2100 inhabitants, and Kola (formerly Malmis), the principal settlement in Russian Lapland, does not now exceed 500.

The Lapps.—The Lapps (Swed., Zappar; Russian, Lo- part; Norw., Finner) call their country Sabme or Same, and themselves Samelats—names almost identical with those employed by the Finns for their country and race, and probably connected with a root signifying “ dark ” (see Donner, Verg. Wort. der Finn.-Ugr. Sprachen, Hels., 1876). Lapp is almost certainly a nickname imposed by foreigners, although some of the Lapps apply it contemptuously to those of their countrymen whom they think to be less civilized than themselves.!

In Sweden and Finland the Lapps are usually divided into fisher, mountain, and forest Lapps. In Sweden the first class includes many impoverished mountain Lapps. As described by Lestadius (1827-32), their condition was a very miserable one; but since his time matters have much improved. The principal colony has its sum- mer quarters on the Stuor-Lule Lake, possesses good boats and nets, and, besides catching and drying fish, makes money by the shooting of wild fowl

and the gathering of eggs. When he has acquired a little means it is not unusual for the fisher to settle down and reclaim a bit of land. The mountain and forest Lapps are the true representatives of the race. In the wandering life of the mountain Lapp his autumn residence, on the borders of the forest district, may be considered as the central point ; it is there that he erects his njalla, a small wooden store- house raised high above the ground by one or more piles. At the beginning of November, a little sooner or later, he begins to wander south or east into the forest land, and in the course of the winter he may visit, not only such places as Jokkmokk and Arjepluog, but even Gefle, Upsala, or Stockholm. About the beginning of May he is back at his njalla, but as soon as the weather grows warm he pushes up to the mountains, and there throughout the summer pastures his herds and prepares his store of cheese. By autumn or October he is busy at his njalla killing the surplus reindeer bulls and curing meat for the winter. From the mountain Lapp the forest (or, as he used to be called, the spruce-fir) Lapp is mainly distinguished by the narrower limits within which he pursues his nomadic life. He never wanders outside of a certain district, in which he possesses hereditary rights, and maintains a series of camp- ing grounds which he visits in regular rotation. In May or April he lets his reindeer loose, to wander as they please ; but immediately after midsummer, when the mosquitoes become troublesome, he goes to collect them. Catching 2 single deer and “belling” it, he drives it through the wood ; the other deer, whose instinct leads them to gather into herds for mutual protection against the mosquitoes, are

1 The most probable etymology is the Finnish dappu, and in this case the meaning would be the ‘‘land’s-end folk.”

attracted by the sound. Should the summer be very cool and the mosquitoes few, the Lapp finds it next to impos- sible to bring the creatures together. About the end of August they are again let loose,

but they are once more collected in October, the forest Lapp during winter pur- suing the same course of life as the mountain Lapp.

In Norway there are three classes—the sea Lapps, the river Lapps, and the mountain Lapps, the first two settled, the third nomadic. The mountain Lapps have, on the whole, a rather ruder and harder life than the same class in Sweden. About Christmas those of Kautokeino and Karasjokk are usually settled in the neighbourhood of the churches; in summer they visit the coast, and in autumn they return inland. Previous to 1852, when they were forbidden by imperial decree, they were wont in winter to move south across the Russian frontiers. It is seldom possible for them to remain more than three or four days in one spot. Flesh is their favourite, in winter almost their only, food, though they also use reindeer milk, cheese, and rye or barley cakes. ‘The sea Lapps are in some respects hardly to be distinguished from the other coast dwellers of Finmark. Their food consists mainly of cooked fish. The river Lapps, many of whom, however, are descendants of Quains or Finns proper, breed cattle, attempt a little tillage, and entrust their reindeer to the care of mountain Lapps.

In Finland there are comparatively few Laplanders, and the great bulk of them belong to the fisher class. Many of them are settled in the neighbourhood of the Enare Lake. In the spring they go down to the Norwegian coast and take part in the sea fisheries, returning to the lake about midsummer. Formerly they found the capture of wild reindeer a profitable occupation, using for this purpose a palisaded avenue gradually narrowing towards a pitfall.

The Russian Lapps are also for the most part fishers, as is natural in a district with such an extent of coast and such a number of lakes, not to mention the advantage which the fisher has over the reindeer keeper in connexion with the many fasts of the Greek Church. They maintain a half nomadic kind of life, very few of them having become regular settlers in the Russian villages. It is usual to dis- tinguish them according to the district of the coast which they frequent, as Murman (Murmanski) and Terian (Terski) Lapps.

The ethnographical position of the Lapps has not been clearly determined, though it is evident they can no longer be classified with the Finns. They are, as has been seen, far from a numerous people, and within the historical period they have considerably recruited themselves from neighbouring races. Shortness of stature! is their most obvious characteristic, though in regard to this much exaggeration has prevailed. Diiben (p. 167) found an aver- age of 4:9 feet for males and a little less for females ; Mante- gazza, who made a number of anthropological observations in Norway in 1879, gives 5 feet and 4-75 feet respectively (Archivio per Pantrop., 1880). Individuals much above or much below the average are rare. The body is usually of fair proportions, but the legs are rather short, and in many cases somewhat bandy. Dark, swarthy, yellow, copper- coloured are all adjectives employed by competent observers to describe their complexion,—the truth being that their habits of life do not conduce either to the preservation or

Se SL SE ee ee ee eel 1 Hence they have been supposed by many to be the originals of the “ little folk’ of Scandinavian legend.

display of their natural colour of skin, and that some of them are really fair, and others, perhaps the majority, really dark. The colour of the hair, too, ranges from blonde and reddish to a bluish or greyish black; and the eyes are black, hazel, blue, or grey. The shape of the skull is the most striking peculiarity of the Lapp. He is the most brachycephalous type of man in Europe, perhaps in the world.? According to Virchow, the women in width of face are more Mongolian-like than the men, but neither in men nor women does the opening of the eye show any true obliquity. In children the eye is large, open, and round. The nose is always low and broad, more markedly retroussé among the females than the males. Wrinkled and puckered by exposure to the weather, the faces even of the younger Lapps assume an appearance of old age. The muscular system is usually well developed, but there is deficiency of fatty tissue, which affects the features (particularly by giving relative prominence to the eyes) and

the general character of the skin. The thinness of the skin, indeed, can but rarely be paralleled among other Europeans. Among the Lapps, as among other lower races, the index is shorter than the ring finger.®

The Lapps are a quiet, inoffensive people. Crimes of violence are almost unknown among them, aud the only common breach of law is the killing of tame reindeer belonging to other owners. In Russia, however, they have a bad reputation for lying and general untrustworthiness, and drunkenness is well-nigh a universal vice. In Scandi- navia laws have been directed against the importation of intoxicating liquors into the Lapp country since 1723.

Superficially at least the great bulk of the Lapps have been Christianized,—those of the Scandinavian countries being Protestants, those of Russia members of the Greek Church. Ineducation the Scandinavian Lapps are far ahead of their Russian brethren, to whoni reading and writing are arts as unfamiliar as they were to their pagan ancestors. The general mauner of life is patriarchal. The father of the family has complete authority over all its affairs ; and on his death this authority passes to the eldest son. Parents are free to disinherit their children ; and, if a son separates from the family without his father's permission, he receives no share of the property except a gun and his wife's dowry.*

By the very circumstances of their position the Lapps are of necessity conservative in most of their habits, many of which can hardly have altered since the first taming of the reindeer. But the strong current of mercantile enterprise has carried a few important products of southern civilization into their huts. The lines in which Thomson describes their simple life—

The reindeer form their riches: these their tents,

Their robes, their beds, and all their homely wealth

Supply ; their wholesome fare and cheerful cups— are still applicable in the main tothe mountain Lapps; but even they have learned to use

coffee as an ordinary bever- age, and to wear stout Norwegian cloth (vadmai).

Linguistically the Laps belong to the great Uralo-Altaic family ; the similarity of their speech to Finnish is evident on the surface.

It is broken up into very distinct and even mutually nnintelligible dialects, the origin of several of which is, however, easily found in

2 Bertillon found in one instance a cephalic index of 94. The average obtained by Pruner Bey was 84°7, by Virchow 82°5.

3 See Retzius, Finska Kranier (Stockholm, 1878); Virchow, in Arch. fir Anthrop., tom. iv., 1870; papers by Virchow (1874), Hagenbeck and Europeus (1875), and Van der Horck (1876), in Zedt- schrift fir Ethnologie; and by Guérault (1863) and Pruner Bey (1864), in Mémoires de la Soc. d Anthrop. Bertillon, in Broca's Revue @ Anthrop., has given a comparison of the craniology of the Lapps with that of Parisians, Kaffres, and New Caledonians.

4 A valuable paper by Ephimenko, on ‘‘ The Legal Customs of the Lapps, especially in Russian Lapland," appears in vol. viii. of the Afem. of Russ. Geog. Soc., Ethnog. Section, 1878.

the political and social dismemberment of the people. Diiben distinguishes four leading dialects; but a much greater number are recognizable. In Russian re alone there are three, due to the influence of Norwegian, Karelian, and Russian (Lonnrot, Acta Soc. Sei. Fennice, vol. iv.). ‘*The Lapps," says Castren, ‘‘have had the misfortune to come into close contact with foreign races while their language was yet in its tenderest infancy, and con- sequently it has not only adopted an endless number of foreign words, but in many grammatical aspects fashioned itself after foreign models." That it began at a very early period to enrich itself with Scandinavian words is shown by the use it still makes of forms belonging to a linguistic stage older even than that of Icelandic. Diiben has subjected the vocabulary to a very interesting

analysis for the purpose of discovering what stage of culturc the people had reached before their contact with the Norse. Agricultural terms, the names of the metals, and the word for smith, are all of Scandinavian origin, and the words for “taming” and ‘ milk” would suggest that the southern strangers taught the Lapps how to turn the reindeer to full account. The important place, however, which this creature must always have held in their estimation is evident from the existeuce of more than three hundred native reindeer words.

The Lapp tongue was long ago reduced to writing by the mission. aries ; but very little has been printed in it except school-books and religious works. A number of popular tales and songs, indeed, have been taken down from the lips of the people by Fjellner, Gronland, and others; J. A. Frijs, professor of Lapp in the university of Christiania, has published Lappéske Sprogprover ; en samling lapp. eventyr, ordsprog, og gader, Christiania, 1856 ; and Lappisk mythologi eventyr og folkesagn, Christiania, 1871. See also G. Donner, Lieder der Lappen; Helsingfors, 1876. The songs are extremely similar to those of the Finns, and a process of mutual borrowing seems to have goneon. In one of the saga-like pieces—Pishan-Peshan’s son—there seems to bea distinct mention of the Baikal Lake, and possibly also of the Altai Mountains. The story of Njavvisena, daughter of the Sun, is full of quaint folklore about the taming of the reindeer. Giants, as well as a blind or one-eyed monster, are frequently intro- duced, and the Asopic fable is not without its representatives. Grammars of the Lapp tongue have been published by Fjellstrom (1738), Leem (1748), Rask (1832), Stockfleth (1840) ; lexicons b Fjellstrém (1780), Leem (1768-1781), Lindahl (1780), Stockflet (1852). Many of the Lapps are able ta speak one or even two of the neighbouring tongues.

The reputation of the Laplanders for skill in magic and divination is of very carly date, and in Finland is not yet extinct. When Erik Blood-axe, son of Harold Haarfager, visited Bjarmaland in 922, he found Gunhild, daughter of Asur Tote, living among the Lapps, to whom she had been sent by her father for the purpose of being trained in witchcraft; and Ivan the Terrible of Russia sent for magicians from Lapland to explain the cause of the appcarance of a comet. One of the

powers with which they were formerly credited was that of raising winds. ‘‘They tye thrce knottes,” says old Richard Eden, ‘‘on a strynge hangyng ata whyp. When they lose. one of these they rayse tollerable wynds. When they lose an other the wynde is more vehement; but by losing the thyrd they rayse playne tempestes as in old tyme they were accustomed to rayse thunder and lyghtnyng” (Hist. of Trawayle, 1577, p. 284), Though we are familiar in English with allusions to ‘‘ Lapland witches,” it appears that the art, according to native custom, was in the hands of the men. During his divination, the wizard fell into a state of trance or ecstasy, his soul being held to.run about at large to pur- sue itsinquiries. Great use was made of a curious divining-drum, oval in shape, and made of wood, 1 to 4 feet in length. Over the upper surface was stretched a white-dressed reindeer skin, and at the corners (so to speak) hang a variety of charms—tufts of wool, bones, teeth, claws, &c. The area was divided into several spaces, often into. three, onefor the celestial gods, one for the terrestrial, and one for man. A variety of figures and conventional signs were drawn in the several compartments : the sun, for instance, is frequently represented by a square and a stroke from each corner, Thar by two hammers placed erosswise ; and in the more modern specimens symbols for Christ, the Virgin, and the Holy Ghost are introduced. An arpa or divin- ing-rod was laid on a definite spot, the drum beaten by a hammer, and conclusions drawn from the position taken up by the arpa. Any Lapp. who had attained, to manhood could in ordinary circum- stances consult the drum for himself, but in matters of unusual moment the professional wizard (ndid, noide, or noaide) had to be called in,

The Laps have a dim tradition that their ancestors lived in a far eastern land, and they tell rude stories of their own conflicts with Norsemen and Karelians. But no answer can be obtained from them to the questions naturally put by the historian in regard to their early distribution and movements. By many it has becn maintained that they were formerly spread over the whole of the Scandinavian peninsula, and they have even been considered by some as the remnants of that primeval race of cave-dwcllers which hunted the reindeer over the snow-fields of central and western Europe. But much of the evidence adduced for these

theories is highly questionable. The contents of the so-called Lapps' graves found in various parts of Scandinavia are often sufficient in themselves to show that the appellation must be a misnomer, and the

syllable Lap or Lapp found in many names of places can often be proved to have no connexion with the Lapps.

Nothing more can be affirmed with certainty than that the arca occupied or visited

by the Lapps once extended farther south (in Russia as far, it would

appear, as Lake Ladoga), and that they already occupied their

present territory at the time when they are first mentioned in

history. According to Diiben the name first occurs in the 13th century —in the Fundinn Noregr, composed about 1200, in Saxo Grammaticus, and in a papal bull of date 1230 ; but the pcople are

probably to be identified with those Finns of Tacitus whom he

describes as wild hunters with skins for clothing and rude huts as only means of shelter, and eertainly with the Skrithiphinoi of Procopius (Goth., ii. 15), the Scritobini of Paulus Warnefridus, and the Scridifinni of the geographer of Ravenna. Some of the details given by Procopius, in regard for instance to the treatment of infants, show that his informant was acquainted with certain characteristic customs of the Lapps. :

In the 9th century the Norsemen from Norway began to treat their feeble northern neighbours as a subject race. The wealth of Ottar,—" northmost of the northmen,"—whose narrative has been preserved by King Alfred, consisted mainly of six hundred of those "deer they call hrenas" and in tribute paid by the natives; and the Kigils saga tells how Brynjulf Bjargulfson had his right to collect contributions from the

Finns (i.¢., the Lapps) recognized by Harold Haarfager. So much valuc was attached to this source of wealth that as early as 1050 strangers were excluded from the fur- trade of Finmark, and a kind of coast-guard prevented their intru- sion. Meantime the Karelians were pressing on the eastern Lapps, and in the course of the 11th century the rulers of Novgorod began to treat them as the Norsemen had treated their western brethren. The ground-swell of the Tartar invasion drove the Karelians west- ward in the 13th century, and for many years cven Finmark was so unsettled that the Norsemen received no tribute from the Lapps. At length in 1326 a treaty was concluded between Norway and Russia by which the supremacy of the Norwegians over the Lapps was recognized as far cast as Voljo beyond Kandalax on the White Sea, and the supremacy of the Russians over the Karelians as far as Lyngen and the Malself. The relations of the Lapps to their more powerful neighbours were complicated by the rivalry of the different Scandinavian kingdoms. After the disruption of the Calmar Union (1523), Sweden began to assert its rights with vigour, and in 1595 the treaty of Tcusina between Sweden and Russia decreed ‘‘ that the Lapps who dwell in the woods between castern Bothnia and Varanger shall pay their dues to the king of Sweden.” It was in vain that Christian IV, of Denmark visited Kola and exacted homage in 1599, and every year sent messengers to protest against the collection of his tribute by the Swedes (a custom which continued down to 1806). Charles of Sweden took the title of ‘‘king of the Kajans and Lapps,”’ and left no means untried to establish his power over al] Scandinavian Lapland. By the peace of Knarod (1618) Gustavus Adolphus gave up the Swedish claiin to Finmark ; and in 1751 mutual renunciations brought the relations of Swedish and Norwegian (Danish) Lapland to their present position. Mcan- while Russian influence had been spreading westward ; and in 1809, when Alexander I. finally obtaincd the cession of Finland, he also added to his dominions the whole of Finnish Lapland to the east of the Muonio and the Kongiima. ;

‘he Lapps have had the ordinary fate of a subject and defenceless people; they have been utilized with little regard to their own interests or inclinations. The cxample set by the carly Norwegians was followed by the Swedes ; a peculiar class of adventurers known as the

Birkarlians (from Bjark or Birk, ‘‘ trade”) began in the 13th century to farm the Lapps, and, recciving very extensive privileges from the kings, grew to great wealth and influence. In 1606 there were twenty-two Birkarlians in Tornio, seventcen in Lule, sixteen in Pite, and sixty-six in Ume Lappmark. They are regularly spoken of as having or owning Lapps, whom they hire out, and dispose of as any other piece of property, In Russian Lapland matters followed much the same course. The very institution of the Solovets monastery, intended by St Tryphon for the benefit of the poor neglected pagans, turned out the occasion of much injustice towards them. By a charter of Ivan Vasilivitch (November 1556), the monks are declared masters of the Lapps of the Motoff and Pctchenga districts, and they soon sought to extend their control over thosc not legally assigned to them (Ephimenko). Other monas- teries in distant parts of the empire were gifted with similar pro- prietary rights; and the supplication of the patriarch Nikon to Alexis Mikhaelovitch, for example, shows only too clearly the oppression to which the Lapps were subjected. :

It is long, however, since these abuses were abolished ; and in Scandinavia more especially the Lapps of the present day enjoy the advantages resulting from a large amount of philanthropie legisla- tion on the part of their rulers. There seems to beno fear of their becoming extinct, except it may be by gradual amalgamation with

their more powerful neighbours. The aggregate number in all Lap- land is estimated at 27,000. According to official statisti¢s the Swedish Lapps increased from 5617 in 1830 to 6702 in 1870. In Norway there were 14,464 in 1845, 17,178 in 1865. For Russian and Finnish Lapland the numbers were given in 1859 as 1200 and 2183, and according to Kelsieff the whole number in Russia is

not now more than 3000. The number of reindeer possessed by |

the.whole people is estimated at 363,000.

Gustaf von Diiben's Om Lappland och Lapparne (Stockh., 1873) is the fullest and most systematic work on its subject. It gives a list of more than two hundred authorities. See also Scheffer, Lapponia (Frankf., 1673; English version, Oxford, 1674), for long the standard book ; Regnard, Voyage de Laponie (1681, often reprinted; English in Pinkerton, vol i.); Hogstrém, Beskrifn. Ofver de till Sveriges Krona lydande Lappmarker, Stockh., 1746; Leem, Beskri- velse over Finmarkens Lapper, Copenh., 1767,, extremely important, in Danish and Latin; Accrbi, Reise durch Schweden, Berlin, 1803; Lestadius, Journal, &¢., Stockh., 1831; Leopold von Buch, Reise durch Norwegen und Lapp- land, Berlin, 1840; Bayard Taylor, Northern Travel, London, 1858; Castren, Nordiska Resor (Hels., 1852-58; Germ, transl., St Petersburg) ; Stockfleth, Dagbog over mine Missions-Reiser, Christ., 1860, of great value; Frijs, En sommer (1867) ¢ Finmarken, &c., Christ., 1871; Aubel, Reise nach Lappland, Leipsic, 1874; Nemirovitch-Dantchenko, Laplandiya 1 Laplandizui, St Peters- burg, 1874; Reports by Kelsieff, &c., for the Anthropological Exhibition at Moscow, 1877, Moscow, 1878; Ecker, Lappland, &c., Freiburg, 1878; Du Chaillu, Land of the Midnight Sun, London, 1881; Edward Rae, The White Sea Peninsula, London, 1882. (H. A. W.)

LA PORTE, chief eity of La Porte county, Indiana, U.S., is situated at the intersection of three railways, 12 miles south of Lake Michigan, and about 60 miles south- east of Chicago. Surrounded by a fertile agricultural region, it carries on a considerable trade, and has manu- factories of agricultural implements, foundries, and various mills. The vicinity has become a favourite summer resi- dence, on account of its beautiful lakes, which in winter supply large quantities of clear ice for the Chicago and southern markets. The population in 1880 was 6195.

LAPPENBERG, Jonann Martin (1794-1865), a German historical writer, was born July 30, 1794, at Hamburg, where his father held a good official position ; early in life he began to study medicine, and afterwards history, at Edinburgh. The latter pursuit he continued in London and at the universities of Berlin and Gottingen, graduating as doctor of laws of Géttingen in 1816. He was forthwith sent by the Hamburg senate as resident minister to the Prussian court, where he

remained till 1823, when he became keeper of the Hamburg archives, an office in which he had the amplest opportunities for the cultivation and exercise of those habits of laborious and critical research on which his highly respectable reputation as an historian rests. He continued to hold this post until 1863, when a serious affection of the eyes compelled him to resign. In 1850 he had the honour of representing Hamburg at the Frankfort conference. His death took place on November 28, 1865.

Lappenberg's most important contribution to literature, and that by which he is best known outside of Germany, was his Geschiehte von England (2 vols., Hamburg, 1834-37), which was translated by Thorpe (1845-57) and continued by Pauli (from 1160). His other works include a continuation of the Gesehiehte des Ursprungs der deutschen Hansa of Sartorius, 1830; Hamburgisehes Urkunden- buch, 1842 ; Hamburger Reehisalierthiimer, 1845; Chroniken der Stadt Hamburg in niederdeutseher Sprache, 1852-61 3 Quellen zur Geschichte des Erzbisthums u. der Stadt Bremen, 1841; editions of Thietmar of Merseburg, Adam of Bremen, Helmold, and Arnold

of Liibeck in the Monwmenta of Pertz, and an edition of Th. Murner's 7%ll Eulenspiegel, 1853

LAPWING, Anglo-Saxon HMledpewince (= one who turns about in running or flight," see Skeat's Htymol. Dictionary, p. 321), a bird, the Tringa vanellus of Linneus and the Vanellus vulgaris or V. cristatus of modern orni- thologists. In the temperate parts of the Old World this species is perhaps the most abundant of the Plovers Charadrude, breeding in greater or fewer numbers in almost every suitable place from Ireland to Japan,—the majority migrating towards winter to southern countries, as the Punjab, Egypt, and Barbary,—though in the British Islands some are always found at that season, chiefly about estuaries. Asa straggler it has occurred within the Arctic

ee' Caxton in 1481 has '"'lapwynches" (Reynard the Fox, cap. 27).

npr it?

Circle (as on the Varanger Fjord in Norway), as well as in Iceland and even Greenland ; while it not unfrequently appears in Madeira and the Azores. Conspicuous as the strongly contrasted colours of its plumage and its very peculiar flight make it, one may well wonder at its success in maintaining its ground when so many of its allies have been almost exterminated, for the Lapwing is the object perhaps of greater persecution than any other European bird that is not a plunderer. Its eggs—the well known "'Plovers' Eggs" of commerce2—are taken by the thousand or ten thousand ; and, worse than this, the bird, wary and wild at other times of the year, in the breeding-season becomes easily approachable, and is (or used to be) shot down in enormous numbers to be sold in the markets for "Golden Plover." Its growing scarcity as a species was consequently in Great Britain very perceptible until an Act of Parliament (35 & 36 Vict. cap. 78) frightened people into letting it alone,? and its numbers have since then as perceptibly increased, to the manifest advantage of many classes of the community—those who would eat its eggs, those who would eat its flesh (at the right time of year), as well as the agriculturists whose lands it frequented, for it is admitted on all hands that no bird is more completely the farmer's friend, What seems to be the secret of the Lapwing holding its position in spite of slaughter and rapine is the adaptability of its nature to various kinds of localities. It will find sustenance for itself and its progeny equally on the driest soils as on the fattest pastures; upland and fen, arable and moorland, are alike to it, provided only the ground be open enough. The wailing cry' and the frantic gestures of the cock-bird in the breeding-season will tell any passer-by that a nest or brood is near; but, unless he knows how to look for it, nothing save mere chance will enable him to find it. Yet by practice those who are acquainted with the bird's habits will accurately mark the spot whence the hen silently rises from her treasure, and, disregarding the behaviour of the cock, which is intended to delude the intruder, will walk straight to one nest after another as though they knew beforehand the exact position of each. The nest is a slight hollow in the ground, wonderfully inconspicuous even when deepened, as is usually the case, by incubation, and the black-spotted olive ee ee ee eee ee

® There is a prevalent belief that many of the eggs sold as ‘‘Plovers’” are those of Rooks, but no notion can be more absurd, since the appearance of the two is wholly unlike, Those of the Redshank, of the Golden Plover (to a small extent), and enormous numbers of those of the Black-headed Gull, and in certain places of some of the Terns, are, however, undoubtedly sold as Lapwings’, having a certain simi- larity of shell to the latter, and a difference of flavour only to be detected by a fine palate, It is estimated that 800,000 Lapwings’ eggs are yearly sent to England from the one province of Friesland in Holland (see Ornith. Centraiblatt, 1877, p. 108).

’ This measure was really insufficient to afford it, or any other bird, proper protection, but the British public scldom read Acts of Parliament critically, and, hearing that one had been passed for the Preservation of Wild Birds, in which the Lapwing was specially named, most persons desisted from persecuting this species, not in the least knowing that the utmost penalty they could incur by killing it in the close-season would be but trifling.

4 This sounds like pee-weet, with some variety of intonation. Hence the names Peewit, Peaseweep, and Teuchit, commonly applied in some parts of Britain to this bird,—though the first is that by which one of the smaller Gulls, Larus ridibundus (see GULL, vol. xi. p. 274), is known in the districts it frequents. In Sweden Vipa, in Germany Kiebitz, in Holland Kiewiet, and in France Dixhuit, are names of the Lapwing, given to it from its usual cry. Other English names are Green Plover and Hornpie—the latter from its long hornlike crest and pied plumage. The Lapwing’s conspicuous crest seems to have been the cause of a common blunder among our writers of the Middle Ages, who translated the Latin word Upupa, properly Hoorok (q.v.), by Lapwing, as being the crested bird with which they were best acquainted. Jn like manner other writers of the same or an earlier period Latinized Lapwing. by Zgrettides (plural), and rendered that again into English as Egrets—the tuft of feathers misleading them also, The word Vanellus is from vannus, the fan used for winnowing corn, and refers to the audible beating of the bird’s wings,

eggs (four in number) are almost invisible to the careless or untrained eye unless it should happen to glance directly upon them. The young when first hatched are clothed with mottled down so as closely to resemble a stone and to be overlooked as they squat motionless on the approach of danger. Ata distance the plumage of the adult appears to be white and black in about equal proportions, the latter

predominating above ; but on closer examination nearly all

the seeming black is found to be a bottle-green gleaming with purple and copper; and the tail-coverts, both above and below, are seen to be of a bright bay colour that is seldom visible in flight. The crest consists of six or eight narrow and elongated feathers, turned slightly upwards at the end, and is usually carried in a horizontal position, extending in the cock beyond the middle of the back ; but it is capable of being erected so as to become nearly vertical. Frequenting (as has been said) parts of the open country so very divergent in character, and as remarkable for the peculiarity of its flight as for that of its cry, the Lapwing is far more often observed in nearly all parts of the British Islands than any other of the group, Limicolzx, to which it belongs. The peculiarity of its flight seems due to the wide and rounded wings it possesses, the steady and ordinarily

somewhat slow flapping of which impels the body at each

stroke with a manifest though easy jerk. Yet on occasion, as when performing its migrations, or even its almost daily transits from one feeding-ground to another, and still more when being pursued by a Falcon, the speed with which it moves through the air is very considerable ; and the passage of a flock of Lapwings, twinkling aloft or in the distance, as the dark and light surfaces of the plumage are alter- nately presented, is always an agreeable spectacle to those who love a landscape enlivened by its wild creatures. On the ground this bird runs nimbly, and is nearly always engaged in searching for its food, which is wholly animal.

Allied to the Lapwing are several forms that have been placed by ornithologists in the genera Hoplopterus, Chettusia, Lobivanellus, Sarctophorus, and so forth ; but the respective degree of affinity they bear to one another is not rightly understood, and space would prohibit any attempt at here expressing it. In some of them the hind toe, which has already ceased to have any function in the Lapwing, is wholly wanting. In others the wings are armed with a tubercle or even a sharp,spur on the carpus. Few have any occipital crest, but several have the face ornamented by the outgrowth of a fleshy lobe or lobes. With the exception of North America, they are found in most parts of the world, but perhaps the greater number in Africa. Europe has three species—Hoplopterus spinosus, the Spur-winged Plover, and Chettusia gregaria and C. leucura; but the first and last are only stragglers from Africa and Asia. (A. N.

LAR, ‘a city of Persia, capital of Laristan, in 27° 30’ N. lat., 53° 58’ E. long., 174 miles from Shiraz, and 127 from the coast at Mogu Bay. Lar stands at the foot of a mountain range in an extensive plain covered with palm trees. The crest of a hill immediately behind the town is crowned by the ruins of a castle formerly deemed impreg- nable. Lar was once a flourishing place, but a large portion is now in ruins, and the population is reduced to about 12,000, There are still some good buildings, of which the most prominent is the bazaar, said to be the finest in Persia, and resembling that of Shiraz, but considerably larger. The governor’s residence stands in the centre of the town, and is

surrounded by strong walls flanked with towers. There is also an outer moat filled by a canal of recent structure, which also serves to supply the numerous cisterns when the rain water fails. Lar is noted for its manufacture of muskets and cloth.

LARCENY. See Tuert.

LARCH (from the German Jerche ;~ Latin, larix), a name applied to a small group of coniferous trees, of which the common larch of Europe is taken as the type. The members of the genus Larix. are distinguished from the firs, with which they were formerly placed, by their deciduous leaves, scattered singly, as in Abzes, on the young shoots of the season, but on all older branchlets growing in whorl-like tufts, each surrounding the ex- tremity of a rudimentary or abortive branch ; from cedars (Cedrus) they differ, not only in the deciduous leaves, but in the cones, the scales of which are thinner towards the apex, and are persistent, remaining attached long after the seeds are discharged. The trees of the genus are closely allied in botanic features, as well as in general appear- ance, so that it is sometimes difficult to assign to them determinate specific characters, and the limit between species and variety is not always very accurately defined. Nearly all are natives of Europe, or the northern plains and mountain ranges of Asia aud North America, though one occurs only on the Himalaya; a somewhat aberrant form, usually placed in a separate sub-genus, is peculiar to north China and Japan.

The common larch (Z. ewropexa) is, when grown in per- fection, a stately tree with tall erect trunk, gradually tapering from root to summit, and horizontal branches

Branchlet of Larch (Larix ewropxa).

springing at irregular intervals from the stem, and in old trees often becoming more or less drooping, but rising again towards the extremities ; the branchlets or side shoots, very slender and pendulous, are pretty thickly studded with the whorls of narrow linear leaves, of a peculiar bright light green when they first appear in the spring, but becoming of a deeper hue when mature. The yellow stamen-bearing

flowers are in sessile, nearly spherical catkins ; the fertile ones vary in colour, from red or purple to greenish-white, in different varieties ; the erect cones, which remain long on the branches, are above an inch in length and oblong- ovate in shape, with reddish-brown scales somewhat waved on the edges, the lower bracts usually rather longer than the scales. The tree flowers in April or May, and the winged seeds are shed the following autumn. When stand- ing in an open space, uncrowded by neighbouring trees,

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the larch grows of a nearly conical shape, with the lower branches almost reaching the ground, while those above gradually diminish in length towards the top of the trunk, presenting a very symmetrical form; but in dense woods the lower parts become bare of foliage, as with the firs under similar circumstances. When springing up among rocks or on ledges, the stem sometimes becomes much curved, and, with its spreading boughs and pendent branch- lets, often forms a striking and picturesque object in the alpine passes and steep ravines in which the tree delights to grow. In the prevalent European varieties the bark is reddish-grey, and rather rough and scarred in old trees, which are often much lichen-covered. The trunk attains a height of from 80 to 140 feet, with a diameter of from 3 to 5 feet near the ground, but in close woods is comparatively slender in proportion to its altitude. The larch abounds on the Alps of Switzerland, on which it flourishes at an elevation of 5000 feet, and also on those of Tyrol and Savoy, on the Carpathians, and in most of the hill regions of central Europe; it is likewise found on parts of the Apennine chain, but is not indigenous to the Pyrenees, and in the wild state is unknown in the Spanish peninsula. It forms extensive woods in Russia, but does not extend its range to the Scandinavian countries, where its absence is somewhat remarkable, as the tree grows freely in Norway and Sweden where planted, and even multiplies itself by self-sown seed, according to Schiibeler, in the neighbourhood of Trondhjem. In the north-eastern parts of Russia, in the country towards the Petchora river, and on the Ural, a peculiar variety prevails, regarded by some as a distinct species (Z sebirica); this form is abundant nearly through- out Siberia,

extending to the Pacific coast of Kamchatka and the hills of Dahuria. The Siberian larch has smooth grey bark and smaller cones, approaching in shape somewhat to those af the American hackmatack; it seems even hardier than the Alpine tree, growing up to latitude 68°, but, as the inclement climate of the polar shores is neared,

dwindling down to the form of a dwarf and even trailing

bush ; on the Altai, however, Pallas states that it flourishes only at medium elevations.

The larch, from its lofty straight trunk and the high quality of its wood, must be regarded as one of the most important of coniferous trees; its growth is extremely rapid, the stem attaining a large size in from sixty to eighty years, while the tree yields good useful timber at forty or fifty; it forms firm heartwood at an early age, and the sapwood is less perishable than that of the firs, rendering it more valuable in the young state.

The wood of large trees is close and compact in texture, in the best varieties of a deep reddish colour varying to brownish-yellow, but apt to be lighter in tint, and less hardin grain, when grown in rich soils or in low sheltered situations. It is remarkably tough, resisting a rending strain better than any of the fir or pine woods in common use, though not as elastic as some ; properly seasoned, it is as little liable ta shrink as to split ; the boughs being small compared to the trunk, the timber is more free from large knots, and the small knots remain firm and undecayed. The only draw- back to these good qualities is a certain liability ta warp and bend, unless very carefully seasoned ; for. this purpose it is recommended to be left floating in water for a year after felling, and then allowed some months to dry slowly and completely before sawing up the logs ; barking the trunk in winter. while the tree is standing, and leaving it in that state till the next year, has been often advised with the larch as with other timber, but the practical inconveniences of the plan have prevented its adoption on any large scale. When well prepared for use, larch is one of the most durable of coniferous woods. Its strength and toughness render. it valuable for. naval purposes, to which it is largely. applied ; its freedom from any

ten- dency to spht adapts it for clinker-built boats, for the construction of which a high authority, Matthew, pronounces it the best of all woods. It is much employed for house building in all countries where it grows in abundance ; most of the picturesque log-houses in Vaud and the adjacent cantons are built of squared larch trunks and derive their fine brown tint from the hardened resin that slowly exudes from the wood after long exposure to the summer sun ; the

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wooden shingles, that in Switzerland supply the place of tiles, are also frequently of larch. In Germany it is much used by the cooper as well as the wien S durable staves for casks being made of this valuable wood, while the form of the trunk admirably adapts it for all purposes for which long straight timber is needed. It is one of the most durable of woods in wet ground or under water, and answers well for fence-posts and river piles; many of the founda- tions of old Venice rest upon larch, the lasting qualities of which were well known and appreciated, not only in medieval times, but in the far-off days of Vitruvius and Pliny. The harder and darker varieties are valuable to the cabinetmaker in the construction of cheap solid furniture, being fine in grain and taking polish better than many more costly woods. A peculiarity of larch wood is the difficulty with which it is ignited, although so resinous, a quality that gives it still higher value to the builder ; for, though not quite so incombustible as the Romans deemed it, large pieces do not as easily take fire as the ordinary kinds of deal timber; and, coated with a thin layer of plaster, beams and pillars of larch might pro- hably be found to justify Cesar’s epithet ‘‘igni impenctrabile lignum” ; even the small branches are not easily kept alight, and a larch fire in the open needs considerable care. Yet the forests of Jarch in Siberia often suffer from conflagration. When these fires occur while the trees are full of sap, a curious mucilaginous matter is exuded from the half-burnt stems ; when dry it is of a pale reddish colour, like some of the coarser kinds of gum-arabic, and is soluble in water, the solution resembling gum-water, in place of which it is sometimes used ; considerable quantities are collected and sold as ‘‘Orenburg gum”; in Siberia and Russia it is occasionally em- ployed

as a semi-medicinal food, being esteemed an antiscorbutic. For burning in close stoves and furnaces, larch makes tolerably good fuel, its value being estimated by Hartig as only one-fifth less than ‘that of beech; the charcoal is compact, and is in demand for iron-smelting and other metallurgic uses in some parts of Europe.

In the trunk of the larch, especially when growing in climates where the sun is powerful in summer, a finc clear turpentine exists in great abundance ; on the declivities of the Alps of Savoy and the south of Switzerland, it is collected by the peasants for sale, though not in such quantity as formerly, when, being taken to Venice for shipment, it was known in commerce as “‘ Venice turpentine.” Old trees are selected, from the bark of which it is observed to ooze in the early summer ; holes are bored in the trunk, somewhat inclined upward towards the centre of the stem, in which, between the layers of wood, the turpentine is said to collect in small lacune ; wooden gutters placed in these holes convey the viscous fluid into little wooden pails hung on the end of each gutter; the secretion flows slowly all through the summer months, and the little tubs are emptied and replaced as they fill; a tree in the proper condition yields from 6 to 8 Ib a year, and will continue to give an annual supply for thirty or forty years, being, however, rendered quite useless for timber by subjection to this exhausting process. In Tyrol, whence a supply is also obtained, a single hole is made near the root of the tree in the spring; this is stopped with a plug, and the turpentine is removed by a scoop in the autumn ; but each tree yields only from a few ounces to 4 tb by this process. Real larch turpentine is a thick tenacious fiuid, of a deep yellow colour, and nearly transparent ; it does not harden by time; it contains 15 per cent. of the essential oil of turpentine, also resin, succinic, pinic, and sylvie acids, and a bitter extractive matter. According to Pereira, much sold wnder the name of Venice turpen- tine is a mixture of common resin and oil of turpentine, and pro- bably little of the real article now reaches ee On the French Alps a sweet exudation is found on the small branchlets of young larches in June and July, resembling manna in taste and laxative properties, and known as Manna de Briancon or Manna Brigantina ; it occurs in small whitish irregular granular masses, which are removed in the morning before they are too much

dried by the sun ; this manna seems to differ little in composition from the sap of the tree, which also contains manmite ; its cathartic powers are weaker than those of the manna of the manna ash (Ornus), but it is employed in France for {he same purposes. The bark of the larch is largely used in some countries for tanning ; it is taken from the trunk only, being stripped from the trees when felled ; its value is about equal to that of birch bark ; but, according to the experience of British tanners, it is scarcely half as strong as that of the oak. The soft inner bark is occasionally used in the wilds of Siberia as a ferment, by hunters and others, being boiled and mixed with rye- meal, and buried in the snow fora short time, when it is employed as a substitute for other leaven, and in making the sour liquor called ‘‘quass.” In Germany a fungus (Polyporus laricis) grows on the roots and stems of decaying larches, which was formerly in esteem in England as a drastic purgative, but has given place to safer drugs, though it is still occasionally used by the Continental pharmacist. The young shoots of the larch are sometimes given in Switzerland as fodder to cattle.

The larch, though mentioned by Parkinson in 1629 as “nursed up” bya few “lovers of variety” as a rare exotic,

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does not seem to have been much grown in England till early in the last century. In Scotland the date of its introduction is a disputed point, but it seems to have been planted at Dunkeld by the duke of Athole in 1727, and about thirteen or fourteen years later considerable plantations were made at that place, the commencement of one of the largest planting experiments ou record ; it is estimated that 14 million larches were planted on the Athole estates between that date and 1826. The cultivation of the tree rapidly spread, and the larch has long become a conspicuous feature of the scenery in many parts of Scot-land. It grows as rapidly and attains as large a size in British habitats suited to it as in its home on the Alps, and often produces equally good timber, but has sometimes been planted under circumstances little adapted to its successful growth. The larch of Europe is essentially a mountain tree, and requires, not only free air above, but a certain

moderate amount of moisture in the soil beneath, with, at the same time, perfect drainage, to bring the timber to perfection,—conditions often occurring on the mountain slope and rocky glen that form its natural habitats, but not always so readily provided in artificial culture. Complete freedom from stagnant water in the ground, and abundant room for the spread of its branches to light and air, are the most necessary requirements for the successful growth of larch,—the contrary conditions being the most frequent causes of failure in the cultivation of this valuable tree. Where these important needs are complied with, it will flourish in a great variety of soils, stiff clays, wet or mossy peat, and moist alluvium being the chief exceptions ; in its native localities it seems partial to the debris of primitive and metamorphic rocks, but is occasionally found growing luxuriantly on calcareous sub- soils ; in Switzerland it attains the largest size, and forms the best timber, ou the northern declivities of the mountains; but in Scotland a southern aspect appears most favourable. The best variety for culture in Britain is that with red female flowers; the light-flowered kinds are said to pro- duce inferior wood, and the Siberian larch does not grow in Scotland nearly as fast as the Alpine tree. The larch is raised from seed in immense numbers in British nurseries ; that obtained from Germany is preferred, being more perfectly ripened than the cones of home growth usually are. The seeds are sown in April, on rich ground, which should not be too highly manured; the young larches are planted out when two years old, or sometimes trausferred to a nursery bed to attain a larger size; but, like all conifers, they succeed best when planted young ; on the mountains, the seedlings are usually put into a mere slit made in the ground by a spade with a triangular blade, the place being first cleared of any heath, bracken, or tall herbage that might smother the young tree; the plauts should be from 3 to 4 feet apart, or even more, according to the growth intended before thinning, which should be commenced as soon as the boughs begin to overspread much; little or no pruning is needed beyond the careful removal of dead branches. The larch is said not to succeed on arable land, especially where corn has been grown, but recent experience does not seem to support this prejudice ; that against the previous occupation of the ground by Scotch fir or Norway spruce is probably better founded, and, where timber is the object, it should not

be planted with other conifers. On the Grampians and neighbouring hills the larch will flourish at a greater elevation than the pine, and will grow up to an altitude of 1700 or even 1800 feet; but it attains its full size on lower slopes. In very dry and bleak localities, the Scotch fir will probably be more successful up to 900 feet above the sea, the limit of the luxuriant growth of that hardy conifer in Britain; and in moist valleys or on imperfectly drained acclivities Norway

spruce is more suitable. The growth of the larch while young is exceedingly rapid ; in the south of England it will often attain a height of 25 feet in the first ten years, while in favourable localities it will grow upwards of 80 feet in half a century or less; one at Dunkeld felled sixty years after planting was 110 feet high; but usually the tree does not increase so rapidly after the first thirty or forty years. Larches now exist in Scotland that rival in size the most gigantic specimens standing in their native woods, a tree at Dalwick, Peeblesshire (said to have been planted in 1725), is 5 feet in diameter; one at Glenarbuck, near the Clyde, is above 140 feet high, with a circumference of 13 feet. The annual increase in girth is often consider- able even in large trees; the fine larch near the abbey of Dunkeld figured by Strutt in his Sylva Britannica increased 24 feet between 1796 and 1825, its measurement at the latter date being 13 feet, with a height of 974 feet.

In the south of England, the larch is much planted for the supply of hop-poles, and is considered one of the best woods for that purpose, the stems being straight and easily trimmed into poles, while they are extremely durable, though in parts of Kent and Sussex those formed of Spanish chestnut are regarded as still more lasting. In plantations made with this object, the seedlings are placed very close (from 14 to 2 feet apart), and either cut down

-all at once, when the required height is attained, or thinned

out, leaving the remainder to gain a greater length; the land is always well trenched before planting. The best season for larch planting, whether for poles or timber, is the month of November ; the operation is sometimes performed in the spring, but the practice cannot be commended, as the sap flows early, and, if a dry period follows, the

growth is sure to be checked. The thinnings of the larch woods in the Highlands are in demand for railway sleepers, scaffold poles, and mining timber, and are applied to a variety of agricultural purposes. The tree generally succeeds on the Welsh hills, and might with advantage be planted on many of the drier mountains of Ireland, now mere barren moor- land or poor unremunerative pasture.

The European larch has long been introduced into the United. States, where, in suitable localities, it flourishes as luxuriantly as in Britain. Of late years some small plan- tations have been made in America with an economic view, the tree growing much faster, and producing good timber at an earlier age, than the native hackmatack, while the wood is less ponderous, and therefore more generally applicable.

The larch in Britain is occasionally subject to destructive casual- ties. The young seedlings are sometimes nibbled by the hare and rabbit ; and on parts of the Highland hills both bark and shoots are eaten in the winter by the roe-deer, which is a great enemy to young plantations ; lareh woods should always be fenccd in to keep out the hill-eattle, whieh will browse upon the shoots in spring. The ‘‘woolly aphis,” ‘‘ American blight,” or ‘‘lareh blight” (Eriosoma laricis) often attaeks the trees in close valleys, but rarely spreads much unless other unhealthy conditions are present. A far more formidable enemy is the disease known as the “‘heart-rot” ; it oceurs in all the more advanced stages of growth, occasionally attacking young larches only ten ycars old or less, but is more com- mon at a later period, when the trees have acquired a considerable size, sometimes spreading in a short time through a whole planta- tion. The trees for a considerable period show little sign of un- healthiness, but eventually the lower part of the stem near the root begins to swell somewhat, and the whole tree gradually goes off as the disease advances ; when cut down, the trunk is found to be decayed at the centre, the ‘‘rot” usually commencing near the ground and gradually extending upwards. Trees of good size are thus rendered nearly worthless, often showing little sign of unhealthiness till felled. Great differenee of opinion exists among foresters as to the cause of this destructive malady ; the manner in which it spreads would seem to indicate a fungoid origin, and the previous growth of

pine on the ground is one of the most usual explanations offered. That some fungoid mycelium may be the remote cause of the disease seems not improbable ; but there 1s little doubt that any cireumstance that tends to weaken the tree acts as

a predisposing cause of the attack, and the best safeguards are probably perfect drainage, and early and sufficient thinning. On exposed hill-sides, and other well-drained breezy localities, the larch is little liable to failure from ‘‘rot” or any other cause. On arid subsoils, however, the tree will sometimes be injured in very dry seasons; and such situations, though suitable for Scotch fir, are therefore badly adapted for larch. : —

Considerable quantities of larch timber are imported into Britain for use in the dockyards, in addition to the large home supply. The quality varies much, as well as the colour and density; an Italian sample in the museum at Kew (of a very dark red tint) weighs about 244 Ib to the cubic foot, while a Polish specimen, of equally deep hue, is 44 Ib 1 oz. to the same measurement.

For the purposes of the landscape gardener, whose chief aim is the picturesque, the larch is a valuable aid in the formation of park and pleasure ground. On steep hill-sides, the lofty aspiring stem and drooping branchlets add a pleasing feature to the prospect ; the light airy aspect of the tree adapts it as a contrast to the heavier masses of the pines and firs; the bright light-green foliage in the spring affords an agreeable variety, and nature presents few more refreshing objects to the sight than a larch plantation bursting into young leaf; in the late autumn, the pale yellow of the changing foliage stands out in strong relief to the sombre tones of the ever- green conifers, or the deep red-brown of the beech ; but in park or plantation the larch is never seen to such advantage as when hanging over some tumbling burn or rocky pass among the moun- tains. A variety with very pendent boughs, known as the ‘‘ droop- ing” larch, is occasionally met with in gardeus.

he bark of the larch has lately been introduced into pharmacy, being given, generally in the form of an alcoholic tincture, in chronic bronchitic affections and internal hemorrhages. It con- tains, in addition to tannin, a peculiar principle called larixin, which may be obtained in a pure state by distillation from a con- centrated infusion of the bark ; it is a colourless substance in long erystals, with a bitter and astringent taste, and a faint acid reaction; hence some term it larixinie aeid.

The genus is represented in the eastern parts of North America by the hackmatack (LZ. americana), of which there are several varic- ties, two so well-marked that they are by some botanists considered specifically distinct. In one (L. mtcrocarpa) the cones are very small, rarely exceeding 4 inch in length, of a roundish-oblong shape ; the scales are very few in number, crimson in the young state, reddish-brown when ripe; the tree much resembles the European larch in general appearance, but is of more slender growth; its trunk is seldom more than 2 feet in diameter, and rarely above 80 feet high ; this form is the red larch, the épinette rouge of the French Canadians. The black larch (LZ. pendula) has rather larger cones, of an oblong shape, about ? inch long, purplish or green in the immature state, and dark brown when ripe, the scales somewhat more numerous, tle bracts all shorter than the scales. The bark is dark bluish-grey, smoother than in the red larch, on thet runk and lower boughs often glossy; the branches are more or less pendulous and very slender. The red larch grows usually on higher and drier ground, ranging from the Virginian mountains to the shores of Hudson’s Bay; the black larch is found often on moist land, and even in swamps. The hackmatack is one of the most valuable timber trees of America ; it is in great demand in the ports of the St Lawrence for shipbuilding, the best vessels built in British America having their frames wholly or partially constructed of this fine wood. It is far more durable than any of the oaks of that region, is heavy and close-grained, and much stronger, as well as more lasting, than that of the pines and firs of Canada. In many parts all the finer trees have been cut down, but large woods of it still exist in the less accessible districts; it abounds especially near Lake St John, and in Newfoundland is the prevalent tree in some of the forest tracts ; it is

likewise common in Maine and Vermont. In the timber and building yards the red” hackmatack is the kind preferred, the produce, probably, of L. mierocarpa ; the

grey” is less esteemed ; but the varieties from which these woods are obtained cannot always be traced with certainty. Several fine specimens of the red larch exist in English parks, but its growth is much slower than that of L. ewropxa, and it has never been planted on a large scale ; the more pendulous forms of ZL. pendula are elegant trecs for the garden. The hackmatacks might per- ed be grown with advantage in places too wet for the common

In western America a larch occurs more nearl i europea, the western larch (L. occidentalis) of NUEal bees of it as found by him in “‘the coves of the Rocky Meoueatets on the western slope towards the Oregon.” The leaves are short, thicker and more rigid than in any of the other larches: the cones are much larger than those of the hackmatacks, egg-shaped or oval in outline ; the scales are of a fine red in the immature state, the bracts green and extending far beyond the scales in a rigid leaf-like point. The bark of the trunk has the same reddish tint as that of the common larch of Europe. Thisis probably the tree described by Fremont as the European larch, and found by him in great abund-

ance on the Blue Mountains, near the valley called the Grand Rond. He alludes to the large size of the trunk, some of the trees being 200 feet high and one 10 feet in circumference ; the stems were often clear of branches for 100 feet from the ground. Little is known of the quality of the timber, but specimens of the wood seem to be firni and close in grain; the colour is a pale reddish tint throughout. From its great size the tree would appear worthy of the attention of American planters.

The other species of the genus Larix present few features of interest except to the botanist. (CHI?)

LARD is the melted and strained fat of the common hog. The bulk of the lard of commerce is obtained from the abdominal fat of the animal; but in the preparation of inferior qualities fatty scraps of all kinds which result from the preparation of pork are melted up, and occasionally entire flanks of pigs are treated for the fat they yield. Ordinary lard is a pure white fat of the consistency of butter, having a faint characteristic taste, and scarcely any odour. It melts at between 78° to 88° Fahr., has a specific gravity of 0-915, and consists of 62 per cent. of fluid fat (olein or lard oil), and 38 per cent. of the hard fats palmitin and stearin. If perfectly pure, it has no tendency to become rancid ; but there is generally sufficient impurity present to develop a change in the olein, which gradually exhibits itself by a yellow colour and a rancid odour and taste. Lard is an article of considerable importance in commerce; it is calculated that the annual produce of the sub- stance in the United States of America alone is not less than 5,000,000 cwts. Its preparation is conducted in connexion with the great pork-curing and packing establish- ments, mostly centred in Chicago, Cincinnati, St Louis, Milwaukee, Louisville, and Indianapolis,—Chicago alone now monopolizing about one-half of the American trade. In these establishments the fat is "'rendered " in large vats heated by coils or worms of steam pipes, each charge being completely melted in from ten to twelve hours. The greaves or cracklings which remain are used for making "dog biscuits," &c. The finest lard is prepared from the "leaf" fat of the abdominal cavity, and passes into commerce as '"'prime steam lard." The intestinal fat, trimmings, and refuse yield No. 2 lard, which is mostly sent to the European market. The summer-killed pigs yield on an average 34 Ib of lard, while the winter-killed animals pro- duce about 37 tb, but in the case of selected animals these figures may rise to 45 tb and 54 kb respectively. The uses of lard are numerous: it is largely employed by biscuit and pastry bakers and in domestic cookery ; it is used in the dressing and currying of leather ; it is an important article in pharmacy for ointments, plaisters, and suppositories ; it forms a principal ingredient in many pomades and prepara- tions for the toilet; and it is the source of the important lard oil and "solar stearin" noted below. Lard is occasion- ally adulterated with water up even to 20 per cent., with starch, chalk, plaster of Paris, baryta, &c. Such falsi- fications, owing to the nature of the substance,

are easily detected :—the water by bringing the substance gently to the melting point when it separates ; starch by the charac- teristic reaction with iodine ; and mineral substance by the ash remaining after the burning of the fat. The imports into the United Kingdom in 1880 amounted to 927,512 cwts., value £1,852,160,—the very large proportion of 873,100 cwts. coming from the United States, and 46,618 from British North America. A large amount of native lard is also consumed in the United Kingdom, this being usually put up in bladders for sale. That prepared in Wiltshire is the most highly prized, and is the quality generally. used in domestic cookery.

Lard oil is the limpid, clear, colourless oil expressed by pressure and gentle heat from lard, leaving a solid, glistening, and crystalline residue, known in commerce as “solar stearin,” which is useful in candle making, but [is also used to adulterate spermaceti. Lard oil has now

an important function in industry, being principally em- ployed for the oiling of wool and in lubrication. It is also a good deal consumed in the falsification of more valuable oils, for which its neutral properties well adapt it; and it in turn is adulterated with cotton seed oil, &e.
LARDNER, Dionystus (1793-1859), a prolific scien- tific writer, was born at Dublin, April 3, 1793. His father was a solicitor, and intended his son to follow the same calling. After some years of uncongenial desk work, Lardner, determining on a university career, cntered Trinity College, Dublin, and graduated B.A. in 1817. In 1828 he became professor of natural philosophy and astronomy

at University College, London, a position which he held |

till 1840, when he eloped with a married lady, and had to leave the country. After a most successful lecturing tour through the principal cities of the United States, which realized 200,000 dollars, he returned to Europe in 1845. He settled at Paris, and continued to reside there till within a few months of his death, which took place at Naples, April 29, 1859.

Though lacking in real originality or brilliancy, Lardner showed himself to be a successful popularizer of science. He was the author of numerous mathematical and physical treatises on such subjects as algebraic geometry (1823), the differential and integ- ral calculus (1825), the steam engine (1828), besides hand-books on various departments of natural philosophy (1854-56) ; but it is as the editor of Lardner's Cyclopedia (1830-44) that he will be best remembered. To this scientific library of 134 volumes many of the ablest savants of the day contributed, Lardner himself being the author of the treatises on aritlimetic, geometry, heat, hydrostatics and pneumatics, mechanics (in conjunction with Kater), and electricity (in conjunction with Walker). The Cabinet Library (12 vols., 1830-32) and the Museum of Science and Art (12 vols., 1854-56) are his other chief undertakings. A few original papers appear in the Royal Irish Academy's Z'ransactions (1824), in the Royal Society's Proceedings (1831-36), and in the Astrono- mical Society's Monthly Notices (1852-53) ; and two Reports to the British Association on railway constants (1838, 1841) are from his pen.

LARDNER, Narnaniet (1684-1768), author of the The Credibility of the Gospel History, was born at Hawk- hurst, Kent, in 1684. After having studied for the Pres- byterian ministry in London, and also at Utrecht and Leyden, he in 1709 took licence as a preacher ; but, failing to gain acceptance in the pulpit, he in 1713 entered the family of a lady of rank as tutor and domestic chaplain, and in this position he remained until 1721. In 1724 he was appointed to deliver the Tuesday evening lecture in the Presbyterian chapel, Old Jewry, London, and in 1729 he became assistant minister to the Presbyterian congregation in Crutched Friars. He died at Hawkhurst on July 24,

1768.

An anonymous volume of Memoirs appeared in 1769 ; and a life by Kippis is prefixed to the edition of the Works of Lardner, pub- lished in 11 vols. 8vo in 1788, in 4 vols. 4to in 1817, and 10 vols. 8vo in 1827. The full title of his principal work—a work which, though now quite out of date, gives its author a permanent place of some

respectability in the history of Christian apologetics—is The Credibility of the Gospel History; or the Principal Facts of the New Testament confirmed by Passages of Ancient Authors, who were con- temporary with our Saviour or his Apostles, or lived near their time. Part i., in 2 vols. 8vo, appeared in 1727 ; the publication of part i1., in 12 vols. 8vo, began in 1783 and ended in 1755. In 1780 there was a second edition of parti., and the Additions and Alterations were also published separately. A Stwpplement, otherwise entitled A History of the Apostles and Evangelists, Writers of the New Testament, was added in 8 vols. (1756-57), and reprinted in 1760. Other works by Lardner are 4 large Collection of Ancient Jewish and Heathen Testimonies to the Truth of the Christian Revelation, with Notes and Observations, 4 vols. 4to, 1764-67 ; The History of the Herctics of the two first Centuries after Christ, published post- humously in 1780; a considerable number of occasional sermons ; and A Letter concerning the question whether the Logos supplied the place of the Human Soul in the Person of Jesus Christ. In this tract, written in 1730 and published in 1759, Lardner indicated his preference for the Unitarian view.

LARES were Roman deities, whose character and wor- ship share in the obscurity that envelops all antique

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Roman religion. They belonged to the cultus of the dead, from which so much of Roman and Greek religion was derived ; they were the deified ancestors still living in their graves in the house, and worshipped by the family as their guardians and protectors. But the dead were powerful also to do harm, unless they were duly propitiated with all the proper rites; they were spirits of terror as well as of good ; in this fearful sense the names Lemures and still more Larve were appropriated to them. The name Lar has been thought to be an Etruscan word, meaning “lord”; it is a common personal name or title in Etruria. We find certainly, from a very early time, a distinction between Lares privati and Lares public. The former were wor- shipped in the house by the family alone, and the Lar familiaris was conceived

as the head of the family and of the family cultus. The Lares publici belonged to the state religion; and their worship, after having fallen into neglect, was restored by Augustus and to some extent re-modelled. It is therefore difficult to distinguish how far the known rites of the cultus are ancient; but it seems certain that the genzus of Augustus, as refounder of the state, was added, and that the original Lares prestites were two in number. Schwegler and others have maintained that this pair are the twin brothers so frequent in early religions, the Romulus and Remus of the Roman foundation-legend ; that the tale of the twins is in most of its elements derived from the religion of the two Lares ; that Acca Larentia, the fostermother of the twins, is the same as Lara, Larunda, Mania, or Muta, the mother of the Lares ; and that the Larentalia, celebrated on December 23, was a feast of the Lares. But the two sets of legends must be strictly dis-tinguished: the difference in the quantity of the opening syllable shows that Larentia has no connexion with Larunda and the Lares; the Larentalia was a festival of Jupiter and Acca Larentia, in which the Lares had no place; and Mommsen argues that Remus was a late addition to the foundation legend, in which originally Romulus alone was known. As restored by Augustus, the Lares prestites were the guardians of the state and protectors of its unity ; and, in lesser circles, every division of the city had likewise its Lares compitales, now three in number, who had their own edicula at the cross roads and their special festival, Compitalia. The temple of the city Lares (sacellwm Larum) was near the top of the Via Sacra.

The worship of the private Lares, who had their home either on the hearth of the atriwm or in their own little shrine, lararium,

ersisted throughout the pagan period, but in later time changed its character to a great extent. The emperor Alexander Severus had images of Abraham, Christ, and Alexander the Great among his household Lares. These domestic Lares were worshipped daily, but with special rites on the kalends, nones, and ides of every niouth ; they shared with the family in every festival ; when the young bride entered the house for the first time she offered a sacri- fice to them; when the boy assumed the toga virilis he dedicated his childish balla to the Lar

familiaris. Marquardt maintains that there was only one Zar in each household, and that the two Lares compitales were the guardians of the two roads that intersected at the compita. The Lemures as distinguished from the Larcs were propitiated at the festival of the Lemuralia, on the 9th, 11th, and 13th of May. In it the dead were propitiated, and the strange un- explained ceremony of throwing the argei into the river was per- formed. A legend of the birth of the Lares makes them children of the god Mercury and a female figure, Larunda, Lara, or Lala. The fact that the dog was sacred to them, and that a stone figure of a dog stood in the Sacellum Larum, deserves notice in illustration of this legend, for the dog is connected with the Greek god Hermes. Probably this may have arisen under Greek influence. Other classes of Lares mentioned as early as the republican period are the Lares rurales, viales, permarini. To the last-named Aurelius dedicated a temple in commemoration of the naval victory over Antiochus, 190 n.c. The generally acecpted view is that the Lares are repre- sented as young men, crowned with laurel, dressed in short high- girt tunics, holding horns and cups in their hands ; but Marquardt, in accordance with his view that there was only one Lar, considers that these two figures are penates, and on a coin of the gens Ceesia

the Lares are represented as two young men with chlamys and XIV. — 40

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the cinctus Gabinus the end of the toga was thrown over the head, whereas the Lares always wear only a tunic, and have never veiled heads. The Compitalia was, during the Republican time, a feria conceptiva, set by the praetor at some time soon after the Saturnalia, December 17-19. Under the empire it was fixed for January 3-5.

See Schomann, De Diis Manibus; Hertzberg, De Diis Roman patr.; Hartung, Relig. der Romer; Schwegler, Lom. Gesch., vol. ii.; Preller, Rim. Mythol.; Jordan, ‘‘ Vesta und die Laren,” aud ‘ De Larum Imag.,” in Annali, 1862; Reifferscheid, ‘‘ De Lar. pict. Pomp.,” in Annali, 1863; Marquardt, Rém. Staatsverw., iii. 120,

197, 244; Mommsen, ‘‘ Acca Larentia,” in Rém. Forsch., ti., and |

*‘ Remus Legend,” in Hermes, 1881.

LARGILLIERE, Nicoxas (1656-1746), perhaps the most distinguished portrait painter of the age of Louis XIV., was born at Paris, October 20, 1656. His father, who was a merchant, took him to Antwerp at the age of three, and when nine years old he accompanied a

friend of the family to London, where he remained nearly |

two years. The attempt to turn his attention to business having failed, he entered, some time after his return to Antwerp, the studio of Goubeau, quitting this at the age of eighteen to seek his fortune in England, where he

was befriended by Lely, who employed him for four years |

at Windsor. His skill attracted the notice of Charles IL., who wished to retain him in his service, but the fury aroused against Catholics by the Rye House Plot alarmed Largilliére for his own safety, and he left England for Paris, where he was well received by Le Brun and Van der Meulen. In spite of his Flemish training the reputation of Largillitre, especially as a portrait painter, was soon established ; his brilliant colour and lively touch attracted all the celebrities of the day,—actresses, public men, and popular preachers flocking to his studio. Huet, bishop of Avranches, Cardinal de Noailles, the Duclos, and President Lambert, with his beautiful wife and daughter, are amongst some of his most noted subjects. It is said that James II. recalled Largillitre to England on his accession to the

throne in 1685, that he declined to accept the office of | keeper of the royal collections, but that, although he conld |

not be induced to remain in London permanently, he

made a short visit, during which he painted portraits of the This last is |

king, the queen, and the prince of Wales. impossible, as the birth of the prince did not take place till 1688 ; the three portraits, therefore, painted by Largilliére of the Pretender in his youth must all have been executed in Paris, to which city he returned some time before March 1686, when he was received by the Academy as a member, and presented as his diploma picture the fine portrait of Le Brun, now in the Louvre. He was received as an historical

painter ; but, although he occasionally produced works of |

that class (Crucifixion, engraved by Roettiers), and also treated subjects of still life, it was in historical portraits that he excelled. Horace Walpole tells us that he left in London those of Pierre van der Meulen and of Sybrecht. His works are rare in the local museums, but several are at Versailles, The church of St Etienne du Mont at Paris contains the finest example of Largillitre's work when dealing with large groups of figures ; it is an ex voto offered by the city to St Genevidve, painted in 1694, and contain- ing portraits of all the leading officers of the municipality. Largillitre passed through every post of honour in the Academy, until in 1743 he was made chancellor. He died on the 20th March 1746, Oudry was the most distin- guished of his pupils. Largillitre's work found skilful in terpreters in Van Schuppen, Edelinck, Desplaces, Drevet, Pitou, and other engravers. '

LARISSA (in Turkish Yeni Shehr), the most important

town of Thessaly, is situated in a rich agricultural dis- |

trict on the right bank of the Salambria (Peneius), about 35 miles north-west of Volo. Up till 1881 it was the seat of a pasha in the vilayet of Janina; it now ranks

spear, seated, with a dog between them. Jordan remarks that in | as the chief town of the new Greek province. | subjection to Turkey has left little trace of a nobler

Its long

antiquity, and the most striking features in the general view are the mosques and the Mohammedan burying- grounds. It was the seat of a strong Turkish garrison, and the great mass of the people were of Turkish blood, In the outskirts is a village of Africans from the Sudan — a curious remnant of the forces collected by Ali Pasha. The manufactures include Turkish leather, cotton, silk, and tobacco, but the general state of trade and industry is far from being prosperous. Fevers and agues are rendered prevalent by the badness of the drainage and the over- flowing of the river; and the death-rate is higher than the birth-rate. The population is estimated at 25,000 or

30,000.

Larissa, written Larisa on ancient coins and inscriptions, is near the site of the Homeric Argissa. It appears in early times as a powerful city under the rule of the Aleuade, whose authority ex- tended over the whole plain of the Pelasgiotis. The inhabitants sided with Athens during the Peloponnesian War, and during the Roman invasion their city was a point of considerable importance. In the 5th century it was made the seat of an archbishop, who has now fifteen suffragans. During the war of Greek independence Larissa was the headquarters of Ali Pasha. Notices of the few ancient inscriptions recently found at Larissa are given by Miller in Mélanges philologiques, Paris, 1880. The name Larissa is a com- mon one, and the city has more particularly to be distinguished from Larissa Cremaste on Mount Othrys.

LARISTAN, a province of Persia, bounded by Farsist4n on the W. and N.W., by Kirmaén on the E. and N.E., by the Persian Gulf on the 8. It lies between 26° 30’ and 28° 25’N. lat., 52° 30’ and 55° 30’ E. long., and has an extreme length and breadth of 210 and 120 miles respectively, with an area of 20,000 square miles. Léaristan is one of the least productive provinces in Persia, consisting mainly of moun- tain ranges in the north and east, and of arid plains varied with rocky hills and salt or sandy valleys stretching thence tothe coast. In the highlands there are some fertile upland tracts producing corn, dates,

and other fruits ; and there the climate is genial, But elsewhere it is extremely sultry, and on some low-lying coast lands subject to malaria. Good water is everywhere so scarce that but for the rain preserved in cisterns the country would be mostly unin- habitable. The coast is chiefly occupied by Arab tribes under their own chiefs, who are virtually independent, paying merely a nominal tribute to the shah's Government. They reside in small towns and mud forts scattered along the coast, and were till recently addicted to piracy. The people of the interior are mostly of the old Iranian stock, intermediate between the Tajiks and Kurds, and speaking an archaic form of Persian. Here the chief tribes are the Mezaijan, about 1600, with numerous flocks and herds; the Bekoi, 2500; and the Tahuni, 200. Laristén was subdued eight hundred years ago by a Turki khan, and — remained an independent state till its last ruler was deposed and put to death by Shah "Abbas the Great. Population about 90,000.

LARK, Anglo-Saxon Léwerce, German Lerche, Danish Lerke, Dutch Leeuwerik, a bird's name (perhaps always, but now certainly) used in a rather general sense, the specific meaning being signified by a prefix, as Skylark, Titlark, Woodlark, and so forth. It seems to be nearly conterminous with the Latin Alauda as used by older authors ; and, though this was to some extent limited by Linnzus, several of the species included by him under

_the genus he so designated have long since been referred

elsewhere. By Englishmen the word Lark, used without qualification, almost invariably means the SkyLarK, Alauda arvensis, which, as the best known and most widely- Spread species throughout Europe, has been invariably considered the type of the genus. It scarcely needs de- scription. Of all birds it holds unquestionably the fore-

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most place in our literature, and there is hardly a poet or poetaster who has not made it his theme, to say nothing of the many writers of prose

who have celebrated its qualities in passages that will be remembered so long as our language lasts. It is also one of the most favourite cage birds, as it will live for many years in captivity, and, except in the season of moult, will pour forth its thrilling gong many times in an hour for weeks or months together, while its affection for its owner is generally of the most marked kind. Difficult as it is to estimate the comparative abundance of different species of birds, there would probably be no error in accounting the Skylark the most plentiful of the Class in Western Europe. Not only does it frequent

almost all unwooded districts in this quarter of the globe,

making known its presence throughout spring and summer, everywhere that it occurs, by its gladsome and heart-lifting notes, but, unlike most birds, its numbers increase with the spread of agricultural improvement, and since the beginning of the century the extended breadth of arable land in Great Britain must have multiplied manifold the Lark-population of the country. Nesting chiefly in the growing corn, its eggs and young are protected in a great measure from all molestation ; and, as each pair of birds will rear several broods in the season, their produce on the average may be set down as at least quadrupling the original stock—the eggs in each nest varying from five to three, The majority of young Larks seem to leave their birthplace So soon as they can shift for themselves, but what immediately becomes of them is one of the many mysteries of bird-life that has not yet been penetrated. When the stubbles are cleared, old and young congregate in flocks ; but the young then seen appear to be those only of the later broods. In the course of the autumn they give place to others coming from more northerly districts, and then as winter succeeds in great part vanish, leaving but a tithe of the numbers previously present. On the approach of severe weather, in one part of the country or another, flocks arrive, undoubtedly from the Continent, which in magnitude cast into insignificance all those that have hitherto inhabited the district. On the east coast of both Scotland and England this immigration has been several times noticed as occurring in a constant stream for as many as three days in succession. Further inland the birds are observed ‘in numbers simply incalculable,” and “in

countless hundreds.” On such occasions the bird-catchers are busily at work with their nets or snares, so that 20,000 or 30,000 Larks are often sent together to the London market, and at the lowest estimate £2000 worth are annually sold there. During the winter of 1867-68, 1,255,500 Larks, valued at £2260, were taken into the town of Dieppe.’ The same thing happens in various places almost every year, and many persons are apt to believe that thereby the species is threatened with extinction. When, however, it is con- sidered that, if these birds were left to continue their wauderings, a large proportion would die of hunger before reaching a place that would supply them with food, and that of the remainder an enormous proportion would perish at sea in their vain attempt to find a settlement, it must be acknowledged that man by his wholesale massacres, which at first seem so brutal, is but anticipating the act of Nature, and on the whole probably the fate of the Larks at his hands is not worse than that which they would encounter did not his nets intervene.

The Skylark’s range extends across the Old World from the Faroe to the Kurile Islands. In winter it occurs in North China, Nepaul, the Punjab, Persia, Palestine, Lower Egypt, and Barbary. It sometimes strays to Madeira, and has been killed in Bermuda, though its unassisted appear-

ance there is doubtful. It has been successfully introduced on Long Island in the State of New York, and into New Zealand—in which latter it is likely to become as trouble- some a denizen as are other subjects upon which Acclima- tization Societies have exercised thetr meddlesome activity. Allied to the Skylark a considerable number of species have

Fic. 1.—A, Alauda agrestis ; B, Alauda arvensis.

been described, of which perhaps a dozen may be deemed valid, besides a supposed local race, Alauda agrestis, the difference between which and the normal bird is shown in the annexed woodcut (fig. 1), kindly lent to this work by Mr Dresser, in whose Birds of Hurope it is described at length. These are found in various parts of Africa and Asia,

The WoopLaRrk, Alauda arborea, is the only other clearly- established European species of the genus, as now limited by some recent authorities. It is a much more local and therefore a far less numerous bird than the Skylark, from which it may be easily distinguished by its finer bill, shorter tail, more spotted breast, and light superciliary stripe. Though not actually inhabiting woods, as its comnion name might imply, it is seldom found far from trees. Its song wants the variety and power of the Sky- lark's, but has a resonant sweetness peculiarly its own. The bird, however, requires much care in captivity, and is far less often caged than its congener. It has by no means so wide a range as the Skylark, and perhaps the most eastern locality recorded for it is Erzeroum, while its ap- pearance in Egypt and even in Algeria must be accounted rare.

Not far removed from the foregoing is a group of Larks characterized by a larger crest, a stronger and more curved bill, a rufous lining to the wings, and some other minor features. This group has been generally termed Galerita,? and has for its type the Crested Lark, the Alauda cristata of Linnzus, a bird common enough in parts of France and some other countries of the European Continent, and said to have been obtained several times in the British Islands. Many of the birds of this group frequent the borders if not the interior of deserts, and such as do so exhibit a more or less pale coloration, whereby they are assimilated in. hue to that of their haunts. 'The same character- istic may be observed in several other groups—especi- ally those known as belonging to the Genera Ca/andrella, Ammomanes, and Certhilauda, some species of which are of a light sandy or cream colour. The genus last named is of very peculiar appearance, presenting in some respects an extraordinary resemblance to the Hoopoes, so much so that the first specimen described was referred to the genus Upupa, and named U. alaudipes. The resemblance, how- ever, is merely one of analogy. The Hoopok (.v.) belongs to a totally distinct Order of birds, widely differing ana- tomically and physiologically, and we can hardly yet assume that this resemblance is the effect of what is commonly

_* See Yarrell (Hist. Br. Birds, ed. 4, i. pp. 618-621), where par- ticular references to the above statements, and some others, are given.

2 The name, however, is inadmissible, owing to its prior use in Entomology.

called “ mimicry,” though that may ultimately prove to be the case. Mi There is, however, abundant evidence of the susceptibility of the Alaudine structure to modification from external cir- cumstances,—in other words, of its plasticity ; and perhaps no homogeneous group of Passeres could be found which better displays the working of “ Natural Selection.” This fact was recognized many years ago, and ere “ Darwinism ” was founded as a creed, by one whose knowledge of the Alaudide was based on the safe ground of extensive personal ob- servation, and by one who cannot be suspected of any prejudice in favour of new-fangled notions. The remarks made by Canon Tristram (dis, 1859, pp. 429-433) de- serve all attention, going, as they go, to the root of the matter, and nothing but the exigencies of space precludes their reproduction here. A monograph of the Family executed by a competent ornithologist from an evolutionary point of view could not fail to be a weapon of force in the hands of all evolutionists. Almost every character that among Passerine birds is accounted most sure is in the Larks found subject to modification. The form

of the bill varies in an ex- ce” CO A

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e) wn SK Ose Hz, >

Fia. 2.—A, Alauda arborea ; B, Certhilauda.

traordinary degree. In the Woodlark (fig. 2, A), already noticed, it is almost as slender as a Warbler’s; in Ammo- manes it is short; in Certhi- lauda (fig. 2, B) it is elon- gated and curved ; in Pyrrhu- lauda and Melanocorypha (fig. 3, A) it is stout and Finch- like; while in Rhamphocorys (fig. 3,B) it is exaggerated to an extent that surpasses almost any Fringilline form, exceeding in its development that found

in some members of the perplexing genus Para- —calandra;_ ~~B, Rhampho~~ doxornis, and even presenting corys clot-bey.

a resemblance to the same feature in the far-distant Anas- tomus—the tomia of the maxilla not meeting those of the mandibula along their whole length, but leaving an open space between them. The hind claw, generally greatly elongated in Larks, is in Calandrella (fig. 4) and some other genera reduced to a very moderate size. The wings exhibit almost every modification, from the almost entire

Fic, 3.—A, Melanocorypha

as. —<—?) ae ae a Be ne

Fie. 4.—Calandrella brachydactyla.

abortion of the first primary in the Skylark to its con- siderable development (fig. 5), and from tertials and scapu- lars of ordinary length to the extreme elongation found in the Motacillidx and almost in certain Zimicole. The most constant character indeed of the Alaudidzx would seem to be that afforded by the podotheca or covering of the tarsus,

| Zealand. Inthe

j one of which,

‘lower latitudes in large flocks.

LARK

which is scutellate behind as well as in front, but a char- acter easily overlooked.!

In the Old World Larks are found in most parts of the Palearctic, Ethiopian, and Indian Regions ; but only one genus, Mirafra, inhabits Australia, where it is represented by, so far as is ascertained, a single species, M.. horsfields ; and there is no true Lark in- digenous to New

New World there is- also only one genus, Otocor’ys,2 where it is represented by two species,

found over near- ly the whole of North America, is certainly not distinguishable from the Shore-Lark of Europe and Asia, O. alpestris ; while the other, confined to the higher eleva- tions of more southern latitudes, seems to be the relic of a former immigration (perhaps during a glacial period) of the northern form, which has through isolation come to be differentiated as O. chrysolema (see Birps, vol. iii. p. 746). The Shore-Lark is in Europe a native of only the extreme north, but is very common near the shores of the Varanger Fjord, and likewise breeds on mountain-tops further south-west, though still well within the Arctic circle. The mellow tone of its call-note has obtained for it in Lapland a name signifying “ Bell-bird,” and the song of the cock is lively, though not very loud. The bird trustfully resorts to the neighbourhood of houses, and even enters the villages of East Finmark in search of its food. It produces at least two broods in the season, and towards autumn migrates to Of late years these have been observed almost every winter on the east coast of

Fig. 5.—A, Alauda arborea; B, Certhilauda ; C, Melanocorypha calandra,

| Great Britain, and the species instead of being regarded,

as it once was, in the light of an accidental visitor to the United Kingdom, must now be deemed an almost regular visitor, though in very varying numbers. The observations on its habits made by Audubon in Labrador have long been known, and often reprinted.? Other congeners of this bird are the O. penicillata of south-eastern Europe, Palestine, and Central Asia—to which are referred by Mr Dresser (B. Hurope, iv. p. 401) several other forms origin- ally described as distinct ; but the specific validity of one of them, 0. longzrostris, has since been reasserted by Dr Scully (Zbzs, 1881, p. 581)—as well as the O. dilopha of Arabia and Mauritania. All these birds, which have been termed Horned Larks, from the tuft of elongated black feathers growing on each side of the head, form a little group easily recognized by their peculiar coloration, which calls to

mind some of the Ringed Plovers, gzalitis (see KinLpEER, p. 76 of the present volume).

The name Lark is also frequently applied to many birds which do not belong to the Alaudide as now understoud.

1 By assigning far too great an importance to this superficial character (in comparison with others), Sundevall (Fentamen, pp. 53-63) was induced to array the Larks, Hoopoes, and several other heterogeneous groups in one ‘‘Scries,” to which he applied the name of Scutelliplantares.

2 By American writers it is usually called Hremophila, but that name seems to be preoccupied in natural history.

3 The osteology of this bird is minutely described by Dr Shufeldt (Bull. U. S. Geol. Survey, vi. pp. 119-147).

LAR—LAR

The Mud-Lark, Rock-Lark, Titlark, and Tree-Lark are Prrrts (g.v.). The Grasshopper-Lark is one of the aquatic WarBuers (q.v.), while the Meadow-Lark of America, as has been already said, is an IcrERus (vol. xii. p. 697). Sand-Lark and Sea-Lark are likewise names often given to some of the smaller members of the Lemicole. Of the true Larks, Alaudidz, there may be perhaps about one hundred species, and it is believed to be a physiological character of the Family that they moult but once in the year, while the Pipits, which in general appearance so much resemble them, undergo a double moult, as do others of the Motacillidz, to which they are most nearly allied. (A. N.)

LARNACA, or Larnica. See Cyprus.

LA ROCHEFOUCAULD, Francois pE (1613-1680), the greatest maxim writer of France, one of her best memoir writers, and perhaps the most complete and accom- plished representative of her ancient nobility, was born at Paris in the Rue des Petits Champs on the 15th of September 1613. His family was one of the most ancient and noble in

France, counting twenty-one descents in the direct male line from I'oucauld, Seigneur de la Roche in the province of Angoumois, who flourished early in the 11th century. The house of Rochefoucauld took the Pro- testant side for a time in the quarrels of the 16th century, but was faithful to Henry IV. in religion as in polities. La Rochefoucauld's father was a favourite of Louis XIII., and. was created by him duke and peer in 1622, the posses- sions of the family in Angoumois and the neighbouring provinces being very considerable. The author of the Maxims, who during the lifetime of his father and his own most stirring years bore the title of Prince de Marcillac, was somewhat neglected in the matter of education, at least of the scholastic kind ; but he joined the army before he was sixteen, and almost immediately began to make a figure in public life. He had been nominally married a year before to Andrée de Vivonne, of whom little enough is known to satisfy even a Greek. She seems to have been an affectionate wife, aud not a breath of scandal touches her,—two points in which La Rochefoucauld was perhaps more fortunate than he deserved. Forsome years Marcillac continued to take part in the annual campaigns, where he displayed the utmost bravery, though he never obtained credit for much military skill. Then he fell under the influence of Madame de Chevreuse, the first of three cele- brated women who successively influenced his life. Through Madame de Chevreuse he became attached to the queen Anne of Austria, and in one of her quarrels with Richelieu and her husband a wild scheme seems to have been actually formed, according to which Marcillac was to carry her off to Brussels ona pillion. 'These caballings against Richelieu, however, had no more serious results than occasional exiles, that is to say, orders to retire to his father's estates. After the death of the great minister (1642), opportunity seemed to be favourable to the vague ambition which then animated half the nobility of France. Mareillac became one of the so-called importants, and took an active part in reconciling the queen and Condé in a league against Gaston of Orleans. But the growing credit of Mazarin came in his way, and the liaison in which about this time (1645) he became entangled with the beautiful duchess of Longueville made him irrevocably a Frondeur. He was a conspicuous figure in the siege of Paris, fought desperately in the desultory engagements which were constantly taking place, and was severely wounded. In the second

Fronde Marcillac followed the fortunes of Condé, and the death of his father, which happened at the time (1650), gave rise to a characteristic incident. ‘The nobility of the province gathered to the funeral, and the new duke de la Rochefoucauld took the opportunity of persuading them to follow him in an attempt on the royalist garrison of Saumur, which, however, was not

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successful We have no space to follow La Rochefoucauld through the tortuous cabals and negotiations of the later Fronde ; it is sufficient to say that he was always brave and generally unlucky. His run of bad fortune reached its climax in the battle of the Faubourg Saint Antoine (1652), where he was shot through the head, and it was thought that he would lose the sight of both eyes. It was nearly a year before he recovered, and then he found him- self at his country seat of Verteuil, with no result of twenty years fighting and intriguing except impaired health, a seriously embarrassed fortune, and some cause for bearing a grudge against almost every party and man of importance in the state. He spent some years in this retirement, and he was fortunate enough (thanks chiefly to the fidelity of Gourville, who had been in his service, and, passing into the service of Mazarin and of Condé, had acquired both wealth and influence) to be able to repair in some measure the breaches in his fortune. He did not, however, return to court life much before Mazarin’s death. Louis XIV, was then in the full adolescence of his absolute power, and the turbulent aristocratic anarchy of the Fronde was a thing utterly of the past.

Somewhat earlier, La Rochefoucauld had taken his place in the salon of Madame de Sablé, a member of the old Rambouillet coterie, and the founder of a kind of successor to it. It was known that La Rochefoucauld, like almost all his more prominent contemporaries, had spent his solitude in writing memoirs, while the special literary employment of the Sablé salon was the fabrication of Sentences and Maximes. In 1662, however, more trouble than reputation, and not a little of both, was given to him by a surreptitious publication of his memoirs, or what purported to be his memoirs, by the Elzevirs. Many

of his old friends were deeply wounded, and he hastened to deny flatly the authenticity of the publication, a denial which (as it seems, without any reason) was not very gene- rally accepted. Three years later (1665) he published, though without his name, the still more famous J/axims, which at once established him high among the men of letters of the time. About the same date began the friend- ship with Madame de la Fayette, which lasted till the end of his life. The gliinpses which we have of him hence- forward are chiefly derived from the letters of Madame de Sévigné, and, though they show him suffering agonies from gout, are on the whole pleasant. He had a circle of devoted friends; he was recognized as a moralist and man of letters of the first rank; he might have entered the Academy for the asking ; and in the altered measure of the times his son the Prince de Marcillac, to whom some time before his death he resigned his titles and honours, enjoyed a considerable position at court. Above all, La Roche- foucauld was generally recognized by his contemporaries from the king downward as a type of the older noblesse as it was before the sun of the great monarch dimmed its brilliant qualities. This position he has retained until the present day. He died at Parison the 17th of March 1680, of the disease which had so long tormented him. ‘

La Rochefoucauld’s character, if considered without the prejudice which a dislike to his ethical views has sometimes occasioned, is thoroughly respectable and even amiable. Like almost all his contemporaries, he saw in politics little more than a chessboard where the people at large were but pawns, and the glory and profit were reserved to the nobility. The weight of testimony, however, inclines to the conclusion that he was unusually scrupulous in his conduct, and that bis comparative ill success in the struggle arose more from this scrupulousness than from anything else. He has been charged with irresolution, and there is some ground for admitting the charge so far as to pronounce him one of those the keenness of whose intellect, together with

their apprehension of both sides of a question, interferes with their capacity as men of action. But there is no ground whatever for the view which represents the Maxims as the mere outcome of the spite of a disappointed in- triguer, disappointed through his own want of skill rather than of fortune.

Interesting, however, as he is when considered as a man and asa typical figure of a brilliant and historically important class, his importance as a social aud historical figure is far inferior to his importance as a man of letters. His work in this respect consists of three parts—letters, Memoirs, and the Maxims. The letters collected by the diligence of his latest editor exceed one hundred in number, and are biographically valuable, besides displaying not a few of his literary characteristics; but they need not further detain us. The Jfemoirs, when they are read in their proper form, yield in literary merit, in interest, and in value to no memoirs of the time, not even to those of Retz, between whom and La Rochefoucauld there was a strange mixture of enmity and esteem which resulted in a couple of most characteristic portraits. But their history is unique in its strangeness. It has been said that a piratcd edition appeared in Holland, and this despite the author's protest continued to be reprinted for some thirty years. It has been now proved beyond doubt or question to be a mere cento of the work of half a dozen different men, scarcely a third of which is La Rochefoucauld's, and which could only have becn possible at a time when it was the habit of persons who frequented literary society to copy pell-mell in commonplace books the MS. compositions of their friends and others. Some years after La Rochefoucauld's death a new recension appeared, somewhat less incorrect than the former, but still largely adulterated, and this held its ground for more than a century. Only in 1817 did any- thing like a genuine edition (even then by no means perfect) appear. The J/axims, however, had no such fate. The author re-edited them frequently during his life, with alterations and additions ; a few were added after his death, and it is usual now to print the whole of them, at whatever time they appeared, together. Thus taken, they amount to about seven hundred in number, in hardly any case ex- ceeding half a page in length, and more frequently con- fined to two or three lines. The view of conduct which they illustrate is

usually and not quite incorrectly summed up in the words “everything is reducible to the motive of self-interest.” Though not absolutely incorrect, the phrase is misleading. The Maaims are in no respect mere deduc- tions from or applications of any such general theory. They are on the contrary independent judgments on different relations of life, different affections of the human mind, and so forth, from which, taken together, the general view may be deduced or rather composed. Sentimental moralists have loudly protested against this view, yet it is easier to declaim against it in general than to find a flaw in the several parts of which it is made up. With a few exceptions La Rochefoucauld’s maxims represent the matured result of the reflexion of a man deeply versed in the business and pleasures of the world, and possessed of an extraordinarily fine and acute intellect, on the conduct and motives which have guided himself and his fellows. There is as little trace in them of personal spite as of forfanterie de vice. But the astonishing excellence of the literary medium in which they are convcyed is even more remarkable than the general soundness of their ethical import. In uniting the four qualities of brevity, clearness fulness of meaning, and point La Rochefoucauld has no rival. His Maxims are never mere epigrams ; they are never platitudes ; they are never dark sayings. He has packed them so full of meaning that it would be impossible to pack them closer, yet there is no undue compression; he

has sharpened their point to the utmost, yet there is no loss of substance. The comparison which occurs most frequently, and which is perhaps on the whole the justest, is that of a bronze medallion, and it applies to the matter no less than to the form. Nothing is left unfinished, yet none of. the workmanship is fiuical. The sentiment, far from being merely hard as the sentimentalists pretend, has a vein of melancholy poetry running through it which calls to mind the traditions of La Rochefoucauld’s devotion to the romances of chivalry. The maxims are never shallow ; each is the text for a whole sermon of application and corollaries which any one of thought and experience can write. Add to all this that the language in which they are written is French, still at almost its greatest strength, and chastened but as yet not

emasculated by the reforming influence of the 17th century, and it is not necessary to say more, To the literary critic no less than to the man of the world La Rochefoucauld ranks among the scanty number of pocket-books to be read and re-read with ever new admiration, instruction, and delight.

The editions of La Rochefoucauld's Maxims published in his lifetime! bear the dates 1665 (editio princeps), 1666, 1671, 1675, 1678. An important edition which appeared after his death in 1693 may rank almost with these. Aslongas the Memoirs remained in the state above described no edition of them need be mentioned, and none of the complete works was possible. There have been several editions more or less complete in the last seventy years, but they are all thrown into the shade by that of MM. Gilbert and Gourdault, 1868-81, in the series of Grands Ecrivains dela France, 8 vols. This is complete as to the text, but a glossary and some other additional matters have yet to appear. The handsomest separate edition of the Maxims is the so-called Edition des Biblio- philes, 1870 ; but cheap and handy issues are plentiful. (G. SA.)

LA SALLE, chief city of La Salle county, Illinois, U.S., is situated on the right bank of the Illinois river, navigable up to this point, about 80 miles south-west of Chicago, with which it is connected by the Illinois and Michigan Canal as well as by rail. La Salle is a rising commercial city, with manufactories of glass, sulphuric acid, and soda- ash, and some export of ice, as well as extensive zinc rolling mills—the ouly works of the kind in the United States. The supply of bituminous coal in the vicinity is large, the output of the mines being 1,000,000 tons annu- ally. The population in 1880 was 7847.

LA SALLE, Ropert Cavetier, SteuR DE (1643-1687), a French explorer in North America, was born at Rouen in November 1643. He became a settler in Canada, and about 1669, leaving his trading post at La Chine, above Montreal, he sought to reach China by way of the Ohio, supposing, from the reports of Indians, this river to flow into the Pacific. He made explorations of the country between the Ohio and the lakes, but, when Joliet and Marquette made it evident that the main

river Mississippi emptied in the Gulf of Mexico, he conceived a vast project for extending the French power in the lower Mississippi valley, and thence attacking Mexico. He obtained exten- sive grants from the French Government, rebuilt Fort Frontenac, established a post above Niagara Falls, and built a small vessel, in which he sailed up the lakes to Green Bay. Thence, despatching his vessel freighted with furs, he proceeded with the rest of the party, in boats and on foot, to the Illinois river, near the head of which he began a post called Fort Créve Coeur, and a vessel in which to descend the Mississippi. Not hearing of his vessel on the lakes, he detached Hennepin, with one companion, to ascend the Mississippi from the mouth of the Illinois, and, leaving Tonty, with five men, at Fort Créve Cveur, he returned by land to Canada. Towards the close of 1681 La Salle, with a party in canoes, again reached the head of Lake Michigan, at the present site of Chicago, and, making

‘ The full original title was Réflextons ou Sentences et Maximes Morales,

the long portage to the Illinois, descended it to the Mississippi, which he followed to its mouth, where he set up a cross and the arms of France, April 9, 1682. La Salle fell sick on his voyage up the river, and sent on intelligence of his success, which was carried to France by Father Membré, and was publislied in Hennepin’s work in 1683. When La Salle reached France, projects were taken up by the Government for an expedition against the rich wnining country of northern Mexico. Plans were submitted by La Salle and by Peiialosa, a renegade Spaniard, who, while governor of New Mexico in 1662, had penetrated apparently to the Mississippi. La Salle was accordingly sent out in July 1684, with four vessels and a small body of soldiers, ostensibly to found an establishment at the mouth of the Mississippi, but really to push on and secure a favourable base of operations, and gain the aid of the Indians against the Spaniards, while awaiting a more powerful force under Pefialosa. The design was so well masked, and subsequently misrepresented, that he is generally said to have been

carried beyond the Mississippi by the treachery of Beaujeu, a naval officer commanding one of the vessels. After running along the coast, La Salle returned to Espiritu Santo Bay, Texas. There he landed his soldiers, but lost one vessel with valuable stores. He refused Beaujeu's offer to obtain aid for him from the West Indies, and when that officer, according to his orders, sailed back, La Salle put up a rude fort. Then for two years, from January 1685 to January 1687, he wasted the time in aimless excursions by land, never getting beyond the present limits of Texas, and making no attempt to explore the coast or reach the Mississippi with his remain- ing vessel. His colonists and soldiery dwindled away ; no reinforcements or expedition under Pejfialosa arrived; and in January 1687, leaving part of his force at Fort St Louis, he set out with the rest to reach Canada by way of the Mississippi to obtain relief. His harshness and arbitrary manner had provoked a bitter feeling among his followers, and he was assassinated on the 19th of March, near the Trinity river. Some of the survivors reached Touty's post on the Arkansas, and returned to France by way of Canada. 'The party left at the fort were nearly all cut off by the Indians, a few survivors having been rescued by a Spanish force sent to root out the French.

For the various operations of La Salle, the chief works are Hennepin's Description of Louisiana, 1683; Le Clereq's Establishment of the Faith, 1691; Tonty's Narrative (1697), and Joutel's (1718); and the immense collection of documents published by Margry (8 vols. 8vo, Paris, 1875-78). Hennepin and Le Clereq's accounts were published partially in Shea's Discovery of the Mississippi, 1852, and recently entire. La Salle's early explorations have been dis- cussed by Tailhan, Verreau, and Shea, historical scholars generally rejecting the claims set up by Margry. Parkman gives La Salle's whole career in his Discovery of the Great West, modified, however, greatly in his Za Salle, Boston, 1879. (J. Ge 8.)

LASCAR, an Anglo-Persian term (from lashkar, an army), which formerly meant a non-combatant, or public follower of the ordnance department, Later on it came to mean any supernumeraries, and especially the native sailors engaged to supplement the crews of

European vessels in the Eastern waters. The term is at present applied generally to the seafaring populations of the Indian seaboard manning British vessels sailing between England and the East. The Peninsular and Oriental and other large steamship companies now employ the lascars almost exclusively, preferring them to European crews on account of their greater docility, temperance, and obedience to orders. Nearly allare Mohammedans, and, besides their several native tongues, speak among themselves a sort of lingua franca based on Hindustani, with a considerable ad- mixture of English, Arabic, and other elements. The word lasear is still applied somewhat in its former sense to tent- pitchers, inferior artillerymen, coolies, or sutlers.

LASCARIS, Constantine (% —1493), an eminent Greek scholar, was a member of the family which in the 13th century had furnished three emperors of Nica, and was born at Constantinople, but in what year is unknown. After the fall of Constantinople in 1453, he took refuge in

Italy, where Francesco Sforza, duke of Milan, appointed

him Greek tutor to his daughter Hippolyta, afterwards married to Alphonso, king of Naples. It was at Milan that Zarot published in 1476 the Grammatica Greca, sive Com- pendium octo Orationis Partium, of Lascaris, remarkable as being the first book entirely in that language issued from the printing press. After leaving Milan, Lascaris taught for some time in Rome and in Naples, but ultimately, on the invitation of the inhabitants, settled in Messina, where he continued to teach publicly until his death in 1493. Among his numerous pupils here was the celebrated Pietro Bembo. Lascaris bequeathed his library of valuable MSS. to the senate of Messina; the collection was afterwards carried off to Spain and lodged in the Escorial.

Besides the Grammatica, which has often been reprinted, Lascaris wrote little of any kind and nothing of any value apart from the im- portance which attaches to his position as one of the promoters of the revival of Greek learning in Italy. Two little treatises by him on Sicilians and Calabrians who had written in Greek were first pub- lished by Maurolico in 1562, and afterwards reprinted by Zaccaria in the Biblioteca di Storia Lettcraria. His dissertation on Orpheus is to be

found in the first volume of the Marmora Tauwrinensia. Iriarte gives some letters of Lascaris in the Regiw Bibliothece Matritensis Codices Greci manuseriptt. See Villemain, Lascaris, ou les Grees du quinziéme siécle, Paris, 1825.

LASCARIS, Joannes or Janus (c. 1445-1535), sur- named Rhyndacenus from the river Rhyndacus in Bithynia, his native province, was born about 1445. He was a member of the imperial family of Lascaris, and after the fall of Constantinople fled into Italy, where ultimately he found refuge at the court of Lorenzo de' Medici, whose intermediary he was with the sultan Bajazet IL. in the purchase of Greek MSS. for the Medicean library. On the expulsion of the Medici from Florence, he, at the invitation of Charles VIII. of France, removed to Paris (1495), where he taught publicly, although he does not appear to have had any official or salaried connexion with the university. Among his pupils were Gulielmus Budeus and Danesius. By Louis XII. he was several times employed on various public missions; and in 1515 he appears to have accepted the invitation of Leo X. to take charge of the Greek college he had founded at Rome. We afterwards find Lascaris employed along with Budzeus by Francis I. in the formation of the royal library at Fon- tainebleau, and also again sent in the service of the French crown to Venice. He died at Rome in 1535.

He edited or wrote Anthologia Epigranvmatum Grecorum, in seven books, Florence, 1494; Callimachi Hymni, cum Scholiis Grecis, Florence, about 1494; Scholia Greea in Iliadem, in integ- rum restituta, Rome, 1517 ; Homericarum questionwm liber, et de Nympharum antro in Odyssca opuseulum, Rome, 1518; De verts Greearum litterarum formis ac causis apud antiquos, Paris, 1586. See Jovius, Elogia clarorum virorum; Hody, De Grecis Illustri- bus; and Bayle's Dietionary, s.v.

LAS CASAS, Barrotomé pre (1474-1566), for some time bishop of Chiapa in Mexico, and known to posterity as "The Apostle of the Indies," was a native of Seville, where he was born in 1474. His father, one of the com- panions of Columbus in the voyage which resulted in

the discovery of the New World, was rich enough to be able to send him to Salamanca, where he graduated. In 1498 he accompanied his father in an expedition under Columbus to the West Indies, from which he returned in 1500; and in 1502 he went with Nicolas de Ovando, tle governor, to Hayti, where eight years afterwards he was admitted to priestly orders, being the first person to receive that conse- eration in the colonies). In 1511, the conquest of Cuba having been resolved on, he passed over to that island to

take part in the work of " population and pacification," and in- 1513 or 1514 he witnessed and vainly endeavoured to check the fearful massacre of Indians at Caonao. Soon afterwards there was assigned to him and his friend Renteria a large village in the neighbourhood of Xagua, with a number of Indians attached to it in what was known as "repartimiento" (allotment), and like the rest of his countrymen he sought to make the most of this opportunity for growing rich, but at the same time he occasionally cele- brated mass and preached. Soon, however, having become deeply convinced of the injustice and other moral evils connected with the repartimiento system, he began to preach against it, at the same time giving up his own slaves. With the consent of his partner he resolved to go to Spain in the cause of the oppressed natives, and the result of his representations was that in 1616 Cardinal Jimenez caused a commission of three Hieronymites to be sent out for the reform of abuses, Las Casas himself, with the title of 'protector of the Indians" being appointed, with a salary, to advise andinform them. This commission had not been long at San Domingo, however, before Las Casas became painfully aware of the indifference of his coadjutors to the cause which he himself had so closely at heart, and July 1517 found him again in Spain, where he developed his scheme for the complete liberation of the Indians,—a scheme which not only included facilities for emigration from Spain, but was intended to give to each Spanish resident in the colonies the right of importing twelve negro slaves. he emigration movement proved a failure, and Las Casas lived long enough to express his sorrow and shame for having been so slow to perceive that the Africans were as

much entitled to the rights of man as were the natives of the New World. Overwhelmed with disappoint- ment, he retired to the Dominican monastery in Hayti, where he joined the order in 1522, and devoted eight years of extreme seclusion to the acquisition of that store of classical and scholastic learning which appears so curiously in all his writings. About 1530 he appears to have re- visited the Spanish court, but on what precise errand or with what result is not known; the vagueness and confusion of the records of this period of his life extends to the time when, after visits to Mexico, Nicaragua, Peru, and Guatemala, in the cause of religion aud of his order, he undertook an expedition in 1537 into Tuzulutlan or the Tierra de Guerra ("Land of War"), the inhabitants of which were, chiefly through his tact and skill, peaceably converted to Christianity, mass being celebrated for the first time amongst them in the newly founded town of Rabinal in 1538. In 1539 Las Casas was sent to Spain to obtain Dominican recruits, and through Loaysa, general of the order, and confessor of Charles V., he was successful in obtaining many royal orders and letters which were supposed to be favourable to his enterprise, among others that which prohibited for the time being the entrance of any lay Spaniard into Tuzulutlan. During this stay in Europe, which lasted more than four years, he more than once visited Germany to see Charles, whom the business of the empire was detaining there; he also (1542) wrote his Veynte Razones (s Twenty Reasons") in defence of the liberties of the Indians and the Brevisima Relacion de la Destruycion des las Indias, the latter of which was published some twelve years later, and has since been translated into several European languages. In 1543 he refused the Mexican bishopric of Cuzco, but was prevailed upon to accept that of Chiapa, for which he sailed in 1544, Thwarted at every point by the officials, and outraged with passionate hatred by his countrymen in his attempt to carry out the "new laws" which his humanity had pro- cured (see the ''Remedios que refirio" in the Seville edition of his Obras, 1552), he returned to Spain and |

resigned his dignity three years afterwards (1547). .In 1550 he met Sepulveda in public debate on the theses drawn from the recently

published Apologia pro Libro de Justis Belli Causis, in which the latter had maintained the lawfulness of waging unprovoked war upon the natives of the New World. The course of the discussion may still be traced in the account of the "' Disputa" contained in the Obras(1552). In 1555 Las Casas successfully remonstrated with Philip II. against the financial project for selling the reversion of the ' encomiendas,"—a project which would have involved the Indians in hopeless bondage. In July of the following year he died at Madrid, whither he had gone to urge (and with success) the necessity of restoring a court of justice which had been repressed in Guatemala.

A Historia de las Indias was left by Las Casas to the convent of San Gregorio at Valladolid, with directions that it should not be printed for forty ycars. Herrera, however, was permitted to con- sult it for his Historia General (1601). It afterwards lay neglected until the Royal Academy of History took it up with an intention of publishing it. That intention was afterwards abandoned ; Pres- cott, who appears to have seen the MS., hopes that it may yet be

| given to the world. Sketches of the life of Las Casas have been

given by Llorente and by Quintana. The English reader will find adcquate notices in the appendix to bk. ii., chap. viii., of Prescott's Conquest of Mexico, and in the copious monograph of Sir Arthur Helps (Life of Las Casas, 1868). LASCO, or Lascx1, JoHN. LASSA. See Luasa. LASSALLE, Ferpinanp (1825-1864), the originator of the social-democratic movement in Germany, was born at Breslau in 1825, Like Karl Marx, the chief of interna- tional socialism, he was of Jewish extraction. His father, a prosperous merchant in Breslau, intended Ferdinand for a business career, and with this view sent him to the com- mercial school at Leipsic; but the boy, having no liking for that kind of life, got himself transferred to the university, first at Breslau, and afterward at Berlin. His favourite studies were philology and philosophy ; he became an ardent Hegelian, and in politics was one of the most advanced. Having completed his university studies in 1845, he began to write a work on Heraclitus from the Hegelian point of view; but it was soon interrupted by more stirring interests, and did

not see the light for many years. From the Rhine country, where he settled for a time, he went to Paris, and made the acquaintance of his great compatriot Heine, who conceived for him the deepest sympathy and admiration. In the letter of introduction to Varnhagen von Ense, which the poet gave Lassalle when he returned to Berlin, there is a striking portrait of the young man. Heine speaks of his friend Lassalle as a young man of the most remarkable endowments, in whom the widest knowledge, the greatest acuteness, and the richest gifts of expression are combined with an energy and practical ability which excite his astonishment, but adds, in his half-mocking way, that he is a genuine son of the new era, without even the pretence of modesty or self-denial, who will assert and enjoy himself in the world of realities. At Berlin Lassalle became a favourite in some of the most distinguished circles; even the veteran Humboldt was fascinated by him, and used to call him the Wunderkind. Here it was, also, towards the end of 1845, that he met the lady with whom his life was to be associated in so remarkable a way, the Countess Hatzfeldt. She had been separated from her husband for many years, and was at feud with him on questions of property and the custody of their children. With characteristic energy Lassalle attached himself to the cause of the countess, whom he believed to have been outrageously wronged, made a special study of law, and, after bringing the case before thirty-six tribunals, reduced the powerful count to a compromise on terms most favourable to his client. The process, which lasted ten years, gave rise to not a little scandal, especially

See ALASco, vol. i. p. 443.

that of the Cassettengeschichte, which pursued Lassalle all the rest of his life. This “ affair of the casket ” arose out of an attempt by the countess’s friends to get possession of a bond for a large life annuity settled by the count on his mistress, a Baroness Meyendorf, to the prejudice of the countess and her children. Two of Lassalle’s comrades succeeded in carrying off the casket, which contained the lady’s jewels, from the baroness’s room at a hotel in Cologne. They were

prosecuted for theft, one of them being con- demned to six months' imprisonment; Lassalle, accused of moral complicity, was acquitted on appeal. He was not so fortunate in 1849, when he underwent a year's durance for resistance to the authorities at Diisseldorf during the troubles of that stormy period. But going to prison was quite a familiar experience in Lassalle's life. Till 1859 Lassalle resided mostly in the Rhine country, prosecuting the suit of his friend the countess, finishing the work on Heraclitus, which was not published till 1858, and taking little part in political agitation, but ever a helpful friend of the working men. He was not allowed to live in Berlin because of his connexion with the disturbances of 748. In 1859, however, he entered the city disguised as a carter, and finally, through the influence of Humboldt with the king, got permission ta stay there. The same year he published a remarkable pamphlet on the /éalian War and the Mission of Prussia, in which he came forward to warn his countrymen against going to the rescue of Austria in her war with France. He pointed out that if France drove Austria out of Italy she might annex Savoy, but could not prevent the restoration of Italian unity under Victor Emmanuel. France was doing the work of Germany by weakening Austria, the great cause of German disunion and weakness; Prussia should form an alliance with France in order to drive out Austria, and make herself supreme in Germany. After their realization by Bismarck these ideas have become sufficiently commonplace; but they were nowise obvious when thus published by Lassalle. In 1861 he published a great work in two volumes, the System of Acquired Rights.

Hitherto Lassalle had been known only as the author of two learned works, as connected with an extraordinary lawsuit which had become a wide-spread scandal, and as a young man of whom even the most distinguished veterans expected great things. Now began the short-lived activity which was to give him an historical significance. It was early in 1862, when the struggle of Bismarck with the Prussian liberals was already begun. Lassalle, who had always been a democrat of the most advanced type, saw that an opportunity had come for asserting a third great cause—that of the working men—which would outflank the liberalism 'of the middle classes, and might even com- mand the sympathy of the Government. His political programme was, however,

entirely subordinate to the social, that of bettering the condition of the working-classes, for which he believed the schemes of Schulze-Delitzsch were utterly inadequate. Lassalle flung himself into the career of agitator with his accustomed vigour. His worst difficul- ties were with the working men themselves, among whom he met the most discouraging apathy. For a war to the knife with the liberal press he was quite prepared, and he accepted it manfully. His mission as organizer and emanci- pator of the working class lasted only two years and a half. In that period he issued about twenty separate publications, most of them speeches and pamphlets, but one of them, that against Schulze-Delitzsch, a considerable treatise, and all full of keen and vigorous thought. He founded the " Allgemeiner Deutscher Arbeiterverein," was its president and almost single-handed champion, conducted its affairs, and carried on a vast correspondence, not to mention about a dozen state prosecutions in which he was during that period

involved. Berlin, Leipsic, Frankfort, and the industrial centres on the Rhine, were the chief scenes of his activity. His greatest success was on the Rhine, where in the sum- mers of 1863 and 1864 his travels as missionary of the new gospel resembled a triumphal procession. The agitation was growing rapidly, but he had achieved little substantial success when a most unworthy death closed his career.

While posing as the Messiah of the poor, Lassalle was a man of decidedly fashionable and luxurious habits. His suppers were well known as among the most exquisite in Berlin. It was the most piquant feature of his life that he, one of the gilded youth, a connoisseur in wines, and a learned man to boot, had become agitator and the champion of the working man. In one of the literary and fashionable circles of Berlin he had met a young lady, a Fraulein von Dénniges, for whom he at once felt a passion, which was ardently reciprocated. In the summer of 1864 he met her again on the Rigi, when they resolved to marry. She was a young lady of twenty, decidedly unconventional and original in character, but the daughter of a Bavarian diplomatist

then resident at Geneva, who was angry beyond all bounds when he heard of the proposed match, and would have absolutely nothing to do with Lassalle. The lady was imprisoned in her own room, and soon, apparently under the influence of very questionable pres- sure, renounced Lassalle in favour of another admirer, a Wallachian, Count von Racowitza. Lassalle, who had resorted to every available means to gain his end, was now mad with rage, and sent a challenge both to the lady's father and her betrothed, which was accepted by the latter. At the Carouge, a suburb of Geneva, the meeting took place on the morning of August 28, 1864, when Lassalle was mortally wounded. In spite of such a foolish ending, his funeral was that of a martyr, and by many of his adherents he has been regarded since with feelings almost of religious devotion,

Lassalle did not lay claim to any special originality as a socialistic thinker, nor did he publish any systematic statement of his views. His aim was not scientific or theoretic completeness, but the practical one of organizing and emancipating the working classes ; and his plans were promulgated in occasional speeches and pamphlets, as the crises of his agitation seemed to demand. Yet his leading ideas are sufficiently clear and simple. Like a true Hegelian he saw three stages in the development of labour : the ancient and feudal period, which, through the subjec- tion of the labourer, sought solidarity without freedom ; the reign of capital and the middle classes, established in 1789, which sought freedom by destroying solidarity ; and the new era, beginning in 1848, which would reconcile solidarity with freedom by introducing the principle of association, It was the basis and starting-point of his opinions that, under the empire of capital and so long as the working man was merely a receiver of wages, no improvement in his condition could be expected. This position he founded on the well-known law of wages formulated by Ricardo, and accepted by all the leading economists, that wages are controlled by the ordinary relations of supply and demand, that a rise in wages leads to an increase in the labouring population, which, by increasing the supply of labour, is followed by a cor- responding fall of wages. Thus population increases or decreases in fixed relation to the rise or fall of wages. The condition of the working man will never permanently rise above the mere

standard of living required for his subsistence, and the continued supply of his kind. _ Lassalle held that the co-operative schemes of Schulze-Delitzsch on the principle of “self-help ” were utterly inadequate, for the obvious reason that the working classes were destitute of capital. The struggle of the working ee ping himself

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with his empty pockets against the capitalists he compared to a battle with teeth and nails against modern artillery. In short, Lassalle accepted the orthodox political economy to show that the inevitable operation of its laws left no hope for the working classes, and that no remedy could be found but by abolishing the conditions in which these laws had their validity—in other words, by abolishing the present relations of labour and capital altogether, And this could only be done by the productive association of the working men with money provided by the state. The states of Europe had spent hundreds of millions in silly dynastic squabbles, or to appease the wounded vanity of royal mistresses; why refuse to advance a few millions to solve the greatest problem of modern civilization 4 Lassalle’s estimate was that a loan of a hundred million thalers would be more than enough to bring the principle of productive association into full movement throughout the kingdom of Prussia. And he held that such association should be the voluntary act of the working men themselves, the Government merely reserving to itself the right to examine the books of the various societies. All the arrange- ments should be carried out according to the rules of business usually followed in such transactions. But how move the Government to grant such a loan? Simply by introducing (direct) universal suffrage. The working men were an overwhelming majority ; they were the state, and should control the Government. The aim of Lassalle, then, was to organize the working classes into a great political power, which in the way thus indicated, by peaceful resolute agitation, without violence or insurrection, might attain the goal of productive association. In this way the fourth estate would be emancipated from the despotism of the

capitalist, and a great step taken in the solution of the great ‘social question.”

It will be seen that the net result of Lassalle’s life was to produce a European scandal, and to originate a socialistic movement in Germany, which, in spite of repressive laws, at last election (1881) was able to return thirteen members to the reichstag. This result was hardly commensurate with his ambition, which was boundless. In the heyday of his passion for Friulein von Dénniges, his dream’ was to be enthroned as the president of the German republic with her seated at his side: With his energy, ability, and gift of dominating and organizing, he might indeed have done a great deal. Bismarck coquetted with him as the representative of a force that might help him to combat the Prussian liberals; so late as 1878, in a speech before the reichstag, he spoke of him with deep respect, as a man of the greatest amiability and ability from whom much could be learned. Even Bishop Ketteler of Mainz had declared his sympathy for the cause he advocated.

Lassalle’s two learned works were Die Philosophie Herakleitos des Dunklen von Ephesos (Berlin, 1858), and the System der erworbenen Rechte (Leipsie, 1861), both marked by great learning and intellee- tual power. But of far more historical interest are the speeches and pamphlets connected with his Socialistie agitation, of which the most important are—Ueber Verfassungswesen ; Arbeiterpro- gramm ; Offenes Antwortsehreiben ; Zur Arbeiterfrage ; Arbeiter- lesebuch; Herr Bastiat-Schulze von Del itzseh, oder Kapital und Arbeit. His drama, Franz von Stckingen, published in 1859, is a work of no poetie value.

The best authority on Lassalle’s life an Brandes’s Danish work, Ferdinand Lassalle Berlin, 1877).

d writings is George (German translation, I See also Laveleye, Le socialisme contemporain Paris, 1881; Fortnightly Review, 1869; Contemporary Review, 1881. There is already a considerable literature on his love affair and death:—Meine Bezichungen zu F. Lassal le, by Helene von Racow- itza, avery strange book; Enthaillungen iiber das

tragisehe Lebensende f, Lassalle’s by B. Beeker; Im Anschluss an die Memotren der H. von Kacowitza, by A. Kutsehbaeh; and an English and Italian

novel. (fe) LASSEN, Curistran (1800-1876), an eminent Orien- talist, was born on October 22, 1800, at Bergen in N orway.

Having received his first university education at Christiania, he went to Germany, and continued his philological studies at Heidelberg and Bonn. The latter university, though only founded a few years previously (in 1818), had already become one of the chief centres of Oriental studies. The lectures of A. W. von Schlegel, the distinguished critic and leader of the German Romantic school, who shares with F. Bopp the honour of having founded the critical school of Sanskrit philology, were especially attractive to the young Norwegian, and determined him henceforth to devote his energies chiefly to the exploration of the newly-opened mine of Indian literature. Having acquired a sound knowledge of Sanskrit, he spent three years in Paris and London, engaged in copying and collating MSS., and collecting materials for future research, especially in reference to the Hindu drama and philosophy. During this period he published, jointly with E. Burnouf, his first work, Essar sur le Pali (Paris, 1826). On his return to Bonn he studied Arabic, for some time, under Freytag, and took the degree of Ph.D., his dissertation discussing the Arabic notices of the geography of the Punjab (Commentatio geographica atque historica de Pentapotamia Indica, Bonn, 1827). Soon after he was admitted privatdocent, and entered on his academical career with an inaugural disserta- tion De Taprobane insula. In 1830 he was appointed “extraordinary ” and in 1840 “ordinary” professor to the newly-created chair of Old Indian language and literature, Schlegel continuing to hold (till his death in 1845) the chair of history. In spite of a tempting offer of the Sanskrit chair at Copenhagen, in 1841, Lassen remained faithful to the university of his adoption to the end of his life. He died at Bonn on May 8, 1876, having been affected with almost total

blindness for many years. As early as 1864 he was relieved of the duty of lecturing.

The numerous works and essays published by Lassen during half a century of unremitting labour, cover a wide field of Oriental researeh, and afford ample evidence of the thorough aceuraey of his seholarship and the eomprehensiveness of his learning. In 1829-31 he brought out, in eonjunetion with Sehlegel, a critical annotated edition of the Hitopadesa, the now well-known manual of political ethies in the form of fables, interspersed with moral maxims. The appearanee of this edition marks the starting-point of the eritical study of the Sanskrit literature. At the same time Lassen assisted his teacher and friend in editing and translating the first two cantos of the epie Rémdyana (1829-38). In 1832 he brought out the text of the first aet of Bhavabhati's drama, Mélattmddhava, anda eoiplete edition, with a Latin translation, of the Sankhya-kérikd, one of the ehief works of the Sankhya philosophy. In 1837 followed his edition and translation of Jayadeva's charming lyrieal drama, Gitagovinda, and his Institutiones lingue Pracritiex, which still forms the standard work on the popular dialeets of the Indian dramas. His Anthologia Sanseritiea, which eame out the following year, econ- tained several hitherto unpublished texts, and did much to stimulate the study of Sanskrit in German universities, where, indeed, it eontinues to be used, new editions of it having been published by Gildemeister in 1865 and 1868. In 1845 Lassen brought out a new and improved edition of Sehlegel's text and translation of the famous philosophieal episode of the Mahdbhdrata, the ''Bhagavadgita." He did not, however, eonfine himself to the study of Indian languages, but aeted likewise as a seientifie pioneer in other fields of philo- logieal inquiry. In his Beitrége zur Deuiung der Eugubinisehen Lafeln (1833), he prepared the way for the correet interpretation of the Umbrian inseriptions ; and the Zeitschrift fiir die Kunde des Morgenlandes (7 vols., 1837-50), started and eonducted by him, —- the first three volumes in eonjunetion with Ewald and Rodiger,— contains, among other valuable papers from his pen, grammatical sketehes of the Beluebi and Brahui languages, and an essay on the Lycian inseriptions. Soon after the appearance of Burnouf's Com- mentatre sur le Yagna (1833), Lassen also direeted his

attention to the Zend, and to Iranian studies generally; and in his work D7e alt- persischen Keilinsehriften von Persepolis (1836) he first made known the true eharaeter of the Old Persian eunciform inseriptions, thereby antieipating, by one month, Burnouf's Mémoire on the same subjeet, while Major (Sir Henry) Rawlinson's famous memoir on the Behistun inseription, though drawn up in Persia, independ- ently of eontemporaneous European research, at about the same time, did not reach the Royal Asiatic Society until three years later. Subsequently Lassen published, in the sixth volume of his

journal (1845), a complete collection of all the Old Persian cuneiform inscriptions known up to that date. He also was the first scholar in Europe who took up, with signal success, the decipherment of the newly-discovered Bactrian coins, which furnished him the materials for his important essay, Zur Geschichte der griechischen und indo-scythischen Kénige in Baktrien, Kabul, und Indien (1838). He likewise contemplated bringing out a critical edition of the Vendidad ; but, after publishing the first five fargards (1852), he felt that his whole energies were required for the successful accom- plishment of the great: undertaking of his life, with which his name willalways be inseparably connected—his Indische Alterthumskunde. In this work—completed in four volumes, published respectively in 1847 (2d ed., 1867), 1849 (2d ed., 1874), 1858, and 1861—which forms one of the greatest monuments of untiring industry and critical scholarship, everything that could be gathered from native and foreign sources, relative to the political, social, and intellectual development of India, from the earliest times down to Moham- medan invasion, was worked up by him into a connected historical account. Only those acquainted with Indian history and literature, where nothing is fixed, can realize the enormous difficulty of the task ; but in spite of much that may turn out to be erroneous, and in spite of still more that is, and from the nature of the subject must always be, uncertain and hypothetical, there can be no doubt that Lassen has laid in this work a solid. foundation for future Indian historical and antiquarian research.

LATAKIA, or LaptkrygH, a seaport town of Syria, situated opposite the island of Cyprus, about 72 miles north of Tripoli, and administratively dependent on the mutas- sarrif of that city. It is a rather poor-looking place ; but, besides being the most important town of a considerable district, the residence of several foreign consuls, and the seat of an American mission, it has considerable historical interest. Remains of the Roman period are still to be seen, the best preserved of which is a sort of triumphal arch hypothetically assigned to the time of Septimius Severus. As a trading port Latakia has recently declined. The harbour, about a mile from the town, is naturally small, and has been silted up so as to be serviceable only for the lesser native craft. The Russian and French steamers, which make Latakia a point of call, lie in the roadstead ; and the whole trade of the place, with Egypt and European countries, does not exceed the value of £100,000 per annum. The great article of export is the famous Latakia tobacco, mainly purchased by Egypt and England. It is grown among the Nosairiyeh hills ; and the hillmen, each with his little plot of ground, bestow great care on the cultivation of the plant. The best and most fragrant is brought from the districts of Diryus and Amamareh. Consul Jago gives the population of the town as about 12,000 in 1874; other estimates vary from 5000 to

14,000.

The oldest name of the town, according to Herennius Philo, was Pauia or Acvih &erh ; it received that of Laodicea (ad mare) from Seleucus Nicator, who founded it in honour of his mother as one of the four ‘‘ sister” cities of the Syrian Tetrapolis (Antioch, Seleucia, Apamea, Laodicea). In the Roman period it was favoured by Julius Cesar, and took the name of Julia; and, though it suffered severely when Dolabella was besicged within its walls (48 B.c.), Strabo describes it asa flourishing port, which supplied, from the vineyards on the mountains, the greater part of the wine imported to Alexandria. The town received the privileges of an Italian colony from Severus, for taking his part against Antioch in the struggle against Niger. Laodicea was the seat of an ancient bishopric, and even had some claim to metropolitan rights. Crusades, ‘‘ Liche,” as Jacques de Vitry says it

was popularly called, was a wealthy city. It fell to Tancred with Antioch in 1102, and was recovered by Saladin in 1188. A Christian settlement was afterwards permitted to establish itself in the town, and to protect itself by fortifications ; but it was expelled by Sultan Kilawun and

the defences destroyed. By the 16th century Laodicca had sunk |

very low ; the revival in the beginning of the 17th was due to the new trade in tobacco. The town has several times been almost destroyed by earthquakes—in 1170, 1287, and 1822.

LATHE.

two upright posts each carrying a fixed pin or dead centre, between which the work in hand is caused to revolve by an

At the time of the |

In its simplest form—a form which is still | employed by the natives of India—the lathe consists of | ‘ without the support of a “ back-centre,” cannot have been

assistant pulling alternately the two ends of a cord passed |

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roundit. A tool held firmly on a bar which forms a “rest” then attacks in succession the projecting parts, and in this way the entire surface is brought to an equal distance from the central axis; in other words, the cross section becomes everywhere circular.

- Fig. 1 shows a “‘dead-centre lathe” of the kind used in Europe during the 18th century, in which the centres are

Fig. 1.—Dead-centre Lathe.

carried by “puppets” or “poppets” which can be adjusted to suit the length of the work, the turner giving the rotation by means of the

treadle and spring-lath attached to the ceiling. This lath, having immortalized itself by giving its name to the “lathe,” has now almost entirely disappeared, the waste of time in its up- ward stroke (during which the work revolves in the wrong direction) being a fatal objection to its use in an age in which economy in that respect is of such importance. Dead-centre lathes them- selves are now almost things of the past, though within their own limits,—which are of course con- fined to such articles as are turned on the outside only, and can be supported at the ends (such as fig. 2)—they offer a steadiness of support and a 2 freedom of rotation which others seldom equal and / never surpass. The system, however, still sur- vives in the small lathes or “throws” used by Fig. 2. watch and clock makers; and for their purposes it is not likely to be soon superseded.

The lathe seems to have but tardily developed into the “foot-lathe,” the application to it of a fly-wheel worked by a crank and treadle having been exceptional rather than usual even in the early part of the present century, though a separate fly-wheel turned by an assistant had long previously been employed, and must have rendered possibie the turning of heavy work which could not have been attempted without it. The naves of cart wheels were doubtless a case in point, and for these as well as for many other purposes detached fly-wheels still render good service where steam or other motive power is not available.

The early attempts at modifying the dead-centre lathe so that articles such as fig. 3 could be turned “en Pat,” oF

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very encouraging. The introduction ofa spindle or mandrel carrying a pulley for the lathe band and screwed at one

end so that the work could be attached to it was a tolerably obvious mode of effecting it, a “headstock” resembling fig. 4 being the result. But the discarding of the dead-centre point and the substitution of a front bearing—a step which was essential to setting free the end of the

mandrel, and so enabling it to carry the work—must have been accompanied by a loss of power and an amount of unsteadiness which quite account for the tenacity with which the simple pole-lathe and the very similar “spring-bow lathe” survived, and make it im- probable that the mandrel was at first ever used in cases for which the older form was admissible. For even if it had been possible with the then existing means to § render a mandrel sufficiently true, | and to obtain an accurate fit between it and the bearing in which it revolved, wrong ideas prevailed as to the best form to be given to it,—the question indeed having only become a settled one within | the memory of persous now living, after various unsatis- factory patterns had :been tried and discarded. It is a matter of great importance, since the proper performance ofa lathe is mainly dependent on the mandrel’s maintaining a thoroughly good fit.

The types of modern lathes are as various as are the occupations of those who use them. The mechanic, the : soft-wood turner, and the amateur, for instance, differ so | greatly in their requirements that a lathe which would be | well suited to the one would be very ill adapted, even if not wholly useless, to the other. Thus the professional turner of soft wood, with a lathe of which the frame and even the fly-wheel are of timber (its value in shillings being | not very different from the price of an amateur’s lathe in pounds) will use a high rate of speed and sharp tools and

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Fia. 4.— Headstock.

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Fic. 5,~Mechanie’s Lathe,

light cuts, and so obtain results with which the owner of an elaborate instrument cannot at all compete. A modern mechanic’s lathe on the other hand, such as fig. 5, has very different demands made upon it. For this the greatest possible steadiness in all the working parts is the main desideratum, and it is of great advantage to have the means of

obtaining a slow speed, so as to be able to take the heaviest cuts which its strength and the power avail- able warrant. Timber has accordingly given place either to cast iron or gun-metal or steel in almost every part of a

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lathe of this class, the resulting increase of weight and firmness enabling the hand turner successfully to operate on small sizes of wrought iron or even steel, notwithstanding that in driving the fly-wheel his force can be applied only during a portion of each revolution.

- In turning hard materials such as these it is of primary importance that the tool should be held more rigidly than it can with the hand when no support is available except that of a narrow T-headed rest. The difficulty of doing this was to some extent got over formerly by employing ‘heel tools,” which transferred most of the strain directly to a flat-topped rest and made correspondingly reduced demands upon the arm of the turner; but it was never completely overcome till the introduction of the “slide-rest” placed the movement of the tool under complete control, and grasped it in a hand that never tires. Fig. 6 shows a

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Fia. 6,—Slide-Rest.

slide-rest such as would be used with the lathe in the previous engraving, for which purpose simplicity of construction and steadiness in all its parts are the points chiefly aimed at. Slide-rests designed for amateurs' use are sometimes very different from this in respect of com- plication and the number of different movements of which they are capable, but each increase in the number of parts intervening between the lathe-bed and the tool is a source of possible unsteadiness which should not be introduced without reason.

Foremost amongst the more complicated lathes both in utility and in the date of their introduction stand " screw- cutting lathes," in which a regular spiral can be traced upon the work by self-acting means, The traversing mandrel, in which this end was formerly attained by giving a longitu- dinal motion to the mandrel and the work attached to it, and keeping the tool stationary, is now but little used, the modern plan of causing the slide-rest to travel along the bed automatically being more convenient in most instances. It involves, however, an amount of gearing almost inadmissible in a foot-lathe, and it is for those driven by steam-power that it is chiefly employed. These, being machine tools, do not come within our present subject. It should be mentioned that screws can be cut in foot-lathes by hand-chasing tools without any special arrangement, and they are done in this way to a great extent by telescope makers and others with beautiful regularity.

"Chucks"—a term which embraces most of the contriv- ances by which the turner establishes connexion between his work and the mandrel—have been made to contribute in various ways to the production of abnormal forms. The oval chuck is used (as its name implies) for giving an elliptical path to the work in lieu of a circular one. The eccentric chuck enables any point or any series of points in succession to be brought into a line with the axis of the mandrel. With the former chuck, therefore, a fixed tool can trace an ellipse on the face of the work, and with the latter a series of intersecting or adjacent circles can be de- scribed by it. In this way a great variety of intricate

‘“‘engine-turned” patterns can be produced in the lathe, some idea of which may be gathered from the compara- tively simple one shown in fig. 7. To the complicated apparatus known as the geometric chuck neither straight lines nor irregular curves are impossible. The “rose-

engine” is a very old device for producing a somewhat similar kind of ornament, such as fig. 8, by giving a chattering motion to the mandrel, which is specially mounted on a vibrating frame for that purpose. The wavy lines on the backs of watches are engraved in this

Fie. 7. An Engine-turned Fic, 8.—Rose-engine Pattern. Pattern.

way, the curvature of the case not preventing the use of the rose-engine, as it would that of the eccentric chuck. But it is probable that these methods of producing face- work ornament will gradually disappear, and that all who still have leisure for doing them will prefer to use elliptic and eccentric and rose cutters fixed in the slide-rest and driven independently of the mandrel by overhead motion. With these similar results can be obtained, and the tool only instead of the entire mass of the work has to follow the desired curve.

Sketches of a few characteristic turning tools are given in fig. 9: A, a chisel, and B, a gouge, for soft wood; ©, a heel tool for wrought iron; D, E, the enlarged ends of a pair of chasing tools for cutting outside and inside screw-threads; and F, G, two slide-rest tools. Of these last F is forged from a square bar of steel (an operation which must be repeated from time to time as

Fie. 9.—Turning Tools,

the edge gets worn away), and G has an iron shank mado once for all, from which the steel-cutting portion ean be removed for the

purpose of sharpening or renewal. The saving of tool-steel thus effected is of course no great consideration in the case of these small tools, but it is very eonsiderable in the large sizes used with the power lathes of the present day. Examples of these will be found under the heading Macuninz Toozs (q..). (C. P. B. 8.)

LATIMER, Hucx (c. 1490-1555), bishop of Worcester, and one of the chief promoters of the Reformation in England, was a native of Thurcaston, Leicestershire, and the son of a yeoman, who rented a farm “of three or four pounds by year at the uttermost.” Of this farm ho “tilled as much as kept half a dozen men,” retaining also grass for a hundred sheep and thirty cattle. The year of Latimer’s birth is not definitely known. In the Lnfe by Gilpin it is

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for 1490.1 Foxe states that at “the age of fourteen years he was sent to the university of Cambridge,” and as he was elected fellow of Clare in 1509, his year of entrance was in all likelihood 1505. Latimer himself also, in mentioning his conversion from Romanism about 1523, says that it took place after he was thirty years of age. According to Foxe, Latimer went to school “at the age of four or thereabout.” The purpose of his parents was to train him up “in the knowledge of all good literature,” but his father “was as diligent to teach him to shoot as any other thing.” As the yeomen of England were then in comparatively easy circumstances, the practice of sending their sons to the universities was quite usual; indeed Latimer mentions that in the reign of Edward VI., on account of the increase of rents, the universities had begun wonderfully to decay. He graduated B.A. in 1510, and M.A. in 1514. Before the latter date he had taken holy orders. While a student he was not unaccustomed “to make good cheer and be merry,” but at the same time he was a punctilious observer of the minutest rites of his faith and “as obstinate a Papist as any in England.” So keen was his opposition to the new learning that his oration on the occasion of taking his degree of bachelor of divinity was devoted to an attack on the opinions of Melanchthon. It was this sermon that determined Bilney to go to Latimer’s study, and ask him “ for God’s sake to hear his confession,” the result being that “from that time forward he began to smell the word of God, and forsook the school doctors and such fooleries.” Soon his discourses exercised a potent influence on learned and unlearned alike; and, although he restricted himself, as indeed was principally his custom through life, to the inculcation of practical righteousness, and the censure of clamant abuses, a rumour of his

heretical tendencies reached the bishop of Ely, who resolved to become unexpectedly one of his audience. Latimer on seeing him enter the church boldly changed his theme to a portrayal of Christ as the pattern priest and bishop. The points of comparison were of course deeply distasteful to the prelate, who, though he professed his " obligations for the good admonition he had received," informed the preacher that he "smelt somewhat of the pan." Latimer was prohibited from preaching in the university or in any pulpits of the diocese, and on his occupying the pulpit of the Augustinian monastery, which enjoyed immunity from episcopal control, he was summoned to answer for his opinions before Wolsey, who, however, was so sensible of the value of such discourses that he gave him special licence to preach throughout England. At this time Protestant opinions were being disseminated in England chiefly by the surreptitious circulation of the works of Wickliffe, and especially of his translations of the New Testament. The newlcaven had begun to communi- cate its subtle influence to the universities, but was working chiefly in secret and even to a great extent unconsciously to those affected by it, for many were in profound ignorance of the ultimate tendency of their own opinions. It was perhaps, as regards England, the most critical conjuncture in the history of the Reformation, both on this account and on account of the position in which Henry VIII. then stood related to it. In no small degree its ultimate fate seemed also to be placed in the hands of Latimer. In 1526 the imprudent zeal of Barnes had resulted in an ignominious recantation, and in 1527 Bilney, Latimer's

1 The only reasons for assigning an earlier date are that he was eommonly known as ''Old Hugh Latimer," and that Bernher, his Swiss servant, states incidentally that he was ''above threescore and seven years" in the relgn of Edward VI. Bad health and anxieties probably made him look older than his years, but under Edward VI. his powers as an orator were in full vigour, and he was at his book

given as 1470, a palpable error, and possibly a misprint | winter and summer at two o'clock in the morning.

most trusted coadjutor, incurred the displeasure of Wolsey, and did humiliating penance for his offences. Latimer however, besides possessing far-seeing sagacity, quick insight into character, and a ready and formidable wit which thoroughly disconcerted and confused his opponents, had naturally a distaste for mere theological discussion, and the truths he was in the habit of inculcating could scarcely be controverted, although, as he stated them, they were diametrically contradictory of prevailing errors both in doctrine and practice. In December 1529 he preached his two “Sermons on the Cards,” which awakened a turbulent controversy in the university, and his opponents, finding that they were unable to cope with the dexterity and keen- ness of his satire, would undoubtedly have succeeded in getting him silenced by force, had it not been reported to the king that Latimer “favoured his cause,” that is, the cause of the divorce. While, therefore, both parties were imperatively commanded to refrain from further dispute, Latimer was invited to preach before Henry in the Lent of 1530. The king was so pleased with the sermon that after it “he did most familiarly talk with him in a gallery.” Of the special regard which Henry seemed to have con- ceived for him Latimer took advantage to pen the famous letter on the free circulation of the Scriptures, an address remarkable, not only for what Mr Froude justly calls “ its almost unexampled grandeur,” but for its striking repudia- tion of the aid of temporal weapons to defend the faith ; “for God,” he says, “will not have it defended by man or man’s power, but by his word only, by which he hath evermore defended it, and that by a way far above man’s power and reason.” Though the appeal was without effect on the immediate policy of Henry, he could not have been displeased with its tone, for shortly afterwards he appointed Latimer one of the royal chaplains. In times so “out of joint” Latimer soon became “weary of the court,” and it was with a sense of relief that he accepted the living of West Kington, Wiltshire, conferred on him by the king in 1531. Harassed by severe bodily ailments, encompassed by a raging tumult of religious conflict and persecution, and aware that the faint hopes of better times, which seemed to gild the horizon of the future, might be utterly darkened by a failure either in the constancy of his courage or in his discernment and discretion, lhe exerted his eloquence with unabating energy in the furtherance of the cause he had at heart. At last

a sermon he was persuaded to preach in London exasperated Stokesley, bishop of the diocese, and seemed to furnish that fervent persecutor with an opportunity to overthrow the most dangerous champion of the new opinions. Bilney, of whom Latimer wrote, “if such as he shall die evil, what shall become of me?” perished at the stake in the autumn of 1531, and in January following Latimer was summoned to answer before the bishops in the consistory. After a tedious and captious examination, he was in March brought before convocation, and on refusing to subscribe certain articles was excommunicated and imprisoned ; but through the interference of the king he was finally released after he had voluntarily signified his acceptance of all the articles except two, and confessed that he had erred not only “in discretion but in doctrine.” If in this confession he to some extent tampered with his conscience, there is every reason to believe that his culpable timidity was occasioned, not by personal fear, but by anxiety lest by his death he should hinder instead of promoting the cause of truth. After the consecration of Cranmer in 1533 his position was completely altered. A commission appointed to inquire into the disturbances caused by his preaching in Bristol severely censured the conduct of his opponents; and, when the bishop prohibited him from preaching in his diocese, he obtained from Cranmer a special licence to preach throughout the province of Canter-

bnry. In 1534 Henry formally repudiated the authority of the pope, and from this time Latimer was the chief co- operator with Cranmer and Cromwell in advising the king regarding the series of legislative measures which rendered that repudiation complete and irrevocable.

It was, however, the preaching of Latimer more than the edicts of Henry that established the principles of the Reformation in the minds and hearts of the people ; and from his preaching the movement received its chief colour and complexion. The sermons of Latimer possess a com- bination of qualities which constitute them unique examples of that species of literature. It is possible to learn from them more regarding the social and political condition of the period than

perhaps from any other source, for they abound, not only in exposures of religious abuses, and of the prevailing corruptions of society, but in references to many varieties of social injustice and unwise customs, in racy sketches of character, and in vivid pictures of special features of the time, occasionally illustrated by interesting incidents in his own life. The homely terseness of his style, his abounding humour, rough, cheery, and playful, but irresistible in its simplicity, and occasionally display- ing sudden and dangerous barbs of satire, his avoidance of dogmatic subtleties and noble advocacy of practical righteousness, his bold and open denunciation of the oppression practised by the powerful, his scathing diatribes against ecclesiastical hypocrisy, the transparent honesty of his fervent zeal, tempered by sagacious moderation—these are the qualities which not only rendered his influence so paramount in his lifetime, but have transmitted his memory to posterity as perhaps that of the one among his contem- poraries most worthy of our interest and admiration.

In September 1535 Latimer was consecrated bishop of Worcester. While holding this office he was selected to officiate as preacher when the friar Forest, whom he vainly endeavoured to move to submission, was burned at the stake for teaching treason to his penitents. In 1539, being opposed to the “ Act of the Six Articles,” Latimer resigned his bishopric, learning from Cromwell that this was the wish of the king. It would appear that on this point he was deceived, but as he now declined to accept the articles he was confined within the precincts of the palace of the bishop of Chichester. After the attainder of Cromwell little is known of him until 1546, when, on account of his connexion with the preacher Crome, he was summoned before the council at Greenwich, and committed to the Tower. Henry died before his final trial could take place, and the general pardon at the accession of Edward VI. procured him his liberty. He declined to resume his see, notwithstanding the special request of the Commons, but in January 1548 again began to preach, and with more effectiveness than ever, crowds thronging to listen to him both in London and in the country. Shortly after the accession of Mary in 1553 a summons was sent to Latimer to appear before the council at Westminster. Though he might have escaped by flight, and though he knew, as he quaintly remarked,

that ‘Smithfield already groaned for him,” he at once joyfully obeyed. The pursuivant, he said, was “a welcome messenger.” The hardships of his imprisonment, and the long disputations at Oxford, told severely on his health, but he endured all with unbroken cheerfulness. On October 16, 1555, he and Ridley were led to the stake at Oxford. Never was man more free than Latimer from the taint of fanaticism or less dominated by “ vainglory,” but the motives which now inspired his courage not only placed him beyond the influence of fear, but enabled him to taste in dying an ineffable thrill of victorious achievement. Ridley he greeted with the words, “Be of good comfort, Master Ridley, and play the man ; we shall this day light such a candle by God’s grace in

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England as (I trust) shall never be put out.” He “received the flame as it were embracing it. After he had stroked his face with his hands, and (as it were) bathed them a little in the fire, he soon died (as it appeared) with very little pain or none.”

Two volumes of Latimer’s sermons were published in 1549. Various volumes of his remains appeared after his death, edited by

Bernher and Thomas Some. A complete edition of his works, edited for the Parker Society by the Rev. George Elwes Corrie, appeared in two volumes, 1844-45. His Sermon on the Plough, and Seven Sermons preached before Edward VI., the best known of his sermons, were reprinted by Arber, 1869. In addition to memoirs attached to editions of his sermons, there are Lives by Gilpin (1755) and Demaus (1869). The principal contemporary authorities are Foxe’s Book of Martyrs, Stow’s Chronieles and Annals, and his own Sermons. (Gee Es)

LATIN LANGUAGE

HE Latin language first appears in history as the us language spoken in the plain of Latium (q.v.). In the 3d century B.c., at which date it first becomes known to us from extant inscriptions and contemporary history, its range as a vernacular was still limited to this district, although the arms of Rome had carried some knowledge of it to the utmost boundaries of the peninsula of Italy. Of the dialects commonly spoken outside the limits of

guages of Latium, two appear to have been entirely distinct in char-

Italy.

Common features of the Ttalian lan- guages,

acter from the rest. In the extreme south-east, inscriptions have been found in considerable numbers, written in a language known as Iapygian or Messapian; but no pro- gress has as yet been made in their interpretation, and it is quite impossible to determine with certainty even to what stock the language may have belonged. There are indications which seem to point in the direction of some kinship with the Albanian, but these are far too slight and untrustworthy to be accepted with any confidence. In Etruria, and at one time in Campania and in the plain of the Po, a language was spoken the affinities of which have not yet been determined satisfactorily (¢f vol. viii. pp. 638-39).

The other dialects of the Italian peninsula may be divided into two main groups, the Umbro-Sabellian and the Latin. The former is the more extensive in range in the earlier historic times, and includes Umbrian and Oscan or Samnite, still known to us by inscriptions, and (according to tradition) the language of the Sabines, the Marsians, and the Volscians, of which but scanty traces re- main. The latter probably had in prehistoric times a much wider range than that to which we find it afterwards con- fined. There are no facts to contradict the hypothesis, ta which a consideration of the geographical relatious of the several tribes seems to point, that at one time, not only Latium, but also Campania, Lucania, Italia proper, and the eastern half of Sicily, were inhabited by tribes belonging to the Latin race. But these regions

were early subjected to Hellenizing influences, or conquered by Sabellian invaders, and the only dialect closely akin to the Latin of which any

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specimens are preserved in inscriptions is that of Falerii |

in southern Etruria.

The Umbro-Sabellian and the Latin share many char acteristics which enable us to unite them as members of a common Italian group; but what is the exact position to be assigned to this group in the Indo-European stock is a question which cannot be regarded as finally determined, Some scholars of eminence, as Schleicher, maintain that its closest affinities are with the Celtic group, mainly on the strength of the agreement of both in the loss of aspirates and retention of spirants, in the form adopted for the expression of the middle or reflexive voice in verbs, and in the dative plural, and on other less significant points, But the more common opinion is that its connexion is closest with the Hellenic group, and that we may safely assume the existence of a common Italo-Hellenic nationality. Hence in vol. xi. pp. 130-131 an attempt was made to reconstruct the main outlines of the language spoken by

the ancestors of both Greeks and Romans, and to point

| this form.

out what phonetic changes and what developments of inflexion must have already taken place. Starting from the basis there laid down, we may now proceed to notice the following leading features, as marking the course of the Italian group of languages after their separation from the Hellenic group. Even for scholars who do not accept this genealogical classification of languages such a survey will not be without its value as a statement of the facts which every theory has to take into account.

1. The vowels remained on the whole unaltered in Latin up to the time of the earliest inscriptions. After that date there was a rapid development of a tendency, of which traces are to be found even earlier, of the degradation of the diphthongs to simple vowels. But in the earlier records we find, ¢.g., still pratdad=praeda

| (0. T. R., 63), wtei = uti (4., 196), virtutei = virtute (tb., 34), ploirwme

=plurimt (tb., 32), Leweestus= Lucetius (Carm. Saliar.), abdoueit = abdueit (OC. I. R., 30). Of these diphthongs ai is found almost exclusively im the inscriptions older than the 7th century of Rome, in words afterwards spelt with ae; e¢ is found representing an @ or an 7 as late as the time of Augustus; 07 occurs regularly for oe or &

| up to the time of the Gracchi, and occasionally later; ew is appar- | ently found in the place of a later @ only in the one form quoted,

although it is probable that in many cases ow represents a still earlier eu, as is shown by Marti Loucetio (C. I. Rhen., 929) by the side of Marti Leucetio (ib. 930), and by the transliteration of Lucius by Aevicios ; ow is found regularly for %, with rare exceptions, up to the time of the Social War.

Umbrian in this respect shows evidence of a much more rapid decay of the vowel-system, and had reached, at the time at which we learn to know it, a stage of monotony to which Latin only attained several centuries later: ¢.g., vini=O. Lat. veindd, kvéstur =O. Lat. guaistor, tu=O. Lat. etto, dst= Lat. drae, toru= Lat. tauros.

On the other hand, Oscan was much more faithful than the contemporary classical Latin to the complex diphthong-system, coming in this respect very near to archaic Latin: ¢.g., Fluws-ai = Florae, deiewm (infinitive, answering to dicere), toutieom—=tuticwm (t.¢., publiewm).

The change of 0 to w, w to 7, and ¢ to? takes place later. Within the history of the Latin language the w retains its full sound, not weakened like the Greek v to w.

2. In respect of the consonants the principal change is in the aspirates. While a comparison of Greck shows that they must have retained their character as sonant aspirates up to the time of the separation, none of the Italian languages have preserved them in In Latin the guttural aspirate becomes g in the middle of a word (comp. &yxw and ango, Aetyxw and lingo) and before r (comp.

| gra-tu-s and xdpis, grando and xdAa¢a); with a parasitic v fre-

quently appended (angui-s and éx:-s), which sometimes leads to the loss of the g (brevi-s and Bpaxt-s). At the beginning it becomes h (hiemps and xidv, holus and XAo-h) or f (fel and xéa-os, for-mus and ep-né-s), the two representative letters sometimes alternating dialectically (haedus and faedus, our goat; fostis and hostis, our guest). The dental aspirate became medially d (medius and péooos for ye6-yos), or sometimes b (uber and obap, ruber and é-pub-pd-s ; comp. also verbum and word, barba and beard), initially only f (fores and bpa, fers and fp). The labial aspirate passes medially into d (ambo and &udw; comp. navibus and vadpu, containing the same element bhi, although the terminations are not identical), initially into f (fa-ri and @nui, fero and Pépw), and rarely into h (perhaps dialectically in horda by the side of forda, and by dissimilation in mi-hi for mi-bi). Hence it appears that in Latin any one of the three original aspirates may be represented by f; we may compare our laugh (Germ. lachen), dwarf (Germ. swerg), Middle Eng. dwerth, the Russian Fodor for Theodore, and the change in Greek from ph ronounced separately) to ph=f. : The Sainte OF Ww, 4 ae = of which is so marked a feature 1m the Greek consonant-system, are retained with but few important

exceptions. The most important of these is the rhotaeism whereby

Dis- tinetive features of Latin.

an s between two vowels passes regularly (probably through the in-termediate stage of a sibilant pronounced like z) into r between two

vowels, as in wro for an earlier wso. The loss of a y (¢) between vowels is not uncommon, ¢.g., sédo for sedato through sedao ; it is less frequent after eonsonants, as in obex for ob-ice-s; under similar eircuistances w (wz) disappears, as in amasti for amavisti, canis for cuanis.

With regard to inflexion, the following may be noted as the chief developments subsequent to the stage described in vol. xi. p, 181:—

1. In substantives there was a considerable extension of the class of i-stems, due partly to new creations, partly to the transforma- tion of stems belonging to other classes. Thus a primitive garu-s, Gr. Bapu-s, in Latin is grau-t-s, a primitivo kvan-s beoomes cani-s. Very few of the Latin 7-stems have corresponding é-stems in Sans- krit or Greek. In some cases the ¢ appears to have been originally ana; comp. imbri- and duBpo-.

2. The final -d of the ablative was retained, and (in Latin at any rate) the ~~bas of the dative plural; on the other hand, the instru~~ mental in -bAd (Gr. ¢1) does not appear at all on Italian soil. ;

3. The dual number was lost both in nouns and in verbs, as in the later Greek. ,

4, An entirely new system of inflexion for the reflexive tenses (the middle, or, as it subsequently became, the passive voice) was createcd by the use of the reflexive pronoun se as a suffix, (Whether this system is common to the Italian and the Celtic languages, or whether the apparently similar formations in the latter aro of different origin, is a question not yet definitely scttled.)

5. In many verbs the componnd aorist with an s element was made by the action of analogy into a perfect in s7,

6. Numerous verbs adopted for their perfect tenses a suffix in -vi or ~~uz. This has been commonly supposed to represent a new pro~~ eess of combination with the root bhu instead of cs; but weighty objections

have recently been brought against this explanation, and it can no longer be propounded with eonfidence.

7. The root bku was employed to form a past imperfect in -bam, and a future in -b0; but in the case of consonant verbs and 7-verbs the lattcr formation was usually replaced by an optative form used as a future.

8. es and pluperfect tenses of the subjunctive were formed apparently by compounding the present and perfect stems with the optative of the root es, ‘to be.”

9. The infinitive and participle system received a considerable expansion, especially by the formation of gerundives and supines, which, however, were differentiated in usage in the various Italian dialects (see below). ;

10. The pronominal clements, though for the most part the same as in Greek, were commonly used in composition one with another, and thus acquired a different form.

11. The w-class also was extended by the more common use of the suffix -tw for verbal nouns.

With regard ta the vocabulary, very extensive additions were made, probably in many instances from Celtic sources. Many of the most common Latin words are entirely without demonstrable cognates in the other Indo-European languages; and, even when the common root may be suggested with considerable plausibility, the particular Latin word has evidently behind it a long and independ- ent history, during which its meaning and usage have been greatly modified. ence all attempts to deal with the etymology of the Latin stock of words are confronted with a residuum which the inatcrials at our command do not allow us to deal with satisfactorily.!

The privcipal distinctions between the Latin branch of the Italian group and the Umbro-Sabellian are the following :—

1. Neither Umbrian nor Oscan had any character for 0; for this the former language used v=, ¢.g., puplum=populum; the latter & (perhaps approximating to 0), ¢.g., gud =quod, or sometimes w, as in aragetid =argentéd.

2. The Old Umbrian did not distinguish between surds and sonants in the case of gutturals and dentals, having no g or d; but both these letters were uscd in Oscan. , :

3. Oscan distinguished between 7 and 7, the latter a sound pro- bably intermediate between 7 and c.

4. In Umbrian d, when occurring between vowels, or at the end of a word after a vowel, was replaced by 7, in later Umbrian by 7s, €.9., asam ar=aram ad, t.e., ad aram, dupursus=bipedibus. “K before ¢ and 7 acquired a palatal sound, not existing in Latin until long afterwards, which was denoted by g, i.c., (85 eg (CSNA = ccna,

. . > mei 9) .

5. The Umbro-Sabellian dialects agreed in retaining the carlicr genitive in s (becoming afterwards in Umbrian 7), e. g., tuta-s Ost a city,” molta-s=muiltae, while the Latin has in the case of a- c- and o-stems substituted for this a form in 7, probably a loeative. ’

6. They retain also the future compounded with es, ¢.g., Umb.

1 The Celtie element in Latin has been discussed by Professor Newman in his Regal Rome, and more satisfactorily by Mr Words-

worth in an appendix to his Lectures on Karly Roman Literature ; |

but the question still requires further examination (comp. also Cuno’s Geschichte Italiens).

LATIN EANRGHIAG EE

heriest, Osc. herest=volet, replaced in Latiu either by the optative or by a new form in -6o. .

7. Both Oscan and Umbrian allowed the velar guttural (¢) to pass into p, as in the Gallo-British branch of Celtic and in Greek, while this is never the case in Latin; comp. qut-s and pis, Quintius with its Samnite equivalent Pontiws=Pompeius,

Three clearly marked stages present themselves in the history of the Latin language :—(1) the archaic stage, pre- vious to the development of literature ; (2) the stage of literary culture, during which the popular spoken language runs, as it were, underground, giving but few traces of its existence; (3) the stage at which the popular language re- appears as colouring literature, and finally recasting it in its own mould.

The archaic stage is known to us almost wholly from inscriptions, and from isolated forms and words quoted by the grammarians; although a careful study of the phenomena of the diction and especially the metre of the early Roman dramatists reveals to us many of its charac- teristic tendencies. It may be said to have lasted until the time of Ennius (d. 169 3.c.), whose growing influence is intimated in the epitaph composed for himself by Nevius (d. 204 B.c.) :—

‘“itaque postquam est Orci traditus thesauro obliti sunt Romai loquier Latina lingua.”

Perhaps the oldest specimen of the Latin language pre- served to us is to be found in two fragments of the Carmina Saliaria preserved by Varro (De ling. Lat., vii. 26, 27), and one in Terentianus Scaurus, but unfortunately they are so corrupt as to be quite unintelligible without the help of very extensive conjectural changes in the reading (cf. Jordan, Krit. Beitrdge, pp. 211-224). More valuable evidence is supplied in the Carmen Fratrum Arvalium, which was found in 1778 engraved on one of the numerous tablets recording the transactions of the college of the Arval brothers, dug up on the site of their grove by the Tiber, 5 miles from the city of Rome; but this also supplies many points for discussion, and even its general meaning is by no means clear (7b, pp. 2038-11; ef Wordsworth, Pragments and Specimens, pp. 157, 158, with the notes).

The text of the Twelve Tables (451-450 B.c.), if preserved in its integrity, would have been invaluable as a record of antique Latin; but it is known to us only in quotations, and it is doubtful whether any accurate reproduction of the laws in their primitive form was accessible to our authorities. Hence the language has been much modernized, and any archaic forms which have been preserved are due rather to the citations of the grammarians than to continuous quotations.

Schoell, whoso edition and commentary (Leipsic, 1866) is the most complete, notes the following traces, among others, of an archaic syntax :—(1) both the subject and the object of the verb are often left to be understood from the context, e.g., 27 tt antestamino, igitur em capito; (2) the imperative is used even for permissions, st volet, plus dato, if he ehoose, he may give him more; (8) the subjunctive is apparently never used in conditional, only in final sentences, but the future perfect is common; (4) the connexion between sentences is of the simplest kind, and conjunctions aro rare; ast (=si) and tgitur (=tum demium) have a different force from that found in later Latin. There are of course numerous isolated archaisms of form and meaning, such as calvitur, pacwnt, endo, escit; but on the whole the diction cannot have been accu- rately preserved.

In the case of inscriptions there is rarely any question of their faithful reproduction of the language at the time at which they were made ; but there may be a diffieulty about determining tlicir date. Perhaps the oldest fragment of Latin preserved in this way is furnished by a vessel dug up in the valley between the Quirinal and the Viminal carly in 1880. The vessel is of a dark brown clay, and consists of three small round pots, the sides of which are con- nected together by short broad pipes, so that there is easy com- munication from one to the other. All round this vessel runs an inscription, in three clauses, two nearly continuous, the third written below; the writing is from right to left, and is still clearly legible ; the characters include some signs not belonging to the Latin alphabet proper, but to the other Italian alphabet, c.g., I for R, and I for Z, while the M has five strokes and the @ has the form of a Koppa.

Stages in the history of the Latin lan- guage.

The arehaie stage.

wrrey BANG,UAGE

The inscription is as follows :—

Jovei Sat deivos qoi med mitat, nei ted endo cosmis virco sied, asted noisi Ope Toitesiai pacari vois.

Dvenos med feced en manom einom dzenoine med imaao statod.

The general style of the writing and the phonetic pcculiarities make it pretty certain that this work must have been produced not later than 300 B.c.; the characters employed prove that the writer was familiar with onc of the dialects spoken in the hilly country to the east of Rome; but on the whole the language nay be taken as Latin. Some points in its interpretation are still open to doubt; but the probable interpretation is—

Jovi Saturno divis qui (—si quis) me mittet, ne te endo (=in te) comis virgo sit, ast nisi Opi Tutesise pacari vis.

Duenus me fecit in manum: enim die noni mc mano stato.

‘‘If any one brings me to the gods Jupiter and Saturn, lct not any maiden be kindly to thee, except unless thou wilt offer a sacri- fice to Ops Tutesia.

‘¢ Duenus made me for the offering to the dead; therefore on the ninth day place me for the offering for the dead.”

The noteworthy phenomena here are the retention not only of et but of the much more archaic o7, apparently taking the place of the former by a dialectic variation; e2 in eiwom for a short e’, ¢ for 7 in feced, g before 0, and dz apparently to represent the sound of

A bronze tablet recently discovered near the Fucine Lake, and some works of art found at Palestrina, belong to the same period. They are undoubtedly Latin, but the Latin has been mixed with other elements so that it would have been quite unintelligible to a native of Rome.

Of the earlier long inscriptions the most important would be the Columna Rostrata, or column of Duilius, erected to commemorate his victory over the Carthaginians in 260 B.c., but for the uncer- tainty as to the extent to which it has suffered from the hands of restorers. The shape of the letters plainly shows that the inscrip- tion, as we have it, was cut in the time of the empire. Hence Ritschl and Mommsen suppose that the language was modified at the same time, and that, although many archaisms have been retained, some were falsely introduced, and others replaced by more modern forms. The most noteworthy features in it are—C always for G (CESET =gessit), D retained in the ablative (¢.g., in altod marid), o for win inflexions (primos, exfociont =exfugiunt), single for double consonants (clases=classes), ¢ for 7 (navebos=navibus, exemet =caxemit); of these the first is probably an affected archaism,

G having been introduced some time before the assumed date of |

the inscription. On the other hand, we have praeda where we should have expected praida; no final consonants are dropped ; and the forms -¢s, -eis, and ~~is for the accusative plural are inter~~ changed capriciously. The doubts hence arising preclude the possibility of using it with confidence as contemporary evidence for the state of the language.

Of unquestionable genuineness and the greatest valuc are the Scipionum Elogia, inscribed on stone coffins, found in the monument of the Scipios outside the Capene gate. The earliest of the family whose epitaph has been preserved is L. Cornelius Scipio Barbatus (consul 298 B.c.), the latest C. Cornelius Scipio Hispanus (preetor in 189 B.c.); but there are good reasons for believing with Ritsch] that the epitaph of the first was not contemporary, but was some- what later than that of his son (consul 259 B.c.). The last may therefore be taken as the earliest specimen of any length of Latin as it was written at Rome; it runs as follows :—

honcoino . ploirume . cosentiont . r[omat}

duonoro . optumo . fuise . uiro [virorwm]

luciom . scipione . filios . barbati

co|nsol . censor . aidilis . hic . fuet a [pud vos]

hele . cepit . corsica . aleriaque . urbelm pugnandod]

de|det . tempestatebus . aide . mereto[d votwm}. The archaisms in this inscription are—(1) the retention of o for u in the inflexion of both nouns and verbs; (2) the diphthongs 07 (=u) and ai (=ae); (3) -et for -dt, hee for hic, and -ebus for ~~ibus; (4) the absence of doubled consonants; and (5) duon~~ for bon-. On the other hand, the dropping of a final m in every case except in Luciom is a sign of the tendency to lighten final syllables, which is a marked characteristic of the language of this period.

In thé epitaph on Scipio Barbatus, 0 nowhere appears where the later language has uw, except in the doubtful case of Samnio (?=Samnium). The diphthongs oz and ai, as well as e7, are found in the latest of all the Scipio inscriptions (aid. ewr. =aedilis curulis), as well as in the EZpistola Consulum ad Tewranos (187 B.c.), and in the almost exactly contemporary decree of L. Aimilius (Hermes, iii. 243 sq.); but in a somewhat earlier epitaph to a Scipio (L. Cornelius Cn. f. Cn. n. Scipio) we have aetate. Of -et for -2t and the like there is another example in dedet (C. I. R., eae comp. dede in C. I. R., 62; navebous (-bus) of the Duilian column.

1 Comp. Jordan in Hermes, xvi. 225-60; Bucheler in Rhein. Mus., xxxvi, 235 sq.

Doubled consonants first appear in the decree of Emilius, though not regularly (comp. posedisent by essent and possidere); in the Epist. ad Teur. they are still not used. Duonus is not found else- where, except in

the Carmen Saliare, but Duelonai for Bellonae appears in the Epist. ad Tewr.; and duellwm for bellwm occurs in Ennius and Plautus, as a legal archaism in Cicero, and as a poetic variation in Horace, Ovid, and Juvenal.

A number of precious indications of archaisms on the one hand and mutilated forms on the other are supplied by dedicatory tablets of about the same age found in Picenum and Latium. As specimens of the former we may select Maurte= Marti, praidad = praeda, Junone=Junoni ; of the latter dedrot or dedro or dederi= dederunt, dede=dedit, cupa=cubat; the omission of a final m is also common.

It was a turning point in the history of the Latin Begin- language when Roman literature took its rise under the mings of influence of the Greek culture. It isa reasonable conjecture oe that the much greater corruption of the Umbrian dialect as ‘ compared with the Latin, and of the Latin as compared with the Oscan, in regard to the precise representation of sound, was due mainly to the varying degrees of contact with Greek civilization. The inscriptions dating from the 5th century of the city show the greatest arbitrariness in such points as the insertion or omission of final s and m, and of n before s, and in the distinction of e and w, e and t. The language of Plautus shows us the struggle of the two tendencies in the plainest manner. On the one hand Archa- we have numerous archaisms not only in form but in isms. quantity. Of the old long vowels in final syllables we have the following still retained, not indeed always, but when it is convenient for the verse :—

-é in the nom. and voc. of the first declension :

ne epistulaé quidem ulla sit in aédibus (Asin., 762).

-bus in dat. and abl. plur: [usually when a pause in the sense affords some istification|

lt ego illic oculis exuram lampadibiis ardéntibus (Afen., 842).

-dr in nom. of substantives, and comparatives, and also in verbs:

médo, quom dicta in me ingerebas, ddium non uxor eram (Asin., 927).

tanté mi egritido auctiré est in animo (bacchiac) (Capt., 782).

pol id quidem experior ita ut praédicas, Palaéstrio (A/il., 633).

-ér in nom. :—

méus fuit patér Antimachus, ego voeér Lyconides (Aul., 772).

-it, not only in the subj. (where it is a eontraction for -¢ét) and in the perf. ind., but even in the present:

potionis aliquid, prius quam pércipit insania (Ifen., 921). et: quod quisque in animo habét aut habiturtst, sciunt (Z'rin., 206). [Ritschl, ''in animod habet "].

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at: fandum alienum art, incultum faimiliarem déserit (Asin., 874). On the other hand we have much more commonly traces pestruc- of the destructive influence which was beginning to affect tive ten- so powerfully the form of Latin words, especially in their dencies. final syllables, From causes which it is now impossible to discover, the freer accentuation of earlier times, the existence of which was proved incidentally by Verner in his famous paper on some exceptions to the law of " Laut- verschiebung" (Kuhn's Zeztschrift, xxiii. 97-138), had been given up in favour of a more rigid system, which never allowed the accent to fall on the final syllable. Hence there was a constant struggle between the desire to preserve the older quantity of the final vowel and the tendency to shorten an unaccented syllable. This difficulty of preserv- ing the quantity of the final vowel is naturally greatest when the accented syllable is short; hence we are led to the formula that for Plautus, and therefore for the spoken language of his time*- =~". This holds good for all vowels, whether in nouns or in verbs, ¢.g.: a: satis si futurumst ; régi me viginti minas (Psewd., 114).

e: cavé practerbitas llas aedis quin roges (£pid., 433). 2; meri béllatores gignuntur, quas hic praegnantis fécit (Afv/., 1077). 0: névé liberto opus ést quod pappet. dabitur, praebebd cibum (Epid., 727). ’

w: quéd mani nequeunt tangere, tantum fas habent, quo manus apstineant (Trin., 288).

The last case is a rare one; the others are very common.

But further, forms like those quoted above from the inscriptions, ¢.g., dedro, oino, cuba, &c., led Ritschl and his followers to the recognition of the fact that even at this early time there was a strong tendency to drop the final consonant in Latin; and this at once furnished a clue to the proper interpretation of many metrical phenomena in Plautus, which had previously been explained on wholly incorrect assumptions.

Tn the case of a line like 7’vrin., 306,

né tibi aegritudinem pitér pdrerem, parsi sédulo,

it was assumed that pater was pronounced like pére, in order to avoid the apparent neglect of the law of position, which would, according to the practice of the classical poets, have lengthened the syllable ~~ter. Two considerations suffice to dispose of this hypo~~ thesis :—first, there is no evidence whatever that a mute between two vowels was ever dropped in early Latin; secondly, if pdter become by ‘‘compression ” pére, it would be natural to find mater becoming mére; but in no case does a form with the first syllable long and the second lengthened by position take the place of onc long syllable. On the other hand, there is positive evidence of a varied and unquestionable charactcr to show that a final consonant was frequently dropped in pronunciation, especially in an iambic word. Hence it is clear that pater was pronounced paté, not pére. This shows too that it was not the case, as has been asserted, that a final r was dropped only when it took the

place of an earlier s, although this is doubtless the most common instance of its omission. The consonants most commonly dropped are the following :—

$: @.g., nimi(s) lépide fecit vérba ad parsimdniam (Awl., 493).

This licence is retained by Ennius (e.g., Ann., 601, tum laterali(s) dolor, certissumu(s) nuntiu(s) mortis), and is common even in Lucretius. Cicero (Orat., 48, 161) speaks as if it had been the usual pronunciation in his own earlier days, and he admits it seven or eight times in his version of Aratus, e.g., magnu(s) Leo, &c.

m: e.g., dam quide(m) ne quid pérconteris quéd mi haud lubeat proloqui.

The practice of eliding a syllable ending in m before a following vowel shows how lightly this consonant was pronounced even by the classical poets. It is very frequently omitted in inscriptions of every period (comp. Corssen, i. 267-74). As Quintilian (ix. 4, 40) says, ‘‘m parum exprimitur. . . neque enim eximitur, sed obscu- ratur.” In this respect Umbrian quite agreed with popular Latin, but Oscan and Volscian carefully preserved the m (Corssen, i. 276).

t: ¢.g., set drraboni dédi(t) quadraginta minas (Jost., 648).

So in inscriptions dede (C. I. L., i. 6216).

d: ¢.g., hic apu(d) nos magna turba ac magna familiast (Aul., 340).

r: as above; or, ¢.g., pater venit. sed quid pértimui autem, bélua (Ter., Phorm., 601).

1 e.g., et stmu(l) conficiam facilius ego qudd volo (Ter., Heaut.,

803).

nm: €.g., aut quid istuc est qudd vos agitis? nén licet. tame(n) stis- picor (Ter., Hec., 874).

Itsis doubtful whether the last two licences occur in Plautus.

Occasionally we find these two tendencies concurring, and pro- ducing a short final syllable by the loss of a final consonant and the shortening of a vowel naturally long under the influence of the accent; so that we have forms like oves, boves, vides, rogas, manus, scanned as two short syllables, not only (a) before vowels, but (0) even before consonants, e.g. :—

(a) asini mordicis me scindunt, bévés incursent eérnibus (Aul.,

(0) fords foras lumbrice qui sub térra erepsist? modo (Aul., 620).

viros nostros quibus tu nos voluisti ésse matres familias (Stich.,

ad pee maniis ferat, labra 4 labris nusquam atiferat (Bacch.,

The tendency to drop the final consonant of an iambic word is

further extended to groups of words of the same scansion, especially when the second is a preposition, as in

uis &d fores est? &c. (Amphitr., 1014). pta id, quod tit contingat tibi vis (Asin., 718). Accent had also an important effect in inducing the voice to hurry over unaccented syllables, even though long by position, in order to lay full stress upon an accented syllable. But this naturally took place only when the syllable thus shortened was itself preceded by a short syllable so that the formula for this process is v-“= v~*. Under this head we may bring a large number of instances of apparent neglect of quantity. Many of these are cases where the usual spelling is with a double conso- nant. Some have argued that as doubled consonants were not used in writing before the time of Ennius (Fest., s. v.

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“ Solitaurilia,” p. 293, confirmed from inscriptions by Ritschl, P. ZL. Mf. Z., p. 123), this is an indication that the pronunciation fluctuated ;

but it is doubtful whether this was ever the case except under the influence of the accent ; and this influence was quite as powerful over syllables followed by two different consonants as by a doubled consonant. Thus, per anndnam caram dixit me natum pater (Stich., 179)

does not differ in principle from :

quia omnis bonas bonasque adcurare addecet (Z'rin., 78); and the unusual quantity of the last two words in

nds potius oner¢mus nosmet vicissatim voliiptatibus (Stich. , 532)

is to be explained in precisely the same way, except that in the latter the voice is hurrying on to dwell upon a long accented syllable, in the former the accent has already fallen on a short accented syllable, a fact which naturally tends to shorten the fol- lowing unaccented one. Compare for this

configo sagittis fires thensaurarios (Awi., 395) where Goetz after Fleckeisen reads " sagitis."

The combinations before which position is most commonly neglected are the following :—

nt: si id mea volintate factumst (Z'rin., 1166).

pt: voliptatem inesse tintam (Rud., 459).

st: magistratus, si quis me hanc habere viderit (Rud., 477).

rv: cassidem in caput, dormibo placided in tabérnaculo (Trin., 726).

ps: scio apsurde dictum hoc deérisores dicere (Capt., 69).

rg: séd sine argento fristraes . . . (Pseud., 378).

It is needless to dwell further upon the details of Plautine scansion. The foregoing instances will have made it clear that, while there are

some archaisms still retained, on the whole the language was beginning to suffer from that process of disintegration, which has left such marked traces upon almost every modern language.

The introduction of Greek metres for the drama doubt- less did much to check this process, and it is probable that, even in the earliest Roman comedies, licences of pronunciation are much less common than they were in the popular language of the time. But the iambic and trochaic measures, especially as employed by the Roman poets, admitted of a free treatment, which left room for much laxity. It was not until the hexameter came to be used for poetry that the laws of prosody were definitely fixed. The rigid canons of dactylic verse required that the pronunciation should be strictly determined; and hence Ennius, although he does not appear to have introduced any marked changes in generally recognized rules of quantity, was compelled to settle positively much which had previously been fluctuating, and so to lay down the lines to which subsequent poetical works had to conform. From this time forward the literary language of Rome parted company from the popular dialect. It has been said with truth that even to the classical writers Latin was in a certain sense a dead language. Its vocabulary was not identical with that of ordinary life. Literary works, whether in prose or in verse, had to conform to a fixed standard. Now and again a writer of fresh originality would lend new vigour to his style by phrases and con- structions drawn from homely speech. But on the whole, and in ever increasing measure, the language of literature was the language of the schools, adapted to foreign models. The genuine current of Italian speech is lost to view with Plautus and Terence, and reappears only in the semi- barbarous products of the early Romance literature.

This appears the proper place for a rapid survey of the pronunciation of the Latin language, as spoken in its best days.

I. Consonants.—l. Guttural. (a) Sonant G, pronounced as in

English, but never softened before about the 6th century after Christ. (2) Surd C, pronounced always as &! (except that in some early

1 The evidence for this pronunciation of ¢ will be found best stated in Corssen, i. 43-67, and Roby, i. xlvii.-liv. It may be summed up as follows:—(1) In some words the letter following ¢ varies in a

Pronun- ciation of Latin.

inscriptions the character is used for G) until about the 7th cen- tury after Christ. K went out of use at an early period, except in a few old abbreviatious for words in whieh it had stood before a, é.g., kal. for kalendas. Q always followed by the consonantal w, exeept in a few old inscriptions, in which it is followed by the vowel wu, &g-, pegunia. X, an abbreviation for cs; xs is, however, sometimes found. (c) Aspirate H, the rough breathing as in English.

9, Palatal. The spirant J, like the English y; it is only in late inscriptions that we find, in spellings like Zanuari, Giove, any indication of a pronunciation like the English.

3, Lingual. (a) R as in English, but probably produced more with the point of the tongue. (6) L as in English. (c) 8, always surd when initial, but at one time sonant between vowels, and possibly when final. (a) Z only found in the transcription of Greek words in and after the time of Cicero. ;

4, Dental. (a) Sonant, D as in English; but by the end of the 4th century di before a vowel was pronounced like our j (comp. diurnal and journal). (b) Surd, T asin English. (¢) Nasal, N as in English; but also (like the English 7) a guttural nasal (ng) before a guttural, Apparently it was very lightly pronounced, and easily fell away before s.

5, Labials. (a) Sonant, B as in English; but occasionally in inscriptions of the later empire v is written for 4, showing that in some cases b had already acquired the soft sound of the contem- porary 8. B before a sharp s was pronounced p, ¢g., in urbs. (b) Surd, P as in English. (¢c) Nasal, M as in English, but very slightly pronounced at the end of a word. (@) Spirant, V like the ow in Fr. owt, but probably often

approximating to the South Ger- man ¥, .¢., a labial, not (like the English v) a labio-dental v.

6. Labio-dental. Spirant, F as in English.

Il. VowEts. —4, %, 7, as the English ah, 00, ee; 6, asound coming nearer to aw than the English 6; é, an open Italian e, nearly as the vowel of pet lengthened. The short sound of each vowel was pro- bably identical in quality with the long sound, differing only in quantity. Henee @ was pronounced as in the French chatte, % nearly as in pull, % nearly as in pit, 6 as in dot, € nearly as in pé. The diphthongs were produced by pronouncing the vowels of which they were composed very rapidly according to the above scheme. This gives—au somewhat broader than ow in house; ew like ow in the Yankee pronunciation of town; ae like the vowel in hat lengthened, with perhaps somewhat more approximation to the i in wine; oc, a sound intermediate between 0 and e; ¢é, nearly as in feint, with the greater stress on the i; wi, as the French owt.

Changes The changes which may be detected in the Latin

in Latin. language during the period of its literary development may be arranged under the heads of (1) vocabulary, (2) inflexion, (3) word formation, (4) syntax.

These will be best regarded separately in connexion with the four principal stages in the history of the language, which may be given, with their chief writers, as follows :—

L Ante-Classical (240-80 B.c.). —Nevius (? 269-204), Plautus (254-184), Ennius (239-169), Cato (234-149), Terentius (? 195-159), Pacuvius (220-132), Accius (170-94), Lucilius (? 168-103).

TI. Classical—Golden Age (80 Bo-l4 A.D.).—Varro (116-28), Cicero (106-44), Lucretius (99-55), Cesar (100-44), Catullus (87-147), Sallust (86-34), Virgil (70-19), Horace (65-8), Propertius (150-— 1%), Tibullus (154-118), Ovid (43 B.c.-18 a.p.), Livy (59 B.O.-18 A.D.).

IIL Classical—Silver Age (14-180 a.p.).—Velleius (719 B.c.-2 31 a.v.), M. Seneca (died ¢. 30 a.p.), Persius (34-62), Petronius (died 66), Lucan (39-65), L. Seneca (died 65 a.v.), Plinius major (23-79 A.D.), Martial (40- 101), Quintilian (42-118), Plinius minor (61-% 113), Tacitus (760-2118), Juvenal (747-3 138), Suetonius (75-160), Fronto (c. 90-170).

IV. Post-Classical.

EEE manner which makes it impossible to believe that the pronunciation of the c depended upon this, eg., decumus and decimus, capis and recipis ; (2) if c was pronounced before e and 7 otherwise than before a, 0, and u, it is hard to see why & should not have been retained for the latter use; (3) no aneient writer gives any hint of a varying pronunciation of c; (4) a Greek x is always transliterated by ¢, and c by x; (5) Latin words containing ¢ borrowed by Gothic and early High German are always spelt with &. To these arguments it may be added that the varying pronunciations of ce, ci in the Romance languages are inexplicable except as derived independently from an original ke, ki.

The additions made to the vocabulary of the Latin Greek language from the Greek belong to four different stages words in- (Corssen, ii. 814). The first corresponds to the period of troduced the early intercourse of Rome with the Greek states, thee especially with the colonies in the south of Italy and ; Sicily. To this stage belong many names of nations, countries, and towns, as Stculi, Tarentum, Graeci, Achivi, Karthago, Poenus; and also names of weights and measures, articles of industry, and terms connected with navigation, as drachuma, mina, talentum, purpura, machina, patina, ancora, aplustre, nausea. To these may be added names of gods or heroes, like Apollo, Pollux, and perhaps Hercules. These were all freely adapted to the phonetic laws of the Latin language.

A second stage is marked by the closer intercourse re- sulting from the conquest of southern Italy, and the wars in Sicily, and by the contemporary introduction of imitations of Greek literature into Rome, with its numerous references to Greek life and culture. In this stage,

also, Greek words were freely adapted to the forms familiar to Roman ears : we find words like pessulus, scutula, amurca, fungus, balineum, bucina, techina, comissari, canistrum, carcer, sona (Covi), tarpessita, &c. In many cases hybrid forms are freely employed, whether by the addition of Latin suffixes to Greek stems as ballistarius, hepatarius, subbase- licanus, sycophantiosus, or of Greek suffixes to Latin stems as plagipatidas, peruonides ; or by derivation, as thermopo- lare, supparasitari ; or by composition as imeuscheme, thyrsigerae, flagritribae, scrophipasci, The character of many of these words shows that the comic poets who indulged in them must have been able to calculate upon a fair knowledge of colloquial Greek on the part of a con- siderable portion of their audience. The most remarkable instance of this issupplied by the burlesque lines in Plautus (Pers., 702 sq.), where Sagaristio describes himself as

Vaniloquidorus, Virginisvendonides, Nugipalamloquides, Argentumexterebronides, Tedigniloquides, Nummosexpalponides, Quodsemelarripides, Nunquampostreddonides. During this period Greek words are generally inflected according to the Latin usage.

But with Accius begins a third stage, in which the Greek inflexion is frequently preserved, ¢g., /Zectora, Oresten, Cithaeron ; and from this time forward the practice wavers. Cicero generally prefers the Latin case-endings, defending, e.g., Piraeeum as against Piraeea (Ad Att., vii. 3, 7), but not without some fluctuation, while Varro takes the opposite side, and prefers poemasin to the Ciceronian poematis. By this time also y and z were introduced, and words newly borrowed from the Greek were faithfully reproduced.

A fourth stage is marked by the practice of the Augustan poets, who, especially when writing in imitation of Greek originals, freely use the Greek inflexions, such as Arcades, Tethij, Aegida, Echis, &c. Worace probably always used the Greek form in his Odes, the Latin in his Satzres and Epistles. Later prose writers for the most part followed the example thus set.

In Plautus we have the best example of the vigorous Lan- native Italian idiom, enriched, but in no way fettered by gu2s° of imitation of the

Greek. His constructions are sometimes free, and do not square with the canons of later gram- marians; but there is much life and freshness, and it is very rarely that the right phrase is lacking to set forth his meaning with telling vigour.

The chief peculiarities of his grammar are :-—

1. The use of some substantives with a gender different from that afterwards usual, ¢.g., dorsus, collus, naswm. :

9. The retention of inflexions afterwards obsolete or retained only in archaic phrases: ɨ in the subj. pres., duint, creduis, posvr, dic septimi. With regard to some of these archaic inflexions it is still a question how far they may be safely restored to the text of

Nevius.

Ennius.

Paeuvius,

Accius.

Plautus ; ¢g., homonem, cubi, eunde, &c., the ablative d, nom. plur. in -és, as fundis. i

8. The use of words excluded from the language of classical literature, but reappearing in the popular dialect: ¢.g., suppetias rt, batuere, clepere, bellus, exinterare, exanclare, nautea, savium, &c. Under this head we may place the very frequent employment of diminntives, ¢.9., paptllarwm horridularwm oppressiunculae, espe- cially as terms of endearment, ‘‘mecwm corculum, meleulum, ver- culum,” passerculum, haedillum, vitcllum, aneticulam, monerulam, catellum, putellum, &c., the use of con, ad, and dc as strengthening particles, and of abstract words, especially in the plural, —all marks of the plebeius sermo.

4, Syntactical constructions afterwards ynusual Legs, the accu- sative after verbs like fungor and utor ; the accusative of the object after the gerundive (agitandwmst vigilias) ; the indicative in indirect questions and with cwm signifying “‘since” or ‘‘although”; present infinitive instead of future after verbs of promising ; guia after verbs of feeling, instead of guod, quontam = ‘‘since,” ‘ after” ; infinitive with purpose of motion ; consulo and condone with double accusa- tive ; decorus, aequus, and expers with ablative; vereor with genitive ; similis with genitive ; quid hoc est hominis ; facere tuert, compendt; Jfaxo with a future logically dependent ; the frequent use of figura etymologica, satin ut, praequam, pracut. There is a free use of verbals in ~~tio: quid tibt hance curatio est rem aut muttitio. By a laxity common in popular language verbs of seeing, knowing, asking, &c., are followed by a direct, not an indirect, question: sede volo, quot reddidisti? Asyndeton is very frequently employed to give life and rapidity to the style: e.g. (Pseud., 168), lepido victu, vino, un~~ guentis, inter pocula pulpamentis.

In Nevius we find archaisms proportionally much more numerous than in Plautus, especially in the retention of the original length of vowels, and early forms of inflexion, such as the genitive in -as, and the ablative in ~~d; shorten~~ ings do not seem so numerous. The number of archaic words preserved is perhaps due to the fact that so large a proportion of his fragments have been preserved only by the grammarians, who cited them for the express purpose of explaining these. The language of Ennius deserves especial study because of the immense influence which he exerted in fixing the literary style. He first established the rule that in hexameter verse all vowels followed by two consonants (except in the case of a mute and a liquid) or a double consonant, must be treated as lengthened by position. The number of varying quantities is also much diminished, and the elision of final m becomes the rule, though not without exceptions. On the other hand he very commonly retains the original length of verbal terminations (ponit, essét, facizt) and of nominatives in or and a, and elides final s before an initial consonant. In declension he never uses -de as the genitive, but -ai or -as; he has an inflexion Meétoco Fufetioeo, probably intended for a dative ; the shorter form of the gen. plur. is ~~wm in common; obsolete forms of pronouns are used, as mis, olli, sum~~

~~(=eum), sas, sos, sapsa; and in verbal inflexion there are irregularities like morimur, faimus, potestur, contudit, de. Some experiments in the way of tmesis (saxo cere com~~ minuit -brwm) and apocope (divum domus altisonum cael, replet te leetificum gaw) were happily regarded as failures, and never took root in the language. His syntax is simple aad straightforward, with the occasional pleonasms of a rude style, and conjunctions are comparatively rare. Pacuvius is noteworthy especially for his attempt to introduce a free use of compounds after the fashion of the Greek, which were felt in the classical times to be unsuited to the genius of the Latin language. Quintilian censures severely his line —

Nerci repandirostrum incurvicervicum pecus.

Accius, though probably the greatest of the Roman tragedians, is only preserved in comparatively unimportant fragments. We know that he paid much attention to grammar and orthography; and_ his language is much more finished than that of Ennius. It shows no marked archaisms of form, unless the infinitive in -der is to be accounted as such.

Lucilius furnishes a specimen of the language of the

period, free from the restraints of tragic diction and the Lucilius, imitation of Greek originals. Unfortunately the greater part of his fragments are preserved only by a grammarian whose text is exceptionally corrupt; but they leave no doubt as to the justice of the criticism passed by Horace on his careless and “muddy” diction. The wrbanitas which is with one accord conceded to him by ancient critics seems to indicate that his style was regarded as free from the taint of provincial Latinity, and it may be regarded as reproducing the language of the educated circles in ordinary life; even the numerous Greecisms and Greek quotations with which it abounds show the familiarity of his readers with the Greek language and literature. Varro ascribes to him the gracile genus dicendi, the distinguishing features of which were venustas and subtilitas. Hence it appears that his numerous archaisms were regarded as in no way inconsistent with grace and precision of diction. But it may be remembered that Varro was himself something of an archaizer, and also that the grammarians’ quotations

may bring this aspect of his language too much into pro- minence. It is to be feared that the disgusting coarseness of many of his lines did not lose them favour with the circle for whom he wrote. He shares with the comic poets the use of many plebeian expressions, the love for diminutives, abstract terms, and words of abuse; but occasionally he borrows from the more elevated style of Ennius forms like simitu (=simul), noenw (=non), facul (=facile), and the genitive in -a7, and he ridicules the contemporary tragedians for their zetematia, their high-flown diction and sesqué- pedalia verba, which make the characters talk “not like men but like portents, flying winged snakes.” In his ninth book he discusses questions of grammar, and gives some interesting facts as to the tendencies of the language. For instance, when he ridicules a praetor wrbanus for calling himself pretor, we see already the beginning of the confusion of ae and ¢, which afterwards became universal. He shows a great command of technical language, and (partly owing to the nature of tle fragments) draf Aeysueva are very numerous.

The treatise of Cato De Re Rustica would have afforded Cato.

invaluable material, but it has unfortunately come down to us in a text greatly modernized. As it is, it is of interest from the point of view of literature rather than of language. We find in it instances of the accusative with uti, of the old imperative praefamino, and of the fut. subj. servassis, prohibessis ; but there is nothing which can be added to what we learn from Plautus.

It is unfortunately impossible to trace the growth of Growth Latin prose diction through its several stages with the of Latin same clearness as in the case of poetry. The fragments of P™S% the earlier Latin prose writers are too scanty for us to be able to say with certainty when and how a formed prose style was created. But the impulse to it was undoubtedly given in the habitual practice of oratory. The earliest orators, like Cato, were distinguished for strong common sense, biting wit, and vigorous language, rather than for any graces of style; and probably personal auctoritas was of far more account than rhetoric both in the law courts and in the assemblies of the people. The first

public speaker, according to Cicero, who aimed at a polished style, and elaborate periods, was M. Amilius Lepidus Porcina, in the middle of the 2d century B.c.1 On his model the Gracchi and Carbo fashioned themselves, and, if we may judge from the fragments of the orations of C. Gracchus which are preserved, there were few traces of archaism remaining. A more perfect example of the urbanitas at which good speakers aimed was supplied by a famous

1 Cicero also refers to certain seripia dulcissima of the son of Scipio Africanus Major, which must have possessed some merits of style.

speech of C. Fannius against C. Gracchus, which Cicero considered the best of all orations of the time. No small part of the wrbanitas consisted in a pronunciation equally removed from boorish roughness and from foreign affecta- tions; and the standard of this was found in the language of the women of the upper classes, such as Lelia and Cornelia.

In the earliest continuous prose work which remains to us, the four books De Rhetorica ad Herennium, we find the language already almost indistinguishable from that of Cicero. There has been much discussion as to the author- ship of this work, now commonly, without very convine- ing reasons, ascribed to Q. Cornificius; but, among the numerous arguments which prove that it cannot have been the work of Cicero, none has been adduced of any import- ance drawu from the character of the language. It is worth while noticing that not only is the style in itself perfectly finished, but the treatment of the subject of style, elocutio (iv. 12, 17), shows the pains which had already been given to the question. The writer lays down three chief requisites—(1) elegantia, (2) compositio, and (3) dignitas. Under the first come Lazinitas, a due avoidance of solecisms and barbarisms, and explanatio, clearness, the employment of familiar and appropriate expressions. The second demands a proper arrangement, free from hiatus, alliteration, rhyme, the repetition or displacement of words, and

too long seutences. Dignity depends upon the selection of language and of sentiments.

Hence we see that by the time of Cicero Latin prose was fully developed. We may, therefore, pause here to notice the characteristic qualities of the language at its most perfect stage. The Latin critics were themselves fully conscious of the broad distinction in character be- tween their own language and the Greek. Seneca dwells upon the stately and dignified movement of the Latin period, and uses for Cicero the happy epithet of gradarius. He allows to the Greeks gratia, but claims potentia for his own countrymen. Quiutilian (xii. 10, 27 sq.) concedes to Greek more euphony and variety both of vocalization and of accent ; he admits that Latin words are harsher in sound, and often less happily adapted to the expression of varying shades of meaning. But he too claims “power” as the distinguishing mark of his own language. Feeble thought may be carried off by the exquisite harmony and subtleness of Greek diction; his countrymen must aim at fulness and weight of ideas if they are not to be beaten off the field. The Greek authors are like lightly moving skiffs; the Romans spread wider sails and are wafted by stronger breezes; hence the deeper waters suit them. It is not that the Latin language fails to respond to the calls that are made upon it. Lucretius and Cicero concur, it is true, in complaints of the poverty of their native language ; but this was only because they had had no predecessors in the task of adapting it to philosophic utterance ; and the long life of Latin technical terms like gwalitas, species, genus, ratio, shows how well the need was met when it arose. Mr Munro has said admirably of this very period :—

“The living Latin for ajl the higher forms of composition, both prose and verse, was a far nobler language than the living Greek. During the long period of Grecian pre-eminence and literary glory, from Aionier to Demosthenes, all the manifold forms of poetry and prose which were invented one after the other were brought to such exquisite perfection that their beauty of form and grace of lan- guage were never afterwards rivalled by Latin or any other people. But hardly had Demosthenes and Aristotle ceased to live when that Attic which had been gradually formed into such a noble instrument of thought in the

hands of Aristophanes, Euripides, Plato, and the orators, and had superseded for general use all the other dialects, became at the same time the language of the civilized world and was stricken with a mortal decay. . . . Epicurus, who was born in the same year as Menander, writes a harsh jargon

that does not deserve to be called a style; and others of whose writings anything is left entire or in fragments, historians and

philosophers alike, Polybius, Chrysippus, Philodemus, are little if any better. When Cicero deigns to translate any of their sentences, see what grace and life he instils into their clumsily expressed thoughts, how satisfying to the ear and taste are the periods of Livy when he is putting into Latin the heavy and uncouth clauses of Polybius! This may explain what Cicero means when at onc time he gives to Greek the preference over Latin, at another to Latin over Greek; in reading Sophocles or Plato he could acknowledge their unrivalled excellence; in translating Panetius or Philodemus he would feel his own immeasurable superiority.”

The greater number of long syllables, combined with the paucity of diphthongs and the consequent monotony of vocalization, and the uniformity of the accent, lent a weight and dignity of movement to the language which well suited the national gravitas. The precision of grammatical rules and the entire absence of dialectic forms from the written literature contributed to maintain the character of unity which marked the Roman republic as compared with the multiplicity of Greek states. It was remarked by Bacon that artistic and imaginative nations indulge freely in verbal compounds, practical nations in simple concrete terms. In this respect, too, Latin con- trasts with Greek. The attempts made by some of the earlier poets to indulge in novel compounds was felt to be out of harmony with the genius of the language. Com- position, though necessarily employed, was kept within narrow limits, and the words thus produced have a sharply

defined meaning, wholly unlike the poetical vagueness of some of the Greek compounds. The vocabulary of the language, though receiving accessions from time to time in accordance with practical needs, was rarely enriched by the products of a spontaneous creativeness, In literature the taste of the educated town circles gave the law; and these, trained in the study of the Greek masters of style, required something which should reproduce for them the harmony of the Greek period. Happily the orators who gave form to the Latin prose were able to meet the demand without departing from the spirit of their own language, and the periods of Cicero and Livy, though very different in structure from those of Plato and Demosthenes, are not less satisfying to the ear, or less adequate to the full expression of thought.

in the way of artjstic finish of style. He represents a protest at one and the same time against the inroads of the plebetus sermo, vulgarized by the constant influx of non-Italian provincials into Rome, and the “jargon of spurious and partial culture” in vogue among the Roman pupils of the Asiatic rhetoricians. His essential service was to have caught the tone and style of the true Roman urbanitas, and to have fixed it in extensive and widely read speeches and treatises as the final model of classical prose. The influence of Cesar was wholly in the same direction. His cardinal principle was that every new- fangled and affected expression, from whatever quarter it might come, should be avoided by the writer, as rocks by the mariner. His own style for straightforward simplicity and purity has never been surpassed ; and it is not without full reason that Cicero and Cesar are regarded as the models of classical prose. But, while they fixed the type of the best Latin, they did not and could not alter its essential character. In subtlety, in suggestiveness, in many-sided grace and versatility, it remained far inferior to the Greek. But for dignity and force, for cadence and rhythm, for clearness and precision, the best Latin prose remains unrivalled. These qualities make it pre-eminently the language of legislation and of commerce. There is no haziness about a Latin sentence; directness, concreteness, and lucidity stamp it as the utterance of men who knew precisely what they wished to say, and said it with all the force at their command.

To Cicero especially the Romans Cicero owed the realization of what was possible to their language and

Varro.

Sallust.

Lucre- tius.

do4 ik eTrne fCaenov 26

It is needless to dwell upon the grammar or vocabulary of Cicero. His language is universally taken as the normal type of Latin ; and, as hitherto the history of the language has been traced by marking differences from his usage, so the same method may be followed for what remains.

M. Terentius Varro, ‘‘ the most learned of the ancients,” a friend and contemporary of Cicero, seems to have rejected the periodic rhythmical style of Cicero, and to have fallen back upon a more archaic structure. Mommsen says of one passage “the clauses of the sentence are arranged on the thread of the relative like thrushes on a string.” But, in spite (some would say, because) of his old-fashioned tendencies, his language shows great vigour and spirit. In his Menippean satires he intentionally made free use of plebeian expressions, while rising at times to a real grace and showing often fresh humour. His treatise De Le Rustica, in the form of a dialogue, is the most agreeable of his works, and where the nature of his subject allows it there is much vivacity and dramatic picturesqueness, although the precepts are necessarily given in a terse and abrupt form. His sentences are as a rule co-ordinated, with but few connecting links; his diction contains many antiquated or unique words.

In Sallust, a younger contemporary of Cicero, we have the earliest complete specimen of historical narrative. It is probably due to his subject-matter, at least in part, that his style is marked by frequent archaisms; but something inust be ascribed to intentional imitation of the earlier chroniclers, which led him to be called “ priscorum

Catonisque verborum ineruditissimus fur.” His archaisms congist partly of words and phrases used in a sense for which we have only early authorities, ¢.9.,cwm animo habere, &c., animos tollere, bene factum, consultor, prosapia, dolus, venenum, obsequela, ingutes, sallere, occipere, collibeo, and the like, where we may notice especially the fondness for frequentatives, which he shares with the early comedy ; partly in inflexions which were growing obsolete, such as senati, solur, comperior (dep.), neglegisset, vis (acc. pl.), nequitur. In syntax his constructions are for the most part those of the contemporary writers.}

In Lucretius and Catullus we have examples of the language of poetry of the same period. The former is undoubtedly largely archaic in his style. We find zm for eum, endo for in, elae, ullae, unae, and aliae as genitives, ald for aliud, rabies as a genitive by the side of genitives in -at, ablatives in ~~i like colli, orbi, parti, nominatiyes in s for 7, like colos, vapos, hwmos. In verbs there are scattt, Fulgit, quaesit, confluxet =confluxisset, recesse = recessisse, induiacere for inicere; simple forms like jligere, lacere, cedere, stinguere for the more usual compounds, the in~~ finitive passive in ~er, and archaic forms from esse like stet, escit, fuat. Sometimes he indulges in tmesis which reminds us of Ennius: inque pediri, disyue supata, ordia prima. But this archaic tinge is adopted only for poetical purposes, and as a practical proof of his devotion to the earlier masters of his art; it does not affect the general

4 substance of his style, which is of the freshest and most vigorous stamp. But the purity of his idiom is not gained by any slavish adherence to a recognized vocabulary: he coins words freely; Mr Munro has noted more than a hundred drag Aeydueva, or words which he alone among good writers uses. Many of these are formed on familiar models, such as compounds and frequentatives ; others are

1 The character of archaism has been denied to his style by Dean Merivale ; and it is true that in the matter of orthography the forms which Sallust adopts, as Corssen has shown, were at least as common in his time as those which became afterwards the rule ; but, when we

compare his diction with that of Cicero, there is quite enough difference to justify the usual view ; and the fact that some of his expressions are found in later writers only goes to show that they imitated him in this respect.

directly borrowed from the Greek apparently with a view to sweetness of rhythm (ii. 412; v. 334, 505) ; others again (forty or more in number) are compounds of a kind which the classical language refused to adopt, such as szlvifragus, terriloguus, perterricrepus. He represents not so much a stage in the history of the language as a protest against the tendencies fashionable in his own time. But his influence was deep upon Virgil, and through him upon all subsequent Latin literature. In Catullus we have the type Catullusy of the language of the cultivated circles, lifted into poetry by the simple directness with which it is used to express emotion, In his heroic and elegiac poems he did not escape the influence of the Alexandrian school, and his genius is ill suited for long-continued flights; but in his lyrical poems his language is altogether perfect. As Macaulay says, “No Latin writer is so Greek. The simplicity, the pathos, the perfect grace, which I find in the great Athenian models are all in Catullus, and in him alone of the Romans,” The language of these poems comes nearest perhaps to that of Cicero’s more intimate letters. It is full of colloquial idioms and familiar language, of the diminutives of affection or of playfulness. Greek words are rare, especially in the lyrics, and those which are employed are only such as had come to be current coin. Archaisms are but sparingly introduced ; but for metrical reasons he has four instances of the inf, pass, in -zer, and several contracted forms; we find also alis and alid, uni (gen.), and the antiquated tetuli and recepso. ‘There are traces of the popular language in the . shortened imperatives cav? and mané, in the analytic perfect paratam habes, and perhaps in the use of unus | approaching that of the indefinite article. . The poets of the Augustan age mark the opening of a Horace, new chapter in the history of the Latin language. – The | influence of Horace was comparatively slight ; he worked in a field of his own, and, although Statius imitated his lyrics, and Persius and Juveual, especially the former, his satires, on the whole there are few traces of any deep marks left by him on the language of later writers. In his Satires and pistles the diction is that of

the contemporary urbanitas, differing hardly at all from that of Cicero in his epistles and dialogues. The occasional archaisms, such as the syncope in erepsemus, evasse, surrexe, the infinitives in ver, and the genitives deum, divum, and nummum may be explained as still conversationally allowable, though ceasing to be current in literature ; and a similar explanation may account for plebeian terms, e.g., balatro, blatero, garrio, mutto, vappa, caldus, soldus, surpite, for the numerous diminutives, and for such pronouns, adverbs, conjunctions, and turns of expression as were common in prose, but not found, or found but rarely, in elevated poetry. Greek words are used sparingly, not with the licence which he censures in Lucilius, and in his hexameters are inflected according to Latin rules. In the Odes, on the other hand, the language is much more precisely limited. There are practically no archaisms (spargier in Carm. iv. 11, 8 is a doubtful exception), or plebeian expressions; Greek inflexions are employed, but not with the licence of Catullus ; there are no datives in% or sin like Tethyt or Dryasin ; Greek constructions are fairly numerous, e.g., the genitive with verbs like regnare, abstinere, desinere, and with adjectives, as enteger vitae, the so-called Greek accusa- tive, the dative with verbs of contest, like /uctarz, decertare, the transitive use of many intransitive verbs in the past participle, as regnatus, triumphatus ; and finally there is a "'prolative " use of the infinitive after verbs and adjectives, where prose would have employed other constructions, which, though not limited to Horace, is more common with him than with other poets. Compounds are very sparingly employed, and apparently only when sanctioned by autho-

Virgil.

Livy.

carry hbANGU AG E

rity. His own innovations in vocabulary are not numerous. About eighty daa Aeyopeva have been noted; butfor the most part there is nothing very distinctive about their character, and perhaps we should find them almost entirely disappear- ing if the remains of contemporary literature were more extensive. Like Virgil, he shows his

exquisite skill in the use of language rather in the selection from already existing stores, than in the creation of new resources : tantwm serves iuncturaque pollet. But both his diction and his syntax left much less marked traces upon succeeding writers than did those of either Virgil or Ovid.

In Virgil the development of the Latin language reached its full maturity. What Cicero was to the period, Virgil was to the hexameter ; indeed the changes that he wrought were still more marked, inasmuch as the language of verse admits of greater subtlety and finish than even the most artistic prose. For the straightforward idiomatic simplicity of Lucretius and Catullus he substituted a most exact and felicitous choice of diction, rich with the suggestion of the most varied sources of inspiration. Sometimes it is a phrase of Homer's "conveyed " literally with happy bold- ness, sometimes it is a line of Ennius, or again some artistic Sophoclean combination. Virgil was equally familiar with the great Greek models of style and with the earlier Latin poets. This learning, guided by an unerring sense of fitness and harmony, enabled him to give to his diction a music which recalls at once the fullest tones of the Greek lyre and the lofty strains of the most genuinely national song. His love of antiquarianism in language has often been noticed, but it never passes into pedantry. His vocabulary and constructions are often such as would have conveyed to his contemporaries a grateful flavour of the past, but they would never have been unintelligible. Forms like tusso, olle, or admittier can have delayed no one.

In the details of syntax it is difficult to notice any peculiarly Virgilian points, for the reason that his language, like that of Cicero, became the canon, departures from which were accounted irregularities, But we may notice as favourite constructions a free use of oblique cases in the place of the more definite construction with prepositions usual in prose, eg., 7¢ clamor caelo, flet noctem, rims currentia vina, bacchatam iugis Naxon, and many similar phrases ; the employment of some substantives as adjectives, like venator canis, and vice versa, as plurimus volitans ; a proleptic use of adjectives, as tristia torquebit; idioms involving tle, atqyue, deinde, haud, quin, vx, and the fre- quent

occurrence of passive verbs in their earlier reflexive sense, as tnduor, velor, pascor (comp. Dr Kennedy's Appen- dix on " Virgilian Syntax ").

In Livy's singularly varied and beautiful style we have Latin prose in that rich maturity which seems to portend and almost to necessitate an early decline. To a training in the rhetorical schools, and perhaps professional experience as a teacher of rhetoric, he added a thorough familiarity with contemporary poetry and with the Greek language ; and these attainments have all deeply coloured his language. It is probable that the variety of style naturally suggested by the wide range of his subject matter was increased. by a half-unconscious adoption of the phrases and constructions of the different authorities whom he followed in different parts of his work ; and the industry of German critics has gone far to demonstrate a conclusion likely enough in itself. Hence perhaps comes the fairly long list of archaisms, especially in formule, which scholars have collected (cf. Kiihnast, Znv. Synt., pp. 14-18). These are, however, purely isolated phenomena, which do not affect the general tone. It is different with the poetical constructions and Greecisms, which appear on every page. Of the latter we find numerous instances in the use of the cases, e.g., in genitives like ad Spet (sc. templum), pars altera regiae

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adulationis erat, oratores pacis petendae, ira praedae omissae, oppidum Antiochiae, aequum campi, qui captt- vorum, in datives like aeneuwm pectort tegumen, comitia collegae creando, gquibusdam volentibus erat, promptus veniae dandae,! in accusatives like wurare calumniam, certare multam, distendere hostem; an especially frequent use of transitive verbs absolutely ; and the constant omission of the reflexive pronoun as the subject of an infinitive in re- ported speech. To the same source must be assigned a very frequeut pregnant construction with prepositions, an attraction of relatives, and a great extension of the employment of relative adverbs of place instead of relative pronouns, ¢9., quo=in guem. Among his poetical characteristics we may place the extensive list of words which are found for the first time

in his works and in those of Virgil or Ovid, and perhaps his common use of concrete words for collective, eg., eqgues for equitatus, of abstract terms such as remigium, servitia, robora, and of frequentative verbs, to say nothing of poetical phrases like “haec ubi dicta dedit,” “adversum montium,” &c. Indica- tions of the extended use of the subjunctive, which he shares with contemporary writers, especially poets, are found in the construction of ante quam, post quam with this mood, even when there is no underlying notion of purpose, of donec, and of cum meaning “ whenever.” On the other hand forsitan and quamvis, as in the poets, are used with the indicative in forgetfulness of their original force. Among his individual peculiarities may be noticed the large number of verbal nouns in -tws (for which Cicero prefers forms in -tio) and in ~~tor, and the extensive use of the past passive participle to replace an abstract sub~~ stantive, e.g., ex dictatorio imperio concusso. In the arrange- meut of words Livy is much more free than any previous prose writer, aiming, like the poets, at the most effective order rather than at that which is logically suggested. His periods are constructed with less regularity than those of Cicero, and gain at least as much in variety and energy as they lose in uniformity of rhythm and artistic finish. His style cannot be more fitly described than in the language of Quintilian, who speaks of his méra cwcunditas and lactea ubertas.

The language of Propertius is too distinctly his own to Proper- It cannot be taken as tus.

call for detailed examination here. a specimen of the great current of the Latin language; it

is rather a tributary springing from a source apart, tinging to some slight extent the stream into which it pours itself,

but soon ceasing to affect it in any perceptible fashion.

“His obscurity, his indirectness, and his incoherence” (to adopt the words of Professor Postgate) were too much out

of harmony with the Latin taste for him to be regarded as in any sense representative ; sometimes he seems to be hardly writing Latin at all. Partly from his own strik- ingly independent genius, partly from his profound and

not always judicious study of the Alexandrian writers, his poems abound in phrases and constructions which are without a parallel in Latin poetry. His archaisms and

Grecisms, both in diction and in syntax, are very. numerous; but frequently there is a freedom in the use of cases and prepositions which can only be due to bold and

independent innovations. His style well deserves a careful

study for its own sake (cf. Postgate’s Introduction, pp.

lvii.cxxv.) ; but it is of comparatively little significance in

the history of the language.

The brief and few poems of Tibullus supply only what Ovid.

is given much more fully in the works of Ovid. In these we have the language recognized as that best fitted for EEE ee

1 Kiihnast (p. 140) holds that of more than three hundred and twenty datives in book xxiii. about thirty show the influence of Greek constructions.

poetry by the fashionable circles in the later years of Augustus. The style of Ovid bears many traces of the imitation of Virgil, but it is not less deeply affected by the rhetoric of the schools. His never-failing fertility of fancy and command of diction often lead him into a diffuseness which mars the effect of his best works; according to Quintilian it was only in his (lost) tragedy of Jfedea that he showed what real excellence he might have reached if he had chosen to control his natural powers rather than to give them full rein. His influence on later poets was largely for evil: if he taught them smoothness of versifica- tion and polish of language, he also co-operated powerfully with the practice of recitation to lead them to aim at rhetorical point and striking turns of expression, instead of a firm grasp of a subject as a whole, and due subordination of the several parts to the general impression. Ovid’s own influence on language was not great: he took the diction of poetry as he found it, formed by the labours of his predecessors ; the conflict between the archaistic and the Greecizing schools was already settled in favour of the latter; and all that he did was to accept the generally accepted models as supplying the material

in moulding which his luxuriant fancy could have free play. He is the pattern of the poet of society, never rising above that which was readily intelligible to the circle in which he moved, but achieving what all were attempting with consummate ease and grace. He has no deviations from classical syntax but those which were coming into fashion in his time (e.9., forsitan and quamvis with the indic., the dative of the agent with passive verbs, the ablative for the accusative of time, the infinitive after adjectives like certus, aptus, &c.), and but few peculiarities in his vocabulary. It is only in the letters from the Pontus that laxities of con- struction are detected, which show that the purity of his Latin was impaired by his residence away fron1 Rome, and perhaps by increasing carelessness of composition.

While the leading writers of the Ciceronian and Augustan eras enable us to trace the gradual development of the

Latin language to its utmost finish as an instrument of –

literary expression, there are some less important authors who supply valuable evidence of the character of the sermo plebevus. Among them may be placed the authors of the Bellum Africanum and the Bellum Hispaniense appended to Cesar’s commentaries. These are not only far inferior to the exquisite wrbanitas of Czsar’s own writings ; they are much rougher in style even than the less polished Bellwm VITT., which are now with justice ascribed to Hirtius. There is sufficient difference between the two to justify us In assuming two different authors; but both freely employ words and constructions which are at once antiquated and vulgar. The writer of the Bellum Alexandrinum uses a larger number of diminutives within his short treatise than Cesar in nearly ten times the space: postguam and ubi are used with the pluperfect subjunctive ; there are numerous forms unknown to the best Latin, liketristi MONG, exporrigere, crucuabiliter, and convulnero; potior is followed by the accusative, a simple relative by the subjunctive. There is also a very common use of the pluperfect for the imperfect, which seems a mark of this plebeius sermo (Nipperdey Quaest. Caes., pp. 13-30).

Another example of what we may call the Latin of business life is supplied by Vitruvius. Besides the obscurity of many of his technical expressions, there is a roughness and looseness in his language, far removed from a literary style; he shares the incorrect use of the pluperfect, and uses plebeian forms like calefuciuntur, JSaciliter, expertiones, and such careless phrases as “rogavit Archi- medem uti in se sumeret sibi de eo cogitationem.” Ata somewhat later stage we have, not merely plebeian, but also

provincial Latin represented in the Satyricon of Petronius. The narrative and the poems which are introduced into it are written in a style distinguished only by the ordinary peculiarities of silver Latinity; but in the numerous conversations the distinctions of language appropriate to the various speakers are accurately preserved ; and we have in the talk of the slaves and provincials a perfect storehouse of words and constructions of the greatest linguistic value. Among the unclassical forms and constructions may be noticed masculines like fatus, wnus, balneus, fericulus, and lactem (for lac), striga for strix, gaudimonium and tristimonium, sanguen, manducare, nutricare, molestare, nesapius (sapius=Fr. sage), rostrum (=o0s), ipsimus (=master), scordalias, baro, and numerous diminutives like camella, audaculus, potiuncula, savunculum, offla, peduclus, coreillum, with constructions such as maledicere and persuadere with the accusative, and adiutare with the dative, and the deponent forms pudeatur and ridetur. Of especial interest for the Romance languages are astrum (désastre), berbex (brébis), botellus (boyau), improperare, muttus, naufragare.

Suetonius (d4ug., c. 87) gives an interesting selection of plebeian words employed in conversation by Augustus, who for the rest was something of a purist in his written utterances: ‘‘ponit assidue et pro stulto baceolum, et pro pullo pulleiaceum, et pro cerrito vacerrosum, et vapide se habere pro male, et betizare pro languere, quod vulgo Jachanizare dicitur.”

The inscriptions, especially those of Pompeii, supply abundant evidence of the corruptions both of forms and of pronunciation common among the vulgar. It is not easy always to determine whether a mutilated form is evidence of a letter omitted in pronunciation, or only in writing; but it is clear that there must have been a great tendency to drop final m, s, and ¢, to omit 7 before s, and to dull the vowel sounds, e¢ and 7 being especially frequently interchanged, and u taking the place of ¢ even in inflexions. There are already signs of the confusion of ae and e, which later on became almost universal. The additions to our vocabulary are slight and unimportant (cf. Corpus Inser. Lat., vol. iv., with Zangemeister's Indices).

To return to the language of literature. In the dark days of Tiberius and the two succeeding emperors a paralysis seemed to have come upon prose and poetry alike. With the one exception of oratory, literature had long been the utterance of a narrow circle, not the expression of the energies of national life ; and now, while all free speech in the popular assemblies was silenced, the nobles were living under a suspicious despotism, which, whatever the advan- tage which it brought to the poorer classes and to the provincials, was to them a reign of terror. Itis no wonder that the fifty years after the accession of Tiberius are a blank as regards all higher Jiterature. Velleius Paterculus, Valerius Maximus, Celsus, and Pheedrus give specimens of the Latin of the time, but the style of no one of these, classical for the most part in vocabulary, but occasionally approaching the later usages in syntax, calls for special analysis. The elder Seneca, in his collection of suasorzae and controversiae supplies examples of the barren quibblings by which the young Romans were trained in the rhetorical schools. A course of instruction, which may have been of service when its end was efficiency in active public life, though even then not without its serious drawbacks, as is shown by Cicero in his treatise De Oratore, became seriously injurious when its object was merely idle display. Prose came to be overloaded with ornament, and borrowed too often the language, though not the genius, of poetry ; while poetry in its turn, partly owing to the fashion of recitation, became a string of rhetorical points.

In the writers of Nero’s age there are already plain

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The age indications of the evil effects of the rhetorical schools upon of Nero. language aswell as literature. The leading man of letters was

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cultivated men to which the prevalent style was due. Writing on practical matters—the art of war, and the

Seneca, undoubtedly Seneca the younger, “the Ovid of prose”; | water-supply of Rome—he goes straight to the point and his style set the model which it became the fashion | without rhetorical flourishes ; and the ornaments of style to imitate. But striking and popular as it was it could not | which he occasionally introduces serve to embellish but commend itself to the judgment of sound critics like Quin- | not to distort his thought. tilian, who held firmly to the great masters of an earlier time. The epic poets of the Flavian age present a striking The He admits its brilliance, and the fertility of its pointed | contrast to the writers of the Claudian period. As a Flavian reflexions, but charges the author justly with want of self- | strained originality was the cardinal fault of the one school, **5** restraint, jerkiness, frequent repetitions, and tawdry tricks | so a tame and slavish following of authority is the mark of of rhetoric. He was the worst of models, and pleased by | the other. The general correctness of this period may his very faults. In his tragedies the rhetorical elaboration | perhaps be ascribed (with Merivale) partly to the political of the style only serves to bring into prominence the | conditions, partly to the establishment of professional frigidity and frequeut bad taste of the matter. But his | schools. Teachers like Quintilian must have done much diction is on the whole fairly classical ; he is, in the words | to repress extravagance of thought and language ; but they of Muretus, “vetusti sermonis diligentior quam quidam | could not kindle the spark of genius, Valerius Flaccus, Epic , Persius. inepte fastidiosi suspicantur.” In Persius there is a| Silius Italicus, and Papiuius Statius are all correct in poets. constant straining after rhetorical effect, which fills his | diction and in rhythm, and

abound in learning: but their verses with harsh and obscure expressions. The careful | inspiration is drawn from books and not from nature or choice of diction by which his master Horace makes every | the heart; details are elaborated to the injury of the | word tell is exaggerated into an endeavour to gain force | impression of the whole; every line is laboured, and over- and freshness by the most contorted phrases. The sin of | charged with epigrammatic rhetoric. Statius shows by far allusiveness, that besets so many young writers, is fostered | the greatest natural ability and freshness ; but he attempts by the fashion of the day for epigram, till his lines are | to fill a broad canvas with drawing and colouring suited barely intelligible after repeated reading. Conington | only to a miniature. Juvenal exemplifies the tendencies Juvenal. happily suggested that this style was assumed only for | of the language of his time, as moulded by a singularly satiric purposes, and pointed out that when not writing | powerful mind. A careful study of the earlier poets, satire Persius is as simple and unaffected as Horace himself. | especially Virgil and Lucan, has kept his language up to a This view, while it relieves Persius of much of the censure | high standard of purity. His style is eminently rhetorical ; which has been directed against his want of judgment, | but it is rhetoric of real power. The concise brevity by makes him all the more typical a representative of this | which it is marked seems to have been the result of a Luean. stage of silver Latinity. In his contemporary Lucan we | deliberate attempt to mould his natural diffuseness into the

Pliny the

have another example of the faults of a style especially attractive to the young, handled by a youth of brilliant but ill-disciplined powers. The Pharsalia abounds in spirited rhetoric, in striking epigram, in high sounding declamation ; but there are no flights of sustained imagination, no ripe wisdom, no self-control in avoiding the exaggerated or the repulsive, no mature philosophy of life or human destiny. Of all the Latin poets he is the least Virgilian, so that Merivale remarks “he had never studied, one is almost tempted to believe that he had never read, Virgil.” It has been said of him that he corrupted the style of poetry, not less than Seneca that of prose, It may be doubted whether his

influence was ever great enough to produce such an effect; it is safer to say that he is the earliest poet in whom the characteristics of the silver Latinity are clearly marked.

In the elder Pliny the same tendencies are seen occasion-

form recognized as most appropriate for satire. In his verses we notice a few metrical licences common to his age, especially the shortening of the final -o in verbs, but asa rule they are as correct as they are sonorous. the tendency of this period to witty epigram finds its most perfect embodiment, combined with finished versification.

The typical prose-writers of this time are Pliny the younger Pliny the A study of their diction and syntax will best oo disclose the characteristics of the silver Latinity. Some of macitus,

and Tacitus.

the features of the style of Tacitus are peculiar to himself ; but on the whole the following statement represents the tendencies shared in greater or less degree by all the writers of this period. The gains lie mainly in the direction of a more varied and occasionally more effective syntax ; its most striking defect is a lack of harmony in the periods, of arrangement in words, of variety in particles arising from the loose connexion of sentences. The vocabulary is ex-

elder. ally breaking out in the midst of the prosaic and inartistic | tended, but there are losses as well as gains. Quintilian’s form in which he gives out the stores of his cumbrous | remarks are fully borne out by the evidence of extant erudition. Wherever he attempts a loftier tone than that | authorities: on the one hand, “quid quod nihil iam of the mere compiler, he falls into the tricks of Seneca. | proprium placet, dum parum creditur disertum, quod et The nature of his encyclopedic subject matter naturally | alius dixisset” (viii, prooem., 24); “a corruptissimo quoque | makes his vocabulary very extensive; but in syntax and | poetarum figuras seu translationes mutuamur ; tum demuni general tone of language he does not differ materially from | ingeniosi scilicet, si ad intelligendos nos opus sit ingenio ” Quin-

contemporary writers. Quintilian is of interest especially | (7b., 25); “sordet omne quod natura dictavit” (¢b., 26); on tian. for the sound judgment which led him to a true apprecia- | the other hand, “nunc utique, cum haec exercitatio procul | tion of the writers of Rome’s golden age. He set himself | a veritate seiuncta laboret incredibili verbornm fastidio, ac strenuously to resist the tawdry rhetoric fashionable in his | sibi magnam partem sermonis absciderit” (viii, 3, 23), own time, and to hold up before his pupils purer and loftier | “ multa cotidie ab antiquis ficta moriuntur ” (2b., 6, 32). A models. His own criticisms are marked by excellent taste, | writer like Suetonius therefore did good service in intro- and often by great happiness of expression, which is pointed | ducing into his writings terms and phrases borrowed, not without being unduly epigrammatic. But his own style | from the rhetoricians, but from the usage of daily life. did not escape, as indeed it hardly could, the influences of In the vocabulary of Tacitus there are to be noted :— his time ; and in many small points his language falls short | 1. Words bere. Coe eee ee iz ae ate ion. ae. purity. There hi more approach ip the canal ig ar naa “oF Hie beer Bate a list of ninety-five y of the best models in Frontinus, who furnishes a | (gyntax und Stil des Tacitus, p. 96).

tinus,

striking proof that it was rather the corruption of literary taste than any serious change in the language of ordinary

5 we : . — 2, Words occurring only, or for the first time, In Tacitus. T 5 according to the same authority number eighty-eight, for the most 4 Me

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part new formations or compounds from stems already in use, especially verbal substantives in -for and -sor, -tus and -sus, -ture and -mentum, with new frequentatives..

3. Words used with a meaning (a) not found in earlier prose, but sometimes (in more than eighty instances) borrowed from the poets, ¢.g., ecomponerc, “to bury” ; scriptura, ‘‘a writing” ; fer- radius, ‘‘armed with a sword”; (6) peculiar to later writers, ¢.9., numerosus, ‘‘numerous”; famosius, ‘‘famous”; decollare, ‘‘to be- head”; imputare, ‘‘to take credit for,” &c.; (c) restricted to Tacitus himself, ¢.9., dispergere=divolgare ; of these Boetticher quotes one hundred and twenty-two.

Generally speaking, Tacitus likes to usc a simple verb instead of a compound one, after the fashion of the poets, employs a pluper- fect for a perfect, and (like Livy and sometimes Cesar) aims at vividness and variety by employing the present and perfect con- junctive in indirect speech even after historical tenses. Collective words are followed by a plural far more commonly than in Cicero. The ellipse of a verb is more frequent. ‘he use of the cases approximates to that of the poets, and is even more free. The accusative of limitation is common in Tacitus, though never found in Quintilian. Compound verbs are frequently followed by the accusative where the dative might have been expected; and the Vir- gilian construction of an accusative with middle and passive verbs is not unusual. The dative ‘‘ absolute ” is shared by Tacitus with Livy; the dative of purpose and the dative with a substantive in place of a genitive are more common with him than with any writer. The ablative of separation is used without a preposition, even with names of countries and with common nouns; the ablative of place is employed similarly without a preposition ; the ablative of time has sometimes the force of duration ; the instru- mental ablative is employed even of persons. A large extension is

given to the use of the quantitative genitive after neuter adjectives and pronouns, and even adverbs, and to the genitive with active participles; and the genitive of relation after adjectives is (probably by a Greacism) very freely employed. In regard to prepositions, there are special uses of citra, erga, iuxta, and tcnus to be noted, and a frequent tendency to interchange the use ofa preposition with that of @ simple case in corresponding clauses. In subordinate sentences wod is used for ‘‘the fact that,” and sometimes approaches the ater use of ‘‘ that” ; the infinitive follows many verbs and adjec- tives that do not admit of this construction in classical prose; the accusative and infinitive are used after negative expressions of doubt, and even in modal and hypothetical clauses.

Like Livy, the writers of this time freely employ the conjunctive of repeated action with a relative, and extend its use to relative conjunctions, which he does not. In clauses of comparison and proportion there is frequently an ellipse of a verb (with nihil aliud quam, ut, tanguam); tanguam, quast, and velut are used to imply not comparison but alleged reason ; guin and quominus are inter- changed at pleasure. Quamquam and quamvis are commonly followed by the subjunctive, even when denoting facts. The free use of the genitive and dative of the gerundive participle to denote purpose 1s common in Tacitus, the former being almost limited to him. Livy’s practice in the use of participles is extended even beyond the limits to which he restricts it. It has been calculated that where Czsar uses five participial clauses, Livy has sixteen, Tacitus twenty-four.

_ In his compressed brevity Tacitus may be said to be individual ; but in the poetical colouring of his diction, in the rhetorical cast of his sentences, and in his love for

picturesqueness and variety he is a true representative of his time.

The language of Suetonius is of interest as giving a specimen of silver Latinity almost entirely free from personal idiosyncrasies; his expressions are regular and straightforward, clear and business-like; and, while in grammar he does not attain to classical purity, he is comparatively free from rhetorical affectations,

A new era commences with the accession of Hadrian (117 a.p.). As the preceding half century had been marked by the influence of Spanish Latinity (the Senecas, Lucan, Martial, Quintilian), so in this the African style was paramount. ‘This is the period of affected archaisms and pedantic learning, combined at times with a reckless love of innovation and experiment, resulting in the creation of a large number of new formations and in the adoption of much of the plebeian dialect. Fronto and Appuleius mark a strong reaction against the culture of the preceding century, and for evil far more than for good the chain of literary tradition was broken. The language which had been unduly refined and elaborated now relapsed into a

tasteless and confused patch-work, without either harmony or brilliance of colouring. subject matter is no set-off against the inferiority of the style. His latest editor is quite pathetic in lamenting the worthlessness of his author, and says that it would have conduced to his reputation if his works had never been unearthed. He deliberately attempts to go back to the obsolete diction of writers like Cato and Ennius. We find compounds like altipendulus, nudiustertianus, tolutilo- quentia, diminutives such as matercella, anulla, passercula, studiolum, forms like congarrire, disconcinnus, pedetemptius, desiderantissimus (passive), conticinium ; gaudeo, oboedio, and perfungor are used with an accusative, modestus with a genitive ; and, if our MS. is to be trusted, the interchange of b and v has already begun. On the other hand he actually attempts to revive the form asa for ara. In

Appuleius the archaic element is only one element in the sppu- queer mixture which constitutes his style, and it probably leius.

was not intended to give the tone to the whole. Poetical and prosaic phrases, Grecisms, solecisms, jingling assonances, quotations, and coinages apparently on the spur of the moment, all appear in this wonderful medley. There are found such extraordinary genitives as sitire beati- tudinis, cenae pignerarer, tncoram omnium, foras corporis, sometimes heaped one upon another, as fluxos vestiwm Arsacidas et

frugum pauperes Ityraeos et odorum divites Arabas. Diminutives are coined with reckless freedom, e.g., diutule, longule, mundule amicta et altiuscule sub ipsas papillas succinctula. He confesses himself that he is writing ina language not familiar to him:—“ In urbe Latia advena studiorum Quiritium indigenam sermonem aerumnabili labore, nullo magistro praeeunte, aggressus excolui”; and the general impression of his style fully bears out his confession. Melanchthon is hardly too severe when he says that Appuleius brays like his own ass. The language of

Aulus Gellius is much superior in purity; but still it Gellius.

abounds in rare and archaic words, ¢.g., edulcare, recentar’t, aeruscator, and in meaningless frequentatives like solztavisse. He has some admirable remarks on the pedantry of those who delighted in obsolete expressions (xi. 7) such as apluda, flocus, and bovinator ; but his practice falls far short of his theory.

The style of the eminent lawyers of this period, foremost The among whom is Gaius, deserves especial notice as showing lawyers.

well one of the characteristic excellences of the Latin language. It is for the most part dry and unadorned, and in syntax departs occasionally from classical usages, but it is clear, terse, and exact. Technical terms may cause difficulty to the ordinary reader, but their meaning is always precisely defined; new compounds are employed whenever the subject requires them, but the capacities of the language rise to the demands made upon it; and the conceptions of jurisprudence have never been more adequately expressed than by the great Roman jurists.

It is needless to tracc in detail the gradual impoverishment and Decay of disorganization of literary Latin. After the time of Gellius, Mee literary ‘he Latin,

is no writer who deserves in any sense to be called classical. true literary tradition was lost; and even the poets who aimed at imitating the best models, by far the best of whom was Claudian, were led into

many faults by the defective taste of their time. The sensc of quantity was lost, and the practice of regarding accent as the ruling principle in metre, which had doubtless never been extinct in popular songs,! and which has left plain traces in a pocm quoted by Gellius (xix. 11), became gradually predominant. Its effects are sometimes to be observed even in the poems of Ausonius (flor. 350 A.D.), and are plain in those of Sedulius in the next century.

In Gaul the rhetorical schools, which flourished greatly in the 4th century, maintained a tradition of learning, which preserved some classical tinge of language, but it sank by degrees into bom-

1 Mr Munro (Cambridge Philosophical Society, 1860) has discussed an inscription in accented hexameters, from Cirta, dating from the 4th century of our era.

In the case of the former the Fronto,

Ecclesi- astical Latin.

pastic extravagance, and the style of Sidonius Apollinaris displays, with a profusion of erudition, an entire absence of correctness. Latin was to him no living language ; his natural medium of expression was the sermo rusticus, and this has left its mark on every page.

The influence of the Christian church in the development of the Latin language was mainly iu two directions. In the first place the new conceptions introdueed brought about a large extension of the vocabulary. As the most important of the early Latin fathers belonged to Africa (Tertullian, Cyprian, Arnobius, Augustine), this extension was made under the influence of the Afriean Latinity ; the newly-eoined terms took an awkward and almost barbarous form; and the tendency of the time to abstract expressions and clumsy compounds was heightened by the needs of the writers. Secondly, the Christian teachers, as several of them expressly say, thought little of the grammatical exactness of their language, pro- Beet they could make

themselves readily intelligible to the com- mon people ; ¢.g., Augustine confesses ‘’ Melius est reprehendant vos grammatici quam non intelligant populi,” and again, ‘¢ Saepe enim et verba non Latina dico, ut vos intelligatis.” Hence in the writings of the early fathers we find a large element of plebeian Latinity introduced into the clumsy and affected rhctoric and the bold linguistic experiments of the African schools. Perhaps it is Tertullian who represents this stage of the language in its most extravagant form. He has genitives like tmbriwm wtilia, aecusatives like Canwania erepta Pompcios, adverbs used for adjectives, meta- phorieal terms employed in the boldest fashion (¢.g., adulter, aestum, census, contcntiosus funis, communicare, &c.), numerous abstract words, often in the plural, like corpulentiae, disecntiae, ineaperientiae, and finally the most extraordinary compounds, such as interibilis, elementicius, conewpiscentivum, ethnicalis, extructorius, famula- torius, &c.

The language of the Vetus Jtala (a version of the Bible, made in Africa) and of the Vulgate has been made the subject of an admirable study by Hermann Ronsch (Itala und Vulgata, 2d. ed., Marburg, 1875), from whom the following sketch of its leading charaeteristies las been mainly derived (comp. also Bernhardy, Aém. Lit., pp. 334, 385). Many of the phenomena are common to the plebeian language generally, and es been already noticed as appearing occasionally in earlier writings.

1. In the formation of substantives there appears a preference for full-sounding forms, constructed by a free use of the suffixes -mentum, -miniwm, -ariwm, -orium, -culum, -bulum, -anewm, -inium, -ura, -udo, -ntia, -itas: eg., nugamentwm for nugae, sessimonium, sessibulum, or sessorium for sedes, calcaniwm for calz, poenitudo for poena, dolositas for dolus.

2. Plebeian terms take the place of their classical equivalents : 2.g., caballus (= cheval), mansio (=maison), bucca (= bouche), testa (=téte), in gyrum (=environ).

3. Substantives in -tor and -io receive large additions (Rénsch gives more than one hundred and eighty of the first kind, and more than two

hundred and seventy of the second kind, found either now for the first time, or previously only in writers like Plantus and Petronius).

4, Adjectives are turned into substantives. From this class are formed many Romance words: ¢.g., montana (=montagne), hiber- num (=hiver), diurnum (=giorno), volatile (=volatili, volailic), matutinum (= mattino, matin), murale (=muraille).

5, Adjectives in -alis and -bilis, -wrnus, -bundus, -Ientus, and ~~osus are largely introduced, often replacing simpler forms : ¢.g., plact~~ bilis = placens, aeternalis = acternus, longiturnus, amarulentus, meticulosus, dignitosus ; and verbals in -or give rise to participial forms like expudoratus, intimoratus, caloratus.

6. The terminations -im and -dtcr largely replace ¢ in adverbs: e.g., inordinatim, pressim, avariter, improbiter.

7. Verbs of secondary derivation take the place of simple verbs, thus meeting the love for fuller forms, as mensurare, amaricare, taediarc, potionare, detertorare ; an intensive force is given by com- position with ad, de, cum, ex, in, and ob; e.g., adminart, coin- quinare, confortare, deplanare, elonginguare, incrassare, obduleare ; and sometimes, in imitation of the Greek, there is a double prefix, as ,. adinerescere, perconterrerc, obrelingucre, discooperire (= decowr- Tir).

8. Intensive and frequentative verbs are especially common, and have given rise to many Romance words; ¢.g., compressure, proicctare, recollectare.

_ 9. In composition there is great freedom, and the usc of the nega-

tive in- is very common, ¢.g., tmbonitas, disconvenientia, indicto- audientia, quaterdweatus (=tetrarch), admanumdeduetor. Hybrid forms are eommon, like thelodives, acctdia (for axndta), cataplectatio (katamrAnyuds), aporiari (awopeic@ai). Especially noteworthy is the use of two prepositions or an adverb with a preposition, as de mane (=demain), de foris (=dehors), de intus, and ab intus (dans =

10. In inflexion there are many irregularities, largely due to the reappearance of forms which had long been obsolete in the literary langnage, but partly produced by the love of fuller forms, often

resulting in hetcroelite words. To the first class belong w-stems in- flected according to the second declension, ¢.g., fructi, victi, strepiti &c.; masculine for neuters, ¢.9., fanus, foenus, lignus, &c., and, on the other hand, naswm, populum, &e. ; numerous pronominal forms such as .alis, ipsud, alio and illo (dat.), &e. To the second class belong osswm for os (comp. August., Doet. Christ., iii. 3: mallem quippe cum barbarismo dict ‘‘non est abseonditum a te ossum meum,” quam ut ideo esset minus apertum, quia magis Latinum est), princi- pens for princeps, praesepium for praesepe, lampada for lampas, retia for rete, &c. Comparatives and superlatives are largely invented, often with the aid of magis and plus, sometimes used pleonastically, as plus lucidiores. In verbs analogy has often replaced the classical forms by others which seemed more regular : odio is inflected through- out like audio; verbs are transferred from one conjugation to another, ¢.g., floriet, fugitt, linies, extergunt ; compare perfects like conterut, porregt, collexi, prandiderunt, futures like augeam, per- suadeam, metuebitis, peries, scibo, sepelibo. Many deponents appear with active forms, as so commonly in archaic Latin, and less fre- quently vice versa.

11, In the meaning of words there are many changes, especially in the way of giving a concrete force to abstract and fective forms. Some of these preserve their aequired force in the Romance languages: ¢.g., cortina (curtain), focus (fwoco, feu), exhibitio (=maintenanee), papilio (pavillon), sella (selle), spatula (épaule), substantia (=property), venatio (venaison), gentes (gens), extermt- nare (exterminate), instawrare (store), involare (embler), rememo- rart (remember), venwntiare (renounce), traducere (traduce), recuperart (recover), stare (étre). Ad and apud are treated as equivalent ; de is constantly used with an instrumental force, and as equal to ex: it replaces the partitive genitive (de colentibus multitudo magna ; tantum de chartis), and

sometimes forms with its case a substantive used as a nominative (ampulla in qua de olco [de V'hwile] continebatur).

12. In syntax there is everywhere visible a negligent simplicity of structure, careless of grammatical rule, but aiming at directness and ready intelligibility. Hence the tendency to analytic rather than synthetic construction, observable in earlier stages, is ex- tended. Prepositions are constantly used instead of the simple cases, often with entire neglect of their classical construction: ¢.g., ab, ewnt, de, ex, in, and sub (of rest), prac, pro, sine, with acc.; in and sub (of motion), zntra, post, &c., with abl.). Verbs are construed kata ovveoww, instead of according to classical usage : ¢.g., egere c. aee., miserert and impedire c, dat. lle, hie, and zs are used for the definite article, wnws for the indefinite. Q2od, guia, and guoniam are constantly used for the accusative with the infinitive ; the in- dicative follows wf and indirect interrogatives. Sometimes (as at times in modern German) the subjunctive is used in expressing astonishment. The infinitive follows a preposition, as qwomodo potest hie nobis dare carnem ad manducare (4 manger); non habwit unde veddere (comp. de quoi vivre). The pluperfect conjunctive fre- quently replaces the imperfect (comp. que je punisse), and the perfect infinitive the imperfect, especially with yosswm and debeo. The abla- tive gerund often takes the place of a participle, and the gerundive of a future infinitive.

Of Grecisms, which are very numerous in the literal versions of the Bible, the only one requiring notice here is the frequent use of habeo with the infinitive (not-unknown even to Cicero), which has given rise to the Romance future.

The changes of pronunciation which had been effected by this time consisted partly in the wider extension given to tendencies previously existing in the popular speech, partly in that gradual] disintegration and weakening of sounds always observable in the history of a language. Our knowledge of them has to be derived almost wholly from inscriptions ; for, although the conclusions de- rived from these may sometimes be usefully supplemented by the evidence of manuscripts, there is usually a doubt possible in the latter case whether

the forms occurring bear witness to the pronun- ciation of the author or to that of the copyist in a later age. Interesting evidence is sometimes furnished by the rhymes found in the poets who discarded the classical forms of verse for rhyming metres. For instance, the tendency to drop a final consonant, shown in inscriptions of every period, comes out plainly in the verses of Sedulius, who has the following rhymes : pectoris—dev, impie—times, viderant—praeviam, personat—pignora, millia— victimam, fundere—originem, torridi—obstrwtt. The following table (mainly from Schuchardt, Vokalismus des Vulgérlatein, 1. 104-5) gives the principal facts of the popular pronuneiation, with an indication of the periods at which the change can be proved to have taken place. It will be understood that it is always possible that the more correct pronunciation may have been retained side by side with the corruption long after the latter makes its first

appearance. o=m (plostrum for plaustrum). le e=ae (see above) : 100-50 2 m obscured before labials (Decebris, CO. I. L., i. 980). BEC: n obscured before dentals and guttnrals (paretes).

m, s, ¢ dropped when final.

EBeTrIN LaReuvuacs&

Savir et podir me dunat, si salvarai eo cist meon fradre

Sapere et posse mthi donabit, st salvare habeo ego ecc’istum meum fratrem

Me donne savoir et pouvoir, je sauverat mon frére

(Surds changed to sonants (bublicac, grassus, &c.).

Aspiration neglected (often even in the Augustan age, and common in Pompeian inscriptions).

: t for 2. BO TOO) ax fob 6. , Karlo et in adjudha et in cadhuna cosa, si cum om per AD. | y for b (very eee 3d ea Carolum et in adjutu et in

quaque una eausa, sic guomodo s for « (rare before 4th century). homo per it or t for et (autor for auctor ; later prefetto for pracfccto). Charles et en aide et en chaque chose, ainsi qu’on doit l * : ‘ spt Mh ee ee Dreit son fradra salvar dist, in o quid il mi altresi iehitin feat a” nthe es ail Oil ame j Direectum suum fratrem salvare debitus est, in eo quod ille] a A a7 * f ° 00-850 he epee meeps ph tn nail ; tite visemoerenelel son frére, & condition qu’il en fasse Cals @ prefixed to s followed by a consonant (tscala = escalier, eat ? Y ee ispiritus = esprit). a“ f tt for pt. Fazet; et ab Ludher nul plaid numquam prindrai ss for sc. Faciet, e ab Lothario nullum placitum nunquam prehendere IV g assibilated before e and ¢. habeo 590-550 | ss for st. Pour mot, et je ne ferat avee Lothaire aucun accord

mm for gm. ope ln inserted between m and n. {i assibilated before ¢ and 7, y

Qui meon vol cist meon fradre Karle in damno sit.

Quod mea voluntate cee’ isto neo fratri Carolo in damno sit.

Qui par ma volonté porte prejudice, & mon frere Charles ict présent. ‘

The details of the changes which the popular Latin experienced Leading in passing into the Romance languages cannot be given in this phonetic connexion ; but a few of the leading features may be not impro- changes perly noticed. It is to be remarked at the outset, however, that in the these concern only those portions of the vocabulary which have Romance come by direct descent from the Latin; in all the Romance Jan- languages there is a large element which is due to borrowing guages

de for @. wo for 0.

The assibilation of ci commenced in Africa, not before the time of Alexander Severus (222-235 a.p.), and was late in extending to Italy ; in Gaul it was common in the 7th century ; that of t was generally adopted even by the educated in the 5th century. In the 6th and 7th

century g was dropped after vowels before ¢ or ¢ (vinti =viginti) in Africa. This phenomenon had been common in Um- brian and Oscan.

The exact date of some of these changes is open to question ; but it would be impossible to attempt to determine it without a fuller discussion of the evidence than is here possible. On the whole, it may be asserted with confidence that all these changes had been fully established before the end of the 6th century after Christ. The question of the relation of the Latin language to the various Romance tongues which have been derived from it is one which can be discussed in detail only under the head of the several languages. The general character of the relation is all that can be touched upon here. But it is of importance to notice that the metaphor which is embodied in the phrase ‘‘ mother and. daughter languages” holds good only for literature. From this point of view M. Littré writes with justice: ‘‘ Latin alters without doubt towards the end of the empire and after the arrival of the barbarians, and the style of Gregory of Tours is very far removed from the purity of Livy ; but aftcr all it is Latin, and not one of the Neo-Latin lan- guages. Then all at once it disappears, and we see arising, as if from under the ground, the various idioms to which it has given birth. It dies suddenly and without transformation, so that these secondary languages cannot be considered as the metamorphosis or expansion of it. We have no right to say that Latin is continued in the new languages ; it died without developing itself, but it died leaving children and heirs.” Sucha breach of continuity is wholly inconceivable as an historical procedure. From the popular Latin various dialects were gradually formed, assuming forms differing with the various influences which were brought to bear upon them. It is true that there is much in the derived languages which cannot be shown to have existed in the popular Latin; but if we set aside what is evidently due to the action of foreign, especially Teutonic idioms—and this is to be found far more in the vocabulary than in the syntax—there is nothing which may not fairly be ascribed to the operation of tendencies already existing in the plebeian speech. By degrees the custom grew up of confining the name Latina to the literary language, while the popular speech was known as lingua Fomana. As early as 660 A.D. St Mummolinus was elected bishop of Noyon, ‘‘ quia praevalebat, non

tantum in Teutonica, sed etiam in Romana lingua.” In the middle of the next century the Acta Sanetorum, speaking of St Adathard, abbot of Corbey, brings out the distinction still more clearly: ‘ qui si vulgari, id est, Romana lingua loqueretur, omuium aliarum putaretur inscius ; Sl vero Teutonica enitebat perfectius, si Latina, in nulla omnino absolutius.”” 3 famous ‘‘ glosses of Reichenan” of the same date explain some words of the Latin vulgate in the popular language : ¢.g., eaenven- tarit=maciont (magons). In the beginning of the 9th century the church ordered the priest to preach, not in literary Latin, but in the popular tongue. The oath of Strasburg (842 A.D.) happily preserved in a contemporary record, gives us what may be called with equal justice the latest specimen of the Latin or the earliest example of the French language.

The |

at a later stage by the learned ; for this portion the tendencies to be mentioned do not come into play. The Italian eagione, Spanish velar, French fréle, are examples of the first class ; Ital. occasione, Span. vigilar, French fragile, are instances of the second. We notice then that (1) the accented vowel, ‘‘the soul of the word,” as it is called by Diez, is always retained, subject to phonctic changes: comp. rdbiem=rage, erétam=erate. (2) An unaccented vowel in the immediate neighbourhood of an accented one is usually lost: comp. auricula=oreille=oreechio, or changed for another, especially a, almost arbitrarily, ¢.g., silvatiews =salvaggio =sauvage. (3) Diphthongs are rarely retained ; the tendency noticed already in Latin to change them into simple vowels con- tinued to operate ; and the numerous diphthongs in the Romance languages are usually of later origin, arising either from contraction, or from the modification of simple vowels. (4) A mute between two vowels is commonly lost : comp. frigidus=froid =freddo ; lau- dare=lower. Hiatus thus caused is usually removed by contrac- tion. (5) When two mutes are brought into contact, by the loss of the intermediate vowel, the former is generally sacrificed : mandueare=mangiare, manger ; berbicarius= berger. (6) C before a, 0, and uw, before a consonant, or at the end of a word, commonly remains, but occasionally is softened ; it is only in French

that as a rule ca becomes cha or che, as in eaballus=cheval, cambiare= changer, while co, cw are retained, as in collum=cow, cwneus=coin. When medial, it is softened usually in Spanish, and frequently in Italian ; in French it passes into y or 7, as in doyen=decanus, braie =braea, or is lost, as in mie=mica, prier=precari. C before é, t, ae, oe, is almost invariably assibilated, in accordance with a linguistic law, examples of which might be adduced from the most diverse quarters. a has passed through precisely analogons changes. (7) The liquids 7 and r freely interchange ; and, while in Latin itself 2 rarely if ever becomes 7, except under the influence of dissimilation, in the Romance languages this change is appar- ently quite as common as the reverse: ¢g., lusciniola=rosig- niolo=rossignol. L regularly becomes 7@ after e (eh) f in Italian, and al before a mute becomes aw in French. Both r and Z arc especially liable to metathesis, as also in Latin and English : ¢.g., Span. blago from baculus, Ital. frugare from furca. frequently becomes 7, as in pampre for pampinus; but the reverse rarely hap- pens. (8) Before sp, st, se, Spanish always, French and Provengal usually, but Italian never prefixes e: comp. spiritus; Span. espiritu, French esprit, Prov. esperit, Ital. spirito.

It is needless to add that assimilation, syncope, and the avoid- ance of a harsh concurrence of consonants, either by the rejection of one or more of them, or by the insertion of a vowel, have all played a great part in the consonantal system of the Romance lan- guages. A table of the chief changes of consonants in combina- tion will be found in Diez, Grammaire des Langues Romanes, vol. i. p. 282.

In nouns the inflexions denoting cases were generally lost and Changes their functions supplied in the genitive, dative, and ablative by the of in- use of prepositions, and this in two ways. On the one hand French flexion. and Provengal, following a tendency common in popular Latin, took the accusative as the typical oblique case, and used forms thence derived for the objective case, while forms derived from the nominative constituted the subjective case: e g., sing. subj. murs (=murus), obj. mur (=murum), plur. subj. mur (=muri), obj.

Pro Deo amur et pro christian poblo et nostro (Latin) Pro Dei amore et pro christiano populo et nostro (French) Pour l’amour de Dieu, et pour le salut du peuple chrétien + ét de notre Commun salvament, d’ist di en avant, in quant Dens Communi salvamento de isto die in ab-ante in quantum Deus Commun salut de ce Jour en avant, autant que Dieu

Changes of voca- bulary,

Con-

tinued use of Latin.

erin DBANGUAGE

murs (=muros). But by the 14th century this distinction, no longer corresponding to any facts in the pronunciation of the French language, fell into disuse, and the objective form alone was used, the last trace of inflexion thus disappearing. On the other hand, Italian and Spanish seem never to have passed through the former stage, but to have adopted from the first the accusative form as the basis of their own subjective as well as objective case, although in the plural (corone, annt) a desire to avoid confusion has led the Italian to adopt forms pointing rather to the nominative. Again, the neuter gender is lost entirely in the Romance languages ; neuter words have become masculine as a rule, not, however, with- out many exceptions, due in some cases to false analogy, in others to the corruptions of the popular Latin, We may notice also the devclopment of the article out of the popular use of zd/e and unus found in all the Romance languages.

The comparison of adjectives shows the steady growth of the pre- fercnce for analytic over synthetic forms, which is a characteristic of Romance grammar generally. The use of magis and plus, eom- paratively rare, especially the latter, in Latin, has become quite nor- inal, the former in Spanish, Portuguese, and Roumanian, the latter in the other language, while the suffixed forms -ior and -issimus have left but few traces, and the definite article has been generally employed to form the superlative on quite a new principle.

In the case of pronouns some of the most common (¢.g., hie, is, uter) are lost altogether, and many new ones are created by com- position.

In the conjugation of verbs, the principal changes are due to the disintegration of the old forms, leading to their replacement by compound forms. In popular Latin there was already a strong tendency to analytic forms, such as habeo compertwm, habeo dicere, which supplied the model for numerous similar expressions. Thus the passive inflexions have been entircly replaced by the use of auxiliary verbs ; the perfect is formed with the aid of habere (for which Spanish and Portuguese often employ ¢éenere [tener, ter]), the future is compounded with habeo (j'aimer-at, &c.); a new mood, the conditional, is formed by a termination borrowed from the past imperfect ; and supines and gerunds are entirely lost. In regard to the inflexion of particular verbs, it is of cspecial importance to notice the distinction between strong and weak forms, the accent in the former falling on the root (eréscere), and in the lattcr on the ter- mination (amdre); comp. tiens=téneo, but tenons =tenémus.,

In adverbs, prepositions, and conjunctions, the chief point to notice is the extent to which, as in pronouns, simple forms have been replaced by compound forms, either as a result of the indistin- guishable shape assumed by the latter in eourse of time, or with a view to a more complete expression of meaning. 'The former cause has led, for example, to the loss of adverbs distinguished from ad- jectives merely by a termination, worn away by the lapse of tiinc ; the latter to compounds like désormats (=de ex hora magis), beau- coup (=bellum colaphum, ''a fine stroke '').

In derivation the Romance languages are especially rich, the loss of numerous simple Latin words, which either were too short to bear the abbreviating effects of time, or would have assumed an incon- venient form under the influence of the necessary phonetic changes, being compensated by new creations. Thus in the place of res, vis, Tus, 08, TUS, sus, crus, mus, We find derivatives from causa, fortia, directwm, bucea, campania, troia, gamba, sorex ; and diminutives very frequently replace their primitives. We may notice finally how frequently it was

necessary to adopt new forms in order to avoid homonyms, thus bellum was driven out by bellus, aequus by equus, puer by purus, sol by solum. Frequently words of non- Latin origin were employed for this purpose.

But the formation of the Romance languages, and thcir occasional employment in popular songs and stories, at first hardly affected at all the use of Latin as the language of literature. Its adoption as the means of utterance of the Christian church lent to it, in the days of its most marked decay, a new though a strangely transformed life. So appropriated, it became familiar to all who had even the elements of education throughout western Europe ; it was univer- sally retained in the services of the church, if not in the discourses with which these services were sometimes, but by no means always, accompanied ; all philosophy and theology to which the new and unformed popular idioms could give no expression was necessarily expressed in its terminology ; and it remained, as it is at the pre- scnt day, the official language of the ecclesiastical authorities. In France it is not until the 10th century that we find any consider- able remains of the vernacular in the form of charters and other muniments, and literary prose does not begin until the 12th cen- tury, when French versions of the chronicles, originally written in Latin, are fairly common. In Italy, as was perhaps natural, the use of Latin for literature was retained still more tenaciously, and the development of the national language in its new form was extremely slow. It was not before the 13th century that there was any seri- ous attempt at writing in Italian ; the earliest prose work, the Composizione del Mundo, dating from the middle of that century, quite In accordance with the spirit of Italian thought at the time, was ascicntific treatise. Numerons norelle are preserved to us from

irrepealable law, that no grcat poet is inspire language.”

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about the same period; but the use of Italian as an organ of literary expression was still so little established that Dante found it natural to write, not only his political treatise De Monarchia, but also lis defence

of the vulgar tongue De Vulgari Eloguio, in Latin.} in the sixteenth century sermons addressed to a mixed audience in Italy were frequently delivered in Latin. large a proportion of the chronicles of the Middle Ages procecded from the monasteries serves to explain the continued use of a language familiar to the writers alike in their religious exercises and in their theological studies ; and in our own English chronicles we have perhaps a unique instance of the history of a nation recorded for centuries in its own vernacular. the secretaries and often the ministers of state in every court in western Europe, Latin continued to be the language of diplomacy and public business ; and, as all science and Icarning was confined to them or to their pupils, works appealing to a learned audience were of necessity clothed in the same garb. Latin poetry produced in the cloisters of the Middle Ages, perhaps it is enough to say, with a scholar whose studies made him excep-

Even

The fact that so

Further, as the clergy supplied

Of the vast mass of

tionally familiar with it, ‘It offers no one exception to the eternal but in his native Even the Latin hymns, some of which have taken their place among the perennial treasures of the church, owe their charm almost wholly to the intensity of their religious emotions, and to the lofty or plaintive music to which they were wedded, and not to any power in wielding the resources of the language, or happy artistic skill, It is perhaps in the De Imitatione Christ that ecclesiastical Latin is seen in its most perfect form. The style is of course wholly unlike that of the classical writers ; but the Hebraic indi- vidualism, which in the Latin fathers often seems to clash inhar- moniously with the general tone of the diction, has here proved strong enough to absorb the whole into its own key. Its terse and preg- nant vigour, its direct simplicity, its profound thought, and its intense passion of self-devotion give it a place in the history of literature hardly inferior to that which it has

always held among works of religious edification. It was one of the happy effects of a universal Ianguage that such a book, embodying, as nove other did, the whole spirit of medizval Christianity, should at once be acccss- ible to the whole of Christendom.

During the long period for which Latin continued to bo the Literary language of learning and science, we find the writers who used it Latin. dividing themselves broadly into two great classes, aceording as they were accustomed to employ the current language of the cloister and tle court, or aimed at a reproduction of the rhythm and diction of classical times. Of course the line cannot be drawn sharply, and all degrecs of purity in idiom and syntax are represented, from the barbarous expressions which tcem in many of the chroniclers to the purism of the Ciceronians. But it is not hard, as a rule, to deter- mine in the case of any particular writer whether his style is merely derived from the traditional teachings of the schools, or drawn from afresh study of the great modcls; and, while it is impossible to trace in detail the fluctuations in the greater or less badness of the former group, it may not be improper to sketch in outline the origin, the development, and it isto be feared that we must add the decline, of the art of using the Latin language with purity and grace. The attempt to return to something like the classical standard may perhaps have originated in the schools of Charles the Great, but it was least unsuccessful where, as in England, Latin was never a living language, and all knowledge of it had to be obtained from regular grammatical instruction. In the 9th and 10th centurics reference is very rarcly made to the classical writers ; it was only in the 11th century, under the influence of the schools of Lanfrane and Anselm, that a purer taste and a wider knowledge begin to show themselves, If the impulse came from Italy, the scholars of Eng- land and France soon surpassed their masters, and there is probably no ltalian scholar who can be placed by the side of John of Salis- bury, or (in the next century) of Abelard and Bernard of Clairvaux. But the influence of the mendicant friars, and the corruption of the monastic houses, led to a decline at least as marked as the revival ; and the Latin of the 13th century was not less barbarous, as a rule, than that of the 10th. A far more enduring movement for reform is connected with the name of Petrarch (1804-1874). According to his

own account the sweetness and sonorousness of the periods of Ciccro charmed his ears, when a boy, and made all other Latin seem to him harsh and discordant. Of course he was unable to escape altogether the influences of his time, and the more accu- rate scholars of a later age, aided by the vast improvement in the subsidia of learning, such as dictionaries and grammars, find much to censure in his diction. But at least he set the example of that enthusiastic study of the great ancient models which is the only possible road to a finished and harmonious Latin style; and the lesson that he taught was not destined to be forgotten, until it had borne its due fruits. His favonrite pupil, John of Ravenna, was him- self the tcacher of the best scholars of the next generation ; and to © ck ut il item imcemmanpeeciten anda aaa

1 The history of Walter Spinelli is, however, enough to show that Italian was

already assuming precise and definite shape, to say nothing of the Sicihan and early Florentine poets.

one of these, Gasparino of Barziza (died 1431), has commonly been assigned the distinction of being the father of the pure and elegant Latinity of the Renaissance. His devotion to the study of Cicero is shown by the plan which he formed to fill up, by conjectural links, the numerous deficiencies in the MSS..~~of the De Oratore then known to scholars, a design happily superseded by the discovery of the famous Codex Laudianus. Additional material was furnished by the recovery of not a few authors or portions of authors of the best period by the unwearied diligence of Poggio Bracciolini ; and from a the study of the Latin classics was pursued with the happiest results. Throughout the 15th century no literary acquire~~ ment was more valued than a good Latin style ; the patronage ex- tended to scholarship by the learned Pope Nicholas V. and the grammatical teaching of scholars like Laurentius Valla combined to encourage its pursuit with energy and success, Towards the latter part of the century Politian at Florence, and Hermolaus Barbarus at Venice, showed a mastery over the Latin language which won for them the enthusiastic admiration of their

contemporaries ; and, though the learning of these eminent scholars proved not unfre- quently injurious to their style by inducing an affectation of obso- lete or unfamiliar words, there is no reason to deny that on the whole this admiration was well deserved. In Germany they had a worthy rival, by somo even ranked before them, in Agricola ; in France and England there was as yet no ono who, in the judgment afterwards expressed by Erasmus, could be said to write Latin at all, As far as purity of style went, the highest pitch of excellence was doubtless reached by the Italians towards the beginning of the 16th century. Sadolet, Bembo, Paulus Manutius, and, we must in justice add, Longolius in France, wrote Latin with a grace and finish which place their works in respect of style almost on a level with those of their great model Cicero. But it cannot be denied that their fastidiousness of language often led them to sacrifice the fruits to the flowers of learning, and justly drew down upon them the witty and biting censures of Erasmus in his Ciceronianus, In the controversy between the men of learning and the men of taste, the best tendencies of the age were decidedly on the side of the former ; and the Italian scholars whose object, as Hallam well ex- presses it, was “ to write pure Latin, to glean little morsels of oman literature, to talk a float iionseh philosophy in private, and to leave tho world to its own abuses,” had little influence on the next generation in comparison with the wider culture and loftier aims of scholars like Erasmus and Melanchthon. ‘he rapid exten- sion of a knowledge of Greek literature, especially in England, France, and Germany, lad its effects in the same direction. Men threw themselves into the new world of thought thus revealed with un cager avidity whieh left little leisure for that elaborate polishing of periods which had been the delight of the Ciceronianists. The 16th century saw enormous advances in the knowledge of antiquity ; but the most learned scholars were by no means always cqually famous for their skill in the use of the Latin language. Even in Italy itself the most eminent writers on classical subjects approach rather to the German than to the Ciceronian type, and are more distinguished for the width of their erudition and the abundance of their quotations than for elegance or purity of style. On this side of the Alps the prevalence of the same type was, as might have been expected, all but universal, Muretus alone perhaps maintained in this

generation the best traditions of style, and was pronounced, even by the judgment of the censorious Scaliger, to have written better Latin than any one since Cicero; in Italy, however, he had a formidable rival in the last of the Ciceronians, Paulus Manutius. It shows how little Latin was now a living language that the latter, like all his school, refused to speak in Latin, for fear that the necessities of daily conversation should make him familiar with bar- barous phrases, which would hardly fail to taint his written style. Others for a similar reason always recited the breviary in Greek, just as in later days some have refused to read the N ew Testament in the original language for fear of spoiling the purity of their Attic prose. In Germany especially the influence of Lipsius founded a new school of Latinists, based on the imitation of the silver Latinity

of Tacitus and Seneca, and conspicuous for some of the merits, and

more than all the faults, which have been noticed above as marking those authors. vA

rs. In Britain the only scholar whose style merits especial notice is George Buchanan) whose prose is hardly less admirable than his famous poetieal version of the Psalms. On the whole it must be said that, while the improvement in works of reference, and in methods of education gencrally (especially through the activity of the Jesuits), raises the average of correctness and purity, there is less grace and power than may be found among the best of the writers of an earlier time. As yet the use of Latin as a means of literary expression and of public business showed no signs of decline, except perhaps in Germany, where the version of the Bible by Luther and his popular works in the vernacular had given a model for literary German, and in England, where some of the on works of controversial theology, notably Hooker’s Zeclestastical

olity, were already published in English, doing thereby incalculable service to the dignity and the enrichment of the native tongue. But during the 17th century, asa consequence of the steady develop-

ment of the various national literatures, Latin came to be more and more merely the language of the learned. Some of the most eminent scholars belong to this period ; and among them Heinsius, Grotius, Salmasius, and his more illustrious antagonist Milton are all famous for the elegance of their diction ; while Scioppius and Vossius contributed largely to the scientific knowledge of grammar. But towards the end of the century complaints as to the general decay of learning frequently occur. In Germany it was almost extinct. In France the Jesuit colleges maintained the traditions of a pure Latinity with some success, and were noted for the polished though sometimes too rhetorical style in which their exercises were conducted. In England the decay of Latin was never so complete as that of Greek ; and the great name of Bentley shines out con- spicuous, set off, it must be-admitted, by the school-boy darkness of most of his rivals. Even he did not escape the ferule of the schoolmaster, Richard Johnson of Nottingham, who claims in his Anti-Aristarchus to have pointed out more than ninety errors in the great scholar's Latinity. In the 18th century we still find Latin used for works on science and philosophy, which appealed to the learned in all countries; to say nothing of Newton's Principia (1689), Burnet's Theoria Tellwris Sacra (1694), and Ray's Synopsis Methodiea (1693), and subsequent botanical works, we find even Linneus in 1760 issuing his Systema Naturae in Latin. But as an organ of general literature it may be said to have expired in the course of the 17th century. The last great philosopher who habitually employed Latin for his works was Leibnitz (1646-1716) ; ce, the last important work in English theology written in

atin was Bull's Defensio Fidet Nicenac (1685).

The use of Latin in diplomacy died out towards the end of the 17th century. The Spanish embassy sent to the court of James I. in 1605 used sometimes Latin and sometimes French ; the Latin state-papers written by Milton during the Commonwealth are well known ; and in the negotiations at Miinster (1644) even the French representative, M. d'Avaux, prided himself on his skill in writing Latin. But at Nymegen (1677) the Danish ambassador's claim that the Latin language should be used between the French representa- tive and himself was rejected

as an impertinence; and he was obliged to agree that, while he might employ Latin himself, the French should use their own language. At Ryswick, Temple opened the proceedings in French ; he was answered by the bishop of Gurk in Latin ; but the French envoys pleaded that they had forgotten their Latin, and the subsequent proceedings were conducted in French (cf. Bernard's Lectures on Diplomacy, pp. 153-155). Long after this date the German empire insisted that all negotiations with it should be conducted in Latin ; and, although Joseph II. attempted to make German the official language of Hungary in its place, he was atten to give way, and it was only in 1825 that Latin was for the first time displaced by Magyar in the debates of the diet (¢f. vol. xii. p. 371). It is now the universal practice that written communications from any European power should be made in the language of that power, but oral intercourse is carried on in French, with rare exceptions.

Authoritics. —For the earliest stage of the Latin language the Corpus Inseriptionum Latinarum, vol. i., or Garrucci's Sylloge In- scriptionum Latinarum, is indispensable. Wordsworth's Fragments and Specimens of Early Latin is very useful. Hiibner's Grundriss zu Vorlesungen tiber die Lateinisehe Grammatik (Berlin, 1880, p. 104) contains a very complete list of all works of value upon the language. Corssen's Aussprache Vokalismus und Betonung der Lateinischen Sprache (2 vols., Leipsic, 1870) contains a valu- able collection of the evidence as to the history of the pronuncia- tion, Neue's Formeniehre (2 vols., Berlin, 1877) is a complete storehouse of the inflexional forms. Driiger's Historische Syntax (2 vols., Leipsic, 1880) is extremely valuable, especially for tho classical writers. Kiihner's Ausfiihrliche Grammvatik der Latein- isehen Sprache (2 vols., Hanover, 1877-78) is the most complete of recent grammars. In English the best graminars are those of Madvig, Dr Kennedy, and Mr Roby. The first is excellent in the syntax, and well represents the most complete knowledge of the Latin language in its classical form to be gained without the aid of comparative philology ; the second in respect of etymology too frequently adopts not only the facts but the less trustworthy theories of Corssen, while in syntax the full collection of examples is sometimes encumbered by an awkward terminology ; the last is equally admirable

for the clearness and fulness of its discussion of phonetics, the careful historical treatment of inflexions, and the freshness and precision of its syntax. For later Latin and its con- nexion with the Romance languages, Schuchardt's Vokalismus des vulgérlatcins, Ronsch's [tala wud Vulgata, and Diez's Grammaire des Langues Romances are the chief text-books. The diction of the most important writers can best be studied in the numerous German treatises and programmes devotcd to them severally, most of which will be found mentioned in Driger's Syntax and in Pro- fessor Mayor's edition of Hiibner's Guide to Latin Literature. Bernhardy's Grundriss der Rénvisehen Littcratur and Teuffel's History of Roman Literature have many useful hints as to the growth of the language. (A. 8. WW)

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LATIN LITERATURE. See Roms.

LATITUDE. See Astronomy, Gropesy, and GEoGRA- poy (MATHEMATICAL).

LATIUM, in ancient geography, was the name given to the portion of central Italy which adjoined the Tyrrhenian Sea on the west, and was situated between Etruria and Campania. The name was, however, applied in a very different sense at different times, and the extent of country comprised under this appellation varied materially. Latium originally means the land of the Latini, and in this sense, which is that alone in use historically, it was a tract of comparatively limited extent ; but after the overthrow of the Latin confederacy, when the neighbouring tribes of the Hernicans, Volscians, and Auruncans, as well as the Latins properly so called, were reduced to the condition of subjects and citizens of Rome, the name of Latium was extended so as to comprise them all, and include the whole country from the Tiber to the Liris. The change thus introduced was not formally established till the reign of Augustus; but it is already recognized by Strabo (v. p. 228), as well as by Pliny, who terms the additional territory thus incorporated Latium Adjectum, while he designates the original Latium, extending from the Tiber to Circeii, as Latium Antiquum. We shall confine ourselves in the first instance to the description of Latium

in this limited sense, in which it figures in Roman history from the foundation of the city to the days of Cicero.

I. Latium Antiquum. In this original sense Latium was a country of but small extent, and consisted principally of an extensive plain, now known as the Campagna di Roma, bounded towards the interior by the lofty range of the Apennines, which rise very abruptly from the plains at their foot to a height of between 4000 and 5000 feet. Several of the Latin cities, including Tibur and Praeneste, were, however, situated on the terrace-like underfalls of these nrountains, while Cora, Norba, and Setia were placod in like manner on the slopes of the Volscian mountains or Monti Lepini, a rugged and lofty range, which branches off from the Apennines near Praneste, and forms a continuous mountain barrier from thence to Terracina. In the midst of the plain thus limited rises a group of volcanic moun- tains, of about 30 miles in circuit, and attaining to a height of over 3000 feet, now commonly known as the Alban hills, though the designation of Albani Montes is not found in any ancient writer. But the highest summit, now called Monte Cavo, on which stood the temple of Jupiter Latiaris, was known as Mons Albanus ; while the north-east summit, which almost equalled it in height, bore the name of Mount Algidus, celebrated in all ages for the dark forests of ilex with which it was covered, No volcanic eruptions are known to have taken place in these mountains within the historic period, but the remains of a crater are distinctly seen near the summit of the Mons Albanus, forming the basin now known as the Campo di Annibale, while the cup-shaped lakes known as the Alban Lake and the Lake of Nemi unquestionably occupy the basins of similar craters at a lower level on the southern slope of the moun- tain, and the adjacent Lacus Aricinus, now drained, was another vent of a similar character.

But, besides this distinctly volcanic group, by far the greater part of the plain now called the Campagna di Roma was formed by volcanic deposits, consisting for the most part of the rock called tufo, an aggregate of volcanic sand, pebbles, and cinders or scorie, varying greatly in hardness and consistency, from a compact rock well adapted for building stone to a loose disintegrating sand known by the local

name of puzzolano. are found, the most distinct of which is a continuous stream extending from the foot of the Alban hills to within 2 miles from Rome, along which the line of the

In a few places only beds of lava |

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Appian Way was carried. These depusits have been

formed upon previously existing beds of Tertiary formation,

which here and there rise to the surface, and in the Monte Mario, a few miles north of Rome, attain to the height of 400 feet. The surface is by no means an uniform plain,

like that of the Terra di Lavoro (the ancient Campania),

but is a broad undulating tract, furrowed throughout by numerous depressions, with precipitous banks, serving as water-courses, though rarely traversed by any considerable stream. As the general level of the plain rises gradually, though almost imperceptibly, to the foot of the Apennines, these channels by degrees assume the character of ravines of a formidable description.

Between the volcanic tract of the Campagna and the sea there intervenes a broad strip of sandy plain, evidently formed merely by the accumulation of sand from the sea, and constituting a barren tract, still covered, as it was in ancient times, almost entirely with wood. This long belt of sandy shore extends without a break for a distance of above 30 miles from the mouth of the Tiber to the promontory of Antium (Porto d'Anzo), which is formed by a low but rocky headland, projecting out into the sea, and giving rise to the only considerable angle in this line of coast. Thence again a low sandy shore of similar character extends for about 24 miles to the foot of the Monte Circello, an isolated mountain mass of limestone of about 9 miles in circumference, and rising to a height of 2000 feet. From the almost insulated character of this remarkable promontory, which is united to

the Apennines at Terracina by a similar strip of sandy coast, between the Pontine Marshes and the sea, there can be no doubt that it was once an island, which has been gradually united to the mainland by alluvial deposits. But it is certain that these deposits must have commenced long before the historical period, and the assertion strangely ascribed by Pliny to Theophrastus, that the Circeian promontory was in the days of that philosopher still an island, is certainly erroneous. The region of the Pontine Marshes, which occupies almost the whole tract between the sandy belt on the sea-shore and the Volscian mountains, extending from the southern foot of the Alban hills below Velletri to the sea near Terracina, a distance of about 30 miles, is a perfectly level plain, rendered pestilential by the stagnation of numerous streams that descend from the neighbouring mountains, and are unable to find their way through this extremely low and level tract, while their outlet to the sea is barred by the sands of the coast between Monte Circello and Terracina.

At the earliest period of which we have any historical record the whole of the country that we have thus described, or Latium in the proper sense of the term, was inhabited by the people known to the Romans as Latini. Of their origin or ethnical affinities we have very little information, except that they belonged to tbe same branch of the Italian races with the Umbrians, Oscans, and Sabellians (see Iraty). Atthesame time they constituted, according to the general testimony of ancient writers, a distinct people from their neighbours the Sabines and the Volscians, who held the mountain districts adjoining their territory, as well as (in a much higher degree) from the Etruscans on the other side of the Tiber. ‘There was once, however, a people called the Rutuli, who occupied a small portion of the Latin territory adjoining the sea-coast, and are described ag a separate people under their own king,—a tradition familiar to all modern readers from its having been adopted by Virgil. But the name of the Rutuli, as that of an

independent people, disappears from history at a very early

period, and their capital city of Ardea was certainly one of the thirty cities that in historical times constituted the Latin league. The list of

these cities given us by Dionysius of Halicarnassus, which has every appearance of

being derived from an authentic document (see Niebuhr's Roman History, vol. ii. p. 23), enumerates them as follows : —Ardea, Aricia, Boville, Bubentum, Corniculum, Carven- tum, Circeii, Corioli, Corbio, Cora, Fortinei (1), Gabii, Laurentum, Lavinium, Labicum, Lanuvium, Nomentum, Norba, Preeneste, Pedum, Querquctulum, Satricum, Scaptia, Setia, Tellenz, Tibur, Tusculum, Toleria, Tricrinum (1), Velitre.

The list thus given by Dionysius is arranged in an order approximately alphabetical. Omitting the two names which are probably corrupt, and a few of which the site eannot be determined with any certainty, the others may be described according to their geographical arrangement. Laurentum and Lavinium, names so conspicuous in the legendary history of Aineas, were situated in the sandy strip near the sea-coast,—the former only 8 miles east of Ostia, which was from the first merely the port of Rome, and never figured as an independent city. Farther eastward again lay Ardea, the ancient capital of the Rutuli, and some distance beyond that Antium, situated on the sea-coast, which, though not in the list of Dionysius, was certainly a Latin city. On the southern underfalls of the Alban mountains, commanding the plain at the foot, stood Lanuvium and Velitre ; Arieia rose on a neighbouring hill, and Corioli was probably situated in the plain beneath. The more im- portant city of Tusculum occupied one of the northern summits of the same group; while opposite to it, in a commanding situation on a lofty offshoot of the Apennines, rose Preeneste, now Palestrina. Bola and Pedum were in the same neighbourhood, Labicum on the slope of the Alban hills below Tusculum, and Corbio on a rocky summit east of the same city. Tibur (Tivoli) occupied a height commanding the outlet of the river Anio. Corniculum, farther west, stood on the summit of one of three conical hills that rise abruptly out of the plain at the distance of a few miles from Monte Gennaro, the nearest of the Apennines, and which were thence known as the Montes Corniculani. Nomentum was

a few miles farther north, between the Apennines and the Tiber, and close to the Sabine fron- tier. The boundary between the two nations was indeed in this part very fluctuating. Nearly in the centre of the plain of the Campagna stood Gabii ; Boville was also in the plain, but close to the Appian Way, where it begins to ascend the Alban hills. Several other cities—Tellene, Scaptia, and Querquetulum—mentioned in the list of Dionysius were probably situated in the Campagna, but their site cannot be determined. Satricum, on the other hand was south of the Alban hills, apparently between Velitre and Antium ; while Cora, Norba, and Setia (all of which retain their ancient names with little modification) erowned the rocky heights which form advanced posts from the Volscian mountains towards the Pontine Marshes.

It must be borne in mind that the list given by Dionysius belonged to a date about 490 B.c., and a considerable number of the Latin cities had before that time either been utterly destroyed or reduced to subjection by Rome, and had thus lost their independent existence. Such were Antemneze and Ccenina, both of them situated within a few miles of Rome, and the conquest of which was ascribed to Romulus; Fidenz, about 5 miles north of the city, and close to the Tiber; and Crustumerium, in the hilly tract farther north towards the Sabine frontier. Pometia also, on the borders of the Pontine Marshes, to which it was said to have given name, was a city of importance, the destruction of which was ascribed to Tarquinius Superbus. But by far the most important of these extinct cities was Alba, on the lake to which it gave its name, which was, according to the tradition universally received, the parent of Rome, as well as of numerous other cities within the limits of Latium, including Gabii, Fidene, Collatia, Nomentum, and other well-known towns. Whether or not this tradition deserves to rank as historical, it appears certain that at an early period there existed a confederacy of thirty towns, of which Alba was the supreme head. A list of these is given us by Pliny (iii. 5, 968) under the name of “populi Albenses,” which includes only six of those found in the list of Dionysius; and these for the most part among the more obscure and least known of the names there given ; while the more powerful cities of Aricia, Lanuvium, and Tusculum, though situated

immediately on the Alban hills, are not included, and appear to have miaintaine? a wholly independent position. This earlier

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league was doubtless broken up by the fall of Alba ; it was probably the increasing power of the Volsci and Atqui that led to the formation of the later league, including all the more powerful cities of Latium, as well as to the alliance concluded by them with the Romans in the con- sulship of Sp. Cassius (493 8.c.).

The cities of the Latin league continued to hold general meetings or assemblies from time to time at the Grove of Ferentina, a sanctuary at the foot of the Alban hills in a valley below Marino, while they had also a common place of worship on the summit of the Alban Mount (the Monte Cavo), where stood the celebrated temple of Jupiter Latiaris. The participation in the annual sacrifices at this sanctuary was regarded as typical of a Latin city ; and they continued to be celebrated long after the Latins had lost their inde- pendence and been incorporated in the Roman state. This change took place in 338 B.c. During the centuries that followed down to the end of the Roman republic many of the Latin towns sank into a very decayed condition. Cicero speaks of Gabii, Labicum, and Boville as places that had fallen into abject poverty, while Horace refers to Gabii and Fidene as mere “ deserted villages.” Many of the smaller places mentioned in the list of Dionysius, or the early wars of the Romans, had altogether ceased to exist, but the statement of Pliny that fifty-three communities (popult) had thus perished within the boundaries of Old Latium is certainly exaggerated, and his list of the “illustrious cities ” (clara oppida) that had thus disappeared is very confused and unintelligible. Still more erroneous is his statement that there were once twenty-four citics on the site occupied in his time by the Pontine Marshes,—an assertion not con- firmed by any other authority, and utterly at variance with the physical conditions of the tract in question.

II. Latium Novum, or ADJECTUM, as it is termed by Pliny, com- prised the territories occupied in earlier times by the Volscians, Hernicans, and Auruncans. It was for the most part a rugged and

mountainous country, extending at the back of Latium proper, from the frontier of the Sabines to the sea-eoast between Terracina and Sinuessa. But it was not separated from the adjacent territories by any natural frontier or physical boundarics, and it is only by the enumeration of the towns in Pliny according to the division ot Italy by Augustus that we ean determine its limits. It included the upper valley of the Anio, with the towns of Sublaqueum and Treba; the Hernican cities of Anagnia, Ferentinum, Alatrium, and Verule—a group of mountain strongholds on the north side of the valley of the Trerus or Sacco ; together with the Volscian cities on the south of the same valley, and in that of the Liris, the whole of which, with the exception of its extreme upper end, was included in the Volscian territory. Here were situated Signia, Frusino, Fabra- teria, Fregelle, Sora, Arpinum, Atina, Aquinum, Casinnm, and Interamna ; Anxur, or Tarracina, was the only seaport that properly belonged to the Volscians, the coast from thence to the mouth of the Liris being included in the territory of the Auruncans, or Ausonians as they were termed by Greek writers, who possessed the maritime towns of Fundi, Formie, Caieta, and Minturne, together with Suessa in the interior, which had replaced their more ancient capital of Aurunca, Sinuessa, on the sea-eoast between the Liris (Garigliano) and the Vulturnus, was the last town in Latinm according to the official use of the term.

Though the Apennines comprised within the boundaries of Latium do not rise to a height approaching that of the loftiest sum- mits of the central range, they attain to a considerable altitude, and form steep and rugged mountain masses from 4000 to 5000 feet high. They are traversed by three principal valleys :—(1) that of the Anio, now called Teverone, which descends from above Subiaco to Tivoli, where it enters the plain of the Campagna; (2) that of the Trerus or Sacco, which has its source below Palestrina (Preneste), and flows through a comparatively broad valley that separates the main mass of the Apennines from the Volseian mountains or Monti Lepini, till it joins the Liris below Ceprano ; (3) that of the Liris or Garigliano, which enters the confines of New Latium about 20 miles from its source, flows under the walls of Sora, and has a very tortuous course from thenee to the sea at Minturne ; its lower valley is for the most part of

considerable width, and forms a fertile tract of considerable extent, bordered on both sides by hills covered with vines, olives, and fruit trees, and thickly studded with towns and villages.

It may be observed that, long after the Latius had ceascd to exist

as a separate people, we mect in Roman writers with the phrase of “nomen Latinum,” used not in an ethnical but a purely ee seuse, to designate the inhabitants of all those cities on which the Romans had conferred ‘‘ Latin rights ” (jus Latinwm),—an inferior form of the Roman franchise, which had been granted in the first instance to certain cities of the Latins, when they became subjects of Rome, and was afterwards bestowed upon many other cities of Italy, especially the so-called Latin colonies. At a later period the same privileges were extended to places in other countries also,—as for instance to most of the cities in Sicily and Spain. All persons enjoying these rights were termed in legal phrascology ‘‘ Latini” or ‘* Latin conditionis.”

For the topography of Latium, and the local history of its more important cities, the reader may consult Sir W. Gell’s Topography of Rome and its Vieinity, 2 vols. 8vo., Lond., 1834, 2d ed., 1 vol., 1846, with a valuable map; Nibby, Analisi Storico-Topografico- Antiquaria della Carta det Dintornt di Roma, 3 vols. 8vo, 1837, 9d ed. 1848; Westphal, Die Rémisehe Kampagne, 4to, Berlin, 1829; Bormann, Alt-Latinisehe Chorographie und Stédte-Gesehiehte, 8yo, Halle, 1852; Burn’s Rome and the Campagna, 4to, Lond., 1871; Hare’s Walks arownd Rome, 2 vols. 8vo, Lond., 1873. An elaborate antiquarian map of Old Latium has been long in pre- paration by the Cavaliere De Rossi, but has not yet made its appearance. (Eh. EB)

LATONA is the Latin name of the Greek Leto, mother of Apollo and Artemis. In Greece she belongs rather to the sphere of mythology than of religion; she forms part of the surroundings of these two great deities, but is not usually a goddess to whom worship is paid or temples built. Different forms of the Latona legend are found in the various seats of Apolline religion. Of these seats the chief are Delos

and Delphi, and the tradition which has obtained the widest literary currency is a union of the legends of these two places, formed doubtless under the unifying influence of the Delphic oracle. Latona, pregnant by Zeus, long seeks in vain for a place of refuge to be delivered. She wanders from Crete over Athens, the coasts of Thrace and Asia Minor, and the islands; at last the barren desolate isle of Delos offers itself. Pindar and later poets tell that Delos was a wandering rock borne about by the waves, till it was fixed to the bottom of the sea to serve for the birth of Apollo. Hence arose the belief that Delos could not be shaken by earthquakes,—a belief that was disproved by several shocks in historical times (Herod, vi. 98; Plin., iv. 66). In the oldest forms of the legend Hera is not mentioned ; but afterwards the wander- ings of Leto are ascribed to the jealousy of Hera, enraged at her amour with Zeus. In the legend the foundation of Delphi follows immediately on the birth of the god; and on the sacred way between Tempe and Delphi the giant Tityus offers violence to Leto, and is immediately slain by the arrows of Apollo and Artemis. Such are the main facts of the Leto legend in its common literary form, which is due especially to the two Homeric hymns to Apollo. We must turn from mythology to actual religion in order to discover the true character of the myth. Then we shall find that Leto is a real goddess, and not a mere mythological figure. The honour paid to her in Delphi and Delos might be explained as part of the cultus of her son Apollo; but temples to her existed in Argos, in Mantinea, and in Xanthus of Lycia; her sacred grove was on the coast of Crete. In Lycia graves are frequently placed under her protection (see Corpus Inscr. Grac., No. 4259, 4300, 4303, &c.); and she is also known as a goddess of fertility and as Koupotpddos. In these attributes we recognize the earth-goddess. Now, although in the common legends Apollo and Artemis are called the twin children of Leto, yet she appears far more conspicuously in the Apolline myths than in those which grew round the great centres of Artemis worship ; moreover, in the older forms of the Apolline myths Artemis is hardly mentioned except as an after-thought, and the Homeric hymn makes them born in different places (ryv peév év Opruyin, tov S& xpavay éve Andy). Facts such as these will be readily explained

if one recognizes that the idea of Apollo and Artemis as twins is one of later growth on Greek soil, and that the two religions come from different origins in Asia Minor. Again Lycia, one of the chief homes of the Apolline religion, is precisely the country where most frequent traces are found of the worship of Leto as tlie great goddess. Etymological considerations point in the same direction. The Greeks always connected the word Leto with the root seen in AavOdvw, AyOn, &c.; but it is more probable that the resemblance is delusive, and that the origin is to be found in words which are not so distinctively Greek. Leto and Leda are both probably forms of the Lycian word Lada, which means woman or lady ; and the island of Lade or Late (Plin., v. 35), the town Lete, the rivers Ladon and Lethzeus, were all named from the goddess.

It is clear then that Latona or Leto was the great goddess of a religion which found its way into Greece, where its mythology was harmonized to a certain extent with that of the other religious systems of the country. Everything points to Lycia as the earlier home of this religion. Zeus, by whatever name he was called, and Leto are heaven and earth; their offspring is Apollo, the ever young god of light and of the sun, born afresh every spring. The myth is the same that occurs over and over again with different names in every district of Greece and Asia Minor. But in Greece Hera was recognized as the supreme consort of Zeus, and Latona could only rank with many other goddesses of antique religions as his concubine; though even in Greece the oldest forms of the tradition recognize her as the goddess-consort, kvdpi mapaxorris, of Zeus. Sappho calls her and Niobe “loving companions.” The father of Leto, Cceus, must be a god in the almost forgotten religion to which she belongs.

In Greek art Leto appears usually in company with her children; in vase paintings especially she is often represented with Apollo and Artemis. The statue of Leto in the Letoon at Argos was the work of Praxiteles.

See Mitth. Inst. Ath., i. 168; Hesiod, Theog., 134; Comze, Reisen auf den Griech. Inseln, p. 91.

LATREILLE, Prerre-Anpri (1762-1833), French naturalist, was born in humble circumstances at Brives-la- Gaillarde, now in the department of Corréze, France, on November 29, 1762. His abilities attracted the attention of the Baron d'Espagnac, who in 1778 placed him at the Collége Lemoine at Paris, where the Abbé Haiiy was at that time a teacher. Having chosen the ecclesiastical career, he was admitted to priestly orders in 1786, and in the same year retired to Brives, devoting all the leisure which the discharge of his professional duties allowed to the study of entomology. In 1788 he returned to Paris and found means of making himself known to the leading naturalists there,—Fabricius, Olivier, Bosc, Lamarck ; his first important contribution to his special science, a "Mémoire sur les Mutilles découvertes en France," contri- buted to the Proceedings of the Society of Natural Mistory in Paris, procured for him the honour of admission to that body, and of being made a corresponding member of the Linnean Society of London. At the Revolution he was compelled to quit Paris, and as a priest of conservative sympathies suffered considerable hardship ; he lay for some time in prison at Bordeaux, and gained his liberty at last only through the intervention of the naturalists Bory de Saint-Vincent and Dargelas. His Précis des Caractéres genériques des insectes, disposés dans un ordre naturel, appeared at Brives in 1796. In 1798 he became a corre- sponding member of the Institute, and at the same time was entrusted with the task of arranging the entomological collection at the recently organized " Muséum d'Histoire Naturelle" (Jardin des Plantes); in 1814 he succeeded Olivier as member of the Académie des Sciences, and in

1821 he was made a chevalier of the Legion of Honour. |

For some time he acted as professor of zoology in the veterinary school at Alfort near Paris, and in 1830, when the chair of zoology of

invertebrates at the Muscum was divided after the death of Lamarck, Latreille was appointed professor of zoology of crustaceans, arachnids, and insects, that of molluscs, worms, and zoophytes being assigned to De Blainville. ‘On me donne du pain quand je n’ai plus de dents,” said Latreille, who was then in his sixty-eighth year. He died on February 6, 1833.

In addition to the works already mentioned, the numerous works of Latreille include—Histoire naturelle générale et particuliére des Crustacts et Insectes (14 vols., 1802-5), forming part of Sonnini’s edition of Buffon; Genera Crustaceorum et Insectorum, secundum ordinem naturalem in familias disposita, 4 vols., 1806-7 ; Considerations générales sur Vordre naturel des animana composant les classes des Crustacés, des Arachnides, et des Inseetes, 1810 ; Familles naturelles du régne animal, eaxposécs succinetement ct dans un ordre analytique, 1825; Cours d’Entomologie (of which only the first volume appeared, 1831); the whole of the section ** Crustacés, Arachnides, Insectes,” in Cuvier’s Régne Animal ; besides many papers in the Annales du Muséum, the Encyclopédie Methodique, the Dictionnatre Classique d’ Histoire Naturelle, and elsewhere.

LAUBAN, chief town of a circle of the same name in the government of Liegnitz and province of Prussian Silesia, is situated in a picturesque valley, at the junction of the lines of railway from Gérlitz and Sorau, 39 miles west- south-west from Liegnitz, in 51° 7’ N. lat., 15° 17’ E. long. Lauban is the seat of a chamber of commerce, and has a Roman Catholic and three Lutheran churches, a conventual house of the order of S. Magdalene, dating from the 14th century, a municipal library and museum, two hospitals, an orphanage, a gymnasium, and a collegiate institute for girls. The industrial establishments comprise tobacco, yarn, thread, and linen and woollen cloth manufactories, bleach- ing, calendering, and dyeing works, a bell-foundry, tile- kilns, breweries, and oil and flour mills. In 1880 the population was 10,779.

Lauban was founded in the 10th and fortified in the 13th cen- tury ; in 1427 and 1481 it was devastated by the Hussites, and in 1640 by the

Swedes. In 1761 it was the headquarters of Frederiek the Great. In 1815 it was the last Saxon town that made its sub- mission to Prussia.

LAUD, Witt1am (1573-1644), archbishop of Canter- bury, was born at Reading on October 7, 1573. In 1590 he became a scholar of St John's, Oxford, and a fellow in 1593. In 1601 he entered the ministry of the church. In 1605 he married the earl of Devonshire to the divorced Lady Rich, an act which he never ceased to regret. In 1611 he became president of St John's. His career at Oxford brought him into collision with the authori- ties of the university. revolted by the Calvinistic Puritanism which prevailed, and he upheld in a sharp irritating way the doctrines on the divine right of Episcopacy, and of the permanent existence of the church during the Middle Ages, which was regarded as rank heresy by the Puritans. In 1616 he was appointed to the deanery of Gloucester, and, with the king's approbation, removed the communion table in the cathedral to the eastend. In 1621 James made him bishop of St David's, though, if a commonly received story is to be believed, he entertained grave doubts whether Laud would exercise the episcopal authority with wisdom. In 1622 the new bishop took part in a controversy with Fisher the Jesuit, on the claims of the Papal Church. His argument, which was afterwards published, was not only a serious contribution to controversial literature, but marks a distinct advance in the direction which was after- wards taken by Chillingworth.

The controversy with Fisher had been entered on in order to save Buckingham's mother from conversion to the Church of Rome. It failed in this object, but it gained for Laud considerable influence over Buckingham himself,

He was one of those who were

and through Buckingham over Prince Charles, who when lhe became king in 1625 was attracted to an ecclesiastical adviser whose opinions so closely resembled his own, and whose firmness of character supplied a contrast to the irresoluteness of which he could scarcely be

unconscious. During the first years of the reign Laud was frequently consulted in matters relating to the church. He is found favouring the promotion of anti-Puritan divines, approving Montague's Appello Cesarem, and generally throwing his weight into the scale against the assumption of the House of Commons to lay down the law in politics and religion.

In 1628 Laud was made bishop of London, and when the ecclesiastical controversy came to a head in the session of 1629, his biography became identified, till the meeting of the Long Parliament, with the history of the Church of England.

Intellectually Laud's position was that of a man opposed to the dogmatism of the Calvinists. "The wisdom of the church," he wrote, "hath been in all ages, or the most, to require consent to articles in general as much as may be, because that is the way of unity, and the church in high points requiring assent to particulars hath been rent." Laud's love of peace unhappily led him to shrink from the free exuberance of spiritual life. Perhaps it could hardly be expected, in an age when each ecclesiastical party was longing to persecute all others, that any man placed in authority should think it possible to allow the struggling parties to grow up side by side, in what must have seemed the vain hope that liberty would bring a larger harmony. Laud, at least, had no conception of the kind. He was by nature a lover of order and discipline, devoid of the higher spiritual enthusiasm or breadth of judgment which charac- terizes the highest order of intellect. He spoke of Aristotle, the philosopher who lays such stress on the formation of habits, as his great master ix humanis. All Laud's work in life was to attempt to form habits, to make men learn to be decent by acting decently, and to be religious by acting religiously. 'Since I came to this place," he said of himself, "'I laboured nothing more than that the external public worship of God—too much slighted in most parts of this kingdom—might be preserved, and that with as much decency and uniformity as might be, being still of opinion that unity cannot long continue in the church when uniformity is shut out at the church doors. And I evidently saw that the public neglect of God's service in the outward face of it, and the nasty lying of many places dedicated to that

service, had almost cast a damp upon the true and inward worship of God,—which, while we live in the body, needs external helps, and all little enough to keep it in any vigour.”

Upon these principles he acted, more especially after his promotion in 1633 to the archbishopric of Canterbury. His metropolitical visitation of the province enforced his system of uniformity in every parish contained in it. He had no sympathy with the special doctrines of the Papal Church, still less with its ceremonial ; but he held that conformity to the prayer book was to be the universal rule. He gave great offence to the Puritans by insisting upon the removal of the communion table to the east end of the church, while the communicants were to receive the sacra- ment on their knees. For this and for the enforcement of other observances he was stigmatized as an innovator, but he repelled the charge in the speech which he delivered at the trial in the Star Chamber of Prynne, Bastwick, and Burton in 1637, declaring that the Puritan usages were themselves innovations on the practice inculcated at the Reformation.

Nor did Laud confine himself to imposing ceremonies upon the clergy. The church courts undertook in those days to reform the morals of the laity, and Laud excited

much ill-feeling by insisting that the powerful and the wealthy should submit to punishment as well as the poor. Asa privy councillor he took part in affairs of state, and upon the death of Portland in 1635 he became a commissioner of the treasury till he procured for Bishop Juxon the appointment of lord treasurer in 1637. The advice which he gave to the king with respect to the introduction of a new prayer book into Scotland proved ultimately fatal to him. Of this prayer book, in the amendment of which he had had a considerable share, he was not unnaturally regarded as the author; and, when in 1640 the Scots triumphantly occupied the northern counties, and sent commissioners to London to negotiate a peace, they called for the punishment of the archbishop as the great incendiary. One of the first acts of the Commons after the meeting of the Long Parliament was to impeach

him. For some time he remained in prison, apparently overlooked. But in 1643 there was fresh need of concili- ating the Scots, and his impeachment was proceeded with. He made an able and in many respects a satisfactory defence, but his condemnation was a foregone conclusion, and he was executed on January 10, 1644, at the age of seventy-two.

The best source of the biography of Laud is to be found in his own. Works, edited by Dr Bliss, in the Anglo-Catholic Library. The adverse view of his character will be found in Prynne's Canterbury's Doom. (S. R. G.)

LAUDANUM. See Opium.

LAUDER, Sir Tuomas Dick, Barr. (17 84-1848), was the only son of Sir Andrew Lauder, the sixth baronet, and was born at Edinburgh in 1784. He succeeded to the baronetcy in 1820. In early life he published two romances, Lochandhu and the Wolf of Badenoch ; and such were the merits of his style that his first contribution to Blackwood's Magazine in 1817, entitled "Simon Roy, Gardener at Dunphail," was by some ascribed to the author of Waverley. He was afterwards a frequent contributor to Blackwood and also to T'ait's Magazine, and in 1830 he published the book by which his name is now best known, An Account of the Great Floods of August 1829 in the Province of Moray and adjoining Districts. Subsequent works were J/ighland Rambles, with Long Tales to shorten the Way (2 vols. 8vo, 1837), Legendary Tales of the Highlands (83 vols. 12mo, 1841), Zour Round the Coasts of Scotland, and Memorcal of the Royal Progress in Scotland (1843). Lauder's paper on "The Parallel Roads of Glenroy," printed in vol. ix. of the U'ransactions of the Royal Society of Edinburgh, first drew attention to the phenomenon in question. Vol. i. of a Miscellany of Natural History, published in 1833, was also partly prepared by Lauder. He died on May 29, 1848, An unfinished series of papers, written for Z'azt's Magazine shortly before his death, was published under the gee Rivers, with a preface by John Brown, M.D., in 1874.

LAUENBURG, formerly a duchy belonging with Holstein to Denmark, but from 1865 to Prussia, was in July 1876 incorporated as a

circle in the Prussian province of Schleswig-Holstein. It lies on the right bank of the Elbe, between 53°21’ and 53° 48’ N. lat., 10°13’ and 11° 3’ E. long., is bounded by the territories of Hamburg, Liibeck, and Mecklenburg, the province of Hanover, and the circle of Oldesloe, and comprises an area of 453 square miles. The surface of the country is a slightly undulating plain. The soil, chiefly alluvial, though in some places arenaceous, is generally fertile and well cultivated, but a great portion is covered with forests, and interspersed with lakes. By means of the Stecknitz Canal, the Elbe, the principal river, is connected with the Trave. The chief agricultural products of the circle are timber, fruit, grain, hemp, flax, and vegetables. Cattle breeding affords

o47 employment for many of the inhabitants. The railroad from Hamburg to Berlin traverses the country. The judicial administration is divided among five courts of law, over which is a superior court for the whole circle, the supreme court of appeal being at Berlin. The capital is Ratzeburg, and there are two other towns, Mélln and Lauenburg. In 1880 the population amounted to 49,185, Low Saxons by descent, and with few exceptions Lutherans by confession.

The earlier inhabitants of Lauenburg were a Slavic tribe known by the name of Polabes (7.¢., dwellers on the Elbe; Slavic, Leba). They were gradually replaced by colonists from Lower Saxony, and about the middle of the 12th century the country was conquered by Henry the Lion, and thus came under the yoke of the dukes of Saxony. Lauenburg subsequently passed into the hands of Valde- mar Ii. of Denmark, but, having in 1227 reverted to the Saxons, it remained in their possession for over four hundred years,—from 1260, however, in the separate line of Saxe-Lauenburg. After the death of Duke Julius Francis in 1689, the line of succession having become extinct, the emperor ordered the sequestration of the duchy, but Duke George William of Brunswick-Luneburg-Celle forcibly occupied it, paid a money indemnity to Saxony, and was recognized by the inhabitants (15th September 1702). Upon his death in 1705, Lauenburg fell to his nephew, George I., elector of Hanover, and afterwards king of England, whose claim was eventually recognized in 1728 by imperial decree. In 1806 Lauen- burg was occupied by the French, and in 1810 it was incorporated with the

department of Bouches de l'Elbe. After the battle of Leipsic in 1813 it reverted to Hanover, and on the 29th May 1815 was ceded to Prussia, which on the 4th June transferred it to Denmark. After the death of Frederick VII. of Denmark (1863) there were various claimants to the duchy, but at the peace of Vienna (30th October 1864) it was ceded by Christian IX. of Denmark to Austria and Prussia. By the convention of Gastein (14th August 1865) Austria surrendered her claims to Prussia upon the payment of 2,509,000 Danish thalers (about £280,000). On the 15th September William I. of Prussia took formal pos- session of the duchy, but it still retained its constitution and special privileges, and was not consolidated and incorporated with the kingdom of Prussia until the 1st of July 1876.

LAUNCESTON, a municipal and parliamentary borough and market-town of England, in the eastern division of the county of Cornwall, is situated on a branch railway line from Plymouth, on an eminence near the Kinsey, an affluent of the Tamar, 213 miles west-south-west from London. The strects are narrow and irregular, but of late years have been considerably improved. The parish church, dedicated to St Mary Magdalene, and built of curiously carved blocks of granite, was erected in the beginning of the 16th century, but possesses a detached tower of the date 1380. There are important remains of the old castle, which was the ancient seat of the earls of Cornwall, and was frequently besieged during the wars of Charles I, For the grammar school originally established in the reign of Edward VI. a new building was erected in 1862. The trade of the town is chiefly in agricultural produce. The population of the municipal borough (area 1504 acres) increased between 1871 and 1881 from 2935 to 3217, and that of the parliamentary borough (area 14,707 acres) from 5468 to 5675.

The ancient name of Launceston was Dunneheved, the swelling hill. The name Launceston, originally Lanstephen, is derived from an old monastery dedicated to St Stephen. From the time of the Conqueror the place has belonged to the earls of Cornwall. It was made a free borough in the reign of Henry I1I., and received a charter of incorporation from Queen Mary in 1555. From 1294 it returned two members to parliament until 1832, when it was deprived of one of its

members, and the disfranchised borough of Newport, comprising the parish of St Stephens, was included in its boundaries, The assizes of the county were transferred to Bodmin in 1838.

LAUNCESTON, the second town of Tasmania, is situated in the north of the island, at the point where the North and South Esk unite to form the river Tamar. It is the northern terminus of the railway from Hobart Town (120 miles distant), and has regular communication by steamer with Melbourne. Among the places of note are

the Government buildings, the town-hall, a theatre, two hospitals, a public library, and a convent of the Presenta- tion Order. The population was 10,100 in 1847, 10,668 in 1870, and 12,753 in 1881. Launceston began to be an important settlement not long after the first colonization of Tasmania. St John's Church (Episcopal) dates from 1824. The town was incorporated in 1858.

LAUREATE. See Roya Housznorp.

LAUREL. There are at least four shrubs or small trees which are called by this name in Great Britain, viz., the common or cherry laurel (Cerasus Laurocerasus, Lois.), the Portugal laurel ((. lusitanica, Lois.), the bay or sweet laurel (Laurus nobilis, L.), and the spurge laurel (Daphne Laureola, L.). The first two belong to the rose family (Rosacew), and are regarded by Bentham and Hooker as a subgenus of Prunus, L. (Genera Plantarum, i. p. 610), to which genus Linnazus referred them.

The common laurel is a native of the woody and sub- alpine regions of the Caucasus, of the mountains of northern Persia, of north-western Asia Minor, and of the Crimea. It was received into Europe in 1576 (De Can- dolle, Prod., ii. p. 540), and flowered for the first time in 1583. Ray in 1688 relates that it was first brought from Trebizonde to Constantinople, thence to Italy, France, Germany, and England. Parkinson in his Paradisus records it as growing in a garden at Highgate in 1629; and in Johnson's edition of Gerard's Lerbal,

published in 1633, it is recorded that the plant ‘is now got into many of our choice English gardens, where it is well respected for the beauty of the leaues and their lasting or con- tinuall greennesse ” (see Loudon’s Arboretum, ii. p. 717). The leaves of this plant are rather large, broadly lance- shaped, and of a leathery consistence, the margin being somewhat serrated. They are remarkable for their poison- ous properties, giving off the odour of bitter almonds when bruised ; the vapour thus issuing is sufficient to kill small insects. Cherry laurel water is a solution of the volatile oil, The leaves when cut up finely and distilled yield the oil of bitter almonds and hydrocyanic (prussic) acid. Sweetmeats, custards, cream, &c., are often flavoured with laurel-leaf water, as it imparts the same flavour as bitter almonds ; but it should be used sparingly, as it is a danger- ous poison, having several times proved fatal. The first case occurred in 1731, which induced a careful investiga- tion to be made of its nature, which was discovered by Schrader in 1802 to be hydrocyanic acid. The effects of the distilled laurel-leaf water on living vegetables is to destroy them like ordinary prussic acid ; while afew drops act on animals as a powerful poison. It was introduced into the British pharmacopeia in 1839, but is more gene- rally superseded by the use of hydrocyanic acid. The following varieties of the common laurel are in cultiva- tion: —the Caucasian (Prunus Laurocerasus caucasica), which is hardier and bears very rich dark-green glossy foliage; the Versailles laurel (P. L. latifolia), which has larger leaves; the Colchican (P. L. colchica), which is a dwarf-spreading bush with narrow sharply serrated pale green leaves. There is also the variety rotundifolia with short broad leaves, the Grecian with narrow leaves, and the Alexandrian with very small leaves. See Hemsley’s Handbook of Hardy Trees, &c., p. 141.

The Portugal laurel is believed to be a native of Portugal and Madeira. This tree, together with a variety called Z/zxa, Ser., which bears larger leaves and has the flowers more loosely disposed, were found growing together in 1827 on the Serra de Gerez in Portugal, the former being 20 feet high while the latter attained to 70 feet, Tt was introduced into England about the year 1648, when it was cultivated in the Oxford Botanic Gardens. During the first half of the 18th century this plant, the common

laurel, and the holly were almost the only hardy evergreen shrubs procurable in British nurseries. They are all three tender about Paris, and consequently much less seen in the neighbourhood of that city than in England, where they stand the ordinary winters but not very severe ones. There is a variety (myrtifolia) of compact habit with smaller narrow leaves, a variegated variety, and one of recent introduction (azorica), probably not so hardy as the Continental form. See LMandbook of Hardy Trees, &c., p- 141.

The evergreen glossy foliage of the common and Portugal laurels render them well adapted for shrubberies, while the racemes' of white flowers are not devoid of beauty. The former often ripens its insipid drupes, but the Portugal rarely does so. It appears to be less able to accommodate itself to the English climate, as the wood does not usually "ripen" so satisfactorily. Hence it is rather more liable to be cut by the frost. According to Prof. A. Gray neither the common nor the Portugal laurel stands either the summer or the winter climate of the United States.

The bay or sweet laurel (Laurus nodilis, L.), belongs to the family Lawracex, which contains sassafras, benzoin, camphor, and other trees remarkable for their aromatic properties. It is a large evergreen shrub, sometimes reaching the height of 60 feet, but rarely assuming a truly tree-like character. The leaves are smaller than those of the preceding laurels, possessing an aromatic and slightly bitter flavour, and are quite devoid of the poisonous pro- perties of the cherry laurel. The small yellowish-green flowers are produced in axillary clusters, and consist of a calyx only, which encloses nine stamens in the male, the anthers of which dehisce by valves which lift upwards as in the common barberry, and carry glandular processes at the base of the filament. The fruit consists of a succulent berry surrounded hy the persistent base of the calyx. The bay laurel is a native of Italy, Greece, and North Africa, and is abundantly grown in the British Isles as an evergreen shrub, as it stands most winters. The date of its introduc- tion is unknown, but must have been previous to 1562, as it is mentioned in Turner's /Zerbal

published in that year. A full description also occurs in Gerard's Herbal, 1597, p. 1222, It was used for strewing the floors of houses of distinguished persons in the reign of Elizabeth. Several varieties have been cultivated, differing in the character of their foliage, as the wdulata or wave-leafed, salicifolia or willow-leafed, the variegated, the broad- leafed, and the curled; there is also the double-flowered variety. The bay laurel was carried to North America by the early colonists, but, like the others, apparently does not thrive there.

This laurel is generally held to be the Daphne of the ancients, though at least Dr Lindley, following Gerard (Herbal, 1795, p. 761), asserts that the Greek Daphne was Ruseus racemosus. Among the Greeks the laurel was sacred to Apollo, especially in connexion with Tempe, in whose laurel groves the god himself obtained purification from the blood of the Python. This legend was dramatically represented at the Pythian festival once in eight years, @ boy fleeing from Delphi to Tempe, and after a time being led back with song, crowned and adorned with laurel. Similar Sapyngpoplat were known elsewhere in Greece. Apollo, himself purified, was the author of purification and atonement to other penitents, and the laure] was the symbol of this power, which came to be generally associated with his person and sanctuaries. The relation of Apollo to the laurel was expressed in the legend of DAPHNE (q.v.). The victors in the Pythian games were crowned with the laurels of Apollo, and thus the laurel became the symbol of triumph in Rome as well as in Greece. As Apollo was the god of poets, the Lawrea Apollinaris naturally belonged to poetic merit, and so we still have a poet laureate. The various prerogatives of the laurel among the ancients are collected by Pliny (Hist. Nat., xv. 30). It wasa sign of truce, like the olive branch; letters announcing

victory and the arms of the victorious soldiery were garnished with it; it was thought that lightning could not strike it, and the

emperor Tiberius always wore a laurcl wreathe during thunder-storms.! From its association with the divine power of purification and protection, it was often set before the door of Greek houses, and

among the Romans it was the guardian of the gates of the Cesars (Ovid, Afet., i. 562 sg.). The laurel worn by Augustus and his successors had a miraculous history : the laurel grove at the imperial villa by the ninth milestone on the Flaminian way sprang from a shoot sent from heaven to Livia Drusilla (Sueton., Galba, i). Like the olive, the laurel was forbidden to profane use. It was employed in divination ; the crackling of its leaves in the sacred flame was a good omen (Tibull., ii. 5, 81), and their silence unlucky (Propert., ii, 21); and the leaves when chewed excited a prophetic afilatus (Sa¢ynpdyo:, comp. Tibull,, wé supra, line 63). There is a poem enumerating the ancient virtues of the laurel by J. Passeratins,

1594. .

The last of the plants mentioned above under the name of laurel is the so-called spurge laurel (Daphne Laure. ola, L.). This and one other species (D. Mezereum, L.), the mezereon, are the sole representatives of the family Thymelacex in Great Britain. The spurge laurel is a small evergreen shrub, with alternate somewhat lanceolate leaves with entire margins. The green flowers are produced in early spring, and form drooping clusters at the base of the leaves. The calyx is four-cleft, and carries eight stamens in two circles of four each within the tube. The pistil forms a berry, green at first, but finally black. De Candolle says they are poisonous to all animals except singing birds. The mezereon differs from it in blossoming before the leaves are produced, while the flowers are lilac instead of green. The bark furnishes the drug Cortex Mezerei, for which that of the spurge laurel is often substituted. Both are power- fully acrid, but the latter is less so than the bark of meze-reon. It is now only used as an ingredient of the compound decoction of sarsaparilla (Pharmacographia, p. 487). Of other species in cultivation there are D. Fortunei from China, which has lilac flowers; D. pontica, a native of Asia Minor; D. alpina, from the Italian alps; D. collina, South European ; and D. Cneorum, the garland flower or trailing daphne, the handsomest of the hardy species. See Hemsley’s Handbook of Hardy Trees, &c., p. 394; Loudon’s Arboretum, iii, p. 1807 sz. (c. H.)

LAURENS, Henry (1724-1792), American statesman, was born at Charleston, South Carolina, in 1724, of Huguenot ancestry. After receiving a good education, he entered a counting-house in London by way of preparation for commercial pursuits, in which he engaged, after his return to Charleston, with such success as to amass rapidly a large fortune. He accepted ardently the advanced views of individual rights then prevalent in the colony, and was several times engaged in stubborn contests with the crown judges, in which he resisted their alleged arbitrary and oppressive rulings, not only by all legal means at his command, but in occasional pamphlets, the vigour and legal acumen of which attracted much attention. He retired from active business in 1771, and spent the next three years in Europe in travel, and in superintending the education of his sons in England. In 1774 he united with thirty-seven other Americans in a petition to parliament against the passing of the Boston Port Bill, in the hope of averting war. Becoming convinced that a peaceful settle- ment was impracticable, he returned to Charleston at the close of 1774, to take part with his fellow colonists in the impending struggle. He was soon made president of the South Carolina council of safety, and in 1776 a delegate from that colony to the general continental congress at Philadelphia, of which body he was president during 1777-78. Throughout these years he was a steadfast and influential promoter of the colonial cause, and a trusted friend of Washington. In 1778 he undertook a mission as minister plenipotentiary to Holland, in furtherance of

1 A similar superstition still exists among the peasants of the Pyrenees,

secret negotiations for a commercial treaty which had been some time in progress ; but, while on the way, he was captured by a British frigate, and taken to London. On the evidence of his papers, which he had vainly attempted to destroy, war was declared upon Holland by Great Britain, and Laurens was closely imprisoned in the Tower. During his imprisonment of nearly fifteen months, his health became greatly enfeebled, yet he steadily refused opportunities for procuring release by abandoning his patriotic principles. Having been set free

late in 1781, he was appointed by congress one of the commissioners for negotiating the peace; and, proceeding to Paris with Franklin and Jay, he signed with them, on November 30, 1782, the preliminaries of the treaty. Failing health obliged him to return to Charleston, South Carolina, where he passed his remaining years in retirement, much respected and beloved by his countrymen. He died in December 1792, and, in accordance with the directions of his will, his body was burned, and the bones and aslies were carefully collected and buried. The most valuable of his papers and pamphlets have been published by the South Carolina Historical Society.

LAURENS, Joun (1756-1782), an American revolu- tionary officer of distinguished bravery, son of Henry Laurens noticed above, was born at Charleston, South Carolina, in 1756. He was educated in England, and on luis return to America in 1777, in the height of the revolu- tionary struggle, he joined Washington's staff. He soon gained his commander's confidence, which he reciprocated with the most devoted attachment, and was entrusted witli the delicate duties of a confidential secretary, which he performed with much tact and skill. He was present in all Washington's battles, from that of the Brandywine to Yorktown, and his gallantry on every oecasion has gained him the title of 'the Bayard of the Revolution." Laurens displayed bravery even to rashness in the storming of the Chew mansion at Germantown; at Monmouth, wliere he saved Washington's life by rushing between him and danger, and was himself severely wounded; and at Coosahatchie, where, with a handful of men, he defended a pass against a large English force under General Prevost, and where he was again wounded. In command of a body of light infantry at the storming of Savannah, he was among the first to penetrate the English lines, and again distingnished himself at the siege of Charleston in 1780. After the capture of Charleston by the English, he rejoined Washington, and was selected by him as a special envoy to appeal to the king of France for supplies for the relief of the American armies, which had been brought by pro- longed service and scanty pay to the verge of dissolution. The more active co-operation of the French fleets with the land forces in Virginia, which was one result of his mission, brought about the unexpected overwhelming of Cornwallis at Yorktown.

Laurens lost no time in rejoining the army, and at Yorktown was at the head of the American storming party which captured the first redoubt, and received the sword of Colonel Campbell, its commander. Laurens was designated with Count de Noailles to arrange the terms of a surrender, which occurred October 19, 1781, and virtually ended the war, although desultory skirmishing, especially in the south, attended the months of delay before peace was formally concluded. In one of these trifling affairs in July 1782, on the Combahee Ferry, Laurens exposed himself needlessly and was killed. Washington lamented deeply the death of Laurens, then in his twenty-seventh year, saying of him, “ He had not a fault that I could dis: cover, unless it were intrepidity bordering upon rashness.

LAURIA, or Lorta, a city of Italy in the province of Potenza, 13 miles south of Lagonegro, consisting of a walled town on the steep side of a hill and another portion in the

plain below. The castle was the birthplace of Ruggiero di Loria, the great Italian admiral of the 13th century. The population was 10,609 in 1871.

LAURVIK, or Lavrvie, a seaport town of south-eastern Norway, in the amt of Jarlsberg, is situated at the head of a short fjord, near where the Lougen or Laagen Elv falls into the sea. A considerable trade in timber and fish is carried on; and formerly the best Norway iron was produced in the immediate neighbourhood, at Fritzé ; but the works are now used as a saw-mill, About a mile to the south is Frederiksveern, formerly a station of the Norwegian fleet, and the seat of a naval academy. The population of Laurvik in 1875 was 7681.

LAUSANNE, the chief town of the canton of Vaud in Switzerland, liey about 27 miles N.E, of Geneva and 1 mile to thé N, of the lake, which used not unfrequently to be called the Lake of Lausanne instead of the Lake of Geneva. It isthe junction of the railways to Geneva from Bern and the Rhone valley, and has direct communication with Paris via

Pontarlier, A railway worked by a cable connects the town proper with the village and port of

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Plan of Lausanne.

4, Hotel de Ville. 5. Post Office. 6. Penitentiary,

1, Academy. 2. Corn Exchange ‘ 3. Arlaud Museum. |

7. Scotch Church. 8. English Church. 9. Ouchy Chureh.

Ouchy on tlie lake. Built on the lower slopes of Mont Jorat, partly on the crests and declivities of three hills and partly in the intervening valleys, Lausanne presents a fine appearance from the water, and in ttm enjoys a wide out- look over the Alps of Savoy on the farther side. Modern improvements have largely modified the original character- istics of the site. The Great Bridge, designed by Pichard (1790-1841) and opened to traffic in Oct. 1844 crosses the Flon, and unites the quarters of St Francis and St

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Lawrence; and a roadway with easy gradients due to the game engineer tunnels beneath the castle and passes round the city. The Place de Riponne, the most spacious of the public squares and the site of the great corn-market and the Arlaud museum, is an artificial level secured by massive substructions above the channel of the Louve. Lausanne is rapidly extending in all directions, and especially towards the south and west. The principal building is the cathedral of Notre

Dame, which occupies a terrace on the highest hill. It is a good example of plain and massive Gothic, the ground plan a Latin cross, and the interior remarkably simple. The erection is assigned to 1235-1275, and the dedication was performed by Gregory X. in presence of the emperor Rudolph of Hapsburg. To the north of the cathedral on the highest point in the city stands the castle, a structure of the 15th century. The academy, founded by the Bernese authorities in 1589, has numbered among its teachers Theodore Beza, Conrad Gessner, De Crousaz, Vinet, and Juste Olivier. The Arlaud museum founded in 1846, the blind asylum established by a wealthy English- man, Mr Haldiman, the penitentiary designed by Pichard, the great cantonal hospital, the theatre, and the cantonal library (80,000 volumes) are among the more noteworthy of the remaining institutions. Besides the well-known Society of Naturalists (established 1841) there are in the town a medical and an historical society (1837). Since the days of Gibbon, whose praises of the town have been often repeated, Lausanne has become a favourite place of residence for foreigners, and an international centre of education. The population was 26,520 (22,610 Protest- ants, 3517 Roman Catholics) in 1870, and 30,179 in 1880. At the end of the 18th century it was only 9000.

Though Lausanne (Latin, Lausonium ; Lausanna in Tab. Peut.) undoubtedly existed at an earlicr date, it was when Bishop Marius of Aventicum (c. 598) chose one of its hills as the new seat of his bishopric that its history practically began. The little episcopal city had a rival in an independent German community on the neighbouring hill, but after long struggles the bishop was. recog- nized as official head of the united community, on condition that every year in May he convoked the three estates to the plaid général. This state of matters lasted till the beginning of the 16th century. In 1536 the Bernese deprived the bishops of their temporal autho- rity, transferred most of the goods of the church to the secular domain, and appointed intendants of their own to guide the action of the local magistracy. In this state of pupilage to Bern the city remained till the Revolution, and in 1798 it was made the chief town of the newly constituted canton of Vaud. In 1875 it was chosen as the seat of the supreme court of the

Swiss confederation. Among the eminent men born in Lausanne are Benjamin Constant and the Secretahs.

See Ludovieus, Chronicon breve Episcoporum Laus., published by Gremaud in 1856; Schmitt, Hist. dw diocésc de Lausanne; Bridel, Matériaux pour une hist. litt. de VAcad. de Lausanne; the Mémoires of the Soc. dhist. de la Suisse romande; Rodolphe Rey, Geneve et les rives du Leman, 1875. The Gazette de Lausanne dates from 1798, though its present name was adopted only in 1804.

LAVA. See GEoLoey.

LAVAGNA, a market-town of Italy, in the province of Genoa, situated on the sea-coast about a mile east of Chiavari, on the railway between Genoa and Pisa. It has a little shipbuilding, and exports (to France, Portugal, Constantinople, &c.) large quantities of excellent slate quarried in the vicinity. Among its buildings are two fine churches, and palaces belonging to the Rivarola, the Palla- vicini, and Fransoni families. The population in 1871 was 5055 for the town and 6066 for the commune.

In the 10th century Lavagna was the seat of the independent courts Fieschi, who, after a severe struggle (1166-1198), were obliged to recognize the supremacy of Genoa. Among the mem- bers of the family born at Lavagna are Sinibaldo (Pope Innocent IV.) and Giovanni Luigi, the famous conspirator against the Doria he Genoa, Filippo of Lavagna was the first printer in Milan

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_ LAVAL, capital of the department of Mayenne, France, is situated on the Mayenne, 186 miles by railway west from Paris. On the right bank of the river stands the

old feudal city, with its ancient castle, and its irregularly built houses whose slate roofs and pointed gables peep from the groves of trees which clothe the hill. On the left bank the regularly built new town extends far into the plain. The river, here 80 yards broad, is crossed by

the handsome railway viaduct, a beautiful stone bridge called “ Pont Neuf,” and the Mayenne bridge of three pointed arches, built in the 16th century. There is communication by steamer as far as to Angers. Laval may justly claim to be one of the loveliest of French towns. Its most curious and interesting monument is the sombre-looking old castle of the counts, now transformed into a prison. The new castle, dating from the Renaissance, is now the court house. Laval possesses several churches of different periods: in that of the Trinity, which serves as the cathedral, the transept is of the 12th century while the choir is of the 16th; the chapel of the Carmelites is an imitation of the Sainte Chapelle at Paris ; Notre Dame des Cordeliers, which dates from the end of the 14th century or beginning of the 15th, has some fine marble altars. Half a mile below the Mayenne bridge is the beautiful 12th century church of Aveniéres, with an ornamental spire of 1534 and a handsome modern pulpit. The finest remaining relic of the ancient fortifications is the Beucheresse gate near the cathedral. There is a scientific museum, and a library containing 25,000 volumes. The town is em- bellished by fine promenades, at the entrance of one of which, facing the mairie, stands the statue of the celebrated surgeon Anibrose Paré. On the Place de Cheverus is a statue to the cardinal of that name, archbishop of Bordeaux. ‘The principal industry of the town is the linen manufacture, introduced from Flanders in the 14th century. A large cloth hall (Halle-aux-toiles), built in last century is used now for industrial, artistic, and agricultural exhibitions. At present tickings are chiefly made. This industry occupies ten thousand workmen, who are not gathered together in great factories, but scattered all over the town. Cotton spinning is also carried on, and there are tanneries, flour-mills, foundries, paper-works, and dye-works. Here also tle marbles of the neighbourhood are sawn, the greater part being converted into lime. Laval is the seat of a bishop, and has a lyceum. Population

27,000.

The history of Laval goes back only to the beginning of the 11th century, but from an early date in the feudal period the barons of Laval were distinguished by their valour and power, and by their alliances.

One of them followed William the Conqueror into England. After having assumed the cross they allied themselves with the Montmorencys and Montforts, and their barony passed on later to the Colignys and the La Trémoilles. Laval was taken by

Talbot in 1428. It changed hands several times during the wars of the League and the war of La Vendée in 1793.

LAVATER, Jowann Kaspar (1741-1801), is a remark- able instance of a man who has obtained celebrity by following a bypath apart from the proper work of his life. As a preacher, theological writer, and spiritual director he occupied during his lifetime a position not very dissimilar to that held by Keble in our own day, but he survives for posterity chiefly as the author of a work on physiognomy. He was born at Ziirich, November 15, 1741. Consistent with himself from the first, he manifested little application to study, but great depth of feeling, especially on religious themes, and a remarkable fluency of fervent and persuasive discourse. When barely one and twenty he greatly distinguished himself by denouncing, in con- Junction with his friend the painter Fuseli, an iniquitous magistrate, who was compelled to make restitution of his ill-gotten gains. In 1769 Lavater took orders, and officiated till his death as deacon or pastor in various churches in his native city. The advantages of his manner and address, as well as his oratorical fervour and genuine

dal depth of conviction, gave him great personal influence, especially with women; he was extensively consulted as a casuist, and was welcomed with demonstrative enthusiasm in his numerous journeys through Germany. His mystical writings were also widely popular. Scarcely a trace however, of this influence has remained, and Lavater’s name would be forgotten but for his work on physiognomy, Physiognomische Fragmente zur Beforderung der Menschen-kenntniss und Menschenliebe, Leipsic, 1775-78, republished in French with extensive additions by the author. The fame even of this universally known book rests to a great extent upon the handsome style of publication and the accompanying illustrations. It is not to be compared with the subsequent labours of Caius for scientific value,

and leaves the study of physiognomy as desultory and unsystematic as it found it. The author's remarks, nevertheless, frequeutly display remarkable acuteness and insight into character, and the illustrations render it very valuable to artists. Next to his physiognomy, Lavater is perhaps chiefly remembered for his acquaintance with Goethe, and the lively portrait of him in Wahrheit und Dichtung. The impression he produced upon one so dissimilar to himself shows that the man was greater than his works. At a later period Goethe became estranged from him, somewhat abruptly accusing him of superstition and hypocrisy. Of the former charge he cannot be acquitted, seeing that he had manifested a tendency to run after Cagliostro; but he seems to have been no more open to the latter than every man whose ideal of creed aud conduct is too exalted to be maintained with unvarying consistency. A more cogeut reason for Lavater's discredit with Goethe was his intellectual intolerance. No man was more bigoted upon paper, while in truth his heart was open to all. He was continually propounding the alternative of his own form of Christianity or atheism ; and it is indeed true that, if passages in his own writings are to be taken literally, he was himself incapable of conceiving a Deity apart from the person of the Redeemer. Much that he has written might be expressed in the language of Feuerbach with but slight alteration. He had a mystic's indifference to historical Christianity, and, although esteemed by himself and others a champion of orthodoxy, was in fact only an antagonist of rationalism. During the latter years of his life his influence waned, and he incurred ridicule by some exhibitions of vanity, pardonable in the recipient of so much incense. He redeemed himself by his patriotic conduct during the troubles occasioned by the French occupation of Switzerland, which brought about his tragical death. On the taking of Ziirich by the French in 1799, Lavater, while endeavouring to appease the soldiery, was shot through the body by an infuriated grenadier, and died after long sufferings borne with great fortitude, on January 2, 1801. His life was written in the following year by his son-in-law Georg Gessner, with natural partiality and unavoidable reticences, but faithfully in the main. There are more recent biographies by Hegner and Bode- mann, the latter entirely from the religious point of view. LAVAUR, chief town of an arrondissement in the department of Tarn, France, 25 miles E.N.E. of Toulouse, stands

at a height of 460 feet on the left bank of the Agout (a tributary of the Tarn), which is here crossed by a bold bridge of a single arch of 160 feet span. The most interesting monument of Lavaur is its cathedral, which dates from the 14th and 15th centuries In front of it is an octagonal bell-tower, without a spire, 131 feet high; a second smaller square tower contains a yaquemart (a metal statue which strikes the hours with a hammer) of the 16th century. In the bishop's garden is the statue of Las Cases. The chief industry of Lavaur is sericulture, but wool-spinning and tanning occupy some of the people.

The town has 7560 inhabitants. It was taken by Simon de Montfort during the war of the Albigenses, and several times during the religious wars of the 16th century.

LAVENDER, botanically Zavandula, a genus of Labiatz distinguished by an ovate tubular calyx, a two- lipped corolla, of which the upper lip has two and the lower three lobes, and four stamens bent downwards,

The plant to which the name of lavender is commonly applied, Lavandula vera, D.C., is a native of the moun- tainous districts of the countries bordering on the western half of the Mediterranean, extending from the eastern coast of Spain to Calabria and northern Africa, growing in some places at a height of 4500 feet above the sea-level, and preferring stony declivities in open sunny situatious. It 1s cultivated in the open air as far north as Norway and Livonia. Lavender forms an evergreen undershrub about 2 feet high, with greyish-green hoary linear leaves, rolled under at the edges when young; the branches are erect, and givea bushy appearance to the plant. The flowers are borne on a terminal spike at the summit of a long naked stalk, the spike being composed of 6-10 verticillasters or dense cymes in the axils of small, brownish, rhomboidal, tapering, opposite bracts, the verticillasters being more widely separated towards the base of the spike. The calyx is tubular, contracted towards the mouth, marked with 13 ribs and 5-toothed, the posterior tooth being the largest. The corolla is of a pale violet colour, but darker on its inner surface, tubular, two-lipped, the upper lip with two and the lower with

three lobes. Both corolla and calyx are covered with stellate hairs, amongst which are imbedded shining oil glands to which the fragrance of the plant is due. The leaves and flowers of lavender are said to have been used by the ancients to perfume their baths; hence the name Lavandula is supposed to have been derived from lavare, to wash. But, although S. Stechas was well known to the ancients, no allusion unquestionably refer- ring to Z. vera has been found in the writings of classical authors, the earliest mention of the latter plant being in the 12th century by the abbess Hildegard, who lived near Bingen on the Rhine. Under the name of llafant or llafantly it was known to the Welsh physicians as a medi- cine in the 13th century. In England lavender is cultivated chiefly for the distillation of its essential oil, of which it yields on an average 14 per cent. when freed from the stalks, but in the south of Europe the flowers form an object of trade, being exported to the Barbary states, Turkey, and America.

In Great Britain lavender is grown in the parishes of Mitcham, Carshalton, and Beddington in Surrey, where about 800 acres are under cultivation, and in Hertfordshire, in the parish of Hitchin, to the extent of 50 acres. The most suitable soil seems to be a sandy loam with a caleareous substratum, and the most favourable position a sunny slope in localities elevated above the level of fogs, where the plant is not in danger of early frost and is freely exposed to air and light. At Hitchin lavender is said to have been grown as early as 1568, but as a commercial speculation its cultivation dates back only to 1823. The plants at present in cultivation do not produce seed, and the propagation is always made by slips or by dividing the roots. The latter plan has only been followed since 1860, when a large number of lavender plants were killed by a severe frost. Since that date the plants have been subject to the attack of a fungus, in consequence of which the price of the oil has been con- siderably enhanced, and the discase is likely, if it continues, to affect seriously the cultivation of the herb. At Market Deeping in

Lincolnshire, where lavender was formerly grown, its cultivation has ae diseontinued on this aecount. The flowers are collected in the beginning of August, a

direct to the still. The yield of oil Hecrae in great autres the weather. After a wet and dull June and July the yield is sometimes only half as much as when the weather has been bright and sunshiny. From 12 to 30 1b of oil per acre is the averace amount obtained. The oil contained in the stem has a more rank odour and is less volatile than that of the flowers ; consequently the portion that distils over after the first hour and a half is collected separately.

The finest oil is obtained by the distillation of the flowers with: out the stalks, but the labour spent upon this adds about 10s. per tb to the expense of the oil, and the same end is practically attained by the fractional distillation. The oil mellows by keeping three years, after which it deteriorates unless mixed with alcohol; it is also improved by redistillation. Oil of lavender is distilled from the wild plants in Piedmont and the South of France, especially in the villages about Mont Ventoux near Avignon, and in those some leagues west of Montpellier. The best French oil realizes searcely one-sixth of the price of the English oil. Cheapcr varieties are made by distilling the entire plant.

Oil of Lavender is a mobile liquid having a specifie gravity from 0°78 to 0°96 (Zeller). It appears to be a mixture in variable propor- tion of oxygenated oils and a stearoptene, the latter being identieal, aecording to Dumas, with common camphor. Its adulteration with alcohol may be detected by chloride of calcium dissolving in it and forming a separate layer of liqnid at the bottom of the vessel. Glycerin acts in the same way. If it contain turpentine it will not dissolve in three volumes of alcohol, in which quantity the pure oilis perfectly soluble.

Lavender flowers were formerly considered good for ‘‘all dis- orders of the head and nerves”; a spirit prepared with them was knewn under the name of palsy drops. At the present day a com- pound spirit of lavender, official in the British pharmacopceia, is sometimes given in conjunction with other stimulants to nervous and hysterical persons suffering from depression of spirits, or is used to give a colour and flavour to medicine.

Lavender water consists of a solution of the volatile oil in spirit of wine with the addition of the essences of musk, rose, bergamot, and ambergris, but is very rarely prepared by distillation of the floweis with spirit.

In the climate of New York lavender is scarcely hardy, but in the vicinity of Philadelphia considerable quantities are grown for the market, the dried flowers being used for sachels or scent bags and for perfuming linen, &c. In American gardens swect basil (Ocimum basilicunr) is frequently called lavender.

Lavandula Spiea (D.C.), a species which differs from L. vera ehicfly in its smaller size, more crowded leaves, and lincar bracts, is also used for the distillation of an essential oil, which is known in England as oil of spike and in France under the name of essence d'aspic. _ It _is used in painting on porcelain and in veterinary medicine. The oil as met with in commerce is less fragrant than that of LZ. vera,—probably because the whole plant is distilled, for the flowers of the two spceies are scarecly distinguishable in frag- rance. L, Spica does not extend so far nortli, nor ascend the mountains beyond 2000 feet. It cannot be cultivated in Britain except in sheltered situations. A nearly allied species, L. Janata (Boiss.), a native of Spain, with broader leaves, is also very fragrant, but does not appear to be distilled for oil.

Lavandula Stecchas (L.), a species extending from the Canaries to Asia Minor, is distinguished from the above plants by its blackish purple flowers, and shortly-stalked spikes crowned by conspicnous purplish sterile bracts. The flowcrs were official in the London pharmacopeeia as late as 1746. They are still used by the Arabs as an expectorant and antispasmodic. The Stcechades (now called the isles of Hyéres near Tonlon) owed thcir name to the abundance of the plant growing there.

Several other species of lavender (twenty in all) are known, some of which extend as far cast as to India. A few which differ from the above in having divided leaves, as L. dentata, L. abrotanoides, L, nultifolia, L. pinnata, and L. viridis, have been cultivated in greenhouses, &c., in England.

Sea lavender is a name applied in England to several species of Statice, a genus of littoral Plumbaginaceous plants. Lavender cotton is a specics of the genus Santolina, small, yellow-flowered,

evergreen undershrubs of the Composite order.

See Pharmacographia, p. 476; De Candolle,Prodromus, xii. p. 145; Pharm. Journal, (1) xi. p. 83; (1) viii. p. 276; (2) 1. p. 2783 (3) iii. p. 826; (8) iv., p. 161; (8) v. p. 1825 (3) viii. p. 301; (3) x. p. 6865 Guigins, Histoire des Lavandes, 1826, (E. M. H.)

LAVOISIER, Antoine Laurent (1743-1794), one of the founders of modern chemistry, was born in Paris, August 26, 1743. His father, a wealthy tradesman, gave him an excellent education at the Collége Mazarin, and encouraged his desire to adopt the career of science. On quitting college, he devoted himself to study with extra- ordinary ardour: he followed the astronomical and mathe- matical course of Lacaille, worked in the laboratory of Rouelle, and took lessons in botany from Jussieu; he renounced all frivolous society, and even restricted himself to a diet of milk in order to repair the damage to his con- stitution caused by excessive application. His first public distinction was gained on the occasion of a prize offered by the Academy of Sciences for an essay on the best mode of

lighting the streets of Paris, To increase the sensitive- ness of his eyes, he immersed himself for six weeks in a room hung with black, from which all light was excluded except that of the lamps experimented upon. His zeal was a pledge of success, and was rewarded with the gold medal, April 9, 1766. A multitude of subjects now en- gaged his attention. He presented to the Academy a masterly analysis of gypsum; travelled through France with Guettard, who was occupied in constructing the first geological map of the country, and composed a work, of which a fragment entitled Mémoire sur les couches des montagnes found a place in the Academy collection for 1789 ; refuted the prevalent error as to the conversion of water into silica by repeated distillation, and studied the phenomena of thunder and aurore, of

crystallization and congelation. He became an associate of the Academy in 1768, and in 1769 obtained the lucrative post of farmer-general of the revenue, with a view to increase the re- sources at his command for the advancement of science.

It was about the year 1770 that the vast possibilities of the new field opened to the researches of chemists by the pneumatic discoveries of Black, Cavendish, and Priestley were recognized by Lavoisier, and the perception gave to his genius the definitive impulse hitherto wanting to it. He repeated and verified experiments which became, in his hands, the means of invalidating their authors' conclusions, and prepared to import the clear-cut precision of his own ideas into a science as yet illogical in form and incoherent in expression. His wealth and position, as well as his enthusiasm, eminently qualified him to lead a successful reform. He lived in the midst of the most stimulating society of his time. Between him and such men as Laplace, Monge, Berthollet, and Fourcroy the constant interchange of ideas established a community of opinion in physical matters so close that the separate intellectual property of each was all but completely merged in the general stock! On one day in each week Lavoisier threw open his laboratory to a select few of his friends, communi- cated the results of his labours, and invited their criticism and advice. By this consultative system his work gained in solidity, and lost nothing in originality. On the 1st of November 1772 Lavoisier, eager to secure the credit of priority, deposited at the Academy a sealed packet contain- ing the record of his earliest conclusions on the crucial point of metallic oxidation. The discovery by Priestley in 1774 of "dephlogisticated air" materially assisted the development of the innovating doctrine, which took the form of a fully fledged theory when Lavoisier in 1778 assigned to the new substance, with the name of " oxygen," the important functions of the universal "acidifying prin- ciple." His analysis of water in 1784, and synthesis of "fixed air" (called by him "carbonic acid," Academy Memoirs, 1781), opened the way for an extended view of the composition of organic as well as inorganic substances, and the anti-phlogistic chemistry was completed by the publication, in 1787, of the Aféthode de nomenclature chimique. The reform of language effected by Lavoisier in conjunction with Guyton de Morveau, Berthollet, and

Fourcroy was an indispensable prelude to the reform of thought. With the current alchemistic jargon science, properly so-called, could have no fellowship. The new terminology prevailed without change for fifty years, and has been fitted, by trifling modifications, to meet the exigencies of recent progress. The acceptance of the “oxygen theory ” was enormously facilitated by the defined and logical form given to it in Lavoisier’s Zrazté élémen- tare de chimie (Paris, 1789). Indeed, the history of science scarcely presents a second instance of a change

1 Guvres de Lavoisier, tom. i. p. 18.

so fundamental accomplished with such ease. The parti- sans of phlogiston did not, it is true, abandon the field without astruggle. In Berlin they met Lavoisier’s demon- strations by burning him in effigy, and in Paris Lamétherie conducted, in the Journal de Physique, a fierce polemic against the party of innovation. The controversy was, however, brief, and its issue visibly certain. Before the end of the century the reformed chemistry was everywhere in a position of uncontested triumph.

The enlightened activity of Lavoisier was no less con- spicuous in his administrative than in his scientific capacity. A prominent member of the body of farmers-general during twenty-oue years, he obtained the abolition of certain taxes equally onerous and unproductive, and earned the gratitude of the Jews of Metz by relieving them from an oppressive impost. Appointed director of the powder-works by Turgot in 1776, he not only suppressed the vexatious searches for saltpetre in the cellars of private houses, but succeeded in quadrupling the produce of the commodity. He, moreover, improved the manufacture of gunpowder so as to add one- third to its explosive force, thereby reversing the previous superiority of English over French ordnance. His philan- thropic zeal was displayed in the provincial assembly of the Orléanais in 1787. In the year following he was attached to the Caisse d’escompte, and presented a report of its opera- tions, November 21, 1789, to the Constituent Assembly. In 1790 he sat on the commission of weights and measures. In 1791 he became

commissary to the treasury, where he established a system of accounts of unexampled punctuality. Requested by the National Assembly to set forth a new scheme of taxation, he composed a treatise De la richesse territoriale de la France, of which an extract, printed at the public expense, shows him to have been possessed of sound and liberal views on political economy. In short, to quote the words of Lalande, “Lavoisier was to be found everywhere.” But those were times when to be conspicuous was to be in peril. On the 2d of May 1794, Dupin, a member of the Convention, presented a frivolous accusation against the whole of the ex-farmers-general, whose wealth constituted in itself an inexpiable crime. Lavoisier found a hiding-place for a day or two in the deserted apartments of the Academy, but, hearing that his absence was likely to prejudice the cause of his colleagues, he voluntarily gave himself up. He thought it impossible that his life could be taken, but expected the confiscation of his property, when, as he told Lalande, he proposed to earn his bread asan apothecary. Half measures, however, were not in favour with the revolutionary tribunal. On the 6th of May, he, with twenty-seven others of the same profession, was condemned to the guillotine, and, two days later, the sentence was carried into execution. “ I} ne leur a fallu,” Lagrange remarked, “qu’un moment pour faire tomber cette téte, et cent années peut-étre ne suffiront pas pour en reproduire une semblable.” It is said that a petition presented in his favour met with the brutal reply: “ The republic has no need of savants.” He was preceded on the scaffold by M. Paulze, whose gifted daughter he had married in 1771. He left no posterity.

To the gift of a transcendent intellect Lavoisier joined the charms of anoble person and winning manners. He was faithful to his friends, charitable to the poor, a model husband, and a patriotic public servant. His fame as the reformer of chemistry rests on no single discovery, but is involved in the first principles of the science (see CHEMISTRY, p. 463). It was his great merit to have made the balance the ultima ratio of the laboratory. Quantitative analysis thus became for the first time possible, and a chemical reaction took in his hands the rigid form of an algebraical equation.? His latest studies were of a physiological character, and M. Dumas* found among his papers a piece showing

that he had arrived at a remarkable anticipation of modern views concerning the relations en ME i we gg ite 3 Lecons de Chimie, 1861.

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2 Guvres, tom. i. p. 108.

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of organic to inorganic nature. He was probably the first to devote systematic attcution to agricultural chemistry, and obtained the practical success of doubling the produce of a large farm owned by him near Blois. A striking proof of his disinterested humanity is afforded by a long and painful investigation of putrefying substances carried out solely with a view to averting accidents in sewers. Not the least notable of his achievements is that of having first formed a clear idea as to the nature of gases, and of matter generally in its relation to heat. He held that bodies exist in the solid, liquid, or gaseous states according as the attractive force of their particles is superior, cqual, or inferior to the repulsive action of an universally- diffused, imponderable fluid which he called ‘‘caloric.” Differences of specific heat he attributed to differences of inter-molccular space. The theory, put forward by him with due reserve, formed a useful if not indispensable preliminary to further progress.

in a series of experiments on specific heat, of the calorimeter.

He was the | inventor of the gasometer, and, jointly with Laplace, his coadjutor | his | Béchamn, Lettres Historiques sur la Chimie.

LAW—LA W

A complete cdition of the writings of Lavoisier was issued in four vols. 4to by the Government of Napoleon IJI., under the title Cuvres de Lavoisier publiées par les soins de son Exeellence le Ministre de U Instruetion publique, Paris, 1864-68. This publication comprises, besides the works already mentioned, Opuseules physiques et chimiques (1774), a large number of memoirs trom the Academy

volumes (during the twenty years 1770-90 he contributed no less than fifty-eight), and numerous letters, notes, and reports relating to the various affairs in which he was engaged. At the time of his

‘death he was preparing an edition of his collected works, and the

portions ready for the press were published by his widow in 1805, in two 8vo vols. entitled Afémoires de Chimie. The plates in the Traité élémentaire were drawn aud engraved by Madame Lavoisier. Biographical notices of Lavoisier are given in Fourcroy’s Notice, and by Lalande in Scherer’s Naehtrdge, Jena, 1796. For an account of his discoveries see Dumas, Legons sur la Philosophie Chimique, and (A. M. C.)

LAW

Nor present article will be limited to the consideration of the phenomena presented for study by positive laws.

The objects which laws ought to subserve, the principles of |

legislation, the sphere of law, the province of government, and other topics of a similar nature which are generally to

be found in writings professing to treat of law in the | abstract have been discussed under the heading GovERN- |

MENT andelsewhere. It will be convenient, and it will be following the lines of a very remarkable development of English thought, to take actual laws as positive facts, without reference to their goodness or badness, aud examine, so far as it can be done within the limits at our command, the character which they present when looked at from different points of view. This conception of the science of law, which is closely related to the scientific ideas of the time, has been developed by the efforts of the modern school of English jurists. In former times the science of law meant anything but science as we have been taught to conceive it by physical philosophers. It meant if anything a philosophy of legal principles not necessarily related to any system of

actual law. A philosophy of laws actually existing in fact is what we in England at least should now consider the science of lawto be. By universal consent the somewhat shifting term jurisprudence has been limited to this meaning. Jurisprudence is the science of positive laws, The present article will attempt to present simply the leading principles and conclusions of juris- prudence.

The human race may be conceived as parcelled out into a number of distinct groups or societies, differing greatly in size and circumstances, in physical and moral character- istics of all kinds. But they all resemble each other in this that they reveal on examination certain rules of conduct in accordance with which the relations of the members inter se are governed. Such rules we may for the present, with- out anticipating a somewhat difficult discussion, term laws. Each society has its own system of laws, and all the systems, so far as they are known, constitute the appro- priate subject matter of jurisprudence. The jurist may deal with it in the following ways. He may first of all

examine the leading conceptions common to all the systems, ‘

or in other words define the leading terms common to them all. Such are the terms law itself, right, duty, property, crime, and so forth, which, or their equivalents, may notwithstanding delicate differences of connotation be regarded as common terms in all systems, That kind of inquiry is what is known in England as analytical juris- prudence. It regards the conceptions with which it deals as fixed or stationary, and aims at expressing them dis- tinetly and exhibiting their logical relations with each other. What is really meant by a right and by a duty, and what is the true connexion between a right and a duty, are

types of the questions proper to this inquiry. Shifting our point of view, but still regarding systems of law in the mass, we may consider them, not as stationary, but as changeable and changing, we may ask what general features are exhibited by the record of the change. This, some- what crudely put, may serve to indicate the field of historical jurisprudence. In its ideal condition it would require an accurate record of the history of all legal systems as its material. As yet the record is exceedingly incomplete, and the results are proportionately limited.

But whether the material be abundant or scanty, the method is the same. It seeks the explanation of institu- tions and legal principles in the facts of history. Its aim is to show how a given rule came to be what it is. The legislative source—the emanation of the rule from a sovereign authority—is of no importance here; what is important is the moral sourcee—the connexion of the rule with the ideas prevalent during contemporary periods. This method, it is evident, involves, not only a comparison of successive stages in the history of the same system, but a comparison of different systems, of the Roman with the English, of the Hindu with the Irish, and so on. The historical method as applied to law may be regarded as a special example of the method of comparison. The comparative method is really employed in all generalizations about law ; for, although the analysis of legal terms might be conducted with exclusive reference to one system, the advantage of testing the result by reference to other systems is obvious. But, besides the use of comparison for purposes of analysis and in tracing the phenomena of the

‘growth of laws, it is evident that for the purposes of

practical legislation the comparison of different systems may yield important results. Laws are contrivances for bringing about certain definite ends, the larger of which are identical in all systems. The comparison of these contrivances not only serves to bring their real object, often obscured as it is in details, into clearer view, but enables legislators to see where the contrivances are deficient, and how they may be improved. i— The ‘science of law,” as the expression is generally used, means the examination of laws in general in one or other of the ways just indicated. It means an investigation of laws which exist or have existed in some given society in fact—in other words, positive laws; and it means an examination not limited to the exposition of particular systems. Analytical jurisprudence is in England asso- ciated chiefly with the name of Joun AUSTIN (¢.v.), whose Province of Jurisprudence Determined systematized and completed the work begun in England by Hobbes, and con- tinued at a later date and from a different point of view by Bentham. The best

view of the subject will be obtained by taking Austin's principal positions in outline, and con-

sidering the criticisms which later jurists have bestowed upon them.

Austin's first position is to distinguish between laws properly so called and laws improperly so called. In any of the older writers on law, we find the various senses in which the word is used' grouped together as variations of one common meaning. 'Thus Blackstone advances to his proper subject, municipal laws, through (1) the laws of inanimate matter, (2) the laws of animal nutrition, digestion, &c., (3) the laws of nature, which are rules imposed by God on men and discoverable by reason alone, and (4) the revealed or Divine law, which is part of the law of nature directly expounded by God. All of these are connected by this common element that they are "rules of action dictated by some superior being." And some such generalization as this is to be found at the basis of most treatises on jurisprudence which have not been composed under the influence of the analytical school. Austin disposes of it by the distinction that some of those laws are commands, while others are not commands. 'The so-called laws of nature are not commands; they are uniformities which resemble commands only in so far as they may be supposed to have been ordered by some intelligent being. But they are not commands in the only proper sense of that word,—they are not addressed to reasonable beings, who may or may not will obedience to them. Laws of nature are not addressed to anybody, and there is no pos sible question of obedience or disobedience to them. Austin accordingly pronounces them laws improperly so called, and confines his attention to laws properly so called, which are commands addressed by a human superior to a human inferior.

This distinction seems so simple and obvious that the energy and even bitterness with which Austin insists upon it now seems superfluous. But the indiscriminate identifi- cation of everything to which common

speech gives the name of a law was, and still is, a fruitful source of con- fusion. Blackstone's statement that when God "put matter into motion He established certain laws of motion, to which all movable matter must conform," and that in those crea- tures that have neither the power to think nor to will such laws must be invariably obeyed, so long as the creature itself subsists, for its existence depends on that obedience, imputes to the law of gravitation in respect of both its origin and its execution the qualities of an Act of Parlia- ment, gravitation are imputed to certain legal principles which, under the name of the law of nature, are asserted to be

binding all over the globe, so that "no human laws are of

any validity if contrary to this." Nonsense like this so exasperated Austin that he never fails to stigmatize the use of "natural laws" in the sense of scientific facts as improper, or as metaphorical. A later writer has pointed out that law in the scientific sense has acquired a position of its own, from which it is impossible to dislodge it, and which involves none of the ambiguities and confusions against which Austin protested. It would be as reasonable for the man of science as for the jurist to set up his own conception of law as the only legitimate one. There is perhaps only one field of inquiry where the two opposed conceptions of law are still to be found entangled. The "laws of political economy" still hover in the minds of many between the jural and the scientific conception. Certain economical principles appear to have acquired a double character,—that of scientific generalizations, and that of rules which may be disobeyed. Measures are pro- nounced to be a violation of the laws of political economy, with a vague implication that these being laws of nature any violation of them must be particularly heinous. Having eliminated metaphorical or figurative laws, we

On the other hand the qualities of the law of

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restrict ourselves to those laws which are commands. This word is the key to the analysis of law, and accordingly a large portion of Austin's

work is occupied with the determination of its meaning. A command is an order issued by a superior to an inferior. It is a signification of desire distinguished by this peculiarity that “the party to whom it is directed is liable to evil from the other, in case he comply not with the desire.” ‘If you are able and willing to harm me in case I comply not with your wish, the expression of your wish amounts to a command.” Being liable to evil in case I comply not with the wish which you signify, I am bownd or obliged by it, or I lie under a duty to obeyit. The evil is called a sanction, and the command or duty is said to be sanctioned by the chance of incurring the evil. The three terms command, duty, and sanction are thus inseparably connected. As Austin expresses it in the language of formal logic; “each of the three terms signifies the same notion, but each denotes a different part of that notion, and connotes the residue.”

All commands, however, are not laws. That term is reserved for those commands which oblige generally to the performance of acts of a class. A command to your servant to rise at such an hour on such a morning is a particular command, but nota law or rule ; a command to rise always at that hour is a law or rule. Of this distinction it is sufficient to say in the meantime that it involves, when we come to deal with positive laws, the rejection of particular enactments to which by inveterate usage the term law would certainly be applied. On the other hand it is not, according to Austin, necessary that a true law should bind persons asa class. Obligations imposed on the grantee of an office specially created by parliament would imply a law; a general order to go into mourning addressed to the whole nation for a particular occasion would not be a law.

So far we have arrived at a definition of laws properly so called. Austin holds superiority and inferiority to be necessarily implied in command, and such statements as that “laws emanate from superiors” to be the merest tautology and trifling. Elsewhere he sums up the character- istics of true laws as ascertained by the analysis thus :— (1) laws, being commands, emanate from a determinate source ; (2) every sanction is an evil annexed to a com- mand ; and (3) every duty

implies a command, and chiefly means obnoxiousness to the evils annexed to commands.

Of true laws, those only are the subject of juris- prudence which are laws strictly so called, or positive laws. Austin accordingly proceeds to distinguish positive from other true laws, which are either laws set by God to men or laws set by men to men, not, however, as political superiors nor in pursuance of a legal right. The discussiol1 of the first of these true but not positive laws leads Austin to his celebrated discussion of the Utilitarian theory. The laws set by God are either revealed or unrevealed, 7.¢., either expressed in direct command, or made known to men in one or other of the ways denoted by such phrases as the “light of nature,” “natural reason,” “dictates of nature,” and so forth. Austin maintains that the principle of general utility, based ultimately on the assumed bene- volence of God, is the true index to such of His commands as He has not chosen to reveal. His exposition of the meaning of the principle isa most valuable contribution to moral science, though he rests its claims ultimately on a basis which many of its supporters would disavow. And the whole discussion is now generally condemned as lying outside the proper scope of the treatise, although the reason for so condemning it is not always correctly stated. It 1s found in such assumptions of fact as that there is a God, that He has issued commands to men in what Austin calls the “truths of revelation,” that He designs the happiness

of all His creatures, that there is a predominance of good in

the order of the world-which do not now command uni- versal assent. It is impossible to place these: propositions on the same scientific footing as the assumptions of fact with reference to human society on which jurisprudence rests. – If the-‘‘Divine laws” were facts like Acts of Parlia- ment, it is conceived that the discussion of their character- istics would not be out of. place in a scheme of juris- prudence. ,

The second set of laws properly so called, which are not positive laws, consists of three classes:—(1) those which are set by men living in a

state of nature; (2) those which are set by sovereigns but not as political superiors, e.g., when one sovereign commands another to act according toa prin- ciple of international Jaw ; and (3) ~~those set by subjects but not in pursuance of legal rights. This group, to which Austin gives the name of positive morality, helps to explain his conception of positive law. Men are living in a state of nature, or a state of anarchy, when they are not living in a state of government or as members of a political society. " Political society" thus becomes the central fact of the theory, and some of the objections that have been urged against it arise from its being applied to conditions of life in which Austin would not have admitted the existence of a political society. Again, the third set in the group is intimately connected with positive laws on the one hand and rules of positive morality which are not even laws properly so called on the other. Thus laws set by subjects in consequence of a legal right are clothed with legal sanctions, and are laws positive. A law set by guardian to ward, in pursuance of a right which the guardian is bound to exercise, is a positive law pure and simple; a law set by master to slave, in pursuance of a legal right which he is not bound to exercise, is, in Austin's phrase~~ ology, to be regarded both as a positive moral rule and as a positive law.1 On the other hand the rules set bya club or society, and enforced upon its members by exclusion from the society, but not in pursuance of any legal right, are laws, but not positive laws. They are imperative and proceed from a determinate source, but they have no legal or political sanction, Closely connected with this positive morality, consisting of true but not positive laws, is the positive morality whose rules are not laws properly so called at all, though they are generally denominated laws. Such are the laws of honour, the laws of fashion, and, most iniportant of. all, international law.

Nowhere does Austin's phraseology come more bluntly into conflict with common usage than in pronouncing the law of nations (which in substance is a compact body of well-defined rules resembling nothing so much as the ordinary rules of law) to be not laws at all, even in the wider sense of the term. That the rules of a private club should be law properly so called, while the whole mass of international jurisprudence is mere opinion, shocks our sense of the proprieties of expression. Yet

no man was more careful than Austin to observe these proprieties. He recognizes fully the futility of definitions which involve a painful struggle with the current of ordinary speech. But in the present instance the apparent paralogism cannot be avoided if we accept the limitation of laws properly so called to commands proceeding from a determinate souree. And that limitation Is so generally present in our conception of law that to ignore it would be a worse anomaly than this. No one finds fault with the statement that the so-called code of honour or the dictates of fashion are, not, properly speaking, laws. We repel the same statement applied to the law of nature, because it resembles in so many of its most

1 This appears to be an unnecessary complication. The sovereien has authorized the master to set the law, although not compelling him to do so, and eaforces the law when set. There seems no good reason why the law should be called a rule of positive morality at all.

striking features—in the certainty of a large portion of it, in its terminology, in its substantial principles—the most universal elements of actual systems of law, and because, moreover, the assumption that brought it into existence was nothing else than this, that it consisted of those abid- ing portions of legal systems which prevail everywhere by their own authority. But, though “ positive morality ” may not be the best phrase to describe such a code of rules, the distinction insisted on by Austin is unimpeachable. The elimination of those laws properly and improperly so called which are not positive laws brings us to the defini- tion of positive law, which is the keystone of the system. Every positive law is ‘‘set by a sovereign person, or sovereign body of persons, to a member or members of the independ- ent political society wherein that person or body is sove- reign or superior.” Though possibly sprung directly from another source, it is a positive law, by the institution of that present sovereign in the character of a political superior. The question is not as to the historical origin of the prin- ciple, but as to its present authority. ‘The legislator is he, not by whose authority the law was first made, but by whose authority it continues to

be law.” This definition involves the analysis of the connected expressions sovereignty, subjection, and independent political society, and of deter- minate body,—which last analysis Austin performs in con- nexion with that of commands. These are all excellent examples of the logical method of which he was so great a master. The broad results alone need be noticed here. In order that a given society may form a society political and independent, the generality or bulk of its members must be in a habet of obedience to a certain and common superior ; whilst that certain person or body of persons must not be habitually obedient to a certain person or body. All the italicized words point to circumstances under which it might be difficult to say whether a given society is political and independent or not. Several of these Austin has discussed,—e.g., the state of things in which a political society yields obedience which may or may not be called habitual to some external power, and the state of things in which a political society is divided between contending claimants for sovereign power, and it is uncertain which shall prevail, and over how much of the society. So long as that uncertainty remains we have a state of anarchy. Further, an independent society to be political must not fall below a number which can only be called considerable. Neither then in a state of anarchy, nor in inconsiderable communities, nor among men living in a state of nature, have we the proper phenomena of a political society. The last limitation goes some way to meet the most serious criticism to which Austin’s system has been exposed, and it ought to be stated in his own words. He supposes a society which may be styled independent, which is con- siderable in numbers, and which is in a savage or extremely barbarous condition. In such a society, “the bulk of its members is not in the habit of obedience to one and the same superior. For the purpose of attacking an external enemy, or for the purpose of repelling an attack, the bulk of its members who are capable of bearing arms submits to one leader or one body of leaders. But as soon as that emergency passes the transient submission ceases, and the society reverts to the state which may be deemed its ordinary state. The bulk of each of the families which compose the given society renders habitual obedience to its own peculiar chief, but those domestic societies are them- selves independent societies, or are not united and com- pacted into one political society by habitual and

general obedience to one common superior, and there is no law (simply or strictly so styled) which can be called the law of that society. The so-called laws which are common to the bulk of the community are purely. and properly

customary laws—that is to say, laws which are set or imposed by the general opinion of the community, but are not enforced by legal or political sanctions." Such, he says, are the savage societies of hunters and fishers in

North America, and such were the Germans as described

by Tacitus. He takes no account of societies in an intermediate stage between this and the condition which constitutes political society.

We need not follow the analysis in detail. Much ingenuity is displayed in grouping the various kinds of government, in detecting the sovereign authority under the disguises which it wears in the complicated State system of the United States or under the fictions of English law, in elucidating the precise meaning of abstract political terms. Incidentally the source of many celebrated fallacies in political thought is laid bare. That the question who is sovereign in a given state is a question of fact and not of law or morals or religion, that the sovereign is incapable of legal limitation, that law is such by the sovereign's command, that no real or assumed compact can limit his action—are positions which Austin has been accused of enforcing with needless iteration, He has cleared them, however, from the air of paradox with which they had been previously encumbered, and his influence was in no direction more widely felt than in making them the commonplaces of educated opinion in this generation.

Passing from these, we may now consider what has been said against the theory, which may be summed up in the following terms. Laws, no matter in what form they be expressed, are in the last resort reducible to commands set by the person or body of persons who are in fact sovereigns in any independent political society. The sovereign is the

person or persons whose commands are habitually obeyed by the great bulk of the community; and by an independent society we mean that such sovereign head is not himself habitually obedient to any other determinate body of persons. The society must be sufficiently numerous to be considerable before we can speak of it as a political society. From command, with its inseparable incident of sanction, come the duties and rights in terms of which laws are for the most part expressed. Duty means that the person of whom it is predicated is liable to the sanction in case he fails to obey the command. Right means that the person of whom it is predicated may set the sanction in operation in case the command be disobeyed.

Before noticing the considerable body of hostile criticism with which in the main we are unable to agree, we may here inter- polate a doubt whether the condition of independence on the part of the head of a community is essential to the legal analysis. It seems tous that we have all the elements of a true law present when we point to a community habitually obedient to the authority of a person or determinate body of persons, no matter what the relations of that supcrior may be to any external or superior power. Provided that in fact the commands of the lawgiver are those be- yond which the community never looks, it seems immaterial to inquire whether this lawgiver in turn takes his orders from some- body else or is habitually obedient to such orders when given. One may imaginc a community governed by a dependent legislatorial body or person, while the supreme sovereign whose representative and nominee such body or person may be never directly addresses the community at all. We do not see that in sucha case anything is gained in clearness by representing the law of the community as set by the suzerain, rather than the dependent legislator. Nor is the ascertainment of the ultimate seat of power necessary to define political societies. That we get when we suppose a community to be in the habit of obedience to a single person or to a determinate combination of persons.

The use of the word ‘‘command” is not unlikely to lead to a misconception of Austin’s meaning. When we say that a law is a command of the sovereign, we are apt to think of the sovereign as

enunciating the rule in question for the first time. Many laws are not traceable to the sovereign at all in this sense. Some are based upon immemorial practices, some can be traced to the influence of private citizens, whether practising lawyers or writers on law, and in most countries a vast body of law owes its existence as such to the fact that it has been observed as law in some other society. The

great bulk of modern law owes its existence and its shape ultimately to the labours of the Roman lawyers of the empire. Austin's definition has nothing to do with this, the historical origin of laws. Most books dealing with law in the abstract generalize the modes in which laws may be originated under the name of the ‘‘ sources" of law, and one of these is legislation, or the direct command of the sovereign body. The connexion of laws with each other.as principles is properly the subject matter of historical jurispru- dence, the ideal perfection of which would be the establishment of the general laws governing the evolution of law in the technical sense. Austin's definition looks, not to the authorship of the law as a principle, not to its inveutor or originator, but to the person or persons who in the last resort cause it to be obeyed. Ifa given rule is enforced by the sovereign it is a law.

It may be convenient to notice here what is usually said about the sources of law, as the expression sometimes proves a stumbling- block to the appreciation of Austin's system. In the corpus juris of any given country only a portion of the laws is traceable to the direct expression of his commands by the sovereign. Legislation is one, but only one, of the sources of law. Other portions of the law may be traceable to other sources, which may vary in effect in different systems. The list given in the Jnstitutes of Justinian of the ways in which law may be made—lex, plcbiscitum, principis placita, edicta magistratuum, and so on—isa list of sources. Among the sources of law other than legislation whicli are most commonly exemplified are the laws made by judges in the course of judicial decisions, and law originating as custom. . The source of the law in the one case is the judicial decision; in the other the custom. In consequence of the decisions and in consequence of the

custom the rule has prevailed. English law is largely made up of principles derived in each of those ways, while it is deficient in principles derived from the writings of independent teachers, such as have in other systems exercised a powerful influence on the development of law. The responsa prudentum, the opinions of learned men, published as such, did undoubtedly originate an immense portion of Roman law. No such influence has affected English law to any a ea extent—a result owing to the activity of the courts of the legislature. This difference has profoundly affected the form of English law as compared with that of systems which have been developed by the play of free discussion. These are the most definite of the influences to which the beginning of laws may be traced. The law once established, no matter how, is nevertheless law in the sense of Austin's definition. It is enforced by the sovereign authority. It was originated by something very different. But when we speak of it as a command we think only of the way in which it is to-day presented to the subject. The newest order of au Act of Parliament is not more positively presented to the people as a command to be obeyed than are the elementary rules of the common law for which no legislative origin can be traced. It is not even necessary to resort to the figure of speech by which alone, according to Sir Henry Maine (Larly History of Institutions, p- 314), the common law can be regarded as the commands of the Government. 'The common law," he says, '' consists of their conimands because they can repeal or alter or restate it at pleasure." 'They command because, being by the assumption possessed of uncontrollable force, they could innovate without limit at any moment." On the contrary, it may be said that they command because they do as a matter of fact enforce the rules laid down in the common law. It is not because they could innovate if they pleased in the common law that they are said to command it, but because it is known that they will enforce it as it stands.

The criticism of Austin's analysis resolved itself into two different sets of objections. One relates to the theory of sovereignty which underlies it; the other to its alleged failure to include rules which in common parlance are laws, and which it is felt ought to be included in any

satisfactory definition of law. As the latter is to some extent anticipated and admitted by Austin himself, we may deal with it first.

A recent writer! has been at great pains to collect a number of laws or rules of iaw which do not square with the Austinian definition of law as a command creating rights and duties. Take the rule that “every will must be in writing.” It is a very circuitous way of looking at things, according to Mr Harrison, to say that such a rule creates a specific right in any determinate person of a definite description. So, again, the rule that “a legacy to the witness of a willis void.” Such a rule is not “ designed to give any one any rights, but simply to protect the public against wills made under undue influence.” Again, the

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1 Mr Frederic Harrison in the Fortnightly Review (vols. xxx., XXX1.).

technical rule in Shelley’s case that a gift to A for life, followed by a gift to the heirs of A, is a gift to A in fee simple, is pronounced to be inconsistent with the definition. It is an idle waste of ingenuity to force any of these rules into a form in which they might be said to create rights.

This would be a perfectly correct description of any attempt to take any of these rules separately and analyse it into a complete command creating specific rights and duties. But there is no occasion for doing anything of the kind. It is not contended that every grammatically complete sentence in a text-book ora statute is per se a command creating rights and duties. A law, like any other command, must be expressed in words, and will require the use of the usual aids to expression. The gist of it may be expressed in a sentence which, standing by itself, is not intelligible ; other sentences locally separate from the principal one may contain the exceptions and the modifications and the interpretations to which that Is subject. In no one of these taken by itself, but in the substance of them all taken together,

is the true law, in Austin's sense, to be found. Thus the rule that every will must be in writing isa mere fragment—only the limb of a law. It belongs to the rule which fixes the rights of devisees or legatees under a will. That rule jin whatever form it may be expressed is, without any straining of language, a command of the legislator. That "every person named by a testator in his last will and testament shall be entitled to the property thereby given him" is surely a command creating rights and duties. After testament add "expressed in writing"; it is still a command. Add further, "' provided he be not. one of the witnesses to the will," and the command, with its product of rights and duties, is still there, Each of the additions limits the operation of the command stated imperatively in the first sentence. So with the rule in Shelley's case. It is resolvable into the rule that every person to whom an estate is given by a conveyance expressed in such and such a way shall take such and such rights. To take another example from recent legislation. A statute passed in 1881 enacts nothing more than this, that an Act of a previous session shall be construed as if "that" meant "this." It would be futile indeed to force this into conformity with Austin's definition by treating it as a command addressed to the judges, and as indirectly creat- ing rights to have such a construction respected, As it happens, the section of the previous Act referred to (the Burials Act, 1880) is an undeniable command, addressed to the clergy, and imposing upon them a specific duty. The true command—the law—is to be found in the two sections taken together.

All this confusion arises from the fact that laws are not habitually expressed in imperative terms. Even in a mature system like that of England the great bulk of legal rules is hidden under forms which disguise their imperative quality. They appear as principles, maxims, propositions of fact, generalizations, points of pleading and procedure, and so. forth. Even in the statutes the imperative form is not uniformly observed. It might be said that the more mature a legal system is the less do its individual rules take the form of commands. The greater portion of Roman law is expressed in terms which would not misbecome scientific or speculative treatises. The institutional works abound in propositions which have no legal significance at all, but which are not distinguished from the true law in which they are

embedded by any difference in the forms of expression. Assertions about matters of history, dubious speculations in philology, and reflexions on human con- duct are mixed up in the same narrative with genuine rules of law. Words of description are used, not words of command, and rules of law assimilate themselves in

form to the extraneous matter with which they are mixed up.

It has been said that Austin himself admitted to some extent the force of these objections. He includes among laws which are not imperative the following :—“ declara- tory laws, or laws explaining the import of existing positive law, and laws abrogating or repealing existing positive law.” He thus associates them with rules of positive morality and with laws which are only metaphorically so called. This collocation is unfortunate and out of keeping with Austin’s method. Declaratory and repealing laws are as completely unlike positive morality and metaphorical laws as are the laws which he describes as properly so called. And if we avoid the error of treating each separate proposition enunciated by the lawgiver as @ law, the cases in question need give us no trouble. Read the declaratory and the repealing statutes along with the principal laws which they affect, aud the result is perfectly consistent with the proposi- tion that all law is to be resolved intoa species of command. In the one case we have in the principal taken together with the interpretative statute a law, and whether it differs or not from the law as it existed before the interpretative statute was passed makes no difference to the true character of the latter. It contributes along with the former to the expression of a command which is a true law. In the same way repealing statutes are to be taken together with the laws which they repeal—the result being that there is no law, no command, at all. It is wholly unnecessary to class them as laws which are not truly iniperative, or as excep- tions to the rule that lawsare a species of commands. The combination of the two sentences in which the lawgiver has expressed himself, yields the result of silence—absence of law—which is in no way incompatible with the assertion that a law, when it exists, isa kind of command. Austin’s

theory does not logically require us to treat every Act of Parliament as being a complete law in itsclf, and therefore to set aside a certain number of Acts of Parliament as being exceptions to the great generalization which is the basis of the whole system.

Rules of procedure again have been alleged to constitute another exception. They cannot, it is said, be regarded as commands involving punishment if they be disobeyed. Nor is anything gained by considering them as commands addressed to the judge and other ministers of the law. There may be no doubt in the law of procedure a great deal that is resolvable into law in this sense, but the great bulk of it is to be regarded like the rules of inter- pretation as entering into the substantive commands which are laws. They are descriptions of the sanction and its mode of working. The bare prohibition of murder with- out any penalty to enforce it would not bea law. To prohibit it under penalty of death implies a reference to the whole machinery of criminal justice by which the penalty is enforced. Taken by themselves, the rules of procedure are not, any more than canons of interpretation, complete laws in Austin's sense of the term. But they form part of the complete expression of true laws. They imply a command, and they describe the sanction and the mode in which it operates.

A more formidable criticism of Austin's position is

' that which attacks the definition of sovereignty. There

are countries, it is said, where the sovereign authority cannot by any stretch of language be said to command the laws, and yet where law manifestly exists. The ablest and the most moderate statement of this view is given by Sir Henry Maine in Larly History of Institutions, p. 380 :—

'Tt is from no special love of modern examples that I take one from India, but because it happens to be the most modern precedent in point. My instance is the Indian province called the Punjaub, the country of the Five Rivers, in the state in which it was for about

a quarter of a century before its annexation to the British Indian empire. After passing through every conceivable phase of anarchy and dormant anarchy, it fell under the tolerably consolidated dominion of a half military half religious oligarchy known as the Sikhs. The Sikhs themselves were afterwards reduced to subjec- tion by a single chieftain belonging to their order, Runject Singh. At first sight there could be no more perfect embodiment than Runjeet Singh of sovereignty as conceived by Austin. He was absolutely despotic. Except occasionally on his wild frontier he kept the most perfect order. He could have commanded any- thing ; the smallest disobediencé to his commands would have becn followed by death or mutilation; and this was perfectly well known to the enormous majority of his subjects. Yet I doubt whether once in all his life he issued a command which Austin would call a law. He took as his revenue a prodigious share of the produce of the soil. He harried villages which recalcitrated at his exac- tions, and he executed great numbers of men. He levied great armies ; he had all material of power, and he exercised it in various ways. But he never madea law. The rules which regulated the lives of his subjects were derived from their immemorial usages, and those rules were administered by domestic tribunals in families or village communities—that is, in groups no larger or little larger than those to which the application of Austin's principles cannot be effected on his own admission without absurdity."

So far as the mere size of the community is concerned, there is no difficulty in applying the Austinian theory. In postulating a considerably numerous community Austin was thinking evidently of small isolated groups which could not without provoking a sense of the ridiculous be termed nations. Two or three families, let us suppose, occupying a small island, totally disconnected with any great power, would not claim to be and would not be treated as an independent political community. But it does not follow that Austin would have regarded the village communities spoken of by Maine in the same light. Here we have a great community, consisting of a vast number of small communities, each independent of the other, and discon- nected

with all the others, so far as the administration of anything like law is concerned. Suppose in each case that the headman or council takes his orders from Runjeet Singh, and enforces them, each in his own sphere, relying as the last resort on the force at the disposal of the suzerain. The mere size of the separate communities would make no sort of difference to Austin's theory. He would probably regard the empire of Runjeet Singh as divided into small dis- tricts, —an assumption which inverts no doubt the true his- torical order, the smaller group being generally more ancient than the larger. But provided that the other conditions prevail, the mere fact that the law is administered by local tribunals for minute areas should make no difference to the theory. The case described by Sir Henry Maine is that of the undoubted possession of supreme power by a sovereign, coupled with the total absence of any attempt on his part to originate a law. That no doubt is, as we are told by the same authority, "the type of all Oriental com- munities in their native state during their rare intervals of peace and order." The empire was in the main in each case a tax-gathering empire. The unalterable law of the Medes and Persians was not a law at all but an occasional command. So again Maine puts his position clearly in the following sentences :—" The Athenian assembly made true laws for residents on Attic territory, but the dominion of Athens over her subject cities and islands was clearly a tax-taking as distinguished from a legislating empire." Sir

Henry Maine, it will be observed, does not say that the

sovereign assembly did not command the laws in the sub- ject islands —only that it did not legislate.

In the same category may be placed without mucli sub- stantial difference all tle societies that have ever existed on the face of the earth previous to the point at which legislation becomes active. Sir Henry Maine is undoubt- edly right in connecting the theories of Bentham and Austin with the overwhelming activity of legislatures in

shown, comes late in the history of most legal systems. Law is generated in other ways, whicli seem irreconcilable with anything like legislation. Not only the tax-gathering emperors of the East, indifferent to the condition of their subjects, but even actively benevolent Governments have up to a certain point left the law to grow by other means than formal enactments. What is ex facie more opposed to the idea of a sovereign's commands than the conception of schools of law? Does it not "sting us with a sense of the ridiculous" to hear principles which are the out- come of long debates between Proculians and Sabinians described as commands of the emperor? How is secta- rianism in law possible if the sovereign's command is really all that is meant by a law? No mental attitude is more common than that which regards law as a natural product—discoverable by a diligent investigator, much in the same way as the facts of science or the principles of mathematics. The introductory portions of Justinian's Institutes are certainly written from this point of view, which may also be described without much unfairness as the point of view of German jurisprudence. And yet the English jurist who accepts Austin's postulate as true for the English system of our own day would have no difficulty in applying it to German or Roman law generated under the influence of such ideas as these.

Again, referring to the instance of Runjeet Singh, Sir H. Maine says no doubt rightly that "he never did or could have dreamed of changing the civil rules under which his subjectslived. Probably he was as strong a believer in the independent obligatory force of such rules as the elders themselves who applied them." That too might be said with truth of states to which the application of Austin's system would be far from difficult. The sovereign body or person enforcing the rules by all the ordinary methods of justice might conceivably believe that the rules which he enforced had an obligatory authority of their own, just as most lawyers at one time, and possibly some lawyers now, believe in the natural obligatoriness, independently of courts or parlia- ments, of portions of the law of England. But nevertheless, whatever ideas the sovereign or his delegates might enter- tain as to "'the independent obligatory force" of the rules which they enforce, the fact that they do enforce them dis- tinguishes them from all other rules. Austin seizes

upon this peculiarity and fixes it as the determining characteristic of positive law. When the rule is enforced bya sovereign authority as he defines it, it is his command, even if he should never so regard it himself, or should suppose him- self to be unable to alter it in a single particular.

It may be instructive to add to these cxamples of dubious cascs one taken from what is called ecclesiastical lav. In so far as this has not been adopted and enforced by the state, it would, on Austin's theory, be, not positive law, but either positive morality or possibly a portion of the Divine law. No jurist would deny that there is an essential difference between so much of ecclesiastical law as is adopted by the statc and all the rest of it, and that for scien- tific purposes this distinction ought to be recognized. How near this kind of law approaches to the positive or political Jaw may be seen from the sanctious on which it depended. ''Thce theory of penitential discipline was this: that the church was an organizcd body with an outward and visible form of government; that all who were outside her boundaries were outside the means of divine gracc ; that she had acommand laid upon her, and authority given to her, to gather men into her fellowship by the ceremony of baptism, but, as some of those who were admittcd proved unworthy of their calling, she also had the right by the power of the keys to deprive them temporarily or absolutely of the privilege of communion with her, and on their amendment to restore them once more to church membership. On this power of exclusion and restoration was founded the system of ecclesiastical discipline. It was a purely spiritual jurisdiction. It obtained its hold over the minds of men from the belief, universal in the catholic church of the early ages, that he who was expelled from her pale was expelled also from the way of salvation, and that the sentence which was pronounced by God's church on earth was ratified by Him in heaven" (Smith's

modern times. And formal legislation, as he has elsewhere | Dictionary of Christian Antiquities, art. " Penitence," p. 1587).

These laws are not the laws of the jurists, though thcy resemble them closely in many points—indeed in all points except that of the sanction by which they are enforced. Itisa spiritual not a political sanction. The force which lies behind them is not that of the sovereign or the state. When physical force is used to compel obedience to the laws of the church they become positive laws. But so long as the belief in future punishments or the fear of the purely spiritual punishments of the church is sufficient to procure obedience to them, they are to be regarded as commands, not by the state, but by the church. That difference Austin makes essen- tial. In rejecting spiritual laws from the field of positive law, his example would be followed by jurists who would nevertheless in- clude other laws, not ecclesiastical in purpose, but enforced by very similar methods. ne

Compare the following account of ‘‘ the mode in which justice was administered in the neighbourhood of Benares towards the end of the last century,” extracted from a very valuable work on the scientific study of Hindu law by MrJ.H. Nelson. ‘‘ The recog- nized mode of compelling a debtor to pay up appears to have been by sending a Brahman to do dharna before his house with a dagger or a bowl of poison to be used by the Brahman on his own body if the debtor proved obstinate. When the tax collector gave too uch trouble, a ryot would sometimes erect a koor or pile of wood and burn an old woman on it by way of bringing sin on the head of the tormentor. The lex talionis obtained in the following shape. Persons who considercd themselves aggrieved by acts of their enemies would kill their own wives and children, in order, as we may suppose, to compel their enemies to do a similar act to their own hurt. Thus two Bralimans cut off their mother’s head to spite a foe.” The same author states that he is ‘‘ firmly persuaded that the normal condition of India has ever been to be without what Europeans understand by laws and law courts.”

So far as the question is one of the propriety of language, the burden in this case is decidedly against those who would extend the phraseology of law to such rules as these. Can we with any advantage speak of one person having a right against another, when his remedy consists in starving himself in order to bring sin upon the head of his opponent or

compel him to do likewise? If dharna or anything like it suffices to keep a community to its customary practices, is it possible to express such customs in terms applicable to the laws of European societies? Oris any harm done by saying that the difference between the two is so great that the former cannot be regarded as positive laws at all?

The true criterion in all these cases is, neglecting the shape and circumstances in which the rules in question may have appeared, to ask by what means compliance with them is enforced. Austin's theory in the end comes to this, that true laws are in all cases obeyed in consequence of the application of regulated physical force by some portion of the community. That is a fair paraphrase of the position that laws are the commands of the sovereign, and is perhaps less objectionable inasmuch as it does not imply or suggest anything about the forms in which laws are enunciated. All rules, customs, practices, and laws—or by whatever name these uniformities of human conduct may be called—have either this kind of force at their back or they have not. Is it worth while to make this difference the basis of a scientific system or not? Apparently it is. If it were a question of distinguishing between the law of the law courts and the laws of fashion no one would hesitate. Why should laws or rules having no support from any political authority be termed laws positive merely because there are no other rules in the society having such support?

The question may perhaps be summed up as follows. Austin's definitions are in strict accordance with the facts of government in civilized states; and, as it is put by Sir H. Maine, certain assumptions or postulates having been made, the great majority of Austin's positions follow as of course or by ordinary logical process. But at the other extreme end of the scale of civilization are societies to which Austin himself refuses to apply his system, and where, it would be conceded on all sides, there is neither political community nor sovereign nor law,—none of the facts which jurisprudence assumes to exist. There is an interme-

diate stage of society in which, while the rules of conduct might and generally would be spokén of as laws, it is difficult to trace the connexion between them and the sovereign authority whose existence is necessary to Austin's system. Are such societies to be thrown out of account in analytical jurisprudence, or is Austin's system to be regarded as only a partial explanation of the field of true law, and his definitions good only for the laws of a portion of the world? The true answer to this question appears to be that when the rules in any given case are habitually enforced by physical penalties, administered by a determinate person or portion of the community, they should be regarded as positive laws and the appropriate subject matter of jurisprudence. Rules which are not so enforced, but are enforced in any other way, whether by what is called public opinion, or spiritual apprehensions, or natural instinct, are rightly excluded from that subject matter. In all stages of society, savage or civilized, a large body of rules of conduct, habitually obeyed, are never- theless not enforced by any state sanction of any kind. Austin's method assimilates such rules in primitive society, where they subserve the same purpose as positive laws in an advanced society, not to the positive laws which they resemble in purpose but to the moral or other rules which they resemble in operation. If we refuse to accept this position we must abandon the attempt to frame a general definition of law and its dependent terms, or we must content ourselves with saying that law is one thing in one state of society and another thing in another. On the ground of clearness and convenience Austin's method is, we believe, substantially right, but none the less should the student of jurisprudence be on his guard against such assumptions as that legislation is a universal phenomenon, or that the relation of sovereign and subject is discernible in all states of human society. And a careful examination of Sir Henry Maine's criticism will show that it is devoted not so much to a rectification of Austin's position as to correction of the misconceptions into which some of his disciples may have fallen. It is a misconception of the analysis to suppose that it involves a difference in juridical character between custom not yet recognized by any judicial decision and custom after such recognition. There is no such difference except in the case of what is properly called 'judicial legislation""—wherein an absolutely new rule is added for the first

time to the law. The recognition of a custom or law is not necessarily the beginning of the custom or law. Where a custom possesses the marks by which its legality is determined according to well understood principles, the courts pronounce it to have been law at the time of the happening of the facts as to which their jurisdiction is invoked. The fact that no previous instance of its recognition by a court of justice can be produced is not material. A lawyer before any such decision was given would nevertheless pronounce the custom to be law,—with more or less hesitation according as the marks of a legal custom were obvious or not. The character of the custom is not changed when it is for the first time enforced by a court of justice, and hence the language used by Sir Henry Maine must be understood in a very limited sense, 'Until customs are enforced by courts of justice"— so he puts the position of Austin— they are merely "positive morality," rules enforced by opinion ; but as soon as courts of justice enforce them they become commands of the sovereign, conveyed through the judges who are his delegates or deputies. This proposition, on Austin's theory, would only be true of customs as to which these marks were absent. It is of course true that when a rule enforced only by opinion becomes for the first time enforceable by a court of justice —which is the same thing as the first time of its being actually enforced —

its juridical character is changed. It was positive morality ; it is now law. So it is when that which was before the opinion of the judge only becomes by his decision a rule enforceable by courts of justice. It was not even positive morality but the opinion of an individual ; it is now law.

The most difficult of the common terms of law to define is right ; and, as right rather than duty is the basis of classi- fication, it is a point of some importance. Assuming the truth of the analysis above discussed, we may go on to say that in the notion of law is involved an obligation on the part of some one, or on the part of every one, to do or forbear from doing. That obligation is duty ; what is right? Dropping the

negative of forbearance, and taking duty to mean an obligation to do something, with the alternative of punishment in default, we find that duties are of two kinds. The thing to be done may have exclu- sive reference to a determinate person or class of persons, on whose motion or complaint the sovereign power will execute the punishment or sanction on delinquents; or it may have no such reference, the thing being commanded, and the punishment following on disobedience, without reference to the wish or complaint of individuals: The last are absolute duties, and the omission to do, or forbear from doing, the thing specified in the command is in general what is meant bya crime. ‘The others are relative duties, each of them implying and relating to a right in some oneelse. A person has aright who may in this way set in operation the sanction provided by the state. In common thought and speech, however, right appears as something agood deal more positive and definite than this, — as a power or faculty residing in individuals, and suggesting not so much the relative obligation as the advantage or enjoyment secured thereby to the person having the right. Mr J. 8. Mill, in a valuable criticism of Austin, suggests that the definition should be so modified as to introduce the element of “advantage to the person exercising the right.” But it is exceedingly difficult to frame a positive definition of right which shall not introduce some term at least as ambiguous as the word to be defined. Professor Holland defines right in general as a man’s “ capacity of influencing the acts of another by means, not of his own strength, but of some authority or power external to him- self.” Direct influence exercised by virtue of one’s own strength, physical or otherwise, over another’s acts, is “might” as distinguished from right. When the indirect influence is the opinion of society, we have a “ moral right.” When it is the force exercised by the sovereign, we have a legal right. It would be more easy, no doubt, to pick holes in this definition than to frame a better one.?

The distinction between rights available against deter- minate persons and rights available against all the world, jura in personam and jura in rem, is of fundamental import- ance. The phrases are borrowed from the classical jurists, who used them originally to distinguish actions according as they were brought to enforce a personal obligation or to vindicate rights of property. The owner of property has a right to the

exclusive enjoyment thereof, which avails against all and sundry, but not against one person more than another. ‘The parties to a contract have rights avail- able against each other, and against no other persons. The

1 In English speech another ambiguity is happily wanting which in many languages besets the phrase expressing ‘‘a right.’ The Latin ‘‘Jus,” the German ‘‘ Recht,” the Italian ‘‘ diritto,” and the French . droit” express, not only a right, but also law in the abstract. To Indicate the distinction between law” and “aright” the Germans are therefore obliged to resort to such phrases as “‘ objectives” and “subjectives Recht,” meaning by the former law in the abstract, and by the latter a concrete right. And Blackstone, paraphrasing the distinction drawn by Roman law between the “‘jus quod ad res” and the ‘jus quod ad personas attinet,” devotes the first two volumes of

his Commentaries to the ‘Rights of Persons and the Rights of Things.” See Holland’s Hlements of Jurisprudence, p. 67.

jus wn rem is the badge of property ; the jus iz personam is a mere personal claim.

That distinction in rights which appears in the division of law into the law of persons and the law of things is thus stated by Austin. There are certain rights and duties, with certain capacities and incapacities, by which persons are determined to various classes. The rights, duties, é&c., are the condition or status of the person; and one person may be invested with many status or conditions. The iaw of persons consists of the rights, duties, &c., constituting conditions or status; the rest of the law is the law of things. The separation is a mere matter of convenience, but of convenience so great that the distinction is universal. Thus any given right may be exercised by persons belonging to innumerable classes. The person who has the right may be under twenty-one years of age, may have been born ina foreign state, may have been convicted of crime, may be a native of a particular county, or a member of a particular profession or trade, &c.; and it might very

well happen, with — reference to any given right, that, while persons in general, under the circumstances of the case, would enjoy it in the same way, a person belonging to any one of these classes would not. If belonging to any one of those classes makes a difference not to one right merely but to many, the class may conveniently be abstracted, and the variations in rights and duties dependent thereon may be separately treated under the law of persons. The personality recognized in the law of persons is such as modifies indefinitely the legal relations into which the individual clothed with the personality may enter. See Holland's Hlements of Juris- prudence, p. 90.

The author last cited disapproves of the prominence given by Austin to this distinction, instead of that be- tween public and private law. This, according to Professor Holland, is based on the public or private character of the persons with whom the right is connected, public persons being the state or its delegates. Austin, holding that the state cannot be said to have legal rights or duties, recog- nizes no such distinction. The term ''public law" he con- fines strictly to that portion of the law which is concerned with political conditions, and which ought not to be op- posed to the rest of the law, but "ought to be inserted in the law of persons as one of the limbs or members of that supplemental department."

Lastly, following Austin, the main division of the law of things is into (1) primary rights with primary relative duties, (2) sanctioning rights with sanctioning duties (relative or absolute). The former exist, as it has been put, for their own sake, the latter for the sake of the former. Rights and duties arise from facts and events ; and facts or events which are violations of rights and duties are delicts or injuries. Rights and duties which arise from delicts are remedial or sanctioning, their object being to prevent the violation of rights which do not arise from delicts.

We are inclined to agree with the view expressed by Mr F. Harrison (fortnightly Review, vol. xxxi.), that the rearrangement of English law on the basis of a scientific classification, whether Austin's or any other, would not result in advantages at all compensating for its difficulties.

If anything like a real code were to be attempted, the scientific classification would be the best; but in the absence of that, and indeed in the absence of any habit on the part of English lawyers of studying the system as a whole, the arrangement of facts does not very much matter. Tt is essential, however, to the abstract study of the principles of law. Scientific arrangement might also be observed with advantage in treatises affecting to give a view of the whole law, especially those which are meant

for educational rather than professional uses. The only XIV. — 46

book worth naming of that kind is Blackstone's Com- mentaries, which, in the hands of successive annotators, retains all its original defects of arrangement. It has simply been brought down to date, and its last condition 1s, from every point of view but that, worse than its first. As an example of the practical application of a scientific system of classification to a complete body of law, we may point to Professor W. A. Hunter's elaborate Lxposition of Roman Law (London, 1876).
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It is impossible to present the conclusions of historical jurisprudence in anything like the same shape as those which we have been discussing. As yet historical juris- prudence is little more than a method, and its results are generalizations of more or less plausibility or probability. 'The inquiry is in that stage which is indicated in one way by describing it as a philosophy. The philosophy of the history of law is all that it can yet claim to be. It resembles, and is indeed only part of, the study which is described as the philosophy of history. Its chief interest hitherto has been in the light which it has thrown upon rules of law and legal institutions which had been and are generally contemplated as positive facts merely, without reference to their history, or have been associated histori- cally with principles and institutions not really connected with them.

The historical treatment of law displaces some very remarkable misconceptions. Peculiarities and anomalies abound in every legal

system; and, as soon as laws become the special study of a professional class, some mode of explaining or reconciling them will be resorted to. One of the prehistorical ways of philosophizing about law was to account for what wanted explanation by some theory about the origin of technical words. This implies some previous study of words and their history, and is an instance of the deep-seated and persistent tendency of the human mind to identify names with the things they represent. The Institutes of Justinian abound in explanations, founded on a supposed derivation of some leading term. Z'estamentum, we are told, ex eo appellatur quod testatio mentis est. A testament was no doubt, in effect, a declaration of intention on the part of the testator when this was written. But the mentum is a mere termination, and has uothing to do with mens at all. The history of testaments, which, it may be noticed incidentally, has been developed with conspicuous success, gives a totally different meaning to the institution from that which was expressed by this fanciful derivation. So the perplexing subject of possessio was supposed in some way to be explained by the derivation from pono and sedeo,—quasi sedibus positio. Posthumi was supposed to be a compound of post and humus. These examples belong to the class of rationalizing derivations with which students of philosophy are familiar. Their characteristic is that they are suggested by some prominent feature of the thing as it then appeared to observers,—which feature thereupon becomes identified with the essence of the thing at all times and places.

Another prebistorical mode of explaining law may be described as metaphysical. It conceives of a rule or principle of law as existing by virtue of some more general rule or principle in the nature of things) Thus, in the English law of inheritance, until the passing of the recent Inheritance Act, an estate belonging to a deceased intestate would pass to his uncle or aunt, to the exclusion of his father or other lineal ancestor. This anomaly from an early time excited the curiosity of lawyers, and the explana- tion accepted in the time of Bracton was that it was an example of the general law of nature :—" Descendit itaque jus quasi ponderosum quid cadens deorsum recta linea vel transversali, et nunquam reascendit ea via qua descendit." The author of an excellent summary of the history of the

law of real property (Mr Digby) supposes that the “rule really results from the associations involved in the word descent.” It seems more likely, however, that these associa- tions explained rather than that they suggested the rule, —that the omission of the lineal ancestor existed in custom before it was discovered to be in harmony with the law of nature. It would imply more influence than the reasoning of lawyers is likely to have exercised over the development of law at that time to believe that a purely artificial inference of this kind should have established so very remarkable a rule. However that may be, the explanation is typical of a way of looking at law which was common enough before the dawn of the historical method. Minds capable of reasoning in this way were, if possible, farther removed from the conceptions implied in the reasoning of the analytical jurists than they were from the historical method itself. In this connexion it may be noticed that the great work of Blackstone marks an era in the development of legal ideas in England. It was not merely the first, as it still remains the only, adequate attempt to

expound the leading principles of the whole body of law,

but it was distinctly inspired by a rationalizing method. Blackstone tried not merely to express but to illustrate legal rules, and he had a keen sense of the value of historical illustrations. He worked of course with the materials at his command. His manner and his work are obnoxious alike to the modern jurist and to the modern historian. He is accused by the one of perverting history, and by the other of confusing the law. But his scheme is a great advance on anything that had been attempted before; and, if his work has been prolific in popular fallacies, at all events it enriched English literature by a conspectus of the law, in which the logical connexion of its principles znter se, and its relation to historical facts, . were distinctly if erroneously recognized.

While the historical method has superseded the verbal and metaphysical explanation of legal principles, it has apparently, in some cases, come into conflict with the conclusions of the analytical school.

The difference between the two systems comes out most conspicuously in relation to customs. ‘There is an unavoidable break in the analytical method between societies in which rules are backed by regulated physical force and those in which no such force exists. At what point in its development a given society passes into the condition of “an independent political society” it may not be easy to determine, for the evidence is obscure and conflicting. To the historical jurist there is no such breach. The rule which in one stage of society is a law, in another merely a rule of “positive morality,” is the same thing to him throughout. By a recent Act of Parliament the Ulster custom of tenant right and other analogous customs were legalized. For the purposes of analytical jurisprudence there is no need to go beyond the Act of Parliament. The laws known as the Ulster custom are laws solely in virtue of the sovereign government. Between the law as it now is and the custom as it existed before the Act there is all the difference in the world. ‘To the historical jurist no such separation is possible. His account of the law would not only be incomplete without embracing the precedent custom, but the Act which made the custom law is only one of the facts, and by no means the most significant or important, in the history of its development. An exactly parallel case is the legalization in England of that customary tenant right known as copyhold. It is to the historical jurist exactly the same thing as the legalization of the Ulster tenant right. In the one case a practice was made law by formal legislation, and in the other without formal legisla- tion. And there can be very little doubt that in an earlier stage of society, when formal legislation had not become

the rule, the custom would have been legalized relatively much sooner than it actually was. Customs then are the same thing as laws to the historical

jurist, and his business is to trace the influences under

which they have grown up, flourished, and decayed, their dependence on the intellectual and moral conditions of society at different times, and their reaction upon them. The recognized science—and such it may now be con- sidered to be—with which historical jurisprudence has most analogy is the science of language. Laws and customs are to the one what words are to the other, and each separate municipal system has its analogue in a language. Legal systems are related together like languages and dialects, and the investigation in both cases brings us back at last to the meagre and obscure records of savage custom and speech. A great master of the science of language (Max Miiller) has indeed distinguished it from jurisprudence, as belonging to a totally different class of sciences. “It is perfectly true,” he says, “that if language be the work of man in the same sense in whieh a statue, or a temple, or a poem, or a law are properly called the works of man, the science of language would have to be classed as an historical science. We should have a history of language as we have a history of art, of poetry, and of jurisprudence ; but we could not claim for it a place side by side with the various branches of natural history.” Whatever be the proper position of either philology or jurisprudence in relation to the’ natural sciences, it would not be difficult to show that laws and customs on the whole are equally independent of the efforts of individual human wills,—which appears to be what is meant by language not being the work of man. The most complete acceptance of Austin’s theory that law everywhere and always is the command of the sovereign does not involve any withdrawal of laws from the domain of natural science, does not in the least interfere with the scientific study of their affinities and relationships. Max Miiller elsewhere illustrates his conception of the different relation of words and laws to the individual will by the story of the emperor Tiberius, who was reproved for a grammatical mistake by Marcellus, whereupon Capito, another gram- marian, observed that, if what the emperor said was not good Latin, it would soon beso. “ Capito,” said Marcellus, “ig a liar; for, Cesar, thou canst give the Roman citizen- ship to men, but not to words.” The mere impulse of a single mind, even that of a Roman emperor, however, probably counts for little more in law than it does in language. Even in language one powerful intellect or one influential academy may, by its own decree, give a bent to modes of speech which

they would not otherwise have taken. But whether law or language be conventional or natural is really an obsolete question, and the difference between historical and natural sciences in the last result is one of names.

The application of the historical method to law has not resulted in anything like the discoveries which have made comparative philology a science. There is no Grimm's law for jurisprudence; but something has been done in that direction by the discovery of the analogous processes and principles which underlie legal systems having no external resemblance to each other. It happens, however, that the historical study of law has, for the most part, been confined to a single system—the Roman law. The Roman law presents itself to the historical student in two different aspects. It is, regarded as the law of the Roman republic and empire, a system whose history can be traced through- out a great part of its duration with certainty, and in parts with great detail. It is, moreover, a body of rationalized legal principles which may be considered apart from the state system in which they were developed, and which

have, in fact, entered into the jurisprudence of the whole of modern Europe on the strength of their own abstract authority,—so much so that the continued existence of the civil law, after the fall of the empire, is entitled to be considered one of the first discoveries of the historical method. Alike, therefore, in its original history, as the law of the Roman state, and as the source from which the fundamental principles of modern laws have been taken, the Roman law presented the most obvious and attractive subject of historical study. An immense impulse was given to the history of Roman law by the discovery of the Institutes of Gaius in 1816. A complete view of Roman law, as it existed three centuries and a half before

_Justinian, was then obtained, and as the later Instztutes

were, in point of form, a recension of those of Gaius,' the comparison of the two stages in legal history was at once easy and fruitful.

Moreover, Gaius dealt with antiquities of the law which had become obsolete in the time of Justinian, and were passed over by him without notice. Roman law has accordingly been the main subject of historical study, and the conclusions of jurisprudence are to a great extent generalizations suggested by the history of Roman law.

Nowhere did Roman law in its modern aspect give a stronger impulse to the study of legal history than in Germany. ‘The historical school of German jurists led the reaction of national sentiment against the proposals for a general code made by Thibaut. They were accused by their opponents of setting up the law of past times as intrinsically entitled to be observed, and they were no doubt strongly inspired by reverence for customs and traditions. Through the examination of their own customary laws, and through the elimination and separate study of the Roman element therein, they were led to form general views of the history of legal principles. In the hands of Savigny, the greatest master of the school, the historical theory was developed into a universal philosophy of law, covering the ground which we should assign separately to jurisprudence, analytical and historical, and to theories of legislation. There is not in Savigny’s system the faintest approach to the Austinian analysis. The range of it is not the analysis of law as a command, but that of a Rechtsverhéiltniss or legal relation. Far from regarding law as the creation of the will of individuals, he maintains it to be the natural outcome of the consciousness of the people, like their social habits or their language. And he assimi- lates changes in law to changes in language. ‘As in the life of individual men no moment of complete stillness is experienced, but a constant organic development, such also is the case in the life of nations, and in every individual element in which this collective life consists ; so we find in language a constant formation and development, and in the same way in law.”?. German jurisprudence is darkened by metaphysical thought, and weakened, as we believe, by defective analysis of positive law. But its conception of laws is exceedingly favourable to the growth of an historical philosophy, the results of which have a value of their own, apart altogether from the character of the first principles. Such, for instance, is Savigny’s famous examination of the law of possession.

There is only one other system of law which is worthy of being placed by the side of Roman law, and that is the law of England. No other European system can be compared with that which is the origin and substratum of them all; but England, as it happens, 1s isolated met Tai a

1 A very useful edition of the Institutes of Justinian, printed as recension of the text of Gaius, has been published by Professor T. E. Holland, Oxford, Clarendon Press, 1882, 2d ed.

2 See Introduction to the History of Jurisprudence, by D. Caulfield Heron, LL.D., London, 1880.

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in jurisprudence. She has solved her legal problems for herself. Whatever element of Roman law may exist in the English system has come in, whether by conscious adaptation or otherwise, ab extra; it is not of the essence of the system, nor does it form a large portion of the system. And, while English law is thus historically independent of Roman law, it is in all respects worthy of being associated with it on its own merits. Its originality, or, if the phrase be preferred, its peculiarity, is not more remarkable than the intellectual qualities which have gone to its formation—the ingenuity, the rigid logic, the reason- ableness, of the generations of lawyers and judges who have built it up. This may seem extravagant praise for a legal system, the faults of which are and always have been matter of daily complaint, but it would be endorsed by all unpre- judiced students. What men complain of is the practical hardship and inconvenience of some rule or process of law. They know, for example, that the law of real property is exceedingly complicated, and that, among other things, it makes the conveyance of land expensive. But the technical law of real property, which rests to this day on ideas that have been buried for centuries, has nevertheless the quali- tics we have named. So too with the law of procedure as it existed under the “science” of special pleading. The greatest practical law reformer, and the severest critic of existing systems that has ever appeared in any age or country, Jeremy Bentham, has admitted this: —“ Confused, indeterminate, inadequate, ill-adapted, and inconsistent

as to a vast extent the provision or no provision would be found to be that has been made by it for the various cases that have happened to present themselves for decision, yet in the character of a repository of such cases it affords, for the manufactory of real law, a stock of materials which is beyond all price. Traverse the whole continent of Europe, ransack all the libraries belonging to all the jurisprudential systems of the several political states, add the contents together, you would not be able to compose a collection of cases equal in variety, in amplitude, in clearness of statement—in a word, all points taken together, in con- structiveness—to that which may be seen to be afforded by the collection of English reports of adjudged cases" (Bentham's Works, vol. iv. p. 460). On the other hand, the fortunes of English jurisprudence are not unworthy of comparison even with the catholic position of Roman law. In the United States of America, in India, and in the vast colonial empire, the common law of England constitutes most of the legal system in actual use, or is gradually being superimposed upon it. It would hardly be too much to say that English law of indigenous growth, and Roman law, between them govern the legal relations of the whole civilized world. Nor has the influence of the former on the intellectual habits and the ideas of men been much if at all inferior. Those who set any store by the analytical Jurisprudence of the school of Austin will be glad to acknowledge that it is pure outcome of English law. Sir Henry Maine has associated its rise with the activity of modern legislatures, which is of course a characteristic of the societies in which English laws prevail. And it would not be difficult to show that the germs of Austin's principles are to be found in legal writers who never dreamed of analysing a law. It is certainly remarkable, at all events, that the acceptance of Austin's system is as yet confined strictly to the domain of English law. Sir H. Maine has found no trace of its being even known to the jurists of the Continent, and it would appear that it has been equally without influence in Scotland, which, like the Continent, is essentially Roman in the fundamental elements of its jurisprudence.

While, however, Roman law has had many historians, and while it has been, in Germany at least, the subject of

| places of our own time.

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a good deal of historical philosophy, English law can hardly yet be said to have had its historian, much less its philo- gopher. What is wanted here, in the first place, is the setting forth of the materials in a condition fit for exami- nation. This has been rightly described as perhaps the most important intellectual want of the present time. But in the meantime the revival of the study of Roman law in England has made the comparison of Roman and English law a matter of course in legal education, and has un- doubtedly led, in accordance, no doubt, with the bent of contemporary thought, to the formation in England of what may not improperly be called a great school of historical jurists.

By far the most considerable contribution made by Eng- land to historical jurisprudence is the writings of Sir Henry Maine. The first of these (Ancient Law), published in 1861, has probably had a more profound influence on contemporary thought than any other book of this generation. The Early History of Institutions and Village Communities in the Last and West have since followed. In Ancient Law Sir Henry Maine proposes to trace the connexion of the subject with the early history of society and its relation to modern ideas. Taking the Roman law as a typical system, he revealed for the first time to English readers

| the connexion between the principles of forgotten lawyers

and, not merely the legal ideas, but the moral common- The book undermined what had been accepted as first principles by showing that they had a history. It gratified the intellectual sense by the brilliant identification of legal ideas, obscured by differences of time and place and circumstance. It is not surprising that its influence has been even more extensive among educated laymen than among professional lawyers, for the latter are condemned by custom to disregard everything in their science but its relation to the business of the day. But Ancient Law set the attitude of regarding a legal rule not as an isolated fact but as the last link in an historical series. In the better sort

of legal text-books which have recently appeared this attitude is discernible, and on the whole to the advantage of the exposition, even for the purposes of practice.

At the present moment conclusions based on an exami- nation of the history of legal systems stand subject to correction by the results of the investigation, which is being conducted with so much diligence and success, into the condition of savage races. If it be a right inference that the phenomena of barbarism, as it exists at the present day, represent a condition through which civilized societies have passed, it is obvious that the origin which recorded history suggests for legal ideas and practices must not be taken as absolute. It so happens that prehistoric society has hitherto engaged a much larger share of attention than the history of laws. Conspicuous among the writers who have made important contributions to the literature of this subjectare Mr E. B. Tylor, Sir J. Lubbock, Mr Lewis Mor- gan, and especially Mr J. F. M‘Lennan. Many of the con- clusions to which these inquirers have been led do not affect any position taken up by historical jurists, but others tend to show that social forms which, seen from the side of legal history, appeared to be the absolute beginning of modern institutions, may themselves have been the result of a long evolution. The most conspicuous example, not of anta- gonism, but of what may be called disconnexion, between juridical and naturalistic theories of the origin of society, is to be found in the Famizy (¢.v.). Here it need only be said that the pars played by the family in the development of legal ideas has,been fully elaborated by historical jurists, sometimes with the inference, implied rather than expressed, that it marks the beginning of the history, or at least is to be found in the earliest period of the race of which we have

trustworthy evidence. Substantially the conclusions of the jurists as to the influence of the conception of the family on historic law remain unimpaired. It is true that a great part of the “legal ideas of civilized races may be traced to this conception, and that the’ history of their development is the history of its slow unwinding.”! But that there is no

anterior condition to that in which the patriarchal family—‘ a group of men, women, and slaves, of animate and inanimate property, all connected together by subjec- tion to the paternal power of the chief of the household ”— is the unit of society, is not, so far as we are aware, affirmed by any historical jurist. The evidence on that question will be found in the article Fam1ty above mentioned.

Another natural group whose place.in legal history has recently been the subject of careful investigation is the village community. In one of its forms—the township— “it is an organized self-acting group of Teutonic families, exercising a commou proprietorship over a definite tract of land, its mark, cultivating its domain on a common system, and sustaining itself by the produce. It is described by Tacitus in the Germania as the vicus; it is well known to have been the proprietary and even the political unit of the earliest English society ; it is allowed to have existed among the Scandinavian races, and it survived to so late a date in the Orkney and Shetland islands as to have attracted the attention of Sir Walter Scott” (Maine, Village Communities, p. 10). Founding on the researclies of G. L. von Maurer, of Nasse, and others on the Teutonic mark, and comparing them with the observed phenomena of the village community in India, Sir H. Maine has shown, in the work just cited, how this widely diffused institution illustrates legal history, more particularly with reference to property in land, and to the conservation of customary law.

The lateness of the intervention of the state or sovereign as a direct legislator has been adverted to in the previous discussion. Formal law-making by the state is everywhere posterior to its intervention as the enforcer of law. Not that law-making was consciously separated from judging, or that the assembly or officer who represented the state was conceived as exclusively judicial. But the state, whether represented by a public assembly or by an officer, undertook to decide disputes between man and man long before it presumed to say ou what principle such disputes should be decided. The judge everywhere comes before the legislator, if indeed terms so purely modern can be applied without danger to early law. That the pronounce- ments of the judge were themselves a source of law,—that he created the law which

he professed to declare,—is true in a sense which, however, requires us to obliterate the most conspicuous of all the duties of a judge conceived in relation to mature law. That the law existed before the judgment, that the judgment should simply declare pre- existing law, that ex post facto laws are unjust—are the inveterate beliefs and prejudices of a civilized society, the strength of which is manifested by the fictions elsewhere noticed as concealing the manufacture of new law. No such conception is to be imported into the notions of early society as to the right and wrong of civil justice. The office of the judge was to settle disputes, to do right where wrong had been done; and whether his decision was founded on law, or custom, or religion, or on personal wisdom or inspiration, was a question which we cannot conceive as being asked, when these things were not distinguished in thought.

A conclusion suggested by the earliest forms of pro- cedure in Roman law is that the intervention of the judge 1s originally that of a private arbitrator. The legis actio sacramenti retained down to a very late period certain

1 Maine's Village Communities, p. 15.

symbolical proceedings, in which the features of a private quarrel were simulated. It was a petrified legal drama, like that played by the vouchers in the English action of ejectment. The parties wrangle over the disputed pro- perty, the magistrate interposes, and they agree to abide by his decision, each staking a deposit on the justice of his case. Maine felicitously compares these formalities with the trial scene depicted on the shield of Achilles in the Iliad, in which the sacramentum is represented hy two talents of gold to go to the judge who shall best decide the points in dispute in the opinion of the spectators. The reward given to the private arbitrator has become in legal symbolism the fee payable to the court on the hearing of the cause. "In confirmation of this view," says Maine, ''it may be added that many observers of the oldest judicial usages of modern Europe have remarked that the fines inflicted by courts on offenders were

originally sacra- menta” (Ancient Law, p. 378). The symbolism of another legis actio is susceptible of a similar interpretation. The condictio was a personal action taking its name from the notification to the defendant to appear before the judge on a day named, and it simulated a quarrel settled, not by the interposition of the arbitrator, but by agreement of the parties in the form of a wager, to be decided by the arbi- trator at a future time. It is consistent with this view of the first manifestations of judicial functions that early as compared with mature law should assign so large a place to mere procedure. The adjective law, as it is now called, was the first portion of the law to take definite shape, and long maintained its place in the foreground of the system. When a special class in society, whether an aristocratic or priestly caste or a profession, became, as was almost uni- versally the case, the exclusive custodians of the law, the formalities of procedure were their most important secrets. It is represented as a revolution in Roman society when the clerk of one of the aristocratic lawyers divulged to the public his master’s notes for the conduct of legal proceed- ings. And at all times, it may be said, the law of pro- cedure or practice is in a special sense the law of the professional lawyer, his knowledge of which makes him a skilled craftsman.

The more definite the judiciary power the more do we approach the state of things in which the postulates of analytical jurisprudence aretrue. Another mark of matur- ing law is its expression in writing, which, while it destroys the secret monopoly of a class, tends to develop the separate profession of free practising lawyers, who in all progressive societies count as the most powerful instrument for mould- ing the shape of the law. The influence of lawyers upon law is one of the topics on which the comparison of English and Roman law throws a flood of light, but its illustration would carry us beyond our present limits. Nor can we do more than allude to the importance tentatively assigned by Maine to the question whether a written law comes relatively early or late in the history of a nation. He appears to hold that the relatively early code of the Romans saved them from that degeneration of custom which takes place when it is transmitted by oral tradition from one generation to another.

We have discussed elsewhere, under the headings Equity and Fictions, two of the modes by which legal changes have been brought about indirectly. Direct law-making by the sovereign power, there is reason to believe, is not only everywhere later than these agencies, but its activity is progressive, and constantly tends to displace them. A glance at the English statute-book will show that the legis- lature at the present day undertakes the deliberate altera- tion of the law to a much greater extent than it has ever done before. A rough illustration is the fact that the chronological table of the statutes from 1235 to 1877

covers over three hundred pages, of which. fully two-thirds are occupied with the legislation of the last hundred years. This activity varies of course at different times, and the variations even in recent times have been remarkable. And, large as are the contributions of modern parliaments to the law, it is notorious that but for defects in the legislative machinery they would be much larger. Nor is this activity to be accounted for by the theory that the domain of law is more intrusive than in earlier times. There has undoubt- edly been within the last generation a steady increase in the eontrol asserted by the state over the habits of its citizens, for some account of which reference may be made to the article Government, But on the whole the range of action with which the English law declines to interfere is probably as great now as it ever has been in civilized societies. The true explanation is that parlia- ment has effectually secured for itself exclusive authority as the source of legal changes. ‘The violent assault of Bentham on judiciary law was but the echo of the lesson taught by the English judges as to omnipotence of parlia- ment, and thoroughly understood and accepted by popular opinion. To that is due the caution, not to say timidity, which now characterizes the judicial interpretation of statutes. The courts adhere to the literal meaning of the enactment unless compelled to open it by its too frequent absurdity or self-contradiction. If there is any way out of a difficulty which will not involve the slightest addition to the enacted law, that will be the way followed by judicial decision. ‘This attitude is a complete reversal of that which once prevailed in the courts, when the law embodied in decided cases,

pure drawn from the fountains of justice, was deemed superior in dignity to the enactments of an unlearned parliament. ‘The tribunals, in so far as they now make law, operate much more freely on the cases than on the statutes.

The consequence of this relation of the judiciary and the legislature is that, while great reforms are no doubt accele- rated, small reforms have to wait. Parliament does in a single session that which would have taken ages to accom- plish under the natural agencies of equity and fiction, and much which would never have been brought about by these agencies at all. But the capacity of parliament is limited, and so is its foresight. The work of legislation is left in- complete, and the judicature carefully avoids completing it, leaving the legislature to take it up again when it may. An instance in point is the late history of the law of evidence. This portion of the law grew to maturity in the courts, whose creation it was. It has been wholly trans- formed by direct legislative enactment (under the influence of Benthamite principles), Act after Act being passed as occasion pointed out defects in what had already been accom- plished. One of the latest Acts on the subject simply enables parties and their husbands or wives to give evi- dence in a certain class of indictments. The substi- tution of an affirmation for an oath has been carried out in the same piecemeal fashion, the courts refraining from developing the principle of the amendments, as they would have doneif the movement had originated with themselves and in an earlier stage of their history. The most por- tentous example of the intervention of the legislature to complete the exact details of its enactments is the Act previously noticed, which orders the word “this” to be interpreted as “that.” The defects of existing legislative methods in England result in some defects in the form of the law, which the tribunals are free to criticize but not to correct. An Act of Parliament bears upon its face the marks of the tumultuous discussion of a large popular assembly, and of the compromise which reconciles the opposing views of the two Houses. Very few Acts, no matter what care may be employed in framing them, are

promulgated in the form best suited for actual exercise,— in the form which would be given to them by an intelligent legislator, charged with the expression of the principle which parliament is supposed to have sanctioned.

In what has been said regarding the relations of the legislature and the judicature it is not implied that the manufacture of case-law by the latter has ceased. On the contrary, it goes on with yearly increasing volume, and the immense accumulation of decided cases is one of the evils of the present state of the law. The hand of precedent never lay heavier on the conscience of the judge than it does now. ‘The necessary literature of the law is increased by a dozen large volumes every year. The law becomes more voluminous without becoming more elastic or more systematic. The stereotyped judicial habit is to follow absolutely the precedents set by every tribunal of higher rank, and almost absolutely those set by tribunals of co- ordinate rank. A careful semi-official record has taken the place of the private reports published by lawyers privileged by the courts to take notes of their proceedings. Every case of any importance is recorded and becomes a precedent which the practising lawyer in future must know, and which the judge must follow. The minute detail into which legal literature is thus made to descend is becoming an intolerable load; and it is a question whether some revolution in respect to precedents is not becoming neces- sary.

Legislation by judges has its counterpart in the use of legislative forms for judicial purposes. Long after legisla- tive and judicial functions have been separated, we find legislative acts serving the purpose of judicial decisions. The history of English law is full of examples, the best known of which is that of divorce. The practice of passing private bills of divorce, at a time when the technical law did not allow of that remedy, hardened into a_ purely judicial practice. The Act which established the Divorce Court did not in effect do more than create a new and better tribunal. So with the General Enclosure Act, which took over from the legislature the purely judicial work of sanctioning enclosures in proper cases.

Comparative jurisprudence, in the sense in which it is distinguishable from historical jurisprudence, can scarcely be said as yet to have a separate existence. Since Leibnitz projected his youthful scheme for tabulating the laws of all the countries of the world, and exhibiting their corre- spondence and differences by parallel columns, little or nothing has been done for the comparison of laws except in connexion with history. One special line of study does indeed use what may be called a comparative method. The “conflict of laws” involves at least a contrast of a vast number of important points in which the laws of different nations disagree. The object of the study of this conflict is of the practical kind which comparative jurisprudence as here conceived is meant to subserve. It is to develop some rationale of decisions where two or more discordant rules claim exclusive application to the case. There are circumstances which seem to show that the mere comparison of laws with no other object but that of discovering in how many ways the same thing can be done, and which way is the best, will enter more and more into the higher legal studies. For one thing, the vast increase which has taken place in the means of communication between nations has made a knowledge of each other’s laws a matter of impera- tive necessity, and has broken down, at least as between the most advanced nations, that barrier of insularity which formerly shut out all suggestions of improvement from abroad. We have already emphasized the marked extent to which this exclusiveness has characterized English law, and we cannot but regard it as typical ofa new temper that in preparing for the solution of important problems of

legislation, the British Government not unfrequently collects from its agents abroad information as to the solu- tion of the same problems in other countries. An im- portant influence always tending in this direction, and greatly strengthened by the changes to which we have alluded, is that of commerce, and particularly of British commerce. England’s business relations are coextensive with the world ; it is a necessity of her business that she

LAW, Joun (1671-1729), best known as the originator of what is usually called the Mississippi scheme, was born at Edinburgh in April 1671. His father, a goldsmith and what we should now describe as banker, bought shortly before his death, which took place in his son's youth, thelands of Lauriston near Edinburgh. John lived at home till he was twenty, and then went to London. He had already studied mathematics, and the theory of com- merce and political economy, with much interest ; but he was known rather as a fop than as a scholar. In London he gambled, drank, and flirted till in April 1694 a love intrigue resulted in a duel. He killed his antagonist, and was arrested, tried, found guilty, and condemned to death. His life was spared, but he was detained in prison. He found means to escape, and fled to Holland, then the greatest commercial country in Europe. Here he observed with close attention the practical working of banking and financial business, and conceived the first ideas of his cele- brated "system." After afew years spent in foreign travel, he returned to Scotland, then exhausted and enraged by the failure of the Darien expedition (1695-1701). He pro- pounded plans for the relief of his country in a work? entitled Money and Trade Considered, with a Proposal for Supplying the Nation with Money (1705). — This attracted some notice, but had no practical effect, and Law again betook himself to wandering over the Continent. He visited Brussels, Paris, Vienna, Genoa, Rome, making large sums by gambling and speculation, and spending them in a lavish and reckless manner. He was in Paris in 1708, and made some proposals to the Government as to their financial difficulties, but Louis XIV. declined to treat with a "Huguenot," and D'Argenson, chief of the police, had him expelled the city as a suspicious character. He had, however, become intimately acquainted with the duke of Orleans, and, when in 1715 the king died, and that prince became regent, Law at once returned to the French capital. The extravagant expenditure of the late monarch had plunged the kingdom into apparently inextricable financial confusion. The debt was 3 milliard livres, the estimated annual expenditure, exclusive of interest pay- ments, 148 million livres, and the income about the same.

The advisability of declaring a national bankruptcy was seriously discussed, and though this plan was rejected measures hardly less

violent were resorted to. By a visa, or examination of the state liabilities by a committee with

1 A work entitled Proposals and Reasons for constituting a Council of Trade in Scotland was published anonymously at Edinburgh in 1701. It was republished at Glasgow in 1751 with Law's name attached ; but several references in the state papers of the time men- tion William Paterson (1658-1719), founder of the Bank of England, as the author of the plan therein propounded. Even if Law had nothing to do with the composition of the work, he must have read it and been influenced by it. This may explain how it contains the germs of many of the developments of the '* system." Certainly the sugges- tion contained in the pamphlet of a central board, to manage great com- inercial undertakings, to furnish occupation for the poor, to encourage mining, fishing, and manufactures, and to bring about a reduction in the rate of interest, is a plan which was to no inconsiderable extent actually realized in the Mississippi scheme. See Bannister's Life of William Paterson (ed. 1858), and Writings of William Paterson (2a ed., 3 vols., 1859).

| should know what view is taken of contracts and the rela- tions arising out of them by the laws of different states, And it is becoming a necessity of the commercial class in all countries that, on fundaméntal points at least, the principles of law should be everywhere the same. Strenu- | ous efforts, for instance, are now being made for the estab-

lishment of a uniform law of negotidble instruments in all

countries, and with some prospect of success.

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full powers of quashing claims, the debt was reduced nearly a half, the coin in circulation was ordered to be called in and reissued at the rate of 120 for 100,—a measure by which foreign coiners profited greatly ; and a chamber of justice was established to punish speculators, to

whom the difficulties of the state were ascribed. These measures had so little success that the billets détat which were issued as part security for the new debt at once sank 75 per cent. below their nominal value. At this crisis Law came for- ward and unfolded a vast scheme to the perplexed regent. A royal bank was to be founded. It was to manage the trade and currency of the kingdom, to collect the taxes, and free the country from debt. The council of finance then under the duke of Noailles, opposed the plan, but the regent allowed Law to go on with part of it in a tentative way. By an edict of 2d May 1716, a private institution called La Banque Générale, and managed by Law, was founded. The capital was 6 million livres, divided into 1200 shares of 5000 livres, payable in four instalments, one-fourth in cash, three-fourths in bzllets @état. It was to perform the ordinary functions of a bank, and had power to issue notes payable at sight in the weight and value of the money mentioned at day of issue. The bank was a great and immediate success. By providing for the absorption of

part of the state paper it raised to some extent the credit of the Government. The notes were a most desirable medium of exchange, for they had the element of fixity of value, which was, owing to the arbitrary mint decrees of the Government, wanting in the coin of the realm. They were also found the most convenient instruments of remittance between the capital and the provinces, and they thus developed and increased the industries of the latter. The rate of interest, previously enormous and uncertain, fell first to 6 and then to 4 per cent. ; and when another decree (10th April 1717) ordered collectors of taxes to receive notes as payment, and to change them for coin at request, the bank so rose in favour that it had soon a note issue of 60 million livres. Law now gained the full confidence of the regent, and was allowed to proceed with

the development of the “system.”

The trade of the large and fertile region in North America about the Mississippi had been granted to a speculator named Crozart. He found the undertaking too large, and was glad to give it up. By a decree of August 1717 Law was allowed to establish the Compagnte des Indes-

Occidentales, and to endow it with privileges practi- cally amounting to sovereignty over the most fertile region of North America. The capital was 100 millions,' divided into 200,000 shares of 500 livres. The payments were to be one-fourth in coin and three-fourths in bel/ets d'état. On these last the Government was to pay 3 millions livres interest yearly to the company. As the state paper was depreciated the shares fell much below par. The rapid rise of Law had made him many enemies, and they took advantage of this to attack the system. D'Argenson, the former chief of the police, and now, in succession to De Noailles, head of the council of finance, with the brothers Paris of Grenoble, famous tax farmers of the day, formed what was called the "anti-system." The farming of the

taxes was let to them, under an assumed name, for 484 million livres yearly. A company was formed the exact counterpart of the Mississippi company. The capital was the same, divided in the same manner, but the payments were to be entirely in money. The returns from the public revenue were sure; those from the Mississippi scheme were not. Hence the shares of the latter were for some time 'out of favour. Law proceeded unmoved with the development of his plans. On the 4th December 1718 the bank became a Government institution under the name of La Banque Royale. Law was director, and the king guaranteed the notes.

transport of money between towns where it had branches was forbidden. The paper issue now reached 110 millions. Law had such confidence in the success of his plans that he agreed to take over shares in the Mississippi company at par at a near date. The shares began rapidly to rise. The next move was to unite the companies Des Indes Orientales and De Chine, founded in 1664 and 1713 respectively, but now dwindled away to a shadow, to his company. The united association was called La Compagnie des Indes; it had practically the monopoly of the foreign trade of France. These proceedings necessitated the creation of new capital to the nominal amount of 25 million livres. The payment was spread over 20 months.

It required four of the old shares and a premium of 50 livres to obtain a new one. All these 500 livre shares rapidly rose to 750, or 50 per cent. above par. Law now turned his attention to the obtaining of additional powers within France itself. On the 25th July 1719 an edict was issued granting the company for nine years the management of the mint and the coin issue. For this privilege the company paid 5 million livres, and the money was raised by a new issue of shares of the nominal value of 500 livres, but with a premium of other 500. The list was only open for twenty days, and five of the former shares were required to obtain a new one. At the same time two dividends per annum of 6 per cent. each were promised. Again there was an attempt to ruin the bank by the commonplace expedient of making a run on it for coin; but the conspirators had to meet absolute power managed with fearlessness and skill. An edict appeared reducing, at a given date, the value of money, and those who had withdrawn coin from the bank hastened again to exchange it for the more stable notes. Public confidence in Law was increased, and he was enabled rapidly to proceed with the completion of the system. A decree of 27th August 1719 deprived the rival company of the farming of the revenue, and gave it to the Compagnie des Indes for nine years in return for an annual payment of 52 million livres, Thus at one blow the anti-system was crushed. One thing yet remained; Law proposed to take over the national debt, and manage it on terms advantageous to the state. The mode of transfer was this. The debt was over 1500 million livres. Notes were to be issued to that amount, and with these the state creditors were to be paid in a certain order, Shares were to be issued at intervals corresponding to the payments, and it was expected that the notes would be used in buying these. The Government was to pay 3 per cent. for the loan. It had formerly been bound to pay 80 millions, it would now pay under 50, a clear gain of over 30. As the shares of the company were almost the only medium for investment, the transfer would be surely effected. The creditors would now look to the Government payments and the commercial gains of the company for their annual returns. Indeed the creditors were often not able to procure the shares, for each succeeding issue was immediately seized upon. The third, on the 2d October, for 500 millions, divided into shares of

The shareholders were repaid in | coin, and, to widen the influence of the new institution, the —

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(with premium) 5000 livres each, was taken up as eagerly as its predecessors, and the shares immediately resold at 8000 livres in the Rue Quincampoix, then used as a bourse. They went on rapidly rising as new privileges were still granted to the company. Law had now more than regal power. The exiled Stuarts paid court to him; the proudest aristocracy in Europe humbled themselves before him ; and his liberality made him the idol of the populace. After, as a necessary preliminary, becoming a Catholic, he was made controller-general of the finances in place of D'Argenson, who was removed to make way for him. Finally, in February 1720, the bank was in name as well as in reality united to the company.

The system was now complete ; but it had already begun to decay. In December 1719 it was at its height. The shares then had mounted to 20,000 livres, forty times their nominal price. A sort of madness possessed the nation. Men sold their all, and hastened to Paris to speculate. The population of the capital was increased by an enormous influx of provincials and foreigners. Trade received a vast though unnatural impulse. Everybody seemed to be getting richer, no one pvorer. Those who could still reflect saw that this prosperity was not real. The whole issue of shares at the extreme market price valued 12 milliard livres. It would require 500 million annual revenue to give a 5 per ceut, dividend on this. Now, the whole income of the company as yet was hardly suflicent to pay 5 per cent. on the original capital of 1 milliard 677 million livres. The receipts from the taxes, &c., could be precisely calculated, and it would be many years before the commercial undertakings of the com- pany—with which only some trifling beginning had been made—would yield any considerable return. People began to sell their shares, and to buy coin, houses, land, —any- thing that had a stable element of value in it. There was a rapid fall in the shares, a rapid rise in all kinds of pro- perty, and consequently a rapid depreciation of the paper money. Law met these

new tendencies by a succession of the most violent edicts. The notes were to bear a premium over specie. Coin was only to be used in small payments, and only a small amount was to be kept in the possession of private parties. The use of diamonds, the fabrica- tion of gold and silver plate, was forbidden. A dividend of 40 per cent. on the original capital was promised. By several ingenious but fallaciously reasoned pamphlets Law endeavoured to restore public confidence. The shares still fell, At last, on the 5th March, an edict appeared fixing the price of these at 9000 livres, and ordering the bank to buy and sell them at that price. The fall now was transferred to the notes, of which there were soon over 24 milliard livres in circulation. A large proportion of the coined money was removed from the kingdom. Prices rose enormously. There was everywhere distress and complete financial confusion. Law became an object of popular hatred. He lost his court influence, and was obliged to consent to a decree (21st May 1720) by which the notes and consequently the shares were reduced to half their nominal value. This created such a commotion that its promoters were forced to recall it, but the mischief was done. What confidence could there be in the depreciated paper after such a measure? Law was removed from his office, and his enemies proceeded to demolish the system. A vast number of shares had been deposited in the bank. These were destroyed, The notes were reconverted into Government debt, but there was first a visa which reduced that debt to the same size as before it was taken over by the company, The rate of interest was lowered, and the Government now only pledged itself to pay 37 instead of 80 millions annually. Finally the bank was abolished, and the company reduced to a mere trading association. By November the system had disappeared. With these last

measures Law, it may well be believed, had nothing to do. He left France secretly in December 1720, resumed his wandering life, and died at Venice, poor and forgotten, 2ist March 1729, °

Of Law’s writings the most important for the comprehension of the ‘‘system” is his Money and Trade Considered. In this work he says that

national power and wealth consist in numbers of people, and magazines of home and foreign goods. These depend on trade, and that on money, of which a greater quantity employs more people ; but credit, if the credit have a circulation, has all the beneficial effects of money. To create and increase instruments of eredit is the function of a bank. Letsuch be created then, and let its notes be only given in return for land sold or pledged. Such a currency would supply the nation with abundance of money ; and it would have many advantages, which Law points out in detail, over silver. The bank or commission was to be a Government institu- tion, and its profits were to be spent in encouraging the export and manufacture of the nation. A very evident error lies at the root of the system. Money is not the result but the cause of wealth, he thought. To increase it then must be beneficial, and the best way is by aproperly secured paper currency. This is the motive force ; but it isto be applied in a particular way. Law had a profound belief in the omnipotence of Government. He saw the evils of minor monopolies, and of private farming of taxes. He proposed to centre foreign trade and internal finance in one huge monopoly managed by the state for the people, and carrying on business through a plentiful supply of paper money. He did not sec that trade and commerce are best left to private enterprise, and that such a scheme would simply result in the profits of speculators and favourites. The system indeed was never so far developed as to exhibit its in- herent faults. We have already seen how the madness of specu- lators ruined the plan when only its foundations were laid. One part indeed might have been saved. The bank was not necessarily bound to the company, and had its note issue been retrenched it might have become a permanent institution. As M. Thiers points out, the edict of 5th March 1720, which made the shares convertible into notes, ruined the bank without saving the company. The shares had risen to an unnatural height, and they should have been allowed to fall to their natural level. Perhaps Law felt this to be impossible. He had friends at court whose interests were involved in the shares, and he had enemies eager for his overthrow. It was necessary to succeed completely or not at all; so Law risked and lost everything. Notwithstanding the faults of the system, it cannot be denied that its author was a financial genius of the first order. He had the errors of his time ; but his writings show that he first propounded

many truths as to the nature of currency and banking then unknown to his contemporaries. The marvellous skill which he displayed in adapting the theory of the system to the actual condition of things in France, and in carrying out the vari- ous financial transactions rendered necessary by its development, is absolutely without parallel. His profound self-confidence and belief in the truth of his own theories were the reasons alike of his success and his ruin. He never hesitated to employ the whole force of a despotic Government for the definite ends which he saw before him. He was not self-seeking. He left France poorer than he entered it, nor was he perceptibly changed by his sudden transitions of for- tune. Montesquieu visited him at Venice after his fall, and has left a description of him not without a certain touch of pathos. Law, he tells us, was still the same in character, perpetually plan- ning and scheming, and, though in poverty, revolving vast projects to restore himself to power, and France to commercial prosperity.

The best account of the Mississippi scheme is that of Thiers, ‘‘ Law et son systtme des Finances,” first published in the Encyclopédie progressive, Paris, 1826; there isan American translation, New York, 1859. See also Heymann, Law und sein System, Munich, 1853; E. Levasseur, Recherches historiques sur le systéme de Law, Paris, 1854; and Jobez, Une préface au Socialisme, ou le systéme de Law et la

chasse aux capitalistes, Paris, 1848. Full biographical details are given in Wood’s Life of Law, Edinburgh, 1824. All Law’s latcr writings are to be found in vA)”

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Collection des principaux Economistes, vol. i., Paris, 1843. (. WA LAW, Witx1am (1686-1761). The events of the life of this remarkable man may be very briefly stated. He was born in 1686 at King’s Cliffe; in 1705 he entered as a sizar at Emmanuel College, Cambridge; in 1711 he was elected fellow of his college and received holy orders, and in 1712 he took his M.A. degree. He resided at Cambridge, taking pupils and occasional duty until the accession of George I., when his conscience forbade him to take the oaths of allegiance to the new

Government and of abjuration of the Stuarts ; his staunch Jacobitism had already been betrayed in a tripos speech which brought him into trouble; and he was now deprived of his fellowship, and became a non-juror. For the next few years he is said to have been a curate in London, but the point is doubtful. In 1727 we

father of the historian, and “the much honoured friend and spiritual director of the whole family” (Gibbon, Zhe Memoirs of my Life and Writings). In the same year he accompanied his pupil to Cambridge, and resided with him as governor, in term time, for the next four years. His pupil then went abroad, but Law was left at Putney, where he remained in Mr Gibbon’s house for more than ten years, acting as a religious guide not only to the family but toa number of pious men who used to make pilgrimages to consult the Putney sage. The most eminent of these were the two brothers John and Charles Wesley, Dr Byrom the poet, Dr Cheyne the famous physician, and Mr Archibald Hutcheson, M.P. for Hastings. In 1737 Mr Gibbon the elder died, and the household was, a short time afterwards, dispersed. Law therefore was parted from his friends, leaving behind him, the historian tells us, “in our family the reputation of a worthy and pious man, who believed all that he professed, and practised all that he enjoined.” In 1740 Law retired to his native village, where he had inherited from his father a house and a small property. There he was presently joined by two ladies, Mrs Hutche- son, the rich widow of his old friend, who recommended her on his death-bed to place herself under Law’s spiritual guidance, and Miss Hester Gibbon, sister to his late pupil. This curious trio lived for twenty-one years a life wholly given to devotion and charity, until the death of Law an 1761.

Such was the singularly uneventful life of this good man; but during the whole period from the time when he became a non-juror almost to the day of his death he was busily engaged in literary work which places him in the very first rank of 18th century divines. As a writer, it will be convenient to consider him under three heads.

1. As a singularly able controversialist. The first of his contro- versial works was Three Letters to the Bishop of Bangor (1717), which were considered both by friend and foe as one of the most powerful contributions to the Bangorian controversy on the High Church side. Dean (afterwards Bishop) Sherlock declared that ‘‘ Mr Law was a writer so considerable that le knew but one good reason why his lordship did not answer him.” ‘Law’s next controversial work was Remarks on Mandeville’s Fable of the Bees (1723), in which he vindicatcs morality on the highest grounds ; for pure style, caustic wit, and lucid argument this is a pan gem ; it was enthusiasti- cally praised by John Sterling, and has been republished by F. D. Maurice. lLaw’s Case of Reason (1732), in answer to Tindal’s Christianity as old as the Creation is to a great extent an anticipation of Bishop Butler’s famous argument in the Analogy. In this work Law shows himself at least the equal of the ablest champion of Deism. His Letters to a Lady inelined to enter the Church of Rome are excellent specimens of the attitude which a High-Churchman maiutains against Romanism.

2. As a very effective writer on practical divinity. The Serious Call to a Devout and Holy Life (1729), together with its predecessor, A Treatise of Christian Perfection (1726), deeply influenced the chief actors in the great Evangelical revival. The Wesleys, White- field, Venn, Scott, and Adam all express their deep obligation to the author. The Serious Call affected others quite as deeply. Dr Johnson, Gibbon, Lord Lyttelton, and Bishop Horne all speak enthusiastically of its merits ; and it has been, until lately, perhaps the only work by which its author was popularly known, In a tract entitled The Absolute Unlawfulness of Stage Entertainments, Law, unlike himself, was tempted by the undoubted corruptions of the stage of the period to use language which transcends the bounds of reason.

3. As one of the few English mystics. Though the least popular, by far the most interesting, original, and suggestive of all Law’s works are those which he wrote in his later years, after he had become an enthusiastic admirer (not a disciple) of Jacob Boehme, the Teutonic theosopher. From his earliest years he had been deeply impressed with the piety, beauty, and thoughtfulness of the writings of the Christian

mystics, but it was not till after his accidental meeting with the works of Bochme, about 1734, that pronounced mysticism appearsin his works. It would far transceniL the limits of this article to describe, however briefly, the purport of Law's niystic writings. All are very beautiful; some are wild anid fanciful; but not one of them is inconsistent with his position as a churchman, and even a very high churchman of the spiritual type.

find him domiciled at Putney as tutor to Edward Gibbon, | The titles of the works written by Law in his mystic stage are 4

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Demonstration of the Gross and Fundamental Errors of a late Book called a *‘ Plain Account, d&e., of the Lord's Supper," 1737; An Appeal to all that Doubt and Disbelieve the Truths of Revelation, 1739; The Grounds and Reason of Christian Regeneration, 1739 ; An Earnest and Serious Answer to Dr Trapp's Sermon on being Righteous Overmueh, 1740; The Spirit of Prayer, 1749, 1752; The Way to Divine Knowledge, 1752; The Spirit of Love, 1752, 1754 2 A Short but Sufficient Confutation of Dr Warburton's Projected Defence (as he ealls it) of Christianity in his Divine Legation of Moses, 1757; A Series of Letters, 1760; a Dialogue between a Methodist and a Churchman, 1760; and An Humble, Earnest, and A ffeetionate Address to the Clergy, 1761.

Mr R. Tighe wrote a short account of Law's life at the beginning of this eentury. Myr C. Walton printed for private cireulation Votes and Materials fur a Complete Biography of W. Law, in 1848; Mr Leslie Stephen in his English Thought in the 18th Century, My Lecky in his History of England in the 18th Century, and Mr Abbey in Zhe English Church in the \&tk Cextury, all give sketches of Law's life, character, and works; and Mr Overton has devoted a volume to him, entitled William Law, Non-juror and Mystic, 1881.

LAWES, Henry (1595-1662), a prominent member of the school of early English musicians, which culminated in Purcell, and was nipped in the bud by his early death, was born at Dinton in Wiltshire in December 1595, and received his musical education from John Cooper, better known under his [talian pseudonym Giovanni Coperario, a famous composer of the day. In 1626 he was received as one of the gentlemen of the chapel royal, which place he held till the Commonwealth put a stop to church music. But even during that songless time Lawes continued his work as a composer, and the famous collection of his vocal pieces, Ayres and Dialogues for One, Two, and Three Voyces, was published in 1653, being followed by two other books under the same title in 1655 and 1658 respectively. When in 1660 the king returned, Lawes once more entered the royal chapel, and composed au anthem for the coronation of Charles II. His death took place October 11, 1662. Lawes's name has become known beyond musical circles by his friendship with Milton, whose Comus he supplied with incidental music for the performance of the masque in 1634. The poet in réturn immortalized his friend in the famous sonnet beginning :—

Harry, whose tuneful and well-measured song

First taught our English music how to span

Words with just note and accent, not to scan

With Midas' ears, committing short and long. In these lines, Milton, with a musical perception not common amongst poets, exactly indicates the great merit of Lawes, which distinguishes his compositions from those of many of his contemporaries and successors. His careful attention to the words of the poet, the manner in which his music seems to grow from those words, the perfect coincidence of the musical with the metrical accent, all put Lawes's songs on a level with those of Schumann or Liszt or any modern composer. At the same time he is by no means wanting in genuine melodic invention, and his concerted music shows the learned contrapuntist.

LAWN TENNIS. See Tennis.

LAW OF NATIONS. See InrernwationaL Law.

LAWRENCE, a city of Kansas, U.S., the capital of Douglas county, is situated on both sides of the Kansas river, about 40 miles above its junction with the Missouri. Founded in 1854 by the Massachusetts Emigrant Aid Society as a centre of the anti-slavery party, Lawrence was at first retarded in its development by the disturbed condition of the State ; but its population has rapidly in- creased from 1645 in 1860 to 8511 in 1880, and it is now the fourth city in the State in population and wealth. Tt is a considerable railway junction, has a good trade, and numbers among its manufacturing establishmeuts a pork- packing factory, planing-mills, foundries, carriage works grist-mills, and breweries. A dam has been constructed across the Kansas. In 1862-63 the State university was settled at Lawrence, the buildings occupying a fine site on Mount Oread, a bluff in the south-west part of the city ; in 1880 it had 14 teachers and 438 students. In 1856 Law-

rence was sacked and partially burned by a party of soldiers and Missourians claiming to act with the sanction of the U.S. Government, and in 1863, during the civil war, it was captured and burned by a Confederate guerilla force.

LAWRENCE, a city of Massachusetts, U.S., one of the county seats of Essex county, 26 miles by rail north of Boston, on the Merrimack, about 35 miles from its mouth. The greater part lies on the north side of the river, to the west of the Spicket. Lawrence is emphatically a manu- facturing town, and its rise and rapid development are mainly due to the abundant water-power supplied by the dam across the Merrimack and distributed by a canal a mile long and 14 feet deep. This is the property of the Essex Company, which was incorporated in 1845, and spent $250,000 on the construction of the dam—a piece of granite masonry 1629 feet in length. The Bay State Woollen Mills (capital $2,000,000) and the Atlantic Cotton Mills (capital $1,800,000), both chartered in 1846, were the first great establishments to take advantage of the position, The Lawrence Duck Company and the Pacific Mills (capital $300,000 and $2,500,000) followed in 1853 ; the Washington Mills ($1,650,000), taking the place of the Bay State, in 1858; the Everett ($800,000) and the Pemberton Mills ($450,000) in 1860, the Lawrence Woollen Company in 1863, the Arlington in 1865. There are now eight large " corporations," the largest of which, the Pacific Mills, alone employs 5800 operatives, and produces weekly 1,500,000 yards of cloth, printed or dyed. In 1880 the total number of looms in the cotton and woollen mills was 10,460, of spindles 345,988, and of operatives 12,124; and it is calculated that the average rate of production is 28,800,000 yards per week. The goods are of a varied description—broad cloth, fine flannels, shawls, pantaloon stuffs, felts, ticks, ginghams, &c. There are a number of large paper-mills in the town, as well as establishments for the manufacture of steam-engines, carriages, sewing machines, cordage, earthenware. Among the principal buildings and institutions may be mentioned the city hall (erected in 1847), the county court-house, the opera-house, the Oliver grammar school, and a public library (22,000 volumes). There are three public parks, one (174 acres) in the heart of the city. Water works, deriving their supplies from the Merrimack, were opened in 1876 at a cost of $1,700,000 ; the people had previously depended on wells and cisterns for drinking water. The population in 1850 was 8232; in 1860, 17,669; in 1870, 28,921; in 1880, 39,178. Lawrence,

so-called in honour of the Lawrence family of Boston, was incorporated as a town in 1847, and attained the rank of a city in 1853.

LAWRENCE (Lavrentivs, Lorenzo), St, according to Pope Leo the Great, whose. account is that given also in the Roman Breviary, was a deacon, who in a time of persecution had been called on by the magistrate to give up the treasures committed to his keeping, and who there- upon had produced the church's poor, who were his special charge. Next, for his firmness in refusing to renounce Christ, he was subjected to scourging and laceration, and finally roasted to death on a gridiron. The later accounts of the martyrologists are much more circumstantial. According to these, Lawrence was a native of Huesca in Spain, but at a very early age had gone to Rome, where for his meekness and blamelessness he was chosen arch- deacon by Pope Sixtus II., and intrusted with the treasures of the church, consisting of vestments, plate, and a little money. Sixtus, having (in the reign of Valerian) been denounced as a Christian, was imprisoned and sentenced to death, whereupon Lawrence addressed to him the words which now form one of the antiphons in the office for St Lawrence's day (August 10): "Whither goest thou, O

my father ! without thy son and servant?" To this the pope replied with a prophecy that in three days Lawrence the Levite should follow Sixtus the priest. At the same time Lawrence was directed to distribute the church treasures among the poor, and so prevent them from falling into the hands of the persecntor. When under the cruel punishment to which he was at last condemned for his steadfastness, he is said to have triumphed over the tyrant by the famous ironical speech—" Assatus est; jam versa et manduca." The fact of the martyrdom of St Lawrence seems to be well established, the most probable date being August 10, 958, he earliest extant mention of the event occurs in the writings of St Ambrose. Lawrence and his martyr- dom have been favourite subjects for artistic treatment. Nuremberg, Genoa, and the Escorial are under his patron-

age.

LAWRENCE, Jonn Larrp Marr Lawrence, Baron (1811-1879), viceroy and governor-general of India, was born at Richmond, Yorkshire, 24th March 1811. His father, Colonel Alexander Lawrence, volunteered the forlorn hope at Seringapatam in presence of Baird and of Welling- ton, whose friend he became. His mother, Letitia Knox, was a collateral descendant of John Knox. To this couple were born twelve children, of whom three became famous in India, Sir George St Patrick, Sir Henry (noticed below), and Lord Lawrence. Irish Protestants, the boys were trained at Foyle College, Derry, and at Clifton, and received cominissions from their mother's cousin, Mr Huddleston, who had been the friend of Schwartzin Tanjore. In 1829, when only seventeen, John Lawrence landed at Calcutta ; he mastered the Persian language at the college of Fort William, and was sent to Delhi, on his own application, as assistant to the collector. The position was the most dangerous and difficult to which a Bengal civilian could be appointed at that time. The titular court of the pen- sioner who represented the Great Mogul was the centre of that disaffection and sensuality which found their oppor- tunity in 1857. A Mussulman rabble filled the city. The district around, stretching from the desert of Rajpootana to the Jumna, was slowly recovering from the anarchy to which Lord Lake had given the first blow. When not administering justice in the city courts or under the village tree, John Lawrence was scouring the country after the marauding Meos and Mohammedan freebooters. His keen insight and sleepless energy at once detected the murderer of his official superior, William Fraser, in 1835, in the person of the nawab of Loharu, whose father had been raised to the principality by Lake, and the assassin was executed. The first twenty years, from 1829 to 1849, during which John Lawrence acted as the magistrate and land revenue collector of the most turbulent and backward portion of the Indian empire as it then was, formed the period of the reforms of Lord William Bentinck. To what is now the lieutenant-governorship of the North-Western Provinces Lord Wellesley had promised the same permanent settle- ment of the land-tax which Lord Cornwallis had made with the large landholders or zemindars of Bengal. The court of directors, going to the opposite extreme, had sanctioned leases for only five years, so that agricultural progress was arrested. In 1833 Mertins Bird and Thomason introduced the system of thirty years' leases based

on a careful survey of every estate by trained civilians, and on the mapping of every village holding by native subordinates. These two revenue officers created a school of enthusiastic economists who rapidly registered and assessed an area as large as that of Great Britain, with a rural population of twenty-three millions. Of that school John Lawrence proved the most ardent and the most renowned. Intermitting his work at Delhi, he became land revenue settlement officer in the district of Etawah, and

| order, without one regular soldier.

O71 there began, by buying out or getting rid of the talukdars, to realize the ideal which he did much to create throughout the rest of his career—a country “thickly cultivated by a fat contented yeomanry, each man riding his own horse, sit- ting under his own fig-tree, and enjoying his rude family comforts.” This and a quiet persistent hostility to the oppression of the people by their chiefs formed the two features of his administrative policy throughout life.

It was fortunate for the British power that, when the first Sikh war broke out, John Lawrence was still collector of Delhi. The critical engagements at Firozshah, following Mudki, and hardly redeemed by Aliwal, left the British army somewhat exhausted at the gate of the Punjab, in front of the Sikh entrenchments on the Sutlej. For the first seven weeks of 1846 there poured into camp, day by day, the supplies and munitions of war which this one man raised and pushed forward, with all the influence acquired during fifteen years of an iron yet sympathetic rule in the land between the Sutlej and the Jumna. The crowning victory of Sobraon was the result, and at thirty-five Law- rence became commissioner of the Jalandhar Doab, the fertile belt of hill and dale stretching from the Sutlej north to the Indus. The still youthful civilian did for the newly annexed territory what he had long before accomplished in and around Delhi. He restored it to By the fascination of his personal influence he organized levies of the Sikhs who had just been defeated, led them now against a chief in the upper hills and now to storm the fort of a raja in the lower, till: he so welded the people into a loyal mass that he was ready to repeat the service of

1846 when, three years after, the second Sikh war ended in the conversion of the Punjab up to Peshawar into a British province.

The marquis of Dalhousie had to devise a government for a warlike population now numbering twenty-three millions, and covering an area little less than that of the United Kingdom. The first results were not hopeful (see next article), and it was not till John Lawrence became chief commissioner, and stood alone face to face with the chiefs and people and ring fence of still untamed border tribes, that there became possible the most success- ful experiment in the art of civilizing turbulent millions which history presents. The province was mapped out into districts, now numbering thirty-two, in addition to thirty-six tributary states, small and great. To each thie thirty years' leases of the north-west settlement were applied, after a patient survey and assessment by skilled officials ever in the saddle or the tent. The revenue was raised on principles so fair to the peasantry that Ranjit Singh's exactions were reduced by a fourth, while agricultural improvements were encouraged. For the first time in its history since the earliest Aryan settlers had been overwhelmed by successive waves of invaders, the soil of the Punjab came to have a marketable value, which every year of British rule has increased. A stalwart police was organized ; roads were cut through every district, and canals were constructed. Commerce followed on increasing cultivation and communications, courts brought justice to every man's door, and crime hid its head. The adven- turous and warlike spirits, Sikh and Mohammedan, found a career in the new force of Irregulars directed by the chief commissioner himself under the governor-general, while Dost Mohammed kept within his own fastnesses, and the long extent of frontier at the foot of the passes was patrolled. In the brilliance of his later services to his country, this, the first, which alone rendered those possible, has not yet received justice.

Seven years of such work prepared the lately hostile and always anarchic Punjab under such a pilot as John Lawrence not only to weather the storm of 1857 but to

lead the older provinces into port. On the 12th May the news of the tragedies at Meerut and Delhi reached him at Rawal Pindi. The position was critical in the last degree, for of 50,000 native soldiers 38,000 were Hindustanis of the very class that had mutinied elsewhere, and the British troops were few and scattered. For five days the fate of the Punjab hung upon a thread, for the question was, Could the 12,000 Punjabis be trusted and the 38,000 Hindustanis be disarmed? Not an hour was lost in beginning the disarming at Lahore ; and, as one by one the Hindustani corps succumbed to the epidemic of mutiny, the sepoys were deported or disappeared, or swelled the uilitary rabble in and around the city of Delhi. The remembrance of the ten years' war which had closed only in 1849, a bountiful harvest, the old love of battle, the offer of good pay, but, above all, the personality of Lawreuce and his officers, raised the Punjabi force into a new army of 59,000 men, and induced the non-combatant classes to subscribe to a 6 per cent. loan. Delhi was in- vested, but for three months the rebel city did not fall. Under John Nicholson Lawrence sent on still more men to the siege, till every available European and faithful native soldier was there, while a movable column swept the country, and the border was kept by an im- provised militia. At length, when even in the Punjab con- fidence became doubt, and doubt distrust, and that was passing into disaffection, John Lawrence was ready to consider whether we should uot give up the Peshawar valley as a last resource, and send its garrison to recruit the force around Delhi. Another week and that must have been faced. But on the 20th September the city and palace were again in British hands, and the chief commis- sioner and his officers united in ascribing "to the Lord our God all the praise due for nerving the hearts of our states- men and the arms of our soldiers." As Sir John Lawrence, Bart., G.C.B., with the thanks of parliament, the gratitude of his country, and a life pension of £2000 a year in addition to his ordinary pension of £1000, the " Saviour of India" returned home in 1859. While guarding the interests of India and its people as a member of the secre- tary of state's council, he was sent out again in 1864 as viceroy and governor-general on the resignation and death of Lord Elgin. At what appeared to be a critical time on the Punjab frontier Lord Palmerston recommended for the office the first civilian, not a peer, who has filled the governor-general's seat since Warren Hastings.

If no great crisis enabled him to increase the lustre of his reputa- tion, his five years' administration of the whole Indian empire was worthy of the ruler of the Punjab. His foreign policy has become a subject of imperial interest ; his internal administration was remarkable for financial prudence, a jealous regard for the good of the masses of the people and of the British soldiers, and a generous interest in education, especially in its Christian aspects. When in 1854 Dost Mohammed Khan, weakened by the antagonism of his brothers in Kandahar, and by the inter- ference of Persia, sent his son to Peshawar to make a treaty, Sir John Lawrence was opposed to any entangling relation with the Afghans after the experience of 1838-49. but he obeyed Lord Dalhousie so far as to sign a treaty of per- petual peace and friendship. His ruling idea, the fruit of long and sad experience, was that de facto powers only should be recognized beyond the frontier. When in 1863 Dost Mohammed's death let loose the factions of Afghanistan he acted on this policy to such an extent that he recognized both the sons, Afzul Khan and Shere Ali, at different times and the latter fully only when he had made himself master of all his father's kingdom. The steady advance of Russia from the north, notwithstanding the Gortchakoff circular of 1864, led to severe criticism of this cautious " buffer"

policy which he justified under the term of " masterly inactivity." But he was ready to receive Shere Ali in con- ference, and to aid him in consolidating his power after it had been established and maintained for a time, when his term of office came to an end and it fell to Lord Mayo, his successor, to hold the Ambala conference in 1869. When, nine years after, the second Afghan war was precipitated, the retired viceroy gave the last days of his life to an un- sparing exposure, in the House of Lords and in the press, of a policy which he had striven to prevent in its incep- tion, and which he did not cease to denounce in its course and consequences.

On his final return to England early in 1869, after forty years' service in and for India, "the great proconsul of our English Christian empire" was created Baron Lawrence of the Punjab, and of Grately, Hants. He

assumed the same arms and crest as those of his brother Henry, with a Pathan and a Sikh trooper as supporters, and took as his motto “Be ready,” his brother’s being ‘Never give in.” For ten years he gave himself to the work of the London school board, of which he was the first chairman, and of the Church Missionary Society. Latterly his eyesight failed, and on the 27th June 1879 he died at the age of sixty-eight. He was buried in the nave of Westminster Abbey, beside Clyde, Outram, and Livingstone. He married the daughter of the Rev. Richard Hamilton, Harriette-Katherine, C.I., who survived him; and he was succeeded by his eldest son, John Hamilton, born in 1846.

Beyond numerous minutes and reports, written in plain and trenchant English, and occasional letters, Lord Lawrence published nothing. These, the printed Summaries of Affairs during his term of office as viceroy, the Friend of India from 1856 to 1870, the evidence which he gave before the East Indian Finance Com- mittee of the House of Commons in June and July 1873, and the Causes of the Afghan War, edited by Sir Arthur Hobhouse, are the authorities for his life, until the memoir appears which Mr Bos- worth Smith is preparing. (G. SM.)

LAWRENCE, Sir Henry Monreomery (1806- 1857), one of the greatest military statesmen of India, and provisional governor-general in the mutiny of 1857, was born at Matura, Ceylon, on 28th June 1806 (see last article). He inherited his father’s stern devotion to duty and Celtic impulsiveness, tempered by his mother’s gentleness and power of organization. Early in 1823 he joined the Bengal Artillery at the Calcutta suburb of Dum Dum where also Havelock was stationed about the same time. The two officers pursued a very similar career, and developed the same Puritan character up to the time that both passed away at Lucknow in 1857. In the first Bur- mese war Henry Lawrence and his guns formed part of the Chittagong column which General Morrison led over the jungly hills of Arakan, till fever decimated the officers and men, and the lieutenant found himself at home again, wasted by a disease which never left him. On his return to India with his younger brother John in 1829 he was appointed revenue surveyor by Lord William Bentinck. At Gorakhpur the wonderful personal influence which radiated from the young officer formed a

school of attached friends and subordinates who were always eager to serve under him. After some years spent in camp, during which he had married his cousin Honoria Marshall, and had surveyed every village in four districts each larger than Yorkshire, he was recalled to a brigade by the out- break of the first Afghan war towards the close of 1838. As assistant to Sir George Clerk, he now added to his knowledge of the people political experience in the manage- ment of the district of Firozpur; and when disaster came he was sent to Peshawar in order to push up supports for the relief of Sale and the garrison of Jalalabad. The war had been begun under the tripartite treaty signed at Lahore on 20th June 1838. But the Sikhs

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were slow to play their part when the calamities in Afghanistan made it possible that the British might be driven south of the Jumna. No one but Henry Lawrence could manage the disorderly contingent which they reluctantly supplied to Pollock's avenging army in 1842, He helped to force the Khyber Pass on 5th April, playing his guns from the heights, for eight and twenty miles. In recognition of his services Lord Ellenborough appointed him to the charge of the charming valley of Dehra Dun and its hill stations, Mussuri and Landaur, where he first formed the idea of asylums for the children of European soldiers. After a montli's experience there it was dis- covered that the coveted appointment was the legal right of the civil service, and he was transferred, as assistant

to the envoy at Lahore, to Ambala, where he reduced to |

order the lapsed territory of Kaithal. Soon he received the well-paid office of resident at the protected court of Nepal, amid the rest of which, assisted by his noble

wife, he began a series of contributions to the Calcutta |

Review, a selected volume of which forms an Anglo- Indian classic. There, too, he elaborated his plans which resulted in the erection and endowment of the noblest philanthropic establishments in the East—

the Lawrence military asylums at Sandwar (on the road to Simla), at Murree in the Punjab, at Mount Abu in Rajputana, and on the Madras Nilgiris, From 1844 to his death he de- voted all his comparatively large income, above a modest pittance for his children, to this and other forms of catholic Christian charity.

The Review articles led the new governor-general, Lord'

Hardinge, to summon Lawrence to his side during the first Sikh war; and not these articles only. He had published the results of his experience of Sikh rule and soldiering in a vivid work, the Adventures af an Officer in the Service of Ranjit Singh (1845), in which he vainly attempted to disguise his own personality and exploits. For the next four years he virtually became Ranjit Singh's successor in the government of the Punjab. After the doubtful triumphs of Mudki and Firozshah Lawrence was summoned from Nepal to take the place of the heroic Major George Broadfoot, who had fallen. Aliwal came ; then the guns of Sobraon chased the demoralized Sikhs across the Sutlej. All through the smoke Lawrence was at the side of the chivalrous governor-general. He gave his voice, not for the rescue of the people from anarchy by annexation, but for the reconstruction of the Sikh government, and was himself appointed resident at Lahore, with power " over every department and to any extent" as president of the council of regency till the maharaja Dhalip Singh should come of age. Soon disgusted by the "'venal and selfish durbar " who formed his Sikh colleagues, he summoned to his side assistants like Nicholson, James Abbott, and Ed- wardes, till they all did too much for the people, as he regretfully confessed. But 'my chief confidence was in iny brother John, . . . who gave me always such help as only a brother could." Wearied out he went home with Lord Hardinge, and was made K.C.B., when the second Sikh war summoned him back at the end of 1848 to see the whole edifice of Sikh " reconstruction " collapse. It fell to the marquis of Dalhousie to proclaim the Punjab up to the Khyber British territory on 29th March 1849. But still another compromise was tried. As the best man to reconcile the Sikh chiefs to the inevitable, Henry Lawrence was made president of the new board of ad- ministration with charge of the political duties, and his brother

Jolin was entrusted with the finances. John could not find the revenue necessary for the rapid civilization of the new province so long as Henry would, for political reasons, insist on granting life pensions and alienating large estates to the needy and sensual remnants of Ranjit

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Singh's court. Lord Dalhousie delicately but firmly removed Sir Henry Lawrence to the charge of the great nobles of Rajputana, and installed John as chief commis- sioner. If resentment burned in Henry's heart, it was not against his younger brother, who would fain have retired. To him he said, "If you preserve the peace of the country and make the people high and low happy, I shall have no regrets that I vacated the field for you."

In the comparative rest of Rajputana he once more took up the pen as an army reformer. In March and September 1856 he published two articles, called forth by conversations with Lord Dalhousie at Calcutta, whither he had gone as the hero of a public banquet. The governor-general had vainly warned the home authorities against reducing below 40,000 the British garrison of India even for the Crimean campaigns, and had sought to improve the position of the sepoys. Lawrence pointed out the latent causes of mutiny, and uttered warnings only to be too soon justified. In March 1857 he yielded to Lord Canning's request that he should then take the helm at Lucknow, but it was too late. In ten days his magic rule put down administrative difficulties indeed, as he had done at Lahore. But what could even he effect with only 700 European soldiers, when the epidemic spread after the Meerut outbreak of mutiny on 10th May? In one week he had completed those preparations which made the defence of the Lucknow residency for ever memor- able. Amid the deepening gloom Lord Canning ever wrote home of him as "a tower of strength," and he was appoiuted provisional governor-general. On the 30th May mutiny burst forth in Oudh, and he was ready. On 29th June, pressed by fretful colleagues, and wasted by unceasing toil, he led 336 British soldiers with 11 guns and 220 natives out to Chinhat to reconnoitre the insur- gents, when the natives joined the enemy and the resi- dency was

besieged. On 2d July, as he lay exhausted by the day's work and the terrific heat in an exposed room, a shot struck him, and in forty-eight hours he was no more.

The authorities for his career, besides his own writings above mentioned, are his Zife by Sir Herbert Edwardes (vol. i.) and Herman Merivale (vol. ii.), and the Afutiny Papers (1857-58) pub- lished by Parliament. His form was tall, spare, and wasted, as is best seen in the engraving from a Lucknow photograph prefixed to Rees's Personal Narrative of the Siege. (G. SM.)

LAWRENCE, Sir Tuomas . (1769-1830), was born at Bristol on the 4th of May 1769. His father was an innkeeper first at Bristol and afterwards at Devizes, and at the age of six Thomas was already shown off to the guests of the Black Boar as an infant prodigy who could sketch their likenesses and declaim speeches from Milton. In 1779 the elder Lawrence had to leave Devizes, having failed in business, and the precocious talent of the son, who had gained a sort of reputation along the Bath road, became the support of the family. His debut as a crayon portrait painter was made at Oxford, where he was well patronized, and in 1782 the family settled in Bath, where the young artist soon found himself fully employed in taking crayon likenesses of the fashionables of the place at a guinea or a guineaand ahalf ahead. In 1784 he gained the prize and silver gilt palette of the Society of Arts fora crayon drawing after Raphael's Transfiguration, and pre- sently beginning to paint in oil, and throwing aside the idea of going on the stage which he had for a short time entertained, he came to London in 1787, was kindly re- ceived by Reynolds, and entered as a student at the Royal Academy. He began to exhibit almost immediately, and his reputation increased so rapidly that he became an

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associate of the Academy in 1791. The death of Sir Joshua in 1792 opened the way to further successes. He was at once appointed painter to the Dilettanti Society, and principal painter to the king in room of Reynolds. In 1794 he was a Royal Academician, and he became the fashionable portrait painter of the age, having as his sitters all the rank,

fashion, and talent of England, and ultimately most of the crowned heads of Europe. In 1815 he was knighted ; in 1818 he went to Aix-la-Chapelle to paint the sovereigns and diplomatists gathered there, and extended his residence on the Continent by visiting Vienna and Rome, everywhere receiving flattering marks of distinction from princes, due as much to his courtly manners as to his merits as an artist. After eighteen months he returned to England, and on the very day of his arrival was chosen president of the Academy in room of West, who had died a few days before. This office he held from 1820 to his death on 7th January 1830. He was never married.

Sir Thomas Lawrence had all the qualities of personal manner and artistic style necessary to make a fashionable painter, and at a period when aristocratic opinion had even more weight than at present his public reputation was extravagantly high. The judgment of his fellow artists was less favourable, and in the present day no one would claim for him a place among great portrait painters, while his more ambitious works, in the classical style, such as his once celebrated Satan, are practically forgotten. His chief merit lay in a certain dexterity of touch and in the conventional grace with which he contrived to clothe his figures,

The best display of Lawrence's work is in the Waterloo. Gallery of Windsor, a collection of much historical interest. '' Master Lambton," painted for Lord Durham at the price of 600 guincas, is regarded as one of his best portraits, and a fine head in the National Gallery shows his powcr to advantage. The Life and Correspondence of Sir 7. Lawrence, by Williams, appeared in 1831. See also Cunningham's British Painters, 1833.

LAYAMON, or Lawemay, the author of a chronicle of Britain entitled Brut, a poetical semi-Saxon paraphrase of the Brut d Angleterre of Wace, was as he himself informs us a priest who read the services of the church at Ernleye, on the banks of the Severn (now Lower Arley or Arley Regis, 34 miles south-east from Bewdley, Worcestershire). Of his personal history nothing further is known. Nor can the date of the work with which his name is associated be very accurately ascertained

; but the probability is that it was not completed before the beginning of the 13th century. The original text, with a literal translation, notes, and a grammatical glossary, was first edited by Sir Frederic Madden in 1847. See Encotish Lanovuacs, vol. vil. p. 394; and Encrisu Lireraturg, 2b. p. 408.

LAYBACH. See Larsacs.

LAYNEZ, Disco. See Jxsurts.

LAZARITES, Lazarists, or Lazartans. The origin or the “Congregation of Priests of the Mission” may in some sense be traced back to 1617, the year of the success- ful labours of St Vincent de Paul, assisted by five other priests, for the evangelization of the common people in the parish of Chatillon-sur-Chalaronne, near Bourg. More im mediately it dates from 1625, when the little community acquired a permanent settlement in the Collége des Bons Enfans in Paris. Archiepiscopal recognition was obtained in 1626; and by papal bull in January 1632 the society was constituted a congregation, with St Vincent de Paul at its head. Shortly afterwards the establishment was confirmed by letters patent from Louis XIII. About the same time the canons regular of St Victor handed over to the congregation the priory of St Lazarus in Paris, which henceforth became its chief house, and gave to the fathers of the mission the name by which they are best known. Within a few years they had acquired another house in

Paris and set up other establishments throughout France ; and in 1639, 1641, and 1651 they broke ground in Savoy, Italy, and Poland respectively. A fresh bull of Alexander VII. in April 1655 further confirmed the society ; this was followed by a brief in September of the same year, regulat- ing its constitution. The rules then adopted, which were framed on the model of those of the Jesuits, were published at Paris in 1658 under the title Regule sew Constitutiones communes congregationis misstonis, The special objects contemplated were the religious instruction of the lower classes, the training of the clergy, the relief or redemption of prisoners in Barbary, and foreign

missions. In the pursuit of these objects the Lazarite priests have had a chequered history in the various quarters of the world where they have gained a footing. At the French Revolu- tion they were dispersed, so far as France was concerned, but permitted to reappear under the empire, and rehabili- tated at the Restoration. In Sardinia they had a similar history. Throughout Italy they have been affected by recent political changes just as the rest of the religious orders have been. The Lazarist province of Poland was singularly prosperous; at the date of suppression in 1796 it possessed thirty-five establishments. ‘The order was permitted to return in 1816, but is now extinct there. In Madagascar it had a mission from 1648 till 1674. In 1783 Lazarists were appointed to take the place of the Jesuits in the Levantine and Chinese missions; they still have some footing in China, and in 1874 their establish- ments throughout the Turkish empire numbered sixteen. In the same year they had fourteen establishments in the United States of America. The total number of Lazarists throughout the world is computed at about 3000.

LAZARUS, St, Orprr or. This religious and military order dates its origin from the occupation of Jerusalem by the first crusaders, its primary object being the succour of the leprous, of whom Lazarus (Luke xvi. 20 sg.) was regarded as the patron. After the expulsion of the crusaders the hospitallers of St Lazarus established them- selves in France, where Louis VII. (1253) gave them the lands of Boigny near Orleans, and a building at the gates of Paris which they turned into a lazar house for the use of the lepers of the city. A papal confirmation was obtained from Alexander IV. in 1255. The gradual dis- appearance of leprosy combined with other causes to change the order into a purely civil corporation. In 1572 it was in Savoy merged by Gregory XIII. in the order of St Maurice. In 1608 it was in France united with that of Notre-Dame du Mont-Carmel; abolished at the Revolu- tion, it was reintroduced at the Restoration, but is again in abeyance, the only order at present conferred or recog- nized being that of the Legion of Honour. In 1633 the buildings of the priory in Paris were handed over to St Vincent de Paul for the use of the fathers of his mission, who from this circumstance came to be generally known as Lazarites.

LEAD. This metal was known to the ancients, and is inentioned in the Old Testament. The Romans used it largely, as it is still used, for the making of water pipes, and. soldered these with an alloy of lead and tin. Pliny treats of these two metals as plumbum nigrum and plumbum album respectively, which seems to show that at his time they were looked upon as being only two varieties of the same species. In regard to the ancients' knowledge of lead compounds, we may state that the substance de- scribed by Dioscorides as poAvBésaiva was undoubtedly litharge, that Pliny uses the word minium in its present sense of red lead, and that white lead was well known to Geber in the 8th century.

Of the various plumbiferous minerals, galena (a com- pound of lead and sulphur, formula PbS, demanding 86°6

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per cent. of metal) and white lead ore or cerusite, PoOCO, (77°5 per cent.), might almost be said to be the only ones which come into consideration as lead ores. Occa- sionally, however, the following also are utilized :—lead- vitriol or anglesite, PbOSO, (68°3 per cent.), and the pyro- morphite group, 3(P, or As,)O;.3PbO + PbCl, (76 to 69 per cent.). Bournonite, CuPbSbS, may also be named, although, containing 13 per cent. of copper besides 42°3 per cent. of lead, it is rather a copper than a lead ore.

_ Galena, the principal lead ore of the Old World, is a dark-coloured metallic-looking compact solid of 7:3 to 7°7 specific gravity and 2°°5 hardness, crystallizing in cubes or other forms of the regular system, but often presenting itself in non-crystallized granular masses. All galena is contaminated with sulphide of silver,—the proportion of noble metal varying from about 0°01 or less to 0°3 per cent., and in rare cases coming up to 4 or 1 per cent. Galena occurs in veins in the Cambrian clay-slate, accom- panied by copper and iron pyrites, zinc-blende, quartz, calc-spar, iron-spar, &c.; also in beds or nests within sandstones and rudimentary limestones, and ina great many other geological formations. It is pretty widely diffused throughout the earth's crust. The principal English lead mines are in Derbyshire; but there are also mines at Allandale and other parts of western

Northumberland, at Alston Moor and other parts of Cumberland, in the western parts of Durham, in Swaledale and Arkendale and other parts of Yorkshire, in Salop, in Cornwall, in the Mendip Hills in Somersetshire, and in the Isle of Man. The Welsh mines are chiefly in Flint, Cardigan, and Montgomery shires ; the Scotch in Dumfries, Lanark, and Argyll; and the Irish in Wicklow, Waterford, and Down. Of Continental mines we may mention those in Saxony and in the Harz, Germany ; those of Carinthia, Austria ; and especially those of the southern provinces of Spain, from which country large quantities of lead are now im- ported into Great Britain.

The native carbonate occasionally presents itself in the form of pure crystals of the compound PbCO, (“ cerusite ”), but more frequently in a state of intimate intermixture with clay (“Bleierde”), limestone, oxide of iron, é&c. (as in the ores of Nevada and Colorado), and sometimes also with coal (‘‘ black lead ore”). All native carbonate of lead seems to be derived from what was originally galena, which, in fact, is always present in it as an admixture. This ore, metallurgically, was not reckoned of much value, until immense quantities of it were discovered in Nevada and in Colorado (U.S.). The Nevada mines are mostly grouped around the city of Eureka, about 200 leagues from San Francisco, The ore there occurs in “ pockets ” dissemin- ated at random through limestone. The dimensions of these pockets are very variable; one is quoted measuring 300 by 60 by 180 feet. The crude ore contains about 30 per cent. of lead and 0:2-to 0°3 per cent. of silver. The Colorado lead district is situated pretty high up in the Rocky Mountains, a few miles from the source of the Arkansas river. The ore was discovered as late as 1877 by a mining engineer, Stephens. It forms gigantic deposits of almost constant thickness, embedded between a floor of limestone and a roof of porphyry. Stephens’s discovery was the making of the city of Leadville, which, in 1878, within a year of its birth, had over 10,000 inhabitants. The Leadville ore contains from 24 to 42 percent. of lead and 0-1 to 2 per cent. of silver. In Nevada and. Colorado the ore is worked chiefly for the sake of the silver; but this industry, especially since 1878, has developed at such a rate as to seriously affect the price of lead even in Europe. Of other American lead districts the most im- portant are those

of Utah, of Missouri, and of the Upper Mississippi, where the ore consists substantially of galena.

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The extraction of the metal from pure (or nearly pure) galena is the simplest of all metallurgical operations. The ore is roasted (i.e., heated in the presence of atmospheric oxygen) until all the sulphur is burned away and the lead left. This simple statement, however, correctly formulates only the final result. The first effect of the roasting is the elimination of sulphur as sulphurous acid, with formation of oxide and sulphate of lead. In practice this oxidation process is continued until the whole of the oxygen is as nearly as possible equal in weiglit to the sulphur present as sulphide or as sulphate. The heat is then raised in (rela- tive) absence of air, when the two elements named unite into sulphurous acid (SO,), while a regulus of molten lead remains. In Wales and the south of England the process is conducted in reverberatory furnaces of the form shown in fig. 1. The sole of the furnace is paved with slags from

Yj eT Fia, 1.—Reverberatory Furnaee. C, chimney; D, opening for feeding the fire.

previous operations, and has a depression in the middle where the metal formed collects to be let off by a tap-hole T. The dressed ore, 12 to 24 ewts., is introduced through the “hopper” H at the top, and exposed to a moderate oxidizing flame until a certain proportion of ore is oxidized, the openings O,O at the side enabling the workmen to stir up tle ore so as to constantly renew the surface exposed to the air. At this stage as a rule some rich slags of a former operation are added and a quantity of quick- lime is incorporated, the chief object of which is to diminish the fluidity of the mass in the next stage, whicli consists in this, that, with closed air-holes, the heat is raised so as to cause the oxide and sulphate on the one hand and the sulphide on the other to reduce each other to metal. The lead produced runs into the hollow and is tapped off. The roasting process is then resumed, to be followed by another reduction, and so on.

A similar process is used in Carinthia; only the furnaces are smaller (adapted to a eharge of only 420 Ib) and of a somewhat different form. They are long and narrow ; the sole is plane, but slopes from the fire-bridge towards the flue, so that the metal runs to the latter end to collect in pots placed outside the furnace. In Carinthia the oxidizing process from the first is pushed on so far that metallie lead begins to show, and the oxygen introduecd predomi- nates over the sulphur left. The mass is then stirred to liberate the lead, which is removed as ‘‘ Riihrblei.” Chareoal is now added, and the heat urged on to obtain ‘‘Pressblei,” an inferior metal formed partly by the action of the charcoal on the oxide of lead. The fuel used is fir-wood.”

In Cumberland, Northumberland, and Durham the reverberatory furnace is used only for roasting the ore, and the oxidized ore is then reduced by fusion in a low square blast furnace (a “‘ Scottish hearth furnace”) as depieted in figs. 2 and 8. The rectangular cavity C is lined with cast-iron, as is also the inelined sole-plate which is made to projeet beyond the furnace, the outside portion W (the “work-stone”) being provided with grooves g guiding any molten metal that may be placed on the ‘stone’ into the cast-1rou pot P; ¢ is the ‘‘tuyere” for the introduetion of the wind.

As a preliminary to the melting process, the ‘browse ” left in the preceding operation (half-fused and imperfeetly redueed ore) is intro-

1 In England eoal is employed everywhere, sometimes along with peat.

duced with some peat and coal, and heated with the help of the blast. It is then raked out on the work-stone and divided into a very poor “grey” slag which is put aside and a richer portion which goes back into the furnace. Some of the roasted ore is strewed upon

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Fia. 2.—Vertical Section of Furnace.

Fia. 3.—Horizontal Section.

it, and, after a quarter of an hour's working, the whole is taken out on the work-stone, where the lead produced runsoff. The ‘‘browse,” after removal of the ‘‘ grey” slag, is reintroduced, ore added, and, after a quarter of an hour's heating, the mass again placed on the work-stone, &¢.

In any form of the lead-smelting process one of the con- ditions of complete success is the absence of silica, because this when present unites with a certain proportion of the oxide of lead into a fusible silicate (slag), Practically the formation of a plumbiferous slag cannot be altogether avoided in any case, and such slag accordingly must be worked up. At Alston Moor, Cumberland, this is effected by means of a hearth (blast) furnace similar to the one just described. The slags (oxide, sulphate, and silicate of lead) are introduced with coal-ashes, furnace bottoms, and other residues, and melted down, this leading to the formation of lead and of a poorer slag. The lead is run off as much as possible; the slag is run into water, which disinte- grates it so that the particles of metal shut up within it are set free and become recoverable by elutriation.

Lead being very appreciably volatile at a red heat, lead- smelting generally, but more especially the Scottish-hearth process, and pre-eminently the slag-recovery process, in- volve the production of large quantities of ‘“ lead-smoke ” (finely divided highly impure oxide and sulphate of lead), which, for sanitary and economic reasons, must be con- densed and recovered. At Alston Moor the smoke for this purpose is led through a very long succession of flues, ascending the slope of a hill, into a chamber at the top which communicates with a chimney. The chamber, by a number of screens going alternately from the floor to near the top, and wice versa, is divided into compartments charged with such a quantity of water that the smoke, which is propelled by means of a fan, is compelled to bubble repeatedly through the water, where most of what has failed to come down in the flues is

precipitated. The smoke deposit is collected, dried, and worked up for lead.

Carbonate and oxide of lead are easily reduced by char- coal or coal. In Leadville and Eureka (U.S.) the earbon- ate is smelted with charcoal in small blast furnaces, about 8 feet high, and rectangular section of 31 by 47 inches worked with charges of about three tons of ore. There are five tuyeres, two at each of the longer sides, and one at the end opposite the outlet-hole. The “crucible” is quite surrounded by hollow wrought-iron plates, kept cool by circulating water.

Complex lead ores of course demaud a complex treat- ment. The famous Frankenscharner Hiitte near Klausthal

in the Harz, where a very complex ore is worked up with a wonderful degree of exhaustiveness and precision, may serve as an example. The ore in this case consists of argentiferous galena associated with copper pyrites, fahl-ore, bournonite, zinc blende, and a gangue consisting of silica, limestone, and heavy spar. After the copper pyrites has been, as far as possible, picked out by hand, the remainder is assorted so as to produce an average of about 55 per cent. of lead. One hundred parts of such ore are mixed with 11 of hearth-mass and lith- arge, 90 parts of a variety of slags from previous opera- tions, and 11 parts of metallic iron (or the equivalent of some rich iron ore plus charcoal), and melted down in blast furnaces similar to those used for iron-smelting, but only 22 feet high. The furnace is charged with alter- nate layers of ore mixture and charcoal. The smelting takes fourteen hours, and yields per charge of 100 parts of ore (containing in all about 74 parts of lead) 25 parts of metallic lead, and 18°4 parts of a “‘stein” consisting of an alloy of sulphides of lead, iron, copper, zine, silver, antimony, intimately mixed with particles of metallic and (? subsulphide of) lead —apart from the slags formed, which contain 4 to 8 per cent. of lead and a trace of silver. The “stein” is subjected to a protracted series of roast- ings, and then melted down with iron and selected slags. There result a ferruginous slag, a certain proportion of metallic lead, and a “stein” of the second order, which of course is richer in copper than the

original one was. This “stein” is again roasted, melted down with iron, &c., until the whole of the lead is extracted, and the copper concentrated in a mass sufficiently rich and pure to be wrought as a copper “ stein.”

Refining.—The lead obtained by any of the above processes is as a rule contaminated with more or less of iron, antimony, zinc, arsenic, and silver, which must be removed,—the base foreign metals because they deteriorate the lead, the silver on account of its high commercial value. The base metals are easily eliminated by subject- ing the crude metal to oxidizing fusion in a shallow cast- iron dish inserted into a reverberatory furnace; the foreign metals, being more oxidizable than lead, go to the top as an oxide-scum, which is constantly removed until pure litharge, instead of the foreign oxides, makes its appearance.

The extraction of the silver is easily effected by means of the process of cupellation, one of the oldest metallurgical operations, which dates back to a time beyond that of Pliny. The metal is placed on a shallow kind of dish made of compressed bone-ash powder and forming the sole of a reverberatory furnace, and therein kept at a red heat in the presence of an abundant supply of air. The lead (and with it the foreign base metals) is oxidized into “litharge” (PbO), which, at the temperature prevailing, melts into a thin liquid, and is made to run off through a slit or hole made in the side of the “cupel” (or “ test ”) ; the silver remains unchanged, so that the regulus becomes richer and richer as the process proceeds. The foreign base metals, as will readily be understood, go off as oxides along with the first portion of litharge, and accordingly can be removed without contaminating the bulk of the latter product. When the percentage of silver has in- creased to about 8 per cent., the regulus, as a rule, is transferred to a fresh cupel, and thereon treated in the same way as before, until the last trace of litharge is seen to go off as a thin film on the regulus, presenting, on account of its thinness, in the glow of the fire, the magnificent appearance of a soap-bubble in sunlight. The silver then is “fine,” ¢.e., almost pure, and ready for the market. The lead, however, is all obtained in the shape of oxide, and consequently, if not saleable as such, must

be reduced with charcoal or coal. The process accordingly is expensive, and generally does not pay with a raw lead containing less than 51, per cent. of the noble metal.

The process, in its direct application to the lead, is now almost extinct, being superseded by the following two methods of “concentration,” which offer the advantage of desilverizing at least the bulk of the lead without depriv- ing it of its metallicity.

1. Pattinson’s Process (invented about forty years ago) is founded upon the fact that, when molten argentiferous lead is allowed to cool slowly, a relatively silver-free lead crystallizes out while a richer metal remains as a mothier- liquor. It will be readily understood that, by a persistent systematic application of this method of partial separation to the’ primary products and again to their derivatives, it is possible to, so to say, split the original material into a very poor portion containing most of the lead, and a “rich” one containing almost all the silver. Practical smelters are generally satisfied when the proportion of silver in the former is reduced to from the one to the three millionth of the weight of the lead, and the latter enriched to the extent of 0°5 to 1°5 per cent. of silver, although it is possible to bring up the percentage to 25. A lead containing as little as half an ounce of silver per ton can be “ Pattinsonized ” with a profit.

2, Karsten’s Process is still more perfect. It has long been known that lead refuses to alloy itself with more than traces of zinc. In 1842 the eminent metallurgist Karsten made the important discovery that, when argentiferous lead is mixed with 1 per cent. or more of zinc (at a temperature insuring liquidity to even the latter metal), about 4 per cent, of zinc remains dissolved in the lead, while the rest rises to the top as a scum, and, besides a deal of lead, takes almost the whole of the silver with it. Parkes snbse- quently brought the process into a workable form, for which he took a patent in England in 1850, The argen- tiferous lead is molten in large cast-iron pots, intimately mixed with about 30 parts of zinc per unit of silver present, the mixture allowed to rest, and the argentiferous scum removed by means of

perforated ladles. The scum, when subjected to “liquation” (partial fusion) on an inclined sole, lets off a quantity of rich lead, which goes to the cupel. From the residue the bulk of the zinc can be withdrawn by distillation, the non-volatile part being fit for cupella- tion. The desilverized lead is freed from its zinc and tle other base impurities it may contain by “refining” (see above). The Parkes process seems to be on a fair way of being superseded by a far more perfect form of the Karsten method which was patented by Cordurié for France in 1866 (October 18, No. 73,167), and of which the most characteristic feature is that the removal of the zinc from the scum and the refining of the desilverized lead are both effected by means of superheated steam. The treatment with zinc is effected in a deep upright half-egg-shaped cast-iron pan (standing on an upper floor), which is provided with a vertical shaft bearing horizontal paddles, and at its lowest point a perforated cast-iron box, which serves to accommodate the zinc; 1 kilogramme per 100 kilos of crude lead containing 0:1 kilo of silver, or up to twice the proportion for richer leads. The argentiferous lead—10 tons at a time—is melted down in the pan, and the paddle- shaft with the zinc introduced and made to revolve until all the zinc has become incorporated with the mass. The shaft is then withdrawn, the mixture allowed to rest for a time ata lower temperature, the scum removed, and the zinc treatment repeated once or twice to eliminate the whole of the silver. The desilverized lead runs direct: from the pan into another pan standing on the ground floor, which has no tap-hole, but is provided with a wrought-iron hood comniunicating by means of a pipe with a condensation

aD OUT chamber. In this pan the metal is heated to redness, and a current of superheated steam is blown through it for two or tliree hours. The zinc and the rest of the impurities are thereby converted into oxides which mostly remain on the surface of the metal, the rest being carried into the chamber and deposited there. The silver scums, after extraction from them of argentiferous lead by liquation, are collected, and, when a sufficient quantity has accumulated, worked with superheated steam like the zinciferous lead,—to produce a richly argentiferous regulus, adapted for cupel- ling, and an oxide-mixture intimately intermixed with particles of the former and containing even

some silver oxide. The working of this bye-product seems to have given the inventor adeal of trouble. Passing over his method, we will mention the one introduced in Lautenthal since 1869. There they dispose of the argentiferous oxides by adding them to the rich lead during its cupellation ; the silver is sucked in by the regulus, the base oxides amalgamate with the litharge. The “poor” lcad resulting from this form of the Karsten process contains only 5 or 6 grammes of silver per metric ton (2.e., per million grammes). The loss of lead with a pure material is only 1 per cent. as against the 4 per cent. involved in the Pattinson process.

It is worth stating that the zine removes, besides the silver, all the copper that may be present, and no doubt also part of the other foreign base metals. At any rate the purity of commercial lead, since the introduction of Cordurié’s process, has undergone a marked increase, Hampé analysed a “refined” lead produced in the “Lautenthaler Hiitte” in 1870, and found it to contain only ‘016 per cent. of impurities. This to all intents and purposes means chemical purity ; yet even such lead is not fit for silver assaying, on account of the trace of silver contained init. To obtain silver-free lead, we must prepare silver-free acetate of lead—by digesting its solution in a lead vessel with lead shavings and filtering—and reduce the dried salt with black finx in a crucible lined with charcoal.

Properties of Lead and its Oxides.—Pure lead is a feebly lustrous bluish-white metal, endowed with a characteristi- cally high degree of softness and plasticity, and almost entirely devoid of elasticity. Its breaking strain is very small: a wire =},th of an inch thick is ruptured by a charge of about 30 ib, The specific gravity was deter- mined exactly by Reich, who found for ingot 11°352, for sheet metal 11:354 to 11:365 (water of 4° C.=1). The expansion of unit-length from 0° C. to 100° C. is 002948 (Fizeau). The conductivity for heat (Wiedemann and Franz) or electricity is 8°5, that of silver being taken as unity. Tt melts at 334° C.=633° Fahr. (Personne) ; at a bright red heat it emits vapours, at the rate, according to A. de Riemsdyk, of about zgyoth of its weight per honr ; but he does not specify the surface. Ata white heat it boils. The specific heat is 0314 (Regnault), that of water near 0° C.

being taken as unity. Lead exposed to ordi- nary air is rapidly tarnished, but the thin dark film (of suboxide') formed is very slow in increasing. When kept in fusion in the presence of air lead readily takes up oxygen, with formation first of a dark-coloured scum (of suboxide?), then of monoxide PbO, the rate of oxidation increasing with the temperature. This oxide is produced industrially in two forms, known as " massicot " and "Jitharge." The former is produced at temperatures below, the latter at temperatures above the fusing-point of the oxide. The liquid litharge when allowed to cool solidifies into a hard stone-like mass, which, however, when left to itself, soon crumbles up spontaneously into a heap of resplendent dark-yellow scales known as "flake litharge. Litharge is much used in the arts for the preparation of

lead silts, for the manufacture of oil varnishes, of certain

cements, and of lead plaster, and for other purposes. Massicot is important as being the raw material for the manufacture of "red lead" or "minium." Finely divided massicot, freed from admixed metal by elutriation, is spread out on the flat sole of a kind of baker's oven, or (better) of a "muffle" heated from the outside, and therein exposed for twenty-four hours or more to air at a temperature of about 300° C. or 600° Fahr. The massicot, at a gradually decreasing rate, absorbs oxygen, and as the latter increases the colour becomes more and more intensely red,—the point of saturation corresponding very nearly to the formula Pb,O,. A more highly oxygenated kind of minium (" orange lead ") can be produced by substituting white lead for massicot as a raw material. The composition of orange lead approxi- mates to Pb,O,. It is very singular that this higher oxide cannot be obtained from massicot, although the first effect of heat on white lead is its conversion into the oxide PbO. Besides the two named there is another red oxide, of the composition Pb,O,, but it is not much known. Red lead is largely used as a pigment and as an ingredient for flint glass, also for the making of certain cements, Any of these red oxides when

treated with dilute nitric acid-is converted into the binoxide PbO,, protoxide passing into solution as nitrate: ¢g., Pb,O,+2H,ON,O;=2 PbON,O; +PbO,+2H,0. The binoxide is a brown powder, in- soluble in aqueous oxygenated acids, but converted by hot hydrochloric acid into chloride PbCl, with evolution of chlorine. ‘To obtain the binoxide in the state of purity, the best method is to pass chlorine into a solution of acetate of lead mixed with excess of carbonate of soda. The hypochlorite formed oxidizes the PbO into PbO,, with formation of chloride of sodium and free acetic acid (Wéhler).

Action of Aqueous Reagents.—Water when absolutely pure has no action on lead by itself. In the presence of free oxygen (air), however, the lead is quickly attacked, with formation of hydrated oxide (PbOH,0), which is appreciably soluble in water forming an alkaline liquid. When carbonic acid is present the dissolved oxide is soon precipitated as basic carbonate, so that there is room made, so to say, for fresh hydrated oxide, and the corrosion of the lead progresses. Now, all soluble lead compounds are strong cumula- tive poisons, hence the danger involved in using lead cisterns or pipes in the distribution of pure waters. We emphasize the word ‘‘pure” because experience shows that the presence in a water of even small proportions of bicarbonate or sulphate of lime prevents its action on lead. All impurities do not act in a similar way. Nitrate and nitrite of ammonia, for instance, intensify the action of a water on lead. It is to be remarked, however, that even pure waters, such as that of Loch Katrine (which forms the Glasgow supply), act so slowly, at least ou such lead pipes as have already been in use for some time, that there is no danger in using short lead service pipes even for them, if the taps, as in any house- hold under normal circumstances, are being constantly used. Lead cisterns of course must be unhesitatingly condemned. G. Bischoff found that a water pipe made of a “ composition” consisting of 1°7 per cent. of antimony and 98°3 of lead was rapidly corroded by a water which, in virtue of its composition, had no action on lead pipes.

Action of Acids.—The presence of carbonic acid in a water does not affect its action on lead (Pattison Muir). Aqueous non- oxidizing acids

generally have little or no action on lead in the absence of air. Dilute sulphuric acid (say an acid of 20 per cent. of H,S0, or less) has no action on lead even when air is present, nor on boiling. Stronger acid (¢.g., any acid strong enough to fairly fall within the meaning of ‘‘ vitriol”) does act, slowly in general, but appreciably, the more so the greater its concentration and the higher its temperature. According to Hasenclever, whose experi- ments were subsequently confirmed by A. Bauer and by James Mactear, pure lead, et. par., is far more readily corroded than a metal contaminated with 1 per cent. or even less of antimony or copper. Hasenclever treated an almost pure lead with pure vitriol of 54° Beaumé (1°55 sp. gr., or 64-65 per cent. H,SO,) in a glass flask. At 40°C, an evolution of gas was observable, which at 80° C. became very distinct. The same lead, after having becn alloyed with a little antimony, was not visibly attacked below 85°C.” A decided gas-evolution commenced only at 140° C, Boiling concen- trated vitriol converts lead into sulphate, with evolution of sul- phurous acid. Dilute nitric acid readily dissolves the metal, with formation of nitrate Pb(NO,),.

LEAD

Lead Alloys. —Lead unites readily with almost all other metals; hence, and on account of its being used for the extraction of (for instance) silver, its alcheniistic name of saturnus. Of the alloys the following may be named :—

With Antimony.—Lead contaminated with small proportions of antimony is more highly proof against vitriol] than the pure metal. An alloy of 83 parts of lead aud 17 of antimony is used as type metal ; other proportions are used, however, and other metals added besides antimony (¢.g., tin, bismuth) to give the alloy certain pro- pertics.

Arsenic renders lead harder. An alloy made by addition of about gsth of arsenic is used for making shot.

Bismuth and Antimony.—An alloy consisting of 9 parts of lead, 2 of autimony, and 2 of bismuth is used for stereotype plates.

Bismuth and Tin.—These triple alloys are noted for their low fusing points. An alloy of 5 of lead, 8 of bismuth, and 8 of tin fuses at 94°°4 C., t.¢., below the boiling-point of water (Rose's metal). An alloy of 15 parts of bismuth, 8 of lead, 4 of tin, and 3 of cadmium (Wood's alloy) melts below 70° C.

Tin unites with lead in any proportion with slight cxpansion (Kuppfer), the alloy fusing at a lower temperature than either component. It is used largely for soldering. The following are the compositions and melting-points of frequently used compounds (Tomlinson) :—

Melts at

340° F. 370° F. 441° F.

Fine solder

COMMON WO.F.cc.cas scasses

ASOULRG: MGs. avercosetiees et

'* Pewter' may be said to be substantially an alloy of the same two metals; but small quautities of copper, autimony, and zinc are frequently added. Common pewter contains about 6 parts of tin for 1 of lead. In France a tin-lead alloy, containing not over 18 per cent. of lead, is recognized by law as being fit for measures for wine or vinegar. '' Best pewter" is just tin alloyed with a mere trifle (4 per cent. or less) of copper.

Lead Salts—-Of the oxides of lead the protoxide, PbO, is the only one which under ordinary conditions is capable of forming salts. Towards potash and soda it plays the part of a feeble acid, being readily soluble in solutions of either caustic alkali; while with acids it behaves as a decided diacid base. By a '"'diacid base" is meant a base which can unite with two monovalent acids at the same time, and form a stable salt. Take, for instance, the case of chloride of lead, PbCl,, which is related to HCl and Pb(OH), exactly as KClis to HCl and K(OH); but, while there is nothing between KCl and K(OH), the two lead

compounds readily unite into Cl—Pb—(OH), oxychloride of lead. This property, common to all diacid bases, is developed in lead oxide to a characteristically high degree.

The nitrate, PbON,O, or Pb(NO,),, easily obtained from the metal as explained above, or by dissolving the oxide in aqueous nitric acid, forms white cystals, difficultly soluble in cold, readily in hot water, almost insoluble in strong nitric acid. It isdecomposed by heat into oxide, peroxide of nitrogen (N,O,), and oxygen. | It is used for the manufacture of fusees and other deflagrating com- pounds. The numerous basic nitrates must here be passed over.

The acetate, Pb(C,H;0,)..3H,O (called ‘‘sugar” of lead, on account of its sweetish taste), is manufactured by dissolving massi- cot in aqueous acetic acid. It forms colourless transparent crystals, soluble in one and a half parts of cold water and in eight parts of alcohol, which on exposure to ordinary air become opaque through absorption of carbonic acid, which forms a crust of basic carbonate. An aqueons solution readily dissolves oxide of lead, with formation of a strongly alkaline solution containing basic acetates (Acctum Plumbi or Saturni). When carbonic acid is passed into this solu- tion the whole of the added oxide, and even part of the oxide of the normal salt, is precipitated as a basic carbonate chemically similar, but not quite equivalent as a pigment, to white lead.

The carbonate, PbCO,, exists in nature as cerusite. It can be produced by addition of a solution of lead salt to an excess of carbonate of ammonia, as an almost insoluble white precipitate. Of greater practical importance is a basic carbonate, substantially 2PbCO;.Pb(OH),, which is largely used as a white pigment under the name of ‘‘white lead.” For the.manufacture of this important substance two methods chiefly are used. In the Old Dutch method, pieces of sheet lead are suspended in stoneware pots so as to occupy the upper two-thirds of the vessels. A little vinegat is poured into each pot; they are then covered with plates of shect

Jead, buried in horse-dung or spent tanner's bark, and left to themselves for a considerable time. 'The organic bath, through its ferinentation, keeps up a suitable temperature and a constant supply of carbonic acid. By the conjoint action of the acetic acid and atmospheric oxygen, the lead is converted superficially into a basie acetate, which is at once decomposed by the carbonie acid, with formation of white lead and acetic acid, which latter then acts de novo. 'After a month or so the plates are converted to a more or lcss cousiderable depth into crusts of white lead. These are knocked off, ground up with water, freed from metal-particles by elutriation, and the paste of white lead is allowed to set and dry in small coni- cal forms. The coherent, snow-white cones are sent out into commerce. The German method differs from the Dutch in this that the Jead is suspended in a large chamber heated by ordinary means, and there exposed to the simultaneous action of vapour of aqueous acetic acid and of carbonic acid. In the famous works at Klagenfurth and in the Lavantthal, Carinthia, the carbonic acid is

roduced by the fermicntation of apple-must or infusion of raisins apt in tubs below the chambers. 'he inferior varieties of com- mercial '* white lead" are produced by mixing the genuine article with more or less of finely powdered heavy spar or occasionally zinc- white (ZnO), which latter, we may state in passing, is the most important of the relatively non-poisonous substitutes for white lead.

The chloride, PbCl,, is obtained by adding hydrochloric acid toa solntion of lead salt, as a white precipitate, little soluble in cold water, less so in dilute hydrochloric acid, more so in the strong acid, and readily soluble in hot water, from which, on cooling, the excess of dissolved salt separates out in acicular crystals. A basic chloride Pb, OCI, was introduced by Pattinson as a substitute for white Icad. Powdered galena is dissolved in hot muriatic acid (PbS+2HCl= PbCl, + H,S), the solution allowed to cool, and the deposit of impure chloride of lead washed with cold water to remove iron and copper. The residue is then dissolved in hot water, the dregs arc filtered off, and the clear solution is mixed with very thin imilk of lime 'so adjusted that it takes out one-half of the chlorine of the PbCl,. The oxychloride comes down

as an amorphous white precipitate. Another oxychloride, PbCly.7PbO, known as ‘‘Cassel yellow,” is produced by fusing pure oxide, PbO, with zyth of its weight of sal- ammoniac.

The sulphato, PbSO,, is obtained, by addition of sulphuric acid to solutions of lead salts, asa white precipitate almost insoluble in water, less soluble still in dilute sulphuric acid, insoluble in alcohol. Sulphide of anmonium blackens it, and it is soluble in solution of alkaline acctate of ammonia, which distinguishes it from sulphate of baryta. It is often obtained industrially as a bye-product.

The chromate, PbOCrOg, is prepared industrially as a yellow pig- ment, by precipitating sugar of lead solution with bichromate of potash, The beautiful yellow precipitate is little soluble in dilute nitric acid, but soluble in caustic potash ley. The vermilion-like pigment which occurs in commerce as- ‘‘ chrome-red ” is a basic

chromate, prepared by treating recently precipitated normal

chromate with a properly adjusted proportion of caustic soda, or by boiling it with normal (yellow) chromate of potash. The approxi- mate composition is CrO3,2Pb0.

The identification of lead compounds iseasy. When mixed with carbonate of soda and heated on charcoal in the reducing flamo they yield malleable globules of metal and a ycllow oxide-ring. Solutions of lead salts (colourless in the absence of coloured acids) are characterized by their behaviour to hydrochloric acid, sulphuric acid, and chromate of potash. But the most delicate precipitant for lead is sulphuretted hydrogen, which produces a black precipi- tate of sulphide of lead, insoluble in cold dilute nitric acid, less so in cold hydrochloric, easily decomposed by hot hydrochloric acid with formation of the characteristic chloride.

Statistics, —The lead, pig or sheet, imported into Great Britain during the year 1880 amounted to 95,202 tons, and during 1881 to 93,400 tons. In 1881 there were 12,824 tons exported to China, 8355 to

Russia, 4715 to Australia, 3390 to France, 3349 to British India, 1041 to Germany, and 8837 to other eountrics.

The following table exhibits the production of lead during 1876:—

‘ Tons. Tons. EM cities s.scsenesdeeses MOMS ID! | Tially……ccsecicessess canescens 9000 Coo Oe BRM) | OEGCE, .ssciveiswe. vonwdaianees sae 8000 Great Britain…..... Boge | SCG IUIN .....5 000 setesee concn 7375 United DUDES cc case cce UMNO! |MPAUISURINE. «seccccsscseesesoncnes 4291 Ee eye ihieciscsieess sss DAO | MEVHGSI Ait leis sicoaiess o0.ninuo els 1083

_ The importation and production of lead in the United States were in the years stated respectively as follows :—

Imported. Produced.

23,225

35,111 (max.)

285

(W. D.)

o19

LEADVILLE, a flourishing mining town of the United States, capital of Lake county, Colorado, is situated at a height of 10,200 feet above the sea, on a narrow plateau between the Saguache or Continental Divide and the Park Range of the Rocky Mountains, about 70 miles south-west of Denver. It is connected with Denver by a branch of the Union Pacific Railway (172 miles), and by the Denver and Rio Grande Railway (279 miles), Though a place of 14,820 inhabitants at the census of 1881, Leadville was then the creation of scarcely more than three years.

As early as 1860 gold placers were discovered in the ncighbour- hood, and for a little time the settlement of Bough Town, as it was then called, was a busy spot in this thinly peopled region. But the gold was soon exhausted ; and, though it was vaguely understood that the heavy black sand which had often proved troublesome to the gold-washers was more or less argentiferous, it was not till 1877 that the first practical attempt to turn it to account was made. No sooner, however, was the real character of the ore ascertained than eager adventurers rushed to Leadville by thousands. In August 1877 there were not more than twenty shanties on the site of the town; but the population rapidly increased, and in_less than two years numbered upwards of 12,000. The first smelting furnace was sct to work in October 1877. It has been estimated that up to the close of 1880 the value of the metals extracted from the soil at Leadville exceeded $35,700,000 :—

1860-73, gold from placers … $6,400,000 | 1877, gold, silver, and lead… $555,330 1874, gold and silver…..... 145,000 | 1878, do. do. ... $8,152,925 1875, do. GO. Ciasenee 208,000”) 1879} do. do. ... 10,189,521 1876, gold, silver, and lead… 85,200 | 1850, do, do, ... 15,095,153

Its site consists for the most part of a porphyritic rock resting on a strongly silicificd dolomite popularly called ‘‘limestone” ; and the brown sand, the source of the wealth of Leadville, is sometimes found just below the surface of the soil, sometimes at a depth of several hundred feet. None of the strects maintain the same level throughout, the contour lines of the declivity on which they are built usually running at right angles. Of the dwelling-houses the vast majority are of wood ; but among the many substantial brick structures are an opera-house, a Catholie church, and several bank buildings. Water, brought from the higher grounds, is distributed by a regular system of mains ; the panied streets are macadam- ized with slag; there is a well-organized fire department and an efficient police force. ‘The city has 6 churches, 7 schools, 3 daily and 2 weekly newspapers, and 6 banks, and is the centre of supply for a large outlying mining region, the value of its general and inin- ing business averaging for 1880 and 1881 over $40,000,000 yearly,

LEAKE, Wittram Martin (1777-1860), antiquarian topographer, was born in London, January 14, 1777. After completing his education at the Royal Military Aca- demy of Woolwich, and spending four years in the West Indies as lieutenant of marine artillery, he was sent by the Government to Constantinople to instruct the Turks in this branch of the service. A journey through Asia Minor in 1800 to join the English fleet at Cyprus inspired him with an interest in antiquarian topography, which he had afterwards frequent opportunities of gratifying, In 180], after travelling across the desert to Egypt, he was, on the expulsion of the French, employed in surveying the valley of the Nile as far as the cataracts; but having sailed with the ship engaged to convey the Elgin marbles from Athens to England, he lost all his maps and observations when the vessel foundered off the island of Cerigo. Shortly after his arrival in England he was appointed to survey the west coast of Albania and the Morea, with the view of assisting the Turks against attacks of the French from Italy, and of this he took advantage to form a valuable collection of coins and inscriptions, and to explore manyancient sites. In 1807 he was made prisoner at Salonica; but, obtaining his release the same year, he was sent on a diplomatic mission to Ali Pasha, whose confidence he completely won, and with whom he remained for more than a year as the representative of England. In 1815 he retired from the army, in which he held the rank of colonel, devoting the remainder of his life to topographical and antiquarian studies, the results of which were given to the world in the following volumes :—Topography of Athens, 1821; Journal of a Tour in Asia Minor, 1824; Travels in the Morea, 1830 : Travels in Northern Greece, 1835; and Numasmata

Hellenica, 1854, followed by a supplement in 1859. A characteristic of the researches of Leake was their com- prehensive minuteness, which was greatly aided by his mastery of technical details. His Zopography of Athens, the first attempt at a scientific treatment of the subject, is still authoritative in regard to many important points. He died January 6, 1860.

A Memoir of Leake by the Rev. J. H. Marsden was printed for private circulation in 1864, See also a paper in the Architect for October 7, 1876; and a notice of him by Professor Curtius of Berlin in the Preussische Jahrbiicher for September 1876.

LEAMINGTON, anciently LeEamincron Priors, or, by licence, since 1838, RovaLt LEAMINGTON Spa, is a munici- pal borough and watering-place of Warwickshire, England, situated 2 miles east from Warwick, on the Leam, near its junction with Shakespeare's Avon. Its rise dates from about 1786, when baths were first erected in eonnexion with saline springs which are held to possess various curative properties, and which had been noticed by Camden in 1586. But the rapid increase and eontinued prosperity of the town are due also, among other causes, to its beautiful and finely sheltered site, to its aristocratic neigh- bourhood, and to the fine hunting country by which it is – surrounded. To this must be added its advantages of

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railway communication by the Great Western and North- Western lines, and the proximity of places of historical and sentimental interest. Warwick is but 2 miles off, Kenil- worth 5, Coventry 9, and Stratford-on-Avon 10: while Evesham, Naseby and Bosworth, and Oxford are all within easy reach. Though the houses are streets spacious and well kept, the rates are low and living is not expensive. There is a choice of social clubs with churches and chapels in large number, hospitals an important college, and many fashiunable schools, The town has five newspapers, a free library, and a school board. The water, supplied

from artesian wells, is pure and abundant, The death rate is but 15 per 1000, which, considering the large numbers of elderly people who settle there, low.

handsome, and the

is very The fact that nearly all the property is freehold

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offers great facilities to those desirous of living in their own houses, and is among the inducements to people to make this a place of permanent residence. The J ephson and pump-room gardens are delightful promenades. Leam- ington was incorporated in 1875. From a population of 543 in 1811 it has, with its suburbs, increased to 26,074 in 1881.

LEANDER. See Hero.

LEASE. See LanpLorp AND TENANT.

LEATHER consists of the hides and skins of certain animals, prepared by chemical and mechanical means in such a manner as to resist influences to which in their natural condition they are subject, and also to give them certain entirely new properties and qualities. Skins in an unprepared moist condition are- readily disintegrated and destroyed by putrefaction, and if they are dried raw they become hard, horny, and intractable. The art of the leather manufacturer is principally directed to overeoming the tendency to putrefaetion, to securing suppleness in the material, to rendering it impervious to and unalterable by water, and to increasing the strength of the skin and its power to resist tear and wear.

Leather is made by three processes, or with three classes of substances. Thus we have—(1) tanned leather, in which the hides and skins are combined with taunin or tannic acid ; (2) tawed leather, in which skins are prepared with mineral salts; (3) shamoyed leather, consisting of skins combined with oils or fatty substances.

Tanned Leather.

Tides and Skins,—The skins of all mammalians may be made into leather, but in practice it is only from a few of the larger animals, readily obtainable in sufficient numbers, and reared and slaughtered for other objects, that eom- mercial supplies are obtained. The term hides is by tanners restricted to the large and heavy skins of full-grown oxen, horses, and other large animals—all the lighter stock being known as skins (calf skins, sheep skins, goat skins, &c.). Of all hides and skins used by the tanner, by far the most important and valuable are those obtained from oxen. Not only do these yicld the most useful and valuable hides, but they are slaughtered in all civilized coun- tries in enormous quantities; and, while in Europe the skins of cattle are only of secondary importance, the vast herds whieh roam practically wild in the plains of South America are valuable more on account of their hides and other products than as sources of animal food. Ox hides are imported into Europe and the United States of America in enormous quantities, and come principally from South America, the Cape, Australia, the East Indies, and North Africa. The main centres of the import trade in hides are Antwerp, Liverpool, Havre, and New York. Jor tanners' purposes calf skins are distinguished from ox hides, and the kinds of leather into which they are manufactured are entirely distinct. Intermediate between the heavy ox hides and calf skins are East Indian kips, a medium weight skin which comes both raw and tanned from Calcutta and Madras in such large quantities as to form a distinct branch of the leather trade. Horse hides and the skins of the other Hguide—the ass, zebra, quagga, &c.—have in modern times become important raw materials of leather. The various breeds of sheep, on account of the vast numbers in which their skins come into the market and the numerous applications of sheep and lamb skins, come near in value to oxen as sources of leather. Asa rule

the importance of a breed of sheep for the purposes of the tauner is in inverse proportion to its value as a source of wool. Goat and kid skins come next in order of importance, the products they yield being beautiful in texture, of high value, and of varied usefulness. Goat skins are obtained

chiefly from the East Indics, the Cape, North Africa, South America, Mexico, Asia Minor, and the hilly regions of Europe. Seal skins, obtained from the arctic regions, are an important material, while hog skins are of value for the purposes of the tanner almost exclusively for making saddle leather. Among the skins which are only occasion- ally or locally used may be enumerated walrus, rhinoceros, hippopotamus, and elephant hide, yielding very thick leather used for buffing wheels in cutlery manufacture, &c., aud the skins of the numerous species of deer and antelope, dogs, kangaroo, and other Australian marsupials, porpoises, alligators, and occasionally boas.

Structure of Skin.—All hides and skins are externally clothed more or less with wool, hair, bristles, or scales. The skin itself has a thin superficial horny and cellular layer, the cuticle or epidermis, into which neither nerves nor blood-vessels penetrate. This layer is, during the life of the animal, continually in progress of peeling off in the form of small flat scales, and is renewed from the inner portion of the epidermis known as the rete mucoswm or Malpighian net. The skin proper (coriwm, dermis, or cutis), which is the only portion of the hide of use for the tanner, consists of a dense plexus of fibrous bundles, knit together and interwoven in every direction, the interspaces being filled up with an albuminoid substance. The bundles of fibres terminate on the upper surface of the corium in separate masses, producing the irregularly papillated appearance seen in the “grain” of leather, and hence that surface is distinguished as the grain side in contradistinction to the flesh or under side. Chemically the connective tissue or fibrous portion of the corium cousists of gelatigenous tissue or collagen, which, according to Reimer, is similar in composition to the fibroin of silk. It is in- soluble in cold water, weak acids, and alkalies, but with

boiling water it dissolves, forming gelatin, and it is also soluble in concentrated acids and alkalies. It combines with tannic acid, forming the essential basis of leather, and it similarly combines with oils and fats. The inter- fibrous binding albuminoid material called by the same authority coriin is soluble in alkaline solutions (being withdrawn from the skin by treatment with lime water, &c.) and in strong hydrochloric acids, but insoluble in water. It is precipitated from solutions by tannin, with which it combines. Many competent authorities main- tain that the distinction between the fibrous and non- fibrous portions of skin is ouly one of physical condition.

Tunning Materials.—Tannin or tannie acid is a product of the vegetable kingdom, abundantly formed in a very large number of plants, and secreted in such diverse organs and members as the bark, wood, roots, leaves, seed-pods, fruit, &c. The tannin obtained from various sources is not precisely the same in its chentical relations and reac- tions, Dr Stenhouse was the first to insist on the principal distinction which possesses practical interest to the tanner. He pointed out that tannin-producing bodies may be divided into two classes, the first class comprising such as by their decomposition develop into gallic acid, and by destructive distillation yield pyrogallic acid. Of these gallotannic acid, obtainable from galls, is the type. The other principal tanuing materials which yield gallotannie acid are sumach, valonia, divi-divi, and myrobalans. The second class embraces tannins which do not resolve themselves into gallic acid or yield pyrogallic acid, and of this class oak bark, mimosa bark, and gambier yield characteristic types. All varieties of tannin, however, agree in possessing a powerfully astringent but not bitter taste, and a distinctly acid reaction ; they yield with solu- tions of salts of peroxide of iron a deep blue-black or green- black solution, and particularly they combine and form insoluble compounds with gelatin and with the gelatigenous

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tissue which constitutes the principal portion of animal skins. By the action of ether, containing a little water, on gall-nuts, pure gallotannic acid may be procured. The ethereal solution separates by repose into two layers, the lower one, which is of an amber colour, being a solution of tannin in water, while the upper layer contains gallic acid, mixed with other substances. On gently evaporating the aqueous solution, nearly pure gallotannic acid is procured, to the extent of from 35 to 40 per cent. from galls. Obtained in this way, it is a shining, porous, uncrystalliz- able mass; it is soluble in water, and then exerts the properties ofanacid. By exposure to air it absorbs oxygen and gives off carbonic acid,—two new products, gallic acid and ellagic acid, being formed at the expense of the tannin; the latter is insoluble. Gallotannic acid may be precipi- tated from its solutions by sulphuric and some other acids; by boiling the precipitate with sulphuric acid for a few minutes in a dilute solution of the same acid, gallic acid is formed, and crystallizes in cooling. Gallie acid also exists ready formed in gall-nuts, sumach, valonia, tea, and other substances. It does not combine with gelatin, and is therefore useless in tanning, Some tanners, however, imagine the gallie acid of the waste liquor to be useful in swelling or raising the hides, preparatory to removing them to a stronger liquor.

Tannin is in no case isolated for use as a tanning agent. It is only brought in contact with skins and hides by the medium of infusions, decoctions, or extracts of the various tanuing materials in which a percentage of tannin is present mixed with colouring and other extractive material.

The substances enumerated below comprise the principal tanning materials in use throughout Europe and America,

Oak Bark.—In early times the bark of the common oak, Quercus Robur, was almost the only tanning material used by British tanners, and it stillis the substance from which the highest quality of heavy tanned leather is prepared, although with it the proeess is necessarily tedious. Throughout the country there are still a few tanners of sole leather whose boast is that they use nothing but oak bark. The entire

supply of British oak bark is estimated at from 200,000 to 300,000 tons annually. This quantity, with the additional import of 30,000 tons from the Continent, is altogether inadequate to meet the demands of the tanners, apart from the neeessity which is now felt for forcing the tanning operation much more rapidly than was formerly the rule. The most useful bark is obtained from coppice wood of about twelve years' growth, although in inner bark of longer growth a large proportion of tannin is seereted. 'The amount of astringent matter in coppice bark may be taken to average from 8 to 10 per cent., but the statements of the quantities of tannin in different samples vary within wide limits, as much as 18 per ceut. being in some cases found. 'There is no doubt that the peculiar excellence of the sole leather of England is due in great measure to the superior oak bark produced there. Oak bark imparts firmness and solidity to leather, while other sorts give softness ; thus the peculiar softness of French curried leather is referred to the bark of the evergreen oak, with which the better kinds are tanned, while the other tanning materials next to be named give each its peeuliar quality with respect to colour, seent, toughness, or the power of resisting moisture and deeay.

Other species of oak also yield tanning materials of mueh importance, and are extensively used. The cork oak, Quercus Suber, of south Europe and north Afriea, in addition to its well-known external layer (the cork of ecommerce), possesses a fibrous inner bark which is richer in tannin than ordinary oak bark. It is much employed in Franee, and is imported also to some extent into the United King- dom. In the United States several varicties of oak yield staple tanning materials. Of these the principal are the rock or ehestnut oak, yellow oak or quercitron, both important sourees of tan barks; the red oak and white oak are of less eonsequence.

Mimosa Bark.—Under this general name a large amount of bark comes to the English market from Australia, principally from Melbourne and Adelaide, and from Tasmania. It is obtained from a large number of trees belonging to the genus Acacia, widely distributed throughout Australasia, and the various barks are rich in tannin, which ranges from 15 up to 32 per cent. The qualities imported into

England are the rieher kinds. They amount to about 30,000 tons annually, and may be assumed to contain on an average 28 per cent. of astringent matter. These richer barks are the produce of A. harpophylla, a Queensland tree, the black wattle (A. molissima), the gold wattle (A. pycnantha), the silver wattle of

Tasmania (A. Iewcophylla), and A. cyanophylla, The red eolour of inimosa bark produces a dark leather against which there 1s a prejudice, and the material has therefore to be used sparingly in mixtures. 1t is also said that mimosa tanning results in a somewhat hard brittle leather. ae

Hemlock Bark is the most important tanning material in North Ameriea, It is the produce of the hemlock spruce, Adies canadensis, which grows in vast forests throughout Canada and the northern and eastern States of the Union, the principal bark-producing States being Pennsylvania, Michigan, and Wisconsin. Hemlock bark is obtained by entting down the trees; and, as no provision 1s made for renewing the denuded forests, the strain on the more accessible por- tions of the American forests is already beginning to make itself apparent. The bark contains 7 or 8 per cent. of tannin, and the loather it makes has a strong reddish-brown colour. A large and increasing amount of hemlock extract, an inspissated decoction of the bark having a specified richness in tannin, is now imported into Europe, principally to the United Kingdom. :

Among barks used to a limited extent and for special purposes are larch and Seotch fir barks, used for tanning sheep skins into basils, &c. Willow bark is used in Russia for tanning russia leather. Mangrove barks (Rhizophora Mangle), which are exceedingly abund- ant in India, and rich in tannin, have been tried in the United King- dom, but their use did not prove satisfactory.

Wood.—Quebracho wood (Aspidospermum Quebracho), a wood rich in tannin, obtained from the river Plate, has recently grown yapidly in

favour as a tanning substance in the United States and Franee, and is now coming into notice in the United Kingdom.

Fruits. —Under this head are eomprised valonia, myrobalans, and divi-divi, three substances which now play an important part in tanning both in Europe and Ameriea. Valonia eonsists of the imbricated acorn cups of a species of. oak, Quercus AZgilops, which is indigenous in Asia Minor, Greece, and southern Turkey, and is mainly shipped from Smyrna. It contains as mueh as from 40 to 45 per cent. of tannin, and the average annual imports into the United Kingdom are now not less than 30,000 tons. Alyrobalans arc the dried immature fruit of species of Terminalia, principally 7. Bellerica and 7. Chebula. They vary in size and appearance, but in general they are oval hard wrinkled nuts rather larger than a filbert. The amount of tannin they yield varies from 20 to 36 or sometimes as high as 40 per cent. Myrobalans grow abundantly throughout India and are largely and increasingly exported from the three presidencies to the United Kingdom. Divi-piv1 (¢.v.) contains as much as 50 per cent. of tannin. Though it is in considerable use, tanning with divi-divi is subject to several grave objections. The abundant mucilage of the pods ferments readily, and thereby some-times causes a rotting of the hides. Leather tanned by divi-divi also draws moisture readily in presence of damp, while in a dry atmosphere it is hard and horny, and further this agent leaves finished leather very dark in colour.

Leaves. Swnaeh.—The leaves of various species of Rhus, under the name of suinach, or sumac, form materials of the first import- ance for the tanning of light skins in whieh it is essential to have a fine white colour, as in the case of bright morocco leather, &. Of the species the most important is the Sicilian sumaeh, 2. Coriaria, a shrub or low tree indigenous to Italy, Spain, France, and the Mediterranean eoasts of Africa. It is cnltivated with much care in Sicily, the leaves being gathered from shoots not more than a year old, which thereafter are cut down elose to the parent stem. The same shrub is largely eultivated in the southern departments of Franee, in Spain, aud in Portugal. The leaves gathered in June are dried and ground under edge rollers to a fine dust, in which con- dition the material comes into the market. It

has a bright olive green colonr with something of the odour of tea, and should contain in the best qualities from 25 to 30 per cent. of gallotannic acid, the same tannin whieh is present in galls. The leaves of the Venetian sumach, R. Cotinus, are similarly used in the eastern countries bordering on the Mediterranean. In America a large quantity of sumach for tanning is obtained from two species of Rhus, ki. copallina and R. glabra, growing principally in Virginia, the Carolinas, Georgia, and Alabama. These are, however, much inferior to Kuropean sumach, both on aeeount of the colour they eommuni- eate to leather, and also from the smaller pereentage of tannin they yield, although it is believed that with eareful cultivation and proper attention the quality might be greatly improved.

Extracts. —Cutoh and Gambir, vegetable extracts obtained from the East, are frequently confounded, and in commeree they in- differently pass under the name of terra-japoniea and eatechu (see CATECHU, vol. v. p. 220). Gambir, which eomes almost exelusively from Singapore, is the inspissated juice of the leaves of Unearia Gambir, a tall shrub belonging to the natural order Rubiaces, The extract eomes into the market in the form of eubes about an inch in size, of a dull brown earthy appearance. In composition and properties it agrees with Cutch. The exports from Singapore amount to about 80,000 tons annually. KINo (¢.v.) is exceedingly rich in a variety of tannie acid, but its high price preeludes its use in tanning. These extracts are used in tanning only in conjunc-

tion with other materials ; they not only hasten the operation, but, judiciously used, they tend to render the leather soft and mellow.

Galls.—Although galls are among the richest of all bodies in

tannic acid, they do not form an important item among the materials of the tanner, being most valuable for othcr industrial purposes, and therefore too costly for use as tanning agents. The ‘ knoppern” galls of Hungary, which are formed on the aeorn cups of a specics of oak, however, are to some extent used in Continental tanneries.

For full information regarding galls, sce vol. x. p. 43.

It is to be noted that most of the tanning substances above alluded to may be and are used in dyeing as well as for tanning.

Grinding and Leaching of Tanning Materials.—Bark, valonia, myrobalans, and other tanning bodies are reduced to a small and as far as possible uniform size by means of grinding or comminuting machinery. The main object in such machines is to produce uniformity of size with as little dust as possible, and the apparatus most commonly used is similar in principle to the ordinary coffee-mill, with breaking arms for the bark and segmental cutters for smaller materials. Various forms of disintegrator are also used, which produce their effect by violent concussion obtained by the revolution in opposite directions of two large and strong disks armed with projecting spikes on the sides of the disks facing each other. These disks aro enclosed within a stout iron drum ; and, as they revolve at a speed rising to three thousand revolutions per minute, some conception of the violence with which the tanning materials are struck and smashed may be formed. The tanning materials so prepared are next leached, latched, or infused for preparing the strongest tanning solutions for use in the “layers” or lay-away pits noticcd below. In making these leaches or infusions, some tanners use hot (even boiling) water, others use cold water alone ; some eniploy only pure water, and by some the weak and exhausted oozes or woozes from the pits are strengthened up by renewed leaching. The sole object of the tanner is to obtain the greatest amount of the tanning principle contained in the materials operated on, and to take care that what he gets is not lost or wasted. The method of leaching commonly adopted in the United Kingdom is to

New or fresh bark is put into the first of the series, aud over it is pumped cold the well-strengthened ooze from the next leacher. In this first pit the ooze or infusion is brought up to the full strength required for the lay-away tan-pits, and after the infusion is pumped off the tan (now somewhat reduced in strength) is passed over into No, 2 leacher, where it is treated with liquor in its turn also somewhat lower in strength. In this manner the bark passes by stages through a series of pits, diminishing in richness in tannin at each stage, and in the same gradual manner being infused in a weaker and weaker liquor, till in the

last of the series it is fully exhausted with pure warm water. Thus pure water is put in at one end of the range and fresh tanning material at the other; the water as it ascends is gradually strengthened till it reach the maximum richness in tanning principle, while the tanning material as it descends is in like proportion deprived of its extractive constituents, till in the end nothing further soluble remains. From the last pit the bark, &e., are turned out as “spent tan,” usually to be burned in a special form of tan-burning furnace for raising steam. The use of leaches or infusions was first insisted on by Seguin about the end of the 18th century, and the adop- tion of his suggestion led to the shortening of the time occupied in tanning heavy leather by about one half. Testing Tan Liquors—The methods by which the tanning value of any substance is determined are numerous, but few of them are at once capable of simple application and minutely accurate. One of the commonest plans for ascertaining the strength of the tan liquor technically called 00ze, Or wooze, is by means of a kind of hydrometer called a

pass the bark through a series of leachers or spender pits. .

barkometer. Itis graduated to the standard of pure water; and, when it is placed in a specimen of ooze, the strength of the latter is judged of by the position of the stem above or below the water-mark. But, as bark or other tanning material may contain several soluble substances besides tannin, the barkometer obviously cannot be relied on. Some tanners judge of the strength of ooze by its astrin- gency to the taste. Seguin, who in the end of the 18th century was the first to insist on the advantage of tanning with previously prepared infusions, proposed the use of a solution of gelatin as a test of the presence of the tannin. In trying the quantity of tannin by Seguin’s process, 480 grains of the bark in coarse powder should be acted on by half a pint of boiling water. The mixture should be frequently stirred, and suffered to stand twenty-four hours ; the fluid should then be strained through a linen cloth, and mixed with an equal quantity of solution of gelatin, made by

dissolving glue, jelly, or isinglass, in hot water, in the proportion of a drachm of glue or isinglass, or six table-spoonfuls of jelly, to a pint of water. The precipitate should be collected by passing the mixture of the solution and infusion through folds of blotting-paper, and the paper exposed to the air till its contents are quite dry. Every 100 grains of precipitate contains 40 grains of tannin nearly. As, however, some kinds of tannin produce larger precipitates of gelatin than other kinds, and as the com- position of tanno-gelatin varies with the strength both of the solution of gelatin and of tannin, this method is not reliable. Sulphate of cinchonin is said to afford a better test; a solution of this, acidulated with a few drops of sulphuric acid, will, it is said, precipitate tannin completely from the solution. Léwenthal's method, founded on the fact that solutions of tannin in presence of sulphuric acid are readily oxidized by permanganate of potash, is very useful for the comparative determination of the value of different tanning substances.

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Sole Leather or Heavy Leather Tanning.—The hides of oxen are received in the tan-yard in four different con- ditions. These are—(1) market or slaughter hides, which, coming direct from local abattoirs, are soft, moist, and covered with dirt and blood; (2) wet salted hides; (3) dry salted hides ; and (4) sun-dried or "flint" hides,—the three last forms being the condition in which the imports of foreign hides are made. The first operation in the tannery is to clean the hides, to free them from salt, and to bring the hard dry hides to the uniformly soft flaccid condition in which all market hides are obtained. The treatment at this stage requires skill and attention to prevent the more soluble constituents of the hide from dissolving out in the washing and soaking processes, and also to secure the complete softening of the entire substance, upon which the successful tanning greatly depends, In the case of market hides cleaning and softening are principally effected by washing and soaking in spent lime- water, while for dry hides and dry salted hides brine is essential, The softening of these materials is helped and rendered thorough by working them for some time in the stocks (fig. 1) after they have been well soaked. After being thus

brought as nearly as pos- sible into a uni- form condition, all hides are treated alike, ‘The first operation to which they are subjected is depilation, which removes, not only the hair, but also the scarf-skin. This is effected variously in differ- ent countries. In England the most common plan is to throw the hide or skin into a strong watery Icy of slaked lime, with lime in excess, By this, in a few days, more or less according to the proportion of lime preseut, the hair is easily detached, the hair-sheath having been dissolved. The hair was formerly taken off by making a sour liquor from fermented vegetable matter, in which the hidcs lay for several days; they were also smoked in a damp state for the same purpose; but both those methods are now abandoned. They are still sometimes, especially on the Continent, sweated, that is, they are laid in heaps and kept wet and warm, a plan which is still adopted in England for skins. In America the sweating is performed cold; the hides are hung up wet in a damp underground cellar, and are kept moist for ten days or a fortnight. In either of these sweating processes incipicnt putrefaction takes place sooner or later, when the hair and scarf-skin are easily removed ; but the fatty matter re- mains, and in some cases prevents the hide from taking the tan.

There have been numerous other methods proposed and patented for unhairing skins, few of which have becnreceived with much favour. Among the agents proposed may be mentioned caustic soda, sulphide of sodium and sulphide of calcium, borax, sugar, and charcoal—substances whicli it is obvious must act in very different manners. Lime and alkaline solutions not only loosen the hair and scarf-skin, but also “plump” the corium or true skin, that is, they swell it and render it consequently porous and more permeable to the tanning solution. Lime further forms with the fatty matter of the flesh side calcareous soap, thus neutralizing the fat which would otherwise interfere with

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Fic, 1.—Double-acting Stocks.

the tannin. Some tauners, especially Americans, wlio work the so-called acid process, plump their hides by the use of sulphuric acid, hanging them six or eight hours in a solution containing =igth of acid. The plumping is sometimes done as a preliminary operation, and again others add the acid to the colour pits, or the first pit into which the hides go for the tan- ning —_— process. Among non-acid tanners the plumping of sweat stock in which there is no lime is se- cured in the weak acid li- quors of the colouring and handling _ pits. In the case of limed stock the hides, at the proper stage, are withdrawn from the pits and stretched over an unhairing beam (fig. 2), when with a working knife (fig. 3, a) a workman partly scrapes partly shaves off the hair and scarf-skin. Another workman in a similar way with a fleshing knife (fig. 3, 4) removes

the fatty compounds and

Fia. 2.—Tanner’s Beam.

ral machines have been

adapted, working mostly

with revolving knives or

cutters, under which the ‘

machines are, however, .

only applied to the smaller Fie. 3.—Tanner’s Knives and Pin, skius. The next step in the preparation of the hide is to remove from it as thoroughly as possible all traces of lime. and interfibrous mat-

ter out of the tissue.

For more complete

neutralization of lime

flesh from the flesh side, For these operations seve- ec =

hides or skins pass in a

fully extended state. Such

This is partly accomplished by going over the hide on the beam with a scudding knife, pressing the combined lime in the larger hides

the influence of the

weak acid of the colouring pits is trusted to. Harness

hides are washed by some means in pure water, the most con- venient and generally adopted method being to place them in the dash wheel (fig. 4), in which they revolve and tumble about whilst fresh water is continually being poured on them within the revolving wheel.

The hides now come to be trimmed and prepared for tanning in the shape in which they are intended ultimately to be sent into the market. An entire untrimmed hide (fig. 5) is termed a crop; a side is half a crop, the dividing line of the two sides being shown at EF; a butt is the back portion ABCD, and a bend is half a butt ABFE. G, G are belly pieces, and H, H the cheeks, both together

Fic. 4.—Dash Wheel.

LEATPHES

being the offal. When the shoulder (the upper part of the butt) is removed, what remains is a short butt.

The actual tanning now commences, and the operations involved may be divided into a series of three—(1) colouring, (2) handling, and (3) the laying away. The colouring consists in exposing the hides in a series of pits containing oozes which are almost entirely deprived of tannin, but in which some amount of gallic and acetic acids have been developed, and which, moreover, contain a large proportion of the colouring matter extracted from the tanning substances. In these pits (also called sus- penders) the hides are sus- pended over poles laid

across the pit, and they are moved daily from one to another of a series of four or six, this stage usually occupying about a week, As the hides are moved forward in the series they are exposed to a liquor containing a small and steadily in- creasing proportion of tannin, and this, it may be said, holds good till the hide reaches the last lay-away pit, in which the tanning is completed. The objects attained in the colouring pits are the superficial colouring or dyeing of the hide, some amount of plumping from the acids of the ooze, and a dissolving out of remaining traces of lime, principally by the acetic acid to which the hide is exposed. After colouring, the hides pass on to the handlers or handling pits, a round or series of which may consist of from four to twelve, according to the mode of working. Jn the handlers the hides are spread out horizontally; and in the first series they are ‘‘ handled” once a day or more frequently if con- venient. ‘The handling consists of lifting the hides out of the pit by means of a tanner’s hook (fig. 6), piling them on the side till they drain, and returning them into the pit, the hide on the top in one handling Z

Fic. 6.—Tanner’s Hook (without handle),

pee ao = = –

De et wemmea nage ey

OY ee ere oe nc ee See

Fic. 5.—Divisions of a Hide.

going to the bottom in the next. This operation is continued tliroughout the series; only as the hides advance the necessity and advantage of frequent handling decreases, while the strength of the tan liquor in which they are laudled increases, The whole handling stage consumes on an average about six weeks. Finally, the hides are carried over into the layers or lay-aways. In these the stock is exposed to the strongest tanning liquors, and between the hides thin layers of the tanning bark or mixture are strewn. The object of this interstratification is to separate the mass of lides so as to secure the more ready permeation of the entire mass by the liquor, and also to feed and strengthen the ooze

itself as its tannin is absorbed by the hides. In these layers the hides are allowed to rest for about six weeks, after which the pits are cleared out, charged with fresh ooze, and filled with the hides and tan as before. These processes may be re- peated three or four times before the tanning is completed. When the process is deemed complete, each lide, on being taken out, will be found to be converted into leather, and a portion of its gelatin which has been dissolved from its interior is, by combination with a portion of tannin from the strong solution, deposited upon its surfaces, where it is found in the form of a yellow deposit, technically known as bloom, or pitching, which disguises the under colour of the leather just as if it were covered with yellow paint. This, prejudice says, must be on its surface, or it is not saleable, but it is so much quality and weight lost to the

BREATHER

consumer, as he pays for it on the outside of his leather to be worked off in the dressing and currying operations. By some tanning agents—mimosa, for example—there is little or no bloom deposited.

The theory of the formation of the bloom is this. As goon as ooze has penetrated into a hide it loses its tanning material, but by capillary attraction is detained; this exhausted ooze acts by maceration on the finer and more soluble interstitial gelatin, and dissolves it. In handling, about one-twelfth of this flows out; the remaining eleven- twelfths accompany the hide into the next stronger solution, of which only one-twelfth is absorbed directly, and a small portion is slowly exchanged by endosmosis and exosmosis. The small portion of strong solution which passes into the pores of the hide contributes to tan the hard fibrous portions not dissolved, and the small portion of weak solution passing out of the hide by exosmosis gives up its dissolved gelatin to the tan of the stronger solution outside to form tannate of gelatin, which partly adheres to the surface as bloom, and partly falls to the bottom of the pit as pitching.

From the time when the raw ox hide is taken in hand till the leather is fully dried, not less than a year is consumed in the case of the best qualities of sole leather. It was formerly the practice in England, as it

still is on the Continent, to tan by the process of stratification, for which purpose a bed of bark is made upon the bottom of the pit; upon this is laid the hide, then bark, then a hide, and so on until the pit is full; water is sometimes pumped in, and the pit left for some months; it is then emptied, and the same hides returned with fresh bark and water for a few months longer; this is repeated again and again, until the tanning is completed, the time varying from one to four years for heavy leather.

The devices and processes which have been proposcd and to some degree put in operation with the view of shortening the time occu- pied in tanning are beyond all enumeration. In scarcely any case have time-abridging processes proved successful in practical working, so far as the production of good leather is involved ; and now the opinion 2 ete to be completely established that, for the thorough tanning of heavy leather, a slowly operating influence and conse- quently long time are essential. The devices for the hastening of tanning have for the most part turned upon some plan for forcing the tan liquor into and through the pelt, or for alternate soaking and squeezing of the hides. Among the plans which have been tried on a commercial scale may be enumerated tanning by the ae ton of hydrostatic pressure to force the liquor through the hides, a method which failed simply because the pressure was equal on both sides. The vacuuni tanning principle is another which has been extensively tried, only to issuc in disappointment. It consists in hanging the hides in a pit or cylinder so constructed that the air can be exhausted by an air pump, after which tan liquors are forced into the vessel, air readmitted, and again withdrawn. Hides, how- ever, loaded with water swell little under diminished atmospheric pressure, and the practical difficulty of procuring and maintaining a vacuum in tan pits is very great. More promising results have been obtained by setting up in tan pits the physical process of endosmosis and exosmosis. This is done by sewing up hides two and two as bags which, being filled with solution diffcring in specifie gravity from the tan liquor in which they are immersed, thereby set up transfusion through the hide. This process failed chiefly through the hardness of the leather it yielded. A plan of sewing hides into bags and suspending them filled with strong tan

liquor, which as the fluid exuded was renewed, was also tried for some time. Again, it has been attempted to keep the hide suspended stationary in the pits and move the liquors instead of carrying over hides from one pit into another. A more recent device, which may not yet be fully tested, consists in keeping up the strength of the liquor by a con- tinuous circulation through pipes from the stronger into the weaker infusions. By this system of circulation, instead of the oozes in which hides are immersed becoming weaker and weaker the longer they rest in the liquor, the ooze is kept up at least to its original strength, and it may indeed, if desirable, be increased in proportion as the tannin combines with the hide.

Heavy hides for sole leather, belting, and similar pur- poses do not require to undergo any elaborate dressing or currying. When finally removed from the tan pits they are piled grain to grain and flesh to flesh to drain, care

being taken that no tan liquor is allowed to lurk in the pile, which is covered over from the light. When sufficiently drained, they are brushed or scoured to free them from adhering impurities, and removed to the drying loft, where, after lightly rubbing over with oil, they are hung on poles to dry. In the loft steam-heated pipes keep a dry atmosphere during winter, and enable the attendants to regulate and control the drying of the leather. The leather when dried in this condition is rough tanned, and for finishing as sole leather it has to be struck out or “ pinned ” and compressed by rolling. For striking or pinning by hand the hide is dampened with water, thrown over a beam, and worked all over the grain side with a striking pin (fig. 3, c). This operation smoothes and levels the grain, removes smaller wrinkles, and to some extent compresses and solidifies the leather. Striking machines (fig. 7) are now very generally used for the operation.

Fie. 7.—Leather Striking Machine.

These consist of a drum or cylinder having a parallel series of projecting knives, or plates of gun-metal, set angularly across its

surface. Underneath the drum is a brass bed, fixed on a yielding cushion, which can be pressed up or eased by means of a foot lever, according as the leather operated on is thick orthin. The drum is made to revolve at a very rapid rate, the blunt edges and external angles of the knives thereby striking the surface of the leather with great violence, and thus the grain is struck out, smoothed, and compressed in a very rapid and efficient manner. Finally, the leather is rolled and compressed on a level zinc-lined wooden bed by a heavy hand roller, such as is shown in fig. 8, or on the platform of one of the numerous forms of machines designed for that purpose.

Fria. 8.—Hand Roller.

The yield of leather from a given weight of dry hide varies very much according to the different styles of tannage and materials used. Asa mean outcome, it may be said that 100 Ib of green hide, tanned with from 300 to 400 of oak bark, will yield 40 to 50 bb of leather; 100 tb of green hide, however, when deprived of hair, flesh, and moisture, will weigh only 18 ib, and, taking 100 b of dry hide, which, fleshed and unhaired, weighs 85 tb, the yield of leather will be from 180 to 200 tb according to tannage.

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The percentage of tannin alone absorbed from different tanning agents has been found to be for hemlock, 64:2 ; pine, 90°8 ; chestnut, 85-2; oak, 76°9; oak, three years in pit, 70°2. Heavy leathers, being sold by weight, are sub- ject to adulteration, and have fictitious weight given them without any benefit to the material, but rather the opposite, by impregnation with such salts as sulphate of magnesium or chloride of barium, or with glucose, the last being the most frequently used adulterant.

Upper Leather.—Under this head are included the thin, soft, and pliable leathers which find their principal, but by no means exclusive, application in making the uppers of boots and shoes, which may be

taken as the type of a class of leathers. Upper leathers are made from such hides and skins as East Indian kips, light cow hide, calf skins, horse hide, and also from split heavy hides. The preparatory dressing of such skins, and the tanning operations, do not differ essentially from those already described. In propor- tion to the thinness of the skin treated, the processes are more rapidly finished and less complex, while at the same time the skins absorb a large percentage of tanning extract. The lime used for unhairing must be removed in the pre- liminary stage, with greater thoroughness than is essential in the case of hides for sole leather; and for this purpose the skins are washed in the dash wheel, and undergo a process of bating or grainering. A quantity of pigeon's dung is dissolved in water, and in this the hides are steeped for a week or ten days, with occasional removals and strikings. The theory of this process is obscure, but it has been explained on the supposition that the uric acid of the dung removes the excess of lime, and that the ammonia generated by the putrefaction of the mixture tends to form an ammoniacal soap with any remaining fat of the hide; but as the gelatin of the hide exists in two states,—one the principal, hard, or fibrous portion, and the other (which is more soluble) contained between the fibres, and more affected by agents and putrefaction—this softer portion is removed by grainering, and the leather, when tanned, is light and porous, and more readily permeable by water. Small skins are not fished one by one out of the colouring and handling pits, but the whole contents of the pits are tied together, so that when the upper skin is seized it is thrown over q sparred cylinder erected between each pair of pits, and, the wheel being set in motion, the entire string of skins comes up over its surface and is passed into the neighbouring pit with the utmost rapidity. Such an apparatus is used for handling all small pieces and re eg as for example the cheeks and bellies of heavy hides,

The time occupied in tanning an upper leather, say an East Indian kip, with a mixed mimosa, sumach, valonia, and terra tannage, may be about three months. In the fine tanning of calf and kip skins on the Continent, for which French aud German tanners are famous, the duration of the operation may be from four to eight months.

Splitting.—In the preparation of most kinds of upper leather, the hides are split into two, or three, and sometimes more portions. In the case of a single split the portions form a grain and flesh side; when three sections, or slices, are made they result in grain, middle, and flesh splits. Some tanners split their hides in the green condition, others after colouring, and in many instances the splitting is done, after the leather is fully tanned, by the currier, as a regular part of his operations, this being particularly the case with imported tanned East India kips, and other fully tanned leather of foreign origin. Splitting machines will be alluded to in connexion with the operations of currying,

Currying.—Leather as it leaves the tannery is a com- paratively rough, harsh, and intractable substance, and the duty of the currier is to dress and otherwise fit it for

stone, fixed in a handle.

LEATHER

the use of the shoemaker, coachbuilder, saddler, and the numerous other tradesmen who work in it. The currier has to smooth the leather, so to pare it down as to reduce inequalities of thickness, to impregnate it with fatty matter in order to render it soft and pliable, and to give it such a surface-dressing, colour, and finish as will please the eye and suit the purposes of its consumers. The operations of currying are complex and varied, each particular class of goods receiving a treatment in many respects peculiar to itself. The fact also that machinery is used by some curriers for nearly every mechanical operation, while others adhere to the old manual system, renders it almost impossible to give in brief an outline of operations which will be consistent with the practice of any considerable number of curriers.

Regarding currying as principally a handicraft, the following may be taken as an outline of the range of operations for the preparation of a waxed calf leather, the commonest form of upper leather in use, The leather is first made pliable by soaking in water, after which it is shaved on the flesh side, and a tolerably smooth surface is produced. This operation is carried ~~» on at a beam, or strong ™ frame of wood,~~

~~support~~ ing a stout plank faced with lignum vite, and set vertically, or nearly Fie. 9.—Currying Kniie. so. The knife (fig. 9) is a double-edged rectangular blade, about 12 inches by 5 inches, with a straight handle at one end, and a cross handle at the other in the plane of the blade. The edges of this knife are first made very keen, and are then turned over so as to form a wire edge by means of

the thicker

of the two

straight steel ©

tools shown in

fig. 10. The

wire edge is

preserved by

drawing the Fic 10.—Currying Apparatus. ©, pommel ; thinner _ steel R, raising board ; §, slicker.

tool along the interior angle of the wire edge from time to time as required, for which purpose the man holds this smaller tool between his fingers, together with the beam- knife. The skin being thrown over the plank, the man presses his body against it, and leaning over the top holds the knife by its two handles, almost perpendicularly to the leather, and proceeds to shave it, shifting it from time to time so as to bring all the parts under the action of the knife, and frequently passing a fold between his fingers to test the progress of his work. The skin is then placed in hot water, and removed to a mahogany or stone table, to which the wet flesh side adheres, and is worked with a tool called a stretching-iron, or slicker S (fig. 10), consisting of a flat, rectangular piece of iron, copper, or smooth hard With this tool a man scrapes the surface of the skin, exerting a strong pressure with both hands, and dashing water upon it from time to time, by which means lumps and

inequalities are made to disappear, the leather is equalized and extended, and the bloom is brought to the surface. The superfluous moisture and the superficial bloom are now slicked out, and a stuffing, or dubbing, of cod oil and tallow is rubbed into both sides of the skin, but chiefly the flesh side, by means of a brush, or with the woolly side of a piece of sheep skin. The skin is now dried in a loft, and, as the water only evaporates, the dubbing sinks into the pores. When dry enough for the

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purpose, the skin is boarded, or worked with a graining board or pommel C (fig. 10), the effect of which is to bring up the grain, or give a granular appearance to the leather, and also to make it supple. The pommel is a piece of hard wood, grooved like a crimping-board, and attached to the hand by means of a strap, whence the word pommel, from the French pawmelle, or palm of the hand. The leather passes through various manipulations, each having its distinct name; thus graining consists in folding the skin with the grain sides in contact, and rubbing strongly on the flesh side ; bruising, or rubbing the extended skin on the grain side; whitening, or passing a knife with a very fine edge over the skin at the beam, so as to clean the flesh side preparatory to waaing, which is done just before the skins are sold; for at this point the currier stores his skins, as they can be kept best in the state of jineshed russet, a8 it is called, previous to waxing. Waxing consists of two parts: the first is the laying on the colour, or black- ing of oil, lampblack, and tallow, which is well rubbed in on the flesh side with a hard brush ; then, secondly, the skin is black-sized with stiff size and tallow, laid on with a sponge or a soft brush, and thoroughly rubbed with a glass slicker, a finishing gloss being given with a little thin size. The curried skin is now said to be black on the flesh, or waxed, in which state it is used for the upper leathers of men’s boots and shoes. In the case of any of the numerous varieties of grained leather which are blackened and dressed on the grain side, the finishing operations are different. These are hard dried after slicking, and the operation of

stuffing or dubbing is omitted. They are grained in the dry state, often by machinery, then boarded to soften them, and next blackened on the grain side with a solution of copperas. The flesh side is whitened or fluffed and the grain is treated with sweet oil or some similar oil, and finally glazed with a thin solution of gelatin or of shellac.

For almost every operation in currying efficient machinery has now been adapted, the use of which not only modifies the operations of the currier, but also cnables him to split up hides and to finish his splits as imitations of any kind of leather he may desire to copy. In machine currying the tanned hides, duly damped, are struck out in a ‘‘stoning” machine. It consists of a strong oscillating arm or bar having a blunt steel blade fixed on its end, which works back and forward over a concave bed on which the hide is laid, and which by its scraping and striking action on the softened leather smooths and equalizes the grain, and produces a compact uniform surface on

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Fig. 11.—Belt Knife Splitting Machine.

it. From the stoning machine the hide may pass to the splitting machine, of which there are numerous forms, the American union splitter with a fixed knife being the oldest and best known. A much more perfect machine, however, is the belt or band splitting

machine. In this machine (fig. 11) the knife or cutter a is an end- less band of steel which revolves at considerable speed with its cutting edges close to the sides of a pair of rollers through which the leather is fed and pressed against the knife. The lower of these rollers is made of short segments or rings, each separately capable of yielding to some extent so as to accommodate itself to the inequal

thicknesses of various parts of a hide. The thickness of the slice of leather to be cut is gauged to the utmost minuteness by means of the hand screws 6, 6, which raise or lower the upper roller. The knife edge of the cutter is kept keen by rubbing against revolving emery wheels c as it passes round. So delicately can this machine effect its work that slices of leather uniform throughout and as thin as paper can be easily prepared by it, and with its help it is no uncommon practice to divide a comparatively thin East Indian kip into three useful splits. Another machine now largely used by curriers is the scouring machine (fig. 12), a level table or platform freely movable in all directions, having mounted over it a recipro- cating frame in which are fixed brushes and pieces of slate or thin

Fig. 12.—Scouring Machine.

stone. These, with a small jet of water, scour and brush the entire surface of the leather lying on the platform, effectually scouring out bloom and all soluble impurities. Other machines are washing and stuffing drums and whitening machines. In the latter the leather is pared and equalized by the cutting action of a small cylinder armed with oblique cutting edges. The cylinder, moved to and fro with a pendulum motion, and revolving at the enormous rate of from $000 to 3000 revolutions per minute, pares and shaves the leather on the same principle as the lawn-mower cuts grass. Embossing or graining cylinders, boarding cylinders, glassing machines, and emery wheels for fluffing the flesh side of levant leather are also among the mechanical adaptations for currier’s use.

Patent or Enamelled Leather.—Leather finished with a brilliant, smooth, and glossy surface, used for dress boots and shoes, dress belts, and fine harness, is known under a variety of names, as lacquered, varnished, japanned, and enamelled leather, &c. Such leather is finished principally from tanned calf skins, and in more recent times from seal, goat, and sheep skins, but lighter ox hides and horse leather are also japanned for special purposes. The finishing of leather in this style involves two processes—(1) the grounding or preparation of a

smooth surface, and (2) the varnishing and polishing. The grounding material used by French and German finishers, who greatly excel in the production of such leather, consists of a thick syrupy mixture of lamp-black with a varnish of boiled linseed oil, umber, and litharge. This is uniformly spread over the surface of the leather, which has been previously stretched and tacked on a wooden frame. ‘The first coating is dried in the air, then exposed in the japanning stove to a heat of about 170° Fahr., and afterwards rubbed smooth with pumice stone. This process of coating, drying, and smoothing is repeated several times, and the leather is next varnished with a compound of boiled oil, Berlin blue, litharge, and some dryer, thinned either with oil of turpentine or petroleum spirit. Two or three thin coat- ings of such varnish are given, the surface being carefully polished after each ; but the composition of the varnishes, &c., and the number of coatings applied, vary much in the hands of different manufacturers. Coloured enamel leathers receive two preliminary coatings of oil, rosin, and spirit of turpentine, which are sun-dried ; they are then brought up

with several coatings of oil, varnish, and the special colour- ing substance, and finished with a thin coat of copal varnish.

Seal Leather.—The tanning of seal skins is now an important department of the leather industry of the United Kingdom, in which this branch has been specially developed. The skins form one of the items of the whaling industry, which principally centres in Dundee, and at that port, as well as at Hull and Peterhead, they are received in large quantities from the arctic regions.

form it is principally used by bootmakers. A proportion of seal leather is finished as enamel and japanned leather.

Russia Leather was originally, as the name implies, a speciality of Russia, where it was made from the hides of young cattle, and dressed either a brownish-red or a black colour, for upper leather or for bookbinding, dressing cases, purses, and similar objects. Russia leather is now made throughout both Europe and America, the best qualities

being obtained from Austria. Horse hides, calf, goat, and sheep skins, and even splits, are now finished as russia leather ; but most of these are decidedly inferior in quality, and, as they are merely treated with birch bark oil to give them something of the odour by which an ordinary observer recognizes russia leather, they scarcely deserve the name under which they pass. Genuine russia leather is tanned like other light leathers, but properly in willow bark, although poplar and spruce fir barks also are used. After tanning, scouring, and setting out, the hides are treated on the flesh side with an empyreumatic oil obtained by the dry distillation of birch tree bark and buds, to which the peculiar smell of the leather is due, The red colour com- monly seen in russia leather is given by dyeing with a pre- paration of brazil wood, rubbed over the grain side with a brush or sponge. Black-coloured russia leather owes its colour to repeated stainings with acetate of iron. The leather of genuine quality is very water-tight and strong, and, owing to its impregnation with empyreumatic oil, it wards off the attacks of insects.

Morocco and Thin Leathers.—Originally morocco leather was a product of the Levant, Turkey, and the Mediterra- nean coast of Africa, where the leather was made from goat skins tanned with sumach, and finished either black or various bright colours. Such leather was peculiarly clear in colour, elastic, and soft, yet firm and fine in grain and texture, and has long been much prized for bindings, being the material in which most of the artistic work of the 16th century binders was executed. Now, in addition to genuine morocco made from goat skins, we have imita- tion or French moroccos, for which split calf and especially sheep skins are employed, and it may be said that, as the appearance of morocco is the result of the style of grain- ing, which can be artificially produced on any leather, and of the finish, morocco can be made from all varieties of thin leather. The Germans distinguish between saffian and morocco, including under the former term leather tanned with sumach, and dyed bright colours without previous stuffing with fats, while as morocco proper they reckon leather which may be prepared with mixed tannage, is stuffed, and afterwards is finished black. Saffians are, according to this classification, the leathers

principally used for bindings and fancy purposes, morocco being more especially devoted to shoe work.

The preparation of skins for morocco leathers must be

Seal leather is generally finished on the grain | side as “‘levant” seal with a large coarse grain, and in that |

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conducted with much care. The skins, being usually hard and dry when received, are first soaked and softened by milling in the stocks and working on the tanner’s beam. They are next limed, unhaired, fleshed, and trimmed in effect as already described in the section on sole leather, and they are pured or bated in a preparation of dog’s dung. After undergoing the influence of this preparation, the skins are washed and slated with a knifeedged piece of slate to remove from their surface fine hairs and adhering dirt, and then they are put into a drench of bran and water, heated to about 185° Fahr., after which they ought to be perfectly free from deleterious impurities and ready for tanning. Several processes are adopted in tanning, but that most approved is based on the original Eastern practice, which consists in first treating the skins with an already used sumach infusion. Next they are, in pairs, sewed up as bags, grain side outwards, and these bags are filled with concentrated sumach liquor and a proportion of powdered sumach, and by the exudation of the liquor through the skins, partly aided by pressure, the tanning is quickly completed. After ripping out, the skins are thrown into vats containing sumach liquor, to tan the edges and shanks, which are not reached by the liquor in the bags. The fully tanned skins are now struck out on the beam with the striking pin, and hung in the loft to dry, when they are ready for the finishing processes. A large proportion of the goat skins imported into western Europe from the East Indies, whence they are exported in enormous quantities, are received in the fully tanned con- dition, and ready for the morocco finishing operations, after a short treatment with sumach liquor. For finishing, the leather is first damped in soap-suds, and shaved on the flesh side to equalize the thickness of the leather, and next on a table worked over repeatedly with slickers, which renders the

skin firm,‘smooth, and uniform, The skins are next blacked on the grain side with a solution of acetate of iron, and from this point the methods of finish diverge in an endless manner according as it is desired to finish the leather as “kid,” “levant,” “peebled,” “ bright,” or “dull,” &c. The bright-coloured moroccos are dyed in two different methods, the dyeing being done as a preliminary to the finishing operations. In the case of genuine moroccos, the skins are dipped and drawn through small troughs containing the dye liquor; two skins are taken, placed flesh side to flesh side, and so worked through the liquor by hand, the operation being repeated as often as necessary to bring up the requisite strength of colour. Imitation morocco, on the other hand, is usually dyed by stretching the skins on a table and brushing the dye liquor over the grainside. After the dyeing the skins are shaved and dressed, the dyed surface is rubbed over with an emulsion of white of egg, linseed oil, and dye liquor, and afterwards grained and glassed, or finished smooth and glossy, according to the purpose for which the leather may be required. In recent times aniline colours have been very largely employed in the dyeing of all bright leathers.

In the tanning of sheep and lamb skins the general

| operations outlined above in the case of goat skins are

necessary. Previous to tanning, the prepared skins are submitted to hydraulic pressure, to expel the oleaginous matter with which sheep skins are richly impregnated. Sheep skins tanned, generally with beech bark in the United Kingdom, and uncoloured are known as baszls, Roan Leather is sheep skin tanned in sumach, coloured and dressed throughout in the same manner as imitation morocco, excepting that it is finished smooth and glassed. Skivers are split grain sides of sheep skins tanned in sumach, and similarly finished,—the flesh split being shamoyed for inferior qualities of shamoy or wash leather. Skivers from their thinness are quickly tanned through in a sumach

liquor, aud in no case are they sewed into bags, as is most commonly the case with entire sheep and goat skins. The splitting machine used

for split sheep skins has two rollers, the lower one of gun-metal and solid, and the upper made of gun-metal rings, while between the two rollers, and nearly in contact, is the edge of the sharp knife, to which an oscillat- ing movement is given by a crank, Whena skin is intro- duced between the two rollers, it is dragged through against the knife edge and divided, the solid lower roller support- ing the membrane, while the upper one, being capable of moving through a small space by means of its rings, adjusts itself to inequalities in the membrane; where this is thin the rings become depressed, and where it is thick they rise up, so that no part escapes the action of the knife. Skivers

are finished white, or in colours in variously lined or diced

patterns, and in imitation grain, and are principally em- ployed for hat and other linings and various purposes in which they meet little strain or tear and wear.

Danish Leather is tanned sheep and Jamb skins princi- pally, but goat and kid skins also are used. The tanning medium is willow bark, and the leather, bright in colour and highly elastic, is used for strong gloves. name is also applied to tawed lamb skins, dressed and finished on the flesh side.

Alligator Leather.—For a number of years leather tanned from the skins of the Mississippi alligator has formed an item in the trade lists of the United States, and it is now also being sought after in the European markets. The industry was started about the year 1860, and centred first at New Orleans, the raw skins being obtained from the rivers of Louisiana. Now, however, the skins are princi- pally procured in Florida, and the tanning isa considerable industry in. Jacksonville. The parts of the skin useful for leather making are the belly and flanks, and these portions alone are steeped in lime to preserve them for the tanner. Alligator leather, which has a scaly surface, is useful for fancy boot and shoe making, and for many small articles such as cigar cases, pocket books, &c.

Kangaroo Leather.—The Australian colonists have turned their attention to the preparation of leather from the skins of the kangaroo,

wallaby, and other marsupials native to their continent. These skins are both tanned and tawed, the principal tanning agent being the mimosa bark, which abounds in Australia. The leathers they yield are of excellent quality, strong, and elastic, and rival in texture and appearance the kid of European tanners. The cir- cumstance that the animals exist only in the wild state renders this a limited and insecure source of leather.

Tawed Leather.

Under the term tawing isembraced the preparation of leather by the action of mineral substances on hides and skins. In the pro- cess of tawing the substance principally employed is alum or some of the simple aluminous salts, although many other inorganic salts have been proposed, some of which have given considerable pro- mise of practical success. The system of tawing is principally ap- plied to thin and light skins of sheep, lambs, kids, and goats, although in former times much heavy leather was tawed for military belts, heavy gloves, machine belts, &c., for most of which purposes, however, sumach-tanned or similar leathers are now found more applicable and durable. The products obtained by tawing are of a pure white colour, whence the name white leather is frequently applied to goods of this class. The most important departments of the tawing industry are the calf kid manufactures for boots and shoes, and glove kid or glacé leather tawing, the products of which are exclusively devoted to glove making. A large number of white tawed sheep skins are also used by druggists and perfumers as tie- over leather for bottles, and for linings by bootmakers, &c.

_ Calf Kid.—The various steps of preparation through which the light skins suitable for this manufacture pass, in respect of softening, liming, unhairing, puring, and drenching, are similar to the process by which morocco skins are prepared for tanning. The tawing itself is accomplished in a drum or cylinder the same as the currier’s stuffing whecl, into which is introduced for one hundred average skins a mixture consisting of 20 fb of alum, 9 ib salt, 40 ib flour, 250

The same |

eggs (or about 14 gallons of egg yolk), % pint of olive oil, and 12 to 16 gallons of water. In this mixture, at a temperature of not more than 100° Fahr., the skins are worked for about forty minutes, by which action the tawing is completed. After the withdrawal from the drum the skins are allowed to drain, dried rapidly by artificial heat, damped, staked out by drawing them over a blunt steel tool, and then wetted and shaved down on the beam to the required thickness. Next they receive, if necessary, a second treatment with the tawing mixture. The dyeing or colouring follows, which in the case of calf kid is always black, the colour consisting of a compound of bichromate of potash, stale urine, logwood extract, and copperas. It is applied either by brushes on a table, or by dyeing the leather in sinall vats as in the parallel case of morocco leather. The dyed leather is washed with pure water, dried, grounded with a curious moon knife, stretched in all directions, ironed, and oiled on the flesh side with a mixture of oil, wax, &c.

Glove Kid.—In the preparation of kid leather for gloves the tender skins of young kids alone are used for the best qualities, but for a large proportion of such leather young lamb skins are also tawed. The genuine kid leather is for the most part produced in Frauce, specially at Annonay and Paris, while lamb kid is more particularly a product of Germany, Austria, and Denmark. Im all stages of the preparation of this leather the utmost care and attention are requisite, and it is specially of consequence that the operations preparatory to tawing should receive thorough attention. The unhairing is best effected by steeping the skins In a mixture of lime and orpiment, and, while the general sequence of unhairing, fleshing, bating with dog’s dung, scudding, washing, and treating with the bran drench is the same as in the case of other skins, much more attention is bestowed on each stage in order to maintain the smoothness of grain, and to obtain a thoroughly clean elastic pelt, than is absolutely needful for any other variety of leather. The tawing mixture consists for each 100 tb of skins of about 28 fb of flour, 34 ib of alum, nearly 1 1b of common salt, and 230 eggs. These substances are made into the consistency of a cream

with water, and placed either in a vat or in arevolving drum. In the former case, the skins are trodden with the feet, while in the latter they are tumbled about. The tawed skins are hung over poles, grain side inwards, and dried rapidly ; when hard dry they are heaped in a damp place to soften a little, then damped by passing them through water, next trodden out by foot on a ridged or barred floor, staked or stretched over a blunt knife, partly dried, and again staked and dried thoroughly. For dyeing, the skins are first washed out in warm water to free them from superfluous alum, and then again “fed” with yolk of eggs and salt. For bright colours such as soft greys, lavenders, and yellows, the skins are plunged iuto small dye vats of the proper dye colours; but for all the darker colours the skins are stretched out on a table and the dye stuffs applied with a brush. In the latter case the leather is first grounded with some alkaline solution, then dyed mostly with logwood, brazil wood, fustic, Prussian berries, or preparations of indigo,—aniline colours being now little used for glove dyeing. The dye is mordanted by a wash of the sulphate of either zinc, copper, or iron, which operation also clears and develops the colour. After dyeing it only remains to free the leather from superfluous moisture, dry it, and then with slight damping stake or stretch it out once or twice, which finishes the preparation of this valuable class of leather.

The ‘‘feeding” of kid leathers with yolk and sometimes oil pro- ducesa partial shamoying, softening the texture and giving the leather that peculiar suppleness to which much of its value is due. The flour added, by means of the gluten it contains, is supposed to facilitate the absorption of the alumina and thus hasten the tawing.

Hungarian Leather consists of hides and heavy skins partly tawed and partly shamoyed. In the preparation of this leather it was formerly the practice to shave off the hair with a sharp knife, but now the hides are unhaired either by sweating or liming. After tawing with alum and salt the leather is stuffed by first heating it over a charcoal fire and impregnating the hot leather with tallow, or, as is now common, by working it in a drum with a hot mixture of cod oil and tallow. This leather, being comparatively cheap, is . much used on the Continent for

common saddlery purposes, for which it is blackened, and it is also serviceable for machinery belts.

A leather has been patented by Professor Knapp, in which the active tanning or tawing principle is a basic salt of the oxide of iron. It was intended principally for sole leather, but it does not appear to have met with practical success, and its manufacture is under- stood to have been abandoned.

Heinzerling's Chrome-tanned Leather.—Quite recently a large amount of attention has been devoted to a system of tanning or tawing by means of chromium compounds patented by Dr Heinzerling, a German chemist. The oxidizing power of chromate salts, and the deoxidizing effect which organic matter has upon these salts, have long been recognized, and the knowledge of this action and counter-action has led to many unsuccessful attempts, in the past, to use chromates in tanning. It is claimed, however, that the difficulties have been overcome by Dr Heinzerling's process, which consists practically in the use of bichromate of potash, chloride of

potassium or chloride of sodium, and sulphate of alumina, These are mixed together in one large stock tank, from which is drawn by means of a system of piping communicating with each pit the quantity required to make the necessary strength of liquor; this at first, as in tanning by bark, is very weak, but is strengthened systematically every few days according to the thickness of the hides being tanned. The quantity of chromic acid used ordinarily amounts to from about 24 to 5 per cent. of the weight of leather produced. The price of bichrome at present is 53d. per tb, so that 100 tb weight of leather would cost for this agent from 1s. to 3s. Light skins such as sheep skins and calf skins are tanned in less than a week, ox and buffalo hides in about a fortnight, and walrus hides, over 2 inches thick, in six weeks. After being tanned, the hides, which are at this stage of a yellowish tint like sumach-tanned leather, are dipped in chloride of barium, which eonverts the soluble chromates on the surface into the insoluble chromate of barium. If any particular shade of colour is desired it is

then put on, and in general hides arc coloured like ordinary leather. After being coloured the leather is allowed to get nearly dry, when it is immersed in pure paraffin wax and resin dissolved together in certain pro- portions. These materials, with chloride of potassium or chloride

of sodium and sulphate of alumina, go to give the necessary sub- | The hides are | afterwards dried and brushed clean by brushing machinery. Thus |

finished, the leather differs very little in appearance from ordinary | T¢ | tions of parchment.

stance, weight, and waterproofing to the leather,

leather.

Dr Heinzerling claims as the meritorious and original features of his process the combined use of chromate compounds and fatty matters. The stuffing with fat or paraffin of chrome leather, he maintains, in the first place, reduces ehromic acid to chrome oxide, and secondly the oxygen thus liberated in the substance of the hide oxidizes the fatty into acid bodies, which, uniting with the ehrome

oxide, form a third insoluble compound mordanted in the fibre of | | it, by pressing into the substance while in a damp condition the

The leather has been reported on by Mr David Kirkcaldy, | London, as considerably stronger than the best bark-tanned leather | After steeping samples of it in cold water | six days it has been found that the total quantity of tanning | material extracted amounted to from ‘014 to ‘135 per cent., while | first-class bark-tanned leather similarly treated yielded 6°79 per |

the leather, rendering it at once supple and waterproof.

he was able to procure.

eent. By boiling chrome leather in water for half an hour, the loss ranged from ‘005 to ‘054 per cent.

The process seems to offer the means of utilizing classes of hides, such as sheep skins, and very heavy hides, as those of the walrus, hippopotamus, &c., in a way which has not hitherto been found practicable by other processes. Sheep skins in chrome- tanning do not require to be pured and freed from their oleaginous constituents, and when finished by this process are no longer porous, but become waterproof. They can be shaved and whitened like calf skins, and may be used for shoe purposes.

The Heinzerling process is at work in various localities throughout Germany. For the United Kingdom and British colonies the patent rights have been acquired by the Eglinton Chemical Company of Glasgow, who, as manufacturers of bichromate of potash, have an

indireet intercst in the development of the system. Although the |

method has yet searcely passed the critical stage of practical experi- ment, the products appear to be gaining the favour of men of experience ; and, should the system meet the expectation of its originator and promoters, it cannot in the end fail greatly to cheapen many useful classes of leather.

Shamoy or Oil Leather,

The process of preparing leather by impregnating hides and skins with oil is probably the oldest system of leather manufacture. It is that which in earlier times was most largely followed, and among rude and semi-civilized people it is still eommonly practised, Not- withstanding this, well-shamoyed leather requires the exercise of much eare and numerous manipulative processes, Hides and skins of all classes are prepared by shamoying ; but sheep, goat, deer, antelope, and small ealf skin are those usually treated, an enormous number of flesh splits of sheep being shamoyed for common pur- poses. The extensive employment of deer skins in shamoying gives the product the name of buck or doe leather, and from the use of the chamois skin of the Alps is

derived the name of the process chamois or shamoy, while from the fact that it may be easily washed like cloth it is called wash leather. In former times a large nuin- ber of ox hides were shamoyed, but now that is little practised.

Skins for shamoying are in the preliminary stages treated almost as for ordinary tanning ; but, beyond unhairing, the surface of the grain is shaved off in all except the small thin skins. They are afterwards treated with fresh lime solution, and repeatedly washed to bring the pelt to somewhat open and porous condition, drenched with bran to remove ‘all lime, and rinsed in an acid liquor. The skins are next staked out and taken to the fulling machine or stocks, where, after being rubbed over individually with fish oil, they are hammered for- about two hours to force the oil into the substanec of the skin. They are then stretched, hung up for some time, again

oiled, and fulled ; and these operations may be repeated from six to twelve times according to the thickness of the skins treated. Aftcr thorough impregnation the skins are dried, then heaped up in a heated room, where a proeess of oxidation is quickly set up. So soon as the skins assume a yellow colour and give off a peculiar odour, not at all like fish oil, the process is complete and the fermentation is stopped. It is now found that about one-half of the oil is oxidized within the skin and combined with the tissue to form leather, while the remainder is present only in the condition of mechanical impregnation. This uncombined oil is washed out with a warm potash solution, and the fat so recovered, known as degras, forms a valuable material for the dressing of common leather by curriers.

Parehment, Vellum, and Shagreen.

These substanees, properly speaking, do not come under the heading of leather at all, seeing they are neither tanned nor tawed, but simply are dressed skius dried and prepared for their peculiar uses. Parchment is made from calf, goat, sheep, ass, and swine skins by the unhairing and dressing processes through which all skins pass preparatory to

tanning. When they are thoroughly scudded and fleshed, the skins are stretched tightly in every direc- tiou over a frame, and in that condition shaved and equalized on both sides with the currier’s knife. After drying, the skins are ready for use as drum leather and for the other ordinary applica- The common kinds of vellum are made from sheepskin splits, of which two may be obtained from a single skin. To prepare these for use, the splits are, after stretching and drying, repeatedly rubbed over with powdered chalk and powdered stone to raise the fine even velvety surface peculiar to vellum. Common shagreen consists of the skins of various species of sharks and rays prepared in a similar manner to parehment ; and Persian shagreen is a kind of tawed parchment with an artificial grain embossed in

small round seeds of a species of Chenopodiwm. Shagreen is fre- quently dyed in bright colours, and used for ornamenting the surfaecs of small articles, and the handles of daggers, swords, &c.

Commeree and Statisties.

It is quite impossible to form any adequate estimate of the extent and value of sueh a trade as that in leather. The raw materials are obtained, in almost equal abundance, throughout the civilized world, and the manufacturing operations are, to a greater or less degree, carried on in every centre of industry. Thus local wants are largely supplied by local producers, and much of this trade is never recorded in any statistical returns. There can be no doubt that leather takes rank among the foremost half dozen of human industries. Both in Europe and Amcrica there is a large international trade in the raw materials and manufactured products, while from the East Indies and the British colonies the largest supplies of various untanned and tanned hides and skins are now exported. Taking cattle hides alone, the import trade of the great manufacturing centres has been thus stated for 1879:—

United Kingdom ….....+... 1,162,405 | Hamburg…..... ACCOCDO COOSA 646,330 MISA GUIOS: sasvcctersеetere«scaeccess = 652,967 | Boston and New York (U.S.).. 3,153,026 PTHVITC. ....0cececs eee 893,741

Antwerp. use. aE ..- 958,412 | Total for Europe and America 7,426,881

These came principally from the River Plate, Rio Grande, and Brazil, and are exclusive of 250,000 horse hides imported into Europe, and the whole of the enormous exports of the Kast Indies, The total number of hides, raw and tanned, exported from India in the year 1877-78 was 9,300,955, and the average for the four preced- ing years exceeded 7,250,000. A great proportion of these are tanned kips, shipped from Madras almost exclusively to the United Kingdom ,—buffalo and the heavier flint dry hides going more largely to the United States. The imports of East Indian kips into the United Kingdom during 1880 amounted to 6,135,978, and in 1881 the number fell to 4,580,303. Of tanned goat and sheep skins, again, the annual export from Madras alone reaches nearly 10,000,000 skins, the numbers for 1880 having been 9,799,900 skins. The total number of sheep and goat skins, raw and rough tanned, imported into the United States in 1880 was 11,731,885, of which 6,332,635 were raw soft stock, 3,353,750 were raw hard East Indian skins, principally from Bengal, and 2,055,500 were tanned East Indian skins.

The following table shows the sources and number of hides imported into the United Kingdom during 1880 :—

River Plate, salted hides ..,... 319,745 | West Indics ….....0+- seerecreeees 10,584

5 dry Oh. 2Bs8000 31,057 | West Coast of America …..... 15,107

Rio Grande, salted ,, ...- 178,897 | Cape kips and gnus …..... 13,097

Cape a Ph lessees 36,538 | North Amcrica….....++ 5,983

oo dry We sssseee 209,176 | East India kips and buffalo … 6,707,142

AMISGUNEG spcas. crcreseesrees

The following are the Board of Trade returns of articles connected with tanning imported into the United Kingdom, and exported, during the five years ending 1880 :—

LEA—LEA

Imports.

1876. 1877. 1878. 1879. 1880.

J. Quantities. Bark for tanners' use..cwts.| 672,319} 645,662) 587,525) 417,554| 449,501

Tanning stuffs—

Cuteh and gambiecr ..tons 26,564 32,018 28,618 25,634 32,10

Sumach 12,797 13,409 13,923 12,131 11,620)

Valonia 84,923 29,989 28,677 34,217 33,773)

CF See 25,884, 26,425) 31,478} 16,512| 51,083 Hides—

Ma seteccbsedeivcaser es » | 1,055,575) 1,146,364) 1,161,994! 1,011,991) 1,241,788)

Tanned, tawed, cur- ried, or dressed … Leather manufactures—

1b|44,768,891|46,917,689 50,571,132|35,185,855|47 653,442

Boots and shoes,doz.pairs| 109,896 99,396| 102,690) 127,504 95,487 Gloves …....-... 7 1,497,437| 1,242,159) 1,060,438] 1,062,747] 1,455,765 Unenumerated …value £) 233,204| 379,005| 613,492) 261,611) 278,75:

Skins— Sheep and lamb… number/13,165,348/12,977,531|11,321,843] 9,402,911/12,331,41

ORG i cen ccanawe och wan 8,051,112) 8,151,599) 7,906,964/10,124,169‘11,467,235 OB coecesusee aa os si 607,276| 763,757| 762,772} 964,208) 653,27 Other sorts…….value £) 244,396 221,147| . 200,122 98, IL. Value. £ £ £ £ | Bark for tanners’ usc ……. 315,278} 282,926) 263,110) 161,573) 180,586 Cutch and gambicr ……. 610,645) 703,905} 564,080) 476,383] 656,861 PBUBGEE cee nas oscavarsvee ess coors 215,253) 224,862} 231,358} 170,692) 145,665 628,852| 668,497) 632,855| 542,949) 520,05: 64,704) 76,834) 78,963) 45,865] 138,358

RAW op cse.. Recor seco

Tanned, tawed, curried, GRATOSBORS.:.. tees arsecese

Leather manufactures—

3,409,065 2,871,052

3,302,288) 3,545,891 2,916,577) 3,879,582

2,977,923} 2,953,722 2,209,680} 3,055,02

Boots and shoes ……. «| 828,479] 348.786] 370,147; 479,498) 381,579 “ding seecseseersscesseecseeeee| 1,840,956] 1,518,557| 1,300,633} 1,286,080) 1,742,591)

1ns— :

Sheep and lamb …….| 1,343,042) 1,260,135) 1,103,928) 934,103) 1,414,837]

Goat ……. oeabes 864,879) 892,272} 890,003) 1,145,422) 1,277,74

Seal .. 219,540) 246,533) 443,784) 555,270

Exports.

1877,

I, Quantities. Leather—

Tanned, unwrought.ewts.| 149,911

Bootsandshoes doz.pairs} 443,293

Other articles …..... Ib] 1,509,874 Saddlery and harness

value £

Skinsand furs, allsorts,, £

II. Values. :

Leather— £ £ £ Tanned, unwrought …....] 1,211,146] 1,165,184} 1,177,282 Boots and shoes….....| 1,404,075) 1,336,478) 1,315,731 Other articles …... 329,778] 305,175) 285,757

144,431 436,166 1,481,225

352,202 839,275

160,985 430,273 1,562,948

401,443 1,032,007

219,890 433,374 1,663,961

424,050 1,380,133

“397,561 851,847

£ £ 1,507,427} 1,152,660 1,311,293] 1,282,221 323,284| 374,6

The imports of hides to the United States through the two a ports, New York and Boston, and the receipts of home ides in these cities for 1878-80, arc shown in the following tables :— New York.

1878.

1879,

1880.

RM Solos Racieiscamatre cess | =©ABOLBEe 93,079 89,158 TRPAORI AY NOR tai vesennys wishes +cdones «does 297,323 280,744 449,898 OHO UIAOD ccs ..0sseysesqenasecctaas vere faoeae 465,202 620,938 931,054 Orinoco……..6 ee 32,386 34,209 31,443 PIGIGTATIAG ssonennpesenicsdeassenanncip septs ‘ 59,531 127,086 141,168 South America (other states).. 112,811 111,857 31,687 Central America hidvaved 267 ,028 242,366 496,909 Mexico ….....64 121,371 98,901 119,476 West Indies …..... 15,601 51,965 63,903 East Indies (loose)..... 21,244 706 27,517

119,533 305,915 328,416 * 65,242 171,332 39,670 126,770 165,091

1,862 em Se Total foreign ….....ssc0se0---| 1,733,944 2,159,278 3,047,052 » G@omestie’..... dedesavscsces 788,470 860,195 578,098

» forcign and domestic…

2,522,414

3,019,471 | 3,625,150

Calcutta bales buffalo …..ss.ssccceseeees BOM wavecrcssdesctec eee’

7,952 1,453

5,593 1,534

9,634 4,540

” 2?

Boston.

1878. 1879, 365,644 15,609 221,458

448 360 6,500 182,063

GOD AYR OR: <0, Join sluce con csacavsisnaseed Montevideo

Rio Grande

PRQGDOAN) WOXER «6 ..c…s00+

422,577 14,277 350,607

- ae: 151,177

247,081 487,562 348,909 1,287,547 794,293

1,040,278 678,209

Total foreign >» domestie

884,004 888,508

Grand total

1,772,512 | 1,713,482

2,081,840

391

Value in Dollars of Leather Exported from the Port of New York during the three Years 1878-80.

1878. 1879. 1880. 1,943,310 971,147 443,884 90,474 157,962 39,024 104,598 62,340 170,429 2,350 13,500

2,172,489 1,522,099 388,673 152,319 153,229 118,542 91,062 85,981 157,199 3,317 31,492

Liverpool

Hamburg

Hull

Beibtoly.; 0: begets. iach Antwerp

PODGOM: cotececnevseades Rotterdam

Glasgow

2,922,931 896,393 786,106 138,256

86,475 129,752 60,538 67,169 20,133 300 10,831

5,118,884

3,999,018

4,876,402

The principal leather markets of the United Kingdom are London, where there are quarterly fairs ; Leeds, with eight fairs yearly ; and Bristol, which has two leather fairs per year. In the United States the commerce centres principally in New York, Boston, and Phila-delphia. On the European continent Paris, Marseilles, Vienna, and Berlin are the most important centres of the leather trade, with Antwerp and Havre as great marts for the sale of hides and skins. (J. PA.)

LEATHER, ArririctaL. Under the name of artificial leather, or of American leather cloth, large quantities of a material having, more or less, a leather-like surface are used, principally for upholstery purposes, such as the covering of chairs, lining the tops of writing desks and tables, é&c. There is considerable diversity in the preparation of the material, but most commonly it consists of a web of calico first prepared with a thick paste to fill up the interstices, and thereafter coated with a mixture of boiled linseed oil mixed with dryers and lamp-black or other pigment, uniformly spread, smoothed, and compressed on the cotton surface by passing it between metal rollers.

When the surface is to possess a glossy enamel-like appearance, it receives a finishing coat of copal varnish. A grained morocco surface is given to the material by passing it between suitably embossed rollers. Another material now largely used for preparing artificial leather consists of gelatin mixed with appropriate colouring material, and such chemical agents as, by their reaction on that body, render it. insoluble,—calico being coated with the mixture in the manner indicated above. Such insoluble compounds are obtained by the action of acetate of alumina on gelatin, with exposure to a temperature of about 160° Fahr., or by the addition of about one per cent. of bichromate of potash to gelatin solution and exposure to light. The addition of a proportion of glycerin to the gelatinous mass renders the resulting “leather” softer and more plastic than it would otherwise be. These preparations have a close affinity to cloth water-proofed with india-rubber, and to such manu- factures as ordinary waxcloth. An artificial leather has been patented and proposed for use as soles for boots, &c., composed of powdered scraps and cuttings of leather mixed with solution of gutta-percha dried and compressed. In place of the gutta-percha solution, oxidized linseed oil or dissolved resin may be used as the binding medium for the leather powder.

LEAVENWORTH, the largest city in the State of Kansas, and chief town of Leavenworth county, is situated in an amphitheatre formed by the bluffs of the right bank of the Missouri, in the midst of a rich agricultural country. The distance from St Louis by river is 496 miles, and by rail 309 miles. In 1853 the site of the city was covered with thick hazel brush, without a trace of human habitation. The following year saw the laying out of the first streets, and by 1864 the value of the taxable pro- perty, real and personal, amounted to $4,103,562, Among the principal buildings are a large Roman Catholic cathedral, a State penitentiary, and a State normal school. Its position on the river, and an extensive railway system, have given Leavenworth a flourishing trade. . It possesses two practically inexhaustible mines of bituminous coal,

and has more Jarge manfacturing establishments than any other town on the Missouri, including grist mills, foundries, and manufactories of waggons, carriages, furniture, and shoes. About 2 miles above the city is Fort Leavenworth, the military headquarters of the department of the Missouri. The Government reservation has a river frontage of 6 miles, with a depth of 1 mile The population was 7429 in 1860, 17,873 in 1870, 16,546 in 1880. At this last date the reservation contained 1115 individuals.

LEBANON. The name of Mount Lebanon (Heb. 129), from the Semitic root laban, “to be white, or whitish,” probably refers, not to the perpetual snow, but to the bare white walls of chalk or limestone which form the character- istic feature of the whole range. Syria is traversed by a branch thrown off almost at right angles from Mount Taurus in Asia Minor, and Lebanon is the name of the central mountain mass of Syria, extending for about 100 miles from north-north-east to south-south-west. It is bounded W. by the sea, N. by the plain Jun Akkar, beyond which rise the mountains of the Nusairieh, and E. by the inland plateau of Syria, mainly steppe-land. To the south Lebanon ends about the point where the river Litany bends westward, and at Banias. A valley narrowing towards its southern end, and now called El-Bukd‘a, divides the mountainous mass into two great paris. That lying to the west is still called Jebel Libnan; the greater part of the eastern mass now bears the name of the Eastern Mountain (Jebel el-Sharki). In Greek the western range was called Libanos, the eastern Antilibanos.! The southern extension of the latter, Mount Hermon (¢.v.), may in many respects be treated as a separate mountain.

Lebanon and Antilibanus have many features in com- mon; in both the southern portion is less arid and barren than the northern, tle western valleys better wooded and more fertile than the eastern, In general the main eleva- tions of the two ranges form pairs lying opposite one another ; the forms of both ranges are monotonous, but the colouring splendid, especially when viewed from a distance; when seen close at hand, indeed, only a few valleys with perennial streams offer pictures of landscape beauty, their rich green contrasting pleasantly with the bare brown and yellow mountain sides.

Geology.—The Lebanon strata are generally inclined, curved, and twisted, often vertical, seldom quite horizontal. Throughout the whole of Syria the prevailing line of cleavage runs from north to south; subordinate to this is another at right angles to it. The rocks belong to the Middle Chalk system, and fall into four subdivisions. The first consists of an under hippurite zone about 3000 feet thick. Sometimes light grey dolomites boldly rise to a height of several hundred yards (as in Kesrawdn); some- times masses of marble present equally grand mountain forms (Jezzin); sometimes again friable marl and clay occur, producing rich pasture lands. The last member of this lower zone is a brown oolite containing sponges, corals, and echinoderms, amongst which the best known fossil is Codaris glandarius (Salima). Here also belong the Radiolaria of Hakel, above which occurs the famous bed of fossil fishes. The second subdivision of the Middle Chalk consists of a thick sandstone formation, distinguished by the presence of Z'rigonia scabra and syriaca, and by a fossil balsam poplar (V%colia). To the period of the formation of this member of the system belong volcanic eruptions of melaphyre and basaltite, and also copious eruptions of ashes, which are now met with as tufa in the neighbourhood of the igneous rocks. These eruptive rocks, which every-

1 Lat., Antilibanus.

The popular form Antilebanon is not legiti- mate,

where have again been overlaid by the thick sandstone, yield bitumen (mineral oils, asphalt, and dysodil), and have also had a great influence upon the superficial aspect of the country, the sandstone stratum (1300 to 1600 feet thick) having become the centre of its life and fertility, inasmuch as here alone water can gather. In the third subdivision, the Turon strictly so-called, oyster beds (Ostrea africana) and a stratum of orbitulites have the widest diffusion. Above the oysters come the ammonites (Ammonites syriacus, Von Buch). 'The fourth subdivision is formed by a light grey chalk of the upper hippurite zone, which

begins in the Bukd‘a, and can be traced as far as to the Red Sea. The latest member is the Eocene nummulite (especially in Antilibanus). Generally speaking the pre- vailing colours are white in the first district, brown in the second, yellow in the third, and grey in the fourth. Apart from the formations already named, there only remain to be mentioned one or two more recent Tertiaries, which in some cases may go back to the end of the Miocene period, but for the most part are Pliocene. They are met with partly on the coast, being due to the action of the sea (Tripoli), partly in the Buka‘a (Zahleh), the result of the action of fresh water. Finally, throughout the whole of the Lebanon district, there are unmistakable traces of ice action in the shape of ground moraines and erratic blocks. The glacier remains may practically be said to be associated with the four chief streams (Nahr Kadisha, Jéz, Ibrahim, and Kelb).

Vegetation.—The western versant has the common characteristics of the flora of the Mediterranean coast, but the eastern portion belongs to the poorer region of the steppes, and the Mediterranean species are met with only sporadically along the water-courses. Forest and pasture land in our sense of the word do not exist: the place of the first is for the most part taken by a low brushwood ; grass is not plentiful, and the higher ridges maintain a growth of alpine plants only so long as patches of snow continue to lie. The rock walls harbour some rock plants, but many absolutely barren wildernesses of stone occur. (1) On the western versant, as we ascend, we have first, to a height of 1600 feet, the coast region, similar to that of Syria in general and of the south of Asia Minor. Character- istic trees are the locust tree and the stone pine; in Mela Azedarach and Ficus Sycomorus (Beyrout) we have an admixture of foreign and partially subtropical elements. The great mass of the vegetation, however, is of the low- growing type (maquis or garrigue of the western Mediter- ranean), with small and stiff leaves, and frequently thorny and aromatic, as for example the ilex (Quercus coccifera), Smilax, Cistus, Lentiscus, Calycotome, &e. (2) Next comes, from 1600 to 6500 feet, the mountain region, which may also be called the forest region, still exhibiting as it does sparse woods and isolated trees wherever shelter, moisture, and the bad husbandry of the inhabitants have permitted their growth. From 1600

to 3200 feet is a zone of dwarf hard-leaved oaks, amongst which occur the Oriental forms Fontanesia phillyreoides, Acer syriacum, and the beautiful red-stemmed Arbutus Andrachne. Higher up, between 3700 feet and 4200 feet, a tall pine, Pinus Brutia, Ten., is characteristic. Between 4200 and 6200 feet is the region of the two most interesting forest trees of Lebanon, the cypress and the cedar. The former still grows thickly, especially in the valley of the Kadisha; the horizontal is the prevailing variety. In the upper Kadisha valley there is a cedar grove of about three hundred trees, amongst which five are of gigantic size; it is alleged that other specimens occur elsewhere in Lebanon. The Cedrus Libani is intermediate between the Cedrus Deodara and the C. atlantica (see CEDAR). The cypress and cedar zone exhibits a variety of other leaf-bearing and coniferous

trees ; of the first may be mentioned several oaks—Quercus Mellul, Q. subalpina (Kotschy), Q. Cerris, and the hop-horn- beam (Ostrya) ; of the second class the rare Cilician silver fir (Abies cilicica) may be noticed. Next come the junipers, sometimes attaining the size of trees (Juniperus excelsa, J. rufescens, and, with fruit as large as plums, J. drupacea). But the chief ornament of Lebanon is the Rhododendron ponticum, with its brilliant purple flower clusters; a peculiar evergreen, Vinca libanotica, also adds beauty to this zone. (3) Into the alpine region (6200 to 10,400 feet) penetrate a few very stunted oaks (Quercus subalpina, Kotschy), the junipers already mentioned, and a barberry (Berberis cretica), which sometimes spreads into close thickets. Then follow the low, dense, prone, pillow-like dwarf bushes, thorny and grey, common to the Oriental high- lands—Astragalus and the peculiar Acantholimon. They are found up to within 300 feet of the highest summits. Upon the exposed mountain slopes rhubarb (Ahewm Lirbes) is noticeable, and also a vetch (Vicia canescens, Lab.) excellent for sheep. The spring vegetation, which lasts until July, appears to be rich, especially as regards corolla- bearing plants, such as Corydalis, Gagea, Bulbillaria, Colchicum, Puschkinia, Geranium, Ornithogalum, &c. The flora of the highest ridges, along the edges of the snow patches, exhibits no forms related to our northern alpine flora, but

suggestions of it are found in a Draba, an Andro- sace, an Alsine, and a violet, occurring, however, only in local species. Upon the highest summits are found Sapo- naria Pumilio (resembling our Silene acaulis) and varieties of Galium, Euphorbia, Astragalus, Veronica, Jurinea, Festuca, Scrophularia, Geranium, Asphodeline, Allium, Asperula; and, on the margins of the snow fields, a Taraxacum and Ranunculus demissus. The alpine flora of Lebanon thus connects itself directly with the Oriental flora of lower altitudes, and is unrelated to the glacial flora of Europe and northern Asia.

Zoology.—There is nothing of special interest about the fauna of Lebanon. Bears are no longer numerous; the panther and the ounce are met with ; the wild hog, hyzena, wolf, and fox are by no means rare; jackals and gazelles are very common. The polecat and hedgehog also occur. As a rule there are not many birds, but the eagle and the vulture may occasionally be seen; of eatable kinds part- ridges and wild pigeons are the most abundant. In some places the bat occasionally multiplies so as actually to become a plague.

Geography.—The district to the west of Lebanon, averaging about six hours in breadth, slopes in an intricate series of plateaus and terraces to the Mediterranean. The coast is for the most part abrupt and rocky, often leaving room for only a narrow path along the shore, and when viewed from the sea it does not lead one to have the least suspicion of the extent of country lying between its cliffs and the lofty summits behind) Most of the mountain Spurs run from east to west, but in northern Lebanon the prevailing direction of the valleys is north-westerly, and in the south some ridges also run parallel with the principal chain. The valleys have for the most part been deeply excavated by the rapid mountain streams which traverse them ; the apparently inaccessible heights are crowned by numerous villages, castles, or cloisters embosomed among trees. Of the streams which are perennial, the most worthy of note, beginning from the north, are the Nahr Akkar, N. Arka, N. el-Barid, N. Kadisha, “the holy river ” (the valley of which begins far up in the immediate neighbour- hood of the highest summits, and rapidly descends in a series of great bends till the river reaches the sea at Tri- poli), Wady el-Jéz (falling into the sea at

Batrin), Wady Fidar, Nahr Ibrahim (the ancient Adonis, having its source In a recess of the great mountain amphitheatre where the

famous sanctuary Apheca, the modern Afka, lay), Nahr el- Kelb (the ancient Lycus), Nahr Beirtit (the ancient Magoras, entering the sea at Beyrout), Nahr Démur (ancient Tam- yras), Nahr el-Auwaly (the ancient Bostrenus, which in the upper part of its course is joined by the Nahr el-Baruk). The “Auwaly and the Nahr el-Zaherdni, the only other streams that fall to be mentioned before we reach the Litény, flow north-east to south-west, in consequence of the interposition of a ridge subordinate and parallel to the central chain. On the north, where the mountain bears the special name of Jebel Akkdr, the main ridge of Lebanon rises gradually from the plain. A number of valleys run to the north and north-east, among which must be mentioned that of the Nahr el-Kebir, the Eleutherus of the ancients, which takes its rise in the Jebel el-Abyad on the eastern slope of Lebanon, and afterwards, skirting the district, flows westward to the sea. To the south of Jebel el-Abyad, beneath the main ridge, which as a rule falls away suddenly towards the east, occur several small elevated terraces having a southward slope; among these the Wadi en-Nusur (“vale of eagles”), and the basin of the lake Yammuna, with its intermittent spring Neb‘a el-Arba‘in, deserve special mention. Of the streams which descend into the Buké‘a, only the Berddni need be named ; it rises in Jebel Sunnin, and enters the plain by a deep and picturesque mountain cleft at Zahleh, With regard to height, the most elevated summits occur in the north, but even these are of very gentle gradient, and are ascended quite easily. The names and the elevations of the several peaks, which even in summer are covered with snow, have been very variously given by different explorers ; according to the most accurate accounts the “Cedar block” consists of a double line of four and three sum- mits respectively, ranged from north to south, with a deviation of about 35°. Those to the east are “‘Uyun Urghush, Makmal, Muskiyya (or Naba‘ esh-Shemaila), and Ras Zahr el-Kazib; fronting the sea are Karn Sauda or Timarun, Fumm el-Mizdb, and Zahr el-Kandil. The height of Zahr el-Kazib, by barometric measurement, is 10,018 feet ; that of the

others is almost the same. South from them is the pass (8351 feet) which leads from Baalbec to Tripoli; the great mountain amphitheatre on the west side of its summit is remarkable. Further to the south is a second group of lofty summits—the snow-capped Sunnin, visible from Beyrout ; its height is 8554 feet, or, according to other accounts, 8895 feet. Between this group and the more southerly Jebel Kuneiseh (about 6700 feet) lies the pass (4700 feet) now traversed by the French post road between Beyrout and Damascus. Among the other bare summits still further south are the long ridge of Jebel el-Barik (about 7000 feet), the Jebel Niha, with the Tau‘amat Niha (about 6100 feet), near which is a pass to Sidon, and the Jebel Rihin (about 5400 feet).

The Buka‘a, the broad valley which separates Lebanon from Antilibanus, is watered by two rivers having their watershed near Baalbec, at an elevation of about 3600 feet, and separated only by a short mile at their sources. That flowing northwards, El-‘Asy, is the ancient Orontes ; the other isthe Litany. In the lower part of its course the latter has scooped out for itself a deep and narrow rocky bed ; at Burghuz it is spanned by a great natural bridge. Not far from the point where it suddenly trends to the west lie, immediately above the romantic valley, at an elevation of 1500 feet, the imposing ruins of the old castle Kal‘at esh-Shakif, near one of the passes to Sidon. In its lower part the Litany bears the name of Nahr el-Kasimiyeh. Neither the Orontes nor the Litany has any important affluent. ;

The Buka‘a used to be known as Coelesyria (Strabo, xvi.

2, 21), but that word as employed by the ancients had a XIV. —- 50

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much more extensive application. is Buké‘a el-‘Aziz (the dear Buka‘a), and its northern portion is known as Sahlet Ba‘albek (the plain of Baalbec). The valley is from 4 to 6 miles broad, with an undulating surface. It is said to eontain one hundred and thirty-seven hamlets or settlements, the larger of which skirt the hills, while the smaller, consisting of mud hovels, stand upou dwarf mounds, the

debris of ages. The whole valley could be much more richly cultivated than it is at present; but fever is frequent.

The Antilibanus chain has in many respects been much less fully explored than that of Lebanon. Apart from its southern offshoots it is 67 miles long, while its width varies from 16 to 13} miles. It rises from the plain of Hasya-Homs, and in its northern portion is very arid and barren. The range has not so many offshoots as occur on the west side of Lebanon; under its precipitous slopes stretch table-lands and broad plateaus, which, especially on the east side looking towards the steppe, steadily inerease in width. Along the western side of northern Antilibanus stretches the Khasha‘a, a rough red region lined with juniper trees, a2 succession of the hardest limestone erests and ridges, bristling with bare rock and crag that shelter tufts of vegetation, and are divided by a succession of grassy ravines. On the eastern side the parallel valley of “Asal el-Ward deserves special mention; the descent towards the plain eastwards, as seen for example at Ma‘lila, is singular, — first a spacious amphitheatre and then two deep very narrow gorges. The perennial streams that take their rise in Antilibanus are not numerous; one of the finest and best watered valleys is that of Helbun, the ancient Chalybon, the Helbon of Ezek. xxvii. 18. The highest points of the range, reckoning from the north, are Halimat el-Kabu (8257 feet), which has a splendid view; the Fatly block, including Tal‘at Musa (8721 feet) and the adjoining Jebel Nebi Barth (7900 feet); anda third group near Bhidan, in which the most prominent names are Shakif, Akhydar, and Abu’l-Hin (8330 feet) Of the valleys descending westward the first to claim mention is the Wady Yafitfa ; a little further to the south, lying north and south, is the rich upland valley of Zebedani, where the Barada has its highest sources. Pursuing an easterly course of several hours, this stream receives the waters of the romantic “Ain Fije (which doubles its volume), and bursts out by a rocky gateway upon the plain of Damascus, in the irrigation of which it is the chief agent. It is the Amana of 2 Kings v. 12; the portion of Antilibanus traversed by it was also ealled by the same name (Cant. iv. 8). The French post road after leaving the Buké‘a first enters a little valley running north and south, where a projecting ridge of Antilibanus bears the ruins of the ancient eities Chalcis and Gerrha. It next

traverses the gorge of Wady el-Harir, the level upland Sahlet Judeideh, the ravine of Wady

LEBANON

At present its fullname | el-Karn, the ridge of ‘Akabat et-Tin, the descent Daurat

el-Billan, and finally the unpeopled plain of Dimas, from which it enters the valley of Baradé&. This route marks the southern boundary of Antilibanus proper, where the Hermon group begins (vol. xi. p. 751). From the point where this continuation of Antilibanus begins to take a more westerly direction, a low ridge shoots out towards the south-west, trending further and further away from the eastern ehain and narrowing the Buké‘a; upon the eastern side of this ridge lies the elevated valley or hilly stretch known as Wady et-Teim. In the north, beside “Ain Faluj, it is connected by a low watershed with the Buka‘a ; from the gorge of the Litany it is separated by the ridge of Jebel ed-Dahr. At its southern end it contracts and merges into the plain of Banias, thus enclosing Mount Hermon on its north-west and west sides; eastward from the Hasbany branch of the Jordan lies the meadow-land Merj ‘Iyun, the ancient Ijon (1 Kings xv. 20).

Political Divisions and Population.—The inhabitants of Lebanon have at no time played a conspicuous part in history. There are remains of prehistoric occupation, but we do not even know what races dwelt there in the historical period of antiquity. Probably they belonged partly to Canaanite, but chiefly to the Aramean group of nationalitics; the Bible mentions Hivites (Judg. iii. 3) and Giblites (Josh. xiii. 5). A portion of the western coast land was always, it may be assumed, in tlic hands of the Pheenician states, and it is possible that once and again their sovereignty may have extended even into the Buka‘a. Lebanon was also included within the ideal boundaries of the land of Israel, and the whole region was well known to the Hebrews, by whosc poets its many cxcellences are often praised. In the Roman period the district of Pheenice ex- tended into Lebanon ; in the 2d century it, along with the inland districts pertaining to it, constituted a subdivision of the province of Syria, having Emesa (Homs) for its capital; from the

time of Diocletian there was a Pheenice ad Libanum, with Emesa as capital, as well as a Pheenicec Maritima of which Tyre was the chief city. Remains of the Roman period occur throughout Lebanon, aud more especially in Hermon, in the shape of small temples in morc or less perfect prescrvation; for the more splendid ruins of Baalbec see that article (vol. iii. p. 176). Although Christianity early obtained a foot- ing in Lebanon, the arta worship, and even Aah sacrifice, nevertheless survived for a long time, especially in remote valleys such as Afka, The present inhabitants are for the most part of Syrian (Aramean) descent; Islam and the Arabs have at no time penetrated very deep into the mountain land. At present the eastcru range belongs to the vilayet of Damascus (Soria), of which Damascus itself constitutes the first subdivision (mutasarriflik) ; the subordinate divisions (kazas) of the government are Damascus, Baalbec, Hasbaya, Rashaya, and Buka‘a Gharbi or Western Buka‘a. Included within the vilayet of Soria, but with an indcpendent administration, is the government of Lebanon properly so called, a region some 87 miles loug, which in virtue of an ordinance published by the Porte in concert with the protecting powers in 1861 and revised in 1864 is ruled by a governor, who must bea Christian, in direct dependence on Constantinople. The seat of the pasha is at present at Ba‘abda, 6 miles south-east from Beyrout, his summer residence being at Btcddin. The pashalik is subdivided into the lieutenancies of Jurd, Batrin, Kasrawan, Metn, Zahle, Shuf, and Jezzin. A somewhat different account of the districts is

given in the statistical statement (1875) of the English consul at Beyrout:—

‘Moham- medans,

Distriet.

Chief Place.

14,472 6,150 2,342

27,986

Bahle……..... 7S. ne

PMESTULWENG crac sscces coscseseesne one

i 6s… drm… 46,060 ULT UM, sessereseeereessercereceee| LODSA..cccccccscoccscssceccccncecees b

GH gens saceisessencsessssssciess 1,996

185,786

The statistics accompanying the French map of 1862 give the population of Lebanon proper as some 100,000 in excess of these figures, but there can be no doubt of the inaccuracy of this csti- mate. The same authority gives the districts (taken in order from north to south) as follow :—Akkar, ed-Dunntye, el-Kuira (Upper and Lower), ez-Zawiye, Bsherre, Batrin, Jebeil, Muneitira, el-Fettth Kesrawan, el-Metn, Zahle, es-Sahil, el-Gharb, el-Mandsif, Shahar, urd, Arkib, Shif, Jezzin, Rihén, Kharntb, Tuffih, Shakif’ Shumér Beshdra, Merj Ayun. Hule and the towns of Sidon,

Maronites.

Orthodox Catholie

Greek. Greek, Total

4,546 48,286 310 11,120

ont 2,716

9,292 46,296 1,324 8,682 1,004 40,790 2,542 50,532 8,962 12,082

27,980 220,504

Beyrout, and Tripoli are also reckoned in this account as belonging to Lebanon. It also enumerates the following districts: —

Orthod. Greek.

Cath. Greek.

Met4-

ite. Moham.]| Total.

170

2,009 8,000

1,200

The Maronites, as the preceding statistics show, are the principal element of the Lebanon population ; for the Drusss, see vol. vil. p. 483. The Metawile, who enjoy no good reputation, are Shiite Mohammedans; their sheikh resides at Jeba‘a in South Lebanon. Of late years Pro- testantism, through the agency of the American mission at Beyrout, has begun to take some hold of the population, and is daily gaining ground. The Catholic missions also, with Beyrout for their centre, are meeting with some success, and the Western schools are indisputably affecting the culture and manners of the country. The present comparative security of life and property are highly favourable to its development. Since the violent outbreak of 1860, the bloody contests between the Maronites and Druses have not been renewed, although the mntual hatred still continues. To what has been already said on this subject (vol. vii. p. 485), it may here be added that the primary object of the Lebanon mountaineers is before everything the maintenance of their national freedom, and that the responsibility for the massacres of 1860 rests chiefly upon the Turkish Government (Ahmet Pasha of Damascus). The property of the Maronites had been promised to the Druses, and the Maronites on the other hand had been persuaded to disarm; as soon as the latter had done so they were attacked by Druses and Turks together. In Dcir el-Kamar alone, the chief place of South Lebanon, eighteen hundred Maronites perished. Since the pacification of the country by foreign intervention, particularly on the part of Napoleon III., the Druses have withdrawn

more into the inaccessible Hauran. Although every inhabitant of Lebanon still retains his warrior habits, and willingly enough joins the high- land troops (six hundred regular soldiers), the situation is now much more pacific, a circumstance due in large measure to the fact that the power of the numerous noble families has bcen much curtailed. On the other hand the clergy, although for the most part an extremely uneducated body of men, has great influence among the Maronites. The number of Maronite monks in the mountain district is said to reach eight thousand. The monasteries posscss a large portion of the best land, which is cultivated by the monks themselves, and is quite exempt from all public burdens. Other land is liable to be taxed annually at the rate of 3s. 6d. upon every £55 of assessed value; there is, besides, a poll tax exigible from every healthy male from the age of fourteen until he becomes unfit for work. The village head (sheikh), for every £8 of taxes, is entitled to exact from the inhabitants 4s. for his own remuncration. Every inhabitant must devote to the public service four days of free labour in the year. The gross revenue of Lebanon, which amounts to about £32,000 per anaum, does not cover the cxpenses of ad- ministration.

The Lebanon mountaineers are a fine vigorous set of men. In what relates to dress they show a preference for gay colours. Tattooing is universal in both sexcs. Their diligence is worthy of all praise. Inthe upper regions cattle breeding is the chief occupation ; the numerous flocks of sheep and goats are the great obstacle to forestry in these parts. No care is taken to protect the woods. For practical utility the trees which are planted (besides various fruit trees, especially figs) are the white poplar (for building purposes), the walnut, the olive, and above all the mulberry,—silk culture being an important industry with the mountain population, and still remunerative notwithstanding the occasional fall of prices. In 1872 the production amounted to 2,000,000 okes (about 5,000,000 ib) of fresh cocoons, from which 1,200,000 okes of raw silk and 200,000 okes of silk fabrics were produccd,

and with great care, at an elevation of 3900 to 5200 feet. Unfortunately the wine is simply stored in large stone jars, there being neither barrels nor cellars; the consequence is that it cannot be kept—in point of fact it is seldom more than a year old—and exportation is impossible. The excellent Lebanon white wine known as vino d'oro belongs to the class of sweet wines. Amongst the mineral products coal deserves special mention ; the beds are thick, but the presence of iron pyrites prevents it from coming into more general use. Some shafts, from which bitumen is obtained, occur in the neighbourhood of Hasbaya ; also petroleum wells. The chief food crops are wheat, [olcus sorghum, and barley, the last being cultivated as high as 6500 feet above the sea. Tobacco culture is universal.

Throughout the whole of Lebanon, but especially on the slope towards the sea, carefully tended terraces occur. The houses, little four-cornered boxes, generally shaded by a walnut or fig tree, stand as a rule upon the slope ; the roof is formed by pine stems upon which other timber, brushwood, and finally a coating of mud clay are laid. Under good government Lebanon, with its able and vigor- ous population, would rapidly develop.

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graphique du corps eapéditionnaire de Syrie en 1860-61, prepared at the French War Office, Paris, 1862. (A. 80.)

LEBANON, a manufacturing “ borough” of the United States, capital of Lebanon county, Pennsylvania, is situated on the Union Canal, 24 miles east of Harrisburg by the Lebanon Valley branch of the Philadelphia and Reading Railway. It is substantially built in brick and stone, and is steadily increasing in importance. Its principal in- dustrial establishments are blast furnaces, rolling mills, car-works, planing mills, foundries, and manufactories of organs, paper, cigars, carriages, and agricultural imple- ments. About 7 miles distant are the Cornwall Ore Banks, three eminences—Grassy, Middle, and Big Hill—consisting almost entirely of iron-ore veined with copper. The town was laid out in 1750, and incorporated as a borough in 1813; gas was introduced in 1857, and in 1872 water was brought into the place by gravitation at an expense of $250,000. The population of Lebanon has increased from 2184 in 1850 to 6727 in 1870, and 8778 in 1880.

LEBDA. Sce Leptis.

LE BEAU, Cuartes (1701-1778), a French historical writer, was born at Paris on October 15, 1701, and was educated at the Collége de Sainte-Barbe and the Collége du Plessis; at the latter he remained as a teacher aftcr the termination of his course as a pupil, until he obtained the chair of rhetoric in the Collége des Grassins. In 1748 he was admitted a member of the Academy of Inscriptions, and in 1752 he was nominated professor of eloquence in the Collége de France. From 1755 he held the office of perpetual secretary to the Academy of Inscriptions, 1n which capacity he edited fifteen volumes (from the 20th to the 39th inclusive) of the JZZ/istoire of that institution.

the latter exclusively for home use. The vino is cultivated, | He died at Paris on March 13, 1778.

The only work with which the name of Le Beau continues to be associated is his Histoire du Bas-Empire, en commencant & Constantin le Grand, in 22 vols. 12mo (Paris, 1756-1779), being a continuation of Rollin's Histoire Romaine and Crevier's Histoire des Empercurs. Its usefulness arises entirely from the fact of its being a faithful résumé of the Byzantine historians, for Le Beau had uo originality or artistic power of his own. Five volumes were added by Ameilhon (1781-1811), which brought the work down to the fall of Constantinople. A later edition, under the care of Saint-Martin and afterwards of Brosset, has had the benefit of careful revision throughout, and has received considerable addi- tions from Oriental sources.

LEBEDIN, a district town of the Kharkoff government in European Russia, 102 miles north-west of the govern- ment town, near the Olshana and Buravka, two small tributaries of the Dnieper. Its population has increased from 15,137 in 1863 to 17,019 in 1879. There are four annual fairs, and a good trade in grain and cattle.

Lebedin dates from the middle of the 17th century, In 1709 it was the headquarters of the operations of Peter the Great against Mazeppa, and

the seene of the execution of nine hundred of that hetman's followers, whose common grave is still marked by a mound 70 feet square.

LEBEDYAN, a district town of the Tamboff government in European Russia, situated 132 miles west of Tamboff, on the bluffs of the right bank of the Don. It possesses a modern cathedral (Kazanskii) and several churches of architectural and antiquarian interest ; and: in the imme- diate vicinity is the great Eletskii Troitskii monastery, which under the name Yablonovoi Pustuin was founded in 1621. The prosperity of the town is closely bound up with that of its three annual fairs, of which the first two continue for a month and the last for six days,—many of the inhabitants deriving the better part of their income from the rents paid by their merchant visitors. The chief fair is held near the monastery, and is known as the Troitskaya. The population, returned in 1863 as 5849 (exclusive of the suburbs, with 3046), was 6010 in 1879.

Lebedyan probably dates from the 15th century. It was reckoned a town in the beginning of the 17th ; and about 1678 it became the centre of a district.

LEBRIJA, or Lesrixa, a town of Spain, in the pro- vince of Seville, near the left bank of the eastern arm of the Guadalquivir, and on the eastern edge of the flat fluvial tract known as "Las Marismas," formed by that river. It is 44 miles by rail from Seville, which lies north by east, and about 50 miles from Cadiz. The climate is somewhat unfavourably affected by the proximity of the marshes ; but the sierra beneath which it lies protects the town from the hot easterly winds, and it enjoys during the heats of summer the pleasant alternation of land and sea breezes. The parish church, the only building of any note, is a somewhat imposing structure in a variety of styles—Moorish, Gothic, Romanesque—dating from the 14th to the 16th century ; it contains some early specimens of the carving of Alonso Cano. The manufactures, which are unimportant, consist chiefly of bricks, tiles, and earthen- ware, for which a useful clay is found in the neighbour- hood ; there 1s some trade in the grain, wine, and oil of the surrounding district. The population in December 1877 was 12,864.

Lebrija is the Nabrissa or Nebrissa, surnamed Veneria, of the Romans ; by Silius Italieus (iii. 393), who associates it with the worship of Dionysus, the name is derived from veBpls. Nebrishah was a strong and populous place during the period of Moorish domination ; it was taken by St Ferdinand in 1249, but again lost, and became finally subject to the Castilian crown only under Alphonso the Wise in 1264. It was the birthplace of Elio Antonio de Lebrija or Nebrija (1444-1522), better known as Ne- brissensis, one of the most important leaders in the revival of learn- ing in Spain, the tutor of Queen Isabella, and a collaborateur with Jimenez in the preparation of the Complutensian Polyglott.

LE BRUN, Cuarzzs (1619-1690), French painter, was born at Paris 24th February 1619, and attracted the notice of Chancellor Séguier, who placed him at the age of eleven

in the studio of Vouet. At fifteen he received commissions from Cardinal Richelieu in the execution of which he dis- played an ability which obtained the generous commenda- tions of Poussin himself, in whose company Le Brun started for Rome in 1642. In Rome he remained four years in the receipt of a pension due to the liberality of the chancellor. On his return to Paris Le Brun found numerous patrons, of whom the celebrated Superintendent Fouquet was the most important. Employed at Vaux le Vicomte, Le Brun, who had an immense amount of worldly tact, ingratiated himself with Mazarin, then secretly pitting Colbert against Fouquet. Colbert also promptly recognized Le Brun’s powers of organization, and attached him to his interests. Together they founded the Academy of Painting and Sculpture (1648), and the Academy of France at Rome (1666), and gave a new development to the industrial arts. In 1660 they established the Gobelins, which at first was a great school for the manufacture, not of tapestries only, but of every class of furniture required in the royal palaces. Commanding the industrial arts through the Gobelins, of which he was director, and the whole artist world through the Academy—in which he successively held every post— Le Brun

imprinted his own character on all that was pro- duced in France during his lifetime, and gave a direction to the national tendencies which endured even after his death. The nature of his emphatic and pompous talent was in harmony with the taste of the king, who, full of admiration at the decorations designed by Le Brun for his triumphal entry into Paris (1660), commissioned him to execute a series of subjects from the history of Alexander. The first of these, Alexander and the Family of Darins, so delighted Louis XIV. that he at once ennobled Le Brun (December 1662), who was also created first painter to his majesty with a pension of 12,000 livres, the same amount as he had yearly received in the service of the magnifi- cent Fouquet. From this date all that was done in the royal palaces was directed by Le Brun. The works of the gallery of Apollo in the Louvre were interrupted in 1677 when he accompanied the king to Flanders (on his return from Lille he painted several compositions in the Chateau of St Germains), and finally—for they remained unfinished at his death—by the vast labours of Versailles, where he reserved for himself the Halls of War and Peace, the Ambassadors' Staircase, and the Great Gallery, other artists being forced to accept the position of his assistants. At the death of Colbert, Louvois, who sueceeded him in tlie department of public works, showed no favour to Le Brun, and in spite of the king's continued support he felt a bitter change in his position. This contributed to the illness which on 22d February 1690 ended in his death in the Gobelins, Besides his gigantic labours at Versailles and the Louvre, the number of his works for religions corpora- tions and private patrons is incredible. He modelled and engraved with much facility, and, in spite of the heaviness and poverty of drawing and colour, his extraordinary activity and the vigour of his conceptions justify his claim to fame. Nearly all his compositions have been reproduced by celebrated engravers.

LECCE, one of most important cities of Southern Italy, and the administrative centre of the province of Lecce (formerly Terra d'Otranto), is situated on the railway between Brindisi and Otranto, about 8 miles from the coast of the Adriatic. Down to the middle of the 18th century it was defended by regular fortifications constructed in the 16th century, and it still preserves some of the gate- ways, as well

as a triumphal arch erected in honour of the entry of Charles V. Among its public buildings are the

| cathedral (dedicated to St Orontius, traditional first bishop

of the city, whose statue, on a lofty column, adorns the principal square), the old convent of the Celestines now

occupied by the prefecture, the old convent of the Capuchins, and the marble church of St Nicholas. Bene- volent institutions are specially numerous, and include a hospital dating from 1389, and a communal orphanage from 1608. A public library was founded in 1863. The name of Lecce has long been familiar throughout Italy in connexion with the great tobacco factory now located in the Dominican convent; and cotton and woollen goods, lace, artificial flowers, hats, &c., are among the products of the local industry. The population increased from 17,836 in 1861 to 18,460 in 1871.

Lecee is identified with Lupie, a eity of the Saleutines, and, though remains of ancient edifices are no longer to be seen, there is evidence of the existence of extensive substructions as late as the 15th century. The name Lycea, or Lycia, begins to appear in the 6th century. The city was for some time held by eonnts of Nor- nian blood, among whom the most noteworthy is Bohemond, son of Robert Guiscard. It afterwards passed to the Orsini, The rank of provincial capital was bestowed by Ferdinand of Aragon in acknowledgment of the fidelity of Lecee to his cause. Scipione Ammirato (Florentine historian), Domenico de Angelis, and G. Baglivi the anatomist were natives of the city.

LECCO, a city of Italy, in the province of Como, situated near the southern extremity of the eastern branch of the Lake of Como, which is frequently distinguished as the Lake of Lecco. It is the meeting place of several important roads, and the terminus of a railway from Bergamo, which joins the line from Milan. To the south the Adda is crossed bya fine bridge originally constructed in 1335, and rebuilt in

1609 by Fuentes. Lecco, in spite of its real antiquity, presents quite a modern appearance; and it is the seat of no small industrial activity. Besides the iron- works, which are particularly important, there are brass foundries and oil-works ; and silk spinning, cotton spinning, and wood carving are successfully prosecuted. The annual cattle fair lasts fifteen days. In the neighbourhood of the town is Caleotto, the residence of Manzoni, who in his Promesst Spost has left a full description of the district. The population of Lecco was 6815 in 1871.

In the 11th century Lecco, which had previously been the seat of a marquisate, was presented to the bishops of Como by Otto II. ; but in the 12th century it passed to the archbishops of Milan, and in 1127 it assisted the Milanese in the destruetion of Como. During the 13th century it was struggling for its existence with the metro- hee city; and its fate seemed to be sealed when the Visconti

rove its inhabitants across the lake to Valmadrera, and forbade them to raise their town from its ashes. But in a few years the people returned ; and Azzone Visconti made Lecco a strong fortress, and united it with the Milanese territory by a bridge across the Adda. During the 15th and 16th centuries the rock of Lecco was an object of endless contention. In 1647 the town witli its terri- tory was made a countship. The fortifications were finally sold by Joseph II. to Connt Serponti. Merlinis, one of the first Italian printers, and Morone, Charles V.’s Italian chancellor, were born in Lecco. See Apostolo, Lecco e suo territorio, Lecco, 1855.

LE CLERC, Juan (1657-1736), or CrEricus, theo- logian and man of letters, was born March 19, 1657 (0.s.), at Geneva, where his father Stephen Le Clerc was pro- fessor of Greek. The family had originally belonged to the neighbourhood of Beauvais in France, aud several of its members have acquired some name in literature. On the completion of his grammar school course (in which he made himself remarkable for his omnivorous reading), he applied himself to the study of philosophy under Chouet the Cartesian, and from his nineteenth to his twenty-first year he attended the theological lectures of Mestrezat, Turretin, and Louis Tronchin. In 1678-79 he spent some time at

Grenoble as tutor in a private family ; on his return to Geneva he passed his examinations and received ordina- tion. Soon afterwards he went to Saumur, where in 1679 were published Liberti de Sancto-Amore E'pistole Theologicz (Irenopoli: Typis Philalethianis), usually attributed to his pen; they deal with such subjects as the doctrine of the Trinity, the hypostatical union of the two natures in Jesus Christ, original sin, and the like, in a manner sufficiently

far removed from that of the conventional orthodoxy of the period. From Geneva, which he still continued to regard as his home, Le Clerc in 1682 went to London, where he remained six months, preaching on alternate Sundays in the Walloon church and in the Savoy chapel. Passing over to Amsterdam he was introduced to Locke and Limborch ; the acquaintance with the latter soon ripened into a close friendship, which naturally strengthened his preference for the Remonstrant theology, already favour- ably known to him by the writings of his granduncle Curcellzeus, and by those of Episcopius. A final attempt to live at Geneva, made at the request of his relatives there, satisfied him of the unwholesomeness of its stifling theological atmosphere, and in 1684 he finally settled at Amsterdam, first as a moderately successful preacher until ecclesiastical jealousy shut him out from that career, and afterwards as professor of philosophy, belles-lettres, and Hebrew in the Remonstrant seminary. This appointment, which le owed to his friend Limborch, he held from 1684 till 1712, when on the death of the latter he was called to occupy the chair of church history also. His suspected Socinianism was the cause, it is said, of his exclusion from the chair of dogmatic theology. Apart from its varied and immense literary labours, his life at Amsterdam was quite uneventful. His marriage to the daughter of Gregorio Leti took place in 1691. In 1728 and following years repeated strokes of paralysis gradually reduced him to a state of mental imbecility, from which he was released by death on January 8, 1736.

A full eataloguc of the publications of Le Clere will be found, along with adequate biographical matcrial, in Haag's France Pro- testante

(where seventy-three works are enumerated), or in Chauffe- pié's Dietionnatre. Only the most important of these ean be men- tioned here. In 1685 he published Sentimens de quelques théologiens de Hollande sur 0 Histotre Critique du Vieux Testament eomposée par le P. Richard Simon, iu which, while pointing out what he believed to be the faults of that author, he undertook to make some positive contributions towards a right understanding of the Bible. Among these last may be noted his argument against the Mosaic author- ship of the Pentateuch, his views as to the manner in which the five books actually were composed, his opinions (singularly free for the time in which he lived) on the subject of inspiration in general, and particularly as to the inspiration of Job, Proverbs, Ecclesiastes, Canticles. Simon's Réponse (1686) clicited from Le Clere a Défense des Sentimens in the same year, which was followed by a new Réponse (1687). In 1692 appeared his Logica sive Ars Ratiocinand?, and also Ontologia et Pnewmatologia; these, with the Physica (1695), are incorporated with the Opera Philosophiea which have passed through several editions. In 1693 his series of Biblical commentaries began with that on Genesis; it was not completed until 1731. The portion relating to the New Testament books in- cluded the paraphrase and notes of Hammond. Le Clere's com- mentary had a great influence in breaking up traditional prejudices and opening men's cyes to the yecdaaey for a more scientific inquiry into the origin and meaning of the Biblical books. It was on all sides hotly attacked,—often for opinions which now seen innocent to the most orthodox. Le Clerc's new edition of the Apostolic Fathers of Cotelerius, published in 1698, marked an advance in the critical study of these documents. But the greatest literary influence of Le Clere was probably that which he exercised over his contemporarics by means of the serials, or, if one may so call them, reviews, of which he waseditor, 'These were the Bibliotheque universelle et historique (Amsterdam, 25 vols. 12mo, 1686-93), begun along with De la Croze; the Bibliothéque choisie, Amsterdain, 28 vols. 18mo, 1708-13; and the Bibliotheque aneienne ef moderne, 29 vols. 18mo, 1714-26. See Le Clerc's Parrhasiana ow Pensées sur des matiéres de eritique, @histoire, de morale, et de politique : avee la défense de divers ouvrages de M. L. C. par Théodore Parrhase, Amsterdam, 1699 ; and Vita et opera ad annum MDCCXI., amict ejus

opusculum, philosophieis Cleriei operibus subjiciendum, also attributed to himself. The supplement to Hammond's notes was translated into English in 1699, Parrhasiana, or Thoughts on Several Subjects, in 1700, and the Harmony of the Gospels in 1701. Twelve Dissertations out of M. Le Clere's Genesis appeared in 1696.

LECTION, Lxcrionary, Lecror. The Jewish custom of reading the books of Moses in the synagogues every Sabbath day was already ancient in the apostolic age, and we learn from Luke iv. 16, 17, that portions were also

read from the prophets, though the system of prophetic lessons at least had not yet reached the fixity of the later ritual. For obvious reasons the reading of Scripture at public worship was continued by the Christian Church with certain modifications (1 Thess. v. 27; Col. iv. 16). An authority so early as Justin Martyr (Apol., i. 67) states that in the Christian assemblies of his day "the memoirs of the apostles, or the writings of the prophets, are read as long as time permits." What we are precisely to understand by these "memoirs of the apostles" is doubtful; but the evidence we have, fragmentary though it is, may be said to make it certain that neither in his day, nor for many years afterwards, was the canon of sacred books to be read in public worship rigidly fixed, and still less were definite portions of Scripture appointed to be read on particnlar days of the ecclesiastical year. Traces of the office of reader as distinct from that of deacon begin to appear in Tertullian (De Prescr., 41), who makes frequent allusions to the public reading of both Old and New Testament Scriptures (Apol., 39; De Prescr., 36 ; De An., 9), but says nothing that can be construed as implying anything like a fixed table of lessons. Towards the end of the 4th century, however, indications of a widely spread custom of reading the Scriptures according to a uniform and rigid scheme became frequent ; and the practice even then was spoken of as ancient. Thus Chrysostom and Augustine both show incidentally that the Acts of the Apostles were publicly read between Easter and Pentecost and then laid aside, while Genesis was read in Lent. In the Apostolical

Con- stitutions (ii. 57) a very methodical service is enjoined ; it prescribes two lessons from the Old Testament by a reader ; the Psalms of David are then to be sung, next the Acts of the Apostles and the epistles of Paul, and finally (by a deacon or presbyter) the gospels, are to be read. The labours of Scholz and Tischendorf have brought to light a large body of MS. Greek lectionaries ranging between the 7th and the 10th century, from which, when fully collated, it will probably be possible to ascertain with precision the order of yearly lections contemplated within the circles to which the documents respectively belong, Most of them contain gospel lessons only; the rest lessons from the Acts and the epistles. The Zvangelion and Apostolos of the modern Greek Church has a proper gospel and epistle, not only for every Saturday and Sunday, but for every day of the week. The order of (continuous) lessons for the five ordinary week days cannot be traced with certainty further back than to the 10th century, but those for the Sundays, also for the most part continuous, can be traced, so far as the gospels at least are concerned, to the 8th, and large coincidences with the Armenian lectionary lead to the in- ference that much had been already fixed before 595. Of Western lectionaries the earliest is probably the Lzber Comitis sive Lectionarius, which used to be attributed to Jerome. On the whole it does not observe a lectio continua, but is characterized rather by free selection of suitable passages for each Sunday. Next in chronological order is the Tabula, drawn up by Victor of Capua (546); it was printed by Gerbert in his Monum. Vet. Liturg. Alem. in 1777. It also has no trace of Jectio continua. The same remark applies to the Luxueil lectionary, edited by Mabillon in the De Liturgia Gallicana (Migne, Patr., Ixxii.); it is assigned by Mabillon to the end of the ¥th century, and certainly is not later than the time of Charlemagne ; besides the usual gospel and epistle, it prescribes a lesson from the Old Testament.

The earliest allusion seeming to imply an order of lectors or readers as one of the standing orders of the church occurs, as already mentioned, in a solitary passage in Tertullian. In Cyprian, allusions much less ambiguous are frequent. The Apostolic Constitutions give a form of prayer to be used

at the ordination of lectors by the imposition of hands. In the modern Greek Church the functions of the Anagnostes are strictly confined to the reading of the epistle, that of the gospel being reserved for the deacon. In the old Catholic Church, the ordination of lectors was by publicly placing the Bible in their hands, with some such formula of exhortation as is prescribed in can. 8 of the fourth council of Carthage. By the council of Trent the order of lector was recognized as one of the minor orders of the Roman Catholic Church, but it has no actual independent existence, being regarded merely as a necessary step in promotion to a higher office.

LEDA. See Castor AND PoLLux.

LEDRU-ROLLIN, Atexanpre Avcusts (1807-1874), was the grandson of a celebrated quack-doctor of the reign of Louis XV., who took the name of Comus, aud made a large fortune in curing or attempting to cure epilepsy by magnetism. He himself was born in the house of Scarron at Fontenay-aux-Roses, on February 2, 1807, was educated at Paris, and had just been entered at the Paris bar, when the revolution of July 1830 broke out. He soon made himself a great name as an advocate, and was engaged on the republican side in all the great political trials of the next ten years. He also wrote many political tracts, and edited more than one republican newspaper, so that when he was elected as deputy for Le Mans in 1841 he was expected to take up an advanced republican position in the chamber. From this time to the outbreak of the revolution of February 1848 he was regarded as the chosen leader of the working men of France, and spoke and wrote in favour of liberty of labour and universal suffrage. It was in the speeches of himself and his friends Lamartine and Louis Blanc at Lille, Dijon, and Chalons at working men’s banquets during the latter months of 1847 that the revolution of 1848 was most clearly foreshadowed and prepared. When it did actually break out, it was Ledru-Rollin who overthrew the project of making the duchess of Orleans regent, and obtained the nomination of a provisional government, In this provisional government he was clearly pointed out

by his influence aniong the working men for the ministry of the interior. When he resigned on June 24, 1848, he found that his four months of office had lost him his old leadership, as the conscientious performance of such an office inevitably would, but he had the credit of having for the first time established a working system of universal suffrage. He tried to regain his old influence, but in vaia, and at the election of president in December had but 370,000 votes. The earlier months of 1849 he spent in protesting against the policy, especially the Roman policy, of the president Louis Napoleon Bonaparte and his ministry, which culminated in his moving their impeachment. His motion being defeated on June 12 by 289 to 8, he on June 13 headed what he called a peaceful demonstration, and his enemies an appeal to arms, which was soon dispersed. Ledru-Rollin himself escaped to London, where he signed the manifestoes of the revolutionary committee of Europe with Kossuth, Mazzini, Riige, and sometimes Desatz. He also employed his leisure in writing a work on the Décadence @ Angleterre, in which he attempted to deduce the necessary fall of England from its aristocratic form of government and the misery of the lower classes, In 1870 he returned to Paris, but though elected in three departments he refused to sit in the national assembly of 1871. In 1874 he con- sented to sit for the department of Var, and spoke at length on June 3 on an electoral scheme, upholding the one great aim and achievement of his life, universal suffrage. The effort was too much for his health; he steadily grew weaker and weaker, and died on December 31, 1874. Perhaps the best succinct description of his character and political position in the sixteen short months of his, real

power is to be found in the speech of Victor Hugo at the unveiling of his bust in Pére La Chaise: ‘ Louis Blanc was the apostle of the revolution of February, Lamartine the orator, and Ledru-Rollin the tribune.”

The Discours politiques et écrits divers of Ledru-Rollin were published by his widow in 1879; his Décadence d’ Angleterre was

published in 1850 ; and an account of his political position is to be found in all histories of the revolution of 1848.

LEDYARD, Joun (1751-1789), traveller, was born in Groton, Connecticut, U.S.,in 1751. After vainly attempt- ing to settle down to the study of law and theology, Ledyard adopted the life of a seaman, and, finding his way to London, was engaged in 1776 as a corporal of marines by Captain Cook, for his third voyage of discovery. On his return in 1778 Ledyard had to give up to the Admiralty the copious notes he had kept, but was never- theless able to publish a somewhat meagre narrative of his experiences (Hartford, U.S., 1783). He continued in the British service till 1782, when, his ship being off Long Island, he managed to escape. Ledyard returned to Europe again in 1784, his purpose being to obtain the means of fitting out an expedition to the north-west coast of America. Having failed in his attempts, he decided to reach his goal by travelling across Europe and Asia. On his arrival in Stockholm (1786) he attempted to cross to Abo in Finland on the ice; but, meeting with open water, he turned back, walked all the way round the head of the gulf, down through Finland, and on to St Petersburg, where he arrived in March 1787 without shoes or stockings, and penniless. He made friends, however (among others Pallas), and got permission from the Government to accompany Dr Brown, a Scotch physician in the Russian service, to Siberia. Ledyard left Dr Brown at Barnaul, went on to Tomsk and Irkutsk, then visited Lake Baikal, and, reaching the Lena, sailed down to Yakutsk, where he arrived on September 18. With a Captain Billings he returned to Irkutsk, where on February 14, 1788, he was suddenly arrested, hurried across Siberia and Europe to the frontier of Poland, and ordered not to return under pain of death. On reaching London, Ledyard was befriended by Sir Joseph Banks, who engaged him on behalf of the African Association to carry on their work of exploration in Africa. His career was, however, cut short at Cairo, where he died on January 17, 1789. Ledyard was a born explorer, and, had he fallen into good hands in good time, and his energies been properly directed, would probably have done good work. As it was, no results of permanent value came of his wide and aimless wanderings. His life, with extracts from his journals, was written by Jared Sparks for the

Library of American Bio- graphy (1828), and is also published separately.

LEE, Natwaniey (c. 1650-1692), dramatist, was the son of Dr Lee, incumbent of Hatfield, Hertfordshire. He studied at Westminster School and Trinity College, Cambridge. After essaying the profession of an actor with very slight success, he wrote several tragedies, the best known of which are The Rival Queens, 1677, and Theodosius, 1680. He also assisted Dryden in producing @dipus and The Duke of Guise. From 1684 to 1688 he was an inmate of Bedlam, and afterwards until his death he was subject to intermittent attacks of insanity. Though he wrote the Princess of Cleve in 1689, and the Massacre of Paris in 1690, he was in his later years dependent chiefly on charity. He died in London in 1692, not in 1690 as is usually stated, the register of St Clements Danes church giving the date of his burial as the 6th May. The dramas of Lee are of course written in the artificial style characteristic of the period, and they also display occasionally a tendency to wild extravagance, but they nevertheless contain many passages of true poetic tenderness and grace.

LEE, RicuarpD Henry (1732-1794), an American states- man and orator, born in Westmoreland county, Virginia, U.S., January 20, 1732, was one of six distinguished sons of Thomas Lee, a descendant of an old Cavalier family. After obtaining the foundation of a liberal education in England, and spending a little time in travel, he returned to Virginia in 1752, coming into possession of a fine property left him by his father, and for several years applied himself to varied studies. At the age of twenty- five he was appointed justice of the peace, and soon after was chosen a delegate to the house of burgesses. He kept a diffident silence during two sessions, his first speech being in strong opposition to slavery, which he proposed to discourage, and eventually to abolish, by imposing a heavy tax on all further importations. In 1764 Lee had applied for a collectorship under the Stamp Act, which afterwards roused the determined hostility of the colonies, but on reflexion he regretted doing so, and became au outspoken promoter of

the most extreme democratic ideas. In February 1766 he organized an association in West- moreland, in accordance with Patrick Heury's famous re- solution against the Act. At the winter session of the burgesses in 1766, Lee, with the aid of Patrick Henry, succeeded in carrying the house upon a test question against the united aristocratic elements of the colony. In 1767 he spoke eloquently against the acts levying duties upon tea and other articles, and in 1768, in a letter to John Dickinson of Pennsylvania, he made the suggestion of a private correspondence among the friends of liberty in the different colonies. Lee is said also to have originated, in a conversation with fellow burgesses in 1773, the plan of an inter-colonial or so-called continental congress, which was carried into effect next year. At this first congress in Philadelphia in 1774, Lee is said to have penned the address to the king, and is known to have prepared that to the people of British America, together with the second address to the people of Great Britain, directed by congress in 1775, both of which are among the most effective papers of the time. On June 7, 1776, instructed by the Virginia house of burgesses, he introduced in congress the resolu- tions declaring ''that these united colonies are, and of right ought to be, free and independent states, that they are absolved from all allegiance to the British crown, and that all political connexion between them and the state of Great Britain is, and ought to be, totally dissolved." Lee was in congress in 1778-80 and 1784-85, and was one of the first senators chosen from Virginia after the adoption of the federal constitution. Though strongly opposed to the adoption of that constitution, owing to what he regarded as its dangerous infringements upon the independent power of the States, he accepted the place of senator in hope of bringing about amendments. He became a warm upholder of Washington's administration, and his prejudices against the constitution were largely removed by its working in practice. He retired from public life in 1792, and died at Chantilly in Westmoreland county, June 19, 1794.

See Afemoirs, by his grandson R. H. Lee, 2 vols., 1825.

LEE, Rosert Epwarp (1807-1870), general of the Con- federate States army, and one of the greatest of modern commanders, was born at

Stratford, in Westmoreland county, Virginia, on January 19,1807. His father, General Harry Lee, better known in the War of Independence as “Light-Horse Harry Lee,” and afterwards governor of Virginia, was the son of a cousin of the subject of last article. Robert Lee entered the military academy at West Point in 1825, and graduated in 1829, when he received a commission in the corps of engineers. When the Mexican war broke out Lee, who was then captain, served in the army under General Scott. He distinguished himself greatly throughout the campaign, and was brevetted as

colonel for his conduct at the siege of Chapultepec, where he was wounded. In 1852 he was appointed superin- tendent of the academy at West Point, and in 1855 he was promoted lieutenant-colonel of the second regiment of cavalry, with which he served in Texas. In March 1861 he was made colonel of the first regiment of cavalry, but in the following month, learning that his native State had withdrawn from the Union, he resigned as an officer of the United States army, and was forthwith put in command of the Virginian forces. When Virginia joined the Con- federacy he was the third of five generals appointed by the Southern Congress. No adequate opportunity of gaining distinction was afforded him, however, until the beginning of June 1862, when he received command of the army of northern Virginia, and commenced the series of operations the result of which before the month had closed was to compel M‘Clellan to abandon the siege of Richmond. Following up this advantage and Jackson’s victory at Cedar Run on August 9, Lee advanced in person to lead the army that was being formed on the south bank of the Rapidan; after crossing that river he inflicted upon Pope at Manassas the disastrous defeat by which the Federal army was compelled to retire within the fortified lines of Washington. Lee now decided on the invasion of Maryland, and advanced to Frederick city, but, being compelled to divide his forces, he sustained a check in the passes of South Mountain (September 16, 17) which compelled him to recross the -Potomac. After afew weeks’ breathing time he found himself again face to face with the Federal army near Fredericksburg early in November ; on December 13 the

enemy, having crossed the Rappahannock on the previous day, assailed his position in strength, but was defeated with great loss. In the following spring the hostile armies still faced one another on the Rappahannock, but the brilliant strategy of Lee, as exhibited in the battles at Chancellorsville (May 2-4), against vastly superior forces, resulted in the retreat of the enemy, while Lee was left free to resume his old policy of throwing the Federal forces on the defensive by an advance into Pennsylvania. He encountered the enemy near Gettysburg on July 1, and decided advantages were gained, but the struggle was renewed on the two following days with disastrous con- sequences to him; he retreated, however, in good order, and reached Virginia on the 12th, when the campaign of the year practically closed. That of 1864 began on May 4, when Grant crossed the Rapidan; the passage itself was unresisted, but his subsequent progress was hotly contested in a series of well-fought battles which did not prevent the Federal general from reaching the south side of the Appomattox. The siege of Petersburg began in June, and lasted until April 2, 1865. A week afterwards Lee surrendered with his whole army, thus virtually terminating the war. In the same year he was elected president of Washington and Lee university at Lexington, Virginia, which office he retained until his death on October 12, 1870.

The events of Lee's military career briefly indicated in this notice belong to the history of the United States, and will call for further notice in that connexion. To do justice to his extraordinary ability as a general, displayed under circumstances of extreme difficulty, when his move- ments were continually hampered by political necessities, as well by the lack of material resources, would require an elaborate military biography; it was never more nobly displayed than in the last hopeless stages of the fatal struggle. The personal history of Lee is lost in the history of the great crisis of America's national life; political friends and foes alike acknowledged the disinterestedness and purity of his motives, his self-denying sense of duty, and the unrepining loyalty with which he accepted thie ruin of his party.

LEE—LEE

LEECH. The medicinal leech (Hirudo medicinalis, L.) is a species grouped under the family Gnathobdellidx (with a dental apparatus composed of armed muscular ridges) of the discophorous Annelida. The body of a leech is spindle- shaped, and flattened dorsally and ventrally so as to be elliptical in transverse section. It is somewhat pointed in front except when tle mouth is in action, while posteriorly it is terminated by adisk or sucker. The surface is marked by a series of anuulations reaching from ninety-five to one hundred, but such are only cutaneous, as indicated by the ganglia, the segmental organs, the white spots on each side, and even by the arrangement of the two outer yellowish stripes, for the primary segments of the body comprise from three to five of these. The anterior sucker (fig. 1, a) is composed of four incomplete annuli and an- other surrounding the mouth, while the posterior (a') has seven. The colour of the dorsum is gene- rally dull olive or olive-brown, with six yellowish, rusty, or greenish-yellow bands more or less interrupted with black, the spots of the latter being some- what symmetrically arranged in the two outer rows. The ventral surface is speckled with black spots on a greyish ground. Seve- a ral varieties occur, according as the dorsum is lighter or darker brownish or olive, and the vent- ral surface with or without spots. Thus Moquin-Tandon, Diesing, and others indicate six or seven, each of which again has various subvarieties, ranging from two to five. Externally the body is invested by a thin translucent chitinous cuticle, which is _per- forated, apparently with some

regularity, by the apertures Ofpyg. 1.—Medicinal Leech (Hirudo

the glands. This coat is shed medicinalis, L.), after Moquin-

Tandon and Rolleston. a, anterior sucker; a', posterior sucker; 8, first and second pairs of ganglia— closely approximated; 6', last ganglion; ¢, first diverticulum of the alimentary canal; c', small intestine (gastroiléal of Gratiolet); ce', eleventh pair of cseca (long and large); , first pair of the nine testes; d', last pair of 'testes; d@', sixth testis displaced outward: so as to show its connexion with the vas deferens ; e, e', segmental organs ; 7, museular ductus ejacu- latorius of the left side, leading from the vesicula seminalis to the base of the

flask-shaped intromittent organ; 4g, club- shaped end of the intromit- tent apparatus; h, penis; 7, ovary of the left side; j, muscular vagina,

at intervals. Beneath is the hypoderm (epidermis of some), which is much firmer and thinner than in the Nemerteans. It contains the pigment, though part of the latter intrudes into the subjacent layer, and is com- posed as usual of columnar granular cells, a horizontal sec- tiou presenting a somewhat regularly areolated aspect. Raw- lins Johnson alludes to the vas- cularity of the surface of the leech, and Ray Lankester notes

the extension of the capillaries into this layer.

The

latter has not been verified, even in the hypoderm of the snout, though preparations presenting such appear- ances are not uncommon. The hypoderm is closely united to the subjacent muscular layer, though it can hardly be said with Gegenbaur that it is continued into the parenchyma of the body. It is this layer and the cuticle which are marked by the superficial annulations. Various' unicellular glands occur underneath the hypoderm, in particular two chief sets— superficial and deep. The former are situated amongst the outer (circular) muscular fibres and pigment, while the latter lie amongst the con- nective tissue, muscular fibres, and vessels that constitute,

Suctorial

appara- tus,

LEECH

the "parenchyma" between the muscular layers of the body-wall and the alimentary canal. It has been suggested that the former secrete the ordinary mucus, the latter the cocoons. Both open by ducts on the surface of the cuticle, and it is stated that those in the neighbourhood of the genital segments are enlarged at the time of oviposition. In the

Nemerteans it is the homologue of the leech's hypoderm which secretes the envelopment of the ova.

The muscular layers consist of external circular fibres in several strata, between which the hypodermic glands, pigment- cells, and vessels intrude. When this coat is examined in thin superficial (horizontal) sections the fasciculi are observed to be separated by intervals. Other circular fibres occur within the longitudinal layer. The latter muscles form the great mass of the body-wall, and are grouped into various bands by the connective tissue and radiating muscles. The latter pass directly from the dorsal to the ventral surface laterally, and thus become vertical fibres; and they are very well seen in Vephelis, where they form four or five conspicuous bands between the circular layer dorsally and ventrally, and thus appear to have a considerable influence in determining the shape of the body. The extensible snout presents a muscular structure analogous to that of the tongue in the higher animals, and it is capable of even more extensive and varied movements. A complex series of muscles (circular, radial, and longitudinal) exists in connexion with the posterior sucker. 'The muscles of the leech are non- striated, and are formed of long spindle-cells with nuclei. The locomotion of the leech is effected by the alternate attachment of the suckers, or by swimming through the water like an eel. It is fond of waving its body to and fro in the water when attached by its posterior sucker, and this would certainly aid the aeration of the blood in the superficial vessels.

There is no special body-cavity, the blood-vessels and connective tissue alone occurring between the muscles and the digestive chamber. Rolleston speaks of dissepiments hetween the digestive diverticula, that between the last two not being prolonged to the ganglia. In the histology of the leech an important part is played by the connective tissue, which envelops all the organs, traverses the muscles, and is filled in certain places and in its cellular elements by brown granules. Moreover, certain of these cells are stated by Ray Lankester to form the walls of the blood-vessels.

The inferior surface of the snout constitutes a spoon- shaped cavity leading into the mouth, which thus with its marginal lip is capable of forming a most. efficient sucker. At the junction of the buccal with the pharyngeal region are a inedian dorsal and two lateral prominent semicircular or sometimes slightly hatchet-shaped elevations, which in contraction fit into pits in the wall, On the free edge of each of these muscular cushions the chitinous buccal lining is furnished with a closely arranged and microscopic series of transverse processes (eighty or ninety in number), each of which somewhat resembles the middle valve of a Chiton or the upper jaw of Physa. They are arranged indeed

after the manner of the ridge-tiles of a roof, the lateral

pieces sloping downward on each side from the prominent median point. These angular transverse plates are sepa- rated by a well-marked interval, and they commence as small processes. They are distinctly calcified. It is these

organs, mounted on the three muscular cushions, which.

cause the somewhat triradiate wounds, and which may pass through the true skin to the cellular tissue, a feat which Poupart's notion of suction could hardly accomplish. Great ambiguity seems to run throughout text-books on this subject, and yet the figures of Brandt and Moquin- Tandon represent the condition very fairly, though some appear to have mistaken the lateral view of the muscular

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cushion for a ''horny jaw." 'These teeth can only act en masse with the muscular pad on which they rest, and have not the individual movement seen for instance in the long hook-rows of certain polychetous Annelids. As Leuckart and others have shown, each of these muscular cushions has a most complex structure. The superficial fibres are for the most part oblique, the central vertical (that is, at right angles to the teeth) and cut into lamelle by transverse fibres. The whole forms a very efficient motor apparatus for both cushion and teeth in all their varied functions.

The mouth opens into the pharynx, the structure of

Organs

which, as in other Gnathobdellide, differs essentially from of di-

that of the Rhynchobdellide. preparations the central canal in front is either triangular or triradiate. Internally it is covered by the cuticular and the tough hypodermic layers, from which the radiating muscles pass to the body-wall, the space between the hypoderm and the strong circular fibres of the organ being occupied by regularly arranged longitudinal fibres clasped by the radial fibres) The mixed muscular layer of the body-wall occurs outside the foregoing. The entire arrangement is well adapted for dilating, shortening, and lengthening the canal, and performing all the complex actions of a powerful suctorial apparatus. In the Ahyn- chobdellidx, on the other hand, the protrusible proboscis, with its intricate structure and its sheath, presents little in common with the foregoing. The pharynx terminates in the stomach, an elongated chamber having eleven lateral diverticula (e to ¢'), which form short pouches directed backward on each side, with the exception of the posterior pair (e'), which are so large and long as to be almost in apposition when distended, and nearly to reach the ter- mination of the body. From the point of bifurcation the canal proper (c') is continued as a somewhat small tube—to end in an anus on the dorsum, immediately in front of the posterior sucker. The inner surface of the alimentary canal is lined by a minutely granular epithelium, Salivary glands have been described by various authors as situated in the parenchyma outside the pharynx, and the number of large granular glands in this region is certainly great. Digestion seems to be slow in leeches, and breeders feed them with blood only once in six months. It is well to remember that the alimentary canal contains blood in those brought direct from their native marshes.

The nervous system consists of twenty-three pairs of ventral ganglia, the first being connected by conimissures (between. which the gullet passes) with the supra-cesophageal or 'cephalic ganglia, An intermediate stomato-gastric ganglion sends branches to the central muscular cushion for the teeth, and another on each side gives twigs to

the lateral cushions. The eephalic mass supplies the eyes and the cup-shaped sense-organs. The former, tothe number of ten, are situated on the three anterior segments and on the fifth and eighth segments, the whole forming an ellipse, and their structure has been carefully investigated by Leydig and others. Dr R. M. Gunn observes that in the leech they are formed of cup-shaped or bell-shaped depressions of the skin, surrounded by numerous pigment- cells. The fundus is furnished with large clear cells having peculiar nuclei. They are merely altered epithelial cells, and are found to be continuous withthem. Between these in the axis of the cup is a space traversed by a nervous filament which pierces the fundus. According to Leydig this nerve-filament ends in a freely exposed. papilliform elevation at the mouth of the cup-shaped eye. No connexion has been found between the nerve and the cells. Milne-Edwards, again, suggests that these refracting cellules are very like the primordial cellules of the refract-

ing cone of the retinal composite eye of insects. Near the XIV. — 51

In ordinary contracted 8%”

Nerves and sense- organs.

Circula- tion,

Seg- mental organs.

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mouth of the cup Ranke figures retinal cones (Glaskérper- kugeln), which are arranged like nerve end-organs in a mosaic, on a flat extension of the optic ganglion. These cones are very like those of the vertebrate eye, consisting of a somewhat rounded granular body, connected at the base with a nerve-filament, and having a clear, stiff, rod-like projection on its outer part. Dr Gunn has been unable to see these cones or the termination of the optic nerve. The wall of the clear cell is very thick, and the “ uucleus” is generally seen to be an inward projection of this wall ending in a knob-like enlargement. Where it appears free, that is probably due to the plane of section, the side or

end of the knob being severed from its connexion. Besides the cells having this inward projection of the wall there are others containing highly refractive spherules like oil globules. Ranke observes how little these “optic cups” differ from the touch or taste organs scattered on the snout and sides of the animal, and he is of opinion that they probably serve equally for the three kinds of sensory per- ception (sight, taste, and touch). If Ranke’s account is correct, and if the cone-mosaic situated at the mouth of the cup be directly stimulated by the rays of light, it is difficult to account for the function of the large clear cells, and more especially the pigment around. From the position of the pigment it cannot serve for the isolation of Ranke’s elements, and it can hardly be required for the prevention of the confusion of images. Yet by its presence the eye of the leech is distinguished from the adjacent and very similar touch-organs. Dr Gunn is of opinion that the light acts on the pigment, and develops some form of energy which affects the contents of the cell, whence a stimulus is communicated to the nerve. Unfortunately a nervous connexion with these cells has not been found.

The three anterior pairs of ventral ganglia (b) coalesce into a single mass, and in the same way the last large ganglion (b’) is composed of seven. The ordinary ventral ganglia give off two branches on each side, one of which has a small ganglion developed on it. The penultimate ganglion sends off only a single branch on eacli side, while the last gives off from seven to nine for the supply of the posterior sucker. The nerve-cells, as usual in these ganglia, are chiefly external, and the fibrous region internal, while the whole is surrounded by a neurilemma. This system has been the subject of many elaborate researches, amongst which those of Leydig and Hoffmann are conspicu- ous. A sympathetic or azygos nerve discovered by Brandt runs along the ventral surface of the digestive tract. In development it is found that in many leeches the long cords are originally separate, but afterwards come close together so as to resemble a single connecting cord.

The circulatory system presents a median dorsal, a median ventral, and two large lateral longitudinal trunks, all anastomosing with each other,

and giving off numerous branches to the muscular layer of the mesoderm and various internal organs. The median sinus in the head surrounds the ganglia and cesophageal ring, It has a ventral development in the rest of the body, where it encloses the alimentary canal and the gangliated nerve-cord. The blood-vessels have a well marked systole and diastole—from eight to ten times per minute. The fluid is red, and devoid of corpuscles. Old observers noticed the finely reticulated condition of the integuments whien the vessels were injected, but, as formerly noticed, vessels could not be seen in the hypoderm proper. The active to and fro waving movements of leeches in the water when attached by the posterior sucker are probably connected with cutaneous respiration.

No part of the leech has caused more discussion than the series of seventeen pairs of segmental organs (e, ¢’) which occur in a line external to the testes, and alternating in posi- tion with them. Some considered them respiratory, others

excretory, while a few connected them with the reproductive system. They consist of a muscular saccate ciliated organ which communicates with the exterior near the posterior part of each primary segment, and externally of a loop- shaped gland, labyrinthine in structure, one end of which opens into the former sac, while a cecal process is prolonged on each of the testes in their region. In minute structure it has been found that the cells which constitute the gland are all penetrated by ductules, which, however, do not communicate with the large duct in the axis of all the lobes (Bourne), The gland is surrounded by an elaborate plexus of blood-vessels. These organs are in the embryo preceded, in the posterior region of the body, by three pairs of looped canals, which disappear before the permanent ones are developed,

The leech is hermaphrodite, but congress of different individuals Repro- is necessary for reproduction, and thereafter spermatophores, which duction,

have a special covering, are found in the respective vagine. The male organs consist of an intromittent apparatus (2) with a museu- lar and glandular basal structure (g), and a duct (/) on each side from the vesieula seminalis, The latter has a vas deferens connect- ing it with the nine globular testes (d, d’, d’, &c.) ranged along each side of the body, one of which is displaced outward at d”. The intromittent organ reaches the exterior at the junction of the first and second sixth of the body (between the twenty-fourth and twenty-fifth rings). The female apparatus is placed in the segment between the seminal vesicles and the first testis, four annuli inter- vening between the respective sexual apertures. The external opening of this system (between the twenty-ninth and thirtieth rings) leads into an oval sac (/), the vagina—furnished with thick museular walls. A coiled oviduct passes from its apex through glandular tissue, which probably secretes the albuminons matter surrounding the eggs, and divides into branches, one leading to each ovary (z). In Haemopis the ovaries form a coiled filament, and on this the ovarian germs are budded. The ova are connected with the filament by a thin envelope which is drawn out into a stalk. There is no cord in Nephelis, but the ovarian germs form groups of cells,

Three or four days after congress the leech may be observed to be contracted above and below the genital apertures, and an abund- ant seerction is ponred out so as to surround this region of the body, as in the Nemerteans. Into this investment the contents of the female organs and their opaline gelatinous envelopment are forced. The animal elongates the anterior part of its body, withdraws its head, and the structure just mentioned slips off as a cocoon con- taining from five to eighteen ova, and frequently showing slight elevations at the points through which the body passed. The cocoons are deposited in cavities in the mud during the summer and autumn, and some seem also to deposit them during the winter. The ovoid cocoons consist of a network of spongy fibres, and indeed have been mistaken fora sponge. The olderauthors considered the leech viviparous until Noble and Rawlins Johnson observed the foregoing phenomena.

There is little difficulty in rearing leeches in confinement if a Leech proper method is followed, and accordingly various leech tanks and

breeding.

ponds have been econstrueted. One of the largest schemes of the kind is a leech farm of 18 aeres near Newton, Long Island, U.S. The breeding ponds are in oblongs, each of 14 acres in extent, and 8 feet or more in depth. The bottom is composcd of clay, and the margins of peat. The cocoons are deposited in the soft peat from June onward, the chief enemics being musk-rats, water-rats, and water-shrews, which dig the eocoons out of the peat. The adult leeches are fed every six months on fresh blood placed in linen bags suspended in the water, It is also the opinion of some that lceches which have been filled with blood make good breeders,

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In regard to the development of the Gnathobdellidx, Nephelis, Develop- —

perhaps, has been more completely worked out than Hirudo (though ment.

the observations of Webcr, Leuckart, Robin, and others on the latter are important), and, as the former very much resembles the latter, except in the presence of cilia in the embryo anteriorly, a bricf notice of it will suffice. Butschli describes the usual divi- sions of the eggs, which need not be given in detail, especially as an excellent summary is to be found in Balfour’s Comparative Embryology. According to these authors the cells which constitute the epiblast give origin to others which form the hypoblast and vitelline spheres. Two patches of epiblast gradually spread over the vitelline spheres. Then the hypoblast cells increase and fill up a spaee bounded behind by three vitelline spheres and in front by the epiblast of the anterior end. At the sides of the hypoblast the mesoblast has become established, probably as two latcral bands. The hypoblast cells range themselves round a central

cavity, increase, and become filled with food-yolk. The month and thiek-walled cesophagus are then developed, probably by epiblastic invagination.

Medici- nal use,

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The mesoblast now forms two lateral curved bands at the sides of the body. The three vitelline spheres become covered with the flattened cells of the epiblast. The cephalic region becomes ciliated, and the cilia enter the cesophagus. The epiblast develops the cuticle, which is raised into transverse rings, without, however, having any relation to the true segmeuts of the mesoblast. The nervous systein is probably derived from the epiblast, the ventral cord breaking up into a series of ganglia, which correspond with the true somites, except that the first and last, as already mentioned, are composed of several. The supra-ccsophagal ganglia arise inde- pendently. The mesoblast probably takes its origin from the two mesoblastic bands, and the segments formed by it grow upward and meet in the dorsal line, and septa are formed between the somites. The somatic layer of the re gives rise to the muscles. The mesoblast also gives origin to the excretory (segmental) and genera- tive organs, and the vascular system. A delicate musculature, how- ever, would appear to be developed independently of the mesoblastic bands. The mouth and pharynx are formed by the epiblast, the rest of the canal by the hypoblast, which from the first has a sac- like shape. The posterior sacculation of the stomach in Hirudo is originally unpaired. The dental pads are formed about the same time as the eyes as protuberances of the oral cavity. The anus is developed very late above the posterior sucker. In the embryo of Hirudo Leuckart found three pairs of segmental organs at the posterior end of the body, consisting of an enlargement from which a convoluted tube is continued for some distance backward, and then bends forward to open on the exterior. The anterior part is broken up intoa labyrinthic network. These organs disappear in the adult. The recent researches of Whitman on Clepsine and of Hoffmann have greatly extended our

information with regard to the histology and morphology of the parts in the embryos of the leechies.

The time between the deposition of the ova and their hatching is variable, and probably depends, as in the ova of the Salmonidx, on temperature and other causes. It is said to range from twenty-five to forty days. The young arrive at perfect coloration when two years old, and become sexually mature at three years, about which age they become fit for medicinal usc; their food consists at first of microscopic organisms, and afterwards, when the mouth has attained more co development, of the larve of insects and other small animals.

There is no annelid that has been more prominently brought under notice than the leech, both on account of its use in medicine from very early times, and its fitness for anatomical and other in- vestigations. The number of treatises, inaugural, historical, and structural, that have been devoted to it is very considerable ; of these the voluminous article in Brandt and Ratzeburg's MMcdicin- tische Zoologie may be taken as a type.

The leech is the BSéAAa of Herodotus, Theocritus, Nicander, and other Greek authors, and the /Htrudo and Sanguisuga of Plautus, Cicero, Horace, Pliny, and other Roman writers. Czlius Aurelianus mentions its use, and Galen and his successors recommend its application. Appian also alludes to the latter, and describes very graphically the process by which it fills itself with blood. It was sufficiently familiar to naturalists both before and after the time of Linnzeus, though occasionally there has been considerable ambiguity in regard to species. The use of the leech is mainly for local blood-letting, but in modern times the practice has greatly diminished ; indeed, in some cities the druggists chiefly use them with doubtful efficiency in cases of incipient gumboil and in facial ecchymosis. They may be applied to any part of the adult skin, and to the mouth, fauces, and other available inlets by the aid of a leech-glass, which consists of a tube with a slightly con- tracted aperture, and provided (or not) with a glass piston to push the leech onward. In China a piece of bamboo serves the same purpose. For such functions the most active specimens

should be chosen (and, as Sir Robert Christison states, these contract firmly when squeezed in the hand) and kept for an hour out of water, and then applied to a perfectly clean surface of skin. They may also be made to bite by smearing the skin with cream or blood, or by immersing the leech for a minute in porter or tepid water. Each fills in about fifteen minutes, and draws from 40 to 85 grains of blood, or, including that afterwards obtained by fomenting the wound, about half an ounce. In young children they should never be placed on parts where firm pressure cannot be applied. It was formerly the practice to prepare the leeches that had been

used for further action by sprinkling a few grains of salt on the snout, and stripping them gently between the fingers so as to cause them to eject the blood. This plan is not now adopted, and rightly so, since various diseases might thus be communicated. They certainly can be applied four and five times in succession by placing them in vinegar and water, and afterwards in a vessel (which the French call a domestic marsh) with turfy earth; but they draw less blood on the fifth occasion. Should the hemor- rhage from the wounds (as in certain constitutions) prove severe, it may be staunched by the application of vinegar, solid nitrate of silver, a hot wire, or a hot solution of alum, or by acupuncture. If a leech by accident be swallowed, a pretty strong solution of common salt, or a glassful or two of wine may be taken. Instead of the actual leech an instrument called an artificial leech is now sometimes used. This consists of a small sharp steel cylinder (worked by a spring) with which a circular incision can be made through the skin, and a glass cylinder capable of being exhausted by a piston worked by a screw. Care must be taken to move the piston at about the same rate as the blood flows, and the edge of the glass cylinder should not press too tightly, else the flow is arrested.

Leeches are imported from France and Hungary, and also through Hamburg from Poland and the Ukraine ; they likewise come from Turkey, Wallachia, Russia, Egypt, and Algeria. They are found in Britain—both in Scotland and England, but especially in the latter. In

the French trade Bordeaux leeches are preferred ; Polish, Swedish, and Hungarian are those most commonly met with in Britain. It is difficult to estimate the number of leeches now used. In 1846 Moquin-Tandon calculated that there were from twenty to thirty millions used in France ; and Leuckart mentions in 1863 that in London seven millions, and in the Parisian hospitals five to six millions, were annually employed. At the great American leech-farm the average sale is one thousand per day. There cannot be a doubt, however, that the use of leeches at the present time is greatly restricted—indeed, the younger generation of British medical men seldom or never prescribe them—so that scarcely one will now be employed where one hundred were a quarter of a century ago. This is very well shown in a note from Messrs Duncan, Flockhart, & Co. of Edinburgh, from which it appears that the account for leeches supplied during three months in 1844 to the Royal Infirmary, Edinburgh, was £45. This steadily decreased until about 1868 it amounted for the same period only to 5s. 6d. Sir Robert Christison mentions that the price of the best leeches in 1845 ranged from £4 to £8 per thousand ; twenty years ago they were from £10 to £15 per thousand; and at the present time good leeches cost about 10s. per hundred, or £5 per thousand.

They inhabit ditches and ponds, with pure running water, weeds for shelter, and muddy banks and bottom. They are captured by nets after attracting them by baits, or by wading into the water, and then stripping them off the legs on coming to land. Leeches are preserved in loose turf or moss constantly moistened, or in earthenware or glass vessels half full of water, covered with glass or linen-gauze ; and some place a rusty nail, others a clean sponge in the vessel, which can be exposed to the light. In transporting them the French “domestic marsh,” a vessel with small perforations inferiorly and filled with moist turfy earth or peat made into a stiff mud, 1s excellent. Sometimes an exterior vessel with a few inches of water is placed round the former. The mouth of the vessel is closed with a coarse linen cloth. Leeches, like many other annelids, live for several years without food in vessels of pure water.

Classifi- cation.

The group (Hirudinci or Discophori) may be divided into three families, viz., Rhynchobdellide, Gnathobdellidw, and Branchio-bdellidex. ;

_ The Rhynchobdellidee are those leeches furnished with a pro-trusible proboscis (which is often exserted if the animal is removed, from the water and placed on a dry surface), This family includes the fish-leeches (Ichythyobdellidx), which have an anterior and posterior sucker, a simple intestine, and mostly two pairs of eyes. Amongst these are Piscicola geometra, L., found on freshwater fishes, P. hippoglossi on the holibut, and P. respirans, in which the body has lateral sacs into which the blood enters. The first- mentioned (P. geometra) is a somewhat beautiful species, and full of activity, waving its body to and fro, aud floating by aid of the expanded posterior sucker on the surface of the water. Another well-known genus (Pontobdclla) is characterized by its thick warty skin, and four rings to cach segment. The best-known example is the skate-leech (P. muricata, L.), which is olive-coloured and dusted with whitish grains. The anterior sucker is furnished with papille round its edge. It adheres to the skin of the skate, and deposits the curious pedicled horny capsules, containing a single egg, inside shells. In the same group is the remarkable genus Branchellion, which has a narrow nuchal region with the sexual orifice at its posterior part, aud a series of frilled lateral appendages, the function of which has been supposed to be branchial. Its stomach is saccu- lated. One species (B. torpedinis, Sav.) is a messmate of the torpedo or electric ray of the Mediterranean ; this has been the subject of very interesting papers by Leydig and De Quatrefages, The next subfamily—the Clepsinide—have somewhat broad bodies capable of being curved dowuward at the margins so’as to form a fhollew ventral groove for the lodgment of the eggs and the young, while the snout is pointed. They have from one to four pairs of eyes, and three rings to each segment. The dorsal blood- vessel is rhythmically contractile, and the median blood-sinus envelops the digestive canal and the ventral nerve-cord. The stomach is branched, and the anus opens above the posterior sucker. The skin in many is warty, and in the Clepsine

echinulata of Grube, from Lake Baikal, the dermal papille are furnished with soft pointed processes, so that in outline they are spinulose. The oviducts have no common tract or vagina, but open at the female pore. The genital apertures occur between the twenty-fifth and twenty-sixth, and between the twenty-seventh and twenty-cighth rings, The ova are in some kept under the body till hatched. Several species abound in the freshwater lakes and ponds of Britain, and their remarkable and beautiful anatomical structure is yet in need ofelucidation. Amongst those most commonly met with is Clepsine bioculata, Sav. (fig. 2), which is about an inch in length, generally

Fig. 2. Fig. 3. Fig. 4. Fig 2.—Clepsine bioculata, Sav., and yo gy Fic, 3.—Clepsine complanata, Sav. Dog ten i ag

Enlarged.

Fic. 4.—Clepsine heteroclita, L. Dorsal view. Enlarged.

has a greenish-grey hue, and is much tapered anteriorly. Two closely approximated eyes occur in front. There is a reddish-brown body on the eleventh ring, marking an aperture described by O. F Miiller, and a whitish opacity in front of it. It often fixes itself by the posterior sucker, and waves its body to and fro in the water and it swims actively like a Nemertean or horse-leech. The ova and young are carried in groups on the abdominal surface. It contracts itself into a ball on irritation. Its food consists of fluviatile and lacustrine mollusks, especially of Phys# (bubble-shells). Clepsine complanata, Sav. (fig. 3), again, is distinguished by its greyish-

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green or pale brown appearance, often with two (sometimes four) interrupted dark brown bands along the middle of the dorsum, in which are pale papille, four rows of the latter being generally present. The eyes are six in number, in parallel series, The body is firm, and the crenatures at the sides are never obliterated. There are six gastric sacs on each side; and in the young the rectum is ciliated. The proboscis is a cylindrical organ slightly narrowed anteriorly and posteriorly, and

finely barred with transverse stria, a feature in C. bioeuwlata due to the arrangement of the granular nucleated glands on its inner surface. It feeds on Planorbis and Limneus (coil and mud-shells). Clepsine heteroclita, L. (fig. 4), a somewhat smaller form, is characterized by its translucent yellowish aspect. The dorsum is rather regularly dotted with pale brownish, so as to give it a checkered appearance. The snout is acute, and is furnished with six eyes, the anterior pair being closely approximated, while the two succeeding are separated by an interval from the foregoing, and the eyes in each pair are at a greater distance from each other. The digestive ceca are beautiful objects from their regularity and complexity. The ova are carried on.the under sur- face of the body. Itis less active than C. complanata. Another form very abundant under flat stones in similar lakes and ponds in certain places is Clepsine tessulata, O. F. Miller (fig. 5), a large

Fig. 5. Fie. 5.—Clepsine tessulata, O. F. Miiller. Fic. 6.—Clepsine tessulata, O. F. Miiller.

Fig. 6.

Dorsal view. Somewhat enlarged. With a swarm of young adhering to the ventral surface. Slightly enlarged, as adhering to a glass vessel.

and conspicuously tinted form. It reaches the length of 3 inches, and is of various shades of green, brownish, or olive, with six rows of yellowish or whitish specks, the marginal in all] cases being the largest, while the four internal occupy papille. The eyes are eight in number in two series approximated in front. The soft, mobile, and almost gelatinous body is capable of assuming endless shapes, and is sometimes like a cordate leaf. Itis gregarious in confinement. When a specimen is detached from its own adherent mass of ova, it occasionally selects another group and fixes itself to the glass to nurse them. The young are borne on the veutral surface (fig. 6). The genus Hementaria has two eyes, a bifid anterior sucker with the mouth in front, a long pointed pro- boscis, and five rings in each segment. The species (¢.g., H. mexi- cana and A. officinalis) occur in the Mexican lakes and South Annerica, the latter being used medicinally, since it is capable of penetrating the skin with its pointed proboscis.

The second family, Gnathobdellide, includes the medicinal leech, besides Hirudo interrupta (M. Tand.) from Algiers, H. javanica from Java, H. sinica (Blainv.) from China, H. guinguestriata(Schm.) from Sidney, and others to be subsequently mentioned. H. decora (Say), the native leech of North America, is used in the same wayas H. medicinalis. Itis bluish, with about twenty-two reddish points on the dorsum and a lateral series of black touches of the same number. The ventral surface is ruddy with black points. It also comprises the genera Bdella, without denticles, and Hxmopis, the best-known example of which is H.-vorax, M. Tand., a kind of horse-leech which is very troublesome to horses, cattle, and camels, by entering their nostrils when drinking; and the same disagreeable accident occurred to the French soldiers in Egypt. The common horse- leech (Aulastomum gulo, Moq. Tand.), with very slightly developed

lateral ceca of the stomach, but with two long posterior ceca, is abundant in British ponds and lakes, as also is Nephelis vul- garis, L. (fig. 7), a specics about 3 inches in length. Its dorsum is brownish-yellow, often with a conspicuously tesselated appearance, while the under surface is pale olive. The eyes are eight—four being placed somewhat in a semicircle, and four a short distance behind, wider apart, and at a different angle. It is active and rest- less, keeping up an undulating motion of its body when attached by the posterior sucker, apparently as in the Phyllodocide, to pro- mote respiration. It also swims on edge through the water like an eel. The skin is exceedingly sensitive to the vapour of chloroform, while the contact of a single drop causes tetanic convulsions, and the annelid dies, quite rigid. The digestive canal is nearly simple, and there are no buccal teeth. The dorsal blood-vessel is absent.

The ova are deposited in a horny capsule fixed horizontally to sub-aquatic structures, and it is curious that Linnzeus described it ¥? a n

hemipterous insect under the name of Coccus aquaticus. Bergmann’s paper in which the error was cor- rected the great Swede wrote ‘‘Vidi et obstu- pui.” Nephelis fceds on earthworms, larve, mol- Insks, and

othcr organ- isms. Trocheta sub- viridis, Dutrochet, is a large European form (7 inches in length), which frequents the marshes and ditches o France and Algcria (aud also. rarely, apparcntly from introduction, of England). It leaves the water to follow' the earthworms on which it | feeds, There are no buccal tecth, and the alimentary tube is only slightly camerated. In Ceylon the Hirudo tagalla or ceylanica, a land-leech about an inch Fie. 7.—Nephelis in length, is a great annoyance to travellers, especially in the rainy season, attacking men and horses when journcying through the woods and jungles, and causing considerable irritation from its bites. They come in troops out of the grass aud dead leaves, and one cannot leave the gravel in the gardcns in some places without being attacked. Leech-gaiters, therefore, are worn by many residents for protection. A similar form occurs at an elevation of 4000 feet in the Philip- pines, and others in Java and Sumatra; and Sir Joseph Hooker found them ata height of 11,000 feet on the Himalayas. Land- leeches also exist in Australia, Japan, and Chili,—where very few occur in the water. They frequent plants, trunks of trees, and slirubs, as well as grass. An eyeless leech, called T'yphlobdella, in- habits the subterranean waters of the Baradlacave in Hungary. An allied eyelcess form, Cyliobdella lumbricoides, Grube, which was found by Fritz Muller in Brazil, lives in damp earth. It has a slender spindle-shaped outline. The exact position of the gigantic Macro- bdella valdiviana of Filippi, a South American leech measuring about 24 fect, is.uncertain. It is eyeless, and has neither lips nor teeth. It probably lives in damp earth, and feeds on earth- worms.

_ In the third family, Branchiobdellide, the irregularly aunulated body is elongated, somewhat cylindrical, with a bilobed eyeless snout, and a sucker at the posterior end. There is no proboscis, but the eres hx has two flattened edentate pads (dorsal and ventral). The body is aie with a ceelom or body-cavity, an unusual feature in the leeches. The alimentary canal is simple. There are only two longitudinal vascular trunks—a dorsal and a ventral, the former showing a dilatation bchind the cephalic branches, some- times termed a heart. Two pairs of segmental organs are present, the posterior pair of which are modified for the conveyance of the ovarian products to the exterior ; for the ovaries, whiclt are sitnated far back, discharge their contents into the

body-cavity. The best known are Branchiobdella astaci, Odier,and B. parasita, Henle, which occur as ectoparasites—the former (smaller) on the branchie, the latter under the tail and on the antenne and eyes, of the crayfish. Myzobdella, Leidy, and Temnocephala, Gay, are allied forms. The latter isa curious Chilian leech having five digitate processes at- tached to its anterior end, behind which a pair of eyes and the mouth are situated. A sucker exists posteriorly. In the same family are placed the aberrant types Acanthobdella and Histriobdella. “The former is characterized by a somewhat flattened spindle-shaped body resembling a Gephyrean, bluntly pointed in front, furnished with minute hooks near the anterior end, and a posterior sucker.

L. Dorsal

vulgaris, Slightly enlarged.

view,

The A. paledina, Grube, a fish-parasite from Sicily, is an example. The latter (Histriobdellide) are remarkable in the group in being dicecious instead of hermaphrodite, and somewhat resemble in out- line grotesque insect-larve. The peculiar beak-like head fitted for

‘suction, the jointed body, and the pair of posterior suckers are

characteristic. ‘They are ectoparasites on marine crustacea; thus Histriobdella homari, Van Beneden, occurs on the lobster, and Saceobdella on other decapods.

Formerly Udonella and Entobdella were included under the leeches, but they seem to be more correctly located amongst the Trematoda. Until lately Malacobdella was also considered one of the group, but its ciliated skin, separate nerve-cords, proboscis, aud devclopment point it out as an intermediate type allied to the Nemerteans.

The following works amongst others may be referred to for more detailed aecounts of the order:—Noble, On the Medicinal Leech, 1822; Rawlins Johnson, On the Medicinal Leech, 1825; Brandt and Ratzeburg, Medicinische Zoologie, 1829; Moquin-Tandon, Monographie de la Fam. des Hirudinées, 2d ed., Paris, 1846; R. Leuekart, Parasiten des Menschen, vol.i., 1863; Sir J. G. Dalzell, Powers of the Creator, vol. ii., 1853; G. Johnston, Catalogue of Worms, British Museum, 1865, Also the varions memoirs of Carena, M. Thomas, Delle Chiaje, Gratiolet, H. Rathke, Van Beneden, F. Leydig, E. Grube, Kinberg, Robin, Vaillant, Dorner, Kennel, Selineider, Hoffmann, Hermann, Whitman, Bourne, Ray Lankester, and Ranke. (W. C. M.)

LEECH, Joun (1817-1864), the most genial of the humorous draftsmen of our century, was born in London on the 29th of August 1817. His father, a native of Treland, was the landlord of the London Coffee House on Ludgate Hill, “a man,” on the testimony of those who knew him, “of fine culture, a profound Shakespearian, and a thorough gentleman.” His mother was descended from the family of the famous Richard Bentley. It was from his father that Leech inherited his skill with the pencil, which he began to use at a very early age. When he was only three, he was discovered by Flaxman, who had called on his parents, seated on his mother’s knee, drawing with much gravity. The sculptor pronounced his sketch to be wonderful, adding, “ Do not let him be cramped with lessons in drawing ; let his genius follow its own bent; he will astonish the world,”—an advice which was strictly followed. One of his early productions, a mail-coach, done when he was six years old, is already full of surprising vigour and variety in its galloping horses. Leech was educated at Charterhouse, where Thackeray, his lifelong friend, was his schoolfellow, and at the age of sixteen he began to study for the medical profession under Mr Stanley at St Bartholomew’s Hospital, where he won praise for the accuracy and beauty of his anatomical drawings. He was then placed under a Mr Whittle, an eccentric practitioner, the original of ‘‘Rawkins ”in Albert Smith’s Adventures of Mr Ledbury, and afterwards under Dr John Cockle ; but gradually the true bent of the youth’s mind asserted itself, and he drifted into the artistic profession. He was eighteen when his

first designs were published, a quarto of four pages, entitled Htchings and Sketchings by A. Pen, Esq., comic character studies from the London streets. Then he drew some political lithographs, did rough sketches for Bell's Life, produced an exceedingly popular parody on Mulready's postal envelope, and, on the death of Seymour, applied unsuccessfully to illustrate the Pickwick Papers. In 1840 Leech began his contributions to the magazines with a series of etchings in Bentley's Miscellany, where Cruikshank had published his splendid plates to Jack Sheppard and Oliver Twist, and was illustrating Guy Fawkes in sadly feebler fashion. In company with the elder master Leech designed for the Jngoldsby Legends and Stanley Thorn, and till 1847 produced many inde- pendent series of etchings. These, however, cannot be ranked with his best work ; their technique is exceedingly imperfect ; they are rudely bitten, with the light and shade out of relation; and we never feel that they express the artist's individuality, the Richard Savage plates, for in- stance, being strongly reminiscent of Cruikshank, and "The Dance at Stamford Hall" of Hablot Browne. In 1845 Leech illustrated St Giles and St James in Douglas J errold's newly started Shilling Magazine, with plates more vigorous

and accomplished than those in Bentley, but it is in subjects of a somewhat later date, and especially in those lightly etched and meant to be printed with colour, that we see the artist's best powers with the needle and the acid. Among such of his designs are four charming plates to Dickens's Christmas Carol, 1844, the broadly humorous etchings in the Comic History of England, 1847-48, and the still finer illustrations to the Comic History of Rome, 1852,—-which last, particularly in its minor woodcuts, shows some exquisitely graceful touches, as witness the fair faces that rise from the surging water in " Cloelia and her Companions Escaping from the Etruscan Camp." Among the other etchings which deserve very special reference are those in Young Master Troublesome or Master Jacky's Holidays, and the frontispiece to L/ints on Life, or How to Rise in Society, 1845,—a series of minute subjects linked gracefully together by coils of smoke, illustrating the various ranks and conditions of men, one of them—the

doctor by his patient's bedside—almost equalling in vivacity and precision the best of Cruikshank's similar scenes. Then in the fifties we have the numerous etchings of sporting scenes, contributed, along with woodcuts, to the Handley Cross novels.

Turning to Leech's lithographic work, which succeeded the early political caricatures already mentioned, we have, in 1841, the Portraits of the Children of the Mobility, an important series dealing with the humorous and pathetic aspects of London street Arabs, which were afterwards so often and so effectively to employ the artist's pencil. Amid all the squalor which they depict, they are full of individual beauties in the delicate or touching expression of a face, in the graceful turn of a limb. The book is scarce in its original form, but in 1875 two reproductions of the outline sketches for tle designs were published,—a lithographic issue of the whole series, and a finer photographic transcript of six of the subjects, which is more valuable than even the finished illustrations of 1841, in which the added light and shade is frequently spotty and ineffective, and the lining itself las not the freedom which we find in some of Leech's other lithographs, notably in the Fly Leaves, published at the Punch office, and in the inimitable subject of the nuptial couch of the Caudles, which also appeared, in woodcut form, as a political cartoon, with Mrs Caudle, personated by Brougham, disturbing by untimely loquacity the slumbers of the lord chancellor, whose haggard cheek rests on the woolsack for pillow.

But it was in work for the wood-engravers that Leech was most prolific and individual. Among the earlier of such designs are the illustrations to the Comic English and Latin Grammars, 1840, to Written Caricatures, 1841, to Hood's Comic Annual, 1842, and to Albert Smith's Wassail Bowl, 1843, subjects mainly of a small vignette size, transcribed with the best skill of such woodcutters as Orrin Smith, and not, like the larger and later Punch illustrations, cut at speed by several engravers working at once on the subdivided block. It was in 1841 that Leech's connexion with Punch began, a connexion which subsisted till his death on the 29th of October 1864, and resulted in the production of the best known and most admirable of his designs. His first contribution appeared in the issue of 7th August, a full-page

illustration—entitled « Foreign Affairs”—of character studies from the neighbourhood of Leicester Square. His cartoons deal at first mainly with social subjects, and are rough and imperfect in execution, but gradually their method gains in power and their subjects become more distinctly political, and by 1849 the artist is strong enough to produce the splendidly humorous national personification which appears in “ Disraeli Measur- ing the British Lion.” About 1845 we have the first of that long series of half-page and qunarter-page pictures of

life and manners, executed with a hand as gentle as it was skilful, containing, as Mr Ruskin has said, “ admittedly the finest definition and natural history of the classes of our society, the kindest and subtlest analysis of its foibles, the tenderest flattery of its pretty and well-bred ways,” which has yet appeared,—a series far too popular and too voluminous to require or admit of particular description here. In addition to his work for the weekly issue of Punch, Leech contributed largely to the Punch almanacks and pocket-books, to Once a Week from 1859 till 1862, to the Illustrated London News, where some of his largest and best sporting scenes appeared, and to innumerable novels and miscellaneous volumes besides, of which it is only necessary to specify A Little Tour in Ireland, 1859, which is noticeable as showing the artist’s treatment of pure landscape, though it also contains some of his daintiest figure-pieces, like that of the wind-blown girl, standing on the summit of a pedestal, with the swifts darting around lier, and the breadth of sea beyond.

In 1862 Leech appealed to the public with a very suc- cessful exhibition of some of the most remarkable of his Punch drawings. These were enlarged by a mechanical process, and coloured in oils by the artist himself, with the assistance and under the direction of his friend Mr J. FE. Millais,

After even such a necessarily incomplete enumeration as we have made of Leech’s main designs, it gocs without saying that he was a singularly rapid and indefatigable worker. Canon Hole tells us, when he was his guest, ‘‘I have known him send off from my house three finished drawings on the wood, designed, traced, and rectified, without

much effort as it seemed, between breakfast and dinner.” The best technical qualities of Leech’s art, his uncrring precision, his unfailing vivacity in the use of the line, are seen most clearly in the first sketches for his woodcuts, and in the more finished drawings made on tracing-paper from these first outlines, before the chiaroscuro was added and the designs were transcribed by the engraver. Turning to the mental qualities of his art, it would be a mistaken criticism which ranked him as a comic drafts- man. Like Hogarth he was a true humorist, a student of human life, though he observed humanity mainly in its whimsical aspects,

“Hitting all he saw with shafts With gentle satire, kin to charity, That harmed not.”

The earnestness and gravity of moral purpose which is so constant a note in the work of the last century master is indeed far less char- acteristic of Leech, but there are touches of pathos and of tragedy in such of the Punch designs as the ‘‘ Poor Man’s Friend,” 1845, and ‘‘ General Feévrier turned Traitor,” 1855, and in ‘‘The Queen of the Arena” in the first volume of Once a Week, which are sufficient to prove that more solemn powers, for which his daily work afforded no scope, lay dormant in their artist. The purity and manliness of Leech’s own character are impressed on his art. We find in it little of the exaggeration and grotesqueness, and none of the fierce political enthusiasm, of which the designs of Gillray are so full. Compared with that of his great contemporary George Cruikshank, his work is restricted both in compass of subject and in artistic dexterity.

No formal biography of Leech has yet appeared, but interesting particulars regarding his life and works will be found in the follow- ing articles :—‘‘ John Leech’s Pictures of Life and Character,” by Thackeray, Quarterly Review, December 1854; ‘John Leech,” by Dr John Brown, North British Review, March 1865, republished, with additional chapters by Canon Hole, in new edition of Dr Brown’s essays (1882); letter by John Ruskin, Arrows of the Chace, vol. i, p- 161; Cornhill Magazine, December 1864; Scribner’s Monthly, vol.

xvii. p. 553; ‘‘Un Humoriste Anglais,” by Ernest Chesneau, Gazette des Beaux Arts, 1875. (J. M. G.)

LEEDS, a town of England, in the West Riding of Yorkshire, the metropolis of the woollen manufacture, and in point of population only exceeded by London, Liverpool, Manchester, and Birmingham. Leeds is situated nearly in the centre of the West Riding, in the wapentake of Skyrack, and in the pleasant and well cultivated valley of the river Aire. The surrounding country possesses much cheerful beauty; and the view from Woodhouse Moor, one of the most elevated parts of the borough, is not excelled in any part of the Riding. For manufacturing and commercial purposes, the situation of Leeds is highly

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advantageous. It is distant from London by the Great Northern Railway 185 miles, from Edinburgh 225, from Liverpool 74, from Manchester 424, and from Birmingham 113, and may be said to occupy a central position in the railway system of England. It has also communication with Liverpool by the Leeds and Liverpool Canal, and with Hull by the Aire and Calder navigation, and through these means of transit has the highest facility for the trans- mission to the principal seaports of England of its various manufactures, and for receiving raw material at the lowest rate of charge. It is, moreover, the centre of an extensive coal and iron district. All the advantages for the success- ful working of machinery are therefore within its reach, and hence it has become the seat of several important industries, especially the woollen and linen manufactures, iron working, and machine-making,

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Though regarded as the capital of the great manufactur- ing district of the West Riding, Leeds is not in its centre, but on its border. Eastward and northward the country is wholly agricultural, while to the west and

south-west the populous villages resound with the shuttle and the steam- engine. In this district are carried on a woollen manufac- ture of great extent and of considerable antiquity and a worsted manufacture of extraordinary vigour (a graft on the woollen manufacture); to these have latterly been added the iron manufacture and that of machines and steam-engines, and the making of boots and ready-made clothing, besides a manufacture of flax, which now con- stitutes one of the staple trades of Leeds.

Cloth is the staple trade of the town, although the manufacture itself is not the leading one within the borough, being carried on, to a large extent, in townships out of the

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Plan of Leeds.

parish and borough of Leeds. In the town, however, the trade centres, and there the cloth is finally prepared for the market by what is technically termed finishing or dressing—a department quite distinct in Leeds from that of the manufacturer. In this respect the Yorkshire cloth trade differs essentially from that of the west of England, where the manufacturer conducts the two operations of making and finishing the cloth within the same premises. Several Leeds firms conduct their business on the west of England model ; but, as the rule, the order of the trade is as follows. The great bulk of the cloths sold in Leeds are produced either in the out-townships of the borough, or in the villages lying west of Leeds, and principally in Pudsey, Farsley, Rawden, Yeadon, Horsforth, and Guiseley, which

are all in other parishes, within an extreme radius of 10 |

miles from Leeds. The cloths so manufactured are sold in the unfinished or balk state to the merchants of Leeds, by whom they are put out to the cloth-dressers or finishers, whose special craft it is to raise the pile or nap on the face of the cloth, and to complete it for the purposes of the tailor and the final consumer. In former times a considerable proportion of the business between the manufac- turer and the merchant was conducted in the cloth halls, which are two in number. In these the manufacturers formerly took their stand and waited the custom of the merchants, but within the last twenty or thirty years a great change has taken place in the mode of transacting business, and the cloth halls have practically fallen into disuse. The merchant now orders his goods direct from the manufacturer, specifying the weight, colour, and quality

of the articles he wants, and these are delivered to him without passing through the halls. Thus a picturesque and characteristic feature of life in Leeds seems likely at no distant date to become extinct. At one period it seemed probable that the business of the cloth trade would assume the west of England type. Mr William Hirst, a very skilful manufacturer, introduced goods of superior texture and quality, and by his success induced many capitalists to erect mills on a large scale, in which all the processes of the manufacture and finishing were conducted. The change was, however, only temporary. Many of these mills are now occupied for finishing only, and some have been devoted to other branches of the local manufactures. The spinning of flax by machinery was commenced in the township of Holbeck (in the borough of Leeds) more than one hundred years since, by Mr John Marshall, who was one of the first to apply the principle of Sir Richard Arkwright’s water frame, invented for the cotton manu- facture, to the spinning of linen yaru. The works of Messrs Marshal & Company are very extensive, and one portion of them is an object of attraction to all strangers visiting the town. It is a vast room 400 feet by 220, filled with machinery, all of which is turned by shafting which requires two

coupled engines of 350 horse-power to impel it, Light is admitted by glass cupolas. The whole building is held together by a double series of iron ties, uniting the iron pillars which sustain the many-arclied roof. The external form is Egyptian.

The spinning of worsted yarn and the weaving of worsted goods were formerly carried on to a considerable extent in Leeds, but have now nearly died out, Bradford, Bingley, and Keighley, with the villages immediately adjoining, having attracted almost the entire trade. Amongst the smaller branches of the textile manufactures carried on in Leeds must be enumerated those of silk and carpeting, neither of them unimportant, though falling far short of the flax and woollen trades.

It is probable that the iron trade in its different branches, including the casting of metal, and the manufacture of steam-engines, of steam-ploughs, of machinery of every kind, and of mechanical tools, now gives employment to a larger number of persons within the borough of Leeds than any other brauch of industry. The great works founded by the late Sir Peter Fairbairn, as well as those of Messrs Kitson & Co, and of Messrs John Fowler & Co., in the last-named of which the Fowler steam-plough is the staple article of manufacture, occupy places in the front rank of such estab- lishments in the country; while Messrs Greenwood & Batley and other tool-makers give employment to a large number of hands, and export the goods they produce to all parts of the globe.

Leeds was at one time famed for the production of artistic pottery, and very fine specimens of old Leeds ware are still occasionally to be discovered among the residences of the poor in the town. This branch of manu- facture, however, became extinct about eighty years ago. Within the last three years it has been revived, and once more attention has been directed to the high artistic merit which the pottery of the town has attained.

In addition to these particular branches of industry, the manufacture of ready-made clothing has become one of great importance. In some of the establishments for this purpose such as that of Messrs John Barrow & Sons, the number of hands employed is so large that from a thou-

sand to twelve hundred suits of clothing can be produced daily. Machinery is now used in all the departments in these places, and the work is conducted with a rapidity and at a price which would have seemed incredible thirty years ago. Leeds has in recent years become famous as the chief seat of the cap manufacture in the United Kingdom.

The leather trade is also one of great importance in the borough, many large tanning establishments being erected on the outskirts, while the wholesale manufacture of boots and slioes for army and other purposes is carried on in workshops which are the largest of their kind in the United Kingdon.

No religious census has been taken in Leeds since that of 1851. There are, however,- 181 places of worship in the town, these being divided as follows :—Church of England, 46; Wesleyan Methodist, 40; Primitive Methodist, 30; United Methodist I'ree Church, 12; Congregational, 12; Baptist, 11; Methodist New Connexion, 10; Catholic, 6; Unitarian, 3; Presbyterian, 2; Friends, 2; various, 5. The Leeds school board, which was established immediately after the passing of the Education Act in 1870, has now (1882) 47 schools under its control within the limits of the borough, and these accommodate 30,000 children. In addi- tion to these there are 34 national and parochial schools, 8 Roman Catholic schools, and 6 Wesleyan schools. The educational insti- tutions of a higher order in the town are numerous and important. Of these the principal is the Yorkshire College, established in 1875 for the purpose of supplying instruction in the arts and sciences which are applicable to the manufactures, engineering, mining, and agriculture of the county. It has a staff of 19 professors, instructors, and assistant lecturers, and upwards of 350 day and 160 evening students. The college, which has carried on its operations hitherto in temporary premises, will shortly remove to permanent buildings designed by Mr Waterhouse, A.R.A. These buildings, which when completed will cost upwards of £100,000, will occupy a site of abont 34 acres, and will comprise extensive laboratories and workshops, large lecture theatres, and a college library and museum. The Leeds Public Library, established

under the Public Libraries' Act, now takes the first place amongst similar institutions in the borough, The reference library contained 26,000 volumes at the close of 1881, and the lending libraries 83,000 volumes, the expenditure for the year being £4150. The issue of volumes during the year reached the large total of 639,616. The Leeds Old Library, a private institu- tion, founded in 1768 by Dr Priestley, who was at that time minister at the Unitarian chapel in the town, contains a very valuable selection of books, numbering about 75,000 volumes, and is in eae of commodious premises in Commercial Street. The

hilosophical and Literary Society, established in 1820, possesses a handsome building in Park Row, containing a laboratory, a lecture room, and a museum, with many fine specimens in natural history, geology, andarcheology. The society also possesses a library of up- wards of 16,000 volumes, chiefly rare scientific works. During the winter months, lectures on scientific and literary subjects are given in the lecture hall by men of eminence. The Leeds Mechanics' Institute in Cookridge Street is a striking building in the Italian style. It comprises a large circular lecture room, with gallery, capable of seating 1500 persons, besides a library, reading, committee, and class rooms. The foundation stone was laid in 1865, and the total cost of the building has been nearly £30,000. Day and even- ing classes and an art school are carried on within the building, and are largely frequented. The Young Men's Christian Associa- tion, another educational institute of importance, occupies the build- ing in South Parade formerly used as a mechanics' institute. The Grammar School, a handsome building, erected at Woodhouse Moor, has endowments producing over £3000 yearly. There are six exhibitions of £50 a year, each tenable for four years at Oxford, Cambridge, and Durham. It provides education for about 280 scholars. There is alsoa large training college for students purpos- ing to enter the Wesleyan Methodist ministry at Headingley, one of the suburbs of Leeds. The principal charitable institution of the town is the general infirmary in Great George Street, a Gothic building, built of brick, with stone dressings, from designs by Sir Gilbert Scott. It is arranged upon the pavilion system, each ward being isolated from the rest of the building, and has a highly orna- niental

exterior, whilst the internal accomniodation is suited to the requirements of the patients and the medical staff. The total cost of the erection was more than £100,000. The house of recovery for fever patients, foundcd in 1802, now occupies a handsome building at Burmantofts. There are also a large building used as a public dispensary in North Street, an institution for the blind, deaf, and dumb in Woodhouse Lane, a School of Medicine and other hospitals and charitable institutions.

The town and borough of Lecds was incorporated by letters patent, 2 Charles I, but this charter was cancelled or sur- rendered. A new charter was granted, 13 Charles II., under the style of mayor, aldermen, and burgesses of the borough of Leeds. The corporation consisted of a mayor, 12 aldcrmen, 24 assistants, and a staff of 18 offieials. The Municipal Act of 1834 gave Leeds a corporation of 16 aldermen and 48 councillors, which has effected great improvements in the management of local matters. In addi- tion to the powers granted to it by the Municipal Reform Act, the town council has acquired, through successive Lnprovemcnt Acts,

complete control over the paving and construction of the streets within the borough, as well as considerable powers for enforcing the consumption of smoke. It has also acquired the whole of the water supply of Leeds, and it controls the public markets, the lighting and watching of the streets, the execution of the Public Health Acts, &c. The supply of water for Leeds is now derived from the valley of the Washburn, one of the tributaries of the Wharfe, where very extensive reservoirs have been provided, at a cost of £1,400,000. The gas supply of the town is also in the hands of the corporation, which purchased the whole of the gas works from the two companies then in existence in 1870, at the cost of nearly £1,000,000. The entire suite of markets, comprising the corn exchange, the Smithfield cattle market, and the produce markets, have been acquired at different periods, and the corporation has expended upon this property £240,000. The rateable value of the municipal borough is £1,122,000, and the income of the

borough derived from the borough rate £88,106. The debt of the town amounted in 1881 to £3,884,000. Of the places of recreation in Leeds, the principal is the Grand Theatre, a handsome building erected from the designs of Mr Corson, in Upper Briggate, in 1879. barge assembly-rooms adjoin this theatre. There is another theatre in King Charles Croft, and there are one or two music halls, Some years ago the corporation acquired, at a large expenditure, Roundhay Park, an estate of great beauty in the neighbourhood of the town. After a portion of the ground had been laid out as building sites, the central part of the estate, comprising splendid lawns, woods of great extent, and a lake covering 40 acres, were reserved as a place of public recreation, and the park is now a favourite resort of the people of Leeds, and also of the inhabitants of the surrounding country. It is under the management of a committee of the cor- poration, and, though situated at an inconvenient distance from the centre of the town, is largely frequented during the summer months. Woodhouse Moor, a common occupying an elevated position north- west of the town, has been planted with trees and provided with walks within the last ten years ; and in other parts of the town the corporation have laid out pieces of land, which had long becn left bare and neglected, as recreation grounds.

The external appearance of the town has been greatly improved within the last twenty years. The event which had the greatest influence in promoting the erection of more handsome buildings than those of which Leeds was formerly constituted was the opening of the town-hall by the Queen in the year 1858. This is a noble building in the Grecian style. It.is 250 feet long and 200 broad, and is crowned by a tower 225 feet high. The principal apartment in it is the Victoria Hall, a richly siren chamber 161 feet long, 72 feet wide, and 75 feet high. The building, which cost, including the site and fittings, more than £130,000, is adorned with statues and portraits of local celebrities. The municipal offices, including school board offices and buildings for the public library, are now in course of erection in the immediate neighbourhood of the town-hall, and will cost when completed upwards of £100,000. The other public buildings of importance in the town are the royal exchange, in Perpendicular Gothic, the foundation

of which was laid in 1872, the corn exchange, a fine oval edifice, and the en of Messrs Beckett & Co., one of the best works of Sir Gilbert

cott.

Leeds has long been distinguished for the activity of its political and public life. It has taken a leading part in many of the great questions which have agitated the country during the present cen- tury, and among its successive representatives in parliament have been Lord Macaulay, Sir William Molesworth, Mr Marshall, three members of the Baines family, and other men whose names are familiar in the annals of the Liberal party, to which upon the whole the borough has given a consistent support since its enfranchisement in 1832. The newspapers published in the town are the Leeds Mereury, daily, Liberal, established in 1718 ; the Yorkshire Post and Leeds Intelligencer, daily, Conservative, established in 1754 ; the Leeds Express, evening, Radical; the Leeds Daily News, evening, Conservative ; and the Leeds Times, weekly, Liberal. The Lceds Merewry for eighty years has been the property of Messrs Edward Baines & Sons, and has long been considered one of the most influential of provincial journals.

The area of the municipal and parliamentary borough is 21,572 acres. In addition to the township of Leeds some ten out-townships are included in this area. The population (207,165 in 1861 and 259,212 in 1871) in 1881 was 309,126, the number of inhabited houses being 65,034. Lecds is one of the boroughs whicli under the Reform Act of 1867 return three members of parliament.

The name of Leeds has been attributed to a chief named Leod. Traces of Roman workmanship have at various times been dis- covered in the town, and in the parish church several very interest- ing Anglo-Saxon crosses, discovered when the church was rebuilt in 1838, are preserved. The castle of Leeds occupied a site on Mill Hill, and is supposed to have been built by Nbert de Laci at the time of the Conquest, but no traces of it remain.

_For the history of Leeds see Ralph Thoresby, Ducatus Leodiensis, 1715, 2d ed., 1816, with notcs and additions by T. D. Whitaker,

who published the same year a companion volume Loidis and Elmete ; Parsons, History of Leeds, Bradford, and Wakefield, 1840 ; Wardell, The Antiquities of the Borough of Leeds, 1853. (T. W. R.) LEEK, the Allium Porrum of botanists, a plant which is now considered as a merevariety of Alliwm Ampeloprasum produced by cultivation. It was formerly regarded as being a native of Switzerland, and the year 1582 has been set down as the date of its introduction to England. Both these assumptions are, however, erroneous. The plant is pro- bably of Eastern origin, since it was commonly cultivated in Egypt in the time of the Pharaohs, and is so to the pre- sent day; while as regards its first appearance in England both Tusser and Gerard—two of our earliest writers on this class of subjects, the former of whom flourished in the early part and the latter in the later part of the 16th century—speak of it as being then commonly cultivated and used.! The Romans, it would appear, made great use of the leek for savouring their dishes, as seems proved by the number of recipes for its use referred to by Celsius. Hence it is more than probable that it was brought to Eng- land by the Romans during the period of their occupation. Italy was celebrated for leeks in the time of Pliny (ZZ. V., xix. c. 6), according to whom they were brought into great notice and esteem through the emperor Nero, derisively surnamed “ Porrophagus,” who used to eat them for several days in every month to clear his voice. The leek is very generally cultivated in Great Britain as an esculent, but more especially in Scotland and in Wales, being esteemed as an excellent and wholesome vegetable, with properties very similar to those of the onion, but of a milder character. In America it is not much cultivated except by market gardeners in the neighbourhood of large cities. The whole plant, with the exception of the fibrous roots, is used in soups and stews. The sheathing stalks of the leaves lap over each other, and form a thickish stem-like base, which is blanched, and is the part chiefly preferred. These blanched stems are much employed in French cookery. They form an important ingredient in Scotch winter broth,

and particularly in the national dish cock-a-leekie, and are also largely used boiled, and served with toasted bread and white sauce, as in the case of asparagus. Leeks are sown in the spring, earlier or later according to the soil and the season, and are planted out for the summer, being dropped into holes which are made with a stout dibble and left unfilled in order to allow the stems space to swell. When they are thus planted deeply the holes gradually fill up, and the base of the stem becomes blanched and prepared for use, a process aided by drawing up the earth round about the stems as they elongate. ‘The leek is one of the most useful vegetables the cottager can grow, as it will supply him with a large amount of produce at a season when it will prove very welcome, namely, during the winter andspring. Itis extremely hardy, and presents no difficulty in its cultivation, the chief point, as with all succulent esculents, being that it should be grown quickly upon well- enriched soil. The plant is of biennial duration, flowering the second year, and perishing after perfecting its seeds. The leek is the national symbol or badge of the Welsh, who wear it in their hats on St David’s Day. The origin of this custom has received various explanations, all of which are probably more or less speculative. ; LEEK, a market-town of Staffordshire, England, is situated on a fine eminence above the river Churnet, and on the Churnet Valley branch of the North Staffordshire Railway, 24 miles east-north-east of Stafford. Its streets

1 Tusser, in his verse for the month of March, writes :—

‘Now leckes are in season, for pottage ful good, 7 And spareth the milck cow, and purgeth the blood ; These hatving with peason, for pottage in Lent, | Thou spareth both otemel and bread to be spent.

are wide and regular, and its sanitary and water arrange- ments are very complete. ‘The church, dedicated to Saint Edward the Confessor, is in the Early English style. Much of the old building, erected in 1180, remains, but it has been frequently repaired, and in 1867 and 1875 under- went extensive restoration. In the vicinity of the town are the ruins of the Cistercian abbey De la Croix (known as Dieulacres),

erected in 1214 by Ranulf de Blondeville, sixth earl of Chester. The grammar school was built in the beginning of last century by the earl of Macclesfield. The other principal buildings are the memorial cottage hospital for the county of Stafford, erected in 1870 from a private bequest, and the new town and market hall erected on the site of the old building. There is an important silk manufacture, and also agricul- tural implement works. The population of the urban sanitary district in 1881 was 12,865.

British and Roman remains have been found in the vicinity of Leek at various periods, and the town itself is of very great anti- quity. For some centuries after the Conquest it was the property of the earls of Chester, but afterwards it was bestowed on the monks of the abbey De la Croix. It received a market from King John. On the 3d of December 1745 it was entered by the troops of the Pretender, and again on the 7th of the same month.

LEER, a seaport and the chief town of a circle in the province of Hanover, Prussia, lies on the right bank of the Leda near its confluence with the Ems, 164 miles south of Aurich in 53° 13’ N, lat., and 7° 27’ E. long. The aspect of the town is generally pleasing, the streets being broad, well-paved, and adorned with many elegant buildings, among which are Roman Catholic, Lutheran, and Calvinist churches, and several public schools. The principal manu- factories are for linen and woollen fabrics, hosiery, paper, cigars, soap, vinegar, and earthenware. ‘There are, more- over, two iron-foundries, several distilleries, tanneries, and shipbuilding yards, besides many large warehouses. The transit trade from the regions traversed by the Westphalian and Oldenburg railways is considerable. The principal exports are cattle, horses, cheese, butter, honey, wax, flour, paper, hardware, and Westphalian coal. Vessels drawing 16 feet of water can approach the quays. The population in 1880 was 10,074.

LEEUWARDEN, or Leuwarven (in Frisian Leewerd, and Latinized as Leovardia), a town of Holland, at the head of the province of Friesland, 17 miles inland from Harlingen and 32 west of Groningen. It is one of the most prosperous of the secondary towns in the country,

and, thanks in great measure to the opening of the railway to Harlingen (1863) and Groningen (1866), full of life and enterprise. To the name of the Frisian Hague it is en- titled as well by similarity of history as by similarity of appearance. As the Hague grew up round the court of the counts of Holland, so Leeuwarden round the court of the Frisian stadtholders; and, like the Hague, it is an exceptionally clean, tasteful, and attractive town, with parks, pleasure grounds, and drives. The old gates have been somewhat ruthlessly cleared away, and the site of the town walls on the north and west competes with the Prince's Garden as a public pleasure ground. Besides the town-house (dating from 1715, and interesting mainly for the value of the archives admirably arranged by the Dutch antiquarian Eekhoff), the Prince Frederick bar- racks, capable of containing one thousand men, the corn exchange, and the beautiful weighhouse (dating from 1546), Leeuwarden contains a royal palace, originally the residence of the Frisian stadholders ; the provincial courts, erected in 1850 ; the so-called chancery (Kanselarij), a fine red brick mansion built in 1502 for the chancellor of Duke George of Saxony, and now used as a house of detention ; the penitentiary, rebuilt since 1870, and the largest estab- lishment of the kind in Holland; and, somewhat oddly,

the communal buildings of the neighbouring commune of Leeuwarderadeel. 'The church of the Jacobins deserves mention as perhaps the largest monastic church in the country, and as the burial-place of the Frisian stadtholders (Louis of Nassau, Anne of Orange, &c.), whose splendid tombs, however, were destroyed in the revolution of 1795. Unlike the Hague, Leeuwarden is by nature and tradi- tion the centre of an extensive and flourishing trade (in grain, cattle, flax, chicory, &c.). Its present distance from the sea is made up for by abundant means of com- munication by road, railway, and canal. The canal to Dokkum opens up the rich clay districts of the province ; the canal to Harlingen (dating from 1507) furnishes a channel for the trade with England; and other canals give access to the province of Groningen and the Zuyder Zee, and so to Amsterdam and the provinces of Holland. And, though the industrial development is

far from keep- ing pace with the commercial, Leeuwarden possesses large timber and boat-building yards, iron-foundries, copper- works, and lead-works; manufactures sewing machines, safes, organs, cardboard, oil, and tobacco; and enjoys a wide reputation for its gold and silver wares. The popula- tion of the town in 1869 was 24,862; that of the com- mune increased from 15,686 in 1714 to 27,003 in 1875 (5217 Roman Catholics, 1124 Jews).

Leeuwarden, or that part of it which was called Nijchove, appears as early as 1149, and received the rank of a town in 1190. At that time it had free command of the sca; but the estuary of the Middelzee on which it stood had already silted up by about 1300. In 1398 we find the town bestowed by Duke Albert of Holland on Gerrolt Cammingha, whose family residence is still one of the notable mansions of the place. During the 15th and 16th centuries it plays a considerable part in Frisian history. The year 1499 saw the erection of a stronghold in the town, which enabled Albert of Saxony to bring the country under, and which made Leeuwarden a place of military importance till it was destroyed in 1580. When in 1559 Utrecht was raised to the rank of an archbishopric, Leeu- warden was made a bishopric, but only one occupant of the see was ad consecrated before the Reformation got mastery of the town in e

LEEUWENHOEK, or Leuwennorx, ANTHONY VAN (1632-1723), a microscopist of remarkable scientific ability, was born at Delft, in Holland, in 1632. He does not seem to have had the advantage of a liberal education, but was probably brought up as a glass-grinder, early acquiring a reputation for the excellent lenses with which he furnished the microscopists who were then turning their attention to the minute structure of organized bodies, He appears soon to have found that single lenses of very short focus were preferable for this purpose to the compound microscopes then in use; and it is clear from the dis- coveries he made with these that they must have been of very excellent quality.1 These discoveries were for the most part originally given to the world in the Philosophical Transactions of the Royal Society, to the notice of which learned body he was first introduced by De Graaf in 1673. He was elected a fellow in 1680, and was chosen in 1697 a

corresponding member of the Academy of Sciences in Paris. He died at his native place in 1723; and Sir Martin Folkes, then vice-president of the Royal Society, says in the eulogium he pronounced :—‘* We have seen so many and those of his most surprising discoveries, so perfectly confirmed by great numbers of the most curious and

1 It is much to be regretted that a cabinet which he bequeathed to the Royal Society of London,—containing twenty-six of these single microscopes, each mounted with a suitable object, and accompanied by a magnified drawing of it, the whole being the work of his own hands,—is no longer in its possession. Baker, in his Treatise on the Afieroscope, affirms, from personal and careful examination, that (con- trary to the statenients of some writers who represented Leeuwenhoek as having worked with globules of glass) ‘‘ every one of the twenty-six microscopes is a double-convex lens, and not a sphere or globule”; and he states that their magnifying powers range from 40 to 160 diameters.

judicious observers, that there can surely be no reason to distrust his accuracy in those others which have not yet been so frequently or so carefully examined.”

His capital discovery was undoubtedly that of the capillary circulation of the blood, first announced in 1690, which afforded the link still wanting for the completion of the doctrine of Harvey, by showing that the blood passes from the arteries into the veins through a network of extremely minute vessels, the thin walls of which allow the fluid plasma to transude into the tissues it traverses, so as to serve for their nutrition. He first sought to discern this in the comb of a young cock, then in the ear of a white rabbit, and then in the membrane of a bat’s wing; but, though in the last he was able to follow an artery to its ultimate subdivision, he found that, as soon as “it became so small as only to admit one or two globules to pass through it ata time, he then lost sight of it,” partly in consequence of “the membrane of the wing being covered with a kind of scale” (epidermis). His first success was obtained with the tail of a newly-hatched tadpole, in which, he says, “I

could distinctly perceive the whole circuit of the blood, in its passage to the extremities of the vessels, and in its return towards the heart,”—its move- ment being made apparent by that of the globules carried along in its current. These corpuscles, which had been previously discovered by Malpighi, were correctly described by Leeuwenhoek as flattened circular disks in man, and as oval disks in tadpoles. He afterwards observed the capillary circulation in the tail-fins of small fishes, and recognized the ellipticity of the corpuscles in that class also. He even made out the capillary circulation in the broad thin extremities of the two smallest or hind feet of small crabs about an inch in diameter, and correctly remarked that the corpuscles of their blood were colourless and far fewer than those of fishes or tadpoles, “the globules in red blood being (I am well assured) twenty-five times more in number than those, in the same space, in the blood of a crab.” To us it seems not a little surprising that his assertions in regard to the capillary circulation were deemed incredible by some of his scientific contem- poraries. It is recorded, however, that Peter the Great, when passing through Delft in 1698, requested Leeuwen- hoek to pay him a visit, and to bring his microscope with him, and that the czar was particularly impressed by the spectacle of the circulation in the tail of a small eel.

Among Leeuwenhoek’s discoveries in the minute anatomy of man and the higher animals may be specially mentioned the tubules of teeth, the fibrous structure of the crystalline lens, the solidity of the human hair (which had been previously represented as tubular), the structure of the epidermis, and the parallel tubules of the medullary substance of the brain,—which last, however, he supposed to be vessels conveying fluid substance from the highly vascular cortical layers, for the support and nourishment of the spinal marrow and nerves. He was also an in- dependent discoverer of the spermatozoa, although anti- cipated by a few months by Ludwig Hamn, a student at Leyden.

As might be expected, he made many observations on the anatomy of insects; and among the most interesting of these are his discovery of the composite structure of the eyes (which he recognized also in the eyes of the shrimp), the scales on the wings not only of moths but of

the gnat, and the annular (really spiral) structure in the walls of the "vessels" (trachex) of their wings. He also proved that cochineal, which had been supposed to be " the fruit of some tree," is really the dried body of an insect, which he not unnaturally supposed to be allied to the ladybird. He likewise gave a very good account of the Splnnerets and poison-claws of spiders, and of the comb-like

appendages to their feet. He made a special study, also, of the anatomy of the flea,—besides following out its repro- duction with great care, as will presently appear,

In examining the stomachs of shrimps, he found in them some minute shells, of which he figured a specimen so exactly that it can be at once recognized as a Nontonina, —probably the first recent foraminifer that had been distinctly noticed. But one of his most interesting observations is that which he made upon a small Balanus attached to a mussel-shell; for he not only gives a good figure of the animal, but describes the way in which it retreats into its shell, and closes its orifice by two shelly valves. His figure most distinctly shows its articulate character, which has only in modern times caused its re-moval from the molluscous to the annulose sub-kingdom.

Not less admirable were his observations on the structure of plants. He made very careful sections of stems of the oak, elm, beech, willow, fir, and other trees, in different direc- tions, of which he gave careful figures and descriptions,— specially noting the horizontal arrangement of the cells in the "medullary rays," and the peculiar "pitting" of tho woody fibre of the fir, as well as the absence of large vessels in the latter. He also examined the structure of various germinating seeds, and gave accurate descriptions of the relation of the embryo to the cotyledons.

Although, when he adventured into physiological speculation, Leeuwenhoek's ideas (like those of the best physiologists of his time) were often very crude, his reasonings upon the facts actually observed by him are often remarkably cogent and sagacious, Thus, to estimate

the insensible perspiration, he placed his hand within a dry glass jar, closed the space between its neck and his wrist by stuffing his handkerchief into it, and carefully collected and weighed the moisture which accumulated in its intcrior during a given time ; and by a computation based on the ratio of the surface of the hand to that of the entire body he concluded that about 28 oz. of fluid are daily lost by transpiration, which is not far from the truth. So, again, he triumphantly refuted the chemical theorics which then reigned in medicine, and which assumed that the blood under- goes a fermentation like that of wine or beer, by the statement that he had never scen in the blood-vessels the bubbles of gas which must be generated in them if this doctrine were correct. In one important point, however, he allowed his imagination to supplement the necessary imperfection of his observations, maintaining that each blood-disk is made up of six coherent particles, an idea probably suggested by the crenated appearance which the blood- disks often present.

It is to Leeuwenhock that we owe the refutation of the then current biological doctrine that animals of high organization can be ‘produced spontaneously, or bred from corruption.” This doctrine had been previously attacked by Redi, who showed that the putrefaction of meat will not engender maggots, if the acccss of blow-flies be prevented. But even Redi, while upholding the . doctrine **Omne vivum ex vivo,” believed that the insects found within the galls of plants, and the parasitic worms by which the human body is sometimes infested, are generated by a peculiar modification of the living vegctable or animal substance. 11 was Leeuwenhoek who first explicitly took up the position that every living organism reproduces its like, no type originating in any other way than by the ordinary generative process of its kind: ‘¢Omne vivum ex ovo.” This he established by careful and pro- longed observation, in a great variety of cases in which ‘ spon- tancous generation” had been reputed to take place ; and he further continually adduced the great complexity of organization which his microscopic researches had revealed in what had been pre- viously regarded as creatures of the lowest grade, as an argument against the doctrine that they are ‘‘ bred from corruption.” Thus he followed out the whole history of oak-galls, and showed that they are a product of a

peculiar vegetable growth, excited by the insertion of an egg by the winged inscct, and supplying the maggot, when hatched, with food. So, again, he showed that the weevils of granaries, then commonly supposed to be bred fron wheat, as well as in it, are nothing else than grubs hatched from eggs deposited by winged insects; and he practically applied this conclusion, by recommending that granarics thus. infested should be repeatedly fumigated with sulphur at the time when these insects come forth, so as to kill them before they deposit eggs. His chapter on the flea, in which he not only describes its structure, but traces out the whole history of its metamorphoses from its first emergence from the egg, is full of interest,—not so much for the exactness of his obscrvations, as for its incidental revela- tion of the extraordinary ignorancc then prevalent in regard to the

origin and propagation of ‘‘this minute and despised creature,” which some asserted to be produced from sand, others from dust, others from the dung of pigeons, and others from urine, but which he showed to be ‘‘ endowed with as great perfection iu its kind as any large animal,” and proved to breed in the regular way of winged insects. He even noted the fact that the pupa of the flea is sometimes attacked and fed upon by a mite,—an observation which suggested the well-known lines of Swift. ,

Althongh Bonnet is usually credited with the discovery of the viviparous propagation of the Aphides, this had been really made by Leeuwenhoek half a century previously. For, his attention having been drawn to the blighting of the young shoots of fruit- trees, which was commonly attributed to the ants fonnd upon them, he was the first to find the Aphides that really do the mischief ; and, upon searching, after his wont, into the history of their genera- tion, he observed the young within the bodies of their parents. He carefully studied also the history of the ant, and was the first to show that what had been commonly reputed to be ‘‘ants’ eggs”’ are really their pups, containing the perfect insect nearly ready for emersion, whilst the true eggs are far smaller, and give origin to “maggots” or larvee. d

Of the sea-mussel, again, and other shell-fish, he argued (in reply to a then recent defence of Aristotle's doctrine by Bonami, a learned Jesuit of Italy) that they are not generated out of the mud or sand which is found on the sea-shore or the beds of rivers at low water, but from spawn, by the regular course of generation. ‘‘For my part,” he says, ‘‘I hold it equally impossible for a small shell-fish to be produced without generation as for a whale to have its origin in the mud,”+ And he maintained the same to be true of the fresh-water mussel (Unio), whose ova he examined so carefully that he saw in them the rotation of the embryo, a phenomenon supposed to have been first discovered long afterwards, ‘‘This uncommonly pleasing spectacle,” he says, ‘‘ was enjoyed by myself, my daughter, and the engraver for three whole hours, and we thought it one of the most delightful that could be exhibited.” Not only was lhe the first discoverer of the rotifers, but he showed ‘‘ how wonderfully nature has provided for the preservation of their species,” by their tolerance of the drying-up of the water they inhabit, and the resist- ance afforded to the evaporation of the fluids of their bodies by the impermeability of the casing in which they then become enclosed. ‘‘We can now easily conceive,” he says, ‘‘that in all rain-water which is collected from gutters in cisterns, and in all waters exposed to the air, animalcules may be found; for they may be carried thither by the particles of dust blown about by the winds.” Although Baker is usually credited with the first careful study of the ‘‘wheel-animalcule,”’ yet he really added very little to the account long previously gee of it by Leeuwenhoek. In the same spirit he investigated the generation of eels, which were at that time supposed, not only by the ignorant vulgar, but by ‘‘respectable and learned men,” to be produced from dew (!) without the ordi- nary process of generation. He was rewarded by the discovery of their viviparous propagation,—his careful and prolonged observa- tions on which point, though since called in question, have never been refuted. The spectacle of the minute eels lying together in a transparent liquid within the body of the female gave him, he says, great pleasure,—affording a complete answer to those who said behind his back, “Since Mr Leeuwenhoek is endeavouring to establish the regular generation of all animals, let him show us in what manner eels are bred.”

Altogether it does not seem too much to affirm that Leeuwenhoek is well entitled to be considered, not only as ‘‘the father of scien- tific microscopy,” but as having contributed more than any other naturalist to the overthrow of the doctrine of ‘‘ spontaneous genera- tion,” and as having set a most admirable example of scientific method in the prosecution of biological research.

Leeuwenhoek’s contributions to the Philosophical Transactions amounted to one hundred and twelve. He also published twenty- six papers in the Memoirs of the Paris Academy of Sciences. Two collections of his works appeared during his life, one in Dutch, and the other in Latin,—the most complete edition having been published at Leyden shortly before his death in 4 vols, (1719-22). A selection from this, translated into English by S. Hoole, was

: ses : ” published in London (1798-81), 2 vols. 4to. (W. BOC)

LEEWARD ISLANDS. See West INDIES.

LEFEVRE D’ETAPLES. Seo Faser, Jacozvs.

LEGATE, one of the special names of a messenger or ambassador of the pope. The first four centuries present us with no actual recorded instances of recognized delega- tion of the papal authority; for that Hosius acted as papal legate at the council of Nice is nothing more than an

1 Leeuwenhoek’s argument in this instauce was partly based on false premises, For he imagined the ZLepralia with which mussel-shells are often encrusted to be the eggs of the mussels, and the contained Polyzoa, whose sixteen tentacles he figures, to be the young mussels.

assertion of Gelasius of Cyzicus, who wrote about the end of the 5th century, and no Western prelate took any part, either personally or otherwise, in the first council of Con- stantinople. The fifth (sometimes called the seventh) canon of the council of Sardica, in 3438, however, shows that the possibility of such delegation had already begun to be discussed, and suggests that it may actually have

been exemplified before that date. This canon provides that, in case of an appeal by a deposed bishop to Rome, if the pope is inclined to grant a new trial, it shall be com- petent for him to write to the bishops of the neighbouring province, but if the appellant wishes the pope to send priests from his own side (‘ut de latere suo presbyteros mittat”), it shall be free to the pope to do so, and give them due rank and dignity in the court thus constituted (Hefele, Conc., i. 568). Instances of delegation of the papal authority in various degrees become numerous in the course of the 5th century, especially during the pontificate of Leo I. Thus Leo writes in 444 (Zp. 6) to Anastasius of Thessalonica, appointing him his vicar for the province of Illyria; the same arrangement, he informs us, had been made by Pope Siricius in favour of Anysius, the predecessor of Anastasius. Similar vicarial or legatine powers had been conferred in 418 by Zosimus upon Patroclus, bishop of Arles. In 449 Leo was represented at the “ Robber Synod,” from which his legates hardly escaped with life ; at Chalcedon, in 451, they were treated with singular honour. Again, in 453 the same pope writes to the empress Pulcheria, naming Julianus of Cos as his representative in the defence of the interests of orthodoxy and ecclesiastical discipline at Constantinople (Zp. 112); the instructions to Julianus are given in Hp, 113 (“hance specialem curam vice mea functus assumas”). The designation of Anastasius as vicar apostolic over Illyria may be said to mark the beginning of the custom of conferring, ex officio, the title of legatus upon the holders of important sees, who ultimately came to be known as legati natz, with the rank of primate ; the appointment of Julianus at Constantinople gradually developed into the long permanent office of apocrisiarius or responsalis. Another sort of delegation is exemplified in Leo’s letter to the African bishops (Zp. 12), in which he sends Potentius, with instructions to inquire in his name, and to report (vicem cure nostre fratri et consacerdoti nostro Potentio delegantes qui de episcopis, quorum culpabilis ferebatur electio, quid veritas haberet inquireret, nobisque omnia fideliter indicaret). Passing on to the time of Gregory the Great, we find Augustine of Canter- bury sometimes spoken of as legate, but it does not appear that in his case this title was used in any strictly technical sense, although the archbishop of Canterbury afterwards attained the permanent dignity of a legatus natus. Boniface, the apostle of

Germany, was in like manner constituted, according to Hincmar (Hp. 30), a legate of the apostolic see by Popes Gregory II. and Gregory III. According to Hefele (Conc., iv. 239), Rodoald of Porto and Zecharias of Anagni, who were sent by Pope Nicolas to Constantinople in 860, were the first who are actually ealled Jlegati a latere. The policy of Gregory VIL. naturally led to a great development of the legatine as distinguished from the ordinary episcopal function. According to the Nova Compilatio Decretalium of Gregory IX., under the title “De officio legati” the canon law recognizes two sorts of legate, the legatus natus and thie legatus datus or missus, The legatus datus (missus) may be either (1) delegatus, or (2) nuncius apostolicus, or (3) legatus a latere (lateralis, collateralis). natus, which included concurrent jurisdiction with that of all the bishops within his province, have been much curtailed since the 16th century; they were altogether suspended in presence of the higher claims of a legatus a

The rights of the legatus

latere, and the title is now almost quite honorary. It still attaches to the sees of Seville, Toledo, Arles, Rheims, Lyons, Gran, Prague, Gnesen-Posen, Cologne, Salzburg, among others. The commission of the legatus delegatus (generally a member of the local clergy) is of a limited nature, and relates only to some definite piece of work. The nuncius apostolicus (who has the privilege of red apparel, a white horse, and golden spurs) possesses ordinary jurisdiction within the province to which he has been sent, but his powers otherwise are restricted by the terms of his mandate. The legatus a latere (almost invariably a cardinal, though the power can be conferred on other prelates) is in the fullest sense the plenipotentiary representative of the pope, and possesses the high prerogative implied in the words of Gregory VII., “nostra vice que corrigenda sunt corrigat, que statuenda constituat.” He has the power of suspending all the bishops in his

province, and no judicial cases are reserved from his judgment. Without special mandate, however, he cannot depose bishops or unite or separate bishoprics. At present legati a latere are not sent by the holy see, but diplomatic relations, where they exist, are maintained by means of nuncios, inter- nuncios, and other agents. According to the congress of Vienna, the diplomatic rank of a papal nuncio corresponds to that of an ambassador. The pope at present has nuncios at the courts of Bavaria, Austria-Hungary, Belgium, Chili, Spain, France, and Portugal. Inferior in rank and less numerous are the iuternuncios (Holland, Brazil). LEGENDRE, Apriex Marte (1752-1833), French mathematician, a contemporary of Laplace and Lagrange, with whom he deserves to be ranked,} was born at Paris (or, according to some accounts, at Toulouse) in 1752. He was brought up at Paris, where he completed his studies at the Collége Mazarin. His first published writings consist of some articles forming part of the T'ratté de Mécanique (1774) of the Abbé Marie, who was his professor; Legendre's name, however, is not mentioned. Soon afterwards he was appointed professor of mathematics in the Ecole Militaire at Paris, and he was afterwards professor in the Ecole Normale. In 1782 he received the prize from the Berlin Academy for his "Dissertation sur la question de balistique," a memoir relating to the paths of projectiles in resisting media. He also, about this time, wrote his "Recherches sur la figure des planétes," published in the Mémoires of the French Academy, of which he was elected a member in succession to D'Alembert in 1783. He was also appointed a commissioner for connecting geodetically Paris and Greenwich, his colleagues being Méchain and Cassini; General Roy conducted the operatious on behalf of England. The French observations were published in 1792 (Haposé des opérations faites en France in 1787 pour la jonction des obser- vatoires de Paris et de Greenwich). During the Revolution, when the decimal system had been decreed, he was one of the three members of the council established to introduce the new system, and he was also a member of the commission appointed to determine the length of the metre, for which purpose the calculations, é&c., connected with the arc of the meridian from Barcelona to Dunkirk were revised. He was also associated with Prony in the formation of the great French tables of logarithms of numbers, sines, and tangents, and natural sines, called

the Z’ables du Cadastre, in which the quadrant was divided centesimally ; these tables have never been published (see LocarirHMs). He also served on other public commissions. He was examiner in the Ecole Polytechnique, but held few important state offices, and he

1 Besides Laplace and Lagrange, with whom it is most natural to associate Legendre, the names of Poisson, Cauchy, Fourier, and Monge should be mentioned as contemporaries. The number of French mathe- maticians of the highest rank who were living at the same time, at the beginning of the century, has often becu the subject of remark.

seems never to have been much noticed by the different Governments ; it has indeed been generally remarked that the offices he held were not such as his reputation entitled him to. Not many facts with regard to lis personal life seem to have been published, but in a letter to Jacobi of June 30, 1832, he writes—‘‘Je me suis marié 4 la suite dune révolution sanglante qui avait détruit ma petite fortune ; nous avons eu de grands embarras et des moments bien difficiles & passer, mais ma femme m/’a aidé puissam- ment & restaurer progressivement mes affaires et & me donner cette tranquillité d’esprit nécessaire pour me livrer 4 mes travaux accoutumés et pour composer de nouveaux ouvrages qui ont ajouté de plus en plus & ma réputation, de maniére & me procurer bientét une existence honorable et une petite fortune dont les débris, aprés de nouvelles révolutions qui m’ont causé de grandes pertes, suffisent en- core pour pourvoir aux besoins de ma vieillesse, et suffiront pour pourvoir & ceux de ma femme bien-aimée quand je n’y serail plus.”

He died at Paris on January 10, 1833, in his eighty-first year, and the discourse at his grave was pronounced by Poisson. He was engaged in mathematical investigations almost up to the time of his death. The last of the three supplements to his Traité des Fonctions Hlliptiques was published in 1832, and Poisson in his funeral oration remarked—“ M. Legendre a eu cela de commun avec la plupart des géométres qui l’ont précédé, que ses travaux n’ont fini qu’ avec sa vie. Le dernier volume

de nos mémoires renferme encore un mémoire de lui, sur une question difficile de la théorie des nombres; et peu de temps avant la maladie qui l'a conduit au tombeau, il se procura les observations les plus récentes des cométes 4 courtes périodes, dont il allait se servir pour appliquer et perfectionner ses méthodes."

Legendre was the author of separate works oun elliptic functions, the integral calculus, the theory of numbers, and the elements of geometry, besides numerous papers which were published chiefly in the Mémoires of the French Academy ; and it will be convenient, in giving an account of his writings, to consider them under the dif- ferent subjects which are especially associated with his name.

Elliptic Functions. —This is the subject with which Legendre's name will always be most closely connected, and his researches upon it extend over a period of more than forty years. His first published writings upon the subject consist of two papers in the A/émoires of the French Academy for 1786 upon elliptic arcs. In 1792 he pre- sented to the Academy a memoir on elliptic transcendents. The contents of these memoirs are ineluded in the first volume of his Exercices de Calcul Intégral (1811). The third volume (1816) eon- tains the very elaborate and now well-known tables of the elliptic integrals which were caleulated by Legendre himself, with an account of the mode of thcir construction. In 1827 appeared the 7'ratté des fonctions elliptiques (2 vols., the first dated 1825, the second 1826) ; a great part of the first volume agrees very closely with the contents of the Exereiccs ; the tables, &c., are given in the second volume. Three supplements, relating to the researches of Abel and Jacobi, were published in 1828-32, and forma third volume. Legendre had pursued the subject which would now be called elliptic integrals alone from 1786 to 1827, the results of his labours having been almost entirely neglected by his contemporaries, but his work had

| scarcely appeared in 1827 when the discoveries which were independ-

ently made by the two young and as yet unknown mathematicians Abel and Jacobi placed the subject on a new basis, and revolution- ized

it completely. The readiness with which Legendre, who was then seventy-six years of age, welcomed these important researches, that quite overshadowed his own, and included them in successive supplements to his work, does the highest honour to him. The sudden occurrence, near the close of his long life, of these great discoveries relating to a subject which Legendre had so completely made his own and apparently exhausted, and their ready acceptance by him, form one of the most striking episodes in the history of mathematics. A very full account of the contents of Legendre's work and of the results obtained by Abel and Jacobi has been given in the article INFINITESIMAL CALCULUS, Vol. xiii. pp. 62-72. See also Leslie Ellis's report ''On the Recent Progress of Analysis," 1 the Report of the British Association for 1846 (pp. 44 sg.). Eulerian Integrals and Integral Caleulus.—The Exercices de Caleul Intégral consist of three volumes, a great portion of the first

| and the whole of the third being devoted to elliptic functions. The

remainder of the first volume relates to the Eulerian integrals and to quadratures. The second volume (1817) relates to the Eulerian integrals, and to various integrals and series, developments, mechanical problems, &e., connected with the integral calculus ; this volume contains also a numerical table of the values of the gamma function. The latter portion of the second volume of the 7'raité des Fonetions Elliptiques (1826) is also devoted to the Eulerian inte- grals, the table being reproduced. Legendre's researches connected with the gamma function are of importance, and are well known ; the subject was also treated by Gauss in his memoir Disquisitiones generales cirea series infinitas (1816), but in a very different manner. 'The results given in the second volume of the Hxereices are of too miscellaneous a character to admit of being briefly described. In 1788 Legendre published a memoir on double integrals, and in 1809 one on definite integrals. Theory of Numbers.—Legendre's Théorie des Nombres and Gauss's Disquisitiones Arithmetiee (1801) are still the standard works upon this subject. The first edition of the former appeared in 1798

under the title Lssai sur la Théorte des Nombres ; there was a second edition in 1808; a first supplement was published in 1816, and a second in 1825. The third edition, under the title Théorie des Nombres, appeared in 1830 in two volumes. To Legendre is due the theorem known as the law of quadratic reciprocity, the most important general result in the science of numbers which has been discovered since the time of Fermat, and which was called by Gauss the ‘‘gem of arithmetic.” It was first given by Legendre in the Afémozires of the Academy for 1785, but the demonstration that accompanied it was

incomplete. The symbol (<) which is known as Legendre’s sym-

bol, and denotes the positive or negative unit which is the remainder when ai(-}) is divided by a prime number p, does not appear in this memoir, but was first used in the Hssai sur la Théorie des Nombres. Legendre’s formula « : (log « ~ 108366) for the approximate number of forms iuferior to a given number « was first given by him also in this work (2d ed., p. 394).

Attractions of Ellipsoids.—Legendre was the author of four important memoirs on this subject. In the first of these, entitled “ Recherches sur l’attraction des sphéroides homogénes,” published in the Mémoires of the Academy for 1785, but communicated to it at an earlier period, Legendre introduces the celebrated expressions which, though frequently called Laplace’s coefficients, are more correctly named after Legendre. The definition of the coefficients is that if

(1-2h cos 9+h?)~! be expanded in ascending powers of h, and if the general term be denoted by Prk”, then Pn is of the Legendrian coefficient of the nth order. In this memoir also the function which is now called the potential was, at the suggestion of Laplace, first introduced. Legendre shows that Maclaurin’s theorem with respect to confocal ellipsoids is true for any position of the external point when the ellipsoids are solids of revolution. Of this memoir Todhunter writes —“ We may affirm that no single memoir in the history of our subject can rival this in interest and importance. During forty years the resources of analysis, even in the hands of D’Alembert, Lagrange, and Laplace, had not carried the theory of the attraction of ellipsoids

beyond the point which the geometry of Maclaurin had reached. The introduction of the coefficients now called Laplace's, and their application, commence a new era in mathematical phy- sics." Legendre's second memoir was communicated to the Aca- demy in 1784, and relates to the conditions of equilibrium of a mass of rotating fluid in the form of a figure of revolution which does not deviate much from a sphere. The third memoir relates to Laplace's thcorem respecting confocal ellipsoids. Of the fourth memoir Todhunter writes, ‘‘ It occupies au important position in the history of our subject. The most striking addition which is here made to previous researches consists in the treatment of a planet supposed entirely fluid; the general equation for the form of a stratum is given for the first time and discussed. For the first time we have a correct and convenient expression for Laplace's nth coefficient." Sce Todhunter's History of the Mathematical Theories of Attraetion and the Figure of the Earth (1873), the twentieth, twenty-second, twenty-fourth, and twenty-fifth chapters of which contain a full and completé account of Legendre's four memoirs, For the theory of the Legendrian coefficients and the analysis connected with them, the reader is referred to Heine's Handbuch der Kugelfunetionen (Berlin, 1878), to Todhunter's Treatise on Laplace's Funetions, Lamé's Funetions, and Bessel's Functions (1875), or to Ferrers's Spherical Harmonies(1877). Itshould be mentioned that Legendre's coefficients have been recently termed zonal harmonics by some writers.

Geodesy.—Besides the work upon the geodetical operations con- necting Paris and Greenwich referred to above, and of which Legendre was one of the authors, he published in the Afémoires of the Academy for 1787 two papers on trigonometrical operations depending upon the figure of the earth, containing many theoreins relating to this subject. The best known of these, which is called Legendre's theorem, is usually given in treatises on spherical trigo- nometry ; by means of it a small spherical triangle may he treated

| as Jonas, Androletti, and Antonio Carlotti.

as a plane triangle, ccrtain corrections being applied to the angles. Legendre was also the author of a memoir upon triangles drawn upon a spheroid. Legendre's theorem is a fundamental one in geodesy, and his contributions to the subject are of the greatest importance.

Method of Least Squares. —In 1806 appeared Legendre's Nouvelles Meéthodes pour la déter mination des orbitesdés Cometes, which is memor- able as containing the first published suggestion of the method of least squares. In the preface Legendre remarks, ‘‘ La méthode qui me paroft la plus simple et Ja plus générale eonsiste 4 rendre minimum la somme des quarrés des erreurs,. . . et que j'appelle méthode des moindres quarrés"; and in an appendix in which the application of the method is explained his words are, ‘‘ De tous les principes qu'on peut proposer pour cet objet, je pense qu'il n'en est pas de plus général, de plus exact, ni d'une application plus facile que celui dont nous avons fait usage dans les recherches précédentes, et qui consiste 4rendre minimum la somme des quarrés des erreurs." The method was proposed by Legendre only as a convenient process for treating observations, without reference to the theory of proba- bility. It had, however, been applied by Gauss as early as 1795, and the method was fully explained, and the law of facility for the first time given by him in 1809. Laplace also justified the method by means of the principles of the theory of probability ; and this led Legendre to republish the part of his Nowvelles Méthodes which related to it in the Mémoires of the Academy for 1810. Thus, although the method of least squares was first formally proposed by Legendre, the theory and algorithm and mathematical foundation of the process are due to Gauss and Laplace. Legendre published two supplements to his Nowvelles Méthodes in 1806 and 1820.

The Elements of Geonetry.—Legendre's name is most widely known on account of his Lléments de géométrie, the most successful of the numerous attempts that have been made to supersede Euclid as a text-book on geometry. It first appeared in 1794, and went through very many editions, and has been translated into almost all languages. An English translation, by Sir David Brewster, from the eleventh French edition, was published in 1823, and is well known in England. ‘The

earlier editions did not contain the trigonometry. In one of the notes Legendre gives a proof of the irrationality of 7. This had been first proved by Lambert in the Berlin Memoirs for 1768. Legendre's proof is similar in principle to Lambert's, but much simpler. On account of the objections urged against the treatment of parallels in this work, Legendre was induced to publish in 1803 his Nowvelle Théorie des paralléles. His Geometry gave rise in England also to a lengthened discussion on the difficult question of the treatment of the theory of parallels.

It will thus be secn that Legendre’s works have placed him in the very foremost rank in the widely distinct subjects of elliptic func- tions, theory of numbers, attractions, and geodesy, and have given him a conspicuous position in connexion with the integral caleulus and other branches of mathematics. He published a memoir on the iutegration of partial differential equations and a few others which have not been noticed above, but they relate to subjects with which his name is not especially associated. A good account of the principal works of Legendre is given in the Bibliotheque Universelle de Geneve for 1833, pp. 45-82. (J.,W. L. G.)

LEGERDEMAIN, PrestIpIcITaTIoN, or SLEIGHT OF Hann, as it is variously called, is the art of deceiving the eye of the spectator by adroit movements of the hand of the operator so as apparently to cause an object either to be changed, produced, or made to disappear. The term “legerdemain” is extended in meaning to include all sorts of “conjuring” by means of mechanical and other con- trivances, although it properly applies to tricks performed with the hand alone. Even in ancient times two distinct branches of magic existed—the impostures of divination and necromancy, and the amusing exhibition of jugglery and sleight of hand. Judging from the accounts which history has handed down to us, the marvels performed by the thaumaturgists of antiquity were very skilfully produced, and must have required a considerable practical knowledge of the art. The Romans were in the habit of giving conjuring exhibitions, the most favourite feat being that of the “cups and balls,” the performers of which were called acetabularii, and the cups themselves acetabula. The balls used, however, instead of being the convenient light cork ones employed by modern conjurors, were simply round white pebbles which must have added greatly to the difficulty of performing the trick. The art survived the barbarism and ignorance of the Middle Ages; and the earliest professors of the modern school were Italians such In England

legerdemain has always found professors and patrons; Chaucer, in describing a motley assemblage, says :— ‘There I saw playenge jongelecurs, Magiciens, tregeteours, Phetonysses, charmeresses, Old witches, sorecresses ; ”

aud in another place (House of Fame, bk. iii.) he records a startling feat of prestidigitation :—- ‘There I saw Coll Tregetour Upon a table of sycamour Play an uncouthe thynge to tell; I saw him cary a wyndemell Under a walnot shale.”

But there is no reason for supposing that the ancient mnagicians were more proficient in the art than their modern successors ; and, as Robert-Houdin, the greatest of modern conjurors, has pithily observed, “if antiquity was the cradle of magic, it is because the art was yet in its infancy.” Towards the close of the reign of Elizabeth the profession had fallen very low in England, and the per- formers were classed with “ruffians, blasphemers, thieves, vagabonds, Jews, Turks, heretics, pagans, and sorcerers.” In 1840 a German physicist named Dobler devised an entertainment which gave an entirely new development to the science, and was in effect the same as tle conjuring entertainments which have since become so popular and familiar. The most eminent conjurors of the modern school have been Robert-Houlin, Wiljalba Frikell, Her- mann, and Buatier de Kolta.

The secrets of legerdemain were for a long time jealously guarded by its professors, but in 1793 a work appeared in Paris entitled Testament de Jérome Sharpe, Professeur de Physique Amusante, which gives a very fair account of the methods then in vogue. Its author was M. Decremps. In 1858 a still more important and accurate book was pub- lished—Sorcellerte ancienne et moderne expliquée, by J. N. Ponsin ; and ten years later J. E. Robert-Houdin issued his Secrets de la Prestidigitation et de la Magie, which is a masterly exposition of the entire art and mystery of con- juring. The last-mentioned book has been translated into English by ‘“ Professor Hoffman,” the author of Modern Magic, the best English treatise on the subject. Modern magic calls to its aid all the appliances of modern science, —electricity, magnetism, optics, and mechanics; but the most successful adepts in

the art look down upon all such succedaneous aids and rely upon address and sleight of hand alone. Confederacy is never resorted to except by the merest tyros. The prestidigitator's motto is 'The quickness of the hand deceives the eye ;" but this very phrase, which is always in a performer's mouth, is in itself one of the innocent frauds which the conjuror employs as part and parcel of his exhibition. The truth is that it is not so much upon the quickness with which a feat is performed as upon the adroitness with which the time and means of performing it are concealed that its success depends. "A prestidigitator," says Robert-Houdin, "is not a juggler ; he is an actor playing the part of a magician, an artist whose fingers should be more clever than nimble. I would even add that, in the practice of legerdemain, the calmer the movements are the more easy is it to produce an illusion on the spectators." Professor Hoffman corroborates this statement, and says, "' The effects of magic are produced by successive adroit substitutions, and the whole magic of the trick consists in the concealment of the particular moment at which each substitution is effected." The right oppor- tunity for executing the required movement is technically called a temps. 'This is defined to be any act or movement which distracts the attention of the audience while some- thing is being "vanished" or "produced." Experiment will readily convince any one that it is absolutely impos-

sible to move the hand so quickly as to abstract or replace any object without being perceived, so long as the eyes of the audience are upon the performer. But it is very easy to do so unnoticed, provided the audience are looking another way at the time; and the faculty of thus diverting their attention is at once the most difficult and the most necessary accomplishment for a conjuror to acquire. It does not suffice to point, or ask them to look in another direction, because they will obviously suspect the truth and look with all the more persistence. The great requisite is to "'have a good eye ""—in French conjuring parlance avoir de U'cetl ; an earnest, convinced look of the performer in a particular direction will carry every one's glances with it, while a

furtive glance at the hand which is performing some function that should be kept secret will ruin all.

Robert-Houdin may be considered the actual founder of the modern school of legerdemain. This celebrated con- juror, who was originally a watchmaker and mechanician, possessed a rcmarkably inventive genius, and, having early turned his attention to legerdemain, he concentrated all his efforts upon the development and improvement of that art. Discarding the clumsy tricks of what he calls the " false-bottomed school," as well as the gaudy paraphernalia with which his predecessors used to encumber their stage, he produced in 1845, at alittle theatre in the Palais Royal, a number of entirely new illusions, in which all the resources of mechanical and electrical science were combined with manual dexterity and personal address, His entertain- ments, which he called Soirées Fantastiques, made a great sensation in Paris, and placed him at once at the head of his profession. His skill and success were so great that the French Government sent him on a sort of roving com- mission to Algeria, in order that he might, by his exhibi- tions of natural magic, destroy the prestige of the mar- abouts —wonder-workers who had obtained a great and dangerous influence over the Arabs by their pretended miracles. The motto prefixed by Robert-Houdin to his chapter on the ''Art of Conjuring" is—" to succeed as a conjuror, three things are essential: first, dexterity; second, dexterity ; and third, dexterity"; and this is not a mere trick of language, for triple dexterity is required, not only to train the hand to the ncedful adroitness, but to acquire the requisite command of eye and tongue.

Besides the legitimate application of legerdemain to the purpose of amusement, it serves another and less innocent purpose, being employed by card sharpers in their nefarious profession. The successful card sharper must have qualities which, if applied in a legitimate direction, would ensure distinction in almost any profession. He must be obser- vant, dexterous, cool; but above all he must have impu- dence. If it requires a considerable share of this quality to perform an ordinary feat of legerdemain with all the advantages of scenic effects and stage arrangements, how much more must it need to

effect a trick under the very eyes of a vigilant adversary, and when the consequences of failure are so extremely unpleasant? Asin legitimate con- juring, too, it is not so much that actual dexterity or the quickness of the hand deceives the eye as that the attention – is diverted by some ingenious but unperceived device at the moment when the operation is performed.

Legerdemain as applied to cheating at cards may be divided into the following branches :—(1) marking the cards ; (2) abstracting certain cards during the game for clandestine use ; (3) previously concealing cards about the person ; (4) packing the cards; (5) substituting marked or prepared packs ; (6) confederacy ; (7) false shuffles. All these methods are thoroughly exposed in Robert-Houdin's work Les tricheries des Grecs.

In addition to the works on conjuring already mentioned, refer- ence may be made to Sleight of Hand, by Edwin Sachs. (E. H. P.)

LEGHORN (Italian, Livorno), a city of Italy, the chief town of the province of Leghorn (which includes the island of Elba), the see of a bishop, and next to Genoa and Naples the greatest commercial port in the kingdom, is situated on the coast of the Ligurian Sea, in 43° 33' N. lat. and 10° 16' E. long., 15 miles south-west of Pisa, with which it is conuected by a branch from the main west coast line. It is built on low-lying ground backed by a ridge of hills, of which the most striking though not the highest is Monte Nero, with its ancient monastery. In some respects one of the least Italian of Italian cities, Leghorn owes its

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J Bartholomen, Eatin? Plan of Leghorn.

1, Duomo (S. Francisco 4. Jewish Synagogue.

d’ Assisi). 5. Monument to Ferdinand I. 2. S. Maria del Soceorso. 6. Monument to Ferdinand 111. 8. English Church. 7. Monument to Leopold II.

prosperity as a port not so much to any special advantages of situation as to wise legislation and labour. Broad and well-kept streets, spacious squares, and large sub- stantial houses are the general characteristics of the city, which has room enough within the circuit of its walls (built 1835-37), though it has scattered its villas on the neighbouring hills and coast. Of note among the buildings are the old cathedral (a Latin cross with a single nave—the facade designed by Inigo Jones), the town-hall, the great oil warehouses erected by Cosmo III. in 1705, the reservoir (a subterranean structure dating from the time of Ferdinand III.), and the Jewish synagogue, which ranks next to that of Amsterdam. Near the port stands the statue of Ferdinand I. by Giovanni dell’ Opera, with four slaves in bronze, by Pietro Tacca, chained to the pedestal ; and the Piazza Carlo Alberto is adorned with statues of the grand dukes Ferdinand III. and Leopold Ii. The old English cemetery (closed 1839), which was up to the present century the only Protestant burial-place in Italy, contains the tombs of Smollett and Francis Horner. The Torre del Marzocco, or “ Tower of the Sculptured Lion,” is one of the

leading landmarks of the city from the sea, and almost the only relic of the republican period. Among the public institutions are the “Chambers of Public Payments,” similar to the London clearing-house, a large naval academy opened in 1881, a chamber of commerce dating from 1801, a public library of 40,000 volumes, and a technical and nautical institute. Great changes have been effected in the port of Leghorn since the middle of the cen- tury. The ‘new port” is formed by a breakwater finished in 1863, which extends north and south for 3300 feet, at a distance of 6 furlongs from the shore. It has a general depth of from 24 to 32 feet. Vessels moored to the break- water are sheltered from all winds, but those in the open part of the basin are exposed to the southerly gales. The inner or old port, formed by a pier projecting

half a mile in a north- north-west direction from the shore, measures 1800 by 1500 feet, and is perfectly secure on all sides. To the south and east lie a number of docks, which in turn are connected with a system of canals complex enough to justify the name Little Venice applied to part of the city. The Canale dei Navicelli extends north to the Arno. Dredging operations for deepening the harbour having been carried on between 1868 and 1878 with little permanent result, a much more

extensive and effective series of improvements (including

the construction of a new breakwater from the shore south of the town to the old lighthouse, and the lengthening of the dry dock so as to take in the largest ships now obliged to dock at Marseilles), received the Government sanction in 1881. Shipbuilding is the principal local industry, and even ironclads have been sent out from the dockyards. The following table shows the foreign trade of the port to have declined since 1860, but a counterbalancing increase to have taken place in the coasting trade :—

Foreign Trade, |Coasting Trade. Foreign Trade, |Coasting Trade.

“ Ton- ; Ton- Ships. nage. Ships. nage.

9,016/1,111/921|| 8,988|1,138,681

8

7,443/1,070,542|| 18: 7,694

In the early part of the century Leghorn became a great depot of British commerce with the Levant, and about twenty British firms were settled in the town. It was a free port, and had an excellent bonding system. But about 1833 the increase of direct intercourse between Britain and her customers began to tell on the trade, and it gradually disappeared altogether. At present the activity of the port is due to exportation of Italian produce (especially from Tuscany), and the importation of iron, coal, fish, and general goods. Marseilles,

Cardiff, and Newcastle are the three ports with which the dealings are most extensive. A considerable trade is also maintained with the United States. The popula- tion of Leghorn city increased from 33,000 in 1807 to 83,543 in 1861; but in 1871 it was 80,948, and in 1881 only 77,781,—a decrease due mainly to the distribution of the population beyond the city limits, especially along the coast. The communal population was 97,096 in 1871, and 97,615 in 1881. Between the city and the village of Ardenza are many seaside residences, occupied mostly by foreign visitors during the bathing season.

The earliest mention of Leghorn occurs in a document of the year 891 relating to the first church; in 1017 it is called a castle. In the 13th century the Pisans tried to attract a popula-

tion to the spot, but it was not till the 14th that Leghorn began to be the rival of Porto Pisano, which it was destined

It was at Leghorn that Urban V. and | assigned to them respectively.

ultimately to supplant. Gregory XI. landed on their return from Avignon. When in 1405 the king of France sold Pisa to the Florentines he kept possession of Leghorn ; but he afterwards (1407). sold it for 26,000 ducats to the Genoese, and from the Genoese the Florentines purchased it in 1421. In 1496 the city showed its devotion to its new masters by a successful defence against Maximilian and his allies. With the rise of the Mcdiei came a rapid inerease of prosperity; Cosmo, Francis, and Ferdinand ereeted fortifications and harbour works, warehouses and churehes, with equal liberality, and the last especially gave a stimulus to trade by inviting ‘‘men of the East and the West,Spanish and Portuguese, Grecks, Germans, Italians, Hebrews, Turks, Moors, Armenians, Persians, and others,” to settle and traffic in the city. Declared free and neutral in 1691, Leghorn was permanently invested with these privileges by the Quadruple Alliance in 1718 ; but in 1796 Napoleon seized all the hostile vessels in its port. It ceased to be a free city by law of 1867.

LEGION OF HONOUR, OrpeEr or tHE. This order of merit was instituted by Napoleon in 1802, all previously existing French military or religious orders—those of St Michael, the Holy Ghost, St Louis, and Military Merit, as well as the united orders of St Lazarus and Our Lady of Mount Carmel—having been abolished at the Revolution. All soldiers on whom sabres of honour had been already conferred were forthwith declared to be members, and all citizens of sufficient merit were declared to be eligible for admission, whatever their birth, rank, religion, or social position might be. At their reception they were required to swear upon their honour to employ all just, reasonable, and lawful means for the service of the republic, the main- tenance of its territory, the support of the government, the law, and the public property, and to withstand every effort towards the restoration of the feudal system and its various accompaniments—in short, to co-operate as much as in them lay for the assertion of the principles of freedom and equality. The grand master was Napoleon himself ; under him were 105 grand officers, 300 commanders, 450 officers, and 3665 chevaliers. To the members of the various classes yearly allowances, ranging from 5000 francs in the case of a grand officer to 200 in that of a chevalier, were assigned. Some unimportant modifications in details were made when the empire was introduced. Between 1805 and 1814 about 48,000 nominations were. made, 1400 only being in favour of civilians. Shortly after the acces- sion of Louis XVIII. considerable changes took place. The old military and religious orders were restored, and that of the Legion of Honour reduced to the last place ; the king was of course its grand master ; the membership was divided into five grades,—80 grand crosses, 160 grand officers, 400 commanders, 2000 officers, and an indetermi- nate number of chevaliers. These fixed numbers were to be exclusive of members of the royal family, princes of the blood, and foreigners. Admission (the reward of at least twenty- five years of distinguished service) in ordinary cases was to be made to the grade of chevalier only ; and only chevaliers of more than four years' standing, officers of two years' standing, and commanders of three years were to be cligible for promotion. The admissions were in every case to be made on parade in the case of military persons, and at a public sitting of a court of first instance in the case of civilians. The terms of the oath required were,

of course, somewhat modified, and the arrangements about yearly allowances could not be continued. After the revolution of July, the ‘Ordre royal de la légion d’honneur” again resumed the unique place and special character which had belonged to it under Bonaparte in 1802. But its constitu- tion: was again remodelled in 1852; the numbers of grand crosses, grand officers, commanders, and officers was fixed respectively at 80, 200, 1000, and 2000, the number of chevaliers being still left vague, while the system of annual allowances was restored. Since 1870 the maximum number of chevaliers has been fixed at 25,000, the remaining four classes having 70, 200, 1000, and 4000

In each grade three-fifths must be military persons, the rest civilians. The yearly pension of a military chevalier is 250 francs, of an officer 500, of a commander 1000, of a grand officer 2000, and of a grand cross 3000. The order may be conferred upon foreigners, but these do not count. It has occa- sionally been conferred upon women (¢.g., Rosa Bonheur). In connexion with the order there is an army medal, which may be distributed to the number of 40,000, and which entitles the bearer to a pension of 100 francs. On January 1, 1874, the military members of the legion, in point of fact, numbered 39,793, drawing 12,718,050 francs annually; and there were 51,460 holders of military medals, drawing 5,146,000 francs, besides not less than 15,000 civil members drawing no pension. By economy in making new appointments, these numbers have subse- quently been reduced. Since 1805 there has existed an institution for the education of daughters, sisters, and nieces of members of the legion; in 1809 the numbers were fixed at 600, the place being the “ Maison d’éducation de Saint Denis.” The arrangements have subsequently been considerably extended. ‘The decoration under the first empire consisted of a white enamelled five-rayed star, bearing the portrait of Napoleon, and a wreath of oak and laurel, with the words “ Napoleon, empereur des Frangais ” ; on the reverse was the French eagle grasping a thunderbolt, and the legend “ Honneur et patrie.” ‘The ribband was of watered scarlet silk. At present the obverse of the star bears the effigy of the republic and

the words “‘ République Frangaise,” the reverse two tricolor flags with the original legend.

LEH, or Lt. See Lapsx.

LEIAH, a town in Derd Isméil Khan district, Punjab, India, is situated near the east bank of the Indus, in 30° 57’ 30” N. lat., 70° 58’ 20” E. long. The population in 1868 was 17,033 (13,151 Mohammedans, 3726 Hindus, 30 Sikhs, and 126 “others”). There is a considerable trade in local produce as well as through traffic between the districts of upper India and the countries to the west.

LEIBNITZ, or Lerpniz, Gorrrriep WILHELM (1646— 1716), almost equally distinguished as philosopher, mathe- matician, and man of affairs, was born on the 21st Juue (0.s.) 1646, at Leipsic, where his father was professor of moral philosophy. The name Leibniz, Leibnitz, or Lubeniecz was originally Slavonic, but his family was German, and for three generations his ancestors had been in the employment of the Saxon Government. Young Leibnitz was sent to the Nicolai school at Leipsic, but, from the time of his father’s death, which took place when lie was only six years old, seems to have been for the most part his own teacher. From his father he had acquired a love of historical study that bore remarkable fruit in after life. The German books at his command were soon all read through, and with the help of two Latin books which fell in his way—the Thesaurus Chronologicus of Calvisius and an illustrated edition of Livy—he learned Latin for himself at the age of eight. By the advice of a neighbouring gentleman his father’s library was now thrown open to him with the permission “Tolle, lege.” At this his joy knew no bounds. “For,” he says, “1 burned to get sight of the ancients, most of them known to me only by name, Cicero and Seneca, Pliny, Herodotus, Xenophon, Plato, and the historical writers, and many church fathers, Latin_and Greek.” Thus before he was twelve he could read Latin easily and had begun Greek ; and his facility in writing Latin verses made his instructors fear that he would be seduced by poetry from more serious pursuits. Next he took with avidity to the study of logic, attempting already to reform its doctrines, and reading the scholastics and

some of the Protestant theologians with such zeal that his

friends now began to fear that he would never leave scholastic subtleties, ‘not knowing,” as he said, “ that my mind could not be satisfied with one kind of things.”

In the autumn of 1661, at the age of fifteen, he entered the university of Leipsic as a student of law. His first two years were devoted to philosophy under Scherzer, a follower of the scholastics, and Jacob Thomasius, a Neo-Aristotelian, who is looked upon as having founded the scientific study of the history of philosophy in Germany. It was at this time probably that he first made acquaintance with the modern thinkers who had already revolutionized science and philosophy, Francis Bacon, Cardan, and Campanella, Kepler, Galileo, and Descartes ; and he began to discuss with himself the difference between the old and new ways of regarding nature. ‘I remember,” he says, “ walking alone, at the age of fifteen, in a wood near Leipsic called the Rosenthal, to deliberate whether I should retain the doctrineof substantialforms. At last mechanism triumphed and induced me to apply myself to mathematics.” It was not, however, till the summer of 1663, which he spent at Jena under Weigel, that he obtained the instructions of a mathematician of repute; nor was the deeper study of mathematics entered upon till his visit to Paris and acquaintance with Huygens many years later.

The three years following his return from Jena were devoted to legal studies, and in 1666 Leibnitz became a candidate for the degree of doctor of law. The doctorate was a pathway to the post of assessor which he coveted, but through the opposition of older candidates for the same office his youth was made an excuse for refusing him the degree. Upon this he left his native town for ever. The doctor’s degree refused him there was at once (November 5, 1666) conferred on him at Altdorf,—the university town of the free city of Nuremberg,—where his brilliant dissertation procured him the immediate offer of a professor’s chair. This, however, he declined, having, as he said, “ very different things in view.”

Leibnitz, not yet twenty-one years of age, was already the author of several remarkable essays. In his bachelor’s dissertation De principio individui (1663), he defended thie nominalistic doctrine that individuality is constituted by the whole entity or essence of a thing; his arithmetical tract De complexionibus, published in an extended form under the title De arte combinatoria (1666), is an essay towards his life-long project of a reformed symbolism and method of thought ; and besides these there are four juridi- cal essays, including the Vova methodus docendi discendique Juris, written in the intervals of his journey from Leipsic to Altdorf. This last essay is remarkable, not only for the reconstruction it attempted of the Corpus Juris, but as containing the first clear recognition of the importance of the historical method in law.

Rejecting the professorial career, but without any definite plan for the future, Leibnitz turned his steps to Nuremberg. That city was a centre of the Rosicrucians, and Leibnitz, busying himself with writings of the alchemists, soon gained such a knowledge of their tenets that he was supposed to be one of the secret brotherhood, and was even elected their secretary. A more important result of his visit to Nuremberg was his acquaintance with Johann Christian von Boineburg, formerly first minister to the elector of Mainz, and one of the most distinguished states- men of the day. By his advice Leibnitz printed his Nova methodus in 1667, dedicated it to the elector, and, going to Mainz, presented it to him in person. It was thus that Leibnitz entered the service of the elector of Mainz, at first as an assistant in the revision of the statute-book, afterwards on more important work.

The policy of the elector, which the pen of Leibnitz was now called upon to promote, was to maintain the security

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of the German empire, threatened on the west by the ageressive power of France, on the east by Turkey and Russia. Thus when in 1669 the crown of Poland became vacant, it fell to Leibnitz to support the claims of the German candidate, which he did in his first political writing, Specimen demonstrationum politicarum, attempting,

under the guise of a Catholic Polish nobleman, to show by

mathematical demonstration that it was necessary in the interest of Poland that it should have the count palatine of Neuburg as its king. But neither the diplomatic skill of Boineburg, who had been sent as plenipotentiary to the election at Warsaw, nor the arguments of Leibnitz were successful, and a Polish prince was elected to fill the vacant throne.

A greater danger threatened Germany in the aggressions of Louis XIV. and the wars of conquest on which he was entering. Though Holland was in most immediate danger from his arms, the seizure of Lorraine in 1670 showed that Germany too was threatened. It was in this year that Leibnitz wrote his Thoughts on Public Safety,: in which he urged the formation of a new “ Rheinbund” for the protec- tion of Germany, and contended that the states of Europe should employ their power, not against one another, but in the conquest of the non-Christian world, in which Egypt, “one of the best situated lands in the world,” would fall to theshare of France. The plan thus proposed of averting the threatened attack on Germany by a French expedition to Egypt was discussed with Boineburg, and obtained the approval of the elector. French relations with Turkey were at tlie time so strained as to make a breach immineut, and at the close of 1671, about the time when the war with Holland broke out, Louis himself was approached by a letter from Boineburg and a short memorial from the pen of Leibnitz, who attempted to show that Holland itself, as a mercantile power trading with the East, might be best attacked through Egypt, while nothing would be easier for France or would more largely increase her power than the conquest of Egypt. On February 12, 1672, a request came from the French secretary of state, Pomponne, that the author of the memorial should further explain himself, and on the 18th of next month Leibnitz started for Paris. Louis seems still to have kept the matter in view, but never granted Leibnitz the personal interview he desired, while Pomponne wrote from the camp before Doesburg, “I have nothing against the plan of a holy war, but such plans, you know, since the days of St Louis, have ceased to be the fashion.” Not yet discouraged, Leibnitz wrote a full account of his project for the king,?

and a summary of the same ? evidently intended for Boineburg. But Boineburg died in December 1672, before the latter could be sent to him. Nor did the former ever reach its destination. The French quarrel with the Porte was made up, and the plan of a French expedition to Egypt disappeared from practical politics till Napoleon menaced the power of England by the same means as those by which Louis had been invited to cripple Holland. The history of this scheme, and the reason of Leibnitz's journey to Paris, long remained hidden in the archives of the Hanoverian library. It was on his taking possession of Hanover in 1803 that Napoleon learned, through the Consilium digyptiacum, that the idea of a French conquest of Egypt had been first put forward by a German philosopher. In the same year there was published in London an account of the Justa dissertatio* of which the British Government had procured a copy in 1799.

1 Bedenken, welchergestalt sccuritas publica interna et externa und status presens jetzigen Umsténden nach auf festen Fuss zu stellen.

2 De expcditione Atgyptiaca regi Francie proponenda justa dissertatio. 3 Consilium Agyptiacum.

4 A Summary Account of Leibnitz's Memoir addresscd to Lewis the Fourteenth, &c. [edited by Granville Penn], London, 18038.

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But it is only since the appearance of the edition of Leibnitz's works begun by Onno Klopp in 1864 that the full history of the scheme has been made known.

Leibnitz had other than political ends in view in his visit to France. It was as the centre of literature and science that Paris chiefly attracted him. Political duties never made him lose sight of his philosophical and scien- tific interests. At Mainz he was still busied with the

question of the relation between the old and new methods.

in philosophy. In a letter to Jacob Thomasius (1669) he contends that the mechanical explanation of nature by magnitude, figure, and motion alone is not inconsistent with the doctrines of Aristotle's Physics, in which he finds more truth than in the Meditations of Descartes. Yet these qualities of bodies, he argues in 1668 (in an essay published without his knowledge under the title Confessio nature contra atheistas), require an incorporeal principle, or God, for their ultimate explanation. He also wrote at this time a defence of the doctrine of the Trinity against Wissowatius (1669), and an essay on philosophic style, introductory to an edition of the Antebarbarus of Nizolius (1670). Clearness and distinctness alone, he says, are what makes a philosophic style, and no language is better suited for this popular exposition than the German. In 1671 hoe issued a Hypothesis physica nova, in which, agreeing with Descartes that corporeal phenomena should be explained from motion, he carried out the meclianical explanation of nature by contending that the original of this motion is a fine ether, similar to light, or rather constituting it, which, penetrating all bodies in the direc- tion of the earth's axis, produces the phenomena of gravity, elasticity, &c. The first part of the essay, on concrete motion, was dedicated to the Royal Society of London, the second, on abstract motion, to the French Academy. Leibnitz thus came to Paris, not merely as a young diplomatist on an important if not very hopeful mission, but also as an author who had already made his début in the world of science and philosophy. At Paris he met with Arnauld, Malebranche, and, more important still, with Christian Huygens. This was pre-eminently the period of his mathematical and physical activity. Before leaving Mainz he was able to announce! an imposing list of dis- coveries, and plans for discoveries, arrived at by means of his new logical art, in natural philosophy, mathematics, mechanics, optics, hydrostatics, pueumatics, and nautical science, not to speak of new ideas in law, theology, and politics. Chief among these discoveries was that of a calculating machine for performing more complicated operations than that of Pascal—multiplying, dividing, and extracting roots, as well as adding and subtracting. This machine was exhibited to the Academy of Paris and to the Royal Society of London, and Leibnitz was elected a fellow of the latter society in April 1673.2. In January of this year he had gone to London as an attaché on a political

mission from the elector of Mainz, returning in March to Paris, and while in London had become per- sonally acquainted with Oldenburg, the secretary of the Royal Society, with whom he had already corresponded, with Boyle the chemist, and Pell the mathematician. It is from this period that we must date the impulse that directed him anew to mathematics. By Pell he had been referred to Mercator's Logarithmotechnica as already con- taining some numerical observations which Leibnitz had thought original on his own part; and, on his return to Paris, he devoted himself to the study of higher geometry under Huygens, entering almost at once upon the series of Investigations which culminated in his discovery of the

1In a letter to the duke of Brunswick-Liineburg (autumn 1671), Werke, ed. Klopp, iii. 258 sq. 2 He was made a foreign member of the French Academy in 1700.

differential and integral calculus. For the history of this discovery and of the controversies to which it gave rise, see vol. xlil. p. 8 sq.

Shortly after his return to Paris in 1673, Leibnitz ceased to be in the Mainz service any more than in name, but in the same year entered the employment of Duke John Frederick of Brunswick-Liineburg, with whom he had corresponded for some time. In 1676 he removed at the duke's request to Hanover, travelling thither by way of London and Amsterdam. At the latter place he saw and conversed with Spinoza, now in the last year of his life.

For the next forty years, and under three successive princes, Leibnitz was in the service of the Brunswick family, and his headquarters were at Hanover, where he had charge of the ducal library. In leaving the electorate of Mainz for the dukedom of Brunswick, Leibnitz passed into a political atmosphere formed by the dynastic aims of the typical German state. The recognition of the rights of the dukedom amongst the states of Europe, the con- solidation and permanence of the reigning house, the union of the two branches of the Brunswick family, and lastly, —the aim to which all the others led up—the attainment of

the electoral hat, were the ends of its political action. Leibnitz had thus to support by his pen the claim of Hanover to appoint an ambassador at the congress of Nimeguen (1676)* to defend the establishment of primo- geniture in the Liineburg branch of the Brunswick family ; and, when the proposal was made to raise the duke of Hanover to the electorate, with the charge of the imperial banner, he had to show that this did not interfere with the rights of the duke of Wiirtemberg, who was the hereditary custodian of the imperial colours. It was in 1692 that the duke of Hanover was made elector. Before, and with a view to this, Leibnitz had been employed by him to write the history of the Brunswick-Liineburg family, and, to collect material for his history, had undertaken a journey through Germany and Italy in 1687-90, visiting and examining the records in Marburg, Frankfort-on-the-Main, Munich, Vienna (where he remained nine months), Venice, Modena, and Rome. At Rome he was offered the custodianship of the Vatican library on condition of his joining the Catholic Church.

About this time too his thoughts and energies were partly taken up with the scheme for the reunion of the Catholic and Protestant Churches. While at Mainz he had joined in an attempt made by the elector and Boine- burg to bring about a reconciliation, and now, chiefly through the energy and skill of the Catholic Royas de Spinola, and from the spirit of moderation which prevailed among the theologians he met with at Hanover in 1683 it almost seemed as if some agreement might be arrived at. It was in these circumstances that, in 1686, Leibnitz wrote his Systema theologicum,* in which he strove to find common standing-ground for Protestants and Catholics in the details of their creeds. But the English Revolution of 1688, and the establishment of the Protestant succession, became a political obstacle to the prosecution of the scheme in Hanover, while it was soon found that the religious difficulties were greater than had at one time appeared. Spinola’s practical and conciliatory tone did not make full allowance for the ecclesiastical and dogmatical claims of Rome, and the moderation of the Hanover theologians was not fairly representative of the spirit of the Protestant Churches. In the letters to Leibnitz from Bossuet, the ee eee

3 Cxsarini Furstenerii tractatus de jure suprematus ac legationis principum Germaniz, Amsterdam, 1677 ; Entretiens de Philarete et d' Eugene sur le droit d'ambassade, Duisb., 1677. ,

4 Not published till 1819. It is on this work that the assertion has been founded that Leibnitz was at heart a Catholic—a supposition clearly disproved by his correspondence.

landgrave of Hessen-Rheinfels, and Madame de Brinon, the aim is obviously to make converts to Catholicism, not to arrive at a compromise with Protestantism, and when it was found that Leibnitz refused to be converted the corre- spondence ceased. A further scheme of church union in which Leibnitz was engaged, that between the Reformed and Lutheran Churches, met with no better success,

Returning from Italy in 1690, Leibnitz was appointed librarian at Wolfenbiittel by Duke Anton of Brunswick- Wolfenbiittel. Some years afterwards began his con- nexion with Berlin through his friendship with the elec- tress Sophie Charlotte of Brandenburg and her mother the princess Sophie of Hanover. He was invited to Berlin in 1700, and on the 11th July of that year the academy he had planned was founded, with himself as its president for life, In the same year he was made a privy councillor of justice by the elector of Brandenburg. Four years before he had received a like honour from the elector of Hanover, and twelve years afterwards the same distinction was conferred upon him by Peter the Great, to whom he gave a plan for an academy at St Petersburg, carried out after the czar's death. At Berlin, in the pleasant suburb of Charlottenburg, Leibnitz read and philosophized with his royal pupil, whose death in 1705 was the greatest loss he ever suffered. After this event his visits to Berlin became less frequent and less welcome, and in 1711 he was tliere for the last time. In the following year he undertook his fifth and last journey to Vienna, where he stayed till 1714. An attempt to found an academy of science thcre was defeated by the opposition of the Jesuits, but he now attained the honour he had covetcd of an imperial privy councillorship (1712), and either at this time or on a previous occasion, was made a baron of the

empire (Leichs- freiherr). eibnitz returned to Hanover in September 1714, but found the elector George Louis had already gone to assume the crown of England. Leibnitz would gladly have followed him to London, but was bidden remain at Hanover and finish his history of Brunswick.

During the last thirty years Leibnitz's pen had been busy with many matters. Mathematics, natural science,! philosophy, theology, history, jurisprudence, politics (par- ticularly the French wars with Germany, and the question of the Spanish succession), economics, and philology, all gained a share of his attention ; almost all of them he enriched with original observations,

His genealogical rescarches in Italy—-through which he established the common origin of the families of Brunswick and Este—were not only preceded by an immense collection of historical sources, but enabled him to publish matcrials for a code of international law.? The history of Brunswick itself was the last work of his life, and had covered the period from 768 to 1005 when death ended his labours. But the Government, in whose service and at whose order the work had been carried out, left it to lic unheeded in the archives of the Ianover library, till it was published by Pertz in 1843,

It was in the years between 1690 and 1716 that Leibnitz's chief philosophical works were composed, and during the first ten of these years the accounts of his system were, for the most part, preliminary sketches. Indeed, he never gave a full and systematic account of his doctrines, His views have to be gathered from letters to friends, from occasional articles in the Acta Eruditorwm, the Journal des Savants, and other journals, and from one or two more extensive works It is evident, however, that philosophy a i i

1 In his Protogwa (1691) he developed the notion of the historical genesis of the present condition of the earth's surface. Cf. O. Peschel, Gesch. d. Hrdkunde, Munich, 1865, pp. 615 sq.

2 Codex juris gentium diplomaticus, 1693 ; Mantissa codicis jure gentium diplomatict, 1700. ~ :

had not been entirely neglected in the years in which his pen was almost solely occupied with other matters. A Ictter to the duke of Brunswick, and another to Arnauld, in 1671, show that he had already reached his new notion of substance ; and it seems to have been the want of leisure and opportunity alone that prevented the systematic expression of his vicws. : March 23, 1690, the leading peculiarities of his system are clearly stated. The appearance of Locke's Zssay in 1690 induced him (1696) to note down his objections to it, and his own ideas on the same subjects. In 1703-4 these were worked out in detail and ready for publication, when the death of the author whom they criticized prevented their appearance (first published by Raspe, 1765). In 1710 appeared the only complete and systematic philosophical work of his life-time, Hssais de Théodicée sur la bonté de Dieu, la liberté de Vhomme, et Vorigine du mal, originally undertaken at the request of the late queen of Prussia, who had wished a reply to Bayle's opposition of faith and reason. sketch of his system under the title of La Monadologie, and in the same year appeared his Principes de la naturé et de la grace. The last few years of his life were perhaps more occupied with correspondence than any others, and, in a philosophical regard, were chiefly notable for the letters which, through the desire of the new queen of England, lic interchanged with Clarke, sur Dieu, 'dme, Uespace, la durée,

Leibnitz died on the 14th November 1716, his closing years enfeebled by disease, harassed by controversy, embittered by neglect, darkened by the loss of his dearest fricnd ; but to the last he preserved the indomitable energy and power of work to which is largely due the position he holds as, more perhaps than any one in modern times, a man of almost universal attainments and almost universal genius. Neither at Berlin, in the academy which he had founded, nor in London, whither his sovereign had gone to rule, was any notice taken of his death. At Hanover, Eckhart, his secretary, was his only mourner ; no courtiers, no clergyman followed him to the grave; not till 1787 was the simple monument that marks the place erected ; "he was buried," says an eye-witness, 'more like a robber than what he really

was, the ornament of his country.”° Only in the French Academy was the loss that had been sustained recognized, and a worthy eulogium devoted to his memory (Noveniber 13, 1717).

Accustomed from his boyhood to a studious life, Leibnitz possessed a wonderful power of rapid and continuous work, and for days together would hardly leave his chair. Even in travelling his time was employed in sclving mathematical problems. He is further described as moderate in his desires and habits, quick of temper bnt easily appeased, charitable in his judgments of others, and tolerant’ of differences of opinion, though impatient of contradiction on small matters. He is also’ said to have been fond of money to the point of covetousness; he was certainly desirous of honour, and felt kcenly the ueglect’ in which his last years were passed.

Leibnitz’’s Philosophy.—The central point in the philosophy ot Leibnitz was only arrived at after many advances and eorreetions in his opinions. This point is his new doetrine of substanee (p. 7024), and it is through it that unity is given to the suceession of oeeasional writings, seattered over fifty years, in which he explained his views. More inelined to agreo than to differ with what he read (p. 425), and borrowing from almost every philosophieal system, his own standpoint is yet most elosely related to that of Descartes, partly as eonsequenee, partly by way of opposition. Cartesianism, Leibnitz often asserted, is the ante-room of truth, but the ante-room only.

Deseartes’s separation of things into two heterogencous substances only eonnected by the omnipotence of God, and the more logical

3 Memoirs of John Ker of Kersland, by himself, 1726, i. 118. * When not otherwise stated, the references are to Erdmann’s edition of the Opera philosophica.

In a letter to Arnauld, of date

In 1714 he wrote, for Prince Eugene of Savoy, a

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absorption of both by Spinoza into tho one divine substance, followed from an erroneous eoneeption of what the true nature of substance is. Substance, the ultimate reality, can only be conceived as foree. Hence Leibnitz's metaphysieal view of the monads as simple, per- cipient, self-active beings, the constituent elements of all things, his physical doctrines of the reality and constaney of force at the same time that space, matter, and motion are merely phenomenal, and his psychological conception of the continuity and development of consciousness. In the closest connexion with the same stand his logical prineiples of consisteney and sufficient reason, and the method he developed from them, his ethical end of perfection, and his crowning theological conception of the universe as the best ene world, and of God both as its efficient cause and its final harmony.

The ultimate elements of the universe are, according to Leibnitz, individual centres of force or mouads. Why they should be individual, and not manifestations of one world-force, he never clearly proves.1_ His doctrine of individuality seems to have been arrived at, not by strict deduction from the nature of force, but yather from the empirical observation that it is by the manifesta- tion of its activity that the separate existence of the individual becomes evident ; for his system individuality is as fundamental as activity. 'The monads," he says, ''are the very atoms of nature —in a word, the elements of things," but, as centres of foree, they have neither parts, extension, nor figure (p. 705). Hence their distinction from the atoms of Democritus and the mate- yialists. They are metaphysical points or rather spiritual beings whose very nature it is to act. As the bent bow springs baek of itself, so the monads naturally pass and are always passing into action without any aid but the absence of opposition (p. 122). Nor do they, like the atoms, aet upon one another (p. 680) ; the action of each exeludes that of every other. each is the result of its own past state, the determinator of its own future (pp. 706, 722). ''The monads have no windows by which eens may go in or out" (p. 705).

“urther, sinee all substances are of the nature of force, it follows that —‘‘in imitation of the notion which we have of souls ”—they must contain something analogous to feeling and appetite. It is the nature of the monad to represent the many in one, and this is per- eeption, by whieh external events are mirrored internally (p. 438). Through their own activity the monads mirror the universe (p. 725), but each in its own way and from its own point of view, that is, with a more or less perfect perception (p. 127); for the Cartesians were wrong in ignoring the infinite grades of perception, and identifying it with the reflex cognizance of it which may be called apperception. Every monad is thus a microcosm, the universe in little,2and according to the degree of its activity is the distinctness of its representation of the universe (p. 709). Thus Leibnitz, borrowing the Aristotelian term, calls the monads entelechies, becauso they have a certain perfection (rd évreAés) and suftieiency (aitdpreia) Which make them sources of their internal actions and, so to speak, incorporeal automata (p. 706). That the monads are not pure entelechies is shown by the differences amongst them. Excluding all external limitation, they are yet limited by their own nature, All created monads contain a passive element or materia prima (pp. 440, 687, 725), in virtue of whieh their perceptions are more or less confused. As the activity of the monad consists in perception, this is inhibited by the passive prineiple, so that there arises in the monad an appetite or tendeney to overcome the inhibition and beeome more perceptive, whence follows the ehange from one perception to another (pp. 706, 714). By the pro- portion of activity to passivity in it one monad is differentiated from another. The greater the amount of activity or of distinct percep- tions the more perfect is the monad ; the stronger the element of

assivity, the more confused its perceptions, the less perfect is it (p. 709). The soul would be a divinity had it nothing but dis- tinet pereeptions (p. 520).

The monad is never without a perception ; but, when it has a number of little perceptions with no means of distinction, a state similar to that of being stunned ensucs, the monade nue being per- petually in this state (p. 707). Between this and the most distinct perception there is

room for an infinite diversity of nature among the monads themselves. Thus no.one monad is exactly the same as another ; for, were it possible that there should be two identical, there would be no sufficient reason why God, who brings them into actual existence, should put one of them at one definite time and place, the other at a different time and place. This is Leibnitz's principle of the identity of indiscernibles (pp. 277, 755) ; by it his early problem as to the prineiple of individuation is solved by the distinetion between genus and individual being abolished, and every individual made swt generis. The principle thus established is formulated in Leibnitz's law of continuity, founded, he says, on the doctrine of the mathematical infinite, essential to geometry, and of importance in physics (pp. 104, 105), in accordance with which

1 See Considérations sur la doctrine @un esprit universel, 1702, 2 Cf, Opera, ed, Dutens, II. ii. 20.

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there is neither vacuum nor break in nature, but 'everything takes place by degrees" (p, 392), the different speeies of creatures — insensible steps from the lowest to the most perfeet form (p. 312).

~ Asin every monad eaeh suceeeding state is the eonsequence of the preceding, and as it is of the nature of every monad to mirror or represent the universe, it follows (p. 774) that the pereeptive eon- tent of each monad is in ''accord" or correspondence with that of every other (cf. p. 127), though this content is represented with infinitely varying degrees of perfection. This is Letbnitz's fainous doetrine of pre-established harmony, in virtue of which the infinitely numerous independent substanees of which the world is composed are related to each other and form one universe, It is essential to notice that it proceeds from the very nature of the monads as per- cipient, self-acting beings, and not from an arbitrary determina- tion of the Deity.

From this harmony of self-determining percipient units Leibnitz has to explain the world of nature and mind, As everything that really exists is of the nature of spiritual or metaphysical points (p. 126), it follows that space and matter in the ordinary sense cau only have a phenomenal existence (p. 745), being dependent not on the nature of the monads themselves but on the way in which they are pereeived. Considering that several things exist at the same time and in a certain order of eoexistence, and mistaking this con- stant relation for something that exists outside of them, the mind forms the confused perception of space (p. 768). But space and time are merely relative, the former an order of coexistences, the latter of successions (pp. 682, 752). Hence not only the seeondary qualities of Descartes aud Locke, but their so-called primary qualities as well, are merely phenomenal (p. 445). The monads are really without position or distance from each other; but, as we pereeive several simple substances, there is for us an aggregate or extended mass. Body is thus active extension (pp. 110, 111). The unity of the aggregate depends entirely on our perceiving the monads com- posing it together. There is no such thing as an absolute vacuum or empty space, any more than there are indivisible material units or atoms from which all things are built up (pp. 126, 186, 277). Body, corporeal mass, or, as Leibnitz ealls it, to distinguish it from the materia prima of which every monad partakes (p. 440), materia secunda, is thus only a ‘‘ phenomenon bene fundatum ” (p. 436). It is not a substantia but substantia or substantiatum (p. 745). While this, however, is the only view consistent with Leibnitz’s fundamental principles, and is often clearly stated by himself, he also speaks at other times of the materia seeunda as itself a composite substance, and of a real metaphysical bond between soul and body. But these expressions occur chiefly in the letters to Des Bosses, in which Leibnitz is trying to reconcile his views with the doctrines of the Roman Catholic Church, especially with that of the real presence in the Eucharist, and are usually referred to by him as doctrines of faith or as hypothetical (see especially p. 680). The true vineulum substantiale is not the materia secunda, whieh a consistent development of Leibnitz’s principles can only regard as phenomenal, but the materia prima, through which the monads are individualized and distinguished and their connexion rendered possible. And Leibnitz

seems to recognize that the opposite assump- tion is inconsistent with his cardinal metaphysical view of tho monads as the only realities.

From Leibnitz's doetrine of force as the ultimate reality it follows that his view of nature must be throughout dynamical. And though his project of a dynamie or theory of natural philosophy was never carried out, the outlines of his own theory and his eriticism of the mechanical physics of Descartes are known to us. The whole dis- tinction between the two lies in the difference between the mechani- cal and the dynamical views of nature. Descartes started from tho reality of extension as constituting the nature of material substance, and found in magnitude, figure, and motion the explanation of the material universe. Leibnitz too admitted the mechanieal view of nature as giving the laws of corporeal phenomena (p. 438), applying also to everything that takes place in animal organisms,? even the human body (p. 777). But, as phenomenal, these laws must find their explanation in metaphysics, and thus in final causes (p. 155). All things, he says (in his Speetmen Dynamicwm), can be explained either by efficient or by final causes. But the latter method is not appropriate to individual oecurrences,* though it must be applied when the laws of mechanism themselves need explanation (p. 678). For Descartes's doctrine of the constancy of the quantity of motion (4.e., momentum) in the world Leibnitz substitutes the prineiple of the conservation of vis viva, and eontends that the Cartesian position that motion is measured by velocity should be superseded by the law that moving force (vis motriz) is measured by the square of the velocity (pp. 192, 193). The long eoutroversy raised by this criticism was really eaused by the ambiguity of the terms employed. The principles held by Deseartes and Leibnitz were both correct, though different, and their eonfliet only apparent. Deseartess

3 The differenee between an organic and an inorganic body consists, he says,

in this, that the former is a machine even in its smallest parts. 4 Opera, ed. Dutens, iii, 321.

principle is now enunciated as the conservation of momentum, that of Leibnitz as the conservation of cnergy. Leibnitz further criticizes the Cartesian view that the mind can alter the direction of motion though it cannot imitate it, and contends that the quantity of ‘‘vis directiva,” estimated between the same parts, is constant (p. 108)— a position developed in his statical theorem for determining geome- trically the resultant of any number of forces acting at a point.

Like the monad, body, which is its analogue, has a passive and an active element. The former is the capacity of resistance, and includes impcenetrability and inertia; the latter is active force (pp. 250, 687). Bodies, too, like the monads, are self-contained activities, receiving no impulse from without—it is only by an accommodation to ordinary language that we speak of them as doing so—but moving themselves in harmony with eaeh other (p. 250).

The psychology of Leibnitz is chiefly developed in the Nowveawz

Essais sur Ventendement humain, written in answer to Locke’s famous Essay, and eriticizing it chapter by chaptcr. In these essays he worked out a theory of the origin and development of knowledge in harmony with his metaphysical views, and thus without Locke’s implied assumption of the mutual influence of soul and body. When one monad in an aggregate perceives the others so clearly that they are in comparison with it bare monads (monades nues), it is said to be the ruling monad of the aggregate, not because it actu- ally does exert an influence over the rest, but because, being in close correspondence with them, and yet having so much clearer percep- tion, it seems to do so (p. 683). This monad is called the entelechy or soul of the aggregate or body, and as such mirrors the aggregate in the first place and the universe through it (p. 710). Each soul or entelechy is surrounded by an infinite number of monads forming its body (p. 714); soul and body together make a living being, and, as their laws are in perfect harmony —a harmony established between the whole realm of final causes and that of efficient causes (p. 714)—we have the same result as if one influenced the other. This is further explained by Leibnitz in his well-known illustration of the different ways in which two clocks may keep

exactly the same time. The machinery of the one may actually move that of the other, or whenever one moves the mechanician nay make a similar alteration in the other, or they may have been so perfectly constructed at first as to continue to correspond at every instant with- out any further influence (pp. 133, 134). The first way represents the conunon (Locke's) theory of mutual influence, the second the method of the occasionalists, the third that of pre-established har- mony. Thus the body does not act on the soul in the production of cognition, nor the soul on the body in the production of motion. The body acts just as if it had no soul, the soul as if it had no body (p. 711). Instead, therefore, of all knowledge coming to us directly or indirectly through the bodily senses, it is all developed by the soul's own activity, and sensuous perception isitsclf but a confused kind of cognition. Not a certain select class of our ideas only (as Descartes held), but all our ideas, are innate, though only worked up into actual cognition in the development of knowledge (p. 212). To the aphorism made use of by Locke, ‘‘ Nihil est in intellectu quod non prius fuerit in sensu,” must be added the clause, ‘‘ nisi intellectus ipse ” (p. 228). The soul at birth is not comparable to a tabula rasa, but rather to an unworked block of marble, the hidden veins of which already determine the form it is to assume in the hands of the sculptor (p. 196). Nor, again, can the soul ever be without perception ; for it has no other nature than that of a percipient active being (p. 246). Apparently dreamless sleep is to be accounted for by unconscious perception (p. 228); and it is by such insensible perceptions that Leibnitz explains his doctrine of pre-established harmony (p. 197). _ Inthe human soul perception is developed into thought, and there is thus an infinite though gradual difference between it and the mere monad (p. 464). Asall knowledge is implicit in the soul, it follows that its perfection depends on the efficiency of the instrument by which it is developed. Hence the importance, in Leibnitz's system, of the logical principles and method the consideration of which oc- eupied hiin at intervals throughout his whole career.

There are two kinds of truths—{1) truths of reasoning, and (2) truths of fact (pp. 88, 99, 707). The former rest on the principle of identity (or contradiction) or of possibility, in virtue of which that is false

which contains a contradiction, and that true which is contradictory to the false. The latter rest on the principle of suffi- eient reason or of reality (compossibilité), according to which no fact is true unless there be a sufficient reason why it should be so and not otherwise (agreeing thus with the principium meléoris or final cause). God alone, the purely active monad, has an a priori know- ledge of the latter class of truths ; they have their source in the human mind only in so far as it mirrors the outer world, i.e, in its passivity, whercas the truths of reason have their source in our mind in itself or in its activity.

Both kinds of truths fall into two classes, primitive and deriva- tive. The primitive truths of fact are, as Descartes held, those of internal experience, and the derivative truths are inferred from them in accordance with the principle of sufficient reason, by their agree- ment with our perception of the world asa whole, They are thus

reached by probable arguments—a department of logic which Leib-nitzwas thefirst to bring into prominence (pp. 84,164, 168, 169, 343), The primitive truths of reasoning are identical (in later terminology, analytical) propositions, the derivative truths being deduced from them by the principle of contradiction. The part of his logic on which Leibnitz laid the greatest stress was the separation of these rational cognitions into their simplest elements—for he held that the root-notions (cogitationes primex) would be found to be few in number (pp. 92, 93)—and the designation of them by universal characters or symbols,! composite notions being denoted by the formule formed by the union of several definite characters, and judgments by the relation of squipollence among these formule, so as to reduce the syllogism toa calculus. This is the main idea of Leibnitz's ‘‘universal characteristic,” never fully worked out by him, which he regarded as one of the greatest discoveries of the age. An incidental result of its adoption would be the intro- duction of a universal synibolism of thought eomparable to the symbolism of mathematics and intelligible in all languages (ef. p. 356). But the great revolution it would effect would chiefly consist in this, that truth and falsehood would be no longer matters of opinion but of correctness or error in calculation* (pp. 83,

84, 89, 93). The old Aristotelian analytic is not to be superscded ; but it is to be ets by this new method, for of itself it is but the ABC of ogic.

But the logic of Leibnitz is an art of discovery (p. 85) as well as of proof, and, as such, applies both to the sphere of reasoning and to that of fact. In the former it has by attention to render explicit what is otherwise only implicit, and by the intellect to introduce order into the a priori truths of reason, so that one may follow from another and they may constitute together a monde intcllectuel. To this art of orderly combination Leibnitz attached the greatest import- ance, and to it one of his earlicst writings was devoted. Similarly, in the sphere of experience, it is the business of the art of discovery to find out and classify the primitive facts or data, referring every other fact to them as its sufficient reason, so that new truths of ex- pericnce may be brought to light.

As the pereeption of the monad when clarified becomes thought, so the appetite of which all monads partake is raised to will, their spontaneity to freedom, in man (p. 669). The will is an effort or tendency to that which one finds good (p. 251), and is free only iu the seuse of being exempt from external control * (pp. 262, 513, 521), for it must always have asufficient reason for its action determined by what seems good to it. The end determining the will is pleasure (p. 269), and pleasure is the sense of an increase of perfection (p. 670). A will guided by reason will sacrifice transitory and pursue constant pleasures or happiness, and in this weighing of pleasures consists true wisdom. Leibnitz, like Spinoza, says that rwelo con- sists in following reason, servitude in following the passions (p. 669), and that the passions proceed from confused perceptions (pp. 188, 269). In love one finds joy in the happiness of another ; aud from love follow justice and law. ‘‘ Our reason,” says Leibnitz,* ‘ illu- mined by the spirit of God, reveals the law of nature,” and with it positive law must not conflict. Natural law rises from the strict command to avoid offence, through the maxim of equity which gives to each his due, to that of probity or piety (honeste vivere), —the highest ethical perfection, —which pean a belief in God, pro- vidence and a future life.5 Moral imimortality—not merely the simple continuity which belongs to every monad—comes from God

having provided that the changes of matter will not make man lose his individuality (pp. 126, 466).

Leibnitz thus makes the existence of God a postulate of morality as well as necessary for the realization of the monads, It is in the Théodicée that his theology is worked out and his view of the universe as the best possible world defended. In it he eontends that faith and reason are essentially harmonious (pp. 402, 479), and that nothing can be received as an article of faith which contradicts an eternal truth, though the ordinary physical order may be superseded by a higher.®

The ordinary arguments for the being of God are retained by Leibnitz in a modified form (p. 375). Descartes's ontological proof is supplemented by the clause that God as the ens a@ se must either exist or be impossible (pp. 80, 177, 708); in the cosmological proof he passes from the infinite series of finite causes to their sufficient reason which contains all changes in the series neccessarily in itself (pp. 147, 708); and he argues teleologically from the existence of harmony among the monads without any mutual influcnce to God as the author of this harmony (p. 480).

1 Different symbolie systems were proposed by Leibnitzat different periods; ef. Kvét, Leibnitzen's Logik, 1857, p. 37. ' }

2 The places at which Leibnitz anticipated the modern theory of logic mainly due to Boole are pointed out in Mr Venn's Symbolic Logic, 1881.

3 Hence the differenee of his detcrminism from that of Spinoza, though Leibnitz too says in one place that ''it is difficult enough to distinguish the actions of God from those of the ereatures " (Werke, ed. Pertz, 2d ser., i, 160).

4 Opera omnia, ed. Dutens, IV. iii. 282. a

5 Jbid., IV. iii, 295. Cf. Bluntsebli, Gesch. d. allg. Staatsrechts u. Politik, 1864, pp. 143 s¢.

§ P. 480; of. Werke, ed. Pertz, 2d ser., i. 158, 159.

In these proofs Letbnitz seems to have in view an extramundane power to whom the monads owe their reality, though such a concep- tion evidently breaks the continuity and harmony of his system, and can only be externally connected with it. But he also speaks in one place at any rate! of God as the "' universal harmony '. and the historians Erdmann and Zeller are of opinion that this 1s the only sense in which his system can be consistently theistic. Yet it would seem that to assume a purely active and therefore perfect monad as the source of all things is in accordance with the principle of continuity and with Leibnitz's conception of the gradation of existences. In this sense he sometimes speaks of God as the first or

highest of the monad (p. 678), and of created substances proceeding |

from Him continually by "'fulgurations " (p. 708) or by "a sort of emanation as we produce our thoughts." ?

The positive properties or perfections of the monads, Leibnitz holds, exist eminenter, 1.¢., without the limitation that attaches to created monads (p. 716), in God—their perception as His wisdom or intellect, and their appetite as His absolute will or goodness (p. 654); while the absence of all limitation ts the divine independence or power, which again consists in this, that the possibility of things depends on His intellect, their reality on His will (p. 506). The universe in its harmonious order is thus the realization of the divime end, and as such must be the best possible (p. 506). The teleology of Leibuitz becomes necessarily a Théodicéc. God created a world to manifest and communicate His perfection (p. 524), and, m choosing this world out of the infinite number that exist im the region of ideas (p. 515), was guided by the principium mclioris (p. 506). With this thoroughgoing optimism Leibnitz has to reconcile the existence of evil in the best of all possible worlds.3 With this end in view he distinguishes (p. 655) between (1) metaphysical evil or imperfection, which is unconditionally willed by God as essential to created beings; (2)

physical evil, such as pain, which is con- ditionally willed by God as punishment or as a incans to greater good (cf. p. 510) ; and (3) moral evil, in which the great difficulty lies, and which Lerbnitz makes various attempts to explain. He says that it was merely permitted not willed by God (p. 655), and, that being obviously no explanation, adds that it was permitted because it was foreseen that the world with evil would nevertheless be better than any other possible world (p. 350). He also speaks of the evil as a mere set-off to the good in the world, which it increases by con- trast (p. 149), and at other times reduces moral to metaphysical evil by giving it a merely negative existence, or says that their evil actions are to be referred to men alone, while it is only the power of action that comes from God, and the power of action is good (p. 658). ;

The great problem of Letbnitz's Théodicée thus remains unsolved. The suggestion that evil consists in a mere imperfection, like his idca of the monads procceding from God by a continual emanation, was too bold and too inconsistent with his immediate apologetic aim to be carried out by him. Had he donc so his theory would have transcended the independence of the monads with which it started, and found a deeper unity in the world than that resulting from the somewhat arbitrary assertion that the monads reflect the universe.

The philosophy of Leibnitz, in the more systematic and abstract form it recetved at the hands of Wolf, ruled the schools of Germany for nearly a century, and largely determined the character of the critical philosophy by which it was superseded. Onit Baumgarten laid the foundations of a science of esthetic. Its treatment of theo- logical questions heralded the German Aufklérung. And on many special points—in its physical doctrine of the conservation of force, its psychological hypothesis of unconscious perception, its attempt at a logical symbolism—it has suggested ideas fruitful for the pro- gress of science.

Literature.—No complete edition of the works of Leibnitz has been yet published, We have (1) the Opera omnia, by Dutens, Geneva, 1768, whieh does not contain all the works known at the time ; (2)

Leibnizens gesammelte Werke, by G. If. Pertz, Berlin, 1843-63 (first series, History, 4 vols.; second series, Philo- sophy, vol. l., eorrespondenee with Arnauld, &e., edited by G. L. Grotefend; third series, Mathematics, 7 vols, edited by C. J. Gerhardt); (8) that of M. Foucher de Careil, 7 vols., Paris, 1859-75, the same editor having previously issued Lettres et Opuscules inédits de Leibniz, Paris, 1854-57; (4) the magnificent editlon of Onno Klopp, Die Werke von Leibniz gemdss seinem handschriftlichen Nachlasse in der Kéniglichen Bibliothek zu Hannover, first series, Historico-Politieal and Politieal Writings, 10 vols., 1864-77. The @uvres de Leibniz, by A. Jaeques, 2 vols., Paris, 1842, may also be mentioned. ‘The philosophical writings have been published by Raspe (Amsterdam and Leipsic, 1765), by J. E. Erdmann (Leibnitii Opera philosophica que exstant Latina, Gallica, Germanica omnia, Berlin, 1840), and by P. Janet, 2 vols., Paris, 1866. The edition begnn in 1875 by C. J. Gerhardt (Die Dhilosophische Schriften von G. W. Leibniz), of which 4 vols. have been published, will, when finished, be the most complete. Leibnitz’s Deutsche Schriften have been edited by G. E. Guhraner (Berlin, 1838-40), and the (ehiefly mathematical) Briefwechsel zwischen Leibniz und Wolf., by C. J. Gerhardt (Halle, 1860). The Systema theologicum, first published by Emery, Paris, 1819, was translated into English by C. W. Russell, D.D., Maynooth, in 1850; an English edition of the correspondenee with Clarke was published by the latter, London, 1717.

The materials for the life of Leibnitz, in addltion to his own works, are the biographleal notes of Eekhart (not published till 1779), the Z7oge by Fontenelle

1 Werke, ed. Klopp, ill. 259; cf. Op. phil., p. 716.

2 Werke, ed. Pertz, 2d ser., i. 167.

4 “SL e’est ici le meilleur des mondes possibles, que sont done les autres?” — Voltaire, Candide, eh. vi.

(read to the Freneh Academy in 1717), the ‘ Euloginm,” by Wolf, in the Acta Eruditorum for July 1717, and the ‘‘ Supplementum” to the same by Feller, published in his Otium Hannoveranum, Leipsic, 1718. The best biography is that of G. E. Guhrauer, G. W. Freiherr von Leibnitz, 2 vols., Breslau, 1842 (Wachtrage, Breslau, 1846). A shorter Life of G. W. von Leibnitz, on the basis of the German work of Guhrauer, has been published by J. M. Mackie, Boston, 1845. More recent works are those of L. Grote, Leibniz und seine Zeit, Ianover, 1869, E. Pfleiderer, Leibniz als Patriot, Staatsmann, und Bildungstr dager, Leipsie, 1870 ; and the slighter volume of F. Kirehner, G. W. Leibniz: sein Leben und Denken, Kéthen, 1876,

The monographs and essays on Leibnitz are too numerous to mention, but referenee may be made to Feuerbaeh Darstellung, Entwicklung, und Kritik der Leibnitz’schen Phil. 2a ed., Leipsie, 1844; Nourrisson, La philosophie de Leibniz, Paris, 1860; R. Zimmermann, Leibnitz und Herbart: eine Ver- gleichung threr Monadologieen, Vienna, 1849; 0. Caspari, Leibniz’ Philosophie beleuchtet vom Gesichispunkt der physikalischen Grundbegritfe von Kraft und Stoff, Leipsie, 1870; G. Hartenstein, ‘‘ Locke’s Lehre yon.der mensehl. Erk. in Vergl. mit Leibniz’s Kritik derselben,” in the Abhandl. d. philol.-hist. Cl. d. K. Sachs. Gesells. d. Wiss., vol. iv., Leipsie, 1861; G. Class, Die metaph. Voraussetzungen des Leibnitzischen Deternrinismus, Tiibingen, 1874; F. B. Kvét, Letbnitzens Log7k, Prague, 1857; the essays on Leibnitz in Trendelenburg’s Beitrdge, vols. ii. and iii., Berlin, 1855, 1867; L. Neff, Leibniz als Sprachforscher, Teidelberg, 1870-71; J. Schmidt, Leibniz und Baumgarten, Halle, 1875; D. Nolen, La Critique de Kant et la Métaphysique de Leibniz, Paris, 1875; and the exhaustive work of A. Pichler, Die Theologie des Leibniz, Munich, 1869-70.

The best complete aecounts of the philosophy of Leibnitz are those of Erdmann, Gesch. d. neuern Phil. ii. 2 (abridged in his Grundriss d. Gesch. d. Phil., 3d ed., 1878, pp. 144-170); of Kuno Fischer, Gesch. d. neuern Phil., vol. il., 2d ed., 1867; and of E. Zeller, Deutsche Philosophie seit Leibniz, 1878, pp. 84-195. Fischer’s volume contains an exeellent biography. (W. R. SO.)

LEICESTER, an inland county of England, is bounded Plate VI.

N. by Nottinghamshire, E. by Lincolnshire and Rutland, S.E. by Northamptonshire, §.W. by Warwickshire, and N.W. by Derbyshire. It lies between 52° 24’ and 52° 59’ N. lat., and between 0° 39’ and 1° 37’ W. long. It has the form of an irregular hexagon, its greatest length being about 44 miles, and its greatest breadth about 40 miles. The area comprehends 511,719 acres, or nearly 800 square miles.

The surface of the county is an undulating table-land, the highest eminences being the rugged Charnwood hills in the north-west, one of which, Bardon Hill, has an elevation of 902 feet. The county belongs chiefly to the basin of the Trent, which forms for a shcrt distance its boundary with Derbyshire. The principal tributary of the Trent in Leicestershire is the Soar, from whose old desig- nation the Letre the county is said to derive its name, and which rises near Hinckley and flows beyond Kegworth. The Wreak, which under the name of the Eye rises on the borders of Rutland, flows south-westward to the Soar, and is connected with the canal navigation. Besides the Soar the other tributaries of the Trent are the Anker, the Devon, and the Mease. ‘The Avon after receiving the Swift passes into Warwickshire to join the Severn, and the Welland forms for some distance the boundary between Leicester and Northampton. The principal canals are the Union and Grand Union, which with their various branches are connected with the Grand Junction canal in Northamptonshire, and the Ashby-de-la-Zouch canal, which crosses the western corner of the county to Nuneaton, where it joins the Coventry canal.

Geology.—An irregularly shaped district of country south of the valley of the Trent and adjoining Derbyshire is occupied by Carboniferous rocks, forming the Leicestershire coal-field. In the north-west Charnwood forest is formed of crystalline and slaty rocks, of special interest to geologists, since, as they contain no fossils and occupy an isolated position, it is impossible to determine their age, although they have been variously classed as Cambrian, Silurian, and Laurentian. Further south, the remainder of the county to the west of the river Soar is occupied chiefly by red sandstone rocks of Triassic age, while to the

east a blue clay of the same age, mixed with marl, predomi- nates. In several districts, especially in the north-east, there are beds of limestone of Oolite age, and drift deposits overlie all the other formations. At Whitwick there is a remarkable vein of dolerite lying between the Coal-measures and the New Red Sandstone. The Coal-measures, which underlie the New Red Sandstone, are workable in the western and eastern districts of Moira and Coleorton, the total area of productive coal extending to 15 square

miles. The available coal in the Moira district is esti- mated at over 450,000,000 tons, and in the Coleorton district at over 380,000,000 tons. In 1870 the amount of coal produced was 599,450 tons, but for some years it has exceeded 1,000,000 tons, the number of collieries being about thirty. At a depth of 593 feet in the Moira coal-field there is a spring of salt-water, the brine of which is brought to Ashby-de-la-Zouch for use in scorbutic and rheumatic affections. Limestone is worked in various portions of the county, freestone is plentiful, gypsum is found, and a kind of granite, which is

50 Acres and under.

From 40 to 100

Aeres.

From 100 to 300 Acres.

Acres. No.

No. Acres. No.

966 896

77,391 74,464

69,044 63,409

1,406 1,407

213,605 244,189

A large number of the holdings between 100 and 390 acres are possessed by owners who farm their own land. In 1881 the total area of arable land was 473,998 acres, of which 91,952 were under corn crop, 22,033 under green crop, 25,302 rotation grasses, 317,869 permanent pasture, and 16,842 fallow; 740 acres were under orchards, 345 market gardens, 125 nursery grounds, and 11,252 woods. It will be observed that the proportion of pasture is very great. The pasture land is especially rich along the banks of the rivers. Of corn crops 33,675 acres were under wheat, 27,724 barley, and 23,330 oats. The number of cows in 1881 was 33,863, the total number of cattle being 123,681, an average of 26 to every 100 acres under cul- tivation, the average for England being 16°9. There are inany dairy farms for the manufacture of cheese, the famous Stilton cheese being made near Melton Mowbray. Horses numbered 18,085, the number used for agricultural pur- poses being 12,243. The breed was much improved by the importation by the well-known agriculturist Bakewell of mares from Flanders. As the county is famed for fox-hunting, there are many excellent riding horses. The number of sheep in 1881 was 263,383, an average of 51 to every 100 acres under cultivation, the average for England being 62°4. The famous New Leicesters, intro- duced by Bakewell, are the most common, but the Old Leicesters are still bred, and there is also a race of sheep peculiar to Charnwood forest. Pigs in 1881 numbered 21,765. According to the return of 1874, the land in 1872-73 was divided among 13,848 proprietors, possess- ing 519,524 acres, with an annual rental of £1,493,378, 10s. Of the owners only 35 per cent. possessed more than 1 acre, and the average value per acre all over was £2, 163. Among the principal proprietors are the duke of Rutland, possessing 30,109 acres; Lord Donington, 10,174 ; Earl Howe, 9755; the earl of Stamford and Warrington, 9012 ; and the earl of Dysart, 8420.

_ Manufactures.—The staple manufacture of the county is hosiery, for which the wool is obtained chiefly from home- bred sheep. Its

principal seats are Leicester, Hinckley, and Loughborough. Cotton hose are likewise made, and the other industries include the manufacture of boots and shoes, elastic webbing, silk plush for hats and lace, agricul- tural implements, bricks and pottery, and artificial manures.

Administration and Population.— Leicestershire com- prises six “hundreds,” the municipal and parliamentary borough of Leicester (122,351), and five other towns with a population of over 5000, viz., Loughborough (14,733), Hinckley, partly in Warwickshire (7673), Ashby-de-la- Zouch (7465), Melton Mowbray (5766), and Market Har- borough (5350). Thepopulation of thecounty, whichin 1801 was only 130,030, was 215,867 in 1841, 269,311 in 1871, and 321,018 (155,429 males and 165,589 females) in 1881, the increase within the last ten years being 19:2 per cent.

From 800 to 500

Acres. No.

165 189

LEC Bet eK

extensively used for paving purposes, is obtained at Charn- wood forest, Mount-Sorrel, Sapcote, and Stoney-Stanton.

Agriculture.—The climate is mild, and, on account of the inland. position of the county, and the absence of any very high elevations, the rainfall is very moderate. The soil is of a loamy character, the richest district being that to the east of the Soar, which is occupied by pasture, while the corn crops are growu chiefly on a lighter soil resting above the Red Sandstone formation. The following table gives a classification of holdings according to size, with the area under each class of holding :-—

From 500 to 1000

Acres, Aboye 1000 Acres,

No.

Acres. Total.

Acres. Aeres. Acres. No, Aeres.

60,990 66,482

8.360

2,506

8,559 8,363

470,005 472,826

15,615 3 21,776 2

The county returns six members to Parliament,—two for North and two for South Leicestershire, and two for the borough of Leicester. It has one court of quarter sessions, and is separated into nine petty sessional divisions, with which the police divisions are nearly identical. The borough of Leicester has a commission of the peace, a separate court of quarter sessions, and also its own police. The county is almost wholly in the diocese of Peterborough, and contains 331 civil parishes, townships, or places, as well as parts of other parishes, It is included in the Midland circuit, and assizes and quarter sessions are held at Leicester.

History and Antiquities.—Before the Roman invasion Leicester- shire was inhabited by the Coritani, and under the Romans it formed part of the province of Flavia Cxsariensis. The principal Roman roads are the Watling Street, which forms for 20 miles the south-west boundary of the county from Dovebridge near the Avon to near Atherstone, where it enters Warwickshire ; the Fosse road from Lincolnshire, which enters the county at Six Hills, and nasses by Leicester to Watling Street; the Via Devana from

olchestcr, which enters the county near Medbourne, and joins thie Fosse at Leicester on its way to Chester. The principal Roman stations were Ratz (Leicester), Verometum (supposed to have been Borough Hill), AManduessedum (Mancetter), and Benones (High- cross), Roman coins, urns, tessclated pavements, military weapons, and domestic utensils and other remains have been found in several places, especially at Leicester, Rothley, Wanlip, Harby, Bottesford, Hinckley, Sapcote, and Melton Mowbray. Two miles from Leicester a Roman milestone of the time of the emperor Hadrian was dis- covered in 1771. Under the Heptarchy Leicester was included in the kingdom of Mercia. Afterwards it was overrun by the Danes, from whom it was recovered by Ethelfieda. The most noteworthy event connected with the county was the battle ot Bosworth Field, where Richard III. was slain 22d August 1485; but it was fre- quently the scene of contests in the rcigns of John and of Henry III. and during the Revolution period.

The principal monastic foundations in Leiccster were priorics of Black Canons at St Mary Pre near Leicester founded in 1143, and at Breedon founded in 1144, priories of Benedictines at Hinckley in 1178 and of Benedictine nuns at Langley near Brecdon in the time of Henry I., a collegiate church at Leicester founded in the reign of William I., a priory of canons of St Augustine at Launde in the reign of Henry I. (now changed into a museum), houses of the Knights Hospitallers at Dalby and Heather, a priory of St Austin at Bradley, a preceptory of Knights Templars at Rothlcy in 1230, a house of Franciscans at Leicester founded by Simon de Montfort, a friary of St Augustine called St Catherine’s, also at Leicester, and a convent of canons regular of St Augustine at Kirkby, founded in 1359. The principal old castles are those of Ashby-de-la-Zouch and Kirkby-Muxloc.

The principal histories of Leicestershire are those of Nichols, 1790, 4th edition 1795-1820, Throsby, 1790, and Curtis, 1831. See also Domesday Book of Leicester, 1862; Walcott, Chantries of Leicester, 1874; Hull, Geology of the Leicester Coal- field, 1860; Aveline, Geology of part of Leicester, 1860; Judd, Geology of part of Leicester, 1875; Harrison, Geology of Leicester and Rutland, 1876, Yora fuller list see Anderson, Topography of the United Kingdom, 1881. ;

LEICESTER, @ municipal and parliamentary borough and market-town of England, and the chief town of the county of Leicester, is situated at the intersection of several railway lines, in a gentle hollow on the river Soar, 97 miles north-north-west of London, and 27 south of

Nottingham. The town is well built, the streets are spacious

LEICESTER

and regular, and the sanitary and water arrangements are very satisfactory. The most important of the churclies are St Martin's, near the site of an old Franciscan convent, restored in 1881 at a cost of £20,000; St Mary's, Early English and Norman, originally built in the 12th century, and restored in 1861 at a cost of £10,000; All Saints, an ancient structure in the Early English style, restored in 1875; St Margaret's, a beautiful and spacious building erected in 1444, Early English and Decorated, recently restored at a cost of £6000; and St Nicholas's, in the Early Norman style. Of the old castle two gateways are still standing, and alsoa portion of the Norman Hall. The other principal buildings are the old town-hall, formerly the guild-hall of Corpus Christi, the new town-hall erected in 1875, the town museum, the school of art, and the public baths, erected in 1879 at a cost of £11,000. One

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Plan of Leicester.

of the ornaments of the town is the memorial clock-tower erected in 1868 in honour of Simon de Montfort and three other less known persons connected with the district. In the neighbourhood of the town are the remains of the ubbey of Black Canons, founded in 1143. On the site of St Margaret's church was the old Saxon cathedral, and in the

adjoining abbey Cardinal Wolsey was buried. Besides Trinity Hospital, founded in 1331 by Henry Plantagenet, earl of Leicester, and Wyggeston's Hospital, founded in 1513, there are a large number of minor charities. There is a fine promenade from the town to the Victoria park and racecourse, in addition to which the Abbey park of 40 acres has lately been opened. The staple trade of Leicester is hosiery, including stockings and all kinds of fancy goods. 'There are also irou-foundries, and mauufac- tures of boots and shoes, elastic webs, and sewing cotton. The population of the municipal and parliamentary borough, 17,005 in 1801, had increased in 1871 to 95,220, and in 1881 to 122,351.

Leicester was an ancient British town, and under the name of Ratz: or Ratiscorion an important Roman station. It was also one of the five old Danish burghs, and until 874 it was an ecclesiastical sec. Its charter of incorporation was obtained from King John, and from the 23d of Edward I. it returned two members to parliament. Parliaments were held in the town by Henry VY. in 1414 and by Henry VI. in 1426. Richard IIJ., who passed a night in it om his way to the fatal battle of Bosworth, was buried in the Francis- can convent. The tewn was stormed by Charles I., May 31, 1645, and recovered by Fairfax in the June following. See the Histories of Throsby (1777), Robinson (1791), and Thompson (1871).

LEICESTER, Simon DE Montrort, Ear or. Montrort.

See

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LEICESTER, Rozperr Duprey, Earz or (c. 1531- 1588). This favourite of Queen Elizabeth came of an ambitious family. They were not, indeed, such mere upstarts as their enemies loved to represent them; for Leicester's grandfather—the notorious Edmund Dudley who was one of the chief instruments of Henry VII.'s extortions—was descended from a younger branch of the barons of Dudley. But the love of power was a passion which seems to have inereased in them with each succeed- ing generation, and though the grandfather was

beheaded by Henry VILI. for his too devoted services in the preceding reign, the father grew powerful enough in the days of Edward VI. to trouble the succession to the crown. This was that John Dudley, duke of Northumberland, who contrived the marriage of Lady Jame Grey with his own son Guildford Dudley, and involved both her and her husband in a common ruin with himself. Robert Dudley, the subject of this article, was an elder brother of Guild-

‘ford, and shared at that time in the misfortunes of the whole family. Having taken up arms with them against ‘Queen Mary, he was sent to the Tower, and was actually

sentenced to death; but the queen afterwards not only pardoned and restored him to liberty, but appointed him master of the ordnance. On the accession of Elizabeth he was also made master ef the horse. He was then, perhaps,

, about seven and twenty, and was evidently rising rapidly in

the queen’s favour. Atan early age he had been married to Amy, daughter of Sir John Robsart. The match had been arranged by his father, who was very studious to provide in this way for the future fortunesof his children, and the wed- ding was graced by the presence of King Edward. But it was not a happy marriage. The lady lived alone at Cumnor Hall in Berkshire, the house of one Anthony Forster, and there in the year 1560she died under circumstances which certainly aroused some suspicions of foul play. The scandal was the more serious as it was insinuated that Dudley stood so high in the queen’s favour that he might reasonably hope to marry her, and that a murder had been deliberately planned to remove an obstacle to his advancement. The point, it must be owned, is not free from obscurity, and recent revelations from the archives of

‘ Simancas prove that even before the unhappy lady’s death

it was said there was a design to poison her. After the event, however, the story was. that she had broken her neck by a fall down stairs, and, suspicious as the case may appear, there is much to be said in favour of

Dudley’s innocence, which cannot be discussed within our limits. Certain it isthat he continued to rise in the queen’s favour.

‘She made him a Knight of the Garter, and bestowed on

him the castle of Kenilworth, the lordship of Denbigh, and other lands of very great value in Warwickshire and in Wales. In September 1564 she created him baron of Denbigh, and immediately afterwards earl of Leicester. In the preceding month, when she visited Cambridge, she at his request addressed the university in Latin. The

‘honours shown him naturally excited jealousy, especially

as it was well known that he entertained still more

‘ambitious hopes, which the queen apparently did not

altogether discourage. The earl of Sussex, in opposition to him, strongly favoured a match with the archduke Charles of Austria. The court was divided, and, while arguments were set forth on the one side against the queen’s marrying a subject, the other party insisted strongly on the disadvantages of a foreign alliance. The queen, however, was so far from being foolishly in love with him that in 1564 she recommended him as a husband for Mary Queen of Scots. But even this, it was believed, was only a blind, and indeed it may be doubted how far the proposal was serious. After his creation as earl of Leicester great attention was paid to him both at home and abroad. The wEY, — “Ge

university of Oxford made him their chancellor, and Charles IX. of France sent him the order of St Michacl. A few years later he formed an ambiguous connexion with the baroness dowager of Sheffield, which was maintained by the lady, with great appearance of truth, to have been a valid marriage, though it was concealed from the quecu. Long. afterwards, in the days of James I., their son, Sir Robert Dudley, a man of extraordinary talents, sought to establish his legitimacy; but

his suit was suddenly brought to a stop, and the documents connected with it sealed up by an order of the Star Chamber, without any reasons being assigned.

In 1575 Queen Elizabeth visited the earl at Kenilworth, where she was entertained for some days with great magnificence. The picturesque account of the event given by Sir Walter Scott has made every one familiar with the general character of the scene. Next year Walter, earl of Essex, with whom Leicester had had some differences, died in Ireland, not without suspicion of poison, and Leicester's subsequent marriage with his widow again gave rise to very serious imputations against him. This marriage, like the former, was kept secret at first ; but it was revealed to the queen in 1579 by Simier, an enlissary of the duke of Alencgon, to whose projected match with Elizabeth the earl seemed to be the principal obstacle. The queen showed great displeasure at the news, and had some thought, it is said, of committing Leicester to the Tower, but was dissuaded from doing so by his rival the earl of Sussex. In February 1582 Leicester, along with a number of other noblemen and gentlemen, escorted the duke of Alencgon on his return to Antwerp to be invested with the government of the Low Countries. In 1584 he inaugurated an association for the protection of Queen Elizabeth against conspirators. About this time there issued from the press the famous pamphlet, believed to have been the work of Parsons the Jesuit, entitled Lewcester's Commonwealth, which was intended to suggest to the people that the English constitution was subverted aud the government handed over to one who was at heart an atheist and a traitor, besides being a man of infamous life and morals. The book was ordered to be suppressed by letters from the privy council, in which it was declared that the charges against the earl were to the queen's certain knowledge untrue; nevertheless they produced a very strong impression, and were believed in by some who had no sympathy with Jesuits long after Leicester's death. In 1585 he was appointed commander of an expedition to the Low Countries in aid of the revolted provinces, and sailed with a fleet of fifty ships to Flushing, where he was received with great enthusiasm. In January following he was invested with the government of the provinces, but immediately received a strong

reprimand from the queen for taking upon himself a function which she had not authorized. Both he and the States General were obliged to apologize ; but the latter protested that they had no intention of giving him absolute control of their affairs, and that it would be extremely dangerous to them to revoke the appointment. Leicester accordingly was allowed to retain his dignity; but the incident was inauspicious, nor did affairs prosper greatly under his management. His nephew Sir Philip Sidney was slain at the unsuccessful siege of Zutphen,.and complaints were made by the States General of the conduct of the whole campaign. He returned to England for a time, and went back in 1587, when he made an abortive effort to raise the siege of Sluys. Disagreements increasing between him and the States, he was recalled by the queen, from whom, contrary to the expectation of his enemies, he met with a very good reception ; and he continued in such favour that in the following summer (the ycar being that of the Armada,

1588) he was appointed lieutenant-general of the army mustered at Tilbury to resist Spanish invasion. After the crisis was past he was returning homewards from tle court to Kenilworth, when he was attacked by a sudden illness and died at his house at Cornbury in Oxfordshire, on the 4th September.

Such are the bare facts of Leicester’s life. Of his character it is more difficult to speak with confidence, but some features of it are indisputable. Being in person tall

‘and remarkably handsome, he improved these advantages

by a very ingratiating manner. A man of no small ability and still more ambition, he was nevertheless vain, and presumed at times upon his influence with the queen to a degree that brought upon him a sharp rebuff. On the other hand, Elizabeth stood by him, as we have seen, against efforts to supplant him. That she was ever really in love with him, as modern writers have supposed, is extremely questionable ; but she saw in him some valuable qualities which marked him as the fitting recipient of high favours. He was a man of princely tastes,

especially in architecture. At court he became latterly the leader of the Puritan party, and his letters were pervaded by expressions of religious feeling which it is hard to believe were insincere. Of the darker suspicions against him it is enough to say that much was certainly reported beyond the truth ; but there remain' some facts sufficiently mysterious to make a just estimate of the man a rather perplexing problem. (3. GA.)

LEIGH, a market and manufacturing town of Lanca- shire, England, is situated on several branch railway lines, 74 miles south-west of Bolton, The ancient parish church was, with the exception of the old tower, rebuilt in 1873 in the Perpendicular style, at a cost of over £10,000. The grammar school, the date of whose foundation is unknown, received its principal endowments in 1655, 1662, and 1681. A union workhouse was erected in 1851 at a cost of £10,000. The staple manufactures of the town are silk aud cotton, but there are also glass-works, foundries, breweries, aud flour-mills, with extensive collieries. The local government board was formed in 1875 by the amalgamation of those previously existing for the town- ships of West Leigh, Bedford, and Pennington. The population of the district was 17,623 in 1871, and 21,733 in 1881. The town includes also a portion of the town- ship of Atherton.

LEIGH, Epwarp (1602-1671), Puritan linguist and theologian, was born in 1602 at Shawell, Leicestershire, was educated at Magdalen Hall, Oxford, from 1616, and subsequently became a member of the Middle Temple. In 1636 he entered parliament as member for Stafford, and during the civil war he held a colonelcy in the parliamen- tary army. He has sometimes been confounded with John Ley, and so represented as having sat in the Westminster Assembly. The public career of Leigh terminated with his expulsion from parliament along with the rest of the Presbyterian party in 1648. From an early period in his life he devoted much of his time to the study of theology and to the preparation for the press of numerous compila- tions, the most important of these being the Critica Sacra, containing observations on all the Radices of the Hebrew Words of the Old and the Greek of the New Testament (1639-44; new ed., with supplement, 1662), for which

the author received the thanks of the Westminster Assembly, to whom it was dedicated. It has frequently been reprinted abroad, and, in the opinion of Leigh's contemporary Fuller, it, " with many other worthy works, will make his judicious industry known to posterity." It is now, however, but little used. Leigh died in Staffordshire in June 1671.

His remaining works include A Treatise of Divinity (1646-51), A Body of Divinity (1654), Annotations upon the New Testament

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(1650), of which Leipsic in Testament (1657), A Treatise of Religion and Learning (1656), Select and Choiee Observations coneerning the First Twelve Cexsars

(1635).

LEIGHTON, Rosert (1611-1684), bishop of Dunblane, and afterwards archbishop of Glasgow, was the eldest son of Dr Alexander Leighton, the author of Zion's Plea against the Prelacie, whose terrible sufferings for having dared to question the divine right of Episcopacy, under the perse- eution of Laud, form one of the most disgraceful incidents of the reign of Charles I. Dr Leighton is said to have been of the old family of Ulishaven in Forfarshire, and his illustrious son was born in the year 1611. From his earliest childhood, according to Burnet, he was distinguished for his saintly temper and disposition, and in his sixteenth year (1627) he was sent to complete his education at the university of Edinburgh, where, after studying with dis- tinguished success for four years, he took his degree of M.A. in 1631.!

After leaving college his father sent him to travel abroad, and he is understood to have spent several years in France, where he acquired a complete mastery of the French language. While there he passed a good deal of time with some relations at Douay who had become Roman Catholics, and with whom he would seem to have formed a strict friendship, as he kept up a correspondence with them for many

years afterwards. Either at this time or on some subsequent visit to the Continent he had also a good deal of intercourse with some members of the Jansenist party. And no doubt what he then saw among these excellent persons of the piety which was possible even in a communion which he believed to be corrupt contributed not a little to the charity towards those who differed from him in religious opinions, which ever after- wards formed so remarkable a feature in his character. The exact period of his return to Scotland has not beeu ascertained ; but in 1641 he was ordained Presbyterian

a Latin translation by Arnold was published at

minister of Newbattle in Midlothian, where he continued ©

for about ten years, At the end of that period he resigned his charge, and went to reside in Edinburgh (1652). What the precise circumstances were which led him to take this step does not distinctly appear. But the account given is that the fiery zeal of his brother clergymen on certain political questions found little sympathy with him, and that this led to severe censures on their part, which were too much for his gentle nature to bear.

Early in the following year (1653) he was appointed principal of the university of Edinburgh, and _primarius professor of divinity. In this post he continued for seven

or eight years, and, according to Burnet, “he was a great

blessing in it; for he talked so to all the youth of any capacity or distinction that it had a great effect on many of them.” A considerable number of his Latin prelections and other addresses to the students were published after his death, and are singularly remarkable for the purity and

1 One has difficulty in thinking of even the youthful Leighton as capable of humour or sarcasm. But it so happens that the only anecdote of his college career which has been prescrved to us indicates the presence of some trace of these in his character. The provost of

Udinburgh at the time was a certain David Aikenhead, who had prob- ably made himself offensive in some way to the young collegians, and Leighton, it appears, was tempted to perpetrate the following little epigram upon him :—

‘“‘That quhilk his name pretends is falsely said,

To wit that of ane aike his head is made,

For if that it had been composed soe,

His fyrie nose had flaimed it long agoe.” To ‘“blaspheme the bailies’ (much more the provost) was at that time a somewhat serious offence, and we are told that he was “ extruded” from the college for his attack upon the provost’s nose. It would seem, however, that the offence was speedily condoned, as he is found soon afterwards to have been restored to his position.

1732, Ann tations on th: Five Poetieal Books of the Old |

elegance of their Latinity, and their subdued and medi- tative eloquence. The reader will be disappointed if he expects to find in them any subtle exposition of a meta- physical system of theology. In this respect they present a curious contrast to any thing that is known of the theology taught at that time in the Presbyterian Church of Scotland. They are rather to be regarded as valuable instructions in the art of living a holy life than as a body of scientific divinity. Throughout, however, they bear the marks of a deeply learned and accomplished mind, fully saturated with both classical and patristic reading, and like all his works they breathe the spirit of one who lived very much above the world. It would be interesting to ascertain how far he succeeded in instilling something of his own spirit into the minds of those who listened to his teaching. We certainly meet with very little indication of its having taken any deep root in the hearts of either the Presbytcrian or the Episcopalian clergy of the twenty or thirty years which succeeded the period of his principal- ship. The only

writer of the time who has spoken with true appreciation of his character is Bishop Burnet ; both in his History of his Own Times and in his Pastoral Care he has referred to Leighton in language of unbounded affection and admiration. This, however, was founded upon knowledge of him obtained in the course of a friend- ship formed after he had demitted his office of principal, and not upon his university teaching.

In 1661, when Charles II. had resolved to force Epis- copacy once more upon Scotland, he fixed upon Leighton for one of his bishops. Looking at the matter, as we are apt to do, in the light of what followed in the history of Scotland during the next twenty-seven years, it seems almost unaccountable how such a man as Leighton could have submitted as he did to the degradation of being | associated with coadjutors like Sharp and some of his companion bishops. The only explanations which can be given perhaps are that Leighton, living very much out of the world, and being somewhat deficient in what may be _ called the political sense, had no idea of the deadly hatred entertained toward Episcopacy by the great mass of the religious people of Scotland, and s0 of its utter unfitness to become the established church polity of the country, and that his soft and gentle nature rendered him too open to the persuasions which were used to induce him to enter a sphere for which he instinctively felt he was ill qualified. Every one will give him credit too for having no conception that the only object of the Government in establishing Episcopacy in Scotland was to make it subservient to despotism and persecution. The Episcopacy which he contemplated was that modified form which had been suggested by Archbishop Ussher, and to which Baxter and many of the best of the English Nonconformists would have readily given their adherence. It is significant on this head that he always refused to be addressed as “my lord,” and it is stated that when dining with his clergymen on one occasion he was so far from arrogating any right of superiority or precedence that he wished to seat himself at the foot of the table.?

If Leighton did not know before, he soon began to dis- cover the sort of men with whom he was to be associated ‘in the episcopate. He travelled with them in the same coach frora London towards Scotland,

but having become, as he told Burnet, very weary of their company (as he doubted not they were of his), and having found that they intended to make a kind of triumphal entrance into Edin- burgh, he left them at Morpeth and retired to the earl of

2 For an interesting and characteristic indication of the purity of his motives in accepting a bishopric, reference may be made to his letter to the earl of Lothian, dated December 23, 1661, which is still pre- | served among the Lothian papers. ~

Lothian's at Newhbattle. He very soon, we are told, lost all hope of being able to build up the church by the means which the Government had set on foot, and his work, as he confessed to Burnet, ''seemed to him a fighting against God." He did, however, what he could, governing his diocese (that of Dunblane) with the utmost mildness, as far as he could preventing tlie persecuting measures which were in active operation elsewhere, and endeavouring to persuade the Presbyterian clergy to sink their differences and come to an accommodation with their Episcopal brethren. In this last matter he seems to have succeeded no better with the Presbyterians than Baxter in England did in a similar attempt with the Episcopalian party; and, after a hopeless struggle of three or four years to induce the Government to put a stop to their fierce persecution of the Covenanters, he at length determined to resign his bishopric, and went up to London in 1665 for this purpose. He told the king that "le could not concur in the planting the Christian religion itself in such a manner, much less a form of government," and so far worked upon the mind of Charles that he promised to enforce the adoption of milder measures. In the hope that this would be carried into effect, he returned to his diocese, but it does not appear that any material improvement took place. In 1669 Leighton again went to London and made fresh repre- seutations on the subject, which were so far attended to, but, partly perhaps from faults on the Presbyterian as well as the Episcopalian side, little result followed. The slight disposition, however, shown by the Government to accommodate matters appears

to have inspired so much hope into Leighton's mind that in the following year he agreed, though with a good deal of hesitation, to accept the archbishopric of Glasgow. In this new and higher sphere he redoubled his efforts with the Presbyterians to bring about some degree of conciliation with Episcopacy, but all was of no avail, and the only result of his attempts was to embroil himself with the hot-headed Episcopal party as well as with tle Presbyterians. In utter despair, therefore, of being able to be of any further service to the cause of religion, he at length in 1674 threw up the arch- bishopric and retired, after a short stay, probably with his successor in the divinity chair, William Colville, within the precincts of Edinburgh university, to the house of his widowed sister, Mrs Lightmaker, at Broadhurst in Sussex. Here he spent the remaining ten years, in all likelihood the happiest, of his life, and died somewhat suddenly on a visit to Londun in 1684, in the seventy-fourth year of his age.

It is difficult to form a just or at least a full estimate of Leighton's character. He stands almost alone in his age. 1n some respects he was immeasurably superior both in intellect and in piety to most of the Scottish ecclesiastics of his time; and yet he seems to have had almost no influence in moulding the characters or conduct of his contemporaries. One is half inclined to think that he would have shown himself a greater or at least a more complete man if a few natural weaknesses and imperfections had intermingled with his nobler qualities. So intense was his absorption in the love of God that little room seems to have been left in his heart for human sympathy or affection. Can it be that there was after all something to repel in his outward manner? Burnet tells us that he had never seen him to laugh, and very seldom even to smile. One can hardly forgive him for regarding Episcopacy so purely under the dry licht of human reason after the horrible treatment which Iris excellent father had suffered from it. In other respects, too, he gives the im- pression of standing aloof from human interests and ties. It may go for little that he never married, but it was surely a curious idiosyn- crasy in the man that he habitually cherished the wish (which was granted him) that he might die in an inn, where there could be no loving hand to support, no loving heart tocheer him. In fact, holy meditation seems to have been the one absorbing interest of his life. At Dunblane tradition still preserves the memory of 'the good bishop," silent and companionless, pacing up and down the sloping

walk by the river's bank under the beautiful west window of his |

cathedral. And from a letter of the earl of Lothian to his countess it appears that, whatever other reasous Leighton might have had

for resigning his charge at Newbattle, the main object which he had in view was to be left to his own thoughts. It is therefore on the whole not very wonderful that he was completely misjudged and even disliked both by the Presbyterian aud the Episcopal party. Some of the bitter expressions of hatred towards him, however, on the part of the former, sonnd yery strauge to us who now know how holy, humble, and blameless the man really was. Thus in Naphtalt it is said, '' Mr

Leighton, prelate of Dumblain, under a Jesuitical- like vizard of pretended holiness, humility, and crucifixion to the world, hath studied to seem to creep upon the ground, but always up the hill, toward promotion and places of more ease and honour, and as there is none of them all hath with a kiss so betrayed the cause and sinitten religion under the fifth rib, and hath been such an offence to the godly, so there is none who by his way, practice, and expressions giveth greater suspicion of a popish affection, in- clination, and design."" So also in the continuation of Robert Blair's life by his son-in-law, William Ross, the most innocent of Leighton's acts have a malicious interpretation put upon them. When he re- signed Newbattle, he ‘‘ pretended insutticiency for the ministry " ; when he returucd to Edinburgh as bishop and expressed an opinion in favour of the English liturgy and ceremonies, ‘‘it was suspected that he was popish and Jesuited''; when he refused the title of lord, and in other respects carried himself modestly and humbly, he was simply ‘‘a pawky prelate." When he spoke in parliament in favour of the outed ministers, and thought that they ought to be ‘‘ cherished aud embraced " instead of persecuted, offending all the other prelates by the course he took, ‘‘it was difficult what to judge of his actings or sayings, he carried so smoothly among the ministers of his diocese." Some, indeed, we are told, thought well of him, but others thought 'that he spoke from a popish principle." When he behaved sweetly and gently to the clergy of his diocese, telling them to hold their presbyteries and sessions as before, and suggesting without commanding any thing, it was ‘‘thought that he was but straking cream in their mouths at first." When disgusted with the proceed- ings of the other bishops in ‘‘ outing so many honest ministers and filling their places with insufficient and for the most part scandalous men," and intimating his wish to demit his office in consequence, he was only ‘‘pretending to be displeased." When the king wrote to the council that some of the most peaceable and moderate onted ministers might have liberty to preach, and Leighton pleaded that all might have the like liberty, it was ‘‘thought that he did this of purpose to oppose and crush it." Nothing that the good man could say or do brought upon him anything bunt suspicion and calumny. Even Wodrow, who generally gets credit for fairness and candonr, tells us that ‘‘he was judged void of any doctrinal princi-

ples,” and that he was regarded ‘‘as very mucli indifferent to all professions which bore the name of Christian.” .

It is worth while to set over against these uncharitable and malig- nant insinuations the estimate which his intimate friend Bishop Burnet formed of him. At the conclusion of his Pastoral Care, he says, ‘‘ I have now laid together with great simplicity what has been the chief subject of my thoughts for above thirty years. I was formed to them by a bishop that had the greatest elevation of soul, the largest compass of knowledge, the most mortified and heavenly dis- position, that I cver yet saw in mortal; that had the greatest

varts as well as virtue, with the perfectest humility that I ever saw

In man, and had a sublime strain in preaching, with so grave a gesture, and such a majesty of thought, of language, and of pro- nunciation, that I never once saw a wandering eye where he ~~ and have seen whole asscinblies often melt in tears before him; and of whom [can say with great truth that, in a free and frequent con- versation with lim for above two and twenty years, I never knew him say an idle word, or onc that had not a direct tendency to edification ; and I never once saw him in any other temper but that which I wished to be in, in the last minutes of my life.”

No one can study Leighton’s works without feeling that Burnet’s judgment of the man must have been the true one. We know not if anywhere, exccpt in Holy Scripture, there is to be found so much of what seems to breathe the very breath of heaven, or to be the expression of a life quite apart from the life of this world. It was characteristic of him that he.could never be made to understand that anything which he wrote possessed the smallest value. None of his works were published by himself, and it is stated that he actually left orders that all his MSS. should be destroyed after his death. But fortunately for the world this charge was disregarded. Like all the best writing, it seems to flow from his pen without effort. It is simply the easy unaffected outcome of his saintly nature, and hence it always carries the reader along with it without arresting the current of his thoughts or diverting his attention by brilliant flashes of imagination or

curious turns of expression like what we find in Jeremy Taylor, Dr Donne, and others of that time. Throughout, however, it is the language of a scholar and a man of perfect literary taste; and with all its spirituality of thought there are no mystical raptures, and none of that luscious seusuousness which sometimes intermingles itself in the Scottish practical theology of the 17th century. No writer conveys a clearer or more clevated idea both of what Christian religion is and what

it is capable of in the heart of man. It was a common reproach against Leighton, as we have seen, that he had leanings towards Roman Catholicism, and perhaps this is so far true that he had formed himself in some degree upon the model of some of those saintly — of that faith, such as Pascal and Thomas a Kempis, who had carried the spiritual life to more ethereal heights than appear to be as yet attained within the lines of Protestantism. Editions.—It is matter of regret that no perfectly satisfactory edition of Leighton's works has as yet appeared. After his death

his Commentary on Peter and several of his other works were pub- |

lished under the editorship of his friend Dr Fall, aud on the whole those early editions may be said to be, with some drawbacks, by far the best. All his later editors have unfortunately been possessed by the tasteless mania of reducing his good archaic and nervous language to the bald fecbleness of modern phraseology, dealing with him like literary martinets correcting a schoolboy's themes. It is unfortunately impossible to exempt from this criticism even the edition, in other respects very valuable and meritorious, lately pub- lished under the superintendence of the Rev. W. West (London,

1875). (J. T. BR)

LEIGHTON-BUZZARD, a market-town of Bedford- shire, is situated on the river Ouse, which there divides Bedford from Bucks, and on the North-Western Railway, 40 miles north of London, Thetown, which is

generally well built, contains a spacious market-place, and of late great improvement has taken place in the appearance of the shops. The church of-All Saints, in the Early English style of architecture, possesses a tower and spire 193 feet in height. Inthe market-place are the town-hall, rebuilt in 1852, and containing portions of a very ancient struc- ture, the corn exchange erected in 1862, and the fine old wnarket-cross, in the Perpendicular style, erected in 1330. National school premises were built in 1872. There are also several charities. The manufacture of straw plait gives employment to a considerable number of females, but the town is chiefly dependent on agriculture. The popula- tion of the registration sub-district in 1871 was 9942, and in 1881] it was 10,384. .

Some identify Leighton-Buzzard with the Lygeanburgh men- tioned in the Saxon Chronicle as having been taken in 571 by Cuthwulf, brother of Ceawlin, king of Wessex. The addition Buzzard has been conjectured to be a corruption of Beau-desert, but others also derive it from Bozzard or Bosart, the name of an

ancient family, one of whom was knight of the shire in the time of Edward III.

LEINSTER. See IRELAND.

LEIPSIC (in German, Leipzig), the second town of the |

kingdom of Saxony in size, and the first in commercial importance, is situated in a large and fertile plain, in 51° 20’ 6” N. lat. and 12° 23’ 37” E. long,, about 65 miles north- west of Dresden and 6 miles from the Prussian frontier. It stands just above the junction of three small rivers, the Pleisse, the Parthe, and the Elster, which flow in various branches through or round the town, and afterwards, under the name of Elster, discharge themselves into the Saale. Though of unimposing exterior, Leipsic is one of the most prosperous and enterprising of German towns, Besides being the most important commercial city in Ger- many next to Hamburg, it possesses the second largest German university, is the headquarters of the supreme courts of the empire, and forms one of the most prominent literary and musical centres in

Europe. It consists of the old or inner city, surrounded by a wide and pleasant pro- menade laid out on the site of the eld fortifications, and of the very much more extensive inner and outer suburbs. Beyond the last is a fringe of thriving suburban villages, such as Reudnitz, Volkmarsdorf, Golilis, Eutritzsch, Plag- witz, and Lindenau, which are gradually becoming absorbed by the growth of the town. On the north-west the town is bordered by the fing public park and woods of the Rosenthal.

The old town, with its narrow streets and numerous houses of the 16th and 17th centuries, still preserves much of its quaint mediaval aspect. The most interest- ing of its buildings are the Rathhaus, a Gothic edifice

built by Hieronymus Lotter in 1556 (now doomed to demolition), and the Fiirstenhaus, with its curious project- ing balconies. The Pleissenburg, or citadel, now used for barracks and public offices, also dates from the middle of the 16th century. Auerbach’s Keller, a curious old wine- vault, is interesting for the use made of it by Goethe in his Faust; it contains a series of mural paintings of the 16th century, representing the legend on which the play is based. The business of Leipsic is chiefly coucentrated in the inner city ; but the headquarters of the book trade lie in the east suburb. The streets of the suburbs are mostly broad and well built. The most netable modern buildings are the new theatre, an imposing Renaissance structure designed by Langhans, and the museum, which stand facing each other at opposite ends of the spacious Augustus-Platz. Most of the west side of the same square

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Plan of L is occupied by the Angusteum, or main building of the university, which, however, also possesses several special institutes in another part of the town. The new district law courts are contained in a large and substantial though not specially imposing building, and the municipal hospital and the hospital of St John are also handsome edifices. The so-called Roman House, with loggie and frescos in the Italian style, is the only private dwelling demanding remark. The churches of Leipsic are comparatively uninteresting. The oldest, in its present form, is the Paulinerkirche or university church, built in 1229-40, and the largest is the Thomaskirche, dating from 1496. ‘The university of Leipsic, founded in 1409 by a secession of two thousand German students from Prague, has long yanked among the most important in Germany. A few years ago it was also the most numerously attended, but it is now outstripped by Berlin, which has about four thousand students as compared with thirty five hundred at Leipsic (1882). The professors and “ Privatdocenten,” or jecturers, number abont one hundred aud seventy. The university library contains 350,000 volumes and 4000 manuscripts ; it eccupies the Paulinum, a characteristic specimen of old monastic architecture, dating in part from

1229-1240. The other educational institutions of Leipsic | publishers and booksellers in the town, and about five

include three gymnasia, two “ Realschnlen,” a commercial academy (Handelsschule), a high school for girls, another for boys, and a large number of admirable public and private schools of a lower grade. :

The number of literary, scientific, and artistic institutions in Leipsic is unusually large for the size of the town. One of the most important is the museum, which contains about four hundred modern paintings, a large number of casts, a few pieces of original sculpture, and a well-

arranged collec- tion of drawings and engravings. The art-industrial museum, the collection of the histurical society, and the ethnographical museum are also of considerable interest, and will be still more useful when they are united in the large building to be erected for them with part of the munificent bequest made to the town by Herr Grassi in 1881. As a musical centre Leipsic is known all over the world for its excellent con- servatorium, founded in 1843 by Mendelssohn-Bartholdy. The series of concerts given annually in the old Gewand-haus, or Drapers' Hall, is also of world-wide reputation, and the operatic stage of Leipsic is deservedly ranked among the finest in Germany. A further stimulus to the musical taste of the inhabitants is afforded by the numerous vocal and orchestral societies, some of which have brought their art to a very high pitch of perfection. The prominence of the publishing interest (more fully noticed below) has attracted to Leipsic a large number of gifted authors, and iaade it a literary centre of considerable importance. About two hundred and seventy newspapers and periodicals are published here, including several of the most widely circulated in Germany.

The outstanding importance of Leipsic as a commercial town is mainly derived from its three great fairs, which annually attract a concourse of about forty thousand mer- chants from all parts of Europe, and from Persia, Armenia, and other Asiatic countries. The most important fairs are held at Easter and Michaelmas, and are said to have been founded as markets about 1170. The smaller New Year's fair was established in 1458. In 1268 Margrave Dietrich granted a safe-conduct to all frequenters of the fairs, and in 1497 and 1507 the emperor Maximilian greatly increased their importance by prohibiting the holding of annual inarkets at any town within a wide radius of Leipsic. During the Thirty Years' War, the Seven Years' War, and the troubles consequent upon the French Revolution, the

trade of the Leipsic fairs considerably decreased, but it

recovered itself after the accession of Saxony to the xerman Customs Union (Zollverein) in 1833, and for the next twenty years rapidly and steadily increased. Since then, owing to the greater facilities of

communication and consequent alterations in the mode of conducting business, the transactions at the fairs may be said to have diminished in relative though they have increased in actual value. Wares that can be safely purchased by sample appear at the fairs in steadily diminishing quantities, while others, such as hides, furs, and leather, which require to be actually examined, show as marked an increase. It is impossible to give accurate statistics of the business done at the fair, but the value of the sales considerably exceeds £10,000,000 sterling per annum. The principal com- modity is furs (chiefly American and Russian), of which about one and a quarter million pounds worth are annually disposed of ; next in order come leather, hides, wool, cloth, linen, and glass. The Leipsic wool-market, held for two days in June, is also important.

In the trades of bookselling and publishing Leipsic occupies a unique position, not only taking the first place in Germany, but even surpassing London and Paris in the number and total value of its sales (Hasse, Leipzig und thre

Umgebung, p. 236).

There are upwards of three hundred | i

thousand firms in other parts of Enrope are represented here by commissioners. About 2500 books, or one-sixth of the total production of Germany, are published in Leipsic annually. Several hundred booksellers assemble in Leipsie every year at Jubilate, and settle their accounts at their own exchange (Buchhdndler-Borse). Leipsic also contains seventy printing-works, some of great extent, and a corre- sponding number of type-foundries, binding-shops, and other kindred industries. The so-called “polygraphic” industries give employment to nearly ten thousand hands.

As a manufacturing town Leipsic is important rather for the variety than for the magnitude of its industries. The great manufacturing staples, such as iron and the textile fabrics, are scarcely represented at all, but in certain specialities, such as etheric oils, artificial flowers, and perfumes, it ranks before any other town in Ger- many. In absolute

value the most important articles of manufacture are pianos and other musical instruments, tobacco and cigars, spirits, chemicals, scientific instruments, and waxcloth. Wool-combing has also of late years been extensively carried on. Upwards of fifty thousand workpeople are employed in the factories in and around Leipsic,

The population of Leipsic has been quintupled within the present century, rising from 31,887 in 1801 to 153,988 in 1881, and has of late increased at the rate of between 3 and 4 per cent. per annunt. With the suburban villages the population amounts to 220,000. While the dwelling-houses in the suburbs have been multiplied six- fold in the last two hundred years, the number in the inner town has remained almost stationary for the same period, the business part of Leipsie thus exhibiting the same phenomicnon as in other large eities. The vast majority of the population (upwards of 90 per eent.) belongs to the Luthcran Church, while the religious bodics next in numerical order are the Roman Catholics (4288), the Reformed (3368), and the Jews (3179). The annual death-rate is 23 to 24 per 1000, in which Leipsic, thanks in part to its execllent system of drainage, compares favourably with other large German towns. It is remarkable that the proportion of suicides to popula- tion is larger in Leipsic than in any other European town. In the five years 1876-80 no fewer than 332 persons voluntarily put an end to their lives, being at the rate of 62 per annum, or 1 suicide to every 30 deaths of adults.

History.—Though recent discoveries point to the conclusion that the site of Leipsic was inhabited even during the Stone Age, the history of the present town begins with the foundation of a Sorbian fishing village at the junction of the Pleisse and the Parthe, which derived its name of Lipzk from the Slavonie dip or lipa, a lime-tree, This settlement was probably already in existence when the emperor Henry IJ. built a castle here about 920. The Slavonic language long continued to be spoken in Leipsic, and was legal in the courts of law down to 1327. The first historical mention of Leipsic occurs in a writing of the beginning of the 11th eentury, when it is spoken of as an ‘‘yrbs,” or fortified place. In 11384 it came into the

_ possession of Conrad of Wettin, margrave of Meissen, and under

Margrave Otho the Rich (1156-89) it received many important privi-leges, and became a flourishing town of 5000 to 6000 inhabitants. Its favourable situation, almost cquidistant from the Baltie Sea and the Alps, the Rhine and the Oder, in the midst of a fertile plain intersected by the principal highways of central Europe from north to south and east to west, co-operated with the fostering care of the margraves in raising it in the 15th century to the position of one of the most important commercial towns inGermany, The growth of its fairs, which of eoyrss were mainly instrumental in producing this result, has been above described. The famous conference between Luther and Dr Eck, held in the Leipsic Pleissenburg in 1519, did much for the spread of the Reformation, but it was not till twenty years later that Lcipsie formally espoused the Protestant eause. In 1547, in the war of the Snialkaldic league, the town was besieged and the suburbs reduced to ashes, and during the Thirty Years' War it suffered six sieges and was four times oceupied by hostile troops. Its commeree was also greatly interrupted by the Seven Years' War. The publishing trade of Leipsie began to grow important towards the eud of the 17th ecntury, when the severity of the censorship at Frankfort-on-the-Main caused many of its booksellers to emigrate to Leipsic. The preliminary years of the French Revolutionary wars were not unfavourable to the commerce of Leipsic, but in 1813 and 1814 the town snffered greatly. Its accession to the Zollverein in 1833 and the establishment of the German system of railways (of which Leipsic is an important centre) naugurated a period of great prosperity, which has continued to the

present day. The revolutionary riots of 1848-49 and the Prussian occupation in 1866-67 were merely passing shadows. In 1879 Leipsic acquired a new importance by becoming the seat of the supreme courts of the German empire.

The immediate neighbourhood of Leipsic has been the scene of

umerous battles, two of which are of more than ordinary import- ance, Viz., the battle of Breitenfeld in 1631 (vol. xi. p. 334), and the great battle of Leipsic, known in Germany as the V élkerschlacht, fought in 1813 betwcen Napoleon and the allied forces of Russia, Germany, and Austria.

Towards the middle of last century Leipsic was the seat of the most influential body of literary men in Germany, over whom GoTTscHED (q.v.), like hiseontemporary Samuel Johnson in England, exercised a kind of literary dictatorship. Then, if ever, Leipsic deserved the epithet of a ‘‘ Paris in miniature” (KJein-Paris), assigned to it by Goethe in his Faust. The young Lessing pro- duced his first play in the Leipsic theatre, and the nniversity counts Goethe, Klopstock, Jean Paul Richter, the Schlegels, Fichte, Schelling, and numerous other eminent writers and thinkers among its quondam alumni. Schiller also resided for a time in Leipsic, and Sebastian Bach, Hiller, and Mendelssohn all filled inusical posts there. Among the famous natives of the town are the philosopher Leibnitz and the composer Wagner.

See the Urkundenbuch der Stadt Leipzig, 1870 sqg.; Grosse, Geschichte der Stadt Leipzig, 1887-42; Sparfeld, Chronik der Stadt Leipzig, 2d ed., 1851; Gretschel, Die Universitét Leipzig, 1830; Moser, Leipztg’s Handel und Messen. 1869; Hasse, Die Stadt Leipzig und thre Umgebung geographisch und statistisch beschrieben, 1878; the Mittheilungen of the Statistical Bureau of Leipsie; and the Schriften of ihe Leipsie Historieal Socicty. (J. F. M.)

LEITH, a municipal and parliamentary burgh of Mid- lothian, the chief seaport of the east coast of Scotland, 17 miles north by east of Edinburgh, with which it is con- nected by Leith Walk and other lines of street. It is built on the southern shore of the Firth of Forth, at the mouth

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Plan of Leith.

divides it into North and South Leith. Stretching along the coast for about 3} miles from Seafield on the east to Granton on the west, the burgh includes the fishing village of Newhaven, the suburb of Trinity, and part of Wardie,

and extends to an area of 1978 acres. It figures as Inver- leith (“ mouth of the Leith”) in the foundation charter of Holyrood Abbey (1128); and many of its houses, in narrow wynds and along the eastern waterside, have an

antique and decayed appearance. The earliest date on any is 1573; but one, at the Coalhill, is thought to be the ‘handsome and spacious edifice” built for her privy council by the queen regent, Mary of Guise. Nothing remains of D’Essé’s fortifications (1549) or of Cromwell’s “fair citadel” (1650); but it was Cromwell’s troops that raised the battery mounds upon the Links, a grassy expanse of 1140 by 400 yards, bought for a public park in 1857. Leith Fort, the headquarters of the royal artillery in Scotland, dates from 1779; the quaint old Tolbooth, where Maitland of Lethington poisoned himself (1573), was demolished in 1819; and the public buildings one and all are modern, most of them classical structures. They comprise the town-hall (1828), the custom-house (1812), Trinity house (1817), with David Scott’s Vasco de Gama and other paintings, the exchange buildings, the corn exchange (1862), the markets (1818), the slaughter-house (1862), the post-office (1876), the public institute (1867), the poor-house (1862), the hospital (1872-76), John Watt’s hospital (1862), the high school (1806), and Dr Bell’s school (1839). In December 1881 eight board schools had 4839 children on the roll, and an average attendance of 3932.

Of twenty-seven churches, belonging to nine different denominations, the only ancient one is that of South Leith parish, which, founded in 1483, and dedicated to St Mary, was originally cruciform, but now, as “restored” in 1852, consists of merely an aisled nave and square north-western tower ; David Lindsay preached in it before Janies VI. a thanksgiving sermon on the Gowrie conspiracy (1600), and in its

graveyard lies the Rev. Jolin Home (1722-1808), author of Douglas, and a native of Leith, Other places of worship are North Leith parish church (1814-16), with Grecian spire of 158 feet; North Leith Free church (1859), in Germanized Gothic, with spire of 160 feet; and St James's Episcopal church (1862-69), a cruciform structure, designed in Early English style by the late Sir G. G. Scott, with apsidal chancel, a spire of 160 feet, and a peal of bells.

So early as 1313 Leith possessed its ships, they in that year being burnt by the English. But in a wide flat foreshore and drifting sands the port has had great diffi- culties to contend with; and Tucker in 1656 describes it merely as 'a convenient dry harbour into which the firth ebbs and flows every tide, with a convenient quay on the one side thereof, of a good length for lading of goods." The earliest dock was commenced in 1720, and the custom- house quay constructed in 1777; but little of the exist- ing works is older than the present century. These, with date, cost, and area, comprise the Old docks (1801-17; £285,108; 104 acres), the Victoria dock (1852 ; £135,000; 5 acres), the Albert dock (1863-69 ; £224,500; 102 acres), and the Edinburgh dock (1874-81 ; £400,000 ; 164 acres); in connexion with the last two 62 and 108 acres were reclaimed from the east sands. The largest of seven graving docks, the Prince of Wales dock (1858), measures 370 by 60 feet, and cost £100,000 ; the east and west piers, extended or formed during 1826-52, and respectively 3530 and 3123 feet long, leave au entrance to the harbour 250 feet broad, with a depth at high water of 20 to 25 feet. The aggregate tonnage registered as belonging to the port was 1702 in 1692, 6935 in 1752, 25,427 in 1844, 28,303 (3946 steam) in 1854, 33,303 in 1860, 44,892 in 1867, 65,692 in 1873, 74,713 in 1878, and 86,509 on 31st December 1881, viz., 64 sailing vessels of 16,371 tons, and 125 steam-vessels uf 70,138 tons, the largest of the latter being one of 2144 tons. This shows marked progress, as likewise does the following table, giving the aggregate tonnage of British and foreign vessels that entered and cleared from and to foreign ports aud coast-

wise, in cargoes and ballast, during the years ending 15th May :—

Entered, Cleared. Year, ‘ Steam. ; Total.

Steam. | Total.

Sailing. Sailing.

1854 ae aor 369,499 ga ae 364,022 1867 | 235,065 | 321,035 | 556,100 | 97,669 | 304,806 | 402,475 1875 | 304,201 | 534,479 | 838,680 | 291,344 | 536,453 | 827,797 1878 | 309,751 | 652,624 | 962,375 | 312,621 | 654,427 | 967,648 1879 | 250,343 | 595,258 | 845,601 | 252,062 | 593,751 | 845,813 1880 | 261,407 | 678,793 | 940,200 | 263,927 | 681,303 | 945,230 1881 | 262,871 | 711,282 | 974,153 | 259,143 | 712,056 | 971,199

Of 3838 vessels of 952,580 tons that entered in the twelvemonth ending 31st December 1880, 861 of 215,268 tons were foreign, 464 of 61,514 tons were in ballast, and 2241 of 343,005 tons were coasters ; whilst of 3766 of 935,607 tons that cleared in the same year, 837 of 212,250 tons were foreign, 1093 of 225,655 tons were in ballast, and 2611 of 471,055: tows were coasters. The total value of foreign and colowial imports was £7,887,096 in 1876, £9,777,270 in 1877, £8,514,889 in 1878, £7,351,548 in 1879, and £9,475,030 in 1880. The total value of exports again was £3,145,820 in 1876, £2,861,992 in 1877, £2,804,912 in 1878, £3,036,780 in 1879, and £2,819,111 in 1880. Lastly, the customs revenue has fluctuated between £607,264 in 1867 and £290,570 in 1880,—the amount for the year ended March 31, 1882, being £466,018; and the port’s revenue and expenditure ainounted to £1,996,609 and £1,993,947 from July 1838 to May 1876, aud to £655,682 and £606,306 from 15th May 1876 to 15th May 1881.

In 1511 James IV. here “‘buildit the ‘ Michael,’ ane verrie imonstruous great ship, whilk tuik sae meikle timber that schee waisted all the woodis in Fyfe, except Falkland wood, besides the timber that cam out of Norroway ;”’ at present three shipbuilding yards einploy together nearly two thousand men. During the six years 1875-80 10 sailing vessels of 932 tons and 34 steam-vessels of 11,217 tons were built at

Leith, of which those built in 1880 were all steamships—1l1 of 3655 tons being of irou, and 5 of 191 tons of wood. Glass-making dates from 1682, sugar-refining from 1757, meat-preserving from 1837; and other industries are flour-grinding, canvas-weaving, soap-boiling, rope-making, engineering, tanning, and the manufacture of artificial manures. Leith is an important centre of trade iu grain, timber, ard wool, and in wine from Spain, Portugal, and France. It is also head of one of the twenty-five fishery districts of Scotland. Granted to the city of Edinburgh in 1329, it first became an independent parliamentary and municipal burgh in 1832-33, with Pertobello and Musselburgh returning one member to parliament, and being governed by a provost, four bailies, a treasurer, and ten councillors. The annual vaine of real property amounted in 1882 to £366,295, against £150,642 in 1860, and £252,349 in 1873. Population

(1811) 20,363, (1841) 26,808, (1851) 30,919, (1861) 30,628, (1871) 44,277, (1881) 58,193.

The history of Leith is closely connected with that of Edinburgh, episodes being the burning of its shipping by the English in 1313 and 1410, its sack by them in 1544 and 1547, its tenure by Mary of Guise as stronghold of the Catholic party from 1548 to 1560 and ineffectual siege in the latter year by the Scotch and English allies, the sailing from it of the first Darien expedition in 1698, and the seizure of its citadel by Brigadier Mackintosh of Borlum and 1600 Highland Jacobites in 1715, to which inay be added the arrival, departure, or visit of James IF. (1437), Mary Queen of Seots (1561), James VI. and his queen Anne of Denmark (1590), Charles L., who is said to have first got tidings of the Irish rebellion (1641) when playing golf upon the Links, Cromwell and Charles I. (1650), George IV. (1822), Queen Vietoria (1842), the king of Den- mark (1874), and the duke of Edinburgh (1881).

See A. Campbell’s History of Leith (Leith, 1827).

LEITMERITZ (Boh., Litomé#ice), an episcopal see and chief town of Leitmeritz district, Bohemia, is situated on the right bank of the Elbe, crossed there by an iron bridge 1700 feet in length, and on the Austrian

North- Western Railway, about 35 miles north-north-west of Prague, in 50 33” N. lat., 14° 10’ E. long. Leitmeritz is the seat of the judicial, fiscal, and military authorities for the district, and has a fine cathedral (founded 1057) and several other Roman Catholic churches and ecclesiastical establishments, also a training institute for teachers, classical, mercantile, and industrial schools, two hospitals, and an old-fashioned town-hall dating from the 16th century. The town is noted for its breweries, producing,

according to the latest returns, 1,056,420 gallons of beer

(F. H. G.)

| In 1421 the town was ineffectually besieged by Ziska.

annually ; it also possesses glass-works, tile-kilns, potteries, and metallic ware factories. The principal agricultural products of the surrounding country, which on account of its fertility has been called the “ Bohemian Paradise,” are cornu, fruit, hops, aud wine. Population in 1880,

10,854.

At a very early date Leitmeritz enjoyed special privileges, which were extended and confirmed in 1825 by King John of Luxembnrg, Royal diets were held there in 1494 and 1547, but subsequently the commune was deprived of several of its ancient rights, and its importanee declined. In 1631, during the Thirty Years’ War, Leitmeritz was captured and forcibly occupied by Saxon troops, who were, however, obliged to relinquish it in 1632 to the imperialists. In 1639 it was taken by the Swedes, who diid irretrievable damage to the town. In 1742 the suburbs were burnt by the French.

LEITRIM, a maritime county of Ireland in the province of Connaught, is bounded on the N.W. by Donegal Bay, N.E. by Fermanagh, E. by Cavan, 8.E. by Longford, and 8.W. by Roscommon and Sligo. Its shape resembles that of an hour-glass. From about 20 miles at the extremities it narrows in the centre to a breadth of only 7 miles, and its

greatest length from south-east to north-west is 52 miles. The total area is 376,212 acres, or about 588 square miles.

The northern portion of the county consists of an elevated table-land, of which the highest summits are Lugnaquila 1485 feet; Benbo, 1365; and Lacka, 1315. In the southern part the country is comparatively level, and is generally richly wooded. ‘The extent of coast-line is only about 3 niles. The principal river is the Shannon, which, issuing from Lough Allen, forms the south-western boundary of the county with Roscommon. The Bonnet rises in the north-west and flows to Lough Gill, and the streams of Bundrows and Bunduff separate Leitrim from Donegal and Sligo. Besides Lough Allen, which has an area of 8900 acres, the other principal lakes in the county are Lough Macnean, Lough Seur, Lough Gill, and Lough Melvin. A canal from Carrick-on-Shannon passes through the county to Lough Erne.

Geology and Minerals.—The central part of the county round Lough Allen is included in the Connaught coal-field, which both north and south is bounded by carboniferous

limestone interspersed with millstone grit and Yoredale beds.

In the southern districts there is a considerable extent of bog resting on marl or blue clay. The coal-fields consist of a series of eminences ranging from 1000 to 1377 feet, the most important beds being those to the west of Lough Allen near the Arigna. Only the lower measures reinain, and they contain marine fossils) The coal is bituminous, and is well suited for manufacturing purposes ; but it is not extensively wrouglit. In the Yoredale shales of the Coal-measures clay ironstone of a very rich quality is found, and was formerly smelted at the Arigna iron- works on Lough Allen. Lead has been found near Lurganboy, and copper in Benbo mountain. Manganese is obtained in considerable quantities, and also yellow ochre and various kinds of clays and chalks. The most important sulphureous spring is that of Drumsna; and the chalybeate springs of Cavan on the borders of the county, aud of Oakfield adjoining the sea-coast, are also mucli visited.

Climate and Agriculture.—The climate is very moist and unsuitable for grain crops. On the higher districts the soil is stiff and cold, and, though abounding in stones, very retentive of moisture, but in the valleys there are some very fertile districts resting upon limestone. In the higher regions the chief implement of culture is the spade. Lime, marl, and similar manures are abundant, and on the coast seaweed is plentiful, The total number of holdings in 1880 was 14,812, of which only 624 were less than one acre. More than two-thirds of the holdings are included

in those between 5 and 15 acres and between 15 and 30 acres, which numbered respectively 5439 and 5250. The following table shows the number of acres under the various crops in 1855 and 1881 :

Tillage. Meadow and

under Clover.

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84,779 82,553

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The acreage under crops is thus less than one-fourth of the whole area. In 1880 there were 212,374 acres under pasture, and 78,330 waste. The number of horses in 1881 was 3983, of which 2627 were used for agricultural purposes. Between 1855 and 1881 cattle diminished from 91,061 to 84,914. The number of milch cows in the latter year was 35,732, the production of butter being one of the principal industries of the small farmer. Sheep diminished from 20,578 in 1855 to 11,347 in 1881, and pigs from 20,790 to 19,302. Poultry in 1881 numbered 311,920.

According to the corrected return of 1878 the land was divided among 451 owners possessing 371,371 acres, with a total annual valuation of £135,946. Of the owners about 70 per cent. possessed more than one acre, and the average value per acre was 7s. 3d. The average size of the estates is 823 acres; and the largest owners are Lord Massy, 24,751; Earl of Leitrim, 22,038; George Lane Fox, 18,850; Owen Wynne, 15,436; and Arthur L. Tottenham, 14,561.

Manufactures.—These are confined chiefly to coarse linens for domestic purposes, but coarse pottery is also made. In 1880 there were three scutching mills in the county, all driven by water.

Railways.—The Longford and Sligo branch of the Mid- land Great Western Railway passes through the southern part of the county, and in the northern part there is a branch between Sligo and Bundoran,

Administration and Population.—The county is divided into 5 baronies, and contains 17 parishes, with 1489 town- lands. It is within the Connaught circuit, and assizes are held at Carrick-on-Shannon, and quarter sessions at Ballinamore, Carrick-on-Shannon, and Manorhamilton. There are two poor-law unions in the county and portions of other three. The county is within the Dublin military district, and there are barracks at Carrick-on-Shannon. It is in the dioceses of Kilmore and Ardagh. In the Ivish House of Commons two members were returned for the county and two for the boroughs of Carrick-on-Shannon and Jamestown, but at the union the boroughs were disfranchised. In 1760 the population was 26,142, which in 1821 had increased to 124,785 and in 1841 to 155,309, but in 1861 had diminished to 104,744, in 1871 to 95,562, and in 1881 to 89,795, of whom 44,777 were males and 45,018 were females. The total number of emigrants from the county between Ist May 1851 and 31st December 1880 was 43,186, a percentage of 41:2 to the population in 1861. In 1880 the rate of marriages per 1000 of estimated population was 2°6, of births 22-4, and of deaths 15°9, The population is almost entirely rural, the only town being Carrick-on-Shannon, with a population in 1871 of 1442.

History and Antiquities.—Anciently the entire country bordering on Lough Erne, including Fermanagh and Cavan, was, according to Ptolemy, occupied by the Erdini. Afterwards, along with Cavan, Leitrim formed part of the territory of Breffny or Brenny, which was divided into two principalities, of which Leitrim under the name of Hy Bruin-Breffny or Brenny formed the western. From the fact that for a long time it was possessed by the O'Rourks, descendants of Roderick, king of Ireland, it was also called Breffny O'Rourk. In the 12th century Tiernan O'Rourk was expelled

from the government by the princes of Leinster and Connaught, but he was afterwards reinstated by Turlough, king of Ireland,

and, although after the arrival of the English it was united to Roscommon, the O'Rourks remained practically independent till the reign of Elizabeth. Large confiscations took place in the reigns of Elizabeth and James I., in the Cromwellian period, and after the Revolution of 1688-89.

There are ''druidical" remains near Fenagh and at Letterfyan, and important monastic ruins at Creevelea near the Bonnet, with several antique monuments, and at Firnagh in the parish of Fenagh. There was an important Franciscan friary at Jamestown. The abbeys of Mohill, Annaduff, and Drumlease have been con- verted into parish churches. Among the more notable old castles are O'Rourk's Hall at Dromahaire, now in ruins, Manorhamilton Castle, originally very extensive, but now also in ruins, and Castle John on an island in Lough Scur.

LELAND, Leytanp, or Laytonps, Joun (c. 1506- 1552), a famous English antiquary, was born in London towards the close of the reign of Henry VIL From St Paul's School, where he was brought up under Lily, the famous grammarian, he passed to Christ's College, Cambridge, and thence to All Soul's College, Oxford. After residing for some time in Paris, he returned to England, and became chaplain to Henry VIII, who appointed him, in 1530, to the rectory of Popeling, in

the marches of Calais, made him his librarian, and in 1533 commissioned him as "' king's antiquary," with power to search for records, manuscripts, and relics of antiquity, in all the cathedrals, colleges, abbeys, and priories of England. Accordingly he set out on a tour which lasted six years, and afforded him materials for study during the remainder of his life. On his return in 1542 he was rewarded by the king with the rectory of Haseley in Oxfordshire; in 1543 he became a canon of King's College (now Christ Church), Oxford, and about the same time a prebendary of Salisbury. Leland now withdrew to his house in the parish of St Michael le Querne, London, and devoted himself exclusively to the digesting of his information. In 1547 he fell into a state of insanity, which continued until his death on the 18th April 1552.

Some of Leland's papers, after passing through several hands, were deposited by Burton, the historian of Leicestershire, in the Bodleian Library at Oxford jn 16382, Others came into the posses- sion of Sir Robert Cotton, and are now, along with the rest of his books, in the British Museum. His principal works are The laboryeuse Journey and Serche for Englandes Antiquitces; A New Yeares Gyfte to Kynge Henry the VIII. in the 37 yeare of his Regne, London, 1549; Commentarii de Seriptoribus Britannicis, edited by Anthony Hall, Oxford, 1709, 2 vols, 8vo; The Itinerary, published by Thomas Hearne, Oxford, 1710-12, 9 vols. 8vo, and reprinted in 1770; and De Rebus Britannicis Collectanea, edited by Hearne, Oxf., 1715, 6 vols. 8vo, and reprinted at London in 1770. See The Lives of those eminent antiquaries John Leland, Thomas Hearne, and Anthony & Wood, vol. i., Oxford, 1772.

LELAND, Joun (1691-1766), a polemical theologian of the 18th century, was born ut Wigan, Lancashire, in 1691, and was educated in Dublin, where he made such progress in theological and other studies that in 1716, without having attended any college or hall, he was appointed first assistant and afterwards sole pastor of a congregation of Presbyterians in New Row. This office he continued to fill until his death on January 16, 1766.

Leland’s first publication was A Defence of Christianity (1733), in reply to Tindal’s Christianity as Old as the Creation; it was suc- ceeded by his Divine Authority of the Old and New Testaments asserted (1738), in answer to The Moral Philosopher of Morgan; in 1741 he published two volumes, in the form of two letters, being Remarks on [H. Dodwell’s] Christianity not Founded on Argument; and in 1758 Reflexions on the Late Lord Bolingbroke’s Letters on the Study and Use of History. A View of the Principal Deistieal Writers that have appeared in England was published in 1754-56. This is the only work of the author—‘‘ most worthy, painstaking, and commonplace of divines,” as he has recently been styled—which can now be said to have any present value. This value, however, is purely historical; his facts about the deists are interesting and useful, but it may be safely conjectured that no one now reads his (doubtless sincere) arguments, here and _ elsewhere, against the creed he opposed without some sense of their hollowness, contra- dictoriness, and obvious unfairness. His latest work was a treatise entitled The Advantage and Necessity of a “grants eon

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shown from the State of Religion in the Aneicnt Heathen We orld. Discourses on various Subjects, with a Life prefixed, was published posthumously, 4 vols. 8vo, 1768-89 ; also a Life by Huddesford,

1772.

LELEGES was the name applied to an early race or set of races around the Augean Archipelago. The name occurs in Leucadia, Acarnania, AStolia, Phocis, Locris, Beotia, Megara, Laconia, Elis, the islands of the Augean, the Troad, and Caria. It is hardly possible to suppose that a single race was to be found in so many widely separated localities. Herodotus identifies the Leleges with the Carians, saying that the ancient name of that race was Leleges, whereas Pausanias declares that the name Leleges was younger, and Atheneus makes the Leleges serfs of the Carians. Homer introduces both Leleges and Carians as distinct

peoples in alliance with Troy. The former havea king Altes and a city Pedasus. Strabo counts the Leleges and the Carians different races, so intermingled that they were often identified. Both in Leucadia and in Laconia the story runs that the autochthonous inhabitants were the Leleges, whereas in Messenia the Leleges were an immigrant race who had founded Pylus. They were said to be the ancestors of the Taphians and Teleboans, two seafaring and piratic races. The only view as yet advanced which introduces any unity into these scattered notices is that of Curtius. According to hin the name Leleges represents rather a stage in historical development than a single race. The name occurs always in the coast lands ; and in the early stage of Greek history, when the simple barbarous tribes of older stock were stimulated to the first beginnings of progress and civilization by the appearance of foreign mariners ou their shore, the mixed race of immigrants and natives was called Leleges. It is the almost universal opinion that the whole of the A‘gean coast lands were occupied by homogeneous tribes of Aryan stock ; on this view then the Leleges, z.¢., as Strabo already maintained, the mixed people, represeut one of the first stages of these original tribes in the path of civilization. Accounts which connect the Leleges with Egypt may be definitely rejected as fabulous.

See Deimling, Zeleger; Curtius, Greek History, i.; Thuce., i. 4; Iliad, x. 429; Strabo, pp. 321, 572, 680, &c.; Herod., i. 171; Pausan., i. 89, 6; Athen,, vi. 2710,

LELEWEL, Joacuim (1786-1861), Polish historian, was born at Warsaw in 1786. His family came from Prussia in the early part of the 18th century; his grand- father was appointed physician to the Polish king then reigning, and his father caused himself to be naturalized as a Polish citizen. The original form of the name appears to have been Loelheffel. From his earliest childhood the future historian showed his fondness for books. In the year 1807 we find him teacher in a school at Krzemieniec in Volhynia, and in 1814 professor of history at Vilna, a post which he quitted in 1820 for a four years’ discharge of the same office at the university of Warsaw, but returned to it in 1824. His lectures enjoyed great popularity, and the enthusiasm felt for him by the students is shown in the beautiful lines addressed to him by

Mickiewicz. But this very circumstance made him obnoxious to the Russian Government, and at Vilna Novosiltzev was then all-powerful. Lelewel was removed from his professorship, and returned to Warsaw, where he was elected a deputy to the diet in 1829. He joined the revolutionary move- ment with great enthusiasm, but was throughout deficient in energy, and, in fact, although the emperor Nicholas distinguished him as one of the most dangerous rebels, he did not appear to advantage as a man of action. On the suppression of the rebellion he made his way in disguise to Germany, and subsequently reached Paris in 1831. There, however, he was. not allowed to stay long,

as the Government of Louis Philippe ordered him to quit French territory in 1833 at the request of the Russian ambassador. The cause of this expulsion is said to have been his activity in writing revolutionary proclamations. He now repaired to Brussels, where he for a time lectured on history at the university, but was from some cause or other compelled to abandon his occupation. Lelewel spent several years in Brussels in great poverty, barely earning a scanty livelihood by his writings. He died in 1861 at Paris, whither he had removed a short time previously. Lelewel was an indefatigable man of letters. He was of a simple austere charaeter, and of the strictest probity—in short, of an antique type, one of the few men who have loved learning for its own sake. His literary aetivity was enormous, extending over the period from the ‘‘Edda Skandinawska” of 1807 to the Géographie des Arabes, 2 vols., Paris, 1851. Many of his works are eoneerned with Polish history, yet he by no meaus confined himself to it. Thus he has written on the trade of Carthage, on Pytheas the early geographer, and on numismatics (La Namismatique dw Moyen Age, Paris, 1835, 2 vols.; Etudes Nwmismatiques, Brussels, 1840). ‘ One, of his most important publieations was La Géographie du Moyen Age, Brussels, 1850-52, with an atlas of fifty plates entirely engraved by himself, for he rightly attached sueh importanee to the accuraey of his maps that he would not allow them to be exeeuted by any one else. His works on Polish history are monumental; they have been eollected into

a series under the title Polska, dzicje 1 rzeczy jej rozpatrzywane (Poland, her History and Affairs Surveyed), pub- lished at Posen, 1854-1868, in 20 vols. He had intended to have written a complete history of the country on an extensive scale, but never aeeomplished the task. His method is shown in the little history of Poland, first published at Warsaw in Polish in 1823, under the title Dzieje Polski, and afterwards almost rewritten in the Histoire de Pologne, published at Paris in 2 vols. in 1844. Two other works on Polish history whieh may be especially mentioned are an edition of the ‘‘Chroniele of Matthew of Cholewa” and ‘‘Aneient Memorials of Polish Legislation ” (Ksicgi ustaw polskich 4 mazowicckich). While employed in the university library of Warsaw he studied bibliography, and the fruits of his labours may be seen in his Bibliograficenych Ksiag dwoje (A Couple of Books on Bibliography) 2 vols. 8vo, Vilna, 1823-26. The eharacteristics of Lelewel as an historian are great researeh and power to draw inferenees from his facts; his style is too often eareless, and his narrative is not pieturesque, but his expressions are frequently terse and incisive. e has left valuable materials for a just eomprehension of his career in his autobiography (Adventures while Prosecuting Rescarehes and Inquiries on Polish Matters). LELY, Sir Perer (1617-1680), a celebrated painter,

was born at Soest, Westphalia, in 1617. His father, a

called Yan der Vaes; the nickname of Le Lys or Lely, by which he was generally known, was adopted by his son asa proper surname. After studying for two years under Peter de Grebber, an artist of some note at Haarlem, Lely, induced by the patronage of Charles I. for the fine arts, removed to England in 1641. There he at first painted historical subjects and landscape; and he soon becaine so

eminent in his profession as to be employed by Charles to paint his portrait shortly after the death of Vandyck. He afterwards portrayed Cromwell. At the Restoration his genius and gentlemanly manners won the favour of Charles IL, who made him his state-painter, and afterwards knighted him. He formed a famous collection, the best of his time, containing drawings, prints, and paintings by the best

masters; it sold by auction for no lessthan £26,000. His great example, however, was Vandyck, whom, in some of his most successful pieces, he almost rivals. Lely's paint- ings are carefully finished, warm and clear in colouring, and animated indesign. The graceful posture of the heads, the delicate rounding of the hands, and the broad folds of the draperies are admired in many of his portraits. The eyes of the ladies are drowsy with languid sentiment, and allegory of a commonplace sort is too freely introduced. His most famous work is a collection of portraits of the ladies of the court of Charles II., preserved at Hampton Court, and known by the title of the Windsor Beauties. Of his few historical pictures, the best is Susannah and the , Elders, at Burleigh House. His Jupiter and Europa, in

military captain and a native of Holland, was originally |

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the duke of Devonshire's collection, is also worthy of note. Lely was nearly as famous for crayon work as for oil- painting. Towards the close of his life he often retired to an estate which he had bought at Kew. He died of apoplexy in London (the Piazza, Covent Garden) in 1680, and was buried in Covent Garden Church, where a monu- inent was afterwards erected to his memory. Pepys characterized Lely in a few graphic words—"a mighty proud man and full of state." The painter married an English lady of family, and left a son and daughter, who died young. His only disciples were Greenhill and Bucks- horn ; he did not, however, allow them to obtain an insight into his special modes of work. ,

LE MANS. See Mans, Le.

LEMBERG (i.e., Leonberg; also Lemburg or Léwenburg ; Polish, Zwow ; Lat., Leopolis), the capital of the Austrian crown-land of Galicia, and according to its population the third city of Austria-

Hungary, lies 180 miles east of Cracow and 60 miles from the Russian frontier. The hollow of the Sarmatian plateau, in which the town is situated, is about 1000 feet above the sea-level, and, as drained by the Peltew, a tributary of the Bug, belongs to the basin of the Vistula. The Léwenburg proper or Castle Hill rises to 1300 feet. In the early part of the present century Lemberg would have been described as a small fortified place, with a number of large villages in the immediate

Plan of Lemberg.

Vicinity; but the fortifications were transformed into pleasure grounds about 1811, and the villages have gradu- ally changed into suburb and town. The old city pro- per occupies only about 60 acres; the suburbs extend over 12 square miles. During the 16th and 17th centuries the most striking feature of Lemberg was the immense number of its ecclesiastical buildings, and it still possesses among the rest a Greek Catholic, a Roman Catholic, and an Armenian cathedral. The church of the Dominicans (an imitation of the Karlskirche at Vienna) contains a Inonument, by Thorwaldsen, to the countess Josepha Borkowska. Lemberg is the seat of a university, founded in 1784 by Joseph II., and restored by Francis I. in 1817 ; aud in the national institution founded by Ossolinski it has

a noble library of books and manuscripts, and valuable antiquarian and scientific collections. The linguistic heterogeneousness of the population requires the mainten- ance of three separate gymnasiums,—for the: Poles, the Germans, and the Ruthenians respectively ; and there are besides two normal colleges, a deaf and dumb institution, and a blind asylum. Industrially and commercially Lemberg is a more important city than Cracow; it has a chamber of trade and commerce, and among the leading articles of manufacture are flour, beer, vinegar, oil of roses, and matches. The population has increased from 87,109 in 1869 to 110,250 in 1880. At the former date 46,252 were Roman Catholics, 26,694 Jews, and 12,406 Greek Catholics.

Leopolis was founded about 1259 by the Ruthenian prince Daniel for his son Leo. From Casimir the Great, who captured it in 1340, it received the Magdeburg rights, and for almost two hundred years the

public records were kept in German. During the whole period of Polish supremacy it was a most important city, and after the fall of Constantinople it greatly developed its trade with the East. In 1648 and 1655 it was besieged by the Cossacks, and in 1672 by the Turks. Charles XII. of Sweden captured it in 1704. In 1848 it was bombarded.

LEMMING, a small animal belonging to the order Rodentia, family Muridz, and subfamily Arvicolinx, or voles, of which the common water-rat and short-tailed field mouse of England are members. It is the Myodes lemmus (Linn.) of most modern zoological systems, the Lemmus norvegicus of Desmarest and some other authors. In both size and colour different specimens vary considerably, but its usual length is about five inches, and its soft fur yellowish-brown, marked with spots of dark brown and black. It has a short, rounded head, obtuse muzzle, small

Lemming.

bead-like eyes, and short rounded ears, nearly concealed by the fur. ‘he tail is very short. The feet are small, each with five claws, those of the fore feet strongest, and fitted for scratching and digging. The usual dwelling place of the lemmings is iu the high lands or fells of the great central mountain chain of Norway and Sweden, from the southern branches of the Langfjeldene in Christiansand stift to the North Cape and the Varangerfjord. South of the Arctic circle they are, under ordinary circumstances, exclusively confined to the plateaus covered with dwarf birch and juniper above the conifer region, though in Tromso amt and in Fiumarken they occur io all suitable localities

down to the level of the sea. tussock of grass or a stone, and constructed of short dry straws, and usually lined with hair. The number of young in each nest is generally five, sometimes only three, occasionally seven or eight, and at least two broods are produced annually. Their food is entirely vegetable, especially grass roots and stalks, shoots of the dwarf birch, reindeer lichens, and mosses, in search of which they form, in winter, long galleries through the turf or

under the snow. ‘They are restless, courageous, and pugnacious little animals. When suddenly disturbed, instead of trying to escape they will sit upright, with their back against a stone or other coign of vantage, hissing and showing fight in a very determined manner.

The circumstance which has given more popular interest to the lemming than to a host of other species of the same order of animals, and has justified its treatment in a separate article in this work, is that certain districts of the cultivated lands of Norway and Sweden, where in ordinary circumstances they are quite unknown, are occasionally and at very uncertain intervals varying from five to twenty or more years, literally overrun by an army of these little creatures, which steadily and slowly advance, always in the same direction, and regardless of all obstacles, swimming across streams and even lakes of several miles in breadth, and committing considerable devastation on their line of march by the quantity of food they consume. In their turn they are pursued and harassed by crowds of beasts and birds of prey, as bears, wolves, foxes, dogs, wild cats, stoats, weasels, eagles, hawks, and owls, and never spared by man; even the domestic animals not usually predace- ous, as cattle, goats, and reindeer, are said to join in the destruction, stamping them to the ground with their feet, and even eating their bodies. Numbers also die from diseases produced apparently from overcrowding. None ever return by the course by which they came, and the onward march of the survivors never ceases until they reach the sea, into which they plunge, and swimming onwards in the same direction as before perish in the waves. These extraordinary and sudden appearances of vast bodies of lemmings, and their singular habit of persistently pursuing the same onward course of migration, have given rise to various speculations, from the ancient belief of the Norwegian peasants, shared in by Olaus Magnus, that they fall down from the clouds, to the almost equally untenable hypothesis, ingeniously maintained by the late Mr W. D. Crotch, that they are acting in these migrations in obedience to an instinct inherited from vastly ancient times, and are still seeking the congenial home in the submerged Atlantis, to which their ancestors of the Miocene period were wont to resort when driven from their ordinary dwelling places by crowding or scarcity of food. The principal really ascertained facts

regarding these migrations, as stated by Mr R. Collett (Proceedings of the Linnean Society, vol. xiii. p. 327, 1878), seem to be as follows. When any combination of circumstances has occasioned an increase of the numbers of the lemmings in their ordinary dwelling places, impelled by the restless or migratory instinct possessed in a less developed degree by so many of their congeners, a movement takes place at the edge of the elevated plateau, and a migration towards the lower-lying land begins. The whole body moves forward slowly, always advancing in the same general direction in which they originally started, but following more or less the course of the great valleys. They only travel by night ; and, staying in congenial places for considerable periods, with unaccustomed abundance of provender, notwithstand- ing all the destructive influences to which they are exposed, they multiply excessively during their journey, having still

The nest is formed under a | usual homes.

The progress may last from one to three years, according to the route taken, and the distance to be traversed until the sea-coast is reached, which in a country so surrounded by water as the Scandinavian peninsula must be the ultimate goal of such a journey. This may be either the Atlantic or the Gulf of Bothnia, according as the migration has commenced from the west or the east side of the central elevated plateau. Those that finally perish in the sea, committing what appears to be a voluntary suicide, are only acting under the same blind impulse which has led them previously to cross smaller pieces of water with safety. Further information about the migrations of the lemming will be found in Mr Collett’s paper referred to above, and also in those of Mr Crotch in the same volume. (W. H. F.)

LEMNOS was an island in the northern part of the /Egean Sea, now called by the inhabitants Limnos. The Italian form of the name, Stalimene, 2.¢., és tiv Ajpror, is not used in the island itself, but is commonly employed in geographical works. The island, which belongs to Turkey, is of considerable size: Pliny says that the coast-line measured 1124 Roman miles, and the area has been estimated at 150

square miles. Great part of it is mountainous, but some very fertile valleys exist, to culti- vate which two thousand yoke of oxen areemployed. The hill-sides afford pasture for 20,000 sheep. No forests exist on the island ; all the wood which is used is brought from the coast of Roumelia or from Thasos. A few mulberry and fruit trees grow, but no olives. The inhabitants number about 22,000, of whom 2000 are Turks and the rest Greeks. The chief towns are Kastro on the western coast, with a population of 4000 Greeks and 800 Turks, and Mudros on the southern coast. Kastro possesses an excellent harbour, and is the seat of all the trade carried on with the island. Greek, English, and Dutch consuls or consular agents were formerly stationed there; but the whole trade is now in Greek hands. The archbishop of Lemnos and Ai Strati, a small neighbouring island with 2000 inhabitants, resides in Kastro. In ancient times the island was sacred to Hephestus, who as the legend tells fell on Lemnos when his father Zeus hurled him head- long out of Olympus. This tale, as well as the name Athaleia, sometimes applied to it, points to its volcanic character. It is said that fire occasionally blazed forth from Mosychlos, one of its mountains ; and Pausanias (viii. 33) relates that a small island called Chryse off the Lemnian coast was swallowed up by the sea. All volcanic action is now extinct,

The most famous product of Lemnosis the medicinal earth, which is still used by the natives. At one time it was popular over western Europe under the name éerra sigillata. This name, like the Greek Anuvla oppayts, is derived from the stamp impressed on each piece of the earth ; in ancient times the stamp was the head of Artemis. The Turks now believe that a vase of this earth destroys the cffect of any poison drunk from it,—a belief which the ancients attached rather to the earth from Cape Kolias in Attica. Galen went to see the digging up of this earth (see Kuhn, Jedic. Gr. Opera, xii. 172 sq.) ; on one day in each year a priestess per- formed the due ceremonies, and a waggon-load of earth was dug out. At the present time the day selected is the 6th of August, the feast of Christ the Saviour. Both the Turkish hodja and the Greek priest are present to perform the necessary ceremonies ; the whole process takes place before daybreak. The earth is sold by apothe- caries in stamped cubical blocks. The hill from which the earth

is dug is a dry mound, void of vegetation, beside the village of Kotschinos, and about two hours from the site of Hephestia. The earth was considered in ancient times a cure for old festcring wounds, and for the bite of poisonous snakes.

The name Lemnos is said by Hecateus (ap. Steph. Byz.) to have been a title of Cybele among the Thracians, and the carliest inhabit- ants are said to have been a Thracian tribe, called by the Greeks Sinties, ¢.e., ‘‘the robbers.” According to a famous legend the women were all deserted by their husbands, and in revenge murdered every man on the island. From this barbarous act, the expression

more numerous families and more frequently than in their | Lemnian deeds, Afuria %pya, became proverbial. The Argonauts

Janding soon after found only women in the island, ruled over by Hypsipyle, daughter of the old king Thoas. From the Argonauts and the Lemnian women were descended the race called Minyx, whose king Euneus, son of Jason and Hypsipyle, sent wine and provisions to the Greeks at Troy. The Minyz were expelled by @ Pelasgian tribe who came from Attica. The historical element underlying these traditions is probably that the original Thracian people were gradually brought into communication with the Grecks as navigation began to unite the scattered islands of the Aigean (see Jason); the Thracian inhabitants were barbarians in com- parison with the Greek mariners. The worship of Cybele was char- acteristic of Thrace, whither it spread from Asia Minor at a very early period, and it deserves notice that Hypsipyle and Myrina (the name of one of the chief towns) are Amazon names, which are always connected with Asiatic Cybele-worship. Coming. down to a better authenticated period, we find that Lemnos was conquered by Otanes, one of the generals of Darius Hystaspes ; but was soon reconquered by Miltiades, the tyrant of the Thracian Chersonese. Miltiades afterwards returned to Athens, and Lemnos continued an Athenian possession till the Macedonian empire absorbed it. On the vicissitudes of its history in the 3d century B.c. see Kohler in Mittheil. Inst. Athen., i. p. 261. The Romans declared it free

in 197 B.c., but gave it over in 166 B.c. to Athens, which retained nominal possession of it till the whole of Greece was made a Roman province. A colony of Attic kAnpodxo was established by Pericles, and many inscriptions on the island relate to Athenians. After the division of the empire, Lemnos of course passed under the Byzantine emperors; it shaved in the vicissitudes of the eastern provinces, being alternately in the power of Greeks, Italians, and Turks, till finally the Turkish sultans became supreme in the Aigean. In 1476 the Venetians successfully defended Kokkinos or Kotchinos against a Turkish siege; but in 1657 Kastro was eaptured by the Turks from the Venetians after a siege of sixty- ee days. Kastro was again besieged by the Russians in

1770.

Homer speaks as if there were one town in the island called Lemnos, but in historical times there was no such place. There were two towns, Myrina, now Kastro, and Hephestia. The lattcr was the chicf town ; its coins are found in considerable number, tlie types being sometimes the Athenian goddess and lier owl, some- times native religious symbols, the caps of the Dioseuri, Apollo, &c. Few coins of Myrina are known. They belong to the period of Attic occupation, and bear Athenian types. A few coins are also known which bear the naine, not of either city, but of tle whole island. Conze was the first to discover the site of Hcphestia, at a deserted place named Palokastro on the east coast. It had once a splendid harbour, which is now filled up. Its situation on the east explains why Miltiades attacked it first when he came from the Clersonese. It surrendered at once, whereas Myrina, with its very strong citadel built on a perpendicular rock, sustained a siege. It is said that the shadow of Mount Athos fell at sunset on a bronze cow in the agora of Myrina. Pliny says that Athos was 87 miles to the north-west ; but the real distance is about 40 English miles. One legend localized in Lemnos still requires noticc. Philoctetes was left there by the Greeks on their way to Troy; and there he suffered ten years’ agony from his wounded foot, until Ulysses and Neoptolemus induced him to accompany them to Troy. He is said by Sophocles to have lived beside Mount Hermeus, which A’schylus (Agam., 262) makes one of the beacon points to flash the news of Troy’s downfall home to Argos.

See Rhode, Res Lemnicwe; Conze, Reise auf den Aeg. Inseln (where the latest account by a skilled eye-witness is to be found ; the above-mentioned facts about the present state of the island are taken from him); also Hunt in Walpole's 7ravels ; Belon du Mans, Observations de plusieurs singularitez, &c.; Finlay, Greece under the Romans ; Von Hammer, Gesch. des Osman. Reiches ; Gtt. Gel. Anz., 1837. The chief references in ancient writers are Iliad, i. 593 ; v. 188; xiv. 229, &. ; Herod., iv. 145; Str., pp. 124, 330; Pim, iv 23 ; xxxvi. 13.

LEMON, the fruit of Citrus Limonum, Risso, which is regarded by some botanists as a variety of Citrus medica, L. The wild stock of the lemon tree is a native of the valleys of Kumaon and Sikkim in the North-West Provinces of India, ascending the mountains to a height of 4000 feet, and occurring under several forms.

The lemon seems to have been unknown to the ancient Greeks and Romans, and to have been introduced by the Arabs into Spain between the 12th and 13th centuries. In 1494 the fruit was cultivated in the Azores, and largely shipped to England, but since 1838 the exportation has ceased. As a cultivated plant the lemon is now met with throughout the Mediterranean region, in Spain and Portu- gal, in California and Florida, and in almost all tropical

and subtropical countries. Like the apple and pear, it varies exceedingly under cultivation. Risso and Poiteau enumerate forty-seven varieties of this fruit, although they maintain as distinct the sweet lime, Citrus Limetta, Risso, with eight varieties, and the sweet lemon, Citrus Lumia, Risso, which differ only in the fruit possessing an insipid instead of an acid juice, with twelve varieties.

The lemon is more delicate than the orange, although, according to Humboldt, both require an annual mean temperature of 62°Fahr. Unlike the orange, which presents a fine close head of deep green foliage, it forms a straggling bush, or small tree, 10 to 12 feet high, with paler, more scattered leaves, and short angular branches with sharp spines in the axils. The flowers, which possess a sweet odour

quite distinct from that of the orange, are in part hermaphrodite and in part unisexual, the outside of the corolla having a purplish hue. The fruit, which is usually crowned with a nipple, consists of an outer rind or peel, the surface of which is more or less rough from the convex oil receptacles imbedded in it, and of a white inner rind, which is spongy and nearly tasteless, the whole of the inte- rior of the fruit being filled with soft parenchymatous tissue, divided into about ten to twelve compartments, each gene- rally containing two or three seeds. The white inner rind varies much in thickness in different kinds, but is never so thick as in the citron. As lemons are much more profitable to grow than oranges, on account of their keeping properties, and from their being less liable to injury during voyages, the cultivation of the lemon is preferred in Italy wherever it will succeed. In damp valleys it is liable to be attacked by a fungus called “charbon” (Dematiwm monophyllum), the stem, leaves, and fruit becoming covered with a blackish dust. This is said to be coincident with or subsequent to the attacks of a small oval brown insect, Chermes hesperidum, L. Trees grown in the shade, and not properly exposed to sunlight and air, suffer most severely from these pests. Syringing with milk of lime when the young insects are hatched, and before they have fixed themselves to the plant, seems to be the most effectual remedy known. Since the year 1875 this fungoid disease has made great ravages in Sicily among the lemon and citron trees, especially around Catania and Messina. M. Heritte attributes the prevalence of the disease to the fact that the growers have induced an unnatural degree of fertility in the trees, permitting them to bear enormous crops year after year. This loss of vitality is in some measure met by grafting healthy scions of the lemon on the bitter orange, but trees so grafted do not bear fruit until they are eight or ten years old.

The lemon tree is said to be exceedingly fruitful, a large one in Spain or Sicily ripening as many as three thousand fruits in favourable seasons. Inthe south of Europe lemons are collected more or less during every month of the year, but in Sicily the chief harvest takes place from the end of October to the end of December, those gathered during the last two months of the year being considered the best for keeping purposes. The fruit is gathered while still green. After

collection the finest specimens are picked out and packed in cases, each containing about four hundred and twenty fruits, and also in boxes, three of which are equal to two cases, each lemon being separately packed in paper. The remainder, consisting of ill-shaped or unsound fruits, are reserved for the manufacture of the essential oil and juice. The whole of the sound lemons collected are usually packed in boxes, but those which are not exported immediately are carefully picked over and the unsound ones removed before shipment. The exporta- tion is continued as required until April and May. The large lemons with a rougher rind, which appear in the London market in July and August, are grown at Sorrento

near Naples, and in this case are allowed to remain on the trees until ripe.

Candied lemon peel is usually made in Eugland from a larger variety of the lemon cultivated in Sicily on higher ground than the common kind, from which it is distinguished by its thicker rind and larger size. This kind, known as the Spadaforese lemon, is also allowed to remain on the trees until ripe, and when gathered the fruit is cut in half longitudinally and pickled in brine, before being exported in casks. Before candying the lemons are soaked in fresh water to remove thie salt. Citrons are also exported from Sicily in the same way, but these are about six times as expensive as lemons, and a comparatively small quantity is shipped. Besides those exported from Messina and Palermo, lemons are also imported into

England to a less extent from the Riviera of Genoa, and.

from Malaga in Spain, the latter being the most esteemed. Of the numerous varieties the wax lemon, the imperial lemon, and the Gaeta lemon are considered to be the best.

The Greek island of Andros is said to produce ten millions of lemons annually ; these are exported chiefly to Constantinople, the Black Sea,

and the Danube, realizing an average price of £1 to £1, 3s. per thousand.

Until recently the United States have been large im- porters of lemons, at good prices, from the Mediterranean. In 1878 Palermo exported 463,977 boxes of this fruit, at 6s. 6d. per box. Owing to increased facilities for transit, and the hazardous character of the trade, the lemons are now chiefly exported by the proprietors of small plantations, who, in their eagerness to dispose of their stock, glut the market at New York and Philadelphia, and sometimes find the speculation a ruinous one.

For some years past lemons have been extensively cultivated in the south of California, and the new industry will probably affect the Mediterranean trade to a serious extent. In 1874 half a million Californian lemons were received in San Francisco. Since it was found that, with a little care in the selection of the soil, these trees could be grown throughout the State, they have been planted in immense numbers, and the produce of each tree has been found to bring from 30s. to 60s. It has been esti- mated that in a few years the produce will be equal to the requirements of the Pacific States and Territories, and that ultimately the whole of the United States may be supplied with lemons from California. In east Florida also, where suitable land is obtainable at 15 to 20 dollars an acre, lemons, limes, citrons, and more especially oranges, are being raised in abundance. In New South Wales lemons are also grown, having been introduced into Sydney about the year 1790.

Lemons of ordinary size eontain about 2 ounces of jnice, of specific gravity 1°039-1°046, yielding on an average 32°5 to 42°53 grains of citric acid per ounce. The amount of this acid, according to Stoddart, varies in different seasons, decreasing in lemons kept from February to July, at first slowly and afterwards rapidly, until at the end of that period it is all split up into glucose and carbonic acid,—the specific gravity of the Juice being in February 1-046, in May 1°041, and in July 1°027, while the fruit is hardly altered in appearance. Mr Geo. Mee, however, states that lemons may be kept for some months with

scarcely perceptible deterioration by varnish- ing them with an alcoholic solution of shellac—the coating thus formed being easily removed when the fruit is required for household use by gently kneading it in the hands. Besides citric acid, lemon juice contains 3 to 4 per cent. of gum and sugar, albuminoid matters and 2°28 per cent. of inorganic salts. Cossa has determined that the ash of dried lemon juice contains 54 per cent. of potash, besides 15 per cent. of phosphoric acid. In the white portion of the pcel (in common with other fruits of the genus) a bitter principle called hesperidine has been found. It is very slightly soluble in boiling water, but is soluble in dilute alcohol and in alkaline solutions, which it soon turns of a yellow or reddish colour. It is also darkened by tincture of perchloride of iron. Another substance named lemonine, crystallizing in lustrous plates, was discovered in 1879 by Palerno and Aglialoro in the seeds, in which it is present in very small quantity, 15,000 grains of the sced yiclding only 80

‘yield 9 to 14 ounces of essence.

grains of it. From hesperidine it differs in dissolving in potash without alteration. It melts at 275°.

Various modes of preserving lemon juice in small quantities for medicinal or domestic use have been suggested. Mr Judicis states that if allowed to deposit and then filtered through paper it kecps well. DrSymes recommends heating the juice to 150° Fahr., filling bottles with it at that temperature, and immediately closing them when perfectly full so as to keep out access of air. Another writer advises the addition of 10 per cent. of alcohol. Perhaps the most simple method is to keep it covered with a layer of olive or almond oil in a closed vessel furnished with a glass tap, by which the clear liquid may be drawn off as required.

As a commercial article for use on shipboard as a preventive of scurvy, lemon juice is largely consumed. By the provisions of the Act of Parliament 80 & 31 Vict. c. 124, § 4, every ship going to other

countries where lemon or lime juice cannot be obtained is required to take sufficient to give 1 ounce to every member of the crew daily. Of this juice it requires about 13,000 lemons to yield 1 pipe (108 gallons). Sicilian juice in November yields about 9 ounces of crude citric acid per gallon, but only 6 ounces if the fruit is collected in April. The crude juice was formerly exported to England, and was often adulterated with sea-water, but is now almost entirely replaced by lime juice. It is said, however, to be still an article of considerable export from Turkey, where lemons are abundantly grown, to Odessa. But a concentrated lemon juice for the manufacture of citric acid is prepared in considerable quantities, chiefly at Messina and Palermo, by boiling down the crude juice in copper vessels over an open fire until its specific gravity is about 1-239, seven to ten pipes of raw making only one of concentrated lemon juice. Of this concentrated juice Messina exported in 1877 1,631,332 kilogramnnes, valued at 2,446,996 lire, and in1878 Naples exported it to the value of £767.

Lemon juice for this purpose is prepared also from the fruits of limes and Bergamot oranges. It is said to be sometimes adulter- ated with sulphuric acid on arrival in England.

Essence or Essential Oil of Lemon.—The essential oil contained in the rind of the lemon also occurs in commerce as a distinct article. It is manufactured chiefly in Sicily, at Reggio in Calabria, and at Mentone and Nicein France. The smal] and irregularly shaped fruits are employed while still green, in which state the yicld of oil is greater than when they are quite ripe. In Sicily and Calabria the oil is extracted in November and December, as follows. A workman cuts three longitudinal slices off each lemon, leaving a three-cornered central core having a small portion of rind at the apex and base. These pieces are then divided transversely ad cast on one side, and the strips of peel are thrown in another place. Next day the pieces of peel are deprived of their-oil by pressing four or five times successively the outer surface of the peel (zest or flavedo) bent into a convex shape, against a flat sponge held in the palm of the left hand and wrapped round the forefinger. The oil vesicles in the rind, which are ruptured more easily in the fresh fruit than in the state in which lemons are imported, yield

up thcir oil to the sponge, which when saturated is squeezed into an earthen vessel furnished with a spout and capable of holding about three pints. After a time the oil separates from the watery liquid which accom- panies it, and isthen decanted. By this process four hundred fruits The prisms of pulp are afterwards expressed to obtain lemon juice, and then distilled to obtain the small quantity of volatile oil they contain. At Mentone and Nice a different process is adopted. The lemons are placed in an éeuelle & piquer, a shallow basin of pewter about 84 inches in diameter, having a lip for pouring on one side and a closed tube at the bottom about 5 inches long and 1 inch in diameter.

Essence of lemon is chiefly brought from Messina and Palermo packed in copper bottles holding 25 to 50 kilogrammes or more, and sometimes in tinned bottles of smaller size. It is said to be rarely found in a state of purity in commerce, almost all that comes into the market being diluted with the cheaper distilled oil. This fact may be considered as proved by the price at which the essence of lemon is sold in England, this being less than it costs the manu- facturer to make it. When long kept the essence deposits a white

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greasy stearoptene, apparently identical with the bergaptene ob- tained from the essential oil of the Bergamot orange. The chief constituent of oil of lemon is the terpene, C,,)H,,, boiling at 348°°8 Fahr., which, like oil of turpentine, readily yields crystals of terpin, Cy) H ,g30H,, but differs in yielding the crystalline compound, ©, ,Hyg+2Cl, oil of turpentine forming one having the formula CioHig + HCl. Oil of lemons also contains, according to Tilden, another hydrocarbon C,)H 4g, boiling at 3 20° Fahr., a small amount of cymene, and a compound acetic ether, C,H30.C,)9H,,0. The natural essence of lemon not being wholly soluble in rectified spirit of wine, an essence for culinary purposes is sometimes prepared by digesting 6 ounces of lemon peel in one pint of pure alcohol of 95 per cent., and, when the rind has become

brittle, which takes place in about two aud a half hours, powdering it and percolating the alcohol through it. This article is known as leinon flavour.

The name lemon is also applied to some other fruits. The Java lemon is the fruit of Citrus javanica, Bl, the pear lemon of a variety of Citrus Limetta, and the pearl lemon of Citrus margarita. The fruit of a passion-flower, Passifiora laurtfolia, is sometimes known as the water-lemon, and that of a Berberi- daceous plant, Podophyllum peltatum, as the wild lemon. In France and Germany the lemon is known as the citron, and hence much confusion arises concerning the fruits referred to in different works, The essential oil known as oil of cedrat is usually a factitious article instead of being prepared, as its name implies, from the citron (Fr. cédratier). An essential oi] is also preparcd from Citrus Lwmia, Risso, at Squillace in Calabria, and has an odour like that of Bergamot but less powerful.

The juice of the sweet lime (Citrus Limetta, Risso), which is now largely substituted in the British navy for lemon juice for the pre-vention of scurvy, is imported principally from Montserrat. This island, although it only contains an area of 47 square miles, possesses the most extensive and best cultivated plantations of limes, Citrus Limetta, in the world. About thirty years ago a small plantation was commenced in the island by Mr Burke, at considerable outlay and with no prospect of an immediate return, and hence was not at first attended with success. But the Montserrat Lime Juice Co. now owns 600 acres, bearing 120,000 trees. Although the fruit is collected all the year round, it is never gathered from the trees, but gangs of women labourers are sent out about 5 o’clock in the morning to collect all the fallen fruit. These when brought home are immedi- ately sorted into sound and unsound fruits. The sound fruits are then bruised by hand in an éewel/e, a saucer-like vessel with a num- ber of projections arising from its bottom ; by this means the oil cells in the rind are ruptured and the oil collects at the bottom of the vessel. More oil may be obtained from green fruits, but these yield less juice and less citric acid, and are therefore not gathercd. The limes are then placed in a hopper with a sliding bottom through which they are supplied to two revolving

rollers of gun-metal fur- nished with projecting spikes of different lengths. By these the frnit is torn to small pieces, which fall on a coarse copper sieve placed below. After passing through this strainer the juice is run directly into oaken puncheons or casks containing 100 gallons. These casks are filled quite full so as to exclude air, and bunged down immediately,—the small proportion of essential oil contained in the vegetable matter which passes through the sieve helping to preserve the juice from decomposition. The slightly musty flavour of lime juice is produced by keeping, even after afew days, although the fresh juice is quite free from it. The whole of the limes collected in the morning must be pressed for lime juice the same day, as the juice rapidly loses citric acid when exposed to the air, even as inuch as 3 ounces in one day, or the whole of the acid in three weeks. Even when run at once into the casks, although it may contain 13 or 14 ounces or rarely 15 ounces of citric acid per gallon, it seldom contains more than 9 or 10 ounces on arrival in England. The mass of fruit pulp, &c., remaining on the sieves is put in bags of coir or cocoa-nut fibre, and a number of these placed one upon another, with strainers between, are then submitted to strong pressure in a screw press, to obtain more juice, the marc left after expression being returned to the plantation as manure, The unsound limes arc treated in like manner and the juice boiled down in copper pans to a consistence of about 40° (Twaddle), a loss of citric acid taking place if the liqnor be further concentrated, It then forms a black fluid of a consistence approaching that of treacle, aud is exported in casks to England for the manufacture of citric acid. Turbines of sixteen horse-power are used as the motors for the machinery. Although the lime begins to bear in three or four years, until the trees are seven or eight years old the crops are very small. The trees require pruning and attention to keep them free from a species of mistletoe with red or yellow berries and a kind of dodder. They are usually manured with cotton seed cake.

tendency to assume the form of a lemon and to become thicker skinned, while nearer the sea they are smaller, more globular, and thinner skinned. The young leaves of the lime are used for per- fuming

the water in finger-glasses, a few being placed in the water and bruised before use. In 1874 concentrated limé juice was exported from Montserrat to the value of £3390; and in 1878 Surinam exported 34,900 litres of lime juice. From Dominica 11,285 gallons, valued at £1825, were shipped in 1875.

Other trces belonging to the same natural order to which the name of limes have been given are Citrus acida, and Atalantia monophylla, the wild lime of the Hindus. Nyssa candicans, the ogeechee lime of North America, and Tilia europea, the common lime or linden tree, belong to other natural orders.

See Pharmacographia, 2d ed., p. 114; Bentley and Trimen, Medicinal Plants,

54; Risso and Pojteau, Histoire naturelle des Orangers, 1873; Alfonso, Colti- vaztone degli Agrumt, 1875.

LEMONNIER, Pierre Cuarves (1715-1799), a dis- tinguished astronomer, was born in Paris, November 23, 1715, where his father combined the practice of astronomy with the profession of philosophy. His first recorded observation was made before he was sixteen, and the presentation of an elaborate lunar map procured for him admission to the Academy, April 21, 1736, at the early age of twenty. He was chosen in the same year to accompany Maupertuis and Clairaut on their geodesical expedition to Lapland. In 1738, shortly after his return, he explained, in a memoir read before the Academy, the striking advantages of Flamsteed’s mode of determining right ascensions, Indeed his persistent recommendation of English methods and instruments combined with the labours of Lacaille to effect a revolution in French practical astronomy, and constituted the most eminent of his services to science, He corresponded with Bradley, was the first to represent the effects of nutation in the solar tables, and introduced, in 174}, the use of the transit-instrument at the Paris observatory. He visited England in 1748, and in company with the earl of Morton and Short the optician continued his journey to Scotland, where he observed the annular eclipse of July 25. The liberality of Louis XV., in whose favour he stood high, furnished him with the

means of procuring the best instruments, many of them by English makers, and gave him the command of the royal printing establishment for the publication of his works. Amongst the fruits of his industry may be mentioned a laborious investigation of the disturbances of Jupiter by Saturn, the results of which were employed and confirmed by Euler in his prize essay of 1748; a series of lunar observations extending over fifty years ; some interesting researches in terrestrial magnetism and atmospheric electricity, in the latter of which he detected a regular diurnal period; and the determination of the places of a great number of stars, including twelve separate observations of Uranus, between 1765 and its discovery as a planet. In his lectures at the Collége de France he first publicly expounded the analytical theory of gravitation, and his timely patronage secured the services of Lalande for astronomy. His temper was irritable, and his hasty utterances exposed him to retorts which he did not readily forgive, Against Lalande, his jealousy having been excited by his preference for Lacaille, he closed his doors "' during an entire revolution of the moon's nodes." TIiis career was arrested by paralysis late in 1791, and a repetition of the stroke terminated his life. He died at Héril near Bayeux, May 31, 1799. By his marriage with Mademoiselle de Cussy, he left three daughters, one of whom became the wife of Lagrange, He was admitted in 1739 to the Royal Society, and was one of the one hundred and forty-four original members of the Institute.

He wrote Histoire Céleste, 1741; Théorie des Cométes, 1743, a translation, with additions, of Halley's Synopsis ; ee astronomiques, 1746, an improyed translation of Keill's text-boo cas Nouveau Zodiague, 1755; Observations de la Line, du Soleil, et des Etoiles fixes, 1751-75 ; Lois du magnétisme, 1776-78, &c.

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LEMUR, a term applied by Linneus to a group of mammals, and suggested by the nocturnal habits and strange ghost-like appearance of some of its members. As they had previously no vernacular appellation in English, it has been generally adopted, and is now completely

anglicized, making “lemurs” in the plural. The French call them Afakis, the Germans Halbaffen, in allusion to their forming, in appearance at least, a transition from monkeys to ordinary quadrupeds. For the same reason they are called Prosimie by some systematic writers. When the name was bestowed by Linnezus, only five species were known, of which one, JL. volans, Linn., Galeopithecus volans of modern writers, is now removed. by common consent from the group. Notwithstanding the discovery of many new and curious forms, the lemurs remain a very natural and circumscribed division of the animal kingdom, though no longer considered a single genus, but divided up into many genera and even families.

The Lemurs, or Lemuroid animals as they ought more properly to be called, were formerly associated with the monkeys in the Linnwan order Primates, and afterwards in the Quadrumana of Cuvier, forming in that order the third main division, called by Geoffroy St Hilaire Strepsirhina, on account of the twisted form of the external nostrils, a division equivalent in value to the Catarhina or Old World and the Platyrhina or New World monkeys. As more complete knowledge of their organization has been gradually attained, the interval which separates them structurally from the monkeys has become continually more evident, and they are now considered either as a distinct suborder of the Primates, or even as forming an order apart, without any very near affinities with the animals with which they have hitherto been so closely associated,

The existing species are not numerous, and do not diverge widely in their organization or habits, being all of small or moderate size, all adapted to an arboreal life, climbing with ease, and, as they find their living, which consists of fruits, leaves, birds’ eggs, small birds, reptiles, and insects, among the branches of the trees, they rarely have occasion to descend to the ground. None are aquatic, and none burrow in the earth. Many of the species, but by no means all, are nocturnal in their habits, spending the day in sleeping in holes, or rolled up in a ball, perched on a horizontal branch, or in the fork of a tree, and seeking their food by night. Their geographical distribution is very peculiar ; by far the larger proportion of species, including all those to

which the term ‘“‘lemur” is now especially restricted, are exclusively inhabitants of Madagascar, where they are so abundant and widely distributed that it is said by M. Grandidier, who has contributed more than any other traveller to enrich our knowledge of the structure and manners of these animals, that there is not a little wood in the whole island in which some of them cannot be found. From Madagascar as a centre a few species less typical in character extend through the African continent westward as far as Senegambia, and others are found in the Oriental region as far east as the Philippine Islands and Celebes.

The following are the essential anatomical characters common to the whole group :—

Teeth heterodont, or divided by their form into incisors, canines, and molars, and diphyodont, or consisting of a first and second set. Molars multicuspidate. Skull with

1 For the arguments in favour of the latter view see Alphonse Milne-Edwards, ‘‘ Observations sur quelques points de l’embryologie des Lemuriens et sur les affinités zoologiques de ces animaux,” in the Ann. des Sciences Nat., October 1871 ; and P. Gervais, ‘‘ Encephale des Lemures,” in Journ. de Zoologie, tom. i. p. 7. For those for retaining them among the Primates, see Mivart, ‘* On Lepilemur and Chirogaleus, and on the Zoological Rank of the Lemuroidea,” in Proc. Zool. Soc., 1878, p. 484.

complete bony margin to the orbits, which communicate freely (except in Zarsius) with the temporal fossa. Lacrymal foramen outside the margin of the orbit. Clavicles well developed. Radius and ulna distinct. Scaphoid, lunar, and central bones of the carpus almost always separate. Five digits on the manus and pes, though the index of the manus may be rudimentary. Pollex (or thumb) and hallux (or great toe) always well developed—the latter especially large, opposable to the other digits, and with a flat nail. The index or second digit of the pes always terminating in a long pointed claw. The fingers and toes generally not tapering towards their extremities, but (except in

Chiromys) dilated, flattened, and rounded at the tips. Cerebral hemispheres not completely overlapping the cerebellum, and but little convoluted. Stomach simple. Czcum always present, generally large. The middle or transverse portion of the colon almost always folded or convoluted on_ itself. Uterus bicornuate. Placenta non-deciduate, diffused or bell-shaped—the whole of the chorion, except the cephalic pole, being covered with villosities. Allantois of great S1Ze.

In subdividing the group for the purpose of a more detailed description of the different animals of which it is composed, it must first be noted that there are two very aberrant forms, each represented by a single species—(1) the little Zarsius of the Indian archipelago, and (2) the singular Chiromys or aye-aye, which, though an inhabitant of the headquarters of the order, Madagascar, and living in the same forests and under the same external conditions as the most typical lemurs, exhibits a most remarkable specia- lization in the structure of its limbs and teeth, the latter being modified so as to resemble, at least superficially, those of the rodents, an order in which it was once placed. The differences between these two forms and the remaining lemurs is so great that the whole order naturally divides itself into three families, the first of which may be again divided into four subfamilies, which with the genera they contain may be thus arranged ; —

Family 1. Lemuride. Genera, Indris. Subfamily 1. Lmdristnd.,.....peecescevereerereeees Propithecus. Avahis. Lemur. Q, LEMMING ..ccccceecrerreeeerersiees Hapalemur, Lepilemur. : Chirogaleus. Pa S. Galagin@. ..2s0esen grease 1 ene antigo: Loris. a A, LOTHSENE.. veececeeeeseceeeentertrees 9 Wycticebus. Perodicticus. Family 2. Tarstpda ……..ccccoeceecererreueereteres Tarsius, yo Be Chipomrytd a. ... eee eee eeeteeen renee Chiromys.

Family LEMURIDE.

Upper incisors two on each side, small and separated by an in- terval in the middle line. Upper canines large, conical, compressed, and pointed. Premolars two or three, molars three on each side above and below, with numerous, more or less pointed, cusps. In the front of the

lower jaw are on cach side two or three closely approximated, long, slender tecth lying almost horizontally and projecting forwards. These are generally considered to represent the incisors and canines, but there is some doubt about their homologies, and they may be all considered as ineisors, the canine being absent. The first lower premolar larger than those behind it, and shaped like a canine. The orbit and temporal fossa widely continuous beneath the bar of bone (formed by the frontal and malar) constituting the posterior boundary of the former cavity. The fibula well developed and distinct from the tibia. All the digits of both feet (except the second of the hind foot) with flat nails, and corresponding form of ungual phalanges. }

I. Subfamily Indrisine.—The dentition of the adult consists of thirty teeth, usually expressed by the formula 72, ct, p%, m3; but, as indicated above, they may be a2, ck, pz, mg. In the

milk dentition there are twenty-two teeth, the truc molars of course not being represented, but there are two additional teeth in the fore part of the lower jaw which have no successors in the permanent series. Hind limbs greatly developed, but the tarsus normal. Hallux of large size, and very opposable. The other toes united at their base by a fold of skin, which extends as far as the end of the tirst phalanx. Mamme two, pectoral. Czcum very large, aud colon extremely long and spirally coiled.

The animals of this group are, as their organization indicates, essentially arboreal, and feed exclusively on fruit, leaves, buds, and flowers. When they descend to the ground, which is but seldom, they sit upright on their hind legs, and move from one clump of trees to another bya series of short jumps, holding their arms above them in the air. They are restricted geographically to the island of Madagasear. Among them are the largest members of the order. A very detailed and beautifully illustrated account of their charac- ters, external and internal, and distribution and habits, is given in the Histoire Naturelle de Madagascar, by A. Grandidier and Alphonse Milne-Edwards

(1875). The species -are not numerous aud are distributed into three gencra.

1. Indris, Geoff.—Upper incisors subequal in size. Upper canine larger than the first premolar, muzzle moderately long, ears exserted. Carpus without an os centrale. Tailrudimentary. Vertebre: C7, D2, L9, 84, C9.

The only well-established species is the indris (J. brevicaudatus, Geoff., fig. 1), discovered by Sonnerat in 1780. It is the largest of

Fic. 1.—Indris (Indris brevicaudatus). From Milne-Edwards and Grandidier, Mammiféres de Madagascar, pl. 12.

the lemurs, the length of the head and body being about 2 feet, and the tail 2inches. It is very variable in colour, for although usually nearly black, marked with whitish spots principally in the Inmibar region and fore arm, individuals have been found quite white. It inhabits exclusively the forests of a part of the east coast of Mada- gascar, living in small troops of four or five in numiber, and resembling in most of its habits the animals of the next genus.

2. Propithecus, Bennett.—Second upper ineisor much smaller than the first. Upper canine larger than the first premolar. Muzzle rather short. Ears short, concealed by the fur. An os centrale in the carpus. C28.

The species are all subject to great variations in colour, which has led to much difficulty in discriminating them, and to much con- fusion of synonymy. Grandidier and Milne-Edwards recognize three as certainly distinct:—P. diadema, P. verreauaxti, and P. coronatus (fig. 2). Some of these are to be found in almost every part of the island of Madagascar, living in the woods in small bands of six or eight together, and feeding exelusively on buds, flowers, and berries. Their powerful hind limbs enable them to leap from tree to tree, often to a distance of ten yards, without any apparent effort, scem-

Tail long. Vertebre: C7, D12, L8, 83, °

ing to fly through the air. When obliged to descend to the ground to pass from one clump of trees to another, they do not run on all fours, but stand erect, and throwing their arms above their heads progress by a series of short jumps, producing an effect which is described by travellers who have seen them thus in their native haunts as exceedingly ludicrous. They are not nocturnal, but most

From Milne-Edwards and

Fia. 2.—Propithecus coronatus. Grandidier, Mammiféres de Madagascar, pl. 7.

active in the morning and evening, remaining scated or coiled up among the branches during the heat of the day. They are naturally of a quiet and gentle disposition, and do not show much intelli. gence. They are also less vociferous than the true lemurs, only when alarmed or angered making a noise which has been compared to the clucking of a fowl. Like the rest of the subfamily they never have more than one young one at a time.

3. Avahis, Jourdan.—Second upper incisor larger than the first. Upper canine scarcely larger than the first premolar. Muzzle very short. Ears very small and hidden in the fur, which is very soft and woolly. Carpus without os centrale. Tail long. Vertebre : C7, D11, L9, 83, C23.

One species, 4. laniger (Gmelin), the woolly lemur, or avahis, considerably smaller than any of the last group. It differs from them in its habits, being quite nocturnal, and not associating in small troops, but being always met with either alone or in pairs. It is very slow in its movements, and rarely descends to the ground, but when it does it walks upright like the other Indrising. It is found throughout the forests which clothe the mountains on the east coast of Madagascar, and also in a limited district on the north-west coast, the specimens from which locality are of smallersize and rather different in colour.

II. Subfamily Lemuringz.—The dentition in the adult consists of thirty-six teeth, which as usually enumerated are 1%, ch, pS, m§. In the forepart of the lower jaw are on each side three elongated,

compressed, procumbent teeth, of which the outer, usually consid- ered the homologue of the canine, is larger than the others. All have long tails. Hind limbs not of the same disproportionate size as in the last group ; and the cecum much less developed. Tarsus but slightly elongated, the os calcis being always less than one-fourth the length of the tibia. Toes of the hind feet free to the base. Habitat, Madagascar and some of the adjacent Comoro islands.

This group contains the typical lemurs, or those to whieh the term is now chiefly restricted. ‘T’wo rather aberrant members make it necessary to divide it into three genera. ; j

1. Lemur, Linn.—Upper incisors separated by an interval in the

middle, but not in contact with each other or the canine, in front of which they are both placed. Muzzle elongated. Ears conspicu- ous and tufted. Mamme two, pectoral. Vertebre : C7, D12, L7 (or D138, L6), $3, C27.

Animals much about the size of a common cat, with fox-like faces, soft thick fur, and long tails well clothed with hair. Not having the same disproportionate size of the limbs as the last group, they are much more quadrupedal in their actions, walking on the ground or running along the branches of trees on all four feet, but also Jjump-

Fig. 3.—Skull of Ring-tailed Lemur (Lemur cotta). x % Mus. Roy. Coll. Surgeons. we, upper canine; le, lower canine; pm, premolars ; m, true molars.

ing with marvellous agility. They are gregarious, living in small troops, are diurnal in their habits, but most active towards evening, wheu they make the woods resound with their loud crics, and feed, not only on fruits and buds, but also on eggs, young birds, and insects. When at rest or sleeping, they generally coil their long, bushy tails around their

bodies, apparently for the sake of the warmth it affords. They have usually either one or two young ones ata birth, which are at first nearly naked, and are carried about, hanging close to and almost concealed by the hair of the mother’s

Fia. 4.— Ring-tailed Lemur (Lemur cotta).

From life.

belly. After a while they change their position and mount upon the mother’s back, where they are carried about until they are able to climb and leap by themselves. Though no member of the Indrisine has as yet lived long enough in captivity to be brought alive to Europe, the lemurs are cominonly seen in menageries, and often breed in England. They present a great tendency to variation in their colouring, in consequence of which many nominal species have been made. ‘The most distinct, and at the same time most beautiful, is the ring-tailed lemur (Z. eatta, Linn.., fig. 4), of a delicate grey colour, and with a long tail marked with alternating rings of black and white. This is said by Mr G. A. Shaw (Proc. Zool. Soc., 1879, p. 132)

LEMUR

to be an exception to all the other lemurs in not being arboreal, but living chiefly among rocks and bushes. Pollen, however, says that it inhabits the forests of the south-west parts of Madagascar, living, like its congeners, in considerable troups, and not differing from them in its habits. He adds that it is extremely gentle, and active and graceful in its movements, and utters at intervals a little plaintive cry like that of a domestic cat. All the others have the tail of uniform colour. The largest species is L. varius, Geoff., the ruffed lemur, sometimes black and white, and sometimes reddish- brown, the variation apparently not depending on sex or age, but on the individual. In ZL. macaco the male is black and the female red. L. mongoz, L. eolbaris, and L. albifrons are other well-known species.

Yo. Hapalemur, Is. be te incisors very small, subequal, separated widely in-the middle line. Those of each side in contact with each

other and with the canine, the posterior one being placed on the inside, and not in front of the latter. Muzzle very short and truncated. Mamme four. There is apparently but one species, H. griseus, smaller than any of the true lemurs, of a dark grey colour, with round face and short ears. Itis quite nocturnal, and lives chiefly among bamboos, subsisting on the young shoots. A second species has been named /7. simus, but it is doubtful if it is not only a variety.

3. Lepilemur, Is. Geoff.; Lepidolemur and Myxocebus, Peters. — Upper incisors absent or only two in number and very small. Muzzle more elongated than in the last. No distinct os centrale in the carpus. L. mustelinus is the best known species. It has, at all events when adult, no upper incisors. It is rare, and like Hapalemur nocturnal in its habits. A second closely allied species, but with better —. premaxille, containing a pair of small styliform incisors, has been described by Peters under the namie of Myzxocebus caniceps (Monatsb. Berlin. Akad., 1874, p. 690).

III. Subfamily Galagine.—Dentition as in Lemurinex, from which they are distinguished by the elongation of the tarsus, caused by a peculiar modification of the os calcis and the naviculare, the distal portion of the former and the whole of the latter having the form of nearly cylindrical rods placed side by side, while the other bones retain nearly their normal form and proportion.

1. Chirogaleus, Geoff.—Third upper premolar very much smaller than the first molar, and with only one external cusp. The ani- mals included under this name appear to form a transition between the true lemurs and the galagos. The genus was originally estab- lished by Geoffroy St Hilaire in 1812 for the reception of three animals only known at that time by drawings made in Madagascar by the traveller Commerson. Subsequent discoveries have brought to light several species that may be referred to it, including one or two which are sometimes considered as forming a genus apart under the name of Mierocebus. They are all small, some being less than a rat in size, long-tailed, and nocturnal in their habits. One of the largest, C. fureifer, is of a reddisli-grey colour, and is distinguished by a dark

median stripe on its back which divides on the top of the head into two branches, one of which passes forwards above each eye. The most interesting peculiarity of these animals, a knowledge of which we owe to M. Grandidier, is that certain species (C. samati, C. gliroides, C. milii, &c.) during the dry season coil themselves up in holes of trees, and pass into a state of torpidity, like that of the hibernating animals in the winter of northern climates. Before this takes place, an immense deposit of fat accu- mulates upon certain parts of the body, especially upon the basal portion of the tail, which has then dimensions corresponding to that of the well known fat-tailed sheep of the Cape, but which ly the time they emerge from their torpor has acquired its normal pro- portions. The smallest species, to which many names have been given (C. pusillus, rufus, smithii, &c.), lives among the small branches on the tops of the highest trees, feeding on fruit and insects, and making nests which resemble those of birds.

2. Galago, Geoff. = Otolienus, liger.—Third upper premolar with two large external cusps, and nearly equalling the first molar in size. Os calcisabout one-third the length of the tibia, and the navi- culare much longer than the cuboid. Vertebre : C7, D13, L6, 83, C22-26. Tail long, and generally bushy. Ears large, rounded, naked, and capable of being folded at the will of the animal. Mamme four, two pectoral and two inguinal.

The galagos differ from all the lemuroids previously mentioned, inasmuch as they are all inhabitants, not of Madagascar, but of the African continent, being widely distributed in the wooded districts from Senegambia in the west to Abyssinia in the east, and as far south as Natal. They pass the day in sleep, but are very active at night, feeding on fruit, insects, and small birds. When they descend to the ground they sit upright, and move about by jump- ing with their hind legs, like jerboas and kangaroos. They are pretty little animals, varying in size from that of a small cat to less than a rat, with large eyes and ears, soft woolly fur, and long tails. There are several species, of which @. erassicaudatus, from Mozambique, is the largest. A similar species, or perhaps variety, from Angola is G. montiert. G. garnetti, alleni,

maholi, demidoffi, and senegalensis are other recognized species. The last-mentioned

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LEMUR

was the first known to science, having been brought from Senegal by Adanson, and described in 1795 by Geoffroy, who adopted the name Galago, by which it was said to be called by the natives,

IV. Subfamily Lorisine.—Dental formula as in Lemuring. In- dex finger very short, sometimes rudimentary and nailless. Fore and hind limbs nearly equal in length. Tarsus not specially elon- gated. Pollex and hallux diverging widely from the other digits, the hallux especialiy being habitually directed backwards, ‘ail short or quite rudimentary. Mamme two, pectoral.

A aanil group of very peculiar animals, of essentially nocturnal habits, and remarkable for the slowness of their movements. They are completely arboreal, their limbs being formed only for climbing and clinging to branches, not for jumping or running. They have rounded heads, very large eyes, short ears, and thick, short, soft fur. They feed, not only on vegetable substances, but, like many of the Lemuridez, also on insects, eggs, and birds, which they steal upon while roosting at night. None of the species are found in Madagascar. One of the greatest anatomical peculiarities of these animals is the breaking up of the large arterial trunks of the limbs into numerous small parallel branches, constituting a rete mirabile, which is found also in the true sloths, with which the loris are sometimes confounded on account of the slowness of their move- ments. The animals of this group are usually divided into four genera, though the characters by which they are separated are very trivial. There are more properly two uatural divisions.

A, Characterized by the index finger being small, but having the complete number of phalanges, and by their Asiatic habitat.

These form the genus Loris of Geoftroy St Hilaire (1796), Stenops of Iliger (1811), but they were in 1812 divided by Geoffroy into two genera, Nycticebus and Loris, a division which has been accepted by most modern zoologists.

Genus Nycticcbus, Geoff.—First upper incisor larger than the second, which is often early deciduous. Inner margin of the orbits separated from each other by a narrow flat space. Nasal and pre- maxillary bones projecting but very slightly in front of the maxille. Body and limbs stout. No tail. Vertebre: C7, D17, L6, S83, C12. The species are NV. tardigradus, the common slow lemur or loris, of the Malay countries, Sumatra, and Borneo; N. javanicus, of Java; and N. cinereus (fig. 5), of Siam and Cochin China. The

Fic. 5.—Grey Loris (Nycticebus cinereus). From A. Milne-Edwards, N. Archives du Muséum, tome iii. pl. 3.

habits of all are much alike. They lead asolitary life in the recesses of large forests, chiefly in mountainous districts, where they sleep during the day in holes or fissures of large trees, rolled up into a ball, with the head between the hind legs. On the approach of evening they awake ; and during the night they ramble among the branches of trees, slowly and quietly, in search of their food, which consists of tender leaves and fruit, small birds, insects, and mice. When in quest of living prey, they move noiselessly till quite close, aud then suddenly seize it with one of their hands. The female a ada but one young one at a time. by Linnzeus at the head of the list of species of his genus Lemur, and its habits doubtless suggested the generic name which was trans- ferred by Geoffroy to the less nocturnal and spectre-like Madagascar members of the group.!

Genus Loris, Geoff.—Upper incisors very small and equal. Orbits very large, and only separated in the middle line above by a thin vertical plate of bone. Nasals and premaxille produced for- wards considerably beyond the anterior limits of the maxille, and supporting a pointed nose. Body and limbs slender. No external tail. Vertebre: C7, D14, L9, 83, C6.

‘ For the anatomy of this genus, see J. L. C. Shroeder van der Kolk and W. Vrolik, “Reeherehes d’Anatomie eomparée sur le genre Stenops d’Illiger,” in Bijdragen tot de Dierkunde, part i., Amsterdam, 1848-54.

L. tardigradus was placed |

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One species, L. gracilis, the slender loris of Ceylon, a very strange-looking creature, about the size of a squirrel, of a yellowish-brown colour, with large, prominent eyes, pointed nose, long thin body, long, angularly bent, slender limbs, and no tail. Its habits are like those of the rest of the group.

B. Index finger reduced to a mere tubercle without nail. the known species are from West Africa.

Genus Perodicticus, Bennett.—A short tail, about a third of the length of the trunk. ‘Two or three of the anterior dorsal vertebra have very long slender spinous processes which in the living animal project beyond the general bat of the skin, forming distinct coni- cal prominences, covered only by an exccedingly thin and naked integument. P. potto (Lemur potto, Gmelin), the potto, is one of the oldest known members of the lemuroid group, having been de- scribed in 1705 by Bosman, who met with it in his voyage to Guinea. It was, however, lost sight of until 1825, when it was re- discovered in Sierra Leone and fully described by Bennett in the Proceedings of the Zoological Society, part i. ,1830-31, under the name of Perodicticus Geofroyi. Bennett’s generic name has been retained, but the specific name bestowed by Gmelin, adopted from Bosman, has been restored. It is also found in the Gaboon. It is strictly nocturnal, and slower in its movements even than Wycticebus tardt- gradus, which otherwise it much resembles in its habits.?

A second species, the awantibo (P. calabarensis, Smith), rather smaller and more delicately made, with smaller hands and feet, and rudimentary tail, constitutes the genus Arctocebus, Gray. It is found at Old Calabar, and is very rare, only a few individuals having as yet been met with. Its anatomy has been described by Professor Huxley in the Proc. Zool. Soc., 1864, p. 314. Vertebre: C7, D15, L7, 83, C9.

Both

Family TARSIUDA,

Dentition, 73, c}, p$, m=, total 34. The first upper incisor large, and in contact with its fellow of the opposite side. Canine of moderate size. Molars, with numerous pointed cusps. Lower canine semi-erect, its apex diverging from that ofthe single incisor. First lower premolar smaller than those behind it. Orbit to a large extent separated from the temporal fossa by a bony partition. Fibula slender, with its lower half confluent with the tibia. Second and third digits of the hind foot with compressed claws ; all the other digits of both feet with flat nails. Calcaneum and navicular bone of the foot elongated as in the chirogales and

alagos, but to a still greater extent, Colon short and not folded. Nanaben s C7, D13, L6, 83, C27.

This family contains the single genus Tarsius, Storr, of which but one species is known, 7’. spectrum, the tarsier, a very singular little animal, rather smaller than an English squirrel, with very large eyes and ears, a long thin tail, tufted at the end, and immensely elon- gated tarsal portion of the foot, in allusion to which its generic name was given to it. It inhabits the forests of many of the islands of the Indo-Malayan archipelago, Sumatra, Borneo, Celebes, and some of the Philippines, feeds chiefly on insects and lizards, sleeps during the day, but is tolerably active at night, moving chiefly by jumping from place to place, an action for which the structure of its hind legs, which present a curions resemblance to those of a frog, seems particularly well adapted, It is rare, not more than two being generally found together, and only brings forth one young at a time.®

Family CHIROMYIDE.

Dentition of adult, 73, ¢%, pi, m$=4, total 18. Incisors very large, compressed, curved, with persistent pulps and enamel only in front as in rodents. Teeth of molar series with flat, very indistinctly tuberculated crowns. In the young, the first set of teeth more resemble those of the normal lemurs, being 72, ch, m%, all very small. Orbit surrounded by a ring of bone posteriorly, bencath which it communicates freely with the temporal fossa. Fibula well-developed and distinct from the tibia. All the digits of both feet with pointed rather compressed claws, except the hallux, which hasa flattencd nail. Middle digit of the hand excessively attenuated. Vertebre: C7, D12, L6, 83, C27.

This family, like the last, is formed for the reception of a single genus, Chiromys, Cuvier,‘ containing one species, C. madagascariensis (Gmelin), the aye-aye, an animal about the size of a cat, with a broad rounded head, short face, and large aud naked ears. It has very large hands and long thin fingers with pointed claws, one of which (the middle or third) is remarkable for its extreme slenderness. The foot

resembles that of the other lemurs in its large opposable hallux, with a flat nail, but all the other toes have pointed com-

2 Van der Hoeven and Van Campen, “ Ontleedkundig onderzoek van der Potto van Bosman,” in Verh. Kong. Akad. van Wetenschappen, Amsterdam, 1859.

3 H. Burmeister, Beitrage zur ndhreren Kenntniss der Gatiung Tarsius, Berlin,

1846.

4 It was first named Daubentonia by Geoffroy; but this name was withdrawn by its author in favour of Chiromys, as it had been previously given to a genus in the vegetable kingdom. It ought not, therefore, to be revived, as has been done by some modern authors.

pressed claws, like that of the second toe in the Lemurinz and the second and third in the Zarsiid#. ‘Tail long and bushy. General colour dark brown, the outer fur being long and rather loose, with a woolly undercoat. Mamme two, inguinal in position. It is a native of Madagascar, where it was discovered by Sonnerat in 1780. The specimen brought to Paris by that traveller was the only one known until 1860. Since then many others have been obtained, and one hag lived for several years in the gardens of the Zoological Society of London. Like so many of the lemurs, it is completely nocturnal in its habits, living either alone or in pairs, chiefly in the bamboo forests. Observations upon captive specimens have led to the conclusion that it feeds principally on succulent juices,

Fig. 6.—Skull of Aye-aye (Chiromys madagascariensis). X $. Mus. Roy. Coll. Surgeons.

especially of the sugar cane, which it obtains by tearing open the hard woody circumference of the stalk with its strong incisor teeth. Itis said also to devour certain specics of wood-boring cater- pillars, which it

obtains by first cutting down with its teeth upon their burrows, and then picking them out of their retreat with the claw of its attenuated middle finger. It constructs large ball-like nests of dried leaves, lodged in a fork of the branches of a large tree, and with the opening on one side. The resemblance of its teeth to those so characteristic of the Ltodentia caused it to be placed for- merly in that order, and it was only when its anatomieal characters were fully known that its true affinities with the lemurs became apparent.?

Extinct Lemuroidea.—The disputed zoological position of the lemurs, and the great importance which has been attached to them by those naturalists who regard them as thie direct transition between the lower and higher mammals, and survivors of a large group, now almost extinct, through which the higher Primates, including man, must have passed in the progress of their development, make the consideration of their ancient history one of great interest. Until very recently fossil lemurs were quite unknown ; at all events the affinities of certain remains provisionally assigned to the group were much questioned; but within the last few years the existence of lemuroid animals in Europe during the later Eocene and early Miocene periods has been perfectly established, and remains of a large uumber of animals attributed, though with less certainty, to the group have been found in beds of corresponding age in North America. In 1862 Riitimeyer described the fragment of a right maxilla and three molars from a sidero- litic deposit (Bohnerz) at Egerkingen, near Soleure, under the name of Cenopithecus lemuroides, supposing them to belong to an animal partaking of the characters of the American monkeys and the lemurs. The remains were, however, by most other paleontologists referred to the Ungulata. More recently M. Bétille discovered in deposits which were being worked for phosphate of lime at Sainte Néboule de Béduer, department of Lot, France, regarded as of early Miocene age, a nearly complete cranium, and subsequently, at the same place, a portion of a ramus of a mandible of apparently the same species of animal. These were described by M. Delfortrie in the Actes de la Société Linnéenne de Bordeaux for 1872 under the name of

1 R. Owen, ‘‘ On the Aye-aye,” in Z’rans. Zool. Soc., vol. v. p. 38, 1862; W. Peters, ‘‘ Ueber die Siugethier-Gattung Chiromys,” in Abhand, Kénigl. Akad. der Wissenschaften, Berlin, 1865, p. 79.

Palzxolemur betillei. The cranium is generally well preserved, but unfortunately the anterior part, containing the incisor and canine teeth, has been broken off. Its affinity to the lemurine animals, especially to the African forms, the Lorisine and Galagine, is chiefly shown by the general form of the cranium, the large size and anterior direction of the orbits, the small and parrow muzzle, and the position of the Jacrymal foramen outside the anterior edge of the orbit. In size the fossil is intermediate between the potto (Perodicticus potto) and Galago crassicaudatus. When the specimen came into the hands of M. Gaudry, that experienced and accurate paleontologist, with the rich treasures of the Paris Museum at hand for comparison, recognized that certain more or less fragmentary remains which had long been in the collection, and had been described from the teeth alone, and generally, though doubtfully referred to the Ungulata, were really nothing more than animals of the same group, and probably even the same species as Palxolemur betille. These were Adapis parisiensis, Cuvier, from the Paris gypsum, described and figured in the Ossemens fossiles, Aphelotherium duvernoyi, Gervais, from the same beds, and other specimens from Barthélemy,near Apt. This result was fully acquiesced in by Gervais; who also added Cenopithecus lemuroides, Riitimeyer, to the synonyms of the animal, which henceforth must be called Adapis parisiensis, as that was the name first assigned to it.

M. Delfortrie’s announcement of a fossil lemur from the south of France was soon followed by that of another species by M. H. Filhol, named Mecrolemur antiquus (Comptes Rendus, 1873, tom. Ixxvii. p. 1111), which was afterwards more fully described and figured (Annales des Sciences Géologiques, tom. v. No. 4, 1874, and Recherches sur les Phosphorites du Quercy, 1876), and a second species of Adapts, of considerably larger size, A. magnus, Filhol, was added tothe group; the latter, of which the skull is upwards of 4 inches in length, resembles M. Delfortrie’s in its general characters, but modified much in the way that the skulls of larger animals differ from

the smaller ones of the same natural group. The brain-chamber and orbits are relatively smaller, the face larger, the muscular crests more developed, and the constriction between the cerebral and facial portion of the skull more marked. These modifica- tions remove the skull in its general characters still further from the existing lemurs—so much so that M. Filhol refers it and the other species of Adapis to a distinct and hitherto unknown zoological type, intermediate between the lemurs and the pachyderms, to which he gives the name of Pachylemur. On the other hand he considers the ecro- lemur antiquus found at St Antonin, which is a very small species, to be a true lemuroid, more nearly resembling Galago senegalensis than any existing species. Unfortu- nately in all these specimens the anterior part of the skull is so much injured that the character and numbers of the incisor teeth cannot be ascertained, a great want in determining the affinities of these animals. And even if the whole of the skulls were found, as long as nothing is known of the limbs, or of any other bones of the skeleton, the determination of their actual zoological position cau only be considered as provisional. All the existing lemurs and pachyderms, or ungulates as they are now generally termed, are so essentially different in structure and mode of life that it is difficult to conceive of a transition from one to the other, and therefore any such forms when found will be full of interest. In skull and teeth characters, as far as they are yet known, these ancient lemur-like animals from France do not deviate sufficiently from the existing lemuroids to justify their separation, but it remains to be proved whether they had the opposable hallux and ungui- culate toes of the forms which now inhabit the world,

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or whether their limbs were of a more generalized type. | down to the social leadership of Paris.

The discussions which have taken place on their nature at all events show how little reliance can be placed upon the characters of the molar teeth alone in judging of the affinities of an extinct animal.

Perhaps the most important of all the numerous recent palzontological discoveries in the Tertiary beds of the rocky mountain district of North America has been that of animals which their describers believe to be low and generalized forms of the order Primates. Their existence was not suspected till 1872, in which year Professor Marsh and Professor Cope almost simultaneously announced the fact. Since that time numerous genera have been assigned to the gronp, including five which were previously described by Leidy from teeth alone, the nature of which he did not venture to determine. These are nearly all from the Eocene or lowest Miocene formations. Until we receive fuller information régarding the remains of these animals, it is premature to speculate upon their real character or affinities. The difficulty of doing so is at present enhanced by their describers in the provisional accounts already given adopt- ing the old assumption that lemurs and monkeys are animals of the same general type, and speaking of them sometimes as one and sometimes as the other. It is possible that these animals, or some of them, may have been monkeys, in which case they were not lemurs; or they may have been lemurs, in which case they were not monkeys. It is possible also that they may form a connect- ing link between the two, and so justify their old associa- tion inone group. The recently described Anaptomorphus homunculus from the Lower Eocene of Wyoming, an ani- mal smaller than Zarsius spectrum, is considered by Cope to be “the most simian lemur yet discovered, and prob- ably representing the family from which the true monkeys and men were derived” (Palzxontological Bulletin, No. 34, February 20, 1882). In this case the lemurs, which, judging by their present distribution, appear to have spread east and west from Madagascar, may have had quite a different origin.

Litcrature.—Besidesthe works and memoirs on partieular families and genera referred to above, see St G. Mivart, ‘‘ Notes on the Crania and Dentition of the Lemuridx,” in Proc. Zool. Soc., 1864 (p. 611-648) and 1867 (p. 960-975); Mivart and Murie, ‘‘On the Anatomy of the

Lemuroidea,” in Trans. Zool. Soc., vol. vii., 1872, pp. 1-118; W. Turner, ‘‘On the Plaecentation of the Lemurs,” in Phil. Trans., elxvi., pp. 569-587 ; F. Pollen and D. C. Van Dam, Recherches sur la Faune de Madagascar, 2me parte, ‘‘ Mammiféres,” 1868. (W. H. F.)

LENA. See Srperra.

LENCLOS, Nryon bE (1615-1705), was the daughter ofa gentleman of good position in Touraine. Her long and eventful life divides into two periods, during the former of which she was the typical Frenchwoman of the gayest and most licentious society of the 17th century, during the latter the recognized leader of the fashion in Paris, and the friend of wits and poets. Of her earlier life the less said the better, and in her defence all that can be pleaded is that she had been educated by her father i the epicurean and sensual beliefs made popular by Montaigne, and that she retained throughout the frank demeanour, and disregard of money, which won from Saint “vremond the remark that she was an honnéte homme. Against her, and the numerous specious defences set up for her by contemporaneous and subsequent French writers, must be mentioned her absolute want of maternal feeling and even of natural shame. The well-known visit of Queen Christina to her attests the extent of her renown, or infamy, and the inefficacy of the threats of Anne of Austria prove her power. Ofa perfectly different character was her later life, when, though she had continued her career of debauchery for a preposterous length of time, she settled

 Then there were to be found in her salon all that was most witty and refined in France,—‘ ladies as well as gentlemen of the highest birth,” remarks a correspondent to Madame de Sevigné, poets like Molitre, abbés like Chateauneuf, Genevese preachers like Turretin, the protegé of Saint

vremond. It became the fashion for young men as well as old to throng round her, and the best of all introductions for a young man who wished to make a figure in society was an introduction to Mdlle. de Lenclos. The cause for this surpassing social success is to be found perhaps as much in her past notoriety, and past intimacy with the great names of the last generation, as in the wit and tact, to which Saint

Evremond, and after him Sainte-Beuve, ascribe it. Her long friendship with Saint Evremond must be shortly noticed. They were of the same age, and had been intimate in their youth, and throughout his long exile the wit seems to have kept a kind remembrance of Ninon. The few really authentic letters of Ninon herself are those addressed to her old friend, and the letters of both in the last few years of their eqnally long lives are exceptionally touching, and unique in the polite compliments with which they try to keep off old age. If Ninon owes part of her posthumous fame to the old wit, she owes at least as much to the young Arouet, who was presented to her asa promising boy poet by the abbé de Chateauneuf, to whom she left 2000 francs to buy books, and who, as Voltaire, was to write a letter on her which was to be the chief authority of many subsequent biographers. Her personal appearance is, according to Sainte-Beuve, best described in a novel of Mdlle. de Seudéry, and the charac- teristic of it was neither beauty nor wit, but high spirits, and perfect evenness of temperament,

The letters of Ninon published after her death were, aeeording to Voltaire, all spurious, and the only authentie ones are those to Saint Evremond, whieh ean be best studied in Dauxmesnil's edition of Saint Evremond, and his notiee on her. Sainte-Beuve has an interesting notiee of these letters in the Cawscrics du Lundi, vol. iv. Most biographies of Ninon are full of unauthentie stories.

LENFANT, Jacques (1661-1728), author of numerous works, chiefly in ecclesiastical history, was born at Bazochie (Eure-et-Loir) on April 13, 1661. His father, Paul Lenfant, was Protestaut pastor at Bazoche and afterwards at Chatillon-sur-Loing until the revocation of the edict of Nantes, when he removed to Cassel. After studying at Saumur and Geneva, Lenfant completed his theological course at Heidelberg, where in 1684 he was ordained pastor of the French Protestant church, and appointed chaplain to the dowager electress palatine. The French invasion in 1688 compelled his withdrawal to Berlin, where in the following year he was again appointed by Frederick to be one of the ministers of the French Protestant church ; this office he continued to hold until his death, ultimately adding to it that of chaplain to the king, with the dignity of consistorialrath. He visited Holland and England in

1707, and had the honour of preaching before Queen Anne, and, it is said, of being invited to become one of her chaplains. In search of materials for his histories he visited Helmstadt in 1712, and Leipsic in 1715 and 1725, but otherwise the course of his life was quite uneventful. He died at Berlin on August 7, 1728.

An exhaustive eatalogue of his publieations, thirty-two in all, will be found in Chauffepié's Dictionnaire, where his personal exeellen- eies ave dwelt upon with some fulness and warmth. See also Haag's France Protestante. He is now best known by his Histovre du Concile de Constance, tirée principalement d' Auteurs qui ont assisté au Concile (Amsterdam, 1714; 2d ed., 1728; English translation, 1730). It is of eourse largely dependent upon the previous laborious work of Van der Hardt, but has indisputable literary merits peeuliar to itself, and in partieular has been praised on all sides for its fairness. It was followed by Histoire du Concile de Pise, ct de ce qui s'est passé dc plus mémorable depurs ce Concile jusqw au Concile de Constance (1724), and (posthumously) by

Histoire de la Guerre des Hussites et du Concile de Basle (Amst.,

1731; German translation, Vienna, 1783-84). Lenfant was one of the chief promoters of the Bibliotheque Germanique, begun in 1720; and he was associated with Beausobre in the preparation of the new French translation of the New Testament with original notes, published at Amsterdam in 1718.

LENKORAN, a town in Trans-Caucasia, on the Caspian, at the mouth of a small stream of its own name, and close to a great lagoon. The lighthouse stands in 38° 45' 38" N. lat., and 48° 50' 18" E. long. Taken by storm on New Year's day 1813 by General Kotliareski, Lenkoran was in the same year surrendered by Persia to Russia by the treaty of Gulistan along with the khanate of Talysh, of which it was the capital. In 1867 it had a population of 15,938 ; but according to the census of 1873 there were only 4779 inhabitants (734 Russians, 232 Armenians). The fort has been dismantled; and in trade the town is being far

outstripped by Astara, the custom-house station on the Persian frontier. :

The district of Lenkoran (2078 square miles), correspond- ing to the khanate of Talysh, is highly interesting from its physical peculiarities. It is a thickly wooded mountainous region, shut off from the dry Persian plateau by the Talysh range (7000-8000 feet high), and with a narrow marshy strip along the coast. The climate is exceptionally moist aud warm (annual rainfall 52:79 inches ; mean temperature in summer 75°, in winter 40°), and fosters the growth of even Indian forms of vegetation. The iron tree (Parrotia persica, OC. A. Meyer), the silk acacia, Carpinus Betulus, Quercus iberica, the box tree, and the walnut Hourish freely, as well as the sumach, the pomegranate, and the @ledztchia caspica. The Bengal tiger is not unfrequently met with, and wild boars are abundant. Of the 95,482 inhabitants of Lenkoran, the Talyshians (42,999) form the most interesting and aboriginal element, belonging as they do to the Iranian family, and speaking an independently developed language closely related to Persian. They are of middle height and dark complexion, with generally straight nose, small round skull, small sharp chin, and large full eyes, which are expressive, however, rather of cunning than intelligence. They live exclusively on rice. In the northern half of the district the Tartar element predomi- nates, and there are a number of villages (Pravolnoye, for instance, with 2000 inhabitants) occupied by various Russian sectarians.

LENNEP, a small town of Rhenish Prussia in. the district of Diisseldorf, is situated 18 miles east of Diisseldorf and 9 miles south of Barmen, at a height of 1050 feet above the level of the sea. It lies in the heart of one of the busiest industrial districts in Germany, and carries on important manufactures of the finer kinds of cloth, wool, yarn, felt, and other articles. It is the seat of a small chamber of commerce, and possesses a large and well-equipped hospital. Lennep, which was the residence of the counts of Berg from 1226 to 1300, owes the founda- tion of its prosperity to an influx of Cologne weavers during the 14th century. Population (1880) 8077, about one- fourth of whom are Roman Catholics.

LENNEP, Jacosp van (1802-1868), Dutch poet and novelist, was born March 24, 1802, at Amsterdam, where his father, David Jacob van Lennep, who also became known as a scholar and poet, was professor of eloquence and the classical languages in the Atheneum. Lennep received his education partly in his native city and partly at Leyden, studying jurisprudence at the latter, and ulti- mately obtaining the degree of doctor of laws; he then settled as an advocate in Amsterdam. His first poetical efforts had been translations from Byron, of whom he was an ardent admirer, and in 1826 he published a collection of original Academic Idylls which had a modi- fied success. He first attained genuine popularity by

the Nederlandsche Legenden, which reproduced ufter the manner of Sir W. Scott, though without much psycho- logical depth or Kteral accuracy, some of the more stirring incidents in the early history of his fatherland. His fame was further raised to a very high pitch by his comedies Het Dorp aan die Grenzen and Het Dorp over die Grenzen, which had reference to the political events of 1830. In 1829 he had broken ground in a new and hitherto untried field with the publication of De Pleegzoon (“The Adopted Son,” 1829), the first of a series of historical romances in prose, which have acquired for him in Holland a position somewhat analogous to that which Scott holds throughout the reading world. The series included De Roos van Dekama (1837), Onze Voorouders (1838), Ferdinand Huyck (1840), Llizabeth Musch (1850), and De Lotgevallen van Klaasje Zevenster (1866), several of which have been trans- lated into German and French, and two (“The Rose of Dekama” and “The Adopted Son”) into English. In a closely connected department of literature, his Dutch history for young people (Geschiedenis van Noord-Nederland aan mijne Kindern verhaald) is attractively written. Apart from the two comedies already mentioned, Lennep was the author of numerous dramatic pieces which have found much acceptance on the Dutch stage. For some years Lennep held a judicial appointment, and from 1853 to 1856 he was a member of the

second chamber, in which he voted with the Conservative party. He died at Ooster- beek near Arnheim, on August 25, 1868, There is a collective edition of his Poetische Werken (13 vols., 1859— 1872), and also of his Romantische Werken (23 vols.,

1855-1872).

LENT (lenten, lente, from A. 8. lencten, spring ; comp. Du. lente, Germ. lenz), the ecclesiastical season known in the early Greek Church as reocapaxoory (afterwards as 4 vyoreia), and in the Latin Church, from at least the 4th century, as Quadragesima.! Irenzus, in a passage which, though not free from difficulties, is yet clear enough in its general scope (apud Euseb., H. H., v. 24), mentions that the custom of keeping a fast before Easter Sunday was quite old even in his day, but that no uniformity of observance had up to that time been established, some thinking they ought to fast for one day, others for two days, and others having further peculiarities. In Tertullian's day the Good Friday fast at all events was "communis et quasi publica jejunii religio" (De Orat., c. 18), and elsewhere (De Jejun. 2) he indicates his opinion that Christians ought to commemorate by a religious fast all the time during which "the bridegroom was taken away from them." This period of fasting was gradually extended, but still without uniformity of praxis. The diversity of usage covered by a common name is referred to by Socrates (H/. #., v. 22) as a source of perplexity to him. He tells us that in Rome the custom was to fast. three continuous weeks before Easter, Saturdays and Sundays not being included ; that in Illyria, Greece, and Alexandria the period of abstinence called recoapaxoory extended over six weeks; and that in some other places, which he does not specify, the custom was to begin the fast seven weeks before Easter, but actually to observe it at intervals only for three periods of five days each, and nevertheless still to call it reroopaxooryn. Cassi- anus (Coll. 21, 5) calls attention to the fact that a fast of seven weeks, when Saturdays and Sundays, except Holy Saturday, are excluded as they ought to be, means a fast of thirty-six days in all, 2e, a tithe of the year,—an idea which seems to have found wide acceptance. Leo L (Serm. 44) alludes to the fast of forty days as having apostolic

1 Literally, it would seem, the fortieth day before Easter (comp. Sexagesima, Septuagesima). From Quadragesima comes the Italian quaresima, Spanish evaresma, French caréme.

authority, but the number dves not seem to have been taken quite literally. In one of the homilies (Zn Evang., xvi.) of Gregory the Great, the precise number is fixed as by Cassianus at thirty-six, but this figure is obtained by reckoning from the sixth Sunday before Easter and deduct- ing Sundays only. In the Corpus Juris Canonici this passage is reproduced, but with an important change which must have been made before the end of the 8th century ; it is to the effect that, in order to make up the sacred number of forty days dedicated to fasting by our Lord, it is necessary to take in as fasts the four days preceding Quadragesina Sunday. As regards the manner of observing Lent, various degrees of strictness have prevailed in the church. Perfect abstinence from all food every fasting day until evening is in theory at least required, and it has also been considered desirable that public worship with sermon should be attended daily, with frequent communion, especially on Saturday and Sunday; public amusements, especially stage plays, are prohibited, and the celebration of religious festivals, as also of birthdays and marriages, is held to be unsuitable ; and increased diligence in almsgiving and deeds of charity is enjoined.

LENTIL, the seed of Lens esculenta, Monch, a small annual of the vetch tribe. The plant varies from 6 to 18 iuches in height, and has many long ascending branches. The leaves are alternate, with six pairs of oblong-linear, obtuse, mucronate leaflets. The flowers, two to four in number, are of a pale blue colour, and are borne in the axils of the leaves, on a slender footstalk equalling the leaves in length ; they are produced in June or early in July. The pods are about 4 inch long, broadly oblong, slightly inflated, and contain two seeds, which are of the shape of a doubly convex lens, and about Linchin diameter. There are several cultivated varieties of the plant, differing in size, hairiness, and colour of the leaves, flowers, and seeds. The last may be more or less compressed in shape, and in colour may vary from yellow or grey

to dark brown; they are also sometimes mottled or speckled. In English commerce two kinds only of lentils are principally met with, viz, the French and the Egyptian. The former are usually vended entire, and are of an ash-grey colour externally and of a yellow tint within; the latter are usually sold like split peas, without the seed coat, and consist of the reddish- yellow cotyledons, which are smaller and rounder than those of the French lentil; the seed coat when present is of adark brown colour. Egyptian lentils are chiefly imported from Alexandria. In 1880 there were shipped from that port 25,000 ardebs, or 17,000 quarters, of red lentils, valued at £25,000, of which amount 80 per cent. was taken by Great Britain. Considerable quantities of lentils are also imported into the United States, but are chiefly consumed by the Germans, with whom lentil soup is a favourite dish. The native country of the lentil is not kuown, although it is supposed to be indigenous to the Himalayas. It was probably one of the first plants brought under cultivation by mankind. The name ‘adas (Heb. wy) appears to be anoriginal Semitic word, andthe red pottage of lentils for which Esau sold his birthright (Gen. xxv. 34) was apparently made from the red Egyptian lentil. This lentil is cultivated in one or other variety in India, Persia, Syria, Egypt, Nubia, and North Africa, and in Europe, along the coast of the Mediterranean, and as far north as Germany, Holland, and France. According to Shaw, Zravels in Barbary, lentils are dressed in that country in the same manner as beans; and in Egypt and Syria the parched seeds are exposed for sule in shops, and esteemed the best food to carry on long journeys. Lentils form a chief ingredient in the Spanish pwchero, and are used ina similar way in France and other countries. For this purpose they are usually sold in the shelled state.

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The reddish variety of the lentil (‘lentillon @hiver”’) is the kind most esteemed in Paris on aeeount of the superior flavour of its smaller seeds. It is sown in autumn either with a cereal crop or alone, and is eultivated chiefly in the north and east of Franee. The large or eommon variety, “lentille large blonde,” cultivated in Lorraine and at Gallardon (Eure-et-Loir), and largely in Ger- many, is the most produetive, but is less esteemed. This kind has very small whitish flowers, two or rarely

three on a footstalk, aud the pods are generally one-seeded, the seeds being of a whitish or creain colour, about 3 of an inch broadand }ineh thick. A single plant produees from 100 to 150 pods, which are flattened, about 4 ineh long and 4 inch broad. Another variety, with seeds similar in form and eolour to the last, but of much smaller size, is known as the “‘lentillon de Mars.” It is sown in spring. This variety and the ‘‘lentille large” are both sometimes ealled the “lentille » la reine.” A small variety, ‘“‘Jlentille verte du Puy,” eultivated chiefly in the departments of Haute Loire and Cantal, is also grown as a vegetable and for forage. The Egyptian lentil was introduced into Britain in 1820. It has blue flowers. Another species of lentil, EZ. monanthos, L., is grown in France abont Orleans and elsewhere under the name of ‘“‘jarosse” and ‘‘jarande.” It is, according to M. Vilmorin, one of the best kinds of green food to grow. on a poor dry sandy soil; on caleareous soil it does not sueceed so well. It is usually sown in autumn with a little rye or winter oats, at the rate of a hectolitre to a hectare.

The lentil also prefers a light warm sandy soil; on rich land it runs to leaf and produees but few pods. The seeds are sown in March or April or early in May, according to the climate of the eountry, as they cannot endure night frosts. If for fodder they are sown broad- cast, but in drills if the ripe seeds are required. The pods are gathered in August or September, as soon as they begin to turn brown,—the plants being pulled up like flax while the foliage is still green, and on a dry day lest the pods split in drying and loss of seed takes place. Lentils keep best in the husk so far as flavour is coneerned, and will keep good in this way for two years either for sowing or for food. An aere of ground yields on an average about 11 ewt. of seed and 30 ewt. of straw. The amount and eharacter of the mineral matter requisite in the soil may be judged from the analysis of the ash, whieh in the seeds has as its chief ingredients— potash 34°6 per cent., soda 9°5, lime 6°38, phosphoric acid 36:2, ehloride of sodium 7°6, while in the straw the percentages are— potash 10°8, lime 52:3, silica 17°6, phosphoric acid 12°3, chloride of sodium 2:1.

Lentils have recently attraeted some notice among vegetarians as a food material. A Hindoo proverb says, ‘‘ Riee is good, but ientils are my life.” But in England they have been reputed difficult of digestion and apt to disorder the bowels and injure the sight. The husk of the seed is certainly indigestible, and to eook lentils properly requires at least two and a half hours, but undoubtedly they are rieher in nutritious matter than almost any other kind of pulse, containing, aeeording to Payen’s analysis, 25:2 per cent. of nitrogenous matter (legumin), 56 per cent. of stareh, and 2°6 per cent. of fatty matter. Fresenius’s analysis differs in giving only 35 per eent. of starch; Einhoff gives 32°81 of starch and 37°82 per cent. of nitrogenous matter. Lentils are more properly the food of the poor in al] eountries where they are grown, and have often been spurned when better food eould be obtained, hence the proverb ‘‘ Dives factus jam desiit gaudere lente.” The seeds are said to be good for pigeons, or mixed in a ground state with potatoes or barley for fattening pigs. ‘The herbage is highly esteemed as green food for suckling ewes and all kinds of eattle (being said to inerease the yield of milk), also for calves and lambs. Haller says that lentils are so flatulent as to kill horses. They were also believed to be the eause of severe serofnlous disorders eommon in Egypt. This bad reputation may possibly be due to the sub- stitution of the seeds of the bitter veteh or tare lentil, Ervwmn Lrvilia, ., a plant whieh elosely resembles the trne lentil in height, habit, flower, and pod, but whose secds are without doubt possessed of deleterious properties—producing weakness, or, aeeord- ing to Lindley, even paralysis of the extremities in horses which have partaken of them.

A few years ago some cases of poisoning of pigs were traced by Mr W. Southall of Birminghain to the use of the seed of this plant in their food ; it had been iniported from Turkey under the name of rovi, and was sold in England under the name of Egyptian pease. The ehief symptom produeed was severe vomiting, followed by speedy death. The poisonous principle seems to reside chiefly in the bitter seed coat, and ean apparently be removed by steeping in water, since Gerard, speaking of the “bitter veteh” (Ervum Ervilia), says ‘kine in Asia and in most other countries do eat thereof, being made sweet by steeping in water.” The seed of Ervwm Ervilia is about the same size and almost

exaetly of the same reddish-brown eolour as that of the Egyptian lentil, and when the seed eoat is re- moved they are both of the same orange red hue, but the former is not so bright as the latter. The shape is the best means of dis- tinguishing the two seeds, that of HZ. Ervilia being obtusely tri- angular.

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Sca-lentil is a name sometimes applied to the gulfweed Sar- Jassum vulgare.

See Bentley and Trimen, Medicinal Plants, No. 76; Pharmaceutical Journal (3), vol. x. p. 481; Watts, Dictionary of Chemistry, vol. iii. pp. 568-71; Yvon, Cours Complet d' Agriculture, xiv. p. 672.

LENTINI. See LeonrIn1

LEO I., who alone of Roman pontiffs shares with Gregory I. the surname of THE GREAT, pope from 440 to 461, was a native of Rome, or, according to a less probable account, of Volterra in Tuscany. Of his family or of his early education nothing is known; that he was highly cultivated according to the standards of his time is obvious, but it does not appear that he could write Greek, or even that he understood that language. No certain traces of his early ecclesiastical career have been discovered. In one of the letters (Zp. 104) of Augustine, an acolyte named Leo is mentioned as having been in 418 the bearer of a communication from Sixtus of Rome (afterwards pope of that name) to Aurelius of Carthage against the Pelagians ; but it is possible that this Leo is rather to be identified with the Leo a priest who is recorded to have been sent by Pope Celestine to Africa with reference to the matter of Apiarius about the year 425. In 429, when the first unmistakable reference to Pope Leo occurs, he was still only a deacon, but already a man of commanding influence; it was at his suggestion that the De Incarnatione of the aged Cassianus, having reference to the Nestorian heresy, was composed in that year, and some two years later (about 431) we find Cyril of Alexandria writing to him that he might prevent the Roman Church from lending its support in any way to the ambitious schemes of Juvenal of Jeru- salem. In 440,

while Leo was in Gaul, whither he had been sent to compose some differences between Aetius and another general named Albinus, Pope Sixtus III. died, and the absent deacon, or rather arclideacon, was forthwith unanimously chosen to succeed him, and received consecration on his return six weeks afterwards (September 29), In 443 he began to take measures against the Manichexans (who since the capture of Carthage by Genseric in 439 had become very numerous at Rome), and in the following year lie was able to report to the Italian bishops that some of the heretics had returned to Catholicism, while a large number had been sentenced to perpetual banishment "in accordance with the constitutions of the Christian emperors," and others had fled ; in seeking these out the help of the provincial clergy was sought. It was during the earlier years of Leo's pontificate that the events in Gaul occurred which resulted in his triumph over Hilarius of Arles, signalized by the edict of Valentinian IIT. (445), denouncing the contumacy of the Gallic bishop, and enacting ‘‘ that nothing should be done in Gaul, con- trary to ancient usage, without the authority of the bishop of Rome, and that the decree of the apostolic see should henceforth be law." In 447 he held the correspondence with Turribius of Astorga which led to the condemnation of the Priscillianists by the Spanish national church, aud to the putting to death of Priscillian—an act which met with Leo's approval. In 448 he received with commenda- tion a letter from Eutyches, the Constantinopolitan monk, complaining of the revival of the Nestorian heresy there ; and in the following year Eutyclies wrote his circular, appealing against the sentence which at the instance of Eusebius of Doryleum had been passed against him at a synod held in Constantinople under the presidency of the patriarch Flavian, and asking papal support at the cecumenical council at that time under summons to meet at Ephesus. ‘The result of a correspondence was that Leo by his legates sent to Flavian that famous epistle in which le sets forth with great fulness of detail the doctrine ever since recognized as orthodox regarding the union of the two natures in the one person of Jesus Christ. The

narrative of the events at the “robber” synod at Ephesus belongs to general church history rather than to the biography of Leo; suffice it to say that his letter, though submitted, was not read by the assembled fathers, and that the papal legates had some difficulty in escaping with their lives from the violence of the theologians who, not content with deposing Flavian and Eusebius, shouted for the dividing of those who divided ‘Christ. When the news of the result of this cecumenical council (cecumenical in every circumstance except that it was not presided over by the pope) reached Rome, Leo wrote to Theodosius “ with groanings and tears,” requesting the emperor to sanction another council, to be held this time, however, in Italy. In this petition he was supported by Valentinian III., by the empress-mother Galla Placidia, and by the empress Eudoxia, but the appeal was made in vain. A change in the position of affairs, however, was brought about by the accession in the following year of Marcian, who three days after coming to the throne published an edict bringing within the scope of the penal laws against heretics the supporters of the dogmas of Apollinaris and Eutyches. To convoke a synod in which greater orthodoxy might reason- ably be expected was in these circumstances no longer difficult, but all Leo’s efforts to secure that the meeting should take place on Italian soil were unavailing. When the synod of Chalcedon assembled in 451, the papal legates were treated with great respect, being provided with seats on the immediate right of the president, and Leo’s former letter to Flavian was adopted by acclamation as formulat- ing the creed of the universal church on the subject of the person of Christ. Among the reasons urged by Leo for holding this council in Italy had been the threatening attitude of the Huns; the dreaded irruption took place in the following year (452). After Aquileia had succumbed to Attila’s long siege, the conqueror set out for Roine. Near the confluence of the Mincio and the Po he was met by Leo, whose eloquence persuaded him to turn back. Legend has sought to enhance the impressiveness of the occurrence by an unnecessarily imagined miracle. The pope was less successful with Genseric when the Vandal chief arrived under the walls of Rome in 455, but he secured a promise that there should be no incendiarism or murder, and that three of the oldest basilicas should be exempt from plunder,—a promise which seems to have been faithfully observed.

The death of Leo occurred in 461, according to the Roman breviary on April 11, on which day the festival of "' Pope Leo, confessor and doctor of the church" is celebrated (duplex). The title of "doctor ecclesie" was given by Benedict XIV. The successor of Leo was Hilarius or Hilarus, who had been one of the papal legates at the "robber" synod in 449. As bishop of the diocese of Rome, Leo distinguished himself above all his predecessors by his preaching, to which he devoted himself with great zeal and success. From his short and pithy Sermones many of the lessons now to be found in the Roman breviary have been taken. Viewed in conjunction with his voluminous corre- spondence, the sermons sufficiently explain the secret of his great- ness, which chiefly lay in the extraordinary strength and purity of his convictions as to the primacy of the successors of St Peter at a time when the civil and ecclesiastical troubles of the civilized world made men willing enough to submit themselves to any authority whatso- ever that could establish its right to exist by courage, honesty, and knowledge of affairs. The works of Leo I. were first collectively edited by Quesnel (Lyons, 1700), and again, on the basis of this, in what is now the standard edition by Ballcrini (Venice, 1753-56). Ninety-three Sermones and one hundred and seventy-three Epistole occupy the first volume; the second containsthe Liber Sacramentorum, usually attributed to Leo, and the De Voeatione Omnium Gentiwm, also ascribed, by Quesnel and others, to him, but more probably

the production of a certain Prosper, of whom nothing further is known. The works of Hilary of Arles are appended.

LEO IL., pope from August 682 to July 683, was a Sicilian by birth, and succeeded Agatho I. Agatho had

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been represented at the sixth cccumenical council (that of |

Constantinople in 680), where Pope Honorius I. was anathe- matized for his views in the Monothelite controversy as a favourer of heresy, and the only fact of permanent historical interest with regard to Leo is that he wrote once and again in approbation of the decision of the

council and in con- demnation of Honorius, whom he regarded as one who “ profana proditione immaculatam fidem subvertere conatus est.” In their bearing upon the question of papal infalli- bility these words have excited considerable attention and controversy, and prominence is given to the circumstance that in the Greek text of the letter to the emperor in which the phrase occurs the milder expression wapexopyoev (‘subverti permisit ”) is used for “subvertere conatus est.” This Hefele in his Conciliengeschichte (iii. 294) regards as alone expressing the true meaning of Leo. It was during Leo’s pontificate that the dependence of the see of Ravenna upon that of Rome was finally settled by imperial edict. Benedict II. succeeded him.

LEO IIL, whose pontificate (795-816) covered the last eighteen years of the reign of Charlemagne, was a native of Rome, and having been unanimously chosen successor of Adrian I. on December 26, 795, was consecrated to the office on the following day. His first act was to send to Charles as patrician the standard of Rome along with the keys of the sepulchre of St Peter and of the city; a

gracious and condescending letter in reply made it still |

more clear where all real power at that moment lay. For more than three years his term of office was quite uneventful; but at the end of that period the feelings of disappointment which had secretly been rankling in the breasts of Paschalis and Campulus, nephews of Adrian L, who had received from hin the offices of primzcertus and sacellarius respectively, suddenly manifested themselves in an organized attack upon Leo as he was riding in pro- cession through the city on St George’s day (April 23, 799); the object of his assailants was, by depriving him of his eyes and tongue, to disqualify him for the papal office, and, although they were unsuccessful in this attempt, he found it necessary to accept the protection of Winegis, the Frankish duke of Spoleto, who came to the rescue. Having vainly requested the presence of Charles in Rome, Leo went beyond the Alps to meet the king at Paderborn ; he was received with much ceremony and respect, but his enemies having sent in certain written charges, of which the character is not now known except that they were of a serious nature, Charles

decided to appoint both the pope and his accusers to appear as parties before him when he should have arrived in Rome. Leo returned in great state to his diocese, and was received with honour ; Charles, who did not arrive until November in the following year, lost no time in assuming the office of a judge, and the final result of his investigation was the acquittal of the pope, who at the same time, however, was permitted or rather required to clear himself by the oath of compurgation. ‘The coronation of the emperor—an act the precise meaning of which does not fall to be discussed here—followed two days afterwards; the effect of it was to bring out with increased clearness the personally subordinate position of Leo, The decision of the emperor, however, secured for Leo’s pontificate an external peace which was only broken after the accession of Louis the Pious. His enemies began to renew their attacks; the violent repression of a conspiracy led to an open rebellion at Rome ; serious charges were once more brought against him, when he was over- taken by death in 816. It was under this pontificate that Felix of Urgel, the adoptianist, was anathematized (798) by a Roman synod. Leo at another synod held in Rome in 810 admitted the dogmatic correctness of the “ filioque,” but deprecated its introduction into the creed. On this

point, however, the Frankish Church persevered in the course it had already initiated. Leo’s successor was Stephen IV.

LEO IV., pope from 847 to 855, was a Roman by birth, and was unanimously chosen to succeed Sergius I]. His pontificate was chiefly distinguished by his efforts to repair the damage done by the Saracens during the reign of his predecessor to various churches of the city, especially those of St Peterand St Paul. It was he who built and fortified the suburb on the right bank of the Tiber still known as the Civitas Leonina. A frightful conflagration, which he is said to have extinguished by his prayers, is the subject of Raphael’s great work in the Sala dell’ Incendio of the Vatican. He held three synods, one of them (in 850) dis- tinguished by the presence of Louis IT., but none of them otherwise of importance. The history of the papal struggle with

Hincmar of Rheims, which began during Leo's ponti- ficate, belongs rather to that of Nicolas I. Benedict ITI. was Leo's immediate successor.

LEO V., a native of Ardea, was pope for some thirty days in 903 after the death of Benedict IV. He was succeeded by Sergius IIT. .

LEO VI. succeeded John X. in 928, and reigned seven months anda few days. He was succeeded by Stcphen Vinh

LEO VIL, pope from 936 to 939, was preceded by John XL, and followed by Stephen IX.

LEO, VIIL, pope from 963 to 965, a Roman by birth, held the lay office of " protoscrinius " when he was elected to the papal chair at the instance of Otho the Great by the Roman synod which deposed John XII. in December 963. Having been hurried with unseemly haste through all the intermediate orders, he received consecration two days after his election, which was unacceptable to the people. In February 964, the emperor having withdrawn from the city, Leo found it necessary to seek safety. in flight, where- upon he was deposed by a synod held under the presidency of John XII. On the sudden death of the latter, the populace chose Benedict V. as his successor; but Otho, returning and laying siege to the city, compelled their acceptance of Leo. It is usually said that, at the synod which deposed Benedict, Leo conceded to the emperor and his successors as sovereign of Italy full rights of investiture, but the genuineness of the document on which this allega- tion rests is more than doubtful. Leo VIII was succeeded by John XIII.

LEO IX., pope from 1049 to 1054, was a native of Upper Alsace, where he was born June 21,1002. His proper name was Bruno; the family to which he belonged was of noble rank, and through his father he was related to the emperor Conrad IJ. He was educated at Toul, where he successively became canon and (1026) bishop ; in the latter capacity he rendered important political services to his relative Conrad IIL, and afterwards to Henry III., and at the same time he became widely known as an earnest and reforming ecclesiastic by the zeal he

showed in spreading the rule of the order of Cluny. On the death of Damasus IJ., Bruno was in December 1048, with the concurrence both of the emperor and of the Roman delegates, selected his successor by an assembly at Worms ; he stipulated, however, as a condition of his acceptance that he should first proceed to Rome and be canonically elected by the voice of clergy and people. Setting out shortly after Christmas, he had a meeting with abbot Hugo of Cluny at Besancon, where he was joined by the young monk Hildebrand, who afterwards became Pope Gregory VII. ; arriving in pilgrim garb at Rome in the following February, he was received with much cordiality, and at his consecration assumed the nameof Leo 1X. One of his first public acts was to hold the ei Easter synod

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of subdeacon) was anew enjoined, and where he at least succeeded in making clear how strongly his own convictions went against every kind of simony. The greater part of the year that followed was occupied in one of those pro- gresses through Italy, Germany, and France which form so marked a feature in Leo's pontificate. After presiding over a synod at Pavia, he joined the emperor Henry III. in Saxony, and accompanied him to Cologne and Aix-la- Chapelle; to Rheims he also summoned a meeting of the higher clergy, which although there were many abstentions was largely attended, and by which several important reforming decrees were passed. At Mainz also he held a council, at which the Italian and French as wellas the German clergy were represented, and ambassadors of the Greek emperor were present; here too simony and the marriage of the clergy were the principal matters dealt with. After his return to Rome he held (April 29, 1050) another Easter synod, which was occupied largely with the controversy about the teachings of Berengarius of Tours ; in the same year he presided over provincial synods at Salerno, Siponto, and Vercelli, and in September revisited Germany, returning to Rome in time for a third Easter synod, at which the question of the reordination of those who had been ordained by simonists was

considered. He next joined the emperor at Pressburg, and vainly sought to secure the submission of the Hungarians ; at Ratisbon, Bamberg, and Worms the papal presence was marked by various ecclesiastical solemnities; but at Mainz, in a dispute about the ordination of a deacon between the arch- bishop and the pope, the latter had to give way. After a fourth Easter synod in 1053 Leo set out against the Nor- mans in the south with an army of Italians and German volunteers, but the forces sustained a total defeat at Astag- num near Civitella (June 18, 1053); on going out, how- ever, from the city to meet the enemy he was received with every token of submission, relief from the pressure of his ban was implored, and fidelity and homage were sworn. From June 1053 to March 1054 he was nevertheless detained at Benevento in honourable captivity; he did not long survive his return to Rome, where he died on April 19, 1054. He was succeeded by Victor IL.

LEO X. (Giovanni de' Medici, 1475-1523), the only pope who has bestowed his own name upon his age, and one of the few whose original extraction has corre- sponded in some measure with the splendour of the pontifical dignity, was the second son of Lorenzo de' Medici, called the Magnificent, and was born at Florence, December 11, 1475. Like his contemporary Henry VIIL, be was from the first destined for the ecclesiastical condition ; he received the tonsure at seven, held benefices at eight, and ere he was thirteen negotiations were in active progress for his elevation to the cardinalate. Innocent VIIL, the reigning pope, was bound to Lorenzo by domestic ties and a common policy and interest; in October 1488 Giovanni was created a cardinal under the condition that he should not be publicly recognized as such for three years. The interval was devoted to the study of theology and canon law, pursuits less congenial to the young prince of the church than the elegant literature for which he inherited his father's taste, and in which he had already made great progress under the tuition of Politian and Bibbiena. In March 1492 he was formally admitted into the sacred college, and took up his residence in Rome, receiving a letter of advice from his parent which ranks among the wisest and weightiest compositions of its class. Within a few months his prospects were clouded by the nearly simultaneous decease of his

father and the pope, a double bereavement closing the era of peace which Lorenzo’s prudent policy had given to Italy, and inaugnrating a

LEHO of 1049, at which celibacy of the clergy (down to the rank |

period of foreign invasion and domestic strife. One of the first consequences of the French irruption into Italy, which shortly ensued, was the expulsion of the Medici family from Florence (November 1494). After having resisted to the best of his ability, the Cardinal de’ Medici found a refuge at Bologna, and, seeing himself deprived for the time of political importance, and obnoxious to Innocent’s successor, Alexander VI., undertook a journey in foreign countries with a party of friends. Upon his return he settled at Rome, withdrawing himself from notice as much as possible, and disarming the jealousy of Alexander by his unaffected devotion to literary pursuits. The accession of Julius II., and the death of his elder brother Piero in the battle of the Garigliano (December 1503), restored him to consequence ; but little is recorded of him until 1511, when Julius appointed him legate at Bologna, an office which gave him the nominal direction of the combined Spanish and papal army then besieging that city. The siege failed, and two months afterwards the allies were totally defeated by the French under Gaston de Foix in the famous battle of Ravenna (April 11, 1512), and the Cardinal de’ Medici himself was taken prisoner. The French victory produced none of the anticipated results; within a short time the conquerors were even obliged to evacuate Milan, carrying their captive with them. In the confusion of the retreat the cardinal effected his escape, and fled to Mantua, where he derived encourage- ment from the prediction of a chiromancer, who promised him the papacy (Gauricus, Z’ractat. Astrol., fol. 20, a passage overlooked by Leo’s biographers). Being reappointed to his legation, he took quiet possession of Bologna; within a few months his family were restored to Florence by the Spanish and papal troops, and the death of Julius IL, on February 21, 1513, raised him most unexpectedly to the papacy on March 11 following, at the age of only thirty- seven years, It seems difficult to assign any adequate reason for an election so contrary to traditional observance apd the private interests of all the more conspicuous members of the conclave ; but it

has never been attributed to simony. The new pope assumed the name of Leo X. Before his coronation, as first pointed out by Lord Acton, he was required to enter into certain engagements, from most of which he speedily absolved himself. Among these was a promise to issuo no brief for collecting money for the repair of St Peter's. Had this pledge been observed, the Reformation might have been deferred for some time, and its course might have been materially different.

At Leo's accession the probability of a religious revolu- tion was contemplated by none. The attention of his immediate predecessors had long been engrossed by the temporal concerns of the papacy. These were apparently in a flourishing, but actually in a precarious condition. The guiding principle of Leo's policy was to preserve the conquests which he had inherited from Alexander VI. and Julius II. The establishment of his family in Florence diminished, although it did not remove, the temptation to create a principality in their interest, as Alexander had done, and his temper rather inclined him to aggrandize the papacy by diplomacy than to emulate the martial exploits of Julius. The preservation, however, of the acquisitions of these pontiffs required and taxed the abilities of a consummate statesman. These were not wanting to Leo, and it is to his credit that he seldom suffered the love of art and letters, which was his ruling passion, and which became his especial distinction among the princes of his age, to divert his attention from public affairs at a time of extraordinary anxiety and vicissitude. Scarcely had he ascended the pontifical throne when the storm burst in the shape of a determined effort of the French kiug to repossess himself of the duchy of Milan.

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An army of Swiss, called into the field by Leo's diplomacy, repelled the invasion, and Italy enjoyed peace until the death of Louis XII, two years subsequently, brought to the throne a young prince who only lived for military glory, and whose entire reign was dominated by the ambition of recovering Milan and Naples. On September 13, 1515, Francis I. totally defeated the Swiss at Marignano. Onc of the first consequences of the battle, which reduced Leo to submission by

placing the Medici in Florence at the mercy of the victor, was the loss of Parma and Piacenza. These duchies, but recently acquired by Julius II., were reunited to Milan, and Leo, temporizing in the true spirit of Italian statecraft, consented to a public interview with Francis, and became apparently his ally. Little as the pope's professions were to be depended upon, Francis thus gained the substantial advantage of a concordat seriously restricting the liberties of the Church of France. Leo meanwhile endeavoured to indemnify himself for the loss of Parma and Piacenza by seizing upon the duchy of Urbino for the benefit of his nephew Lorenzo, an enterprise fully as unscrupulous as any of the similar exploits of Czesar Borgia, and by no means executed with equal ability. After a severe struggle, however, Leo's arms triumphed for the time, but the undertaking proved as injurious to his credit as to his exchequer, and the financial exhaustion which it occasioned helped to prepare the great disaster of his reign, Another unfortunate occurrence of this period was a plot of several cardinals to poison the pope, which led to the execution of one and the imprisonment of several others. Leo has been accused of excessive severity, but apparently without reason, although he may be censured for having held out expectations of pardon which he did not intend to fulfil. This conspiracy probably made him distrustful of the sacred college as then constituted, and led to one of the most remarkable acts of his pontificate, the creation of thirty-one cardinals in a single day. This dangerous stretch of authority made him absolute master in his own court for the remainder of his reign, and it must be admitted that most of the new cardinals were men of distinguished merit. A much more momentous event was uow at hand, which, however, belongs more properly to the biography of Luther than that of Leo. On All Saints' eve, 1517, the daring protest of Luther against the intolerable impostures and rapacity of the papal vendors of indulgences, commissioned by Leo to raise money for the rebuilding of St Peter's, gave the signal for the Reformation. Leo was at first amused. "The axe," he said, alluding to the danger he had lately escaped from, the conspiracy of the cardinals, "is taken from the root, and laid to the branches." When at length his eyes were opened he followed the policy of mingled menace and cajolery which was alone possible where the secular arm was unavailable, and which might probably have

succeeded with a man of different mould from Luther. By 1520 the breach had become irreparable, and an invincible fatality had linked the name of the most ostentatious of the popes with the profoundest humiliation of the church.

Leo died before the full extent of the calamity was apparent, and amid a full tide of political prosperity which would have easily consoled him for the diminution of his spiritual prerogatives. He had profited by the general tranquillity to expel the petty tyrants of the ecclesiastical states. Perugia, Sinigaglia, Fermo had been added to the domains of the church, and Ferrara had narrowly escaped. The death of his nephew Lorenzo about the same time made him the virtual ruler of Florence also. Abroad, his policy had apparently received a check by the election of Charles V. as emperor, but the continued rivalry between Charles and his competitor Francis soon

placed the dearest wish of his heart within his reach. “Could I recover Parma and Piacenza for the church,” he had said to the Cardinal de’ Medici, “I would willingly lay down my life” His wish was granted him. Allying himself with Charles, he contributed efficaciously to the expulsion of the French from Milan in November 152]. Parma and Piacenza returned to the Holy See, and there was talk of the Medici replacing the Sforzas on the ducal throne of Milan. The news reached Leo at his villa of Malliana on a November night. Overjoyed, his mind engrossed by ambitious projects, he long paced a chamber through whose open window streamed the chill and malarious air of the adjoining woods. He returned to Rome in apparent health, but on the 24th of November withdrew indisposed to his apartments, and on December 1 expired with such suddenness that the last sacraments could not be administered. Poison was generally suspected,

. but the circumstances alleged in support of this belief wear

the aspect of inventions, and seem inconsistent with the universal dismay excited by his decease. There was more ground for this consternation than men fully knew. The most fortunate and

magnificent of the popes had bequeathed his successors a religious schism and a bankrupt exchequer. If, however, his profusion had impoverished the church and indirectly occasioned the destruction of her visible unity, he had raised her to the highest rank as the apparent patron of whatever contributed to extend knowledge or to refine and embellish life. If he had not kindled the genius of Raphael, employed equally by his predecessor, he had recognized and fostered it, and in so doing had apparently reconciled antique art with Christianity, and effaced the re- proach of indifference or hostility to culture which for fifteen centuries had more or less weighed upon the latter. Asa patron of literature Leo's merits had been even more con- spicuous: every Italian man of letters, in an age of singular intellectual brilliancy, had tasted or might have hoped to taste of his bounty; had Italy been Europe, the scholars and authors elsewliere forward in revolt would have been indissolubly attached to the Church of Rome. The essential paganism of the Renaissance art and literature was not then perceived ; and even now that it is fully understood the prestige which Leo gave the church remains but little impaired. The hostility of the Renaissance to Catholicism has been unanswerably shown by Catholic writers them- selves, but the popular imagination only notes that Raphael and Michelangelo wrought in the name of religion, and at the bidding of a pope. However severely then Leo may be judged from the strictly sacerdotal point of view, sacerdotalism itself cannot deny its obligations to him; while, from the point of view of liberal culture, he appears as near perfection in his ecclesiastical character as that character admits.

His personal disposition has been the subject of much controversy, ** Among all the individuals who have attracted the attention of mankind, there is perhaps no one whose character has stood in so doubtful a light as that of Leo X." This exaggerated dictum of Roscoe's at all events expresses the fact that men's views of Lco's character have been coloured in a more than ordinary degree by party spirit. To onc class he represents the ideal of the papacy as a civilizing and beneficent institution ; to another—comprisiug Catholics as well as Protestants—he is the personification of its worldliness and apostacy. The merit or demerit of his actions will be variously cstimated to the end of time.

The leading traits of his character, however, are matters of fact, which prepossessions should not be allowed to distort, and it may be confidently affirmed that they were mostly amiable and laudable. He was constitution- ally kind, compassionate, and bountiful, —endowed with Florentine prudence and circumspection, but cast altogether in a more liberal mould than the mercantile race from which he sprung. | The best of the Medici except his father Lorenzo, he isin many points more humanly interesting than the latter, and the disadvantage at which he occasionally appears is mainly attributable to his being less

perfectly equipped by nature for the part assigned to him by fortune. His geniality sometimes degenerated into indecorum, and

in a certain degree injured the credit of the church, His esthetic pantheism, though inspired by a real religious sentiment, fixed the reproach of paganism upon her at the precise moment when an evangelical reaction was springing up. The best possible pope for the age that was going out, he was the worst possible for the age that was coming in: hence the splendours of his administration were cphemeral, and its disasters lasting. If his reputation as a pope and a statesman is thus ambiguous, no such deduction need be made from his serener fame as a patron of letters and art. In this respect he stands almost alone, except for such rare examples as his father and the modern kings of Bavaria, as a prince who did not merely strike a tacit bargain with men of genius, setting his patronage against their flattery, but one who entered into their pursuits from a genuine congeniality of taste and temperament, and aided them efficaciously not only as their patron but as their com- panion. Unlike most cxalted patrons of literature, he was a scholar first and a sovereign afterwards; hence his contact with the best intellect of his age was far more direct and personal than that of an Augustus or a Louis XIV. Great as were the obligations con- ferred upon individuals by his tact and discernment, it is no doubt true that the intellectual movement of his age arose and could well have subsisted without him. It is none the less true that, if not the source of that light, his court was the focus to which it con- verged, and which

gave it back with a lustre which still renders the era that bears his name, in its literary and artistic aspects, onc of the brightest periods in the history of mankind.

The life of Leo was written shortly after his death by Paolo Giovio, bishop of Nocera, who had known him intimately. Roscoc's eclebrated biography, though sometimes diffuse and sometimes trite, is in the main a work of great merlt, and very agrecable from the entire sympathy between the author and the age he depicts and the subject of his biography. It has received much illustration from the notes of the German and Italian translators, Henke and Bossi, but requires to be re-cdited with the aid of thc numerous publications from archives which have taken place since Roscoe's time. Audin's_ French life is a poor performance— partial, mainly borrowed from Roseoe, and disfigured by unsuccessful efforts after the plcturesque. {R. G.)

LEO XI. (Alessandro de' Medici) was chosen, under French influence, to succeed Clement VIII. as pope on April 1, 1605, and died on April 27 of the same year. His successor was Paul V.

LEO XII. (Annibale della Genga), pope from 1823 to 1829, a native of Romagna, was born on August 22, 1760. In 1790 he first gained public recogni- tion of his talents by the success with which he accom-plished the delicate task laid upon him by Pius VI. of pronouncing a funeral discourse over the emperor Joseph II. ; in 1793 he was sent as nuncio to Lucerne with the title of archbishop of Tyre ; in the following year he went, also as nuncio, to Cologne; in 1805 he attended the diet of Ratisbon as papal plenipotentiary ; and in 1808 he shared with Caprara a difficult mission to France. Some years of retirement at the abbey of Monticelli now followed; but in 1814 he was made the bearer of the pope's con- gratulations to Louis XVIIL ; in 1816 he became cardinal priest of Sta. Maria Maggiore, receiving also the bishopric of Sinigaglia, while in 1820 he became cardinal vicarius, On September 28, 1823, he was chosen to fill the vacancy caused by the death of Pius VII.; at the time it was believed that he had not long to live, and, in point of fact, on the 23d day of the following December his condition became so serious that the last sacraments

were administered to him; suddenly, however, he recovered. One of his first cares was for the due observance of the approaching jubilee year, and on May 27, 1824, the bull was sent forth which invited all Christendom to Rome in the following December ; but foreign Governments responded coldly to the appeals made for their co-operation in forwarding pilgrims, and even Leo's own subjects viewed the prepara- tions made in their neighbourhood with indifference or aversion, and the most determined efforts of the papal government did not succeed in averting a somewhat ridiculous failure. Throughout his pontificate Leo showed himself a man of simple tastes and laborious habits 3 his diplomatic relations with the European powers were on the whole characterized by firmness, tact, and moderation, and perhaps the most unfavourable criticism to be made upon his domestic policy is that it was unpractical in its meddlesomeness and unstatesmanlike in its severity. He

died on February 10, 1829, and was succeeded by Pius VELL.

LEO I., Fuavius, surnamed Macnus and Turax, emperor of the East, was born about 400 a.p., in the country of the Bessi, Thrace, and succeeded Marcian in February 457. At the time of his elevation he was an obscure military tribune, but had become steward to Aspar, patrician and commander of the guards, who might himself have aspired to the purple had he not been tainted with the Arian heresy. In recommending his servant to the soldiers, who proclaimed him emperor, Aspar hoped through him to be able to exercise the reality of power. The election of Leo was ratified by the senate; his coronation by Anatolius, the patriarch of Constantinople, is said to have been the earliest instance of such an ecclesiastical ceremony. The precise nature of the military success against the barbarians which, according to the chronicles, the new emperor achieved in the first year of his reign is not accurately known. Of the more conspicuous incidents of his subsequent life, the first in chronological order is his intervention in the politico-religious troubles in Egypt, where the Eutychians had gained the upper hand, and, encouraged by the Arianizing Aspar, had

made their own nominee, Timotheus Ailurus, patriarch of Alexandria. Leo made peace by deposing and banishing the new patriarch, and, when reminded by Aspar that it ill became a wearer of the purple to be guilty (as in this case he had been) of promise-breaking, retorted that it was equally unbecoming that a prince should be compelled to resign his own judgment and the public interest to the will of a subject. In 466 the Huns, invading Dacia, were defeated by Leo's generals Anthemius and Anagastus, and again by the latter in 468. In 468 Leo, in concert with Anthemius, whom in the intervening year he had caused to be made emperor of the West, equipped a naval armament against the Vandals of Africa, who, under Genseric, had long been the scourge of Italy and the Mediterranean. The large fleet of more than one thousand vessels was intrusted to the command of Leo's brother-in- law Basiliscus, who, after a prosperous passage, disembarked his troops safely at Cape Bona within 40 miles of Carthage, but weakly granted a truce of five days to the enemy ; during the interval, favoured by the wind and the darkness of the night, the fleet of Genseric, with several fireships in tow, attacked the Roman vessels, burning and sinking one half of them, and thus causing the entire failure of the expedition. A widespread belief that the Arian Aspar had somehow helped to bring about this disastrous defeat furnished Leo with a pretext for getting rid of this dangerous kingmaker, who accordingly was treacherously put to death, along with one of his sons, in 471. To avenge (as they alleged) the murder, the Goths invaded Thrace, and ravaged the country almost to the walls of the capital. In October 473 Leo associated with himself his child grandson Leo IL., and in the following year he died (February 3, 474); his successor survived him fora few months only. The somewhat misleading surname of Great borne by Leo I. is due solely to the obsequious gratitude of the orthodox party ; by the Arians he was, not without some show of justice, nicknamed Macellarius ("butcher ").

LEO IIL, Fuavivs, surnamed Tue Isavurtay, a native of Isauria, born about 680, was originally called Conon, a name which he dropped after he had risen to military dis- tinction. In 713 he received from Anastasius IT. the command of the eastern army; and, when that emperor was deposed by Theodosius III. in 716, Leo, marching to

Constantinople, compelled the usurper to resign, and was himself made emperor amid much popular enthusiasm, in March 718. The internal troubles of the empire had meanwhile permitted the advance of the Arabs, who in

large numbers invested the capital by land and sea in the following August ; the siege was not raised until 720. Relieved from this pressing danger, and also in 721 froma conspiracy originating with the deposed emperor Anastasius II, Leo speedily inaugurated the aggressive religious policy with which his name is associated, by promulgating, in 722, the edicts commanding the baptism of Jews and Montanists throughout the empire, and in 726 that against the ‘idolatry of image worship,” which was destined ultimately to produce so important effects on the relations of Italy and the West with Byzantium. Instigated by Pope Gregory IL, the Italians refused to obey the command to remove the pictures from their churches ; and when Paulus, the newly- appointed exarch of Ravenna, sought to employ force, he was defeated and slain, A revolt which had broken out in the Cyclades and the Peloponnesus was with difficulty quelled, and an insurrection in Constantinople was only repressed after much bloodshed (730). In November 730 a council was held by Gregory II. at Rome, in which anathemas were pronounced against the destroyers of images, and therefore, by implication at least, against Leo. He retaliated by severing the Trans-Adriatic provinces from the Roman patriarchate, and by confiscating large posses- sions of the Roman see in Calabria and Sicily. Another council under Gregory IIL, in 732, joined in a solemn excommunication of all iconoclasts, and image worship was set up in Rome on a more splendid scale than had previously been known, The emperor made a last effort to relieve his exarch Eutychius, shut up in Ravenna, and to bring the pope and Italy to obedience; but the great fleet which he sent was wrecked in the Adriatic, and with it the exarchate became practically lost totheempire. The closing years of Leo’s reign were disturbed by troubles with the Arabs ; and 740 was made memorable by a great earthquake which devastated Constantinople, Thrace, and Bithynia, He died in 741.

LEO V., Fuavius, surnamed THE ARMENIAN, served as general under Nicephorus I, but was banished for treachery in 811. Shortly afterwards he was recalled and appointed commander of the eastern army by Michael I. After gaining some distinction in war with the Arabs in 812, he accompanied his sovereign, in 813, on an expedition. against Crum, king of the Bulgarians. Taking advantage of the disaffection of the army during a battle with the enemy near Adrianople, he withdrew with the forces under his command, leaving Michael to total defeat. Shortly afterwards he was crowned at Constantinople without opposition (813). In 814, and again in the following year, he inflicted decisive defeats upon the Bulgarians. He then began to show great zeal against the image worshippers, but such was his severity that even his closest friend, Michael the Stammerer, who had done much to help him to the throne, ultimately turned against him. Michael was convicted of conspiracy and condemned to death, but by the intervention of his friends, who assassinated Leo in the palace chapel on Christmas Eve 820, was raised from prison to the throne.

LEO VI., Fuavius, surnamed Sapiens and Puito- SOPHUS, succeeded his father, Basil I., in 886, and died in 911. One of his first acts was to depose the well-known Photius, patriarch of Constantinople, who had been his tutor. The rest of his biography, so far as recorded, tells of unimportant wars with barbarians and struggles with churchmen. In explanation of his somewhat absurd sur- name, all that can be said, as Gibbon has remarked, is ‘that the son of Basil was less ignorant than the greater part of his contemporaries in church and state, that his education had been directed by the learned Photius, and that several books of profane and ecclesiastical science were composed by the pen, or in the name, of the imperial

philosopher.” His works include a treatise on military tactics (De Apparatu Bellico, translated by Sir John Cheke in 1554, and frequently since), seventeen Oracula, in iambic verse, on the destinies of future emperors aud patriarchs of Constantinople, thirty-three Ovations,

chiefly on theo- logical subjects, and some epigrams in the Greek Antho- logy.

LEO, JoHANNES, usually called Leo AFrRIcANUS, some- times ELIBERITANUS (z.e., of Granada), is best known as the author of a valuable Africe Descriptio, which long ranked as almost the only authority in regard more especially to the Sudan. Born probably at Granada, of a noble Moorish stock, Alhasan ibn Mohammed Abwazzan Alfasi (for this was his real designation) received an excellent education at Fez, where his family settled after the expulsion from Spain. He was still in his sixteenth year when he began a course of travel which extended, not only through the northern and central parts of Africa (where he had advanced to the south-east of Lake Chad), but also into Arabia, Syria, Persia, Armenia, Tartary, and portions of Europe. As he was returning from Egypt about 1517, he was captured by pirates near the island of Gerba, and he was ultimately presented as a slave to Leo X. The pope no sooner discovered what manner of man he was than he assigned him a pension; and having persuaded him to profess the Christian faith, he stood sponsor at his baptism, and bestowed on him his own names, Johannes and Leo. The new convert, having made himself acquainted with Latin and Italian, not only taught Arabic to Atgidius Antoninus, bishop of Viterbo, and others, but wrote books in both tongues. He appears to lave returned to Africa, and to have put off his Christianity, before his death ; but the later part of his career is involved in obscurity. He was still alive in 1526.

The Africe Descriptio was originally written in Arabic, but the MS. (at one time in the library of Vincenzo Pinelli, 1535-1601) is not known to be extant. The author’s own translation into passable Italian was first published by Ramusio, Navigationi e Viaggi. Ver- sions of this or of the widely used Latin translation by F. Florianus

have appeared in English, French, Dutch, &c. For notices of Leo’s other works see Lorsbach’s edition (Herborn, 1801).

LEOBSCHUTZ (Bohemian, Hlubczyce), a town in the Prussian province of Silesia, circle of Oppeln, is situated on the Zinna, about 20

miles to the north-west of Ratibor. It carries on a considerable trade in wool, flax, and grain, its markets for these commodities being very numerously attended. ‘The principal industries are carriage-building, wool-spinning, and glass-making. The town contains three Roman Catholic churches, a Protestant church, a synagogue, a new town-hall, anda gymnasium. Leobschiitz is known to have existed in the 10th century, and from 1524 to 1623 was capital of the principality of Jigerndorf, which was divided between Prussia and Austria in 1742. Population in 1880, 12,015.

LEOCHARES, one of the sculptors of the younger Attic school in the fine period of Greek art. He is called a young man in a pseudo-Platonic epistle which must be later than 366 B.c. He worked on the Mausoleum along with Scopas, Bryaxis, Timotheos, and Pythis about 356 B.0.; the west side of the frieze, of which all the extant fragments are in the British Museum, was entrusted to him. He made the statue of Isocrates which was erected at Athens about 354 B.c. Many other portrait statues are known to have been his work. Along with Lysippus he represented Alexander the Great engaged in a lion hunt. This group was in bronze, whereas another in the Philip- peion at Olympia, representing the family of Philip and Alexander, was in ivory and gold. Finally, an inscription records that he made the statues of an Athenian family. Though nothing is recorded of the character of these works, it may be gathered from the list that they were idealized

portraits; chryselephantine statues were always ideal. Leochares was also the sculptor of many purely ideal works, These comprise three statues of Zeus, of which one was on the Acropolis, one at the Pireeus, and the third was carried away to Rome, where Pliny saw it on the Capitol ; he is also recorded to have carved three statues of Apollo, one of which was bought by Dionysius of Syracuse. Absolutely nothing is known of the character of these works ; but we are more fortunate in regard to his master- piece, the Rape of Ganymede, of which many imitations have been preserved to us sufficient to give some idea of its real character. Ganymede, characterized as a shepherd

by crook and syrinx, has been resting under a tree, when the eagle swoops down and bears him off direct heavenwards ; the looks of both are directed upwards. Ganymede, a youth of perfect beauty, does not struggle, but yields himself completely to his captor, so that his body hangs down in easy, graceful lines. The eagle, with magnificent outstretched wings, conscious, as Pliny says, "' what his burden is and to whom he bears it," grasps the boy gently with his talons, and seems to swoop straight upwards, unencumbered by the weight. The problem of supporting the figures in the air, clumsily solved in the imitation preserved at St Mark's in Venice by hanging the group up with a rope, was skilfully overcome by means of the tree from beneath which the boy has been seized; while the dog beneath, looking up after his master, both gives an appearance of naturalness to the whole scene, and suggests more vividly the idea that the boy is far above the ground. The great skill of the group lay in the manner in which the idea of swift easy motion upwards was expressed ; while the widespread wings of the eagle and the drooping form of the boy gave a beautiful outline to the whole. Overbeck (Gesch. der Griech. Plast., ii. 51) has well ex- pressed the distinction between the fine character of this work and the sensualism of a later class of similar groups, where the eagle is obviously Zeus himself and not a mere messenger. The colossal acrolithic statue of Ares at Halicarnassus is sometimes attributed to Leochares, some+ times to Timotheus,

On the share of Leochares in the Mansoleum and on the style of the sculptures, see Newton, Halicarnassus, Cnidus, and Branchide. On the inscriptions mentiouing works of Leochares, see Overbeck, Schriftquelicn, See also Jahn, Archxol. Beitr., p. 20.

LEOMINSTER, a municipal and parliamentary borough and market-town of England in the county of Hereford, is situated in a rich agricultural country on the Lug, 150 miles west-north-west of London and 12 north of Hereford. The town has regular and spacious streets, and some fine old timber houses lend picturesqueness to its appearance. The parish church, which is of mixed architecture, includ- ing the fine Norman nave of the old priory church, and contains some of the most beautiful examples of window tracery in England, was

restored in 1866, and enlarged by the addition of a south nave in 1879. The other public buildings are the corn exchange, erected in 1859 at a cost of £4000, and the town-hall, to make room for which, in 1855, the Butter Cross, a beautiful example of old timber work of the date 1663, was removed to form a private dwelling house. The principal industries of the town are leather and woollen manufactures, iron and brass founding, glove and hat making, and the manufacture of agricultural implements. Leominster originated in a monastery founded by Merwald king of Mercia, who had a castle near the town, where a fortress stood till 1055, when it was demolished by the Welsh. The town re- ceived a charter of incorporation from Queen Mary, and has sent members to Parliament since the 23d of Edward L. ; in 1868 its representation was reduced from two members to ene. The limits of the municipal and the parliamentary

boroughs are identical, the population in 1871 being 5868, which in 1881 had increased to 6042.

See the Historics by Price (1795) and Townsend (1863), and a paper by E. A. Freeman in Archexologia Cambrensis, 1853.

LEON, one of the forty-nine provinces of Spain, is bounded on the N. by Oviedo, on the E. by Palencia, on the §. by Valladolid and Zamora, and on the W. by Orense and Lugo, and has an area of 6166 square miles, with a population (in 1877) of 350,210. Its boundaries on the north and west, formed respectively by the central ridge and southerly offshoots of the great Cantabrian chain, are strongly marked; towards the south-east it merges imperceptibly into the Castilian plateau, the line of demarcation being for the most part merely conventional. It belongs partly to the Miiio and partly to the Duero river system, these being separated by the montaiias de Leon, which extend in a continuous wall (with passes at Manzanal and Poncebadon) from north to south-west. To the Mifio flow the Sil, Boeza, Burbia, Cua, Valcarce ; the principal tributaries of the Duero are the Esla (with its affluents the Tuerto, Orbigo, Bernesga, Torio, Cuereno, and Ceo) and the Valderaduey. To the north-west of the montafias de Leon is the district

known as the Vierzo, a richly wooded pastoral and highland district, which in its lower valleys produces grain, fruit, and wine in abundance, The Tierra del Campo in the west of the province is fairly productive, but in need of irrigation, The hills of Leon were wrought for gold in the time of the Romans; iron is still obtained to some extent ; and coal and antimony also occur. The commerce and industries of the province are unimportant, Besides Leon, the capital, the only towns of any note are Astorga and Ponferrada, respectively the Asturica Augusta and the Interamnium Flavium of the Romans. There is railway communication with Madrid; but the line from Leon to Gijon at present terminates, on the south side of the pass, at Busdongo, while that to Coruiia does not extend further than Brafiuelas.

The province was anciently inhabited by the Vettones and Callaici; after the Romen conquest it formed part of Hispania Tarraconensis. Among the Christian kingdoms which arose in Spain as the Saracenic irruption of the 8th century receded, Leou was one of the oldest, after that of Asturias, the title of king of Leon having been first assumed by Ordofio in 918, Ferdinand I. (the Great) of Castile united the crowns of Castile and Leon in the 11th century ; the two were again separated in the 12th, until a final union took place (1280) in the person of St Ferdinand. The limits of the kingdom varied with the alternations of success and defeat in war, but roughly speaking it may be said to have embraced what are now the provinces of Leon, Palencia, Valladolid, Zamora, and Salamanca. ‘The province of Leon prior to 1838 included Leon, Zamora, and Salamanca,

Lxon, the capital of the above province, is pleasantly situated upon a rising ground in the angle formed by the Torio and Bernesga, which here unite to form the Leon, a tributary of the Esla; its distance north-west from Madrid is 258 miles, The town, which is surrounded by old and dilapidated walls, everywhere presents an aspect of ruin and decay. Many of the buildings are fine. Of these the most important is the cathedral, founded about 1195 ; it is built in the pointed Gothic style, of a warm cream- coloured stone, and is remarkable for its simplicity, lightness, and strength. The collegiate church of San Isidro was founded in 10638, and consecrated in 1149; it is Byzantine in

character. The church belonging to the convent of San Marcos, ordered by Ferdinand V. in 1514, was begun by Charles V. in 1537, and consecrated in 1541. Other buildings of less architectural importance are the town-house, the episcopal palace, and that of the Guzman family. As might be expected from the ecclesiastical character of Leon, there are a variety of religious and charitable institutions ; the industries of the place are linen Weaving, glove making, and the knitting of caps and

stockings, but the trade is insignificant. The population in 1877 was 11,515.

Leon (Arab., Liywn) owes its name to the Legio Septima Gemina of Galba, whieh, under the later emperors at least, had its head- quarters there. The place is mentioned under this name in the Jéin. Ant. About 540 it fell into the hands of the Gothie king Leovigildo, and in 717 it eapitulated to the Saracens. Retaken about 742, it ultimately, in the beginning of the 10th eentury, beeame the eapital of the kingdom of Leon. About 996 it was taken by Almansur, but on his death, which oeeurred soon afterwards, it reverted to the Spaniards. It was the seat of several eeelesiastieal couneils, one of which was held under Alphonso V., a seeond in 1090, and others in 1106, 1114, 1134, 1228, and 1288.

LEON, a city of Mexico, in the state of Guanajuato, the chief town of a department, and in population second only to the capital of the republic, from which it is distant about 100 miles. It is situated on the right bank of the Rio Torbio, in the midst of a fertile and flourishing region, and is altogether one of the best built and most prosperous places in the country, with a large trade in grain and other agricultural produce, and a number of considerable industries—cotton and woollen weaving, tanning, and saddlery. For some time Leon has aspired to become the chief town of a new state, and even to take the place of Mexico as the national capital. The opening of the railways south-east to Mexico and north-east to the Rio Grande will further stimulate its development. The foundation of Leon dates from 1576, and it has

ranked as a city since 1836, but the beginning of its present prosperity belongs only to the middle of the century.

LEON, the chief city of a department of the same name in the republic of Nicaragua, situated in an extensive plain about midway between the great inland lake of Nicaragua and the Pacific Ocean. It is connected by rail (1881) with Corinto on the coast (which has taken the place of Realejo, its former port); and the line is being extended to Leon Viejo on Lake Managua and thence to Granada. The city is spread over so wide an area that Squier, after a three months' residence, found himself discovering new and secluded portions. Its public buildings are among the finest of Central America. The cathedral (1746-1774) is a strong piece of masonry, with a roof of massive arches, which has several times been used as a fortress during the civil wars. The old episcopal palace (1678), the new episcopal palace (1873), and the college of St Ramon (1678) also deserve to be mentioned. The population is estimated at from 20,000 to 30,000. Contiguous to Leon, and practically one with it, is the Indian pueblo of Subtiaba, which has its own public buildings, and among the rest a church which almost rivals the cathedral.

At the time of the Spanish eonquest Subtiaba was the residence of the great eaeique of Nagrando, and the seat of an important temple. The eity of Leon, founded by Hernandez de Cordova in 1523, was originally situated at the head of the western bay of Lake Managua, and was not removed to its present position till 1610. Thomas Gage, who visited it in 1665, deseribes it as a splendid eity; and in 1685 it yielded rich booty to Dampier and his eompany. See Squier, Central America, vol. i.; and Scherzer, Free States of Central America.

LEON, Luis Ponce DE (1528-1591), usually known as Fray Luis de Leon, Spanish religious writer, was born about 1528, most probably at Granada, entered the university of Salamanca, where Melchior Cano was a few years his senior, at the age of fourteen, and in 1544 became a member of the Augustinian community there. His academical promotion was comparatively rapid ; in 1561 he obtained by public competition a theological chair at Salamanca, to which in 1571 was

added that of sacred literature, His views in exegesis and Biblical criticism were so far in advance of those of the majority of his immediate contemporaries that he was denounced to the Inquisition for having written a too secular translation of the book of Canticles, and for maintaining the possibility

of correcting the text of the Vulgate. In March 1572 he was consequently thrown into prison at Valladolid, where his confinement lasted pntil December 1576 ; the charges against him were then abandoned, and he was released with an exhortation to circumspection, moderation, and prudence. He at once resumed his former posts at Salamanca, and the remainder of his days were passed in comparative peace. In 1580 a Latin commentary on Canticles was published, and in 1583-85 he gave to the world three books of a treatise on the names of Christ, which he had written in prison, In 1583 also appeared the most popular of his prose works, a treatise entitled La Perfecta Casada ("The Perfect Wife") for the use of a lady newly married. Shortly before his death, which occurred at Madrigal on August 23, 1591, his appointment to be vicar-general of the Augustinian order was sanctioned by the pope.

It is ehicfly as a poet that Fray Luis de Leon is now remembered and admitted to a high plaee among the classic authors of Spain. His poetical works inelude historical translations of all the Zelogues and two of the Gcorgics of Virgil, some thirty odes of Horaee, forty psalms, and passages from the Greek and Italian, all charaeterized by mueh spirit and graee of style. The original pieees, which are ehiefly religious, not merely possess the technieal merits of idiom and versifieation whieh perhaps only Castilian ears ean appreciate, but in many eases give beautiful expression to feelings which are shared by the whole of the Christian world. Of one in partieular, the ode ‘‘De la Vida del Cielo," Hallam has justly remarked that it is ‘‘an exquisite piece of lyrie poetry, which in its peeuliar line of devout aspiration has perhaps never been excelled." The works of Luis de Leon inelude a Spanish eommentary on Cantieles, which was not published until 1798

; a translation, in Spanish oetaves, of the same book, first printed in 1806; and an exposition of Job, whieh first appeared in 1779.

The first eollective edition of Obras proprias y traduccioncs was published by Quevedo at Madrid in 1631 ; another, fuller and more carefully edited, appeared at Valencia in 1761; the latest and best is that of Merino (Obras reconocidas y cotejadas con varios manuscritos, 6 vols., Madrid, 1804-16). His original poems, with a German translation, by Schliiter and Storek, appeared at Miinster in 1858. There are two reeent German monographs on Luis de Leon (Wilkens, Fray Luis de Lcon, Halle, 1866; and Reusch, Luis de Leon u. die Spanische Inquisition, 1873), and one in Spanish (José Gonzales de Tejada, Vida de Fray Lwis de Leon, Madrid, 1863).

LEONARDO (or LIONARDO) DA VINCI was born in 1452 and died in 1519, having during his life excelled in almost every honourable human attainment and pursuit, the commercial and political excepted. Considering the range of his speculative as well as that of his practical powers, he seems certainly the man whose genius has the best right to be called universal of any that have ever lived. In the fine arts, he was the most accomplished painter of his generation and one of the most accomplished of the world, a distinguished sculptor, architect, and musician, and a luminous and pregnant critic. In inventions and experimental philosophy, he was a great mechanician and engineer, an anatomist, a botanist, a physiologist, an astronomer, a chemist, a geologist and geographer,—an insatiable and successful explorer, in a word, along the whole range of the physical and mathematical sciences when most of those sciences were new. Unfortunately he paid the penalty of his universality. The multifariousness and the equal balance of his faculties caused him to labour promiscuously in all fields of effort. He set himself to perform tasks and to solve problems too arduous and too manifold for the strength of any single life. The con-Sequence was that in art he was able to carry few undertak- ings to completion, and in science to bring no fully matured researches to the light. But the works of art which he did produce were of an excellence unapproached by his contemporaries, and only rivalled by men who came a generation after him, and profited by his example; while, in

science both theoretical and applied, his unpublished writings and the records of his inventions prove him to have anticipated at a hundred points the great masters of

reasoned discovery in the ensuing age. No wonder, therefore, if there has always been a mysterious attraction about his name. He stands out to after times in the character of a great if only half-effectual magician, one pre-eminent less by performance than by power. He has been called the Faust of the Italian Renaissance. The description would be just if the legend of Faust had con- ferred upon its hero the artist's gift of creation, as well as the ingenuity of the mechanical inventor, and the philosopher's passion for truth As it is, these three powers, the shaping or artistic, the contriving or mechanical, and the reasoning or philosophical, had never even been imagined as existing, still less have they ever been known actually to exist, in combination, in the same measure in which they were all combined in Leonardo. The man thus extraordinarily gifted was the son of a Florentine lawyer, born out of wedlock by a peasant mother. 'The place of his birth was Vinci, a "castle" or fortified village in the Florentine territory near Empoli, from which his father's family derived its name. The Christian name of his father was Piero (the son of Antonio the son of Piero the son of Guido, all of whom had been men of law like their descendant). Leonardo's mother was called Caterina. Her relations with Ser Piero da Vinci seem to have come to an end almost immediately upon tho birth of their son. She was soon afterwards married in her own rank of life. Ser Piero on his part was four times married, and had by his last two wives nine sons and two daughters ; but the boy Leonardo had from the first been acknowledged by his father, who brought hint up in his own house, principally, no doubt, at Florence. Inthat city Ser Piero followed his profession, and was after a while appointed notary to the signory, or governing council of the state, a post which several of his forefathers had filled before him. The son born to him before marriage grew up into a youth of manifest and shining promise. 'To signal beauty and activity of person he joined a winning charm of temper and manners, a tact for all societies, and an aptitude for all

accomplishments. An inexhaustible energy lay beneath this amiable surface. Among the multifarious pursuits to which he set his hand, the favourite were modelling and drawing. His father, perceiving this, sought the advice of an acquaintance, Andrea del Verrocchio, who at once recognized the boy's vocation, and was selected by Ser Piero to be his master. Verrocchio, as is well known, although not one of the great creative or inventive forces in the art of this age at Florence, was a thoroughly capable and spirited craftsman alike as goldsmith, sculptor, and painter, while in teach- ing he was particularly distinguished. In his studio Leonardo worked for several years in the company of Lorenzo di Credi and other less celebrated pupils. He had soon learnt all that his master had to teach—more than all, if we are to believe the oft-told tale of the figure, or figures, executed by the pupil in the picture of Christ's Baptism designed by the master for the monks of Vallombrosa. The work in question is now in the Academy at Florence. According to Vasari the angel kneeling on the left, with a drapery over its right arm, was put in by Leonardo, and when Verrocchio saw it his sense of Its superiority to his own work caused him to forswear painting for ever after. The latter part of the story is certainly false. Moreover, a closer examination seems to detect the hand of Leonardo, not only in the figure of the angel, but also in that of Christ and in the land- scape background, which are designed with extreme refine- ment, and painted in the new medium of oil, while the remainder of the picture has been executed by Verrocchio in his accustomed vehicle of tempera. The work was probably produced between 1480 and 1482, when Leonardo

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was from eighteen to twenty years of age. By the latter date we find him enrolled in the lists of the painters' guild at Florence. Here he continued to live and work probably for eight or nine years longer. Up till 1477 he is still spoken of as a pupil or apprentice of Verrocchio ; but in 1478 he receives an independent commission from the signory, and in 1480 another from the monks of San Donato in Scopeto. He had in the meanwhile been taken into special favour by Lorenzo the Magnificent. The only memorials now existing of Leonardo's industry

during this period consist of a number of scattered drawings and studies, most of them physiognomical, in chalk, pen, and silver point, besides two painted panels. One of these is a large and richly composed picture, or rather a finished preparation in nionochrome for such a picture, of the Adoration of the Kings; this may have been done for the monks of San Donato, and is now in the Uffizi; the other is a similar preparation for a St Jerome, now inthe Vatican gallery at Rome. We possess, however, the record of an abundance of other work which has perished. Leonardo was not one of those artists who sought in the imitation of antique models the means of restoring art to its perfection. He hardly regarded the antique at all, and was an exclusive student of nature. From his earliest days he had flung himself upon that study with an unprecedented passion of delight and curiosity. In drawing from life he had found the way to unite precision with freedom, the subtlest accuracy of definition with vital movement and flow of line, as no draughtsman had been able to unite them before. He was the first painter to recognize light and shade as among the most significant and attractive of the world's appearances, and as elements of the utmost importance in his art, the earlier schools having with one consent neglected the elements of light and shade in favour of the elements of colour and line. But Leonardo was not a student of the broad, regular, patent appear-

'ances only of the world; its fugitive, fantastic, un-

accustomed appearances attracted him most of all. Strange shapes of hills and rocks, rare plants and animals, unusual faces and figures of men, questionable smiles and expressions, whether beautiful or grotesque, far-fetched objects and curiosities, these were the things which he most loved to pore upon and keep in memory. Neither did he stop at mere appearances of any kind, but, having stamped the image of things upon his brain, went on indefatigably to probe their hidden laws and causes. The laws of light and shade, the laws of " perspective," includ- ing optics and the physiology of the eye, the laws of human and animal anatomy and muscular movement, and of the growth and structure of plants, all these and much more furnished food almost from the beginning to his insatiable spirit of inquiry. The

evidence of his preferences and preoccupations is contained in the list of the lost works which he produced during this period. One of these was a painting of Adam and Eve in opaque water-colours ; and in this, besides the beauty of the figures, the infinite truth and elaboration of the foliage and animals in the background are celebrated in terms which bring to mind the treatment of the subject by Albert Diirer, in his famous engraving done thirty years later. Again, a peasant of Vinci having in his simplicity asked Ser Piero to geta picture painted for him on a wooden shield, the father is said to have laughingly handed on the commission to his son, who thereupon shut himself up with all the noxious insects and grotesque reptiles he could find, observed and drew anid dissected them assiduously, and produced at last a picture of a dragon compounded of their various shapes and aspects, which was so fierce and so life-like as to terrify all who saw it. With equal research and no less

effect he painted on another occasion the head of a snaky-

haired Medusa! Lastly, Leonardo is related to have modelled in clay and cast in plaster, about this time, several heads of smiling women and children. In addition to these labours and researches, he was full of new ideas concerning both the laws and the applications of mechanical forces. His architectural and engineering projects were of a daring which amazed even the fellow-citizens of Alberti and Brunelleschi. History presents few figures more attractive to the mind’s eye than that of Leonardo during this period of his all-capable and dazzling youth. There was nothing about him, as there was afterwards about Michelangelo, dark-tempered, secret, or morose; he was open and genial with all men. From time to time, indeed, he might shut himself up for a season in com- plete intellectual absorption, as when he toiled among his bats and wasps and lizards, forgetful of rest and food, and insensible to the noisomeness of their corruption ; but anon we have to picture him as coming out and gathering about him a tatterdemalion company, and jesting with them until they were in fits of laughter, for the sake of observ- ing their burlesque physiognomies ; or anon as

standing radiant in his rose-coloured cloak and his rich gold hair among the throng of young and old on the piazza, and holding them spell-bound while he expatiated on his plan for lifting the venerable baptistery of St John, the bel San Grovannt of Dante, up bodily from its foundations, and planting it anew on a stately basement of marble. Unluckily it is to the written biographies and to imagina- tion that we have to trust exclusively for our picture. No portrait of Leonardo as he appeared during this period of his life has come down to us.

The interval between 1480 and 1487 is one during which the movements of our master are obscure, and can only be told conjecturally. Up to the former date we know with certainty that he was working at Florence, under the patronage of Lorenzo de' Medici. By the latter date he had definitively passed into the service of Duke Ludovico Sforza, called il Moro, at Milan. The main determining cause of his removal would seem to have been his selection by Ludovico for the task of erecting a great memorial statue in bronze to the honour of his victorious father, the condottiere Francesco Sforza. The project of such a monument had been already entertained by the last duke, Ludovico's elder brother. sessed himself of the regency in 1480, he appears to have revived the scheme, and to have invited various artists to compete for its execution. One who complied with the invitation was the Florentine Antonio del Pollaiuolo, by whom a sketch for the monument is still preserved at Munich. It would seem as if the competition had been won by Leonardo, but a considerable time had been allowed to elapse before the work was actually put in hand, The question then arises, Was it during this period of postponement that Leonardo went on his mysterious travels to the Hast? The earlier biographers know nothing of these travels ; recent investigation of Leonardo's MSS. has brought them to light. It has been not inaptly con- jectured that the speculations of transcendental Platon- ism, which absorbed at this time the thoughts and the

conversation of the Medicean circle, were uncongenial to | : | Divina Proportione he designed the figures.

1 A picture of this subject at the Uffizi still does duty for the original of Leonardo, but is in all likelihood merely the production of some later artist to whom the descriptions of his work have given the cue. In like manner, the Madonna in the Borghese gallery at Rome, in which occurs the motive of a bottle beaded with drops of dew, though it may well be the same painting which Vasari admired in the possession of Clement VII., is unquestionably the work, not of Leonardo, to whom Vasari ascribes it, but of his fellow-pupil Lorenzo di Credi. Altogether spurious, it may here be said, is the small Madonna which is made to pass for an early work of Leonardo in the Gallery at Dresden,

} adventurous and far-sought experience.

| his: services,

After Ludovico had pos- |

the essentially experimental cast of Leonardo’s mind, and that he was not sorry to escape from the atmosphere of Florence. At any rate his devouring curiosity would have made welcome the opportunity of enlarging his knowledge of men and countries by Eastern travel, even at the cost, which to one of his freethinking habits would not have been great, of a temporary compliance with Islamite observances, Certain it is that he took service as engineer with the sultan of ‘ Babylon,” which in the geographical nomenclature of those days meant Cairo, and in the course of his mission visited Egypt, Cyprus, Constantinople, the

‘ coasts of Asia Minor, especially the Cilician region about

Mount Taurus, and Armenia. This biographical discovery adds to the career of Leonardo a characteristic touch of Perhaps it was his acquaintance with the Levant which made him adopt the Oriental mode of writing from right to left, a habit which some of his biographers have put down to his love

| of mystification, and others explain more simply by the

fact (to which his friend Luca Pacioli bears explicit testi- mony) that he was left-handed. The probable date of Leonardo's Eastern travels falls between 1480 and 1483-84. By the last-named year, if not sooner, he was certainly back in Florence, whence he wrote to Ludovico il Moro at Milan a letter making him the formal offer of The draught of this letter is still extant. It does not altogether tally with the statements of the earliest biographers, that Leonardo was recommended by Lorenzo de Medici to the duke regent particularly for his accom- plishments in music, Vasari indeed says expressly that Leonardo was the bearer to Ludovico of a lyre of his

invention, ingeniously fashioned of silver in the form of a /horse's head. In the autograph draft of the letter, to

which we have referred, Leonardo rests his own title to patronage chiefly on his capabilities in military engineer- ing. After explaining these under nine different heads, he speaks under a tenth of his proficiency as a civil engineer and architect, and adds a brief paragraph with reference to what he can do in painting and sculpture, undertaking in particular to carry out in a fitting manner the monument to Francesco Sforza. We shall probably be

'safe in fixing between the years 1484 and 1485 as the

date of his definitive removal to Milan.

From this time for the next fourteen or fifteen years (until the summer of 1499) Leonardo continued, with very brief intervals of absence, to reside in high favour and con- tinual employment at the court of Ludovico il Moro. His occupations were as manifold as his capacities. He super- intended the construction of military engines, and seems to

| have been occasionally present at sieges and on campaigns. 'He devised and carried out works of irrigation and other } engineering schemes in the territory of the duchy.

He designed a cupola for the cathedral of Milan, and was consulted on the works of Certosa of Pavia. He managed with ingenuity and splendour the masques, pageants, and ceremonial shows and festivals of the court. Withal

‘he continued incessantly to accumulate observations and

speculations in natural philosophy, working especially at anatomy with Marcantonio della Torre, and at geometry and optics with Fra Luca Pacioli, for whose book De He made excursions into the Alps, and studied and drew with minute fidelity the distribution and formation of the mountain masses. He was placed at the head of a school or “Academy” of arts and sciences, where he gathered about him a number of distinguished colleagues and eager disciples. His pupils in painting included the sons of several noble families of the city and territory.

Among the more immediate scholars of Leonardo may be men- tioned Antonio Boltraffio, Marco be Gian Petrino, and

the master’s special friend and favourite, Salai or Salaino. But by far the most important painter formed under Leonardo’s influence at Milan was the admirable Bernardino Luini. Other disciples or adherents of his school were Bazzi of Siena, called I] Sodoma, Gaudenzio Ferrari, Andrea Solario, Bernardino dei Conti, and Ambrogio Preda or de Predis. Scveral of the pupils or adherents here mentioned belong, however, to a later period of the master’s life than that with which we are now concerned.

Leonardo’s own chief undertakings in art during his residence at the court of Ludovico il Moro were two in number, namely, the equestrian monument of Francesco Sforza and the mural painting of the Last Supper. For the former he had probably made some preparatory sketches and models before he left Florence. After his arrival at Milan

the work seems to have proceeded with mally interruptions, and according to a MS. note of his own to have been finally and actively resumed in 1490. In the Royal Library at Windsor are preserved a whole series of small experimental studies for the monument. Leonardo was a great lover and student of horses, and would never be without some of the noble race in his stable. It is difficult to retrace the stages of development marked by the several sketches in question, or their relations to the final design. But it seems as if Leonardo had first proposed to represent his hero as mounted on a charger violently prancing or rearing above a fallen enemy, and had in the end decided to adopt a quieter action, more nearly resembling that of the work upon which Verrocchio was simultaneously engaged at Venice. Some difficulties must have been encountered in the casting, or there would have been no meaning in the words of Michelangelo when twelve years afterwards he is said to have taunted Leonardo with incapacity on that account. But contemporary writings are explicit to the effect that the group of horse and rider, 26 feet in height, was actually cast in bronze, and set up to the admiration and delight of the people, under a triumphal arch constructed for the purpose, during

the festivities held at Milan in 1493 on the occasion of.

the marriage of the emperor Maximilian to a bride of the house of Sforza. Within ten years the glory of that house had departed. Ludovico, twice overthrown by the invaders whom he had himself called into Italy, lay languishing in a French prison, and his father's statue had served as a butt to the Gascon archers of the army of Louis XII.

to his own city; but nothing seems to have come of the project ; and within a few years Leonardo's master-work in sculpture had between mischief and neglect been irretriev- ably destroyed.

Only a little less disastrous is the fate which has overtaken the second great enterprise of Leonardo's life at Milan, his painting of the Last Supper. This, with the Madonna di San Sisto and Michelangelo's Last J udgment, is the third most celebrated picture of the world. It was painted, twenty years the earliest of the three, on the refectory wall of

the convent of Santa Maria delle Grazie at Milan, where its defaced remains are still an object of pilgrimage and wonder. The commission for the work came partly from the duke and partly from the monks of the con- vent. Leonardo is said to have consumed upwards of ten years upon his task, a circumstance which is not surprising when we consider his fastidious spirit and the multiplicity of other calls upon his time. But the monks were impatient, and could not make allowance for the intervals of apparent idleness, intervals really of brooding and searching and meditation, which were incidental to Leonardo's way of work, On one occasion it became necessary for the duke himself, whose dealings with his gifted servant seem to have been consistently intelligent and kind, to take the painter's part against the prior of the convent. But in

In 1501 the duke Ercole d'Este sought leave from | moniously interlinked by some natural connecting action with the the French governor of Milan to have the statue removed |

working out his conception of the scene, and in devising the pictorial means for its presentment, Leonardo allowed his craving for quintessential excellerce to overmaster him. He could not rest satisfied without those richnesses and refinements of effect which are unattainable in the ordinary method of mural painting, that is, in fresco, but must needs contrive by his chemistry a method for painting on the wall in oil, Neither could any of the traditional ideals of art content him in the representation of the scene. He must toil and ponder until he had realized a more absolute set of types, and grouped them in more masterly and speaking actions, than had ever been attempted before. The master type of all, that of Christ, it is said that he could never even realize to the height of his conception at all, but left it to the last uncompleted. Unhappily Leonardo's chemistry was unequal to his purpose, and his work had begun to peel and stain within a few years of its execution. 'The operation of time and damp has since been accelerated at intervals by the vandalism of men. After almost disappearing, the picture has been revived once and again, latterly

either from copies or from engravings taken during the earlier periods of its deteriora- tion, until now there is probably not a vestige of the original workmanship remaining. Nevertheless, through all these veils of injury and disguise, it is still possible in some measure to appreciate the power of that creation which became from the first, and has ever since remained, the typical representation for all Christendom of the sacra- ment of Christ's Supper.

Goethe in his famous criticism has said all that necds to be said of the essential character of the work. The painter has de- parted from precedent in grouping the company of disciples, with their Master in the midst, along the far side and the two ends of a long, narrow table, and in leaving the near or service side of the table towards the spectator free. The chamber is scen in a per- fectly symmetrical perspective, its rcar wall pierced by three plain openings which admit the sense of quiet distance and mystery from the open landscape beyond ; by the central of these openings, which is the widest of the three, the head and shoulders of the Saviour are framed in. On his right and left are ranged the dis- ciples in equal numbers. The serenity of the holy company has within a moment been broken by the words of their Master, ' Onc of you shall betray Me." In the agitation of their consciences and affections, the disciples have started into groups or clusters along the table, some standing, some still remaining seated. There are four of these groups, of three disciples each, and each group is har-

next. Leonardo, though no student of the Greeks, has perfectly carried out the Greek principle of expressive variety in particulars subordinated to gencral symmetry. 'The relations of his groups to one another, and of each figure within the sevéral groups to its neighbour and to the central figure of Christ, are not only triumphs of technical design, they are evidences of a complete science of human character, emotion, and physiognomy held at the service of a nobly inspired and nobly directed art. The furniture and acces- sories of the chamber, very simply conceived, have been rendcred with scrupulous exactness and distinctness ; yet they leave to the human and dramatic elements the absolute mastery of the scene. Neither do the academical draperies of

the personages impair the sense of imaginative truth with which the representation impresses us. Our first glance at the ruins of this famous picture makes us feel, and study does but strengthen the conviction, that the painter rose to the height of his argument, and realized worthily and for good this momentous scene in the spiritual history of mankind.

Of authentic preparatory studies for this work there remain but few. There is a sheet at the Louvre containing some nude sketches for the arrangement of the disciples about the table, and another of great interest at South Kensington, on which the painter has noted in writing the several dramatic motives which he pro- pes to embody in the disciples. At Windsor and Milan are a few

nished studies in red chalk for the heads. A highly-reputed series of black crayon drawings of the same heads, of which the greater portion is at Weimar, has no just claim to originality. Of the other pictures and sculptures which Leonardo is known to have produced while in the service of the duke, such as the painting of the Nativity, sent as a present to the emperor Maximilian, and the portraits of Lucrezia Crivelli and Cecilia Gallerani, one of the duke's mistresses, no trace remains, nor is there sufficient reason for accepting the recently suggested attribution to Leonardo of an

admirably wrought bust now preserved in the Louvre, of which the features are those of Ludovico's wifc, the duchess Beatrice.

These services,~~especially the maintenance of his cele~~ brated Academy, required on the part of Leonardo no in- considerable outlay. On the other hand, the payments received by him seem to have been neither adequate nor regular, at all events during the latter part of his resi- dence at the ducal court, when the exigencies of war and policy were already pressing hard upon Ludovico. Leon- ardo had finished his Last Supper between 1497 and 1499. In the spring of the latter year we find that he received, in consideration of payments due, the gift of a vineyard outside the city. Within a month or two his patron had fallen.

Milan was taken and held in hostile occupa- tion by the French. A contemporary historian has related with what admiration the invading monarch, Louis XIL, when he entered the refectory of Sta Maria delle Grazie, fixed his gaze on the work of Leonardo, and how he desired, were it possible, that it should be transported across the Alps to France. But by this time or soon afterwards the painter himself had left Milan. In the spring of 1500. we hear of him working at Venice, where, among other things, he painted (not, it appears, from life) a portrait of Isabella Gonzaga, marchioness of Mantua. The well-known head in the manner of Leonardo at the Louvre, commonly known as the Belle Ferronniére, has sometimes been identificd as the portrait in question; but not on sufficient grounds, Early in the next year, 1501, Leonardo was once more in Florence; and thither the same inarchioness, Isabella Gonzaga, sent an envoy to endeavour to attach him to her service. His answer was not unfavourable, but the envoy reported that, though recently engaged upon one or two small pictures, he was for the moment indifferent to the brush, and wholly absorbed in inathematics, In the end he attached himself, not to the court of Mantua, but to the service of Czesar Borgia, then in the plenitude of his criminal power, and almost within reach of the realization of his huge ambitions. Leonardo's new patron had been one of the worst enemies of the fallen Ludovico, and had entered Milan as a conqueror in the suite of the French king. But artists and men of letters formed, in those days, a caste apart, and changed service not less readily than did the condottieri or hired military commanders. Between the beginning of 1502 and the catastrophe which overtook the house of Borgia in the summer of 1503, Leonardo travelled as engineer in the employ of Duke Casar over a great part of Central Italy. In Umbria and the Marches, he visited Urbino, Pesaro, Rimini, Cesena, Cesenatico, Buonconvento, Perugia, and Foligno; in Tuscany, he was at Chiusi, at Siena, at Piombino on the coast over against Elba, and southward at least as far as Orvieto and Lake Bolsena, or even, it would appear, as far as Rome. He has left notes and drawings taken at each of the stations we have named, besides a set of six large-scale maps drawn minutely with his own hand, and including nearly the whole territory of Tuscany and the Maremma between the Apennines and the

Tyrrhene Sea. His excursions seem to have come to, an end early in 1503, as by March of that year we find him once more in Florence.

To the period of three years' wandering which followed Leonardo's departure from Milan there ensued another period of three years, during which he lived a settled life at Florence, He was now fifty-one years of age, and the most famous artist of Italy, though within a year or two the young Michelangelo was destined to challenge his supremacy, and the still younger Raphael to apprehend and assimilate the secrets of his skill, as he did those of the skill of every great predecessor and every distinguished rival in succession. The first important commission put

into Leonardo's hands at Florence was that for an altar- piece for the church of the Servite monks (Santa Maria dell?' Annunziata). The work had been already entrusted to Filippino Lippi, who had even made some beginning with it, but willingly gave up his claim in favour of his illustrious fellow-citizen. The monks undertook to lodge and nourish Leonardo in their convent while he carried on the work. After long premeditation he began, and prepared that admirable cartoon in black chalk which is now the treasured possession of the Royal Academy in London. The Virgin, partly seated on the left knee of St Anne, holds by the body the infant Christ, who leans across the figure of the elder woman, and lifts his hand in benediction of the little St John leaning against her knee. In the lines and management of the composition there is not less charm than there is research. The elder mother smiles upon her daughter, and the daughter smiles upon her child, each with a look of loving prescience and rapt self-congratulation which is the sweetest of all those mysterious expressions that Leonardo loved to seize and to perpetuate. When the cartoon was finished and exhibited, all Florence came flocking in delight to see and praise it. Between fastidi- ousness and preoccupation Leonardo, however, carried the undertaking no farther, and the work was put once more into the hands of Filippino Lippi, and on his death into those of Perugino. Leonardo's next great enterprise at Florence

was a historical painting for the Palace of the Signory. He had been on the commission of artists appointed to determine where Michelangelo's statue of David should be placed, and now he was chosen, along with his young rival, to finish a mural picture for the new Hall of Council. Each painter chose a battle subject: Michelangelo, as is well known, the surprise of the Florentine forces in the act of bathing near Pisa; Leonardo, an episode in the victory of the generals of the republic over Niccolo Picciuino at Anghiari, in the upper valley of the Tiber. In one of the sections of the 7'reatise on Painting, Leonardo has detailed at length, and obviously from his own observation, the pictorial aspects of a battle. His choice of such a subject was certainly not made from any love of warfare or indifference to its horrors. In the writings of Leonardo there occur almost as many trenchant sayings on life and human affairs as on art and natural law; and of war he has disposed in two words as a "bestial frenzy" (pazzia bestialissima). In his design for the Hall of Council, Leonardo set himself to depict this frenzy at its fiercest. He chose the moment of a terrific struggle for the colours between the opposing sides; hence the work became known in the history of art as the Battle of the Standard. Judging by the accounts of those who saw it, the tumultu- ous entanglement of men and horses, and the expressions of martial fury and despair, must in this case have been combined and rendered with a mastery not less command- ing than had been the looks and gestures of soul's perplexity and dismay among the peaceful company on the convent wall at Milan. Leonardo had finished his cartoon in less than two years (1504-1505), and when it was exhibited along with that of Michelangelo, the two rival works seemed to all men a new revelation of the powers of art, and served as a model and example to the students of that generation, as the frescos of Masaccio in the Carmine had served to those of two generations earlier. The young Raphael is well known to have been one of those who profited by what they saw. Other Florentine artists who were especially influenced at this time by Leonardo were Fra Bartolommeo, Jacopo da Pontormo, Ridolfo del Ghirlandajo; and in sculpture Baccio Ban- dinelli and Rustici. He also speaks of having among his pupils G. F. Penni called "Tl Fattore," a certain Lorenzo, and a German Jacopo, who cannot be further identified.

His favourite assistant Salai had, we know, accompanied him from Milan, and remained with him.

Leonardo lost no time in proceeding to the execution of his design upon the mural surface; this time he had devised a technical method of which he regarded the success as certain ; the colours were to be laid on a specially prepared ground, and then fixed by heat, in some way analogous to the processes of encaustic or enamel. When portions of the work were done the heat was applied, by means of fires lighted on platforms, but it was found to take effect unequally, and the result was a failure more or less complete. Leonardo abandoned the work in chagrin, and presently betook himself to Milan. Payments for his great battle-picture had been made to him in advance, and the gonfaliere Piero Soderini complained on behalf of the signory that Leonardo had treated them ill. When, however, he soon afterwards honourably offered to refund the amount, the offer was not less honourably declined. The unfinished painting before long disappeared from the wall. The cartoon also, no less than the competing cartoon of Michelangelo, has perished. Our only memorials of the work are a few preliminary sketches, an engraving executed by Lucensi in 1558, not from the original but from a copy, and the far more celebrated engraving of Edelinck after a study made by Rubens, in his own essentially personal, obstreperous, un-Italian manner, of a portion only of the composition. During the years between 1500 and 1505 Leonardo was also engaged at intervals upon the portraits of two ladies of the city—-Ginevra Benci, and Lisa di Antonio Maria di Noldo Gherardina, the wife of Zanobi del Giocondo, commonly called Mona (z.e., Madonna) Lisa or la Gioconda. The first of these portraits is lost; the second was bought by Francis I. for four thousand gold florins, and is now one of the glories of the Louvre. In Madonna Lisa Leonardo seems to have found a sitter whose features possessed in a singular degree the in- tellectual charm in which he delighted, and in whose smile was realized that inward, haunting, mysterious expression which had always been his ideal. He worked, it is said, at her portrait during some portion of four successive years, causing music to be played

during the sittings that the rapt expression might not fade from off her countenance, and labouring by all the means of which he was master to bring his work to perfection. It remains perhaps the most striking example of his powers. The richness of colouring on which Vasari expatiates has indeed flown, partly from injury, partly because in his preference for effects of light and shade the painter was accustomed to model his figures on a dark ground, and that in this picture the ground has toa large extent come through. Nevertheless, in its brown and faded state, the portrait is pre-eminent alike for fascination of expression, for refine- ment and precision of drawing, and for the romantic in- vention of its background, wherein a far-seen champaign with bridged rivers and winding roads is bounded by a fantastic coast of islands and rock-bound estuaries.

During these years of work at Florence, Leonardo's father died at a good old age in that city. Some stray notes, in which the painter mentions a visit to "Caterina" in the hospital, and inscribes the amount of expenses paid " for the funeral of Caterina," though they are of uncertain date, prove too that when Leonardo's peasant mother drew near her end her illustrious son was there to tend her. From his half brothers, the legitimate children of Ser Piero, Leonardo after their father's death experienced unkindness. They were all much younger than himself. One of them, who followed his father's profession, made himself the champion of the others in disputing Leonardo's claim to his share, first in the paternal inheritance, and then in that which had been left to be divided between the

brothers and sisters by an uncle. The litigation thus set on foot lasted for several years, and the annoyances attending it, with his disappointment at the failure of his great wall-painting, may have been among the causes which determined Leonardo to go back to Milan. Return thither he at all events did, with leave obtained from the signory, and attended by his faithful Salai, in the summer of 1506. For nearly nine years after that he seems to have made the Lombard city his principal home, residing sometimes on his own vineyard and

sometimes in the villa of a wealthy young friend and disciple, Francesco Melzi. The French remained in occupation at Milan until 1513, and Leonardo held the title of court painter and engineer to the French king, Louis XII., the transfer of his services having been formally requested by that monarch from the Florentine signory. The record of his occupations and performances during this period is meagre. He was several times, and for considerable periods at a time, in Florence, on business connected with the litigation above mentioned. From thence he writes at the beginning of 1511 to the French governor of Milan, asking about the payment of his salary, and saying that he means to bring with him on his return two pictures of the Madonna, of different sizes. But there can be no doubt that his thoughts became with his advancing years ever more and more engrossed in the problems of natural science. To this time belong a large proportion of the vast collections in which are accumulated the results of his observation and research. .

There are Only three extant pictures which we can with pro- bability assign to this, the second Milanese period of Leonardo's career, and to what points within the period it is hard tosay. Two of these are replicas or rather variations of the same theme, the Virgin and Child with St John the Baptist and an angel, in a landscape of fantastic rocks and flowery grottoes by the sea-shore. The composition is known as the Vierge aux Rochers. The most celebrated version of it is that formerly in the collection of Francis I., and now in the Louvre. The other version was painted, according to Lomazzo, for the Cappella della Concezione at Milan, where it was purchased in 1796 by Gavin Hamilton, and by him sold to the earl of Suffolk, from the hands of whose descendant it has lately passed into the National Gallery. Both of these paintings seem to betray signs of the handiwork of the master himself, assisted probably in each case by pupils. Both have suffered, the French example most from repainting, the English most from blackening. On the whole, of these two admirable and fascinating pictures, the English example may be pronounced to be both of the higher authenticity and the greater beauty, having the advantage of the French especially in the difference of position in the right hand of the kneeling angel. The third picture conjecturally referred to about this

date is also at the Louvre, and again represents a holy family. Leonardo has recurred to the motive on which he had founded his design for the Church of the Servites at Florence, in so far as he has seated the Virgin in the lap of St Anne, whom he depicts smiling at the happy intercourse of her mystic grand- child and hismother. But this time the Virgin stoops across as she sits, to lift the child from the ground on which he stands fondling a lamb. John the Baptist is absent, and the background is a pastoral landscape bounded towards the horizon by lagoons and mountains. The picture is unequally finished—minutely in some parts, and in others carelessly enough,

A great change took place in the affairs of Milan at the close of the year 1512. The French supremacy came to an end, and Maximilian Sforza, the son of Ludovico, returned for a few years to rule over the reduced dominions of his father. ll affairs were thrown into confusion, and Milan ceased to be a desirable place of abode for Leonardo and his scholars. In the meantime Giovanni de' Medici, the son of the painter's ancient patron Lorenzo, was elected pope under the title of Leo X., and continued with still greater magnificence the encouragement of art and artists of which his warlike predecessor Julius had set the example. On the 24th September 1514 Leonardo too set out for Rome from Milan with a company of his pupils. The youngest brother of the pope, Giuliano de' Medici, was his friend, but it is not true that Leonardo, as

Vasari says, had accompanied Giuliano to Rome on the occasion of his brother's elevation to the papal chair. Ill success attended the now ageing master during his stay in the shadow of St Peter's. He is said, indeed, to hav.

delighted the pope, who was himself something of a alchemist, by his experiments and ingenuities in science, and especially by a kind of zoological toys, which he had invented by way of pastime, as well as mechanical tricks played upon living animals. But when, having received a commission for a picture, he was found distilling for himself a new medium of oils and herbs before he had begun the design, the pope was convinced, not quite unreasonably, that nothing

serious would come of it. The hostility of Michelangelo, with whom Leonardo was in competition for the fagade of San Lorenzo at Florence, may also have done something towards hindering the employ- ment of the elder master on any important works. At all events no such employment came to him, and he seems, while he was at Rome, to have painted nothing but two sniall panels, one of a child, the other of a Madonna, for an official of the papal court, ;

By the end of the year 1515 Leonardo had left Rome and returned once more to Milan. In the meantime the brief rule of Maximilian Sforza had been terminated by the victory at Marignano of Francis I., who prevailed on Leonardo, by this time in his sixty-fourth year, to enter his service and return with him to France. It was in the beginning of 1516 that the painter crossed the Alps, taking with him his friend, the youthful Francesco Melzi. The Chateau Cloux in Touraine, near Amboise, was appointed for his place of residence. But his race was nearly run. In France he projected some canal works, and painted two pictures of classical mythology, which have been lost, a Leda and a Pomona; and that was all. He desired to put in order some of his vast accumulations of MS. notes and researches, but soon discovered that he who had been endeavouring so insatiably for all these years, in his own words, to learn to live had only been learning to die, That form of strength and beauty, and that exquisitely shaping and all-searching mind, were dissolved before decay or infirmity impaired them. Leonardo died at Cloux, in the sixty-seventh year of his age, on the 2d of May 1519. King Francis, then at his court of St Germain en Laye, is said to have wept for the loss of such a servant; that he was present beside the death-bed and held the dying painter in his arms is a familiar but an untrue tale.

The contents of our narrative will have justified the definition of Leonardo with which we set out, as a genius all but universal and a man pre-eminently great, yet great rather by power than by performance. Thus, in painting, there have come down to us no more than ten undisputed works from his hand ; and among those ten are included the picture by his master Verrocchio in which Leonardo had only a share, as well as the cartoon at the Royal Academy, and the

unfinished panels at the Uffizi and the Borghese gallery. Of the remaining well certified works of Leonardo, one is at the National Gallery (the Suffolk Verge aux Rochers), the others are the second Vierge aux Rochers, the Virgin and Child with St Anne, the portrait of Mona Lisa, and the young John the Baptist, all at the Louvre. The remains of the fresco said to have been painted by Leonardo and Melzi together, in the villa which belonged to the latter at Vaprio near Milan, are too frag- mentary and disputable to be counted. Of works, in addition to these, ordinarily claimed for Leonardo's hand, the best and nearest to his manner, if not actually his, is the portrait commonly known as La Belle Ferronniére, also at the Louvre, which students conjecture to be in reality that of the marchioness of Mantua, others that of Lucrezia Crivelli, Another highly reputed picture in the manner

of Leonardo is the Vierge au Bas-relief at Gatton Park ; another version, however, of the same theme, said to be in no way inferior to that at Gatton, exists at Milan, and is there rightly attributed to Cesare da Sesto. The multitude of smiling daughters of Herodias, allegorical Floras, and the like, 'besides some admirable religious pictures (includ- ing the Christ Preaching to the Doctors, at the National Gallery), which are currently attributed in public and private galleries to Leonardo, belong really to the various pupils or imitators of his school—the greatest number to Bernardino Luini, who added to a peculiar grace and suavity of his own much of the great master's intellectual power and exquisiteness of choice and finish. Such as they are, the meagre original remains of Leonardo's craft in painting are enough to establish his place in history as the earliest complete painter of the Renaissance, In his work thero are no longer to be perceived, as there are in that of all his contemporaries, any of the engaging imperfections of child- hood ; there is no longer any disproportion between the conception and its embodiment. He had wrestled with nature from the cradle, and for the purposes of pictorial representation had mastered her. He could draw with that ineffable left hand of his (the words are those of his friend Luca Pacioli) a line firmer, finer, and truer than has been drawn by the hand of any other man, excepting

perhaps Albert Diirer. Further, Leonardo carried the refinement of solid modelling in light and shade to the same high point to which he carried the refinements of linear definition. Colour he left where he found it, or rather perhaps, by his predilection for effects of light and shade, did something towards bringing about the degradation of colour. Of character and action he was an unrivalled master—prefer- ring for his own pleasure the more far-fetched and enigma- tical, sometimes even the grotesque among humau types and expressions, but capable on occasion, as in his master- work of the Last Supper, of laying aside curiosity and strangeness, and treating a great theme in a great and classical spirit. If these qualities can be sufficiently dis- cerned in the few extant paintings of this master, it is only by the study of his drawings and sketches that his industry and fertility in the graphic art can be appreciated. These are very numerous as well as very various in kind, and are widely scattered among different possessors, occurring sometimes apart from and sometimes in connexion with the sheets of his MS. notes and writings (see note below).

Passing from Leonardo's achievements in art to his attainments and inventions in science, a subject on which the present writer has no authority for speaking at first hand, it appears that, in this sphere also, the spirit of fanciful curiosity and ingenuity coexisted in Leonardo with an incomparably just and powerful grasp of natural fact and natural law. Gossiping biographers like best to speak of his-mechanical birds, of his mechanical walking lion stuffed with lilies, of the lizard which he fitted with horns and artificial eyes and oscillating wings filled with quick- silver, and the like; but serious students assure us that he was one of the very greatest and most clear-sighted as well as one of the earliest of natural philosophers. They declare him ta have been the founder of the study of the anatomy and structural classification of plants; the founder, or at least the chief reviver, of the science of hydraulics ; to have anticipated many of the geometrical discoveries of Commandin, Autolycus, and Tartaglia ; to have divined or gone far towards divining the laws of gravitation, the earth's rotation, and the molecular composition of water, the motion of waves, and even the undulatory theory of light and heat. He discovered the construction of the eye and the optical laws of vision, and invented the

camera obscura. Among useful appliances he invented the saw which is still in use in the marble quarries of Carrara,

and a rope-making machine said to be better than any even yet in use. He investigated the composition of explosives and the application of steam power; he per- ceived that boats could be made to go by steam, and designed both steam-cannon and cannon to be loaded at the breech. He.made innumerable designs for engines of war, and plans of tunnels and canals for traffic. A few of his practical inventions were carried out in his time, but both of these and of his speculative researches the vast majority, lying buried in unpublished MSS., remained after his death unknown or forgotten. The discoveries

which he had made wholesale were left to be rediscovered

piecemeal by the men of narrower genius who came after him.

So much for the intellectual side of Leonardo’s character and career. As a moral being we are less able to discern what he was like. The man who carried in his brain so many images of subtle beauty, as well as half the hidden science of the future, must have lived spiritually, in the main, alone. Of things communicable he was at the same time, as we have said, communicative—a genial com- panion, a generous and loyal friend, ready and eloquent of discourse, and impressing all with whom he was brought in contact by the power and the charm of genius. We see him living on terms of constant affection with his father, tending the last hours of his mother, and in disputes with his brothers not the aggressor but the sufferer from aggres- sion. We see him open-handed in giving, not grasping in getting—“ poor,” he says, “‘is the man of many wants ”; not prone to resentment—*‘the best shield against injustice is to double the cloak of long suffering’ ; zealous in labour above all men——“‘as a day well spent gives joyful sleep, so does a life well spent give joyful death.” With these instincts aud maxims, his moral experience is not likely to have been deeply troubled. In matters of religion he seems to have had some share of the philosophical scepticism of a later age. In matters of the heart, if any

consoling or any disturbing passion played a part in his life, we do not know it; we know only of affectionate relations with friends and pupils, of public and private regard mixed in the days of ‘his outh with dazzled admir- ation, and in those of his age with something of reverential awe.

Of the presence and aspect of this illustrious man we have, as has been said, no record belonging to the earlier period of his life except that of the written descriptions which celebrate his beauty. The portraits which we possess represent him in after years, as he may have appeared during his second residence at Milan, when the character of sage and archimage had fully imprinted itself on his countenance. The features are grand, clear, and deeply lined, the mouth firmly set and almost stern, the eyes strong and intent beneath their bushy eyebrows, the hair long and white, descending and commingling with a majestic beard. The most authentic sheet which thus represents him is a drawing nearly in full face, unquestion- ably by his own hand, at Turin. Other studies, but none of such high quality as this, represent the same features in profile. On both the full-face and the profile drawings many painted portraits have been founded, some of them done by nearly contemporary hands ; but none can with safety be attributed to the master himself.

The materials for a definitive life of Leonardo are at present wanting. They may be expected to be in great part supplied by the promised publication of Dr J. P. Riehter, The Literary Works of Leonardo da Vinci. In the meantime the results of recent investigation may be best gathered from the same writer’s bio- graphy of the painter (London, 1880), supplemented by his ‘‘ Leonardo-Studien ” in Liitzow’s Zettschrift fiir bildende Kunst, 1880, 1881; and by Ivan Lermolieff (Sig. Gioy. Morelli) in his Werke Italienischen Meister in Miinchen, Dresden, u. Berlin 1880, p. 107 sg. See also Karl Woermann in Woltmann and Woermann, Geschichte der Malerei, vol, il. p. 541 sg. On several matters of faet the authorities above named must be regarded as superseding all earlier biographies. The principal of these, tuking them In the ehronological order of their eompositlon, are as

follows: P. Jovius, ‘f Vita Leonard! Vineii,” printed in Tirabosehi, Storia delia Lett.

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italiana, t. vii, 1718-19; ‘‘Breve vita dl Leonardo da Vinci, seritta da un Anonimo di 1500,” printed by G. Milanesi in the Archivio Storico /tal., 1872, p. 222 sq.; Vasari in his eelebrated Zives; and Lomazzo in his 7rattato dell’ arte della pittura (1584), and Jdea del tempio della pittura (2d ed., 1590). From this time no contribution of importanee was added until the work of Amoretti, which has formed the foundation of all later researches (C. Amoretti, Afemorie Storiche sulla vita, &c., dé Lionardo da Vinci, 2d ed., Milan, 1804). The other chief contributions of new material have bccn contained in Fumagalli, Scuola di Leonardo da Vinei,1811; Gaye, Carteggio @ Artisti, 1839, vol. i., pp. 223, 224; the Lemonnier edition of Vasari, 1851, vol. vii. p. 11 sg.; the new cdition of the same by G. Milanesl, vol. iv. p. 17 sg.; G. L. Calvl, Notizie dei professori di belle arti, &e., Milan, 1869 ; and Gust. Uzielli, Ricerche intorno a Leonardo da Vinci, Florenee, 1872. The best general handlings of the subject, antecedent to those mentioned at the beginning of our list, have been, in France, by Arsene Houssaye, Listoire de Léonard de Vinci, 2d ed., Paris, 1876 ; and Charles Clément, Aaphael, Léonardo de Vinci, et Michelange, 4th ed., Paris, 1879; 1n Germany, by G. F; Waagen, Kleine Schriften, Stuttgart, 1875; W. Liibke, Gesch. der Jtal. Malerei, vol. il.; and C. Brun in Dohme’s Aunst u, Kistler, vol. iii., No. 61; In England, Mrs Heaton, Life of Leonardo da Vinci, London, 1874. With regard to the scientific attainments and achievements of Leonardo, the authorities are J. B. Venturi, Essai sur les ouvrages physico-mathématiques de Léonard de Vinci, Paris, 1797; Marx, Ueber M. A. Torre u. Leonardo da Vinci, Gittingen, 1848; Libri, Histoire des Sciences Mathénatiques en Italie, vol. ii.; Lombardinl, Dell’ origine et del Progresso della Scienza tdraulica, Milan, 1872; G. Mongeri, G. Govi, and C. Boito, Saggio delle opere de Leonardo da Vinci, Milan, 2 (a summary of the eonclusions of these writers is given In an essay by C. E. Black In Mrs

Heaton’s biography); and lastly, H. Grothe, Lionardo da Vinci als Ingenieur u, Philosoph, Berlin, 1874,

The celebrated Treatise on Painting, which has hitherto been the only pub- llshed portion of Leonardo’s writlngs, consists of brief didactic chapters, or more properly paragraphs, of practical direction or erltical remark on all the branches and all the eonditions of a painter’s practice. The original MS. draft of Leonardo has been lost, though a great number of notes for it are scattered throngh the varlous extant Volumes of hls MSS. The work has been printed in two different forms; one of these is an abridged version consisting of 365 sections; the first edition of it was published jn Paris In 1551, the last, translated into English by J. F, Rigaud, In London, 1877. The other is a more extended version, In 912 seetlons, divided Into eight books; this was printed in 1817 by Greg. Manzi at Romo, from a 17th century MS. which he had discovered in the Vatlean Library; a German translation from the same MS, has been edited by G. H. Ludwig in Eltelberger’s series of Quellenschriften fiir Kunstgeschichte. On the history of the bt In general see Max Jordan, Das Malerbuch des Leonardo da Vinci, Tetpeie,

1873.

The MSS., writings, sketches, and memoranda of Leonardo have undergone many vielssitudes sinee they were bequeathed in the mass by their author to his frlend and famulus Franceseo Melzi. Within fifty years of Leonardo’s death the son of thelr Inheritor had allowed them to pass out of hls hands, and they were in the possesslon partly of the seulptor Pompeo Leoni, and partly In that of Dr Guido Mazenta, By 1637 a considerable portion of them were again reunited In the Ambrosian Library at Milan. During the domination of the Freneh under Bonaparte, these treasures were brought to France, and the greater part of them were not reclaimed. Milan, Indeed, possesses that immense composite volume of Leonardo’s MSS. which is perhaps the most valuable of them all, and is called from lts bulk the Cedice Atlantico. Fourteen volumes more aye in the library of the Institute at Paris. A number of others are dispersed in various English col- leetions

—the most Important In the Royal Library at Windsor, some at the British Museum and South Kensington, and others in the private collections of Holkham Hall and Ashburnham House. The well-known sonnet, beginning ‘Chi non pud quel che vuol, quel che pud voglia,” which has been quoted since the 16th century as of Leonardo’s writing, has recently been proved to have been — fifty years before his time (see G. Uzielli in the journal Z/ sie eta

75)» . (S. C.)

LEONIDAS (“Son of the Lion”) was a very common Greek name. The most famous person who bore it was a king of Sparta, seventeenth of the Agid line. He had been king for one year when Xerxes invaded Greece, 480 B.c. The congress of the Greek states bent on resistance, which met at the isthmus of Corinth, sent Leonidas with a force of at least 8000 men to hold the narrow pass of Thermopyle against the Persians (see GREECE). When the Persians, through the treacherous aid of Ephialtes, had turned the pass, Leonidas dismissed all his army except the 300 Spartan citizens, 700 Thespians, and the Theban contingent, which was suspected of treachery. Every man of the Lacedzemonians and Thespians died on the field, while the Thebans laid down their arms. A monument was erected on the spot where the Greeks made their final struggle. It was a lion, and we may compare with it the lion set up by the Thebans on the battlefield of Cheronea to com- memorate the sacred band who were all slain there 338 B,c. There is no foundation for the common story that Leonidas had only three hundred men with him at Thermopyle.

There were also two Greek poets named Leonidas. The elder was born at Tarentum, and lived ijn the time of Pyrrhus ; he spent a wandering life of poverty. There remain over a hundred of his epigrams, chiefly inscriptions on works of art, or dedicatory offerings, which are among the best of their kind, showing much ingenuity of thought and cleverness of expression. The other was born at Alexandria, and came to live in Rome, where he obtained great reputation in the time of Nero. His epigrams are destitute of merit. The only ingenuity displayed in them

is that some of them have an equal number of letters in every verse.

LEONTINI, a town in the south-east of Sicily, was founded by the Chalcidians from Naxos (730 B.c.). Its history is so interwoven with that of its more powerful neighbour Syracuse that it can hardly be treated separately. The people of Leontini were more than once transferred to Syracuse, but the town was always refounded.! It was situated in a very fertile district, and was a wealthy place, as is proved by its numerous coins, on which ears of corn are afrequent type. The locus classicus for the topography of the ancient city is Polybius, vii. 6. The most dis- tinguished name in literature belonging to Leontini is that of the sophist Gorgias. It continued to exist throughout the Roman and medieval periods, and still preserves the old name slightly altered as Lentini.

LEOPARD, a name now commonly given to a well- known animal, called pard (dpdos and rdpdads) or panther (rdvOyp) by the ancients. Leopard (leo-pardus) was a later term, originally applied, it is believed, to the animal now known as the cheetah or hunting leopard, upon the supposition that it was a creature intermediate between the lion and the true pard. If so it has been completely transferred to the more common species, and though in this sense a perfectly unnecessary and unmeaning term, has gradually superseded those by which this was originall known. Pard, so commonly used by Elizabethan authors, is now nearly obsolete in the English language, and panther has either become synonymous with leopard, or is used

Leopard.

vaguely for any similar large feline animal, even the puma of Anierica. ’

Owing to their extensive geographical range, and the great variations, both in size, form, and coloration to which leopards are subject, zoologists have scarcely decided whether all the forms popularly referred to this animal should be regarded as specifically alike, or

whether they should constitute several distinct species, but the prevailing Opinion at present is in favour of the former view. The attempts to separate a larger and more robust variety, under the name of panther, from a smaller and more

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1 The restoration of the Leontine exiles was one of the alleged reasons for the Athenian expedition against Syracuse, 417 B.o.

graceful form, to which the term leopard might properly be restricted, have failed owing to the existence of inter- mediate conditions which cannot be assigned definitely to either one or the other form. The most marked anatontical difference yet noted in different varieties of leopard is in the length of the tail as compared with that of the body, even the number of the caudal vertebrae showing variation, though within what limits, and whether correlated with other characters, has not yet been clearly ascertained. The fur of those specimens which inhabit the most northern confines of its range of distribution, as North China, is longer and softer, and the markings are consequently less distinct than on those from more congenial climates, and the well-marked variation thus produced has given rise to the idea of specific distinction.

Treating the species as one, it is the Felis pardus, Linn., of most systematic authors, belonging to the family Felidz (for the characters of which see Mammatia), and is one of the most typical members of the genus Felis, both in its structure and habits. It belongs to that section of the genus (which includes most of its larger members, as the lion and the tiger) in which the hyoid bone is looscly con- nected with the skull, owing to imperfect ossification of its anterior arch, and in which the pupil of the eye when con- tracted under the influence of light is circular, not linear as in the smaller cats. The teeth consist on each side of three small incisors, and a formidable large, conical, sharp- pointed canine above and below, and three premolars and one molar above, and two premolars and one molar below, all except the very small upper true molar with sharp compressed trenchant crowns.

The skull can scarcely be distinguished, except by its inferior size, from that of the lion. There are seven cervical, thirteen dorsal, seven lumbar, three sacral, and usually twenty-three caudal vertebree. The toes, five on the forefoot (of which the first or pollex is much shorter than the others) and four on the hind foot, are all armed with powerful, sharp-pointed, much-curved, compressed, retractile claws, The size of different individuals, as before said, varies greatly, the head and body usually measuring from 34 to 44 feet in length, and the tail from 2} to 3 feet, but specimens have been met with which fall short of or exceed these limits, The ground colour of the fur varies from a pale fawn to a rufous buff, graduating into a pure white on the under parts and inside of the limbs. Thisis spotted over with dark brown or black; the spots on the back and sides being arranged in rosettes or broken rings, which vary greatly in size and distinctness in different individuals, but are without the central spot seen in those of the jaguar. The spots on the under parts and limbs are simple and blacker than those on the other parts of the body. The bases of the ears behind are black, the tips buff. The upper side of the tail is buff, spotted with broken rings like the back, its under surface white with simple spots. The hair of the cubs is longer than that of the adults, its ground colour less bright, and its spots less distinct. Perfectly black leopards, which, however, in certain lights show the charac- teristic markings on the fur, are not uncommon. These appear to be examples of melanism, occurring as individual variations, sometimes in one cub out of a litter of which the rest are normally coloured, and therefore not indicating a distinct race, much less a species. These are met with chiefly in southern Asia. We are not aware of any recorded case from Africa, but the wild animals of that continent are not so well known. ;

In habits the leopard resembles the other large cat-like animals, yielding to none in the ferocity and bloodthirsti- ness of its disposition. It is exceedingly quick and active in its movements, but seizes its prey by waiting in ambush or stealthily approaching to within springing distance, when

it suddenly rushes upon it and tears it to ground with its powerful claws and teeth. It preys upon almost any animal it can overcome, such as antelopes, deer, sheep, goats, monkeys, peafowl, and is said to have a special liking for dogs. It not unfrequently attacks human beings in India, chiefly children and old women, but instances have been known of a leopard becoming a regular "'man-eater." When favourable opportunities occur, it often kills many more victims than it can devour at once, apparently to gratify its propensity for killing, or only for the sake of their fresh blood. It generally inhabits woody districts, and can climb high trees with facility when necessary for its safety when hunted, but usually lives on or near the ground, among rocks, bushes, and roots and low branches of large trees.

The present geographical range of the leopard is very extensive, as it is met with in various suitable localities, where not too much interfered with by human cultivation, throughout the greater part of Africa from Algeria to the Cape Colony, and through the whole of the south of Asia from Palestine to China, including all India south of the Himalayas, and the islands of Ceylon, Java, Sumatra, and Borneo. Fossil bones and teeth, indistinguishable from those of existing leopards, have been found in cave de posits of Pleistocene age in Spain, France, Germany, and England. The evidence of the former existence of the leopard in England is described at length by Boyd Daw- kins and Sanford in their British Pleistocene Mammalia (Palzontographical Society, 1872). (w. H. F.)

LEOPARDI, Giacomo (1798-1837), the one Italian poet of the 19th century who has taken an uncontested place among the classics of the language, was born at Recanati in the March of Ancona, June 29, 1798. All the circumstances of his parentage and education conspired to foster his precocious and sensitive genius at the expense of his physical and mental health. His family was ancient aud patrician, but so deeply embarrassed as to be only rescued from ruin by the energy of his mother, who had taken the control of business matters entirely into her own hands, and whose engrossing devotion to her undertaking seems to have almost dried up the springs of maternal tenderness.

Count Monaldo Leopardi, the father, a mere nullity in his own household, secluded himself in his exten- sive library, to which his nervous, sickly, and deformed son had free access, and which absorbed him exclusively in the absence of any intelligent sympathy from his parents, any companionship except that of his brothers and sister, or any recreation in the dullest of Italian towns. The lad spent his days over grammars and dictionaries, learning Latin with little assistance, and Greek and the principal modern languages with none at all. Any ordinarily clever boy would have emerged from this discipline a mere pedant and bookworm. Leopardi came forth a Hellene, not merely a consummate Greek scholar, but penetrated with the classical conception of life, and a master of antique form and style. Atsixteen he composed a Latin treatise on the Roman rhetoricians of the 2d century, a commentary on Porphyry's life of Plotinus, and a history of astronomy ; at seventeen he wrote on the popular errors of the ancients, citing more than four hundred authors. A little later he imposed upon the first schiolars of Italy by two odes in the manner of Anacreon. At eighteen he produced a poem of considerable length, the "Appressamento alla Morte," which, after being lost for many years, has recently been discovered and published by Signor Zanino Volta. It is a vision of the omnipotence of death, modelled upon Petrarch, but more truly inspired by Dante, and in its conception, machinery, and general tone offering a remarkable resemblance to Shelley's "Triumph of Life," written six years subsequently, and of which Leopardi probably never heard. This juvenile

work was succeeded (1819) by two lyrical compositions which at once placed the author upon the height which he maintained ever afterwards. The ode to Italy, and that on the monument to Dante erected at Florence, gave voice to the dismay and affliction with which Italy, aroused by the French Revolution from the torpor of the 17th and 18th centuries, contemplated her forlorn and degraded condition, her political impotence, her degeneracy in arts and arms, and the frivolity or stagnation of her intellectual life. They were the outcry of a student who had found an ideal of national existence in his books, and to

whose disappointment everything in his own circumstances lent additional poignancy. But there is nothing unmanly or morbid in the expression of these sentiments, and the odes are surprisingly exempt from the failings characteristic of young poets. They are remarkably chaste in diction, close and nervous in style, sparing in fancy, and almost destitute of simile and metaphor, antique in spirit, yet pervaded by modern ideas, combining Landor's dignity with a consider- able infusion of the passion of Byron. These qualities continued to characterize Leopardi's poetical writings throughout his life. A third ode, on Cardinal Mai's discoveries of ancient MSS., lamented in the same spirit of indignant sorrow the decadence of Italian literature. The publication of these pieces widened the breach between Leopardi and his father, a well-meaning but apparently dull and apathetic man, who had lived into the 19th century without imbibing any of its spirit, and who provoked his son's contempt by a superstition unpardonable in a scholar of real learning. Very probably from a mistaken idea of duty to his son, very probably, too, from his own entire dependence in pecuniary matters upon his wife, he for a long time obstinately refused Leopardi funds, recreation, change of scene, everything that could have contributed to combat the growing pessimism which eventually became nothing less than monomaniacal. The affection of his brothers and sister afforded him some consolation, and he found intellectual sympathy in the eminent scholar and patriot Pietro Giordani, with whom he assiduously corresponded at this period, partly on the ways and means of escaping from "this hermitage, or rather seraglio, where the delights of civil society and the advantages of solitary life are alike wanting." This forms the keynote of numer- ous letters of complaint and lamentation, as touching but as effeminate in their pathos as those of the banished Ovid. It must be remembered in fairness that the weakness of Leopardi's eyesight frequently deprived him for months together of the resource of study. At length (1822) his father allowed him to repair to Rome, where, though cheered by the encouragement of Bunsen and Niebuhr, he found little satisfaction in the trifling pedantry that passed for philology and archzology, while his sceptical opinions prevented his taking orders, the indispensable condition of public employment in the papal states. Dispirited, and with exhausted means, he returned to Recanati, where he spent three miserable years,

brightened only by the production of several more lyrical masterpieces, which appeared in 1824. The most remarkable is perhaps the Bruto Minore, the condensation of his philosophy of despair. In 1825 he accepted an engagement to edit Cicero and Petrarch for the publisher Stella at Milan, and took up his residence at Bologna, where his life was for a time made almost cheerful by the friendship of the countess Malvezzi. In 1827 appeared the Operetie Morali, consisting principally of dialogues and his imaginary biography of Filippo Ottonieri, which have given him a fame as a prose writer hardly inferior to his celebrity as a poet. Modern literature has few productious so eminently classical in form and spirit, so symmetrical in construction and faultless in style. Lucian is evidently

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the model; but the wit and irony which were playthings to Lucian are terribly earnest with Leopardi. Leopardi's invention is fully equal to Lucian's, and his only drawback in comparison with his exemplar is that, while the latter's campaign against pretence and imposture commands hearty sympathy, Leopardi's philosophical creed is a repulsive hedonism in the disguise of austere stoicism. His Ice- lander rebuking Nature for his cruelty and inhospitality, his Soul protesting against the original wrong of creation, his Familiar Spirit explaining the impossibility of making his master happy for a single instant—all, in fact, of the chief interlocutors in these dialogues profess the same unmitigated pessimism, claim emancipation from every illusion that renders life tolerable to the vulgar, and assert or imply a vast moral and intellectual superiority over unenlightened mankind. When, however, we come to inquire what it is the privation of which renders them miserable, we find it is nothing but pleasurable sensation, fame, fortune, or some other external thing which a lofty code of ethics would deny to be either indcfeasibly due to man or essential to his felicity. A page of Sartor Leesartus scatters Leopardi's sophistry to the winds, and leaves nothing of his dialogues but the consummate literary skill that would render the least fragment precious. As works of art they are a possession for ever, as contributions to moral philosophy they are worthless, and apart from their literary qualities can only

escape condemnation if regarded as lyrical expressions of emotion, the wail extorted from a diseased mind by a diseased body. “ Filippo Ottonieri” is a portrait of an imaginary philosopher, imitated from the biography of a real sage in Lucian’s Demonaz, Lucian has shown us the philosopher he wished to copy, Leopardi has truly depicted the philosopher he was. No- thing can be more striking or more tragical than the picture of the man superior to his fellows in every quality of head and heart, and yet condemned to sterility and impotence because he has, as he imagines, gone a step too far on the road to truth, and illusions exist for him no more. The little tract is full of remarks on life and character of sur- prising depth and justice, manifesting what powers of observation as well as reflexion were possessed by the sickly youth who had seen so little of the world.

Want of means soon drove Leopardi back to Recanati, where, deaf, half-blind, sleepless, tortured by incessant pain, at war with himself and every one around him except his sister, he spent the two most unhappy years of his unhappy life. In May 1831 he escaped to Florence, where he formed the acquaintance of a young Swiss philologist, M. de Sinner. To him he confided his unpublished philological writings, with a view to their appearauce in Germany. Sinner showed himself culpably remiss in the execution of his trust, and it is no adequate extenuation of his negligence that these treatises were of less value than Leopardi may have thought. Though continually reclaimed by the latter’s friends after his death, they were never published by Sinner, but were purchased after his decease by the Italian Government, and, together with Leopardi’s correspondence with the Swiss philologist, have been partially edited by M. Aulard. In 1831 appeared a new edition of Leopardi’s poems, comprising several new pieces of the highest merit. These are in general less austerely classical than his earlier compositions, aud evince a greater tendency to description, and a keener interest in the works and ways of ordinary mankind. “The Resurrection,” composed on occasion of his unexpected recovery, is a model of concentrated energy of diction, and “The Song of the Wandering Shepherd in Asia” is one of the highest flights of modern lyric poetry. The range of the author’s ideas is still

restricted, but his style and melody are unsur- passable. Shortly after the publication of these pieces

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(October 1831) Leopardi was driven from Florence to Rome by an unhappy attachment, the history and object of which have remained unknown. His feelings are powerfully expressed in two poens, “To Himself” and “‘ Aspasia,” which seem, however, to breathe wounded pride at least as much as wounded love. In 1832 Leopardi returned to Florence, and there formed acquaintance with a young Neapolitan, Antonio Ranieri, himself an author of merit, and destined to enact towards him the part performed by Severn towards Keats, an enviable title to renown if Ranieri had not in his old age tarnished it by assuming the relation of Trelawny to the deceased Byron. Leopardi accompanied Ranieri and his sister to Naples, and under their care enjoyed four years of comparative tranquillity. He made the acquaintance of the German poet Platen, his sole modern rival in the classical perfection of form, and composed “La Ginestra,” the most consum- mate of all lis lyrical masterpieces, strongly resembling Shelley’s “Mont Blanc,” but more perfect in expression. He also wrote at Naples “The Sequel to the Battle of the Frogs and Mice,” his most sustained effort, a satire in ottava rima on the abortive Neapolitan revolution of 1820, clever and humorous, but obscure from the local character of the allusions. The more painful and distasteful details of his Neapolitan residence may be found by those who care to seek for them in the deplorable publication of Ranieri’s peevish old age (Sette Anne di Sodalizio). The decay of his constitution continued ; he became dropsical ; and a sudden crisis of his malady, unanticipated by himself alone, put an end to his life-long sufferings on June 15,

1837,

Leopardi’s sole but sufficient apology for the effeminacy of endless complaints, and an extremely low view of the conditions of human happiness, is to have been a poor invalid tortured by incessant pain, who in demanding pleasurable sensations for mankind was but craving what was indeed an absolute necessity for himself. With all his

dramatic skill in dialogue, the cast of his mind was essen- tially subjective ; he was wholly incapable of placing himself at any other point of view than his own. His philosophical opinions accordingly posscss merely a personal interest, and are valueless except as illustrations of human nature in abnormal circumstances. The patriotic ee of his earliest poems, the brief gleam of happi- ness he enjoyed in female society at Bologna, reveal how different might have been his history and the spirit of his writings had his physical organization qualified him for either love or action. Bereft of every possibility of healthy energy, it is no wonder that he should have sunk into a despairing quietism, a solace probably to himself, and only hurtful to others if represented as a powerful in- tellect's deliberate and unbiassed solution of the problem of the universe. Leopardi's perfect literary expression owes nothing to the nature of the ideas it is employed in embellishing, and is, indeed, most conspicuous when he stands upon common ground with other poets. Thus the magnificent description of the setting of the moon in ''T] Tramonto della Luna" is finer than the reflexions it ushers in, and his crowning work, "La Ginestra," owes most of its impressive- ness to the assemblage of noble and picturesque objects which the poet summons as witnesses to the frailty of man. In the presence of Vesuvius and Pompeii such meditations seem natural, and, aftcr all, the association of the destinies of mankind with the revolutions of nature produces rather a sentiment of grave and chastened exal- tation than the self-abasement enforced by the poet. This natural and moral sublimity raises it above Leopardi's other lyrics, which in point of poetical feeling and literary workmanship are for the most part nearly on a par. They are truly classic—not, as with Platen, by a laborious imitation of antique metres, but, as with Shelley and Landor and the English neo-classic poets, by a perfect appropriation of the classical spirit. As with the ancients, their range of senti- ment is narrow but their form perfect ; there is probably no other modern writer in whom it would be so impossible to alter a line without detriment. The same perfection characterizes Leopardi's prose writings, and his letters would be hardly less admirable but for the hollow professions and inflated compliments exacted by the conventional proprieties of Italian correspondence. The insincerity of his letters to his father is especially painful ; and his professed

yearning for death is strangely associated with a frantic dread of cholera, Censure, however, is silent in the contemplation of his moral and physical sufferings; and his intimates unanimously attest the attractiveness of his personal character save for some infirmities that should never have been dragged to light. Asa precocious

and at the same time cnduring genius he can only be compared to Pascal, whom he greatly resembles in many respects.

The poems which constitute Leopardi's principal title to immor- tality are only forty-one in number, and some of these are merely fragmentary. They may for the most part be described as odes, meditative soliloquies, or impassioned addresses, generally couched in a lyrical form, although a few are in magnificent blank verse. Some idea of the style and spirit of the former might be obtained by imagining the thoughts of the last book of Spenser's Faerie Qucene in the metre of his Lpithalamiwm. They were first edited complete by Ranieri at Florence in 1845, forming, along with the Operette Morali, the first volume of a proposed edition of Leopardi's works, which does not, however, include the '"'Sequel to the Battle of the Frogs and Mice," first printed at Paris in 1842, nor the recently discovered writings. Vols. ii.~~iv. contain the philological essays and translations, with some letters, and vols. v. and vi. the remainder of the correspondence. The juvenile essays preserved in his father's library at Recanati were edited by Cugnoni in 1879, with the con~~ sent of the family. Leopardi's biography is mainly in his letters, which his recent historians (Brandes, Bouché-Leclercq, Rosa) have merely wrought up with the addition of criticisms, excellent in their way, more particularly Brandes's, but generally much overrating his significance in the history of human thought. Mr Glad- stone's essay (Quart. Rev., 1850), since reprinted in vol. ii. of the author's Gleanings, is, on the other hand, too much pervaded by the theological spirit, but is in the main a pattern of generous and discriminating enlogy. Ranieri's infelicitous contribution to lis friend's biography has been mentioned ; a recent

publication by the countess Teresa Leopardi, widow of Leopardi's brother Carlo, has done much to correct misconceptions respecting the circumstances aud feelings of his family. There are excellent German translations of his pocms by Heyse and Brandes ; it is very improbable that there will ever be an adequate one in English. A translation of his essays and dialogues by Mr C. Edwards has, however, just appeared (1882), and most of the dialogues have been rendered into our language with extraordinary felicity by Mr James Thomson, author of The City of Dreadful Night. It is much to be hoped that these versions may ere long be disinterred from the files of the National Reformer, and made generally accessible. (R. G.)

LEOPOLD I. (1640-1705), Holy Roman emperor, the second son of the emperor Ferdinand III. and Maria Anna of Spain, was born June 9, 1640, He became king of Hungary in 1655, and king of Bohemia in 1658, in which year he also received the imperial crown, the electors having chosen him in preference to Louis XIV. of France. Leopold had been educated for the church, and throughout life he had the tastes and sympathies of a churchman rather than those of a secular ruler. He secluded himself as much as possible from the world, and would have preferred to live in peace, yet his long reign was destined to be one of the most agitated periods in German history. It happened that he had in Louis XIV. a rival of extraordinary power, and Leopold was in no respect a match for his craft, ambi- tion, and audacity. The serious difficulties of Leopold's career began in 1662, when the mismanagement of his ministers in regard to Transylvania made war with Turkey inevitable. The Turks invaded Hungary, and, having seized Grosswardein and Neuhdusel, broke into Moravia and Silesia. The princes of the empire, who had been made virtually independent by the results of the Thirty Years' War, watched the progress of the struggle with indifference ; but in 1663, Leopold having made a personal appeal to them in the diet at Ratisbon, they were induced to grant him aid. On the lst of August 1664 Montecuculi defeated the Turks at St Gotthard on the Raab, and had the war been prosecuted with energy much future disaster would probably have been prevented. The emperor, how- ever, made no further uso of his victory than to induce the Turks to accept an armistice for twenty years. He allowed

them to retain Grosswardein and Neuhiusel, and their candidate for the principality of Transylvania was formally reeognized. In 1672 Leopold came for the first time into direct collision with Louis XIV. As it seemed highly probable that the French king would not be content with the conquest of Holland, Leopold, as head of his hereditary territories and as emperor, associated himself with Brandenburg and Spain for the support of the Dutch.

For some time, in consequence of the intrigues of Prince Lobkowitz, the emperor's minister, the war was conducted indolently by the Germans; and early in 1675 Turenne gained a series of brilliant victories in Alsace. Later in the same year Turenne was slain, and his army defeated at Sassbach ; and Montecuculi forced his way across the French frontier. The treaty of Nimeguen having been signed by the Dutch in 1678, the emperor concluded peace in 1679. The French retained Freiburg in Breisgau; and soon afterwards Louis XIV., instead of giving up towns which he had undertaken to resign, seized many new cities and districts. To these acts of robbery he gave an appearance of legality by instituting so-called 'Chambers of Reunion." The German people bitterly resented his aggression, but the princes declined to interfere, and tlie energies of the emperor were fully occupied elsewhere. His system of government in Hungary was arbitrary and tyrannical, and in 1682 the Hungarians, headed by Emeric Tokélyi, broke into open revolt. They were encouraged by Louis XIV., who stirred up the Turks to join them in attacking Austria. In 1683 a Turkish army of 200,000 men, led by the grand vizier Kara Mustapha, entered Hungary, and pushed on to Vienna, which thcy besieged from the 14th of July till the 12th of September. The German princes were unwilling to act even in such an emergency as this, but at last an imperial army under the electors of Bavaria and Saxony marched towards Vienna, and they were joined by John Sobieski of Poland with a corps of 26,000 men. These troops, in association with the emperor's army under Duke Charles of Lorraine, attacked the Turks on the 12th of September 1683, at the Kalenberg, near Vienna. The Turks were so effectually defeated that they were soon driven from Hungary. Another great victory was gained over them at Mohacz in 1687 ; and in 1697 they were defeated by Prince Eugene at Zenta. In

1699 the treaty of Carlowitz was signed, whereby the emperor became complete master of the districts which the Turks had conquered in Hungary. Twelve years before (1687), the Hungarians, worn out by the struggle, had submitted to the emperor at the diet of Pressburg, the monarchy being made hereditary in the house of Hapsburg instead of elective. This settlement had scarcely been concluded when the emperor was involved in new troubles by the French invasion of the Palatinate in 1688. On this occasion Louis XIV. had to account with an antagonist of a very different character from the emperor Leopold. William of Orange, when raised to the throne of England, made it the object of his life to break the supremacy of France; and through his efforts was formed the Grand Alliance, which for more than eight years carried on war by sea and land. The emperor did not approve of the treaty of Ryswick (1697), but after the withdrawal of his allies he had no alternative but to con- sent to the establishment of peace. Louis was compelled to cede most of the acquisitions he had made after the treaty of Nimeguen, but retained Strasburg. In 1701 began the war of the Spanish succession, waged by Leopold in defence of the claims of his second son Charles against those of Philip of Anjou, grandson of Louis XIV. In this war Leopold was supported by the empire, and by England, Holland, and Prussia. It opened with several victories gained by Prince Eugene; but afterwards King Joseph and the margrave of Baden were repeatedly defeated, and the emperor was weakened by a renewal of the movement for national independence in Hungary. His confidence was revived by the battle of Blenheim, but he did not live to see the full results of that great victory. On the 5th of May 1705 he died of dropsy in the chest. He was a man of ungainly appearance, the most prominent feature of his face being his large hanging under-lip, The life of his court

was regulated in accordance with the strictest rules of Spanish etiquette, but in his relations to his family a naturally kind disposition often broke through the crust of rigid conventions, Although one of the most intolerant sovereigns of his age, he gave considerable attention to science, and took a prominent part in the establishment of the

universities of Innsbruck, Olmiitz, Halle, and Breslau. Early in his reign he allowed his judgment to be controlled by his cabinet, but he never placed implicit trust in any minister after the discovery that Lobkowitz had been in communication with the French. He was married three times, and two of lis sons became emperors—Joseph I. and Charles VI. (J. SI.)

LEOPOLD II., Holy Roman emperor, was born on the 5th of May 1747. After the death of his father, the emperor Francis I, in 1765, he became grand-duke of Tuscany, a country which he ruled for twenty-five years in a thoroughly enlightened spirit. Earlier than his brother, Joseph II., he saw the necessity of ecclesiastical reform, but he effected with moderation and good sense the changes which he considered advisable. Agriculture, industry, and commerce he encouraged in accordance with the ideas of his age, and Tuscany owed to him a well-conceived criminal code, He had even prepared a scheme for instituting representative government in Tuscany when, in 1790, he succeeded Joseph II. in the hereditary lands of the house of Hapsburg and inthe empire. Joseph, with all his good intentions, had left his hereditary states in much confusion ; and vigour and prudence were essential for the re-establish- ment of order. The chief difficulty was in the Netherlands, which were disinclined to respond to Leopold's advances, He despatched an army against them, and it entered Brussels on the 3d of December 1791. The country was then at his mercy; but he acted with great discretion, restoring certain ancient rights which Joseph, in his zeal for improvement, had withdrawn. In Hungary, too, the emperor succeeded in calming popular excitement; and on the 4th of August 1791 the treaty of Sistova was signed, bringing to an end the unlucky war which Joseph had waged with the Turks. The violence of the French Revolution- ists produced a bad effect on the internal policy of Leopold, who supposed that it was necessary, not only to introduce a secret police, but to limit the freedom of the press. The same influences led him to conciliate Prussia, which had been always on its guard against Austria since the estab- lishment of the Confederation of Princes by Frederick the Great. On the 27th of August 1791 the emperor and the king of Prussia met at Pillnitz; and it was agreed that they should act together for the deliverance of Louis XVI. of France.

In pursuance of this understanding a defensive and offensive treaty of alliance between Austria and Prussia was concluded on the 7th of February 1792; but the emperor's schemes were suddenly broken by death. He died on the 1st of March 1792, and was succeeded by his son, the emperor Francis II.

LEOPOLD I. (1790-1865), king of the Belgians, was the fourth son of Francis, duke of Saxe-Coburg-Saalfeld, and thus the uncle of Queen Victoria of England. His youth was chiefly spent in the Russian military service; he commanded a battalion at Liitzen, Bautzen, and Leipsic, entered Paris with the allied sovereigns, and accompanied them to England. In May 1816 he married the Princess Charlotte, only child of the Prince Regent (who died in the following year), having previously been created duke of Kendal in the English peerage. In 1830 he declined the crown of Greece, but was elected to the throne of Belgium in June 1831. For the subsequent events of his life see Beterum, vol. iii. p. 528 sq.

LEOPOLD I. (1676-1747), duke of Anhalt-Dessau, der alte Dessauer, a famous Prussian general, was born at

Dessau, July 3, 1676. Possessing great physical energy and an absorbing interest in military affairs, he at an early age displayed capacity for commands of high responsibility. On the death of his father in 1693 he succeeded him as colonel of a regiment in the service of Brandenburg, and, having rendered invaluable assistance at the capture of Namur by William III of Orange in 1696, he obtained the rank of major-general. Returning shortly afterwards to his principality, he conceived a passionate attachment for the daughter of an apothecary, whom he raised to the rank of nobility and made his wife on reaching his majority. During the years that he now spent in his principality, he won the ardent affection of the mass of the people, both by his considerate regard for their welfare and by the influence of his strong personality. In com- mand of a division of twelve thousand men at Blenheim in 1704, Leopold so acted in a critical contingency as practically to turn the scales of victory ; and in Eugene's Italian

campaigns he was conspicuous at the battle of Cassano in 1705, the storming of Turin in 1706, and in other affairs of minor importance. After serving as a volunteer at Malplaquet in 1709, he received an inde- pendent command from Prussia, and rendered important assistance to Marlborough against Villars. Created field- marshal in 1715, he gained the special confidence of Frederick William I., and it was in no small degree to his instructions in military tactics, and the splendid perfection to which he had brought the small army of Prussia, that the great military triumplis of Frederick II. were duc, His more important military inventions are the iron ram- rod and the equal step. Asa general he specially excelled in stratagems and surprises, in which he was greatly aided by his daring and impetuous energy. These qualities were specially displayed in the surprise and bloodless capture of Mors castle in 1712, the seizure during night of the island of Riigen in 1715, the formation in 1741 of the famous entrenched camp at Gottin near Magdeburg, where with an army of thirty-six thousand men he was prepared for events either in Saxony or Hanover, the defeat of the Austrians at Neustadt in 1744, and the expulsion of the Saxons, though superior both in numbers and artillery, from a strongly entrenched position at Kesselsdorf in 1745, He died 7th April 1747. Leopold is graphically portrayed in Carlyle's Frederick, where he is spoken of as "'a man of vast dumb faculty, dumb but fertile, deep—no end of imagination, no end of ingenuities—with as much mother wit as in whole talking parliaments."

Sec also the Lives by Varnhagen von Ense, 3d edition 1872, Hosaus 1876, and Siebigk 1876 ; aud Crousatz, Alilitérische Denkwitrdig- keiten des Fiirsten Leopold von,Anhalt-Dessau, 1875.

LEPANTO (the Italian form of the modern Greek Epakto), known in ancient times as Naupactus, a name which has recently been revived in official documents, is a town in the nomarchy of Acarnania and A'tolia, Greece, situated on a bay on the north side of the straits of Lepanto, by which the gulf of the same name is connected with that of Patras. It stands on the south-eastern and southern slopes of one of the spurs of Mount Rigani; the surround- ing plain is well watered and fertile, but the harbour, once the best on the northern coast of the

Corinthian Gulf, is now almost entirely choked up, and is accessible only to the smallest craft. Lepanto is an episcopal see ; the population of the deme of Naupactus in 1879 was 5295.

According to traditional etymology, Naupactus derived its name from the cirenmstance that here the Heraclide built the fleet with which they invaded the Peloponnesus. The place is first men- tioned in actual history as having been taken from the Locri Ozole by the Athenians, who settled it with Messenian helots at the close of the third Messenian war (455 B.c.), and who made it their chief military and naval station in western Greece during the war of the Peloponnesus. After Agospotami it was successively held by the Locrians, Achzans, and AStolians, and finally, after a siege of two

months, it fell into the hands of the Romans, 191 B.c. It was still a flourishing placc in the time of Pausanias, but according to Procopius it was destroyed by an earthquake in the reign of Justinian. In the Middle Ages it fell into the hands of the Venetians, who fortified it so strongly that in 1477 it successfully resisted a four months' siege by a Turkish army thirty thousand strong ; in 1499, however, it was taken by Bajazet II. The mouth of the Gulf of Lepanto was the scene of the great sea fight in which the naval power of Turkey was for the time being destroyed by the united papal, Spanish, and Venetian forces (October 7, 1571). See Joun or AustriA. In 1678 it was recaptured by the Venctians, but was again restored in 1699 by the treaty of Carlowitz to the Turks ; in the war of independence it finally became Greck once more (March 1829).

LEPIDOSIREN is the name of one of the most remarkable genera of fishes, of which one species (Lepidosiren paradoxa) has been found in tributaries of the river Amazon, and the other (Lepidosiren annectens) occurs in the systems of all the large rivers of tropical Africa. 'The latter species differs in some points, notably in having six instead of five branchial arches, from L. paradoxa, and therefore has been generically separated by Owen under the name of Protopterus,—which name likewise is in common use. Together with the Australian

Ceratodus, the lepidosirens are the only living representa- tives of a very old type of fishes, the Dipnoz, which reaches back to the Devonian age, thus giving us an insight into the organization of fishes of which nothing but some obscure and fragmentary impressions of the hard parts are preserved. The body of Lepidosiren is eel-shaped, and covered with small thin scales, A single vertical fin sur- rounds the posterior part of the body and the tail; the paired fins are reduced to two pairs of long threads, internally supported by a series of small cartilages. The dentition is very characteristic, and consists of a pair of conical pointed vomerine teeth, and a pair of large cuspidate and ribbed molar teeth on the palate and in the lower jaw.

The skeleton is notochordal; and lungs are present in |

addition to gills. From this latter fact it may be inferred that the lepidosirens can breathe air as well as water; and, although they lave never been observed to leave the water voluntarily, either in a state of nature or in captivity, they rise from time to time to the surface to fill their lungs with a fresh supply of air; further, when, during the hot season, the water of the tauks in which they live changes into mud, branchial respiration is entirely superseded by pulmonal. Of the habits of Lepidosiren paradoxa scarcely anything is known; only a few specimens have been found by naturalists, and neither Bates nor Wallace succeeded in obtaining one. This species, therefore, is one of the greatest desiderata in zoological museums. ‘The African species, on the other hand, is common in the upper Nile, in the central lake-region, on the Zambesi, and in all the rivers of the west coast. Baker states that in some districts of central Africa the lepidosiren is so abundant as to form an article of food, fresh and dried. Specimens living in pools which dry up during the hot season bury themselves in the mud, and form an oval cavity, the inside of which is lined with a protecting coat of hardened mucus and in which they wait, coiled up and in a torpid condition, for the return of the rainy season. These retreats are discovered by the natives by a circular opening at the upper surface, which is closed by the mucous film. If the capsules are not broken, the fishes, imbedded in the clay- balls, can be transported to Europe, and emerge from their prison on being placed in tepid water.

Both species attain to a length of 6 feet, and feed on frogs, fishes, and other of aquatic animals, For the details of the organization the Lepidostren see the article IcHtTHyoLocy.

LEPIDUS, M. Aimitius, a member of the second Roman triumvirate, was a son of M. Aimilius Lepidus, who had been consul in 1373.c. He joined the party of Czesar

in the civil wars, and was by the dictator thrice nominated magister equitum and raised to the consulship 46 B.c, He was a man of great wealtl and influence, and it was pro- bably more on this ground than on account of his ability that Cesar raised him to such honours. In the beginning of 44 3c, he was sent to Gallia Narbonensis, but before he had left the city with his army Ceasar was murdered. Lepidus, as commander of the only army near Rome,

became a man of great importance in the troubles which |

followed, Taking part with Antony, he joined in the recon- ciliation which the latter effected with the senatorial party, and afterwards sided with him when open war broke out, Antony, after his defeat at Mutina, joined Lepidus in Gaul, and in August 43 3,c, Octavian, wlio lad forced thie senate to make him consul, effected an arrangement with Antony and Lepidus, and the triumvirate was organized at Bononia. Antony and Octavian soon reduced Lepidus to an inferior position, His province of Gaul and Spain was taken from him; and, though he was included in the triunivirate when it was renewed in 37 B.c., his power was only nominal. He made an effort in the following year to regain some reality of power, conquered part of Sicily, and claimed the whole island as his province, but Octavian found means to sap the fidelity of his soldiers, and he was obliged to supplicate for his life. He was allowed to retain his fortune and the office of pontzfex maximus, to which he had been appointed in 44 B.c., but had to retire into private life. He died 13 Bc.

Lepidus was the cognomen of a Roman family in the patrician gens Aimilia. The first of this name of whom anything is recorded is M. Amilius Lepidus, consul 285 B.c. From this time onwards the family

continued in an almost unbroken series of distinguished men till in the 1st century after Christ it disappears, Another M. Amilius Lepidus was one of the three ambassadors sent to Egypt as twtores of the infant king Ptolemy V. He was consul in 187 and 175, censor 179, pontifex maximus from 180 onwards, and was six times chosen by the censors princeps senatus. He died in 152. It is uncertain whether he is the Lepidus who is com- memorated on a coin of the gens A'milia as having slain an encmy and saved a citizen's life at the age of fifteen, while still dressed in the boy's toga pretexta. Another of the same name was consul 187 B.c. Being sent to Spain to conduct the Numantine war, he began against the will of the senate to attack the Vacciei, This enterprise was so unsuccessful that he was deprived of his com- mand in 186 and condemned to pay a fine, He was among the greatest of the earlier Roman orators, and Cicero praises him for having introduced the well-constructed sentenee and even flow of language from Greek into Roman oratory. He contributed mueh to forming the style of Tiberius Graechus,

Another of the same name was infamous for his oppressive pretorship in Sicily (81 B.c.). In the civil wars he sided with Sulla and bought much of the confiscated property of the Marian partisans. Afterwards he became leader of the popular party, and was with the help of Pompcy elected consul for 78 B.c., against the will of Sulla, When the dictator died, Lepidus tried in vain to prevent the burial of his body in the Campus Martius, and to alter the constitution established by him. is colleague Lutatius Catulus found a tribune to place his veto on Lepidus's proposals ; and the quarrel between the two parties in the state became so inflamed that the senate made the consuls swear not to take up arms. Lepidus was then ordered by the senate to go to his province, Transalpine Gaul; but he stopped in Etruria on his way from the city and began to levy an army, He was declared a public enemy early in 77 3.c., and forthwith marehed against Rome. A battle took place in the Campus Martius, Pompey and Catulus commanding the senatorial army, and Lepidus was defeated. He sailed to Sardinia, where he was also repulsed ; and soon after he died. One of his two sons was L. Aimilius Paullus, consul 50, who built during his eedileship in 55 the Basilica Aimilia in the forum.

LEPROSY (Lepra Arabum, Elephantiasis Grecorum, Aussatz, Spedalskhed), the greatest disease of medieval Christendom, is identified, on the one hand, with a disease endemic from the earliest historical times (1500 3.c.) in the delta and valley of the Nile, and on the other hand with a disease now common in Asia, Africa, South America, the West Indies, and certain isolated localities of Europe. An authentic representation of the leprosy of the

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Middle Ages exists in a picture at Munich by Holbein, painted at Augsburg in 1516; St Elizabeth gives bread and wine to a prostrate group of lepers, including a bearded man whose face is covered with large round reddish knobs, an old woman whose arm is covered with brown blotclies, the leg swathed in bandages through which matter oozes, the bare knee also marked with discoloured spots, and on the head a white rag or plaster, and, thirdly, a young man whose neck and face (especially round the somewhat hairless eyebrows) are spotted with brown patches of various size. It is conjectured by Virchow that the painter had made studies of lepers from the leper-houses then existing at Augsburg. These external characters of medizeval leprosy agree with the descriptions of it by the ancients, and with the pictures of modern leprosy given by Danielssen and Boeck for Norway, by various authors for sporadic European cases, by Anderson for Malacca, by Carter for India, by Wolff for Madeira. and by Hillis for British Guiana. ‘There has been some confusion in the technical naming of the disease; it is called Hlephantiasis (Leontiasis, Satyriasis) by the Greek writers, and Lepra by tlhe Arabians, The latter term has been generally adopted in modern books, but in England the name of Lepra is applied (after Willan) to an entirely different disease of the skin.

Iistory.—F.gypt was regarded by the ancients (positively by Lneretius) as the country whence leprosy came. It was probably endemic among the Hebrews when they migrated from Egypt. The minute diagnostic indications given in Lev. xiii, appear to relate to true leprosy and to

other diseases that might be mistaken for it, and the frequently recurring word Sdara‘ath (translated ‘“leprosy”) is best taken in a generic sense; those cases in which progress would show itself at so short intervals as seven days, and those cases for which the ceremonial of cleansing was pro- vided, could hardly have been cases of leprosy, a disease always incurable, and with stages reckoned rather by months or years than by weeks. Herodotus knew of leprosy as existing in Persia. The earlier Greek and Latin writers speak of it as a foreign disease, but it became estab- lished in Greece and Italy in the 1st century 3,c.; Pliny implies that it was introduced by the army of Pompey returning from Syria. The disease soon appeared in the Roman colonies of Spain, Gaul, and Britain. The Lom- bard king Rothar (7th century) made laws regulating the marriage of lepers, and similar laws were made by Pippin and Charlemagne. Leper-houses existed at Verdun, Metz, and Maestricht in the 7th century, at St Gall in the 8th, and at Canterbury in the 11th. It was amidst the stir and movement of the crusades that leprosy grew to be epidemic in western Europe; it attacked the people in great numbers and in all ranks (including members of royal families). Leper-houses (mostly religious and dedicated to St Lazarus, but in northern Europe more secular and dedicated to St George) were founded in every considerable town; the total number of these in Europe was loosely estimated by Matthew Paris at 19,000, the number in France is independently estimated at 2000, and (according to Sir J. Y. Simpson) there were 95 houses of the first class in England (of these 7 at Norwich and 5 at Lynn), and several in Ireland and Scotland. The isolation of lepers was strictly enforced by law and popular senti- ment. They wore a special costume, usually a long grey gown with hood drawn over the face, and carried a wooden clapper to give warning of their approach. They were forbidden to enter inns, churches, mills, or bakehouses, to touch healtliy persons or eat with them, to wash in the Streams, or to walk in narrow footpaths. Their outcast state was signified by the German name (Awssaéz) ; the Chronicle of Limburg (uuder the year 1374) speaks of a

famous monkish poet, whose songs all Germany was sing- ing, as one “der ward von den Leuten aussdtzig, und war nicht rein.” The disease began to decline (first in Italy) in the 15th century, and had mostly disappeared in the 17th. A leper-house was founded in Edinburgh (at Greenside) as late as 1591, and it was not till 1741 (others give 1798) that the last known leper died in Shetland. Present Geographical Distribution.—Survivals of the great medizval outbreak are found on the west coast of Norway (about two thousand lepers; leper hospital at Bergen founded 1277, now added to), in the Baltic pro- vinces of Russia (leper hospitals founded at Riga in 1220 and Revel 1237, not now in use), on the Riviera (a small and diminishing number), on the Sicilian coasts, and in certain coast provinces of Spain and Portugal (leper hospital at Lisbon since the 13th century). Sporadic cases of home origin have also been described for Hungary and Rouimania ; the cases occurring in England and Franco are in persons who have been born or have lived in the East or West Indies. The disease is met with also in Iceland, along the Caspian and delta of the Volga, along the Black Sea, and in islands of the Levant (especially Scio and Crete). It is common all over the East from Syria to Japan and Kamchatka, in Egypt and North African states, in West Africa from the Senegal to the Congo, in Cape Colony, Madagascar, Mauritius, Isle de Bourbon, St Helena, Madeira, Canaries and Azores, Brazil, Central America, the West Indies, Mexico, New Brunswick (small isolated French colony), and especially in the Hawaiian Islands. Leprosy has been found among Chinese immi- grants in the United States as far east as Chicago, and in Queensland. Leper hospitals (with inmates numbering from two hundred downwards) are kept up in several of the West Indian colonies, at T’racadie (New Brunswick), at Cape Town, in Mauritius, at Malacca and Singapore, at Colombo, at Madras, Cochin, and Bangalore, at Bombay and Rajkot, and at Calcutta, Benares, and Agra, There are also leper hospitals at Bergen (3), Molde, and Trondhjem, at San Remo, at Oporto, Coimbra, and Lisbon, at Terceira (Azores), Las Palmas (Grand Canary) since 15th century, and Funchal (Madeira) since about 1500, at Pernambuco, Bahia, and Rio, at Honolulu, at Macao (for two hundred years) and Canton, in Java (several) and in Ainboyna, at Scio (since 1445), Scutari, Damascus, and Jerusalem. A ruined convent at Ramleh accommodates thirty lepers or more, and a

mosque at Nablus is occupied by about seventy. In several of the above instances the leper hospital is built upon an outlying island. Leper villages occur in China and Japan, and in Persia. Leper communities exist in Crete, but the largest of them is now mostly occupied by a non-leprous population. Throughout the East, including British India, the hospital accommodation for lepers is only casual, and isolation is not carried out to the same extent as during the prevalence of the disease in Europe. Definition, Characters, Pathology, and Causation. —- Leprosy is an incurable constitutional disease, marked externally by discoloured patches and nodules on the skin, and deeply implicating the structure and function of the peripheral nervous system. Like the infections, it has a prodromal stage, which is uncertain in its character, and is measured rather by months or years than by days or weeks; the chief premouitory symptoms are unaccount- able lassitude and mental depression, pains in the limbs and joints, febrile periods (cold and hot fits), loss of appetite, and nausea. ‘That stage is followed by the “periodically eruptive stage,” during which blotches on the skin come and go; sooner or later these erythematous congestions and exudations leave either permanent spots, brown or blanched, which are often without feeling, or they leave nodules. The disease diverges into two main

varieties, the spotted (Zepra maculosa) and the nodular (Lepra tuberculosa). The two kinds are found side by side in the same population, and sometimes in the same person. The maculae arjse in the place of former recurrent spots, and are often raised indurations; when the pigmentation deepens, the disease is Z. maculosa nigra; when the spots become blanched, it is Z. maculosa alba or white leprosy. Anzesthesia, which very generally goes with the leprous process, is especially marked in the blanched spots, hence the name ZL. anesthetica. Anesthetic spots are apt to have bulls forming on them (pemphigus leprosus), their periodical cruption being attended with fever. The nodules (characteristic of the other form) generally arise also in the situation of old blotches; they are at first small scattered points, but they grow and coalesce to the size of lentils, hazel nuts, or

walnuts. While the macule of leprosy may occur in any part, the nodules are most apt to form on the face (brows, eyelids, ears, wings of the nose, lips, cheeks), causing thickening of all the features (Leontiasis, Satyriasis); but they often occur on the hands and feet, and sometimes over the whole body. The nodules, from being exposed to the weather and to injuries, often ulcerate, and the ulcers, like those of syphilis and lupus, tend to spread. Macule, especially on the limbs, are liable to slighter ulcerations followed by inerustation. Deep ulceration and necrosis occur at the joints of the fingers and toes, which may drop off joint by joint, leaving a well-healed stump (LZ. mutzlans). Certain mucous membranes thicken, become nodulated, and ulcerate, viz., the conjunctiva corner (causing pannus leprosus), and the lining of the mouth, nose, throat, and larynx (causing hoarseness) The external groups of lymphatic glands enlarge; leprous affections of the viscera also are described. The peripheral nerves are the subject of thickenings and degenerations like those in the skin. The new-formed tissue in all situations is granulation-like, as in syphilis and lupus; and leprosy, with those two diseases, is treated of by Virchow under the head of granuloma. By some the nervous lesions (including an alleged affection of the spinal cord) are taken to be primary, while the changes in the skin and other parts (with aneesthesia) are held to be secondary and due to disordered innervation. Leprosy has been claimed as one of the diseases caused by parasites, on several occasions by old writers in the gross sense, and recently by observers who have found innumerable minute bacillus-rods within the cells of the leprous new growth. The essential cause of leprosy is unknown. It probably arose in the Delta and valley of the Nile in prehistoric times, and under similar climatic and telluric conditions in other (chiefly inter- tropical) countries; and the most memorable fact in its history is its rise and subsidence as an epidemic disease in Europe. It is now endemic (chiefly but not exclusively) among peoples who inhabit the sea-coast or the estuaries of rivers, who live much on fish (often putrid), and who inter- marry closely. The old opinion that leprosy is contagious 18 now generally discredited.

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LEPTIS, now Leppa, the leading city of the ancient Tripolis, Northern Africa, extensive ruins of which exist on the coast, about 50 miles east of Tripoli. Leptis Magna, as it is usually called to distinguish it from Leptis Parva (now Lemta) in Byzacium, was a Pheenician colony, pro- bably superimposed on an old Libyan settlement. The old town, of which the massive quays and docks are still extant, is similar to Carthage in position and plan, occupying a tongue of land to the west of the harbour. The new town, whose simple appellation Neapolis almost threatened the disuse of the name Leptis, is much more extensive; but the ruins belong to the later period of the Roman empire. Septimius Severus was a native of the place; and he not only bestowed upon it the jus Jtalicum, but enriched it with many costly buildings, the most remarkable being the palatium dedicated fortunz sux (Procopius). Ammi- anus mentions that Leptis was laid waste by the Austurians (a Libyan tribe) in 370 ; and, though Justinian enclosed

a part of the city with new walls and made it the military seat of the province of Tripolis, it never recovered its pro- sperity, and from the time of the Arab conquest it disap- pears from history. The local inscriptions are Greek, Latin, and Punic. See Travels of Alu Bey (by Badia y Lablich) ; Barth, Wanderungen, &c. ; and Corpus Inscr, Lat., viii.

LERIDA, one of the forty-nine provinces of Spain, is bounded on the N. by France (and the “republic” of Andorra), on the E. by Gerona and Barcelona, on the 8. by Tarragona, and on the W. by Saragossa and Huesca, and has an area of 4772 square miles, with a population (in 1877) of 285,297. It is almost entirely mountainous, and partakes of the features common to the whole southern slope of the Pyrenees. The principal river is the Segre, a tributary of the Ebro. The province has five cities, Lérida, Balaguer (Bergusia), Cervera, Seo de Urgel, and Solsona, but only the first-mentioned of these has a population exceeding 5000; the next largest (Balaguer) in 1877 had only 4742. The inhabitants are chiefly employed in pastoral occupations.

LiripA, the capital of the above province, and in point of numbers and prosperity the second city in Catalonia, is situated on the right bank of the Segre, crossed there by a handsome stone bridge. The distances by rail from Saragossa and Barcelona respectively are 114 and 113 miles. The old cathedral, on the top of an eminence overlooking the town, was begun in 1203 and consecrated in 1278; it isa Gothic building of merit in some respects, but is rapidly going to decay, having never been used for religious purposes since 1707. The actual cathedral is a Graeco-Roman structure dating only from 1749. The town has no other feature of interest. There are manufactures of glass, leather, paper, and of woollen and cotton goods, and a considerable trade in the timber brought down from the Pyrenees by the Segre. Population in 1877, 20,369.

Lérida is the Ilerda of the Romans, and was the capital of the people whom they called Ilerdenses (Pliny) or Nergetes (Ptolemy). By situation the key of Catalonia and Aragon, it was from a very early period an important military station. In the Punic wars it sided with the

Carthaginians and suffered much from the Roman arms. In its immediate neighbourhood Hanno was defeated by Scipio in 216 B.c., and it afterwards became famous as the scene of Cesar's arduous struggle with Pompey's generals Afranius and Petreius in the first year of the civil war (49 B.c.). It was alrcady a municipium in the time of Augustus, and enjoycd great prosperity under later emperors. Under the Gotlis it became an episcopal see, and at least one ecclesiastical council is recorded to have met there (in 546). Under the Saracens Lareda became one of the principal cities of the province of Saragossa; it became tributary to the Franks in 793, but was reconquered in 797. In 1149 it fell into

the hands of Don Ramon Berenguer IV., last count of Barcelona. In modern times it has come through numerous sieges, having been

former schoolfellow, associated him with himself in the

taken by the French in November 1707 during the war of succes- sion, and again in 1810. In 1300 Jaime IJ. of Aragon founded a university at Lérida, which achieved some repute in its day, but is now extinct. Pope Calixtus III. at one time taught within its walls, and Vicente Ferrer was one of its alumni.

LERMONTOFF, Mrxuam, Yurevircw (1814-1841), often styled the poet of the Caucasus, was born in Moscow, but belonged to a respectable family of the Tula govern- ment, and was brought up in the village of Tarkhanui (in the Penzensk government), which now preserves his dust. By his grandmother—on whom the whole care of his childhood was devolved by his mother's early death and his father's military service—no cost nor pains was spared to give him the best education she could think of. The intellectual atmosphere which he breathed in his youth differed little from that in which Pushkin had grown up, though the domination of French had begun to give way before the fancy for English, and Lamartine shared his popularity with Byron. From the academic gymnasium in Moscow Lermontoff passed in 1830 to the university, but there his career came to an untimely

close through the part he took in some acts of insubordination to an obnoxious teacher. From 1830 to 1834 he attended the school of cadets at St Petersburg, and in due course he became an officer in the guards, ‘To his own and the nation’s anger at the loss of Pushkin (1837) the young soldier gave vent in a passionate poem addressed to the czar, and the very voice which proclaimed that, if Russia took no vengeance on the assassin of her poet, no second poet wonld be given her was itself an intimation that a poet had come already. The czar, however, seems to have found more impertinence than inspiration in the address, for Lermontoff was forth- with sent off to the Caucasus as an officer of dragoons. He had been in the Caucasus with his grandmother as a boy of ten, and he found himself at home by yet deeper sympathies than those of childish recollection. The stern and rocky virtues of the mountaineers against whom he had to fight, no less than the scenery of the rocks and mountains themselves, proved akin to his heart; the emperor had exiled him to his native land. He was in St Petersburg in 1838 and 1839, and in the latter year wrote the novel A Zero of Our Time, which is said to have been the occasion of the duel in which he lost his life in July 1841. In this contest he had purposely selected the edge of a precipice, so that if either combatant was wounded so as to fall his fate should be sealed.

Lermontoff published only one small collection of poems in 1840.

Three volumes, much mutilated by the ceusorship, were issued in

1842 by Glasunoff; and there have been full editions of his works in 1860 and 1863.) poems (Michail Lermontof’s poctischer Nachlass, Berlin, 1842,

2 vols.), which indeed was the first satisfactory collection, he is indebted for a wide reputation outside of Russia. His novel has found several translators (August Boltz, Berlin, 1852, &c.). Among

his best-known pieces are ‘‘Ismail-Bey,” ‘‘Hadji Abrek,” “Walerik,” “The Novice,” and, remarkable as an imitation of the old Russian ballad, ‘The song of the Czar Ivan Vasilivitch, his young bodyguard, and the bold merchant Kalashnikoff.”

See Taillandier, “Le Poete du Cauease,” in Revue des Deux Mondes (February 1855), reprinted in Allemagne et Russie, Paris, 1856 ; and Duduishkin’s “ Materials for the Biography of Lernontoff,” prefixed to the 1863 editlon of bis works.

LEROUX, Pierre (1798-1871), a French writer on philosophy and politics, commonly recognized as the chief of the (so-called) Humanitarian school, was born at Paris In 1798, He was the son of an artisan. He received his carly education at the Lycée Charlemagne, and continued his studies at Rennes. Having obtained an admission to the Polytechnic school, he renounced it in order to support by the labour of his hands his mother and family, who had been left destitute by the death of his father. He first Worked as a mason, but soon became a compositor in the printing establishment of his cousin, and afterwards over-

eer in that of M. Panekoucke. In 1824 P. Dubois, a

To Bodenstedt’s German trauslation of his

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foundation of the Globe newspaper, in which he became a co-worker with De Broglie, Guizot, Duvergier de Hanranne, Jouffroy, and other distinguished persons. For some time he occupied the position of an advanced Liberal of the ordinary type; but in January 1831 he gave his adhesion to the Saint-Simonian community, of which he became a prominent member; and under his influence the Globe became the organ of its doctrines, In November of the same year, when Enfantin preached the enfranchisement of women and the fnnctions of the couple-prétre, Leroux took the part of Bazard, and, protesting in the name of morality, separated himself from the sect. In 1838, in conjunction with J. Reynaud, who had seceded with him, he founded the Lncyclopédie Nouvelle, in which he ex- pounded his philosophical and social views. Amongst the articles which he inserted in it werc one entitled De PEgalité, and a Réfutation de l Eclectisme, which afterwards appeared as separate works. In 1840 he published his treatise De ?‘Mumanité, which contains the fullest exposi- tion of his

system, and was regarded as the philosophical manifesto of the Humanitarians. In 1841, disgusted with the Revwe des Deux Mondes on account of its desertion of the democratic cause, he established, with the aid of M. Viardot and Mme. George Sand, the Mevwe-Indépendante. By his philosophic association with the latter eminent writer he obtained the advantage of an eloquent interpreter, capable of charming and impressing the masses. Mme. Sand's Spiridion, which was dedicated to him, her Sept Cordes de la Lyre, her Consuelo, and its continuation La Comtesse de Rucolstadt, were written under the Humani- tarian inspiration. From the year 1843 M. Leroux devoted himself tothe practical applications of his doctrines. He established at Boussac (Creuse) a printing association organized according to his systematic ideas, and founded the Revue Sociale, in which, as well as in separate publica- tions, he coutinued to explain and develop his theoretic views and his suggestions for the renovation of society, professing, amongst other things, to supply "a pacific solntion of the problem of the proletariat." After the outbreak of the revolntion of 1848 he was clected to the constituent assembly as representative of the department of the Seine, obtaining 90,000 votes, and afterwards, in 1849, to the legislative assembly. He spoke there on the organization of labour, on the colonization of Algeria, and other questions. His discourses from the tribune were sometimes of so abstract and mystical a character, and contained proposals so eccentric and impracticable that they rather created ridicule than influenced opinion. The coup d'état of 1851 made him an exile; he settled with his family in Jersey, where he pursued agricultural experl- ments, The gencral amnesty of 1860 permittcd his return to France, but he lived at Lausanne till after the definitive amnesty of 1869, when he again fixed his residence at Paris. He died there in April 1871, during the reign of the Commune. That body deputed two of its members to attend his funeral, as a homage, "not to the partisan of the mystical idea, of which we now fecl the evil, but to the politician who, after the days of June, courageously undertook the defence of the vanquished." The writings of Leroux, though they won a transitory éclat and gave him a position as hicad of a scliool, appear to have no permanent significance in the history of thought. His social theories do not rest on any scientific basis ; he was vather the propagandist of sentiments and

aspirations than the expounder of well-defined and distinctly appreciable ideas. He seems to have had a natural bent towards the mystic and the nebulous. Hels, indeed, a system, but it is a singular medley of doctrines borrowed, not only from Saint- Simonian, but from Pythagorean and Buddhistic sources. In philosophy his fundamental principle is that of what he calls the ‘‘triad,”—a triplicity which he finds to pervade all things, which in God is ‘‘ power, intelligence, and love” in man “sensation,

sentiment, and kuowledge.” His religious doetrine is Panthicistic ; and, rejecting the belief in a future life as eommonly eoneeived, he substitutes for it a theory of metempsyehosis. In social economy his views are very vague; he preserves the family, eountry, and property, but finds in all three, as they now are, a despotism which: must be eliminated. He imagines certain combinations by which this triple tyranny ean be abolished, so that the human being may be developed under the influcnee of those several institutions with- out being oppressed by them. But his solution seems to require the ereation of families without heads, eountries without governments, and property without rights of possession. In politics he advoeates absolute equality —a democracy pushed to anarchy. A full eritieism of his system will be found in L. Reybaud’s Etudes sur les Réforma- teurs et Socialistes Modernes.

The full title of Leroux’s principal work is De ?Humanité, de son prineipe et de son avenir, ow se trowve exposée la vraie définition de la religion, et o% Von eaplique le sens, la sutte, et Venchatnement du Mosaisme et du Christianisme. A second edition of this work appeared in 1845. Amongst his other publications, in addition to some already mentioned, are—Discours sur la situation aetwelle de la Société ct de Uesprit humain, 1841, new ed., 2 vols., 1847 ; D’wne Religion nationale, ow du Culte, 1846; Discours sur la fixation des heures de travail, 1848 ; Projet @une Constitution dénoeratique et sociale, 1848; Du Christianisme et de ses origines démoeratiques, 1848 ; Le Carrosse de M. Aguado, ou si ce sont les riches qui payent les pawvres, 1848 ;

De la Ploutoeratic; ou du gouvernement des riches, 1848; Malthus et les Economistes, ow VY aura-t-il toujours des pauvres? 1848; Quelques pages de Vérités, 1859; portions of a philosophical poem, entitled La Gréve de Samarez, 1863-64 ; Job, drame en cing actes, par le prophete Isaie, tradwit de 0 hébrew, 1865. M. Leroux also produced, with the aid of an anonymous collaborator, a translation of Goethe's Werther, which was published in 1843, with a preface by George Sand.

LERWICK. See SuerLanp IsLanvs.

LE SAGE, Auain Rent (1668-1747), novelist and dramatist, was born at Sarzeau in the peninsula of Rhuys, between the Morbihan and the sea, on the 8th of May 1668, and died on the 17th of November 1747, at Boulogne-sur-Mer. Rhays was a legal district, and Clande Le Sage, the father of the novelist, held the united positions of advocate, notary, and registrar of its royal court. His wife's name was Jeanne Brenugat. Both father and mother died when Le Sage was very young, and his property was wasted or embezzled by his guardians. Little is known of his youth except that he went to school with the Jesuits at Vannes until he was eighteen. Conjecture has it that he continued his studies at Paris, and it is certain that he was called to the bar at the capital in 1692. In August 1694 he married the daughter of a joiner, Marie Elizabeth Huyard. She was beautiful but had no fortune, and Le Sage had little practice. About this time he met his old schoolfellow the dramatist Danchet, and is said to have been advised by him to betake himself to literature. He began modestly as a translator, and published in 1695 a French version of the Zpistles of Aristeenetus, which was not successful. Shortly afterwards he found a valuable patron and adviser in the Abbé de Lyonne, who bestowed on him an annuity of 600 livres, and recommended him to exchange the classics for Spanish literature, of which he was himself a student and collector. Le Sage began by translating plays chiefly from Rojas and Lope de Vega. Le Praitre Puni and Le Point d1lonneur from the former, Don Félix de Mendoce from the latter, were acted or published in the first two or three years of the 18th century, In 1704 he translated the continuation of Don Quixote by Avellaneda, and soon afterwards adapted a play from Calderon, Don César Ursin, which had a divided fate, being successful at court and

damned in the city. He was, however, nearly forty before – he obtained anything like decided success. But in 1707 his admirable farce of Crispin vival de son Maitre was acted with great applause, and Le Diable Boiteux was published. This latter went through several editions in the same year, and was frequently reprinted till 1725, when Le Sage altered and improved it considerably, giving it its present form. Notwitlistanding the success of Crispin, the actors did not

like Le Sage, and refused a small piece of his called Les Etrennes. He thereupon altered it into Z'wrearet, his theatrical masterpiece, and one of the best comedies in French literature. This appeared in 1709. Some years passed before he again attempted romance writing, and then the first two parts of Gi Blas appeared in 1715. Strange to say, it was not so popular as the Diable Boiteux. Le Sage worked at it for a long time, and did not bring out the third part till 1724, nor the fourth till 1735. For this last he had been part paid to the extent of a hundred pistoles some years before itsappearance. This is the only positive statement we have about his gains. During these twenty years he was, however, continually busy. Not- witlistanding the great merit and success of Turcaret and Crispin, the Théatre Frangais did not welcome him, and in the year of the publication of Gil Blas he began to write for the Théatre de la Foire—the comic opera held in booths at festival time. This, thongh not a very dignified occupation, was followed by many writers of distinction at this time, and by none more assiduously than by Le Sage. According to one computation lie produced either alone or with others about a hundred pieces, varying from strings of songs with no regular dialogues, to comediettas only distinguished from regular plays by the introduction of music. He was also industrious in prose fiction. Besides finishing G2 Blas he translated the Orlando Inamorato, rearranged Guzman d'Alfarache, published two more or less original novels, Le Bachelier de Salamanque and Lstévanille Gonzales, and in 1733 produced the Vie et Aventures de M. de Beauchéne, which is curiously like certain works of Defoe. Besides all tlis, Le Sage was also.the author of La Valise TZrouvée, a collection of imaginary letters, and of some minor pieces, of which Une Journée des Parques is

the most remarkable. This laborious life he continued until 1740, when he was more than seventy years of age. His eldest son had become an actor, and Le Sage had disowned lim, but the second was a canon at Boulogne in comfortable circumstances. In the year just mentioned his father and mother weut to live with him. At Boulogne Le Sage spent the last seven years of his lifc, dying, as has been said, on the 17th of November 1747, at the age of nearly eighty.

Not much is known of Le Sage's life and personality, and the foregoing paragraph contains not only the most important but almost the only facts available for it. The few anecdotes which we have of him represent him as a man of very independent temper, declining to accept the condescending patronage which in the earlier part of the century was still the portion of men of letters. Thus it is said that, on being remonstrated with, as he thouglit impolitely, for an unavoidable delay in appearing at the duchess of Bouillon's honse to read Z'urcaret, he at once put the play in his pocket and retired, refusing absolutely to return. In his old age, when he was very deaf, he is also said to have been decidedly arbitrary in his choice of the persons whom he permitted to have access to his trumpet, but this is not unusual in such cases. It may, however, be said that as in time so in position he occupies a place apart from most of the great writers of the 17th and 18th centuries respectively. He was not the object of royal patronage like the first, nor the pet of salons and coteries like the second. Indeed he seems all his life to have been purely domestic in his habits, and purely literary in lis interests.

The importance of Le Sage in French and in European literature is not entirely the same, and hv has the rare dis- tinction of being more important in the latter than in the former. His literary work may be divided into three parts. The first contains his Z7'hédtre de la Foire and his few miscellaneous writings, the second his two remarkable

plays Crispin and Turcaret, the third his prose fictions, In the first two he swims within the general literary current in France; he can be and must be compared with others of his own nation. But in the third he

emerges altogether from merely national comparison. It is not with French- men that he is to be measured. He formed no school in France ; he followed no French models. His work, admir- able as it is from the mere point of view of style and form, is a parenthesis in the general development of the French novel, That product works its way from Madame de la Fayette through Marivaux and Prévost, not through Le Sage. His literary ancestors are Spaniards, his literary contemporaries and successors are Englishmen. The position is almost unique; it is certainly interesting and remarkable in the highest degree.

Of Le Sage's miscellaneous work, including his numerous farce-operettas, there is not much to be said except that they are the very best kind of literary hack work. 'The pure and original style of the author, his abundant wit, his cool humoristic attitude towards human life, which wanted only greater earnestness and a wider conception of that life to turn it into true humour, are discernible throughout. But this portion of his work is practically forgotten, and no sensible critic who has taken the trouble to examine it will say that for the world at large there is any reason why it should be resuscitated. Of such work every generation produces its own quota, which is sufficient for the day. Crisp and Twurcaret show a stronger and more deeply marked genius, which but for the ill-will of the actors might have gone far in this direction, But Le Sage's peculiar unwillingness to attempt anything absolutely new discovered itself here. Even when he had devoted himself to the Foire theatre, it seems that he was unwilling to attempt when occasion called for it the absolute innovation of a piece with only one actor, a crux which Piron, a lesser but a bolder genius, accepted and carried through. Orispin and T'urcaret are unquestionably Molieresque, though they are- perhaps more original in their following of Moliére than any other plays that can be named. For this also was part of Le Sage's idiosyncrasy that, while he was apparently unable or unwilling to strike out an entirely novel line for himself, he had no sooner entered upon the beaten path than he left it to follow his own devices. Crispin Rival de son Maitre is a farce in one act and many scenes, after the earlier manner of motion. Its plot is somewhat extra- vagant, inasmuch as it lies in the effort of a knavish valet, not as usual to further his master's interests, but to supplant that

master. But the charm of the piece consists first in the lively bustling action of the short scenes which take each other up so promptly and smartly that the spectator has not time to cavil at the improbability of the action, and secondly in the abundant wit of the dialogue. Twrcaret is a far more important piece of work. The only thing which prevents it from holding the very highest place is a certain want of unity in the plot. This unity, however, which was too often attained by Moliére through the exaggeration of the ruling-passion theory, as in Tartuffe and the Misanthrope, is compensated in Turcaret by the most masterly profusion of character-drawing in the sepa- rate parts. Turcaret, the ruthless, dishonest, and dissolute financier, his vulgar wife as dissolute as himself, the hare- brained marquis, the knavish chevalier, the barouess (a coquette with the finer edge taken off her fine-ladyhood, yet by no means unlovable), are each and all finished portraits of the best comic type, while almost as much may be said of the minor characters. The style and dialogue are also worthy of the highest praise ; the wit never degenerates into mere “ wit-combats.”

Tt is, however, as a novelist that the world has agreed to remember Le Sage, and the world as usual is right. A

great deal of unnecessary labour has been spent on the discussion of his claims to originality. What has been already said will give a sufficient clue through this thorny ground. In mere form Le Sage is not original. He does little more than adopt that of the Spanish picaroon romance of the 16th and 17th century. Often, too, he prefers merely to rearrange and adapt existing work, and still oftener to give himself a kind of start by adopting the work of a preceding writer as a basis, But it may be laid down as a positive truth that he never in any work that pretends to originality at all is guilty of anything that can fairly be called plagiarism. Indeed we may go further, and say that he is very fond of asserting or suggesting his indebtedness when he is really dealing with his own funds. Thus the Diable Boitewx borrows the title, and fora chapter too the plan and almost the words, of the Diablo Cojuelo of Luis Velez de Guevara. But after a few pages Le Sage

leaves his predecessor alone. Even the plan of the Spanish original is entirely discarded, and the incidents, the episodes, the style, are as independent as if such a book as the Diablo Cojuelo had never existed. The case of Gil Blas is still more remarkable. It was at first alleged that Le Sage had borrowed it from the Marcos de Obregon of Vincent Espinel, a curiously rash assertion, inasmuch as that work exists and is easily accessible, and as the slightest consultation of it proves that, though it furnished Le Sage with separate incidents and hints for more than one of his books, Gil Blas as a whole is not in the least indebted to it. After- wards Father Isla asserted that Gi Blas was a mere trans- lation from an actual Spanish book—an assertion at once incapable of proof and disproof, inasmuch as there is no trace whatever of any such book. A third hypothesis is that there was some manuscript original which Le Sage may have worked up in his usual way, in the same way, for instance, as he professes himself to have worked up the Bachelor of Salamanca, This also is in the nature of it incapable of refutation, though the argument from the Bachelor is strong against it, for there could be no reason why Le Sage should be more reticent of his obligations in the one case than in the other. Except, however, for historical reasons, the controversy is one which may be safely neglected. There is as little doubt (with the limitations already laid down) of the originality of Le Sage as of that of any great writer in the world. GJ Blas then remains his property, and it is admittedly the capital example of its own style. Fielding bas been called the prose Homer of human nature, but in the sense in which the expression was used it is doubtful whether his master (as Le Sage certainly was) is not better entitled to the term. For Le Sage has not only the characteristic which Homer and Shakespeare have of absolute truth to human nature as distinguished from truth to this or that national character, but he has what has been called the quality of detachment, which they also have. He never takes sides with his characters as Fielding does. Asmodeus and Don Cleofas, Gil Blas and the Archbishop and Doctor Sangrado, are produced by him with exactly the same impartiality of attitude. Except that he brought into novel writing this highest quality of artistic truth, it perhaps cannot be said that he did much to advance prose fiction in itself. He invented, as had been said, no new genre; he did not, as Marivaux and Prévost did, help on the novel as distin- guished

from the romance. In form his books are undis- tinguishable, not merely from the Spanish romances which are, as have been said, their direct originals, but from the medizval romans d'aventures and the Greek prose romances. But in individual excellence they have few rivals. Nor should it be forgotten, as it sometimes is, that Le Sage was a great master of French style, the greatest unques-

tionably between the classics of the 17th century and the XIV. — 60

classics of the 18th. He is perhaps the last great writer before the decadence (for since the time of Paul Louis Courier it has not been denied that the philosophe period is in point of style a period of decadence). His style is perfectly easy at the same time that it is often admirably epigrammatic. It has plenty of colour, plenty of flexibility, and may be said to be exceptionally well fitted for general literary work.

The dates of the original editions of Le Sage's most important works have already been given. He published during his life a collection of his regular dramatie works, and also one of his pieces for the Foire, but the latter is far from exhaustive; nor is there any edition which can be called so, though the Guvres Choisies of 1782 and 1818 are useful. The Diable Boiteux and Gil Blas have been reprinted and translated numberless times. Both will be found conveniently printed, together with Vstévanille Gonzales and Guzman @ Alfarache, the best of the minor novels, in four volumes of Garnier's Bibliotheque Amusante (Paris, 1865). Turcaret and Crispin are to be found in all eollected editions of the French drama. There is a useful edition of them, with ample specimens of Le Sage's work for the Foire, in two volumes (Paris, 1821). (G. SA.)

LESBOS was the name applied by the Greeks to the island now called Metilin—the ancient name of the chief city on the island, Mytilene, having been in the Middle Ages applied to the whole island. It lies along the coast of Mysia, north of the entrance to the Gulf of Smyrna. Strabo estimates its circumference as 1100 stadia, about 138 miles, and

Scylax reckons it seventh in size of the islands in the Mediterranean Sea. The narrowest part of the channel which divides it from the Mysian coast, between the promontory of Argennum and the town of Assos, is about 8 miles wide. The island is of irregular shape; it has three prominent points, Argennum on the north-east, Sigrium (now Sigri) an the west, and Malea (now Maria) on the south-east, and a deep gulf, the Euripus Pyrrheeus, now the port of Calloni, runs far into its western side between Sigrium and Malea. The surface is mountainous, but the soil is in spite of this exceedingly fertile ; the wine, oil, and grain of Lesbos were well known in ancient times. The climate is perhaps more delightful than that of any other part of the Augean ; the breezes and the sea temper the heat of summer, and the winter is not severe. Earth- quakes were often experienced in the island; the latest, that of 1861, is still remembered as one of the severest known in a country of earthquakes.

The oldest inhabitants are said to have been Pelasgians ; and two generations before the Trojan war came Jonians under Macareus. These two races may be said to represent respectively the first period of primitive barbarism, and the second period, when navigation brought to the island the commerce and intercourse of more advanced races; it deserves notice that the name Macareus, the Pheenician Melkarth, is taken by Curtius as a sign of the presence of Phoenician traders. But the island begins to be important in history from the time of the Auolian immigration, which is said to have commenced one hundred and thirty years after the Trojan war; from this time it continued long to be one of the chief homes of Hellenic civilization. Homer refers to its wealth and its populous cities; its chief fame lies in its connexion with the earliest development of Greek poetry and literature. Lesches the cyclic poet, Terpander, Arion, Hellanicus, Pittacus, Alczus, and Sappho were all natives of Lesbos. Probably no district of Greece can boast of so many names, most of them associated with some marked advance in literature, as Lesbos can enumerate between 700 and 500 B.c.

The chief city of Lesbos was Mytilene or Mitylene, the latter spelling being general in literature while the former is the official spelling used

on coins. It was originally built on an island close to the western coast of Lesbos a afterwards when the limits of the island were too narrow it was joined to Lesbos by a causeway, and the city spread

out along the coast. On each side of this istlmus was a harbour; not far from the city was a place called Maloeis, but it does not appear that this name was, as some have said, given to the northern harbour. The city has always been known for its delightful and healthy climate. With the advantage of its strong situation and good harbour it soon became one of the most powerful Greek cities of Asia Minor. It was the only Molian city that possessed a strong navy. Its colonies were spread along Asia Minor and Thrace, and in the 6th century it maintained a long though finally unsuccessful contest with Athens for the possession of Sigeum. About its internal government little is known. After the kingly period there was a time when oligarchical and democratical factions contended with one another. The noble family of the Penthelidee, descended from Pentliilus, son of Orestes, played a great part in these con- tentions. Its Pelopid descent may be compared with various legends that connect Pelops with the island of Lesbos. The city fell under the Persian power after the defeat of Croesus. A tyrant Coes ruled it soon after, but was expelled when the island joined the Jonic revolt in 500 B.c. It was freed from the Persian yoke after the battles of Plateea and Mycale, and was a member of the Delian confederacy. It revolted from Athens 429 z.c., and was reduced after a long siege. The story of the cruel revenge which the Athenian assembly at first resolved on, of the second meeting and the more merciful resolution, and of the arrival of the second despatch vessel barely in time to prevent the massacre of the whole male popula- tion, has been told by Thucydides. The territory of Myti- lene was, however, divided among Athenian xAypotyou. The harbour was the scene of a great battle between Callicratidas and Conon in the latter part of the Pelopon- nesian war; but it is impossible here to trace all the vicissitudes of its history, which are coincident with the history of Greece in the East. It continued to be a rich and prosperous city throughout ancient history, and its name came during the Byzantine period to be applied to the whole island. It was Jong a stronghold of

the Venetians during the Middle Ages, but has belonged to the Turkish empire since 1460.

The other chief towns besides Mytilene were Methymna, Antissa, Eresus, and Pyrrha; hence the island is some- times called a Pentapolis. There was also a town called Arisba, which was destroyed by an earthquake before the time of Herodotus; Conze finds its site inland at Palaio- kastro, north-east of the port of Calloni. Pyrrha lay on the south-east coast of this port, at a place also called Palaiokastro, Antissa, near Sigrium, was destroyed by the Romans in 168 Bc, as having sided with Perseus in the Macedonian war. Jresus, now Eresi, was also near Sigrium. Of these five cities, Mitylene was the chief; Pyrrha, Eresus, and Antissa were under its influence, and seem almost always to have followed its lead. But Methymna on the north coast, though it had not such a fine situation as Mytilene, was a very strong place; it was therefore able to maintain a constant quarrel with the more powerful city, and was always ready to side with its enemies. Molivo, still the second city of the island, occupies the site of the old Methymna. The name Methymna or Mathymna is derived from the wine for which it was famous (Virg., Georg., ii. 90).

See Conze, Reise auf der Insel Lesbos ; Plehn, Lesbiaea ; Boutan, Archives d. Missions Scient. et Inter., v. (according to Conze not very trustworthy) ; Zanders, Beitr. 2. Kunde d. Insel Lesbos ; New- ton, Zravels; and for the geography Cramer, Deser. of Asia Minor,

and Forbiger, Alt. Geogr. The best maps are the English admiralty charts, and those in Conze’s work.

LESGHIANS, or Lzscuts (from the Persian Leksi, called Leki by the Grusinians or Georgians, Armenians, and Ossetians), a number of tribes in the Caucasus forming

aiong with the Tchetchenians (about 165,000) the East Caucasus group, and spreading southward over the borders of Daghestan, the country which they have occupied from time immemorial, into the

Transcaucasian eircles Kuba, Shemakha, Nukha, and Sakataly. They are mentioned as Ajxat by Strabo and Plutarch along with the T'dau (perhaps the modern Galgai, a Tchetchenian tribe), and their name occurs with great frequency in the old chronicles of the Georgians, whose territory was exposed to their raids for centuries, until through the fall of Shamyl they were brought under subjection to Russia. Moses of Chorene mentions a battle in the reign of the Armenian King Baba (370-377 A.p.), in which Shagir, king of the Lekians, was slain. Among the Lesghians the chief place, both on account of numbers and importance, is due to the Avars (155,194) and the closely related Andians (35,511), to whom may be attached the Dido (9074) and a number of small tribes, confined to a few villages or even to one, and speaking different though intimately connected languages. The Avars, extending from the Sulak and the Kumyk steppe right through Daghestan to the Alasan in the Sakataly circle, were once the dominant people as their language is still the dominant language of all this district. Their neighbours the Kasimukhians (35,139), who call themselves Lakians, have a language of their own, and are well known as traders not only through all Transcaucasia but also in European Russia ; beside them a small fragment of another race occupies the village Artchi (592 inhabitants) in a separate mountain valley. Towards the Caspian Sea the Lakians are bordered by the Darginians (88,045) and the Tabassaranians (16,350), who in the matter of dialect are strongly marked off from each other. To the north and south of the basin of the Samur (which consequently bears the native name Kulan-uaz or "middle river") lives another of the leading tribes of Daghestan, the Kurinians or Lesghians par excellence, who by themselves alone occupy the circles of Kuri and Samur, as well as the greatest part of Kuba, and parts of Shemakha, Nukha, &c. Their language (investigated like other Caucasian tongues by Baron Uslar) is there spoken by 130,873 individuals; and closely related to it apparently are the languages of the neighbouring Agulians (5357), Rutulians (11,803), Zakhurians (4561). According to the specimens collected by Von Seidlitz in 1880 during a visit to their country, which lies round the snowy peak of the Shakh Dagh in the Kuba circle, the Djekians, Haputlians, and Krysians speak what seem to be dialects of Kurinian; but he cannot connect with any other tongue the language spoken by

the peculiar-looking inhabitants of the neighbouring village of Khinalugh (2196). The Udinians (9668) are another Lesghian tribe, which, though at present it only occupies a few villages in the Nukha circle, was formerly widely distributed over the plain of the Kura, and may possibly be the wretched remnant of the Albanians, mentioned by Strabo and others as a people of similar importance with the Grusinians and Armenians.

All these Lesghians are more or less tall, good-looking and powerful, sometimes fair sometimes dark, bold, enduring, and intelligent—in one word, excellent material for the work of civilization as soon as their country is opened up by roads and the railway just projected from Vladikavkas by Petrovsk to Baku. Smith-work and cutlery are skilfully wrought among the Lesghians in general ; the women weave excellent shawls (which vary in style according to locality) ; and the felt cloaks of Andi are known throughout the Caucasus.

See Von Scidlitz, ‘‘ Ethnographie des Kaukasus,” in Petermann’s Mittheilungen, 1880.

LESLEY, Joun (1527-1596), bishop of Ross, Scottish historian and statesman, was born in 1527. His father

was Gavin Lesley, parson of Kingussie. He was educated at the university of Aberdeen, where he took the degree of M.A. In 1538 he obtained a dispensation permitting him to hold a benefice, notwithstanding his being a natural son, and in June 1546 he was made an acolyte in the cathedral church of Aberdeen, of which he was afterwards appointed a canon and prebendary. He also studied at Poitiers, at Toulouse, and at Paris, where he was made doctor of laws. In 1558 he was appointed official of Aberdeen, and in 1559 he was inducted into the parsonage and prebend of Oyne. At the Reformation Lesley became a champion of the Romish faith, and appeared on that side at the disputation held in Edinburgh in 1561, when Knox was one of his antagonists. He was one of the commissioners sent the same year to bring over the young Queen Mary to take the government of

Scotland. He returned in her train, and was appointed a privy councillor, and in 1564 one of the senators of the college of justice. Shortly afterwards he was made abbot of Lindores, and in 1565 bishop of Ross. He was one of the sixteen commissioners appointed to revise the laws of Scotland, and the volume of the Acts of Parliament known as the Black Acts was, chiefly owing to his care, printed in 1566.

The bishop was one of the most steadfast friends of Queen Mary.! After the failure of the royal cause, and whilst Mary was a captive in England, Lesley continued to exert himself on her behalf. He was one of the com- missioners at the conference at York in 1568. He appeared as her ambassador at the court of Elizabeth to complain of the injustice done to her, and when he found he was not listened to he laid plans for the escape of the queen. He also projected a marriage for her with the duke of Norfolk, which ended in the execution of that nobleman. For this he was put under the charge of the bishop of Ely, and afterwards imprisoned in the Tower of London. During his confinement he collected materials for his history of Scotland, with which his name is now chiefly known. In 1571 he presented the latter portion of this work, written in his own vernacular tongue, to Queen Mary to amuse her in her captivity. He also wrote for her use his Piz Consolationes, and the queen devoted some of the hours of her captivity to translating a portion of it into French verse.

In 1573 he was liberated from prison, but was banished. from England. For two years he attempted unsuccess- fully to obtain the assistance of Continental princes in favour of Queen Mary. While at Rome in 1578 he pub- lished his history De Origine, Moribus, et Rebus Gestis Scotorum, the Latinity of which is held only second to that of Buchanan. In 1579 he went to France, and was made suffragan and vicar-general of the archbishopric of Rouen by the Cardinal de Bourbon. Whilst visiting his diocese, however, he was thrown into prison, and had to pay 3000 pistoles to prevent his being given up to Elizabeth. During the remainder of the reign of Henry ITI. he lived unmolested, but on the accession of the Protestant Henry IV. he again fell into trouble. In 1590 he was thrown into prison, and had to purchase his freedom at the same expense as before. In 1593 he waa

made bishop of Coutances in Normandy, and had licence to hold the bishopric of Ross till he should obtain peaceable possession of the former see. Being tired of life, he retired at Jast to a monastery at Gurtenburg near Brussels, where he died in 1596.

The works of Lesley are as follows:—A defence of the Honour of Marie Quene of Scotland, by Fusebtus Dicxophile, 8vo, London,

1569; A treatise concerning the defence of the Honour of Marie Quccne of Scotland, made by Morgan Philippes, bachclar of divinitie,

1 An interesting account of his care of her during her illness at Jedburgh is given in Proc. Roy. Soc. Ant. Scot., vol. xv. p. 210.

8vo, Liége, 1570-71; Pix afflicts animé consolationes, ad Mariam Scot. Reg., 8vo, Paris, 1574; Pro libertate impetranda Oratio, ad Elizabetham, 8vo, Paris, 1574; De origine, moribus, et rebus gestis Seotorum, libri decem, 4to, Rome, 1578 and 1675; De allustriwm Seminarum in republica administranda authoritate libellus, 4to, Rheims, 1580; De titulo ct jure Mariz Scot. Reg., quo regni Angliz successionem sibi juste vindicat, 4to, Rheims, 1580; A treatise touching the right of Marie Queenc of Scotland, and of King James her graces sonne to the succession of the croune of England, 8vo, 1584; Congratulatio Alberto Archiduct Austriz de ejus adventu ad regimen provinciarum inferioris Germaniz#, 8vo, Brussels, 1596; The History of Scotland from 1486 to 1561, edited for the Banna- tyne Club by Thomas Thomson from a MS. in the possession of the earl of Leven and Melville, 4to, Edinburgh, 1830, Several of Lesley's works, of which the originals are very rare, will be found reprinted in Anderson's Collections relating to the History of Queen Mary; and in Jebb, De vita Mariz Reg. Scotoruwm.

LESLIE, ALEXANDER. See LEVEN, Ear or.

LESLIE, or Lestry, Cuarztes (1650-1722), a pro- minent nonjuror, famous as the author of A Short and Easy Method with the Deists, was

born in 1650 in Ireland, where his father, Dr John Leslie, was bishop of Raphoe and subsequently of Clogher. His early education was received at Inniskilling, Fermanagh, and in 1664 he was admitted a fellow commoner in Trinity College, Dublin, where he continued until he commenced master of arts. On his father's death in 1671, removing to England, he entered himself as a student of law at the Temple, but soon afterwards turned his attention to theology, and took orders in 1680. Seven years later he became chancellor of the cathedral of Connor and a justice of the peace, and began a long career of public controversy by responding in public disputation at Monaghan to the challenge of the Roman Catholic bishop of Clogher. Although an eager and uncompromising opponent of Roman Catholicism, Leslie was a firm supporter of the Stuart dynasty, and,

having declined at the Revolution to take the oath to.

William and Mary, he was on this account deprived of his benefice. In 1689 the growing troubles in Ireland induced him to withdraw to England, where he employed himself for the next twenty years in writing various controversial pamphlets in favour of the nonjuring cause, and in numerous polentics against the Quakers, Jews, Socinians, and Papists, and especially in that against the Deists with which his name is now most commonly associated. A warrant having been issued against him in 1710 for his pamphlet Zhe Good Old Cause, or Lying in Truth, he in that year resolved to quit England and to accept an offer made by the Pretender (with whom he had previously been in frequent correspondence) that he should reside with him at Bar-le-duc. After the failure of the Stuart cause in 1715, Leslie accompanied his patron into Italy, where he remained until 1721, in which year, having found his sojourn amongst Roman Catholics extremely unpleasant, he sought and obtained permission to return to his native

oey Ife died at Glaslough, Monaghan, on April 13,

_The Theological Works of Leslie were collected and published by himself in 2 vols. folio in 1721; a later edition, slightly enlarged, appeared at Oxford in 1832 (7 vols, 8vo). They handle the econ-troverted points of which they treat with considerable foree of

argument and vigour of style; he had the somewhat rare distinetion of making several converts by his reasonings, and probably persons might still be found who are prepared to concur in Dr Johnson's dictum that ' Leslie was a reasoner, and a reasoner who was not to be reasoned against." But the questions in dispute are no longer discussed on the basis which seems to have been pretty unanimously accepted by the orthodox theologians of that age. This is suffi- ciently seen when the promise given in the title of his best-known work is contrasted with the actual performance. The book pro- fesses to be A Short and Hasy Method with the Deists, wherein the certainty of the Christian Religion is Demonstrated by Infallible Proof from Four Rules, which are incompatible to any tmposture that ever yct has been, or that can possibly be (1697). The four rules which, according to Leslic, have only to be rigorously applied in order to establish not the probability merely but the absolute cer- tainty of the truth of Christianity are simply these:—(1) that the

matter of fact be such as that men's outward senses, their eyes and ears, may be judges of it; (2) that it be done publicly, in the face of the world; (3) that not only publie monuments be kept up in memory of it, but some outward actions be performed; (4) that such monuments and such actions or observances be instituted and do commence from the time that the matter of fact was done. Other publications of Leslie are The Snake in the Grass (1696), against the Quakers; 4 Short Mcthod with the Jews (1689); The Socinian Controversy Discussed (1697); The Truc Notion of the Catholic Church (1708); and The Case Stated between the Church of Rome and the Church of England (1718).

LESLIE, Cuartes Roperr (1794-1859), one of the most popular of English genre-painters, was born in London on the 19th of October 1794. His parents were American, and when he was five years of age he returned with them to their native country. They settled in Philadelphia, where their son was educated and afterwards apprenticed to a bookseller. He was, however, mainly interested in painting and the drama, and when George Frederick Cooke visited the city he executed a portrait of the actor, from recollection of him on the stage, which was considered a work of such promise that a fund was raised to enable the

young artist to study in Europe. He left for London in 1811, bearing introductions which procured for him the friendship of West, Beechey, Allston, Coleridge, and Washington Irving, and was admitted as a student of the Royal Academy, where he carried off two silver medals. At first, influenced by West and Fuseli, he essayed “high art,” and his earliest important subject depicted Saul and the Witch of Endor; but he soon discovered his true aptitude and became a painter of cabinet-pictures, dealing, not like those of Wilkie, with the contemporary life that surrounded him, but with scenes from the great masters of fiction, from Shakespeare and Cervantes, Addison and Moliére, Swift, Sterne, Fielding, and Smollett. Of individual paintings we may specify Sir Roger de Coverley going to Church, 1819; May-day in the Time of Queen Elizabeth, 1821; Sancho Panza and the Duchess, 1824; Uncle Toby and the Widow Wadman, 1831; La Malade Imaginaire, act iii. sc. 6, 1843; and the Duke’s Chaplain Euraged leaving the Table, from Don Quixote, 1849. Many of his more important subjects exist in varying replicas. He possessed a sympathetic imagination, which enabled him to enter freely into the spirit of the author whom he illustrated, a delicate perception for female beauty, an unfailing eye for character and its outward manifestation in face and figure, and a genial and sunny sense of humour, guided by an instinctive refinement which prevented it from overstepping the bounds of good taste. In 1821 Leslie was elected A.R.A., and five years later full academician. In 1833 he left for America to become teacher of drawing in the military academy at West Point, but the post proved an irksome one, and in some six months he returned to England, where he practised his profession with unfailing assiduity till his death on the 5th of May 1859.

In addition to his skill as an artist, Leslie was a ready and pleasant writer. His Lifc of his friend Constable, the landscape painter, appeared in 1845, and his Handbook for Young Painters, a volume embodying the substance of his lectures as professor of painting to the Royal Academy, in 1845. In 1860 Tom Taylor edited his Autobiography and Letters, which contain interesting reminiscenees of his distinguished friends and eontemporarics.

LESLIE, Sir Jonn (1766-1832), geometrician and physicist, was born of humble parentage at Largo, Fifeshire, on April 16, 1766, received his early education there and at Leven, and in his thirteenth year, encouraged by friends who had even then remarked his aptitude for mathematical aud physical science, entered the university of St Andrews. On the completion of his arts course, he nominally studied divinity at Edinburgh until 1787; in 1788-89 he spent rather more than a year as private tutor in a Virginian family, and from 1790 till the close of

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LESLIE

1792 he held a similar appointment in Staffordshire, employing his spare time in experimental research and in preparing a translation of Buffon's Natural History of Birds, which was published in nine 8vo vols. in 1793, and brought him some money. For the next twelve years (passed chiefly in London or at Largo, with an occasional visit to the Continent) he continued his physical studies, which resulted in numerous papers contributed by him to Nicholson's Philosophical Journal, and in the publication (1804) of the Luperimental Inquiry into the Nature and Propagation of Heat, a work which gained for its author the Rumford Medal of the Royal Society of London. In 1805 he was elected to succeed Playfair in the chair of mathematics at Edinburgh, not, however, without violent though unsuccessful opposition on the part of a narrow- minded clerical party who accused him of heresy in some- thing he had said as to the "unsophisticated notions of mankind" about the relation of cause and effect. During his tenure of this chair he published two volumes of a Course of Mathematics—the first, entitled lements of Geometry, Geometrical Analysis, and Plane Trigonometry, in 1809, and the second, Geometrical Analysis, and Geo- metry of Curve Lanes, in 1821; the third volume, on " Descriptive Geometry " and the "Theory of Solids" was never completed. With reference to his invention (in 1810) of a process of artificial congelation, he published in 1813 A Short Account of Experiments and Instruments depending on the relations of Air to Heat and Moisture ; and in close connexion

with the subject of this treatise he also wrote a paper on the gethrivscope, which appeared in 1818 in the Z'ransactions of the Royal Society of Edinburgh. In 1819, on the death of Playfair, he was promoted to the more congenial chair of natural philosophy, which he con- tinued to hold until his death, and in 1823 he published, chiefly for the use of his class, the first volume of his never-completed Hlements of Natural Philosophy. Leslie's main contributions to physics were made by the help of the "differential thermometer," an instrument whose inven- tion was contested with him by Count Rumford, By adapting to this instrument various ingenious devices he was enabled to employ it in a great variety of investiga- tions, connected especially with photometry, hygroscopy, and the temperature of space. In 1820 he had been elected a corresponding member of the Royal Institute of France, the only distinction of the kind which he valued, and early in 1832 he was, on the recommendation of Lord Chancellor Brougham, created a knight of the Guelphic order, He died at Coates, a small property which he had acquired near Largo, on November 3 of the same year. LESLIE, Tomas Epwarp Cuirre (1827-1882), one of the ablest and most original English economists of the present century, was born in the county of Wexford in (as is believed) the year 1827. He was the second son of the Rev. Edward Leslie, prebendary of Dromore, and rector of Annahilt, in the county of Down. His family was of Scotch descent, but had been connected with Ireland since the reign of Charles I. Amongst his ancestors were that accomplished and energetic prelate, John Leslie, bishop first of Raphoe and afterwards of Clogher, who, when holding the former see, offered so stubborn a resistance to the Cromwellian forces, and the bishop's son Charles, the well-known nonjuror. Cliffe Leslie received his elementary education from his father, who resided in England, though holding church preferment as well as possessing some landed property in Ireland ; by him he was taught Latin, Greek, and Hebrew, at an unusually early age; he was afterwards for a short time under the care of a clergyman at Clapham, and was then sent to King William's College, in the Isle of Man, where he remained until, in 1842, being then only fifteen years of age, he entered Trinity College,

Dublin. He was a distinguished student there, obtaining, besides other honours, a classical scholarship in 1845, and a senior moderatorship (gold medal) in mental and moral philosophy at his degree examination in 1846. He became a law student at Lincoln's Inn, was for two years a pupil in a conveyancer's chambers in London, and was called to the English bar. But his attention was soon turned from the pursuit of legal practice, for which he seems never to have had much inclination, by his appointment, in 1853, to the professorship of jurisprudence and political economy in Queen's College, Belfast. The duties of this chair requiring only short visits to Ireland in certain terms of each year, he continued to reside and prosecute his studies in London, and became a frequent writer on economic and social questions in the principal reviews and other periodicals, In 1870 he collected a number of his essays, adding several new ones, into a volume entitled Land Systems and Industrial Economy of Lreland, England, and Continental Countries. J.S. Mill gave a full account of the contents of this work in a paper in the Fortnightly Review, in which he pronounced Leslie to be "one of the best living writers on applied political economy." Mill had sought his acquaintance on reading his first article in Macmillan's Magazine; he admired his talents and took pleasure in his society, and treated him with a respect and kindness which Leslie always gratefully acknowledged.

In the frequent visits which Leslie made to the Con- tinent, especially to Belgium and some of the less-known districts of France and Germany, he occupied himself much in economic and svcial observation, studying the effects of the institutions and system of life which prevailed in each region, on the material and moral condition of its inhabi- tants, In this way he gained an extensive and accurate acquaintance with Continental rural economy, of which he made excellent use in studying parallel phenomena at home. The accounts he gave of the results of his observa- tions were among his happiest efforts; 'no one," said Mill, "was able to write narratives of foreign visits at once so instructive and so interesting." In these excursions he made the acquaintance of several distinguished persons, amongst others of M. Léonce de Lavergne and M. Emile de Laveleye. To the memory of the former of these lie afterwards paid a graceful tribute in

a biographical sketch (Fortnightly Review, February 1881) ; and to the close of his life there existed between him and M. de Laveleye relations of mutual esteem and cordial intimacy.

Two essays of Leslie's appeared in volumes published under the auspices of the Cobden Club, one on the " Land System of France" (2d ed., 1870), containing an earnest defence of la petite culture and still more of la petite propriété ; the other on "Financial Reform" (1871), in which he exhibited in detail the impediments to production and commerce arising from indirect taxation. Many other articles were contributed by him to reviews between 1875 and 1879, including several discussions of the history of prices and the movements of wages in Europe, and a sketch of life in Auvergne in his best manner ; the most important of them, however, related to the philosophical method of political economy, notably a memorable one which appeared in the Dublin University periodical, Hermathena. In 1879 the provost and senior fellows of Trinity College published for him a volume in which a number of these articles were collected under the title of Assays in Political and Moral Philosophy. These and some later essays, which ought one day to be united with them, together with the earlier volume on Land Systems, form the essential contribution of Leslie to our economic literature. He had long con- templated, and had in part written, a work on English economic and legal history, which would have been his magnum opus—a more substantial fruit of his genius and

his labours than anything he has left to us. But the MS. of this treatise, after much pains had already been spent on it, was unaccountably lost at Nancy in 1872; and, though he hoped to be able speedily to reproduce the missing portion and finish the work, it is feared that but a small part of it, if any, has been left in a state fit for publication. What the nature of it would have been may be gathered from an essay on the " History and Future of Profit" in the Fortnightly Review for November 1881, which is believed to have been in substance an extract from it.

That he was able to do so much may well be a subject of wonder when it is known that his labours had long been impeded by a painful and depressing malady, from which he suffered severely at intervals, whilst he never felt secure from its recurring attacks. To this disease he in the end succumbed at Belfast, whither he had gone to discharge his professorial duties, on the 27th of January 1882, in the fifty-fifth year of his age.

Leslie's work may be distributed under two heads, that of applied political economy, and that of discussion on the philosophical method of the science, The Land Systems belonged principally to the former division. The author perceived the great and growing importance for the social welfare of both Ireland and England of what is called ''the land question," and treated it in this volume at once with breadth of view and with a rich variety of illustrative detail. His general purpose was to show that the territorial systems of both countries were so encumbered with elements of feudal origin as to be altogether unfitted to serve the purposes of a modern industrial society. The policy he recommended is summed up in the following list of requirements, ''a simple jurisprudence relating to land, a law of equal intestate succession, a prohibition of entail, a legal sccurity for tenants' improvements, an open registration of title and transfer, and a considcrable number of peasant properties." The volume is full of practical good sense, and exhibits a thorough knowledge of home and foreign agricultural economy ; and in the handling of the subject is everywhere shown the special power which its author possessed of making what he wrote interesting as well as instructive, The way in which sagacious observation and shrewd comment are constantly intermingled in the discussion not seldom reminds us of Adam Smith, whose manner was more con- genial to Leslie than the abstract and arid style of Ricardo.

But what, more than anything else, marks him as an original thinker, and gives him a place apart, among contemporary econo- mists, 1s his exposition and defence of the historical method in political economy. Both at home and abroad there has for some time existed a 1 a and growing dissatisfaction with the method and many of the doctrines of

the hitherto dominant school, which, it is alleged, under a, ‘ fictitious completeness, symmetry, and exact- ness” disguises a real hollowness and discordance with fact. It is urged that the attempt to deduce the economic phenomena of a society from the so-called universal principle of ‘‘the desire of wealth.” is illusory, and that they cannot be fruitfully studied apart from the general social conditions and historic development of which they are the outcome. Of this movement of thought Leslie was the principal representative, if not the originator, in England. There is no doubt, for he has himself placed it on record, that the first influence which impelled him in the direction of the historical method was that of Sir Henry Maine, by whose personal teaching of jurisprudence, as well as by the example of his writings, he was led ‘‘to look: at the present economic structure and state of society as the result of a long evolution.” The study of those German economists wha represent similar tendencies doubtless confirmed him in the new line of thought on which he had entered, though he does not seem to have been further indebted to any of them except, perhaps, in some small degree to Roscher. And the writings of Comte, whose ‘ prodigious genius,” as exhibited in the Philosophie Positive, he admired and proclaimed, though he did not accept his system as a whole, must lave powerfully co-operated to form in him the habit of regarding economic science as only a single branch of sociology, which should always be kept in close relation to the others. The earliest writing in which Leslie’s revolt against the so-called ‘orthodox schoal” distinctly appears is his Essay on Wages, which was first published in 1868, and was reproduced as an appendix to the volume on Land Tenures. In this, after exposing the inanity of the theory of the wage-fund, and showing the utter want of agree- ment between its results and the observed phenomena, he concludes by declaring that “‘ political economy must be content to take rank as an inductive, instead of a purely deductive science,” and that, by this change of character, ‘‘it will gain in utility, interest, and real truth far more than a full compensation for the forfeiture of a fictitious title to mathematical exactness and certainty.” But it is

in the essays collected in the volume of 1879 that his attitude in relation to the question of method is most decisively marked. In one of

these, on ‘‘the political economy of Adam Smith,” he exhibits in a very interesting way the co-existence in the Wealt), of Nations of historical-inductive investigation in the manner of Montesquieu with a@ priori speculation founded on theologico- nietaphysical bases, and points out the error of ignoring the former element, which is the really characteristic feature of Smith’s social philosophy, and places him in strong contrast. with his soi-disant followers of the school of Ricardo. The essay, however, which con- tains the most brilliant polemic against the ‘‘orthodox” school, as well as the most luminous account and the most powerful vindica- tion of the new direction, was that of which we have above spoken as having first appeared in Hermathena. It may be recommended as supplying the best extant presentation of one of the two con- tending views of economic method. On this essay mainly rests the claim of Leslie to be regarded as the founder and first head of the English historical school of political economy. How far his opinions on the philosophical constitution of the science are destined to pre- vail must for the present remain doubtful, Those who share his views on that subject regard the work he did, notwithstanding its unsystematic character, as in reality the most important done by any recent English economist. But even the warmest partisans of the older school are ready to acknowledge that he has done excel- lent service by insisting on a kind of inquiry, heretofore foo much neglected, which is of the highest interest and value, in whatever relation it may be supposed to stand to the establishment of eco- nomic truth. The members of both groups alike recognize his great learning, his patient and conscientious habits of investigation, and the large social spirit in which he treated the problems of his science. (J. K

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LESSING, GorrHotp Epuratm (1729-1781), was born at Kamenz, in Upper Lusatia, Saxony, on the 22d of January 1729. He was descended from Clemens Lessing, a Saxon clergyman, whose name is found attached to an ecclesiastical document of 1580, Lessing’s father, Johann Gottfried, born in 1693, was the son of Theophilus Lessing, the burgomaster of Kamenz, who died at the age of eighty- nine, when Lessing was between six and seven years old, At the time of Lessing’s

birth his father was one of the clergymen of Kamenz, where, a few years afterwards, he became pastor primarius, or head pastor. He was a man of high character, rather irascible, but earnest in the fulfilment of his pastoral duties, and universally beloved for his kindness to the poor. Throughout life he continued the studies in theology and church history which he had successfully begun at the university of Wittenberg, and he made some reputation as an original writer and asa translator of Tillotson. Of the Frau Pastorin we do not know much except that she was a faithful and affectionate wife and mother. They had twelve children, of whom Lessing was the second who survived infancy. He seems to have been an exceedingly happy child, healthy and playful, and already remarkable for his fondness for read- ing. After attending the Latin school of Kamenz, he was sent in 1741 to the great school of St Afra at Meissen, where he was maintained free of charge. Here he made such rapid progress in classical and mathematical study that, towards the end of his career as a pupil, he was described by the rector as “a steed that needed double fodder.” Work which was oppressive to others, added the rector, was to Lessing “as light as a feather.” He had the reputation of being one of the most sarcastic, but at the same time one of the most loyal and generous, boys in the school. In 1746 he left St Afra’s and went to the university of Leipsic, nominally for the purpose of studying theology. To theology, however, he did not give the slightest attention. Under Professors Christ and Ernesti he continued his classical studies, and he also attended the philosophical disputations presided over by his friend Kastner, a young professor of mathematics. For some time Lessing was shy and retired amid his new surround- ings, but being of an eminently social disposition he soon became tired of this kind of life, and began to form friends among his fellow-students, and strove to acquire the manners of a free and polished man of the world. His

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prinéipal friend was Weisse, who afterwards attained a respectable position as a man of letters. He also became intimate with Mylius, who was considerably older than himself, and had made a certain mark as a literary and scientific writer. There was at this time in Leipsic an excellent actress, Frau Neuber, who had gathered around her a number of respectable players, and Lessing, in company with Weisse, was one of the most regular attenders at her theatre. At St Afra's he had begun a comedy, Der Junge Gelehrte, and this he now completed. Frau Neuber immediately accepted it, and it was received with much favour by the public of Leipsic.

Alarmed by reports of what was supposed to be his dissolute life, the elder Lessing summoned him to Kamenz, where he remained for some months. He soon succeeded in overcoming the fears of his parents, who allowed him to return to Leipsic on condition that he would devote himself to the study of medicine. Some medical lectures he did attend ; but his ambition was to become a great dramatist, and as long as Frau Neuber's company kept together he

occupied himself almost exclusively with the theatre, being »

frequently present at rehearsal during the day as well as at the performance in the evening.

In 1748 the company broke up, and Lessing, finding nothing to interest him in Leipsic, went to Wittenberg, and afterwards, towards the end of the year, to Berlin, where his friend Mylius had established himself as a journalist and man of science. In Berlin Lessing now spent three years, maintaining himself chiefly by literary work. He translated two volumes of Rollin's history, wrote some of the best of his early plays, and, in association with Mylius, started a periodical (which soon came to an end) for the discussion of matters connected with the drama, larly in 1751 he accepted the office of literary critic to the Voss Gazette, and in this position he reviewed some of the most important German and French books of the day, manifesting already to some extent the learning, judgment, and wit which were to make him the greatest critic of modern times. His father had been bitterly opposed to lis scheme of life, and in 1751 urged him to complete his studies at the university of

Wittenberg. Feeling the need of further thought and research, Lessing at last consented, and at the close of the year left Berlin. It is worthy of note that he had been brought into slight contact with Voltaire, for whom he had translated some documents relating to the Hirsch trial. Voltaire's secretary having lent him a volume of the Stécle de Louis XIV., which had not yet been published, he took it with him to Wittenberg. This came to the ears of Voltaire, who assumed that Lessing intended to print either a pirated edition or an unauthorized translation. The affair led to an angry correspondence, and was a subject of much talk in Berlin.

Lessing remained about a year in Wittenberg, where he passed most of his time in the university library, every volume in which, he afterwards declared, had passed through his hands. Having taken the degree of master of arts, he returned to Berlin, determined to make literature his profession; and the next three years were among the busiest of his life. Besides translating for the booksellers, he issued several numbers of the Theatralische Bibliothek, a periodical essentially the same as that which he had begun with Mylius. He also resumed his labours as critic to the Voss Gazette. For many years the most influential writer in Germany had been Gottsched, the Leipsic professor, who continually proclaimed the necessity of rigid adherence, in the drama and in poetry, to French rules. In his articles for the Voss Gazette, Lessing made it his principal object to ridicule the pretensions of Gottsched and his school, and in a short time there was no writer of whom

they were so much afraid. In 1754 he produced a deep impression by Hin Vade Mecum fiir den Herrn Sam. Gotth. Lange, in which he exposed with bitter satire Lange's errors in his popular translation of Horace. During these three years Lessing took a definite position in contemporary literature by issuing, in six small volumes, those of his writings which he considered worthy of preservation. They included his lyrics and epigrams, some of the latter being in German, others in Latin. Most of his lyrics were written in Leipsic, and had already appeared, during his first residence in Berlin, in a volume of

Kleinigkeiten, published without his name. Although they do not, like Goethe's lyrics, touch deep sources of natural feeling, they have the merit of being bright, gay, and musical, and some of them are still sung by German students. The epigrams, many of which were produced in Wittenberg, are in the style of Martial, and give evidence, like Lessing's critical writings, of a keen and biting humour. Among his collected writings there was also a remarkable series of Letters, in which, for the first time in German literature, some of the results of extensive learning were presented in a free and vivid style. Even more important, perhaps, were the papers entitled Rettwngen, in which he undertook to vindicate the character of various writers wlio had been misunderstood by preceding generations. One of the best of these Lettwngen is on Horace, whom he defends against the critics who charge him with sensuality and cowardice. In another, almost equally good, he shows that Cardan, instead of being an atheist, did full justice to the evidences for Christianity, as they were understood in his time, while he did rather less than justice to other religions. This essay contains a powerful argument in favour of Mohammedanism, developed from the point of view of an intelligent believer in the Prophet. In addition to these varied contents, Lessing published in the six volumes of his Schriften his early plays and JMfiss Sara Sampson. Of the former the chief are Der Junge Gelehrte, already mentioned, Der Freidenker, Die Juden, and Der Misogyn. Although superior to any other German comedies produced at the same time, they cannot be said to reveal a high dramatic faculty. In the arrangement of his plots and the balancing of his characters, Lessing follows closely the methods of contemporary French comedy, and in the dialogue there is often a too obvious straining after effect. Miss Sara Sampson, written in 1755, marks a wholly different stage of his development. It has many faults both in conception and in execution, but it exercised a powerful influence by indicating to the dramatists of Germany that materials for tragedy are to be found in the experiences of ordinary men and womenas well as in those of "the great." Lessing attributed much importance to this principle, which had been suggested to him chiefly by the study of Richardson, whose Clarissa is almost exactly reproduced in the heroine of Afiss Sara Sampson.

This tragedy, when represented in Frankfort-on-the-Oder, was received with so much applause that he resolved to devote himself to the drama; and in fulfilment of his design he suddenly quitted Berlin in October 1755, and went to Leipsic, where a good theatre had been lately established. During his second residence in Berlin he had made his name widely known, and he had secured several friends, whose affection he retained during the rest of his life. The chief of these was Moses Mendelssohn, in association with whom, in 1755, he wrote an admirable treatise, Pope ein Metaphysiker, tracing sharply the lines which separate the poet from the philosopher. The Berlin Acatlemy of Sciences had offered a prize for the best essay on Pope's doctrine that ' Whatever is, is right," as com- pared with the optimism of Leibnitz. The treatise of the two friends was written to show that there cannot be a

true comparison between a poetic and a philosophic con- ception; and they threw much light on the aims both of Leibnitz and of Pope. Other Berlin friends of Lessing were Nicolai, the bookseller, and Ramler, the author of many well-known odes. He had also made the acquaint- ancc of Gleim, the Halberstadt poet, and Ewald Christian von Kleist, a Prussian officer, whose fine poem, Der Frihling, had won for him Lessing's warm esteem.

In Leipsic, Lessing was asked by Winkler, a wealthy young merchant, to accompany him in a foreign tour, which was to last three years. As he offered liberal terms, Lessing consented ; and early in the summer of 1756 they started for England. They did not, however, get beyond Amsterdam, for after the outbreak of the Seven Years' War they heard that Winkler's house was occupied by the Prussian commandant; and he deemed it necessary to hasten back. After some time Winkler was offended by Lessing's intimacy with certain Prussian officers, and suddenly announced to him that he must consider their engagement at an end. Lessing demanded compensation, and in the end the courts decided in his favour, but not until the case had dragged on for about six years. In the meantime it detained him in Leipsic, and, as there was

little opportunity for earning money by literature in a city occupied by foreign troops, he went through a period of extreme hardship. During these anxious months he began the study of medizeval poetry, in which some interest had been awakened by the Swiss school of critics; he also translated several English writings, and worked occasion- ally for the Bzbliothek, a periodical edited by Nicolai. Fortunately he had an opportunity of developing his friendship with Kleist, who happened to be stationed in Leipsic. Kleist, a man of truly heroic temper, with the simplicity of a child, was powerfully attracted by Lessing's frank and noble nature, and Lessing loved him with an ardour which was excited by no other friend, not even by Mendelssohn. Kleist's regiment being ordered to new quarters early in 1758, Lessing decided not to remain behind him, and, saying farewell to his friend (who was mortally wounded in the following year at the battle of Kunersdorf), he returned once more to Berlin.

His third residence in Berlin was made memorable by the Interaturbriefe, a series of critical essays (written in the form of letters to a wounded officer) on the principal works that had appeared since the beginning of the Seven Years' War. 'The scheme was suggested by Nicolai, by whom the Letters were published. Those written by Lessing manifested far higher intellectual power than anything he had yet accomplished. The critical principles set forth in the JLvteraturbriefe are now universally recognized, but they were then new, and even at the present day they seem to derive fresh vitality from the force, precision, and animation with which he expresses them. He insisted especially on the necessity of truth to nature in the imaginative presentation of the facts of life, and in one letter he boldly proclaimed the superiority of Shakespeare to Corneille, Racine, and Voltaire. At the same time he marked the immutable conditions to which even genius must submit in order to move enduring sympathies. While in Berlin at this time, he edited with Ramlecr a selection from the writings of Logan, a vigorous epigrammatist of the 17th century, and introduced to the German public The War Songs of a Grenadier, by Gleim. He admired the vigour of these songs, but in several private letters protested against the vehemence of the author's patriotism—patriotism being a virtue which, he thought, he ''could do very well

without.” In 1759 he published Philotas, a prose tragedy ; and in the same year appeared a complete collection of his fubles, with an essay on the essential idea of the fable. The latter is one of his

best essays in criticism, defining with perfect lucidity what is meant by “the action” in works of imagination, and distinguishing the action of the fable on the one hand from that of the epic and the drama on the other. His theory prevented him from lending poetic interest to his own fables, but they surpass the works of all other German fabulists in the depth and variety of the moral truths which they are intended to enforce.

In 1760, weary of incessant writing, and feeling that change of scene and work was necessary for his health, Lessing went to Breslau to apply for the post of secretary to General Tauentzien, to whom Kleist had introduced him in Leipsic. Tauentzien was not only a general in the Prussian army, but governor of Breslau, and director of the mint. He willingly granted the vacant office to Lessing, who retained it for more than four years. He thus found himself in circumstances wholly different from those to which he had been hitherto accustomed. He associated chiefly with Prussian officers, went much into society, and became passionately fond of the gaming table, where he played for such high stakes that even General Tauentzien expostulated with him. While, however, he seemed to be wasting his energies, he never lost sight of his true goal. He gradually collected a library of about 6000 volumes (which he was ultimately obliged to sell); and after the conclusion of the Seven Years’ War in 1763 he resumed more enthusiastically than ever the studies which had been partly interrupted. In investigating the early history of Christianity, he obtained a profound knowledge of the fathers; and a remarkable letter to Mendelssohn shows that he had penetrated more deeply than any con- temporary thinker into the significance of the philosophy of Spinoza. In 1764 he was prostrated by a severe illness, during which he reviewed, in a rather sorrowful spirit, his past life, and formed many serious resolutions for the future. Before this time he had worked hard at Laocoon, and in fresh spring mornings he had sketched in a garden the plan of Minna von Barnhelm. His parents were now in exceedingly

straitened circumstances, and often appealed to him for aid. He responded generously to their demands, but they greatly overrated his power to help them, as they assumed that he intended to remain permanently in General Tauentzien's service. In reality, he had always regarded the engagement as a temporary one, and in 1765 he resigned his office, and left Breslau.

It seemed not improbable that he might find a suitable appointment in Dresden, but he was again compelled, much against his will, to become a resident of Berlin, whither he went after a brief visit to Kamenz and Leipsic. His friends exerted themselves to obtain for him the office of keeper of the royal library, but Frederick had not forgotten Lessing's quarrel with Voltaire, and declined to consider his claims, although, about the time when Lessing went to Breslau, he had confirmed his election as a foreign member of the Berlin Academy of Sciences. During the two years which Lessing now spent in the Prussian capital he was restless and unhappy, yet it was during this period that he published two of his greatest works—JZaocoon in 1766, and Minna von Barnhelm in 1767. Laocoon ranks as a classic not only in German but in European literature, and its style alone, which is as near perfection as anything Lessing ever wrote, would almost entitle it to this position. His central aim is to define by analysis the limitations of poetry and the plastic arts. Many of his conclusions have been corrected and extended by later criticism ; but he indicated more decisively than any of his predecessors the fruitful principle that each art is subject to definite conditions, and that it can accomplish great results only by limiting itself to its special function. The most valuable parts of the work are those which relate to poetry, of which he had a

much more intimate knowledge than of sculpture and painting. His exposition of the methods of Homer and Sophocles is especially suggestive, and he may be said to have marked an epoch in the appreciation of these writers, and of Greek literature generally. He invariably starts from the consideration of doctrines set forth by other scholars (chiefly Winkelmann, Caylns, and Spence); but he is never

satisfied until he arrives at positive principles, and he leads us towards them gradually by the paths he himself has trodden, glancing at many side issues by the way. He was unable in later years to complete his scheme, but even in its fragmentary form, as Goethe testifies in Wakrhat und Dichtung, Laocoon was welcomed with gratitude by the most active minds of the age. The power of Minna von Barnkhelm was also immediately recognized. This is, on the whole, the best of Lessing's purely dramatic writings. The hero, Tellheim, is an admirable study of a manly and sensitive soldier, with somewhat exaggerated ideas of conventional honour; and Minna, the heroine, is one of the brightest and most attractive figures in the dramatic literature of Germany. The subordinate characters are conceived with the same force and vividness ; and the plot, which reflects precisely the struggles and aspirations of the period that immediately followed the Seven Years' War, is simply and naturally unfolded. This beautiful play is valued by the Germans, not only as a work of art, but as one of the earliest and most striking manifestations of the growing spirit of German nationality.

In 1767 Lessing settled in Hamburg, where he had been invited to take part in the institution of a national theatre. The scheme promised well, and, as he associated himself with Bode, a literary man whom he respected, in starting a printing establishment, he hoped that he might at last look forward to a peaceful and prosperous career. The theatre, however, being mismanaged, was soon closed, while the printing establishment failed, and left behind it a heavy burden of debt. Many of Lessing's letters from Hamburg breathe almost a spirit of despair, and towards the end of his residence there he determined to quit Germany, believing tliat in Italy he might find congenial labour that would suffice for his wants. Even in Hamburg he made splendid contributions to enduring literature, the chief being his Z/amburgische Dramaturgie. It consists of criticisms of some of the plays represented in the Hamburg theatre; but in these criticisms he offers a complete theory of the laws of dramatic art. In the main his theory is that of Aristotle, but it is maintained on independent grounds and applied in new ways. By this powerful work he delivered German dramatists for ever from the yoke of the classic tragedy of France, and directed them

to the Greek dramatists and to Shakespeare as the poets who have opened most truly the fountains of tragic feeling. Another result of his labours in Hamburg was the Antiquarische Briefe, a series of masterly letters in answer to Klotz, a pedantic writer who, after flattering Lessing, had attacked him, and sought to establish a kind of intellectual despotism by means of critical journals which he directly or indirectly controlled. In connexion with this controversy, Lessing wrote his brilliant little treatise, Wee die Alten den Tod gebildet, contrasting the medieval representation of death as a skeleton with the Greek conception of death as the twin-brother of sleep.

Instead of going to Italy as he intended, Lessing accepted, in 1770, the office of librarian at Wolfenbiittel, a post which was offered to him by the hereditary prince of Brunswick. In this position he passed his remaining years. For a time he was not unhappy, but by and by he was rendered miserable by his inability to pay the debts which he had contracted in Hamburg. He missed, too, the society of his friends, and his health, which had

hitherto been excellent, gradually gave way. In 1775 he travelled for nine nionths in Italy with Prince Leopold of Brunswick ; and in the following year he married Eva Konig, the widow of a Hamburg merchant, with whom he had been on terms of intimate friendship. She was in every way worthy of Lessing, and their correspondence during his lonely years in Wolfenbiittel forms one of the most attractive elements of his biography. Their happiness in each other was perfect, but it lasted only for a brief period; in 1778 she died in childbed. After her death Lessing found one of his chief sources of consolation in the love of his four step-children, to whom he was tenderly attached.

Meanwhile he had extended his fame by several import- ant writings. Soon after settling in Wolfenbiittel he found in the library an ancient manuscript, which proved to be a treatise of Berengarius of Tours on transubstantia- tion in reply to Lanfranc. Lessing was thus induced to write an essay on Berengarius, vindicating his character as a serious and consistent thinker. The essay was much admired by the leading

theologians of Germany, and it is, on the whole, the ablest and most interesting of his Rettungen. In 1771 he published his Zerstreute Anmerk- ungen tiber das Epigramm, und einige der vornehmsten Epigrammatisten—a work which Herder described as "'itselfan'epigram." Lessing's theory of the origin of the epigram is somewhat fanciful, but no other critic has offered so many pregnant hints as to the laws of epigram- matic verse, or defended with so much force and ingenuity the character of Martial. In 1772 lovers of the drama were delighted by the appearance of Lmilia Galotti, a tragedy which he had begun many years before in Leipsic. The subject was suggested by the Roman legend of Virginia, but the scene is laid in an Italian court, and the whole play is conceived in accordance with the modern spirit. Its defect is that its tragic conclusion does not seem to be absolutely inevitable, but there is high imaginative power in the character of the prince of Guastalla and in that of Marinelli, his chamberlain, who weaves the intrigue from which Emilia escapes by death. The diction of Hmilia Galotti is at once refined and vigorous, and there are scenes in which some of the deepest passions of human nature are sounded with perfect art. Having completed Hmilia Galotti, Lessing occupied him- self for some years almost exclusively with the treasures of the Wolfenbiittel library. The results of his researches (some of them of high value) he embodied in a series of volumes, Zur Geschichte und Literatur, the first being issued in 1773, the last in the year of his death.

The concluding period of Lessing's life was devoted chiefly to theological controversy. Reimarus, professor of Oriental languages in Hamburg, who commanded general respect as a scholar and thinker, wrote a book entitled Apologie oder Schuteschrift fiir die verniinftigen Verehrer Gottes. The standpoint of Reimarus was that of the English deists, and he investigated, without hesitation, the evidence for the miracles recorded in the Bible. The manuscript of this work, after the author's death in 1767, was entrusted by his daughter, Elise Reimarus, to Lessing, who published extracts from it in his Zur Geschichte und Interatur, in 1774-78. These extracts, the authorship of which was not publicly avowed, were known as the " Wolfenbiittel Fragments." They created profound excite- ment among orthodox theologians, and

evoked many replies, in which Lessing was bitterly condemned for having issued writings of so dangerous a tendency. Lessing delighted at all times in the stir of combat, and prepared to offer a full and vigorous defence. His most formidable assailant was Pastor Goeze, of Hamburg, a sincere and earnest theologian,

but utterly unscrupulous in his choice of weapons against

an opponent. To him, therefore, Lessing addressed his most elaborate answers,—LHine Parabel, Axiomata, eleven letters with the title Anti-Gioeze, and two pamphlets in reply to an inquiry by Goeze as to what Lessing meant by Christianity. These papers are not only full of thought and learning ; they are written with a grace, vivacity, and energy that make them hardly less interesting to-day than they were to Lessing's contemporaries. He does not undertake to defend the conclusions of Reimarus; his immediate object is to claim the right of free criticism in regard even to the highest subjects of human thought. The argument on which he chiefly relies is that the Bible cannot be considered necessary to a belief in Christianity, since Christianity was a living and conquering power before the New Testament in its present form was recognized by the church. The true evidence for what is essential in Christianity, he contends, is its adaptation to the wants of human nature ; hence the religious spirit is undisturbed by the speculations and researches of the boldest thinkers. The effect of this controversy was to secure wider freedom for writers on theology, and to suggest new problems regarding the growth of Christianity, the formation of the canon, and the essence of religion. On one subject, the origin of the gospels, Lessing poured a flood of fresh light in a treatise, published after his death, presenting "A New Hypothesis concerning the Evangelists, regarded as merely human writers." The Brunswick Government having, in deference to the consistory, confiscated the "' Fragments " and ordered Lessing to discontinue the controversy, he resolved, as he wrote to Elise Reimarus, to "try whether they would let him preach undisturbed from his old pulpit, the stage." In Vathan der Weise, written in the winter of 1778-79, he gave poetic form to the

ideas which he had already developed in prose. Its governing conception is that noble character may be associated with the most diverse creeds, and that there can, therefore, be no good reason why the holders of one set of religious principles should not tolerate those who maintain wholly different doctrines. This element of Wathan der Weise receives so much attention from its critics that many of them overlook the high artistic qualities of the work. As a play it has serious imperfections, but as a dramatic poem it is one of the finest creations of the 18th century, The characters possess true vitality, and several passages (including, of course, the famous passage setting forth the parable of the three rings) have both the depth and the spontaneity which are the unmistakable notes of genius. In 1780 appeared Die Erziehung des Menschengeschlechts, the first half of which he had published in 1777 with one of the " Frag- ments." This work, composed of a hundred brief paragraphs, was the last, and is, perhaps, the most suggestive, of Lessing's writings. The doctrine on which its argument is based is that no dogmatic creed can be regarded as final, but that every historical religion has played a great part in the development of the spiritual life of mankind. Lessing also maintains that history reveals a definite law of progress, and that occasional retrogression may be necessary for the advance of the world towards its ultimate goal. These ideas afterwards became familiar, but they offered a striking contrast to the principles both of orthodox and of sceptical writers in Lessing's day, and gave a wholly new direction to religious philosophy. Another work of Lessing's last years, Zrnst und Falk (a series of five dialogues, of which the first three were published in 1777, the last two in 17 80), also indicated in a fascinating style many new points of view. Its nominal subject is freemasonry; but its real aim is to plead for a humane and charitable spirit in opposition to a narrow patriotism, an extravagant respect for rank, and exclusive devotion to any particular church.

Lessing's theological opinions exposed him to much petty persecution, and he was in almost constant straits for money. Nothing, however, broke his manly and generous spirit. To the end he was always ready to help those who appealed to him for aid, and he devoted him- self with growing ardour to the search for truth. He formed many new plans of

work, but in the course of 1780 it became evident to his friends that he would not be able much longer to continue his labours. His health had been undermined by excessive work and anxiety, and after a short illness he died at Brunswick on the 22d of January 1781.

He was rather above the middle height, and during the greater part of his life maintained an appearance of vigour and elasticity. Luther himself was not of a more fearless and independent character. In an age when men of letters were fond of grouping themselves in sects and coteries, Lessing pursued his own way, unmoved by clamour, and indifferent to popular favour. Yet no man was ever more warmly loved by friends, and he had the satisfaction of knowing that the younger generation of writers looked up to him with confidence and reverence. Jacobi wished for many years to make his acquaintance, but was deterred from addressing him, as he explained to Lessing, by a profound consciousness of the difference between himself and one whom he regarded as “a king among minds.” ‘*We lose much, much in him,” wrote Goethe after Lessing’s death, “more than we think.” It may be questioned whether there is any other writer to whom the Germans owe a deeper debt of gratitude. He was succeeded by poets and philosophers who for a time gave Germany the first place in the intellectual life of the world, and it was Lessing, as they themselves acknowledged, who prepared the way for their achievements. Without attaching himself to any particular system of philosophical doctrine, he fought incessantly against error, and in regard to art, poetry, the drama, and religion, suggested ideas which kindled the enthusiasm of aspiring minds, and stimulated their highest energies. While his work was thus effective in its own day, it has lost little of its value for later ages. His great dramas have imaginative qualities which appeal to every generation, and an un- fading charm is conferred on his critical and theological writings by the power and classical purity of his style.

The first edition of his collected works appeared, in 30 vols. 5 ID) 1771-94. A critical edition by Lachmann, in 13 vols., was issued in 1838-40, and this edition was revised, with additions, by Malt- zahn in 1858-57. Inu 1868-77 Lessing’s works, edited by several competent scholars, were published in 20 vols. by Hempel, and there is an

illustrated edition in 8 vols. (Grote, 1875-76). See Lessing's Leben, 1798, by Karl G. Lessing (his brother); Danzel, G. HE. Lessing, sein Leben und seine Werke, 1850 (completed by Guhrauer, 1853-54); Stahr, G. FE. Lessing, sein Leben wnd seine Werke, 1859 ; H. Diintzer, Lessing's Leben, 1882 ; and in English, J. Sime, Lessing, 1877, and H. Zimmern, Gotthold Ephraim Lessing, 1878. (J. Si.)

L'ESTRANGE, Sir Rocer (1616-1704), an indefatigable pamphleteer on the royalist and court side during the Restoration epoch, but principally remarkable as the first English man of letters of any distinction who made journalism a profession, was born at Hunstanton in Norfolk, December 17, 1616. In 1644, during the civil war, he headed a conspiracy to seize the town of Lynn for the king, under circumstances which led to his being condemned to death as a spy. The sentence, however, was not executed, and after four years' imprisonment in Newgate he escaped to the Continent. He was excluded from the Act of Indemnity, but in 1653 was pardoned by Cromwell upon his personal solicitation, and lived quietly until the Restoration, when after some delay his services and suffer- ings were acknowledged by his appointment as licenser of the press, This office was administered by him in the

spirit which might be expected from a zcalous cavalier. He made himself notorious, not merely by the severity of his literary censorship, but by his vigilance in the suppres- sion of clandestine printing. The inconsistency of this course with his actions and professions when himself opposed to the party in power naturally aggravated the unpopularity inevitably attaching to his office. Few men have been more heartily abused than L'Estrange, aud it is undoubtedly true that the rights of free speaking and printing, the indispensable conditions of civil and religious liberty, have seldom had a more determined or more dangerous opponent. At the same time there is no ground for questioning his integrity, and lhe was probably no more intolerant than any similar official of any Government in that day, inspired by an equal strength of conviction, would have been in his place. The

representation of him in Grant's History of the Newspaper Press as a mere political hireling is entirely contrary to truth. He was a militant loyalist, who used the pen as he had been wont to use the sword, and proved his zeal for his party by the production of a mass of pamphlet literature, above the ordinary standard of the time in ability, and quite on a par with it in virulence and coarseness. These productions still possess an historical value, but their titles are not worth enumerating here. His memory is more honourably preserved by his con- nexion as an author with the journalism which as a licenser he laboured to cripple and emasculate. In 1663 he com- menced the publication of Zhe Public Intelligencer and the News, succeeded in February 1665 by The London Gazette, not to be confounded with the official journal still existing, which appeared for the first time at the close of that year, and was at first printed at Oxford. In 1679 he established The Observator, a journal specially designed to vindicate the court from the charge of a secret inclination to popery. This line of political controversy, and it may be hoped some natural humanity and good sense as well, obliged him to discredit the Popish Plot, and he manfully resisted the delusion by which many wiser and better men were carried away. The suspicion he thus incurred was increased by the conversion of his daughter to Romanism, but there seems no reason to question the sincerity of his own attachment to the Church of England. In 1687 he gave a further proof of independence by discontinuing Zhe Observator from his unwillingness to advocate James II.'s Edict of Toleration, although he had previously gone all lengths in support of the measures of the court. The Revolution cost him his office as licenser, and the remainder of his life was spent in obscurity. He died in 1704. L'Estrange's place is rather in history than in literature. The importance of the part he played as licenser would be more exactly known if it could be more accurately ascertained how much literature he may have been the means of suppressing. The post he held so long was in itself an unmitigated mischief, but at the same time an evil which men of all parties, with the rare exception of men so far in advance of their time as Milton, then deemed necessary ; and no obloquy should attach to L'Estrange for haviug discharged its functions with zeal and efficiency. As a pamphleteer he is but slightly above mediocrity, and he labours under a special imputation of having

contributed to corrupt his native language. The same charge is brought against journalists in all ages, and there are obvious reasons why it should be true to a certain extent. The practice of daily writing for the press is undoubted]

one of the numerous forces which tend to wear down an

degrade a language, but it also keeps the diction of the cultivated classes in contact with the speech of the people, and prevents the absolute divorce between them which seems to have existed in ancient times. It is to L'Estrange's credit that among the agitations of a busy

political life he should have found time for much purely literary work as a translator of Josephus, Cicero, Seneca, Quevedo, and other standard authors. (R. G.)

LESUEUR, Jean Francois (1763-1837), was born near Abbeville in 1763, and studied music under Roze at the college of Amiens. Appointed choirmaster of a church in Paris in 1784, he completed his musical education under Sacchini. In 1786 Lesueur obtained by open competition the musical directorship of Notre-Dame, where he gave successful performances of sacred music with a full orchestra. This place he resigned in 1788; and, after a retirement of five years in a friend's country house, he produced La Caverne and two other operas at the theatre Feydeau in Paris. At the foundation of the Paris Conservatoire (1795) Lesueur was appointed one of its inspectors of studies, but was dismissed in 1802, owing to his disagreements with Mehul. On the recommendation of Paisiello, Lesueur succeeded this celebrated composer as Maestro di cappella to Napoleon, and produced (1804) his Ossian at the Opera. He also composed for the emperor's coronation a mass and a Te Deum. Louis XVIII, who had retained Lesueur in his court, appointed him (1818) professor of composition at the Conservatoire ; and at this institution he had, among many other pupils, Hector Berlioz, Ambroise Thomas, Besozzi, and Gounod. He died October 6, 1837. Lesueur composed eight operas and several masses, and other sacred music. All his works are written

in a style of rigorous simplicity ; and to this may be ascribed their want of popularity at the present time.

LETHE (A6y, oblivion) is sometimes used as the name of a river in the infernal regions. It seems to have been an idea current in the religion of the mysteries that there were in the lower world two streams, one of memory and one of oblivion. The initiated were taught to distin- guish between them, and directions for this purpose written on a gold plate have been found in a tomb at Petilia, buried doubtless with some initiated person. So beside Lebadea, at the oracle of Trophonius, which was counted an entrance to the lower world, the two springs Mnemosyne and Lethe were shown. This thought begins to appear in literature in the end of the 5th century B.c., when Aristophanes (Frogs, 186) speaks of the plain of Lethe. Plato (Rep., x.) embodies the idea in one of his finest myths of the future life. Itis difficult to find any passage in the earlier writers showing acquaintance with this idea. Hesiod makes Lethe one of the children of Eris, along with Toil, Hunger, Pains, &c.; but his meaning probably is that ingratitude and forgetfulness spring from strife. In the epitaph on Anacreon attributed to Simonides, but reckoned by Bergk spurious, the expression AwOys ddéuor occurs; but even if the epigram be an early one it is not certain that the words have any mythological sense.

LETRONNE, Jean Antoine (1787-1848), French archeologist, was born at Paris on January 2, 1787. His father, a poor engraver, having chosen the profession of an artist for him, sent him to the studio of David, but his own tastes drew him towards literature, and he became a student in the Collége de France, where it is said he used to exercise his already strongly developed faculty of critical divination by correcting for his own amusement old and bad texts of Greek authors, afterwards comparing the results he had thus obtained with the latest and most approved editions. From 1810 to 1812 he travelled in France, Switzerland, and Italy, and on his return to Paris published an Lssai critique sur la topographie de Syracuse (1812), designed to elucidate Thucydides ; two years later appeared his Lecherches géographiques et criteques on the De Mensura Orbis Terre of Dicuil, along with a restored text. In 1815 he was appointed by Government to com-

plete the translation of Strabo (1805-1819) which had been begun by Laporte-Dutheil, and in March 1816 he was one of those who were admitted to the Academy of Inscriptions by royal ordinance, having previously con- tributed a Mémoire, “On the Metrical System of the Egyptians,” which had been crowned. Further promotion came rapidly; in 1817 he was appointed director of the Ecole des Chartes, in 1819 inspector-general of the univer- sity, and in 1831 professor of history in the Collége de France. This chair he exchanged in 1838 for that of archeology, and in 1840 he succeeded Daunou as keeper of the national archives. Meanwhile he had published, among other works, Considérations générales sur l’évaluation des monnaies grecques et romaines et sur la valeur de l’or et de Vargent avant la découverte de lV’ Amérique (1817), Recherches pour servir a Vhistoire d’Loypte pendant la domination des Grecs et des Romains (1823), and Sur Porigine Grecque des zodiaques prétendus égyptiens (1837) ; by the last-named he finally exploded a fallacy which had up to that time vitiated the chronology of con- temporary Egyptologists. His Diplomes et chartres de Vépoque Mérovingienne sur papyrus et sur velin were pub- lished in 1844. The most important work of Letronne is the Recueil des inscriptions grecques et latines de l Egypte, of which the first volume appeared in 1842, and the second in 1848, He died at Paris on December 14, 1848.

LETTRES DE CACHET are really Jetéres closes, that is, letters sealed in such a way that they cannot be opened without breaking the seal, and which were originally always addressed to individuals, in contradistinction to lettres patentes, or letters patent, beginning “know all men by these presents.” Lettres closes interfering with the administration of justice or the liberty of the subject were forbidden by numerous edicts in the 14th, 15th, and 16th centuries, and the term lettres de cachet, as synonymous with lettres closes, is first found in the ordinance of Orleans in 1560. The convenience of such a means to consign one’s enemies to prison was seen by Richelieu and Mazarin, who followed the Guise Government in using them frequently, despite numerous protestations on the part of the parlements, of which the

most notable was when in 1648 an ordinance was registered that no man should be kept in prison three days without interrogation. When once Louis XIV. had begun to rule, he made frequent use of lettres de cachet both for state purposes and to control and disorganize his nobility, and he boldly justified their use in an edict of 1705. – But the most marked justifica- tion is to be found in the circular letter addressed to the parlements of France in reply to protests against arbitrary imprisonment in 1759, in which the king says that “he reserves arbitrary orders—in other words, lettres de cachet ——for occasions wherein they may be necessary for the public good and the interests of families.” In this remark he distinguishes between the two purposes for which such letters were granted. He first alleges state reasons why he should have power to arrest arbitrarily—a power no one would deny to the executive on occasions of emergency, if used under proper restrictions, Secondly, he says that they are issued in the interest of families, and here he touches the great source of their injustice and unpopularity. It was the custom for the king to sign a number of blank lettres de cachet which his ministers gave away to whoever they pleased. Thus they often fell into hands of people who used them to gratify private hate; fathers obtained them and inserted the names of their sons, wives inserted the names of their husbands, opera dancers those of lovers who had spurned them. The evil grew to such a height that Turgot and Lamoignon de Malesherbes refused to enter the ministry of Louis XVI. unless they might see the contents of the orders they countersigned,

and see the causes for which men were to be imprisoned. It is needless to say that when the cahiers of the primary assemblies were prepared, to instruct the deputies to the states-general in the wishes of their constituents, abolition of lettres de cachet was demanded in almost all the cahiers of the noblesse and tiers état. The subject was men- tioned in the early debates of the Constituent Assembly, but lettres de cachet were not formally abolished till January 15, 1790, and on March 13 of the same year all imprisoned under them were ordered to be set at liberty. The great authority for the history and injustice of lettres de

cachet is Mirabeau's Hnquiries concerning Lettres de Cachet and State Prisons, written in the dungeon at Vincennes into which his father had thrown him by a lettre de cachet, It is one of the ablest and most eloquent of his works, had an immense circulation, and was translated into English with a dedication to the duke of Norfolk in 1788. See also Mercier's Tableaux de Paris (ed. 1783), vol. vii. chap. 588, and numerous stories in Linguet's Bastille, and especially in the Bastille dévoilée (1790).

LETTS. See Lirruvanrans,

LEUCADIA. See Santa Maura.

LEUCIPPUS, the founder of Atomism in Greek philosophy, flourished about the middle or latter half of the 5th century B.c. Almost nothing is known of his life. His birthplace is variously given as Elea, Abdera, or Miletus. It is disputed whether he left any writings. Empedocles of Agrigentum and Anaxagoras of Clazomene were his contemporaries, while Zeno the Eleatic is said to have been his teacher. As pupil and associate he had Democritus of Abdera, beside whose greater fame his own work has been thrown into the background. Thus Epicurus would not look upon him as a philosopher at all ; Lucretius ignored him; and he is barely mentioned by Lange, the modern historian of materialism. But the references of Aristotle, as well as of later authorities, leave no doubt that the leading principles of the Atomic theory are due to him. He eluded the Eleatic criticism of plurality and motion by postulating the reality of that which is not, the empty or space. Empty space and atoms are,"he held, the ultimate constituents of all things. The former is infinite in magnitude; the latter are infinite in number, indivisible, and with only quantitative differences amongst one another. Nor is there any such thing as qualitative change ; but all growth and decay are merely the compounding and separation of atoms. The atoms are always in activity or motion, and all things happen of necessity. Worlds, infinite in number, are produced by the atoms, variously shaped and of different weight, falling in empty space and giving rise to an eddying motion by their mutual impact. In this way worlds are being for ever produced and again destroyed. In the notices of

Leucippus handed down to us there are additional traces of a cosmology, differing slightly from that of Democritus, and of a psychology which identified the soul with spherical atoms, and explained sensation and thought by a change brought about in it mechanically through the entrance of external images. The further development of the Atomic philosophy was the work of Democritus.

See Diog. Laert., De Vitis, lib. ix. c. 6; Ritter and Preller, Hist, Phil., pp. 111 sq. ; Zeller, Phil. d. Griechen, 4th ed., i. 760 SY.

LEUK, or Lokcue ta Vit1#, a village of Switzerland, at the head of a district in the canton of Valais, 15 miles by rail east of Sion, on the right bank of the Rhone. The population has increased from 1220 in 1870 to 1411 in 1880. About 5 miles to the north, in the valley of the Dala, at a height of 4642 feet above the sea, and over- shadowed by the immense cliffs of the Gemmi, lie the Baths of Leuk, Leukenbad, or Loéche-les-Bains, a place of only 650 permanent inhabitants, but largely frequented during

its brief summer season by French, Swiss, and Italian visitors, attracted by the hot mineral springs, These springs are twenty-two in number, and vary considerably in chemical composition and temperature, The hottest and strongest is the Lorenz spring, the water of which, registering 124° Fahr., has to be allowed to cool over night before it is used. The patients remain for hours up to their necks in the bath, talking, reading, and otherwise amusing themselves in the most sociable style, Most of the hotels are open only from June to September, The little village has several times been destroyed by avalanches (1518, 1719, 1758), and a strong embankment has been erected on the eastern side to protect it from similar catastrophes,

LEOTSCHAU (Hungarian, Zéese; Latin, Leutsovia ; Slovakian, Levocza), capital of the Cis-Tisian county of Szepes, Hungary, and until 1876 a royal free town, lies in an elevated position surrounded by mountains, and near the railway from Kassa (Kaschau) to Oderberg, about 120 miles north-east from Budapest, in 49° 1’ N. lat., 20° 35’

KE. long. Leutschau is the seat of the county administra- tion, and of a royal court of law, and has many fine old buildings, of which the most interesting is the church of St James, a Gothic structure of the 13th century, with richly carved altar, several monuments, and a celebrated organ erected in 1623, and long reputed the largest in Hungary. The educational establishments comprise a royal upper gymnasium (founded 1520), a state upper real schoo] (1868), a collegiate institute for girls, and a Minorite convent. The soil of the surrounding country is generally stony and sandy, and the climate from October to April severe, but the inhabitants nevertheless succeed in raising barley, wheat, oats, flax, and a large quantity of garden produce, especially beans and pease, which are considered the best in Hungary. Other sources of occu- pation are mining, foresting, horse, sheep, and cattle breeding, bee-keeping, and the preparation of wax, honey, and mead, for which last the town has long been noted. The number of beehives in 1881 was seven hundred. In December 1881 the population was 6900, mostly Germans and Slovaks by nationality, and Roman Catholics and Lutherans by creed.

Founded by Saxon colonists in 1245, Leutschau had by the early part of the 16th century attained @ position of great relative import- ance. In 1599 a conflagration laid the greater part of the town in ashes, and during the 17th century it suffered repeatedly at the hands of the Transylvanian princes and leaders. In 1849, at the os of the revolutionary war, nearly half the houscs were destroyed

y fire.

LEVEN, ALEXANDER Lesiiz, Ear of, one of the most distinguished soldiers of his time, was born about the close of the 16th century. He was descended from a younger son of the ancient Scottish family of Balquhain. His father was George Leslie of Balgonie, commander of the castle of Blair, and his mother was Anne, daughter of Stewart of Ballechin. At his first outset in life he acted as a volunteer in Lord Vere’s regiment in Holland, fighting with the Dutch against the encroachments of Spain, where he rose to the rank of captain. He then entered the service of Gustavus Adolphus of Sweden, and became

field-marshal. In 1628, when the town of Stralsund was besieged by Wallenstein, and reduced almost to the last extremity, the king of Sweden sent Leslie to take the command of the garrison, and he acted with such resolution that he obliged the count to raise the siege. For this service medals were struck in his honour. In 1630 he drove the imperialists out of the island of Riigen, and continued to serve with great distinction in the Swedish armies till the troubles in Scotland brought him home. In 1639 he was invited by the Covenanters to take the command of their army. One of his first exploits was te take the castle of Edinburgh by

surprise, without the loss of a man. He commanded the Scottish army at Dunse Law in May of that year, and in 1640 he invaded England, and defeated a party of the king's troops at Newburn, which gave him possession of Newcastle and other towns. At the treaty with the king at Ripon, Leslie was one of the commissioners of the parlia- ment, and Charles was so well pleased with his behaviour that he created him Lord Balgonie and Earl of Leven, by patent dated 1641.

After suppressing an insurrection in Ireland in 1642, he was in 1643 appointed to the command of the Scottish army sent to assist the parliamentary party against King Charles, but after the execution of that prince he warmly espoused the cause of his son, and served as a volunteer against Cromwell at the unfortunate battle of Dunbar in 1650. Next year, however, a gathering at Alyth of Angus royalists, of whom Leslie was one, was surprised and captured by the troops of General Monk, who was then besieging Dundee. The earl with some others was sent to London and confined in the Tower, where he remained incarcerated for some time, till by the intercession of the queen of Sweden he obtained his liberty. After visiting the queen, and thanking her in person for this service, he retired to his seat at Balgonie in Fifeshire and died there at an advanced age in 1661. He is said to have been of a diminutive size, and deformed in person, but prudent, vigilant, and expert in war. He acquired considerable landed property, particularly Inchmartin in the Carse of Gowrie, which he

called Inchleslic, His granddaughter married George, earl of Melville; their descendant, the present representative of the title (1882), is twelfth earl of Leven and ninth earl of Melville.

LEVER, CuaRtes, novelist, was born at Dublin on the 31st of August 1806 (not 1809 as usually stated), and died at Trieste on the Ist of June 1872. The accounts of the earlier part of his life are, considering the time at which he lived, singularly meagre, confused, and conflicting. His father was an architect, and he entered Trinity College, Dublin, in 1822, taking his degree in 1827. Many of the adventures of college life recorded in Charles O'Malley are believed to have actually happened. Later, Lever studied at Gottingen, and obtained a degree there. At some time or other before 1832 (for in this unsatisfactory way most of the facts of this part of his life are recorded) he is said to have visited America, and to have sojourned with the Indians, adopting their dress and mode of life, and going through adventures afterwards utilized in Con Cregan and Arthur O'Leary. But it is impossible to be certain as to this period; it is only towards the cholera outbreak of 1832 that something like a firm ground offers itself to the biographer. Lever had taken up the profession of medicine, and he was appointed, first to a district of which the head- quarters was Kilrush in Galway, where Harry Lorrequer was begun, local stories being largely embodied in it, and then toa district in Ulster, around Coleraine and Newtown Limavady, where material was gathered for Charles O'Malley and the Knight of Gwynne. He married Miss Kate Baker, but even here the mist of uncertainty which envelops him exists, and it is not clear what the real date of the marriage was. After his cholera work was done he proceeded to Brussels. It has been usual to represent him as physician to the embassy, and even Thackeray (who knew him well) has given currency to the description by a quotation in the Book of Snobs. But it is certain that Lever was never formally appointed physician to the embassy, though he had letters of introduction to the secretary of the English legation there, and unquestionably practised. Harry Lorrequer was completed at Brussels, and it began to be published in 1837. It was followed by Charles O'Malley and Jack Hinton. All these stories, but

especially the first two, were made up to a great extent of experiences through which Lever had gone, or stories which he had heard in Ireland, and of the reminiscences and oddities of English residents at Brussels, where there were then many retired English officers who had gone through the Peninsular and other campaigns of the great war. It is said in particular that Major Monsoon was almost a photograph of a well-known living character at the time, and much the same thing has been asserted of other personages. ‘This piecing together of scraps accounts for the incoherency and absence of plot in the earlier books—defects which were increased by the author’s habit of com- posing them in fragments, and revising them for the press with the utmost carelessness. The abundance and variety of his materials, however, his skill as a raconteur, and the fresh and almost boisterous good humour which blew through all his work, made him very popular, and he found a congenial illustrator in H. K. Browne. After a time proposals were made to him to undertake the editor- ship of the Dublin University Magazine, which he accepted, and held the post from 1842 to 1845. During this time his income was considerable, amounting, according to his biographer, to fully three thousand a year. He lived not in Dublin but a little way out of it, and exercised boundless hospitality to visitors. Besides this, he was an inveterate card player, and not on the whole a lucky one, and he was very fond of horses, which he kept in large numbers for himself and all his family. He was indefatigable in novel writing, Zom Burke, The O’ Donoghue, The Knight of Gwynne, &c., following those already named. But the work of editing was irksome to him, and for the reasons just named residence in Ireland made it comparatively unprofitable. He therefore resigned his editorship in the year 1845, and went abroad, where he was always more at home than in England or even in Ireland. At first he lived at Carlsruhe, where G. P. R. James was also residing; then he pitched his tent in a castle of Tyrol, which is said to be pretty accurately described in A Day’s Ride. Afterwards he wandered about, finally settling at Florence. This neigh- bourhood became specially agreeable to him, uniting as it did abundant society with the possibility of enjoying it without great expense. In November 1858 he received from Lord Derby one of the rare pieces of patronage which have fallen in modern days to the share of Englishmen of letters, by being appointed consul

at Spezzia. During this period of wandering or settled life on the Continent, he changed his style of novel writing. His method was, as has been hinted already, always one rather of observation and reproduction than of deliberate creation, and as he had formerly drawn on the humours of Irish life, or the oddities of Wellington's veterans, so now he dealt with those of travelling Britons abroad, and with similar subjects. The Daltons, The Dodd Family Abroad, Davenport Dunn, &e., belong to this time and family for the most part, though some of them rather fall under the earlier class in style and date of composition. One of Them, Barrington, The Fortunes of Glencore, &c., led up to the most singular of all Lever's books, A Day's Ride, a Life's Romance. "This book, which was published in Al the Year Round, was said at the time—with what truth it is not easy to say—to have positively lowered the sale of that publication, yet it contains some of Lever's best work, and displays an originality not common with him. The mixture of burlesque and sentiment was, it may be Supposed, either uncongenial or incomprehensible to the ordinary reader.

As he grew older, Lever, whose politics had been a rather indefinite Toryism, became more of a party man, and showed this in the papers published in Blackwood's Magazine, under the name of "Cornelius O'Dowd," papers of a mis- cellaneous kind, but often political. THe is said to have

thought of engaging, or to have been invited to engage, in regular journalism, but wisely declined. In 1867 he was transferred from Spezzia to Trieste, a change pecuniarily advantageous, but involving the loss of the society which he passionately loved. The last years of Lever's life were somewhat clouded. His health had never been good, and he had not lived carefully. His wife, to whom he was much attached, died before him. But he was still active with his pen, and the novels of his last period, if less lively than his earlier ones, are far better written as well as far more regular and careful in construction.

Such are Sir Brooke Fosbrooke, That Boy of Norcott's, Sir Jasper Carew, The Bramleighs of Bishop's Folly, and his last book, Lord Kilgobbin. He died, as has been said, in the summer of 1872. Novels not yet mentioned are Roland Cashel, Luttrell of Arran, Tony Butler, Maurice Tiernay, the Martins of Cro' Martin, St Patrick's Eve, dc.

Lever deserves an honourable place among the secondary novelists of the 19th century, but it is not very probable that any single novel of his will have a long lease of popularity. He is one of the authors who do not take the trouble to learn the mechanism of their art until the heyday of their imaginative force is past. The defects of his earlier works have been already indicated. They are written with almost inconceivable carelessness, the same incidents occurring over and over again, and the chronology being altogether bewilder- ing. This is especially the case with Charles O' Malley, which, how- ever, owing to the liveliness of its adventures and the personage of Mickey Free the Irish servant, is still perhaps the most popular of all, With young and uncritical readers this popularity is likely to be maintained until some supplanter in the same kind arises, or until the state of manners and society becomes too obsolete for any- thing more than historical interest. Then Lever, like all writers whose formal excellence is not sufficient to save them, will be for- gotten; for his later work, though almost alwaysamusing and some- times more, has little abiding interest. The sole authority for Lever's biography is the Life by Dr W. J. Fitzgerald (London, 1879).. (G. SA.)

LEVERRIER, Urnsain Jean JosepH (1811-1877), one of the greatest astronomers of modern times, was born at St L6é in Normandy, March 11, 1811. His father, who held a small post under Government, made great efforts to send him to Paris, where a brilliant examination gained him, in 1831, admittance to the Ecole Polytechnique. The distinction of his career there was rewarded with a free choice amongst the departments of the public service open to pupils of the school. He selected the administra- tion of tobaccos, addressing himself especially to chemical researches under the guidance of Gay-Lussac, and gave striking proof of ability in two papers on the combinations of phosphorus with hydrogen and oxygen, published in Annales de

Chimie et de Physique (1835 and 1837). His astronomical vocation, like that of Kepler, came from without. The place of teacher of that science at the Ecole Polytechnique falling vacant in 1837, it was offered to and accepted by Leverrier, who, ‘docile to circumstance,” instantly abandoned chemistry, and directed the whole of his powers to celestial mechanics. The first fruits of his arduous labours were contained in two memoirs presented to the Academy, September 16 and October 14, 1839. Pursuing the investigations of Laplace, he demonstrated with greater rigour the stability of the solar system, and calculated the limits within which the eccentricities and inclinations of the planetary orbits vary. This remarkable début excited much attention, and, on the recommendation of Arago, he took in hand the theory of Mercury, produc- ing, in 1843, tables of that planet far superior in accuracy to those hitherto available. The perturbations of the comets discovered, the one by Faye in November 1843, the other by De Vico a year later, were minutely investi- gated by Leverrier, with the result of disproving the supposed identity of the first with Lexell’s lost comet of 1770, and of the other with Tycho’s of 1585. On the other hand, he made it appear all but certain that Vico’s comet was the same with one seen by Lahire in 1678.

He was once more, by the summons of Arago, recalled to planetary studies, and this time it was to Uranus that his attention was directed. Step by step, with sagacious and patient accuracy, he advanced to the great discovery which has immortalized his name. Carefully sifting all the known causes of disturbance, he showed that one hitherto unknown must be added to their number, and on the 23d of September 1846 the planet Neptune was discerned by Galle at Berlin, within one degree of the spot indicated by Leverrier. See AsTRONoMY, p. 813.

This memorable achievement was grected with an out- burst of public enthusiasm, and requited with a shower of public distinctions. Academies vied with each other in enrolling Leverrier among their members; the Royal Society awarded him the Copley medal; the king of Denmark sent him the order of the Dannebrog; he was named

officer in the Legion of Honour, and preceptor to the Comte de Paris; a chair of astronomy was created for his benefit at the Faculty of Sciences ; he was appointed adjunct astronomer to the Bureau of Longitudes. Returned to the Legislative Assembly in 1849 by his native de- partment of Manche, he voted with the anti-republican party, but devoted his principal attention to subjects con- nected with science and education. After the coup d'état he became a senator and inspector-general of superior instruction, sat upon the commission for the reform of the Keole Polytechnique (1854), and, on January 30, 1854, succeeded Arago as director of the Paris observatory. His official work in the latter capacity would alone have strained the energies of an ordinary man. The institu- tion had fallen into a state of lamentable inefficiency. Leverrier placed it on a totally new footing, freed it from the control of the Bureau of Longitudes, and raised it to its due rank among the observatories of Europe. He did not, however, escape the common lot of reformers. His uncompromising measures and unconciliatory manner of enforcing them raised a storm only appeased by his removal, February 5, 1870. Three years later, on the death of his successor Delaunay, he was reinstated by M. Thiers, but with authority restricted by the supervision of acouncil. In the midst of these disquictudes, he executed with unflinching resolution a task the gigantic proportions of which cannot be contemplated without amazement. This was nothing less than the complete revision of the planetary theories, together with a laborious comparison of results with the most authentic observations, and the construction of tables representing the movements.thus corrected. It required all his indomitable perseverance to carry through to the end a purpose which failing health continually menaced with frustration. He had, however, the happiness of living long enough to perfect his work. Three weeks after he had affixed his signature to the printed sheets of the theory of Neptune he died at Paris, in his sixty-seventh year, September 23, 1877. By his marriage with Mademoiselle Choquet, who survived him little more than a month, he left a son and daughter.

The discovery with which the memory of this great man is popu- larly identified was only an incident in his career. The elaboration of the scheme of the heavens traced out by Laplace in the Mécanique Céleste

was its larger aim, for the accomplishment of which forty years of unremitting industry barely sufficed. ‘The work once donc, however, may almost be said to have been done for all time, from the extraordinary care with which errors were guarded against, and imperfections in the data allowed for. The organization of the meteorological service in France is entirely due to Leverrier, and the present system of international weather-warnings is the realization of a design which he warmly promoted. He founded the Associa- tion Scientifique, and was active in introducing a practical scientific clement into public education. His inference of the existence, between Mercury and the sun, of an appreciable quantity of circu- lating matter (Comptes Rendus, 1859, ii. p. 379), though unques- tionably sound, has uot yet been satisfactorily verified by observa- tion, He was twice, in 1868 and 1876, the recipient of the gold medal

of the Royal Astronomical Society, London, and the university of Cambridge conferred upon him, in 1875, the honorary degree of LL.D. All his planetary tables have been adopted by the Nautical Almanac, as well as by the Connaissanee des Temps.

The Annales de U’ Obscrvatoire de Paris, the publication of which was set on foot by Leverrier, contain, in vols, i.-vi. (Mémoires), 1855-61, and x.-xiv., 1874-77, his theories and tables of the several planets. In vol. i. will be found, besides his masterly report on the observatory, a general theory of secular ineqnalities, in which the development of the disturbing function is carried to a point hitherto unattempted. The memoirs and papers communicated by him to the Academy have been suminarizcd in Comptcs Rendus, 1839-76, and the more important published in full either separately, or in the Conn. des Temps and the Journal des Mathématiques. That entitled Dévcloppemens sur différents points de la Théorie des per- turbations, 1841, las been translated in part xviii. of Taylor’s Scientific Memotrs. For his scientific work see Professor Adams’s address, Monthly Notices, vol. xxxvi. p. 282, and M. Tisserand’s review in Ann. de l’Obs., tom. xv.,

1880; for a notice of his life, M. Bertrand's " Eloge Historique," Mém. de U'Ac. des Sciences, tom. xli., 2me série. (A. M. C.)

LEVIS, formerly Pointe Levi or Point Levis, the chief town of a county of the same name in Canada, on the other side of the St Lawrence from Quebec, with which it com- municates by a ferry. In the beginning of the present century Pointe Levi was a cluster of white houses, with a church and a number of large mills ; it has now become an important station on the Grand Trunk Railway, and in the extent of its river trade is surpassed by only a few places in the Dominion. , In 1881 the population was 7597.

LEVITES (09), or sons of Levi (22°23), are defined according to the usual methods of Hebrew genealogical history as the descendants of Levi, the third son of Jacob by Leah (Gen. xxix. 34).1 But in Hebrew genealogies we are not necessarily entitled to look upon the eponymus of a tribe as more than an ideal personality, and, without entering into the large question how far the patriarchal history may be held to furnish exceptions to this rule, it may be observed that the only narrative in which, on a literal interpretation, Levi appears as a person (Gen. xxxiv.) bears internal evidence of the intention of the author to delineate under the form of personification events in the history of the tribes of Levi and Simeon which must have taken place after the sojourn of Israel in Egypt.? The same events are alluded to in Gen. xlix. 5-7, where Simeon and Levi are plainly spoken of as communities with a communal assembly (Snp). They were allied tribes or brothers; their onslaught on the Shechemites was condemned by the rest of Israel; it took place before the Hebrews had passed from pastoral to settled life (ver. 5, "instruments of violence are their shepherds' staves") ; and its results were disastrous to the actors, when their cause was disavowed by their brethren. The Bné Hamor regained possession of Shechem, as we know from Judges ix., and both the assailing tribes were scattered through Israel, and failed to secure an independent territorial position. The details of this curious portion of the earliest Hebrew history must remain obscure; the narrative in Gen, xxxiv. does not really place them in so clear a light as the briefer reference in Gen. xlix.; for the former chapter has been recast and

largely added to by a late writer, who looks upon the action of the brethren in the light of the priestly legislation, and judges it much more favourably than is done in Gen. xlix. In post-canonicul Judaism the favourable view of the zeal of Levi and Simeon becomes still more dominant (Judith ix. 2 sqg.; B. Jubil., chap. xxx. ;

1 In Gen. xxix. 34 the name of Levi is connected with 93,

‘attach oneself to.” The form, however, is that of a gentile noun, and it is most probably a nisbeh from Leah, as suggested by Well- hausen. See also Stade in Z. f. ATlichc Wissenschaft, i. 115.

2 Jacob in verse 80 is not a personal but a collective idea, for he says, ‘‘I am a few men,” and the capture and total destruction of a considerable city is in the nature of things the work of two tribes rather than of two individuals,

and especially Theodotus, ap. Polyhistor, in Miiller’s Frag- menta, iii. 217 sq.), and the curse of Jacob on the ferocity of his sons is quite forgotten! In the oldest history, however, tle treachery of Levi and Simeon towards a com- munity which had received the right of connubium with Israel is represented as a crime, which imperilled the posi- tion of the Hebrews and was fatal to the future of the tribes directly involved.

But while the Levites were scattered throughout Israel their name does not disappear from the roll of the tribes. In the Blessing of Moses (Deut. xxxiii.), where Simeon 1s passed over, Levi still appears, not as a territorial tribe but as the collective name for the priesthood. The priesthood meant is that of the northern kingdom under the dynasty of Jehu, to which the chapter in question belongs ; and in fact we know that the priests of the important northern sanctuary of Dan traced their origin toa Levite (Jud. xvil. 9), Jonathan the son of Gershom, the son of Moses (Jud. xviii, 30).2 That the Judean priesthood were also known as Levites in the later times of the kingdom appears from the book of Deuteromony, especially from x. 8 sq., xvili. 1 sq. ; and we

learn from Ezek, xliv. 10 sg. that the Judean Levites were not confined to the service of the temple, but included the priests of the local high places abolished by Josiah. Alike in Judah and in the north the priestly prerogative of Levi was traced back to the days of Moses (Deut. x. 8, xxxill. 8); but in later times at least the Judzan priesthood did not acknowledge the Levitical status of their northern colleagues (1 Kings xii. 31). It must, however, be observed that the prophets Amos and Hosea never speak of the northern priesthood as illegitimate, and Hosea iv. certainly implies the opposite. Presumably it was only after the fall of Samaria, and the introduction of large foreign elements into the population of the north, that the southern priests began to disavow the ministers of the sanctuaries of Samaria, most of whom can no longer have been representatives of the old priesthood as it existed before the northern captivity (2 Kings xvii. 28, comp. Amos vii. 17, Jud. xviii, 30, 2 Kings xxiii. 20, in contrast with verses 8 sq.)

In the most developed form of the hierarchical system the ministers of the sanctuary are divided into two grades. All are regarded as Levites by descent, but the mass of the Levites are mere subordinate ministers not entitled to approach the altar or perform any strictly priestly function, and the true priesthood is confined to the descendants of Aaron. In the documents which reveal to us the actual state of the priesthood in the northern and southern kingdoms before the exile, there is no trace of this distinction. Every Levite isa priest, or at least is qualified to become such (Deut. x. 8. xviii. 7). The subordinate and menial offices of the tabernacle are not assigned to members of a holy guild; in Jerusalem at least they were mainly discharged by members of the royal body-guard (the Carians and footmen, 2 Kings xi. 4, Heb.), or by bond slaves, the ancestors of the later Nethinim,—in either case by men who might even be uncircumcised foreigners (Ezek. xliv. 7 sq.). A Levitical priest was a legitimate priest ; when the author of 1 Kings xii. 31 wishes to represent Jeroboam’s priests as illegal he contents himself with saying that they were not taken from the sons of Levi. The first

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1 According to Wellhausen's analysis (Jahrb. f. D. i 435 sq.), the old narrative consisted of a me te ie 19, 25*, 26*, 30, 81, the asterisk denoting that only parts of the verses inarked by it are ancient. The latest and most satisfactory discussion is that of Kuenen (Theol. Tijdsch., xiv. 257 sq.), in which the opposite view of Dillmann (Genesis, ad 1.) is fully refuted.

2 It is generally agreed that Moses (MWD) is the true reading. The later Jews corrected the name to Manasseh by inserting the letter 3, but did not venture to do so except above the line (720), so that the reading of the archetype can still be restored. '

baal Tes

historical trace of a modification of this state of things is

found in connexion with the suppression of the local high

places by Josiah, when their priests were brought to

Jerusalem and received their support from the temple

offerings, but were not permitted to minister at the altar

(2 Kings xxiii. 9). The priests of the temple, the sons of

Zadok, were not prepared to concede to their provincial

brethren all the privileges which Deut. xviii. had proposed

in compensation for the loss of their local ministry.

Ezekiel, after the fall of the temple, in planning a scheme

of ritual for the new temple, raises this practical exclusion

from the altar to the rank of a principle. In the new

temple the Levites who had ministered before the local

altars shall be punished by exclusion from proper priestly work, and shall fill the subordinate offices of the sanctuary

in place of the foreigners who had hitherto occupied them,

but shall not be permitted to pollute Jehovah's house in

future by their presence (Ezek. xliv. 7 sg.). After the exile

this principle was actually carried out ; priests and Levites

are distinguished in the list of the Jews who returned

under the decree of Cyrus (Ezra ii. ; Neh. vii.) ; but the. former, that is, the descendants of the pre-exilic priests of the royal temple, greatly outnumber the Levites or descend-

ants of the priests of the high places. At this time other classes of temple servants, tle singers, the porters, the

Nethinim or slaves of the sanctuary, and the children of

Solomon's slaves, whose hereditary service would, on Eastern

principles, give them a pre-eminence over other slaves of the sanctuary, are also still distinguished from the Levites ;

but these distinctions lost their significance when the word Levite itself came to mean a subordinate minister. In the time of Nehemiah, Levites and singers, Levites and porters,

are very much run into one (Neh. xi, xii, xiii.) and ultimately the absorption of the other classes of subordinate ministers into the hereditary guild of Levites is formally expressed in the shape of genealogies, deriving the singers,

and-even families whose heathenish and foreign names show them to have originally belonged to the Nethinim,

from the ancient stock of Levi.3

The new hierarchical system found its legal basis in the Pentateuch, or rather in the so-called priestly legislation, first publicly accepted as an integral part of the Torah under Ezra and Nehemiah. Here the exclusion of the Levites from all share in the proper priesthood of the sons of Aaron is precisely formulated (Num. iii. sg.); their service is regulated from the point of view that they are essentially the servants and hereditary serfs of the priests (ili. 9), while, on the other hand, they are recognized as possessing a higher grade of holiness than the mass of the people, and are endowed with the tithes, of which in turn they pay a tithe to the priests (Num. xviii. 21 sq.). These regulations as to tithes were enforced by Nehemiah ; but the subordinate position of the Levites was hardly consistent with their permanent enjoyment of revenues of such importance, and we learn from the Talmud that they were finally transferred to the priests. Another provision of the law, viz., the assignation to the Levites of certain cities with a definite measure of inalienable pasture ground (Num. xxxv. ; Lev. xxv. 34), was apparently never put in force after the exile.

As the priestly legislation carried its ordinances back into the time of Moses (see PENTATEUCH), so the later developments of the Levitical service as they existed in the time of the Chronicler about the close of the 4th century

3 See the details, and the proof that the later Levites included men

whose actual ancestry belonged to other tribes, in Ewald's Geschichte, iii. 3 Wellhausen, Geschichte, i. 152, 229; Graf in Merx's Archiv,

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Ri See Mishna, Maaser Sheni, chap. v. end, and the Jerusalem Gemara (iii. 259 of Schwab's translation); Yebamoth, f. 86a; Carpzov, App. ad Godw., p. 624; and Hottinger, De Dec., vi. 8, ix. 17.

B.c. are referred by that author to David (1 Chron. xv., xvi., xxiii.) or to Hezekiah (2 Chron. xxix.) and Josiah (2 Chron. xxxv.). The chief

point is the development of the musical service of tle temple, which has no place in the Pentateuch, but afterwards came to be of the first import- ance, as we see from the Psalter, and attracted the special ‘attention of Greek observers (Theophrastus, ap. Porph., De Abstin., ii. 26).

While it is not difficult to trace the history of the Levites from the time of the Blessing of Moses and Deutcronomy downwards, the links connecting the priestly tribe with the earlier fortunes of the tribe of Ecvi are hardly to be determined with any certainty.

According to the traditional view the scheme of the Levitical legislation, with its double hierarchy of priests and Levites, is of Mosaic ordinance. But there are many proofs that in the Pen- tateuch, as we possess it, divergent ordinances, dating from very different ages, are all carried back by means of a legal convention to the time of the wilderness journey. And, if the complete hier- archical theory as it existed after the exile was really the work of Moses, it is inexplicable that all trace of it was so completely lost in the time of the monarchy, that Ezekiel speaks of the degradation of the non-Zadokite Levites as a new thing and as a punishment for their share in the sin of the high places, and that no clear evidence of the existence of a distinction between priests and Levites has been found in any Hebrew writing demonstrably earlier than the exile! It is indced argued that the narrative of the rebellion of Korah, and the list of Levitical cities in Josh. xxi., imply that the precepts of the post-exile law were practically recognized by Moses and Joshua; but it is certain that the distribution spoken of in Josh. xxi. did not take place at the time of the conquest, because many of the cities named were either not occupied by the Hebrews till long afterwards, or, if conquered, were not held by Levites. The Levitical cities of Joshua are indeed largely identical with ancient holy cities (Hebron, Shechem, Mahanaim, &c.); but in ancicnt Israel a holy city was one which possessed a noted sanctuary (often of Canaanite origin), uot one the inhabitants of which belonged to the holy tribe. These sanctuaries had of course their local priest- hoods, which in the time of the monarchy were all called Levitical ; and it is only in this sense, not in that of the priestly legislation, that a town like

Shechem can ever lave been Levitical. So again the narrative of Korah proves on critical examination to be of com- posite origin ; the parts of it which represent Korah as a common Levite in rebellion against the priesthood of Aaron belong to a late date, and the original form of the history knows nothing of the later hierarchical system.?

We are thus compelled to give up the idea of carrying back the distinction of Levites and Aaronites in the later sense to the time of Moses, and are excluded from using the priestly parts of the Pentateuch and Joshua as a source for the earliest history of the tribe. It still, however, remains certain that under the monarchy the priestly consccration of Levi was referred to the time of Moses, who was himself a member of the tribe, and in Deut. x. 8 the functions of Levi are specially connected with the Mosaic sanctuary of the ark. Now we know from 1 San. ii. 27 sq. that the priests of the ark in the period of the Judges claimed descent froin the family of Moses ; and the case of Micah's Levite shows that a descendant of Moscs was regarded as a peculiarly fit priest. The whole evidence conspires to show that from the time of Moses downward his kin had a certain hereditary prerogative in connexion with the worship of Jehovah. In the earliest times the ritual of Jehovah's sanctuary had not attained such a development as to occupy a whole tribe ; but if, as appears probable, the mass of the tribe of Levi was almost annihilated in the first age after Moses, the name of Levite might very well continue to be known only in connexion with those of the tribe who traced kin with Moses or remained by the sanctuary. The multiplication of Hebrew holy places was effected partly by syncretism with the Canaanites, partly nl other ways that had nothing to do with the Mosaic sanctuary, and so a variety of priestly guilds arose which certainly cannot have been all of Levitical desccnt. But, as the nation was consolidated and a uniform system of sacred law, referred to Moses as its originator, came to be administered all over the land, in the hands of the ministers of the greater sanctuaries, the various guilds must

1 The recent defence of the traditional view by 8. I. Curtiss (The Levitical Priests, 1877) still seeks such evidence in 1 Kings viii. 4, But there are many evidences that the text of this part of Kings has

undergone considerable editing at a pretty late date. The LXX. translators did not read the clause which speaks of ‘‘ priests and Levites,” and the Chronicler read ‘‘ the Levite priests,”—the phrase characteristic of the Deuteronomic identification of priestly and Levitical ministry.

2 See the latest researches of Kuenen, Theol. Tijdsch., xii. 159 sg., where other recent discussions of the chapter are cited and examined,

have been drawn together and have aimed at forming such a united body as we find described in Dent. xxxiii.; and this unity would find a natural expression in the extension of the name of Levites to all priesthoods recognized by the state. If this was the course of things we can hardly supposc that the term came into large use till the Israelites were consolidated undcr the monarchy, and in fact the integrity of the text in 1 Sam. vi. 15,2 Sam. xv. 24, as well as 1 Kings viii. 4, is open to question. Up to the time of David and Jeroboam, as appears from the cases of Samuel, Zadok, Eleazar (1 Sam. vii. 1), and the sous of David (2 Sam. viii. 18), as well as from 1 Kings xii. 31, the priesthood was not essentially hereditary; but, like all occupations that required traditional know- ledge, it must have tended to become more and more so, so that all priests would appear as Levites by adoption if not by descent. Wellhausen (Gesch., i. 189) has argued from Deut. xxxiii. 9 that the northern priesthood was notan hereditary guild, but involved the surrender of all family connexion; the words, however, are more naturally understood as praise of the judicial impartiality which refused to be influenced by family ties. Our data are too scanty to clear up the details of this interesting piece of history ; but it can hardly be doubted that the development of a consolidated and hereditary pricstly corporation in all the sanctuaries was closcly bound up with the unification of the state and the absorption of tribal organization inthe monarchy. ‘The reaction of tribal feeling against the central government, of which there arc many traces iu the history of Ephraim, has perhaps its counterpart in the opposi- tion to the unified priesthood which is alluded to in Deut. xxxiii. 11.

There have been many attempts on the part of recent writers from the time of Vatke downwards to deny that Levi was one of the original tribes of Israel, but they all break down before the testi- mony of Gen. xlix. See especially Kuenen's refutation of the theory of Land, Theol. Tijdsch., 1872, p. 628 sq.; and for the latest aspects of the whole subject Graf in Merx's Archiv, vol. i. (1869), " Zur Geschichte des Stammes Levi"; Wellhausen, Gecsch., i. p. 123 sg. ; Stade, Gesch. d. V. Isracls, p. 152 sq. (W. BR. S.)

LEVITICUS. See Penrateucu.

LEW-CHEW ISLANDS. The Lew-chew, Loochoo, Liu Kiu, or Riu Kiu Islands® include, in the wider applica- tion of the name, the whole series extending in a north- east and south-west direction from the southern end of Kiushiu in Japan proper to the north-east of Formosa. Within the northern group lies the intersection of 130° E. long. and 30° N. lat. ; and in the southern group that of 125° E. long. and 25° N. lat. The islands, however, to the north of 29° are not unfrequently considered, by Europeans as well as Japanese, to belong in part to Japan proper, and in part to constitute the separate group of tle Linschotens, Shichi-to, or Cecille Archipelago.

The following, according to Docderlein, are the recognized sub-divisions and areas of the whole archipelago:—(1) Zhe Northern Islands (attached to Satsuma or Kiushiu Osumi, 398 square miles): Tanega (189 square miles), Make, Yakuno (172 square miles), Take, Yuo or Iwoga, Kuro, Kose or Kowose, and Kuchino-Erabu or Nagarobe ; (2) Shichi-to (43 square miles): Kuchino, Gaza or Yebi, Naka-no (the largest, 13 squarc miles), Hira or Fira, Suwase, Akuseki, Takara, and Yoko ; (3) Hokuwbu-Shoto (515 square miles): Oshima (302 square miles), Kageruma or Katona (40 square miles), Yoro, Uke or Uru, Kitai, Tokono or Kakirouma (92 square miles), Naka Erabu, and Yoron or Yori; (4) Chubu-Shoto (592 square miles): Tori or Iwo, Eheya or Tebeya, Isona, Iye, Awakuni or Agunyeh, Tonashi, Kume, Kerama or Amakirima, and Okinawa (520 square miles) ; (5) Nambu-Shoto or the Meiakoshima Group (315 square miles): Miyako or Ty-pin-san (57 square miles), Misuna and Taraina, Ishigaki or Pat-chung-

san (104 square miles), Taketoma or Robertson Island, Ohaina or Kubah, Kuro or Baugh, Iriomoto Nishiomoto or Koo-Kien-San, Aragusuku or Chung-chi, Hateruma or Hasyokan, Yonakuni or Kumi.

The area of the Lew-chews proper is thus 1423 square miles, that of the whole chain 1864 square miles. The largest islands are Okinawa (often called Great Lew-chew) and Oshima, the former being also the political centre of the whole archipelago. The Lew-chews consist in the main of crystalline rocks—gneiss, hornblende, and granite — upheaved at a very remote date, and only partially covered by severely weathered sedimentary strata seldom left in their original horizontal position. Coralline lime- stone is found in great abundance even on the tops of the hills, and the coasts are often fringed by coral reefs. In

- ° . . 9 oe 3 See a curious history of the name in Li Ting Yuen's J ournal.

Okinawa a soft argillaceous rock occupies a large part of the surface. Though the existence of Sulphur Island with its smoking crater towards the north-west shows that volcanic activity is still going on at no great distance, the main islands at least seem to bear no trace of recent subterranean disturbance. Their surface is very irregular: Okinawa consists for the most part of a succession of rounded swelling hills, 300 to 500 feet in height, broken towards the centre by more precipitous crags, and Oshima may be best described as a cluster of steep mountains reaching in Yowangatake a height of about 2100 feet. Of the many streams a few attain considerable dimensions, and serve to carry the timber from the highlands; and all round the coasts are excellent harbours. The mildness and humidity of climate, which is the natural consequence of the geographical position of the archipelago, is further enhanced by the neighbourhood of the Kuro-Siwo or Pacific gulf-stream. Snow never falls on the tops even of the highest hills; but at the same time even in summer the heat is seldom extreme. Three days seldom pass without rain ; sudden downpours are not unfrequent,

and wet weather often lasts for several days on end. The boundary between the Paleoarctic and Oriental regions passes to the north of Oshima, which is the northern limit of many southern forms at once of vegetable and animal life both on land and sea. Sago trees and other Cycadacez, banyans, and pine trees (resembling the cedar of Lebanon) are abundant, and the natives, who succeed well both as farmers and as gardeners, grow wheat, rice, bananas, tarro (Colocasia), sweet potatoes, maize, millet, sugar-cane, egg- plants, &c. There is a small but excellent breed of cattle

(usually black); and ponies, pigs, goats,and poultry are kept.

Part of the population of the northern Lew-chews is evidently Japanese, but the aboriginal and prepouderating element is of quite another type, in some points similar to the Ainos. The striking features, aceording to Doederlein, are a comparatively narrow face ending.in a pointed chin, large European-looking eyes, thin lips, thin and rather convex nose, strongly developed beard, and a luxuriant growth of hair over breast, arms, and legs. The women are (or were, for the practice is forbidden by the Japanese) accus- tomed to tattoo the back of the hands with’a special pattern in a dark blue eolour. Though closely allied to J apanese, the native language isa genuinely independent form, containing obsolete words only found in the ancient monuments of Japanese literature, and showing the greatest resemblance to the Satsuma dialect, The use of Japanese and Chinese by the learned has prevented it being used for literary purposes ; and the version of the Bible prepared by the missionary Dr Bettelheim (sent out in 1845) is really in Japanese. There was neither printing press nor bookshop in the islands as late as 1876 (see G. W. Aston in Church Miss. Intell, 1879). The lowest class of the population have neither civil rights nor personal freedom ; next in order come the peasants, who rent the land from the Government ; and above all are the literati or governing class, Rank is indieated by various syinbols, partieularly by the kind of inetal of which the hair-pins are made, and by the colour of the robes and jead-dress. Confucianism and Buddhism seem to have had considerable influenee on the upper elasses at least in Okinawa; in Oshima there is neither temple nor priest, and the people say they pray

to no god. The sole objects of worship (if worship it be) are the manes of one's immediate ancestors. To the dead great respeet 1s shown in both islands,—the wealthier people building on the hillsides large and handseme tombs, which from a distance look like dwelling-houses. The body is buried in a coffin ina sitting posture, and after seven years the bones are colleeted and placed in an urn,

The population of Okinawa was estimated by the Ameri expedition at from 150,000 to 200,000. Weeden was 'nietietl by the offieials that Amami Oshima contained 50,000 souls, but thinks 30,000 a more probable conjeeture, Besides Napa or N apa- Kiang the eapital, and Shui the royal residenee, there are some thirty-six towns in Okinawa, with about 6000 inhabitants each ; in the other island Nase the chief town (comprising Itsubemura and Kanekumura) has not more than 2000, and only five or six of the other villages exceed 500.

Though Captain Broughton visited Napa in 1797, it was not till the Alceste and Lyra cxpedition in 1816-17 that detailed infor- mation about the Lew-chews was obtained. The people at that time showed a curious mixture of courtesy and shyness. Her British Majesty's ship "Sphinx" visited Okinawa in 1852 ; and

the American expedition under Commodore Perry (1852-54) added very largely to our knowledge of the island, and eoneluded a treaty of friendship with its Government, seeuring for the United States the right of using Tamui near Napa as a eoaling depot.

Theen-sun, "Grandson of Heaven," is the mythical founder of the Lew-ehew monarehy. Towards the close of the 12th eentury, his descendants were driven from the throne by a usurper Le-yung; but the old national party soon found a victorious leader in' Sun- thien-ong son of Tametomo, a member of the famous Yoritomo family, who, having been expelled from Japan, had come to Lew-ehew and married the youngest sister of Ansoo, governor of Oho-prto, The introduction of the arts of reading and writing are assigned to Sun-thien-ong's reign. Chinese invasions of Lew-ehew may be traced baek to the 6th

century, but they did not result in annex- ation ; andit was Hung-woo, the founder of the Ming dynasty, who first in 1395 obtained from the Lew-chew ruler recognition of Chinese supremacy. The earliest notice of intercourse with J apan belongs to the year 1441, when a voluntary gift of copper money (at that time extremely scarce in Japan) was made by the Lew-chewans to the tenno Go-Hanazono; but for a long time afterwards the relations of the two powers eontinued to be of the friendliest de- scription. In the beginning of the 17th century the Lew-chew minister Yaua, anxious to gain favour with the Chinese Govern- ment, persuaded his king to break off all connexion with Japan, and when the prince of Satsuma sent to remonstrate against this course of conduct his envoys werc maltreated. For this insult the prince exacted signal vengeance. With the pemnission of his liege lord he invaded the islands with 8000 men, took the capital by storm, and captured the king and earried him off to Kagoshima. A few years later the unfortunate Seang-leng was restored to his throne, but only on condition that he and his successors should re- ceive reinvestiture on the accession of each new shogun, and that each _ new king of Lew-chew should send an embassy to Yedo, The Lew-chewans nevertheless continued to pay tribute to China, and Chinese commissioners were despatched to attend the installation of their kings. Particular interest in the islands was displayed by the emperor Kang-hi, whose memory is still cherished by the natives as that of a great benefactor; he built them a temple in honour of Confucius, founded a Chinese sehool, and, when they were in great distress through hurricanes, plague, and famine, contributed liberally for their retief. Su-pao-Koang, from whose report was derived the first information about the islands which found its way to Europe, was Kang-hi’s commissioner in the year 1719. When in 1859 the house of Seang became extinct in the direct line, Sho-tai, a descendant of Satto, governor of Urasoyé, was called to the throne. On the establishment of the imperial anthority of the mikado he received the title of sovereign prince of Lew-chew ; but at the same time his territory was deelared first a han or feudal dependency and afterwards a ken or province of the oy monarchy. In 1878, according to a custom with which the lords of Satsuma had not in- terfered, the people of Lew-chew sent to pay their biennial tribute to China. This was forbidden by the set ; and it was in vain that they urged—“ For five

hundred years China has protected us: we regard China as our father, and Japan as our mother." The Japanese Government insisted on its exclusive rights, and undertook to scttle the difficulty with China. Its claims were formally recognized by the treaty of Peking in 1874, and the islands are treatcd as an integral part of the empire.

See Gaubil's extraets from Su-pao-Koang in Leftres édifiantes," yol. xxiii; Klaproth in Mémoires rel. & Aste, vol. ii.; Mervey de Saint Denys's translation of Ma-twan-lin's Encyclopedia; Basil Hall, Voy. of Dis. to the West Coast of Corea and the Great Loochoo Island, London, 1818; John M'Leod, Voy. of I.M.S. "'Alceste,"' London, 1819; George Smith (bishop of Vietoria), Lew-chew and the Leu-chewans, London, 1853; Halloran, Wae Yang Jin—Eight Months' Journal, &c., London, 1856; Commodore Perry's Narrative, New York, 1856 (a most import- ant work) ; E. W. Satow, " Notes on Loo-ehoo," in The Pheniz (a monthly maga- zine for India, é&e.), vol. iii., London, 1872-78; J. J. Hoffmann in Bijdragen tot de Lf. L, en V. Kunde van Ned. Ind.; L. Serrurier, " De Lioe-Kioe Arehipel," in Tijdschr, v. het Aardrijksk, Gen. te Amsterdam, 1880 (containing extraets from the Japanese sketeh of the geography of Japan, published in 1878 by the minister of war); Wells Williams's epitome of " Shi Liu-Kiu-Ki,—Journal of an Envoy to Lew-ehew by Li Ting Yuen, 1803," in Proc. of Roy. As. Soc., North China Branch, 1871; Henry Brunton, 'Visit to Okinawa," in Japan Mail, January 22, 1876; Tournafond, "Les isles Loutsehou," in Z'£xploration, 1880; A. y. Kléden in Petermann's Miftheil., 1880; Doederlein, " Die Liu-Kiu-Insel Amami Oshima," in AMittheil. d. deut. Ges. f. Natur- und Vélkerk, Ostasiens, Yokohama, 1881.

LEWES, a market-town and parliamentary borough, and the county town of Sussex, England, is situated on the river Ouse, at the junction of a number of railway lines, 50 miles south of London, and 7 north of Newhaven, which is its port. It occupies the slope of one of the chalk hills, and consists principally of one main street with smaller and narrower ones at right angles, St Michael's church, restored in 1878, is without architectural merit, but possesses some old brasses and

monuments ; St Anne’s church is a very ancient structure in the Early English style ; St Thomas at-Cliffe, in the Perpendicular style, was

erected in the 15th century ; St John’s, Southover, is of mixed architecture, but preserves some specimens of Early Norman. There are only slight remains of the old castle, occupying a picturesque situation on the height, and supposed to have been founded by Alfred and rebuilt by William de Warren. In the grounds of the old Cluniac priory of St Pancras, founded in 1078, the leaden coffins of William de Warren and Gundrada were dug up during an excavation in 1845. There is a free grammar school dating from 1512, and among the other public buildings are the county-hall, the prison, and the Fitzroy memorial library. The industries include the manufacture of agricultural implements, brewing, tanning, and iron and brass founding. The population of the urban sanitary district in 1871 was 6010, and in 1881 it was 6017, the population of the parliamentary borough (area 1087 acres) in the same years being 10,753 and 11,199. Lewes was incorporated by royal charter in 1881.

From various discoveries that have been made of Roman coins, and the traces that still remain of old mounds and tumuli, the town is believed to be of very ancient origin. It was a royal demesne of the South Saxon kings. Mints were established at it by Athelstan, which were in operation till the reign of Harold. At the battle of Lewes, May 18, 1264, Simon de Montfort defeated Henry III. From the time of Edward I. until 1868 the town returned two members to parliament, but now it returns only one.

See, besides the historics of Sussex, Horsfield, History of Lewes, 2.

vols., 1824-27, and several interesting papers in the Sussex A7chexo-logieal Collection.

LEWES, Grorce Henry (1817-1878), a prolific and versatile writer, born in London in 1817, was a grand- son of Charles Lee Lewes, a comedian who had a con- siderable reputation in his day. He was

educated in London, Jersey, and Brittany, and began active life by attempting business and afterwards medicine. Later he appears to have had serious thoughts of making the stage his profession. He finally fixed his choice on a literary career. His early writings belong mainly to the lighter departments of letters. He contributed a large number of critical studies to the leading quarterly and other reviews. These discuss a wide variety of subject, and, though often

characterized by hasty impulse and imperfect study, betray |

a singularly acute critical judgment, which has been enlightened by philosophic study. Of these critical writ- ings the most valuable are those on the drama, which were afterwards republished under the title Actors and Acting (1875). With this may be taken the volume on Zhe Spanish Drama (1846). The combination of wide scholar- ship, philosophic culture, and practical acquaintance with the theatre gives these essays a high place among the best efforts in English dramatic criticism. In 1845-1846 he published Zhe Biographical History of Philosophy, an attempt to depict the life of philosophers as an ever-renewed fruitless labour to attain the unattainable. In 1847-1848 he made two attempts in the field of fiction— Ranthrope, and Lose, Blanche, and Violet—which, though displaying considerable skill both in plot, construction, and in characterization, have taken no permanent place in literature. The same is to be said of an ingenious attempt to rehabilitate Robespierre (1849). The culmination of

the author’s work in prose literature is the Life of Goethe |

(1855), probably the best known of his writings. Lewes’s many-sidedness of mind, aud his combination of scientific with literary tastes, enlinently fitted him to appreciate the

large nature and the wide-ranging activity of the German |

poet. The high position this work has taken in Germany itself, notwithstanding the boldness of its criticism and the

to have always manifested a distinctly scientific bent in his writings, and his closer devotion to science was but the following out of early impulses. Considering the author's want of the usual course of technical training, these studies are a remarkable testimony to the penetration of his intel- lect. The most important of these essays are collected in the volumes Seaside Studies (1858), Physiology of Com- mon Lrfe (1859), Studies in Animal Life (1862), and Aristotle, a Chapter from the History of Science (1864). They are much more than popular expositions of accepted scientific truths. They contain able criticisms of authorized ideas, and embody the results of individual research and individual reflexion. He struck out a number of impressive suggestions, some of which have since been accepted by physiologists at home and abroad. Of these the most valuable is that now known as the doctrine of the functional indifference of the nerves —that what are known as the specific energies of the optic, auditory, and other nerves are simply differences in their mode of action due to the differences of the peripheral structures or sense-organs with which they are connected. This idea has since been inde- pendently arrived at by Wuudt (Physiologische Psychologie, 2d ed.,p 321). In 1865, on the starting of the Fortnightly Teview, Lewes became its editor, but he retained the post for less than two years. This date marks the transition from more strictly scientific to philosophic work. He had from early youth cherished a strong liking for philosophic studies ; one of his earliest essays was an appreciative account of Hegel's Wsthetics. Coming under the influence of positivism as unfolded both in Comte's own works and in J. S. Mill's System of Logic, he abandoned all faith in the possibility of metaphysic, and recorded this abandon- ment in the above-mentioned History of Philosophy. Yet he did not at any time give an unqualified adhesion to Comte's teaching, and with wider reading and reflexion his mind moved away further from the positivist's stand- point. In the preface to the third edition of his History of Philosophy he avowed a change in this direction, and this movement is still more plainly discernible in subse- quent editions of the work. 'The final outcome of this intellectual progress is given to us in Zhe Problems of Life and Mind, which may be regarded as the crowning work of his life. His sudden death in 1878 cut short the work, yet it is complete enough to allow us to judge of the author's

matured conceptions on biological, psychological, and metaphysical problems.

The first two volumes on Z'he Foundations of a Creed lay down what he regarded as the true principles of philosophizing. He here seeks to effect a rapprochement between metaphysic and science. He is still so far a positivist as to pronounce all inquiry into the ultimate nature of things fruitless. What matter, form, spirit are in themselves is a futile question that belongs to the sterile region of ''metempirics." But philosophical questions may be so stated as to be susceptible of a precise solution by scientific method. Thus, since the relation of subject to object falls within our experience, it is a proper matter for philosophic investigation. It may be ques- tioned whether Lewes is right in thus identifying the methods of science and philosophy. Philosophy is not a mere extension of scientific knowledge ; it is an investigation of the nature and validity of the knowing process itself. In any case Lewes cannot be said to have done much to aid in the scttlement of properly philosophical questions. His whole treatment of the question of the relation of subject to object is vitiated by a confusion between the scientific truth that mind and body coexist in the living organ- ism and the philosophic truth that all knowledge of objects implies a knowing subject. In other words, to use Mr Shadworth Hodg- son's phrase, he mixes up the question of the genesis of mental

| forms with the question of their natwre (see Philosophy of Reflex-

unpopularity of some of its views (e.g., on the relation of | the second to the first part of Faust), is a sufficient testi- |

mony to its general excellence. writings show that he was occupying himself with scientific

From about 1853 Lewes's —

ton, vol. ii. pp. 40-58). Thus he reaches the ''monistic" doctrine that mind and matter are two aspects of the same existence by attending simply to the parallelism between psychical and physical processes

given as a fact (or a probable fact) of our experience, and by leaving out of account their relation as subject and object in the cognitive act. His identification of the two as phases of one ex-

and more particularly biological work. He may be said ! istence is open to ériticistn, not only from the point of view of

philosophy, but from that of science. In his treatment of such ideas as ‘‘ sensibility,” ‘‘ sentience,” and the like, he does not always show whether he is speaking of physical or of psychical phenomena. Among the other properly philosophic questions discussed in these two volumes the nature of the causal relation is perhaps the one which is handled with most freshness and suggestiveness. The third volume, Zhe Physical Basis of Mind, further develops the writer’s views on organic activities as a whole. He insists strongly ou the radical distinction between organic and inorganic processes, and on the impossibility of ever explaining the former by purely mechanical principles. With respect to the nervous system, he holds that all its parts have one and the same elementary property, namely, sensibility. ‘Thus sensibility belougs as much to the lower centres of the spinal cord as to the brain, contributing in this more elementary form elements to the ‘‘subconscious ” region of mental life. The higher functions of the nervous system, which make up our conscious mental life, are merely more complex modifications of this fundamental property of nerve substance. Closely related to this doctrine is the view that the nervous organ- ism acts as a whole, that particular mental operations cannot be referred to definitely circumscribed regions of the brain, and that the hypothesis of nervous activity passing in the centre by an iso- lated pathway from one nerve-cell to another is altogether illusory. By insisting on the complete coincidence between the regious of nerve-action and sentience, and by holding that these are but differ- ent aspects of ‘one thing, he is able to attack the doctrine of ani- mal and human automatism, which affirms that feeling or con- sciousness is merely an incidental concomitant of nerve-action, and in no way essential to the chain of physical events, Lewes’s views in psychology,

partly opened up in the earlier volumes of the Problems, are more fully worked out in the last two volumes (3d series). He discusses the method of psychology with much insight. He claims against Comte and his followers a place for introspection in psychological research. In addition to this subjective method there must be an objective, which consists partly in a reference to nervous conditions, and partly in the employment of sociological and historical data. Biological knowledge, or a consideration of the organic conditions, would only help ns to explain mental Junctions, as feeling and thinking; it would not assist us to under- stand differences of mental faculty as manifested in different races and stages of human development. The organic conditions of these differences will probably for ever escape detection. Hence they can be explained only as the products of the social environment. This idea of dealing with mental phenomena in their relation to social and historical conditions is probably Lewes's most important con- tribution to psychology. Among other points which he emphasizes is the eee of inental phenomena. Every mental state is regarded as compounded of three factors in different proportions— naniely, a process of sensible affection, of logical grouping, and of motor impulse, But Lewes's work in psychology consists less in any definite discoveries than in the inculcation of a sound and just method, His biological training prepared him to view mind as a complex unity, in which the various functions interact one on the other, and of which the highest processes are identical with and evolved out of the lower. Thus the operations of thought, or ‘‘ the logic of signs," are merely a more complicated form of the elemen- tary operations of sensation aud instinct, or ‘‘ the logic of feeling." The whole of the last volume of the Problems may be said to be an illustration of this position. It is a valuable repository of psycho- logical facts, many of them drawn from the more obscure regions of mental life and from abnormal experience, and is throughout sug- gestive and stimulating. To suggest, and to stinulate the mind, rather than to supply it with any complete system of knowledge, may be said to be Lewes's service in philosophy. The exceptional rapidity and versatility of his intelligence seems to account at once for the freshness in his way of envisaging the subject-matter of

philosophy and psychology, and for the want of satisfactory elaboration and of systematic co-ordination. (J. 8.)

LEWIS ann HARRIS form together an island of the Outer Hebrides, nearly separated into two parts by the inlets of Loch Reasort and Seaforth,—the northern part, Lewis or the Lews, being in Ross-shire, and the southern part, Harris, in Inverness, The island is situated about 30 miles from the mainland, between 57° 40’ and 58° 39’ N. lat., and 6° and 7° W. long. Its length is 60 miles, the average breadth 15, and the extreme breadth 30. The area is 770 square miles, of which 575 are comprised in Lewis. The greater part of the surface is composed of gneiss rocks, which in Ben More attain a height of 1750 feet, but there is also a large breadth of peat and swamp, with remains of an ancient forest. The coast is much indented by bays. The climate is very moist and un- suitable for tillage. Agriculture is in a backward condi-

tion, but much has been done in draining, reclamation, and planting of trees by the late proprietor of Lewis, Sir James Matheson. Barley and potatoes are the principal crops, and a large number of black cattle are reared. Kelp making is also carried on, but one of the chief supports of the inhabitants is fishing, Stornoway being the largest station for the herring fishing in Scotland, and employing over 1000 boats with nearly 4000 men and boys. The town was made a burgh of barony by James VI. It has a commodious harbour with a patent slip suitable for vessels of 1000 tons. On a height overlooking the bay is the beautiful residence of the proprietor of the island. The most remarkable archeological remains in Lewis are the druidical stones of the temple of Callernish. There are also a large number of old obelisks, aud at Mealista in Uig the remains of an old monastery. Six miles from Stornoway there is a huge cave covered with stalactites. See HEBRIDES.

LEWIS, Sir Grorce CornEWALL, Barr. (1806-1863), statesman and man of letters, was born in London on 21st April 1806. His father, Thomas F, Lewis of Harpton Court, Radnorshire, after holding subordinate office in various administrations became a poor-law

commissioner. He was made a baronet in 1846. Lewis was educated at Eton, and at Christ Church, Oxford, where in 1828 he took a first-class in classics and a second-class in mathe- matics. He then entered the Middle Temple, and was called to the bar in 1831. In the year before he had, with John Romilly and John Stuart Mill, attended the celebrated lectures on jurisprudence delivered by John Austin at London University. In 1832 he undertook his first public work as one of the commissioners to inquire into the condition of the poor Irish residents in the United Kingdom. Again, in 1834, Lord Althorp included him in the commission to inquire into the state of church property and church affairs generally in Ireland. To this fact we owe his work on Local Disturbances in Ireland, and the Irish Church Question (London, 1836), in which he condemned the existing connexion between churcli and state, proposed a state provision for the Catholic clergy, and maintained the necessity of an efficient workhouse organization. During this period of appren- ticeship to politics Lewis's mind was much occupied with the phenomena of language. Before leaving college he had published some observations on Whately's doctrine of the predicables, and soon afterwards he assisted Thirlwall and Hare in starting the Phzlological Museum. Its suc- cessor, the Classical Museum, he also supported by occasional contributions. In 1835 he published an Zssay on the Origin and Formation of the Romance Languages (re-edited in 1862), which, though anticipated by Schlegel, may be taken as the first effective criticism in England of Raynouard's theory of a uniform romance tongue, represented by the poetry of the troubadours. He also set an excellent example to county gentlemen by compiling a glossary of provincial words used in Herefordshire and the adjoiniug counties. But the most important work of this earlier period was one to which his logical and philo- logical tastes both contributed. The Remarks on the Use and Abuse of some Political Terms (London, 1832) may have been suggested by Bentham's Book of Parliamentary Fallacies, but it shows all that power of clear sober original thinking which marks his larger and later political works. And yet this original mind did more than most scholars in the humbler walk of useful translation. He translated Boeckh's Public Economy of Athens and Miiller's History

of Greek Literature, and he assisted Tufnell in the trans- 1a lh steel cl genet… eel

1 See the Adstract of Final Report of Commissioners of Irish Poor Enquiry, &e., by G. C. Lewis and N. Senior, 1837.

lation of Miiller's Dorians. Some time afterwards he edited a text of the Mables of Babrius. While his friend Hayward conducted the Law Magazine, he wrote in it frequently on such subjects as secondary punishments and the penitentiary system. In 1836, at the request of Lord Glenelg, he accompanied John Austin to Malta, where they spent nearly two years reporting on the condition of the island and framing a new code of laws. One leading object of both commissioners was to associate the Maltese in the responsible government of the dependency, On his return to England Lewis succeeded his father as one of the principal poor-law commissioners. But his literary activity did not cease. In 1841 appeared the Lssay on the Government of Dependencies, a systematic statement and discussion of tlie various relations in which colonies may stand towards the mother country. In 1844 Lewis married Lady Maria Theresa Lister, sister of Lord Clarendon, and a lady of literary tastes. Much of their married life was spent in Kent House, Knightsbridge. They had no children. In 1817 Lewis resigned his office. He was then returned for the county of Hereford, and Lord John Russell appointed him secretary to the Board of Control, but a few months afterwards he became under secretary to the Home Office. In this capacity he introduced two important bills, one for the abolition of turnpike trusts and the management of highways by a mixed county board, the other for the purpose of defining and regulating the law of parochial assessment. On the latter subject his evidence before the select committee (Lords) of 1850 is the clearest statement of general results which we have. In that year he succeeded Hayter as financial secretary to the Treasury. About this time, also, appeared his Essay on the Influence of Authority in Matters of Opinion. Lewis seems to have thought that authority was too much divided to be of much use in theological matters, while in the world of

science he found sufficient authority for declaring that homeopathy, mesmerism, and phrenology were all impostures, On the dissolution of parliament which followed the resignation of Lord John Russell's ministry in 1852, Lewis was defeated for Herefordshire and then for Peterborough, Excluded from parliament he accepted the editorship of the Edinburgh Review, which the death of Empson had left vacant. Lord Halifax offered him, in 1853, the governorship of Bombay, but he remained editor until 1855. During this period he did some public work on the Oxford commission, and on the commission to inquire into the government of London. But its chief fruits were the Z''reatise on the Methods of Observation and Reasoning in Politics, and the Lnquiry into the Credibility of the Karly Roman History, in whicli he vigorously attacks the theory of epic lays and other theories on which Niebubr's reconstruction of that history had proceeded. In 1855 Lewis succeeded his father in the baronetcy. He was at once elected member for the Radnor boroughs, and Lord Palmerston made him chancellor of the exclicquer. The position was difficult, for he had a war loan to contract and heavy additional taxation to impose. But his industry, method, and clear vision carried him safely through. His financial statement of 13th February 1857, and his speech on 12th February 1858 on the bill for the better government of India were most successful efforts. After the change of ministry in 1859 Sir George became home secretary under Lord Palmerston, and in 1861, much against his wish, he succeeded Sidney Herbert (Lord Herbert of Lea) at the War Office. The closing years of his life were marked by increasing intellectual vigour. In 1859 he published an able Zssay on Foreign Jurisdiction and the Extradition of Criminals, a subject to which the attempt on Napoleon's

1 Translated into German by Liebrecht, Hanover, 1858.

life, the discussions on the Conspiracy Bill, and the trial of Bernard, had drawn general attention. He advocated the extension of extradition treaties, and condemned thie principal idea of Weltrechtsordnung which Mohl of Heidel- berg had proposed. His two latest works were

the Survey of the Astronomy of the Ancients, in which, without professing any knowledge of Oriental languages, he applies a sceptical analysis to the ambitious Egyptology of Bunsen ; and the Dialogue on the Best Form of Government, in which, under the name of Crito, the author points out to the supporters of the various systems that there is no one abstract government which is the best possible for all times and places. An essay on the Characteristics of Federal, National, Provincial, and Municipal Government does not seem to have been published. Sir George died in April 1863. A marble bust by Weekes stands in Westminster Abbey. He has two other monuments—the reprint from the Edinburgh Review of his long series of papers on the Administrations of Great Britain (1864), and his Letters to various Friends (1870), edited by his brother, who succeeded him in the baronetcy.

Lewis was a man of mild aud affectionate disposition, much beloved by a large circle of friends, among whom were Sir E. Head, the Grotes, the Austins, Lord Stanhope, J. S. Mill, Dean Milman, the Duff Gordons. In public life he was distinguished, says Lord Aberdeen, “for candour, moderation, love of truth.” He had a passion for the systematic acquirement of knowledge, and a keen and sound critical faculty. Nothing is more remarkable than the practical good sense of his speculative writings. Sometimes he betrayed a slight intellectual impatience ; but this was merely the passing irritation of a healthy and modest judgment.

LEWIS, Marruew Grecory (1775-1818), often referred to as “Monk” Lewis, was born in London on July 9, 1775. He was educated for a diplomatic career at West- minster School and at Christ Church, Oxford, spending most of his vacations abroad in the study of modern lan- guages; and in 1794 he proceeded to the Hague as attaché to the British embassy. His stay there lasted only a few months, but was marked by the composition, in ten weeks, of Ambrosio, or the Monk, which was published in the summer of the following year. It immediately achieved extensive celebrity ; but some passages it contained were of such a nature that about a year after its appearance an injunction to restrain its sale was moved for and a rule nist

obtained. Lewis published a second edition from which he had expunged, as he tliought, all the objection- able passages, but the work still remains of such a character as almost to justify the severe language in which the author of English Bards and Scotch Reviewers addresses—

**¢ Wonder-working Lewis, Monk or Bard, Who fain would’st make Parnassus a churchyard ;

Even Satan’s self with thee might dread to dwell, And in thy skull discern a deeper hell.”

Whatever its demerits, ethical or esthetic, may have been, The Monk did not interfere with the reception of Lewis into the best English society ; he was favourably noticed at court, and almost as soon as he came of age he obtained a seat in the House of Commons as member for Hindon, Wilts. After some ycars, however, during which he never ventured to address the House, he finally with- drew from a parliamentary career. His tastes lay wholly in the direction of literature, and Zhe Castle Spectre (1796, a musical drama of no great literary merit, but which enjoyed a long popularity ou the stage), Zhe Minaster (a translation from Schiller’s Kabale wu. Liebe), Rolla (1797, a translation from Kotzebue), with numerous other operatic and tragic pieces, appeared in rapid succession. Zhe Lravo of Venice, 2 romance translated from the German, was

published in 1804, and has since been reprinted; next to The Monk it isthe work connected with the name of Lewis which has been most extensively read. By the death of his father he succeeded to a large fortune, and in 1815 embarked for the West Indies to visit his estates; in the course of this tour, which lasted four months, the Journal of a West Indian Proprietor, published posthumously in 1833, was written. A second visit to Jamaica was under- taken in 1817, in order that he might become further acquainted with, and able to ameliorate, the condition of the slave population; but the fatigues to which he exposed himself in the tropical climate brought on a fever which terminated

fatally on the homeward voyage, May 14, 1815. The Life and Correspondence of M. G. Lewis, in two volumes, was published anonymously in 1839; compiled by friendly hands, it makes it sufficiently plain that, what- ever may have been the errors of judgment and taste dis- played in the writings of his precocious youth, he was nevertheless a man of more than ordinary discretion, good feeling, and generosity.

LEWIS, Merrwetuer (1774-1809), American ex- plorer, was born near Charlottesville, Virginia, August 16, 1774. In 1794 he volunteered with the troops called out to suppress the “whisky insurrection,” was commis- sioned as ensign in the regular army in 1795, and as captain in 1800, and was President Jefferson’s private secretary from 1801 to 1803. On Jefferson’s recom- mendation he was appointed by Congress to conduct, in connexion with Captain William Clarke, an expedition to the headwaters of the Missouri river, and thence across the mountains to the Pacific Ocean—the first extended exploration of the north-western portion of the United States. The States had as yet acquired no claim to this region, and the exploration was designed by Jefferson in the interests not ouly of geographical science but of territorial acquisition. Lewis and Clarke, setting out late in 1803 with twenty-eight men, spent the winter at the mouth of the Missouri. arly in the spring the party embarked in several boats, and during the summer made the difficult ascent of the Missouri as far as 47° 21’ N. lat., where the second winter was passed among the Mandan Indians. In 1805 the ascent of the Missouri was continued as far as the tributary which they named Jefferson river, which was followed to its source in the south-western part of what is now Montana territory. Procuring a guide and horses from the Shoshone Indians, they pushed westward through the mountains, and on October 7 embarked in cinoes on a tributary of the Columbia river, the mouth of which they reached on November 15. They had travelled upwards of 4000 miles from their starting point, had en- countered various Indian tribes never before seen by whites, had made scientific collections and observations, and were the first explorers to reach the Pacific by crossing the conti- nent north of Mexico. After spending the winter upou the Columbia, they made the return journey across the moun- tains and down the Missouri,

reaching the Mississippi in September 1806. The reports of the Lewis and Clarke expedition attracted great attention at the time, and it has scarcely been exceeded in romantic interest by later explora- tions in any quarter of the globe. The leaders and men of the exploring party were rewarded with liberal grants of land, and Lewis was made governor of the territory of Mis- sour In the unwonted quiet of his new duties his mind, always subject to melancholy, became unbalanced, and, while on his way to Washington, he committed suicide near Nashville, Tennessee, October 11, 1809.

Jefferson wrote a memoir of Lewis, published in 1814 in con. nexion with Biddle and Allen's Narrative of the Lewis and Clarke Expedition. A new edition by M'Vickar was published at New York in 1848.

LEW—LEY

LEWISTON, a city of the United States, in Androscog- gin county, Maine, is situated 36 miles north of Portland, on the left bank of the Androscoggin, and is connected by several bridges with Auburn, a city of 9556 inhabitants, and the capital of the county. As the river at this point breaks over a ledge of mica schist and gneiss, and the natural fall of 40 feet has been raised to 50 feet by a strong granite dam, Lewiston commands an abundant supply of water-power. Cotton and woollen goods (shirt- ings, Sheetings, cassimeres, beavers, tweeds, cloakings), twine, boots and shoes, machinery, &c., are produced to the annual value of $11,000,000—there being nine con- siderable manufacturing corporations in the city besides the Franklin Company, which owns the entire water-power. The city hall (1872) is a very fine building; and a public library (over 6000 volumes in 1880) was founded by the corporation in 1861. Bates College, founded by the Free Baptists in 1863-64, and named in honour of Benjamin F. Bates of Boston, possessed in 1880 11 professors, 161 students, and a library of 5537 volumes.

Lewiston dates from 1770. In 1795 it was incorporated as a town, and in 1861 as acity. The population was 3584 in 1850, 7424 in 1860, 13,600 in 1870, and 19,083 in 1880.

LEXINGTON, capital of Fayette county, Kentucky, is situated near the centre of the State, in the midst of a table-land 1100 feet above the sea, known as the Blue Grass region. It stands on a small subtributary of the Kentucky river, 79 miles south of Cincinnati, and 94 miles east by south of Louisville. The population (3584 in 1850, 7424 in 1860, and 13,600 in 1874) in 1880 was 16,656, including about 8000 negroes. Lexington is an important railway junction, has an extensive trade, and manufactures whisky, flour, bagging, ropes, carriages, and machinery. Two railroads, completed in 1882, give access to the mountainous eastern region of the State, from which iron, coal, and timber are obtained in abundance. The surrounding district is characterized at once by beauty and fertility, and the town has been laid out in a spacious and attractive style. It is the seat of the State university (chartered in 1858, originally cpened at Harrodsburg in in 1859, and removed to Lexington and incorporated with the Transylvania university in 1865), the State agricul- tural college, and one of the State lunatic asylums (625 patients). Besides the university library, there is a public library of 15,000 volumes.

Lexington was founded by Colonel Robert Patterson in 1775, and received its name in honour of the first eontest in the war of Ainerican independence, fought in April of that year at Lexington, Middlesex county, Massachusetts.

Lexington in Kentueky must not be confounded with (1) Lexing- ton, the capital of Lafayette county, Missouri, with a population in 1880 of 3996 ; or (2) Lexington, eapital of Rockbridge county, Vir- ginia, a place of 2771 inhabitants, and the seat of the Washington and Lee university (founded in 1749; professors in 1880, 9; students, 300; library, 15,000 volumes), and of the Virginia mili- tary institute, founded in 1839, under the patronage of the State, with 12 professors and 300 students.

LEYDEN, or LEIDEN, a city of the Netherlands, in the province of South Holland, about 20 miles south-west of Amsterdam, and 6 miles inland from the German Ocean. The Old Rhine, on which it is situated, enters at the eastern side by two arms which unite near the middle of

the town so as to divide the western half into two nearly equal portions. Though the boundaries, which now include about 467 acres, have been six times extended, the general shape is wonderfully regular, nor is regularity wanting in the interior arrangement of the quiet respectable town with its canals and moats, its broad streets, and lifeless squares. The pensive and even melancholy impression which it seems sometimes to produce on the stranger is easily explained. Leyden is par excellence an academic city ; the bustle of its great markets for cattle and dairy produce is

confined to certain spots, and lasts only for so many hours on so many days, and its industrial activity, considerable though it be, is not sufficient to give that appearance of life and movement which their flourishing local and transit trade makes so generally characteristic of the towns of Holland. The woollen goods (coverlets and broadcloths), the cotton stuffs, the worsted and yarns, the iron and copper wares, and the books and lithographic work which it still produces, are far from maintaining for it the position which it enjoyed when, at the close of the 15th century, its weaving establishments (mainly broadcloth) numbered from three to four hundred, or when, after the expulsion of the Spaniards, Leyden cloth, Leyden baize, and Leyden camlet became familiar terms at home and abroad. Owing to changes of fashion, unwise preservation of old customs and institutions, party spirit, the development of manu- factures in other places, these industries had so far declined in the beginning of the 19th century—the total production of all the factories in 1802, for example, did not exceed 1086 pieces of cloth—that the baize manufacture was altogether given up, and the beautiful Say (Worsted) Hall was closed. Although after the revolution of 1813 comparative prosperity was the result of the removal of the French yoke, and more especially of the

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Plan of Leyden.

introduction of steam, the times of a Maurice or a Fre- derick Henry have never returned, and still less the wonderful days of the 15th century. ‘The university is still a flourishing institution, with fifty professors; but other universities have grown up in the Netherlands, and even professors of European reputation can no longer attract from foreign lands the numbers that visited Leyden in the days of Lipsius, Vossius, Heinsius, Gronovius, Hem- sterhuis, Ruhnken, Valckenaer, Scaliger, and Boerhaave. As a class the students are remarkably quiet and orderly. Many are destined to a diplomatic career. The university (Akademie) was opened in February 1575, and originally located in the convent of St Barbara. In 1581 it was transferred to the convent of the White N uns, the site of which it still occupies, though the building was destroyed in 1616. Of the institutions connected with the univer- sity it is sufficient to mention the library (upwards of 160,000 volumes and 4650 MSS. and 2400 pamphlet portfolios), rich in Oriental and Greek manuscripts and old Dutch travels; the botanic gardens, with splendid collec- tions of East Indian plants; the observatory (1860) ;

the museum of natural history, one of the principal establish- ments of its kind in Europe; the museum of antiquities, With a specially valuable Egyptian department; the ethnographical museum, of which the nucleus was Von Siebold's Japanese collections; and the national insti-

tution for East Indian languages, ethnography, and geo- graphy. The Thysian library and the library of the Society of Dutch literature (1766) are both large col- lections, the former especially rich in legal works and native chronicles; the great school of navigation, and the Remonstrant seminary, transferred from Amsterdam in 1873, deserve special mention, and in general it may be said that there is no city in the Netherlands better supplied than Leyden is with educational and intellectual institutions.

Objects of artistic and antiquarian interest are fewer than might be expected from the position which Leyden holds in the history of painting (Rembrandt, Jan Steen, and Gerard Douw were natives of the town) ; but such as they are—pieces by Van Finck, Fr. van Mieris, Cornelis Engelbrechtszoon, Lucas of Leyden, and other masters — they have for the most part been collected in the newly founded municipal museuin located in the old cloth hall. More interesting is the great collection of portraits of famous professors in the aula of the university. All the gate-houses of the city were still standing about the close of the 17th century; two only, the Zijlpoort and the Morschpoort have been spared. The old town-hall is a quaint 16th century building, and St Pancratius church has some striking features. Near the site of the Rijnsburg gate is the statue of Boerhaave by Stracké. The "Burg," on an artificial mound (perhaps of Roman origin) in the centre of the town, is an old circular wall resting on tweuty arches; it forms a favourite promenade, and affords a fine point of view. Towards the south side of the town lies an open space, suggestively called the Ruin, which in 1807 was the scene of a terrible disaster, a powder- ship blowing up and destroying eight hundred houses and killing hundreds of men. In 1623 the population of Leyden was much more than 50,000,

and in 1640, it is estimated, reached 100,000. Between 1796 and 1811 it sunk to 30,000. In 1850 it was 35,864; in 1870, 38,943 (9632 Roman Catholics, 396 Jews); and in 1882 about

41,000.

Though Lugdunum Batavorum is used by the learned as the Latin name for Leyden, there is no possibility of identifying the town itself with the Lugdunum of the Romans. It first appears in 11th and 12th eentury doeuments as Leythen, Leithen, Leithon, and Leithan. The history of Leyden follows the same general lines as the history of the Netherlands. During the period of the counts the eity suffered from the quarrels of one count with another (as when Countess Ada was besieged in the eastle by Lewis of Loon in 1203), or of the nobles with the eitizens ; between 1419 and 1485 it was besieged and captured no less than six times by the ‘‘ Hooks” or the ‘‘Cods.” From Floris V. it reeeived the confirmation of its privileges (1266) and of its freedom from toll throughout Holland (1290). During the struggle with Spain Leyden covered itself with glory by the persistence with which it held out against the double siege from 31st October 1573 to 21st Mareh 1574, and from 25th May to 2d October (see Motley, Rise of the Dutch Republic, vol. ii.). With the internal troubles of the 17th century it was closely eonneeted. Coolhas, one of the first professors of its university, gave rise about 1578 to a question of ieresy which formed in some sort the prelude to the great eontest in which his suecessors Arminius and Gomarus were protagonists. In 1587 Leicester vainly attempted to bring the eity over to his side; in 1618 Maurice was there constrained to alter the government ; and in 1672 there were violent disturbances in eonnexion with the elevation of William III. to the stadtholdership. The revolution, exeited by the French, took plaee in 1798 ; and in 1813 the Rhenish peasants, in revolt against the conseription, marehed into the city. In 1836 there was a great inundation eaused by the Haarlem Lake. The bieentenary of the university was eelebrated with great ceremony in 1874.

See Mieris, Beschrijving der Stad Leyden, 1772-84.

LEYDEN, Joun (1775-1811), was born on the 8th of September 1775, at Denholm on the Teviot, not far from Hawick. Like most Scottish villages, Denholm is com- monplace and uninteresting, but Leyden's upbringing was in a wilder part of the country, at the foot of Ruberslaw, whither his father had gone as shepherd to a relation of

the family. Though he did not attend school till he was nine years old, long before that he had learnt at home to read, and had devoured all the books he could lay his hands on in the border farm houses and cottages. Naturally his parents thought that a boy so fond of letters was meant for something clse than shepherding ; and, as the only scholarly office clearly within their horizon was that of a parish minister, they concluded that his gifts pointed in that direction, and with much stinting of their own little comforts sent him to Edinburgh university in 1790. There the uncouth lad, dressed in rough home- spun, with a voice that smacked strongly of the Jed and the Teviot, played his part manfully enough in the class- work, but still better:in the " societies" where Brougham, Jeffrey, Sydney Smith, Horner, and other clever young fellows were then chopping logic and cracking jokes. Leyden was a diligent but somewhat miscellaneous student, reading everything apparently, except theology, for which he seems to have had no taste. Accordingly, though he completed his divinity course, and took licence from the presbytery of St Andrews, and preached occasionally, it soon became clear that the pulpit was not his vocation, and that the border shepherds were not to find a second Thomas Boston in John Leyden.

In 1794 Leyden had formed the acquaintance of Dr Robert Anderson, editor of Zhe British Poets, and of The Literary Magazne, a cultivated but not otherwise re- markable individual, who, however, filled a rather im- portant niche in the Edinburgh of that time. Contri- butions to his magazine were probably what brought them first together, but more important results followed from their intimacy than either the verses on " Ruberslaw," or "The Descent of Odin," translated fram the Norse. For it was Anderson who introduced him to Dr Alexander Murray, and Murray, probably, who led him to the study of Eastern

languages, to which that great scholar was ¢o pas- sionately devoted. Soon they became warm friends and generous rivals, though Leyden excelled, perhaps, in the rapid acquisition of new tongues, and acquaintance with their literature, while Murray was the more scientific philologist. Through Anderson also he came to know Richard Heber, by whom he was brought under the notice of Walter Scott, when he was collecting materials for his Afinstrelsy of the Scottish Border. Leyden was admirably fitted for helping in this kind of work. A borderer himself, an enthusiastic lover of old ballads and folk-lore, he spared no pains to enrich the work that promised to bring fame to his beloved hills and glens. Scott tells us how, on one occasion, Leyden walked 40 miles to get the last two verses of a ballad, and returned at midnight, singing it all the way with bis loud, harsh voice, to the wonder and consternation of the poet and his household. Neither Scott nor Leyden, however, studied this folk-lore for proper scientific pur- poses. They cared only for the picturesque and the poetic in it, and were not very successful in their efforts to restore it to life. Of course, the rough old ballads them- selves were a welcome addition to our literature, but Leyden's attempt to make Lord Soulis interesting in a modern ballad was something of a failure, and, though he miglit have made a Scotch Lorelei out of the mermaid of Corrievreckan, his poem wants the delicate touch of the German, and he does not know where to stop. Scott, however, got valuable assistance from him in his task, and learned to esteem highly the blunt integrity of the man, his literary enthusiasm, and his large attainments.

Leyden was evidently drifting away from the church into the life of a scholar, but as yet he had not found lis line there, was indeed only wasting himself on miscellaneous learning. He had compiled a work of four hundred pages on the Discoveries and Settlements of Europeansin Northern

and Western Africa, suggested by Mungo Park's travels. He had. edited for Constable The Complaint of Scotland, giving a glossary, and a long preliminary dissertation. He had printed various poems, and

nearly finished his Scenes of Infancy, a poem in four books, based, no doubt, on border scenes and traditions, but meandering “at its own sweet will” over all the world, and a good way beyond it. There are, here and there, some effective enough lines in this poem, but, in the main, it is of the thin, artificial, big- sounding order, and has no unity of design, so that there is no particular reason why it should not go on for ever. He had also made some translations from Eastern poetry, Persian and Arabic, but they have not somehow the aroma of the East. Clearly, here was a man of great and varied powers which, however, were like to run to waste unless he found a definite field to work in. So, at last, friends got him an appointment in India, at first on the medical staff, for which he qualified by a year of intense hard work ; but it was hoped something more fitting would turn up by and by. In 1803, therefore, he sailed for Madras, and took his place in the general hospital there. From that he was soon promoted to be naturalist to the commis- sioners going to survey Mysore. Ere long, however, his knowledge of the languages and dialects of India procured him an appointment as professor of Hindustani, which he soon after resigned for a judgeship, and that again to be a commissioner in the court of requests, which required a familiarity with several Eastern tongues. Friends who had come from the same border country—Lord Minto, Sir John Malcolm, and others—had done what they could to make his path smooth for him, and his linguistic attain- ments had been recognized by Colebrooke, the greatest Oriental scholar of the day. But in 1811, having joined Lord Minto in the expedition to Java, on landing there he made his way into a library which was said to contain many Eastern MSS., without having the place aired, and was seized with shivering and sickness, first symptoms of the Batavian fever. The climate of India had never agreed with him, and his constitution had already been shaken by several serious illnesses. He was ill fitted, therefore, to endure the assault of this deadly complaint, and after three days of struggle he died on the 28th of August, in the thirty-sixth year of his age. Cut off thus prematurely, he has left comparatively little fruit of all the bright promise of his youth. Asa poet he cannot take high rank, but in his knowledge of Eastern languages he would probably have been no mean rival of Henry Colebrooke, had he been spared a little longer to methodize and perfect his attainments. A genuine and

generous nature, with a fine enthusiasm for learning, there were few of Britain's sons in India from whom friends at home looked for better work, and few therefore who were more deeply regretted. (w. c. s.*)

LEYDEN, Lucas van. See Lucas.

LHASA, often written Lassa, for many centuries the chief city of Tibet. Though the place is of great celebrity, the accounts of it are scanty, and information has to be sifted from authorities differing considerably in age. Till recently the latitude even of Lhasa has been stated with variations extending over 14 degrees, whilst the longitude has naturally been still more uncertain. The Jesuit Grueber, who was at Lhasa in 1661-62, made the latitude 29° 6'. In the maps of Tibet sent from China by the Jesuits, and engraved on five separate sheets in Du Halde, it is about 29° 40'. D'Anville, in his Carte Générale du Thibet, chiefly based on these last, but modified to suit other data, reverted nearly to Grueber's figure; Giorgi in his Alphabetum Tibetanum states it at about 30° 30° Klaproth, stretching every datum to cracking point, to suit his fantasies about the course of the great river of Tibet, made it 30° 45' iat. (and 91° 50' long.); our last and

highest authority, Pundit Nain Singh, gives (from a mean of twenty observations) 29° 39' 17", a result which closely confirms the Jesuit record. The longitude according to the protraction of the same explorer's route is 90° 57' 13". The height above the sea, by repeated observation of the boiling point, is stated at 11,700 feet (but the report of Nain Singh, on his second visit, gives 11,910). The city stands near the middle of a tolerably level plain, which is surrounded on all sides by hills, and extends about 13 iniles from east to west and about 7 miles from north to south. It lies half a mile to the north of a considerable river called the Kichu Tsanpu, or Tsang-chu, flowing here from east-north-east (called by the Mongols, according to Klaproth, Galjao-Muren, or " Turbulent River"), and join- ing the great Tsanpu (or upper course of the Brahma- putra) some 35 miles to the south-west.

The hills round the city are absolutely barren, and without growth of any kind except an occasional bush of so-called “Tartar furze.” There are, however, gardens scattered over the plain round the city, and these are planted with trees of some size (it would seem cedar, willow, and cypress). Four defiles in the encompassing hills, by which the approaches to the city pass, are defended by as many forts. We may quote the description of Huc, which, though a little vague, is vivid, and is the only passage affording anything like a picture of this city, so difficult of access :—

‘The sun was about to set as we completed our descent of the innumerable zigzags of the mountain path. Issuing into a wide valley, we beheld on our right Lhasa, the famous metropolis of the Buddhist world. The multitude of aged trees which encircle the city as with a girdle of foliage, the lofty white houses, terminating in flat roofs surrounded by turrets, the numerous temples with their gilt eanopies, the Buddhala [Potala], crowned by the palace of the Dalai Lama,—all unite to give Lhasa a majestic and imposing appearance,”

The meaning of the name Lhd-Sa is “God’s ground.” Formerly it used to be known to the Mongols as Baron- tala, the “right side” or western region; now, according to Huc they call it Monhe Dhot or Dehot, “Eternal Sanctuary.”? In eastern Turkestan it seems to be best known as Jo, a name which properly refers to the great central temple of which we shall speak.

The city is nearly circular in form, and according to Nain Singh less than a mile in diameter. It was walled in the latter part of the 17th century, but the walls were destroyed during the Chinese occupation in 1722. The population has been estimated at 40,000 to 80,000 ; the last estimate perhaps including the great population of monks and students in the convents near the city.

The chief streets of the city are wide and straight, and in dry weather tolerably clean, but the inferior quarters are unspeakably filthy, and are rife with evil smells and large mangy dogs.* Part (much the greater part, according to Nain Singh) of the houses are of clay and sun-dried brick, but those of the richer people of stone and brick. All, however,

are frequently white-washed, the doors and Windows being framed in bands of red and yellow. In the suburbs there are houses entirely built of the horns of Sheep and oxen set in clay mortar. This construction, according to Huc, is very solid and highly picturesque. a

? This is corrected to the latest value of Madras longitude, viz., 80°14’ 51”.

2 The first word of this phrase is certainly the Mongol mungke, “eternal.” The second is probably a clerical error for dchot, which may represent the Jo of the next sentence, which is literally (Tib.) “*master, lord,” and is applied to very sacred images.

5 Nain Singh says that a census in 1854 gave ‘9000 women and 6000 men, exclusive of the military and the priests.’ But these words are subject to too many doubts for precise interpretation.

*The Chinese have a proverb as to the three products of Lhasa being dogs, drabs, and lamas.

The houses generally are large, and of three stories at least. The owner of the house, with his family, occupies the upper story, whilst the two lower floors swarm with tenants. Externally the lower part of Tibetan houses generally presents lofty dead walls pierced by a few air- holes ~~only ; above these rise tiers of windows with project~~ ing balconies, and over all flat broad-eaved roofs at vary- ing levels. According to Desideri, in the better houses there are often spacious and well-finished apartments, the principal halls, the verandas, and terraces being often paved with a composition of coloured fraginents of stone set in a cement of resin, &c., which with much beating and rubbing becomes like a surface of polished porphyry. Inu every house there is a kind of chapel or shrine, carved and gilt, on which are set images and sacred books, and before them lamps and incense, with the usual offerings of barley, fruits, &e.

Lhasa is not only the nucleus of a cluster of vast monastic establishments, which attract students and aspi- rants to the (so-called) religious life from all parts of Tibet and Mongolia, and the seat of a quasi papacy, but is also a great place of pilgrimage, so that the streets and public Spaces swarm with visitors from every part of the Hima- layan plateau, and from all the steppes of Asia between Manchuria and the Balkash Lake, who come to adore the living Buddha, to seek the purgation of their sins and the promise of a happy transmigration, and to carry away with them holy relics, blessed rosaries, and all the miscellaneous trumpery which is set forth to catch the money of idle people in Asia and Europe, whether they are pilgrims or frequenters of mineral waters ,° whilst as usual a great tratfic arises quite apart from the pilgrimage. The city thus swarms with crowds attracted by devotion and the love of gain, and presents an astonishing diversity of language, costume, and physiognomy ; though, in regard to the last point, varieties of the broad face and uarrow eye greatly predominate. Much of the retail trade of the place is in the hands of the women. Huc's account of the curious practice of the Lhasa women in plastering their faces with a dark-coloured unguent is well known, but it does not rest on his authority alone.

During the month of December especially traders arrive from western China by way of Tatsienlu ('Tachindo of the Tibetans), bringing every variety of silk-stuffs, carpets, china-ware, and tea; from Siningfu (commonly in Tibet and Turkestan called Siding, Ziling, or Zling, a circumstance that has caused sundry misapprehensions) come silk, gold lace, Russian goods, carpets of a superior kind, semi- precious stones, horse furniture, horses, and a very large breed of fat-tailed sheep ; from eastern Tibet musk in large quantities, which eventually finds its way to Europe through Nepal ; from Bhutan and Sikkim, rice; from the latter also tobacco; besides a variety of Indian and European goods from Nepal and Darjiling, and churas (resinous exudation of hemp) and saffron from Ladak and Kashmir. The merchants, who arrive in December, leave Lhasa in March, before the setting in of the rains renders the rivers impassable.

The tea importation from China is a large matter, on which an interesting paper has been written by Mr E. Baber. The tea is of the coarsest quality, derived from straggling and uncared-for trees, allowed to grow to a height of 10 feet or more, and the coarsest produce of these. This is pressed into bricks or cakes, and carried by porters. The quantity that pays duty at Tatsienlu is about 10,000,000 ib, besides some amount smuggled. No doubt a large part of this comes to Lhasa. Tea is an

5 Among articles sold in the Lhasa bazaars are numerous fossil bones, called by the people ‘‘ lightning boncs,” and believed to have

healing virtues. XIV —=963

absolute necessary to the Tibetan; he is miserable with- out it.

The chief industries of Lhasa are the weaving of a great variety of stuffs from the fine Tibetan wool; the making of earthenware (said to be of very good quality), and of the wooden porringers (varying immensely in elaboration and price) of which every Tibetan carries one about with him; also the making of certain fragrant sticks of pastille much valued in China aud elsewhere.

It is curious that Tibet, though using coined money, seems never, strictly speaking, to have had a coinage of its own. Till nearly the end of last century the coinage had for a long time been derived from Nepal. That valley prior to the Gorkha domination (1768) was under three native dynasties (at Bhatgaon, Patan, and Khatmandu), and these struck silver mohurs, as they were called, of the nominal value of half arupee. The coins were at first not struck specially for Tibetan use, but were soafterwards. These latter bore (obverse) a Nepalese emblem surrounded by eight fleurons containing the eight sacred Buddhist jewels, and (reverse) an eight-petalled flower surrounded by eight fleurons con- taining the names of the eight jewels in Tibetan characters. Ingots of Chinese silver were sent from Lhasa with a small proportion of gold dust, and an equal weight in mohurs was returned,

leaving to the Nepal rajahs, between gold- dust and alloy, a good profit. The quality of these coins (weighing about 81 grains Troy) was low, and at last deteriorated so much that the Tibetans deserted the Nepal mints. The Gorkhas, after becoming masters of Nepal, were anxious to renew the profitable traffic in coin, and in this view sent a deputation to Lhasa, with a quantity of coin to be put in circulation. But the Gorkhas were mis- trusted, and their coin refused. A coinage was then issued (it would appear once only) in Tibet for domestic use, modelled on an old Khatmandu pattern, and struck by Nepalese artists (see fig. 1) The Gorkhas, however,

Fra. 1.—Coin struck in Tibet, from specimen in India Library ; inscribed ‘27th year (of cycle=1772 a.p.) from the princely

residence of Galdan.” in 1788 and following years continued to strike coins of progressively debased quality, which were rude imitations of the old Nepalese mintage (see fig. 2), and to endeavour to force this currency on the Tibetans, eventually making the departure of the latter from old usage a pretext for war and invasion. This brought the intervention of the

Fria, 2,—Gorkha debased coinage ; rubbing from coin in British Museum. Chinese, who drove the Gorkhas out of Tibet (1792), and then began to strike silver coins for Lhasa use, bearing Chinese and Tibetan characters (see fig. 3). For prac- tical use these Tibeto-Chinese coins (of which 24=1

rupee, and which are known as naktang, 1.¢., nagskyang, “cash ”), are cut into aliquot parts by the guidance of the figures on them. Large lumps of Chinese silver, stamped

ia. 3.—Tibeto-Chinese coinage (‘‘ Aienlung, 58th year,” ¢.¢. 1793 a.D.). From specimen in India Library.

with the imperial seal, are also used. But of late years there has been an enormous influx of Anglo-Indian rupees, so that these have become

practically the currency of the country, even to the frontier of China, and are now counted, instead of being valued as bullion. They are called Peiling ch'ranka, or chanka (probably Hind. tanka), "English (Firinghi?) coins." Those that bear a crowned head of the queen are called Lama heads, the crown being taken for a wandering lama's head-gear. This great influx of rupees indicates a very considerable amount of trade with India. And, in spite of the extraordinary difficulties of the road eastward from Lhasa, quantities of trifling European articles find their way even to Tatsienlu on the Chinese frontier. Mr Baber found quarter-rupees very popular as buttons, British army buttons very common, corkscrews offered for sale (though no one kuew their use), and tin-plates very common, stamped with the heads of Napoleon III, Mr Gladstone, and other celebrities.

The permanent population embraces, besides Tibetans of the country, settled families of Chinese and Kashmiris in considerable numbers, as well as people from Bhotan and Nepal, from Ladak and even from Patna. The Kashmiris and many of the other foreigners are Mohammedans, and much of the trade is in their hands. Desideri, a century and a half ago, speaks also of Armenians and even ** Muscovites." The Chinese have a crowded burial-ground at Lhasa, tended carefully after their manner. The Kashmiris, who are called Khach'hé, are an important body, and have their mosque, and a provost, at once civil and religious, who is recognized by the Government. With their turbans, their fine Caucasian features, and their beards, they strikingly contrast with the mass of other nationalities. The Nepalese (called at Lhasa, according to Huc, Pe-beéin) supply all the mechanics and metal-workers. There are among them excellent gold and silversmiths ; aud they make the elaborate gilded canopies crowning the temples, which form so notable a feature of Lhasa. Huc describes a striking custom among the native population. Every evening, as light begins to fail, they leave off business, and form groups in the streets; all sit down and begin to chant prayer in a low voice. ' The combination of religious music arising from these numerous companies produces au aggregate of vast and solemn harmony, which is exceedingly moving."

In the middle of the city is an open space or place, in which markets are held; this is densely thronged in the afternoon and evening. On the north side, overlooking this place, is a great building which is the residence of the Gyalbo, or so-called king of Tibet. It was built at great cost by the dissolute Lama who was set up by the crafty regent Sangje Gyampo, and put to death by the Calmuck prince Latsan or Jenghiz Khan in 1706-7 (see infra) ; and, as the Lama used to divert himself there with the dances of the ladies of Lhasa, the palace is known as the

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Trasi-khang or “dancing house” (so Desideri; the word trast cannot be identified).

Inmediately west of the place stands the great temple and convent of Labrang (bLa-brang, ‘‘ Lama-house”), re- garded as the wmbilicus and centre of all Tibet, and from which all the main roads are considered to radiate. This is not merely the great metropolitan convent, sanctuary, and church-ceutre of Tibet, the St Pcter’s or Lateran of Lamaism, but contains the palace of the government and seat of civil administration. It is believed to have been founded by the Tibetan Constantine, Srong-dsan-gampo, in the 7th century, as the shrine of one of those two very sacred Buddha images which were associated with his conversion, and with the foundation of the civilized mon- archy in Tibet. From this image, called Jo, or Jd, it is known to the Mongols as the Jo Erdeni (‘the precious Lord”) or Jo Shakyamuni (to the Chinese as 7’a-shao-s2’, ‘‘house of the great Jz”), and hence as Ju or Jo simply, a name used in eastern Turkestan (as already noticed) and probably in Mongolia, as a synonym of Lhasa. The temple appears to be known also as Lhasat Chhod-khang, “ ofter- ing-house of Lhasa,” and among Indian and Nepalese visitors as Jfdchendra Nath. The Potala as a sacred centre is modern, whilst the Labrang attaches itsclf to the whole thread of Tibetan history and religion. On one of the walls of this temple is a picture of the famous “ Master of the Law,” Hwen T’sang,

the travelling doctor of Buddhism (see vol. xii. p. 418), whose journeys have in the revolution of the ages become so familiar to European students, as a mine of information on the geography and history of India during a period so clouded as the 7th century. He is represented with three of his disciples. And before the gate of the Labrang stand several monuments of antiquity, especially that famous obelisk spoken of below, which bears the inscribed record of the treaty of peace concluded in 822 between Thi-de-srong-tsan, king of Tibet, and the emperor Mo-tsung of China. Before this obelisk the apostate from Lamaism, Langdharma, brother and successor of the last-named king, was standing in proud contempla- tion, when a fanatic recluse, who had been stirred by a vision to avenge his persecuted faith, shot him with an arrow in the forehead.

The main building of the Labrang is three stories high. The entrance, facing castward, forms a portico ni i on six great timber columns, richly carved and gilt, whilst the walls are painted with the history of Sakya. Great folding-doors, covered with reliefs in bronze and iron, lead to the ante-hall, and from this a second gate to the cella (so to call it) of the temple. On each side of the gate, two and two, stand colossi of the spirit-kings of the four pints of heaven. Within is a great basilica, divided into naves aud aisles by inany pillars, whilst along each wall, north and south, are chapels or sanctuaries, fourteen to a side.

At the west end steps ascend to a quadrangular choir or chancel, on each side of which also are tlirce chapels, and at the extremity a rectangular apse (if it may be called so), and in it is the altar or graded throne, on which stands the great image of Sakya, scen through a lattice of silver gilt, —the higher shelves or offscts of the altar being beset with small figures in precious inetals of deotas and saints, and the lower ones with lamps burning josticks, platters holding offerings of butter and meal, flowers modelled from butter, &c. In the choir to the right (z.c., looking from the altar) is the elevated and stepped throne of the Grand Lama, laid with splendid cushions, succeeded by the nearly equal throne of the Teshu Lama

of Shigatzé, and then by the seats of other ecclesiastical potentatcs, |

reborn and elected, in order; on the left of the Buddha throne, opposite the Grand Lama's, and of equal height, there is said now to he a throne for the emperor of China, then, at a lower level, that of the so-called king of Tibet, whilst the ministers of state follow opposite the inferior lamas. ;

In a space shut in with silver lattice, on the south side of the

1So in Nain Singh's narrative. But the word is properly Mats-yendrandth, which is the name of a saint adored by the Nepalese Buddhists, and identified with Padmapani, the fourth Dhy&ni Bod-hisatva of their system (sce Hodgson in Journ. Roy. As. Soc., xviii. 394),

chancel-steps, are seen fourteen or fifteen great disks of silver, set with precious stones, on which are embossed fundamental Buddhist symbols, such as their system of cosmogony, the circle of transmi-gration, the births of Sakya, &c.

The great nave or central aisle of the basilica is truly hypethral, but on the second and third apparent floors it is encompassed with colonnades or verandas, from which the women and the laity look down upon the lamas engaged in chanting the services or in other functions, The sanctuary or chancel itself towers above the rest of the building, and is crowned with a rectangular canopy or pavilion of gilt metal, which rises to a ridge scrrated with fantastic figures. This canopy rests ou columns which are also gilt, and from its eaves and angles hang bells that tinkle with every breeze, whilst the pillars beneath the eaves are crowned with a great frieze of bas- reliefs embossed in gilt metal.

This ancient temple contains a vast accumulation from the ages of gold and silver vessels, lamps, reliquaries, and precious bric-a- brace of every kind, which is annually exposed to view in the spring festivities. The daily offices in the Labrang are attended by crowds of

worshippers, and a sacred way which leads round it is constantly traversed by devotees who perform the circuit as a work of merit, always in a particular direction.

Besides the convent-cells, halls of study, and magazines of pre- cious lumber, buildings grouped about the Labrang are occupied, as we have said, by the civil administration, ¢.g., as treasuries, customs office, courts of justice, &c.; and there are also private apartments for the Grand Lama and other high functionaries, No woman is permitted to pass the night within the precinct.

Another great and famous temple is the Mamo-chhé ("large pen or fold"), at the north end of the city. This is also regarded as a foundation of Srong-dsan-gampo, and is said to contain the body of his Chinese wife, and the second of the primeval palladia, the image that she brought with her to the Snow-land; whence the Mongols aud Chinese call it the temple of the little J? The lamas of this convent, as well as of that next to be mentioned, arc noted for their pretensions to and practice of magical arts, one of the degrading characteristics of the lama forms of Buddhism. The orthodox " yellow " sect indeed profess to distinguish between lawful and unlawful magical formule, and to give degrees only in the former. The lamas of Ramo-chhé have also the ill repute of cultivating that species of doctrine which is connected, like their magic, with Tantric mysticism, and which professes to destroy sensual passion by the contemplation of its representations. The walls of the convent are defiled with a series of sculp- tures of gross obscenity."

Another convent within the city is that of Jforu, also near the north end, remarkable for its external order and cleanliness, and, though famous like the last as a school of orthodox magic, noted also for the printing-house in the convent garden. Lastly we notice the Garmakhia, the inmates of which are sorcerers of the ruder kind, who seem really to represent the rude medicine-men of the supersti- tions which preceded Buddhism in Tibet. As the vulgar will not dispense with their marvels (knife-swallowing, fire- breathing, cutting off their own heads, and the like), every great orthodox monastery in Tibet keeps one of

these conjurors, who does not belong to the fraternity of the house, but lives in a particular part of it, bearing the name of Choi-chong (Cl'hos-skyong) or "protector of religion," and is allowed to marry. These practitioners of the black art possess no literature, but hand down their mysterics from father to son. Their fantastic equipment, their frantic bearing, and their cries and howls seem to identify them with the grossest Shamanist devil-dancers,—strongly remote in externals from the gentle and cultivated persons in the higher ranks of the Lama Church, of whom we read in Turner or Huc. Other monasteries in or near the city are the Chumuling at the north-west corner; the Tankyaling

2 Tt was in this convent that P. Desideri studied the religion of the lamas. 'From March to July," he says, ''I set myself, I will not say to read, but rather to devour the chief books of the Kaa-n-ghiur, and to take in a complete knowledge of all that pertains to that false religion."

at the west of the city; the Kontyaling, about a mile west of | mass, in four stories, to a great height, terminating in a

the city, at the foot of a low isolated hill called Chapochi. Three miles south, beyond the river, is the Chochuling. These four convents are known as " The Four Ling." Leaving the city by the side of the Ramoch'hé, we see on our left the famous Potala with its many edifices crowning and seeming to grow out of a rocky hill, which rises like an island from the plain. It forms altogether a majestic mountain of building. At the south base of the rock isa large space inclosed by walls and gates, with great porticoes on the inner side, This swarms with lamas, its nooks with beggars basking in the sun. A series of tolerably easy staircases, broken by intervals of gentle ascent, leads to the summit of the rock. The whole width of this is occupied by the palace. The central part of this group of buildings rises in a vast quadrangular

gilt canopy similar, it would seem, to that on the Labrang. Here on the lofty terrace is the Grand Lama's hall of audieuce, and from this great height he looks down upon the crowds of his votaries far below, thronging the plain, and streaming to kneel before the sacred hill. The monastic buildings attached to the palace temple are said to contain cells for ten thousand monks, Other palatial buildings, towers, chapels, chodtens (chaityas), pavilions,

' gleaming with gold and silver, Buddhas and other idols,

cluster round and crown the three peaks of Potala. The

_ palace itself is said to be painted externally with red and

white stripes. The walls and ceilings of all the chief apartments and temples are covered with rich silks. We give an engraving of it (fig. 4), extracted from a Chinese view of Lhasa, published by Klaproth in the work quoted

Fia, 4.—Potala, the Palace-Temple of the Grand Lama.

at the end. The Potala has every appearance of having been drawn from the reality. Two avenues bordered with trees of considerable size lead from the city to the foot of Potala. 'You see there constantly," says Huc, "a great nuinber of foreign pilgrims, passing between their fingers the beads of their long Buddhist rosaries, with lamas of the court splendidly attired, and mounted on richly caparisoned horses. There reigns in the neighbourhood of the Potala great and incessant movement; but for the most part everybody is grave and silent; religious thoughts appear to occupy the minds of all." It would seem that between the palace and the city runs a stream which is crossed by a bridge called "The Bridge of Glazed Tiles,"

On the north side of the rock a wide and easy road descends winding. By this, which has a parapet along the edge, it is lawful to ride. Not far from the base is a garden-palace in the middle of a lake which is surrounded by trees and shrubberies. This palace, called Lu-khang, is described by Desideri as of attractive style, and circular in form, with a

loggia or portico running all round, and adorned with paintings. Here the dissolute Lama who built it, at the end of the 17th century, used to give himself up to dissipation with the women of Lhasa. Several other villas or gardens of the Tibetan pope are mentioned ; in one of them the Panch'hen-Rinpoch'he (or Teshu Lama) is received when he visits Lhasa, and the two living Buddhas drink tea together there. It is in the numerous gardens round the town that those large trees grow of which Huc

speaks as giving Lhasa such a green girdle of foliage. There is no natural wood.

No country in the world—not even Spain or Italy in the last century—has so abounded in convents and monks as Tibet. The district of Lhasa alone is said to contain thirty great convents, besides many smaller establishments, and a notice of Lhasa would be incomplete without some mention at least of the great monastic establishments which stand within a few miles of the city, and constitute an essential element in its existence. These are not single masses of building like the great convents of Europe. The temple (Lha-khang) is the focus of the whole. Round this are gathered numerous houses detached from one another, though not far apart, and generally three stories in height. In each of these are various apartments, each assigned toa monk of some authority and dignity, with several younger members or uovices under his immediate direction. Each house has a little garden, and a quantity of vases in which plants are grown. Library, storehouse, hostel, occupy other buildings, and a varying multitude of the peculiar Buddhist objects of adoration which we know as dagobas or chaityas, as well as of masts with sacred flags and streamers. The whole is usually enclosed ina lofty and solid wall. These establish- ments have undoubtedly a vast population, though we can hardly accept specific figures, in which indced authorities do not agree. Huc says the inmates of each of the three great convents which we are about to namie amounted to

15,000; Nain Singh states them at 7700, 5500, and 3300 respectively ; the former numbers seem excessive, the latter artificial ; but no doubt the real numbers are large. In the Labrang they show a copper kettle holding more than oue hundred buckets, which was used to make tea for the lamas who took part in the daily teniple service.

The three great convents in the vicinity, all claiming to be foundations of Tsongkhapa, the medixval reformer and organizer of the modern orthodox Lama Church, are the following :—

1. Bre-bung (written Bras-sPungs, * the Riee-Heap," so ealled from the shape of the hill on which it stands), ealled by Nain Singh Debang, is 5 or 6 miles froin Lhasa, west of the city, at the entranee to the plain from the side of Shigatzé and Nepal. In the middle of the convent buildings rises a kind of pavilion, brilliant with colour and gilding, whiel: is reserved for the Dalai Lama, when he visits Brebung onee a year, and expounds to the inmates, The place is greatly frequented by the Mongol students who eome toLhasa to graduate, and is known in the country as the Mongol convent.

2. Sera ('The Golden") is 2 or 3 miles from the city on the acclivity of the hills which border the valley on the north, and close to the road by which pilgrims enter from Mongolia. The hill is planted with holly and cypress, and from a distance the crowd of buildings and temples, rising in amphitheatre against a back- ground of trees, forms a pleasing pieture. In the recesses of the hill, high above the eonvent, are scattered cells of lamas adopting the solitary life. There are three great temples rising in many stories, the walls of which are entirely covered with gilding, whenee the convent's name. In the ehief of these temples is preserved the famous Dorjé of Buddha, 7.¢., the Vajra or Thunderbolt (of Indra properly), or Adamant, the symbol of the strong and inde- struetible, which the priest grasps and manipulates in various ways during prayer. From this doryé, aeeording to one etymology at least, eomcs the name of the Himalayan sanatarium Dorjiling or Darjeeling. The emblem is a bronze instrument, shaped much like a dumb-bell with pointed ends, and it is said by Koeppen to have been one of the later lama borrowings from Sivaism. 'The original is earried

solemnly in procession to abrang during the New Year’s festival, the city by the Dzungar Khan in 1717, spoken of below.

The hill adjoining Sera is believed to be rich in silver ore, but it is not allowed to be worked. On the summit isa spring, and a holy place of the Lhasa Mohammedans, who resort thither. Near the eonvent there is said to be gold, which is worked by the monks. ‘Should they . . . discover a nugget of large size, it is imme- diately replaced in the earth, under the impression that the large nuggets . . . germinate in time, produeing the small lumps whieh they are privileged to seareh for” (Nain Singh).

3. Galdan.—This great convent is 10 or 12 miles east of Lhasa, on the other side of the Kichu Tsangporiver. It is the oldest monas- tay of the ‘‘ Yellow” sect, having been founded by Tsongkhapa, and having had him for its first superior. Here his body is said to be preserved with miraculous cireumstanees, and here are other relics of him, such as the impression of his hands and feet in hard butter.

Samayé (bSam-yas) is another famous convent intimately con- neeted with Lhasa, but it lies some 36 miles south-east on the left bank of the great Tsangpo. It was founded by Padma Sambhava (Ur-ghien of the Tibetans), the apostle who eame from Udayana in the 8th century as the great reviver of Buddhism, and was at the head of the old Red seet. It is visited by the Dalai Lama once a year. It is surrounded by a very high eireular stone wall, 14 miles in circumference, with gates facing the four points of the eompass. On this wall Nain Singh who was here on his last journey (1874), eounted 1030 chaityas of brick. One very large temple (Lha-khang) oecupies the ecntre, and round it are four smaller but still very large temples. Many of the idols are of pure gold, and the wealth is very great. The interiors of the temples are covered with beauti- ful writing in enormous Nagari characters, which the vulgar believe to be the writing of Sakya himself.

Lhasa Festivities.—The greatest of these is at the new year. This lasts fifteen days, and is a kind of lama carnival, in which masks and mummings, wherein the Tibetans take especial delight, play a great part. The celebration commences at midnight, with shouts and

clangour of bells, gongs, chank-shells, drums, and all the noisy repertory of Tibetan music; whilst friends exchange early visits and administer coarse sweetmeats and buttered tea. On the 2d day the Dalai Lama gives a grand banquet, at which the Chinese and native authorities are present, whilst in the public spaces, and in front of the great convents, all sorts of shows and jugglers' performances g0 on. Next day a regular Tibetan exhibition takes place. A long cable, twisted of leather thongs, is stretched from

In Sera P. Desideri found shelter during the eapture of

O01 a high poiut in the battlements of Potala slanting down to the plain, where it is strongly moored. Two men slide from top to bottom of this huge hypothenuse, sometimes lying ou the chest (which is protected by a breast-plate of strong leather), spreading their arms as if to swim, and descending with the rapidity of an arrow-flight. Occasion ally fatal accidents occur in this performance, which is called "'the dance of the gods"; but the survivors are rewarded by the court, and the Grand Lama himself is always a witness of it. This practice occurs more or less over the Himalayan plateau, and is known in the neighbourhood of the Ganges as Barat. It is employed as a kind of expia- tory rite in cases of pestilence and the like. And exactly the same performance is described as having been exhibited in St Paul's Churchyard before King Edward VL., and again before Philip of Spain, as well as, about 1750, at Hertford and other places in England (see Strutt's Sports, d&c., 2d bd, (p. 198).

The most remarkable celebration of the new year's festivities is the great jubilee of the Monlam (sMon-lam, prayer"), instituted by Tsongkhapa himself in 1409, Lamas from all parts of Tibet, but chiefly from the great convents in the neighbourhood, flock to Lhasa, and every road leading thither is thronged with troops of monks on foot or horseback, on yaks or donkeys, and carrying with them their breviaries and their cooking-pots. They descend like swarms of bees upon the city, and those who cannot find lodging bivouac in the streets and squares, or pitch their little black tents inthe plain. The festival lasts six days, during which there reigns a kind of saturnalia, and the town is

abandoned to these crowds of monks. Unspeakable confusion and disorder reign, whilst gangs of lamas parade the streets, shouting, singing, and coming to blows. The object of this great disorderly gathering is, however, supposed to be devotional. Vast processions take place, with mystic offerings and lama-music, to the Labrang and Moru convents; the Grand Lama himself assists at the festival, and from an elevated throne beside the Labraug receives the offerings of the multitude, aud bestows his benediction.

On the 15th of the first month multitudes of torches are kept ablaze, which lighten up the city to a great distance, whilst the interior of the Labrang is illuminated throughout the night by innumerable lanterns shedding light on coloured figures in bas-relief, framed in arabesques of animals, birds, and flowers, and representing the history of Buddha, and other subjects, all modelled in butter. The figures are executed on a large scale, and, as described by Huc, who witnessed the festival at Kunbum on the frontier of China, with extraordinary truth and skill. These singular works of art occupy some months in preparation, and on the morrow are thrown away. On other days horse-races take place from Sera to Potala, and foot-races from Potala to the city. On the 27th of the month the holy Dorjé is carried in solemn procession from Sera to the Labrang, and to the presence of the Lama at Potala.

Of other great annual feasts, one, in the fourth month, is assigned to the conception of Sakya, but appears to con- nect itself with the old nature-feast of the entering of spring, and to be more or less identical with the Hléof India. A second, the consecration of the waters, in September-Oc- tober, appears, on the confines of India, to be associated with the Dasehra.

On the 30th day of the second month there comes off a strange ceremony, akin to that of the scapegoat (which is not unknown in India). It is called the driving out of the demon. A man is hired to perform the part of demon (or victim rather), a part which sometimes ends fatally. He is fantastically dressed, his face mottled with white and black, and is then brought forth from the Labrang to en-

gage in quasi-theological controversy with one who repre- sents the Grand Lama. This ends in their throwing dice against each other (as it were for the weal or woe of Lhasa). If the demon were to win the omen would be appalling ; so this is effectually barred by false dice. The victim is then marched outside the city, followed by the troops, and by the whole populace, hooting, shouting, and firing volleys after him. Once he is driven off, the people return, and he is carried off to the Samayé convent. Should he die shortly after, this is auspicious ; if not, he is kept in ward at Samayé for a twelvemonth.

Nain Singh, whose habitual accuracy is attested by many facts, mentions a strange practice of comparatively recent origin, according to which the civil power in the city is put up to auction for the first twenty-three days of the new year. The purchaser, who must be a member of the Bre- bung monastery, and is termed the Jalno, is a kind of lord of misrule, who exercises arbitrary authority during that time for his own benefit, levying taxes and capricious fines upon the citizens.

Climate, &c.—Pundit Nain Singh, who lived at Lhasa continuously from 26th January to 21st April (1866), inade indoor observations of the thermometer from 9th to 23d February hourly, with the exception of eight hours of sleep (11 p.m. to 7 A.M.); and the extreme variation in the record is from 26° (February 2d, 11 a.m.) to 45°°75 (February 22d, 2 p.m.). He also mentions that the river (Kichu Tsangpo) which flows by Lhasa was frozen in December,—the great river (Brahmaputra) being open and passed by boats. Water kept in the warmest part of a house froze, and burst the vessels holding it. It is not easy to draw very precise conclusions from these facts, but they perhaps indicate a somewhat less severe winter than that of Ladak, where the true air temperature is reckoned by Captain H. Strachey to range between zero and 30° Fahr. In other respects the Pundit’s account of the climate does not differ materially from those we possess of western Tibet. He says, besides, that strong and high winds are very pre- valent, especially during March and April; but snow fell only twice in the three months of his stay, and not deeper than 3 inches. The fall on the surrounding hills was some- what heavier, but apparently it

did not lie, for in general hardly any snow was to be seen from thie city. Should the snowfall in Lhasa ever exceed a foot, it is regarded as an evil omen. What little Desideri says is to like effect. The cold, he says, was never hurtful to health, and he had often spent the night (in winter apparently) under the open sky, without suffering. Lightning, which occurs only in con- nexiou with the summer rains, is never known to strike houses or to kill.

It begins to be warm in May, and the sun's power rapidly grows most oppressive. 'There is a distinct rainy season at Shigatze (July to September), and this appears to extend to Lhasa, though the information is not very precise. Nain Singh was told that earthquakes are unknown in the Lhasa province. Cholera is said to be unknown; but dysentery is often violent, and rapidly fatal. Cough and chest diseases are not prevalent, nor are skin diseases common, in spite of the filthy habits of the people. The most dreaded of all diseases is smallpox. Inoculation is habitually used. Ophthalmia is very prevalent and severe.

History.—The seat of the princes whose family raised Tibet to a position anong the powers of Asia was originally on the Yarlung river, in the extreme east of the region now occupied by Tibetan tribes. It was transplanted to Lhasa in the 7th century by the king Srong-dsan-gampo, conqueror, civilizer, and proselytizer, the founder of Buddhism in Tibet, the introducer of the Indian alphabet. On the three-peaked crag now occupied by the palace- monastery of the Great Lama this king is said to have established his fortress, whilst he founded in the plain below temples to receive the sacred images, brought respectively from Nepal and from China, by the brides to whom his own conversion is attributed.

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Tibet endured as a conquering power some two centurics, and the more famous among the descendants of the founder added to the city. This-rong-de-tsan (who reigned 740-786) is said to have erected a great temple-palace of which the basement followed the Tibetan style, the middle story the Chinese, and the upper story the Indian—a

combination which would aptly symbolize the elements that have moulded the culture of Lhasa, such as it is. His son, the last of the great orthodox kings, in the next century, is said to have summoned artists from Nepal and India, and among many splendid foundations to have erected a sanctuary (at Samayé) of vast height, which had nine stories, the three lower of stone, the three middle of brick, the three uppermost of timber. With this king the glory of Tibet and of ancient Lhasa reached its zenith, and in 822 an obelisk recording his treaty on equal terms with the Great T'ang emperor of China was erected in the city. There followed dark days for Lhasa and the Buddhist Church in the accession of this king's brother Langdharma, who has been called the Julian of the Lamas. 'This king rejected the doctrine, persecuted and scat- tered its ministers, and threw down its temples, convents, and images. It was more than a century before Buddhism recovered its hold, and its convents were rehabilitated over Tibet. The country was then split into an infinity of petty states, many of them ruled from the convents by warlike ecclesiastics; but, though the old monarchy never recovered, Lhasa seems to have maintained some supremacy, and probably never lost its claim to be the chief city of that eon- geries of principalities, with a comnion faith aud a common language, which was called Tibet.

The Arab geographers of the 10th century speak of Tibet, but it is without real knowledge, and none speak of any city that we can identify with Lhasa. The first passage in any Western author inwhich such identification can be probably traced occurs in the narrative of Friar Odorico of Pordenone (c. 1830). This remarkable traveller's route from Europe to India, and thence by sea to China, can be traced satisfactorily, but of his journey homeward through Asia the indi- cations are very fragmentary. He speaks, however, on this return journey of the realm of Tibet, which lay on the confines of India proper :—" The folk of that country dwell in tents made of black felt. But the chief and royal city is all built with walls of black and white, and all its streets are very well paved. In this city no one shall dare to shed the blood of any, whether man or beast, for the reverence they bear a certain idol that is there worshipped. In that city dwelleth the Abassi, i.¢., in their tougue the pope, who is the head of all the

idolators, and who has the disposal of all their benefices such as they are after their manner.”

We know that Kublai Khan had constituted a young prince of the Lama Church, Mati Dhwaja, as head of that body, and tributary ruler of Tibet, but besides this all is obscure for a century. This passage of Odoric shows that such authority continued under Kublai’s descendants, and that some foreshadow of the position since occupied by the Dalai Lama already existed. But it was not till a century after Odoric that the strange heredity of the dynasty of the Dalai Lamas of Lhasa actually began. And in the first two centuries of its existence the residence of these pontiffs was rather at Brebung or Sera than at Lhasa itself, though the latter was the eentre of devout resort. A great event for Lhasa was the conver- sion, or reconversion, of the Mongols to Lamaism (c. 1577), which made the city the focus of sanctity and pilgrimage to so vast a tract of Asia. It was in the middle of the 17th century that Lhasa became the residence of the Dalai Lama. A native prince, known as the“T’sanpo, with his seat at Shigatzé, had made himself master of southern Tibet, and threatened to absorb the whole. The fifth Dalai Lama, Navang Lobsang, called in the aid of a Calmuck prince, Gushi Khan, from the neighbourhood of the Koko-nur, who defeated and slew the Tsanpo and made over full dominion in Tibet to the Lama (1643). The latter now first established his court, and built his palace, on the rock-site of the fortress of the ancient monarchy, which apparently had fallen into ruin, and to. this he gave the name of Potala.}

In the time of this Dalai Lama, Lhasa was visited for the first time by European travellers. In 1624 Antonio d’Andrada, a Portu- guese Jesuit, had penetrated to Tibet through the Gangetic Hima- laya, and returned the following year with a coadjutor. But the place which he reached was Caparangue in the kingdom of Cogue, as he calls it, 7.¢., Chaprang in the province of Gugé on the Tibetan Sutlej, and he never got nearer Lhasa. In June 1661 the J esuit

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1 This name is absurdly explained by Abbé Huc as Buddha-la = ‘hill of Buddha.” This is not even a possible etymology, for, whilst the actual term Buddha seems never to be used untranslated in Tibet, one may discern from Huc’s own book that da means, not “‘a hill,” but ‘a pass” over mountains. The name seems to be really taken from the classical traditions of the Buddhists. Potala, ‘‘the harbour”’ (the Pattala of the Greeks, the modern Hyderabad on the Indus), was in legend the royal seat, for more than a hundred generations, of the Sakya progenitors of Gautama Buddha (see Csoma de Kérés in Journ. As. Soc. Bengal, ii. 390.

fathers, Albert D’Orville and John Grueber, started from Peking, and, by the way of Siningfu and the Koko-nur, reaehed Lhasa, where they stayed a month, and then went on through Nepal to India. The extraets from Grueber’s narrative, given by Athanasius Kircher in his China Ilustrata (Amst., 1667), are accompanied by a drawing of Potala which, though meagre, appears to be genuine, and is the only European representation in existence of that Tibetan Vatican.

The founder of Potala died in 1682, and his death was followed by events whieh brought on a time of trouble. He had appointed as “regent” or civil administrator (7isri, or Deba), one supposed to be his own natural son. This remarkable personage, Sangje Gyamtso, of great ambition and accomplishment, still renowned in Tibet as the author of some of the most valued works of the native literature, concealed the dcath of his master, asserting that the latter had retired, in mystic meditation or trance, to the upper chambers of the palace. The government contiuued to be carried on in the Lama’s name by the regent, who leagued with Galdan Khan of Dzungaria against the Chinese (Manchu) power. It was not till the great emperor Kang-hi was marching on Tibet that the death of the Lama, sixteen years before, was admitted. A solemn funeral was then performed, at which 108,000 lamas assisted, and a new incarnation was set up in the person ofa youth of fifteen. This young man was the seandal of the Lamaite Church in every kind of evil living and debauehery. But it was under

him and the regent Sangje Gyamtso that the Potala palace attained its present scale of grandcur, and that most of the other great buildings of Lhasa were extended and embellished. In 1705-6 a Calmuek prince, Latsan Khan, great grandson of Gushi Khan, taking the renowned name of Jenghiz Khan, made himself master of Tibet, and put to death both the crafty regent and the dissolute lama whom he had set up. The Dzungarians crossed the northern desert in 1717, and stormed Lhasa, but were in turn driven out by the army of Kang-hi in 1720, and from that time the Chinese power, though, as elsewhere, it has been at times severely shaken, has never quite lost its hold of Tibet.

It was in the midst of these troubled times (1708) that a Capuchin mission entered Lhasa. It was unfortunate in the death of its successive heads, and from about 1712 it was abandoned for several years, but after an interval the Capuchins reappeared, twelve in number, reaching Lhasa by Nepal in 1720. Nothing almost was heard of them till the head of the mission, P. Orazio della Penna, appeared at Rome in 1735 to report that ninc were dead, and to ask reinforcement. He returned with nine more, carrying presents to the Grand Lama and the so-ealled ‘‘ king of Tibet.” In 1742 he reported his safe arrival, and that the presents were well received. Called to Nepal, where there was a branch of the mission, he died there in 1747. We possess some of the results collected by this mission in an excellent short treatise on Tibet by P. Orazio himself, as well as in the extraordinary hodge-podge of crude philo- logy, rubbish, and valuable facts (like fossils imbedded in a bank of mud), the Alphabetum Tibetanwm of the Augustine monk Ant. Giorgi (Rome, 1762). The mission seems to have been expelled from Tibet in 1754, and found refuge for a time in Nepal. Some fifty volumes, the relics of the mission library, were in 1847 reeovered from Lhasa by Mr Bryan Hodgson, through the courtesy of the Grand Lama himself, and were transmitted as an offering to Pope Pius IX., then in the first bloom of reputation.

In 1716, moreover, two Jesuits, P. Ipolito Desideri of Pistoia, and P. Freyre, a Portuguese, reached Lhasa by way of Kashmir, Ladak, and the enormous journey from Ladak by the holy lakes and the valley of the Tsanpu. Desideri remained at Lhasa till April 1721, witnessing the

capture of Lhasa successively by Dzungar and Chinese. Of the moderation of the latter, and their abstinence from all out- rage or plunder, he speaks highly. His departure was due to con- troversies between the Jesuits and Capuchins at Rome, which caused an order to be issued for his retirement from Tibet. An interesting letter from him, dated April 10, 1716, is printed in the Lettres Hdi- Jiantes, Ree. xv., but a large MS. volume of his observations dur- ing his residence in Tibet is still unpublished. The next European visitor was Samuel Van de Putte of Flushing, an LL.D. of Leyden, whose thirst for travel carried him through India to Lhasa, where he is said to have resided a long time, to have acquired the language, and to have become intimate with some of the lamas. After travelling from Lhasa to Peking with a lania mission he returned, again by Lhasa, to India, and was an eye-witness of the sack ef Delhi by Nadir Shah in 1737. Unhappily he ordered his papers to be burnt after his death, and the knowledge that such a traveller must have accumulated died with him. We pass on to 1811-12 when the first (and last) English visit to Lhasa occurred. The traveller was Thomas Manning, a Cambridge man of Caius College, who had been long devoted to Chinese studies, the ‘“ friend M.” of Charles Lamb, from whom ‘ Elia” professes to have got that trans- lation of a Chinese MS. whieh furnished the immortal dissertation on roast pig. After residing some years at Canton, Manning went to Calcutta, bent on reaching the interior of China through Tibet, since from the seaboard it was sealed. He actually did reach Lhasa, stayed there about five montlis, and had several interviews with the Dalai Lama, but was compelled to return to India. He never

published anything regarding his Journey, and the very fact of its occurrence was known to few, when his narrative was printed, through the praiseworthy zeal of Mr C. Markham, in1876. The man had given the reins to his own eceentricities till he seemed to have lost all power of seriousness, and the account, though containing some passages of great interest, is most disappointing.

The uext travellers to reach Lhasa were Huc and Gabet, French Lazarist priests, who travelled from China the route followed by Grueber and by Van de Putte, via Siningfu, and reaehed Lhasa 29th January 1846. On the 15th of March they were seut off under escort by the rugged road to Sz'-chuen. Huc's book, Souvenirs d'un Voyage, &c., is probably still well known, and deserves to be so, for it is one of the most delightful among books of travel. Hue was indeed, not only without science, perhaps without accurate know- ledge of any kind, but also without that geographical sense which sometimes enables a traveller to bring baek valuable contributions to geographical knowledge though unable to make instrumental observations. He was, however, amazingly clever asa narrator and sketcher of character ; and, in this his first work, his ambition to shine had not gained the upper hand as it did fatally in later works. It was Ke-shen, a well-known Chinese statesman, disgraeed for making peace with the English at Canton in 1841, and who was then on a special deputation to Lhasa, who ostensibly expelled them. The Tibetan regent, with his enlightened and kindly spirit, is painted by Huc in most attractive colours, and Mr Mark- ham expresses strongly the opinion that the native authorities were most willing to receive strangers, whilst the jealousy that excluded them was Chinese only. Recent experiences of attempts to enter Tibet contradict this view. The lamas, whose rule seems to have becoine more and more grasping and oppressive, appear to be sen- sible that their system would easily fall to pieces, and are violently opposed to the passage of Europeans across the Tibetan frontier.

Our latest narrative of a visit to Lhasa is that of the late Pundit Nain Singh, trained as an explorer in the Indian survey department, He reached the city in the course of two most remarkable journeys. In the first, after an ineffeetual attempt by Nepal, he travelled by the Manasarowar Lake, and the road thenee eastward, parallel to the course of the Tsanpu, reaching Lhasa 10th January 1866, and leaving it 21st April 1867. On the second journey (1874) he started from Ladak, crossing the vast and elevated plateau by the Tengri-nor and other great lakes, and again reaching Lhasa 18th November. Between these two journeys Lhasa had also been visited by another native explorer in

1872.! Nain Singh, by his extraordinary surveys, and by repeated observations of latitude on his first visit, has fixed for us the position of Lhasa. But he also has given an aecount of his journeys, and of his residence there, which, though brief, is full of intelligence and interest, and appears to be thoroughly trust- worthy. This enterprising and deserving man was, on tlie comple- tion of his journey in 1875, rewarded by the Indian Government with a pension and grant of land, and afterwards reeeived the gold medal of the Roy. Geog. Soc. and the Companionship of the Star of India. He died early in 1882.

See Koeppen, Die Lamatsche Hierarchiec und Kirehe (Berlin, 1859), being the 2d vol. of Die Religion des Buddha ; Giorgi, Alpha- betum Tibetanwm, Rome, 1762 ; Huc, Souvenirs d'un Voyage, &c., Paris, 1850, vol. ii. ; Dese. dw Tubet (Wei-tsang-thou-chy), edited by Klaproth, Paris, 1881; Pundit Nain Singh (Colonel Montgomerie's Report) in Jowrn. Roy. Geog. Soc., vol. xxxviil. 129 sq.; Tibet (Bogle and Manning), by C. Markham, C.B. (2d ed. 1879); MS. narrative of P. Ipolito Desideri (copy in possession of Hakluyt Soc.). Also articles, by Dr A. Campbell in Journ. As. Soc. Bengal, vol. xxlv. p. 215; by the late Wilfrid Heeley, B.C.S., in Cale. Review, vol. lix. p. 1; by Col. H. Yule, in Blackwood's Mag., Mareh 1852, and in the Zimes, May 15, 1876; paper on " Chinese Tea Trade with Tibet," by E. C. Baber, printed in Suppt. to Gazette of India, November 8, 1879; 'The Silver Coinage of Tibet," by M. Terrien de la Couperie, in Numism. Chron., 3d ser., vol. i. (ide Ys)

L'HOPITAL, or L'Hospirat, Micuen DE (c. 1505-1573), chancellor of France from 1560 to 1568, was born near Aigueperse in Auvergne (now Puy-de-Déme) about the year 1505. His father, who was physician and comptroller of accounts to the constable Charles de Bourbon, sent him to study at Toulouse, whence at the age of eighteen he was driven by the evil fortunes of the family patron, after suffering arrest and imprisonment, to Padua, in which university he studied law and letters for about six years. On the completion of his studies he joined his father at Bologna, and afterwards, the constable having died, went to Rome in the suite of Charles V. For some time he held the position of auditor of the rota at Rome, but in

1534, encouraged by the fair promises of Cardinal de ae ee ee

1 See Walker’s Report for 1873-74.

Grammont, he returned to France. The death of his patron soon afterwards seriously impaired his prospects ; but after he had entered himself of the Parisian bar, his marriage, in 1537, to a daughter of the lieutenant-criminel procured for him the post of counsellor to the parliament of Paris. This office he held until 1547, when he was sent by Henry IL ona mission to Bologna, where the council of Trent was at that time sitting ; after sixteen months of wearisome inactivity there, he was by his own desire recalled at the close of 1548. L’H6pital now for some time lield the position of “chancellor” in the household of the princess Margaret, duchess of Berri, and in 1554 he was made superintendent of the royal finances. In 1559 he accom- panied his mistress, now duchess of Savoy, to Nice, where, on the following year, tidings reached him that he had been chosen to succeed Olivier in the chancellorship of France. One of his first acts after entering on the duties of his office (in July 1560) was to cause the parliament of Paris to register the edict of Romorantin, of which he is sometimes, but erroneously it would seem, said to have been the author. Designed as it was to protect so-called heretics from the secret and summary methods of the Inquisition, it certainly had his sympathy and approval. In accordance with the consistent policy of inclusion and toleration by which the whole of his official life was characterized, he induced the council to call the Assembly of Notables, which inet at Fontainebleau in August 1660 and agreed that the States General should be summoned, all proceedings against heretics being meanwhile suppressed, pending the reforma- tion of the church by a general or national council. The States General met in December ; the edict of Orleans (July 1561) followed, and finally, after the colloquy of Poissy, that of January 1562, the most liberal (except that of Nantes) ever obtained by the Protestants of France. Its terms, however, were not carried out, and during the war which was the inevitable result of the massacre of Vassy in May, L’Hopital, whose dismissal had been for

some time urged by the papal legate Hippolytus of Este, found it necessary to retire to his estate at Vignay near Etampes, whence he did not return until after the pacification of Amboise (March 19, 1563). It was by his advice that Charles IX. was declared of age (August 17, 1563) at Rouen, a measure which really increased the power of Catherine de' Medici; and it was under his inflnence also that the parliament of Paris in 1564 refused to sanction the publication of the acts of the council of Trent, on account of their inconsistency with the Gallican liberties. In 1564-66 he accompanied the young king on an extended tour through France ; and in 1566 he was instrumental in the promulgation of an important edict for reform of abuses in the administration of justice. The renewal of the religious war in September 1567, llowever, was at once a symptom and a cause of diminished influence to L'Hépital, and in February 1568 he obtained his letters of discharge, which were registered by the parliament on May 11, his titles, honours, and emoluments being reserved to him during the remainder of his life. Henceforward he lived a life of unbroken literary seclusion at Vignay, his only subsequent public appearance being by means of a "'mémoire" which he addressed to the king in 1570 under the title Le but de la guerre et de la paix, ou Discours du chancelier L' Hospital pour exhorter Charles LX. & donner la paix & ses subjects, Though not exempt from considerable danger, he passed in safety through the troubles of the St Bartholomew, but did not long survive them. His death took place either at Vignay or at Bélesbat (Courdimanche, Iitampes) on March 13, 1573.

After his death Pibrae, assisted by De Thou and Seévole de Sainte-Marthe, collected a volume of the Poemata of L/Hépiial, and in 1585 his grandson published Epistolarwm sew Sermonwm

libri sex. The complete Huvres de Hépital were published for the first time by Dufey (5 vols. 8vo, Paris, 1824-25). They inelude his " Harangues " and " Remonstranees,"' the Epistles, the Mémotre to Charles 1X., a Traitté de la Reformation de la Justice, and the will of L'Hépital. Haag (France Prot., vii. p. 88) gives the titles of several

MSS. still unpublished. Villemain wrote a Vie de L' Hépital, which has reeently been reprinted (1874), and there are et also by Taillandier (1861) and by Dupré-Lasal

(1875).

LIAU-YANG, or Leaou-YAane, a city of China, formerly the chief town of the province of Liau-tung or Shing-king (southern Manchuria), and still a place of considerable mark, 35 miles south of Moukden. It is situated in a rich cotton district, and carries on no small trade. The walls include an area about 24 miles long by 2 miles broad, and there are pretty extensive suburbs; but a good deal even of the enclosed area is under cultivation. The population is estimated at 80,000.

LIBANIUS, a Sophist, was the most distinguished Greek writer of the 4th century a.p. He was born at Antioch beween 314 and 316. He studied at Athens, and spent most of his earlier manhood in Constantinople and Nicomedia. His private classes at Constantinople were much more popular than those of the public professors ; and their jealousy found means of having him expelled from Constantinople in 346 on the charge of studying magic. He was recalled from Nicomedia after five years. Ill health obliged him to retire to Antioch, where he spent the later part of his life. Though a pagan by religion, he enjoyed the favour of the Christian emperors. When Julian restored paganism as the state religion, Libanius showed no intolerance. Among his pupils he numbered St John Chrysostom and St Basil. His works, consisting chiefly of orations, declamations on set topics, and letters, are very voluminous, and have not yet been published in one single edition. He devoted much time to the study of the classical Greek writers, on whom his style is modelled with considerable success.

The best edition of the orations and declamations is Reiske's, of the letters Wolf's. Sce Westermann, Gesch. d. Griech. Beredtsam- keit ; Bernhardy's and other histories of Greek literature; Forster, = Schriftstelleret des Libanios, and articles in Hermes, vols. ix. anu X.

LIBAU (Leepaja of the Letts), a port of Russia, on the Baltic Sea, in the government of Courland and district of Grobin, 143 miles by rail south-west of Riga. It is situated at the northern extremity of a narrow sandy peninsula which separates Lake Libau (12 miles long and 2 miles wide) from the Baltic Sea. The town is well built of stone, with good gardens, aud has a gymnasium and more than twenty different schools, cigar manufactories, machine works, and a small wharf. The sea throwing up a good deal of amber, many inhabitants are engaged in the fabrica- tion of small articles of that substance. The harbour of Libau was 2 iniles south of the town until a canal was dng through the peninsula in 1697; but this canal is liable to be silted up, and the depth at the bar is only 9 feet, or even 6 feet during south-west winds, so that larger ships must lie in the open roadstead. Libau being the most southern Baltic port in Russia has the advantage of freezing only for a few weeks during the winter. Since being brought, in 1872, into railway connexion with Moscow, Orel, and Kharkoff, it has become an important Russian port, and competes with the northern ports of Prussia, the exports already exceeding by 100,000 tons those from Konigsberg. In 1879 the port of Libau was visited by 1976 ships, and the export of corn, flax, hempseed, and linseed has reached 28,212,600 roubles (about £2,822,000), against 1,980,000 roubles and 367 ships in 1872. The merchants carry on an active trade in grain and flax, mak- ing their purchases directly in southern Russia; their warehouses are numerous, spacious, and well built. The

yearly fair has some importance for the neighbouring dis- tricts. The town is also a watering-place, yearly visited by several hundreds of persons. Population in 1881, 27,900 ; with military and railway servants, 30,000.

The port of Libau, Lyra portus, is mentioned as early as 1263 ; it then belonged to the Livonian order. In 1418 it was burnt by Lithuanians, and in 1560 it was mortgaged by the grandmaster of the order to the Prussian duke Albert. It was annexed to Russia in 1795.

LIBEL anp SLANDER are the terms employed in Eng- lish law to denote injurious attacks upon a man's reputation or character by words written or. spoken, or by equivalent signs. In most early systems of law we find verbal injuries treated as a criminal or quasi-criminal offence, the essence of the injury lying not in pecuniary loss, which may be compensated by damages, but in the personal insult which must be atoned for,—a vindictive penalty coming in the place of personal revenge. By the law of the XII. Tables, the composition of scurrilous songs and gross noisy public affronts were punished by death. Minor offences of the same class seem to have found their place under the general conception of enjuria, which included ultimately every form of direct personal aggression which involved contumely or insult. In the later Roman jurisprudence, which has, on this point, exercised considerable influence over modern systems of law, we find verbal injuries dealt with in the edict under two heads. The first comprehended defamatory and injurious statements which were made in a public manner (conviciwm contra bonos mores). In this case the essence of the offence lay in the unwarrantable public proclamation, in the contumely which was offered to a man before his fellow-citizens. In such a case the truth of the statements was no justification for the unnecessarily public and insulting manner in which they had been made. The second head included defamatory statements which were made in private, and in this case the offence lay in the imputation itself, not in the manner of its publication. The truth was therefore a sufficient defence, for no man had a right to demand legal protection

for a false reputa- tion. Even belief in the truth was enough, because it took away the intention which was essential to the notion of imjurid. The law thus aimed at giving sufficient scope for the discussion of a man's character, while at the same time it protected him from needless insult and pain. The remedy for verbal injuries was long confined to a civil action for a money penalty, which was estimated according to the gravity of the case, and which, although vindictive in its character, doubtless included practically the element of compensation. Buta new remedy was introduced with the extension of the criminal law, under which many kinds of defamation were punished with great severity. We find at the same time increased importance attached to the publication of defamatory books and writings, the /éb7 or libellt famost, from which we derive our modern use of the word libel; and under the later emperors the latter term came to be specially applied to anonymous accusations or pasquils, the dissemination of which was regarded as peculiarly dangerous, and visited with very severe punislі- ment, whether the matter contained in them were true or false.

The earlier history of the English law of defamation is somewhat obscure. Civil actions for damages seem to have been tolerably frequent so far back as the reign of Edward I. There was no distinction drawn between words written and spoken. When no pecuniary penalty was involved such cases fell within the old jurisdiction of the ecclesiastical courts, which was only finally abolished during the present reign, Jt seems, to say the least, uncertain whether any generally applicable criminal process was in use. The crime of scandalum magnatum, spreading false reports

about the magnates of the realm, was established by statutes,

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but the first fully reported case in which libel is affirmed generally to ke punishable at common law is one tried in the Star Chamber in the reign of James I. In that case no English authorities are cited except a previous case of the same nature before the same tribunal; the law and terminology appear to be taken directly from Roman sources, with the insertion that libels tended toa breach of the peace ; and it seems

probable that that not very scrupulous tribu- nal had simply found it convenient to adopt the very stringent Roman provisions regarding the libelli famosi without paying any regard to the Roman limitations. From that time we find both the criminal and civil remedies in full operation, and will now consider how the law stands with regard to each at the present time.

Civil Law.—The first important distinction we encounter is that between slander and libel, between the oral and written promulgation of defamatory statements. In the former case the remedy is limited. The law will not take notice of every kind of abusive or defamatory language. It must be shown either that the plaintiff has suffered actual damage as a direct consequence of the slander, or that the imputation is of such a nature that we are entitled to infer damage as a necessary consequence. The special damage on which an action is founded for slanderous words must be of the nature of pecuniary loss. Loss of reputa- tion or of position in society, or even illness, however clearly it may be traced to the slander, is insufficient. When we cannot prove special damage, the action for slander is only allowed upon certain strictly defined grounds. These are the imputation of a crime or misdemeanour which is punishable corporeally, e.g., by imprisonment ; the imputa- tion of a contagions or infectious disease ; statements which tend to the disherison of an apparent heir (other cases of slander of title when the party is in possession requiring the allegation of special damage); and lastly, slanders directed against a man’s professional or business character, which tend directly to prejudice him in his trade, profes- sion, or means of livelihood. In the latter case the words must either be directly aimed at a man in his business or official character, or they must be such as necessarily to imply unfitness for his particular office or occupation. Thus words which merely reflect generally upon the moral character of a tradesman or professional man are not actionable, but they are actionable if directed against his dealings in the course of his trade or profession. But, in the case of a merchant or trader, an allegation which affects his credit generally is enough, and in the same way it has been held that statements are actionable which affect the ability or moral characters of persons who hold offices, or exercise occupation which require a high degree of

ability, or infer peculiar confidence. In every case the plaintiff must have been at the time of the slander in the actual exercise of the occupation or enjoyment of the office with reference to which the slander is supposed to have affected him.

The action for libel is not restricted in the same way as that for slander. Originally, as we have seen, there appears to have been no essential distinction between them, but the establishment of libel as a criminal offence had probably considerable influence, and it soon became settled that written defamatory statements, or pictures and other signs which bore a defamatory meaning, implied greater malice and deliberation, and were generally fraught with greater injury than those which were merely made by word of mouth. ‘The result has been that the action for libel is not limited to special grounds, or by the necessity of proving special damage. It may be founded on any statement which disparages a man’s private or professional character, or which tends to hold him up to hatred, contempt, of

ridicule. In one of the leading cases, for example, the XIV. — 64

plaintiff obtained damages because it was said of him that he was a hypocrite, and had used the cloak of religion for unworthy purposes. In another case a charge of ingratitude was held sufficient. In civil cases the libel must be published by being brought by the defendant under the notice of a third party, and it has even been held that it is sufficient if this has been done by gross carelessness, without deliberate intention to publish. Every person is liable to an action who is concerned in the publication of a libel, whether he be the author, printer, or publisher ; and the extent and manner of the publication, although not affecting the ground of the action, is a material elemeut in estimating the damages.

It is not necessary that the defamatory character of the words or writing complained of should be apparent on their face. They may be couched in the form of an insiuuation, or may derive their sting from a reference to circumstances understood by the persons to whom they

are addressed. In such a case the plaintiff must make the injurious sense clear by an averment called an innuendo, and it is for the jury to say whether the words bore the meaning thus ascribed to them.

In all civil actious for slander and libel the falsity of the injurious statements is an essential element, so that the defendant is always entitled to justify his statements by their truth ; but when the statements are in themselves defamatory, their falsity is presumed, and the burden of proving their truth is laid upon the defendant. There are however, a large class of false defamatory statements, commonly called privileged, which are not actionable on account of the particular circumstances in which they are made. The general theory of law with regard to these cases is this. It is assumed that in every case of defamation intention is a necessary element; but in the ordinary case, when a statement is false and defamatory, the law presumes that it has been made or published with an evil intent, and will not allow this presumption to be rebutted by evidence or submitted as matter of fact to a jury. But there are certain circumstances in which the natural presumption is quite the other way. There are certain natural and proper occasions on which statements may be made which are in themselves defamatory, and which may be false, but which naturally suggest that the statements may have been made from a perfectly proper motive and with entire belief in their truth. In the cases of this kind Which are recognized by law, the presumption is reversed. It lies with the plaintiff to show that the defendant was actuated by what is called express malice, by an intention to do harm, and in this case the question is not one of legal inference for the court, but a matter of fact to be decided by the jury. Although, however, the theory of the law seems to rest entirely upon natural presumption of inten- tion, it is pretty clear that in determining the limits of privilege the courts have been almost wholly guided by considerations of public or general expediency.

In some cases the privilege is absolute, so that we cannot have an action for defamation even although we prove express malice. Thus no action of this kind can be maintained for statements made in the course of judicial proceedings if they are in any sense relevant to the matter in

hand. In the same way no statements or publications are actionable which are made in the ordinary course of parliamentary proceedings. Papers published under the authority of parliament are protected by a special Act, 3 & 4 Vict. c. 9, which was passed after a decree of the law courts adverse to the privilege claimed. The reports of judicial and parliamentary proceedings stand in a some- what different position, which has only been attained after a long and interesting conflict. The general rule now is that all reports of parliamentary or judicial proceedings

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are privileged in so far as they are honest and impartial. Even ex parte proceedings, in so far as they take place in public, now fall within the same rule. But if the report is garbled, or if part of it only is published, the party who is injured in consequence is entitled to maintain an action, and to have the question of malice submitted to a jury. Comments on subjects of public interest, ou the proceedings of courts or public bodies, on publications, exhibitions, and on persons who have in any way chosen to invite the public attention, fall within a similar rule. The public interest demands that on all these subjects a fair latitude for discussion should be permitted; the critic is entitled to the utmost liberty so long as he expresses nothing more than his honest opinion of the subject before him, but if it can be proved that he has used false and defamatory language out of malice, and especially if he has travelled beyond the facts which are properly before the public, he is no longer protected by his privilege. In private life a large number of statements are privileged so long as they remain matters of strictly private communication. It is difficult to define the limits of private privilege without extensive reference to concrete cases ; but generally it may be said that it includes all communications which are made in performance of a duty not merely legal but moral or social, answers to bona fide inquiries, communications made by persons in confidential relations regarding matters in which one or both are interested, and even statements made within proper limits by persons in the bona fide prosecution of their own interest. Common examples of this kind of privilege are to be found in answer to inquiries as to the character of

servants or the solvency of a trader, warnings to a friend, communications between persons who are jointly interested in some matters of business, But in every case we must be careful not to exceed the limits of publication required by the occasion, or otherwise the privilege is lost. Thus defamatory statements may be privileged when made toa meeting of shareholders, but not when published to others who have no immediate con- cern in the business.

In a few instances in which an action cannot be maintained even by the averment of malice, the plaintiff may maintain an action by averring not only malice but also want of reasonable and probable cause. The most common instances of this kind are malicious charges made in the ordinary course of justice and malicious prosecutions. In such cases it would be contrary to public policy to punish or prevent every charge which was made from a purely malicious motive, but there is no reason for protecting accusations which are not only mali- cious, but destitute of all reasonable probability.

Criminal Law.—Publications which are blasphemous, immoral, or seditious are frequently termed libels, and are punishable both at common law and by various statutes. The matter, however, which constitutes the offence in these publications lies beyond our present scope. Libels ‘upon individuals may be prosccuted by criminal information or indictment, but there can be no criminal prosecution for slander. So far as concerns the definition of libel, and its limitation by the necessity of proving in certain cases express malice, there is ho substantial difference between the rules which apply to criminal prosecutions and to civil actions, with the one important exception (now considerably modified) that the falsity of a libel is not in criminal law an essential element of the offence. If the matter alleged were in itself defamatory, the court would not permit inquiry into its truth. The sweeping application of this rule seems chiefly due to the indiscriminate use, in earlier cases, of a rule in Roman law which was only applicable to certain modes of publication, but has been supported by various reasons of general policy, and especially by the

by 6 & 7 Vict. c 96.

view that one main reason for punishing a libel was its tendency to provoke a breach of the peace. The same view has occasioned a difference in the publication required in civil and criminal actions. It is enough in criminal law that the libel has been published to the party against whom it is directed, if it is averred that it is intended or calculated to produce a breach of the peace. Important alterations, however, have been introduced into this branch of the law By that Act any person who maliciously publishes a defamatory libel may be punished by fine or imprisonment or both, the imprisonment not to exceed one year. Any person maliciously publishing a defamatory libel, knowing the same to be false, is liable to fine and imprisonment for two years. In every case the truth of the matters charged may be inquired into if it be pleaded, but the truth does not amount to a defence unless it is also proved that the publication was for the public benefit ; and if, after such plea, the defendant is convicted, it is competent to the court to consider whether the guilt of the defendant is mitigated or aggravated by the plea, and the evidence given in relation to it By the same Act a defendant is protected from publication of libels without his knowledge, authority, or consent, if the publication did not arise from the want of due care and caution on his part. The court are further authorized to award costs to the defendant in any information or indict- ment at the instance of a private prosecutor.

An important dispute about the powers of the jury in cases of libel arose during last century in connexion with some weil known trials for seditious libels. The point is familiar to readers of Macaulay in connexion with the trial of the seven bishops, but the cases in which it was brought most prominently forward, and which led to its final settlement, were those against Woodfall (the printer of Junius), Wilkes, and others, and especially the case against Shipley, the dean of St Asaph (21 St. Tr. 925), in which the question was fought by Mr Erskine with extraordinary energy and ability. The controversy turned upon the question whether the jury were to be strictly confined to matters of fact which required to be proved by evidence, or whether in every case they were entitled to form their own opinion upon the

libellous character of the publication and the intention of the author. There could be no doubt of course that the jury, if they pleased, had it in their power to return a general verdict of guilty or not guilty, but both in theory and practice they were subject in law to the directions of the court, and had to be informed by it as to what they were to take into consideration in determining upon their verdict (see Jury). There is no difficulty about the general application of this principle in criminal trials. In a case of murder, for example, the judge directs the jury that if they are satisfied the accused did so and so they ought to find him guilty. He directs them, not merely as to the definition of the crime, but as to the particular facts which fall within that definition. If the crime is one which is inferred by law from certain facts, they are only concerned with these facts, and must accept the construction which is put upon them by law. Applying these principles to the case of Jibel, juries were directed that it was for the court to determine whether the publication fell within the definition of libel, and whether the case was one in which malice was to be inferred by construction of law. If the case were one in which malice was inferred by law, the only facts left to the jury were the fact of publication and the meaning averred by innuendoes; they could not go into the question of intention, unless the case were one of privilege, in which express malice had to be proved. In general principle, therefore, the decisions of the court were in accordance with the ordinary principles of criminal law. But there were

undoubtedly some peculiarities in the case of libel. The sense of words, the inferences to be drawn from them, and the effect which they produce are not so easily defined as gross matters of fact. They seem to belong to those cases in which the impression made upon a jury is more to be trusted than the decision of a judge. And further, owing to the mode of procedure, the defendant was often punished before the question of law was determined. But neverthe- less the question would scarcely have been raised had the libels related merely to private matters. The real ground of dispute was the liberty to be accorded to political discussion. Had the judges taken as wide a view of privilege

in discussing matters of public interest as they do now, the question could scarcely have arisen ; for Erskine's whole contention really amounted to this, that the jury were entitled to take into consideration the good or bad intent of the authors, which is precisely the question which would now be put before them in any matter which concerned the public. But at that time the notion of a special privilege attaching to political discussion had scarcely arisen, or was at least confined within very narrow limits, and the cause of free political discussion seemed to be more safely entrusted to juries than to courts. The question was finally settled by Mr Fox's Libel Act (32 Geo. IID, c. 60), by which the jury were entitled to give a general verdict on the whole matter put in issue.

Scotch Law.—In Scotch law there were originally three remedies for defamation. It might be prosecuted by or with the concurrence of the lord advocate before the Court of Justiciary ; or, sccondly, a criminal remedy might be obtained in the commissary (ccclesiastical)

courts, which originally dealt with the defender by public retractation or penance, but subsequently made use of fines payable to their own

- procurator or to the party injured, these latter being regarded as

solatium to his feelings ; or, lastly, an action of damages was competent before the Court of Session, which was strictly civil in its character, and aimed at the reparation of patrimonial loss. The first remedy has fallen into disuse ; the second and third (the commissary courts being now abolished) became mixed up togethcr, and are represented by the oe action for damages or solatium. Originally the action before the Court of Session was strictly for damages—founded, not upon the animus injuriandi, but upon culpa, and could be defended by proving the truth of the statements. Bat in time the Court of Session began to assume the original jurisdiction of the commissary courts, and entertained actions for solatium in which the animus injuriandi was a necessary element, and to which, as in Roman law, the truth was not necessarily a defence. Ultimately the twoactions got very much confused. We find continual disputes as to the necessity for the animus tnjuriandi and the applicability of the plea of veritas convicti, which

arose from the fact that the courts were not always conscious that they were dealing with two actions, to one of which these notions were applicable, and to the other not. On the introduction of the jury court, presided over by an English lawyer, it was quite natural that he, finding no very clear distinction maintained between damage and solatium, applied the English plea of truth as a justification to every case, and retained the animus injuriandi both in ordinary cases and cases of privilege in the same shape as the English con- ception of malice. The leading and almost only differences between the English and Scotch law now are that the latter makes no essential distinction between oral and written defamation, that it practically gives an action for every case of defamation oral or written upon which in England a civil action might be maintained for libel, and that it possesses no criminal remedy. In consequence of the latter defect and the indiscriminate application of the plea of veritas to every case both of damages and solatium, there appears to be at present no remedy in Scotland even for the widest and most needless publication of offensive statements if only they are true.

Anerican Law.—In this as in so many other departments the American law scarcely if at all differs from that of England. In so far indeed as the common law is concerucd, they may be said to be substantially identical. The principal statutes which have altered the English criminal law, such as Mr Fox’s Act, and 6 & 7 Vict. c. 96, are also represented by equivalent legislation in most American States. (A. GI.)

LIBER anp LIBERA, among the Romans, were a pair of deities, male and female, in whose worship two very different phases exist side by side. In the country feast of the vintage, and the city festival of March 17th called

Inberalia, we find purely Italian ceremonial unaffected by Greek religion. The country festival was a great merry- making, where the first-fruits of the new must were offered to the gods. It was full of unbridled rejoicing, and characterized by the grossest symbolism, in honour of the fertility of nature. It is usual to refer the name Liber to

the free unrestrained character of his worship. In the city festival, growing civilization had impressed a new character on the primitive religion, and connected it with the frame- work of society. At this time the youths laid aside the boy's toga pretexta and assumed the man's toga libera or virilis. Cakes of far, honey, and oil (/iba) were offered to the two gods at this festival. Liber is often invoked as Liber Pater, and we find even the expression Jupzter Liber, taking us back to the primitive stage of religion when no divine hierarchy of gods had been elaborated, and when Liber and Libera were in the sphere of their cultus the sole god and goddess. Originally Liber is probably only an epithet of Jupiter.

At an early period the Hellenic religion of Demeter, common to all the Greek colonies of Italy and Sicily, spread to Rome; then Liber and Libera were identified with Dionysus and Persephone, and associated with another Italian goddess Ceres, who was identified with Demeter. At the order of the Sibylline books, a temple was built to these three deities near the Circus Flaminius ; the whole cultus was borrowed from the Greeks, down even to the ter- minology, and priestesses were brought from the Greek cities. The temple, Zdes Cereris, was founded by Aulus Postumius, 496 B.c., and dedicated by Spurius Cassius, 493 B.c. The chief festival of this cultus lasted eight days, from the 12th

to the 19th of April; it was accompanied by games, called –

Ludi Cereales or Liberales. The plebeian ediles, appointed about the time when the temple was founded, were closely attached to it, and from that time plebeian liberty con- tinued in intimate relation to the Wdes Cereris and the gods there worshipped.

LIBERIA, a Negro republic on the Grain Coast of West Africa. Founded in 1822 by American philanthro- pists for the settlement of freedmen who wished to return to their native land, or to enjoy political and social privi- leges then denied them in the United States, it remained for twenty-five ycars under the tutelage of the mother country, bunt on the 26th July 1847 it was declared inde- pendent. In 1848 it was recognized as a sovereign state by Great Britain, which aided it in various ways, and by other Continental powers, and finally

in 1861 by the United States. Its nominal boundaries are from the river Jong, a tributary of the Sherbar, in 7° 35’ N. lat., 12° 20’ W. long., and the river San Pedro, in 4° 45’ N. lat., 6° 40’ W. long., a distance of 380 miles, the limits of the state in the interior being usually stated at from 80 to 100 miles eastward, though this is unsettled, and the entire area of the country at 24,000 square miles, or 1000 miles less than Holland and Belgium combined. Like that of northern Guinea generally, the Liberian shore ig low, but the country rises towards the interior, and is well-wooded and watered by numerous streams. The climate is, however, hot and unhealthy for Europeans, though of late years it has been improved by drainage, and is considered superior to that of any part of the neighbouring coast. The soil is fertile and well suited for the growth of tropical crops, stich as cotton, rice, sugar, indigo, yams, ground- nuts, bananas, ginger, cassava, pine-apples, cocoa-nuts, limes, oranges, tamarinds, and the Liberian variety of coffeel held in such high esteem. These products, in addition to palm oil, form the main support of the inhabitants, who in

1 Liberian coffee (see CorFEE, vol. vi. p. 110) has been introdueed

into Brazil, Ceylon, the Dutch Indies, &c. The quantity actually exported from Liberia is comparatively small.

returu’ import arms, ammunition, tobacco, salt provisions, implements of husbandry, cutlery, British. cottons, and other manufactured goods. Coffee, palm oil, palm-kernels, rubber, ivory, dye woods, hides, ivory, arrowroot, sugar, cocoa, ginger, and rice form the principal articles of its commerce, which is carried on chiefly with Great Britain, Holland, Hamburg, and America. Copper, gold, iron, and deposits of gum-copal exist, but they are not worked ;. and all the large wild animals have long since been killed or driven out of the woods. Stock can be kept in the higher lands. The government is modelled on that of the Unitcd States, and consists of a president, and a congress composed of a senate of eight members elected for four years, and of a house of representatives of thirteen members elected for three years, in addition to a supreme court, and a cabinet of the American type. One additional

represen- tative is given for each additional 10,000 inhabitants by which the population may increase. Military service in the militia is obligatory on every male citizen between the ages of sixteen and fifty, but there is no standing army. There is no established church, and all faiths are equally tolerated. The state is divided into four counties (Mczurada, Grand Bassa, Sinoe, and Maryland?), and these again into town- ships, each 64 square miles in arca. There are a number of little villages, but the only place of any consequence is Monrovia, the capital, containing 13,000 inhabitants, and in appearance very like a town in the southern United States, but in no way remarkable except for the large number of churches within its bounds. Besides Monrovia tlie chief ports are Robertsport, Marshall, Edina or Buchanan, Greenville, Sesters River, Sasstown, and Harper, and in 1881 foreigners were further permitted to trade at any point to the north of Robertsport. The present population of the republic (1882) comprises 18,000 civilized negroes, chiefly of American origin, and 1,050,000 half-wild natives, some of whom are adopting a settled life, and conforming to the habits of their tamed countrymen. Among the more interesting tribes are the Veis, the Bassas, the Krus, and the Mandingoes, The American Methodist Episcopal mission dates from 1833, the American Episcopal from 1834, and that of the American Baptists from 1835. The revenue of the state was returned at September 30, 1875, as 111,457 dollars, chiefly derived from customs, the national debt being 500,000 dollars, contracted in England in 1871. Of this neither principal nor intcrest has been paid. Socially and politically the state cannot be pronounced a marked success. The negroes in America display little desire to throw in their fortunes with it, now that they are free to go whither they list, nor do the barbarous tribes on the border of the republic seem to admire the black parody on a white man’s government, which for sixty years has been presented to them. There is now and again a small immigration from the United States, but the Liberian civilization, cut off from the benefit of intercourse with a higher and broader culture, is apt to deteriorate, while neither the climate nor the laws and social surroundings are ever likely to attract many white men to its: shores, It is, however, only fair to add that, though internal dis- order is too often the rule, the state shows an appreciation of education and religion, and a keen desire to

stand well _ in the good opinion of the powers with which it has * relations by accredited representatives. It has formed treaties with most of the European countries, and with Hayti and the United States; and, though it has not paid its debts, successive Governments are in the habit of registering vows to meet this first obligation of a nation towards its neighbours. British coin and an irredecmable

? Maryland was originally a separate colony, founded in 1831 3 it

became an independent republic in 1854, and about 1860 was incor- porated with its older neighbour. ~

paper currency are the money chiefly in circulation, but all accounts are kept in United States dollars and cents. The weights employed are also British, except that gold from the interior is bought and sold by the usano = 16 akis = 16,000 cowrics=314°76 grainstroy. The gondar-ardeb (7:74 imperial pints), the massuah-ardeb (2°32 imp. gals.), and the kuba (1°788 imp. pints) are also in common use.

See Gurley's Life of Jehudi Ashmun, 1835; Stoekwell, The Republic of Liberia, 1868; Wilson, West Afriea, 1856; Hutehinson, Impressions of West Africa, 1858; Ritter, in Zeitschrift fiir alige- meine Erdkunde, vol. i., 1853; Brown, Countries of the World, vol, vi. pp. 123-127, 1881; Bowen, Central Africa, 1857; Thomas, West Coast of Afriea, 1860; '* Die Negerrepublik Liberia," in Unsere Zeit, vol. iii., 1858 ; U.S. Consular Reports, 1881.

LIBERIUS, pope from 352 to 366, the successor of Julius I., was consecrated according to the Catalogus Liberianus on May 22, His first recorded act was, after a synod had been held at Rome, to write to Constantius, then in quarters at Arles (353-54), asking that a council might be called at Aquileia with reference to the affairs of Athanasius ; but his messenger Vincentius of Capua, so far from being successful in his mission, was himself compelled by the emperor at a conciliabulnm held in Arles to subscribe against his will a condemnation of the orthodox patriarch of Alexandria. In 355 Liberius was one of the few who, along with Eusebius of Vercelli, Dionysius of Milan, and Lucifer of Cagliari, refused to sign the condem- nation of Athanasius, which

had anew been imposed at Milan by imperial command upon all the Western bishops ; the consequence was his relegation to Bercea in Thrace, Felix II. (antipope) at the same time being consecrated his successor by three " catascopi haud episcopi," as Athanasius called them. At the end of an exile of more than two years he yielded so far as to subscribe the third Sirmian formula giving up the "homoousion,"—an act which pro- cured his immediate and triumphant return to Rome, but lias ever since caused considerable embarrassment to maintainers of the indefectibility of Roman orthodoxy. The remainder of his pontificate was uneventful. He died on September 24, 366, and was succeeded by Damasus I. With the rest of the first sixty popes he shares the title of "Saint." His biographers used to be perplexed by a letter purporting to be from Liberius, in the works of Hilary, in which he seems to write, in 352, that he had excommunicated Athanasius at the instance of the Oriental

bishops; but the document is now held to be spurious. See Hefele, Conciliengesch., i, p. 648 sq.

LIBOURNE, the chief town of an arrondissement, and in point of population the second town of the department of Gironde, France, is situated at the confluence of the Isle with the Dordogne, 337 miles by rail south-west from Paris, and 22 miles east from Bordeaux, The sea is 56 miles off, but the tide affects the river so as to admit of vessels of 300 tons burden reaching the town. The Dordogne is here crossed by a stone bridge 492 feet long, and a suspension bridge across the Isle counects Libourne with the adjoining Fronsac, the citadel of which, 235 feet above the sea, was at one time occupied by a palace of Charlemagne, and subsequently became an important fortress. Libourne is regularly built, but has no monuments of much archi- tectural or historical interest ; the (restored) Gothic church has a stone spire 232 feet high. On the quay there is a machicolated clock-tower which is a remnant of the ramparts of the 14th century ; and the town-house, contain- ing a small museum, is a quaint relic of the 16th

century. There is a statue of the Duc Decazes, who was born in the neighbourhood. ‘The principal articles of commerce are the wines and brandies of the district, the growths of chief repute being those of St Emilion, a short distance above Libourne, on the right bank of the Dordogne, and of Canon, a little below Fronsac. ‘There is also some trade in yarn, grain, and wood for cooperage. Woollen stuffs and some articles of army outfit are manufactured ; and nailmaking, tanning, shoemaking, and shipbuilding are also carried on. The harbour is used exclusively by small vessels for the export of wines; the shipping owned in the place does not exceed 2500 tons. The population of Libourne in 1876 was 15,231.

Like other sites at the confluence of important rivers, that of Libourne was appropriated at an early period. Under the Romans Condate stood rather more than a mile to the south of the present Libourne, where the old Gothie ehapelle de Condat now is; it was destroyed during the troubles of the 5th century. Resuseitated by Charlemagne, it was rebnilt, under its present name, and on the site and plan it still retains, by Edward, prinee of Wales, in 1270. It suffered considerably in the struggles of the French and English for the possession of Guienne in the 14th eentury, and again during the religious wars, and finally in the war of the Fronde in the minority of Louis XIV. Nevertheless it ultimately ontgrew both its power- ful neighbours Fronsae and Saint Emilion, the latter of which is arehzologieally one of the most cnrions spots in Franee.

LIBRARIES

HISTORY AND DESCRIPTION. ANCIENT PERIOD.

IBRARIES, in our modern sense of collections of printed or written literature, imply an advanced and elaborate civilization. If the term be extended to any considerable collection of written documents, they must be nearly as old as civilization itself. The earliest use to which the invention of inscribed or written signs was put was probably to record important religious and political transactions. These records would naturally be preserved in sacred places, and accordingly the earliest libraries of the world were probably temples, and the earliest

librarians priests. And indeed before the extension of the arts of writing and reading the priests were the only persons who could perform such work as, ¢.g., the compilation of the Annales Maximi, which was the duty of the pontifices in ancient Rome. The beginnings of literature proper in the shape of ballads and songs may have continued to be conveyed orally only from one geueration to another, long after the record of important religious or civil events was regularly committed to writing. The earliest collections of which we know anything therefore were collections of

as to require a magnifying glass.

archives. Of this character appear to have been such famous collections as that of the Medians at Ecbatana or the Persians at Susa. It is not until the development of arts and sciences, and the growth of a considerable written literature, and even of a distinct literary class, that we find collections of books which can be called libraries in our modern sense, It is of libraries in the modern sense, and not, except incidentally, of archives that we are to speak. The researches which have followed the discoveries of Botta and Layard have thrown unexpected light not only upon the history but upon the arts, the sciences, and the literatures of the ancient civilizations of Babylonia and Assyria. In all these wondrous revelations no facts are more interesting than those which show the existence of extensive libraries so many ages ago, and none are more eloquent of the elaborateness of these forgotten civilizations. In the course of his excavations at Nineveh in 1850, Layard came upon some chambers in the south-west palace, the floor of which, as well as of the adjoining rooms, was covered to the depth of a foot with tablets of clay,

covered with cuneiform characters, in many cases so small These varied in size

Assyria,

Egypt.

Greece,

from an inch to a foot square. A great number of them were broken, as Layard supposed by the falling in of the roof, but as the late Mr George Smith thought by having fallen from the upper story, upon which he believed the collection to have been placed. These tablets formed the library of the great monarch Assur-bani-pal—the Sarda-napalus of the Greeks—the greatest patron of literature amongst the Assyrians. It is estimated that this library consisted of some ten thousand distinct works and docu- ments, some of the works extendirig over several tablets. The tablets appear to have been methodically arranged and catalogued, and the library seems to have been thrown open for the general use of the king's subjects! A great portion of this library has already been brought to Eng- land and deposited in the British Museum, but it is calculated that there still remain some 20,000 fragments to be gathered up. For further details as to Assyrian libraries, and the still earlier Babylonian libraries from which the Assyrians drew their science and literature, see BaByYtontA, vol. iii. p. 191.

Of the libraries of ancient Egypt our knowledge is much less full and precise. It seems to be ascertained that the oldest hieroglyphic writings now extant run some centuries farther back than 2000 B.c. We possess a papyrus manu- script which is assigned to the age of Amenophis I. of the 18th dynasty, perhaps about 1600 B.c., and the fabric is so perfect as to point toa much earlier invention.? With the invention of papyrus came the age of books. The temples were the centres of literary activity, and to each of them were attached professional scribes who occupied a very respectable position. Their function was regarded as a religious one, for the distinction between religion and science had not yet been made. The sacred books of 'Thoth—forty-two in number—constituted as it were a com- plete encyclopzedia of religion and science. But they did not forbid speculation, or a wider development of the principles contained in them, So there arose a great mass of litera- ture in the shape of exposition and commentary. To such an extent did this increase that at the time of the Greek conquest of Egypt the Thoth literature is said to have amounted to 36,525 books.? Books were

collected not only in the temples but also at the tombs of kings. The most famous of these libraries dates from the 14th century B.C., and was the so-called library of King Osymandyas, described by Diodorus Siculus, who relates that it bore an inscription which he renders by the Greek words YYXHS IATPEION, “the dispensary of the soul.” Osymandyas has been identified with the great king Ramses I., and the seat of the library is supposed by Wilkinson to have been the Ramesseum, the magnificent palace temple near Thebes.4 Lepsius thinks he has found the tombs of two of the librarians of Osymandyas.5 According to Eustathius there was also a great collection in a temple at Memphis. A heavy blow was dealt to the old Egyptian literature by the Persian invasion, and many of their books were carried away by the conquerors. They were only delivered from the yoke of Persia to succumb to that of Greece, and henceforward their civilization was dominated by foreign influences, Of the libraries of Greece under the Ptolemics we shall there- fore speak a little further on.

Of the libraries of ancient Greece we have very little knowledge, and such knowledge as we possess comes to us for the most part from late compilers. Amongst those who are known to have collected books are Pisistratus, Polyerates of Samos, Euclid the- Athenian, Nicocrates of

1 See Menant, Bibliotheque du Palats de Ninive, Paris, 1880. 2 Wuttke, Lntstchung der Schrift, p. 531, Leipsic, 1872.

5 Lepsius, Chronologie der Aegypter, p. 42, Berlin, 1849.

4 Wilkinson, Ancient Egypt, i. 111 sq.

5 Lepsius, Chronologie der Aegypter, p. 39.

Cyprus, Euripides and Aristotle (Athenzus, i. 4). At Cnidus there is said to have been a special collection of works upon medicine.

Pisistratus is said to have been the first of the Greeks who collected books on a large scale, Aulus Gellius, indeed, tells us in language perhaps “not well suited to the 6th century B.c.,”° that he was the first to establish a public library. The authority of Aulus Gellius is hardly sufficient to secure credit for the story that this library was carried away into Persia by Xerxes and subsequently restored to the Athenians by Seleucus Nicator. Plato is known to have been a collector; and Xenophon tells us of the library of Euthydemus. The library of Aristotle was bequeathed by him to his disciple Theophrastus, and by Theophrastus to Neleus, who carried it tc Scepsis, where it is said to have been concealed underground to avoid the literary cupidity of the kings of Pergamus. Its subsequent fate has given rise to much controversy, but, according to Strabo (xiii, pp. 608, 609), it was sold to Apellicon of Teos, who carricd it to Athens, where after Apellicon’s death it fell a prey to the conqueror Sulla, and was transported by him to Rome. The story told by Athenzus (i. 4) is that the library of Neleus was purchased by Ptolemy Philadelphus. The names of a few other libraries in Greece are barely known to us from inscriptions; of their character and contents we ,know nothing. If indeed we are to trust Strabo entirely, we must believe that Aristotle was the first person who collected a library, and that he communi- cated the taste for collecting to the sovereigns of Egypt.

It is at all events ccrtain that the libraries of Alexandria Alexan- were the most important as they were the most celebrated ‘a.

of the ancicnt world. Under the enlightened rule of the Ptolemies a society of scholars and men of science was at- tracted to their capital. It seems prettycertain that Ptolemy Soter had already begun to collect books, but it was in the reign of Ptolemy Philadelphus that the libraries were properly organized and established in separate buildings. Ptolemy Philadelphus sent into every part of Greece and Asia to secure the most valuable works, and no exertions or expense were spared in enriching the collections, Ptolemy Euergetes, his successor, is said to liave caused all books brought into Egypt by foreigners to be seized for the benefit of the library, while the owners had to be content with receiving copies of them in exchange. Nor did the Alexandrian

scholars exhibit the usual Hellenic exclusiveness, and many of the treasures of Egyptian and even of Hebrew literature were by their means translated into Greek. There were two libraries at Alexandria; the larger, inthe Bruchium quarter, was in connexion with the Museum, a sort of academy, while the smaller was placed in the Serapeum. The number of volumes in these libraries was very large, although it is difficult to attain any certainty as to the real numbers amongst the widely varying accounts. According to a scholium of Tzetzes, who appears to draw his information from the authority of Callimachus and Eratosthenes, who had been librarians at Alexandria, there were 42,800 volumes or rollsin the Serapeum and 490,000 in the Bruchium.' This enumeration seems to refer to tle librarianship of Callimachus himself under Ptolemy: Euergetes. In any case the figures agree tolerably well with those given by Aulus Gellius® (700,000) and Seneca? (400,000). It should be observed that, as the ancient roll or volume usually contained a much smaller quantity of matter than a modern book—so that, eg., the history of. Herodotus might form nine "books" or volumes, and the. Iliad of Homer twenty-four—these numbers must be dis-

6 Grote, History of Greece, iv. 87, following Becker. ; ' me Die Alexandrinischen Bibliotheken, p. 22; Opuse. Phil., i eet .

B NASI: 9 De Trang. An., 9.

Pergas mus,

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HISTORY. |

counted for the purposes of comparison with modern collec- tions.! The series of the first five librarians at Alexandria appears to be pretty well established as follows :—Zenodotus, Callimachus, Eratosthenes, Apollonius, and Aristophanes ; and their activity covers a period of about a century.2 The first experiments in bibliography appear to have been made in producing catalogues of the Alexandrian libraries. Amengst other lists, two catalogues were prepared by order of Ptolemy

Philadelphus, one of the tragedies, the other of the comedies contained in the collections. The Ilivaxes of Callimachus formed a catalogue of all the principal books arranged in 120 classes. When Cusar set fire to the fleet in the harbour of Alexandria, the flames accidentally extended to the larger library of the Bruchium, and it was destroyed. Antony endeavoured to repair the loss by presenting to Cleopatra the library from Pergamus. This was very probably placed in the Bruchium, as this continued to be the literary quarter of Alexandria until the time of Aurelian. Thenceforward the Serapeum became the principal library. The usual statement that from the date of the restoration of the Bruchium under Cleopatra the libraries continued in a flourishing condition until they were destroyed after the con- quest of Alexandria by the Saracens in 640 A.D. can hardly be supported. It is very possible that one of the libraries perished when the Bruchium quarter was destroyed by Aurelian, 273 a.p. In 389 or 391 an edict of Theodosius ordered the destruction of the Serapeum, and its books were pillaged by the Christians. When we take into ac- count the disordered condition of the times, and the neglect into which literature and science had fallen, there can be little difficulty in believing that there were but few books left to be destroyed by the soldiers of ‘Amr. The familiar anecdote of the caliph’s message to his general (vol. i. p. 494) rests mainly upon the evidence of Abulfaragius, so that we may be tempted to agree with Gibbon that the report of a stranger who wrote at the end of six hundred years is overbalanced by the silence of earlier and native annalists. It is, however, so far from easy to settle the question that a cloud of names could easily be cited upon either side, while some of the most careful inquirers confess the difficulty of a decision.‘

The magnificence and renown of the libraries of the Ptolemies excited the rivalry of the kings of Pergamus, who vied with the Egyptian rulers in their encouragement of literature. Despite the obstacles presented by the embargo placed by the Ptolemies upon the export of papyrus, the library of the Attali attained considerable importance, and, as we have seen, when it was transported to Egypt numbered 200,000 volumes. We learn from a notice in Suidas that in 221 B.c, Antiochus the Great

summoned the poet and grammarian Euphorion of Chalcis to be his librarian.

The early Romans were far too warlike and practical a people to devote much attention to literature, and it is not until the last century of the republic that we hear of libraries in Rome. The collections of Carthage, which fell into their hands when Scipio sacked that city (146 3.c.), had no attractions for them; and with the exception of the writings of Mago upon agriculture, which the senate

reserved for translation into Latin, they bestowed all the rn re.

1 This view as to the smallness of the aucient book before Callimaehus has been pushed perhaps a little too far. See Theodor Birt's ingenious suggestions in Das antike Buchwesen, Berlin, 1882, p. 489 $q., &e. Birt, indeed, agrees that these large numbers must be discounted, but only on the ground of the very considerable trumber of duplicates in the Alexundtitin libraries.

? Ritschl, loc. citi; 19.

3 Parthey (Alexandrinisches Afusewm) assigns topographical reasons for doubting this story.

+ Some of the authorities have been eolleeted by Parthey, op. cit.

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books upon the kinglets of Africas It is in accordance with the military character of the Romans that the first considerable collections of which we hear in Rome were brought there as the spoils of war. The first of these was that brought by Amilius Paulus from Macedonia after the conquest of Perseus (167 3.c.). The library of the conquered monarch was all that he reserved from the prizes of victory for himself and his sons, who were fond of letters. Next came the library of Apellicon the Teian, brought from Athens by Sulla (86 3.c.). This passed at his death

into the hands of his son, but of its later history nothing is known. The rich stores of literature brought home by Lucullus from his eastern conquests (about 67 B.C.) were freely thrown open to his friends and to men of letters. Accordingly his library and the neighbouring walks were much resorted to, especially by Greeks. It was now becoming fashionable for rich men to furnish their libraries well, and the fashion prevailed until it became the subject of Seneca's scorn and Lucian's wit. The zeal of Cicero and Atticus in adding to their collections is well known to every reader of the classics. Tyrannion is said to have had 30,000 volumes of his own; and that M. Terentius Varro had large collections we may infer from Cicero's writing to him: "Si hortum in bibliotheca habes, nihil deerit." Not to prolong the list of private collectors, Serenus Sammonicus is said to have left to his pupil the younger Gordian no less than 62,000 volumes, Amongst the numerous projects entertained by Cvesar was that of presenting Rome with public libraries, though it is doubtful whether any steps were actually taken towards its execution. The task of collecting and arranging the books was entrusted to Varro. This commission, as well as his own fondness for books, may have led Varro to write the book upon libraries of which a few words only have cone down to us, preserved by a grammarian. Varro also appears to have been the first to ornament a library with the statues and busts of learned mien, though the idea is sometimes attributed to Asinius Pollio, The greater honour of being the first actually to dedicate a library to the public is said by Pliny and Ovid to have fallen to Pollio, who erected a library in the Atrium Libertatis on Mount Aventine, defraying the cost from the spoils of his Illyrian campaign. The library of Pollio was followed by the public libraries cstablished by Augustus. That emperor, who did so much for the embellishment of the city, erected two libraries, the Octavian and the Palatine, The former was founded (33 3.c.) in honour of his sister, and was placed in the Porticus Octavia, the lower part of which served as a promenade, while the upper part contained the library. The charge of the books was committed to C. Melissus. The other library formed by Augustus was attached to the temple of Apollo on the Palatine hill, and appears from inscriptions to have consisted of two departments, a Greek and a Latin one, which seem to have been separately administered. The charge of the Palatine collections was given to

Pompeius Macer, wlio was succeeded by Julius Hyginus, the grammarian and friend of Ovid. The Octavian library perished in the fire which raged at Rome for three days in the reign of Titus. The Palatine was, at all events in great part, destroyed by fire in the reign of Commodus. The story that its collections were destroyed by order ef Pope Gregory the Great in the 6th century is now generally rejected, The successors of Augustus, though they did not equal him in their patronage of leariing, maintained the tradition of forming libraries. Tiberius, his immediate sUCCESSOT; established one in his splendid house on the Palatine, to which Gellius tefers as the ‘Tiberian library,” and

5 Pliny, W. N., xviii. 5.

Constan- tinople.

Suetonius relates that he caused the writings and images of his favourite Greek poets to be placed in the public libraries. Vespasian established a library in the Temple of Peace erected after the burning of the city under Nero. Domitian restored the libraries which had been destroyed in the same conflagration, procuring books from every quarter, and even sending to Alexandria to have copies made. He is also said to have fonnded the Capitoline library, though others give the credit to Hadrian. The most famous and important of the imperial libraries, however, was that created by Ulpius Trajanus, known as the Ulpian library, which was first established in the Forum of Trajan, but was afterwards removed to the baths of Diocletian. In this library were deposited by Trajan the “libri lintei” and “libri elephantini,” upon which the senatns consulta and other transactions relating to the emperors were written. The library of Domitian, which had been destroyed by fire in the reign of Commodus, was restored by Gordian, who added to it the books bequeathed to him by Serenus Sammonicus. Altogether in the 4th century there are said to have been twenty-eight public libraries in Rome.

Nor were public libraries confined to Rome. Besides a library at Tibur, which is twice mentioned by Gellius, and was probably founded by Hadrian, the younger Pliny mentions that he had himself dedicated a library to his fellow-townsmen at Comum; and an inscription discovered at Milan proves that he also contributed a large sum to the support of a library there. Hadrian established a library at Athens; and Strabo mentions the library of Smyrna. Gellius also mentions a library at Patre. From one of his references (xix. 5) to the Tiburtine library we may infer that it was not unusual for books to be lent out from these libraries. Considerable care was bestowed by the Romans upon the placing of their libraries. The room or building generally had au eastern aspect. The books or rolls were arranged upon the shelves of presses running round the walls, with additional presses placed in the middle of the room. Thus the library discovered at Herculaneum contained 1756 MSS. placed on shelves running round the room to a height of some 6 feet, with a detached central press. These presses in large libraries were numbered. They were often made of precious woods and richly orna- mented, while the room was adorned with portraits and statues. | As the number of libraries in Rome increased, the librarian, who was geuerally a slave or freedman, became a recognized public functionary. The names of several librarians are preserved to us in inscriptions, including that of C. Hymenzus, who appears to have fulfilled the double function of physician and librarian to Augustus. The general superintendence of the public libraries was com- mitted to a special official Thus from Nero to Trajan Dionysius, an Alexandrian rhetorician, discharged this func- tion. Under Hadrian it was entrusted to his former tutor C. Julius Vestinus, who afterwards became administrator of the Museum at Alexandria.

_ When the seat of empire was removed by Constantine to his new capital upon the Bosporus, the emperor established a collection there, in which Christian literature was pro- bably admitted for the first time into an imperial library. Diligent search was made after the Christian books which had been doomed to destruction by Diocletian. Even at the death of Constantine, however, the number of books which had beeu brought together amounted only to 6900. The smallness of the number, it has been snggested, seems to show that Constantine’s

library was mainly intended as a repository of Christian literature. However this may be,

death it is said to have increased to 100,000 volumes. Julian, himself a close student and voluminous writer, though he did his best to discourage learning among the Christians, and to destroy their libraries, not only aug- mented the library at Constantinople, but founded others, including one at Nisibis, which was soon afterwards de- stroyed by fire. From the Theodosian code we learn that in the time of that emperor a staff of seven copyists was attached to the library at Constantinople under the direction of the librarian. The library was burnt under the emperor Zeno in 477, but was again restored.

Meanwhile, as Christianity made its way and a distinc- tively Christian literature grew up, the institution of libraries became part of the organization of the church. When the church of Jerusalem was founded in the 3d century a library was added to it, and it became the rule to attach to every church a collection of the books neces- sary for the inculcation of Christian doctrine, The largest of these libraries, that founded by Pamphilus at Czsarea, and said to have been increased by Eusebius, the his- torian of the church, to 30,000 volumes, is frequently mentioned by St Jerome. St Augustine bequeathed his collection to the library of the church at Hippo, which was fortunate enough to escape destruction at the hands of the Vandals.

The removal of the capital to Byzantium was in its result a serious blow to literature. Henceforward the scieuce and learning of the East and West were divorced. The libraries of Rome ceased to collect the writings of the Greeks, while the Greek libraries had never cared much to collect Latin literature. The influence of the church became increas- ingly hostile to the study of pagan letters. The repeated irruptions of the barbarians soon swept the old learning and libraries alike from the soil of Italy. With the close of the Western empire in 476 the ancient history of libraries may be said to cease.

MeEpDI2ZVAL PERIOD.

During the first few centuries after the fall of the Western empire, literary activity at Constantinople had fallen to its lowest ebb. In the West, amidst the general neglect of learning and literature, the collecting of books, though not

wholly forgotten, was cared for by few. Sidonius Apolli- Gaul.

naris tells us of the libraries of several private collectors in Gaul. Publius Consentius possessed a library at his villa near Narbonne which was due to the labour of three generations. The most notable of these appears to have been the prefect Tonantius Ferreolus, who had formed in his villa of Prusiana, near Nimes, a collection which his friend playfully compares to that of Alexandria, The Goths, who had been introduced to the Scriptures in their own language by Ulfilas in the 4th century, began to pay some attention to Latin literature. Cassiodorus, the favourite minister of Theodoric, was a collector as well as an author, and on giving up the cares of government retired to a monastery which he founded in Calabria, where he employed his monks in the transcription of books. Henceforward the charge of books as well as of education fell more and more exclusively into the hands of the church. While the old schools of the rletoricians died out new monasteries arose everywhere. Knowledge was no longer pursued for its own sake, but became subsidiary to religious and theological teaching. The proscription of the old classical literature, which is symbolized in the fable of the destruction of the Palatine library by Gregory the Great, was only too effectual. The Gregorian tradition of opposition to pagan learning long continued to dominate

the collection was greatly enlarged by some of Constantine’s | the literary pursuits of the monastic orders and the labours successors, especially by Julian and Theodosius, at whose | of the scriptorium.

British Islands.

Alcuin.

Charle- magne.

St Bene- dict.

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During the 6th and 7th centuries the learning which had been driven from the Continent took refuge in the British Islands, where it was removed from the political disturbances of the mainland. In the Irish monasteries during this period there appear to have been many books, and the Venerable Bede was superior to any scholar of his age. Theodore of Tarsus brought a considerable number of books to Canterbury from Rome in the 7th century, including several Greek authors. The library of York, which was founded by Archbishop Egbert, was almost more famous than that of Canterbury. The verses are well known in which Alcuin describes the extensive library under his charge, and the long list of authors whom he enumerates is superior to that of any other library possessed by either England or France in the 12th century, when it was unhappily burnt. The inroads of the Northmen in the 9th and 10th centuries had been fatal to the monastic libraries on both sides of the channel. It was from York that Alcuin came to Charlemagne to superintend the school attached to his palace ; and it was doubtless inspired by Alcuin that Charles issued the memorable document which enjoined that in the bishoprics and monasteries within his realm care should be taken that there shall be not only a regular manner of life, but also the study of letters. When Alcuin finally retired from the court to the abbacy of ‘Tours, there to carry out his own theory of monastic discipline and instruction, he wrote to Charles for leave to send to York for copies of the books of which they had so much need at Tours. While Alcuin thus increased the library at Tours, Charlemagne enlarged that at Fulda, which had been founded in 774, and which all throngh the Middle Ages stood in great respect. Lupus Servatus, a pupil of Hrabanus Maurus at Fulda, and afterwards abbot of Ferriéres, was a devoted student of the classics and a great collector of books. His correspondence illustrates the difficulties which then attended the study of literature through the paucity and dearness of books, the declining care for learning, and the

increasing troubles of the time. Nor were private collections of books altogether wanting during the period in which Charlemagne and his successors laboured to restore the lost traditions of liberal education and literature. Pepin le Bref had indeed met with scanty response to the request for books which he addressed to the pontiff Paul I. Charlemagne, however, collected a considerable number of choice books for his private use in two places. Although these collections were dispersed at his death, his son Louis formed a library which continued to exist under Charles the Bald. About the same time Everard, count of Friuli, formed a considerable collection which he bequeathed to a monastery. But the greatest private collector of the Middle Ages was doubtless Gerbert, Pope Sylvester If., who showed the utmost zeal and spent large sums in collecting books, not only in Rome and Italy, but from Germany, Belgium, and even from Spain.

The hopes of a revival of secular literature fell with the decline of the schools established by Charles and his successors. The knowledge of letters remained the prerogative of the church, and for the next four or five centuries the collecting and multiplication of books were almost entirely confined to the monasteries. Several of the greater orders made these an express duty; this was especially the case with the Benedictines. It was the first care of St Benedict, we are told, that in each newly founded monastery there should be a library, “et velut curia qudam illustrium auctorum.” Monte Cassino became the starting point of a long line of institutions which were destined to be the centres of religion and of literature. It must indeed be remembered that literature in the sense of St Benedict meant Biblical and theological works, the lives of the saints and martyrs, and the lives and writings of

the fathers. Of the reformed Benedictine orders the Carthusians and the Cistercians were those most devoted to literary pursuits. The abbeys of Fleury, of Melk, and of St Gall were remarkable for the splendour of their libraries. Ina later age the labours of the congregation of St Maur form one of the most striking chapters in the history of learning. The

Augustinians and the Dominicans rank next to the Benedictines in their care for literature. The libraries of St Genevidve and St Victor, belonging to the former, were amongst the largest of the monastic collections, Although their poverty might seem to put them at a disadvantage as collectors, the mendicant orders cultivated literature with much assiduity, and were closely connected with the intellectual movement to which the universities owed their rise. In England Richard of Bury praises them for their extraordinary diligence in collecting books. Sir Richard Whittington built a large library for the Grey Friars in London, and they possessed considerable libraries at Oxford.

It would be impossible to attempt here an account of all Monastic We must libraries,

the libraries established by the monastic orders. be content to enumerate a few of the most eminent.

In Italy Monte Cassino is a striking example of the dangers and vicissitudes to which monastic collections were exposed. Ruined by the Lombards in the 6th century, the monastery was rebuilt and a library established to falla prey to Saracens and to fire in the 9th. The collection then reformed survived many other chances and changes, and still exists. It affords a conspicuous example of monastic industry in the transcription not only of theological but also of classical works. The library of Bobbio was famous for its palimpsests. The collection, of which a catalogue of the 10th century is given by Muratori,! was finally transferred to the Ambrosian library at Milan. Of the library of Pomposia, near Ravenna, Montfaucon has printed a catalogue dating from the 11th century.”

Of the monastic libraries of France the principal were those of Fleury, of Cluny, of St Riquier, and of Corbie. At Fleury Abbot Macharius in 1146 imposed a contribution for library purposes upon the officers of the community and its dependencies, an example which was followed elsewhere. After many vicissitudes, its MSS., numbering 238, were deposited in 1793 in the town library of Orleans. The library of St Riquier in the time of Louis the Pious contained 256 MSS., with over

500 works.? Of the collection at Corbie in Picardy we have also catalogues dating from the 12th and from the 17th centuries. Corbie was famous for the industry of its transcribers, and appears to have stood in active literary intercourse with other monasteries. In 1638, 400 of its choicest manuscripts were removed to St Germain-des- Prés, The remainder were removed after 1794, partly to the national library at Paris, partly to the town library of Amiens.

The chief monastic libraries of Germany were at Fulda, Corvey, Reichenau, and Sponheim. The library at Fulda owed much to Charlemagne and to its abbot Hrabanus Maurus. Under Abbot Sturmius four hundred monks were hired as copyists. In 1561 the collection numbered 774 volumes. The library of Corvey on the Weser, after being despoiled of some of its treasures in the Reformation age, was presented to the university of Marburgin 1811. It then contained 109 volumes, with 400 or 500 titles. The library of Reichenau, of which several catalogues are extant, fell a prey to fire and neglect, and its ruin was consummated by the Thirty Years' War. The library

1 Antig. Ital. Med. div,, iii. 817-24.

2 Diarium Italidum, chap. xxii.

3 Catalogue printed in Edwards, Memoirs f ge i. 297-301.

of Sponheim owes its great renown to John Tritheim, who was abbot at the close of the 15th ceutury. He found it reduced to 10 volumes, and left it with upwards of 2000 at his retirement. The library at St Gall, formed as early as 816 by Gozbert, its second abbot, still exists.

In England the principal collections were those of Canter- bury, York, Wearmouth, Whitby, Glastonbury, Croyland, Peterborough, and Durham. Of the library of the monas- tery of Christ Church, Canterbury, originally founded by Augustine and Theodore, and restored by Lanfrane and Anselm, a catalogue has been preserved dating from the 13th or 14th century, and containing 698 volumes, with about 3000 works. Bennet Biscop, the first abbot of Wearmouth, made five journeys to Rome, and on each occasion returned with a store of books for the library. It was destroyed by the Danes about 867. Of the library at Whitby there is a catalogue dating from the 12th century. The catalogue of Glastonbury has also been printed! When the library of Croyland perished by fire in 1091 it contained about 700 volumes. The library at Peterborough was also rich; from a catalogue of about the end of the 14th century it had 344 volumes, with nearly 1700 titles. The catalogues of the library at the monastery of Durham have been printed by the Surtees Society, and form an interesting series.

These catalogues with many others? afford abundant evidence of tle limited character of the monkish collections, whether we look at the number of their volumes or at the nature of their contents) We must remember that the beliefs and discipline imposed upon the monk hardly allowed of his caring for literature for its own sake; we must also remember that the transcription of manuscripts so industriously pursued in the monasteries was a mechanical employinent. The scriptoria were manufactories of books and not centres of learning. Indeed the very pains bestowed upon carefulness and neatness of transcription, and especially upon the illustrating and ornamenting of the more beautiful manuscripts, were little calculated to divert the attention of the monks from the vehicle to the thought which it expressed. The pride taken by so many communities in the richness and splendour of their libraries was often doubtless the pride of the collector and not of the scholar. That in spite of the labours of so many transcribers the costliness and scarcity of books remained 80 great may have been partly, but cannot have been wholly, due to the scarcity of writing materials. It may be suspected that indolence and carelessness were the rule in most monasteries, and that but few of the monks

keenly realized the whole force of the sentiment expressed by one of their number in the 12th century—‘Claustrum sine armario quasi castrum sine armamentario.” Nevertheless it must be admitted that to the labours of the monkish transcribers we are indebted for the preservation of Latin literature.

The first conquests of the Arabians, as we have already seen, threatened hostility to literature. But, as soon as their conquests were secured, the caliphs became the patrons of learning and science. Greek manuscripts were eagerly sought for and translated into Arabic, and colleges and libraries everywhere arose. Baghdad in the East and Cordova in the West became the seats of a rich development of letters and science during the age when the civilization

1 By Hearne in his edition of John of Glastonbury.

2 Many such catalogues may be found in the collections ot D’Achery, Martene and Durand, and Pez, and in the bibliographical periodicals of Nanmann and Petzholdt. The Rev. Joseph Hunter has collected some particulars as to the contents of the English monastic libraries, and Mr Edwards has printed a list of the catalogues known to exist (Libraries and Founders of Libraries, 1865, pp. 448-54). There are said to be over six hundred such catalogues in the Royal Library at Munich,

of Europe was most obscured. Cairo and Tripoli were also distinguished for their libraries. The royal library of the Fatimites in Africa is said to have numbered 100,000 manuscripts, while that collected by the Omayyads of Spain is reported to have contaifed six times as many. It is said that there were no less than seventy libraries opened in the cities of Andalusia. Whether these figures be exaggerated or not—and they are much below those given by some Arabian writers, which are undoubtedly so —it is certain that the libraries of the Arabians and the Moors of Spain offer a very

remarkable contrast to those of the Christian nations during the same period.®

The literary and scientific activity of the Arabiaus appears to have been the cause of a revival of letters amongst the Greeks of the Byzantine empire in the 9th century. “ Under Leo the Philosopher and Constantine Porphyrogenitus the libraries of Constantinople awoke into renewed life. The compilations of such writers as Stobseus, Photius, and Suidas, as well as the labours of innumerable critics and commentators, bear witness to the activity, if not to the lofty character of the pursuits, of the Byzantine scholars. The labours of transcription were industriously pursued in the libraries and in the monasteries of Mount Athos and the Aigean, and it was from these quarters that

the restorers of learning brought into Italy so many Greek Renais- In this way many of the treasures of ancient s4nce.

manuscripts. literature had been already conveyed to the West before the fate which overtook the libraries of Constantinople on the fall of the city in 1453.

Meanwhile in the West, with the reviving interest in literature which already marks the 14th century, we find arising outside the monasteries a taste for collecting books. St Louis of France aud his successors had formed small collections, none of which survived its possessor. It was reserved for Charles V. to form a considerable library which he intended to be permanent. In 1373 he had amassed 910 volumes, and had a catalogue of them prepared, from which we see that it included a good deal of the new literature. In our own country Guy, earl of Warwick, formed a curious collection of French romances, which. he bequeathed to Bordesley Abbey on his death in 1315. Richard d’Aungervyle of Bury, the author of the Philobiblon, amassed a noble collection of books, and had special opportunities of doing so as Edward III.’s chancellor and ambassador. He founded Durham College at Oxford, and equipped it with a librarya hundred years before Humphrey, duke of Gloucester, made his benefaction of books to the university. The taste for secular literature, and the enthusiasm for the ancient classics, gave a fresh direction to the researches of collectors.

A disposition to encourage literature began to show itself amongst the great. This was most notable amongst the Italian princes. Cosimo de' Medici formed a library at Venice while living there in exile in 1433, and on his return to Florence laid the foundation of the great Medicean library. The honour of establishing the first modern public library in Italy had been already secured by Niccolo Niccoli, who left his library of over 800 volumes for. the use of the public on his death in 1436, Frederick, duke of Urbino, collected all the writings in Greek and Latin which he could pro- cure, and we have an interesting account of his collection writteu by his first librarian, Vespasiano, The ardour for classical studies led to those active researches for the Latin writers who were buried in the monastic libraries which are especially identified with the name of Poggio, For some time before the fall of that capital, the perilous state

3 Among the Arabs, however, as among the Christians, theological bigotry did not always approve of non-theological literature, and the great library of Cordova was sacrificed by Almanzor to his reputation for orthodoxy, 978 a.p,

British Museum.

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of the Eastern empire had driven many Greek scholars | from Constantinople into western Europe, where they had directed the studies and formed the taste of the zealous students of the Greek language and literature. The enthusiasm of the Italian princes extended itself beyond the Alps. Matthias Corvinus, king of Hungary, amassed a collection of splendidly executed and magnificently bound manuscripts, which at his death are said to have reached the almost incredible number of 50,000 volumes. The library was not destined long to survive its founder. There is reason to believe that it had been very seriously despoiled even before it perished at the hands of the Turks on the fall of Budain 1527. A few of its treasures are still preserved in some of the libraries of Europe. While these munificent patrons of learning were thus taking pains to recover and multiply the treasures of ancient literature by the patient labour of transcribers and

calligraphers, an art was being elaborated which was destined to revolutionize the whole condition of literature and libraries. With the invention of printing, so happily coinciding with the revival of true learning and sound science, the modern history of libraries may be said to begin.

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These aré most conveniently described in geographical order, and a general survey on this method will be found in the tables at the end of this article. The following sketch supplies additional details.

The United Kingdom.

The British Museum ranks in importance before all the great libraries of the world, with the single exception of the Bibliothéque Nationale at Paris, and far excels the latter institution in the systematic arrangement and accessibility of its contents. Recent changes have some- what limited its former universality of character, but it still remains the grand national repository of literature and archeology. ‘The library consists of over 1,550,000 printed volumes and 50,000 manuscripts. This extra- ordinary opulence is principally due to the enlightened energy of the late Sir Antonio Panizzi. The number of volumes in the printed book department, when he took the keepership in 1837, was only 240,000; and during the nineteen years he held that office about 400,000 were added, mostly by purchase, under his advico and direction. It was Panizzi likewise who first seriously set to work to see that the national library reaped all the benefits be- stowed upon it by the Copyright Act.

The foundation of the British Museum dates from 1753, when effect was given to tho bequest (in exchange for £20,000 to be paid to his executors) by Sir Hans Sloane, of his books, manuscripts, curiosities, &c., to be held by trustees for the use of the nation. A bill was passed through parlianient for the purchase of the Sloane collec- tions and of the Harleian MSS., costing £10,000. To these, with the Cottonian MSS., acquired by the country in 1700, was added by George IL, in 1757, the royal library of the former kings of England, coupled with

the privilege, which that library had for many years enjoyed, of obtaining a copy of every publication entered at Stationers' Hall. This addition was of the highest importance, as it enriched the museum with the old collections of Archbishop Cranmer, Henry prince of Wales, and other patrons of literature, while the transfer of the privilege with regard to the acquisition of new books, a right which has been

maintained by successive Copyright Acts, secured a large | and continuous augmentation, the yearly average of which has nowreached 8000 or 9000 volumes. A lottery having

been authorized to defray the expenses of purchases, as well as for providing suitable accommodation, the museum and library were established in Montague House, and opened to the public 15th January 1759. In 1763 George Ill. presented the well-known Thomason collection (in 2220 volumes) of books and pamphlets issued in England between 1640 and 1662, embracing all the controversial literature which appeared during that period. The Rev. C. M. Cracherode, one of the trustees, bequeathed his collection of choice books in 1799 ; and in 1820 Sir Joseph Banks left to the nation his important library of 16,000 volumes. Many other libraries have since then been incorporated in the museum, the most valuable being George ITT.'s royal collection (15,000 volumes of tracts, and 65,259 volumes of printed books, including many of the utmost rarity, which had cost the king about £130,000), which was presented (for a pecuniary consideration, it has been said) by George IV. in 1823, and that of the Right Honourable Thomas Grenville (20,240 volumes of rare books, all in fine condition and binding), which was acquired under bequest in 1846. The Cracherode, Banksian, King's, and Grenville libraries are still preserved as separate collections. Other libraries of minor note have also been absorbed in a similar way, while, at least since the time of Panizzi, no opportunity has been neglected of makin g useful purchases at all the British and Continental book auctions.

The collection of English books is far from approaching completeness, but, apart from the enormous number of volumes, the library contains an extraordinary quantity of rarities, Few libraries in the United States equal either in number or value the American books in the museum, The collection of Slavonic literature, due to the initiative of the late Mr Watts, is a remarkable feature ; after that of the St Petersburg Imperial Library it is believed to be the largest in existence. Indeed, in cosmopolitan interest the museum is without a rival in the world, possessing as it does the best Hungarian collection out of that country, the best Dutch library out of Holland, and in short the best library in any European language out of the territory in which the language is vernacular, The Hebrew books number over 12,000, the Chinese nearly 27,000, and the printed books in other Oriental languages about 13,000 volumes. Periodical literature has not been forgotten, and the series of newspapers is of great extent and interest, Great pains are taken by the authorities to obtain the copies of the newspapers published in the United King- dom to which they are entitled by the provisions of the Copyright Act, and upwards of 1900 are annually collected, filed, and bound. Under the English Copyright Act there were received, in 1881, not counting single pieces, sucli as broadsides, songs, &c., 8857 volumes and pamphlets, and 21,792 parts of volumes, and through the international copyright treaties 941 volumes and 433 parts.

The department of MSS. is at least equal in importance to that of the printed books. The collection of MSS. in European languages ranges from the 2d century before Christ down to our own times, and includes the ALEX- ANDRIAN MS. (¢.v.). The old historical chronicles of England, the charters of the Anglo-Saxon kings, and the celebrated series of Arthurian romances are well represented ; and care has been taken to acquire on every available oppor- tunity the unprinted works of English writers. The famous collections of MSS. made by Sir Robert Cotton, and Harley earl of Oxford, have already been mentioned, and from these and other sources the museum has become rich in early Anglo-Saxon and Latin codices, some of them exhibiting

_ marvels of skill in calligraphyand ornamentation, such as the

charters of King Edgar and Henry I. to Hyde Abbey, which are written in gold letters, others interesting for different reasons, such as the book of Durham, in Latin and Anglo-

Saxon, reputed to have been Bede's own copy. The Burney collection of classical MSS. furnished important additions, so that from this source and from the collection of Arundel MSS. (transferred from the Royal Society in 1831), the museum can boast/of an early copy of the /diad, and one of the earliest known codices of the Odyssey. There is likewise an extensive series of ancient Irish texts, with many modern transcripts, the Bridgewater MSS. on French history, and Lord Guilford's similar collection to illustrate the history of Italy. Special reference may be made to the celebrated Bedford Missal, illuminated for the duke of Bedford, regent of France, and to Henry VI.'s copy of Hardyng's chronicle. The Oriental collection is also extremely rich and ample, including the library formed by Mr Rich (consul at Baghdad in the early part of this century), and a vast quantity of Arabic, Persian, and Turkish MSS. ; the Chambers collec- tion of Sanskrit MSS. ; several other collections of Indian MSS. ; and a copious library of Hebrew MSS. (including that of the great scholar Michaelis, and codices of great age, recently brought from Yemen). The collection of Syriac MSS., embracing the relics of the famous library of the convent of St Mary Deipara in the Nitrian desert, formed by the abbot Moses of Nisibis, in the 10th century, is the most important in existence; of the large store of Abyssinian volumes many were amassed after the campaign against King Theodore. The number of genealogical rolls and documents relating to the local and family history of Great Britain is very large. Altogether there are now over

2 vols. 8vo, 1834, describing the geographical and topographical collections ; and then the Bibliotheca Grenvilliana, 1842-72, 4 vols. 8vo. The first vol. (letter A) of a general catalogue appeared in 1841 in a folio volume which has never been added to, 'I'he octavo catalogue of the Hebrew books came out in 1867; that of the Sanskrit and Pali

literature is in 4to, 1876; and the Chinese cata- logue is also in 4to, 1877. There are also printed lists of the books of reference (1871) and bibliographics (1881) in the reading-room. Private enterprise has done a great deal towards cataloguing the American books (by Mr H. Stevens, 4 vols. 8vo), and the British topographical literature has recently been the subject of a similar publication by Mr J. P. Anderson, 8vo, 1881.

The printed catalogues of the MSS. are—that of the old Royal

Library, 1734, 4to; the Sloane and others hitherto undescribed, ” 1782, 2 vols. 4to; the Cottonian, 1802, folio; the Harleian, 1808, i 4 vols. folio; the Hargrave, 1818, 4to ; the Lansdowne, 1819, folio ; the Arundel, 1840, folio; the Burncy, 1840, folio; the Oriental (Arabic and Ethiopic), 5 pts., folio, 1888-71; the Syriac, 1870-73, 83 pts., 4to; the Ethiopic, 1877, 4to; the Persian, 1879-80, 2 vols, 4to; and the Spanish, 1875-80, 3 vols. 8vo. There are also cata- logues of the Greek and Egyptian papyri, 1839-46, 5 pts., folio. The additional MSS. from 1831-75 are described in 10 vols, 8vo, 1835-77, with indexes (1788-1835) in folio and (1854-75) in 8vo. A catalogue of the MS. music was produced in 1842, 8vo; and one of the MS. maps in 1844, 2 vols. 8vo.

The binding is done upon the premises, and the sum expended each year is £9000. The average sum annually spent upon the purchase of books is about £10,000, and upon MSS. £2500. Since the catalogues ceascd to be transcribed £3000 is annually spent on $ printing.

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London is very badly off as regards public libraries, and Other | the largest general collection which is available without any Loe tedious preliminary forms is that of the corporation of the“ _

50,000 MSS. (of which 8500 are Oriental), besides 45,000 charters and rolls.

The musical works comprise upwards of 11,000 volumes of vocal and nearly 6000 volumes of instrumental music, the number of separate pieces amounting to more than 70,000. The catalogue is in manuscript. The collection of maps, charts, plans, and topographical drawings is also a remark- able one. The maps are nearly 116,000 in number. Letter A of a printed catalogue of the maps is already in

type.

The name of Panizzi is inseparably connected with his circular reading-room, opened in 1857, This is encompassed by the new library, with shelf-space for a million and a half volumes. The presses inside the reading-room, arranged in three tiers, contain upwards of 80,000 volumes, those on the ground floor (20,000) being books of reference to which readers have unlimited access. The comfortable accommodation for readers is briefly described below. Perhaps not the least convenient arrangement here is the presence of the superintendent, whose duty it is to help readers in their diffi- culties ; the varied qualifications of the present holder of the office are well known. The electric light has been successfully used until 8 o’clock P.M. through the darker months from the carlier part of October. In order to enjoy the privilege of reading at the British Museum, the applicant (who must be over twenty-one ycars of agc) must obtain a renewable ticket of admission through a recommenda- tion from a householder addressed to the principal librarian. Formerly no person was admitted until the ticket had been pre- sented at the entrance, but latterly this rule has been considerably relaxed. During 1881 the number of rcaders was 133,842. In spite of the hostile criticism to which it has sometimes becn subjected, it cannot be denied that the general catalogue of the printed books (which now runs to upwards of 2000 volumes in manuscript) is a marvellous work executcd in a praiseworthy manner. Some slight notion of the extent of the catalogue may be derived from the fact

that it contains the works of over 2400 authors of the name of

Smith. But the rapidly increasing size of the catalogue has impelled the trustees to resort to print in order to diminish tho bulk, Since 1880 the titles of all accessions have been printed, and as it becomes necessary to break the manuscript volumes, the titles contained in them are also printed ; in course of time, therefore, the whole of the titles will have been put into type. The sheets are published at regular intervals, and can be purchased. It is proposed to issue separately headings of special interest, whethcr of subjects or of authors, ¢.g., Shakespeare, Bible, Liturgies, &c. Considerable progress has been made in the preparation for the press of a cata- logue of English books printed before the year 1640.

The printed catalogues of books commence with one published in 2 vols. folio, 1787, followed by that of 1813-19 in 7 vols. 8vo; the next is that of the library of George III., 1820-29, 5 vols. folio, with

city of London at the Guildhall, lished here by Sir Richard Whittington between 1421-26, and several notices in the civic records show how well in those times the citizens cared for their books.

A library was estab-

But it did not remain without accident; in 1522 the Lord Protector Somerset carried off three cart-loads of books, and during the great fire of 1666 the remainder was destroyed together with the library buildings. Nothing was done to repair the loss until 1824, when a committee was appointed, and rooms set apart for library purposes. In 1840 a catalogue of 10,000 volumes was printed, and in 1859 a second was prepared of 40,000 volumes. In consequence of the large and increasing number of the readers, the present fine building was commenced about ten years later, and, after having cost £90,000, was opened in 1873 as a free public library. There are now upwards of 80,000 printed volumes and 300 MSS. ‘The contents are of a general character, and include a special collection of books about London, the Solomons Hebrew and rabbinical library, and the libraries of the Clockmakers’ Company and the old Dutch church in Austin Friars. The only rate-supported library in: the metropolis is that of the united parishes of St Margaret and St John at Westminster (13,527 volumes),

founded in 1857, principally by the influence of the late Lord Hatherley, with a small branch at Knightsbridge. The Notting Hill Free Public Library (5000 volumes) is supported by Mr James Heywood, and the Bethnal Green Free Library and South London Free Library by voluntary subscriptions.

Of libraries of a more special character, those principally devoted to theology have perhaps the first claim to notice. The archiepiscopal library at Lambeth was founded in 1610 by Archbishop Bancroft, and has been enriched by the gifts of Laud, Tenison, Manners Sutton, and others of his successors ; it is now lodged in the noble hall built by Juxon. The treasures consist of the illuminated MSS., and a rich store of early printed books; of the latter two catalogues have been issued by 8. R. Maitland. The MSS. are described in H. J. Todd's catalogue, 1812. Sion College is a guild of the parochial clergy of the city and suburbs of London, and the library was founded in 1629 for their use ; laymen may also read (but not borrow) the

books when recommended by some beneficed metropolitan clergyman. The library is especially rich in liturgies, Port- Royal authors, pamphlets, &c, The copyright privilege was commuted in 1835 for an annual sum of £363, 15s. 2d. The present building was erected immediately after the great fire.

The chamber in the old cloisters, in which the library of the |

dean and chapter of Westminster is preserved, is well known from the charming description by Washington Irving in his Sketch Book. There are about 11,000 volumes, mostly of old theology and history, including many rare Bibles and other valuable books, The library of the dean and chapter of St Paul's was founded in very early times, and now numbers some 8700 volumes, mainly theological, besides over 10,300 pamphlets, with a good collection of early Bibles and Testaments, Paul's Cross Sermons, and works connected with the cathedral. Dr Williams's library was founded by the will of an eminent Presbytcrian divine of that name; it was opened in 1729. The books

(30,000 printed volumes and 1000 MSS,) are housed in a new building, completed in 1873, Theology of all schools of opinion is represented, and there are special collections of theosophical books and MSS., the works of Boehme, Law, and other mystical writers. The MSS. include the original minutes of the Westminster Assembly, letters and treatises of Richard Baxter, &c. The British and Foreign Bible Society has a remarkable collection of Bibles and Biblical . literature, of which a printed catalogue was published in 1855. Perhaps the best library of Catholic theology in London is that of the Oratory at South Kensington, established in 1849.

Of the law libraries, that at Lincoln's Inn is the oldest and the largest. It dates from 1497, when John Nethersale, 2 member of the society, made a bequest of forty marks, part of which was to be devoted to the build- ing of a library for the benefit of the students of the laws of England. A catalogue of the printed books was pub- lished in 1859, and the MSS. were catalogued by the Rev. Joseph Hunterin 1837. The library of the Inner Temple is known to have existed in 1540. In the middle of the 17th century it received a considerable benefaction from William Petyt, the well-known keeper of the Tower records. There are now about 36,000 volumes, including the pamphlets collected by John Adolphus for his ZZistory of England, books on crime and prisons brought together by Mr Craw- ford, and a selection of works on jurisprudence made by John Austin. A library in connexion with the Middle Temple was in existence during the reign of Henry VIIL, but the date usually assigned to its foundation is 1641, when Robert Ashley left his books to the inn of which he had been a member. Gray's Inn Library was perliaps established before 1555. In 1669 was made the first catalogue of the books, and the next, still extant, in 1689. The Incorporated Law Society (1831) has a good law and general library (30,000 volumes), including the best collec- tion of private Acts of Parliament in England, and a large number of pamphlets relating to Anglo-Catholic contro- versies brought together by the late Rev. Joseph Mendham. The catalogue was printed in 1869.

The collegiate library at Dulwich dates from 1619, and a list of its earliest accessions, in the handwriting of the founder, may still be seen.

There are now about 7000 volumes: of miscellaneous works of the 17th and 18th centuries, with a few rare books. A catalogue of them was printed in 1880; and one describing the MSS. (567) and the muniments (606) was issued during the succceding year. The last two classes are very important, and include the well-known “Alleyn Papers” and the theatrical diary of Philip Henslow. Soon after the foundation of the University of London in 1837, an endeavour was made

than to purchases for its accessions. In 1871 the univer- sity obtained, in this manner, the library of the historian Grote, and in the same year Lord Overstone purchased and presented the mathematical collection of De Morgan, A catalogue was printed in 1875, The books at University College (1828) are much more numerous, and here also a considerable proportion are donations, including the Morrison Chinese library of 10,000 volumes, the Daulby- Roscoe Icelandic books, the Graves mathematical and physical library, and the Barlow Dante bequest. A printed catalogue of the greater portion was brought out in 1879, The library at King’s College includes a collection of works on Eastern subjects bequeathed by Dr Marsden, as well as the scientific books formerly belonging to Sir Charles Wheatstone. The medical library is distinct. The educational library at the South Kensington Museum numbers about 42,200 volumes, and may be consulted by teachers and students of the departmental schools, and by other persons on the same terms as the art library men- tioned below. The ninth edition of the catalogue appeared in 1876,

The library of the Patent Office is the largest scientific and technical collection, indeed the only one which is readily open to the public. There are at present 80,000 volumes, including a very extensive series of the trans- actions and journals of learned bodies. A catalogue is now in the press. Transactions and proceedings of societies, with scientific periodicals, compose almost the whole library of the Royal Society, which extends to about 40,000 volumes. The diarist Evelyn induced

the seventh duke of Norfolk to present to the Society the Arundel library, part of which had formerly belonged to Matthias Corvinus. The MSS., however, were sold to the British Museum in 1831 for £3559, and a quantity of rare printed books have also been disposed of. Scientific inquirers are freely admitted to the Museum of Practical Geology in Jermyn Street, where there are over 30,000 volumes on geology, mineralogy, mining, and metallurgy, including the former collections of De la Beche and Mur- chison. A printed catalogue was issued in 1878. For the libraries of other scientific institutions see the tables.

Medical and surgical libraries are attached to all the chief hospitals and medical societies (see the tables).

For the fine arts there is the National Art Library (1852) at the South Kensington Museum, which is now an excellent collection of 56,000 volumes, 56,000 photographs, 25,000 drawings, and 80,000 prints. Art students are ad- mitted free, as are ordinary visitors on Museum pay days ; otherwise a charge of 6d. per week is made to the latter. The library of the Royal Academy of Arts, after its journey from Somerset House to Trafalgar Square, has been lodged in the old ball-room of Burlington House since 1875. At the National Gallery is preserved for official use the library (3500 volumes) formerly belonging to Sir C. L. Eastlake, P.R.A., which is particularly rich in catalogues and descriptions of picture galleries. The Royal Insti- tution of British Architects (1834) possesses over 6500 volumes on architectural and allied subjects, including an almost complete collection of editions of Vitruvius. The library of the Royal Academy of Music (1822) is almost exclusively musical, and, although numbering less than 1000 volumes, contains many rare and interesting works. The library of the Sacred Harmonic Society is said to be one of the best arranged and most valuable musical collections in England. A third edition of the printed catalogue appeared in 1872, when the library contained 4851 volumes.!

1 For a very complete account of the chief public and private musical collections both at home and abroad, sec the article Musical

to provide a library, but it has had to look to gifts rather | Librarics," in Dr Grove's Dictionary of Music, ii, 417.

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The best library of archzeology and kindred subjects is that of the Society of Antiquaries, consisting of nearly 20,000 printed volumes and 500 MSS. It is rich in early printed books, topography, heraldry, and numismatics, and includes a curious collection of books on pageants presented by Mr Fairholt, and the remarkable assemblage of lexicogra- phical works formerly belonging to the late Albert Way, given by his widow. 'There is a good muster of heraldic works at the Herald's College, and the library of Sir John Soane (15,000 volumes) is still preserved in the museum at his house in Lincoln's Inn Fields. The printed catalogue (1878) shows that it is a fairly good collection of books on architecture and antiquities.

Among subscription libraries, the London Library stands first in order of importance. It was founded in 1841 asa lending library for the use of scholars, and Dean Milman, Sir G. C. Lewis, Mr Gladstone, Thomas Carlyle, Henry Hallam, and other eminent men took part in its formation. By means of a moderate subscription, funds were raised for the purchase of books on general subjects, which now amount to about 90,000 volumes. The latest catalogue was printed in 1875, with a supplement in 1881. The London Institution (1805) is a proprietary library to which proprietor's nominees and yearly subscribers also have admission. For reference purposes reader's tickets are very liberally granted to other persons. The books now nuinber about 70,000 volumes in general literature ; the departments of history and topography are especially rich, and the number is rapidly growing. A complete catalogue was published in 1837-43; almost the whole collection, including reference and circulating libraries very minutely classified, is contained in one room. Porson filled the position of librarian here at the close of his life, but he proved no better a librarian than did Casaubon before him at Paris, The library of the Royal Institution of Great Britain was founded in 1803 by the subscriptions

of the members, amounting, in 1806, to £6000. There are now 40,000 volumes in scientific and general literature; they are not lent out, There is an interesting series of 56 volumes of MS. correspondence relating to the American war.

The libraries of the two branches of the legislature may be named with those of the great public offices. The Foreign Office library contains about 70,000 volumes, including the old library of the Board of Trade (20,000 volumes) ; history, geography, and law are well represented, and the department of treaties and diplomacy is of course very complete. The India Office library was formed by a vote of the court of directors of the East India Company in 1801. The services in India were also invited to aid in the creation of an institution which should become a per- manent repository of Oriental lore, and many munificent donations were received in consequence of the appeal, The printed books now number nearly 40,000, chiefly on Indian and Oriental subjects, with about 10,000 Sanskrit, Arabic, Persian, Pali, and other Oriental manuscripts. Loth's excellent catalogue of the Arabic codices was published in 1877, and other catalogues are now ready for the press, At the Colonial Office there is a collection of about 12,000 works relating to colonial history and administration, and the Home Office possesses about 5000 volumes of parlia- mentary, historical, and legal works. The Admiralty library extends to about 25,000 volumes, chiefly voyages and travels; a printed catalogue was issued in 1875, At the War Office there are also 25,000 volumes, mainly topographical and military. The MS. records are estimated to extend to 100,000 volumes, but only those of the last twenty years are kept in Pall Mall, the remainder being at the Record Office. These records extend from the time of Queen Elizabeth, and there are some of earlier date. The older volumes belonged to the late Board of Ordnance,

and the series also includes the despatches from generals commanding armies on foreign service. All these libraries are for official use only, but at the India Office strangers are admitted upon proper introduction.

Many of the principal clubs possess libraries ; that of the Athcneum is by far the most important. It now numbers about 48,000 volumes of books in all departments of literature, and is especially rich in well-bonnd and fine copies of works on the fine arts, archeology, topography, and history. The pamphlets, of which there is a complete printed catalogue, as well as of the books, form a remark- able series, including those collected by Gibbon and Mackintosh. Next comes the Reform Club, with about 30,000 volumes, chiefly in belles-lettres, with a fair pro- portion of parliamentary and historical works. The Oxford and Cambridge Club has 20,000 volumes in general and) classical literature. At the Garrick there is a small tl dramatic collection ; and the United Service Club, besides a number of books on professional subjects, possesses the fine library which formerly belonged to Dugald Stewart.

A few libraries which could not be brought into any of the foregoing classes may now be spoken of, First comes the library of the Royal Geographical Society (1832), a | valuable collection of 20,000 volumes of voyages and . travels, and works on the sciences connected with geography, with many costly Government publications and geographical serials, The catalogue has been printed with supplements down to 1880. The maps and charts number 35,000, with 500 atlases and 240 large diagrams, Since 1854, in consideration of an annual grant of £500 from the treasury, the map room has been open for public reference. At the Royal United Service Institution there are also about 20,000 volumes, chiefly naval and military, with a printed catalogue, 1865. Besides the members, officers of both services are admitted. The Royal Asiatic Society has a library of nearly 8000 printed books, with 750 MSS. in Sanskrit, Persian, Turkish, &c., 5000 Chinese books, and 220 Japanese. Besides the art and educational libraries (at South Kensington, there are also deposited at the museum, and open under the same regulations, the library of the Rev. Alexander Dyce, bequeathed in 1869, and the books of John Forster, left in 1876. The Dyce collection (15,000 volumes) is strong in the English drama and poetry, Italian literature, and classical authors. The Forster library (19,000 volumes) abounds in history, biography, travels, plays, and fiction, tracts, Americana, proclamations, ballads, &c.; the manuscripts

include three note-books of Leonardo da Vinci, and the Garrick correspondence in 39 volumes,

Notices of a considerable number of other metropolitan libraries, not mentioned in the preceding pages, may be found in the tables at the end of this article.

With one or two exceptions, libraries are attached to the Cathedral cathedrals of England and Wales. Though they are of libraries. course intended for the use of the cathedral or diocesan clergy, they are in most cases open to any respectable person who may be properly introduced. They seldom contain very much modern literature, chiefly consisting of older theology, with more or less addition of classical and historical literature. They vary in extent from a few volumes, as at Llandaff or St David's, to 15,000 volumes, as at Durham. Together they possess nearly 150,000 printed and manuscript volumes. As a rule, very little is spent upon them, and they are very little used.

The library of Christ Church, Oxford, belongs alike to the college and the cathedral, but will be more properly deseribed as a college library. The cathedral library of Durham dates from monastic times, and possesses many of the books which belonged to the monastery. These were added to by Dean Sudbury, the second

founder of the library, and Bishop Cosin. The collection has been considerably increased in more modern times, and now contains

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15,000 volumes. It is especially rich in MSS., some of which are of great beauty and value ; a catalogue of them was printed in 1825. The library has good topographical and entomological collections. The

chapter spend £370 per annuim in salarics and in books. The library at York numbers about 11,000 volumes, and has been very liberally thrown open to the public. It is kept in the former chapel of the archbishop's palace, and has many valuable MSS. and early printed books. 'The foundation of the library at Canterbury dates probably from the Roman mission to England, 596 a.p., although the library does not retain any of the books then brought over, or even of the books said to have been sent by Pope Gregory to the first archbishop in 601. It is recorded that among Lanfranc's buildings was a new library, and Becket is said to have collected books abroad to present to the library. The collection now num- bers about 9900 sine' books, with about 110 MS. volumes, and between 6000 and 7000 documents. A catalogue was printed in 1802, The present building was crected in 1867 on part of the site of the monastic dormitory. The library at Lincoln contains 7400 volumes, of which a catalogue was printed in 1859. It pos- sesses a fine collection of political tracts of the age of Elizabeth, James, and Charles I. The present collection at Chichester dates from the Restoration only ; that at Ely is rich in books and tracts relating to. the non-jurors. The library at Exeter possesses many Saxon MSS. of extreme interest, one of them being the gift of Leofrie, the first bishop. The treasures of Lichfield were destroyed by the Puritans during the civil war, and the existing library is of later formation. Frances, duchess of Somerset, bequeathed to it nearly 1000 volumes, including the famous Evangcliary of St Chad. The collection at Norwich is chiefly modern, and was presented by Dr Sayers. The earlier library at Peterborough having almost Wholly perished in the civil war, Bishop White Kennett became the virtual founder of the present collection. Salisbury is rich in incunabula, and a catalogue has recently been printed. Winchester Cathedral Library is mainly the bequest of Bishop Morley in the 17th century. The library at Bristol, then numbering 6000 or 7000 volumes, was burnt and pillaged by the mob in the riots of 1831. Only about 1000 volumes were saved, many of which were recovered, but few additions have been made to them. At Chester in 1691 Dean Arderne bequeathed his books and part of his estate 'as the beginning of a public library for the clergy and city." The library of Hereford is a good specimen of an old monastic library ; the books are placed in the Lady Chapel, and about 280 choice MSS. are

chained to oaken desks. The books are ranged with the edges outwards upon open shelves, to which they are attached by chains and bars, The four Welsh cathedrals were supplied with libraries by a deed of settlement in 1709. The largest of then, that of St Asaph, has about 1750 volumes.

The Bodleian Library, though it had been preceded by various efforts towards a university library, owed its origin to Sir Thomas Bodley. After a long and honourable career as a diplomatist he determined, as he says, to take his farewell of state employments, and concluded to set up his staff at the library door in Oxon. Contributing largely himself, and procuring contributions from others, he opened the library with upwards of 2000 volumes in 1602, In 1610 he obtained a grant from the Stationers' Company of & copy of every work printed in the country. The additions made to the library soon surpassed the capacity of the room, and the founder proceeded to enlarge it, By his will he left considerable property to the university for the maintenance and increase of the library. The example set by Bodley found many noble imitators. Amongst the chief benefactors have been Sir Henry Savile, Archbishop Laud, John Selden, Sir Kenelm Digby, Lord Fairfax, Richard Gough, Francis Douce, Richard Rawlinson, Rev. Robert Mason, and F. W. Hope. The library now con- tains almost 400,000 printed volumes, and about 30,000 manuscripts, The number of separate works exceeds a million. But the number of volumes conveys a very inadequate idea of the valuable character of the collection. In the department of Oriental manuscripts it is perhaps superior to any other European library ; and it is exceed- ingly rich in other manuscript treasures. It possesses a splendid series of Greek and Latin editiones principes, and of the earliest productions of English presses. Its historical manuscripts contain most valuable materials for the general and literary history of the country.

The last general catalogue of the printed books was printed in 4 vols, folio, 1843-51, In 1859 it was decided to prepare a new

ject index.

manuscript catalogue on the plan of the great catalogue at the British Museum, and this has recently been completed in dupli- cate. It extends to over 700 folio volumes, in which the books are entered on manifolded slips. It is an alphabetical author-catalogue ; and the Bodleian, like the British Museum, has no accessible sub- A catalogue on subjects is now, however, in course of preparation. Thereare also printed catalogues of the books belong- ing to several of the separate collections, The MSS. are in general catalogued according to the collections to which they belong, and they are all indexed, although they are not all catalogued as yet. Five volumes have been published under the late Mr Coxe's editorship of the ' Catalogi Codicum MSS. Bibliothece Bodleian, " 1853-63, in quarto, and there is a folio catalogue of Oriental MSS.

In 1860 the beautiful building known as the * Radcliffe Library," now called the '' Camera Bodleiana," was offered to the curators of the Bodleian by the Radcliffe trustees. It is uscd as a storehouse for the more modern books, including the new periodicals, which lie upon its tables; and it also serves asa reading-room. It is the only room open after the hour when the older building is closed owing to the rule as to the exclusion of artificial light. 'The separa- tion of the books is a source of some inconvenience in practice, and it has been proposed of late years to remove the entire collections to a new building which should be erected for the purpose of accommodating them.

The library is open by right to all graduate members of the university, and to others (over eighteen years of age) upon producing a satisfactory recommendation. No bovks are allowed to be sent out of the library except by special leave of the curators, in which respect there is a marked contrast with the practice at the Univer- sity Library at Cambridge, and still more so with the conspicuous liberality in this respect of the university libraries of Germany. The hours are from 9 to 4 and 9 to 3, according to the time of year, the Camera being open from 10 to 10 all the year round, The library is only closed altogether some twenty-nine working days in the year. The general control of the

library is committed to a board of thirteen curators. The permanent endow- ment is comparatively small; the ordinary expenditure, chiefly defrayed from the university chest, is about £4500.

The other important collections not connected with particular colleges are the Radcliffe Library and the library of the Taylor Institution, The former was founded by the famous physician Dr John Radcliffe, who died in 1714, and bequeathed, besides a per- manent endowment of £350 a year, the sum of £40,000 for a build- ing. The library was opened in 1749. Many years ago the trustecs resolved to confine their purchases of books to works on medicine and natural science. When the university museum and labora- tories were built in 1860, the trustees allowed the books to be trans- ferred to the museum. ‘The completeness and convenience of the arrangements make the Radcliffe the model of a working scientific library. The Taylor Institution is due to the benefaction of Sir Robert Taylor, an architect, who died in 1788, leaving his property to found an establishment for the teaching of modern languages. The library was established in 1848, and is devoted to the literature of the modern European languages, It contains a fair collection of works on European philology, with a special Dante collection, about 1000 Mazarinades and 400 Luther pamphlets. It contains altogether 30,000 volumes, with a few MSS. The Finch collection, left to the university in 1830, is also kept with the Taylor Library. Books are lent ont to members of the university and to others on a proper introduction. The endowment affords an income of £800 to £1000 for library purposes, and about 2000 volumes are added

early.

; The libraries of the several colleges vary considerably in extent and character. That of All Souls was established in 1443 by Arch- bishop Chichele, and enlarged in 1710 by the munificent equest of Christopher Codrington. It devotes special attention to juris- prudence, of which it has a large collection. It possesses 40,000 printed volumes and 300 MSS., and fills a splendid hall 200 fect long. The library of Brasenose College has a special endowment fund, so that it has, for a college library, the unusually large income of £200. The library of

Christ Church is rich in divinity and topo- graphy. It embraces the valuable library bequeathed by Charles Boyle, third earl of Orrery, amounting to 10,000 voluines, the books and MSS. of Archbishop Wake, and the Morris collection of Oriental books. The building was finished in 1761, and closely resembles the basilica of Antoninus at Rome, now the Dogana. Corpus possesses a fine collection of Aldines, many of them presented by its founder Bishop Fox, and a collection of 17th century tracts catalogued by Mr Edwards, with about 400 MSS. Exeter College Library has 25,000 volumes, with special collections of classical dis- sertations and English theological and political tracts. The library of Jesus College has few books of later date than the early part of the last century. Many of them are from the bequest of Sir Leoline Jenkins, who built the existing library. There are also some valuable Welsh MSS. The library of Keble College consists largely of theology, including the MSS. of many of Keble's works. The library of Magdalen College lias about 22,500 volumes (including

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many volumes of pamphlets) and 250 MSS. It has scientific and topographical collections. 'The library of Merton College has of latc devoted itself to foreign modern history. New College Library has about 17,000 printed volumes and about 350 MSS., several of which were presented by its founder, William of Wykeham. Oriel College Library, besides its other possessions, has a special collec- tion of books on eomparative philology and mythology, with a ptinted catalogue. The fine library of Queen's College is strong in theology, in English and modern European history, and in English county historics. St John's College Library is largely composed of the literature of theology and jurisprudence before 1750, and possesses a collection of medical books of the 16th and 17th cen- turies. The newer half of the library building was erected by Inigo Jones at the expense of Laud, who also gave many printed and manu- script books. Thc room used as a library at Trinity College formed part of Durham College, the library of which was established by Richard of Bury. Wadham College

Library includes a collection of botanical books bequeathed by Richard Warner in 1775 and a collection of books, relating chiefly to the Spanish Reformers, pre- sented by the executors of Benjamin Wiffen. Worcester College Library has of late specially devoted itself to classical archeology. It is also rich in old plays.

It must be admitted that the college libraries as a rule have not been uscd to any great extent. Of late, however, there have been signs of awakening interest. About 1871 there was a meeting of college librarians ; and it was agrecd that the colleges, instead of making merely sporadic purchases from the whole field of literature, should rather husband their limited resources and restrict them- selves each to some special department. But the idea has not been carried out very thoroughly, and a good deal must be done before the college libraries can be said to be as useful and efficient as they might be.

The history of the University Library at Cambridge dates from the earlier part of the 15th century. Two early lists of its contents are preserved, the first embracing 52 volumes dating from about 1425, the second a shelf-list, apparently of 330 volumes, drawn up by the outgoing proctors in 1473. Its first great benefactor was Thomas Scott of Rotherham, archbishop of York, who erected in 1475 the building in which the library continued until 1755. He also gave more than 200 books and manuscripts to the library, some of which still remain. ‘The library received other benefactions, but nevertheless appeared “ but mean” to John Evelyn when he visited Cambridge in 1654. In 1666 Tobias Rustat presented a sum of money to be invested to buy the choicest and most useful books. In 1715 George I. presented the library of Bishop Moore, which was very rich in early English printed books, form- ing over 30,000 voluines of printed books and manuscripts. The funds bequeathed hy William Worts and John Manistre, together with that of Rustat, produce at present about £1500 a year. The share of university dues appropriated to library purposes amounts to £3000 a year. In addition the library is entitled to new books under the Copyright Acts, The number of printed volumes in the library cannot be exactly stated, as no recent calculation on the subject exists. It has been variously estimated at a quarter or half atmillion.

The calendar states it as 200,000. Itincludes a fine series of editiones principes of the classics and of the early productions of the English press. The MSS. number 5723, in which are included a considerable number of adversaria or printed books with MS. notes, which form a leading feature in the collection. The most famous of the MSS. is the celebrated copy of the four gospels and the Acts of the Apostles, which is known as Codex Beze, and which was presented to the university by that Reformer. A catalogue of the MSS. las been published in 4 vols, 1856-61. There is no printed catalogue of the books, although the catalogue is in print, the accessions being printed and cut up and arranged in volumes. The regulations of the library with regard to the lending of books are very liberal, as many as ten volumes being allowed out to one borrower at the same time,

Therc isa library attached to the Fitzwilliam Museum bequcathed

to the university in 1816. It consists of the entire library of Lord Fitzwilliam, with the addition of an archeological library bought

from the executors of Coloncl Leake, anda small nuniber of works, chiefly on the history of art, since added by purchase or bequest. It contains a collection of engravings of old masters, a eollection of music, printed and MS., and a collection of illuminated MSS., chiefly French and Flemish, of the 14th to 16th centuries. The books are not allowed to be taken out.

The library of Trinity College, which is contained in a magnifi- cent hall built by Sir Christopher Wren, has about 90,000 printcd and 1918 MS. volumes, and is especially strong in theology, classics, and bibliography. It owcs to numerous gifts aud be- quests the possession of a great number of rare books and manu- scripts. Amongst these special eollections are the Capell collection of early dramatic and especially Shakespearian litcrature, the collec- tion of German theology and philosophy bequeathed by Archdcacon Hare, and the

Grylls bequest in 1863 of 9600 volumes, including many early printed books. There are printcd catalogues of the Sanskrit and other Oriental MSS. by Dr Aufrecht and Professor Palmer, and of the incunabula by the present librarian, Mr Sinker. The library is open to all members of the college, and the privi- lege of using it is liberally extended to properly accredited students.

Noue of the other college libraries rivals Trinity in the number of books. The library of Christ's College received its first books from the foundress. Clare College Library includes a number of Italian and Spanish plays of the end of the 16th eentury left by George Ruggle. The library of Corpus Christi College first became not- able through the bequest of books and MSS. made by Archbishop Parker in 1575. The printed books are less than 5000 in number, and the additions now made are chiefly in such branches as throw light on the extremely valuable collection of ancieut MSS., which attracts scholars from all parts of Europe. There is a printed catalogue of these MSS. Gonville and Caius College Library is of carly foundation. A catalogue of the MSS. was printed in 1849, with pictorial illustrations, and a list of the incunabula in 1850. The printed books of King's College includes the fine collection bequeathed by Jacob Bryant in 1804. The MSS. are almost wholly Oriental, chiefly Persian and Arabic, and a catalogue of them has been printed. Magdalene College possesses the curious library formed by Pepys and bequeathed by him to the college, together with his collections of prints and drawings and of rare British portraits. It is remarkable for its treasures of popular literature and English ballads, as well as for the Scottish manuscript poetry collected by Sir Richard Maitland. The books are kept in Pepys's own cases, and remain just as he arranged them himself. The library of Pcterhouse is the oldest library in Cambridge, and possesses a catalogue of some 600 or 700 books dating from 1418, in which year it was completed. It is chiefly thcological, though it possesses a valuable collection of modern works on geology and natural science, and a uniquc collection of MS. music. Queen's College Library contains about 30,000 volumes, mainly in theology, classics, and Semitic literature, and has a printcd class- catalogue. The library of St John's College is rich in early printed books, and possesses a large collection of English his-

torical tracts. Of the MSS. and rare books there is a printed cata- logue. For the other college libraries see the tables.

Free Public Lnbraries.—In the year 1850 Mr Ewart Free introduced the first Public Libraries Act into the House public of Commons, and it has since been supplemented and libraries.

amended by the Acts of 1855, 1866, 1871, and 1877. Mr Ewart had previously carried through parliament the Museums Act of 1845; and small libraries had been established in connexion with museums under that Act at Salford and Warrington. The number of towns which have established rate-supported libraries, or in which the Acts have been adopted, now amounts to at least ninety- six, ten of these towns being in Scotland, and one only in Ireland. It is noticeable that the Acts have not been adopted in any of the great capital towns of the three kingdoms, except in one single parish of Westminster, Many of our largest towns are also in default. Glasgow may be considered to be sufficiently provided for by the munificent Mitchell bequest. Of the libraries which have actually been opened sixteen are in places of over 100,000 inhabitants, twenty in towns of between 50,000 and 100,000 inhabitants, sixteen in towns of between 30,000 and 50,000, eleven in towns of between 20,000 and 30,000 inhabitants, seventeen in towns of between 10,000 and 20,000 inhabitants, and finally six in towns of less than 10,000 inhabitants.

Taking the latest returns we have been able to obtain,

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which are with a few exceptions those of the year 1880-81, the number of volumes in stock and of the total issues is as follows. In eighty-one libraries returning their number of volumes, there is a total of 1,448,192 volumes in stock ; while the total issues for the year in seventy-six libraries amounted to the enormous number of 9,023,742 volumes. Even these figures afford a very inadequate idea of the service rendered by these institutions in supplying popular reading.

They take no account of the visits made to the newsrooms which are almost invariably connected with the libraries, or of the use made of the magazines and periodicals which lie upon the tables. The free public libraries generally consist of a lending department, with a reference library wherever the institution can provide one. A very large proportion of the issues from the lending departments consists of fiction, the percentage varying in different libraries from about 50 to as much as 75 per cent. of the whole. It is only in the case of the wealthier institutions, such as those in the great towns of Liverpool, Manchester, and Birmingham, that the reference depart- ments are so important as to claim consideration here in respect of the intrinsic character of their collections. Even some of the smaller libraries, however, present features of interest in their collections of local books, or of books illustrating the trade or industry of the district, or the life and writings of some great man connected with or born in the locality.

The Salford Free Public Library was one of the libraries which were established nnder the Museums Act of 1845, and was opened in 1850 in connexion with the museum and picture gallery at Pecl Park. The buildings are pleasantly situated in grounds of 46 acres in extent. The refereuce om now contains 33,500 volumes, and besides the central lending departments there are three branches in different parts of the borough. The income from the penny rate is about £3300 ; but this is found to be inadequate.

The Manchester Free Library was the first to be established under the Act of 1850. A public subscription of nearly £13,000 was raised to defray the expenses of its establishment, and the library was opened in September 1852. The working of this library was a success from the outset. The issues in the first year were in the reference departments 61,080 volumes, and in the lending departments 77,232. The progress made since then may be measured by the number of volumes issued last year (1881), which amounted to 966,468, and by the fact that six branch libraries have been established. The rate produces an income of £11,000. The reference library now possesses a valuable collection of 65,000 volumes, chiefly of standard works. It contains several special collections, chiefly connected with the industries and history of the

district. The library of the English Dialect Society, of which a catalogue has been printed, is deposited here. In addition, the library possesses a very extensive series of pcriodicals, and a larger collection of political and commercial tracts than can be found any- where in the country except at the British Museum. A good catalogue was printed in 1864, and a new and extensive index has just appeared.

The library at Liverpool, which was established under a special Act passed in 1852, is the most successful of all the free public libraries, and is connected with a splendid muscum and art gallery, the former formed around the nucleus of the ornithological speci- mens bequeathed to the town by the thirteenth earl of Derby. The rapid extension of museum and library soon rendered larger premises a necessity. The late Sir William Brown took upon him- self the entire cost of the present extensive buildings, which were opened in 1860. In 1880 was opened the Picton Reading-Room. It is a circular room 100 fect in diameter, surmounted by a dome, the entire height being 56 feet. It contains 50,000 volumes, and will accommodate over 300 readers. Since April 1881 the electric light has been employed. Under the reading-room is a large circular lecture-room accommodating 1500 persons, in which lectures are regularly delivered. There is a numerous collection of local books and pamphlets. The Binns collection, consisting of maps, plans, drawings, portraits, &c., all having reference to the county of Lancaster, is very interesting and valuable. The issues from the reference library in 1880 were 870,716, and with the issues from the two lending departments make the enormous aggregate of 1,307,131. The rate produces an income of £13,000 per annum, of which more than £5000 is expended upon the libraries. An elaborate catalogue of the reference library was published in 1872, and a supplement is now being printed. In 1853 Bolton established a library which now has a circulation

addition to the central reference and lending libraries.

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of over 240,000 volumes. In 1855 libraries were established at Birkenhead and Sheffield. At Birkenhead the rate produces £1500, and 130,000 volumes were lent out last year. At Sheffield, where the rate produces £4750, there are three branches, and the total issues last year were 384,266. The reference library has only 9000 volumes.

The Acts, after having been rejected at Birmingham in 1852, were adopted in 1860. By 1868 four branches had been opened in The issues from the lending departments last year were 400,000 volumes. The reference library consisted of over 50,000 volumes. The Shake- speare Memorial Library consisted of about 7000 volumes. There were also the Staunton Warwickshire collections of books and MSS. and the Cervantes books. All these collections were unfortu- nately destroyed by a fire on Jannary 11, 1879. The inhabitants of Birmingham have shown much public spirit in repairing the losses then sustained so far as is possible, and the new central reference and lending libraries are expected to be open early in 1882, when it is anticipated that there will be as many volumes ready to be placed in the reference library as there were when the forincr library was destroyed. No town in England is so surrounded with free libraries as Birmingham. ‘The rate at Birmingham produces over £6000.

The free library at Nottingham (1867) has recently had new . quarters found for it in the new university buildings. It has two branches, and its issues are about 160,000. The rate prodnces £2200. The local collections include a Byron library. The library at Leeds (1868) has no less than twenty-one branclies, and together they count over 109,000 volumes. The issues last year, in addition to the use made of the central reference library, were 639,613. The rate produces nearly £5000. At Leicester there is only a halfpeuny rate, which produces about £800. ‘The issues last ycar were 192,317. At Bradford (Acts adopted 1871)

the rate produccs £3200, and there are five branches with a circulation of 291,276 volumes, besides the use made of the reference library. At Plymouth (Acts adopted 1871, library opened 1876) the cireulation was 171,851 last year; at Rochdale (Acts adopted 1872) 168,514. At each placc there isa good collection of local literature, and at Rochdale a collection of works on the woollen manufacture. The library at Newcastle, opened in 1880, has issued from its lending departments, in its first year, no less than 301,925 volumes to about 14,000 readers.

It will be seen from this summary statement that the libraries established under the Acts have in the cases mentioned been abundantly used. The merit of these results is very largely due to the enlightened energy of those who are entrusted with their administration.

Amongst the English libraries that have not yet been described there are few that call for special mention. Some of these have been founded by individuals, and still bear their names. The most notable of these is the fine old library established by Humphrey Chetham at Manchestcr im 1658, which is still housed in the old collegiate buildings where Raleigh was once entertained by Dr Dec. The collection consists largely of older literature, and numbers 40,000 volumes, with 300 MSS. It is freely open to the public, and may be said to have been the first free library in England. Dr Shepherd's library at Preston was bequeathed by the founder, a physician of the town, to the corporation of Preston in trust for the inhabitants in the year 1759. It is a library of reference, accessible on a recommendation from an alderman. The William Salt Library, a special Staffordshire library with numerous MSS. and other collections, formed to bring together materials for a history of Staffordshire, was opened to the public in 1874.

Some mention should be made also of the more important Subscrip-

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most part in the latter half of the 18th ccntury. cult for us to realize how few collections of books were accessible to the public of the last

century even im London. The earliest circulating library in the metropolis was established about the middle of the century. The first in Birmingham was opened by Hutton in 1757. The idea of a proprietary te appears to have been first carried out at Liverpool 1n ios: € library then formed still flourishes at the Lyceum, and possesses a collection of 72,000 volumes and an income of £1200 a year. In 1760 a library was formed at Warrington which has been merged

in the Warrington Museum. The Leeds library was established in 1768, and now has 85,000 volumes, and an income of £1430. In 1772 the Bristol museum and library was formed, and numbered Coleridge, Southey, and Landor among its earlier members. It now reckons 50,000 volumes, aud an income of £1400 a year. The Birmingham (old) library was formed in 1779, and its rules were drawn up by Dr Priestley, who had already taken an active share in the management of the libraries at Warrington and Leeds. The library has now 40,000 to 50,000 volumes, and an income of £1600. Many similar institutions are noticed in the tables, while others have given place to the trade circulating libraries and to the libraries established under the Free Libraries Acts.

A few modern collegiate librarics, finally, claim a summary notice. The library of the university of Durham dates only from 1833, and was begun by a gift of books from Bishop Van Mildert, to which many other donations have since succceded. The Routh collection includes a large collection of early tracts. The Winter- bottom collection is chiefly classical, and the Maltby collection classical and theological. The library of the Owens College, Man- chester, was formed on the establishment of the college in 1851 by a gift of books from Mr James Heywood, F.R.S. It has since been largely increased by donations and bequests, including the librarics of Bishop Lee, Mr Crace Calvert, and others. It has an endowment fund of £2500. The library at Stonyhurst

College has gradually grown since the establishment of the college in 1794. There is a printed catalogue of books printed before 1551. The Walshian Library at St Mary's College, Oscott, was established by Bishop Walsh in 1839, having been purchased by him from the Marchese Marini. It has 70 MSS, and many carly printed books,

The principal library in Scotland is that of the Faculty of Advocates, who in 1680 appointed a committee of their number, which reported that "it was fitt that, seeing if the recusants could be made pay their entire money, there wold be betwixt three thousand and four thousand pounds in cash; that the same be imployed on the best and fynest lawers and other law bookes, conforme to a catalogue to be condescended upon by the Facultie, that the samen may be a fonde for ane Bibliothecque whereto many lawers and others may leave their books." In 1682 the active carrying out of the scheme was committed to the Dean of Faculty, Sir George Mackenzie of Rosehaugh,

who may be regarded as the founder of the library. In:

1684 the first librarian was appointed, aud the library appears to have made rapid progress, since it appears from the treasurer's accounts that in 1686 the books and furni- ture were valued at upwards of £11,000 Scots, exclusive of donations, In the year 1700, the rooms in the Exchange Stairs, Parliament Close, in which the library was kept, being nearly destroyed by fire, the collection was removed to the ground floor of the Parliament House, where it has ever since remained. The library retains the copyright privilege conferred upon it in 1709. The number of volumes in the library is computed to amount to 265,000 ; of the special collections the most important are the Astorga collection of old Spanish books, purchased by the faculty in 1824 for £4000; the Thorkelin collection, consisting of about 1200 volumes relating chiefly to the history and antiquities of the northern nations, and including some rare books on old Scottish poetry ; the Dietrich collection of over 100,000 German pamphlets and dissertations, including many of the writings of Luther and Melanchthon, purchased for the small sum of £80; and the Combe collection,

The faculty appear early to have turned their attention to the collection of MSS., and this department of the library now numbers about 3000 volumes. Many of them are of great interest and value, especially for the civil and ecclesiastical history of Scotland before and after the Reformation. There are thirteen monastic chartularies which escaped the destruction of the religious houses to which they belonged. The MSS. relating to Scottish church history include the collections of Spottiswoode, Woodrow, and Calderwood. The Woodrow collection consists of 154 volumes, and includes his correspondence, extending from

| families.

1694 to 1726. Sir James Balfour's collection and the Balearres papers consist largely of original state papers, aud include many interesting royal letters of the times of James V., Queen Mary, and James VI. The Sibbald papers, numbering over 30 volumes, are largely topographical. The Riddel notebooks, numbering 156 volumes, contain collections to illustrate the genealogy of Scottish There are about one hundred volumes of Icelandic MSS., purchased in 1825 from Professor Finn Magnusson, and some Persian and Sanskrit, with a few classical, manuscripts. The department has some interesting treasures of old poetry, extending to 73 volumes. The most important are the Bannatyne MS., in 2 vols. folio, written by George Bannatyne in 1568, and the Auchin- leck MS., a collection of ancient English poetry, named after Alexander Boswell of Auchinleck, who presented it in 1774.

The first catalogue of the printed books was compiled in 1692, and contains a preface by Sir George Mackenzie. Another was prepared under the care of Ruddiman in 1742. In 1853 the late Mr Halkett commenced a catalogue, which has been printed in 6 vols. 4to, with a supplement, and includes all the printed books in the library at the end of 1871, containing about 260,000 entries. It is an illustration of the

public spirit with which they conduct their library, that the whole cost of printing this extensive catalogue, over £5000, has been borne by the members of the faculty. The library, managed by a keeper and staff, under a board of six curators, is easily accessible to all persons engaged in literary work, and is for all practical purposes the public consulting library of Scotland.

The origin of the University Library of Edinburgh is to be found in a bequest of his books of theology and law made to the town in 1580 by Clement Little, advocate. This was two years before the foundation of the university, and in 1584 the town council caused the collection to be removed to the college, of which they were the patrons. As it was the only library in the town, it continued to grow and received many benefactions, so that in 1615 it became necessary to erect a library building. Stimulated perhaps by the example of Bodley at Oxford, Drummond of Hawthornden made a large donation of books, of which he printed a catalogue in 1627, and circulated an appeal for assistance from others. In 1678 the library received a bequest of 2000 volumes from the Rev. James Nairue. In 1709 the library became entitled to the copy privilege, which has since been commuted for a payment of £575 per annum. In 1831 the books were removed to the present library buildings, for which a parliamentary grant had been obtained. The main library hall (190 feet in length) is one of the most splendid apartments in Scotland. One of the rooms is set apart as a memorial to General Reid, by whose benefaction the library has greatly benefited. Amongst the more recent accessions have beenthe Halliwell- Phillips Shakespeare collection, the Laing collection of Scottish MSS., the Baillie collection of Oriental MSS. (some of which are of great value), and the Hodgson collection of works on political economy. The library now consists of about 140,000 volumes of printed books with 2000 MSS.

The library of the Writers to Her Majesty’s Signet was established by the society in 1755. At first it consisted of law books exclusively, but in 1788 they began to collect the best editions of works in other departments of literature. During the librarianship of Macvey Napier (1805-37) the number of volumes was more than sextupled, and in

1812 the library was removed to the new hall adjoining the Parliament House. In 1834 the upper hall was devoted to the collection. Thisisa magnificent apartment

142 feet long, with a beautiful cupola painted by Stothard. The library now contains nearly 70,000 volumes, exclusive of pamphlets, and includes some fine specimens of early printing, as well as many other rare and costly works. It is especially rich in county histories and British topography and antiquities. A catalogue of the law books was printed in 1856. The late David Laing, who became librarian in 1837, published the first volume of a new catalogue in 1871. The second volume is nearly completed. The books are lent out to the Writers and even to strangers recommended by them. This library, like that of the Advocates, is most liberally opened to literary inquirers, and has thus acquired a quasi-public or national character.

There are various other important libraries in Edinburgh, but no considerable lending library open freely to the poorest of the people, and two attempts which have been made to introduce the Libraries' Acts have been unsuccessful.

The first mention of a library at St Andrews is as early as 1456. The three colleges were provided with libraries of their own about the time of their foundation—St Salvator's 1455, St Leonard's 1512, St Mary's 1537. The University Library was established about 1612 by King James VI., and in the course of the 18th century the college libraries were merged in it. The copy- right privilege was commuted in 1837. The collection numbers 90,000 volumes exclusive of pamphlets, with about 200 MSS., chiefly of local interest. About 1200 volumes are added yearly. A library is supposed to have existed at Aberdeen since the founda- tion of King's College by Bishop Elphinstonein 1494, The present collection combines the libraries of King's College and Marischal College, now incorporated in the university. The latter had its origin in a collection of books formed by the town authorities at the

time of the Reformation, and for some time kept in one of the churches. The library has benefited by the Melvin bequest, chiefly of classical books, and those of Henderson and Wilson, and contains some very valuable books. The general library is located in Old Aberdeen, while the medical and law books are in the New Town. The library has a grant, in lieu of the copy privilege, of £320. The library of the university of Glasgow dates from the 15th century, and nuinbers George Buchanan and many other distinguished men amongst its early benefactors. A classified subject-catalogue is in progress. The annual accessions are about 1500, and the commutation-grant £707. Connected with the university, which is trustee for the public, is the library of the Hunterian Museum, formed by the eminent anatomist Dr William Hunter. It is a collection of great bibliographical interest, as it is rich in MSS. and in fine specimens of the early printing, especi- ally in Greek and Latin classics. The printed books number about 13,000 volumes, and the MSS. some 600 volumes. All the Scottish university libraries lend books to students, on deposit of £1, to graduates, for an annual subscription of half a guinea, and to persons engaged in literary research, by permission of the senatus.

The Mitchell Library at Glasgow bids fair to be the most im- portant public library outside Edinburgh. It was founded by a munificent bequest of £70,000 from the late Mr Stephen Mitchell. The library was opened in 1877, in temporary premises, and already contains over 36,000 volumes. It includesa special collec- tion of Scottish poetry called ‘‘ The Poets’ Corner,” and a collection of Glasgow literature, including early specimens of Glasgow printing. The library is open to all persons over fourteen years of age, and the number of readers during the first three years in which the library has been opened is believed to be without precedent. The number of volumes issued in 1880 was 390,732.

The English Libraries Act of 1850 was extended to Scotland in 1854, and the first town to put it into operation was Airdrie, in 1856. The largest of the libraries which have been opened under the Acts is at Dundee, which possesses 35,500 volumes, with a circulation of 252,314. The rate produces £2390. Although the resources of the other

towns in which the Acts have so far been adopted do not enable them to rival the larger English towns, the results are proportionately quite as satisfactory. The turn- over of their stock of books is generally large, and the reading done appears to be more solid and serious than in England. The per- centage of fiction issued is at least 10 or 15 per cent. below the average rate in the English free libraries.

The establishment of the library of Trinity College, Dublin, is contemporaneous with that of the Bodleian at Oxford, and it is an interesting circumstance that, when Challoner and Ussher (afterwards the archbishop) were in London purchasing books to form the library, they met Bodley there, and entered into friendly intercourse and co-operation with him to procure the choicest and best

books. The commission was given to Ussher and Challoner as trustees of the singular donation which laid the foundation of the library. In the year 1601 the English army determined to commemorate their victory over the Spanish troops at Kinsale by some permanent monument. Accordingly they subscribed the sum of £1800 to establish a library in the university of Dublin. For Ussher's own collection, consisting of 10,000 volumes and many valuable MSS., the college was also indebted to military generosity. Onhis death in 1655 the officers and soldiers of the English army then in Ireland purchased the whole collection for £22,000 with the design of present- ing it to the college. Cromwell, however, interfered, alieging that he proposed to found a new college, where the books might more conveniently be preserved. They were deposited therefore in Dublin Castle, and the college only obtained them after the Restoration. In 1674 Sir Jerome Alexander left his law books with some valuable MSS. to the college. In 1726 Dr Palliser, archbishop of Cashel, bequeathed over 4000 volumes to the library ; and ten years later Dr Gilbert gave the library nearly 13,000 volumes which he had himself collected and arranged. In 1741 the library received a valuable collection of MSS. as a bequest from Dr Stearne. In 1802 the collection formed by the pensionary Fagel, which

had been removed to England on the French invasion of Holland, was acquired for £10,000. It consisted of over 20,000 volumes. In 1805 Mr Quin bequeathed a choice collection of classical and Italian books. There have been many other smaller donations, in addition to which the library is continually increased by the books received under the Copyright Act. The library now contains 192,000 volumes and 1880 MSS., and about 3000 volumes are added every year. There is no permanent endowment, and purchases are made by grants from the board. The whole collections are contained in one building, erected in 1732, consisting of eight rooms. The great library hall is a magnificent apartment over 200 feet long. A new reading-room was opened in 1848, A catalogue of the books acquired before 1872 is now in course of printing. There is no printed catalogue of the MSS. Graduates of Dublin, Oxford, and Cambridge are admitted to read permanently, and temporary admission is granted by the board to any fit person who makes applica- tion. Books and MSS, are lent out only under special regulations. A lending library has been established to make provision for the needs of the students.

The public library, St Patrick's, Dublin, sometimes called Marsli's Library after its founder, was established about 1694 by Archbishop Marsh, was incorporated by Act of Parliament in 1707, and endowed by its founder at his death in 1713. The building was erected by the founder, and the original oak fittings still remain. There is no room for additions, and a large collection of modern books was refused a few years ago on that account. The endowment is too small to allow of purchases from the funds of the library, so that it still retains the character of a 17th century library. The books are chiefly theological, and in the learned languages ; they include the libraries of Bishop Stillingficet and of Elias Bouhereau, a French refugee, who was the first librarian.

The library of the Royal Dublin Society was commenced shortly after thé formation of the society in 1731. With the exception of about 10,000 volumes of the publications of learned societies and scientific periodicals, with a few carly editions, its books were trans- ferred to the state, in 1877, to assist in forming the national library of Ireland.

The manuscript collections of Walter Harris on Irish history were purchased and placed in the library for public use by the Irish parliament. The library of the Royal Irish Academy was established on the formation of the Academy in 1785, for the purpose of promoting the study of science, literature, and antiquities in Ireland. The library possesses about 40,000 printed volumes and about 1400 MSS. ‘There is a large collection of MSS. and books relating to the history, ancient language, and antiquities of Ireland. They include the Bethain collection, acquired partly by public subscription in 1851. The library is partly supported by a Government grant of £200 per annum, and is freely open on a proper introduction. Under the direction of the present honorary

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librarian, the publication of Irish MSS. in the library was begun in 1870, and has sinee continued. The library of King’s Inns was founded, pursuant to a bequest of books and legal MSS. under the will of Mr Justice Robinson in 1787, to form the nucleus of a library for law students. It is partly supported from the funds of the benchers, but partly also by a treasury grant of £433, 6s. 8d. in lieu of the eopy privilege. No books are lent out, and the use of the library is confined to students and barristers; so that the public has no advantage in return for the annual contribution of publie money.

There is no library in Dublin corresponding in extent and publie accessibility to the British Museum in London, or the Advoeates’

‘Library in Edinburgh. About 1850 it was proposed to supply the

deficiency by combining the libraries of the Dublin Society and the Irish Academy, both of which had long reeeived grants of public money, together with the collection of Archbishop Marsh. Aecordingly in 1854 an Act of Parliament was passed ‘‘ for the establish-

ment of a national gallery and for the eare of a publie library in Dublin.” The scheme thus authorized has never been carried out. In 1877, however, the National Library of Ireland was established in the apartments of Leinster House. The library is under the Seience and Art Department of South Kensington, and is super- intended by a body of twelve trustees in Dublin. For the last two years it has received an annual vote of £1000 from parliament for the purchase of books. As already mentioned, the books of the Royal Dublin Soeiety have been transferred to it. It is freely open to the public on a respectable introduction, and is much used.

The public library of Armagh was founded by Lord Primate Robinson in 1770, who gave a considerable number of books and an endowment. The books are freely available, either on the spot, or by loan on deposit of double the value of the work applied for. At Belfast the Queen’s College Library has about 36,000 volumes, with a special eolleetion of books on the languages and literatures of the East. The library of the Queen’s College, Cork, contains about 25,000 volumes, 1600 of the most valuable of which have been presented by Mr Crawford. The library is easily ac- cessible to literary inquirers, and is much used by strangers, The library of Maynooth College is chiefly theological, and contains the collcetions bequeathed by the late president, Monsignor Russcll. There are about 40,000 volumes and a few MSS.

Dundalk is at present the only town that has a library under the Publie Libraries Aets, which were adopted there in 1856. The rate produces only about £80.

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French libraries (other than those in private nands) belong either to the state, to the departments, to the communes, or to learned societies, educational establish- meuts, and other public institutions; the libraries of judicial or administrative bodies are not considered to be owned by them, but to be state property. Besides the unrivalled library accommodation of the capital, France possesses a remarkable assemblage of provincial libraries. The communal and school libraries also form striking

features of the French free library system.

Five and twenty years ago (see Tableau statistique des bibliothéques publiques, 1857) there were in the depart- ments,—exclusive of those not literally free, and of all Parisian libraries, —340 public librariescontaining 3,734,260 volumes and 44,436 MSS. In 1857 there were only 32 provincial libraries which owned more than 30,000 volumes each ; there are now 54 which are of that extent and upwards.1_ In Paris there are now 16 containing over 30,000 volumes each.

Libraries of Paris.—The Bibliothéque Nationale (still the most exteusive library in the world) has had an advan- tage over all others in the length of time during which its contents have been accumulating, and in the great zeal shown for it by several kings and other eminent men. Enthusiastic writers find the original of this library in the MS. collections of Charlemagne and Charles' the Bald, but these were dispersed in course of time, and the few precious relics of them which the national library now possesses have been acquired at a much later date. Of the library which St Louis formed in the 13th century

1 In 1877 a questionnavre was issued in order to obtain materials for a more complete report, but the results have not yet been made public.

(in imitation of what he had seen in the East) nothing has fallen into the possession of the Bibliothtque Nationale, but much has remained of the royal collections made by kings of the later dynasties. The rcal foundation of the institution (formerly known as the Bibliothtque du Roi) may be said to date from the reign of King John, the Black Prince's captive, who had a considerable taste for books, and bequeathed his "royal library" of MSS. to his successor Charles V. Charles V. organized his library in a very effective manner, removing it from the Palais de la Cité to the Louvre, where it was arranged on desks in a large hall of three stories, and placed under the manage-

ment of the first librarian and cataloguer, Claude Mallet, the king's valet-de-chambre. His catalogue was a mere shelf-list, entitled Jnventaire des Livres du Roy nostre Seigneur estans au chastel du Louvre ; it is still extant, as well as the further inventories made by Jean Blanchet in 1380, and by Jean le Bégue in 1411 and 1424. Charles V. was very liberal in his patronage of literature, and many of the early monuments of the French language are due to his having employed Nicholas Oresme, Raoul de Presle, and other scholars to make translations from ancient texts. Charles VI. added some hundreds of MSS. to the royal library, which, however, was sold to the regent, duke of Bedford, after a valuation had been established by the inventory of 1424, The regent transferred it to England, and it was finally dispersed at his death in 1435. Charles VII. and Louis XI. did little to repair the loss of the precious Louvre library, but the news of the invention of printing scrved as a stimulus to the creation of another one, of which the first librarian was Laurent Paulmier. The famous miniaturist Jean Foucquet of Tours was named the king's enlumineur, and although Louis XI. neglected to avail himself of many precious opportunities that occurred in his reign, still the new library developed gradually with the help of confiscation. Charles VIII. enriched it with many fine MSS. executed by his order, and also with most of the books that had formed the library of the kings of Aragon, seized by him at Naples. Louis XIT., oncoming to the throne, incorporated the Bibliothéque du Roi with the fine Orleans library at Blois, which he had inherited. The Blois library, thus augmented, and further enriched by plunder from the palaces of Pavia, and by the purchase of the famous Gruthuyse collection, was described at the time as one of the four marvels of France. Francis I. removed it to Fontainebleau in 1534, enlarged by the addition of his private library. He was the first to set the fashion of fine artistic bindings, which was still more cultivated by Henry II., and which has never died out in France. During the librarianship of Amyot (the translator of Plutarch) the library was transferred from Fontainebleau to Paris, not without the loss of several books coveted by powerful thieves. Henry IV. removed it to the Collége de Clermont, but in 1604 another change was made, and in 1622 it was installed in the Rue de la Harpe. Under the librarianship of J. A. de Thou it acquired the library of Catherine de' Medici, and the

glorious Bible of Charles the Bald. In 1617 a decree was passed that two copies of every new publication should be deposited in the library, but this was not rigidly enforced till Louis XIV.'s time. The first catalogue worthy of the name was finished in 1622, and contains a description of some 6000 volumes, chiefly MSS. Many additions were made during Louis XIIL's reign, notably that of the Dupuy collection, but a new era dawned for the Bibliothtque du Roi under the patronage of Louis XIV. The enlightened activity of Colbert, one of the greatest of collectors, so enriched the library that it became necessary for want of space to make another removal. It was therefore in 1666 installed in the Rue Vivien (now Vivienne) not far from its present habitat.

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The departments of engravings and medals were now created, and before long rose to nearly equal importance with that of books, Marolles's prints, Foucquet's books, and many from the Mazarin library were added to the collection, and, in short, the Bibliothéque du Roi had its future pre-eminence undoubtedly secured. Nic. Clément

made a catalogue in 1684 according to an arrangement | at the disposal of readers;

which has been followed ever since (that is, in twenty-three

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classes, each one designated by a letter of the alphabet), |

with an alphabetical index to it. After Colbert's death Louvois emulated his predecessor's labours, and employed Mabillon, Tlevenot, and others to procure fresh accessions from all parts of the world. A new catalogue was com-

piled in 1688 in eight volumes by several distinguished |

scholars. The Abbé Louvois, the minister's son, became head of the library in 1691, and opened it to all students —a privilege which although soon withdrawn was after- wards restored. Towards the end of Louis XIV.'s reign it contained over 70,000 volumes. Under the manage-

in all departments, and the library was removed to its present home in the Rue Richelieu. Aimong the more important acquisitions were 6000 MSS. from the private library of the Colbert family, Bishop Huet's forfeited collection, and a large number of Oriental books imported

by missionaries from the further East, and by special |

agents from the Levant. Between 1739 and 1753 a cata- logue in eleven volumes was printed, which enabled the administration to discover and to sell its duplicates. Louis XVL's reign the sale of the La Valliére library furnished a valuable increase both in MSS. and printed books. A few years before the Revolution broke out the latter department contained over 300,000 volumes and opuscules. The Revolution was serviceable to the library, now called the Bibliotheque Nationale, by increasing it with the forfeited collections of the émigrés, as well as of the suppressed religious communities. In the midst of the difficulties of placing and cataloguing these numerous acquisitions, the name of Van Praet appears as an administrator of the first order. Napoleon increased the amount of the Government grant; and by the strict enforcement of the law concerning new publications, as well as by the acquisition of several special collections, the Bibliothtque made considerable progress during his reign towards realizing his idea that it should be universal in character. At the beginning of this century the recorded nunibers were 250,000 printed volumes, 83,000 MSS., and 1,500,000 engravings. After Napoleon's downfall the MSS. which he had transferred from Berlin, Hanover, Florence, Venice, Rome, the Hague, and other places had to be returned to their proper owners. The MacCarthy sale in 1817 brought a rich store of MSS. and incunabula. From that time onwards to the present, under the enlightened administration of MM. Taschereau and Delisle, the accessions have been very extensive.

The official estimate of the number of voluines in the Département des Imprimés now reaches the extraordinary total of about 2,290,000, but the contents have not been actually counted since 1791, and as the above enumerates pieces of which many are included in one volume, perhaps something like 1,827,000 is nearer the proper number. The annual additions are about 45,000. The réserve (con- sisting of articles of the highest importance) extends to more than 50,000 volumes. The collection of books on French history is in itself an enormous library, amounting to 440,000 volumes. The mapsand charts, said to number 300,000, are included in this department. The Département des MSS. comprehended, in 1876, 91,700 volumes. The Département des Médailles possessed, in 1873, 143,030 coins, medals, engraved stones, &c., and since that date has aequired many important accessions. More than 2,200,000 engravings are in the Département des Estumpes, where 20,000 pieces are annually received under the copyright law. The annual vote for purchases and binding is 200,000 francs.

Admittance to the Salle de Travail is obtained by a bulletin

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of that name, by Cardinal Frangois de la Rochefoucauld. | persons also gave books, and in 1687 the library is said to have con-

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personnel, which is procurable without difficulty. This, the read- ing-room for students, was built in 1868, and affords accommodation for 344 readers. There are but few books of reference, and readers

_ are only allowed five books a day. The Salle publique contains

40,000 books, which are freely available to the public. Plans are now under consideration for an enlargement of the Bibliothéque, and a sum of 3,700,000 franes is to be devoted to that purpose. The Bibliotheque Nationale does not possess a general catalogue the MS. catalogues of the various classes of the printed books are for official use only. Besides the old catalogue of 1739-53, there is the very elaborate

Catalogue de Histoire de France (1855-79, 11 vols. 4to), with a lithographed supplement ; the indexes will appear shortly. The third volume of the Catalogue des Scienecs Médicales is now in the press, and that devoted to English history is nearly tinished in manuscript. ‘The vellum books have been described by Van Praet (1822-23, 6 vols. 8vo, and supplement, 1877). The MSS. are much better provided for. The printed catalogues of these commence with that of Anicet Melot, 1739-44, 4 vols. folio, continued in a way by the Notices et Exiraits des MSS. du Bibl. du Roi, 1787-1875. The work of M. Paulin Paris, Les MSS. Francois; leur histoire et celle des textes allemands, anglois, italiens, ct espagnols (1836-48, 7 vols. 8vo), is well known. Catalogues of the Italian, Spanish, Belgian, Pali,

: ea | Sanskrit, Ethiopian, and Chinese MSS. have also appeared between ment of the Abbé Bignon numerous additions were made > { Pine ae

1807 and 1844. The first and second volumes in 4to of a new Catalogue des MSS. Frangais have been printed, and two volumes of the Inventatire of M. Delisle, besides five parts of his Inventaire des MSS. Latins (1863-71). The authorities have also brought out a Catalogue des Manuserits Hebreux et Samaritains (1866, 4to), besides those of MSS. Syriaques et Sabéens (1874, 4to), ISS. Ethiopiens (1877), and MSS. Espagnols (1879).

Paris is much better provided than London or any other city in the world with great public libraries. Besides the Bibliothéque

| Nationale there are four libraries, each over 120,000 volumes (with

others less extensive), to which the public have free access, the Bibliothéque de l’Arsenal being the largest of them. The collection of the Marquis de Paulmy d’Argenson was the basis of this library, which also acquired a portion of the books of the Duc de la Valliére in 1781. It is peculiarly rich in romances, the drama, and French poetry, and possesses 80,000 volumes on French history alonc. It is freely open, but there are not many readers.—The Biblio- theque Mazarine was founded by the great cardinal, who in 1643 placed about 12,000

volumes at the disposal of the public. The books were chiefly brought together through the exertions of Gabriel Naudé, who tells us that in 1648 they amounted to 40,000 volumes. After the death of Mazarin, his magnificent library was bequeathed to the college bearing his name; it remained under the direction of the Sorbonne from 1688 to 1791, since which time it has been subject to the control of the state. It is rich in incunabula and theology, including the works of Protestant divines, and is annually visited by over 12,000 readers.—The Bibliothéque Sainte Geneviéve was founded in 1624, at the ave

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tained 20,000 printed volumes and 400 MSS. In 1710 C. M. Le Tellier bequeathed his collection, and in the Almanach Royal of the same year an announcement appeared that the library would be open to students during certain hours every day. Louis, Duc d'Orleans, the son of the Regent, took up his abode here, and in 1730 the library was considerably enlarged by him. It was opened to the. public in 1790, and at the time of the Revolution there were 80,000 printed volumes and 2000 MSS.; there are now 120,000 volumes and 2392 MSS. The reading-room is open in the evening, and is much frequented, especially by students. The library con- tains a good collection of incunabula, many of which have been described by Dibdin, a number of rare Italian and Spanish chronicles, and a very complete series of periodicals from the 17th century to the empire.—The Bibliothéque de l'Université (or the

| Sorbonne) was formerly restricted to the use of the members of the

five faculties of Paris, but the public has been freely admitted during the last thirty years.—The Bibliothéque de l'Institut having been plundered during the Revolution, the old town library was transferred toit. Persons not members are admitted upon the recom- mendation (which lasts twelve months) of any academician.—The Bibliotheque de la Ville, founded in the 18th century, and reorganized at the time of the Revolution, was destroyed in 1871. It has since been entirely re-established in the Hétel Carnavalet, which contains the historical museum of the city, and comprehends 60,000 voluines of books and

40,000 engravings, entirely rclating to the history and description of Paris. The other public libraries are under the authority of the minister of public instruction, but the Bibliotheque de la Ville is under the control of the prefect of the Seine The municipal libraries in Paris are 20 in number, with 70,000 voluines ; there are besides 440 school libraries, with 44,120 books.

Of other libraries in Paris, not included in our tables, we may name the Bibliothéque de la Préfecture de Police (10,000 volumes, with curious MSS. relating to the Revolution), Bibliotheque du

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Tribunal de premiére instance (28,000 volumes), Bibliothéque de l'Kcole Polytechnique (30,000 volumes), Bibliothéque de VEcole Normale (26,000 volumes, which acquired the library of Georges Cuvier in 1833), Bibliotheque des Invalides (28,000 volumes, a good collection on history and military affairs), Bibliothéque de l'Heole Nationale des Beaux Arts (15,000 voluines, 12,000 drawings, 100,000 prints and photographs), Bibliothéque du Conservatoire de Musique (30,000 volumes, one of the finest collections of musical literature in the world), Bibliothéque des Archives Nationales (founded by Danon in 1808, containing 25,000 volumes on paleo- graphy, history, and jurisprudence,—as this is the record office of France, the archives are very extensive), Bibliotheque du Luxem- bourg (25,000 volumes), Bibliothéque du Lycée Louis le Grand (30,000 volumes), Bibliothéque du Ministére de 1'Intérieur (17,000 volumes, including Parisian and provincial history and documents).

Pro- Besides the various collections belonging to learned and scientific

vinces of societies, educational institutions, and other bodies, outside Paris,

France. over 215 French provincial towns possess public libraries, which range in number of volumes from 2000 or 3000 to 190,000, as at Bordeaux. Most of them were founded at the end of the last or the beginning of the present century, but someare earlier. The library at

Lyons was established by Francis I. in 1530, that at Nantes dates from 1588, La Rochelle from 1604, Abbeville, Besancon, and Troyes from the latter part of the same century, and Orléans from the beginning of the 17th century. The large majority were formed by confiscation at the time of the Revolution. In February 1790 the Assemblée Nationale abolished the different religious communi- ties, and in September of the same year the provincial tribunals and parliaments met with the same fate. The books (said to number 10 or 12 millions) of these corporations were declared national pro- perty, a committee was appointed to consider what should be done with them, and a general catalogue of all the sequestered effects ordered to be drawn up. In consequence of the recommendations of the committee, the Convention Nationale (January 27, 1794) decreed the establishment and augmentation of public libraries. The orders of the Convention were not carefully executed, and ae stories are told of valuable works sold by the yard as they ay upon the ground, of precious manuscripts and printed rarities left to rot in the open air or burnt for fuel. As the government became more settled, the libraries (when not destroyed) of condemned persons were restored to their representatives. A very large number of books still remained, however, and it is to them that the town libraries of France chiefly owe their riches. Theology, law, history, and the severer litcrature of the 17th and 18th centuries conse- quently predominate, although for many years more modern re- quirements have been mainly considered in the acquisition of books. Many collections of local and provincial literature have been formed, as at Angers, Auxerre, Chaumont, Grenoble, La Rochelle, Lille, Marseilles, Orléans, Toulouse, Tours, and Versailles. Some of the libraries are very extensive. Douai and Troyes have 100,000 volumes each ; Lyons and Rouen over 120,000 ; Besancon, 130,000; Aix and Nantes, 150,000; Grenoble, 170,000; aud Bordeaux, 190,000 volumes. All have catalogues, mostly alphabetical; a few of them are in print. The Catalogue général des MSS. des bibliothéques publiques des départements is a noble undertaking on the part of the French Government. The first volume came out in 1849, and the latest, the sixth, in 1879; the treasures of eighteen libraries have now been catalogued (about 9650 MSS.), and there remain over 45,000 MSS. to be described. Besides this, Angers, Amicns, Auxerre, Caen,

Carpentras, Chartres, Orléans, and Tours possess separate printed catalogues of their MSS. The chambers aunually vote large sums for books, which are distributed to the town libraries by the minister of public instruction. The sums granted by the different municipalities for their libraries vary in amount; for instance, Grenoble (170,000 volumes and cight persons employed) gives 26,314 francs, Bordeaux (190,000 volumes and eight persons) 21,350 francs, and Nantes (150,000 volumes and four persons) 13,600 franes.

Popular libraries of every description, including military and workmen's libraries, owe much to the 'Société Franklin pour la propagation des bibliothéques populaires," which, founded in 1862, has since been of immense service in originating and helping those iustitutions. Between 1868 and 1878 the Société had spent 550,000 francs on these purposes. It issues a Catalogue Populaire of a good selection of recommended books, and publishes a journal of its proceedings.

School libraries had an organized existence in France as far back as 1831, and by 1848 the books which had been distributed by the state amounted in value to 2 millions of francs; two years later, however, no trace of books or libraries could be found.! In 1860 the question was again taken up, and in 1862 the minister of public instruction ordered that in every primary school a library should be established under the care of the schoolmaster. For some years the Government annually granted 120,000 francs, a sum which was raised to 200,000 francs in 1878; for their share

1 See De Watteville, Rapport sur les Bibliothéques scolaires, 1879.

of the expenses the departments contributed in 1875 as much as 170,000 francs. As an instance of the rapidity with which the school libraries have increased, it may be stated that Haute- Marne, which only possessed 44 of them in 1866, ten years later had 548; in 1877

there were about 17,764 bibliothéques scolaires possessing 1,716,904 works, and there are now over 20,000 of them in France. The libraries, which are intended not only for the use of school children but also for their parents and other adults, are re- gulated by a commission sitting at the ministry of public instruction.

Germany (with Austria and Switzerland).

Germany is emphatically the home of large librarics ; Germany, her want of political unity and consequent multiplicity of capitals have had the effect of giving her a considerable number of large state libraries, and the number of her universities has tended to multiply considerable collections.

Berlin is well supplied with libraries, seventy-two being Berlin, registered by Petzholdt in 1875, with about 1,293,030 printed volumes. The largest of them is the Royal Library, which was founded by the ‘Great Elector” Frederick William, and opened as a public library in a wing of the electoral palace in 1661. From 1699 the library became entitled to a copy of every book published within the royal territories, and it has received many valuable accessions by purchase and otherwise. It is now estimated to contain upwards of 700,000 printed volumes and over 15,000 MSS. The amount yearly expended upon binding and the acquisition of books, &c., is £4800.

The catalogues are in manuscript, and include a general alphabetical author-catalogue, and a systematic subject- catalogue in a handy form. The building, erected about 1780 by Frederick the Great, has long been too small, and a new one is in contemplation. The conditions as to the use of the collections are, as in most German libraries, very liberal. Any adult person is allowed to have books in the reading-room. Books are lent out to all higher officials, including those holding educational offices in the university, &c., and by guarantee to almost any one recom- mended by persons of standing; admission to the journal- room is more strictly limited. By special leave of the librarian, books and MSS. may be sent to a scholar at a distance, or, if especially valuable, may be deposited in some public library where he can conveniently use them. There appears to be no limit to the number of books which

may be borrowed, although it is prescribed that not more than “three works” must be asked for on one day. Professor Lepsius reports the issues for last year as 71,400 works, to above 5000 readers. The University Library (1831) numbers 200,000 volumes with 353 MSS. The number of volumes lent out in 1880 was 40,101. The library possesses the right to receive a copy of every work published in the province of Brandenburg. Some of the governmental libraries are important, especially those of the Military Academy and the General Staff, which was increased in 1872 by acquiring the library of the “ Kcole d’Application ” at Metz. In 1850 some popular libraries were established by a society for giving scientific lectures. There are now thirteen such libraries with over 54,000 volumes, but the yearly number of readers is only about

12,000.

The libraries of Munich, though not so numerous as those Munich. | of Berlin, include two of great importance. The Royal Library, the largest collection of books in Germany, was

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founded by Duke Albrecht V. of Bavaria (1550-79), who made numerous purchases from Italy, and incorporated the libraries of the Nuremberg physician and historian Schedel, of Widmannstadt, and of J. J. Fugger. The number of printed volumes is estimated at about one million, although it is long since any exact enumeration has been made. The library is especially rich in incunabula, many of them being derived from the libraries of thie monasteries closed in 1803. The Oriental MSS. are

numerous and valuable, and include the library of Martin Haug. The amount annually spent upon the library is

O27

the twenty-one universities of Germany, most of them being coeval Univer- with the universities themselves. Thus the oldest library is that of sity Heidelbcrg, which in its earlier form dates from 1386. In 1608 it libraries.

GERMANY. |

Dresden.

£5400, of which £2050 is expended upon books and binding. The catalogues of the printed books are in manuscript, and include (1) a general alphabetical cata- logue, (2) an alphabetical repertorium of each of the 195 subdivisions of the library, (3) biographical and other subject catalogues. A printed catalogue of the MSS. in 8 volumes is nearly complete; the first was published in 1858. The library is open only twenty-nine hours during the week, while the Royal Library at Berlin is, except in the three winter months, cpen for thirty-nine. The library of the British Museum is now open for sixty-six hours per week, but it lends no books out. The regulations for the use of the library are very similar to those of the Royal Library at Berlin. The building erected for this collection under King Louis I. in 1832-43 is regarded as a niodel library structure. The archives are bestowed on the ground floor, and the two upper floors are devoted to the library, which occupies seventy-seven apartments.— The University Library was originally founded at Ingol- stadt in 1472, and removed with the university to Munich in 1826. It participated in 1803 in the division of the literary treasures of the disestablished monasteries. At present the number of volumes in the general library amounts to 290,000, besides which several special collections are also deposited in the library to the number of 32,800 volumes. The MSS. number 1744. The various libraries of Munich have upwards of 1,400,000 volumes.

Dr Petzholdt has registered no less than 49 libraries in Dresden, where indeed his inquiries were likely to be particularly exhaustive. The Royal Public Library iu the Japanese Palace was founded in the 16th century. Among its numerous acquisitions have been the library of Count Biinau in 1764, and the manuscripts of Ebert. Special attention is devoted to history and literature. The library does not claim to possess more than 350,000 volumes, although Petzholdt in 1875 reckoned them as at least 500,000 printed books, as well as 400,000 dissertations. The MSS. number 6500 volumes. Admission to the reading-room is granted to any respectable adult on giving his name, and books are lent out to persons qualified by their position or bya suitable guarantec. Herc, as at other large libraries in Germany, works of belles-lettres are only supplied for a literary purpose. The number of persons using the reading-room in a year is about 3900, and about 10,000 works (not volumes) arc lent to about 500 readers.—The ‘‘ Prinzliche Secundo- Genitur” Library, now in the possession of Prince George of Saxony, and of which Dr Petzholdt, the Nestor of bibliographers, is librarian, is a private library to which access is permitted.

had become so important that Joseph Scaliger wrote of it ‘ Locu- pletior est et meliorum librorum quam Vaticana.” In 1623 the library was carried to Rome as a present to the pope, but some of the treasnres were ultimately restored. The later collection was first formed in 1703. The collection of MSS. is extremely valuable. —The library of Leipsic university dates from 1409, although it was not until the middle of the 16th century that it was properly organ- ized.—The library of Géttingen owcs much to the labours of the illustrious Heyne. It ranks as one of the most complete and best arranged of the German libraries. New buildings for its accom- modation are in course of erection.—The library at Strasburg, although founded only in 1871 to replace that which had becn destroyed in the siege, already ranks amongst the largest libraries of the empire. Its books and MSS. togcther amount to 513,000. The remaining university libraries are noticed in the tables.

Some of the town libraries of Germany mentioned in the tables were amongst the earliest established after the revival of learning. The

oldest of them is perhaps that of Ratisbon, which was founded at least as early as 1430. Since Ratisbon has ceased to be an imperial city it has had to part with many of its treasures to the library at Munich.

The whole number of libraries in the German empire enumeratcd by Dr Petzholdt is 1547, distributed amongst 584 towns.

A report issued in 1873-74 by the Austrian Statistical Austria.

Commission, furnishes an account of the condition of the libraries in those portions of Austria which are represented in the Reichsrath, as they were at the end of the year 1870. The number of libraries registered was 577, of which 23, however, were private libraries. Of the rest 159 belonged to religious corporations and seminaries, 105 were military libraries, 56 belonged to literary and scien- tific societies, 189 were of an educational and scholastic, and the remaining 45 of a public character.

The largest library in Austria, and one of the most im- portant collections in Europe, is the Imperial Public Library at Vienna, apparently founded by the emperor Frederick III. in 1440, although its illustrious librarian Lambecius, in the well-known inscription over the entrance to the library which summarizes its history, attributes this honour to Frederick's son Maximilian. However this may be, the munificence of succeeding emperors greatly added to the wealth of the collection, including a not inconsiderable portion of the dispersed library of Corvinus. Since 1808 the library has also been entitled to the copy privilege in respect of all books published in the empire. The sum devoted to the purchase of books is 26,250 florins annually. The main library apartment is one of the most splendid

Stutt- The Royal Public Library of Stuttgart, although only established halls in Europe. Admission to the reading-room is free gart. in 1765, has grown so rapidly that it now possesses about 425,000 | to everybody, and books are also lent out under stricter — Re aes works i a MSS. rr eee ae aes limitations.—The University Library of Vienna was estab- collection of Bibles, containing 7200 volumes. le annual expendi- | q; Neues r San ee 5 ture is about £2640, of which £1250 is

devoted to books wallbacgl: igi es —— ‘3 ie — reong ‘ a FR 2 sa ing. The library also enjoys the copy-privilege in Wiirtemberg. | 2′ COMers, and the library 1s open much longer than 1s ‘‘The borrowing of books for home use is open to all members of | the rule with university libraries generally. In winter, the German empire resident in Stuttgart, whose personal and | for instance, it is open from 5 to 8 in the evening, and it is economic circumstances offer the necessary guarantees ea eae even open from 9 to 12 on Sundays. In 1879, 159,768 of the national property. The library may, moreover, be used from : ; . any part of in axihexg on ain of the cost of carriage.” volumes were used in the library, 16,300 volumes lent The annual number of borrowers is over 1800, who use nearly out in Vienna, and 4418 volumes sent carrlage free to 17,000 volumes. The number issued in the reading-room is at least | borrowers outside Vienna. The total number of libraries twice as great. The number of parccls despatched from Stuttgart | in Vienna enumerated by Dr Petzholdt is 101, and many is nearly 900.—Admission is also gladly granted to the Royal f th f lo ce ‘ Private Library, fonnded in 1810, which contains abont 50,000 | OF (AGM are Ol consicleranle extent. volumes and 600 MSS. The other libraries of Stuttgart, of which The number of monastic libraries in Austria is very considerable. Monastic Darm- Petzholdt reckons 11, are not of importance.—The Grand-ducal | Particulars are furnished, in the report already quoted, of 107 of libraries. stadt. Library of Darmstadt was established by the grand- duke Louis | them, varying from a few hundreds of volumes to as many as 80,000. I. in 1817, on the basis of the still older library formed in the 17th Many other such libraries are known to exist in the 463 monas- century. The number of volumes used in the course of the year is | teries. The oldest of them, and the oldest library in Austria, is that about 30,000, of which 9000 are lent out to abont 5000 readers.— | of the monastery of St Peter at Salzburg, which was established Gotha. The Ducal Library of Gotha was established by Duke Ernest the | by St Rupert in the 6th century. It possesses 60,000 volumes, with

Pious in the 17th century, and contains many valnable books and MSS. from monastic collections. It numbers about 240,000 works, with upwards of 6000 MSS. The catalogue, now in course of pub- lication,

of the Oriental MSS., chicfly collected by Seetzen, and forming one-half of the collection, is one of the best in existence, Other great Ducal Libraries are noticed in the tables,

Libraries of varying extent and importance are attached to all

nearly 20,000 incunabula. The four next in point of antiquity are Kremsmiinster (50,000), Lambach (22,000), Admont (80,000), and Melk (60,000), all of them dating from the 11th century. Of the 107 libraries enumerated in the report, 56 possessed 5000 volumes or upwards at the end of 1870. For further particulars as to the larger Anstrian libraries the reader is referred to the tables. _

The libraries in the Hungarian kingdom are not included in the

Switzer- land.

Italy.

Public libraries.

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report, aud, as will be seen from the tables, are not very numerous. he most important of them are at Buda-Pest.

The public libraries of Switzerland have been very carefully registered by Dr Ernest Heitz, as they existed in 1868. Alto-

cther uo less than 2096 libraries are recorded, four-fifths of these Hane to the elass of "' bibliothéques populaires et eelles pour la jeunesse," and few are of literary importanee. Only cighteen have as many'as 30,000 volumes. 'The largest collection of books in Switzerland is the University Library of Basel, founded with the university in 1460. The monastie libraries of St Gall and Ein- siedeln date respectively from the years 830 and 946, and are of great historieal and literary interest.

ITAty.

As the former centre of civilization, Italy is of course the country in which the oldest existing libraries must be looked for, and in which the rarest and most valuable MSS. are preserved. The Vatican at Rome and the Laurentian Library at Florence are sufficient in themselves to entitle Italy to rank before most other states in that respect, and the venerable relics at Vercelli, Milan, and La Cava bear witness to the eulightenment of the peninsula in times when other nations were slowly taking their places in the circle of Christian polity. The local rights and interests which so long helped to impede the unification of Italy were useful in creating and preserving at numerous minor centres many libraries which otherwise would probably have been lost during the progress of absorption that results from such centralization as exists in England. In spite of long centuries of suffering and of the aggression of foreign swords and foreign gold, Italy is still rich in books and MSS. ; there are probably more books in united Italy than in any other country except France. When thie Italian Government published its valuable report on “ Biblioteche” in the Statistica del Regno d’Italia in 1868, a table of relative statistics was given, which professed to show that, while the number of books in Austria (2,408,000)

of class 1 constitute the “board of direction,” which is presided over by the prefect or librarian, and meets from time to time to consider important measures connected with the administration of the library. The candidates for posts in classes 1 and 2 must possess certain scholastic qualifications and serve for a specified time as alunni on probation. An important feature of the regulations consists of the scheme (unfortunately not yet in working order) which is eventually to supply Italy with a body of young librarians properly trained in all the theoretical and technical branches of their profession. Each library is to possess, alike for books and MSS., a general inventory or accessions-

catalogue, an alphabetical author-catalogue, and a subject-

_ catalogue.

was greater than the total contents of the public libraries |

in any one of the countries of Great Britain, Prussia, Bavaria, or Russia, it was surpassed in France (4,389,000) and in Italy (4,149,281), the latter country thus exhibiting a greater proportion of books to inhabitants than any other state in Europe, except only Bavaria. The opulent libraries of Rome and Venice had not yet become Italian, and were not included in the report.}

The public libraries (b2blioteche governative) are under

the authority of the minister of public instruction, and are |

subject to certain regulations finally agreed upon during the ministry of Signor Ruggiero Bonghi in 1876.2. They are classed under the headings of (1) national libraries of Florence, Naples, Turin, Palermo, Vittorio Emanuele of Rome, the Brera of Milan, and the Marciana of Venice ; (2) the hbraries of the universities of the first class— Bologna, Naples, Padua, Pavia, Pisa, and Rome; (3) those of the universities of the second class—Cagliari, Catania, Genoa, Messina, Modena, Parma, and Sassari ; (4) those of academies and institutions of fine arts; the last, although under Government control, are ruled by special regulations of their own. Small collections are sometimes handed over to the local authorities, should this be considered desirable, and the state will take into its own hands the adminis- tration of provincial or communal libraries if necessary. The librarians and subordinates are divided into (1) pre- fects, librarians, and sublibrarians; (2) assistant librarians; (3) attendants, or book distributors ; (4) ushers, &c. Those

1 The Statistica describes 210 libraries, of which 164 were open to the public and 46 not accessible; 171 were general and 39 special libraries, the latter including 25 devoted to ascetic theology, 11 to science and literature, and 3 to the fine arts. Tuscany, Sicily, and Emilia were the richest in books, the latter province alone containing one quarter of the whole number.

2 See the "‘ Regulations of Italian Public Libraries," by Count Ugo Balzani, Library Journal, iv. pp. 183-87.

| the store of Greek codices.

When they are ready, catalogues of the special collections are to be compiled, and these the Government intends to print, together with the subject-catalogues of the MSS. Various other small registers are provided for. The sums granted by the state for library purposes must be applied to (1) salaries and maintenance; (2) binding and repairs ; {3) purchase of books, MSS., &c. Books are chosen by a committee nominated by the minister, which, in the national libraries, includes the members of the council of direction. In other libraries two members only of the council form part of the committee. In the university libraries two-fifths of the expenditure is decided by the committee, and the remainder by a council formed by the professors of the different faculties. The rules for lending books and MSS. allow them to be sent to other countries under very special circumstances.

The dcblioteche governative are now 32 in number, and annually spend about 150,000 lire in books. From the three sources of gifts, copyright, and purchases, their accessions in 1879 were 35,541, being 5187 more than the previous year. The nuniber of readers is now gradually increasing. In 1879 there were 895,749, who made use of 1,154,853 volumes, showing an increase of 10,393 readers and 130,051 books as contrasted with the statistics of the previous year.°

The minister of public instruction has kept a watcliful eye upon the literary treasures of the suppressed monastic bodies. In 1875 there were 1700 of these confiscated libraries, containing two millions and a half of volumes. About 650 of the collections were added to the contents of the public libraries already in existence; the remaining 1050 were handed over to the different local authorities, and served to form 371 new communal libraries, and in 1876 the number of new libraries so composed was 415.

The Biblioteca Vaticana stands in the very first rauk Vatican.

among Europeanlibraries as regards antiquity, since from the middle of the 5th century we have evidence of the existence of a poutifical library at Rome; and Pope Zachary (d. 752), himself a Greek, is known to have added considerably to The Lateran Library shared in the removal of the papal court to Avignon, and it was ou the return of the popes to Rome that the collection was permanently fixed at the Vatican. Nicholas V. (d. 1455) may, however, be considered the true founder of the library, and is said to have added 5000 MSS. to the original store. Calixtus ITI. also enriched the library with many volumes saved from the hands of the Turks after the siege of Constantinople. So large a proportion of the printed books of the 15th century having been produced by the Italian presses, it is natural to expect that a great number of specimens may be found in the papal library, and, but for the wholesale destruction of books and MSS. during the sack of Rome by the duke of Bourbon in 1527, the

3 Lists of foreign accessions to the biblioteche governative are published by the minister of public instruction from time to time. Jn 1877 E. Narducci made proposals for a general catalogue of their con- tents, and issued a speeimen of Boccaccio.

Vatican Library would have been as rich in early printed literature as it is now rich in manuscripts. Sixtus Y. erected the present building in 1588, and considerably augmented the collection. Gregory XV. received as a gift from Maximilian, duke of Bavaria, the library of the elector Palatine seized by Tilly at the capture of Heidelberg in 1622. The greater part of the library at Urbino, founded by Duke Federigo, was acquired in 1655 by Alexander VII. for the sum of 10,000 scudi, and some of the famous palimpsests from the Benedictine monastery of Bobbio were also added to the treasures of the Vatican. After the death of Christina, queen of Sweden, her collection of books and manuscripts, formed from the plunder seized at Prague, Wiirtzburg, and Bremen by her father Gustavus Adolphus, became by succession the property of the Ottoboni family, the liead of which, Alexander VIIL., in 1689 placed 1900 of the MSS. in one of the galleries.

Clement VIL. and Pius II. also enriched the Vatican with valuable manuscripts, including many Oriental, In 1740 Benedict XIV. united with it the Ottoboniana, and in the same pontificate the Marchese Aless. Capponi bequeathed his precious collec- tions, Clement XIII. in 1758, Clement XIV. in 1769, aud Pius VI. in 1775 were also important benefactors. For over two hundred years the history of the Vatican was oue of unbroken prosperity, but it suffered a serious blow at the close of the 18th century, when MSS. dating before the 9th century, and the most choice artistic specimens, altogether to the number of 500, were carried off by the French to Paris in 1798. Thegreater part were, however, restored in 1815, and most of the Palatine MSS., which formed part of the plunder, ultimately found their way to the university of Heidelberg in 1816. Pius VII. acquired for the Vatican the library of Cardinal Zelada in 1800 ; Leo XII. was able to add the noble collection of fine art literature of Count Cicognara in 1823; and Gregory XVI. also largely augmented the library. Pius IX. in 1856 added 40,000 volumes belonging to Cardinal Mai.

Few libraries are so magnificently housed as the Biblio- teca Vaticana. The famous Codict Vaticani are placed in the salone or great double hall, which is decorated with frescos depicting ancient libraries and councils of the church. At the end of tlie great hall an immense gallery, also richly decorated, and extending to 1200 feet, opens out from right to left. Here are preserved in different rooms the codici Palatini, Regin., Ottoboniani, Cappouiani, &c. Most of the printed books are contained in a series of six chambers known as the Appartamento Borgia. The printed books only are on opeu shelves, the MSS. being preserved in closed cases.

The present official estimate of the number of printed volumes is about 220,000, including 2500 15th century editions, of which many are vellum copies, 500 Aldines, and a great number of bibliographical rarities.1 There are 25,600 MSS., of which 19,641 are Latin, 3613 Greek, 609 Hebrew, 900 Arabic, 460 Syriac, 78 Coptic, &e. Among the Greek and Latin MSS. are some of the most valuable in the world, alike for antiquity and intrinsic importance. It is sufficient to mention the famous Biblical Codex Vaticanus of the 4th century, the Virgil of

the 4th or 5th century, the Zerence equally ancient, the palimpsest De Republica of Cicero, conjectured to be of the 3d century, discovered by Cardinal Mai, and an immense number of richly ornamented codices of extraordinary beauty and costliness, The archives are apart from the library, aud are quite inaccessible to the public ; no catalogue is known to exist. Leo XII. has appointed a committee to con- sider what documents of general interest may expedieutly

- The books have never been actually counted, and this estimate has been reduced by some persons to half the number.

be published, and a greater liberality in the use of them is said to be contemplated.

The Biblioteca Vaticana is now open from 8 to 12 every morning between November and June, with the exception of Sundays, Thursdays, and the principal feast days. Per- mission to study is obtained from the cardinal secretary of state. The want of proper catalogues for the use of readers isa great drawback. There are imperfect written lists (for the use of the librarians alone) of the printed books, and various catalogues of special classes of the MSS. have been published. New catalogues, however, are in course of preparation. The Oriental MSS. have been described by J. S. Assemanni, Bibliotheca orientalis Clementino-Vaticana, Rome, 1719-28, 4 vols. folio, and Bibl. Vat. codd. MSS. catalogus ab 8. EL. et JS. Assemanno redactus, ib., 1756-59, 3 vols. folio, and by Cardinal Mai in Script. Vet. nova collectio. The Coptic MSS. have been specially treated by G. Zoega, Rome, 1810, folio; and by F. G. Bonjour, Rome, 1699, 4to. There are printed catalogues of the Capponi (1747) and the Cicognara (1820) libraries.

Next in importance to the Vatican library is the Casanatense, Other so called from the name of its founder, Cardinal Casanata (1700). Roman

It contains about 130,000 volumes of printed books, including a libraries,

large number of 15th century impressions and early cditions with woodcuts, as well as about 2500 MSS., amongst which are one of the 7th century and several of the 8th, 9th, and 10th centuries. They are carefully arranged in eleven rooms, the large central hall being one of the finest in Rome. Books are not allowed to be taken out of the reading-rooms, but admission is freely granted, and the annual number of readers is about 18,000. The subvention is a small one, but additions continue to be made, and the library is well administered. All the officials, in accordance with the founder's will, belong to the Dominican order. The incomplete catalogue of the printed books, prepared by A. Audiffredi (Rome, 1761-88, 4 vols. folio), still remains a model of cataloguing.—The Biblioteca Vittorio Emanuele forms part of the Collegio Romano, and was made up from the old Jesuit library, enriched by accessions from a number of other suppressed iustitutions. It now consists of 360,000 volumes, with 5000 MSS., and is united to the Casana- tense by a bridge. The entire edifice is spacious enough to contain a million of volumes, besides the Kircherian and other museums which are already located in it.2—The Biblioteca Angelica possesses all the authentic acts of the Congregatio de Anxiliis, and the precious collections of Cardinal Passionei and Lucas Holstenius.—The Biblioteca Alessandrina dclla R. Universita di Roma, founded by Alexander VII., is considerably used by students: there were in 1879 57,000 readers. The greater part of the printed books formerly in the collection of the dukes of Urbino is now in this library.2—The Biblioteca del Senato is very rich in collections of municipal history and statutes of Italian cities. The printed catalogue (1878) describes no less than 1067 statutes or volumes containing them, relating to 443 localities.—The Biblioteca Vallicelliana was founded by S. Filippo Neri, and contains some valuable manuscripts, including a Latin Bible of the 8th century attributed to Alcuin, and some inedited writings of Baronius.—In 1877 Professor A. Sarti presented to the city of Rome his collection of fine-art books, 10,000 volumes, which was placed in charge of the Accademia di San Luca, which already possessed a good artistic library.—Of private libraries accessible by permission, we note

the 3iblioteca Barberina, including many rare editions with valuable autographs, but especially remarkable for its MSS.; these were clucfly collected by Cardinal Fr. Barberini, the nephew of Urban VIII., and comprehend the letters and papers of Galileo, Bembo, and Bellarmine, the reports on the state of Catholicism in England zn the time of Charles J., and a quantity of inedited materials for the listory of the Stuarts. A catalogue was published at Rome in 1681, 8 vols. folio.—The Corsiniana, founded by Clement X11. (Lorenzo Corsini), is also a private library ; it is rich in incunabula, and includes one of the most remarkable collections of prints in Italy, the series of Marc-Antonios being especially complete.—The library of the Collegium de Propaganda Fide was established by Urban VIII. in 1626, and in 1687 the rector Andrea Bonvicini obtained permission to preserve in it prohibited books. It was

2 Sce Collegio Romano, Discorso di Ruggiero Bonghi, Rome, 1876.

3 Signor E. Narducci produced a catalogue of the MSS. other than Oriental in 1877. The Casanatense, Vitt. Emanuele, Angelica, and Alessandrina are Governmental, and in 1878 the minister of public instruction published a catalogue of the Oriental MSS. in the three last. The Oriental MSS. of the other diblioteche governative will he treated in subscquent volumes.

Xie ae

There are at least thirty libraries in Rome which are nore or less | produetions of the earliest German and Italian printers. —The aecessible to the publie. One is now in course of formation which Biblioteca Marciana, or library of St Mark at Venice, was founded Venice. will include everything relating to the emaneipation of Italy. in 1362 by a donation of MSS. from the famous Petrarch (most of

Subiaco. At Subiaco, a few miles from Rome, the library of the Benedic- | them now lost), and instituted as a library by Cardinal Bessarion in tine monastery of Santa Scolastica is not a very large one, eompris- | the 15th eentury. It is open daily, and is used by about 40,000 ing only 6000 printed volumes and 400 MSS., but the place is

re- | readers annually. The precious eontents inelude Greek MSS. of markable as having been the first seat of typography in Italy. It | great value, of whieh more than 1000 were given by Cardinal Bes- was in this monastery that Sehweynheim and Pannartz, fresh from | sarion, important MS. eolleetious of works on Venetian history, rare the dispersion of Fust and Schoeffer's workmen in 1462, established | ineunabula, and a great number of volumes, unique or execedingly their press and produced a series of very rare and important works | rare, on the subject of early geographical researeh. Amongst the which are highly prized throughout Europe. The Subiaeo Library, | MSS. is a Latin Homer in the autograph of Boccaeeio, an in- although open daily to readers, is only visited by students who are | valuable codex of the laws of the Lombards, and the autograph curious to behold the eradle of the press in Italy, and to inspect the | MS. of Sarpi's History of the Council of Trent. Sinee the fall series of original editions preserved in their first home of the republic and the suppression of the monasteries afterwards,

National The great national libraries are as follows :— a great many private aud conventual libraries have been incor-

libraries. The Biblioteea Nazionale of Florence, formed from the union | porated with the Marciana.

Florence. of Magliabeehi's library with the Palatina, is the largest in Of the university libraries wider Government eontrol it is Univer- Italy. The Magliabechi collection became public property at | sufficient to notice the Biblioteea della Universita at Bologna, sity his death in 1714, and, with the aeeessions made from time to | founded in 1712 by Count Luigi F. Marsigli or Marsili. The libraries. time, held an independent place until 1862, when the Biblioteea | MSS. comprise a rieh Oriental eolleetion of 547 MSS. in Arabie, Palatina (formed in 1815 from the old Pitti Library and the | 173 in Turkish, and several in Persian, Armenian, and Hebrew. colleetions of Poggiali and Rzewuzky) was incorporated with it. | Amongst the Latin codiees is a Laetantius of the 6th or 7th An old statute by which a copy of every work printed in | eentury. The other noteworthy artieles include a eopy

of the Tuseany was to be presented to the Magliabechi Library was for- | Armenian gospels (12th century), the Avicenna, with miniatures merly much neglected, but has been maintained rigorously in force | dated 1194, deseribed in Montfaucon's Diariwm Italicwm, and since 1860. There are many valuable autograph originals of famous | some unpublished Greek texts. Amongst the Italian MSS. is a works in this library, and the MSS. inelude the most important ex- | rich assemblage of municipal historics. Mezzofanti was for a long tant codict of Dante aud later poets, as well as of the historians from | time the eustodian here, and his own collection of books has been Villani to Machiavelli and Guicciardini. Amongst the printed books | incorporated in the library, which is remarkable likewise for the is a very large assemblage of rare early impressions, a greatnumber of | number of early editions and Aldines which it contains. It the Rappresentazioni of the 16th century, at least 200 books printed | possesses the Mainz Latin Bible dated 1462; the Laetantius and on vellum, and a copious eollection of municipal histories and | Augustine De Civitate Dei printed by Schweynheim and Pannartz, statutes, of testi di lingua, and of geographical and topographieal | the Foligno Dante of 1472, and a eopy of Henry VIII.'s Assertio maps. The MS. portolani, 25 in number, are for the most part of | Sacramentorwm with the royal author's autograph. A eollection great Importance ; the oldest is dated 1417, and several seem to be | of drawings by Agostino Caracci is another special feature of worth. the original charts executed for Sir Robert Dudley (duke of | The Manfredi palace, in which the library is arranged, is a fine Northumberland) in the preparation of his Arcano del Marc. | building begun in 1714 and finished in 1744. The grand hall with The annual increment of books in this library is about 12,000. | its fine furniture in walnut wood merits particular attention. The It is open freely to the publie, and about 50,000 readers annually | library is open to the publie ; the yearly number of readers is about make use of it. About 60,000 printed volumes and 2500 MSS. are | 25,000, and of books consulted 40,000.2 : eonsulted annually, not including some 1500 books and 50 MSS., Of the remaining Government libraries the following may whieh are lent out yearly to certain students.—The Biblioteca | be named.—The Biblioteca del Monastero della S. Trinitd, at La Cava.

Naples. Nazionale at Naples, though only opened to the public in | La Cava dei Tirreni in the province of Salerno, is after the 1804, is the largest library of that eity. The nucleus from | Biblioteca dell' Archivio Capitolare at Vercelli the most aneient which it developed was the collection of Cardinal Seripando, | library in the Italian kingdom, its foundation being said to which comprised many MSS. and printed books of great value. | be contemporaneous with that of the Benedictine abbey itself Acquisitions eame in from other sources, especially when in the | (beginning of the 11th century). It only contains some 10,000 year 1848 many private and eonventual libraries were thrown ou the | volumes, but these include a number of MSS. of very great Neapolitan market.!_ The Biblical section is rich in rarities, eom- | rarity and value, ranging from the 8th to the 14th century. mencing with the Mainz Bible of 1462, printed on vellum. Other | Amongst these is the eelebrated Codex Legum Longobardorum, speeial features are the eollection of testi di lingua, that of books | dated 1004, besides a well-known geographical chart of the 12th on voleanoes and that of works printed at famous presses, parti- | century, over 100 Greek MSS., and about 1000 eharters begin- cularly those exeeuted by the typographers of Naples. The MSS. | ning with the year 840, more than 200 of whieh belong to inelude a palimpsest containing writings of the 3d, 5th, and 6th | the Lombard and Norman periods.— At Florence the Marucelli centuries under a grammatical treatise of the 8th, 2 Latin papyri | Library, founded in 1752, is remarkable for its artistie wealth of of the 6th eentury, over 50 Latin Bibles, and a great number of | early woodcuts and inetal engravings. The number of these and of illuminated books with miniatures. There are more than 40 books | original drawings by the old masters amounts to 80,000 pieces. — printed on vellum in the 15th and 16th centuries, including a fine | At Modena is the famous Biblioteca Palatina, sometimes called Modena. first Homer, There are several MS. maps and portolani, one of | the Biblioteea Estense from having been founded by the Este them dating from the end of the 14th century. About 10,000 | family at Ferrara in 1398; it was transferred to Modena by

in ae use this library, eonsulting some 140,000 books yearly.—The | Cesare D'Este in 1598. Muratori, Zaeearia, and Tirabosehi were

an. | ibliotheea Nazionale of Milan, better known as the Brera, founded | librarians here, and made good use of the treasures of the library.

mn 1770 by a deeree of the empress Maria Theresa, eonsists | It is particularly rich in early printed literature and valuable of 163,123 printed volumes and 3646 MSS., witha yearly increment | codices.—The oldest library at Naples is the Biblioteca Bran- of about 6000 volumes, and the annual number of readcrs is said to | eaeeiana, with many valuable MSS. relating to the history of crite a comprises nearly 2300 books printed in the | Naples. Two planisphercs by Coronelli are preserved here. It ia a Er ing the Tare Monte Santo di Dio of Bettini, | was founded in 1673 by Cardinal F. M. Brancaecio.—The Regia ‘Aaa urst th, MSS aga and a xylographic Biblia Pauperum. | Biblioteea di Parma, founded definitively in 1779, owes its origin Parma. oat e – are an early Dante and autograph letters of | to the grand-duke Philip, who employed the famous sehotar si sp some rene in Mid autograph, and a fine series of illus- | Paciaudi to organize it. It is now a publie library containing i ee Me + as miniatures representing the advanee of | 218,995 volumes, including 4000 MSS., with an annual increment

Pal : iin Ce on | t P 4 pee oe century. These were formerly | of nearly 1000 volumes. Amongst its treasures is De Rossi’s

alermo. ee pee : i 7 Bibliotheca Nazionale of Palermo, | magnificent collection of Biblical and rabbinieal MSS. from other libraries eas ce . Chali pe with additions Chief among the great libraries not under Government con- Mediceo- colar Tool aubith ee es slab a pe ee im 15th | trol comes the world-famed Biblioteca Medicco-Laurenziana at Lauren- en aad ae er ines 4 ae a ; Florence, formed from the colleetions of Cosimo the Elder, Pietro ziana. o : _ : ae Slt 2 : Turin. euriosities of the 16th and following centuries. —The Bibboteea de! edie! ome Loren 20 tia aaa ere 2 OMe ars eed

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destroyed by the French army in 1798, and owes its present rich- ness almost entirely to testamentary gifts, among whieh may be mentioned those of Cardinals Borgia, Caleppi, and Pietro. It isa private collection

for the use of the congregation and of those who belong to it, but permission may be obtained from the superiors.

Nazionale of Turin is extensively used by readers, whose annual eS. ES ee Eee eee

1 A pamphlet by the present chicf librarian, Vito Fornari, Naples, 1874, gives many useful details, although he there overstates the number of MSS. as 10,000 (there may be some confusion between volumes and works).

number amounts to 120,000. The majority of the books are works for scientifie study, but amongst them are several rarities, | eomprising a Sedulius MS. of the 5th century, the eelebrated MS. of the De Jmitatione (on whieh the assignment of its authorship to Gersen is founded,—see Kermpis), and several

away from the family after the expulsion of the Medici from Florence, and were repurchased by Cardinal Giovanni, afterwards Leo X.). It was first constituted as a public library in Florence by

2 Notices of other libraries of this class will be found in the tables.

Ambro- giana. °

Monte Cassino.

Vercelli,

Brussels,

LOW COUNTRIES. |

Clement VII., who charged Michelangelo to construct a suitable edifice for its reception. It was opened to the publie by Cosimo I. in

1571, and has ever since gone on increasing in value, the acces- sions in the 18th century alone being enough to double its former importance. The printed books it contains are probably no more than 3000 in number, but are almost all of the highest rarity and interest. Itis, however, the precious collection of MSS., amounting to about 7000 articles, which gives its chief importance to this library. They comprise some of the most valuable codices in the world,—the famous Virgil of the 4th or 5th century, Justinian's Pandects of the 7th, a Homer of the 10th, and several other very early Greek and Latin classical and Biblical tcxts, as well as copies in the handwriting of Petrarch, about 100 codices of Dante, a Decameron copied by a contemporary from Boccaccio's own MS., and Cellini's MS. of his autobiography. Bandini's catalogue of the MSS. occupies 13 vols. folio, printed in 1764-78.—At Genoa the Biblioteca Franzoniana, founded about 1770 for the instruction of the poorer classes, is noteworthy as being the first Kuropean library lighted up at night for the use of readers.— The famous Biblioteca Ambrosiana at Milan was founded in 1609 by Cardinal Fed. Borromeo. It contains 164,000 printed volumes and 8100 MSS. ,Amongst the MSS. are a Greek Pentateuch of the 5th eentury, the famous Peshito and Syro- Hexaplar from the Nitrian convent of St Maria Deipara, a Josephus written on papyrus, supposed to be of the 5th century, several palimpsest texts, including an early Plautus, and St Jerome's commentary on the Psalms in a volume of 7th century execution, full of contemporary glosses in Irish, Gothic fragments of Ulfilas, and a Virgil with notes in Petrarel's handwriting.' Note- worthy amongst the printed books is Valdarfer's Boccaccio of 1471, as well as the Virgil of 1470 (Venice), and the editio prin- eeps of Isoerates, both printed on vellum. Cardinal Mai was formerly custodian here. In 1879 Professor C. Mensinger presented his " Biblioteca Europea," consisting of 2500 voluines, 300 maps, and 5000 pieces, all relating to the literature and linguisties of Kuropean countries, 2—The Melzi and Trivulzio libraries should not pass with- out mention here, although they are private and ecaatte without special permission. The former is remarkable for its collection of early editions with engravings, including the Dante of 1481, with twenty designs by Baccio Bandinelli. The latter is rich in MSS. with miniatures of the finest and rarest kind, and in printed books of which

many are unique or nearly so. It consists of 70,000 printed volumes.—The foundation of the monastery of Moute Cassino is due to St Benedict, who arrived there in the year 529, and established the prototype of all similar institutions in western Europe. He brought with him a few manuscripts, four or five of which are still to be seen. The library of printed booksnow extends to about 20,000 volumes, chiefly relating to the theological sciences, but ineluding some rare editions. A collection of the books belong- ing to the monks is in course of formation ; it contains about the same number of volumes. But the chief glory of Monte Cassino eonsists of the archivio, which is quite apart; and this includes 30,000 or 40,000 bulls, diplomas, charters, and other documents, besides 1000 MSS. dating from the 6th century downwards. The latter coniprehend some very early Bibles and important codices of patristic and other medieval writings. There are good written catalogues, and a ealendar is now being published, Bibliotheca Casincnsis, of which 4 volumes have appeared. These libraries enjoy no special revenues, and owe their accessions entirely to donations.—At Ravenna the Biblioteca Classense has a 10th century codex of Aristophanes and two 14th century codices of Dante. Here are also the autograph correspondence of Muratori, and many unpublished letters of modern writers.—At Vercelli the Biblioteca dell' Archivio Capitolare, the foundation of which ean be assigned to no certain date, but must be referred to the early days when the barbarous eonquerors of Italy had become Christianized, comprises nothing but MSS., all of great antiqnity and value. Amongst them is an Evangeliarium S. Eusebii in Latin, supposed to be of the 4th century ; also the famous codex containing the Anglo-Saxon homilies which have been published by the Ailfric Soeiety.—The ' Frari" at Venice contains an enormous collection of archives, the invaluable state paper records of the Venetian republic.

Not a few of the communal and municipal libraries, as will be seen from the tables, arc of great extent and intercst.

Belgium and Holland.

The national library of Belgium is the Bibliotheque Royale at Brussels, of which the basis may be said to eonsist of the famous Bibliothéque des Ducs de Bourgogne, the library of the Austrian sovereigns of the Low Countries, which had gradually accumulated

1 Ceriani has published many of the uniquc treasures of this collection in his Monumenta Sacra et Profana.,

2 This, as well as the Brera library, is exhaustively described in Gli Istituti scientifici, letterari, ed artistict di Milano, published by the Socicta Storica Lom- barda in 1880; a special treatise on the Brera was published in 1873 by the librarian G. Sacchi. Sce also Boscha, De origine et statu Bibliothece Ambrosiane,

during three eenturies.? After suffering many losses from thieves and fire, in 1772 the Bibliothéque de Bourgogne received eonsider- able augmentations from the libraries of the suppressed order of Jesuits, and was thrown open to the public. On the oecupation of Brussels by the French in 1794 a number of books and MSS. were confiscated and transferred to Paris (whence the majority were returned in 1815) ; in 1795 the remainder were formed into a publie library under the care' of La Serna Santander, who was also town librarian, and who was followed by Van Hulthem. At the end of the administration of Van Hulthem a large part of the precious eollections of the Bollandists was acquired. In 1830 the Bibliotheque de Bourgogne was added to the state archives, and the whole made available for students. Van Hulthem died in 1832, leaving one of the most important private libraries in Kurope, described by Voisin in Bibliotheca Hulthemiana, Brus., 1836, 5 vols,, and extending to 60,000 printed volumes and 1016 MSS., mostly relating to Belgian history. The collection was purehased by the Government in 1837, and, having been added to the Bibliotheque de Bourgogne (open since 1772) and the Bibliotheque de la Ville (open since 1794), formed what has since been known as the Bibliotheque Royale de Belgique. The printed volumes now number

350,000, with 30,000 MSS., 100,000 prints, and 50,000 coins and medals. The yearly additions to the books amount to between 1500 and 3000; the other departments receive few acces- sions. The special collections, each with a printed catalogue, consist of the Fonds van Hulthem, for national history ; the Fonds Fétis, for music; the Fonds Goethals, for gencalogy; and the Fonds Miiller, for physiology. The catalogue of the MSS. has been partly printed, but in an imperfect manner.

The University Library of Ghent, known successively as the Bibliothéque de I'Keole Centrale and Bibliotheque Publique de la Ville, was founded upon the old libraries of the Conseil de Flandres, of the College des Echevins, and of many suppressed religious communities. It was declared public in 1797, and formally opened in 1798. On the foundation of the university in 1817 the town placed the collection at its disposal, and the library has sinee remained under state control. The printed volumes now amount to 250,000, with 1600 MSS; the annual increment is about 2500 volumes. There are important special collections on archeology, Netherlands literature, national history, books printed in Flanders, and 23,000 historical pamphlets of the 16th and 17th ccnturies. There are printed catalogues of the works on jurisprudence (1839), and of the MSS, (1852).—The Bibliothéque de l'Université Catholique of Louvain is based upon the collection of Beyerlinek, who bequeathed it to his alma mater in 1627 ; this example was followed by Jacques Romain, professor of medicine, but the proper organization of the library commenced in 1636. There are now said to be 250,000 volumes.—The Bibliothéque de l'Université of Liége dates from 1817, when on the foundation of the university the old Biblioth¢que de la Ville was added to it. There are now 105,746 printed volumes, 87,254 pamphiets, 1544 MSS., and 142 ineunabula. The Liége collection (of which a printed catalogue appeared in 3 vols. 8vo, 1872), bequeathed by M. Ulysse Capitaine, extends to 12,061 volumes and pamphlets. A printed catalogue of the medical books was published in 1844, and one of the MSS. in 1875.

The national library of Holland is the Koninklijke Bibliotheek at the Hague, which was established in 1798, when it was decided to join the

library of the princes of Orange with those of the defunct Government bodies in order to form a library for the States General, to be called the Nationa] Bibliotheek. In 1805 the present name was adopted ; and since 1815 it has become the national library. In 1848 the Baron W. Y. H. van Westreenen van Tiellandt bequeathed his valuable books, MSS., coins, and antiquities to the country, and directed that they should be preserved in his former residence as a branch of the royal library. There are now upwards of 200,000 volumes of printed books, with an annual increment of 4000 volumes. The MSS. number 4000, chiefly historical, but including many fine books of hours with miniatures. Books are lent all over the country. Some twenty-five years ago it was decided for economical reasons to restrict the purchases to political, historical, and legal works, but recently, in consequence of an increase in the yearly subsidy, literature has been added to these three elasses. Tho library boasts of the richest collection in the world of books on chess, Duteh incunabula, Elzevirs, and Spinozana. There is ono gencral written eatalogue arranged in classes, with alphabetical indexes. In 1800a printed catalogue was issued, with four supplements down to 1811; and since 1866 a yearly list of additions has been published. Special mention should be made of the excellent catalogue of the incunabula published in 1856.

The next library in numerical importance is the famous Biblio- theca Academie Lugduno-Batavee, which dates from the foundation of the university of Leyden by William I., prinee of Orange, on February 8, 1575. It has acquired many valuable additions from the books and MSS. of the distinguished scholars, Golius, Joseph

3 A most interesting account of the history of this library may be read in the introduction to Catalogue des MSS. de la bibliothéque reyale des ducs de Bourgogne, by M. Marchal, Brussels, 1842, 3 vols. 4to,

Ghent.

Louvain,

Liége.

The Hague.

Leyden.

Utrecht.

Amster- dam.

Copen- hagen.

Chris- tiania.

Stock- holm.

0932

Scaliger, Isaac Voss, Ruhnken, and Hemsterhuis. The MSS. comprehend many of great intrinsic importance ; the Oriental codices number 2400. The library of the Society of Netherland Literature has been placed here since 1877; this is rich in the national history and literature. The Arabic and Oriental MSS. known as the Legatum Warnerianum arc of great value and interest ; and the collection of maps bequeathed in 1870 by J. J. Bodel Nyenhuis is also noteworthy. The library is contained in a building which was formerly a church of the Béguincs, adapted in 1860 somewhat after the stylc of the British Museum. The catalogues (onc alphabetical and one classified) are on slips, the titles being printed. MSS. was printed in 1716, one of books added between 1814 and 1847 in 1848, and a supplementary part of MSS. only in 1850. A catalogue of the Oriental MSS. was published in 6 vols., 1851-77.

The University Library at Utrecht dates from 1582, when certain conventual collections were brought together in order to form a public library, which was shortly afterwards enriched by the books bequeathed by Hub. Buchelius and Ev. Pollio. Upon the founda- tion of the university in 1636, the town library passed into its charge. Among the MSS. arc some interesting cloister MSS. and the famous ‘‘ Utrecht Psalter,” which contains the oldest text of the Athanasian

creed. The last edition of the catalogue was in 2 vols. folio, 1834, with supplement in 1845, index from 1845-55 in 8vo, and additions 1856-70, 2 vols. 8vo. The titles of accessions are now printed in sheets and pasted down for insertion.

The basis of the University Library at Amsterdam consists of a collection of books brought together in the 15th century and preserved in the Nieuwe Kerk. At the time of the Reformation in 1578 they became the property of the city, but remained in the Nieuwe Kerk for the use of the public till 1632, when they were transferred to the Atheneum. Since 1877 the collection has been known as the University Library, and in 1881 it was removed to a building designed upon the plan of the new library and reading- room of the British Museum. The library includes the best collection of medical works in Holland, and the Bibliotheca Rosenthaliana of Hebrew and Talmudic literature is of great fame and value; a catalogue of the last was printed in 1875. The libraries of the Dutch Geographical and other societies are preserved here. A general printed catalogue was issued in 6 vols. 8vo, Amsterdam, 1856-77 ; one describing the bequests of J. de Bosch Kemper, E. J. Potgieter, and F. W. Rive, in 3 vols. 8vo, 1878-79 ; a catalogue of the MSS. of Professor Moll was published in 1880, and one of those of P. Camper in 1881.

Denmark, Norway, and Sweden.

The commencement of the admirably managed national library of Denmark, the great Royal Library at Copenhagen, may be said to have taken place during the reign of Christian III. (1533-59), who took pride in importing foreign books and choice MSS. ; but the true founder was Frederick III. (1648-70); to him is tainly due the famous collection of Icelandic literature and the acquisition of Tycho Brahe’s MSS. The present building (in the Christiansborg Castle) was commenced in 1667. Among notable accessions may be mentioned the collections of C. Rcitzer, the count of Danneskjold (8000 volumes and 500 MSS.), and Count de Thott ; the last bequeathed 6039 volumes printed before 1531, and the remainder of his books, over 100,000 volumes, were eventually purchased. In 1793 the library was opened to the public,

and it has since remained under state control. Two copies of every book published within the kingdom must be deposited here. The incunabula and block books form an important serics. There is a general classified catalogue in writing in 295 folio volumes for the use of readers ; and an alphabetical one on slips arranged in boxes for the officials. A good cataloguc of the De Thott collection was printed in 12 vols. 8vo, 1789-95 ; a catalogue of the French MSS. appeared in 1844; of Oriental MSS., 1846; of the Danish collec- tion, 1875, 8vo. Annual reports and accounts of notable MSS. Lae been published since 1864. There were 7000 additions in _ The University Library, founded in 1482, was destroyed by fire in 1728, and re-established shortly afterwards. A copy of every Danish publication must be deposited here. The MSS. include the famous Arne-Magnean collection (see vol. xii. p. 626).

The chief library in Norway is the University Library at Christiania, established at the same time as the university, Septem- ber 2, 1811, by Frederick II., with a donation from the king of many thousands of duplicates from the Royal Library at Copen- hagen, and since augmented by important bequests.

The Royal Library at Stockholm was first established in 1585. The original collection was given to the university of Upsala by Gustavus II., that formed by Christina is at the Vatican, and the library brought together by Charles X. was destroyed by fire in 1697. The present library was organized shortly afterwards. The Benzelstjerna-Engestrom Library (14,500 printed volumes and 1200 MSS., rich in materials for Swedish history) is now annexed to it. Natural history, medicine, and mathematics are left to other

librarics. Among the MSS. the Codex Aureus of the 6th or 7th century, with its interesting Anglo-Saxon inscription, is particularly noteworthy. The catalogues are in writing, and are both alpha- betical

and classified ; printed catalogues have been issued of portions of the MSS. The present building was opened in 1882.

The University Library at Upsala was founded by Gustavus Upsala.

Adolphus in 1620, from the remains of several convent libraries; he also provided an endowment. The MSS. chiefly relate to the his- tory of the country, but include the Codex Argenteus, containing the Gothic gospels of Ulfilas. The general catalogue is in writing. A catalogue was printed in 1814 ; spccial lists of the foreign acces- sions have been published each year from 1850; the Arabic, Persian, and Turkish MSS. arc described by C. J. Tornberg, 1846. The library at Lund dates from the foundation of the university in 1668, and was based upon the old cathedral library. The MSS. include the De la Gardie archives, acquired in 1848.

Spain and Portugal.

The chief library in Spain is the Biblioteca Nacional (formerly Madrid.

the Biblioteca Real) at Madrid. The printed volumes number 400,000 volumes, with 200,000 pamphlets ; the accessions in 1880 amounted to 25,840 articles. Spanish literature is of course well represented, and, in consequence of the numerous accessions from the libraries of the suppressed convents, the classes of theology, canon law, history, &c., are particularly complete. The number of bibliographical rarities was largely increased by the incorporation of the valuable collection formed by the well-known bibliographer Don Luis de Usoz. There are 30,000 MSS., contained in 10,000 volumes and bundles; they include some finely illuminated codices, historical documents, and many valuable autographs. The col- lection of prints extends to 120,000 pieces, and was principally formed from the important series bought from Don Valentin Carderera in 1865. In 1880 54,875 books were issued to 51,966 readers. The annual revenue is only £1600. The printed books have one catalogue arranged under authors' names, and one under titles ; the departments of niusic, maps and charts, and prints have subject-catalogues as well. There is a general index of the MSS., with special catalogues of the Greek and Latin codices and genea-

logical documents. The first (and only) volume of a printed catalogue of the Greek MSS. plied in 1769. The cabinct o1 medals is most valuable and well arranged. Of the other Madrid libraries (see the tables) it is enough to mention the Biblioteca de la Academia de la Historia (20,000 volumes and 1500 MSS.), which contains some printed and MS. Spanish books of great value, including the well-known Salazar collection.—The history

of the library of the EscorrAu has been given at vol. viii. p. 541. Escorial.

In 1808, before the invasion, the Escorial is estimated to have contained 30,000 printed voluines and 3400 MSS. ; Joseph removed the collection to Madrid, but when it was returned by Ferdinand 10,000 volumes were missing. There are now 32,142 printed volumes, with 588 Greek, 1905 Arabic, 78 Hebrew, and 2050 Latin MSS. The Arabic MSS. have been described by M. Casiri, 1760-70 ; and a catalogue of the Greck codices by Miiller was issued at the expense of the French Government in 1848. Thcre is an imperfect written catalogue of the printed books, and the present librarian is now engaged upon a catalogue of the Latin MSS. Permission to study at the Escorial, which is one of the royal private libraries, must be obtained by special application.!

Among the libraries of Portugal the Bibliotheca Nacional at Lisbon.

Lisbon naturally takes the first place. In 1841 it was largely increased from the monastic collections, which, however, seem to have been little cared for according to a report prepared by the principal librarian three years later. There are now said to be 200,000 volumes of printed books, amoug which theology, canon law, history, and Portuguese and Spanish literature largely pre- dominate. The MSS. number 9415, including many of great value. There is also a cabinet of 40,000 coins and medals.—The Biblio- theca da Academia, founded in 1780, is preserved in the suppressed convent of the Ordem Terceira da Penitencia. In 1836 the Academy acquired the library of that convent, numbering 30,000 volumes, which have since been kept apart. The Archivo Nacional, in the same building, contains the archives of the

kingdom, brought here after the destruction of the Torre do Castello during the great earthquake.

The Bibliotheca Publica Municipal at Oporto is the second largest Oporto.

in Portugal, although only dating from July 9, 1833, the anniver- sary of the debarkation of D. Pedro, and when the memorable siege was still in progress ; from that date to 1874 it was styled the Real Bibliotheca do Porto. The regent (ex-emperor of Brazil) gave to the town the libraries of the suppressed convents in the northern provinces, the niunicipality undertaking to defray the cxpense of keeping up the collection, but only £180 is yearly spent on books and bindings, and £880 on salaries. Recent accessions consist

1 Gachard, Les bibliothéques de Madrid et de [Escorial; notices et extraits des MSS. qui concernent (histoire de Belgique, Brussels, 1875, 4to; Ch. Graux, Essai sur les origines du fonds grec de l’ Escurial.

St Peters- burg.

Moseow.

mainly of Portuguese and French books. The important Camoens collection is described in a printed catalogue, Oporto, 1880. A notice of the MSS. may be found in Catalogo dos MSS. da B. Pub- lica Eborense, by H. da Cunha Rivara, Lisbon, 1850-70, 3 vols. folio, and the first part of an Indice preparatorio do Catalogo dos Manu- scriptos was produced in 1880,

Russia.

The Imperial Public Library at St Petersburg is the third largest library in the world, and uow claims to possess 1,000,000 printed volumes. The commencement of this magnificent collection may be said to have been the books seized by the Czar Peter during

his invasion of Courland in 1714; the library did not receive any

uotable augmentation, however, till the year 1795, when, by the acquisition of the famous Zaluski collection, the Imperial Library suddenly attained a place in the first rank among great European libraries. The Zaluski Library was formed by the Polish count Joseph Zaluski, who collected at his own expense during forty-three years no less than 200,000 volumes, which were added to by his brother Andrew, bishop of Cracow, by whom in 1747 the library was thrown open to the public. At his death it was left under the control of the Jesuit College at Warsaw ; on the suppression of the order it was taken care of by the Commission of Education ; and finally in 1795 it was transferred by Suwaroff to St Petersburg as a trophy of war. It then extended to 260,000 printed volumes and 10,000 MSS., but in consequence of the withdrawal of many medical and illustrated works to enrich other institutions, hardly 238,000 volumes remained in 1810. Literature, history, and theology formed the main features of the Zaluski Library; the last class alone amounted to one-fourth of the whole number. Since the com- mencement of this century, through the liberality of the sovereigns, the gifts of individuals, careful purchases, and the application of the law of 1810, whereby two copies of every

Russian publication inust be deposited here, the Imperial Library has attained its present extensive dimensions. Nearly one hundred different collections, some of them very valuable and extensive, have been added from time to time. They include, for example, the Tolstoi Sclavonic collec- tion (1830), Tischendorf's MSS. (1858), the Dolgorousky Oriental MSS. (1859), and the Firkowitsch Hebrew (Karaite) collection (1862-63), the libraries of Adelung (1858) and Tobler (1877), that of the Slavonie scholar Jungmann (1856), and the national MSS. of Karamzin (1867). This system of acquiring books, while it has made some departments exceedingly rich, has left others com- paratively meagre. The library was not regularly opened to the public until 1814; it is under the control of the minister of public instruction. In the printed book department the yearly average of readers is now 107,000, and of books consnlted 285,300. The annual grant from the treasury is 79,174 silver roubles ; an income of 3438 roubles is derived from other sources. The official estimate of the number of printed books is 1,000,000 volumes, with 19,059 maps and 75,000 prints and photographs. The yearly accessions amount to about 28,000. The Russian books number 100,000 and the Russica 30,000 volumes ; the Aldines and Elzevirs form a nearly perfect collection ; and the incunabula are numerous and very instructively arranged.

The manuscripts include 26,000 codices, 41,340 autograplis, 4689 charters, and 576 maps. The glory of this department is the celebrated Codex Sinaitieus of the Greek Bible, brought from the con- vent of St Catherine on Mount Sinai by Tischendorf in 1859. Other important Biblical and patristic codices are to be found amoug the Greek and Latin MSS.; the Hebrew MSS. include some of the most ancient that exist, and the Samaritan collection is one of the largest in Europe; the Oriental MSS. comprehend many valuable texts, and ainong the French are some of great historical value.

The general catalogues are in writing, but the following special catalogues of the printed books have been published:—the Tolstoi eollection of early printed Russian books, 1829; the Aldines, 1854; the Elzevirs, 1862, and another in 1864, by C. F. Walther; editions printed during the reign of Peter the Great, by Bytschkoff, 1867 ; the foreign

books relating to Peter the Great by P. Minzloff, 1872 ; and the Russica, 2 vols., 1873. Lists of the forcign books have been issued since 1863, and the Comptes Rendus published since 1850 contain notices of the most important acquisitions.

The following catalogues of the MSS. are in print :—the Tolstoi Slavonic collection, 1825 ; Dorn's catalogue of the Oriental MSS., 1852; old German, 1853; the Greck, by Muralt, 1864; the Khani- koff Oriental codices, by Dorn, 1865; Russian MSS. on the history of Peter the Great, by Bytschkoff, 1872; the French, 1874 ; Samari- tan, 1875 ; Hebrew Biblical, 1875; Slavonic and Russian mis- cellaneous, parts 1 and 2, 1878-80.

The nucleus of the library at the Hermitage Palace was formed by the empress Catherine II., who purchased the books and MSS. of Voltaire and Diderot. In the year 1861 the collection amounted to 150,000 volumes, of which nearly all not relating to the history of art were then transferred to the Imperial Library.

The second largest library in Russia is contained in the public museum at Moscow. The class of history is particularly rich, and

LIBRARIES

m ope

O33 Russian early printed books are well represeuted. The MSS. number 5000, including many ancient Sclavonic codices and hig torical documents of value. 'One room is devoted to a collection of Masonic MSS., which comprehend the archives of the lodges in Russia between 1816 and 1821. There is a general alphabetical catalogue in writing ; the catalogue of the MSS. has been printed, as well as those of some of the special collections,

For other Russian libraries see the tables.

India, China, and Japan.

Of Indian libraries it is sufficient to notice those that have India.

importance for Oriental letters. At Calcutta the Sanskrit college has 1652 printed Sanskrit volumes and 2769 Sanskrit MSS., some as old as the 14th century ; there is also a large collection of Jain MSS. A catalogue is now being prepared for publication.—The Arabic library attached to the Arabic department of the Madrasa was founded about 1781, and now includes 731 printed volumes, 143 original MSS. and 151 copies; the English library of the Anglo-Persian department dates from 1854, and extends to 3254 volumes.—The library of the Asiatic Society of Bengal was founded in 1784, and now contains 15,000 printed volumes, chiefly on Eastern and philological subjects, with a valuable collection of 9500 Arabic and Persian MSS. A catalogue is now passing through the press.

At Bombay the library of the Bombay branch of the Royal Asiatic Society, established in 1804 as the Literary Society of Bengal, is now an excellent general and Oriental collection of 40,000 printed volumes and 200 MSS., described in a printed catalogue of 1875. The Moolla Feroze Library was bequeathed for public use by Moolla Feroze, head priest of the Parsis of the Kudini sect in 1831, and consisted chiefly of MSS. in Arabie and Persian on history, philosophy, and astronomy ; some additions of English and Gujarati works have been made, as well as of European books on Zoroastrianism. A catalogue has been printed.

The library of Tippoo Sahib, consisting of 2000 MSS., fell into the hands of the British, and a descriptive catalogue of them hy Charles Stewart was published at Cambridge in 1809, 4to. A few were presented to public libraries in England, but the majority were placed in the college of Fort William, then recently established. The dst volume, containing Persian and Hindustani poetiy, of the Catalogue of the Libraries of the King of Oudh, by A. Sprenger, was published at Calcutta in 1854. The compiler shortly atterwards left the Indian service, and no measures were taken to complete the work. On the annexation of the kingdom in 1856 the ex-king is believed to have taken some of the most valuable MSS. to Calentta, but the largest

portion were left behind at Lucknow. During the siege the books were used to block up windows, &c., and those which were not destroyed were abandoned, and plundered by the soldiers. Many were burnt for fuel; a few, however, were rescued and sold by auction, and of these some were purchased for the Asiatic Society of Bengal.

Perhaps the most remarkable library in India is that of the raja of Tanjore, which dates from the end‘of the 16th or beginning of the 17th century, when Tanjore was under the rule of the Telugn Naiks, who collected Sanskrit MSS. written in the Telugu character. In the 18th century the Marhattas conquered the country, and since that date the library increased but slowly. By far the greater portion of the store was acqnired by Sharabhoji Raja during a visit to Benares in 1820-30 ; his successor Sivaji added a few, but of inferior value. There are now about 18,000 MSS. written in Devanagari, Nandinagari, Telugu, Kannada, Granthi, Malaydlam, Bengali, Panjabi or Kashmiri, and Uriya; 8000 are on palm leaves, Dr Burnell’s printed catalogue describes 12,375 articles.

Thanks to the enlightened policy of the Government of India, we are beginning to know much more respecting native librarics than was possible a few years ago, and since 1868 a yearly sum of 24,000 rupees has been granted to carry on the work of searching for Sanskrit MSS. The first part of a list of those in private hands in southern India has been published by Dr G. Oppert ; it contains a description of 8376 MSS., and anothcr volume is in course of pre- paration. Dr Biihler, in his investigation of Santinath’s library at Cambay, found 300 MSS. of great antiquity, six dating from the beginning of the 12th century. A pandit has examined the Samghavina Pada Library in Pathan, and a catalogue has been pre- pared for printing. A copy of the oldest Sanskrit dictionary, the Sasvata Kosha, of which only one other copy (at the Bodleian) is known, was found here. Dr Biihler also purchased 429 volumes for the Government. Inquiries made in Behar have not met with much result. Notices of Sanskrit MSS. in the presidency of Bengal have been prepared under the direction of Dr Rajendralala Mitra ; seven fasciculi (1000 pp.) have been printed, describing 842 articles. The same scholar has also printed a catalogue (755 pp.) of the

library of the maharaja of Bikanir, describing 2000 Sanskrit MSS. 2 and his analysis of the Sanskrit Buddhist literature of Nepal will shortly be published. The total number of Sanskrit MSS. acquired in this presidency is now 1612, some of which are new to Europeans. Two catalogues of 180 Sanskrit MSS. discovered in the North-Western Provinces and Oudh during 1878-80 have been prepared,

Singa- pore.

Batavia.

China.

Japa.

Canada.

Cape-

town.

Aus- tralia.

United States.

and the following libraries (containing many important texts) of the Punjab have been examined :—that of Pandit Rikhikesha, of 500 books; Pandit Jwala Datta Prasada, 2500 MSS., the largest collection in the province; and Pandit Dilaram, 430 MSS. The efforts of Dr Forchhammer will probably bring to light many valuable Sanskrit MSS., both in Upper and Lower Burmah.

The Raffles Library at Singapore was established as a proprietary institution in 1844, taken over by the Government in 1874, and given legal status by an ordinance passed in 1878. It now contains 11,000 volumes in general literature, but books relating to the Malayan peninsula and archipelago have been made a special feature, and since

the acquisition of the collection of J. R. Logan in 1879 the library has become remarkably rich in this department.

The library of the Genootschap van Kunsten en Wetenschap- pen at Batavia contains books printed in Netherlandish India, works relating to the Indian Archipelago and adjacent countries, and the history of the Dutch in the East. There are now 20,000 printed volumes and 1630 MSS., of which 243 are Arabic, 445 Malay, 303 Javanese, 60 Batak, and 517 on loutar leaves in the ancient Kawi, Javanese, and Bali languages, &c. The last edition of the catalogue appeared in 1877 ; printed catalogues of the Arabic, Malay, Javanese, and Kawi MSS. have also been issued.

China.—The Great Imperial Library was founded by K'in Lung, 18th century, and from a catalogue which has been issued ap- pears to have contained about 12,000 works, extending to 168,000

volumes. There are many provincial libraries in China, and thie |

chief Buddhist monasteries also possess collections of books.

Japan.—The library of the Tokio Fu (municipality of Tokio) at |

Leido, in the old Chinese university, contains 63,000 Chinese and

Japanese volumes, and 5000 European, principally English and | Dutch. The reading-room is supplied with native daily papers, and |

the chief foreign periodicals. The library is open for purposes of reference, and books may be borrowed by special permission. The Asakusa Library, now occupying the former fireproof ricc store-houses of the shogun, is one of the oldest in the country, and is reported to contain 143,000 volumes, including many ancient books and MSS. ; an entrance fee of about $d. is charged here. The Imperial University has a good collection of European and Japanese science and general literature. The libraries of the large templcs often contain rare books of valuc to the philologist, and many of the leading towns throughout the country are provided with free libraries. Lending

libraries of native and Chinese literature have existed in Japan from very carly times.

British Colonies.

Of such librarics as may be found in the British colonies there are very few that call for particular mention here.

The largest collection of books in Canada is the library of parlia- ment at Ottawa, Though founded in 1815, it contained very few books until 1841, when the two librarics of Upper and Lower Canada were joined. After being destroyed by fire, the library was re-established in 1855, chiefly for parliamentary use. It now contains 100,000 volumes, and is open to the public except when parliament is sitting. Books are lent out. The main library is a handsome octagonal apartment with beautiful carved work in Canadian white wood.

In the South African Public Library at Capetown, which was established in 1818, there are 39,000 volumes, including the collec-

tion bequeathed by Sir George Grey, comprising, besides MSS. and |

early printed books, an unrivalled collection of works in the native languages of Africa, Australia, &c. The library is open to any re- spectable person.

The largest library in the Australian colonies is the Public Lib- rary of Victoria at Melbourne, which was established in 1853. In 1881 it numbered 89,387 volumes with 22,257 pamphlets ; it pos- sesses a collection of works on Australasia. The library has a printed catalogue (1880). It is supported by an annual parliament- ary vote, which amounted last year to £5495. Readers are admitted without any formality, and have free access to the shelves. Although books are not lent out of the library individually, there is a system by which parcels of from 100 to 400 books are lent to libraries, mechanics' institutes, &c., in the inland towns of Victoria. There are several other not inconsiderable libraries in Melbourne. Next in importance to the Melbourne Library is the Sydney Free Public Library, which is said to

contain the largest collection of works on Australasia anywhere to be found. It hasa lending as well as a reference department, and is much nsed.

Particulars of other colonial libraries will be found in the tables.

United States.

to find in a country where intelligence and education are so widely diffused, are exceedingly numerous. A great mass of information with regard to them has been published by the Bureau of Education, particularly in

a : | Was vested in the company by the State legislature in 1792 The libraries of the United States, as we should expect: |

the comprehensive Special Report on Public Libraries issued in 1876. From this report, and the annual reports of the commissioners of education which have since appeared, we learn that the number of public | libraries already registered is 3842, with upwards of

12,569,450 volumes. It is of course true that the great

majority of these libraries are not numerically important.

On the other hand, many of them are very rapidly growing, and their very youth implies that their shelves are not burdened with much obsolete literature. The recent development of American libraries is indeed very striking. Of the libraries reported in 1875, about 64 appear to have been established before 1800, and 30 of these between 1775 and.1800. Between 1800 and 1825 there were established 179 libraries, between 1825 and 1850 as many as 551, and finally between 1850 and 1875 no less than 2240, which in the latter year contained as many as 5,481,068 volumes. It will be convenient to deal with these libraries in groups according to the historical order of their development. The earliest libraries formed were in connexion with educational institutions, and the oldest is that of Harvard (1638). It was destroyed by fire in Harvard. 1764, but active steps were at once taken

for its restora- tion. From that time to the present, private donations have been the great resource of the library. In 1840 the collection was removed to Gore Hall, which was erected for the purpose with a noble bequest from Christopher Gore, formerly governor of Massachusetts. There are also nine special libraries connected with the different depart- ments of the university. The total number of volumes in all these collections is 259,000, exclusive of over 200,000 paniphlets. The annual increase is about 7000 volumes, and the library has an endowment fund of over $200,000. There is a MS. card-catalogue in two parts, by authors and subjects, which is accessible to the readers. The only con- dition of admission to use the books in Gore Hall is respectability; but only members of the university and privileged persons may borrow books. The library of Yale. Yale College, New Haven, was founded in 1700, but grew so slowly that, even with the 1000 volumes received from Bishop Berkeley in 1733, it had only increased to 4000 volumes in 1766, and some of these were lost in the revolu- tionary war. During the present century the collection has grown more speedily, and now the main library numbers 102,000 volumes, while the special libraries in the control of the college bring up the total to 143,000 volumes. The yearly increase is about 4500 volumes, and the library has a book fund of $100,000. Amongst the other important university libraries are those of the college of New Jersey (Princeton), Dartmouth College (Hanover), Amherst College, Cornell University, and Brown University (Pro- vidence, R. I.). In 1875 the number of college libraries (not reckoning academy and school libraries) was 312, besides 299 libraries belonging to college students' societies. The establishment of proprietary or subscription libraries Proprie- runs back into the first half of the 18th century, and is tary _ connected with the name of Benjamin Franklin. It was libraries. at Philadelphia, in the year 1731, that he set on foot what he calls "his first project of a public nature, that for a subscription library. .... The institution soon manifested its ability, was imitated by other towns and in other pro- vinces." The Library Company of Philadelphia was soon regularly incorporated, and gradually drew to itself other collections of books, including the Loganian Library, which

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in trust for public use. Hence the collection combines the character of a public and of a proprietary library, being freely open for reference purposes, while the books circulate only among the subscribing members. It numbers at present 123,000 volumes, of which 11,000 belong to the

State libraries.

Library of Con- gress.

AMERICA. |

Loganian Library, and may be freely lent. classed cataloguc of the library has been praised by Brunet and Allibone. In 1869 Dr James Rush left a bequest of over one million dollars for the purpose of erecting a building to be called the Ridgeway branch of the library. The building is very handsome, and has been very highly spoken of as a library structure. Philadélphia has another large proprietary library—that of the Mercantile Library Company, which was established in 1821. It possesses 143,135 volumes, and its members have always enjoyed direct access to the shelves. The library of the Boston Athenzum was established in 1807, and numbers 122,000 volumes. It has recently published an admirable dictionary- catalogue. The collection is especially rich in art and in history, and possesses a part of the library of Washington. The Mercantile Library Association of New York, which was founded in 1810, has the largest of all the subscrip- tion libraries, counting over 193,000 volumes. New York possesses two other large proprietary libraries, one of which claims to have been formed as early as 1700 as the “public” library of New York. It was organized as the New York Society Library in 1754, and has been especially the library of the old Knickerbocker families and their descendants, its contents bearing witness to its history. It contains about 80,000 volumes. The Apprentices’ Library has about 63,000 volumes, and makes a special feature of works on trades and useful

arts. It is main- tained by the General Society of Mechanics and Tradesmen. Finally, the Brooklyn Library deserves mention, if only for its very useful and admirable catalogue, the printing of which was completed in December 1880, and which embraces 60,000 volumes.

Although the State libraries of Pennsylvania aud New Hampshire are known to have been established as early as 1777, it was not until some time after the revolution that any gencral tendency was shown to form official libraries in connexion with the State system. It is especially within the last thirty years that the number of these libraries has so increased that now every State and Territory possesses a collection of books and documents for official and public purposes. These collections depend for their increase upon annual appropriations by the several States, and upon a systematic exchange of the official publications of the general Government and of the several States and Territories. The largest is that of the State of New York at Albany, which contains 116,000 volumes, and is composed of a general and a law library, of which a printed catalogue has been published with full subject-indexes. The State libraries are libraries of reference, and only members of the official classes are allowed to borrow books, although any well-behaved person is admitted to read in the libraries.

In addition to the libraries maintained by the several States, there are the collections belonging to the general Government, most of which are at Washington. The most important of them is of course the Library of Congress, but there are also considerable libraries attached to the house of representatives, the senate, the department of state, the patent office, and the office of the surgeon-general.

The Library of Congress was first established in 1800 at Washington, and was burned together with the Capitol by the British army in 1814. President Jefferson’s books were purchased to form the foundation of a new library, Which continued to increase slowly until 1851, when all but 20,000 volumes were destroyed by fire. From this time the collection has grown rapidly, and now consists of 396,000 volumes with ‘130,000 pamphlets. In 1866 the library of the Smithsonian Institution, consisting of 40,000 volumes, chiefly in natural science,

was transferred to the library of congress. The library is specially well pro- vided in history, jurisprudence, the political sciences, and

LIBRARIES

The printed | Americana.

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Since 1832 the law collections have been constituted into a special department. This is the national library. In 1870 the registry of copyrights was transferred to it under the charge of the librarian of congress, As two copies of every publication which claims copyright are required to be deposited in the library, the receipts under this head are nearly 25,000 articles per annum. The sum annually appropriated by congress for the management and increase of the library is $52,840. The present accommodation is inadequate, and a separate building is to be erected of size to contain two million volumes. There is an alphabetical card-catalogue kept constantly up to date, and a printed catalogue of subject-matters. The library is open every day in the year, except on four legal holidays, from 9 a.m. to 4 p.a., and admission is granted to all persons over sixteen years of age without formality or introduction, but books are only lent to members of the official classcs.

Since the organization of the Government in 1789, no less than one hundred and sixty historical societies have been formed in the United States, most of which still continue to exist. Many of them have formed considerable libraries, and possess extensive and valuable manuscript collections. he oldest of them is the Massachusetts Historical Society, which dates from 1791.

The earliest of the scientific societies owes its origin to Franklin, and dates from 1743. The most extensive collection is that of the Academy of Natural Sciences of Philadelphia, which consists of 35,000 volumes and 40,000 pamphlets. For information as to the numerous professional librarics of the United States—theological, legal, and medical—the reader may be referred to the report already mentioncd.

Of all the libraries of the United States none have achieved a Town greater fame, and none are more zealously and admirably conducted, libraries.

than those which are supported from the public funds of some of the great cities. Legislation on the subject of free public libraries was almost synchronous in England and America. Of the free town libraries of America, much the largest and most successful is the Boston Public Library, which was established in 1852. Besides the liberal appropriations made by the city for its support, it has been the object of a long series of splendid gifts in money and books. Among the more conspicuous of its benefactors have been Joshua Bates, Theodore Parker, and George Ticknor. Since the library has becn opened to the public there has thus been gathered "tlic largest collection of books, under one administration, upon this continent." The number of volumes in the library on July 1, 1881, was 395,478, and the annual accessions are over 17,000 volumes. In addition to the income available from trust funds, the annual appropriation by the city is $115,000. Besides the central library, with the Bates Hall 'and Lower Hall, there are eight branches, and the total circulation is considerably over 1,000,000 volumes per annum. Any inhabitant of Boston over fourteen years of age is admitted to read in the library and to borrow books, The principal catalogue of the library is upon cards, in addition to which there are printed catalogues of special collections, and a per- fect multitude of useful class catalogues and bibliographical helps of various kinds. The number of persons engaged in the service of the library is one hundred and forty-three. 'The library is open to readers from 9 A.M. to 6 P.M. from October to March, and until 7 P.M. during the rest of the year. Booksarc delivered for home use until 9 in the evening. The periodical room is open from 9 A.M. to 9 P.M. on week days, and on Sundays from 2 to 9. A new building is in contemplation.

Of the remaining free town libraries, the most important-are those of Cincinnati and Chicago. The public library of Cincinnati, which was established on its present footing in 1867, has 122,930 volumes besides pamphlets. Its expenditure last ycar was $51,465, and its total

issues, including those from the two branches, were 768,565. The reading-rooms are open every day in the year from 8 a.m. to 10 p.m. The library buildings were completed in 1873 at a cost of about $400,000, and are “among the handsomcst in the world.” The Chicago Public Library was established in 1872, and owed its origin to the sympathy felt for Chicago in England after the great fire of 1871. The number of volumes now in the library is 76,120. There is a very full and minute card-catalogue, in one alphabet, of authors and subjects ; the contents of collections, volumes of essays, &c., are analysed under their subjects. The reading-room is open three hundred and sixty-five days in the year from 9 A.M. to 9 P.M., and is not even closed for the purpose of taking stock or cleaning. The library has not yet an appropriate building. Of smaller free town libraries there is a considerable number, especi- ally in Massachusetts. Of the entire number ten only possess over 30,000 volumes each. It is the opinion of the energetic and

Astor library.

Lenox library.

Argen- tine Republic.

Brazil.

Chili.

Mexico.

enlightened managers of these libraries that a free public library is the proper corollary of a frec system of public education, and it is their aim as far as possible to direct the taste and to methodize the reading of those who use the collections under their charge.

We cannot conclude this brief sketch without mentioning some notable illustrations of that public-spirited munificence which is nowhere

perhaps so frequeutly found as in the United States. The Astor Library in New York was founded by a bequest of Jolin Jacob Astor, whose example was followed successively by his son and grandson. The library was opened to the public in 1854, and at the end of 1880 the collection due to their joint benefaction con- tained 192,547 volumes. It consists of a careful selection of the most valuable books upon all subjects. It is a library of reference, for which purpose it is freely open, and books are not lent out. It is ‘‘a working library for studious persons,” and such persons on a proper introduction are allowed to pursue their studies in the alcoves. In 1880 the number of general readers was 45,670, and the number of visits to the alcoves was 7961. The total endow- ment is over $1,100,000. There isa printed catalogue for about half the library, with a printed index of subjects, and a similar catalogue for the rest is in preparation. ‘The Lenox Library was established by Mr James Lenox in 1870, when a body of trustees was incorporated by an Act of the legislature. In addition to the funds intended for the library building and endowment, amounting to $1,247,000, the private collection of books which Mr Lenox has long been accumulating is extremely valuable. Though it does not rauk high in point of mere numbers, it is exceedingly rich in early books on America, in Bibles, in Shakesperiana, and in Elizabethan poetry. The Peabody Institute at Baltimore was established by Mr George Peabody in 1857, and contains a reference library open to all comers, numbering about 72,000 volumes. ‘he institute has an endowment of $1,000,000, which, however, has to support, besides the library, a conservatoire of music, an art gallery, and courses of popular lectures. The largest legacy yet made for a public library has recently fallen to the citizens of Chicago in the Newberry bequest of over $2,000,000 for the founding of a free public library in the north division of Chicago.

South Ameriea and Mexico.

The importance of public libraries has been fully recognized by the Argentines, and at present more than two hundred of them are in the country. They are due to benefactions, but the Government in every case adds an equal sum to any endowment. A central commission exists for the purpose of facilitating the acquisition of books and to

promote a uniform excellence of administration. The inost considerable is the Biblioteca Nacional at Buenos-Ayres, which contains at present 40,000 volumes, and has been almost doubled since 1872. It is passably rich in MSS., some of great intercst, concerning the early history of the Spanish colonies.

The chief library of Brazil is the Bibliotheca Publica Nacional at Rio de Janeiro, founded in 1807, and now comprising 120,000 printed volumes with 1000 MSS. National literature and works connected with South America are special features of this collection. The Royal Library of Ajuda (including 4000 MSS.) was taken to Brazil by King Joao VI., but was sent to Portugal on the declaration of independence. Since 1873 the annual Government grant has been largely increased. Among other libraries of the capital may be mentioned those of the Faculty of Medicine (18,000 volumes), Marine Library (19,500 volumes), National Museum (9000 vol- umes), Portuguese Literary Club (53,000 volumes), Bibliotheca Fluniinense (43,000 volumes), Benedictine Monastery (9000 vol- umes), and the Bibliotheca Municipal (15,500 volumes). In the official report on Brazil, submitted at the Philadelphia. Exhibition in 1876, it was stated that the aggregate number of volumes in all the libraries of the empire accessible to the public was then 460,272 volumes. In 1875 the libraries were visited by 85,044 persons.

. The Biblioteca Nacional at Santiago is the chief library in Chili. The catalogue is printed, and is kept up by annual supplements.

Only sixteen out of the twenty-nine states and territories of the Mexican republic have public libraries, and only a small propor- tion of the contents consists of modern literature. Many, however,

possess rare and valuable books, of interest to the bibliographer and

historian, which have come from the libraries of the suppressed religious bodies. It is caleulated that books in all the public lib- raries amount to about 250,000 volumes. There are about seventy- three scientific and literary associations in the republic, each possess- ing books. The Society of Geography and Statistics, founded in 1851

is the most important of them, and owns a fine museum and excellent library. After the triumph of the Liberal party the cathedral, university, and conventual libraries of the city of Mexico came into the possession of the Government, and steps were taken to form them into one national collection. No definite system was organized, however, until 1867, when the church of San Augustin was taken and fitted up for the purpose. Two copies of every book printed in Mexico must be presented to this library. The only other publie library in the city is the Biblioteca Cinco de Mayo, which is under the management of the Lancastrian Socicty.

LIBRARIES

[LIBRARY

The Biblioteca Nacional at Lima was founded by a decrec of the Peru. liberator San Martin on August 28, 1821, and placed in the house of the old convent of San Pedro. The nucleus of the library con- sisted of those of the university of San Marcos and of several monasteries, and a large present of books was also made by San Martin. The library is chiefly interesting from containing so many MSS. and rare books relating to the history of Peru in vice-regal times. The volumes marked ‘‘ Papeles varios”? contain reports on the superstitions of the Indians, abstracts of the ecclesiastical councils of Lima, and memoirs on provincial administration and petitions. It is reported (1881) that the whole library has been seized by the Chilians and transferred to Santiago.

LIBRARY MANAGEMENT.

Library Buildings.\—The conditions of no two libraries being
Buildings.

precisely alike, it is impossible to lay down rules to suit all, but certain principles of general application may be stated. In the first place the internal arrangements ought to be devised by a person thoroughly acquainted with the practical working of such a library as the building is intended to accommodate. The reading-rooms, book-rooms, work-

rooms, and officcs should be made to fall into the most convenient relations one to the other. And as libraries grow with wonderful rapidity the plan ought to admit of easy development. The site should be dry and airy, and permit isolation of the fabric, which should be constructed of fire-proof materials, iron being preferable to stone, and brick to either. Every floor should be laid upon rolled iron beams, supported by lattice girders, the space between the beams being fitted in with porous terra cotta, and the beams covered with concrete. To protect thein against fire, girders and pillars must be covered with terra cotta. Iron doors (or, better still, stout wooden doors plated with thin iron) should separate the different rooms.?. The safety and convenient disposal of the books must never be sacrificed to outside show. ‘The old form of library, the museum-like room with alcoves and a large block of vacant space in the centre, or the series of apartments with books on the walls only, is no longer in favour. The reading-room, commodious, well lighted, and supplied with works of reference, should be away from the main collection, and the lending department should be kept apart from the refereuce library. It is convenient to have separate rooms for ladies and for readers to whom special facilities may be granted ; and letample provision be made for work-rooms, librarians’ offices, cataloguing rooms, and a bindery if necessary. The chief portion of the books (at any rate those in most demand) should be on the ground floor, and more than two stories are to be avoided. Plenty of light and good ventilation are two conditions of great importance. The basement should be vaulted. As the store-room, or that in which the main collection is deposited, is one to which readers have seldom the right of access, the greatest economy as to shelvage and passage way may be effected. Bookcases may be placed against the walls, but not too close to them, and double presses, about 3 feet apart, arranged across the floor. To prevent the objectionable use of high ladders, no shelf should stand more than 8 feet above the ground. Ifthe room be sufficiently lofty it may contain one or more perforated iron floors, sustained by the upright portion of the presses, also of iron, Spiral staircases are to be avoided. Lifts may be introduced with advantage. In many college libraries in America (e.g. at Princeton) the circular form, with cases radiating from the centre, has been adopted success- fully. The spacious rotundas of the British Museum and that

of the Liverpool Free Public Library are good examples of the circular reading-room.

Mr Justin Winsor has devised an excellent plan for a library of one million volumes capacity (see ‘‘ Library Buildings,” in Report on Public Librarics of U.S., p. 465), and the same system might be applied to one much less extensive. Another distinguished American librarian, Mr W. F. Poole of Chicago, has made some novel suggestions on library architecture which have met with consider- able approval. He objects to the waste of space in the central portion of most large library rooms, to the difficulty of ventilating and heating them, to shelving books in galleries on the walls, to the destruction of bindings from gas and heat (‘‘ books cannot live where man cannot live’), to the excessive labour of procuring books from long distances, the insecurity from fire, the inconvenience of keeping many volumes (other than those of reference) in the public reading-room, and the unnecessary cost of the present system. ‘To remedy these defects a plot of land is required 200 feet square, and surrounded with open spaces. At the niiddle of the principal side may be placed the main building, 60 feet front and 75 feet deep, devoted to administrative and working purposes. The books will be stored, not in one central repository, but in a series of rooms thrown out ia wings from the central edifice, and

EE ES a et 1 Plans of most of the chief libraries of Europe may be scen in the Mfemoirs of Libraries of Mr Edwards (2 vols., 1859), and in the Katechismus der Bibliotheken- lehre of Dr Petzholdt (1871) ; the volumes of the Zibrary Journal contain repre- sentations of many new American libraries. 2 A recipe to make wood incombustible, and other suggestions, ar2 given by C. Walford in Afanchester Trans. Libr. Assoc., 1880, p. 65.

Heating.

Shelves,

Reading- room.

MANAGEMENT. |

extending round the four sides of the quadrangle with a vacant space in the middle. Each room is 50 feet wide, 15 feet high, and as long as convenient. Ten of these rooms will occupy the ground floor, so that, carrying the same construction four stories high, there will be forty different rooms in the whole structure. Each will be devoted to one large, or two or more small, classes of books. Alcoves and galleries are not to be permitted, but the books will be shelved on the walls or on double presses within reach. Every room will receive light on two sides, will be furnished with tables and chairs for readers, and provided with an attendant ; no general reading- room will therefore be wanted. Asa protection against fire, each room will be cut off by means of brick fire-walls extending to the roof, and access from one room to the other will be by a light iron corridor on the inside of the quadrangle. At the rear of the central building will be a lift for readers, and there will be staircases as well. In this way, on one story there will be about 25,250 square feet in the different wings, which, after deducting sufficient space for readers' tables, &c., will give about 20,200 square feet for books. As each square foot will shelve 25 volumes, each story will hold 505,000 volumes, or on the four stories 2,020,000 volumes. Oue of the front rooms (to hold 67,500 volumes) might serve as a circulating library. Mr Poole estimates the cost of such a building in America at $530,000, or complete with shelving and furniture $640,000. (See Library Journal, vi. 69 sg.) Inthe same volume, B 77 sq., is a description of the proposed plan for a new national ibrary building at Washington. In this scheme the architect has in view the centralization towards a circular reading-room, good light, the possible expansion of the library for one hundred years, accessibility to all parts, economical administration, and division into different fire-proof compartments.

Of the various systems for heating libraries open fire-places have the best appearance, are very safe, and best convey heat ; close stoves are the cheapest at first hand. Perhaps steam heating is the safest aud most economical for large buildings. Unprotected gas jets are very injurious to the books. Ifgas be used at all, the sun-light system or the Benham light is the best means of conveying away the fumes and heated air.

The electric light is used with great success at Liverpool and in the British Mugeum.

Bookcases and Shelves, Furniture and Appliances.1—F¥or presses and shelves, should wood be preferred, English oak or the cheaper deal (well seasoned) is the best material; or the presses may be made of iron and the shelves of slate or galvanized iron. At the British Museum the presses are all on one scale and all of the same model, —the standards being of galvanized iron, with holes for brass pins, which are so shaped that the space is altered by merely turning them half-way round. The shelves are also of galvanized iron, covered with leather, on wooden frames; movable pads covered with leather protect the books at either end from being rubbed, and there are leather falls to keep the dust out. In the Radcliffe iron bookcase, invented by Dr Acland, the framework is of iron, and the shelves of wood, faced with leather. It is 7 feet high, and stands on any floor-spacc 48 inches by 18 inches ; books are placed on both sides to the number of 500 octavos. Danner’s revolving bookcase is useful for reference books ; it is square, stands about 5 fect high, occupies no more space than a chair, and holds about 250 volumes. Economy of space is also a feature in Mr Virgo’s bookcase, in‘the front of which is a door, itself shelved, which, on being swung round, discloses another row of shelves behind. The Eastlake portable bookcasecan be taken to pieces, and is madc to stand against a wall. In providing for shelf room it is usual to allow about 110 square feet of shelving to 1000 volumes ; and in giving directions for presses and shelves it is well to have them planned upon a uniform scale. Perhaps the best supports for the shelves are Tonks’s movable shelf-fittings, consisting of two rows of metal strips, with oblong perforations at intervals of ? inch, in which are inserted small metal plates, The tops of reading tables, trays and barrows for carrying books, and such shelves as may be intended for heavy or choice books, should be padded. Very large volumes had better be kept flat in sliding trays. There is much diversity of opinion as to whether the fronts of the presses should be glazed or not, or whether they should be protected by wooden doors, curtains, or wire screens ; many librarians object to glass doors as harbouring dry rot, and to any opaque screen as concealing the books.

The arrangement of the reading-room of the British Museum furnishes a good example of perfcct supervision combined with every consideration for the comfort of readers. The tables are here arranged as the spokes of a wheel, with smaller square tables between them for large volumes. Each reader at the radiating tables has a separate place 4 fect 3 inches long, and is screened from his opposite neighbour by a division running along from one end to the other ; in front is a hinged desk, with racks, inkstand, and a folding shelf for books. The framework of each table is of iron, forming channels by which air is conveyed through screens at the top ofthe longitudinal divisions. A tubular foot-rail affords facility for warming the feet in cold weather. The catalogue-stands (with

GR ae mann 2 1 Details in the werks of Edwards and Petzholdt, the Library Journal, the publications of the Library Association, and of the Library Bureau (Boston, U.S.).

presses of special bibliographies near them) are placed in two concentric circles around the enclosure of the superintendent, who can thus observe every reader in the room.

A speedy supply of books is ensured by the use of the automatic Supply.

book-delivery contrived for the Harvard bookstore (of six stories) by Mr Justin Winsor. At the delivery-desk a keyboard shows the digits which combine the various shelf-marks ; andthe number of the book wanted, being struck upon it, is repeated at the floor on which the work is located, where it is sought for by an attendant and placed in a box attached to an endless belt, which carefully deposits it on a cushioned receptacle close by the delivery-desk.

Many English lending libraries find that a great saving of time Indi- and trouble both to officials and readers is made by the use of the

cators.

indicator for public reference. There are many varieties of this invention, but the main principle is a frame containing a series of small pigeon-holes, each numbered and referring by that number to a book ; when a volume is lent out, the borrower's card, &c., are placed in the pigeon-hole and signify that it is absent. This roughly describes the Birmingham indicator (Mr Morgan's) ; in that of Mr Elliot, the title of the book is pasted against each pigeon- hole; Mr W. H. K. Wright uses at Plymouth a system which serves as a catalogue and register of books lent as well; and Mr A. Cotgreave has improved the original idea by his indicator-book, a sort of ledger of the persons to whom each volume is lent, which is placed in the small pigeon-hole previously spoken of. The card- ledger of Mr G. Parr, used at the London Institution, is for the use of the librarians alone and not for the readers; it is applied to a borrowing system which permits several volumes to be taken away by the same person, and also acts as a register of borrowers."

For the purpose of stamping the name of the library on the books, Minor ap- &c., some persons prefer the embossing stamp, and some the ink pliances,

stamp now very conveniently made in india-rubber. Props, either to screw upon the shelves, or made of thick blocks of wood, or of tin folded at right angles, are useful for preventing books falling about in a slovenly manner. Reading cases are necessary for perio- dicals and choice bindings ; periodical cases are made conveniently of wood with strong leather backs. In order to keep the consecutive numbers of current periodicals and newspapers clean and in perfect order, some kind of temporary binder is required. The contents of the different shelves or recesses may be printed on labels made of leather or cloth. The " Van Everen"' printed numbers and letters for the marks on the shelves and the backs of the books are to be purchased at a small cost.

Classification and Shelf-Arrangement.—The defect of most classi- Classifica- ficatory systems, especially of those which profess to be particularly tion.

philosophical and logical, is that they are better adapted for a systematic review of human knowledge than for the arrangement of a miscellaneous collection of books. A small library will not require so extensive a scheme as a larger onc, and a popular library needs less minute classification than one for reference or for the use of more learned readers. Again, the classes which are best represented in the library, and its special or local collections, deserve more elaborate treatment than the classcs in which it possesses but few volumes. The same system cannot invariably be used in all respects both for the shelves and for the catalogue, as a book can have but one position in the presses, but the title may appear under any number of headings in different parts of the catalogue. or these reasons, the natural order should be followed as far as possible. Thatis tosay, the books should suggest their own classification, which should be made to harmonize with the requirements of the library, and the various classes should not be strained to fit some arbitrary method, how- ever logical in theory. As the title of a book is often an unsafe guide to its contents, no one should attempt classification by the help of the title alone. In vol. ii of Edwards's Memoirs of Libraries, he gives a number of schemes both on philosophical and on natural or practical principles ; and Petzholdt, in his Bibliotheca Bibliographica (Leipsic, 1866), has drawn up an account of no less than one hundred and seventeen different methods of classification, a number which could now be largely increased, as the practical ingenuity of American librarians alone has added many to the roll. Some of these schemes have been elaborated with great care, but, however intcresting on account of the useful hints they may now and then supply, most of them are useless either for the catalogue or the shelves. All thesc are systems to classify the whole range of literature, but there are many classified bibliographies and other guides useful for the scientific arrangement of special departments.*

Books are usually arranged upon the shelves either in order of (1) their sizes, (2) authors' names, (3) subjects, or sometimes (4) of accession, or by a modification of two or more of these systems. The arrangement by subjects is that which displays

2 See Oxford Trans. Lib. Assoc., 1879, p. 76; Afanchester Trans., 1880,

b (ecg pa ; Pr; POF aetnie: in the class of fine arts may be consulted the Bibliographie ee: Beaux-Arts (Paris, 1874-8), which the late M. Erncst Vinet left mneompe tS Te botany may be classified with the help of Mr B. D. Jackson's Guide ne iter i. ture of Botany (London, 1881). In the Memoirs of Libraries (ii.) may ye found a uscful classification for MSS., and further on an account of perhaps the best systems for prints and maps, being those of the Bibliotheque Nationale

most conveniently the richness or poverty of the collection. Although a library may possess the most complete of subject cata- logues, it cannot be considered in perfect order without classification on the shelves. In carrying out slielf-arrangement ample space should be left for additions, and in fixing upon the places of the bookeases those containing the works in most demand should be nearest the point of delivery. In some libraries the books are loeated without any classification, and the shelf marks are all in all. At Munich and many other Continental libraries there are thirty or forty classes, designated by single or double letters, and the books are arranged in sets of octavo, quarto, and folio in the different classes under the names of their authors, so that Macaulay's History of England would be found in the octavo alphabet under M of the class " history." Mr Richard Garnett sup- plies an interesting description of the system of classifying books on the shelves followed at the British Museum in the Trans. of Conf. of Libs, (London, 1878, pp. 108, 188). There are ten classes:— (1) theology, (2) jurisprudence, (3) natural history and medicine, (4) archeology and arts, (5) philosophy, (6) history, (7) geography, (8) biography, (9) belles lettres, (10) philology ; and the classes have five hundred and fifteen divisions. Periodicals, academical pub- lications, state papers, the Oriental departments, the Grenville Library, and the reference library are all distinct, but the principle of classification is practically identical. By allowing intervals

in the numbering of the presses space is allowed for new ones to contain additions, and as the different presses are alike in size, they may be shifted at will and no alteration of press-marks is wanted. Mr Edwards (Afem. of Libs., ii. 814) proposes a system for a public free library of upwards of thirty thousand volumes to be arrau ged under (1) theology, (2) philosophy, (3) history, (4) politics and commerce, (5) seiences and arts, (6) literature and polygraphy. A novel scheme, marked with many practical advantages, is the Amherst or Dewey system,! according to which the library is divided into ten classes, the first being a zero or general class, including bibliography, poly-graphy, general periodicals, &c., while'the sthers are philosophy, which is numbered 100; theology, 200; sociology, 300; philology,

400; natural scieuce, 500; useful arts, 600; fine arts, 700; literature, | 800; and history, 900. These classes are then separated again into :

nine special divisions of the main subject, preceded by a zero or general division. Hach of these divisions again has nine sections (preeeded by a zero). Thus 513 is the third section (geometry) of the first division (mathematies) of the fifth class (natural science). This is the classification or class number, and is affixed to every book and pamphlet belonging to the library. The zero in a class num-

ber has its normal power, and signifies a general treatise, so that |

500 is a book on natural science in general. The system was devised in the first instance for classifying and indexing, but it can also be used for numbering aud arranging books and pamphlets on the shelves. For this purpose the absolute location by shelf and book- marks is wholly abandoned, and the relative location by class and book-number used instead. Accompanying the class-number is the book-number, which prevents confusion of different books on the same subject. Thus the first geometry catalogued is marked 513°1, the second 513°2, and soon. The books of each section are all together, arranged by book-numbers, and these sections are also arranged in simple numcrical order throughout the library. The number 513°11 will therefore mean the eleventh book in subject 513, or the eleventh geometry belonging to the library.—A repre- sentative specimen of the philosophical

method is that devised by Dr W. J. Harris for the catalogue of the Public School Library

of St Louis, which is classed in a modified form of the Bacoman |

plan. The main classes are (1) science, ineluding philosophy,

theology, social and political sefences, and natural science and the | useful arts, (2) art, (3) history, (4) appendix, including polygraphy, :

eyclopedias, and periodieals, These main elasses are again divided into one hundred swhbelasses, many of which arc divided still further. Thus, under natural history, class 50 is zoology ; 50a, vertebrates ; 50a i, mammals, &c.-—The divisions Médecine and

Histovre de Franee in the great printed catalogue of the Bibliothéque |

Nationale are excellent examples of classification, 2

_ Every volume upon the shelyes should have a mark to indicate its position, One system is to designate each press by a number, each shelf by a letter, and if necessary, each volume on the shelf by another conseeutive number, so that 13 D 16 is the sixteenth volume on the fourth shelf of the thirteenth press. The principles underlying numbering systems as well as shelf-arrangement are discussed by Mr Melvil Dewey (see Library Journal, iv. they U5, LN. 191), and the combined system of numbering and arranging of Mr J. Schwartz, as well as his mnemonic system ‘of classification (ib., iti. 6 ; iv. 8), are also well worth attention. The new scheme of classification devised for the usc of the Boston Athenzum by

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1 See A Classification and Subject-Index for Cataloguing and Arranging the Books and Pamphiets of a Library, by Melvil Dewey, Amherst (Mass.), 1876,

2 A proposal for a new co-ordinative catalogue and subject-index is made by Mr Hy. Wilson in his contribution, ‘ Classification in Public Libraries,” to the Transactions, &c., of Library Association at Manchester (London, 1880, pp. 79, 155); and in the same work (p. 85) may be rcad some remarks on the various classifications used in reporting statistics of issues in the chief public free librarics.

[LIBRARY

Mr Cutter is also described in the Library Journal, iv. 284. A catalogue for the Winchester Library (1879) was prepared by Mr Cutter on the principles there detazied.

Many authorities strongly recommend that, instead of a fixed mark for the shelves, the location of books should be indicated by a running number or combination of letters and numbers; so that, although the books should not always remain in the same place, their relative position would be unaltered, and, while they could be found just as readily by means of the number, any quantity ot additions could be introduced without affecting the whole scheme.

In a circulating library it may be found convenient to designate each press by letter, and to omit to number the shelves from top to bottom, but number each volume consecutively. ‘The shelf-notation may be placed inside each volume or on a label upon the back.

Binding.*—The best binding is the cheapest in the end, since it Binding,

lasts longer under alleircumstances, and is always better treated by readers. Morocco resists wear and tear and the action of gas and heated air better than any other leather. Vellum is the most durable material, but it is not suitable for all purposes. Then follow in order of merit calf, russia, basil, roan, buckram, and cloth. Morocco should be used as much and russia as little as pos- sible. Buckram, linoleum, crctonne, leatherette, &c., have met with favour from time to time, but are not recommended. Olive, light brown, and red are said to be the most lasting colours ; then come dark blue and green, light blue and green.

Black is a lasting colour. Some persons assign a particular colour to each class of literature, but, as there are more classes than colours to suit them, such an arrangement consistently carried out can only lead to confusion ; besides, a want of variety on the shelves destroys at once the individual appearance which it is always desirable to give to each sct of books in order to make them easily dis- tinguishable. The council of the Library Association have sug- gested as a pattern for ordinary library binding that the volumes should be sewn ali along, with the first and last sheets overcast, ou strong cords, the slips to be drawn in ail along, and the backs made close (flexible); half-bound, with corners of same material; s:nooth cloth sides ; edges cut, sprinkled, and burnished, or, if so directed, top edge only cut, &e., the others trimmed and left with proof; end-papers of stout Cobb's paper, with cloth joints in quartos an folios ; lettered with author's name, short title, and date ; gilt fillets, but no other tooling ; two-page plates to be guarded so as to open out flat; all materials of the best quality, and the work to be done carefully. In making contracts some such specifica- tion as that suggested by the Library Association should be decided upon. Full instructions should always accompany work sent out, and a copy must be kept in a binding-register. Rare and valuable books demand special treatment and a special binder. The British Museum authorities have adopted a style of binding in half-morocco, with the leather coming only just over the back to act as a hinge, the sides whole cloth, the corners tipped with vellum.

How to deal with pamphlets is a troublesome question. At the Pamph- British Museum each was formerly done up separately in slight lets,

binding. This is certainly the best system, but out of the reach of most libraries from its cost. Failing this, the pamphlets eau be arranged in solander cases as they come in, and afterwards bound up in volumes according to size and subject, with the contents marked on the fly leaf of each. The rebinding of a MS. is to be avoided ; it is better to preserve the old cover and place the book in a case. Drawings and prints are best preserved in sunk mounts, and maps, charts, &c., should be backed with thin linen.

Practical Hints. —Collate every volume when it comes in, so as to Hints.

prevent binder’s imperfeetions ; remove plate-paper when the book is quite dry; strings and silk registers are to be avoided, as they tear the leaves ; preserve old bindings as far as possible, and do not permit book-plates, the names of former owners, and MS. notcs of any kind to be destroyed ; be eareful with metal clasps and corners ; let gilding be used sparingly ; do not hurry the binder overmuch, as he may retaliate by returning his work insufficiently dried and pressed ; be careful with letterings ; index dictionaries and works of reference on the fore edges ; bind up paper wrappers; never let a binder exercise his fatal proclivity to cut away full margins.

For the removal of grease and ink-spots, and the restoration of old bindings, prints, &c., consult L’art de restaurer les estampes et les livres (Paris, 1858) and La réparation des vieilles reliures (ib., 1858), both by A. Bonnardot, and Rouveyre, Connaissances néces- saires & un Bibliophile (Paris, 1880). To restore calf-bindings which have become impoverished, it has been recommended ® that they should be lightly washed with a soft sponge dipped in a pre- paration eonsisting of 4 oz. of the best glue, dissolved in a pint of warm water, to which add a teaspoonful of glycerin and a little flour paste. Should the state of the leather be very bad, a second

3 For an account of the history and practice of binding consult the article Booxsinpine (vol. iv. p. 41 sg.); also Marius-Michel, La Reliure Francaise artistique (Paris, 1880), and La Reliure Francaise depuis Vinvention de limpri- merie jusqu’& nos jours (Paris, 1881); La Reliure, ancienne et moderne, Paris, 1878; J. W. Zaehnsdorf, The Art of Bookbinding, London, 1880.

4 Monthly Notes of Lib. Assoc., vol. ii. p. 52.

5 By Mr C. P. Russell, Oxford Meeting of Library Assoctation, p. 100.

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Cata- logues,

dressing may be found necessary. The volumes must be rubbed with chamois leather when dry. Neat's-foot or olive oil has been suggested for the same purpose, but it ought to be uscd with a sparing hand. Much has been written about the effect of gas and heat upon binding.!_ The question is still undecided, but it seems likely that the deterioration of the leather is eaused more directly by the over-heated air, so that thorough ventilation, especially as regards the upper shelves, is most important for the well-being of a library. Morocco, vellum, and buckram resist this action best, and calf, russia, and roan worst. Professor H. A. Hagen has studied the various kinds of bookworms and other insect pests of librarians." Most libraries of the first class bind on the premises, and M. Hipp. Gariel of the Bibliotheque de Grenoble is persuaded, after a very careful inquiry, that any library which binds as many as nine hundred volumes a year will save largely by keeping up a binding establishment of its own.?

Catalogues and Cataloguing-—A library is useless. without a proper equipment of good eatalogues, wliich to be thoroughly efficient should be compiled upon a well-considered plan, carefully kept up to date, and made accessible to cvery reader. The variety of different catalogues is very great, and no one form can be adopted alike by libraries for study and those for popular reading, nor yet by those which combine the two functions in whatever proportions. As regards the amount of information necessary to be given, the titles of the books may be either short, or not more than a single line to each, as in the London Library Catalogue (1875); medium, or several lines to each, asin the Royal Academy Library Cataloguc (1877) ; or full, asin the Cataloguc of the Huth. Library, 5 vols. large 8vo (1880), where the title is copied in extenso and a quantity of bibliographical details are added.

The ehief questions to be answered by a catalogue.are :—1. Has the library a certain work by a certain author? 2. What has it by any p= author? 38. Has ita certain book of which the title only is known to the

inquirer? 4. Hasit a certain book of which the subject only is. known to the inquirer? 5. What has it ona given subject'. 6. What works in certain classes or languages has it? To supply this information, catalogues are arranged sometimes under the names of the authors in alphabetical order (1 and 2); or under the first words of the titles (3) ; or classified under subjects, whether in alphabetical or systematic order (4 and 5); or by a combination of two or more of these methods. A dictionary-cata- logue answers all six questions under the names of authors, the

cataloguer should be allowed to prepare a title exccpt from the very copy of the book whieh he is cataloguing.

In order to secure precision and uniformity in the descriptions of the books and in the headings under which they are placed, some well-considered code of rules is absolutely necessary as a guide to the cataloguer. All such rules are founded more or less upon those of the British Museum, printed in 1841, which have been followed

- with modifications by Professor Jewett (in the Smithsonian Report ' on the Construction of Catalogues, 1852), by Mr E. Edwards (Menvoirs

of Libs., 1859, vol. ii.), by Mr F. B. Perkins (in the American Pub- lisher, 1869), with many additions by Mr ©. A. Cutter (in his Rules Sor a printed Dictionary-Catalogue, 1876)," by the condensed rules of the American Library Association (Library Journal, iii, 12), and by the Library Association of the United Kingdom (as finally agreed. upon and printed in their Afonthly Notes, ii. 81). The authorities of the Cambridge University Library have also printed their rules. In drawing up a sct of rules the special wants of the library and the readers. should be first considered, and then the most suitable rules chosen from one or other of the schemes mentioned above. But when rules are decided upon, no alteration should be permitted during the compilation of the

catalogue, as bad rules uniformly followed are better than. good rules without uniformity.

Among disputed questions, that ef how best to describe the sizes of booksis perhaps the most difficult. What is wanted is a system that can be understood by every one, and which is capable of being applied to old as well as to new books.® For books printed before the introduction of machine-made paper about. the beginning of the eentury, the correct bibliographical size may be derived from the fold of the sheet, that is, roughly speaking, a quarto is a sheet folded four times, au octavo eight times,&c. The great variety of modern papers (a different scale of sizes being used in each country) renders. this method no longer available, and it seems generally admitted that some system of fixed measurements of heights to denote certain. sizes is wanted for library purposes. A report on the subject, giving details of three rival schemes, including that of the American Library Association, an ingenious adaptation of the ‘‘demy” scale paper, and one following the ordinary binder’s scale, may be found in 7rans., dc., of Manchester Meeting, 1880 (p. 11), of the Library Association. A committee of the same body subsequently devised a plan which endeavoured to embrace the different merits of all three.schemes, but it has not yet been gene- rally adopted.?

titles of books, the subjects and forms-of literature (7.c., essays, or French, German, &c.), which are arranged in one alphabet and connected one with the other by a complete system of cross-

Printed catalogues are doubtless costly, and they soon become out Printed of date, but they are much easier to consult than manuscript eata- volumes, and possess the great advantage that they admit of being logues.

references. A modified. form of short-title dictionary-cataloguc, with the names of authors, titles of books, and subjects in one alphabet, is a useful type fora popular library to adopt. No author- catalogue can be considered roualet without an index of subjects,* and every classified catalogue requires an index of authors, if alphabetical, and of both authors and classcs if systematic. An ideal catalogue would furnish

references under each name and subject to every work, part of work, or even magazine article con- tained in the library which illustrated it. This can rarely be attempted, but a near approach to perfection is shown by the new catalogues of the Boston Atheneum and the Brooklyn Mercantile Library ; the last is a model of thoroughness. It is becoming a laudable practice to give the contents of collected works and perio- dicals in catalogues ; aud good examples.of the value of annotations are the catalogues of the classes of history, biography, travel, and historical fiction. in the Boston Public Library.

In inaking choice of a form of catalogue the way is sufficiently

plain should the alphabetical system under authors be adopted, °

neither can there be much cause: for discussion in fixing upon an alphabetical subject-catalogue ; but, should it be decided to compile a systematic subject-catalogue, the question becomes a much more serious one. A subject-index of some sort is an indispensable sup- plement to any catalogue merely arranged under authors. The refer- ences had better be strictly alphabetical in form ; for instance, a work on ants should be indexed under that word and not under the gencral heading of insects or entomology; but there is no rcason why there should not be cross references under the larger to the smaller head- ings. In an appendix to Mr Cutter's article on ‘‘ Library Cata- logues ” ® there is a descriptive. list of more than a thousand printed catalogues of American libraries, among which many useful types might be selected. All the printed catalogues of European libraries which were published before 1840 are mentioned in Vogel's Literatur curop. off. u. Corporations-Bibliotheken (Leipsic, 1840).

Librarians should take a share in the compilation of their cata- logues at any sacrifice of time and trouble, for by no other means can they obtain so exact an acquaintance with their collections. No _ } See Conf. of Lib., ly. 255, 435 5 v. 50, 213.

2 Id., iv, 251, see also p. 376, 448.

3 La Bibl. de Grenoble, Paris, 1878, 8vo, pp. 19, 20.

- Of sueh an index a very eomplete specimen may be seen in the Catalogue of

the Royal Medical and Chirurgical Society’s Labrary, 1879, 3 vols, 8yo. 5 See U.S. Report, p. 577

1878, p. 232; also Library Journal, i. 124; iii. 64,229;

used away from the library. On the whole the balance of convenience is strongly in their favour, and few libraries of any importance fail to print as soon as they ean. For frec public libraries printed catalogues are absolutely necessary, and they are extremely useful in those of a more learned or special charactey.

As regards the form of catalogue most suitable for library reference, card-catalogues are used comparatively little in England, but are found to act satisfactorily in many American. libraries. They possess many peculiar advantages, among others being the facility with which titles may be added, withdrawn, or rearranged. Readers do not object to turning over the cards, as the labour is shortened by indexes standing above the rows ; and there are many contrivances to prevent the unauthorized removal of the titles.?°

It is obvious that, if a universal catalogue of printed literature existed, it would be only necessary for each library to mark in a copy the particular works it ehanced to possess, Such a plan on a small scale has bcen adopted in many cathedral and college libraries, where: a copy of the Bodleian printed catalogue is used for the purpose. A satisfactory stcp in the direction of co-operative cataloguing has been made by Mr Henry Stevens in his proposals for a bibliographical clearing-housc,!! which shall supply exact copies of the title pages of rare (and eventually of more common) books by means of photography. Mr Stevens has now many thousands of these ‘‘ photograms ” of titles, which are all reduced to a, uniform scale, with the full titles. and collations added in ordinary type. They are very convenient for eard-catalogues.

Thus far the wants of readers have been principally considered; but librarians ought to possess two other kinds of very important catalogues, which they must keep up in their own interests. The first is the accessions-catalogue, or record of every book, part of book, pamphlet, or periodical as it comes in; and the second the shelf-catalogue, or stock-book of the library, a register of the con-

6 Prefixed to the printed eatalogue of letter A. The rules, which were com- piled by Sir A. Panizzi, Th. Watts, J. Winter Jones, J. H. Parry, and E. Edwards, have been eonveniently arranged by Mr Nichols in Handbook for Readers at the British Museum, 1866, and have been reprinted with additional rules by Mr Hy. Stevens in his Catalogue of the American Books in the British Museum.

7 Seeond part of Report on Public Libraries of U.S., Washington, 1876. ’

8 See C. Evans, in Library Journal, i. 58; and W. Blades, in Afonthly Notes, i259:

9 See Monthly Notes. i. 61, 62. ‘ ;

10 The Bonnange and other systems of eard-eatalogues are deseribed in Report on Public Libraries of U.S., pp. 555, &e.

11 Transactions of Conference of Librarians, London, 1878, p. 70.

tents of every press and every shelf. These tell the source and date of every addition, and enable all the books to be checked at any time. A novel form of accessions-catalogue is that of the Liverpool Free Public Library, which is a sort of large photographic album to show printed titles of accessions in alphabetical order ; loose sheets are laced into the body of the catalogue to provide for any number of additions as quickly as possible. In the same library the titles of new books are also pasted upon blocks arranged in a frame for the information of readers. Adminis- Administration.—In any library which manages its own

financial tration, matters, however small, all accouuts should be as carefully kept as those of a trading establishment. In the same way a periodical stock-taking should be made by ineans of the shelf-eatalogue. It is a great convenience to display recent accessions for a short time in some place put apart for the purpose. A recommendation and complaint-book are both useful. The rapid and efficient supply of books is greatly promoted by requiring that all demands should be made in writing and not verbally. The books should be carefully dusted from time to time by experienced persons ; and the leaves of all new books, &c., should be cut by the library staff.

In issuing and taking note of books lent, either the ledger or the slip-system may be used, or a combination of the two, something like a shelf-catalogue. Accounts are kept either against the borrower, against the book, or against time ; the first, with the ledger system, may be well for small libraries, but in larger institu- tions the slip-system must be resorted to, and it is better to keep the accounts against the books, with perhaps a ledger-index of borrowers. Where more than one volume is lent at a time a small card is sometimes placed in a pocket in each book ; the card, whether marked with borrower's name, &c., or not, being retained as a voucher, as in the ‘‘ card-ledger ” spoken of on p. 587, which is on the slip-system with the account against the borrower. The special feature of the ‘‘card-ledger” is that no writing whatever is required. It is necessary to introduce some device for overdrawn or reserved books,

Besides furnishing the materials for reading, it is now recognized that a popular library has also the function of indicating the method of readingand study. A collection of well-chosen books suitable for girls and boys is now a good feature in many English free libraries. At the Providence Public Library, Rhode Island, Mr W. E. Foster issues daily notes on current topics and events, with detailed references by which the subject may be illustrated by the resourcesof the library ; more complete special lists, e.g., on Herbert Spencer, Irish landlord and tenant, &c., are also issued from time to time. Library lectures are now given at several free libraries in Engand, but, to make these efforts distinctly useful in adding to the good work of the institution, they

should be restricted to lectures on books and courses of reading, so that, by illustrating certain works or depart- ments of the library, these lectures may gradually lead readers to a more careful consideration of literature. Aimless and purposeless reading is the bane of a free public library, and it should be the desire of its authorities to do what can be done to induce people to use with due circumspection books of a higher class and of a more use- ful and informing character. The admirable catalogue of history, biography, and travel of the Boston Public Library, with its sugges- tive notes and illustrations, had the effect of lowering the reading of fiction from 74 per cent. to 69 per cent. In the same library even the reading of novels has been elevated by the catalogue of English prose fiction arranged on the same plan.

Experience shows that in all that relates to such questions as preliminary forms, age of readers, days and hours of admission, Sunday-opening, aecess to catalogues, shelves, and librarians, fines, loans of books, guarantees, number of volumes allowed, time of reading, &c., a liberal tendency is always beneficial both to the library and the public. aa Fe ee of an outbreak of fire, some well considered plan should

, ed upon. Extincteurs and hand-pumps should be kept ready against for usein central positions. The means for extinguishing fire should fire. be familiar to the members of the staff, who should all be practised

in fire-drill, in order that each may know his proper place and duty in case of emergency. Full directions should be suspended in conspicuous places. In the case of fire breaking out after library ae it aed | ouuay understood where the keys are to be ound, what officials should be sent for, and i for use within the building. iS eee Lib- Librarians.—Without insisting upon quite so wid rarians, subjects as did F. A. Ebert in his Pisin tes Bibliothekars (oan 1820), one may expect the librarian of a grcat library to be a man of liberal education, and specially endowed with sympathy with books and reading ; a practical acquaintance with bibliography including paleography, and bibliology, is also necessary, as well as with the theory and practice of library

management. To be thoroughly qualified, a librarian should have had the practical experience of library-work which it is impossible to obtain from any amount of book reading. Besides this, he ought to be a man of ousiness habits and a good administrator. These acquirements imply qualifications of a somewhat higher

character than may perhaps be necessary in all public libraries; but some knowledge of languages and literatures, bibliography, bibliology, and generallibrary management should be possessed by any person holding the chief position in the administration of any library, however small. As regards the qualifications of the librarian of a popular institution or of library-assistants, it may be useful to give the outline of a plan recently proposed by a committee of the Library Association for their examination (see Monthly Notes, vol. ii). There should be a preliminary examination, chiefly in the subjects of a sound English education, special attention being paid to English literature ; proficiency in the elements of one or more classical or modern languages would be specially indorsed upon the certificate, one language to be necessary. The suggested subjects for the preliminary examination are—arithmetic, English grammar and composition, English history, geography, and English literature. After having been engaged in library work for not less than one year, a second-class certificate might be awarded to any librarian or assistant who should pass a satisfactory examination in English litera- ture, especially of the last hundred years, some one other European literature, principles of the classification of the sciences, elements of bibliography, including cataloguing and library management, — a cataloguing knowledge of at least two languages besides English to be necessary. A first-class certificate Would be given, after a satisfactory examination, to a librarian or assistant of at least two ycars’ experience, for an advanced knowledge of the subjects last mentioned, with the addition of general literary history. A cata- loguing knowledge of at least three languages would be necessary for the higher certificate, —an acquaintance with

any others, as well as proficiency in any subjects (not more than two in number) offered by the candidate, being specially indorsed.

Women are gradually making their way in libraries. At Man- chester and elsewhere they are successfully employed as assistants ; and in several other places in England the chief charge of the library is maintained in a very efficient manner by a lady. In the United States the majority of the librarians are ladies (at the Boston Public Library no less than two-thirds of the staff), and many of the most accomplished cataloguers are of the same sex.

The first general meeting of librarians took place at New York, September 15 to 17, 1853, upon an invitation signed by Professor C. C. Jewett, Mr W. F. Poole, and others ‘‘ for the purpose of conferring together upon the means of advancing the prosperity and usefulness of public Tiratties, aud for the suggestion and discussion of topics of importance to book collectors and readers.” About eighty persons attended, many questions were debated, and the suggestion to form a permanent association mct with considerable favour. Nothing came of it, however, and twenty-three years had elapsed when, having in view the Centennial Exhibition of 1876, a second meeting was convened on October 4 to 6, at Philadelphia, which was attended by one hundred and two Americans and one English representa- tive. Atthe Philadelphia conference of 1876, the American Library Association, which has since done so much good work in practical librarianship, was founded. In October 1877 a conference of librarians was held in London, under the presidency of the late Mr J. Winter Jones, and attended by two hundred and sixteen librarians and others, including representatives of the French, German, and Greek Governments, all the chief libraries of the United Kingdom, as well as certain of those of the United States, Belgium, Denmark, France, Italy, and Australia. Altogether one hundred and forty different libraries sent representatives, and nearly the whole field of library-science was reviewed at the dif- ferent sittings. The Transactions and Proceedings of the Conference of Librarians (London, 1878) is the title of the official report of the mceting. The chief result of the conference was perhaps the foundation of the Library Association of the United

Kingdom, of which the ‘‘ main object shall be to unite all persons engaged or interested in library work, for the purpose of promoting the best possible administration of librarics; it shall also aim at the encouragement of bibliographical research.” Monthly meetings of the assoeiation take place at the London Institution, and the members hold an annual conference in some one or other locality, where the different libraries are inspected, various questions of library economy are discussed, and new library appliances are exhibited. Full reports of these meetings have been published ; Monthly Notes are also issued. Every important British library is now represented in the association, which numbers over 360 members.

Guides to Selection of Books. —As it is not only necessary to find out Selection. |

the best treatises on given subjects, but also to decide upon the respective merits of different editions and even of different states or copies of the same edition, au acquaintance with bibliography or the science dealing with the technical features of books and MSS., and with bibliology, or that which deals more especially with their literary aspect, is to be expected in those forming a library.?

1 The article BistiocRrapny (vol. iii. p. 651 sg.) will afford a general idea of the immense extent of this literature; in addition to the speeial works there men- val ee may be made to Sabin’s Bibliography of Bibliography, New

ork,

Acquisi- tion.

‘public documents.

MANAGEMENT. |

So necessary is bibliography in library selection that Dr Cogswell, as a preliminary step to collecting books for the Astor Library, formed a bibliographical apparatus of five thousand volumes to help him in his

arduoustask. To assist librarians and collectors in their choice, among earlier works may be mentioned that of G. Peignot, Manuel du Bibliophile, ou traité du choix des livres, Dijon, 1823, still interesting on account of the descriptions of the favourite reading of eminent men. Catalogue of my English Library (Lon- don, 1853) is the title of a little volume prepared by Mr Henry Stevens to assist in getting together the best editions of the standard English authors. ‘The idea was followed on a larger scale by M. Hector Bossange in Ma Bibliotheque Francaise (Paris, 1855). The best guide for ordinary purposes, but far from perfect, is The best Reading: hints on the selection of books, on the formation of libraries, public and private, by F. B. Perkins (4th ed. New York, 1877). The list is restricted to books now in the market ; prices are appended. The titles are very brief, and are arranged in an alphabet of subjects ; and a selection is appended of the chief French, German, Italian, and Spanish authors. A new edition of Porter’s Books and Reading appeared in 1881. Current German literature is well looked after in G. Schwab and K. Kliipfel’s Wegweiser durch die Literatur der Deutschen (4th ed., Leipsic, 1870), with several supplements. The leading literary reviews, as well as the publishers’ trade journals, will guide in the acquisition of the books of the day. ‘he careful cataloguing and excellent descriptive notes in the New York Publishers’ Weckly are good examples of what book committees are glad to have before them. An examination of the authorities quoted by authors of repute will frequently help in deciding upon the merits of rival treatises, and the printed catalogues of well-chosen libraries are also useful. To his practical little treatise, Free Libraries and Newsrooms, Mr J.D. Mullins appends a list of books he considers desirable for free public libraries, and to form the basis of a collection of high- class fiction, Mr F. B. Perkins has drawn up a list of the best hundred novels procurable in English (Library Journal, i. 166). The Coming Catalogue, about which we hear now and then from America, will contain selected lists of books, with short notes.

Acquisition of Books.Public libraries must look to purchases as their chief means of getting the books they want. The best system is to draw up lists of the desired works and editions, and circulate the lists among the leading booksellers, who will notify the prices and conditions of

the copies they may be able to supply ; announcements of books wanted can also be inserted in the book- sellers' trade organs. Second-hand booksellers will willingly furnish their catalogues, which, if they are not required to purchase from, are always useful for reference. It is usually more convenient to give commissions for books at sales than for the librarian to attend in person ; but an occasional visit to the auction rooms will give much information as to current prices of books, a matter which, coupled with frequent visits to the shops of second-hand booksellers and the diligent study of their catalogues, will be carefully attended to by the capable librarian. The works of Brunet, Lowndes, and Graesse may also be consulted for the prices of old books. It is perhaps needless to add that the state of condition and binding makes a great difference in the market value of copies of the same book. Libraries will frequently dispose of their duplicates or surplus copies to other institutions at a low price. For new books, periodicals, newspapers, &c., special terms may always be arranged with local tradesmen.

From time to time the Governments of Great Britain, France, and the United States have had under consideration various schemes for the international exchange of books upon a systematic basis, but the proposals were never carried into effect, and it was left to the public spirit of a French gentleman, M. Alexandre Vattemare, to devise and carry out for some years a large scheme for the inter- change of books among the chief public institutions of Europe and America. In 1853 M. Vattemare was able to state that one hundred and thirty such establishments had participated in the benefits of the system, but unfortunately it gradually fell off. Earlier than 1851, however, a similar agency was in full working order at the Smithsonian Institution, and it has been kept up with efficiency to the present time. The institution acts as a medium for the exchange of their publications among the chief learned bodies and other public institutions of Europe and America, and undertakes the cost of receiving and sorting the parcels, and the renumeration of the agents in the chief centres of the Old World to whom they are sent, and by whom they are distributed free of charge. The corresponding societies are only required to deliver their parcels without expense at Washington.

On several occasions the United States Congress has passed special Acts directing the exchange of Government publications with those of other countries, and in 1848 the joint committee on the library was authorized to appoint agents for the exchange of books and As the scheme did not appear to work satis- factorily, the Act was repealed four years later. But since 1867 it has been ordered that fifty copies of all documents printed by cither

House of Congress or by any Government department be placed

with the joint committee on the library, to be exchanged for foreign works. It is most unfortunate that this enlightened policy is not followed by the English authorities.

Many learned bodies which issue their proceedings willingly pre- sent them to libraries, and authors find tis a useful means of spreading a knowledge of their works, when they are not of sufficient public interest to ensure a large or rapid sale. Library committees may often secure valuable additions by a discreet application ; indeed, privately printed works and local publications (unless given spontaneously) are almost only to be had in this manner.

Many valuable works are issued at the expensc of Governments. It might be naturally expected that these should be sent, free of charge, to all public libraries of any importance. In England, however, this is not done. In countries where the public libraries are subject to the minister of public instruction, as in France and Italy, more is done in this direction, especially as regards expensive volumes. In 1853 a select committee of the House of Commons recommended that parliamentary papers should be sent free of charge to free public libraries, but the recommendation has never been carried out.

In America official publications can be obtained without charge by public institutions from the secretary of the interior upon the order of a

senator or representative, but the system is said not to be in a satisfactory condition.

Many valuable English Government pnblications, notably the state papers and chronicles, and the fine art handbooks of the South Kensington Musenm, are easily to be had at less than the cost of production, and parliamentary papers are neither inaccessible nor highly priced. Although there is no fixed rule as to distribu- tion, some of the departments may now and then be induced to present copies of their publications on being applied to in a proper manner.

The privilege of demanding copies of all books, periodicals, news- Copy- musical publications, maps, and prints, when published, right Copyright Acts, is enjoyed by Acts.

papers, under the provisions of the various only a very few, generally only by one, of the chief national libraries in each country. This system has grown up under the different enactments of the censorship of the press. The first Act of Parliament passed in England to enjoin printers to present their publications was that of 14 Charles II. c. 33, which directed that three copies should be sent, one to his Majesty's library, and one to each of the universities of Oxford and Cambridge. By 8 Queen Anne c. 20 the number was increased to nine, and by the 41 George III. c. 107 to eleven, viz., to (1) the Royal Library ; (2) University Library of Cambridge ; (3) Bodlcian Library ; (4) Edinburgh University Library ; (5) Glasgow University Library ; (6) King's College Library, Aberdeen ; (7) University Library, St Andrews ; (8) Sion College Library, London ; (9) Advocates' Library, Edinburgh ; (10) Trinity College Library, Dublin ; (11) King's Inns Library, Dublin. This was in force till 1835, when by the 6 & 7 William IV. c. 110 the privilege was abolished as regards six of the eleven libraries mentioned, and a yearly grant, estimated at £3028, allowed in compensation. The Act under which five libraries, viz., the British Museum, the Bodleian, the Cambridge University, the Advocates', Edinburgh, and Trinity College, Dublin, now receive the copyright books is 5 & 6 Vict. c. 45. (Sec Copy- RIGHT, vol. vi. p. 358.)1

As instances of the variety in practice in different countries, it may be mentioned that in France the Bibliotheque Nationale is entitled to a copy of every book, &c., printed within the dominion of the republic ; in Belgium and the N etherlands one copy must be sent to the respective national libraries in order to secure the advantages of copyright; in Spain the Biblioteca Nacional of Madrid enjoys the privilege of one copy ; in Portugal two copies are claimed, one by the Bibliotheca Nacional at Lisbon, and one by the Bibliotheca Publica of Oporto ; in the United States a copy of every work must be sent tothe library of Congress ; the]mperial Library at St Petersburg receives two copies of every book printed in Russia ; by the Brazilian law the Biblioteca Nacional of Rio de Janeiro is entitled to a copy of everything published within the municipality ; and in Mexico two copies have to be dclivercd to the National Library.

Authorities.—There have been many books written about library-management; a eomplete list of those published down to about 1865, with eritical notes, is given in Petzholdt's Bibliotheca Bibliographica (Leipsie, 1866). Among recent treatises the valuable works of Mr Edward Edwards— Memoirs of Libraries (1859, 2 vols. 8vo), Free Town Libraries (1869), Libraries and Founders of Libraries (1865), Lives of the Founders of the British Museum (1870, 2 vols. 8vo)—should be in the hands of all librarians. Petzholdt's Katechismus der Bibliothekenlehre (Leipsic, 1871) is a practieal little volume. The report of the Bureau of Education on Public Libraries of the U.S. (Washington, 1876, 2 parts 8vo), besides giving an exhaustive account of all the American libraries, also includes a great variety of valuable information on library eeonomy. The six volumes of the Library

Jo i ss useful for praetical librarianship; it is a well ted Geriodical, Polltiolat's Aien ; bibliographical eharacter. The

i riodi i iger is of amore : edited periodical. Petzholdt's Anzeiger is Tide e greaideal of 1 teresting

different publications of the Library Assoeiation inc matter.

1 In the recent Repert of the Royal Commission mendation is made that the privilege should in futu Museum alone.

on Copyright, 1878, a recom- re be granted to the British

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THE WORLD.

LISnmatiazs

TABLES OF THE PRINCIPAL LIBRARIES THROUGHOUT

In compiling the following tables officials of each of the libraries have been personally applied to, and in most instances the infor- mation has been supplied by them. An attempt has been made to give particulars of all libraries of general or special interest in the United Kingdom. As regards those of other countries the list has been usually limited to those of 30,000 vols. and upwards, with a

few exceptions. collections of that

extent.

In India and the British Colonies there are few

The abbreviation L. A. in the United Kingdom signifies that the library is under the Public Libraries' Act ; 0. b. 1. means open

by leave. I. GREAT BRITAIN AND IRELAND. rg s Special Character and No. of Vols. | yo whom ae 5 Remarks. Accessible. iS Print. |MSS. ABBEY TAVISTOOK : Public Lib. 1799 10,000 Sub. ABERDEEN: Free Ch. Coll. Lib. Theol., Hist., Rabbin. 20,000 Mem. Mechanics' Inst. /1824/Gen., Eng]. and Fr. 16,000 Mem. University Lib. Gen. and Scient, 90,000 | 400 |Mem. ABERYSTWITH: Municipal Free Lib./1874 L. A. 1,710 Open. University College. hip Wales. 3,000 Mem. AIRDRIE: Free Public Llb. |1856'L. A. 4,500 Open, ALDERSHOT: | Prince Consort's L.|1859 Silt, ti ee also} 4,500 Officers, one at Dublin. ARBROATH + Public Library. 1797 13,000

Sub. ARMAGH: Public Library. 1771 Foundation L. 17,000} 150 |Open. ASHTON: Mechanics' Inst. {1825 7,500 Sub. ASTON MANOR: Free Public Lib. |1877/L. A. 6,253 Open. AYR: Public Library. 1870) 6,926 8 (Sub. BANGOR : Free R. Room and)1873\L. A. 1,500 Open. Museum. BATH; Royal Literary and)1825|Ref., Sct. ; Agriculture. 10,000} 30 |Sub. Scientific Inst. BEBINGTON: Mayer Free Lib. 1866 Polit. and Relig. excluded; 28,000 | MSS. |Open. maintained by Mr Mayer. BEDFORD: , Lit. and Sct. Inst. |1832 12,000 Sub. BELFAST: Queen's Coll. Lib, [1849/Gen., Orient. 35,797 Mem. , (0. b. 1) BILSTON : ee Free Library. 1873'L.A.; branch reading-room| 8,000 Open. BIRKENHEAD: Free Public Lib. | 1855/L. A. 60,000 Open. BIRMINGHAM : Frec Library. 18—|Gen., Shakesp., Birmingh.;| 100,000 } 200 /Open. L. A.; 5 branches. Friends' Library. {1829/Gen. 2,600 Mem. Library (Union St.).!1779|Gen, 45,000 Sub. Queen's Coll. Lib. |1828)Gen. 2,000 Mem. BLACKBURN: Fr. L. and M. 1862|L. A. 26,000 Open. Stonyhurst Coll. L,/1794 a cat. of early} 50,000 | MSS. |Mem. books. Bouton: Public Library. 1853/L. A.; section for sub-] 46,466 Open. cribers; 2 lending de- partments, BRADFORD: Free Public Lib. 1871\L. A. 32,056 Open. Lib. and Lit. Soc. |1774/Gen, 17,500 Mem. BRIDGWATER : j Free Library. 1860)L. A. 2 Be ee HILL: aa vee: ree Library. I875/L. A. BRIGHTON: baa ila Free Library. 1875/Gen., Class., Med., Shake- 26,000 Open. Speare ; L. A. BRISTOL ' : i Bristol Baptist Col- |1770|Gen., Theol. ; incunabula;| 12,000 | 200 /Qpen. lege, English Bibles, incl. only

Cathedral Library. Free Library. Mus. and Library

BURSLEM : Free Library (Wedgwood Inst.). BuRY: Co-operative Pro- vision Society's L. CAMBRIDGE: Cavendish Coll. L.

16th|Burnt 1831, except 1000 vols.

Gcn., Bristol; Acts adopted 1875 ; 3 branches.

1772\Gen., Hist., and Top.;

Chatterton MSS.

1863/Gen., Sci.; L. A.

1860/18 newsrooms ; branch libraries,

2 small

188-|Small.

Name.

| Founded.

CAMBRIDGE—contd. | Christ’s Coll. Lib. Clare College Lib. Corpus Christi Col-

lege Library. Downing Coll. Lib.‘1800 Emmanuel Coll. L. Fitzwilliam Mus. L. 1816

Special Character and Remarks.

16th and 17th cent. Lit.

Clas., Hist., Theol.; MS. coll, notable,

Largely Law and Hist.

Theol. and Lit.

Art, Archl.;

engravings and music.

Gonville and Caius‘1348 College.

Jesus College Lib.

King’s Coll. Lib. c.‘1441

Magdalene Coll. Newnham Coll. L. |1872 Pembroke Coll. L.

Peterhouse Library ./1418 Philosophical Lib. |1881

Public Free Library }1853 Queen’s Coll. L. ¢.|1448 Ridley Hall Carr. L.}1881 St Catherine’s Col.

St John’s Coll. Lib,|1624

Sidney Sussex Col. |1598 Taylor Library,

Trinity Coll. L.

Trinity Hall L. ,|1350|/Law;

1816

14—

Union Society. University Library

CANTERBURY: Dean and Chapter Library.

Pr. cat. of the MSS., 1849.

Gen., Clas., Theol.; 300 Oriental MSS.

Pepysian Library.

2 branches.

Pr, cat, in preparation.

Gen., Theol.

Sci. Tran., &c.; based upon Lib. of Cam. Phil. Soc. Geu., Camb., Shakespeare;

L. A; 1 brch. Chiefly Clas., Theol. Theol.

Gen., early prints; pr. cat. of MSS., and rare books. Chiefly Theol, and Clas,

17—|Math. and Sci. ; separately

administered.

c.|1546/Gen., Theol., Clas. ; Hare

and Capell collections,

original desks to which the books were chained.

Gen.

Copyright privilege.

Gen., Div., Hist.; Early English Bibles.

Free Lib. and Mus,‘1800/L. A.

St Augustine’s Col. CARDIFF:

Free Library. 1862 CARLISLE :

Cathedral Library.

CHELTENHAM: Cheltenham Lib. (1863 CHESTER: Cathedral Library. Free Public Lib. (1876

CHICHESTER: Cathedral Library. |1660

i

| Library Society.

1794

CLITHEROE:

Free Library. 1878 CoRK:

Queen’s Coll. Lib. {1849

Royal Cork Inst. [1807 COVENTRY :

Free Library. 1868 DARLASTON :

Free Library. 1876 DARWEN :

Free Public Lib. 187] DERBY:

Free Lib. and Mus,1877 DEVONPORT:

Free Public Lib, [1881 DONCASTER :

Borough Free Lib. |1869 DUBLIN:

King’s Inns Lib. [1787

King and Queen’s/1711

Coll. of Physns, Law L., Four Courts/1816 Mechanics’ Inst. {1838
National Lib. of 1re-|1877

land. Pub. L., St. Patrick’s|/¢, W. &M. Royal Coll. of Sci.|/1867

(freland). Royal Coll. of Surg.|/1784 Royal Dublin Soc. {1731

Royal Irish Acad. Trinity Coll. Lib.

1785 1602

DUNBLANE: Bibl. Leightoniana.|1684

1701

DUNDALK: Free Public Library|1858

1848 Theol., Missions,

L. A.; sci. and art school,

Gen., Sei.

Monastic. L. A.

Gen., Clas., Div.; earlier coll. destroyed 1642; cat. pr. 1871.

L.A.

Gen., Orient.

Gen., Sci., Hist.

L. A.

L. A.

L, A.

L. A.

L. A.; mus. in connexion.

L, A.

Leg., Gen.

Med., Sci.; founded by Sir Patrick Dun’s will.

Law.

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LIBURNIANS were a people who at different times were prominent on the Adriatic coasts. They were originally, one cannot doubt, one of the homogeneous Illyrian tribes (see Intyr1a). Living in a barren rocky country along the north-eastern coast of the Adriatic, they devoted themselves to the sea, and were the chief navigators of the Adriatic in the early period. They settled on the coast of Picenum, where the town of Truentum was always counted Liburnian ; and the Greek colonists found them at Corcyra and other places. They were pressed on all sides

by other races, but were still a powerful people in the time of Scylax (Scyl., p. 7). The islands that lay along the coast were peopled by them and called by their name. They were a race of pirates, who used swift boats with a large sail. These Liburnian ships became famous when the Romans adopted them in several of their naval wars. The heavy and lofty ships that had been developed by the later Greek states proved unequal to the light and swift Liburnian boats. The country was incorporated by the Romaus in the province of Dalmatia.

LIBYA was a geographical name by which the Greeks usually designated Africa, with the exception of Egypt, although sometimes the continent was thought to be divided between Libya and Ethiopia. Libya enters into the sphere of ancient history only in so far as it came into contact with the civilized races of antiquity, and the present article will

| of Libya.

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touch this point only; the natural features and the ethnology willbe found under other headings (see AFRICA). The native tribes came several times into collision with the kings of ancient Egypt. In the reign of Rameses the Great and his successor they invaded the Delta, and various expeditions were made by the Pharaohs into the outlying country, on the south particularly (see Ecypr). Herodotus mentions one important expedition sent out by Pharaoh Necho (610-594 B.c.), which started from the Red Sea, circumnavigated the continent, and reached the mouth of the Nile after three years' absence. The truth of the tale has often been doubted, but one circumstance in which Herodotus hiniself expresses his disbelief, viz., that as they sailed west they had the sun on their right hand, has in modern times been generally accepted as proving that the voyage was actually made.

The Pheenician colonies on the north coast, Utica, Car- thage, &c., beginning between 1000 and 800 3.c., established a powerful and civilized empire in a hitherto unknown part Their trading expeditions gave them a wide acquaintance with the geography of the country, even with the Atlantic coast as far almost as the equator; but the contempt with which the Roman conquerors treated the literature of the Carthaginians allowed much valuable material to disappear. The historian Sallust, when preetor of Numidia, was still able to use the Punic records which

he got interpreters to translate for him (Sall, Jug., 17); and fortunately one record of an exploring voyage along the west coast, preserved in a temple in Carthage, was translated by some Greek traveller and is still

available (see Hanno). For all that is known of the Carthaginian rule in Libya see CARTHAGE.

Greek mariners must have visited Libya at a very early period, for the edible lotus of the northern coast is men- tioned in the Odyssey.

In the latter part of the 7th century Bo, the Greeks began to colonize the north coast. Between the Cartha- ginian territory and the borders of Egypt they planted a number of cities, and the Pentapolis of which Cyrene was the chief was among the richest and most flourishing of all the Greek states (see CYRENE). When the Persians invaded Egypt they made some attempt to extend their empire over Libya; but the expedition of Cambyses (about 525 B.c.) was too unfortunate to encourage them to further efforts. The camel was introduced into Egypt under the Persian rule, and from this time it became easier to make long journeys over the Libyan deserts. Herodotus shows much knowledge of the Sahara, and it is clear that his account must be founded on the reports of traders and caravan guides well acquainted with the desert route. Under the Macedonian kings know- ledge of Libya was much extended ; they sent exploring expeditions for scientific purposes into Abyssinia, while growing wealth and luxury caused a continually increas- ing demand for the ivory, spices, and other produce of Libya. In the period 500-200 Bc. it seems certain that commerce was maintained with the countries beyond the Sahara in at least two ways—by the Carthaginian ships trading along the Atlantic coast, and by the over- land route across the desert to the Nile. The Roman conquest of Carthage closed the former route, Polybius indeed was commissioned by Scipio to explore the country, and sailed a long way down the west coast ; but the Romans themselves had not the maritime enterprise required for such voyages. The record which Polybius wrote for his friend Scipio is quoted by Pliny and Stephanus. Sallust also collected information about the country, and under the emperor Nero an exploring expedition was sent into Abyssinia. The Romans added more to the knowledge of Libya in other ways,—by a better organization of the province and increased facilities of travel and trade, by the frontier wars against surrounding tribes, and finally by the expeditions sent directly into the heart of the country to procure wild

animals for the amphitheatre. The passion of the Roman populace for seeing strange animals slaughtered in the public games was gratified by the emperors and magistrates. Enormous numbers of Libyan wild beasts were exhibited in the amphitheatre; even hippopotami and alligators are mentioned. One Roman officer, Maternus, penetrated at least as far as Lake Chad. The Periplus of Arrian preserves a record of the trade along the east coast of Libya in the 1st century. In these ways a fairly accurate knowledge of northern Libya was obtained, and Ptolemy could, in the 2d century, construct a good map of Africa as far south as 11° N., though his idea of the shape of the continent further to the south is less accurate than that of Herodotus.

See Ritter, Erdkunde, i. ; Heeren, Historical Researches, or in the German Jdeen, vol. ii. ; and the geographical works of Forbiccr Kiepert, Bunbury, &c. o

LICATA. See Axtcata, vol. i. p. 574.

LICHENS (Lichenes) may briefly be defined ag cellular perennial plants, furnished with a vegetative system containing gonidia, and with a reproductive system consisting of female thecasporous fruits and male spermo- gonous organs. They constitute a distinct class of cellular cryptogams, intermediate between alge and fungi, to

both of which in some respects they present certain affinities. By the earlier authors they were regarded as being Aerophyce or terrestrial alge, while of recent years they have been viewed by some writers as being Ascomycetous fungi. From both of these, however, they are sufficiently distinguished and separated by the special structure of their thallus, by the presence of certain

immediate principles proper to their tissues, and by their

mode of life and nutrition. Their relations to these neighbouring classes, and their true systematic place, will be best elucidated on considering their structure and its bearings upon some recent speculations,

Structure of Lichens.

A complete lichen consists of a nutritive and vegetative system termed the thallus, and of reproductive bodies borne upon it in the form of apothecia and spermogones. Occasionally, however, there is no thallus present (¢.g., Sphinctrina, various Lecidex, Hndococcus), in which case

the fructification is parasitical on the thalli of other lichens. –

I. Vegetative System.—The thallus is very variable in external form and colour, as also in internal structure.

1. In external form it presents the following modifica- tions. (a) The foliaceous thallus, which may be either peltate, z.e., rounded and entire, as in Umbilicaria, &c., or variously lobed and laciniated, as in Sticta, Parmelia, &c. This is the highest type of its development, and is some- times very considerably expanded. (6) The fruticulose thallus, which sometimes is filamentose, as in Hphebe, and may be either erect, becoming pendulous, as in Usnea, Ramalina, &e., or prostrate, as in Alectoria jubata, var. chalybeiformes. It is usually divided into branches and branchlets, bearing some resemblance to a miniature shrub amongst the Phanerogamia. An erect cylindrical thallus terminated by the fruit is termed a podetiwm, as in Cladonia. (c) The crustaceous thallus, which is the most common of all, forms a mere crust on the substratum, varying in thickness, and may be squamose (in Sguamaria), radiate (in Placodium), areolate, granulose, or pulveruleut (in various Lecanore and Lecidex). In its pulverulent state it is either the rudimentary or the abortive condition of many species. (d) The hypophieodal thallus is often concealed beneath the bark of trees (as in some Verrucariz and Arthonizx), or enters into the fibres of wood (as in Aylographa and Agyrium), being indicated externally only by a very thin film or macula, To this may also be referred the evanescent thallus which is denoted solely by gonidia sparingly scattered on the stone or wood (as in some Calicied and Lecidex). This is the simplest form under which lichenose vegetation occurs. These two latter forms of thalli may be either determinate, 7.c., of a definite shape with a distinct margin or boundary, or effuse, t.e, spreading extensively over the

substratum with no visible limits. ‘The differences in these forms are no doubt connected with differences in the chemical composition of the thallus. In colour also the thallus externally is very variable. In the dry and more typical state it is most frequently white or whitish, and almost as often greyish or greyish glaucous. Less com- monly it is of different shades of brown, red, yellow, and black. These various colours do not originate from any colouring matters contained in the cells themselves, but, according to investigations made by Nylander (see Flora, 1879, p. 558) they depend upon such as are deposited in the granulations and cellular walls, whence they appear on the epithallus. In the moist state of the thallus these colours are much less apparent, as the textures then become more or less translucent, and the epithallus usually presents the greenish colour of the gonidia (¢g., Parmelia Borreri, Peltidea aphthosa, Umbilicaria pustulata, and pulverulent Lecidex).

2. The internal structure of the thallus presents two principal modifications, viz., the stratified thallus, having its different elements 4 (hyphz and gonidia) ar-

‘ranged in layers, and the unstratvfied thallus, in which these different elements are confused in a homogeneous tissue.

A. The stratified thallus. —On making a vertical sec- tion this is scen in a folia- ceous lichen to consist of three layers constituting a cortical, a gonidial, and a medullary system, to which in the case of many crusta- ceous lichens is to be added a fourth, viz.,a hypothalline stratum,

(a) The cortical stratum S 5 occupies the whole of the ex- e625 Pn ‘5 fe0'S7E ternal surface of filamen- @ o,°C? ,,o.,0°% Q tose and fruticulose lichens, 2 2. 9-2,9a%° O_2

both the upper and under cafe Ef : : Fria. 1.—Section of Stratified Thallus surfaces of some foliaceous of Ricasolia herbacea. a, cortical

and squamulose species o~ St initie mail pel a io stratum; 06, gonidial stratum; c, medullary stratum.

upper surface of crustaceous lichens. It usually consists of a colourless cellular tissue, in which the cellules are closely compacted and form a pseudo-parenchyma. Its most superficial portion, termed by Nylander the epithallus, a sort of cuticle, is amorphous, often morc indurated and coloured. In some lichens (¢.9., Collema) it is the only portion of the cortex present, while in pulverulent crustaceons thalli it is entirely wanting. (0) The gonidial stratum is situated immediately beneath the cortical stratum, and consists usually of greenish spherical cellules, or of granules destitute of a cellular membrane. It is not always continuous, but is often interrupted, the gonidia occurring in dissociated masses. Sometimes it is situated on the upper part of the medullary stratum, in which case the gonidia are arranged either between or amongst its exterior elements. In general its limits may readily be distinguished from the others by its peculiar colour. – Various important matters relating to the gonidia will more ‘appropriately be afterwards discussed at length. (c) The medullary. stratum is more variable in its constituent elements, but, being always colour- less, is easily recognized. It presents the three following princi- pal modifications. (a) The ‘woolly medulla consists of simple or branched filaments, which in foliaceous species are loosely intcrsected and entangled, and in fruticulose species are more or less congluti- nated, assuming a longitudinal direction, and constituting, as in Usnea, a kind of solid axis for the support of the thallus. (8) The cretaceous medulla occurs only in crustaccous lichens, and is generally characterized by its tartareous appearance. It is more compact than the preceding, and consists for the most part of molecular granulations often intermixed with octahedral crystals of lime, and presenting but few traces of filamentose elements. (~~y) The celZulose medulla consists of a tissue of angular, rounded, or oblong cellules containing gonidia in their interior or in their interstices (¢.g., Pannaria, Endocarpon). In some species (e.g., Verrucaria fuscula) the cellules have a tendency to reunite into filaments and then to separate again into rows of cellules. (d) The hypothailline stratum is the inferior one of the thallus and that upon which the other strata are developed, thongh it is not always visible,~~

~~and is sometimes entirely wanting. It usually presents itself under a twofold aspect, viz., the hypothallus and rhizine. (a) The hypothallus proper, which is immediately developed upon the prothallus (i.¢,, the filaments of the germinating spore), is a hori~~ zontal stratum consisting of interlacing filaments or of elongated, short, or rounded cellules, and is sometimes of a white or whitish colour, but usnally dark or blackish. In many crustaceous lichens it is represented only by a black or dark-coloured border limiting the thallus (e.g. Lecidea geographica, &c.). (B) The rhizine consist of vertical rhizoid fibrille, usually branching and tufted at their extremities, blackish or greyish in colour, rarely white, which occur on the lower surface of foliaccous lichens. They consist of several filamentose elements which are most frequently articulated and agglutinated (e.9., Parmelia, Physcia), or sometimes simple and then always articulated (¢.g., Sticta). It is to be observed that the hypothallus and the rhizine serve merely as bases of attachment for the lichens to the substratum, and do not in any way aid in its nutrition,

B. The unstratified thallus.-—This occurs amongst the Lichenacei (which, however, are most frequently stratified as above), and in

various species belonging to the inferior genera, which have a pul- verulent or hypophlcodal thallus. In these the constituent elements are more or less mixed together, though the gonidial stratum generally remains distinct, and is often visible when the others are absent. It is, however, the families of the Byssacei and Collemacei that are more especially characterized by an unstratified thallus, Here the cortical stratum is chiefly represented by a greenish (in Collema), rarely brown (in Synalissa, &c.), non-cellular epithallus, or in others (Leptogium) by a thin stratum of angulose cellules dis- tinct from the other elements of the thallns. The gonidial granules are also disposed in a different manner to those of the Lichenacei, In the majority of the Collemacct they are strung together monili- formly, and distributed without order in a gela- tinous pellucid sub- stance; while sometimes they are agglomerated into small groups, and situated for the most part next to the epithal- lus. In Ephebacci they are not moniliformly arranged, but are tuni- eated or involved in a gelatinous cellulose stra- tum. The rest

of the ; thallus consists of the ‘ medullary system (ex- cept in Ephebacci, in which there is no me- dulla), and is composed of tubular or hollow filaments, with roundish cavities containing the gonidial granules, and imbedded in the gela- tinous substance, which very readily water. There are a few lichens in which there is no trace whatever of

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Fie. 2.—Section of Unstratified Thallus of Collema conglomeratum, with Moniliform stratification, as the Gonimia scatterel amongst the Hyphal

genus Cenogonium, in Filaments.

which the entire thallus is composed of filamentose membranous elements, and the peculiar family of the Myriangiacet (doubtfully, however, referable to lichens), in which it is equally cellulose throughout.

In addition to the hyphal and gonidial anatomical elements which thus enter into the structure of the thallus, there is another to be noticed, which, however, is to be regarded rather as an immediate principle. This is the molecular granulations, which are extremely small and (in form) irregular corpuscles, 0°001-0°002 millim. in diameter, and visible only when very highly magnified (300-400 diameters). They occur in all parts of the thallus, especially in the younger cellules, from the epithallus to the hypothallus, being especially abundant in the medulla of crustaceous species, In the epithallus they are variously coloured according to the colours which it presents, but in all other parts they are colourless. They occur also in the apotheca, in the epithecium, the thece, and the spores, and constitute the famous ‘‘ micro- gonidia” of Dr Minks. By the application of sulphuric acid many of them are transformed into small acicular crystals, and in the spores they are frequently agitated by a Brownian movement.

We may here also, in connexion with the vegetative system of lichens, refer to certain peculiar excrescences which are some- times presented by the upper or under surface of the thallus. Of these the principal are the following. (1) Soredia are pulveru- lent eruptions on the cortical stratum, varying in form, being rounded or diffuse, and either are scattered upon the upper surface of the thallus or border its margins. They are of a lighter colour than the thallus, and consist of a mass of gonidia and of molecular granulations intermingled with filamentose elements. They occur in many fruticulose, foliaceous, and crustaceous lichens, and their protrusion through the cortical stratum is owing most probably to an excessive development of the gonidial element. Occasionally also they appear on the disk of apothecia (in Pertusaria), which they render abortive, and in this case constitute the pseudo-genus Variolaria of older authors. When detached from the thallus they are capable under certain favourable circumstances of giving rise to new plants, and thus act the part of bulbils in the Phanerogamia. It is no doubt by their means that many species which are never found in a fertile state (e.g., Thamnolia vermicularis) are propagated. (2) Cyphelle are small, urceolate, pale excavations which al abundantly on the under surface of many species of Stictet. T 1ey are generally naked, but are often also pulverulent or sorediiferous,

in which latter case they are called pseudo-cyphelle. Their physio-logical function is not detinitely known, but they are most likely connected with the nutrition of the plants. (3) Jsidia constitute an exuberant condition of some foliaccous and crustaceous thalli.

They consist of elevated, eoralloid, stipitate excrescences, which |

are sometimes branched, and which are always of the same colour and texture as the thallus itself. This isidioid eondition in erustaceous thalli is the basis of the old pseudo-genus /sidiwm, which is merely an

anomalous state of some species of Pertusaria. Isidia have the same functions as the soredia, and serve as pro- pagula. (4) Cephalodia are orbicular and flattened or globular tubercles of a peculiar texture which occur on the thallus of many species belonging to different genera. They are usually epigenous, as in Stereocaulon, Usnea, Leeanora gelidu, Lecidea panzola, &c. In a few species, however, they are hypogenous, as in Peltidea venosa and Psoroma euphyllum, while in various Stictet, Nephroma expulli- dum, &c., they are endogenous, forming pyrenoid protuberances on the lower surface. Recently Nylander has detected both epigenous and hypogenous cephalodia on Psoroma arenarium and Lecanora allorhiza. They are of a paler colour than the rest of the thallus, from which they differ also in structure, being confusedly eellulose, and containing gonidial granules. According to Th. M. Fries (in Flora, 1866, p. 19) they are only morbid excrescences eaused by algals intruding themselves under the cortex ; but this is at once refuted by the fact of their forming constant characters of so many different species occurring in various situations. In these they

evidently constitute normal organs, the use of which, however, is |

nnknown.

Il. Reproductive System.—This consists of apothecia or the female organs, of spermogones or the presumed male organs, and probably also of pycnides or a secondary kind of fructification.

1. The apothecia, like the thallus, are very variable in external form and colour, as also in their internal structure. In external form they present three principal modifications, viz., (1) disciform (or gymnocarpous), in which the shape is that of a disc (as in all the higher genera) ; (2) nacleiform (or angiocarpous), in which the shape is that of a rounded tubercle with an apical ostiole (as in Zndocarpon, Verru- caria) ; and (3) peridiiform, similar in shape to the preced- ing, but closed, with no ostiole (as in YZhelocarpon, Endococcus). The last two are but little variable in figure, and consequently do not in this respect admit of different designations. The disciform apothecia, however, present various shapes, of which the following are the

principal :—(a) peltate, which are large, rounded, without any distinct thalline margin (e.g., Usnea, Peltigera) ; (6) lecanorine, or scutelliform, which are orbicular and sur- rounded by a distinct, more or less prominent thalline margin (e.g., Parmelia, Lecanora), having sometimes also in addition a proper one (e.g., Zhelotrema, Urceolaria) ; (¢) lecideine, or patelliform, which are typically orbicular, with only a proper margin (e.g., Lecidea), sometimes obsolete, and which are occasionally irregular in shape, angular or flexuose (c.g., Lecidea jurana, L. myrmecina), or complicated and gyrose (eg., Gyrophora), and even stipitate (e.g., Bzomyces) ; (d) lirelliform, which are of very irregular figure, elongated, branched or flexuose, with only a proper margin (¢g., Aylographa, Graphis, &c.) or none (¢9., some Arthoniz), and are often very variable even in the same species. It may be here observed that young disci- form apothecia are more or less nucleiform. In colour the apothecia are extremely variable, and it is but rarely that they are concolorous or subconcolorous with the thallus (e.g., Usnea, Ramalina). Usually they are discolorous, and may be black, brown, yellowish, or also less frequently rose-coloured, rusty-red, orange-reddish, saffron, or of various intermediate shades. Occasionally in the same species their colour is very variable (eg., Lecanora metaboloides, Lecidea decolorans), while sometimes they are white or glaucous, rarely greenish, pruinose. Lecideine apothecia, which are not black, but otherwise variously coloured, are termed bratorzne.

The two principal parts of which an apothecium consists are the hypothecium and the theciwm.

LICHENS

(1) The hypothecium, which corresponds to the hypothallus, is the coneeptacle of the apothecia. It is composed of cellular tissue, generally very dense, and often presenting an indistinct stratitica- tion. This tissue may in general be distinguished from that of the neighbouring parts of the thallus by its cellules being smaller, more compact, and differently coloured, though in some instances (as in certain Pannariz) the limits are not determinable. In the apothecia of such genera as Calicium, Beomyees, &c., the hypothecium is

composed of hollow cemented filaments arranged longitudinally and constricted into a stipe for the support of the fruit. The hypo- thecium in disciform apothecia is usually termed the exeipulwm proper, while in nucleiform apothecia it is termed the pyrentum, and in peridiiform apothecia the peridium. When the pyrenium quite covers the nucleus it is said to be entire, dimidiate when it covers only the upper portion. The hypotheciu is either colourless or dark, or reddish or yellowish, according as its cellules are tinged.

(2) The thecium, or as it is more frequently termed the hymeniwm, is that part of the apothecium which contains the organs of the fruit, viz., the thalamiwm and the thecee, which are placed perpendicularly to the hypothecium. It is penetrated by an amyloid substance, eolourless and very greedy of water, termed the hymeniat gelatine, formed of the lichenine, which becomes bluish or wine-reddish when tinged with iodine. The thecium itself corresponds to the gonidial- medullary stratum, while its superficial portion, termed the epithe- cium, eorresponds to the epithallus. (a) The thalamium generally consists of paraphyses which are erect colourless filaments arising from the hypothecium, and whose function is to aid in the expulsion

| of the spores by the pressure which they exercise upon the thece.

They are of nearly equal height, closely placed together, usually very slender, though slightly variable in thickness, frequently articulated, and rarely branched or anastomosing. Internally they are hollow and filled with protoplasm, which sometimes is separated into little globules. Their apices are generally coloured, in most instances dilated, sometimes clavate, and are cemented together by gelatin. They are frequently confused together ; occasionally they are but little evolute ; while in many of the Pyrenocarpet they are entirely wanting, though in these the ostiolar filaments of the hypothecium have sometimes been mistaken for them. (b) The thece are large,

oblong, cylindrical or ovoid cellules or vesicles containing the spores, and are usually more or less attenuated towards the base. In size and shape they vary considerably in the different genera and species according to the size, =

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number, form, and ar- rangement of their spores. ‘They differ also in the saime species, within certain limits, according to age, the young theca being more slender than those which are older. In some genera which have very large spores (¢.9., Varicel- laria, Pertusaria) the thece are distended in proportion, and gene- rally present a saccate or oblongo-ventricose form. The theca itself is a thin membranous ;’

eellule, the walls of Frc, 3.—Vertical Section of Apothecium of which are at first of Physcia partetina. a, paraphyses; 6, an equal thiekness thece with bilocular spores; ¢, hypo- throughout, butin pro- thecium.

eess of development

they become eauaally thinner, except at the summit, where they re- tain their original thickness. In some species the wall is remarkably thick at the apex (¢.g., Arthonia), and in others it is invested through- out with a kind of external cuticle (e.g., Pertusaria). The theca are resorbed after the expulsion of the spores ; though where their walls are extremely thin (as in Calieiwm) they are ruptured and disappear at a very early stage. The spores are the special reproductive organs of lichens, and are produced in the thece by free cell-forma- tion, i¢., by the separation and subsequent condensation of the protoplasm of the fully developed theca around certain points in its interior, corresponding in number to that of the spores to be formed. After the formation of the external spore-wall has taken place, the spores have a definite outline, and may consist of only one eellule or loculus (simple spores), or may be divided by one or more trans- verse partitional membranes (septate spores). Sometimes the loculi are restricted to the two ends or poles of the spore (one in each) and are said to be polari-bilocular, the two loculi being occasionally united by a longitudinal tube. At other times the transverse parti- tions are further divided by several longitudinal partitions, in which case the spore is said to be mwrali-divided, from the resemblance it then bears to the stones ina wall. The contents of the spores are

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a homogeneous protoplasm, molecular granulations (often abundant), and a pale-yellow oily substance, which in the fully developed spore often becomes condensated into one or more globules, visible generally near its ends or in the middle. The number of the spores in each theca varies very much in different species, being in most lichens 8, occasionally 6, 4 or 2, or rarely only 1. In some species, however, they are 20-100, when the thece are said to be polyspored, In form they are also very variable, the principal shapes assumed by them in order of frequency being ellipsoid, fusiform, oblongo- cylindrical, spheroid, and acicular, with several intermediate forms. They are still more variable as to size, being smallest in polyspored (c.g., Lecanora fuscata, &c.), and largest in monospored species (c.g., Pertusaria communis, &c.). The largest spores of all are found in Varicellaria amicrosticta, where they are 0°225-0°030 inil- limetre long, and 0°095-0°115 millim. thick. As to colour, they are either colourless (white, nearly hyaline or pale yellow under the microscope), or colowred (brownish, or brown, or blackish), while im Spherophoron there is also a bluish-blaek superficial pigment. The spore-wall varies in thickness, and is typically eomposed of two strata, the outer of which is termed the epispore and is coloured, while the inner is termed the endospore and is colourless, gelatinous, and generally less distinet. Notwithstanding that in these respects the spores are so variable in different specics, they are when mature remarkably constant in the same species, so that their characters afford valuable specific diagnoses. Apparently it is only those lichens which germinate from spores that occur in a fertile coudition.

2. The spermogones, which are the presumed male organs of reproduction, at once differ in appearance from the apothecia in being very minute corpuscles. In many cises their outline is invisible to the naked eye, unless the thallus has been previously moistened, when they appear as minute points or papilla. When magnified they externally bear a resemblance to the apothecia of the Pyreno- carpet, but internally, on microscopical examination, they are seen to differ essentially from these. In form they are uucleiform, round, or oblong,

and are either sessile on the surface of the thallus, or more or less immersed in its sub- stance, or sometimes enclosed in prominent thalline verruce. Usually they are simple, though occasionally two or several become confluent or aggregated into little groups. They almost always occur on the same thallus as the apothiecia, or rarely on different thalli (e.g., Hphebe pubescens), so that lichens are consequently moncecious and dicecious. In colour the spermogones are black or brown, or concolorous with the thallus itself. They are composed of two parts,

viz., a shell or conceptacle and a nucleus.

(1) The conceptacle, which is analogous to the hypothecium of the apothecium, is composed of a tissue formed of very smal] cellules, which are cemented together and have thick walls. The ostiole at its summit is generally similar to that of nucleiform apothecia, and in the case of entirely immersed spermogoues is the only portion visible.

(2) The nucleus consists of the sterigmata and spermatia, and of a mucilaginous substance (the spermatic gelatin) in the cavity between them, which very greedily imbibes water and aids in the expulsion of the spermatia. Sometimes also there are present in the nucleus a few elongated, articulated, and occasionally branching filaments intermixed with the sterigmata which are comparable witb the paraphyses of the apothecia (¢.g., Ramalina). (a) The sterig- mata are elongated cellules filled with a colourless fluid, and are attached to the interior face of the conceptacle growing from it con- vergently towards the centre, and often nearly filling its entire cavity. They present two important modifications, viz., simple stcrigmata and articulated sterigmata or arthrosterigmata, both of which may become somewhat branched. When arrived at maturity they possess the faculty of producing from their apices or also from the articuli the spermatia, one at a time, though many in succession, as may be inferred from the immense number of them lying in the cavity of the nucleus. (b) The spermatia are very small, slender, eolourless corpuscles, which at first appear as minute protrusions on the apices of the sterigmatic cells.

They subsequently become eniomesst elongated, and, on reaching maturity, detach themselves

rom the sterigmata and lie free in the cavity of the nucleus, till in wet weather they are expelled through the ostiole of the spermo- gones. In form they present two principal modifications, viz., acieular and ellipsoid, of which the former, the more frequent, is tather variable. They may be slightly fusiformi-inerassate at one apex (¢.g., Usnea), or at both apices (e.g., Parmelia), or they may be cylindrical and straight, the most eommon shape, or cylindrical and areuate (¢.g., Roceella). The spermatia of arthrosterigiata are cylindrical and straight, but slightly thickened and obtuse at the

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apices. In size they also vary, though more in length than in thiek- ness, the arcuate spermatia being sometimes very long (0°040 milli- metre). These differences in form and size are often very useful in the discrimination of species, just as the two types of the sterigmata are sometimes of great service in the distinction of genera. The sper-

Fig. 4.—Vertieal Section of a Spermogone of Parmelia physodes, showing the Sterigmata and Spermatia.

matia frequently exhibit a Brownian movement, but they possess no faculty of germination, their functions, as generally acknowledged, being the fertilization or fecundation of the spores. That the spermogones are rightly presumed to be the male organs of repro- duction may legitimately be inferred alike from their relation to and their antagonism with the apothecia. In the former respect their position on the thallus relatively to the apothecia is similar to that of the sexual organs in other classes of plants; while in the latter respeet spermogones are plentiful on thalli destitute of apothecia, and on those with apothecia are much more sparingly present. The manner, however, in which the spermatia impregnate the spores has not yet been definitely ascertained. Most probably, as suggested by Nylander (in Syn., p. 40, note 1), the spermatia do not exercise any direct influence on the female organ in the hymenium, but their fecundating

influence is rather exercised on the prothalline elements of the growing thallus. M. Stahl indeed has recorded and illustrated (Beitr. zur Entwick. der Flechten, 1877) the result of certain researches on Collema microphyllum, in which he supposed that he had detected sexual organs in the shape of an ascogonium and a trichogyne, regarded by him asa kind of carpo- gonium. These observations, however, have not been confirmed by subsequent researches on the same or any other species of Collema, while his attributing to the hyphe a faculty of ‘‘contortion” or spirally coiling themselves, which from their nature they do not and cannot possess, is calculated to invalidate all that he otherwise observed and depicted.

3. The pyenides are minute, dark-coloured pyrenodean conceptacles which occur on the thalli of various lichens, especially such as are crustaceous. In external appearance they resemble to some extent the spermogones, from which, however, they at once differ in their internal organization. They consist of simple filaments composed of narrow (often short) cellules, termed basidia, bearing on their apices bodies called stylospores, which are colourless, usually oblong, but variable in form and size, and filled with organic matter (in part at least oily) similar to the spores. Each basidium produces only a single stylospore, which, unlike the sper- matia, has a germinative property. Their occurrence in lichens was first pointed out by Tulasne, who showed their affinity to certain analogous fruits (Diplodia, Phoma, Septoria, &c.) in various thecaspored fungi, and regarded them as supplementary or secondary sporiferous reproduc- tive organs. Considering the number of parasitic Jungillr

which frequently occur on lichens, it might be supposed

that the pycnides in reality belonged to the same category. .

From their constant occurrence, however, on the same species, and the evident correlation between them and the accom- panying fructifications, as also from the resem- blance of their stylo- spores to the spores of the apothecia, there are good grounds for adopting the

conclusion come to by Tulasne. in ae ie Fic. 5.—Pyenides of Peltigera rufeseens. eet a, basidia; b, stylospores.

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states of Peltigera canina and P. rufescens, where they lave often been mistaken for spermogones, which in this genus have not yet been detected. Pycnides occur also in Lecidea vermifera, and abundantly in L. tantdla, in Habrothallus, in several species of Strigula, in Spilonema revertens, and will probably be yet observed in other lichens.

The Gonidia of Lichens,

In view of the important place occupied by the gonidia in the structure of lichens, and of the discussious that have recently taken place concerning them, they require to be considered somewhat in detail in order that their real nature and relation to the hyphe, or the thalline filaments, may become apparent. The gonidia are sphe- rical, ellipsoid, or variously rounded cellules, with thin, colourless walls composed of cellulose, coutaining chloro- plyll (or a subsimilar colonring matter), homogeneous or granulose, with generally a solid nucleus in the centre. As to the origin of the chlorophyll, it may be observed in passing that this is the same in lichens as in other crypto- ganiic plants, e.g., mosses and Hepatice, in which it occurs, tle only visible difference being that gonidia often occur as discrete cellules. The gonidia increase by binary (very rarely by ternary or quarternary) division, the nucleus also dividing into two portions, each of which forms the centre of a secondary gonidial cellule. In the gonidial stratum, where they are arranged between the radicles of the hyphe, their division necessarily proceeds only slowly, but in ecorticated thalli, leprose and others, in which they are free, they are readily multiplied by repeated division. In gonidia isolated from the thallus of some species belonging to Cladonia, Evernia, and Physcia, zoospores have been detected by M. Famintzin and M. Boranetzky (see Ann. Sc. Nat., 1868, p. 137), and, although Nylander failed to perceive such in subsequent experiments (Flora, 1877, No. 23), he adds that it is possible they may be generated in free gonidia (7.¢., in unstratified thalli), which could not be the case in gonidia closely surrounded by

thalliue filaments. The subject will well repay further investigation. Other matters relating to the character and relations of the goni- dia will be best elucidated by considering the forms which they present, and their origin in the thallus,

I. The Forms of the Gonidia.—

Nylander in the Pore, loe. eit., Meet ‘ae frst adneheaten sition and classification of them have been given. According to the views there propounded, gonidia in their wider acceptation include three very distinct types :—(1) Hugonidia (or gonidia proper), which are involved in a distinct cellular membrane, and are usually bright green ; (2) Gonimia (or the gonidial granules already mentioned), which are naked, pale greenish, glaucous greenish or bluish; and (3) Gonidimia (or Leptogonidia), which are intermediate between the two preceding, smaller, and of an oblong form. Of these the dis- tinction between eugonidia and gonimia is fundamental, and of ‘so

great weight that lichens seem to present a twofold parallel series” according to the presence of the one or the other in their texture,

These two different anatomical elements, as observed by Nylander, have a certain biological analogy with the blood globules in animals, and similarly afford absolute characters. ‘The principal forms pre- sented by these three kinds of gonidia are the following. 1. Eugonidia consist of—(a) Haplogonidia, the most frequent, simple, of a protococcoid form, or sometimes glomerulose (as in granuloso- leprose thalli) ; (b) Platygonidia, being depressed and variously membranosely connated gonidia (Syngonidia), as in some foliicolous species (e¢.g., Platygramma phyllosema) ; (e) Chroolepogonidia (or Chrysogonidia), containing chlorophyll and orange grains (endo- chrome) in the same cellule, more or less similar to Chroolepa (as in Gyalecta ehlorobwa, Arthonia pruiosa, Platygrapha periclea, Ver-

rucaria tnsiliens, and the genus Thelopsis) ; (d) Confervogonidia,

somewhat resembling Conferve, and forming the chief element of the thallus of Cenogoniwm. 2. Gonidimia are smaller than gonidia proper,

with the wall of the cellules less distinct. They occur in Peltidea, Solorina, and Nephroma expallidwm. To these belong

also hymenial gonidia, which are often very minute, and are present .

in the thalamium (destitute of paraphyses) of various Pyrenoearpet (e.g., Verrnearia pallida, V. wmbrina, and V. hymenogonia), rarely of Arthoniw as in A. echroolepida. 8. Gonimia (including the gonimia of Cephalodia) consist of—(a) Haplogonimia, which are somewhat large (very large in Phyllisewm), and either simple, or two or several aggregated ; (b) Strogonimia, which are scytonemoid or sirosiphoid gonimia, distinguished by the gonimia being tunicated, and are characteristic of the family Ephebaeei ; (ey Hormogonimia, the most common form, smaller, moniliformly arranged, and con- tained in syngonimia, especially characteristic of the family Collem- aeei, whence Collema (or Nostoe) itself, according to Nylander, is to be considered but as a single syngonimium ; (ad) Speirogonimia, which are similar to the preceding, but are not moniliform, with the syngonimia subglobose, smaller and more. scattered, as in Ompha- larva and Synalissa. It will be perceived from the above that many of these forms are more or less similar to ‘‘ gonidioid ” alge, though, as we shall presently see, they are not identical with these.

IJ. The Origin of the Gonidia.—By pre-microscopic authors this was a subject necessarily ignored, and indeed it is only within the last thirty ycars that it lias becn investigated by lichenists. The earliest theory as to their origin was that propounded by Bayrhoffer (Einiges ub. d. Liehenen und deren Befraehtung, 1851), confirmed by observations of Speerschneider (Bot. Zeit., 1853, &c.), and sup- ported by Schwendener (Untersuch. ib. d. Fleehtenthallus, 1868). This was to the effect that the gonidia derived their origin from the hyphe (7.e., the thalline filaments), in the way succinctly detailed by M. Fries (in Scand., 1871, p. 7, where it is fully endorsed). “The hyphe,” he sdys, ‘‘ are not only elongated into filaments, but also put forth short branchlets, the terminal cell of which is gradu- ally dilated, becomes subglobose, and is at length filled with ehlorophyll (or a subsimilar matter); in a few that (terminal cell) is changed into a gonidium, and

then by varied division germinates other gonidia.” For several years this theory was accepted at second-hand by most authors who referred to the subjeet, though a different origin of the gonidia, presently to be noticed, was indi- eated by the celebrated Tulasne so early as 1852, in his “‘ Mémoire sur les lichens” (Ann. Se. Nat.). The erroneous nature of this theory was well pointed out by Schwendener, who (Die Algcntypen d. Flechtengonidien, 1869) very correctly affirmed that the actual development of a gonidium from the terminal cell of a hypha had not been observed, though, strange to say, he had previously him- self observed this phenomenon. Not being able otherwise to account for the origin of the gonidia, and following up one of two alternatives put. forward by De Bary (Morpholog. und Physiolog. der Pilze, Fleehten, &c., 1865, p. 291), he promulgated the hypo- thesis now familiarly known as Schwendenerism. The conclusion to which De Bary came on noticing the resemblance between the gonidia of Collemacex and certain alge was as follows :—‘‘ Either the lichens in question,” he says, ‘‘are the perfectly developed states of plants, whose imperfect forms have hitherto stood amongst the alge, as Nostocacex and Chrooeoceacex, or these latter are typical algee which assume the forms of Collema, Ephebe, &e., through cer- tain parasitic Ascomycetes penetrating into them, spreading their mycelium into the continuously growing thallus, and frequently attached to their phycochrome-bearing cells.” Taking this latter suggestion as his starting point, and assuming the identity of cer- tain algal types with the gonidia of lichens, and the identity of the mycelium of fungi with their hyphe, Schwendener extends the said alternative to various other groups of lichens than the Collemacex, and comes to the conclusion that a lichen is eomposed of a parasitic fungus (the hyphe) and a number of low alge (Chlorophyllacew and Phycoehromacex), the former of which produces the reproductive bodies and is nourished by the latter. This theory was sub- sequently expanded and illustrated at length by Bornet (Lecherehes sur les Gonidies des Liechens, 1873), who affirms, as the result of numerous investigations, ‘‘ that the connexion of the hyphe with the gonidia is of such a nature as to exclude all possibility of the one organ being produced by the other,” and that the theory of parasitism can alone explain it satisfactorily. To give any detailed

account of the investigations of these authors, and the arguments by which they endeavour to support the hypothesis, would exeeed the limits of the present article, even were all other matters relating to lichens to be excluded. Suffice it to state briefly that, according to Schwendenerism, a lichen is not an individual plant, but rather a community made up of two different kinds of individuals belonging to two distinct classes of cryptogains, viz., a master-fungus and colonies of algal slaves, which it has sought out, caught hold of, and retains in perpetual captivity in order to provide it with nourish- ment. To sueh a singular theory, which from its plausibility has met with considerable support in certain quarters, various a priori objections of great validity may be taken. Amongst others whicli have been adduced two inay especially be noticed, having reference to the nature of this alleged parasitism, and the situations in whieh lichens are found. (1) The parasitism described is of a kind un- known in the vegetable kingdom, inasmuch as the host (the Alga), instead of suffering any injury, only flourishes the more vigorously. Moreover, the algal slaves being entirely enclosed in the master- * fungus, can evidently supply mo nourishment to it whatever, while direct observation shows that it is through the surface of the thallus of the lichen that nourishment is conveyed to the gonidial stratum, where the active life chiefly has its seat. (2) As is well known, lichens shun such habitats as are most frequented by alge and fungi, and occur in situations where neither of these are seen. . Where then are the algal colonies which, according to the hypothesis, the fungus goes forth in quest of, and ‘‘ presses into its service’’? Either of these arguments is sufficient to throw more than donbt upon Schwendenerism. At the same time, as will be perceived, the origin of the gonidia in the thallus remains to be accounted for, in order that the hypothesis may be utterly subverted. It might at first sight be supposed that this was a matter of no very great diffi- culty, since by cultivating lichens from the spores it would readily become apparent. All attempts, however, in this direction (and many such have reeently been made) have, owing to the peculiar character and conditions of lichen-growth, confessedly proved futile, and the cxperiments instituted have been productive of no definite results. This

is not altogether to be regretted, since in nature itself, when lichens occur on certain substrata, we have in various instances the whole process of the evolution of their vegetative system placed before our eyes, from the first germinations of the spores to the for- mation of the per- fect thallus. It is to Nylander, whose services here as elsewhere in liche- nological science— structural, physio- logical, and syste- matic —are so valu- able, that we owe the first clear en- unciation as to the origin of the

onidia in the

ichen – thallus. This, though pre- viously indicated by him, as we shal] preseutly see, was at greater length and still more de- finitely stated in several important papers in the Flora, viz., ‘De gonidiis et eorum formis animadversiones ” (te77, No. 23), “*Circa _ lichenes i vitricolas notula” (1879, No. 19), and

Fie. 6.—Hypothalline condition of Lecanora

De a hypothallo cinerea, showing the origin of the first Corti- notula” (1879, No. cal Gonidiogenous Cellules. (After Tulasne.) 36). In these he

incontrovertibly demonstrates that the gonidia originate, not from the filaments themselves, but in the cellules of the first cortical glomerules which are produced upon the young hypothallus. This may very easily be studied in the earlier stages of development of crustaceous lichens growing on pure quartz rocks (e.9., Lecidea geographica), on the smooth bark of young trees (e.g., Lecanora subfusea), and more especially on the surface of old glass (e.g., Leeanora galactina and Lecidea alboatra). In the case of the youne thalli of Leeanora cinerea this was sufficiently well de- ineated by the celebrated Tulasne in 1852, the year subsequent to the promulgation of the Bayrhofferian theory, in his elaborate *‘Memoire sur les Lichens,” pl. iii. f. 8. Afterwards, as the evolu-

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tion of the cortical stratum advances, its lower portion is resorbed, and the gonidia there become free, giving rise to the gonidial stratum, to the hyphe in which they are not adnate, as hasbeen represented, but only adherent by means of the gelatin which pene-._ trates all the elements of the lichen. Often also growing gonidia, young and adult, may be observed in the pseudo-parenchymatous cortical eellules in lichens which in this respect are best adapted for examination, such as Umbilicaria (vide Nylander in Flora, 1875, p. 803), Physeia pulverulenta, Psoroma hypnorum, &c. Similarly, with respect to the origin of the gonimia, Nylander observes (Flora, 1868, p. 353) that the isidia in the Collemacei (more especially in Collema) ‘‘ show very clearly under the microscope the entire his- tory of the evolution of the thallus from its first origin from a cellule containing a single gonimium to a minute true nostoc, and ultimately to the perfect texture of a Collema.”” With ,these facts before us, to which various others might be added, sueh as the entire absence of any algals on pure substrata, where lichen growth preseuts itself in all its stages, we are compelled to eome to the con- clusion that the gonidia constitute a true organic system in lichens, and in nature are nowhere seen outside the thallus. Consequently those free algal forms, such as Protococcus, &c., regarded as the free gonidia of lichens, are true alge, there being indeed a parallel- ism between them but no identity. On the other hand,-as to the alleged identity of the lichen-hypha with a fungus-mycelium, it is to be observed that the two are totally different in their-nature. The hyphe of lichens (myelohyphe of Nylander) are rigid, elastic, containing lichenine, not becoming putrid by maceration, with no faculty of penetrating or involving, while the hyphe of fungi are caducons, soft, flexile, with thin walls, &. Henec, as there is no algal in the lichen, so neither is there any fungus, though there is a parallelism between the fructification of lichens and the ascifer- ous section of fungi (Crombie in Pop. Se. Rev., 1874).

Nutrition and Life of Lichens.

As already intimated, licheus derive their nourishment directly from the atmosphere, in the shape of rain (or dew) with the materials contained in it. Here, as elsewhere, water is the condition of life, and

through its medium is conveyed to them the nutrient substances requisite for their existence and growth, from the clouds, from rivers, and, in the case of maritime species, even from the sea. Where, however, the atmosphere is impregnated with smoke, soot, or other deleterious ingredients, lichens will not grow nor flourish. Hence in our larger cities, or even in smaller manufacturing towns, scarcely any lichen vegeta- tion, or none whatever, is seen. Even in their more immediate suburban districts they occur only in a gonidial or rudi- mentary state, constituting the pseudo-genus Lepraria of the older botanists, and increasing through long periods by bisection, but never developing into perfect plants. Indeed it is now a well-known fact that their fully developed condition is a sure indication of the purity of the air and thé salubrity of the districts in which they occur. It has sometimes been stated that they draw some portion at least of their nutriment from the substratum to which they are affixed. For this, however, their structure is by no means well adapted, and such inorganic substances as iron and lime, which enter into their composition, are only as if mechanically derived in solution from the substratum. This in very many instances, ¢g., bare quartzose rocks, dead sapless wood, and pure naked glass, can evidently supply no nutriment whatever. Moreover, in the case of crustaceous species, such as Lecanora tartarea, &c., and also of terricole fruticulose species, such as Cetraria islandica, &c., the portion of the thallus next to the substratum is dead, so that no nutrient substances can be conveyed through it to the upper layers of the thallus. A very simple, but at the same time convincing, illustration of this is adduced by Nylander. ‘By immersing,” he says, “any fruticulose thallus, such as Usnea, by the base in water, it remains entirely dry (with the exception of the part submersed), but if water be poured over the other portions, it quickly absorbs it, softens, and revives.” The same thing may be seen in nature itself, in the case of such species as Cladina rangiferina, Alectoria ochroleuca, Platysma nivale, &e., growing on temporarily wet substrata,

when the base of their thalli is soft and moist, and all the rest dry and rigid. It cannot therefore be doubted that. the nutritive elements contained in the rain or other water are conveyed to the lichen through the surface of the thallus. It isin the superficial parts also, as Nylander has well observed (in Flora, 1874, No. 4), that “the active life has its seat, chiefly around the gonidia, manifesting itself in the putting forth of young parts (lobes, laciniz, branches, isidia), and in the functions of the apothecia and tbe spermogones, so that the nourishing humours necessary for all the actions of life are especially and directly poured upon these.” The vital activities, however, in lichens thus nourished are, as might be expected from the nature of the source whence their nutrimeut is derived, very intermittent, and in dry weather cease to operate, and become entirely dormant. Hence their life, unlike that of all other plants, is twofold, viz., one active, in which when moistened all the vegetative and reproductive functions are at work, and the other passive, in which when dry these functions are completely in abeyance. ence, at one time vegetating, at another lethargic, their organ-

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ization in all its parts, gonidial and otherwise, is admirably —

adapted. More especially is this the case with respect to the

lichenine found in their textures, which, being readily dried |

and as readily moistened, enables them to resist with im- punity the greatest extremes of temperature, alternate periods of drought and wet, the scorching heat of the sun, the vehemence of stormy winds, and the nipping frosts of winter.

In this fitful and abnormal life of lichens we have the explanation in a great measure of their almost indefinite duration of existence. It is well known that they are perennial plants in the widest sense of the term, and that, though in the earlier stages ‘of their existence their growth is comparatively rapid, yet this becomes extremely slow when they arrive at a certain age. The time required for the development of even

the most rapidly growing species may be calculated by the appearance of such of these as are met with on gravestones, mortar of houses, stone walls, wooden palings, and such like, the date of whose erection is known. Amongst other instances which have come under the present writer's own observation may be adduced the case of Physcia parietina, growing in fair quantity on the stones of a granite wall built in 1836 in a mari- time district where the plant is extremely abundant, and whiere atmospherical and other conditions are well suited for its growth. In a recent visit to the spot it was found that, although the thallus is now well developed, no fructification whatever is visible, though traces of spermogones are beginning to appear, so that

in the space of forty-five years this plant has not yet |

attained full maturity. But slow as is the growth of lichens after a certain stage of their development, their tenacity of life is very remarkable, as might a priori be inferred from their capacity of enduring without injury the greatest extremes of temperature and of hygrometrical conditions. It is on record that, after the lapse of nearly half a century, the same specimen on the same spot of the

condition. Qn this point also E. Fries (in Z. 2, p. xlv.) notices that certain species such as Physcia ciliaris, kept in houses for upwards of a year, revive when again exposed to the influences of the atmosphere, —an observation which in the case of Cladina rangiferina similarly kept for a still longer period the present writer can fully corroborate. Endowed then with this singular inter- mittent vitality, we can easily understand how many in- dividuals which occur on hard mountainous rocks or on the trunks of aged trees in ancient forests are in all probability many hundreds of years old. Nor does age seem in any way to weaken their fecundity, even when the

| in water it is dissolved and lost. | in large lenticular grains scattered in the tissues. | lichens oxalate of lime predominates, and forms a large proportion

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thallus has apparently ceased to grow. This, as observed by Nylander (in Syn., p. 5), is shown from the circumstance that were it otherwise "the already old fruits would be destitute of spores, which is never the case," unless in plants of some lower tribes, ¢.g., Graphidet and Verrucarte,

| in which the thallus is but sparingly gonidiose, and the

life consequently is shorter. In other instances the central portion of the thallus sometimes normally perishes in old plants, as in Pterygium centrifugum, Collema melenum, Parmelia centrifuga, and P. saxatilis, leaving only peri- pherical circles, in which, however, the life of the indivi- dual still continues for ages. In fact, "the life of lichens bears in itself no cause of death, and is only to be ended by external injnries "(E. Fries, Z. H., loc. cct.), or by the altera- tion of climatic and atmospherical conditions. Hence the assumption is not unwarrantable that individuals of such

_confessedly long-lived species as Lecidea geographica,

growing on rocks upon the summits of lofty mountains,

date from more than 'fabulous epochs," and probably For such a peculiar dnplex exist- |

outrival in longevity the ages assigned to the oldest trees

| on the surface of the globe,

Chemistry of Lichens, and Chemical Reactions,

Chemistry of Lichens.—This is still but little understood, notwithstanding that the subject has been more or less in- vestigated by authors. Their examinations, however, have been too limited and desultory to enable us to give any detailed account of the different principles which enter into the composition of the lichen tissues. Moreover, with respect to those species which have been more particularly analysed, they have sometimes employed not only the

same terms in different senses, but also different terms to denote the saine substance. There can, however, be no doubt that the chemical composition of lichens not only produces

| great modifications in their form, but also considerable | diversities in their properties.

The prineipal substance which oecurs in lichens, especially in sueh as are foliaceous and fruticulose, is lichenine—a special kind of gelatin peculiar to them. It is intermediate in character between dextrin and stareli, and very eagerly imbibes water, though if boiled Starch also very rarely oceurs In erustaceous

of the thallus, c.g., 65 per cent. in Lccanora esculenta aceording to Gebel. Chlorophyll and its modification phycochromc are found in lichens only in relatively small quantities, as is also the ease with most of the other principles they present. These are enume- rated by Nylander (in Syn., p. 51) aeeording to the affinities they bear, as follows:—(1) phosphate of lime, sea-salt, manganese, iron ; (2) picrolichenine, variolarine, oreeine, cetrarine, inuline, ery- thrine, roccelline, picroerythrine; (8) gyrophoric acid, parellie acid, usneic acid, orceic acid, erythrinic acid; (4) sugar not erys- tallizable, oil, waxy matter, resinous matter. Several others, especi- ally phosphates and aeids, have been enumerated by authors, which in some instances have not been corroborated, and in others are doubtfully distinct. In illustration of the manner in whicli several of these prineiples enter into the composition of lichens, we may adduce the analyses given in one or two species which have been more fully subjected to experiment. In Cetraria islandica there have been detected starch, including lichenine and inuline, to the extent of 80 per eent.; gummy and waxy matters ; a bitter prin-

: _ ciple, cetraric acid ; a fatty principle, lichcstcaric acid ; fumaric same tree has been observed without any change in its |

acid, which exists also in Fumaria officinalis, gallic acid, the astringent prineiple of galls; uncrystallizable sugar ; various salts, such as bitartrate of potash, and tartrate and phosphate of lime. Again, in

Physcia parictina there have been found several alimen- tary principles, as gliadine, starch, sugar, gum ; several medicinal substanees, as resin, bitter matter, gallic acid, and a peculiar ether- eal oil ; a yellow colouring matter called chrysophanic acid ; also wax, stearine, and some salts, as carbonate of lime. The ash of lichens is said to constitute from 8 to 10 per cent. of their bulk, and consists of various earthy bases, such as potash, soda, lime, magnesia, alumina, silica, manganese, and peroxide of iron, in eom- bination with various acids, such as carbonic, phosphorie, sulphurie, and hydrochloric. The whole subject, however, of the cheinistry of lichens requires to be investigated in a more extensive and methodi- cal manner than has hitherto been done either by chemists or lichenists.

Hace ENS

Chenrical Reactions tn Lichens.—These have reference to the thallus and the apothecia, and in both respects afford valuable assist- anee in the systematic study of lichens. (a) Zhalline reactions depend upon the presence in the thallus of certain colourable materialsin the form of acids, and are manifested on the application of hydrate of potash and the hypochlorite of lime either on the gortical stratum or the medulla. Ofthese reagents, hydrate of potash (K), composed of equal weights of caustic potash and water, and hypochlorite of lime (CaCl), composed of chloride of lime and water of any strength, may give certain reactions or none, according to the presence or absence of particular acids in the thallus. If no reaction takes place, this is denoted by K-—, CaCl-, and similarly if there is reaction by K+, CaCl+. A very convenient mode of symbolizing the positive and negative reactions of the cortical layer and the medulla of the saine species is to place the reaction of the former above the latter, ¢.g., Ka, CaCl-, denoting that with K the cortical stratum shows reaction and the medulla none, while with CaCl the cortical stratum gives none, but the medulla a dis- tinct reaction. Again, there is often no reaction produced by K alone, but if CaCl be added to it while still moist, a decided reaction appears, for which K(CaCl)+ is the symbol; or, on the other hand, the reaction given by K may be neutralized by the immediate application of CaCl, in which case it is expressed by K+(CaCl)-—. The positive reactions

are due to the presence of par- ticular acids in the thallus, such as erythrinic acid giving a crimson reaction with CaCl, chrysophanic acid giving a purple reaction with K, glawcinic acid giving a yellow reaction with CaCl, and leeanoric acid giving a citrine reaction with K. In most cases where the natural colour of the thallus (often also of the medulla) is yellow or orange, chrysophanic acid is present, and with K gives a purple reaction (¢.g., Physeia lychnea), but in others externally similar in colour and general appearance, where only leeithophanic acid is present (¢.g., Lecanora laciniosa), K gives no reaction what- ever. Sometimes K produces at first a yellow colour which immedi- ately changes into a red or purple, as in Lecanora cinerea, which at once enables us to distinguish it from the closely allied species Z. gibbosa and L. calcarea. A solution of iodine (1) is also in certain cases useful as a test on the medulla, and in the discrimination of some species of Collema. The value of these chemical tests in lichens was first pointed out by Nylander in Flora, 1866, pp. 223, 224, was subsequently illustrated by him in Flora, 1869, passim, in the case of species belonging to various genera, and has since been generally acknowledged by lichenists and employed by them in all specific diagnoses. ‘They are unquestionably most important, not only in the discrimination of many difficult and closely allied species, but also in enabling us to refer with certainty varieties to the species to which they properly belong. Nay, even a small frag- ment of the thallus, whether sterile or fertile, may by their aid be readily determined, while otherwise it would be either quite indeter- minable or doubtful. Generally they may be obtained on any por- tion of the thallus, but they are frequently more vivid, as might be expected, in the growing or circumferential portions. It is, however, only immediate reactions which depend on the colouring matter contained in the cortical stratum and the medulla that are to be attended to, and not secondary or tardy reactions which may otherwise originate, ¢.g., from the dissolution of the chlorophyll of the gonidia. At the same time it is to be observed, in order to prevent a misconception which has occasionally been entertained, that they do not per se constitute a special specific character, but only an additional and confirmatory specific character. As such their value is clearly apparent in cases where the external characters are similar or approximate, and doubt necessarily exists as

to their specific value. (b) Apothecial reactions for the most part take bre either externally on the epithecium or internally on the 1ymenial gelatin. The reactions of the epithecium arc generally produced by K on species which have yellow or orange apothecia (¢.g., Lecanora aurantiaca, Lecidea leweoxantha), while others with concolorous apothecia (¢.g., Lecanora epanora, Lecidea lucida) give no reaction whatever, owing to tle presence or absence of chryso- phanic acid. In certain cases also the reaction with CaCl is very useful in enabling us to separate closely allied species with similar apothecia, eg., Leeanora subcarnea (epithecium CaCl—) from LZ. glaucoma (epithecium CaCl+ yellow). Again, with respect to the reaction of the hymenial gelatin, this, as already observed, depends on the application of a solution of iodine. The formula by which the solution is to be prepared is—iodine, gr. j.; iodide of potash, gr. ii) ; distilled water, 4 ounce. In most lichens, where the spores are mature, this solution will tinge the hymenial gelatin in some cases only blue, in others at first blue and then wine-red, and in others wine-red or tawny wine-coloured only, without any preceding blue tinge. In such instances the reaction obtained is often very useful as a confirmatory specific character: Sometimes, however, the blue reaction takes place only on the thece (c.g., Pertusaria, Cladonia, &c.), and at other times only on the epispore (e.9., Gra- phis, Thelotrema, &c.). In the case of some species belonging to the inferior genera the reaction with I is especially valuable for the assistance it lends in distinguishing them from certain pyrenomy-

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cetous fungi, to which otherwise they might be supposed to belong. True, in some fungi (¢.g., Peziza) we obtain a reaction with I, and in some licliens we have no reaction visible ; but otherwise in such exceptional instances their respective anatomical characters readily show to which class they belong.

Economic Uses of Lichens.

These are intimately connected with their chemical con- stituents, and are in some respects very important. In the arts, as food and as

medicine, many of them have been highly esteemed, though others are not uow employed for the same purposes as formerly.

l. Lichens Used in the Arts—Of these the most important are such as yield, by maceration in ammonia, the valuable dyes known in commerce as archil, cudbear, and litmus. ‘These, however, may with propriety be regarded as but different names for the same pigmentary substance, the variations in the character of whicli are attributable to the different modes in which the pigments are manufactured. Archil proper is derived from several species of Loccella (¢.g., R. Afontaguet, R. tinctoria), which yield a rich purple dye and fetch a high price in the market. Of considerable value is the “ perelle” prepared from Lecanora parella, and much used in the preparation of ared or crimson dye. Inferior to this is ‘ cudbear,” derived from Lecanora tartarea, which was formerly very extensively employed by the peasantry of north Europe for giving a scarlet or purple colour to woollen cloths. By adding certain alkalies to the other ingredients used in the preparation of these pigments, the colour becomes indigo- blue, in which case it is the litmus of the Dutch manu- facturers. Amongst other lichens affording red, purple, or brown dyes may be mentioned Ramalina scopulorum, Parmelia saxatilis and P.- omphalodes, Umbilicaria pustulata and several species of Gyrophora, Urceolaria scruposa, all of which are more or less employed as domestic dyes. Yellow dyes, again, are derived from Chlorea vulpina, Platysma juniperinum, Parmelia caperata and P. conspersa, Physcia jlavicans, Ph. parietina, and Ph. lychnea, though like the preceding they do not form articles of commerce, being merely used locally by the natives of the regions in which they occur most plentifully. In addition to these, many exotic licheus, belonging especially to Parmelia and Sticta (eg., Parmelia tinctorum, Sticta argyracea), are rich in colorific matter, and, if obtained in sufficient quantity, would yield a dye in every way equal to archil. These pigments primarily depend upon special acids contained in the thalli of lichens, and their presence may readily be detected by means of the reagents already noticed. In the process of manufacture, however, they undergo various changes, of which the chemistry is still but little understood. At one time also some species were used in the arts for supplying a gum as a substitute for gum-arabic. These were

chiefly Ramalina fraxinea, Lvernia prunastri, and Parmelia physodes, all of which contain a considerable proportion of gummy matter (of a much inferior quality, however, to gum-arabic), and were employed in the process of calico-printing and in the mak- ing of parchment and cardboard. In the 17th century some filamentose and fruticulose lichens, viz., species. of Usnea and Ramalina, also Evernia furfuracea and Cladina rangiferina, were used in the art of perfumery. From their supposed aptitude to imbibe and retain odours, their powder was the basis of various perfumes, such as the celebrated “Poudre de Cypre” of the hairdressers, but their employment in this respect has long since been abandoned.

2. Nutritive Lichens.—Of still greater importance is the capacity of many species for supplying food for man and beast. This results from their containing amylaceous substances, and in some cases a small quantity of saccharine

matter of the nature of mannite. One of the most useful nutritious species is Cetraria islandica, ‘‘ Iceland moss,” which, after being deprived of its bitterness by boiling in water, is reduced to a powder and made into cakes, or is boiled and eaten with milk by the poor Icelander, whose sole food it often constitutes. Similarly Cladina rang- ferina and Cl. sylvatica, the familiar “reindeer moss,” are frequently eaten by man in times of scarcity, after being powdered and mixed with flour. Their chief importance, however, is that in Lapland and other northern countries they supply the winter food of the reindeer and other auimals, who scrape away the snow and eagerly feed upon them. Another nutritious lichen is the “ Tripe de Roche” of the Arctic regions, consisting of several species of the Gyrophorei, which when boiled is often eaten by the Canadian hunters and Red Indians when pressed by hunger. But the most singular esculent lichen of all is the ‘‘ manna lichen,” which in times of drought and famine has served as food for large numbers of men and cattle in the arid steppes of various countries stretching from Algiers to Tartary. This is derived chiefly from Lecanora esculenta, which grows unattached on the ground in

layers from 3 to 6 inches thick over large tracts of country in the form of small irregular Jumps of a greyish or white colour. Speaking of the distribution of these nutritive lichens, whose qualities depend on the presence of amylaceous matter, Dr Lindsay (in Pop. Hist. Brit. Lich., p. 82) very appropriately remarks that, “by a beautiful provision of nature, they occur precisely under the circumstances where they are most wanted—in northern or arctic countries, or on arid steppes, where grain stuffs are unknown, and food of a better kind is often scarce or deficient.” In connexion with their use as food we may observe that of recent years in Scandinavia and Russia an alcoholic spirit has been distilled from Cladina rangiferina and extensively con- sumed, especially in seasons when potatoes were scarce and dear. Formerly also Sticta pulmonaria was much employed in brewing instead of hops, and it is said that a Siberian monastery was much celebrated for its beer which was flavoured with the bitter principle of this species.

3. Medicinal Lichens.—During the Middle Ages, and even in some quarters to a much later period, lichens were extensively used in medicine in various European countries. Many species had a great repute as demulcents, febrifuges, astringents, tonics, purgatives, and anthelmintics. The chief of those employed for one or other, and in some cases for several, of these purposes were Cladonia pyxrdata, Usnea barbata, Ramalina farinacea, Evernia prunastri, Cetraria islandica, Sticta pulmonaria, Parmelia saxatilis, Physcia parietina, and Pertusarta amara. Others again were believed to be endowed with specific virtues, ¢.7., Peltigera canina, which formed the basis of the celebrated ‘* pulvis antilyssus” of Dr Mead, long regarded as a sovereign cure for hydrophobia; Platysma juniperinum, lauded as a specific in jaundice, no doubt on the similia similibus priuciple from a resemblance between its yellow colour and that of the jaundiced skin ; Peltidea aphthosa, which on the same principle was regarded by the Swedes, when boiled in milk, as an effectual remedy for the aphthe or rash on their children. Almost all of these virtues, general or specific, were imaginary ; and at the present day, except perhaps in some remoter districts of northern Europe, only one of them is employed as a remedial agent, This is the “Iceland moss” of the druggists’ shops, which is undoubtedly an excellent demulcent in various dyspeptic and

chest complaints. Probably also Pertusaria amara, froin the intensely bitter principle which it contains, might still with propriety be employed asa febrifuge. No lichen is known to be possessed of any poisonous properties, although Chlorea vulpina is believed hy the Swedes to be

destructive to wolves when powdered and “mixed with pounded glass.” Nor are lichens, as has sometimes been alleged, injurious to the trees upon which they grow, except to a very limited extent. Not being parasites properly so called, the only injury they can inflict upon them is by slightly interfering with the functions of respiration, or, when growing very crowdedly upon the branches of orchard trees, by checking the development of buds.

Classification of Lachens.

From the time of Acharius, the father of lichenological science, different authors have proposed different classifica- tions of lichens, according to the degree of importance attached by them to one or other of their vegetative and reproductive organs. Most of these classifications, however, whether proposed by microscopical or pre-microscopical lichenists, have been too artificial and arbitrary, and indeed less natural in various ways than that originally propounded by Acharius. Of recent years they have been entirely super- seded by other two systems, viz., that of the Massalongo- Koerberian and that of the Nylanderian school. With respect to the former of these, its characteristic feature is the prominence which it assigns to the form and structure of the spores not only in the differentiation of species but also in the foundation of genera. Though it has been adopted, with various modifications, by many Continental lichenists, yet essentially it also proceeds on an artificial principle, and necessitates the adoption of far too many genera, distinguished from each other merely by slight differences in the spores. The other system—that of Nylander, which was first proposed by him in his Zssaz dune Nouvelle Classification des Lichens (1854-55),—has since then commended itself more and more to the accept- ation of lichenists, so that even the disciples of the

opposite school (the sporologists) have in many respects gradually approximated towards it in their most recent writings. Not only is it the only complete system of classification yet wrought out; it is also the most natural and philosophical of any hitherto propounded. In its main outline it proceeds upon the principle of showing the near relation

of certain lichens to some genera of alge on the one

hand, and of certain other lichens to some genera of fungi on the other hand, and connects these three great classes of cryptogams together by a sort of twofold chain, commencing with those genera of lichens nearest allied to the alge, working up to those genera best de- veloped (Sticte), and thence retrograding and terminating with those nearest allied to the fungi. His genera also are principally founded, not upon a single special character, but upon the combined anatomical characters presented by the thallus, the apothecia, and the spermo- gones. It may here be further observed that we are indebted to the same accomplished lichenist for the succinct but comprehensive diagnoses, generic and specific, of the different parts of a lichen, which have tended so much to facilitate their systematic study. The following is a conspectus of the Nylanderian classification of lichens, with the leading characters of the different families and tribes, and an enumeration of all the principal genera of which these are composed.

Family I.—Zphebacet, Nyl.

Thallus but little turgid when moist, gonidial stratum consisting of gonimia which are tunicated ; medullary filaments none.

Tribe 1. Sirosiphet, Ny].—Thallus filamentoso-fruticulose, gonimia variously connate. Apothecia biatorine or lIccideine. Sper- mogones with sterigmata or arthrosterigmata.

Genera : Sirosiphon, Ktz. ; Gonionema, Nyl. ; Spilonema, Born.

Tribe 2. Pyrenopsei, Nyl.—Thallus thinly granulose, rubricose within, gonimia simple or connate. Apothccia lccanorine or pyrenocarpous. Spermogones with simplish sterigmata.

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Genera: Huopsis, Nyl. ; Pyrenopsis, Nyl.

Tribe 8. Homopsidei, Nyl.—Thallus either fruticolose with the gonimia seriated, or squamuliform or granulose with the gonimia subsolitary. Apothecia pyrenocarpous with or without paraphyscs. Spermogones with simple sterigniata.

Genera: Ephcbe, Fr.; LEphebeia, Nyl.; Phylliscum, Nyl.; Phylliscodium, Nyl. ; Collemopsidium, Ny).

Tribe 4, Magmopsei, Nyl.—Thallus pyrenopsidian, containing syngonimia, the gonimia arranged without order. Apothecia peridieine.

Genus: Magmopsis, Nyl.

Family I].—Collemacci, Nyl.

Thallus turgid when moist, gonidial stratum consisting of gonimia moniliformly arranged ; medulla not discrete.

Tribe 1. Laehinet, Nyl.—Thallus fruticulose or radiately lacini- ated, gonimia clongato-seriately moniliform, subconnate. Apothccia lecanorine or lecideine. Spermogones with sterigmata or arthro-sterigmata.

Genera: Lichina, Ag. ; Pterygiwm, Nyl.; Leptogidiwm, Nyl. ; Lichinodium, Nyl.

Tribe 2. Collemet, Nyl.—Thallus membranaceous, lobate, rarely fruticulose, granulose or subsquamulose, gonimia moniliformly arranged, cortical stratum none or distinct. Apothecia lecanorine or rarcly pyrenocarpous. Spermogones with simplish sterigmata or arthrosterigmata.

Genera: Lecviophysma, Fr. fil. ; Synalissa, DR. ; Omphalaria, DR. ; Anema, Nyl. ; Paulia, Fée ; Schizoma, Nyl. ; Collema, Ach. ;

Leptogium, Ach. ; Ramalodium, Nyl.; Lichinella, Nyl.; Am- phidium, Nyl. ; Collemopsis, Nyl. ; Hydrothyria, Russ.

Tribe 8. Pyrenidiet, Nyl.—Thallus fibrillose, gonimia monili- formly coherent, cortical stratum distinct. Apothecia pyrenoid.

Genus : Pyrenidium, Nyl.

Family III.—Lichenacei, Nyl.

Thallus not gelatinous, with a gonidial, rarely gonimic stratum ; medullary stratum more or less distinct.

Series I.—Epiconiodei, Ny].

Apothecia with the spores usually naked and pulverulent on the surface of the fructification.

Tribe 1. Calictet, Nyl.—Thallus horizontally expanded, some- times none. Apothecia stipitate, capituliform or sessile. Spermo- gones with simple sterigmata.

Genera: Sphinctrina, Fr.; Caliciwm, Pers; Stenocyde, Ny). ; Coniocybe, Ach. ; Pyrgidium, Ny); Trachylia, Fr. ; Pyrgillus, Ny.

Tribe 2. Tylophorei, Nyl.—Thallus thinlycrustaceous. Apothecia at first pyrenodean and then lecanorine with sporal mass. Spermo- gones with somewhat branched sterigmata.

Genus: Tylophoron, Nyl.

Tribe 8. Spherophoret, Nyl.—Thallus fruticulose, branched. Apothecia at first nucleiform, becoming variously dehiscent, with sporal mass. Spermogoncs with simplish sterigmata or arthro- sterigmata.

- Genera: Sphwxrophoron, Pers. ; Acroscyphus, Lev. ; Tholurna, orm. Series I]. —Cladodei, Nyl.

Apothecia terminal on podetia, rarely sessile, biatorine or rarely lecanorine.

Tribe 4. Beomycetei, Nyl.—Thallus horizontally expanded. Apothecia substipitate. Spermogones with sterigmata or arthro- sterigmata.

Genera: Gomphillus, Nyl.; Bezomyces, Pers.; Glossodiwm, Nyl. ; Thysanotheciwm, Berk. ; Stercocauliscum, Ny).

Tribe 5. Pilophorei, Nyl.—Thallus granulose, cephalodiiferous, with rigid podetia. Apothecia cephalodine, on the podetia, with the paraphyses prolongated into the hypothecium. Spermogones with simplish sterigmata.

Genus : Pilophoron, Tuck.

Tribe 6. Stercocaule', Nyl.—Thallus exspitose, podetiiform, solid. Apothecia terminal or lateral, lecideine or rarely lecanorine. Spermogones with simple sterigmata.

Genera: Stereocaulon, Schreb. ; Stereocladiwm, Nyl.; Argopsis, Fr. fil. ; Oxocladiwm, Mut.

Tribe 7. Cladoniei, Nyl.—Thallus foliaceous or fruticulose, with fistulose podetia. Apothecia biatorine on the podetia, rarcly sessile on the leaflets. Spermogones with simplish sterigmata.

Genera : Heterodca, Nyl. ; Pyenothelia, Ach. ; Cladonia, Hftm. ; Cladina, Ny). ; Cladia, Nyl.; Ramalea, Ny).

Series II].—Ramalodei, Nyl.

Thallus efoliolose, fruticulose, orfilamentose. Apothecia generally

ecanorine.

Tribe 8. Roccellei, Nyl.—Thallus simplish or branched, inter- nally with filamentose medulla. Apothecia irregular (normally

lecanorine), adnate, terminal, or lateral. Spermogones with simplish sterigmata.

Genera : Combca, DN. ; Roccclla, DC.

| pressed, with firm medullary axis.

| or lecideine and gyrose.

| gonidial system consisting of true gonidia.

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Tribe 9. Siphulet, Nyl.—Thallus podetiiform, simple or fruti- culose, internally with filamentose or fistulose medulla. Apothecia unknown. Spermogones (where seen) with arthrosterigmata.

Genera: Siphula, Fr. ; Endocena, Cromb. ; Thamnolia, Ach.

Tribe 10. Ramalinei, Nyl.—Thallus fruticuloso-foliaceous, rounded or compressed, with woolly medulla. Apothecia lecanorine, scutellate. Spermogones with arthrosterigmata.

Genus: Ramalina, Ach.

Tribe 11. Usneei, Nyl.—Thallus much branched, rounded, or com- Apothecia parmelioid, peltate. Spermogones with simplish sterigmata.

Genera: Usnea, Hffm.; Newropogon, N. and Fl. ; Chiorea, Nyl.

Tribe 12. Alectoriet, Nyl.—Thallus branched, rounded, or com- pressed, with woolly medulla. Apothecia parmelioid, scutelliform. Spermogones with simplish sterigmata or arthrosterigmata.

Genera: Alectoria, Ach. ; Dactylina, Nyl. ; Dufourea, Ach.

Tribe 18. Cetrariet, Nyl.—Thallus fruticulose or foliaceous, with woolly medulla. Apothecia parmelioid, marginal, obliquely affixed. Spermogones with simple sterigmata or arthrosterigmata.

Genera: Cetraria, Ach. ; Platysma, Hffm.

Series IV.—Phyllodei, Nyl.

Thallus foliaceous, usually depressed, lobate. Apothecia generally peltiform or lecanorine.

Tribe 14. Parmelici, Nyl.—Thallus frondosely dilated, or lobate, or laciniated, with woolly, rarely solid, medulla, Apothecia par- melioid, scutelliform. Spermogones with simple sterigmata or arthrosterigmata.

Genera: Evernia, Ach. ; Hvcrniopsis, Nyl.; Parmelia, Ach. ; Parmeliopsis, Nyl.

Tribe 15. Sttctet, Nyl.—Thallus large, lobate, cyphellate, or ecyphellate beneath; gonidial stratum composed either of nodulose gonimia or of true gonidia. Apothecia lecanorine, rarely parmeleine. Spermogones with arthrosterigmata.

Genera : Stictina, Nyl. ; Lobarina, Nyl. ; Sticta, Ach. ; Lobaria, Nyl. ; Ricasolia, DN.

Tribe 16. Peltigere', Nyl.—Thallus frondosely dilated, the cortical stratum often wanting bencath; gonidial stratum consisting either of gonidia or (usually) of gonimia, rarely of gonidimia. Apothecia peltiform, adnate, orinnate. Spermogones (where seen) with arthro- sterigmata.

Genera: Nephroma, Ach. ; Nephromium, Nyl. ; Peltidea, Ach. ; Peltigera, Hffm. ; Solorina, Ach.

Tribe 17. Physcict, Nyl. Thallus stellato-orbicular, rarely fruti- culose, internally with woolly medulla; gonidial stratum consisting of true gonidia. Apothccia lecanorine. Spermogones with arthro- sterigmata.

Genus : Physcia, Nyl.

Tribe 18. Pyxinci, Nyl—tThallus stellato-laciniated, with woolly medulla and true gonidial stratum, Apothecia lecideine. Spermo- gones

with arthrosterigmata.

Genus: Pyxine, Fr.

Tribe 19. Gyrophorei, Nyl.—Thallus umbilicatcly affixed, with woolly medulla and true gonidial stratum. Apothecia lecanoroid, Spermogones with arthrosterigmata. Genera: Umbilicaria, Hifm. ; Gyrophora, Ach.

Series V.—Placodei, Nyl.

Thallus variously crustaceous, sometimes evanescent, rarely hypophleodal, without any filamentose medullary stratum. Apo- thecia lecanorine, or lecideine, or lirelleeform.

Tribe 20. Lecanoret, Nyl.—Thallus crustaceous, rarely evanescent or obsolete; gonidial stratum consisting of gonidia, rarely of gonimia. Apothecia lecanorine, rarely subbiatorine or typically biatorine. Spermogones with simple stcrigmata or arthrostcrigmata.

Genera : Pannaria, Del.; Gymnoderma, Nyl.; Erioderma, Fée ; Heppia, Neg.; Amphiloma, Fr.; Psoroma, Fr.; Lccanora, Ach.; Glypholecia, Nyl.; Peitula, Nyl.; Dermatiscum, Nyl.; Dirina, ¥r.

Tribe 21. Pertusarici, Nyl.—Thallus crustaceous, continuous; Apothecia endocarpoid or lecanoroid. Spermogones with simple stcrigmata.

Genera: Pertusaria, DC. ; Varicclaria, Ny]l.

Tribe 22. Thelotremet, Nyl.—Thallus crustaceous, or pulverulent, or areolatc, with true gonidial stratum. Apothecia urccolato- impressed with double margin. Spermogones with simple or somewhat branched stcrigmata.

Gencra: Phlyctis, Wallr.; Tremotylium, Nyl.; Thelotrema, Ach. ; Urceolaria, Ach.; Belonia, Krb.; Gyrostomum, Nyl.; Ascidium, Fée ; Gymnotrema, Nyl.

Tribe 23. Lecideci, Nyl.—Thallus variously crustaceous, pulveru- lent, evanescent or none proper, with the gonidial stratum consist- ing of gonidia (rarely chrysogouidia), rarely gonimia. Apothecia lecideine (or biatorine). Spermogones with' simple or simplish sterigmata. :

Genera: Cenogonium, Ehrh. ; Byssocaulon, Mut. ; Pannularia, Nyl. ; Coccocarpi, Pers.; Lecidea, Ach.; Gyrothectum, Nyl.; Epiphora, Nyl.

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Tribe 24. Graphidet, Nyl.—Thallus thinly crustaccous, or hypo- phleodal, or rarely none proper; gonidial stratum consisting of gonidia (rarely chrysogonidia). Apothecia lirclline or rotundate. Spermogones with simple sterigmata.

Genera: Xylographa, Fr.; Agyriwm, Fr. ; Lithographa, Nyl. ; Graphis, Ach. ; Thelographis, Nyl. ; Helminthocarpon, Fée ; Leuco- grapha, Nyl.; Opegrapha, Ach. ; Platygrapha, Nyl. ; Stigmati- dium, Mey.;

Series VI.—Pyrenodet, Nyl.

Thallus peltate, or crustaccous, or hypophleodal, or evanescent. Apothecia nucleiform, with an apical ostiole.

Tribe 25. Pyrenocarpet, Nyl.—Thallus various, often macular or obsolete; gonidial system consisting of gonidia (rarely chrysogonidia), sometimes of gonimia. Apothecia pyrenodeine, often without para- physes. Spermogones with simple sterigmata or arthrosterigmata.

Genera: Cora, Fr.; Dichonema, N. ab Es. ; Normandina, Nyl. ; Endocarpon, Hedw.; Verrucarina, Nyl.; Verrucaria, Pers. ; Zhelenella, Nyl.; Thelopsis, Nyl.; Obryzwm, Wallr. ; Strigula, Fr.; Paratheliwum, Nyl.; Melanotheca, Fée; Zrype- thelium, Ach. ; Astrotheliwm, Eschw.

Series VII.—Peridiodet, Nyl.

Thallus thin, often wanting. Apothecia peridieine, without any ostiole.

Tribe 26. Peridei, Nyl.—Thallus thin, macular, or noue proper. Apothecia consisting of a peridium. Spermogones (where seen) with simple sterigmata.

Genera: Thelocarpon, Nyl.; Thelococeus, Nyl. ; Endococeus, Nyl. ; Mycoporum, Flot.

Family IV.—Myriangiacei, Nyl. Thallus unstratified, entirely and equally cellulose. tion not discrete. Tribe 1. Myriangiet, Nyl—Thallus noduloso-pulvinate, thecia sublecanorine. Spermogones unknown. Genus: Myriangiwm, Mnt. and Berk. In the Nylanderian arrangement, most of these tribes and genera are again

divided into subtribes and subgenera, the latter being further subdivided into sections according to the affinities of the different species.

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Habitats and Distribution of Lichens.

These two subjects are intimately related and present many interesting features which here we can only very generally notice without entering into details.

1. Habitats of Lichens.—These are extremely varied, and comprehend a great number of very different substrata, Chiefly, however, they are the bark of trees, rocks, the ground, mosses, and, rarely, perennial leaves. (a) With respect to corticole lichens, some prefer the rugged bark of old trees (¢.g., Ramalina, Parmelia, Stictet) and others the smooth bark of young trees and shrubs (¢g., Graphider and some Lecidex). Many are found principally in large forests (e.g., Usnea, Alectoria jubata); while a few occur more especially on trees by roadsides (eg., Physcia parietina and Ph. pulverulenta). In connexion with corti- cole lichens may be mentioned those lignicole species which grow on decayed or decaying wood of trees and on old pales

(¢.9., Calicied, various Lecidex, Xylographa). (b) As to saxicole lichens, which occur on rocks and stones, they may be divided into two sections, viz., calcicole and calci- fugous. To the former belong such as are found on calcareous and cretaceous rocks, and the mortar of walls (e.g., Lecanora calcarea, Lecidea calcivora, and several Verrucariz), while all other saxicole lichens may be regarded as belonging to the latter, whatever may be the mineralogical character of the substratum. It is here worthy of notice that the apothecia of several calcicole lichens (¢.g., Lecanora Prevostw, Lecidea calcivora) have the power (through the carbonic acid received from the atmosphere) of forming minute faveoli in the rock, in which they are partially buried. (c) With respect to terricole species, some prefer peaty soil (e.g., Cladonia, Lecidea decolorans), others calcareous soil (e.g., Lecanora crassa, Lecidea decipiens), others argillaceous soil or hardened mud (e.g., Collema limosum, Peltidea venosa) ; while many may be found growing on all kinds of soil,

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from the sands of the sea-shore to the granitic detritus of lofty mountains, with the exception of course of cultivated ground, there being no agrarian lichens. (d) Muscicole lichens again are such as are most frequently met with on decayed mosses and jungermannias, whether on the ground, trees, or rocks (¢.g., Leptogium muscicola, Gomphillus calicioides). (e) The epiphyllous species are very peculiar as occurring upon perennial leaves of certain trees and shrubs, whose vitality is not at all affected by their presence as it is by that of fungi. In so far, however, as is known, they are very limited in number (eg., Lecadea Bouteillei, Strigula). With the exceptions of these last, it is to be observed that all the rest may, under different conditions of locality and climate, be found growing for the most part indiscriminately on the substrata mentioned, a normally saxicole species becoming corticole, a terricole one becoming muscicole, and vice versa. – Amongst other instances of this that might be adduced, the case of Lecidea geographica, a peculiarly saxicole species, growing on the stems of Rhododendron in the Tyrolese Alps, and that of Lecidea rivulosa, a like peculiarly saxicole species, growing on the bark of

trees in Germany, are especially striking. Sometimes also various lichens occur abnormally in such unexpected habitats as dried dung of sheep, bleached bones of reindeer and whales, old leather, iron, and glass, in districts where the species are abundant. Consequently it is apparent that in many cases lichens are quite in- different to the substrata on which they occur, whence we infer that the preference of several for certain substrata depends upon the temperature of the locality or that of the special habitat. Thus in the case of saxicole lichens the mineralogical character of the rock has of itself little or no influence upon lichen growth, which is influenced more especially and directly by their physical properties, such as their aptitude for imbibing and retaining heat and moisture. Asa rule lichens have a propensity for open exposed habitats, though some are found only or chiefly in shady situations ; while, as already observed, scarcely any occur where the atmosphere is impregnated with smoke. Many species also prefer growing in moist places by streams, lakes, and the sea, though very few are normally, and probably none entirely, aquatic, being always at certain seasons exposed for a longer or shorter period to the atmosphere (¢.g., Lichina, Leptogium rivulare, Endocarpon fluviatile, Verrucaria maura). Some species are entirely parasitical on other lichens (¢g., various Lecidee and Pyrenocarpei), and may be peculiar to one (¢.g., Lecidea vitellinaria) or common to several species (¢.g., HMabro- thallus parmeliarum). A few, generally known as erratic species, have been met with growing unattached to any substratum (¢.g., Parmelia revoluta, var. concentrica, Leca- nora esculenta); but it seems somewhat doubtful if these are really free ab initio (vide Crombie in Journ. Bot., 1872, p. 306). It is to the different characters of the stations they occupy with respect to exposure, moisture, &c., that the variability observed in many types of lichens is to be attributed. The fact also that in numerous instances they are so indifferent to the nature of their habitats clearly shows that they do not at all depend upon the substratum for their nourishment.

2. Distribution of Lichens.—From what has now been said it will readily be inferred that the distribution of lichens over the surface of the globe is regulated, not only by the presence of suitable substrata, but also and more especially by atmospherical and climatal conditions,

At the same time it may safely be affirmed that their geo- graphical range is more extended than that of any other

| class of plants, occurring as they do in the coldest and

warmest regions—on the dreary shores of the palsocrystic sea and in the torrid valleys of tropical climes, as well as on

the greatest mountain elevations yet attamed by man, on projecting rocks even far above the snow-line (e.g., Lecidea geographica), where, as in many other situations, fungus- mycelium and gonidioid algal are unknown. Our know- ledge of the distribution of lichens in various countries, like that of other plants, is derived from general and local floras, from special works on lichenology, from the observa- tions of scientific travellers and the collections made by them in distant parts of the world. Most of these, however, of an earlier date, are to be used with great caution, as the species recorded were, in the absence of microscopical examination, not sufficiently discriminated, and in many cases are prima facie entirely erroneous. Amongst botanical travellers whose contributions are most trustworthy may be mentioned pre-eminently Sir Joseph D. Hooker, whose remarks on this subject in his Flora Antarctica and in various papers in rans. Linn. Soc., vol. xiv., &c., are most valuable and suggestive. Again, in purely lichenological works, the general principles regulating lichen distribution (with statistical tables) are admirably expounded by Nylander in the introduction to his Synopsis Methodica Lichenum, while the only complete record of the distribution of species is that given by the same author in his Hnumération générale des Lichens. Since the date of this latter work (1858) our knowledge of the range of lichens, both European and exotic, has been greatly extended, apart from the discovery of numerous species previously unknown. No special treatise, however, on the subject has been published, though there is now ample material, very much scattered no doubt, available for the purpose. It may, however, be observed that of the four thousand species (exclusive of numerous varieties and forms) which have been described, the geographical dis- tribution is known almost as well as

that of phanerogams and filices, as well, if not more so than that of mosses and hepatics, and far better than that of alge and fungi. In arctic regions lichens form by far the largest portion of the vegetation, occurring everywhere on the ground and on rocks, and fruiting freely; while terricole spocies of Cladonia and Stereocaulon are seen in the greatest luxuri- ance and abundance spreading over extensive tracts almost to the entire exclusion of other vegetation. The lichen flora of temperate regions again is essentially distinguished from the preceding by the frequency of corticole species belonging to Lecanora, Lecidea, and Graphidei. In inter- tropical regions lichens attain their maximum development (and beauty) in the foliaceous Stécte' and Parmeliei, while they are especially characterized by epiphyllous species, as Strigula, and by many peculiar corticole Thelotremei, Gra- phidei, and Pyrenocarpet. Some lichens, especially saxicole ones, seem to be cosmopolitan (eg., Lecanora subfusca, Cladonia pyxidata); and others, not strictly cosmopolitan, have been observed in regions widely apart. A consider- able number of species, European and exotic, seem to be endemic, but further research will no doubt show that most of them occur in other climatal regions similar to those in which they have hitherto alone been detected. To give any detailed account, however, of the distribution of the different genera (not to speak of that of individual species) of lichens would necessarily far exceed the limits at our disposal. Suffice it to say that both in horizontal and vertical range, they sufficiently correspond with the distri- bution of phanerogams in the several regions of vegetation into which the surface of the globe has been divided. The proportion of lichens to phanerogams in different regions Increases in a regular ratio from the equator to the poles, and from the base to the summit of lofty mountains, till at length in more arctic and alt-alpine tracts lichens constitute almost and sometimes entirely the sole vegeta- tion. (J. M. C.)

LICHFIELD, a city and municipal and parliamentary borough of Staffordshire, England, is situated ina pleasant and fertile valley, on a small tributary of the Trent, and on the South Staffordshire Railway, 16 miles north from Birmingham. The town is well built, and contains many handsome houses. Of the old Norman cathedral there are now no remains. The present building is supposed to belong to the end of the

12th or beginning of the 13th century, Its style is Early English approaching to Deco- rated, and it possesses an imposing central tower 285 feet in height, with two western spires 183 feet. The tran- septs, which contain some portions of Norman architecture, are richly ornamented, and adorned with windows of beautiful tracery. The total length of the building from east to west is 403 feet. The damage which it suffered during the civil wars was repaired by Bishop Hackett in 1671, and at present (1882) it is undergoing extensive restorations. A new building for the King Edward's grammar schoo} was erected in 1850. In the market-place is a statue of Dr Johnson, facing the house where he was born. A guild-hall, a market-hall, a corn exchange, and a public library and museum are the principal buildings of a secular character. There are several charitable institu- tions. The industries of the town include brewing and coach-building ; and in the neighbourhood there are large nurseries and market gardens. The municipal and parlia- mentary boroughs have the same area (3416 acres) ; the population in 1871 was 7347, and in 1881 8360,

Lichfield is spelt by Bede Licidfeld, the word being supposed to mean ‘‘ Field of the Dead," from a massacre which took place near it of a large number of Christians. It. was made an episcopal see in 669, St Chad being its first bishop. In the reign of Offa it was promoted to be an archbishopric, but in 803 the primacy was restored to Canterbury. In 1075 the see of Lichfield was trans- ferred to Chester, and thence, a few years aftcrwards, to Coventry, but it was restored in 1148. The town has returned members to parliament since 1305, at which time it also received a charter of incorporation. Since 1867 it has returned only one member. It was made a city by Edward VI, in 1549.

Seethe histories of Lichfield by Jackson (1805)and Harwood (1806), and histories of the cathedral by Britton (1820) and Stone (1870).

LICHTENBERG, formerly a small German principality on the west bank of the Rhine, enclosed by the Nahe, the Blies, and the Glan, now forms the circle of St Wendel in the government district of Treves, Rhenish Prussia. The principality was constructed of parts of the old electorate of Treves, Pfalz-Zweibriicken, and Salm, and lay between

Rhenish Bavaria and the old Prussian province of the Rhine. Originally called the lordship of Baumholder, it owed the name of Lichtenberg and its elevation to a principality to Ernest, duke of Saxe-Coburg, to whom it was presented by Prussia in 1815 in accordance with terms agreed upon at the congress of Vienna. The duke, however, restored it to Prussia in 1834, in return for an annual pension of £26,000 sterling. The area is 210 square miles, and the population 45,000.

LICHTENBERG, Gore Curistopy (1744-1799), phy- sicist and satirical writer, was born at Oberramstadt, near Darmstadt, July 1, 1744. In 1763 he entered Gottingen university, where in 1770, after spending several years in England, he became extraordinary professor of physics, and five years later ordinary professor. This post he continued to hold till his death, February 24,1799. As a physicist he is best known for his investigations in electricity, more especially as to the so-called Lichten- berg figures (see vol. viii. p. 66), which are fully described in two memoirs De nova methodo naturam ac motum fluidi electrict investigandi (Géttingen, 1778-79). He sent many excellent contributions to the Gottingen Taschenkalender from 1778 onwards, and to the Gottingische Magazin der Literatur und Wissenschaft, which he edited for three years (1780-82) along with J. G. A. Forster.

His various scientific writings occupy the latter part of his Vermischte Schriften, edited by Kriess (9 vols., Gottingen, 1800-5; new edition, 6 vols, Gotha, 1844-46). The earlier volumes of these collected writings contain his satirical and humorous productions. His keen satire in- volved him in many a literary controversy with well-known contemporaries, such as Lavater, whose science of physio- gnomy he wittily ridiculed, and Voss, whose views on Greek

pronunciation called forth a powerful satire Ueber die |

Pronunciation der Schipse des alten Griechenlandes (1782). Notes of his lectures on natural philosophy, astronomy, and physical geography were published by Gamauf (Vienna, 1808-12, 1813, 1819); and more recently some of his brilliant sayings have been collected by Grisebach

in one volume, Lichtenberg’s Gedanken und Maximen: Licht- Strahlen aus seinen Werken (Leipsic, 1871).

LICINIUS. Publius Flavius Galerius Valerius Lici- nianus Licinius, Roman emperor, of Dacian peasant origin, was born probably about 250 a.p., and was elevated after the death of Severus to the rank of Augustus by Galerius, his former friend and companion in arms, on November 11, 307, receiving as his immediate command the provinces of Illyricum. On the death of Galerins in May 311, he shared the entire empire with Maximin, the Hellespont and the Thracian Bosphorus being their mutual boundary. In March 313 he entered into alliance with Constantine at Milan, and in the following month inflicted a, decisive defeat on Maximin at Heraclea, with the result of establishing himself as master of the East, while Con- stantine (now his brother-in-law) was supreme in the West. Tn the following year his jealousy led him to encourage a treasonable enterprise on the part of Bassianus against Constantine. When his perfidy became known a civil war ensued, in which he was twice severely defeated—first near Cibalis in Pannonia (October 8, 314), and next in the plain of Mardia in Thrace; the outward reconciliation, which was effected in the following December, left Licinius in possession of Thrace, Asia Minor, Syria, and Egypt, but added numerous provinces to the Western empire. In 323 Constantine, tempted by the “advanced age and unpopular vices” of his colleague, anew declared war against him, and, having defeated his army at Adrianople (July 3, 323), succeeded in shutting him up within the walls of Byzantium. The defeat of the superior fleet of Licinius by Crispus, Constantine’s eldest son, compelled his withdrawal to Bithynia, where a last stand was made ; the battle of Chrysopolis (September 18) finally issued in his submission and death.

LIEBER, Francis (1800-1872), a distinguished publicist and writer on political science, was by birth a German, by adoption a citizen of the United States. He was the son of Frederick William Lieber, and was born at Berlin, March 18, 1800. Upon the return of Napoleon Bonaparte from Elba, young Lieber, then only fifteen years of age, volunteered as a soldier, and served with his

two brothers under Marshal Bliicher in the campaign of |

1815. He fought at Ligny, Waterloo, and Namur. In the last-named battle he was twice severely and dangerously wounded. At the close of the war he returned to his studies, and joined the Berlin gymnasium under Dr Jahn. Shortly afterwards he was arrested and thrown into prison for his political sentiments, the chief evidence against him being several songs of liberty which he had written. After several months' confinement he was discharged without a trial, but informed that he would not be permitted to pursue his studies at the Prussian universities. He accordingly went to Jena, where he took his degrees in 1820, subsequently continuing his studies at Halle and Dresden. When the Greek revolution broke out, young Lieber instantly resolved to take part in the struggle for

Grecian independence., He made his way with great difficulty to Marseilles, travelling much of the way on foot, and thence embarked for Greece. His experiences there are recorded in his Journal in Greece, published at Leipsic in 1823, and at Amsterdam in the same year under the title of The German Anacharsis. Returning from Greece after the failure of the struggle, he landed at Ancona, and proceeded to Rome. Thérehe made the acquaintance of Niebuhr, then Prussian ambassador to Rome, who took great interest in him and employed him as tutor to his son. He lived a year in the family of the historian, a period of his history which he afterwards embalmed in his Reminiscences of Niebuhr, first published in America, and afterwards in England. Returning from Rome to Berlin in 1823, he was soon again arrested by the Prussian authorities on the old charges of enmity to the Govern- ment. and advocating republican opinions, and was imprisoned in the bastile of Koepnik, but was. released after some months' confinement through the influence of Niebuhr. In 1825 he abandoned his country, and after spending a year in London went to the United States (1827), and as soon as possible was naturalized as a citizen of that country. Lieber took up his residence at Boston, and was occupied for five years in his laborious work The Encyclopxzdia

Americana (13 vols.). In 1832 he removed to New York, where he published a translation of De Beaumont and De Tocqueville's work on the penitentiary: system, with many notes. In 1833 he went to Philadelphia to prepare a plan of education for Girard College, then newly founded. While there he published Letters to a Gentleman in Germany and a supplement to his Encyclo- pedia. In 1835 he was appointed professor of history and political economy in South Carolina College at Columbia, S.C., where he remained more than twenty years, and during this period wrote and pubiished the three great works upon which his fame as a writer chiefly rests—the Manual of Political Ethics (1838), Legal and Political Hermeneutics (1839), and Civil Liberty and Self Govern- ment (1853),1

In 1856 Lieber resigned the professorship in South Carolina College, and was immediately elected to a similar professorship in Columbia College, New York, and to the chair of political science in the law school of the same institution. He continued in the discharge of the duties of these positions until his death, which occurred October 2, 1872. During the great war for the preservation of the Union from 1861 to 1865, Lieber rendered services of great value to the Government of his adopted country, and was frequently consulted by the secretary of war. He was one of the first to point out by his pen the madness of secession, and was ever active in supporting the Govern- ment and upholding the Union. He prepared, upon the requisition of the president, the Code of War for the Government of the Armies of the United States in the Field, which was adopted and promulgated by the Government in General Orders No. 100 of the war department. This code has been characterized by many European publicists as a masterpiece, and it suggested to Bluntschli his codification of the law of nations, as may be seen in the preface to his Droit International Codifié. During this period also Lieber wrote his Guerilla Parties with Reference to the Laws and Usages of War, a valuable contribution to the law of war. At the time of his death he was by appointment of the Government of the United States the umpire of the commission for the adjudication of Mexican claims. The political writings of Francis Lieber are held in great estimation by all publicists Sir Edward 8.

1 New editions of these works and of his miscellancous writings have been published recently at Philadelphia. :

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Creasy, in his First Platform of International Law, allud- ing to his death, has justly said of him, “ America and the civilized world in general have lately had to deplore in his death the loss of one whom the French jurist M. Laboulayehas truly styled ‘une des figures les plusoriginales parmi les jurisconsultes de notre temps.’ ”

. Besides the works already mentioned, Lieber published at various times many simaller works and pamphlets on different subjects, all of which attracted. public attention, such as The Origin and De- velopment of the First Constituents of Civilization, Great Events Described by Great Historians, Essays on Property and Labour, The Laws of Property, Penal Laws and the Penitentiary System, Prison Diseipline, The Relation between Education and Crime, The Pardon- ing Power, The Charaeter of the Gentleman, International Copyright, Laura Bridgman’s Vocal Sounds, On Anglican and Gallican Liberty, The Post Office and Postal Reforms, Independence of the Judiciary, Nationalism, Rise of the Constitution (an unfinished work), and many minor tracts and publications. These works are all written with as much ease and purity of idiom as if English had been his native tongue, a fact not more remarkable than that he, a German, should have become the great American teacher of the philosophy of Anglican political science. (OLR)

LIEBIG, Justus (1803-1837), was born at Darmstadt in 1803. His father carried on business as a drysalter and dealer in dye-stuffs, and made various experiments with a view to improved methods of preparing and purifying his wares. These led the son to take an interest in chemistry, and to seek for knowledge in the chemical books and periodicals in the grand-ducal library, which is rich in scientific works. At home he employed his time in repeating, as far as the means at hiscommand admitted, the experiments he found described in books, and thus while still a boy attained a theoretical and practical knowledge of chemistry compar- able with that of many full-grown

professors of the science. He determined to be a chemist, to devote his life to the pursuit of science. The only kind of chemist available for teaching purposes was the chemist and druggist, and accord- ingly Liebig, at the age of fifteen, entered the shop of an apothecary at Heppenheim near Darmstadt to study

chemistry. He soon found out how great is the difference | between practical pharmacy and scientific chemistry, and | returned to Darmstadt, after ten months, to look for another | After some | months spent in study at home he entered the university of |

and more likely way of attaining his object.

Bonn, which ke soon left for Erlangen. There he attended the lectures of Kastner on chemistry, and, besides the study of allied sciences, devoted some time to make up for the almost total neglect of school work caused by his early love of chemistry. He was much influenced by the metaphysical speculations of Schelling, and in after life referred to this influence as injurious to him as a scientific investigator. In those days there were no laboratories accessible to ordinary students, and Liebig had to content himself with

what the university could give him in the lecture-room and in the library. Both at Bonn and at Erlangen he formed © a students' chemical and physical society for the discussion | of new discoveries and speculations as these appeared in – In 1822 he left Erlangen : with the degree of Ph.D. By means of the liberality of ' Louis [., grand-duke of Hesse-Darmstadt, Liebig was |

scientific books or periodicals.

enabled to continue his chemical studies in Paris. There

he made the acquaintance of Runge, Mitscherlich, and |

Gustav Rose. He attended the lectures of Gay-Lussac,

Thenard, and Dulong, and, while carrying on the investiga- .

tion into the composition and properties of the fulminates which he had already partly published, he attempted, as at Erlangen, to work up his neglected school studies. results of his work on the fulminates were communicated to the Academy of Sciences, and attracted the favourable attention of Humboldt, who was at that time in Paris. Humboldt introduced Liebig to Gay-Lussac, who admitted him into his private laboratory as a pupil. Here he had opportunities of learning all the mysteries of the art from

one of the most skilful and ingenious of experimenters. It was on the advice of Humboldt that Liebig determined to become a teacher of chemistry, but difficulties stood in his way. Asa native of Hesse-Darmstadt, he ought, according to the academical rules of the time, to have studied and graduated at the university of Giessen, and Humboldt had to use his influence to induce the authorities to forgive his having attended the foreign university of Erlangen. After examination his Erlangen degree was recognized, and in 1824, in his twenty-first year, he was appointed extra- ordinary professor of chemistry in the university of Giessen. Two years later he was promoted to the post of ordinary professor, which he held for twenty-five years, notwith-standing the most tempting offers from other universities. It was here, in the small town and small university of Giessen, that by far the most of Liebig's work was done. He began by remedying the evil which as a student he had himself felt. He induced the Darmstadt Government to build a chemical laboratory in which any student of the university might obtain a thorough practical training. It is difficult for us, who live in a time when nearly every university and many schools possess well-arranged and often well-endowed laboratories, to understand how great a revolution was made in the practical teaching of physical science by the foundation of the Giessen laboratory. We can form some idea of it by reading Liebig's articles on the condition of chemistry in Austria and Prussia, in which he goes over in detail the means of teaching afforded in the various universities of those great countries.

He tells us that in 1838 two young Prussians came to Giessen to study chemistry, unable to obtain entrance to a laboratory in their. own country, but were ordered back again by the Prussian, Government. Fortunately other Governments were less.

| strict, or other students were less obedient, and crowds of

young men anxious to study chemistry came to Giessen, and carried home the light there acquired. Partly by Liebig's urgent appeals to the interests and to the shame of the great German states, partly by the influence of his pupils, a great reform was effected, and German universities now vie with one another in offering opportunities of practi- cal instruction in chemistry and the other physical sciences..

The amount and the importance of the laboratory work done by Liebig in Giessen were very great. Without con- sidering here the work done by his students under his direction, of which no doubt a very large part was conceived by him, and in the execution of which he constantly contri- buted his assistance and advice, we shall look only at what appears under his own name. During the twenty-six years he spent at Giessen as ordinary professor, he contributed to scientific journals more than two hundred papers, about twenty of which were records of joint work, chiefly with Wohler. During the same time he published his works on organic analysis, organic chemistry, chemistry applied to physiology and agriculture, his Chemical Letters, and many smaller treatises. From 1832 he was joint editor of the Annalen der Pharmacie, from 1837 of the Handworter- buch der reinen und angewandten Chemie, and from 1847 to 1856 of the Jahresbericht der Chemte. These statements give some idea of the amount of his work ; of its import- ance and of its effect on the history of science we shall speak later.

In 1845 he was raised to the hereditary rank of baron under the title of Freiherr von Liebig. In 1852 he accepted the invitation of the Bavarian Government to the ordinary professorship of chemistry in the university of Munich. This office he held till his death in 1873.

In private life Liebig was hospitable, courteous, and kindly. Honoured by all the great scientific societies of the world, aud regarded by almost every one as the great authority in chemistry, he assumed no airs of superiority,

and lived the simple and quiet life of a German professor. Liebig's influence on the history of chemistry may be con- sidered under five heads :—(1) the effect of the opening of the Giessen laboratory, and of Liebig's constant efforts to induce other universities to follow this example; (2) the improvements introduced by him in methods of investigation and in apparatus; (3) the discovery of new facts; (4) the development of theory ; and (5) the application of chemistry to physiology, agriculture, and the arts.

We have already spoken of the first. Under the second head by far the most important change introduced by Liebig was his method of organic analysis. Organic substances were analysed, and analysed with accuracy, before 1830, but such analyses could then be carried out only by highlyskilled chemists, and involved great labour and the use of cumbrous apparatus. Liebig's method of organic analysis, which was published in all its details in 1831, and which (with important but secondary improvements) is that still used, made it easy for any advanced student to make a fairly accurate and very uscful analysis of an organic substance. Analysis is to the chemist what astronomical mcthods for determining longitudes and latitudes are to the geographical explorer. Without it many iu- teresting and useful discoveries may be made, but it is only when complete and accuraté analyses are made of all the new substances produced in the course of a researeh that the research becomes fully available to other explorers. If Liebig had contributed nothing to organic chemistry but his method of analysis, he would still have been in a perfectly true sense the founder of modern organic chemistry. Many other improvements of apparatus are duc to him; we need only mention the simple form of condenser called by his name, and constantly used by every chemist, and the easy and accurate method for determining the quantity of urea

in a solution, which was the first step towards introducing precise chemical methods into practical medicine. This is also the proper place to refer to his analyses of the natural alkaloids, and his discovery of the method of determining their equivalents by the analysis of their chloroplatinates. In the third place we have to consider the new facts discovered by Liebig. The very grcat addition to our knowledge of organic chemistry made by Liebig naturally throws into the shade his contributions to inorganic cheinistry, but we ought to remember his numerous analyses of mineral watcrs and his contributions to the difficult question of the accurate separation of cobalt and nickel. It is, however, in organic chemistry that Liebig's great discoveries were made. 'These dis- coveries are so intimately connected with his chemical theories that we may most conveniently consider them along with the fourth head, his contributions to the development of chemical theory.

The notion of compound radicals is to be found in cheiistry as far back at least as the time of Lavoisier. Lavoisier says, '' Some experiments of my own and some made by M. Hassenfratz have convinced me that in general nearly all the vegetable acids, such as tartaric, oxalic, citric, malic, acetic, pyrotartaric, pyromucic acids, have for thcir radical hydrogen and carbon, but united so as to form a single base, that all these acids differ from one another by the difference in proportion of these two substances and the degrees of oxidation." Berzelius adopted this view and expressed it thus,— 'We find the difference between organic and inorganic bodies to be that, while in inorganic nature all the oxidized substances have a simple radical, all the organic substances have compound radicals. Just as ammonia is an alkali with a compound radical, but possess: ing nevertheless the greatest analogies with the mineral alkalies which have simple radicals, so we find the greatest analogy between the mineral and the organic acids, so that the relations of potash and soda to acetic, oxalic, citrie acids are the same as their relations to sulphuric, nitric, phosphoric aeids." These views were published by Berzelius in 1817. In 1815 Gay-Lussac had discovered cyanogen, and shown that this compound of carbon and nitrogen is the radical of prussic acid and its salts, in the same sense as chlorine is the radical of hydrochloric acid and the chlorides.

Ampere had indicated a theory of the constitution of the ammonia salts, which Berzelius worked out in detail, according to which those salts contain a compound radical, ammonium, playing in them the part of potassium in the potash salts. Finally, Davy suggested in 1815 that the hydrated aeids which correspond in function to hydrochloric acid should be regarded as the true acids, and proposed to represent then as compounds of hydrogen with a radical.

Such were the knowledge and the theoretical position of chemists on this question when Liebig became professor ; the dates to which we have referred correspond to the time when as a schoolboy he was devouring the contents of chemical journals at Darmstadt, and no doubt he then became acquainted at first hand with the discoveries ani speculations of Ampere, Davy, Gay-Lussac, and Berzclius.

We have seen that his first investigation referred to the fulmi- nates. He continued his researches upon the compounds of cyanogen. and the substances connected with them formed frequent

combined water, ether does not.

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subjects of his researches during his whole life. In this region of organic chemistry he made many important discoveries, of which the limits of this article do not allow a detailed account ; we can only mention melone, mellam, ammeline, ammelide, and melanine, as substances discovered and investigated by him. In the course of these investigations he discovered the precise nature of the chemical changes which occur in the manufacture of bromide of potash. In 1831 he examined the action of chlorine upon alcohol, among other substances discovered chloral, and commenced the series of investigations into the derivatives of alcohol and ether to which we shall refer immediately. In 1832 Wohler and Licbig published the results of their joint research on the oil of bitter almonds and its derivatives. This research may be said to stand at the head of modern organic chemistry. For elegance of method and for clearness of insight it is unrivalled, and will always remain a model of what such an investigation should be.

They showed in the clearest manner that the compound O,H,0 (here and elsewhere in this article we use the symbols now in common use, instead of those employed by the authors), to which they gave the name of benzoyl], is the constant part, or radical, of a great series of com- pounds. The importance of this investigation was generally recog- nized. Berzelius hailed it as the advent of real daylight on the

-subject of organic chemistry, and even suggested the names proin

or orthrin (from mpwf and dpépos) for the newly discovered radical.

We now come to the long controversy as to the constitution of alcohol and ether, which engaged so much of Liebig's time and energy. Gay-Lussac had shown in 1815 that alcohol and cther might, as far as their composition is concerned, be represented as compounds of olefiant gas and water, and further that, if we repre- sent the quantities by volume of gas or vapour, ether contains one volume of olcfiant gas and half a volume of water vapour, while alcohol contains equal volumes of the two. In 1828 Dumas and Boullay published an elaborate memoir on the preparations and properties of the ethers, in which they further devcloped the ideas suggested by oe They regarded olefiant gas as the radical of all the etherial compounds, as ammonia is of the ammouiacal salts,

and formulated them thus :—

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We have given only a sample of their tables, leaving out among otherssome substances in reference to the composition of which they had fallen into error, error which Liebig detected and used as an argument, valid enough then no doubt, but of little intcrest now. 1n 1833 Liebig proposed a quite different theory, one which stands to Dumas and Boullay's in the same relation which the ammonium theory holds to the ammonia theory of the constitution of the ainmoniacal salts. Just as Ampére and Berzelius regarded sal- ainmoniac, not as NH;,HCl, but as NH,,Cl, so Liebig proposed » for muriatic ether the formula C,H;,Cl instead of C,H,,HCL The really cogent argument

which he brought forward, the argument which we can now best appreciate, is that, while alcohol contains According to Duinas and Boullay alcohol and ether are both hydratcs, but in Liebig's view ether is (C.H;),0 and alcohol (C,H;),0,H,O. If we wish to understand this argument we must recollect that to the chemists of that time oxidized hydrogen was water, and Liebig's arguments are as sound now as they were then, for the most recent views represent alcohol as C,H,—O—H, and this contains oxidized hydrogen, or, as we may say, half a molecule of water, and Licbig's tests do not distinguish preformed water, but hydrogen and oxygen combined as they are in water. Much debate and investigation followed, in the course of which the relations of all the substances derived from alcohol were thoroughly and practically studied in a fuller and more careful manner than would have been possible had there not becn a theoretical point to defend and to attack. The enormous number of facts discovered by Liebig put him in a very favourable position as the advocate of his theory. Chemists could not do without a knowledge of these facts, and they could only get this knowledge through Liebig's papers, in whieh the facts were expressed in the language of his theory. In 1835 Regnault began a series of most important researches into the compounds derived from olefiant gas. He showed that many of these substances might be classified and thcir relations explained by the assumption of a radical C,Hg, to which he gave the name of aldehydene. Liebig saw that according to his view of the meaning of the word radical, as ‘‘ the unehanging constituent in a series of compounds,” the same radical may be assumed in alcohol and in acetic acid, and in 1839, in a note published in the Annalen, he puts the matter in a very clear light. He says, ‘‘ Ether and ammonia have in their compounds a certain resemblance which was

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first indicated by Dumas and Boullay, and the view of the constitution of the ammonia salts which is generally held in France was the reason why ether was cousidered'the first hydrate of olefiant gas, alcohol as the second hydrate, &c. ; in Germany and other countries the water necessary for the constitution of the salts of ammonia with

oxygen acids was considered as an integral part of the base; it was assumed that this water forms with the ammonia oxide of ammonium (NH,),0, and this view in a certain sense smoothed the way for another, according to which the existence of organic oxides, capable of neutralizing acids, appeared very probable, as a necessary complement to the organic acids which chemists had long been inclined to regard as oxides of organic radicals. Ether was in these countries regarded as an organic oxide, and this difference of view excited a ten years' strife, as an imniediate result of which' we may regard the discovery of a great number of com- pounds which enriched science with innumerable important obser- vations. No region of organic chemistry has been so thoroughly and so completely stndied as the compounds connected with ether ; and now, when the existence of organic oxides is no longer denied, the support of the opposite opinion has come to an end, although it cannot be said that thequestion itself has been experimentally decided. If we compare in the light of our present knowledge the ammonia compounds with the ether compounds, we at once see that the opposing views were fundamentally the same in the two cases. The disputes took place because we were not at one as to the interpreta- tion of the phenomena. Theether and ammonia compounds assume in fact the same form if amidogen is regarded as the unchange- able radical of the ammonia compounds, and acetyl [Regnault's aldehydene] as the starting point of the ether compounds. The two sets of compounds differ only in so far as we must ascribe to acetyl the power of forming acids, a power which amidogen does not possess."

He then gives a table containing in two columns the ammonia and the ether compounds, in which OH; corresponds to NH,, C,H, to NH3, and C,H; to NH,, and adds, 'These formule require no explanation ; they have been developed. in order to

Show the extraordinary resemblance of the ammonia and the ether compounds, and to show why it was that many chemists regarded olefiant gas as the first member of the series of ether compounds. Both of the formerly antagonistic theories have, as may be easily scen, from

this point of view the same foundation, and all further questions as to the truth of the one or other view is thus of course set at rest.”

It was during the course of the controversy which then closed that Liebig had discovered aldehyde, chloral, and, simultaneously with Soubeiran, chloroform, besides numerous other substances of less general interest, and developed the theory now generally received of the formation of ether by the action of sulphuric acid on alcohol.

In the very short sketch given above of the discussion as to the constitution of ether, we mentioned that Liebig’s ethyl theory was to some extent borrowed from Berzelius. Berzelius had suggested that ether was the oxide of a radical (Liebig’s ethyl), but he was at first inclined to regard alcohol, not as the hydrate oxide of the same radical, but rather as the oxide of another one, which with our symbols would be written C,H, But there was a deeper difference than this between the radical theories of Berzelius and Liebig. This essential difference first clearly showed itself in the notes which Liebig added to two letters from Berzelius to Wéhler, published in the Annalen in 1839. In these letters Berzelius gives his views of the constitution of oxychlorides, with which he classes such bodies as trichloracetic acid. All those bodies he represents as compounds of oxides and chlorides, in harmony with the dualistic system.

Thus, instead of SO,Cl,, C,HCI,0,, &c., he writes SCl,+2S0,, C,Cl,+C,03, &c. (taking the anhydrous acid). In his second letter on Malaguti’s chlorinated ethers he naturally arrives at formule of extreme complexity. In his notes Liebig states that he does not agree with Berzelius, and that the analogy first pointed out by Berzelius between inorganic and organic compounds and his theory of organic radicals had been a guiding star in a labyrinth in which previously no one could find the way. “But, while there are points of resemblance, there are very many points of difference ; we should follow a theory as long as it gives us light and explains facts ; up to a certain point the principles of inorganic chemistry help us in organic chemistry, beyond it they leave us, and produce instead of removing complications; beyond this point we require new principles.”

These new principles were supplied by Liebig's radical theory. As Licbig showed, abstract discussions as to the truth of a theory are out of place in an experimental science; the question is not as to their essential truth but as to their practical fruitfulness. Do they help us to understand old and to discover new facts? If they do, the morrow may take thought for its own theories. These are not Liebig's words, but they seem to express his ideas.

Liebig early expressed his approval of Davy's views as to the con- stitution of acids, but he rarely used the language or the notation corresponding to that view. This divergence between his theory and his habitual language is interesting as showing that he held

that the same truth may be expressed in more than one way, and that where no immediate point is to be gained it is well to employ the language best understood by those whom we address. In this, as in his preference for what was called the equivalent system of notation over that of Berzelius, he showed his sound practical judg- ment and cominon sense. We now see that the notation of Berzelius was nearer the truth, but its advantages could not be felt until chemistry had advanced further, and its retention would have led to complications of formule and obscuring of relations. The resemblance indeed of our present notation to that of Berzelius is to a great extent accidental, and the advance was hastened rather than hindered by what now looks like a retrograde step.

There is one other point which we have to mention under the present head. Liebig at once saw the importance of Graham's re- searches on the phosphates. He applied Graham's idea of poly- basicity to organic acids, and satisfactorily proved, notwithstanding the opposition of Berzelius, that tartaric acid is dibasic and citric acid tribasic.

We have hitherto said nothing as to the relation of Liebig's theories to those at present held by chemists. On this subject a word may suffice. The great revolt against the radical theory led by Laurent and Gerhardt produced a long and acrimonious contro- versy. In that controversy

Liebig took his part, and many hard and some unfair things were said by him. The controversy itself was of course the means of producing a vast amount of thorough research, and was thus, like all such contests, of direct use; it also led to the revision of all theoretical opinions from a totally new point of view. From this ordeal the radical theory has emerged, not very different in appearance. But it has undergone a profound change. Its foundations have becn immensely strengthened, it has' been to a great extent explained. Some chemists secm to think that this makes it an entirely new theory. We cannot share this view. Our reasons for believing in ethyl and benzoyl differ from the reasons adduced by Wohler and Liebig only in this that we have arguments which they had not ; their arguments remain. We now know some- thing of the reason why such radicals exist; we can, to a certain extent, deduce their properties from thosc of the elements which they contain, but explanation is something different from refu- tation ; the theory has grown, but still remains the same theory.

Liebig all his life showed a special predilection for the study of the immediate products of animal life. He investigated with untiring zeal the substances contained in urine and in the juice of ficsh. In these researches he discovered many new substances, and cleared up doubts and difficulties as to their relations to one another and to other bodies. Late in life: he expressed the most lively interest in Volhardt's synthesis of sarcosin and ercatine, substances with the preparation of which he had long before been engaged. In this connexion it is right that we should mention his elaborate investigation on uric acid and its derivatives. This line of study led him to interest himself in the chemistry of food, and the im-

ortance of his work in this direction can scarcely be overestimated. We do not refer alone to his methods of preparing the extract of meat and the food for infants, which have perhaps spread his fame more widely than his strictly scientific work could have done; we refer rather to the influence which his analyses and calenlations have had on medical opinion and practice. And this leads us to our fifth head, Liebig's influence on the application of chemistry to physio- logy, agriculture, and the arts.

Before Liebig undertook his investigations into the chemistry of vegetation, the views (they can scarcely be called theories) held as to the manncr in which plants are nourished were vague in the extreme. The only point satisfactorily made out was that under the influence of light the green parts of plants are capable of decom- posing carbonic acid, giving off oxygen and retaining the carbon. Saussure, to whose careful experiments the establishment of this fact, first noticed by Priestley, is mainly due, believed that the nitrogen of the plant came from soluble organic substanccs absorbed by the roots, and expressly says that the main use of ammonia in manure is asa solvent of humus, which he supposed to be one source of the carbon in plants ; and, although the ashes of the vari- ous plants had been analysed, the importance of the mincral con- stituents of vegetables was not at all recognized. Liebig undertook the investigation of this question in 1840. He showed that the plant derives its nourishment partly from the air, partly from the soil ; the carbonic acid and water, the ammonia and nitric acid, which he showed to be the sources of the plant's nitrogen, come from the atmosphere ; while the potash, soda, lime, iron, magnesia, sul- phuric acid, phosphoric acid, and silica come from the soil. No exhaustion can take place of the former, but the soil contains only a limited amount of the lattcr in a soluble state, and when this is used up the soil becomes barren. Not only so, but the absence of any one of the necessary substances makes the soil barren. He showed how manure acts by restoring these deficient ingredients, and how, when the land is left fallow, atmospheric influences dccom- pose the insoluble minerals and supply the soil with what has been removed. He further showed that plants use and therefore remove from the soil the articles of plant food in various proportions,

and thus explained the advantage of a rotation of crops. The arti- ficial manures which he introduced contained the essential mineral substances, and a small quantity of ammoniacal salts, because he held that while the air supplies ammonia it does not always supply it fast enough, particularly to the less leafy plants. He bought a field near Giessen for his experiments, aud treated it with the artificial manure,

but the result was disappointing. The manure was not inactive, but not nearly so active as it should have been. It was many years before he detected the cause. To prevent the rain washing away the alkalies in the manure, he had taken great pains to render them insoluble. Way's experiments on the absorp- tion of manure by soils (1850) occurred to him as suggesting an explanation, and in 1857 he made a number of experiments on the retention of various substances by earth. In these he confirmed and extended Way's observations, and thus saw that his effort to make his manure better had made it worse. As he says, ''I had sinned against the wisdom of the Creator, and received my righteous

unishment. I wished to improve His work, and in my blindness cheval that, in the marvellous chain of laws binding life on the earth's surface and keeping it always new, a link had been forgotten which I, weak powerless worm, must supply."

Now, just as he showed that plants require certain—often sinall—quantities of particular substances, else they will not grow at all, however great may be the quantities of other kinds of food supplied, so he showed that animals also require, not only a proper quantity of food, but also the right proportion of the different kinds of food, mineral as well as organic. In the classification of the kinds of organic food into heat-producing and blood-forming, it was necessary to examine whether the carbohydrates, starch, sugar, &c., should be placed alongside of fat. He was thus led to inquire into the power of the animal body to produce fat from starch or sugar, and came to the conclusion, contrary to the opinion of Dumas and Boussingault, that this transformation does take place.

Liebig's investigations into the relations of organic chemistry to hysiology led him to the conviction that the only source of animal cat is the heat produced by the oxidation of the tissues, and,

strange as it may apzear, he had to defend this view against what 'he truly enough, though perhaps somewhat impolitely, called the absurd nonsense of his medical opponents. He also succeeded in demolishing, it is to be hoped finally, the ridiculous belief in the possibility of the spontaneous combustion of the human body.

“. Liebig’s theory of FERMENTATION (q.v.) aimed at explaining the phenomena on purely chemical principles. He ridiculed the physiological theories, and looked upon the growth of fungi rather as incident of the fermentation, adducing the fermentative changes of amygdaline and similar substances as cases of fermentation ‘without life.

We have still to notice one of Liebig’s chemical discoveries, of secondary interest chemically, but of great practical importance. “This is his discovery of a method for depositing a uniform film of ‘metallic silver on smooth clean surfaces. This mcthod may render it possible to use reflectors for astronomical telescopes of a size ‘unattainable with the old speculum metal.

The most important of Liebig’s works separately published are as follows:— Anleitung zur Analyse organischen Kérper, 1837, 2d ed., 1853; Die Chemie in threr Anwendung auf Agricultur und Physiologie, 1810, 9th ed., 1875-76; Die Ihier-Chemie oder die organische Chemie in threr Anwendung auf Physiologie und Pathologie, 1842, 3d ed., 1847; Handbuch der Chemie mit Riicksicht auf Phar- . macie, 1843; vol. i. of Geiger’s Handbuch der Pharmacie, new ed.; Chemische Briefe, 1844, 6th ed., 1878; Chemische Untersuchungen tiber das Fleisch und seine Zubereitung als Nahrungsmittel, 1847; Grundsdtze der Agricultur-Chemie, 1855; Zur Theorie und Praxis in der Landwirthschajt, 1856; Naturwissenschaftliche Briefe tiber die moderne Landwirthschaft, 1859; Reden und Abhandlungen, 1874, a posthumous collection of some of his addresses and shorter publications. -Liebig’s seientifie papers were chiefly published in Poggendorff’s Annalen till 1839, and in Liebig’s Annalen from 1832 onwards. His eriticism of Bacon appeared in the Augsburge: allgemeine Zeitung in 1863 and 1864, and also as a separate

(A. C.

publication. B.)

_ LIECHTENSTEIN, a sovereign and independent prin- cipality, the smallest in Germany, is bounded on the N.E and E. by the Austrian Vorarlberg, on the S. by the Swiss canton of Grisons, and on the W. by the Rhine, while on the north it tapers almost to a point. The state, consisting of the lordships of Vaduzand Schellenberg, is only 15 miles in length, hardly over 5 miles in its average breadth, and comprises an area of 68 square miles, Excepting in the immediate neighbourhood of the Rhine the surface of the country is mountainous, being traversed from south to north by spurs of the Rhetian Alps, which at some points attain an altitude of about 7000 feet. The climate is mild, and the soil generally fertile and well watered. The chief products are corn, wine, flax, fruit, and timber. Agriculture and the tending of cattle form the chief employment of the inhabitants. A branch of the Vorarlberg railway from Feldkirch to Buchs passes through

the state. In 1876 the population amounted to 8664, of old German extraction, and Roman Catholics by con- fession. The capital is Vaduz or Liechtenstein, with 960 inhabitants.

Until 1866 Liechtenstein formed part of the German confedera- tion, but from that date it has been constitutionally independent, although for the sake of convenience the postal system, customs, and currency are under the general Austrian administration, from which the principality receives annually some £1600 as its share in the customs dues. According to the charter of the 26th September 1862, Liechtenstein is a constitutional monarchy, the sovereign prince sharing the legislative power with a diet of fifteen members (elected sexennially), of whom three are nominated by the prince, and twelve elected by popular suffrage. The chief control of the principality is carried on at Vienna by a court chancellory, which also serves as the judicial court of appeal of first instance, the ulti- mate court of appeal being at Innsbruck. The immediate direction of the principality in administrative and judicial matters is at Vaduz. The inhabitants are free from military service and direct taxation. The annual revenue amounts to about £6000. Although the sovereignty of the prince is so small, his

estates in Austria and elsewhere render him one of the wealthiest landed proprictors in Germany, his income from them amounting to nearly £140,000 sterling. The house of Liechtenstein, one of the oldest in Central Europe, was elevated to the princely dignity in the early part of the 17th century. Anthony Florian in 1713 obtained a vote and seat in the imperial diet, and after the union, in 1719, of the lord- ships of Vaduz and Schellenberg into one principality under the name of Liechtenstein, his privileges were, in 1723, confirmed to his successors. See Jacob von Falke, Geschichte des fiirstlichen Hauses Licchtenstein, 2 vols. (Vienna, 1868-77).

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Plan of Liége.

rail), and 16 miles south-south-west of Maestricht. It occupies a remarkably fine position on the banks of the Meuse, which at this point is joined by the Ourthe. On the left-hand side stands the older city with the citadel and the more important historical buildings ; on the right hand lies the lower and more modern portion, commanded by the fort of the Chartreuse. The river, there 460 feet across, is spanned by several bridges, of which the Pont des

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Arches, rebuilt in 1860-63, dates originally from the 8th century, and plays a prominent part in the local aunals. Place St Lambert is the historical centre of Liége. Here still stands the noble buildiug—erected (1508-40) by Cardinal de la Marck in a late Gothic stylk—which down to the revolution was the palace of the prince-bishops, aud is now with its modern extensions occupied by the public courts and other administrative offices. And here, till it was ruined by the revolutionists

in 1794, and completely removed in 1808, stood the old cathedral of St Lambert, originally founded in 712, and rebuilt after a great fire at the close of the 12th century. The rank of cathedral was in 1802 transferred to the abbey-church of St Paul, the foundation of which is assigned to 968, though the nave is no older than the 16th century, and the choir belongs to 1280. The stained glass and the wood carving of the pulpit by Geefs deserve particular mention, Other churches of note are St Jacques, a fine Gothic building founded in 1016, with a Romanesque west tower and a polygonal choir; St Barthélemy, a completely modernized basilica of the 12th century ; St Martin, founded in 962 and rebuilt in the middle of the 16th century; and the Holy Cross, founded by Notker in 979, with a west choir dating from the 12th'century, and the east choir and nave from the 14th. The university of Liége, established in 1817, is a flourishing institution with about 40 professors and 800 students, a library of 100,000 volumes, a botanic garden (1819, formerly the Jesuits' garden), a school of mines (1825), a school of arts and manufactures, a normal grammar school, and several other auxiliary foundations. There is no theological faculty,—the theological seminary, with a large library of its own, being an independent insti- tution. The city further possesses a blind asylum, a deaf and dumb institute, schools of design, painting, and music, a zoological garden, a municipal museum, &e. The Place d'Avroi is adorned by an equestrian statue of Charlemagne by Jehotte ; and in front of the theatre stands a bronze statue of Gretry, the composer, who was born at Liége.

Liége is the centre of a great mining district rich in coal, lead, zine, and iron; the coal-mines extend under the city and the river. In 1879 358,100 tons of coal were raised in the province, 22,156 persons being employed in the pits. The iron, lead, and zine foundries in the town and neighbourhood work up large quantities of ore in addition to the local supply. Steel, copper, and tin wares, steam-engines and general machinery, woollen goods, excellent saws and files, nails, needles, mirrors, clocks, leather, paper, and oil are among the products of the versatile industry of the place. Liége firearms have long enjoyed a wide reputation. They give employment to about 30,000 workmen, who for the inost part work in their own houses, though in 1878 a large

factory was erected in the American style for making all parts of the weapon by machinery. In 1878 183,806 single-barrelled guns, 113,121 double-barreled guns, 403,649 revolvers, 19,395 saddle pistols, and about 85,000 army weapons, &c., were passcd by Liége through the Government testing office. The trade of Liége is favoured by the fact that the town is an important junction on the Rhenish Belgian Railway, commands more than one navigable river, and has long been one of the leading cattle-markets in the country. The population was 115,956 in 1874.

About 720 the bishops of Tongres, after oscillating between Tongres and Maestricht, settled at Li¢ge, though they did not take the title hishop of Liége for more than two ccuturies. Their church of St Lambert received large territorial endowments, and in the 14th cen- tury they became princes of the empire. For centuries the struggle was maintained between episcopal tyranny and civic independence ; and ducal and imperial armies were called in to crush the insurrec- tions. In this way Charles the Bold of Burgundy made himself master of the city in 1467, and again with much bloodshed and barbarity in 1468. Bishop Ferdinand in 1650 and Bishop Maxi- milian in 1684 were each imposed on the citizens by force of arms, and kept them down by means of a strong eitadel and foreign sol- diers. In 1691 Liége was bombarded for five days by Marshal de Boufilers ; in 1702 Marlborough took the citadel by storm from a French garrison ; and in 1792 the town was the scene of a great defeat of the Austrians by the French.

See Henaux, ist. du pays de Liéye; Polain, Mist. delancien pays de Liége,

and Liége pitioresque; Polain and Raikem, Coutwnes du pays de Liége; Baron de Gerlache, Hist. de Liége (20 cd., 1859) ; Becdelitvre, Biographie Liégeoise,

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LIEGNITZ, the capital of a district of the same name in the Prussian province of Silesia, is picturesquely situated on the Katzbach, just

above its junction with the Schwarzwasser, and 40 miles west-north-west of Breslau. It consists of an old town, surrounded by pleasant, shady promenades, and several well-built suburbs. ‘The most prominent building is the palace of tho former dukes of Liegnitz, rebuilt after a fire in 1835, and now occupied by the administrative offices of the district. The Ritter Academie, founded by the emperor J oseph in 1708, for the education cf the young Silesian nobles, was reconstructed as a gymnasium in 1810. The Roman Catholic church, with two fine towers, contains the burial vault of the dukes. The principal Lutheran church dates from the 14th century. There are also several other churches and schools, aud a number of benevolent institutions, The theatre, the barracks, the military hospital, and the town- house are the most noteworthy of the remaining buildings. The manufactures of Liegnitz are considerable, the chief articles being cloth, wool, leather, tobacco, and pianos. Its trade in grain and its cattle-markets are likewisc important. The large market gardens in the suburbs grow vegetables to the value of £20,000 per amium. Population in 1880 37,168, about one-sixth being Roman Catholics.

Licgnitz is first mentioned in an historical document in the year 1004. In 1164 it became the seat of the dukes of Liegnitz, who greatly improved and enlarged it, especially in 1170 and 1175. The dukes were members of the illustrious Piast family, which gave so many kings to Poland. At Wahlstatt, near Liegnitz, the tide of Mongolian invasion was stemmed, in 1241, in a hard-fought battle between the Tartars and the Christian chivalry under the duke of Silesia. The victory, indeed, remained with the invaders, but the obstinate resistance deterred them from any further attack ou Gerinany. During the Thirty Years’ War Liegnitz was’ taken by the Swedes, but was soon recaptured by the Imperialists. The Saxon army also defeated the imperial troops near Lieguitz in 1634. On the death of the last duke of Liegnitz in 1675, the duchy came into the possession of Austria, which retained it until the Prussian conquest of Silesia in 1740-45. In 1760 Frederick the Great gained a decisive victory near Liegnitz over the Austrians under Laudon, and in 1813 the list of important battles in this neighbourhood was completed by Bliicher’s defeat of the French at the battle of the

Katzbach. During the present century Liegnitz has been uniformly prosperous, and its population has increased fivefold since 1800.

See Schuchard, Die Stadt Liegnitz (Berlin, 1868); Sammter and Kraffert, Chronik von Licgnitz (Liegnitz, 1861-73).

LIEN, in English and American law, properly means a right of detaining goods of another in your possession until a debt due to you from the owner of the goods is paid. To the original or common law conception of a lien it would appear tu be necessary that the goods over which lien is claimed should be actually in the possession of the ercditor, and further that the debt should have been incurred with reference to the gocds which are detained. Such is the lien of the workman to whom articles are delivered for the purpose of being operated upon by him in the way of his trade. He is entitled to keep the article he has worked at until remuneration for his labour has been made to him. Of precisely the same character is the lien of the carrier over the goods conveyed by him, for the fare; of the farrier over the horse which he has cured, for his fee; of blacksmiths, shipwrights, and other artificers for the wages they have earned by working at or on the thing detained. This, the true lien of the English law, is denominated a particular lien in contradistinction to a right of detainer exercisable over the property of another for a debt not incurred in relation to the thing detained. The latter is a general lien. The former is said to be favourably, the latter strictly, construed by the law. The former arises by implication of law from the relation of the parties; the latter requires a special contract either expressed in terms or to be inferred from the usage of trade. Again, as pos- session is the foundation of lien in common law, a parting with the possession would in general operate as a waiver

or forfeiture of the lien. The same effect would follow of course from any agreement by the lien holder to give up his right while retaining possession of the property. Again as a general rule lien means only a

right of deten- tion, not a power of sale,—a fact which distinguishes it from a pledge of property in security for a loan. But in special cases powers of sale have by statute or judicial decision been added to liens. Thus innkeepers now have, in addition to their ordinary right of lien, power to sell goods and chattels left with them after six weeks (41 & 42 Vict. c.38). In the United States the principle of the particular lien has been developed in a notable manner in protecting the rights of workmen employed in building. At common law, the building belongs absolutely to the owner of the soil ; and accordingly, when a house is erected by contract, the contractor may receive payment from his employer and may fail to pay the labourers he has employed, who are consequently left without redress. The ‘mechanics’ liens,” created by statute in several of the American States, give labourers a lien over the build- ing which they have erected for their unpaid wages. Notice having been filed in the prescribed manner, they acquire a right to have their wages paid out of the property, which may if necessary be sold for that purpose. A similar preferential charge, not depending on possession, is recognized by the law in various cases, and goes by the name of lien. Thus in equity an unpaid vendor has a charge for the amount of the purchase money, or the balance thereof, over the estate, although it may no longer be in his possession. Charges of this kind are sometimes denominated equitable liens. Of the same nature is the charge acquired over a ship by a person who has supplied her with necessaries for the voyage under a lawful contract with the master (maritime lien).

LIERRE, or Lier, a town of Belgium, in the province of Antwerp, 94 miles south-east of Antwerp (on the railway to Malines), at the junction of the Great and Little Neethe. It is a busy place of 15,659 inhabitants (1874), and manufactures silk, lace, and shoes, beetroot sugar, and a peculiar kind of white beer known as cavesse. The church of St Gommarius (in plan a Latin cross with a lofty tower in front) is one of the most notable buildings of its class in Belgium. It was commenced in 1425, but not completed for more thana century. Of the fine stained glass windows three were presented by the emperor Maximilian.

Lierre, which dates from the 9th century, owed much to the favour of the dukes of Brabant, to whose territory it belonged. The more important facts in its annals are the celebration of the marriage of Philip the Fair with Joanna of Castile (1496) ; the residence in the town of Christian IT. of Denmark during his exile ; and the con- tests between the Dutch and Belgian forees in 1830. Joseph II. ordered the fortifications to be razed in 1784.

LIFE ASSURANCE. See InsurANcE.

LIFEBOAT. It will be convenient to consider here, not the lifeboat simply, but also other means of saving life at sea. When it is borne in mind that the vast commerce of such a country as Great Britain extends to every part of the world, that the arrivals and departures from the ports of the country in one year average six hundred thousand vessels, that these are manned by more than two hundred thousand men and boys, and carry goods to the estimated value of six hundred millions sterling, with unknown thousands of passengers, that its seaboard is nearly 5000 miles in extent, many parts of it being exceed- ingly dangerous to shipping, that about two thousand wrecks occur every year on its shores, and above seven hundred lives are lost, the necessity that exists for a well- organized system of life-saving apparatus becomes very apparent. It is satisfactory to be able to add that this well-organized system is most efficiently provided by the Royal National Lifeboat Institution, with its splendid fleet

of two hundred and seventy-one lifeboats, and by the Rocket Service. The number of lives saved annually, either by the lifeboats or by special exertions for which the insti- tution has granted rewards, averages in round numbers nine hundred, and by far the greater proportion of these (four-fifths) are saved by lifeboats. These lifeboats, too, are the means of saving every year from twenty to thirty vessels which, owing to stress of weather, exhausted men, &c., would almost certainly have been lost but for the aid afforded by the fresh and experienced lifeboat crews.

The qualities of the lifeboat first deserve our attention. These are such that this boat is able to live in seas, and go into positions of danger, that would overwhelm ordinary boats or insure their destruction. Eight important quali- ties are possessed by it in a very high degree :—(1) buoyancy ; (2) great lateral stability, or resistance to up- setting; (3) the power to right itself if upset; (4) the power of immediate self-discharge when filled with water ; (5) strength; (6) stowage room for a large number of passengers ; (7) speed against a heavy sea; (8) facility in launching and taking the shore.

. The buoyancy of the institution’s lifeboat, or its inability

to sink, be it ever so deeply laden, is secured chiefly by means of a watertight deck or floor, air-cases round the sides inboard, and two large air-chambers, one in the bow, the other in the stern, The “extra buoyancy” thus obtained cannot be too great so long as it does not inter- fere with the space necessary for working the boat and stowing shipwrecked persons. The air-cases round the sides serve also to confine any water shipped to the centre of the boat, a point of great importance. There is an air- tight space between the boat’s floor and its bottom, filled partly with air partly with cork-ballast, which gives it additional buoyancy, but the air-chambers above the floor would float the boat even if she were stove in and this space filled with water. In a 33-feet boat the buoyancy obtained by all its chambers is equal to 11} tons.

Stability is obtained chiefly by means of ballast. Im- mense difficulty was experienced in arriving at the present form of the institution’s splendid boat, because qualities of differing value had to be sacrificed to each other in due proportion. Thus, while breadth of beam secured stability, it seriously interfered with the self-righting quality. Bal- last, therefore, in the form of a heavy iron keel, instead of breadth, became necessary to give the requisite stability.

Fig. 1 represents, let us say, the 33-feet, double-banked, ten- oared, self-righting, and self-emptying lifeboat of the institution on its transporting carriage, ready for launching; figs. 2 and 8, respectively, a section and a bird’s-eye view of the same. The

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Fic. i, —Ben-Owed Lifeboat.

breadth is 8 feet, with stowage room for forty-three persons—thirty passengers and thirteen of a crew. The festooned lines (fig. 1) enable people in the water to elamber inboard even without assist- ance. The shaded parts of figs. 2 and 3 show the position of the air-eases, The white oblong space in fig. 3 shows the free space available for crew and passengers. In fig. 2 are seen the depth to which the air-cases descend, and the height to which the bow and stern air-chambers ascend above the gunwale, also the ballast space between the floor and the keel.

The self-righting power is due to the large elevated air- chambers in bow and stern, coupled with great sheer, or rise fore and aft, of gunwale, to the iron keel, which weighs

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about 9 cwts. in a 33-feet boat, and to the air-cases and ballast, which latter weighs from 7 to 8 ewts. When the boat is upset it cannot rest on its two elevated air-chambers; it necessarily rolls on one side, then the heavy iron keel and ballast come into play and drag it back to its right position

Fic. 3.—Lifeboat (Deck Plan).

This principle of self-righting was dis-

covered—at all events first exhibited—at the end of last

century, by the Rev. James Bremner of Orkney, but was

not finally adopted till the middle of the present century. The self-emptying quality. depends chiefly on the well-

in a few seconds.

known physical fact that water must find its level. The floor of the lifeboat (fig. 2, the dotted double line ex- tending from stem to stern), on which the men's feet rest when seated on the thwarts, is placed so as to be very slightly—2 or 3 inches—above the level of the sea when the boat is fully manned and loaded. In this floor there are six holes of 6 inches diameter, into which are fitted six metal tubes. These pass through the boat's bottom into the sea, The water of course enters them, but cannot rise above them into the boat, because it cannot rise above its own level. Valves at the upper ends of the tubes, opening downwards, prevent the annoyance of water spurt- ing in, but allow it freely to run out. When, then, a billow overwhelms the boat, and fills it, the water rushes violently down the discharging tubes until it reaches the sea-level ; by that time it has descended below the level of the floor and left the boat empty. So complete and swift is the process that a filled boat frees herself in about halfa minute. This principle was first applied by the institution in 1851. Lifeboats devoid of the self-discharging quality become temporarily useless when filled by a sea, as they can be emptied only by the slow and laborious process of baling.

Strength, that will enable the lifeboat to suffer treatment which no ordinary boat could stand, is dependent on peculiarity of construction and material. The best Hon- duras mahogany is used, and the diagonal plan of construc- tion adopted,—that is, the boat has two distinct "skins " of planking, both sets of planks being laid on in a position diagonal to the boat's keel and contrary to each other, besides passing round from gunwale to gunwale under the boat instead of from stem to stern as in ordinary boats. The skins have a layer of prepared canvas between them, and thus great strength and elasticity are combined.

The carriage of the lifeboat is an essential adjunct for the purpose of conveying it over any kind of road or beach to the place where it may be required. It can be run deep into a raging surf, and the boat, with its crew seated and oars ready out, can be launched at once, by blocks and tackle, so as to enable the men to dash forward and meet the incoming rollers with sufficient force to propel it through or over the seas, and

thus avoid the risk of being hurled back on the beach. Each lifeboat is furnished with a set of spare oars, as these are frequently broken.

The institution’s lifeboats are of various sizes—six, eight, ten, and twelve oared,—and they are placed at various

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points of the coast according to the necessities of each station. Some are called out at long intervals; others, such as those near the Goodwin Sands, are constantly on duty in rough weather—that of Ramsgate having a steamer to attend on it, which lies in harbour, with its fires banked up, ready for instant action night and day. The average cost of a lifeboat station is £1000,—the boat and equip- ments, including belts and carriage, costing £650, and the boat-house £350. The average annual expense of main- taining a station is £70, which is expended in paying the crew for going off and saving or attempting to save life from shipwreck, for exercising the lifeboat ones a quarter, paying coxswain’s salary, replacing gear, and repairs.

The Uifebelt of the institution is a part of the equipment of the lifeboat which merits spceial attention, g

beeause it is a very efficient contrivance, ; and has been the means of saving many lives in time past. Fig. 4 shows its appearance aud the manner in which it is worn. It was designed in 1854 by Admirai J. R. Ward, the institution’s chief inspector of lifeboats. It ismade of cork fastened on canvas, and combines great buoyancy with strength and flexi- bility. It not only floats a heavily-clothed man head and shoulders above water, but enables him to support a comrade easily ~ —the extra buoyaney being 25 Ib. One of its distinctive features is its division at the waist, by which means great freedom of action is allowed. It serves also as a species of armour to protect the wearer’s most vital parts from blows against rock or wreck, while it affords some degree of warmth. No man may serve in the lifeboats of the institution

Fig. 4. without it, and it would be well if every British ship were obliged to carry lifebelts of this kind.

History.—The first lifeboat was conceived and designed by

Lionel Lukin, a London coachbuilder, in 1785. Encouraged in his philanthropic plans by the prince of Wales (George IV.), Lukin fitted up a Norway yawl as a lifeboat, took out a patent for it, and wrote a pamphlet descriptive of his ‘‘ Insubmergible Boat.” Buoy- ancy he obtained by means of a projecting gunwale of cork and air- ehambers inside—one of these being at the bow, another at the stern. Stability le seeured by a false iron keel. The self-righting and self-emptying prineiples he seems not to have thought of ; at all events he did not compass them. Despite the patronage of the prinee, Lukin went to his grave a neglected and disappointed man. But he was not altogether unsuccessful, for, at the request of the Rev. Dr Shairp, Lukin fitted up a coble as an ‘‘ unimmergible ” lifeboat, which was launched at Bamborough, saved several lives the first year, and afterwards saved many lives and mueh property. Publie apathy in regard to shipwreck was at length swept away by the wreek of the ‘‘Adventure” of Neweastle in 1789. This vessel was stranded only 300 yards from the shore, and her erew dropped, one by one, into the raging breakers in presenee of thousands of spectators, none of whom dared to put off in an ordinary boat to We reseue. An exeited meeting among the people of South Shields followed ; a committee was formed, and premiums were offered for the best models of a lifeboat. This ealled forth many plans, of which those of William;Wouldhave, a painter, and Henry Greathead, a boatbuilder, of South Shiclds, were seleeted. The committee awarded the prize to the latter, and, adopting the good points of both models, gave the order for the construction of their boat to Greathead. This boat was rendered buoyant by nearly 7 ewts. of cork, and had very raking stem and stern-posts, with great curvature of keel. It did good service in after years, and Greathead was Well rewarded; nevertheless no other lifeboat was launched till 1798, when the duke of Northumberland ordered Greathead to build him a lifeboat which he endowed. This boat also did good service, and its noble owner ordered another in 1800 for Oporto. In the same year Mr

Cathcart Dempster ordered one for St Andrews, where, two years later, it saved twelve lives. Thus the value of life- boats began to be recognized, and before the end of 1808 Greathead had built no fewer than thirty-one boats—eighteen for England, five for Seotland, and eight for foreign lands. That these boats were lamentably insufficient to meet the necessities of England was shown year after year by the ever enlarging record of wreck and loss of life on her shores ; nevertheless, publie interest in lifeboats was not thoroughly aroused till 1823. ’ In that year Sir William Hillary, Bart., stood forth to champion the lifeboat cause. Sir William dwelt in the Isle of Man, had

assisted with his own hand in the saving of three hundred and five lives, and felt the horrors of shipwreck so keenly that he resolved to stir up public men and the nation generally to a sense of their duty in regard to this matter, Eventually, in eon- junction with two members of parliament—Mr Thomas Wilson and Mr George Hibbert—he founded the ‘‘ Royal National Institu- tion for the Preservation of Life from Shipwreck.” This, perhaps the grandest of England’s charitable societies, and now named the ‘Royal National Lifeboat Institution,” was founded on the 4th of Mareh 1824. ‘The king and many of the nobility and gentry patronized it. The archbishop of Canterbury presided at its birth; the most eloquent men in the land—among them Wilberforce—pleaded the cause; the institution was launched under the most favourable auspices, and began its noble carecr with a sum of only £9826. In the first year twelve new lifeboats were built and placed at different stations, besides which thirty-nine lifeboats had been stationed on the British shores by benevolent individuals and by independent associations over which the institu- tion exercised no control though it often assisted them. In its early years the institution placed the mortar apparatus of Captain Manby at many stations, and provided for the wants of sailors aud others saved from shipwreck. The latter duty is now efficiently discharged by the ‘‘Shipwreecked Fishermen and Mariners’ Royal Benevolent Society.” At the date of the institution’s second report it had contributed to the saving of three hundred and forty-two lives, either by its own life-saving apparatus or

by other means for which it had granted rewards. With fluctuating success, both as regards means and results, the institution continued its good work from year to year—saving many lives, and oceasionally losing a few brave men in its tremendous battles with the sea. District or branch societics were established in mostof the coast towns. Ultimately it began to be recognized that inland towns owed something to the lifeboat cause, as well as towns on the eoast, and now such eities as Manchiester, Liverpool, Glasgow, Edinburgh, &c., have presented lifeboats to the institution and become annual contributors. Sinee the adoption of the self-righting boats, loss of life in the service has been comparatively small and infrequent.

Towards the middle of this century the lifeboat cause appeared to lose interest with the publie, though the life-saving work was prosecuted with unremitting zeal, but the inereasing loss of life by shipwreck, and a few unusually severe disasters to lifeboats, brought about the reorganization of the society in 1850. The late Prince Albert beeame vice-patron of the institution in conjunction with the late king of the Belgians, and afterwards Her Majesty the Queen, who had been its patron since her aceession, beeaime an annual contributor to its funds. About the same time its present secretary, Mr Richard Lewis, barrister-at-law, was appointed. The following year (1851) the duke of Northumberland became its president, and from that time forward a tide of prosperity set in which is literally unpreeedented in the history of benevolent insti- tutions, both in regard to the great work accomplished and the peeuniary aid received. Its flow of prosperity les never sinee been checked. In 1850 its committee undertook the immediate superintendenee of all the lifeboat work on the coasts, with the aid of local committees. Periodical inspections, quarterly exercise of erews, fixed rates of payments to coxswains and men, and quarterly reports were instituted, at the time when the self- righting self-emptying boat came into being. This boat was the result of a hundred-guinea prize, offered by the president, for the best model of a lifeboat, with another hundred to defray the cost of a boat built on the model chosen. In reply to the offer no fewer than two hundred and eighty models were sent in, not only from all parts of the United Kingdom, but from Franee, Germany, Holland, and the United States of America.

The prize was gained by Mr James Beeching of. Great Yarmouth, whose model, slightly modified by Mr Peake, one of the committee of inspection, became the foundation of the present boat, which, having been still further improved as time and experience have suggested, is now probably as near to perfection as can be attained.

_ The shortest way, perhaps, to exhibit the progressive work of the institution is to contrast the report of 1850 with that of 1880. In the former year the receipts had dwindled down to £84 of subscrip- tions and donations, whieh, with £270 of dividends (on a capital of £9000) and a balance of £476 on hand, gave an available income of £830. The expenditure was £590, and the lives saved were about one hundred. In 1880 donations and annual subseriptions amounted to £29,240; dividends and interest (on a eapital of £231,000) amounted to £9266. The total income was £38,506 besides legacies in the same year to the amount of £40,782. The expenditure, including liabilities, was £40,586, and the number of lives saved was about seven hundred. In the past unusually disastrous year (1881), the institution has saved 966 lives by its boats, and granted rewards for the saving of 155 more, besides rescuing 38 vessels from destruction. The total number of lives saved either by the lifeboats, or by special exertions for which the institution has granted rewards, since its formation, is 28,724, for which services 95 gold incdals, 939 silver medals, and £69,000

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in cash have been granted as rewards. So highly are the services of the institution appreciated that donations of boats, gifts of money, acknowledgments, and legacies come in from nearly all quarters of the globe, in sums varying from a shilling to £10,000.

Rocket Apparatus.—This, next to the lifeboat, is the most important and successful means by which shipwrecked per- sons are rescued on the British shores. Many vessels are cast every year on the rocky parts of the coasts, under cliffs, where no lifeboat could be of service. In such places the rocket alone is available. It is worked by the men of the coastguard, with the aid, in a few places, of volunteer rocket brigades. The courage and skill displayed in its use are evinced by the saving of

many lives every year, and by the fact that a large proportion of the medals given by the lifeboat institution for heroic conduct are awarded to the men of the coastguard, who, besides managing the rockets, frequently man the lifeboats and also effect rescues in their own boats. The number of lives saved by means of the rocket apparatus in the year ending 30th June 1881 was 657, This, however, is the greatest number saved in any one year since 1856, at which date the life-saving rocket apparatus was placed under the entire control and management of the Board of Trade. The rocket stations on the coast at the 30th June 1881 numbered 288. The Board of Trade now gives a sun: of money for each life saved, besides awarding silver and bronze medals for acts of special gallantry.

The apparatus consists of five principal parts, viz., the rocket, the rocket-line, the whip, the hawser, and the sling lifebuoy. Tho mode of working it is as follows. A rocket, having a light line attached to it, is fired over the wreck. By means of this line the wreeked crew haul out the whip, which is a double or endless line, rove through a bloek with a tail attached to it. The tail-block, having been detached from the rocket-line, is fastened to a mast, or other portion of the wreek, high above the water. By means of the whip the rescuers haul off the hawser, to which is hung the travel- ling or sling lifebuoy. When one end of the hawser has been made fast to the mast, about 18 inehes above the whip, and its other end to tackle fixed to an anchor on shore, the lifebnoy is run out by the rescuers, and the age ee persons, getting into it one at a time, are hauled ashore. Sometimes, in cases of urgency, the lifebuoy is worked by means of the whip alone, without the hawser. A tally- board with instructions to wrecked crews, printed in English and French, is sent off with the whip, as ignorance in regard to the mode of working the apparatus has been the cause of much loss of life. Such ignoranee is culpable, becanse the Board of Trade issues enamelled plates with instruetions, which are supplied gratuitously to shipowners and masters to be placed on conspicuous parts of their vessels, and are fixed in public places along the British coast, while every certificated officer in the mercantile marine is required to understand the working of the rocket apparatus.

The late Captain G. W. Manby, F.R.S., in 1807 invented, or at least introduced, the mortar apparatus, on which the system of thé rocket apparatus is founded. Previously, however, in 1791, the idea of throwing a rope from a wreek to the shore by means of a shell from a mortar had occurred to Serjeant Bell of the Royal Artillery, and about the same time, to a Freneliman named La Fére, both of whom made suecessful experiments with their apparatns. In the same year (1807) a rocket was proposed by Mr Trengrouse of Helston in Cornwall, also a hand and lead line as means of communicating with vessels in distress. The heaving- cane, a fruit of the latter suggestion, is now used at every station in the kingdom. In 1814 forty-five mortar stations were established, and Manby received £2000, in addition to previous grants, in acknowledgment of the good service rendered by his invention. Mr John Dennett of Newport, Isle of Wight, introduced the rocket, which was afterwards extensively used. In 1826 four places in the Isle of Wight were supplied with Dennett's rockets, but it was not tillafter Government had taken the apparatus under its own control, in 1855, that the rocket now in nse was adopted. It was invented by Colonel Boxer, and its peeuliar characteristie lies in the com- bination of two rockets in one case, one being a continuation of the other, so that, after the first compartment has carricd the machine to its full elevation, the second gives it an additional impetus, whereby a great increase of range is obtained. The roeket has now entirely superseded the mortar in England.

The United States Life-Saving Service is chief among the lifeboat societies of other nations, both as regards the extent of coast embraeed and the amount of work done. There are several points of differenee between this serviee and that of England which are noteworthy. In the first place the whole or nearly the whole of its

support is provided for by annual grants of money from Congress. Seeondly, besides protecting its vast extent of seaboard, it has to provide for the shores of its great lakes, or fresh-water seas. Then, the coasts of America, unlike those of England, are destitute of

human habitations in many plaees, which renders necessary the |

constant employment of surfmen for the express purpose of looking out for vessels in distress and manning the surf-boats.

It also |

necessitates the erection of houses of refuge, provisioned so as to |

afford shelter and food to shipwrecked crews fora considerable time, at places where, without such provision, those who escape the sea would probably perish from hunger and exposure.

The shores of the United States—lakes and sca—are over 10,000 miles in extent, embracing almost every variety of climate and formation of land. This vast extent of coast-line is divided into 12 districts, with a total of 179 stations. Of these 139 are on the Atlantic, 34 on the lakes, and 6 on the Pacific. Those on the desolate coast of Florida are houses of refuge only, without boats or apparatus. Many of the stations are closed during the fine months of the year, their crews being disbanded till the winter gales again summon them to the heroic and dangerous work of saving the shipwrecked. That they render noble service in this way may be gathered from the annual reports. shows that the disasters to shipping in that year amounted to 300, that on board of the vessels thus endangered there were 1989

ersons, of whom 1980 were saved and only 9 lost. The property umperilled at the saine time was estimated at, in round numbers, £790,000, of which over £540,000 worth was saved, besides which, in one hundred and twenty-eight instances, stranded vessels were hove off, and piloted out of danger by the surfmen. The total number of lives saved by this service, since the introduction of the present system in 1871, to the close of the fiscal year in Junc 1881, was 11,864; the total number of persons sheltered 2610, and the number of days' shelter afforded 7850 ; the total value of property saved, $14,958,875.

Owing to the flat shores of the Atlantic coast, and tho sparseness of the population, heavy boats are found unsuitable. Only a few boats on the

English model exist in the service. The boats chiefly in use are surf-boats, incapable of self-righting, and liable to be swamped, but which nevertheless seem well suited for the work, and are admirably managed. They are very light, and can, on their transporting carriages, be easily dragged along the shore by their crews. The cork life-belts worn by the men are of the plan first designed in 1854 by Rear-Admiral Ward. For projecting a line over a stranded vessel, the Americans prefer the mortar, or other ee of ordnance, to the rocket. In addition to the travelling life-

uoy, they use a metallic car, or small covered boat, which can hold three or four ‘persons, who, entering it by a small manhole, are shut in and drawn ashore, safely protected from injury, even though overturned by the surf. This clever contrivance has been of great service in rescuing invalids, children, and aged persons. The total cost of the service is somewhere about £90,000 a year.

The history of the United States Life-Saving Service may be said to have begun in 1848, though half a century before that the Humane Society of Massachusetts had erected some huts of shelter and stationed some boats on the coast. In that year the United States Government was led to consider the subject of loss on their shores, chiefly through the energy of the Hon. W. A. Newell of New Jersey, a member of the House of Representatives. Captain Douglass Ottinger (the inventor of the lifc-car) was charged with the manage- ment and reconstruction of the service. The impetus given to it at this time was never quite lost. Again, in 1854, renewed efforts were made to improve the service, but no great progress was made till the year 1871, when the present effective system was organized ; new stations were built ; the patrol system between the stations was introduced ; the regular keeping of journals and sending in of reports was ordered ; libraries for the use of the men were sent to stations;

uniformity in signals was arranged, and a thorough reform in all ;

departinents accomplished.

The Freneh Society for Saving Life from Shipwreck, modelled on the basis of the English system, is a vigorous and healthy offshoot. It continues steadily to extend its operations along the coasts of France, besides introdncing its life-saving apparatus into Algeria and other colonies. It was founded in the year 1865, and from that year onward has continued to do good and ever-increasing service in the saving of life and property. At the date of its report ending 30th June 1881, its lifeboat stations numbered 62, and its mortar or other projectile stations 391. During the year its life- boats and gun apparatus had saved 209 livesand 16 ships, to which may be added 31 lives, for the saving of which the society had granted rewards. From the time of its commencement in 1865 to the above date it has rendered the following noble service :—

Lives saved by its own boats and apparatus …..... 1,826 Lives saved by other means, for which the society granted rewards in gold, silver, and bronze medals, } 3068 EINE oo, sisagie.n+> a+ vse ox atieanenee Eee em Total of lives saved from the beginning …... 2,129

The report for 1880 |

543.

Besides this it has saved 149 vessels and succoured 348, and has awarded 28 gold, 129 silver, and 319 bronze medals, 513 diplémes

| @honneur, and about £20,400 in recompenscs to those who have

assisted in saving life in circumstances of unusual danger. It has also spent about £53,000 in the purchase and repair of its matériel. The receipts of the society show that its work is appreciated. At 31st December 1880 the subscriptions and donations together amounted to nearly £2600, and the legacies bequeathed to it the same year were about £1000. The boats chiefly used are built on the model of those of the English institution. The gun is preferred to the rocket in connexion with the life-saving apparatus. In addition to its direct work of saving life, the French society has aceoinplished much good indirectly by its influence. It has been instrumental in bringing about this result that,

among the qualifica- tions for a captain's certificate in the French mercantile marine, a thorough knowledge in detail of the means of saving life from shipwreck is required. It has also laboured to extend the usefulness and reduce the cost of the gun and rocket apparatus, besides securing that this apparatus, on Mr Delvigne's system, shall be supplied to every ship of the French navy.

The German Association for the Reseue of Life from Shipwreck, under the patronage of the emperor William, was founded at Kiel in May 1865, and is prosperous both in regard to its work and finances. It is maintained by voluntary contributions, and has 21 local branches on the coast and 27 in the interior, besides 149 agencies over the country. Previous to 1865 several private societies for saving life from shipwreck existed in the chief seaports of the North Sea and Baltic. These have been absorbed in the present association, the proceedings of which are reported in a paper entitled From Shore and Sea, published at Bremen once a quarter, and largely modelled on the Lifeboat Journal of the English institution. The association provides the whole extent of the German coast with life-saving apparatus. It has 74 lifeboat stations, 20 of which are provided with the mortar or rocket apparatus. With these means it has, in the year 1880-81, saved 122 lives and 2 ships. The total number of human lives saved by the association since its commencement is 1184. From May 1880 to May 1881 the amount subseribed by its members was £57,000. As in America, the heavy self-righting and self-emptying Loats of England have been found unsuitable to the thinly peopled and flat ee beaches of Germany. Lighter and shallower boats have therefore been adopted. These are iron-plated and not self-righting, but almost impossible to cap- size. The stations are visited at least once a ycar by an inspector, and the whole system seems to be well regulated and thoroughly efficient.

In addition to the above, lifeboat societies or other lifeboat organizations—formed more or less on the basis of the National Lifeboat Institution of Great Britain—are to be found in Russia, Italy, and Spain.

Life-saving Hammoeks, &c.—Various forms of buoyant mattresses, pillows, and india-rubber cloth life jackcts and belts haye been contrived. Among these may be specially mentioned the air lifebelt of Admiral Ward, which has four compartments, separately inflated, so that the puneture of one does not qnite destroy the belt, Admiral Ryder's hammock also deserves notice. Its virtue lies simply in a cork mattress, which, when rolled np in its hammock, forms an efficient lifebuoy capable of supporting a man with his head and shoulders well above water, and it enables three inen to float in an upright position. Cork mattresses are said to be cheaper and more comfortable than those stuffed with hair. Two such hammocks lashed together, about 20 inches apart, will enable two or three men to propel themselves easily through the water. The advantage of having such mattresses in a ship is obvious, for every one on board would be thus provided with a life-preserver.

It has also been suggested that the enshions of deck and cabin Seat whould, in a similar way, be made life-preservers, and that catmr ttirniture should be constructed so as to form rafts in cases of emergency. It is well to know, on the authority of the Philosophical Magazine (vol. xx. p. 862), that even a hat tied in a pockct handkerchief and held with the crown downwards may help to sustain a drowning man. It need scareely be added that empty water-casks, tightly bunged, with ropes arranged for clinging to, form pretty good life-preservers. GB. DBs)

LIFTS may properly be held to include all sorts of ap- paratus whose object is the lifting of weights. When the apparatus consists of comparatively small, separate, and portable pieces, it is called léfting tackle. When the lifting apparatus reaches that degree of size and compli- cation that entitles it to be called machinery, there seems to be no general technical term that will include all kinds, but for the different classes of lifting machines there are such special names as cranes, hoists, elevators, lifts, wind- ing engines, and lift pumps.

There is very little distinction made between hoists,

elevators, and lifts. The word hoist refers more particu- larly to machines used in warehouses and factories for raising goods from one story to another. They are worked by hand or by power, and are for comparatively light loads. Elevator is used in two different senses. It refers to apparatus for lifting passengers to the upper stories of buildings. It also refers to the very different sort of apparatus used in grain-mills and storehouses for trans- ferring the grain from one floor to another. The grain is drawn along channels or pipes, which are sometimes vertical and more often inclined, by means of a rotating archimedean screw, or of a strap continuously travelling upwards through the interior of the channel and carrying, fastened to it, a series of small buckets. Occasionally, if the inclination to the horizontal be small, a broad strap of the same width as the bottom of the channel runs along that bottom, and carries the grain with it simply lying on its upper surface. This latter method of transportation is more efficient, however, as a horizontal carrier or distributor than as a means of lifting. Grain might also easily be blown up a pipe by an air-blast, but the writer does not know any instance of this method having beenused. J/fts are constructed either for raising passengers in buildings or for heavier loads, such as freighted trucks and waggons, or the superstructure of bridges and large roofs during their erection.

In lifts or elevators, the working force is either hand, steam, or hydraulic power. Gas-engines are unsuitable as direct sources of power for lifts, but they may be advantageously used to store hydraulic power in an ac- cumulator from which water is supplied to work an hydraulic lift. Electricity has quite recently been used, but has not yet been tried sufficiently to allow of any valuable opinion being formed of its ultimate practical success,

The lift consists of (1) a box or “cage” to contain tlie persons or material to be raised; (2) a vertical square well or shaft, to the walls of which are attached guides to prevent the cage swinging to and fro; (3) a rope or chain by which to haul the cage upwards from above, or else a long rod or pillar by which to push it up from below; (4) a “barrel” or “sheave” over which to wind the chain or rope, and which is mounted ona shaft lying in bearings firmly supported by tlie building, or else a

cylinder to contain water or steam to actuate the lifting rod; (5) mechanism through which the working power is transmitted to the barrel, or else water or steam piping connecting the cylinder above mentioned with the source of power; and (6) the driving engine or other source of power.

Most accidents happen to lifts through the hauling chain or rope breaking. For the sake of safety, therefore, particular care should be exercised in the choice of material for this part, and an appliance should always be attached to the cage whereby, if the rope breaks, the cage is caught immediately in whatever position it may be at the time of the breakage.

For light loads hempen ropes are sufficient and more convenient than chains, because they are noiseless in their action. If of the best quality (Manila) they are quite as reliable as ordinary chains, and an advantage claimed for them is that their gradual destruction by wear becomes easily apparent, and gives timely warning before they become dangerous, whereas the failure of a chain may take place without any easily visible previous sign having been given. for very heavy loads, however, chains or wire ropes should be used in preference to hempen ropes. Wire ropes may be made stronger for a given weight per foot of length than chains are, but unfortunately as commonly manufactured their quality cannot be certainly relied on, Like hempen ropes, they are almost noiseless.

Lif Ts

To insure smoothness and noiselessness in passenger lifts, the sheave over which the rope passes is lined in the groove with leather.

For the sake of safety, the rope by which the cage hangs is often duplicated. Sometimes even three or four are used. In order that these should give additional safety, each rope must be capable of supporting the load by itself. Generally the load is lifted by one or other kind of power, and descends by the weight of the cage itself. This weight is always much more than sufficient for the purpose, and therefore counterpoises are intro- duced to balance the greater part of it, thus

lessening the work to be done during ascent by an amount equal to the product of the balance weight and the height of the lift. In the commonest arrangement, the balance weights are hung on the same rope as that by which the cage is sus- pended. This passes over a pulley whose diameter is half the width of the well, so that the cage end of the rope rises vertically from the centre of the roof of the cage. This pulley is keyed on a horizontal shaft, which is driven by power from below, either directly by means of a rope or chain passing over another pulley, or else through inter- mediate spur gearing. The actual working rope is in this case not attached to the cage. Less frequently the rope from the engine forms one of the suspenders of the cage, the balance weights being attached by separate ropes.

The rope or chain by which the load hangs has to be so strong that its own weight is very considerable. A large excess of strength being more in demand in this kind of machinery than in other kinds, a greater stress than about 1 ton per square inch cannot be put upon the chain or rope (supposed to be of iron). This would make the rope weigh 3:4 tb per foot of length for every ton of load carried. If the height of lift were, for example, 60 feet, then, comparing the top and bottom positions of the cage, there would be in the former 60 feet less of rope on the cage side of the pulley, and 60 feet more on tlie counter- poise side, than in the latter position, so that if the counter-weight just balanced the load when the cage was at the bottom, it, along with the rope, would outweigh the cage in its highest position by the weiglit of 120 feet of rope, that is 408 ib for every ton of load, or nearly 4th of the whole load. Since the whole load—that is, that of cage, ropes, and passengers or goods—is three or four and sometimes five or six times as great as the net load, this is a very serious increase on the unavoidable loss of balance resulting from tlie fact that the cage is alternately loaded and unloaded. The difficulty can be got over by extend- ing the rope downwards from the balance weight to pass underneath a grooved pulley at the bottom of the well, and up from this to the under side of the cage, where it is attached. There will then be an equal length of rope always hanging on each side of the top bearing pulley; but an extra amount of friction occurs at the bearing jour- nals due to the weight of the extra rope. The lower half of the

rope may be of cheap inferior material, since there is very little stress upon it.

A preciscly similar difficulty occurs if the cage be lifted from be- low by an hydraulic ram or piston-rod. Occasionally the weight of the cage and ram is Jeft unbalanced. In this case the water pressure on the ram or piston has to support the whole load. Sup- pose the pressure in the reservoir from which the water is drawn to remain stcady during the ascent, then evidently at the top of its stroke the water pressure on the ram is less than at the bottom of its stroke, by the weight of a column of water, of section equal to that of the ram, and height equal to the lift. Suppose, for example, that the water pressure at the level of the face of the ram in its highest position is 200 fb per square inch. Then for every ton of total load there must be provided about 11 square inches of piston area. A column of water of this horizontal section and 1 foot high weighs about 4°751b. This would give a difference of support- ing pressure of 285 tb for every ton of total load in a lift of 60 feet, — that is, about 3th of the total load. More commonly the weight

of the cage and the ram is balanced by counterpoises on chains fastened to the top of the cage and passing over a pulley overhead, while the water pressure is used to overcome only the friction, and the additional load of passengers or goods. In this case again, owing to the passage of the chains over the pulleys, the balance is disturbed in a rise of 60 feet, by about 4th the weight of the cage and the ram, while the upward water pressure on the ram is in the same rise diminished by 3th. The former disturbance of balance is a decrease of the load resting on the basc of the ram, while the latter is a deercase of the supporting pressure on the same base. If these were made equal, the cage and load would be perfectly balanced in every position. To make them equal, it oun be necessary simply to adjust the ratio of the part of the load borne by the counter- poise to the part borne by the water. Let the former part be W, and the latter We, the total load being W,+W,.. Then fora water pressure of 200 Ib per square inch, it would be necessary to have $W,=4§We, or W\=3W,=4(W, + W,). For a pressure of 400 Ib per

square inch, the equation would be W\=70W.=2(W, + W,). For 100 fb per square inch it would be W, = gw, = £(Wi + V,).

This adjustment would necessitate a large unnecessary consump- tion of water, because the weight of cage and ram always bears a much greater ratio to the extra weight of passengers or goods than any of the above fractions 3%, 8, or even $. The adjustment being attainable by other means, this waste can in no case be desirable.

Ifa second eylinder stand beside the lift-well and be connected by a pipe to the cylinder directly underneath the cage, so that there is a continually open passage between the two cylinders, then the supporting rod underneath the eage, together with the column of water leading from its base through the pipes to the second cylinder, is the exact counterpart in compression of the overhead ropes in tension in the other class of machine ; and, as counterweights are hung upon these ropes, a balancing weight may be laid on the surface of the water in the second cylin- der. The balance weight, equal- ling that of cage and ram, rests ona plunger or piston fitting this eylinder, and the rod is extended upwards into a third smaller cylinder, on the plunger of which is admitted, by means of the valve worked from the eage or landing-platforms, an extra amount of watcr pressure suf-

Fig. 2.

ficient to elevate the extra load of is the arrangement in Tomassi's hydraulic balanced lift. 'The column of water which takes the place of the rope in the over- head arrangement passes from one cylinder to the other, and vice

passengers or goods. This

versa, in the same way as the rope passes from the cage side to the counterweight side of the overhead pulley. Thus the balance, which may be made correct for one position of the lift, becomes dis- turbed for other positions by a similar amount to that already investigated. A

perfect balance of the constant part of the total load, namely, that of the cage and ram, is, however, obtained for all positions of the cage by the arrangement shown in figs. 1 and 2. This is the design of Mr Edward Ellington, described by him in a paper read before the Institution of Mechanical Engineers in January 1882. The whole load is borne by the rod a underneath the cage, which enters as a ram into the vertical cylinder A. This rod is made solid in order to reduce the sizeof the cylinder as much as possible, and, therefore, also the size of the well that has to be bored in tlre ground to contain this cylinder. This class of lifts is especially expensive on account of this boring, and the objection tc them on the score of expense is lessened by making the well small. The rod is made only just strong enough to safely bear the load on it. Its section should be designed with reference to the height of lift, because the longer the free length of the supporting pillar the greater is its tendency to buckle under a given load. If & be the stress per square inch calculated to be admissible on its section, and if W be the weight of cage and ram together and W' that of assengcrs

or goods to be raised, the section is made equal to = , Since

this same load has to be supported by the water pressure on the lower end of this rod, that water pressure is made also equal to &. This eylinder A is kept always in open communication with the lower end of the cylinder B. 'In this moves a piston } fastened to the top of the thick piston rod d. This passes downwards into the third cylinder C, and to its lower extremity is fastened the large piston ¢, These pistons have a common stroke, which is much shorter than the lift of the cage. The cylinders are correspondingly shorter than A, and they stand above ground. The ratio of the strokes may range from 5 to 8, and is the same as the ratio of the annular area of the under side of the piston } to that of the rod a. If d and d be the areas of the piston and piston rod, and a@ that of the rod supporting the cage, the ratio of the strokes is b-d:a. Suppose the piston 0 to be at the top of-its stroke and the cage to be veda a | at the bottom of the lift-well, then, if in this position the piston 6 be at a height above the lower end of a equal to h inches, and if w be the weight of a cubic inch of water, then, the pressure per square inch on a@ being &, that on the dower side of piston 6 isk-hw.

The whole upward pressure on this piston is therefore (k-hw)(b—d); and a downward pressure equal to or rather more than this must be exerted on this piston in order to lift the cage. This is supplied by admitting the water from the main, or from thehydraulic accumulator if force-pumps are employed to provide water-pressure, into the upper ends of the cylinders B and C, The lower end of C is always kept in open communication with the atmosphere. The water is continually admitted to B, and the water pressure on the top surface of piston } is designed to balance the eonstant load of cage and ram when this piston is at the top of its stroke. During the ascent of the cage, the water is admitted into C by a valve moved from the cage or platforms by means of the rope ¢, and the water pressure on the annular top surface of piston ec, when that piston is at its highest position, is designed to balance the extra load of passengers or goods. During the descent, the eage being empty, the eonnexion between C and the aceumulator is shut by the valve actuated from the cage, and the water is allowed to escape freely to the drains, so that the pressure on ¢ becomes equal to atmospheric pressure. If p be the pressure per square inch of the working water at the level of the piston 6 at its highest position, and ¢ be the area of the cross-section of cylinder C, and if A' be the length of plunger d, then in this position the whole downward force that is borne by the water underneath the piston 2, and distributed over its area (6-d), is pb+(p+h'w)(e—d), when the pressure is on piston ¢, and simply pb when this pressure is cut off from ©. (To this should be added the weight of 6, d, and ¢, but for our present urpose of explanation only this may be left out of account.) The former quantity has to equal (k-hw)(b-d), and the latter should equal

W (gw hav \ da), These two equations serve to determine two of the quantities in- volved in terms of the others.

When the water pressure is admitted to the upper side of 0 alone, the intensity of pressure on the under side of d is evidently as many times greater than the intensity on its upper side as the area of its upper side is greater than that of its lower surface. Thus any increase of intensity on the upper surface will cause a correspond- ingly greater increase of intensity on the lower. Now if the pres- sure on the under side of 6

were to remain the same while the cage ascended, the pressure on the lower end of a would decrease by an amount proportional to the change in their difference of level. If, for example, the rati> of the strokes b-—d:a is 6:1, then, as the cage rises 6 inches, 6 will fall 1 inch, and A, the difference of level

between 6 and a, will be decreased 7 inches. The pressure per square inch on a would decrease 7w if that on the under side of b kept constant. But, as the upper side of 6 also sinks 1 inch, the pressure per square inch on it will increase by w. If now the ratio of this upper area of 6 to its lower area be made 7, this increase of won the top face will cause an increase of 7w on the lower face, and thus just neutralize the diminution of pressure on @ due to the combined rise of the cage and fall of the lower side of 6. Thus the unloaded cage will be in perfect balance, at whatever height it stands, if the areas b and b-d are given the ratio

The ratio b – d: a of the two strokes having been already chosen, this equation gives b directly. From the other two equations c and the necessary pressure p arc found. This pressure y may be obtained by hydraulic pumps and an accumulator loaded to the right amount. If, however, the water from the mains is to be used, the ratio of the strokes or the size of a may be modified so as to suit the avail- able working pressure p. If ¢ be proportioned for the extra load at a given height, it will not be correct for all other heights, but this is of little consequence, because the extra load itself is variable from 0 upwards, so that no adjustment of c except to its maximum desired amount is possible. An excess of pressure on c above that needed for any given load has the effect simply of accelerating the speed of ascent, and this is modified roughly by partially closing the valve admitting water to C.

We have chosen this lift for description as the latest improve- ment in the design of hydraulic lifts. In it no water is wasted in raising or lowcring the constant load.

When the hydraulic power is applied to the cage through a chain or rope passing over an overhead pulley, the hydraulic cylinder is usually laid horizontally for facility of setting and examination. Of course this arrangement involves much greater frietional resistance to the motion of the apparatus, but in it all the severely stressed parts may be in tension. Thereis greater security when they are so than when they are in compression. Tangye Brothers' hydraulic lift is arranged in this way.

Accidents to lifts occur in two ways. First, the suspending chain or rope may break, or, in those supported from below, the ram may break, or the cylinder or pipes enclosing the water may burst. To lessen the risk of such breakages the only method is to insist on good design in the details, good materials (which should be subjected to test before being used), and good workmanship. The connexion at both ends of the rope or chain to the load sus- pended from it, or the jointing of the different sections of the ram to each other and to the cage, is a point especially important. If such a breakage does actually occur, however, the cage is usually kept from falling by an automatic catch which grips it in whatever position it hap- pens to occupy when the accident occurs. Tangye Brothers have for this purpose at each corner of the cage a toothed cam. The suspending rope sustains the cage through levers as shown in fig. 8. So long as there is a considerable pull on the rope, the levers keep the cams in the position shown. If the strain on the rope 1s relieved by accident to it, powerful Fie, 2 spiral springs immediately force the cams i outwards and the teeth become buried in the wooden guide-posts. A toothed rack is sometimes bolted to the vertical posts and tooth- shaped prongs are forced forward by springs to engage with the rack when the rope breaks. Similar arrangements are not placed between the top of the ram and the cage of direct-acting hydraulic lifts, but it is a mistaken idea that they are not as necessary in this case as in the other. Such appliances should be examined and tested at regular frequent intervals. They are apt to get out of working order through disuse. A double rope is a greater safe- guard against accident.

In chain or rope lifts the gearing or other machinery may break, and in consequence the cage might run down with dangerous rapidity without

the rope either breaking, or being wholly relieved of tension so that the above catches may not come into action. This may be at pe by a self-acting elutch on the shaft, which prevents the

arrel rotating unless the clutch is specially released. The most perfect and mechanically beautiful of the many devices that have been invented for this purpose is Weston's frictional automatic coupling. Fig. 4 shows it as applied to a hand sack-hoist. To the shaft @ is keyed a ratchet wheel b. A pawl gearingin this prevents the shaft from ever rotating except in one direction. The plate cis also keyed to the shaft. The hauling rope sheave d and the wind- ing barrel ¢ both run loose on the shaft. Their opposing end sur- faces are cut helically, so that, according to the relative angular positions of d and ¢, they are either jammed against each other and between ¢ and 8, or are loose and free to rotate round the shaft. On pulling the sheave d in one direction all the parts are frictionally

~~axial thrust multi~~

coupled together, and the barrel hauls up the load. The axial pressure producing friction between ¢ and ¢ and between d and 0 is greater than the load being hauled up in the ratio of the circum- ference of the barrel to the pitch of the helix. As there are two frictional sur- faces, the whole fric- tion is double this

plied by the coefficient of friction, and this friction must act at such a mean radius from the shaft as to haveamoment greater than that of the load. " If this is so for one load, it is so also for all others, as the fric- tion is proportional to the load. To get suf- ficient frietion for heavy loads with a diminished axial thrust, the very in- genious design shown in fig. 5 is adopted. Here the shaft a@ is ine

driven by power, and 18+

is keyed to the boss d with a helix cut on one end. This helix

abuts against a similar helix on the pinion e¢, which drives the –

hoisting barrel on a second shaft. The ratchet wheel } abuts against the collar f on the shaft a; b runs loose on the shaft and is cast on the end of a hollow drum containing three disks of hard wood, P,P,P. These disks can slide axial- ly along the interior of the drum, but are prevented from turn- ing except along ACES with the drum. In- Fic. 5

tervening between lg Poe

these wood disks are two iron disks, 0,0, which may slide axially along the boss of the pinion ¢, but are prevented from rotating except along with this pinion. The axial pressure is transmitted from d to f, through the surfaces of the disks P and O, and, there being six pairs of surfaces between which this pressure is exerted, a very slight axial thrust produces sufficient friction at these surfaces to couple the ratchet wheel 0 to the pinion e. So long as this is exerted all the parts are jammed together, and the pawl engaging in b prevents the load lowering. When, however, the shaft a is rotated backwards, the helices disengage and the friction no longer binds e with 0, so that e along with d and a@ can be rotated back- wards and the load thus lowered. The weight of the load keeps e following @ closely in its backward motion, and as soon as the operator or machine ceases to turn the shaft backwards the whole apparatus becomes once more frictionally bound together, and the ratchet wheel prevents further lowering, Fig. 6 shows another arrangement where- TIEN

by the pinion ¢ is uncoupled and al- lowed to lower the load by only a slight q backward motion of ‘ — ee oe the shaft a, it being yy ‘ unnecessary to ro- tate the shaft back- : ward continuously. Fic. 6

This last is obvious- 2

ly the most handy arrangement, and when worked carefully is as absolutely safe as the other. This device in a modified form is used in Tangye’s lifts.

Thomas & Sons, of Cardiff, have a similar patent safety shaft coup- ling, which, although it has a very different form, is constructed on exactly the same principle as that of fig. 4.

Steam has been used as a motive power in long cylinders similar to those in hydraulic lifts. It has the great advantage of having very little weight, so that the difference of head occasioned by the rise of the piston is practically nil. The disadvantage is that the steam rapidly condenses, and thus the load could not be held up at any desired height for a length of time, without a continual fresh supply of steam to the cylinders. It is not likely to come into general use for passenger lifts, but may be uscd advantageously for goods lifts and heavy cranes. (R. H. 8.*)

Subject- ive and objective mean- ings of the word Light,

OUND may be defined as any effect on the sense of S hearing, and in the same way Light may be defined as any effect on the sense of sight. This is the purely subjective use of the terms. But both terms are quite as frequently used in the objective as in the subjective seuse. Thus, as Sound may be defined in terms of the motion of the air in the cavity of the external ear, mechanically affecting the tympanum, so Light may be defined by the mechanical effect produced upon the extension of the optic nerve which forms the sensitive surface of the retina,

In treating of Light it will be convenient to use the term in a sort of mixed sense, at least until we come to discuss the different theories which have been devised to account for the propagation of the agent which causes vision. Then we shall have to use the term entirely in the objective sense. On the other hand, in Physiological Optics we are concerned chiefly with the subjective sense of the term.

The present article is intended to give a general sketch of the subject of Optics, so far as it can be treated by the help of elementary mathematics, but with sufficient detail to show the connexion of its various branches, and to enable the reader who desires further information on any point to judge for himself under what heading he

will find it in this work. The subject is arrange1 in the following order :—

Early History of Optics.

Preliminary Statements with regard to Vision, the Colour-Sense, and the Duration

Sources of Light.

General Reflexions on the Mechanism of Propagation of Light. Division of the Subject into Geometrical and Physical Optics.

Distinct Vision, of Visual Impressions.

GEOMETRICAL OPTICs.

Rectilinear Propagation of Light in Homogeneous M edia, Shadows. Camera Obscura, &c.

Intensity of Illumination as depending on the Distance of the Source and the Obliquity of the eee Brightness and Intrinsic Brightness.

Photometry.

Velocity of Light.

Behaviour of Light at the Common Media.

Reflexion. Plane, Spherical, and Cylindrical Mirrors. Real and Virtual Images,

Single Refraction. Composite Nature of White Light. Refrac- tive Index. Dispersion. Prisms; Fraunhofer’s Lines. Irrationality of Dispersion, Achromatism. Lenses. Telescope, Microscope. Pure Spectrum. Refraction by Cylinder. Rainbow.

Refraction in a Non-homogeneous Medium. Hamilton’s Charac- teristic Function. Mirage.

Absorption, Abnormal Dispersion, Fluorescence, Phosphorescence.

Surface of Two Homogeneous

PHYSICAL Optics. UNpDULATORY THEORY.

Nature and Propagation of Waves. Huygens's Principle. Explanation of Reflexion and Single Refraction. Disproof of the Corpuscular Theory.

Sketch of the History Discovery of Interference.

Interference Bands. Spectrum formed by Grating. Measure of Wave-Length. Loss of Semiundulation. Newton's Rings. Colours of Thin Plates and of Grooved Surfaces.

Relation between Wave-Length and Refractive Index.

Double Refraction. Wave-Surface in Iceland Spar.

tion. Transverse Vibrations. Nature of Unpolarized

ight.

Plane, Circularly, Prism. Rhomb,

Doppler's Principle. Measurement of the Relative Velocity of

uminous Source and Spectator.

Under Oprics (Grometricat, Puysicat, and Prysto- LoGicaL) further developments will be given; and the

of the Undulatory Theory. Young's

and Elliptically Polarized Light. Depolarization by Doubly-Refracting Plate.

Nicol's Fresnel's

connexion between light and radiant heat will be discussed under RADIATION. :

Harty History or THE Suzsect.—It is to sight that The we are mainly indebted for our knowledge of external ancients' things. All our other senses together, except under very Knowledge special conditions, do not furnish us with a tithe of the °! PY information we gain by a single glance. And sight is also that one of our senses which we are able most effectively and extensively to aid by the help of proper apparatus— not merely (as by spectacles, invented circa 1300) for the cure of natural defects, but (as by the telescope and microscope) for the examination of bodies either too distant or too minute to be studied by the unassisted eye.

It is very remarkable, under these circumstances, to find Light how slowly men have reached some even of the simplest moves in facts of optics. We can easily understand how constant —— experience must have forced on them the conviction that" light usually moves in straight lines,—7.¢,, that we see an object in the direction in which it really-lies. But how they could have believed for ages that objects are rendered visible by something projected from the eye itself—so that the organ of sight was supposed to be analogous to the tentacula of insects, and sight itself a mere species of touch —is most puzzling. They seem not till about 350 B.c. to have even raised the question—If this is how we see, why cannot we see in the dark? or, more simply,—What is darkness? The former of these questions seems to have been first put by Aristotle,

The nature and laws of reflexion were, of course, forced Re- on the ancients by the images seen in still water; and the flexion. geometers of the Platonic school were well acquainted with these laws. To Hero of Alexandria we owe the important deduction from them that the course of a reflected ray is the shortest possible.

The general nature of refraction also was known, with Re- some of its special applications, such as, for instance, to fraction. burning-glasses and to magnifiers. These were probably either spherical glass shells

filled with water (Pliny, ZW., xxxvi. 67 [25]; Lact., De Ira Dei, c. 10) or balls of rock erystal (Pliny, xxxvii. 10).

In the first century of our era Cleomedes pointed out how a coin at the bottom of an empty cup, where the eye cannot see it, can be made visible by filling the cup with water ; and he showed that, in a similar way, the air may render the sun visible to us while it is still under the horizon. Shortly after this date Ptolemy (the celebrated astronomer) published his great work on Optics. He treats of vision, reflexion, the theory of plane and concave mirrors, and refraction. He measured, with considerable accuracy, the angles of incidence and refraction, for rays passing from air into water and into glass, and from water into glass; it was not, however, till more than fifteen hundred years had passed that the true relation between these angles was discovered, In addition to what has just been mentioned, the ancients' knowledge of optics was limited to a very superficial acquaintance with some of the properties of rainbows, halos, mirage, &c. But it was fragmentary in the extreme—though it far surpassed in amount as well as in accuracy their knowledge of the other branches of physical science. .

_It is not easy to understand the ideas of the ancients Colour. about colour. That it is a property of a body—just as its density, its hardness, or its smell is a property—was probably held by them. But they also imagined that a body could communicate its colour to light; thus, for instance, the clouds were, by some of them, supposed XIV. — 73

Vision.

Distance of most

distinct

vision,

Limits of

distinct vision.

to communicate their colours to the sunbeams which form a rainbow.

Our next glimpse of real progress dates from the 11th or 12th century, when ALHAZEN (9.v.)1 wrote a treatise on optics in Arabic, which for five hundred years or more was a recognized authority on the subject. It was, in many parts, founded on the work of Ptolemy, but with considerable additions and improvements. Alhazen gives an anatomical description of the eye, and points out, fairly enough, how with two eyes we see only one image. But he also points out that we see each object, however small, bya pencil of diverging rays,—not (as the ancients imagined) by asingleray. Alhazen accounts for twilight, and shows how by it to measure the height of the atmosphere. He also gives the now generally received explanation of the curious fact that the sun and moon appear larger when rising or setting than when they are high in the heavens.

The farther progress of the subject we need not now trace. From the end of 16th century that progress has been extremely rapid. The dates of the more important steps, and the names of their authors, will be given when we treat of these, in their turn, in the course of the article ; and we will give them the additional interest of being presented, when this can readily be done, in the author’s own words.

PRELIMINARY STATEMENTS.—Before we commence a more rigorous treatment of the subject, it may be well to make a few preliminary statements as to the nature of vision and the conditions for distinct vision. Properly speaking, these belong to Optics (PHystoLocicat) (¢.2.), but it is impossible to treat intelligibly any part of our subject without presupposing some, generally very slight, knowledge of other parts. And the few preliminary state- ments we have now to make are in no respect theoretical, while they are so simple that any one may at once test their truth for himself.

Except in the case of a very abnormal eye (extremely short-sighted or long-sighted as the case may be) there is a distance from it—usually somewhere about 10 inches— at which if an object be placed it is seen

more distinctly than if placed at any other distance. Almost every one, perhaps without knowing it, habitually places at or about that distance from his eye an object which he wishes to examine carefully. When he places it at a smaller distance he becomes conscious of the effort required to see it distinctly. He has, in fact, to alter the form of the optical machinery of the eye, by a muscular effort, so that

it may become capable of bringing to a focus on the retina |

rays more divergent than those for which the parts were in their unstrained state adapted. A corresponding effort, but usually much more slight, is commonly felt to be

required if the object be at a distance greater than 10 inches,

Hence we arrive at the conclusion that, for the minimum of strain on the eye, rays should fall on it diverging as if they came from a point about 10 inches distant. But for all ordinary eyes any divergence from double of this Ge, a a ne OE,

1 The proper name of this eometer is El-Hasan (or accounts Mohammed) ibn anaes ibn el-Haitham, – vd ee Tbn el-Haitham that he is commonly referred to. See Woepcke Li Algebre @Omar Alkhayydm' (Paris, 1851), p. 78 sq, and Bat Hebreus, Chron., p. 221 sg. Several of his mathematical treatises exist in English libraries (see the Catalogues of the Br. Mus., Bodl and India Office MSS.) ; but the only copy of his great optical work— the Avtdb el Mandzir—known to be in Europe is No. 1011 of the Leyden collection, with the commentary Tankih el Mandzir of Kemal ed-Din Abu'l Masan (Cat. Cod. Or. Lugd. Bat., iii. 61). A smaller work (Woepcke, wt supra) was based on the optical treatises ascribed to Euclid and Ptolemy, and Ibn el-Haitham claims to have restored the lost first book of the latter. The Arabs bad Euclid's Optics (Kitab el Mandzir) in the version of Nasir ed-Din Tusy (H. Khal., No. 10,532; Loth, aLSS. of India Office, No. 748).

divergence as if from a distance of 5 inches) to zero (i.e, parallel rays) is consistent with the possibility of distinct vision. Rays either more

divergent than the former limit, or convergent, are unfit to produce distinct vision. Hence every optical instrument, whatever be the reflexions or refractions to which light has been subjected in passing through it, must finally allow the light to escape either in parallel rays or with a divergence within the above specified limits, if it is to be employed by an ordinary eye. The comparatively slight differences which exist among ordinary eyes are easily compensated by the rack-work, or screw adjustment, which is invariably attached to the eye-piece of a good telescope and to the body of a good microscope. Every motion of this rack-work alters the divergence of the rays as they finally escape from the instrument. Any eye, however abnormal, if it be capable of producing dis- tinct vision at all, has only to be furnished with suitable spectacles in order that it may behave exactly as does a normal eye, This statement, however, refers only to sharpness of definition, not in any degree to colour, The deficiency which causes colour-blindness cannot be supplied by any conceivable process, A definite part of the ordinary organ of vision is wanting (or inactive) in such cases— while the merely optical parts of the eye are usually in perfect order.

Another fact which must be stated here is that, to pro- Inverted duce vision of a body in its natural position, the image on image on the retina, as seen from the back, must be inverted—not a

, etina, merely as regards up and down, but also as regards right and left. Thus, in the ordinary astronomical telescope, the image on the retina is not inverted, and we therefore see an inverted image.

A third is that our judgment of the relative distances of Judg- objects is formed mainly by the use of the two eyes simul- ment of taneously. One eye, kept still, can inform us only of “stance relative distance in virtue of the greater or less effort to see distinctly (already spoken of). With both eyes, or with one eye moved from side to side, parallax comes in, and gives us the stereoscopic effect, as it is called. This power of judging distance is, of course, greater as the eyes are set more widely apart. There is, practically, no limit to the effective distance

between the eyes when the proper instrumental methods (as with the telestereoscope) are employed.

It is also necessary to premise a few words about colour. Colour. The various homogeneous rays of the solar spectrum have each a colour of its own which no refraction can modify.

But what about the many colours which do not occur in

the spectrum? To such a question as “ What is yellow” 4

the answer is, “ Hach particular kind of yellow may be any

one of an infinite number of different combinations of homo- geneous rays.” And the same is true, in general, of all

other colours, Clerk Maxwell found that a yellow equiva-

lent to that of the spectrum can be obtained by mixing in proper proportions certain homogeneous red and green rays.

This single example is sufficient to show that the colour-

sense is of a very singular nature. This question will be

fully treated in Optics (PHysIoLocicaL); but for our present purpose it is only necessary to say that we now know (after Wiinsch and Young) that the normal eye has only three colour-sensations—a red, a green, and a violet,—and that

the apparent colour of any light which falls on it depends merely on the relative intensities.of the excitement produced by the light on the three organs of sense corresponding to

these sensations. This is true, however, only within certain | limits of intensity ; for extremely bright light, whatever be its real colour, seems to excite all the three sensations simultaneously, much as white light does ; and with very feeble light (as, for instance, that of an ordinary aurora or of a lunar rainbow) we are sometimes searcely conscious of

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ior Te ee

colours. In colour-blindness one or more of these organs of sense is wanting, or imperfect. The most common form, Daltonism, depends on the absence of the red sense. Great additions to our knowledge of this subject, if only in con- firmation of results already deduced from theory, have been obtained in the last few years by Holmgren!; who las experimented on two persons, each of whom was found to have one colour-blind eye, the other being nearly normal. In this way was obtained, what could otherwise have been matter of conjecture only, a description of colour-blind vision in terms of (at least approximately) normal vision. Duration Finally, the sensation of sight is not limited to the of visual duration of the mechanical action on the eye. It is impres- known that we do not see a sudden flash (an electric sions: spark for instance) until a measurable, though very short, period has elapsed. This depends on the rate at which an excitation is propagated along the optic nerve. But the familiar experiment of whirling a red-hot stick in a dark room shows that the sensation of sight lasts for a short period after the mechanical action which produced it has ceased. This period is probably different for different eyes, and for different amounts of excitement even in the same eye. (If the light be very intense the effect lasts much longer, but completely changes its character.) For our present purpose it may be assumed that the dura- tion is somewhere about #th of a second. Thus, if the end of the red-hot stick describes a circle once in 7th of a second, we see the complete circle; if in a longer period, we only see at once such a part of it as was described in Intensity }th of a second. Connected with this is the remarkable asde- result obtained experimentally by Swan,? that the amount ee. of sensation is, for flashes of short duration, directly pro- tion of portional, not only to the brightness of the flash, but also exciting to its duration. A flash which lasts for ;4,th of a second cause. produces the full effect on the eye; but an electric spark, as a flash of lightniug, which certainly does not endure for more than zggdyqoth of a second, produces at most only rog/gooth of the effect it would produce if it lasted qth of a second. On this short duration of visual im- pressions

depends the action of the thaumatrope, the wheel of life, &c. By various kinds of machinery a succession of views of an object in different positions or forms is presented to the eye, each for a brief interval. The result is that we fancy we see one and the same object going through a species of continuous motion, or of change of form, which would present it to the eye in these succes- Sive positions or forms. Thus, a tadpole may be repre- sented as wriggling about, or as developing continuously into a frog, dc.

Sources or Licut.—This subject will be fully treated in other parts of this work under various heads: from the purely scientific point of view under Rapration ; from the more practical side under Licutinc (ELEcTRIc), ke. For our present purpose a very brief summary of the question will suffice; and we do not require to investigate the process by which, in any case, the light is produced.

Incan- 1. The main source of light is dncandescence. (It is descence. ysually understood that to be incandescent a body must be at a high temperature.) This may be due to any of a number of causes, such as the following :-—

(a) The Potential Energy of Gravitation of Scattered Fragments of Matter.—When these fall together, as in the formation of the sun and stars, heat enough is generated by impact to render the whole vividly incandescent. It is probable that the light of nebulz, and the proper light of comets, is due to this cause. The proximate cause, in all these cases, is the kinetic energy of the fragments

Colour blind- ness.

1 Proc. Roy. Soc., Jan. 1881. 2 Trans. Roy. Soc. Edin., 1849, 1861.

before impact. To this class, therefore, can be reduced i aca given out when a target is struck by a cannon snot.

(0) The Kinetic Energy of Current Electricity or of an Hlectric Discharge.—Here we have lightning, the electric light, and probably also the light of the aurora.

_ © The Potential Energy of Chemical A finity.—The

limelight, gas-light, candle and lamp-light, fire-light, the magnesium light, &c.; also phosphorus, dead fish (?), d&c., glowing in the dark.

(d) Friction, as in the trains of sparks from a grindstone or brake; though here, in general, chemical affinity also has a share.

(e) Sudden great Compression of a Gas, as of air by meteoric stones and falling stars.

2. Another very curious source, not (so far as is known) Fluor- reducible to incandescence, is the giving out (usually in eseence, an altered fornr) of light previously absorbed :—fluorescence, phosphorescence, &c.

3. A third source is physiological :—fire-flies, glow- worms, Medusce, dead fish (?), &c., the eye of a cat.

Any not black and not transparent body, exposed to any of these sources of light, becomes in its turn what may for our purpose also be treated as a source.

As will be shown in Raptation, the only bodies which, when incandescent, give every constituent of white light are bodies which are black in the sense of absorbing each and every ray which falls upon them. Such bodies are not necessarily solids—though the best examples we have of them are lamp-black, and (somewhat less perfect) char- coal and gas-coke,

Newton’s speculations on these subjects, taken from the Newton “Queries” at the end of his Optics, give an exceedingly © interesting sketch of the state of this subject in his time, *euos

. ; of light, We quote a few of the more curious. There is a strange admixture of errors, but a still more strange anticipation of some of the most important of modern discoveries.

‘*Query 6. Do not Black bodics conceive heat more easily from light than those of other colours do, by reason that the light falling ou them is not reficcted outwards; but enters the bodies, and is i reflected and refracted within them, until it be stifled and ost ?

“ Query 8. Do not all Fixed bodies, when heated beyond a certain degree, emit light and shine ; and is not this emission performed by the vibrating motions of their Parts. And do not all bodies, which abound with Terrestrial parts, and especially with Sulphurcous ones, emit light, as often as those Parts are sufficiently agitated ; whether that agitation be made by heat, or by friction, or percussion, or putrefaction, or by any vital motion, or any other cause?....

“Query 9. Is not Fire a body heated so hot, as to emit light copiously ? For what else is a red hot iron than fire? And what else is a burning coal than red hot wood ?

“Query 10. Is not Flame a vapour, fume or exhalation leated red hot, that is, so hot as to shine? For bodies do not flame without emitting a copious fume, and this fume burns in the flame. The Jgnis Fatwus is a vapour shining without heat; and is there not the same difference between this vapour ‘and flame, as between rotted wood shining without heat and burning coals of fire? In distilling hot spirits, if the head of the still be taken off, the vapour, which ascends out of the still, will take fire at the flame of a candle, and turn into flame, and the flame will run along the vapour from the candle to the still. Some bodies heated by motion or fermentation, if the heat grow intense, fume copiously ; and if the heat be great enough, the fumes will shine, and beeome flame. Metals in fusion do not flame for want of a copious fume, except speltcr, which fumes copiously, and thereby flames, All flaming bodies, as oil, tallow, wax, wood, fossil coals, piteh, sul- phur, by flaming waste and vanish into burning smoke ; which smoke, if the flame be put out, is very thiek and visible, and some- times smells strongly, but in the flame loses its smell by burning ; and, according to

the nature of the smoke, the flame is of several colours; as that of sulphur, blue; that of eopper opened with sublimate, green ; that of tallow, yellow ; that of camphire, white. Smoke passing through flame cannot but grow red hot ; and red hot smoke can have no other appearanee than that iibhines, 6 wa a

‘*Query 11. Do not Great bodies eonserve their heat the longest, their parts heating one another; and may not Great dense and Fixed bodies, when heated beyond a certain degree, emit light so

copiously, as by the emission and re-action of its light, and the reflexions and refractions of its rays within its pores, to grow still hotter, till it comes to a certain period of heat, such as is that of the sun? And are not the sun and fixed stars great earths vehe- mently hot ; whose heat is conserved by the greatness of the bodies, and the mutual action and re-action between them, and the light which they emit ; and whose parts are kept from fuming away, not only by their Fixity, but also by the vast weight and density of the atmospheres incumbent upon them, and very strongly compressing them, and condensing the vapours and exhalations which arise from them ? And the same great weight may condense those vapours and exhalations, as soon as they shall at any time begin to ascend from the sun, and make them presently fall back again into him ; and by that action increase his heat, much after the manner that in our earth the air increases the heat of a culinary fire. And the same weight may hinder the globe of the sun from being diminished, unless by the emission of light, and a very small quantity of vapours and exhalations.”

THEORIES OF PROPAGATION oF Licut.—We may begin by assuming that the sensation of light is due to a mechanical action on the retina (see EyE). Now such a mechanical action must have a mechanical cause, and, as far as we can judge with our present knowledge, the latter must consist of impacts on the retina, due to moving matter. This matter may have travelled all the way from the source of light, or it may have been set in motion in the eye by a disturbance (analogous to a wave) which has travelled from the source.

What is trans- ferred, or what moves, is a quite independent question. Light must, as far as we can conceive, consist in the motion of particles of some kind from external objects to the eye, or in the propagation of some disturbance or wave- motion in an as yet unknown medium. Though it has been proved, as we will presently show, that some of the consequences of the first supposition are entirely incon- sistent with observed facts, the nature of the propagation of the supposed luminous particles is still a very interest- ing study, and indeed many of the fundamental propositions in optics follow more easily from this hypothesis than from the other. We will therefore not at present dismiss this hypothesis, but will refer freely to it now and then, until its truth is shown to be inconsistent with experiment.

Cor- This view, associated with the names of Newton, Laplace, oe and Biot, is known as the corpuscular theory of light. – A ‘ery formidable ‘objection to it, ix limine, will be easily seen to be furnished by the velocity of light. Since every point of every visible body must (on this theory) send such corpuscles to the eye, moving as we shall find at a rate of nearly 200,000 miles per second, their masses must be inconceivably minute in order that their united momentum may not amount to something comparable with that of a caunon shot, a supposition of course utterly destructive of all belief in the hypothesis, But, as we shall see, there are still higher grounds of objection, and such as no mere smallness of mass or size of each corpuscle can explain away, The rival “apa ee under considerable disadvan- ages, inasmuch as the theory of wave-propagation is ve theory. much more obscure and difficult than ka of aie motion ot free particles; but the student, who has mastered the fundamental difficulties of sound (see Acoustics), which presents a fair although not an exact analogy, will find it comparatively easy to obtain a clear conception of the fundamental principles of the explanation offered by the undulatory theory of light. The difference between these two theories of light may be illustrated by contrasting wind moving at the rate of 1100 feet per second (an inconceivably violent hurricane) and sound, gentle or violent, moving at precisely the same rate—yet how different in its effects ! Division oF THE SUBJECT.—Optics, or the science of Light,

is usually divided into two parts. A simple illus- tration of the nature of this division will be found in

Mechan- ism of propaga- tion of light.

Undula- tory

LIGHT

the different conditions of fluid equilibrium according as Geo- we do not or do introduce the idea of action between metrical the fluid and the containing vessel (Carmtary Action, *? “siti q.v.). In the first or hypothetical case it is known oral that the free surface must be horizontal, and that all

its separate parts must lie in the same plane; in the second, 7.¢., the actual, case we find molecular action modi- fying these results, sometimes indeed to a very large extent, so that no part of the free surface is plane, and no

two portions of it are at the same level. So in what is called GEOMETRICAL OPTIcs it is assumed from experiment

that light moves in straight lines in air, while Paysica Optics, or the undulatory theory, agrees with experiment

in showing that under certain circumstances a ray of light bends round an obstacle. But as, in obtaining the main facts of fluid equilibrium, capillary forces may be neglected,

so, for the explanation of the ordinary phenomena of light,

even with accuracy sufficient for the construction of the very finest telescopes and microscopes, it suffices that Geometrical Optics, based on laws nearly verified by ex- periment, be followed out to its consequences. The residual phenomena then came in to be treated by the undulatory theory. Pouillet divides the subject, in con- sequence of this distinction, into two parts, viz, (1) that

in which we deal with the direction only of the rays, and

(2) that in which we deal with the physical properties of

the rays themselves.

phenomena we shall have found that the corpuscular theory must be rejected, and we will therefore give, without detail, the principles of the undulatory explanation, which will be fully discussed in a special article,

GEOMETRICAL OPTICS. Rectilinear Propagation of Light.

It is approximately true that, in any homogeneous medium, light moves in straight lines. ‘

If an opaque body be placed anywhere in the straight line between the eye and an object, the object is concealed, Through a long straight tube no objects can be seen but those situated in the direction of its axis produced. This is so fundamental a fact, or it is so evident a result of experience, that it is the foundation of every process which involves the direction in space of one object as regards another,—whether it be for the aiming with a rifle, the pointing of a telescope, or for the delicate observations of a geodetic survey. But we must carefully observe the re- strictions under which the statement is made. Not merely is it said to be only approximately true, but it is so only in a homogeneous medium. ‘To both of these restrictions we will revert later,

(a) On this is founded the geometrical theory of shadows, Shadows, — a subject of some importance, especially as regards eclipses. In this application the results may be considered as absolutely true, though, as we shall see in a subsequent page, the statement is liable in certain delicate cases to somewhat startling exceptions. When an opaque body is

placed between a screen and a luminous point, it casts a | shadow on the screen. (The sun’s image formed by a lens or burning glass of short

focus is our best mode of

attempting to realize the conception of a luminous point ; but a fair approximation may be made by piercing a very small needle-hole in a large plate of thin metal, and placing | it close to any bright flame or incandescent body.) The 1 outline of the shadow is, of course, to be found by drawing straight lines from the luminous point so as to touch the

Geo-

metrical shadow.

Penum-

bra.

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separate shadows,

LIGHT

opaque body all round. These lines form a cone. The points of contact form a line on the opaque body separating the illuminated from the non-illuminated portion of its surface. Similarly, when these lines are produced to meet the screen, their points of intersection with it form a line which separates the illuminated from the non-illuminated parts of the screen.

This line is called the boundary of the geometrical shadow. A common but beautiful instance of it is seen when a very small gas-jet is burning in a ground-glass shade, near the wall of a room. In this case the cone, above mentioned, is usually a right cone with its axis vertical, Thus the boundary of the geometric shadow is a portion of a circle on the roof, but a portion of an hyperbola on the vertical wall. Ifthe roof be not horizontal, we may obtain in this way any form of conic section. Interesting and useful hints in projection may be obtained by obsery-

ing the shadows of bodies of various forms cast in this way by rays which virtually diverge from one point: ¢.7., how to place a plane quadrilateral of given form so that its geometric shadow may be a square; how to place an elliptic disk, with a small hole in it, so that the shadow may be circular with a bright spot at its centre, &c.,

When there are more luminous points than one, we have only to draw separately the geometrical shadows due to each of the sources, and then superpose them, A new con- sideration now comes in. ‘There will be, in general, portions of all the separate geometrical shadows which overlap one another in some particular regions of the screen, In such regions we still have full shadow; but around them there will be other regions, some illuminated by one of the sources alone, some by two, &c., until finally we come to the parts of the screen which are illuminated directly by all the sources. There will evidently be still a definite boundary of the parts wholly unilluminated, 7.e., the true shadow or umbra, and also a definite boundary of the parts wholly illuminated. The region between these boundaries—z.e., the partially illumined portion—is called the penumbra,

Fig. 1 shows these things very well. It represents the

shadow of a circular disk cast by four equal luminous ~ Int

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AM { Yilierrs Fig. 1.

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points arranged as the corners of a square,—the disk being large enough to admit of a free overlapping of the The amount of want of illumination in each portion of the penumbra is roughly indicated by the shading. The separate shadows are circular, if the

is obvious that the degrees of darkness at different portions of the penumbra will also increase indefinitely ; i.e. there will be a gradual increase of bright-

ness in the penumbra from total , | darkness at the edge next the geo- {

metrical shadow to full illumination \ |

at the outer edge. It is most in- structive to contrast with the above lin , figure that now given (fig. 2), in 4 | which the size of the disk is con- (| } siderably diminished — everything ||

else being unchanged. Here there Fie. 2

is no true shadow—only four equally lt bright portions of the penumbra, each illuminated by three of the sources,

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Ss ——

Thus we see at once why the shadows cast by the sun Sharp.

or moon are in general so much less sharp than those cast ness of by the electric light (when it is not surrounded by a semi- *4

opaque screen). For, practically, at moderate distances from the electric arc, it appears as a mere luminous point. But, if we place a body at a distance of a foot or two only from the arc, the shadow cast will have as much of penumbra as if the sun had been the source. The breadth of the penumbra when the source and screen are nearly equidistant from the opaque body is equal to the diameter of the luminous source. Simple as is the question from the point of view we have adopted, it may to some persons appear simpler to imagine themselves placed (as spectators) on the screen in different parts of the shadow or penumbra, and to consider what portions of the luminous source they would then be in a position to see.

This is what happens to us when we observe an eclipse of the sun. When the eclipse is total, there is a real geometrical shadow,—very small compared with the penumbra (for the apparent diameters of the sun and moon are nearly equal, but their distances areas 370: 1); when the eclipse is annular, the shadow is all penumbra. Ina lunar eclipse, on the other hand, the earth is the shadow- casting body, and the moon is the screen, and we observe things according to our first point of view.

‘Suppose, next, that the body which casts the shadow is a large one, such as a wall, with a hole in it, If we were to plug the hole, the whole screen would be in geometrical

l IM

disk is parallel to the screen. If we suppose the number | shadow. Hence the illumination of the screen by the of sources to increase indefinitely, so as finally to give the | light passing through the hole is precisely what would be

appearance of a luminous surface as the source of light, it | cut off by a disk which fits the hole,

Fig. 3, which is the

OWS.

Eclipses,

Light passing through an aper- ture,

582

complement of fig. 1, gives therefore the effect of four equal sources of light shining on a wall through a circular hole. And it is evident that, with the change of a word here and there, the previous reasoning may be applied to this case also. The umbra in the former case becomes the fully illuminated portion, and vice versa. The penumbra remains the penumbra, but it is now darkest where before it was brightest, and vice

versa. For further information we subjoin the complement (fig. 4) of the second case above,—the same four sources, but the smaller hole. Here we have four equally bright, separate images —one belonging to each of the sources. Thus we see how,

Images when a small hole is cut in the window-shutter of a dark

bysmall room, a picture of the sun, and bright clouds about it, is

hole. formed on the opposite wall, This picture is obviously inverted, and also perverted, for not only are objects de- picted lower the higher they are, but also objects seen to the right are depicted to the left, &c. But it will be seen unperverted (though still inverted) if it be received on a sheet of ground glass and looked at from behind. The smaller the hole (so far at least as Geometrical Optics is concerned) the less confused will the picture be. As the hole is made larger the illuminated portions from different sources gradually overlap; and when the hole becomes a window we have no indications of such a picture except from a body (like the sun) much brighter than the other external objects. Here the picture has ceased to be one of the sun, itis now a picture of the window. But if the wall could be placed 100 miles off, the picture would be one of the sun. To prevent this overlapping of images, and yet to admit a good deal of light, is one main object of the lens which usually forms part of the camera obscura.

The formation of pictures of the sun in this way is well seen on a calm sunny day under trees, where the sunlight penetrating through small chinks forms elliptic spots on the ground. During a partial eclipse these pictures have, of course, a crescent form. When detached clouds are drifting rapidly across the sun, we often see the shadows of the bars of the window on the walls or floor suddenly shifted by an inch or two, and for a moment very much more sharply defined. They are, in fact, shadows cast by a small portion of the sun’s limb, from opposite sides

Shadow alternately. Another beautiful illustration is easily ob- image. tained by cutting with a sharp knife a very small T aperture in a piece of note paper. Place this close to the eye, and an inch or so behind it place another piece of paper with a fine needle-hole init. The light of

the sky passing through the needle-hole forms a bright picture of the T on the retina. The eye perceives this picture, which gives the impression of the T much magnified, but turned upside down. Another curious phenomenon may fitly be referred to in this connexion, viz., the phantoms which are seen when we look at two parallel sets of palisades or railings, one behind the other, or look through two parallel sides of a meat-safe formed of perforated zinc. The appearance presented is that of a magnified set of bars or apertures which appear to move rapidly as we slowly walk past. Their origin is the fact that where the bars appear nearly to coincide the apparent gaps bear the greatest ratio to the dark spaces; «¢, these parts of the field are the most highly illuminated. The exact determination of the appearances in any given case is a mere problem of convergents to a continued fraction. But the fact that the

Fig. 4.

Phantom pali- sades.

apparent rapidity of motion of this phantom may exceed in any ratio that of the spectator is of importance,— enabling us to see how velocities, apparently of impossible magnitude, may be accounted for by the mere running along of the condition of visibility among a group of objects no one of which is moving at an extravagant rate.

(6) Another important consequence of this law is that Mumi- af the medium be transparent the intensity of illumination nation, which a luminous point can produce on a white surface directly exposed to it is inversely as the square of the distance.

The word transparent implies that no light is absorbed or stopped. Whatever, therefore, leaves the source of light must in succession pass through each of a series of spherical surfaces described round the source as centre. The same amount of light falls perpendicularly on all these surfaces in succession. The amount received in a given time by a unit of surface on each is therefore inversely as the number of such

units in each. But the surfaces of spheres are as the squares of their radii,—whence the proposition. (We assume here that the velocity of light is constant in the medium, and that the source gives out its light uniformly and not by fits and starts.) When the rays fall otherwise than perpendicularly on the surface, the illumination pro- duced is proportional to the cosine of the obliquity; for the area seen under a given spherical angle increases as the secant of the obliquity, the distance remaining the same.

As a corollary to this we have the further proposition Bright- that the apparent brightness of a luminous surface (seen ness at through a transparent homogeneous medium) is the same at ae

: istances, all distances.

The word brightness is here taken as a measure of the amount of light falling on the pupil per unit of spherical angle subtended by the luminous surface. The spherical angle subtended by any small surface whose plane is at right angles to the line of sight is inversely as the square of the distance. So also is the light received from it. Hence the brightness is the same at all distances,

The word brightness is often used (even scientifically) in another sense from that just defined. Thus we speak of a bright star, of the question —When is Venus at its brightest? &c. Strictly, such expressions are not defen- sible except for sources of light which (like a star) have no apparent surface, so that we cannot tell from what amount of spherical angle their light appears to come. In that case the spherical angle is, for want of knowledge, assumed to be the same for all, and therefore the bright- ness of each is now estimated in terms of the whole quantity of light we receive from it. It is in this sense Maxi- only that we use the word when we speak of Venus at its mum brightest ; for if we take the former definition of bright- — ness the solution of this once celebrated problem would be ‘antl very different from that usually given, As the question, however, is an interesting one both in itself and histori- cally, we give an approximate solution of it. The approxi- mation assumes what is certainly not true, that the illuminated portion of Venus always

appears uniformly bright, and of the same degree of brightness in all aspects.

Let a be the radius of the earth’s orbit, b that of the orbit of Venus, 5 the distance between the planets when Venus is brightest.

Then if @ be the apparent angular distanee of the earth from the sun as seen from Venus, the illuminated part of the disk of Venus as seen from the earth is

1+ cos 6

2

of the whole disk. Hence 1+cos 6 25? is a maximum,—with the obvious trigonometrical relation a? = §? + 6? – 268 cos 6.

a

—

LIGHT

Substituting for cos @, and putting the differential coefficient =0, we have a quadratic equation of which the only admissible root is the positive one

5= 3a? +0? – 2b,

From this the other quantities can be calculated.

Effect of But another matter has to be taken into consideration

contrac: when we apply the above definition of brightness in practice,

tion of For the aperture of the pupil is usually very much con-

pup: tracted when we look at a brightly illuminated sky or cloud. Thus there isa rough compensation which, to a certain extent, modifies the

effect on the retina.

Argu- Founded on the above is Cheseaux’s celebrated argument

ment for about the finite dimensions of the stellar universe. For it

me is easy to see, as below, that if stars be scattered through

nq e infinite space, with average closeness and brightness such as is presented by those nearest us, and if stellar space be absolutely transparent, the whole sky should appear of a brightness like that of the sun. Cheseaux and Olbers en- deavoured to show that, because the sky is not all over as bright as the sun, there is absorption of light in stellar space. This idea was ingeniously developed by Struve.

Consider a small spherical angle w The number of stars in- cluded in it whose distances are between 7 and r+ 87 from the earth is proportional to

wr sr, The whole amount of light received from such a portion of the sky

must be therefore as CO of dr ?

0

provided that no star intercepts the light coming from another. This condition is unattainable, so that the conclusion is that the brightness is as great as it can be with the materials employed. Every portion of the background shines as if it were a star.

(c) A third very important fact, connected with our present subject, but not immediately deducible from our obi. Principle, is—The brightness of a self-luminous surface does quities, %0t depend upon its inclination to the line of sight.

Thus a red-hot ball of iron, free from scales of oxide, &c., appears flat in the dark; so, also, the sun, seen through mist, appears asa flat disk. This fact, however, depends ultimately upon the second law of

thermodynamics, and its explanation will be fully given under RaptaTion.

It may be stated, however, in another form, in which its connexion with what precedes is more obvious—The amount of radiation, in any direction, from a luminous surface is proportional to the cosine of the obliquity.

General The flow of light (if we may so call it) in straight lines from, the ahi luminous point, with constant velocity, leads as we have seen to

0

Beory of the expression + (where r is the distance from the luminous point) illumi- cite

nation,

Bright- ness at

for the quantity of light which passes through unit of surface perpendicular to the ray in unit of time, w being a quantity indi- cating the rate at which light is emitted by the source. This represents the illumination of the surface on which it falls. The flow through unit of surface whose normal is inclined at an angle 6 to the ray is of course

Be

a cos 6, again representing the illumination, These are precisely the expressions for the gravitation force exerted by a particle of mass

1. ona unit of matter at distance r, and for its resolved part in a §iven direction. Hence we may employ an expression

V=2 ,

which is exactly analagous to the gravitation or electric potential, for the purpose of cleans the effect due to any number of separate sources of light.

And the fundamental proposition in potentials, viz., that, if » be the external normal at any point of a closed surface, the integral

YR® dn taken over the whole surface, has the value

— 4m s

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where yy is the sum of the values of » for each source lying within the surface, follows almost intuitively from the mere consideration of what it means as regards light. For every source external to the closed surface sends in light which goes out again. But the light from an internal source goes wholly out; and the amount per second from each unit source is 4x, the total area of the unit sphere surrounding the source.

It is well to observe, however, that the analogy is not quite com- plete. To make it so, all the sources must lie on the same side of the surface whose illumination we are dealing with. This is due to the fact that, in order that a surface may be illuminated at all, it must be capable of scattering light, i.c., it must be to some extent opaque. Hence the illumination depends mainly upon those sources which are on the same side as that from which it is regarded.)

Though this process bears some resemblance to the heat analogy employed by Sir W. Thomson for investigations in statical elcc- tricity (Cambridge Mathematical Journal, 1842) and to Clerk Maxwell's device of an incompressible fluid without mass (Cam. Phil. Trans., 1856), it is by no means identical with them. Each method deals with a substance, real or imaginary, which flows in conical streams from a source so that the same amount of it passes per second through every section of the cone. But in the present process the velocity is constant and the density variable, while in the others the density is virtually constant and the velocity variable. There isa curious reciprocity in formule such as we have just given. For instance, it is easily seen that the light received Jrom a uniformly illuminated surface is represented by

dS cos @ P

As we have seen that this integral vanishes for a closed surface which has no source inside, its value is the same for all shells of equal nniform brightness whose edges lie on the same cone.

We have said that light moves in straight lines in a theo. homogeneous medium. This rectilinear path follows at retical once from the corpuscular theory, as well as from the ¢Plana- undulatory theory of light: in the first case there is no — – deflecting cause, so each corpuscle moves in a straight line ; jinear in the second, the direction of propagation of a plane wave propaga- in an uniform isotropic medium is always perpendicular tion. to its front. Looking along a hot poker or the boiler of a steamboat, we see objects beyond distorted; te, we no longer see each point in its true direction. Here we have a non-homogeneous medium, the air being irregu- Non- larly expanded in the neighbourhood of the hot body, To homo- this simple cause are due the phcnomena of mirage, the lt fata morgana, the reduplication of images of a distant ; object seen through an irregularly heated atmosphere, the scintillation or twinkling of stars, and the uselessness of even the best telescopes at certain times, &c. It is intercst- ing to note here that Newton? says :—‘‘ Long telescopes may cause objects to appear brighter and larger than short ones can do; but they cannot be so formed as to take away that confusion of the rays which arises from the tremors of the atmosphere. The only remedy is a most serene and quiet air, such as may perhaps be found on the tops of the highest mountains, above the grosser clouds.”

PHOTOMETRY.—The principle above explained suggests Photo- many simple methods of comparing the amounts of light meters. given by different sources. If, for instance, a porcelain plate, or even a sheet of paper, of uniform thickness, havo one half illuminated directly by one source of light, the other by a different source, and if one or other of these sources be moved to or from the plate till the halves appear equally illuminated, it is obvious that the amounts of light given out by the two sources are directly as the squares of their distances from the screen. This is the principle of Ritchie’s photometer. Rumford

suggested the com- Ritchie’s. parison of the intensity of the shadows of the same object aes thrown side by side on a screen by the two lights to be ‘°° ® compared. In this case the shadow due to one source 18

1 from the formula of which the proof has been indicated Green’s theorem and its consequences follow immediately. But we need not give these here.

2 Optics, end of part i.

lit up by the other alone; and here again the amounts of light given out by the sources are as the squares of their distances from the screen when the shadows are equally intense. The shadow-casting object should be near the screen, s0 as to avoid penumbra as much as possible ; yet not too near, so that the shadows may not overlap.

Bunsen has recently suggested the very simple expedient of making a greasc-spot on white paper for photometric purposes. When the paper is equally illuminated from both sides, the grease-spot cannot be seen except by very close inspection. In using this photometer, the sourccs are placed in one line with the grease-spot, which lies between them and can be moved towards one or other. To make the most accurate determinations with this arrangement the adjustment should first be made from the side on which one source lies, then the screen turned round and the adjustment made from the side of the other source,—in both cases, therefore, from the same side of the paper screen. Take the mean of these positions (which are usually very close together), and the amounts of light are as the squares of the distances of the sources from this Wheat- point. Wheatstone suggested a hollow glass bead, silvered stone’s, internally, and made to describe very rapidly a closed path,

for use as a photometer. When it is placed between two sources, we see two parallel curves of reflected light, one due to each source. Make these, by trial, equally bright ; and the amounts of light from the

sources are, again, as the squares of the distances, These simple forms of apparatus give results which are fairly accurate, so long at least as the qualities of the light furnished by the two sources are nearly the same. But, when we endeavour to compare differently coloured lights, the result is by no means so satisfactory. In fact, we cannot well define equality of illumination when the lights are of different qualities. In the undulatory theory, no doubt, we can distinctly define the intensity of any form of radiation. Difficul- But the definition is a purely dynamical one, and has not a. necessarily any connexion with what we usually mean et by intensity, viz., the amount of effect produced upon the nerves of the retina. Thus the theoretical intensities of a given violet and a given red source may be equal, while one may appear to the eye very much brighter than the other. Think, for instance, of a colour-blind person, who might, under conceivable circumstances, be unable to see the red at all. We are all as it were colour-blind as far as regards radiations whose wave-lengths are longer or shorter than those included in the range of the ordinary solar spectrum.

Other modes of measuring the intensity of light usually depend upon more recondite physical principles,—such as, for Instance, the amounts of chemical action of certain kinds which can be produced by an exposure of a given duration to the light from a particular source. But all have the same grand defect ’as the simpler processes,— they are not adapted to the comparison of sources giving different qualities of light. And those last mentioned are liable to another source of error, viz. the action of radiations which are not called light, only because they are not visible to the eye ; for inallother respects they closely resemble light, and are often more active than it is in pro- ducing chemical changes.

Vetocrty or Licut.—Light moves with a velocity of nearly 186,000 miles per second. Of this we have four distinct kinds of proof, on each of which depends a method which is capable of giving pretty accurate results.

1. Lémer’s Method.—By this the finite velocity of light was discovered in 1676. Suppose, to illustrate this, that at a certain place a

cannon is fired precisely at intervals of an hour while the weather is perfectly calm. A person

Bunsen’s photo- meter.

Chemical photo- metry.

Velocity of light.

Roénier’s method.

Lae 2 a

provided with an accurate watch travels about in the sur- rounding district. When he first hears the cannon let him note the time by his watch, then on account of the non- instantaneous propagation of sound, if at the next discharge he be nearer the gun than before, the report will arrive at his ear before the hour’s interval has elapsed; if he be farther from the gun, the interval between the discharges will appear longer than an hour; and the number of seconds of defect or excess will evidently represent the time employed by sound in travelling over a space equal to the difference of his distances from the gun at the suc- cessive observations.

Now the satellites of Jupiter are subject—like our moon, only much more frequently—to eclipse, and the interval between two successive eclipses can easily be observed. The almost sudden extinction of the light is a phenomenon similar to the discharge of the gun; and, if light take time to move from one place to another, we should find the interval between successive eclipses too short when we are approaching Jupiter, too long when we are receding from him. Such was found to be the case by Romer; and he also found that the shortening or lengthening of the interval depended upon the rate at which the earth was approaching to or receding from Jupiter. The inevitable conclusion from these facts is that light is propagated with finite velocity. Rémer calculated from them that light takes about 1675 to cross the earth’s orbit. The exact velocity deduced by this method is,

after making all corrections, and assuming the most probable value of the solar parallax, about 186,500 miles per second.

2. Bradley’s Method. —This depends on the aberration of Bradley’s light, discovered by Bradley in 1728, When in a calm method, rainy day one stands still he holds his umbrella vertical in order to protect himself. If he walk he requires to hold it forwards, and more inclined the faster he walks. In other words, to a person walking the rain does not appear to come in the same direction as to a person standing still. Now the earth’s velocity in its orbit is a very large quan- tity, some 184 miles per second, or about zggoa th of that of light. Hence the light from a star does not appear to come in the proper direction unless the earth be moving exactly to or from the star, and, as the direction of the earth’s motion is continually changing, so the directions in which different stars are seen are always changing, and thus this phenomenon, called the “aberration of light,” proves at once the finite velocity of light and the earth’s motion round the sun.

As an additional illustration of the phenomenon, suppose a bullet fired through a railway carriage, in a direction perpendicular to the sides of the carriage. If the carriage be standing still, the bullet will make holes in the sides, the line joining which is perpendicular to the length of the carriage; if it be in motion, then the second side of the carriage will have moved through a certain space during the interval occupied by the bullet in passing from side to side, and thus the line joining the holes in the sides (2.¢., the line pursued by the bullet relatively to the carriage), will be inclined at an angle greater than a right angle to the direction of the train’s motion.

It is evident that the path apparently described by each star during a year, in consequence of aberration, will be found by laying off from the star lines which bear the same ratio to the star’s distance as the velocity of the earth does to that of light,—their directions being always the same as that of the earth’s motion at every instant. This is precisely the definition of the Hopocrarn (¢.v.) of the earth’s orbit. Hence, on account of the finite velocity of

1’In fact, to estimate the relative direction and velocity of two moving bodies we must subtract the vector velocity of the first from that of the second,

Fizeau’s method.

Let Ge ED

light, each star appears to describe in space a circle (not an ellipse) of fixed magnitude in a plane parallel to that of the ecliptic. As seen from the earth, therefore, stars will appear to describe paths which are the projections of these circles on the celestial sphere. These are in general ellipses, but circles for stars at the poles of the ecliptic and straight lines for stars in the ecliptic. This is found to be quite consistent with observation ; and the major axes of these ellipses, the diameters of the circles, or the lengths of the lines subtend equally angles of about 41” at the earth. Hence the velocity of light is to the velocity of the earth as 1: tan 3 41”; that is, about 10,000: 1.

Both these methods depend, for their final result, upon a true knowledge of the earth’s distance from the sun. But the most accurate measurements of this quantity are probably to be obtained from the velocity of light itself, this being independently determined by the physical pro- cesses next to be described. Thus the earth’s distance from the sun will in future be measured rather by the constant of aberration, or by the acceleration or retarda- tion of the eclipses of Jupiter’s satellites, than by a transit of Venus, by the moon’s motion, or by the parallax of Mars. Thus Rémer’s and Bradley’s processes are now applied to the determination of solar parallax.

3. Fizeaws Direct Measurement of the Velocity of Light. —To illustrate the next and by far the most convincing popular proof of the finite velocity of light, suppose a perscn looking at himself in a mirror, before which is moving a

screen with a number of apertures, the breadth of each’

aperture being equal to the distance between any two of them. If the screen be at rest with an aperture before the mirror, the light from the observer’s face passes through the aperture and is reflected back, so that he sees himself as if the screen were not present. Suppose the screen to be moving insuch a way that, when the light which passed through the aperture returns to the screen after reflexion, the unpierced part of the screen is in its way, it is evident that the observer cannot see himself in the mirror. If the screen pass twice as fast, the light that escaped by one aperture will, after reflexion, return by the next, so that he will see his image as at first. If three times as fast, the second unperforated part of the screen will stop the returning light; so he cannot see his image. To apply this practically a thin metallic disk had a set of teeth cut on its circumference so that the breadth of a tooth was equal to that of the space between two teeth. This disk could beset in very rapid rotation by a train of wheelwork, and the rate of turning could easily be determined by Savart’s method (see Acoustics, vol. i. p. 108). Light passed between two teeth to a mirror situated at 10 miles’

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Cornu in 1874, the value 186,700 miles for the velocity in vacuo (Nature, xi. p. 274

4. Foucault’s Method.—This was described in 1850 to Fou-

J It depends upon the principle cault’s of the rapidly revolving plane mirror introduced by ™*#o-

the Academy of Sciences.

Wheatstone to demonstrate the non-instantaneous propa- gation of an electric discharge. The mirror was made to revolve from 600 to 800 times per second, by means of a siren (see Acoustics) driven by steam. A ray of sunlighit fell upon it from a small aperture crossed by a grating of platinum wires. Between the wires and the mirror was placed an achromatic lens—the wires being farther from it than its principal focus, but not twice as far—so that the rays falling on the

mirror were slowly convergent. ‘They formed an image of the wires at a distance of about 4 metres from the mirror. In certain positions of the revolving mirror, the rays fell upon a concave mirror of 4 metres radius whose centre of curvature was at the centre of the revolving mirror. They were, therefore, reflected back directly to the revolving mirror, and, passing again through the lens, formed an image of the wire grating which, when the adjustment was perfect, coincided with the grating itself. This coincidence was observed by reflexion from a piece of unsilvered glass, placed obliquely in the track of the rays, the image in which was magnified by an eye-piece. It is obvious that, when the mirror is made to turn, the light which comes back to it after passing to the fixed mirror, finds it in a position slightly different from that in which it left it. That difference is due to the amount of rotation during the time of passage of the light to and fro along an air-space of 4 metres. Accordingly, as soon as the mirror began to rotate with considerable velocity, the coincidence between the wires and their images was destroyed; and the two were separated more and more widely as the velocity of rotation was increased. It was easy to calenlate, from the measured dimensions of the apparatus, the amount of deflexion, and the rate of rotation of the mirror, the velocity of light. The rate of rotation was, of course, given by the pitch of the note produced by the siren.

Foucault’s early results with this apparatus sliowed that the velocity of light which had been deduced from the old methods was too large; and he concludes his first paper by the statement that the determination of the distance of the earth from the sun must now be made by physical instead of astronomical methods. Foucault’s process has recently been very considerably improved by Mitchelson, who, in 1879, found for the velocity of light in vacuo 186,380 railes per second (Nature, vol..xxi. p. 226).

By interposing a tube filled with water, and having flat Proof glass ends, between the fixed and revolving mirrors, that Foucault found that (for the same rate of rotation) the ae displacement of the image was greater than before in the iN proportion of the refractive index of water

to unity. Thus in air it was at once evident, by a mode of experimenting exposed than in

to no possible doubt, that light moves faster in air than ¥@ter.

distance, which sent it back by the same course, so that when the wheel was at rest the reflected light could be seen. On turning the disk with accelerated velocity the light was observed to become more and more feeble up to a certain velocity, at which it was extinguished ; turning faster it reappeared, growing brighter and brighter till the

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velocity was doubled ; then it fell off, till it vanished when the velocity was trebled, and so on. It is evident from the first illustration above that the velocity of light in air is to that of the tooth, at the first disappearance of the reflected light, as the distance of the mirror from the disk is to the half breadth of the tooth. It is not to be sup- posed that the description we have just given embodies all the details of this remarkable experiment. On the con- trary, telescopes were used at each station to prevent loss of light as much as possible, and many other precautions were adopted which would be unintelligible without refer- ences to later parts of this article. This method and its first results were published in 1849 in the Comptes Rendus. The experiments gave, on their very careful repetition by

in water, and, therefore, as will be seen later, that the corpuscular theory of light must be abandoned.

Other methods of determining the velocity of light in air, and for comparing the velocities of light in air and water (on which depends the most definite proof of the erroneousness of the corpuscular theory), and in still and moving water, will be afterwards explained. They give results of very great value, but we cannot introduce them here, as they depend upon somewhat more recondite principles of physical optics.

It is interesting to observe that, as the nearest fixed star is probably about 200,000 times farther from us than the sun is, we now see such a

star by light which left it more than three years ago. If, as is now supposed, varzable stars

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Time of (such as Mira Ceti) owe their rapid periodical changes of

passage brightness to eclipses, and if different homogeneous rays

of light travel with different velocities in free space, it is evident

thee that such stars would show a gradual change of colour as

stars, “they wax, and an opposite change as they wane. Nothing of the kind has as-yet been observed, though it has been carefully sought for. Hence we have every reason to con- clude that, in free space, all kinds of light have the same velocity. It will be seen later that dispersion has been accounted for by the different velocities of light of different wave-lengths in the same refracting medium,—this being a consequence of the ultimate grained structure of ordinary matter, which is on a scale not incomparably smaller than the average wave-length.

Behaviour of Light at the Common Surface of Two Homogeneous Media.

Effect at | When aray of light, moving in one homogeneous medium, a surface falls on the bounding surface of another homogeneous of separ- medium, it is in general divided into several parts, which ey pursue different courses. These parts are respectively— two

media.

tered ; (6) absorbed. In the first two categories the result is two or three rays

of light pursuing definite paths according to laws presently | The fraction of the incident light which is |

to be given. reflected is in general greater as the angle of incidence is greater. In one important class of cases the reflexion is total. But at direct incidence the reflected portion is much greater for some bodies, such as mercury, than for others, such as water or glass. In bodies which give no scattering, the refracted portion of a ray consists of all the non-re- flected portion, and therefore usually diminishes as the angle of incidence increases.

In the third category the common surface of the two media becomes illuminated, and behaves as if it were itself a source of light, sending rays in all directions. It may be objected to this, that in many cases the rays are scattered while penetrating the second medium, But in such cases the second medium cannot be called homogeneous. This will come up for discussion when we treat of absorption and colours.

In the fourth category the light ceases for an instant to exist as light; but its energy may either become heat in the absorbing body, or it may again be given out by the absorbing body in the form of light, but of a degraded character. This is called fluorescence, or phosphorescence, according as the phenomenon is practically instantaneous or lasts for a measyrable time.

In category (a) the light is sent back into the first medium ; in (f) it penetrates into the second ; in (y) it goes, in general, mainly to the first; in (8) it is shared by both.

Visi: It is by scattered light that non-luminous objects are, bility of in general, made visible. Contrast, for instance, the effects ae wer ray of sunlight in a dark room falls upon a piece objects. of PO ished silver, and when it falls on a piece of chalk, Unless there be dust or scratches on the silver you cannot see it, because no light is given from it to surrounding bodies except in one definite direction, into which (practi- cally) the whole ray of sunlight is diverted. But the chalk sends light to a// surrounding bodies from which any part of its illuminated side can be seen ; and there is no special direction in which it sends a much

more powerful ray than in others. It is probable that if we could, with sufficient closeness, examine the surface of the chalk, we should find its behaviour to be of the nature of reflexion, but reflexion due to little mirrors inclined in all conceivable aspects, and at all conceivable angles, to the incident light. Thus scattering may be looked upon as ultimately due to

(a) reflected ; (8) refracted (singly or doubly); (y) scat-.

to the reflecting surface at the point of incidence,

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reflexion. When the sea is perfectly calm, we see in it one intolerably bright image of the sun only. But when it is continuously covered with slight ripples, the definite image is broken up, and we have a large surface of the water shin- ing by what is virtually scattered light,—though it is really made up of parts each of which is as truly reflected as it was wlien the surface was flat.

We have spoken above of the behaviour of light at the Gradnal common surface of two media. Now we do not by this tran- phrase necessarily mean two media different in their bel chemical composition. We mean merely media optically medinm different. Thus water with steam above it, and in very to an- special cases layers of water or air of different temperatures, other. give surfaces of separation at which reflexion and refraction may and do take place. But, except in such special cases, we rarely have an abrupt change, such as is necessary for reflexion, between two portions of the same substance in the same molecular state. In general the transition is gradual; and special mathematical methods must be applied for the purpose of tracing the behaviour of the ray, which is now really travelling in a non-homogeneous medium. |

REFLEXION oF Licut.—If light be reflected from a Reflexion | plane surface bounding two dissimilar isotropic media, the f Hight encident and reflected rays are in one plane with, and are | equally inclined (on opposite sides) to, the perpendicular This is sometimes stated in the

form—Zhe angles of incidence and of reflexion are equal to one another, and in one plane. The best experimental proof of the truth of this statement is deduced from the use of a reflecting surface of mercury in observations with the mural circle. The graduation of such an instrument is the most perfect) that human skill can accomplish, and no one has ever been able to find by it the slightest exception to the pre- ceding statement.

The principle of Hadley's quadrant, and of the sextant as now used (an invention of Newton's), is founded on this fact. Ifa plane mirror on which a ray falls be turned through any angle about an axis perpendicular to the plane of reflexion, the reflected ray is turned through twice that angle. 'Thisis an immediate consequence of the above law. For, if the plane be turned through any angle 6, the perpendicular to it is turned through the same angle. Hence the angle between the incident ray and the perpen- dicular is increased or dintinished by 0, and therefore that between the incident and reflected rays (which is double of this) is altered by 26. A plane mirror is now exten- sively used for the purpose of indicating, by the change of direction of a reflected ray, the motion of a portion of an instrument to which the mirror is attached. Thus the magnetometers of Gauss, the tuning-forks of Lissajoux, and the electrometers and galvanometers of Sir W. Thom- | son are all furnished with mirrors. The law of reflexion is also the basis of the goniometer, for the measurement | of the angles of crystals and prisms.

It follows from this law that, if a ray pass from one Mini- |

point to another, after any number of reflexions at fixed mum surfaces, the length of its whole path from one point to mae 4 the other is the least possible—subject to the condition ?"" that it shall meet each of the reflecting surfaces. For

the point in a given plane the sum of whose distances

from two given points (on the same side of the plane)

is the least possible is that to which, if lines be drawn

from the points, they are in one plane with the normal

(or perpendicular) to the given plane and make equal

angles with it. And, as the same is true of each separate reflexion, it is true for the whole course of the ray, since

for any one of the reflecting surfaces may be substituted ‘ its tangent plane at the point of incidence. i

j q q

|

Images by re- flexion,

hit @ HT

It is to be remarked that there are exceptions to this form of the statement. The true form is that the actual path of a ray, under the given conditions, is less in length than any other path (satis- fying the conditions) which is nowhere finitely divergent from it. This may be best seen by another method. Suppose a series of ellipses to be deseribed whose foci are the source of light and an assigned point which is to be reached by the reflected ray. Let this system turn about the line joining the foci; it generates a series of prolate spheroids such that the time of light’s passing from one focus to a point in any one of the surfaces, and thenee to the other foeus, is the same whatever point be ehosen on that particular sur- face. If we take any point without that surface, for it the eorre- sponding time is obviously greater. Hence to find the path of that one of a system of rays diverging from a given point which, after reflexion at a given surface, shall pass through a given point, we have only to imagine spheroids constructed as before. Of these one at least will touch the given surface. All points on the surface in the neighbourhood of the point of contact (mark this Hmitation) will in general be outside the spheroid. Hence this point gives the shortest path. But the spheroid and the reflecting surface

have the same tangent plane, and therefore the parts of the ray are equally inclined to the surface.

Formation of Images by Reflexion at a Plane Surface.— We may assume here—what is indeed evident from the rectilinear propagation of light—that objects are rendered visible to the eye by rays diverging from them. Hence, if we have a set of reflected or refracted rays diverging from any point, or diverging as if they came from any point, they will convey to the eye the impression of the existence of a luminous source at that point. The eye, in fact, can only tell us what effect is produced upon it, z.e., what sort of mechanical action it is subjected to, Its indications must therefore depend only upon what reaches it, and in no other sense whatever upon the source or the path of light. This point from which rays diverge, or appear to diverge, is called an image.

The image of any point in a plane mirror is found by drawing from the point a perpendicular on the mirror and producing it till its length is doubled.

The extremity of the line so drawn is the image of the point ; or, in other words, rays proceeding from the point diverge after reflexion as if they came from the image so

Real and found. The image in this case is called virtual, to dis-

virtual images,

tinguish it from cases, subsequently to be mentioned, where it is real—the distinction being that the rays have actually passed through a real image, while they only appear to come from a virtual one.

To prove this it is only necessary to observe that, if A (fig. 5) be a luminous point or a point from which rays

Big. 6. diverge, and CB any section of the mirror by a plane through AB, the perpendicular to it, and if we make Ba=AB, and take any point P, then, joining AP, aP, and producing the latter, the angles APB, aPB, and therefore CPQ are equal; also the plane of the paper contains the perpendicular to the mirror at P. Hence PQ is the reflected ray; or the ray, after reflexion, appears

to come from a. Hence a is the image—a virtual one, as before noticed. Also, if R be any point whatever (not P) in the plane of the mirror, we have obviously aR=RA. Hence the path AR, RQ is equal to ak, RQ, two sides of the triangle aRQ, of which aQ, which is equal to the actual path (AP, PQ), is the third side. Fig. 6 represents the pencils of diverging rays by which two points of the image are rendered visible to an eye placed in front jum of the mirror. From the re- quisite modifi-cation of this figure it follows that one can see his whole per- son in a mirror of only half his height and breadth. Dircks’s ghost, which has

played a prominent part in popular enter- tainments for some years back, is the image, in a large sheet § of — unsilvered

Fig. 6. plate glass hung at the front of the stage, of an actor or figure strongly illuminated, and concealed from the audience

in a sort of enlarged prompter’s box. Any one can see the phenomenon completely by looking into a plate-glass win- dow on a sunny day, when he sees the passers-by ap- parently walking inside the house.

The principles already stated suffice fully for the ex- planation of the curious vistas of images formed by two parallel plane mirrors facing one another at opposite sides ofaroom. The only additional observation necessary on this subject is that, if the mirrors are silvered on the back, the light at each reflexion has to pass twice through the glass. Thus, if the glass be pinkish or greenish, the various images are more and more coloured as they are due to more numerous reflexions,

These principles also easily explain the KALEMOoSCcOPE Kaleido- (g.v.) of Sir D. Brewster, where images are formed by two scope.

mirrors inclined to one another. It is easy to see that the series of images of a luminous point produced by such an arrangement after one, two, &c., reflexions must all lie on a circle; also that, if the angle between the mirrors be an aliquot part of four right angles, these images will form – a finite number of groups, cach consisting of an infinite number of images which have exactly the same position.

The explanation of the law of reflexion which is fur- nished by the corpuscular theory is excessively simple. We have only to suppose that at the instant of its impact on the reflecting surface the velocity of a corpuscle per- pendicular to the surface is reversed, while that parallel to the surface is unchanged. It bounds off, in fact, like a billiard-ball from the cushion. The undulatory theory gives an explanation, which is, in reality, quite as simple, but requires a little more detail for those who are not familiar with the common facts of wave-motion. We therefore reserve it for a time.

Reflexion at a Spherical Surface.—Let APB (fig. 7) be Spherical a section of a concave spherical mirror by a plane passing ™T0r

through its centre of curvature O, and through the lumi- nous point U. Then, if any ray from U, as UP, meet the surface, it will be reflected in a direction PV, such that UP, PO, and PV are in one plane, and so that PO bisects

Conju- gate foci,

Generali- zation of the formula.

the angle UPV. (This follows because OP, a radius of the sphere, is normal to the surface at P.) Hence it is

Fig. 7.

rigorously true that, if V be the intersection of PV with UOA,

VO OU

YP” OP’

The full consequences of this exact statement will be developed under Optics (GEomETRICAL). For our pre- sent purpose, an approximation will amply suffice. Let us suppose P to be so near to A that no sensible error is introduced by writing A for P in the above formula. This amounts to supposing the mirror’s breadth to be very small in comparison with its radius of curvature. The formula now becomes

vo ou, AV AU’ or, what is the same, AO-AV AU-AO, oe

and V is, to the degree of approximation above stated, independent of the position of the point P. If we call » the radius AO of the mirror, «=AU the distance of the source, and v= AV, the distance of the point V from the mirror, this becomes

pen PN ame ye 12) (a). v UW U v ws

The formula, or the cut, shows at once that this relation between U and V is reciprocal ; i.¢., all rays from V, falling on the mirror, will be made to converge at U. These points are therefore called conjugate foci.

The simplicity of (a) is remarkable; so, also, is that of its interpretation. or the rays passing from a source to a given object, like the mirror, are less and less divergent as the source is farther off. Hence (a) signifies that the (alge- braic) sum of the divergences of the incident and reflected rays is equal to that divergence which the mirror can con- vert into parallelism.

In fact the rigorous geometrical relation may be written in the obvious form AVP + AUP =2AOP,—which, when all three angles are small, is simply (a). A similar state- ment may easily be made in the case of refraction.

Before we proceed to develop the consequences of this simple formula, we may point out that it is applicable to all cases,—to convergent rays falling on a concave mirror, to divergent rays falling on a convex mirror, &c., &c. The reader may easily verify this by trial for himself. But it follows at once from the necessary interpretation of the negative sign in geometry. Thus, if the mirror were convex, O would be to the /eft of A, as the figure is drawn ; and AO, if formerly positive, would now be negative. Thus, for a convex mirror, the formula is

sat

—_—-—=—=

u v rT

If the incident rays be convergent, U is to the left of A, and therefore AU, or wu, is negative; and so on. :

We must now study the relative positions of U and V, in order to find the size and position of the image for different positions of the object.

Returning to the formula (a) above, we see that the following pairs of values of « and v satisfy it :—

LIGHT

Uw v

ar.

Greater than 47, less than 7.

Infinite. Greater than .

r r,

‘Less than 7, greater than 47. Greater than 7.

47, Infinite. Greater than 0, less than $7. Negative.

0. 0.

Thus, when the source is at a practically infinite distance Principal

(as the sun or a star) the image is formed at a distance from the mirror equal to half its radius of curvature. It is then said to be in the principal focus. As the source comes nearer, the image comes out to meet it, and they coincide at the centre of curvature of the mirror. In fact, a ray leaving the centre of the mirror must meet the surface at right angles, and thus go back by the way it came. When the source comes still nearer, the image goes further off, until, when the source is at the principal focus, the image is at an infinite distance ; that is, the rays go off. parallel to one another. This is the mode in which a concave reflector is employed for lighthouse purposes. When the source comes still nearer, the image is behind the mirror, ze, the incident rays are so divergent that part of their divergence remains after reflexion. This remnant of divergence becomes greater and greater as the source is

nearer to the mirror, ¢.¢., the (then virtual) image comes closer to the mirror, which finally behaves, for a very near source, almost precisely like a plane mirror.

All of these phenomena can be beautifully seen in a dark room by employing a beam of sunlight, rendered distinctly visible, in the fashion noted by Lucretius, by the motes in the air.

For further explanation pictures are given (figs. 8, 9), Paths of

showing the course of the pencil of rays when (1) a real

and (2) a virtual image is formed by a concave mirror. It will be seen at once that, in the cases figured, the real image is inverted and less than the object, the witual image erect and larger. In fact the size of a small object is obviously to that of its image in proportion to their distances from O, the centre of curvature of the mirror. Also the image is erect when it lies on the same side

focus.

rays forming an image.

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Causties.

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of the centre of curvature with the object; inverted, if on the opposite. In other words, the image is inverted if the rays cross one another’s path, erect if they do not. When the breadth of the mirror is large compared with its radius, the approximation upon which all these results depend can no longer be made, There is then no definite image even of a luminous point. It becomes spread over what is called a caustic, a section of which is the bright

and also that the angles QSR and QST are equal. Henee the following theorems, which enable us at onee to draw a figure on es object plane such that its image shall appear of any assigned orm.

1. Any line, such as QR, on the object plane, drawn from a point Q in the section of the eylinder so that the angles OQR and OQA are og ,is seen after reflexion as a generating line of the eylinder.

2. If an epieycloid be deseribed by lines of fixed length OS, SR, turning about O with angular veloeities 1 and 2, and both ecoin- eiding with OA at starting, its image will be a circular section of

the eylinder. Thus, if we imagine as drawn on the cylinder any number Diagrams

curve familiar to every one who has looked at a cup of milk in sunshine.

Spherical Even when the approximation is close enough for | of vertical and horizontal sections, forming a network, the for cylin- _— ordinary purposes, it is not so for astronomical purposes, | object corresponding to them can be traced as a number ——

101. .

and the effect of its inexactness upon the image is known as spherical aberration. For the fine mirrors of reflecting TELESCOPES (q.v.) the spherical form cannot be employed ; the surface of the mirror must be of parabolic section.

of intersecting straight lines and epicycloids. Thus we have a well-known means of drawing the required object. A similar process may be applied to other modes of using such mirrors.

Cylin- Cylindrical Mirrors,—As a simple example of the ap- When the cylinder has a small diameter, it may be Reflexion drical plication of the law of reflexion at curved surfaces, when | usefully employed to intercept and reflect part of a beam of nee! 4 mm” the rigorous

solution is demanded, let us take the case of | sunlight entering a dark room. It is easy to see, by a Po)*”°

a vertical right cylinder, the object being a drawing on a horizontal plane. Such mirrors, with the frightfully dis- torted drawings necessary to give an image of natural proportions, were very common fifty years ago, but are now rarely seen. They are still, however, valuable as illustrations of our subject.

Let the plane of the object eut the axis OB of the eylinder at right angles in O (fig. 10), and let A be the position of the eye, and RQA a ray from a point R of the ob- ject, reflected at Q. Draw QP perpendicn- lar to the axis. Then AQ and QR are in the same plane with QP (the normal to the surface) and make equal angles with it. Henee, when this figure is projeeted by vertical lines on the plane of the objeet, it takes the form in fig. 11; and AQ, QR now make equal angleswith OQ. Also, if AB be drawn (in fig. 10) per- : pendicular to OP, the Fig. 10. ratio of AQ to QR in fig. 11 is equal to that of BP to PO in fig. 10.

geometrical construction, that the reflected rays will, in this case, form a right cone, whose axis is that of the cylinder ; and one of its generating lines will be parallel to the incident ray. Thus the angle of the cone becomes smaller as the inclination of the reflecting cylinder to the ray becomes less. If the ray, at the point of interruption, was at the centre of a spherical dome, after reflexion it will form on the dome a circle, small or great, which passes through its original point of incidence.

In the language of QUATERNIONS (g.v.), let a be the ineident

ray, 6 the axis of the eylinder, 7 any normal to the eylinder, p the reflected ray. Then the law of reflexion gives

V.ratp=0. The property of the normal gives Spr=0. Eliminating 7, we have at onee fis (32) a? Sap)’ the equation of a right cone. Imitations, more or less perfect, of primary and second- ary rainbows can easily be made by this process,—-the sun-

beam being led through a prism just before it falls on the cylindrical rod. This experiment is a very striking one ;

| but, though capable of giving much information, it is of

that dangerous kind which is liable to mislead instead of instructing an audience.

If we look at a great number of thin cylindrical rods, parallel to one another, and illuminated by sunlight, the rays which reach the eye must, by what we have already said, each form a side of some right cone (of definite angle) whose axis is parallel to each of the cylinders. The appearance presented will therefore be that of a luminous circle, passing through the sun. Its angular diameter becomes less as the axes of the cylinders are less inclined to the incident rays.

This phenomenon js beautifully shown by some specimens of crystals, especially of Iceland spar, which are full of minute tubes parallel to one another. In a plate of such a doubly-refracting crystal, however, there are necessarily four images. That which is throughout due to the ordinary ray (this term will be explained later) shows perfectly the phenomenon above described. The light of the luminous circle is white. The other three curves are not circles, and in them the colours are separated. One of them, which is elliptical, is usually very much brighter than either of the remaining two.

Fig. 11. QS : QO: GR: OA, and draw ST parallel to OA. Then it is obvious that

_~%So,. SR=ST=§50A ;

REFRACTION.—If homogeneous light be refracted at a Ordinary plane surface separating two homogeneous isotropic media, — the incident and refracted rays are in one plane with the” * normal to the surface, and the sines of their inclinations

to it are in a constant ratio.

Take

Newton on the composi- tion of white light.

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The law of single refraction was putin a form equi- valent to this (all but one word) for the first time by Snell in Leyden, some time before 1626. It was first published in 1637 by Descartes, who undoubtedly obtained it from Snell; but he gave it without any mention of its author.

The one word referred to is homogeneous as applied to the incident light. For the fact that white light consists of innumerable different homogeneous constituents, which are separated from one another by refraction, was first established by Newton. We quote his own account of this important discovery from his letter to Oldenburg, dated Feb. , 1673:—

‘To perform my late promise to you, I shall without further ceremony acquaint you, that in the year 1666 (at whieh time I applied myself to the grinding of optick-glasses of other figures than spherical) I procured me a triangular glass-prism, to try there- with the celebrated phenomena of colours. And in order thereto, having darkened my chamber, and made a small hole in my window-shuts, to let in a convenient quantity of the sun’s light, I placed my prism at its entrance, that it might be thereby refracted to the opposite wall. It was at first a very pleasing divertisement, to view the vivid and intense colours produced thereby ; but after a while applying myself to consider them more circumspeetly, I beeame surprised to see them in an oblong form ; which, according to the received laws of refractions, I expected should have been cir- cular. They were terminated at the sides with streight lines, but at the ends the decay of light was so gradual, that it was difficult to determine justly what was their figure, yet they seemed semi- circular.

‘* Comparing the length of this coloured spectrwm with its breadth, I found it about five times greater; a disproportion so extravagant, that it excited me to a more than ordinary curiosity of examining from

whence it might proceed. I could scarce think, that the various thickness of the glass, or the termination with shadow or darkness, could have any influence on light to produce such an effect : yet I thought it not amiss, first to examine those circum- stances, and so tried what would happen by transmitting light through parts of the glass of divers thicknesses, or through holes in the window of divers bignesses, or by setting the prism without, so that the light might pass through it, and be refracted, before it was terminated by the hole: but I found none of those circumstanees material. ‘The fashion of the colours was in all these cases the same.

‘‘Then I suspected, whether by any unevenness in the glass, or other contingent irregularity, these colours might be thus dilated. And to try this, I took another prism like the former, and so placed it, that the light passing through them both, might be refracted con- trary ways, and so by the latter returned into that course from which the former had diverted it: for by this means I thought the regular effects of the first prism would be destroyed by the second prism, but the irregular ones more augmented, by the multi- plicity of refractions, The event was, that the light, which by the first prism was diffused inte an oblong form, was by the second re- duced into an orbicular one, with as much regularity as when it did not at all pass through them. So that whatever was the cause of that length, it was not any contingent irregularity.

“‘T then proceeded to examine more critically, what might be effected by the difference of the ineidence of rays coming from divers parts of the sun ; and to that end, measured the several lines and angles belonging to the image. Its distance from the hole or prism was 22 foot ; its utmost length 134 inches ; its breadth 28 ; the diameter of the hole 3 of an inch. ‘The angle which the rays, tending towards the middle of the image, made with those lines, in which they would have proceeded without refraction, was 44 deg. 56 min. and the vertical angle of the prism 63 deg. 12 min. Also the refractions on both sides the prism, that is, of the incident and emergent rays, were, as near as I could make them, equal ; and consequently about 54 deg. 4 min. And the rays fell perpendicu- larly upon the wall. Now subducting the diameter of the hole from the length and breadth of the image, there remains 13 inches

in the length, and 23 the breadth, comprehended by those rays which passed through the center of the said hole; and consequently the angle of the hole, which that breadth subtended, was about 31 min. answerable to the snn's diameter ; but the angle which its length subtended, was more than 5 such diameters, namely, 2 deg. 49 min.

'* Having made these observations, I first computed from them the refractive power of that glass, and found it measured by the ratio of the sines 20 to 31; and then by that ratio 1 computed the refractions of two rays flowing from opposite parts of the sun's discus, so as to differ 31 min. in their obliquity of ineidence, and found that the emergent rays should have comprehended an angle of about 31 min. as they did before they were incident.

'* But because this computation was founded on the hypothesis of

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the proportionality of the sines of incidence and refraction, which though by my own experience I could not imagine to be so errone- ous, as to make that angle but 31 min. which in reality was 2 deg, 49 min. yet my curiosity caused me again to take my prism: and having placed it at my window, as before, I observed, that by turn- ing it a little about its axis to and fro, so as to vary its obliquity to the light, more than an angle of 4 or 5 degrees, the colours were not thereby sensibly translated from their place on the wall; and consequently by that variation of incidence, the quantity of refrac- tion was not sensibly varied. By this experiment, therefore, as well as by the former computation, it was evident, that the differ- ence of the incidence of rays, flowing from divers parts of the sun, could not make them after decussation diverge at a sensibly greater angle, than that at which they before converged ; which being at most but about 31 or 32 min. there still remained some other cause to be found out, from whence it could be 2 deg. 49 min.

'Then I began to suspect, whether the rays, after their trajection through the prism, did not nove in curve lines, and according to their more or less curvity, tend to divers parts of the wall. And it increased

my suspicion, when I remembered that I had often seen a tennis-ball, struck with an oblique racket, deseribe such a curve line. For, a circular as well as a progressive motion being com- municated to it by that stroke, its parts, on that side where the motions conspire, must press and beat the contiguous air more vio- lently than on the other, and there excite a reluctancy and re-action of the air proportionably greater. And for the same reason, if the rays of light should possibly be globular bodies, and by their oblique passage out of one medium into another acquire a circulating motion; they ought to feel the greater resistance from the ambient ether, on that side where the motions conspire, and thence be continually bowed to the other. But notwithstanding this plausible ground of suspicion, when I came to examine it, I could observe no such curvity in them. And besides (whieh was enough for my purpose) I observed, that the difference betwixt the length of the image aud the diameter of the hole, through which the light was transmitted, was proportionable to their distance.

“The gradual removal of these suspicions at length led me to the experimentum crueis, Which was this. I took two boards, and plaeed one of them close behind the prism at the window, so that the light might pass through a small hole, made in it for the pur- pose, and fall on the other board, which I placed at about 12 feet distance, having first made a small hole in it also for some of that incident light to pass through. Then I placed another prism behind this seeond board, so that the light trajected through both the boards might pass throngh that also, and be again refracted before it arrived at the wall. This done, I took the first prism in my hand, and turned it to and fro slowly about its axis, so much as to make the several parts of tlie image, cast on the second board, suc- cessively pass through the hole in it, that I might observe to what places on the wall the seeond prism would refraet them. And I saw, by the variation of those plaees, that the light, tending to that end of the image towards whieh the refraction of the first prism was made, did in the second prism suffer a refraction considerably greater than the light tending to the other end. And so the true eause of the length of that image was detected to be no other, than that light is not similar or homogeneal, but consists of difform rays, some of which are more refrangible than others ; so that without any

difference in their incidence on the same medium, some shall be more refracted than others ; and therefore that, according to their particular degrees of refrangibility, they were transmitted through the prism to divers parts of the opposite wall.”

The constant ratio mentioned in the above statement of Refrac- Its tive

the law of refraction is called the refractive index. numerical value depends upon the nature of the two media, and also upon the quality of the homogeneous light. It is usually greater for orange light than for red, for yellow than for orange, and so on,—so that the violet rays are often called the “more refrangible” rays.}

The following experimental facts are additions to the law.

When refraction takes place from a rarer into a denser medium, the angle of refraction is usually less than that of incidence,

If the refractive index for a particular kind of light from

a medium A into another B be p, that from B to A is 1.

Bb In other words, a refracted ray may be sent back by the path by which it came. |

If w, be the refractive index for a particular ray from A

} This statement is, however, liable to some very singular exeep- tions, which will be mentioned later, when we are dealing with anomalous dispersion.

into Cis “2 called the critical angle. When an equilateral triangular Critical from B into C is 7 prism of glass is placed in a ray of sunlight, and made to angle. Refrac- These being premised, let us consider a source of | rotate, we see (besides the spectra formed by refraction) tion by homogeneous light in air shining on a surface of water. | beams of white light reflected alternately from the outside water. Here we may take pw as about equal to +. and the cuside of each face. The

totally reflected ray from Let MN (fig. 12) be the perpendicular to the water | the inside is seen to be very much brighter than that surface at the point where the incident ray AP meets it. | reflected from the outside. In the plane APM make the angle QPN such that To an eye placed nearly in the vertical of A, A appears sin APM=4 sin QPN, | at Ay, where : then PQ is the refracted ray. If QP be produced back- | A,B=7AB. ; } wards to meet the guppcueeueepereccos Thus a clear stream, when we look vertically into it, Appear- vertical line BA in | appears to be of only ths of its realdepth. But when we on q, We may present | look more and more obliquely, seeing A for instance by the tr ter this statement in ray QP, the image appears nearer and nearer to the surface * water

LIGHT

into B, and y», that for the same ray from A into C, that

the form

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from those which (at least partially) escape into air is

or, if A be at the bottom, the water will appear more and

PB OPB more shallow; and all objects in it will appear to be

PA = apy’ crowded towards the surface. Thus the part of a stick

is immersed in water appears bent up towards the surface of PA=$Pq. | the water.

If the rays fall nearly perpendicu- larly on the surface, we may put (ap- § proximately) B for P, and we have

Bg=4BA. |

Hence, an eye placed under water and nearly in the vertical through A, sees a virtual image of A at g, one-third farther from the surface of the

water.

As P is taken farther and farther from A, the angle of incidence becomes more nearly a right angle, and the sine of the angle of refraction becomes more nearly equal to 3. A ray cannot go from air into water so as to make, with the perpendicular to the surface, an angle whose sine ts greater

Fig. 12.

Again, to an eyeat A, all objects above the water will be seen within a right cone of which AB is the axis and AP, aside. The rest of the water surface, outside the cone just mentioned, shows us objects at the bottom by reflexion in a perfect mirror.

All this is on the supposition that the light is homo- geneous. But when white light is emitted by A, the point A, will be nearer the surface for each constituent the greater is the refractive index. Thus a white point at A will appear drawn out into a colonred line whose lower end is red and upper end violet.

It is easily seen from the law of refraction that light, on passing through a plate of homogeneous material with parallel faces, finally emerges in a direction parallel to that at incidence, and therefore white light comes out from it still white. If the plate be water in a glass vessel with parallel sides, a body placed close to one side, while the eye is close to the other, appears to be at iths of its real distance from the eye.

The explanation of the law of refraction, on the corpus- Corpus- cular theory, was given by Newton. It is still of import- cular ance, as the earliest instance of the solution of a problem ¢xPlana- ° A tion of involving molecular forces. Newton shows that, as the the law molecular forces on a corpuscle balance one another at of re. every point inside either of the media, its velocity must be fraction, constant in each, but that in passing through the surface of separation of the two media the square of the velocity perpendicular to the surface undergoes a finite change.

Thus, if v be the velocity in air, a the angle of incidence, then in glass the velocity parallel to the surfaee is still v sin a, but that perpendicular to the surface is V/v%cos’a+a2, Thus the whole velocity is Vv?4a?; and, if a’ be the angle of refraction,

Vv? +a? sin a =v sin @. |

Prisms.—When the surfaces are plane, but not parallel, Prism. we have what is called a prism.

The general nature of the action of a prism will be easily understood by the help of the previous illustrations, if we restrict ourselves to the case of a prism of very small angle and to rays passing nearly perpendicular to each of its

Fig, 13.

than {. The true nature of this curious statement is, however, best seen when we suppose the source to be under water, and the light to be refracted into air If APQ (fig. 13) be the course of a ray, we have as before

AP =4Py. faces. Thus, the rays falling nearly at right angles to its

Basen if 2: be taken vo that surface from a point A (fig. 14) will, after the first refrac- . I tion, appear to diverge from a luminous line RV, red at the

AP, = §P,B, end next to A, violet at the other. This line isin the

Total re-

Fe it is clear that ¢ coincides with B, or the ray AP,, refracted €xlon,

at P,, runs along the surface of the water. If AP, be less than $ P,B, no point ¢ can be found; so that the ray AP, cannot get out of the water. It is found to be completely reflected in the water. This reflexion unaccompanied by refraction is called total reflexion. The limiting angle of Incidence (at P,) which separates the totally reflected rays

perpendicular AB from A to the first surface of the prism. Draw from R and V perpendiculars RS, VT to the second surface of the prism. Join BS, BT, and draw Ar, Av parallel to them so as to cut RS in ry and VT in vw To an eye behind the prism, the bright point A will appear to be drawn out into a coloured line rv, red at the end nearest

to A;

Spec- trum.

Disper- sion.

Aclhito- matism,

If A bea narrow bright line of light, parallel to the edge of the prism, it will appear to be drawn out into a rectangle consisting of images of the line ranged parallel to one another, and due to the various homogeneous constituents of white light in order of their refrangibility. If the light do not contain rays of every degree of refrangibility, some of these images will be wanting, and there will be corre-

Fig. 14.

sponding dark lines or bands crossing this spectrum (as it is called). The amount by which any part of this spectrum is shifted from the true position of the bright slit depends (ceteris paribus) upon the amount of the refraction. It also depends on the angle of the prism. And, for a given angle, the length of the spectrum depends upon the differ- ence between the refractive indices for the red and the violet rays. This is called the dispersion.

If a second prism, of the same glass, and of the same angle, as tlie first, be placed in a reversed position behind it (as indicated by the dotted lines in the figure), the effect of the two would be simply that of a plate of glass with parallel faces ; the emergent rays would each be parallel to its original: direction, and there would be no separation of colours.

The reversed prism would therefore undo the work of the direct prism. Then we should have no dispersion, but we should also have no refraction. We have, however, as has already been shown, an increase of divergence, 2z.¢., the image is nearer to the eye than tlie object. Blair, Brewster, and Amici devised combinations of two pairs of prisms of the same glass, those of each pair having theit edges parallel, such that the combination acted as a sort of achromatic telescope of low power.

Newton, from some rough experiments, hastily concluded that the amount of dispersion is in all substances propor- tional to that of the refraction. If such were the case it is casy to see that prisms of two differently refracting materials and of correspondingly different angles, combined (as above described) so as to annul the dispersion, would likewise annul the refraction. Thus Newton was led to suppose that refraction without dispersion is impossible.

It was found by Hall in 1733, and afterwards (inde- pendently) by Dollond, that this idea is incorrect—that, in fact, we have in certain media large refraction with com-

paratively small dispersion, and vice versa, and thus that the dispersion may be got rid of while a part of the refrac- tion remains. James Gregory had previously conjectured that this might be done by using, as is done in the eye, more media thanone. Thus we have for certain specimens of flint and crown glass, whose optical constants were carefully measured by Fraunhofer, the following values of the refractive index for three definite kinds of homo-

geneous light :-—

Cc D F Flint glass ……..sc0+ 0+ 1°6297 1°6350 1°6483 Crown glass …....ssssesees 1°5268 1°5296 1°5360

The rays C and F are in the red and greenish blue re- spectively, and are given off by incandescent hydrogen. D is the orange-yellow ray of

sodium.

When the angle of the prism is very small (the only case we treat here), we may consider Avv as approximately a straight line, whose length is (ceteris paribus) proportional to the angle of the prism. Also the distances Ar, Av, are to one another in the proportion of the refractive indices of red and violet rays, each diminished by unity. Hence, for a prism of flint glass such as was employed by Fraunhofer, the distances from A to its images formed by these three kinds of homogeneous light respectively are very nearly as

630, 635, 648.

When a prism of crown glass is used they are nearly as

527, 530, 536.

Tho differences between the numbers for C and F are

For flint glass …....c0ssccccsecesersssseenen sonees 18 yy CTOWN Glass ..cccssecsssseseseuecreecseseteenseees 9 oras 2:1. Hence if we make the small angle of the crown-

glass prism twice that of the flint, and observe A through the two prisms, with their edges turned in opposite direc- tions, the C and F images will coincide. Both, however, will be displaced from the real direction of A as if a prism had been employed, with its edge turned as that of the crown glass was, and to the same extent as that prism would have displaced them had its refractive index been about 1:21 and the same for the two kinds of light C and F.

In fact, the displacements by the flint prism are as

630, 648,

and those by the crown prism (to the opposite side) are as

1054, 1072.

The differences, in favour of the crown prism, are as

424, 424,

This combination of prisms is called achromatic, or colourless, but is not perfectly so. the displacement of the D image, we find that it is as

635

for the flint prism ; but as

1060

in the opposite direction, for the crown prism. Hence its whole displacement is as

425,

a little greater than that common to C and F. The reason for this is obvious from Fraunhofer's numbers given above. The interval from C to D is to that from C to F ina greater ratio in crown than in flint glass, —so that the spectra given by these media are not similar. The rays of higher refrangibility are more separated in proportion to those of lower refrangibility in flint than in crown glass. This is the irrationality of dispersion—which, so far as we yet know, renders absolute achromatism unattainable. Three lenses in combination give a better attempt at achromatism than can be made with two; and some re-

For if we inquire into Irration- |

Lines in the solar

spectrum.

Impure spectrum,

Spherical

refract- ing sur- face,

markable results°were obtained by Blair,! with two glass lenses enclosing a lenticular portion of a liquid.

By looking through a prism at a very narrow slit, formed by the window shutters of a darkened room, Wollaston (in 1802) found that the light of the sky (@e., sunlight) gives a spectrum which is not continuous. It is crossed by dark bands, as already hinted. These bands are due to the deficiency of intensity of certain definite kinds of homogeneous light. They were, independently, redis- covered, and their positions measured, by Fraunhofer? in 1817 with far more perfect optical apparatus. He also found similar, but not the same, deficiencies in the light from various fixed stars. The origin of these bands will be explained in RApIATION, along witli the theory of their application in spectrum analysis. In optics they are useful to an extreme degree in enabling us to measure refractive indices with very great precision. Wollaston’s own account of his discovery is as follows :—

“If a beam of day-light be admitted into a dark room by a erevice yyth of an inch broad, and received by the eye at the distance of 10 or 12 feet, through .a prism of flint-glass, free from veins, held near the eye, the beam is seen to be separated into the four following colours only, red, yellowish-green, blue, and violet, in the proportions represented in fi

‘*The line A that bounds the red side of the spectrum is some- what confused, which seems in part owing to want of power in the eye to converge red light. The line B, between red and green, in a certain position of the prism is perfeetly distinct ; so also are D and E, the two limits of violet. But C, the limit of green and blue, is not so clearly marked as the rest; and there are also on each side of this limit other distinet dark lines f and g, either of which in an imperfect experiment might be mistaken for the boundary of these colours,

“The position of the prism in which the colours are most elearly divided is when the incident light makes about equal angles with two

of its sides. I then found that the spaces AB, BC, CD, DE ceeupied by them were nearly as the numbers 16, 23, 36, 25.'

The mode of formation of a spectrum which was employed by Newton, and which is still used when the spectrum is to be seen by many spectators at a time, differs from that just explained in this, that the light from a source A is allowed to pass through the prism, and to fall on a white screen at a considerable distance from it. In this case the paths of the various rays as they ultimately escape from the prism are found by joining the points r,....v, With the prism and producing these lines to meet the screen. Unless one surface of the prism be covered by an opaque plate, with a narrow slit in it parallel to the edge of the prism, the spectrum produced in this way is very impure, z.e., the spaces occupied by the various homogeneous rays overlap one another. To make it really pure an achromatic lens is absolutely re- quisite. This leads us, naturally, to the consideration of the refraction of light at spherical surfaces.

Refraction at a Spherical Surface.—Following almost exactly the same course as that taken with reflexion above, let O (fig. 15) be the centre of curvature of the spherical refracting surface AB. Let U be the point-source of homogeneous light, and let PV be the prolongation (back-

wards) of the path pursued, after refraction, by the ray UP. |

1 Trans, R.S.E., vol. iii. (1791). 2 Gilbert's Annalen, lvi. 3 "¢The correspondence of these lines with those of Fraunhofer IJ have, with some difficulty, ascertained to be as follows :— A, B, f, C, g, D, E, . . . Wollaston's lines. B,D, 6, ¥F, G, H,... Fraunhofer's lines. There is no single line in Fraunhofer's drawing of the spectrum, nor is there any in the real spectrum, coincident with the line C of Wol- laston's, and indeed he himself describes it as not being 'so clearly marked as the rest.' I have found, however, that this line C corre- sponds to a number of lines half-way between } and F, which, owing to the absorption of the atmosphere, are particularly visible in the light of the sky near the horizon."—Brewster, Report on Opties, Brit. Association, 1832.

Then, rigorously, we have sin UPO=un sin OPV, where yp is the index of refraction between the two media employed. This may be written (by omitting a common factor) as OU OV Pu ~ *py” If, as before, tlie breadth of the surface be small com- pared with its radius of curvature, we may approximate

Fig. 15.

(sufficiently for many important practical purposes) by writing A for P. Thus we have

ou= Ov AU” “AV: Retaining the same notation as in the case of reflexion, we get

ad gt ee 6 <8 Ply? or i. JN) al ry = ee, —— cy) ° . ° . . (1). Notice that, if we put »= — 1, this becomes the formula

for reflexion at a concave mirror.

Lenses.—Suppose now that, after passing a very short Thin distance into the refracting medium, the ray escapes again lenses. into air through another spherical surface whose centre of curvature also lies in the line OA. Let s be the new radius of curvature, w the value of the quantity corre- sponding to v for the escaping ray. Then, remembering

that the refractive index is now ,we have (by the previous B

formula)

1 1

= ey He DH w «% or ce Ie. ae (2). Ww Vv s

Adding (1) and (2) we get rid of v, which indicates the behaviour of the rays in the substance of the lens, and have

This contains the whole (approximate) theory of the behaviour of a very thin lens. When the source is at an infinite distance, or w= o,

we have

1 7

ar li »(-)

suppose.

=

This quantity f, defined entirely in terms of the refrac- tive index and of the curvatures of the two faces of the lens, is called the principal focal distance. If wbe greater than 1, 7.¢, as in the case of a glass lens in air, f is post- tive if Ae

a? 8 be so; and it obviously retains the same value, and sign, Reversi- if the lens be turned round. For, in the formula, r and s bility of

change places, and they also change signs; é.c., we must ‘Jens. XIV. — 75

Images pro- duced by lenses,

594

put —s for r and —7 for s. changed.

All lenses, therefore, whose sections are of any of the forms in fig. 16, whichever way they are turned, render

This leaves the result un-

Fig. 16.

parallel rays which pass through them divergent. Their characteristic is that they are thinnest at the middle. But

1. 4&4

- &

is negative for lenses whose sections are of any of the forms |

shown in fig, 17. Such lenses, whichever way they are

turned, render parallel rays convergent. Their characteristic |

Fig. 17.

is that they are thickest at the middle. But these char- acters are interchanged when pw is less than 1; as, for instance, when the lens is an air-space surrounded by water. The similarity on reversal is not in general true in a second approximation.

The formula for a thin lens now takes the form,

a ee

w i and differs from that for a curved reflecting surface only in the sign of the second term. With the proper allowance for this, then, all that we have said of reflexion at spherical mirrors holds true of refraction through thin leuses with spherical surfaces,

We may now put the whole matter in the excessively simple form which follows :—

A thin lens increases or diminishes by a definite quan- tety the convergence or divergence of all rays which pass through tt.

This quantity is the divergence or convergence of rays falling on the lens from or passing from it to its principal focus. Or it is the convergence or divergence which the lens produces in parallel rays. Thus, if the distance of an object from a convex lens is twice the focal length of the lens, the image is formed at the same distance from the lens, and is equal in size to the object.

Figs. 18 and 19 show the production of a real image and of a virtual image by lenses which produce converg- ence of parallel rays—along

with the rays by which these are seen by an eye placed behind the lens. In either case it is obvious that the sizes of object and image are, respectively, as their distances from the centre of the lens,

LIGHT

Fig. 18 shows how a lens produces a real inverted image Real, of a body placed farther from it than its principal focus. This is the case in the camera obscura, in the solar

Fig, 18.

microscope, and in the object glass of a telescope. Fig. 19 shows how a virtual image is formed of a body Virtual. placed nearer to a lens than its principal focus, Thisis the case of a single lens used as a microscope. In the former

case the divergence of the incident rays is so small that the lens renders them convergent. In the latter the divergence is so great that the lens can only diminish, not destroy it.

Fig. 19.

In using a hand-magnifier in this way, we so adjust it, by _ practice, that the enlarged image appears to be formed at the distance from the eye at which vision is most distinct. It is obvious that the amount of magnification must, then, be greater as the focal length of the lens is less,

We can now understand the working of the ordinary Astrono- astronomical telescope (fig. 20). The object glass furnishes mical an inverted but real image of a distant body, within our t!esRe reach. We can, therefore, place the eye-glass (like the single microscope above spoken of) so as to form a virtual magnified image of this real image treated as an object.

It is still, of course, inverted. It is easy to see that the

Fig, 20.

angle subtended at tle eye by the virtual image seen through the eye-piece is to that subtended by the object at the unaided eye approximately as the focal length of the object lens is to that of the eye lens. These angles

are, in fact, those subtended at the centres of the two lenses by the real image. ‘This ratio is, therefore, called the magnifying power of the telescope.

The compound microscope, in its simplest form, is pre- Com- cisely the same arrangement as the astronomical telescope, pound The only difference is that the object, being at hand, can saa be placed near to the object-glass (still, however, beyond ” its principal focus), so that the real image formed is already considerably larger than the object, and is then still further magnified by the eye-glass.

Lensesin contact.

Achro- matic lenses,

Achro- matic eye- pieces,

LUG HT

The magnifying power of a single lens, when used as a hand microscope, is to be measured by the ratio of the angle under which the virtual image of an object is seen (at the distance of most distinct vision) to that at which the object itself would be seen (at that same distance) ; 2.e., it is the ratio of 10 inches to the focal length of the lens.

Combinations of Lenses in Contact.—From the formula

poe-a(-2)

we see that the focal length of a simple lens is less as ys is greater. Thus all that we have just said is true for homo- geneous light alone.

But if we combine two thin lenses, placing them close together, we may arrive at an approxi- mately achromatic arrangement. For we have, for the first

lens Iii o wif}; For a second, close to it, we have 1 i 1

Hy fer For the two, considered as one, we have

and there is an infinite number of ways in which 7’ and s’ can be chosen, when 7 and s are given, such that the values of the right hand side shall be equal for two values of wand the corresponding values of ’. Any one of these gives an achromatic combination, of the necessarily imper- fect kind described above in considering prisms. But, as we have now the curvatures of four surfaces to deal with, we can adjust these so as not only to make the best attainable approximation to achromatism, but also to reduce the unavoidable spherical aberration to a minimum,

These questions, however, are beyond the scope of this article. We can remark only that the adjustment for two rays, for which the refractive indices are » and + 8u in the first medium, and yp’ and p’ + 8p’ in the second, requires the one relation

a ae 2 ara Ses F which involves only the ratio of the focal lengths of the two lenses—leaving their forms absolutely undetermined. But, if both and »’ be greater than unity, the signs of fand f” must be different ;—z.¢., in an achromatic combination of two lenses one must be convex and the other concave.

The reader must, however, be reminded that we are dealing with a first approximation only, and that spherical aberration does not come in till we reach a second. The details for a proper achromatic combination will be given in Optics (GEOMETRICAL).

Before leaving this subject, we must find the behaviour of two thin lenses which are placed at a finite distance from one another. For the first lens we have, as before,

1 eel

ye | 0,

ww ff If the second lens be placed at a distance a behind the first, the rays which fall on it appear to come from a distance w+a, Hence, for the light emerging from the second lens, we have

When zw is infinite, we have from the last two equations Raw: a f+a 1

It is obvious that a combination of this nature offers the

d95

same kind of facilities for the partial cure of dispersion and of spherical aberration as when the lenses are in contact, with one additional disposable constant. Thus we have compound achromatic eye-pieces, which can be corrected for spherical aberration also.

Formation of a Pure Spectrum.—We may now go back Pure by a prism, and inquire spectrum.

to the formation of an image how, by the use of an achromatic lens, we can project a pure spectrum on a screen. We have seen that a thin prism, for rays falling nearly perpendicular to it, forms a virtual and approximately rectilineal image of a lumi- nous point, in which the colours are ranged in order of refrangibility. Suppose the light which passes through the prism to fall on an achromatic lens, placed at a distance greater than its focal length from the virtual image above mentioned. These rays after passing through the lens will proceed to form, at the proper distance, a real linear coloured image of the luminous point, in which (as in the virtual image) the colours do not overlap. Instead of a luminous point, rays diverging from a very narrow slit parallel to the edge of the prism are employed. It is usual to place the lens at double its focal distance from the virtual image, and thus the real image is formed at an equal distance on the other side of it, and is of the same size. It may now, if required, be magnified by means of an achromatic eye-piece. Or, in other words, it may be

examined by means of a telescope. In fact a telescope, whose object glass is covered by a thin prism, has been usefully employed during a total eclipse in examining the light of the solar corona. A similar arrangement, made to have an exceptionally large field of view, is employed to find the nature of the spectra of meteorites or falling stars,

Refraction at a Cylindrical Surface-—A very simple, Cylin- but interesting, case of refraction at a cylindrical surface Arical re- is furnished by a thermometer tube. It is easily seen that ‘@°t”

the diameter of the bore appears, to an eye at a distance large as compared with the diameter of the tube, to be greater than it really is, in the proportion of the refractive index of the glass to unity. Thus in flint glass it appears magnified in about the ratio 5:3. Hence the mercury appears completely to fill the external surface of such a tube, if the bore be only $ths of the external diameter.

But a far more interesting case is that of parallel rays Rainbow.

falling on a solid cylinder of glass or water. Its interest consists in the fact that by its aid we can explain the phenomena of the rainbow. We, accordingly, devote special attention to it. The problem, without losing any of its applicability to the rainbow, is much simplified by supposing the rays to be incident in a direction perpendi- cular to the axis of the cylinder ; for in this case the whole course of each ray is in a plane perpendicular to the axis. We need not treat here of rays which pass close to the axis of the cylinder. For such the cylinder acts as a lens, and its focal length (to the usual first ap- proximation) can easily be obtained by methods such as those given above. –

Fig. 21.

What we are mainly concerned with is the behaviour of

the rays which escape into the air, after one or two re-

flexions at the inner surface of the cylinder. Suppose first that we consider a ray once reflected in the

interior of the cylinder. Let SP (fig. 21) be one of the set of incident parallel rays, and let its path be SPQP’S. This involves refraction at P, reflexion at Q, and again refrac-

tion at P’. But it is obvious from the symmetry of the circular section, and from the, laws of refraction and reflexion, that this path is symmetrical about the line OQ which joins the axis of the cylinder to the point at which the ray is reflected. Hence SP, S’P’ meet OQ in ‘the common point s; and the amount by which the direction of the ray has been turned round by the refractions and the reflexion is twice the supplement of half the angle at s. But the angle POR is double OPQ the angle of refraction, while OPs is equal to the angle of incidence. Hence the half angle at s is the excess of twice the angle of refraction over the angle of incidence. : Turn now to fig. 22, in which we have two concentric circles whose radii are to one another as the refractive index of the cylinder is to unity. If A be any point on a diameter, and tangents Ap and Aq be drawn from it, we see at once that the sines of the angles at A are to one another as the radii of the circles. Hence, if OAp be the angle of inci-

Now suppose the diameter of the cylinder to be small compared with the distance of the eye from it. In this case the point s may be considered as being in the axis of the cylinder.

Let SsE, (fig, 23) be made equal to the maximum value of s ; then an eye placed anywhere in the line sE, will receive the rays which are congregated towards the maximum. An eye within the angle SsE, (as at E,) will receive some of the straggling rays, while an eye outside that angle (as at E,) will see nothing. Let there now be imagined a great number of paral- lel cylinders; let E,o be drawn parallel to the incident rays, and make the angle cE,s’ equal to cE,s. Then the eye at E

Fig. 23. will see the concen- trated rays (already spoken of) in the directions E,s and

E,s’. From points within sH,s’ some straggling rays will reach it, from points outside that angle none,

dence, OAq is the cor- responding angle of re- fraction ; and it is easy

Now suppose cylinders to be placed in great numbers Primary in all directions perpendicular to the incident rays. The rainbow, eye at E, will see a bright circle of light whose centre is Homo. inE,o. Inside that circle there will be feeble illumination ; geneous

Fig. 22. to see that the half angle at s (in fig. 21) will in fig. 22

Crowding of rays

Soe Now one of the conditions of a maximum or minimum of | _ Introduce the idea of the different kinds of homogeneous white of maxi- any quantity is that, near it, the value of the quantity | light which make up sunlight, and we find a circular (almost light, mum or changes very slowly. Thus a number of issuing rays are | pure) spectrum—the less refrangible rays being on the

— crowded together near the direction corresponding to this | outside, Next we introduce the consideration of the finite Finite

be represented by the excess of OAg over gAp. Now when OA is large, both of these angles are small, and thus their difference is likewise small. As OA becomes less the difference of the angles becomes greater, but only up to a certain point, for when A is near the outer circle the angle OAp begins to increase much faster than does OAg. Vence there is a single definite position of A for which the difference is a maximum. In the first figure these changes in the angles of incidence and refraction, for the members of a group of parallel rays, correspond to the varying position of P in the circular section of the cylinder, Hence there is one position of P for which the angle at s isa maximum.

maximum, the others being more widely scattered,—while for all of them the angle ats is smaller. Newton gives us as an illustration of this, the very slow change of length of the day when the sun is near one of the tropics.

To find this Maximum Angle.—If @ be the angle of incidence,

re) that of refraction, and yw the refractive index, we have to find the maximum value of

outside it, darkness, rainbow, where we have spherical drops of water instead of the cylinders above spoken of. For each spherical drop is effective only in virtue of a section through its centre, containing the incident ray and the eye ; and such sections are the same as those of the cylinders,

Thus far we have been dealing with parallel rays of homogeneous light; and the appearance (to the degree of

approximation we have adopted) is that of a bright circle .

whose centre is diametrically opposite to the source of light, whose radius is (for raindrops) about 42° 2’, and whose area is slightly illuminated.

disk of the sun, and we have an infinite series of such disk of arrangements superposed on one another, the centre of each ¥-

individual of the series being at the point diametrically opposite to the point of the sun’s disk which produced it. This leaves the general aspect of the phenomenon un- changed, but altogether destroys the purity of the spectrum.

a (1) If we next consider light which has been twice reflected with the condition ’ | within the cylinder, we have a figure like the diagram sin @=y si 5! (iude dwt d ; 3 ‘ ; ¢ Plhias ale atcha usin} (2) fig. 24; where the lettering is as nearly as possible the 2dp = de, and . BK cosd df=cosé dé. Hence

mcomerm ieee. 2. ww, C8); From (2) and (3) we have

3 cos?@=y?-1; which determines the requisite angle of incidence. The values of

the other quantities are easily calculated from this; and we finally have, for the maximum value of the sine of the half angle at s, the

expression 1 (4-p2\3 ae) ° ; oF oh ah cee:

This is obviously smaller as » is greater, at least up to the limit m=2.

With the value $ for » (which is uearly that for yellow rays refracted into water) we have

L sin 4s=9°55462, which corresponds very nearly to $s=21°)’,

Fig. 24,

same as that in fig. 23. Everything is still symmetrical about the line Os, which obviously cuts at right angles the ray QQ.

Reasoning precisely similar to that above given shows that the complement of half the angle at s is now equal to the excess of thrice the angle of refraction (OPQ) over that of incidence (the supplement of OPs), and that this also has a maximum value, vc., that s itself has a minimum value.

This is obviously the case of the light.

Second- ary rain- bow.

Ler eG FT 597

To find it, we have

5 7 38= 36-8,

with : sin =p sin ¢. Differentiating, &c., as before, we find 8 cos *=p”-1, whence, finally, pi +18u? – 27 Sus This quantity increases with y, for its differential cocflicient is

1 (a9 2

Go which is necessarily positive. (It vanishes, no doubt, for »=38, but then so does 6.)

For p= the value of sin 4s is 0°4303 nearly,

sin $s=

so that 3= 50° 58’.

Carrying out the same steps of reasoning as before, and applying the result to raindrops, we find a second rainbow concentric with the first, but with a greater radius, viz., about 51° (for yellow light). All the above remarks about the impurity of the spectrum, é&c., apply to this bow also. In this bow the less refrangible rays are on the cnner side, and the straggling rays illuminate feebly the space outside it. Hence the space between the red boundaries of the two bows has no illumination from rays reflected either once or twice within the water drops.

What we have now given is nearly all that geometrical optics can tell us about the rainbow. It seems that the first really important steps in the explanation, viz. (1) that the primary bow is due to rays falling on the outer portions of the drops, which suffer two refractions and one reflexion before reaching the eye, and (2) that the secondary bow is due to rays falling on the inner side, and suffering two refractions and two reflexions, are due to Theodorich, about 1311. His work was not published, and its contents were first announced by Venturi! in the present century. These results were, independently, discovered by De Do- minis*in 1611. Neither of these writers, however, pointed out the concentration of the rays in particular directions. This was done by Descartes in 1637, by the help of Snell’s law. He calculated with great labour the paths of each of 10,000 parallel rays falling on different

parts of one side of the drop, and showed that from the 8500th to the 8600th the angle between the extreme issuing rays is measured in minutes of arc,—thus discovering by sheer arithmetic the maximum which, as we have seen above, is so easily found by less laborious methods. Newton's addition to this theory consisted mainly in applying his discovery of the different refrangibilities of the different homogeneous rays. The explanation was then thought to be complete. For a long time this was held to be one of Newton's most brilliant discoveries, It is well to notice that he himself speaks of it in its true relation to the work of his predecessors. He merely says :—" But whilst they understood not the true origin of colours, it is necessary to pursue it here a Jittle Surther." And he said well; for a full investigation con- ducted on the principles of the undulatory theory intro- duces, as was first pointed out by Young, certain important modifications in the above statements, Of these we need mention only one, viz., that in each bow there is more than one maximum of brightness for each homogeneous ray.

Spurious The spurious bows, as they are called, which often appear

bows.

like ripples, inside the primary and outside the secondary bow, and which depend upon the fact just mentioned, have . .. . =" aera ran ? Commentari sopra la storia e le teorte dell' Ottica, Bologna, 1814. * Newton, in his Optics, says the work of De Dominis was written twenty years before it was published.

no place in even Newton's theory. About them, in fact, geometrical optics has nothing to say. Young, in 1804,

took the first step for their explanation. They were fully Complete investigated, from the undulatory point of view, by Airy, theory in 1836-38 ; and his results were completely verified by °f™"- the measurements of Hallows Miller in 1841.3 Miller used

a fine cylinder of water escaping vertically from a can.

This is ove of the reasons which induced us to treat the subject as a case of refraction and reflexion in a right cylinder.

The overlapping of the colours in the rainbow, due to the White apparent size of the sun’s disk, is occasionally so greatly bows. exaggerated that only faint traces of colour appear. This may happen, for instance, when the sun shines on raindrops in the lower strata of the atmosphere through clouds of ice- crystals in the higher strata. By reflexion from the faces of these crystals, the source of light is spread over a much larger spherical angle, and there is no sharp edge to it as in the case of the uncloudcd disk. The rainbow is then much broader and fainter than usual, and nearly white.

The size of the drops also produces modifications which are not indicated by the geometrical theory.

When the moon is the source of light, the rainbow is so Lunar faint that it is often difficult to distinguish the colours ; rain- but with full moon, and other favourable circumstances, it P°W: is easy to assure one’s self that the colours are really present.

The refraction of sunlight, or moonlight, through ice- Halos, crystals forming cirrhus clouds, gives rise to coloured halos, parhelia, paraselene, &c. Their approximate explanation depends upon the behaviour of prisms with angles of 60° or 90°, and therefore does not come within the scope of the present article. They must not, however, be confounded with coronx, those rings which encircle the sun or moon Corone, when seen through a mist or cloud. Halos have definite radii depending on the definite angles of ice-crystals; the size of a corona depends on the size of the drops of water ina mist or cloud, being smaller as the drops are larger, Thus their diminution in radius shows that the drops aro becoming larger, and implies approaching rain. They are due to diffraction, and can only be explained by the help of the undulatory theory.

Refraction in a Non-Homogeneous Medium.—The prin- Non- ciples already explained are sufficient for the purpose of homo- treating this question also. But they require, for thcir chop application, the artifice

of supposing the medium to be ‘ made up of layers, in each of which the refractive power is the same throughout the layer, but finitely differs from one layer to another, and then supposing these layers to become infinitely thin and infinitely numerous. In this case there will of course be only an infinitely small difference in properties between contiguous layers; and the abrupt change of direction which accompanies ordinary refraction is now replaced by a continuous curvature of the path of the ray.

Glimpses of a more general method had been obtained even in Hamil- the 17th century ; and in the 18th these had become a consistent ton’s process so far as application to the corpuscular theory is concerned. general But it was reserved for Sir W. R. HaMILron (q.v.) to discover the investi- existence of what he called the characteristic function, by the help gations. of which all optical problems, whether on the corpuscular or on the undulatory theory, are solved by one common process. Hamilton was in possession of the germs of this grand theory some years be- fore 1824, but it was first communicated to the Royal Irish Academy in that year, and published in imperfect instalments some years later. The following is his own description of it. It is extremely important as showing his views on a very singular part of the morc modern history of science.

‘‘ Those who have meditated on the beauty and utility, in theo- retical mechanics, of the general method of Lagrange, who have felt the power and dignity of that central dynamical theorem which he deduced, in the Afécanique Analytique… , must feel that mathe-

3 Airy’s paper is in vol. vi. of the Cambridge Phil. Trans., Miller’s in vol. vii.

matical opties can only then attain a coordinate rank with mathe- matical mechanics… , when it shall possess an appropriate method, and become the unfolding of a central idea… . It ap- pears that if a general method in deductive optics can be attained at all, it must flow from some law or principle, itself of the highest generality, and among

the highest results of induction. . . . [This] must be the principle, or law, called usually the Law of Least Action ; suggested by questionable views, but established on the widest induction, and embracing every known combination of media, and every straight, or bent, or curved line, ordinary or extraor- dinary, along which light (whatever light may be) extends its influence successively in space and time: namely, that this linear path of light, from one point to another, is always found to be such that, if it be compared with the other infinitely various lines by which in thought and in geometry the same two points might be connected, a certain integral or sum, called often Aetion, and depending by fixed rules on the length, and shape, and position of the path, and on the media which are traversed by it, is less than all the similar integrals for the other neighbouring lines, or, at least, possesses, with respect to them, a certain stationary property. From this Law, then, which may, perhaps, be named the LAw oF STATIONARY ACTION, it seems that we may most fitly and with best hope set out, in the synthetic or deductive process and in the search of a mathematical method.

‘* Accordingly, from this known law of least or stationary action I deduced (long since) another connected and coextensive principle, which may be called by analogy the LAw oF VaRryING ACTION, and which seems to offer naturally a method such as we are seeking ; the one law being as it were the last step in the ascending scale of induction, respecting linear paths of light, while the other law may usefully be made the first in the descending and deductive way.

‘* The former of these two laws was discovered in the following manuer. The elementary principle of straight rays showed that light, under the most simple and usual circumstances, employs the direct, and therefore the shortest, course to pass from one point to another. Again, it was a very carly discovery (attributed by Laplace to Ptolemy), that, in the case of a plane mirror, the bent line formed by the incident and reflected rays is shorter than any other bent line having the same extremities, and having its point of bending on the mirror. These facts were thought by some to be instances and results of the simplicity and economy of nature ; and Fermat, whose researches

on maxima and minima are claimed by the Continental mathematicians as the germ of the diffcrential caleulus, sought anxiously to trace some similar economy in the more complex case of refraction. He believed that by a metaphy- sical or cosmological necessity, arising from the simplicity of the universe, light always takes the course which it can traverse in the shortest time. To reconcile this metaphysical opinion with the law of refraction, discovered experimentally by Snellius, Fermat was led to suppose that the two lengths, or indiees, which Snellius had measured on the incident ray prolonged and on the refracted ray, and had observed to have one cominon projection on a refracting plane, are inversely proportional to the two successive velocities of the light before and after refraction, and therefore that the velocity of light is diminished on entering those denser media in which it is observed to approach the perpendicular ; for Fermat believed that the time of propagation of light along a line bent by refraction was represented by the sum of the two products, of the incident portion multiplied by the index of the first medium, and of the refracted portion multiplied by the index of the second medium ; because he found, by his mathematical method, that this sum was less, in the case of a plane refractor, than if light went by any other than its actual path from one given point to another, and because he per- ceived that the supposition of a velocity inversely as the index reconciled his mathematical discovery of the minimum of the fore- going sum with his cosmological principle of least time. Des- cartes attacked Fermat's opinions respecting light, but Leibnitz zealously defended them ; and Huygens was led, by reasonings of a very different kind, to adopt Fermat's conclusions of a velocity inversely as the index, and of a minimum time of propagation of light, in passing from one given point to another through an ordinary refracting plane. Newton, however, by his theory of emission and attraction, was led to conclude that the velocity of light was direetly, not inversely, as the index, and that it was ¢nereascd instcad of being diminished on entering a denser medium ; a result incompatible with the theorem of the shortest time in refraction. This theorem of shortest time was accordingly abandoned by many, and among the rest by Maupertuis, who, however, proposed in its stead, as a new cosmological principle, that celebrated law of

least aetion which has since acquired so high a rank in mathematical physics, by the improvements of Euler and Lagrange.

‘* Maupertuis gave the name of aetion to the product of space and velocity, or rather to the sum of all such products for the various elements of any motion,—conceiving that the more space has been traversed and the less time it has been traversed in, the more action may be considered to have been expended ; and by combining this idea of action with Newton’s estimate of the velocity of light as

increased by a denser medium, and as proportional to the refracting index, and with Fermat’s mathematical theorem of the minimum sum of the products of paths and indices in ordinary refraction at a plane, he concluded that the course chosen by light corresponded always to the least possible aetion, though not always to the least possible time. He proposed this view as reconciling physieal and metaphysical principles which the results of Newton had seemed to put in opposition to each other ; and he soon proceeded to extend his law of least action to the phenomena of the shock of bodies, Euler, attached to Maupertuis, and pleased with thesc novel results, employed his own great mathematical powers to prove that the law of least action extends to all the curves described by points under the influence of central forces ; or, to speak more precisely, that if any such curve be compared with any other curve between the same extremities, which differs from it indefinitely little in shape and in position, and may be imagined to be described by a neighbouring point with the same law of velocity, and if we give the name of action to the integral of the product of the velocity and element of a curve,

_ the difference of the two neighbouring values of this action will be

indefinitely less than the greatest linear distance (itself indefinitely small) between the two near curves ; a theorem which I think may be advantageously expressed by saying that the action is stationary. Lagrange extended this theorem of Euler to the motion of a system of points or bodies which act in any manner on each other; the action being in this case the snm of the masses by the foregoing integrals,

‘* Laplace has also extended the use of the principle in optics, by applying it to the refraction of crystals, and has pointed out an analogous principle in mechanics, for all imaginable connexions between force and velocity.”

We give, first, a very brief indication of the nature of Hamilton’s Varying method, as applicable directly to the corpuscular theory. Here the action. aetion of a corpuscle is the quantity which possesses the stationary Corpus- property. Let w be the velocity at any point x, y, 2 of the medium, cular ds an element of the path, a, 8, y the direction cosines of ds, which theory.

are supposed to enter linearly and homogeneously into the expres- sion for v. Then the action V is given by

V=/eds. Hence, for a path nowhere finitely distant from the first, 5V =/(5vds + vdbs). But

‘dv av dv OU ee geet a

d dy dv dv ie ae aye the first three terms depending on the translation of the clement ds, the others on its change of direction, and all the differcntial coefficients being partial. The homogeneity of v gives

da’ “ap* “dy *

os dv

Also dix =ddx=8.ads=da.ds + adds,

with two similar equations in y and z. By the help of these, and a partial integration of the factors dw, &e., we have : v dv v bV= 7 be ap dpeu rd

dv dv +f [oe as – ane a Fe: er Se |: where the integrated part is to be taken between proper limits.

If the initial and final points of the path be fixed, 5x, &c., vanish in the integrated part, and the stationary condition shows that we must have

dv da

with other two similar conditions, only two of the three being independent because of the necessary relation a2 + B?+7%=1,

These may be regarded as the differential equations of the ray, or path of the corpuscle.

But the essence of Hamilton’s method of varying aetion depends upon a change of the terminal point of the ray, and leads at once to the three equations

dv ans = d =,

SV_do 8V_do BV_dv da da’ sy dp’ 8 dy’

‘which follow directly from the general value of 5V above, by taking

account of the vanishing of the unintegrated part in consequence of the stationary condition. We may now write d for § everywhere in these expressions,

:

Undula- tory theory.

Maxwell’s fish-eye problem,

LIGHT

In any isotropic body, homogeneous or not, it is clear that dV =v(adx + Bdy + ydz) ; and then we have, to determine V, the partial differential

equation av\?. /dV\? /dV¥" -. (a) +(a)) +(e) -*

The treatment of this equation is precisely the same as that of the corresponding one which will presently be derived from the undulatory view of the question.

We will now illustrate the application of Hamilton's method to the undulatory theory, in which the ¢ime of passage from one point of the path to another is the characteristic which fulfils the station- ary condition. For the sake of limitation, we will confine ourselves to its application to single refraction in a non-homogeneous medium. In such a medium the velocity of light, at any point, is the same whatever be the direction of the ray. Hence it depends only upon the coordinates of the point, aud upon some characteristic (say the wave-length) of the light considered.

If r be this time of passage, ds an element of the path, and v the velocity of light in that element, we must have

-[F t=/f/ —, v

a quantity fulfilling the stationary condition. This gives dis dsdv br=/ —-f/ >. v Ye

Now, by what has just been said, if A be the wave-length, we

have an equation expressing the data of the problem, v= fla, x, Y; z), where the form of f depends on the arrangement of the parts of the

medium. Hence dadix + dydsy + dzddz (dv dv, Sr -/ ~~f al Rrtzet~~..)

1 /dzx 1 dv : ~~[+(Gree)]~~ 2 e Gane

The unwritten part consists of an integral which, by the station- ary condition, vanishes if the ray be ofa definite wave-length and the terminal points through which it passes be given, 7.¢., if dx, dy, 32, be each equal to 0.

The rest of the expression depends on the terminal points of the ray, and on the wave-length, only. It gives the equations

ds

or_ 1 dz br 1. dy br dt dz to ds' fy wo ds Sz» de' and 1 dv da Jv? dan

Squaring and adding the first three, we have

5r\? /dr\?2 ér\? 1 (=) +(5) +(z) ~e

It is easily shown, by a process similar to that used for varying action (see MecHANIcs), that, if we can find a complete integral of this equation, containing therefore two arbitrary constants, in the form

Ms F(z, Y, 2, A, a, B),

then dr dp be are the equations of two series of surfaces whose intersections give the paths of the rays. @ and 3 here are also arbitrary constants. (These four constants are necessary, and sufficient, for the purpose of making the two intersecting surfaces pass each through any two given points.)

As an illustration, let us suppose the light to be homogeneous, and the medium to be arranged in concentric spherical shells such that the velocity at a distance r from their centre is expressed by

B24 72 v= €

dr da ™

?

where b and ¢ are absolute constants. It is easy to sce that, on account of the symmetry, the path of every ray is in a plane through the centre of the spheres. We may therefore restrict our work to the plane of x, passing through that centre.

The equation is then

dr ie as a dx dy] (B47)2’

or, by change to polar coordinates, (22) A (#1) get dr} ‘ r\de)/ (+r)?

What we require is a sufficiently general solution. Assume,

therefore,

and we have

dr a vA c a dr (2472/2 72° From tliese tT=26+ / dr ay Cee F (+77)? 7?

The equation of the path is thercfore

d: Ly oa: sale = ES r ad ee = _. (P+rpP 7 – v? — 72 =6-cos -! _ j a r a or $2 —72

a. ab nets – = vs 4b? cos (@-A).

This is the equation of a series of circles, whose one common characteristic is that the rectangle under the segments of any chord which passes through the origin is 02.

Hence every ray in any diametral plane describes pairs of conjugate foci are situated on a line through the centre, the rectangle under their distances from the centre being 0?, The property holds therefore for all rays in the medium. ‘This very singular ideal arrangement was suggested to Clerk Maxwell by the eye of a fish. He has given an investigation of it, by a totally different analysis, in the Cambridge and Dublin Mathematical Journal, vol. ix. As an illustration of those effects of want of homogeneity to which (as already stated) all the complex pheno- mena of mdrage, &c., are due, it may be well to consider this simple case more closely. We will therefore consider how images are seen in such a medium. To get rid of the difficulty which would arise from finite change of density if ancye were supposed to be plunged in the medium, we will suppose it to be cut across by a crevasse whose surface is everywhere nearly at right angles to the rays by which the image is to be seen,—the eye being then placed (in air) close to such a cutting surface.

Let AB (fig. 25) be a small object, O the centre of the spherical layers of equal refractive index. Then every ray from A describes a circle

which passes x . through A’, where # AOA’ is a straight line, and

AO. OA’=3?,

A similar construction gives B’ from B. To an eye placed at EK, (in a little cre- vasse as before ex- plained), and looking towards the object, it will be seen erect,— A being seen in the direction of a tangent to the circle throngh § AE, A’, and similarly for B. Here the rays have not passed through their con- jugate focus. But if the eye be turned away the object,

,

a circle; and

Fig. 25. rather its image) will be scen, A’ in the direction opposite to that

it (or in which A was seen, B’ in the opposite direction to B. The image will now be an inverted one, but it will easily be seen to possess a strange peculiarity. For what is now seen will be the back of the object, the side farthest from the eye. The reader may easily trace for himself the course of the rays which would fall on the eye in any other assigned position. ‘Vision in such cases would usually be of a peculiar character from another point of view, viz., the amount of divergence in the plane of the figure will in general differ from that perpendicular to its plane, and therefore the rays would have different divergence for the height and for the breadth of the image. These would therefore appear at different distances from the spectator. This, however, could he cured by a proper cylindrical lens. It is clear from this example (which has Leen chosen for its special simplicity) that want of

Mirage.

Seatter- ing and absorp- tion.

homogeneity in a refracting medium is capable of producing plic- nomena of the most extraordinary character.

It ig difficult to ascertain exactly what is the condition of the atmosphere when multiple images, mirage, &c., are seen ; and it is obvious from the remarks and illustrations already given that many very different arrangements will produce sensibly the same result to a spectator in a given position. Comparison of the appearances seen simultaneously by a great number of scattered observers is the only way in which we can expect to obtain definite information on such a point. But the following investigation suggests the general nature of the explanation.

lf we suppose the refractive index of the air to depend only upon the vertical height above the carth's surface, rays will all travel in vertical planes, and Hamilton's equation (neglecting the curva- ture of the carth's surface) takes the very simple form

() + (2) re

x being measured horizontally, and the refractive index being pro- portional to V f(y).

This equation gives, as before, r= axt+ dy f (y)—@, and the equation of the path of a ray is

dr dy

=-=A=2-a/ >>:

da ™ Nf (y)- #

Here, on the corpuscular theory, a is the horizontal velocity of the light, and 4/f(y)— a? the vertical velocity. If the form of f and the value of « be such that we can have f(7)—a?=0, it is clear that at y=7 the ray is for a moment horizontal. The form of the equation of the ray shows that it has a vertex at this point, and that it is symmetrical about

a vertical axis passing through the vertex. If, 1 be the coordinates of the vertex for a ray passing through the point 0, b, we have the relation

Via & Vf (y)-f (a)

This is the equation of the locus of the vertices of all rays which, starting from a given point, return again to the same level. To find, then, the various rays by which a distant object near the horizon can be seen, all that we have to do is to draw the curve of vertices which passes through the eye of the spectator, and to find the points in whicli it is intersected by a vertical line situated mid- way between the object aud the eye. Each of these points is the vertex of a ray by which the object can be seen. When the curve of vertices leans forward towards the eye at one of these points, two contiguous rays cross one another, and an inverted image is scen ; when it leans from the cye, they do not cross, and the image 1s crect.

Now, when the curve of vertices is traced, from the above for- mula, for an arrangement of the air such that the refractive index falls off through a horizontal stratum of air from a greater value below the stratum to a smaller valuc above it, it is found that the curve of vertices in the stratum can in general be cut by a vertical line in one point only. But if the refractive index have a nearly stationary value at the upper boundary of the stratum the curve of vertices can be cut twice, or not atall, bya vertical line. When there is no intersection we have only the direct image; but when there are two intersections a distant ship will be seen as usual through the lower uniform air, while there will be seen above it an inverted image, and then a direct image, both due to the stratum. This is a form of mirage very commonly seen at sca.! When there is no stationary value of the index at the upper boundary, the upper erect image is not given by the stratum. This arrangement, however, turned upside down, explains the ordinary mirage of the desert—where we see objects directly through the nearly uniform air at some distance above the sand, but also an inverted image (suggesting reflexion from a pool or lake) formed

by the refraction in the hot layer of air near the sand.

ABSORPTION, FLUORESCENCE.—We must now take up the third and fourth of the categories under which light incident on the bounding surface of two media may fall —scattering and absorption. We take them together, because in the great majority of bodies, as we have already seen, scattering takes place not merely at the surface but within some distance below the surface, which in general is small, but in some cases considerable. And when the scattering takes place, even in part only, below the surface, the scattered light is usually modified by absorption.

1 See especially Vince, in the Bakerian Lecture, Phil. Trans., 1799.

Lig oH ®

An excellent instance of this scattering from below the White- surface is afforded by a mass of thin films or small particles ness of of transparent bodies, such as glass, water, or ice. Thus on pounded glass, froth or foam, snow, clouds, &c., appear clouds, brilliantly white in sunlight, and are, in consequence, &. opaque when in layers of sufficient thickness. Here the light is obviously scattered by reflexion. What passes through one film, crystal, or particle is, in part, reflected from the next, and so on.

Even when the froth consists of bubbles of a highly coloured liquid, such as porter for instance, it usually shows but slight traces of colour, for the great majority of the scattered rays have passed through very small thick- nesses only of the liquid. In the same way, very finely pounded blue or red glass (unless it be exceedingly deeply coloured when in mass) appears nearly white. But when a mass of water is full of air bubbles, as, for instance, is Colour the case in the neighbourhood of a breaker, the light of the reflected from the surfaces of these bubbles suffers a double °° absorption by the water before it reaches the eye. This is one of the causes of the exquisite colours of the sea. Near shore, or in shoal water, another cause sometimes comes into play, viz., fine solid particles suspended in the water. When such particles, whether in air or in water, are ex- ceedingly small, they may produce colours due to their minuteness alone, and not to their own

colour nor to the absorptive properties of the medium. This, however, is a question of physical optics.

In general, even the most highly coloured opaque or

translucent solids, such as painted wood or stained paper, are visible by scattered light whatever portion of the spectrum falls onthem. This is very well seen with highly coloured paper-hangings, when illuminated by homogeneous light, such as that of a sodium flame (a Bunscn flame, into which is thrust a platinum wire dipped in strong brine). The red, orange, and yellow parts usually appear very bright under such treatment, the blue parts appearing but slightly illuminated. The colour of all is, of course, that of the incident light. It appears, therefore, that some of the light is scattered from the surface. It is by this, for instance, that the blue parts arc feebly visible. But that which is scattered from the portions coloured red, orange, &c., must come mainly from under the surface.

An excellent proof of this is furnished by mixing, in Mixtures _ proper proportions, a yellow and a blue powder, or yellow of Dis: and blue paints. It is commonly imagined that the green meni colour which is thus produced is a mixture of blue and yellow. Far from it! When a disk divided into alternate sectors, coloured with the same blue and yellow pigments, is made to rotate rapidly in its own plane, it of course | produces on the eye the true result of a mixture of these Mixtures | blue and yellow colours. This depends for its exact tint i, } on the pigments employed, and on the angles of the sectors, °°°™™ | but is usually a faint pink or a muddy purple,—utterly : different from the green produced by mixing the powders or the paints. Helmholtz was the first to point out the true source of the grecn. It is the one colour which is not freely absorbed either by the yellow or by the blue pigment. For the scattered light by which the mixture is seen comes chiefly from below the surfacc, and has thus suffered absorption by each of the component powders. The yellow powder removes the greater part of the blue, indigo, and violet rays ; the blue, the greater part of the reds, oranges, and yellows. Thus the light which finally escapes is mainly green.

For the accurate study of the absorptive power of a solid Exact or liquid medium, it is necessary to compare the spectrum — 4 | of white light which has passed through a plate or layer of jn | it with a normal spectrum. This is easily effected by — placing the absorbing medium (if a fluid, it must be in a

LA @ hp 601

glass trough with parallel sides) in front of the narrow slit suppose that, if a layer of unit thickness weakens in any ratio through which the light passes, and in such a position that | the intensity of any particular homogeneous ray, another one half of the slit only is thus covered. We have then | unit layer will farther weaken in the same ratio that which side by side, under precisely similar circumstances, two | reachesit,andsoon. Thns the amount which passesthrough spectra to be compared (one altered by absorption, the | a number of layers diminishes in geomctrical progression, other not) ; and very minute differences between them can | while the number of layers increases in arithmetical pro- thus be detected. When the medium produces a general gression. This is certainly true (neglecting the amount weakening of the whole spectrum, as well as particular local reflected), unless the intensity of the light have an effect absorptions, the white light passing through the other half | on the percentage transmitted. And fig. 27 shows, in a of the slit may be weakened to any desired extent by re-| very striking manner, the difference between similar terms flexion at the proper incidence from a plate of glass, before | of different geometric series as the common ratio becomes it falls on the slit. less and less. This ratio is not much less than 1 for cer- Absorp- ‘To give a satisfactory representation of the phenomena | tain red and blue rays, is smaller for yellow, and is very tion of absorption spectra by the help of a woodcut is not easy. | small for the rest of the red, for orange, and for green. spect ‘The highest artistic skill could not adequately represent the | The latter colours are therefore rapidly got rid of with in- ordinary solar spectrum by the use of the finest pigments. | creasing thickness; then the yellow becomes too feeble to All optical colour phenomena must be seen, they cannot be | be seen; while, even after the blue becomes almost insen- reproduced by

painting. In such circumstances the simplest | sible, the specially favoured red rays are still transmitted method of indicating the locality and amount of the absorp- | in sufficient quantity to be observed. tion is the best. As we have already seen that we cannot If’r be the fraction of any species of homogencous light which is by the eye judge of the relative intensities of lights which | transmitted by a layer of unit thickness, that transmitted by a differ much in colour, we shall represent the normal spectrum layer of thickness x is r*% The following little table will greatly

f ll : assist the reader in understanding the relative rapidity of extinction (for our present purpose) as equa y bright throughout, and | of different rays passing through various thicknesses of an absorb-

indicate the absorption at different parts by shading of | ing medium. * Itis a table of double entry, the first column giving various degrees of depth. A few of the Fraunhofer lines | various values of x, and the upper row various values of 7, while are introduced to indicate (in the absence of colour) the the value of 7* isin the same column as that of 7 and in the same . ; row as that of a.

parts of the spectrum which are attacked by the various

absorbents. These lines are, of course, in the same abso- lute positions in all the various spectra; for the spectra are all supposed to be given by the same prism. The line B isin the red, D in the orange, E and F in the green, and G in the indigo. They correspond, as we have already said, to perfectly definite kinds of homogeneous light, and | Thus a ray which loses 1 per cent. in unit thickness still preserves therefore adequately represent the distribution of colours | more than 90 per cent. after passing through ten units. Buta ray

. : : ° : : which loses 10 per cent. in the first unit (and which therefore, will ~ ce = ~ pig: however much irrationality of dispersion thus far appear scarcely more weakened than the first) is reduced to may be shown by the material of the prism. ; . 35 per cent. by passage through ten units. After passing through Absorp- In fig, 26 a represents the

spectrnm of light which | a hundred units the first ray has lost only 63 per cent., the second

i has passed through diluted blood ; 8 shows the spectrum | is practically invisible. ’ when the blood In thin plates cobalt glass is blue, because the particular has been acted red which it does not absorb freely forms only a small on by a reducing fraction of the whole transmitted rays; while in thick agent ; and y the masses it is nearly red, for then little but this favoured red spectrum when the is transmitted. For a similar reason Condy’s fluid (per- blood has been manganate of potash) changes its tint in a very singular altered by acidu- manner (even when preserved from the action of the air) lation with acetic by gradual dilution with water. or tartaric acid. The imperfection of the achromatism of the eye is readily Defect of These figures are proved by looking through a plate of cobalt glass at a small achrom- taken from an important paper by Stokes (Proceedings of | hole in the window-shutter of a dark room. The hole at first a the Royal Society, 1864). appears red with a blue space round it; but, by an effort “°° Absorp- Fig. 27 shows in a rude way the absorption by cobalt | of the muscles of the eye, we can see the hole blue, and | ue by then there is a red space surrounding it. Rays of so | glass, widely different refractive index cannot be seen in focus | simultaneously. | Very curious effects are produced when we examine a landscape through such a glass. Foliage of certain kinds scatters scarcely any blue rays, and therefore appears reddish. Bluish-greens, again, which scatter very little red, appear blue. The effects may be exaggerated in a very striking degree by combining the absorptions of two or more media, so as to allow of the free transmission of a few, far detached, portions of the spectrum. Brewster made the very singular discovery that a solu- tion of oxalate of chromium and potash produces one

Fis. 27. solitary, narrow, absorption band, almost resembling one of . the broader lines in the solar spectrum. glass cut in wedge form, and corrected by an equal prism of Closely connected with intense local absorption in certain Abnor- clear glass. parts of the spectrum is the phenomenon of abnormal mal

The commonly received method of calculating the ab- | dispersion, one of the most singular discoveries of modern a Sorption by layers of gradually increasing thickness is to | times. It seems to have been first observed by Fox” * XIV. — 76

Talbot’s experi- ment.

Todine vapour.

Fuchasine.

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Talbot; and he discovered its real nature. But the first published notice of such phenomena is due to Le Roux. Christiansen and others have since greatly extended our knowledge of the subject, and Helmholtz and Ketteler have given theoretical explanations of it. Fox Talbot’s experi- ment, though the earliest on record, is one of the easiest to perform, and we therefore quote his own account. The experiment was made about 1840, and the following accouut is from the Proc. Roy. Soc. Hdin., 1870-71.

‘I prepared some square pieces of window glass, about an inch square. ‘Taking one of these, I placed upon it a drop of a strong solution of some salt of chromium, which, if I remember rightly, was the double oxalate of chromium and potash, but it may have been that substance more or less modified. By placing a second square of glass on the first, the drop was spread out in a thin film, but it was prevented from becoming too thin by four pellets of wax placed at the corners of the square, which likewise served to hold the two pieces of glass together. The glasses were then laid aside for some hours until crystals formed in the liquid. These were neccs- sarily thin, since their thickness was limited by the interval between the glasses. Of course the central part of each crystal, except the smallest ones, was bounded by parallel planes, but the extremities were bevilled at various angles, forming so many little prisms, the smallest or them floating in the liquid. When a distant candle was viewed through these glasses, having the little prisms interposed, a great number of spectra became visible, caused by

the inclined edges. Most of these were no doubt very imperfect, but by trying the glass at various points, some very distinct spectra were met with, and these could with some trouble be isolated by covering the glass with a card pierced with a pin-hole. It was then seen that each prism (or oblique edge of crystal) produced two spectra oppo- sitely polarized and widely separated. One of these spectra was normal ; there was nothing particular about it. The colours of the other were very anomalous, and, after many experiments, I came to the conclusion that they could only be explained by the supposition that the spectrum, after proceeding for a certain distance, stopped short and returned upon itself."

Le Roux in 18601} discovered that vapour of iodine, which allows only red and blue rays to pass, refracts the red more than the blue. He, like Talbot, did not at first venture to publish his result, and it appeared only in 1862. Among the many convincing proofs of its accuracy he shows that the dispersion by an iodine-vapour prism can be nearly achromatized by a glass prism which gives refraction in the same direction. He also states that the dispersion in iodine-vapour is less as the temperature is higher.

Christiansen's ? earliest determinations were made in 1870 upon an alcoholic solution of fuchsine (one of the powerful aniline colours). This solution gives a dark absorption band in the green ; and it was found that the refractive index rises (as in normal bodies) for rays from the red to the yellow. But all the rest of the transmitted light, consisting of the so-called " more refrangible " rays, is less refracted than the red. -Kundt and others shortly afterwards greatly extended these observations.

The explanation of this phenomenon, which has been advanced by Helmholtz,? depends upon an assumption as to the nature of the mutual action between the lumini- ferous ether and the particles of the absorbing medium, coupled with a further assumption connecting the absorp- tion itself with a species of friction among the parts of each absorbing particle.

In 1879 De Klerker* made a very curious observation, which shows that the whole subject is still obscure. He employed two hollow prisms of equal angle, turned opposite ways, and filled with alcohol. Through such a combination light passes (as we have seen) without refraction or disper- sion. When a few drops of the fuchsine solution were added to the contents cf one of the prisms, the yellow, orange, and red rays (in the order named) began to separate themselves from the others. This process could be carried on until the solution was so strong that it trans- mitted no visible light. All this time the blue and violet

1 Comptes Rendus, lv., 1862. 3 Pogg. Ann., clv., 1874.

2 Pogg. Ann., cxli. + Comptes Rendus, 1879.

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rays remained apparently unrefracted—the yellow, orange, and red showing continually increasing refraction. The conclusion from this, on either theory of light, is that the addition of fuchsine to alcohol alters the velocity of propa- gation of the (so-called) less refrangible rays, but not per- ceptibly that of the more refrangible.

Fluorescence. —The singular surface appearances presented Fluor-

by “canary” glass, by some specimens of fluor spar, and °scence,

by certain liquids, such as a solution of sulphate of quinine acidulated with sulphuric acid, had been the source of much speculation long before their true nature was traced by Stokes in 1852.5 By a series of well-contrived experi- ments, one or two of which will presently be described, he put it beyond doubt that the cause of these phenomena

lies in a change of refrangibility of the light which has Change

been absorbed by the upper layers of the medium, and then given off again. In every case the fluorescent light appears to belong to a less refrangible part of the spectrum than does the incident light which

gave rise to it, thus affording an instance of dissipation, or degradation of energy.

The yellowish-green surface-colour of canary glass (coloured with oxide of uranium) is well known, as the substance is, mainly on account of this property, very commonly used for ornaments. If we admit a ray of sunlight (or light from the electric lamp) into a dark room, through a cobalt glass so dark that the feeble violet- coloured light it transmits is scarcely visible, we find that the canary glass shows its yellow-green colour vividly when placed in the track of the ray. Striking as this experiment is, it is not quite conclusive as to the true cause of the appearance. But if we take another piece of glass, slightly tinged of a brownish-yellow (by oxide of gold), we find that it is quite transparent to the brilliant light from the canary glass ; if, however, we place it in the track of the violet rays before they fall on the uranium glass, it prevents the production of the phenomenon altogether. Thatis, rays which cannot pass through the glass coloured with gold are rendered capable of freely passing through it after incidence on the canary glass. That the phenomenon is due to rays which are stopped by the uranium glass itself is proved by the fact that a second piece of the glass, placed in the track of the rays which have passed through the first, does not show the phenomenon. Unless, indeed, the source of light be very bright, the appearance is confined to a mere surface- layer of the first piece of canary glass) The phenomenon is very well shown by an aqueous infusion of horse-chestnut bark. Some specimens of paraffin oil exhibit it most brilliantly.

To find the rays which are most effective in producing the fluorescence of any substance, we have only to place it in a pure spectrum of sunlight (or, preferably, of the electric light),—prisms and lenses of quartz being used for producing the spectrum, because that material is found to be far less opaque than glass is to the violet and ultra- violet rays. When this is done with uranium glass we find scarcely a trace of effect until the substance reaches the blue rays, and the effect persists through all the higher colours, and even very considerably beyond the bounds of the visible spectrum. Stokes in fact used it as a means of

studying the otherwise invisible, but far extending, spectrum of the ultra-violet rays of the electric spark.

The mechanism of the process by which these extra- ordinary results are produced is still somewhat obscure, and we cannot attempt to explain it here.

The duration of fluorescence is so very short that it is only by specially devised methods that we can make certain that it persists for any measurable time after the exciting

5 Phil. Trans., "' On the Change of Refrangibility of Light."

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light is cut off from the fluorescent body. Becquerel's ingenious phosphoroscope was invented for the purpose of inquiries of this kind. It consists essentially of a shallow drum, in whose ends two excentric holes, exactly opposite to one another, are cut. Inside it are fixed two equal metal disks, attached perpendicularly to an axis, and divided into the same number of sectors, the alternate sectors of each being cut out. One of these disks is close to one end of the drum, the other to the opposite end, and the sectors are so arranged that, when the disks are made to rotate, the hole in one end is open while that in the other is closed, and vice versa. If the eye be placed near one hole, and a ray of sunlight be admitted by the other, it is obvious that while the sun shines on an object inside the drum the aperture next the eye is closed, and vice versa. If the disks be made to revolve with great velocity by means of a train of toothed wheels, the object will be presented to the eye almost instantly after it has been exposed to sunlight ; and these presentations succeed one another so rapidly as to produce a sense of continued vision. By means of this apparatus we can test with considerable accuracy the duration of the phenomenon after the light has been cut

light, and to dole it out continuously for so long a time and mainly in the form of light, is exceedingly puzzling,— especially as no other physical or chemical change has yet been found to accompany the

process. Another curious fact connected with their behaviour was discovered by Becquerel. He found that the less refrangible rays have in some cases the power of arresting the cmission of light from these bodies when they have been previously excited by higher rays.

The chemical effects of light will be treated under PHOTOGRAPHY, so far as they are connected with decom- position. Its effects in causing combination, as of hydrogen and chlorine, have already been treated under CuEmisTRY.

UNDULATORY THEORY oF LIGHT.

The explanation of the fundamental laws of Geometrical Optics by the wave-theory requires some preliminary remarks. As the subject will be more fully discussed in a special article, we confine ourselves to what is strictly necessary for the immediate purposes of the present article.

(a) The essential characteristic of wave-motion is that a Wave- disturbance of some kind is handed on from one portion of motion. a solid or fluid mass to another. In certain cases only, this disturbance is unaltered in amount and in kind as it proceeds.

(5) So far as light is concerned, the velocity with which Velocity each particular species of disturbance passes in any direction of propa- through a homogeneous isotropic medium is constant and is 84tion- the same for all directions. When the medium is not homo- geneous, the velocity may vary from point to point. If the medium be not isotropic, the velocity may depend upon the direction of propagation. Examples of each of these pecu- liarities will be met with presently.

(c) When two or more separate disturbances simultane- Inter- ously affect the same portion of a medium, the effect may ference. be very complex. But, in the case of light, it has becn found that a geometrical (or rather kinematical) superposi-

off. For such a purpose we require merely to know the number of sectors in the disks and the rate at which they are turned. ‘To guard against deception by the persistence of impressions on the retina, the

eye should not be directed fixedly on the object, but should be kept travelling slowly round the position in which it is seen to lie,

Uranium glass shows, with rapid turning, nearly as vivid an effect as when exposed to continuous light, but fades rapidly when the speed of the rotation falls off. A pinkish kind of ruby, exposed to concentrated sunlight in the phosphoroscope, is seen to glow with a bright red like a piece of live coal. With very rapid turning, feeble fluorescence can be detected in a great many substances in which the ordinary methods will not show it. This is due in great measure to the fact that the phosphoroscope entirely does away with the scattered light, which in the

ordinary mode of examining these substances overpowers their feeble fluorescence.

tion or composition agrees, at least to the degree of accuracy of the experiments, with all the observed facts. This

Phos- What is correctly termed phosphorescence has nothing | would be the case, as a dynamical result, if the distortions phor- to do with phosphorus (whose luminosity in the dark is | due to wave-motion were always, even for the most power- escence.

due to slow oxidation), but it is merely a species of fluorescence which lasts for a much longer time after the excitation has ceased than does that just described. Pliny

ful light, exceedingly small. On this is based the whole doctrine of interference, Young’s grandest contribution to the wave-theory (1801).

speaks of various gems which shine with a light of their own, and Albertus Magnus knew that the diamond becomes phosphorescent when moderately heated. But the first

(d) The disturbance at any point of a medium, at any Huy- instant, is that due to the superposition of all the disturb- gens’s

ances which reached it at that instant from the various ae.

Luminous the

: paint,

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discovery of phosphorescent substances, such as are now so common, belongs to the early part of the 17th century. During that century the Bologna stone (sulphide of barium) and Homberg's phosphorus (chloride of calcium) were dis- covered, Canton's phosphorus (sulphide of calcium) dates from 1768. To the substances mentioned may now be added sulphide of strontium. Any of these sulphides, which must be carefully preserved from the air in sealed glass tubes, appears brilliantly luminous when carried from sunlight into a dark room, and for a long time after presents the general aspect of a hot body cooling. The rays which excite their luminosity are (as with the generality of fluorescent bodies) those of higher refrangibilities ; but the colours of the phosphorescent light are of the most varied kind, even in specimens of almost precisely the same chemical composition, but prepared at different times.) The causes of this strange diversity are as yet quite unguessed at; but the property has been taken advantage of for production of what arc called luminous paints. The behaviour of these substances is one of the most singular phenomena in optics. How they manage to store up so large a supply of energy during a short exposure to bright

surrounding parts of the medium. This is (in a somewhat generalized form) what is commonly known as Huygens's principle, first enunciated in 1678.

(e) The front of a wave is defined at any instant as the Wave- continuous locus of all portions of the medium which, at front.

that instant, are equally and similarly distorted. The word continuous is inserted because, in oscillatory wave- motion, such as that of light, a large number of successive waves are exactly equal and similar to one

another. Thus we have a series of wave-fronts following one another, which are not to be considered as parts of one wave-front. The distance between two successive fronts in which the distortions are similar, measured in the direction in which the light is travelling, is called the wave-length.

(f) The colour of homogeneous light depends entirely on Colour.

the period of a wave, 7.e., on the time of passage from one wave-front to the next. This is obviously the same thing as the time of a complete vibration of any one particle of the medium—whatever be the velocity of light in the medium, or the consequent wave-length.

These being premised, let us take the propagation of homogeneous light from a luminous point in a homo-

Wave- motion in homo- geneous isotropic medium.

geneous isotropic medium. Here we have simply a suc- cession of concentric spherical wave-fronts, their radii differing by one or more whole wave-lengths. The dis- turbance in any portion of one of these fronts is propagated radially. But we may consider it from a different point of view, as hinted in (d) above. Simple as this particular case is, the reader will probably find that it will greatly assist him in understanding the more complex ones which follow.

Every disturbed portion of the medium may be looked upon as a centre of disturbance from which a new set of spherical waves is constantly spreading. Take then, as common radius, the space described by a disturbance in any very short interval ; and, with centres at every point of any one wave-front, describe a series of spheres. The ultimate intersections of these spheres will lie on a surface which is the envelop of them all. In the case considered, it is obviously a sphere whose radius exceeds that of the wave-front from which we started by the common radius of the set of spheres. This is shown in a central section in fig. 28 below, which suffices to prove that we arrive by this mode of

construction at the result which we know in this simple case to be the correct one. It will be seen that the centres of the construction-spheres lie on a certain part of one wave-front, while their ultimate intersections lie on the corresponding part of the future wave-front. This holds for spheres of all radii, and for continually increas- ing radii shows that a plane wave moves perpendicularly to its front. This is so important a part of Huygens's work that we give it in his own words (Z'raité de lu Lumiere, 1690, pp. 18-20) :—

'* Pour venir aux proprietez de la lumiere ; remarquons premicre- ment que chaque partie d'onde doit s'étendre en sorte, que les extremitez soient tousjours comprises entre les mesmes lignes droites tireés du point lumineux. Ainsi la partie de l'onde BG, ayant le point lumineux A pour centre, s'étendra en l'arc CE, terminé par les droites ABC, AGE. Car bien que les ondes particulieres, pro- duites par les particules que comprend |'espace CAE, se repandent aussi hors de cet espace, toutesfois elles ne concourent point en mesine instant, 4' composer ensemble une onde qui termine le mouve-

ment, que precisement dans la circonference CE, qui est leur tangente comniune.

- Et dicy l'on voit la raison pourquoy la lumiere, & moins que ses rayons ne soient reflechis ou rompus, ne se repand que par des lignes droites, en sorte qu'elle n'éclaire aucun objet que quand le chemin depuis sa source jJusqu'a cet objet est onvert suivant de telles lignes. Car si, par exemple, il y avoit une ouverture] BG, borneé par des corps opaques BH, G1; Vonde de lumiere qui sort du point A sera tousjours termineé par les droites AC, AK, comme il vient d'estre de- monstré: les parties des

Fig. 28.

ondes particulieres, qui s'étendent hors de l'espace ACE, estant trop foibles pour y produire de la lumiere.

*"Or quelque petite que nous fassions l'ouverture BG, la raison est

tousjours la mesme pour y faire passer la lumiere entre des lignes droites ; parce que cette ouverture est tousjours assez grande pour contenir un grand nombre de particules de la matiere etherée qui sont d'une petitesse inconcevable ; de sorte qu'il paroit que chaque petite partie d'onde s'avance necessairement suivant la liene droite qui vient du point luisant. Et c'est ainsi que l'on peut prendre des rayons de lumiere comme si c'estoient des lignes droites,

'Tl paroit au reste, par ce quid esté remarqué touchant la foiblesse des ondes particulieres, qu'il n'est pas necessaire que toutes les particules de I'Ether soient égales entre clles, quoique Végalité soit plus propre 4 la propagation du mouvement. Car il est vray que linégalite fera qu'une particule, en poussant une autre plus grande, fasse effort pour reculer avec une partie de son mouvement, mais il ne s'engendrera de cela que quelques ondes particulieres en arriere vers le point lumincux, incapables de faire de la lumiere: & non pas d'onde eomposeé de plusieurs, comme estoit CE.

'Une autre, et des plus merveilleuses proprietez de la lumiere est que, quand il en vient de divers costez, ou mesme d'opposez, elles

font leur effet l'une & travers l'autre sans aucun empéchement. D'ou vient aussi que par une mesme ouverture plusieurs spectateurs peu-vent voir tout & la fois des objets differens, et que deux personnes se voyent en mesme instant les yeux l'un de lautre. Or suivant ce qui a esté expliqué de l'action de la lumiere, et comment ses ondes ne se détruisent point, ny ne s'intcrrompent les unes les autres quand elles se croisent, ces effets que je viens dc dire sont aisez & concevoir. Qui ne le sont nullement 4 mon avis selon Vopinion de Des-Cartes, qui fait eonsister la lumiere dans une pression continuelle, qui ne fait que tendre au mouvement, Car cette pression ne pouvant agir tout a la fois des deux costez opposez, contre des corps qui n'ont aucune inclination 4 s'approcher ; il est impossible de comprendre ce que je viens de dire de deux personnes qui se voyent les yeux mutuellement, ni comment deux flambeaux se puissent éclairer]'un l'autre."

We will now, for the purposes of this elementary article, assume that something similar holds in all cases, and will not trouble ourselves with the fact that our construc- tion, if fully carried out, would indicate a retrograding wave as well as a progressive one. The obvious fact that a solitary wave can be propagated in water, or along a stretched string, may assist the reader in taking the bold step which we have proposed to him. And we will also assume that this mode of representation leads to correct results even when we do not choose a wave-front as the locus of the centres of disturbance,—that in fact we may choose for our purpose any surface through which the rays pass, provided always that the radii of the spheres are so chosen that the length of each ray from some definite wave-front to the centre of the sphere, together with the radius of that sphere, always corresponds to a path described in a given time.

We are now prepared to explain the reflexion of light,

Undula-

and we need do so for a plane reflecting surface alone, tory ex-

because the length of a wave, as we shall soon see, is an almost vanishing quantity in comparison with the radius of curvature of any artificial mirror, be it even the smallest visible drop of mercury.

Let a plane wave-front be approaching a plane mirror, and at any instant let fig. 29 represent a section by a plane perpendicular to each, cutting the wave-front in AB and the mirror in AC. From what has been already said, the motion of every part of AB is perpendicular to that line, and in the plane of the figure. During the time that the disturbance at B takes to reach C, the disturbauce which had reached A will have (in part, for there is usually a_ refracted & part also) spread back into the medium in the form of a spheri- cal wave whose radius, AD, is equal to BC. Its section is of course

Fig. 29. a circle. That from any other point P will have reached Q, and then (in part) diverged into a spherical wave whose centre is Q and radius QT(= QT’) =BC-PQ, Obviously all the circles which can be

thus drawn ultimately intersect in the straight line CD. This is a section of the reflected

wave-front. A plane wave, therefore, remains a plane wave after reflexion, each part of it obviously moves in the plane of incidence, and the similarity of the triangles ABC and CDA proves the equality of the angles of incidence and reflexion, for the ray is everywhere perpendicular to the wave-front. It is to be particularly noted that this is in- dependent of the velocity of the light, so that all rays are reflected alike. In this, as in the preceding and the im- mediately following instances, the diagram has been taken (with but slight change) from Huygens.

This being true of any plane wave-front, large or small in area, is necessarily also true of any wave-front of finite

plana- tion of

reflexion, —

ourvature. Thus, if a set of rays be drawn perpendicular to any wave-front, they will after reflexion be perpendicular to a new wave-front ; and the lengths of all the rays, from wave-front to wave-front, will be equal.

This is merely another way of stating that if a set of rays can be cut at right angles by a surface (of finite curvature) they will always be capable of being cut at right angles by such a surface, even after any number of reflexions at surfaces of finite curvature, provided they move in a homogeneous isotropic medium.

Undulas § This proposition will be seen to be capable of extension tory ex- to refraction, provided always that both media are homo- _ geneousand isotropic. Fora plane wave, falling on a plane tion, refracting surface, our construction (fig. 30) is as follows :—

Let AB be, as before, a plane wave-front in the first medium, and AC the plane surface of the second medium. As before, let BC be

perpendicular to AB. Also let CD’ be drawn parallel toBA. With centre A and radius AD equal to the space described in the

Fig. 30. second medium while BC is described in the first, let a

sphere be described. The disturbance at A will have diverged in this sphere, while that at B has just reached C. The disturbance at any other point, as P, will have passed to Q, and then have diverged into a sphere of radius QT such that QT: QT’: : AD: BC.

Obviously all spheres so drawn ultimately intersect along CD, which is therefore the front of the refracted wave. The angles of incidence and refraction, being the in- clinations of the incident and refracted rays to the normal, are the inclinations BAC and DCA of the incident and refracted wave-fronts to the refracting surface. Their sines are evidently in the ratio of BC to AD, ie. they are directly as the velocities of propagation in the two media.

Hence the law of refraction also follows from this hypothesis. But there will now be separation of the various homogeneous rays, because the ratio of their velocities in the two media is not generally constant.

Besides, it is clear from the investigation above that, in the refracting medium, the rays are still perpendicular to the wave-front. Thus the proposition lately given may now be extended in the following form : —

If a series of rays travelling in homogeneous isotropic media be at any place normal to a wave-front, they will possess the same property after any number of reflexions aud refractions. And it is clear from the investigations already given that the ¢éme employed by light in passing from one of these wave-fronts to another is the same for every ray of the series.

Test of We now see how crucial a test of theory is furnished by

theory. the simple refraction of light. On the corpuscular theory the velocity of light in water is to its velocity in air as 4: 3 nearly; on the

undulatory theory these velocities are as 3: 4, since, as we have seen, the refractive index of water is about $. But Foucault's experimental method / showed at once that the velocity is less in water than in |

air. This finally disposed of the corpuscular theory. Though it had been conclusively disproved long before, by certain interference experiments whose nature will presently | be described, the argument from these was somewhat | indirect and not well suited to convince the large non- mathematical class among optical students and experi-menters. The true author of the undulatory theory is

undoubtedly Huygens, Grimaldi, Hooke, and others had expressed more or less obscure notions on the subject, but Huygens in 1678 first gave it in a definite form, based to

a great extent upon measurements of his own. It was

read to the French Academy, but not published till 1690,

when it appeared with the title Zraité de la Lumiere. Huygens gives the explanation of the double refraction

of Iceland spar, which had been described by Bartholinus

in 1670. Unfortunately the remarkable step taken by Newton in explaining the law of refraction on the corpus-

cular theory—the earliest solution of a problem connected

with molecular forces—had for some time been before the scientific world. The authority of Newton was paramount

in such matters, and the work of Huygens produced no

effect at the time. Even the genius of Young, who at the commencement of the present century recalled attention to

this all-but-forgotten theory, and enriched it by the addition

of the principle of interference, as well as by many important applications, failed to secure its recognition.

It was not till 1815 and subsequent years that, in the opposi- hands of Fresnel, the undulatory theory finally triumphed, tion to and, even then, the battle was won against determined _ nt resistance on the part of the upholders of the corpuscular Seong.” theory. Witness what Laplace! said, in 1817, in the following excerpt from a letter to Young :—

‘*J’ai regu la lettre que vous m’avez fait ’honneur de m’écrirc, et dans laquelle vous cherchez & établir que, suivant le syst¢me des ondulations de la lumiére, les sinus d’incidence et de réfraction sont en rapport constant, lorsqu’elle passe d’un milieu dans un autre, Quelque ingénieux que soit ce raisonnement, je ne puis le regarder que comme un apergu, et non comme une démonstration géomét- rique. Je persiste & croire que le probléme de la propagation des ondes, lorsqu’elles traversent différens milieux, n’a jamais été résolu, et qu’il surpasse peut-étre les forees actuelles de l’analyse. Des- cartes expliquoit ce rapport constant, au moyen de deux oa, apie, Pune, que la vitesse des rayons lumineux parallélement 4 la surface du milieu refringent ne changeoit point par la réfraction ; l’autre, que sa vitesse entiére dans ce milieu étoit la méme, sous toutes les ineidences; maiscomme il ne rattachoit aucune de ces suppositions aux lois de la mécanique, son explication a été vivement com- battue et rejettée par les plus grand nombre des physiciens jusqu’ & ce que Newton ait fait voir que ces suppositions résultoient de l’action du milien refringent sur la lumiére ; alors on a eu une ex- plication mathématique du phénoméne dans le systéme de 1’émis- sion de la lumiére : systeme qui donne eneore |’explication la plus simple du phénoméne de l’aberration, que n’explique point le systeme des ondes lumineuses. Ainsi les suppositions de Descartes, comme plusieurs apergus de Kepler sur le systéme du monde, ont été vérifiées par analyse: mais le mérite de la

découverte d’une vérité appartient tout entier & celui qui la démontre. Je convicns

ue de nouveaux phénoménes de la lumiére sont jusqu’ 4 présent trés difficiles & expliquer;’ mais en les étudiant avee un grand soin, pour découvrir les lois dont ils dépendent, ou parviendra peut-étre un jour 4 reconnaitre dans les molecules lumineuses des propriétés nou- velles qui donneront une explieation mathématique de ees phéno- ménes. Remonter des phénoménes aux lois et des lois aux forces, est, comme vous le savez, la vraie marehe des sciences naturelles,’

Poggendorff remarks that there is no other instance, in the whole history of modern physics, in which the truth was so long kept down by authority. Poggendorff further remarks that of the six chief phenomena of light known in Huygens’s time he fully explained three —reflexion, refraction, and the double refraction of Iceland spar—at least so far as concerns the direction of the reflected or refracted rays. Phenomena such as diffraction, and the colours of thin plates, required the principle of interference for their explanation, which was first given by Young; and dispersion (not yet quite satisfactorily disposed of) was first accounted for in comparatively recent times by Cauchy. Huygens himself was the discoverer of polariza- tion, but he could not account for it. Even Young also, because like Huygens he supposed the undulations to be in the direction of the ray, failed to account for it; and it was not explained till Fresnel reintroduced with the

1 Young’s Works, ed. by Peacock, vol. i. p. 374. It is matter for

. curious remark that Laplace refers to Descartes only, and not to Huygens.

Classes of waves.

Tnter- ference,

Tides of Batsha.

Young’s dis- coveries.

most brilliant success a guess of Hooke's (of date 1672), that the vibrations of light in an isotropic medium are perpendicular to the direction of the ray.

Taking the undulatory theory as the only one left possible by the experiments of Foucault, we will now con- sider the explanation it offers of various phenomena, It will be remembered that we have as yet made no assumption whatever as to the precise nature of a wave; and it will be found that a large class of important phenomena can be explained by it without our making any such assumption, but that other classes of phenomena compel us to adopt certain limitations of the very general hypothesis with which we started. As long as we deal with the first class of phenomena, we may take for granted those properties which are common to all ordinary forms of wave-motion, such as those in water or air. In ordinary water-waves the motion of a particle is partly to and fro in the direction in which a wave is travelling, partly up and down and therefore perpendicular to that direction. This is obvious to every one who watches a floating cork. In sound-waves, whether in air or in water, the displacement of each particle of the medium is wholly in the direction in which the wave is travelling. Directly connected with this there is another distinction between these classes of waves. In ordinary water-waves the water-elements change only their form as the wave passes ; in sound-waves there is change of volume also. A third distinction, also directly connected with the first, is that sound-waves in water travel at a much greater rate than the swiftest, ¢.¢2, the longest, of surface waves. But, in either case, when two similar and equal series of waves arrive at a common point they ¢nterfere, as it is called, with one another, so that the actual disturbance of the medium at any instant is the resultant of the disturb- ances which it would have suffered at that instant from the two series separately. Thus if crests, and therefore troughs, arrive simultaneously from the two series, the result is a doubled amount of disturbance. If, on the contrary, a crest of the first series arrive along with a trough of the second, the next trough of the first series will arrive along with the next crest of the second, and so on. One series is

then said to be half a wave-length behind the other. Inthis case, the portion of the medium considered will remain undisturbed. Thus, at the port of Batsha in Tong-king, the ocean tide-wave arrives by two different channels, one part being nearly six hours, or half a wave-length, behind the other. As a result, there is scarcely any noticeable tide at Batsha itself, though at places not very far from it the rise and fall are consider- able. This was known to Newton, and is noticed by him in the Principia, iii, 24. See also Phil. Zrans., vol. xiv. p. 677, for the observed facts and Halley's comments. Thus also (see Acoustics) two sounds of the same wave- length and of equal intensity produce silence if they reach the external ear with an interval of half a wave-length, or any odd multiple of half a wave-length.

It is not remarkable that Young's Bakerian Lecture (1801), in which the principle of interference is for the first time described and applied, should consist in great part of extracts from the Principia. For there are many passages in Newton's works which might have been written by an upholder of the wave-theory. Unaccountably, how- ever, Newton in the context almost always brings in a reference to the "rays of light" as something different from the vibrations of the ether, yet capable of being acted on by them so as to be put into "fits of easy reflexion or of easy transmission." These allusions are the most obscure parts of all Newton's scientific writings ; and it is very difficult to form a precise conception of what he meant to express in them.

reply (Works, vol. i. p. 202) to the violent but ignorant assault on him by Lord Brougham in the Hdinburgh Review, is chosen as showing his own estimate of his own work and of its'relation to what was already known :—

'Tt was in May 1801 that I discovered, by reflecting on the beautiful experiments of Newton, a law which appears to me to account for a greater variety of interesting phenomena than an other optical principle that has yet been made known. ~ I shall endeavour to explain this law by a comparison.

‘‘ Suppose a number of equal waves of water to move upon the surface of a stagnant lake, with a certain constant velocity, and to enter a narrow channel leading out of the lake. Suppose then another similar cause to have excited another equal series of waves, which arrive at the same channel, with the same velocity, and at the same time with the first. Neither series of waves will destroy the other, but their effects will be combined: if they enter the channel in such a manner that the elevations of one series coincide with those of the other, they must together produce a series of greater joint elevations; but if the elevations of one series are so situated as to correspond to the depressions of the other, they must exactly fill up those depressions, and the surface of the water must remain smooth ; at least I can discover no alternative, either from theory or from experiment.

‘* Now I maintain that similar effects take place whenever two portions of light are thus mixed ; and this I call the general law of the interference of light. I have shown that this law agrees, most accurately, with the measures recorded in Newton’s Optics, relative, to the colours of transparent substances, observed under circum- stances which had never before been subjected to calculation, and with a great diversity of other experiments never before explained. This, I assert, is a most powerful argument in favour of the theory which I had before revived: there was nothing that could have led to it in any author with whom I am acquainted, exccpt some imperfect hints in those inexhaustible but neglected mines of nascent inventions, the works of the great Dr Robert Hooke, which had never occurred to me at the time that I discovercd the law ; and except the Newtonian explanation of the combinations of tides in the port of Batsha.”

Young’s first application of the principle of interference Inter-

was made to the colours of striated surfaces, the next to ference experiments.

the colours of thin plates. These, however, are not so easily intelligible as the application to an experiment devised by Fresnel several years later. We therefore commence with Fresnel’s experiment, which gives the most simple arrangement yet contrived, but it must be under- stood

that the explanation is really due to Young. BCD (fig. 31) is an isosceles prism of glass, with the angle at C very little less than two right angles. A luminous point is

placed at O, in the plane through the obtuse edge of the

prism and perpendicular to its base. If homogeneous light be used, the light which passes through the prism will consist of two parts, diverging as if from points O, and O, symmetrically situated on opposite sides of the line CO. Suppose a sheet of paper to be placed at A with its plane perpendicular to the line OCA, and let us consider what illumination will be produced at different parts of this paper.

Hence they will arrive simultaneously at A, which is equidistant from them, and there they will reinforce one another. Thus there will be a bright band on the paper parallel to the edges of the prism. If P, be cliosen so that the difference between P,O, and P,Q, is half a wave-length (ze, half the distance between two’ successive crests), the two streams of light will constantly meet in such relative conditions as to destroy one another. Hence there will be a line of darkness on the paper, through P,, parallel to the edges of the prism. At P,, where O,P,

The following passage, extracted from Young’s temperate | exceeds O,P, by a whole wave-length, we have another

As O, and O,are images of O, crests of waves Fringes

must be supposed to start from them simultaneously, in homo- geneous

light.

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bright band; and at P,, where O,P; exceeds O,P, by a wave-length and a half, another dark band ; and so on. Hence, as everything is symmetrical about the bright band through A, the screen will be illuminated by a series of bright and dark bands, gradually shading into one another. If the paper screen be moved parallel to itself to or from the prism, the locusof all the successive positions of any one band will (by the nature of the curve) obviously be an hyperbola whose foci are O, and O,. Thus the interval between any two bands will increase in a more rapid ratio than does the distance of the screen from the source of light. But the intensity of the bright bands diminishes rapidly as the screen moves farther off; so that, in order to measure their distance from A, it is better to substitute the eye (furnished with a convex lens) for the screen. If we thus measure the distance AP, between A and the nearest bright band, measure also AO, and calculate (from the known material and form of the prism, and the distance CO) the distance O,0,, it is obvious that we can deduce from them the lengths of O,P, and O,P,. Their difference is the length of a wave of the homogeneous light experimented with. Though this is not the method actually employed for the purpose (as it admits of little precision), it has been thus fully explained here because it shows in a very simple way the possibility of measuring a wave-length.

The difference between O,P, and O,P, becomes greater as AP, is greater. Thus it is clear that the bands are more widely separated the longer the wave-length of the homogeneous

meet of light employed. Hence when we use white light, and thus

have systems of bands of every visible wave-length super- posed, the band A will be red at its edges, the next bright bands will be blue at their inner edges and red at their outer edges. But, after a few bands are passed, the bright bands due to one kind of light will gradually fill up the dark bands due to another ; so that, while we may count hundreds of successive bright and dark bars when homo- geneous light is used, with white light the bars become gradually less and less

defined as they are farther from A, and finally merge into an almost uniform white illumina- tion of the screen.

In this example, and in all others of a similar character which will be introduced into this elementary article, the solution is only approximate. The utmost resources of mathematics are in most cases required for the purpose of complete solution.

We are now in a position to prove that light moves slower in glass than in air, by the process which was merely zxdicated while we were discussing the velocity of light. For, if we could slightly lengthen the paths of the rays which come from Q,, leaving those from O, unaltered, the system of bands would obviously be shifted in the direction from A to P in the figure. ‘This happens if a very thin film of glass be interposed in the path of the rays which appear to come from O,. The best mode of making the experiment is to put a piece of very uniform plate glass, cut into two parts, between the prism and the screen, so that rays from O, pass through one part and those from O, through the other. So long as these pieces are parallel, no shifting takes place. But if one be slightly turned, so as to give the rays a longer path through it, the system of bands is at once displaced to the side at which it is situated.

Also, we can now see how it is possible to discover whether light has its velocity affected by that of the medium in which it is travelling. We know that sound travels faster with the wind, and slower against it, than it does in still air. We may, therefore, suppose a disposi- tion of the interference apparatus such that the two rays which interfere have each passed through a long tube full of water. A rapid current may be established, in either

direction, in one or other of the tubes, or in opposite directions in the two, and the shifting of the interference- bands will at once indicate the nature of the effect. We cannot describe the details of the process. The result, however, is analogous to that of wind on sound, but of course

very much smaller; and it seems that the actual change of the velocity of light is Jess than the velocity of the current. See Eruer.

Let us next consider the effect of a grating, a series of Inter- fine parallel wires placed at small equal intervals, or a ference piece of glass or of speculum metal on which a series of 8*tirg:

equidistant parallel lines have been ruled by a diamond point. We take only the case in which plane waves of homogeneous light are incident in a direction perpendicular to the plane of the grating, and when the bars and open- ings of the grating are all equal in breadth.

Consider the effect on an eye or screen at a considerable distance, in the direction BE (fig. 32). If there were no grating, practically no light would reach the eye from the aperture AD unless ABE were very nearly a right angle.

Fig. 32.

This is, of course, the statement of Huygens already quoted. But Young’s principle enables us to say why this is the case. Let us divide AD into aseries of equal parts by lines perpendicular to BE, and distant from one another by half a wave-length of the homogeneous light employed. The portions coming to the eye from any two adjacent parts AB, BC will be practically of the same intensity, and will exactly neutralize one another’s effects on the eye. For if we take points a and 0 similarly situated with regard to A and B respectively, the distances of a and 6 from the eye differ by half a wave-length, and rays from a neutralize those from 6. This is true wherever a be taken between A and B. Hence, under the conditions assumed, no light reaches the eye.

Now suppose the alternate parts AB, CD, &c., to be opaque. Similar reasoning will show that the remaining rays conspire to strengthen one another. Thus, when homogeneous light from a distant point falls perpendicu- larly on a grating in which the breadth of the bars is equal to that of the interstices, it will be seen brightly in a direction inclined at an angle 6 (ABE) to the plane of the grating,—the angle @ being such that

AC cos 6= wave-length.

Similar reasoning shows that the light is reinforced when-

ever @ is such that AC cos 6

is an integral multiple of the wave-length. The appearance presented when a long narrow slit is the luminous object, and the bars of the grating are placed parallel to it, is therefore (with homogeneous light) a central image with others equidistant from it on each side—their angular distances from it being the values of the angle correspond- ing to the sines

& ; aX : a » &e,

a a a Here 2 is the wave-length, and a is the sum of the breadths of a bar and an interstice. It is found in practice, and it is also deducible from the complete

Inter- ference spec- trum,

Wave- lengths for different homo- geneous rays.

Comple- mentary gratings.

Shadow of circu- lar disk.

theory, that the ratio of the breadths of the bar and interstice has but little effect on the result, unless it be either very large or very small. Hence if A be expressed as a fraction of an inch, and x be the number of lines per inch in the grating, the angular deviations of the bright bands have the sines

NA, 2nA, 8nA, &e.

The mean wave-length of visible rays in air is about soyooth of an inch. Thus a grating with 5000 equi- distant lines per inch will give

with such light an angular deviation of about 6° for the first bright diffraction line.

If we notice that the sine of the deviation is proportional to the wave-length, it will be obvious that when white light is used the result will be a series of spectra on each side of the central white image, their more refrangible ends being turned towards that image. When the grating is a very regular one, and the appearances are examined by means of a telescope adjusted for parallel rays, the spectra formed in this way show the Fraunhofer lines with as great perfection as do the best prisms. And they have one special advantage, which prisms do not possess. The relative angular separation of the various colours depends solely on their wave-lengths, and thus the spectra formed by different gratings are practically similar to one another. There is, in fact, almost no irrationality in this kind of dispersion. In glass prisms and especially in those of flint glass, the more refrangible part of the spectrum is much dilated, while the less refrangible part is compressed.

The counting of the number of lines per inch in a grating is not difficult, nor is the accurate measurement of the angle of deviation of any particular Fraunhofer line. Hence, by the help of the very simple formula given above, the wave-lengths of light corresponding to the various Fraunhofer lines have been determined with very great accuracy from the diffraction spectra of gratings. The following are, according to Angstrém,! a few of the chief

values. A is expressed in ten-millionths of a millimetre.?

A Atmospheric 7604 rip

B Atmospheric 6867 13309 Cc Hydrogen 6562 1°3317 D (double) Sodium saee | 1°3336 E Calcium and Iron 5269 1°3358 F Hydrogen 4861 1°3378 G Iron 4307 1°3413 H (double) Calcium and Iron a 1°3442

For the sake of a discussion to be entered on later, we have appended the refractive index from air into water for each of these rays, as given

by Fraunhofer himself.’

If now we suppose AB, CD, &c., to be transparent, while BC, &c., become opaque, it is obvious that the new grating will be the complement of the old one, and will give precisely the same appearances at points outside the course of the direct beam. For when there is no grating there is practi- cally no illumination at such points. This statement of course is equally true of any grating, whatever be the ratio of the breadths of the bars to those of the interstices.

Another very curious result of the theory of interference, fully verified by experiment, is furnished by the fact that the central spot of the shadow of a small circular disk, cast by rays diverging from a distant point in its axis, is as brightly illuminated as if the disk had not been inter- posed.

The final example of interference which we can give here is noteworthy on account of a peculiarity which it

1 Spectre Solaire, 1863.

2 As there are nearly 25 millimetres in an inch, these numbers each multiplied by 4 give the wave-lengths approximately in thousand-mil- lionths of an inch.

3 Gilbert’s Annalen, lvi., 1817.

LIGHT

presents.

Let us consider the case of homogeneous light Reflexion

reflected by a thin plate or film of a transparent material. from

Let AB (fig. 33) be the direction of the incident ray, a

BdE the direction in which part of it is reflected to an eye E at a considerable distance; and let DE be the direction in which another

part escapes after refraction into the plate at B and partial retlexion at the second surface of the plate at C. Then if Dd be drawn perpendicular to BE, the re- tardation of the wave in DE as compared with that in BE will be (2uBC — Bd)/A wave-lengths, where p is the refrac- tive index into the plate.

If a’ be the angle of refraction, and ¢ the thickness of the plate, it is easily seen that

Fig, 33.

BC cos a’ =¢, and BD=2BC sin a’=2¢ tana’. Hence 2uBC – Bd =2ut cos a’.

Hence whenever, for a given thickness of plate, a’ is

such that Qut cos a’

is an integral multiple of A, the two rays should reinforce

one another at E. The same will happen fora given angle

of incidence when the thickness of the plate is such that Qut cos a!

is an integral multiple of 4. When, on either account

Qut cosa’ is an odd integral multiple of 4/2 ; the rays at E

will weaken (perhaps destroy) one another.

Hence, in homogeneous light, a thin plate, turned about, Colours

alternately reflects and does not reflect to an eye in a given position. And a fixed plate of non-uniform thickness reflects light from some parts and not from others. When white light is used there will in general be colours seen which vary with the angle of incidence, and also with the thickness. If the plate is infinitely thin it would appear that there should be infinitely slight retardation only, and the plate

should thus be bright in homogeneous light (and of course white in white light) at all incidences.

In general this is not the case. Thus when a soap bubble, or a vertical soap-film, is screened from currents of air, and allowed to drain, the uppermost (¢.e., the thinnest) part becomes perfectly black. It can, in fact, be seen only by the feeble light scattered by little drops of oil or particles of soap or dust on its surface. Here, again, Young's sagacity supplied the germ at least of the explanation. It is given in the following extract from his Theory of Light and Colours, the Bakerian Lecture for 1801 already referred to :—

"¢ Proposition IV.—When an undulation arrives at a Surface Loss of

which is the Limit of Mediums of different Densities, a partial Reflexion takes place, proportionate in Foree to the Difference of the Densities.

'This may be illustrated, if not demonstrated, by the analogy of elastic bodies of different sizes. 'Ifa smaller elastic body strikes against a larger one, it is well known that the smaller is reflected more or less powerfully, according to the difference of their magni- tudes: thus, there is always a reflexion when the rays of light pass from a rarer to a denser stratum of ether, and ogeny, an echo when a sound strikes against a cloud. A greater body striking a smaller one propels it, without losing all its motion; thus, the particles of a denser stratum of ether do not impart the whole of their motion to a rarer, but, in their effort to proceed, they are recalled by the attraction of the refracting substance with equal force ; and thus a reflexion is always secondarily produced, when the rays of light pass from @ denser to a rarer stratum.' But it is not absolutely necessary to suppose an attraction in the latter case, since the effort to procced would be propagated backwards without

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of thin plates.

Black-

ness.

half wave- length.

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it, and the undulation would be reversed, a rarefaction returning in place of a condensation ; and this will perhaps be found most consistent with the phenomena.”

This idea, of a rarefaction returning by reflexion when a condensation is incident, is equivalent to a loss or gain of half a wave-length when light in a denser body is reflected at the surface of a rarer body. Whether, then, the plate be denser or rarer than the medium surrounding it, one or other of the two interfering rays loses half an undulation more than the other in the mere act of reflexion. This completely removes the difficulty. But Young went farther, and pointed out that if a thin plate be interposed between two media, one rarer, the other denser than the plate, this half wave-length effect should disappear. He verified this conjecture by direct experiment, founded on a modification of a process due to Newton.

Newton’s Newton had, long before, devised and carefully employed mings: an excessively ingenious (because extremely simple and effective) method of studying the colours of thin plates. It consisted merely in laying a lens of long focus on a flat plate of glass. The film of air or other fluid between the spherical surface and its tangent plane has a thickness which is directly proportional to the square of the distance from the point of contact. When such an arrangement is looked at in homogeneous light, the lens having been pressed into contact with the flat plate, there is seen a central black spot, surrounded by successive bright and dark rings, whose number appears to be practically unlimited. The radii of the successive bright rings were found by Newton to be as the square roots of the odd numbers tS; 5, &c. Hence the thicknesses of the film of air are directly as these numbers. When rays of higher refrangibility are used the rings

diminish in diameter. Hence when white light is employed we have a superposition of coloured rings of all sizes, but it is no longer possible to trace more than four or five alternations of bright and dark rings—the colours being then more and more compound. This series of coloured rings is named after Newton, and the successive colours, gradually more and more composite, form Newton's scale of colours. Thus we read, in books more than thirty years old, of a red or blue of the third order, meaning those colours as seen in the third bright ring round the central dark spot.

Many of the most vivid colours of natural and artificial bodies are due to one or other of the forms of interference we have roughly explained. Thus Barton's buttons (once employed for ornament as they produce an effect very similar to that of diamonds) were simply polished metal plates stamped by a die of hardened steel, on whose surface a pattern had been engraved consisting of small areas ruled in different directions with close equidistant parallel grooves, That the colours of a pearl and of mother-of- pearl are due to a similar surface corrugation was proved by Brewster, who took impressions from such substances in black wax, and found that it was thus rendered capable of giving the same play of colours. The scales from the wings of butterflies owe their bright colours to a delicate ribbed structure. On the other hand, the thin transparent Wings of the house-fly, earwig, é&c., owe their colours to their thinness, The same is true of the temper colour of steel, Nobili's rings, &c. Very beautiful examples of thin Plates scaled off from decayed glass (found in Roman exca- vations) have been figured, with their play of colours, by Brewster.

Here we can only say a word or two about the probable dex i, 'elation between the wave-length of homogeneous light €xX in . 5 . . . °

terms of 28d its refractive index for any isotropic medium. The wave-existence of dispersion was attributed by Cauchy to the length. fact that even the most homogeneous media, such as water,

a ee 1 Trans, Roy. Soc. Edin., 1861.

Colours of grooved surfaces,

Thin plates,

have grained or heterogeneous structure of dimensions not incomparably smaller than the average length of a wave of light. This grained structure has been recently proved to exist, by several perfectly independent processes arising from totally unconnected branches of physics ; and its dimensions have been assigned, at least in a roughly approximate manner. See Atom, and ConsTITUTION oF BoDIEs.

It appears from the theory of disturbances in such a medium that the velocity of a ray depends upon its wave- length in a manner which is expressed by a series of even inverse powers of that wave-length. Hence we have a relation such as

in which, from our present ignorance of the precise con- nexion between matter and ether, we must be content to find the multipliers of the various terms by direct measure- ment. If we neglect all but the first two terms, we may determine a and £ from the known wave-lengths of two of Fraunhofer's lines, and their refractive indices for a particular medium. We can then test the accuracy of the formula by its agreement with the corresponding numbers in the same medium for others of the fixed lines. Thus, taking the data for water given above, we have, from the numbers for the two hydrogen lines Cand F, the values a=1°3243, B=0°000000003819.

Calculating from these, and the wave-length of H, we have for its refractive index 1:3447, instead of 1:3442 as deter- mined by Fraunhofer. So far as we may trust this theory, which certainly accords fairly with the experimental data for substances of moderate dispersive powers, though by no means well with those for substances of high dis- persive power such as oil of cassia, the value of the quantity a is the refractive index for the longest possible waves; te. it is that of the inferior limit of the spectrum.

Dovste Rerraction.—We now come, to phenomena Double which cannot be even roughly explained by processes refrac- based on the

vague analogies of sound and water waves tion. which have hitherto sufficed for our elementary treatment of the subject.

These phenomena were first observed in Iceland spar. Iceland They were described in a general way by Bartholinus, who spar. showed that one of the two rays into which a single incident ray is divided by this substance follows the ordinary law of refraction. Huygens, who studied the subject only eight years later, verified the greater part of the results of Bartholinus, and added many new ones. From his point of view it was of course obvious that the ordinary ray is propagated by spherical waves, ie., its velocity is the same in all directions inside the crystal.

To explain the extraordinary ray, he assumed that it was Wave- propagated in waves of the form of an ellipsoid of revolu- surface tion, the simplest assumption he could make. To test its °f ae accuracy he first noticed that a rhombohedral crystal of * aia Iceland spar behaves in precisely the same way whichever

pair of parallel faces light passes through. Hence he acutely concluded that the axes of the ellipsoids of revoln-

tion (if such were the form of the waves for the extra- ordinary ray) must be symmetrically situated with regard

to each of these planes. The only such lines in a rhombo- hedron are parallel to that which joins those corners which

are formed by the meeting of three equal plane angles. In

the case of Iceland spar these equal angles are obtuse. Huygens then verified, by experiments well contrived, though carried out by a very rough mode of measurement,

the general agreement of his hypothesis with the fact ; and

he further tested it by comparing its indications as to the position of the two images for any position of the crystal

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with the results of direct observation. There can be no question that the whole investigation was, for the age in which it was made, of an exceedingly high order. But it must not be left unsaid that far more accurate measure- ments than those of Huygens were necessary before it could be asserted that the form of the extraordinary wave zs an ellipsoid of revolution, and not merely a surface closely resembling such an ellipsoid. These improved measurements were made 1802 by Wollaston, and they have recently been repeated with far more perfect optical means by Stokes, Mascart, and Glazebrook. The result has been the complete verification of Huygens's conjecture.

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refracted rays are concerned, are explained by supposing the wave-surface in the crystal to be made up of the sphere and the ellipsoid of revolution above described. 'Thus, when both eyes are used, the two images of a plane object seen through a crystal of Iceland spar appear in general to be situated at different distances above the plane. One of them maintains its apparent position as the crystal is made to rotate about a perpendicular to the two faces employed ; the other's position varies as the crystal is turned.

But we have now to inquire why the incident ray is divided into two, and why one of them follows the ordinary

The generating ellipse of the extraordinary waves is found to have its minor axis, which is that of revolution, equal to the diameter of the corresponding sphere for the ordinary ray. Its major axis is to the minor nearly in the ratio 1654; 1°483.

We are now in a position to trace the paths of the two rays into which a ray falling in any direction on a surface

law of refraction. Here another experimental result of Polariza — Huygens comes to our assistance. We paraphrase the tion of author's description :— igh

'*T will, before concluding, mention another remarkable pheno- Huy- menon which I discovered after the above was written. For, gens's |

although I have not yet been able to find the cause of it, I do not dis- wish on that account to refrain from pointing it out, in order that covery.

of the crystal is divided by refraction.

others may have an opportunity of seeking to explain it. It appears that it will be necessary to make hypotheses additional to

Refrac- Let fig. 34 represent a plane wave front AB (in air) | those already given,—though these will lose none of their proba- tion by falling on the surface AC of a piece of Iceland spar cut in | bility, confirmed as they have been by so many tests. The pheno- Iceland any way. The figure is a section perpendicular to the menon is that, taking two fragments of the crystal (Iceland spar) | spar. aan d 451 454 tho decent Th neay Pers and laying them on onc another, or even holding them apart, if all | rlace, and parailel to the incident ray. € wave-Irollt | the faces of the one be parallel to those of the other, a ray of light AB cuts the surface of the spar in a line (not shown) at | divided into two by the first fragment will not be farther subdivided right angles to the plane of the paper. Draw from A the | by the second. The ordinary ray from the first will be refracted axis Aa (not necessarily in the plane of the paper) and the eked by a oe the apap any pina Fey» "ae : F nd the same thing happens not only in this arrangement but 1n sphere and ellipsoid of revolution which have , Aa for @ | a) others in which the rincipal sections? of the two fragments are common axis. Then, if C be taken such that BC is to Aa 8 | in the same plane, whether the surfaces turned towards one another the velocity of light in air is to that of the ordinary ray in | be parallel or not. It is, in fact, marvellous that these rays, fall- | ing on the second fragment, do not divide like the ray incident on the first. One would say that the ordinary ray from the first

frag- ment had lost what is necessary for the production of extraordinary refraction, and the extraordinary ray that which is necessary for ordinary refraction ; but there is something else which upsets this view. For when one places the fragments so that their principal sections are at right angles, whether the opposed surfaces be parallel or not, the ordinary ray from the first suffers only extraordinary refraction by the second, and vice versa. ‘* But in all the infinite number of positions other than those named, both rays from the first fragment are divided into two by the second. Thus the single incident ray is divided into four, sometimes equally sometimes uncqually bright, according to the varying relative position of the crystals. But all together do not seem to have more light than has the single incident ray. <.. ‘* When we consider that, the two rays given by the first crystal remaining the same, it depends upon the position of the second crystal whether they shall be divided into two or not, while the in- cident ray is always divided, it appears that we must conclude that the waves of light which have traversed the first crystal have acquired a form or disposition which in some positions enables them to excite the two kinds of matter which give rise to the two kinds of refraction, in other positions to excite only one of them. But Fig. 34. I have not yet been able to find any satisfactory explanation of the crystal, the wave-front of the ordinary ray is found by — . : drawing a tangent plane to the sphere, passing through (| 9° far Huygens. His statements are perfectly in accord- and perpendicular to the plane of the paper. This touches | #2°° with fact; and they were reproduced by Newton? the sphere in a point o (in the plane of the paper) and AoO | 22 Very nearly the same form. Newton adds :—“ The un- Newton's is the ordinary ray.1_ To find the direction of the extraor- | SU! refraction is, therefore, performed by an original conjec- dinary ray, a plane perpendicular to the paper, and passing property of the rays. And it remains to be enquired, through C, must be drawn so as to touch the ellipsoid. Let whether the rays have not more original properties than e be the point of contact, which will in – | are yet discovered. Have not the rays of light several Pp , general not be in | #F& ¥' ; an aes the plane of the paper unless Aa is in or perpendicular sides, endued with several original properties?” to that plane; then AcE is the extraordinary ray. It is very curious to notice how near each of these

great Thus, in general, the extraordinary ray is not in the | Men came to the true explanation, and yet how long time plane of incidence. Also the ratio of the sines of the | clapsed before that explanation was found. The date of angles of incidence and refraction is generally different for Huygens’s work is 1690, that of Newton’s 1704. It was different directions of incidence, in the case of the | 2°t till 1810 that farther information on the subject was extraordinary ray. obtained. Z'hen one brilliant observation opened the way Images In an elementary article we cannot attempt more fully | for a host of discoveries in a new and immense field of y P y — ‘ to study these phenomena; so we merely state that all the | 0Ptcs. Icetaet. Observed appearances, so far as the directions of the spar, Se * Defined as passing through the shorter diagonal of one of the

1 This is merely a repetition of the construction we have already given for singly refracting bodies.

rhombic faces of the crystal, and through the edge formed by the two adjacent faces, 3 Optics, Queries 25, 26.

Polariza- tion by

| Trans: verse vibra- tions,

=—_

| Analogies,

Inter- ference of polar- ized rays,

Polar- izing angle,

reflexion.

In the last-mentioned year Malus, while engaged on the theory of double refraction, casually examined through a doubly refracting prism of quartz the sunlight reflected from the windows of the Luxembourg

palace. He was surprised to find that the two rays alternately disappeared as the prism was rotated through successive right angles, —in other words, that the reflected light had acquired properties exactly corresponding to those of the rays transmitted through Iceland spar. Even Malus was so imbued with the corpuscular theory of light that he named this phenomenon polarization, holding it as inexplicable on the wave theory, and as requiring a species of polarity (akin to the magnetic) in the light-corpuscles—a close reproduction of one of Newton's guesses.

But after a short time Hooke's old guess was independ- ently reproduced, and in the hands of Young and others, but most especially of Fresnel, the consequences of the assumption, that the vibrations of the luminiferous medium take place perpendicularly to the direction of the ray, were the almost complete explanation of the cause of double refraction, and the discovery (often the prediction) of a long series of the most gorgeous phenomena known to science.

The real difficulty in the way of this conception probably lay in the fact that most of the familiar forms of wave- motion—such as sound-waves in air or in water, and ordinary water waves—are not of this character. In sound-waves the vibrations are wholly in the direction of the ray, while in surface-waves in water they are partly parallel to and partly perpendicular to the direction in which the wave is travelling. That a body may transmit waves in which the vibration is perpendicular to the direction of a ray, it must have the properties of an elastic solid rather than of a fluid of any kind) And our experience of the almost entire absence of resistance to the planetary motion seems, at first sight at least, altogether incompatible with the idea that the planets move in a jelly-like solid, filling all space through which light can be propagated.

Without going into difficult dynamical details, we may obtain a notion of the nature of the motion now to be considered, by observing the propagation of a wave when a long stretched wire or string is struck or plucked near one end. Here the line of motion of each part of the wire is almost exactly perpendicular to the direction of the wire, @.e. to the

line along which the wave travels. (When the string is extensible there may be another wave, due to extension ; but this, which is analogous to sound, has its vibrations along the string, and it usually travels at a very different rate from the other, so that the two are not in any way associated).

Now it is clear that waves of this wholly transverse character can have, in Newton's language, sedes, And it is also clear that they cannot interfere so as mutually to destroy one another unless their corresponding sides are parallel to one another; nor can they interfere at all if their sides are perpendicular to one another. Hence a very severe test of the theory will be furnished by examining various cases of interference of polarized light, which ought to present in general marked differences from those of ordinary light. It was by experiments of this kind that Fresnel and Arago first firmly established the bases of the theory of polarization, The important fact discovered by Malus was soon generalized into the following state- ment :— '

Light reflected from the surface of substances so different as water, glass, polished wood, &c., at a certain definite angle, which depends on the nature of the substance, is found to possess all the properties of one of the rays transmitted through Iceland spar. If the plane of re-

flexion is parallel to the axis of the spar, the properties of the reflected light are those of the ordinary ray ; if perpendicular to it, those of the extraordinary ray.

It was reserved for Brewster to discover, as the resul of an extraordinary series of experimental measurements, the very siniple law which follows:—

The tangent of the polarizing angle is equal to the Brewster's refractwe index of the reflecting substance. law.

This may be put in another form, in which its connexion with theory is a little more evident :—

When the reflected ray is completely polarized, it is perpendicular to the refracted ray.

Bearing in mind Huygens's observations on light which has passed through two crystals of Iceland spar, we can now see that a ray of light polarized by reflexion is in general divided into two by a crystal of Iceland spar. But there is only one ray when the principal plane of the crystal is parallel to the plane of reflexion, and none when these planes are perpendicular to one another.

We may now much simplify matters by suppressing the Polarizer Iceland spar, and using two reflecting plates of glass, so and placed that a ray meets each of them in succession at the @™Ys™ polarizing angle, It is then found that when the planes of reflexion are parallel the ray is reflected (almost without loss) from the second plate, but when they are perpendicular to one another there is complete extinction.

In intermediate positions the intensity was found by Arago to be as the square of the cosine of the inclination of these planes.

This very simple experiment, which any one may easily make for himself, by putting two pieces of glass at the proper angle in the ends of two wooden tubes which fit into one another, enables us to form a general notion of the modification which is called polarization. The 'sides " of the reflected ray are obviously in, and perpendicular to, the plane of incidence ; for a ray can be reflected over and over again if the successive planes of incidence are parallel, but is stopped at once if one of them be perpendicular to the others.

Here, however, two new difficulties come in at once :— Diffi. (1) Are the vibrations of the reflected ray in, or perpen- culties dicular to, the plane of reflexion? (2) As ordinary sun or i the lamp light, reflected at the proper angle from a polarizing ney: surface, shows no variation of intensity when the azimuth

| of the plane of reflexion is changed, what can be then the

direction of its vibrations? These questions have not

yet been answered in a thoroughly satisfactory manner

Many important phenomena are explained in terms quite Plane of independent of the proper answer to (1); and, in others vibra- which do depend on the answer, the theoretical differences — wt between the results of the two hypotheses are so small raleiice- as to have hitherto remained undetected. Inan important tion. test, suggested by Stokes, the experimental results have

been at variance in a way not yet explained. It is quite possible that, as is required by Clerk Maxwell's edectro- magnetic theory of light (see EruEr), there may be simul- taneous displacements, but of different characters, in each

of these planes, and then the question would be reduced to—Which of these displacements is the luminous one}

But on this theory, both are probably essential to vision.

As to the second question, it may be said—irst, that, Nature so far as the test of double refraction can inform us, a °f com- polarized ray whose plane of polarization is made to rotate light. rapidly produces precisely the same effects as a ray of ordinary light ; and, secondly, that, so great 1s the number of vibrations even of red light in one second, it would be impossible to make the plane of polarization rotate fast enough to affect the circumstances of any of the phenomena of interference, even when they take place between two portions of the same ray, one of which is retarded

Reflex- ion not at the polar- izing angle.

Polar- ization by ordi- nary re- fraction.

Nicol's prism.

thousands of wave-lengtbs more than the other. But, thirdly, the fact that, when homogeneous light is used, Newton's rings have been counted up to the 7000th shows that, whatever be the actual nature of the vibrations of unpolarized light, they must for at least 7000 waves in succession be almost precisely similar to one another. Then, for other 7000 waves or so, we may have a totally different type of vibration. But, fourthly, in the course of +th of a second, at the very utmost, the vibrations must have been almost uniformly distributed over all directions perpendicular to the ray. Again, however, Jifthly, another quite different view may be suggested. All common light has its origin from a practically infinite number of sources, consisting of the vibrating particles of the luminous body. 'The contributions from each of these sources (so far as one definite wave-length is concerned) may be and probably are at any one point as different in direction of vibration as they certainly must be in phase.! From this point of view, which we cannot develop here, the uniformity of optical phenomena becomes quite analogous to the statistical species of uniformity which is now found to account for the behaviour of the practically infinite group of particles forming a cubic inch of gas. The reader need only think of the fact that, so numerous are those particles, it is practically (though not theoreti- cally) impossible that even a cubic millimetre of air should, even for yo$qpth of a second, contain oxygen particles alone.

When light is reflected at an incidence either less or greater than the polarizing angle, it behaves as if part of it only were polarized and the rest ordinary light; and it is said to be partially polarized. Tested by a crystal of Iceland spar, it gives two images in all positions of the crystal ; but their brightness is unequal except in the special positions where they would be of equal brightness were the ray wholly polarized.

From the fourth of the remarks made above regarding common light, and the facts of double refraction, it follows at once that, when light is to any extent polarized by reflexion, there must be an exactly equal amount of polarized light in the refracted ray, and its plane of polarization must be perpendicular to that of refraction. This was

established by experiment soon after Malus's discovery. But as the reflected ray from glass, water, &c., is in general much weaker than the refracted ray, the percentage of polarized light is generally much greater in the former. It was found, however, by experiment that refraction at a second glass plate parallel to the first increases the proportion of polarized to common light in the transmitted ray, and thus that light may be almost completely polarized by transmission, at the proper angle, through a number of parallel plates. The experimental data of this subject were very carefully obtained by Brewster. He has found, for instance, how the angle of incidence for the most complete polarization varies with the number of plates. The plane of polarization of such a bundle is perpendicular to the plane of refraction,

This, however useful on many occasions, is at best a rough arrangement for producing polarized light. By far the most perfect polarizer for a broad beam of light is a crystal of Iceland spar, sufficiently thick to allow of the complete separation of the two rays. But such specimens are rare and costly, so that the polarizer in practical use is now what is called Wicol's prism, invented in 1828 (Jameson's Journal, p. 83). By cutting a rhomb of Iceland spar in two, and cementing the pieces together with Canada balsam (after carefully polishing the cut faces), SS eee ee

bal curious exception occurs in the case of light radiated from a body which polarizes by absorption. See RADIATION.

LMG Eber

Nicol produced an arrangement in which one only of the two rays is transmitted, the other being totally reflected at the surface of the balsam. 'The reason is simply that the refractive index of Canada balsam is intermediate to those of the ordinary and extraordinary rays in the spar. The ordinary ray, falling very obliquely on a medium of a smaller refractive index, is totally reflected; the extra- ordinary ray, falling on a medium of greater, but very little greater, refractive power, is almost wholly transmitted. The only defect of the Nicol's prism is that, to secure the total reflexion, its length must be considerably

greater than its breadth; and thus it necessarily limits the diver- gency of the beam it allows to pass.

Certain doubly refracting crystals exert considerable Polar- absorption on one of the two rays they produce, and can ization therefore, when in plates of sufficient thickness, be he

: 5 : ption. employed as polarizers. This is the case with some specimens of tourmaline when cut into plates parallel to the axis of the crystal. It is also found in the flat crystals of several artificial salts, such as, for instance, iodo-sulphate of quinine.

Let us now suppose that by one or other of these pieces Two of apparatus, say a Nicol's prism, light has been polarized, Nicols, If we examine this ray by means of a second Nicol, placed

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unaltered. As the second Nicol is made to rotate, more and more of the light is stopped, till the rotation amounts to a right angle. 'Two well-constructed Nicols, placed in this position, are practically opaque to the strongest sunlight. During the next quadrant of rotation the transmitted ray gradually increases in brightness, until at 180° of rotation it passes practically unaltered. Precisely the same phenomena occur in the same order during the next half of a complete rotation. The reader will observe that this is merely Huygens's original statement, limited to

in a similar position to the first, it passes practically

one of the four rays which are produced by passing common light successively through two crystals of Iceland spar,

Whatever be the true mechanism of polarized light, Sym- there can be no doubt that its vibrations are symmetrical meee s with respect to the ray, and also with respect to the plane se of polarization. Hence we may, for many important . purposes, symbolize them by simple harmonic vibrations |

|

taking place either in or perpendicular to the plane of polarization. But, if they be supposed to take place simultaneously in these two planes, their quality or nature must be essentially different in the two, else the symmetry above referred to would be violated. Hence it will be sufficient for the present to assume that they take place perpendicular to the plane of polarization. The nature of the resulting effects, so far as the eye is concerned, will not be different for the different hypotheses. Also, as no instance has yet been observed, even with the most intense beams of light,’in which the joint effects observed are not those due to simple superposition, we may assume that the elastic force of the luminiferous medium, called into play by a displacement, is directly proportional to the displacement, and therefore that the vibrations for each wave-length follow the simple harmonic law, that of the cycloidal pendulum.

The subject of the composition of simple harmonic motions of equal period falls to be discussed as an im- portant branch of imematics (see Mucnantcs). We will therefore here assume the following results,—referring to the above-quoted article for their proof :—

1. Two simple harmonic motions of the same period, in Proper- lines perpendicular to one another, give, in general, elliptic pe a motion, which may be in the positive or negative direction ee | of rotation. motion.

2. The ellipse becomes a straight line, and the resultant motion therefore simple harmonic, when the phases of the

components are the same, or differ by an integral multiple of 7.

3. It becomes a circle when the amplitudes of the components are equal, and their phases differ by an odd multiple of $7. The motion takes place in one direction (say right-handedly) in the circle when this

multiplier is 1, 5, 9, 13, &e., and in the opposite (left-handed) when it is ma, 15, 15, &. ..

Now, suppose a plane polarized ray to fall on a plate of

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In what precedes, we have assumed that homogeneous White In general, a doubly-refracting plate light.

light was used. produces a difference of phase in its two rays which will depend on their wave-length; and thus when white light is used we have a display of colour, sometimes extremely gorgeous, and we may distinguish light thus circularly polarized from common light by slight changes of colour and intensity as the second Nicol is turned.

Hitherto we have spoken of the polarizing angle for light Effect of reflected in air from bodies such as glass, water, &c., which total have a higher refractive index than air, and we have seen ‘“¢*- that an equal amount of light is polarized in the refracted

Effect of) . j aplate of a doubly-refracting crystal (a thin plate of mica or selenite,

doubly for instance). Within the plate it will in general be refract- divided into two, which are polarized in planes at right

material, angles to one another. The directions of vibration in beam. But what if there be no refracted beam? This is these rays are determined by the physical properties of | the case of total reflexion inside the denser body. Fresnel the material. Let them be represented by the lines Oz, | discovered that in this case the two kindsof polarized light

Homo- Oy in fig. 35. Then, if OA represents the semiampli- | (in planes at right angles to one another) co-exist in the

geneous tude of vibration in the incident totally reflected ray, but that they differ in phase, and

light. ray, it may be looked on by (2) therefore in general recombine into elliptically polarized above as the resultant of two light. Guided by peculiar theoretical considerations, he simple harmonic motions of the was led to construct a piece of glass (Mresnel’s rhomb), Fresnel’s same period, whose semiamplitudes inside which light is twice totally reflected at a certain thom». are OM and ON, and which are in angle with the result that, if it be originally polarized in the same phase. Each of these a plane inclined at 45° to the plane of reflexion, the will pass through the plate of emergent light is circularly polarized. erystal unchanged. But one will, Reflexion from the surface of metals, and of very highly Metallic in general, travel faster than the refractive substances such as diamond, generally gives at reflex- other; for the essential cause of all incidences elliptically polarized light. Attempts have double refraction is the difference been made to determine from such effects the refractive of velocities of the two rays. The indices of metals and other opaque substances. These are portions of the two rays which all based upon theory, and cannot as yet command much simultaneously escape from the Fic. 35 confidence, With certain doubly-refracting substances the erystal, and which travel together ap ne light reflected at a definite angle is differently polarized, and outside it, will therefore differ ix phase. Hence, to find | sometimes even differently coloured, for different azimuths the nature of the transmitted light, we must recombine | of the plane of incidence. the vibrations in OM, ON, taking account of this dif- When a thin plate of doubly-refracting crystal, which Rings ference of phase. By (1) above the result will be in | gives a bright colour when placed between two Nicols, is and general elliptic motion. The ellipse will necessarily be | slightly inclined to the ray, the colour changes as the °Toss in one of the infinite number which can be inscribed in the | difference of phase of the two refracted rays is increased. — rectangle AA’BB’, whose construction is obvious. We | If, now, we take a plate of Iceland spar cut perpendicularly crystal, have then, in general, what is called edliptically polarized | to the axis, no colour will be produced by parallel rays

Ellipti- ight. ‘This degenerates (by (2) above) into plane polarized | passing through it perpendicularly, because both rays have

cally and light, whose vibrations are along OA or OA’ according as | a common velocity parallel to the axis ; but, if divergent

a the difference of phase is 0, 27, 47, &c., or 7, 37, 52, &e. | light be used, there is a gorgeous display of circular

ll And it will become cirewlarly polarized light if OM =ON | coloured rings surrounding the axis, which depends upon

ized = (1.2, if AOx=4r) and the difference of phase be an odd | the increasing retardation of the ordinary ray behind the

light, multiple of }7. By (3) above this will be right or left | extraordinary as their inclination to the axis increases,

handed, according to the value of the odd multiplier.

This conclusion from the assumption above made is fully borne out by experiment. When a plate of mica, of such a thickness as to retard one of the two rays a quarter of a wave-length more than the other, is interposed between two Nicols, we observe the following phenomena : —

If the Nicols were originally placed so as to extinguish the light, the introduction of the mica plate in general partially restores it. Now, let the mica plate be made to rotate in its own plane. The light vanishes for successive positions, differing by a quadrant of rotation, z.e. whenever the directions of vibration in the crystal coincide with the principal planes of the Nicols. In each of these positions the light from the first Nicol passes unchanged through the mica, and is therefore entirely stopped by the second Nicol. Half-way between these positions the light trans- mitted through the system is at its brightest ; and in these cases it is not altered in brightness by rotating the second Nicol. It is then circularly polarized, and in whatever direction the second Nicol is placed the component of the circular motion which is

ready to pass through it is of the Same amplitude. Here, then, is a case in which a Nicol (the second) cannot enable us to distinguish between com- mon light and light very seriously modified.

When the principal planes of the Nicols are at right angles, this system of rings is intersected by two black diameters, in these planes respectively. When the second Nicol is turned through a right angle, we have exactly the complement of the former appearance, 7.¢., a figure such that, if superposed on the former, it would give an uniform field of white light.

It is to be noticed that none of these phenomena can be observed without the use of the second Nicol. This arises from the fact that, where the vibrations in any direction interfere so as to destroy one another, those in the direction perpendicular to the former interfere so as to strengthen one another. The second Nicol enables us, to select one of these portions, and examine it independently of the other.

The only double refraction we have considered particu- Biaxal larly is that of Iceland spar, where everything is symme- crystals.

trical about the axis of the crystal. Such crystals, and they include as a rule all those of the second and third systems in CRYSTALLOGRAPHY (q.v.), are called uniaxal. Crystals of the first system are not doubly refractive. But it was one of the most valuable of Brewster’s discoveries that the great majority of non-isotropic substances are doubly refracting, and in general are biawxal, 2.¢., have two

Fresnel’s equally important axes inclined to each other at angles of

wave.

Conical refrac- tion.

Double refrac- tion due to stress.

Déppler’s

all values from 0° to 90°. The form of the wave-surface in such bodies was, at least very approximately, assigned by Fresnel. This forms one of the most brilliant of his many grand discoveries ; and it led to Hamiltou’s prediction of the existence of the two species of conical refraction, which was experimentally verified by Lloyd.

Fresnel also made the striking discovery that glass and other simply refracting bodies are rendered doubly refract- ing when in a state of strain. To this Brewster added the observation that the requisite strain might be produced by unequal heating instead of by mechanical stress, and also that unannealed glass is usually doubly refractive. Clerk Maxwell in 1873 (Proc. Roy. Soc.) showed that shearing stress in viscous liquids, such as Canada balsam, renders them temporarily doubly-refractive. This subject has been elaborately investigated by Kundt (Pogg. Ann., 1879).

The details of these subjects, with those of the polariza- tion of light reflected from small particles, the rotatory polarization produced by quartz, sugar, transparent bodies under the influence of magnetism, &c., must be deferred to Optics (PHYSICAL).

There is, however, one elementary point which must not be omitted here, as it is intimately connected with the wave-theory,—that is, the alteration which light undergoes in consequence of the relative motion of the source and spectator in the line of vision.

When a steamer is moving in a direction perpendicular

principle. to the crests of the waves, she will encounter more of them

in a given time if her course is towards them than if she were at rest, while, if she be moving in the same direction as the waves, fewer of them will overtake her in a given time than if she were at rest. Thesame thing is true of sound- waves. When an express train passes a level crossing at full speed, the pitch of the steam whistle is higher during

thé approach to and lower during the recess from the listener at the gate than it would be if the engine were at rest. The successive sound-pulses are emitted at the same intervals as before, but from points successively nearer to or farther from the listencr. Hence more or fewer ‘reach his ear ina given time. ‘The principle is precisely the same as that of Rémer’s observation of the frequency of eclipse of Jupiter’s satellites, which we have already given : the number of light-waves which reach the eye per second is increased if the source is approaching, and diminished if it be receding. We are now dealing with a phenomenon which occurs some 600,000,000,000,000 times per second instead of once every forty-two hours. Now, increased wave-frequency, with unaltered velocity of light, certainly implies shorter wave-length and most probably greater refrangibility, and vice versa. There is, undoubtedly, a weak link in this reasoning, due to our ignorance of the true nature of the luminiferous medium and of the species of vibration on which light depends. If we knew some- thing definite about the nature of the ether, and the mechanism of its vibrations, this weakness would be at least in part got rid of. Observation has not yet settled the question of the relative motion of bodies, the ether they contain, and the ether in free space.

This principle has been applied with success by Huggins and others to find the rate at which we are approaching to or receding from different fixed stars, and the rate of motion in solar cyclones; and it may even be applied, as was ingeniously suggested by Fox Talbot (B. A. Report, 1871), to determine (from the relative velocities of the compouents of a double star in the line of sight, measured by its aid) the distance of the star itself from our system.

The reader is advised to consult, in connexion with the whole of the second part of this article, the previous article ETHER. (P. G. T,)

LIGHTFOOT, Joun (1602-1675), an eminent rab- binical scholar, was the son of Thomas Lightfoot, vicar of Uttoxeter, Staffordshire, and was born at Stoke-upon-Trent in that county, on March 29, 1602. His school education was received at Morton Green near Congleton,

Cheshire, and in June 1617 he entered Christ's College, Cambridge, where he made great progress in Latin and Greek, and was reckoned the best orator among the undergraduates. After taking his bachelor's degree, he became for some time assistant master at Repton in Derbyshire; at the canonical age he received ordination, and shortly afterwards was appointed curate of Norton-under-Hales in Shropshire. There he attracted the notice of Sir Rowland Cotton, an amateur Hebraist of some attainments it would seem, who made him his domestic chaplain at Bellaport, and was the first to awaken his taste for rabbinical learning. Shortly after the removal of Sir Rowland with his family to London, Lightfoot followed him thither, but for some unexplained reason soon left the capital again, and, visiting his parents at Uttoxeter, took a solemn leave of them, having resolved ''to travel beyond the seas." An unexpected and pressing invitation induced him to change his determination, and to accept a charge at Stone in Staffordshire, where he con- tinued for about two years, and where, on May 21, 1628, he married Joyce, daughter of William Crompton of Stone Park, and widow of George Copwood of Delverne, Stafford- shire. From Stone he removed to Hornsey near London, for the sake of the library of Sion College, which he often had occasion to consult; his first published work, entitled Erubhin, or Miscellanies, Christian and Judaical, penned for recreation at vacant hours, and dedicated to Sir R. Cotton, appeared at London in 1629, During the summer

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and autumn of 1630 he lived at Uttoxeter, aud in September of that year he was presented by Sir R. Cotton to the rectory of Ashley in Staffordshire, where he continued to discharge his pastoral duties, and to prosecute his rab- binical studies, for the next twelve years. For the more uninterrupted pursuit of the latter he is said to have bought a small piece of land near his parsonage, and to have built upon it a small house "containing a study and withdrawing room below, and a lodging chamber above." "Here he closely followed his said studies with great delight and unwearied diligence, and did choose to lodge here very often, though it were so near to his family and parsonage house." In June 1642 he left Ashley for London ; the precise occasion

of the removal isnot known, but probably it arose out of the necessity for personal superintendence of the publication of his next work, A few and new Observations upon the Book of Genesis : the most of them certain ; the rest, probable ; all, harmless, strange, and rarely heard of before, which appeared at London in that year with a dedication to “my dear and loving countrymen of the county of Stafford, and other my friends residing in the city of London.” Soon after his arrival in the capital he became minister of St Bartholomew’s church, near the Exchange ; and in 1643 he was appointed to preach the sermon before the House of Commons on occasion of the public fast of March 29. It was afterwards published under the title of Hlias Redivivus, the text being Luke i. 17 ; in it a parallel is drawn between the Baptist’s ministry and the work of reformation which in the preacher’s judg- ment was incumbent on the parliament of his own day. Lightfoot was also one of the original members of the Westminster Assembly, which held its first formal meet-

ing on Saturday, July 1, 1643; his “Journal of the Proceedings of the Assembly of Divines from January 1, 1643 to December 31, 1644,” now printed in the thirteenth volume of the 8vo edition of his Works, is a valuable historical source for the too brief period to which it relates. He was assiduous in his attendance from the first, and, though frequently standing almost or even quite alone, especially in the Erastian controversy, exercised a material influence on the result of the discussions of the Assembly. In 1643 Lightfoot published 4 Handful of Gleanings out of the Book of Exodus, dedicated to the inhabitants of Bartholomew Exchange, and in the same year he was made master of Catherine Hall by the parliamentary visitors of Cambridge, and also, on the recommendation of the Assembly, was promoted to the rectory of Much Munden in Hertfordshire ; both appointments he retained until his death. In 1644 was published in London the first instal- ment of the laborious but never completed work of which the full title runs The Harmony of the Four Evangelists among themselves, and with the Old Testament, with an explanation of the chiefest difficulties both in Lan- guage and Sense: Part I. From the beginning of the Gospels to the

Baptism of our Saviour. The second part From the Baptism of our Saviour to the first Passover after followed in 1647, and the third From the first Passover after our Saviour's Baptism to the second in 1650. On August 26, 1645, he again had the honour of preaching before the House of Commons on the day of their monthly fast; in the discourse, which was afterwards published (A Fast Sermon, on Rev. xx. 1, 2), after controverting as erroneous and false the doctrine of the Millenaries, he goes on to urge upon the parliament various practical suggestions for the repression with a strong hand of current blasphemies ("I do hold it a truer point in divinity that 'errans conscientia liganda' than 'ligat'"), for a thorough revision of the authorized version of the Scriptures, for the encourage- ment of a learned ministry, and for a speedy settlement of the church. "TI rejoice to see what you have done in platforming classes and presbyteries, and I verily and cordially believe it is according to the pattern in the mount." In the same year appeared A Commentary upon

LIGHT

I. LIGHTHOUSE CONSTRUCTION.

a. primary and most important consideration relating

to the design and construction of a lighthouse tower which is to be built within the tide mark is the force of the waves which may be expected to assail it, and the directions and heights at which that force will act on the building. The great waves which are found in the open ocean cannot be generated in smaller seas, and, with a due regard to economy in construction, ought not therefore to be provided against. What is wanted is to ascertain in such shorter seas the height of waves in relation to the length of "fetch" in which they are generated, and next to determine their energy when on reaching the shore or a sunken rock, and so ceasing to be waves of oscillation, they enormously increase their destructive force by be- coming waves of translation. Full information as to these points and as to the marine dynamometer —an instru- ment used for ascertaining the force of the waves on an exposed surface—will be found in the article Hargzours, to which the reader is referred. It is enough here to state that the law of increase in

the height of waves was found by Mr T. Stevenson to be proportional to the square root of the distance from the windward shore, and that the greatest force recorded on rocks exposed to the ocean was 34 tons per square foot. The relative forces of summer

the Acts of the Apostles, chronical and critical ; the Difficulties of the text explained, and the times of the Story cast into annals. From the beginning of the Book to the end of the Twelfth Chapter. With a brief survey of the contemporary Story of the Jews and Romans (down to the third year of Claudius); and in 1647 he published The Harmony, Chronicle, and Order of the Old Testament, which was followed in 1655 by Zhe Harmony, Chronicle, and Order of the New Testament, inscribed to Cromwell, with an epistle dedicatory to his highness's honourable council. In the last-named year Lightfoot, who in 1652 had commenced doctor of divinity, was chosen vice- chancellor of the university of Cambridge, but continued to reside by preference at Munden, in the rectory of which, as well as in the mastership of Catherine Hall, he was con- firmed, through the influence of friends, at the Restoration. The remainder of his life was principally devoted to the production of the work by which his name now chiefly lives, the Lore Hebraice et Talmudice, in which the volume relating to Matthew appeared in 1658, that relat- ing to Mark in 1663, and those relating to 1 Corinthians, John, and Luke, in 1664, 1671, and 1674 respectively. Towards the close of 1675, while travelling from Cambridge to Ely (where he had been collated by Sir Orlando Bridgman to a prebendal stall), he caught a severe cold, upon which, by an indiscretion in diet it is said, fever supervened ; falling afterwards into a lethargy which con- tinued for about a fortnight, he died at Ely on December 6, 1675. The Hore Iebraice et Talmudice impense in Acta Apostolorum et in Ep. S. Pauli ad Romanos were published posthumously.

The Works of Lightfoot were first edited, in 2 vols. fol., by Bright and Strype in 1684; the Opera Omnia, cura Texelii, appeared at Rotterdam in 1686 (2 vols. fol.), and again, edited by Leusden, at Franeker in 1699 (8 vols. fol.). A volume of Remains was published at London in

1700. The Hor. Hebr. et Talm. were also edited in Latin by Carpzov (Leipsic, 1675-79), and again, in English, by Gandell (Oxford, 1859). The most complete edition is that of the Whole Works, in 18 vols. 8vo, edited by Pitman (London, 1822-25). It includes, besides the works already noticed, numerous sermons, letters, and miscellaneous writings; aud also The Temple, especially as it stood in the Days of our Saviour (Lon- don, 1650).

HOU Ss

and winter gales were found to be as 1 to 3, and the vertical force, after acting on a curved sea wall, was eighty- four times greater than the horizontal force at a height of 23 feet above high water.

The history of the ancient lighthouses is of so scanty a nature that we may pass at once to more modern works, commencing with Winstanley's Eddystone light.

Winstanley's Eddystone Light.—The Eddystone Rocks, which lie about 14 miles off Plymouth, are fully exposed to the south-western seas. The lighthouse was completed by Winstanley in four seasons. In 1698 it was finished at a height of 80 feet and the light exhibited; but in 1699, in consequence of damage by storms, the tower was increased by an outer ring of masonry 4 feet thick, and made solid from the foundation to nearly 20 feet above the rock. The height was increased to nearly 120 feet, and completed in 1700. During the well-known hurricane of 20th November 1703 the tower was destroyed. In general design as well as in details this work must be placed among the vetanda of maritime engineering. For example, in plan it was polygonal instead of circular. In his blind devotion to ornamentation Winstanley violated throughout the principles of uniformity of outer profile so as to present great obstructions to the action of the waves.

Rudyerd's Eddystone Tower.—This work was commenced

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in 1706 and completed in 1709, in the form of a frustum of a cone 92 feet high. The work consisted principally of timber, the lower part being oak carefully bolted together, and also to the rock. Above the lower structure of oak courses of stone, cramped together and fixed to the timber work and to the rock, were added in order to give weight to the structure. This lighthouse stood for forty-six years, and was destroyed by fire in 1755. In every respect the simplicity of the structure and the judicious character of the details of the design may be regarded as models of engineering. First, it rested upon a stepped level base, was circular in plan, did not wholly depend upon fixtures but upon weight, preserved a uniform external surface devoid of outside projections and ornamentation; and, above all, the engineer did not by splaying out the base needlessly throw away the small diameter which the rock afforded, but with much judgment adopted the conical form.

Smeaton's Hddystone Tower.—This justly celebrated work, which consisted entirely of stone, was commenced in 1756, and the masonry was finished in 1759. Smeaton was the first engineer who adopted a structure of masonry for a sea tower and dovetailed joints for the stones, which averaged a ton in weight. This work cannot be regarded as a safe model for general imitation in exposed situations, and Rudyerd's earlier tower was certainly as successful in resisting the forces to which it was exposed. Rudyerd unquestionably selected for so small a rock as the Eddystone a preferable form to that adopted by Smeaton. The sharply curved profile in Smeaton's design greatly reduced the diameter of the . seis building at a small height above the rock, and so re- duced its strength. Smeaton's reasoning about tue similarity of a tower exposed to the surf and an oak tree resisting the wind was very conclusively shown to be fallacious by the late Mr Alan Stevenson. The arching of the floors, as shown in fig. 1, was also a source of weakness which the introduction of the iron chains, shown black in the diagram, was intended to counteract. Mr Douglass in 1878 stated that "for several years the safety of the Eddystone had been a matter of anxiety and watchful care to the corporation of the Trinity House, owing to the great tremor of the building with each wave stroke." He also stated that the projecting cornice at the top had been lifted, and that the rock itself had

been considerably undermined. A new tower has now |

(1882) been erected in place of Smeaton’s by Mr Douglass. Bell Rock Lighthouse Tower.—The Bell Rock, which lies 12 miles off the coast of Forfarshire, is fully exposed to the assaults of the German Ocean. The rock is of considerable extent but of a low level, the tower being covered about 16 feet at high water of spring tides. Mr R. Stevenson, of Edinburgh, when he first landed on the rock, decided to adopt a stone tower as Smeaton had done at the Eddy- stone, but he deviated largely from that design in the Fhickness of the walls, >a ZZ in raising the tower to pz OM A, 100 feel aatsnd of 68 2 aay feet, and the level of the solid to 21 feet above high water instead of 11 feet.

Fig. 2.

Instead of employ- ing arched floors as at the Eddystone, he adopted lintel stones for the floors which formed part of the outward walls, and were feathered and grooved as in carpentry, besides having dovetailed joggles across the joints where

they formed part of the walls. It will be seen on fig, 2 that the floors instead of being sources of weakness, as in Smeaton’s tower, were converted into effective bonds tying

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the walls together. He also used a temporary beacon or barrack on the rock for the engineer and his workmen to live in while the tower was in progress. The bill intro- dueed into parliament for this work in 1802 was not passed in consequence of financial difficulties. As the Bell Rock was scarcely dry at low water, while the Eddystone was scarcely covered at high water, the commissioners, in order to fortify Mr Stevenson’s views, consulted Mr Telford, and before going to parliament for the second time they also, on Mr Stevenson’s suggestion, obtained for the scheme the support of Mr Rennie, with whom he could afterwards advise in case of emergency during the progress of the work. The second bill was passed in 1806, and the

works, which were begun in 1807, were finished in 1810, and the light was exhibited in 1811. The total weight of the tower is 2076 tons.

Skerryvore Lighthouse.—The Skerryvore Rocks, 12 miles off the island of Tyree in Argyllshire, which is the nearest land, are wholly open to the Atlantic. The works, designed and carried out by the late Mr Alan Stevenson, were com- menced in 1838 and finished in 1843. The first tem- porary barrack was destroyed in 1838, and another erected on a more sheltered part of the rock. The tower, which is of a hyperbolic curve, is 138 feet high, 42 diameter at the base, and 16 at the top. Its weight is 4308 tons.

Lishop Rock.—The Bishop Rock, lying off the Scilly Islands, is fully exposed to the Atlantic. It was designed by the late Mr James Walker, and carried out by Mr J. N. Douglass. It is 100 feet above high water, 34 feet in diameter at the base, and 17 at top. The lowest part of the foundation of tower is covered about 19 feet at high water springs ; the solid is 20 feet above high water, where the walls are 9 feet thick, and decrease to 2 feet at the top. Owing to the great tremor in this building, it has lately been found necessary to strengthen it by an internal structure of ironwork.

Wolf Lock.—This much exposed rock is about midway between Scilly and the Lizard Point, and is submerged to the depth of about 2 feet at high water. The first design for a lighthouse was in 1823, by Mr R. Stevenson, but it was not till 1862 that a lighthouse was commenced under the superintendence of Mr Douglass, from a design by the late Mr Walker. It is 1164 feet high, 41 feet 8 inches diameter at the base, decreasing to 17 at the top, and the walls are 7 feet 94 inches thick, decreasing to 2 feet 3 inches. The shaft is a concave elliptic frustum, and contains 3296 tons. The Jower part of the tower has projecting scarcements in order to break up the sea, but, as has been already stated in the case of the Eddystone, such projections are not in accordance with the principle of uniformity of external surface, and are, therefore, more likely to produce disturbance of the masonry than to add to its stability.

Dhu Heartach Rock Lighthouse—The Dhu Heartach Rock, which is 35 feet above high water, is 14 miles from the island of Mull, which is the nearest shore. The maximum diameter of the tower, which is of parabolic outline, is 36 feet, decreasing to 16 feet; the shaft is solid for 32 feet above the rock; the masonry weighs 3115 tons, of which 1810 are contained in the solid part. The temporary barrack for the workmen was made of malleable iron bars with an iron drum on the top in which the workmen lived. This tower was designed by Messrs D. & T. Stevenson, and occupied six years in erection, the length of the working season being only about two and a half months in each year.

Chickens Rock Lighthouse.—The Chickens Rock lies 1 mile off the Calf of Man. The curve of the tower, which is 123 feet 4 inches high, is hyperbolic, the diameter varying from 42 feet to 16 feet. The tower issubmerged 5 feet at

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high-water springs. The solid is 32} feet in height, weighing 2050 tons, the whole weight of the tower being 3557 tons. ‘The walls decrease from 9 feet 3 inches to 2 feet 3 inches in thickness. The work was designed by Messrs D. & T. Stevenson, and was begun in 1869 and completed in 1874.

Great Basses Lighthouse near Ceylon.—Great Basses lighthouse lies 6 miles from the nearest land, and was designed by Mr Douglass. The tower has a cylindrical base 32 feet in diameter, above which is a tower 67 feet 5 inches high and 23 feet in diameter. The walls vary in thickness from 5 feet to 2 feet. The tower, including the base, contains about 2768 tons, and the work was finished in three years.

There are several other lighthouses in Ircland, India, and America which merit more attention than our space admits of, and we shall therefore conclude with directing the attention of the engineer to the important influence of the configuration of rocks in modifying the breaking of waves. It cannot but excite surprise that some of the structures which were erected on the Eddystone should have withstood the waves so long as they did. This fact seems to lead to the conclusion that the Eddystone Rock, at one time at least, acted to some extent as a shelter to the structures which were built on it. During a summer gale when Dhu Heartach lighthouse was being erected fourteen stones each of 2 tons weight, which had been fixed on the tower by joggles and Portland cement at the level of 37 feet above high water, were torn out and swept off into deep water, as shown on Plate VII. At the Bell Rock stones of 2 tons weight were several times swept away during the construction of the tower, while it is a remarkable fact that no stones were ever moved at the Eddystone. But what is more striking, the thin glass panes of Winstanley's first tower stood successfully through a whole winter's storms at the same level above the water as that at which the fourteen heavy blocks wére swept away at Dhu Heartach, where it was found necessary from the experience acquired when constructing the light- house to raise the solid base of the tower to nearly the same height above the water as the glass panes in Smeaton's tower, which have hardly ever been broken during the storms of more than a hundred years.

The conclusion then which seems fairly deducible from these facts is that the level of the plane of dangerous impact of the waves above high water depends upon the relation subsisting between their height and the configuration of the rocks above and below high water, as well as perhaps on the configuration of the bottom of the sea near the lighthouse. Thus, while the rock at Dhu Heartach, from its height above high water, forms a great protection against the smaller class of waves, it operates as a dangerous conductor to the largest waves, enabling them to exert a powerful horizontal force at a much higher level than they would had the rock been lower. The lighthouse engineer must therefore beware of taking it for granted that Smeaton's Eddystone tower is a model for general imitation, and must carefully

consider as best he can in what way the configur- ation of the rock may affect the stability of the tower which he has to design. Unfortunately in the present state of our information no specific directions can be laid down for his guidance in this matter, but the following general rules

of construction may be given:—

(1) The tower should have a low centre of gravity, and sufficient mass to prevent its being upset by the waves. (2) It should be throughout circular in the horizontal plane, and either straight or continuously curved in the vertical plane, so as to present no abrupt change of outline which would check the free ascent of the rising waves, or the free descent of the falling waves, or the free Vent of those passing round the tower. All external scarcements

m the vertical plane, or polygonal outline in the horizontal plane,

are therefore objectionable. (3) Its height, cetcris paribus, should be determined by the distance at which the light requires to be seen by the sailor. The rule for determining this height will be afterwards given. (4) Where the rock is soft, or consists of ledges which are easily torn up, the tower should spring from the foun- dation-course at a low angle with the surface of the rock, so as to prevent its being broken up by reaction of the waves from the building ; or, in other words, the tower must have a curved profile. But special care should be taken to sink the foundation-courses below the surface of the rock, as the superincumbent weight decreases with the sine of the angle of inclination of the wall. If the rock overhangs, owing to the wearing action of the waves, the tower should, if possible, be built at a distance from the place where this dangerous action is in progress. (5) Where the rock is hard and of ample area, the tower may be of such a curved form as will best suit the economic arrangement of the materials, so as to avoid an unnecessary thickness of the upper walls. (6) When the rock is hard, but of small dimensions, the diameter above the base should not be suddenly reduced by adopting a curved rofile, but a conical outline should be adopted ; and if the rock be hard, but of yet smaller dimensions, a eylindrie form of greater height should be adopted so as to thicken the walls, and to increase the weight and

therefore increase the friction, which is directly proportional to the weight of the blocks of masonry. In all cases where the rock is small the thickness of the walls should be decreased by steps or scarcements internally, but never externally. (7) The level of the top of the solid part of the tower, and the thickness of the walls above it, should, in different towers having the same exposure, be determined in each case by the level and configuration of the rock and of the bottom of the sea. (8) The best position for the tower is not necessarily the highest part of the rock. It should, in each case, be selected so as to secure the greatest protection in the direc- tion of the maximum fetch and deepest water near the reef. (9) The tower should not, if possible, be erected across ahy chasm which divides the rock, or in the direction of any gully which projects into it, especially if it be of converging form, oak would concentrate wave action. (10) No permanent fixture of the tower to the rock is required for te the stability of the structure. The foun- dation-course (unless where a curved profile is adopted) becomes, indeed, in the end the most stable of all, because it has the greatest weight above it, to keep it in its place. (11) The stones should, however, be sufficiently eonneeted together, and fixed to the rock, in order to prevent their being washed away during the construc- tion of the work, when they have no superincumbent weight to keep them in their beds. (12) The tower should rest on a truly level base, or on level steps cut in the rock. (18) The pressure of all the materials within the tower should act vertically so as not to produce a resolved force acting laterally as an outward thrust. (14) The tower should be of such height and diameter, with walls of such thickness, as to prevent the masonry being disturbed by the impact of the waves, (15) The entrance door should be placed on that side of the tower where the length of fetch is shortest, or where from the eonfiguration of the reef and the depth of water, the force of the waves is least. This was determined at the Bell Rock by the distribution of the fucus which grew on the lower parts of the tower dur- ing the first winter, the vege- tation being least where the waves were heaviest. (16) The materials should be of the highest specific gravity that can be readily obtained, and, in some special cases, lead, or dove-tailed blocks of cast iron set in cement, might perhaps be employed.

Plate VII. shows sec- tions on the same scale

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more remarkable light- ———fal//

house towers. AT Fig. 3 shows an iron -~—-f¥4

pile light erected s Haneda, in the Bay of -—l Yedo, Japan. Fig. 3.

Modes of Uniting the Stones and Courses of Masonry.— Fig. 4 (p. 618) shows the mode of combining the stones during construction at different lighthouses in the United Kingdom and in America.

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618 EIGHTH Us Ek

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Eddystone Floor,

Chickens, 6th Course.

SCALE OF THE COURSES. oe 20

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Fia, 4,.—Courses of various Lighthouse Tewers.

Il. LIGHTHOUSE ILLUMINATION.

What is required of every lighthouse apparatus is either the equal distribution of the rays constantly or periodically over the whole horizon, or else their unequal distribution over certain azimuths only.

The first of these two cases, viz, the equal distribution of the light, will be best understood by explaining the

different manner in which the rays are operated on by the .

apparatus for a fixed light and by that for a revolving light. The characteristic of a fixed light, which is that of being seen constantly and always of the same power round the whole horizon, might no doubt be perfectly produced by a naked flame without any apparatus, but then all the rays which did not fall on the navigable track of shipping would be lost to the sailor. In order then to intercept and utilize those rays which, instead of falling on this navigable track, would either go upwards to the sky or downwards on the shore close to the lighthouse tower, and on that part of the sea which is very near the shore, we must have recourse to optical agents both for bending down the rays which naturally point too high, and for bending up those which point too low. It thus appears that the apparatus for a fixed light should bend the rays in the vertical plane only, but should not interfere with their natural horizontal divergence in azimuth.

The demands which are made on a light that has to revolve are not nearly so great as on one that is fixed, for the revolving light does not, like the fixed, require to illuminate the whole horizon simultaneously, but only each point of it at successive intervals of time. When the dark intervals occur, the rays from the flame which are then pointing in the direction of the dark spaces should therefore have their directions so altered laterally as to pass into the adjoining light spaces and thus to increase the power of the luminous flashes. A revolving light, though supplied by a flame of the same power as a fixed, will thus necessarily be far more intense, as it does not lose its power by diffusing the rays constantly over the whole horizon, but gathers them up into a number of separate bundles or beams of great intensity. The apparatus of a revolving light has consequently more optical work to do than that of a

fixed, for the rays must be bent not only in the vertical plane but laterally in the horizontal and in all intermediate planes as well.

In the construction of lighthouse apparatus either metallic or glass agents may be employed, but it has been found by experiments that a great saving of light (about 25 per cent.) is effected when glass only is used. All kinds of apparatus may conveniently be ranged either under the catoptric system, where metallic reflexion only is used, the dioptric where the material employed is wholly glass producing refraction and total reflexion, or the catadioptric, in which both glass and metal are employed.

CaToPpTRic SysTEM of Illuminating every Azimuth with Light of equal Power cither Constantly or Periodically.

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Passing over the early and rude expedients of such night marks Catoptric |

as open eoal fires or naked candles placed in glazed lanterns, we system

shall confine our attention to the gradual development of those optical designs whieh are now or were lately adopted for lighthouse ap- paratus.

Parabolic Refice- tors.—In 1768, or at latest before 1777, parabolie re- fleetors were first used for lighthouse ~ OAs illumination by Mr Fig. 5. Fig. 6. Hutehinson, doekmaster of Liverpool. In his work on Practica Seamanship, published in 1777; he states that the Mersey lights were fitted with reflectors (figs. 5 and 6) formed of small facets of silvered

Arrange- ment of reflec- tors.

Fanal sidéral,

glass, and made, as he says ‘‘as nearly as they can be to the parabolie eurve.” This is unquestionably the earliest published notiee of the use of parabolie refleetors for lighthouse illumination. Up to 1782 the wieks of the lamps were of a fiat form, but in that year Argand introdueed wieks and burners of a hollow eylindrie form whieh admitted a eentral eurrent of-air through the burner so as to ignite the eone of gas issuing from the wiek both within and without. Seon afterwards split up the eone of gas into several eoncentrie shells.

‘It is remarkable,” says Mr J. T. Chance in his exeellent memoir (Min. Ins, Civil Eng., vol. xxvi.), ‘* how many inventors have contributed their respeetive parts to the multiple burner: — Argand, the double eurrent ; Lange, the indispensable eontraetion of the glass ehimney; Careel, the mechanism for an abundant supply of oil; and Count Rumford, the multiple burner, an idea made feasible by these eontrivances, and finally realized by Arago and Augustin Fresnel.”

Optical Properties of the Parabolie Reflector.—In the parabolic refleetor all rays diverging strietly from the focus and falling on the

araboloid emerge in one beam of parallel rays. But as an oil light is not a mathematical point, but an objeet of considerable magni- tude, the rays from the outside of the flame being exfoeal will, after reflexion, emerge as a cone whose divergence is directly pro- portional to the radius of the flame and inversely to the foeal dis- tance of the refleetor. Its intensity must eonsequently vary as the squares of the distanees from the lighthouse. Optical apparatus does not then prevent that divergenee whieh is due to the flame being of sensible magnitude.

Defeets of the Paraboloid.—It will be seen from fig. 7 that the parabolie mirror a@ is at best but a very imperfeet instrument, for even if the radiant were strictly a mathematieal point, the eone of oh (shown undotted) eseaping past the lips of the mirror must be os

Fia. 7.—Vertical Seetion. Fia. 8.—Plan.

Mode of Employing Reflectors for Fixed and Revolving Lights.—In order to produee, on the eatoptrie system, a fixed light showing all round the eircle, a number of refleetors (0, 0, 0, fig. 8) are fixed round the outside of a stationary ehande- lier », As the ordinary paraboloid has abont 14° of divergenee, twenty-five re- fleetors were needed to light up continu- ously (though not equally) the whole horizon, If again the light was to revolve, then a revolving chandelier (figs. 9 and 10) was employed having a eertain number of flat faces, on eaeh of whieh was fixed a number of separate lamps and refleetors with their axes parallel to each other. When the chandelier revolved, and one of the flat sides was turned towards the sailor, he would, when at some distanee from the shore, receive a flash at once froin each of the mirrors whieh were on that face, but when the faes was turned away from him a dark period would intervene until the next face eame round again.

Bordier Mareet's Fanal Sidéral, 1819.—In order strietly to equalize a fixed light over x the whole horizon, whieh could not possibly be done with separate reflectors, Mareet proposed this ingenious instrument, whieh. 1s generated by the revolution of the para- bolie profile pp' (fig. 11) round its para- meter as a vertical axis, instead of round a horizontal axis, as in all former refleetors. The vertices of the parabola are eut off, so| as to permit of a eommon foeus for the flame. The rays will therefore be refleeted parallel to the. horizontal axis in the vertieal plane, while the natural divergence of the light in azimuth will not be interfered with. By this excellent contrivanee the light was for the first time spread equally round the horizon in one continuouszone. But even though the radiants were reduced to a mathematical point, very

Fig, 10.— Plan.

many of the rays (shown in hard lines in the elevation, fig. 11) are allowed to eseape past the lips of the reflector, and this loss takes place all round the eircle.

Fig. 11.

DiorTric SYsTEem.

Beginning in 1822, Augustin Fresnel, the eminent physicist and Dioptric mathematician, entirely revolutionized the previously existing light- system. house system by means of his annular lenses, eylindrie refractors, and totally refleeting prisms. Before deseribing these and their eombinations it is neeessary to state that the size of the flame pro- duces divergence with lenses as well as with refleetors. The measure of this divergence for any point of the lens is the angle whose sine

1s Radius of flame

Distance of point from centre of flame

Fresnel's Optical Agents,

Annular Lens, 1748-1822. —Buffon in 1748 suggested a new form Fresnel's of lens for burning purposes in order to save the loss of heat by annular absorption of the sun's rays in passing throngh a thick lens of large lens. size whose outer profile is eontinuously spherieal. He proposed to grind out of a solid piece of glass a lens in steps or coneentric zones in order to reduee the thicknes3 to a minimum (figs. 12 and 13). Condoreet, in his Eloge de Buffon, in 1778 (Paris edition, 1804, p.°35) pro-

osed the eapital improvement of / utidinge up Buffon's stepped lens in } separate rings, and pointed out that } the eutting of the surface into steps \, had the effeet of eorrecting toa large . extent the spherieal aberration, or 3 divergenee from the parallel, of the r rays emitted by any continnonsly ms 12,— Fic, 138.— spherieal lens. Sir D. Brewster, in ection. Elevation. 1811, also described the same plan. But both these writers designed their lenses for burning purposes only, and not for operating on light, while all the surfaces of their lenses were spherical, In 1822 Fresnel construeted a built-up lens for lighthouse purposes, in which the centres of enrvature of the different rings reeeded from the axis according. to their distanee from the centre, so as prac- tically to eliminate spherical aberration, the only spherieal surfaee left being the

small eentral part a (fig. 13). These lenses are used for revolving lights only.

Cylindrie Refractor.—This instrument was introduced by Fresnel Cylindric for effeeting dioptrieally by refraction in front of the flame what refractor. had been done before eatop- trically by Mareet's refleetor by reflexion from behind the flame. It eonsisted of a zone or hoop of glass (figs. 14 and 15) generated by the revolution round a vertieal axis of the middle section of the annular lens just de- seribed, whieh lens, on the other hand, being generated by the same profile round a horizontal axis, parallelized the rays in every plane, whereas the eylindric re- fraetor does so in the vertical plane only.

Totally Reflecting Prisms. —Fresnel next coneeived the admirable improvement of employing the principle of "total" or internal re- flexion by glass prisms. The ray Fi (fig. 16) falling on a f ane prismoidal ring, ABC, is refracted and bent in the direction 7R, and falling on the side AC, at an angle of ineidence greater than the eritieal, is totally reflected in the direction Re, and, impinging on the side BC at ¢, it undergoes a second refraction, and emerges horizontally. The highest ray FA after refraction by AB and reflexion by AC must (in order to avoid superfluous glass) pass

Prisms.

Fig. 15.—Vertieal Section.

Central lamp.

Cata- dioptric fixed light.

Dioptric fixed light.

along AR, and after a second refraction at B emerge horizontally. The lowest ray FB after refraction by AB must, for like reason, pass along

BC, and after reflexion by AC and a second refraction by BC also emerge horizontally.

livery other ray incident on the — a prisms between A and B is, ae, after one reflexion and two re- Sd ‘ zs

fractions, emitted horizontally. Re aff

Straight Refracting Prism.— hat Fresnel’s straight refracting if prism which refracts the rays Fig, 16 that fall on it, but in one plane Dag ; only, requires no further explanation, as it is simply a straight prism of the same horizontal cross section as one of the prisms of his cylindric refractor, so as when placed in front of his fixed ap- paratus to produce a beain of parallel rays like a lens.

Great Central Lamp.—We will now go on to describe the manner in which Fresnel utilized the four new optical agents which he originated, by first referring to his central burner system. In all lighthouses prior to 1822 the mode of getting up the required power was by employing a sufficient number of separate reflectors, each of which (unless we except Bordier: Marcet’s mirror) required its own separate lamp. Instead of numerous independent lamps and talloctors, Fresnel used a single lamp which had four concentrie wicks, and was fed with oil by a pump worked by clock work. Surrounding this burner was a stationary cylindric refractor for a fixed light, and annular lenses ~evolving outside of it for a revolv- ing light.

an o F a

Fresnel’s Combinations of his Optical Agents.

Catadioptrice Fixed Light.—This apparatus (figs. 17 and 18), in which a central burner is used, consists of a dioptric cylindric refractor with zonés of silvered mirror above and below similar in profile to Bordier Marcet’s reflector. By the adoption of the

Fic. 17.—Section. Fic. 18.—Plan.

refractor the whole of the wasteful divergence which occurs in Marcet's reflector is prevented. We have here a geometrically perfect combination, but it is not so physically, because metallic oe is used. This physical defect Fresnel obviated in his next esign. Dioptric Fixed – Light.—First Application of Total Reflexion to Fixed Lights.—In this apparatus Fresnel substituted his totally

Tag

19.— Elevation.

Fre. Fic. 20.—Vertical Section.

reflecting prism p and lens R for Marcet's reflector, and thus distributed the whole light equally over the horizon by means of dioptric agents alone. This was the first application of total

LIGHTHOUSE

reflexion to lighthouse apparatus, and this beautiful instrument continues till now in universal use. Figs 19 and 20 represent an elevation and section of this apparatus.

Fresnel's Revolving Light.—\n this form of revolving light (fig. Revolv- 21) the central burner is surrounded by annular lenscs L, and ing light, a compound arrangement as of inclined _ trapezoidal lenses L' and plane silvered mirrors M. 'The inclined lenses fit closely to each other and form a pyra- midal dome, and the light, intercepted by them, is sent upwards in inclined beams until, falling upon the plane mirrors M, it is sent outwards in horizontal parallelized beams. All these optical agents are made to revolve round the central lamp, and the sailor receives a full flash when the axis of one of the emerging beams passes his eye, and as soon as it ------- passes him he is in dark- ness until the next beam comes round. This de- ------x sign, unlike that of his fixed light, is imperfect on account of the employ- ment of metallic reflexion, and because two agents are employedfor all except the central portion of the rays.

Fixed Light varied by

Fic. 21.—Vertical Section.

= Fixed

Flashes. —T his distinction light (figs. 22 and 23) Fresnel | With produced by placing his flashes,

straight refracting prisms y on a revolving frame outside of his fixed light apparatus rr, so that when the upright prisms come in line with the observer the light is in- creased to the power of the revolving light, a broad flash as in the annular lens being produced in place of a narrow strip of rays as in the unassisted fixed light.

Fra, 23.—Vertical Section.

Alan Stevenson’s Improvements.

Mr Stevenson was the first to introduce the dioptric system into Alan Britain, and in doing so he made the following improvements. Stevens

1. Refractor of a Truly Cylindrical Form.—Owing to difficultics son’s im- in construction, Fresnel] adopted a polygonal instead of a cylindric prove- form for his refractor, but Mr Stevenson succeeded in getting Messrs ments. Cookson of Newcastle to construct a first order refractor of a truly cylindric form.

2. Helical Glass Joints for Fixed Lights.—Mr Stevenson further improved the apparatus by constructing the refractor in rhomboidal instead of rectangular pieces (figs. 24 and 25), thus producing helical joints and preventing serious obscuration of the b light in any azimuth.

38. Helical Metallic Framings.—The internal metallic frame work for supporting the upper cupola of prisms was also, for the same reason, made by him of a helical form.

4. Diagonal Framed Lantern.—The astragals : or sash bars of the lantern Vertical were likewise made dia- Section. gonal and

constructed of bronze instead of iron in order to reduce their sectional area. A,small harbour light with inclined astragals was made in 1836 by Mr E. Sang. Mr Stevenson also prepared a design in 1846 for Start Point, Orkney, in which he extended the helical arrangement to the astragals, but it was never carried out. Mr Douglass independently designed and afterwards carried into practice this form of lantern.

Alan Stevenson's Improved Revolving Light for Skerryvore.— Tn 1835 Mr Stevenson, in a report to the Northern Lighthouse Board, proposed to add fixed reflecting prisms p (fig. 26) below the lenses of Fresnel's revolving light, and he communicated this proposal to M. LL, Fresnel, who approved of his suggestion, and

Cc a

Fic. 24.—Ele- vation.

ad

Fria, 25.—

Holo- photal system.

Cata- dioptric holo- phote.

assisted in carrying out the design in 1843. This combination added, however, but little to the power of the flash, and produced both a periodically flashing and constantly fixed light; but it must be remembered that the prism for fixed lights was the only kind of reflecting prism then known. The combination of trapezoidal lenses and mirrors wag also, for the same reason, still used. The prisms for Sker- ryvore were the first that were made of the large size (first order), and were constructed by M. Soleil at Paris under the superintendence of Leonor Fresnel, the successor of his brother Augustin, then deceased. Besides the designs which have been described for improv- ing Fresnel's revolving light, there were many

others, among which may be mentioned those of Leonor Fresnel, Sir David Brewster, W. H. Barlow, F.R.S., A. Gordon, Lepaute, Letourneau, Reynaud, and Tabouret ; dint . but in all these, as well as in Fic. 26.—Vertical Section, those which have been described, the rays were either not parallel- ized in every plane or else unnecessary agents were resorted to for that purpose.

T. Stevenson's HoLoPHOTAL System.

It was not till 1849-50 that the problem was first solved of condensing the whole sphere of rays diverging from a flame into a single beam of parallel rays without any unnecessary reflexions or refractions.

Catadioptrie Holophote.—In figs. 27 and 28 part of the anterior hemisphere of rays is intercepted and at once varallelized by the

Fia. 27.—Vertical Section. Fic, 28.—Front Elevation.

lens L, whose principal focus (i.¢., for parallel rays) is in the centre of the flame, while the remainder is intercepted and made parallel by the paraboloid a, and thus the double agents in Fresnel's design are dispensed with. he rays of the posterior hemisphere are re- flected by the spherical mirror } back again through the focus, whence passing onwards one portion of them falls on the lens and the rest on the paraboloid, so as finally to emerge in union with and parallel to the front rays. This was the first instrument which intercepted and parallelized all the rays proceeding from a focal point by the minimum number of agents. It is therefore geomctrically per- fect, and was called by Mr Steven- son a holophote, but it is not physi- cally so, for it employs metallic reflexion, and with an ordinary oil flame and burner some of the rays reflected by the spherical mirror would fall upon the burner and be lost. This instrument was first employed at the North Harbour of Peterhead in 1849.

Holophotal Catadioptrie Appa- ratus Revolving round a Central Flame. —If in place of Fresnel's compound arrangement of trape- zoidal lenses and plane mirrors there are substituted mirrors R, R (fig. 29) generated by the revolu- tion of a parabolic profile round a horizontal

axis, all the light will be at once sent out in parallel beams by them and the lenses L, and the apparatus is therefore geometrically perfect, but metallic instead of glass agents are still employed.

Fig. 29.—Vertical Section.

T. Stevenson’s Holophotal Dioptric Agents.

The agents for rendering the holophote purely dioptric fall next to be described.

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_ Holophotal Prisms, 1850.—If prisms are generated by the revolu-
Holo- tion of sections of Fresnel’s prisms round a horizontal instead of
a photal vertieal axis, as shown in fig. 30, rays incident upon them will
prisms. be made parallel in every plane instead of in the vertical plane
only as in Fresnel’s prisms.!

In 1852 it was stated that A. Fresnel, in 1826, tried prisms of 3 this kind on lamp-posts for the & quays of a canal in Paris, but their use was discontinued, They were not so arranged as to be

Section 072 ab, _&

Fig. 30. applicable to lighthouses, and no account of them was published.

Double Reflecting Prisms giving Two Internal Reflexions instead of One, 1850.—The object of these prisms is to an 6 the rays back through the focus, The rays from / (fig, 31) pass normally through

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Fia. 31.—Vertical Section.

-| the surface dc and fall upon the surfaces ad, ac, by which they are

totally reflected and sent back to the flame.?

Optical Combinations of Dioptric Holophotal Agents,

Dioptrie Holophote with Dioptric Spherical Mirror.—lf rings of Dioptric holophotal prisms y, p (fig. 832), combined with a central refracting holophote lens L subtending together 180°, be placed before a flame, the whole with of the front half of the diverging sphere of rays will be at once mirror. condensed by refraction and total reflexion into one beam of parallel] rays. Next, if there be placed behind the flame a dome of glass a formed of zones generated by the revolution of the cross section of the double reflecting prisms round a horizontal axis, the back hemisphere of rays will, after the double reflexion, be re- turned by it through the flame so as to diverge along with the front rays; for this dome is a perfect mirror, not only for the faint light that is superficially reflected by the first concave surface, but also for the main portion of the rays which enter the substance of the glass and are there totally reflected. Thus the whole light is paral- lelized entirely by glass agents. This com- bination should therefore produce the light of maximum intensity, being both geometrically and physically perfect when the radius is a luminous point. Still, some of the rays reflected by

the upper and lower parts of the mirror will not clear the burner of an oi] light, but falling on it will be lost.

Dioptrie Holophotal Revolving Light.—Application of Total Revolving Reflexion to Revolving Lights, 1850.—If sections of the front half ot light. the dioptric holophote be arranged as a polygonal cage round a large central flame and made to circulate round that flame, a revolving light with its periodic flashes will be pro- duced (fig. 33), which is therefore geometrically and physically perfect, and the double agents used in Fresnel's revolving light are thus wholly dispensed with. Mr J. T. Chance says, ''on the whole the modern plan (holophotal) must give light five or six times more intense than that of the former (Fresnel's) arrangement." The greater sim- plicity and compactness of this light p may be seen in comparing figs, 21 or 26 with fig. 33.

The holophotal revolving light is now the only one that is employed for all new lights. It was first intro- 'ie duced in 1850 on the small scale by ed Messrs Stevenson at Horsburgh Rock, Singapore, and on the larger scale at North Ronaldshay in Orkney, the ; prisms of which were most successfully made in 1851 by Letourneau

of Paris.

Fic. 82.—Vertical Section.

sh

Fia. 338.—Elevation.

1 Trans, Roy. Scot. Soc. of Arts, 1850, 2 Ibid.

Fixed light with flashes.

Back prisnis.

Perfeet

form of for an Oil Flame.—By combining

holo- phote.

Chanee’s

improve-

meut.

Holophotal Fixed Light varied by Flashes.—Fresnel’s double agents (figs. 22, 23) are here also dispensed with by the single ageney of panels of fixed light apparatus p’, p’ (fig. 34) and eylindriecal refractors L’, L’, alternating with panels of holophotal apparatus p, p, L, L, both of which revolve together round the central burner.

Back Prisms.—It will be noticed that, while perfection was attained by single agency in Fresnel’s fixed apparatus and also in the holophotal revolving apparatus, a physical de- fect still attaehed to every form of § holophote which compressed the light into a single beam where the rays require to be sent back through the flame. The defect is nota geometric one, and would be non-existent were the laminant a mathematical point. In order to remedy this objection, Mr T. Stevenson and Mr Brebner designed what they termed ‘‘ back” ptisms capable of deviating the rays through an angle of 130°, i“ that the engineer becomes virtually in- – ‘ dependent of the critical angle. Pid. 32. Verdier Seqiion. Professor Swan of St Andrews also independently proposed the same kind of prism, accompanied by general formule for its construction. The ray ab (fig. 35) is refracted at b, totally re-

Circular form. Straight form. Section. Plank iii? Elevation

Section

Fig. 35. flected at c, and again refracted at d, so as to pass out parallel to the horizontal axis. These prisms may be formed by the revolution of the generating section round either a vertical or horizontal axis, or they may be made straight as shown in elevation and section in the

diagram. The “ back prisms” which were first used in Islay, Argyleshire, were made by Messrs Chance in accordance with Professor Swan’s formula,

Perfect Form of Dioptric Holophote

the back prisms ga, he (fig. 36) just } deseribed with a ot iales rae j subtending 180° and a portion of the dioptric spherical mirror dk, no light is lost on the burner, and all the rays are parallelized, so that this apparatus, Ate being all of glass, is both geometrically eS and physieally perfeet. h

J. T. Chanee’s Improvement of 1862 Fig, 36.—Vertieal Seetion, on Stevenson’s Dioptrie Spherical Mirror.—Mr Chance says, ‘The plan of generating zones round the vertical axis (instead of the horizontal) was introduced by the author, who adopted it in the first

Section ovline AB Llevation A

Fig, 37.

complete catadioptric mirror which was made and was shown in the exhibition of 1862 by the Commissioners of Northern Lighthouses,

for whom it was constructed, in order to further the realizing of what Mr T. Stevenson had ingeniously suggested about twelve years pre-viously. During the progress of this instrument the idea oecurred to the author of separating the zones (fig. 37) and also dividing them into segments like the ordinary reflecting zones of a dioptric light ; by this means it became praetieable to increase considerably the radius of the mirror and thereby to render it applicable to the largest sea light without overstepping the limits of the angular breadths of the zones, and yet without being compelled to resort to glass of high refractive power.”

Mr Stevenson states (Ain. Civ. Eng., vol. xxvi.) that he origin- ally intended to generate the prisms round a vertical axis, but adopted the horizontal as more practicable where flint glass which was taken out of

the melting pot on the end of a rod had to be employed for the most important and smaller central parts of the apparatus, which at that date were the only ones that could be constructed.

Professor Swan’s Designs.—Among several ingenious arrange- Swan’s iments and new forms of agents proposed by Professor Swan? is designs, the mode of sending rays from prisms through inter- stices left between other prisms placed in front, and also a form of agent which he termed the triesoptric prism, in which the rays would undergo two refrac- #>-.. tions and three reflexions. / In fig. 38 are the front and 0 the triesoptric prisins. The two upper and lower prisms are constructed of flint glass of high refractive \ 5 power. It will be observed * bg from the drawing that this ingenious arrangement is

nevertheless open to objec-

tion, for cones of light of : Wo Were ria 30° in front and of 65° at the VY 4 back are lost through the aati Ay mare: Sel a interstices, Fia, 38. —Vertical Section.

T. Stevenson’s Azimuthal CONDENSING SysTEM for Distributing the Light Uncqually in Different Directions ctther Constantly or Periodically.

Previous to 1850 all apparatus was designed to emit light of Condens- equal power in every azimuth either constantly or periodically, so ing that when applied to illuminate seas extending farther in some system. directions than in others, such, for example, as long narrow sounds, the power was either needlessly great in some azimuths or not nearly strong enough in others. ‘The only exception was where a tower was placed on a long straight coast, when a spherical mirror was fixed behind the flame to prevent the light passing landward.

The light that would have been lost on the land was, in this way,

sent seawards, but no attempt was ever made to condense the light

over a given arc or to alloeate this auxiliary light in proportion to

the varying lengths of the different ranges and the amplitudes of

the ares over which it had to be seen, nor, where a light had to

show all round the horizon, to weaken its intensity in one are and

with the rays so abstracted to strengthen some other are which

from its range being longer ought to be of greater power. As the

optical agents which we have,

described were insufficient for this purpose, it became neces- sary to devise new agents pos-, sessing special optical properties, for distributing the rays not, oaly but equitably. Some;

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the more important of these

agents and their combinations ih

will be described, but before a

doing soit is necessary to make

some preliminary explanations. The form of the emergent

light from condensing ap-

paratus is neither a solid beam

of parallel rays like that from Fic, 39

an annular lens nor yet a zone hig

of rays diverging naturally in azimuth all round like that from an

ordinary fixed apparatus, but is intermediate between these, being

a solid angle or wedge of light strengthened by those rays which

would naturally diverge in other direetions, but which are diverted

and spread over the given sector as shown perspectively in plan in

fig. 39, in which L represents the position of the lighthouse, LD'

1" Professor Swan's Designs," Zrans. Roy. Scot. Soc. of Aris, 1867-68.

the range, or distance at sca from which the light can be seen, and D'ddLD the solid horizontal angle that is to be illuminated and into which all the light DAD' which would naturally diverge over the rest of the cirele must be compressed, and over which it must be uniformly spread. Fixed Requirements for Fixep Condensing Lights.—1. Where alight has condens- to be seen constantly over only one arc of the horizon, the apparatus ing must compress all the rays within that one arc whatever its ampli- lights. tude may be, and spread them uniformly over it.

2. Where the whole horizon has to be constantly illuminated, but the light has to be seen at greater distances over some parts of the sea than over others, as much light must be abstracted as can be spared from the shorter ranges and diverted to the longer so as to allocate the rays in the compound ratio of the number of degrees and the squares of the distances from which the light has to be seen in each arc ; and the light thus diverted from one arc to strengthen another must be spread uniformly over the one that has to be strengthened. By this mode of abstraction and addition there is produced a constant equitable distribution over the whole horizon of all the rays from any single flame. Where the whole horizon has not to be lighted, and where more than one are has to be strengthened, the rays which would be lost on the land or ean be spared in some other direction must be diverted to

and spread uniformly over these arcs in proportion to their amplitudes and ranges.

Revolv- — Keguirements for REVOLVING Condensing Lights.—1. Where a ing con- light has to give its flashes periodically over only one are of the densing horizon, all the rays must be collected and sent out periodically in lights. solid beams of equal power over that arc.

2. Where the whole horizon has to be periodically illuminated, but where its flashes have to be seen at greater distances over some parts of the sea than over others, the apparatus must be made (as in number 2 of the fixed condensing light) to vary proportionally the power of the flashes whenever they begin to pass over those parts of the sea where the ranges are of different lengths so as to produce an equitable periodic distribution of all the rays,

3. Where the whole horizon has not to be lighted, and where more than one arc has to be strengthened, the rays which would be lost on the land or can be spared in some other direction must be aiverted to and spread uniformly over these ares so as to strengthen the flashes in proportion to their amplitudes and ranges.

If n be the number of degrees in an arc to be illuminated, and d the distance in miles to be traversed by the light, then, neglecting atmospheric absorption, the quantity of light to be allocated to that arc will be proportional to nd?; but if we take account of atmo- spheric absorption, supposing q¢ to be the quantity out of a unit of transmitted light which escapes absorption after passing through a mile of air, then the whole light needed by the arc to be illuminated will be proportional to m=nd?g4, Supposing now that L is the whole 360° of available light from the apparatus, the quantity to be apportioned to the given arc will be mL/m, where Sm denotes the sum of the several numbers m computed for the respective arcs of the horizon.

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The Principal Optical Condensing Agents.

Condens- ing straight prisins.

Condensing Straight Prisms.—These, either by reflexion or refrac- tion or both, cause a ray fr (fig. 40) proceeding in any compass

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myn a-—

A Fig. 40.

bearing from a fixed light apparatus AA to ay! emerge in the direction, ¢.g., parallel to Plan fEXS the corresponding ray fb, which proceeds in the same compass bearing from another part of the apparatus and so of any other ray fc which is bent parallel to the ray fa. Right- Liight-Angled Expanding Prisms.—These angled (fig. 41) are right-angled vertically, while Prisms. 7% plano two of them C,C, are semi-rings, and the third C, a scmi-cone.

Fig. 41, eylindric beam of parallel rays passing vertically upwards and falling normally on the bases a of the prisms enter the glass, are reflected

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by the sides b, and pass out horizontally and normally to the other sides ; but, as the prisms are bent through a circular segment d’ad in plano, the emergent rays will be spread over the same angle in azimuth, and this will be true of any angle in azimuth subtended by the prisms. As those in the diagram subtend ,

180°, the light will in this case be spread over half

the horizon d’ad. :

Twin Prisms.—These are for carrying out Pro- fessor Swan’s mode of causing light coming from prisms behind to pass through spaces left for the purpose between others in front. The twin prisms (fig. 42) are formed by cutting out the apex (shown black on diagram) of a straight

prism so as to leave a sufficient space between it and the next prism for the passage of rays coming from behind. The length of glass traversed by the rays is lessened by this arrangement, and the size of the apparatus and lantern can at the same time be very greatly reduced,

Differential Lens.—Horizontal divergence may be obtained to any Differen- required amount by varying the radius of curvature of the inner tial lens faee of an annular and re- lens. The outer face fractor. (fig. 43) is the same as that of an ordinary annular lens, while the other face (fig, 44), though straight in the vertical, is ground to the re- quired curve in the horizontal plane. The rays fe (fig. 45) fall- ing upon the lens x converge to the verti- cal foeal oe Sf’ and afterwards _ diverge through the smaller horizontal angleaz’/“x’, and so for any other case. rio ag + Mian ae tor.—This is the ap- ; : plication to the cylin- ’ ex Saal nections dric refractor of the same principle which has been described above for the ordinary annular lens.

Condensing Catoptrie Spherical Mirror.—lf a large arc of a Spherical spherical mirror bo cut opposite to a short range of sea, and a mirror, smaller arc be cut in the mirror opposite to the longer range which has to be strengthened, then the light passing through the larger cut is received on an elliptic reflector placed behind, so as, with the help of an additional reflector and Icns, to cause the larger cone of rays to be compressed into the smaller are which has to be strengthened. WS ‘

Spherical Mirror of Unequal Area.—This mirror is cut down in height in such a way that its different heights represent inversely the different distances of the neighbouring land from the lighthouse, so as to reflect less light in the shorter and more in the longer ranges, ,

Twin prisms,

EF

Fia. 42,— Section.

Application to Fixed Condensing Apparatus,

Fixed Condensing Light for a Single Sector, 1850.—The holophote Light for pLp (fig. 46) throws its whole light on straight condensing prisms single e, each of which distributes the sector, rays over the required sector.

Condensing Apparatus for Steamers' Side Lights.—By means of this application of the eon- densing principle (figs. 47 and 48) all the light ean be dis- tributed with strict equality over 112° 30', which is the are

rescribed for steamers by the

oard of Trade. Several of the Transatlantic and other stcamers have adopted this kind of ap- paratus, which is hung on gim- bals and placed in iron towers, ; ' having an entry from below the deck, which can be made use of in bad weather. ; weed

Condensing Quadrant.—The fixed apparatus 6b}, with spherical Condens- mirror behind, throws its rays directly through the angle of 90° ing quad- afa', while the supplementary rays falling on the straight condens- rant. ing prisms 7, p, p', p' (fig. 49) are sent out parallel to the corre- sponding rays in the unobstructed central quadrant of the main apparatus. The whole light will therefore be condensed equally over 90°.

Steamers'

Fia, 46.—Vertical Section.

Condens- ing oetant.

Condensing Octant.—The central fixed apparatus 00 (figs. 50, 51) with spherieal mirror dd throws its rays direetly over the angle of 45° pgp, while the supplemental rays fall upon the straight eondens-

Fic. 47,—Side Elevation.

ing prisms p, each of which spreads the ineident rays parallel to the corresponding rays in the central angle pgp. In this way the whole of the front hemisphere of rays is parallelized in the vertical

Fic. 48.—Horizontal Section.

plane and spread equally over the 45°in azimuth. The hemisphere of back rays is condensed into the same are seawards by the dioptrie spherieal mirror, which returns the rays incident upon it through

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= este 2 c i Fia. 50,—Vertical Elevation.

the flame, where mingling with the front rays they are finally distributed over the are of 45°. The light passing above the spherieal mirror is parallelized by a half holophote

Fic. 49.—Horizontal Section.

Sleat Sound

FOUsS £

vertieally upwards, when, falling on the expanding prisms gfe, it also is finally spread over the required are. Thus the whole light is condensed and distri- ,

buted with strict equality over the 45° by means of six different optical agents, ‘Two apparatus of this kind form the leading lights to the River Tay.

Condensing Twin Pris : Light.—Fig. 52 shows part of the Lamlash light in the Firth of Clyde. Its aetion will — be easily understood by the numbers shown on the diagram.

Fixed Condensing Lights Jor more than one Sector

= Wi A a oe S Sete Fic. 51.—Horizontal Seetion. of Glenelg, in which the Isle Oronsay light has to be seen generally at a distanee of 3 or 4 miles across the Sound, but in the direetion AB down the sound an angle of 10° has to be seen about 15 miles and

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Fic. 52.—Horizontal Section.

another up the sound between C and D an angle of 10° has to be seen about 7 miles. Fig. 54 shows in plan the apparatus, which was for certain local reasons not construeted according to the

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Loch lourm

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Fig. 53. formula, but 193° of the spare light which would otherwise have

fallen upon the land were allocated down Sleat Sound and 189° down the Sound of Glenelg, That for Sleat Sound was given

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ne

Fig. 54.—Horizontal Seetion. Fic. 55.—Vertical Seetion.

direetly by the main apparatus through the are 8, and that to Glenelg through the are g, but these ares were respectively strengthened by portions of the holophotes B and C, the light from whieh was condensed respectively over the are 8 by each of the straight prisms a and over the are 6 by each of the prisms b. The eondensed light at Isle Oronsay, which is of the fourth order, appears to be equal to that of a first order, so that with a

Condens- ing twin | prism,

Lights for see- tors of unequal range,

LIGHTHOUSE

lamp consuming annually only 170 gallons of oil a light is obtained in the only direction in which great power is required equal in effect to a lamp consuming 800 gallons per annum.

Fixed Condensing Lighis of Unequal Range which constantly Illuminate the whole Horizon.—For this purpose the condensing spherical mirror or spherical mirror of uneqnal area will be found applicable.

Revolving or Intermittent Lights for Condensing the Rays into one Seetor.—The holophote in fig. 55 throws its rays on straight condensing prisms P, each of which spreads the light over the préscribed sectors, while masks M turning horizontally on pivots cut off the light either slowly or suddenly so as to produce a revolving or an

intermittent light, both of which condense all the rays uni- formly over the one sector.

Application of Condensing Principle to Revolving Lights of Unequal Range, which do not Ilwminate the whole Horizon.

Repeat- ” Repeating Light.—Plane mirrors M (fig 56) revolve on an endless ing light. chain placed outside of the apparatus and alter the direction of the

Revoly- :

ing lights.

Inter-

mittent refracting or reflecting prisms,

flashes after they pass into the dark are on the landward side so as to cause the lenses L, L to repeat their flashes over the sea- ward are which requires strengthening. The condensing spherical mirror and mirror of unequal areas will also be found applicable in cases where the flashes : do not require to sweep – over the whole horizon.

Condensing Revolv- ing Lights which Peri- odieally Illuminate the whole Horizon, but which Vary the Strength of the Flashes in Pass- ing over Certain See- tors.—The spherical _wgggl ees yaa Fie. 56.—Horizontal Section.

mirror are equally well suited for those that revolve,

Condensing Intermittent Lights.—Figs. 57 and 58 show straight which revolve and intercept as they

lights. pass round certain of the

rays from a central fixed

light apparatus so as to

produce perfect darkness

over the sectors which

they subtend at the time,

while they spread the

rays which they intercept

uniformly over and thus

strengthen the interme- ae

ta ssttors which are Fic. 57.—Horizontal 0 on

uluminated directly by Section. 2 pea

the central apparatus. The peculiar property of this arrangement

is that the power is increased in proportion to the duration of the

intervening periods of —

darkness. ‘Thus, ne- a i

glecting the loss by ab- oe

sorption, &c., the power =.) —e_ i’s ¢ ke

is doubled when the x — i

eriods of light and = SS arkness are equal, tre- ~— EEE

bled when the dark = — H

periods are twice as long = SS

as the light, and soon)§=#==——= aS

in proportion, while in =e

a ad. the rays are 4¢-— ⎯ 4 ;

ani uniformly over | op falal

cach illuminated sector. i——_——f _— Inter- —- Intermittent Condens- a mittent ing Light with Differen- —— : light tial Refraetor. —Figs. 59 a ee with and 60 show the new

differen- apparatus of Mull of

tial re. fractor,

Galloway in which ABA is the differential re- fractor, by the com- pound horizontal and Vertical action of which single agent the whole condensing inter- mittent effect is produced, so that condensing prisms are done

away with opposite the central, which is the most important, part of the apparatus. The centre of the inner curve of the refractor is at O in fig. 60. ‘ ; Though there is s no relative mo- tion in this ap- paratus, every part of whieh re- volves together, the parts may be arranged so that the con- densers only move. ‘This ap- paratus was con- structed in the most satisfactory manner by Messrs Barbier & Fenes- tre, Paris. Alteration of Fixed to Intermit- tent Apparatus. —Any existing fixed light can at once be made in- termittent so as to show either equal or unequal

Fig. 60.

periods by simply causing condensing prisms to circulate round it, while the power will be increased in proportion to the ratio of the duration of light to dark periods.

Beacons and Buoys.

Change

of tixed to intermit- tent ap- paratus.

Beacons in exposed situations are constructed sometimes of Beacons,

stone, and cement-concrete or cement-rubble, but generally of cast-

iron columns let into heavy base plates which are fixed to the rock

by strong lewis bats. The small class iron beacons are generally of malleable iron and the larger of cast-iron, but steel or bronze might with advantage be used in very exposed places. Fig. 61 shows a first order cast- iron beacon as used in Scotland.

T. Stevenson's Apparent Light.—This kind of light is specially useful at places where there is a sunk rock with little seca-room round it, and at the pierheads of harbours which must be closely hugged by vessels seeking entrance. It con- sists of certain forms of optical apparatus for reflect- ing and redistributing at a beacon placed on a_ sub- merged rock parallel rays which procced from a lamp and apparatus placed on the land. An optical deception is thus produced, as the sailor naturally supposes that there isa lamp burning on the beacon itself. The first light of this kind, which has been in use since 1851, was placed in a beacon on a sunk reef in Storno- way Bay, and is shown pictorially'in fig. 62. This light is 530 feet distant from the lighthouse where the lamp is placed. Others have since been established at Grangemouth, which is 585 feet from the light, and at lesser distances at the harbours of Ayr and Arbroath, at Odessa in the Black Sea, and at Gat Combe Head, Queensland.

Beacon Lights.—Lamps without

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Apparent light.

ass chimneys, as used in the Beacon

1

early experiments with paraffin, aut as uscd with gas in Pintsch's lights.

buoy, having iron tubes placed at certain distances above the flame, and supplied with very large cisterns of crystal oil, have been kept continuously burning in Scotland for about a month without trimming. These lamps are for rocks at sea which can only be reached when the weather is moderate.

Illumination of Beaeons by Gas to Produce a Fixed Light.—A light near Port-Glasgow has been illuminated by gas since 1861. The tower is about 300 feet from the shore, and the supply and pressure of gas are regulated by self-acting arrangements on the

shore. ,

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Pintsch's Pintsch's Gas Illuminated Buoy for Produeing a Fixed Light. — | sounds the whistle. It is said that an undulation of even 12 inches

buoy. These buoys are gas and water tight, and are charged to a pressure | is sufficient to sound the whistle. } ' ia : Tolling of Bells by the Hydrostatic Tolling of : Pressure of the Tide.—In 1810 Mr R. bells by Stevenson designed apparatus for tolling tide. a bell on the Carr

Rock beacon, which was to have been effected by afloat when ascending with the pressure of the flowing tide, when descending with the fall of the ebb tide and by means of a peculiar arrangement of weights for keeping the bell in action during the time of slack water. Llluminants. After Argand’s ordinary single-wick-oil Tlumin- Fic, 62 burner, Fresnel still adheringto Argand’s ants. ? Saar te Ko principle of the double air current intro- Oils, of ten atmospheres. The buoy is filled with gas snfficient to burn duced two, three, and four concentriewick burners, Mr AlanSteverison night and day for three or four months ; the burning pressure is | the five, and Mr Douglass the six wick burner. These burners are kept constant by Pintsch’s regulator. These buoys promise to be | suitable for the consumption of animal and vegetable oils, which of great service, and have now been in use for more than a year at | were in usein the various several places both in England and Scotland. lighthouse services of Automatic Meter for Prodweing Intermittent Lights by the Flow of | the world till within the the Gas.—In order to distinguish one buoy or beacon from another, | last few years. These Mr ‘T. Stevenson has proposed to make the flow of the gas itself | oils are, however, super- produce automatic intermittent action without using clockwork. | geded by hydrocarbons, The full flame continues to burn until the action of the meter which at one half the reduces the supply, but leaves a small jet still burning in the | cost give an increased sockets of the burner till the full flame is again produced. This luminous intensity for meter has been tried successfully on shore for twenty-eight hours | an equal consumption, f consecutively. — but they require a larger Uniform Uniform System of Beacons and Buoys.—The first proposal for | supply of air for their

system of dealing systematically with the colours of beacons and bnoys was in

beacons,

Autos matic buoy.

1828, when Mr R. Stevenson proposed for the navigation of the

TA

Fic. 63.—Courtney’s Automatic Buoy. A, cylinder, 27 ft. 6 in. long ; B, mooring shackle ; C, rudder ; D, buoy ; E, diaphragm ; F, ball valves; G, air inlet tubes; H, air (compressed) outlet tube to

tran a compressed air inlet to buoy ; K, manhole ; L, steps ;

river Forth that red buoys should be taken on the starboard and black on the port side in going up the river. This system has since been adopted generally in the United Kingdom. In 1857 Admiral E. J. Bedford suggested a uniform system for all the coasts of the country, which was carried out in Scotland by Mr A. Cuning- ham. A different uniform system has been adopted in England by the Trinity House. In 1859 Mr J. F. Campbell suggested what is undoubtediy the best system, that a buoy shall indicate by its shape and colour the compass direction in which a vessel shonld sail aftcr seeing the buoy. |

Courtenay’s Automatic Buoy.—This useful form of buoy first used in America, has a cylindrie tube A projecting below the level of the water, on the upper part of which cylinder there is a whistle N and also two inlet valves F, F, so that the rising and falling of the buoy draws in and expels the air alternately which

(fig. 63)

combustion, and con- sequently an improved form of burner, M. Maris in 1856 devised a single-wick burner for this purpose which gave good results, but many and all attempts to con- struct a multiple-wick mineral oi] burner failed till 1868, when Captain Doty’s form was devised. By a happy choice of proportions in the various parts of his burner (fig. 64), and by the addition of an exterior cylinder sur- rounding the outer wick, and a central disk, both placed in such a manner as to throw a eurrent of air into the flame at the right place, Captain Doty succeeded in producing single and multiple-wick hydro- carbon burners, which carry a flame of great luminous intensity and regularity.

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MW ey few), ~ Comm iy A QW we ihe. »

tin, stl

Fig, 64,

The following table gives the details of these burners, and also the candle power and con- sumption, as determined by Dr Stevenson Macadam :-—

Candle Power in Sperm Candles, cach consuming 120 grs. Sperm per Hour.

Height of Mcan Dia- | intense part meter of of Flame, Outer Wick} excluding in Inches, Tails, in Inches,

Value of

Light from |Consumption Consumption] per Tour in of 1Gallon| Gallons. in fb Sperm,

Number

(0)

Wicks.

ee oe ee Ree) SEs, eet ay

Mr J. N. Douglass has also introduced a mineral oil burner, which, however, Doty claims as similar in principle to his. By ignitin only half the number of wicks (the outer in a six-wick for snabaaeht the power of the burner can be diminished by one half, This is Mr Douglass's lamp of single and double power for use in clear and fogey weathers respectively.

_ The mineral oi] employed most extensively in lighthouse illumina- tion is Scotch paraffin. The specific gravity, which is a test of the relative richness of the oil, should be from 0°8 to 0°82 at 60° Fahr.,

and the flashing point or temperature at which it begins to evolve inflammable vapour should not be lower than 125° nor higher than 135° Fahr. The Board of Northern Lighthouses was the first light-house authority in Britain that adopted paraffin and Doty burners, and by doing so an annual saving of between £4500 and £5000 in the maintenance of the lights on the Scotch coast was effected.

Single-wick burners are supplied with oil from the cistern by the capillary action of the wick alone. But in the ease of multiple. wick burners other methods must be employed to seeure a sufficient supply. If the cistern be placed above the level of the top of the burner, the flow of the oil to the wick cases is effected by the direct

Coal- gas,

Eleetric

light.

EEG HT

aetion of gravity, regulated by a eontrivanee which maintaius a constant head. If, however, the eistern be placed below this level, either a mechanical lamp is employed, in which the oil is forced into the burncr by pumps worked by clockwork, or a moderator lamp, in which this is effected by the pressure exerted by a weighted piston descending in a eylinder forming the cistern. Coal-Gas.—Coal-gas was first used as a lighthouse illuminant at Salvore, near Trieste, in 1817. For many years it has been used in the harbour lights of Great Britain when in the neighbourhood of gas-works. Mr J. R. Wigham has designed a compound or crocus burner eonsisting of a group of twenty-eight vertical tubes, each carrying an ordinary double fish-tail burner, and the ignited gases issuing from all these jets unite into one large flame. Addi- tional groups of twenty jets each can readily be arranged around the first, which forms a central nucleus, and in this way, depending on the state of the atmosphere, the power of the burner can be made at will 28, 48, 68, 88, or 108 jets. Fig. 65 shows the arrangement

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Fig. 67.

for 28 jets, and fig. 66 one for 108 jets. In his triform or quadri- form systems Mr Wigham places two, three, or four of the burners already described vertically one above the other (fig. 67), with lenses opposite to each. The following table gives the candle powers, &e., of Mr Wigham's burners.

andle Power in Sperm Candies, consuming 120 grs. per Hour,

429°6

8320 1250718

2408°0

29230

Consumption of Cannel c

Number of Jets, Gas per Hour.

The dlameter of the 108-jet burner is 12 inehes.

Faraday and Holmes's Magneto-Eleetrie Light.—In 1853 Professor Holmes made the first magneto-electrie machine for lighthouses, which was tried by the Trinity House in 1857, and the clectrie light was first shown to the mariner in 1858. The Trinity House subsequently introduced it at Dungeness in 1862 and at Souter Point in 1871. The optical apparatus for these lights was designed by Mr J. T. Chance. In 1869 Holines eonstructed for the Trinity House a dynamo-

electric machine (in which no permanent magnet is used), giving alight of about 2800 candles. The magneto-electric

_ light of Holmes as exhibited from a third order dioptric apparatus

at the South Foreland light has been estimated at 152,000 candles, or twenty times that of the old first order dioptric fixed white light. The following table shows the results which have been obtained by Dr Tyndall and Mr Douglass by the magneto-electric and dynamo-electrie machines, tried at the South Foreland, 1876-77 :—

Light pro- dueed per HP. in Stand- ard Candles.

Order

Minute.

Name of Machines. 0 é Merit.

Revolu- tions per

rs i] Oo

Holmes’s Magncto-Electric Allianee do.

i ho own)

Gramme Dynamo-Electric (No. 1).. Do. do.

Siemens’s Do. Do.

Two Holmes’s Magncto-Electrie ….

Two Gramme Dynamo

He 00 TD ihe SUD o°o°o°o

. (small, No. 68)

Two Siemens’s do.

&8 and 68)

oO DD G9 G9 Cr Cr CO GD Bd Crs Go Cr NIG bo

HOUSE 627

It must be x in view that in the eleetric as well as in every other light the following requirements must be fulfilled :—(1) it shall be constantly in sight during those periods of time at which it is advertised to the mariner as being visible ; (2) it shall be seen as far as possible in a thick and hazy atmosphere ; (8) it shall con- stantly maintain the distinctive character of the station where it is employed so as not to be mistaken for another light ; and (4), when revolving, its flashes shall remain long enough in view to let the sailor take the compass bearing of the light. he electric light practieally fulfils all Fee conditions, and, when we consider its transcendent intensity, and the smallness of the luminous radiant which enables the engineer to adapt it to any required conditions far more strictly than oil light, we may certainly conclude that the electrie is the best though the most costly of all illuminants.

The only question which has not yet been decided is whether an electric light of equal initial power will penetrate a hazy atmosphere as far as an oil light. Experiments made at Edinburgh in 1866 seemed to show that the highly distinctive flash of the electric light when acted on by optical apparatus is perhaps not so much due to a greater amount of light as to the more complete parallelism of the rays arising from the smallness of the radiant. The apparatus of a small size which was first used both in England and France necessarily produced a wasteful vertical divergence, and has there- fore been now justly disearded.

Allard’s Statistics of Lighthouse Apparatus,

The following useful formule are taken from M. Allard’s very Allard’s valuable Mémoir. sur U Intensité et la Portée des Phares, Paris, 1876. statistics

Consumption of Oilin Relation to Diameter of Burner.—lf ¢ denote the consumption of mineral oil in grammes per hour, @ the diameter of the burner in centimetres, then

ex 4-92-22, Luminous Intensities, —A Carcel burner consuming 40 grammes

of colza oil per hour being taken as unity, if I denote the intensity for mineral oil in a burner of diameter d in centimetres,

then I=0:‘22d?“1,

Luminous Intensities of Apparatus.—Loss due to Reflexion, Ab- sorption, and Framing of Apparatus.—The loss due to surface reflexion on entering and leaving the glass may be valued at. ‘050, 052, 058, 075, °120, ‘230, for angles of incidence respectively of 0°, 15°, 80°, 45°, 60°, 75°. In totally reflecting prisms the lumin- ous ray suffers three deviations instead of two, therefore the above values should be multiplied by $.?

The loss by absorption in the glass, although properly given by an exponential formula, may, with sufficient aceuracy, be taken as ‘03 per centimetre of glass traversed.

The loss due to the horizontal joints of the lenses, and to the intervals between the reflecting rings, varies from ‘02 to ‘03, or from ‘01 to ‘04, in passing from the first to the fifth order.

Coefficients. —These are the ratios in which the intensity of the lamp is increased by the apparatus. Where m is the coefficient, f the focal distance, d the diameter, and # the height of flame ina fixed light apparatus, they can, if expressed in centimetres, be caleulated from the formula—

m=a(t)”, or m= 212(4).

Annular Lens. —The intensity of an annular lens is obtained by multiplying that of the eorresponding fixed light by gh. where ¢ is a ~

the angle subtended by the annular lens, and «the horizontal semi divergence. The intensity of light from an ordinary fixed light apparatus is increased 38 per eent. bv the use of the dioptric spheri- eal mirror.

Distinctions of Lights.

The most important characteristic distinctions of lights are the Distinc- Two of these are sometimes shown tions of (2) The revolving light, lights.

following—(1) The fixed light. at different heights from the same tower. which at equal and comparatively long periods comes slowly and gradually into full power, and then as ig med disappears. (3) The flashing light, which at short periods (such as a few seconds) comes very quickly, though gradually, into full power, and as quickly and gradually fades away, was first introduced by the late Mr Robert Stevenson in 1825. (4) The coloured light, which is obtained by using coloured media, and was first employed by Mills of Bridlington. (5) The intermittent light, introduced by the late Mr R. Stevenson in 1830, which bursts instantaneously into full power, and after remaining as a fixed light for a certain lencth of time is as suddenly eclipsed and succeeded by a dark

period. When the periods are very short the intermittent is now

1 This result as to total reflexion is not in accordance with the experiments of Professor Potter, which, however, were made with a very finely polished prism made for optieal purposes.

Distribu- tion of lights,

called au occulting light. (6) The dntermitient light of unequal periods, first proposed by Mr R. L. Stevenson in 1871, showing from the same apparatus different durations of the dark periods with equal periods of light, such as fixed for 2” eclipsed 5”, fixed 2” eclipsed for 2”, and

then, as at first, fixed for 2”. (7) Group jlashing light. This distinction consists in giving a series of groups of two or more flashes separated by short eclipses, the groups being separated from one another by a larger eclipse.

Mr Wigham of Dublin first proposed this distinction, and applied it to a dioptrie revolving apparatus illuminated by gas, the effect being produced by raising and lowering the gas as Mr Wilson of Troon had done in 1827. Dr Hopkinson produced the same effect optically and for auy illuminant by altcring the arrangement of the ordinary revolving apparatus. (8) Fixed lights illuminating the whole horizon, but showing revolving or intermittent characteristics over small arcs. These can be produced by masks arranged like venetian house blinds placed opposite the arc where the character- istic is to be different from the main light. This arrangement and No. 9 were lately proposed by Mr T, Stevenson. (9) Lnécrinittent flashing light. This is produced by condensing prisms revolving round a fixed light apparatus. The flashing light continues giving its rapidly recurring flashes for a certain period, which is succeeded bya hak period. ‘The light which is not required during the dark periods is condensed by the prisms so as to strengthen the light

eriods,

fl Uniform System of Charaeteristics. —Various modes of distinguish- ing lights have been at different times ae nee such as Babbage’s, which represented the stations by numbers, and Sir W. Thomson’s by the Morse alphabet, or dots and dashes; but the following results seem to show that the present system is satisfactory, while it is free from many objections to which the other modes are liable.

The Board of Trade reeords of shipwrecks show that during the space of twenty years (1857 to 1876) 2716 vessels were wrecked by stranding on the coasts and islands of Scotland and the Isle of Man, and that of all these there were only twenty-six, and the greatmajority of them were small vessels, in which it was even alleged that the cause was a failure in identifying the distinctive characteristic of some one of the Northern lighthouses, and in one-third of these cases the sailors

were foreigners, and made such glaring mistakes as taking a fixed for a revolving light. It is surely more probable that in many of these cases they did not confound the characteristics at all, but really did not know what they were. But, waiving all these con- siderations, there were after all only about 1 per cent. of all the wrecks which were alleged to have been caused by mistaking one light for another.

Power of Coloured Lights. —Experiments, and particularly those of. M. Reynaud, have shown that red of the same initial power as white penetrates a fog to a greater distance than the white, owing to the red rays not being so much dispersed by refraction. Experi- ments made at Edinburgh in 1868 show that a light should, before passing through red glass, have four and a half times the initial power of a white light. The same results have sincc been obtained by M. Allard of Paris.

An objection to all coloured lights is the fact that some persons are unable to detect any difference between certain colours, Accord- ing to the cxpcriments of Professor Holmgren on from sixty to seventy thousand persons in Europe and America, about 4°2 per cent. are congenitally colour-blind, and the commonest form of this defect is inability to distinguish between red and green, which are the only tints employed for lighthouse distinctions, This objection, however, must gradually lose its weight, as the Board of Trade has now adapted the ‘colours test” as part of thcir examinations for certificates in navigation.

Distribution of Lights on a Coast.—Mr Alan Stevenson gives the following as a few of the chief considerations which should guide us in the selection of sites and characteristic appearance of the lighthouses to be placed on a line of coast.

“1. The most prominent points of a line of coast, or those first made on over-sca voyages, should be first lighted; and the most powerful lights should be adapted to them, so that they may be dis- covered by the mariner as long as possible before his reaching land.

“2. So far as is consistent with a due attention to distinction, revolving lights of some deseription, which are necessarily more powerful than

fixed lights, should be employed at the outposts ona line of coast.

“3. Lights of precisely identical character and appearance should not, if possible, occur within a less distance than 100 miles of each other on the same line of coast which is made by over-sea vessels.

‘*4. In all cases the distinction of colour should never be adopted except from absolute necessity.

“5, Fixed lights and others of less power may be more readily adopted in narrow seas, because the range of the lights in such situations is generally less than that of open sea-lights.

“*6, In narrow seas also the distance between lights of the same appearance may often be safely reduced within much lower limits than is desirable for the greater sca-lights. Thus there are many instances in which the distance separating lights of the same

me DG? we ee ow

character need not excecd 50 miles; and peculiar cases occur in which even a much less separation between similar lights may be sufficient.

“7, Lights intended to guard vessels from reefs, shoals, or other dangers should, in every case where it is practicable, be placed sea-ward of the danger itself, as it is desirable that seamen be enabled to make the lights with confidence.

*¢8, Views of economy in the first cost of a lighthouse should never be permitted to interfere with placing it in the best possible position ; and, when funds are deficient, it will generally be found that the wise course is to delay the work until a sum shall have been obtained sufficient for the erection of the lighthouse on the best site.

*¢9, The elevation of the lantern above the sea should not, if possible, for sea-lights, exceed 200 feet ; and about 150 feet is suffi- eient, under almost any circumstances, to give the range which is required, Lights placed on high headlands are subject to be fre- quently wrapped in fog,

and are often thereby rendered useless, at times when lights on a lowcr level might be perfectly efficient. But this rule must not, and indeed cannot, be strictly followed, especially on the British coast, where there are so many projecting cliffs, which, while they subject the lights placed on them to occa- sional obscuration by fog, would also entirely and permanently hide from view lights placed on the lower land adjoining them.

“10. The best position for a sea-light ought rarely to be neglected for the sake of the more immediate benefit of some neighbouring port, however important or influential ; and the interests of naviga- tion, as well as the true welfare of the port itself, will generally be much better served by placing the sca-light where it ought tobe, and adding, on a smaller scale, such subsidiary lights as the channel leading to the entrance of the port may require.

“11. It may be-held as a general maxim that the fewer lights that can be employed in the illumination of a coast the better, not only on the score of economy, but also of real efficiency. Every light needlessly erected may, in certain circumstances, become a source of confusion to the mariner; and in the event of another light being required in the neighbourhood, it becomes a deduction from the means of distinguishing it from the lights which existed previous to its establishment.

“12. Distinctions of lights, founded upon the minute estimation of intervals of time between flashes, and especially on the measure- ment of the duration of light and dark periods, are less satisfactory to the great majority of coasting seamen, and are more liable to derangement by atmospheric changes, than those distinctions which are founded on what may more properly be called the characteristic appearanee of the lights, in which the times for the recurrence of certain appearances differ so widely from each other as not to require for their detection any very minute observation in a stormy night, Thus, for example, flashing lights of five seconds’ interval, and revolving lights of half a minute, one minute, and.two minutes, are much more characteristic

than those which are distinguished from each other by intervals varying according to a slower series of 5”, 10”, 20”, 40”, &c.

‘13. Harbour and local lights, which have a circumscribed range, should generally be fixed instead of revolving ; and may often, for the same reason, be safely distinguished by coloured media, In many cases also, where they are to serve as guides into a narrow channel, the leading lights which are used should, at the same time, be so arranged as to serve for a distinction from any neighbouring lights.”

Table of Distances at which Objects can be scen at Sea, aceordiny to their respective elevations, and the elevation of the eye of the observer.

Distances in Distances in Distances in

Neights| Geographical || Heights] Geographical || fcights| Geographical

in Feet.| or Nautieal |/in Feet.| or Nautical |/in Feet.| or Nautical Miles, Miles. Miles, 5 2°565 7 9°598 250 18°14 10 3°628 75 9°935 800 19°87 15 4443 80 10°26 350 21:46

20 5°130 85 10°57 400 22.0

25 5736 90 10:88 450 24°33 0) 6 283 95 11°18 500 25°65 35 6787 100 11-47 550 26°90 40 7°255 110 12°03 600 28°10 45 7 696 120 12°56 650 29°25 50 8:112 130 13:08 706 30°28 55 8509 140 13°57 800 82°45 60 8-886 150 14:22 900 84°54 65 9-249 200 16°22 1000 36°28

Example.—A tower 200 feet high will be visible 20°66 nautical miles to an observer whose eye is elevated 15 feet above the water ; thus, from the table :—

15 feet elevation, distance visible 4°44 nautical miles, 200 Zi

99 +39) a3 93 9

20°66

Distances at which objects are visi- ble.

together ; and the glass is the best plate } inch thick. Storm panes

Floating Prior to 1807 the only kind of floating light was a ship with | are kept at hand which can be applied in a few minutes in the

lights. small lanterns suspended from the yard-arms or frames. The late | event of a pane being broken, which sometimes occurs from large Mr Robert Stevenson introduced in that year a lantern which sur- | birds driving against the lantern and by stones thrown up from the rounded the mast of face of cliffs by sca and wind during storms. Mr Douclass's cylin- thevessel, and was cap- dric or helical janterns Xs 4 able of being lowered (fig. 72) have steel astra- down to the deck to gals, and the panes, which be trimmed. By his are also cylindrical, are 4 ah plana lantern of much inch thick. LI greatcr size could be Lightning Conductors.— FANS Light- used, and with this Each lighthouse tower is AIS ning con- increase of size a larger furnished with a copper VA A A A/V . ductors.

and more perfect ap- paratus could be eni- ployed which admitted of gearing for working a revolving light, as adopted by the Trinity House. In fig. 68, (| aa isthe mast, b tackle

hook, ¢, ¢ brass flanges for fixing parts of lan- tern together, e and g weather guards, h oop glass front of antern, ¢ shutter by which lamps are trim- med, & lamps, J silver reflector. Revolving catoptric apparatus was applied to float- ing lights in England, and M. Letourneau, in 1851, proposed to em- ploy a number of sets of dioptric apparatus in one lantern ; figs. 69 and 70 show eleva- tion and plan of one of the Hooghly floating lights on the dioptric

SST eas Fig. 68. principle, designed for the Indian Government by Messrs Stevenson.

It will be observed that not fewer than four of the separate lights are always in view from every part of the compass at once.

The “Seven Stones” light- ship, which has all the recent Trinity House im- provements, is moored off the Lands End in 42 fathoms. Her moor- ings consist of a 40 ewt. mushroom anchor, and 315 fathoms of 14 inch studded chain cable. he vessel is timber-built, copper-fastencd through- out, sheathed with Muntz metal. Her length is 103 feet between perpendi- culars ; extreme breadth, 21 feet 3 inches ; depth of hold from the strake next the timbers to the upper side of the upper deck

Wu l Fria. 69.—Dioptric Floating Light. Elevation.

lightning conductor con- sisting of a $ inch copper rod or wire rope. These conductors terminate about 18 inches above the top of dome of lantern in a forked shape with two latinum points; the ower end bifureated and furnished with large cop- per earth ~~plates is sunk into moist earth or into the sca. The con~~ uctor is put into metallic connexion with all large masses of metal outside or inside the lightroom. See LicuTninc ConDUcTors.

nea etal

Fic, 72.— Helical Lantern.

Fic. 71.— Diagonal Lantern,

Machinery.—Revolving lights are ie one by clock-work Machin- he machines are pro- ery.

machinery actuated by a falling weight. vided with a maintaining power which keeps the apparatus mov- ing while the machine is being wound up, and a bell is attached which rings to warn the keepers when the machine requires winding up. A clock face is also attached which keeps time with the + eee clock when the apparatus is revolving at the proper speed.

Masking Screens.—For the purpose of cutting off sharply the light Masking proceeding from any fixed light apparatus, the late Mr J. M. Balfour screens,

devised what he called radial masking screens. These screens, which are in use at several lighthouses where the fairway for ships is narrow, consist of a series of thin plates Race with their edges towards the apparatus, and with such a distance between them, and of such a length as will secure that only rays having the desired divergence can pass through between them.

With revolving lights itis not possible to effect a ‘‘cut off” as in the case of fixed li hts, on any particular bearing; for the direction of the axis of the luminous beam projected by the lens or reflector is being continually changed in the horizontal a by the revolu- tion of the frame on which it is fixed. Mr Stevenson’s mode of overcoming this difficulty is by fixing a light metallic screen or coloured glass shade outside of the revolving apparatus and on the safety side of the danger arc. These screcns are fitted with rollers for running on a slightly inclined plane or circular path. Small projecting rods or snugs fixed to the sides of each lens are, in revolving, brought against the edge of the screen, and gradually oress the screen before it up the inclined plane. By the time the ens reaches the edge of the danger arc the screen has been pushed to the top of the inclined plane, and the full beam of light, coming from the now entirely uncovered lens, points in the required line of cut off, which is the border of the danger arc. But whenever the further revolution of the apparatus causes the snugs to pass clear of the edges of the screen so as to free it from their pressure it immediately runs back again to its original position in front of the lens, so as to prevent any of the light being now sent seawards, By this and idk reciprocative movement of the screen, as lens after lens comes round, the same effect will be successively produced and the light will always be cut off on the lines of obscuration, so that the flashes can never be seen within the danger are.

beams, 10 feet 3 inches.

In the event of the vessel Mathematical investigations and formulx# for constructing the Mathe- breaking adrift, she is optical instruments for lighthouses will be found in the books matical provided with sails, the undernoted by Alan Stevenson, Swan, Chance, Nehls, Reynaud, formula, mizzen being frequently Allard, &c., to which the reader is referred. used for steadying the ‘ e , j vessel at her inoorings Literature. —Smeaton, Narrative of the Eddystone Lighthouse, London, 1793; Litera- Th f th ;. Stevenson, Account of the Bell-Rock Lighthouse, Edinburgh, 1824; Fresnel, ture © cost eo the vessel, Mémoire sur un nouveau systéme d’éclairage des phares, Parls, 1822; Brewster, : fully equipped for sea, Treatise on Burning Instruments, 1812; Fanale di Salvore, nell’ Istria, Iluminato with illuminating and fog a Gaz, Vienna, 1821; Account of a New System of Iilumination for Lighthouses, signal apparatus complete 1827; Alan Stevenson, Account of Skerryvore Lighthouse, with Notes on Light- 2 _ ic ee 2 house Illumination, 1847; Stevenson, Treatise on the History, Construction, and was about £9500. Rlumination of Lighthouses, London, 1850; Report of the Lighthouse Board of Lanterns, Lanterns are generally America, Washington, 1852; J. T. Chance, ‘‘ On Optical Apparatus used in Light- houses,” in Proc. Jnst. C. £., vol. xxvl.; ‘‘ Dioptrie Apparatus in Lighthouses for

constructed of diagonally framed astragals (fig. 71) to avoid the obscura- tion of light in any one azimuth as would be the case with dioptric fixed Horizontal Section.

light apparatus were vertical astragals uscd. The astragals are made of gun-metal, having a tensile strain of 33,000 Ib to the square inch; the dome is made of copper platcs rivetted

Fic. 70.—Dioptrie Floating Light.

the Electric Light,” Proc. Inst. C. E., vol. lii.; Douglass, ** The Wolf-Rock Light- house,” Proc. Inst. C. E., vol. xxx.; ‘‘Electrie Light applied to Lighthouse Ilumination,” Proc Inst. C. E., vol. lvii.; Thos. Stevenson, Lighthouse J/lumina- tion, 2d ed., Edinburgh, 1871 (German translation with appendix, Ueber die Berechnung von Leuchtthurmhohen und Leuchtthurm-apparatus, by Chr. Nehls,

Hanover, 1878); L. Reynaud, Mémoire sur l’éclairage et le balisage des cétes de France, Paris, 1864; Thos. Stevenson, Lighthouse Construction and Hlumina- tion, London, 1881; W. Swan, “ New Forms of Lighthouse Apparatus,” 7’rans. Roy. Scot. Soe. of Arts, vol. viil.; M. E. Allard, Mémotre sur Uintensité et la portee des phares, Paris, 1876; Id., Mémoire sur les phares électriques, Paris, 1881; Proc. Inst. C. E., passim. (T. ST.)

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LIGHTING, Execrric. Artificial light is generally produced by raising some body to a high temperature. If the temperature of a solid body be greater than that of surrounding bodies it parts with some of its energy in the form of radiation. Whilst the temperature is low these radiations are not of akind to which the eye is sensitive ; they are exclusively radiations less refrangible and of greater wave-length than red light, and may be called infra-red. As the temperature is increased the infra-red radiations increase, but presently there are added radiations which the eye perceives as red light. As the temperature is further increased, the red light increases, and yellow, green, and blue rays are successively thrown off. On pushing the temperature to a still higher point, radiations of a wave-length shorter even than violet light are pro- duced, to which the eye is insensitive, but which act strongly on certain chemical substances; these may be called ultra-violet rays. It is thus seen that a very hot body in general throws out rays of various wave- length, our eyes, it so happens, being only sensitive to certain of these, viz., those not very long and not very short, and that the hotter the body the more of every kind of radiation will it throw out, but tle proportion of short waves to long waves becomes vastly greater as the temperature is increased. The problem of the artificial production of light with economy of energy is the same as that of raising some body to such a temperature that it shall give as large a proportion as possible of those rays which the eye happens to be capable of feeling. For practical purposes this temperature is the highest tempera- ture we can produce. As an illustration of the luminous effect of the high temperature produced by converting other forms of energy into heat within a small space, con- sider the following statements. 120 cubic

feet of 15 candle gas will, if burned in ordinary gas burners, give a light of 360 standard candlesfor one hour. The heat pro- duced by the combustion is equivalent to about 60 million foot-pounds. If this gas be burned in a gas-engine, about 8 million foot-pounds of useful work will be done outside the engine, or four horse-power for one hour. This is sufficient to drive an “ A” Gramme machine for one hour ; the energy of the current will be about 6,400,000 foot- pounds per hour, about half of which, or only 3,200,000 foot-pounds, is converted into radiant energy in the electric arc, but this electric arc will radiate a light of 2000 candles when viewed horizontally, and two or three times as much when viewed from below. Hence 3 million foot-pounds changed to heat in the electric arc may be said roughly to affect our eyes six times as much as 60 million foot-pounds changed to heat in an ordinary gas burner.! Owing to the high temperature at which it remains solid, and to its great emissive power, the radiant body used for artificial illumination is nearly always some form of carbon.

The consideration of electric lighting naturally divides into two parts—the production of suitable electric currents, and the conversion of the energy of such currents into radiations. Although electric lights were first produced from currents generated by batteries, they have only attained commercial importance by the use of machines for converting mechanical energy into electric current.

Dynamo-Electric Machines.—In the widest sense a dynamo-electric machine may be defined as an apparatus for converting mechanical energy into the energy of electrostatic charge, or mechanical power into its equivalent electric current through aconductor. Under this definition would be included the electrophorus and all frictional machines ; but the term is used in a more restricted sense

1 Proc. Inst. C. H., lii. 69; Report from the Select Commitiee on Electric Lighting, 1879.

for those machines which produce electric currents by the motion of conductors in a magnetic field, or by the motion of a magnetic field in

the neighbourhood of a conductor, The general laws of electromagnetic induction need not be set forth here; as they are fully explained in the article Execrricity, they will be assumed in all that follows. Since, if the current in a closed circuit be in one direction when the number of lines of force is increasing, it will be in the opposite direction when they are diminishing, it is clear that the current in each part of the circuit which passes through the magnetic field must be alternate in direction. Hence also the current in the wire outside the machine must also be alternate, unless something of the nature of a comniutator be employed to reverse the con- nexions of the internal wires, in which the current is induced, and the external circuit, We have then broadly two classes of dynamo-electric machines:—the simplest, the alternate current machine,? where no commutator is used ; and the continuous current, in which a commutator is used to change the connexions to the external circuit just at the moment when the direction of the current would change.

The mathematical theory of alternate current machines is com- paratively simple.? Let 7 be the period of the machine, that is, the time taken to move the armature from one position to the next exactly similar position, ¢.g., in a Siemens alternate current machine of sixteen magnets on each side, one-eighth of the time of revolution; let y be the cocfficicnt of self-induction of the whole cireuit, and R the resistance of the whole ecireuit; and let ¢ denote the time at any instant counting from any epoch as initial, and I the magnetie induction at time ¢ multiplied by the number of convolutions, The clectromotive force in the circuit at time ¢ will be

dl , dt :) and the equation of the current will be

dx dl Vi +z = di’

where x is the current. Now I may be expressed in the form

3° A, sin Qns! 7

where A, and ¢, are constants for the macuiue with given excitation of the fixed magnets. Henee

reas Rz=3} “ap As eos 2ms =

Rn eos Onda tas:

e=Ce 7 + 02784 a T

gh (=7)’+m Le

t 2rst, Brsy a. eT G

where

_R, The term Ce * is nnimportant exvept just aftcr elosing the cireuit. In the Sieniens machine M. Joubert states that the only

2 For descriptions of various alternate current machines, consult the following authorities: —ALLIANCE: H. Fontaine, Eelairage & UV Elec- tricité, Paris, 1879, p. 114; Dr. Schellen, Die magnet- und dynamo- electrischen Maschinen, Cologne, 1879, p. 35. Dr MERITENS: Engineer- ing, xxviii. 872, xxxii. 856, 380, 392; Tel. Jowr., vi. 398; Shoolbred, Electric Lighting, London, 1879, p.14; Llectrician, ii. 27. GRAMME: Engineering, xviii. 418, xxvi. 63, xxix. 184, xxxil. 615; Tel. Jour., viii. 26, ix. 206 ; Electrician, iv. 176 ; Shoolbred, 25 ; Foutaine, 161; Schellen, 176 ; Report from the Select Commitice on Electric Lighting, ~ 231. Howtmes: Fontaine, 119; Schellen, 35. HoLMEs-ALLIANCE: Shoolbred, 18. Lacnausste: Engineering, xxxii. 465; Tel. Jour., ix. 881. Lowntin: Engineering, xxv. 48, xxviii. 174 ; Shoolbred, 22 ; Fontaine, 171 ; Report from the Select Committee on Electric Lighting, 229; Schcllen, 167. RapierF: Tel. Jour., viii. 150. SIEMENS: Tel. Jour., vii. 284; Schellen, 315.

3 Journal de Physique, x. 141; Joubert, ‘‘ Théorie des machines & eourants alternatifs,” in Phil. Mag., x. 298, 384.

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important term is that of longest period. Hence, properly choosing the epoch, we write

t-r

32x

fed” te TE sis BT

af (24t) +8 T where

2rr ony t =

ee

Hence we sec the current is diminished either by increasing + or increasing R, also that the moment of reversal of current is not coincident with that of no electromotive force, but occurs after that time by an amount depending on the relative magnitudes of y and R. This explains in a general way what is known as the lead of the brushes in a continuous current machine. If we wished to apply a commutator to the Siemens alternate eurrent machine for the purpose of producing an external current constant in direction, the change effected by the commutator should occur at an epoch after that of greatest clectromotive foree, an epoch which, with varying external resistance or varying speed, will depend on the resistance and speed.

The power of the current is Rx*, and the energy in any consider- able time, ©, is Qn? A3 al

Se (Ge) +R

‘Dp which shows that most power will be required to drive the machine when R= tt :

In what precedes it has been assumed that the copper Wires are the only conducting bodies moving in the magnetie ficld. In most cases the moving wire coils of these machines have iron cores, the iron being in some cases solid, in others more or less divided, It is found that if such machines are run on open circuit the iron becomes hot, very much hotter than when the circuit of the copper wire is closed; in some cases

the phenomenon is so marked that the machine actually takes more to drive it when the circuit is quite open than when the machine is short-circuited. The explanation is that on open circuit currents are induced in the iron cores, but that when the copper eoils are closed the current in the latter by its induction diminishes the current in the iron. The effect of currents in the iron cores is not alone to waste encrgy and heat the inachine ; the current produced is also actually less for a given intensity of ficld and speed of revolution. The cure of the evil is to subdivide the moving iron as much as possible in directions perpendicular to those in which the current tends to circulate.

Continuous or Direct Current Machines.—It has been shown that to produce a continuous current a commutator isneeded. If there is but a single wire in the armature, or if there are more than one, but all are under maximum electromotive force at the same time, the current outside the machine, though always in the same direction, will be far from uniform. This irregularity may be reduced to any extent by multiplying the wires of the armature, giving each its own connexion to the outer circuit, and so placing them that the electromotive force attains a maximum successively in the several circuits. A practically uniform electric current was first commercially produced with the ring armature of Pacinotti as perfected by Gramme. Suppose a straight bar electromagnet surrounded by a coil of copper wire from end to end. Let the electromagnet be bent with the copper wire upon it until its ends meet and it forms an annulus or anchor ring. Let the two ends of the copper wire be connected, so that the iron core is surrounded by an endless copper wire, and you have the Pacinotti or Gramme ring. This ring rotates about its axis of figure between two diametrically opposed magnetic poles of opposite name. ‘The ring may at any instant be supposed divided in halves by a diameter perpendicular to the diameter joining the centre of the poles. Equal and opposite electromotive forces act on the copper wire of the two halves, giving two opposite electric poles half way between the magnetic poles If electric connexions could be maintained with these two points as the ring revolves, a continuous current would be drawn off. In practice this

is only approximated to. The copper wire is divided into a series of equal sections, and at the point of junction of each section with its neighbour a connexion is made with a plate of a commutator, having as many divisions as there are divisions of the copper coil. Collecting brushes bear upon the commutator plates, which are connected to the coil nearest to the point of maximum potential. Owing to the self-induction and mutual induction of the several coils of the armature, this point is displaced in the direction of rotation when a current is being drawn off, to an extent greater as the current is greater in relation to the strength of the magnetic field. The magnetic field in the Gramme and other continuous dynamo-electric machines may be produced in several ways.! Permanent magnets of steel may be used, as in the smaller machines now made, and in all the earlier machines ; these are frequently called magneto- machines. Electromagnets, excited by a current from a smaller dynamo-electric machine, were introduced by Wilde ; these may be described shortly as dynamos with separate exciters. The plan of using the whole current from the armature of the machine itself for exciting the magnets was proposed almost simultaneously by Siemens, Wheatstone, and S. A, Varley.' For some purposes it is advantageous to divide the current from the armature, sending the greater part through the external circuit, and a smaller portion through the electromagnet, which is then of very much higher resistance, as the electromagnet is a shunt to the external circuit. Machines so arranged are sometimes called shunt dynamos.* The last two arrangements depend on residual magnetism to initiate the current, and below a certain speed of rotation give no practically useful electro-motive force.

In discussing the comparative efficiency of dynamo- machines there are two points to be examined—(1) how much of the power applied is converted into energy of current in the whole circuit, whether external or in the wires of the armature or of the electromagnets, and (2) how much of the power is available outside of the machine. The pe 2 a I erred Ml, SA ab ld ell dl

1 See for deseriptions of various continuous current machines :=— BaLL: Engineer, lii. 807; Tel. Jour., ix. 415; Electrician, vii. 395 9

Lingineering, xxxiii. 52. Brusu: Engineering, xxxi. 55, 85, 123; Engineer, xlv. 447, li. 15; Tel. Jour., vii. 21 ; Electrician, iii. 87 ; Shoolbred, 21 ; Fontaine, 181. Biirarn: Engineering, xxxii. 205 ; Electrician, vii. 229, Cance: Tel. Jour., viii. 8346. De Menitens: Engincering, xxxii. 356, 380, 892. Epison: Engineering, xxxii. 409, 418, xxxiii, 226, 252, 805, 407; Tel. Jour., x. 440; Engineer, lii, 325, lili. 42; Electrician, viii. 28, 202. Frin: Electrician, vii. 117; Engineering, xxxiii, 115. Firz@Eranp: Fingineer, 1, 284; Electrician, v. 224. GramME: Engineering, xxviii. 64, xxxiii. 53)3 Engineer, xlv. 447; Tel. Jour., vi. 491; Electrician, i. 15; Shool- bred, 18 ; Fontaine, 151 ; Regort from the Select Committce on Electric Lighting, 226; Schellen, 113. Giticner: Lugineer, lit. 848; Electri- cian, vii, 873, Hetnricn: Engineering, xxxii. 120; Tel. Jour., xviii. 359. HENLEY: Tel. Jour., ix. 288. Jiincensen: Engincering, xxxiii. 130 ; Engineer, lii. 287; Electrician, vii. 8381. Lapp: Fontaine, 124, Lontin: Fontaine, 169. Maxim: Engineering, xxxi. 618; Electri- cian, viii, 228; Tel. Jour., viii. 418. Pactnorn: Engineering, xxxii. 501; Engineer, lii. 298; Tel. Jour., vii. 217, ix. 478 ; Schellen, 123 Nuovo Cimento, xix. (1864); Journal de Physique, x. 461. ScHucKERT: Schellen, 189; Engineering, xxxiii. 244; Tel. Jour., vii. 119. SIEMENS: Lngineering, xxviii. 101; Electrician, ii. 89, vii. 58 ; Shoolbred, 17; Fontaine, 173; Schellen, 42,144. Wannacr-FarMEr: Engineer, xlv. 447; Shoolbred, 20; Report from the Select Committee on Electric Lighting, 246. Wrston: Eugineering, xxxii. 42; Electri- cian, i, 267; viii. 280. WitpE: Shoolbred, 19; Fontaine, 121; Schellen, 49.

2 Maseart, Journal de Physique, vi. vii.

3 See for experiments on machines so arranged :—AUERBACH and MEYER: Wiedemann's Annalen, November 1879. Crompton: Engineering, xxxii. 205. Hopkinson: Proc. Inst. Mech. E., 1879, 288, 1880, 266; Engineering, xxvii. 408, xxix. 424; Engineer, xlvii. 349; Tel. Jour., vii. 167, 185, viii. 167;. Electrician, ii. 279, iv, 295. ScHWENDLER: Tel. Jour., vii. 47, 82, 895; Electrician, ii. LOZ) 17.

4 ¥or experiments on Soc., 1880.

'* shunt dynamos" see Siemens, Zrans. Roy.

practical sources of loss are friction of bearings, and of the brushes on the commutator, electric currents induced in the iron of the machine, production of heat in the copper wire of the armature due to its resistance, and production of heat in the wire of the electromagnet due to its resistance. There is also a certain loss in sparks upon the commutator. The currents in the iron are reduced by dividing the iron by insulating surfaces perpendicular to the electromotive force tending to produce such currents. The loss by resistance of wire in armature and magnets greatly depends on the dimensions of the machine. For imagine two exactly similar dynamo-electric machines, the one being 2 times the dimensions of the other, we lave the following relations between them, assuming the same magnetic field per square centimetre, and the same speed of rotation :—

The electric resistances of the several parts are as 1:7 ;

The electromotive foree of the armature as 7? ;

Current round magnets required to produee the field as x,

Thus the work wasted in heating the wire of the electro- maguets varies as the linear dimensions of the machine. The current which the armature can carry with safety to the insulation will increase more rapidly than the linear dimensions of the machines, but less rapidly than the square of the linear dimensions. If the current vary as the linear dimensions 7, the whole electric work done by the machine will vary as its weight ”?, and the work wasted in the coils both of the electromagnets and of the armature will only vary as 2,—showing a great theoretic advantage in favour of the larger machines.

Electric Lamps. Incandescent Lamp.1—The simplest way of obtaining light from an electric current is by passing it through a considerable resistance in such small compass that the conductor becomes intensely hot. It is of course necessary that the conductor shall be able to endure a very high temperature without injury. Iridium and platinum- iridium wire have been employed, but are too expensive for commercial use.

Hitherto the only available sub- stance is carbon, in the form of a thread or filament. This carbon must be protected from the air by en- closing it in a glass globe from which every trace of air has been removed. An electric current passing through a carbon filament obeys Ohm's law, as through a metallic vire. But in metals the resistance increases as the tem- perature rises, in carbon it diminishes? The filament or thread of carbon being enclosed in a vacuous space, the energy of current converted into heat in the filament only leaves it in the shape of radiations. To light economically, it is necessary to heat the filament to such a temperature that the greatest possible proportion of these radiations shall belong to that part of the spectrum to which the eye 18 sensitive, z.¢., to the highest temperature the filament will stand. The fundamental problem of incandescent electric ligliting is to produce a carbon thread the substance of which shall permanently stand the highest possible temperature, to make good electrical conuexion between the ends of the filament and the conducting wires, and above all to secure that the thread shall be uniform throughout its length, for the current which can be safely used is limited by the weakest point of the filament. Several inventors have recently succeeded in meeting these eee Se

1 See for descriptions of various incandescent lamps :—Broucuam and ANDRE: Engineer, xlix. 190; Electrician, iv. 213. Eprson: Iinginecring, xxxiii. 805, 407; Tel. Jour., viii. 28, x. 440; Llectri- cian, vii. 862. Fox (St G. LANE): Engineer, li. 197; Tel. Jour. ix. 97; Electrician, viii. 5. JAaBLOcHKOFF: Engineering, xxii. 391. Konn : Electrician, vii. 861; Fontaine, 292. Maxim: Engineering, xxxi. 618. Napowr: Hlectrictan, vi. 138. Sawyer-Mann : Engineer, xlvii. 5; Tel. Jour., vii. 7; Electrician, ii. 100. Srarr: Electri- eo vii. 361. Swan: Tel. Jour., viii. 378; Electrician, vii. 218,

- Thomson, Jel. Jour, ix. 378.

conditions, but their relative merit and priority cannot be discussed here.®

Semt-incandescent Lamp.—The lamps of Werdermann, Reynier, and Joel are intermediate between arc lamps and incandescent lamps, and present the distinctive advantages of neither.*

Arc Lights.—Sir Humphry Davy discovered that if two pieces of carbon were placed in contact with each other, and the current from a battery of a sufficient number of elements were passed from one piece to the other, the current did not cease when the carbons were slightly parted, but that the current passed across the intervening space, causing an intensely high temperature and consequently brilliant light. ‘The pieces of carbon gradually burned away, the positive carbon being consumed more rapidly than the negative. When an electric current passes through a conducting solid body maintained at a con- stant temperature, the difference of potential on the two sides of the body has a constant ratio to the current pass- ing through; this constant ratio is known as the electric resistance of the body at its then temperature. No such constant ratio exists in the case of the electric are. If you increase the current passing between two carbons at a small distance apart, you do not materially change the difference of potential at the two ends of the electric arc. It is, therefore, not strictly appropriate to speak of the resistance of the electric arc; the appropriate con- stant, or approximate constant, for an electric are is the difference of potential between the two sides of the arc.® However near the carbons approach without touching, this does not fall below a certain minimum value, and as the carbons are separated its value increases. In ordinary practice with continuous currents the potential of the electric arc may be taken as ranging from 35 to 45 volts. If the current in amperes be multiplied by the difference of potential in volts, and the product be divided by 746, we have the power used in the arc itself in horse-power, that is, the power effectively used in lighting. The mechanism of an electric lamp has two functions to perform, it has first to bring the carbons into contact and then part them, or simply part them if they are initially in contact when the light is started, or when it is accidentally extinguished (this is called striking the arc); it has also to bring the carbons together as they are consumed. The former function is always accomplished by an electro- magnet or solenoid. In the electric candles, eg., those of Jablochkoff, Rapieff,

Wilde, or Siemens, the carbons are approximately parallel, and they burn down as does a candle,—the arc being forced to the ends of the carbons by the repulsion of the current in the carbons on the electric are. In the ordinary arc lamps the carbons have their axes in the same line, and their approach or recession must be controlled by the current passing through, by the difference of potential, or by both combined. When the same current passes through a succession of lamps in series, it is clear that the regulation cannot be by the

3 The application of incandescent lighting on a large scale has been thoroughly worked out in all its details by Edison. For a description of the whole system see Hngineering, xxxiii. 226, 250, 305, 407.

4See for description of various semi-incandescent lamps :—JOEL : Tel. Jour., viii. 864 ; Electrician, vi. 2938. REYNIER: Zlectrician, ii. 88; Tel. Jour., vii. 335; Fontaine, 297 ; Shoolbred, 38. WERDER-MANN: Engineer, xlvi. 312; Fontaine, 801; Shoolbred, 39.

5 Edlund, Pogg. Annal., 1867, 1868.

® See for descriptions of various electric candles :—DrE MERITENS : Shoolbred, 43. GarenmousE: Tel. Jour., viii. 352. HEINRICH: Engineer, xiviii. 418. HickbtEy: Tel. Jour., vii. 229. JABLOCH-KOFF: Enginecring, xxxii. 251, 300, 326; Tel. Jour., vii. 10; Shool-bred, 41 ; Fontaine, 76 ; Report from the Select Committce on Electric Lighting, 233 ; Schellen, 248. Jamin: Tel. Jour., viii. 224 ; Electri-cian, V. 68; Fontaine, 81. RaprerF: Tel. Jour., vii. 43; Shoolbred, 44. WILDE: Tel. Jour., vii. 46; Shoolbred, 44; Lngineering, xlvii. 385.

current alone, as this is the same for all the lamps, and might be maintained constant by the adjustment of any one only of the lamps. When lamps are burned in series, it is essential that the difference of potential shall be an element in the control. This is done by using an electro- magnet bound by fine wire so as to have a resistance of some hundreds of ohms, and connecting it to the two sides of the arc. In the Siemens differential lamp, and in some others, a potential or shunt coil

and a current coil oppose each otlier ; as the arc lengthens the current becomes less, and the potential greater, each acting to cause the carbons toapproach. It will be seen that the possible combinations of mechanisms and electromagnets for adjusting an electric arc are endless; and so also are the patents for such com- binations.1_ When an alternate current is used for an elec- tric arc, the phenomena are much more complicated, owing to the difference of potential being a discontinuous function of the time. The difference of potential will be (say) 40 volts in one direction for a certain fraction less than half of the periodic time of the current; the current then entirely ceases, generally for a finite time, and is then reversed with a sudden reversal of difference of potential.2 The work done in the are is measured by the time integral of the product of difference of potential and current passing. A knowledge of neither the mean strength of the current, nor of the difference of potential, nor of both, gives the means of ascertaining the work done in an arc with alternate current. The only satisfactory electrical method is the quadrant electrometer suitably connected, and this is open to the objection that a considerable resistance must be introduced into the circuit.

Lilectric Light Measurements.—Under this head we con- tent ourselves with a warning. A bare statement that an electric arc light is of so many candle power really conveys no accurate information at all. The light from an electric are differs greatly in colour from that of a candle;? a given arc light may lave three thousand times as much red of a certain wave-length as a standard candle has of the same wave-length, but ten thousand times as much green light. Any one will admit that green light is not measurable in terms of red light; a mixture of red and green is not

1 See for descriptions of various arc lamps :—Brockiz: Engineering, xxxi. 93; Engineer, xlix. 268; Tel. Jour., viii. 114 3 Electrician, iv, 232, Brus: Engineering, xxxi. 55, 85, 123; Engineer, li. 15 ; Tel. Jour., vii. 21; Electrician, iii. 87 ; Fontaine, 45. Oancze: Tingineering, xxxiii. 30. Crompton: Engineering, xxxii. 205; Hingineer, xlix. 323; Tel. Jour., viii. 131; Electrician, iv. 278, vii. 229. DE MERSANNE: Engineering, xxxii. 647, 650; Shoolbred, 34. FonTaINe: Fontaine, 70. FoucauLT and

DuBoscg: Fontaine, 48 ; Schellen, 211. Gairre: Fontaine, 36. Gorpon: Tcl. Jour., viii. 397. Gramme: Tel. Jour., ix. 250; Lingineering, xxxiti. 172. Gttcner : Engineer, lit. 848; Tel. Jour., ix. 464; Electrician, vii. 373. HEDGE: Engineering, xxxiii. 393; Electrician, iv. 40, vii. 404; Tel. Jour., ix. 418. Hetnricn: Engineering, xxxii. 154; Te. Jour., vii. 301, ix. 73; Electrician, iii. 201. HicKuey: Tel. Jour., Vii. 371. Jaspar: Engineering, xxxii. 645 ; Fontaine, 40. Krupp: Engineer, xvii. 167; Tel. Jour., vii. 198; Electrician, ii. 255. LACASSAGNE and THIERS: Fontaine, 28. Lontin: Shoolbred, 33; Fontaine, 59. MAcKENZIE: Engineering, xxxi. 38. Maxim: Tel. Jour., viii. 417, ix. 144; Fontaine, 69. Mozera and Ceprian: Tel. Jour., vii. 231. Orme: Tel. Jour., vii. 184. Prmsen: Eingineer- mg, xxxi, 514, xxxiii. 152; Tel. Jour., viii. 419. Raprerr: Enginecring, xxvii. 55; Tel. Jour., vii. 60 ; Fontaine, 22 ; Shool-

bred, 34; Report from the Select Committee on Electric Lighting,

239. ScriBneR: Tel. Jour., viii. 379. SERRIN : Shoolbred, Bue Fontaine, 53; Schellen, 218. Siemens: Engineering, xxxi. 276; Tel. Jour., vii. 318, 412, viii. 98; Hilectrician, ii, 52; Schellen, 227; Fontaine, 63; Shoolbred, 33. SonEIL: Engineering, xxxii. 453. Stewart: Tel. Jour., viii. 80, 115. Tomson and Houstan: Engineer, xlvi. 295; Electrician, i. 282; Fontaine, 67. TcxrKo- LEFF : /lectrician, v. 80. WALLACE-FaRMER : Engineer, xlvi. 295 Shoolbred, 36; Fontaine, 33 ; Report from the Select Committee on Hilectric Lighting, 246. WHESTON: Enginecring, xxxii. 42; Elec- trician, viii. 246,

- Joubert, Journal de Physique, ix. 297.
- Abney, Proc. Roy. Soc., 1878.

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measurable in terms 0. another mixture in which the pro- portions of the colours are wholly different. Again, the intensity of the light obtained from an arc light depends

greatly on the direction in which it is viewed.4 Neither of these considerations applies in the same degree to in-

candescent lamps. (J. HO.) LIGHTNING. See Merrorotocy and THUNDER- STORMS.

LIGHTNING CONDUCTOR, or Licutxing Rop (Paratonnerre, Blitz-ableiter), is the name usually given to apparatus designed to protect buildings or ships from the destrustive effects of lightning. The title, alike in English, French, and German, is misleading ; for, when properly constructed, lightning rods serve rather to prevent the occurrence than to ward off the effects of a flash of light- ning. Damping the enemy's powder would be a most efficient precaution agaiust cannon-shot, but it would be very inappropriately termed fortification. When a con- ductor charged with electricity is brought near to another conductor connected with the earth, it induces on it a charge of the opposite kind of electricity. The result is an attractive force which tends to bring the conductors nearer to one another, and to augment the electric density on their opposed surfaces. When the density is sufficiently great, there is rupture of the dielectric (air) between the conductors, and the disruptive discharge takes place as an electric spark. Jf one of the conductors have projecting points or angles, the electric density is usually much greater at such places than over the rest of the surface. But, though the density is great at such places, the charge on them is usually small, and the discharge takes place in au almost continuous manner by a brush or glow. When, for instance, a large conductor, connected with an electric machine, is giving a rapid succession of bright sparks to a ball connected with the ground, the sparks cease as soon as a pointed wire, connected with the ground, is held in the vicinity of the conductor. No discharge is heard, but in the dark a faint glow is seen at the end of the wire, which continues as long as the machine is turned. Re- move the wire and the sparks instantly recommence. This glow is known to sailors as St Elmo's (San Telmo's) fire, in old days Castor and Pollux (Plin., ZZ. W., ii. 37). Sup- pose now one of the conductors to be a thundercloud, the other the surface of the earth, the discharge will usually take place between the places of greatest surface density ; and it will in general be the more gradual as these are more pointed, and of less capacity. Hence Franklin's idea of furnishing buildings or other prominent objects with a projecting metal spike well connected with the ground, for the

purpose of preventing a lightning discharge by substi- tuting for it what is practically a continuous electric current.

To effect this object thoroughly, only three things are necessary :—(1) the points should so project from the building or ship to be protected as to prevent any great development of electric density elsewhere than on them- selves ; (2) they should be effectually connected with the earth ; (3) the connecting rod ought to be so good a con- ductor as not to be injured even by a powerful electric discharge.

The first of these conditions is realized by making the rod branch out to all the salient portions of the building or ship, and furnishing it with points projecting beyond each of them. No general rule can be laid down as to the extent of the region protected by a single point, though it may usually be assumed with safety that the region extends throughout a vertical cone whose vertex is at the point,

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4 Allard, Mémoire sur les phares électriques, p. 18, Paris, 1881; Proc. Inst. C. E., vii. 180 ; Shoolbred, 59. XIV. — 80

and whose semivertical angle is about 45°. This is pro- bably not true if the point be very high,—on the top of a tall chimney or tower, for instance. Objects not far from the base of such a protected tower, and within the cone just described, have occasionally been damaged by lightning.

The second condition is easily fulfilled in towns by connecting the lower end of the rod with the iron gas and water-mains, which form an excellent “earth,” as it is technically called. Water-pipes, being usually jointed with metallic-lead-washers, are preferable to gas-pipes, which are usually put together with white lead. This condition is also easy to secure in ships and in lighthouses, where large metal plates (in the case of a ship, the copper sheathing is precisely what is required) can easily be permanently immersed in sea-water. In country houses it is usually

more difficult to obtain a proper earth. Plates and tubes of metal, of large surface, buried in ground which is permanently damp, form usually the best arrange- ment. A well makes a good earth; a carefully constructed water tank (of stone or cement) is not an earth at all.

The third condition, so far as experience can guide us, seems to be effectually realized by making the conductor throughout of iron rod of an inch in diameter, or of copper rod not less in diameter than 2ths of an inch. Such rods of equal length have nearly the same conducting power, and therefore would have equal amounts of heat developed in them by a given discharge. But if such a discharge took place, the copper would be heated much more than the iron, in consequence of its smaller mass per foot (the specific heat being approximately the same in the two materials). Hence iron is, in this respect, preferable to copper, if the conducting powers of the rods are equal. Another advantage possessed by the iron rod is that it is much less likely to be wilfully damaged or stolen. Against this may be set the objections that it is easily injured by rust, and is not nearly so flexible as the equivalent copper rod. Conductors are now usually made of wire-rope, so that the question of flexibility is no longer of serious importance ; but when iron is used it should always be protected by zinc, ze, be what is absurdly called ‘‘galvanized.” Many fantastic forms of lightning rods were devised in consequence of the old erroneous notion that their efficiency depended on their surface and not on their cross section. In reality all conductors of equal length, and of the same material, are equally efficient if their cross sections be equal.1_ Thus, instead of stating the diameter of a rod, we may speak of its weight per foot, and say that a copper conductor should weigh at least about half a pound, and an iron one at least two pounds and a half per foot,—provided the materials be of good conducting quality.

The points need not be very sharp, but they ought to be protected by a coating of platinum or other non-oxidizable metal. And they should be in a group of two or three at the end of each branch of the rod, lest one of them should be fused and impaired in efficiency by an accumulation of electricity so rapid as to make the silent continuous dis- charge impossible. Joints should be avoided as far as possible ; where they are

unavoidable they should be made, not by screws or brazing, but by means of a large mass of solder completely enveloping the ends to be connected.

Another point to be carefully attended to is that all large metallic bodies, such as lead or zinc roofing, metal tanks, &c., should be in good conducting connexion with the rod, so as to prevent discharges of electricity inside the ship or building. In many buildings we see the lightning rods

1 Some curious modifications of this statement are introduced when we deal with magnetizable metals, but they are unimportant in practice.

attached by means of glass or porcelain insulators, such as are employed for telegraph wires. This is a perfectly needless, expensive, and possibly dangerous practice.

The literature of this subject is very extensive, as may be seen from Ronalds's Catalogue of Works on Electricity. The reader may also consult Anderson on Lightning Conductors (1880), and the Report of the Lightning-Rod Conference (1882). In the latter work will be found abstracts of many valuable papers, especially the reports on lightning-rods made to the French Academy by some of its most distinguished members, including Coulomb, Laplace, Poisson, Gay Lussac, Fresnel, Pouillet, Cagniard de la Tour, Regnault, &c. There will also be found hints about some of the most ludicrous devices employed by men ignorant of the laws of electrical pheno- mena. One of themost singular of these was theso-called '" Repeller." A lightning-rod, in all respects sufficient, was wont to be capped by a picce of glass like a thick soda-water bottle, inverted upon its point. The effect of this could only have been to prevent the possibility of the silent discharge, to produce which is the proper function of the rod, and to make probable a lightning flash, just as if the rod had been terminated by a ball instead of a point. Onc of these dangerous monuments of ignorance was removed from a British lighthouse within the last ten years. In an

Irish light- house, which was recently examined after suffering serious damage, it was found that the lower end of the lightning-rod was jumped into the solid rock—a truly original form of ‘‘earth’’!

In 1876 Clerk Maxwell suggested to the British Association the idea (based on Faraday’s experiments) of protecting a building from the effects of lightning by surrounding it with a sort of cage of rods or stout wire. Here an ‘‘earth” would not be absolutely required. The present writer had some months previously suggested the same idea in a Report to the Board of Northern Lights. It is possible, though not certain, that this form of defence might be useful against globe-lightning, which undoubtedly occurs, and against which ordinary lightning-rods would probably be of little use.

These brief remarks contain all that is yet known to be necessary to the complete solution of an important practical problem about which many treatises have been written. (E.G. 2)

LIGNITE, See Coat.

LIGNUM VITA. See Guaracum.

LIGUORI, LIGUORIANISM. The name Liguorian- ism has been popularly given in the present century to a particular school of moral and devotional theology in the Roman Catholic Church by the controversial oppo- nents of that school, whether themselves Roman Catholics or not. It is derived from the name of one of its principal and most influential exponents, Alfonso Maria de’ Liguori, a theologian, saint, and doctor of the Roman Church. In strictness, the term is not accurate, for Liguori was in no sense the founder of the school, nor did he innovate upon, develop, or exaggerate its principles and maxims.

e was simply a fair representative of the national] type of piety of Italian devotees in his day; and, as a casuist, he was a diligent compiler, whose avowed design was to take a middle course between the two principal varieties of teaching in moral theology current in his own time, avoid- ing their extremes of severity or laxity. His own words, in the preface to his Homo Apostolicus, a work intended for the

guidance of priests in hearing confession, explain clearly the intention of his bulkier treatise, the Zheologia Moralis. He says:— When compiling that work, I spent the labour of fifteen years in perusing and weighing the teaching of very many writers whom I examined, some of whom I found more lenient than is just; . .. while I found others who, strongly disliking such indulgence, fell into the other extreme of excessive rigour. And this was my principal task, to select from such a mass of opinions those decisions which, on the one hand, should uphold the obedience due to the precepts of God and of the church, and on the other should not add burdens which God has not imposed, by binding every one to that perfection which, through human weakness, is morally impossible to the general body of believers." A brief glance at the names of those casuists whom he cites most frequently, as Covarruvias, Soto, Lessius, Vasquez, Bonacina, the doctors of Salamanca, Sanchez, Diana, &c., shows them to belong mainly to the hundred years between 1580 and 1680, and

therefore to the period of Jesuit predominance in moral theology, and 6éf the prevalence of those maxims which Pascal lashed in the Provinciales, many of which were soon after condemned by Pope Innocent XI. in 1679. But, as Liguori embodies also in his materials the casuistical authors of the succeeding century, who were taught some caution by those mishaps of their predecessors, his works represent the final stage of casuistry in what is accounted a purified and moderate form, and have a yet greater importance, in that they have been accorded an official approval and authorization from the highest authorities of the Roman Catholic Church, such as those of no previous casuist of the post-Reformation era can allege. They are fully sanctioned, encouraged, and recommended for general use amongst the Roman Catholic clergy, and in fact only just fall short of being actually enjoined. Consequently they themselves, and the works based on them by Scavini and Gaume, as also the kindred manual of Gury, are all but universally found in use, and it is thus easy to learn from them what is now the accredited moral theology pre- valent throughout the Latin obedience. So much being premised, we may now turn to the

life of Liguori himself, and thence to the analysis of the system which he expounds.

Alfonso Maria de' Liguori, son of Giuseppe de' Liguori, a Neapolitan noble, and of Anna Cavalieri de Brindes, his wife, was born at Marianella, near Naples, on September 27, 1696. He was educated chiefly at home, though he attended an Oratorian school at Naples for a time; and, as his father desired that he should rise to office in the magistracy, he was especially directed to the study of jurisprudence, both civil and canonical. He took the degree of doctor in this faculty in January 1713, being then little more than six- teen years old. He was called to the bar in due course, and obtained considerable practice, while his biographers dwell much on the high moral tone of the rules he laid down for his guidance in the conduct of professional business. The loss of an important suit in which he was engaged as counsel for a Neapolitan noble against the grand-duke of Tuscany, and in which he had entirely mistaken the force of a leading document, so mortified him that, acting on a temper already disposed towards the monastic life, it induced his withdrawal from the legal profession, which he never resumed after this defeat. He soon adopted the ecclesiastical dress as a candidate for orders, which he received in December 1724, when he entered as a novice into the Congregation of Missions, being ordained priest in December 1726.

He soon became popular as a preacher and as a confessor, obtaining much influence in Naples and its vicinity. In 1732 he founded the "Congregation of the Most Holy Redeemer," usually known as Redemptorists, or, as they are often named, Liguorians, whose special object is the religious instruction of the rural poor and other uneducated classes, establishing the first house of the society, in the force of much opposition, at the little town of Scala, about 8 miles from Salerno. The headquarters were transferred somewhat later to Ciorani, and in 1743 to Nocera dei Pagani, which is still the chief house. The confirmation of the rule and institute was obtained from Benedict XIV. in February 1749, and in the following year Liguori, who had previously made some minor literary ventures, published one of his most famous and popular books, Le Glorie di Maria, a book

intended to promote the cultus of the Blessed Virgin ; and in 1753 he issued his yet more celebrated Moral Theology, dedicating it to Pope Benedict XIV., expressly as a “via media” treatise. An Italian version of this book, somewhat abridged, recast, and adapted for the use of the clergy, Was his next task ; and, on this shorter treatise becoming

popular, and a demand for it arising outside of Italy, he translated it into Latin, and issued itin 1755 as the Homo Apostolicus.

In 1762, being then sixty-six years of age, he accepted the bishopric of Sant' Agata dei Goti, a small town in the province of Benevento, at the express desire of the pope (though he had several years before refused the arch- bishopric of Palermo, offered him by the king of Naples), and by a very unusual concession was permitted to retain his superiorship of the Redemptorists, governing them by means of a vicar-general. He worked diligently in this sphere of labour for thirteen years, busying himself with practical reforms of various kinds in his diocese, notably in trying to raise the standard of clerical life and work, while not intermitting either his literary pursuits or his efforts to promote the growth of his Redemptorist institute. In 1775, being then seventy-nine years of age, he obtained permission from Pius VI. to resign his bishopric, on the plea of enfeebled health, and retired to the Redemptorist house at Nocera dei Pagani, where he died August 1, 1787, aged nearly ninety-one. He was decreed the rank of " Venerable" very speedily, being so named by Pius VI. in 1796, was beatified by Pius VII. in 1816, canonized by Gregory XVI. in 1839, and finally declared a " Doctor of the Church" by Pius [X., March 11,1871. He is one of the most copious of the later Roman theologians, and his productiveness extended over a period of thirty years, from the issue of his Visits to the Blessed Sacrament in 1747 till the appearance of no fewer than eleven treatises in 1777; but his only writings necessary to be added here to those already named are his treatises De Usu Moderato Opinionis Probabilis, 1754, recast and reissued in 1756 ; Prawis Confessarii, 1756 ; six apologies in defence of his views on probabilism and of his Moral Theology, in the same year, followed by three more in 1768; Verita della Fide, against Helvetius and the deists, 1767 ; Storia delle Eresie, directed chiefly against the Jansenists and Molinists, 1772 ; Dissertazioni teologiche morale, 1772 ; and Vindicie pro suprema Pontificia sotestate, adversus Justinum Febronium, in the same year.

He was a man of naturally amiable and gentle disposition, ascetic and self-denying in his personal habits, indefatig- ably diligent in many forms of activity, and of more than respectable abilities, though with the emotional side of his character in greater relief than its intellectual

side. He was learned, as learning was understood amongst the Italian clergy of the 18th century, though altogether lacking in critical faculty, whence he is quite untrustworthy as a controversialist, not only as habitually quoting spurious or interpolated authorities, but by adding matter of his own to amplify genuine quotations which fall short of proving his case. In estimating the nature of his moral teaching, not only have these personal characteristics to be steadily kept in mind, but also the fact that his life exactly synchronizes with that epoch of European history which was the seed-time of the Revolution, and when, owing to reaction from the fervid theological controversies of the 16th and 17th centuries, a general languor, coldness, and indifference towards religious questions reigned in all parts of Western Christendom. It was Liguori's firm belief that only the most lenient and gentle treatment could win back the alienated laity; and consequently, though he professed to steer a middle course between errors of laxity and severity in moral teaching, and fully. believed himself to have done so, yet in fact such a treat- ment was impossible to one who viewed the question as he did. For, while he regarded errors on the side of laxity as pardonable mistakes committed through excess of zeal in winning over penitents, contrariwise he looked on the stricter method of the rigorists, who upheld a loftier

morality, as not merely inexpedient, but as positively and intentionally evil, as designed to make religion odious by making it impossible, and so to prepare the way for the triumph of unbelief. He identified all teaching of the sort with Jansenism, and Jansenism, from its resistance to various pontifical decrees, seemed to him all but equivalent to atheism.

Hence the opinions of rigorist theologians find almost no place in his writings, save for the purpose of censure, since he did not regard them as authorities to be relied on; and accordingly the line he draws is not, what he probably thought it, an intermediate one between rigorism and laxity, but between a greater and a lesser degree of laxity, depending on the working of the principle known as "Probabilism." The meaning

of this principle (due to the scholastic form of the Aristotelian dialectic, and thus visible in germ as early as St Thomas Aquinas, though not taking final shape till the writings of Medina, Valencia, Vasquez, and others, mainly, but not exclusively, Jesuits, at the close of the 16th ceutury) is simply this :—when a doubt arises as to the binding force of some divine or human precept in any given case, it is permissible to abandon the opinion in favour of obedience to the law—technically known as the “safe” (¢wéa) opinion—for that which favours non-compliance, provided this laxer opinion be “ probable.” And by “probable” is meant any judgment or opinion based on some reasonable grounds, though with some doubt that the opposite view is perhaps the true one (Gury, Zheol. AMor., vol. i. n. 51). It may be probable in two chief ways,—intrinsically, because of reasons drawu from the nature of the thing itself, or extrinsically, because supported by one or more theologians of repute; and its degree of probability may vary according to a variety of conditions. Casuists are divided into six classes according to their mode of regarding probability :—(1) Rigorists, who lay down that the safer way, that of obedience to the law, is always to be followed ; (2) Mitigated Rigorists, or “Tutiorists,” who, holding that the law is always the safer and better way, yet allow that an opinion of the highest intrinsic probability in favour of liberty may sometimes be followed ; (3) Probabiliorists, who hold that the law is always to be obeyed unless an opinion clearly very probable (probabilior) is opposed to it; (4) Equiprobabilists, who teach that in a balance of opinions the less safe opinion may be lawfully followed, provided it be as probable, or nearly as probable, as its opposite; (5) Moderate Proba- bilists, according to whom it is lawful to follow the less safe and somewhat less probable opinion, provided it have some degree of real probability, even if the opposite opinion be clearly more probable; (6) Laxists, who hold that even slightly probable opinions may be followed ; but, as they were condemned by Innocent XL, they no longer exist as an avowed school, but are still latent under classes 4 and 5.

_ On further examination, it appears that the right of judging of the intrinsic probability of an opinion is restricted to persons of considerable learning, and specially versed in moral theology, since

they alone can know that there is not any certain argument in opposition. All other inquirers must fall back on extrinsic probability, that is, on what may be called “counsel’s opinions.” And, in forming a judgment on this basis, the following rules are laid down by IF’. Gury : —a moderately educated person may accept as probable any opinion which he finds asserted by distin- guished theologians of the present day, and may follow even a single author of repute, though teaching contrary to the commonly received view, provided he brings forward some fresh argument, and can urge reasonable pleas against former solutions; while an ignorant man may take the word of any person whom he thinks trustworthy, able, and

learned, that a particular opinion is probatle (Theol. Mor., vol. i. n. 54). Some classes of things are, however, ex- cluded by Roman casuists from the operation of this prin- ciple ; as, for example, all questions relating to matters of faith, in which the very highest degree of probability is not sufficient to excuse from following the safe opinion, which is that of the Roman Church. Liguori’s own posi- tion is that of an equiprobabilist, and he therefore, as a rule, leans to the laxer side.

Before procceding to illustrate the exact nature of his teaching by extracts from his works, it is desirable to ascertain what degree of authority attaches to those works in virtue of the position now accorded to him. In the first place, one of the earliest steps in the process of canonization is a strict review of every writing of the candidate proposed, whether published or unpublished. Every single proposi- tion therein must be separately considered, and be judged on its own merits, without taking the author’s probable intention into account, and if even one passage be found which fails to stand this test, as containing any moral or theological error, the process is stopped at once, unless proof be adduced that the authcr had in his lifetime formally and fully retracted the erroneous opinion. But a decree of the Congregation of Rites, confirmed by Pius VII. in 1808, declared that in none of the writings of Alfonso de’ Liguori was anything found

meriting censure, and the tcstimouy of Artico, bishop of Asti, and prince-prelate of the papal household, is that the examination had been unusually severe, that Liguori's system of morality had been discussed more than twenty times, and that the approval of the congregation was perfectly unanimous. Next, in the year 1831, Cardinal Rohan-Chabot, archbishop of Besancon, submitted a case to the cardinal grand penitentiary, desiring to know, whereas the teaching of Liguori's Moral Theology was resisted by some persons in his diocese, as too lax, dangerous to salvation, and contrary to the moral law, whether a professor of theology might safely follow and teach the opinions in that work, and further, whether a confessor should be molested for follow- ing those opinions in the coufessional, solely on the ground that they had been pronounced free from censure by the apostolic see, and without having examincd them inde- pendently himself. 'To the former of these questions an affirmative reply was given, to the latter a negative one. Thirdly, in the bull of canonization, issued by Gregory XVI. in 1839, the entire absence of error in Liguori's writings is once more asserted.

So far, no more is implied than the entire orthodoxy and moral soundness of Liguori's writings, vouched for to the ordinary Roman Catholic by the fact of his canonization. And, though the liberty is thereby taken away of directly censuring any proposition in the writings of a saint as doctrinally or morally untenable, yet there is no precise obligation to follow all things contained therein. It is still lawful to challenge the opinions of a saint, if it be done modestly and with the production of strong reasons (Bened. XIV., De Canoniz., ii. 32, 12); but this liberty is very seriously abridged if the saint be also a " Doctor of the Church." For the meaning of that title is that the person who bears it is one whu has not merely transmitted the teaching of the church to others, but has taught the church itself (Bened. XIV., De Canoniz., iv. ii. xi. 11), and whose doctrine has consequently been gencrally followed and authorized by the church. The number of these doctors of the church is very small ; and, in the special case of Liguori, he is not only the latest so named, but the only post-medizeval casuist who has yet been canonized. Accordingly, it is not merely permissible,

as heretofore, to follow his teaching, but it is now clothed with so high a degree of authority that it becomes matter of grave doubt

whether even such a modified expression of dissent from his teaching as occurs in the Apologia of Cardinal Newman in 1864 be now feasible without risk of censure. Tor the letters apostolic of Pius IX. declare that the works of Liguori may be used publicly in the same manner as the writings of other doctors of the church, such as Augustine, Gregory the Great, and Thomas Aquinas ; with, however, this notable difference that, whereas the tcaching of those earlier doctors is necessarily qualified and conditioned by the subsequent development of theology, and by the suc- cessive glosses which they have received, on the other hand, Liguori's recent date makes him the sole authoritative interpreter of all moral theologians earlier than himself, while no writer has yet appeared to modify authoritatively, much less to supersede, his own moral teaching.

It may seem, at first sight, that a great advantage is gained by having thus a standard text-book on morals, even if some exceptions may be taken to its rulings in certain cases, because it may be expected to check serious divergency of opinion, and to put, indirectly at least, a high ethical ideal before the body of religious teachers. This, however, can be the case only when such a text-book expressly repudiates the principle of probabilism, and so comes to be ranked amongst rigorist works. For once probabilism is conceded as part of the system, as is the case with Liguori, then every opinion not officially con- demned by authority, which is set down in the text-book itself, and is fortified with the names of any casuists of repute, becomes thereby probable and sanctioned, even though it be not the one professed by Liguori himself. Thus it may freely be followed by any priest in the confes- sional; and, what is yet more startling, it is the common and preferable doctrine that a penitent in confession can require absolution to be given him as a right, if he claim to have followed a probable opinion as to the act involved, even though not only tlie opposite opinion may be the more probable in the confessor's judgment, but that of the penitcnt

seem absolutely false, and the confessor is there- fore bound sub gravi to absolve in such a case (Lig., Z'heol. Mor., vi. 605); nor is it necessary that the opinion which the penitent advances should really convince or satisfy his own conscience. It is enough that it stands in the books, and is citable. Accordingly, the only practical effect of such a text-book as Liguori's is to undermine all rigorist propositions, and to make tenable every lax proposition, except the very few which have becn specifically condemned.

As regards Liguori himself, his usual method is to begin with taking very high ground, and to state in unexception- able terms the moral obligation of the precept with which he is concerned, but then to evacuate it of all real force by exceptions and qualifications. That such was felt to be the case, even in the relaxed society of his own day, appears from the frequency with which, even before his death, his moral teaching was impugned in Italy and France as of dangerous consequences, and fron the number of apologies he was obliged to put forward in its defence.

He lays down broad general propositions, such, for example, as that all voluntary departure from the divine rule, whether of human and natural law or of revealed law, is sin (Theol. AMfor., ii. 1, 1); that nearly all sins against the decalogue are mortal sins (Zdid., ii. 52, 2); that all sins, whether mortal or venial, deserve punishment (Jdzd., 11. 51, 1, 2); and, specifically, that all lying and falsehood is a breach of one precept of the decalogue (Zézd., vi. 1, procm.), and all theft and dishonesty a breach of another (Jdzd., iv. 518); but the favourable impression which such un- impeachable rulings produce is not maintained on further inquiry.

In the first place, he lays down that, to make any act sinful, three conditions must be fulfilled :—(1) it must be

done with consent of the will; (2) it must be free, that is, it must be in the power of the will to do it or leave it undone; (3) there must be intellectual consciousness (advertentia) of its evil nature. These look

specious enough, and against the first uo objection can be raised. But Liguori then alleges that violent gusts of passion or desire, which disturb the reason, and take away liberty of action, sometimes excuse from sin (/did., ii. 1, 2). He is not speak- ing of actual insanity, which is not under consideration ; and he adds that evil acts done by a drunken person are either not sinful at all, or are at most venial sins (Jdid., ii. 1, 4), because the effect caunot be more sinful than the cause. And as to the degree of advertence necessary as a condition of sin, he first mentions the stricter view, that actual and immediate attention to the nature of the act is not required, but that a virtual knowledge of its character suffices, by which a man might reasonably be expected to recognize it, since otherwise all evil-doers who are blinded by their passions, or by a long course of malpracticcs, may go on taking no notice, and continue to commit sins with moral impunity. He then states the laxer and con- moner view, that some direct advertence of the sinful nature of the act is necessary to constitute sin in doing it, and proceeds to reconcile these two opinions by ruling that voluntary ignorance, whether due to conscious neglect, to deliberate following of passion, to a course of evil habit, or to omission of the degree of consideration which the act demands, does not excuse from sin; but that all other forms of it do acquit the offender. The obscurity insepar- able from some of these qualifications complicates a sufficiently simple matter, and in any case the doubter is at liberty to fall back on the laxer opinion. But there is one exception ;—unbelicvers and heretics cannot plead ignorance as their excuse. All their errors, of whatever kind, are imputed to them as sin (/bid., ii. 1, 4). A further difficulty is created by the distinction made between mortal and venial sins, and by the inferences drawn from this distinction. “A mortal sin is that which, by reason of its gravity, dissolves grace and friendship with God, and merits eternal punishment. It is called mortal, because it takes away the principle of spiritual life, that is, habitual grace, and brings death on the soul. A venial sin is that which, by reason of its slightness, does not take away grace and friendship, thongh it abates the warmth of charity, and deserves temporal punishment. It is called vcnial, because, without damage to the principle of spiritual life, that is, grace, it brings on the soul an easily curable weakness, and easily obtains pardon” (Zbid., ii. 51). This seems at first merely a recognition

of the broad practical distinction between serious and trifling offences acknowledged by every sound ethical thinker and by every civilized penal code. But its consequences go much further, for in the Roman system of casuistry the aim is as arule to attenuate mortal sins into venial ones ; while these latter are regarded as of such little moment as scarcely to deserve the very name of sin. This appears from the fact that, whereas tlie canon (xxi.) Omnis utriusque sexus fidelts of the council of Lateran (1215), which first made private confession compul- sory, enjoins the confession of all one's sins at least yearly, on the other hand, the council of Trent (Sess. xiv. c. 5) lays down that only mortal sins need be so disclosed, while venial sins, though they may be named in confession, according to the practice of devout persons, can be passed over in silence without any fault. And Liguori gives his own sanction to the proposition that a Christian does not sin gravely who proposes to commit every one of the venial sins (Theol. Mfor., v. 1,12). Such being the light estimate of these sins, it might be fairly supposed that great care would be taken to mark them off so clearly from mortal sins that even the least instructed conscience could not

confuse them with each other. But every sin which, considered in itself, is mortal, becomes venial if any one of these three conditions be absent :—full advertence and deliberation ; entire consent; for the most part, gravity of the subject matter. Insufficient deliberation may be known in three ways:—imperfect consciousness of the sinfulness of the act, as if one were half asleep ; subsequent regret, and a conviction that you would not have done the act had you fully apprehended it; such disturbance, through passion, alarm, or distraction, as to confuse the sense of what you were doing, Imperfect consent is established by the presence of a doubt in any one's mind whether he did really consent ; by the habitual disposition being that of regarding mortal sin as a worse evil than death ; by consciousness of having proceeded very timidly and hesitatingly in the action; by being half asleep, so as to be only doubtfully conscious, and being of opinion that the act would not have been done in case of full possession of the senses. And gravity of

the subject matter is to be decided, not merely on the merits of the thing in itself, but in its relation to the end proposed by the agent. [If it make but little for this end, it is trifling ; if much, then it becomes serious (7Z'heol. Mor., ii. 54, 55, 56).

It is obvious that each of these subdivided qualifications admits of indefinite hair-splitting, and so that the security apparently provided by the general distinction between mortal and venial sins is elusive. It is true that there are also causes which will raise a venial sin to the rank of mortal ; but the ascending process is more uncertain and difficult than the descending one. A venial sin, committed deliberately as a stepping-stone to a mortal sin, is to be judged in respect of this its object, and so becomes mortal. A venial sin, so passionately clung to as to make its votary ready to commit a mortal sin rather than forego its indul- gence, also becomes mortal. But in neither of these cases is it necessary to confess the venial sin, only the mortal sin to which it has led up. The third mode of a venial sin becoming mortal is when it is committed with the formal and express purpose of disobedience to a superior, or to a precept, just because it is a precept. And in this case alone, because of the supreme place given to obedience in the Roman system, wherein it is not only the first and highest of virtues, but practically almost the only one insisted on for all, there is no manner of withdrawal from the category of mortal sins (Theol. Mor., ii. 59, 60, 61).

So far, only the general principles on which Liguori's system is based have been explained. It next remains to exhibit their prac- tical application, both as regards his own statements and also as regards those opinions of other casuists which, though not accepting them for himself, he yet embodies without censure in his work, thereby giving them the character and sanction of probability. It will simplify the inquiry to limit it mainly, though not exclusively, to the teaching on falsehood and theft.

Both of these are declared by Liguori to be sins of grave charac- ter, and in regard to the former he cites, amongst other authori- tative condemnations, these words of Pope Innocent III. : 'Not even to

defend our life is it lawful to speak falsely.” He adds that persons who are being lawfully questioned by such as have a right to interrogate, as judges in court, ora priest in the confessional, are bound to disclose truly all that they know of the matter inquired into. Those who are questioned by such as have no right to interrogate them, or are questioned irregularly by lawful authority, are not bound to communicate their knowledge, and may set aside and avoid sueh questioning by any lawful means,—such means however, not including falsehood, nor answers made with mental reservation, making the words actually spoken falsc, this latter mode of evasion having been formally condemned by Innocent XI. in 1679, though it was permitted by the casuists of the immediately preceding period. This is all tenable enough, but its apparent force is easily reduced by a little ingenuity.

In the first place, he distinguishes amphibology or equivocation from mental reservation, and names three varieties of equivocation : (1) that of a word having two quite different senses, as volo in Latin means to ‘‘wish” and to ‘ fly,”—to which may be added the fre- quent English ambiguity oftwo distinct words having the samesound, as air and heir; (2) a sentence having two main meanings, as ‘‘ This

book is Peter’s,” which may signify his ownership or his author- ship; (3) that of words having two senses, one more common than the other, or one literal and the other metaphorical. The example he gives of this last form is the phrase ‘‘I say No,” uttered by a person who wishes to conceal something as to which le is ques- tioned. The words seem to his hearer to denote express denial of the fact; the meaning in which he uses them is merely ‘‘I utter the word ‘No,’” this sentence being complete in itself. ‘It is certain,” adds Liguori, ‘‘and the common opinion of all, that it is lawful for a just cause to use equivocation in the manners described, and to confirm it with an oath. . . . And the reason is because we do not then deceive our neighbour, but for a just cause permit him to deceive himself; and besides, we are not bound, if there be a just cause, to speak so that others may understand. And any

onest object for retaining any good things that are useful to our body or spirit may be a just cause” (Theol. Mor., iv. 151).

But suppose that it is impossible to allege a just cause, is it then mortal sin to swear with such equivocation? Some of the stricter casuists say so, but Liguori sides with the laxists, and declares it merely venial, except in a court of law or in formal contracts,— alleging that, save in these two cases, any reasonable cause, such as desire to be quit of troublesome and irregular questioning, is sufficient to mitigate the sin. He adds, however, two cautions— that a more serious cause is required to justify equivocation with an oath than without one, and that, in proportion as the equivocal words employed give greater occasion for mistake, a graver cause is required for their proper use, a qualification instantly modified by the next clause, which lays down that, when words which are in themselves equivocal, having two equally valid meanings, are used, then they give little or no cause for error, and may be used on the very lightest grounds.

Next, as to mental reservation, or ‘‘restriction,” which is the technical name, this was expressly condemned in three propositions by Innocent XI., forbidding it in all cases. Necomting to the analogy of all prohibitory Jaws, this general prohibition of the genus should include prohibition of all the species also. But the casuists, unable to oppose direct resistance to the papal decree, have turned its flank by inventing a new distinction which was unknown in 1679. They have now divided mental restriction into two main heads, the first of which, absolute or “pure” mental restriction (by which is meant such reservation as cannot possibly be observed by the hearers, or conjectured from the attendant circumstances), is always illicit, whether with or without an oath. But ‘‘non-pure” mental restriction (that is, such as may conceivably be observed and inferred from attending circumstances, such asan in- audible whisper, or a qualifying gesture) does not, they allege, fall under the ban of Innocent XI., and is always lawful for a just cause. ‘‘ The reason of this opinion is that, if it were not permissible to use non-pure mental restriction, there would be no lawful means of con- cealing a secret, which one could not disclose without loss or incon- venience, which would be as hurtful as lying to

human intercourse. And therefore the condemnation passed by the pope on mental restriction is rightly to be understood of a restriction taken absolutely and strictly, for that alone can be called true mental restriction which takes place in the mind alone, and so remains hidden, and can in no wise be recognized from external circumstances" (Theol. Mor., iv. 152). And the following illustrations are supplied, (1) A confessor may affirm with an oath that he is ignorant of a crime which he has heard in confession, secretly meaning thereby that he is ignorant of it as a mere man, though not as a minister of religion. (2) An accused or a witness, if trregularly questioned by the judge in court, may swear that he knows nothing of a crime which he does in fact know of, understanding thereby that he does not know it so as to be legally bound to answer or depose concerning it. This alarming proposition is apparently corrected by the warning that, when the interrogation of the judge is in due form, then the person questioned is bound to obedience, and barred from all equivocation. But this safeguard is at once fatally weakened by the further pro- visions that, if the act be not a crime in the witness's opinion, he need not disclose it, and that if the crime be altogether hidden (t.e., where only the criminal himself and the witness know the facts), the witness is not merely permitted, but is actually bound, to say that the accused did not cominit it. And the accused is equally free to do so, unless there be already '* half-full" proof against him, because, in the absence of such a degree of presumption, the judge has no legitimate right to question him as to his guilt. Those who have deceived the court by such sworn equivocation are, Liguori rules, entitled to absolution without the tomo of the truth being imposed as a condition.! (3) A needy man, who has made

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1 Akin to this teaching is the maxim laid down in another place, that it is lawful to procure the giving of perjured evidence, ''if you havea great interest in employing perjury to expose the fraud of another person in order to obtain your own rights" (Theol. Mor., iii. 3, 77), with which may be coupled the permission for suitors to offer and for

Judges to take bribes for expediting causes, so long as the bribing is not expressly for delivering false Judgment (Zdid., v. 196, 212),

away, for his maintenance, with property due to his creditors, may affirm to the judge that he has nothing. (4) A witness asked by the judge whether he has had any conversation with the accused may deny it, meaning that he has not talked with him so as to co- operate in the crime. (5) An adulteress, questioned by her husband as to her guilt, may deny it in any of these four ways: (a) that she has not broken the marriage-tie, because it is not voided by adultery ; (0) if she have gone to confession, she ma say that she is innocent of the crime, because it has been remitted in confession ; (c) that she has not committed adultery, using the word in its fre- quent Biblical sense of ‘‘ idolatry ” ; (d) that she has not committed it so as to be bound to tell him of it (Theol. Mor., iv. 158-162).

Promises are no safer than assertions under this code. As usual with Liguori, a broad statement of their binding character is pre- fixed to the qualifications which leave nothing but the outer shell remaining. For we are told (a) that ‘the whole obligation is com- monly understood as depending on the intentions of the promisers, and not binding unless that be confirmed with an-oath or a formal document, in the absence of which it may be considered a mistake ora jest”; and (6) that ‘‘it is certain that every promise, even an accepted one, does not bind, if after the date of the promise it be- comes impossible, or very hurtful, or unlawful, or useless, and generally speaking, when there has been a serious change of circum- stances, which, if foreseen, would have prevented the promise ; such a promise is always presumed to have been made under some such tacit condition” (Theol. Mor., iv. 7 20).

Theft is treated in a very similar fashion. A broad general rule is laid down as to its sinfulness, and this is at once traversed by the following doctrine : ‘It is certain that a man who is in extreme necessity may purloin other people’s goods, enough to relieve him- self from such necessity. So the doctors in common say, agree- ing with St Thomas.” Extreme necessity is defined as meaning risk of loss of life, or of some

limb or other important bodily member, peril of perpetual captivity, or of any serious disease or discredit. And Liguori, contradicting the stricter casuists, in- cludes under the same heading the case of a man of rank ashamed to work or to beg, who may then lawfully steal to maintain himself, Then the case is put whether a poor man in extreme need is free to steal before asking. One rigorist lays down that it is a mortal sin to do so, because no man can be held to be in extreme necessity who can get what he wants by asking. But the laxer casuists rule that, though he is bound to ask first, he sins only venially by omitting to do so ; and Liguori solves the difficulty by saying that the robber sins mortally if what he takes is not absolutely necessary to relieve his want, but that, if he does so need it that the owner, if aware of the fact, would be bound by the laws of charity to give it him, then he does not sin even venially by stealing it, because he has in that case an absolute right to take it (Theol. Mor., iv. 520).

Some of these rulings are contrived so as to evade the condemna- tion passed by Innocent XI. on the proposition that ‘‘it is allowable to steal, not only in extreme necessity, but also in grave necessity.” But a more direct conflict with the papal ruling appears in respect of another censured proposition, that “‘men and women servants may secretly pilfer from their employers to compensate themselves for their work, which they account as of more value than the wages they receive.” This is explicit enough, but it is at once set aside by the casuists, who allege that the rule holds good only in the case of a servant who has of his free will contracted to accept a low salary, as he thereby bars himself from compensation; but if he has made the bargain under any sort of constraint, as, for instance, being in great poverty, and thus glad to take any situation, he is at liberty to steal to the amount of what he considers his just additional wages. Some casuists do, indeed, question the servant’s right to be judge and assessor in his own cause, but the point is ruled practically in his favour (Theol. Mor., iv. 522, 528, 524). Again, servants may purloin such eatables and drinkables as are not locked up, provided they do so for their own consumption, and not to sell out of doors, and so long as each such theft is singly trifling (Zbid., iv. 54). Even when restitution is enjoined, there is a notable provision in favour of the thief. If he is uncertain who it is he has robbed, he is to

make restitution in one or other of certain ways, one of which is that if he be poor he may apply the proceeds of the theft to him- self or to his family (Prawx. Confess., ii. 44).

In addition to these glosses on the decalogue, there is one element of doubtfulness introduced into nearly all questions of theft, which is, as to the ‘‘ gravity of matter,” constituting the offence mortal or venial according to the degree of this factor, and a comparison of the various places where Liguori employs the term “ sravitas materis ”’ shows that in all cases where numerical expression can apply he means quantity. Accordingly, he, in common with many other casuists, constructs a sliding tariff of guilt, depending, as a rule, on the amount stolen (Theol. Mor., iv. 526-528).

A few brief citations from other decisions will show that the same prneiples applied to questions of lying and theft extend to the remaining forms of sin. (1) A man of high position may lawfully

if] any one who attempts to slap his face, if there be no other way of warding off the insult (Theol. Mor.. iv. 38). (2) He who kills

A, meaning to kill B, is not bound to make compensation, because the homicide is casual and inadvertent as regards A ; and similarly if a man burns down the house of his friend, meaning to burn that of an enemy (Jbid., iv. 628, 629). (3) Though we are bound to love our enemies, we are not bound to salute them, to speak to them, to visit them if sick, to comfort them in any trouble, to receive them into our house, or to hold any kind of familiar inter- course with them (bid., v. 8, 28). (4) A servant may help his imaster, by lifting him on his shoulders, or by providing him with a ladder, to enter a house, even forcibly, for immoral purposes ; for the act is innocent and colourless in itsclf, nay, even an act of charity or good-will, and the servant is not responsible for the subsequent conduct of his employer (7 bid., iii. 8, 66).

For all practical purposes, the probabilism which is at the base of all this casuistical method, and which is simply the substitution of an external authority for the dictates of conscience, is now in absolute possession throughout the Latin obedience, having finally conquered the resistance it has encountered at intervals since its first formulation as a working theory. Although it owes its chief development to the Jesuits, yet somie of its ablest oppoucnts were members of that company, such as Comitolus, Rebellus, Gisbert, and even two of the generals, Mutio Vitclleschi and Tirso Gonzales; while the Sorbonne and the Dominicans were also engaged in fre- quent controversy against its upholders, and in censuring the teaching of several of Liguori's favourite authorities, such as Lessius, Escobar, Tamburini, Bauny, Viva, Busembaum, and Diana.

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LIGURIA, in ancient geography, was the name given to a portion of the north-west of Italy, including the districts, on both sides of the Maritime Alps and the Apennines, which border on the Tyrrhenian Sea from the frontiers of Gaul to those of Etruria. Along the sea-coast it extended from the river Varus or Var, which separated it from Gaul, to the Macra (Magra), which formed its limit on the side of Etruria, thus comprising the whole district between the mountains and the sea, now known as the Riviera of Genoa. But besides this it comprehended a broad tract to the north of the same range, formed by the underfalls of

the Apennines and the hilly tract adjoining them, extending to the plains of the Padus or Po,—that river itself constituting its northern limits under the Roman administration. But at an earlier period the term had a much wider signification,—all the tribes on the south slopes of the Alps, in the north-west of Italy, being apparently of Ligurian origin. This we are expressly told by ancient authors in the case of the Taurini, who dwelt around Turin, and of the Levi and Libici, who extended from thence to the Ticinus; and there can be little doubt that it was true also of the Salassi, who occupied the modern Val d'Aosta. But to the west of the Maritime Alps also the Ligurians were undoubtedly widely spread in ancient times, and occupied a considerable extent of what was afterwards included in Gaul. Thus the Salyes, who held all the southern part of Provence from the Var to the Rhone, are distinctly termed a Ligurian tribe, as well as the minor tribes of the Oxybii and Deciates, near Frejus and Nice. All the early Greek writers speak of the important colony of Massilia as founded in Liguria.

Of the origin or affinities of the Ligurians (or Ligyans, as they are termed by Greek writers) we know absolutely nothing. All ancient writers concur in representing them as a distinct people from the Gauls on the one hand, and from the Iberians on the other; and the attempts of some modern writers to assign them to a Celtic stock rest upon no adequate foundation. In the absence of all remains of their language, all such speculations must be matters of mere conjecture, They appear in the historical period as a rough and hardy race of mountaineers, cultivating a

rugged territory with much industry, and opposing a stubborn resistance to the efforts of the Romans to reduce them to subjection. They first came in contact with the Roman arms in 235 B.c., but it was not till after the Second Punic War—in which the Ligurians had openly espoused the cause of Hannibal—that a serious struggle began, which, commencing in 200 B.c., was continued with little intermission for more than eighty years. While the Roman generals in the East were

overthrowing, with com- parative ease, the powerful monarchies of Macedonia and Syria, one of the consuls was generally engaged in inglori- ous hostilities with the hardy mountaineers of the Ligurian Apennines. Even after these were reduced to subjection, the tribes which held the still more rugged fastnesses of the Maritime Alps long maintained their independence, and it was not till the reign of Augustus that they were finally subdued. The construction by that monarch of a Roman highway along the coast, which followed almost exactly the same line as the modern road of the Corniclie, marked the period of their complete subjection.

The physical geography of Liguria has been already described in the article of Iraty. All the rivers which take their rise on the northern slope of the mountains ultimately discharge their waters into the Po; of these by much the most considerable is the Tanaro, which receives the tributary streams of the Stura and the Bormida, while to the east cf it flow the Scrivia and the Trebia, celebrated by the victory of Haunibal over the Romans. This last stream, according to the division of Augustus, formed the boundary between Liguria and Gaul south of the Po. The streams which flow from the Apennines southward to the sea are for the most part inconsiderable, and mere moun- tain torrents. But the Magra, which forms the limits of the province on the east, isan important stream, and brings with it the waters of its tributary, the Boactes or Vara. On the west also the Var is a river of considerable magni- tude, which forms a natural boundary on this side between Liguria and Gaul, as it long constituted their political limit. The Rutuba or Roya, a little farther east, is also a considerable river, descending through a deep mountain valley from the Col di Tenda.

The principal Ligurian tribes were (1) the Apuani, inhabiting the valley of the Magra, including the district known in modern times as the Lunigiana ; (2) the Friniates, on the northern slope of the Apennines towards Modena ; (3) the Briniates, in the valley of the Vara; (4) the Genuates, around Genoa; (5) the Veturii, immediately west of the preceding; (6) the Ingauni, whose capital was Albium Ingaunum, still called Albenga ; (7) the Intemelii, whose chief city still retains the name of Vintimiglia ; and (8) the Vediautii, extending thence to the

Var. North of the Apennines the most important tribes were the Vagienni, who held the whole mountain tract from tlie Monte Viso and the sources of the Po to the Tanaro 3 and the Statielli, east of them, whose chief town was Aquze Statiellee or Acqui.

The chief city on the Lignrian sea-coast was, in ancient as In modern times, that of Genoa, which combined an excellent natural port with a central position, and easy communications with the interior. West of it, along the coast, were Vada Sabbata (Vado, near Savona), Albium Ingaunum (Albenga), Albium Intemelium (Vintimiglia) the Portus Herculis Monceci (Monaco), and Nicsea (Nice), wlich was founded by a colony from Massilia. Tn its immediate vicinity was the Roman town of Cemenelium (Cimiez). On the northern slope of the Apennines were several considerable towns, almost all of them of Roman origin. The chief of these were Augusta Vagiennorum (Bene), Alba Pompeia, Asta, Aque Statielle, Dertona (Tortona), and Iria (Voghera), but none of them attained

to anything like the same prosperity and importance as the great cities of Cisalpine Gaul. The towns on the eastern Riviera, between Genoa and tle Gulf of Spezia, were incon- siderable places ; and even on the shores of that gulf, forming the magnificent port called the Portus Lune, there was never any town of importance, Luna itself being some distance inland, and within the confines of Etruria. (z. H. B.)

LILAC, Syringa vulgaris, L., belongs to the olive family, Oleacex. The common lilac is said to have come from Persia in the 16th century, but according to Heuffel it is indigenous in Hungary, the borders of Moldavia, &e. (De Candolle, Prod., viii. p. 282). Two kinds of Syringa, viz., alba and cxrulea, are figured and described in Gerard’s Herball (1597), which he calls the white and the blue pipe privets. The former is the common privet, Ligustrum vulgare, L., which, and the ash tree, Fraxinus eaxcelsior, L., are the only members of the family native in Great Britain. The latter is the lilac, as both figure and descrip- tion agree accurately with it. It was carried by the European colonists to North-East America, and is still grown in gardens of the

Northern and Middle States. There are several varieties of lilac, eg., “Dr Lindley,” which bears large clusters of reddish lilac flowers, alba, violacea, rubra insignis, and rosea grandiflora. 8S. dubia, Pers., or chinensis, Willd., the Siberian lilac, is a closely allied species, if it be really distinct. The variety Lothomogensis, Mirb., or Lilas Varin of the French, probably belongs to this species. Of other species, there is S. Jostkea, Jack., from Transylvania, with scentless bluish-purple flowers, S. Zmodi, Wall, a native of the mountains of India, and S. persica, L., the Persian lilac, rarely exceeding 4 or 5 feet, the flowers of which vary from rosy carmine to white.

LILBURNE, Joun (1618-1657), an English sectary and prolific pamphleteer, was the younger son of a gentleman of good family in the county of Durham, and was born in 1618. At the age of twelve lie was apprenticed to a clothier in London, but he appears to have paid only slight attention to business, and to have early addicted himself to the “ contention, novelties, opposition of govern- ment, and violent and bitter expressions” for which he afterwurds became so conspicuous as to provoke the saying of Marten that, “‘if the world was emptied of all but John Lilburn, Lilburn would quarrel with John, and John with Lilburn,” He appears at one time to have been law-clerk to Prynne. In February 1638, for the part he had taken in importing and circulating the Merry Litany and other publications of Bastwick and Prynne, offensive to the bishops, he was sentenced to be publicly whipped from the Fleet prison to Palace Yard, Westminster, there to stand for two hours in the pillory, and afterwards to be kept in jail until a fine of £500 had been paid. Though gagged at the pillory, and confined in prison, he was not the man to give up his opinions or forego the pleasure of expressing them, and in the following year he did not improve his prospects of a speedy release by the kind of literary activity to which he devoted lis enforced leisure.1 In point of fact he did not regain luis liberty until November 7, 1640, when one of the earliest recorded speeches of Oliver

1 Come out of Her, My People: or An Answer to the Questions of a Gentlewoman, a professor in the Anti-Christian Church of England, about Hearing the public Ministers ; where it is largely discussed, and

proved to be unlawful. Also a Just Apology for the way of Total Separation, commonly but falsely called ‘* Brownisin”; that it ts the truth of God though lightly esteemed in the eyes of the world. With a challenge to dispute them publicly before King and Council, to prove whatsoever I have said at the pillory against them: viz., that the call-tng of them is jure Diaboli, even from the Devil himself. By me John Lilburne, close prisoner in the Fleet for the cause of Christ. Printed

< the year of hope of England's Purgation and the Prelates’ Dissolu-ton, 1639,

Cromwell was made in support of his petition to the House of Commons. In 1641 he received an indemnity of £3000. He now entered the army, and in 1642 was taken prisoner at Brentford and tried for his life; sentence would no doubt have been executed had not the parliament by threatening reprisals forced his exchange. He soon rose to the rank of lieutenant-colonel, but in April 1645, having become dissatisfied with the general conduct of affairs, and especially with the predominance of Presbyterianism, he resigned his commission, presenting at the same time to the Commons a petition for considerable arrears of pay. His violent language in Westminster Hall about the speaker and other public men led in the following July to his arrest and committal to Newgate, whence he was discharged, however, without trial, by order of the House, in October. In January 1647 he was again committed to the Tower for accusations which he had brought against Cromwell, but was again set at liberty in time to become a disappointed spectator of the failure of the levelling or ultrademocratic party in the army at the Ware rendezvous in the following December. The scene produced a deep impression on his mind, and in February 1649 he along with other petitioners presented to the House of Commons a paper entitled The Serious Apprehensions of a part of the People on behalf of the Commonwealth, which he followed up with a pamphlet, Lngland’s New Chains Discovered (March 1, 1649), criticizing Ireton, and another exposing the conduct of Cromwell, Ireton, and other leaders of the army since June 1647 (The Hunting of

the Fowes from Newmarket and Triploe Heath to Whitehall by Five Small Beagles, the “beagles ” being Lilburne, Overton, Walwyn, Prince, and another). Finally, the Second Part of England’s New Chains Discovered, a violent outburst against “the dominion of a council of state, and a con- stitution of a new and unexperienced nature,” became the subject of discussion in the House, and led anew to the imprisonment of its author in the Tower on Aprilll. His trial in the following October, on a charge of seditious and scandalous practices against the state, resulted in his unanimous acquittal, followed by his release in November. In January 1652, for printing and publishing a petition against Sir Arthur Hasilrig and the Haberdasher’s Hall for what he conceived to have been an injury done to his uncle George Lilburne in 1649, he was sentenced to pay fines amounting to £7000, and moreover to be banished the Commonwealth, with prohibition of return under the pain of death. In June 1653 he nevertheless came back from the Low Countries, where he had busied himself during the interval in pamphleteering and such other agitation as was possible, and was immediately arrested ; the trial, which was protracted from July 13 to August 20, indeed issued in his acquittal, to the great joy of London, but it was nevertheless thought proper to keep him in captivity for ‘the peace of the nation.” He was detained succes- sively in the Tower, in a castle at Jersey, and in Dover Castle. At Dover he came under Quaker influence, and signified his readiness at last to be done with “carnal sword fightings and fleshly bustlings and contests” ; and in 1656, on giving security for his good behaviour, he was set free. He now settled at Eltham in Kent, fre- quently preaching at Quaker meetings in the place and neighbourhood during the brief remainder of his troubled life. He died on August 29, 1657.

See Masson, Life of Milton, who refers (iv. 120) also to Walker (History of Independeney, ii. 247), Godwin (Commonwealth, iii. 163-177), and Bisset (Omitted Chapters of the History of England, 191-251), and adds, ‘‘ Mr Bisset relates Lilburne’s trial (in 1649) at length, with copious extracts, and makes John more of a hero than Godwin does, though Godwin is not unfavourable. On the whole, I like him myself, and am glad that he is in the history of England, but think he was an ass.”

LILLE, capital of the department of N ord, France, and the ancient capital of Flanders, is situated about 155 miles by rail north of Paris, and at an elevation of 75 feet, in a low plain on the Deule, which flows to the Scheldt by the Lys. It is the chief fortress of the north of France, and headquarters of the first army corps, and is defended by a rampart and by a pentagonal citadel situated to the west of the town beside the Deule. The water of the river fills the moat, and the environs of the citadel can be laid under water. Prior to 1858 the town occupied an elliptical area of about 2500 yards by 1300, with the church of Notre Dame de la Treille in the centre, but the ramparts on the

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‘Plan of Lila

1. Barracks of St André. 7. Grand Theatre. 15. Church of St Michel. 2. Cattle Market and] 8. Exchange. 16. Church of St Peter and Siaughter House. 9. Hotel de Vilie. St Paul. 8. Palais de Justice. 10. Military Hospital. 17, Nouvelle Aventure 4. Bank of Franee, 11. Ch. of St Sauveur. Market. 5. Notre Dame de la | 12. St Sauveur Hospital. | 18. Arsenal. Treille, | 13. Paris Gate. 19. St Eugénie Hospital. 6. Lycée and Museum. | 14. Industrial Institute. {| 20. Ch. of St Martin.

south side have since been demolished and the ditches filled up, their place being now occupied by the great Boulevard de la Liberté, which extends in a straight line from the goods station of the railway to the citadel. The new enceinte is much more extensive, and encloses the old communes of Esquermes, Wazemmes, and Moulins-Lille, the area of the town being thus more than doubled ; in the new quarters fine boulevards and handsome squares, such as that De la République, have been laid out in pleasant contrast with the sombre and dirty aspect of the old town. The district of St André to the north, the only elegant part of the old town, is the residence of the Lille aristocracy.

At the demolition of the old fortifications, the Paris gate, a triumphal arch erected in 1682 in honour of Louis XIV., after the conquest of Flanders, was preserved, as also the Ghent and Roubaix gates, which date from the time of the Spanish domination, and are built in the Renaissance style, with bricks of different colours. The present rampart is pierced by eleven gates, besides a special gate for the railway, and two water gates for the canal of the Deule. The goods station has also its special outlet, and a line from it, after making the round of the new quarters, passes within the enceinte to the quays of the river. Crossing the bridges which span the different arms of the Deule, we reach the citadel, the glacis of which,

planted with trees, forma public walk. Within the citadel are extensive barracks and a considerable arsenal. The church of Notre Dame de la Treille, in the style of the 13th century, which has been in process of building since 1855, occupies the site of the old Chateau du Buc, the original nucleus of the city. The town-house, on the site of the old palace of the duke of Burgundy, Philip the Good, was built in 1846. The exchange, which dates from the period of the Spanish domination, is in an original style. It is surmounted by a graceful campanile, and contains a statue of Napoleon I., made from cannon taken at Austerlitz. In the middle of the great square stands a column, erected in 1848, commemorating the defence of the town in 1792. There are several large hospitals, faculties of medicine and of science, a Catholic institute, comprising the five faculties of theology, letters, law, science, and medicine, an academy of music affiliated to the Conservatoire at Paris, several learned societies, and a large number of various kinds of schools. The picture gallery, with upwards of eight hundred works, is one of the richest in the provinces, and the Wicar museurn con- tains a unique collection of original designs of the great Italian masters. Lille possesses also an ethnographical museum (Musée Moillet), as well as museums of archzo- logy, numismatics, the industrial arts, and natural history. The communal library is also worthy of mention; it includes

numerous MSS., and particularly a valuable Evangeliarium of the 12th or 13th century. On the front of the building where the departmental archives are kept are to be seen medallions of all the sovereigns who have successively possessed Lille from Baldwin of the Iron Arm to Louis XIV. Lille, which is pre-eminently a manufactur- ing and commercial town, enjoys exceptional advantages as regards means of transit. The lower Deule is canalized to its junction with the Lys, and there is continuous water communication with the Scheldt in Belgium, and with Paris by way of Douai and St Quentin. The town is at the same time an important railway junction, and is also pro- vided with tramways.

The principal industry is flax-spinning, in which thirty- five mills, with 190,000 spindles, give employment to 14,000 persons (of whom 9000 are females), the annual turnover being £1,800,000. Forty thread mills employ 2000 persons, and produce thread to the annual value of £240,000. Fifteen factories, with 1000 operatives, produce woollen goods worth from £120,000 to £160,000 per annum ; 5000 persons are engaged in cotton-spinning (115,000 spindles), to the amount of £800,000. There are besides eighty factories in which damasks, tickings, and the usual staples of the linen trade are manufactured ; quilts and packsheets occupy from 6000 to 7000 persons, and 4000 are employed in producing the fabric out of which the smock frocks of the peasantry are made. Connected with these industries are dye-works, bleach- fields, and establishments for the production of engines, looms, and combing and carding machines ; and there are also chemical works, sugar-works, breweries, and oil-works.! The state manufacture of tobacco in Lille gives employment to 1200 persons. The total population of Lille in 1876 was 162,775.

Lille is said to date its origin from the time of Count Baldwin IV. who in 1030 surrounded with walls a little town which had arisen around the castle of Buc. At the end of the 12th century Lille which had developed rapidly, obtained communal privileges. Destroyed by Philip Augustus in 1212, it was rebuilt by Johanna of Constantinople, but besieged and retaken by Philip the Fair in 1297. After having taken part with the Flemings against the kin of France, it was ceded to the

latter in 1812. In 1369 Charles v gave it to Louis de Male, who transmittcd his rights to his daughter

1 The old commune of Moulins, now annexed to the town, derived its name from the windmills in which the oil was pressed,

Margarct, wife of Philip the Bold, duke of Burgundy. Under the Burgundian rule Lille enjoyed great prosperity ; its merchants were at the head of the London Hansa. Philip the Good made it his residence, and within its walls held the first chapters of the order of the Golden Fleece. With the rest of Flanders it passed from the dukes of Burgundy to Austria, and then to Spain. After the death of the Philip IV. of Spain, Louis XIV. reclaimed the territory, and besieged Lille in 1667. He forced it to capitulate, but preserved all its laws, customs, privileges, freedoms, and liberties. In 1708, after an heroic resistance, it surrendered to Prince Eugene and the duke of Marlborough. The treaty of Utrecht restored it to France. In 1792 the Austrians bombarded it for nine days and nights without intermission, but had ultimately to raise the siege. (G. ME.)

LILLEBONNE, capital of a canton in the department of Seine-Inférieure, France, 131 miles west-north-west by rail from Paris, and 20 miles due east from Havre, is a pretty little town, picturesquely built at the foot of wooded hills, in the valley of the Bolbec, which falls into the Seine 3 miles lower, at Port Jéréme. The principal industries are cotton-spinning and the manufacture of calico. The population in 1876 was 5400.

Lillebonne was the capital of the Caletes, or inhabitants of the Pays de Caux, in the time of Cesar, by whom it was destroyed. It was afterwards rebuilt by Augustus, who called it Juliobona after his daughter; and before it was again ruined by the barbarian invasions it had become a very important centre, whence Roman roads branched out in all directions. Some forty years ago the remains of ancient baths and of a theatre capable of containing 3000 persons were brought to light. Statues, tombstones, all sorts of articles in iron, bronze, ivory,

marble, stone, glass, &c., have been found in the course of excavation, and deposited, for the most part, in the museum at Rouen. The most beautiful object yet discovered is a large mosaic found in 1870 (some 28 feet by 21). In the Middle Ages the fortifications of the town were constructed out of the materials supplied by the theatre. William of Normandy built at Lillebonne a castle whence he dates several charters. It is now aruin within a charming park. The 13th century donjon, with walls over 12 feet in thickness, is in admirable preservation. The church of Notre Dame, of the 16th century, had a fine porch, formerly adorned with rich sculptures, which have mostly dis- appeared. The graceful tower is about 180 feet high.

LILLY, Wititam (1602-1681), an astrologer somewhat famous in his day, was born in 1602, at Diseworth in Leicestershire, his family having been settled as yeomen in the place for "'many ages." He received a tolerably good classical education at the school of Ashby-de-la-Zouche, but he naively tells us what may perhaps have some significance in reference to his after career, that his master "never taught logic." In his eighteenth year, in consequence of his father having fallen into great poverty, he went to London, and was employed in a sort of menial situation in attendance on an old citizen and his wife, with whom he so managed to ingratiate himself that his master, at his death in 1627, left him an annuity of £20; and, Lilly having soon afterwards married the widow, she, dying in 1633, left him property to the value of about £1000. Having now a good deal of leisure on his hands, he began to dabble in astrology, reading all the books on the subject he could fall in with, and occasionally trying his hand at unravelling mysteries by means of his art. The years 1642 and 1643 were devoted to a careful revision of all his previous reading, and in particular having lighted on Valentine Naibod's Commentary on Alchabitius, he "seriously studied him and found him to be the pro-foundest author he ever met with." Him he "traversed over day and night," and so "advanced his judgment and knowledge" to the utmost height he ever arrived at. He characterizes him as "a most rational author and the sharpest expositor of Ptolemy that hath yet appeared." About the same time he tells us that he "did carefully take notice of every grand action betwixt king and parlia- ment, and did first then

incline to believe that as all sub- lunary affairs depend on superior causes, so there was a possibility of discovering them by the configurations of the superior bodies." And, having thereupon "made some essays," he 'found encouragement to proceed further, and

ultimately framed to himself that method which he ever afterwards followed." He then began to issue his pro- phetical almanacs and other works, and it is a curious illustration of the state of intelligence even among educated people at the time that trash of this kind really seems to have met with serious attention from some of the most prominent members of the Long Parliament. If we may believe himself, Lilly lived on friendly and almost intimate terms with Bulstrode Whitlock, Lenthall the speaker, Sir Philip Stapleton, Elias Ashmole, and others. Even Selden seems to have given him some countenance, and probably the chief difference between him and the mass of the com- munity at the time was that, while others believed in the general truth of astrology, he ventured to specify the future events to which its calculations pointed. Even from his own account of himself, however, it is evident that he did not trust implicitly to the indications given by the aspects of the heavens, but like more vulgar fortune-tellers kept his eyes and ears open for any information which might inake his predictions safe. It appears that he had corre- spondents both at home and in foreign parts to keep him conversant with the probable current of affairs. He was evidently a proficient in all the unscrupulous cunning, adroitness, and plausibility which go to make up the successful quack and impostor, and not a few of his exploits indicate rather the quality of a clever police detective than of a profound astrologer. After the Restoration he very quickly fell into disrepute. His sympathy with the parliament, which his predictions had generally shown, was not calculated to bring him into royal favour, and the frivolous and sceptical character of the age could scarcely be expected to fall in with transcendentalism either in the shape of sense or nonsense. He came under the lash of Butler, who, making allowance for some satiric exaggeration, has given in the character of Sidrophel a probably not very incorrect picture of the man; and, having by this

time amassed a tolerable fortune, he bought a small estate at Hersham in Surrey, to which he retired, and where he diverted the exercise of his peculiar talents to the practice of medicine. He died in 1681, in the eightieth year of his age.

Lilly's life of himself, published after his death, is still worth looking into as a remarkable record of credulity and successful imposture. Superstition dies hard ; and it is a curious evidence of the inveteraey of popular delusions that so lately as 1852 a prominent London publisher put forth a new edition of Lilly's Introduction to Astrology, ‘‘ with numerous emendations adapted to the improved state of the seience.”’

LILY, Zliwm, the typical genus of Lliacee, embraces nearly fifty species, all confined to the northern hemisphere, about fifteen being natives of Japan and China, six of the mountains of India, eight of south Europe, five of the east and nine of the west coasts of North America. The earliest in cultivation were described in 1597 by Gerard (Herball, p. 146), who figures eight kinds of European (true) lilies, viz., Z. album (L. candidum, L.), and a variety, L. bizantinum, two umbellate forms of the type L. bulbiferum, Park., named ZL. aureum and L. cruentum latifolium, and three with pendulous flowers, apparently forms of the martagon lily. Parkinson, in his Paradisus (1629), described five varieties of martagon, six of umbellate kinds—two white ones, and L. pomponium, L. chalcedone- cum, L. carniolicum, and L, pyrenatcum—together with one American, Z. canadense, which had been introduced in 1629. For the ancient and medieval history of the lily, see M. de Cannart d'Hamale's Monographie historique et littéraire des Lis (Malines, 1870). Since that period many new species have been added. ‘The latest authorities for description and classification of the genus are J. G. Baker (“Revision of the Genera and Species of Tulipez,” Journ. of Linn. Soc., xiv. p. 211, 1874) and J. H. Elwes

(Monograph of the Genus Lilium, 1877-78), who first tested all the species under cultivation, and has published every one beautifully figured by W. H. Fitch, and some hybrids. With respect to the

production of these latter, the genus is remarkable for its power of resisting the influence of foreign pollen, for the seedlings of any species, when crossed, generally resemble that which bears them. Tor the hardier kinds in cultivation, reference may be had to Hemsley's /Tandbook of Hardy Trees, &c., p. 501. The structure of a lily is of simple type, consisting of two whorls, of three free parts each, six free stamens, and a consolidated pistil of three carpels, ripening into a three valved capsule containing many winged seeds. In form, the flower assumes three types :—trumpet-shaped, with a more or less elongated tube, ¢g., LZ. longiflorum and L. candidum ; an open form with spreading perianth leaves, ag., L. auratum; or assuming a pendulous habit, with the lips strongly reflexed, ¢g., the martagon type. All have scaly bulbs, which in three west American species, as L. Humboldti, are remarkable for being somewhat interme- diate between a bulb andacreeping rhizome. JL. bulbiferum and its allies produce aerial reproductive bulbils in the axils of the leaves. The bulbs of several species are eaten, _ such as of Z. avenaceum in Kamchatka, of LZ. Martagon by the Cossacks, and of LZ. tagrinum, the " tiger lily," in China and Japan. Medicinal uses were ascribed to the species, but none appear to have any marked properties in this respect. See HorticuLTurg, vol. xii. p. 257.

The white lily, Z. candidum, the Aefpiov of the Greeks, was one of the commonest garden flowers of antiquity, appearing in the poets from Homer downwards side by side with the rose and the violet. Aecording to Hehn, roses and lilies entered Greece from the east by way of Phrygia, Thrace, and Maeedonia (Kulturpflanzen und Haus- thiere, 3d ed., p. 217). The word Aefpror itself, from whieh Jidium is derived by assimilation of eonsonants, appears to be Eranian (lvid., p. 527), and according to ancient etymologists (Lagarde, Ges. Abk., p. 227) the town of Susa was eonneeted with the Persian name of the lily sésan (Gr. codcov, Heb. shéshan). Mythologieally the white lily, Rosa Junonis, was fabled to have sprung from the milk of Hera. As the plant of purity it was eontrasted with the rose of Aphrodite. The word xpfvov, on the other hand, ineluded red and purple lilies, Plin., H. N., xxi. 5 (11, 12), the red lily being best known in Syria and Judea (Phaselis). This perhaps is the ''red lily of Constan- tinople" of

Gerarde, Z. chalecdonicum, L. The lily of the Old Testament (shéshan) may be conjeetured to be a red lily from the simile in Cant. v. 13, unless the allusion is to the fragranee rather than the colour of the lips, in which case the white lily must be thought of. The "'lilies of the field," Matt. vi. 28, are xpiva, and the comparison of their beauty with royal robes suggests their identification with the red Syrian lily of Pliny. Lilies, however, are not a conspicuous feature in the flora of Palestine, and the red anemone (Ancmone coronaria), with which all the hill-sides of Galilee are dotted in the spring, is perane more likely to have sug- gested the figure. For the lilyin the pharmacopceia of the ancients see Adams's Paul. Afgincta, ili. 196. It was usedin unguents and against the bites of snakes, &e. In the Middle Ages the flower continued to be eommon, and was taken as the symbol of heavenly purity. The three golden lilies of Franee are said to have been originally three lance-heads.

LILYE, Wittiam (c. 1466-1523), one of the introducers of a knowledge of the Greek language into England, was born at Odiham, in or about the year 1466. He entered the university of Oxford in 1484, became a demy of Magdalen in 1486, and after taking his first degree in arts went on a pilgrimage to Jerusalem. On his return he put in at Rhodes, which was still occupied by the Knights, under whose protection many Greeks had taken refuge after the taking of Constantinople by the Turks. Here he laid the foundation of a knowledge of the Greek language. We next hear of him in Italy, following the lectures of John Sulpitius and Pomponius Letus at Rome. From this he passed on to Venice, from which place he writes to his friend and patron Thomas Starkey, that "he is assiduously attending the lectures of Egnatius in Latin, but that he finds no one in Venice who can assist him in the study of Greek. He reads, however, Greek by himself, and has

read seven plays of Sophocles, five of Euripides, three of Aristophanes, besides extracts from Xenophon and Plutarch, by himself without a teacher." After his return he settled in London, as a private teacher of grammar, and is believed to have been the first who

taught Greek in that city. In 1510 Colet, dean of St Paul's, who was then founding the school which afterwards became famous, appointed Lilye the first highmaster. He held this office only twelve years, dyiug of the plague in February 1523.

Lilye's name deserves commemoration, not only as one of the pioneers of Greek learning, but as one of the joint authors of a book, familiar to many generations of students, down to the present century, the old Eton Latin grammar. The Brevissima Institutio, a sketch by Colet, corrected by Erasmus, and worked upon by Lilye, contains two portions, the authorship of which is indisputably Lilye's. These are' the lines on the genders of nouns, beginning " Propria que maribus," and those on the con- jugation of verbs, beginning "As in presenti." The "Carmen de moribus" bears Lilye's name in the early editions ; but Hearne asserts that it was written by Leland, who was one of his scholars, and that Lilye only adopted it. Besides the Brevissima Institutio, Lilye wrote a variety of Latin pieces both in prose and verse. Some of the latter are printed along with the Latin verses of Sir Thomas More in Progymnasmata Thome Mori et Gulielmi Lylit Sodalium, Basel, 1518. Another volume of Latin verse directed against a rival schoolmaster and grammarian, Whittington, whose grammar that of Lilye superseded, is entitled Antibossicon ad Gulielmum Hormannum, 1521.

The only authority for the few facts which make up the above life of Lilye is a short sketch furnished by his son George to Paulus Jovius, who was collecting for his history the lives of the learned men of Great Britain. All the other names, such as Bale, Pits, Fuller, Wood, which figure in the dictionaries as authorities, are only Lapa of George Lilye. To these scanty memoranda the present article adds an extract from three letters of Lilye's pre- served in the British Museum, Cotton. Nero, B. vi. fol. 157, now printed for the first time.

LIMA, capital of the republic of Peru, as also of the department and province of Lima, is situated on an exten- sive plain, 500 feet above the sea-level, and 7 miles east from its port Callao on the Pacific coast, in 12° 2' 34" S. lat., 77° 7'36" W. long. The general configuration of

the main portion of the city, previous to 1870 surrounded by walls, is that of an irregular triangle, whose base rests on

BAY orp CALLAO

Miraflores

Fig. 1.—Neighbourhood of Lima and Callao,

the river Rimac, which separates the city from its offshoot or suburb of San Lazaro. Sheltered on the north and east by the spurs of the Andes, the city is exposed to the winds prevailing from the south-east, as also to those from the south and west. Although the atmosphere is moist, and the transitions of the seasons are rapid, the climate is not unhealthy, the rainfall being slight, and the variations of

temperature not excessive. The summer commences in December, and the winter in June, and the mean temper- ature for the year is about 73° Fahr. The city is divided into five quarters or parishes, and is well laid out with broad and regular thoroughfares, the streets intersecting one another at right angles. The houses are spacious, but generally of only two stories, and are approached by portals leading into an open court or yard. In the principal square, which covers an area of 9 English acres in the centre of the city, stands a fine fountain of bronze. Here also are the cathedral, a stone structure with two lofty towers and a broad fagade, the archiepiscopal palace, the Government house, and the Portal de los Escribanos, con- taining the municipal offices and archives. Besides the cathedral there are five chief parochial and sixty-two other churches and chapels, and numerous monasteries and con- vents. Of the churches, the largest is that of San Pedro (1598), which has seventeen altars ; of the religious houses that of the Dominicans is the finest, and that of the Fran- ciscans the most exteusive. The university, built in 1576, is the oldest in America; it contains the hall and offices

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Fic. 2.—Plan of Lima,

1, Cathedral. 7. Cavalry Barracks. 13. Municipal Hall.

2. Plaza Mayor. 8. Penitentiary. 14, Governor’s Palace, 3. Plaza Bolivar, 9, Military Hospital. 15, Telegraph Office. 4, Principal Theatre. 10. 16, Museum, &c.

5. Infantry Barracks. 11. > Railway Stations. 17, Library.

6. Artillery Barracks. 12. 18. Botanical Garden.

used by the chamber of deputies. Lima has more than seventy schools, a public library containing upwards of forty thousand volumes, and many charitable institutions, several of them connected with the religious orders. The principal place of amusement is the amphitheatre for bull- fights in the Plaza del Acho, accommodating nine thousand spectators. In the Plaza de la Exposicion is a marble statue of Columbus unveiling a figure of America. Of the many other monuments in Lima the most famous is the bronze equestrian statue of Simon Bolivar in the Plaza de la Independencia (or de Bolivar), 11 tons in weight, com- memorating the battle of Ayacucho, which secured the independence of Peru. Among the public promenades are reckoned the cemetery outside the Maravillas gate, and the Paseo de la Alameda de los Descalzos, in the centre of which is a gorgeous garden. As the capital of Peru, Lima is one of the most important trading centres in South America. It has, however, but few home industries, its manufactured goods being chiefly imported from Europe wa Callao, the medium of nearly all its foreign commerce. Several attempts have from time to time been made to establish factories, but the high

price of labour has hitherto prevented any efforts on a large scale being permanently successful. There are, however, manufactories for tallow, soap, sperm candles, glue, gold lace, gilt leather, and silver filigree work, and the capital supplies the towns of the republic with coarse woollen fabrics. The market is attended daily by about a thousand

dealers. Fish is supplied from Callao, and vegetables partly from gardens in the city and environs, and partly from the native villages. Since 1857 the water for drinking purposes has been obtained filtered froin the Rimac, and supplied by pipes to the houses. The imports are various ; the exports include guano, cinchona, Indian wool, raw cotton, hides, sugar, saltpetre, gold, silver, and other minerals. Under ordinary conditions the imports and exports together exceed £5,000,000 annually, There are railways from Lima leading to Callao, Chancay, Chorrillos, and Oroya; the construction of several other lines has been stopped by the war with Chili. In 1780 the population of Lima was 50,000; in 1860 it had reached 100,341, and in 1868 121,362, of whom 38,761 were foreigners. A recent estimate (1877) gives the number at about 200,000, but, considering the vicissitudes the city has since then endured, these figures must be considered at the present time (1882) as far too high. The Spanish natives have the reputation of being courteous, affable, and generous, but at the same time fond of pleasure, improvident, and superstitious. By confession they are mostly Roman Catholics.

Lima was founded 18th January 1535, by Francisco Pizarro, who named it Ciudad de los Reycs in honour of the emperor Charles Y. and Dofia Juana his mother, or, according to some authors, from its site having been selected on the 6th January, the Feast of the Epiphany. The name afterwartls gave place to that of Lima, a Spanish corruption of the Quichua word Rimac. In 1548 Lima received its first archbishop, and in 15$2 the earliest provincial council for the state was held there. Remaining under Spanish rule during the 17th, 18th, and early part of the 19th centuries, the city continued to increase in prosperity, though often visited by terrible earthquakes, of which the most disastrous was that of the 28th October 1746, when 5000 of the inhabitants perished and the port of Callao was destroyed (see CaLLAo, vol. iv. p. 107). On the 12th July 1821, after a siege of some months, Lima was entered by a Chilian force under General San Martin, who on the 28th was proclaimed protector of Peru as a free state, but its independence was not finally secured until after the victory of Ayacucho (9th December 1824). In March 1828 the city again suffered from an earthquake, and in 1854-55 the yellow fever

carried off a great number of the inhabitants. On the 11th of August 1857, Mr Sullivan, British minister to Peru, was assassinated. 1n November 1864 a congress of plenipotentiaries from Chili and other South American states was held here to concert measures of ’mutual defence. Of the various revolts which have during the last few years taken place at Lima may be mentioned that of November 1865, when President Pezet was displaced for Canseco ; the riots against religious toleration, 15th April 1867; and the military insurrection, 22d July 1872, when Gutierrez, minister of war, arbitrarily assumed power, had President Balta imprisoned and shot, but himself soon fell a victim to the popular fury; order being afterwards with difficulty restored by Vice-President Zavallos. In consequence of the ill-success of the war with Chili, Lima towards the close of 1879 was again in an unsettled condition ; President Prado fled, and on the 22d Decem- ber, after a sanguinary coup d’état, Pierola was proclaimed dictator. In April 1880 Callao was blockaded by Chiltan war ships, and Lima had to be placed in a state of defence. On the 20th of Nov- ember the Chilian army effected a landing at Pisco, a fortified place about 100 miles south of Lima, and, having afterwards advanced upon the capital, forcibly occupied it upon the 17th of January

1881.

See Mariano F. Paz Soldan, Diccionario geogrdfico estadistico del Pert, Lima, 1877, pp. 513-27; Mateo Paz Soldan and M. F. Paz Soldan, Geografia del Pert, Paris, 1862, vol. i. pp. 290-320; M. A. Fuentes, Lima, or Sketches of the Capital of Peru, Historical, Statistical, Administrative, &e., London, 1866; C. R. Mark- ham, Cuzco… and Lima, London, 1856. For further information as to the carly history of Lima, see Lopez de Gémara, Hist. gen. de las Ind.; A. de Ilerrera, Hist. gen. de las Ind. Occid.; W. H. Prescott, Hist. of the Conquest of Peru; F. de Xeres, Conquista del Pert; A. de Zarate, Hist. de la Cong. del Pert; and J. de Ferreras, Hist d’Espagne (French translation by Hermilly), Paris, 1751. (E. D. B.)

LIMA, capital of Allen county, Ohio, ‘U.S., on the Ottawa river, and at the intersection of four railway lines, 130 miles north of Cincinnati. It

is pleasantly situated

in a fine farming country, and has two large railway repairs shops, extensive car-works, and other smaller manufactories. The population in 1850 was 757; in 1860, 1989; in 1870, 4464; and in 1880, 7567.

LIMBORCH, Puiuie van (1633-1712), a prominent Nemonstrant theologian, was born June ¥9, 1633,, at Amsterdam, where his father held a good position in the legal profession. He received his education at Utrecht, at Leyden, in his native city, and finally at Utrecht university, which he entered in 1652. In 1657 he became a Remonstrant pastor at Gouda, and in 1667 he was transferred to Amsterdam, where, in the following year, the office of professor of theology in the Remonstrant seminary was added to his pastoral charge. He died there on April 30, 1712.

His most important work, Znstitutiones theologiz christiane, ad praxin pietatis et promotionem pacis christiane unice directx (Amsterdam, 1686, 5th ed. 1735), remains unrivalled as a fulland clear exposition of the system of Episcopiusand Curcelleus. The fourth edition (1715) included a posthumous “ Relatio historica de origine et progressu controversiarum in fcederato Belgio de pradestina- tione.” Limborch also wrote De veritate religionis Christiane amica collatio cum erudito Judwo, Gouda, 1687 ; Historia Inquisi- tionts (1692), in four books prefixed to the ‘Liber Sententiarum Inquisitionis Tolosane ” (1807-1323), aud Commentarius in Acta Apostolorum et in Epistolas ad Romancs et ad Hebreos, Rotterdam, 1711. His editorial labours included the publication of vari- ous works of his predecessors, and of Epistole ecelesiastice pre- stantium ac eruditorum virorum (Amsterdam, 1684), chiefly by Anninius, Uytenbogardus, Vorstius, Vossius, Grotius, Episcopius (his grand-uncle), and Barleus; they are of great value for the history of Arminianism. An English translation of the Theologia, ‘with improvements, from Wilkinson, Tillotson, Scott, and others,” was published in the beginning of last century by W. Jones (A Complete System or Body of Divinity, both Speculative and Prac- tical, founded on Scripture and Reason, London, 1702); and

a translation of the History of the Inquisition, by S, Chandler, with “fa large introduction concerning the rise and progress of perse- cution and the real and pretended causes of it” prefixed, appeared in 17381.

LIMBURG, or Limgoure, oue of the nine provinces of Belgium, is bounded on the N. and E. by Holland, on the S. by the province of Liége, and on the W. by those of Brabant and Antwerp ; the area is 932 square miles, with a population, in 1880, of 211,694. The surface is for the most part flat, but rising somewhat towards the south-east. Most of the province is included in the barren and marshy district of sandy heath known as La Campine (Flem., Kempen). The Meuse, with a tolerably fertile valley, is its chief river. The soil is metalliferous ; the chief vegetable products are cereals, leguminous plants, flax, hemp, and beetroot ; and stock-breeding is largely carried on. In- dustries are less developed in Limburg than in the rest of Belgium ; but the distilleries of the province are very con- siderable and noted. Limburg is divided for administra- tive purposes into three arrondissements, of which the capitals are Hasselt (population 11,500), Tongres (7600), and Maeseyck (4400). The last-named is the birthplace of Hubert and John van Eyck, the Flemish painters. One of the most interesting towns of the province is St Tronp (q.v.), thought to be the ancient Atwaticwum Oppidum, the oldest town in Belgium. Near Tongres is a mineral well, described by Pliny.

The territory of Limburg was that of the Eburones, whom the Romans exterminatcd, and was afterwards inhabited by the Tungri and Taxandri. It was one of the first conquests of the invading Franks, who established themselves and proclaimed their first kings there. In the Middle Ages it constituted the county of Looz, holding of the bishop of Liége ; afterwards it became the duchy of Limburg, which was taken possession of in the 13th century by the duke of Brabant. From the 12th to the end of the 18th century the duchy included only a small portion of the present province ; it extended eastward from the Meuse as far as to Aix-la-Chapelle, and southward to the Vesdre. In the 16th century Limburg remained in the possession of Spain, and it passed to Austria in 1718. After

the treaty of Campo Formio (1797) it became a French department, Mense-Inférienre, with Maestricht as capital. By the treaty of

Vienna (1815) it formed one of the nineteen provinces of the kingdom of the Netherlands, and by that of London (1831) the eastern portion was ceded to Holland, becoming a Dutch province, the remainder constituting the present province of Belgium.

LIMBURG, or Limzoure, one of the eleven provinces of Holland, is bounded on the W. by Belgium (Limburg) and North Brabant, on the N. by North Brabant and Guelderland, on the E. by Rhenish Prussia, and on the 8. by Belgium (Liége), and has an area of 851 square miles, with a population in 1876 of 235,135 (97 per cent. being Roman Catholics). The surface, which is flat, is partly covered with heaths and fens; of the latter the most considerable is the “peel” or marsh in the north, which extends into North Brabant. The province is traversed by the Maas, of which the chief affluents here are the Geule, the Geleen, and the Roer, all on the right ; means of water communication are also supplied by the Zuid Willem’s canal and its branches. The agricultural products are similar to those of Belgian Limburg; bee-keeping is also engaged in. Coal occurs within the province, and there is a mine at Kerkrade. The arrondissements are two in number,—Maestricht and Roermonde,—Maestricht being the capital. For the history of the province see the preceding article.

LIMBURG, a town in the circle of Unterlahn and district of Wiesbaden, Prussia, is situated 360 feet above the sea-level, on the Lahn, here crossed by a bridge dating from 1315, and on the Nassau Railway midway between Coblentz and Wetzlar. A local branch line connects it with Hadamar. It is the seat of a Catholic bishop, and has one evangelical and four Catholic churches. The only prominent architectural feature is the small seven-towered semi-Byzantine cathedral, picturesquely situated on a rocky site overhanging the river; it was founded by Conrad Kurzbold, count of Niederlahngau, in 905, and finally consecrated in 1235 (restored 1872-78). Limburg has a seminary for the education of priests, and a variety of schools ; the

industries, which are unimportant, include manufactures of cloth, tobacco, machinery, pottery, and leather. The population in 1875 was 5161.

Limburg, which was a flourishing town during the Middle Ages, passed in 1404 into the possession of the archbishops of Treves after the extinction of its own line of counts, and in 1803 fell to the duke of Nassau. It was the scene of a victory of the archduke Charles of Austria over the French under Jourdain on September 16, 1796. It possesses an intcresting MS. fragment of its chronicles, the Fasti Limpurgenses. The original writer is supposed to have been the recorder Tillmann (ob. 1400), additions being made by subsequent copyists; the document, which has been morc than once printed, is

valuable especially for the ancient rhymes it embodies, and for its notices of old German pocts.

LIMBUS. The Limbus Infantum or Puerorum in

medieval theology is the “margin” or “border ” (limbus) |

of hell to which human beings dying without actual sin, but with their original sin unwashed away by baptism, were held to be consigned; the category included, not unbaptized infants merely, but also idiots, cretins, and the like. The word “limbus,” in the theological application, occurs first in the Swmma of Thomas Aquinas; for its extensive currency it is perhaps most indebted to the Commedia of Dante (Znf., c. 4). The question as to the destiny of infants dying unbaptized presented itself to theologians at a comparatively early period, and received very various answers. Generally speaking it may be said that the Greek fathers inclined to a cheerful and the Latin to a gloomy view. Thus Gregory of Nazianzus (Orat. 40) says “that such children as die unbaptized without their own fault shall neither be glorified nor punished by the righteous Judge, as having done no wickedness, though they die unbaptized, and as rather suffering loss than being the authors of it.” Similar opinions have been expressed by Gregory of Nyssa, Severus of Antioch, and others,—

‘

| opinions which it is almost impossible to distinguish from

the Pelagian view that children dying unbaptized might be admitted to eternal life, though not to the kingdom of God. In his recoil from Pelagian heresy, Augustine was compelled to sharpen the antithesis between the state of the saved and that of the lost, and taught that there are only two alternatives,—to be with Christ or with the devil, to be with Him or against Him. Following up, as he thought, his master’s teaching, Fulgentius declared that it is to be believed as an indubitable truth that, ‘“ not only men whi have come to the use of reason, but infants dying, whether in their mother’s womb or after birth, without baptism in the name of the Father, Son, and Holy Ghost, are punished with everlasting punishment in eternal fire.” Later theologians and schoolmen followed Augustine in rejecting the notion of any final position intermediate between heaven and hell, but otherwise inclined with practical unanimity to take the mildest possible view of the destiny of the irresponsible and unbaptized. Thus the proposition of Innocent III. that “the punishment of original sin is deprivation of the vision of God” is practically homologated by Thomas, Scotus, and all the other great theologians of the scholastic period, the only outstanding exception being that of Gregory of Rimini, who on this account was afterwards called “tortor in- fantum.” ‘The first authoritative declaration of the Latin Church upon this subject was that made by the second council of Lyons (1274), and confirmed by the council of Florence (1439), with the concurrence of the representa- tives of the Greek Church, to the effect that “the souls of those who die in mortal sin or in original sin only forthwith descend into hell, but to be punished with unequal punish- ments.” Perrone remarks (Prel. Theol., pt. iii. chap. 6, art. 4) that the damnation of infants and also the compara- tive lightness of the punishment involved in this are thus de fide; but nothing is determined as to the place which they occupy in hell, as to what constitutes the disparity of

| their punishment, or as to their condition after the day of

judgment. In the council of Trent there was considerable difference of opinion as to what was implied in deprivation of the vision of God, and no definition was attempted, the Dominicans maintaining the severer view that the “limbus infantum” was a dark subterranean fireless chamber, while the Franciscans placed it in a lightsome locality above the earth. Some theologians continue to maintain with Bellarmine that the infants “in limbo” are affected with some degree of sadness on account of a felt privation ; others, following Sfrondati, hold that they enjoy every kind of natural felicity, as regards their souls now, and as regards their bodies after the resurrection, just as if Adam had not sinned. In the condemnation (1794) of the synod of Pistoia (1786), the twenty-sixth article declares it to be false, rash, and injurious to treat as Pelagian the doctrine that those dying in original sin are not punished with fire, as if that meant that there is an intermediate place, free from fault and punishment, between the kingdom of God and everlasting damnation.

The Limbus Patrum, Limbus Inferni, or Sinus Abrahe is defined in Roman Catholic theology as the place in the underworld where the saints of the Old Testament were confined until liberated by Christ on his “descent into hell.” Regarding the locality, and its pleasantness or painfulness, nothing has been taught as de fide, and opinions have been various. It is sometimes regarded as having been closed and empty since Christ’s descent, but other authors do not think of it as separate in place from the limbus infantum. The whole idea, in the Latin Church, has been justly described as the mere caput mortuum of the old catholic doctrine of hades, which was gradually super- seded in the West by that of purgatory.

LIME 647

LIME is the name of the strongly basic monoxide CaO of the metal calcium. This base is widely diffused throughout the three kingdoms of nature in the form of salts, of which the carbonate CaCO, and the hydrated sulphate CaSO,.2H,O are by far the most abundant. Both are found in the mineral kingdom in a variety of forms. Of native carbonates of lime, cale-spar (Iceland spar), though comparatively

rare, may be mentioned first as representing the purest native form of the compound. It generally presents itself in the form of well-developed transparent colourless rhombohedra, which possess to a remarkable degree the property of producing double refraction of light, whereupon is founded its applica- tion in the construction of certain optical instruments. Of the varieties of massive or crystalline carbonate of lime, those which, through the fineness of their grain and other qualities, lend themselves for the purposes of the sculptor go by the name of marble, while the remainder are embraced under the generic term of limestone. This name, however, is understood to exclude chalk, a soft, amorphous variety which, according to Ehrenberg, consists mainly of Yoraminifera shells. All limestones contain at least traces of magnesia. When this foreign base is present in considerable proportion the rock is termed “dolomite” (see MAGNEsIUM). Among the native forms of (hydrated) sulphate of lime the mineral “selenite” (glacies Maris) corresponds to Iceland spar among the carbonates. It forms colourless transparent clino-rhombic prisms, generally united into “twins,” and flattened down into plates readily cleavable along planes parallel to the surface. Hardness ranges from 1°5 to 2; the specific gravity is 2°3. Far more common than selenite are the massive varieties known as ALABASTER (see vol. i. p. 439) and ordinary Gypsum (vol. xi. p. 337).

Both sulphate and carbonate of lime, apart from their occurrence as independent minerals, are almost universally diffused throughout the earth’s crust, and in the waters of the ocean. Now the sulphate is appreciably soluble in even pure water, while the carbonate, though practically insoluble in pure, is quite decidedly soluble in carbonic acid water. As all atmospheric water must necessarily hold carbonic acid gas in absorption, most natural waters, and certainly all deep-well waters, are contaminated with more or less of bicarbonate or sulphate of lime, or with both. When such a water is being boiled, there is an escape of the free and the loosely combined carbonic acid, and the carbonate of lime comes down as a loose precipitate or as a “crust”; and, when the water is sufficiently concentrated by evaporation, the sulphate likewise is partly deposited. The decomposition of the “bicarbonate” in fact takes place, though slowly, even at ordinary

temperatures, when the water in which it is held in solution is exposed to the atmosphere. It is in this manner that stalagmites and stalactites frequently seen within rock-caverns are produced, and there is no difficulty in accounting for the grotesque and fantastic forms which the latter often exhibit.

Quicklime.—The native carbonate always serves as the starting-point in the preparation of calcium compounds. From it the oxide CaO, known as quicklime or caustic lime, is produced industrially by heating limestone or marble in kilns, between layers of fuel, which in the United Kingdom is generally coal. The carbonic acid goes away with the gaseous products of combustion, and the oxide remains in unfused lumps of the form of the original stones. Lime, when pure, is an amorphous white solid, which is absolutely iufusible and non-volatile; and on this account, when raised to high temperatures, it emits a brilliant white light ("lime-light"). The commercial article is generally grey or otherwise discoloured by the presence of foreign metallic oxides,

The decomposition that goes on in a limekiln 1s not brought about by the effect of heat alonc. Gay-Lussae found long ago that carbonate of lime, when heated to intense redness in a closely covered crucible, loses its carbonic acid only very slowly, while the acid goes off readily even at somewhat lower temperatures when a current of steam is passed over the heated limestone. This may be accounted for by assuming that the steam, in the first instance, produces hydrate—from the carbonate—of lime, which latter then at once breaks up into its two components. More probably, however, the steam acts only by producing a guasi vacuum, that is, by clear- ing out the carbonic acid which, if allowed to stagnate even at high temperatures, would react on the quicklime produced, thus pre- venting the decompositiou of a portion of the carbonate.

Quicklime acts readily and energetically on water, with evolution of much heat (269 units per unit weight of lime, Berthelot) and formation of a bulky white powder of the hydrate CaOH,O or Ca(OH), This powder readily mixes with water into a smooth paste, which may be

diluted to a milky liquid—milk of lime. This, when filtered through paper, yields "'lime-water," a strongly alkaline liquid con- taining about 735th of its weight of lime (calculated as CaO). When bviled it deposits a part of its dissolved lime as such, and when exposed to ordinary air it quickly draws a skin of carbonate of lime. Hence its application as a reagent for carbonic acid, and the extensive use of millc of lime (whitewash) as a cheap white pigment in wall- painting. Lime paste, as every one knows, is most extensively used as a mortar or cement for bricks and stones in building. For this purpose it is always mixed with a certain proportion of sand. This admixture in all probability was originally intended only to save lime and prevent shrinking. But it is now generally assumed to have a chemical function, causing the formation of a hard silicate of lime pervading and thus strengthening the mortar. Some chemists deny the practical importance though not the occurrence of this silication ; what admits of no doubt is that the hardening of mortar involves the very gradual conversion of the original hydrate into car- borate of lime. Under the name of plaster, a fine smooth paste of lime and sand, with short hair to increase the tenacity of the mixture, is a most important material for coating the internal walls and roofs of ordinary buildings.

Hydraulic Cements.—Ordinary mortar, on account of the solubility of lime in water, is unfit for aquatic masonry; for this purpose hydraulic cements must be used. Of these there are a great variety, which, however, mostly agree in this that they consist of calcined mixtures of limestone and clay (preferably alkaliferous clay) and other silicates. By calcining such mixtures at temperatures short of that at which a glass would be produced, the lime becomes caustic, and part of the caustic lime, by uniting with the clay (and silicate generally), forms a silicate sufficiently basic to be disintegrable by acids and even by water. When such cement, as a powder, is mixed with water, the lime acts upon the silicate of alkali and the gelatinous silica-hydrate transitorily produced, and with the silica and alumina and oxide of iron unites into a hard, waterproof, very complex, silicate mixture.

H. Ste Claire Deville having found that magnesia has hydraulic properties, hydraulic cements have been made by calcining dolomites

of the proper composition so far as to decompose only the carbonate of magnesia (into MgO and CO,). See CEMENT, vol. v. p. 328.

Lime, being the cheapest of powerful bases, is largely used in chemical manufacturing. It serves for the caustic- izing of soda, for the preparation of ammonia from ammonia salts, and for the manufacture of bleaching powder. It also enters into the composition of certain kinds of glass, and is used (as lime or as carbonate), in the making of soda ash.

Lime Salts. —These can in general be prepared by the saturation of the respective acids with lime hydrate. Thus the (pure) car-

bonate CaCO may be prepared by passing carbonic acid into lime-water. Buta more convenient method is to decompose a solution of pure chloride of calcium with excess of carbonate of ammonia, preferably at 70-80° C., when the carbonate assuines the form of a crystalline precipitate which settles readily and is easily washed with hot water. The sulphate (artificial gypsum) appears as a volu- minous white precipitate, consisting of minute cbtouelis needles, when sulphuric acid is added to a not too dilute solution of chloride of calcium or other lime salt. The precipitate CaSO,.2H,O is appreciably soluble in water, 1000 parts of which at 0°, 35°, and 100° C. dissolve 2°05, 2°54, and a little over 2 parts respectively of gypsum. The hydrated sulphate at temperatures exceeding 110° C. loses its water. The anhydrous sulphate, if formed below about 200° C., readily recombines with water into compact gypsum (plaster of Paris). By exposure to high temperatures (500° C. and upwards) sulphate of lime loses its power of recombining with water ; at very high temperatures it fuses. A naturally anhydrous sulphate of lime (anhydrite) occurs in association with rock salt, and otherwise, as a not very common mineral.

The well-known favourable action of gypsum as a manure, more especially for clover (see AGRICULTURE), has lately been explained by Déherain on the strength of analyses and vegetation experiments of

his own, by assuming that it converts the carbonate of potash of the soil into sulphate, which, being less obstinately retained by the soil, more readily finds its way into the roots of the plants.

Chloride of Calcium (muriate of lime), CaCl,, is prepared by dis-solving marble or limestone in aqueous muriatic acid. The iron aud mianganese generally present as impurities can be eliminated, after peroxidation by chlorine water, by digestion with hydrate of lime, which also, if allowed sufficient timc, removes the magnesia.

The filtrate is acidified with hydrochloric acid and concentrated by |

evaporation, so far that, on cooling, it deposits part of the dissolved salt as crystals, These have the conrposition CaCl,.6H,O. They are very easily soluble in water and alcohol, and highly hygroscopic. Hence the salt is used occasionally to keep textile fibres moist and in a fit state for being woven. The crystals when kept in a basin at about 200° lose about two-thirds of thcir water, and leave that porous kind of chloride of calcium which analytical chemists prefer for the drying of gases. This substance, when heated to redness— which must be done in platinum to prevent contamination—loses the rest of the water and (at 723° C., Carnelley) fuses into the anhydrous salt CaCl,, which on cooling hardens into a stone-like mass. In this final process of dehydration, however, part of the chlorine goes off as hydrochloric acid, so that the product obtained is contaminated with some oxychloride. This can be prevented by igniting the salt with sal-ammoniac or—more surely—by effectng the dehydration in a current of anhydrous hydro- chloric acid gas. laboratories as a powerful dehydrating agent. It combines with ammonia gas into a solid compound. It dissolves in methyl alcohol and in cthyl alcohol, forming crystallizable ‘ alcoholates”’ (Graham), compounds of CaCl, with ‘‘ crystal alcohol.”

Nitrate of Caletum, Ca(NO3)., crystallizing with 4H,0, isa very hygroscopic salt, soluble in even absolute alcohol. It is mentioned here as a material for the convenient preparation of pure lime—by simple ignition of the salt in a platinum crucible. Regarding bleaching

powder, a double salt of hypochlorite and chloride of calcium Cl—Ca —(CI0), see CuLorENe, vol. v. p. 678.

Fluoride of Calcium, CaF, obtainable by precipitation of chloride of calcium with an alkaline fluoride, occurs in nature as FLVORSPAL (q.v.). Fluoride of calcium is widely disseminated throughout the nineral kingdom as an admixture with other minerals. All native forms of phosphate of lime contain it ; some in considerable ibe ane Traces of it are found in bones and in the ashes of most plants.

Metallic Calcium cannot be prepared by the reduction of the oxide with charcoal. It may be produced, however, by the electro- lysis of the fused chloride or—more conveniently —by heating the iodide Cal, (seven parts) with sodium (one part) in an iron crucible. The metal hasa yellow very malleable and ductile (Liés-Bodart and J obin). The specific gravity is 1°578 (Bunsen and Matthicson). It does not tarnish in dry air, but readily decomposes water, with evolution of hydrogen and formation of hydrate of lime. It is practically non-volatile. When heated in air or oxygen it burns with a most brilliant licht into oxide, CaO. a

Tests. —Solutions of ordinary calcium salts are not affected visibly by sulphuretted hydrogen, sulphide of ammonium, or pure ammonia. Carbonate of ammonia, even in the presence of sal-ammoniac, pre- cipitates the carbonate. So far calcium behaves like barium and strontium. From the former it is distinguished by its not being precipitated by either hydrofluosilicic acid or bichromate of potash, and from both by its spectrum and the relatively large solubility of its sulphate in water. The latter is obtained from any calcium solution by addition of sulphuric acid and alcohol. The sulphate is washed with alcohol on a filter. When then boiled with water it yields a solution which, dilute as it is, fives a very distinct pre-

Anhydrous chloride of calcium is much used in |

colour; itis somewhat harder than lead, and |

cipitate with oxalate of ammonia (barium and strontium sulphates in these circumstances give negative results). Oxalate of ammonia is the most delicate precipitant for calcium ; the precipitate is in- soluble in water, in ammonia and ammonia salts, and in acetic acid. From solutions (in acids) of phosphate or oxalate of calcium ammonia and likewise sulphide of ammonium precipitate the metal as phosphate or oxalate. To detect it in such a precipitate, dis- solve in hydrochloric acid and add sulphuric acid and alcohol. The calcium is precipitated as sulphate, which can be identified as just explained.

For the phosphates of lime, see PHospuATES. (W. D.)

LIME, or Linpen. The lime trees, species of Zilia, are familiar timber trees with mellifluous flowers, rarely if ever maturing their fruit in England, which are borne on a common peduncle proceeding from the middle of a long bract. 7’. europea, L., is indigenous to Europe, except- ing the extreme north, and extends eastwards across Russian Asia to the Altai. The lime is much planted in Britain, and is probably wild in south and west England, and perhaps in Ireland. The truly indigenous form in north Europe is always a small-leaved one. The large leaved variety (Z’. grandifolia, Ehrh.) is of South-European origin (Bentham, Handbook of the British Flora, i. 157) ; ?’. parvifolia, L., is perhaps the English wild form of the Continental 7. ewropxa, L.; while 7’. intermedia, D. C.,

_ probably a sub-species of 7. ewropea, L., is the so-called

common lime (Hooker, Stadent’s Flora of the British Isles, p. 76). For a full description of the European and Ameri- can forms, see Loudon, Arboretum, i. p. 364, and De Can- dolle, Prod., i. 513. The lime sometimes ‘acquires a great size: one is recorded in Norfolk as being 16 yards in cir- cuniference, and Ray mentions one of the same girth. The famous linden tree which gave the town of Neustadt in Wiirtemburg the name of “Neustadt an der grossen Linden” was 9 feet in diameter.

The economic value of the tree chiefly lies in the inner bark or liber, called bast, and the wood. The former was used for paper and inats and

for tying garlands by the ancients (Od., i. 38; Pliny, xvi. 14, 25; xxiv. 8, 33). 7 grandfolia and 7. parvifolia lave been found in the debris of lake dwellings in Switzerland. Bast mats are now made chiefly in Russia, the bark being cut in long strips, when the liber is easily separable from the corky superficial layer. It is then plaited into mats about 2

| yards square ; 14,000,000 come to Britain annually, chiefly

from Archangel. The wood is used by carvers, being soft and light, and by architects in framing the models of build- ings. Turners use it for light bowls, &c. The flowers, alone, are used for an infusion in Austria and elsewhere, with much success in vertigo and spasms, producing perspiration, and alleviating coughs; but the bracts and fruit are astringent.

The common lime was well known to the ancients. Theophras- tus says the leaves are sweet and used for fodder for most kinds of cattle. Pliny alludes to the use of the liber and wood, and describes the tree as growing in the mountain valleys of Italy (xvi. 30). See also Virg., Geo.,i. 178, &c.; Ov., AMct., viii. 621, x. 92. The pirdpa (Hdt., 4. 67) was the lime of the Greeks, perhaps J. argentea (sve Pickering's Chron. Hist. of Plants, pp. 214, 227, 418). Allusion to

| the lightness of the wood is made in Aristoph., Birds, 1378.

Fer the sweet lime (Citrus Limetta) and lime juice, see Lemon.

LIMERICK, a maritime county of Ireland, in the province of Munster, is bounded on the N. by the estuary of the Shannon and the counties of Clare and Tipperary, on the E. by Tipperary, on the S. by Cork, and on the W. by Kerry. Its greatest length from north to south is 35 iniles, and its greatest breadth east and west 54 miles. The total area comprises 662,973 acres, or 1036 square miles.

The greater part of the county is comparatively level, and rests on limestone, but in the south-east the picturesque Galtees, which extend into Tipperary, and are composed of Silurian strata overlaid by Old

Red Sandstone, attain in Galtymore a height of 3015 feet, and on the west stretching

LIME

into Kerry there is a circular amphitheatre of less elevated mountains composed of volcanic rocks. ‘The Shannon is navigable to Limerick, above which are the rapids of Doonas and Castleroy. The Maig, which rises in the Galtees, and flows into the Shannon, is navigable as far as the town of Adare. Limerick includes the greater part of the Golden Vale, the most fertile district of Ireland, which stretches across the centre of the county from Cashel in Tipperary to near the town of Limerick. Along the banks of the Shannon there are large tracts of flat meadow land formed of deposits of calcareous and peaty matter, and possessing extraordi- nary fertility. The soil in the mountainous districts is, for the most part, thin and poor, and incapable of improvement. In 1880 there were 176,774 acres under tillage, 415,107 pasture, 8407 plantations, and 62,465 waste. The total number of holdings in 1880 was 16,286, of which 1937 were less than one acre, and 11,273 between 15 and 100 acres in extent, 1019 between 100 and 200 acres, 259 between 200 and 500 acres, and 29 above 1000 acres. The large farms occupy the low grounds, and are almost wholly devoted to grazing. The following table shows the area under the principal crops in 1855 and 1881 :—

Other Meadow Potatoes.| Turnips.| Green| Flax,| and Total. Crops. Clover.

1855 | 17,149 [45,455 | 12,057 | 35,723 | 11,894 | 2,771 | 243 | 71,292 |196,084 1881 | 7,257 |21,440; 3,003 | 23,035 5,520 3,994 6 | 112,578 |176,S33

Other Cereals.

Wheat.| Oats.

The table shows a remarkable increase in the area under ineadow, notwithstanding which the total area under tillage has considerably

decreased. The number of horses has, since 1855, declined from 17,206 to 15,389, of which 10,228 were used for agricultural purposes. Cattle have increased from 159,710 to 201,456, an average of 28 to every 100 acres under cultivation, the average for Ireland being 25:8. The number of cows was 95,225. Sheep have diminished from 80,914 to 50,599, and pigs from 61,733 to 48,801. The number of goats was 10,012, and of poultry 428,398.

According to the corrected return of 1878, the land, exclusive of that in the county of the city of Limerick, was divided aniong 1676 proprietors, possessing 660,386 acres, of the annual value of £461,213, or 13s. 11d. per acre. Of the owners nearly 40 per cent. possessed less than 1 acre, the average extent being 394. The following were the largest proprietors :—Earl of Devon, 33,026 ; Earl of Dunraven, 14,298; Lord Ashton, 11,273; Arch- deacon Goold, 10,966 ; Lady Louisa Fitzgibbon, 10,316 ; Sir Croker Barrington, 9485.

Manufactures—The inhabitants are employed chiefly in agriculture, but coarse woollens are manufactured, and also paper, and there are a considerable number of meal and flour mills. At one time there were a number of flax- spinning and weaving mills, but that industry is now almost wholly extinct.

Administration and fPopulation.—The county includes 14 baronies, 131 parishes, 2067 townlands, and the city and parliamen- tary borough of Limerick. The number of members returned to the Irish parliament was eight, two being returned for each of the boroughs of Askeaton and Kilmallock, in addition to the two returned as at present for the county, and the two returned for the county of the city of Limerick. There are three poor-law unions wholly within the county, and portions of four others. Assizes are held at Limerick, and quarter sessions at Bruff, Limerick, Newcastle, and Rathkeale. The county is within the Cork military district, with a brigade depét at Tralee. The population, estimated in 1760 at 92,376, had increased in 1821 to 277,477, and in 1841 to 331,003, but since that period it has been gradually diminishing, being 217,277 in 1861, and in 1881 only 177,203, of whom 86,541 were males and 90,662 females. The

deerease since 1871 has been 7°7 per cent., the decrease per cent. in Ireland being 4°7._ Besides the city of Limerick, with a population in 1881 of 48,246, only two other towns, Rathkeale and Wotcestle, had a population of over 2000. From 1st May 1851 to 31st December 1880 the number of emigrants

from the county was 130,333, a proportion of 60 per cent. of the population in 1861.

History and Antiquities. —Limerick, originally inhabited by the Coriondi, was included in the kingdom of Thomond. Afterwards it had a separate existence under the name of Aine-Cliach. From the 8th to the 11th century it was partly occupied by the Danes. By Henry II. it was granted to Henry Fitzherbert, but his claim was afterwards resigned, and subsequently various Anglo-Norman settlements were made. About 100,000 acres of the estates of the earl of Desmond, which were forfeited in 1586, were situated in the county, and other extensive confiscations took place after the Crom- wellian wars. In 1709 a German colony from the Palatinate was settled by Lord Southwell near Bruff, Rathkeale, and Adare.

There are only slight remains of the round tower at Ardpatrick, but that at Carrigeen is much better preserved. There are im- portant remains of stone circles, pillar stones, and altars on Loch Gur. In several places there are remains of old moats and tumuli. Besides the monasteries in the city of Limerick, the most important monastic ruins are those of Adare Abbey, Askeaton Abbey, Kil- shane Abbey, Galbally Friary, Kilflin Monastery, Kilmallock Abbey, and Monaster-Nenagh Abbey. See the History of Limerick by Fitzgerald and M‘Gregor, 1826-27.

Limerick, a county of a city, paruamentary borough, and the chief town of the county of Limerick, is situated on both sides of the Shannon, at the head of its estuary,

and on an island of the river, 120 miles west-south-west of Dublin by rail.

Plan of Limerick.

1490, is a cruciform structure in the Gothic style, with an embattled tower 120 feet in height. A Roman Catholic cathedral in the First Pointed style was erected in 1860. The other principal public buildings are the court-house, the custom-house, the exchange, the chamber of commerce, the town-hall, the county jail, the city jail, the infirmary, and Barrington's hospital. There are barracks for cavalry, artillery, and infantry. Limerick as a port occupies the fourth position in Ireland, and, while possessing secure and open communication with the Atlantic, is included in a vast network of inland navigation. Vessels of 1000 tons can unload at the floating dock, and vessels of 500 tons at the quays. A graving dock, admitting vessels of 1500 tons for repair, has lately been constructed. The value of the imports in 1880 was £837,269, the average for the four years 1876-79 being sala sac – 1872-75 .— 82

£873,533. Tor the same dates the value of the exports was £26,569, £9552, and £12,516. The principal in- dustries are flax spinning and weaving, and the manufacture of lace and gloves. There are also breweries, distilleries, tanneries, and flour-mills. The population in 1851 was 48,961, which in 1871 had increased to 49,980, but in 1881 had diminished to 48,246.

Limerick is said to have been the ancient Regia of Ptolemy and the Rosse-de-Nailleagh of the Annals of Multifernan. There is a tradition that it was visited by St Patrick in the 5th century, but it is first authentically known as a settlement of the Danes, who in the middle of the 9th century madc it one of their principal towns, but were expelled from it in the 11th century by Brian Boroimhe. From 1106 till its conquest by the English in 1174 it was the seat of the kings of Thomond or North Munster, and, although in 1179 the kingdom of Limerick was given by Henry II. to Herbert Fitz- herbert, the city was frequently in the possession of the Irish chief- tains till 1195. By King John it was committed to the care of William de Burgo, who founded English Town, and for its defence erected a strong castle. The city was

frequently besieged in the 13th and 14th centuries. In the 15th century its fortifications were extended to include Irish Town, and until their demolition in 1760 it was one of the strongest fortresses of the kingdom. In 1651 it was taken by General Ireton, and after an unsuccessful siege by William III: in 1690 its resistance was terminated in October of the following year by the treaty of Limerick. The town first obtained municipal privileges in 1199, and these were confirmed and extended by Edward I. and other sovereigns. In 1609 it re- ceived a charter constituting it a county of a city, and also incorpo- rating a society of merchants of the staple, with the same privileges as the merchants of the staple of Dublin and Waterford. The powers of the corporation were remodelled by the Limerick Regu- lation Act of 1823. The prosperity of the city dates chiefly from the foundation of Newtown Pery by Mr Sexton Pery in 1769. It returns two members to parliament. See the History by Linahan,

1866.

LIMITATION, Sratutes of, are Acts of Parliament by which rights of action are limited to a fixed period after the occurrence of the events giving rise to the cause of action, This is one of the devices by which lapse of time is employed to settle disputed claims. There are mainly two modes by which this may be effected. We may say that the active enjoyment of a right—or possession—for a deter- mined period shall be a good title against all the world. That is the method known generally as PRESCRIPTION (q.v.). It looks to the length of time during which the defendant in a disputed claim has been in possession or enjoyment of the matter in dispute. On the other hand, the principle of the statutes of limitation is to look to the length of time during which the plaintiff has been out of possession. The point of time at which he might first have brought his action having been ascertained, the lapse of the limited period after that time bars him for ever from bringing his action. In both cases the policy of the law is expressed by the maxim Interest reipublice ut sit finis litium.

The principle of limitation was first adopted in English law in connexion with real actions, z.e,, actions for the recovery of real

property. At first a fixed date was taken, and no action could be brought of which the cause had arisen before that date. By the Statute of Westminster the First (3 Edward I. c. 39), the beginning of the reign of Richard I. was fixed as the date of limitation for such actions. This is the well known “period of legal memory ” recognized by the judges in a different class of cases to which a rule of prescription was applied. Posses- sion of rights in alieno solo from time immemorial was held to be an indefeasible title, and the courts following the statutes above mentioned held time immemorial to begin with the first year of Richard: I.

A period absolutely fixed became in course of time useless for the purposes of limitation, and at last the method of counting back a certain number of years from the date of the writs was adopted in the Statute 32 Henry

years for various classes of actions named therein. A large number of statutes since that time have established periods of limitation for different kinds of actions. Of those now in force the most important are 21 Jaines Ic. 16 for personal actions in general, and 3 & 4 Will IV. c. 27 relating to actions for the recovery of land. The latter statute has been repealed and virtually re-enacted by the Real Property Limitation Act, 1874, which reduced the period of limitation from twenty years to twelve, for all actions brought after the lst January 1879. The principal section of the Act of Will. LV. will show the modus operand: :—“ After the 31st December 1833, no person shall make an entry or distress, or bring an action to recover any land or rent but within twenty years next after the time at which the right to make such entry or distress or to bring such action shall have first accrued to some person through whom he claims, or shall have first accrued to the person making or bringing the same.” Another section defines the times at which the right of action or entry shall be deemed to have accrued in particular cases; ¢.g., when the estate claimed shall have been an estate or interest in reversion, such right shall be deemed to have first accrued at the time at which such estate or interest became an estate or interest in possession. Thus suppose lands to be let by A to B from 1830 for a period of fifty years, and that a portion of such lands

is occupied by C from 1831 without any colour of title from B or A—C's long possession would be of no avail against an action brought by A for the recovery of the land after the determination of B's lease. A would have twelve years after the determination of the lease within which to bring his action, and might thus, by an action brought in 1891, disestablish a person who had been in quiet posses- sion since 1831. What the law looks to is not the length of time during which C has enjoyed the property, but the length of time which A has suffered to elapse since he might first have brought his action.

It is to be observed, however, that the Real Property Limitation Act does more than bar the remedy. It extin- guishes the right, differing in this respect from the other Limitation Acts, which, while barring the remedy, preserve the right, so that it may possibly become available in some other way than by action.

By section 14 of the Act of Will. IV., "when any acknowledgment of the title of the person entitled shall have been given to him or his agent in writing signed by the person in possession, or in receipt of the profits or rent, then the right of the person (to whom such acknow- ledgment shall have been given) to make an entry or distress or bring an action shall be deemed to have first accrued at the time at which such acknowledgment, or the last of such acknowledgments, was given. By section 15, persons under the disability of infancy, lunacy, or coverture, or beyond seas, and their representatives, are to be allowed ten years from the termination of this disability, or death (which shall have first happened), notwithstanding that the ordinary period of limitation shall have expired.

By 21 James I. c. 16, actions of trespass, detinue, trover, replevin, or account, actions on the case (except for slander), actions of debt arising out of a simple contract, and actions for arrears of rent not due upon specialty, shall be limited to six years from the date of the cause of action. Actions for assault, menace, battery, wounds, and imprisonment are limited to four years, and actions for slander to two years. Persons labouring under disabilities are allowed the same time after the removal of the disability. When the defendant is "' beyond

seas” (z.e, outside the United Kingdom and the adjacent islands) a similar extension of time is allowed.

An acknowledgment, whether by payment on account

VIII. c. 2, which fixed periods of thirty, fifty, and sixty | or by mere spoken words, was formerly sufficient to take

the case out of the statute. The Act 9 Geo. IV. c 14 (Lord Tenterden’s Act) requires any promise or admission of liability to be in writing and signed by the party to be charged, otherwise it will not bar the statute.

Contracts under seal are governed as to limitation by 3 & 4 William IV. c. 42, which provides that actions for rent upon any indenture of demise, or of covenant, or debt, or any bond or other specialty, and on recognizances, must be brought within twenty years after cause of action. Actions of debt on an award (the submission being not under seal), or for a copyhold fine, or for money levied on a writ of jiert facias, must be brought within six years.

Of the miscellaneous limitations fixed by various Acts, the following may be noticed. Suits and indictments under penal statutes are limited to two years if the forfeiture is to the crown, to one year if the forfeiture is to the common informer. Tenal actions by persons aggrieved are limited to two years (3 & 4 Will. IV. c. 42). Actions brought against a justice of the peace for acts done in the execution of his office are limited to six calendar months (11 & 12 Vict. c. 44). Acts done under any local or personal Act of Parliament can only be sued upon within two years (5 & 6 Vict. c. 97).

A defence under the statutes of limitations must in general be specially pleaded. Limitation is regarded strictly as a law of procedure. The English courts will therefore apply their own rules to all actions, although the cause of action may have arisen in a country in which different rules of limitation exist. This is also a recognized principle of private international law.

United States.—The principle of the statute of limitations has passed with some modification into the statute-books of every State in the Union except Louisiana, whose laws of limitation are essentially the prescriptions of the civil law drawn from the Partidas, or “Spanish Code.” As to personal actions, it is generally provided that they shall be brought within a certain specified time—usually six years or less—from the time when the cause of action accrues, and not after, while for land the “general if not universal limitation of the right to bring action or to make entry is to twenty years after the right to enter or to bring the action accrues” (Bouvier’s Law Dictionary, art. “Limitations ”). The constitutional provision prohibiting States from passing laws impairing the obligation of con- tracts is not infringed by a law of limitations, unless it bars a right of action already accrued without giving a reason- able term within which to bring the action. (E. R.)

LIMOGES, capital of the department of Haute Vienne, France, and the ancient capital of Limousin, lies in the form of an amphitheatre on the right bank of the Vienne, 248 miles by rail south-south-west from Paris, on the Paris and Toulouse Railway, at its junction with the Charente line. It has also direct railway communication by Bellac with Poitiers. The population in 1876 was 59,011. In spite of many modern improvements and clearances, commenc- ing with the administration of Turgot in 1762, the city still contains old quarters, which are dark, wretched, and un- healthy.

The cathedral, the most remarkable building, not only in the town but in the entire province, is in the Parisian Ogival style, and occupies the site of an old heathen basilica, which, according to tradition, was transformed into a Chris- tian church by St Martial. The present edifice was built between 1273 and 1327, and has been quite recently re- stored, the north front of the transept, distinguished by the richness and perfection of its details, having been finally completed in 1851. The campanile is an elegant slightly leaning tower, 204 feet high. The interior of the church is remarkable for the boldness and elegance of its construc- tion. It has a magnificent rood-loft, attributed to Bishop

Jean de Langeac (1533) ; close by the choir screen is the mausoleum of the same prelate. The glass was repaired in the 16th century, but is still undergoing restoration. Under the choir is the erypt of the old Roman church, containing frescos of the llth century. Some of the houses still standing in Limoges date from the Middle

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Plan of Limoges. Ages; and commemorative tablets mark the birthplace of the chancellor D'Aguesseau and of Marshals Jourdan and Bugeaud. There is a museum of painting and sculpture, and, in connexion with the local industry, a very valuable ceramic museum. Limoges is the headquarters of the 12th army corps, and is also the seat of several learned societies, and of a court of appeal.

The principal industry is the manufacture of porcelain. The kaolin of St Yrieix is of such superior quality that it is exported even to America; the pegmatite used for enamel is obtained at Chanteloube, about 25 miles from Limoges, on the Paris railway. Thirty-five factories with eighty furnaces and fifty-four painting rooms (800 artists) employ 5800 workers of both sexes, and produce goods to the annual value of 12 millions offrancs, There are many others in the immediate neighbourhood of the town. Limoges has also wool and cotton spinning-mills, and cloth factories, paper-works, foundries, &c. Shoemaking gives employment to 600 persons, and the manufacture of clogs to 250. There is an extensive trade in wine and spirits, cattle, cereals,and wood. The Vienne is navigable for-rafts above Limoges, and the logs brought down by the current are stopped at the entrance of the town by the inhabitants of the Naveix quarter, who form a special guild for this industry.

Limoges was a place of importance even at the time of the Roman conquest, and sent ten thousand soldiers to the defence of Alesia. In 11 B.c. it took the name of Augustus (Augustoritwm) ; but in the 4th century it was anew called by the name of the Lemovices, whose capital it was. It then contained palaces and baths, had its own senate and the right of coinage. (Till 1837 it had a mint.) Christianity was introduced by St Martial. In_ the 5th century Limoges was devastated

by the Vandals and the Visigoths. Viscounts were set over it by Clovis. It suffered again in the wars between the Franks and the people of Aquitaine, from Norman

invasion, and from a struggle which arose between two parties into which the city was divided, led by the abbot of St Martial and by the bishop respectively. During the Hundred Years' War it was taken again and again by the French and English. Confiscated under John Lackland, it was again ceded by Louis 1X. In 1370 the Black Prince took it by assault, and gave it up to fire and sword, — a disaster from which it was slow to recover. The religious wars, pestilence, and famine desolated it in turn, but the ravages of all these were surpassed by the plague of 1630-31, which carried off more than twenty thousand persons. The wise administrations of Henri d'Aguesseau, father of the chancellor, and of Turgot enabled Limoges to recover its former prosperity. There have been several noteworthy conflagrations, destroying whole quarters of the city, built, as it then was, of wood. That of 1790 lasted for two months, and destroyed one hundred and ninety-nine houses; that of 1864 laid under ashes an area of 10,000 square metres. Limoges celebrates every seven years a curious religious festival (Féte d'Ostension), during which the relics of St Martial are exposed for seven wecks, attracting large numbers of visitors. It dates from the 10th century, and commemorates a pestilence (mal des ardents) which, after destroying forty thousand persons, is believed to have been stayed by the intercession of the saint.

LINACRE, or Lynaxer, THomas (1460-1524), a distinguished humanist and physician, was born at Canterbury about the year 1460. Of his parentage or descent nothing certain is known. He received his early education at the cathedral school of Canterbury, then under the direction of William of Selling, afterwards prior of Canterbury. Selling was an ardent scholar, and one of the earliest in England who cultivated Greek learning. From him Linacre must have received his first incentive to this study, in which he afterwards became eminent. Linacre entered the university of Oxford about the year 1480, and in

1484 was elected a fellow of All Souls' College. Shortly afterwards he visited Italy in the train of William of Selling, who was sent by Henry VIII. as an envoy to the papal court, and accompanied his patron as far as Bologna. There he became the pupil of Angelo Poliziano, and afterwards shared the instruction which that great scholar imparted at Florence to the youthful sons of Lorenzo de' Medici. The younger of these princes became Pope Leo X., and was in after years mindful of his old companionship with Linacre.

Among his other teachers and friends in Italy should be mentioned Demetrius Chalcondylas, Hermolaus Barbarus, Aldus Romanus the printer of Venice, and Nicolaus Leonicenus of Vicenza. Linacre took the degree of doctor of medicine with great distinction at Padua. On his return to Oxford, full of the learning and imbued with the spirit of the Italian Renaissance, lhe formed one of the brilliant circle of Oxford scholars, including Colet, Grocyn, and William Latimer, who are mentioned with so much warm eulogy in the letters of Erasmus.

Linacre does not appear to have practised or taught medicine in Oxford. About the year 1501 he was called to court as tutor of the young prince Arthur; and con- tinued to act in this capacity till the prince's death in 1503. On the accession of Henry VIII. he was appointed the king's physician, an office at that time of considerable in- fluence and importance, and practised medicine in London, having among his patients most of the great statesmen and prelates of the time, as Wolsey, Warham, and Fox.

After some years of professional activity, and when in advanced life, Linacre received priest's orders. But, as he had for some years previously held several clerical benefices it would seem that he must have been already a deacon, and thus nominally at least a cleric, but this status would not in those days have interfered with his practising as a physician. There is no doubt, however, that his ordination as priest was connected with his retirement from active life. Literary labours, and the cares of the foundation which owed its existence chiefly to him, the Royal College of Physicians, occupied Linacre's remaining years till his death in 1524,

Linacre was more of a scholar than a man of letters, and rather a man of learning. than a scientific investigator. It is difficult now to judge of his practical skill in his profession, but it was evidently highly esteemed in his own day; and several instances are recorded of his wise prognosis and judicious treatment. He took no part in political or theological questions, and died too soon to have to declare himself ou either side in the formidable controversies which were even in his lifetime beginning to arise.

But his career as a scholar was one eminently character- istic of the critical period in the history of learning through which he lived. He was one of the first Englishmen who studied Greek in Italy, whence he brought back to his native country and his own university the lessons of the "New Learning." His teachers, who have already been named, were some of the greatest scholars of the day. Among his pupils was one —Erasmus—whose name alone would suffice to preserve the memory of his instructor in Greek, and others of note in letters and politics, such as Sir Thomas More, the lamented Prince Arthur, and Queen Mary. Colet, Grocyn, William Lilye, and other eminent scholars were his intimate friends, and he was esteemed by a still wider circle of literary correspondents in all parts of Europe.

Linacre's literary activity was displayed in two directions, in pure scholarship and in translation from the Greek. In the domain of scholarship he was known by the rudiments of (Latin) grammar composed in English for the use of the Princess Mary, and after- wards translated into Latin by George Buchanan, and bya work on Latin composition, De emendata structura Latini sermonis, which enjoyed a wide popularity. It was originally composed for the use of St Paul's school, when founded by Dean Colet, but was set aside as unsuited for the purpose. It was, however, printed in London, in 1524, and many times reprinted on the Continent.

Linacre's only medical works were his translations. It was the cherished project of his life to make the works of Galen (and indeed those of Aristotle also) accessible to all readers of Latin. What he effected in the case of the first, though not trifling in itself, is in-

considerable as compared with the whole mass of Galen's writings; and of his translations from Aristotle, some of which are known to have been completed, nothing has survived. The following are the works of Galen translated by Linacre :—(1) De Sanitate Tuenda, printed at Paris in 1517 ; (2) Methodus Medendi, Paris, 1519 ; (8) De Temperamentis et de Inequali Intemperie, Cambridge, 1521; (4) De Naturalibus Facultatibus, London, 1528; (5) De Symptomatum Differentiis et Causis, London, 1524; (6) De Pulswuum Usu, London, without date. He also translated for the use of his pupil Prince Arthur an astronomical treatise of Proclus, De Sphera, which was printed at Venice by Aldus in 1499. The accuracy of these trans- lations and their elegance of style were universally admitted. They have been generally accepted as the standard versions of those parts of Galen's writings, and frequently reprinted, cither as a part of the collected works or separately.

But the most important service which Linacre conferred upon his own profession and science was not by his writings. To him was chiefly owing the foundation by royal charter of the College of Physicians in London, which first gave the medical profession in this country a recognized legal status, and which has becn the model of all the similar colleges of physicians and surgeons in the three kingdoms. He was the first president of the new college, which he further aided by conveying to it his own house, and by the gift of his library. Shortly before his death Linacre obtained from the king letters patent for the establishment of readerships in medicine at Oxford and Cambridge, and placed some valuable estates in the hands of trustees for their endowment. ''T'wo reader- ships were founded in Merton College, Oxford, and one in St John's College, Cambridge, but owing to neglect and bad manage- ment of the funds, they fell into uselessness and obscurity. The Oxford foundation was revived by the university commissioners in 1856 in the form of the Linacre professorship of anatomy. Pos- terity has done justice to the generosity and public spirit which prompted these foundations ; and it is impossible not to recognize a strong constructive genius in the scheme of the College of Physicians, by which Linacre not only first organized the medical profession in England, but impressed upon it for some centuries the

stamp of his own individuality. The intellectual fastidiousness of Linacre, and his habits of minute accuracy were, as Erasmus suggests, the chief cause why he accomplished so little and left behind no more permanent literary memorials. It will be found, perhaps, difficult to justify by any extant work the extremely high

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reputation which he enjoyed among the scholars of his time. His Latin style was so much admired that, according to the flattering eulogium of Erasmus, Galen spoke better Latin in the version of Linacre than he had before spoken Greek ; and even Aristotle dis- played a grace which he hardly attained to in his native tongue. Erasmus praises also Linacre's critical judgment (vir non exacti tantum sed severi judicii). According to others it was hard to say whether he were more distinguished as a grammarian or a rheto- rician. Of Greek he was regarded as a consummate master ; and he was equally eminent as a ‘‘ philosopher," that is, as learned in the works of the ancient philosophers and naturalists. In this there may have been, as the custom of the day was, some exaggeration ; but all have acknowledged the elevation of Linacre's character, and the fine moral qualities summed up in the epitaph written by John Caius :—‘‘Fraudes dolosque mire perosus; fidus amicis ; omnibus ordinibus juxta carus."'

The matcrials for Linacre's biography are to a large extent containcd in the older biographical collections of George Lilly (in Paulus Jovius, Descriptio Britanniz), Bale, Leland, and Pits, in Wood's Athenz Oxonienses, and in the Biographia Britannica; but all are completely collected in the Life of Thomas Linacre, by Dr Noble Johnson, London, 1835. Reference may also be made to Dr Munk's Roll of the Royal College of Physicians, 2d ed., London, 1878; and the {ntroduction, by Dr Payne, to a facsimile reproduction of Linacre's version of Galen, de Temperamentis, published by Messrs Macmillan, Cambridge, 1881. With the exception of this treatise, none of Linacre's works or translations have been reprinted in modern times, (dg. 2)

LINARES, an important mining town in the province of Jaen, Spain, is sitnated in an arid plain, near the foot of the Sierra Morena, 24 miles north-north-east from the town of Jaen, 12 north-east from that of Baeza, and half an hour by rail from the Vadollano station of the Madrid and Cordova line. The streets are ill paved, irregular, and ugly, and, apart from a fine fountain of Roman origin, the town presents no architectural features of interest. There is some trade in the oil and wine of the neighbourhood, which are excellent and plentiful; wool is exported to Catalonia and Valencia; and cattle-breeding, especially of animals for the bull-ring, is also carried on. But the population, which in 1877 numbered 36,630, and includes some 120 English, with a consul and a chaplain, is chiefly engaged in the working of the extensive lead-mines to the north-west of the town, and in various concomitant industries, such as the manufacture of gunpowder, dynamite, match for blasting purposes, rope, and the like The mining plant is entirely imported, principally from England. In respect of the quantity and uniform excellence of their productions the lead-mines of the province of Jaen are un- surpassed. For the year 1876-77 the joint output of those of Linares, Vilches, Bailen, Carboneros, Santa Helena, and (in part) La Carolina was stated at 1,620,000 cwts. of ore, worth upwards of £800,000,—the proportion of silver to lead varying from 20 to 60 grammes of the former to every 50 kilogrammes of the latter. The best class of ore is exported, chiefly to France and Belgium; the inferior classes are smelted for the most part in Spain. About 2 miles to the south of Linares is the village of Cazlona, which still shows some remains of the ancient Castulo; and the ancient mines some 5 miles to the north, which are now known as “Los Pozos de Anibal,” may with some proba- bility be assigned to the Carthaginian period.

LINCOLN, one of the four eastern maritime counties of England, lies between 52° 39’ and 53° 43’ N. lat., and 0° 22’ E. and 0° 56’ W. long. It is bounded on the N. by the Humber, E. by the German Ocean and the Wash, S.E. for 3 miles by Norfolk, 8. by Cambridge and North-ampton, 8.W. by Rutland, W. by Leicestershire and Notts, and N.W.. by Yorkshire. Its greatest length north and south, from Barton-on-Humber to Market Deeping, is 75 miles, its greatest breadth, from Wroot on the west to Salt- fleet on the east, is 50 miles, its circuit

about 260 miles. Its area is 1,767,962 acres, or about 2762 square miles, making it the second largest county in England.

Coast-Line.-—The coast-line, about 110 miles in Jength, is low and marshy, and artificial banks for guarding against the inroads of the sea are to be found, in places, all along the coast. From Grimsby to Skegness traces of a sub-

marine forest are visible; but while the sea is encroaching upon some parts of the coast it is receding from others, as shown by Holbeach, which is now 6 miles from the sea. Several thousand acres have been reclaimed from this part of the Wash, and round the mouth of the Nene on the south- east. The deep bay between the coasts of Lincolnshire and Norfolk, called the Wash, is full of dangerous sandbanks and silt ; the navigable portion, off the Lincolnshire coast, is known as the Boston deeps. The rapidity of the tides in this inlet, and the lowness of its shores, which are generally indistinct on account of mist from a moderate offing, render this the most difficult portion of the navigation of the east coast of England.

Surface and Geology.—The surface of Lincolnshire is generally a large plain, some portions of which are below the level of the sea. The south-east parts are perfectly flat; and about one-third of the county consists of fens and marshes, intersected in all directions by artificial drains, called locally dykes, delphs, drains, becks, leams, and eaux. This flat surface is, however, broken by two ranges of cal- careous hills running north and south through the county, and known as the Cliff and the Wolds. The former range, on the west, runs nearly due north from Grantham to Lincoln, and thence to the Humber, traversing the Heaths of Lin- colnshire, which were formerly open moors, rabbit warrens, and sheep walks, but are now enclosed and brought into high cultivation. Parallel with this range on the east side of it runs the old Roman Ermine Street, sometimes called the Cliff Row Road. The Wolds form a ridge of bold hills extending from Spilsby to Barton-on-Humber for about 40 miles, with an average breadth of about 8 miles. Between the Wolds and the sea lie the Marshes, a level tract of rich

alluvial soil extending from Barton-on-Humber to Wain- fleet, varying in breadth from 5 to 10 miles. Between the Welland and the Nene in the south-east of the county are Gedney Marsh, Holbeach Marsh, Moulton Marsh, and Sutton Marsh.

The Fens, the soil of which has been formed partly by tidal action and partly by the decay of forests, occupy the Isle of Axholme on the north-west, the vale of Ancholme on the north, and most of the country south-east of Lincoln. The chief of these are the Holland, Wildmore, West, and East Fens draining into the Witham; and the Deeping, Bourn, Great Porsand, and Whaplode Fens draining into the Welland. Owing to the dead level of these districts there is perhaps more artificial drainage in Lincolnshire than in any other English county; and this part of the country resembles in many respects, especially in embank- ments and dykes, the continental Holland.

The drainage of the Fens appears to have early occupied attention. Shortly after the Norman Conquest Richard de Rulos, lord of Brunn, and chamberlain to William I., enclosed and drained a large part of Deeping Fen in so complete a manner that the work would not be disgraced by a comparison with the more scientific efforts of modern times. Excluding the Welland by a bank, he changed ‘‘deep lakes and impassable fens into most fruitful fields and pastures, and the most humid and moorish parts thereof into a garden of pleasure.”

The drainage of the remaining levels of Lincolnshire was chiefly commenced in the reigns of James I. and Charles I. The East, West, and Wildmore Fens were contracted for in the 7th Charles I. The earl of Lindsey undertook all the fens in Holland and Kesteven, north of the river Glen up to Lincoln, ou the completion of which 24,000 acres were awarded to him. Inthe18th of the same reign, the king declared himself the ‘‘ Undertaker” of the Holland Fen, containing 22,000 acres, out of which he was to have 8000 for his share. Sir John Monson with other freeholders drained the Ancholme level in the north, and had 5827 acres assigned to them. In the same reign the Isle of Axholme was undertaken by Cornelis Vermuijden and his Dutch and Flemish followers. These operations were interrupted during the

civil wars, and many of the works destroyed by the ‘‘ stilt-walkers,” so curiously described by Camden. Little was done towards restoring the works thus destroyed till the middle of the 18th century, when several townships, haying a right of common over particular fens, began to join in procuring Acts of

Parliament for their drainage, enclosure, and division. The Holland Fen was the first to be dealt with, about 1768 ; in spite of renewed and riotous opposition from the “stilt-walkers,” all the fen lands were successfully drained and enclosed, and on the completion of the East, West, and Wildmore Fens (about 60,000 acres) the race of “ stilt-walkers ” became extinct. The low lands adjoining the tidal reaches of the Trent and Humber, and part of those around the Wash, have been raised above the natural level, and enriched by the process of warping, which consists in letting the tide run over the land, and retaining it there a sufficient time to permit of the deposit of the sand and mud held in solution by the waters.

The general appearance of the county is very pleasing. The level tracts are richly cultivated ; the hills and dales are interspersed with wood and lawn; and many spots on the Cliff or Wolds command extensive and charming views. The charms of the Fen districts are described as “a beauty as of the sea, of boundless expanse and freedom” (Kingsley). Not a few passages in the writings of Tennyson (a native of the county) bear the impress of the scenery and colour- ings of the Fens. :

The geological formations, for the most part, extend in parallel belts, nearly in the line of the length of the county, from north to south, and succeed one another, in ascending order, from west to east.

1. The lowest is the Triassic or New Red Sandstone found in the Isle of Axholme and the valley of the Trent in the form of marls, sandstone, and gypsum. The presence of the peroxide of iron which tinges the beds red seems to have been prejudicial to animal life ; therefore few fossils are found. Fish scales and teeth, with bones and footprints of the Labyrinthodon, are to be met with in the sand- stone. ‘The red clay

is frequently dug for brick-making. The beds dip gently towards the east. At the junction between the Trias and Lias are series of beds termed Rheetics, which seem to mark a trans- ition from one to the other. These beds are in part exposed in pits near Newark, and extend north by Gainsborough to where the Trent flows into the Humber, passing thence into Yorkshire. The characteristic shells are found at Lea, 2 miles south of Gains- ery with a thin stratum of bone bed full of fish teeth and scales.

2. The Lower Lias comes next in order, with a valuable bed of ironstone now largely worked. This bed is about 27 feet in thick- ness, and crops out at Scunthorpe, where the workings are open and shallow. The Middle Lias, which enters the county near Wools- thorpe, is about 20 or 30 feet thick, and is very variable both in thickness and mineralogical character. The Upper Lias enters the county at Stainby, te by Grantham and Lincoln. It forms the west slope of the Cliff range, and is thickest upon the highest hills. The Lias thus occupies a band about 8 or 10 miles in width in the south, narrowing until on the Humber it is about a mile wide.

8. To this succeed the three Oolite formations. The Lower Oolite, somewhat narrower than the Lias, extends from the boundary with Rutland due north past Lincoln to the vicinity of the Humber. The Middle Oolite, very narrow in the south near Wilsthorpe, widen- ing gradually about Sleaford, and then suddenly contracting again south of Lincoln, sends out a narrow band south-east towards Spilsby. It then proceeds north from Lincoln with decreasing width to the vicinity of the Humber. The Upper Oolite and Kim- meridge clay start from the vicinity of Stamford, and after attaining their greatest width near Horncastle, run north-north-west to the Humber. ,

4. In the Cretaceous system of the Wolds, the Lower Greensand runs nearly parallel with the Upper Oolite past South Willingham to the Humber. The Upper Greensand and Gault run north-west from Irby, widening out as far as Kelstern on the east, and cross the Humber. The Chalk formation, about equal in breadth to the three preceding, extends from Burgh across the Humber.

5. All the rest of the county, comprising all its south-east portions between the Middle Oolite belt and the sea, all its north-east por- tion between the Chalk belt and the sea, and a narrow tract up the course of the Ancholme river, consists of alluvial deposits or of

reclaimed niarsh.

Minerals.—Gypsum is dug in the Isle of Axholme, whiting is made from the chalk near the shores of the Humber, and lime is made on the Wolds. Freestone is quarried around Ancaster, and good oolite building stone is quarried near Lincoln and other places. Ironstone is found and worked at Claxby near Caistor, and carried into Yorkshire to be smelted ; it is also worked at Frodingham, 9 miles north-north-west of Brigg.

Rivers.—The Humber separates Lincolnshire from York- shire. Its ports on the Lincolnshire side are Barton, New

[county.

Holland, and Grimsby. The Trent divides the Isle of Axholme from Lindsey, and falls into the Humber about 30 miles below Gainsborough. Like the Severn, it is noted for a tidal phenomenon called the “eager” or bore, which, at spring tides, rises to the height of from 6 to 8

feet. The Witham rises on the south-west border of the’

county, flows north past Grantham to Lincoln, and thence east and south-east to Boston, after a course of about 80 miles. This river was once noted for its pike. The Welland rises in north-west Northamptonshire, enters the county at Stamford, and, after receiving the Glen, flows through an artificial channel into the Fossdyke Wash. The Nene on the south-east has but a small portion of its course in Lincolnshire; it flows due north through an artificial outfall called the Wisbech Cut.

Canals.—The principal canals are—the Stainforth and Keadby, connecting the Trent with the Yorkshire coal-field ; the Louth Navigation, from Louth to Tetney Haven; the Sleaford Navigation, connecting Sleaford with the Witham ; and the Grantham Canal, from that town to the Trent at Nottingham. The remainder are chiefly small rivers artificially deepened and embanked.

Climate.—The climate of the higher grounds is now noted for its salubrity, aud meteorological observation does not justify the reputation for cold and damp often given to the county as a whole. The mean annual temperature of the Fens as given by ten years' observation (1864—73) is 47°-9, 1°°6 below that of Greenwich. The rainfall of the Fen district is very small as compared with other parts of England. While the average of the whole country was little over 30 inches, at Boston the average fall from 1830 to 1849 was 23°58 inches, and from 1850 to 1869 22°08. At Wisbech south-west winds prevail on an average six months in the year, and north-east winds barely two months.

Soil and Agriculture.—The soils vary considerably, accord- ing to the geological formations; ten or twelve different kinds may be found in going across the country from east to west. A good sandy loam is common in the Heath divi- sion; a sandy loam with chalk, or a flinty loam on chalk marl, abounds on portions of the Wolds; an argillaceous sand, merging into rich loam, lies on other portions of the Wolds; a black loam and a rich vegetable mould cover most of the Isle of Axholme on the north-west; a well- reclaimed marine marsh, a rich brown loam, and a stiff cold clay variously occupy the low tracts along the Humber, and between the north Wolds and the sea; a peat earth, a deep sandy loam, and a rich soapy blue clay occupy most of the east and south Fens; and an artificial soil, obtained by "warping," occupies considerable low strips of land along the tidal reaches of the rivers. The wide grazing lands of Lincolnshire have long been famous, and the arable lands are specially adapted for the growth of wheat and beans. There is no generally recognized rotation of crops. The

cattle raised are the Shorthorus and improved Lincolnshire

breeds. The dairy, except in the vicinity of large towns, receives little attention. The sheep are chiefly of the Lincolnshire and large Leicestershire breeds, and go to the markets of Yorkshire and the metropolis. Lincolnshire has long been famous for a fine breed of horses both for the saddle and draught. Horse fairs are held every year at Horncastle and Lincoln. Large flocks of geese were formerly kept in

the Fens, but their number has been diminished since the drainage of these parts. Where a large number of them were bred, nests were constructed for them one above another; they were daily taken down by the gooseherd, driven to the water, and then reinstated in their nests, without a single bird being misplaced.

Decoys were once numerous in the undrained state of the Fens.

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440,422 acres, a perceutage of 24-9 instead of 23-0.

COUNTY. |

under crops comprehended 1,498,676 acres, a percentage of 84°7 instead of 81°7 in 1870 ; corn crops had an area of 611,977 acres, a percentage of 34°6 instead of 34-9 in 1870 ; -grcen crops, 238,719 acres, a percentage of 13°5 instead of 13-2 in 1870; rotation grasses, 167,252 acres, a percentage of 9°5 instead of 9°4 ; permanent pasture, The area under crops is thus more than three times the amount under pasturage. The area under woods in 1881 was 39,431 acres, and under orchards 1788, under market gardens 660, under nursery grounds 137. Of the corn crops the most largely grown is wheat, which in 1881 occu- pied 245,645 acres, —barley or bere, grown mostly on the Wolds and the Heath districts, coming next with 199,900 acres; then oats, 113,564 acres ; lastly rye, 1300 acres. Beans occupied 41,073 acres, pease 10,495 acres. Of the green crops the most largely grown in 1881 were turnips and swedes, 142,300 acres, mostly on the Wolds and Lincoln Heath. Potatoes occupied 39,794 acres; mangold, 21,488 ; vetches and other green crops, except clover or grass, 18,615 acres ; cabbage, kohl-rabi, and rape, 15,057 acres ; carrots, 1515 acres. Onions are raised to a great extent in the Isle of Axholme, and under good management have been known to return £50 per acre. Flax occupied 353 acres, and hops 8. The bare fallow or uncropped arable land in 1881 was 39,950 acres. In 1870, 81:7 per cent. of

50 Acres and under.

50 to 100 Acres.

1875.

Manufactures and Trade-—The manufactures are few and comparatively small There are, however, some large agricultural machine and steam-engine factories in and around Lincoln ; and similar works exist at Boston, Gains- borough, Grantham, and Louth. At Frodingham there are extensive iron-works. At Little Bytham a very hard brick, called the adamantine clinker, is made of the silicious clay that the Romans used for their manufactures of pottery. At Louth there is a carpet manufactory, also several tanneries and iron foundries. Bone crushing, leather working, the manufacture of oil-cake for cattle, rope making, and sack weaving are carried on in various places. The chief ports are Grimsby, Boston, Sutton Bridge, and Gainsborough, the first being by far the most important. For the fisheries of GrimsBy see vol. ix. p. 249,

LRailways.—The first line opened in the county was the Midland Railway to Lincoln, in August 1846. The Manchester, Sheffield, and Lincolnshire Railway, first opened in 1848-49, goes from Lincoln north-east to Market Rasen, and thence, by way of Barnetby and Ulceby junc- tions, to Grimsby and Cleethorpes. A second branch runs north-east from Gainsborough to New Holland and Barton on the Humber, and a third from Barnetby due west to the Yorkshire coal-fields. The Great Northern main line runs through the south-west of the county past Grantham to Newark, and throws off several branches. A loop line connecting Spalding, Boston, and Lincoln with the direct

line from London to York was opened in 1848. The East

Lincolnshire Railway (leased to the Great Northern) runs from Boston to Grimsby.

Administration.—The primary divisions of Lincolnshire are three trithings or ridings. The north division constitutes the Parts of Lindsey,

the south-west the Parts of Kesteven, and the south-east the Parts of Holland. Each of these divisions had before the Norman Conquest its own trithing gerefa or reeve, and to this day each has its separate magistrates, quarter sessions, clerk of the peace and treasurer, but they are all under one lord-lieu- tenant and one sheriff, and subject to the court of assize held at Lincoln. These ‘‘ Parts” are again subdivided into wapentakes, sokes, and hundreds. The trithings do not in any way coincide with parliamentary divisions. The Parts of Lindsey comprise more than half the county, and contain seventeen wapentakes. The Parts of Kesteven, exclusive of the soke and borough of Grantham and the borough of Stamford, comprise nine wapentakes. The Parts of Holland comprise three wapentakes only. Before the passing of the Reform Act of 1832 Lincolnshire sent twelve members to parlhament —two for the county, two for the city of Lincoln, and

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According to the agricultural returns for 1881, the total area |

100 to 300 Acres. | 300 to 500 Acres. |500 to 1000 Aeres.

1880.

655

the entire area of Lincolnshire was returned as cultivated, in 1879, 84°1 per cent., and in 1880, 84°5. The number of horses used solely for agriculture in 1881 was 49,656; mares and unbroken horses, 15,171 —total, 64,827. The number of cows and heifers in milk or in calf in 1881 was 53,499, and of other cattle 156,706. The number of sheep was 1,336,147, or 90°2 for every 100 acres, the average for Great Britain being 76°3, for England 62°4. Pigs in 1881 numbered 82,497.

The agriculture of Lincolnshire is only seeond to that of East Lothian, by which alone it is excelled in the use of fixed steam- engines upon its farmsteads. In the south part of the county small proprietors abound. According to the landowner’s returns for 1872-73, the land in the county of Lincoln was divided among 30,497 owners, and its gross

estimated rental was £3,173,825. Of the owners, 13,768, or more than 45 per cent., possessed less than 1 acre; the average value per acre was £1, 19s. 64d. There were four proprietors possessing over 20,000 acres each :—Earl of Yarborough, 55,272 acres; Lady Willoughby de Eresby, 24,696 acres; Henry Chaplin, M.P., 23,370 acres; and Christopher Turnor, 20,664 acres.

The following table gives a classification of holdings accord- ing to size as returned on the 25th June 1875 and the 4th June 1880 :—

1000 Acres and

upwards. Total.

1875. 1880.

1875. 1880. 817 833 25,990 26,542

45,516 | 1,475,447 | 1,494,626

two each for the boroughs of Great Grimsby, Boston, Grantham, and Stamford. After the passing of that Act the county returned four members, and Grimsby lost one. In 1867 Stamford also lost a member, and the representation of the county, newly divided into Mid, North, and South Lincolnshire, was increased to six, each new division returning two members. Lincolnshire comprises one city, Lincoln (population 37,312), which is also a municipal and peviamentayy borough ; four other municipal and parliamentary

oroughs—Boston (18,867), Grantham (17,345), Great Grimsby (45,373), Stamford, partly in Northampton (8995); and one municipal borough—Louth (10,690). .

The county belongs to the midland circuit. Besides the winter and summer assizes held at Lincoln, there are spring assizes held at the same place for Lincoln and Notts, and autumn assizes at Notting- ham for Notts and Lincoln. Quarter sessions for the Parts of Lindsey are held at Lincoln and Spilsby, for the Parts of Kesteven at Bourn and

Sleaford, for the Parts of Holland at Boston and Spalding. The county is divided into seventeen county court distriets, many of which coincide with the unions. For the con- venience of rating there are eighteen poor law unions ; five of these, however, include eighty parishes in the adjacent counties. Ecclesi- tically the county, with that of Nottingham, forms the diocese of Lincoln, which is divided into the three arehdeaconries of Lincoln, Stow, and Nottingham, the latter place giving title to a suffragan bishop without a see.

Education.—The educational resources of the county in 1881 embraced one theological and one training college, both at Lincoln, and fourteen endowed grammar sehools at the following places :—Alford (founded 1565), Boston (1554), Bourn (1636), Caistor (1630), Donington (1701), Gainsborough (1589), Grantham (1528), Horn-castle (1571), Lincoln (1583), Louth (1551), Moulton (1561), Sleaford (1604), Spalding (1588), Spilsby (1550).

Population.—In 1881 the population of the county was 469,994 (235,014 males and 234,980 females); in 1861 it had been 412, 246, and 436,599 in 1871. The figures for nine of the principal towns, in addition to the boroughs already given, are as follows :—Bourn (7121), Caistor (8793), Gainsborough (10,964), Glandford Brigg (3107), Holbeach (5190), Horncastle (4814), Sleaford (4967), Spald-ing (9260), and Spilsby (7082).

History and Antiquitics.—It is highly probable that theterritory now forming Lincolnshire was first settled by a tribe of the Belge, who, however, at the time of the invasion by Cesar, had become a mixed race with the real Britons. This territory was unaffected by Ceesar’s first invasion, and cven after the reduction of Britain by Claudius the Fenland remained intact. The county was conquered about 70 A.p., and formed part of the province of Flavia Cesari- ensis. The tribes which occupied Lincolnshire, according to Ptolemy, were the Coritani, who had Lindum and Rate (Leicester) for their towns. The date of the introduction of Christianity is uncertain, but we learn from Bede (Hist. Ececles., ii. 16) that Adelphius of Colonia Londinensium, which has been mistaken for London, attended the council of Arles (314). Under

the Saxon kingdom of Mercia, Lindscy, which probably extended nearly or quite over the modern county of Lincoln, appears to have been a dependent state. Under Edwin of Northumbria, the conqueror of Mercia, Christianity was reintroduced by Paulinus of

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south wing of the transept, two sides of the decagonal chapter- house (1282), and the beautiful west gate-house, Karly Perpen- dicular (1332-88), with an oriel window on the east.

The general beauty of the parish churches of Lincolnshire is proverbial, but it is incorrect to suppose that they are equally good in every partof the county. In the Parts of Lindsey, though there are some of considerable beauty and interest, the churches ean scarcely be considered above the average; several though | small and mean present curious early features, particularly the | well-known tower of St Peter, Barton-on-Humber, supposed to be | of the Saxon period, and those of Crowle, Heapham, and Stow. | Those of Grimsby and Wainfleet are cruciform. .

York, and Bede tells us that Blecca, the governor of Lincoln, was, with his household, among the first converts (628).

Early in 870 the Danes or Northmen landed at Humberstone near Grimsby, and ravaged Lindsey and the famous monastery of Bardney on the Witham. Lincolnshire passed permanently into the hands of the Danes about 877, and was included within the boundary of the ‘‘Danelage” of Danish jurisdiction as settled by the treaty of 878. Probably the greatest changes consequent upon the Danish invasion are, first, the supplanting of the Anglo-Saxon names of places by those of the Danish termination ending in by, which are numerous, and the substitution of the wapentake for the earlier division of the hundred ; the ancient British laws and those

of the Danes were otherwise not dissimilar. In time the two In the Parts of Kesteven the churches are not only elegant but populations became amalgamated and came under the dominion of | well finished, built of

excellent stone which abounds at Ancaster | the Anglo-Saxon crown. The subsequent history of the county | and near Sleaford. The church of St Andrew Heckington is the

best example of Middle Pointed architecture in the county ; it is famed for its Easter sepulchre and fine sedilia. The largest and finest church in this division is doubtless that of St Wolfran at Grantham, 200 by 87 feet, with three collateral naves, and steeple, 271 feet high, of the 14th century.

It is principally in the Parts of Holland that we are to look for the finest churches in the county ; they are not to be equalled by those of any other district in the kingdom, which is the more remarkable as the district is comprised wholly of marsh land, and is without stone of any kind. It is highly probable that the churches of the south part of this district owe their origin to the munificence of the abbeys of Crowland and Spalding. The earliest specimen of Norman architecture is that of Long Sutton, which has been called the counterpart of Christ Church, Oxford. St Mary and Nicholas at Spalding, 157 feet by 95, has the uncommon feature of a double aisle on each side of the nave, as well as a transept. The glory of the division of Holland is beyond question the church of St Botolph, Boston.

LINCOLN, the capital of the county of that name, is a city and county in itself, and is also a municipal and parliamentary borough. It is picturesquely situated on the summit and south slope of the limestone ridge of the Cliff range of hills which rises from the north bank of the river Witham, at its confluence with the Foss Dyke, to an altitude of 200 feet above the banks of the river. It is 132 miles north-west from London by road, and 138 miles by rail; 53° 15’ N. lat., 32’ W. long.

under the Normans is associated more or less with the city of Lincoln. In the civil war between Stephen and the empress Matilda a battle was fought near Lincoln in 1141. In 1174 the Isle of Axholme was the scene of the struggle between Roger de Mowbray, one of the adherents of Prince Henry, and the forces sent against him by his father Henry II. The issue was decided by the Lincolnshire men in favour of the king. In 1216 occurred King John’s march across the county, when he lost

all his baggage and jewels in the Fossdyke Wash on his way to Swineshead Abbey. In the reign of Edward IV. Sir Kobert Wells, at the head of 30,000 Lincolnshire m2n, was defeated at Losecoat Field near Stamford, March 1470. At the suppression of the monasteries a rebellion broke ont at Louth headed by Makerel, the last prior of the abbey of Barlings Oxney, October 1536. The prior was hanged, and the shire for the trouble it gave to King Henry VIII. was designated in a state paper as ‘‘one of the most brute and beestalie of the whole realm.” During the civil wars the county was a scene of numerous contests, the most famous of which was the battle at Grantham in 1648, won by Cromwell over the royalists. The advantage that was taken by the Fenmen to destroy the efforts made to drain and enclose the remaining levels of Lincolnshire during this stormy period has been already noticed. Riots broke out at intervals, and were continued down to the middle of the 18th century.

Remains of British camps are found at Barrow, Folkingham, Ingoldsby, Revesby, and Well. Traces of Roman camps are found at Alkborough, Caistor, Gainsborough, Gedney Hill near Holbeach, Honington near Grantham, South Ormsby, and Yar- borough. The Roman roads are nearly perfect,—Ermine Street, on the east side of the Cliff hills, and the Fossway running south- west from Lincoln. The crown of these remains is without doubt the famous Roman arch called the Newport Gate at Lincoln. Tesselated pavements have been found at Denton, Horkstow, Lincoln, Scampton, and Winterton. Coins of the emperors Nero, Vespasian, and Julian have been found at Lincoln and Ancaster, and two Roman altars to the west of Stow.

There are remains of fendal castles at Boston, Lincoln, Sleaford, Somerton, Tattershall, and Torksey. The seats worthy of note (chiefly modern) are Appleby Hall, Aswarby Hall, Belton Honse, Blankney Hall, Brocklesby, Bulby House, Burghley House (near Stamford), Burton Hall, Casewick House, Denton Hall, Easton Hall, Hackthorn Hall, Haverholm Priory, Lea Hall, Leadenham House, Manby Hall, Newton House, Nocton Hall, Normanby Hall, Norton Place, Panton Hall, Riby Grove, Somerby Park, Stourton, Syston Park, Thonock House, Thurlby Hall, Uffington, and Willingham by Stow.

At the time of the suppression of the monasteries in the reign of Henry VIII. there were upwards of one hundred religious houses ; and among the Fens rose some of the finest abbeys held by the Benedictines. The Gilbertines were a purely English order which took its rise in Lincolnshire, the canons following the Austin rule, the nuns and lay brothers that of the Cistercians. They generally lived in separate houses, but formed a community having a common church in which the sexes were divided.by a longitudinal wall. These houses were at Alvingham, Catley, Holland Brigg, Lincoln before the gate of which was erected the first Eleanor Cross New- stead in Lindsey, Semperingham, the chief house of the order founded by St Gilbert of Gaunt in 1139, Stamford (a college for students), and Welles. There were nunneries of the order at pe eee Nun Ormsby, and Tunstal.

he following are a few of the most famous abbeys. ine Oxney (Premonstratensian), founded 1154, for teas cee The tower, Decorated, with arcading pierced with windows and the east wall of the south wing remain. (2) The Benedictine Mitred Abbey of Crowland, founded 716, refounded in 948. The foundations of the new church in 1114 were laid on massive piles of oak. Part of the west front was repaired in 1255-81, with beautiful Early English sculpture of the legend of St Guthlac and saints ; this, with the Perpendicular north-west tower, 1469-70, remain. (8) Swineshead Abbey (Carthusian), colonized from Fur- ness in 1134 by eleven monks. (4) Thornton-upon-Humber Abbey (Black Canons), founded in 1139. There remain a fragment of the

Plan of Lincoln.

Lincoln is one of the most ancient and interesting cities in England. The ancient British town occupied the crown of the hill beyond the Newport or North Gate of the subsequent Roman town, the ancient earthworks and ditches of which are nearly conterminous with the present boundaries of the parish of St John. The Roman town consisted of two parallelograms of unequal length, the first of which extended west from the Newport gate to a point

east as far as Broad Street.

city. |

a little west of the castle keep. The second parallelogram extended due south from this point down the hill towards the Witham as far as Newland, and thence in a direction due Returning thence due north, it joined the south-east corner of the first and oldest paral- lelogram in what was afterwards known as the Minster yard, and terminated its east side upon its junction with the north wall in a line with the Newport gate. This is the oldest part of the town, and is named ‘“‘above hill.” After the departure of the Romans, the city walls were extended still further in a south direction across the Witham as far as the great bar gate, the south entrance to the High Street of the city ; the junction of these walls with the later Roman one was effected immediately be- hind Broad Street. These three divisions comprise the boundaries of the municipal and parliamentary boroughs, which are conterminous. The “above hill’ portion of the city is not well built, but consists of narrow irregular streets, some of which are too steep to admit of being ascended by carriages. The south portion, which is named ‘below hill,” is much more commodious, and contains the principal shops and inns, with many elegant buildings and private residences. Here also are the Great Northern and Midland Railway stations.

The glory of Lincoln is its noble minster. Asa study to the architect and antiquary this stands unrivalled, not only as the earliest purely Gothic building in Europe, but as containing within its compass every variety of style froni the simple massive Norman of the west front, to the Late Decorated of the east portion. The building material is the oolite and calcareous stone of Lincoln Heath and Haydor, which has the peculiarity of becoming hardened on the surface when tooled. Informer days the cathe- dral had three spires, all of wood or leaded timber. The spire on the central tower was blown down in 1547. Those on the two western towers, 101 feet high, were removed in 1808 ; good representations of them will be found in the well-known views by Hollar and Buck. The ground plan of the first church, adopted from that of Rouen, was laid by Bishop Remigius in 1086, and the church was consecrated four days after his death, May 6, 1092; the central

west front and the font are of this period. The approximate dates of the remaining portions of the fabric may be assigned as follows :—the three west portals and the Norman portion of the west towers above the screen to the top of the third story, about 1148 ; the nave, its aisles, and the north and south chapels of the west eud, completed 1220; the Early English portion of the west front, and the upper parts of the north and south wings, with pinnacle turrets, 1225; the west porch of the main transept, 1220 ; the crossing, and lower part of the central tower, 1235 ; the upper part, 1307 ; the west door of the choir aisles, 1240. The south porch of the presbytery dates 1256. The east window, the finest of its style in England, 57 by 34 feet, dates 1258-88. The choir screens date 1280, the Easter sepulchre 1290. The gables and upper parts of the main transept, the parapets of the south side of the nave, south wing, and west front, and the screen in the south aisle, all date from 1225. The upper parts of the west towers date from 1365 ; their upper stories, the west windows and parapet of the galilee porch, and the chapel screens in the transept, 1450. The vaulted lantern of the central tower is 127 feet above the floor. The main transept has two fine rose windows ; the one on the north called the Dean's Eye is 30 feet indiameter. The Bishop's Eye to the south is very fine Decorated (c. 1350). The rood screen is mainly c. 1340.1. The other buildings in

1 The dimensions of the cathedral internally are—nave, 252 x 79'6× 80 feet; choir, 158 × 82×72 feet; angels' choir, which in- cludes presbytery and lady chapel, 166× 44×72 feet; main tran-

the close that call for notice are the chapter-house of ten sides, 60 feet diameter, 42 feet high, with a fine vestibule of the same height built in 1225, and the library, 104 by 17 feet, which contaius a little museum. Among the most famous bishops were St Hugh, who died 1200 ; Grosseteste, died 1253; Flemming, died 1431, founder of Lincoln College, Oxford ; Smith, died 1521, founder of Brasenose, Oxford ; Wake; and Gibson. Every stall has produced a prelate or cardinal; among those who have been capitular members may be named Walter

Mapes, Henry of Huntingdon, Polydore Vergil, W. Grocyn, W. Outram, George Herbert, S. Pegge, W. Paley, Cartwright, inventor of the power-loom, and O. Manning the topo- grapher. Lincoln, the enormous diocese of which in early times extended from the Thames to the Humber, was one of the thirteen cathedrals of the old foundation served by secular canons.

History.—The name of Lincoln is a hybrid of Celtic and Latin. It appears in the Ravenna geographer in the form of Lindum Colonia, and in Bede as Lindocolina. Lindum is purely Celtic, and exactly describes the early British settlement as the ‘hill fort by the pool.” Lindum Colonia was founded on the site of what is now the castle and cathedral, about 100 a.p. It was besieged by Saxons in 518, and became one of the chief cities of Mercia. After being frequently ravaged by the Danes, Lincoln was recovered by Edmund HH. in 1016. Lincoln Castle was built by William I. in 1086, which occasioned the removal of one hundred and sixty-six houses. Great and destructive fires occurred in 1110, 1123, and 1141. King Stephen besieged the empress Matilda in the castle in 1140. Henry II.was crowned there in the followingyear, as was King Stephen at Christmas 1147 ; David, king of Scots, did homage to King John, 1201. Lincoln was captured by King John in 1216, and invested by the barons in 1217. The battle of Lincoln Fair took place in 1218. The city was sacked in 1266. John of Gaunt, earl of Lincoln, married there in 1396 Lady Swinford, Chaucer’s sister-in-law ; in virtue of his title he held the castle, but built himself a winter house in the lower part of the city. A parliament of Henry VI. met at Lincoln in 1466. The town was stormed by Earl Manchester on belialf of the Parliament in 1644.

Antiquities.—One of the most perfect specimens of genuine Roman architecture in England is the Newport or North Gate of Lincoln. It is sunk fully 11 feet below the present level of the street, and has two smaller arches on each side, the one to the west being concealed by an adjoining house. The Roman Ermine Street passes through this gate, and runs north from it for 11 or 12 miles as straight as an arrow. Many Roman coins, &c., have been found in the immediate vicinity of the gate. The other gates within the city worthy of notice are the

Exchequer Gate, a fine specimen of 13th century work, one of the bosscs of the north arch having upon it a carved representation of the crucifixion, Pottergate and Stonebow at the top of High Street, over which is the guildhall. The castle shows traces of Norman work, the foundations of which consisted of massive beams of wood and grouting. The hall of the old episcopal palace is 90 feet by 60 wide, and had two rows of grey marble pillars. The modern palace is at Rise- holme, 3 miles north of Lincoln. In the cloister garden are pre- served a tesselated pavement and the sepulchral slab of a Roman soldier ; the splendidly carved stone coffin lid of Bishop Remigius found there has recently been removed into the cathedral. The ancient conduits of St Mary le Wigford, picturesque Gothic, and '*the Greyfriar's goodly conduit" in the High Street, may also be noticed. The St Mary's Guild near St Peters at Gowts is a fine specimen of Norman architecture ; another fine relic of the domestic architecture of this period is the Jews' House, the mouldings of which are identical with those of the west portals of the cathedral (c. 1148). Near this is Dunestall, where the little Lincoln boy afterwards known as Little St Hugh was crucified by Jews in August 1255. There were formerly three small priories, five friaries, and four hospitals in or near Lincoln. The preponderance of friaries over priories of monks is explained by the fact that the cathedral was served by secular canons. The famous Bishop Grosseteste was the devoted patron of the friars, particularly the Franciscans, who were always in their day the town missionaries.

There were fifty-two churches in the city before the Reforma- tion, all the names of which are preserved. Fourteen remain or have been rebuilt. There are fifteen benefices in the city, consist- ing of three rectories and twelve vicarages. There are fourteen Nonconformist places of worship.

sept, 220 × 63 × 74 feet ; choir transept, 166 × 44 × 72 feet. Externally the west front is 173 feet broad by 130 feet; the west towers are 206 feet high ; the central tower, from which booms the new Great Tom of Lincoln (5 tons 8 ewts.), is 262 feet high.

The charities comprise the new county hospital, general dis- pensary, lunatic asylum, penitent females' home, and institute for nurses. The educational institutions comprise a theological college (formerly old county hospital), grammar school (formerly Grey- friars), blue coat school, training college for mistresses (Newport), St Martin's parochial schools, British schools (in Newland), Wesleyan school, and a school of art. Of other institutions may be named the Lincolnshire agricultural society, permanent library, mechanics' institute, county newsroom (above hill), city newsroom, and choral society. The remaining public buildings are the new corn exchange and masonic hall, county assembly-room and theatre in High Street. The public park is near the cattle market, and the racecourse beyond Newland. Population in 1811, 7000; in 1871, 26,766 ; in 1881, 37,312.

For the county and city of Lincoln see Wm. White, History of Lincolnshire, 1872; Sir C. H. J. Anderson, Lincoln Pocket Guide, 1880; J. P. Faunthorpe, Geography of Lincolnshire, 1872; Prof. W. Bright, Early English Church History, 1878; Sir Wm. Dugdale, Monasticon Anglicanum, 1673-82; J. Geikie, Pre- historic Europe, 1881; 8. H. Miller and S. B. J. Skertchly, The Fenland Past and Present, 1878 ; Rev. M. C. Walcott, Memorials of Lincoln, 1866, and English Minsters, 1879, 2 vols. (C. H. C.)

LINCOLN, a city of the United States, capital of Logan county, Illinois, is situated near Salt Creek, at the junction of three railways, 145 miles south-west of Chicago. It has fifteen churches, three banks, a high school, a telephone exchange, a coal-mine, two foundries, three flour-mills, five newspapers, and several grain elevators. It is the seat of Lincoln university (Cumberland Presbyterian) and of the State asylum for feeble-minded youth. A portion of the town dates from 1835, but the newer part was named in honour of Abraham Lincoln, and was incorporated in 1853. Population in 1880, 5639.

LINCOLN, a city of the United States, county seat of Lancaster county, Nebraska, and capital of the State. It is pleasantly situated about 50 miles west of the Missouri river, at the junction of several

railroads, in the midst of a highly fertile and healthful region of undulating prairie, and near rich salt springs. Lincoln is the seat of the following State institutions :—university, State prison, insane asylum, and home for the friendless. The prison and the asylum grounds, occupying several hundred acres, are 3 miles from the centre of the city, and 2 miles from each other. The United States Government has lately completed, at a cost of $200,000, a massive building for collection of revenue, United States courts, and post- office. With its broad streets, its public park, and the State House and other grounds, the healthful ventilation of Lincoln is amply provided for. It has three daily papers, four banks, one of the largest printing and publish- ing houses west of the Mississippi, and several prosperous wholesale stores. Although but thirteen years old, it has a population (1880) of 13,003.

ABRAHAM LINCOLN Copyright, 1882, by John G. Nicolay.

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dent of the United States of America, was born in Hardin county, Kentucky, on February 12, 1809. His father, Thomas Lincoln, and his mother, Nancy Hanks, were both natives of Virginia, as was also his paternal grand- father, whose ancestors came from Berks county, Pennsyl- vania, When Lincoln was eight years of age his father moved to Indiana, in what is now Spencer county. The region was still a wilderness, and the boy grew up in pioneer life, dwelling ina rude log-cabin, and knowing but the primi- tive manners, conversation, and ambitions of sparsely settled backwood neighbourhoods. Schools were rare, and teachers only qualified to impart the merest rudiments of instruction. “‘Of course when [came of age I did not know much,” wrote the future president; “still somehow I could read, write, and cipher to the rule of three, but that was all. I have not been to school since. ‘The little advance I now have upon this store of education I have picked up from time to time under the pressure of necessity.” In 1818

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his mother died, and his father a year afterwards married again. When nineteen years of age Lincoln made a journey asa hired hand ona flatboat to New Orleans. In 1830 his father emigrated to Macon county, Illinois, and Lincoln aided in building the cabin, clearing a field, and splitting rails to fence it. The locality proved unhealthy, and general sickness made them resolve to abandon it. Being now twenty-one years of age, Lincoln hired himself to one Offutt, in Sangamon county, assisting him to build a flat- boat and float it down the Sangamon, Illinois, and Missis- sippi rivers to New Orleans. Afterwards Offutt made him clerk of his country store at New Salem; this gave him moments of leisure to begin self-education. He borrowed a grammar and other books, and sought explanations from the village schoolmaster. Next year the Black Hawk Indian war broke out; Lincoln volunteered in one of the Sangamon county companies, and was elected captain. He was already a candidate for the Illinois legislature when this occurred; his printed address “‘To the people of Sangamon county” bears date March 9, 1832, and betokens talent and education far beyond mere ability to ‘““read, write, and cipher.” The Black Hawk campaign lasted about three months; Lincoln shared the hardships of camp and march, but was in no battle. He was defeated for the legislature that summer, being yet a comparative stranger in the county, but received a flattering majority in his own election precinct, where also, a little later, local friendship, disregarding politics, procured his appointment as postmaster of New Salem. The purchase and failure of a small country store having burdened him with debt, the county surveyor of Sangamon opportunely offered to make him one of his deputies. He qualified himself by study in all haste, and entered upon the practical duties of survey- ing farm lines, roads, and town sites. “This,” to use his own words, “procured bread, and kept body and soul together.”

The year 1834 had now arrived, and Lincoln was chosen one of the members of the Illinois legislature. He was re-elected successively in 1836, 1838, and 1840, after which he declined further nomination. At the two latter terms he received the complimentary vote of his party

friends for speaker, they being in the minority. During the canvass of 1834 his political friend and colleague John T. Stuart, a lawyer in full practice, strongly encouraged him to study law, and lent him text-books to begin his reading. Lincoln followed his advice, and, working diligently, was admitted to the bar in the autumn of 1836. On April 15, 1837, he quitted New Salem, and removed to Springfield, which was then the county seat, but soon after became the capital of the State, to begin practice in partnership with his friend Stuart. His legislative experience was still further enlarged by his service of one term as representative to the Congress of the United States, to which he was elected in August 1846. He had become an eloquent and influential public speaker, and in several campaigns was on his party ticket as Whig candidate for presidential elector. Though to some extent still mingling in politics, Lincoln now for a period of about five years devoted himself more exclusively to the study and practice of law, his repeated successes drawing him into the most important cases.

In 1854 began the great slavery agitation by the repeal of the slavery prohibition of 1820, called the Missouri Compromise. Aroused to new activity by what he regarded a gross breach of political faith, Lincoln entered upon public discussions with an earnestness and force that by common consent gave him leadership of the opposition in Illinois, which that year elected a majority of the legis- lature. This would have secured his election to the United States senate, in the winter of 1854, to succeed Shields, a

Democrat ; but four opposition members, of Democratic antecedents, refused to vote for Lincoln, who was yet called a Whig, and by their persistence compelled the election of Trumbull. The Republican party of Illinois was formally organized in 1856; the campaign resulted substantially in a drawn battle, the Democrats gaining a majority in the State for presideut, while the Republicans elected the governor and State officers. In 1858 the senatorial term of Douglas, author of the repeal of the Missouri compromise, was expiring, and he sought re-election. Lincoln, who had four years before successfully met him in

public debate, was now by unanimous resolution of the Republican State convention designated ag his rival and opponent. Yielding to the wish of his party friends, Lincoln challenged Douglas to a joint public discussion. The antagonists met in debate at seven designated points in the State, while they also separately addressed audiences in nearly every one of the hundred counties, At the November election the Republicans received a majority in the popular vote, but the Democrats, through a favourable apportionment of representative districts, secured a majority of the legislature, which re-elected Douglas. This remark- able campaign excited the closest attention from every part of the Union. Lincoln, addressing the convention which nominated him, June 16, 1858, opened the discussion with the following bold prophecy :—

‘‘ A house divided against itself cannot stand. I believe this Gov- ernment cannot endure permanently half slave and half free, Ido not expect the Union to be dissolved—I do not expect the house to fall—but I do expect it will cease to be divided. It will become all one thing or all the other. Either the opponents of slavery will arrest the further spread of it, and place it where the public mind shall rest in the belief that it is in course of ultimate extinction; or its advocates will push it forward, till it shall become alike law- ful in all the States, old as well as new—North as well as South.”

Lincoln’s speeches in this campaign won him a national fame, which was greatly increased by several made in Ohio the following year, and especially by his Cooper Institute address in New York city, February 27, 1860. More than any contemporary statesman he had in the long six years’ agitation insisted that, transcending the technical point of constitutional authority, or the problem of public policy, the deeper question of human right and wrong lay at the bottom of the slavery controversy.

The Republican national convention, which made “ No Extension of Slavery” its principal tenet, met at Chicago, May 16, 1860. Seward was the leading candidate ; but the more conservative delegates opposed him as being too radical, and uniting their forces nominated

Lincoln, who was elected president of the United States after an unusu- ally animated political campaign, November 6, 1860,! and inaugurated at Washington, March 4, 1861. Meanwhile a formidable movement, begun by South Carolina a month before the November election, and based on the slavery agitation, had carried the slave States South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, and Texas into secession. A provisional government under the designation “The Confcderate States of America,” with Jefferson Davis as president, was organized by the seceding States, who seized by force nearly all the forts, arsenals, and public buildings within their limits. Great division of sentiment existed in the North, whether in this emergency acquiescence or coercion was the prefer- able policy. lLincoln’s inaugural address declared the Union perpetual and acts of secession void, and announced the determination of the Government to defend its autho-

Jy ithe popular vote cast for electors stood:—Lincoln, 1,866,462 ; Douglas, 1,375,157; Breckinridge, 847,953; Bell, 590,631. The official vote cast by the electors on December 5, 1860, and counted and declared by Congress on February 13, 1861, was:—Lincoln, 180 : Breckinridge, 72 ; Bell, 39 ; Douglas, 12. :

rity, and to hold forts and places yet in its possession. On the other hand, he disclaimed any intention to invade, subjugate, or oppress the seceding States. “You can have no conflict,” he said, “without being yourselves the aggressors.” Fort Sumter in Charleston harbour had been besieged by the secessionists since J anuary ; and, it being now on the point of surrender through starvation, Lincoln sent the besiegers official notice on April 8 that a fleet was on its way to carry provisions to the fort, but that he would not attempt to reinforce it unless this effort were resisted. The Confederates, however, immediately ordered its reduction, and after a thirty-four hours’ bombardment the garrison capitulated, April 13, 1861.

With civil war thus provoked, Lincoln on April 15th by proclamation called 75,000 three months' militia under arms, and on May 4th ordered the further enlistment of 64,748 soldiers and 18,000 seamen for three years' service, He instituted a blockade of the Southern ports, took effective steps to extemporize a navy, convened Congress in special session, and asked for legislation and authority to make the war "short, sharp, and decisive." The country responded with enthusiasm to his summons and suggestions ; and the South on its side was not less active. The Sumter bombardment rapidly developed and increased the limits of insurrection. Four additional slave States drifted into secession; the Unionists maintained ascendency in Maryland, Kentucky, and Missouri, and succeeded in dividing Virginia. Minor engagements soon took place between the opposing forces; and on July 21, 1861, the first important battle was fought at Bull Run, and resulted in the defeat and panic of the Unionists.

The slavery question presented vexatious difficulties in conducting the war. Acute observers could not fail to note that its gigantic agencies were beginning to work in the direction of practical abolition. Congress in August 1861 passed an Act confiscating rights of slaveowners to slaves employed in hostile service against the Union. On August 31st General Fremont by military order declared martial law and confiscation against active enemies, with freedom to their slaves, in the State of Missouri. Believ- ing that uuder existing conditions such a step was both detrimental in present policy and unauthorized in law, President Lincoln directed him to modify the order to make it conform to the Confiscation Act of Congress. Strong political factions were instantly formed for and against military emancipation, and the Government was hotly beset by antagonistic counsel. The Unionists of the border slave States were greatly alarmed, but Lincoln by his moderate conservatism held them to the military support of the Government. Meanwhile he sagaciously prepared the way for the supreme act of statesmanship which the gathering national crisis already dimly foreshadowed. On March 6, 1862, he sent a special message to Congress recommending the passage of a resolution offering pecuniary aid from the general Government to induce States to adopt gradual abolishment of slavery. Promptly passed by Congress,

the resolution produced no immediate result except in its influence on public opinion. A practical step, however, soon followed. In April Congress passed and the president approved an Act emancipating the slaves in the District of Columbia, with compensation to owners—a measure which Lincoln had proposed when in Congress in 1849. Meanwhile slaves of loyal masters were constantly escaping to military camps. Some commanders excluded them altogether; others surrendered them on demand; while still others sheltered and protected them against their owners. Lincoln tolerated this latitude as falling properly within the military discretion pertaining to local army operations. A new case, however, soon demanded his official interference. On the 9th of May 1862 General

Hunter, commanding in the limited areas gained along the southern coast, issued a short order declaring his depart- ment under martial law, and adding—‘‘Slavery and martial law in a free country are altogether incompatible. The persons in these three States—Georgia, Florida, and South Carolina—heretofore held as slaves are, therefore, declared for ever free.” As soon as this order, by the slow niethod of communication by sea, reached the newspapers, Lincoln (May 19) published a proclamation declaring it void; adding further, “Whether it be competent for me as commander-in-chief of the army and navy to declare the slaves of any State or States free, and whether at any time or in any case it shall have become a necessity indis- pensable to the maintenance of the Government to exercise such supposed power, are questions which under my responsibility I reserve to myself, and which I cannot feel justified in leaving to the decision of commanders in the field, These are totally different questions from those of police regulations in armies or camps.” But in the same proclamation Lincoln recalled to the public his own proposal and the assent of Congress to compensate States which would adopt voluntary and gradual abolishment. ‘To the people of these States now,” he added, “I most earnestly appeal. I do not argue. I beseech you to make the argument for yourselves. You cannot, if you would, be blind to the signs of the times.” Meanwhile the anti- slavery sentiment of the North constantly

increased. During June Congress hy express Act prohibited the existence of slavery in all territories outside of States. On July 12th the president called the representatives of the border slave States to the executive mansion, and once more urged upon them his proposal of compensated emancipation. ‘If the war continues long,” he said, “as it must if the object be not sooner attained, the institution in your States will be extinguished by mere friction and abrasion—by the miere incidents of the war. It will be gone, and you will have nothing valuable in lieu of it.” While Lincoln’s appeal brought the border States to no practical decision, it served to prepare public opinion for his final act. During the month of July his own mind reached the virtual determination to give slavery its coup de grace, and he wrote and submitted to his cabinet the draft of an emancipation proclamation substantially as afterward issued. Serious military reverses constrained him for the present to withhold it, while on the other hand they served to increase the pressure upon him from anti- slavery men. Horace Greeley having addressed a public letter to him complaining of ‘“‘the policy you seem to be pursuing with regard to the slaves of the rebels,” the president replied August 22, saying, “My paramount object is to save the Union, and not either to save or destroy slavery. If I could save the Union without freeing any slave, I would do it; if I could save it by freeing all the slaves, I would do it ; and, if I could do it by freeing some and leaving others alone, I would also do that.” Thus still holding back violent reformers with one hand, and leading up halting conservatives with the other, he on September 13 replied among other things to an address from a delegation : “T do not want to issue a document that the whole world will see must necessarily be inoperative like the pope’s bull against the comet… . I view this matter as a practical war measure, to be decided on according to the advantages or disadvantages it may offer to the suppression of the rebellion. .. . I have not decided against a proclamation of liberty to the slaves, but hold the matter under advisement.”

The year 1862 had opened with important Union victories. Grant captured Forts Henry and Donelson, and won the battle of Shiloh. Burnside took possession of Roanoke island on the North Carolina coast. The

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famous contest between the new ironclads “Monitor” and “Merrimac” ended in the Confederate vessel being beaten back, crippled, and ultimately destroyed. Farragut with a wooden fleet ran past the twin forts St Philip and Jackson, compelled the surrender of New Orleans, and gained control of the lower Mississippi. These successes extended from January to April. The succeeding three months brouglit disaster and discouragment to the Union army. M‘Clellan’s campaign against Richmond was made abortive by his bad generalship, and compelled the with- drawal of his army. Pope’s army, advancing against the same city by another line, was beaten back upon Washing- ton in defeat. The tide of war, however, once more turned in the defeat of Lee’s invading army at South Mountain and Antietam in Maryland on the 14th and 17th of September, compelling him to retreat.

With public opinion thus ripened by alternate defeat and victory, President Lincoln on September 22, 1862, issued his preliminary proclamation of emancipation, giving notice that on the 1st of January 1863, “all persons held as slaves within any State or designated part of a State the people whereof shall then be in rebellion against the United States shall be then, thenceforward, and for ever free.” In his message to Congress on the Ist of December following, he again urged his plan of gradual, compensated emancipation “as a means, not in exclusion of, but additional to, all others for restoring and preserving the national authority throughout the Union.” On the Ist day of January 1863 the final proclamation of emancipation was duly issued, designating the States of Arkansas, Texas, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and certain portions of Louisiana and Virginia, as “this day in rebellion against the United States,” and proclaiming that, in virtue of his authority as commander-in-chief, and as a necessary war measure for suppressing rebellion, “I do order and declare that all persons held as slaves within said designated States and parts of States are and henceforward shall be free,” and pledging the executive and military power of the Govern- ment to maintain such

freedom. The legal validity of these proclamations was never pronounced upon by the national courts; but their decrees gradually enforced by the march of armies were soon recognized by public opinion to be practically irreversible. Such dissatisfaction as they caused in the border slave States died out in the stress of war. The systematic enlistment of negroes and their incorporation into the army by regiments, hitherto only tried as exceptional experiments, were now pushed with vigour, and, being followed by several conspicuous instances of their gallantry on the battlefield, added another strong impulse to the sweeping change of popular sentiment. To put the finality of emancipation beyond all question, Lincoln in-the winter session of 1863-64 strongly supported a movement in Congress to abolish slavery by constitutional amendment, but the necessary two-thirds vote of the House could not then be obtained. In his annual message of December 6, 1864, he urged the immediate passage of the measure. Congress now acted promptly: on January 31, 1865, that body by joint resolution proposed to the States the 13th amendment of the federal constitution, providing that “neither slavery nor involuntary servitude, except as a punishment for crime, whereof the party shall have been duly convicted, shall exist within the United States or any place subject to their jurisdiction.” Before the end of that year twenty-seven out of the thirty-six States of the Union (being the required three-fourths) had ratified the amendment, and official proclamation made December 18, 1865, declared it duly adopted.

__ The foreign policy of President Lincoln, while subordinate in importance to the great questions of the civil war,

PRESIDENT. |

nevertheless presented several difficult and critical problems for his decision. Towards the close of 1861 the arrest by Captain Wilkes of two Confederate envoys proceeding to Europe in the British steamer ‘‘ Trent ” seriously threatened peace with England. Public opinion in America almost unanimously sustained the act; but Lincoln, convinced that the proceeding had been unlawful, promptly, upon the suggestion of England, ordered the liberation of the prisoners. A still broader

foreign question grew out of Mexican affairs, when events culminating in the setting up of Maximilian of Austria as emperor under protection of French troops demanded the constant watchfulness of the United States. Lincoln's course was one of prudent moderation. France voluntarily declared that she sought in Mexico only to satisfy injuries done her and not to overthrow or establish local government or to appro- priate territory. The United States Government replied that, relying on these assurances, it would maintain strict non-intervention, at the same time openly avowing the general sympathy of its people with a Mexican republic, and that 'their own safety and the cheerful destiny to which they aspire are intimately dependent on the continuance of free republican institutions throughout America." In the early part of 1863 the French Govern- ment proposed a mediation between the North and the South. This offer President Lincoln declined to consider, Seward replying for him that it would only be entering into diplomatic discussion with the rebels whether the authority of the Government should be renounced, and the couutry delivered over to disunion and anarchy.

The civil war gradually grew to dimensions beyond all expectation. By January 1863 the Union armies numbered near a million men, and were kept up to this strength till the end of the struggle. The Federal war debt eventually reached the sum of $2,700,000,000. The fortunes of battle were somewhat fluctuating during the first half of 1863, but the beginning of July brought the Union forces decisive victories. The reduction of Vicksburg and Port Hudson, with other operations, restored complete control of the Mississippi, severing the Southern Confederacy. In the east Lee had the second time marclied his army into Pennsylvania to suffer a disastrous defeat at Gettysburg, on July Ist to 3d, though he was able to withdraw his shattered forces south of the Potomac. At the dedication of this battlefield as a soldiers' cemetery in November, President Lincoln made the following oration, which has taken permanent place as a classic in American literature : —

'¢ Fourscore and seven years ago our fathers brought forth on this continent a new nation conceived in liberty and dedicated to the

proposition that all men are created equal. Now we are engaged in a great civil war testing whether that nation, or any nation so con- ceived and so.dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that ficld as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this. But, in a larger sensc, we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here have consecrated it far above our poor power to add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. Itis for us the living rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honoured dead we take increased devotion to that cause for which they gave the last full measurc of devotion—that we here highly resolve that these dead shall not have dicd in vain, that this nation undcr God shall have a new birth of freedom, and that government of the people, by the people, for the people, shall not perish from the earth.”

In the unexpected prolongation of the war, volunteer cnlistments became too slow to replenish the waste of urmies, and in 1863 the Government was forced to resort

to a draft. The enforcement of the conscription created much opposition in various parts of the country, and led to a serious riot in the city of New York on July 13. President Lincoln executed the draft with all possible justice and forbearance, but refused every importunity to postpone it. It was made a special subject of criticism by the Democratic party of the North, which was now organizing itself on the basis of a discontinuance of the war, to endeavour to win the presidential election of the following year. Mr Vallandigham of Ohio, having inade a violent public speech against the war and military proceedings, was arrested by General Burnside, tried by military

commission, and sentenced to imprisonment; a writ of habeas corpus was refused, and the sentence was changed by the president to transportation beyond the military lines. By way of political defiance the Democrats of Ohio nominated Vallandigham for governor. Prominent Democrats and a committee of the Convention having appealed for his release, Lincolu wrote two long letters in reply discussing the constitutional question, and declaring that in his judgment the president as commander-in-chief in time of rebellion or invasion holds the power and responsibility of suspending the privilege of the writ of habeas corpus, but offering to release Vallandigham if the committee would sign a declaration that rebellion exists, that an army and navy are constitutional means to suppress it, and that each of them would use his personal power and influence to prosecute the war. This liberal offer and their refusal to accept it counteracted all the political capital they hoped to make out of the case; and public opinion was Still more powerfully influenced in behalf of the pre- sident's action, by the pathos of the query which he pro- pounded in one of his letters :—‘‘ Must I shoot the simple- minded soldier boy who deserts, while I must not touch a hair of a wily agitator who induces him to desert?” When the election took place in Ohio, Vallandigham was defeated by a majority of more than a hundred thousand.

Many unfounded rumours of a willingness on the part of the Confederate States to make peace were circulated from time to time to weaken the Union war spirit. To all such suggestions, up to the time of issuing his eman- cipation proclamation, Lincoln announced his readiness to stop fighting and grant amnesty, whenever they would submit to and maintain the national authority under the constitution of the United States. Certain agents in Canada having in 1864 intimated that they were em- powered to treat for peace, Lincoln, through Greeley, tendered them safe conduct to Washington. They were by this forced to confess that they possessed no authority to negotiate. The president thereupon sent them, and made public, the following standing offer :—

‘*To whom it may concern :

“ Any proposition which embraces the restoration of peace, the in- tegrity of the whole Union, and the abandonment of slavery, and which comes by and with an authority that can control the armies now at war against the United States, will be received and con- sidered by the Executive Government of the United States, and will be met by liberal terms on substantial and collateral points, and the bearcr or bearers thereof shall have safe conduct both ways.

- ABRAHAM LINCOLN.” ‘July 18, 1864.”

A noteworthy conference on this question took place near the close of the civil war, when the strength of the rebellion was almost exhausted. F. P. Blair, senior, a personal friend of Jefferson Davis, acting solely on his own responsibility, was permitted to go from Washington to Richmond, where, after a private and unofficial inter- view, Davis in writing declared his willingness to enter a conference ‘‘to secure peace to the two countries.” Report being duly made to President Lincoln, he wrote a note consenting to receive any agent sent informally “ with

a view of securing peace to the people of our common country.” Upon the basis of this latter proposition three Confederate commissioners finally came to Hampton Roads, where President Lincoln and Secretary Seward met them, and on February 3, 1865, an informal conference of four hours’ duration was held. Private reports of the interview agree substantially in the statement that the Confederates proposed a cessation of the civil war, and post- ponement of its issues for future adjustment, while for the present the belligerents should unite in a campaign to expel the French from Mexico, and to enforce the Monroe doctrine. President Lincoln, however, declined the ensnaring alliance, and adhered to the instructions he had given Seward before deciding to personally accompany him. ‘These formulated three indispensable conditions to adjustment :—first, the restoration of the national authority throughout all the States; second, no receding by the executive of the United States on the slavery question ; third, no cessation of hostilities short of an end of the war, and the disbanding of all forces hostile to the Government. These

terms the commissioners were not authorized to accept, and the interview ended without result.

As Lincoln’s first presidential term of four years neared its end, the Democratic party gathered itself for a supreme effort to regain the ascendency lost in 1860. The slow progress of the war, the severe sacrifice of life in campaign and battle, the enormous accumulation of public debt, arbitrary arrests and suspension of habeas corpus, the rigour of the draft, and the proclamation of military emancipation furnished ample subjects of bitter and vindictive campaign oratory. A partisan coterie which surrounded M‘Clellan loudly charged the failure of his Richmond campaign to official interference in his plans. Vallandigham had re- turned to his home in defiance of his banishment beyond military lines, and was leniently suffered to remain. The aggressive spirit of the party, however, pushed it to a fatal extreme. The Democratic National Convention adopted (August 29, 1864) a resolution declaring the war a failure, and demanding a cessation of hostilities; it nominated M‘Clellan for president, and instead of adjourning sine die as usual, remained organized, and subject to be convened at any time and place by the executive national committee. This threatening attitude, in conjunction with alarming in- dications of a conspiracy to resist the draft, had the effect to thoroughly consolidate the war party, which had on.June 8 unanimously renominated Lincoln. At the election held November 8, 1864, Lincoln received 2,216,076 of the popular votes, aud M‘Clellan but 1,808,725; while of the presidential electers 212 voted for Lincoln and 21 for ae Lincoln’s second term of office began March

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While this political contest was going on the civil war was being brought to a decisive close. Grant, at the head of the army of the Potomac, followed Lee from before Washington to Richmond and Petersburg, and held him in siege to within a few days of final surrender, Sherman, commanding the bulk of the Union forces in the Mississippi valley, swept in a victorious march through the heart of the confederacy to Savannah on the coast, and thence northward to North

Carolina. Lee evacuated Richmond April 2, and was overtaken by Grant and compelled to surrender his entire army April 9,1865. Sherman pushed Johnston to a surrender April 26. This ended the war, the submission of scattering detachments following soon after.

Lincoln being at the time on a visit to the army, entered Richmond the day after its surrender. Returning to Washington, he made his last public address on the evening of April 11, devoted mainly to the question of reconstruct- ing loyal governments in the conquered States. On the

evening of April 14 he attended Ford's theatre in Washington. While seated with his family and friends absorbed in the play, John Wilkes Booth, an actor, who with others had prepared a plot to assassinate the several heads of government, went into the little corridor leading to the upper stage-box, and secured it against ingress by a wooden bar. Then stealthily entering the box, he discharged a pistol at the head of the president from behind, the ball penetrating the brain. Brandishing a huge knife, with which he wounded Colonel Rathbone who attempted to hold him, the assassin rushed through the stage-box to the front and leaped down upon the stage, escaping behind the scenes and from the rear of the building, but was pursued, and twelve days afterwards shot in a barn where he had concealed himself. The wounded president was borne to a house across the street, where he breathed his last at 7 a.m., April 15, 1865.

In 1842 he had married Mary Todd, also of Kentucky, who bore him four children. Only one son, Robert T. Lincoln, survives, who is at this date (1882) secretary of war of the United States.

President Lincoln was of unusual stature, 6 feet 4 inches, and of spare but muscular build; he had been in youth remarkably strong and skilful in the athletic games of the frontier, where, how- ever, his popularity and recognized impartiality oftener made him an umpire than a

champion. He had regular and prepossessing features, dark complexion, broad high forehead, prominent cheek bones, grey deep-set eyes, and bushy black hair, turning to grey at the time of his death. Abstemious in his habits, he possessed great physical endurance. He was almost as tender-hearted as a woman. “I have not willingly planted a thorn in any man’s bosom,” he was able to say. His patience was inexhaustible. He had naturally a most cheerful and sunny temper, was highly social and sympathetic, loved pleasant conversation, wit, anecdote, and laughter. Beneath this, however, ran an undercurrent of sadness ; he was occasionally subject to hours of deep silence and introspec- tion that approached a condition of trance. In manner he was simple, direct, void of the least affectation, and entirely free from awkwardness, oddity, or eccentricity. His mental qualities were —a quick analytic perception, strong logical powers, a tenacious memory, a liberal estimate and tolerance of the opinions of others, ready intuition of human nature; and perhaps his most valuable faculty was rare ability to divest himself of all feeling or passion in weighing motives of persons or problems of state. His speech and diction were plain, terse, forcible. Relating anecdotes with appre- ciative humour and fascinating dramatic skill, he used them freely and effectively in conversation and argument. He loved manliness, truth, and justice. He despised all trickery and selfish greed. In arguments at the bar he was so fair to his opponent that he fre- quently appeared to concede away his client’s case. He was ever ready to take blame on himself and bestow praise on others. ‘I claim not to have controlled events,” he said, ‘‘ but confess plainly that events have controlled me.” The Declaration of Independence was his political chart and inspiration. He acknowledged a univer- sal equality of human rights. ‘‘ Certainly the negro is not our equal in colour,” he said, ‘‘perhaps not in many other respects ; still, in the right to put into his mouth the bread that his own hands have earned, he is the equal of every other man white or black.” He had unchanging faith in selfgovernment. ‘‘The people,” he said, ‘‘are the rightful masters of both congresses and courts, not to overthrow the constitution, but to overthrow the men who pervert the constitution.” Yielding and accommodating in non-essentials, he was inflexibly firm in a principle or position deliberately taken. ‘‘Let us have faith that right makes might,” he said, ‘‘ and in that faith let us to

the end dare to do our duty as we understand it.” The emancipation proclamation once issued, he reiterated his purpose never to retract or modify it. ‘‘ There have been men base enough,” he said, ‘‘ to propose to me to return to slavery our black warriors of Port Hudson and Olustee, and thus win the respect of the masters they fought. Should I do so, I should deserve to be damned in time and eternity. Come what will, I will keep my faith with friend and foe.” Benevolence and forgiveness were the very basis of his character ; his world-wide humanity is aptly embodied in a phrase of his sccond inaugural: ‘With malice toward none, with charity for all.” His nature was deeply religious, but he belonged to no denomination ; he had faith in the eternal justice and boundless mercy of Providence, and made the golden rule of Christ his practical creed. History must accord him a rare sagacity in guiding a great people through the perils of a inighty revolution, an admirable singleness of aim, a skilful discernment and courageous seizure of the golden moment to free

his nation from the incubus of slavery, faithful adherence to law and conscientious moderation in the use of power, a shining per- sonal example of honesty and purity, and finally the possession of that subtle and indefinable magnetism by which he subordinated and directed dangerously disturbed and perverted moral and politi- cal forces to the restoration of peace and constitutional authority to his country, and the gift of liberty to four millions of human beings. Architect of his own fortunes, rising with every opportunity, mas- tering every emergency, fulfilling every duty, he not only proved himself pre-eminently the man for the hour, but the signal benefactor of posterity. Ag statesman, ruler, and liberator civilization will hold his name in perpetual honour. (J. G. N.)

LINDAU, a town in the government district of Swabia and Neuburg, Bavaria, and the central point of the transit trade between that country and Switzerland, is situated on two islands off the north-eastern shore of Lake Constance, in 47° 34’ N. lat., 9° 43’ E.long. The town isa terminus of the Vorarlberg Railway, and of the Munich-Lindau line of

the Bavarian State Railway, and is connected with the mainland both by a wooden bridge and by a railway embankment of stone erected in 1853. There are Roman Catholic and Lutheran churches, a royal chateau, an old town-hall, classical, commercial, and industrial schools, and also manufactories for surgical and musical instruments, a fishery, and a fine harbour provided with a lighthouse and much visited by steamers from Constance and other places on the lake. Opposite the custom-house is a bronze statue of king Maximilian II, erected in 1856. The trade is chiefly in grain, fruit, wine, cherry-brandy, fish, cheese, and lard. In January 1882 the population was about

5350.

On the site which the town now occupies there is beheved to have been formerly an ancient Roman camp, Castrwm Tiberit. Authentic records of Lindau date back to the end of the 9th cen- tury. In 1581 it joined the Smalkald league, and in 1647 was in- effectually besieged by the Swedes. From 1275 to 1803 it was a pe iene town. In 1804 it passed to Austria, and in 1805 to

avaria.

LINDLEY, Joun (1799-1865), botanist, was born on February 5, 1799, at Catton near Norwich, where his father, George Lindley, author of A Guide to the Orchard and Kitchen Garden, owned a nursery garden. He was educated at Norwich grammar school, and early manifested a taste for the studies in which he afterwards gained dis- tinction. His first publication, in 1819, a translation of the Analyse du Fruit of Richard, was followed in 1820 by an original Monographia Rosarum, with descriptions of new species, and drawings executed by himself, and in 1821 by AMonographia Digitalium, and by “Observations on Pomacex” contributed to the Z’ransactions of the Linnean Society. Shortly afterwards he went to London, where he was engaged by Loudon to write the descriptive portion of the Encyclopedia of Plants. In the course of his labours on this undertaking, which was completed in 1829, and of which the “botanical merits” are in the preface assigned by the editor to Lindley, he became thoroughly convinced of

the superiority of the “natural” system of Jussieu, as distinguished from the “artificial” system of Linnzus followed in the Encyclopedia ; the conviction found expres- sion in A Synopsis of British Flora, arranged according to the Natural Order (1829), and in An Introduction to the Natural System of Botany (1830). In 1829 Lindley, who since 1822 had been assistant secretary to the Horticultural Society, was appointed to the chair of botany in University College, London ; he lectured also on botany from 1831 at the Royal Institution, and from 1835 at the Botanic Gardens, Chelsea. During his professoriate of more than thirty years he wrote many scientific and popular works, besides contributing largely to the Botanical Register, of which he was editor for many years, and to the Gardeners Chronicle, in which he had charge of the horticultural department from 1841. He became a fellow of the Royal, Linnean, and Geological Societies, and had

the honour of being admitted to a large number of foreign scientific bodies. He resigned his chair in 1860, and died of apoplexy at Turnham Green on November 15 1865,

Besides those already mentioned, the works of Lindley include An Outline of the First Principles of Horticulture (1882), An Out- line of the Structure and Physiology of Plants (1832), A Natural System of Botany (1836), The Fossil Flora of Great Britain (the joint work of Lindley and Hutton, 1831-37), Flora Medica (1888), The Vegetable Kingdom (1846), Theory of Horticulture (2d ed., 1855), Folia Orchidacca (1852), Descriptive Botany (1858), a Ladies’ Botany, » School Botany, the volume Botany in the Library of Useful Knowledge, and most of the botanical articles in the Peuny Cyclopedia. Sce Boraxy, vol. iv. p. 81.

LINDSEY, THeEopuinus (1723-1808), an English theo- logical writer, was born in Middlewich, Cheshire, on June 20, 1723, was educated at the Leeds Free School, and in 1741 entered St John’s College, Cambridge, of which, after graduating with distinction, he became a fellow in 1747. For some time he held a curacy in Spitalfields,

London, and from 1754 to 1756 he travelled on the Continent in the capacity of tutor to the young duke of Northumberland. On his return he was presented to the living of Kirkby- Wiske in Yorkshire, and after exchanging it for that of Piddletown in Dorsetshire he in 1763 removed to Catterick in Yorkshire. Meanwhile he had begun to entertain anti-Trinitarian views, and to be troubled in conscience about their inconsistency with the creed he had repeatedly subscribed ; since 1769 the intimate friendship of Priestley had served to foster his scruples, and in 1771 he united with Archdeacon Blackburne (his father-in-law), Jebb, Wyvell, and Law in preparing a petition to parliament with the prayer that clergymen of the church, and graduates of the universities, might be relieved from the burden of subscribing to the thirty-nine articles, and "restored to their undoubted rights as Protestants of interpreting Scripture for themselves." After two hundred and fifty signatures to the document had, with six months of vast effort on Lindsey's part, been obtained, it was, in February 1772, rejected in the House of Commons by a majority of two hundred and seventeen to seventy-one ; the adverse vote was repeated in the following year, and in the end of 1773, seeing no prospect of obtaining within the church the relief which his conscience demanded, Lindsey resigned his vicarage and took leave of a warmly attached congregation. In April 1774 he began to conduct a Unitarian service in a room in Essex Street, Strand, London ; four years later he removed to a chapel built for him in the same street. Here he continued to labour till 1793, when he resigned his charge in favour of Disney, who like himself had left the established church, and had become his colleague. His active interest in the Unitarian movement continued, however, until his death, which took place on November 3, 1808.

Lindsey's chief work is An Historical View of the State of the Unitarian Doetrine and Worship from the Refovination to our own Times, 1783 ; in it he claims, amongst others, Burnet, Tillotson, S. Clarke, Hoadly, and Sir I. Newton for the Unitarian view. His other publications, mostly occasional, include Apology on Resigning the Vicarage of Catterick (1774), and Sequel to the Apology (1776); The Book of Common Prayer reformed according to the plan of the late Dr Samael Clarke, 1774; Dissertations on the Preface to St John's Gospel

and on praying to Jesus Christ, 1779; Vindieixw Pricstleiane, 1788 ; Conversations upon Christian Idolatry, 1792 ; and Conver- sations on the Divine Government, showing that everything is from God, and for good to all, 1802. Two volumes of Sermons, with appropriate prayers annexed, were published posthumously in 1810; and a volume of Afemoirs, by Thomas Belsham, appeared in 1812.

LINEN MANUFACTURES. Under this term are comprehended all yarns spun and fabrics woven from flax fibre. The cultivation and preparation of the fibre, and its treatment till it reaches the market as a commercial product, are dealt with under Fax, vol. ix. p. 293.

From the earliest periods of human history till almost the close of the 18th century the linen manufacture was

one of the most extensive and widely disseminated of the domestic industries of European countries. The prepara- tion and spinning of yarn gave occupation to women of all classes; and the. operations of weaving employed large numbers of both sexes. The industry was most largely developed in Russia, Austria, Germany, Holland, Belgium, the northern provinces of France, and certain parts of England, in the north of Ireland, and throughout Scotland ; and in these countries its importance was _ generally recognized by the enactment of special laws, having for their object the protection and extension of the trade. The inventions of Arkwright, Hargreaves, and Crompton in the later part of the 18th century, benefiting as they did, almost exclusively, the art of cotton spinning, and the unparalleled development of that branch of textile manu- factures, largely due to the ingenuity of these inventors, gave the linen trade as it then existed a fatal blow. Domestic spinning, and with it hand-loom weaving, immediately began to shrink ; a large and most respectable section of the operative classes in western Europe found their employment dwindling away, and the wages they earned from their diminished labour insufficient to ward off starvation. The trade which had supported whole villages and provinces entirely disappeared, and the linen manufacture, in attenuated dimensions and changed con- ditions,

took refuge in special localities, where it resisted, not unsuccessfully, the further assaults of cotton, and, with varying fortunes, rearranged its relations in the com- munity of textile industries. The linen industries of the United Kingdom were the first to suffer from the aggression of cotton; more slowly the influence of the rival textile travelled across Continental countries; and even to the present day, in Russia, and in other regions remote from great commercial highways, the domestic manufacture of linens holds its place almost as it has done from the earliest period. In 1810 Napoleon I., with a view partly to promote Continental linen industries, and partly to strike a blow at the great British manufacture of cotton, issued a proclamation offering a reward of one million francs to any inventor who should devise the best machinery for the spinning of flax yarn. Within a few weeks thereafter Philippe de Girard patented in France important inventions for flax spinning by both dry and wet methods. His inventions, however, did not receive the promised reward, and were indeed neglected in his native country. In 1815 he was invited by the Austrian Government to establish a spinning mill at Hirtenberg near Vienna, which was run with his machinery for a number of years, but ultimately it failed to prove a commercial success. In the meantime, however, English inventors, stimulated rather than daunted by the success of cotton machinery, had applied themselves to the task of adapting machines to the preparation and spinning of flax. The foundation of machine spinning of flax was laid by John Kendrew and Thomas Porthouse of Darlington, who, in 1787, secured a patent for “a mill or machine upon new principles for spinning yaru from hemp, tow, flax, or wool.” These machines, imperfect as they were, attracted much notice, and were introduced in various localities both in England and Scotland into mills fitted specially for flax spinning, By innumerable successive iinprovements and modifications the invention of Kendrew and Portliouse developed into the perfect system of machinery with which, at the present day, spinning-mills are furnished ; but progress in adapting flax fibres for mechanical spinning, and linen yarn for weaving cloth by power-loom, was much slower than in the corresponding case of cotton.

The implements used in the preparation of linen yarn in ancient and modern times, down to the end of the 18th century, were of the most primitive and inexpensive

description. ‘Till comparatively recent times, the sole spinning implements were the spindle and distaff. The spindle, which is the fundamental apparatus in all spinning machinery, was nothing more nor less than a round stick or rod of wood about 12 inches in length, tapering towards each extremity, and having at its upper end a notch or slit into which the yarn might be caught or fixed. In general, a ring or “ whorl” of stone or clay was passed round the upper part of the spindle to give it momentum and steadi- ness when in rotation. The distaff, or rock, was a rather longer and stronger bar or stick, around one end of which, in a loose coil or ball, the fibrous material to be spun was wound. The other extremity of the distaff was carried under the left arm, or fixed in the girdle at the left side, so as to have the coil of flax in a convenient position for drawing out to yarn,

The modern manufacture of linen divides itself into two branches, spinning and weaving, to which may be added the bleaching and various finishing processes, which, in the case of many linen textures, are laborious undertakings and important branches of industry.

Flax, when received into the mills, has to undergo a train of preparatory operations before it arrives at the stage of being twisted into yarn. The whole operations in yarn manufacture comprise (1) heckling, (2) preparing, and (3) spinning.

Heckling.—This first preparatory process consists not only in combing out, disentangling, and laying smooth and parallel the separate fibres, but also serves to split up and separate into their ultimate filaments the strands of fibre which, up to this point, have been agglutinated together. The heckling process was, until receut times, done by the hand ; and it was one of fundamental importance, requir- ing the exercise of much dexterity and judgment. The

1 See Dr Arthur Mitchell's The Past in the Present, Edinburgh, 1880.

broken, ravelled, and short fibres, which separate out in the heckling process, form tow, an artide of much inferior value to the spinner; and the proportion of tow made in the process of hand-heckling varies according to the skill and knowledge of the heckler. A good deal of hand-heck- ling is still practised, especially in Irish and Continental factories; and it has not been found practicable, in any case, to entirely dispense with a rough preparation of the fibre by hand labour. In heckling by hand, the heckler stakes a handful or "'strick" of rough flax, winds the top end around his hands, and then, spreading out the root end as broad and flat as possible, by a swinging motion dashes the fibre into the teeth or needles of the rougher or "ruffer" heckle. The rougher is a board plated with tin, and studded with spikes or teeth of steel about 7 inches in length, which taper to a fine sharp point. The heckler draws his strick several times through this tool, working gradually up from the roots to near his hand, till in his

judgment the fibres at the root end are sufficiently combed | out and smoothed. He then seizes the root end and |

similarly treats the top end of the strick. The stricks, as finished, are carefully piled up in a regular manner, keep-

ing each handful separate for convenience of future treat- | The same process is again repeated on a similar |

ment. tool, the teeth of which are 5 inches long, and much more closely studded together; and for the finer counts of yarn

a third and a fourth heckle may be used, of still increasing |

fineness and closeness of teeth. In dealing with certain

varieties of the fibre, for fine spinning especially, the flax | is, after roughing, broken or cut into three lengths—the |

top, middle, and root ends. Of these the middle cut is most valuable, being uniform in length, strength, and quality. The root end is more woody and harsh, while the top, though fine in quality, is uneven and variable in strength. From some flax of extra length it is possible to take two short middle cuts; and, again, the fibre is occasionally only broken into two cuts according to the judgment and requirement of the manufacturer. Flax so prepared is known as “cut line” in contradistinction to “long line” flax, which is the fibre unbroken. The sub- sequent treatment of line, whether long or cut, does not present snfficient variation to require further reference to these distinctions.

In the case of heckling by machinery, the flax is first roughed and arranged in stricks, as above described under hand heckling. Considerable variations are presented in the construction of heckling machines, but the general principles of those now most commonly adopted, such as the machines of Combe, of Horner, or of Cotton, &c., are identical. These are known as vertical sheet heckling machines (fig. 1), their essential features being a set of end- less leather bands or sheets f, g revolving over a pair of rollers c, h ina vertical direction. These sheets are crossed by iron bars, to which heckle stocks, furnished with teeth, are screwed. The heckle stocks on each separate sheet are of one size and gauge, but each successive sheet in the length of the machine is furnished with stocks of increasing fineness, so that the heckling tool at the end where the flax is entered is the coarsest, while that to which the fibre is last submitted has the smallest and most closely set teeth. Thus the whole of the endless vertical revolving sheet presents a continuous series of heckle teeth, and the machines are furnished with a double set of such sheets revolving face to face, so close together that the pins of one set of sheets intersect those on the opposite stocks. Overhead, and exactly centred between these revolving sheets, is the head or holder channel a, from which the flax hangs down while it is undergoing the heckling process on both sides. The flax is fastened in a holder 8, consisting of two heavy flat plates of iron, between which it is spread

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and tightly screwed up. The holder is 11 inches in length, and the holder channel is fitted to contain a line of six, eight, or twelve such holders, according to the number of separate bands of heckling stocks in the machine. ‘The head or holder channel has a falling and rising motion, by which it first presents the ends and gradually more and more of the length of the fibre to the heckle teeth, and, after dipping down the full length of the fibre exposed, it slowly rises and lifts the flax clear of the heckle stocks. By a reciprocal motion the whole of the holders are then moved forward one length; that at the last and finest set of stocks is thrown out, and place is made for filling in an additional holder at the beginning of the series. Thus with a six-tool heckle, or set of stocks, each holder full of flax from beginning to end descends

into and rises from the heckle teeth six times in travelling from end to end of the machine. The root ends being thus first heckled, the holders are shot back along an inclined plane, the iron plates unclamped, the flax reversed, and the top ends are then submitted to the same heckling operation. The tow made in the heckling process is cleared from the heckle teeth, as they revolve, by doffers Z, /, which in travelling upwards are, by passing over special guide rollers e, e, projected out from the line of the heckle teeth. The doffers themselves are cleared by fixed combs d, d, and the tow falling down is collected in troughs &, & on each side of the machine. Tow, which is a much less valuable substance than dressed line, undergoes a some- what different preparing process, and is used only for the lower numbers of yarn.

Preparing.—The various operations in this stage have for their object the proper assortment of dressed line into qualities fit for spinning the different counts or sizes of yarn for which it may be suitable, and the drawing out of the fibres to a perfectly level and uniform continuous ribbon or sliver, containing throughout an equal quantity of fibre in any given length. From the heckling the now smooth, glossy, and clean stricks are taken to the sorting room, where they are assorted into

different qualities by the “line sorter,” who judges by both eye and touch the quality and capabilities of the fibre. So sorted, the material is passed to the spreading aud drawing frames, a series or system of machines all similar in construction and effect. The essential features of the spreading frame are— (1) the feeding cloth or creeping sheet, which delivers the flax to (2) a pair of “feed and jockey” rollers, which pass it on (3) to the gill frame or fallers. The gill frame con-

sists of a series of narrow heckle bars, with short closely | same, but the rove, as unwound from its bobbin, first

studded teeth, which travel between the feed rollers and the drawing or ‘“‘ boss and pressing” rollers to be immediately attended to. They are, by an endless screw arrange- ment, carried forward at the rate at which the flax is delivered to them, and when they reach the end of their course they fall under, and bya similar screw arrangement are brought back to the starting point ; and thus they form an endless moving level toothed platform for carrying away the flax from the feed rollers. The drawing rollers grip the fibre as it leaves the gill, and, as they revolve much more rapidly than the feeding rollers, the fibre is drawn out through the gill teeth say to twenty or thirty times the length it had on the feeding board, and is con- sequently reduced to a sliver or loose ribbon of correspond- ingly greater tenuity. The sliver from the drawing frame is delivered into a tin can which holds 1000 yards, and the machine automatically rings a bell when that length is delivered. From the spreading frame the cans of sliver pass to the drawing frames, where from four to twelve slivers combined are passed through feed rollers over gills, and drawn out by drawing rollers to the thickness of one. A third and fourth similar doubling and drawing may be embraced in a preparing system, so that the number of doublings the flax undergoes, before it arrives at the roving frame, may amount to from one thousand to one hundred thousand, according to the

quality of yarn in progress. Thus, for example, the doublings on one preparing system maybe 6× 12× 12× 12× 8=82,944. Theslivers delivered by the last drawing frame are taken to the roving frame, where they are singly passed through feed rollers and over gills, and, after drafting to sufficient tenuity, slightly twisted by flyers and wound on bobbins, in which condition the material—termed ‘‘rove” or “rovings”—is ready for the spinning frame.

The preparation of tow for spinning differs in essential features from the processes above described. Tow from different sources, such as scutching tow, heckle tow, &c., differs considerably in quality and value, some being very impure, filled with woody shives, &c., while other kinds are comparatively open and clean. A pre- liminary opening and cleaning is necessary for the dirty much- matted tows, and in general thereafter they are passcd through two carding engines called respectively the breaker and the finisher cards till the slivers from their processes are ready for the drawing and roving frames. In the case of fine clean tows, on the other hand, passing through a single carding engine may be sufficient. The processes which follow the carding do not differ materially from those followed in the preparation of rove from line flax.

Spinning.—The spinning operation, which follows the roving, is done in two principal ways, called respectively dry spinning and wet spinning, the first being used for the lower counts or heavier yarns, while the second is exclu- sively adopted in the preparation of fine yarns up to the highest counts manufactured. The spinning frame does not differ in principle from the throstle spinning machine used in the cotton manufacture (see Corton, vol. vi. p. 495). The bobbins of flax rove are arranged in rows on each side of the frame (the spinning frames being all double) on pins in an inclined plane A (fig. 2). The rove passes downwards through an eyelet or guide Z to a pair of nipping rollers », », between which and the final drawing rollers ¢, c, placed in the case of dry Spinning from 18 to 22 inches lower down, the fibre receives its final draft while passing over and under cylinders d and guide-plate g, and attains that degree of tenuity which the finished yarn must possess. From the last rollers the now attenu- ated

material, in passing to the flyers f, receives the degree of twist which compacts the fibres into the round hard cord which constitutes spun yarn ; and from the flyers it is wound on the more slowly rotating spool é within the flyer arms, centred on the spindle S. In wet spinning the general sequence of operations is the

passes through a trough of water heated to about 120° Fahr. ; and, moreover, the interval between the two pairs of rollers in which the draw- ing out of the rove is accom- plished is very much shorter. The influence of the hot water on the flax fibre ap- pears to be that it softens the gummy principle which binds the separate cells to- gether, and thereby allows the elementary cells to a certain. extent to be drawn out without breaking the continuity of the fibre; and further it makes a finer, smoother, and more uniform strand than can be obtained by dry spinning. The ex- tent to which the original strick of flax as laid on the feeding roller for (say) the production of a 50 lea yarn is, by doublings and draw- ings, extended, when it reaches the spinning spindle, may be stated thus :—35 times on spreading frame, 15 times on first drawing frame, 15 times on second drawing frame, 14 times on third drawing frame, 15 times on roving frame, and 10 times on spinning frame, in all 16,537,500 times its original length, with 8 × 12 × 16 =1536doublings on the three drawing frames. That is to say, 1 yard of heckled line fed into the spreading frame is spread out, mixed with other fibres, to a length of about 9400 miles of yarn. In the case of fine yarns, by the additional drawings given, the doublings and elongations are very mucli greater.

The next operation is reeling from the bobbins into hanks. By Act of Parliament, throughout the United Kingdom the standard measure of flax yarn is the “lea,” called also in Scotland the “cut” of 300 yards. The flax is wound or reeled on a reel having a circumference of 90 inches (24 yards) making “a thread,” and one hundred and twenty such threads form a lea. The grist or quality of all fine yarns is estimated by the number of leas in a pound; thus “50 lea” indicates that there are 50 leas or cuts of 300 yards each in a pound of the yarn so denomi- nated. With the heavier yarns in Scotland the quality is indicated by their

weight per “spindle” of 48 cuts or leas; thus “3 ib tow yarn” is such as weighs 3 ib per spindle, equivalent to “16 lea.”

The hanks of yarn from wet spinning are either dried in a loft with artificial heat, or, in rural localities, exposed over ropes in the open air. When dry they are twisted back and forward to take the wiry feeling out of the yarn, and made up in bundles for the market as “‘ grey yarn.” English and Irish spinners make up their yarns into “bundles” of 20 hanks, each hank containing 10 leas ; Scotch manufacturers, on the other hand, adhere to the spindle containing 4 hanks of 12 cuts or leas.

Fie, 2.—Section of Dry Spinning Frame.

Commercial qualities of yarn range from about 6 Ib tow yarns (8 lea) up to 160 lea line yarn. Very much finer yarn up even to 400 lea may be spun from the system of machines found in many

factories ; but thesc higher counts are only used for fine thread for sewing and for the making of lace. The highest counts of cut line flax are spun in Irish factories for the manufacture of fine camibrics and lawns which are characteristic features of the Ulster trade. Exeeedingly high counts have sometimes been spun by hand, and for the preparations of the finest lace threads it is said the Belgian hand spinners must work in damp cellars, where the spinner is guided by the sense of tonch alone, the filament being too fine to be seen by the.eye. Such lace yara is said to have been sold for as mueh as £240 per ib. In the Great Exhibition of 1851 yarn of 760 lea, equal to about 130 miles per Ib, was shown which had been spun by an Irish woman eighty-four years of age. Inthe same exhibition there was shown by a Cambray manufacturing firm hand-spun yarn equal to 1200 warp and 1600 weft or to more than 208 and 278 miles per ib respectively.

A large proportion of the linen yarn of commerce under- goes a more or less thorough bleaching before it is handed over to the weaver. Linen yarns in the green condition contain such a large proportion of gummy and resinous matter, removable by bleaching, that cloths

which might present a firm close texture in their natural unbleached state would become thin and impoverished in a perfectly bleached condition. Manufacturers allow about 20 per cent. of loss in weight of yarn in bleaching from the green to the fully bleached stage ; and the intermediate stages of “creamed,” “‘half-creamed,” ‘ milled,” and “ improved,” all indicating a certain degree of bleaching, have corresponding degrees of loss in weight. The differences in colour resulting from different degrees of bleaching are taken advantage of for producing patterns in certain classes of linen fabrics.

Linen thread is prepared from the various counts of fine bleached line yarn by winding the hanks on large spools, and twisting the various strands, two, three, four, or six cord as the case may be, on a doubling spindle similar in principle to the yarn spinning frame, excepting, of course, the drawing rollers. A large trade in linen thread has been created by its use in the machine manufacture of boots and shoes, saddlery, and other leather goods, and in heavy sewing-machine work generally. The thread industry is largely developed at Lisburn near Belfast, at Johnstone near Glasgow, and at Paterson, New Jersey, United States. Fine cords, net twine, and ropes are also twisted from flax.

Weaving.—The application of the power-loom to the weaving of linen was hindered by many obstacles which were not met with in dealing with the weaving of cotton and woollen fabrics. The principal difficulty arose through the hardness and inelasticity of the linen wefts, owing to which the yarn frequently broke under the sharp sudden jerk with which the picker throws the shuttle in power- loom weaving. The difficulties in the way of power-loom linen weaving, combined with the obstinate competition of distressed hand-loom weavers, delayed the introduction of factory weaving of linen fabrics for many years after the system was fully applied to other textiles. Competition with the hand-loom against the power-loom is conceivable, although it is absolutely impossible for the work of the spinning wheel to stand against the rivalry of drawing, roving, and spinning frames. To the present day, in Ireland especially, a great deal of fine weaving is done by hand-loom ; and the persons who first applied machinery to the

weaving of linen damasks in Scotland are yet (1882) alive. Power was applied on a small scale to the weaving of canvas in London about 1812; in 1821 power-looms were started for weaving linen at Kirkcaldy, Scotland ; and in 1824 Maberly & Co. of Aberdeen had two hundred power-looms erected for linen manufacture. The power- loom has been in uninterrupted use in the Broadford factory, Aberdeen, which then belonged to Maberly & Co., down to the present day, and to that firm may be awarded the credit of being the effective introducers of power-loom weaving in the linen trade.

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The various operations connected with linen weaving, such as winding, warping, dressing, beaming, and drawing- in, do not differ in essential features from the like processes in the case of cotton weaving, &c., neither is there any significant modification in the looms employed. Dressing is a matter of importance in the preparation of linen warps for beaming. It consists in treating the spread yarn with flour paste, applied to it by cylinders, the lowermost of which revolves in a trough of paste. The paste is equalized on the yarn by brushes, and dried by passing the web over steam-heated cans before it is finally wound on the beam for weaving. See WEAVING.

For the bleaching and calendering of such linen fabrics as undergo these processes see BLEACHING vol. iii. p. 821; CALENDER, vol, iv. p. 682.

Linen fabrics are numerous in variety and widely different in their qualities, appearance, and applications, ranging from heavy saileloth and rough sacking to the most delicate cambrics and lawns. The heavier manufactures include as a principal item sail- cloth, with canvas, tarpaulin, sacking, and carpeting. The prin- cipal seats of the manufacture of these linens are Dundee, Arbroath, and Forfar. The medium weight linens, which are used for a great variety of purposes, such as teut-making, towelling, covers, outer garments for men, linings, upholstery work, &c., include duck, huckaback, erash, tick,

dowlas, osnaburg, low sheetings, and low brown linens. Plain bleached linens forma class by themselves, and inelude principally the materials for shirts and collars and for bed sheets. Under the head of twilled linens are included drills, diapers, and dimity for household use ; and damasks for table linen, of which two kinds are distinguished—single or five-leaf damask, and. double or eight-leaf damask, the pattern being formed by the inter- section of warp aud weft yarns at intervals of five and eight strands of yarn respectively. The fine linens are eambrics, Tawns, and handkerchiefs ; and lastly, printed and dyed linen fabries may be assigned to a special though not important class. Numerous local, faney, and temporary names are frequently attached to linen fabries ; but in the above list are only included such articles as oeeupy a standing position in the great markets. In a general way it may be said regarding the British industry that the heavy linen trade centres in Dundee ; medium goods are made in most linen manufacturing districts; damasks are chiefly produced in Dun- fermline and Perth; and the fine linen manufactures have their seat in Belfast and the north of Ireland. Leeds is the centre of the linen trade of England.

Linen fabrics have several advantages over cotton, resulting principally from the microscopic structure and length of the flax fibre. The eloth is much smoother and more lustrous than cotton eloth ; and, presenting a less ‘‘ woolly”’ surface, it does not soil so readily, nor absorb and retain moisture so freely, as the more spongy eotton ; and it is at once a cool, elean, and healthful material for bed-sheeting and clothing. Bleached linen, starched and dressed, possesses that unequalled purity, gloss, and smoothuess which make it alone the material suitable for shirt-fronts, collars, and wristbands ; and the gossamer delicacy, yet strength, of the thread it may be spun into fits it for the tine lace-making to which it is devoted. Flax is a heavier material than cotton, but weight for weight it is much stronger, single yarn having proportionate strength in the ratio of 3 to 1°83, doubled yarn 3 to 2°26, and cloth 3 to 2:13. Of course cotton, on the other hand, has many advan- tages peculiarly its own.

Trade and Commerce.—The application of macliine power to the entire range of linen manufactures has greatly improved the position and developed the resourees of the industry, so that linen now oceupies a well-defined and important position among the principal textiles. Had it not been for the sudden and unprecedented growth of the jute trade, no doubt the coarser and heavier branches of the trade would have attained much greater dimensions; and the development of the jute industry of Scotland fully accounts for the comparatively inelastic condition of the Seottish linen trade.

The following table indicates tlic extent of the linen industries in the United Kingdom at the various dates specified :—

1856. 1861. 1870. 1880,

Number of factories ……0….00606 417 399 500 wes ” spindles…….....+++++|1,288,000 1,217,000 |1,558,000 |1,367,000 a power-looms. os 8,689 14,792 35,301 41,990 Horse -power—Steam .. 14,387 31,727 52,017 es _ Water… 3,935 4,354 4,978 Persons employed—Ireland…... 28,753 33,525 55,039 Ane . “a Scotland… 31,722 38,599 49,917 _ an x England…..|. 19,787 20,305 19,816 ae Total. | 80,262 87,429 124,772

It is only in Ireland that the linen industrics during the above period have exhibited a healthy expansion. To that country alone the following figures apply :—

1856. 1861. 1870. 1880,

Number of factories ….....00+ 113 217 312 nes fF SPINGICR..- ccc. essceseeces 568,000 593,000 867,000 911,000

(1859) (1871)

3 power-looms ……... 3,633 4,933 14,509 21,153

The number of fiax spindles aud power-looms in the European factories in 1881 is given in the Annwal Report of the Irish Flax Supply Association as follows :—

senate. PGW or Spindles.

Looms.

Looms.

160,000 | 3,000

879,835 | 21,177 || Russia …...0…..0000.

..| 265,263 | 16,756 || Italy …..... 59,223 722 “.| 190,808 | 4,081 | Switzerland | 9,000] ... 470,000 | 22,000 || Holland .| 7,700} 1,200 Austria-Hungary …| 380,440 500 || Sweden…. 3,810 98 Genuany eee 318,467 | 8,000 || Spain … see 1,000 Belgium …....0+...| 295,140 | 4,755 |/

In all these returns no account is taken of the hand-looms in use, although in most of the Contincutal districts hand-loom weaving is more common than weaving by power.

The amount and declared value of the exports of linens, linen yarn, &c., from the United Kingdom at intervals extending over fifty years is thus stated from official sources :—

Linen Manufactures. Thread, &c. Yarns. Yards. | Value in £ | Value in £ Ib Value in £ 1831 69,288, 892 2,400,043 61,661 a0 oo9

1841 90,321,761 8,194,827 111,261 17,733,575 822,876

1851 | 129,106,753 | 3,822,935 284.461 | 18,841,326 951,426 1861 | 116,322,469 | 3,571,131 269,778 | 27,981,042 | 1,622,216 1871 220.467,476 6,911,223 592,593 | 36,235,625 2,218,129

1881 | 173,853,300 | 5,163,669 | 680,260 18,285,500 | 1,057,172

The principal consumers of British linen manufactures are indi- cated in the following table, showing the exports for the year 1881 :—

Country. Piece Goods, Yarns. Yards. Value in £ Tb Value in £

Win CEU SELES ecssee.secvse00-e00- <0. 82,050,900 | 2,844,910 Fa ” Spanish West Indlies……. 19,088,500 447,653 PAMUSEIAELL wocacss seis crccseccsesetsesos 13,526,200 404,917 acs tee GRETNA arscsyscessscetersesscsceccesese 4,980,900 209,223 | 2,476,500 209,165 British North Ameriea……. 6,281,600 155,237 oe =. FYance ..0..0. orci vatenessasrueecuceete 3,318,000 173,924 | 1,527,200 182,164 FEGUIENI lives orscavsvevcsccevecvesseeactes 298,800 11,241 | 2,438.100 102,364 Belgium Romtnciseslscettisnssescss secesiee 5s0 600 1,629,500 125,619 Spain and Canarics ……. see eee 6,552,600 280,212 Other countries …….escceeese. 35,550,600 | 1,089,477 | 3,661,600 | 157,648

Toto sececcsee 165,045,500 | 4,836,582 18,285,500 1,057,172

To which add:— PHONE researc rec] f 5480800 | 161,115 Sailcloth and suils…... 3,308,000 165,972 ‘Thread for sewing…... che ree atc

UWnenumrenited’ .....c.:.cccccesee

2,587,100 | 329,984 ie: 350,326

Total lincn manufactures… » yarn, thread, &c…....

173,853,300 | 5,163,669 |—___ = 1,737,482 PS 1,737,432

» valuc of exports ……

6,901,101

(J. PA.) LING (Molva vulgaris), a fish of the cod-fish family (Cradidz), readily recognized by its long body, two dorsal fins (of which the anterior is much shorter than the posterior), single long anal fin, separate caudal fin, a barbel on the chin, arid large teeth in the lower jaw and on the palate. Its usual length is from 3 to 4 feet, but

larger individuals of 5 or 6 feet in len pounds in weight, have been taken. The ling is found ; the North Atlantic, from Spitzbergen and eae ie wards to the coast of Portugal. Its proper home is the German Ocean; especially on the coasts of Norway. Denmark, Great Britain, and Ireland it occurs in great abundance, generally at some distance from the land, in depths varying between 50 and 100 fathoms. During the winter months it approaches the shores, when great numbers are caught by means of long lines. On the American side of the ocean it is less common, although generally distributed along the south coast of Greenland, and on the banks of Newfoundland, This fish is one of

gth, and some seventy.

the most valuable species of the cod-fish family ; a certain number are consumed fresh, but by far the greater portion are prepared for exportation to various countries on the Con- tinent (Germany, Spain, Italy), They are either salted and sold as “ salt-fish,” or split from head to tail and dried, forming, with similarly prepared cod and coal-fish, the article of which during Lent immense quantities are con- sumed in Germany and elsewhere under ths name of “‘stock-fish.” Also the oil is frequently extracted from the liver and used by the poorer classes of the coast popula- tion for the lamp or as medicine.

LING. See Heats.

LINGARD, Joun (1771-1851), the Roman Catholic historian of England, was born of humble parentage at Winchester on February 5, 1771. His intellectual abilities began to manifest themselves at a very early age, and in 1782 he was sent to the English college at Douay, where he continued until shortly after the declaration of war by England (1793). For some time after his return to England he lived as tutor in the family of Lord Stourton, but in October 1794 he settled along with seven other former members of the old Douay college at Crook Hall near Durham, where on the completion of his theological course he became vice-president of the reorganized seminary. In 1795 he was ordained priest, and soon afterwards undertook the charge of the chairs of natural and moral philosophy. In 1808 he accompanied the com- munity of Crook Hall to the new and more commodious

buildings at Ushaw, Durham, but in 1811, after declining the presidency of the college at Maynooth, he withdrew to the secluded mission at Hornby in Lancashire, where for the rest of his life he found the leisure which his literary pursuits demanded. In 1817 he visited Rome, where he made some researches in the Vatican Library, and also negotiated some business connected with the English college. In 1821 Pope Pius VII. created him doctor of divinity and of canon and civil law; and in 1825 Leo XII. is said to have made him cardinal iz petto. He died at Hornby on July 17, 1851.

Lingard was the author of a considerable number of occasional and ephemeral writings of an avowedly controversial character. He also wrote The Antiquities of the Anglo-Saxon Church (1806), of which a third and greatly enlarged addition appeared in 1845 under the title The History and Antiquities of the Anglo-Saxon Chureh,; containing an aecount of its origin, government, doctrines, worship, revenues, and elerieal and monastic institutions ; but the work with which his name is chiefly associated is A History of England, from the first invasion by the Romans to the convmencement of the reign of William FHI., which appeared originally in 8 vols. at intervals between 1819 and 1830. Three successive subscquent editions had the benefit of extensive revision by the author; a fifth cdition in 10 vols. 8vo appeared in 1849, and a sixth, with life of the author by Tierney prefixed to vol. x., in 1854-55. Soon after its appearance it was translated into French, German, and Italian. It is a work of ability and research ; and, thongh Cardinal Wiseman certainly claimed too much for its author when he called him ‘‘ the only im- partial historian of our country,” yet the candid and dispassionate student will always find it profitable to learn from the pages of Lin- gard the aspects which the events of English history presented to the mind of an able and intense Roman Catholic in the earlicr decades of the 19th century.

LINKOPING, a city of Sweden, the see of a bishop, and the chief town of the province of East Gothland, is situated in a fertile plain 21 miles by rail south-west of Stockholm, and communicates with Lake Roxen (4 mile to the north) and the Gata and Kinda canals by means of the now navigable Stanga. Most of the houses are of wood. The cathedral

(1150-1499), a Romanesque building with a Gothic choir, is, next to the cathedral of Upsala, the largest church in Sweden, and, since the cathedral of Trondhjem has lost so many of its treasures, presents the richest variety of objects of interest to the student of medizeval art in the country. Inthe church of St Lawrence, also called the Church of the Estatcs, are some paintings

by Horberg, the Swedish peasant artist. Other buildings of note are the massive old episcopal palace (147 0-1500), afterwards a royal palace, and the old gymnasium founded by Gustavus Adolphus in 1627, which contains a valuable library (30,000 velumes) of old books and manuscripts, formerly kept in the cathedral. The population, 3285 in 1810, was 8706 in 1878.

Linképing early became a place of mark, and was already a bishop's see in 1082. _It was at a council held in the town in 1153 that the payment of Peter's pence was agreed to at the instigation of Nicholas Breakspeare, afterwards Adrian IV. The coronation of Birger Jarlsson Waldemar took place in the cathedral in 1251; and in the reign of Gustavus Vasa several important diets were om in the town. A large portion of it was burned down in

1700.

LINLITHGOW, or Wxst Lotutay, a county of Scot- land, stretching for 17 miles along the south coast of the Firth of Forth, and bounded FE. and S.E by Edin- burghshire or Midlothian, S.W. by Lanarkshire, and W. by Stirlingshire. It lies between 55° 49’ and 56° 1’ N. lat., and 3° 18’ and 3° 51’ W. long. According to the ordnance survey the area is 127 square miles, or 81,114 acres, a considerable increase on previous estimates, The longest straight line that can be drawn within the county is one of about 22 miles from north-east to south-west, but the average length does not exceed 16 miles, and the average breadth is about 7. To the east and west the boundaries are in the main natural, following in the one case the Almond and the Breich Water (except in the neighbourhood of Mid Calder, where Edinburgh encroaches on Linlithgow), and in the other the Avon and Drumtassie Burn. ‘To the south they are more conventional, the line of the watershdd between the Clyde and the Forth being disregarded, and a good deal assigned to Lanarkshire which physically belongs to the Lothians. The whole county lies in the basin of tle Forth, and there is a general slope upwards from the shore of the firth to the hilly district in the south-west. The surface is diversified by hill and dale, and, with the exception of the upland moors on the borders of Lanarkshire, there is no extensive tract of level ground. A kind of irregular valley stretches across the county from east to west, affording the most convenient route for road, canal, and railway. Between this valley and the firth runs a line of crags and hills often beginning to rise immediately behind the shore ; the more prominent are Dalmeny, Dundas, the Binns, and Glowerow’rem or Bonny- tounhill, the last a rounded eminence 559 feet above the sea, crowned by a conspicuous monument to General A. Hope, who fell in the Indian mutiny of 1858. To the south of the valley the ground rises pretty rapidly towards the west, more gradually towards the east. Between Bathgate and Linlithgow a general height is obtained of from 600 to 700 feet,—the principal eminences being Knock (1017 feet), Cairnpaple or Cairnnaple (upwards of 1000), the Torphichen Hills, Bowden (749), and Cockleroy (942). Farther east come the Riccarton Hills; and the range may be said to terminate with Binny Craig, a striking crag-and-

tail similar to those of Stirling and Edinburgh. To the south-east stands the isolated Dechmont Law (686 feet).

There is no stream of any considerable size belonging exclusively to the county. The Almond rises in Lanark- shire, enters Linlithgowshire near Polkemmet, receives the White Burn and the Black Burn, and joining the Breich Water (also from Lanarkshire) passes Livingston, Mid Calder (Midlothian), and Kirkliston, and reaches the firth across the Drum Sands at Cramond. The Avon, which is already nearly as large as it ever becomes when it reaches the borders of the county below Muiravonside, passes Linlithgow bridge and Kinneil, and falls into the firth Some distance below Inveravon. With the exception of

Locheot, the only lake in the county is Linlithgow Loch, a sheet of water covering 102 acres to the north of the town, well-known as a meeting place for curling and skating clubs. The eastern end is not more than 10 feet deep, but in the western portion there is one place about 50 feet deep. Fels are still caught in great numbers ; and the perch and the worthless roach, locally called the braise, are abundant. See Lakg, p. 220.

“The eastern portion of the county,” says Mr H. M. Cadell, “consists of Lower Carboniferous Sandstones, thin estua- rine limestones, and shales. The Carboniferous Limestone series, to which the strata in the western portion belong, is separated from the underlying Calciferous Sandstone series by the Carboniferous or Mountain Limestone, which dips westward and is well exposed along the outcrop in the disused lime-quarries of Hillhouse, Silvermine, and Bath- gate. The overlying rocks consist of sandstones, shales, and coal-seams, which are worked at Bathgate and Bo’ness, above which come the three upper marine bands named respectively the Index, the Calmy or Janet Peat, and the Castlecary or Levenseat Limestone, the last of which is taken as the top of the Carboniferous Limestone series and the base of the Millstone Grit. The strata containing most of the workable coals at Bo’ness have a thickness of about 150 fathoms, measuring from the Index Limestone to the lowest seam. The extensive sheets of

contemporaneous volcanic rocks (basalts, dolerites, and tuffs) form a remarkable feature in the geology of the county. ‘The high ground between Linlithgow and Bathgate is formed of an almost uninterrupted pile of these rocks about 2000 feet in thickness. They thin out towards the north and south, and on the shore of the firth they occur regularly interbedded with the seams of the Bo’ness coal-field, which are usually in no degree injured by their presence. The tuffs or ash beds are well seen at Preston Burn, Carriden House, and St Magdalen’s near Linlithgow, while Binns Hill near Blackness is the remnant of an old voleano of Lower Carboniferous age. Trap dykes rise through the strata and run‘in an east and west direction, one of which can be traced for 4 miles between Parkly Craigs and the Avon.” A few mineral springs, sulphurous and chalybeate, are known to exist in the county, but none of them are now of medical repute. In 1875 a salt spring was discovered in the volcanic rocks to the west of the town of Linlithgow, boring having been prosecuted to the depth of 451 feet in search of drinking water. (See Proc. Roy. Soc. Hdin., 1875.) Coal-mining has been prosecuted in the county probably from the time of the Romans; and the earliest document extant in regard to coal- pits in Scotland is a charter granted about the end of the 12th century to William Oldbridge of Carriden. In 1871 it was estimated by the Government commissioners that the Linlithgow coal-fields still contained 127,621,800 tons of coal accessible at depths not exceeding 4000 feet. About 1440 miners were employed in the twenty coal-mines in 1881, and the output for the year was 504,338 tons. Atthe same date there were six iron-mines in operation, with 926 miners and an output of 180,194 tons. The Kinneil Company, which is the largest in this department, employs about 700 persons. Fire-clay is worked in connexion with the coal ; at Kinneil 60,000 bricks can be turned out per week. Since their value was made apparent by Mr Young about 1850, the shales have been the object of an extensive industry at Broxburn, Uphall, Dalmeny, and Hopetoun. The six mines in 1881 employed 691 miners, and the output was 353,826 tons. Limestone, freestone, and whinstone are all quarried within the county, and the Binny freestone has been used for the Royal Institution, the National Gallery, and many of the principal buildings of both Edinburgh and

Glasgow. As a manufacturing district Linlithgow does not stand high, —the chief estab-

lishments, apart from those mentioned in connexion with the town, being grist-mills, distilleries, chemical works, glass works, spade and shovel works, and a pottery.

The climate of the county hardly differs from that of the western portion of Midlothian. The annual rainfall, however, is somewhat greater, and is a fifth more than that of East Lothian : for the twenty-one years ending 1880 the mean at Linlithgow was 31°76 inches, while at East Linton (east of Haddington) it was 26°52.

Linlithgow is classed as a mixed agricultural and pastoral county ; the agricultural element, however, preponderates largely, though the area of permanent pasture has been increasing. It is calculated that of the total area of 81,114 acres about 20,000 acres consist of the best sorts of clay (carse, &c.), 22,700 of clay on a cold bottom, 9500 of loam, as much of light gravel and sand, 14,000 of moorland and high rocky ground, and 1500 of peat. Only a very small part of the arable land remains unreclaimed; the parish of Livingston, which in the beginning of last century was nearly covered with heath and juniper, is now all under rotation. Bathgate and Torphichen contain patches of peat moss and swamp. In Carriden and Dalmeny, and generally along the coast, the soil is light and early, though in some parts it varies so often that no single term is applicable to any considerable area. According to the agri- cultural returns for 1881, the corn crops occupied 17,347 acres, green crops 7264, clover and grass under rotation 12,980, permanent pasture (exclusive of heath or mountain land) 21,289. Oats are the most important of the cereals, 10,348 acres; and barley comes next with 4874 acres, an increase on the 8787 acres of 1856. Wheat has been steadily losing ground ; while 1856 showed 4643 acres, 1881 gives only 1450. Beans, which used to occupy about 1000 acres, are now reduced to 655. An increasing area is devoted to clover and grasses for hay ; but on the other hand the turnip area has been considerably reduced—5142 acres in 1856, 3861 in 1881, The extent

of land under potatoes has slightly increased,—3052 acres for 1881, 2355 being the average for 1866-75. Cattle breeding is not much attended to, but a considerable number of animals are bought and fattened, and dairy farming is largely prosecuted, the fresh butter and churn milk being sent mainly to Edinburgh, but also to Newcastle, &c. Very little cheese is made. As a sheep- farming county Linlithgow stands very low—the returns givin: 17,605 head in 1881, 23,070 in 1866. But few horses are bred, an the number of those in the county has remained wonderfully steady for the last fifteen years. Pigs have grown greatly fewer—3166 in 1866, and only 1442 in 1881.

The average extent of the farms is 108 acres, rather less than in Midlothian ; of the total 542 more than 200 do not exceed 50 acres, and only 35 rise above 300. Very little of the land is rented at more than £3 per acre ; an average of £2 to £2, 10s. for the best districts, of 80s. to 85s. for medium soils, and 15s. to 25s. for the worst land, will not be wide of the mark. ‘The leases of the arable lands are almost invariably for nineteen years, and grass lands are usually let annually by public auction, though in some instances they are taken for a period of three or five years.” ?

Though it is only in the neighbourhood of the principal mansions that large stretches of wood exist, the county as a tree-growing district rises considerably above the average for Scotland,—the woodland area being returned as 4899 acres in 1881, or one-sixteenth of the whole (Edinburgh shows oue-twentieth). The finest woods are those of Hopetoun (where the beech avenues are especially note- worthy), Newliston, Kinneil, and Dalmeny. Much of the old timber has been recently cut down, but replanting has been vigorously prosecuted.

The valued rent of the county in 1649 was £75,027 Scots, or about, £6252 sterling. In 1806 the real rent was £64,518 sterling, and in 1811, £88,745. Exclusive of railways, the valuation was £189,198 in 1876-77, and £216,011 in 1881-82. In the be- ginning of the century the county was practically in the hauds of between thirty and forty landowners (Trotter). According to the Government return for 1872-78, the total number of owners was 1535, of which 287 possessed

upwards of 1 acre. The pro- prietors holding estates above 2000 acres were as follows :—Earl of Hopetoun, 11,870 acres; Earl of Rosebery, 5680; Sir William Baillie of Polkemmet, 4320; Duke of Hamilton's Trustees, 3694 ; Lord Cardross, 2995 ; William Cowan of Linburn, 2231 ; Robert H. J. Stewart of Champfleurie, 2036 ; Dundas's Trustee, 2082.

Hopetoun House, the seat of the earl of Hopetoun, and the grandest mansion in the county, occupies a fine position between Queensferry and Blackness. Begun about 1696 by Sir William Bruce of Kinross, and completed long afterwards by Mr Adam, it practically occupies the site of the old castle of Abercorn, which

1 For earlier notices of rainfall, &c., see Trotter's Agriculture of West Lothian.

2 See Thomas Farrall, in Trans. of Highland and Agric. Soc. of Scotland, 1877.

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was taken from the Douglas family by James II. in 1455. Dalmeny Park (earl of Rosebery) lies about 14 mile west of Cramond; the neighbouring ruins of Barnbougle Castle, an ancient seat of the Mowbrays, have been ineor orgie'. with a modern building. Almondell House (earl of Buchan) is situated on the Almond, not far from Mid Calder. Kinneil, a now deserted residence of the dukes of Hamilton, associated with memories of Colonel Lilburn and Dugald Stewart, is a short distance to the south-west of Bo'ness. On a trap rock jutting out into the firth stands Black- ness Castle, now used as a powder magazine, but once one of the 'keys of the kingdom," with a busy little pee under its protec- tion. Niddry Castle (often called West or Seten Niddry), one of the resting places of Queen Mary, is now a mere ruin. Newliston (now owned by T. A. Hog) was for many years the residence of Lord Stair, who first introduced the field cultivation of cabbage, and is said to have laid out the woods according to the plan of the battle of Dettingen. Dundas Castle was the original seat of the Dundas family. Pardovan recalls the memory of Walter Steuart, author

of the Collections concerning the Worship, dc., of the Church of Scotland, and Philipstoun that of John Dundas, another Scottish ecclesiastical lawyer. Kincavel was the birthplace and family mansion of Patrick Hamilton.

There are two royal burghs in the county—Linlithgow and Queensferry, and, besides the towns Bathgate, Borrowstounness or Bo'ness, Armadale, a nuniber of thriving villages.

The Union Canal connecting the Forth and Clyde Canal with Edinburgh a along the central valley, and crosses the Almond and Avon by bridges designed hy Thomas Telford. The North British Railway has two lines between Edinburgh and Glasgow, which pass through the county via Linlithgow and Bathgate respectively. Queensferry and Bo'ness are both connected with the system by branch-lines, and Bathgate is a junction of some importance.

The population of West Lothian has increased from 17,844 in 1801 to 43,198 (22,486 males and 20,762 females) in 1881. The greatest increase (8601) took place in the decennial period 1851-1861, the least (606) in 1811-21. The females were in excess of the males in every census down to 1841; since then the preponderance has been on the other side. The total population was*23,291 in 1831, 26,872 in 1841, 30,044 in 1851, 38,645 in 1861, and 40,965 in

1871.

Traces of the prehistoric occupation of the county are fairly numerous. On Bowden Hill is an earthwork connected by Mr Glennie and others with the Arthurian contest. On Cairnpaple may be seen a circular building of unknown but early origin, and at Kipps is a cromlech once surrounded by circles of stones. Stone cists have been discovered at Carlowric, Dalmeny, Newliston, &c. Near Inveravon is a vast accumulation of shells considered by several geologists to be a natural bed, but claimed by anti- quaries as an artificial mound, either a kitchen midden or a heap for the manufacture of lime (see David Grieve, Proc. Se. Soc. of Ant., 1870-71). The Wall of Antoninus lies for a con- siderable distance within the county, and is believed to give

origin to the names Carriden and Walton (see an account of a detailed exploration of the wall in Builder, 1877, pp. 1028-25). A fine legionary tablet was discovered at Bridgeness in 1868 (Proc. Sc. Soc. of Ant., vol. viii.). Roman camps can be distinguished in several places.

At Torphichen are the remains of a preceptory of the Knights of St John of Jerusalem, partly used as a parish church. The churches of Dalmeny, Abercorn, Kirkliston, Uphall, and South Queensferry are of early origin, —Romanesque and Norman Gothic.

Linutucow, the county town of the above county, and a royal and parliamentary burgh, situated in the central valley, 18 miles by rail from Edinburgh, consists almost exclusively of a single street running east and west along both sides of the highway; gardens behind the houses stretch down to the lake or climb the lower slopes of the rising grounds, on which a considerable number of suburban residences have been erected. In the early part of the century the general aspect of the street was antique and picturesque, but the greater proportion of the frontage has been rebuilt or modernized. Apart from the palace and the contiguous church of St Michael, the only edifices of any note are an ancient towerlike build- ing near the railway station, which tradition regards as a mansion of the Knights Templars, the town-house (1688), and the county courts (1865). “ Linlithgow for wells” is a proverbial expression ; and the cross well in the public

5 See Abstract of the Charters… in the Chartulary of Torphichen (ed. 1880),

square in front of the town-house is a striking piece of grotesque carved work in stone, originally erected, it is believed, in the reign of James V., but rebuilt in 1807. The burgh school goes back to the pre-Reformation times. Shoemaking and tanning are the leading industries; but a large distillery and (in the neighbourhood) two paper mills, glue works, and a soap factory add considerably to the business of the place. Linen bleaching is altogether a thing of the past. A grain market

is held every Friday. The riding of the marches of the burgh is still performed annually by the magistrates and trades. The population of the burgh was 2282 in 1792-93, 3843 in 1861, 3690 in 1871, and 3913 in 1881.

Linlithgow Palace is by gcneral consent the fincst ruin of its kind in Scotland. Heavy but effective, the sombre walls rise above the green knolls of the promontory which divides the lake into two nearly equal portions. In plan it is almost square (168 by 174 fect), enclosing a court (91 by 88 fect), in the centre of which stands the ruined fountain used as a model for that erected in front of Holyrood Palace. At each corner there is a tower with an internal spiral staircase,—that of the north-west angle being crowned by a little octagonal turrct known as " Queen Margaret's Bower," from the tradition that it was there that the consort of James IV. sat and watched for his return from Flodden. The oldest portion of the building is probably the west sidc, whose massive masonry, hardly broken by a single window, is supposed to date in part from the time of James III.; but the larger part of the south and east sides belong to James V., about 1535; and the north side was rebuilt in 1619-20. Of James V.'s portion, which is architcctur- ally the richest, the main apartments are the Lyon chamber or parliament hall, and the chapel royal. The grand cntrance ap- proached by a drawbridge, was on the east side; above the gate way are still some weather-worn remains of rich allegorical designs, once resplendent with colour. A few yards to the south of the palace is the church of St Michacl, a Gothic (Scottish Decorated) building (180 fect long internally excluding the apse and the steeple, by 62 in breadth excluding the transepts) probably founded in 1242, but mainly built in the 15th century. The central west front steeple was till 1821 topped by a crown like that of St Giles, Edinburgh.!

Linlithgow (wrongly identified with a Roman Linudum) was a royal burgh with a royal castle and an endowed church as far back as the reign of David I. Edward I., who had encamped there the night before the battle of Falkirk (1298), wintered at Linlithgow in 1301, and next year built ''a pele (castle) mekill and strong," which in 1313 was captured by the Scots through the assistance of William Bunnock or

Binning and his famous hay-cart. Later in the century (1369) the customs of Linlithgow yielded more than those of any other chief town except Edinburgh; and the burgh was taken along with Lanark to supply the place of Berwick and Roxburgh in the court of the Four Burghs (1368). Robert II. granted it a charter of immunities, the oldest still preserved, in 1384. The palace becoming a favourite residence of the kings of Scotland, and often forming part of the marriage settlement of their consorts (Mary of Guelders, 1449 ; Margaret of Denmark, 1468 ; Margarct of England, 1503), is frequently mentioned in Scotch history. James V. was born within its walls in 1512, and his daughter Mary, December 7, 1542. In 1570 the Regent Murray was assassinated in the High Strect by Hamilton of Bothwell- haugh. In 1600 the title earl of Linlithgow was bestowed on Alexander, Lord Livingston, by James VI., who after his accession to the English throne retained an affection for the palace, and visited it again in 1617. The university of Edinburgh took refuge at Linlithgow from the plague in 1645-46 ; and in the same year the national parliament, which had often sat in the palace, was held there for the last time. The public burning of the Cove- nant (1661), the passing of Prince Charles through the town in 1745, and the burning of the palace by Hawley's dragoons in 1746 are the chicf remaining facts in the local annals. Most of the privileges which Linlithgow enjoyed have dropped away. The rise of Bo'ness gave the last blow to the prosperity of its port at Blackness ; its burgh lands have all been sold; and, after gaining its case three times in the Court of Session, it was deprived (1859) by the House of Lords of any claim to levy bridge toll and custom from the Edin- burgh and Glasgow Railway.

Besides the Statist. Account of Scotland, see Sir Robert Sibbald's Hist. of the Sheriffdoms of Linlithgow and Stirlingshire, Edinburgh, 1710; Penney, Hist. Account of Linlithgowshire, Edinburgh, 1832, extracted from Chalmers's Ca/e- donia; J. Trotter, General View of Agriculture of W. Lothian, Edinburgh, 1794, new and enlarged edition, 1810; J. P. Wood, The Ancient and Modern State of the Parish of Cramond, Edinburgh, 1794; James Collie, The Royal Palace of Lin- lttthgow, with arehiteetural plates, Edinburgh, 1840; George Waldic, Hist. of the Town and Palace of Linlithgow, Linlithgow, 3d ed., 1879.

1 See Billing’s Antiquities; Collie’s monograph ; and Characteristics of Old Church Architecture of Scotland, 1861.

LINNAGUS (1707-1778). Carl von Linné, better

known under his earlier name of Carolus Linnzeus, was born 13th May 1707 0.s., at Rashult, in the parish of Stenbrohult, in the province of Sm&land, Sweden.? His parents were Nils Linnzus, the comminister, afterwards pastor, of the parish, and Christina, the daughter of Brodersonius, the previous incumbent ; Carl, the subject of our notice, being their eldest child. When only four years old he was much impressed with his father’s con- versation with some of his people concerning the properties and names of certain of the local plants of economic value ; from that time he constantly asked his father about the quality and nature of every plant he met with, often asking more than his father could answer; at other times, having forgotten the information previously given him, he was threatened with a refusal to answer his queries unless he promised to remember what he was told. To this early discipline Linneus afterwards ascribed his tenacious memory, which, added to his extreme sharpness of sight, laid the foundations of his eminence as a reform- ing naturalist.

His formal education began in 1714, when he was put under the private tuition of Telander, and three years later he entered the primary school at Wexié. In 1719 he was committed to the care of Gabriel Hék, who afterwards married his pupil’s sister Anna Maria; this preceptor had greater skill as a teacher than his predecessors, and was less severe ; still he was unable to overcome the distaste the youth had acquired for ordinary scholastic studies. During his last years at school Linnzus took advantage of the greater liberty then allowed him to ramble in search of plants.

In 1724 he passed from the school to the gymnasium, carrying with him the same dislike for all those studies which were considered necessary for admission to holy orders, his father’s intention being to bring up his son in his own profession. Botany, a science at that time

entirely neglected, almost wholly engrossed his attention; he formed a small library of the few Swedish writers who had treated of plants, which he was constantly poring over, although unable to comprehend all he found in their volumes.

In 1726 his father came to Wexié, hoping to hear a good report of the two years' study of his son; but, whilst there was no complaint as regards his moral deportment, his progress in the prescribed studies had been so unsatis- factory that his father was recommended to apprentice him to a tailor or shoemaker, in preference to giving hima learned education, for which he was evidently unfitted. The old clergyman, deeply grieved at this poor return for his struggles to keep his son at school during the previous twelve years, went to visit Dr Rothman, a medical practi- tioner and lecturer on physics in the town, to consult him regarding a bodily ailment from which he was suffering. In the course of conversation he mentioned his mortifica- tion at his son's dulness, when Rothman expressed his con- fident belief that he could end the troubles of both father and son, and that Carl, though extremely backward in theo- logical studies, would yet distinguish himself in medicine and natural history. Rothman further offered to board and lodge Carl during the twelvemonth more which must be passed in the gymnasium. A short time after this, Rothman gave his pupil a course of private instruction in physiology with great success, the young man acquitting himself excellently on examination. His tutor also gave

2 The new style being then in process of gradual adoption in Sweden, the year 1704 was regarded as a common year in that country, consequently the true date of Linnzeus's birth, according to our present reckoning, was 23d May 1707, the commonly received date, 24th May, being an error due to supposing the calendar in Sweden and Russia at that time to be identical.

him hints as to the proper manner of studying plants, and directed his attention to Tournefort's system of arrange- ment, which was founded on the differences in the flowers.

He proceeded to the university of Lund in 1727, bearing a dubiously worded testimonium from Nils Krok, the rector of the gymnasium, to the effect that shrubs in a garden may disappoint the cares of the gardener, but if transplanted into different soil may prosper, therefore the bearer was sent to the university, where, perchance, he might find a more propitious climate. His former preceptor Hék kept back this doubtful recommendation, and presented Linnzeus to the rector and dean as his own private pupil, thus pro- curing his matriculation.

Whilst studying here, Linneus lodged at the house of Dr Kilian Stobzeus, afterwards professor of medicine, and physician to the king, who possessed an excellent museum of minerals, shells, birds, and dried plants; the methods of preservation here adopted were as a revelation to the young student, and taught him how to prepare his own acquisitions. Stobzeus suffered greatly from ill-health, he was also lame, and one-eyed ; but he was an amiable and extremely able man, having a large practice among the wealthier classes in the province of Skane. Linnzeus was sometimes called upon to assist the physician by writing the prescriptions, but as he wrote a bad hand, he was frequently sent away again. In those days physicians wrote legibly.

A German student named Koulas also lodged with Stobeus, and amongst the indulgences he enjoyed was that of access to the library of his landlord; with his fellow-student Linnzus formed a close friendship, and in return for instruction in the physiology which Linnus had learned of Dr Rothman, Koulas supplied him with volumes from the book-shelves of Stobsus, which were read by him stealthily at night. The mother of Stobseus, who was old and wakeful, noticed that there was constantly a light in Linnzus’s room, and, being afraid of fire, desired her son to reprimand the young man for his carelessness. T’wo nights afterwards, Stobeus went into Linneus’s chamber at eleven o’clock, expecting to find him asleep, but was astonished to find him poring over books. He was forced to confess whence these were obtained, and was at once ordered to bed; but the next morning, being further questioned, he was granted full liberty to use the library, and perfect familiarity was accorded by the doctor, who, having no children, held out hopes of making the young student his heir.

Whilst botanizing in the spring of 1728, Linnzus was attacked by what he considered to be a venomous animal, afterwards named by him Furia infernalis, in allusion to the torment and danger he suffered from it ; after his recovery, he passed the summer at his father's house in Smaland. Here he again met Rothman, who strongly advised him to quit Lund and to go to Upsala, where he would find greater facilities for the prosecution of his medical studies, and possibly obtain some scholarship to eke out his scanty means, Linnzus adopted his patron's advice, and started for Upsala with a sum of £8 sterling. that being all he was to expect' from his parents. At this seat of learning his slender funds were soon exhausted : being young and unknown, he found no means of earning money by lecturing or teaching; he became dependent on chance generosity fora meal, and had to repair his shoes with folded paper. He could not well return to Lund, for Stobzeus had taken offence at his departing without con- sulting him; and, besides, the journey required money which he did not possess.

In the autumn of this year, 1729, Linnzeus was engaged intently examining some plants growing in the academical garden, when a venerable clergyman asked him what he

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was studying, whether he understood botany, whence he came, and how long he had been busied in the study. After being questioned at length, he was requested to follow his companion home; there he discovered him to be Dr Olaf Celsius, professor of theology, at that time working at his Hierobotanicon, which saw the light nearly twenty years later. When the professor saw Linnzus's collections he was still more impressed, and, finding him necessitous, he offered him board and lodging; he afterwards admitted him to close intimacy, and allowed him the free use of his rich library. The temporary adjunctus of the faculty of medicine being incompetent, Linnzeus, by the recommenda- tion of Celsius, was able to get some private pupils, and thereby to assume a more creditable appearance.

At this time there was only one medical student who distinguished himself by diligence in study, and that was Peter Arctedius, who afterwards styled himself Artedi. A close friendship sprang up between the two young men; they studied in concert, and vied with each other in their attainments, with perfect good temper, though of very diverse dispositions. Linnzeus was sovereign in ornithology, entomology, and botany, Artedi reserving to himself the umbelliferous plants, fishes, and amphibia, A. silence, almost total, prevailed in the university at this time on topics of natural history; during his whole curriculum Linnzus did not hear a single public lecture delivered on anatomy, botany, or chemistry.

During this period of intense receptivity, he came upon a critique which ultimately led to the establishment of his artificial system of plant classification, This was a review of Vaillant's Sermo de Structura Florum, Leyden, 1718,! a thin quarto in French and Latin; it set him upon examining the stamens and pistils of flowers, and, becoming convinced of the paramount importance of these organs, he formed the idea of basing a system of arrangement upon them. Another work by Wallin, Tdpos dirwv, sive Nuptize Arborum Dissertatio, Upsala, 1729, having fallen into his hands, he drew up a short treatise on the sexes of plants, and showed it to Dr Celsius, who put it into the hands of the younger Olaf Rudbeck, at that time professor of botany in the university. In the following year Rudbeck, whose advanced age compelled him to lecture by deputy, appointed Linnzus his adjunctus; in the spring of 1730, therefore, the latter began his lectures, and was accompanied by many pupils on his botanical excursions. The academic garden was entirely remodelled under his auspices, and furnished with many rare species, he being now in a position to direct the gardener, whereas in the year before he had actually solicited appointment to the vacant post of gardener, which was refused him on the ground of his capacity for better things.

His evenings were now devoted to the preparation of his epoch-making books, which were issued: several years afterwards in the Netherlands. His position at the university having become unpleasant, he readily undertook to explore the little known country of Lapland, at

the cost of the Academy of Sciences of Upsala. He started thence on May 12, 1732 o.s., carrying all his luggage on his back, journeying at first on horseback along the road skirting the coast to Umea, thence by boat up the river to Lyksele within the Arctic Circle, penetrating to what he terms Olycksmyran (z.e., the unlucky marsh) in spite of the melting of the ice, which made travelling in that part almost impossible. Unable to penetrate farther into the interior, he returned to Umea, still skirting the sea-shore by Pitea to Lule&, From this latter place he made a long excursion to the north-west by Jockmock and Qvickjock ;

1 This work has a serious mistake on both title pages ; it is corrected in the errata, but the correction seems to have escaped the notice of every bibliographer.

then, crossing the mountain range, he came out upon the coast of Finmark. He retraced his steps to Luled, and at Calix he learned the art of assaying “in two days and a night,” continuing his journey through Tornea, and the eastern coast of the gulf of Bothnia to Abo; there he rested eight days, and finally reached Upsala by sea. The distance traversed in this tour was upwards of 4600 English statute miles ; the cost of his journey is given at 112 silver dollars, or less than £25 sterling. His own account of the journey was published in English by Sir J. E. Smith, under the title Lachesis Lapponica, in 1811; the scientific results were published in his flora Lapponica, Amsterdam, 1737. In 1733 Linnzeus was engaged in teaching the method of assaying ores, and hoped to be allowed to lecture on botany ; but a quarrel broke out between a rival, Rosen, and himself, the former having, by private influence, contrived to get a prohibition put on all private lectures on medicine in the university. Linnzus, enraged at finding his livelihood thus cut off, went so far as to draw his sword upon Rosen, but was prevented from harming his antagonist. At this juncture the governor of Dalecarlia invited Linnzeus to travel through his province, as he had done through Lapland. Whilst on this journey he lectured at Fahlun to large audiences; Browallius, the chaplain

there, after- wards bishop of Abo, now strongly urged Linneus to go abroad and take his degree of M.D. at a foreign university, by which means he could afterwards settle where he pleased, Linnzus, having become attached to the eldest daughter of Dr Moré or Morzus, left Sweden in 1735 to seek his fortune in the manner stated, and to return to claim her hand.

He travelled by Liibeck and Hamburg ; detecting a seven-headed hydra to be a fabrication at the latter, he was obliged to quit the town in haste toavoid the wrath of its possessor, From Altona he went by sea to Amsterdam, staying there a week; he then proceeded to Harderwijk, where he went through the requisite examination, and de- fended his thesis on the cause of intermittent fever. His scanty funds were now nearly spent, but he passed on through Haarlem to Leyden; there he called on Grono- vius, who, returning the visit, was shown the Systema Nature in MS., and was so greatly astonished at it that he sent it to press at his own expense. The first: edition was in eight folio sheets; the subsequent editions were in 8vo; and the twelfth immensely enlarged edition appeared during the author’s lifetime. This famous system, which, artificial as it was, substituted order for confusion, largely made its way on account of the lucid and admirable laws, and comments on them, which were issued almost at the same time. See Botany, vol. iv. p. 80. Boer- haave, whom Linneus saw after waiting eight days for admission, recommended him to Burman at Amsterdam, where he stayed a twelvemonth, living at the house of the professor. While there he issued his Mundamenta Botanica, an unassuming small octavo, which has exercised immense influence. The wealthy banker Cliffort having invited Linnzus to visit his magnificent garden at Harte- camp, he remained there, living like a prince, but work- ing most assiduously in the garden and library, both of which were kept up without regard to cost. His Flora Lapponica was now printed, containing a description of the genus Linnea, by his friend Gronovius; he selected this plant to bear his name, from a similarity, as he thought, hetween it and himself. Whilst living with Cliffort, Linnzus met with his old fellow-student Artedi, who was quite destitute, having spent all his money in London ; Linnzeus introduced him to Seba, then working at fishes, Artedi’s chief object of study ; he worked hard at describ- ing

them, until only six remained undescribed, when he unfortunately fell into a canal at night, and was drowned.

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Linnzus persuaded Cliffort to redeem the manuscript, and he i aoa it as a memorial of his deceased friend.

n 1736 Linneus visited England. He was warmly recommended by Boerhaave to Sir Hans Sloane, but the old collector seems to have received him coldly.

On his return to the Netherlands he completed the printing of his Genera Piantarum, a volume which must be considered the starting point of modern systematic botany ; Tournefort formed many genera, but Linnzus was the first to circumscribe them. During the same year, 1737, Linneus finished arranging Cliffort's collection of plants, living and dried; these were described in the Hortus Cliffortianus, a folio illustrated with engravings by Ehret ; this book was entirely written in nine months. During the compilation he used to "amuse" himself with drawing up the Critica Botanica, also printed in the Netherlands. But this strenuous and unremitting labour told upon him ; the atmosphere of the Low Countries seemed to oppress him beyond endurance ; he resisted all Cliffort's entreaties to remain with him, and started homewards.

Van Royen managed to detain him a year at Leyden, to help in rearranging the garden, thereby offending Cliffort, whom he had quitted on the plea of hastening back to Sweden. Linnzus now published his Classes Plantarum, and almost at the same time appeared Van Royen's Hortus Leydensis and Gronovius's Flora Virginica, both of these being drawn up on the Linnzan system. In 1738 Boerhaave pressed Linnzus to accept a post at Surinam; he declined this for himself, but passed it on to Johan Bartsch of Kénigsberg, a member with himself of a select club of naturalists at Leyden. Bartsch ultimately fell a victim to the climate of that colony.

While residing at Leyden Linnzus was warned that one of his acquaintance was endeavouring to supplant him in the affections of Sara Moré; he intended to set out at once, but was attacked by ague before he could start. Cliffort, hearing of this, took Linnzus to his own house again, and would not suffer him to depart until he was sufficiently well. His complete recovery, however, did not take place until he had gained the higher country of Brabant, where in one day he felt himself entirely renovated. He con- tinued his journey to Paris, where he visited Antoine and Bernard de Jussieu, botanizing with the latter. Abandon- ing all notion of returning through Germany, he went to Rouen, sailed for Sweden, and landed at Helsingborg.

Linnzus established himself in September 1738 as physician in Stockholm, but, being unknown as a medical man, no one at first carea to consult him, a great change from the attention paid to him abroad ; he himself declared ‘“‘that, had he not been in love, he would certainly have left his native country.” By degrees he found patients, was then appointed naval physician at Stockholm, with minor appointments, and was married on the 26th June 1739.

Early in 1740 Rudbeck died, and Roberg resigned ; the chairs of botany and medicine at Upsala being thus vacant, Rosen and Linnzeus were chosen respectively to fill them. The former rivals afterwards agreed to exchange professor- ships to their mutual benefit; in 1741, previous to this exchange, Linnzus travelled through Oland and Gothland, by command of the state, publishing his results in Olandska och Gothlindska Resa, 1745. The index to this volume shows thefirst employment of trivial names in nomenclature,

Henceforward his life was a continuous course of pro- sperity, his time being taken up by teaching and the prepara- tion of other works. In the year 1745 he issued his Flora Suecica and Fauna Suecica, the latter having occupied his attention during fifteen years ; afterwards, two volumes of observations made during journeys in Sweden, Wédstgéta

Resa, Stockholm, 1747, and Skanska Lesa, Stockholm, 1751. He examined the collections made many years before in Ceylon by Hermann, the full publication taking place in his Mlora Zeylanica, Stockholm, 1747. In 1748 he brought out his Zortus Upsaliensis, showing that he had added eleven hundred species to those formerly in cultiva- tion in that garden. In 1750 his Philosophia Botanica was given to the world; it consists of a commentary on the various axioms he had published in 1735 in his Funda- menta Botanica, and was dictated to his pupil Léfling, while the professor was confined to his bed by an attack of gout so violent as to threaten his life ; he attributed his recovery to eating plentifully of wood-strawberries, a regimen he afterwards carefully observed. A much slighter attack in the following year was mainly cured by the pleasure caused by Kalm bringing home many new plants from Canada.

He catalogued the Queen's Museum at Drotningholm, and the King's at Ulrichsdal, but the most important work of this period of his life is unquestionably his Species Planta- rum, Stockholm, 1753,—a second edition being issued in 1762. In this volume the trivial names are fully set forth ; although they had been previously shadowed forth by Linnzus and others, yet to him belongs the merit of establishing the use of a single epithet in addition to the generic name. In the same year Linnzus was created knight of the Polar Star, the first time a scientific man had been raised to that honour in Sweden.

In 1755 he was invited by the king of Spain to settle in that country, with a liberal salary, and full liberty of conscience, but he declined on the ground that whatever merits he possessed should be devoted to his country's service; Lofling was sent instead, but died within two years. He was enabled now to purchase the estates of Séfja and Hammarby ; at the latter he built his museum of stone, to guard against loss by fire. His lectures at the university drew men from all parts of the world ; the normal number of students at Upsala was five hundred, whilst he occupied the chair of botany there it rose to fifteen hundred. In 1761 a patent of nobility was granted, antedated to 1757, from which time Linnzus was styled Carl von Linné; his arms were those now borne by the Linnean Society of London. To his great delight the tea plant was

introduced alive into Europe in 1763; this year also his son Carl was allowed to assist his father in his professorial duties, and to be trained as his successor.} At the age of sixty Linné's memory began to fail; an apoplectic attack in 1774 greatly weakened him; two years after he lost the use of his right side; and he died Sa ee ee

u Carl von Linné the younger, the elder son of the distinguished naturalist, was born at Fahlun, 20th J anuary 1741. Delicate in constitution, he seemed to be oppressed with his father's reputation and his having to support it. He published two decades of new plants and three dissertations, contributing also some descriptions to the first edition of Aiton 8 Hortus Kewensis, at the time of his visit to England He died unmarried at Upsala, Ist November 1783; and, his ouly brother J ohan having died in infancy, the succession became extinct in the male line. His mother sold the collections and books of father and son to Dr. J. E. Smith, the first president of the Linnean Society of London, When Smith died in 1828, a subscription was raised to purchase the herbarium and library for the Society, whose property they now remain. Smith sold the collection of minerals in 1796, and added. many insects to the Linnean types, but the herbarium is practi- cally in the same state as when the elder Linné himself last used it.

The manuscripts of most of his publications, and the letters he received from his contemporaries, are likewise in the possession of the Society.

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10th January 1778, of an ulceration of the bladder. He was buried in the cathedral of Upsala, with every token of universal regret. _

In person Linneus was described as of medium height, with large limbs, brown piercing eyes, and acute vision, and quick-tempered. He was accustomed to sleep five hours in summer and ten in winter. He lived simply, acted promptly, and noted down his observations at the moment. His handwriting was peculiar, and not very easy to read ; copies of his own books were interleaved and copiously annotated,

every new discovery being posted into its proper place at once, su that new cditions were readily prepared when wanted.

With him arrangement seemis to have been a passion ; he delighted in devising classifications ; not only did he systematise the three kingdoms of nature, but even drew up a treatise on the Genera Morborum. Ue found biology a chaos; he left it a cosmos.. When he appeared upon the scene, new plants and animals were in course of daily discovery in increasing numbers, due to the increase of trading facilitics; he devised schemes of arrangement by which these acquisitions might be sorted provisionally, until their natural affinities should have become clearer. He made many mistakes ; but the honour due to him for having first enunciated the true principles for defining genera and species, and his uniform use of trivial names, will last so long as biology itself endures. His style is tersc and laconic ; he methodically treated of each organ in its proper turn ; he had a special term for each, the meaning of which did not vary, so that the term did not suggest two ideas at once. The reader cannot doubt the author's intention ; his sentences are business-like, and to the point. The omission of the verb in his descriptions was an innovation, and gave an abruptness to his language which was foreign to the writing of his time; but it probably by its succinctness added to the popularity of his works.

By his force of character he shifted the scientific centre of gravity during his life to a small town in Sweden; he was constantly receiving presents and praise from crowds of correspondents in every civilized country and in every station of life; hence it is not surprising that this universal homage should have bred the vanity which disfigures the latter part of his diary.

No modern naturalist has impressed his own character with greater force upon his pupils than did Linneeus. He imbued them with his own intense acquisitiveness, reared them in an atmosphere of enthusiasm, trained them to close and accurate observation, and then dispatched them to various parts of the globe. His students being drawn from many quarters, he had an extensive choice ; some fell victims to

fatigue and unkindly climates, but there was no lack of successors. With these young enthusiasts their master's lore was like a gospel; they were eager to extend the knowledge of it, and to contribute to its richness.

The published works of Linneus amount to more than one hundred and eighty, including the Amenitates Academice, for which he provided the material, revising them also for press; corrections in his handwriting may be seen in the Banksian and Linnean Society's libraries. His correspondence was wide and copious. Some of his letters have been published, but the bulk of them remains inedited. Many works remain in MS.; some have lately been published, such as the Flora_Daleearlica, and the Svenska Arbeten, both edited by Dr Ewald Ahrling ; those which were issued during the author's life are enumerated by Dr Pulteney in his General View of the Writings of Linnzus. 3) Da)

LINNELL, Joun (1792-1882), a richly gifted English painter, was born in London on the 16th of June 1792. His father being a carver and gilder, Linnell was early brought into contact with artists, and when he was ten years old he was already drawing and selling his portraits in chalk and pencil. His first artistic instruction was received from Benjamin West, and he spent a year in the house of John Varley the water-colour painter, where he had William Hunt and Mulready as fellow pupils, and made the acquaintance of Shelley, Godwin, and other men of mark and individuality. In 1805 he was admitted a student of the Royal Academy, where he obtained medals for drawing, modelling, and sculpture. He was also trained as an engraver, and executed a transcript of the Burial of Saul, one of Varley's most impressive pictures. In after life he frequently occupied himself with the burin, publishing, in 1834, a series of outlines from Michelangelo's frescos in the Sistine chapel, and, in 1840, superintending the issue of a selection of plates from the pictures in Buckingham Palace, one of them, a Titian landscape, being mezzotinted by himself. At first he supported himself mainly by miniature painting, and by the execution of

larger portraits, such as the likenesses of Mulready, Whately, Peel, and Carlyle. Several of his portraits he engraved with his own hand in line and mezzotint. He

also painted many subjects like the St John Preaching, the |

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Covenant of Abraham, and the Journey to Emmaus, in

which, while the landscape background is usually pro- minently insisted upon, the figures are yet of sufficient size and importance to supply the title of the work. But it is mainly in connexion with his long series of paintings of pure landscape that his name is known to the public. When he was only seventeen, his Removing Timber carried off the fifty-guinea prize offered by the British Institution for the best landscape, and for many years Linnell was a regular contributor to the exhibitions of that body, and to those of the Royal. Academy and the Society of Painters in Oil and Water Colours. His works commonly deal with some scene of typical uneventful English landscape, which is made impressive by a gorgeous effect of sunrise or sunset. ‘They are full of true poetic feeling, and are rich and glowing in colour, His art proved exceptionally remunerative ; he was able to command very large prices for his pictures, and about 1850 he purchased a property at Redhill, Surrey, where he resided till his death, on the 20th of January 1882, surrounded by his children—two of them artists like himself—and his children’s children, and painting with unabated power till within the last few years of his life. His leisure was greatly occupied with a study of the Scriptures in the original, and he published several pamphlets and larger treatises of Biblical criticism, Among his literary productions area work on Zhe Misnam- ing of the Scripture the Old and New Testament, 1856; The Lord’s Day the Day of the Lord, 1859 ; a pamphlet on Zhe Ascension Sacrifice of the Old Testament, 1864; and one on The Royal Academy a National Institution, 1869. A word

should be said regarding Linnell's connexion with William Blake. He was one of the best friends and kindest patrons of the great visionary artist. He gave him the two largest commissions he ever received for single series of designs— £150 for drawings and engravings of Zhe Inventions to the Book of Job, and a like sum for those illustrative of Dante.

LINNET, Anglo-Saxon Zinete and Linet-wige, whence seems to have been corrupted the old Scottish ‘‘ Lintquhit," and the modern northern English " Lintwhite,"—originally a somewhat generalized bird's name, but latterly specialized for the Fringilla cannabina of Linneus, the Linota canna- bina of recent ornithologists, This is a common and well- known song-bird, frequenting almost the whole of Europe south of lat. 64°, and in Asia extending to Turkestan. In Africa it is known as a winter visitant to Egypt and Abyssinia, and is abundant at all seasons in Barbary, as well as in the Canaries and Madeira. Thougli the fondness of this species for the seeds of flax (Zimum) and hemp (Cannabis) has given it its common name in so many European languages,! it feeds largely, if not chiefly, in Britain on the seeds of plants of the order Compositx, especially those growing on heaths and commons. As these waste places have been gradually brought under the plough, and improved methods of cultivation have been applied to all arable land, in England and Scotland particularly, the haunts and means of subsistence of the Linnet have been slowly but surely curtailed, and hence of late years its

numbers have undergone a very visible diminution through-

out Great Britain, and its diminution has also been aided by the detestable practice of netting it in spring—for it is a popular cage-bird —so popular indeed as to require no special description. According to its sex, or the season of the year, it is known as the Red, Grey, or Brown Linnet,

- #.g., French, Linotte; German, Hdnfling ; Swedish, Hampling.

and by the earlier English writers on birds, as well as in many localities at the present time, these names have been held to distinguish

at least two species; but there is now no question among ornithologists on this point, though the conditions under which the bright crimson-red colouring of the breast and crown of the cock's spring and summer plumage is donned and doffed may still be open to discus- sion. Its intensity seems due, however, in some degree at least, to the weathering of the brown fringes of the feathers which hide the more brilliant hue, and it is to be remarked that in the Atlantic islands examples are said to retain their gay tints all the year round, while throughout Europe there is scarcely a trace of them visible in autumn and winter; but, beginning to appear in spring, they reach their greatest brilliancy towards midsummer ; and it is also to be remarked that they are never assumed by examples in confinement. The Linnet begins to breed in April, the nest being generally placed in a bush at no great distance from the ground. It is nearly always a neat structure composed of fine twigs, roots, or bents, and lined with wool or hair. The eggs, often six in number, are of a very pale blue marked with reddish or purplish brown. Two broods seem to be commonly brought off in the course of the season, and towards the end of summer the birds—the young of course greatly preponderating in number—collect in large flocks and move to the sea-coast, whence a large proportion depart for more southern latitudes. Of these cmigrants some return the following spring, and are invariably recognizable by the more advanced state of their plumage, the effect presumably of having wintered in countries enjoying a brighter and hotter sun.

Nearly allied to the foregoing species is the Twite, so named from its ordinary call-note, or Mountain-Linnet, the Lnnota flavirostris, or L. montium of ornithologists, which can be at once distinguished by its yellow bill, longer tail, and reddish-tawny throat. This bird never assumes any crimson on the crown or breast, but the male has the rump at all times tinged more or less with that colour. In the breeding-season it seems to affect exclusively hilly and moorland districts from Herefordshire northward, in which it partly or wholly replaces the common Linnet, but is very much more local in its distribution, and, except in the British Islands and some parts of Scandinavia, it only appears as an irregular visitant in winter. At that season it may, however, be found in large flocks in the low-lying countries, and as

regards England even on the sea-shore. In Asia it seems to be represented by a kindred form, Z. brevirostris.

The REDPoLLs (9.v.) form a little group placed by many authorities in the genus Zinota, to which they are un- questionably closely allied, but in this work they may be considered later; and, as before stated (FiNcH, vol. xi. p. 192), the Linnets seem on the other hand to be related to the birds of the genus Leucostzcte, the species of which, in number uncertain, inhabit the northern parts of North- West America and of Asia, The most recent list of the birds of the former country by Mr Ridgway (Bull. U. 8. Nat. Museum, No. 21, 1881) includes four species and one local race, of which there is need here to mention only Z. tephrocotis, It is generally of a chocolate colour, tinged on some parts with pale crimson or pink, and has the crown of the head silvery-grey. Another species, Z. arctoa, was formerly said to have occurred in North America, but its proper home is in the Kurile Islands or Kamchatka. This has no red in its plumage. The birds of the genus Leucosticte seem to be more terrestrial in their habit than those of Zinota, perhaps from their having been chiefly observed where trees are scarce; but it is possible that the mutual relationship of the two groups is more apparent than real. Allied to Lewcosticte is Montifringilla,

to which belongs the Snow-Finch of the Alps, 2. nivalis, go often mistaken by travellers for the Snow-Bunting, Plectrophanes nivalis, (A. N.)

LINOLEUM is a kind of floor-cloth, invented and introduced by Mr F. Walton, who in 1860 obtained a patent for its manufacture. It consists of a preparation of linseed oil and ground cork intimately mixed and spread in a uniform layer over a sheet of rough jute canvas. Under the name of kamptulicon, a material similar in appearance and properties, but in which prepared india- rubber took the place of oxidized linseed oil, was in use to a limited extent previous to the introduction of linoleum ; the latter material, however, was found to possess several advantages ; among others it had the merit of comparative cheapness

as against kamptulicon, which it entirely supplanted. Linoleum also became a formidable competitor with the old form of oil floor-cloth, and on the expiry of Mr Walton's patent the manufacture of the new material was very generally taken up in Kirkcaldy, the principal seat of the floor-cloth trade. In the hands of Messrs Michael Nairn & Co., who were the first to introduce the floor-cloth industry into Scotland, the machinery used for making linoleum has been improved in important respects, and the ingenuity and resource of Mr Walton, the original patentee, have discovered several new adaptations and modifications of his original invention,

The making of linoleum involves three distinct prelim- inary operations—(1) the oxidation of the linseed oil, (2) the grinding of the cork, and (3) the weaving of the jute canvas backing. Of these operations the oxidation of the oil is the most peculiar and distinctive. The linseed oil is first boiled with litharge in the way practised for pre- paring ordinary boiled oil (see LinsEED), and it is next oxidized by exposure, in exceedingly thin films, to the influence of air. To secure the exposure of sufficient surfaces of oil to the atmosphere, a large lofty apartment is hung with sheets or continuous webs of calico cloth, which are allowed to depend from near the roof into troughs or tanks on the floor, These webs of calico are kept suf- ficiently far apart to allow free circulation of air between them. They are daily drenched with boiled oil by allowing it to trickle down from the top over their entire surface, the distribution being effected by a special arrangement of movable tanks and tubs. It will be seen that an enormous surface of oil can thus be exposed within a comparatively limited space. The influence of oxygen on the oil films is facilitated by the blowing of heated air into the chamber so as to keep up a continual circulation; and the activity of the process is unpleasantly manifested by the extremely acrid odour which is evolved by the oil. Day by day the thickness of the coating of oxidized oil increases, and when a deposit of about half an inch has been accumulated, the drenching is stopped. The product, now ready for being withdrawn, forms firm translucent sheets of a caoutchouc- like substance having a straw yellow colour, possesséd of a certain amount of elasticity, and communicating no oily stain to paper. These sheets are now torn into small pieces and reduced

to a uniform plastic mass by means of powerful crushing rollers, after which the material is placed in a close boiler with the addition of certain proportions of kawrie gum, rosin, and oehre, umber, or other pigment, according to the ground-colour desired. The boiler is heated by steam, and the entire mass, being thoroughly incorporated by means of stirrers, is run into a shallow trough, from which, after cooling and solidifying, it is taken in large slabs. These are piled up awaiting future use, and when required for manufacturing purposes they are cut into blocks about the size of an ordinary brick.

Ground cork, which is the second essential constituent af linoleum, may be made from cork cuttings and scraps ;

but, the supply of such material being unequal to the demand, bale cork, of secondary quality as imported, is very largely used. It is first broken to pieces about the size of a nut; the fragments are fed into the hopper of a mill; and the cork passes thence between a pair of ordinary millstones in which it is reduced to a meal-like condition, in exactly the same way as wheat is ground to flour. The product is sifted, and the insufficiently ground portions are returned to be passed again through the mill. In the grinding of the cork great care is necessary to prevent iron, stone, or other hard foreign material from getting into the mill, as such substances, causing sparks between the stones, readily give rise to explosions in air so laden with fine dust as that of the mill necessarily is.

In the making of the jute backing the only notable feature is the great width of the loom, in which webs 12 feet broad are woven by Messrs Nairn, The maximum width of that produced by other makers, however, has hitherto been 6 feet.

The actual preparation of linoleum fioor-cloth in the factory of Messrs Nairn is conducted in a continuous series of operations by machinery which has been patented by that firm. The bricks of oxidised oil and the requisite proportion of cork are thrown into a hopper, where they are thoroughly mixed in a kind of pug mill, whence the mixture is shot forward in atube, at the open end of which it is sliced off in thin crumbling masses by a revolving knife. Spread out in thin sheets, it

passes from this between a series of steam-heated rollers, from the last of which it is scratched: off by a circular drum covered with sharp steel points, and falls in a fine shower into a feeding box the whole width of the linoleum to be made From this feeding box the mixture is uniformly delivered on the surface of the canvas, which here meets it, and passing immediately between powerful smooth rollers, the semi-plastic mixture is firmly squeezed on the surface of, and rendered adherent to, the rough open canvas which forms its back. The distance between the upper and lower compressing roller determines the thickness of the linoleum, three standard thicknesses being recognized, viz., 3, 45, and 3%, parts of an inch. Linoleum of the thickness of + of an inch is also made for public libraries and reading- rooms on account of its perfect noiselessness. It only remains to coat or waterproof the raw canvas back with oil paint, and the floor-cloth is finished as plain linoleum. The printing of patterns in various colours on its surface is done as described under Fioor-CLorH, vol. ix. p. 8329. Corticine is a form of linoleum, in which the oil is oxidized by chemical agents.

Recently a method of ornamenting linoleum with patterns in the form of tiles or tessare, the colour of each tile going right through to the eanvas or sufficiently deep for constant. wear, has been devised and patented by Mr ©, F. Leake. The patentee prefers to use eanvas first covered with a thin linoleum coating. This he brings on a table on whieh are a series of moulds corresponding with the coloured tile pattern required. Into each mould is put the required quantity of properly-coloured granulated linoleum material, which is eompressed into solid tiles by the deseent of plungers. The part eovered by the pattern is carried forward and powerfully squeezed between hydraulic rams, the tiles being thus made smooth, homogeneous, and firmly adherent, while in the meantime the moulds are being filled and a new set of tiles prepared in the first stage of the operation. Mr Walton, the original patentee of Hnoleum, has adapted a pee ee of oxidized oil and eork or other

thickening material embossed with patterns for wall decorations under the name of ‘‘ Lincrusta Walton.” (J. PA.)

“LINSEED is the seed of the common flax or lint, Iinum usitatissimum, from which also the well-known fibre flax is obtained. The plant itself is figured and described under Fax, vol. ix. p. 293. The fruit of the flax plant consists of a globose capsule which splits into five cocci, each containing two seeds. These seeds, the linseed of commerce, are of a lustrous brown colour externally, and a

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compressed and elongated oval. form, with a slight beak or projection at one extremity. The brown testa contains, in the outer of the four cvats into which it is microscopically distinguishable, an abundant secretion of mucilaginous matter; and it has within it a thin layer of albumen, enclosing a pair of large oily cotyledons. The seeds when placed in water for some time become coated with glutinous matter from the exudation of the mucilage in the external layer of the epidermis ; and by boiling in sixteen parts of water they exude sufficient mucilage to form with the water a thick pasty decoction. The cotyledons contain the valuable linseed oil referred to below. Linseed grown in tropical countries is much larger and more plump than that obtained in temperate climes, but the seed from the colder countries, on the other hand, yields a finer quality of oil. Fliickiger and Hanbury found that six seeds of Sicilian linseed, thirteen of Black Sea, and seventeen of Archangel linseed weighed respectively one grain. The average com- position of linseed may be fairly represented by the fol- lowing analysis by Dr Thomas Anderson ; —albuminous substances, 24°44 ; oil, 34:00; gum sugar and cellulose, 30°73 ; ash, 3°33 ; water, 7°50. Linseed is cultivated and secured as a crop in all, European flax-growing countries, where the seed is probably not less valuable than

the fibre. It is also obtained from Egypt and India, being cultivated in the latter country solely on account of the seed.

Apart from its value as a source of oil, and for sowing, linseed is not a product of much economic importance. It formed an article of food among the Greeks and Romans, and it is said that the Abyssinians at the present day eat it roasted. The oil is to some extent used as food in Russia, and in parts of Poland and Hungary. Linseed meal, partly on account of its bland oily constitution, is a valuable material for poultices. At one time the crushed seeds were the officinally recognized cataplasmic material, but the readiness with which that preparation became rancid through the oxidation of its abundant oil frequently ren- dered it a dangerous application for open sores. The lind farina of the pharmacopeeia is now the powdered meal of the cake left after expression of the oil, with a propor- tion of olive oil added when about to be used. An infusion of linseed under the name of “linseed tea” is a popular diluent in bronchial and other inflammatory affections. The abundant mucilage in linseed meal makes it a most useful material for luting stoppers in chemical jars, and other such joints in glass-work. Linseed cake, the marc left after the expression of the oil, is a most valuable feed- ing substance for cattle. According to a recent analysis by Dr Voelcker (Journ. Roy, Agric. Soc., 2d ser., vol. xvii. p. 659) it contains in 100 parts—oil, 10-90 ; albuminous compounds, 24°56; mucilage, sugar, and digestible fibre, 31°97 ; woody fibre, 11°47; ash, 6:20; moisture, 14°90.

Linseed is subject to extensive and detrimental adulterations, resulting not only from careless harvesting and cleaning, whereb seeds of the flax dodder and other weeds and grasses are mixed wit it, but also from the direct admixture of cheaper and inferior oil seeds, such as wild rape, mustard, sesame, poppy, &c,, the latter adulterations being known in trade under the generic name of ‘‘buffum.” In 1864, owing to the serious aspect of the prevalent adulteration, a union of traders was formed under the name of the ** Linseed Association,” the members of which bind themselves to

ive compensation for all adulterations in excess of 4 per cent. of f freien matter. Highly adulterated linseed is, however, still very common outside the field of operations of the Linsecd Association.

The quantity of linseed imported into the United Kingdom during the year 1881 was 1,829,838 quarters, of a value of £4,395,061. About one-half of this amount, 937,059 quarters, valued at £2,299,877, came from the East Indies, and tlc imports from Russia, amounting to 728,358 quarters, valued at £1,694,720, account for the greater part of the remainder.

Linseed Oil, the most valuable and characteristic of the series of drying oils, is obtained by expression from the seeds, with or without the aid of heat. Preliminary to

the operation of pressing, the seeds are crushed between a pair of revolving rollers, and ground to a fine meal under heavy edge stones on a stone bed. For the extraction of the fine quality of oil known as cold-drawn the meal is, without further preparation, filled into woollen or canvas bags and enclosed in horse-hair envelopes for pressure, either in a Dutch mill worked by means of wedges and falling stampers or in a screw press, or, what is now more prevalent, in a special form of hydraulic press. The oil so obtained is of a clear yellow colour, and is comparatively devoid of odour and taste. The cake left by cold pressure is again ground up, heated in a steam kettle to about 212° Fahr., and while hot submitted to further pressure, which results in the exudation of a less pure oil of a brownish- yellow colour. In general practice, cold-drawn oil is little prepared ; the linseed after grinding is submitted to a high heat, whereby the mucilage in the epidermis is destroyed, and the oil flows more freely; and in many crushing establishments the oil is obtained by a single operation under the press, The yield of oil from different classes of seed varies, but from 23 to 28 per cent. of the weight of the seed operated on should be obtained. A good average quality of seed weighing about 392 ib per quarter has been found in practice to give out 109 bb of oil.

Commercial linseed oil has a peculiar rather disagreeable sharp taste and smell ; its specific gravity is given as vary- ing from 0°928 to 0°953, and it does not solidify under the influence of very low temperature. It is soluble in 32 parts of alcohol, sp. gr. 0°82, in 6 parts of boiling alcohol, and in 1°6 of ether. By saponification it yields about 95 per cent, of fatty acids, principally linoleic acid (C,,H,,0,), a body peculiar to the drying oils, and by treatment with oxide of lead about nine-tenths of the resulting lead salt is found to be linoleate of lead. The oil may be perfectly bleached by treatment with a solution of green sulphate of iron, with repeated shaking and exposure to the light for a period of four to six weeks. Exposed to the air in thin films, linseed oil absorbs oxygen and forms a resinous semi- elastic caoutchoue-like mass, oxylinoleic acid, C,,H,,O;. The oil, when boiled with small proportions of litharge and minium, undergoes the process of resinification in the air with greatly increased rapidity. Sacc found by boiling 2500 grains of raw oil for ten minutes with 30 grains each of litharge and minium, and weighing after twenty-four hours exposure to the atmosphere, that the oil had lost only 60 grains. A second sample he boiled till there was a loss of 5 per cent. in weight, when the product assumed the consistency of molasses ; and a third portion boiled to a loss of 12 per cent. became a caoutchouc-like mass. The first of these products he found dried, on exposure, to a fine transparent varnish ; the second did not resinify after fifteen days' exposure ; and the atmosphere had no effect on the third portion. The weight of the film of the first after complete resinification was increased 50 per cent. through absorption of oxygen, and the rate at which absorption took place was much influenced by heat.

To these physical ae ae the varied industrial applications of linsced oil are principally due. Its most important use is certainly found in the preparation of oil paints and varnishes. By painters both raw ae boiled oil are used, the latter not only forming the

rincipal medium in oil painting, but also serving scparately as the Viasts of all oil varnishes. Boiled oil is prepared in a variety of ways—that most common being by heating the raw oil in an iron or copper boiler, which, to allow for frothing, must only be about three-fourtlis

filled. The boiler is heated by a furnaec, and the oil is brought gradually to the point of ebullition, at which it is main- tained for two hours, during which time moisture is driven off, and the scum and froth which accumulate on the surface are ladled out. Then by slow degrees a proportion of “dryers” is added—usually equal weights of litharge and minium being used to the extent of 8 per cent. of the charge of oil; and with these a

small proportion of umber is generally thrown in. After the addition of the dryers the boiling is continued two or three hours ;

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the fire is then suddenly withdrawn, and tlie oi] is left covered up in the boiler for ten hours or more. Before sending out, it 1s usually stored in settling tanks for a few weeks, during which time the uncombined dryers scttle at the bottom as ‘‘foots.” Besides the dryers already mentioned, acetate of lead, borate of manganese, binoxide of manganese, sulphate of zinc, and other bodies are used. The theory of the influence of boiling and of the addition of these bodies on linseed oil is not well understood. By Liebig it was suggested that they simply removed the mucilaginous and other foreign constituents of the oil which by their presence intercepted the action of oxygen ; but by Chevreul and others the opinion was held that the chemicals used, by giving up oxygen to the oil, thereby induce a more rapid and energetic absorption from the air. However this may be, it does not appear at least that boiling is essential for the production of that active condition of the oil, as it may also be induced by treatment of cold raw oil with lead acetate and other agencics. Boiled oil is now very largely used in the manufacture of linoleum floor-cloth. See LINOLEUM.

Linseed oil is also the principal ingredient in printing and litho- graphic inks, The oil for ink-making is prepared by heating it in an iron pot up to the point where it either takes fire spontaneously or can be ignited with any flaming substance. After the oil has been allowed to burn for some time according to the consistence of the varnish

desired, the pot is covered over, and the product when cooled forms a viscid tenacious substance which in its most concen- trated form may be drawn into threads. By boiling this varnish with dilute nitric acid vapours of acrolein are given off, and the substance gradually becomes a solid non-adhesive mass the same as the ultimate oxidation product of both raw and boiled oil.

Linseed oil is subject to various falsifications, chiefly through the addition of cotton-seed, niger-seed, and hemp-seed oils ; and rosin oil and mineral oils also are not infre aver added. Except by smell, by change of specific gravity, and by deterioration of drying properties, these adulterations are difficult to detect. (J. PA.)

LINUS is one of a numerous class of heroic figures in Greek legend, of which other examples may be found under Hyacinruus, Aponis. The connected legend is always of the sarne character: a beautiful youth, fond of hunting and rural life, the favourite of some god or goddess, suddenly perishes by a terrible death in spite of the heavenly love that would fain protect him. In some cases nothing is known to us with certainty beyond the mythological figure, but in many. cases the religious back- ground from which the legend stands out in relief has been preserved to us; in such cases we see that an annual ceremonial, everywhere of the same enthusiastic character, commemorated the legend. At Argos this religious charac- ter of the Linus myth was best preserved : the secret child of Psamathe by the god Apollo, Linus is exposed, nursed by sheep, and torn in pieces by the sheep-dogs. Every year in the festival Arnis or Cynophontis, the women of Argos mourned for Linus and propitiated Apollo, who in revenge for his child’s death had sent a plague on the Argive children. The grave of Linus, like that of Hyacinthus at Amycle, was shown at Argos, at Thebes, at Chalcis, and probably at other places. The enthusiasm and abandon which characterized the similar festivals over Greece, Asia Minor, and Syria prove that it was part of the nature worship which spread in various forms by different roads and at different periods from the East into Greece. The songs of lamentation which accompanied the festival strongly im- pressed the Greeks, and it is most probable that the Phoe- nician words az lenu, ai lenu, which formed the burden of

the Adonis songs, originated the Greek words Linus and Ai\wos. The Linus song is frequently mentioned in Greek literature, Homer, //., xviii. 569; Pind., Fr. 139 (Bergk), &c. ; the tragic poets often use the word AiAwos as the refrain in mournful songs, and Euripides calls the custom Phrygian (Or. 1380). In Phrygia the mythic correspondent of Linus is called Lityerses. There can be no doubt that Linus, Adonis, Manerus, Narcissus, &c., are personifications of the life and bloom of nature suddenly slain by the hot sun of summer, while with the religious mourning over the catastrophe of nature were intertwined the ideas of life in relation to death, of good and evil, and so on. The religious side of the Linus myth seems hardly to have

existed in Greece outside of Argos ; in Thebes, which also was a chief home of the legend, Linus was a hero of song and music. In this forta he has passed into literature, e.g., Virgil, Ecl., vi. 67. He is conceived as the inventor of musical methods, especially of the ©pjvos, a kind of lament; this idea was expanded in various ways, parti- cularly by the Alexandrine poets, and finally he was, after the analogy of Muszeus, transformed into a composer of prophecies and legends.

See Brugsch, Die Adonis Klage und das Linos Lied, &c.

LINUS, one of the saints of the Gregorian canon, was, according to the Breviarium Romanum, the immediate successor of Peter in the seeof Rome. He was a native of Volterra, who had attained a high degree of sanctity, and by his prevailing faith was able, not only to cast out devils, but to raise the dead. He wrote an account of the res geste of Peter, especially of his controversy with Simon Magus. He was beheaded by the orders of the ungrateful consul Saturninus, whose daughter he had freed from demoniac possession, after a pontificate of eleven years two months and twenty-three days. The authorities for the statement that Linus was, leaving Peter out of account, the earliest president of the Roman Church, are very early (Irenzeus, Adv. Her., iii. 3, 3; Euseb., H. E,, iii, 2, 13); and that there actually was a presbyter of that name may be gathered from 2 Tim. iv. 31. According to Tertullian, however (De Prescr., 32), Peter appointed Clement to be his successor. The genuineness of the alleged epitaph of Linus found in Rome is uow

no longer maiutained; and the two books on the martyrdom of Peter and Paul, which pass under his name, must also be regarded as apocryphal and late.

LINZ, capital of Upper Austria, and see of a bishop, in 48° 19’ N. lat., 14° 16’ E. long., lies upon the right bank of the Danube, 98 miles west of Vienna, at the junction of the Kaiserin-Elizabeth Western Railway with a line from Prague and Budweis. The market-town of Urfahr, on the opposite side of the river, is connected with the city

1. New Cathedral. 2. Academy. 3. Post Office.

4, Telegraph Office. 5, Public Library.

6. Military Hospital, 7. Theatre.

by an iron bridge 700 feet in length, constructed in 1872. Linz possesses two cathedrals, one dating from 1670, and another, dedicated to the Immaculate Conception, com- menced in 1862, and still unfinished, a Lutheran (1845) and several Roman Catholic churches, the new synagogue opened in 1877, and many religious houses. The old

Landeshaus, or House of the Estates (1562), the Bibliotheca Publica (1788), now (1882) containing 34,000 volumes, the Museum Francisco-Carolinum (1834), and a state theatre (1803) may also be noticed, with the episcopal and archducal palaces, aud the castle now used as barracks. There are many educational establishments, including the theological diocesan lyceum, a new gymnasium and normal schools, and several hospitals and asylums. The principal manufactories are of tobacco (in 1880 employing 787 hands, and producing 25,286,050 cigars and 1850 tons of to- bacco), and boot-varnish and blacking (2500 ewts.), the last chiefly exported to Hungary and Italy. ‘l’wo breweries in 1881 produced 1,781,828 gallons of beer, and the other industries include iron-boat-building, and the manufacture of locomotives and agricultural implements. Trade and

commerce are facilitated by the river. About forty-six thousand passengers embark or disembark at the steamboat landing stage, and the imports and exports there amount together to about 500,000 cwts. annually. There isa con- siderable traffic in woollen goods, carpets, linen fabrics, thread, prepared leather, iron wares, and salt. Cattle and meat markets are held twice a week. The Volksfest, a popular fair held generally every second September, is much resorted to by strangers. The surrounding country is highly picturesque. On the 31st December 1880 the population (exclusive of the garrison, 2799) was 36,116, or With the suburbs of Waldegg (1204) and Lustenau (1568) 38,888, chiefly Roman Catholics.

Linz is believed to stand on the site of the Roman station Lentium or Lentia. The authentic history of Linz cannot be traced farther back than 799. In 1140 it was purchased from Gottschalk, count of Kyrnberg, by Leopold IV., margrave of Austria; in 1324 it first received hee rights, and in 1490 became the capital of the province above the Enns, Of various attacks which Linz from time to time successfully resisted the most notable was that by the insurgent peasants under Stephen Fadinger, 2lst and 22d July 1626, when the suburbs were laid in ashes. At Linz (16th Decem- ber 1645) peace was concluded between the emperor Ferdinand III. and the Transylvanian prince Rakéezy (sce Huncany, vol. xii. p. 870). During the siege of Vienna in 1683 the castle at Linz was the residence of Leopold I. The triple deliverance of Linz from war, fire, and pestilence was commemorated by Charles VI., in 1723, by the crection of a marble monument known as Trinity Column. In 1741, during the war of the Austrian suecession, Linz was taken by the troops of the elector of Bavaria, but on the 23d January 1742 it was recovered by the Austrians. The bishopric was established by Pope Pius VI. in 1784. On the 15th of August 1800 many of the principal buildings were destroyed by fire. On the 17th May 1809 an Austrian force was defeated near the city in an engagement with Saxon and Wurtemberg troops. The chain of outlying forts, thirty-two in number, now abandoned, and toa great extent demolished, was constructed between 1828 and 1836 under the direction of Archduke Maximilian d’Estc. A general assembly of the Catholic Union for Germany was held here

24th to 26th September 1850. Tramways were introduced in 1880, and a new line of railway through the Kremsthal was completed as far as Kremsmiinster in 1881.

See the anonymous Fiihrer auf der Kremsthalbahn, mit Beschreibung von Linz, Linz, 1881; the Statisticher Bericht Oberésterreichs 1876-1880, Linz, 1881, vol. ii. pp. 248-283 ; the official Hrgebnisse tiber die Volkszdéhlung in Linz, Linz, 1881; I', Krackowizer, Die Landeshauptstadt Linz, Linz, 1875; and G. H, Heinse, Linz und seine Umgebungen, 2d ed., Linz, 1838.

LION. From the earliest historic times few animals have been better known to man than the lion. Its geogra- phical habitat made it familiar to all the races among whom human civilization took its origin, and its strongly marked physical and moral characteristics have rendered it proverbial, perhaps to an exaggerated degree, and have in all ages afforded favourite types for poetry, art, and heraldry. ' .

The literature of the ancient Hebrews abounds in allusions to the lion; and the almost incredible numbers that are stated to have been provided for exhibition and destruction in the Roman amphitheatres (as many as six hundred on a single occasion by Pompey, for example) show how abundant these animals must have been within acces- Sible distance of the capital of the world.

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| The geographical range of the lion was once far more extensive than at present, even within the historic period covering the whole of Africa, the south of Asia, including Syria, Arabia, Asia Minor, Persia, and the greater part of northern and central Hindustan, and also the south-eastern portion of Europe, as shown by the well-known story told by Herodotus of the attacks by lions on the camels which carried the baggage of the army of Xerxes on its march through the country of the Peonians in Macedonia. The very circumstantial account of Herodotus shows that the animal at that time ranged through the country south of the Balkans, through Roumania to the west of the river Carasu, and through Thessaly as far south as the Gulf of Lepanto

and the Isthmus of Corinth, having as its western boundary the river Potamo and the Pindus mountains. The whole of the evidence relating to the existence of lions in Europe, and to their retreat from that continent shortly before the commencement of the Christian era, has been collected in the article on “Felis spelsea” in Boyd Dawkins and Sanford’s British Pleistocene Mammalia, 1868. Fossil remains attest a still wider range, as it is shown in the same work that there is absolutely no osteological or dental character by which the well-known cave lion (Felis snelea of Goldfuss), so abundantly found in cave deposits of the Pleistocene age, can be distinguished from the existing L’elis leo. There are also remains found in North America of an animal named Felis atrox by Leidy, which the palm- ontologists just quoted attribute to the common lion; but, as they are very fragmentary, and as the specific characters by which most of the Felidz are distinguished are more dependent on external than on anatomical conformation, this determination cannot be so absolutely relied upon,

At the present day the lion is found in localities suitable to its habits, and where not exterminated (as it probably was in Europe) by the encroachments of man, throughout Africa from Algeria to the Cape Colony, and in Mesopo- tamia, Persia, and some parts of the north-west of India. According to Blanford,! lions are still very numerous in the reedy swamps bordering the Tigris and Euphrates, and also occur on the west flanks of the Zagros mountains and the oak-clad ranges near Shiraz, to which they are attracted by the immense herds of swine which feed on the acorns. The lion nowhere exists in the table-land of Persia, nor is it found in Baluchistan. In India it appears now to be confined to the province of Kathiawar in Gujerat, though within the present century its range extended through the north-west parts of Hindustan, from Bahawalpur and Sind to at least the Jumna (about Delhi), southward as far as Khandesh, and in Central India through the Sagur and Ner- budda territories, Bundelkund, and as far east as Palamau. It was extirpated in Hari4na about 1824. One was killed at Rhyli, in the Dumaoh district, Sagur and Nerbudda territories, so late as in the cold season of 1847-48; and about the same time a few still remained in the valley of the Sind river in Kotah, Central India (Blyth).

The great variations in external characters which different lions present, especially in the colour and the amount of mane, has given rise to the idea that there are several species, or at all events distinct varieties peculiar to different localities. It was at one time supposed, on the authority of Captain Walter Smee,' that the lion of Gujerat differed essentially from that of Africa in the absence of mane, but subsequent evidence has not supported this view, which was probably founded upon young specimens having been mistaken for adults. Lions from that district as well as from Babylonia, which have lived in the gardens of the London Zoological Society, have had as

1 Zoology and Geology of Eastern Persia, 1876. * Transactions of the Zoological Society, vol. i. p. 165, 1835.

fully developed manes as any other of the species. Mr F. C. Selous! has shown that in South Africa the so-called black-maned lion and others with yellow scanty manes are found, not only in the same locality, but even among individuals of the same parentage.

The lion belongs to the very natural and distinctly defined group constituting the genus Felis of Linnzus (for the characters and position of which see article MAMMALIA), a genus held by Pallas and other philosophical naturalists as a model of what a genus ought to be, although recent writers have divided and subdivided it into as many as thirteen sections, on each of which a new generic term has been imposed. Among these sections is one containing the largest members of the group, and differing from the others in the well-marked anatomical character that the anterior cornu of the hyoid arch is but little ossified, and by the less important one that the pupil of the eye when contracted is a circular hole, instead of a vertical slit as in thecat. The lion agrees with the tiger and the leopard in these respects, but differs from them in its uniform style of colouring, and from all the other Felide in the arrangement of its hairy covering, the hair of the top of the head, chin, and neck, as far back as the shoulder, being not only very much longer, but also differently disposed from the hair elsewhere, being erect or directed forwards, and so constituting the

character- istic ornament called the mane. There is also a tuft of elongated hairs at the end of the tail, one upon each elbow, and in most lions a copious fringe along the

Fic, 1.—Lion and Lioness, after a Drawing by Wolf in Elliot's Monograph of the Felidzx.

middle line of the under surface of the body, wanting,

however, in some examples? It must, however, be observed that these characters are peculiar to the adults of the male sex only, and that, even as regards their coloration young lions show indications of the darker stripes antl mottlings so characteristic of the greater number of the members of the genus; just as the young of nearly all the

1 A Hunter's Wanderings in Africa, 1881, p. 258.

® Mr Selous, whose opportunities for obtaining evidence upon this subject were very large, says that in the region of South Africa, between the Zambesi and the Limpopo rivers, he never saw a lion with any long hair under the body, and that the manes of the wild lions of that district are far inferior in development to those commonly seen in menageries in Europe,

plain-coloured species of deer show for a time the light- coloured spots which are met with in the adults of only some of the species. The usual colour of the adult lion is yellowish-brown, but it may vary from a deep red or chest- nut brown to an almost silvery grey. The mane, as well as the long hair of the other parts of the body, sometimes scarcely differs from the general colour, but it is usually darker and not unfrequently nearly black. The mane begins to grow when the animal is about three years old, and is fully developed at five or six.

In size the lion is only equalled or exceeded by the tiger among the existing Felidx; though both species present great variations, the largest specimens of the latter appear to surpass the largest lion. A full-sized South African lion, according to Selous, measures slightly less than 10 feet from nose to tip of tail, following the curves of the body.

Harris gives 10 feet 6 inches, of which the tail occupies 3 feet. The lioness is about a foot less.

The internal structure of the lion, except in slight details, resembles that of the other Felidx, the whole organization being that of an animal modified to fulfil, in the most perfect degree yet attained, an active, predaceous mode of existence. ‘The teeth especially exemplify the carnivorous

Fia. 2.—Front View of Skull of Lion.

type in its highest condition of development. The most important function they have to perform, that of seizing and holding firmly animals of considerable size and strength, violently struggling for life, is provided for by the great, sharp-pointed, and sharp-edged canines, placed wide apart at the angles of the mouth, the incisors between them being greatly reduced in size and kept back nearly to the same level, so as not to interfere with their action. The jaws are short and strong, and the width of the zygomatic arches, and great development of the bony ridges on the skull, give ample space for the attachment of the powerful muscles by which they are closed. In the molar series of teeth the sectorial or scissor-like cutting function is developed at the expense of the tubercular or grinding, there being only one rudimentary tooth of the latter form in the upper jaw, and none in the lower. They are, however, sufficiently strong to break bones of large size. The dental formula is expressed as follows :—incisors §, canines +, premolars $, molars }=#; total, 30. The tongue is long and flat, and remarkable for the development of the papilla: of the anterior part of the dorsal surface, which (except near the edge) are modified so as to resemble long, compressed, recurved, horny spines or claws, which, near the middle line, attain the length of one-fifth of an-inch. They give the part of the tongue on which they occur the appearance and feel of a coarse rasp, and serve the purpose of such an instrument in cleaning the flesh from the bones of the animals on which the lion feeds. The vertebral

column is composed of seven cervical, thirteen dorsal, seven lumbar, three sacral, and about twenty-six caudal vertebree. The clavicles are about 3 inches in length, embedded loosely in the muscles, and not directly connected either with the sternuin or the scapula. The limbs are digitigrade, the animal resting upon round soft pads or cushions covered with thick, naked skin, one on the under surface of each of the principal toes, and one larger one of trilobed form, behind these, under the lower ends of the metacarpal and metatarsal bones, which are placed nearly vertically in ordinary progression. The fore feet have five toes, of which the third and fourth are nearly equal and longest, the second being slightly and the fifth considerably shorter. The first or pollex (corresponding to the human thumb) is much shorter than the others, and does not reach to the ground in walking. The hind feet have only four toes, the third and fourth being the longest, the second and fifth somewhat shorter and nearly equal. The first or hallux (or great toe) is represented only by a rudimentary metatarsal bone. The claws are all very large, strongly compressed, very sharp, and exhibit the retractile condition in the highest degree, being drawn backwards and upwards into a cutaneous sheath by the action of an elastic ligament so long as the foot is in a state of repose, but exserted by muscular action when the animal strikes its prey. By this remarkable piece of animal mechanism their edges and points are always kept sharp and unworn.

The habits of the lion ina state of nature are fairly well known from the united observations of numerous travellers and sportsmen who have explored those districts of the African continent in which it is still common. It lives chiefly in sandy plains and rocky places interspersed with dense thorn-thickets, or frequents the low bushes and tall rank grass and reeds that grow along the sides of streams and near the springs where it lies in wait for the larger herbivorous animals on which it feeds. Although it is occa- sionally seen abroad during the day, especially in wild and desolate regions, where it is subject to but little molestation, the night is, as in the case of so many other predaceous

animals, the period of its greatest activity. It is then that

its characteristic roar is chiefly heard, as thus graphically described by Gordon Cumming :—

‘*Qne of the most striking things connected with the lion is his voice, which is extremely grand and peculiarly striking. It con- sists at times of a low deep moaning, repeated five or six times, ending in faintly audible sighs; at other times he startles the forest with loud, deep-toned, solemn roars, repeated in quick suc- cession, each increasing in loudness to the third or fourth, when his voice dies away in five or six low muffled sounds very much resemb- lingdistant thunder. At times, and not unfrequently, a troop may be heard, roaring in concert, one assuming the lead, and two, three, or four more regularly taking up their parts, like persons singing a eatch. Like our Scottish stags at the rutting season, they roar loudest in cold frosty nights ; but on no occasions are their voices to be heard in such perfection, or so intensely powerful, as when two or three troops of strange lions approach a fountain to drink at the same time. Whien this occurs, every member of each troop sounds a bold roar of defiance at the opposite parties ; and when one roars, all roar together, and each seems to vie with his com- rades in the intensity and power of his voice. The power and grandeur of these nocturnal concerts is inconceivably striking and pleasing to the hunter’s ear.” ;

“The usual pace of a lion,” C. J. Andersson ! says, ‘is a walk, and, though apparently rather slow, yet, from the great length of his body, he is able to get over a good deal of ground in a short time. Occasionally he trots, when his speed is not inconsiderable. His gallop —or rather succession of bounds—is, for a short distance, very fast,— nearly or quite equal to that of a horse. Indeed, unless the steed has somewhat the start when the beast charges, it will be puzzled to escape. Many instances are on record of horsemen who have incautiously approached too near to

1 The Lion and the Elephant, 1873, p. 19.

the lion, prior to firing, who have been pulled down by him before they could get out of harm's way. Happily, however, the beast soon tires of the exertion of galloping, and unless his first rush succeeds he, for the most part, soon halts and beats a retreat." "The lion, as with other members of the feline family," the same writer tells us, "seldom attacks his prey openly, unless compelled by extreme hunger. For the most part he steals upon it in the manner of a cat, or ambushes himself near to the water, or a pathway frequented by game. At such times he lies crouched upon his belly in a thicket until the animal approaches sufficiently near, when, with one prodigious bound, he pounces upon it. In most cases he is successful, but should his intended victim escape, as at times happens, from his having miscalculated the distance, he may make a second or even a third bound, which, however, usually prove fruitless, or he returns disconcerted to his hiding- place, there to wait for another opportunity." His food consists of all the larger herbivorous animals of the country in which he resides,—buffaloes, various kinds of antelopes, zebras, giraffes, or even young elephants or rhinoceroses, though the adults of these latter he dare not attack. In cultivated districts the eattle, sheep, and even human inbabitants are never safe from his nocturnal ravages. He appears, however, as a general rule, only to kill when hungry or attacked, and not for the mere pleasure of killing, as with some other carnivorous animals. He, moreover, by no means limits himself to animals of his own killing, but, according to Selous, often prefers eating game that has been killed by man, even when not very fresh, to taking the trouble to catch an animal himself. All books of African travel and sport abound with stories, many of which are apparently well authenticated, of the lion's prodigious strength, as exemplified by his being able to drag off a whole ox in his mouth to a long distance, even leaping fences and dykes with it.

The lion appears to be monogamous, a single male and female continuing attached to each other irrespectively of the pairing season. Atall events the lion remains with the lioness while the cubs are young and helpless, and assists in providing her and them with food, and in educating them in the art of providing for themselves. The number of cubs at a birth is from two to four, usually three. They are said to

remain with their parents till they are about three years old. The following account by an eyewitness gives a good idea of lion family life?:—

“‘T once had the pleasure of, unobserved myself, watching a lion family feeding. Iwas encamped on the Black Umfolosi in Zulu- land, and towards evening, walking out, about half a mile from eamp, I saw a herd of zebra galloping across me, and when they were nearly 200 yards off, I saw a yellow body flash to- wards the leader, and saw hiin fall beneath the lion’s weight. There was a tall trce about 60 yards from the place, and anxious to see what went on, I stalked up to it, while the lion was still too much occupied to look about him, and climbed up. He had by this time quite killed the beautifully striped animal, but instead of procecding to eat it, he got up and roared vigorously, until there was an answer, and in a few minutes a lioncss, accompanied by four whelps, came trotting up from the same direction as the zebra, which no doubt she had been to drive towards her husband. They formed a fine picture, as they all stood round the carcase, the whelps tearing it and biting it, but unable to get through the tough skin. hen the lion lay down, and the lioness driving her offspring before her did the same 4 or 5 yards off, upon which he got up, and commencing to eat, had soon finished a hind-leg, re- tiring a few yards on one side assoon as he had done so. The lioness came up next and tore the carcase to shreds, bolting huge mouthfuls, but not objecting to the whelps eating as much as they could find. There wasa good deal of snarling and quarrelling among these young lions, and oecasionally a stand-up fight for a minute, but their mother did not take any noticc of them, except to give them a smart blow with her paw if they got in herway. ... There was now little left of the zebra but a few bones, which hun-

“2 Hon. W. H. Drummond, Tke Large Game and Natural History of South and South-East Africa, 1875, p. 278. XIV. — 86

dreds of vultures were circling round waiting to pick, while almost an equal number hopped awkwardly about on the ground within 50 or 60

yards of it, and the whole lion family walked quietly away, the lioness leading, and the lion, often turning his head to see that they were not followed, bringing up the rear.”

Though not strictly gregarious, lions appear to be sociable towards their own species, and often are found in small troops, sometimes consisting of a pair of old lions,

with their nearly full-grown cubs, but occasionally of adults |

of the same sex ; and there seems to be good evidence that several lions will associate together for the purpose of hunting upon a preconcerted plan. their natural ferocity and powerful armature are sometimes turned upon one another; combats, often mortal, occur among male lions under the influence of jealousy; and Andersson relates an instance of a quarrel between a hungry lion and lioness over the carcase of an antelope which they had just killed, and which did not seem sufficient for the appetite of both, ending in the lion not only killing, but even devouring his mate. Old lions, whose teeth have become injured with constant wear, often become “man-eaters,” finding their easiest means of obtaining a subsistence in lurking in the neighbourhood of villages, and dashing into the tents at night and carrying off one of the sleeping inmates. Lions differ from most of the smaller Felide in never climbing trees; indeed, as mentioned before, they are rarely found in forests.

With regard to the character of the lion, those who have had opportunities of observing it in its native haunts differ greatly. The exaggerated accounts of early writers as to its courage, nobility, and magnanimity have led to a reaction, which causes some modern authors to speak of it in language quite the reverse, and to accuse it of positive cowardice and all kinds of meanness. Livingstone goes so far as to say, ‘nothing that I ever learned of the lion could lead me to attribute to it either the ferocious or noble character ascribed to it elsewhere,” and he adds that its roar is not distinguishable from that of the ostrich, Of course these different estimates depend to a great extent upon the particular standard of the writer, and also upon the circumstance that lions, like other animals, undoubtedly show

considerable individual differences in character, and behave differently under varying circumstances. They are certainly not so reckless as to be entirely devoid of the instinct of self-preservation, and if one, perhaps satiated with a good meal the night before, unexpectedly disturbed in the day time, will occasionally retreat when confronted, even by an unarmed man, that is scarcely a reason for assigning cowardice as one of the characteristics of the species. The latest authority, Selous, while never denying the daring courage of the lion when hungry or provoked, and vindicating the awe-inspiring character of the roar of several lions in unison, when heard at close quarters, as the eget sound in nature, says with regard to its outward aspect :—

_ ‘It has always appeared to me that the word ‘majestic’ is singularly inapplieable to the lion in its wild state, as when seen by daylight he always has a stealthy furtive look that entirely does away with the idea of majesty. To look majestica lion should hold his head high. This he seldom does. When walking he holds it low, lower than the line of his back, and it is only when he first becomes aware of the presenee of man that he sometimes raises his head and takes a look at the intruder, usually lowering it imme- diately, and trotting away with a growl. When at bay, standing with open mouth and glaring eyes, holding his head low between his shoulders, and keeping up a eontinuous low growling, twitching his tail the while from side to side, no animal can. look more unpleasant than a lion; but there is then nothing majestic or noble in his appearance.”

Notwithstanding this evidently truthful description of the animal when seen under what may be called unfavour- able circumstances, no one with an eye for beauty can contemplate the form of a fine specimen of a lion, at all

Bement be supposed, | The total population of the islands in 1871 was 18,400,

events in a state of repose, even though in the confinement of amenagerie, without being impressed with the feeling that it isa grand and noble-looking animal. Gv. Ha LIPARI ISLANDS. These islands, which take their name from the largest and most populous member of

the group, are situated to the north of the eastern half of Sicily, between 38° 20’ and 38° 55’ N. lat., and 14° 15’ and 15° 15’ E. long. The seven principal islands are Lipari, Salina, Vulcano, Stromboli, Panaria, Filicudi, and Alicudi ; besides which there are ten islets, some of them mere rocks, the remains of a great central voleano now submerged.

and the area is less than 50 square miles. They were known to the ancients as the Hephestiades or Vulcanie insule, from their supposed connexion with Vulcan; the Liparenses, from their mythical king Lipara; and the Holi insulz, from Molus, who was said to have married the daughter of Lipara, and to have succeeded to the kingdom. Lipara, the chief island, was colonized in the 6th century B.c. by Cnidians and Rhodians, who rapidly spread to the adjacent islands of Hiera and Didyme. The new settlers maintained their independence in spite of the attacks of the Tyrrhenian pirates, but they later became subject successively to the Athenians, Carthaginians, and Romans, In the Middle Ages the Saracens took possession of the islands, but they were expelled by the Normans in the 11th century. Finally Ferdinand the Catholic annexed

them to Sicily.

Lipari has an area of about 11 square miles, with a population of 12,000. It is mountainous in character, and consists of tuffs and lavas, and of highly siliceous volcanic products such as quartz-trachyte, pumice, and obsidian. The great central cone, Monte Sant’ Angelo (1952 feet), is the ruin of an extinct volcano, as is also Monte Chirica (1978 feet) ; while Campo Bianco or Monte Pelato (1500 feet) is a mountain of white pumice, breached by an out- flow of vitreous lava. Hot springs exist in various parts of the island, the most important being those of San Calogero, mentioned by Diodorus Siculus, and situated about 6 miles from the town. The water, which possesses a temperature of 198° Fahr., contains free carbonic acid and sulphuretted hydrogen, together with carbonates of calcium and magnesium, and chlorides of calcium and

sodium. The chief town, which stands on the eastern point of the island, is quite modern, and contains no objects of interest. The cathedral and several other churches are

within the precincts of the castle, and they are presided —

over by a bishop and thirty-two canons. The castle is used as a prison for some four hundred malefactors, sent from various parts of Italy. The island is governed by a delegate, subject to the prefect of Messina. The soil is fertile ; and a considerable trade is carried on by a number of merchants who export currants, figs, pumice stone, and malmsey wine. Water is scarce owing to the great porosity of the soil.

Six miles to the south of Lipari is the island of Vulcano, anciently known as Hiera, Vulcania, and Therusia. In early times it wasa very active volcano ; and it is described by Thucydides, Aristotle, and Callias as being frequently in a state of violent eruption. In the 2d century B.c. the smaller island of Vulcanello was upheaved from the sea. The present crater was probably formed during the eruption of 1786, from which time the volcano remained in a quiescent state till the autumn of 1873, when it commenced to discharge clouds of vapour, showers of sand, and large stones. Blue and green flames were also seen to issue from rifts in the floor of the crater. When visited by the writer in 1879, the voleano had again relapsed into the solfatara stage, and it had recently been purchased by a Scotch firm | for £8000, for the purpose of extracting alum, boracic

acid, and sulphur from the numerous products which line the sides and cover the floor of the crater. voleanic minerals have been obtained from Vulcano; the most remarkable perhaps was that lately analysed by Professor Cossa of Turin, which was found to contain seven non-metallic elements and eight metals, among them the rare bodies thallium, czsium, and rubidium. The highest point of Vulcano—a portion of the old crater ring—has an altitude of 1601 feet.

A little more than 20 miles to the north-north-east of Lipari, the cone of Stromboli rises from the sea to a height of 3022 feet. It is of special interest to the vulcanologist from the fact that it is the only example in Europe of a volcano in a state of constant activity, and also because, from an elevated point above the crater (which is at the side of the cone below the summit), it is possible, when the wind blows away from the observer, to sit for hours and watch the operations going on within the crater. Such observations, carried out in 1788 by Spallanzani, made him the father of modern vulcanology, and furnished some of the most important data upon which the science is founded. The mountain is mentioned as early as the 4th century B.c.

Between Stromboli and Lipari there is a group of islets represent- ing portions of the crater ring of a great volcano, the largest of which, Panaria (Acesia), is 7 miles in circuit, and contains about 200 inhabitants. It produces wheat, oil, and wine. Salina (Didyme), 8 miles to the north-west of Lipari, has an area of 10 square miles, and consists of two volcanic cones rising respectively to the height of 3156 and 2821 feet. The island contains nearly 5000 inhabitants, who are mainly employed in cultivating the vines, which produce a fine malmsey wine. The cone of Filicudi rises to a height of 2598 feet, some 10 miles to the west of Salina, while at an equal distance further west is Alicudi, the most westerly mem- ber of the Lipari group. It is partly cultivated, and is inhabited by about 500 fishermen and shepherds.

Good maps of thé Lipari Islands have been published by the Italian Government, The best general account of the islands is still that of Admiral Smyth (Sicily and its Islands, 1824), while Professor J. W. Judd has exhaustively discussed their geology in the pages of the Geological Magazine for 1875. (G. F. R.)

LIPETSK, a district town of Russia, in the government of Tamboff, 95 miles west of the chief town of the govern- ment, and 23 miles north-west of Gryazi railway junction, at the confluence of Lyesnoy Voronesh and Lipovka rivers. The town is built of wood, and the streets are unpaved, but it is a commercial centre of some importance. There are several beetroot-sugar and leather works, tallow-melting

houses, and distilleries. There is a brisk business at the weekly fairs, and the merchants carry on active trade in horses, cattle, tallow, skins, and honey, sent by rail to the northern provinces, and in timber, shipped down to the province of the Don Cossacks. The Lipetsk mineral springs came into repute in the time of Peter I, who caused them to be surrounded by galleries, and laid down three gardens ; they continue to attract visitors during the summer. Lipetsk received municipal institutions in 1779. Population 14,500.

LIPPE is the name of a territory in north-western Germany, now divided into two small sovereign principali- ties, but formerly united under the same ruler. The name is derived from the river Lippe, which rises in the Teuto- burgian Forest, and flows into the Rhine at Wesel.

I. Lippe proper, also called Lippx-DETMOLD, is bounded on three sides by the Prussian province of Westphalia, and on the E. and N.E, by Hanover, Pyrmont, and Hesse-Cassel. It also possesses three small enclaves in Westphalia. Its area is about 450 square miles. The greater part of the surface is mountainous, especially towards the south, where it is intersected by the Teuto- burgian Forest. The chief rivers are the Weser, which crosses the north extremity of the principality, and its affluents the Werre, Exter, Kalle, and Emmer. | The forests of Lippe are among the finest in Germany, and

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produce abundance of excellent timber. The valleys con-

A number of | tain a considerable amount of good arable land, the tillage

of which occupies the greater part of the inhabitants. The principal crops are corn, flax, and rape. Cattle, sheep, and swine are also reared, and the “Senner” breed of horses is celebrated. The industries of Lippe are almost confined to a little yarn-spinning and linen-weaving. Its trade is also inconsiderable; but, besides agricultural products, timber, meerschaum pipes, and starch are ex- ported, The brine springs of Salzuflen produce about 1500 tons of salt annually. In 1880 the

population amounted to 120,216 souls, upwards of 95 per cent. of whom were Calvinists (Reformed Church), the remainder being Lutherans, Roman Catholics, and Jews. Education is provided for by two gymnasia and numerous other efficient schools. The principality contains seven small towns, the chief of which are Detmold, the seat of government, and Lemgo. The present constitution was granted in 1836, and is modified by a new election law of 1876. It pro- vides for a representative chamber of twenty-one members, whose functions are mainly consultative. For electoral purposes the population is divided into three classes, rated according to taxation, each of which returns seven members. The estimated revenue in 1881 was £49,200, and the expenditure £50,850. The public debt amounts to nearly £60,000. Lippe has one vote in the German Reich- stag, and also one vote in the Federal Council. Its military forces form a battalion of the 6th Westphalian infantry. ‘

II. Scpaumpure-Lippz, or Lippr-Bickrsure, to the north of Lippe-Detmold, consists of the western half of the old countship of Schaumburg, and is surrounded by West- phalia, Hanover, and the Prussian part of Schaumburg. The northern extremity of the principality, which is 175 square miles in extent, is occupied by a lake named the Steinhuder Meer. The southern part is mountainous, but the remainder consists of a fertile plain, producing abundant crops of cereals and flax. Besides husbandry, the inhabit- ants practise yarn-spinning and linen-weaving, and the coal-mines of the Biickeburg, on the south-eastern border, are very productive. ‘The great bulk of the population, which in 1880 amounted to 35,374, are Lutherans. The capital is Biickeburg, and Stadthagen is the only other town. Under the constitution of 1868 there is a legisla- tive diet of fifteen members, ten of whom are elected by the towns and rural districts and three by the nobility, clergy, and educated classes, while the remaining two are nominated by the prince. Schaumburg-Lippe sends one deputy to the Federal Council, and has one vote in the Reichstag. It contributes a battalion of riflemen to the imperial army. The budget of 1881-82 showed an estimated revenue of £25,750, which was balanced by the expenditure. The public debt is about £18,000.

History.—The district now named Lippe was inhabited in the earliest times of which we have any record by the Cherusci, whose leader Arminius annihilated the legions of Varus in the Teuto- burgian Forest (9 A.D.). It was afterwards occupied by the Saxons, and was subdued by Charlemagne. The founder of the present reigning family, one of the most ancient in Germany, was Bernard I. (1128-58), who received a grant of the territory, till then called the countship of Haholt, from the emperor Lothair, and assumed the title of lord of Lippe. Bernard VIII., who with his people cmbraced the tencts of the Reformation in 1456, was the first to style himself count of Lippe. In 1613 Lippe was divided among the three sons of Simon VI., the lines founded by two of whom still exist, while the third (Brake) became extinct in 1709.

Lippe-Detmold was the patrimony of the cldest son, whose descendants became princes of the empire in 1789. In 1809 it joined the Confederation of the Rhine, and in 1813 the German Confederation. Under the prudent government of the Princess Pauline (1807-20) the little country enjoyed great prosperity. Her son, Paul Alexander Leopold, ruled in the same spirit, and in 1836 granted the charter of rights on which the government is now based. In 1842 Lippe entered the German Customs Union

(Zollverein), and in 1866 it threw in its lot with Prussia and joined the North German Confederation.

Philip, the youngest son of Simon VI. (see above), received but a scanty share of his father’s possessions, but in 1640 he inherited a large part of the countship of Schaumburg, including Biickeburg, and adopted the title of count of Schaumburg-Lippe. The ruler of this territory became a sovereign prince in 1807. In 1866 the prince at first sided with Austria, but afterwards entered the Ger- man Confederation.

For further information consult Falkmann, Beitrdge 212 Geschichte des Filrst- enthums Lippe, 1869; Schikedanz, Das Fiirstenthum Lippe-Detmold in geo- graphischer, statestischer, und geschichtlicher

Beztehung, 1830; ‘“ Erinnerungen aus dem Leben der Fiirstin Pauline,” in Sybel’s Historische Zeitschrift, 1861.

LIPPI, the name of three celebrated Italian painters.

I. Fra Frurppo Liprr (1412-1469), commonly called Lippo Lippi, one of the most celebrated painters of the Italian quatrocento, was born in Florence,—his father, Tommaso, being a butcher. His mother died in his earliest infancy, and his father ¢wo years later. His aunt, a poor woman named Monna Lapaccia, then took charge of him ; and in 1420, when only eight years of age, he was registered in the community of the Carmelite friars of the Carmine in Florence. Here he remained till 1432, and his early faculty for fine art was probably developed by studying from the works of Masaccio in the neighbouring chapel of the Brancacci. Between 1430 and 1432 he executed some works in the monastery, which were destroyed by a fire in 1771 ; they are specified by Vasari, and one of them was particularly marked by its resemblance to Masaccio’s style. Eventually Fra Filippo quitted his convent, but it appears that he was not relieved from some sort of religious vow; there is a letter of his, dated in 1439, in which he speaks of himself as the poorest friar of Florence,and says he is charged with the maintenance of six marriageable nieces, In 1452 he was appointed chaplain to the convent of 8. Giovannino in Florence, and in 1457 reetor (Rettore Commendatario) of 8. Quirico at Legnaia,and his gains were considerable, and even uncommonly large from time to time; but his poverty seems to have been chronic none the less, the money being spent, according to one account, in frequently recurring amours.

_ Vasari relates some curious and romantic adventures of Fra Filippo, wkich modern biographers are not inclined to believe. Except through Vasari, nothing whatever is known of his visits to Ancona and Naples, and his inter- mediate capture by Barbary pirates and enslavement in Barbary, whence his skill in portraitsketehing availed to release him. The doubts thrown upon his semi-marital relations with a Florentine lady appear, however, to be somewhat arbitrary; Vasari’s aecount is circumstantial, and in itself not greatly improbable, and to say that he

is the sole authority for the facts goes but a small way towards invalidating them. Towards June 1456 Fra Filippo was settled in Prato (near Florence) for the purpose of fulfilling an important commission which had been given him to paint frescos in the choir of the cathedral. Before actually undertaking this work he set about painting, in 1458, a picture for the convent chapel of St Margaret of Prato, and there saw Lucrezia Buti, the beautiful daughter of a Florentine, Francesco Buti; she was either a novice or a young lady placed under the nuns' guardianship. Lippi asked that she might be permitted to sit to him for the figure of the Madonna; he made passionate love to her, abducted her to his own house, and kept her there spite of the utmost efforts the nuns could make to reclaim her. The fruit of their loves was a boy who became the painter, not less celebrated than his father. Filippino Lippi (noticed below). Such is substantially Vasari's narrative, published less than a century after the alleged events ; it is not refuted by saying, more than three centuries later, that perhaps Lippo had nothing to do with any such Lucrezia, and perhaps Lippino was his adopted son, or only an ordinary relative and scholar. The arguinent that two reputed portraits of Lucrezia in

paintings by Lippo, one as a Madonna in a very fine picture in the Pitti gallery, and the other in the same character in a Nativity in the Louvre, are not alike comes to very little; and it is reduced to nothing when the disputant adds that the Louvre painting is probably not done by Lippiat all. This painting comes, however, from St Margaret's at Prato, and is generally considered to be the very one on which Vasari's story hinges.

The frescos in the choir of Prato cathedral, being the stories of the Baptist and of St Stephen, represented on the two opposite wall spaces, are the most important and monumental works which Fra Filippo has left, more especi- ally the last of the series, showing the ceremonial mourning over Stephen's corpse. This contains a portrait of the painter, but which is the proper figure is a question that has raised some diversity of opinion. Some of the subjects are legendary, as, for instance, the attempt of the devil to substitute a changeling for the infant protomartyr. At the end wall of the choir are 8. Giovanni Gualberto and S. Albert, and on the ceiling the four evangelists,

The close of Lippi's life was spent at Spoleto, where he had been commissioned to paint, for the apse of the cathedral, some scenes from the life of the Virgin. In the semidome of the apse is Christ crowning the Madonna, with angels, sibyls, and prophets. This series, which is not wholly equal to the one at Prato, was conipleted by Fra Diamante after Lippi's death.

That Lippi died in Spoleto, on or about 8th October 1469, is an undoubted fact ; the mode of his death is again a matter of dispute. It has been said that the pope granted Lippi a dispensation for marrying Lucrezia, but that, before the permission arrived, he had been poisoned by the indignant relatives either of Lucrezia herself, or of some lady who had replaced her in the inconstant painter's affections, This is now generally regarded as a fable; and it may very well be such, although the incident does not present any intrinsic improbability in relation to the Italy of the 15th century. Fra Filippo lies buried in Spoleto, with a monument erected to him by Lorenzo the Magnifi- cent; he had always been zealously patronized by the Medici family, beginning with Cosmo Pater Patris. Francesco di Pesello (called Pesellino) and Sandro Botticelli were among his most distinguished pupils.

Some leading pictures by Lippi not already mentioned are the following. In 1441 he painted an altarpiece for the nuns of S. Ambrogio which is now a prominent attraction in the Accademia of Florence, and has been celebrated in Browning's well-known poem. It represents the Coronation of the Virgin among angels and saints, of whom many arc Bernardine monks. One of these, placed to the right, is a half-length portrait of Lippo, pointed out by an inscrip- tion upon an angel's scroll " Is perfecit opus." 'The price paid for this work in 1447 was 1200 Florentine lire, which secms surprisingly or even unaccountably large. For Gcminiano Inghirami of Prato he painted the death of St Bernard, a fine specimen still extant. His principal altarpiece in this city is a Nativity in the refectory of S. Domenico,—the Infant on the ground adored by the Virgin and Joseph, between Sts George and Dominic, in a rocky landscape, with the shepherds playing and six angels in the sky. In the Uffizi is a fine Virgin adoring the infant Christ, who is held by two angels ; in the London National

Gallery, a Vision of St Bernard. The picture of the Virgin and Infant with an Angel, in this saine gallery, also ascribed to Lippi, is disputable.

Few pictures are so thoroughly enjoyable as those of Lippo Lippi; they show the naiveté of a strong rich nature, redundant in lively and somewhat whimsical observation. He approaches religious art from its human side, and is not pietistic though true to a phase of Catholic devotion. He was perhaps the greatest colourist and technical adept of his time, with good draughtsmanship,—a naturalist, with less vulgar realism than some of his contemporaries, and with much genuine episodical animation, including semi-humorous incidents and low characters. He made little effort after perspective and none for foreshortenings, was fond of ornamenting pilasters and other architectural features. Vasari says that Lippi was wont to hide the cxtremitics in drapery, to evade difficulties. His carcer was one of continual development, without fundamental variation in style or in colouring. In his great works the proportions are larger than life.

LIP—LIP

II. Fitiprrno or Lipprno Liprr (1460-1505) was the natural son of Fra Lippo Lippi and Lucrezia Buti, born in Florence and educated at Prato. Losing his father before he had completed his tenth year, the boy took up his avocation as a painter, studying under Sandro Botticelli, and probably under Fra Diamante. The style which he formed was to a great extent original, but it bears clear traces of the manner both of Lippo and of Botticelli,—more ornamental than the first, more realistic and less poetical than the second. His powers developed early ; for we find him an accomplished artist by 1480, when he painted an altarpiece, the Vision of St Bernard, now in the Badia of Florence ; it is in tempera, with almost the same force as oil painting. Soon afterwards, probably from 1482 to 1490, he began to work upon the frescos which completed the decoration of the famous Brancacci chapel in the Carmine, commenced by Masolino and Masaccio many years before. He finished Masaccio’s subject of the Resurrection of the King’s Son, and was the sole author of Paul’s Interview with Peter in

Prison, the Liberation of Peter, the Two Saints before the Proconsul, and the Cruci- fixion of Peter. These works, were none others extant from his hand, are sufficient to prove that Lippino stood in the front rank of the artists of his time. The dignified and expressive figure of St Paul in the second-named subject has always been particularly admired, and appears to have furnished a suggestion to Raphael for his Paul at Athens. Portraits of Luigi Pulci, Antonio Pollaiuolo, Lippino himself, and various others are to be found in this series. In 1485 he executed the great altarpiece of the Virgin and Saints, with several other figures, now in the Uffizi Gallery. Another of his leading works is the altar- piece for the Nerli Chapel in §. Spirito—the Virgin En- throned, with splendidly living portraits of Nerli and his wife, and a thronged distance. In 1489 Lippino was in Rome, painting in the church of the Minerva, having first passed through Spoleto to design the monument for his father in the cathedral of that city. Some of his principal frescos in the Minerva are still extant, the subjects being in celebration of St Thomas Aquinas. In one picture the saint is miraculously commended by a crucifix; in another, triumphing over heretics. In 1496 Lippino painted the Adoration of the Magi now in the Uffizi, a very striking picture, with numerous figures. This was succeeded by his last important undertaking, the frescos in the Strozzi Chapel, in the church of S. Maria Novella in Florence— Drusiana Restored to Life by St John the Evangelist, St John in the Cauldron of Boiling Oil, and two subjects from the legend of St Philip. These are conspicuous and attractive works, yet somewhat grotesqueand exaggerated,— full of ornate architecture, showy colour, and the distinctive peculiarities of the master. Filippino, who had married in 1497, died in 1505 of an attack of throat disease and fever, aged only forty-five. His character for amiability and courtesy is described in very laudatory terms by Vasari. The best-reputed of his scholars was Raffaellino del Garbo.

Like his father, Filippino had a most marked original genius for painting, and he was hardly less a chief among the artists of his time than Fra Filippo had been in his; it may be said that in all the annals of the art a rival instance is not to be found of a father and son each of whom had sueh pre-eminent natural gifts and leadership. The father

displayed more of sentiment, and candid sweetness of motive ; the son more of richness, variety, and lively pietorial combination. He was admirable in all matters of decora- tive adjunct and presentment, sueh as draperies, Jandscape back- grounds, and aecessories ; and he was the first Florentine to intro- duce a tasto for antique dctails of costume, &c. He formed a large collection of objeets of this kind, and left his designs of them to his son. In his later works there is a tendeney to a mannered development of the extremities, and generally to facile overdoing. The London National Gallery possesses a good and characteristic though not exactly a first-rate specimen of Lippino, the Virgin and Child between Sts Jerome and Dominic.

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IIL Lorenzo Lrppt (1606-1664), a painter and poet, was born in Florence. He studied painting under Matteo Rosselli, the influence of whose style, and more especially of that of Santi di Tito, is to be traced in Lippi's works, which are marked by taste, delicacy, and a strong turn for portrait-like naturalism. His maxim was "to poetize as he spoke, and to paint as he saw." After exercising his art for some time in Florence, and having married at the age of forty the daughter of a rich sculptor named Susini, Lippi went as court painter to Innsbruck, where he has left many excellent portraits. There he wrote his humorous poem named Malmantile Racquistato, which was published under the anagrammatic pseudonym of " Perlone Zipoli." Lippi was a friend of Salvator Rosa, and was a. . man of pleasant and generous temper, and very polite. He was, however, somewhat self-sufficient, and, when visiting Parma, would not look at the famous Correggios there, saying that they could teach him nothing. He died of pleurisy in 1664.

The most esteemed works of Lippi as a painter are a Crucifixion in the gallery at Florence, and a Triumph of David whieh he executed for the saloon of Angiolo Galli, introducing into it portraits of the seventecn children of the owner. His poem the Malmantile Racquistato is a burlesque romance, mostly compounded out of a variety of popular tales ; its principal subject-matter is an expedition for the recovery of a

fortress and territory whose queen had been expelled by a female usurper. It is fall of graceful or raey Florentine idioms, and is counted by Italians as a ‘“‘testo di lingua.” Lippiis more generally or more advantageously remem- bered by this poem than by anything whieh he has left in the art of pai It was not published until 1688, several years after his

eath. (W. M. R.)

LIPSIUS, Justus (1547-1606), the Latinized form of Joest Lips, an eminent humanist of the 16th century, born 18th October 1547, at Overyssche, a small village in Brabant, about half way between Brussels and Ottignies. Sent early to the Jesuit college in Cologne, he was removed at seventeen to the university of Louvain by his parents, who had some reason for fearing that he might be induced to become a professed member of the Society of Jesus But he had received at Cologne two mental tendencies from which he never emancipated himself. One of these, which was suppressed or suspended in middle life, asserted itself later in his return to the bosom of the Catholic Church before his death. The other, derived from his Jesuit train- ing, showed itself in his merely rhetorical or verbal view of classical literature, of which the one interest lay in its style.

ee rushed into print at twenty with one of those volumes of miscellaneous remarks then in vogue (Variarum Lectionum Libres Tres, 1567), the dedication of which to Cardinal Granvella procured him an appointment as Latin secretary, and a visit to Rome in the retinue of the cardinal. Here Lipsius remained two years, using his spare time in study of the Latin classics, in viewing the monuments, collecting inscriptions, and handling MSS. in the Vatican. A comparison of a second volume of miscellaneous criticism (Antiquarum Lectionum Libri Quingue, 1575), published after his return from Rome, with the Variw Lectiones of eight years earlier shows that he had advanced from the notion of purely conjectural emendation to that of emending by collation, and that he had learnt to distinguish between a “good” and a “bad” MS. In Rome he also made the acquaintance of Muretus, Paullus Manutius, and the other

humanists of the catholic reaction who were then in credit there. He was also noticed by Cardinal Sirleto and Fulvio Orsini; but he can hardly have even seen in the street Sigonio and Vettorio, and the introduction of these cele- brated names is perhaps only a stylistic flourish of the biographer Le Mire, to whom we owe the only original account of Lipsins's life. In 1570 he wandered over Burgundy, Germany, Austria, Bohemia, in search of learn-

ing and learned acquaintance, and was engaged for more | ing against them (Hall's Lpzstles, cent. i. ep. 5). Lipsius

than a year as teacher in the university of Jena, a position which implied an outward conformity to the Lutheran Church. On his way back to Louvain, he stopped some time at Cologne, where he must again have comported himself as a Catholic. Here he married, but the union was without issue, and in other respects did not conduce to happiness, as we gather from various allusions scattered through Lipsius's letters. He returned to Louvain, but was soon driven by the civil war to take refuge in Antwerp, where he received, in 1579, a call to the newly founded university of Leyden, as professor of history.

At Leyden, where he must have outwardly conformed to _the Calvinistic creed and worship, Lipsius remained eleven years,—years about which his Catholic biographer Le Mire has nothing to tell, but speaks of the period as an enforced temporary sojourn among the infidels, —till the restoration of peace allowed him to return to his home in Brabant. In truth, this period of Lipsius's life was the period of his greatest productivity. It was now that he prepared his Seneca, and that he perfected, in successive editions, his Tacitus. To edit and comment on two authors of the first class, such as Tacitus and Seneca, in addition to the daily drudgery of teaching, might seem work enough for eleven years. But Lipsius's industry enabled him, over and above, to bring out, from the press of Plantin at Antwerp, a series of works of varied character and contents, some of pure scholarship, others

collections from classical authors, and others again of more general interest. Of this latter class was a treatise on politics (Politicorum Libri Sex, 1589), in which he let it be seen that, though a public teacher in a country which professed toleration, he had not departed from the state maxims of Alva and Philip II. He lays it down that a Government should only suffer one religion to exist in its territory, and that dissent should be extirpated by fire and sword. This frank avowal of what were known to be his real sentiments might have easily had disagreeable consequences for the author, if he had not been sheltered from the attacks to which it exposed him by the prudence of the authorities of Leyden. Lipsius was prevailed upon to publish a declaration that his expression ‘“ Ure, seca,” was not intended of material fire and sword, but was only a metaphor for “ vigorous treatment.”

The time at last arrived when Lipsius, who had always been somewhat ill at ease in his Calvinistic disguise, was to throw it off and return into the bosom of the church. In the spring of 1591 he left Leyden under pretext of taking the waters at Spa for the relief of a liver complaint. He went to Mainz, where he was reconciled to the church by the instrumentality of the Jesuit fathers.) The event was one which deeply interested the Catholic world, and mvitations poured in on Lipsius from the courts and universities of Italy, Austria, and Spain, But he preferred to remain in his own country, and after two years of unsettled residence at Liége, Spa, d&c., settled at Louvain, as professor of Latin in the Collegium Buslidianum. He was not expected to teach, and his trifling stipend was eked out by the appointments of privy councillor and historiographer to the king of Spain,

From this time till his death Lipsius continued to publish antiquarian collections and dissertations as before. But he was, in fact, lost to learning, His name and fame, and his sententious and amusing style, were placed at the disposal of the Jesuits, and used by them to restore the credit of two local images of the Virgin, whose authentic miracles were retailed by Lipsius in two tracts, Diva Virgo Hallensis, and Diva Virgo Sichemensis. Joseph Hall, afterwards bishop of Norwich, was at

Spa in the suite of Sir E. Bacon at the time of the appearance of Lipsius's brochures, and was like to have got into trouble by disput-

died at Louvain on the 23d of March 1606, at the age of fifty-eight. His Greek books and MSS. he left to the Jesuit college at Louvain ; the rest of his library, choice rather than extensive, to a nephew. His furred doctor's robe he ordered to be offered at the shrine of the Virgin at Hall.

If, according to the faney of some biographers, Scaliger, Casaubon, and Lipsius be ereeted into a literary triumvirate, Lipsius repre- sents Lepidus. His knowledge of elassieal antiquity was extremely limited. He had but slight aequaintanee with Greek ; ‘‘ pour sa provision ” only, said Sealiger. He is fond of adorning his letters with Greek phrases, his quotations betraying that he is a stranger in that eountry, In Latin literature the poets and Cieero lay out- side his range ; he had no ear for metre, and no taste for poetieal expression. Where he was strong was in the Latin historians and in Roman antiquities. His greatest work was his edition of Tacitus. This author he had so completely made his own that he eould repeat the whole, and offered to be tested in any part of the text, with a poniard held to his breast, to be used against him if he should fail. His Tacitus first appeared in 1575, and was five times revised and correeted by the editor—the last time in 1606, shortly before his death. His Seneca is dated Antwerp, 1605. His Opera Omnia were colleeted in 4 vols., Antwerp, 1637, of which the Wesel edition, 1675, is a verbal reprint in the same number of volumes, but in a smaller form. The first volume contains also Le Mire's Life of Lipsius, whieh had appeared separately in 1607. Both editions eoutain ten centuries of his epistles, to which additions have been made in Epistolarum que in Centuriis non ex ant Decades XIL., &e., Harderwijk, 1621; Burmann's Sylloge, tom. 1. ; Lettres inédites, ed. Delprat, Anist., 1858. On Lipsius's relations with Scaliger see Bernay's J. J. Scaliger, note 40. A bibliographieal list of his separate publications, forty-eight in number, may be found in Nieeron, Alémoires, xxiv. p. 118, (M.. Ba

LIQUEURS are perfumed and sweetened spirits pre- pared for drinking, and for use as a flavouring material in confectionery and cookery. The term liqueur is also applied to certain wines and spirits remarkable for their amount of bouquet, such as tokay and liqueur brandy, &c. Ordinary liquenrs consist of certain mixtures of pure spirit with essential oils and vegetable extracts, and with syrup of refined sugar. A certain number of such prepara- tions have an established reputation; but the methods by which these are compounded, and the precise proportions of the various ingredients they contain, are valuable trade secrets, scrupulously kept from public knowledge.

The raw materials employed in the preparation of liqueurs are—(1) a pure flavourless spirit, which must be free from fusel oil ; (2) various essential oils, on the purity and constant quality of which much of the success of the manufacture depends, or, in place of the oils, the aromatic substances from which they may be distilled; (3) bitter aromatic vegetable substances, fruits, rinds, &c., or their alcoholic extracts called tinctures; (4) fresh juicy fruits possessed of special flavour ; (5) refined sugar prepared in the form of a perfectly smooth colourless syrup; (6) soft or distilled water; and (7) tinctorial substances for those liqueurs in which a particular colour is demanded by fashion. The Freuch, who excel in the preparation of liqueurs, grade their products according to their sweetness and alcoholic streugth into crémes, huiles, or bawmes, which have a thick oily consistency, and eaux, extraits, or elixirs, which, being less sweetened, are perfectly limpid. Liqueurs of British fabrication, generally of inferior quality, are frequently dealt in under the name of cordials. utters form a class of liqueurs by themselves, claiming to possess certain tonic properties and a medicinal value. Certain liqueurs, containing only a single flavouring ingredient, or having a prevailing flavour of a particular substance, are named after that body, as for example—créme de rose, vanille, thé, cacao, anisette, and kiimmel, &c. On the other hand, the liqueurs which in general are most highly prized are compounded of very numerous aromatic prin- ciples, and they are not considered fit for use till they have matured and mellowed for several years.

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The simplest method of preparing liqueurs is by adding the requisite proportion of essential oil to spirit of known strength, and then mixing this with the necessary amount of clear syrup. In this way, indeed, the greater number of the commoner and cheaper kinds are manufactured. Thus for making (say) 20 gallons inferior quality of kiimmel, there are added to 7 gallons of spirit of wine 4} tb of essential oil of caraway seed, 74 drachms of feunel-seed oil, and 15 drops of bitter almond oil. With this preparation is mixed a syrup containing 40 ib of refined sugar dissolved in about 12 gallons of water, and when fined with gelatine or with alum and soda solution the liqueur is ready for use. To prepare, on the other hand, 20 gallons of fine kiimmel liqueur, there would be placed in a simple still, with 10 gallons of spirit and 8 of water, 4 ib of caraway seeds, } tb of fennel, and 2 oz. of Florentine iris root. This mixture after maceration is distilled, the first portion of the distillate being put aside on account of its rough aroma, after which about 8 gallons of fine kiimmel spirit is obtainable. There still may be procured, by forcing the heat, from 3 to 4 gallons of inferior spirit. To the 8 gallons of fine spirit is added a syrup consisting of 60 tb of refined sugar dissolved in 10 gallons of water, the two compounds being thoroughly incorporated with heat in an open vessel. On cooling, the amount of water necessary to make up 20 gallons is added; the liqueur is fined with isinglass, and stored to mature and mellow. All varieties of liqueurs may be made or imitated by both these methods; but as a rule it is only the simple-flavoured and commoner varieties which are compounded by the addition of essential oils and alcoholic tiuctures. Fine liqueurs are made by macerating aromatic bodies and subsequent distillation ; bitters by maceration and straining.

Of trade liqueurs the most highly esteemed in the United King- dom are Chartreuse, Curagoa, Maraschino, and Doppel-Kiimmel or Allasch. Ofall kinds the most famous is Chartreuse, so called from being made at the famous Carthusian monastery near Grenoble. Three qualities are made—green, yellow, and white, the green being the richest and most delicate in flavour. Chartreuse is said to be a most complex product, resulting from the maceration and distillation of balm leaves and tops as a principal ingredient, with orange peel, dried hyssop tops, peppermint, wormwood, angelica seed and root,

cinnamon, mace, cloves, Tonquin beans, Calamus aromaticus, and eardamoms. Curacoa, which is a simple liqueur, is chiefly made in Amsterdam from the dried pecl of the Curagoa orange. The pcel is first softened by maceration in water; then three-fourths of the quantity in preparation is distilled with mixed spirit and water, and the remaining fourth is macerated in a proportion of this dis- tillate for two or three days; the tincture is strained off and expressed and added to the original distilled Curagoa spirit. The flavour of Curagoa is improved by the addition of about one per cent. of Janiaica rum. The centre of the Maraschino trade is at Zara in Dalmatia. Genuine Maraschino is prepared from a variety of cherry—the Marasca—peculiar to the Dalmatian mountain regions. The juice of the cherry fermented and distilled yields the spirit, which is flavoured with the broken cherry kernels themselves. Imitations of Maraschino are easily prepared,—a praiseworthy liqueur resulting from raspberry juice, bitter almonds, and orange- flower water. In the preparation of Allasch—which is a rieh Kitimmel—bitter almonds, star-anise, angclica root, Florentine iris root, and orange peel are used in addition to caraway seeds. Gold-water and silver-water are liqueurs to which small quantities of powdered gold-leaf and silver-leaf have been addcd, on account of their lustre. They are now little used.

Gentian root is the fundamental “bitter” in most of the pre- parations known as Bitters. These compounds, prepared by maeer- ation, are very various in their constitution, but the following isa fair typical sample of the composition of a kind largely used. To prepare 20 gallons of bitters there are taken 6 Tb of gentian, 5b each of cinnamon and caraway sceds, 1 tb of juniper berrics, and 4 tb of cloves. These are macerated in 7 gallons of spirit, 60° over proof, strained and filtered, and to the product is added 10 ib of sugar dissolved in 13 gallons of water, and the resulting liquor is coloured with cochineal.

The following list ineludes the names of the principal commercial liqueurs not already named :—Noyeau (white and pink), trappistine (yellow and green) (from the Abbey de la Grace Dieu), bénédictine (from Fécamp), peppermint liqueur, French cherry brandy or kirscbaer (from Copenhagen), mandarinc, parfait amour, créme de

vanille, créme de rose, thé, café, menthe, cacao, vanille, pomeran- zen, ratafia (from Dantzic), anisette (from Amsterdain and Bor- deaux), kirschenwasser (from Switzerland and the Black Forest), absinthe, and vermouth. (J. PA.)

LIQUIDAMBAR, Liquip Amper, or SWEET Gum, is a product of Liguidambar styraciflua, L., order Hamamelidex, a deciduous tree of from 30 to 50 feet high and attaining 15 feet in circumference in Mexico, of which country it is a native, as well as of the greater portion of the United States. It bears palmately-lobed leaves, somewhat resem- bling those of the maple, but larger. The male and female inflorescences are on different branches of the same tree, the globular heads of fruit resembling those of the plane. This species is nearly allied to Z. orientalis, Miller, a native of a very restricted portion of the south-west coast of Asia Minor, where it forms forests. Itis from the bark of this latter tree that the storax of the ancients (Herod, iii, 107; Diose., i. 79), the medicinal styrax of to-day, is prepared (Bentley and Trimen, Aled. Plants, No. 107). The earliest reeord of the tree appears to be in a Spanish work by F. Hernandez, published in 1651, in which he describes it as a large tree producing a fragrant gum resembling liquid amber, whence the name (ov. Plant., &e, p. 56). In Ray's Historia Plantarum (1686) it is called Styrax liquida. It was introduced into Europe in 1681 by Banister, the missionary collector sent out by Bishop Compton, who planted it in the palace gardens at Fulham.

The wood is very compact and fine-grained,—the heart- wood being reddish, and, when cut into planks, marked transversely with blackish belts. It is employed for veneering in New York. Being readily dyed black, it is sometimes used instead of ebony for picture frames, balusters, &e.; but it is too liable to decay for out-door work. 'The principal product of the tree, however, is the resinous gum which issues from between the bark and wood. It is sometimes called white balsam of Peru, or liquid storax, though it is said by Michaux (Les Végétaux résineux, ii. p. 337) to differ materially from the latter. It is considered to be styptic and to possess healing and balsamic properties, being stimulant and aromatic. It possesses nearly the same properties as the balsam of Peru and of Tolu, for which it is often substituted, us well as for storax. Mixed with tobacco, the gum was used for smoking at the court of the Mexican emperors (Humb., iv. 10). It has been long used in France as a perfume for gloves, &c. It is

mainly produced in Mexico, little being obtained from trees growing in higher latitudes of North America, or in England. For localities where it has been observed, see Pickering's Chron. Hist. of Plants, p. 741.

LIQUORICE. The hard and semi-vitreous sticks of paste, black in colour and possessed of a sweet somewhat astringent taste, known as liquorice paste or black sugar, are the inspissated juice of the roots of a leguminous plant, Glycyrrhiza glabra, the radix glycyrrhize of the pharma- copeia. The plant is cultivated throughout the warmer parts of Europe, especially on the Mediterranean shores, and its geographical limits travel eastward throughout Central Asia to China, where its cultivation is also prosecuted. In the United Kingdom it is grown in Surrey and in York- shire. The roots for use are obtained in lengths of 3 or 4 feet, and varying in diameter from + to 1 inch, soft, flexible, and fibrous, and internally of a bright yellow colour with a characteristic sweet pleasant taste. To this sweet taste of its root the plaut owes its generic name Glycyrrhiza (the sweet root), of which liquorice is a corruption. According to the analysis of Sestini (Gaz. Chim. Ftal., vol. viii. p. 131), the root dried at 110° C. has the following composition : — resin, fat, and colouring matters, 3°220; glycyrrhizin, 6°378; starch, 57-720; cellulose, 19°790; albuminoid substances,

6-373; ammonia (combined), 0'043; asparagine, 2-416; ash, 4:060. It is to the sugar-like body glycyrrhizin in combination with ammonia that the peculiar taste and properties of liquorice root are due. Glycyrrhizin in itself is a tasteless nearly insoluble substance having the com- position of C,,H»,O, ; but in combination with ammonia, potash, or soda it develops its sweet taste. It is easily precipitated from its combination by the influence of mineral acids. Liquorice has been known and its virtues appreciated from the most remote periods, and the root is an article of some commercial importance on the Continent.

Stick liquorice is made by crushing and grinding the roots to a pulp, which is boiled in water over an open fire, and the decoction separated from-the solid residue of the root is evaporated in copper pans till a sufficient degree of concentration is attained, after whieh, on cooling,

it isrolled into the form of sticks or other shapes for the market. The preparation of the juice is a widely extended industry along the Mediterranean coasts; but the quality best appreciated in the United Kingdom is made in Calabria, and sold under the names of Solazzi and Corigliano juice. The liquorice grown in Yorkshire is made into a confection called Pontcfract cakes. Liquorice in various forms is a popular remedy for coughs ; and it is largely used by children asa sweetmeat. It enters into the eomposition of many cough lozenges and other demulcent pre- parations ; and in the form of aromatic syrups and elixirs it is a remarkable effeet in niasking the taste of nauseous medicines, a property peculiar to glycyrrhizin. A considerable quantity of liquorice is used in the preparation of tobacco for chewing. Com- mereial liquorice paste is frequently mueh adulterated, and often contains distinct traces of copper, apparently derived from the vessels in which the juice is inspissated.

LIQUOR LAWS may be divided into the three great systems of free trade, restriction, and prohibition. The system of free trade may mean either that no special licence is required by law for carrying on a traffic in intoxicating liquors, or that such a licence is required, but that the licensing authority is bound to grant it in every case in which certain conditions are complied with. Wherever the determination of these conditions involves an appeal to the discretion of the licensing authority, the system of free trade tends to pass into the system of restriction. For practical purposes it does not matter much whether the law says, “every man of good character is entitled to a licence for a properly constructed house in a suitable locality,” or ‘the magistrate must consider the character of the applicant and of the premises, but is not bound to give reasons for his decision.” But wherever the applicant can submit toa court capable of dealing with evidence the question of fact whether he has fulfilled certain conditions defined by law, the system of free trade may be said in theory to exist. Wherever, on the other hand, the law distinctly affirms an absolute discretion in the magistrate, or lays down a positive principle, such as the “normal number” or the fixed proportion between public-houses and population, the system is properly de- scribed as restriction, or monopoly. This system, again, in its extreme form, tends to pass into

one of prohibition, Under one of the alternative plans permitted by the Swedish licensing law of 1855, generally known as the Gothenburg plan, the municipality begins by the partial, and advances to the total, prohibition of liquor traffic, except by servants of the municipality ; and this plan is sometimes advocated merely as a step towards the suppres- sion of all trade in liquor. In nearly all countries the nature of the trade carried on in public-houses has gub- jected them to a much more rigorous police supervision than ordinary trades. All trades, however, must be carried on under the conditions required by the public comfort and safety ; and to give unlimited licence in such matters to publicans would be to violate social rights not inferior to freedom of industry and trade.

Of recent years there has been a considerable increase in the amount of drunkenness in Kurope generally. There

are no means of determining the law of the increase by reliable statistics, but it seems probable that the increase is confined to the large towns and to the lowest classes. There has also been of late, both in the United Kingdom and on the Continent, a very earnest and animated discus- sion on the policy and results of the various systems of liquor law. It cannot be said that so far any decisive experience has been adduced on the subject. In fact the legislation of Europe is in a very uneasy and changeful state. Thus, prior to the federal constitution of 1874, the eantons of Switzerland were in the habit of directing the municipal authorities to observe a certain proportion between the number of licences and the population. The new constitution, however, laid down the general principle of free trade, and the federal council intimated to the various cantons that it was no longer lawful to refuse a licence on the ground that there was no public need of it. In the previous year precisely the opposite change took place in Denmark. The licence system rested on the law of 29th December 1857, but this was modified by the law of 23d May 1873, which increased the conditions to be fulfilled by those applying for a licence, and conferred upon the communal authorities the power of fixing the maximum number of licences to be granted. Similarly, in France, the liquor law rests upon the decree of 1851, but public opinion is turning against the

absolute discretion reposed in the administrative authority, and the law pro- posed by M. de Gasté and approved of by the chamber of

deputies on 22d March 1878 will probably lead to a system

of greater freedom. In the German empire the various states are still permitted by a law of the confederation, dated 21st June 1869, to restrict the issue of licences to what the public seem to require, but except in Wiirtem- berg this permission seems not to have been used. In Austria the rapid growth of drunkenness in Galicia made

| necessary the severe police law of 19th July 1877, but in

other parts of the empire the exceptionally lenient law of 20th December 1859 seems to be considered sufficient. In the midst of so many fluctuations of opinion, the practical questions of legislation must be decided on general principles and not by experimental evidence. Those who speak and write on the reform of the liquor laws are divided into two great classes—(1) the nephalists, who consider alcohol, in every form, whether in distilled or in fermented liquors, to be poison, and therefore wish the sale of it to be entirely suppressed ; (2) those who see no objection to moderate drinking, especially of the less alcoholic beverages, or at least regard the idea of suppres- sion as an impracticable chimera. In the United Kingdom the nephalists are at present agitating for Sir Wilfrid Lawson's Permissive Bill, which has latterly taken the form of a local option resolution. This means that in each burgh or parish two-thirds of the ratepayers may decide that no licences shall be given, a vote to be taken on the subject every three years. On 17th March 1879 the select committee of the House of Lords on intemperance reported emphatically against the scheme of the Permissive Bill. The committee did not examine witnesses from the United States with respect to the experiments in prohibi- tion which have been made there on a large scale; but it is generally admitted that the Maine Liquor Law has succeeded only in villages and rural districts ; in towns it has failed. So also the Michigan Law, prohibiting the sale of liquor except for medicinal or mechanical purposes, was condemned after twenty years' experience; and in 1875 a licence tax was imposed on dealers in liquor.

The result is the same under those celebrated ‘local option laws” which are in force in some of the United States. These laws pro- ceed from the legislatures of the various States. They sometimes take the form of a gencral prohibition of the sale of intoxicants,

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subject to a vote of the inhabitants in each township or county, but more frequently they merely provide in general terms for the issue of licences in the usual way, unless the local constituency shall otherwise determine. Such lawsare in force in Massachusetts, New Jersey (which had the Chatham Local Option Law of 1871), New Hampshire, Connecticut, and Vermont. But whether they are constitutional or not is a matter of serious controversy in the courts of the United States. On the one hand, it is said that such a law amounts to a delegation by the State of its legislative power, —that it leaves the hands of the senate and general assembly in an unfinished state, commanding nothing, prohibiting nothing. On the other hand, it is said this is a police regulation, which is properly entrusted to county commissioners, or boards of select men for the protection of the health and morals of the localities over which they preside; and it is quite competent for a State to make a law delegating the power to determine some fact or state of things, upon which the law makes, or intends to make, its own action depend, In the case of the States already mentioned the constitutional character of the local option law has been npheld by decision, but in the cases of Delaware, Texas, Indiana, Cali- fornia (Wall’s Case), Iowa, and Pennsylvania, it has been denicd, The question has also been raised in the American courts whether in the case of intoxicants being imported from one State to another a local option law, which prohibits the sale of the imported goods, does not violate the freedom of commerce which is guaranteed to all the States by the American Constitution.!

Among those who are not nephalists a variety of schemes has been suggested. A small minority are in favour of free trade subject to certain conditions. An experiment of this kind was tried by the

Liverpool magistrates in 1853. “The premises were to be of high rateable value ; the excise duty was to be greatly increased ; the licencee was invariably to reside on the premises; and a special police for the inspection of licensing houses was to be pro- vided.” These conditions being complied with, no licence was refused. ‘his experiment was made the subject of inquiry by Mr Villier’s select committee of 1854. That committee, which included Sir George Grey and Lord Sherbrooke (Mr Lowe), reported unanimously in its favour. A similar experiment’ was made in Liverpool during the years 1862-66 without evil results, and also since 1862 in the Prescot division of the county of Lanca- shire. On the Continent the only countries where free trade prevails are Belgium, Holland, Greece, Spain, and Roumania. In certain parts of Bavaria communes possess breweries, the produce of which they are by custom entitled to sell without any licence; and the Rhenish Palatinate has never been subject to the restrictions mentioned below which apply to the rest of the empire. In Belgium licences are unknown. The only tax which the publican pays is the “patent” which is paid by every trade. So strong is the general law in Belgium that in 1866, when the muni- cipal authorities of Antwerp issued a regulation prohibiting the sale of alcoholic drinks in the streets, this was held to be illegal by the court of cassation. The Dutch law is the same as in Belgium. It must not be supposed, however, that the Dutch are satisfied with the present law. The Dutch “society for total abstinence from strong drink” is very active ; and in 1880 the Government presented to the lower chamber a bill, introducing a licence and also the principle of the normal number, the proportion of licences to population varying according to the total population of towns. In Belgium the Association contre V’abus des boissons alcooliques is endeavouring to secure amendments of the law, chiefly of a fiscal and police character, but the introduction of the licence is not suggested. In Germany, with the ex-

1See Cooley, On Constitutional Limitations, and On Taxation, p. 403; Dillon, On Municipal Corporations, i. p. 892; and the recent case of Boyd v. Bryant, 37 Amer. Rep. 6. In some States it has been attempted to prohibit indirectly by raising enormously the licence fee. The subject is frequently before the courts, and it is decided that where the

licensing power is given for revenue purposes there is no limit to the discretiou of the licensing authority, but where it is given for purposes of regulation the fee should not exceed the expense of issuing the licence and inspecting and regulating the licensed trade.

ception of Wiirtemberg and those places where the licence is unknown, the liquor trade is practically free. The law of 1869 declares that a licence can be refused for two reasons only—if the police condemn the structure or situation of the premises, or if the applicant is likely to encourage drunkenness, gaming, reset of theft, or improper meetings. This system may be contrasted with those of Italy and Russia. In Italy, under the law of 20th March 1865, a licence is obtained from the sub-prefect or autorita politica del ctrcondario on the demand of the syndic (sindaco) of the commune and after consulting with the municipal giunta, In Russia, under the decree of 1861 and the com- munal law of 28th June 1870, the licence is got from the municipal or communal council, or, in certain cases, from the owners of land, especially church land. In both countries the licensing authorities have unlimited discretion, which they have exercised so as to multiply public-houses,.enor- mously, Assuming that sufficient guarantees can be got for the respectability of the applicant and the good sanitary condition of his premises, the system of free trade, or of un- restricted licensing on defined conditions, is the only one which can be defended on principle. It is impossible for the magistrates to exercise a just discretion in deciding what public-houses are required for a locality. The fact that an applicant has invested capital in the business and is ready to begin is the best evidence that there is a demand to be supplied. There is, however, no prospect of free trade being established in the United Kingdom. The select committee of 1879 reported against it.

A larger number of licensing reformers support the scheme for introducing the “normal number” to the United King- dom. This was embodied in the bills of Sir Robert Anstruther and Sir Harcourt Johnstone (1876). No new licences were to be granted till the number

had been re- duced to 1 in 500 of the population in towns, and 1 in 300 in country districts. At present the proportion is 1 to 173 of the population in towns in England and Wales. It seems impossible to determine any such proportion ab ante. Even were it possible, the rough classification of towns by population, and the failure to discriminate between various rural districts, would result in great injustice. In Mr Cowen's bill of 1877 and Lord Colin Campbell's bill of 1882 it was proposed to have in each locality a separate licensing board elected annually by the ratepayers. This proposal sins against the recognized principle in the reform of local government that authorities must be con- solidated, not multiplied. The select committee of 1879 suggested that the function of licensing might be entrusted to the proposed representative county boards.

Another scheme, which has the advantage of appealing to modern experience in Europe, was contained in Sir Robert Anstruther's bills of 1872 and 1874 and Mr Chamberlain's bill of 1877. These were all modifications of the Gothenburg system, which Mr Carnegie, a Scotch brewer in Gothenburg, has done much to make known in the United Kingdom. In Sweden, prior to 1855, there was absolute free trade in liquor. The General Licensing Act, passed in that year, gave power to local authorities, subject to confirmation by the provincial governor, to fix annually the number of licences, and to sell them for three years on certain conditions. If acompany, or " bolag," were formed for the purpose of taking all the licences, the local authority might contract with the company for three years. The Act did not apply to beer. The result of this Act has been twofold. In rural districts almost no licences have been issued. In towns, on the other hand, drinking has in- creased of late, and has led to the severe police laws of 18th September 1874 and 15th October 1875. In 1866 Gothen- burg set the example of transferring the whole public-house traffic to a bolag, which undertakes to appropriate no profit

from the business, but to conduct its establishments in the interest of temperance and morality, and to pay over to the municipality the profits made beyond a fair interest on capital. This experiment has been a great financial success, and if developed will relieve the town from the greater part of its local taxation. The example has been followed by every town in Sweden having a population above 5000; and in 1877, after long discussion, it was adopted in Stockholm, the capital, where the number of life licences presented unusual difficulties. Mr Chamberlain proposed that the work done by the Swedish bolag should be attempted by town councils in the United Kingdom. For this purpose he asked power to acquire the freehold of all licensed premises and the interests of the licence holders. The business would then be carried on by the town council, the profits being carried to the credit of the education and poor rates. The powers of the licensing justices would cease on the adoption of the scheme by the town council. The select committee of 1879 recommended that levislative facilities should be given for the adoption of this scheme. It is doubtful, however, if the burden would be generally submitted to, except on the understanding that the local rates would be pro tanto diminished ; and, were this realized, the tendency would be to support the municipality on the liquor trade by extending its operations. ‘

The great mass of opinion in the United Kingdom, however, seeks some modification of the present licensing system. That system is extremely complicated. The wholesale licences are granted by the excise without a magistrate’s certificate, but for nearly all retail licences such a certificate is required. Gencrally, the magistrates have absolute discretion as regards licences to sell on the premises, but in England a licence to sell off the premises can be refuscd only for one or more of the following reasons—no satisfactory cvidence of good character, disorderly house, previous forfeiture of licence by misconduct, want of legal qualification. The English law is contained in the Wine and Beerhouse Act 1869, and the Licensing Act 1872 and 1874.1 The great features of the legislation of 1872 were (1) the introduction of a confirming authority (viz., the licens- ing committee in counties and the whole magistrates in burghs) for the purpose of restricting the issue of new licences ; (2) the quali- fication of annual

value in public-house premises for the purpose of raising the character of those engaged in the trade; (3) the new regulations for closing ; (4) the new regulations of police penalties, especially with reference to the endorsement of convictions on the licence and the forfeiture of the licence. The Act of 1874 abolished the necessity of confirmation in the case of "' off" licences, gave the magistrates absolute discretion as regards the endorsement of convic- tions, and removed from magistrates all discretion as regards closing hours. There are not many peculiarities in the licensing law of Ireland. Public-house licences are gencrally held by shopkeepers, and no qualification of value is required except in the case of beerhouses. Mr Meldon's Act of 1877 (37 & 38 Vict. c. 69) closed public-houses on Sunday. In Scotland prior to 1853 licences were regulated by the Home-Drummond Act (9 Geo. IV. ec. 58), which authorized only one form of certificate for 'common inns."2 In 1846 a select committee reported that the combination of the grocer trade with the sale of spirits to be consumed on the preniises was productive of evil to the working classes. This led tothe Forbes Mackenzie Act of 1853, which was ainended in 1862, upon the report of a royal com- mission 1n 1860 (16 & 17 Vict. c. 67; 25 & 26 Vict. c. 35). It created three licences—(1) for hotels, (2) for public-houses, (3) grocers' licences. Under the hotel licence intoxicating liquors may be sold to lodgers and travellers, On Sundays the public-honscs are closed, and on week days the sale is practically limited to the period between 8 A.M. and 11 p.m. Cameron's Act of 1876 (389 & 40 Vict. c. 26) makes the refusal of a certificate by the magistrate final, and in the case of a new licence requires the confirmation of a county licensing

roe ae or in burghs of a joint committee of magistrates and justices.

Information on this subject is to be found ehiefly in the Reports of roy = missions and seleet committees, It has been seedy disenssed at the emt the Soeial Scienee Association, and there is a large literature of pamphlets and magazine articles, to whieh, among many others, Lord Sherbrooke, Mr Cham- berlain, and Mr Arthur Arnold have eontributed. The reports of the various international eongresses "pour l'étude des questions relatives & l'aleoolisme," may be studied with

advantage. See also Metman's Etudes sur les Legislations Européennes relatives aux débits de boissons alcooliques, Paris, 1879, (W. C. S.)

1 32 & 38 Viet. e. 27; 35 & 36 Viet. c. 94; 37 & 88 Vict. e. 49. ? So also the first English Act, 5 & 6 Edw. VI., provided one form of licenee for " alehouses."'

LISBON (Portuguese, Lisboa), the capital of the king- dom of Portugal, is situated in 38° 42' N. lat. and 9° 5' W. long., on the northern bank of the Tagus (Téjo), at the spot where the river broadens to a width of 9 miles, some 8 or 9 miles from the point where it enters the Atlantic. Standing on a range of low hills, backed by the lofty granite range of Cintra, and extending along the margin of the wide Tagus, Lisbon wears a very noble aspect to those who approach it from the sea. In regard to beauty of position it may rightly claim to be the third of European cities, Constantinople and Naples alone rank- ing before it. The river affords secure anchorage for a very large number of vessels, and the bar at the mouth is easily crossed even in rough weather. Like London, Paris, and Vienna, Lisbon stands in a geological basin of Tertiary formation. 'The upper portion consists of loose sand and gravel destitute of organic remains, below wliicli is a series of beds termed by Mr Daniel Sharpe the Almada beds, composed of yellow sand, calcareous sandstone, and blue clay, rich in marine remains. The greater part of Lisbon stauds on tliose beds which belong to the older Miocene epoch, and are nearly of the same age as those of Bordeaux. Next comes a conglomerate without fossils. These Tertiary deposits, which cover altogether an area of more than 2000 square miles, are separated, near Lisbon, from rocks of the secondary epoch by a great sheet of basalt which covered the Secondary rocks before any of the Tertiary strata were in existence. The uppermost of the Secondary deposits is the Hippurite Limestone, which corresponds to a part of the Upper Chalk of northern Europe. 'The narrow valley of Alcantara, in the immediate neighbourhood of Lisbon, has been excavated in this deposit; and here there are extensive quarries, where abundance of its peculiar shells may be collected.3

Liskon stretches along the margin of the river for 4 or 5 miles, and extends northward over the hills for nearly 3 miles, but much of it is scattered amongst gardens and fields. In the older parts the streets are very irregular, but that portion which was rebuilt after the great earth-quake of 1755 consists of lofty houses arranged in long straight streets. Here are the four principal squares, the handsomest of which, the Praga do Commercio, is open on one side to the river, and on the other three is surrounded by the custom-house and Government offices, with a spacious arcade beneath. In the middle is a bronze equestrian statue of Joseph I., in whose reign the earthquake and restoration of the city took place. At the middle of the north side is a grand triumphal arch, under which is a street leading to another handsome square, the Rocio or Praga do Dom Pedro (built on the site of the Inquisition palace and prisons), where stands the theatre of D. Maria II. The houses are for the most part well built, and are divided into flats for the accommodation of several families. The streets had formerly a bad reputation in regard to cleanliness, but of late years great improvement has taken place in this respect, although no general system of drainage has yet been adopted. They are lighted with gas made from British coal. The public gardens, five in number, are small, but are much frequented in the evenings. The city contains seven theatres and a bull ring. The hotels of Lisbon offer but indifferent accommodation to

3 After careful investigation, Mr Sharpe discovered that the greatest force of the earthquake of 1755 was expended upon the area of the above-mentioned Almada blue elay, and that not one of the buildings standing upon it eseaped destruction. Those npon the slopes of the hills immediately above the elay suffered very severely, and all on the Tertiary strata were more or less injured, whilst none of the buildings on the hippurite limestone or the basalt suffered any damage whatever, —the line at which the earthquake ceased to be destruetive corresponding exactly with the boundary of the Tertiary

beds.

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LISBON

strangers; the shops present little display, and are ill furnished with wares. The markets are tolerably well supplied with meat, fish, and country produce. A large quantity of excellent fruit is brought in for sale during the season.

The king usually resides at the palace of Ajuda, situate on a hill above the suburb of Belem. It is in the Italian style, and was intended to be one of the largest palaces in Europe, but it has been left incomplete. It contains a large library, a collection of pictures, and a numismatic cabinet. There is another royal palace at Lisbon (that of the Necessidades), where former monarchs were wont to reside; and in the neighbourhood of the city are numerous others. Several of the nobility have good and ‘spacious houses in the city, which are dignified with the name of palaces.

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The houses of the British residents are mostly to be found in the elevated district called Buenos Ayres.

Two or three small forts, one on a rock at the mouth of the Tagus, afford a very inadequate defence against the attacks of a hostile fleet. In ascending the river the

picturesque Tower of Belem, built about the end of the 15th century, is seen on the north bank close to the water’s edge. On a rocky hill stands the citadel of St George, surrounded by the most ancient part of Lisbon, composed of narrow tortuous streets, still retaining its old Moorish name, Alfama. The chief naval and military arsenals of the kingdom are at Lisbon.

Attached to the former Here

Fic, 1.—Plan of Lisbon.

troops and for the municipal guard. The churches are numerous, but are nearly all in the same tasteless Italian style; the interiors, overlaid by heavy ornament, contain pictures utterly devoid of merit. The cathedral is gloomy without being grand, but the oldest part behind the high altar may deserve inspection. The largest church in the city is St Vincent's, 222 feet by 82. . The large adjacent convent is now the residence of the cardinal patriarch, In a modern chapel attached to the church the coffined corpses of the monarchs of the house of – Braganza are deposited, and the public are admitted to see them on certain days in the year. Perhaps the most striking church in Lisbon itself is that of the Estrella, with a dome commanding an extensive view, and two towers, the whole design reminding the visitor of St Paul's, London. At St Roque is the famous chapel of St John

the Baptist, designed by Vanvitelli, and made at Rome for King John V., who had been enriched by the discovery of the gold and diamond mines in Brazil. Before being sent to Portugal it was set up in St Peter's, and Benedict»XEV. celebrated the first mass in it. It is composed of" precious marbles with mosaics and ornaments in silverdnd* bronze, and is said to have cost upwards of £120,000″ By far the most interesting architectural object' at Lisbon is, however, the unfinished Hieronymite:church and monastery at Belem. The church was begtin in 1500 near the spot where Vasco da Gama had' embarked three years before on his famous voyage to India." The style is a curious mixture of Moorish Gothic and Renaissance, with beautiful details, The English college was founded in 1628 for the education of British Roman Catholics ; and the Irish Dominicans have a church and convent originally established for the educe-

tion of youths intended for the priesthood. Ecclesiastically Lisbon is a patriarchate, the holder of the dignity being at the head of the clergy of the kingdom, and president of the chamber of peers. He is usually made a cardinal.

The two chambers of parliament hold their sittings in a huge building, formerly the monastery of St Bento, to which a handsome fagade has

been added. New and ornamental buildings have been erected for the courts of justice and the municipal chamber. ‘The niint is fitted up with steam machinery on a small scale for coining gold, silver, and copper. Postage stamps and inland revenue stamps are printed at this establishment. The national astronomical observatory is near the Ajuda palace, and the meteorological observatory is at the Polytechnic school, which also contains the national museum of natural history. Here is a good collection of the birds of Portugal, with collections in other branches of the zoology of Portugal and the Portuguese possessions in Africa—minerals, fossils, &c. The fossils collected by the Geological Commission to illustrate the geology of the kingdom are preserved in the sequestrated Convento do Jesus,

Lisbon is singularly destitute of works of high art. The gallery of the Academy of Fine Arts contains only a few pictures worth notice. Inthe custody of the academy is an interesting assemblage of gold and silver plate taken from suppressed monasteries. There is also a collection of pictures at the Ajuda palace. At the Carmo church is an archeological museum. The great national library consists for the most part of old theological works and ecclesiastical histories swept out of various suppressed monasteries, and has a collection of 24,000 coins with some Roman bronzes. The Portuguese take little interest in literature, art, or science, and almost everything connected with them is in a neglected state, Literary and scientific societies are few in number and badly supported, the principal one being the Royal Academy of Sciences, founded in 1779. The national printing office, a Government establishment, turns out creditable work, but the booksellers’ shops are few and ill-stocked, Eight or ten daily journals are published in Lisbon, and there are a few weekly news- papers, besides periodicals appearing at longer intervals, and chiefly devoted to special interests.

Several cemeteries have been constructed of late years near Lisbon, the practice of interring in churches having been abandoned. In the English cemetery lies the English novelist Fielding, who died here in 1754; a marble sarcophagus with a long Latin inscription covers his re-mains, The British residents maintain a chaplain who performs service regularly in an adjacent chapel, and the Scottish Presbyterians have

also a place of meeting. The great hospital of S, José contains beds for nine hundred patients, and the large lunatic asylum has accommodation for four hundred patients. The Foundling Hospital takes in more than two thousand children annually, At Belem 1s an excellent establishment where a large number of male orphans and foundlings are fed, clothed, educated, and taught various trades. The Lazarctto is a vast build- ing on the south side of the Tagus, where one thousand 1nmates can be reccived at one time.

Lisbon is connected by railway with Madrid, and there is also a line northward to Coimbra and Oporto, as well as lines southward to Setubal, Evora, and Beja. Submarine cables connect it with England and with Brazil, There is communication by regular lincs of steamers with the Portuguese islands in the Atlantic and the colonies in Africa, and with a great number of ports in Britain, con- tinental Europe, and other parts of the world. Lisbon is the largest port in the kingdom, and its custom-house is a spacious and very substantial fire-proof building worthy of any capital in Europe, in which merchants are allowed to

deposit their goods free of duty for a year, or for two years in the case of Brazilian produce. The duties annually collected here exceed £1,150,000, tobacco alone producing £400,000. Upwards of 1400 foreign vessels, and about 1100 Portuguese ships, including coasters, enter the port annually. The annual importsamount to about £5,600,000, and the exports to £4,500,000. A considerable number of foreign merchants reside in Lisbon, and there are about fifty British firms. The most active commerce is carried on with Brazil and Great Britain, tropical produce being

Fic. 2.—Port of Lisbon.

imported from the one, and manufactured goods from the other, while wine and oil are sent to both in return. The wine for exportation is all made and stored outside the city bounds, so as not to be subject to the octroi duty. There are several joint-stock banks, one of them being British (the New London and Brazilian Bank), as well as private bankers. Manufactures are carried on only to a limited extent. The largest establishment by far is the tobacco manufactory, where 1600

persons are employed, and three millions of pounds are annually manufactured,

The chief supply of water: for the use of the city is brought by an aqueduct 9 miles in length, from springs situated on the north-west. This work, one of the boasts of Lisbon, was completed in 1738, and was so well executed that the great earthquake did it no injury, It crosses the Alcantara valley on thirty-five arches, the principal one being 263 feet above its base, with a span of 110 feet, On reaching the city the water is conducted into a covered massive stone reservoir, which an inscription styles “ urbis ornamentum orbis miraculum,” and thence it flows to the fountains, thirty-one in number, distributed throughout the city. From these fountains it is removed in barrels to the houses by “‘ Gallegos,” men from Galicia, who do the prin- cipal part of the hard work in Lisbon, Although there are two other reservoirs near the city, the supply of water is insufficient for the requirements of the place during the warm season.

For municipal purposes the city is divided into four districts (barros), the whole under one municipal chamber, and two suburban districts under separate chambers. The city chamber consists of twelve members elected by the burgesses every two years. Its revenue is about £75,000. The octroi duties, levied on provisions and fuel entering the city, are ‘collected on account of the Government, and exceed £270,000 a year. The police force is paid by the Government, and consists of the municipal guard, a military force of cavalry and infantry under the orders of the home secretary, and a body of ordinary policemen at the orders of the civil governor, an official appointed by Government. According to the census of 1878 the popu- lation in the thirty-nine parishes of the city and suburbs was 253,000.

_ Climate.—Notwithstanding the mildness of the climate, Lisbon 1s not considered a healthy place of residence, owing ehiefly to the defeetive sanitary arrangements. The annual death-rate is 36 per thousand. The deaths are said to exeeed the births, and the population would therefore decrease were the city nof eontinually recruited from the country. To chest invalids it is not by

any means to be recommended as a winter resort, on account of the frequent and rapid changes of temperature to which it is subject. These changes, and the great difference between the temperature of sun and shade during the winter and spring, are dangerous to the delicate. In summer the heat is great, and all who have the means betake themselves during that season to Cintra or to the seaside. The following data, deduced from twenty years' observations (1856 to 1875) taken at the Meteorological Observatory, a well-managed institution which stands 335 feet above the level of the sea, will afford the means of judging the climate in its principal features. Mean annual tempcrature of shade, 60°°37 Fahr.; mean annual range, 61°‘2; mean daily range, 12°°6 ; highest and lowest registered during the whole period, 98°°8 and 30°°8. Mean annual quantity of rain, 28°84 inches ; greatest and least annual quantity during the period, 38°8 inches (1865) and 1722 inches (1874). The rainfall of 1876, however, amounted to 45 inches, more than one- third of which fell in the month of December. The mean annual number of days on which rain fell was one hundred and twelve, whilst snow fell only three times during the twenty years. The mean atmospherie moisture (100=saturation) was 70°89. The mean annual height of the barometer was 29°8 inches, and its mcan annual range 1°3 inches. ‘The prevailing winds of the winter and autumn are from the north, of the spring and summer from the north-north-west.

History. —The name Lisbon (Portuguese, Lisboa) is a modification of the ancient name Olisipo, also written PE setpe under the in- fluence of a mythical story of a city founded by Ulysses in Iberia, which, however, according to Strabo, was placed by aucient tradition yather in the mountains of Turdetania. Under the Romans Olisipo became a inunicipium with the epithet of Felicitas Julia, but was inferior in importance to the less ancicnt Emerita Augusta (Merida). After the Romans the Goths and the Moslems successively became masters of the town and district. Under the latter the town bore in Arabie the

name of Lashbfina or Oshbfina. It was the first point of Moslem Spain attacked by the Normans in the invasion of 844, When Alphonso I. of Portugal took advantage of the decline and fall of the Almoravid dynasty to incorporate the provinces of Fstremadura and Alemtejo in his new kingdom, Lisbon was the last city of Portugal to fall into his hands, and yielded only after a siege of several months (21st October 1147), with the aid of English and Flemish crusaders who were on their way to Syria. In 1184 the city was again attacked by the Moslems under the power- ful caliph Abu Ya‘kub, but the enterprise failed. In the reign of Ferdinand I., the’ greater part of the town was burned by the Cas- tilian army under Henry II. (13873), and in 1384 the Castilians again beseiged Lisbon, but without success. Lisbon became the scat of an archbishop in 1890, the seat of government in 1422. It gained much in wealth and splendour from the maritime enter- prises that began with the voyage of Vasco da Gama (1497). The patriarchate dates from 1716. From 1586 to 1640 Lisbon was a provincial town under Spain, and it was from this port that the Spanish Armada sailed in 1588. In 1640 the town was captured b. the duke of Braganza, and the independence of the kingdom restored. For many centuries the city had suffered from earthquakes, of more or less violence, but these had been almost forgotten when, on the 1st of November 1755, it was reduced almost in an instant to a heap ofruins. A fire broke out to complete the work of destruction, and betwecn 30,000 and 40,000 persons lost their lives. Pombal, an unscrupulous minister, but a man of great talent, applied himself with unremitting energy both to the protection of the rights of property (for the place was infested by bands of robbers) and to the reconstruction of the buildings. The handsomest part of the present city was erected under his direction, but even to this day there are editices which speak forcibly of the great earthquake. In 1807 Napoleon proclaimed that the house of Braganza had ceased to reign in Kurope, whereupon the regent Don Jolin (his mother the reigning queen Maria I. having become insane) thought it prudent to quit the country for Brazil, and next day a French army under Junot entered the city, possession of which he retained for ten months. He then quietly embarked his army under the protection of the inexplicable convention of Cintra so disgraceful to the English generals. In 1859 Lisbon was stricken by yellow fever, and many

thousands were carried off before the plague was stayed. Lisbon boasts of having been the birthplace of St Anthony, surnamed of Padua, of Camocns, the national epic poet (to whose honour a bronze statue has been placed in one of the squares), and of Pope John XXI. (Af; WG dls)

LISBURN, a market-town, cathedral city, and municipal and parliamentary borough of Ulster, Ireland, partly in Antrim and partly in Down, is situated in a beautiful and fertile district on the Lagan, and on the Ulster Railway, 8 miles south-south-west of Belfast. It is substantially built, and consists principally of one long and irregular street, in the centre of which there is a large open space

for the market. The parish cliurch, which possesses a fine

octagonal tower, is the cathedral church of the united dioceses of Down, Connor, and Dromore, and contains a monument to Jeremy Taylor, who was bishop of the see. Among other buildings are the court-house, the market- house, the linen-lall, and the county infirmary. There are a number of charitable foundations. The staple manu- facture of the town is linen, specially damasks and muslins. There are also bleaching and dyeing works, The popula- tion in 1871 was 9326, and in 1881 it was 10,834.

In the reign of James I. Lisburn, which was then known as Lisnegarvy, was only an inconsidcrable village, but in 1627 it was granted by Charles I. to Viscount Conway, who erected the castle for his residence, and laid the foundation of the prosperity of the town by the introduction of English and Welsh settlers. In November 1641 the town was taken by the insurgents, who on the approach of superior numbers set fire to it. The troops of Cromwell gained a victory ncar the town in 1648, and the castle surrendered to them in 1650. The church was constituted a cathedral by Charles II., from whom the town received the privilege of returning two members to varliament, but since the Union it has returned only one.

LISIEUX, capital of an arrondissement in the depart- ment of Calvados, France, 113 miles by rail west-north- west from Paris, and 24 miles as the crow flies east from Caen, is prettily situated on the Touques, at the point where it is joined by the Orbiquet, 24 miles above Trouville. The Paris and Caen Railway has a branch from Lisieux to Honfleur and Trouville, and another to Orbee, The cathedral church, dedicated to St Peter, founded about 1045, and finished in 1233, which has recently been restored, is the most interesting specimen to be found in Normandy of the transition from the Roman to the Ogival style. It is 360 feet in length, 90 in breadth, and 65 in height ; the south tower rises to 230 feet. The nave is remarkable for harmony of proportion, purity of design, and unity of style. The church of St Jacques, built at the end of the 15th century, contains some beautiful glass of the Renaissance, some remarkable woodwork and old frescos, and a curious picture on wood, restored in 168], The old episcopal palace (Lisieux ceased to be a bishopric in 1801) near the cathedral is now used as a court-house and prison. In the court-house is a beautiful hall called the Salle Dorée. The town still retains quaint examples of the wooden houses of the 14th, 15th, and 16th centuries ; and there are some elegant modern villas. It also possesses a charming public garden and a small museum. The confluence of the two rivers renders it subject to disastrous inundations; but its commerce and industry cause it, notwithstanding, to rank among the richest towns of Normandy. ‘There is a large cattle trade, and the arron- dissement has nearly three hundred factories, employing about ten thousand workmen in the manufacture of cloth and cretonnes. Connected with this industry are numerous spinning-mills, bleacli-fields, and dye-works ; and there are besides wool-mills, chemical works, tanneries, saw-mills, and the like, which bring up the trade of Lisieux to an annual aggregate of upwards of 50 million francs, The population in 1876 was 18,400.

In the time of Cesar, Lisieux, by the name of Noviomagus, was the capital of the Lexovii. Though destroyed by the bar- bariaus, by the 6th century it had become one of the most import- ant towns of Neustria. Its bishopric is said to date from the 3d or 4th century. In 877 it was pillaged by the Normans; and in 911 we find it included in the duchy

by the treaty of St Clair-sur-Epte. Civil authority was exercised by the bishop as count of the town. In 1136 Geoffrey Plantagenet laid siege to Lisieux, which had taken the side of Stephen of Blois. The war lasted five years, and reduced Lisieux and its neighbourhood to the direst extremities of famine. In 1152 the marriage of Henry II. of England to Elcanor of Guienne, which added so largely to his dominions, was celebrated in the cathedral. Thomas & Becket took refuge here, and some vestments used by him are still shown in the hospital chapel. Taken by Philip Augustus and reunited to France in 1203, the town was a

frequent subject of dispute between the contending parties during the Hundred Years' War, the religious wars, and thosc of the League.

Among the bishops of Lisieux may be mentioned Nicholas Oresme, who died in 1382, and Pierre Cauchon, the judge of Joan of Arc, who oceupied this see after he had becn driven from that of Beauvais.

LISKEARD, anciently Liscarret, a market-town and municipal and parliamentary borough in the county of Cornwall, England, is picturesquely situated, partly in a hollow and partly on a rocky eminence, 12 miles east of Bodmin, and 265 west-south-west of London by rail. The church of St Martin, in the Perpendicular style, with a tower of earlier date which possesses a Norman arch, is the largest ecclesiastical building in the county, except the church of Bodmin. III., but its principal charter in 1586, from Queen Elizabeth. The population of the municipal borough (area 810 acres) in 1871 was 4700, and in 1881 it was 4479, that of the parliamentary borough (area 8387 acres) in the same years being 6576 and 5591,

LISLE, Josepx Niconas bE (1688-1768), astronomer, was born at Paris on April 4, 1688, and was educatcd at the Collége Mazarin, His devotion to astronomy dates from 1706, in which year he carefully observed an eclipse of the sun. In 1714 he was admitted to the Academy of Sciences, and in 1720 he made the proposals for determin- ing the figure of the earth, which were carried out under the

auspiccs of that body some years afterwards. In 1724 De Lisle visited England, where, through Newton and Halley, he was received into the Royal Society, and in 1726 he accepted an invitation from Catherine I. to the chair of astronomy in the Imperial Academy of Sciences at St Petersburg, In 1747 he returned to Paris, and was allowed a very imperfect observatory in the Hotel Cluny, where Messier and Lalande were among his pupils. In 1753, previous to the transit of Mercury, he published a map of the world representing the effect of that planet's parallaxcs in different countries, and in 1754 he was made geographical astronomer to the naval department. In 1762 he resigned in favour of Lalande, and withdrew to the abbey of Sainte'Gcnevidve, where he died of apoplexy on September 11, 1768.

Besides numerous papers contributed to the 7ransactions of the Academies of Paris, Berlin, and St Petersburg, he wrote Ménuoires pour servir & Vhistoire et aux progres de lV' Astronomic, de la Géographie, ct de lw Physique (St Petersburg, 1738), Eelipses cireum-Jovialium, ad annos 1734, 1788, et menses priores 1739 (Berlin, 1734), and Mémoire sur les nowvelles déeowvertes au nord de la mer du Sud (Paris, 1752-53). See Asrronomy, vol. ii. p. 757.

LISMORE, an island of 9600 acres, about 10 miles long aud averaging 14 miles broad, with a population in 1881 of 630, lying south-west and north-east at the entrance of the Linnhe Loch in Argyllshire, Scotland. The name means the great enclosure (whether " garden," as the Scotch, or "fort," as the Irish authorities suppose, is uncertain), and occurs in Ireland in the Waterford Lismore and ten other places. " Lis" is one of the most frequent words in compound Irish names, there being one thousand four hundred townlands or villages which begin with it. A Columban monastery was founded there by St Moluag about 592 (Recves, Adamnan, p. 34), whose bell ig perhaps that found in 1814 at Kilmichael Glassary,1 and whose crozier or staff is in the possession of the duke of

- Anderson, Scotland in Early Christian Times, 1st ser., p. 206, where it is figured,

Argyll.? About 1200 the see of Argyll was separated from Dunkeld by Bishop John “the Englishman,” and Lismore soon after became the seat of the bishop of Argyll, some- times called “Episcopus Lismoriensis” (Skene, Celtic Scotland, ii. p. 408 sq.), quite distinct from the bishop of the Isles (Sudreys and Isle of Man), called “ Episcopus Sodoriensis ” or ‘‘Insularum,” whose see was divided into the English bishopric of Sodor and Man and the Scottish bishopric of the Isles in the 14th century (Keith’s Catalogue, p. 173). The monastic establishment of Lismore, at one time consisting of Culdees (Reeves, Cul- dees, p. 49), was converted into a chapter of canons regular and a dean, whose right to elect the bishop was recognized as early as 1249 (Baluze, Afiscel., vii. p. 442; Orig. Paroch. Scot., ii. pt. 1, p. 161).

Lismore has an accidental cclebrity from the Book of the Dean of Lismore, a MS, collection of poems, Gaelic and English, made by James M‘Gregor, vicar of Fortingall and dcan of Lismore (1514-51). A selection of the Gaelic poems, with translations by Rev. ‘I’, M‘Lauchlan, and introduction by Mr W. F. Skene, published 1862, is of value both for the language and the contents. The language is the Gaelic of the West Highlands, spelt phonetically, as spokcn in the beginning of the 16th century, and its variations from ancient Irish on the one hand and modern Gaelic on the other are of much interest to Celtic scholars, Its contents are Ossianic fragments, some of Irish, others of Scotch origin, and a few more recent Gaclic verses. The publication of this work, and J. ¥. Campbell of Islay’s collection from oral sources of the existing bead tiofiaCuslic poetry, have for the first time given a genuinc historical solution of the Ossianic problem (see Ossran). There are remains of thrce castles on Lismore :—at Tireforr a fort of two concentric circles of dry stones, supposed to be Norse or Danish ; at Achindown a square keep with walls 40 feet high, believed to be the palace of the bishop ; and on the west side of the island Castle Corffin, mentioned in a grant to Campbell of Glenurqhay in 1470 (Orig. Par. Se., ii, p. 109).

LISMORE, a market-town and seat of a diocese, partly in Cork but chiefly in Waterford, Ireland, is beautifully situated on a steep eminence rising abruptly from the Blackwater, 40 milcs west-south-

west of Waterford. At the verge of the rock on the western side is the old baronial castle, erected by King John in 1185, which was the residence of the bishops till the 16th century. It was besieged in 1641 and 1643, and in 1645 it was partly destroyed by fire. To the east, on the summit of the height, is the cathedral of St Carthagh, erected in 1663 by the earl of Cork, in the Later English style, with a square tower surmounted by a tapering spire. There are a grammar school, a free school, and a number of charities. Some trade is carried on by means of the river, and there is a salmon fishery. The population of the town in 1871 was 1946.

The original name of Lismore was Maghsciath. Its present name was derived from a monastery, founded by St Carthagh in 633, which became so celebrated as a seat of learning that it is said no less than twenty churches were erected in its vicinity, In the 9th and beginning of the 10th centuries the town was repeat- edly plundered by the Danes, and in 978 the town and abbey were burned by the Ossorians. Henry II., after landing at Waterford, received in Lismore castle the allegiance of the archbishops and bishops of Ireland. In 1518 the manor was granted to Sir Walter Raleigh, from whom it passed to Sir Richard Boyle, afterwards earl ofCork. From the earls of Cork it descended by marriage to the dukes of Devonshire. It was incorporated as a municipal borough in the time of Charles I., when it also received the privilege of re- turning members to parliament, but at the Union it was disfranch- ised, and also ccased to exercise its municipal functions. Lismore is the birthplace of Robert Boyle, but its claim to be the birthplace of Congreve docs not rest on a sufficient foundation.

LISSA (in Polish, Zeszna), a manufacturing town in the circle of Fraustadt, district of Posen, Prussia, is situated on the Breslau and Posen Railway, near the frontier of Silesia. The most prominent buildings are the handsome chateau, the medizval town-house, the three churches, and the synagogue. Its manufactures consist chiefly of cloth, liqueurs, tobacco, and wax; it also

- See Orig. Paroch. Seot., where it is figured.

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possesses several tanneries and a large steam flour-mill, and carries on a brisk trade in grain, cattle, spirits, wine, and furs. The population in 1880 was 11,758, including 3810 Roman Catholics and 1833 Jews.

Lissa owes its origin to a number of Moravian Brothers from Bohemia, who were banished by the emperor Ferdinand I. in the 16th century, and found a refuge on the estate of the Polish family of Leezynski. heir settlement reecived municipal rights in 1548, During the Thirty Years' War the population was reinforeed by other refugees, and Lissa became an important eommereial town, and the ehief seat of the Moravian Brothersin Poland. CoMENIvS (7.v.) was long rector of the eelebrated Moravian school there. Lissa was twice burned down (in 1656 and 1707) during the Swedish and Polish wars.

LISSA (Lat., Zssa ; Slav., Vs), an Austrian island in the Adriatic, 9 miles long, with a greatest breadth of 4 miles, is situated 41 miles from the coast of southern Dalmatia, almost due west of the mouth of the Narenta, in 43° 1' N. lat. and 16° 6' E. long. " The shape is along parallelogram with two breaks, the Porto di S. Giorgio (one of the finest harbours of refuge in the Adriatic) on the eastern short side, and the Vallone di Comisa contained between two long prongs stretching due west and south-west, The outer walls are stony ridges rising from 470 to 610 feet above sea-level, and declining quaquaversally to the fertile plateau which, averaging 400 feet high, forms the body of the island. The apex is Monte Hum, a bald and flattened cone (1868 feet) on the south-west" (Burton). Wine- growing (for which Issa was famous of old) still forms the principal means of subsistence, an average season yielding from 70,000 to 80,000 barrels; but the sardine fishery (15,000 to 25,000 barrels per annum) is of growing importance, and the peasants distil about 24,000 bb of rosemary oil annually. The island is divided into two communes, Lissa and Comisa. In the former is the chief town, Lissa, with the palace of the old Venetian counts Gariboldi, the former residence of the English governor, the monastery of the Minorites, aud at a little distance to the west the ruins of the ancient city of Issa. The population, 6485 in 1869, was 7871 in 1880.

Issa is said to have been settled by people from Lesbos, the Issa of the Agean. The Parians, assisted by Dionysius the Elder of Syracuse, introduced a colony in the 4th century 3.c. During the First Punie War the Isswans with their beaked ships helped the Roman Duilius; and the great republie, having defended their island against the attacks of Agron of Ilyria and his queen Teuta, again found them faithful and servieeable allies in the war with Philip of Macedon. As early as 996 we find the Venetians in possession of the island, and, though they retired for a time before the Ragu- sans, their power was effectually established in 1278. Velo Selo, whieh by that time had beeome the chief settlement, was destroyed by Ferdinand of Naples in 1483, and by the Turks in 1571. The present city arose shortly afterwards. During the Napoleonic wars Lissa was oceupied by the French, but the Eng- lish defeated their squadron in 1810, and kept possession of the island till July 1815, erecting fortifications (dismantled in 1870) and making it a centre of operations. In 1866 the Italians under Persano made an attack on Lissa, but were defeated by the Austrians under Tegetthoff— the battle being fought about 10 miles north of

the harbour. See Willsinson (1848); Neale (1861); Brackenbury, in the Times, August 14, 1866 ; Revue marit. et col., 1867; and Burton In Journ. Roy. Geog. Soc., 1879.

LISTON, Joun (1776-1846), comedian, was the son of a watchmaker in Soho, London, where he was born in 1776. While the teacher of a day school near Leicester Square, he began to take part in private theatricals, and soon conceived a passion for the stage. He made his début at a small theatre in the Strand, and shortly afterwards obtained an engagement at Dublin theatre, where, although he adopted tragedy as his role, his natural talent for acting attracted the attention of Stephen Kemble, who engaged him for bis theatre at Newcastle-on-Tyne. Discovering accidentally that his forte was not tragedy but comedy, Liston displayed in his personation of old men and country boys a fund of drollery and humour which proved irre- sistible. An introduction to Charles Kemble led to his

| appearance at the Haymarket in 1805 as Zekiel Homespun,

and from this time he occupied an unrivalled position in his own line of performance, his broad humour being tempered by true artistic finish, while he possessed an original power of creation which, with his boundless faculty in the elaboration of absurdities, filled up meagre and commonplace outlines with the characteristics of vivid individuality. Paul Pry, first represented in 1825, and always his most popular part, soon became to many a real personage. Liston played successively at Covent Garden, Drury Lane, and the Olympic, and remained on the stage till almost the close of his life. He died March 22, 1846.

LISTON, Rozertr (1794-1847), an eminent Scottish surgeon, was born on the 28th of October 1794, at Eccle- fechan, where his father was parish minister. Te com- menced the study of anatomy under Dr Barclay in Edin- burgh University in 1810, and soon became a skilful anatomist. After eight years' study, he began his career as a lecturer on anatomy and surgery in the Edinburgh School of Medicine; and in 1827 he was elected one of the surgeons to the Royal Infirmary. In 1835 he was invited to fill the chair of clinical surgery in University College, London. He held the appointment until his death, on the 7th of December 1847. Liston was a teacher more by what he did than by what he said. He taught simplicity in all operative procedures; fertile in expedients, of great nerve, and of powerful frame, his name is remembered at the present day as a bold and rapid operator. He inspired all around with confidence, and every one present at his operations felt that the knife in his hands, however rapidly he worked, was guided with skill founded upon knowledge. He was the author of Zhe Elements of Surgery and Practical Surgery, and made several improvements in methods of amputation, and in the dressing of wounds.

LITANY. This word (Arraveia), like dur) (both from Aitouat), is used by Eusebius and Chrysostom, most commonly in the plural, in a quite general sense, to denote a@ prayer, or prayers, of any sort whatever, whcther public or private ; it is similarly employed iu the law of

Arcadius (Cod. Theod., xvi. tit. 5, leg. 30), which forbids heretics to hold assemblies in the city “ad litaniam faciendam.” But some trace of a more technical meaning is found in the epistle (Zp. 63) of Basil to the church of Neocesarea, in which he argues, against those who were objecting to certain innovations, that neither were “litanies” used in the time of Gregory Thaumaturgus. The nature of the recently introduced litanies, which must be assumed to have been practised at Neoczsarea in Basil’s day, can only be vaguely conjectured ; probably they had many points in common with the “rogationes,” which, according to Sidonius Apollinaris, had been gradually coming into occasional use in France about the beginning of the 5th century, especially when rain or fine weather was desired, and which, so far as the three fast days before Ascension were concerned, were first definitely fixed, for one particular district at least, by Mamertus or Mamercus of Vienne (c. 450 a.D.), We gather that they were penitential and intercessory prayers offered by the community while going about in procession, fasting, and clothed in sackloth. Sidonius alludes to the incongruity of men going “ castorinati ad litanias.” In the following century the manner of making litanies (litanias facere) was to some extent regulated for the entire Eastern empire by one of the Wovels of Justinian, which forbade their celebration without the presence of the bishops and clergy, and ordered that the crosses (which were carried about in procession) should not be deposited elsewhere than in churches, nor be carried by any but such persons as were duly appointed to doso. ‘The first synod of Orleans (511 4.D.) in its twenty-seventh canon enjoins

for all Gaul that the “litanies” before Ascension be | celebrated for three days; on these days all menials are to be exempt from work, so that every one niay be free to attend divine service. The diet is to be the same as in Quadragesima ; clerks not observing these rogations are to be punished by the bishop. In 517 a.p. the synod of Gerunda provided for twosets of ‘‘litanies”; the first were to be observed for three days (from Thursday to Saturday) in the week after Pentecost with fasting, the second for three days from November 1. A synod of Paris (573) in its tenth canon ordered litanies to be held for three days

at the beginning of Lent, and the fifth synod of Toledo (636) appointed litanies to be observed throughout the kingdom for three whole days from December 14. The first mention of the word litany in connexion with the Roman Church goes back to the pontificate of Pelagius I. (555), but implies that the thing was at that time already old. In 590 Gregory I, moved by the pestilence which had followed an inundation, ordered a " litania septiformis," that is to say, a sevenfold procession of clergy, laity, monks, virgins, matrons, widows, poor, and children. He is said also to have appointed the processions or litanies of April 25 (St Mark's day), which seem to have come in the place of the ceremonies of the old Robigalia. In 747 the synod of Cloveshoe (can. 16 and 17) ordered the litanies or rogations to be gone about by all the clergy and people with great reverence,—on April 25 "after the manner of the Roman Church," and on the three days before Ascension "after the manner of our ancestors." The latter are still known in the English Church as Rogation Days. (Games, horse racing, junkettings were forbidden ; and in the litanies the name of Augustine was to be inserted after that of Gregory. The reforming synod of Mainz in 813 ordered the major litany to be observed by all for three days, not with horses or in magnificent attire, but in sackcloth and ashes, and barefoot. The sick only were exempted from this command.

As regards the form of words prescribed for use in these "'litanies" or 'supplications," documentary evidence is somewhat defective. Sometimes it would appear that the "procession" or "litany" did nothing else but chant "Kyrie eleison " without variation. There is no reason to doubt that from an early period the special written litanies of the various churches all showed the common features which are now regarded as essential to a litany, in as far as they consisted of (1) invocations, (2) deprecations, (3) intercessions, (4) supplications. But in details they must have varied immensely. The offices of the Roman Catholic Church at present recognize two litanies, the " Litanie majores " and the ' Litaniz breves," which differ from one another chiefly in respect of the fulness with which details are entered upon under each of the four heads mentioned above. It is said that in the time of Charlemagne the angels Orihel, Raguhel, Tobihel were invoked, but the names were removed by Pope Zacharias as really

belonging to demons. In some medizeval litanies there were special invocations of 8. Sapientia, 8. Fides, S. Spes, 8. Charitas. The major litanies, as given in the Breviary, are at present appointed to be recited on bended knee, alone with the penitential psalms, in all the six week days of ‘Lent when ordinary service isheld. Without the psalms they are said on the feast of Saint Mark and on the three rogation days. They are also chanted in procession before mass on Holy Saturday. The “litany” or “general supplication ” of the Church of England, which is appointed “to be sung or said after morning prayer upon Sundays, Wednesdays, and Fridays, and at other times when it shall be commanded by the ordinary,” closely follows the “‘ Litaniz: majores” of the Breviary, the invocations of saints being of course omitted. A very similar German litany will be found in

the works of Luther. In the Roman Church there are a number of special litanies peculiar to particular localities or orders, such as the “‘Litanies of Mary” or the “ Litanies of the Sacred Name of Jesus.”

LITHGOW, Wittiam (c. 1583-c. 1660), a noted Scot- tish traveller, was born in Lanark, where his father was a burgess, possessed of considerable heritable property. The date generally assigned to his birth is 1583; and he was educated at the grammar scliool of his native town, then celebrated as a seminary of learning. His natural disposition was probably active and restless, as even in his boyhood he tells us that he made voyages to both the Orkneys and the Shetlands, and somewhat later travelled through the Low Countries, Germany, Bohemia, and Switzer- land. The final impelling cause of his leaving Scotland, however, appears to have been sonle savage outrage com- mitted either upon himself or on one nearly connected with him, arising, it is thought, from some love affair, which gave him an intolerable disgust to home. He left his native country about 1608 or 1609, and proceeded to Paris, where he remained ten montlis, and then crossed the Alps to Rome and Naples; after which he wandered through Istria, Dalmatia, Albania, Greece, Asia Minor, Syria, Meso- potamia, Palestine, and Egypt, most of his journey having been

performed on foot. In the course of his travels he escaped innumerable dangers from robbers, and hardships from exposure to inclement weather. He returned to England by Sicily and Paris. Another tour which he made lay through Morocco, Algiers, Tunis, Tripoli, Hungary, Germany, and Poland. On his arrival in London he became an object of interest to King James, who, on the spirit of travel again returning upon him, furnished him with commendatory letters to all kings, princes, dukes, &c., whose territories he might desire to visit. In 1619, accordingly, he went over to France, and thence passed through Portugal and Spain as far as Malaga. There he was apprehended as a spy, and after suffering the most excruciating tortures, first in prison and after- wards in the Inquisition, he was at length released on the interference of the English consul, and allowed to return to England in 1621. The minute description which he gives of the terrible torture to which he was subjected is almost unequalled for horror, and, when he arrived in London, he had the appearance of a man more dead ;than alive. He was carried on a feather bed to Theobald's in order that King James might be an eyewitness of what he called his "martyred anatomy." The whole court crowded to see him. The king commanded that the greatest care should be taken of him, and he was twice sent to Bath at his Majesty's expense. On recovering his health, he was desired by James to apply to Gondomar, the Spanish ambassador, for recovery of the money and other valuables of which he had been plundered by thie governor of Malaga, and for a thousand pounds in repara- tion of his injuries. Gondomar gave fair promises that all his demands should be granted, but nothing was done. Whereupon, having met the ambassador at the royal levee, and reproached him with his perfidy, after high words on both sides, Lithgow furiously assailed him with his fists, in the presence of the king, the imperial ambassador, and the knights and gentlemen of the court. This, of course, was an offence which could not be passed over, and, though his boldness was generally commended, he lad to suffer an imprisonment of nine weeks in the Marshalsea. His latter years are understood to have been spent in his native town, and he is said to have died somewhere about 1660.

_ A portion of his travels appeared in a small volume in London in 1614, but the complete work was not published till 1632. It has been

repeatedly reprinted. It was also translated into Dutch

and published at Amsterdam in his lifetime. His other works are —An Account of the Siege of Breda (1637) at which he had been

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present ; 4A Survey of London and England’s Static, 1643 ; Relation of the Siege of Newcastle, 1645. His poetical remains, collected by James Maidment, were published at Edinburgh in 1863.

LITHIUM, one of the rarer metallic elements, intermediate in its character between sodium and barium. It was discovered in 1817 by Arfvedson in the course of an analysis of petalite in Berzelius’s laboratory. He recognized the presence in this mineral of a new kind of alkali, which his master subsequently named “lithia,” to denote its mineral origin. Lithia, though widely dis- seminated throughout the mineral world—traces of it being found in almost all alkaliferous silicates, in the soils derived from these, and in many mineral waters—nowhere occurs in any abundance, except in the immense masses of lithia-mica (lepidolite) known to exist in Bohemia. Of other lithia-minerals (all rare) we may name petalite and spodumene (both silicates of alumina and alkalies) and triphylline, a mixed phosphate of ferrous, manganous, and lithium oxides. Only lepidolite comes into consideration as a raw material for the preparation of lithia and its salts. But the extraction from it of pure lithia in any form is difficult. The first step is the disintegration of the finely powdered mineral, which may be effected by means of vitriol and hydrofluoric acid (or vitriol and fluor- spar); the silicon goes off as gaseous fluoride, the bases remain as sulphates. Or else we may mix the mineral intimately with quicklime, and by very intense heating of the mixture produce a more highly basic silicate, which is readily disintegrable by acids. In either case it is easy to unite all the bases (Al,O,, Fe,O,, CaO, MgO, Li,O, K,O, Na,O) into a solution of chlorides or sulphates. From it we

precipitate successively and remove by filtra- tion (1) the bases not alkalies or Li,O by means of excess of milk of lime, and (2) the lime introduced by operation (1) by means of carbonate of ammonia. There results a mixed solution of potash, soda, lithia, and ammonia salt, from which the last-named component is easily removed by evaporation to dryness and ignition. For these very tedious operations Troost has substituted an elegant process which, though admittedly imperfect in the analytic sense, lends itself admirably to manufacturing purposes. He mixes ten parts of the finely powdered mineral with ten parts of carbonate of baryta, five parts of sulphate of baryta, and three parts of sulphate of potash, and melts down the mixture in a power- ful wind-furnace. There results a mass which separates spontaneously into a lower layer forming a transparent glass, and an upper one consisting of the sulphates of barium, potassium (sodium), and lithium, the latter representing about three-fourths of the lithia contained in the mineral. By treatment with water the sulphate of baryta is easily ‘removed as an insoluble residue; the mixed alkaline sulphates are converted into chlorides by decomposition with chloride of barium, and fron the dry mixed chlorides approximately pure chloride of lithium is obtained by lixiviation with ether-alcohol, which solvent dissolves only very small proportions of the other chlorides, To purify the crude chloride it is dissolved in water and, by double decomposition with carbonate of soda, converted into a precipitate of carbonate of lithia, Li,CO,, which must be washed with small instalments of water, as it is very appreciably soluble in water. This carbonate of lithia is still contaminated with soda. To purify it fully dissolve it in water with the help of carbonic acid, filter, and evaporate slowly on a water-bath ; the added carbonic acid goes off, and pure carbonate of lithia separates out in crystalline crusts (Troost). One litre of pure water dissolves 12 grammes; 1 litre of water kept saturated with carbonic acid dissolves 52°5 grammes of the carbonate. The dry salt fuses at a red heat, but before doing so loses part of its carbonic acid, which, after cooling, it shows no

tendency to take up again from the atmosphere. Perfectly acid-free lithia, Li,O, can be obtained by heating a mixture of the carbonate and pure charcoal in a platinum crucible, or by heating the nitrate for a long time in a silver one. If the preparation, ultimately, of the hydrate Li,OH,O = 2LiOH is contemplated, the latter operation may be very materially shortened by addition of metallic copper, which reduces the nitric acid. The anhydrous oxide, when treated with water, dissolves without much evolution of heat as hydrate, LiOH, which, by evaporation (in silver) is easily obtained in the solid form. It melts at a dull red heat, but at even higher temperatures loses no water. It dissolves in water (far less abundantly than soda), with formation of a strongly alkaline solution, which neutralizes all acids, with formation of salts. Like baryta, it refuses to form acid sulphates or carbonates (the bodies HLiSO, and HLiCO, exist only in solution), and forms insoluble or almost insoluble salts with carbonic and phosphoric acids (formule Li,CO, and Li,PO,); and, last not least, it is not reducible to metal by charcoal at any temperature. Add to this that the highly deliquescent chloride LiCl, when dehydrated by heating, always loses part of its chlorine as HCl, and we feel tempted to conclude that in the case of lithium, as in that of barium or magnesium, two equivalents are united into one atom Li=Li,=14. But the specific heat of the metal demands the lesser number.} .

Metallic Lithiwm, although long before known to exist, was successfully prepared for the first time in 1855, by Bunsen. He obtained it by fusing the pure chloride in a porcelain crucible, and decomposing the fused salt by a battery of four or six ‘*Bunsens,” using a rod of retort charcoal as a positive and a kuitting wire as a negative pole. The metal separates out in about pea-sized globules, which stick to the wire, and, thanks to the

rotecting action of the fused chloride, can be lifted out and _col- ected without reoxidation, under rock-oil. Lithium is a silver- white metal, of only °58 specific gravity (it floats on rock-oil), somewhat softer than lead, and like it susceptible of being pressed into wire. It tarnishes in air, though far less readily than sodium. When thrown upon water it gradually dissolves as hydrate, with evolution of hydrogen, but without

fusing. The metal melts at 180° C., and at a somewhat higher temperature takes fire and burns into oxide with a brilliant white flame. Hence the characteristic intensely red colour which a colourless gas flame assumes when a lithium salt is volatilized in it must be a property of something else than the metal itsclf; perhaps it is the hydroxide LiOH that emits it. The red lithium flame forms a spectrum consisting chicfly of one brilliant red and a somewhat faint orange line.

Lithia-salt solutions behave to general reagents pretty much like those of potash or soda, from which, however, they differ in the following points :—(1) concentrated solutions are precipitated by carbonate of potash or soda ; (2) even dilute solutions when mixed with phosphate of soda and caustic soda, in the heat more readily, give precipitates of the phosphate PO,Li;, soluble in 2530 parts of plain, and in 3900 parts of ammonia water, more largely in solutions of ammonia salts; (3) unlike potassium salts, they give no precipitate with chloride of platinum. (W. D.

LITHOGRAPHY. The principle upon which the art of lithography is based is very simple—the antagonistic qualities of grease and water. An unctuous composition is made to adhere to a peculiar kind of limestone; the parts thus covered acquire the power of receiving printing ink ; the other parts are prevented from receiving it by the interposition of a film of water; and then by pressing paper strongly upon the stone impressions are obtained. There are two distinct branches in lithography—drawing and printing. Those practising the first are known as lithographic draughtsmen or writers, the second as litho- graphic printers.

The art of lithography was discovered by Alois Senefelder, a native of Prague, born 6th November 1771. His father, Peter Senefelder, was one of the performers of

1 Lithia oxide and carbonate were loug supposed to exert a charac- teristically powerful corrosive action on platinum vessels used for their fusion. This, according to Troost, holds only for such preparations as

are contaminated with rubidia or cesia. The pure lithia com- pounds, even the oxide (and hydrate ?), do not attack platinum.

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the Theatre Royal at Munich. The son Alois wished to follow the same profession, but, his father being opposed to this, he went to the university of Ingolstadt, and devoted himself to the study of jurisprudence, Owing to the death of his father shortly afterwards, he was unable to continue his studies at the university, and, yielding to his old inclination, he tried to support himself as a performer and author, but without success. In order to accelerate the publication of one of his works, he frequently spent whole days in the printing office, and thus became acquainted with all the particulars of the process of print- ing. It appeared so simple that he conceived the idea of purchasing a small printing press, thus enabling himself to print and publish his own compositions ; but his means were inadequate, and to this circumstance we probably owe the invention of lithography. Unable to pay for the engraving of his compositions, he attempted to engrave them himself. He tried numerous experiments with little success ; tools and skill were alike wanting. Copper-plates were expensive, and the want of a sufficient number entailed the tedious process of grinding and polishing afresh those he had used. About this period his attention was accidentally directed to a fine piece of Kellheim stone which he had purchased for the purpose of grinding his ink. His first idea was to use it merely for practice in his exercises in writing backwards, the ease with which the stone could be ground and polished afresh being the chief inducement. The idea of being able to take impres- sions from the stone had not yet occurred to him. While he was engaged one day in polishing a stone slab on which to continue his exercises, his mother entered the room and desired him to write her a bill for the washer- woman, who was waiting for the linen. Neither paper nor ink being at hand, the bill was written on the stone he had just polished. The ink used was composed of wax, soap, and lamp-black. Some time afterwards, when about to wipe the writing from the stone, the idea all

at once struck him to try the effect of biting the stone with aqua fortis. If the parts written on resisted its action, impressions might then be taken in the same way as from wood engravings. Surrounding the stone with a border of wax, he covered its surface with a mixture of one part of aqua fortis and ten parts of water. The result of the experiment was that at the end of five minutes he found the writing elevated about the tenth part of a line (;45 inch). He then proceeded to apply the printing ink to the stone, using at first a common printer's ball, but soon found that a thin piece of board covered with fine cloth answered better, communicating the ink more equally. He was able to take satisfactory impressions, and, the method of printing being new, he hoped to obtain a patent for it, or even some assistance from the Government. For years Senefelder continued his experiments, until the art not only became simplified, but reached a high degree of excellence in his hands. In later years the king of Bavaria settled a handsome pension on Senefelder. He died at Munich in 1834, having lived to see his invention brought to comparative perfection.

Materials Employed by the Lithographic Artist. —Litho- graphic stones are very compact homogeneous limestones, imported chiefly from Germany. The traffic has its centre in the village of Solenhofen, in the district of Monheim. The Solenhofen stone, in its chemical decomposition, con- sists of lime and carbonic acid. It is generally cut in slabs from 2 to 3 inches in thickness, and is sold by weight. Stones yielding impressions in the lithographic press have been found in England, France, Italy, Canada, and the West Indies; but all are much inferior to the best German stones. Lithographic stones vary in colour from a dull grey or yellow to a light creamy shade, the dark

grey stones being the hardest. They are sometimes uneven in colour, having light and dark patches. These are suitable for ordinary trausfer work; but, in cases where the artist requires to see the effect he is producing during progress (as in chalk drawing), stones of an even grey or drab colour should be selected.

Lithographic ink is composed of tallow (4 0z.), wax (5 0z.), soap (4 oz.), shellac (3 0z.), and quant. suff. of fine Paris black. The inks of

Lemercier and Vanhymbeeck are generally considered as among the best. Lithographic chalk is made in the same manner as the ink, but requires to be burnt sufficiently hard for use indrawing. Excellent lithographic crayons are manufactured by Lemercier of Paris. They are made of several degrees of hardness, copal chalk, used for outlining, being the hardest.

Transfer paper for writing and drawing is prepared by coating the surface of the paper with a composition of size, made from parchment cuttings and flake white. Some- times the coating is composed of starch and glue. Colouring matter, generally gamboge, is added, the object being to show more readily which is the coated side of the paper. The coating is applied with a full brush. For writing, the paper used is thin, for drawing it is thicker; for large subjects ordinary drawing paper is used. It is afterwards glazed by being pulled through the lithographic press, face down, on a smooth stone, or hot pressed. There are several other varieties of transfer papers—a transparent or tracing paper, and a transfer paper for chalk drawing, hav- ing a finely granulated surface. Mr Nelson of Edinburgh patented a method of graining transfer paper by means of stippled plates. The older method was to press the coated surface of the paper on an ordinary sand-grained stone or plate.

Instruments and Appliances used in Lithographic Draw- ing and Writing.—F¥or the finer purposes of lithography ordinary steel pens are useless; “ Perry’s lithographic pen” may be found serviceable when the work is not very delicate. Transfer writers prefer pens of their own mak- ing. These are either made from quills scraped down, before cutting, with a piece of broken glass, until the barrel yields to pressure of the nail, or cut with a pair of sharp scissors from thin sheets of steel prepared for the purpose. This operation is difficult, and requires much skill and practice. Pens are also made of watch springs, reduced to the necessary tenuity by nitric acid and water.

Lithographic brushes are made from red sable crowquill pencils ; a portion of the hair is cut away all round, and only the central part of the brush is used.

Scrapers are employed in correcting the work upon stone, but a penknife or ordinary erasing knife answers the pur- pose equally well.

Crayon holders of the ordinary kind may be used for lithographic chalk. When cut in two and fitted with a wooden handle, they will be found lighter and pleasanter to work with.

The hand-board is a piece of wood about 6 inches wide, three-eighths of an inch thick, and somewhat longer than the stone on which the draughtsman works. It rests upon thick strips of millboard fixed round the edges of the stone, to keep it from touching the part to be drawn on.

Ruling and circle pens, parallel rulers, tracing paper, a tracing point, and red tracing paper, for transferring tracings to paper or stone, are also requisites.

Drawing on Stone-—The Chalk Method.—-For artistic purposes this is perhaps the most important and interesting department of lithography. In preparing the stone for chalk drawing, the surface, instead of being polished, is broken up into minute points or “grained.” The coarseness or fineness of the grain is varied according to the work to be done. A hard stone, free from veins, marks, and chalk

spots, and of a clear grey colour, is selected. It is first ground and pumiced to free it from scratches. A small quantity of the finest gravel sand, or “graining-sand,” is sprinkled over the surface, anda few drops of water added; a smaller stone of the same size and hardness is placed above, face downwards, and moved about with a circular motion ; water is added from time to time, and fresh sand when needed. Care niust be taken that no scratches are caused by grains of coarser sand finding their way to the stone; the stone is afterwards washed in clean water and dried, and the grain tested with a crayon. IE it prove too

coarse or too. fine, or if scratches are dis- covered, the graining is done over again.

The drawing is then traced upon the stone. As it has to be reversed, the tracing is fastened face downwards ; red tracing paper is introduced between, and the outline care- fully gone over with a steel tracing point or a hard pencil. The tracing papers are then removed, and the surface of the stone protected with a sheet of plain paper. The hand-board is placed across to. keep the warmth of the hand from causing the condensation of moisture resulting from its coming in contact with the paper covering the stone. The paper covering the part of the drawing to be first commenced is then removed. The crayons are pointed with the knife, cutting from the point upwards.

Great care and cleanliness are necessary to prevent injury to the work. If the artist wishes to talk he ought first to cover up the surface of the stone, as a drop of saliva falling upon it prevents the penetration of the chemical chalk, and a white spot wilk be the result when the drawing is “brought up” by the printer. If the stone is touched by greasy hands, the form of the fingers and of the skin will appear in black.

The drawing is commenced by outlining. For this pur- pose the hardest chalk (copal) may be used, but No. 1, when it will answer the purpose, is better. The “tinting” or shading follows; lights may be picked out with the scraper or penknife, and ink used when sharp, dark touches are desirable, It is difficult to, rectify mistakes — prevention is better than cure. In reversing the drawing a small hand looking-glass will be found useful.

When completed the drawing is “etched.” There are two different ways of applying the acid—one by flooding the stone with nitric acid diluted with water, the other with acid diluted with gum-water, applied with a flat, soft brush about 4 or 5 inches in width. Although this opera- tion appears simple, it is not without risks; much of the success of the impressions depends upon it. If the stone is too strongly etched, the delicate. tints and lines dis- appear ; if not etched strong enough, the drawing is apt to lose clearness, and run smutty in printing. When the etching is completed, the water is drained off and the stone gummed

and allowedtodry. It may then be put into the hands of the printer for. proving.

Pen and Brush Method:—The surface of the stone is ground and afterwards polished with Water-of-Ayr stone or snake-stone. The drawing or. writing is traced upon the surface in the manner already described. The principal drawback in this method is the necessity of reversing writ- ing and lettering, which cannot be done without consider- able practice. Its advantages over the transfer method scarcely compensate for. the additional difficulties. The stone is etched as in chalk drawing before passing into the printer's hands.

Engraving on stone is chiefly useful in the reproduction of drawings by architects, civil engineers, &c. Its advant- ages are accuracy and sharpness in drawing and printing. A thin film of gum is spread on the surface of the stone, and when dry washed off; a dark ground is then laid on by rubbing in Paris black. Red grounds also are sometimes

used. The tracing, if on a black ground, is made with paper prepared with chrome yellow, if on a red ground with Paris black. Tho method of engraving is simple. The tools are strong needles, firmly fixed in cane handles, and good spring dividers; the incised lines show white upon the black or red ground. When the work is finished they are filled up with fatty ink, and the stone cleared with water and a piece of coarse flannel.

In printing, the stone is damped in the usual way, but the ink is applied with a dabber instead of a roller.

Lithography on Paper, or Transfer Lithography.—By this method the work is done on paper, and afterwards transferred to the stone. The paper has been already described, as also the instruments used in writing and drawing. Theink is prepared by rubbing a small quantity into a saucer of white delft or china, the saucer being first heated to make the ink adhere ; water is then added, and the ink rubbed with the finger till it dissolves. Care has to be taken to make it of the proper

consistency. If pale and thin, it will not transfer properly ; if too thick, it will not flow freely from the pen or brush, and will spread in transferring.

The paper should not be handled or touched, except at the edges. Finger marks from a moist or greasy hand will roll-up black. A piece of clean white paper is kept under the hand when working. The same line must not be gone over twice while wet, as the composition on the surface of the paper is apt to get mixed with the ink and destroy its qualities. In drawing on chalk transfer paper the crayon is used instead of the brush or pen. Dark touches may be put in with ink, and the lights picked out with the knife.

The stone for the reception of transfers is polished free from perceptible scratches, and is generally warmed to make it more susceptible of receiving the ink, The transfer is placed face downwards on the stone, pulled repeatedly through the press, and afterwards removed to the trough, where: hot water is poured over it, It is then peeled off, leaving the ink and the composition on tho stone ; the latter is washed off, and the stone gummed and allowed to dry. The work is afterwards “ proved” by rolling-up, cleaning, etching, and taking the. first impressions.

The transfer method is also applied successfully to the reproduction by lithography of engraved plates, wood en- gravings, and type.

Photo-Lithography.—By this method copies of prints or drawings executed in clear lines or dots can be produced. They may be either of the same or of altered dimensions. The copying is done by photography upon glass ; but, as it is necessary that the negatives should have straight marginal lines, ordinary photographic lenses are not adapted for the purpose—“ rectilinear,” “ aplanatic,” “symmetrical,” and other varieties being used instead. The negative is put into a photographic printing frame, and a piece of sensitive transfer paper placed face downwards upon it, the glass side being exposed to the light. The time of exposure varies according to the intensity of the light and the quality of the negative. When sufficiently exposed it is carried into a dark room, the photographic print taken out of the frame,

laid face downwards on a stone coated over with transfer ink, and pulled through the press. It is then soaked for a few minutes in water warmed to the temperature. of 100°, and the inked side of the paper carefully sponged with gum-water to remove the transfer- ring ink from the parts upon which the light could not act. After being washed in warm water it is allowed to dry, and is then transferred to. the stone and printed from in the usual manner.

Zincography so nearly resembles lithography in its principles that a very few words of explanation will be sufficient. Zinc plates possess the advantage of costing less

and being much more portable than lithographic stones, and are easily cut into convenient sizes. They are grained in the same manner as lithographic stones, a muller of zinc being used instead of one of stone. Drawings on zinc, whether in chalk or ink, are executed on a grained surface. Zine plates are subject to oxidation, and care must be taken to dry them off quickly after graining. The drawing is done precisely in the same way as on stone; the etching solution is applied with a flat camel-hair brush. It con- sists of a decoction of nut-galls; a solution of gum and phosphoric acid is sometimes added. During printing the plate is screwed for support to a block of beech or other hard wood. As neither crayon nor ink penetrates the zinc as they do the stone, the adhesion of the ink forming the drawing is less thorough than in lithography, and greater precautions have to be taken to prevent accidents in printing.

Chromo-Lithography.—Great advances have been made in recent years in this branch of the art, notably in the reproduction of works of an artistic character. Its simplest form is the tint, in several gradations of one colour, printed over drawings in chalk or line ; in its more elaborate forms it includes imitations of water-colour drawings, decorative and ornamental designs, &c. The term “chromo-litho- graphy ” is usually applied only to the more elaborate kinds of colour printing.

All lithographs in two or more colours are printed from two or more stones, It is therefore necessary to employ some method to get a correct repetition of the subject on the first stone made upon the others, and to be able in printing to place the sheet so correctly in position that the second and each succeeding printing shall fall exactly into its place upon the first. Much of the success of the work depends upon this, and various modes of “registering,” by “lay,” by needles, by fixed points, &e., are employed. The first drawing is generally in outline. It is called the keystone, and provision is made in it for “registering,” according to the particular method adopted by the artist. It is used only to take as many impressions on other stones as are required for the several colours, and as a means of getting each colour in its exact place. In work of an artistic character it is omitted in printing,

For ordinary colour printing the stone is polished; when gradation of colour is required the stone is grained, but ina somewhat coarser way than for chalk drawing. It will be sufficient here to describe the production of drawings with two tints. The principal drawing is done upon a grained stone in chalk, and should be very bold, more like a sketch on tinted paper, the middle and finer tints being left out. The stone is then etched, and two impressions are taken, so that when each of these is put upon a roughly-grained stone, and passed through the press, counter impressions will be found upon the stones, revealing the drawing quite distinctly. After having cut in the outlines with a sharp-pointed graver, or steel needle, the artist covers those parts on the two stones which are not to appear in the one or the other colour, as well as the margin of the two stones, with a brush containing acid and gum. The stones are then warmed, and a composition containing the same ingredients, as soft chalk, with double the quantity of soap, and three times the quantity of tallow, is rubbed over it with a bit of coarse flannel, until it is of a dark greyish-brown colour. From having been previously cut in, the outline comes out very distinctly. ‘The artist can now produce an effect similar to crayon sketches which have been washed in with two separate colours. Those portions which have been rubbed in, and which appear dark greyish-brown, form the middle tint, and the scraper may be used to reduce the colour of the tint where the

gradation of colour is desired,— the darkest portions being laid in with lithographic ink,

and the blending together done with chalk, brush, pen, and scraper, so as to produce in many places the effect of shadings of one colour over another. When the work is of a very elaborate or complicated nature, the order in which the colours should succeed each other in printing is of much importance, and requires to be very carefully considered, In highly finished chromo-lithographs, fifteen or more printings are frequently necessary. Difficulties sometimes arise from the paper stretching, either from the moisture on the surface of the stone or from the action of the press,

Oleography differs from chromo-lithography only in name, and is a mere vulgar attempt to imitate oil painting. The finished print is mounted on canvas, sized, and varnished, The loaded colours and rough textures, if there happen to be such in the original, are suggested by embossing, with what result it is hardly needful to say.

Instruments, Tools, and Apparatus used in Printing.—Litho- graphic presses are of a great variety of construetion, and we can only glanee at the chief points in their mechanism. The scraper is a wedge-formed plate of boxwood, fixed to the bottom of the platten ; its edge is covered with a piece of leather, and properly adjusted. The table on which the stone with the paper for receiving the im- pression is placed, and on which the tympan is brought down, is, by means of a handle or wheel, brought upon the metallic moving roller and under the scraper ; the pressure is applied with a lever, and continued from one end of the stone to the other ; when it has passed through the pes the lever is lifted, the moving table brought to its original place, and the printed sheet removed. The lithographic steam-press began to be generally used about 1867, and has quite revolutionized the lithographie trade.

The rollers for printing may be made of different lengths, from 6 to 24 inehes long, and 34 to 5 inches in diameter. They are made of wood of the alder and lime tree, with wooden handles to project and hold by ; the roller is then covered with: several complete turns of flanncl, well stretelied and fastened by sewing at the extremities near the handles ;

the whole is then covered with calf-skin, sewed with great care, so as to fit tightly, and laced near the handles. For printing ehalk, tints, and colours, skins of different prepara- tions are required. Hollow metallic rollers, covered with flannel and ealf-skin, are in use on some parts of the Continent, where they are preferred to rollers made of wood,

The best varnishes for making the printing-ink are boiled from old linseed oil, of different degrees of strength—thin, middle, strong, and very strong varnish ; for printing with gold-leaf, bronze, and dusting eolours, the very strong varnish is required. For writings, maps, and music, common caleined lamp-black is ground with the varnish ; some hard blue is added to improve the colour, and to make the ink dry in a short time ; for chalk ink, Paris black is used instead of the common lamp-black. For tinting and colour-printing, colourless or bleached varnish must be used, as otherwise the purity of the colours will suffer.

Printing.—After the stones containing the writings or drawings in chalk and those used for tinting or colour-printing are etched, and the preparation has become dry, the stones may be put into the press and.properly fixed. To prevent a stone containing drawings of any value from breaking, it should, if thin, be backed to another stone, or, whatis better, toa slab of Aberdeen granite. This is done by a mixture of plaster of Paris and cold water, of the consistency of syrup, a pretty thick coating of which should be spread evenly and quiekly on the slab; the stone containing the drawing is placed into this layer, and moved in all directions until the plaster of Paris becomes quite hard, which will take place in a very short time. After the printing is accomplished, the stone can be quite easily removed from the slab, by using a chisel, and by giving some side strokes with a wooden hammer. The old dry plaster of Paris is now reinoved, and the slab is again fit for use.

Everything being ready, the gum is entirely washed away with a soft Turkey sponge and water ; the writing or drawing is then ob- literated by taking a clean sponge and oil of turpentine, to which may be added, at pleasure, a few drops of sweet oil, after which the stone must be cleaned with water, An entirely elean sponge (or for writings, a bit of

soft canvas manufactured for the purpose) is now required for the printing. The stone is slightly wetted with this sponge ; the printing roller, charged already with the proper ink, is passed repeatedly over the whole stone, and the writing or draw- ing will begin to reappear ; the roller is again worked on the ink- slab, the stone wetted anew with the sponge, and again rolled over, until the writing or drawing appears in full strength. A sheet of damped paper (dry paper may bo used for writings and drawings in line) is put on the stone, the tympan is let down, the seraper brought to its proper place, the pressure effected, and, by means of the handle, cross, or wheel, aeeording to the style of press, the table with the stone is slowly and equally drawn through to nearly

the end of the stone, for which purpose the press requires to be set properly beforehand. The printer now relaxes the pressure, the table with the stone runs to its original place, the tympan is put back, and the impression is carefully taken up from the stone. The stone is then again wetted as before, inked in anew, the paper placed upon the stone, and further impressions are effected. When the stone is to be kept after the required number of impressions has been struck off, it should always be inked up with preserving ink, which is made by melting lard, tallow, and wax, in equal propor- tions, with a quantity of printing-ink. Whcn about to be used, this preserving-ink may be thinned with some oil of turpcntinc, thinly spread on aroller kept for this purpose ; it must then be properly turned on the slab ; the writing or drawing is washed out with oil of turpentine, the whole removed with a clean sponge, and the stone wetted and inked in with this preserving-ink. A few minutes afterwards, when the turpentine ie evaporated, a thin solution of gum-arabic is spread over the stone, containing a little sugar-candy to prevent the cracking of the gum by change of atmosphere. The stone will kecp any length of time; but the pre- serving-ink should be renewed at least every twelve months.

The printing of tint and colour stones is treated in the samc way, only the rollers, varnishes, and colours are different from those used for

ordinary black and chalk printing. The printing of this class of work requires great skill and taste. Many of the lithographic pes of London, Paris, Brussels, Munich, Berlin, Vienna, and

resden are justly famed for their beautiful productions.

An engraved stone is printed by using a small wooden tapper or tampon, either round at the sides, flat below, with handle at top, or square, with the corners rounded off. This tampon is covered several times with a very coarse blanket, or coarse thick firm cloth, fastened at the sides ; the ink is then spread very thinly on the slab, the tapper is properly tapped into it, the gum is removed from the stone, and the drawing is removed with oil of turpentine ; the stone is wetted, the tampon is tapped over the whole drawing, the stone cleaned with a bit of wet canvas, and finally a printing roller is passed once or twice over the stone, which removes all impurities; a damped sheet of paper is then placed on the stonc, and the impres- sion made as formerly explained.

Some printers ik engraved outlines or drawings done with thin lines entirely with the roller, which is a great saving of time ; other printers again ink an engraving with a large shoe brush with long, stiff bristles —which is rubbed on the ink-slab to give it the ink required—by brushing over the drawing in all directions.

Paper.—The proper selection of paper for lithographic printing when beauty of impression is a chief consideration, is of great im- portance. Hand-made and hand-sized papers are objectionable, the materials used in sizing being frequently inimical to perfect litho- graphic ae Absorbent papers, such as India paper, plate- paper, half-sized plate-paper, and fine printing paper yield the best impressions ; common writing paper, hand-made writing, loan, or other hand-made English-sized papers should be used only when the work is for business or similar purposes.

Since the invention of photography, and its wide appli- cation to processes connected with art, artistic lithography, except in the way of colour printing, has been perhaps rather less in demand than formerly.

Many of the finest British examples of lithographic art date from more than twenty to thirty years back, when artists such as J. D. Harding, Samuel Prout, Louis Haghe, Ghemar, William Simpson, and others were largely—some of them almost exclusively—engaged in its practice. Harding, although practising as a water-colour painter, devoted much of his time to lithography. The dexterity and brilliancy of his execution give to his works in this style a peculiar charm, altogether wanting in the more laboured productions of the professional lithographic artist. Of this quality in Hard- ing's drawings on stone, Mr Ruskin writes—* His execu- tion, 2 ats way, no one can at all equal. The hest chalk drawing of Calame and other foreign masters is quite childish and feeble in comparison." Samuel Prout, also a water-colour painter, produced many admirable works in lithography. Mr Ruskin's testimony may again be quoted :—* All his published lithographic sketches are of the greatest value, wholly unrivalled in power of composi- tion, and in love and feeling of architectural subject." "His lithographic work (Sketches in Flanders and Ger- many), which was, I believe, the first of the kind, still remains the most valuable of all, numerous and elaborate as its various successors have been. Their value is much increased by the circumstance of their being drawn by the

artist's own hand upon the stone." Louis Haghe's work on the Archetecture of the Middle Ages in Germany and the Netherlands, Roberts's Holy Land and Lgypt (drawn on stone by Haghe), and Simpson's drawings of the Crimean war may also be cited as excellent examples of artistic lithography. Lithographic studies of heads and figures by Julien of Paris, and other foreign artists, were at one time largely employed as copies by drawing masters; the new system of teaching introduced of late years has almost put an end to their use for this purpose, and they are now less frequently met with. Although lithography is increas- ingly employed for commercial and other purposes, artists of first-rate ability now seem, on the whole, to prefer other processes for the reproduction of their works. (c RE.)

LITHUANIANS, a people (about 3,000,000 in number) of Indo-European origin, which inhabits several western provinces of Russia

and the north-eastern parts of Poland and Prussia, on the shores of the Baltic Sea, and in the basins of the Niemen and of the Duna. Very little is known about their origin, and nothing about the time of their appearance in the country they now inhabit. Ptolemy mentions (lib. iii. chap. 5) two clans, the Galinde and Sudeni, most probably Lithuanians of the western branch of this nationality, the Borussians. In the 10th century they were already known under the name of Litva, and, together with two other branches of the same stem,—the Borussians and the Letts,—they occupied the south-eastern coast of the Baltic Sea from the Vistula to the Duna, extending north-east towards the Lakes Wierzi-yiirvi and Peipus, south-east to the watershed between the affluents of the Baltic and those of the Black Sea, and south to the middle course of the Vistula (Brest Litovsky),—a tract bounded by Finnish tribes in the north, and by Slavonians elsewhere.

The country which since that time they have continued to inhabit is flat, undulating, and covered by numberless small lakes, ponds, and wide marshes, which, though to a great extent drained during the last ten centuries, never- theless still cover immense tracts of land. The costly work of artificial draining has been actively carried on dur- ing late years, but in the south the marshes are disappear- ing slowly. The soil, being sandy in the north, and a hard boulder-clay elsewhere, is unproductive. Thick forests cover it, and—though considerable tracts have been destroyed by fires and by the hatchets of the budniki who during many centuries have cleared the most remote thickets, founding there their villages, while, later, wide forest regions, given by Catherine II. as gifts to her officials, have quite disappeared—there still remain im- mense tracts of land covered with nearly virgin forests ; thus, the Byelovyesh Pushcha covers no less than 550,000 acres of land on the level plateau 650 feet high, where tributaries of the Nareff and Bug have a common origin in marshes. These forests have played an important part in the history of the Lithuanians, giving many original features to their history, as well as to their mythology, poetry, and music, They protected them from foreign invasions, and have contributed to the maintenance of their national character, notwithstanding the vicissitudes of their history, and of their primitive religion until the 14th century. Their chief priest, the Krive-Kriveyto

(the judge of the judges), under whom were no less than seventeen different classes of priests and elders, worshipped in the forests ; the Waidelots brought their offerings to the divinities at the foot of mighty oaks, and even during the 14th century an unextinguishable fire, the ‘‘zincz,” was maintained in the midst of the “‘pushta,” or “‘pushcha”; even now, the worship of great oaks is a widely spread custom in the villages of the Lithuanians, and even of the Letts. In the absence of great forests they worship isolated trees.

Even at that time the Lithuanian stem was divided into three main branches:—the Borussians or Prussians; the Letts (who call themselves ZLatvis, whilst the name under which they are known in Russian chronicles, Letygola, is an abbreviation of JLatvin-galas, “the confines of Lithuania”) ; and the Lithuanians, or rather Lituanians, Litva, or Letuvininkai,—these last being subdivided into Lithuanians proper, and Jmud’ (4mudz, Samoghitians, or Zemailey), the “ Lowlanders.” To these three main branches, which have maintained their national distinctions uninterrupted until the present time, must be added also the Yatvyags, or Yadzvings, a warlike, black-haired people who inhabited the thick forests at the upper tributaries of the Niemen and Bug, and the survivors of whom are easily distinguishable now as a mixture with White-Russians and Mazurs in some parts of the governments Grodno and Plotsk, and in several north-eastern parts of those of Lomza and Warsaw. Nestor’s chronicle distinguishes also the Jemgala, who later became known under the name of Semigallia, and inhabited in the 10th century the left bank

of the Duna. Several authors consider alsoas Lithuanians –

the Korg of Russian chronicles, or Courons of Western authors, who inhabited the peninsula of Courland, and the Golad’, a clan settled on the banks of the Porotva, tributary of the Moskva river, which seems to have been thrown far from the main stem during its migration to the north.? The Xrivitcht, who inhabited what is now the government of Smolensk, whose name recalls the Krive-Kriveyto, and whose ethnological features recall the Lithuanians, seem to belong to the

same stem; but now these are rather a mixture of Lithuanians and Slavonians.

All these peoples are only ethnographical subdivisions, and each of them was subdivided in its turn into numerous independent clans and villages, separated from one another by forests and marshes; they had no towns or fortified places, a feature which has struck many earlier Occidental writers. The Lithuanian territory thus lay open to foreign invasions, and the warlike Russian Anzaz'es, as well as the German crusaders, availed themselves of the opportunity. The Borussians soon fell under the dominion of Germans, and ceased to constitute a separate nationality, leaving only their name to the state which later became Prussia. The Letts were driven farther to the north, mixing there with Livs and Ehsts, and fell under the dominion of the Livonian order. Only the Lithuanians proper, together with Samoghitians, succeeded in forming an independent state. The early history of this state is but imperfectly known, all the more that the old Lithuanian chronicles have suffered from subsequent alterations (Antonovitch, loc. cit.). During the continuous petty war carried on against Slavonic invasions, the military chief of one of the clans, Ryngold, acquired, in the first half of the 3th century, a certain preponderance over other clans of Lithuania and Black Russia (Yatvyags), as well as over the republics of Red Russia. At this time, the invasions of the Livonian order becoming more frequent, and always extending southward, there was a general feeling of the necessity of some organization to resist them, and Ryngold's son, Mendowg, availed himself of this opportunity to pursue the policy of his father. He made different concessions to the order, ceded to it several parts of Lithuania, and even agreed to be baptized, in 1250, at Novograd Litovsky, receiving in exchange a crown from Innocent IV., with which he was erowned king of Lithuanians. He ceded also the whole of Lithuania to the order in case he should die without leaving offspring. But he had accepted Christi- anity only to increase his influence among other clans; and,

1 W. B, Antonovitch, A Sketch of History of the Great Principality

of Lithuania, and Professor Barsoff, Russian Historical Geography, both in Russian.

as soon as he had consolidated a union between Lithu- anians, Samoghitians, and Cours, he relapsed, proclaiming, in 1260, a general uprising of the Lithuanian people against the Livonian order. The yoke was shaken off, but internal wars followed, and three years later Mendowg was killed. About the end of the 13th century a new dynasty of rulers of Lithuania was founded by Lutouver, whose second son, Gedymin (1316-1341), with the aid of fresh forces he organized from his relations with Red Russia, established something like regular government ; he extended at the same time his dominions over Russian countries—over Black Russia (Novogrodok, Zditoff, Grodno, Slonim, and Volkovysk) and the principalities of Polotsk, Tourovsk, Pinsk, Vitebsk, and Volhynia. He named him- self Rex Lethowinorum et multorum Ruthenorum. In 1325 he concluded a treaty with Poland against the Livonian order, which treaty was the first step towards the union of both countries realized two centuries later. The seven sons of Gedymin considered themselves as quite independent; but two of them, Olgerd and Keistut, soon became the more powerful. They represented two different tendencies which existed at that time in Lithuania. Olgerd, whose family relations attracted him towards the south, was the advocate of union with Russia; rather politician than warrior, he in- creased his influence by diplomacy and by organization. His wife and sons being Christians, he also soon agreed to be baptized in the Greek Church. Keistut represented the revival of the Lithuanian nationality. Continually engaged in wars with Livonia, and remaining true to the national religion, he became the national legendary hero. In 1345 both brothers agreed to re-establish the great principality of Lithuania, and, after having taken Vilna, the old sanctuary of the country, all the brothers recognized the supremacy of Olgerd. His son Yagello, who married the queen of Poland, Yadviga, after having bcen baptized in the Latin Church, was crowned, on February 14, 1386, king of Poland. At the beginning of the 15th century Lithuania was a mighty state, extending her dominions as far east as Vyazma on the banks of the Moskva river, the present government of Kaluga, and Poutivl, and south- east as faras Poltava, the shores of the Sea of

Azoff, and Hadji-bey (Odessa), thus including Kieff and Loutsk. The union with Poland remained, however, but nominal until 1569, when Sigismund Augustus was king of Poland. In the 16th century Lithuania did not extend its power so far east and south-east. as two centuries before, but it con- stituted a compact state, including Polotsk, Moghileff, Minsk, Grodno, Kovno, Vilna, Brest, and reaching as far south-east as Tchernigoff. From the union with Poland, the history of Lithuania becomes a part of Poland's history, Lithuanians and White-Russians partaking of the fate of the Polish kingdom. After its three partitions, they fell under the, dominion of the Russian empire. In 1792 Russia took the provinces of Moghileff and Polotsk, and in 1793 those of Vilna, Troki, Novgorod-Syeversk, Brest, and Vitebsk. In 1797 all these provinces were united together, constituting the "Lithuanian government" (Litovskaya Gubernia). But the name of Lithuanian provinces was usually given only to the governments of Vilna and Kovno, and, though Nicholas I. prohibited the use of this name, it is still used, even in official documents. In Russia, all the White-Russian population of the former Polish Lithuania are mostly considered as Lithuanians, the name of Jmud being restricted to, Lithuanians proper.

The ethnographical limits of the Lithuanians are quite undefined, and their number ts estimated very differently by different authors. The Letts oecupy a part of the Courland peninsula (according to M. Rittich, they. numbered there 305,300 in 1870, te which several authors, add 185,800 Cours), of Livonia (416,400 at same date), and

of Vitebsk (185,600), a few other settlements being spread also in the governments of Kovno (18,500), St Petersburg (2700), and

Moghileff (1000). The Lithuanians proper inhabit the governments of Kovno (435,810), Vilna (350,700), Suvalki (54,300), and Grodno (2500) ; whilst the Samoghitians, or Jmud, inhabit the governments of Kovno (498,900) and Suvalki (165,200). To these must be added about 200,000 Borussians, the whole number of Lithuanians being 2,687,000 in 1870 (2,873,000 with the Cours), or, taking into account the rate of increase of population for different governments, about 3,014,700 in

1882 (3,231,000 with Cours). Other authors estimate the number of Lithuanians in the Polish provinces at 277,050 in 1869, probably including Yatvyags, mixed to some extent with Mazurs. In this case the number of Lithuanians would be in 1882 about 3,082,000 (3,298,000 with Cours). They are now slowly extending towards the south, especially the Letts, who leave their country in consequence of want of land and of the difficulty they experienced in getting means of subsistence ; numerous emigrants have already penetrated into Slavonic lands as far as the govern- ment of Voronesh.

The Lithuanians are well built ; the face is mostly elongated, the features fine ; the very fair hair, blue eyes, and delicate skin distinguish them from Poles and Russians. Their dress is usually plain in comparison with that of Poles, and the predominance im it of greyish colours has been frequently noticed. language has great similarities to the Sanskrit. It is affirmed that whole Sanskrit phrases are well understood by the peasants of the banks of the Niemen. But it contains also a considerable amount of Slavonic words. The vocabulary is very copions, especially in words referring to natural phenomena, and which express certain pathological states of the mind. Diminutives are exceedingly numerous, and various diminutive forms are applied even to adjectives aud verbs. But, asa whole, the Lithuanian language is at a very low stage of development, and the written literature is very poor ; onl Twidiews books, a few translations, and a single newspaper are published in it. On the other hand, the unwritten popular literature is very rich, and contains true treasures of poetry. It was long doubted if Lithuanians have any epic poetry ; it now appears, however, that there are, scattered in songs, fragments of a great Lithuanian epic poem, But the popular poetry is especially rich in idyllic and yee songs, imbued with tenderest love and melancholy, and a most poetical feeling of nature, and remarkable by their absolute chastity ; the irony which sometimes appears in them is usually refined and gentle. The elegies (raudas) are very melancholy, a of a rare beauty. The national character is fully expressed in these songs,—not warlike at all, melancholy, very lovely, and not very sociable.

The language of the Letts is, according to Schleicher, as similar to the Lithuanian as the Italian to the Latin, but contains a greater mixture of German and Slavonic words. The literary language is more developed. A scientific Lettish grammar was published by Stender at the end of the last century, and the Letts possess translations of Shakespeare, Schiller, and other great poets. Five political papers were published in Lettish in 1876. A revival of national feeling having begun in this century, rich collections of Lettish songs were published by Germans, Russians, and Letts, M. Briwsemniaks's collection, published by the Moscow Anthropologi- cal Society, being the most recent. The Lettish songs have the Same characters as those of the Lithuanians, to which a special feature, the hatred of the people to the German landholders, must be added.

The Letts of Courland, with the exception of about 50,000 who belong to the Greek Church, are Lutherans, Nearly all can read. Those of the government of Vitebsk, who were under Polish dominion, are Catholics, as well as the Lithuanians proper, a part of whom, however, have returned to the Greek Church, in which they were before the union with Poland. The Samoghitians are Catholics ; they more than other Lithuanians have conserved their national features. But all Lithnanians have maintained much of their heathen practices and creed; the names of pagan divinities, very numerous in the former mythology, are continually mentioned in songs, and also in common speech.

The chief occupation of Lithuanians is agriculture. The trades in towns are generally carried on by men of other races—mostly by Germans, Jews, or Poles. The only exception is afforded to some extent by the Letts. The Samoghitians are good hunters, and all Lithuanians are given to apiculture and cattle breeding. But the Lithuanians, as well in the Baltic provinces as in the central ones, were not until the most recent time proprietors of the soil they tilled. They have given a few families to the Russian nobility, but the great mass of the pcople became serfs of foreign landowners, German and Polish, who reduced them to the greatest misery. Since the Polish insurrection of 1863, the Russian Government has given to the Lithuanians the land of the

Polish proprietors on much easier terms than in central Russia ; but the allotments of soil and the redemption taxes are very unequally distributed ; and a not insig- nificant number of peasants (the tchinsheviki) were even deprived of the land they had for centuries considered their own. The Letts Temain in the samc state as before, and are restrained from emigrating en masse only by coercive measures. (Ey aeeice)

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LITMUS (German, Lackmus; French, Tournesol), a colouring matter which occurs in commerce in the form of small blue tablets, which, however, consist mostly, not of the pigment proper, but of carbonate and sulphate of lime and other matter devoid of tinctorial value. Litmus is never used as a dye, but is extensively employed by chemists as a reagent for the detection of free acids and free alkalies. An aqueous infusion of litmus, when exactly neutralized by an acid, exhibits a violet colour, which by the least trace of free acid is changed to red, while free alkali turns it to blue. The reagent is generally used in the form of test paper,—bibulous paper dyed red, purple, or blue by the respective kind of infusion, Litmus is manufactured in Holland from the same kinds of lichens (species of Roccella and i as are used for the preparation of ARCHIL (q.v.).

What orcein is to archil, a substance “ azolitmin,” which Kane extracted from it, seems to be to litmus, At any rate, Kane’s analysis supports the idea of its being formed from orcin, thus:—

C,H,0,+ NH,+0,=H,0+C,H,NO,.

Orcin. Azolitmin, A solution of this substance when treated with nascent hydrogen loses its colour. So does litmus solution when left to itself in closely stoppered bottles. When pieserved in contact with air it retains its colour.

LITTLE FALLS, a village and township in Herkimer county, New York, on the Erie canal, 734 miles west- north-west of Albany by the New York Central and Hud- son River Railroad, at a point where the Mohawk river passes by a series of rapids through a picturesque defile. The water-power is turned to account in the manufacture of paper, woollen and cotton goods, starch, &e. The vil- lage, which lies partly in the township of Manheim, had a population of 6910 in 1880. Little Falls has the largest cheese market in the United States.

LITTLE ROCK, capital of the State of Arkansas, United States, as well as of Pulaski county, is situated on the south bank of the Arkansas river, about 250 miles from its mouth, and near the centre of the State. It derives it name from occupying the top of a rocky cliff about 50 feet in height, which is much less conspicuous than the precipitous cliffs that line the river just above the city. The river, which is navigable by large steamers to this point during two-thirds of the year, is crossed here by an iron drawbridge on the St Louis, Iron Mountain, and Southern Railway. Little Rock, founded in 1820, con- tains the State house, the State asylums for the blind and for deaf mutes, the State prison, the State library, St John's Military College, and other schools. It is algo the seat of the United States court of the eastern dis- trict of Arkansas, and a United States arsenal and land office. Flour-mills, carriage-works, and foundries are among the chief industrial establishments. Population in 1880,

13,138.

LITTLETON, Tuomas pg, of Frankley in Worcester- shire, judge of the court of common pleas in the reign of Edward IV., and author of the well-known work on Tenures. Littleton's surname was that of his mother, who was the sole daughter and heiress of Thomas de Littleton, lord of Frankley. She married one Thomas Westcote. Thomas was the eldest of four sons of the marriage, and took the name of Littleton, or, as it seems to have been more commonly spelt, Luttelton. The date of his birth appears to be uncertain. He is said by Sir E. Coke to have been a member of the Inner Temple, and to have lectured there on the Statute of Westminster II., De Dons Conditionali- bus. His name

occurs in the Paston letters about 1445 as that of a well-known counsel. He appears to have been recorder of Coventry in 1450, to have been made king's sergeant in 1455, and afterwards to have been a justice of assize on the northern circuit. In 1466 he was made a

judge of the common pleas, and in 1475 a knight of the Bath. He died, according to the inscription on his tomb in Worcester cathedral, on August 23, 1481. He married Joan, widow of Sir Philip Chetwind of Ingestre in Stafford- shire, and by her had three sons, through whom he became ancestor of the families in which are the existing peerages of Lyttelton and Hatherton.

The work on tenures was probably written late in his life. It is addressed to his second son Richard, who went to the bar, and whose name occurs in the year books of the reign of Henry VII. The book, both historically and from its intrinsic merit, may be characterized as the first text- book upon the English law of property. The law of property in Littleton's time was mainly concerned with rights over land, and it was the law relating to this class of rights which Littleton set himself to digest and classify. The time was ripe for the task. Ever since the Conquest regu- lar courts of justice had been at work administering a law which had grown out of an admixture of Teutonic custom and of Norman feudalism. Under Henry II. the courts had been organized, and the practice of keeping regular records of the proceedings had been carefully observed. The centralizing influence of the royal courts and of the justices of assize, working steadily through three centuries, had made the rules governing the law of property uniform throughout the land; local customs were confined within certain prescribed limits, and were only recognized as giving rise to certain well-defined classes of rights, such, for instance, as the security of tenure acquired by villeins by virtue of the custom of the manor, and the rights of freeholders, in some towns, to dispose of their land by will. Thus, by the time of Littleton (Henry VI. and Edward IV.), an immense mass of material had been acquired and preserved in the rolls of the various courts. Reports of important cases were published in the

“year books.” A glance at Statham’s Abridgment, the earliest digest of de- cided cases, published nearly at the same time as Littleton’s Tenures, is sufficient to show the enormous bulk which reported cases had already attained as materials for the knowledge of English law.

Littleton’s treatise was written in French, or rather in that peculiar dialect compounded of Norman-French and English phrases called law French. Although it had been provided by a statute of 36 Edward III. that wva voce proceedings in court should no longer be conducted in the French tongue, “ which was much unknown in the realm,” the practice of reporting proceedings in that language, and of using it in legal treatises, lingered till a much later period, and was at length prohibited by a statute passed in the time of the Commonwealth in 1650. Unlike the preceding writers on English law, Glanville, Bracton, and the authors of the treatises known by the names of Britton and Fleta, Littleton borrows nothing from the sources of Roman law or the commentators. He deals purely and exclusively with English law.

The book is written on a definite system, and is the first attempt at something like a scientific classification of rights over land. Littleton’s method is to begin with a definition, usually clearly and briefly expressed, of the class of rights with which he is dealing. He then proceeds to illustrate the various characteristics and incidents of the class by stating particular instances, some of which refer to decisions which had actually occurred, but more commonly they are hypothetical cases put by way of illustration of his prin- ciples. He occasionally but rarely refers to reported cases. His book is thus much more than a mere digest of judicial decisions; to some extent he pursues the method which gave to Roman law its breadth and consistency of principle. In Roman law this result was attained through the practice of putting to jurisconsults hypothetical cases to be solved

by them. Littleton, in like manner, is constantly stating and solving byreferenceto principles of law cases which may or may not have occurred in actual practice.

In dealing with freehold estates Littleton adopts a classification which has been followed by all writers who have attempted to systcmatize the English law of land, especially Sir M. Hale and Sir William Blackstone. It is indeed the only possible approach to a scientific arrangement of the intricate ‘‘estatcs in land” known to English law. He classifies estates in land by reference to their duration, or in other words by reference to the differences between the persons who are entitled to succeed upon the death of the person in possession or ‘‘ tenant.” First of all, he describes the character- istics of tenancy in fee simple, —an interest in lands which devolves on the death of the tenant to his heir, whether such heir be of the same line or collateral. This is still as it was in Littleton’s time the largest interest inland known to the law. Next in order comes tenancy in fee tail, the outcome, as Littleton informs us, of the Statute of Westminster II., 13 Edw. I. ¢. 1, ‘‘ De Donis Condition- alibus,” which enacted in the interest of the great lords that a gift to a man and ‘‘the heirs of his body” should no longer bear the construction which the courts had put upon the words, holding the donee to be thereby invested with full power over the land so soon as he had issue born, but should descend according to the form of the gift to lincal descendants so long as lineal descendants should exist, The various classes of estates tail are sketched by Littleton with brevity and accuracy, but he is silent as to the important practice, which first received judicial recognition shortly before his death, of ‘‘ suffering a recovery,” whereby through a series of judi- cial fictions a tenant in tail was enabled to convert his estate tail into a fee simple, thus acquiring full power of alienation. After discussing in their logical order other freehold interests in land, he passes to interests in land called by later writers interests less than freehold, namely, tenancies for terms of yearsand tenancies at will. With the exception of tenancy from year to year, now so familiar to us, but which was a judicial creation of a date later than the time of Littleton, the first book is a complete statcment of the principles of the common law, as they for the most part still exist, governing and regulating interests in lands. The first book con- cludes with a very interesting chapter on copyhold tenures, which marks the exact point at which the tenant by copy of court roll, the successor of the villein, who in his turn represented the freeman reduced to villenage by the growth

of the manorial system, acquired security of tenure by the judicial recognition of the fact that the “will of the lord” was controlled by and could only be exercised in accordance with the ‘‘ custom of the manor.”

The sccond book relates to the reciprocal rights and duties of lord and tenant, and is mainly of historical interest to the modern lawyer. It contains a complete statement of the law as it stood in Littleton’s time relating to homage, fealty,and cscuage, the money compensation to be paid to the lord in lieu of military service to be rendered to the king, a peculiar characteristic of English as distin- guished from Continental feudalism.

Littleton then proceeds to notice the important features of tenure by knight’s service with its distinguishing incidents of the right of wardship of the lands and person of tite infant heir or heiress, and the right of disposing of the ward in marriage. The non-military freehold tenures are next dealt with; we have an account of ‘‘socage tenure,” into which all military tenures were subsequently commuted by a now unrecognized Act of the Long Parliament in 1650, afterwards re-enacted by the well-known statute of 12 Charles II. c. 24, and of ‘‘frankalmoign,” or the spiritual tenure by which churchmen held, their duty being ‘‘ to make orisons, prayers, masses, and other divine services for the souls of their grantor or feoffor, and being bound to no fealty to the lord because that this divine service is better for them before God than any doing of fealty.” In the description of burgage tenure and tenure in villenage, the life of which consists in the validity of ancient cus- toms recognized by law, we recognize survivals of a time before the iron rule of feudalism had moulded the law of land in the interests of the king and the great lords. Finally he deals with the law of rents, discussing the various kinds of rents which may be reserved to the grantor upon a grant of lands and the remedies for recovery of rent, especially the remedy by distress.’ ;

The third and concluding book of Littleton’s treatise deals mainly with the various ways in which rights over land can be acquired and terminated in the case of a single possessor or several possessors. This

leads him to discuss the various modes in which several persons may simultaneously have rights over the same land, as parceners :— daughitcrs who are co-heiresses, or sons 1n gavelkind; pei saa nal = a ee a ee I I

1 These two books are stated, ina note tothe table at the conclusion of the work, to have been made for the better understanding of certain chapters of the Antient Book of Tenures. This refers to a tract called The Old Tenures, said to have been written in the reign of Edward II. By way of distinguishing it from this work, Littleton's book is called in all the carly editions ‘‘ Tenores Novelli.”

joint tenants, where the intcrest does not pass to the heir of the deceased joint tenant, but devolves upon the surviving joint tenant; and tenants in common, where the interest is separate and descends to the heir of each of the co-tenants, though the land over which the richt exists is undivided and held in common with one or more other persons. Next follows an elaborate discussion upon what are called estates upon condition,—a class of interests which occupicd a large space in the early common law, giving rise on one side to estates tail, on another to mortgages. In Littleton's timc a mort- gage, which he carefully describes, was merely a conveyance of land by the tenant to the mortgagec, with a condition that, if the tenant paid to the mortgagce a certain sum on a certain day, he might re- enter and have the land again. If the condition was not fulfilled, the intcrest of the mortgagee became absolute, and Littleton gives no indication of any modification of this strict rule, such as was introduced by courts of equity, permitting the debtor to redeem his land by payment of all that was due to the mortgagce although the day of payment had passed, and his interest had become at law indefcasible. ‘The remaindcr of the work is occupicd with an exposition of a miscellaneous class of modes of acquiring rights of property, the analysis of which would occupy too large a space. _ The work is thus a complete summary of the common law as it stood at the time. It is nearly silent as to the remarkable class of rights which had already assumed vast practical importance—

equitable interests in lands. These are only noticed incidentally in the chapter on ‘‘ Releases.” But it was already clcar in Littleton’s

all. Littleton’s own will, which has been preserved, may be adduced in proof of this assertion. Although nothing was more opposed to the spirit of Norman feudalism than that a tenant of lands should dispose of them by will, we find Littleton directing by Ins will the feoffees of certain manors to make estates to the persons named in his will. In other words, in order to acquire over lands powers unknown to the common law, the lands had been conveyed to ‘“feoffees ” who had full right over them according to the common Jaw, but who were under a conscientious obligation to exercise those rights at the direction and for the exclusive benefit of the person to whose ‘‘use” the lands were held. This conscientious obligation was recognized and enforced by the chancellor, and thus arose the class of equitable interestsin lands. Littleton is the first writer on English law after these rights had riscn into a prominent position, and it is curious to find to what extent they are ignored by him. Unlike their treatinent of copyhold interests, the common lawyers wholly refused to recognize the right of the real or beneficial owner, when the legal interest was vested in another, though the latter had then but the semblance without the reality of ownership. Hence it was that the most important class of rights developed outside the common law. After an unhappy attcmpt to reunite the classes of legal and equitable intcrests by the Statute of Uses (27 Henry VIII. e, 10), the effect of which was to introduce still greater technicality and complication into the law of real property, the two classes have continued to exist side by side, until in our own timc the Judicature Act of 1873, by uniting in one court the tribunals the difference between which originally gave rise to the distinction betwcen legal and equitable interests, has perhaps paved the way for a simpler and more rational classification of rights over land.

The work of Littleton occupies a place in the history of typography as well as of law. The earliest printed edition seems to be that by John Lettou and William de Machilinia, two printers who probably came from the Continent, and carried on their business in partnership, as their note to the edition of Littleton states, “in civitate Londoniarum,

juxta eeclesiam omnium sanctorum.” The date of this edition is uncertain, but the most probable conjecture, based on typographical grounds, places it about the latter part of 1481. The next edition is one by Machlinia alone, probably about two or three years later than the former. Machlinia was then in business alone ‘‘juxta poutem que vulgo dicitur Fleta brigge.”” Next came the Rohan or Rouen edition, erroneously stated by Sir E. Coke to be the earliest, and to have been printed about 1533. It was, however, of a much earlier date. Tomlins, the latest editor of Littleton, gives reasons for thinking that it canuot have becn later than 1490. lt is stated in a note to have been printed at Rouen by William le Tailleur “ad instantiam Richardi Pynson.” Copies of ail these editions aie in the British Museum. In all these editions the work is styled Tenores Novelli, probably to distinguish it from the “Old Tenures.” : :

There are three early MSS. of Littleton in the University Library at Cambridge. One of these formerly contained a note on its first page to the effect that it was bought in St Paul’s Churchyard on July 20, 1480, It was therefore in circulation in Littleton’s lifetime. The other two MSS. are of a somewhat latcr date; but one of them contains what seems to be the earliest English translation of the Tenures, and is probably not later than 1500.

In the 16th century editions of Littleton followed in rapid succession from the presses of Pynson, Redmayne, Berthclet, Totty], and others. The practice of annotating the text caused several additions to be introduced, which, however, are easily detected by comparison of the earlier copies. 1n 1581 West divided the text into seven hundred and forty-six sections, which have ever since been pre- served, Many of these editions werc printed with large margins for purposes of annotation, specimens of which may be secn in Lincoln’s Inn Library.

The practice of annotating Littleton was very general, and was adopted by many eminent lawyers besides Sir E. Coke, amongst others by Sir M. Hale. One coin- mentary of this kind, by an unknown hand of earlier date than Sir E. Coke’s, was edited by Cary in 1829, Following

the general practicc of dealing with Littleton asthe great authority on the law of England, “the most perfect and ab

The first printed English translation of Littleton was by Rastell, who seems to

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have combined the professlons of author, printer, and sergcant-at-law, between 1514 and 1533. Many English editions by various editors followed, the best of which is Tottyl’s in 1556. Sir E. Coke adopted some translation earlier than this, which has since gone by the name of Sir E. Coke’s translation. He, however, throughout comments not on the translation but on the French text; and the

teputation of the commentary has to some extent overlaid and obscured the intrinsic merit of the original. (K. E. D.)

LITTRE, Paut Maximinien Emitx (1801-1881), the compiler of the best dictionary of any living language, and the Frenchman of most encyclopedic knowledge since Diderot, was born at Paris on February 1, 1801. His father had been a gunner, and afterwards sergeant- major of marine artillery, in the French navy, and was

‘ deeply imbued with the revolutionary ideas of the day. | Settling

g down as a collector of taxes, he married Sophie

| Johannot, a free-thinker like himself, and devoted himself

to the education of his son Emile. The boy was sent to

| the Lycée Louis-le-Grand, where he had for friends | Hachette and Eugéne Burnouf, and he distinguished him-

self alike in his work and in all athletic exercises. After he had completed his course at school, he hesitated for a time as to what profession he should adopt, and meanwhile

_made himself master, not only of the English and German time that this class of rights would become the most important of |

languages, but of the classical and Sanskrit literature and philology. At last he determined to study medicine, and in 1822 entered his name as a student of medicine. He passed all his examinations in due course, and had only

his thesis to prepare in order to obtain his degree as doctor

when in 1827 his father died, leaving his mother absolutely without resources. He at once renounced his degree, and, while attending the lectures of Rayer and taking a keen interest in medicine, began teaching Latin and Greek for a livelihood. He carried a musket on the popular side in the revolution of February 1830, and was one of the national guards who followed Charles X. to Rambouillet.

| At last, in 1831, when quite thirty years of age, he obtained

an introduction to Armand Carrel, the editor of the National, who gave him the task of reading the English and German papers for excerpts. Carrel by the merest chance, in 1835, discovered the ability of his reader, who from that time became a constant contributor, and eventu- ally director of the paper. In 1836 he began to contribute articles on all sorts of subjects to the Revue des Deux Mondes ; in 1837 he married ; and in 1839 appeared the first volume of his edition of the works of Hippocrates. This volume at once placed Littré in the forefront of the literary and scientific world; its ability was recog- nized by his election the same year into the Académie des Inscriptions et Belles-Lettres. At the age of thirty- eight then he had won for himself a high reputation as a learned man of letters and of science, but was still tormented by the unsettled ideas and thoughts which generally beset younger men, and were only increased by the study of his favourite authors Byron and Obermann. At this epoch he came across the works of Auguste Comte, the reading of which formed, as he himself said, “the cardinal point of his life,” and from this time onward appears the influence of positivism on his own life, and, what is of even more importance, his influence on positivism, for he gave at least as much to positivism as

he received from it. He brought to it a wide knowledge of science and literature, a great and growing reputation, and a clear head. He soon became an intimate friend of Comte's, and set to work to popularize his ideas in numerous works on the positivist philosophy, while at the same time continu- ing his edition of Hippocrates, which was not completed till 1862, publishing a similar edition of Pliny's Vatural History, assisting after 1844 in the place of Fauriel at the committee engaged on the J/istotre littéraire de la France, where his knowledge of the early French language and literature was invaluable, and contributing largely to the

National and Revue des Deux Mondes. In the revolution XTV. — 89

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of July 1848 he took a keen interest, and himself took part in the repression of the extreme republican party in June 1849, under the banner of order. His essays, con- tributed during this period to the Watzonal, were collected together aud published under the title of Conservation, Révolution, et Positivisme in 1852, and show, not only a lively faith in a good time coming, but a thorough accept- ance of all the doctrines propounded by Comte. However, during the later years of his master's life, he began to perceive that he could not wholly accept all the dogmas or the more mystic ideas of his friend and master, but he studiously concealed his differences of opinion almost from himself, and Comte failed to perceive that his pupil had outgrown him, as he himself had outgrown his master Saint-Simon. Comte's death in 1858 freed Littré from any fear of embittering his master's later years, and he published his own ideas in his Paroles de la Philosophie Positive in 1859, and at still greater length in his work in Auguste Comte et la Philosophie positive in 1863. book he traces the origin of Comte's ideas through Turgot, Kant, and Saint-Simon, then eulogizes Comte's own life, his method of philosophy, his great services to the cause, and the effect of his works, and finally proceeds to show where he himself differs from him. He approved wholly of Comte's philosophy, his great laws of society, and his philosophical method,

which indeed he defended warmly against J. S. Mill, but declared that, while he believed in

a positivist philosophy, he did not believe in a religion of ‘

humanity. In the year 1863, after completing his Hippo- crates and his Pliny, he set to work on his great French dictionary, bringing to the task an unexampled know- ledge of old French, of modern and classical languages, and of modern philology, which were to make his dictionary unique in its interest aud accuracy. In the same year he was proposed for the Académie Fraugaise, but rejected, owing to the opposition of the fiery bishop of Orleans, who denounced him as the chief of the French materialists. He also at this time started with M. Wyrouboff the Philosophie Positive, a review which was to embody the views of modern positivists, and to which he largely con- tributed. His life was thus absorbed in literary work, and flowed quietly on, till the overthrow of the empire called on him to take a part in politics, He felt himself too old to undergo the privations of the siege of Paris, and retired with his family to Britanny, whence he was summoned by M. Gambetta to Bordeaux, to lecture on history, and thence to Versailles to take his seat in the senate to which he had been chosen by the department of the Seine. In December 1871 he was elected a member of the Académie Frangaise in spite of the renewed opposition of the Mgr. Dupanloup, bishop of Orleans, who resigned his seat rather than receive him, His dictionary was completed in 1873, and he lived on full of years and honours, for in 1874 he was elected a life senator. The most notable of his pro- ductions in these latter years were his political papers attacking and unveiling the confederacy of tle Orleanists and legitinists, and in favour of the republic, his republication of many of his old articles and books, among others the Conservation, Revolution, et Positivisme of 1852 (which he reprinted word for word, appending a formal, categorical renunciation of many of the Comtist doctrines therein contained), and a little tract Pour la derniére fois, in which he maintained his unalterable belief in materialism. When it became obvious that the old man could not live much longer, his wife and daughter, who had always been fervent Catholics, strove to convert him to their religion. He had long interviews with Pere Millériot, a

celebrated controversialist, and was much grieved at his death; but it is hardly probable he would have ever been really converted. Nevertheless, when on the point of death, his wife had him

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baptized, and his funeral was conducted with the rites of the Catholic Church. He died June 2, 1881.

It is almost impossible to characterize the varied learning and immense intellectual activity of Littré. As a philo- sopher he had popularized and sifted the ideas of Comte, and had succeeded Comte as Comte succeeded Turgot, Kant, and Saint-Simon; as a lexicographer he has been compared to Johnson, though his work is as far ahead of Johnson’s as the philological knowledge of the 19th century is in advance of that of the 18th; and as a man of almost universal knowledge, and a writer ou every sort of subject, from barbarian learning and modern science to epic poetry and the military genius of Napoleon, he remains unrivalled, even in a country which can boast of Diderot and Comte.

It would take too much space to give a complete list of all Littreé's voluminous works, but the following are those of greatest import-

| ance :—his editions of Hippocrates, 1839-61, and of Pliny's Natural

History, 1848-50; his translation of Strauss's Vie de Jésus, 1839- 40, and Miiller's Manwel de Physiologic, 1851; his edition of the works of Armand Carrel, with notes, 1854-58 ; the Histoire de la langue francaise, a collection of magazine articles, 1862; and his Dictionnaire de la langue francaise, 1863-72. In the domain of science must be noted his edition, with Charles Robin, of Nysten's Dietionnaire de médecine, de chirurgie, &c., 1855; in that of philo- sophy, his Analyse raisonnée du eowrs de philosophie positive de M. A. Comtc, 1845; Application de la Philosophie positive au Gouverne- ment, 1849; Conservation, Révolution, et Positivisme, 1852 (2d edition with supplement, 1879) ; Paroles de la Philosophie positive, 1859 ; Auguste Comte et la Philosophie positive, 1863 ; La Science aw point de vue philosophique, 1878 ; Fragments de philosophic et de sociologie contemporainc, 1876 ; and his most interesting miscellaneous works, his Etudes et Glanures, 1880; La Verité sur la mort d' Alexandre le Grand, 1865 ; Etudes sur les barbares et le moyen dge, 1867 ; AMédecine et Médeeins, 1871; Littérature et Histoire, 1875 ; and Discowrs de Reception & V Académie frangaise, 1873.

For his life consult Sainte-Beuve's notice, 1862, and the nume- rous articles published after his death in the newspapers and reviews, of which the best are the notices of M. Durand-Gréville in the Nouvelle Revue of August 188], of M. Caso in the Revue des Deux Mondes, and of M. Frédéric Godefroy in the Lettres chreé- tiennes. (H. M. 8.)

LITURGY. The word "Liturgy " technically denotes the " Order for the Celebration and Administration of the Eucharist." It has come to be used in a more popular sense to denote any or all of the various services of tho Christian church, whether contained in separate volumes or bound up together in the form of a Book of Common Prayer. We propose to treat of "the liturgy" chiefly, but not exclusively, in the former and stricter sense, and, without further discussion of the

use of the word in Biblical or patristic literature, and without eutering into various questions with reference to their origin, growth, first committal to writing, &c., to give our readers some account of the principal liturgies which exist, or have existed, in the Christian church.

There are five main families or groups of liturgies, three of them Eastern in origin and use, one Eastern in origin but Western in use, one Western both in origin and use. They are known either by the names of the apostles with whom they are traditionally connected, or by the names of the countries or cities in which they are known or believed to have been once or always in use.

Group I. St James, West Syrian, Jerusalem.—The prin- cipal liturgies to be enumerated under this group are the Clementine, so called from being found in the eighth book of the Apostolic Constitutions, which have been erroneously referred to St Clement, first bishop of Rome (lib. viii, 10-15); the Greek and Syriac liturgies of St James ; the Greek liturgies of St Basil and St Chrysostom ; the Armenian liturgy of St Gregory the Illuminator, first patriarch of Armenia; a large number of later Syriac liturgies springing from the Syriac liturgy of St James. Of these liturgies, that of St Chrysostom is used now by the Orthodox Eastern Church, except on the first five Sundays in Lent, Thursday and Saturday in Holy Week,

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the vigils of Christmas and Epiphany, and St Basil’s Day, when the liturgy of St Basil is used; and in Lent (except Sundays and Saturdays and Lady Day), when the liturgy of the pre-sanctified is used.

This group, like all the purely Eastern liturgies, is marked by an absence of flexibility as to number and shape of prefaces, collects, dsc. Its special feature, if we may adopt a recently employed canon of differentiation, is the position of the great intercession for quick and dead, for rulers in church and state, for the sick, for travellers, for the fruits of the earth, &c., after the consecration of the elements has been completed by the invocation of the Holy Spirit (C. E. Hammond, Lit. Hastern and Western, pp. 26-29).

Group iL St Mark, Lgyptian, Alexandria.—This group includes the Greek liturgies of St Mark, St Basil, and St Gregory ; the Coptic liturgies of St Cyril, St Basil, and St Gregory; the Ethiopic liturgy known as the “Canon Universalis” or ‘Liturgy of all the Apostles,” together with sixteen other subordinate Ethiopic liturgies. They are distinguished by the position of the great intercession in the middle of the preface, as well as by the prominent part assigned throughout to the deacon.

Group IIL. St Adeus, Hast Syrian, Edessa.—There are three extant liturgies belonging to this group, now exclusively used by Nestorian Christians,—those of SS. Adzus and Maris, Theodore of Mopsuestia, and Nesto- rius ; the titles of three lost liturgies have been preserved, —those of Narses, Barsumas, and Diodorus of Tarsus. The liturgy of the Christians of St Thomas, on the Malabar coast of India, formerly belonged to this group, but it was almost completely assimilated to the Roman liturgy by Portuguese Jesuits at the synod of Diamper in 1599, The characteristic of this group is the position of the great intercession in the middle of the consecration, between the words of institution (or, to speak more accurately, the place where the words of institution must have occurred) and the invocation.

Group IV. St John, Hispano-Gallican, Ephesus.—This group of Latin liturgies, which once:prevailed very widely in western Europe, has been almost universally superseded by the liturgy of the Church of Rome. Where it survives it has been either partially or almost completely assimilated to the Roman pattern. It prevailed once throughout Spain, France, part of northern Italy, and Great Britain and Ireland, in forms of which a detailed account is appended. The term “ Hphesine” has been applied to this family of liturgies, chiefly by modern English liturgiologists, to denote a theory as to their origin which, although upheld by other than English writers, must be regarded rather as a possible hypothesis than a proved fact (Leslie, Pref. to Mozar. Missal, sect. 25; Bickell, Messe und Pascha, p. 10). The many traces of Eastern influence in their composition, and the close connexion which is known to have existed at a very early period between the churches of Lyons and of western Asia Minor, have

suggested the theory that the latter country must have been the birth-place of this class of liturgies. The names of the apostle St John and of Ephesus his place of residence have been pressed into service as further particularizations of the same theory. The special feature of these liturgies is the position of the great intercession after the offertory, before the com- mencement of the preface and canon.

The chief traces of Oriental affinity lie in the follow- ing points :—(1) the various proclamations made by the deacon, including that of "Silentium facite" before the epistle (Migne, tom. lxxxv. p. 534); (2) the presence of a third lesson, preceding the epistle, taken from the Old Testament ; (3) the occasional presence of " preces," a series of short intercessions resembling the Greek " Ektene," or

deacon's litany ; (4) the position of the kiss of peace at an early point in the service, before the canon, instead of the Roman position after consecration; (5) the exclamation "sancta sanctis" occurring in the Mozarabic rite, the counterpart of the Eastern ra dyia rots dyios ; (6) traces of the presence of the " Epiklesis," that is to say, the invocation of the Holy Spirit, in its Eastern position, after the words of institution, as in the collect styled the Post- pridie in the Mozarabic service for the second Sunday after Epiphany :—' We beseech thee that thou wouldest sanctify this oblation with the permixture of Thy Spirit, and con- form it with full transformation into the Body and Blood of our Lord Jesus Christ." On the other hand, the great variableness of its parts, and its immense number of proper prefaces, ally it to the Western family of liturgies.

We now proceed to give a more detailed account of the chief liturgies of the Hispano-Gallican group.

1. The Mozarabie Liturgy.—This was the national liturgy of the Spanish Church till the close of the 11th ceutury, when the Roman liturgy was forced upon it. Its use, however, lingered on, till in the 16th century Cardinal Ximenes, anxious to prevent its becoming quite obsolete, had its books restored and printed, and founded a college of

priests at Toledo to perpetuate its use. It survives now only in that and one other church in Spain, and even there not without certain Roman modifications of its original text and ritual.

Its date and origin, like the date and origin of all exist- ing liturgies, are uncertain, and enveloped in the mists of antiquity. It is evidently not derived from the Roman liturgy. Its whole structure, and every separate detail, disprove such a parentage, and therefore it is strange to find St Isidore of Seville (Zi. de Eecles. Offic., i. 15) attributing it to St Peter. No proof is adduced, and the only value which can be placed upon such an unsupported assertion is that it shows that a very high and even apos- tolic antiquity was claimed for it. A theory, originating with Pinius, that it may have been brought by the Goths from Constantinople when they invaded Spain, is as im- probable as it is unproven. It may have been derived from Gaul. The Gallican liturgy stood to it in the relation of twin-sister, if it could not claim that of mother. The resemblance was so great that, when Charles the Bald (843-877) wished to gain some idea of the character of the already obsolete Gallican rite, he sent to Toledo for some Spanish priests to perform mass according to the Mozarabic rite in his presence. But there is no record of the conversion of Spain by Gallican missionaries. Christi- anity existed in Spain from the earliest times. Probably St Paul travelled there (Rom. xv. 24-28). It may be at least conjectured that its liturgy was Pauline rather than Petrine or Johannine.

2. Gallican Liturgy.—This was the ancient and national liturgy of France till the commencement of the 9th century, when it was suppressed by order of Charlemagne, who directed the Roman missal to be everywhere substituted in its place. All traces of it seemed for some time to have been lost, until three Gallican sacramentaries were dis- covered and published by Thomasius in 1680, under the titles of Afissale Gothicum, Missale Callicum, and Missale Francorum, and a fourth was discovered and published by Mabillon in 1687, under the title of Sacramentarium Bobbiense. Fragmentary discoveries have been made since then. Mone discovered fragments of eleven Gallican masses, and published them at Carlsruhe in 1850. Other fragments from the library of St Gall have been published by Bunsen (Anal.

Ante-Nic., iii. 263-66), and from the Ambrosian library at Milan by Cardinal Mai (Scrip. Vet. Vat. Coll., iii. 2, 247). More of this MS. is being pre- pared for publication by Dr Ceriani. A single page was

discovered in the library of Gonville and Caius College, Cambridge, in 1867, which has not yet been published. These documents, illustrated by early Gallican canons, and by allusions in the writings of Sulpicius Severus, Casarius of Arles, Gregory of Tours, Germanus of Paris, and other authors, enable scholars to reconstruct the greater part of this liturgy. The previously enumerated sigus of Eastern origin and influence are found here as well as in the Mozarabic liturgy, together with certain other more or less minute peculiarities, which would be of interest to professed liturgiologists, but which we must not pause to specify here. They point to the possibility of the theory that the Gallican liturgy was introduced into use by Irenzus, bishop of Lyons (c. 130-200), who had learned it in the East from St Polycarp, the disciple of the apostle St John.

3. Ambrosian Liturgy.—Considerable variety of opinion has existed among liturgical writers as to the proper classifi- cation of the “ Ambrosian” or “ Milanese” liturgy. If we are to accept it in its present form, and to make the present position of the great intercession the test of its genus, then

we must place it under Group V., the “ Petrine,” and con- .

sider it asa branch of the Roman family. If, on the other hand, we consider the important variations from the Roman liturgy which yet exist, and the still more marked and numerous traces of variation which confront us in the older printed aud MS. copies of the Ambrosian rite, we shall detect in it an original member of the Ephesine group of liturgies, which for centuries past has been undergoing a gradual but ever increasing assimilation to Rome. We know this as a matter of history, as well as a matter of iuference from changes in the text itself. Charlemagne adopted the same policy towards the Milanese as towards the Gallican Church. He carried off

all the Milanese Church books which he could obtain, with the view of substituting Roman books in their place, but the complete- ness of his intentions failed, partly through the attachment of the Lombards to their own rites, partly through the intercession of a Gallican bishop named Eugenius (Mabillon, Mus. Ital., i., ii. p. 106). It has been asserted by Joseph Vicecomes that this is an originally independent liturgy drawn up by St Barnabas, who first preached the gospel at Milan (De Missx Rit., i. chap. xi., xii.), and this tradition is preserved in the title and proper preface for St Barnabas Day in the Ambrosian missal (Pamelius, i. 385, 386).

We can trace the following points in which the Milanese differs from the Roman liturgy, many of them exhibiting distinct lines of Ephesine or Eastern influence. Some of them are no longer found in recent Ambrosian missals, and only survive in the earlier MSS. published by Pamelius (Litwrgicon, tom. i. p. 298), Muratori (Lit. fiom. Vet., i. 132), and Ceriani (in his edition, 1881, of an ancient MS. at Milan). .

(a) The collect entitled ‘‘oratio super sindonem,” correspond- ing to the ebx) mers 7d GrrAwOivar Td efantdy; (b) the procla- mation of silence by the deacon before the epistle; (c) the litanies said after the Ingressa (introit) on Sundaysin Lent, closely resembling the Greek Ektene ; (d) varying forms of introduction to the Lord’s Prayer, in Coena Domini (Ceriani, p. 116), in Pascha (tb., p. 129); (e) the presence of passages in the Prayer of Consccra- tion whieh are not part of the Roman canon, and one of which at least corresponds in import and position though not in words to the Greek ‘EmlxAnois : T’wwm vero est, omnipotens Pater, mittere, &c. (2b., p. 116) ; (f) the survival of a distinctly Gallican form of con- secration in the Post-Sanctus ‘‘in Sabbato Sancto”: Vere Sanctus, vere benedictus Dominus noster, &c. (ib., p. 125); (g) the varying nomenclature of the Sundays after Peutecost; (2) the position of the fraction before the Lord’s Prayer; (z) the omission of the second oblation after the words of institution (Muratori, Zit. Rom. Fet., i. 133); (%) a third lection or Prophetia from the Old Testament pre- ceding the epistle and gospel ; (/) the lay offering of the oblations and the formule accompanying their reception (Pam., i. 297) ; (m) the position of the ablution of the hands in the

middle of the canon just before the words of institution; (7) the position of the ‘foratio super populum” which corresponds in matter but not in name to the collect for the day before the Gloria in Excelsis,

4, Celtic Liturgy.—We postpone the consideration of

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this subject to a position under the heading of the liturgies of Great Britain and Ireland.

Group V. St Peter, Italian, Rome.—There is only one liturgy to be enumerated under this group, viz., the present liturgy of the Church of Rome, which, though originally local in character and circumscribed in use, has come to be nearly coextensive with the Roman Church, sometimes cuckoo-like ejecting earlier national liturgies, as in France and Spain, sometimes incorporating more or less of the ancient ritual of a country into itself, and producing from such incorporation a subclass of distinct uses, asin England, France, and North Italy. Even these subordinate uses have for the most part become, or are rapidly becoming, obsolete. The genius and policy of Rome are in favour of uniformity ; and it requires no keen powers of vision to foretell that, liturgically speaking, she will be, before long, within all her dominions supreme.

The date, origin, and early history of the Roman liturgy are obscure. The first Christians at Rome were a Greek- speaking community, and their liturgy must have been Greek, and is possibly represented in the so-called Clemen- tine liturgy. But the date when such a state of things ceased, when and by whom the present Latin liturgy was composed, whether it is an original composition, or, as its structure seems to imply, a survival of some intermediate form of liturgy,—all these are questions which are waiting for their solution, and to which no certain answer can be given, unless and until some further discovery shall be given of earlier liturgical remains.

One MS. exists which claims to represent the Roman liturgy as it existed in the time of Leo I., 440-61. It was discovered at Verona by

Blanchini in 1735, assigned by him to the 8th century, and published under the title of Sacramentarium Leonianum; but this title was from the first purely conjectural, and is in the teeth of the internal evidence which the MS. itself affords, and is now being gradually abandoned. It is impossible here to enter into the minutize of the evidence for this and other conclusions. The question is discussed at some length by Muratori, Liz. om. Vet., i. chap. 3.

A MS. of the 9th or 10th century was found at Rome by Thomasius, and published by him in 1680 under the title of Sacramentarium Gelastanum. But it was written in France, and is certainly not a pure Gelasian codex ; and, although there is historical evidence of that pope (492-96) having made some changes in the Roman liturgy, and although other MSS. have been published by Gerbertus and others, claiming the title of Gelasian, we neither have nor are likely to have genuine and contemporary MS. evidence of the real state of the liturgy in that pope's time.

The larger number of MSS. of this group are copies of the Gregorian sacramentary, that is to say, MSS. representing, or purporting to represent, the state of tle Roman liturgy in the days of Gregory the Great (590-604), But they cannot be accepted as certain evidence, for the following reasons :—not one of them was written earlier than the 9th century ; not one of them was written in Italy, but every one north of the Alps ; every one contains internal evidence of a post-Gregorian date in the shape of masses for the repose or for the intercession of St Gregory, and in various other ways.

The Roman liturgy was introduced into England in the 7th, into France in the 9th, and into Spain in the 11th century. In France certain features of the service and certain points in the ritual of the ancient national liturgy became interwoven with its text, and formed those many varying medizeval Gallican uses, which are associated with the names of the different French sees.

The distinguishing characteristics of the Pctrine liturgy are these :—(a) the position of the great intercession within the callon,

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the commemoration of the living being placed just before, and the commemoration of the departed just after, the words of institution; (b) the absence of the Kpiklesis or Invocation of the Holy Spirit ; (e) the position of the Pax or “ Kiss of Peace” after the consecration and just before the eomimnnion, whereas in other liturgies it ocenrs at a much earlier point in the service.

Liturgres of the British Islunds.

Pertop I. The Celtic Church.—Until recently almost nothing was known of the character of the liturgical service of the vast Celtic Church which existed in these islands before the Anglo-Saxon couquest, and which continued to exist in Ireland, Scotland, Wales, and Cornwall for very considerable though varying periods of time after that event. But recently a good deal of light has been thrown on the subject, partly by the publication of the few genuine works of SS. Patrick, Columba, Columbanus, and other Celtic saints ; partly by the discovery of liturgical remains in the Scottish Book of Deer, and in the Irish Books of Dimma and Mulling and the Stowe Missal; partly by the publication of medizval Irish compilations such as the Leabhar Breac, Liber Hymnorum, &c., which contain ecclesi- astical calendars, legends, treatises, &c., of considerable but very varying antiquity. The evidence collected from these sources is sufficient to prove that the liturgy of the Celtic Church was of the Ephesine type. In central England the churches, together with their books and everything else belonging to them, were destroyed by heathen invaders from Jutland, Schleswig, and Holstein at the close of the 5th century; but the Celtic Church in the remoter parts of England, as well as in the neighbouring kingdoms of Scot- land and Ireland, retained its liturgical independence for many centuries afterward.

An examination of its few extant service books and fragments of service books yields the following evidence of the Ephesine origin and character of the Celtic liturgy :—(a) The presence of whole eollects and anthems which occur in the Gallican and Mozarabic but not in the Roman liturgy; (b) various formule of thanks- giving after communion

; (¢) frequent addresses to the people in the form of Gallican Prafationes ; (d) the Gallican form of conse- eration prayer, being a variable Post-Sanctus leading up to the words of institution; (ce) the complicated rite of fraction as described in an Irish tract at the end of the Stowe missal finds its only counter- part in the elaborate ceremonial of the Mozarabic Church ; (f) the presence of the Gallican ceremonial of Pedilaviwm or '* Washing of Feet " in the earliest Irish baptismal office. For a further descrip- tion of these and of other features whieh seem to be peculiar to the Celtic liturgy the reader is referred to Warren's Liturgy and Ritual of the Celtie Chureh, 1881.

Periop Il. Zhe Anglo-Saxon Church.—We find ourselves here on firmer ground, and can speak with certainty as to the nature of the liturgy of the English Church after the beginning of the 7th century. Information is drawn from the liturgical allusions in the extant canons of numerous councils, from the voluminous writings of Bede, Alcuin, and many other ecclesiastical authors of the Anglo-Saxon period, and above all from a very considerable number of service books written in England before the Norman Conquest. Three of these books are manuscript missals of more or less completeness, and, as none of them have yet been published, their names are appended:—(1) the Leofric missal, a composite 10th to 11th century M6., presented to the cathedral of Exeter by Leofric, the first bishop of that see (1046-1072), now in the Bodleian Library at Oxford; (2) the missal of Robert of Jumiéges, arch- bishop of Canterbury (1051-52), executed probably at Winchester, and presented by Archbishop Robert to his old monastery of Jumiéges in the neighbourhood of Rouen, in the public library of which town it now lies; (3) the Red Book of Derby, an incomplete missal of the second half of the 11th century, now in the library of Corpus Christi College, Cambridge.

A perusal of these volumes proves, what we should have expected a@ priori, that the Roman liturgy was in use in

the Anglo-Saxon Church. This was, no doubt, the case from the very first. That church owed its foundation to the forethought of a Roman

pontiff, and the energy of a band of missionaries, headed by St Augustine, who came directly from Rome, and who brought, as we are expressly assured by Bede, their liturgical codices with them from their uative country (//ist. Lc., ii. 28). Accordingly, when we speak of an Anglo-Saxon missal, we mean a Roman missal only exhibiting one or more of the following features which differentiate it from an Itulian missal of the same century. _ (a) Rubrics, and other entries of a miscellaneous character, written in the vernacular language of the country ; (b) the commemora- tion of national or local saints in the calendar, in the canon of the mass, and in the litanies whicl: occur on Easter eve, and in the baptismal offices ; (¢) the presence of a few special masses in honour of these national saints, together with a certain number of collects of a necessarily local character, for the rulers of the country, for its natural produce, &c. ; (d) the addition of certain peculi- arities of liturgical structure and arrangement interpolated into the purely Roman service from an extraneous source. There are two noteworthy examples of this in Anglo-Saaon service books. Every Sunday and festival, and almost every votive mass, has its proper preface, although the number of such prefaces in the Gregorian

‘sacramentary of the same period had been reduced to eight. There

were a large but not quite an equal number of triple episcopal bene- dictions to be pronounced by the bishop after the Lord’s Prayer and before the communion. This custom must either have been perpetuated from the old Celtic liturgy, or directly derived from a Gallican sonree.

Periop ILL Anglo-Norman Church.—The influx of numerous foreigners, especially from Normandy and Lorraine, which preceded, accompanied, and followed the Conquest, and the occupation by them of the highest

| posts in church as well as state, had a distinct effect on the

liturgy of the English Church. These foreign ecclesiastics brought over with them a preference for and a habit of using certain features of the Gallican liturgy and ritual, which they succeeded in incorporating into

the service books of the Church of England. One of these prelates named Osmund, a Norman count, earl of Dorset, chancellor of England, and bishop of Salisbury, 1078-99, undertook the revision of the English service books, and the missal which he produced in 1085, which we know as the Sarum Missal, or the Missal according to the Use of Sarum, practi- cally became the liturgy of the English Church. It was not only received in the province of Canterbury, but was largely adopted beyond those limits—in Ireland in the 12th, and in various Scottish dioceses in the 12th and 13th centuries,

It would be outside the scope of a general article like the present to tabulate the numerous and frequently minute differences between a medieval Sarum and the earlier Anglo-Saxon or contemporaneous Roman liturgy. They lie mainly in differences of collects and lections, variations of ritual on Candlemas, Ash Wednesday, and throughout Holy Week, the introduction into the canon of the mass of certain clauses and nsages of Ephesine character or origin, the wording of rubrics in the subjunctive or imperative tense, the peculiar ‘‘ Preces in Prostratione,” the procession of Corpus Christi on Palm Sunday, the forms of ejection and reconciliation of penitents, &c. The varying episcopal benedictions as used in the Anglo-Saxon Church were retained, but the numerous proper pre- faces were discarded, the number being reduced to ten.

Besides the famous and far-spreading use of Sarum, other uses, more local and less known, grew up in various English dioceses. In virtue of a recognized diocesan independence, bishops were able to regulate or alter their ritual, and to add special masses or com- memorations for use within the limits of their jurisdiction. The better known and the more distinctive of these uses were those of York and Hereford, but we also find traces of, or allusions to, the uses of Bangor, Lichfield, Lincoln, Ripon, St Asaph, St Paul’s, Wells, and Winchester.

Other Serviee Books. —The Eucharistic service was contained in the volume called the Missau (q.v.), as the ordinary choir offices were contained in the volume known as the BREVIARY (g.v.). But besides these two volumes there were a large number of other ser- vice books.

Mr Maskell has cnumerated and described ninety-one such volumes in the use of the Western Church only. It must be understood, however, that many of these ninety-one names are synonyms (Mon. Rit. Eccles. Anglic., 1846, vol. i. p. exciv.). The

list might be increased, but it will be possible here only to name and describe a few of the more important of them. (1) Agenda= Ritwale. (2) The Antiphonary contained the antiphons sung at the canonical hours, and certain other minor portions of the service. (3) The Benedietional contained those triple episcopal benedictions previously described as used on Sundays and the chief festivals throughout the year. (4) The Collectariwm contained the collects for the season, together with a few other parts of the day offices. It was an inchoate Breviary. (5) The Epistolarium con- tained the epistles, aud (6) the Hvangelistariwm the gospels for the year. (7) The Gradual contained the introit, gradual, sequences, and the other portions of the communion service which at high inass were sung by the choir. (8) The Legenda contained the lections read at matins and at other times, and may be taken as a generic term to include the Homiliarium, Martyrology, Passional, and other volumes. (9) The Manwal was the term usually employed in England to denote the Ritwale. (10) The Pontifical contained the order of ordination, consecration, and such other rites as could, ordinarily, only be performed by the bishop. (11) The Rituale or Ritual comprised the occasional offices for baptism, wnarriage, burial, aud those other offices which it ordinarily fell to the lot of the parish priest to execute. ‘I’o these we must add a book which was not strictly a church office book, but a handy book for the use of the laity, and which was in very popular use, and often very highly embellished in the 14th to 16th century, the Book of the Howrs, ov Hore Beate Mariz Virginis. It contained portions of the canonical hours, litanies, the penitential psalms, and other devotions of a miscellancous and private character.

The Eastern Church, too, possessed and still possesses numerous and voluminous office books, of which the chiefare the following:— The

Euchologion, containing the liturgy itself with the remaining sacramental offices bound up in the same volume ; tle orologion, containing the unvarying portion of the Breviary, the Menza being equivalent toa complete Breviary; the Afenologion, or martyrology; the Octoechus and Paraelctiee, containing Troparia, and answering to the Western Antiphonary ; the Pentecostarion, containing the ser- vices from Easter Day to All Saints' Sunday, as the 7'riodion con- tained those from Septuagesima Sunday to Easter eve. The T'ypi- cum was a general book of rubrics corresponding to the Ordinale or the Pie of Western Christendom.

Periop IV. The Reformed Church.—The liturgy of the English Church passed through a more marked phase of change in the 16th century than during any of those periods which we have briefly described. The desire for some reform, aud the sense of its necessity, which had been manifesting itself in various ways for more than a century and a half, culminated in the reign of Edward VI, and caused the appearance, with the full sanction of church and state, of the First Prayer Book of Edward VI. which was published on March 7, 1549, and came into general use on the feast of Whitsunday, June 9, 1549. Without attempting to enumerate particular points, we will sum- marize the general features which marked this change, and will exhibit the gains of sucha reform, which, from an Anglican point of view, constitute its complete justification.

(a) Simplification in the number and character of books required for divine service. The Prayer Book is a compendium of most of the volumes which have been recently named and described. Its matins and evensong are a compilation from the Breviary ; the office of Holy Communion, with the collects, epistles, and gospels, is a translation and adaptation of the missal ; the occasional offices represent the ritual or manual, and the offices of confirmation and of ordination are taken, with modifications, from the pontifical.

(b) The removal from the service of a vast quantity of legendary matter which was read in the form of lections, and which was objec- tionable partly because it was unhistorical, partly because it was ludicrous and

almost profane. As an instance of unhistorical matter, we quote a passage from the fourth leetion for the festival of St Silvester, December 31, bishop of Rome, 314—835 :—

*«¥n which office of the pricsthood he (Silvester) distinguished himself above the rest of the clergy, and afterwards succeeded Melchiadcs on the papal throne in the reign of Constantine. That emperor suffered from leprosy, and, in order to cure himself, by the advice of his physicians he ordered a bath to be prepared of infants' blood. But the holy apostles Peter and Paul appeared to him in private, and told him that, if he wished to be free from his leprosy, he should abandon the mad plan of an impious bath, and send for Silvester dwelling in seclusion at Mount Soracte, that by him the emperor should be refreshed in the bath of salva- tion, and should order temples to be built in every province of the Roman empire after the fashion of the Christians, and that he should do away with the images of vain deities, and institute the worship of the true God. Constantine, therefore, in obedienee to the divine warnings, made diligent search for and summoned Silvester, by whom, recognizing the description of the apostles, he was baptized, and incited to defend and extend the Christian religion."

This lection retains its position in the present Romau Breviary, although its unhistorical character can be abundantly proved and

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is generally acknowledged. The Breviary in fact is still, and_ was even more so then, full of legends which once passed for but have long since been abandoned as history.

As examples of the ludicrous we quote the first lection for the festival of St Felanus from the Aberdeen Breviary of 1509, fol. xxvi., and the eighth lection for the festival of St Serf from the same Breviary (July 2, fol. xvi.) :-—

"He (Feelanus) was born, as it was foretold of him, with a stone in his mouth, on account of which he was so despised by his father that he

was ordered immediately after his birth to be thrown into a neighbouring pond and drowned. ln this pond he was miraculously nourished by angels for a whole year. But after the lapse of a year he was found by Bishop Ibarus, to whom a divine revela- tion of the fact had been given, playing among the angels. He was taken out of the pond safe and sound, was baptized, and atterwards beeame distinguished in sacred literature.”

“A certain robber carried off one day a sheep which used to live and feed in the house of St Serf, and killed it and ate it. Diligent inquiry was made for the thief but withoutsuccess. At length suspicion fell on the robber, and he hastened into St Serf’s presence, prepared to deny the accusation with an oath. He swore a big oath that he was innocent of the charge laid against him, when, wonderful to relate (a fact which would not be believed on merely human testimony), the sheep which had lately been eaten began to baa in the stomach of the robber, Whereupon in confusion the man fell prostrate to the ground, and huinbly asked for pardon, and the saint prayed for hin.”

There was also a quantity of objectionable matter introduced by a process of adaptation, or sometimes, as it was technically termed, by a process of farsing, into the older prayers. The Gloria in Excelsis in the Sarum Missal is printed thus (Burntisland edit., 1861, p. 586)—the farsed words are represented by italics :—

‘Qui tollis peccata mundi, suscipe deprecatiouem nostram, ad Mariz gloriam. Qui sedes ad dexteram Patris, imiserere nobis. Quoniam tu solns sanctus, Mariam sanetificans. Tu solus Dominus, Mariam guberuans. Tu solus altissimus, Mariam eoronans, Jesu Christe, cum Sancto Spiritu in gloria Dei Patris. Amen.”

(c) For the first time, so far as can be ascertained, in the history of the English Church, the vernacular tongue was employed.

(d@) The numerous litanies to and invocations of the saints, especially of the Virgin Mary, were expunged.

(e) There was a very great extension of the portion of Holy Scrip- ture read in divine service, partly by the excision of non-Scriptural matter, partly by the lengthening of lessons which sometimes con- sisted only of one or two verses, so ‘‘that many times there was more business to find ont what should be read than to read it when it was found out.”

(f) There was a general simplification of the services, by the re- duction of the number of saints’ days, by the cutting away of anthems, invitatories, and responds, by the compression of the seven canonical hours into the two daily services of matins and evensong, &c.

(g) ‘he various offices for the dead were abolished, and numerous prayers which involved a belief in the medieval idea of the penal flames of purgatory made way for the present burial office and the commemoration of the departed in the Eucharistic service.

The first reformed Prayer Book of 1549 remained in use till 1552, when by Act of Uniformity passed on April 6 it was ordered that a further reformed Prayer Book should come into general use on the feast of All Saints (November 1) following. This second Prayer Book, commonly spoken of as the Second Prayer Book of King Edward the VL, marks the furthest point in the Puritan direction which was ever reached by the liturgy of the Church of England. An idea of its character may be gained by mentioning some of the features retained in the first and discarded in the Second Prayer Book, and some of the features added in thie Second but absent from the First Prayer Book.

In the former class are—(a) the sign of the cross used in conse- eration, confirmation, marriage, and visitation of the sick ; (b) the use of exorcism, chrisom, and chrism in baptism ; (¢) unction of the sick ; (d) certain prayers for the dead, and a special Kucharist for funerals ; (¢) the mention of vestments with albs and tunics for Eucharistic use, and of the pastoral staff and cope for bishops; (f) the ceremonies of crossing and knocking on the breast left optional ; (g) the invocation of the Holy Ghost before consecration ; (A) the mixed chalice ; (z) directions to communicants to receive the consecrated bread in their mouths, and for reservation for the sick. In the latter class are—(a) the addition of the Scriptural sentences, exhortation, confession, and

absolution before morning and evening prayer ; (0) the addition of the Jubilate, Cantate, and Deus Misereatur as alternative canticles; (c) the words ‘‘ com- monly called the mass” omitted from the title of Holy Communion ; (d) the words ‘‘ militant here on earth” added to the title of the prayer for the whole state of Christ’s Church ; (e) the decalogue introduced at the commencement of the communion service ; (/) the second clause in the formula of sacramental distribution was substituted for the first, the two being subsequently combined in 1559. These are merely sampies out of many more points which

| might be named.

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It has not been ascertained that this Prayer Book ever received the sanction of Convocation, and it probably never came into complete use. Such use was in anycase short-lived, for Edward VI. died on July 6, 1553, and the English Prayer Book was abolished and the Latin missal restored to nse by one of the first Acts of Queen Mary, in October 1553. Queen Mary died on November 17, 1558, and another complete change of policy took place. The reformed Prayer Book was brought into use again on June 24, 1559, not in the exact shape which it bore in 1552, but with various modifications, which we forbear to enumerate in detail. It may be said of them, as of the various alterations introduced subsequently into the Prayer Book, that their general tendeucy was conservative rather than destructive, and in a Catholic rather than in a Protestant direction. The next important revisions of the Prayer Book took place in 1604, under James I, after tlie Hampton Court Conference, and in 1661-62, after the restoration of Charles If. The Book of Common Prayer had been abolished under the Commonwealth, and it could only be used under the risk of heavy penalties from 1645 to 1661. It was now restored with a considerable number of additions and alterations, after having been discussed withont any satisfactory result between churchmen and Puritans at the Savoy conference in 1661. When these had received the sanction of the Convocations of Canterbury and York, it was attached to an Act of Uniformity which received the royal assent on May 19, 1662, by the

pro- visions of which Act it came into general use on St Bartholomew's Day, August 24, 1662. Since that date, although various slight changes have been made in recent years, nothing has been done amounting to a revision or new edition of the Prayer Book, or demanding notice in these columns.

A few words are added about other national versions of the reformed liturgy.

The Liturgy of the Scottish Episcopal Church.—This liturgy in nearly its present form was compiled by Scottish bishops in 1636, and imposed, or, to speak more accurately, attempted to be imposed upon the Scottish people by the royal authority of Charles I. in 1637, The prelates chiefly concerned in it were Spottiswood, bishop of Glasgow; Maxwell, bishop of Ross; Wedderburn, bishop of Dunblane; and Forbes, bishop of Edinburgh. Their work was approved and revised by certain members of the English episcopate, especially Laud, archbishop ef Canterbury; Juxon, bishop of London; aud Wren, bishop of Norwich. This liturgy has met with varied fortune, and passed through several editions. It is now used as an alternative jon with the English communion office in the Scottish Episcopal Church.

Among its more noteworthy features are—(a) the retention in its integrity and in its primitive position after the words of institu- tion, of the invocation of the Holy Spirit ;+ (0) the reservation of the sacrament is permitted for the purpose of communicating the absent or the sick ; (c) the mixed chalice is explicitly ordered ; (d) the minimum number of communicants is fixed at one or two, in- stead of three or four. The general arrangement of the parts ap- proximates more closely to the First Prayer Book of Edward VI. than to the present Anglican Book of Common Prayer.

The American Liturgy. —The Prayer Book of the " Pro- testant Episcopal Church" in America was adopted by the General Convention of the American Church held in 1789. It is substantially the same as the English Book of Common Prayer, but among the more important variations we may

1The present clause runs thus:—‘‘ And we most humbly beseech thee O merciful Father to hear us, and of Thy almighty goodness vouchsafe to bless and sanctify with Thy word and Holy Spirit these and Thy gifts and creatures of Bread and Wine, that they may become the Body and Blood of Thy most dearly-beloved Son.” This petition is found in the Eastern but not in the Roman or Anglican liturgies.

name the following :—(a) the arrangement and wording of the communion office rather resembles that of the Scottish than of the Anglican liturgy, especially in the position of the oblation and invocation immediately after the words of institution; () the Magnificat, Nunc Dimittis, aud Athanasian creed are disused ; (c) ten selections of psalms are appointed to be used as alternatives for the psalms of the day. In addition to these there are various verbal and other unimportant alterations.

The Ivish Prayer Book.—The Prayer Book in use in the Irish portion of the United Church of England and Ireland was the Anglican Book of Common Prayer, but after the disestablishment of the Irish Church several changes were introduced into it by a synod held in Dublin in 1870. These changes included (a) the excision of all lessons from the Apocrypha, (’) of the rubric ordering the recitation of the Athanasian creed, (c) of the rubric ordering the vestments of the second year of Edward VI., (d) of the form of absolution in the office for the visitation of the sick, (¢) the addition of one question and answer iu the Church Catechism, bringing out more clearly the spiritual character of the real presence.

The Presbyterian Church.—The Presbyterian churches of Scotland at present possess no liturgy properly so called. Certain general rules for the conduct of divine service are contained in the “Directory for the Public Worship of God,” agreed upon by the Assembly of Divines at West- niuster, with the assistance of commissioners from the Church of Scotland, approved and established by an Act of the General Assembly, and by an Act of Parliament, both in 1645. In 1554 John Knox had drawn up an order of liturgy, closely modelled on the

Genevan pattern, for the use of the English congregation to which he was then ministering at Frankfort. On his return to Scotland this form of liturgy was adopted by an Act of the General Assembly in 1560, and became the established form of worship in the Presbyterian Church, until the year 1645, when the Directory of Public Worship took its place. Herein regulations are laid down for the conduct of public worship, for the reading of Scripture, and for extempore prayer before and after the sermon and in the adminis- tration of the sacraments of baptism and the Lord's supper, for the solemnization of marriage, visitation of the sick, and burial of the dead, for the observance of days of public fasting and public thanksgiving, together with a form of ordination, and a directory for family worship. In all these cases, although the general tenor of the prayer is frequently indicated, the wording of it is left to the dis- cretion of the minister, with these exceptions :—at the act of baptism this formula must be used—"T baptize thee in the name of the Father, and of the Son, and of the Holy Ghost ;" and for the Lord's Supper these forms are sug- gested, but with liberty to the minister to use "other the like, used by Christ or his apostle upon this occasion :"—

- According to the holy institution, command, and example of our blessed Saviour Jesus Christ, I take this bread, and, having given thanks, break it, and give it unto you. Take ye, eat ye ; this is the body of Christ which is broken for you ; do this in re- membrance of him." And again; '' According to the institution, command, and example of our Lord Jesus Christ, I take this cup and give it unto you; this cup is the New Testament in the blood of Christ, which is shed for the remission of the sins of many ; drink ye all of it."

There is also an unvarying form of words directed to be used before the minister by the man to the woman and by the woman to the man in the case of the solemnization of matrimony. The form of words on all other occasions, including ordination, is left to the discretion of the officiat- ing minister, or of the presbytery.

Continental Protestant Churches. The Calvinistic Churches.— Rather more of the liturgical element, in the shape of a set form of

words, enters into the serviee of the French and German Calvinistie Protestants. The Sunday morning serviec, as drawn up by Calvin, was to open with a portion of Holy Scripture and the recitation of the Ten Commandments. Afterwards the minister, inviting the people to aeeompany him, proeeeded to a eonfession of sins and sup- plication for graee. Then one of the Psalms of David was sung. Then eame the sermon, prefaeed by an extempore prayer and con- eluding with the Lord's Prayer, ereed, and benediction. The eommunion service began with an exhortation leading up to the apostles' ereed ; then followed a long exhortation, after whieh the bread and cup were distributed to the people, who advanced in reverence and order, while a Psalm was being sung or a suitable passage of Seripture was being read. After all had eommunieated aset form of thanksgiving was said by the minister. Then the hymn of Simeon was sung by the congregation, who were then dismissed with the blessing. This form of serviee has been modified in vari- ous ways from time to time, but it remains substantially the type of serviee in use among the Reformed Churehes of Germany, Switzerland, and Franee.

The Lutheran Chureh.—Luther was far nore eonservative than the rest of the Protestant Reformers, and his conservatism appeared nowhere more than in the serviee books whieh he drew up for the use of the ehurch which bears his name. In 1523 he published a treatise Of the Order of the Service in the Congregation, and in 1526 he published the German Mass. Exeept that the vernaeular was substituted for the Latin language, the old framework and order of the Roman missal were elosely followed, beginning with the Con- fiteor, Introit, Kyrie Eleison, Gloria in Execlsis, &e. The text of this and other Lutheran serviees is given in Agende fiir christliche Gemeinden des lutherischen Bekenntnisses, Nérdlingen, 1853. At the same time Luther was tolerant, and expressed a hope that different portions of the Lutheran Chureh would from time to time make such ehanges or adaptations in the order of scrviee as might be found eonvenient. The Lutheran Churches of northern Europe have not been slow to avail themselves of this adviee and permission. Most of them have drawn up liturgies

for themselves, sometimes following very closely, sometimes differing considerably from the original serviee eomposed by Luther himself. In 1822, on the union of the Lutheran and Reformed (Calvinistic) Churehes of Prussia, a new liturgy was published at Berlin. It is used in its entirety in the chapel royal, but great liberty as to its use was allowed to the paroehial elergy, and considerable variations of text appear in the more recent editions of this serviee book.

The Swedenborgians, Irvingites, and other Protestant bodies have drawn up liturgies for themselves, but they are hardly of sufficient historical importance to be deseribed at length here.

The Old Catholics, lastly, published a Ritwale in 1875 eontaining the oceasional offices for baptism, matrimony, burial, &e., and a form for reeeption of holy communion, in the German language. The latter is for temporary use in anticipation of a revised and not yet published missal, corresponding to the order of eommunion in English published Mareh 8, 1548, in anticipation of the eomplete offiee in the Prayer Book of 1549. (F. E. W.)

LIUTPRAND (c. 922-972), Italian chronicler, was born towards the beginning of the 10th century, of a good Lombard family. The name is sometimes spelled Liudprand and even Luitprand. In 931 he entered the service of King Hugo of Italy as page ; he afterwards rose to a high position at the court of Hugo’s successor Berengarius, having become chancellor, and having been sent (949) on an embassy to the Byzantine court. Falling into disgrace with Berengarius, he attached himself to the emperor Otto I., whom in 961 he accompanied into Italy, and by whom in 962 he was made bishop of Cremona. He was frequently employed in missions to the pope, and on two occasions (968, 971) to Byzantium, to negotiate on behalf of the younger Otto (afterwards Otto IL) for the hand of Theophano. Liutprand died in 972.

He wrote (1) Antapodoseos, sew rerum per Europan gestarwm, Libri VI., an historical narrative, relating to the events from 887 to 949, compiled, as its name almost implies, with the object of aveng- ing himself upon Berengarius and Willa his queen; (2) Historia Ottonis, unfortunately eovering only the years from 960 to 964; and (3) Relatio

de Legatione Constantinopolitana (968-969). All are to be found in the Afonwm. Germ. Hist. of Pertz, and in the Ker, Ital. Seript. of Muratori; there is a recent edition by Diimmler (1877); and a partial translation into German, with an introduetion by Wattenbach, is given in the second volume of the Geschichte- sehreiber der Deutschen Vorzett (1853). Compare Wattenbach, Deutschlands Geschichtsquellen im Mittelalter (3d ed., 1873). Three other works, entitled Adversaria, Chronieon (606-960), and Opus- eulum de vitis Romanorum pontificum, are usually, but wrongly, assigned to Liutprand.

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LIVERPOOL, a city and seaport of England, in the hundred of West Derby, in the county palatine of Lancaster, situated on the right bank of the estuary of the Mersey, about three miles from the opensea. The form of the city is that of an irregular semicircle, having the base line formed by the docks and quays extending about six miles along the east bank of the estuary, which here runs nearly north and south, and is about a mile in breadth. On the north the city is bounded by the borough of Bootle, along which the line of docks is continued. The area of the city is 5210 acres.

General Aspect and Features.—The subsoil of Liverpoul is the Bunter stratification of the New Red Sandstone, overlying the Coal-measures, which rise up some distance to the eastward. In the lower districts there is a deposit of boulder clay, which has been extensively used for the manufacture of bricks, The sandstone rises in long ridges

to the eastward, in the highest points about 250 feet above The city therefore lies on a continuous

the sea-level.

Port of Liverpool.

slope varying in gradient, but in some districts very steep. Exposed to the western sea breezes, with a dry subsoil and excellent natural drainage, the site is naturally salubrious, but neglect and perverseness have in past times done much to neutralize these advantages. The old borough, lying between the pool and the river, was a conglomeration of narrow alleys and mean houses packed together without any regard to sanitary provisions; and during the 16th and 17th centuries it was several times visited by the plague, which carried off many of the inhabitants. When the town burst its original limits, and expanded up the slopes beyond, a better state of things began to exist. The older parts of the town have at successive periods been entirely taken down and renovated. The streets of shops—Church Street, Bold Street, &c.—are equal in display to similar establishments in London. The commercial part of the city is remarkable for the number of palatial-looking piles of offices, built of hewn stone, principally in the Italian Renaissance style, amongst which the banks and insurance offices stand preeminent. The

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demand for cottages about the beginning of the present century led to the construction of what are called “courts,” being narrow culs de sac, close packed, with no thorough ventilation. This, combined with the degraded habits of a population brought together indiscriminately, resulted in a very high rate of mortality, to contend with which enormous sums have been expended in sanitary reforms of various kinds. The more modern cottages, erected on the higher grounds, are all that can be desired for that class of habitation.

prominent feature in the aspect of thetown. The earliest, the Prince’s Park, was laid out in 1843 by private enter- prise. Sefton Park, the most extensive, containing about 400 acres, was commenced in 1865,

and completed at a cost of £410,000. A large portion of the land round the margin has been leased for the erection of villas. Waver- tree, Newsham, Sheil, and Stanley Parks have also been constructed at the public expense. Conuected with Waver- tree Park are the botanic gardens, with the usual plant houses, and a large and lofty palin house. The suburbs are

Parks.—The public parks of Liverpool now form a | rapidly extending, and those on the south contain many

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Plan of Liverpool.

good private residences. A boulevard, about a mile in length, planted with trees in the centre, leads to the entrance to Prince’s Park.

Public Buildings.—The old town has been so completely renovated during the present century that scarcely any of the public buildings date from an earlier period.

The earliest, and in many respects the most interesting, is the town-hall in Castle Street. This was erected from the designs of John Wood, the architect of the squares and crescents of Bath, and wasopened in 1754. The building has since undergone considerable alterations and extensions, but the main features remain unchanged. It is a classical rectangular stone building in the Corinthian style, with an advanced portico in front, and crowned with a lofty dome

surmounted by a seated statue of Minerva. The interior was destroyed by fire in 1795, and was entirely remodelled in the restoration. It now

contains a splendid suite of apartments, including a ball-room about 100 feet by 60, approached by a noble staircase. The building is occupied by the mayoras the municipal mansion house. A range of municipal offices was erected in Dale Street in 1860. The building is in the Palladian style, of considerable extent and imposing design, with a dominating tower and square pyramidal spire.

The crowning architectural feature of Liverpool is St George's Hall, completed in 1854. The original intention was to erect a music hall suited for the triennial festivals which had been periodically held in the town. About the

same time the corporation proposed to erect law courts for the assizes, which had been transferred to Liverpool and Manchester. In the competitive designs, the first prize was gained in both cases by Harvey Lonsdale Elmes. He was employed to combine the two objects in a new design, of which the present building is the outcome.

The structure is one of which the city may well feel proud, and notwithstanding some defects it will always hold a high and honourable place amongst the erections of modern times. It is fortunate in its situation, occupying the most central position in the town, and surrounded by an area sufficiently extensive to exhibit its proportions to the best advantage. Another advantage it possesses is that of size ; there are few buildings in the country, forming a solid mass under one roof, which surpass it in dimension. The plan is simple in arrangement, and easily described. The centre is occupied by the great hall, 169 feet in length, and, with the galleries, 87 feet wide and 74 feet high, covered with a solid vault in masonry. Attached to each end, and opening therefrom, are the law courts. A corridor runs round the hall and the courts, com- municating with the various accessory rooms. Externally the east front is faced with a fine portico of sixteen Corinthian colurans about 60 feet in height. An advanced portico of

similar columns fronts the south end crowned with a pediment filled with sculpture, with the inscription—

“ Artibus, Legibus, Consiliis

Locum Municipia Constituerunt Anno Domini mpcccx.t1.”

The style is Roman, but the refinement of the details is suggestive of the noblest period of Grecian art.

The great hall is finished with considerable richness in polished granite columns, marble balustrades and pavements, polished brass doors with rich foliated tracery, &c. The organ, built by Messrs Willis of London, from the specification of Dr Samuel Wesley, is equal to any in the country for extent, power, and beauty of tone. Mr Elmes, a young architect of great promise, having died during the progress of the work, the building was completed by the late Mr C. BR. Cockerell, R.A.

Next to the public buildings belonging to the city, the most important is the exchange, forming three sides of a quadrangle, adjoining the town-hall on the north side. The town-hall was originally built to combine a mercantile exchange with municipal offices, but the merchants per- versely preferred to meet in the open street adjoining. This, with other circumstances, led to the erection of the new exchange, a building of considerable merit, which was commenced in 1803 and opened in 1808. It had scarcely been in use for more than fifty years when it was found that the wants of commerce had outstripped the accommo- dation, and the structure was taken down to make room for the present building, in which greater convenience has been attained, with considerable sacrifice of esthetic effect.

The revenue buildings, commenced in 1828, on the site of the original Liverpool Dock, combine the customs, inland revenue, post-office, and dock board departments, It is a huge heavy structure, with three advanced porticoes in the Ilyssus Ionic style. Near by stands the sailors’ home, a large building in the Semi-Gothic or Elizabethan style.

The Philharmonic Hall in Hope Street, with not much pretension externally, is one of the finest music rooms in the kingdom; it accommodates an audience of about 2500.

The group of buildings forming the free public library, museum, and gallery of art are finely situated on the brow of the slope opposite St George's Hall. The library and gallery of art are separate buildings connected by the circular reading-room in the middle. The latter possesses some novelties in construction, having a circular floor 100 feet in diameter without columns or any intermediate support, and a lecture-room underneath, amphitheatrical in form, with grades or benches hewn out of the solid rock.

Ratlways.—There are three passenger stations in Liver- pool, the London and North-Western, the Lancashire and Yorkshire, and the combined station of the Midland, Great Northern, and Manchester and Sheffield. The rapid increase of traffic has led to large extensions of the North- Western, and a very large addition to the Lancashire and Yorkshire is in progress (1882). The tunnel under the

Mersey now in course of construction will give access for the Great Western and Cumbrian systems into Liverpool.

Water and Gas Supply.—The original supply of water was from wells in the sandstone rock, but in 1846 an Act

was passed, under which extensive works were constructed at Rivington, about 25 miles distant, by which a much larger supply was obtained. The vast increase of popula- tion led to further requirements, and in 1880 another Act gave power to impound the waters of the Vyrnwy, one of the affluents of the Severn.

This scheme which, it is expected, will give a copious supply for many years to come, is now being carried out. The gas-works are the property of acompany. Efforts have been made to effect a purchase by the city, but hitherto without success.

Administration of Justice.—The city has quarter sessions for criminal cases, presided over by the recorder, but the sessions are really held eight times in the year. The court of passage for civil cases is a very ancient institution, dating from the foundation of the borough by King John, originally intended for cases arising out of the imports and exports passing through. Its jurisdiction has been con- firmed and settled by parliament, and it is now competent, by consent, to try causes to any amount. The mayor is nominally the president, but the actual judge is an assessor appointed by the crown. There are two police courts which sit daily, one presided over by the lay magistracy, the other by the stipendiary magistrate.

Ecclesiastical.—The parish, which was separated from Walton-on-the-Hill in 1699, contained two churches, St Nicholas, the ancient chapel, and St Peter's, then built. There were two rectors, the living being held in medieties. Of recent years changes have been sanctioned by parliament. The living is now held by a single incumbent, and a large number of the churches which have since been built have been formed into parishes by the ecclesiastical commissioners. St Peter's has been constituted the pro- cathedral, pending the erection of a more suitable building. Besides the two original parish churches, there are sixty-seven others belonging to the establishment.

The Roman Catholics form a very numerous and powerful body in the city, and it is estimated that from a third to a fourth of the entire population are Catholics. A large part of these are Irish settlers or their descendants, but this district of Lancashire has always been a stronghold of Catholicism, many of the landed gentry belonging to old Catholic families.

Charities.—These are numerous, and are maintained with no niggardly hand. The earliest foundation is the Blue Coat hospital, established in 1708, for orphans and fatherless children born within the borough. The building, erected in 1717, is a quaint and characteristic specimen of the architecture of the period. It now maintains two hundred and fifty boys and one hundred girls. There is an orphan asylum, established in 1840, for boys, girls, and infants, and a seamen's orphan asylum,

commenced in 1858, for boys and girls. The Roman Catholics have similar establishments. The medical charities are large and flourishing. The royal infirmary has had a school of medicine attached, which has been very successful, and is now merged in the new University College. The medical charities are aided by simultaneous collections in the churches and chapels on “Hospital Sunday,” the first Sunday in the year, the amount averaging about £10,000.

Literature, Art, and Science.—The free library, museum, and gallery of arts, established and managed by the city council, was originated in 1850. The library building was erected by Sir William Brown at a cost of £40,000. The Derby museum, containing the collections of Edward, the thirteenth earl, were presented by his son. The Mayer museum of historical antiquities and art was con-

tributed by Mr Joseph Mayer, F.S.A. Sir Andrew Walker crected the art gallery which bears his name at an expense of £35,000. The Picton circular reading-room, and the Rotunda lecture-room were built by the corporation at the cost of £25,000. The library contains nearly 100,000 volumes. An annual exhibition of paintings has been established, the sales from which average about £12,000 per annum. A permanent gallery has also been formed, which is now being enlarged at a cost of about £12,000.

The literary and philosophical society was established in 1812, and still flourishes. There are also philomathic, geological, chemical, historic, and various other societies for the cultivation of almost every branch of knowledge and inquiry. An art club has been established with great success, and possesses an excellent club-house and gallery. The royal institution, established by Roscoe in 1817, pos- sesses a fine gallery of early art, and is the centre of the various literary institutions of the town.

Education.—Elementary education has always met with cordial support in Liverpool, and is now carried on with vigour by the schoo] board, supplemented by voluntary schools. For middle class and higher

education there have existed for many years three institutions, which have been very successful, viz, the school attached to the royal institution, the collegiate institution in Shaw Street, and the Liverpool institute high school. A further effort has been successfully made resulting in the foundation of University College, the inaugural meeting of which was held on January 14,1882. This college is affiliated to the Victoria university of the north-west of England. The sum of £135,000 has been raised by voluntary subscrip- tion, to which £30,000 have been contributed by the corporation. Seven chairs have been endowed, and pro- fessors appointed, and a suitable building has been pro- vided.

Recreation and Social Life-—There are eight theatres, besides many minor music halls and places of amusement. The most fashionable and exclusive is the Philharmonic Hall, which is a large handsome building open only to proprietors, where concerts take place every fortnight dur- ing the season. The Philharmonic concerts, and the balls at the Wellington Rooms (the Almacks of Liverpool), afford the principal opportunities for the gatherings of the fashionable world. ‘The Alexandra theatre, the new Court theatre, the Prince of Wales theatre, and Hengler’s cirque are all that could be desired in point of decoration and the mise en scene. The minor houses are conducted on the whole with great propriety and success.

Population.—According to the censusof 1881 (preliminary report) the number of inhabitants within the parliamen- tary and the municipal borough—the limits of which are conterminous—amounted to 552,425 persons, 271,640 being males and 280,785 females, At the end of the 17th century the population of Liverpool was 5145, but since then it has steadily increased as follows :—

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If the boroughs of Bootle and Birkenhead, which are component parts of the port, are included, Liverpool has now a population of about

three quarters of a million.

Trade and Commerce.—The progress of the commerce of Liver- pool during the present century is almost without a parallel. In 1800 the tonnage of ships entering the port was 450,060; in 1880 it reached 7,933,620 tons. In 1800 4746 vessels entered, averaging 94 tons; in 1880 there were 20,249, averaging 440 tons. Theonly British port which can at all come into competition with Liverpool is London, the total trade of which, comprising exports and imports, amounted in 1880 to 16,479,108 tons, against 14,496,364

in Liverpool. A large proportion of this, however, is a coasting trade, indicated by the smaller size of the ships, averaging 240 tons each in London as compared with 440 tons in Liverpool. The coasting trade in Liverpool has rather fallen off owing to the superior advantages of railway traffic. The proportion of steamers to sailing ships has very largely increased of late years. The return for 1881 gives 5,534,462 tons of steam navigation to 2,379,466 tons in sailingships. If we take the value of the imports as a criterion, London is far in advance of Liverpool, the values in 1880 being £141,442,907 and £107,460,187, but the London imports consist, to a great extent, of very valuable commodities, such as tea, silk, indigo, wines, &c., whilst the Liverpool imports principally consist of grain, food, and raw produce, the materials for manufacture. Ifwe look at the exports the balance is reversed, Liverpool, in 1880, having exported the value of £84,029,651, against £52,600,929 from Loudon. In the number of ships regis- tered as belonging to the port, Liverpool stands first in the world, the tonnage belonging to Liverpool being 1,554,871, against 1,120,359 in London, and 1,005,894 in the whole of the ports on the Clyde.

The commerce of Liverpool extends to every part of the world, but probably the intercourse with America stands pre-eminent, there being five lines of steamers to New York alone, besides lines to Philadelphia, Boston, Halifax, Canada, New Orleans, &c. The size of the ships has

greatly increased, having reached 8000 tons burden, with 10,000 horse-power.

The imports into Liverpool comprise produce of every description from every region under the sun. Cotton, however, is the great staple, almost the whole trade of the commodity centring here. Grain comes next, American and Australian corn occupying a large proportion of the market. Within the last few years an enormous trade in American provisions, including live cattle, has sprung up. Tobacco has always been a leading article of import into Liverpool, along with the sugar and rum from the West Indies. Timber, principally from Canada, forms an important part of the imports, the stacking yards extending for miles along the northern docks. At one time tea from China, and wool from Australia, promised to be imported with advantage, but the financial arrangements with London have drawn these trades almost entirely away. In regard to exports, Liverpool possesses decided advantages ; lying so near the great manufacturing districts of Lancashire and the West Riding of Yorkshire, this port is the natural channel of transmis- sion for their goods, and, if everything clse fails, there are always coal and salt from Wales and Cheshire ready to make up a cargo. The consequence is that many ships, after discharging their home- ward cargoes at London and the eastern ports, come round in ballast to Liverpool for an outward cargo.

Manufactures. —The manufactures of Liverpool are not extensive. Attempts have been repeatcdly made to establish cotton-mills in and near the city, but have resulted in uniform failure. Engineer- ing works, especially as connected with marine navigation, have naturally grown up, and have been carried on successfully on a large scale. Shipbuilding, in the days of the old wooden walls, in the early part of the present century, was active and prosperous, several frigates and sloops-of-war for Government having been built here, but the keen competition of the Clyde and the north of England drew away a large portion of the trade. Therc are now four shipbuilding establishments on the Mersey. In the year 1880-81 there were launched from these yards thirty-three iron ships, with a tonnage of 53,971 tons. At one period the soap manufacture filled a large space in the industry of Liverpool, but

it has almost entirely departed. During the latter half of last cen- tury and the beginning of the present, the pottery and china manu- facture flourished in Liverpool. John Sadler, a Liverpool manu- facturer, was the inventor of printing on pottery, and during the early period of Josiah Wedgwood's career, all his goods which required printing had to be sent to Liverpool. A large establish- ment, called the Herculaneum Pottery, was founded in a suburb on the bank of the Mersey, and was carried on with success for many years, but the whole trade has long disappeared. One manufacture, established at an early period, still continues to flonrish—the watch and chronometer trade. Litherland, the inventor of the lever watch, was a Liverpool manufacturer, and Liverpool-made watches have always been held in high estimation. There are several extensive sugar refineries, and two large tobacco manufactories.

Docks.—The docks of Liverpool on 'both sides of the Mersey are under the same trust and management, and equally form part of the port of Liverpool. On the Liverpool side they extend along the margin of the estuary 6} miles, of which 14 miles is in the borough of Bootle. The Birkenhead docks have not such a front- age, but they extend a long way backward. The water arca of the Liverpool docks and basins is 3334 acres, with a lineal quayage of 22 miles. The Birkenhead docks, including the great float of 120 acres, contain a water area of 160 acres, with a lineal quayage of 9 miles. The system of floating docks was commenced by the corpor- ation in 1709. With the advancing demands of commerce the docks were extended north and south. Thcy constituted from the

first a public trust, the corporation never having derived any revenue from them, though the common council of the borough were the trustecs, and in the first instance formed the committee of manage- ment. Gradually the dock ratepayers aequired influence, and were introduced into the governing body, and ultimately, by the Act of 1856, the corporation was entirely superscded. Under the present constitution, the management is vested in the Mersey Docks and

Harbour Board, consisting of twenty-eight members, two of whom are nominated by the Board of Trade and the rest elected by the dock ratepayers, of whom a register is kept and annually revised. The affairs of the board are of considerable magnitude, The revenue is derived from tonnage rates on ships, dock rates on goods, town dues on goods, with various minor sources of income. amounted in the year ending July 1, 1881, to £1,226,497. The amount of debt outstanding is £16,284,881, for which a rate of interest averaging 44 per cent. is paid.

Down to 1848 the docks were confined to the Liverpool side of the Mersey. Several attempts made to establish docks in Cheshire had been frustrated by the Liverpool corporation, who bought up the land and kept it in their own hands. In 1843 a scheme was privately concocted for the construction of docks at Birkenhead. Plans were prepared by Mr Rendel, C.E., the money subscribed,

and arrangements made with the Admiralty,—the corporation being |

kept in ignorance of the proceedings. Application was then made by private individuals to purchase 200,000 square yards of land on the margin of an inlet called Wallasey Pool. The common council, which had been reformed in 1836, innocently fell into the snare, and in the ensuing session of parliament a rival scheme of docks for Birkenhead was brought out and passed. The great expectations

pool have been signally falsified. Aftera twelve years’ struggle and

litigation, the Birkenhead dock affairs had fallen into a hopeless |

state of insolvency, without any prospect of recovery, and in 1855 the docks were transferred to the corporation of Liverpool on pay- ment to the bondholders of 18s. in the pound on their claims. Under the Act of 1856, settling the future constitution of the dock

board, the Birkenhead docks were transferred to the Mersey Docks |

and Harbour Board. The result on the whole has been disastrous. The amount expended on the Birkenhead docks down to 1881 has been

nearly 6 millions. The returns for this immense outlay do little more than defray the working expenses, the difference having to be made up from the revenue on the Liverpool side,—so that, in consequence of this unfortunate rivalry, the shipping frequenting the port is taxed to the amount of £270,000 per annum, which otherwise might have been remitted. The Birkenhcad great float, of 120 acres, though it contributes little to the revenue, is valuable as a depét for ships lying up, so as not to interfere with the working docks. In addition to the floating docks, there are in Liverpool eightcen graving docks and three in Birkenhead, and two gridirons on the Liverpool side.

The great landing stage of Liverpool is unique in its dimensions and utility. It was originally constructed in 1857, from the plans of Mr J. Cubitt, and greatly enlarged and extended in 1874, mak- ing the entire cost £373,000. The grand fabric had just been com- pleted, and was waiting to be inaugurated by the duke of Edin- burgh, when on the 28th July 1874 it accidentally caught fire, and, the timber being impregnated with kreosote, the flames spread with unexampled rapidity, and in a few hours the whole was destroyed. It was again constructed with improvements. Its length is 2063 feet, or about 2ths of a mile, and its breadth 80 feet. It is supported on floating pontoons rising and falling with the tide, connected with the quay by seven bridges, besides a floating bridge for heavy traffic 550 feet in length. The southern half is devoted to the traffie of the Mersey ferries, of which there are eight—New Brighton, Egremont, Seacombe, Birkenhead, Tranmere, Rock Ferry, New Ferry, and Eastham. The northern half is used for sea-going steamers, and for the tenders of the great ‘‘liners.” The ware- houses for storing produce form a very prominent feature in the commercial part of the city. Down to 1841 these were entirely in private hands, distributed as chance might direct, but in that year a determined effort was made to construct docks with warehouses around on the margin of the quays. This met with considerable opposition from those interested, and led to a municipal revolution, but the project was ultimately carried out in the construction of the Albert dock and warehouses, which were opened by Prince Albert in 1845. Other docks since constructed have been similarly surrounded. The Albert warehouses form an immense pile

stand- ing between the dock and the river, imposing from their huge dimensions, but otherwise the very incarnation of bald ugliness.

Grain warehouses on a large scale have been constructed by the dock board both at Liverpool and Birkenhead. The machinery for elevating, distributing, drying, and discharging is of the most com- plete and thorough construction. The rental received from the warehouses in the year 1880-81 was £240,394.

History.—There are no archeological difficulties attending the origin of the town, which is clearly defined by documentary evidence. The part of the country in which Liverpool is situated was not very

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distinguished in the earlier periods of English history. No Roman remains have been discovered within a considerable distance. Under the Saxons the site formed part of the kingdom or province of Deira, the river Mersey (Mcerc-sea) forming the boundary between that kingdom and Mercia. During the Danish irruptions of the 8th century colonies of Norsemen made settlements on both sides of the Mersey, as is indicated by the names of the villages and town- ships in the districts. After the Conquest, the site of Liverpool formed part of the fief (inter Ripam et Mersham) granted by the Conqueror to Roger de Poitou, one of the great family of Mont- gomery. After various forfeitures and regrants from the crown, it was ultimately handed over by Henry IL. to Warine, the keeper of the castle and prison of Lancaster. In a deed executed by King Jolin, then earl of Mortaigne, about 1190, confirming the grant of this with other manors to Henry Fitzwarine, son of the former grantee, the name of Liverpul first occurs.

The namie is spelt in a variety of ways, and much ingenuity has been exercised in the endeavour to explain its etymology. Prob- ably the most plausible is the derivation from Cymric Llyer-

_ pul, *‘the expanse of the pool,” or ‘‘the pool at the confluence,”

which exactly expresses the peculiarity of the original site. It is, however, open to the objection that the Welsh language had died out in the locality long before Liverpool was founded.

The immediate origin of Liverpool was owing to the following circumstances. After the partial conquest of Ireland by Strongbow, earl of Pembroke, under Henry II., the principal ports of com- inunication were Bristol for the south and Chester for the north.

| The gradual silting up of the river Dee soon so obstructed the | navigation as to rendcr Chester a very unsuitable place of embarka- which were entertained of their successful competition with Liver-

tion. A quay was then constructed at Shotwick, about 8 miles below Chester, with a castle to protect it from the incursions of the neighbouring Welsh; but a better site was sought and soon found. Into the tidal waters of the Mersey, a small stream, fed by a peat moss on the elevated land to the eastward, ran in an oblique direetion from north-east to south-west, forming at its mouth an open pool or sea lake, of which many existed on both sides of the river. The triangular piece of land thus separated formed a pro- montory of red sandstone rock, rising in the centre about 50 feet above the sea-level, sloping on three sides to the water. The pool was admirably adapted as a harbour for the vesscls of that period, being well protected, and the tide rising from 15 to 21 feet. King John repurchased the manor from Henry Fitzwarine, giving him another in exchange, and here he erected a eastle on the usual Plantagenet plan of round bastions connected by curtain walls, with an inner ballium and buildings. He also founded a town by the erection of burgage tenements, one hundred and sixty-eight in num- ber, and in 1207 he issued the following letter patent or charter :— Carta Regis Johannis.

**Rex omnibus qui burgagia apud villam de Liverpul habere voluerint, &c. Seiatis quod eoncessimus omnibus qui burgagia apud Liverpul eepint ouod habeant omnes libertates ct liberas consuctudines in villa de Liverpul quas aliquis liber burgemotus super mare labet in terra

nostra, Et nos vobis maudamus quod secure et in pacc nostra illuc veniatis ad burgagia nostra recipienda et hospi- tanda,. Et in hujus rei testimoninm has littcras nostras patentes vobis trans- mittimus, Testo Simon de Pateshill apud Winton xxviij die Aug. anno regni nostri nono."

Charter of King John.

"The king to all who may be willing to have burgages at the town of Liverpul, &c. Know ye that we have granted to all who shall take burgages at Liverpul that they shall have all liberties and free customs in the town of Liverpul which any free borough on the sca hath in our land. And we command you that securely and in our peace you may come there to receive and inhabit our bur- gages. And in testimony hereof we transmit to you these our letters patent. Witness, Simon de Pateshill, at Winchester, the 25th day of August, in the ninth ycar of our reign."

From the Patent Rolls and the sheriff's accounts we learn that considerable use was made of Liverpool in the reign of John for shipping stores and reinforcements to Ireland and Wales. In 1215 the town was garrisoned for the king during the rising which took place after the granting of the Great Charter.

In 1229 a charter of incorporation was granted by Henry II1., authorizing the formation of a merchants' guild, with a hanse and other liberties and free customs, with sac and soc, toll and thean, &c., and freedom from toll in all the other seaports. Charters were subsequently granted by suecessive monarchs down to the reign of William and Mary, which last was the governing charter to the date of the Municipal Reform Act (1835). In 1880 when the new diocese of Liverpool was created, the borough was transformed into a city by royal charter.

The crown revenues from the burgage rents and the royal customs were leased in fee-farm from time to time, sometimes to the corporation, at others times to private persons. The first lease was from Henry III., in 1229, at £10 per annum. In the same year the borough

with all its appurtenances was bestowed, with other lands, on Ranulf, earl of Chester. During the sub- sequent two centuries the fief was repeatedly forfeited and regranted, until it finally passed into the hands of John of Gaunt, duke of Lancaster, and from the accession of his son Henry IV. it merged in the crown. In 1628 Charles I., in great straits for means which were refused by parliament, offered for sale about a thousand manors, among which Liverpool was included. The portion con-

taining Liverpool was purchased by certain merchants of London, who, in 1632, reconveyed the crown rights, including the fee-farm rent of £14, 6s. 8d., to Sir Rd. Molyneux, recently created Lord Maryborough, for the sum of £450. In 1672 all these rights and interests were purchased by the corporation,

Apart from the national objects for which Liverpool was founded, its trade developed very slowly. From £10 per annum, in the beginning of the 13th century, the crown revenues had increased towards the end of the 14th century, to £38—in modern currency about £570; but then they underwent a decline. The Black Death, the fatal scourge of the 14th century, passed over Liverpool about 1360, and carried off a large part of the population. The Wars of the Roses, in the 15th century, unsettled the north- western districts, and repressed all progress for at least a century. The crown revenues diminished from £38 to less than half that sum, and were finally leased at £14, 6s. 8d., at which they continued until the sale by Charles I.

Liverpool sent no representatives to Sinton de Montfort’s parlia- iment in 1264, but to the first royal parliament, called in 1296, the borough sent two members, and again in 1306. The writs of suminons were then suspended for two centuries and a half. Dur- ing the 14th and 15th centuries nearly the whole of the returns of the sheriffs of Lancaster were to the following effect :—“ There is not any city or borough from which any citizens or burgesses are able or accustomed to come,

according to the tenor of the writ, by reason of their debility and poverty.” In 1547 Liverpool, with the rest of the Lancashire boroughs, resumed the privilege of returning members. In 1588 the borough was represented by Sir Francis Bacon, the immortal philosopher and statesman. During the civil war the town was fortified and garrisoned by the parlia- ment. It sustained three sieges, and in 1644 was escaladed and taken by Prince Rupert with considerable slaughter.

The true rise of the commerce of Liverpool dates from the testoration. Down to that period its population had been either stationary or retrogressive, never exceeding about 1000 souls, Its trade was chiefly with Ireland, France, and Spain, exporting fish and wool to the Continent, and importing wines, iron, and other commodities. The rise of the manufacturing industry of South Lancashire, and the opening of the American and West Indian trade, gave the first impulse to the progress which has ever since continued. The importation of sugar led to the establishment of sugar refineries, which after the lapse of two centuries continue to form an import- ant branch of local industry. By the end of the century the population had increased to 5000. The town burst the narrow limits within which it had hitherto been confined, and extended itself across the pool stream. In 1699 the borough was constituted a parish district from Walton, to which it had previously apper- tained. In 1709, the small existing harbour being found insufficient to accommodate the shipping, several schemes were propounded for its enlargement, which resulted in the construction of a wet dock closed with flood-gates impounding the water, so as to keep the vessels floating during the recess of the tide. This dock in Liverpool was the first of the kind, and was the parent of all the magnificent structures which have attracted the admiration of the world. The name of the engineer, Thomas Steers, deserves recording, as the author of the practical application of a principle already known leading to a world-wide utility, of a similar class to the adaptation of the railway by George Stephenson at a subsequent period.

About this date the merchants of Liverpool entered upon a traffic which, however questionable in point of morality, became very profitable during the remainder of the century—the slave tradc, into

which they were led by their connexion with the West Indies. In 1709 a single barque of 80 tons burden made a venture from Liverpool and carried 15 slaves across the Atlantic. Little was done during the next twenty years, but in 1730, encouraged by parliament, Liverpool went heartily into the new trade. In 1751 53 ships sailed from Liverpool for Africa, of 5334 tons in the ageregate. From this time the trade set in with such a steady current that it soon became one of the most lucrative branches of the commerce of the port. The voyage was threefold. The ships sailed from Liverpool to the west coast of Africa, where they shipped the slaves, and thence to the West India Islands, where the slaves were sold and the proceeds brought home in cargoes of sugar and rum. In 1765 the number of Liverpool slavers had increased to 86, carry- ing 24,200 slaves. By the end of the century five-sixths of the African trade centred in Liverpool. Just before the abolition in 1807 the number of Liverpool ships engaged in the traffic was 185, carrying 43,755 slaves in the year. .

Another branch of maritime enterprise which attracted the atten- tion of the merchants of Liverpool was privateering, which during the latter half of the 18th century was a favourite investment. After the outbreak of the Seven Years' War with France and Spain, in 1756, the commerce of Liverpool suffered severely, the French having overrun the narrow seas with swift well-armed privateers, and the premiums for insurance against sea risks having risen to an amount almost prohibitory. The Liverpool merchants took a lesson from the enemy, and armed and sent out their ships as

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privateers. Some of the early expeditions having proved very successful, almost the whole community rushed into privateering, with results of a very chequered character. When the War of Independence broke out in 1776 American privateers swarmed about the West India Islands, and crossing the Atlantic intercepted British commerce in the narrow seas. 'The Liverpool merchants again turned their attention to retaliation. Between August 1778 and April 1779 120 privateers were

fitted out in Liverpool, carrying 1986 guns and 8754 men. The results, though in some cases very profitable, were exceedingly demoralizing.

During the whole of the 18th century the commerce of Liverpool kept steadily increasing in spite of external war and internal com- petition, and has so continued to the present time. The increase of the population supplies a fair index to the growth of its coin- merce.

The Municipality.—Under the Municipal Reform Act of 1835, the boundaries of the original borough were extended by the annexa- tion of portions of the surrounding district. The city is divided into sixteen wards, returning three members each to the common council, with sixteen aldermen, making sixty-four in all. The wards were originally divided according to Pee but the lapse of nearly half a century has so completely disturbed the pro- portions that, whilst some of the wards in the commercial localities have diminished in population, the Everton and Kirkdale ward, originally a rural suburb, now contains a population of 150,000, with a constituency of more than 20,000 clectors. The electoral franchise, before the Reform

The arms of the city as set forth in the confirmation by the Heralds' College, in 1797, are described as follows :—‘‘ Argent, a Cormorant, in the beak a branch of seaweed called Laver, all proper, and for the crest, on a wreath of the colours, a Cormorant, the wings elevated ; in the beak a branch of Laver proper.” The supporters, granted at the same time are—‘‘ The dexter Neptune with his sea- green mantle flowing, the waist wreathed with Laver, on his head an eastern crown or, in the right hand a trident sable, the left sup- porting a banner of the arms of Liverpool; on the sinister a Triton wreathed as the dexter and blowing his shell ; all proper.” The motto is ‘* Deus nobis hee otia fecit.”

The corporation of Liverpool has possessed from a very early period considerable landed property, the first grant having been made by Thomas, earl of Lancaster, in 1309. This land was originally of value only as a turbary, but in modern times its capacity as building land has been a fruitful source of profit to the town, a large proportion of the southern district being held in free- hold by the corporation leased for

terms of seventy-five years, re- newable from time to time on a fixed scale of fines, The income from this source amounted in 1879 to £83,746. There was formerly another source of income now cut off. The fee farm rents and town dues originally belonging to the crown were purchased from the Molyneux family m 1672 on a long lease, and subsequently in 1777 converted into a perpetuity. With the growth of the commerce of the port these dues enormously increased, and became a cause of great complaint by the shipping interest. In 1856 a bill was introduced into parliament and passed, by which the town ducs were transferred to the Mersey Docks and Harbour Board on payment of £1,500,000, which was applied in part to the liquidation of the bonded debt of the corporation, amounting to £1,150,000. The town dues at that time produced £132,592 per annum, which has increased in 1881 to £260,698. The markets produce an income of abont £12,000 clear of expenses,

The council form the sanitary authority of the city, in which capacity they expended in the year 1880-81 the sum of £255,738, derived from rates. In the same year there was expended for lighting and watching, £75,263 ; for parks and places of recreation, £49,178; for town improvements, £33,192. These amounts are partly defrayed out of the corporate funds ; the part for the con- stabulary is paid by Government, and the rest out of rates.

The mayor has an annual allowance of £2700, to sustain the dignity of his office and maintain the hospitality of the town-hall.

The city returns three members to parliament.

The see of Liverpool was created in 1880 under the Act of 1879, by the authority of the Ecclesiastical Commissioners, an endowment fund of about £100,000 having been subscribed for the purpose.

See Leland’s Jtinerary ; Camden’s Britannia; R. Blome, Britannia; Daniel Defoe, Tour through Great Britain; W. Enfield, Hist. of Leverpool (sic), 1774; J. Aikin, M.D., Forty Mites round Manchester, 1795; T. Troughton, Hist. of Liverpool, 1810; M. Gregson, Fragments relating to Hist. of Lancashire, 1817-24 ; H. Smithers, Liverpool, its

Commerce, &c., 1825; R. Syers, Hist, of Everton, 1830 ; Ed. Baines, Hist. of County Palatine of Lancashire, vol. iv., 1836 ; Thos. Baines, Hist. of Commerce and Town of Liverpool, 1852; Rd. Brooke, Liverpool during the last quarter of 18th Century, 1858; J. A. Picton, Memorials of Liverpool, 2 vols., 2d ed., 1875. J. A. P.)

LIVERPOOL, Caries JENKINSON, FIRST EarL oF (1727-1808), was the eldest son of Colonel Jenkinson, Wal- cot, Oxfordshire, where be was born 16th May 1727. He was educated at Charterhouse school and at University Col-

lege, Oxford, where after a career of special distinction he | graduated M.A. in 1752. Almost immediately on entering | parliament as member for Cockermouth in 1761, he was | appointed under-secretary of state under Lord Bute, and, as he soon shared equally with that nobleman the favour of the king, his political advancement was rapid and uninter- rupted while the friends of the king remained in office. By Grenville he was in 1763 appointed secretary of state ; in the Grafton administration he, in 1766, obtained a seat at the Admiralty Board; and from 1778 till the close of Lord North's ministry he was secretary at war. On the accession of Pitt to power in 1784, he became president of the Board of Trade, retaining office till Pitt's resignation in 1801. Besides direct political power he also enjoyed a large share both of substantial and honorary political rewards. In 1773 he became member of the privy council, and obtained the vice-treasurership of Ireland, which he afterwards exchanged for the clerkship of the pells; and from 1786 to 1802 he was chancellor of the duchy of Lancaster. In 1786 he was created Baron Hawkesbury, and ten years afterwards earl of Liverpool. He died 17th December 1808, Lord Liverpool was generally believed to be the chief political adviser of George HII His prudence, practical talents, and knowledge of the details both of home and foreign politics rendered him a specially safe and useful member of a cabinet.

He was the author of several political works, which display industry and discrimination, but, with the exception of his well- known Treatise

on the Coins of the Realm, 1805, are without striking merits. His other writings are—National and Constitu- tional Force in England, 1756; Treaties between Great Britain and other Powcrs, 1648-1788, 3 vols., 1785; The Conduct of Great Britain in respect to Neutral Nations, 1785, 3 vols., 1801.

LIVERPOOL, Rogert Banks JENKINSON, SECOND Earu oF (1770-1828), son of the above by his first wife Amelia, daughter of Mr Watts, governor of Bengal, was born June 7, 1770. He was educated at Charterhouse and at Christ Church, Oxford, where he had Canning, afterwards his close political associate, for a contemporary. In 1791 he entered parliament as member for Rye, but he first held office in 1801 as foreign secretary in Addington's adminis- tration, when he conducted the negotiations for the abortive treaty of Amiens. On the accession of Pitt to power in 1804, he obtained the home office, and till his elevation to the House of Peers he acted as leader of the party in the House of Commons. He declined the premiership on the death of Pitt in 1806, and remained out of office till the accession of Perceval in 1809, when he again became home secretary. After the assassination of Perceval in 1812 he became prime minister, and retained office till compelled in February 1827 to resign by the illness (paralysis) which terminated his life, 4th December 1828. The political career of Lord Liverpool was entirely of a negative character so far as legislation was concerned; the only principle which regulated his statesmanship was persistent opposition to every kind of change, especially in the direction of increased religious or political liberty. From the begin- ning he strongly resisted Catholic emancipation, and he was also prominent in delaying the emancipation of the slaves. The energy of Castlereagh and Canning secured the out- ward success of the foreign policy of the cabinet, but in | his home policy he was always unfortunate and retrograde. The Pains and Penalties Bill against Queen Caroline greatly | increased his unpopularity, first originated by the severe measures of repression employed to quell the general distress, which had been created by undue taxation and was aggravated by blind adherence to protection. Though, therefore, actuated throughout by an honesty beyond all question, and though always commanding the

sincere respect of his opponents by his dignified and considerate bearing, Lord Liverpool was destitute of wide and genial

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sympathies, and of true political insight, and his resigna- tion of office was followed almost immediately by the complete and permanent reversal of his domestic policy.

LIVERWORTS. The Liverworts or Hepaticx constitute a group of the higher Cryptogamia, allied to the mosses. Their shoots are either thalloid, in some genera (Marchantia) highly differentiated in structure, in others (Anthoceros) of simple homogeneous texture, with an upper and lower sur- face, the latter fixed to the ground by capillary rootlets, and generally margined with minute scales; or they are folzose, the central stem bearing on each side a row of leaves, con- sisting of one series of cells invested with a structureless epidermis, and destitute of nerves, such as prevail in the leaves of mosses. Frequently on the inferior aspect a third row of leaf-like scales is found, differing from the former, and known as stipules, bracteoles, or amphigastria. Hence the shoots, although typically trilateral, often appear bi- lateral. The reproductive organs of the Hepatice are of two kinds—sexual and asexual.

I. The sexual germs of the mosses and Hepatice were first described by Hedwig just one hundred years ago (1782). They consist, as in the higher plants, of germ-cells and sperm-cells. As the fronds approach maturity the terminal leaves become modified so as to form an involucrum, within which a special covering appears, the colesule or perianth, surrounding the pistillidia; this is tubular, conical, or compressed in form, with the mouth plicate and generally dentate.

On section of the colesule a number of minute flask-shaped bodies are found, attached to the apex of the stem, which have been named archigonia or pistillidia. After fertiliza- tion one of these enlarges, active cell formation proceeding from the central cell at the base,

within which appears the germ-cell, which in time becomes the capsule, the ultimate contents producing spores arranged in fours, and elongated cells bearing within spiral filaments (elaters). Until the maturity of the spores, the sporangium remains at the base of the colesule, but at length the outer coat (calyptra) ruptures near the summit, and by the rapid evolution of the cells of the fruit-stalk (seta) the capsule is borne up- wards. At this stage, which is of brief duration, the fronds look as if dotted with black-headed pins on white stalks. Released from pressure, the hygrometric action of the elater soon ruptures the wall of the capsule, which divides, in the majority of species, into four valves, and the spores are scattered around.

The antheridia are sometimes found imbedded in crypts within the substance of the thallus (iccca), or in special receptacles either sessile or raised above the surface of the same (Marchantia). In the foliose Hepatice they are usually seated in the axils of modified leaves (perigonial), sometimes appearing beneath the fertile involucra (mone-cious), or on special branches of the same plant (parcecious), or they occur on separate plants (dicecious). The antheridia are much smaller than the capsules, spherical or ovoid in form, and seated on a short footstalk. They are invested with a single coat of tabular cells. Before maturity they are greenish, but when ripe their colour turns to yellow. On pressure they rupture irregularly, and allow the escape of crowds of lenticular cells, which revolve actively under

| the microscope until the ciliated phytozoa within them are

released. .

The phytozoa of mosses were first figured by Unger (1834), who described them as consisting of a thick body, and a thin thread-like prolongation, which goes in advance when the body is in motion, and is spiral in form. Thuret has since shown that the so-called “tail” bears two long oscillating cilia. Hofmeister first observed the formation of the free germinal vesicle within the basal cell of the pistillidium as the direct result of fertilization.

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Il. Asexual Germs.—Beyond the true fructification, in the majority of MHepaticx, certain bodies are met with, which are known as gemnie, but which differ from each other in complexity and significance.

(1) In some Jfarchantie basket-like or crescentic re- ceptacles are found, containing lenticular bodies, which, under favourable conditions, will produce new fronds.

(2) On the borders of the leaves, especially near the apex of the shoots, prolification from the ordinary cellular tissue is met with in most Hepaticx, in the form of detached cells or tufts of such cells. These are generally described as gemma, but resemble more closely the gonidia of lichens, and probably aid in the diffusion of dicecious species, which from the absence of 4 or ? plants would otherwise become extinct.

(3) Another process has been ascribed to gemmation, but has been more happily named by Dr A. Braun rejuvenescence (Verjungung). In decayed or apparently withered fronds, certain cells, after a period of rest, assume new activity and multiply so as to give rise to new individuals (Anthoceros, Riccia, &ec.).

Distinction between Hepatice and Musci.—There is scarcely a character in the definition of Hepaticw which might not refer to some genus of mosses, although the definition as a whole may be sufficiently distinctive, and practically there is no difficulty in dis- tinguishing one from the other.

In JMfusci the urn-case or capsule generally opens by means of a lid, and the mouth is surrounded by a peristome divided into four, eight, or more teeth. A columella is nearly always present, and the spores ripen in a sac between the former and the walls of the eae From the early elongation of the fruit rudiment, the calyptra is ruptured at an earlier stage, the upper part investing the urn-case like a cap, during the development of the spores; the lower remnant remains at the base of the seta (which, as well as the cap- sule, is composed of more ligneous texture than in Hepatice) as the vaginula. The spore gives rise to a confervoid prothallus often ex- tensively branched, and from this the

leaf-buds arise. The leaves are imbricated on all sides of the stem, and the phyllotaxis is usually 34, #, or 8. The leaves are frequently strengthened by a midrib, and the rootlets are divided by numerous septa.

Habitat.—The Hepatice are cosmopolitan in range, and form a relatively important average of the alpine vegetation, being abund- ant in moist equable and insular places, ¢.g., Ireland, Scotland, New Zealand. .Thcy are also met with in more tropical zones, such as South America, India, Java, and the West Indies,

Classification.

I. Marchantiacee.—Fronds thalloid, prostrate, furcate ; epider- mis pierced with curious stomata ; inner section areolate, occupied by green gonidial cells, lower surface simply cellular, emitting long rootlets, papillose within.

(a) Marchantice.—Capsules aggregate on a stalked receptacle:

e.g., Marchantia, Astcrella, Fegatella, Dumortiera, Lwnu- laria, &e.

(0) Targionice.—Antheridia immersed ; involucre like a split

pea; capsule nearly sessile, below the apex.

(c) Ricctew.—Antheridia and pistillidia immersed, the latter

emitting the spores by the decay of the walls; spores with- out elaters: e¢.g., Riccia, Ricciella, &c.

Il. Jungermanniacex.—Capsule solitary terminal on the primary shoots or on short lateral ones, splitting into four valves.

- Foliosx.

(a) Leaves succubous: ¢.g., Jungermannia, Scapania, Lopho-

colea, &c. (b) Leaves incubous: ¢.g., Lijennia, Frullania, Schisma, Lept- dozia, &c.

- Frondose: ¢g., Pellia, Blasia, Petalophyllum, &c.

Ill. Anthoceroteew.—Capsule horn or pod-like, opening by one or two valves, columella central, spores intermingled with deformed elaters: ¢.g., Anthoceros, Monoclza.

Uses.—At the present time the Hepatice are of little practical use to man. In the dark ages of medicine, when the doctrine of ‘*sionatures”’ was in fashiou, the strongly-marked epidermic cells were supposed to resemble the structure of the liver, and the specics Were esteemed ‘‘a sovran remedy” in liver complaints. The He- patica fontana (Marchantia polymorpha) of Casper Bauhine, ‘‘ which grows near springs, wells, and watery places, very lowe, almost likea moss, and puts out flowers about June, not unlike stars,” is wonder- fully commended by Schréder, in those disorders of the liver which arise from too much heat (English Dispensary, 1733). A few species possess a pungent, bitter taste (Porclla) resembling that of Scdwm aere. Many also evolve a musky odour, observable in the woods

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and an after rain, and incorrectly referred to the smell of moist earth.

Beyond the beauty of tint and outline, which light up many a dreary ravine, they supply abundant material for the microscope, enabling us by the translucency of tissue, and their easy preserva- tion, so long as moisture is supplied, to study cell and leaf-struc- ture, and the wonders of reproduction, as no other class will do.

Lastly, many fern-growers have of late included the Hepatice and Mfusci in their lists of favourites, the variety adding immeasurably to the interest of their collections. Most of the species are readily cultivated in a cold frame or fernery, the atmosphere of which must be kept moist and equable. In the renowned ferneries of Mr Backhouse of York, A. Stansfield of Todmorden, and the Glasnevin Gardens, Dublin, species have long been cultivated, many foreign to the climate, and introduced with forcign plants. (B. C.)

LIVINGSTON, Epwarp (1764-1836), American jurist and statesman, was born in Clermont, Columbia county, New York, May 26, 1764. He was a great-grandson of Robert Livingston, the first possessor under royal patent of ‘‘ Livingston Manor,” a tract of land on the Hudson, comprising the greater part of the present counties of Dutchess and Columbia. Having graduated at Princeton in 1781, he began to practise law in New York city, and rapidly rose to distinction as an advocate. He was a member of congress during 1794-98, and in 1801 was appointed United States district attorney for the State of New York, and while retaining that position was also elected mayor of New York city, then an office of high dignity and emolument. In the summer of 1803 New York was visited with a violent epidemic of yellow fever, during which Livingston displayed great courage and energy in his endeavours to prevent the spread of the disease, and to relieve the widespread distress. He suffered an attack of the fever in its most violent form, during which the people of the city gave many proofs of their attachment and anxiety. He recovered to find his private affairs, which he had neglected, in some confusion, and he was at the same time deeply indebted to the Government for public funds which had been lost through the mismanagement of a confidential clerk. Livingston at once surredered all his property, and, having resigned his offices, removed to Louisiana, which had then just been ceded by France to the United States. He soon acquired a large law practice in New Orleans, and repaid the Government in full. Almost immediately upon his arrival in Louisiana he was appointed by the legislature to prepare a provisional code of judicial procedure, which was continued in force from 1805 to 1825. During the short war with England in 1814-15, Livingston was active in rousing the mixed population of New Orleans to resistance, and acted as adviser and aide-de-camp to Jackson. In 1821, by appointment of the legislature, Livingston began the preparation of a new code of criminal law and procedure, since widely known in Europe and America as the “Livingston Code.” It was prepared in both French and English, as required by the necessities of practice in Louisiana, and, though substantially completed in 1824, and in greater part then adopted by the State, it was not printed entire until 1833. It was at once reprinted in England, France, and Germany, attracting wide interest and praise from the most

distinguished sources by its remarkable simplicity and vigour, and more especially by reason of its philanthropic provisions, which have noticeably influenced; the penal legislation of several countries. Livingston was a member of congress during 1823-29, was afterwards senator, and for two years secretary of state under President Jackson. From 1833 to 1835 he was minister plenipotentiary to France, and conducted with suc- cess negotiations of considerable difficulty and importance. He died May 23, 1836.

See Livingston's Life by C. H. Hunt (New York, 1864), and his complete Works (2 vols., 1873).

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LIVINGSTON, Rozert R. (1746-1813), American statesman, brother of Edward Livingston noticed above, was born at New York, November 27, 1746. He gradu- ated at King's College, New York, at the age of nineteen, became a practitioner of law, and, in 1773, recorder of the city, but was soon displaced by loyalist influence because of his sympathies with the revolution. In 1776 he was a member of the committee of congress which drew up the Declaration of Independence, and in 1777 was a prominent member of the convention at Kingston, which framed the first constitution of New York. Upon the adoption of that instrument in the same year he became the first chancellor of the Stite, which office he held until 1801, whence he is best known as "Chancellor " Livingston. He administered the oath of office to Washington at his first inauguration to the presidency in New York, April 30,1789. In 1801 he was appointed by President Jackson as minister to France, and in 1803 effected in behalf of his Government the purchase from France of the vast territory then known as Louisiana, comprising the entire territory between the Mississippi and the Rocky Mountains, from the Spanish to the British possessions. This was, perhaps, the most im- portant transfer of territory by purchase ever made, but none of those who participated in it realized its importance. Napoleon's agent obtained ten million francs more than he had been instructed to accept for the cession, and Jefferson and Livingston were at the time bitterly censured for rashly

concluding so useless a purchase. In 1804 Livingston withdrew from public life, and after spending a year in travel in Europe, returned to New York, where he occupied his remaining years in promoting various improvements in agriculture. He also assisted Fulton in his invention of the steamboat. He died in February 1813.

LIVINGSTONE, Davin (1813-1873), missionary and explorer, was born on March 19, 18153, at the village of Blantyre Works, in Lanarkshire, Scotland. David was the second child of his parents Neil Livingston (for so he spelled his name, as did his son for many years) and Agnes Hunter. His parents were poor and self-respecting, typical examples of all that is best among the humbler families of Scotland. At the age of ten years David left the village school for the neighbouring cotton-mill, and by strenuous efforts he qualified himself at the age of twenty-three to undertake a college curriculum. He attended for two sessions the medical and tle Greek classes in Anderson's College, and also a theological class. In September 1838 he went up to London, and was accepted by the London Missionary Society as a candidate. During the next two years he resided mostly in London, diligently attending medical and science classes, and spending part of his time with the Rev. Mr Cecil at Ongar in Essex, studying theo- logy and learning to preach.. He took his medical degree in the Faculty of Physicians and Surgeons in Glasgow in November 1840. Livingstone had from the first set his heart on China, and it was a great disappointment to him that the Society finally decided to send him to Africa. To an exterior in these early years somewhat heavy and uncouth, he united a manner which, by universal testimony, was irresistibly winning, with a fund of genuine but simple humour and fun that would break out on the most unlikely occasions, and in after years enabled him to overcome difficulties and mellow refractory chiefs when all other methods failed.

Livingstone sailed from England on December 8, 1840. From Algoa Bay he made direct for Kuruman, the mission station, 700 miles north, established by Hamilton and Moffat thirty years before, and there he arrived on July 31, 1841. The next two years Livingstone spent in

travelling about the country to the northwards, in search of a suitable outpost for settlement. During these two

years he had already become convinced that the success of the white missionary in a field like Africa is not to be reckoned by the tale of doubtful conversions he can send home each year,—that the proper work for such men was that of pioneering, opening up and starting new ground, leaving native agents to work it out in detail. Tle whole of his subsequent career was a development of this idea. He selected the valley of Mabotsa, on one of the sources of the Limpopo river, 200 miles north-east of Kuruman, as his first station. It was shortly after his settlement licre that he was attacked by a lion which crushed his left arm, and nearly put an end to his career. The arm was iin- perfectly set, and it was a source of trouble to him at times throughout his life, and was the means of identi- fying his body after his death. Toa house, mainly built by himself at Mabotsa, Livingstone in 1844 brought. home his wife, Mary Moffat, the daughter of Moffat of Kuru- mau. Here he laboured till 1846, when he removed to Chonnane, 40 miles further north, the chief place of the Bakwain tribe under Sechele. In 1847 he again removed to Kolobeng, about 40 miles westwards, the whole tribe following their missionary. With the help of and in the company of two English sportsmen, Mr Oswell and Mr Murray, he was able to undertake a journey of great im- portance to Lake Ngami, which had never yet been seen by a white man. Crossing the Kalahari Desert, of which Livingstone gave the first detailed account, they reached the lake on August 1, 1849. In April next year he made an attempt to reach Sebituane, who lived 200 miles beyond the lake, this time in company with his wife and children, but again got no further than the lake, as the children were seized with fever. A year later, April 1851, Living- stone, again accompanied by his family and Mr Oswell, set out, this time with the intention of settling among the Makololo for a period. At last he succeeded, and reached the Chobe, a southern tributary of the Zambesi, and in the end of June discovered the Zambesi itself at the town of Sesheke. Leaving the Chobe on August 13, the party reached Capetown in April 1852. Livingstone may now

be said to have completed the first period of his career in Africa, the period in which the work of the missionary had the greatest prominence. Henceforth he appears more in the character of an explorer, but it must be remembered that he regarded himself to the last as a pioneer missionary, whose work was to open up the country to others. Having, with a sad heart, seen his family off to England, Livingstone left the Cape on June 8, 1852, and reached Linyanti, the capital of the Makololo, on the Cliobe, on May 23, 1853, received in royal style by Sekeletu, and welcomed by all the people. His first object in this journey was to seek for some healthy high land in which to plant a station. Ascending the Zambesi, he, however, found no place free from the destructive tsetse insect, and therefore resolved to discover a route to the interior from either the west or east coast. To accompany Livingstone in his hazardous undertaking twenty-seven men were selected from the various tribes under Sekeletu, partly with a view to open up a trade route between their own country and the coast. The start was made from Linyanti on November 11, 1853, and, by ascending the Leeba, Lake Dilolo was reached on February 20, 1854. On April 4 the Coango was crossed, and on May 31 the town of Loanda was entered, much to the joy of the men,—their leader, however, being all but dead from fever, semi-starvation, and dysentery. Livingstone speaks in the warmest terms of the generosity of the Portuguese merchants and officials. From Loanda Livingstone sent his astronomical observa- tions to Maclear at the Cape, and an account of his journey to the Royal Geographical Society, which in May 1855 awarded him its highest honour, its gold medal,

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Loanda was left on September 20, 1854, but Livingstone lingered long about the Portuguese settlements. Making a slight detour to the north to Cabango, the party reached Lake Dilolo on June 13. Here Livingstone made a careful study of the watershed of the country in what is perbaps the most complicated river system in the world. He “now for the first time apprehended the true form of the river systems and the continent,” and the conclusions he came to have been essentially confirmed by subsequent observations. The return journey

from Lake Dilolo was by the same route as that by which the party came. Their reception all along the Barotse valley was an ovation, and Linyanti was reached in the beginning of September.

For Livingstone's purposes the route to the west was unavailable, and he decided to follow the Zambesi to its mouth. With a numerous following, he left Linyanti on November 8, 1855.

On December 12 he arrived in England, after an absence of sixteen years, and met everywhere with the welcome of a hero. He told his story in his Missionary Travels and Researches in South Africa (1857) with straightforward simplicity, and with no effort after literary style, and no apparent consciousness that he had done anything extra-ordinary. Its publication brought what he would have considered a competency had he felt himself at liberty to settle down for life. In 1857 he severed his connexion with the London Missionary Society, with whom, however, he always remained on the best of terms, and in February 1858 he accepted the appointment of "Her Majesty's consul at Kilimane for the eastern coast and the independ- ent districts in the interior, and commander of an expedition for exploring eastern and central Africa."

The Zambesi expedition, of which Livingstone thus became commander, sailed from Liverpool in H.M.S8. " Pearl" on March 10, 1858, and reached the mouth of the Zambesi on May 14, and the party ascended the river from the Kongone mouth in a steam launch, the '' Ma-Robert," reaching Tette on September 8. The remainder of the year was spent in examining the river above Tette, and especially the Kebrabasa rapids. Most of the year 1859 was spent in the exploration of the river Shire and Lake

Nyassa, which was discovered in September ; and much of the year 1860 was spent by Livingstone in fulfilling his promise to take such of the Makalolo home as cared to go. In January of next year arrived Bishop Mackenzie and a party of missionaries sent out by the Universities Mission to establish a station on the upper Shire.

After exploring the river Rovuma for 30 miles in his new vessel the ‘‘ Pioneer,” Livingstone and the mission- aries proceeded up the Shire to Chibisa’s; there they found the slave trade rampant, desolating the country and paralysing all effort. On July 15 Livingstone, accom- panied by several native carriers, started to show the bishop the country. Several bands of slaves whom they met were liberated, and after seeing the missionary party settled in the highlands of Magomero to the south of Lake Shirwa, Livingstone spent from August to November in exploring Lake Nyassa. While the boat sailed up the west side of the lake to near the north end, the explorer marched along the shore. He returned more resolved than ever to do his utmost to rouse the civilized world to put down the deso- lating slave-trade. On January 30, 1862, at the Zambesi mouth, Livingstone welcomed his wife and the ladies of the mission, with whom were the sections of the ‘Lady Nyassa,” a river steamer which Livingstone had had built at his own expense, absorbing most of the profits of his book, and for which he never got any allowance. When the mission ladies reached the mouth of the Ruo tributary of the Shire, they were stunned to hear of the death of the bishop and of Mr Burrup. This was a sad blow to Livingstone, seem- ing to have rendered all his efforts to establish a mission futile. A still greater loss to him was that of his wife at Shupanga, on April 27, 1862.

The “Lady Nyassa” was taken to the Rovuma. Up this river Livingstone managed to steam 156 miles, but further progress was arrested by rocks. Returning to the Zambesi in the beginning of 1863, he found that the deso- lation caused by the slave trade was more horrible and widespread than ever. It was clear that the Portuguese officials were themselves at the bottom of the traffic. Kirk and Charles Livingstone being compelled to return to England on account of their health, the doctor resolved once more to visit the lake, and proceeded some distance up the west side and then north-west as far as the water- — shed that separates the Loangwa from the rivers that run into the lake. Meanwhile a letter was received from Earl Russell recalling the expedition by the end of the year. In the end of April 1864 Livingstone reached Zanzibar in the “Lady Nyassa,” and on the 30th he set out with nine natives and four Europeans for Bombay, which was reached

after an adventurous voyage of a month, and on July 23 Livingstone arrived in England. He was naturally dis- appointed with the results of this expedition, all its lead- ing objects being thwarted through no blame of his. For the unfortunate disagreements which occurred, and for which he was blamed in some quarters, he must be held acquitted, as he was by the authorities at home; though it is not necessary to maintain that Livingstone was exempt from the trying effects on the temper of African fever, or from the intolerance of lukewarmness which belongs to all exceptionally strong natures. Still the results at the time, and especially those of the future, were great. The geo- graphical results, though not in extent to be compared to those of his first and his final expeditions, were of high importance, as were those in various departments of science. Details will be found in his Narrative of an Expedition to the Zambesi and its Tributaries, published in 1865.

By Murchison and his other staunch friends Livingstone was as warmly welcomed as ever. When Murchison proposed to him that he should go out again, although he seems to have had a desire to spend the remainder of his

days at home, the prospect was too tempting to be rejected. He was appointed H.M. consul to central Africa without a salary, and Government contributed only £500 to the expedition. The chief help came from private friends. During the latter part of the expedition Government ‘granted him £1000, but that, when he learned of it, was devoted to his great undertaking. The Geographical Society contributed £500. The two main objects of the expedition were the suppression of slavery by means of civilizing influences, and the ascertainment of the watershed in the region between Nyassa and Tanganyika. At first Living- stone thought the Nile problem had been all but solved by Speke, Baker, and Burton, but the idea grew upon him that the Nile sources must be sought farther south, and his last journey became in the end a forlorn hope in search of the “fountains”

of Herodotus. Leaving England in the middle of August 1865, wa Bombay, Livingstone arrived at Zanzibar on January 28, 1866. He was landed at the mouth of the Rovuma on March 22, and started for the interior on April 4. His company consisted of thirteen sepoys, ten Johanna men, nine African boys from Nassick school, Bombay, and four boys from the Shire region, besides camels, buffaloes, mules, and donkeys. This imposing outfit soon melted away to four or five boys. Rounding the south end of Lake Nyassa, Livingstone struck in a north-north- west direction for the south end of Lake Tanganyika, over country much of which had not previously been explored. The Loangwa was crossed on December 15, and on Christ- mas day Livingstone lost his four goats, a loss which he felt very keenly, and the medicine chest was stolen in January 1868. Fever came upon him, and for a time was his almost constant companion; this, with the fearful dysentery and dreadful ulcers and other ailments which subsequently attacked him, and which he had no medicine to counteract, no doubt told fatally on even his iron frame. The Chambeze was crossed on January 28, and the south end of Tanganyika reached March 31. Here, much to his vexation, he got into the company of Arab slave dealers, by whom his movements were hampered ; but he succeeded in reaching Lake Moero. After visiting Lake Mofwa and the Lualaba, which he believed was the upper part of the Nile, he, on July 18, discovered Lake Bangweolo. Pro- ceeding up the west coast of Tanganyika, he reached Ujjji on March 14, 1869, "'a ruckle of bones."

partly by the natives, partly by the slave hunters, and partly by his long illnesses. It was, indeed, not till March 29, 1871, that he succeeded in reaching the Lualaba, at the town of Nyangwe, where he stayed four months, vainly trying to get a canoe to take him across. It was here that a party of Arab slavers, without warning or provocation, assembled one day when the market was busiest and commenced shooting down the poor women, hundreds being killed or drowned in trying to escape. Livingstone had "the impression that he was in hell," but was helpless, though his "first impulse was to pistol the murderers." The account of this scene which he sent home roused indignation in England to such a degree as to lead to determined and to a considerable extent successful

efforts to get the sultan of Zanzibar to suppress the trade. In sickened disgust the weary traveller made his way back to Ujiji, which he reached on October 13. Five days after his arrival in Ujiji he was cheered and inspired with new life, and completely set upagain, as he said, by the timely arrival of Mr H. M. Stanley, the richly laden almoner of Mr Gordon Bennett, of the New York Herald. Mr Stanley's residence

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with Livingstone was almost the only bright episode of these last sad years. With Stanley Livingstone explored the north end of Tanganyika, and proved conclusively that the Lusize runs into and not out of it. In the end of the year the two started eastward for Unyanyembe, where Stanley provided Livingstone with an ample supply of goods, and bade him farewell. Stanley left on March 15, 1872, and after Livingstone had waited wearily at Unyanyembe for five months, a troop of fifty-seven men and boys arrived, good and faithful fellows on the whole, selected by Stanley himself. Thus attended, he started on August 15 for Lake Bangweolo, proceeding along the east side of Tanganyika. His old enemy dysentery soon found him out. In January 1873 the party got among the endless spongy jungle on the east of Lake Bangweolo, Livingstone's object being to go round by the south and away west to find the "foun- tains." Vexatious delays took place, and the journey became one constant wade below, under an almost endless pour of rain from above. The doctor got worse and worse, but no idea of danger seems to have occurred to him. At last, in the middle of April, he had unwillingly to submit to be carried in a rude litter. On April 29 Chitambo's village on the Lulimala, in Ilala, on the south shore of the lake, was reached. The last entry in the journal is April 27 :-— "Knocked up quite, and remain—recover—sent to buy milch goats. We are on the banks of the Molilamo." On April 30 he with difficulty wound up his watch, and early on the morning of May 1 the boys found "the great master," as they called him, kneeling by the side of his bed, dead. His faithful men preserved the body in the sun as well as they could, and wrapping it carefully up, carried it and all his papers, instruments, and other things across Africa to Zanzibar. It was borne to

England with all honour, and on April 18, 1874, was deposited in Westminster Abbey, amid tokens of mourning and admiration such as England accords only to her greatest sons. Government bore all the funeral expenses. His faithfully kept journals during these seven years' wanderings were published under the title of the Last Journals of David Livingstone in Central Africa, in 1874, edited by his old friend the Rev. Horace Waller.

In spite of his sufferings and the many compulsory delays, Livingstone's discoveries during these last years were both extensive and of prime importance as leading toa solution of African hydrography. Nosingle African explorer has ever done so much for African geography as Livingstone during his thirty years' work. His travels covered one- third of the continent, extending from the Cape to near the equator, and from the Atlantic to the Indian Ocean. Livingstone was no hurried traveller ; he did his journeying leisurely, carefully observing and recording all that was worthy of note, with rare geographical instinct and the eye of a trained scientific observer, studying the ways of the people, eating their food, living in their huts, and sympa- thizing with their joys and sorrows. It will be long till the tradition of his sojourn dies out aniong the native tribes, who almost, without exception, treated Livingstone as a superior being; his treatment of them was always tender, gentle, and gentlemanly. But the direct gains to geography and science are perhaps not the greatest results of Living- stone's journeys. He conceived, developed, and carried out to success a noble and many-sided purpose, with an unflinch- ing and self-sacrificing energy and courage that entitle him to take rank among the great and strong who single- handed have been able materially to influence human pro- gress, and the advancement of knowledge. His example and his death have acted like an inspiration, filling Africa with an army of explorers and missionaries, and raising in Europe so powerful a feeling against the slave trade that it may be considered as having received its deathblow. Personally Livingstone was a pure and tender-hearted man,

full of humanity and sympathy, simple-minded as a child. The motto of his life was the advice he gave to some school children in Scotland, —‘“ Fear God, and work hard.” See, besides his own narratives and Dr Blaikie’s Life, the publi- cations of the London Missionary Society from 1840, the Proceedings of the Royal Geographical Society, the despatches to the Foreign Office sent home by Livingstone during his last two expeditions, and Mr H. M. Stanley’s How I Found Livingstone. (UE ISE LS) LIVIUS ANDRONICUS occupies the position of the oldest among the recognized poets of Rome. He determined the course which Roman literature followed for more than a century after his time. The imitation of Greek comedy, tragedy, and epic poetry, which produced great results in the hands of Neevius, Plautus, Ennius, and their successors, received its first impulse from him. To judge, however, by the very insignificant remains of his writings, and by the testimonies of Cicero and Horace to his merits, he can have had no pretension either to original genius or to artistic accomplishment. His real claim to distinction was that he was the first great schoolmaster of the Roman people, and the first acknowledged medium through which the genius of Greece acted on the Roman mind, and found for itself arude expression in the Latin language. His name, in which the Greek Andronicus is

combined with the gentile name of one of the great Roman.

houses, while indicative of his own position as a manumitted slave, is also significant of the influences by which Roman literature was fostered,—viz., the culture of men who were either Greeks or “semi-Greci” by birth and education, and the protection and favour afforded to them by the more enlightened members of the Roman aristocracy. He is supposed to have been a native of Tarentum, and to have been brought while still a boy, after the capture of that town in 272 B.c., as a slave to Rome. He lived in the household of a member of the gens Livia, probably of that branch of it to which M. Livius Salinator, the colleague of C. Claudius Nero in the year of the battle of the Metaurus, belonged. We learn from Suetonius that, like Ennius after him, he obtained his living by teaching Greek and Latin; and it was probably as a schoolbook, rather than as a work of literary pretension, that his

translation of the Odyssey into Latin Saturnian verse was executed. This work was still used in schools' when Horace was taught at Rome by the famous grammarian and disciplin- arian Orbilius. From the few fragments of the translation that have been preserved it may be inferred that it was owing to the conservatism of educational methods, rather than to its fitness to impart to boys in the Ciceronian age instruction either in Greek literature or in the Latin lan- guage, that it enjoyed this distinction. But at the time when it appeared it must have satisfied a real want. In the wars with Pyrrhus and Tarentum the Romans had for the first time come into close contact with the Greeks ; and during the First Punic War (from 261 to 241 8.c.), in which Sicily was the chief battleground of the combatants, this contact was much closer. The knowledge of Greek became essential to men in a high position, as a means of inter- course with Greeks; and at the same time the new ideas and new interests of Greek literature began to exercise some- thing of that stimulating and refining power over the minds of the leading men which it exercised in a later generation over Scipio Africanus, T. Quintius Flamininus, M. Fulvius Nobilior, and others like them. But the presence of the Roman armies in southern Italy and Sicily must have accustomed many who had no means of obtaining a literary education to the representations of the Greek tragic and comic poets. Although the great creative age of the Athenian drama was passed, the passion for the representa- tion of the old plays still continued, and was not confined to Athens. The number of theatres of which the remains are still seen in Sicily—as at Segesta, Syracuse, Catania,

Taormina—indicate that, in the island in which Epicharmus had produced his old Dorian comedies, the representation of tragedy and comedy continued to be a most important element in the life of the people. But the Romans and Italians had an indigenous drama of their own, known by the name of Satwra, which prepared them for the reception of the more regular Greek drama. The distinction between this Satwra and the plays of Euripides or Menander was that it had no regular plot. This the Latin drama first received from Livius

Andronicus ; but it did so at the cost of its originality. In the year 240, the year after the end of the First Punic Wax, he produced at Rome a translation of a Greek play (it is uncertain whether a comedy or tragedy), and this representation marks the beginning of Roman literature. In this translation he discarded the native Saturnian metre, and adopted the iambic, trochaic, and cretic metres, to which Latin more easily adapted itself than either to the hexameter or to the lyrical measures of a later time. He continued to produce plays for more than thirty years after this time. The titles of some of his tragedies are Achilles, Aigisthus, Equus Trojanus, Hermione, T'ereus,—all suggestive of subjects which were treated by the later tragic poets of Rome. The titles of some of his comedies are Gladiolus, Ludius, &c. In the year 207, when, if he was a captive after the taking of Tarentum, he must have been of a great age, he was appointed to compose the hymn of thanksgiving for the victory of the Metaurus. Another tribute of national recognition paid him was that, as a compliment to him, the "college" or "guild" of poets obtained a place of raeeting in the temple of Minerva on the Aventine.

A good account of his remains is to be found in Wordsworth's Fragments and Specimens of Early Latin. The fragments of his dramas are to be found in Ribbeck's Z'ragicorum Latinorum Relt- quiz, and Comicorum Latinorum Reliquiz. (W. Y. 58.)

LIVNY, a district town of Russia, in the government of Orel, 87 miles east-south-east of the chief town of the government, at the confluence of the rivers Livenka and Sosna. It has railway connexion with the line between Orel and Gryazi. The town is an important centre for trade in grain, hemp, tallow, skins, and cattle. A large amount of grain is purchased in the neighbouring govern- ments, and the flour is sent to Moscow and the neighbour- ing towns, as well as to the Baltic ports. Hemp is sent to St Petersburg, and cattle to Moscow, or they are killed for the preparation of tallow. The 13,000 inhabitants of Livny find employment in trade and in the flour-mills, and hemp, tallow-candle, and oil works. The district of Livny is one of the most fertile and populous of central Russia, and is remarkable for its numerous large villages.

Livny was founded in 1586, at the junction of the three highways to Astrakhan, to Little Russia, and to the Crimea, along which the Tartars usually made thcir inroads on Russian provinces. It was several times destroyed by Tartars during the 16th and 17th cen- turics. In the great internal wars of the first half of the 16th century, Livny was a centre where all kinds of discontented persons and marauders met. Its fort, or kreml, with thick earthen and wooden walls, existed until 1784.

LIVONIA, or Livianp (Liflandia of the Russians), one of the three Baltic provinces of Russia, is bounded by the Gulf of Riga on the W., Esthonia on the N., the governments of St Petersburg, Pskov, and Vitebsk on the © E., and Courland on the 8. A group of islands, situated at the entrance of the Gulf of Riga, of which Osel, Mohn, Runo, and Paternoster are the largest, belong to this government. It covers, with the islands, a surface of 18,160 square miles, but of this the part of Lake Peipus, or Tchudskoye, which belongs to it occupies 1090. Its surface is diversified by several plateaus, those of Haanhoff and of the Livonian Aa having an average height of 700 feet, whilst several summits reach from 800 to 1000 feet or more (such as the Munna-Miggi, 1063 feet; Haising-

kalns, 1028 feet ; Vella-Miggi, 946 feet ; Teufelsberg, 847 feet). The edges of the plateaus are intersected by deep valleys, which give a hilly character to the country; the hilly tract between the Duna and its tributary the Livonian Aa has received from its picturesque narrow valleys, covered with deep forests and numerous lakes, the name of “Wendish Switzerland.” The plateau of Odenpi, watered by the tributaries of the Embach river, which flows for 93 miles from lake Wierz-yarvi into Lake Peipus, occupies an area of 2830 square miles, and has an average height of 500 feet. More than a thousand lakes are scattered over Livonia, of which that of Wierz-yirvi, having a surface of 105 square miles (114 feet above sea-level), is the largest ; marshes and peat-bogs occupy as much as one-tenth of the province. Of the very numerous rivers which water Livonia, only the Duna, which flows for 90 miles along its frontier, and the Embach are navigable.

The geological structure of Livonia has been elaborately examined. The Silurian formation which covers Esthonia, and much resembles the Norwegian Silurian, appears in the northern part of Livonia, the remainder of the province consisting of Devonian strata. The whole is covered with a mighty sheet of glacial deposits, sometimes 400 feet thick. The typical bottom moraine, with boulders of all sizes up to 20 feet in diameter, brought from Finland, extends all over the country, reaching even to the summit of Munna-Maggi. Glacial furrows, striz, and elongated troughs are met with everywhere, running mostly from north-west to south-east, as well as dsar, which have the same direction and consist of morainic nucleus covered with stratified sands and clays; sand-downs cover large tracts on the shores of the Baltic. As in Esthonia, no traces of marine deposits are found higher than 100 or 150 feet above the present sea-level. The soil is not very fertile. Forests cover about two-fifths of the surface of this government, several of them having a diameter of 150 to 250 miles. The climate is rather severe. The mean temperatures are 43° Fahr. at Riga (winter, 23°; summer, 63°), and 423° at Dorpat. The intensity and direction of winds are very variable ; the average number of rainy and snowy days is one hundred and forty-six at Riga ‘rainfall 24°] inches) ; fogs are not uncommon.

The population of Livonia, which was but 621,600 in 1816, reached 1,000,876 in 1870, and is now about 1,121,000 in 1882. Though it is often described as a German province, only about 7 per cent. of the population (64,120 in 1863) are Germans, the great bulk being Ehsts or Esthonians (47 per cent.) and Letts (41°6 per cent.). The Russians number about 35,000, Poles 5000, and Jews 7000. The Livonians, who have given their name to the country, and who formerly extended far east to Sebej in the government of Vitebsk, have nearly all passed away ; only a few thousands (2050 in 1863) inhabit the forests at the utmost extremity of the penin- sula of Courland. Their native language, of Finnish origin, is rapidly disappearing, their present language being rather a Lettish patois. Sjégren, in 1846, had much difficulty in making a gram- mar and dictionary of it from the mouths of old people. The Ehsts, who greatly resemble the Finns of Tavastland, have main- tained their ethnic features, their customs,

national traditions, national songs and poetry, and their harmonious language. There 1s now a marked revival of national feeling, favoured by ‘‘ Young Esthonia,” together with a tendency towards a union with Finland. No less than eight political papers are published in the Esthonian language. The prevailing religion is the Lutheran (746,654 in 1863) ; about 80,000 Ehsts in Livonia and Esthonia, and 50,000 Letts (see LirHUANIANS), as well as the Russians, belong to the Greek Church (156,874 in 1863) ; of the Russians, however, a considerable proportion are raskolniks (nonconformists), who have emigrated to the Baltic provinces in consequence of prosecutions ; these last number about 14,500, of whom 8000 are found in the neighbourhood of Riga. About 6000 are Catholics. The Germans belong to the nobility, or to the burgher class in the towns.

The efforts of the German conquerors to Germanize the country have completely failed. The Ehsts and Letts openly display their traditional hatred against the invaders. The teaching in primary schools is carried on in Esthonian and Lettish ; German prevails in colleges and higher schools. The Russian Government has for

some time becn labouring for ‘‘ Russification”; the Russian civil code was introduced in the Baltic provinces in 1835, and the use of Russian, instead of German, in official correspondence and in law courts was ordered in 1867, but not generally brought into practice; the fact that the privileges given by the military law to those who have received primary education extend only to those who know Russian contributes to the extension of that language.

Nearly all the soil belongs to the nobility, the extent of peasants’ estates being only 15 per cent. Serfdom was abolished in 1819, when the peasants received personal liberty, remaining, however, under the jurisdiction of their landlords, who maintained also the right to have a predominant influence in the nomination of nunisters. Since 1849 the contribution in forced labour which the peasants were compelled to pay to landlords has been gradually, though imperfectly, commuted to a money payment, and the peasants have received the right to purchase

their allotments. But, owing to later limitations of this law, as well as to the high price of allotments and to the establishment of a minimum size of 80 acres, the redemption of the land is going on very slowly. The elass of peasant proprietors being restricted to a small number of wealthy peasants, the great bulk have remained Knechts, that is, tenants at will; they are very miserable, and about onc-fourth of them are continually wandering in search of work. They readily einigrate, even to such unfertile provinces as Novgorod and Vitebsk, and from time to time the emigration takes the shape of a mass movement, which the Government stops by forcible measures. The average size of landed estates is from 9500 to 11,000 acres, far above the general average for Russia. The cstates of the nobility are generally as well cultivated as in western Europe, while the peasants' farms are mostly in a deplorable state. In 1877 21°4 per cent. of the surface of Livonia was under crop, yielding 1,942,600 quarters of grain, and 1,843,200 quarters of potatoes. There were at the same time 146,000 horses, 372,000 cattle, 312,000 sheep, and 150,000 pigs. The shores of the Baltic yield valuable fisheries. Manufactures are steadily increasing. The distilleries yield about 1,400,000 gallons of spirits, part of which is ex- ported ; the beer breweries (two hundred) produce beer worth about 650,000 roubles. There are woollen, cotton, and silk mills, saw-mills, and paper, glass, candle, tobacco, and machinery works,—the chief* manufacturing districts being Pernau and Riga. Livonia carries on a large export trade, especially through Riga and Pernau, in flax, linseed, hemp, grain, timber, and wooden wares; the Duna is of course the chief channel for this trade. During the last ten years, however, Libau has entered into brisk competition with the more northern ports of Livonia. The imports, especially through Riga, are also most important, the custom-houses of Livonia having had in 1881 an income of 6,000,000 silver roubles. The government is divided in eleven districts—Riga (104,200), Wollmar (2050), Dorpat (22,600), Pernau (12,500), Wenden (65,000), Arensburg in the island Osel (3150), Walk (2950), Fellin (2900), Werro (2050), Limsall (1450), and Schlock (800). The capital of the government is Riga.

The first historical notices of Livonia are by Tacitus and Jordanes, but coins of the time of Alexander the Great, found on the island of Osel,

show that the coasts of the Baltic were at an early time in commercial] relations with the civilized world. The ehroniele of Nestor mentions as inhabitants of the Baltic coast the Tchud, the Lives, the Narova, Letgola, Semigalians, and Korg. It is probably about the 9th century that the Tchud became tributary to the Varyago-Russian states. As they rcacquired their independence, Yaroslaff I. undertook in 1030 a campaign against them, and founded Yourieff (Dorpat). The first Germans penetrated into Livonia in the 11th century, and in 1158 several Bremen merchants landed at the mouth of the Duna. In 1186 the emissaries of the archbishop of Bremen began to preach the Christian religion among the Ehsts and Letts, and in 1200 the archbishop of Livonia estab- lished his residence at the mouth of the Duna, at Riga. In 1202 or 1204 Innocent III. recognized the Order of Brothers of the Sword (Schwert-briider), the residence of its grandmaster being at Wenden ; and the order, spreading the Christian religion by sword and fire among the natives, carried on from that time a scries of uninterrupted wars against the Russian republics and Lithuania, as well as a struggle against the influence of the archbishop of Riga, which last was supported by the importance acquired by Riga as a centre for trade, intermediate between the Hanseatic towns and those of Novgorod, Pskov, and Polotsk. The first active interfer- ence of Lithuania in the affairs of Livonia dates from the times which immediately followed the great outbreak of peasants on Osel; Olgerd devastated then all southern Livonia. The order happening to purchase the Danish part of Esthonia, in 1347, began with fresh forces the war against the bishop of Riga, as well as against Lithuania, Poland, and Russia. The wars against those powers were terminated respectively in 1435, 1466, and 1483. About the end of the 15th century the master of the order, Pletten-

_berg, acquired a position of great importance, and in 1527 he was

recognized as a prince of the empire by Charles V. On the other hand, the authority of the bishops of Riga was soon completely

destroyed (1566). The war of the order with John IV. in 1550 led to a division of Livonia,—its northern part, Dorpat included, being taken by Russia, and the southern part falling under the dominion of Poland. From that time Livonia formed a subject of dispute between Poland and Russia, the latter only formally abdicating its rights to the country in 1582. In 1621 it was the theatre of a war between Poland and Sweden, and was conquered by the latter power, enjoying thus for twenty-five years a milder rule. In 1654, and again at the beginning of the 17th century, it became the theatre of war between Poland, Russia, and Sweden, and at last was finally conquered by Russia. The official concession was confirmed by the treaty of Nystad in 1721, Russia guaranteeing the privileges of the nobility and citizens, and the freedom of the evangelical confession. (BIA. Ke)

LIVY, the Roman historian, belonged by birth to those regions of northern Italy which had already given to Roman literature Catullus, Cornelius Nepos, and Virgil. He was born in 59 B.c., the year of Cesar's first consulship, and was thus eleven years younger than Virgil and six years younger than Horace. His native city Padua (Patavium) could challenge comparison, in the days of Augustus, even with such great centres of industry as Alexandria or Gades ; and, while its active municipal life, and long traditions of hard won independence, may have quickened Livy's sympathies with republican freedom, its ancient connexion with Rome naturally helped to turn his attention to the study which became the work of his life. For Padua claimed, like Rome, a Trojan origin, and Livy is careful to place Antenor, the founder of Padua, side by side with Auneas. A more real bond of union was found in the dangers to which both had been exposed from the assaults of the Celts (Livy, x. 2), and Padua must have been drawn to Rome,as the conqueror of her hereditary foes, by much the same motives as those which led the Greeks in southern Italy to seek Roman aid against the Oscan invader. Moreover, at the time of Livy's birth, Padua had long been in possession of the full Roman franchise, and it is possible that the historian's family name had been taken by one of his ancestors out of compli- ment to the great Livian gens at Rome, whose connexion with Cisalpine Gaul is a well-established fact (Livy, xxvii. 35; Suet.,

7%7b., 3), and by one of whom his family may have been enfranchised.

Livy's easy, independent life at Rome, and his aristo- cratic leanings in politics, have been taken as proof that he was the son of well-born and opulent parents ; and it is certain that he was able to afford the luxury of a good education, for he was widely read in Greek literature, and a student both of rhetoric and philosophy. We have also evidence in his writings that he had prepared himself for his great work by researches into the history of his native town. His youth and early manhood, spent perhaps chiefly at Padua, were cast in stormy times, and the impression which they left upon his mind was ineffaceable. He was ten years old when Cesar crossed the Rubicon and civil war began. In his fifteenth year came the murder of the great dictator, of whom he afterwards declared that he knew not "whether it were better for him to have been born or not," and one year later the murder of Cicero, to whose memory he paid an eloquent tribute. Of the part taken by Padua in the troubles which distracted the em- pire from 49 s.c. till the decisive victory at Actium we know nothing beyond the fact that in 43 B.c. it closed its gates against Antony, and was afterwards punished for doing so by Asinius Pollio. Livy's personal sympathies were with Pompey and the republican party (Tac., Anzn., iv. 34); but far more lasting in its effects was his experi- ence of the licence, anarchy, and confusion of these dark days. The rule of Augustus he seems to have accepted as a necessity, but he cannot, like Horace and Virgil, welcome it as inaugurating a new and glorious era. While he endeavours to stifle his recollections of the horrors

he had witnessed, by fixing his whole mind on older and better times, he writes of the present with despondency as a degenerate and declining age; and, instead of triumphant prophecies of world-wide rule, such as we find in Horace, Livy contents himself with pointing out the dangers which already threatened Rome, and exhorting his contemporaries to learn, in good time, the lessons which the past history of the state had to teach.

It was probably about the time of the battle of Actium that Livy established himself in Rome, and there he seems chiefly to have resided until his retirement to Padua shortly before his death. We have no evidence that he travelled much, though he must have paid at least one visit to Campania (xxxviii. 56), and he never, so far as we know. took any parw4in political life. Nor, though he enjoyed the personal friendship and patronage of Augustus (Tac., Ann., iv. 34), and stimulated the historical zeal of the future emperor Claudius (Suet., Claud., xli.), can we detect in him anything of the courtier. There is not in his history a trace of that rather gross adulation in which even Virgil does not disdain to indulge. His republican sympathies were freely expressed, and, it should be added, as freely pardoned by Augustus. We must imagine him devoted to the great task which he had set himself to perform, with a mind, as he tells us himself in his preface, free from all disturbing cares, and in the enjoyment of all the facilities for study afforded by the Rome of Augustus, with its liberal encouragement of letters, its newly-founded libraries, and its brilliant literary circles. As his work went on, the fame which he had never coveted came to him in ample measure. He is said to have declared in one volume of his history that he had already won glory enough, and the younger Pliny (/pist., ii, 3) relates that a Spaniard came all the way from Gades merely to see him, and, this accomplished, at once returned home satisfied. The accession of Tiberius (14 a.p.) materially altered for the worse the prospects of literature in Rome, and Livy may have feared for himself the fate which afterwards befell Cremutius Cordus, who was tried before the senate, for having in his annals spoken of Brutus and Cassius as the last of the Romans (Tac., Ann., iv. 34). However this may have been, Livy retired to Padua, and died there in the third year of the reign of Tiberius (17 a.p.), at the ripe age of seventy-six. When we have added that he had at least one son (Quintil., x. 1), who was possibly also an author (Pliny, Vat. Hist., i. 5, 6), and a daughter married to a certain L. Magius, a rhetorician of no great merit (Seneca, Controv., x. 29, 2), we have reached the end of all that is known with certainty of Livy’s personal history; and the apocryphal nature of the details which have been added by later admirers has been too often exposed to make it necessary to deal with them here.!

But for us, as for Livy himself, the interest of his life centres in the work to which the greater part of it was devoted. For we must decline to believe with Niebuhr that his history was all written in his later years. On the contrary, various indications point to the period from 27 to 20 B.c., as that during which the first decade was writ- ten. In the first book(i. 19) the emperor is called Augustus, a title which he assumed early in 27 B.c., and in ix. 18 the omission of all reference to the restoration, in 20 Bc., of the standards taken at Carrhe seems to justify the in- ference that the passage was written before that date. In the third decade, the allusion in xxviii. 12 to victories in Spain may, as Weissenborn thinks, refer to Agrippa's cam- paigns in 19 B.c., but the words ' ductw auspicioque Au- gusti Cesaris " point more naturally to those of Augustus

1 For Livy's life see the introduction to Weissenborn's edition, Berlin, 1871, and the article in Smith's Dictionary of Biography.

himself, 27-25 B.c. In the epitome of book lix. there is areference to a law of Augustus which was passed in 18 B.c. The books dealing with the civil wars must have been written during Augustus's lifetime, as they were read by him (Tac., Ann., iv. 34), while there is some evidence that the last part of the work, from book cxxi. onwards, was published after his death (14 a.D.).

Livy's history begins with the landing of Aineas in Italy, and closes with the death of Drusus, 9 3.c., though it is possible that he intended to continue it as far as the death of Augustus. The original title of the work is unknown, but of its general plan it is possible to speak with more certainty. The division into decades is certainly not due to the author himself, and is first heard of at the end of the 5th century; on the other hand, the division into "libri" or " volumina" seems to be original. Itis referred to by Livy himself (x. 31, "per quartum jam volumen" ; xxxi. 1, "multa volumina"), as well as by Pliny (WV. JZ, pref.) and by later writers. That the books were grouped and possibly published in sets is rendered probable both by the prefaces which introduce new divisions of the work (vi. 1, xxi. 1, xxxi. 1) and by the

description in one MS. of books cix.—cxvi. as “bellorum civilium libri octo,” Such arrangement and publication in parts were moreover common with ancient authors, and in the case of a lengthy work almost a necessity.

Of the 142 “libri” composing the history, the first 15 carry us down to the eve of the great struggle with Carth- age, a period, as Livy reckons it, of 488 years (xxxi. 1); 15 more (xvi—xxx.) cover the 63 years of the two great Punic wars. With the close of book xlv. we reach the conquest of Macedonia in 167 B.c. Book lviii. described the tribunate of Tiberius Gracchus, 133 zc. In book Ixxxix. we have the dictatorship of Sulla (81 3B.c.), in ciii. Ceesar’s first consulship (59 3B.c.), in cix.-cxvi. the civil wars to the death of Czesar (44 B,c.), in cxxiv. the defeat of Brutus and Cassius at Philippi, in cxxxiii. and cxxxiv. the battle of Actium and the accession of Augustus. The remaining eight books give the history of the first twenty years of Augustus’s reign.

Such in outline was the vast work of which Martial (xiv. 190) complains that his whole library could not contain it. But a small portion of it, however, has come down to modern times ; only thirty-five books are now extant (i.~~x., xx,—xlv.), and of these xli. and xliii. are incomplete. The lost books seem to have disappeared between the 7th cen~~ tury and the revival of letters in the 15th,—a fact suffi- ciently accounted for by the difficulty of transmitting so voluminous a work in times when printing was unknown, for the story that Pope Gregory I. burnt all the copies of Livy he could lay his hands on rests on no good evidence. Only one important fragment has since been recovered,—the portion of book xe. discovered in the Vatican in 1772, and edited by Niebuhr in 1820, Very much no doubt of the substance of the lost books has been preserved both by such writers as Plutarch and Dion Cassius, and by epitomizers like Florus and Eutropius. But our know- ledge of their contents is chiefly derived from the so-called “perioche ” or epitomes, of which we have fortunately a nearly complete series, the epitomes of books cxxxvi. and cxxxvil. being the only ones missing. These epitomes have been ascribed without sufficient reason to Florus (2d cen- tury); but, though they are probably of even later date, and

are disappointingly meagre, they may be taken as giving, so

far as they go, a fairly authentic description of the original. They have been expanded with great ingenuity and learn- ing by Freinsheim in Drakenborch's edition of Livy.?

1 The various rumours onee eurrent of complete copies of Livy in Constantinople, Chios, and elsewhere are notieed by Niebuhr, Zntrod, Lect., p. 67, Eng, transl. See also Pauly, Real-Hncyclopédie, s.v.

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The received text of the extant thirty-five books of Livy is taken from different sources, and no one of our MSS. contains them all. The MSS. of the first decade, some thirty in number, are with one exception derived, more or less directly, from a single archetype, viz., the recension made in the 4th century by the two Nicomachi, Flavianus and Dexter (not by one only, as Nicbuhr thought), and by Victorianus. This is proved in the case of the older MSS, by written subscriptions to that effect, and in the case of the rest by internal evidence. Of all these descendants of the Nicomachean recension, the oldest is the Codex Parisinus of the 10th century, and the best the Codex Mediceus or Florentinus of the 11th. An independent value attaches to the ancient palimpsest of Verona, of which the first complete account was given by Mommsen as recently as 1868 (Berliner Monatsber., January). It contains the third, fourth, fifth, and fragments of the sixth book, and, according to Mommsen, whose conclusions are aceepted by Madvig (Zmend. Liviane, 2d ed., 1877, p. 37), it is derived, not from the Nieo-maehcan reeension, but from an older archetype common to both.

For the third deeade our chief authority is the Codex Puteanus, an uncial MS. of the 8th century, now at Paris. For the fourth we have two leading MSS.,—Codex Bambergensis, 11th century, and the slightly older Codex Moguntinus, which is only known through the Mainz edition of 1518-19. What remains of the fifth decade de- pends on the Laurishamensis or Vindobonensis from the monastery of Lorsch, edited at Basel in 1531. It belongs to the 6th century.

If we are to form a correct judgment on the merits of Livy's history, we must, above all things, bear in mind what his aim was in writing it, and this he has told us himself in the celebrated preface which Niebuhr rather unaccountably denounces as "the worst part of his work" (Introd. Lect., p. 60). He set himself the task of record- ing the history of the Roman people, 'the first in the world," from the beginning. The task was a great one, and the fame to be won by it uncertain, yet it would be something to have made the attempt, and the labour itself would bring a welcome relief from the contemplation of present evils ; for his readers too this record will, he says, be full of instruction: they are invited to note especially the moral lessons taught by the story of Rome, to ob- serve how Rome rose to greatness by the simple virtues and unselfish devotion of her citizens, and how on the decay of these qualities followed degeneracy and decline.

He does not therefore write, as Polybius wrote, for students of history. With Polybius the greatness of Rome is 2 phenomenon to be critically studied and scientifically explained; the rise of Rome forms an important chapter in universal history, and must be dealt with, not as an isolated fact, but in connexion with the general march of events in the civilized world. Still less has Livy anything in common with the naive anxiety of Dionysius to make it clear to his fellow Greeks that the irresistible people who had mastered them was in origin, in race, and in language Hellenic like themselves.

Livy writes as a Roman, to raise a monument worthy of the greatness of Rome, and to keep alive, for the guidance and the warning of Romans, the recollection alike of the virtues which had made Rome great and of the vices which had threatened her with destruction. In so writing he was in close agreement with the traditions of Roman literature, as well as with the conception of the nature and objects of history current in his time. To a large extent Roman literature grew out of pride in Rome, for, though her earliest authors took the form and often the language of their writings from Greece, it was the greatness of Rome that inspired the best of them, and it was from the annals of Rome that their themes were taken. And this is naturally true in an especial sense of the Roman historians; the long list of annalists begins

at the moment when the great struggle with Carthage had for the first time brought Rome into direct connexion with the historic peoples of the ancient world, and when Romans themselves awoke to the importance of the part reserved for Rome to play in universal history. To write the annals of Rome became at once a task worthy of the best of her citizens, Though

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other forms of literature might be thought unbecoming to the dignity of a free-born citizen, this was never so with history. On the contrary, men of high rank and tried statesmanship were on that very account thought all the fitter to write the chronicles of the state they had served. And history in Rome never lost either its social prestige or its intimate and exclusive connexion with the fortunes of the Roman people. It was well enough for Greeks to busy themselves with the manners, institutions, and deeds of the “peoples outside.” The Roman historians, from Fabius Pictor to Tacitus, cared for none of these things. This exclusive interest in Rome was doubtless encouraged by the peculiar characteristics of the history of the state. The Roman annalist had not, like the Greek, to deal with the varying fortunes and separate doings of a number of petty communities, but with the continuous life of a single city. Nor was his attention drawn from the main lines of political history by the claims of art, literature, and philo- sophy, for just as the tie which bound Romans together was that of citizenship, not of race or culture, so the history of Rome is that of the state, of its political constitution, its wars and conquests, its military and administrative system. Livy’s own circumstances.were all such as to render these views natural to him. He began to write at a time when, after a century of disturbance, the mass of men had been contented to purchase peace at the price of liberty. The present was at least inglorious, the future doubtful, and many turned gladly to the past for consolation. This retrospective tend- ency was favourably regarded by the Government. It was the policy of Augustus to obliterate all traces of recent revolution, and to connect the new imperial regime as closely as possible with the ancient traditions and institu- tions of Rome and Italy. The neid of Virgil, the Fust? of Ovid, suited well with his own

restoration of the ancient temples, his revival of such ancient ceremonies as the Ludi Seculares, his efforts to check the un-Roman luxury of the day, and his jealous regard for the purity of the Roman stock, And, though we are nowhere told that Livy under- took his history at the emperor's suggestion, it is certain that Augustus read parts of it with pleasure, and even honoured the writer with his assistance and friendship. Livy was deeply penetrated with a sense of the greatness of Rome. From first to last its majesty and high destiny are present to his mind. Aineas is led to Italy by the fates that he may be the founder of Rome (i. 1; comp. 1. 4, "debebatur fatis tante origo urbis"). Romulus after his ascension declares it to be the will of heaven that Rome should be mistress of the world; and Hannibal marches into Italy, that he may "set free the world" from Roman rule. But, if this ever-present consciousness often gives dignity and elevation to his narrative, it is also re- sponsible for some of its defects. It leads him occasionally into exaggerated language (e.g., xxii. 33, "nullius usquam terrarum rei cura Romanos effugiebat"), or into such mis- statements as that in xxi. 99, where he explains the course taken by the Romans in renewing war with Carthage by saying that 'it seemed more suitable to the dignity of the Roman people." Often his jealousy for the honour of Rome makes him unfair and one-sided. In all her wars not only success but justice is with Rome (e.g., the war with Perseus of Macedon; see Cobet in Ifnemosyne for 1881). When Hieronymus of Syracuse deserts Rome for Hannibal, Livy says nothing of the complaints against Rome, by which, according to Polybius, he justified his change of policy. To the same general attitude is also due the omission by Livy of all that has no direct bearing on the fortunes of the Roman people. 'I have resolved," he says (xxxix. 48), "only to touch on foreign affairs so far as they are bound up with those of Rome." The opera- tions of the Rhodians in Asia Minor (197 B.c., xxxiii. 20)

he curtly dismisses in a sentence, that he may pass 'ad ea que propria Romani belli sunt ;" and so again (xli. 25) "it is not worth my while to recount in detail the wars of foreigners with each other ; it is as much and more than I can do to record the doings of the Roman people." As

the result, we get from Livy very defective accounts even of the Italic peoples most closely connected with Rome. Of the past history and the internal condition of the more distant nations she encountered he tells us little or nothing, even when he found such details carefully given by Polybius.

Scarcely less strong than his interest in Rome is his interest in the moral lessons which her history seemed to him so well qualified to teach. This didactic view of history was a prevalent one in antiquity, and it was con- firmed no doubt by those rhetorical studies which in Rome as in Greece formed the chief part of education, and which taught men to look on history as little more than a store- house of illustrations and themes for declamation. But it suited also the practical bent of the Roman mind, with its comparative indifference to abstract speculation or purely scientific research, It is in the highest degree natural that Livy should have sought for the secret of the rise of Rome, not in any large historical causes, but in the moral qualities of the people themselves, and that he should have looked upon the contemplation of these as the best remedy for the vices of his own degenerate days. It is possible too that the simplicity and even austerity of manners for which Padua was afterwards celebrated may have charac- terized its citizens in Livy's time, and that he was thus especially fitted to appreciate the purity, reverence, and loyalty of early Rome. But, whatever the cause, there isno doubt of the fact. He is never tired of insisting on the virtues of past days, or of contrasting them with the vices of the present. He dwells with delight on the un- selfish patriotism of the old heroes of the republic. In those times children obeyed their parents, the gods were still sincerely worshipped, poverty was no disgrace, sceptical philosophies and foreign fashions in religion and in daily life were unknown. But this ethical interest is closely bound up with his Roman sympathies. His moral ideal is no abstract one, and the virtues he praises are those which in his view made up the truly Roman type of character. ''Minime Romani ingenii homo" is the sentence of con- demnation he passes (xxii. 58) on a Roman soldier who broke faith with Hannibal, Camillus is praised as " vir ac vere Romanus" (xxii. 14); "to do and to suffer bravely" is Roman (ii, 12). The prominence thus given to the moral aspects of the

history tends to obscure in some de- gree the true relations and real importance of the events narrated, but it does so in Livy to a far less extent than in some other writers. He is much too skilful an artist either to resolve his history into a mere bundle of examples, or to overload it, as Tacitus is sometimes inclined to do, with reflexions andaxioms. The moral he wishes to enforce is usually either conveyed by the story itself, with the aid perhaps of a single sentence of comment, or put as a speech into the mouth of one of his characters (e.g., xxiii. 49; the devotion of Decius, viii. 10, comp. vii. 40 ; and the speech of Camillus, v. 54) ; and what little his narrative thus loses in accuracy it gains in dignity and warmth of feeling. In his portraits of the typical Romans of the old style, such as Q. Fabius Maximus, in his descriptions of the unshaken firmness and calm courage shown by the fathers of the state in the hour of trial, Livy is at his best ; and he is so largely in virtue of his genuine appreciation of character as a powerful force in the affairs of men.

This enthusiasm for Rome and for Roman virtues is, moreover, saved from degenerating into gross partiality by the genuine candour of Livy's mind and by his wide sympathies with every thing great and good. Seneca has

described him as "candidissinus omnium magnorum ingeniorum estimator" (Suasor., vi. 21). Quintilian (x. 1, 101) places him on a level with Herodotus as a writer ''clarissimi candoris," and this candid admiration is not reserved exclusively for Romans. Hasdrubal's devotion and valour at the battle on the Metaurus are described in terms of eloquent praise (xxvii. 49, 'there, as became the son of Hamilcar and the brother of Hannibal, he fell fighting") ; and even in Hannibal, the lifelong enemy of Rome, he frankly recognizes the great qualities that balanced his faults. Nor though his sympathies are unmistakably with the aristocratic party, does he scruple to censure the pride, cruelty, and selfishness which too often marked their conduct (ii. 54; the speech of Canuleius, iv. 3; of Sextius and Licinius, vi. 36); and, though he feels acutely that the times are out of joint, and has

apparently little hope of the future, he still believes in justice and goodness. He is often righteously indignant, but never satirical, and such a pessimism as that of Tacitus and Juvenal is wholly foreign to his nature.

Though he studied and even wrote on philosophy (Senec., Ep. 100), Livy is by no means a philosophic historian. We learn indeed from incidental notices that he inclined to Stoicism and disliked the Epicurean system. With the scepticism that despised the gods (x. 40) and denied that they meddled with the affairs of men (xliii. 13) he has no sympathy. The immortal gods are everywhere the same (xiii. 3); they govern the world (xxxvii. 45) and reveal the future to men by signs and wonders (xliii. 13), but only a debased superstition will look for their hand in every petty incident (xxvii. 23, ‘(minimis etiam rebus prava religio inserit deos ”), or abandon itself to an indiscriminate belief in the portents and miracles in which popular credulity delights (xxviii. 11, xxi. 62, “multa ea hieme prodigia

. aut quod evenire solet, motis semel in religionem animis, multa nunciata et temere credita”). The ancient state religion of Rome, with its temples, priests, and auguries, he not only reverences as an integral part of the Roman constitution, with a sympathy which grows as he studies it (xliii. 13, “et mihi vetustas res scribenti, nescio quo pacto antiquus fit animus”), but, like Varro, and in true Stoic fashion, he regards it as a valuable instrument of government (i. 19, 21), indispensable in a well-ordered community. As distinctly Stoical is the doctrine of a fate to which even the gods must yield (ix. 4), which disposes the plans of men (i. 42) and blinds their minds (v. 37), yet leaves their wills free (xxxvil. 45).

But we find no trace in Livy of any systematic appli- cation of philosophy to the facts of history. He is as innocent of the leading ideas which shaped the work of Polybius as he is of the cheap theorizing which wearies us in the pages of Dionysius. The events are graphically, if not always accurately, described; but of the larger causes at work in producing them, of their subtle action and reaction upon each other, and of the general conditions amid which the history

worked itself out, he takes no thought at all Nor has Livy much acquaintance with either the theory or the practice of politics. He exhibits, it is true, political sympathies and antipathies. He is on the whole for the nobles and against the commons; and, though the unfavourable colours in which he paints the leaders of the latter are possibly reflected from the authorities he followed, it is evident that he despised and disliked the multitude (xxiv. 25, ‘‘aut servit humiliter aut superbe dominatur”). Of monarchy he speaks with a genuine Roman hatred, and we know that in the last days of the republic his sympathies were wholly with those who strove in vain to save it. He betrays too an insight into the evils which were destined finally to undermine the imposing fabric of Roman empire. The

decline of the free population, the spread of slavery (vi. 12, vii. 25), the universal craving for wealth (iii. 26), the employment of foreign mercenaries (xxv. 33), the corrup. tion of Roman race and Roman manners by mixture with aliens (xxxix. 3), are all noticed in tones of solemn warn- ing. But his retired life had given him no wide experience of men and things. It is not surprising, therefore, to find that he fails altogether to present a clear and coherent pic- ture of the history and working of the Roman constitution, or that his handling of intricate questions of policy is weak and inadequate.

If from the general aim and spirit of Livy’s history we pass to consider his method of workmanship, we are struck at once by the very different measure of success attained by him in the two great departments of an historian’s labour. He is a consummate artist, but an unskilled and often careless investigator and critic. The materials which lay ready to his hand may be roughly classed under two heads : —(1) the original evidence of monuments, inscrip- tions, &c., (2) the written tradition as found in the works of previous authors. It is on the second of these two kinds of evidence that Livy almost exclusively relies. Yet that even for the very early times a certain amount of original evidence still existed is proved by the use which was made of it by Dionysius, who mentions at least three important inscriptions,

two dating from the regal period and one from the first years of the republic (iv. 26, iv. 58, x. 32). We know from Livy himself that the breastplate dedicated by Cossus (428 B.c.) was to be seen in his own day in the temple of Jupiter Feretrius, nor is there any reason to suppose that the “libri lintei,” quoted by Licinius Macer, were not extant when Livy wrote. For more recent times the materials were plentiful, and a rich field of research lay open to the student in the long series of laws, decrees of the senate, and official registers, reaching back, as it probably did, at least to the commencement of the 3d century B.c. Nevertheless it seems certain that Livy never realized the duty of consulting these relics of the past, even in order to verify the statements of his authori- ties. Many of them he never mentions ; the others (¢.g., the libri lintei) he evidently describes at second hand. Anti- quarian studies were popular in his day, but the instances are very few in which he has turned their results to account. There is no sign that he had ever read Varro; and he never alludes to Verrius Flaccus. The haziness and inaccuracy of his topography make it clear that he did not attempt to familiarize himself with the actual scenes of events even that took place in Italy. Not only does he confuse Thermon, the capital of Atolia, with Thermopyle (xxxiii. 35), but his accounts of the Roman campaigns against Volsci, Aqui, and Samnites swarm with confusions and difficulties ; nor are even his descriptions of Hannibal’s movements free from an occasional vagueness which betrays the absence of an exact knowledge of localities.

The consequence of this indifference to original research and patient verification might have been Jess serious had the written tradition on which Livy preferred to rely been more trustworthy. But neither the materials out of which it was composed, nor the manner in which it had been put together, were such as to make it a safe guide. It was indeed represented by a long line of respect- able names. The majority of the Roman annalists were men of high birth and education, with a long experience of affairs, and their defects did not arise from seclusion of life or ignorance of letters. It is rather in the conditions under which they wrote and in the rules and traditions of their craft that the causes of their short- comings must be sought. — :

It was not until the 6th century from the foundation of the city that historical writing began in Rome. The father of Roman his- tory, Q. Fabius Pictor, a patrician and a senator, can scarcely have published his annals before the close of the Second Punic War, but these annals covered the whole period from the arrival of Evander in Italy down at least to the battle by Lake Trasimene (217 B.C.) Out of what materials, then, did he put together his account of

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the earlier history? Recent criticism has succeeded in answering this question with some degree of certainty. A careful exainination of the fragments of Fabius (see H. Peter, Historicorum Romanorum Relliquiz, Leipsic, 1870 ; and Nitzsch, Rim. Annalistik, Berlin, 1878) reveals in the first place a marked differeuce between the kingly period and that which followed the establishment of the republic. The history of the former stretches back into the regions of pure mythology. Itis little more than a collection of fables told with scarcely any attempt at criticism, and with no more regard to chronological sequence than was necessary to make the tale run smoothly or to fill up such gaps as that between the flight of Aneas from Troy and the supposed year of the foundation of Rome. But from its very commencement the history of the republic wears a different aspect. The mass of floating tradition, which had come down from early days, with its tales of border raids and forays, of valiant chiefs, and deeds of patriotism, is now rudely fitted into a framework of a wholly different kind. This framework consists of short notices of important events, wars, pro- digies, consecration of temples, &c., all recorded with extreme brevity, precisely dated, and couched in a somewhat archaic style. They were taken probably from one or more of the state registers, such as the annals of the pontiffs, or those kept by the ediles in the temple of Ceres. This bare official outline of the past history of his city was by Fabius filled in from the rich store of tradition that lay ready to his hand. The manner and spirit in which he effected this conibination were no doubt wholly uncritical. Usually he seems to have transferred both annalistic notices and popular traditions to his pages much in the shape in which he found them. But he unquestionably gave undue

prominence to the tales of the prowess and glory of the Fabii, and probably also allowed his own strong aristocratic sympathies to colour his version of the early

olitical controversies, This fault of partiality was, according to

olybius, a conspicuous blot in Fabius's account of his own times, which was, we are told, full and in the main accurate, and, like the earlier portions, consisted of official annalistic notices, supple-

mented, however, not from tradition, but from his own experience .

and from contemporary sources. But even here Polybius charges him with favouring Rome at the expense of Carthage, and with the undue exaltation of the great head of his house, Q. Fabius Cunctator.

Nevertheless the comparative fidelity with which Fabius seems to have reproduced his materials might have made his annals the starting point of a critical history. But unfortunately intelligent criticism was exactly what they never received. It is true that in some respects a decided advance upon Fabius was made by subse- quent annalists. M. Porcius Cato (234-149 B.c.) widened the scope of Roman history so as to include that of the chief Italian cities, and made the first serious attempt to settle the chronology. In his his- tory of the Punic wars Celius Antipater (circa 130 B.c.) added fresh material, drawn probably from the works of the Sicilian Greek Silenus, while Licinius Macer (70 B.c.) distinguished himself by the use he made of the ancient ''linen books." No doubt, too, the later annalists, at any rate from Celius Antipater onwards, improved upon Fabius in treatment and style. But in more essen- tial points we can discern no progress. One annalist after another quietly adopted the established tradition, as it had been left by his predecessors, without any serious alterations of its main outlines. Of independent research and critical analysis we find no trace, and the general agreement upon main facts is to be attributed simply to the regularity with which each writer copied the one before him. But, had the later annalists contented themselves with simply reproduc- ing the earlicr ones, we should at least have had the old tradition before us ina simple and tolerably genuine form. As it was,

while they slavishly clung to its substance, they succeeded as a rule in destroying all traces of its original form and colouring. L. Cal- purnius Piso, tribune in 149 B.c. and consul in 183 B.c., prided himself on reducing the old legends to the level of common sense, and importing into them valuable moral lessons for his own gener- ation. By Celius Antipater the methods of rhetoric were first applied to history, a disastrous precedent enough. He inserted speeches, enlivened his pages with chance tales, and aimed, as Cicero tells us, at not merely narrating facts but also at beautifying them. His successors carried still farther the practice of dressing up the rather bald chronicles of earlier writers with all the orna- ments of rhetoric. The old traditions were altered, almost beyond the possibility of recognition, by exaggerations, interpolations, and additions. Fresh incidents were inserted, new motives suggested, and speeches composed in order to infuse the required life and fresh- ness into these dry bones of history. At the same time the politi- cal bias of the writers, and the political ideas of their day were allowed, in some cases perhaps half unconsciously, to affect their representations of past events. Annalists of the Gracchan age im- ported into the early struggles of patricians and plebeians the cconomic controversies of their own day, and painted the first tribunes in the colours of the two Gracchi or of Saturninus. In the next generation they dexterously forced the venerable records of the early republic to pronounce in favour of the ascendency of the

senate, as established by Sulla. To political bias was added family pride, for the gratification of which the archives of the grcat houscs, the funeral panegyrics, or the imagination of the writer himself supplicd an ample store of doubtful material. Pedigrees were invented, imaginary consulships and fictitious triumphs inserted, and family traditions and family honours were formally incorporated with the history of the state. B

Things were not much better even where the annalists were dealing with recent or contemporary events. Here indeed their materials were naturally fuller and more trustworthy, and less room was left for

fanciful decoration and capricious alteration of the facts. But their methods are in the main unchanged. What they found written they copied ; the gaps they supplied, where personal experience failed, by imagination. No better proof of this can be given than a comparison of the annalist's version of history with that of Polybius. In the fourth and fifth decades of Livy the two appear side by side, and the contrast between them is striking. Polybius, for instance, gives the number of the slain at Cynos- cephale as 8000; the annalists raise it as high as 40,000 (Livy, xxxiii, 10). In another case (xxxii. 6) Valerius Antias, the chief of sinners in this respect, inserts a decisive Roman victory over the Macedonians, in which 12,000 of the latter were slain and 2200 taken prisoners, an achievement recorded by no other authority. In some parts of these two decades, however, Livy gives us only the annalists' story. Of the campaigns in Cisalpine Gaul, Liguria, and Spain, as described by him on their authority, Nissen well remarks (Untersuch., p. 94), ''One would think that the Gauls, Ligurians, and Spaniards were there for the sole purpose of being slaughtered in thousands by the Romans. Year after year they rise in revolt against Rome, lose some 40,000 men in the struggle, and finally submit, only to begin the same game afresh the next year."

Such was the written tradition on which Livy mainly relied. We have next to examine the manner in which he used it, and here we are met at the outset by the difficulty of determining with exactness what authorities he is following at any one time ; for of the import- ance of full and accurate references he has no idea, and often for chapters together he gives us no clue at all. More often still le contents himself with such vague phrases as ''they say," 'the story goes," 'some think," or speaks in general terms of '' ancient writers" or '' my authorities." Even where lhe mentions a writer by name, it is frequently clear that the writer named is not the one whose lead he is following at the moment, but that he is noticed incidentally as differing from Livy's guide for the time being on some point of detail (compare the references to Piso in the first de- cade, i. 55, ii. 82, &c.). It is very rarely that Livy explicitly tells us whom he has selected as his chief source (¢.g., Fabius, xxii. 7 ; Polybius, xxxiii. 10). Bya careful analysis, however, of those por- tions of his work which admit of a

comparison with the text of his acknowledged authorities (e.g., fourth and fifth decades, see Nissen, Untersuchungen, Berlin, 1863), and elsewhere by comparing his version with the known fragments of the various annalists, and with what we are told of their style and method of treatment, we are able to form a general idea of his plan of procedure. As to the first decade, it is generally agreed that in the first and second books at any rate he follows such older and simpler writers as Fabius Pictor and Calpurnius Piso (the only ones whom he there refers to by name), to whom, so far as the first book is concerned, Niebuhr (Introd. Lect., p. 33) would add the poet Ennius. With the close of the second book or the opening of the third we ceme upon the first traces of the use of later authors. Valerius Antias is first quoted in iii. 5, and signs of his handiwork are visible here and there throughout the rest of the decade (vii. 36, ix. 27, x. 3-5). In the fourth book the principal authority is apparently Licinius Macer, and for the period following the sack of Rome by the Gauls Q. Claudius Quadrigarius, whose annals began at this point in the history. We have besides a single reference (vii. 3) to the anti- quarian Cincius, and two (iv. 23, x. 9) to Q. Hlius Tubero, one of the last in the list of annalists. Passing to the third decade, we find ourselves at once confronted by a question which has been long and fully discussed—the relation betwcen Livy and Polybius. Did Livy use Polybius at all, and, if so, to what extent? (See for details Hiibner, Grundriss zu Vorlesungen tb. d. Rom. Litteratur- geschichte, p. 195).

It is conceded on all hands that Livy in this decade makes considerable use of other authorities than Polybius (e.g., Fabius, xxii. 7; Celius Antipater, xxi. 38, 46, 47, xxil. 31, &c.), that he only once mentions Polybius (xxx. 45, ‘‘ Polybius haudquaquam sper- nendus auctor’), and that, if he used him, he did so to a much less extent than in the fourth and fifth decades, and in a very different manner. It is also agreed that we can detect in Livy’s account of the Hannibalic war two distinct elements, derived originally, the one from a Roman, the other from a non-Roman source. But from these generally accepted premisses two opposite conclusions have been drawn. On the one hand, it is maintained (e.g., by Lachmauun, C. Peter, H. Peter, Hist.

Rom. Rellig.) that those parts of Livy's narrative which point to a non-Roman authority (e.g., Hannibal's

movements prior to his invasion of Italy) are taken by Livy directly from Polybius, with occasional reference of course to other writers, and with the omission (as in the later decades) of all matters un-interesting to Livy or his Roman readers, and the addition of rhetorical touches and occasional comments. It is urged that Livy, who in the fourth and fifth decades shows himself so sensible of the great merits of Polybius, is not likely to have ignored him in the third, and that his more limited use of him in the latter case is fully accounted for by the closer connexion of the history with Rome and Roman affairs, and the comparative excellence of the available Roman authorities, and, lastly, that the points of agree- ment with Polybius, not only in matter but in expression, can only be explained on the theory that Livy is directly following the great Greek historian. On the other hand, it is maintained (cspecially by Schwegler, Nitzsch, and K. Bottcher) that the extent and nature of Livy's agreement with Polybius in this part of his work point rather to the use by both of a common original authority. It is argued that Livy's mode of using his authorities is tolerably uniform, and that his mode of using Polybius in particular is known with certainty from the later decades. Consequently the theory that he used Polybius in the third decade requires us to assuine that in this one instance he departed widely, and without sufficient reason, from his usual course of procedure. Moreover, even in the passages where the agreement with Polybius is most apparent, there are so many discrepancies and divergencies in detail, and so many unaccountable omissions and additions, as to render it inconceivable that he had the text of Polybius before him. But all these are made intelligible if we suppose Livy to have been here following directly or indirectly the same original sources that were used by Polybius. The earliest of these original sources was probably Silenus, with whom may possibly be placed, for books Xxl., xxii, Fabius Pictor. The latter Livy certainly used directly

for some parts of the decade. The former he almost as certainly knew only at second hand, the intermediate authority being prob- ably Celius Antipater. This writer, who confined himself to a history of the Second Punic War, in seven books, is expressly referred to by Livy eleven times in the third decade ; and in other pe where his name is not mentioned Livy can be shown to rave followed him (eg., xxii. 5, 49, 50, 51; xxiv. 9). In the latter books of the decade his chief authority is possibly Valerius Antias,

In the fourth and fifth decades the question of Livy's authorities presents no great difficulties, and the conclusions arrived at by Nissen in his masterly Untersuchungen have met with general acceptance. These may be shortly stated as follows. In_the portions of the history which deal with Greece and the East, Livy follows Polybius, and these portions are easily distinguishable from the rest by their superior clearness, accuracy, and fulness. On the other hand, for the history of Italy and western Europe lie falls back on Roman annalists, especially, it seems, on Claudius Quadrigarius and Valerius Antias,—a most unfortunate choice,— and from them too he takes the annalistic mould into which his matter is cast.

Livy's general method of using these authorities was certainly not such as would be deemed satisfactory in a modern historian. He is indeed free from the grosser faults of deliberate injustice and falsification, and he resists that temptation to invent to which 'the minds of authors are only too much inclined " (xxii. 7). Nor is he unconscious of the necessity for some kind of criticism. He distin- guishes between rumour and the precise statements of recognized authorities (cf. xxi. 46, v. 21, vii. 6). The latter he reproduced in the main faithfully, but with a certain cxercise of discretion. Where they disagreed, he calls attention to the fact, occasionally pronouncing in favour of one version rather than another (ii. 41, xxl, 46), though often on no adequate grounds, or attempting to reconcile and explain discrepancies (vi. 12, 88). Where he detects or suspects the insertion of fabulous matter he has no scruple in saying so (¢g., li. 7, v. 21, ''inseritur huic loco fabula"). Gross exaggerations, such as those in which Valerius Antias indulged, he roundly denounces (xxxvi. 88, ''in augendo numero

non_alius intemperantior’’), and with equal plainness of speech he condemns the family vanity which had so constantly corrupted and distorted the truth. “‘I suppose,” he says (viii. 40), ‘“‘that the record and memorial of these matters hath been depraved and corrupted by these funeral orations of praises,. ... while every house and family draweth to it the honour and renown of noble exploits martial feats, and dignities by any untruth and lie, so it be colourable.” The legendary character of the earliest traditions he frankly admits. ‘‘Such things as are reported either before or at the foundation of the city, more beautified and set out with poets’ fables than grounded upon pure and faithful reeords, I mean neither to aver nor disprove” (Pref.); and of the whole history previous to the sack of Rome by the Gauls (890 B.c.) he writes that it was obscure ‘‘ both in regard of exceeding antiquity, and also for that in those days there were very few writings and monuments, the only faithful safeguard and true remembrancers of deeds past ; and, besides, whatsoever was icgistered in the commentaries of the

priests and in other public or private records, the same for the most part, when the city was burned, perished withal.” Yurther than this, however, Livy’s criticism does not go. Wherc his written authorities are not palpably inconsistent with each other or with probability he accepts and transcribes their record without any further inquiry, nor does he ever attempt to get behind this re- cord in order to discover the original evidence on which it rested. His acceptance in any particular case of the version given by an annalist by no means implies that he has by careful inquiry satis- fied himself of its truth. At the most it only presupposes a com- parison with other versions, equally second hand, but either less generally accepted or less in harmony with his own views of the situation ; and in many cases the reasons he gives for his prefer- ence of one account over another are eminently unscientific (e.9., xxvi. 49, ‘media simillima veris”). Livy’s history, then, rests on no foundation of original research or even of careful verification. It is a compilation, and even as such it leaves much to be desired. For we cannot credit Livy with having made such a preliminary survey of his

authorities as would enable him to determine their relations to each other, and fuse their various narratives into a con- sistent whole. It is clear, on the contrary, that his circle of authorities for any one decade was a comparatively small one, that of these he selected one, and transcribed him: with the necessary embellishments and other slight modifications until impelled by various reasons to drop him. He then, without warning, takes up another, whom he follows in the same way. The result isa curious mosaic, in which pieces of all colours and dates are found side by side, and in which even the great artistic skill displayed through- out fails to conceal the lack of internal unity. Thus many of Livy's inconsistencies are due to his having pieced together two versions, each of which gave a differently coloured account of the same event. Mommsen has clearly shown that this is what has happened in his relation of the legal proceedings against the elder Africanus in book xxxviil. (Rim. Forschwngen, ii.); and in the story of the first secession, as he tells it, the older version which represented it as duc to political and the later which explained it by economical grievances are found side by side. Similarly a change from one authority to another leads him not unfrequently to copy from the latter statements inconsistent with those he took from the former, to forget what he has previously said, or to treat as known a fact which has not been mentioned before (cf. ii. 1, xxxiv. 6, and Weissenborn's Introduction, p. 87). In other cases where the same event has been placed by different annalists in different years, or where their versions of it varied, it reappears in Livy as two events. Thus the four campaigns against the Volsci (ii. 17 sq.) are, as Schwegler (R. G., i. 18) rightly says, simply variations of one single expedition. Other instances of such ''doublettes" are the two single combats described in xxiii. 46 and xxv. 18, and the two battles at Beecula in Spain (xxvii. 17 and xxviii. 12), Without doubt too much of the chronological confusion observable throughout Livy is due to the fact that he follows now one now another authority, heedless of their differences on this head. Thus he vacillates betwecu the Catonian and Varronian reckoning of the years of the city, and between the chronologies of Polybius and the Roman annalists,

To these defects in his method must be added the fact that he does not always succeed even in accurately reproducing the authority he is for the time following. In the case of Polybius, for instance, he allows himself great freedoin in omitting what strikes him as irrelevant, or tedious, or uninteresting to his Roman readers, a process in which much valuable matter disappears. In other cases his desire to give a vividness and point to what he doubtless considered the rather bald and dry style of Polybius leads him into absurdities and inaccuracies. Thus by the treaty with Antiochus (188 n.c.) it was provided that the Greek communities of Asia Minor ‘shall settle their mutual differences by arbitration,” and so far Livy correctly transcribes Polybius, but he adds with a rhetorical flourish, ‘“‘or, if both parties prefer it, by war” (xxxviii. 88). Elsewhere his blunders are apparently due to haste, or ignorance, or sheer carelessness ; thus, for instance, when Polybius speaks of the ZEtolians assembling at their capital Thermon, Livy (xxxili. 85) not only substitutes Thermopyle, but gratuitously informs his readers that here the Pylzan assemblies were held. Thanks partly to carelessness, partly to mistranslation, he makes sad havoc (xxxv. 5 sq.) of Polybius’s account of the battle of Cynoscephale, while in xxxviil. 7 he mistakes `upeods (‘‘ shields”) for` vpas (‘‘ doors’), and makes nonsense of the passage accordingly. Finally, Livy cannot be altogether acquitted on the charge of having here and there modified Polybius in the interests of Rome, as when he gives an air of magnanimous moderation to the spoliation of Ambracia (189 B.c.), by adding, after describing the carrying away of all statues, bronzes, and pictures, ‘“‘nihil praterea tactum violatumve” (xxxviil. 9, comp. xlv. 19; and Nissen, Uniers., p. 81).

Serious as these defects in Livy’s method appear if viewed in the light of modern criticism, it is probable that they were easily pardoned, if indeed they were ever

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discovered, by his contemporaries. For it was on tli | artistic rather than on the critical side of history that stress was almost universally laid in antiquity, and the thing that above all others was expected from the

historian was not so much a scientific investigation and accurate exposition of the truth, as its skilful presentation in such a form as would charm and interest the reader. In this sense Cicero, De Legg., i. 2, speaks of history as an ‘opus oratorium,” and Quintilian, x. 1, as “‘a prose poem” (carmen solutum) ; and so we find that in the judgment of ancient critics it is by their artistic merits that historians stand or fall. Tried by this standard, Livy deservedly won and held a place in the very first rank. Asinius Pollio sneered at his Patavinity, and the emperor Caligula denounced him as verbose, but with these exceptions the opinion of antiquity was unanimous in pronouncing him a consummate literary workman. ‘The classical purity of his style, the eloquence of his speeches, the skill with which he depicted the play of emotion, and his masterly portraiture of great men, are all in turn warmly commended, and in our own day we question if any ancient historian is either more readable or more widely read. It is true that for us his artistic treatment of history is not without its drawbacks. The more trained historical sense of modern times is continually shocked by the obvious untruth of his colouring, especially in the earlier parts of his history, by the palpable unreality of many of the speeches, and by the naiveté with which he omits everything, however important, which he thinks will weary his readers. But in spite of all this we are forced to acknowledge that, as a master of what we may perhaps call ‘narrative history,” he has no superior in antiquity ; for, inferior as he is to Thucydides, to Polybius, and even to Tacitus in philosophic power and breadth of view, he is at least their equal in the skill with which he tells his story. He is indeed the prince of chroniclers, and in this respect not unworthy to be classed even with Herodotus (Quint., x. 1). Nor is anything more remarkable than the way in | which Livy’s fine taste and sense of proportion, his true poetic feeling and genuine enthusiasm, saved him from the besetting faults of the mode of treatment which he adopted. ‘The most superficial comparison of his account of the earliest days of Rome with that given by Dionysius shows from what depths of tediousness he was preserved by these qualities. Instead of the wearisome prolixity and the misplaced pedantry which make the latter almost unreadable, we find the old tales briefly and simply told. Their primitive beauty is not marred by any attempt to force them into an historical mould, or disguised beneath an accumulation of the

insipid inventions of later times. At the same time they are not treated as merc tales for children, for Livy never forgets the dignity that belongs to them as the prelude to the great epic of Rome, and as consecrated by the faith of generations. Perhaps an even stronger proof of the skill which enabled Livy to avoid dangers which were fatal to weaker men is to be found in his speeches. We cannot indeed regard them, with the ancients, as the best part of his history, for the majority of them are obviously unhistorical, and nearly all savour somewhat too much of the rhetorical schools to be perfectly agreeable to modern taste. To appreciate them we must take them for what they are, pieces of declama- tion, intended either to enliven the ccurse of the narrative, to place vividly before the reader the feelings and aims of the chief actors, or more frequently still to enforce some lesson which the author himself has at heart. The substance no doubt of many of them Livy took from his authorities, but their form is his ‘own, and, in throwing into them all his own eloquence and enthusiasm, he not only acted in conformity with the established traditions of his art, but found a welcome outlet for feelings and ideas

which the fall of the republic had deprived of all other means of expression. To us, therefore, they are valuable not only for their eloquence, but still more as giving us our clearest insight into Livy’s own sentiments, his lofty sense of the greatness of Rome, his appreciation of Roman courage and firmness, and his reverence for the simple virtues of older times. But, freely as Livy uses this privilege of speechmaking, his correct taste keeps his rhetoric within reasonable limits. With a very few exceptions the speeches are dignified in tone, full of life, and have at least a dramatic propriety, while of such incongruous and laboured absurdities as the speech which Dionysius puts into the mouth of Romulus, after the rape of the Sabine women, there are no instances in Livy.

But, if our estimate of the merits of his speeches is moderated by doubts as to his right to introduce them at all, no such scruples interfere with our admiration for the skill with which he has drawn the

portraits of the great men who figure in his pages. We may indeed doubt whether in all cases they are drawn with perfect accuracy and impartiality, but of their life-like vigour and clearness tliere can be no question, With Livy this portrait-paint- ing was a labour of love. ‘To all great men,” says Seneca, ‘he gave their due ungrudgingly,” but he is at his best in dealing with those who, like Q. Fabius Maximus, ‘the Delayer, ” were in his eyes the most perfect types of the true Roman. Over their pictures he lingers with loving care. Each act of their lives, and every speech that is put into their mouths, adds something to the completeness of the sketch, or brings into stronger relief its characteristic features, and thus the desired impression is produced more indelibly than by pages of critical analysis or panegyric.

The general effect of Livy’s narrative is no doubt a little spoilt by the awkward arrangement, adopted from his authorities, which obliges him to group the events by

| years, and thus to disturb their natural relations and con-

tinuity. As the result his history has the appearance of being rather a series of brilliant pictures loosely strung together than a coherent narrative. But it is impossible not to admire the copious variety of thought and language, and the evenly flowing style which carried him safely through the dreariest periods of his history; and still more remarkable is the dramatic power he displays when some great crisis or thrilling episode stirs his blood. ‘The sen- tences with which he begins his account of the sack of Rome by the Gauls are impressive in their solemn sim- plicity :—“ In the same year one M. Ceedicius, a plebeian, gave notice to the tribunes that in the new road where now there standeth a chapel, above the temple of Vesta, there was in the still time of the night a voice heard, louder tllan any man’s, commanding that the magistrates should be told that the Gauls were coming” (vi. 32). With genuine tragic irony he describes how, as the hour of their fate drew nigh, the minds of the Romans were blinded (vi. 37), and how they forgot their ancient cunning in counsel and their courage in the fight, till “full unhappily and in an ill hour” they were scattered to the winds by their foes. Equally vivid is his picture of the self-devotion

of the senators who refused to save themselves by flight— “then the elders that had triumphed aforetime, and been consuls, openly gave out and said that they would live and die together with them.” . . . But we have not space to follow the story to its triumphant close, when the banished Camillus arrived to save the country which had driven him into exile. Nor can we do more than refer to the descrip- tion of the forced march of the consul Claudius in the

Second Punic War, of the battle by the river Metaurus, and

the death of Hasdrubal. j Livy, however, is not always at his best. For the full exercise of his powers he seems to require either the

stimulus supplied by the absorbing interest of the par- ticular events he is describing, or the absence of any authority so full and so little to be disregarded as to fetter his freedom. Certain it is that in his accounts of the kingly period, and of the Hannibalic war, he is seen to much better advantage than in the fourth and fifth decades. We may naturally suppose too that his energies flagged as the work progressed; and in the extant fragments of the ninety-first book ‘other critics besides Niebuhr have detected the signs of failing strength.

In style and language Livy represents the best period of Latin prose writing. He has passed far beyond the bald and meagre diction of the early chroniclers. In his hands Latin acquired a flexibility and a richness of vocabulary unknown to it before. If he writes with less finish and a less perfect rhythm than his favourite model Cicero, he excels him in the varied structure of his periods, and their adaptation to the subject-matter. It is true that here and there the “creamy richness” of his style becomes ver- bosity, and that he occasionally draws too freely on his inexhaustible store of epithets, metaphors, and turns of speech ; but these faults, which did not escape the censure even of friendly critics like Quintilian, are comparatively rare in the extant parts of his work. From the tendency to use a poetic diction in prose, which was so conspicuous a fault in the writers of the silver age, Livy is not wholly free. In his earlier books especially there are numerous

phrases and sentences which have an unmistakably poetic ring, recalling sometimes Ennius and more often his con- temporary Virgil (see for instance Teuffel, p, 482, n. 14). But in Livy this poetic element is kept within bounds, and serves only to give warmth and vividness to the narrative. Similarly, though the influence of rhetoric upon his language, as well as upon his general treatment, is clearly perceptible, he has not the perverted love of antithesis, paradox, and laboured word-painting which offends us in Tacitus; and, in spite of the Venetian richness of his colouring, and the copious flow of his words, he is on the whole wonderfully natural and simple,

These merits, not less than the high tone and easy grace of his narrative and the eloquence of his speeches, gave Livy a hold on Roman readers such as only Cicero and Virgil besides him ever obtained. His history formed the groundwork of nearly all that was afterwards written on the subject. Plutarch, writers on rhetoric like the elder Seneca, moralists like Valerius Maximus, went to Livy for their stock examples. Florus and Euiropius abridged him; Orosius extracted from him his proofs of the sinful blind- ness of the pagan world; and in every school Livy was firmly established as a text-book for the Roman youth.

By far the most complete account of the various editions of Livy, and of all that has been written upon him, will be found in Emil Hiibner's Grundriss zu Vorlesungen iiber die Rémische Literatur- geschichte, 4th ed., Berlin, 1878. The most successful translation of his history is that by Philemon Holland, London, 1600, (H. F. P.)

LIZARD. The name Lizard (Lat., lacerta) originally referred only to the small European species of four-legged reptiles, but is now applied to a whole order (Lacertilia) which is represented by extremely numerous species in all temperate and tropical parts of the globe. Lizards may be described as reptiles with a more or less elongate body terminating in a tail, and with the skin either folded into scales (as in snakes) or granular or tubcrcular; legs are generally present—usually four, rarely two in number— but sometimes they are reduced to rudiments or entirely hidden below the skin; the jaws are toothed, and

the two mandibles firmly united in front by an osseous suture. Eyelids are generally present. The vent is a transverse slit, and not longitudinal as in Crocodilians. Other struc- tural characteristics, especially of the skeleton, separate lizards from the other orders of reptiles; but will be better

understood if described in relation to_the other members of that class). See REPTILEs.

At a low estimate the number of described species of lizards may be given as about one thousand seven hundred.} They are extremely scarce north of 60° N. lat. ; and in the southern hemisphere the southern point of Patagonia forms the furthest limit of their range. As we approach the tropics, the variety of forms and the number of individuals increase steadily, the most specialized and the most developed forms (the monitors and leguans) being restricted to the tropical regions where lizards abound. They have adapted themselves to almost every physical condition, except the extreme cold of high latitudes or altitudes. Those inhabiting temperate latitudes hibernate. The majority live on broken ground, rocks with or without vegetation ; others are arboreal ; to a few (certain monitors) the neighbourhood of water is a necessity; whilst others’are true desert animals, in colour scarcely distinguishable from their surroundings. Some, like many geckos, live near or in houses, being enabled by a peculiar apparatus of their toes to run along perpendicular and even overhanging surfaces. No lizard enters the sea, with the exception of one species, the leguan of the Galapagos (Amblyrhynchus), which feeds on sea-weed. Some, like the majority of the geckos, are nocturnal.

The motions of most lizards are executed with great but not enduring rapidity, With the exception of the chame- leon, all drag their body over the ground, the limbs being wide apart, turned outwards, and relatively to the bulk of the body generally weak. But the limbs show with regard to development great variation, and an uninterrupted transition from the most perfect condition of two pairs with five separate clawed toes to their total disappearance; yet even limbless

lizards retain rudiments of the osseous framework below the skin. The motions of these limb- less lizards are very similar to those of snakes, which they resemble in their elongate body passing into a long cylindrical and tapering tail.

In a great many lizards (Zacertidx, skinks, geckos) the muscles of the several vertebral segments of the tail are so loosely connected, and the axisof thevertebree is so weak, that the tail breaks off with the greatest facility, The part severed retains its muscular irritability for a short time, wriggling as if it were a living creature. A lizard thus mutilated does not seem to be much affected by its loss, and ina short time the part is reproduced ; but, whilst the muscles and also the integuments may be perfectly regenerated, the osseous part always remains replaced by a cartilaginous rod, without vertebral segmentation. This faculty is of great advantage to the lizards endowed with it; they are either species in which the tail has no special function, such as to assist in a particular kind of locomotion or to serve as a weapon of defence, or they are small species which lack other means of escape from their numerous enemies. The geckos are even able to throw off their tail spontaneously, and are said to do this frequently when pursued by some other animal, which is satisfied with capturing the wriggling member, whilst the owner saves its life by a rapid flight.

The majority of lizards are carnivorous, the larger feed- ing on small mammals, birds, fishes, and eggs, the smaller on insects, worms, and other invertebrates. Not a few, however, are herbivorous, as the larger leguans, and many agamas. ‘This difference in diet is quite independent of modifications of dentition. Generally the teeth are simply

1 The two latest general works on lizards are those by Duméril and Bibron (Erpétologie générale, with atlas, tom. i.—ix., Paris, 1834-54, 8vo), and by J. E. Gray (Catalogue of Lizards in the Collection of the British Museum, London, 1845, 8vo). Both are now antiquated, and a new edition of either is much required.

conical, pointed, more rarely blunt, or notched at the top or sides. Always anchylosed with the bone, they are inserted either on the inner side of the margin of the jaws (plewrodontes), or on the edge of the bones (acrodontes). The form of the tongue exhibits many modifications which have been used for the division of the order into families, as will be seen from the systematic list given below.

All lizards are oviparous, the eggs being of an oval shape, and covered with a hard or leathery calcareous shell, The number of eggs laid is, in comparison with other reptiles small, perhaps never exceeding forty, and some, like the anolis and geckos, deposit only one or two at a

time, but probably the act of oviposition is repeated in jsn4, oily. Australia,

these lizards at frequent intervals. The parents do not take care of their progeny, and leave the eggs to hatch where they were deposited. In a few lizards, however, the eggs are retained in the oviduct until the embryo is fully developed; these species, then, bring forth living young, and are called ovoviviparous.

No lizard is venomous, with, perhaps, a single exception (Heloderma) to be mentioned hereafter.

The order of lizards may be divided into the following suborders and families :—

First Suborder. —Ctonocrania.

Vertebre: procelian ; an orbital ring with a temporal bar more or less complete ; columella present ; parietal bone single.

Family 1. Monitoridx.—Scales of the belly oblong, quadrangular, in cross-bands, on the back and tail rhombic, very smaljl or granular. Tongue very long, exsertile, ending in two long filaments, sheathed at the base. Head with small polygonal shields. The largest lizards, inhabiting the African, Indian, and Australian regions.

Genera: Psammosaurus, Odatria, Varanus (Monttor), Hydrosaurus.

Family 2. Tejid@.—Scales small, granular, sometimes with larger tubercles; those of the belly oblong, quadrangular, in cross bands, Head with large symmetrical scutes. Tongue long, scaly, bifid at the end. Dentition acrodont. No fold of the skin along the sides. Tropical and subtropical Amcrica.

Genera: Tejus, Callopistes, Ameiva, Cnemidophorus, Dicrodon, Acrantus, Centropyx, Crocodilurus, Ada, Custa,

Family 8. Lacertidx.—Scutellation as in the preceding family. Tongue long, exsertile, bifid at the end, without sheath at the basc, Dentition pleurodont. Old World, especially from the Europo- Asiatic, African, and Indian regions.

Genera: Lacerta, Tropidosaura, Tachydromus, Ichnotropis, Acanthodactylus, Psammodromus, Scraptetra, Eremias, Mesalina, Cabrita, Ophiops, Chondrophiops, Tracheloptychus.

Family 4, Xanthusiide#.—Distinguished from the preceding family by a broader non-exsertile tongue. California, Central America, and Cuba.

Genera: Xanthusia, Lepidophyma, Cricosaura.

Family 5. Z’rachydermi.—Scales arranged in transverse rows, frequently swollen or tubercular. Tongue cnding in two short points. Dentition pleurodont. No femoral pores. Central America, extending into the subtropical parts of North America.

Genera: Heloderma, Gerrhonotus.

Family 6. Zonuride.—Scales arranged in transverse rows, quad-rangular, those of the back generally keeled ; a fold of the skin runs along the side of the body, separating the upper from the lower parts, Head with large symmetrical shields). Tympanum distinct. African region; Pseqdopus from the Europo-Asjatic, and Ophisaurus from the North American region.

Genera: Cordylus, Zonurus, Platysaurus, Gerrhosaurus, Pleurostrichus, Saur- ophis, Caitia, Pseudopus, Ophisaurus, Tyalosaurus.

Family 7. Chalcididew.—Scales arranged in transverse bands, quadrangular; searccly a trace of a lateral fold infront. Head with large symmetrical shields. Tongue scaly, bifid in front. Typauum hidden, Body long, with rudimentary limbs, Tropical America.

Genera: Brachypus, Microdactylus, Chalcis, Ophiognomon, Bachia, Propus, Fleterodactylus.

Family 8. Cercosauridx.—Scales rhombic or quadrangular, genc:- rally arranged in transverse series. No lateral fold, or only a trace of it. Head with large symmetrical shiclds. Tonguc scaly, bifid in front. Tympanum distinct. Body modcrately elongate, with four developed limbs. Males with femoral pores. Tropical America,

Genera: Cercosaura, Pantodactylus, Chalcidolepis, Iphisa, Perodactylus, Placo- soma, Holaspis, Lepidosoma, Ecpleopus, Euspondylus, Cricosaura, Proctoporus, Urosaura, Emphrassotis, Lepidophyma, Loxopholis, Trettoscincus.

Family 9. Chamesauridx.—Body slender, with rudimentary

limbs. Scales arranged in transverse series, equal all round the body, provided with a sharp keel, the keels forming longitudinal ridges ; no lateral fold. Typanum distinct. Tongue with a very shallow notchin front. South Africa.

Genus: Chamexsaura.

Family 10. G@ymnophthalmidx.—The entire body is covered with rounded imbricate quincuncial scales; head with symmetrical shields. No eyelids. Nostrils lateral, in a single shield. Body long, with the limbs small or rudimentary. Irregularly distributed over the tropical regions.

Genera: Gymnophthalmus, Epaphelus, Ablepharus, Blepharosteres, Crypioble- pharus, Morethia, Menetia, Miculia, Lerista, Blepharactisis.

Family 11. Pygopodidx.—Scutellation as in the preceding family, but the nostrils are situated above the upper edge of the first labial shield. No eyelids. Body long, with a pair of rudimentary hind

Genera: Pygopus, Delma.

Family 12. Aprasiidx.—Scutcllation as in the preceding families, the nostrils in a suture between the nasal and first labial shields. No eyelids. Limbs none. Australia,

Genus: Aprasia,

Family 13. Lialide.—Scales imbricate, quincuncially arranged ; head with'imbricate scale-like shields. No cyelids. Body long, with a pair of rudimentary hind limbs only, Australia.

Genus: Lialis.

Family 14. Scincidex.—The entire body is covered with rounded imbricate scales, quincuncially arranged ; head with symmetrical shields. Eyelids developed. Nostrils behind the rostral, in a separate shield, or between two or three small shields. Tongue short, with a notch in front. Ground-lizards.—This family has so wide a distribution that its range almost coincides with that of the order generally,

The following genera are composed of numerous specjes, and extend over several geographical regions: Z/inulia (Indian and Australian regions), Zumeces, including Mocoa and Riopa, Lygosoma and Chelomeles (Indian and Australian regions), Plesttodon (Europo-Asiatic, North American, and Indian regions), Mabouia and Tiliqua (Euprenes), generally distributed in the tropical and sub- tropical regions, Heteropus (Indian and Australian regions), Sphenops and Gon- gylus (Europo-Asiatic and African regions),

Indian gencra: Lipinia, Amphixestus, Lygosaurus, Cophosctncus, Ristella, Podophis, Chiamela, Senira, Brachymeles, flagria, Tropidophorus, Norbea, Dasia, Sphenocephalus, Sepophis.

Australian genera: Hemiergts, Tetr'adactylus, Omolepida, Staphos, Anoma- lopus, Rhodana, Ophioscincus, Soridia, Lioscincus, Tribolonotus, Trachydosaurus, Corucia, Cyclodus, Silubosaurus, Egernia, Tropidolepisma, Tropidoscincus, Nan- noscincus, Ophioseps.

Tropical American genera: Qphtodes, Celestus, Camilia, Diploglossus, Sauresta, Panolopus.

African genera: Liolepisma, Dumerilia, Pygomeles, Eumecia, Scelotes, Thyrus, Amphiglossus, Sepsina, Sepomorphus, ierpetosaura, Sepacontias,

Europo-Asiatic genera: Scincus, Anguis, Ophiomorus, Zygnopsis, Hemipodion, Seps, Heteromeles.

North American genus: Anniella.

Family 15. Acontiide.—Scutellation similar to that of the skinks, but the rostral shield is enlarged, cup-shaped, the nostril being in the rostral, with a long slit between it and the hinder margin of the rostral. Eyes distinct, with a lower eyelid. Limbs rudi- mentary or absent, Africa, Madagascar, and Ceylon,

Genera: Nessia, Evesia, Aconttias, Aparallactus.

Family 16. 7yphlinide.—Differing from the preceding family by having the eyes hidden under the skin. Africa, East Indian Archi- pelago, New Guinea,

Gencra: Typhlosaurus, Feylinia, Dibamus.

Family 17. Iguanidw.—Scales of the back and sides imbricate, generally in transverse, oblique rows, those of the belly similar ; head with numerous, irregular small scutes. Tongue short, scarccly notched

in front, not exsertile. Dentition pleurodont; teeth fre- quently compressed towards the point. Toes 5-5. The whole of this large family are found in the New World, with the exception of two gencra, one (Brachylophus) inhabiting the Fiji Islands, the other (Hoplurus) Madagascar.

The genera may be divided into two groups,—one comprising arboreal forms with compressed slendcr body, slender legs, and Iong tail, the other forms, which live on the ground, with a broader, more dcpressed body, stouter legs, and shorter tail. Both groups pass into each other.

Arboreal genera: Polychrus, Urotrophus, Ecphymotes, Lemancius, Iguana, Aloponotus, Brachylophus, Metopoceros, Trachycephalus, Oreocephalus, Cyclura, Ctenosaura, Enyaliosaurus, Basiliscus, Corythwolus, Corythophanes, Chamzx- leopsis, Ophryoessa, Ophryoessoides, Enyalius, Chameleolis, Xiphosurus, Dactyloa, Xiphocercus, Acantholis, Norops, Anolis, Uraniscodon, Plisa.

Terrestrial genera: Tropidolepis (Sceloporus), Liodera, Liolemus, Pygoderus, Proctotretus, Liocephalus, Helocephalus, Scartiscus, Stenocercus, Trachycyclus, Holbrookia, Uta, Aneuporus, Taraguira, Tropidurus, Microphractus, Aniso- phractus, Hoplurus, Hoplocercus, Strobilurus, Liosaurus, Diplolemus, Sauro- malus, Cachryx, Uranocentron, Crotaphytus, Phymaturus, Centrura, Callisaurus, Uma, Tropidogaster, Phrynosoma.

Family 18. Agamidx,—Differing from the preceding family by their acrodont dentition. Tropical regions of the Old World and Central Asia.

Arboreal Indian genera: Draco, Sttana, Lyriocephalus, Arpephorus, Cerato- phora, Cophotis, Otocryptis, Gonyocephalus, Japalura, Dilophyrus, Orotiaris, Tiaris, Acanthosaura, Calotes, Bronchocela, Salea, Lophocalotes, Hypselurus, Gonyocephalus, Lophura, Physignathus.

Terrestrial Australian geriera: Chelosania, Gindalia, Chlamydosaurus, Lopho- gnathus, Diporophora, Grammatophora, Tympanocryptis, Moloch.

Terrestrial African, Indian, and Asiatic genera: Stellio, Agama, Charasia, Trapelus, Brachysaura, Phrynocephalus, Megalochilus, Centrotrachelus, Uroma- styx, Liolepis, Chalarodon.

Second Suborder.—Chameleonoidea.

Vertebre procelian ; a bar crossing from the parietal to the mastoid ; temporal bar complet:. No columella. Parietal bone single. 1.

Family 1. Chameleontide.—Body granular. Toes 5-5, formed into two grasping opposable groups. Tongue very long, worm- shaped, very extensile. Exclusively arboreal. Africa and Mada-

gascar, one species extending into Europe and India, Genera: Chamzleon, Rhampholeoa.

Third Suborder.—Nyctisaura.

Vertebree amphicelian ; orbital ring and temporal bars not de- veloped. A columella. Parietal bone paired.

Family 1. Geckotide.—Upper parts granular, rarely with scales ; lower parts covered with imbricate scales. Tongue thick, short, slightly notched in front. Eyes large, without (very rarely with) eyelids. Body depressed. Toes frequently with a more or less

developed adhesive apparatus. Tropical and subtropical regions.

Genera with a wide range: Hemidactylus (Peripia), Phyllodactylus (not ex- tending into the Indian region), Diplodactylus (Tropieal Ameriea, Australia, and Afriea), Thecadactylus (Tropical Ameriea and Australia), Platydactylus (Afriea and Australia), Heteronota (Indian and Australian regions), Phelsyma (Indian aud Afriean regions).

Tropical American genera: Caudiverbera, Aristelliger, Sphxrodactylus, Homo- nota, Goniodactylus. Same of these genera go beyond the limits of the tropics southwards or northwards,

New Zealand genus: Maultinus.

Australian genera: @dura, Rhynchedura, Strophura, Slenodactylopsis, Cor- relophus, Ceratolophus, Gehyra, Nephrurus, Phyllurus.

Indian genera: Spathodactylus, Callodactylus, Ptyo?actylus, Nycteridium, Pentadactylus, Gecko, Luperosaurus, Ptychozoon, Eublepharis, Geckoella, Cyrto- dactylus, Gymnodactylus, Teratolepis.

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African genera: Paredura, Ebendvia, Rhoptropus, Uroplates, Theconyz, Tarentola, Pachydactylus, Psilodactylus, Pristiurus, Stenodactylus, Chondrodac- tylus, Geckolepis, Spatalura.

Europo-Asiatie genera: Bunopus, Ceramodactylus, Teratoscincus, Agamura, These inhabit only the southern parts of the region in Asia; representatives of some African or Indian genera (viz., Piyodactylus, Tarentola, Gymnodactylus, and Stenodactylus) likewise extend into this region.

This list, from which many subgenera have been excluded, will give an idea of the wide distribution of the order of lizards, and of the great variety of forms which it com- prises. Indeed, in both respects, it far surpasses the other orders of reptiles. The scope of the present article does not permit us to enter into further taxonomic details, but a few notes may be added on some lizards, to which special interest is attached, or of which most frequent mention is made in general literature.

The first family, that of Monitoridz, comprises very large lizards, the largest exceeding a length of 6 feet. Some are terrestrial, others semi-aquatic, the former having a rounded the latter a compressed tail with a sharp, saw-like upper edge, which assists them greatly in swimming, and at the same time forms a formidable weapon with which these powerful animals can inflict deep wounds on the incautious captor. They range all over Africa, the Indian region, and Australia; their prey consists of other vertebrate animals, small mammals, birds, frogs, fishes, and eggs. The young are prettily spotted with white and black ocelli, the old ones having a plainer coloration. The Monitor of the Nile (Monitor niloticus, fig. 1) is an

Fig. 1.—Monitor of the Nile (Afonitor niloticus).

aquatic species, found in the neighbourhood of all large rivers of tropical Africa. The Arabs know it well under the name Waran (whence the generic name Varanus is

derived), and it frequently appears also among the engrav-

ings and hieroglyphs of ancient Egypt. Some respect was and still is paid to it, as it is said to prey largely on the eggs of crocodiles. Another Monitor, the Waran el ard of the Arabs (Psammosaurus scincus), also inhabits North Africa, but is strictly terrestrial, and has a rounded tail. Most of the European lizards with four well-developed limbs belong to the genus Lacerta. They are of small size, and insectivorous. Their tongue is deeply cleft at the end, and is frequently exserted when the animal is in a state of excitement from fear or anger. As in all the lizards of the family Lacertidz, their tail is easily broken, and as readily reproduced, the reproduced portion often assuming a monstrous or double shape, so that the animal appears to be provided with two tails. Only three species occur in Great Britain (see fig, 2). The Common Lizard (Lacerta vivipara) frequents heaths and banks in Eneland and Scotland, and is locally met with also in Ireland: it is ovoviviparous. Much scarcer is the second species, the Sand-Lizard (Lacerta agilis), which is confined to some localities in the south of England, the New Forest and its vicinity ; it does not appear to attain

on English soil to the same size as on the Continent, where it abounds, growing sometimes to a length of 9 inches. Singularly, a

snake (Coronella levis), also common on the Continent, and feeding principally on this lizard, has followed it across the British Channel, apparently existing in those localities only in which the sand-lizard has settled. This lizard is oviparous. The males differ by their brighter green ground colour from the females, which are brown,

Fic. 2.—Heads of British Lizards.

a, Lacerta vivipara;

6, L. agilis; ¢, L. viridis. spotted with black. The third British species, the Green Lizard (Lacerta viridis), does not occur in England proper ; it has found a congenial home in the island of Guernsey, but is there much less developed as regards size and beauty than in the countries south of the Alps and Pyre-

nees. This specics is larger than the two preceding ;

it is green, with niinute blackish spots. In Germany and France one other species only (Lacerta muralis) appears ; but in the south of Europe the species of Lacerta are much more numerous, the largest and finest being L. ocellata, which grows to a length of 18 or 20 inches, and is brilliantly green, ornamented with blue eye-like spots on the sides. Even the small island-rocks of the Mediterranean, sometimes only a few hundred yards in diameter, are occupied by peculiar races of lizards, which of late years have attracted much attention from the fact that they, like other reptiles, have assumed under such isolated conditions a more or less dark, almost black, coloration.

Heloderma horridum is a Mexican lizard, which in its native country has the reputation of being a most poisonous reptile. Its anterior teeth are, indeed, provided with a deep groove, as in many poisonous snakes, and the submaxillary gland is enormously developed.

Sumichrast has recently proved by actual experiment on mammals the fatal effects of the bite of this lizard; and J. Stein, a traveller in Mexico, who was bitten in the finger, suffered from symptoms similar to those resulting from the bite of a poisonous snake. It thus appears that the fear in which it is held by the natives is not due merely to its hideous appearance, as was formerly believed. Tubercles of a dirty brown and yellow colour, with which its body is covered, give it the appearance of a leprous skin. It is about 20 inches long, and is known by the name of “ Kscorpion.”

The Glass-Snake (Pseudopus pallasit) or Sheltopusih: (Russ.) is common in Dalmatia, Hungary, southern Russia, and the western parts of Central Asia. Externally it resembles a snake, the fore limbs being entirely absent, and the hind limbs reduced to smallrudiments. It attains to a length of 2 or 3 feet, and feeds on insects, worms, mice, and small birds. In captivity it becomes perfectly tame. North America is inhabited by a very similar glass- snake (Ophisaurus), and North Africa by a_ third (Hyalosaurus). Limbless lizards are especially common in Australia, but their scutellation is so different from that of the glass-snakes of the northern hemisphere that they are placed in distinct families, which have been noticed in the systematic list (Pygopodide, Aprasiide, Lialide).

The family of skinks also includes many genera with rudimentary Jimbs or without any, the Slow-Worm or Blind-Worm (Anguis fragilis) being the one most generally known. It is distributed over the greater part cf Europe, and rarely exceeds a length of 15 inches. Its eyes, although small, are perfectly developed aud provided with eyelids. It is ovoviviparous; the young, in the first year of their life, differ considerably from the old in their coloration, the back being of a milk-white colour, with a black line down the middle. In the south of Europe it gradually disappears, and its place is taken by the similarly shaped Seps, a genus distinguished from Anguis by the presence of four very small rudiments of limbs, wliuch have no function.

The Skink, which has given the uame to the whole family, is a small lizard (Scincus officinalis) of 6 or 8 inches in length, common in arid

districts of North Africa and Syria. A peculiarly wedge-shaped snout, and toes provided witli strong fringes, enable this animal to burrow rapidly in and under the sand of the desert. In former times large quantities of it were imported in a dry state into Europe for officinal purposes, the drug having the re- putation of being efficacious in diseases of the skin and lungs; and even now it may be found in apotliecaries' shops in the south of Europe, country people regarding it as a powerful aphrodisiac for cattle.

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Of the family /guanidx we refer to three genera only: —Iguana, Anolis, and Phrynosoma. Herpetologists dis- tinguish several species of Zgwana or Leguans, which, how- ever, do not appear to differ in their habits). They are found in the forest regions of tropical America only, in the neighbourhood of water, into which when frightened they jump from the overhanging branches of trees, to escape capture by swimming and diving. Feeding ex-

Fia, 3.—Head of Leguan (Iguana rhinolophus).

clusively on leaves or frnits, they are themselves highly esteeined as food, and their eggs also are eagerly searched for by the natives. Iguanas grow to a length of from 2 to 5 feet, and are readily recognized by a row of long compressed and pointed scales which form a more or less high crest along the middle of the back and tail, and by a compressed and pendant dewlap at the throat. These large lizards are strictly arboreal, and of a brilliant colora- tion, in which green prevails.

The smallest lizards of this family belong to the genus Anolis, extremely numerous as regards species and in- dividuals on bushes and trees of tropical America, and especially of the West Indies. They offer many points of analogy to the humming birds in their distribution, colours, and even disposition. Gosse (A WNaturalist's Sojourn in Jamaica, pp. 75 sq.) has given a vivid and faithful de- scription of their manners. Hundreds may be seen on a bright day, disporting themselves on the trees and fences, leaping from branch to branch, fearlessly entering houses, chasing each other, or engaging in combat with some

rival. Like the iguanas, they (at least the males) are pro- vided with a large, expansible dewlap at the throat, which is brilliantly coloured, and which they display on the slightest provocation. This appendage is merely a fold of the skin, ornamental and sexual, like the wattles of the throat of a gallinaceous bird; it has no cavity in its interior, and has no communication with the mouth or with the respiratory organs; it is supported by the posterior horns of the hyoid bone, and can be erected and spread at the will of the animal. The presence of such dewlaps in lizards is always a sign of an excitable temper. The

anolis possess the power of changing their colours in a most extraordinary degree, the brilliant iridescent hues of their body passing almost in an instant into a dull sooty brown in an irritated or alarmed animal. They are much fed upon by birds and snakes, and have, like all small much-persecuted lizards, a fragile tail, easily reproduced. They bring forth only one large egg at a time, but probably breed several times during the season.

The third iguanoid, Phrynosoma, is a terrestrial form. Several species are known, inhabiting the plains of south- western America and Mexico. Since the opening of the Pacific Railway, living specimens are frequently sent to Europe, and sold under the name of “ Californian toads.” Although they belong to the same family, a greater con- trast than that between the nimble, slender, and long- tailed Anolds and the toad-like Phrynosoma can hardly be imagined. The body is short, broad, and depressed, end- ing in a short tail, covered with rough tubercles or spines; the short head is armed behind with long bony spikes; the colours are a motley of brown, black, and yellow. Their defence against birds lies chiefly in their outward appearance, as, whilst they rest quiet, they are difficult to distinguish from a stone overgrown with lichen; nor have we ever found their remains in the stomach of snakes, their spines proving a sufficient protection against these equally formidable enemies. They are said to move with rapidity in a wild state, but in confinement, especially when the aninial believes itself observed, their movements are extremely sluggish and their

manners uninteresting. It seems to be a common belief in California that they have the power of squirting a blood-red fluid from the corner of the eye to some distance; but nothing has been found, on anatomical examination, to establish the correct- ness of this assertion. They attain a length of from 6 to 8 inches.

Of the Agamzdz, which represent the iguanas in the Old World, and which have been differentiated into a still greater number of distinct generic forms, several genera deserve more than a merely nominal notice. The perhaps most highly specialized form are the Dragons (Draco), a genus of small lizards from the East Indies, more common in the archipelago than on the continent, but absent in Ceylon. The character by which they are at once recog- nized is the peculiar additional apparatus for locomotion, formed by the much-prolonged five or six hind ribs, which are connected by a broad expansible fold of the skin, the whole forming a subsemicircular wing on each side of the body. The snakes are the only order of vertebrates in which the ribs serve as organs of locomotion, but, whilst in that order all the ribs are charged with a function for which no other special organ exists, in the dragons only a part of the ribs are modified for the purpose of assisting four well-developed limbs. The dragons are tree-lizards; they take long flying leaps from branch to branch, supported in the air by their expanded parachutes, which are laid backwards at the sides of the animal while it is sitting or merely running. If the hind or fore limbs of a dragon were cut off, it would be helpless, and deprived of locomotion, but it could continue to move with velocity after the loss of its wings. Like the anolis, whose analogues they are in the Old World, they are provided with long highly ornamented dewlaps. These appendages are found in both sexes, one in the middle and one on each side of the throat, but they are much more developed in the mature male. The tail is very long and slender, not fragile; we have never seen a dragon in which this member was mutilated ; it seems to be necessary for their peculiar locomotion, and probably its loss soon proves fatal tothe animal. Cantor says that the transcendent beauty of their colours baffles description.

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As the lizard lies in the shade along the trunk of a tree, its colours at a distauce appear as a mixture of brown and grey, and render it scarcely distinguishable from the bark, Thus it remains with no signs of life except the restless

Fic. 4.—Dragon (Draco teniopterus). eyes watching passing insects, which, suddenly expanding its wings, it seizes with a sometimes considerable unerring leap. All the species attain a length of 7 or 8 inches, of which the tail takes at least one half. They deposit three or four eggs at a time.

Calotes is another genus of agamoids peculiar to the East Indies ; it comprises numerous species well known in India by the name of “ blood-suckers,” a designation the origin of which cannot satisfactorily be traced. They are tree-lizards, extremely variable in their colours, which change, not only with the season, but also at the will of the animal. The males, and in some species also the females, possess a crest of compressed scales along the back.

Of the Australian agamas no other genus is so numerously represented and widely distributed as Gram- matophora, the species of which grow to a length of from 8 to 18 inches. Their scales are generally rough and spinous ; but otherwise they possess no strikingly distin- guishing peculiarity, unless the loose skin of their throat, which is transversely folded and capable of inflation, be regarded assuch. On the other hand, two other Australian agamoids have attained some celebrity by their grotesque appearance, due to the extraordinary development of their integuments. One (fig. 5) is the Frilled Lizard (Chlamy- dosaurus), which is restricted to Queensland and the north coast, and grows to a length of 2 feet, including the long tapering tail. It is provided with a frill-like fold of the skin round the neck, which, when erected, resembles a broad collar, not unlike the gigantic lace-collars of Queen

Elizabeth’s time. The late Mr Krefft has made the obser- vation that this lizard when startled, rises with the fore- legs off the ground, and squats and jumps in kangaroo- fashion, thus reminding us of the peculiar locomotion ascribed to certain gigantic extinct reptiles The other lizard is one which most appropriately has been called

Fig, 5.—Frilled Lizard (Chlamydosaurus).

Moloch horridus. It is covered with large and small spine- bearing tubercles; the head is small, and the tail short. It is sluggish in its movements, and so harmless that its armature and (to a casual observer) repulsive appearance are its sole means of defence. It grows only to a length of 10 inches, and is not uncommon in the flats of South and West Australia.

The majority of the ground-agamas, and the most common species of the plains, deserts, or rocky districts of Africa and Asia, belong to the genera Stel/io and Agama. They resemble much the Grammatophora of the Australian region, their scales being mixed with larger prominent spines, which in some species are particularly developed on the tail, and disposed in whorls. Nearly all travellers in the north of

Africa mention the Hardhén of the Arabs (Stellio cordylinus), which is extremely common, and has drawn upon itself the hatred of the Mohammedans by its habit of nodding its head, which they interpret as a mockery of their own movements whilst engaged in prayer. Uromastyx is one of the largest and most developed genera of ground-agamas, and likewise found in Africa and Asia. The body is uniformly covered with granular scales, whilst the short, strong tail is armed with powerful spines disposed in whorls. The Indian species (U. harderickii) feeds on herbs only; the African species probably take mixed food.

The Chameleons are almost peculiar to the African region, and most numerous in Madagascar, where out of the thirty-six species known not less than seventeen occur. Only one species (C'. vulgaris) extends into India and Ceylon. No other member of the order of lizards shows such a degree of specialization as the chameleons. The tongue, eyes, limbs, tail, skin, lungs are modified in a most extraordinary manner to serve special functions in the pecu- liar economy of these animals. They lead an exclusively arboreal life ; each of their feet is converted into a grasping

hand, by means of which, assisted by a long prehensile tail, they hold so fast to a branch on which they are sitting that they can only with difficulty be dislodged. Their move- ments are slow on the ground, and still more so in the water, where they are nearly helpless. As in ant-eaters,

| woodpeckers, or frogs, their tongue is the organ with which

they catch their prey ; it is exceedingly long, wornt-like, with a club-shaped viscous end ; they shoot it out of

the mouth with in-{ credible rapidity to- wards insects, which remain attached to it, and are thus caught. The globular eyes are covered with a circular lid pierced by a small central hole, and are so prominent that more than one-half of the ball stands out of the head. Not only can they

be moved in any direction, but each has an action independent of the other; one eye may be looking forwards, whilst an object behind the animal is examined with the other. The lungs of the chameleons are very capacious, and are in- flated when the. animal is angry or frightened. The faculty of changing colour, which they have in common with many other lizards, is partly dependent. on the degree in which the lungs are filled with air, and different layers of chromatophores are pressed towards the outer surface of the skin. Some species are only a few inches long, whilst others attain toa length of 8 and 20 inches. The

Fia. 6.—Forefoot of Chameleon o'shaughenestt.

| majority are oviparous, a few ovoviviparous.

Almost all the lizards belonging to the family of Geckos may be recognized at first sight; the head is broad and depressed, the eyes large, the body depressed ; the tail is thick at. the base, tapering, generally somewhat deformed, as a specimen is rarely met with in which this member is not reproduced. The limbs are stout, rather short, with at least four of the toes well developed. Geckos are found in almost every part of the globe between and near the tropics, fre- quenting houses, rocks, and trees; and some of the species are so numerous around and within human dwellings as to be most familiar objects to the in- habitants.

Many are able Fic. 7.—Lower Surface of the Toe of to run up and along the (a) Gecko, (0} Hemidactylus—en- surface of a wall or of [ed

any other perpendicular object ; for this purpose the lower surface of their toes is provided with a series of mov- able plates or disks,! by the aid of which they adhere to the surface over which they pass. In forest- species this apparatus is generally less developed, or entirely absent, claws being of greater use for walking up the rough bark of a tree. Geckos, with few exceptions, are nocturnal

}and, consequently, large-eyed animals, the pupil being | generally contracted in a vertical direction, shaped like

two rhombs placed with the angles towards each other. They are of small size, the largest species not exceeding 10 or 14 inches in length. They are carnivorous, destroy- ing moths and all kinds of insects, and even the younger and weaker members of their own species. They have been seen devouring the skin which they cast off, and “i? i air a 2

1 ‘The mechanism resembles in some the adhesive organ of Echenets

or sucking-fish, in others that of the legs of a fly. XIV. — 93

their own wriggling tail. They are of a fierce disposition, frequently fighting among themselves; but house-geckos readily become habituated to the presence of man; ac- customed to be fed at a certain time with rice, these little lizards will punctually make their appearance, and fearlessly take the proffered food. Another peculiarity of geckos is that they, or at least some genera, are endowed with a voice. The large Gecko guttatus and G. monarchus of the East Indies utter a shrill cry, sounding like “‘tokee” or “tok.” The common species found in houses in the south of Europe are a species of Memidactylus (H. verruculatus) and 7Jarentola, the terrentola of the Italians. All geckos seem to be oviparous. A. C, G.)

LLAMA, sometimes spelt Zama, a word by which the Peruvians designated one of a small group of closely allied animals, which, before the Spanish conquest of America, were the only domesticated hoofed mammals of the country, being kept, not only for their value as beasts of burden, but also for their flesh, hides, and wool,—in fact, supplying in the domestic economy of the people the place of the horse, the ox, the goat, and the sheep of the Old World. The word is now sometimes restricted to one particular species or variety of the group, and sometimes used in a generic sense to cover the whole. Although they were often compared by early writers to sheep, and spoken of as such, their affinity to the camel was very soon perceived, and they were included in the genus Camelus in the Systema Nature of Linneus. They were, however, separated by Cuvier in 1800 under the name of Zama, changed by Illiger in 1811 to Auchenia (in allusion to

the great length of neck, adyyv), a term afterwards adopted by Cuvier, and almost universally accepted by systematic zoologists, although there has been of late a disposition to revive the earlier name.

The animals of the genus Auchenia or Lama are, with the two species of true camels (to which the generic term Camelus is now restricted), the sole existing representatives of a very distinct section of the "artiodactyle" or even-

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Fic. 1.—Llama (from an animal living in the Gardens of the Zoological Society of London).

toed ungulates, called Z'ylopoda, or " boss-footed," from the peculiar bosses or cushions placed on the under surface of their feet, and on which they tread. This section thus consists of a single family, the Camelidz, the other sec- tions of the same great division being the Suna or pigs,

LLA—LLA

the Zragulina or chevrotains, and the Pecora or true

ruminants, to each of which the 7'ylopoda have more or less affinity, standing in some respects in a central position between them, borrowing as it were some characters from each, but in others showing great special modifications not found in any of the other sections.

Until within the last few years the existence of two genera having so very much in common as the camels and the llamas, and yet so completely isolated geographically, had not received any satisfactory explanation, for the old idea that they in some way "represented" each other in the two hemispheres of the world was a mere fancy without philosophical basis. The discoveries made mostly within the past ten years of a vast and previously un- suspected extinct fauna of the American continent of the Tertiary period, as interpreted by the able paleontologists Leidy, Cope, and Marsh, has thrown a flood of light

upon the early history of this family, and upon its relations to other mammals. It is now known that llamas at one time were not confined to the part of the continent south of the Isthmus of Panama, as at the present day, for their remains have been abundantly found in the Pleistocene deposits of the region of the Rocky Mountains, and in Central America, some attaining a much larger size than those now existing. There have also been found in the same regions many camel-like animals exhibiting different generic modifications, and, what is more interesting, a gradual series of changes, coinciding with the antiquity of the deposits in which they are found, have been traced from the thoroughly differentiated species of the modern epoch down through the Pliocene to the early Miocene beds, where, their characters having become by degrees more generalized, they have lost all that especially distinguishes them as Camelide, and are merged into forms common to the anecstral type of all the other sections of the Artio-dactyles. Hitherto none of these annectant forms have been found in any of the fossiliferous strata of the Old World ; it may therefore be fairly surmised (according to the evidence at present before us) that America was the original home of the Z'ylopoda, and that the true camels have passed over into the Old World, probably by way of the north of Asia, where we have every reason to believe there was formerly a free communication between the con- tinents, and then, gradually driven southward, perhaps by changes of climate, having become isolated, have undergone some further special modifications ; while those members of the family that remained in their original birthplace have become, through causes not clearly understood, restricted solely to the southern or most distant part of the continent. There are few groups of mammals of which the paleontological history has been so satisfactorily demonstrated as the one of which we are treating.!

The special characters which the llamas and camels have in common, and the combination of which distinguishes them from the rest of the Artiodactyles, are as follows. The premaxille have the full number of incisor teeth in the young state, and the outermost is persistent through life, an isolated laniariform tooth. The canines are present in both jaws, and those of the mandible are dif- ferentiated hci the long, procumbent,

and spatulate incisors, being suberect and pointed. The crowns of the true molars belong to the crescentic or ‘‘ selenodont” type, and are very long or “ hypsodont”; but one or more of the anterior premolars is usually detached from the series, and of simple pointed form. The hinder part of the body is much contracted, and the femur long and vertically placed, so that the knee-joint is lower in position, and the thigh alto- gether more detached from the abdomen than in most quadrupedal mammals. The limbs are long, but with only two digits (the third and fourth) developed on each, no traces of any of the others rier present. The trapezoid and magnum of the carpus, and the cuboi and navicular of the tarsus are distinct. The two metapodal bones of each limb are confluent for the greater part of their length, though

1 See especially E. D. Cope, in Wheeler’s Report of the Survey West of the 100th Meridian, iv. pt. 2, pp. 325-46, 1877.

separated for a considerable distance at the lowerend. Their distal articular surfaces, instead of being pulley-like, with deep ridges and grooves, as in other Artiodactyles, are simple, rounded, and smooth. The proximal phalanges are expanded at their distal ends, and the wide, depressed middle phalanges are embedded in a broad cutaneous pad, forming the sole of the foot, on which the animal rests in walking instead of on the hoofs. The ungual phalanges are very small and nodular, not flattened on their inner or opposed surfaces, and not completely encased in hoofs, but bearing nails on their “— surface only. The cervical region is long and flexuous, and the vertebre of which it is composed are remarkable for the position of the canal for the transmission of the vertebral artery, which does not perforate the transverse process, but passes obliquely through the anterior part of the pedicle of the arch (a con- dition only found in two other genera of mammals, Macrauchenia and Myrmecophaga). There are no horns or antlers. Though these animals ruminate, the stomach differs considerably in the details of its construction from that of the Pecora. The interior of the ramen or paunch has no villi on its surface, and there is no distinct psalterium or maniplies. Both first and second

compartments are remarkable for the presence of a number of pouches or cells in their walls, with muscular septa, and a sphincter-like arrangement of their orifices, by which they can be shut off from the rest of the cavity, and into which the fluid portion only of the contents of the stomach is allowed to enter.! The placenta is diffuse as in the Swina and Tragulina, not cotyledonary as in the Pecora, Finally, they differ not only from other ungulates, but from all other mammals, in the fact that the red corpuscles of the blood, instead of being circular in outline, are oval as in the inferior vertebrated classes. The following characters apply especially tothe llamas. Dentition of adults:—incisors 4, canines +, premolars 2, molars 3; total 32. In the upper jaw there is a compressed, sharp, pointed laniariform incisor near the hinder edge of the premaxilla, followed in the male at least by a moderate-sized, pointed, curved true canine in the anterior art of the maxilla. The isolated caninc-like premolar which follows in the camels is not present. The teeth of the molar series which are in contact with each other consist of two very small premolars (the first almost rudimentary) and three broad molars, constructed generally like those of Camelus. In the lower jaw, the three incisors are long, spatulate, and procumbent; the outer ones arc the smallest. Next to these is a curved, suberect canine, followed after an interval by an isolated minute and often deciduous simple conical premolar; then a contiguous series of one premolar and three molars, which differ from those of Camelus in having a small accessory column at the anterior outer edge. The skull generally resembles that of Camelus, the relatively larger brain-cavity and orbits and less developed cranial ridges being due to its smaller size, The nasal bones are shorter and broader, and are joined by the premaxille. Vertebree:—cervical 7, dorsal 12, lumbar 7, sacral 4, caudal 15 to 20. Ears rather long and pointed. No dorsal hump. Feet narrow, the toes being more separated than in the camels, each having a distinct plantar pad. Tail short. Hairy covering long and woolly. Size smaller and general form lighter than in the camels. At present and within historic times they are entirely confined to the western side and southermost parts of South America, though fossil remains have been found in the caves of Brazil, in the pampas of the Argentine republic, and, as before mentioned, in Central and North America.

In essential structural characters, as well as in general appearauce and habits, all the animals of this genus very closely resemble each other, so that the question as to whether they should be considered as belonging to one, two, or more species has been one which has led to a large amount of controversy among naturalists. The question has been much complicated by the circumstance of the great majority of individuals which have come under observa- tion being either in a completely or partially domesticated state, and descended from ancestors which from time immemorial have been in like condition, one which always tends to produce a certain amount of variation from the original type. It has, however, lost much of its import-

1 The stomach of the camel inhabiting the Arabian desert is commonly looked upon as a striking example of specialized structure, adapted or modified in direct accordance with a highly specialized mode of life ; it is therefore very remarkable to find an organ exactly similar, except in some unessential details, in the llamas of the Peruvian Andes and the guanacos of the Pampas. No hypothesis except that of a common origin will satisfactorily account for this, and, granting that this view is correct, it becomes extremely interesting to find for how long a time two genera may be isolated and yet retain such close similarities in parts which in other groups appear readily subject to adaptive modifications.

ance since the doctrine of the distinct origin of species has been generally abandoned. The four forms commonly distinguished by the inhabitants of South America are re- cognized by some naturalists as distinct species, and have had specific designations attached to them, though usually with expressions of doubt, and with great difficulties in defining their distinctive characteristics. These are—(1) the lama, Auchenia glama (Linn.), or Lama peruana (Tiede- mann) ; (2) the alpaca, A. pacos (Linn.) ; (3) the guanaco or huanaco, A. huanacus (Molina); and (4) the vicugna,

A. vicugna (Molina), or A. vicunna, (Cuv.). The first and second are only

known in the do- mestic state, and are variable in size and colour, being often white, black, or piebald. The third and 4 fourth are wild, F# and of a nearly uniform _light- brown colour, passing into white below. They cer- tainly differ from = each other, the SRE vicugna being Fro, 2 —Head of Vicugna (from an animal liv- smaller,more slen- ing in the Gardens of the Zoological Society der in its propor- of London).

tions, and having a shorter head than the guanaco. It may, therefore, aceording to the usual view of species, be considered distinct. It lives in herds on the bleak and elevated parts of the mountain range bordering the region of perpetual snow, amidst rocks and precipices, occurring in various suitable localities throughout Peru, in the southern part of Ecuador, and as far south as the middle of Bolivia. Its manners very much resemble those of the chamois of the European Alps; and it is as vigilant, wild, and timid, The wool is extremely delicate and soft, and highly valued for the purposes of weaving, but the quantity which each animal produces is not great.

The guanaco has an extensive geographical range, from the high lands of the Andean region of Ecuador and Peru to the open plains of Pata- gonia, and even the wooded islands of Tierra del Fuego. It constitutes the principal food of the Patagonian Indians, and its skin is invalu- able to them, as furnishing the material out of which their long robes are con- structed. It is about the size of a European red Fic. 3.—Heaa of Guanaco (from an animal living deer, and is an in the Gardens of the Zoological Society of

: London). elegant animal, being possessed of a long, slender, gracefully curved neck and fine legs. Dr Cunningham,? speaking from observa- tion on wild animals, says :—

2 Natural History of the Strait of Magellan, 1871.

‘* It is not casy to describe its general appearance, which combines some of the characters of a camel, a deer, anda goat. The body, deep at

the breast but very small at the loins, is covered with long, soft, very fine hair, whieh on the upper parts is of a kind of fawn- colour, and beneath varics from a very pale yellow to the most beautiful snow-white. The head is provided with large ears, in general carried well back, and is covered with short greyish hair, which is darkest on the forehead. Occasionally the face is nearly black. Asa rule, it lives in flocks of from half a dozen to several hundreds, but solitary individuals are now and then to be met with. They are very difficult to approach sufficiently near to admit of an easy shot, as they are extremely wary, but, on being disturbed, canter off at a pace which soon puts a safe distance between them and the sportsman, even though he should be mounted. Despite their timidity, however, they are possessed of great curiosity, and will sometimes advance within a comparatively short distance of an unknown object, at which they will gaze fixedly till they take alarm, when they effect a speedy retreat. Theircry is very peculiar, being something between the belling of a deer and the neigh of a horse. It would be difficult to overestimate their numbers upon the Patagonian plains; for in whatever direction we walked we always came upon numbers of portions of their skeletons and detached bones.”

Darwin, who has given a most interesting account of the habits of the guanaco in his WVaturalist’s Voyage, says that they readily take to the water, and were seen several times at Port Valdes swimming from island to island.

The llama is only known as a domestic animal, and is chiefly met with in the southern part of Peru. Burmeister, the latest and a very competent writer on the subject,! says that he is perfectly satisfied that it is the descendant of the wild guanaco, an opinion opposed to that of Tschudi. It generally attains a larger size than the guanaco, and is usually white or spotted with brown or black, and some- times altogether black. The earliest and often quoted account of this animal by Augustin de Zarate, treasurer- general of Peru in 1544, will bear repeating as an excellent summary of the general character and uses to which it was put by the Peruvians at the time of the Spanish conquest.

He speaks of the llama as a sheep, observing, however, that it is camel-like in shape, though destitute of a hump :—

‘*TIn places where there is no snow, the natives want water, and to supply this they full the skins of sheep with water and make other living sheep carry them, for, it must be remarked, these sheep of Peru are large enough to serve as beasts of burden. They can carry about one hundred pounds or more, and the Spaniards used to ride them, and they would go four or five leagues a day. When they are weary they lie down upon the ground, and as there

are no means of making them get up, either by beating or assisting them, the load must of necessity be taken off. When there is a

man on one of them, if the beast is tired and urged to go on, he ;

turns his head round, and discharges his saliva, which has an un-pleasant odour, into the rider’s face. These animals arc.of great use and profit to their masters, for their wool is very good and fine, particularly that of the species called pacas, which have very long fleeces ; and the expense of their food is trifling, as a handful of inaize suffices them, and they ean go four or five days without water. Tlieir flesh is as good as that of the fat sheep of Castile. There are now public shambles for the sale of their. flesh in all parts of Peru, which was not the case when the Spaniards came first ; for when one Indian had killed a sheep his neighbours came and took what they wanted, and then another Indian killcd a sheep in his

turn.”

The disagreeable habit here noticed of spitting in the face of persons whose presence is obnoxious is common to all the group, as may be daily witnessed in specimens in confinement in the menageries of Europe. One of the principal labours to which the llamas were subjected at the time of the Spanish conquest was that of bringing down ore from the mines in the mountains. Gregory de Bolivar estimated that in his day as many as three hundred thousand were employed in the transport of the produce of the mines of Potosi alone,

but since the introduction of horses, mules, and donkeys the importance of the llama as a beast of burden has greatly diminished.

l Nescription Physique de la République Argentine, vol. iii. p. 458,

The alpaca is believed by most naturalists to be a variety of the vicugna ; others have, however, identified it with the guanaco, and some consider it as a distinct species. It is usually found in a domesticated or semi-domesticated state, beiug kept in large flocks which graze on the level heights of the Andes of southern Peru and northern Bolivia at an elevation of from 14,000 to 16,000 feet above the sea-level, throughout the year. It is not used as a beast of burden like the llama, but is valued only for its wool, of which the Indian blankets and ponchas are made. Its eolour is usually dark brown or black. The characteristics of its wool, and the history of its introduction into British manufacturing industry, are described in the article ALPACA. (w. H. F)

LLANDAFF, a city of Glamorgan, South Wales. See Carp1FF, within which parliamentary borough it is almost entirely included.

LLANDUDNO, a watering-place in Carnarvonshire, North Wales, situated on the Irish Sea, and at the mouth of the Conway, in a finely sheltered bay, 50 miles west of Chester by rail. It lies between Great Orme’s Head and Little Orme’s Head, two lofty promontories which rise pre- cipitously from the sea to the height of several hundred feet. Round Great Orme’s Head a public drive has been made, from which very picturesque views are obtained. The rock is greatly frequented by many varieties of sea birds, and is also the habitat of many rare plants. The old parish church of St Tudno, situated on a cliff over- looking the sea, has been replaced by a later structure (St George’s), and the Church of Holy Trinity in the First Pointed style was erected in 1865. The chief attrac- tions of the town are its picturesque and sheltered situa- tion, and the fine facilities it affords for sea bathing. In the

neighbouring copper-mines various mineralogical speci- mens of interest have been found. On the summit of the head there are the remains of old circular buildings, some portions of an old fortress, and a rocking stone. The population of the urban sanitary district in 1871 was 2762, and in 1881 it was 4838, but these figures do not repre- sent its summer population, which is nearly twice as great.

LLANELLY, a market-town, parliamentary borough, and seaport town of Carmarthenshire, South Wales, is situated on a creek of Carmarthen Bay, on the river Lougher, and on several railway lines, 11 miles west of Swansea, and 225 west-north-west of London. It is a prosperous manufacturing town. The church of St Elli or Llanelly is in the Early English style, with a square embattled tower. The other principal buildings are the town-hall and the atheneum. The town possesses ex- tensive docks. It imports large quantities of copper ere, and carries on an export trade in its special manufactures. For the last five years the exports have averaged above £150,000 annually, and the imports £50,000. There are copper, silver, lead, and tin works, iron foundries, manu- factures of pottery, chemical works, brick and tile works, flour- mills, and breweries; and in the vicinity there are extensive collieries. Llanelly is included in the Carmarthen district of parliamentary boroughs. ‘The population of the urban sanitary district in 1871 was 14,973, which in 1881 had increased to 19,655.

LLANGOLLEN, a picturesque market-town of Denbigh- shire, North Wales, and a favourite summer resort, is beautifully situated in a fine vale surrounded by lofty mountains, on the right bank of the Dee, and on a branch line of the Great Western Railway, 9 miles south-west of Wrexham, and 22 south-west of Chester. The river is crossed by a peculiarly constructed bridge of five arches built in 1345. The church, dedicated to St Collen, is a plain but ancient structure, partly in the Early English style. Opposite the town, on the summit of a conical hill,

are the remains of a very ancient fortress, the Castell Dinas Bran. The beautiful abbey of Valle Crucis, in a neighbouring dell, is one of the finest ecclesiastical ruins in Wales. Near it there is an ancient British

monument, the “ Pillar of Eliseg.” The principal secular buildings of the town are the town-hall and the court-house. The industries include the manufacture of linen and wool, and in the vicinity there are collieries, lime-works, and iron- works. The population of the urban sanitary district in 1871 was 2798, and in 188] it was 3124.

LLORENTE, Juan Antonio (1756-1823), the historian of the Spanish Inquisition, was born March 30, 1756, at Rincon de Soto, near Calahorra, Aragon, studied at Tarragona and Saragossa, received (by dispensation) priest’s orders in 1779, and became vicar-general to the bishop of Calahorra in 1782. In 1785 he became commissary of the Holy Office at Logrofio, and in 1789 its general secretary at Madrid. In 1805 he obtained a canonry at Toledo, and in 1806-8 his Nottcias Historicas sobre las tres Provincias Vascongadas appeared. In the crisis of 1808 Llorente identified himself with the Bonapartists, and from 1809 onwards he was engaged in superintending the execution of the decree of suppression of the monastic orders, and in examining tlie archives of the Inquisition for his Ltstory, a work which appeared in 1817-18 at Paris, where its author had been residing since the return of Ferdinand VIL to Madrid in 1814, under the title Wistocre critique de ’Inquisition @ Espagne, depuis Pépoque de son établisse- ment par Ferdinand V. jasqu’ au régne de Ferdinand VII, tirée des pieces originales du Conseil de la Supréme et de celles des tribunaux subalternes du Saint Office. ‘Translated within a few years into German, English, Dutch, Italian, and Spanish, it attracted much attention throughout Europe, and involved its author in considerable persecution and hardship, whicb, on the publication of his Portraits politiques des Papes in 1822, culminated in a peremptory order (December 1822) to quit France. His death, caused, or at least hastened, by the fatigues of the hasty journey to Spain, took place at Madrid on February 5, 1823, Both the personal character and the literary trustworthiness of Llorente have been very bitterly assailed; but, although he was very imperfectly equipped as an exact historian, there is no reason to doubt that he made an honest use of documents (now no longer extant) relating to the Iuquisi- tion, to which he had access at Madrid. An English (abridged) translation of the //¢story

appeared in 1826. A full list of the numerous writings of Llorente is given in the Biographte Générale.

LLOYD'S, an association of merchants, shipowners, underwriters, and ship and insurance brokers, having its headquarters in a suite of rooms in the north-east corner of the Royal Exchange, London. Originally a mere gathering of merchants for business or gossip in a coffee- house kept by one Edward Lloyd in Tower Street, London, the earliest notice of which occurs in the London Gazette of 18th February 1688, this institution has gradually become one of the greatest and most perfect organizations in the world in connexion with commerce. 'The establish- ment existed in Tower Street up to 1692, in which year it was removed by the enterprising proprietor to Lombard Street, in the very centre of that portion of the old city of London most frequented by merchauits of the highest class. Shortly after this event Mr Lloyd gave another proof of his enterprise and intelligence by the establishment of a weekly newspaper furnishing commercial and shipping news, in those days an undertaking of no small difficulty. This paper took the name of Lloyd's News, and, though its life was not a prolonged one, it was destined to be the precursor of the now ubiquitous Lloydi's List, the oldest existing paper, the London Gazette excepted, of the present

day. In Lombard Street the business transacted at Lloyd's coffee-house steadily grew in extent and importance, but it does not appear that throughout the greater part of the 18th century the merchants and underwriters frequenting the rooms were bound together by any rules, or acted under any organization. By and by, however, the rapid increase of marine insurance business made a change of system and improved accommodation absolutely necessary, and accordingly, after finding a temporary resting-place in Pope's Head Alley, the underwriters and brokers finally settled down in the Royal Exchange in March 1774. One of the first improvements in the mode of effecting marine insurance springing out of this new state of things was the introduction of a printed form of policy. Hitherto various forms had

been in use; and, to avoid the numerous disputes consequent on a practice so loose and unsatis- factory, the committee of Lloyd's proposed a general form, which was finally adopted by the members on the 12th of January 1779, and which remains in use, with only a few slight alterations, to this day. 'The two most important events in the history of Lloyd's during the present century are the reorganization of the association in 1811, and the passage of an Act in 1871 granting to Lloyd's all the rights and privileges of a corporation sanctioned by parliament. According to this Act of Incorporation, the three main objects for which the society exists are—first, the carrying out of the business of marine insurance ; secondly, the pro- tection of the interests of the members of the association; and thirdly, the collection, publication, and diffusion of intelligence and information with respect to shipping. In the promotion of the last-named object, obviously thie foundation upon which the entire superstructure rests, an intelligence department has been gradually developed which for wideness of range and efficient working has no parallel among private enterprises in any country.

The rooms at Lloyd's are available only to subscribers and members. The former pay an annual subscription of five guineas without entrance fce, but have no voice in the management of the institution. 'The latter consist of non- underwriting members, who pay an entrance fee of twelve guineas, and of underwriting members, who pay a fec of one hundred pounds. Underwriting members are also required to deposit securities to the value of £5000 to £10,000, according to circunistances, as a guarantee for their engagements. The management of the establishment is delegated by the members to certain of their number selected as a"'committee for managing theaffairs of Lloyd's." With this body lies the appointment of all the officials and agents of the institution, the daily routine of duty being entrusted to a secretary and a large staff of clerks and other assistants. The mode employed in effecting an insurance at Lloyd's is very simple. The business is done entirely by brokers, who write upon a slip of papcr the name of the ship and shipmaster, the nature of the voyage, the subject to be insured, and the amount at which it is valued. If the risk is accepted, each underwriter subscribes lis name and the amount he agrees to take or

underwrite, the insurance being effected as soon as the total value is made up. The sum paid by the insured to the under- writers is denominated the premium, a tax upon the profits of the merchant which the progress of science, of the art of shipbuilding, and of navigation has in these days reduced to a very moderate figure. Gy. P.)

LOACH. The loaches (Cobitidina) are small fishes of the Carp family (Cyprinidx), with a generally cylindrical body, with very small or without any scales, with six or more barbels round the mouth, with a short dorsal and anal fin, and with the pharyngeal teeth in a single series. The air-bladder is double, as in other carps, the two divisions lying side by side, or one behind the other ; but

it is always entirely or partially enclosed in a bony capsule formed by the anterior vertebre. The largest of the ninety species known grow to a length of 10 or 12 inches, but the majority are of much smaller dimensions. They are found in Europe and Asia only. The typical species are partial to fast-running streams with stony bottoms ; they abound in the waters draining the central Alps of Asia, and extend far towards the north of the Europo- Asiatic region. The tropical forms from south of the Himalayas are not less common, and some of them have assumed a more compressed form of the body with a bright coloration. In Great Britain two species occur, viz., the common loach (Wemachilus barbatulus), and the more local Cobitis tenia, which is distinguished by a small spine below the eye. The former is esteemed as food in parts of the Continent where it occurs in sufiicient abund- ance. See IcHTHYOLOGY.

LOANDA, or in full Sao Paulo de Leanda, the capital of the Portuguese settlements in western Africa, and the principal municipality of the Loanda district, one of the three into which Angola is divided, is situated on the mainland in 8° 48’ §. lat. and 13° 7’ E. long. The beautiful bay, protected from the surf by the long narrow island of pure sand from which the town takes its name, is backed by a line of low sandy cliff which at its southern end sweeps out with a sharp curve and terminates in the bold point crowned by Fort San

Miguel. A good part of the town lies on the shore, but the more important build- ings—the Government offices, the governor's residence, the palace of the bishop of Angola, and the admirable hospital —are situated on the higher grounds. Most of the European houses are large stone buildings of one story with red tile roofs. The streets, formerly full of loose fine sand, have in many cases been paved, The great defect of the situation is the want of water, which had to be brought for the most part in little boats from the Bengo and the Dande ; but the Portuguese Government signed a contract in November 1877, by which a canal 43 miles long was to be constructed, at a cost of 6,000,000 francs, from Tanda- bondo (a point 37 miles from the mouth of the Bengo) to the city. Loanda is a busy place; the shops are well supplied with European goods, and large native markets are held in various parts of the town. While the slave trade to Brazil was still in full prosperity, the traffic of the port was of no small account; and after a period of great depression it is now developing in more legitimate direc- tions. There is a regular service of steamers from Lisbon and Liverpool, and in 1877 746 vessels entered and 693 cleared. The population is from 10,000 to 12,000 (Lux gives 18,000 to 20,000), about a third being whites. From 1641 to 1648 Loanda was occupied by the Dutch.

See J. J. Monteiro, Angola and the River Congo, London, 1875 ; and Lux, Von Loanda nach Kimbundu, Vienna, 1880.

LOANGO, in the wider signification of the name, is a region on the west coast of southern Africa, which extends from the mouth of the Congo (Zaire) river in 6° 8. lat. northwards through about two degrees, with no very definite limit in this direction, unless we adopt the Numbi river which falls into Chilunga Bay in 4° 9'. lat., and was formerly considered the northern boundary of the Loango kingdom. In a narrower sense it is the country bounded on the 8. by the Luemma, and on the N. by the Kuilu,—the district between the Luemma and the Chiloango being known as Chiloango or Little Loango, that between the Chiloango and the Congo as Kakongo and Angoy, and that to the north of the Kuilu as Chilunga. The whole country between 6° and 4° may be described as the lowland portion of the seaward versant of the

Serra do Crystal or Serra Complida, a range running almost parallel with the coast, from which its spurs and underfalls are distant only

30 or 40 miles. It has an irregularly undulating or hilly surface, slowly rising in somewhat indefinite terraces, and is traversed from north-east to south-west by a number of considerable streams flowing in well-marked valleys. The coast-line in some stretches is low and swampy, while in others, as along Loango and Kabinda Bays, it presents a series of cliffs 40 to 50 feet high. Behind the region of alluvial deposits which prevails for some distance inland there is a broken belt of Tertiary rocks; but these soon give place to laterite, and beyond the laterite lie the mica- schists, tales, and gneiss of which the mountains are com- posed. Of the Loango rivers the best explored is the Kuilu or Quillu. At its mouth, in 4° 29’ §S. lat., it is a noble stream 1100 feet wide, but the bar has hitherto proved an insuperable obstacle to the entrance of sea-going ships ; near the Mayombe factory, which may be reached in fifteen hours from the coast, it begins to take the char- acter of a mountain stream. Its principal affluent is the Nanga. Farther south are the Songolo and the Luemma. Of greater importance as a navigable route towards the interior is the Chiloango or Loango Luse (sometimes errone- ously called the Kakongo), which disembogues in 5° 12’ 8. lat. and 12° 5’ E. long., and is formed about 15 miles inland by the junction of the Loango and the Lukula, of which the one separates Loango proper from the Osobo country and the other the Osobo country from Kakongo,

Though a large proportion of the Loango coast region is occupied by primeval forest, with trees rising to a height of 150 and 200 feet, there is considerable variety of scenery—open lagoons, mangrove swamps, scattered clusters of trees, park-like reaches, dense walls of tangled underwood along the rivers, prairies of tall grass through which no pathway can be driven, and patches of cultivation. Among the more characteristic forms of vegetation are baobabs, silk- cotton trees, screw-pincs, and palms—especially Hyphene guineen- sis (a fan-palm), Raphia (the winc-palm), and lewis gwineensis (the oil-palm).

Anonaceous plants (notably Anona senegalensis) and the pallabanda, an olive-myrtle-like tree, are common in the prairies; the papyrus shoots up to a height of 20 feet along the rivers (par- ticularly the Luemma); the banks are fringed by the cottony Hibis- cus tiliaceus, ipomeas, and fragrant jasmines ; and the thickets are bound together in onc inextricable mass by lianas of many kinds, Among the fruit trees arc the mango and the papaw; the orange has been successfully introduced at Vista and Kabinda; and the lemon continues to flourish well up the country. Negro-pcpper (a variety of capsicum) and ginger grow wild ; the natives, in addition to manioc (their staple sustenance) and bananas, cultivate ground- nuts and tobacco; and the plantcrs have European vegetables in their gardens.

The crocodile, the hippopotamus, and several kinds of apes—includ- ing the chimpanzee and the rare gorilla—are the most noteworthy larger animals ; the birds are various and beautiful—grey parrots, shrikes, fly-catchers, rhinoceros birds, weaver birds (often in large colonies on the palm-trees), ice-birds, from the Cecyle Sharpit to the dwarfish Alcedo cristata, butterfly-finches, and helmet-birds (Turacus giganteus), not to mention doves, snipes, and other more familiar types. Snakes are extremely common—Caucus rhombeatus, Atraetaspis irregularis, Dendraspis Jamesonii, Dasypeltis palma- rum, &c.; but they give comparatively little trouble. The curious climbing-fish, which frequents the mangroves, the Pteropterus or lung-fish, which lies in the mud in a state of lethargy during the dry season, the strange and poisonous Tetrodon guttifer, and the herring-like Pellona africana, often caught in great shoals—are the more remarkable of the fishes. Oysters are got in abundance from the lagoons, and the Portuguese fatten the huge Cardisoma arma- twm or heart-crab for table. Fireflies and unfortunately also mos- quitoes and sandflics are among the most familiar forms of insect life; the bird spider among the rarer, A kind of ant builds very striking pent-house or umbrella-shaped nests rising on the tree trunks onc above the other like the roofs of a Chinese pagoda.

Well-built and tall (average height of the men 5°5 feet, of thic women 5:2), strongly dolichocephalous and very thick of skull, never black

but of various shades of warm brown with the faintest sug- gestion of purple, the Bafiote (as the natives of the Loango coast call themselves) are on the whole very favourable specimens of the Negro stock to which they belong. Their black curly hair never becomes white with age, and grey only in the case of very old people. Baldness is quite unknown, and many of the men wear beards. Physieal deformity is extremely rare. Like the west-coast negroes in general the Bafiotc have a ghastly and grotesque belief in fetiches and witcheraft; and their gangas or priests employ the cassa (ukassa)

ordeal with such recklessness that for every grown-up person who dies a natural death three or four, it is estimated, perish by this judgment of the invisible powers. A custom which readily catches the eye of the foreigner is that of setting their marriageable maidens forth to view in a little bower specially erected in front of the

arents' dwelling—their skins stained red with a peculiar powder. Near Chinchoxo there is a curious tribe, the Mavumbu or Umwambu, known to Europeans as Black Jews on account of their strikingly Semitic features. The coast people proper or Bavilli look down on their more inland neighbours as less civilized; and these in their turn pay the same compliment to those beyond,—the Bayombe and Bayaka, who occupy the mountainous woodland on the borders of Loango, being reckoned as genuine savages.

The people are scattered throughout the country in small villages; Nkondo, probably the largest, contains only 350 to 400 huts, though it is the seat of one of the most influential ‘‘ princes.” There is no town or village of Loango,—the place of that name on Loango Bay being a mere group of factories. Buri, Boari, or Boali, was the name of the former capital ; Loangiri or Loangele (visited in 1873 by Bastian) was the burial-place of the aucicnt kings; and Lubu, which is still neutral in war, is that of the ‘‘ princes.” At one time included in the great Congo kingdom, Loango became independent about the close of the 16th century, and was still of considerable importance in the days of Abbé Proyart (1750), though Kakongo and other districts were practically

independent. At present there is no central authority in the country; the petty local chiefs are local chiefs and nothing more; but the members of the blood royal are still honoured with special privileges, a large number of nominal titles remain in use, and a common tradition of greatness gives a sort of cohesion to the political conglomerate.

The slave trade was longer maintained in Loango than anywhere else on the West African seaboard ; and since its extirpation palm oil and india-rubber have been the main objects of commerce. Per- fect freedom of trade prevails; and there are Dutch, Portuguese, German, French, and English factories on the coast and up the rivers. The Portuguese have made considerable efforts to secure territorial supremacy ; but they have hitherto failed, partly owing to direct French opposition, partly to the state of the country.

The following are the principal stations of Europcan trade :— Banana at the mouth of the Congo, the central post of the Rotter- dam African Trading Company, whose comptoirs are scattered along a vast extent of the west coast; Muanda, with one of the best of the native villages ; Vista; Kabinda, the natives of which are known as far south as Mossamedes for their enterprise and skill as car- penters, tailors, &c.; Landana, the seat of Dutch, French, and Portuguese factories, and of a French mission from the Gaboon; and Chincho or Tchinchotcho (5° 9’ 14” S. lat., 12°3’ 45” E. long.) the post occupied by the German Exploring Expedition in 1873-76.

See, besides Merolla and Battel (Pinkerton, vol. ii.), Proyart, Histotre de Loango, Paris, 1766 (also in Pinkerton); Degrandpré, Reise nach der westlichen Kiiste von Afrika, Weimar, 1801; Bastian, Die deutsche Expedition an der Loango-Kiiste,

Jena, 1874-75 ; and Die Loango-Expedition, by Dr Paul Giissfeldt (1879), Julius Falkenstein (1879), and Pechuel-Loesche (1882).

LOBELIA, L., the typical genus of the tribe Lobeliex, of the order Campanulacex, named after Matthias de Lobel, a native of Lille, botanist and physician to James I. It numbers about two hundred species, natives of nearly all the temperate and warmer regions of the

world, excepting central and eastern Europe as well as western Asia. For the sections into which the genus is divided, see Genera Plantarum, by Bentham and Hooker, vol. it p. 551; and for species, De C., Prod., vii. p. 357. Two species are British, Z. Dortmanna, L., named after Dortmann, a Dutch druggist, which occurs in gravelly mountain lakes ; and ZL. urens, L., which is only found on heaths, &c., near Axminster (see Baxter's Brit. Gen., No. 79). The genus is distinguished from Campanula by the irregular corolla and completely united anthers, and by the excessive acridity of the milky juice. The species earliest described and figured appears to be Z. cardinalis, L., under the name Trachelium americanum sive cardinalis planta, " the rich crimson cardinal's flower"; Parkinson (Paradisus, 1629, p. 356) says, "it groweth neere the riuer of Canada, where the French plantation in America is seated'; De Candolle records it from New England to Carolina (Prod., vii. 382). This species, as well as several others, are in cultivation as ornamental garden plants, eg., the dwarf blue #. Hrinus, L., from the Cape, which, with its varieties, forms a familiar bedding plant. Z. splendens, Willd., and LZ. fulgens, Willd., growing from 2 to 4 feet high, from Mexico, have scarlet flowers ; while Z. amena, Mich., from North America, as

well as ZL. syphilitica, L., and its hybrids, from Virginia, have blue flowers. The last-named was introduced in 1665, according to Paxton (Bot. Dict., p. 340), but is not mentioned by Parkinson. Certain species of lobelia are used medicinally, the chief being Z. inflata, L., a native of north-eastern America, called "Indian tobacco," as its effects are very similar to those of tobacco; for its localities, &c., see Pickering, Chron. Hist. of Pl., p. 1015. It is expec- torant and diaphoretic in small doses, but in full medicinal doses is nauseating and emetic. It is used for spasmodic asthma, and as an adjunct to diuretics, See Bentley and Trimen's fed. Pl., No. 162; Pharmacographia, p. 357 ; and FPereira's Mat. Med., vol. ii. pt. ii p. 8. For active principles, see Pharm. Journ., vol. x. pp. 270, 456. Another medicinal species is LZ. syphilitica, L., the blue cardinal, of which the root is used by the North American Indians for the purpose implied in the specific name. The value,

however, is said to have no foundation in fact (Pearson, Obs. on var. Art. of Mat. Med., p. 70), but see Amer. Dispens., p. 494. A third species is LZ. decurrens, Cav., from near Arequipa in Peru, where the Iudians use it as an emetic (Pharm. Journ. [1], vol. xiii. p. 14).

LOBO, Izronimo (1593-1678), a Jesuit missionary, was born in Lisbon in 1593, and entered the Order of Jesus at the age of sixteen. In 1621 he was ordered to repair as a missionary to India, and in 1622 he arrived at Goa. With the intention of proceeding to Abyssinia as a mission- ary, he left India in 1624, but after disembarking on the coast of Mombas, and attempting to reach his destination by land, through the Galla country, was forced to return. Repeating the attempt in the ensuing year, in concert with Mendez, the newly-appointed patriarch of Ethiopia, and eight missionaries, Lobo landed on the coast of the Red Sea, and settled down in Abyssinia as superintendent of the missions in the state of Tigre, travelling about a good deal over the country, and thus obtaining much valuable information on its geography and people. He remained at his post for some years, until death deprived the Catholics of their protector, the emperor Segued. Forced by persecution to leave the kingdom, in 1634 Jobo fell, along with his companions, into the hands of the Turks at Massowah, and was sent by them to India to procure a ransom for his imprisoned fellow-missionaries. This object he gained, and at the same time he endeavoured, though without avail, to persuade the Portuguese viceroy to send an armament against Abyssinia. Intent upon accomplish- ing this cherished project, he embarked for Portugal, and after he had been shipwrecked on the coast of Natal, and captured by pirates, arrived at Lisbon. Neither at this city, however, nor at Madrid and Rome, was any counten- ance given to Lobo’s plan for Christianizing Abyssinia by the aid of arms. He accordingly returned to India in 1640, and was elected rector, and afterwards provincial, of the Jesuits at Goa. After some years he returned to his native city, and died there January 29, 1678.

Lobo wrote an account of his travels in Portuguese, which appears never to have been printed, but is deposited in the monastery of St Roque, Lisbon. Balthezar Telles made large use of the information

therein in his Historia Geral da Etiopia Alta (Coimbra, 1660), which is often erroneously attributed to Lobo (sec Machado's Bibliotheca Lusitana}. Lobo's own narrative was translated from a MS. copy into French, under the title of Voyage Historique de Abissinie, by the Abbé Legrand, Paris, 1728. In 1669 a translation by Sir Peter Wyche of several passages from a MS. aceount of Lobo's travels was published by the Royal Society, and this was translatcd into Thenevot's Relation des Voyages in 1673. An English abridg- ment of Legrand's edition by Dr Johnson was published in 1735, and reprinted in 1789. In a Mémoire justicatif en rehabilitation des Pierre Pacz ct Jerome Lobo, Dr C. T. Beke maintains the

accuracy of Lobo's statements as to the source of the Abai branch of the Nile against Bruce.

LOBSTER. See Crustacea, and FIsHERIks, vol. ix. p. 265.

LOCK—not being a canal lock—means the fastening of a door, or box, or drawer, which requires a key, or else some secret contrivance or nlanipulation, to open it. It is generally fixed to the door, but it may also be loose, and then it is called a padlock, which is internally like other locks, but externally has a half link or dow turning on a hinge at one end, while the other, after being put through a chain or staple on the door, enters the lock and is fastened by the bolt therein, The bolt may be moved by the key, or may close by a spring, but require a key to open it, as in the case of handcuffs, which are a pair of padlocks of this kind united by a short chain. A common door lock also comprises a spring latch which opeus by a handle, and sometimes a small bolt held by friction either shut or open, which is moved by a smaller handle inside the room only ; but neither of these is the lock proper, any more than a hook or a button, or a common lifting latch. Therefore, omitting them, a lock is as defined above.

The earliest lock of which the construction is known is the Egyptian, which was used four thousand years ago. In fig. 1, aa is the body of the lock, 66 the bolt, and cc the key. The three pins p, p, p drop into three

holes in the bolt when it is 3) pp pushed in, and so hold it fast ; and they are raised again by putting in the key through the large hole in the bolt and raising it a_ little, so that the pins in

Fig. 1. the key push the locking pins up out of the way of the

bolt. The security of this is very small, as it is easy enough to find the places of the pins by pushing in a bit of wood covered with clay or tallow, on which the holes will mark themselves ; and the depth can easily be got by trial. Mr. Chubb, the well-known lock-maker, used to show a wooden Chinese lock very superior to the Egyptian, and, in fact, founded on exactly the same principle as the Bramah lock, which long enjoyed the reputation of being the most secure lock ever invented; for it has sliders or tumblers of different lengths, and cannot be opened unless they are all raised to the pro- per heights, and no higher. Until about a century ago no lock so good as this was known in England. The locks then in use (fig. 2) were nothing better than a mere bolt, held in its place, either shut or open, by a spring b, which Fig. 2. pressed it down, and so held it at either one end or the other of the convex notch aa; and the only impediment to opening it was the wards which the key had to pass before it could turn in the keyhole. But it was always

Fig. 3. Fig. 4.

possible to find the shape of the wards by merely putting in a blank key covered with wax, and pressing it against them ; and when this had been done, it was by no means necessary to cut out the key into the complicated form of

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the wards (such as fig. 3), because no part of that key does any work except the edge 6c farthest from the pipe a; and so a key of the form fig. 4 will do just as well; and a small collection of skeleton keys, as they are called, of a few different patterns, were all the stock in trade that a lock-picker required.

The common single-tumbler lock (fig. 5) was rather better than this, as it requires two operations instead of one to open it. The tumbler a¢ turns on a pivot at ¢, and has a square pin at a, which drops into a notch in the bolt 6b, when it is either quite open or quite shut, and the tumbler must be lifted by the key be- fore the bolt can be moved again. But this also is very easy, unless the lock is so made that the tumbler will go into another notch in the bolt if it is lifted too high, as in the lock we shall now describe, which was the foundation of all the modern improvements in lock-making.

Barron's Lock.—This was the first lock with several Fig. 6. tumblers. It was patented in 1778. Fig. 6 is a front view, and fig. 7 a horizontal section. First consider it with reference to one tumbler at gw only. Unlessthe |} square pin a is lifted by the key to the proper height, and no May # higher, the bolt cannot move, and that alone adds very considerably to the difficulty of picking, except by a method not discovered for many years after. But Barron added another tumbler, and unless both were raised at once to the proper height, and no higher, the lock could not be opened. The

Fig. 8.

face, or working edge, of the key of a many-tumblered lock assumes this to the different heights to which the tumblers have to be raised, and one of them acting on the bolt, and they may have a much wider range of difference The key here drawn is also one with the wards of such ag ton except itself can pass them. The form, however, can way by a wax im- pression ; and as it weakens the key expensive to cut, it is not often used. Bramah's Lock.—

form (fig. 8), the steps corresponding tban in this figure.

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foil i shape that no skele- 4 be got in the usual very much, and is The next lock of

Fig. 9. any importance was the celebrated one patented ten years

after Barron’s, by Joseph Bramah (see Braman). In figs. 9 and 10 aaaa is the outer barrel of the lock, which is screwed to, or cast with, the plate; ccce is a cylinder, or inner barrel, turning within the other. It is shown sepa-

rately at fig. 11; and fig. 12 is a cross section of it, the black ring being the keyhole, and the light spot in the

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middle the drill-pin, which goes into the key. The short pin 6 in figs. 9, 10, 11 is set in the end of the cylinder,

Fig. 12.

near its edge; and, when the cylinder turns round, that pin shoots or draws the bolt, by acting in a slit of the form shown in fig. 13. The security of the lock depends

upon a number of sliders, s, s, of 7, –

which the shape is shown in fig. 14, and the cross section | 777 in fig. 12, They are made of plates of steel doubled, and sprung open a little, so as to make them move with a little friction in the slits of the cylinder or revolving barrel in which they lie, and are pressed up against the cap of the lock by a spiral spring. They are shown so pressed up in fig. 9, and pressed down by the key in fig. 10, There is a deep groove cut round the barrel, and in each of the sliders there is a deep notch which can be pushed down to that place in the barrel by a key slit to the proper depth; and it is evident that when all the sliders are pushed down to that position the barrel will present the appearance of having no sliders on it. A steel plate (fig. 15), made in two pieces in order to get it on, embraces the barrel at the place where the groove is, having notches in it corresponding to the sliders, and is fixed to the body of the lock by two screws marked d, d in figs, 9, 10, and 15. When the sliders are pushed up by the spring they fill the notches in the plate,

and prevent the barrel from turning; but when they are pushed down by the key the notches in the sliders all lie in the plane of the plate, and so the barrel can turn with the key, and the pin 6 in the end of it drives the bolt as before described. The key has a bit, &, sticking out from the pipe, the use of which is to fix the depth to which it is to be pushed in, and then, as the bit slips under the cap of the lock, it keeps the key at the same depth while it is being turned.

This was the construction of the lock for a good many years, and Bramah pronounced it in that state “not to be within the range of art to produce a key, or other instrument, by which a lock on this principle can be opened.” It was found, however, long before the defeat

of the improved challenge Bramah lock by Mr Hobbs in 1851, that the inventor had made the common mistake of pronouncing that to be impossible which he only did not see how to do himself. As it has been generally supposed that what is called the tentative method of lock-picking was unknown in England before it came over from America in the year of the Exhibition of 1851, we must remind our readers that it was described in the 7th edition of this work fifty years ago, though the lock-picking fraternity were not of sufficiently literary habits to make themselves acquainted with it. Mr Hobbs, it is true, carried the process further than had been supposed possible before ; but all the Barron and Chubb and other many-tumblered locks, which were supposed impregnable, might long ago have been opened by anybody who had paid attention to the method by which the Bramah locks were known to have been picked some seventy years ago, before the introduction of the false notches designed in 1817 by Mr Russell, then one of Mr Bramah’s workmen. If you apply back- ward pressure to the bolt of a tumbler lock when locked, or twisting pressure to the barrel of a Bramah lock, first pressing down the spiral spring, there will be a greater pressure felt against some of the tumblers or sliders than against others, in consequence of inevitable inequalities of workmanship ; and if you keep the pressure up, and gently move any of the tumblers or sliders on which the pressure is felt, you will at last get it to some point where it feels loose. That may or may not be the exact place to which the key ought to lift it; but as soon as you feel it

loose leave it alone, it will not fall again, as the friction is sufficient to prevent it; and, if necessary, you may fix it there by a proper instrument, or measnre the depth and keep the measure till you begin again. Then try another tumbler which feels tight, and raise it till it also feels loose. And if you go on in that way, always leaving the loose tumblers alone, and raising the one which feels tight, they will at last all be got into the position of complete freedom, 2.e., to tlie place where the stump of the bolt can passthem. The operation is just the same in principle in the Bramah lock and in tumbler locks ; only, as all the sliders are acted on by one spring in the Bramah as now made, you need only just push down that spring, and hold it there, and then the sliders may be moved freely either way by means of a hook or a small pair of self-acting forceps to pull them up if they accidentally get pushed too far. At first each slider had a separate spring.

But if the sliders have some false notches in them not so deep as the true ones (see fig. 14), and the corners of

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Fig. 14.

the notches in the plate dd are cut out a little (as in fig. 15), then you might by trial get all the sliders into such a position that the barrel could turn a very little, but no more ; and when it is turned that little, you cannot push the sliders in any further, and so (as was long supposed) the tentative process is defeated; and undoubtedly it is made much more troublesome, but it only requires more time and patience. You can still feel that the pressure is greater against some one or more

of the tumblers or sliders than against others, and, wherever that is the case, XIV. — 94

you know that it must be at a false notch, and not the true one, for a true one gives no pressure at all. Proceeding in this way, Mr Hobbs opened the challenge lock with eighteen sliders, or guards, which had hung in Messrs Bramah's window for many years, in nineteen hours, and would have done it sooner, but that one of his instruments broke in the lock. He afterwards repeated the operation three times within the hour, in the presence of the arbitrators ; and a more recent one with eight sliders he opened in four minutes, by means of an instrument which is equivalent to a Bramah key with adjustable slits, which are set tothe sliders as the operation of feeling them and getting their depths goes on. It is, moreover, to be re- membered that thieves do not always confine themselves to the conditions of a challenge, in whieh force and injury to the lock are of course prohibited ; and, if a lock can be easily opened by tearing out its entrails, it is of very little use to say that it would have defied all the arts of polite lock-picking. In this respect the Bramah lock is singularly deficient ; for if the exposed cap or nozzle of the keyhole is cut off, as it easily may be, or if the hole is widened out by a centre-bit, the sliders can all be pulled out, and there is an end of the lock.

Inside and Outside Locks.—Locks for drawers, closets, iron chests, and the like are only required to lock on oue side, and their keys are therefore generally made with a pipe, which slips on to a pin in the lock called the drill-pin, and turns on it. Doors which have to be locked sometimes on one side and sometimes on the other cannot have their keys made in this way ; the key is solid, and its plug or stem, being thicker than the flat part or web, acts as an axis fitting into the upper part of the keyhole, though that hole does not completely enclose it. All keysfor these inside and outside locks must be symmetrical, or alike on each side of a line through their middle, in order to fit the lock either way, which limits the variety of the tumblers in the case of

many-tumblered locks. A Bramah lock, to open on both sides, must be made double, with one set of

sliders to push in from one side of the door, and the other |

set from the other side; and, consequently, they are very seldom used for this purpose. It may be convenient to observe that when we use the term Bramah lock we mean a lock of that construction ; for, the patent having long ago expired, such locks may be made by anybody, only Bramah's name must not be used. Messrs Mordan's locks are the same as Bramah's, except that they make the number of sliders odd, while Messrs Bramah make it even.

Letter Locks.—At one time it used to be supposed that locks which could only be opened by setting a number of rings or disks to a particular combination of letters could not possibly be opened by anybody who was not in possession of the secret; and hence they were also called puzzle-locks. At first they were made with a fixed combination, which could not be changed. Afterwards the rings were made double, the inner one having the notch in it which the bolt had to pass, and the outer one capable of being fitted on to the inner in any position, by unscrewing some part of the lock, so that you might set them to any combination desired. This was the first instance of a changeable lock, of which we shall have more to say further on. But it was afterwards found that these puzzle-locks have just the same vulnerable point as all our locks had until lately, viz., that the pressure of the bolt can be felt on some of the rings more than on the others; and Mr Hobbs says emphatically, in the Rudimentary Treatise on Locks, ‘‘ wherever that is the case, that lock cau be picked.” Apart from this defect, these locks have very much gone out of use on account of their being troublesome to handle, and perhaps also from the risk of forgetting the combination to which the lock was set last, if it has been left for some

time; and therefore we do not think it necessary to go farther into the details of their construction.

Chubb’s Locks.—Of the multitude of locks which have been made on the many-tumbler principle invented by Barron, none enjoyed so much celebrity before Hobbs’s as Chubb’s. This was partly due to superior workman- ship and use of more tumblers than usual, and perhaps still more to the inventor having had the good fortune to hit upon the name “detector” for a certain part of the machinery, which, besides adding to the security against auy mode of picking then known, also captivated the public with the idea of discovering if anybody had been tampering with the lock, though the operator might depart in ignorance that he had left any trace of his attempt behind him. It is remarkable that the detector was not even then a new invention ; for a lock exactly the same iu principle, but slightly different in arrangement, had been previously made by a Mr Ruxton, and is described in Price’s treatise on Locks and Keys, &c., 1856. In the same way false notches were used in Strutt’s tumbler lock above thirty years before they were reinvented, by Chubb and others, with the idea of defeating the tentative method of picking by them. In all lever or tumbler locks there is a square pin B, called the stump, rivetted to the bolt, which has to clear the passage in the tumblers called the gating. The original form of Chubb’s detector is shown in fig. 16 by

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Fig. 16.

the lever DT, which turns on a pin in the middle, and is acted upon atits end T by a spring 8, which will evidently allow some play to the lever on either side of the corner X, but the moment it is pushed past that point the spring will carry it further in the same direction, like what is

called in clock-work a jumper. In its proper position that end always remains above the turning-point; but, if any one of the tumblers is raised too high, the other end D of the detector, which reaches over all the tumblers, is lifted so far that the end T is sent down below the corner, and the tooth T then falls into a notch in the bolt, and so prevents it from being drawn back, even though all the tumblers are raised properly by the right key, which at once reveals that somebody

has been trying to pick the lock. The way to open it then is to turn the key the other way, as if to overlock the bolt ; you observe a short piece of gating near the end of the tumblers, to allow the bolt to advance just far enough to push the tooth of the detector up again by means of its inclination there, and then the lock can be opened as usual. In some more recent locks the tumbler is made in another form. The back tumbler, or the one which has to be raised highest, has a pin d reaching over all the others, and if any of them are overlifted that back tumbler is also, and then a square corner & in it gets past the end of the detector spring fs, and is held up. It is set right by overlocking the bolt as before, the bolt itself raising the end % of the spring, and

letting the tumbler fall. This form of detector is, however, inferior to the other, as it informs the picker what he has done, by the back tumbler itself being held up, which he can feel directly.

But since Mr Hobbs’s mode of picking locks became known all these detectors have become useless. Some persons have even gone so far as to say that the detector may be made a guide to picking. Whether this be so or not, the detector does not act unless some of the tumblers are raised too high, which they never are by a skilful operator on this plan, nor does it act (even if thrown by accident) against picking backwards, or feeling the way to shoot the bolt a little further, as if to free the detector; and in this way the measure of the key can be taken without any hindrance from the detector. Before 1851 tumbler locks were seldom made with false notches, except Strutt’s, in which the tumblers were in the form of quadrants, with a very large angular motion, and a number of short or false notches and one deep one. But after that year Chubb and other makers of tumbler locks adopted false notches, together with revolving curtains, which cover the straight part of the keyhole as soon as the key is turned, and barrels going down from the back of the curtain to prevent a false key or pick from turning without turning the curtain ; other obstacles were added, of which the object is in all cases to prevent the maintaining of pressure of the stump upon the tumblers at the same time that the tumblers themselves are moved,

or, as Mr Hobbs called it, tickled, by some other instrument. These provisions undoubtedly make the locks more difficult to pick, but it is by no means safe to assume that a lock will never be

picked, merely because it would take a first-rate hand a

long time to do it or gradually make his key.

Hobbs's Lock.—The invention which most directly meets the defect of all previous locks is Mr Hobbs's " movable stump," which is not rivetted into the bolt as usual, but is set on the end bof a bent lever abc (fig. 17) which lies in a hollow of the bolt A behind it, turning on a pivot in the bolt itself, and kept steady by a small friction-spring ¢. The stump comes through a hole in the bolt large enough to let it have a little play ; and the long end a of the lever stands just above the edge of a square pin d, which is fixed in the back plate of the lock. When the lock is locked, if you push the bolt back, you produce no sensible pressure on the tumblers, but only just enough to turn this protector lever, as Mr Hobbs calls it, on its pivot c, and so bring down its end a in front of the square pin, and then the bolt can no more be pushed back than when held by Chubb's detector. The protector is set free again by merely pushing the bolt forward with the key, without reference to the tumblers. It was found, however, that in this state the protector could be prevented from acting by a method used by the inventor himself for another purpose, viz, pushing a piece of watch-spring through the keyhole, and up behind the bolt, so as to reach the protector at a, and keep it up while you push the bolt back, or, again, by pushing up the watch-spring be- tween any two of the tumblers, and holding the end 6 of the protector with it, so as to press the stump against the tumblers. Both these devices, however, are prevented now by letting ina feather FF in a groove between the bolt and the back of the lock, which no watch-spring can pass, and also bringing a piece of the feather forward through the front gating of the tumblers just under the stump. In this form the lock is safe against any mode of picking at present known, unless the keyhole happens to be large enough to admit the inspecting method, which is this. A person in-

tending to pick the lock goes beforehand and smokes the bellies, or lower edges of the tumblers, through the keyhole. When the key comes, it wipes off the black on each tumbler, according to the length of the bit which raises it; and then, when the picker returns, he throws a strong light into the keyhole, and, by means of a narrow reflector put into it, reads off, as it were, the length of bit required to raise each tumbler to the proper height. This operation may sound impossible ; but it is an established method of lock-picking in America. It requires a largish keyhole however, and it may be prevented by any kind of revolving cylinder which will conceal the view of the tumblers while the keyhole is open. The inspecting method might also be frustrated by making the acting part of the bellies of all the tumblers no Jonger than would be reached by the shortest bit in the key. In that case, the long bits would not begin to act at their points, but on their sides, and would leave no measure of their length upon the tumblers.

A multitude of other many-tumbler locks acted on by springs, and with various kinds of detectors and revolving curtains, all more or less upon the same principles, may be seen described in Price's book above-mentioned, but we are not aware that any of them have ever come into general use, or are superior to Chubb's or equal to Hobbs's protector locks. There is another group of locks which involve fanciful and thick ugly keys, and for that or other reasons have not got much beyond patents and exhibitions. " Revolving curtains" have been proved to be less serious impediments to picking than they would seem, inasmuch as they must leave room for an instrument no thicker than the key itself to turn. The only kind of curtain that is not open to this objection must be one that absolutely prevents any touching of the bolt while any instrument at all is within the lock, and projects at all outside. Mr Hobbs accomplished that by the odd-looking contrivance of a key consisting only of its web, or flat or acting part, which is pushed into the lock, and then carried round by a fixed handle in another place, which closes the keyhole until it has come round again and delivered the key-web ready to be taken out by a proper hook. But this was tvo troublesome for common use. The same object is effected in another way by Sir E. Beckett's lock, which we shall presently describe.

Tucker’s Locks—There have been several locks on the disk principle invented in succession by Mr Tucker of Fleet Street, London, the first two of which had revolving disks ; and in the last : and more simple one, patented in 1855, though the disks no longer Ee revolve, they &£ slide between fix- — ed plates without — springs, and do [not turn on a & pin like common tumblers, and | will stand in differently any where. It will be sufficient to | describe the last of these inven- mig 5 tions, as Mr Tucker himself states it to possess all the ele- ments of security of the former ones, with the advantages of being much cheaper, because more simple in construction. In fig. 18 TT is one of the sliders, which are separated by thin fixed plates, and slide upon the guide-pins at TT, and have also friction-springs X pressing on them to keep

them steady. S is the bolt stump, which can only enter I, the gating of the tumblers, when they are pushed the proper distance towards the left, which the key will do as soon as it turns towards the left, in the usual way of unlocking. But something else still prevents the bolt from falling, and that is the flat curtain C, which turns with the key, and has also a barrel B, as in several of the other locks we have spoken of. This curtain prevents the stump from being pressed against the tumblers, being just big enough to keep it from touching them until it has turned nearly three quarters round, when the pin 8, which stands up on the stump, can enter the opening D in the curtain (shown by a dotted line in the drawing, to prevent con- fusion). But by the time the curtain has got so far round, any instrument in the keyhole would be prevented by the barrel from reaching the tumblers so as to push them back and feel the pressure of the stump; at least so the inventor asserts, and we do not venture to contradict him; but it must be remembered that no revolving curtain and barrel have yet been able to prevent the instruments of the American lock-pickers from reaching and moving the tumblers at the same time that the barrel is being pressed the other way in order to keep up pressure on the bolt. We have not yet explained how the bolt in this lock is drawn back when the curtain has got into the proper position for it. It is not done by the last bit in the

key acting directly on the bolt as usual, but by a bit P fixed on the curtain itself, which acts upon the notch B in the bolt, as the key usually does. And this same bit P performs another function in locking, viz., shooting all the tumblers into the position here shown by striking against a pin which is set in the bottom one, and comes up to the

curtain, and so carries all the others with it by means of

the square notch which is cut in all of them, except the one which has the pin in it. It must be observed that the curtain does not lie close upon the tumblers, but there is the thickness of the bolt, or of the bit P, between them. A spring locks into the curtain and prevents it from being turned, except when this spring is pressed down by putting a key into the keyhole. One object of making the curtain, and not the key, to lock and unlock the bolt is that you guard against the risk of what is called short-locking, i.e. sending the bolt in any common tumber-lock not quite far enough for the tumblers to drop. There are means by which a person intending afterwards to pick a lock might cause it to lock short, if he had previous access to it, or possession of the key, at least as locks are generally made, and then, of course, he has only to pull the bolt back, the tumblers having never fallen. Moreover, this arrangement in Tucker's lock allows it to be locked by any key that will turn in the keyhole, though it cannot be unlocked by any but the true key, or one which will move all the tumblers to the right place for the stump to enter them. Mr Tucker has also applied the curtain in his padlocks in such a way that the shackle has a tail reaching inwards and resting against the curtain at all times, except when it is in the proper position for opening, z.e., when this tail is opposite to a segment cut out of the curtain corresponding to the opening D in the lock just now described, but much larger. The object of this is to obtain greater strength than usual to resist all attempts to force the shackle open. The cheapness of these locks is due to the circumstance that all the principal parts can be stamped out of sheet brass, the curtain alone being cast with the barrel and bit P on it, and its face turned, which is a cheaper operation than filing. In this respect it approaches to Mr Hobbs's style of lock-making ; only he has carried the stamping and machine-finishing system much further ; indeed, it is hardly

exaggerating to say that he has abolished the use of the file, and left nothing to hand labour except the mere fitting

in consequence.

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of the pieces together, and putting the tumblers in the right position to have the gating cut according to the key. Nettlefold's Bolt.—We have already alluded to padlocks, and we shall do so no farther, because they are generally of exactly the same interral construction as other locks of the same maker. And, for the same reason, it is unneces- sary to describe the various modifications of the fastening part of locks to adapt them to peculiar uses or positions ; but there is one which does seem to be worth a short notice, viz., an invention of Mr Nettlefold, patented in 1839, for making the bolt hook into the striking plate, against which it locks. Fig. 19 will explain the nature of the contrivance at once. We have inserted no tumblers, because it may be used with one kind of lock as well as another. It is convenient for writing-desks, sliding cup- boards, and even for drawers, which can often be prized open by merely putting in a screwdriver above the lock, and forcing up the piece over it just enough to let the bolt, which is generally short, pass. There are other ways of doing the same thing, such as making the bolt itself hooked, and giving it two motions, first vertical, to shoot it out, and then horizontal, to hook it into the striking plate ; and some Bramah locks are made with a kind of annular bolt, which forms a rim to the cylinder, with a segment cut off in one place to let the striking plate come down, which is then taken hold of by the other part of the ring as it revolves. Bramah locks of portfolios, and articles of that kind, are usually made in this way, which is very cheap and simple. Master-Keys.—It is often convenient to have a set of locks so arranged that the key of one will open none of the others, and yet the owner of the whole may have one . master-key that will open them all. In the old locks with fixed wards this was done by making the wards of a slightly different form, and yet such that one skeleton will pass them all, just as the skeleton-key in fig. 4 will serve for the warded key of fig. 3, and a multitude of others. In locks with sliders or

tumblers, the way is to make one tumbler in each lock with a wider gating, so as not to require lifting so high as it does in the other locks of the set ; then the key of that lock will raise that tumbler in that lock high enough to clear the stump, and yet the master-key, which has a longer bit in that place, will not raise it too high, because the gating is wide enough for both; but the special key of that lock will not open any other of the set which has not the same tumbler widened in the gating. Mr Chubb, many years ago, made a set of locks for the Westminster Bridewell, with keys for the different grades of officers. The owner of the head key can stop out any of the under keys; and if any attempt is made to pick any lock, and the detector is thrown, it cannot be released by any of the subordinate keys, though they can open the lock in its normal state, and consequently the governor must be acquainted with it. There are a variety of other forms of many-tumblered locks, but none of them involve any novelty in principle, and they are all capable of being dealt with in the same way; and therefore we shall at once pass on to another class of locks, viz., those which shut of themselves, and are called— Spring or Latch Locks. — These locks we chiefly notice because they require a particular provision to make them in the smallest degree secure, and are, nevertheless, often left without it, by way of saving a shilling or two in their price, and multitudes of street-door robberies are committed The former of these two names is

generally used fora lock which shuts of itself on a box or drawer, or articles of that kind; and the latter for street or room-door locks which shut of themselves, and open with a handle on the inside, but only with a key on the outside. In the simplest and cheapest form of these locks there is no pretence of any security except a few fixed wards, which the key has to pass; and, as before explained, that is no security at all against anybody with the smallest dexterity, and with a serious intention of opening the lock. Next to them, or rather below them, pretending to be what they are not, come the locks which lock a certain

distance themselves by means of a spring, but can be locked further by the key, and have tumblers, but no fixed wards (which a good tumbler-lock does not require). But though this kind of lock cannot be opened when it is thus double locked, except by the key, or some efficient mode of picking, yet when they are only self-locked the tumblers are of no more use than if they did not exist, and the lock can be opened by any bit of bent wire that will go intothe keyhole. It should be remarked, however, that the Bramah lock is just as secure as usual when used for a spring or latch lock, because the key cannot turn at all without pushing in the sliders properly. But in this, as in all latch-locks, it is very unsafe to have a handle which pulls back, as it can easily be reached bya wire put through a hole in the door; the handle should always be made to turn, like a common room-door handle.

There are two ways in which spring-locks with tumblers are made as safe as the same lock with an ordinary bolt. One is to make a click or catch fall into the bolt when it is drawn back, and not to make the tumblers to fall when the bolt is drawn back; in the shutting of the door this catch is pushed back by some knob projecting for the purpose, and then the tumblers fall and hold it fast. Prison locks are made in that way. But this will not do for a latch-lock which is intended to open by a handle on one side of the door. For that purpose the proper plan is that which is now adopted in all good latch and spring locks, not to let the key act directly on the bolt, which has no stump, but on the false bolt which lies on the top of the real one, and has the stump fixed in it. When the real bolt is shut by the spring it carries the false one with it, and that is then locked by the tumblers. But the real bolt can be pushed back by the door shutting, or pulled back by the handle, without moving the false bolt, though it cannot be reached through the keyhole. In buying a lock, the test of this is to see whether the stump moves as you push or pull the bolt back. good for nothing, unless it is on some other peculiar construction. |

Latches and Latch Locks.—The latter of these, so called by Mr Chubb, is substantially on the principle just now described, and so is Hobbs’s and Hart’s latch lock, which also has the protector stump, and therefore is as unpickable as their other locks, provided neither the handle nor

the bolt can be got at. Chubb's latch (not his latch-lock) consists only of four tumblers, which come out and form the bolt, and fit between a sort of mouth in the striking-plate on the door post, and have all to be lifted to the same height by the key ; but that can easily be picked by the tentative method, though it might delay a common street thief for an inconvenient time.

Spring Curtain.—All latch locks for street doors are liable to stick fast through dirt getting between the tumblers, especially in a smoky town. They will keep clean much longer if the keyhole is protected by Sir E. Beckett's self-acting spring curtain, which can be added to any lock which is worth it. It consists only of a small thin steel plate, sliding on the key-pin, and another pin just below the keyhole to guide it, with a slight spring

If it does the lock is

behind, for which there is room in any latch lock with a sliding locking plate over the bolt. They are not patented, and the cost is quite insignificant, and it is odd they are not nlore commonly insisted on by purchasers.

Safe Locks with Small Keys. —In all the locks we have yet mentioned the bolt is acted on by the key, even though the key may not touch it; the key must therefore be strong enough to move the bolt besides lifting the tumblers, or whatever is substituted for them, and this makes the key for a large lock too large and heavy to be conveniently carried in the pocket, and a bunch of such keys impossible. To get over this difficulty, most of the makers of iron safes have adopted the plan (we do not know by whom invented) of shooting a large bolt, or a number of bolts, by means of a handle, and then a small lock witha small key locks into one of them, and thus fastens them all. The security then depends upon the impregnability of the small lock against fraudulent picking or forcible evisceration. There are certain thieves' instruments by which a force sufficient to tear open the inside of a lock can be inserted through a keyhole of the common size. This, however, is now

defeated by cutting out a piece of the back plate, and then screwing it on again with only a few small screws; and so that alone gives way under any bursting pressure, whether from the instrument called the jack-in-the-box, or from gunpowder, which is another of the thieves' methods for cutting the knot which they cannot untie. If the small lock, therefore, cannot be picked, or forced, this mode of locking the bolts of a large door is quite safe, and you have the advantage of a very powerful lock with nothing to carry in your pocket larger than a small desk key.

Sir EH. Beckett's Lock.—A lock was invented by Sir Edmund Beckett (formerly Denison) in 1852, but not patented, which combines the advantages of large and strong works with a keyhole so narrow that no instrument strong enough to injure the lock could be got in, nor a reflector to observe the bellies of the tumblers; and the bolt is not only shot by turning the handle, but locked besides, without using any key at all. This lock enjoys the distinction of being the only one of English invention which was pronounced secure against any known method of picking, by Messrs Hobbs and Tomlinson, in the treatise before referred to.

In fig. 20 are shown the tumblers T, turning on a pin at or near the middle of their length, so as to be nearly

Fig. 20.

balanced, though in small locks this is unnecessary. Between every two adjacent tumblers, and between the bolt and the tumbler next to it, there is a thin steel plate, which occupies the position shown by the dotted lines PP. These plates have one edge lying against the upper side of the lock, so that they cannot turn at all on the tumbler- pin, which goes through them quite loosely. One or two of the plates should be bent a little to make them act as friction springs on the tumblers when the cap of the lock

is on, so that they will stand indifferently in any position. In the figure they are drawn all pressed down, so as to prevent the stump S from entering the gating, and this has been done by the long tail Y of the handle, which, it is easy to see, will raise the left end of the tumblers, and depress the right, after the fan-tailed piece X of the handle has shut the bolt. After the tumblers have been raised to the proper height by turning the key half round (where it may be stopped by the plates P, P), the stump can enter the gatings, and the bolt can be drawn back by the handle, the tail Y then doing nothing. So far as we have yet gone, the lock would possess no greater security than any other many-tumblered lock; but there is a steel curtain CC, which does not revolve as usual, but slides on two pins set in the back of the lock, and is pressed up against the front plate by two spiral springs, so as to close the keyhole completely, except when it is pressed in. From the back of the curtain there goes a kind of square plug (shown in section at fig. 21), which can be pushed through a hole in the back plate, and has a notch

in it just in the plane of the bolt, and

the bolt itself has a corner there; in

this way, when the curtain is up, the

bolt can be drawn back through the ----~

notch in the curtain plug; but when the “~~ ¢ plug is pushed in ever so little the bolt c cannot be drawn back, because its corner

cannot pass the curtain plug, and in“

this position the stump cannot be made

to touch the tumblers, except one of Fig. 21. them, which is made a little longer than the rest (as shown at T in fig. 20), in order to keep the bolt steady. It is evident then that as soon as the curtain is pushed in, to admit any instrument whatever, the bolt is held fast, and it becomes impossible to put any pressure of the stump upon the tumblers; in other words, the tentative mode of picking is impossible. In small locks the

curtain has no plug, but merely works against the edge of a second stump of the bolt, which can only pass when the curtain is up, and it slides on the drill-pin and another pin below it.

The security of the lock is farther increased by the addition (DEG) of what may be called a detector, as it does detect if the bolt has not been shot far enough by the person who locked it, and, what is of more consequence, prevents it from being opened in that state. It turns on a hinge or pin at G, and is held up or down by a jumper- spring at E, as in Chubb's first detector. In fig. 20 it is shown as held down, or out of the way of the bolt ; but, as the handle turns back again and draws back the bolt, the pin below X raises the detector a little, and then the spring is ready to throw its tooth into the notch in the bolt as soon as it is shot only about half-way. In that state the bolt cannot be drawn back without turning the handle far enough for the fan-tail X to send the detector down again below the corner of the spring, and by doing that you will also have locked all the tumblers, and so made the lock fast until the key comes to open it. And it is to be observed that the curtain cannot be pushed in until the bolt is fully shot, so that no exploration of the lock can take place while it is open, or even partially open. By adding a spring catch under the curtain, to be freed by one of the tumblers when it is fully locked, it may be arranged, if required, that the curtain could not be pushed in, not only until the bolt is shot, but until the tumblers are locked also.

The following, therefore, are the advantages of this lock. 1. A very large lock, with all its parts strong, only requires a very small key, not weighing above a quarter of an ounce. 2. No key is re- quired to lock it, and you cannot leave the keyin the lock (a fruit- ful source of mischief), and yet it is free from the inconvenience of spring-locks, which sometimes shut themselves when not intended,

and moreover, when large, require large and strong keys to open them. 3. It cannot get out of order from the usual causes of the tumblers sticking together, or tumbler-springs breaking, because there are none, and the tumblers do not touch each other, but the friction-plates

between them. 4. The keyhole being always quite closed by the curtain, except while the key is in, the lock is pro- tected from dirt and from the effects of a damp or smoky atmo- sphere, which injures other locks. 5. The smallness of the keyhole revents the insertion of any instrument strong enough to force the ock, and also prevents inspection. 6. It is pronounced by the highest authority to be seeure against any known mode of picking. 7. It requires no delicacy of coustruction or high finish in any of the parts, and the moving parts are few—in fact, the whole of them together are fewer than the number of springs alone in the great American lock of Day & Newell. 8. It is free from the incum- brance of a patent, the inventor being one of those who agree with the opinion of the jury on philosophical instruments in the exhibition of 1851, and with many of the first engineers and most scientific men, that ‘‘ patents are a great obstruction to the progress of science,” and waste, on the whole, more money than they gain for real inventors.

Changeable Key Loeks,

Any lock with many tumblers may be changed by taking it off and transposing any two or more of the tumblers; but it will then want a different key, and the process is too troublesome to be resorted to except when there is reason to apprehend that the original key has fallen into bad hands, or had a copy taken of it. A lock which can be locked by a great number of keys, but can only be opened by the one ; which locked it last, is evi- Fig, 22. dently an immense addition to security. Those keys may either be all distinct, or there may be a great number of different webs, or stepped parts, fitting toa common handle ; or each bit or step may be ae, and on screwed together into the key frame as shown in fig 22.

ey a lock with n tumblers, each raisable to m distinct heights, if you have only x loose bits of the m different heights you may compose 1×2×3…. keys, which for nine tumblers =362, 880. But if you also have m bits for each place in the web, the possible number of different keys is very much greater, viz., m”; for every

ossible length of bit in each place may be used with every possible fongth in every other place. If mis 7 and ” 9, as they are in the locks we are going to describe next, each lock may have very nearly sixty million different keys, or key-webs capable of fitting into one shank or handle ; and the chances are so many against a lock-picker hitting on the right one.

The first changeable key lock known in England was Day & Newell’s ‘‘ Parautoptic” (inspection-defying) lock, which was brought from America by Mr Hobbs at the time of the 1851 Exhibition, and has been largely used since for banks and other safes, It was fully described in the last edition of this work, and in the books above referred to; but in this place we will describe instead a much simpler form of it, since introduced by Mr Hart of the firm of

Fig. 23.

Hobbs, Hart, & Co, The principle of all changeable key locks is that instead of a single stump fixed to the bolt, there are as many stumps as tumblers, and each one is the projecting part 8 of a slider PPS which can ride up and down on two pins PP in the bolt, and will stay at any height where itis left when the bolt B is shot. Fig. 23 shows the lock open and the slider stumps lying in the jaws or gating of the tumblers ready to be raised to

any height. In fig. 24 the bolt has been shot, and the sliders carried forward with it. Just before they leave the tumblers they are received by the two small teeth C, C on the frame of the lock, holding each slider at whatever height it may then be; those teeth go right down to the thin part of the bolt or as deep as the sum of all the tumblers and sliders. In this figure the topmost slider is received at its third notch, and each of those below it at some other notch. The tumblers having fallen behind all the stumps, the sliders cannot move until the tumblers are all raised again to the various heights at which they left them, which is possible only by the key that locked the lock. These locks have

Fig. 24.

Hobbs's protector behind the bolt ; ana the bit which moves the bolt is behind a revolving curtain (the darkest circle) which is kept steady by one of the tumblers resting on its flattened top. The bellies of the tumblers are shortened, to obviate a certain tric by which one of Newell's locks was picked, but which it is not necessary now to explain. So far as we can jndge, this lock has more than all the advantages of that, as it is much less complicated and liable to get out of order from any cause except that to which all locks with spring tumblers are liable, viz., from two tumblers getting stuck together by dirt, so that one of them rises too high with its neighbour. iling tumblers is accordingly fatal to them, though it is necessary in other parts of a lock.

The keys of these locks are practically made not of distinct bits screwed into a key frame as in fig. 22, which is the plan used in the Day & Newell lock, and makes a heavy thing to carry, but separate webs are made, each complete in itself, and fitting into a thickish key pipe which need not be carried about. You may leave it near the safe, and lock up therein, or keep somewhere else, all the bits except the one you use for the day, and carry that in your waistcoat pocket. For such a lock as that described you may have as many of the sixty million bits as you like, and may get new ones from time totime. Or you may have rome bits, as in the parautoptic lock, but in that case you must take good care of the key whenever the lock is shut.

The risk of tumblers sticking together in a changeable lock, or any other, may be obviated by not using springs but utting thin plates between the tumblers, as in Sir E. Beckett's feck giving the tumblers tails coming down on the right of the keyhole in figs. 23, 24, and making the revolving curtain act on all the tails just before the key comes out, by means of an intermediate lever, or else by a small handle which might at the same time bring an escutcheon or external curtain over the keyhole.

Yale Lock.

This American lock is remarkable for the smallness of its key, which is shown from & to a in fig. 25, full size, and isa thin flat piece of steel weighing only ‘1 of an ounce. The narrowness of the keyhole would be an impediment to intro- ducing a picking in- strument — together with any other in- tended at the same ; time to give a twist- AN ing pressure to the [\ smal barrel abe, which has to turn, as in the Bramah lock, in order to move the 42 bolt, which is not shown in these figures. That may be done either as in Bramah

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Fig. 25.

locks or by a tongue or bit attached to the end ab of the barrel as in several other locks. The barrel is prevented from being turned,

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except by the proper key, thus. The a | age five plugs with spiral springs over them in fig. 25 are really all divided at the cross line dc, being all now lifted to the proper height by the key. Conse- quently the barrel abc can turn round, as there is no pug either projecting from it or projecting into it. But when the key is out, all the plugs are pushed down by the springs, and so the upper ones descend into the barrel and hold it fast. And again, if any of the steps of a false key are too high, some of the lower plugs will be pushed up beyond the barrel into the holes above them, and so the barrel cannot turn. The bevelled end of

the key near a enables it to be pushed in under the plugs, though with some friction and resistance. It does not appear, however, to be any more secure than the Bramah lock, except by virtue of the smallness of its keyhole. Nor is the flatness and thinness of the key of any particular value on a bunch of keys, though very convenient for a single latch key to be carried in the waistcoat pocket, as extreme security is not requisite for latch locks. Yale Time Lock.

The same company have an entirely different kind of lock from all the preceding ones; it consists of a watch in a case enclosed within the safe door, and has a dial with pins marked for every hour, something like a ‘‘ tell-tale clock.” Any number of these pins can be pulled out a little, and the watch will let a weighted lever fall against the bolts of the safe during all those hours, and hold it up during all the other hours, or vice versa. For security the case contains two snch watches, so that onc may do the work if the other happens to fail. Thus no key is used (except the watch key for winding), but the safe can be opened by a handle moving its bolts at such hours as the watch is sct for, and at no other.

It should be added that Mr Hobbs introduced into England in 1851 the American system of manufacturing every part of a lock by machinery, so that all similar locks of a given size are exactly alike, except the keys, and the gating in the tumblers, which is cut when they are lifted by the key ; and even those are done by machinery adjustable to secure what may be called an infinite number of varia- tions. The same system has been adopted in the Government rifle manufactories, and for clocks and watches ; and no hand-work can compete with it. , (E. B.)

LOCKE, Joun (1632-1704). Some idea of the man and his surroundings is more needed for the interpretation of what Locke has written than in the case of most philosophers. His youth was spent amidst the war of principles of which England was the scene in the middle of the 17th century. In later life he mixed much with the chief actors in the political drama that followed the Restoration. In his advanced years he was the intel- lectual representative of tendencies

which at the Revolution settlement inaugurated the tranquil material progress and tolerant but more prosaic spirit of the 18th century in England. It is instructive to see how the foundations of belief and the constitution of knowledge are investigated by an English gentleman, who was no recluse medieval monk or pedantic modern professor, but a man of the world, practically conversant with affairs, in tone calm and rational, and now justly regarded as the typical English philosopher.

Locke was born in the county of Somerset, on the 29th of August 1632, six years after the death of Bacon, and three months before the birth of Spinoza. His father was a small landowner and attorney at Pensford, near the northern boundary of the county, to which neighbourhood the family had migrated from Dorsetshire early in the century. The elder Locke, a strict but genial Puritan, by whom the son was carefully educated at home, was engaged in the military service of the popular party when the sou was a boy, Bristol being one of the centres of the war. “From the time that I knew anything,” Locke wrote in 1660, “I found myself in a storm which has continued to this time.” For fourteen years his education was going on at home, in the Puritan family. The house at Beluton, on his father’s little estate, in which these years were spent, may still be seen on the side of one of the orchard-clad vales of Somerset, half a mile from the market- town of Pensford, and 6 miles from Bristol. The actual place of Locke’s birth was at Wrington, 10 miles westward, in a house which still exists, where his mother chanced to be on a visit,

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In 1646 he entered Westminster School, then of course under Puritan control, and at the headquarters of the parliamentary movement. The six following years were mostly spent there. He does not seem to have liked Westminster, and its memories perhaps produced the bias against public schools which afterwards almost disturbed lus philosophic impartiality in his Thoughts on Education.

In 1652 Locke passed from Westminster to Oxford. He there found himself at Christ Church, in charge of John Owen, the newly appointed

Puritan dean, and _ vice- chancellor of the university. Christ Church was more or less Locke's home for thirty years. For eight years after he entered Oxford was ruled by the Independents, who, through Owen and Goodwin, unlike the Presbyterians, were among the first in England to promulgate the prin- ciples of genuine religious liberty. Locke's hereditary sympathy with the Puritans was gradually lessened by what he saw of the intolerance of the Presbyterians and the fanaticism of the Independents. He found, he says characteristically, that "' what was called general freedom was general bondage, and that the popular assertors of liberty were the greatest engrossers of it too, and not unfitly called its keepers." The influence of the liberal divines of the Church of England became apparent after- wards in the progress of his mental history.

Oxford had suffered as a seat of learning during the civil war. Under Owen the scholastic studies and dis- putations were maintained with a formality unsuited to Locke's free inquisitive temper. The reaction against them which he expressed showed thus early a strong disposition to rebel against empty verbal reasonings. He was not, according to his own account of himself to Lady Masham, a very hard student at first. He sought the company of pleasant and witty men, with whom he like- wise took great delight in corresponding by letter; and in conversation and in these correspondences he spent much of his time. He took his bachelor's degree in 1656, and that of master in 1658, the latter on tlie same day with Joseph Glauvill, the author of Scepsis Scientifica. In December 1660 he was made tutor of Christ Church, and lectured in Greek, rhetoric, and philosophy in the following year.

At Oxford Locke was within reach of distinctive intellectual influences, then of great strength, and parti- cularly fitted to promote self-education in a strong character. The metaphysical works of Descartes had appeared a few years before he entered Christ Church, and the Human Nature and Lenathan of Hobbes during his undergraduate years. It does not seem that Locke read extensively, but he was soon drawn to Descartes. 'The first books, he told Lady Masham, which gave him a relish for philosophical things were those

of Descartes. He was delighted in read- ing them, though he very often differed in opinion from the writer, for he found that what he said was very intelligible. After the Restoration he lived amidst the influences which were then drawing Oxford and England into experimental research. Experiments in physics be- came the fashion after 1660. The Royal Society was that year founded at Oxford. Wallis and Wilkins, and after- wards Boyle and Wren, at Oxford, and Barrow and Newton at Cambridge, helped to make chemistry, meteor- ology, and mechanics take the place of verbal disputes. We find him, accordingly, at work in chemistry about 1663, and also in the meteorological observations which always interested him.

The restraints of professional life were not well suited to Locke. There is a surmise that he once contemplated taking orders in the Church of England. His religious disposition attracted him to theological studies. His revulsion from the severe dogmatism of Presbyterians and

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the unreasoning fanaticism of Independents favoured that connexion with liberal Anglican churchmen which he maintained in later life. Whichcote was his favourite preacher, and latterly his closest intimacy was with the Cudworth family. But, though he has a place among the lay theologians of England, his dislike to ecclesiastical impediments to free research, as well as his taste for experimental investigations, led him in the end to turn to medicine when he had to think about a profession. This was soon after the Restoration, and before 1666 he seems to have been practising medicine in Oxford. But, though afterwards known among his friends as “ Doctor Locke,” he never graduated as a physician. His health was uncertain, for he suffered all his life from chronic consumption and asthma, and besides that an event soon occurred which withdrew him from medical practice. To the end, however, he was fond of the science, and also ready on occasion to give friendly advice.

Locke had early shown an inclination to politics as well as to theology and to medicine. In 1665 he diverged from medical study at Oxford to diplomacy, and was engaged for a few months in this sort of business,

as secretary to Sir Walter Vane on his embassy to Cleves. It was soon after his return from Germany in the following year that the incident occurred which determined his career in the direction of politics. Lord Ashley, after- wards first earl of Shaftesbury, the most truly historical figure among the statesmen of Charles II.'s reign, had come to Oxford for health. There Locke was accidentally

'Introduced to him. This meeting was the beginning of

a lasting friendship, sustained by a common sympathy with liberty—civil, religious, and philosophical. In 1667 Locke removed from Christ Church to Exeter House, Lord Ashley's London residence, to become his private secretary, and in 1673 secretary of the Board of Trade. Although he retained his studentship at Christ Church, and occasion- ally visited Oxford, and also his patrimony at Beluton, lately inherited from his father, he found a home and shared fortune with the great statesman during the fifteen years which followed his removal to Exeter House.

The manuscripts of Locke which belong to this Oxford period throw welcome light on the growth of his mind in early life. Among them is an essay on the '' Roman Commonwealth," which expresses convictions as to religious liberty and the relations of religion to the state which were only strengthened and deepened in the progress of his life. Objections to the sacerdotal conception of Chris- tianity are strongly stated in another paper; short work is made of human claims to infallibility in the interpre- tation of Scripture in a third; a scheme of utilitarian ethics, wider in its conception than that of Hobbes, is offered in a fourth. But the most significant of those early revelations is an 'Essay concerning Toleration," dated in 1666, which anticipates many of the positions maintained nearly thirty years later in his famous Letters on that subject.

The Shaftesbury connexion helped to save Locke from those idols of the den to which professional life in every form is exposed. It brought him much in contact with public men, with the springs of political action, and with the details of office. The place he held as confidential adviser of the greatest statesman of his age is indeed the most

remarkable feature in his middle life. Exeter House afforded every opportunity for society, and of this Locke, according to his disposition, availed himself. He became one of the intimates among others of the illustrious Sydenham. But though he joined the Royal Society he seldom went to its meetings, for his custom all his life was to encourage small reunions of intimate friends. One of these at Excter House was the occasion of the enterprise

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which has made lis name memorable in history ; for it was there that “five or six friends” met one evening in his rooms, about 1671, and discussed “ principles of morality and religion” which seemed remote from questions about ‘human understanding.” They “found themselves quickly at a stand by the difficulties that arose on every side.” Locke suggested a careful examination of the exact limits of man’s power to know the universe as the proper way out of their difficulties. The results of the reflexion to which these difficulties thus gave rise, he thought, when he set to work, might be contained on ‘“‘one sheet of paper.” But what was thus “‘begun by chance was continued by entreaty, written by incoherent parcels, and after long intervals of neglect resumed again as lumour and occa- sions permitted,” till at last, at the end of nearly twenty years, it was given to the world as the Hssay on I/uman Understanding. This work gave intellectual unity and a purpose to his life as a man of letters and philosophy.

The fall of Shaftesbury in 1675 enabled Locke to escape for four years from the centre of English politics to a retreat in France, where he could unite the study of “human understanding” with attention to health. He spent three years partly at Montpellier and partly in Paris. His journals and commonplace books of this period show the ssay in process of construction. The visits to Paris were times of meeting with men of letters and science, among others Guenellon, the well-known Amsterdam physician ; It6mer, the Danish astronomer ; Thoynard, the critic; Thevenot, the traveller; Justel, the jurist; and Bernier, the expositor of Gassendi. There is no mention of Malebranche, whose Mecherche dela Vérité had appeared three years before, and who was

then at tle Oratoire, nor of Arnauld, his illustrious rival at the Sorbonne.

Locke returned to London in 1679. A reaction against the court party had for a time restored Shaftesbury to power. Locke resumed his old confidential relations.

In his fifty-second year, in the gloomy autumn of 1683,

Locke retired to Holland in voluntary exile. It was then the asylum of eminent persons who were elsewhere denied civil and religious liberty. Descartes and Spinoza had meditated there; it had been the home of Erasmus ard Grotius; it was now the refuge of Bayle. Holland was Locke's sanctuary for more than five years; but it was hardly a voluntary retreat. His (unpublished) letters from thence represent a man of tender feelings, on whom exile sat heavily. Amsterdam was his first Dutch home. For a time he was in danger of arrest at the instance of the English Government. After anxious mouths of conceal- ment in the houses of friends, he escaped; he was, however, deprived of his studentship at Christ Church, and Oxford was finally closed against him by order of the king. But Holland introduced him to new friends. One of these, ever after an intimate correspondent, was Philip van Lim- borch, the successor of Episcopius as Remonstrant professor of theology, lucid, learned, and tolerant, the friend of Cudworth, Whichcote, and More. Limborch attached him to Le Clerc, then the youthful representative of letters and philosophy in Limborch's college, who had escaped from Geneva and Calvinism to the milder atmosphere of Holland. The Bibliotheque Universelle of Le Clerc, com- menced in 1686, soon became the chief organ in Europe of men of letters. Locke was at once united with him in the work, and contributed several articles. It was his first appearance as an author, although he was uow more than fifty-four years of age, and afterwards produced so many volumes. This tardiness in authorship is a signifi- cant fact in Locke's mental history, in harmony with the tempered wisdom aud massive conimon sense which reign throughout his works. The next fourteen years were those in which the world received the

thoughts which observa- tion of affairs and reflexion had so long been forming in his mind. They were taking shape for publication while he was in Holland. The Hssay was finished there, and a French epitome of it appeared in 1688, in Le Clerc's journal. Locke was then at Rotterdam, where he lived for more than a year in the house of a Quaker friend, Benjamin Furley, a wealthy merchant and collector of books. The course of affairs in England at last opened a way for his return to his native country. At Rotterdam he was the confidant of the political exiles, including Burnet and Mordaunt, afterwards the famous earl of Peterborough, as well as of the prince of Orange. William landed in England in November 1688 ; Locke followed in February 1689, in the same ship with the princess of Orange and Lady Mordaunt.

It was after his return to England that through author- ship Locke emerged into European fame. Within a month he had declined the embassy to Brandenburg, and taken instead the modest office of commissioner of appeals with its almost nominal duties. The two years, 1689 and 1690, during which he lived at Dorset Court, in London, were memorable for the publication of his two chief works in social polity, and also of the most popular and widely influ- ential book in modern philosophy, which expresses in a generalized form the principles that lie at the root of all his political and other writings. The first of the three to appear was the defence of religious liberty in the state, in the Lynstola de Tolerantia, addressed to Limborch. It was published at Gouda in the spring of 1689, and translated into English in autumn by William Popple, a Unitarian merchant in London. The Two Treatises on Government, in defence of the sovereignty of the people, followed a month or two after. The Hssay concerning Muman Understanding saw the light in the spring of 1690. He received £30 for the copyright, which was nearly the same

'| as Kant afterwards got for the first edition of his Kritik

He had carried the manuscript XIV. — 95

der reinen Vernunft.

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from Holland, ready for the press except a few last touchies, It was the first book in which his name appeared, for the other two were published anonymously.

Locke’s asthma and other ailments had increased in the latter part of 1690. The air of London always aggravated them. The course of public affairs also disappointed him, for the settlement at the Revolution in many ways fell short of his ideal. It was then that the home of his old age, the brightest of all his homes, opened to receive him. This was the manor house of Oates in Essex, pleasantly situated midway between Ongar and Harlow, the country seat of Sir Francis Masham. Lady Masham was the accomplished daughter of Cudworth, and Locke had known her before he went to Holland. In the course of the two years after his return, she told Le Clerc, ‘ by some considerably long visits Mr Locke made trial of the air of this place, which is some 20 miles from London, and he thought that none would be so suitable for him, His company could not but be very desirable for us, and he had all the assurances we could give him of being always welcome; but, to make him easy in living with us, it was necessary he should do so on his own terms, which Sir Francis at last assenting to, he then believed himself at home with us, and resolved, if it pleased God, here to end his days—as he did.” It was in the spring of 1691 that this idyllic life at Oates began. There, among the green lanes of rural England, he enjoyed for fourteen years as much domestic peace and literary leisure as was consistent with broken health and sometimes anxious visits to London on public affairs. Oates was in every way his home. In his letters and otherwise we have charming pictures of its inmates and its internal economy, as well as of occasional visits of friends who went there to see him, among others Lord Peterborough and the Lord Shaftesbury who wrote the Characteristics, Isaac Newton, William Molyneux, and Anthony Collins.

At Oates he was always busy with his pen. The Letter on TLoleration had already involved him in controversy. The Answer of a certain Jonas Proast of Queen's College, Oxford, had drawn forth in 1690 his Second Letter on Toleration. A rejoinder in 1691 was followed by Locke's Third Letter in the summer of the following year. And other questions divided his interest with this one. In 1691 those of currency and finance were much in his thoughts; in the year after he addressed a letter to Sir John Somers on the Consequences of the Lowering of Interest and Rarsing the Value of Money. It happened too that when he was in Holland he had written letters to his friend Clarke of Chipley about the education of his children. These letters formed the substance of the little volume that appeared in 1693, entitled Thoughts on Education, which still holds its place among the classics in that department. Nor were the "principles of revealed religion" forgotten, Which a quarter of a century before were partly the occa- sion of the Lssay. The circumstances of the time now made him desire to show how few and simple all the essential points held in common by the religious com- munity of England were, and to bring men if possible to agree to differ as individuals regarding all beyond. The Issue was an anonymous essay on the Reasonableness of Christianity as delivered in the Scriptures, which appeared in 1695, in which Locke tried to separate the divine essence of Christianity from accidental accretions of dogma, and verbal reasoning of professional theologians, ignorant of the limits within which the conclusions of human beings on such subjects must be confined. This irenicon involved him in controversies that lasted for years, A host of angry polemics assailed the book. A now forgotten John Edwards was conspicuous among them. Locke produced a Vindication which added fuel to the fire,

and was followed by a Second Vindication in 1697. Notes of opposition to the Hssay too had been heard almost as soon as it appeared. John Norris, the metaphysical rector of Bemerton, an English disciple of Malebranche, criticized it in certain Cursory Reflexions in 1690. Locke took no notice of this at the time, but his second winter at Oates was partly employed in writing what appeared

after his death as an Hxamination of Malebranche's Opinion of Seeing all Things in God, and as Remarks upon some of Mr Norris's Books, —tracts which throw important light upon his own theory, or rather want of theory, as to perception through the senses. When he was examining Malebranche he was also preparing the Hssay for a second edition, and corre- sponding with his friend William Molyneux at Dublin about amendments in it. This edition, with a chapter added on " Personal Identity," and numerous alterations in the chapter on '' Power," appeared in 1695. It was followed by a third, which was only a reprint, later in the same year. Wynne's well-known abridgment in that year helped to make the book known in Oxford, and Molyneux had years before introduced it in Dublin. In 1695 a return to questions about the currency diverted Locke's attention for a little from metaphysics and theology. Circumstances in that year gave occasion to his tract entitled Observations on Stlver Money and also to his Further Considerations on Ratsing the Value of Money.

In 1696 Locke was induced to accept a commissionership on the Board of Trade, which made frequent visits to London needful in the four following years, and involved him considerably in the cares of office. Meantime the Essay on Human Understanding and the Reasonableness of Christianity were both becoming more involved in the wordy warfare between dogmatists and latitudinarians, trinitarians and unitarians, of whigh England was the scene in the last decade of the 17th century. The controversy with Edwards was followed by another with Stillingfleet, bishop of Worcester, which takes its place among the memorable philosophical controversies of the modern world. It arose in this way. John Toland, an Irishman, in his Christianity not Mysterious, had exagger- ated some passages in the Hssay, and then adopted the opinions as his own. Inthe autumn of 1696, Stillingfleet, who was a learned and argumentative ecclesiastic more than a religious philosopher, in a Vindication of the Doctrine of the Trinity wrote some pages on Locke, condemning him especially for eliminating mystery from human knowledge in his account of what is meant by "substance." Locke replied in a Letter dated January 1697. Stillingfieet's rejoinder appeared in May, followed by a Second Letter from Locke in August, to which the bishop replied in the following

year. Locke’s elaborate Third Letter, in which the ramifications of the controversy are pursued with a tedious expenditure of acute reasoning and polished irony, was delayed till 1699. The death of Stillingfleet in that year brought this famous trial of strength toanend. (The interesting episode of Molyneux’s visit to Oates, followed by his death a few days after his return to Dublin, occurred in 1698, when the Stillingfleet controversy was at its height.) Other critics were now entering the lists against the Hssay. One of the ablest was John Sergeant, a Catholic priest, in his Solid Philosophy Asserted Against the Fancies of the Ideists, in 1697. He was followed by Thomas Burnet and Dean Sherlock. Henry Lee, rector of Tichmarch, produced in 1702 a folio volume of notes on each chapter in the Zssay, under the title of Aztz-Scepte- cism; John Broughton dealt another blow in his Psycho- logia in the following year. About the same time too John Norris returned to the attack, if various passages in his Theory of the Ideal or Intelligible World. Locke was defended with vigour by Samuel Bolde, a Dorsetshire

clergyman. The Essay was all the while spreading over Europe, impelled by the great name of its author as the chief friend and philosophical defender of civil and re- ligious liberty. The fourth edition (the last while Locke was alive) appeared in 1700. It contained two important new chapters on “Association of Ideas” and “ Enthu- siasm.” What was originally meant for a third chapter was prepared but withheld. It appeared among Locke’s posthumous writings, under the now well-known title of Conduct of the Understanding, in some respects the most characteristic of his works. The French translation of the Essay by Pierre Coste, Locke’s amanuensis at Oates, was almost simultaneous with the fourth edition. The Latin version by Burridge of Dublin appeared the year after, reprinted in due time at Amsterdam and at Leipsic.

After 1700 Locke was gathering himself up for the end, in the rural repose of family life at Oates. The commission at the Board of Trade was resigned, and the visits to London ceased. Scriptural studies and

religious medita- tion engaged most of his available strength in the four years that remained. The Gospels had been much searched by him when he worked in theology years before. He now turned to the Epistles of St Paul, and applied the spirit of the Zssay, and the rules of critical interpretation which apply to other books, to interpret a literature which he still venerated with the submissiveness of the pious Puritans who surrounded his youth. The results of these studies were ready for the printer when he died, and were published about two years afterwards. A few pages on Jfzracles, written in 1702, in connexion with Fleetwood's essay, also appeared posthumously. More adverse criticism was now reported to him, and the Essay was formally condemned by the authorities at Oxford. "I take what has been done rather as a recommendation of the book," he wrote to his young friend Anthony Collins, a neighbouring Essex squire, then a frequent visitor at Oates, and afterwards a leader of free thought, '"'and when you and I next meet we shall be merry on the subject." One attack only moved him. In 1704 his adversary Jonas Proast unexpectedly revived their old controversy. Locke in consequence began a Fourth Letter on Toleration. The few pages in the posthumous volume, ending in an un- finished sentence, seem to have exhausted his remaining strength in the weeks before he died. Thus the theme which had employed him at Oxford more than forty years before, and had been his ruling idea throughout the long interval, was still dominant in the last days of his life. All that summer of 1704 he continued to decline, tenderly nursed by Lady Masham and her step-daughter. On the 28th of October he passed away, as he declared, "in perfect charity with all men, and in sincere communion with the whole church of Christ, by whatever names Christ's followers call themselves." The tomb of Locke may be seen on the south side of the parish church of High Laver, in which he often worshipped, near the tombs of the Mashams, and of Damaris, the widow of Cudworth, bearing a Latin inscription prepared by his own hand, At the distance of a mile are the garden and park where the manor house of Oates once stood, sur- rounded by a green undulating country, in the lanes of which the slender delicate figure, with the refined reflective countenance made familiar to us by Knoeller, was so often seen in the last years of the 17th century.

Locke’s history, combined with his writings, has made his intellectual and moral features not less familiar. The reasonableness of taking probability for our ultimate guide in all the really important concerns of life was the essence of his philosophy. The desire to see for himself what is really true in the light only of its reasonable evidence, and that others should do the like, was his ruling passion, if

the term can be applied to one so calm and judicial. ‘“T can no more know anything by another man’s understand- ing,” he would say, “than I can see by another man’s eyes.” The knowledge which one man possesses is “a treasure which cannot be lent or made over to another.” This repugnance to believe blindly what rested on autho- rity, as distinguished from what was seen to be sustained by self-evident reason or by demonstration or by good probable evidence, runs through his life. He is typically English in his reverence for facts, whether facts of sense or of rational consciousness, in his tendency to turn away from purely abstract speculation and merely verbal reason- ings, in his suspicion of mysticism, in his calm reason- ableness, and in his ready submission to truth, even when the truth was incapable of being reduced to system, pro- vided only that it served a human purpose. The delight he took in making use of his reason in everything he did, and a wise use of it too, was what his friend Pierre Coste found most prominent in Locke’s daily life at Oates. “He went about the most trifling thing always with some good reason. Above all things he loved order, and he had got the way of observing it in everything with wonderful exactness. As he always kept the useful in his eye in all his disquisitions, he esteemed the employments of men ouly in proportion to the good they were capable of pro- ducing; for which cause he had no great value for the critics who waste their lives in composing words and phrases, aud in coming to the choice of a various reading in a passage that has after all nothing important in it. He cared yet less for those professed disputants who, being taken up with the desire of coming off with victory, justify themselves behind the ambiguity of a word, to give their adversaries the more trouble. And whenever he had. to deal with this sort of folks, if he did not beforehand take a strong

resolution of keeping his temper, he quickly fell into a passion, for he was naturally choleric, but his anger never lasted long. If he retained any resentment it was against himself, for having given way to so ridiculous a passion, which, as he used to say, may do a great deal of harm, but never yet did any one the least good.” Large, “ round-about,” even prosaic common sense, with intellectual strength solidly directed by a virtuous purpose, much more than subtle or daring speculation sustained by an idealizing faculty, in which he was deficient, is what we find con- spicuous in Locke’s conduct, correspondence, and books. A defect in speculative imagination undoubtedly appears whien he encounters the vast and complex problem of human knowledge in its organic unity, and when he is obliged to recognize the need for philosophy as an additional inquiry to that within the scope of any one, or all, of the special sciences.

In the inscription on his tomb Locke refers to his printed works as the true representation of what he really was. They are concerned with Soc1aL Ponity, CHRISTIANITY, EDUCATION, and PH1LOsoPiryY. It may be convenient to arrange them under these four heads, in the order in which they were published, and then to give some account of his opinions under each head.

I. Socrat Pouiry.—(1) Epistola de Tolerantia, 1689 (translated into English in the same year). (2) Z’wo Treatises on Government, 1690 (the Patriareha of Filmer, to which the First Treatise was a reply, appeared in 1680). (8) A Second Letter concerning Tolera- tion, 1690. (4) Some Considerations on the Consequence of Lowering the Rate of Interest and Raising the Value of Money, 1691. (5) A Third Letter for Toleration, 1692. (6) Short Observations on a printed paper entitled, ‘‘ For Eneouraging the Coining of Silver Money in England, and after for Keeping it here,” 1695. (7) Further Considerations concerning Raising the Value of Money, 1695 (this was occasioned by a Report containing an ‘¢ Hssay for the Amendment of Silver Coins,” published that year by William Lowndes, a secretary for the Treasury ; Locke anticipates some later views in political economy). (8) A Fourth Letter for Toleration, 1706 (posthumous).

IJ. Curistianiry.—1. Zhe Reasonablencss of Christianity as delivered in the Seriptures, 1695. (2) A Vindication of the Reason-

ableness of Christianity from Mr Edwards's Reflexions, 1695. (3) A Second Vindieation of the Reasonableness of Christianity, 1697. (4) 4 Paraphrase and Notes on the Epistles of St Paul to the Galatians, First and Second Corinthians, Romans, and Ephesians. Lo which ts prefixed an Essay for the understanding of St Paul's Epistles by consulting St Paul himself, 1705-7 (posthumous).

Ili. Epucation.—(1) Some Thoughts coneerning Edueation, 1693, (2) The Conduet of the Understanding, 1706 (posthumous). (3) Some Thoughts concerning Reading and Study for a Gentleman, 1706 (posthumous). (4) Jnstrnetions for the Conduct of a Young Gentleman, 1706 (posthumous). (5) Of Study (written in France in Locke's journal, and published in L. King's Life of Locke in 1830).

IV. Pumosopuy.—(1) An Essay concerning Human Understand- ing, in four books, 1690. (2) A Letter to the Bishop of Woreester conecrning some passages relating to Mr Loeke's Essay of Human Understanding in a late Discourse of his Lordship's in Vindication of the Trinity, 1697. (3) Mr Locke's Reply to the Bishop of Worees- ter's Answer to his Letter, 1697. (4) Mr Locke's Reply to the Bishop of Woreester's Answer to his Seeond Letter, 1699. (5) A Discourse of Miracles, 1706 (posthumous). (6) An Examination of Father Malebranehe's opinion of Sceing all Things in God, 1706 (posthu- mous). (7) Remarks upon Some of Mr Norris's Books, wherein he asserts Father Malebranehe's opinion of Seeing all Things in God, 1720 (posthumous),

The following are Miscellaneous Tracts:—(1) 4 New Method of a Common Place Book, 1686 (this was Locke's first article in the Bibliotheque of Le Clerc; his other contributions to it are uncertain, except the Epitome of the Essay, in 1688). (2) The Fundamental Constitutions of Carolina (prepared when Locke was Lord Shaftesbury's secretary at Exeter House about 1673 ; remarkable for its recognition of the ae of toleration, and published in 1706, in the

posthumons collection). (3) Memoirs relating to the Life of Authony, First Earl of Shaftesbury, 1706. (4) Elements of Natwral Philosophy, 1706. (5) Observations upon the Growth and Culture of Vines and Olives, 1706. a Society which met once a Week, for their improvement in Useful Knowledge, and for the promotion of Truth aud Christian Charity, 1706. (7) A Letter from a Person of Quality to his Friend in the Country, published in 1875 (included by Des Maizeaux in his Colleetion of Several Picees of Mr John Locke's, 1720), and soon afterwards burued by the common hangman by orders from the Ilouse of Lords, was disavowed by Locke himself. It may have been dictated by Shaftesbury.

There are also various writings of Locke first biographies of Lord Haig and of Mr Fox Bourne.

Locke's numerous Letters to Thoynard, Limborch, Le Clere, Guenellon, Molyneux, Collins, Sir Isaac Newton, the first and the third Lord Shaftesbury, Lords Peterborough and Pembroke, Clarke of Chipley, and others, many of them unpublished, are models in their kind. They express the courtesy and humour which were natural to him, and his varied interests in human life. Those to Molyneux and Limborch in particular throw light on the Essay, and his works on Tolcration and Christianity. .

I. It has been truly said that all Locke's writings, even the Essay on Human Understanding itself, were 'occasional, and intended directly to counteract the enemies of reason and freedom in hisown age." This is obviously true of his works on Social Polity, written in an age when the principles of democracy and toleration were struggling with passive obedience and divine right of kings, and when even ''the popnlar assertors of public liberty were the greatest engrossers of it too." The state with Locke was the issue of free contract, and was not a natural organism. That the people, in the exercise of their sovereignty, have the right to govern themselves in the way they judge expedient for the common good, and that the civil government, whatever form it assumes, has no right to interfere with religious beliefs not expressed in actions inconsistent with civil socicty, is the essence of his political

philo- sophy. He based the ultimate sovereignty of the people on a virtual consent or eontract on the part of the people themselves to be so governed. The precise terms of contract, he allowed, might and should be acid by the sovereign people from time to time, in accommodation to ever changing circumstances. He saw that things in this world were in so constant a flux that no society long remained in the saine state, and that ‘the grossest absurdities” must be the issuc of “following custom when reason has left the custom.” With an English love of compromise in the working of political affairs, he was always disposed towards liberal] ecclesiastical concessions for the sake of religious unity and peace, and recom- mended obedience to the civil magistrate in all indifferent things in worship and government, not otherwise expressly determined by supernatural revelation.

His attack on Sir Robert Filmer in the First Treatise on Govern- ment was an anachronism, even when it was published; in the democratic principle argued for in the Second Treatise, while in advance of the practice of his age, he was anticipated by Aquinas and Bodin, as well as by Grotius and Hooker. His philosophical defence of the social rights of religious beliefs was the most original

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and important of his contributions to polity, and the most far-reach- ing in its ultimate assumptions. Locke had a more modest esti- mate of human resources, natural and supernatural, for forming true judgments in religion, and a less pronounced judgment of the im- morality of religious error, than either the Catholic or the Puritan, The toleration which he spent his life in arguing for meant a revolution from the absolute to a relative point of view in the theory of knowledge. It was a protest against those who in theology ‘*peremptorily require demonstration, and demand certainty where probability only is to be had.” he practice of universal tolera- tion amidst increasing religious differences was the most important application to the circumstances of

his own age of the theory about human knowledge which pervaded his Essay. This paradox is now a commonplace, and the superabundant argument and irony in the Letters on Toleration fatigue the modern reader. The change of opinion is more due to Locke himself than to any one else, The rights of free thought and liberty of conscience had indeed been pleaded for, on various grounds, throughout the century in which he lived. Chillingworth, Jeremy Taylor, Cudworth, Glanvill, and other philosophical thinkers in the Church of England urged toleration in the state, in conjunction with a wide comprehension in the church, on grounds which implied intellectual limitation and even un- certainty in religious matters. Puritan Independents and Baptists, like Owen, Goodwin, and Richardson, whose idea of ecclesiastical comprehension was dogmatic and narrow, were ready to accept sectarian variety within the state, on the ground that it was possible to have many religions in the land, but only their own form within their sect. The existence of separate Christian nationalities, on the other hand, was the only justification of separate religious socicties to the latitudinarian churchmen with whom Locke associated A ia each nationality they would have a comprehensive church eo- extensive with the nation. Locke went far to unite ina higher principle what was best in the broad Anglican and in the Puritan theories, while he recognized the individual liberty which has ever distinguished the national church of England. (a) In his reasonings for toleration he insists on the fact that all human theologics must consist more of belicfs determined on pre- sumptions of probability than of knowledge founded on what is eithcr self-evident or demonstrable in the light of reason. A_pro- found sense of the limits of human reason was at the bottom of his arguments for a tolerant comprelicnsion by the state and also by the church. He had no objections to a national establishment of some form of religion, provided it was comprchensive enough, and was really the nation organized to promote goodness, and not to protect the metaphysical subtleties by which professional theologians spoil the original simplicity of Christianity. The recall of the national religion to this primitive simplicity, he hoped, would make toleration of nonconformists unnecessary, as few would then remain to ask for it. (b) The speculative, and therefore individually and socially harmless, nature of most persecuted beliefs and forms of worship is another point

on which he insists. ‘No man is hurt because his neighbour is of a different religion fron: his own, and no civil society is hurt because its members arc of different rcligions from one another.” The more various our beliefs are, the more probable it becomes that a complete view of truth may by degrecs be reached at last by the human race. In the meantiine beliefs in religion concern the individual only and not society. To the atheist alone Locke absolutely refuses toleration, on the ground that the social bonds can have no hold over him, for “the taking away of God dissolves all.” If atheism means the denial that reason is the ultimate regulative principle in the universe, then the consistent atheist without doubt ‘dissolves all,’”-and must reject physical science even, as well as morality, in an absolute nescience, so that he is incapable of citizenship as one who is insane. In Locke’s own philosophy, as we shall see, the existence of God is represented as demonstrable, but the distinctive articles of Christianity are founded

only on presumptions of probability. He argued too against full

toleration to the Chureh of Rome, at least in the circumstances of the age in which the Tolcration Act was passed, on the ground of its allegiance to a foreign sovereign. (e) The unfitness of force as a means of sending the light of truth into a human mind is a third argument urged by Locke, founded on the psychology of human understanding. Persecution can only transform a man into a hypocrite ; belief must be formed by individual discernment of evidence. Apart from evidence, a man cannot command his own understanding ; he cannot determine arbitrarily what opinions he is to hold. Thus all Locke’s pleas for a universal toleration resolve at last into a philosophical view of the limits and origin of knowledge.

Il. The ee nalples which determined Locke’s social polity largely determined his way of looking at Christianity. His ‘‘latitudin-arianism” was really the result of an extraordinary reverence for truth, and of his perception that in matters of religion knowledge may be sufficient for practice while it falls far short of perfection and demonstration. He insists on referring questions in religion to the

reasoning individual, and never loses sight of the essential reasonableness of Christianity as the only ground on which it

ean rest. Locke accepted the Scripture as infallible with the reverence of a Puritan, but he did not, like so many Puritans, mean only Scripture as interpreted by himself. Confidence in Biblical infallibility was also combined in Locke with a distrust in the pre- tensions of ‘‘ enthusiasm,” which predisposed him to regard miracles as a criterion needed for distinguishing reasonable religious con- victions from mere ‘‘inclinations, fancies, and strong assurances.” Assent in religion as in every thing else he could only justify on the grounds of its evident rationality; ‘‘illumination without search, and certainty without proof and without examination,” was to him a sign of the absence of the divine spirit. Fanatical confidence that we are right, he would say, is no proof that we are right ; when God makes us assent to the truth of a proposition in religion, he either discovers to us its intrinsie rationality by the ordinary mcans of scientific insight, or offers miraculous signs, of the existence of which we nlust have sufficiently probable presumption. Reasonableness somehow must at last be our guide. His own faith in Christianity rested on its moral excellence when it is rightly understood in its rimitive simplicity, and on the extraordinary signs in nature which be believed to have accompanied its first promulgation. ‘‘ Even in those books which have the greatest proof of revelation from God, and the attestation of miracles to confirm their being so, the miracles,” he says, ‘‘are to be judged by the doctrine, and not the doctrine by the miracles.” All this sort of argument became commonplace in books about the ‘‘ evidences” in the 18th ccutury. The Reasonableness of Christianity was an attempt to recall religion from verbal reasonings of theological schools, destructive of peace among Christians, to its original simplicity, but it no doubt involved an abatement of its transcendent mystery and ultimate incompre- hensibility. The book was probably written to promote a com- prelicnsion of the dissenters. All who practically acknowledge the supremacy of Jesus as the Messiah accept all that is essential to the Christianity of Locke, whatever other theological ie they may

individually or collectively add to this only catholic one. Christian teachers and apologists in the succeeding age, as well as the assailants of Christianity, alike appealed to the Essay on Human Understanding, and the catholie tradition of Anglican theology was thus interrupted in the church for more than a hundred years. His own Christian belief, sincere and earnest, was more the outcome of the sort of common sense sagacity which through him moulded the prudential theology of England in the 18th century, than of the nobler elements present in More, Cud- worth, and other religious philosophers of the preceeding age, or afterwards in Law and Berkeley, Coleridge and Schleiermacher. III. Locke takes his place in the succession of great writers on the theory and art of Education. His educational writings might be regarded either as an immediate introduction to or as an applica- tion of the Zssay on Human Understanding. In his T'houghts on Education imaginative sentiment is never allowed to weigh against prudential utilitarianism ; information and mere learning are subordinated to the formation of character and practical wisdom ; the part which habit plays in individuals is always kept in view ; the dependence of conscious mind, which it is the purpose of edu- cation to improve, upon the health of the corporeal organism is steadily inculecated ; to make those happy who are undergoing education is a favourite precept ; accumulating facts in the memory without using the power to think, and without accustoming the youthful mind to apply reason to the evidence by which individual thoughts must be tested, is always referred to as the cardinal vice in teaching. Wisdom more than learning is what he requires in the teacher. In the knowledge to be communicated he gives the first place to ‘‘ that which may direct us to heaven," and the second to "the study of prudence, or discreet conduct and management of our- selves in the several occurrences of our lives," which most assists our " quiet prosperous passage through this present life." The infinity of knowable existence in contrast with the narrowness of human understanding and experience is always in his thoughts. This *‘ disproportionateness " is one reason given for due deliberation in the choice of studies, and for declining those which lie out of the way of a really wise man, however much they may have been favoured by custom. Among these last he warns especially against ‘‘ that maze of words and phrases which have been employed

only to instruct and aniuse people in the art of disputing, and which will be found perhaps, when looked into, to have little or no meaning, . . . words being of no value nor use, but as they are the signs of things ; when they stand for nothing they are less than ciphers, for, instead of augment- ing the value of those they are joined with, they lessen it and make it nothing." Knowledge of what the opinions of other men have been is another study which Locke depreciates. ‘‘ Truth needs no recommendation, and error is not mended by it; in our inquiry after knowledge it little concerns us what other men have thought. .. . It is an idle and useless thing to make it one’s business to study what have been other men’s sentiments in matters where reason is only to be judge.’ Realism and individual rationality are two essential educational principles with Locke. In his Conduet of the Understanding the pupil is to be led to the point at which "a full view of all that relatcs to a question " is to be had, and at

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which alone a rational discernment of the truth is possible. The uneducated mass of mankind, on the contrary, either ‘seldom reason at all," or else ‘‘put passion in the place of reason," or ‘‘ for want of large, sound round-about sense" they direct their minds only to one part of the evidence, ‘‘couverse with one sort of men, read but one sort of books, and will not come in the hearing of but one sort of notions, and so carve out to themselves a little Goshen in the intellectual world, where light shines, and, as they conclude, day blesses them ; but the rest of the vast expansion they give up to night and darkness, and avoid coming near it." It is a treatise on the wisdom needed for the management of the individual mind, so as that it may overcome the idola or common tendencies to error against which Bacon had warned mankind. Hasty judg- ment, bias, or want of an a priori ‘‘ indifference" to what evidence may require us to conclude, undue regard for authority or love for custom and antiquity, indolence and sceptical despair, are among the states of mind marked by him as most apt to interfere with the formation of our individual thoughts in harmony with the Universal Thought that is latent in nature. The development of vigorous intellect in each person is the aim of this admirable tract.

IV. The LZssay Concerning Human Understanding contains Locke's Metaphysical Philosophy. It was the first attempt, on a great scale, and in the Baconian spirit, to show the certainty and inadequacy of human knowledge. This enterprise seemed to Locke to hold out the most reasonable hope of a solution of some sort for the perplexities which encompassed every department of in- quiry.

; The Introduction to the Zssay is the keynote to the whole. The ill fortune of mankind in their endeavours to comprehend them- selves and their surroundings is there attributed to their disposition to extend their inquiries into matters beyond the reach of our intelligence, letting their thoughts wander into depths whcre we can have no footing. ‘‘ Whereas, were the capacities of our under- standings well considered, the extent of our knowledge once dis- covered, and the horizon found which sets the bounds between the enlightened and the dark parts of things, between what is and what is not comprehensible by us, men would perhaps with less scruple aequiesce in the avowed ignorance of the one, and employ their thoughts and discourse with more advantage and satisfaction on the other.” To inquire into ‘‘the original, certainty, and extent of human knowledge, together with the grounds and degrees of belicf, opinion, and assent,” is Locke's own account of the design of his Essay. He expressly excludes from his inquiry ‘‘ the physical con- sideration of the mind,”—the natural causes (and, one might add, the transcendental reasons) for our conscious experience being what in his own ‘ plain historical method” he might find it to be. He wanted to be able to make a faithful report, based on what he actu- ally found, as to how far a merely human understanding of the universe can extend, to what extent human beings can share in pure knowledge, and ‘‘in what cases they can only judge and guess' on grounds of probability. Although his report might show that the knowledge attainable by the individual must be ‘‘ narrow,” and far short of a ‘‘ universal or perfect comprehension of what- soever is,” it might also convince us that it is “ sufficient,” because ‘‘suited to our individual state.” The 'light of reason,” the 'candle of the Lord” that is set up in us, “shines bright enough for all our purposes. If we will disbelieve everything because we cannot certainly know all things, we shall do much as wisely as he who would not use his legs, but sit still

and perish because he had no wings to fly." Locke thus opens his Essay ina tone which, with a more homely checrfulness, reminds one in parts of the sublime conceptions of Pascal, and in others of the wise moderation of Bishop Butler. The outcome is that, if it should tum out on investigation that human understanding cannot solve the meta-physical problem of the universe, we may at least find that at no stage of our individual existence are we the sport of chance or of

'an evil power,—that there is a way by which we can secure our

final wellbeing, even within the inexorable causal connexions, con-ditioned by space and time, with their imperfectly calculable issues, by which we are environed.

The fourth book alone is concerned directly with the professed design of the Essay. It has been suggested by Stewart that Locke may have cominenced with this book, especially as it contains few references to preceding parts of the Essay, so that ''it might have been published separately without being less intelligible than it is." The inquiries in the preceding books are of a more abstract and schol- astic nature, which probably opened gradually on his mind as he studied his subject more closely. The second and third books both relate to our iudividual ideas or thoughts. That each person has thoughts, and that without thoughts or consciousnesses there could be no knowledge for him, is Lovke's postulate. This, he presumes, "will be easily granted"; for "every one is conscious of ideas in himself, and men's words and actions will satisfy him that they are in others." Questions about knowledge and its extent therefore presuppose questions about ideas or thoughts. But our miere ideas are, as Locke reminds us, '' neither true nor false, being nothing but bare appearances in our own minds." Truth

and falsehood belong only to the assertions or denials of the mind. The idea of a centaur has no more falschood in it, when it appears in our minds, than the name centaur has falsehood in it when it is pronounced

by our mouths, or written on paper. Truth and falseliood lie always in affirmations or negations, aud the mere

‘ thoughts of which as individuals we happen to be conscious are

not per se either true or false. They do not become either real knowledge or error ‘‘ till the mind affirms or denics somcthing of them.”

That none of our knowledge is ‘‘innate” is the conclusion argued for in the First Book. But the drift of this famous argu- ment has been overlooked by Locke’s critics. It has been criticized as if it was a metaphysical discussion about the existence of trans- cendental elements in human knowledge, like that at issue in the present day between empiricism and intellectualism. If it were so it would be an example of the fallacy of irrelevant conclusion. For this Locke himself is no doubt partly responsible. It is not casy to determine who or what he had in view in this polemic. Lord Her- bert alone is made prominent as the defender of innatcness, and Locke was perhaps too little read in the literature of ancient and modern philosophy to do full justice to those who, from Plato downwards, have recognized the intuitions of rcason as well as the phenomena of sense in the constitution of knowledge. The positions which he assails would have been disclaimed by the most eminent defenders of the transcendental elements. ‘‘ Innate,” as Lord Shaftesbury says, ‘‘is a word Mr Locke poorly plays on,’’—at least if he is to be understood as engaged in an intel- lectual struggle against Plato or Descartes. ‘‘The right word, though less used, is connatural. For what has birth, or the progress of the fetus, to do in this case?” The real question, as Shaftesbury adds, is not about the time when the supposed innate knowledge cntered, but ‘‘ whether the coustitution of man be such that, being adult and grown up, the ideas of (rational) order and ad- ministration of a God will not infallibly and necessarily spring up in him.” But this Locke himself does not deny. ‘‘That there are cer- tain propositions,” we find him saying, ‘‘ which, though the soul from the beginning, or when a man is born, does not know, yet, by assistance from the outward senses, and the help of some previous cultivation, it may afterwards come certainly

eer the truth of, is no more than what I] have affirmed in my first book" (see '¢ Epistle to Reader," in second edition). This further appears from the fact that, although the Hssay opens with an attack on innateness in human knowledge, yet the self-evidence, in the light of edueated reason, of inuch that we know is asserted elsewhere not less strennously. Much of our knowledge he reports in the fourth book to be reached by purely rational insight and demon- stration. What he really argucs against in the first book is that any of it should be supposed to have a claim to protection against a free criticism of its reasonableness. He argucs there against the innateness of our knowledge of God and of morality; yet in the fourth book he reports, as a result of his search into our rational consciousness, in the '' plain historical method," that the existence of God is a couceauaile rational conclusion, involved in that causal necessity without which there could be no knowledge at all ; and he maintains in various places that morality may be found to be as demonstrably necessary as mathematics. The two posi- tions are quite consistent. The demonstrable rational necessity of these and other sorts of knowledge often remains latent, he might say, in the share of reason that is potentially present in indi- viduals, and therefore cannot be called '' innate" knowledge; but, for all that, such truths ''carry their own evidence along with them" in every mind that is rationally awake. Even in the first book he appeals to what might be called common reason, which he calls *f comnion sense." ''He would be thought void of common sense who asked, on the one side, or, on the other, went to give a reason, why ' it is impossible for the same thing to be and not to be.' It carries its own light and evidence with it, and needs no othcr proof ; he that understands the terms assents to it for its own sake, or else nothing else will ever be able to prevail with him to do it" (bk. i. chap. 8, § 4). The truth is neither Locke nor the intellectualists of the 17th century expressed their meaning with enough of precision; if they had, Locke's first book would probably lave taken a form more consistent with its true intention. It is really to be read as an energetic argumentative protcst against anything in human knowledge being supposed to be independent of rational criticism. Locke believed that in attacking innate principles he was really substituting conscious self-evidence and rational demonstration instead of blind repose on

authority, and was thus, as he says himsclf, not ‘‘ pulling up the foundations of knowledge,” but “laying those foundations surcr.” Truth is to be found in ‘‘the eontemplation of things themselves,” that is, by actual rational insight on the part of each individual. But when men heard of ‘‘some general propositions that could not be doubted as soon as understood,” it wasa short and easy way to eon- clude that such propositions are ‘‘innate,” and that a personal

erception of their rational self-evidence is unnecessary. This cing once received, ‘‘it eased the lazy from the pains of scarch,

and stopped the inquiry of the doubtful coneerning all that was once styled innate.” Dogmas became protected against rational criticism. ‘‘1lt was no smal] advantage to those who affected to be masters and teachcrs to make this the principle of principles—that principles must not be questioned.” The mcre assumption that they are ‘‘innate” was enough ‘“‘to take men off the use of their own reason and judginent, and to put them upon believiug and taking upon trust without further examination. ... Nor is it a small power it gives a man over another to have the authority to make a inan swallow that for an innate principle which may serve his pur- pose who teachcth them” (bk. i. chap. 4, § 24). Locke’s examina- tion of the way in which the rational consciousness of self-evident truths is actually reached refers them to ‘‘the being of things themselves duly considered, and to the application of those faculties that are fitted to receive and judge of them when duly employed.” Thus the reasoning which runs through the first book is a return, in a more general and therefore more philosophical way, to that defence of individual rational insight against blind dependenee on authority which was offered in the Letters on Toleration.

The Second Book opens with the suggestion of a general proposi- tion regarding the genesis and constitution of ideas or thoughts ; it closes after a laboured endeavour to verify it. This hypothetical proposition is that all human thoughts, even the most complex and abstract, are due to ‘‘experience.” If so, the significanec of all abstract words, and the objective truth of all individual thoughts, must be tested by the

elements of which ‘‘ experience” consists, and cannot in any instance claim protection against this test.

The important point is what ‘‘ experience ” consists of. Locke says that it all comes cither from external sources or from the mind itself; and he promises to show that even our most abstract thoughts, which seem to reach to infinity, may be traced to one or other or both of these constituents. In his own words, our most ‘*complex ideas” are all made up of ‘‘simple idcas,” either from without or from the mind ; they are due to phenomena of which we are percipient in the five senses, or clse due to reflexion upon ‘‘the operations of mind.” The ‘‘verification” of this position, in the central chapters of the second book, is to the effect that even those thoughts which are ‘‘ most abstruse, how remote soever they may seem from sense, or from any opcrations of our minds, are yet only such as the understanding frames to itself by repeating and joining together ideas that it had either from objects of sense, or from its own operations about objects of sense,”—so that even large and abstract ideas are derived from one or other of the two sources (bk. ii. chap. 12, § 8). For this purpose our thoughts of space, time, infinity, power, substance, personal identity, causality, and several others which ‘‘ seem most remote from the supposed original,” are examined one aftcr another, in the ‘‘ historical plain method,” and their complex constitution is resolved into (a) perceptions of things external, through the five senses, or into (b) perccptions of operations of our own minds.

The source of experience which depends upon the five senses Locke calls sensation ; the other, through which mind is reflectively aware of its own operations, he calls reflexion. This last, ‘‘ though it be not sense, as having nothing to do with external objects,” is yet, he says, ‘“‘ very like it, and might properly enough be called internal sense.” The suggestion that ‘‘sense” might designate both the springs of experience is misleading, when we find in the sequel how much Locke tacitly credits ‘‘ reflexion” with,—in the way of rational tendencies and intellectual obligations ; it may be ob- jected to on grounds like those on which the somewhat analogous employment by Reid and others of ‘‘ common sense” for common reason has been condemned.

They both mean to say that we may call that ‘‘sense” in which reason at onee carries the light of its own evidence, and does not even admit of external proof. Reason in its own cvidence is thus analogous to what sense is popularly assumed to be. The elasticity of Locke’s language in explaining his thesis makes the most opposite interpretations of the Essay possible, and all we can do is to compare one part with another, and in doubtful cases to give him the bencfit of the doubt. His vacillation in the use of words is unfortunate. It was partly caused by a determination to avoid rigid technicality and pedantry. ‘“Sensation ” for instance is, in one definition, confined to ‘‘ im- pressions or motions made in some part of the body which produce perceptions in the understanding” (bk. ii. 1, § 28); yet, when treated as one of the two springs of experience, it is made equivalent to what philosophers now call sense-pereeption, while ‘‘ reflexion ” tums out to be another name for self-conseiousness. Accordingly, although the second book is professedly limited to the examination of our ideas or thoughts only, it by implication makes the (pro- visional) assumption that the ‘‘ ideas” of which we are conscious 1n “sensation” are at the same time to be regarded as ‘‘ qualities” of sensible things which in some sort of way exist ‘ without us,” and also that the successive ‘‘ operations” presented in ‘‘reflexion ” are those of an individual mind, presumed to exist somehow independ- ently of them. Locke thus starts as a common sense perceptionist, and likewise relicves himself of the difficulty of having at the outset to show how the data abstracted by each sense are united in real

things and persons. In order to make his theory work, he begins by assuming a hypothetical duality beneath phenomena,—some phenomena referable to external things, others referable to the conscious self,—and in fact confesses that this dual experience is the ultimate fact, the denial of which would make it impossible to speak about the growth and constitution of our thoughts.

In the early chapters of the second book, the ‘‘ simple ’’ thoughts into which he promises to resolve all possible ‘‘ complex ” ones are

arranged in classes. Some of them, he reports, are conditioned ** by one sense only," as colours by sight, or heat, eold, and solidity by touch; others " by more senses than one," as space or extension and motion, which are perceivable both by the eyes and by touch ; a third class are got from reflexion only, when " the mind turns its view inward upon itself," and by this means we get our ideas of perception or thinking itself, and also of willing, as well as the *'modes of these two," such as remembrance, discerning, reason- ing, knowledge, faith, &c.; lastly, there are simple ideas which we have both from sensation and reflexion, for instance, our thoughts of bodily and mental pleasures and pains, as well as thouglits of existence, unity, power, and succession. Such, aceording to Locke, are the elements of the sublimest human thoughts. While the mind is becoming gradually stored with simple ideas like these (which are, however, somehow complex for us, when we " are conscious of them"), we find a growing power to elaborate them for ourselves at pleasure in an almost infinite variety ; we are in fact obliged to do this in our tentative endeavours inductively to bring the thoughts of our individual minds into harmony with the actual complexity of thought that is presented to us in the order of nature. " But it is not in the power of the most exalted wit or enlarged understanding to invent or frame any new simple idea not taken in in one or other of these two ways,"—in proof of which Locke would have any one try to fancy any taste which had never affected his palate, or to frame the thought of a scent he had never smelt; and when he can do this he is ready to concede that a born blind man has ideas of colours, and a born deaf man notions of sounds.

The contrast and correlation of these two fountains of indi- vidual experience is suggested in the eighth chapter of this book, on the " qualities" of matter, in which we are introduced to a noteworthy vein of speculation running through the Essay.

'*something yet more remote from our comprehension." For, not knowing what size, figure, and texture of parts they are on which depend and from which result those qualities which make our complex

idea, for example, of gold, ‘‘it is impossible we should know what other qualities result from, or are incompatible with, the same constitution of the insensible parts of gold, and so consequently must always coexist with that complex idea we have of it, or else are inconsistent with it.”

Some of the most remarkable chapters in the second book are these which relate to the verification of its initial proposition. They carry us towards the metaphysical mysteries which so attract meditative minds. The hypothesis that our most complex thoughts are all resolvable into ‘‘experience” is tested in these chapters by the modes or modifications, and substantiations, and relations which, in various degrees of complexity, we find ourselves someliow obliged to make the simple phenomenal thoughts of sense and reflexion undergo. Such, for instance, are the thoughts of finite quantity in space and time and number, in which Locke reports that we find ourselves mentally impelled towards immensity, eternity, and the innumerable, that is to say, towards Infinity, which transcends quantity ; the complex thought of Substance, towards which he reports that we find ourselves impelled in another of the ‘‘ opera- tions of our minds,” when the simple phenomena of the senses have to be regarded as powers or qualities of ‘‘something”; the thought of the Identity of individuals, involved in the apparently inconsistent idea of their constant phenomenal changes ; and, above all, the mental tendeney we find we somehow have to suppose what we call a ‘‘ Cause”’ whenever we observe a change. Let us see how Locke deals with these crucial instances.

He dwells much on our ideas of Space, Succession, and Number. The first he says begins to appear when we use our senses of sight and touch; the second he finds ‘‘ suggested ” by all the phenomena of sense, but still more by ‘‘ what passes in our minds”’ ; the third is ‘*suggested by every object of our senses, and every thought of our minds, by everything that either doth exist or ean be imagined.” The modifications of which these three sorts of simple ideas are susceptible he reports to be ‘‘inexhaustible and truly infinite, extension alone affording a boundless field to the mathematicians.” In his own patient judicial way, he finds many curious analogies between spaceand time.

Neither is limited by the world of indivi- dual things. We can imagine space without bodies, but we cannot pereeive or imagine bodies without space. Places and periods are all relative to objects and events, but both space and time are absolutely indivisible. A trinal space extends in all directions, while time has only one dimension. All things exist in the same present time, while no two things oecupy the same space. The parts of time cannot be thonght to coexist ; the parts of space cannot be thought to succeed one another. Whether the thought of unoccu- pied space is the thought of a substance or of an attribute Locke professes that he eannot tell, at least till they that ask show him ‘ta clear distinct idea of substance.”—But the real mystery whieh he has to report of these thoughts of space and time is that ‘‘some- thing in the mind” hinders us from imagining any limit to either. We find ourselves, when we try, obliged to lose our positive thought of space in the negative thought of Immensity, and our positive thought of time in the negative thought of Eternity. We have never seen, and we cannot mentally imagine, an object whose extent is boundless. Yet we find when we reflect that there is an ‘operation of the mind” which somehow forces us to think that rat and time have no limits. ‘‘I would fain meet with that thinking man that can in his thoughts set any bounds to space more than he can to duration” (§ 21). Thus Locke by implication acknowledges something added by the mind to the originally pre- sented “‘simple ideas” of extension and succession, though he explains that what is added is not positively imaginable. When we reflect on our thoughts of immensity and etcrnity, we find them to be thoughts, yet negations of all imaginable thought; and that whether we proceed by addition or by division. He chiaracteristi- cally accepts the fact; he does not inquire why mind should find itself thus obliged to add without limit, and to divide without limit. He simply reports that immensity and eternity are inevitable negative ideas, and that every endeavour to transform them into positive or imaginable ones only issues in the contradictory attempt to represent as a bounded quantity what is really infinite or beyond quantity. The idea of the infinite, or unquantifiable in extent and in succession, has so far, he finds, ‘‘something that is resolvable into the simple positive ideas of space and time.” For, when we try to think of the infinite in space or duration, we at first usually make some very large idea (imaginable in

itself, though by men unimaginable), as perhaps of millions of miles or ages, which possibly we multiply millions of millions of times. All that we thus ainass in our thoughts is positive (i.c., imaginable in its nature, although not imaginable by a human mind). But at the end of this we are as far from the infinite reality as we were at the beginning, so that what lies beyond the imaginable idea fowards the infinite lies ‘‘in obscurity, and has the indeterminate sion of a negative idea” — irresistible and incomprehensible, | *

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Locke, with all his aversion to what is unrepresentable in forms of coexistence and succession, is too faithful to rational facts to overlook these mysterious elements of our rational experience. His integrity is also illustrated in his acknowledgment of the un- imaginable, and in this sense incognizable, in our thought of Sub- stance. He tries to phenomenalize it ; but he finds that it cannot be phenomenalized, and yet that we cannot dispense with it. An unsubstantiated succession of phenomena, without a centre of unity to which thcy are referable, is unintelligible; we could not have a language consisting only of adjectives. Locke had an obscure apprehension of this intellectual obligation as a fact of rational consciousness. According to his report, ‘‘the operations of the mind” oblige us to suppose something beyond phenomena, to which as qualities phenomena must belong ; but he was honestly perplexcd by the ‘confused negative” thought of this ‘‘some- thing,” which was all that he could reach, and of which he says we ‘neither have nor can have any positive idea either by sensation or reflexion.” The word substance thus means ‘‘ only an uncertain supposition of we know not what” (i. 4, § 18). All attempt to realize it is like the attempt to realize immensity or eternity, and we are involved in an endless—inevitable yet incomprehensible —regress. If one were to ask what the substance is in which this colour and that taste and smelling ‘‘inhcre,” and was told that they belong to the solid and extended parts, or primary qualities, of the thing, he must again ask

what their substance is, and so on for ever. ‘He would be in a difficulty like the Indian, who, after saying that the world rested on an elephant, and the elephant on a broad-backcd tortoise, could only suppose the tortoise to rest ou ‘something, 1 know not what.’” try either to phenomcnalize our thought of substance or to dispense with it. He finds that our only positive complex ideas of sub- stances are these in which we imagine an aggregate of attributes ; it is only thus that we can rise to any positive thought even of God, in ‘*the power we have of enlarging indefinitely some of the idcas we receive from scnsation and reflexion ’”’ (ii, 23, § 33). Why we must be in this strange mental predicament with regard to our thought of substance, Locke characteristically did not inquire. He reported the fact in his own ‘‘plain historical way.”

e struggled bravely to be faithful to facts in his report of the not unlike mental predicament in which we find ourselves when reflexion awakens in us the conviction of our own Individuality and continued personal sameness. The paradoxes of expression in which he gets involved in the chapter on ‘‘personal identity” are evidence of this. He mixes the thought of our actual indi- vidual personality, given in our consciousness of something external to self, and above all in our moral experience of responsible agency, with the negative thought of the transcendental relation of sub- stance, which, when we try to phenomenalize it, becomes “an uncertain supposition of we know not what.”

But we must pass on to his report about our thoughts of Causality and Power, especially as his theory of real knowledge in the fourth book is very much an application of the principle of causality. The intellectual demand for the cause of an event is what we find we can- uot help having, and yet it isa demand for what in the end we cannot grasp in a phenomenal representation. ‘I’he eausal thought in the form of power very much perplexed Locke, in his famed chapter on that idea (21); the perplexity is not so obvious in the sections on ‘* cause and effect,” in another chapter (26), where he eonsiders only the circumstances in which this relational thought arises.

Locke traces the thought of ‘‘cause and effect” back to our ‘*constant observation ” that ‘‘ qualities and finite substances begin to exist, and receive their existence” from other beings which produce them. Seeing, for instance, that, ‘‘in the substance which we eall wax, flwidity is eonstantly produced by the applica- tion of a certain degree of heat, we somehow eome to think of heat as the cause and fluidity as the effect.” This is to report what happens in our minds when we observe a particular example of that causal connexion which gives intelligibility to successive phenomena, converting them into the concatenated system which we call the universe. Through calculated observations we, in this way, learn that this is the cause of that, and that such as this is the cause of such as that. But Locke’s words in the 26th chapter do not explain the rational necd for this causal expectation. Any- thing, as far as ‘‘eonstant obscrvation” tells us, might have becn the eause of anything; no finite numbcr of instances of an ** observed” seyuence—in the strict meaning of the term ‘‘observa- tion “—ean guarantee its universality. Elsewhere, indeed, he adds to this meagre account the important statcment that ‘‘ our clearest idea of power is got through our consciousness of our own voluntary agency, and therefore through reflexion” (chap. 21). Bodily pheno- mena he there reports to be incapable of presenting originative agency, this being an idea which eannot be phenomenalized in external sense. In changes among bodies we observe no origina- tion, but only phenomenal order—significant and therefore intcr- pretable phenomena. The thought of the “production” of motions is connected with what we are conscious of when we excrt volition. Locke here approaches the view of power afterwards taken by

We must fail, in short, when we.

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Berkeley, which was the constructive principle of Berkeleyan philo- sophy. But neither Locke nor Berkeley explains the transformation of our moral consciousness of ourselves, as free or originative, and therefore, to this extent, responsible agents, into the universal rational principle, on which both proceed in explaining our know-

ledge of the real existence of God and of the sensible world,

Locke’s language sometimes suggests that the transformation is made through an induction that is either instinctive or produced by custom. Now, not to say that every inductive gencralization presupposes causal connexion, the particular fact that this, that, or the other person, through his moral experience, finds himself a frce cause, does not, consistently with inductive rules, warrant the universal conclusion that the phenomenal changes of the universe must all be referred to power like our own personal power. That we are somehow obliged to think a caused or phenomenal cause, and ultimately an uncaused or free agent, of every change—that we are obliged to view changes as events or issues from adequate productive causes into which they may be refunded—is vaguely accepted in the Zssay as a fact of rational consciousness ; but no explanation is given of its origin, only of the circumstances in which it arises in the individual mind. The inquisitive reader still asks why the individual mind is obliged to think back all changes into sufficient causes of which they are the issues, and why each set of antecedent phenomena, into which we thus refund new phenomena, themselves occasion a fresh intellectual, demand for a preceding cause, while, after all, the mind is still left dis- satisfied until it rests in a truly originative or unconditioned cause, And yet if the intellectual need for a phenomenal cause were with- drawn there could be no rationality in, and therefore no reasoning possible about, Nature; for all the physical government of the universe depends upon it ; and again, if uncaused or unconditioned power were withdrawn there could be no moral responsibility or moral government. This sort of reductio ad absurdwm of every merely empirical analysis of the causal thought into what is strictly observable was foreign to Locke. His aversion from mysticism may have made him pass slightly over the mystery of an experi- ence that like ours is conditioned by relations of place, which lead to the unimaginable thought of Immensity, of succession, which lead to the unimaginable thought of Eternity, and of change, which lead to the unimaginable thoughts of Substance and Power.

Locke’s book about our individual ideas or thoughts leads natu- rally to his Third Book, which is especially about those of them that are

general and abstract, and their connexion with language. It is here that he describes ‘abstract ideas”; here also he illus- trates the confusion apt to be produced in our thoughts by the imperfections of language.

But we must pass on to the Fourth Book, about knowledge, which closes the Essay. Knowledge, he says, is perception or discernment of relations among our thoughts ; real knowledge is discernment of their relations to what is objectively real. In his books about our “ideas” he had dealt with ‘‘simple apprehensions”; here he is concerned with ‘‘judgments” and ‘‘reasonings,” and largely with judgments and reasonings about mattcrs of fact. At the end of the long and patient research among our mere thoughts or simple apprehensions, he supposes his reader apt to complain that he has been ‘‘all this while only building a castle in the air,” and to ask what the purpose is of all this stir about our thoughts, or our knowledge either, if we are not thereby carried beyond our own individual thoughts, and must accordingly regard our own. fancies as the universe. ‘‘If it be true that knowledge lies only in the agreement or disagreement of our own ideas, the visions of an enthusiast and the reasonings of a sober man will be equally certain. It is no matter how things themselves are” (iv. 4, § 1). This is the keynote of the fourth book. It does not, however, carry him into an analysis of the rational constitution of know- ledge as knowledge, as it would carry a transcendentalist of the 19th century, or even an associative philosopher. Transcendental analysis is too remote from huian affairs to interest Locke. Huwe, moreover, had not yet shown the difficulties which sceptical ingenuity could suggest against those facts of rational consciousness which Locke accepted without analysis. The sceptic who doubted the very constitution of reason and experience, because it could not be supported by external proof, was less in_ his view than minds blindly resting on authority or on irrational instincts. Universal scepticism like Hume’s he would at any rate probably have regarded as a frivolous amusement, into which no human mind could permanently subside, and therefore unworthy of the serious attention of a wise man. What he wanted was to awaken a conscious conviction of principles apt to be dormant in the individual, but to which he believed a respouse must be given when reflexion was called forth. He was careless as to how far these principles might be

developed into a reasoned system of speculative philosophy. ‘‘ Where we perceive the agreement or disagreement of any of our ideas there is certain knowledge ; and wherever we are sure these ideas agree with the reality of things, there is certain real knowledge” (chap. 4, § 18). He is anxious throughout to show that a great deal of commonly supposed real

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knowledge is not cntitled to be called ‘‘ knowledge,” and that it fs merely presumption more or less probable. Instead of the imme- diate or the demonstrable insight, which alone is what he intends by knowledge, it is only ‘‘assent,” ‘‘opinion,” “probability.”

Locke’s report about human knowledge and the narrow extent of it is contained in the first thirteen chapters of the fourth book. The remainder of the book is concerned for the most part with what he found when he examined instances of ‘‘assent”’ or reason- able presumption, so liable to error, but on which human life really turns, as he and Butler are fond of reminding all transcendentalists. He takes for.granted that ‘‘all the knowledge we have or are capable of” must be discernment of one or other of four sorts of agreement or disagreement among our thoughts themselves, or between our individual thoughts and the reality that is inde- pendent of them. All that can be conceivably known must be either (a) relations of identity and difference in what we are conscious of, that, for instance, ‘‘ blue is not yellow”; or (6) this thought being mathematically related to that, as, for instance, that ‘“‘two triangles upon equal bases between two parallels must be equal”; or © that one quality does or does not coexist with another in the same substance, as that ‘‘iron is susceptible of magnetical impressions”; or (d) that a thought has a real objective existence, independent of our individual mind, as that ‘‘ God exists,” or the ‘earth exists.” What would now be called merely analytical know- ledge exemplifies the first sort; mathematical (Locke would add moral) knowledge represents the second ; physical and natural science, if this can become knowledge proper at all, would eome under the third head; metaphysical knowledge forms the fourth. The third and

several following chapters of this concluding book of the Essay are really an inquiry, under these four heads, how far knowledge is possible for man in mathematics, and in morality ; about nature or natural phenomena in relations of coexistence and succession ; and about the hyperphenomenal reality of our own existence, the existence of God, and the existence of matter.

Locke found a difference among the examples of what “knowledge” is that were offered in his natural experience. In some instances the known relation was at once evident, as when he judged that a circle was not a triangle, or three more than two and equal to one and two. In other cases the known relation was perceived only through the medium of something else, as in a mathematical con- clusion, in which each step is taken by a rational intuition. The former is rationally intuited and the latter rationally demonstrated knowledge. In strictness all knowledge or rational certainty, he would have it, is in one or other of these two kinds. There is, however, a third sort of certainty which rather puzzled him. He found that ‘our perceptions of the particular existence of finite beings without us” go beyond mere probability, although they are not examples of rational necessity. There is nothing contradictory to reason in the supposition that our sense-perceptions are illusory, although we are, in fact, incapable of doubting their reality. We find ourselves ‘‘ inwardly conscious of a different sort of percep- tion,” when we look on the sun by day and only imagine the sun at night. This, which is Locke’s third sort of knowledge, might be called sense-perception. The difficulty that a ‘‘sense-perception ” only of the present moment, divorced from the past and the future, can be other than ‘‘ blind,” or irrational, does not occur to him.

Locke next inquired to what extent a human knowledge—in the way either of intuitive or demonstrative rationality, or of sense perception —is possible in regard to each of the four (already men- tioned) sorts of knowable relation in which must be contained all knowledge we can be supposed capable of. Our knowledge must of course be confined within our ‘‘ideas”; for it is self-evident that we cannot have knowledge of a thing if consciousness is dormant. But there is only one of the four sorts of knowable relation in regard to which our

knowledge is coextensive with our thoughts. The only knowable relation which he finds to be coextensive with his thoughts is that of ‘‘ identity and diversity” ; we cannot be con- scious at all without distinguishing, and every affirmation implies negation. The second sort of knowable relation—purely rational concatenation among our thoughts—is intuitively and also de- monstrably discernible in thoughts about quantities, in forms of space, time, and number; it is through this discernment that the mathematical sciences are constructed. Morality too, Locke thinks, as well as quantity, is capable of being thus rationalized. ‘Where there is no property there is no injustice,” he offers as an example of a proposition ‘‘ as certain as any demonstration in Euclid.” Only we are more apt to be biassed, and thus to have reason withdrawn from us, in dealing with problems of morality than in dealing with those of mathematics. Mankind might in consequence, in questions of morals, ‘‘ with Egyptian darkness expect Egyptian bondage, were not the candle of the Lord set up by himself in their minds” (ch. 4, § 20). It is not easy to say whether the mathematics and morality which Locke finds thus demonstrable would be, as understood by him, sciences of what Kantists call analytical judgments founded on arbitrary definitions, or sciences consisting of synthetical judgments @ priort.

In turning from mathematical and moral relatious to those of

coexistence and succession among phenomena,—Locke’s third sort of knowable relation, —he finds the light of pure reason disap- pear, although the relations in question are those in which ‘‘the greatest and most important part of what we desire to know” consists. Of relations of this third kind, with which all the physical and natural sciences are concerned, he reports that ‘‘our knowledge is very short, if indeed we have any at all,” and are not wholly thrown on presumptions of greater or less probability, or even left in ignorance. According to the philosophy of the Hssay “there can be no science of bodies.” All physical and natural science depends on a knowledge of the relations between the secondary qualities and other powers of bodies on the one

hand, and the primary or mathematical qualities of their atoms on the other, or else ‘‘on somcthing yet more remote from our comprehension.” Now, asa rational insight of these relations, either intuitively or through demonstration, is beyond our reach, we must be satisfied with inductive presumptions, which the completest ‘* vérification ” leaves, after all, only presumptions that more facts inight prove to be unwarranted. Our inductive generalizations about particular things must always involve an element of possible error, or at least inadequacy, and therefore of probability only. Arbitrariness of connexion, and not rational necessity, reigns over the whole realm of physical government, with its relations of constant coexistence and succession ; we only presume, as reasonably as we can, what its actually established laws are, and we can only presume that these laws are sustained in a steady and uniform government. The presumption is ‘‘sufficient for our purposes.”

The ainount of our knowledge under Locke’s faith eategory of knowable relations—those of real metaphysical or metaphenomenal existence—is reduced, in his report, to—(a) rational perception of our own individual existence as conscious persons ; (0) the demon- strable rationality of the existence of God or Supreme Mind ; and (c) sense-perception of the existence of particular objects—as long as, but only as long as, they are actually present in sense. That each individual person exists is manifested to himself in memory, and no certainty beyond that of each passing thought while it passes ean be greater than this. ‘‘If I doubt all other things,” says Locke, after Descartes, “‘that very doubt makes me perceive my own existence, and will not suffer me to doubt of that” (iv. 9, 3). The eternal existence of God or Supreme Reason is with Locke only another way of expressing the prineiple of causality and suffi- cient reason in its universality, as suggested by our conviction that our own personal existence had a beginning. Each individual per- son knows that he now exists, and is convinced that he once had a begiuning ; with not less intuitive certainty of reason he knows that ‘‘nothing can no more produce any real heing than it can be equal to two right angles.” The finai rational conclusion is that there must be eternally ‘‘a most powcrful and most knowing Being, in which, as the origin of all, must be contained all the

perfec- tions that can ever after exist," and out of which can come only what it has in itself, so that, as the adequate cause, it must involve mind. There is thus a rational necessity for Eternal Reason, or what we call God. He cautiously adds elsewhere, ‘‘ Though I call the thinking faculty in me ‘mind,’ yet I cannot, because of that name, equal it in any thing to that infinite and incomprchensible Being which, for want of right and distinct conceptions, is called ‘mind’ also, or the eternal mind."

Turning from the metaphysics of religion to the metaphysics of matter, nearly—but perhaps not quitc—all that one can affirm or deny about things external to us is, according to Locke, not knowledge but only presumptive trust. We have on the whole no knowledge of the real existence of anything other than our own individual existence, that of Universal Reason, and that of par- ticular objects of sensc—while, but only while, they are present to our senses. ‘* When I see an external object at a distance, a man for instance, I cannot but be satisfied of his existence while I am looking at him. (Locke might have added that when one thus ‘""seesa man" it is only his visible qualities that are perceived ; for his other qualities are as little ‘actual present sensations’ as if he was out of the range of the senses altogether.) But when the man leaves me alone, I cannot be certain that he still exists. There is no necessary connexion betwecn his existence a minute since (when he was present to my sense of sight) and his existence now (when he is absent from all my senses); by a thonsand ways he may have ceased to be. I have not that certainty of his continued existence which we call knowledge; though the great likelihood of it puts it past doubt. But this is but probability and not knowledge" (chap. 11, § 9). Either a rationally intuitive or a rationally demonstrative scienee of Nature is thus, according to Locke, impossible. A conception of the co- existences and successions of phenomena which form the external world being essentially the natural expression of the Universal Mind, and therefore capable of being reasoned about by our individual minds, in our gradual scientific progress towards agree- ment between the objective thought in nature and our subjective thoughts, was too speculative and mystical for Locke. He prefers to urge the matter-of-fact consideration that all our interpretations

of nature can be only presumed probabilities—not purely rational certainties. For him the vast region of reality—beyond our im- mediate sense-perceptions, memory, and the demonstrably ncces- sary causal connexion with Universal Mind—is either presumed probability, grounded on faith, or clse it is within that veil which separates what is behind it from reasonable belief as well as from knowledge. And he even fails to explain how anything at all above the world of sense can be ‘‘ known” in a sense-perception that is restricted to the transitory ‘‘actual present sensation” of each moment. No past events and no future events can be known in the strict mcaning of ‘‘ knowledge.” It is unreasonable to demand a knowledge of more than abstract propositions and present momentary experiences. For the rest, we can only gradually con- vert beliefs into certainties that are absolute for all practical purposes. Snch is the outcome of the Essay.

We might expect to learn from Locke something as to the rationale of the probable presumptions by which, as supplementary to our limited knowledge of real existence, we pass beyond the narrow sphere within which that knowledge is confined, according to his report of it, and possess ourselves so far of the unperceived past, distant, and future, in our experimental reasonings. He does little to satisfy us here. The concluding chapters of the fourth book contain judicious advice for human beings, whose lives are passed in a world of probabilities and presumptions, for avoiding the conse- quent risks of error or misiuterpretation in their reasonings about what they see,—with or without the help of syllogism, the function of which, as an organ of discovery, he criticizes in the seventeenth chapter. Nothing is done to connect ‘‘ probable” interpretations of the contingent phenomena of existence with the rational relations involved in the knowable part of its constitution, with which the preceding chavters were occupied.

This subject was resumed by Hume, very much at the point where Locke left it. With a still humbler view of the possible extent of human knowledge than Locke’s, Hume proposed as a subject ‘‘ worthy of

curiosity," to inquire what is ''the nature of that evidence which assures us of any real existence and matter of fact, beyond the present testimony of our senses and the records of our memory," remarking that ''this part of philosophy has been little cultivated either by the ancients or the moderns." The result of the inquiry was his announcement that Custom and the associative tendencies are a sufficient practical explanation of the formation of our experience. All beyond each present transitory ''impression" is connected with it, through ''ideas,'' by means of Custom and Association. Hume's solvent, in the form either of individual or of inherited associative tendency, has since been made the philosophical explanation of all humau experience in the Empirical Philosophy to which his Inquiry conducted. As for Locke, the "association of ideas"—either in the individual or as inherited—was not alluded to in the first edition of the Essay. The short chapter on the subject—now found at the end of the second book—was introduced in the second edition, not as in any way philosophically explanatory either of the thoughts or of the knowledge and probable beliefs of en, but as the chief source of human prejudices—as a cause of hunian errors against which men, dependent largely on probable presumptions, need in an especial manner to be warned. This useful chapter was an afterthought caveat, regarding a tendency which Locke saw was apt to spoil the ''quality" of our individual thoughts,—apt, if one may put it so, to make them inconsistent with the Universal Thought fitont in nature, by which our personal thoughts about what the laws in nature are must be tested.

On the other hand, an analysis like Kant's of what is abstractly implied in knowledge is cven more foreign to the design of Locke, and to the tone of his philosophy, than the attempts of 18th and 19th century associationists and evolutionists to account for know- ledge as if it were a fact of physical science. To show, in the case of any self-evident conception or judgment, that without it know- ledge could not exist at all, would be to show what Locke took for granted, for all the purposes he had in view. His aim was to determine to what extent experience, presumed to be rationally constituted, could come within the individual consciousness of man. On the one hand, to analyse in the abstract the rational constitution of knowledge, into which he

found that man is able only very partially to subdue the universe, or, on the other hand, to seek for the physical causes of its (partial) realization in the human individual, were neither of them inquiries properly included in his enterprise.

Locke's function was to present to the philosophical mind of the modern world, in his own ''historical plain method," the largest assortment ever made by any individual of the actual facts of sense consciousness and rational consciousness in man. The further investigation of these facts, in Germany on the Transcendental Method, in England and France on the Empirical Method, as well as, by Butler and Reid, in Locke's own Common Sense Method— all under the stimulus of Hume's sceptical analysis—has employed philosophers since the Essay on Human Understanding collected materials for speculation.

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Literature.—The Essay concerning Human Understanding, which was thus the philosophy of Locke's own life, and also of the century which followed, has passed through more editions than any similar book of ancient or modern times, Before the middle of the 18th century it had reached a thirteenth, and it has now passed through some forty editions, besides being translated into Latin, French, Dutch, German, and modern Greek, in various versions. There are also several abridgments, in which the attempt is made to reinove some of its innumerable repetitions. A considerable philosophical library might be formed out of the criticisms and comments to which it has given rise in the last hundred and ninety years. In addition to those which appeared when Locke was alive, some of which are mentioned above, among the most important are Leibnitz's Nouveaux Essais sur ' Entendement Humain—written about 1700 and published in 1765, in which each chapter of the Essay of Locke is examined in a corre- sponding chapter; Cousin's "Ecole Sensualiste: Systeme de Loeke," in his Histoire.de la Philosophie au XVIII, Siécle, 1829; and the recent criticisms in Professor Green's Introduction to the Philosophical Works of dfume, 1874. The Letters on Toleration, Thoughts on Education,

and Reasonableness of Chris- tianily have also gone through many editions, and been translated into different languages. The first eollected edition of Locke's Works was in 1714, in three folio volumes. The best edition is that by Bishop Law, in four quartos, 1777, The one most eommonly known is in ten volumes, 1812. The Essay, as well as the other treatises, needs textual revision and critical annotation.

The loge of Le Clere:(Bibliothégue Chotsie, 1705) has been the basis of the memoirs of Locke prefixed to the successive editions of his Works, and contained in the biographical dictionaries. In 1830 a Life of Locke, in two volumes, was published by his descendant Lord King. This adds a good deal to what was previously known, as Lord King was able to draw from the mass of corre- spondence, journals, and commonplace books of Locke in his possession. 1n the same year Dr Thomas Foster published some interesting letters from Locke to Benjamin Furley. The most copious account of the details of Locke's life is contained in the two volumes by Mr Fox Bourne (1876), which are the results of laborious and faithful research in the Shaftesoury Papers, Locke MSS. in the British Museum, the Public Record Office, the Lambeth, Christ Chureh, and Bodleian libraries, and in the Remonstrants' library at Amsterdam, (A. C.F.)

LOCKHART, Joun Gipson (1794-1854), was born in the manse of Cambusnethan in Lanarkshire, where his father, Dr Lockhart, was minister. His mother was daughter of the Rev. John Gibson, minister of St Cuth- bert's, Edinburgh. In 1796 his father was transferred to Glasgow, where John Lockhart was reared and educated. He derived his rare abilities from his mother, and his first regular teaching from the High School of Glasgow. He appears to have been from the first distinguished as a clever, but by no means industrious boy. Like most clever boys he read everything that came in his way ; and what he had once devoured he never forgot ; for his memory was so retentive that, in after life, like Macaulay and Sir George Lewis, he seldom found it necessary to verify a passage for quotation. No livelier boy than John Lockhart ever lived ; in or out of school his sense of fun and humour, expressed in joke, sarcasm, and pencil caricatures, was irrepressible.

At the same time, however merry and mischievous, he was a proud and reserved boy; and this was the side he mostly turned to the outer world as a man. The struggle between a very affectionate nature and a determination not to show his feelings, or perhaps an incapacity to give way to them, cost him dear. A younger brother and sister were carried off within a few days of each other. John appeared to bear the loss like a stoic, but he fell seriously ill, and had to be removed finally from the High School. On his recovery, though still under twelve years of age, he was entered at college, where he sketched the professor for the amusement of his com- panions, as he had sketched the masters before. When examination time came, he astonished all by a display of erudition, especially in Greek authors, of the acquisition of which he had given no signs ; a Snell exhibition, just vacant at Oxford, was accordingly offered to him and accepted.

Lockhart was not turned fourteen when he was entered at Balliol College, but he soon asserted his character and his powers. His fun and satire made him at once popular and formidable, while beyond the regular studies of the place he acquired a great store of extra knowledge. He read French, Italian, German, and Spanish, was curious in classical and British antiquities, and well versed in heraldic and genealogical lore. Lockhart went up to the schools in the Easter term of 1813—not nineteen years of age—and, notwithstanding the most audacious employ- ment of part of his time in caricaturing the examiners, he came out first in classics.) The name of Henry Hart Milman, a subsequent friend through life, stood next his.

For mathematics he never had the least inclination.

LOH

He now quitted Oxford, and before settling to the study of Scottish law, for which his father had designed him, he indulged a long cherished wish to visit Germany. His knowledge of German had introduced him to the great band of poets and scholars who had suddenly exalted the fame of German literature. Lockhart had no means to undertake the journey ; but here his reputation came to his aid. A proposal to translate Frederick Schlegel’s Lectures on the Study

of History was accepted by Mr Blackwood, and the price of the labour paid before a line was written. Lockhart always spoke of this as a most generous act on “ Ebony’s” part, and his friendship with the liberal publisher lasted through life. He meanwhile paid his visit to Germany, was introduced to Goethe at Weimar, traversed France and the Netherlands, made careful observations on pictures and architecture, and returned to Edinburgh to study law by the time he was twenty-one. In 1816 he was called to the bar. But he had no friends among writers and attorneys, his brilliant powers of conversation did not comprise that of public speaking, and few, if any, briefs came in. His habits of observation, however, turned the time to a use afterwards exemplified in Peter’s Letters.

Edinburgh was then the stronghold of the Whig party. The Edinburgh Review was their organ, and it was not till 1817 that the Scotch Tories found a national channel of assertion and defence—namely, in Blackwood’s Magazine. This periodical held its way dully enough with its first numbers, when suddenly an outburst of wit and ridicule directed against the hitherto unchallenged writers of the Whig party, surpassing them in cleverness and equalling them in personalities, electrified the Edinburgh world. Wilson (Christopher North), Hogg (the Ettrick Shepherd), and Lockhart had joined the staff, and retaliation for long pent-up wrongs began. Lockhart’s pen contributed scholarly papers on various subjects, including hearty criticism and eulogium on Coleridge, Wordsworth, and other victims of a Review which could find only scant praise even for Walter Scott. His translations also of the Spanish ballads appeared for the greater part in Blackwood. But his pen was more often dipped in caustic, dealing out attacks and recriminations which led to regrettable con- sequences. Meanwhile the gifted and handsome young man, for Lockhart’s head was cast in the highest type of brilliant manly beauty, had attracted the notice of Walter Scott. They met first in 1818. The acquaintance soon ripened into friendship, and that friendship led to the union between Lockhart and Scott’s eldest daughter, Sophia, in April 1820. For more than five years after his marriage Lockhart tasted the best form of domestic happiness. Winters spent in Edinburgh and summers at a cottage fitted up for them at pretty Chiefswood, near Abbotsford, gave

the young couple the constant enjoyment of friendship, society, and even worldly distinction, added to the blessing of a perfect home. At Chiefswood Lock- hart's two eldest children, John Hugh and Charlotte, were born; Walter, later, at Brighton.

Between 1818, when he joined the Blackwood staff, and 1825 Lockhart's pen was indefatigably at work. As early as 1819 Peter's Letters to his Kinsfolk appeared. Like Goldsmith's Citizen of the World, these profess to give the impressions of a stranger in a new country. Dr Peter Morris, a Welsh physician, passes some time in Scotland, especially in Edinburgh, and describes the men and manners very freely to his relations at home. His descriptions of the chief notabilities of the day have a certain historical, almost antiquarian interest, though now the least interesting part of the work. What we enjoy most is the reflexion of a young and ardent mind dealing out opinions and estimates far beyond its years, the cor-

rectness of which time has singularly verified. The amount of reading too which crops out in every page is amazing; a perpetual play of allusions, quotations, and happy nicknames—for which Lockhart to his last days was famous—is given with a raciness of tone of which the reader might tire, but for the simple, vigorous English in which it is clad. A chapter on dandies is a chef d'ceuvre in its way. That a work describing the appearance and | idiosyncrasies of many living individuals should give offence was a matter of course. His description of the northern universities was not likely to please; while for the unsparing ridicule and ruthless quizzing heaped ou the General Assembly—'" men," he is supposed to have said, "of like passions with ourselves, but worse manners" —it would be strange indeed if the author had escaped with impunity.

Valerius, a Roman Story, followed next (1821). As Valerius was intended to illustrate the manners and customs of Rome in the time of Trajan, so Reginald Dalton, published in 1823, aimed at exhibiting the life of an undergraduate at Oxford as he had known it. Lockhart's strength did not lie in novel writing, and, to those who read Reginald

Dalton now, the digressions of the author are far more interesting than the adventures of the hero. But a plot of simpler construction and intenser passion showed Lockhart's strength to greater advantage. Adam Blair (1822) is a tale of temptation, fall, and repentance, each fearful in its way, told with tremendous power, and as far removed from all that is morbid and false in senti- ment as the author was himself. It gave great offence to the Scottish Church, for the erring man is a minister, and the scene is laid in a Scottish manse.

In 1826, on the death of Mr Gifford, the editorship of the Quarterly Review was offered to Lockhart, and accepted. He was singularly free in position, however far from idle. He was next heir to Milton Lockhart, the property of his unmarried half-brother, who eventually survived him; the legal profession to which he had been destined was virtually abandoned; and time had shown him that the party strife which prevailed in Edinburgh was demoralizing to both sides. This last conviction did the most to reconcile him to the separation from all Scottish surroundings. His friends gave him a farewell dinner, when, labouring with strong feelings, and with his habitual dislike or incapacity to express them, he said, on returning thanks, " You all know that I am no speaker ; had I been, there would have been no occasion for this parting."

The conduct of a great periodical like the Quarterly Review is the touchstone of a man's capacity, knowledge, and temper. Looking back to an editorship which lasted twenty-eight years, it must be admitted that Lockhart maintained a high position in all these respects. He con- tributed largely to the Review himself, his biographical articles being especially admirable. He also found time, being a very glutton in work, for many a paper in Blackwood ; he wrote what remains the most charming of the biographies of Burns; and he undertook the superintendence of the series called Murray's amily Inbrary, which he opened in 1829 with a Life of Napoleon. But his chief work was the Life of Walter Scott, a task at once of love and duty. Lockhart knew the greatand good man as no one else did, and felt that, whatever the mistakes in judgment, no life from first to last could better afford complete revelation. There have not been wanting those in Scotland

who have taxed him with ungenerous exposure of his subject, but to most healthy minds the impression conveyed by the biography was, and is, one of the most opposite kind—namely, that Lockhart has almost deified Scott. The labour incurred was in so far one of love, inasmuch as the writer reaped

no part of its considerable proeeeds, but resigned them absolutely for the benefit of Scott's creditors.

Lockhart's life in London was a long succession of con- stant work, of dignified social success, and of heavy bereave- ments. His eldest boy, the suffering "Hugh Littlejohn" of the Tales of a Grandfather, died in 1831. Sir Walter died in 1832; Anne Scott, the second daughter, who had come to live with the Lockharts in London, in 1833; Mrs Lockhart in 1837. The love for his children was for long the one bright element in his life. But the death in 1852, and, sadder still, the previous life, of his surviving son Walter, a fine youth, who had entered the army under unfortunate auspices, broke down all that remained of health and spirit in the father.

Failing health compelled Lockhart to resign the editor- ship of the Quarterly Review in 1853. He spent the next winter in Rome, but returned to England with no restoration of vital power. He was conveyed to Abbotsford, where, under the tender care of his daughter Mrs Hope Scott, and cheered by the prattle of his grand- daughter, now the possessor of Abbotsford, he lingered till his death, November 25, 1854. He was buried in Dry- burgh Abbey, at the feet of Walter Scott. (E. EB)

LOCKPORT, capital of Niagara county, New York, about 21 miles cast of Niagara Falls, at the point where the New York Central Railroad crosses the Erie canal. It takes its name from the locks (ten in number) by which the canal is lowered 66 feet from the level of Lake Erie to that of the Genesee river ; and its prosperity as a manu- facturing centre is due to the water-power. The sur- rounding country is a rich agricultural district, and in the vicinity are extensive limestone

and sandstone quarries. Flour-mills are prominent among the industrial establish- ments; there are also numerous saw-mills, cotton and woollen factories, foundries, &c. Lockport was made a eity in 1865. The population in 1870 was 12,426; in 1880, 13,522. The buildings in the business part of the city are generally heated by steam on the Holly dis- tributing system, which originated in Lockport, as did the celebrated Holly water-works system.

LOCLE, Lg, a large town-like village of Switzerland, in the canton of Neuchatel, 10 miles W.N.W. from Neuchatel. Along with La Chaux de Fonds, 5 miles north-east, it is the seat of the most extensive watch-making industry in the world; and it also carries on the domestic manufac- ture of lace. The valley in which Le Locle is situated used to be subject to inundation, but in 1802-6 a tunnel was construeted by which the surplus waters of the Bied discharge into the Doubs. About a mile to the west of the town the stream plunges into a deep chasm, and on the almost vertical face of the rock are what are usually called the subterranean mills of Cul des Roches, situated one above the other, to turn tlie water-power to account. The population of the commune was 10,464 in 1880.

LOCRI, a people of Greece who are found in two different districts, on the AZgean coast opposite Eubcea and on the Corinthian Gulf between Phocis and Adtolia. The former are divided into the northern Locri Epicnemidii, so called from Mount Cnemis, and the southern Locri Opuntii, whose chief town was Opus; but the name Opuntii is applied to the whole district by Thucydides, Herodotus, &c. Homer knows no distinction of tribes among the Locri. They were considered by Aristotle to bea Lelegian tribe ; but they became Hellenized at an early time, and rank in Homer along with the other Greek tribes before Troy. Their national hero is Ajax Oileus, who often appears on coins. The Locri Ozole on the Corinthian Gulf were a rude and barbarous race who make no appear- ance in Greek history till the Peloponnesian War. It is

tions before the Trojan war, but Homer does not mention

them. The most probable view is that the Locri were once

a single race spread from sea to sea, that subsequent im- migrations forced them into two separate districts, and that the eastern Locri advanced with the growth of civi- lization, while the remote Ozole remained ignorant and barbarous.

A colony of Locrians, probably Opuntians, though Strabo expressly calls them Ozolz, settled at the south- west extremity of Italy about the end of the 8th century B.c. They are often called Locri Epizephyrii from the promontory Zephyrion 15 miles south of the city. The earliest and most famous event recorded in the history of the Italian Locri is the legislation of Zaleucus about the middle of the 8th century B.c. The Locri boasted that Yaleucus was the first of the Greeks to promulgate a written code of laws.

LOCUS, in Greek rézros, a geometrical term, the inven- tion of the notion of which is attributed to Plato. It occurs in such statements as these:—the locus of the points which are at the same distance from a fixed point, or of a point which moves so as to be always at the same distance from a fixed point, is a circle; conversely a circle is the locus of the points at the same distance from a fixed point, or of a point moving so as to be always at the same distance from a fixed point ; and so in general a curve of any given kind is the locus of the points which satisfy, or of a point moving so as always to satisfy, a given condition. The

| theory of loci is thus identical with that of curves; and

it is in fact in this very point of view that a curve is con- sidered in the article Curve; see that article, and also Grometry (ANALYTICAL). It is only necessary to add that the notion of a locus is useful as regards determinate problems or theorems: thus, to find the centre of the circle circumscribed about a given triangle ABO, we see that the circumscribed circle must pass through the two vertices A, B, and the locus of the centres of the circles which pass through these two points is the straight line at right angles to the side AB at its mid-point; similarly the circumscribed circle must pass through A, C, and the

locus of the centres of the circles through these two points is the line at right angles to the side AC at its mid-point ; thus we get the ordinary construction, and also the theorem that the lines at right angles to the sides, at their mid-points respectively, meet in a point. The notion of a locus applies, of course, not only to plane but also to

said that they separated from the eastern Locri four genera- | solid geometry. Here the locus of the points satisfying a

single (or onefold) condition is a surface ; the locus of the points satisfying two conditions (or a twofold condition) is a curve in space, which is in general a twisted curve or curve of double curvature,

LOCUST. In its general acceptation this term is strictly applicable only to certain insects of the order Orthoptera, family Acrydiidz (see Insmcts); and it is advisable to reiterate that according to modern classifica- tion the family Zocustide is now viewed in a sense that does not admit of what are popularly termed “locusts” being included therein. We universally associate with the term the idea of a very destructive insect ; therefore many orthopterous species that cannot be considered true locusts have had the term applied to them; in North America it has even embraced certain Hemiptera-Homoptera, belonging to the Cicadidx, and in some parts of England cockchafers are so designated. Ina more narrow definition of the term we are wont to associate with the destructive propensities the attribute of migration, and it therefore becomes necessary that a true locust should be a migratory species of the family Acrydiide. Moreover, the term has yet a slightly different signification as viewed from the Old or New World. In Europe by a locust is meant an insect of large size, the smaller allied species being ordinarily known as “grasshoppers,” hence the notorious “ Rocky Mountain locust” of North America is to Eastern ideas rather a grasshopper than a locust.

In Europe, and a greater part of the Old World, the best known migratory locust is that which is scientifically termed Pachytylus migratorius, to which is attached an allied (but apparently distinct)

species known as P. cinerascens. Another locust found in Europe and neigh- bouring districts is Caloptenus ctalicus, and still another, Acrydium peregrinum, has once or twice occurred in Europe (even in England in 1869), though it can only be considered a straggler, its home (even in a migratory sense) being more properly Africa and Asia, These practically include all the locusts of the Old World, though a migra- tory species of South Africa known as Pachytylus pardalinus (presumed to be distinct from P. migratorius) should be mentioned. The Rocky Mountain locust of North America is Caloptenus spretus, and in that continent there occurs an Acrydium (A. americanum) so closelyallied to A. peregrinum as to be scarcely distinct therefrom, though there it does not manifest migratory tendencies. In the West Indies and Central America the absolutely true A. peregrinum is also reported to occur.

As to general biology, a few words will suffice. The females excavate holes in the earth in which the eggs are deposited regularly arranged in a long cylindrical mass en- veloped in a glutinous secretion. The young larvee hatch, and immediately commence their destructive career. As these insects are "'hemimetabolic" (see [Nsxcts), there is no quiescent stage ; they go on increasing rapidly in size, and as they approach the perfect state the rudiments of the wings begin to appear. Naturally in this stage they are incapable of flight, but their locomotive powers are never- theless otherwise extensive, and their capacity for mischief very considerable, for their voracity is great. Once winged and perfect these powers become infinitely more disastrous, redoubled by the development of the migratory instinct. The laws regulating this instinct are not yet perfectly understood. Food and temperature have a great deal to do with it, and there is a tendency for the flights to take a particular direction, varied by the physical circumstances of the breeding districts. So likewise it is certain that each species has its area of constant location in which it always exists, and its area of extraordinary migration to the extremes of which it only occasionally extends. Per- haps the most feasible of the suggestions as to the causes

of the migratory impulse is that locusts naturally breed in dry sandy districts in which food is scarce, and are thus

impelled to wander in order to procure the necessaries of life ; but against this it has been argued that swarms bred

in a highly productive district in which they have tem- porarily settled will seek the barren home of their ancestors. Another ingenious suggestion is that migration is intimately connected with a dry condition of the atmospliere, urging them to move on until compelled to stop for food or procreative purposes. The distance particular swarms may travel depends upon a variety of circumstances, such as the strength of impulse, the quantity of food, and many other causes. Certain it is that 1000 miles may, in particular cases, be taken as a moderate estimate; probably it is often very much less, certainly sometimes very much more. As a rule the progress is only gradual, and this adds vastly to the devastating effects, which may he likened to those caused by a foreign army levying black-mail upon the inhabitants of an invaded country through which it is marching. When an extensive swarm temporarily settles in a district, all vegetation rapidly disappears, aud then hunger urges them on another stage. Such is their voracity that it has been tolerably well ascertained that the large Old World species, although undoubtedly phytophagous, are often compelled by hunger to attack at least dry ani- mal substances, and even cannibalism has been asserted as an outcome of the failure of all other kinds of food. The length of a single flight must depend upon circumstances. From certain individual peculiarities in the examples of Acrydium peregrinum that were taken in England in 1869, it has been asserted that they must of necessity have come direct by sea from the west coast of Africa; and what is probably the same species has been seen in the Atlantic at least 1200 miles from land, in swarms completely covering the ship, and obscuring the air; thus, although it is no doubt usual for the swarms to rest during the night, it undoubtedly happens in certain cases that flight must be sustained for several days and nights together. The height at which swarms fly, when their horizontal course is not liable to be altered by mountains, has been very variously estimated at from 40 to 200 feet, or even in a particular

case to 500 feet. A “dropping from the clouds” is a common expression used by observers when describing the apparition of a swarm. ‘The extent of swarms, and the number of individuals in a swarm, are matters that must of necessity be purely speculative. That the sun may sometimes be utterly obscured, and the noise made hy the rustling of the wings be deafening, is confirmed by a multitude of observers. We prefer to decline the attempt to grapple with so vast a subject,—not unnaturally so when one observer says of a particular swarm that, when driven out to sea and drowned, the dead bodies washed up formed a bank 50 miles long and 3 or 4 feet high.

No special periodicity appears to have governed these flights (which, it is necessary to state, happily do not occur to an alarming extent every year), still an American writer (Mr Thomas) makes the interesting remark that the interim between the years of superlatively extra-ordinary appearance is both in Europe and America ‘very nearly a multiple of 11.”

In Europe the best known and ordinarily most destructive species is Pachytylus migratorius (fig. 1), and it is to it that the numerous records of devastations in Europe mainly refer, but it is probably not less destructive in many parts of Africa and Asia. Eastern Europe, and especially the plains of southern Russia, appear to be more especi- ally liable to its attacks. That the arid steppes of Central Asia are the home of this insect appears probable; still much on this point is enveloped in uncertainty. In any case the area of permanent dis- tribution, according to Képpen (who published an elaborate memoir on the subject in 1871), is enormous, and that of occasional distri-

bution is still greater. The former area extends from the parallel of 40° N. in Portugal, rising to 48° in France and Switzerland, and

passing into Russia at 55°, thence continuing across the middle of Siberia, north of China to Japan; thence south to the Fiji Islands, to New Zealand, and North Australia; thence again to Mauritius and over all Africa to Madeira. But Képpen remarks that the southern

distribution is uncertain and obscure. Taking exceptional distribution, it is well known that it occasionally appears in the British Isles, and has in them apparently been noticed as far north as Edinburgh ; so also does it occasionally appear in Scandinavia, and it has probably been seen up to 63° N. in Fin- land. Looking at this vast area, it is easy to conceive that an element of uncertainty must always exist with regard to the exact determination of the species, and in Europe especially is this the case, because (as before stated) there exists an apparently distinct species, known as P. cinerascens, which Koppen docs not take into

Fic. 1.—Pachytylus migratorius.

This and the other figures are all natural size.

account. This latter species is certainly the most common of the ‘‘locusts’’ occasionally found in the British Isles, and De Selys-Longchamps is of opinion that it breeds regularly in Belgium, where-as the true P. migratorius is only accidental in that country. In the case of this, as of all other locusts, it is impossible within the limits of this article to chronicle even the years of greatest abund- ance. That they are probably as destructive now as formerly appears within the bounds of belief. At any rate we read that only a year or two ago a detachment of Russian soldiers in Turcomania was so beset that a stampede at last took place, and eventually the men were held prisoners by the insects forty-eight hours until the villagers killed them and carried them away for manure, locomotion being as difficult as if the men had been on ice.

Acrydium peregrinum (fig. 2) can scarcely be considered even an accidental visitor to Europe ; yet it has been seen in the south of Spain, and, most extraordinarily, in many examples spread over a large part of England in the year 1869. ‘It is a larger insect than P. migratorius. No serious attempt to define the range of this species has yet been made, but there is every reason to believe that it is the most destructive locust throughout Africa and India and other parts of tropical Asia, and its ravages are not one whit less important than are those of P. migratorius. Presumably it is the species that, on more than one

occasion, has been noticed in a vast swarm in the Atlantic, very far from land, and presumably also it occurs in the West Indics and some parts of Central America. But

“sit has been already remarked that A. americanwm of North

America, although so closely allied as to be scarccly distinguish- ible, is said not to be migratory, and is therefore scarcely a true

‘‘locust.” In the Argentine Republic a (possibly) distinct species (A. paranense) is the migratory locust.

Caloptenus italicus (fig. 3) is a smaller insect, with a less extended area of migration ; and, though from this cause its ravages are not so notable, still the destruction occasioned in the districts to which

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Fig. 2.—Acrydium peregrinum.

it is limited is often scarce less than that. of its more terrible allies. It is essentially a species of the Mediterranean district, and especially of the European side of that sea, yet it is also found in North Africa, and appears to extend far into southern Russia.

Fig. 3.—Caloptenus ttalicus.

Caloptenus spretus (fig. 4) is the ‘‘Rocky Mountain locust” or ‘*hateful grasshopper ” of the North American continent. Though a comparatively small insect, not so large as some of the grass- hoppers of English fields, its destructiveness has procured for it within the last twenty years a notoriety scarcely excelled by that of any other. It is only recently that the persistent migration of American settlers westward extended into the home of this creature. Travellers and prospectors in these regions had previously spoken of enormous swarms of a destructive grasshopper as existing there, and no doubt

these occasionally extended into regions already civilized, but the species was not recognized as distinct from some of its non-migratory congeners to which it is so closely allied as to require a practised entomological eye to separate it therefrom. As time drew on, the various ‘‘State entomologists” made it their special duty to report on the insect, and at length, in 1877, the matter had become so scrious that Congress appointed a United

States Entomological Commission to investigate the subject, and report upon the best (if any) means of counteracting the evil effects of the pest. The result, so far as published, consists of two enormous volumes, teeming with information, and taking up the whole subject of locusts both in America and the Old World. C. spretus has its home or permanent area in the arid plains of the central region east of the Rocky Mountains, extending slightly into the southern portion of British North America ; outside this

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Fria, 4.—Rocky Mountain Locust (Caloptenus spretus). a, a, a, female in different positions, ovipositing; 6, egg-pod extracted from ground, with the end broken open ; ¢, a few eggs lying loose on the ground ; d, ¢ show the earth partially removed, to illustrate an egg-mass already in place, and one being placed; # shows where such a mass has been covered up. (After Riley.)

is a wide fringe to which the term sub-permanent is applied, and this is again bounded by the limits of only occasional distribution, the whole occupying a large portion of the North American continent; but it is not known to have crossed the Rocky Mountains westward, or to have extended into the eastern States.

As to remedial or preventive measures tending to check the ravages of locusts, little unfortunately can be said, but anything that will apply to

one species may be used with practically all. One point is certain; direct remedies must always be of small avail. Something can be done (as is now done in Cyprus) by offering a price for all the egg-tubes collected, which is certainly the most direct manner of attacking them. Some little can be done by destroying tle young larve while yet in an unwinged condition, and by digging trenches in the line of march into which they can fall and be drowned or otherwise put an end to. Infinitesimally little can be done with the winged hordes having the migratory instinct upon them ; starvation, the outcome of their own work, probably here does much. It has been shown that with all migratory locusts the breeding places, or true homes, are comparatively barren districts (mostly elevated plateaus) ; hence the progress of civilization and colonization, with its concomitant necessity for converting those heretofore barren plains into areas of fertility, may (and probably will) gradually lessen the evil.

Locusts, like all other animals, have their natural enemies. Many birds greedily devour them, and it has many times been remarked that migratory swarms of the insects were closely followed by myriads of birds. Predatory insects of other orders also attack them, especially when they are in the unwinged condition. More- over, like all other insects, they have still more deadly insect foes as parasites. Some attack the fully developed winged insect. But the greater part adopt the more insidious method of attacking the eggs. To such belong certain beetles, chiefly of the family Can- tharid#, and especially certain two-winged flies of the family Bombyliid#. These latter, both in the Old and New World, must prevent vast quantities of eggs from producing larve. Popular ignorance on this subject is yet great, and within a few months before this article was written it was exemplified in a remarkable manner by a suggestion from the Government officials of Cyprus that a certain parasite known to be destructive to the eggs in Asia Minor might be introduccd into the island, a suggestion immediately followed by the discovery that what is probably the same parasite already existed there.

A flight of locusts would appear not to be always an unmixed evil, evento man. The larger Old World species form articles of food with

certain semi-civilized and savage races, by whom they are considered as delicacies, or as part of ordinary diet, according to the race and the method of preparation.

Literature.—Kirby and Spence, Introduction to Entomology, 7th ed., London, 1856; Képpen, “ Die geographische Verbreitung der Wanderheuschrecke,” in Geograph. Mittheilungen, vol. xvii., 1871; Gersticker, Die Wanderheuschrecke, Berlin, 1876; Reports of the Untted States Entomological Commission on the

Rocky Mountain Locust, by Riley, Paekard, Thomas, and cthers, 2 vols., Washing- ton, 1878-80. (R. M‘L.)

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LOCUST-TREE, Ceratonia Siliqua, L., the carob-tree, of the tribe Cassicx of the order Leguminose, is the sole species, widely diffused spontaneously and by cultivation from Spain to the eastern Mediterranean regions, and from Egypt to Bornou in Central Africa (Hogg, Hooker’s Journ. of Bot., i. 113), and imported to Hindustan (Graham, p. 254). It differs from all leguminous plants by the dilated disk to the calyx. It has no petals, and the flowers are polygamous or dicecious. The legume is compressed, often curved, indehiscent, and coriaceous, but with sweet pulpy divisions between the seeds, which, as in other genera of the Cassiex, are albuminous. The pods are eaten by men and animals, and in Sicily a spirit and a syrup are made from them. These husks being often used for swine are called swine’s bread, and are probably referred to in the parable of the Prodigal Son. It is also called St John’s bread, from a misunderstanding of Matt. iii. 4. The carob-tree was regarded by Sprengel as the tree with which Moses sweetened the bitter waters of Marah (Exod. xv. 25), as the kharrdb, according to Avicenna (p. 205), has the property of sweetening salt and bitter waters. Gerard (Herball, p. 1241) cultivated it in 1597, it having been introduced in 1570 (Loudon’s Arb., ii. 660). For various names, extent of distribution, historical references, &c., see Pickering’s Chron. Hist. of Pl., p. 141.

LODEVE, capital of an arrondissement of the depart- ment of Hérault, France, lies at an elevation of 674 feet, under a range of hills rising to 2790 feet, in a small valley where the Soulondré joins the Lergue, a tributary of the Hérault, 34 miles east-north-east from Montpellier. A bridge over the Lergue connects the town with the fau- bourg of Carmes on the left bank of the river, and two bridges over the Soulondré lead to the extensive ruins of the Chateau de Montbrun. There is railway communica- tion with Agde by a line following the Hérault valley. The old cathedral of St Fulcran, founded by him in 950, was rebuilt in the 14th century and restored in the 16th; the cloister, dating from the 15th century, is ornate in style. In the picturesque environs of the town stands the well-preserved monastery of St Michel de Grammont, dating from the 12th century; it is now used as farm buildings. In the neighbourhood are three fine dolmens. Lodéve is one of the most important industrial centres of the south of France, upwards of 7000 workmen being employed in the manufacture of woollens for army clothing ; the aggregate horse-power of the factories is 1500. Wool is imported in large quantities from the neighbouring provinces, and from Morocco; the exports are cloth to Italy and the Levant, wine, brandy, chemicals, and wood. The population in 1876 was 10,528.

Luteva existed prior to the invasion of the Romans, who for some time called it Forwm Neronis. Tle inhabitants were converted to Christianity by St Flour, first bishop of the city, about 323. After passing successively into the hands of the Visigoths, the Franks, the Ostrogoths, the Arabs, and the Carlovingians, it became in the 9th century a separate countship, and afterwards the domain of the bishops of Lodéve. During the religious wars it suffered

much, especially in 1573, when it was sacked. It ceased to be an episcopal see in 1789.

LODGE, Tuomas (c. 1556-1625), dramatist, novelist, pamphleteer, poet,—but not player,—was born about the year 1556 at West Ham, and was possibly the son of a namesake, shortly afterwards lord mayor of London. He was educated at Trinity College, Oxford, and then

entered as a student at Lincoln's Inn, where, as in the other Inns of Court, a love of letters, and a crop of debts and diffi- culties, alike grew as matters of course. Thus already as a young man he preferred the looser ways of life and the lighter aspects of literature. When the penitent Stephen Gosson had (in 1579) published his Schoole of Abuse, Lodge took up the glove in his Defence of Poetry, Music, and Stage-

plays (1579 or 1580), which shows some of the moderation as well as of the learning befitting a scholar and a gentleman. The publication was, however, prohibited, besides being answered by Gosson in his Playes Confuted in Five Actions, as by a man sure of his ground if not of his cause. Having fleshed his pen, Lodge displayed a strong inclination for continuing its use. In 1584 he published his Alarwm Against Usurers, a pamphlet to which he no doubt gave the benefit of his personal experience, and in which he mentions the fate of his previous literary venture. Soon after this his years of wandering seem to have begun, It is clear that their primary cause lay in the straits to which he had been reduced, or had reduced himself; that he ever took so bold a leap into disreputableness as to become an actor is improbable in itself, and the assertion which has been made to that effect has been shown to rest on some- thing less satisfactory than conjecture. Lodge joined Captain Clarke in his raid upon Terceira and the Canaries, and seems, in 1591, to have made another similar voyage with Cavendish. During the former expedition, he, to beguile the tedium of his voyage, composed his prose tale of Rosalynde, Huphues' Golden Legacie, which, published in 1590, afterwards suggested the story of As You Luke It. The novel, which in its turn owes some, though no very considerable, debt to the Zale of Gamelyn, is a pleasing example of the Euphuistic manner, but proves how slight an advance an individual author of secondary rank is able to effect in a branch of composition of which the genius of his age has not taken hold. In the year before (1589) Lodge had already given to the world a volume of poems, including the delectable Scillaes Metamorphosis. One would gladly resign this and much else of Lodge's sugared verse,

together with some of his perfumed prose, for the lost Sailor's Kalender, in which he must after some fashion have told of his sea adventures. During the last decade of the century he produced a farrago of literary products —a Juvenal, if not a very "Young Juvenal," at least in the readiness of his wit and in the robustness of his moral indignation. In conjunction with Greene he produced, in

a popular vein, the odd but far from feeble play of A |

Looking Glasse for London and England. Probably about the same time he wrote his Tragedy of the Wounds of Civil War lively set forth in the True Tragedies of Marius and Sylla (published 1594), a good second-rate piece in the fashion of its age, and deficient neither in rhetorical nor in comic vigour. His Life and Death of William Longbeard (1593), and his Jfistory of Lobin the Divell, are among his contemporary non-dramatic works ; to which should be added Phillis (1593), a collection of lyrical pieces, and a Fg for Momus (on the strength of which he has been rather loosely termed the earliest English satirist). In his later years,—possibly about 1596, when he published his Wits Mvserie, which is dated from Low Leyton, and

the prose Prosopopeia (if, as seems probable, it was his), in

which he repents him of his "' lewd lines " of other days,—he was engaged in the practice of medicine, for which he is said to have qualified himself by a degree at Avignon. His works henceforth have a sober cast, comprising a translation of Josephus (1602) and another of Seneca (1614), besides a Treatise of the Plague (1603), and a popular manual, still in manuscript, on Domestic Medicine. He was abroad on urgent private affairs of one kind or another in 1616, from which time to his death from the plague, in 1625, nothing further concerning him remains to be noted. His life is one of those which attract the curiosity of the literary student, who knows that it is precisely in the mental and moral phases and experiences of able and active men devoid of original genius, such as he, that much of the history of an age of literature is to be read.

Lodge’s works have not yet becn completely reprinted, though the satisfaction of this want may no longer be far distant. His Rosalynde is accessible in Hazlitt’s Shakespeare’s Library (vol. ii.) and elsewhere. Its relation to Shakespeare’s comedy is exhaust- ively discussed in an essay by Delius in the Jahrbuch of the German Shakespeare Society (1871). Other works of his are scattered through the publications of the old Shakespeare, the Hunterian, and possibly other Societies; lists of them will be found in the edition of Glaucus and Silla, &c., printed at the Chiswick Press in 1839, in Hazlitt, and elsewhere. The question, Was Thomas Lodge an Actor? has been set at rest by Dr C. M. Ingleby in his pamphlet bearing that title (1868), of which the main conclusion is embodied in this notice. (A. W. W.)

LODI, a city of Italy, in the province of Milan, lies on the right bank of the Adda, in 45° 18’ N. lat. and 9° 30’ E. long. ‘The site of the city is an eminence rising very gradually from the Lombard plain, and the surrounding country is one of the richest dairy districts in Italy. A rather plain and ungainly cathedral (1158) with a huge lateral tower, the church dell’ Incoronata erected by Bramante in 1476, the Palazzo Modegnani with a fine gateway in the style of Bramante, the episcopal palace dating from 1202, and the great hospital with its cloistered quadrangle, are the most noteworthy buildings. Besides an extensive trade in cheese (Lodi making more Parmesan than Parma itself) and other dairy produce, there are manufactures of linen, silk, majolica, and chemicals. The population of the city in 1871 was 18,537.

The ancient Laus Pompeia lay about 5 miles west of the present city, and the site is still occupied by a considerable village, Lodi Vecchio. In the 11th century, according to Landulphus Junior, Lodi was second to Milan among the cities of northern Italy. a with the archbishop of Milan about the investiture of the bishop of Lodi (1024) proved the beginning of a bitter and protracted feud between the two cities. In 1111 the Milanese laid the whole place in ruins and forbade their rivals to restore what they had destroyed, and in 1158, when in spite of this prohibition a fairly flourishing settlement had again been formed, they repeated their work in a more thorough manner. A number of the Lodigians had settled on Colle Eghezzone; and their village, the Borgo

d'Isella, soon grew up under the patronage of Frederick Barbarossa into a uew city of Lodi. At first subservient to the emperor, Lodi was before long compelled to enter the Lombard League, and in 1198 it formed alliance offensive and defensive with Milan. The strife between the Sommariva or aristocratic party and the Overgnaghi or democratic party was so severe that the city broke into two distinct communes. The Overgnaghi, expelled in 1226, werc restored by Frederick IJ. who took the city after three months' siege. During the rest of the Guelf and Ghibelline struggle, and down to the be-

| ginning of the 16th century, the annals of Lodi are crowded with

stirring events, connected for the most part with the general troubles of the country. In the main it was dependent on Milan. The duke of Brunswick captured it in 1625 in the interests of Spain; and it was occupicd by the French (1701), by the Austrians (1706), by the king of Sardinia (1733), by the Austrians (1736), by the Spaniards (1745), and again by the Austrians (1746). On 10th May 1796 was fought the battle of Lodi between the Austrians and Napoleon, which made the latter master of Lombardy.

LODZ (Lodz), a town of Russian Poland, in the province of Piotrokow, lies 40 miles by rail to the north of the chief town of the province, on a branch railway of the line between Warsaw and Vienna. Only a small hamlet with 800 inhabitants in 1821, when its woollen manufactures were first introduced by Germans, it is now the second town of Poland, both by population and by the importance of its cotton-mills, the annual production of which amounts to a value of about £150,000, that is, five- sixths of the whole production of cottons in Poland. This, as well as the other less important industries of the place (woollen cloth manufacture, dyeing, and so on), is chiefly in the hands of Germans, and thus the German language predominates in the town. Although its population in 1872 amounted to 50,500, Lodz still maintains its village character, consisting of one broad street 7 miles long, on which are situated alike the factories, the houses of the merchants, and the dwellings of the working men.

LOFOTEN anp VESTERAALEN, a “ fogderi ” or baili- wick in the “amt” of Nordland, Norway, consists of a large

and picturesque group of islands lying north-east and south- west off the north-west coast of Norway, between 67°30’ and 69° 20’ N. lat., and between 12° and 16° 35’ E. long. The extreme length of the group from Andenses, at the north of And6, to Rést, is about 130 English miles; the aggregate area amounts to about 1560 square miles, supporting a per- manent population of about 20,000. It is separated from the mainland by the Vestfjord, Tjzldsund, and Vaagsfjord, and is itself divided into two sections by the Raftsund between Hindé and Ost-Vaago : to the west and south of the Raftsund lie the Lofoten Islands proper, of which the most important are Ost-Vaagé, Gimsd, Vest-Vaagé, Flakstadé, Moskenes6, Mosken, Viré, and Rost; east and north of the Raftsund are the islands of Vesteraalen, the chief being Hindé, Ulvé, Langé, Skogs6, and Andé. The islands, which are all of granite or metamorphic gneiss, are precipitous and lofty; the highest peaks are in the Lofoten group, Vaagekallan on Ost-Vaag6 rising directly from the sea to a height of 3090 feet. The channels which separate them are narrow and tortuous, and generally of great depth ; they are remarkable for the strength of their tidal currents, particularly the Raftsund mentioned above, and the once famous Malstrém or Moskenstrém between Moskenzs and Mosken. Though situated wholly within the Arctic Circle, the Lofoten and Vesteraalen group enjoys a climate that cannot be called rigorous when compared with that of the rest of Norway. The isothermal line which marks a mean January temperature of 32° F. runs south from the Lofotens, passing a little to the east of Bergen onwards to Gothenburg and Copenhagen. The prevailing winds are those from the south and west; the mean temperature for the year is 38°‘5 F., and the annual rainfall is 43°34 inches. In summer the hills have only patches of snow, the suow limit being about 3000 feet. The natural pasture produced in favourable localities permits the rearing of cattle to some extent; but the growth of cereals (chiefly barley, which here matures in ninety days) is insignificant. A few potatoes are planted. The islands yield no wood.

The great and characteristic industry of the district, and an important source of the national wealth, is the cod fishery which is carried on along the east coast of the Lofotens in the Vestfjord from January to April. It employs about 18,000 men from all parts of Norway; the annual take of cod amounts to an average of twenty millions, worth on the spot about £250,000. The fish, which is dried during early summer, is exported principally to Spain (where it is known as bacalao), but also to Holland, Sweden, and Belgium. Other industries arising out of the fishery are the manu- facture of cod-liver oil and of artificial manure. The summer cod fisheries and the lobster fishery are also valuable. The herring is frequently taken in large quantities off the west coasts of Vesteraalen, but is a somewhat capricious visitant. The bailiwick contains no towns properly so called, but Kabelvaag on Ost-Vaagé and Svolveer on a few rocky islets off that island are considerable centres of trade and (in the fishing season) of population ; Lédingeu also, at the head of the Vestfjord on Hindé, is much frequented as a port of call. Regular means of communication are afforded by the steamers which trade between Hamburg or Christiania and Hammerfest, and also by local vessels; less accessible spots can be visited by means of boats, in the management of which the natives are adepts. ‘There are some roads on Hindo, Langé, and Ando. The largest island in the group, and indeed in Norway, is Hindé, with an area of 864 square miles. The south-eastern portion of it belongs to the amt of Tromsd. In the island of Ando there is a bed of coal at the mouth of Ramsaa which is likely to prove ultimately of some prac- tical value.

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LOG. The ordinary log for ascertaining the speed of a ship consists of four parts, viz., the log-glass, log-line, log-reel, and log-ship. The word log may have been derived froin the fact that a piece of wood was thrown overboard, to lie as a log in a fixed position, motionless; now the same name is applied to many contrivances and ingenious inventions for indicating directly, or for registering, the ship’s progress through the water.

Though such information now appears to be so essential, nay, imperatively necessary to the safe conduct of a ship, it is a fact that no such simple means as the log and line was devised before the 17th century, or the subject even thought of theoretically before 1570. At least nothing can be found in ancient writings, or even in the works professedly treating upon navigation, till after 1620, while, on the contrary, various passages occur from which we may fairly infer that there was nothing better at the command of the mariner than a rough unassisted estimate. The work of Martin Cortes (Seville, 1556), after giving much valuable information for that day, including a description and use of the cross-staff, astrolabe, &e., a table of the sun's declination, with much else, makes no other reference to the ship's motion through the water than this,—the pilot must estimate the distance, making allowance for the effects of winds and currents, every day, and as the estimation "is imperfect, especially in a long voyage and long time, it is convenient that he should rectify his position by the corresponding position of the heavens." Mr J. Tapp, who published a translation and improved edition of Martin Cortes fifty-three years after (1609), made no alteration in that part of the work.

In 1578 William Bourne published Jnventions and Devices. There are one hundred and thirteen subjects treated of, many of them highly interesting, as they contain the crude germ of useful inventions. The' twenty-first device is a close approach to Massey's self-registering log, which was found so useful two hundred and sixty years later. The credit of the device is ascribed to Humfray Cole; the probable date is 1570. The proposal was to have a 'little small close boat" with a wheel, or wheels, and an axletree, to turn clock-work in the little boat, with dials and pointers to indicate respectively fathoms, leagues, scores of leagues, and hundreds of leagues. If a small serew rotator had been used instead of a wheel, this might have been a great success. It was only a suggestion, perhaps untried ; and in common with seamen and writers about that time the author allows only 5000 feet to a mile. Edward Wright's Certain Errors in Navigation detected and corrected (1610) gives much new and useful information, but the nearest allusion to the ship's speed is in the part translated from the Spanish of Roderigo Samorano, under the head of finding the ship's place on the

chart, called the “point of imagination.” ‘This point doth presuppose the knowledge of two things: to wit, the rhumb by which we have sailed, and that is known by the compass, and the leagues which we have run; and this hath no certainty, but is a little more or less than a good mariner according to his imagination supposeth that he hath sailed; whereof the said point took its name.” In 1624 an edition of Gunter by Edward Weaver, after much valuable geometric information, proposes at chap. vi., in a long rambling manner, that an account should be kept of the ship’s way. “The way that a ship maketh may be known to an old seaman by experience, by others it may be found,” as he recommends, with the log-line or by known marks on the ship’s side, bearing the proportion to a league or mile, that a certain number of seconds do to an hour. So far good; but he reckons a mile as 5866 feet (214 too little), and states that seamen count in paces of 5 feet each, and 1000 to a mile, z.e., only 5000 feet. He also proposes to

divide the degrees into one hundred parts, each to be called | line” off without assistance, steadying it just before the

“centesmes.” The whole subject is treated as a new thing.

It is stated by Purchas (1625) that Christopher Columbus | his assistant with the glass to “turn.”

(1492) deceived his crew with respect to the distance sailed from home, and that “even the pilots did not know how far they had gone” as they glided so smoothly with a continuous fair wind. Had any kind of log been hove, the ship’s speed would have been publicly known. Mr Burnaby (Ancient Geography, p. 554) states that “no ancient writer has preserved any account of the mode in which ancient navigators computed distance.” Following such an authority and the quotations above, we may safely agree with the statement of Purchas that it was

first used in 1607. Also we know that it did not become general till many years after. In one of our best works on navigation, printed in 1843, the log is inaccurately described.

If we are surprised that so many centuries passed, and that long voyages were made, after the discovery of the compass, without any means of measuring the distance sailed, we may be almost as much so at the diversity of opinion which prevailed among seamen with regard to the length of the log-line and the length of a mile. At the present day the principle upon which this log is arranged is easily understood. The mean degree of the meridian (see vol. x. p. 198) is assumed to be 69°09 statute miles, which gives 6080 feet to the mean nautical mile, —an estimate sufficiently accurate for navigating upon any part of the sphere. The dis- tances upon the log-line being marked by pieces of line placed between the strands and carrying the requisite number of knots, this has given the name of knot to the nautical mile. The line is marked to knots and half knots (a single knot) only; the intermediate fractions are estimated. ‘Two measurements are now in common use; that in the British navy is 47 feet 3 inches of line for each knot made per hour, which corresponds with a twenty-eight second glass,—thus (28 × 6080) + 3600 = 47,288 feet; in the mer- chant service a knot is 50 feet 7 inches, which is the correct proportion to a mile with the half minute glass. When a ship is going more than five or six knots, a short glass is used, fourteen or fifteen seconds, then the indications by the line are doubled. The shorter measure was probably chosen in consequence of the custom in vogue till about 1833 of marking the run on the log-board, or book, in knots and fathoms (or sea furlongs) ; the fractions are now invariably entered as tenths. The whole length of line is 60 to 80 fathoms, according to the speed anticipated ; 10 to 20 fathoms of which is allowed as stray line, that the log-ship may be in a fair position, before the rag of bunting called the turn mark passes the hand. The line should be stretched and well wet before it is measured, and should be remeasured every day at sea. The inner end of the line is made fast to a light reel upon which it is wound.

The “log-ship” (fig. 1) is a piece of wood about 4 inch thick and the fourth part of a circle, having a radius of 5 or 6 inches, weighted with

lead round the curve in order to keep it upright in the water, but not to sink it. Two holes are bored, about 14 inches from the lower angles; through one a short piece of line is passed and knotted ; the other end of the line has a bone or hard peg spliced to it,

Fig. ol.

which is inserted in the other hole, thus forming a span

by which it is attached to the log-line, and hangs square. When the log is used, a man holds the reel over his

head, the officer places the peg in the log-ship, and throws

it well clear of the wake, then allows it to run the “stray

turn mark comes to hand; as the mark passes he calls to As the sand runs pay out freely till the word “stop” is expected, then bring the line into a state of tension similar to what it was in when the turn mark passed. At the word “stop” nip the line instantly, count the nearest knots, and estimate the tenths. When the line is stopped the strain should cause the peg to draw from the log-ship, and it can easily be hauled in. In ships of war it is hove every hour. The value of the operation depends, of course, entirely upon the care bestowed.

Ground-Log.—In large rivers, such as Rio de la Plata, where a strong current runs, and shoals are found out of the sight of land, a lead of four or five pounds weight is used instead of the log-ship; the lead rests on the bottom, the line and sand-glass being used in a manner similar to that above described. This is called the ground-log, and indicates the speed at which the ship is passing over the ground, irrespective of currents or tides ; it will show also the lateral effect of current as it is hauled in; this is the only log which can do so.

The sand-glasses are very primitive contrivances for measuring the requisite number of seconds ; they are much affected by damp and change of temperature, and no reliance can be placed on their accuracy. In 1868 a timepiece sounding a gong at the required intervals

was devised by the late Admiral Sir Walter Tarleton, and was tried on board some of Her Majesty's ships, but failed after a short time from damp or other causes. The writer of this article was then attempting to produce a log-gong, but abandoned it on being told that they could be obtained below his estimated cost.

Screw Logs.—In 1725 Henry de Saumarez described a machine which was to supersede the ordinary log. This was on the prin- ciple of the serew, having vanes which caused it to revolve and eommunicate a rotary motion to a piece of rope; this most probably went inboard to elockwork; hence the failure. Mr Smeaton made many experiments about 1751; he found the results very irregular, especially at high velocities, just as the writer of this artiele did with one of Massey's flies and a line or wire attached to a spindle, supported by large friction rollers inboard ; both experiments were dead failures on account of the friction. In 1773 two screw logs were tried on board H.M. ship ''Racehorse" during. a short voyage to the Polar Sea; each was made to communicate motion to a counter inboard. In 1792 Mr Gower took out a patent for a serew log. None of these experiments were sufficiently successful to gain the confidence of seamen.

We see that the principle was not new in 1834 when Mr Massey patented a serew log, which has been so generally adopted that it de- serves special notice and description. Though Massey took out other patents, and others have followed with modifications, the principle of all is the same, and likely to remain in use with the ''common log" for many years to come. Massey fitted his log to the stern- post of a few vessels, a vertical spindle conveying the rotations of the fly to a register in the eabin above, but it did not answer.

The log of 1836 which came into general use is represented in fig. 2. It econ- sists of two parts united by 2 or 3 == feet of rope. The "fly" consists of . a hollow eopper Fig. 2. cylinder about 9 or 10 inches long with four fins or blades placed at a given angle, eausing it to rotate onee in a eertain distance. The rope is attaehed to the fly and to a spindle which freely revolves in a brass box; an endless serew acting upon a system of wheel-work records the fraetions of a mile on one

dial, units upon a second, and tens up to one hundred on the third, on the same principle with the index of a gas meter. Wi

The last patent was for the ‘*frietionless log ” shown in fig. 3, which is similar to the former ex- cept that, by dispensing with the piece of rope and part of the heavy box, it is mueh more compact and less liable to foul,—an accident to which all logs when. towed after a ship are very liable. Walker’s harpoon log is very similar

to the last of Massey’s, but has a plate at the back in the shape of a harpoon to prevent the upper part from revolving. This log is now supplied to Her Majesty’s ships. The fins or blades which eause the rotation in each of the logs above described are flat pieces of brass (not portions of a screw) soldered to a cylinder, which is hollow in order to diminish the tendency to sink when going slowly ; but if the log be left overboard when the ship stops, the tow-line will allow it to sink abont 100 feet, the pressure of water will then fill it, and there is no means provided for getting the water out. Screw logs will also at low speeds hang obliquely and be useless. Mr Friend tried a log with paddles protruding from a brass box instead of using a screw; but the plan was not adopted. However accurate the registering logs may be, an hourly log cannot be dispensed with, unless the ship be on one course during the whole twenty-four hours, or her speed be uniform; even then the old log and line should not be neglected. Both Massey and Walker are now trying logs the rotators of which are towed, while the dials for registering are on the ship’s stern.

Pressure Log.—In 1849 the Rev. E. L, Berthon patented a log (fig. 4), indicating the speed of the ship by means of the pressure of water due to the velocity acting upon a tube about 3 of an inch diameter in the clear, closed at the end, protruding some 8 inches below the ship’s bottom, with an aperture of about an } of an inch in diameter in the front side, near the closed end. A vane was used to turn the aperture in the direction of the ship’s progress (conrse and leeway combined). At

the upper end of the the same pipe a pointer indi- cated the amount of leeway. To take into account the effect which change of draught would produce, another pipe was used having the apertmre in a neutral direction (41°30) with en to the ship's progress, so that the water was neither forced in nor drawn out. The two pipes communicated with air-vessels, which were allowed to be about half full of water; thence two flexible tubes righ Soa the pressure to the ends of an inverted siphon partly filled with mercury, one leg of which forms a glass index tube, 2 graduated scale being placed behind it, calculated upon the principle that the pressure will increase according to the square of the velocity. As the ee specific gravity of merenry is so great, the scale even up to 16 knots is brought within a convenient com- pass; and it can be hungin gimbals (as a barometer) in any part of the ship. The leeway indicator in more recent fittings has been abandoned. The writer of this article first saw it in one of the Jersey packets, when she was steaming about 13 knots; it appeared to be very sensitive, and he was strongly impressed in its favour. For details respecting this log see paper by Vaughan Pendred, before the Society of 'Engineers, December

6, 1869.

The motions or disturbances im- parted to the water by the body of the ship passing through it at ¢ high velocity must vitiate in a f great degree all attempts to mea- sure the speed by instruments } placed near the hull of the ship, and under varying circumstances of draught, speed, and foulness of bottom. For the results of ex- periments and opinions on this point, by the late William Froude, F.R.S., and Mr R. Edmund Froude, see Brit. Assoc. Rep., 1874, p. 225, and 1879, p. 210.

Electric Log.—In the chrono- logical order in which we have taken various descriptions of" log, the last deserving notice is Kelway's " electric log," the only uch log known to the public. Its chief feature is the making and breaking of an electric circuit by means of a screw revolving in the water and an electric battery connected with the step motion indicator, One of the difficulties

Fig. 4.

Fig. 5.

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to be overcome was that of securing a chamber wherein to form the electric contacts, which should remain watertight under the pressure due to its depth below the surface of the sea, particularly in the event of the ship stopping and suffering it to sink when being towed with 50 fathoms of line. Mr Kelway now believes that he has overcome that difficulty, and his log has been tried on board several of Her Majesty's ships at Portsmouth, with satisfactory results, a screw similar to Massey's being towed, while in electric connexion with a dial on board.

What is considered by Mr Kelway to be an improved application of the principle is now (1882) on view in the International Exhibi- tion at the Crystal Palace. It is intended that a hole should be cut in the ship's bottom, by preference in the engine-room, large enough to allow a short eylinder (fig. 5) containing the screw R to pass down below the ship's bottom. The cylinder is open in a fore-and-aft line and attached to a cage H, which is drawn up or lowered by means of a large screw G working through a stuffing box F. The iron box D containing the cage is 4 feet in height, made in three parts; the lower part (high enough to receive a sluice valve C) is to be bolted to the ship's bottom, and must, with the rest of the box, be nearly as strong; the central part is secured to the valve box and covered by a lid E, there being space enough above the sluice valve for the cage and screw.

To place the log, let the sluice valve C be lightly closed ; open two small taps to fi the water out of the box and to prove that the valve is acting. Open the lid, run the lowering screw through the cage, place it, secure the lid, open the sluice valve, and lower the rotator to the desired distance. The blades of the rotator are por- tions of a true screw. An endless screw on the spindle of the rotator communicates the revolutions to a vertical spindle M, which moves a train of wheels in a watertight box N; the last of these wheels revolves once in a mile, and on the same spindle is a wheel having eight ratchet teeth, which by moving a lever complete an electric enrrent, which passes by the wire

O to a dial placed in any part of the ship, sounding a bell and causing one hand of the dial to make a step and mark an eighth; one revolution indicates'a mile, and other dials carry the register up to 100 miles. This form of electric log has, however, the disadvantage pointed ont as affect- ing the Berthon or any log placed under the hull of a ship.

The electric towing log (by Kelway) promises to show continuously on board the ship what she is doing, while keeping a record of what has been-done. A rating table would be at the dial, in any part of the ship; or several dials could be worked by the same electric current. It will be exposed to the danger of fouling sea- weed, &e., as other towing logs are.

The logs now generally uscd are Massey's, Walker's, and a few of Berthon's, generally in conjunction with the old log-ship and line. (H, A. M.)

LOGAN, Joun (1748-88), a Scottish poet of some reputation, was born in 1748, and was son of George Logan, a farmer at Soutra, in East Lothian. Being destined for the church, he was in 1762 sent to study at the university of Edinburgh. After finishing his course, Logan was in 1768-69 tutor at Ulbster to the well-known Sir John Sinclair, and in 1770 he edited some of the poems of his college friend MicyarL Bruce (q.v.). This publication was for the benefit of Bruce's parents, who were in humble circumstances. In order to make up a volume he inserted some poems of his own, with some from other sources, and in his preface he stated that these could be easily distinguished without any names being attached. Of the seventeen pieces in the volume five were by Bruce, two by Bruce and Logan, eight by Logan, one by Sir James Foulis, and of one the authorship is unknown, One of the poems by Logan was "' The Ode to the Cuckoo."

In 1770 Logan was licensed as a preacher by the pres- bytery of Edinburgh, and in 1771 was presented to the charge of South Leith, but was not inducted till 1773, In 1779 he delivered a course of lectures on the philosophy of history in St Mary's Chapel, Edinburgh. An analysis of these lectures was published in 1781 under the title of Elements of

the Philosophy of History, and was followed by one of the lectures On the Manners and Govern- ment of Asia, 1781.

Logan was an active member of the committee of the General Assembly of the Church of Scotland appointed in 1775 to revise the “Translations and Paraphrases ” drawn up in 1745 for use in private families, and to adapt them for public worship. The committee finished its

labours in 1781, and their collection of paraphrases is still in use. Eleven of them are the composition of Logan, and others were revised or altered by him. In the same year he published his poems in a volume which attracted so much attention that a second edition was issued in 1782, It also included the ‘Ode to the Cuckoo,” with which Edmund Burke was so pleased that when in Edin- burgh he sought out Logan and complimented him as the author of the finest ode in the English language.

In 1783 he published a tragedy called Munnamede, which met with little success. In 1786 he resigned his charge at South Leith, retaining part of his stipend. He then went to London, where he devoted himself to litera- ture. He was engaged on the management of the Lnglish Review, and in 1788 published a pamphlet on the charges against Warren Hastings. He died in December 1788.

A work on ancient history, published that year under the name of Dr Rutherford, rector of an academy at Uxbridge, is believed to have been the lectures written by Logan. His sermons were published in 1790-91, in two volumes, and have been several times reprinted. His poems were collected and published in 1812, with a memoir understood to be by the Rev. R. Douglas of Galashiels.

About forty years after Logan’s death what may be called the Bruce-Logan controversy arose by the publication in 1836 of a life of Michael Bruce, prefixed to an edition of his poems by the Rev. Dr MaeKelvie. In this work there is claimed for Bruce the author- ship of

sixteen of the pieces in the volume issued by Logan in 1770. Logau was at the same time charged witli having retained some of Bruce's MSS. entrusted to him, which he used in the revision of the paraphrases. abuse of Logan in a memoir of Bruce prefixed to an edition of his works published in 1865, by the Rev. Dr Grosart. In this edition the paraplirascs written by Logan are inserted as having been written by Bruce. The evidence, however, brought against Logan in these biographies of Bruce, being nearly altogether of a hearsay character, is not of much value, and it may be urged that Logan was not blamed during his life for any such literary delin- quencies. If anything can be brought against him with justice, it is his publishing as his own, with very few alterations, tlie sceond Paraphrase, which is the composition of Dr Doddridge.

Within the last few years the various pieces in the volume of Bruce's poems issued by Logan in 1770 have been subjected to careful criticism, and the statements made from personal knowledge by the Rev. Dr Robertson of Dalmeny, the college friend of Bruce and Logan, who was often referred to on the subject, must be held to be substantially correct. Tlicse will be found in a brochure by Dr David Laing, Ode to the Cuckoo (Edinburgh 1770), with remarks on tis authorship, in a letter to J. C. Shairp, LL.D., 1878. See also a paper by J. Small in the Brit. and For, Evan. Rev., 1877, and especially two papers by the Rev. R. Small, dbid., 1878.

LOGANSPORT, capital of Cass county, Indiana, U.S., is situated at the confluence of the Wabash and the Eel rivers, and on the Wabash and Erie canal, 75 miles north-west of Indianapolis. It is an important railway junction, and the trading-centre of an extensive agricultural district—deal- ing in grain, pork, and timber (poplar and black walnut). The Pittsburg, Cincinnati, and St Louis railroad maintains

at this point large carriage-works, occupying 25 acres, and |

employing 600 men. The population was 11,198 in 1880.

LOGARITHMS. The definition of a logarithm is as follows :—if a, a, m are any three quantities satisfying the equation a*=m, then a is

called the base, and x is said to be the logarithm of m to the basea. This relation between 2, a, m, may be expressed also by the- equation x= log, m.

Properties.—The principal properties of logarithms are given by the equations

m loga (mn) =loga m+log.n, loge = loga m —loga n,

r

1

log, m” =r logam, loga 5/m= > logam ,

Sa

which may be readily deduced from the definition of a logarithm. It follows from these equations that the logarithm of the product of any number of quantities is equal to the sum of the logarithms of the quantities, that the logarithm of the quotient of two quantities is equal

These statements have been reiterated with mucli |

LOG—LOG

to the logarithm of the numerator diminished by the logarithm of the denominator, that the logarithm of the rth power of a quantity is equal to 7 times the logarithm of the quantity, and that the logarithm of the rth root of

a quantity is equal to ith of the logarithm of the quantity.

Logarithms were originally invented for the sake of abbreviating arithmetical calculations, as by their means the operations of multiplication and division may be re- placed by those of addition and subtraction, and the operations of raising to powers and extraction of roots by those of multiplication and division. For the purpose of thus simplifying the operations of aritlimetic, the base is taken equal to 10, and use is made of tables of logarithms in which the values of a, the logarithm, corresponding to values of m, the number, are tabulated. The logarithm is also a function of frequent occurrence in analysis, being regarded as a known and recognized function like sin x or tan x; but in mathematical investigations the base gene- rally employed is not 10, but a certain quantity usually denoted by the letter e, of value 2°71828 18284. ...

Thus in arithmetical calculations if the base is not expressed it is understood to be 10, so that log m de- notes log,, m; but in analytical formule it is understood to bee.

The logarithms to base 10 of the first twelve numbers to 7 places of decimals are

log 1=0°0000000 log 5=0°6989700 log 9 = 09542425

log 2=0°3010300 log 6 =0°7781513 log 10=1-0000000

log 8=0°4771213 log 7=0°8450980 log 11 = 1°0413927

log 4=0°6020600 log 8=0°9030900 — log 1210791812

The meaning of these results is that

1=10° ; 2 =] 09-3010300 | 3 == 1004771218 | 10=10!, Titel estetere J 2 = 1(1-0791812 |

The integral part of a logarithm is called the index or characteristic, and the fractional part the mantissa. When the base is 10, the logarithms of all numbers in which the digits are the same, no matter where the decimal point may be, have the same mantissa ; thus, for example,

log 2°56138 =0°4084604, log 25°613=1°4084604, log 2561300 =6°4084604, &c.

In the case of fractional numbers (7.¢., numbers in which the integral part is 0) the mantissa is still kept positive, so that, for example,

log *256183=1°4084604, log -0025618=3°4084604, &c.,

the minus sign being usually written over the characteristic, and not before it, to indicate that the characteristic only and not the whole expression is uegative ; thus 14084604 stands for – 1+ *4084604.

The fact that when the base is 10 the mantissa of the logarithm is independent of the position of the decimal point in the nuinber affords the chief reason for the choice of 10 as base. The explanation of this property of the base 10 is evident, for a change in the position of the decimal points amounts to multiplication or division by some power of

10, and this corresponds to the addition or subtraction of some integer in the case of the logarithm, the mantissa therefore remaining intact. It should be mentioned that in most tables of trigonometrical functions, the number 10 is added to all the logarithms in the table in order to avoid the use of negative characteristics, so that the characteristic 9 denotes in reality 1, 8 denotes 2, 10 denotes 0, &c. Logarithms thus increased are frequently referred to for the sake of distinction as tabular logarithms, so that the tabular logarithm =the true logarithm + 10.

In tables of logarithms of numbers to base 10 the mantissa only is in general tabulated, as the characteristic of the logarithm of a number can always be written down at sight, the rule being that, if the number is greater than

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unity, the characteristic is less by unity than the number of digits in the integral portion of it, and that if the number is less than unity the characteristic is negative, and is greater by unity than the rumber of ciphers be- tween the decimal point and the first significant figure.

It follows very simply from the definition of a logarithm that

logabxlogsa=1, log,m=loga mx

1

log, 6 :

The second of these relations is an important one, as it shows that from a table of logarithms to base a, the corre- sponding table of logarithms to base b may be deduced by multiplying all the logarithms in the former by the

constant multiplier : 2 7 which is called the modulus of

08a the system whose pase is b with respect to the system whose base is a.

The two systems of logarithms for which extensive tables have been calculated are the Napierian, or hyperbolic, or natural system, of which the base is e, and the Briggian, or decimal, or common system, of which the base is 10; and we see that the logarithms in the latter system may be deduced from those in the former by multiplication by the

1 __ | which is called the modulus of log. 10 the common system of logarithms. The numerical value of this modulus is 0°43429 44819 03251 82765 11289 …, and the value of its reciprocal, log, 10 (by multiplica- tion by which Briggian logarithms may be converted into Napierian logarithms) is 2°30258 50929 94045 68401 molt…

The quantity denoted by e is the series,

1 1 1 1

Lhe 97 epee

the numerical value of which is, 2°71828 18284 59045 23536 02874…

The mathematical function log z, or log, x, is one of the small cae of transcendental functions, consisting only of the circular unctious (direct and inverse) sin x, cos x, &c., are sin 2, are cos @, &c., e*, and log x, which are universally treated in analysis as known functions. It is the inverse of the exponential function ¢*, the theory of which may be regarded as including that of the cir- eular functions, since

constant multiplier

sin @= ayo —e-*), cosa 4(ei* + ¢-‘2),

There is no series for log x proceeding either by ascending or descending powers of z, but there is an expansion for log (1+), viz. :—

log (1+) =a -— 47+ fa? -4dx44+ &c.; the series, however, is convergent for real values of x only when x lies between +1and -—1. Other formule which are deducible from this equation are given in the portion of this article relating to the calculation of logarithms.

We have also the fundamental formule—

A @.) limit of 7-=2 h

(ii.) S Gn’s x +const.

Hither of these results might be regarded as the definition of log x; they may be readily connected with one another, for we have in general

, When / is indefinitely diminished, =log x ;

fr a 1 grt

x a a ;

but if n= -—1, this formula no longer gives a result. Putting, however, 7= —1+-A, where / is indefinitely small, we have

x h

The result (ii.) establishes a relation, which is of historical

A [e-Ft const. =” 1 | const. =log x+const. by (i.).

interest, between the logarithmic function and the quadrature of |

the hyperbola, for, by considering the equation of the hyperbola in the forin zy=const., we see at once that the area included between the arc of a hyperbola, its nearest asymptote, and two ordinates drawn parallel to the other asymptote from poiuts on the first

asymptote distant a and 0 from their point of intersection is pro-portional to log Lig a

The function log « is not a uniform function, that is to say, if « denotes. a complex variable of the fonn a@+7), and if complex quantities are represented in the usual manner by points in a plane, then it does not follow that if x describes a closed curve log z also deseribes a closed curve; in fact we have

log (a+ tb) =log «/(a? +2) + (a+ Qn), where « is a determinate angle, and » denotes any integer. Thus, even when the argument is real, log x has an infinite number of values ; for, putting b=0 and taking positive, in which case a= 0, we obtain for log the infinite system of values loga+2nmi. It follows from this property of the function that we cannot have for log x a series which shall be convergent for all values of x, as is the case with sin x, cos x, and e*; as such a series could only represent a uniform function, and in fact the equation

log (14+a)=a- 427+ 423 -}a4+ &e.,

is true only when tlie analytical modulus of z is less than unity.

The notation log x is generally employed in English works, but Continental writers usually denote the function by lx or lgz.

ITistory.—The invention of logarithms has been accorded to John Napier, baron of Merchiston, in Scotland, with a unanimity which is rare with regard to important scientific discoveries. ‘The first announcement was made in Napier’s Mirrfici logarithmorum canonis descriptio (Edinburgh, 1614), which contains an account of the nature of loga- rithms, and a table giving natural sines and their logarithms for every minute of the quadrant to seven or eight figures. These logarithms are not what would now be called Napierian or hyperbolic logarithms (¢.e., logarithms to the base e), though closely connected with them, the relation between the two being

L e=10%e 107, or L=107 log. 107-107, where / denotes the logarithm to base e and L denotes Napier's logarithm. The relation between N (a sine) and L its Napierian logarithm is therefore i N=107e 10',

and the logarithms decrease as the sines increase. Napier died in 1617, and his posthumous work Mirifict logarith- morum canonis constructio, explaining tle mode of construc- tion of the table, appeared in 1619, edited by his son.

Henry Briggs, then professor of geometry at Gresham College, London, and afterwards Savilian professor of geometry at Oxford, admired the Canon mirificus so much that he resolved to visit Napier. In a letter to Ussher he writes, " Naper, lord of Markinston, hath set my head and hands at work with his new and admirable logarithms, I

hope to see him this summer, if it please God ; for I never

saw a book which pleased me better, and made me more wonder." Briggs accordingly visited Napier in 1615, and stayed with hima whole month. He brought with him some calculations he had made, and suggested to Napier the advantages that would result from the choice of 10 as a base, having explained them previously in his lectures at tresham College, and written to Napier on the subject. Napier said that he had already thought of the change, and pointed out a slight improvement, viz., that the character- istics of numbers greater than unity should be positive and not negative, as suggested by Briggs. In 1616 Briggs again visited Napier and showed him the work he had accomplished, and, he says, he would gladly have paid him a third visit in 1617 had Napier's life been spared. Briggs's Logarithmorum chilias prima was published, probably privately, in 1617, after Napier's death, as in the short preface he states that why his logarithms are dif- ferent from those introduced by Napier "'sperandum, ejus librum posthumum abunde nobis propediem satisfacturum." The liber posthumus was the Canonis constructio already mentioned. This work of Briggs's, which contains the

first published table of decimal or common logarithms, is only a small octavo tract of sixteen pages, and gives the logarithms of numbers from unity to 1000 to 14 places of decimals. There is no author's name, place, or date. The date of publication is, however, fixed as 1617 by a letter from Sir Henry Bourchier to Ussher, dated December 6, 1617, containing the passage—" Our kind friend, Mr Briggs, hath lately published a supplement to the most excellent tables of logarithms, which I presume he has sent to you." Briggs's tract of 1617 is extremely rare, and has generally been ignored or incorrectly described. Hutton erroneously states that it contains the logarithms to 8 places, and his account has been followed by most writers. There is a copy in the British Museum.

Briggs continued to labour assiduously at the calculation of logarithms, and in 1624 published his Arithmetica logarithmica, a folio work containing the logarithms of the numbers from 1 to 20,000, and from 90,000 to 100,000 (and in some copies to 101,000) to 14 places of decimals. The table occupies 300 pages, and there is an introduction of 88 pages relating to the mode of calculation of the tables, and the applications of logarithms.

There was thus left a gap between 20,000 and 90,000, which was filled up by Adrian Vlacq, who published at Gouda, in Holland, in 1628, a table containing the loga- rithms of the numbers from unity to 100,000 to 10 places of decimals. Having calculated 70,000 logarithms and copied only 30,000, Vlacq would have been quite entitled to have called his a new work. He designates it, however, only a second edition of Briggs's Arithmetica logarithmica, the title running Arithmetica logarithmica sive logarith- morum chiliades centum,. .. Editio secunda aucta per Adrianum Vlacq, Goudanum. This table of Vlacq's was published, with an English explanation prefixed, at London in 1631 under the title ZLogarithmicall Arithmetike… London, printed by George Miller, 1631. There are also copies with a French title page and introduction (Gouda,

1628).

Briggs had himself been engaged in filling up the gap, and in a letter to Pell, written after the publication of Vlacq's work, and dated October 25, 1628, he says :—

‘“*My desire was to have those chiliades that are wantinge betwixt 20 and 90 calculated and printed, and I had done them all alinost by my selfe, and by some frendes whom my rules had suffi- ciently informed, and by agreement the busines was conveniently parted amongst us; but I am eased of that charge and care by one Adrian Vlacque, an Hollander, who hathe done all the whole hundred chiliades and printed them in Latin, Dutche, and Frenche, 1000 bookes in these 3 languages, and hathe sould them almost all. But he hathe cutt off 4 of my figures throughout ; and hathe left out my dedication, and to the reader, and two ee the 12 and 13, in the rest he hath not varied from me at all.

The original calculation of the logarithms of numbers from unity to 101,000 was thus performed by Briggs and Vlacq between 1615 and 1628. Vlacq's table is that from which all the hundreds of tables of logarithms that have subsequently appeared have been derived. It contains of course many errors, which have gradually been discovered and corrected in the course of the two hundred and fifty years that have elapsed, but no fresh calculation has been published. The only exception is Mr Sang's table (1871), part of which was the result of an original calculation.

The first calculation or publication of Briggian or common logarithms of trigonometrical functions was made in 1620 by Gunter, who was Briggs's. colleague as professor of astronomy in Gresham College. The title of Gunter's book, which is very scarce, is Canon triangulorum, and it contains logarithmic sines and tangents for every minute of the quadrant to 7 places of decimals.

The next publication was due to Vlacq, who appended to his logarithms of numbers in the Arithmetica logarithmica

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of 1628 a table giving log sines, tangents, and secants for every minute of the quadrant to 10 places; these were obtained by calculating the logarithms of the natural sines, &c., given in the Vhesaurus Jathematicus of Pitiscus (1613).

During the last years of his life Briggs devoted himself to the calculation of logarithmic sines, &c., and at the time of his death in 1631 he had all but completed a logarithmic canon to every hundredth of a degree. This work was published by Vlacq at his own expense at Gouda in 1633, under the title 7'rigonometria Britannica. It contains log sines (to 14 places) and tangents (to 10 places), besides natural sines, tangents, and secants, at intervals of a hundredth of a degree. In the same year Vlacq published at Gouda his 7'rigonometria artificialts, giving log sines and tangents to every 10 seconds of the quadrant to 10 places. This work also contains the logarithms of the numbers from unity to 20,000 taken from the Avrithmetica logarithmica of 1628. Briggs appreciated clearly the advantages of a centesimal division of the quadrant, and by dividing the degree into hundredth parts instead of into minutes, made a step towards a reformation in this respect, and but for the appearance of Vlacq's work the decimal division of the degree might have become recognized, as is now the case with the corresponding division of the second. 'The calcu- lation of the logarithms not only of numbers but also of the trigonometrical functions is therefore due to Briggs and Vlacq ; and the results contained in their four fundamental works—Arithmetica logarithmica (Briggs), 1624 ; Arith- metica logarithmica (Vlacq), 1628; Zrigonometria Britan- nica (Briggs), 1633; Z'rigonometria artificialis (Vlacq), 1633—have never been superseded by any subsequent calculations.

A translation of Napier's Descriptio was made by Edward Wright, whose name is well known in connexion with the history of navigation, and after his death published by his son at London in 1616 under the title A Description of the admirable T'able of Logarithmes (12mo); the edition was revised by Napier himself. Both the Descriptio (1614) and the Constructio (1619) were reprinted at Lyons in 1620 by

Bartholomew Vincent, who thus was the first to publish logarithms‘on the Continent.

Napier calculated no logarithms of numbers, and, as already stated, the logarithms invented by him were not tobasee. The first logarithms to the base e were published by John Speidell in his Vew Logarithmes (London, 1619), which contains hyperbolic log sines, tangents, and secants for every minute of the quadrant to 5 places of decimals.

In 1624 Benjamin Ursinus published at Cologne a canon of logarithms exactly similar to Napier’s in the Descriptio of 1614, only much enlarged. The interval of the arguments is 10’, and the results are given to 8 places; in Napier’s

| canon the interval is 1’, and the number of places is 7.

The logarithms are strictly Napierian, and the arrangement is identical with that in the canon of 1614. This is the largest Napierian canon that has ever been published.

Kepler took the greatest interest in the invention of logarithms, and in 1624 he published at Marburg a table of Napierian logarithms of sines, with certain additional columns to facilitate special calculations.

The first publication of Briggian logarithms on the Continent is due to Wingate, who published at Paris in 1625 his Arithmétique logarithmétique, containing seven- figure logarithms of numbers up to 1000, and log sines and tangents from Gunter’s Canon (1620). In the following year, 1626, Denis Henrion published at Paris a Z’razcté des Logarithmes, containing Briggs’s logarithms of numbers up to 20,001 to 10 places, and Gunter’s log sines and tangents to 7 places for every minute. In the same year De Decker also published at Gouda a work entitled Miewwe Zelkonst, tnhoudende de Logarithmi voor de Ghetallen beginnende van

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LOGARITHM™MS

1 tot 10,000, which contained logarithms of numbers up to 10,000 to 10 places, taken from Briggs's Arithmetica of 1624, and Gunter's log sines and tangents to 7 places for every minute. Vlacq rendered assistance in the publication of this work, and the privilege is made out to him.

The preceding paragraphs contain a brief account of the main facts relating to the invention of logarithms. In describing the contents of the works referred to the language and uotation of the present day have been adopted, so that for example a table to radius 10,000,000 is described as a table to 7 places, and so on. Also, although logarithms have been spoken of as to the base e, &e, it is to be noticed that neither Napier nor Briggs, nor any of their successors till long afterwards, had any idea of connecting lugarithms with exponents.

The invention of logarithms aud the calculation of the earlier tables form a very striking episode in the history of exact science, and, with the exception of the Principia of Newton, there is no mathematical work published in the country which has produced such important consequences, or to which so much interest attaches as to Napier's Descriptio. The calculation of tables of the natural trigonometrical functions may be said to have formed the work of the last half of the 16th century, and the great canon of natural sines for every 10 seconds to 15 places which had been calculated by Rheticus was published by Pitiscus only in 1613, the year before that in which the Descriptio appeared. In the construction of the natural trigonometrical tables England had taken no part, and it is remarkable that the discovery of the principles and the formation of the tables that were to revolutionize or super- sede all the methods of calculation then in use should have been so rapidly effected and developed in a country in which so little attention had been previously devoted to such questions.

The only possible rival to Napier in the invention of logarithms is Justus Byrgius, who about the same time constructed a rude kind of logarithmic or rather anti- logarithmic table; but there is every reason to believe that Napier's system was conceived and perfected before that of Byrgius; and in date of publication Napier has the advantage by

six years. The title of the work of Byrgius is Arithmetische und geometrische Progress-T'abulen ; in his table he has log 1=0 and log 10 = 230270022. The only contemporary reference to Byrgius is contained in the sentence of Kepler, ' Apices logistici Justo Byrgio multis annis ante editionem Neperianam viam preiverunt ad hos ipsissimos logarithmos," which occurs in the " Preecepta" prefixed to the Zabule Rudolphine (1627); the apices are

the signs °, ', ", used to denote the orders of sexagesimal |

fractions. The system of Byrgius is greatly inferior to that of Napier, and it is to the latter alone that the world is indebted for the knowledge of logarithms. The claims of Byrgius are discussed in Kastner's Geschichte der Mathe- matik, vol. ii. p. 375, and vol. iii, p. 14; Montucla's L/s- toire des Mathématiques, vol. ii p. 10; Delambre's L/zstowe del Astronomie moderne, vol. i. p. 560 ; De Morgan's article on "Tables" in the Hnglish Cyclopedia ; and Mr Mark Napier's Memoirs of John Napier of Merchiston (1834). An account of the facts connected with the early history of logarithms is given by Hutton in his //story of Logarithms, prefixed to all the early editions of his logarithmic tables, and also printed in vol. 1. pp. 306-340 of his Zracts (1812); but unfortunately Hutton has inter- preted all Briggs's statements with regard to the invention of decimal logarithms ina manner clearly contrary to their true meaning, and unfair to Napier. This has naturallyproduced retaliation, and Mr Mark Napier has not only successfully refuted Hutton, but has fallen into the opposite extreme of attempting to reduce Briggs to the level of a mere com-

T7135 puter. It seems strange that the relations of Napier and Briggs with regard to the invention of decimal logarithms should have formed matter for controversy. The state- meuts of both agree in all particulars, and the warmest friendship subsisted between them. Napier at his death left his manuscripts to Briggs, and all the writings of the latter show the greatest reverence for him. 'The words that occur on the title page of the Logarithmicall arith. metike of 1631 are 'These nunbers were first invented by the most excellent Iohn Neper, Baron of Merchiston ; and the same were transformed, and the foundation and

use of them illustrated with his approbation by Henry Briggs.” No doubt the invention of decimal logarithms occurred both to Napier and to Briggs independently ; but the latter not only first announced the advantage of the change, but actually undertook und completed tables of the new logarithms. For more detailed information relating’ to Napier, Briggs, and Vlacq, and the invention of logarithms, the reader is referred to the life of Briggs in Ward’s Lives of the Professors of Gresham College, London, 1740 ; Thomas Smith’s Vitzx quorundam eruditissimorum et illustrium virorum (Vita Henrici Briggii), London, 1707; Mr Mark Napier’s ALemoirs of John Napier already referred to, and the same author’s Napert libri qui supersunt (1839) ; Hutton’s J/istory; De Morgan’s article already referred to; Delambre’s Jfistoire de l’Astronomie Moderne; the report on mathematical tables in the J? eport of the British Association for 1873; and the Philosophical Magazine for October and December 1872 and May 1873. It may be remarked that the date usually assigned to Briggs’s first visit to Napier is 1616 and not 1615 as stated above, the reason being that Napier was generally supposed to have died in 1618; but it was shown by Mr Mark Napier that the true date is 1617.

For a description of existing logarithmic tables, and the purposes for which they were constructed, the reader is referred to the article Tastes (MaTnEemMaticaL). In what follows only the most important events in the history of logarithms, subsequent to the facts counected with their invention and the original calculations, will be noticed,

Nathaniel Roe’s Tabulw logarithmicx (1633) was the first com- plete seven-figure table that was published. It contains seven- figure logarithms of numbers from 1 to 100,000, with eharaeteristies unseparated from the mantisse, and was formed from Vlaeq’s table (1628) by leaving out the last three figures. All the figures of the number are given at the heads of the eolumns, exeept the last two, which run down theextreme columns, —1 to 50 on the left hand side, and 50 to 100 on the right hand side. ‘he first four figures of the logarithms are printed at the tops of the eolumns. ‘There is thus an advaniee half way towards the arrangement now universal in seven-figure tables. ‘The final step was made by John Newton in his

Trigononometria Britannica (1658), a work which is also noticeable as' being the only extensive eight-figure table that has ever been published ; it contains logarithms of sines, &c., as well as loga- rithms of nunbers.

In 1705 appeared the original edition of Sherwin's tables, the first of the series of ordinary seven-figure tables of logarithms of uumbers and trigonometrical functions such as are in general use now. 'The work went through several editions during the last century, and was at length superseded in 1785 by Hutton's tables, which have continued in successive editions to maintain their position up to the present time.

In 1717 Abrahain Sharp published in his Geometry Improv'ad the

| Briggian logarithms of numbers from 1 to 100, and of primes from

100 to 1100, to 61 plaees ; these were copied into the later editions of Sherwin and other works.

In 1742 a seven-figure table was published in quarto form by Gardiner, whieh is eelebrated on account of its aeeuraey and of the elegance of the printing. A Freneh edition, which closely re- sembles the original, was published at Avignon in 1770.

In 1783 appeared at Paris the first edition of Callet's tables, which correspond to those of Hutton in England. These tables, which form perhaps the most eomplete and practically useful eol- lection of logarithms for the general eomputer that has been pub- lished, have passed through many editions, and arc still in use.

In 1794 Vega published his Thesaurus logarithmorum completus, a folio volume containing a reprint of the logarithms of numbers

from Vlacq's Arithmetica logarithmica of 1628, and Trigonometria artificialis of 1638. The logarithms of numbers are arranged as in an ordinary seven-figure table. In addition to the logarithms reprinted

from the 7’rigonometria, there are given logarithms for every second of the first two degrees, which were the result of an original calculation. Vega devoted great attention to the detection and correction of the errors in Vlacq’s work of 1628. He also pub- lished in 1797, in 2 vols. 8vo, a collection of logarithmic and trigonometrical tables which has passed through many editions, a very useful one volume stereotype edition having been published in 1840 by Hiilsse. ‘The tables in this work may be regarded as to some extcut supplementary to those in Callet.

If we consider only the logarithms of numbers, the main line of descent from the original calculation of Briggs and Vlacq is Roe, John Newton, Sherwin, Gardiner; there are then two branches, viz., Hutton founded on Sherwin and Callet on Gardiner, and the editions of Vega form a separate offshoot from the original tables. Among the most useful and accessible of modern ordinary seven- figure tables of logarithms of numbers and trigonomctrical functions niay be meutioned those of Bremiker, Schron, and Bruhns. For logarithms of numbers only perhaps Babbage’s table is the most convenient.

In 1871 Mr Sang published a seven-figure table of logarithms of numbers extending from 20,000 to 200,000 ; and the logarithms of the numbers between 100,000 and 200,000 were calculated de novo by Mr Sang as if Jogarithms had never been computed before. In tables extending from 10,000 to 100,000 the differences near the beginning of the table are large, and they are so numerous that the proportional parts must either be very crowded, or some of them have to be omitted; and to diminish this inconvenience many tables extend to 108,000. By beginning the table at 20,000 instead of at 10,000, the differences are halved in magnitude, while the number of them in a page is quartered. In this table multiples of the differences, instead of proportional parts, are given.

As regards the logarithms of trigonometrical functions, the next great advance on the T’rigonometria artificialis took place more than a century aud a half afterwards, when Michael Taylor published in 1792 his seven-decimal table of log sines and tangents to every second of

the quadrant; it was calculated by interpolation from the 7rigonomctria to 10 places and then contracted to 7. On account of the great size of this table, and for other reasons, it never caine into very general use, Bagay's Nouvelles tables astronomiques (1829), which also contains log sines and tangeuts to every second, being preferred, but this work is now difficult to pro- eure. 'lhe only other logarithmic canon to every sccond that has been published forms the second volume of Shortrede's Logarithmic Tables (1849). It coutains also proportional parts, and is the most complete and accessible table of logarithms for every second. Shortrede's tables originally appeared in 1844 in one volume, during the author's absence in India; but, not being satisfied with them in some respects, he made various alterations, and published a second edition in two volumes in 1849. There have been subsequent editions of the voluine containing the trigonometrical canon. The work is an important one, and the pages are clear, although the nunber of figures on each is very great.

On the proposition of Carnot, Prieur, and Brunet, the French Government decided in 1784 that new tables of sines, tangents, &c., and their logarithins, should be calculated in relation to the cen- tesimal division of the quadrant. Prony was charged with the direction of the work, and was expressly required '' Non seulement a composer des tables qui ne laissassent rien 4 désirer quant & lexactitude, mais 4 en faire le monument de calcul le plus vaste et le pius imiposant qui efit jainais été exécuté ou méme congu." Those engaged upon the work were divided into tliree sections: the first consisted of five or six mathematicians, including Legendre, who were engaged in the purely analytical work, or the calculation of the fundamental numbers ; the second section consisted of seven or eight calculators possessing some mathematical knowledge; and the third comprised seventy or eighty ordinary computers. The work, which was performed wholly in duplicate, aud independ- ently by two divisions of computers, occupied two years. As a consequence of the double calculation, there are two manuscripts in existence, one of which is deposited at the Observatory, and the other in the library of the Institute, at Paris. Each of the two manuscripts consists essentially of seventeen large folio volumes, the conteuts being as follows :—

Logarithms of numbers up to 200,000 ONE Thiet Wy MN Set tecen de seterectacesccsertascsct=veassns=2esesaissewsele-.cers-ceb 1
Logarithms of the ratios of ares to sines from 07-00000 to 07-05000, and log sines throughout the quadrant. .....s.ccseeees ere cecees 4
Logarithms of the ratios of arcs to tangents from 07:00000 to 07-05000, and log tangents throughout the quadrant …..,.... 4

The trigonometrical results are given for every hundred- thousandth of the quadrant (10” centesimal or 3°24 sexagesimal), The tables were all calculated to 14 places, with the intention that only 12 should be published, but the twelfth figure is not to be relied upon. The tables have never been published, and are

gencrally known as the Tables du Cadastre, or, in England, as the great French manuscript tables.

A very full account of the Tables dw Cadastre, with an explana- tion of the methods of calculation, formule employed, &c., hag been published by M. Lefort in vol. iv. of the Annales de [’ Observa- toire de Paris. ‘The printing of the table of natural sines was once begun, and M. Lefort states that he has seen six copies, all incom- plete, although including the last page. Babbage compared his table with the Tables du Cadastre, aud M. Lefort has given in his paper just referred to most important lists of errors in Vlacq’s and Briggs’s logarithms of numbers which were obtained by comparing the manuscript tables with those contained in the

It may be mentioned here that the late Mr John Thomson of Greenock made an independent calculation of the logarithms of numbers up to 120,000 to 12 places, and that the manuscript of the table was presented in 1874 to the Royal Astronoinical Societ, by his sister. ‘The table has becn used to verify the errata weiiiel M. Lefort found in Vlacq and Briggs by meaus of the Zables du Cadastre. An account of Mr Thomson’s table, and of this and other comparisons between it and the printed tables, is to be found in the Monthly Notices of the Society, vol. xxxiv. pp. 447-75 (1874).

Although the Zables du Cadastre have never been published, other tables have appeared in which the quadraut is divided cen- tesimally, the most important of these being Hobert and Ideler's Nouvelles tables trigonométriques (1799), and Borda and Delambre's Tables trigonométriques décimales (1800-1). The former work contains natural and log sines, cosines, tangents, and cotangents to 7 places, up to 3° (ceutesiinal) at camels of 10" (centesimal), and thence to 50° at intervals of 1'. The latter gives log sines, cosines, tangents, and cosines for centesimal arguinents, viz., from 0' to 10' at intervals of 10", and from 0° to 50° at intervals of 10', to 11 places, and also, in another table, log sines, cosines, tangents, cotangents, secants, and cosecants from 0° to 3° at intervals of 10", and thence to 50° at intervals of 1' to 7 places. After the work was printed it was read by Delambre with the Tables du Cadastrc, aud a number of last-figure errors which are given in the preface were thus detected. Callet's tables already referred to contain in a convenient form logarithms of trigonometrical functions for ccu- tesimal arguments.

Two tables of logarithms of numbers which have been recently published may be noticed, as they involve points of novelty. The first of these is Pineto's Tables de logarithmes (St Petersburg, 1871). The tables are intended to give in a small space (56 pages) all the results that can be obtained from a complete ten-figure table by means of the following principle :—only the logarithms of the numbers froin 1,000,000 to 1,011,000 are given directly, all other numbers being brought within the range of this table by multipli- cation by a factor, the logarithm of which factor is to be subtraeted from the logarithin in the table. A list of the most convenient factors and their logarithms is given in a separate table. The principle of multiplying by a factor which is subsequently cancelled by subtracting its logarithm is one that is frequently employed in the calculation of logarithms, but the peculiarity of the present work is that it forms part of the process of using the table. The other tables, which occupy only ten pages, were published in a tract entitled Tables de logarithmes & 12 décimales jusqu' a 484 milliards by MM. Namur and Mansion at Brussels in 1877. 'The fact that the differences of the logarithms of numbers near to 434294 (these being the first figures of the modulus of the Briggian

logarithms) commenced with thie figures 100…, so that the interpolations in this part of the table are very easily and accurately performed, is ingeniously made use of. A table is given of logarithms of numbers near to 434294, and other numbers are brought within the range of the table by multiplication by one or two factors which are indicated.

In the ordinary tables of logarithms the natural numbers are all integers, while the logarithms tabulated are incommensurable. In an antilogarithmic table, the logarithms are exact quantities such as 00001, 00002, &c., and the numbers are incommensurable. The earliest and largest table of this kind that has been constructed is Dodson's Antilogarithmic canon (1742), which gives the numbers to 11 places, corresponding to the logarithins from '00001 to 99999 at intervals of '00001. The only other extensive tables of the same kind that have been published occur in Shortrede's Logar- ithmic tables already referred to, and in Filipowski's Zable of antilogarithms (1849). Both are similar to Dodson's tables, from which they were derived, but they only give numbers to 7 places.

The most elaborate table of hyperbolic logarithms that exists is due to Wolfram, a Dutch lieutenant of artillery. His table gives the logarithms of all numbers up to 2200, and of primes (and also of a great many composite numbers) from 2200 to 10,009, to 48 decimal places. The table appeared in Schulze's Neuc und erwetterte Sammlung logarithmiseher Tafeln (1778), and was reprinted in Vega's Thesaurus (1794), already referred to. Six

logarithms omitted in Schulze's work, and which Wolfram had been prevented from computing by a serious illness, were published subsequently, and the table as given by Vega is complete. 'The largest hyperbolic table as regards range was published by Zacharias Dase at Vienna in 1850 under the title Tafel der natiirlichen Logarithmen der Zahlen. It gives hyperbolic logarithms of numbers from 1000°0 to

10500°0 at intervals of **1 to 7 places, with differences and proportional parts, arranged like an ordinary seven-figure table of Briggian logarithms. The table appeared in the thirty-fourth part (new scries, vol. xiv.) of the Annals of the Vienna Observatory (1851); but separate copies were issued. Hyperbolic antilogarithms are simple exponentials, 7.¢., the hyperbolic antilogarithm of x is e**. A seven-figure table of e* and its Briggian logarithm from z=-01 to x=10 at intervals of 01 is given in Hiilsse's edition of Vega's Sammlung, and in other collections of tables; but by far the most complete table that has been published occurs iu Gudermann's Zhcorie der potenzial- oder cyklisch-hyperbolischen Functionen, Berlin, 1833. 'This work consists of reprinted papers from Crelle's Journal, and one of the tables contains the Briggian logarithms of the hyperbolic sine, cosine, and tangent of x from x=2 to x5 at intervals of '001 to 9 places, and from x=5 to 7=12 at intervals of 0°01 to 10 places. Since the hyperbolic sine and cosine of x are respectively $(e*—e-*) and 4(e*+e-*), the values of e* and e-* may be deduced from the results given in the table by simple addition and subtraction. Logistic numbers is the old name for what would now be called

ratios or fractions. Thus a table of log Sat where x is the argu- ment and @ a constant, is called a table of logistic or proportional logarithms; and since log = =log a —log x itis clear that the tabular

results differ from those given in an ordinary table of logarithms only by the subtraction of a constant and a change of sign. The first table of this kind appeared in Kepler's Chilias logarithmorum

(1624) already referred to. The object of a table of log "is to és

facilitate the working out of proportions in which the third term is a constant quantity a. In most collections of tables of logarithms, and especially those intended for use in connexion with navigation, thero occurs a small table of logistic logarithms in which a=3600" (=1° or 14), the table giving log 3600 – log x, and a being expressed in minutes and seconds. It is also common to find tables in which a@=10800"(=3° or 34), and x is expressed in degrees (or hours), minutes, and seconds. Such tables are generally given to 4 or 5 i tee

The usual practice in books seems to he to call logarithms ogistic when is 3600", and proportional when a has any other value.

Gaussian logarithms are intended to facilitate the finding of the logarithms of the sum and difference of two numbers whose logarithms are known, the numbers themselves being unknown ; and on this account they are frequently called addition and sub- traction logarithms. The object of the table is in fact to give log (a-+6) by only one entry when log a and log b are given. The utility of such logarithms was first pointed out by Leonelli in a book entitled Supplément logarithmique, printed at Bordeaux in the year XI. (1802-3); this work being very scarce, a reprint of it was published by M. J. Houel in 1876. Leonelli calculated a table to 14 places, but only a specimen of it which appeared in the Supplément was printed. The first table that was actually pub- lished is due to Gauss, and was printed in Zach's Monatliche Core- spondenz, vol. xxvi, p. 498 (1812). Corresponding to the argument A it gives, to 5 places, B and C, where

A=logz, B=log (1 + 7) , C=log(1+z),

so that C=A+B. We have identically

log (a +b) =log a +log (a dp +) =log a+B (for argument log 5

and, in using the tablc, the rule is to take log @ to be the larger of the two logarithms, and to enter the table with log a—log bd as argument ; we then have log (a+6)=log a+B, or, if we please, —log6+C. The formula for the difference is log (a -6)=log b+ A (argument sought in column C) if log a — log b is greater than *30103 and =log b—A (argument sought in column B) if log a—log 6 is less than °30103.

The principal tables of Gaussian logarithms are (1) Mathiessen, Tafel zur bequemern Berechnung (Altona, 1818), giving B and C for argument A to 7 places,—this table is not a convenient one; (2) Peter Gray, Tables and Formule (London, 1849), and Addendum (1870), giving full tables of C and log (1-2) for argument A to 6 places; (8) Zech, Tafeln der Additions- und Subtractions-logarithmen (Leipsic, 1849), giving 7-place values of B for argument A, and 7-place values

of C for argument B. These tables appeared originally in Hiilsse's edition of Vega's Sammlung (1849); (4)

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Wittstein, Logarithmes de Gauss (Hanover, 1866), giving values of B for argument A to 7 places. 'This is a large table, and the arrangement is similar to that of an ordinary seven-figure table of logarithms.

In 1829 Widenbach published at Copenhagen a small table of

modified Ganssian logarithms giving log ete (=D) corresponding

to A asargument ; Aand D are thus reciprocal, the rclation between them being in fact 104+? —104+410"+1, so that either A or D inay be regarded as the argument.

Ganssian logarithms are chiefly useful in the calculations con- ea with the solution of triangles in such a formule as cot 3C= at a—b

Calculation of Logarithms.—The name logarithm is derived from the words Aéywv dpiO.ds, the number of the ratios, and the way of regarding a logarithm which justifies the name may be explained as follows. Suppose that the ratio of 10, or any other particular number, to 1 is compounded of a very great number of equal ratios, as for example 1,000,000, then it can be shown that the ratio of 2 to 1 is very nearly equal to a ratio compounded of 301,030 of these small ratios, or ratiwncule, that the ratio of 3 to 1 is very nearly equal to a ratio compounded of 477,121 of them, and so on. The small ratio, or ratiuncula, is in fact that of the millionth root of 10 to unity, and if we denote it by the ratio of a to 1, then the ratio of 2 to 1 will be nearly the same as that of a 301,00 to 1, and so on; or, in other words, if a denotes the milliouth root of 10, then 2 will be nearly equal to a 01039, 3 will be nearly equal to a 477121, and so on.

Napier's original work, the Descriptio canonis of 1614, contained, not logarithms of numbers, but logarithms of sines, and the relations between the sines and the logarithms were explained by the motions of

points in lines,in a manner not unlike that afterwards employed by Newton in the method of fluxions. An account of the processes by which Napier constructed his table is given in the Constructio canonis of 1619. These methods apply, however, specially to Napier’s own kind of logarithms, and are different froin those actually used by Briggs in the construction of the tables in the Arithmetica logarithmica, although soine of the latter are the same in principle as the processes described in an appendix to the Constructio. It may be observed that in the Constructio logarithms are called artificials, and this seems to have been the name first employed by Napier, but which he subsequently replaced by logarithms. It is to be presumed that he would have made the change of name also in the Constructio, had he lived to publish it himself.

The processes used by Briggs are explained by him in the preface to the Arithmetica logarithmica (1624). His method of finding the logarithms of the small primes, which consists in taking a great number of continued geometric means between unity and the given primes, may be described as follows. He first formed the table of numbers and their logarithms:

tan (A—B), and in the calculation of life contingencies.

Number, Logarithm.

1

3°162277… 05 1°778279… 0°25 1°333521… 0°125 1154781… 0°0625

each quantity in the left hand column being the square root of the one above it, and each quantity in the right hand column being the half of the one above it. To construct this table Briggs, using about thirty places of decimals, extracted the square root of 10 fifty-four times, and thus found that the logarithm of 100000 00000 00000 12781 91493 20032 35 was 0:00000 00000 00000 05551 11512 31257 82702, and that for numbers of this form (ie., for numbers beginning with 1 followed by fifteen ciphers, and XIV. -— 98

then by seventeen or a less number of significant figures) the logarithms were proportional to these significant figures. He then by means of a simple proportion deduced that log (1:00000 00000 00000: 1)=0-00000 00000 00000 04342 94481 90325 1804, so that, a quantity 1:00000 00000 00000 «x (where x consists of not more than seven- teen figures) having been obtained by repeated extraction of the square root of a given number, the logarithm of 100000 00000 00000 «x could then be found by multiply- ing x by ‘00000 00000 00000 04342…..

To find the logarithm of 2, Briggs raised it to the tenth power, viz., 1024, and extracted the square root of 1:024 forty-seven times, the result being 1:00000 00000 00000 16851 60570 53949 77. Multiplying the significant figures by 4842… he obtained the logarithm of this quantity, viz., 0°00000 00000 00000 07318 55936 90623 9336, which multiplied by 247 gave 001029 99566 39811 95265 277444, the logarithm of 1:024, true to 17 or 18 places. Adding the characteristic 3, and dividing by 10, he found (since 2 is the tenth root of 1024) log 2 = ‘30102 99956 63981 195. Briggs calculated in a similar manner log 6, and thence deduced log 3.

It will be observed that in the first process the value of the modulus is in fact calculated from the formula

h 1

104-1 “loge 10’

the value of h being a and in the second process log, 2

is in effect calculated from the formula

947) 1 247

x log. 10 4 To .

Briggs also gave methods of forming the mean propor- tionals or square roots by differences; and the general method of constructing logarithmic tables by means of differences is due to him.

The following calculation of log 5 is given as an example of the application of a method of mean proportionals. The process consists in taking the geometric mean of numbers above and below 5, the object being to at length arrive at 5:000000. To every geometric mean in the column of numbers there corresponds the arithmetical mean in the column of logarithms. ‘The numbers are denoted by A, B, C, &c., in order to indicate their mode of formation.

Numbers. Logarithms. 3A = 1°000000 0°0000000 a= 10°000090 1-0000000 C =/(AB) = 3°162277 05000000 D =r/(BC) = 5623413 0°7500000 = /(CD) = 4:‘216964 0°6250000 FF =a/(DE) = 4°869674 0°6875000 G =a/(DF) = 5°232991 0°7187500 H =/(FG) = 5:048065 0°7081250 Le \/ (FH) = 4°958069 0°69538125 K =+/(HI) = 5002865 06992187 L =/IK) = 4:°980416 0°6972656 M = f(KL) = 4:991627 0°6982421 N =/(KM)= 4:997242 0°69873804 O =A/(KN) = 5:000052 0°6989745 P =a/(NO) = 4:998647 0°6988525 @ =a/(OP) = 4°999350 0°69891385 R= /(0Q) = 4:999701 0°6989440 S =a/(OR) = 4:999876 0°6989592 T =a/(OS) = 4:°999968 0°6989668 V =/(OT) = 5-000008 0°6989707 W = (TV) = 4:°999984 0°6989687 A A WV)= 4°999997 06989697 Y =a/(VX)= 5:000008 0°6989702

= AL (X Y)= 5:000000 0°6989700

Great attention was devoted to the methods of calculating logarithms during the 17th and 18th centuries. The earlier methods proposed were, like those of Briggs, purely arith- metical, and for a long time logarithms were regarded from the point of view indicated by their nanie, that is to say,

LOGARITHMS

as depending on the theory of compounded ratios. The introduction of infinite series into mathematics effected a great change in the modes of calculation and the treatment of the subject. Besides Napier and

Briggs, special refer- ence shonld be made to Kepler (Chalias, 1624) and Mercator (Logarithmotechnia, 1668), whose methods were arith- metical, and to Newton, Gregory, Halley, and Cotes, who employed series. A full and valuable account of these methods is given in Hutton's ''Construction of Logarithms," which occurs in the introduction to the early editions of his Mathematical Tables, and also forms tract 21 of his Mathematical Tracts (vol. i., 1812), Many of the early works on logarithms were reprinted in the Scriptores logarithmict of Baron Maseres (6 vols. 4to, 1791-1807).

In the following account only those formulze and methods will be referred to whicli would now be used in the calcula- tion of logarithms.

Since

log, (1 +x) =a — 42° + §a*- Jat+ &e.,

we have, by changing the sign of x,

loge (1-2) = — a fa? — Ja® – ort &e.; whence "OBe gt = = (w+ Ja + 4a + he,), 1d, therefore, replacing a by 22 , and, therefore, replacing x laa # ogi Po8 a Wend (2=2)" ge 108 "4 . red teh ae "ro Silay

in which the series is always convergent, so that the formula affords a method of deducing the logarithm of one number from that of another. As particular cases we have, by putting g=1, ery (Pat) s 3 (2S) 4 ae. | log, p=2 PHS + (BS + 3 + &C. ¢ , and by putting g=p+1,

il 1 1 —lo¢g,7= ——- a . . ek hes Sp+1 * **@p+iys** pip t *° "=

the former of these equations gives a convergent series for log.p, and the latter a very convergent series by means of which the logarithm of any number may be deduced from the logarithm of the preceding number.

From the formula for log, £ we may deduce the following very convergent series for log, 2, log. 8, and log. 5, viz. :—

log. 2=2(7P +5Q +8R),

log. 8 =2(11P+8Q +5R),

log. 5 = 2(16P +12Q+7R),

where P= 5] + §- Gis + 4- “aiye +&c. Q=2 +3. foe +4. as + &e. R=75 +4. asi ee asi te

The following still more convenient formule for the calculation of log, 2, log. 8, &c. are given by Professor J. C. Adams in the Proceedings of the Royal Society, vol. xxvii. (1878), p. 91. If

log 2=7a-2b+3c, log 3=1la-3d+5c, log 5=16a—-4b+7e, and log 7 =3(89a -—10b+17c-d) or =19a- 46+ 8c+e,

and we have the equation of condition, a-—2b+c=d+2e.

By means of these formule Professor Adams has caleulated the values of log. 2, log. 3, log. 5, and log. 7 to 260 places of decimals,

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and he has deduced the value of log. 10 and its reciprocal M, the modulus of the Briggian system of logarithms. The value of the modulus found by Professor Adams is

M=-43429 44819 03251 82765 11289

18916 60508 22943 97005 80366 65661 14453 78316 58646 49208 87077 47292 24949 338438 17488 18706 10674 47663 03733 64167 92871 58963 90656 92210 64662 81226 58521 27086 56867 03295 93370 86965 88266 88331 16360 77384 90514 28443 48665 76864 65860 85135 56148 21234 87653 43543 43573 17247 48049 05993 55353 (05

The values of the other logarithms are given iu the paper referred to. If the logarithms are Briggian all the series in the preceding formule must

be multiplied by M, the modulus; thus, for example, logy (1 +2) = M(a — $2? + $29 – da4+ &c.), and so on. ‘

As has been stated, Abraliam Sharp’s table contains 61-decimal Briggian logarithms of primes up to 1100, so that the logarithms of all composite numbers whose greatest prime factor does not ex- ceed this number may be found by simple addition; and Wolfram’s table gives 48-decimal hyperbolic logarithms of primes up to 10,009. By means of these tables and of a factor table we may very readily obtain the Briggian logarithm of a number to 61 ora less number of places or of its hyperbolic logarithm to 48 or a less number of places in the following manner. Suppose thehyperbolic logarithm of the prime number 43,867 required. Multiplying by 50, we have 50 × 48,867 =2,193,350, and on looking in Burekhardt’s Table des diwiseurs for a number near to this which shall have no prime factor greater than 10,009, it appears that

2,193 849 =23 × 47 × 2029 ; thus 43,867 = 74,(28 × 47 × 2029 +1), and therefore

log. 43,867 = log. 23 + log. 47 + log. 2029 — log, 50

1 1 1

a 2,193,349 a (2,193,349)? +4 (2,193,349)? os The first term of the series in the second line is

0:00000 04559 23795 07319 6286;

dividing this by 2 × 2,193,349 we obtain

0°00000 00000 00108 93325 8457, aud the third term is

0:00000 00000 00000 00003 1590,

so that the series=

0700000 04559 23691 13997 4419;

whence, taking out the logarithms from Wolfram’s table, log. 48,867 =10°68891 76079 60568 10191 3661.

The principle of the method is to multiply the given prime (sup- posed to consist of 4, 5, or 6 figures) by such a factor that the pro- duct may be a number within the range of the factor tables, and such that, when it is increased by 1 or 2, the prime factors may all be within the range of the logarithmic tables. The logarithm is then obtained by use of the formula

d Ce a log. (2+d)=log,#+ = —4 Z cakGaa — ke.,

in which of course tlic object is to render # as small as possible,

If the logaritlun required is Briggian, the value of the series is to be multiplied by M.

1f the number is incommensurable or consists of more than seven figures, we can take the first seven figures of it (or multiply and divide the result by any factor, aud take the first seven figures of the result) and proceed as before. An application to the hyperbolic logarithm of is given by Burckhardt: in the introduction to lis Table des diviseurs for the second million.

The best general method of calculating logarithms consists, in its simplest form, in resolving the number whose logarithm is required into factors of the form 1— ‘Irn, where 7 is one of the nine digits, and making use of subsidiary tables of logarithms of factors of this form. For example, suppose the logarithm of 543839 required to twelve places. Dividing by 10° and by 5 the number becomes 1:087678, and resolving this number into factors of the form 1 — “I”m we find that

543839 = 108 × 5(1 — °128)(1 — “146)(1 — °156)(1 — *13)(1 — +173)

x (1 = °185)(1 — *197)(1 — “12°9)(1 — 228)(1 — -1222) where 1 – ‘128 denotes 1 — ‘08, 1 — ‘146 denotes 1 — 0006, &c., and so

on, All that is required therefore in order to obtain the logarithm of any number is a table of logarithms, to the required number of places, of ‘n, ‘9n, ‘99n, *999n, &., for n=1, 2, 3,...9.

The resolution of a number into factors of the above form is easily performed. Taking, for example, the number1‘087678, the object is to destroy the significant figure 8 in the second place of decimals ; this is effected by multiplying the number by 1 – ‘08, that is, by subtracting from the number eight times itself advanced two places, and we thus obtain 1:00066376. To destroy the first 6 multiply by 1—-0006 giving 1:000063361744, and multiplying successively by 1 – 00006 and 1-000008, we obtain 1-000000857932, and it is clear that these last six significant figures represent without any further work the remaining factors required. In the corre- sponding antilogarithmic process the number is expressed as a pro- duct of factors of the form 1+ “1%z.

This method of calculating logarithms by the resolution of num- bers into factors of the form 1—‘1*m is generally known as Weddle’s method, having been published by him in The Mathe- matician for November 1845, and the corresponding method for antilogarithms by means of factors of the form 1+(‘1)‘n is known by the name of Hearn, who published it in the same journal for 1847. In 1846 Mr Peter Gray constructed a new table to 12 places, in which the factors were of the form 1-(‘01)“n, so that n had the values 1, 2,... 99; and subsequently he constructed a similar table for factors of the form 1+(‘01)‘n. He also discovered a method of applying a table of Hearn’s form (7.e., of factors of the form 1+‘1”) to the construction of logarithms, and calculated a table of logarithms of factors of the form 1+ (-001)” to 24 places. This was published in 1876 under the title Tables for the formation of logarithms and antilogarithms to twenty-four or any less number of places, and contains the most complete and useful application of the method, with many improvements in points of detail. Taking as an example the calculation of the Briggian logarithm of the number 43,867, whose hyperbolic logarithm has been calculated

above, we multiply it by 3, giving 131,601, and find by Mr Gray's process that the factors of 1°31601 are

(1) 1°316 (5) 1-(001)4002

(2) 1:000007 (6) 1-(001)5602

(3), 1:(001)2598 (7) 1:(001)8412

(4) 1(001)3780 (8) 1:(001)7340.

Taking the logarithms from Mr Gray's tables we obtain the required logarithm by addition as follows:—

522 878 745 280 337 562 704 972 = colog3 119 255 889 277 936 685 5538 918 = log (1) 3 040 056 733 157 610 289 = log (2) 259 708 022 525 453 597 = log (3) 338 749 695 752 424 = log (4) 868 588 964 = log (5) 261 445 278 = log (6) 178 929 = log (7) 148 = log (8) 4642 137 9384 655 780 757 288 464 = logy) 43,867

In Shortrede's Tables there are tables of logarithms and factors of the form 1+('01)" to 16 places and of the form 1+ ('1)'n to 25 places; and in his Tables de Logarithmes & 27 Deéei- males (Paris, 1867) Fédor Thoman gives tables of logarithms of factors of the form 14 1". In the Messenger of Mathcmaties, vol. iii. pp. 66-92, 1873, Mr Henry Wace gave a simple and clear account of both the logarithmic and antilogarithmic processes, with tables of both Briggian and hyperbolic logarithms of factors of the form 14°1"n to 20 places.

Although the method is usually known by the names of Weddle and Hearn, it is really, in its essential features, due to Briggs, who gave in the Arithmetica logarithmica of 1624 a table of the logarithms of 1+ '1"n up to r=9 to 15 places of decimals. It was first for- mally proposed as an independent method, with great improve- ments, by Robert Flower in The Radix, a new way of making Loga- rithms, which was published in 1771; and Leonelli, in his Supplément logarithmique (1802-3), already noticed, referred to Flower and reproduced some of his tables. A complete bibliography of this method

has been given by Mr A. J. Ellis ina paper ‘‘ on the potential radix as a means of calculating logarithms,” printed in the Proceedings of the Royal Society, vol. xxxi., 1881, pp. 401-407, and vol. xxxil., 1881, pp. 377-879. Reference should also be made to Hoppe’s Tafcln zur dreissigstelligen logarithmischen Rechnung (Leipsic, 1876), which give in a somewhat modified form a table of the hyperbolic logarithm of 1+ ‘1*n.

The preceding methods are only appropriate for the caleula- tion of isolated logarithms. If a complete table had to be recon- structed, or calculated to more places, it would undoubtedly be most convenient to employ the method of differences. A full account of this method as applied to the calculation of the Tables du Cadastre is given by M. Lefort in vol. iv. of the Annales de l’Observatoire de Paris. (. WeebaGa)

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1. OGIC, in the most general acceptation of the term,

may be regarded as the systematic study of thought. So wide a definition is certainly sufficient to comprehend all that may have been at various times included within the scope of logical doctrine, but in other respects it is of sinall value. It does not serve to mark off logic from philosophy as a whole, which is unquestionably the systematic exposi- tion of thouglit, nor from psychology, which includes within its wider range what may well be described as the study of thought. Without some more accurate discrimination of the province and method of logic, neither the extent of matter to be included within the study nor the pecu- liarity of the method by which such matter is treated can be determined.

Preliminary queries of a similar kind are naturally encountered in the case of all other branches of human knowledge, and are generally answered by two methods. We may refer either to the distinct characteristics of the matter to be treated, or to the esseutial features of the method of treatment. We may determine the province of a science either by external division, by classification of objects according to their prevailing resemblances and differences, or by internal definition, by exposition of the fundamental characters of the method employed. By neither process, unfortunately, can an unambiguous answer be supplied, at least without much art, in the case of logic.

2. The reasons for the manifold difficulties encountered in the attempt to determine accurately the province of logic, whether by reference to a division of the sciences or by precise definition of the essential features of logical analysis, are not far to seek. Tlic systematic classification of the sciences involves not only consideration of the con- tents of the sciences as empirically presented, but also certain leading principles or fundamental views, which are in essence of a philosophical character. According to the general conception of knowledge which in various kinds is manifested in the special sciences, there will be radically divergent methods of classification, and the province assigned to each member of the ensemble will, for the most part, have its limits determined according to the character of the general view adopted. Moreover, if any of the more prominent specimens of classification of the sciences be critically inspected, they will be found to presuppose a certain body of principles, of scope wider than any of the special disciplines, and to which no place in the ensemble can be assigned. In short, a systematic distribution of human knowledge into its distinctly marked varieties rests upon and presupposes a general philosoplry, the character of which affects the place and function of cach part of the distribution. Logic, as may readily be imagined, has therefore experienced a variety of treatment at the hands of systematizers of scientific knowledge. It has appeared as one of the abstract sciences, in opposition to those disciplines in which the character of the concrete material is the essential fact ; as a subordinate branch of a particular concrete science, the investigation of mental phenomena ; as a nondescript receptacle for the formulation

in generalized fashion of the method and logical precepts exemplified in the special sciences. By such processes no more has been effected than to bring into light, more or less clearly, some of the characteristics of the supposed science, without in any way supplying an exhaustive and comprehensive survey of its boundaries and relations to other branches of knowledge. Thus, when logic is marked of from the concrete sciences and associated with mathematics in the most general sense, as the treatment

of formal relations,! and further differentiated from mathematics as implying no reference to the quantitative character of the most general relations under which facts of experience present themselves,? there is certainly brought to the front what one would willingly allow to be a cominonplace respecting all logical analysis, namely, that its principles are coextensive with human knowledge, and that all objects as matters of conscious experience have an aspect in which they are susceptible of logical treatment. But no more is effected. Itis still left to a wider consider- ation to determine what the specific aspect of things may be which shall be called the formal and be recognized as the peculiarly logical element in them. There may be sclected for this purpose either the general relations of cvincidence and succession in space and time, or the fundamental properties of identity and difference, or the existences of classes, but in any case such selection depends upon and refers to a theory of the nature of knowledge and of the constitution of things as known. In truth, the notions of form and formal relations are by no means so simple and free from ambiguity that by their aid one can at once solve a complicated problem of philosophic arrange- ment. To lay stress upon form as the special object of logical treatment still leaves undecided the nature and ground of the principles which are to be employed in cvolving a science of form, and therefore leaves the logical problem untouched.

Still less satisfactory are the results when logic is regarded as in some way a subordinate branch of the psychological analysis of mental phenomena.? Neither the grounds on which such a classification rests, nor the con- clusions deduced from it, seem beyond criticism. The stuple facts that certain mental processes are analysed in logic, aud that

psychology is generally the treatment of all inental processes, by no means necessitate the view that logic is therefore the outgrowth from and a subordinate part of psychology. For it is clear, on the one hand, that logic has a scope wider than psychology, since in any sense of the term it has to deal with all the processes (or with some aspect of all the processes) by which on any subject knowledge is formed out of disjointed or disconnected experiences. And, on the other hand, since the subordina- tion of one science to another, as species to genus, is fallacious, uuless the two agree in fundamental charac- teristics, the position so assigned to logic would imply that in aim and method it shall be essentially one with psycho- logy, @ position equivalent to the negation of logic as a separate and independent discipline. It is not surprising therefore to find that so soon as logic has been distin- guished as arising from psychology, and so dependent on it, the peculiarity of its position and functions compels the recognition of its more general scope and the reduction of its connexion with psychology to au amount small enough to be compatible with absolute independence. Strong

1 As, eg., by H. Spencer, Classification of the Sciences, pp. 6, 12; H. Grassmann, Die Ausdehnungslehre von 1844 (1878), Einleitung, xxii. —xxili,

2 Logic and mathematics, under this view, may be regarded either as generically distinct—which is apparently the opinion of Spencer, H. Grassmann, and Jevons—or as species of & more coinprehensive genus, the theory of formal (symbolic) operations—which is apparently the opinion of R. Grassmann (see his Formenlehre, 1872) and Boole (see his Afathematical Analysis of Logic, 1847, p. 4, and Differential Equations, 1859, chap. xvi., specially pp. 888, 389), An adinirable treatment of that which is implied in Boole's method is given in Mr Venn's Symbolic Logic, 1881.

3 For this extremely common arrangement, see Hamilton, Lectures on Metaphysics, i. p. 121-8; Ueberweg, System der Logik, § 6.

reasons, indeed, may be advanced for holding that logic is entirely to be separated from psychology, as differing from it in aim, method, and principle, that logical analysis is generically distinct from psychological, and that the two disciplines, while connected as parts of the general body of philosophical reflexion, hold to one another a relation the reverse of that commonly accepted.

As to the endeavour to collect from consideration of the sciences in detail a body of precepts, the rules of scientific method, and to assign the systematic arrangement of such rules to one special discipline, called logic, it seems to stand on the same footing and to be open to the same criticism as the allied attempt to treit general philosophy as the receptacle for the most abstract propositions reached in scientific knowledge. There is a peculiar assumption underlying the supposed possibility of distinguishing between scientific method and its concrete exemplifications in the special sciences, and only on the ground of this assumption could there be rested the independence of logic as the systematic treatment of method. It is taken for granted, without examination, that the characteristic features of correct and well-founded thinking are palpable and general, and that we thus possess a criterion for marking off what iscommon to all scientific procedure from that which is special and peculiar to the individual sciences. An elaborate philosophic doctrine lies at the root of this assumption, and the position assigned to logic may easily be seen to depend, not on what is apparent in the argument, namely, comparison of the sciences with one another, but on what lies implicit in the background, the philosophic concep- tion of the nature of scientific knowledge in general. Without reference to the ultimate philosophic view, no definite con- tent could be assigned to logic, and it would remain impossible to distinguish logic from the sciences in detail.?

3. Thus the various attempts to define the province and functions of logic from general classification of the sciences, to define, in short, by the method of division, yield no sitisfactory answer, and refer ultimately to the philosophic view on which classification and division must be based. A similar result becomes apparent when we consider the various descriptions of logic that have been presented as following

from more precise and accurate determination of the essential features of logical analysis and method.

“The philosophical deduction or construction of the notion of logic presupposes a comprehensive and well- grounded view, whether of the nature and mode of opera- tion of the human mind, a definite part of which falls under logical treatment, or of the problems and objects of philosophy in general, from among which in due order may be distinguished the particular problem of logic.” The inost elementary distinctions, by means of which, in the ordinary exposition of logic, progress is effected towards an accurate determination of the province of the science, not only refer to some such ultimate philosophic view, but lead to the most diverse results, according to the peculiarity of the views on which they are based. Of these elementary distinctions the following are at once the more usual and the more important :—the distinction between the province of logic and the province of the special sciences, as that between general and special; the distinction between

1 It is to be acknowledged that most of the writers on logic who emphasize the connexion of psychology with logic introduce distinctions equivalent to the remarks above made, but the grounds for such dis- tinctions and the conclusions to be deduced from them are not generally brought into clear light.

2 See, for a clear statement of this impossibility, Comte, Philos. Positive, i. 84, 85. Detinitions of logic as theory of method, which are based on general philosophic views (e.g., the definition by Sigwart, Logik, i. § 1), stand on a different footing, and are to be examined on different principles.

3 Twesten, Die Logik, insbesondere die Analytik (1825), p. 2.

natural growth of knowledge, with its natural laws, and the normal procedure whereby grounded knowledge is obtained, with its normal or regulative principles; the distinction between knowledge as a whole

and its several parts, immediate and mediate, with restriction of logic to the treatinent of all or portion of mediate knowledge ; the distinction between the constituents of knowledge as on the one hand given from without (in experience), and on the other hand due to the elaborative action of intellect itself To one or other of these may be traccd tlre common definitions of logic, and a brief consideration of their contents will be sufficient to show that they severally rest upon more or less developed general philosophic doctrines, and that their significance for accurate determination of the field of logic depends not so much on what is explicitly stated in them as on what is implied in the general doctrines from which they have taken their rise.

The distinction of logic from the sciences, as dealing in the abstract with that which is concretely exemplified in each of them, is certainly a first step in the process of deter- mination about which there can be little or no doubt. But if the distinction remain vague, it is not sufficient to differentiate logic from many other disciplines, philosophical or philological, and if it be made more precise, the new characteristics will be found to involve some special view as to what constitutes the common feature in the sciences, and to vary with the possible varieties of view. As a rule, too, the added characteristics do not serve by themselves to mark off logical treatment as an independent kind of investigation. They are most frequently obtained by a general survey of scicntific procedure. Thus it may be said that in all sciences there are implied clearly defined notions, general statements or judgments, and methodical proofs ; logic therefore, as the theory of the general element in science, will appear as the treatment of notions, judg- ments, and proofs generally, or in the abstract. If so, then, unless some implied principle further determine the course of procedure, logic would be regarded as a merely descriptive account of the parts making up scientific know- ledge, and it would be not only impossible to assign to it an independent position, but hard to discriminate it from psychology, which likewise deals with the parts of knowledge. If it be understood, however, or explicitly stated, that in all scientific knowledge there is community of method, resting on common principles or Jaws of know- ledge as such, then clearly not only the province of logic, as now made identical with the

treatment of the essence of knowledge, but the special nature of the theorems making up the body of logic, must depend upon the general conception of knowledge with which the thinker starts. In the view of logic taken, eg., by Mill, the fuadamental idea is that of evzdence, under which must be included all the grounds for any judgment not resting on immediate perception. So far as verbal statement is concerned, the adoption of this as the root idea would not distinguish in any special way the treatment of logical problems resting on it, but in fact each problem is dealt with in accordance with the particular theory of what, from the nature of human knowledge, constitutes evidence. Logic thus in- volves, or in truth becomes, a theory of knowledge, and in the end, for general spirit and details of doctrine, refers to an ultimate philosophic view. There seems no escape from this conclusion. Start as we may, with popular, current distinctions, no sooner do logical problems present them- selves than it becomes apparent that, for adequate treatment of them, reference to the principles of ultimate philosophy is requisite, and logic, as the systematic handling of such problems, ceases to be an independent discipline, and becomes a subordinate special branch of general philosophy.

The attempt to avoid this conclusion must of necessity

take form in some discrimination of logic from other varieties which may with it be classed under philosophy in general, and such discrimination is usually effected by laying stress on one or other of the following characteristics.

(1) In the whole process of knowledge, it may be said, we are able to distinguish and to regard in isolation tlie inethods according to which, from a combination of various elements, cognition of things grows up, and the laws according to which these elements must be ordered, if our subjective consciousness is to represent accurately and faithfully the relations of things. ‘The laws of knowledge, there being understood by knowledge the whole sum of mental determinations in and through which the world of external and internal experience is realized for us,

are of two distinct kinds, natural and normal. For the treatment of the natural laws the most appropriate title is psychology ; for that of the normal or regulative laws the title logic is peculiarly appropriate. By the one science knowledge is regarded in its relation to the subjective consciousness, as so much of what enters into and constitutes the world of inner experience; by the other. knowledge is regarded in its relation to truth, to the objective system, as the means whereby, for theoretical or practical purposes, an orderly and verifiable conception of this system is realized. A definite place seems thus secured for logic, but, if one may judge merely from the various attempts to expound the body of logical doctrines from this point of view, the characteristic feature is not yet sufficient to determine the boundaries of the science or the specific nature of its problems. In fact, the feature selected might be accepted as the distinguishing mark of logical science by writers who would include under that common title the most diverse matters, and who would differ fundamentally in respect to the treatment of isolated problems. The metaphysical logic of Hegel, the empirical logic of Mill, the formal logic of Kant, might all claim to be developments of this one view of the essence of logic. So wide a divergence is clear evidence that the criterion selected, though possibly accurate, is not sufficiently specific, and that the interpretation of it, which in truth determines for each the nature and boundaries of the science, depends upon the view taken respecting knowledge as a whole in its relation to the objective order of experience, respecting the import of the so-called normal laws, and respecting the subjective elements supposed to constitute knowledge.

On all sides this particular definition of logic is beset with difficulties, which it cannot afford to dismiss by means of the simple demand that knowledge shall be accepted as somehow given. For, apart altogether from the danger that under so wide a term as knowledge many differences may be accommodated, it then becomes impossible to do more tlian treat in a quasi-empirical fashion mental facts, the nature and peculiarities of which are to be learned from some external source. In the later, more detailed examina- tion of the view of logic here briefly described, it will be pointed out that the usual formula by which the several logical notions are introduced, viz., that their nature as

mental facts is dealt with in psychology, from which logic borrows, is in fact much more than a formula. The logical peculiarities will be found to rest mainly upon the psycho- logical characteristics as borrowed, while it is evident that no substantive, independent existence can be vindicated for a doctrine, the succession of whose parts, and their essential nature, are given externally.

(2) Some of the perplexities that arise when logic is treated as the theory of the normal laws of knowledge may be obviated by the current distinction between immediate and mediate knowledge. The normal laws of knowledge might be said to apply solely to the process of mediate cognition, and their final aim would be defined as harmony

between mediate knowledge and immediate experience. But it is difficult to distinguish with perfect accuracy between the two kinds of knowledge in question; it is impossible that the treatment of the logical problem should not de- pend entirely on the view taken as to the nature of that which differentiates mediate from immediate knowledge. Whether we express this as thought or as belief, its nature then becomes tlie all-important factor in determin- ing the course of logical treatment, and further progress will manifest divergencies according as stress is laid on the subjective characteristics of thought, the laws to which, from its essential nature, all its products must conform, or on the limitations imposed by principles which have reference to the most general relations of the things thought about. In the one case a formal logic, of the type commorly known as the Kantian, would be developed, in the other either an empirical logic, like that of Mill, wherein the nature of notions, propositions, and reasonings is con- sidered from the point of view of the empirical conception of experience, or a transcendental logic, like that involved in the Critique of Pure Reason, or a metaphysical logic, like that of Hegel, or a mixed doctrine, like that of Trendelenburg, Lotze, and Ueberweg. In short, the general philosophic view of thought is that upon which the character of logic as a science rests.

(3) There has above appeared, incidentally, one of the most current methods of solving the logical problem, by procedure from the distinction between that which is given to the mind in knowledge, and that which is supplied by the mind itself. No distinction seems more simple; none is in reality more complex. The opposition on which, in its popular acceptation, it rests is that between the indi- vidual concrete thinking subject and the world of objective facts, existing, as it were, to be cognized. The full signi- ficance of such an opposition, the forms in which it presents itself in conscious experience, the qualifications which must be introduced into the statement of it that it may have even a semblance of reality,—these are problems not solved by a simple reference to the distinction as existing. It may well be held that knowledge is, for the individual, the mode (or one of the modes) in which his relation to the universe of fact is subjectively seized, but it is not therefore rendered possible to effect an accurate and mechanical separation of knowledge into its matter and form. Even on lower grounds it may be held that by the employment of this criterion little or no light is thrown upon the logical question. For no determination is supplied by it of the universal characteristic of form as opposed to matter in knowledge, and a comparison of various expositions will show the most startling diversity of view respecting the nature and boundaries of the formal element in knowledge. It is of course true that in one sense any scientific treatment of knowledge is formal. Our analysis extends only to the general or abstract aspect of cognition, not to its actual details. But we are not, on that account, dealing with the form of knowledge. So soon as it is attempted to define more accurately what shall be understood by form then itis found that various views of logic arise, corresponding to the variety of principles supposed to be applied in the treat- ment of form. Thus the stricter followers of the Kantian logical idea, e.g., Mansel and Spalding, recognize, as sole principles which can be said to be involved universally in the action of thought, the laws of identity, non-contradiction, and excluded middle, and in their hands logic becomes merely the systematic statement of these laws, and the exposition of the conditions which they impose upon notions, judgments, and reasonings. Analytical consistency, 1.¢., absence of contradiction, is on this view the one aspect of knowledge which is susceptible of logical

treatment. On the other hand, the idea of a contribution furnished by the

mind itself to knowledge may lead to a more concrete and yet not less exact system of the forms of knowledge, if there be taken into account the real character of the opera- tion by which such contribution is made. Thus in the logic of Ulrici, from the view of thought as essentially the distinguishing faculty, by which definiteness is given to the elements entering into knowledge, there follows not simply an iteration of the principle that thought must not contra- dict itself, but a systematic evolution of the fundamental relations involved in the action of thought, in which the more specifically logical products, the notion, judgment, and reasoning, have a determinate place assigned to them.

Not only, then, may quite distinct provinces be assigned to logic by thinkers who start with the same idea of thought as contributing to knowledge, but, as may well be imagined, the treatment of special logical problems presents a most bewildering variety. The nature of judgment, the principle

ef reasoning, the characteristics of thought which is in

accordance with logical rule, will be viewed differently according to the special interpretation put upon the func- tions of the subjective factor in knowledge. Here again we find that the really influential fact in the determination of the province and method of logical science is a general philosophic conception of knowledge or thought.'

4, There remains yet one method by which a clear and sufficient definition of the province and function of logic may be attainable. It may be that the separation of logic from other philosophic disciplines has come about his- torically, and that the assignment to logic of a special body of problems and a special kind of treatment is due to the accidents of its development. We might therefore hope to gain from a comparative survey of the field of logic, as that has been historically

marked out, some definite view not only respecting the specific problems of logical theory, but also regarding the grounds for the isolated treatment of them. That in the history of logic there should be found a certain continuity of doctrine and development may, however, be compatible with entire absence of a common body of received logical matter, and the result of an historical research may be little more than a statement of distinct conceptions regarding the nature and province of the science, leading to the inclusion of very distinct materials within its scope. It requires but a superficial investigation of that which at various intervals has pre- sented itself as logical theory to arrive at the conclusion that the differences in general spirit and in the mass of details far outbalance any agreement as to a few detached doctrines and technical symbols. If the survey were limited even to the period preceding the atten:pts at radical refor- mation of philosophy in general, and of logic as included therein, to the period in which the Aristotelian doctrines,

as they may be called, formed the common basis of logical

treatment, we should be able to detect differences of such a kind as to indicate radically distinct fundamental views. The scholastic logic, which, even by itself, cannot be regarded as one theory with unimportant modifications, is most falsely described as Aristotelian. The technical terminology, the general idea and plan, and some of the formal details are certainly due to the Aristotelian analysis of reasoned knowledge, but in spirit, in ruling principles, and in the mass of details the method of the scholastic logic is alien to that of Aristotle. It will be shown later that the Aristotelian analysis is saturated with the notions and aims of the Aristotelian metaphysics and general theory of knowledge, and that on this account alone, apart from

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1 In Rosenkranz, Die Modificationen der Logik abgeleitet aus dem Begriff des Denkens (1846), a similar conclusion is illustrated by an elaborate classification of possible modifications of the view of logic. Compare also Braniss, Die Logik in threm Verhdltniss zur Philosophie geschichtlich betrachtet (1823).

the introduction of many foreign ingredients, from Stoic, Arab, and Byzantine sources, into the scholastic system, an important difference must subsist between the original doctrine and that which presents itself as but its historical development. Even morc radical is the divergence of modern logic from the Aristotelian ideal and method. The thinker who claimed for logic a special pre-eminence among sciences because ‘‘since Aristotle it has not had to retrace a single step, and to the present day has not been able to make one step in advance,” ? has him- self, in his general modification of all philosophy, placed logic on so new a basis that the only point of connexion retained by it in his system with the Aristotelian may be not unfairly described as the community of subject. Both deal in some way with the principles and methods of human thinking, but as their general views of the constitution of thought are diverse, little agreement is to be found in the special treatment of its logical aspect. So when a later writer prefaces his examination of logical principles with the declaration that “logic is common ground on which the partisans of Hartley and of Reid, of Locke and of Kant, may meet and join hands,” ° we are not unprepared for the result that, with a few unimportant exceptions, his views of logical principle coincide with those of no recognized pre-decessor in the same field, diverge widely from either the currently received or the genuine Aristotelian doctrines, and lead to a totally new distribution, in mass and detail, of the body of logical theorems and discussions. Such divergence is, indeed, most intelligible. If one reflects on the signi- ficance which would be attached in any one of these logical systems, of Aristotle, of Kant, of Mill, to the wnzversal or universalizing element of thought, and on the fact that such universal must manifest itself as the characteristic feature in all the important products of thinking, the notion, the judgment, the syllogism, the conclusion is inevitable that difference of view in respect to the essence must make itself felt in difference of treatment of details. The ulti- mate aim of proof, and the general nature of the methods of proof, must appear differently according as the accepted ground is the Aristotelian conception of nature and thought, the Kantian theory of cognition, or subjective empiricism.

If, adopting a simpler method, one were to inspect a fair proportion of the more extensive recent works on logic, the conclusion drawn would be probably the same,—that, while the matters treated show a slight similarity, no more than would naturally result from the fact that thought is the subject analysed, the diversity in mode of treatment is so great that it would be impossible to select by comparison and criticism a certain body of theorems and methods, and assign to them the title of logic. That such works as those of Trendelenburg, Ueberweg, Ulrici, Lotze, Sigwart, Wundt, Bergmann, Schuppe, De Morgan, Boole, Jevons, and these are buta selection from the most recent, treat of notions, judgments, and methods of reasoning, gives to them indeed a certain common character; but what other feature do they possess in common? In tone, in method, in aim, in fundamental principles, in extent of field, they diverge so widely as to appear, not so many different expositions of the same science, but so many different sciences. In short, looking to the chaotic state of logical text-books at the present time, one would be inclined to say that there does not exist anywhere a recognized, currently received body of speculations to which the title logic can be unambiguously assigned, and that we must therefore resign the hope of attaining by any empirical consideration of the received doctrine a precise determination of the nature and limits of logical theory.

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2 Kant, Kritik, Vorrede, p. 13. 3 Mill, System of Logic, i. p. 13.

5. In order to make clear the reasons for this astonishing diversity of opinion regarding the province and method of logic, and so make some advance towards asolution of what may well be called the logical problem, it seems necessary to consider some of the leading conceptions of logic, with such reference to details as will suffice to show how difference of fundamental view determines the treatment of special logical problems. In this consideration the order inust be historical rather than systematic. Not, indeed, that it is needful, nor is it

proposed, to present an historical account of philosophy at large, or even of logic in particular;

our purpose is merely to disentangle and bring clearly –

forward the nature of the principles respecting logical theory which have served as basis for the most character- istic logical systems. Such an inquiry will not only assist in explaining the divergencies of logical systems, but throw light upon the essence of logic itself.

In this historico-critical survey, the first section must naturally be devoted to a consideration of the Aristotelian logic. The records of Oriental attempts at analysis of the procedure of thought may, for our present purpose, be dis- regarded.?

The Aristotelian Logie.

6. In a remarkable passage at the close of the tract called by us the Sophistical Refutations, Aristotle claims for himself distinct originality in the conception of subjecting to analysis the forms or types of argument. “The system I have expounded had not been partially, though imperfectly, elaborated by others ; its very foundations had to be laid… .. The teachers of rhetoric in- herited many principles that had long been ascertained ; dialectic had absolutely no traditional doctrines. Our researches were long, teutative, and troublesome. If, then, starting from nothing, it bears a comparison with others that have been developed by divi- sion of labour in successive generations, eandid criticism will be readier to commend it for the degree of completeness to which it has attained thau to find fault with it for falling short of perfec- tion.”’* Although the specific reference in this passage is to the analysis of dialectical argument contained in the Zopica, the same claim might with justice have been made in regard to the more ex- tensive analysis of the forms of reasoning in general which makes up the substance of the other books of the Organon. There had been, prior to Aristotle, much discussion of problems that would uuder any view be included under the head of logic, but no syste- matic attempt had been made to analyse knowledge as a whole in its formal aspect, to throw under general heads or classes the types

of reasoning, whether dialectical or scientific, and to exhibit the general relations in which the elements of all reasoning stand to oue another. After Aristotle, it became possible to refer all such discussions to a common head, and to view them as componcnt parts of one systematic doctrine. In a peculiar sense, then, Aristotle may be described as the founder of logical science.

The precise nature of the inquiries falling within the scope of the Aristotelian logic may receive some preliminary explanation supplementary to that which can only be given by a careful study of the chief theorems of the system, if there be taken into account (a) the advances towards a theory of logical method contained in the speculations of earlier Greek thinkers, (b) the classification of philosophic discipline which underlies the body of Aristotle's writings, and © the general conception of the matter of logical analysis which may be deduced from any special or incidental treatment of the question in Aristotle. Of these in order.

7. (a) Logical discussions prior to Aristotle.

_ The inquiries which find a place in the Aristotelian logic arc all, in a large sense, problems of the theory of knowledge. They arise, therefore, only in connexion with critical reflexion on the nature, grounds, and method of knowledge. The carliest forms of Greek speculation, turning rather upon explanation of natural fact, being in essence attempts to reduce the multiplicity of known fact to unity of principle, contain, as a consequence, problems of a meta- physical character, which might involve problems of strictly logical eharacter, but were logical only in potentiality. Of all these metaphysical questions the most important eentre round the fundamental opposition between unity of principle and multi- plicity of fact, between the one and the many, an opposition which under varied forms presents itself at every stage in the

1 For a notice of works on the history of logic, seenote A p. 802.

2 For a notice of some of the more deyvcloped systems of Oriental logic, see note B p. 802.

3 The above translation, which is somewhat free, is taken from Mr Poste s edition of the Sophistici Elenchi, p. 95.

history of philosophic speculation. In the first period of Greek speculation, the problem presented itself in its simplest, most direct aspect, and, after a few rough attempts at a quasi-physical explanation of the genesis of many out of one, there come forward, as reasoned, ultimate solutions, the Eleatic doctrine that only unity has real being, the Heraclitic counter-doctrine that only in change, in the many, is truth to be found, and the Pythagorean notion of number, harmony, as containing in abstracto the union of the op- posites, one and many. No one of these philosophic treatments can be said to contain specifically logical elements, but they raise questions of a logieal kind, and, especially in the reeords of the Eleatic views, one can trace a close approximation to the critical reflexion which marks the transition to a new order of ideas. Results which in these systems are stated with metaphysical refer- ence only, reappear with new aspect among the sophists and the Socratic schools. The transition stage, indeed, partly aided by the atomic separation of objective fact from subjective sense experience, is mainly the effect of the sophistic and Socratic teaching. Socrates and the sophists have this in common that both treat the funda- mental problem of philosophy as it had been handed down with special reference to the subjective experience of the individual. In the teaching of the sophists generally is to be discerned the opposition between subjective reflexion and objective fact; in that of Protagoras aud Gorgias in particular there appear as problems of the theory of knowledge difficulties for the older metaphysic of Heraclitus and the Eleatics respectively. The Heraclitic prin- ciple of change is the general foundation for the doctrine that the momentary perception is the only fact of cognition, and upon it may be based the eonclusions that all truth is relative to the individual state of the individual subject, and that judgment, as a mode of expressing truth, is a contradiction in itself. Thus the extreme Heracliteans, as Cratylus, rejected the proposition, or combination of words, as expressing a unity and permanence not to be found in things, and reduced speech to the

symbolism of pointing with the finger. Less developed but not less clear is the connexion between the brief sceptical theses of Gorgias and the Eleatic doctrine of unity. As knowledge was im- possible on the Heraclitean view, since it implied a synthesis nct discoverable ainidst incessant change, so for Gorgias knowledge was impossible, since in the synthesis was involved au element of dif- ference, multiplicity, not reconcilable with the all-embracing unity of things. It is evident from the treatment of such views in Plato and in Aristotle, how many of the illustrations used in support of the general thesis depended for their apparent strength on neglect of some of the elementary conditions of thought, aud how inevitably reflexion upon these difficulties led to the construction of a theory of thought. The first outlines of such a theory are to be found in the Socratic principle of the notion (or concept, as we may call it, for the notion as viewed by Socrates is certainly the concrete class notion, the simple result of generalization and abstraction), and to Socrates is assigned by Aristotle the first statement of two im- portant logical processes—induction, or the collection of particulars from which by critical eomparison a generalized result might be drawn, and definition, or the explicit statement of the general elements disclosed by critical comparison of instances.4 In the Socratic teaching, so far as reeords go, no explicit reference was made to the problems in connexion with which those processes are of greatest significance, but in the lesser Socratic schools on the one hand, and in Plato on the other, we find the new principle either brought to bear upon the old difficulties, or developed into a com- prehensive method.

The Socratic concept contains in itself the union of one and many, but it isin nature subjective; it is a mode of knowledge. If, then, it be regarded as only subjective, the old difficultics reappear. How is it possible to reconcile, even in thought, an opposition so fundamental as that between unity and plurality? Must there not be a like irreconcilable opposition between the subjective counter- parts of these objective relations, between the individual notion, the atom of knowledge, and the proposition or definition? How, indeed, can there be a combination in thought of that which is in essence uncombinable? Whether we take Aristippus, who draws mainly for theory of

knowledge on the Heraclitic-Protagorean sources, or Antisthenes, who leans towards the Eleatic, or the Megarics, who also, in accordance with tho Eleatic thoughts, devoted chief attention to the polemical aspect of the theory, we find a set of problems appearing, the solution of which imperatively called for a theory of knowledge as the combination of one and many. Perhaps the most interesting of these carly thinkers, so far as the history of logic is concerned, is Antisthenes, whose extreme nominalism presents the most curious analogies to some recent logical work.> According to Antisthenes, the world of cog-

4 Metaph., 1078b, 27-29.

5 On Antisthenes, see the third part of the Theewtetus, which appears, beyond doubt, to refer to him (comp. Peipers, Untersuchungen tiber das System Plato's, 1874, pp. 124-48), and Aristotle, Afetaphysics, 1024b, 32; 1043b, 24; Topica, 104b, 21.

nizable fact consists of combinations of elementary parts (arpéra). These rp@ra appear in cognition as irreducible elements denoted by the simplest clements of speech, names. The name is the mark for the sense-impression by which each mpéroy is communicated to us, for they are only known by sense, and are strictly individual. A composite thing is known through the combination of names of its parts, and such a combination (suurAoxy) is a proposition or definition (Aéyos). Each thing has its specific Adyos (oiketos adyos), and a judgment is merely the expression of this. There is therefore no distinction of subject and predicate possible ; even identical propositions, the only possible forms under this theory, are mere repetitions of the complex name. Predication is either impossible or reduces itself to naming in the predicate what is named in the subject. It is the simple result of so consistent a nominalism that all truth is arbitrary or relative ; there is no pos- sibility of contradiction, not even of one's self.

The theory of Antisthenes, strange as it may at first sight appear, rested on certain metaphysical difficulties, which lie at the root of all the

perplexity regarding the import of propositions, and it is not too much to say that these difficulties were kept continually in mind by Plato and Aristotle in their several attempts to explain the nature of knowledge. Both thinkers find themselves confronted with the ultimate question, What is the ground of unity in things known, and in what way does thought unite the detached attri- butes of things into a subjective whole? What is the nature of the unity which binds things, themselves in a sense units, into classes or wholes, and how comes it that in the judgment subject and predicate are, in a sense, set at one?

In Plato, for whom the solution was found in the participation in or imitation of ideas by things, we find more distinctly conceived the series of logical processes involved obscurely in the Socratic method. So far as positive statements regarding the ideas can carry one, it may be said that in essence these processes concern only the formation of or deduction from the concrete universal cou- cept or general notion. The ideas, in the Platonic system, at least in reference to the thought which apprehends them, resemble most closely class notions. A deeper significance often appears to attach to the relative processes of induction, whereby the resemblances of things, the idea in them, is disclosed, definition, whereby the content of the idea is made explicit, and division, whereby the external con- nexion of idcas with one another, their system, is deduced, but such significance attaches to the more purely metaphysical aspects of the theory, and had no particular bearing on the Aristotelian treatment of the same problems. Not much is given in Plato towards a theory of the proposition, though sometimes an analysis of its elements is sketched; and the method of division could yicld only a few of the types of deductive reasoning. But, over and above these more de- finite contributions towards the construction of a theory of know- ledge, there are general aspects of the Platonic work of not secondary importance for the Aristotelian logic. In Plato the fundamental differences of earlier philosophic views appear in a new phase, and are elevated to a higher stage. Sophistic method is analysed, not as in forms actually existing, but in its essential features, and the opposition between sophist and philosopher is viewed as the opposition between opinion and knowledge. Heraclitic principle of change and Eleatic doctrine of unity are resolved into the

more comprehensive opposition of the universal and the particular, while hints of an ultimate solution, of a universal which is at once and per’ se particular, are not wanting. The Socratic method of thought appears as that by which alone a solution of philosophic difficultics is to be obtained, and the consideration of thought in its relation to facts is marked out for special investigation. A deeper view of thought was thus made at once possible and necessary.

8. (b) Much, then, had been effected by Aristotle’s predecessors in the way of preparing a definite body of problems and a method of dealing with them, problems and method which might fairly be said to belong to a thcory of knowledge as such, and from the occasional references in the Organon to opinions of contemporaries it is evident that many isolated attempts at solution of such questions were being carried on. In Aristotle we find a systematic examination of many of these problems, but it is left by him doubtful what place in the general scheme of philosophic sciences should be assigned to it. The distribution into physics, mathe- matics, and first philosophy, or the wider classification of doctrines as poetic, practical, or theoretical, in no way enables us to class logic or the body of speculations making up the Organon. That the forms of proof analysed in these writings are of universal scope is unambiguously declared ; that the first principles assumed in all proof are dealt with in first philosophy is also made clear ; but the relations between the two doctrines so reciprocally related cannot be determined from any statement made by Aristotle him- self. That he should have regarded the inquiries of the analytics as propedeutic in character, and should have held that those who assume to discuss problems of first philosophy ought to have made themselves acquainted with the general theory of proof, is intelligible, and more than this significance cannot, we think, be assigned to the passage in the Metaphysics, on the ground of which the logical

inquiries have been classed as the gencral, common introduction to the whole system.! For the close connexion betwecn the analytical researches of the Organon and the inquiry into essence or being as such forbids us to accept, in any strict sense, a separation of these as forming distinct and independent sciences.. To metaphysics is assigned

the consideration of the principles of proof, and the kind of inquiry making up first philosophy is described by Aristotle in a fashion which assimilates it most closely to researches'of the analytics. That which is left undecided the Aristotelian classification is the relation of the logical i ies to the organic whole of which first philosophy is the maM or sole part.2 To obtain any fresh light we must turn to the consideration of indica- tions supplicd by Aristotle as to the nature of the inquiries grouped under the head Analytics.

9. (c) Such indications are unfortunately most scanty. As we probably have not the Afetaphysics in its full extent, actual or contemplated, the want of a clear separation between the inquiries belonging specially to first philosophy and those appropriate to the analytical researches may be due in part to the deficiency of our materials. There are, however, two lines of separation discernible, from which some useful inferences may be drawn. What we call the logic of Aristotle, z.¢., the treatises making up the Organon, is roughly divisible into three parts:—(1) the formal analysis of syllogism and its allied types of reasoning, with the more particular discussion of the elementary parts of reasoning=the proposition ; (2) the theory of scientific proof and definition (apodictic); (8) the theory of probable arguments, or of reasoning based on currently received opinions and leading to conclusions more or less probable (dialectic). Certainly for Aristotle there was no such distinction between the first and the remaining two parts as would in any way correspond to the modern separation of general or formal logic from the theory of knowledge, or material logic; the three parts in conjunction make up one body of doctrine. Now dialectic is very specially indicated as being of a formal character, 7.¢., as dealing with no special matter, but with xowd, opinions, or types of opinions common toall sciences. Apodictic, we may assume, is in like manner the formal study of what constitutes knowledge strictly so-called, the nature of the principles on which knowledge rests, the special marks distinguishing it, and the method by which knowledge is framed. But in every body of doctrine we may distinguish, according to Aristotle, three things,—the genus or class of objects with which the demonstration is conccrned, the essential or fundaniental attributes, qualities of these objects, which are to be demonstrated of them, and,

thirdly, certain common axiqms or principles of demonstration, not themselves demonstrable, and not entering as integral parts into the demonstration, but lying in the background as security for the reasoning carried out by thought employing them. Can anything corresponding to these three facts be discovered, if we assuine for the moment, what certainly is not explicitly stated by Aristotle, that analytic constitutes a special body of doctrine? The genus or class about which the doctrine is concerned can only be reasoning itself, either as apodictic or dialectic, and the latter for a special reason may be left out of account ; addeéts, then, is the matter concerning which the doc- trine is put forward. But dmoderés is a form of knowledge, that is to say, is subjective. The properties, therefore, of apodictic science can only be made clear if we consider on the one hand the objective counterparts of necessity and universality in thought, and on the other hand the nature of universality and necessity of thought itself, ‘The common principles or axioms, finally, can only be such presuppositions as are made in apodictic or reasoning gencrally respecting thought in its relation to fact, as grasping or apprehend- ing reality. ‘The consideration of such axioms, it has been already seen, pertains to first philosophy. Analytics then would appear as an independent doctrine, holding of first philosophy on the one hand, both in regard of the common axioms and in regard of the attributes of being, by which it is a possible object of science, and on the other hand referring to the subjective treatment of thought, whether in relation to principles or to fact gencrally.

A very similar result may be attained if we follow out a linc of distinction indicated in more than one portion of the Metaphysics.* Separating the modes in which being is spoken of into four—(1) 7 bv Kate cuuBeBnkds ; (2) 7d dv ds GANGES Kal TL MH dy Gs Td Peddos ; (3) ro dy Kata Ta oXHmaTA THs KaTnyopias ; (4) Td dy Buvdwer Kal évepyela—Aristotle excludes the second from the special researchies peculiar to first philosophy, the study of being as being, but ncither excludes it from general consideration in metaphysics as a whole,

1 Metaph.. iv. 1005b, 2. See Zeller, Ph. d. Gr., ii. 2 (3d ed.), p. 184, 2.; Rassow, De Definit. Not., 46, 47; Schwegler, Comment zur Metaph., iii. 161; and, contra, Prantl, Gesch. der Logik, i. 137. Zeller maintains the view that Aristotle intends to indicate the place occupied by the analytics in his general scheme of philosophy.

2 On Aristotle's use of the term Aoytxds and its allies, see (in addition to Waitz, Com. in Organ., ii. p. 353-55) Schwegler, Commentar zu Ar. Metaph., vol. iv. p.

48-51.

3 See Anal. Post.,i.11; Rhet., i. 1, and in many passages. Cf. Heyder, Method, d. Arist., p. 348. ~ ;

4 Metaph., vi. 4, v. 29, ix.10. Cf. Schwegler, Com., iii. 241, iv. 29 sqg., 186; and Brentano, Bedeutung des Setenden nach Arist., 21 sq.

nor handles it at length, deferring it rather for more detailed treatment. A comparatively clear account, however, of what is understood by him under the head of being as truth and non-being as falsity may be extracted from the various passages referred to, and little doubt can remain that being so regarded is in a peculiar sensc the matter of analytical (z.e., logical) researches.

Being as truth and non-being as falsity refer to and rest upon combination and division of the elementary parts of thought. For truth and falsity have no significance when applied to things, but only to the connexion of thought which is dominated by the one principle of non-contradiction. Nay, thinking has not even immediate and direct reference to being as such, but only to being as the existent, as qualified, or quantified, or modified in some other way (z.c,, according to the categories), and it is in its very essence the conjunction or unifying of elements. What cannot be conjoined, as, ¢.g., the notions

of elementary facts themselves, are not either true or false, and are not matters of thought. Thought thus moves in a definite sphere, that of the combinable or separable, the correspondence of conceptions with real relations, and has its limits on the one hand in the elementary data apprehended by intellect (vo}s=reason), and on the other hand in the infinite sea of particular, accidental qualifications of things (cvuBeBnkdra). The possibility of contradictory assertions (for true and false judgments together make up the contradiction, 7d 5€ odvoAoy wep) pepiopdy avtipdcews) is the distinguishing mark of thought. Now it is this very possibility that lies at the root of all the analytical researches. Not, indeed, that one can assume for Aristotle a view which has appeared in later logical works, that all forms of logical reasoning are to be deduced from the principle of contradiction. Quite the reverse. The common axioms underlie all processes of proof, direct or indirect, but they do not enter into or form part of proof. Nothing can be deduced from them; but their authority can be appealed to against any one who refuses to allow a conclusion reached by a correct syllogism from true premisses.!_ (The nerve of logical proof would thus lie in the disjunctive proposition ; either this conclusion is to be granted or the principle of contradiction is denied.) Now the analytical rescarches are in especial the treatment of combination and separation in thought. For even the syllogism may be regarded as only a complex judgment or synthesis, and in the exposition of the forms of combination and separation we shall find a complete system extending from the nnproved principles and exhibiting the methods according to which thought proceeds towards the determination of the essential properties of things or the discrimination of various heads under which the transitory and accidental attributes may be advantageously classed.

So far then as one can judge, the matter of Aristotle’s analytical researches may be expressed as the concrete nature of thought, characterized by its fundamental attribute, the possibility of contradiction, correlated with the real system of things, and having as its end the realization of systematic knowledge, 7.c., the adequate subjective interpretation of being.

10. The indication that the analytics have to do with being as conceived by thought, conducted under the general axiom of non-contradiction and expressed in language, requires to be filled up by a more detailed treatment of the Aristotelian theory of thought in relation to being. Upon the characteristics assigned to thought or knowledge in this special relation, must depend the general nature of the Aristotelian logic, the determination of the scope of logical treatment, and the essence of logical method. For from a quite similar statement regarding the province within which logic moves totally diverse conclusions might be drawn respecting the precise function of logical method. One might have either a formal doctrine or technic, or a real methodology, either an attempt to evolve logical principles from the axiom of contradiction, or a development of the laws according to which thought, necessarily acting under the said axiom, proceeds towards the construction of knowledge. The history of logic clearly shows how differently the matter of the analytics may be viewed. For one of the possible conclusions, that logic is a technic or quasi-mathematical exposition of formal relations, has been accepted as the undoubted result of Aristotle's teaching, and has so prevailed as to make itself the current conception.* The other, the view of logic as theory of the method of scientific thought, has been cast entirely into the back- ground, so far as logical doctrines are concerned, and, if allowed at all, has been regarded as foundation for a species of applied logic, an appendix to the other,

11. Not much aid is afforded directly by any classification or division of the books now collected together as the Organon. As above noted, the Prior and Postcrior Analytics with the Topics form one connected whole, while the Categories and the De Enunciatione stand apart as isolated treatments of special problems, not organi- cally or necessarily part of the research. The genuineness of both these treatises has been doubted (see ARISTOTLE, vol. ii. p. 514), and it is not improbable that both are redactions of Aristotelian

1 Of. generally Anal. Post., i. 14. 2 Cf. Brandis, Gr.-rém. Phil., ii, 375-75.

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material, perhaps drawing from other lost writings of Aristotle, perhaps based on oral teaching, by some Aristotelian scholar. A summary view of the contents of the other books will be found at vol. ii. p. 516.

12. The logical researches as a whole manifest a strong unity, and at the same time refer to one fundamental opposition, that between apodictic and dialectic reasoning. *®

The opposition between apodictic and dialectic is in the Aristo- telian system the development of that which had alrcady played so important a part in Plato and Socrates, the distinction between science and opinion. Knowledge in the strict sense had there pre- sented itself as the generalized notion referring to bcing in its very essence, and resting on thought or reason. Opinion is the quasi- knowledge of the particular, referring to that which is not being but only accident, and resting on sense or imagination. In the Platonic method this distinction had come forward as the under- lying basis for the opposition of philosophy and sophistical rhetoric; in Aristotle a much more precise formulation is given of the char- acteristics of the two opposed forms of thought, and the connexion between opinion or dialectic and rhetorico-sophistical discussion is made more concrete and profound. Dialectic, with Aristotle, is the

_ systein resulting from the attempt to reduce to rule or generalize

modes of argument which rest upon current received doctrines as principles, which move within the region of interests about which current opinions pro and con are to be found, and which terminate not in the decisive solution of a problem but in clearing the way for a more profound research or at least in the establishment of the thesis as against an opponent. Dialectic, then, has no special pro- vince ; it deals with roid or évdoéa, and its methods are perfectly general. On the one hand, as being the application of reasoning, it refers to and employs the specific types of reasoning, syllogism and induction ; on the other hand, as being applied to matters of opinion, and borrowing its

principles from current floating dicta about matters of common interest, the types of reasoning tend in it to assume special forms resembling those employed in rhetoric (which is a kind of offshoot from dialectic—the application of dia- lectic to political principles), The province of dialectic being thus essentially vague, the matters about which dialectic reasoning is concerned being of the most fluctuating character, tlicre must be, for Aristotle, the greatest difficulty in determining, per se and apart from the opposition to apodictic, what is the character of dialectic syllogism and induction. Nor can it be said that the interpreter of Aristotle has an easy task in the endeavour to discover what pre- cisely is dialectical reasoning and in what way the forms which are assumed to be common both to apodictic and dialectic come to have any application to the fluctuating mass of current opinions. It is comparatively simple to say apodictic and dialectic differ in this, that the one rests on principles essential, necessary, seen to be true, while the other proceeds from data which are merely received as credible and as containing probable, received opinions on a subject about which there may be difference of view ; and it may be added that in the one we reach conclusions which are essential, in which the predicate is necessarily and universally true of the subject, while in the other the conclusion remains, like the data, credible merely, and is, at best, only one of the probable answers to a question. But there remains the difficulty, which is certainly not cleared up by any direct statement from Aristotle—of what nature is the syllogistic inference that applies to material of this kind? what is the nervus probandi in a dialectic syllogism? There are two possible views— either that the principle of syllogistic inference is purely formal, deducible from the characteristic of thought as either affirming or denying in reference to a particular subject, and therefore capable of application either to probable or to necessary matter, or that the syllogism is explicable only as a form in which knowledge is estab- lished and is applicable but per accidens, as one may express it, to probable matters. Under this second view, the possibility and reality of syllogistic inference would be traced to the correlative peculiarities of human thought and of the nature of the objects of thought, and it would follow that in strictness there is no dialectic syllogism. Such a conclusion at first sight appears to stand in

sharp opposition to quite emphatic utterances'of Aristotle, but if we suppose, for the sake of example, that a dialectic syllogism were

framed, we should readily discern that the link of connexion be-

tween data and conclusion, the nervus probandi, as it may be called,

does not in fact differ from that involved in the apodictie syllogism.

The merely probable character of the data prevents the conclusion

3 The most important treatments of the principles and details of the Aristo- telian logic, which are here drawn upon frecly, are (1), instar omnium, that of Prantl (Gesch. d. Logik, i. pp. 87-346); (2) that of Brandis, Aristoteles, pp. 148-434, aud Aristotelisches Lehrgebaéude, pp. 12-62 (in which there is sharp criti- cism of Prantl's view); (3) that of Grote, Aristotle, vols. i. and ii. pp, 1-134 (most patient and accurate, but tending continuously to minimize the speculative element); (4) that of St Hilaire, in his essay De la Logique d' Aristote, 2 vols., 1838, and in his translation of the Organon; (5) that of Biese, Phil. d. Arist., i, 44-319. Trendelenburg's Elementa Logices Aristotelew, Waitz's edition of the Organon, and Ueberweg's System der Logik contain much of value. Mr Poste's translation of the Post. Anal. and Sophis. Elenchi, Mr E. Wallace's Outlines of the Phil. of Aristotle, and Mr Magrath's Selections from the Organon will also be found of service.

from having a higher value than mere likelihood, but does not affect the chain of inference, which proceeds on assumptions iden- tical with these involved in apodictic. Aristotle is chary of any examples of dialectic syllogism, and indeed, if one considers that all forms of modality are investigated in the general analysis of syllogism, it becomes difficult to see what specially distinguishes dialectic inference. It is not to be denied, however, that the investigation of the grounds for the coexistence of dialectic and apodictic is incomplete in Aristotle, as it confessedly is in Plato.

Unless, then, it ean be shown beyond possibility of question that Aristotle does lay down purely formal rules for syllogism, rules de- ducible simply from the fundamental axiom of thought—and the evidence on which such a view is based will be examined later—we do not obtain much light from the opposition between dialectic and apodictic. More important results, however, are gained when we consider the Aristotelian doctrine of genuine knowledge, of amédergis, for, among the numerous elements that here fall to be noted, some are of quite general import, and apply to the whole process of the formation of knowledge.

18. Apodictic knowledge generally is definable through the special marks of its content. It deals with the universal and necessary, that which is now and always, that which cannot be other than it is, that which is what it is simply through its own nature. It is the expression of the true universal in thought and things, rd xaddaov. Further, as a method, awdderés is characterized by the nature of its starting point, and of the connecting link in- volved, as well as by the peculiarity of its result. It rests upon the first, simplest, best known, unprovable elements of thought, the mpata Kal &ueora, Which are not themselves in the strict sense matters of apodictic science, which are avamdderxra. In all the inter- mediate processes of scientific proof there is involved generally this dependence upon previously established principles, and, when apo- dictic is taken in its ultimate abstraction, these previously estab- lished principles “are seen to be the prior, ultimate elements, assumptions in thought about things, as one may provisionally describe them. The peculiar connexion involved is simply what we understand by the principle of syllogism. No syllogism is pos- sible without the universalizing element, the a6dAov, and know- ledge in its essence is syllogistic.’ The conclusion of the syllogism in which essential attributes are attached to a subject is the con- cretion or closing together of the two aspects of all thought aud being, the universal and particular.?

The fuller explanation of apodictic thus refers us to three points of extreme importance in the Aristotelian theory of knowledge, the precise nature of the ra8dAov, which presents itself as the character-

istic feature of ddderéis, the relation of fundamental and universal in things on which the possibility of dmddeés is founded, and the forms of thought through which the universal and particular factors are subjectively realized. The three are most elosely connected, and as they involve the main difficulties of the Aristotelian philo- sophy as a whole, a general treatment of them is indispensable. First then of 7 «a0éAov, the characteristic term in the explanation of knowledge. This notion is essentially double-sided. On the one side it is the universal of empirical knowledge, the generic or class universal—it is 7) kar& mayrds; on the other hand, it is the root or ground of the empirical universal—it is 7d nal' abrd ka abtd,® that which is in, for, and through itself, the essential. Now the essential, xaé' airé, is, in the first place, either that which enters into the being and notion of a thing as a neccessary prerequisite (for example, line is a necessary element in the being and notion of

triangle), or that which is the necessary basis of an attribute (¢.9.,

line in reference to straight and curved), or in the second place that which is as subject only and not as predicate, or finally that which is per se the cause or ground of a fact or event. Thus the function of thought (of apodictic) is the exposition with reference to a deter- mined class of objects of all that necessarily inheres in them, on account of the elementary factors which determine their existence and nature. Leal things, individual objects, are the basis of all knowledge, but in these individuals the elementary parts, causally connected, and leading to ulterior consequences, form the general element about which there may be demonstrative science. Thought which operates upon them does so, as we have already secn, under the peculiar restriction of its very nature, as the subjective reali-

1 Of. Topics, pp. 164a, 10.

2 See specially Anal. Pr., 67a, 39 sq., and compare the elaborate note of Kampe, Erkenntnisstheorie des Arts., p. 220 (also p. 84). Grote (Aristotle, i. p. 268a) remarks: '' Complete cognition (7 évepyety, according to the view here set forth) consists of one mental act corresponding to the major premiss, anothcr corre- sponding to the

minor, and a third including both the two in conscious juxta- position. The third implies both the first and the second.” The connexion between this and the Aristotelian doctrines of vovds in its relation to aicéyots will not escape attention.

3 Anal. Post., 73b, 26, cabddrov 8€ A€yw d dy Kara mavrds Te UTapxy Kal Kad’ aT Kaif avto See Index Aristotelicus, s. v., pp. 356-57, and on a8” avro compare Heyder, Method. d. Arist., 310 n., and Bonitz, Com. in Met., pp. 265-66. On the distinction between xadAov and yévos, see Bonitz, Com. in Met., p. 299, 300; Zeller, Ph. d. Gr., ii. 1, p. 205, 206.

4 Of. Prantl, Ges. d. Logik, i. 121, 122, who has rightly placed the function of xa@oAov in the foreground,

zation of the notion of things, and the principles expressing this restriction, the logical axioms, may be appealed to if demonstration be opposed groundlessly, but these axioms do not enter into the process of demonstration. ‘‘ When the apodictic process has attained its end, that is, when all the universal propositions relat- ing to a given class, with insight%into the necessary character of the predication in each case, have been gathered up, then the ra9éaou of knowledge in respect to that class has been realized.” e

14. Probably the example of apodictic which Aristotle bears chiefly in mind is mathematical science, and in his treatment of the characteristic marks of this doctrine most of the peculiarities of apodictic occur. In mathematical science abstraction is made of the material qualities of the things considered, of those qualities which give to them a place as physical facts, but the abstracta are not to be conceived as entities, self-existing. They are not even to be conceived as existing only in mind, as ideal types ; they truly exist in things, but are considered separately (é adatpécews). The first principles of mathematical science are few and definite, and the procedure is continuously from the simple and absolutely more known to the concrete and relatively more known. As in proof generally, so in mathematical demonstration, an

essential quality (cvpBeBnnds kad aird) may be proved of a subject, and yet such quality may be still accidental, .¢., not predicated of the subject on account of its generic constituent marks, but capable of being deduced from the constituent mark of that which enters into the subject, as, ¢.g., a given figure’s exterior angles are equal to four right angles. Why? Because it is an isosceles triangle. Why has an isosceles this property ? Because it is a triangle. Why has a triangle ? Because it is a rectilineal figure. If this reason is ultimate, it completes our knowledge, nal xaOdAou 5€ rére.® Thus the range of mathematical proof extends from the mpéra, the original definitions, which at the same time assume the existence of the things defined, through the determinations ka’ abrd to the qualities (cupBeBHKoTa), which can be shown to attach to their subjects, to be in a sense xa6’ aird, while a continuous scries of middle notions, concerning which there cannot be much ambiguity, effects the transi- tion. Moreover, in mathematical science, one can see with the utmost evidence the correlation of reason and sense, which will pre- sently appear as a fundamental factor in Aristotte’s general theory of knowledge. The mp@ra are not to be conceived as innate or as possessed before experience. They are seen or envisaged, intuited in perception by vods, and induction here as elsewhere is the pro- cess by which perceptions are gathered together for the reflective and intuiting action of vods. In the mathematical individual, more evidently than in any other case, is visible the union of thought and sense. The demonstration which employs a diagram does not turn upon any properties of the diagram which are there for sense only, not for reason, but upon the general elementary relations contemplated inthought.’ In mathematical development, that which is potentially contained in the #An vonrf on which mathematical thinking operates is brought forward into actuality by the constructive processes through which the proof is mediated, and the potential knowledge contained in the intuition of mathie- matical elements becomes actual through the process of construc- tive thought.®

Finally, the relation of pure mathcmatical reasoning to that found in sciences generically onc with mathematics, ¢.g., optics, astronomy,

harmonics, &c., furnishes an interesting example of the relation between reasoning based on fact and on causal ground.®

15. The process of awddertes generally and of mathematical demonstration in particular has brought into clear light the prominent characteristic of knowledge according to the Aristotelian view. Knowledge must always be regarded from two sides, as having rcelation to the universal, and as bearing upon the particular.!° It isin itself the union of the general and the particular, of the universal aud the individual. This fundamental notion of knowledge is not only the integral element in the Aristotelian theory of science, but also the guiding principle in his scientific method.” In all cases we require to keep in mind the necessary correlation of the particular facts and the general grounds, the multiplicity of effects and the unity of cause. The one element is not apart from the other. Universals as such are of no avail either as explanations of knowledge or as grounds of existence. Particulars as such are infinite, indefinite,

5 Prantl, i. 126. 6 Anal. Post., i. 24, 86a, 2.

7 Of. the passage from De Memor., p. 450, quoted by Brandis, Av iséoteles, p. 1133,—cvpBaiver yap To obTd ABs ev TH voety Kai ev TH Staypaerv® éxet Te yap dvOey mpooxpHmevor TS TO TOTOY wPLMEVOY elvat TO TpLyovor, duws ypapomeyv

_@piopevoy Kata TO mogéy’ Kat 6 voaY woalTws, Kav wy TOGoY VOR, TiHETaL mpo

dupdrwv moody, voet Sovx F mogdv. av dé dvots f Tav Tocay, ddpioroy dé, 7iPerar wev TOTOY wpiomevoY, voet Sé 7) TOGOV povov. Cf. also Jfét., vii. 10 and 11. Aristotle’s view strongly resembles, in this point at least, that of Kant.

8 See Metaph., ix. c.9, p.105la. Some interesting remarks on the process of mathematical construction and its relation to syllogistic proof will be found in Ueberweg’s System der Logik, § 101, p. 273.

9 See generally Anal. Post., chap. 13. Of Aristotle's views on mathematics the best expositions seem to be those of Biese (Ph. d. Arist., ii. 216-34), Brandis (Aristoteles, pp. 185-39, and Ariséot. Lehrgebdude, 7-11), and Eucken (dfethode d, Arist. Forschung, pp. 56-66).

10 Gf. specially Anal. Pr., ii. 21.

11 This is excellently put by Euckcn, op. cit., pp. 44-55,

and incognizable. Only in the union of these, a union which objectively regarded is the combination of form and matter, of potentiality and aetuality, of genus and ultimate difference, sub- Jectively is the combination of the data of sense, imagination, and intuitive faculty of reason, is knowledge possible. Aud the methods by which knowledge is formed in us regarding things exhibit the same twofold aspect. Syllogism as the form of the process from generalia to the determination of attributcs of the individual sub- ject, induction as the method of procedure from the vaguely apprehended individuals to the generalia or principles, alike, when analysed, exhibit the conjunction of the universal and parti- cular.

16. In each branch of knowledge there are involved the specific genus or class, the attributes concerning which there is to be demonstration, and the eommon axioms or principles. Each branch, moreover, implies special principles, Y81a: apxat; there is no all-comprehensive science from which truths are to be deduced, and from the common maxims alone nothing can be inferred. 'Amddetéis involves principles, and starts therefore of necessity with what may be called definitions. Yet definitions are at the same time the final result of apodictic demonstration, and the original assumptions may be pushed farther and farther baek till they appear as the mpdra: kal &ueoor mpordcers which are only apprehended by vovs. From this distinction between knowledge as completed and knowledge as in process of formation, as from the distinction between sciences of the same genus as more or less general (¢.g., geometry and optics), there follow the distinctions

between proposi- tions necessary and propositions true émt +b moav, between proof of fact and proof of essence, between deduction and induction, between syllogism as generic form of all proof, and the special type of syllogism in which completed knowledge is expressed. We are thus enabled to reconcile what seem at first sight discrepancies in the Aristotelian doctrine,—as, ¢.g., the insistance upon induction as furnishing the principles of reasoning (7& xa0éAov) coupled with the attempt te show that induction too is a kind of syllogism; the explanation of proof as involving essence, coupled with the admis- sion of syllogisms of fact ; the treatment of propositions as nevessary and contingent in themsclves, coupled with the distinction between émorhun and ddta. In all forms of knowledge there is the twofold aspect, that which turns upon the essential connexions, and that which refers to the isolated facts wherein such connexions make their appearanee. Syllogistic as formal analysis of what is common jin all knowledge is one part of the all-comprehensive theory of ‘knowledge, an integral but not a self-existing part.

17. The general idea of the Aristotelian analytic thus obtaincd does not require to be supplemented by any detailed survey of the logical system into which it is evolved, but a brief summary of the most important points and indication of the relation in which the parts stand to the whole may be of advantage.

The simplest form of knowledge, that in which being as true or false is apprehended, is the judgment. The consideration of the judgment is therefore the first part of the analytical researches. Here Aristotle distinguishes more accurately than any of his prede- cessors (indeed for the first time with accuracy) between subject and predicate as integral parts, symbolized by the noun and verb, and signifying the relations for us of things as appearing under the schemata of the categories. The material basis of the judgment, as one may call it, is the thing as an object of possible knowledge, t.e., the thing as individual (and therefore as involving matter and form, the particular and the general), as qualified, specifically, in time, space, quantity, and relation, and existing as one mode in the universal nexus of potentiality and actuality. These metaphysical forms, and, specially, the

deep-lying modes of potentiality and actuality, reflect themselves in the forms whereby subjectively knowledge is realized in us, and the resulting knowledge is con- ditioned partly by them, partly by the modes in which intellect as a reality is developed in us. The proposition has necessarily a reference to them, and thus alongside of formal distinctions between universal, particular, singular, and indefinite judgments we have

1 The passages in which an apparently formal view of logical relations is ex- pressed are mainly the following :—Topics, i. chap. vi. (in which the fundamental logical forms of definition, genus, property, and accident are explained by refer- ence to the coincidence of the spheres of subject and predicate in a proposition) ; Anal. Post., i. chap, 26 (ovAdoytouds éoriv, ds dv otTws ExN, Bore 7 OAov mpds Képos 7} 14€p0s Mpds bAov exetv); Anal. Post., li. 3 (érépov 5é érepa amddecéts, cd wh WS HEPOS] TLTHS OANS. TOUTO bE A€yw, dri SéSeceTat TO ivooxedés S¥0 OpOats, et wav Tptywvoy dédecktac' repos yap' Tos" Odov); Rhetoric, i, 2,§ 19. The general treat- ment of syllogism in Anal. Pr.,i. 4, as apparently resting on' the principle of subsumption or logical substitution, has no precise bearing. But the use of the term dAoy by Aristotle is not to be regarded as identical With its use by later logicians, and it is not rashly to be assumed that in Aristotle's view the only logical relation is that between genus and species. The distinction between ex- tent and intent, on which later writers have laid stress, is never suffercd in Aristotle to become a distinction in kind; the two elements, extent and content (karé mavrds and xa' avrd), are always involved, and the difference is only in the process by which our knowledge is formed. Probably the rclations of extent and content would never have been severed from one another had it not been for the error, almost a necessary failing in the attempt to treat formal logic systemati- cally, of regarding notions and judgments as completely formed and dcfined pro- ducts apart from the reasoning in which they appear (sec, for a diametrically opposed view, Hamilton, Lectures on Logic, ii. p. 266).

the distinctions between necessary, contingent, and possible, which appear partly as given qualities of the judgment, partly as repre- senting differences in the conditions of knowledge, partly as refer- ring to differences of subjective apprehension.

The essence of the judgment as the apprehension of truth or falsehood consists in its twofold aspect as affirmative and negative, the former of these in a sense prior and better known, but the latter no less necessary, aud both referring to objective relations of things. The affirmative and negative character of judgments, the essential dvripacis of human thought, is further defined in reference to (a) the quantitative distinctions already recognized (the doctrine of logical opposition), (2) the distinctions of necessary, contingent, and possible, which are rightly regarded as real matters about which the assertion is,? and ©, consequent on this, the oppo- sition of modal judgments.?

Propositions as integral parts of knowledge turn upon the ulti- mate relations of things known. The distinctions between first principles and deduced truths, out of which the theory of proof is developed, themselves rest upon those distinctions which have been already noted in treating of apodictic. Syllogism as the form by whieh the general and particular elements are mediated and con- joined is therefore of universal application, and inay be analysed formally.* The various modes in which syllogistic inference, pure or modal, the main types to which these modes inay be reduced, their relations to one another, and the general laws implied in them are worked out in a fashion which does not admit of any brief statement. The conclusion unites the elements which in isolation appear in the premisses, and is, in a sense, the complex or organic whole unfolded in thesyllogistic form. To every syllogism three things are necessary, the presence of a positive element, uni- versality in one of the premisses (resting, as above shown, on the recognized property of all proof as involving a general fact), and consequence, or necessary connexion between conclusion and pre- misses. Now from this third element there follow certain interest: ing deductions. The necessity of consequence rests on the very nature of syllogistic thought, and if each syllogism be taken as it stands, as a simple unit, no further inquiry is needful. But the eharacter

of the premisses in themselves may be taken into account, and we then discover that syllogism proceeds continuously on the par cae that the general law of syllogistic proof is in the special case realized. It need not be in fact realized. We may have premisses in themselves false, from which a true conclusion is reached, and the falsity of the premisses only becomes apparent when they are themselves treated as conclusions of a possible syllogism, and so the regress made towards ultimate principles. Syllogistic form, in short, is the hypothetical application of the general rule of necessary connexion between ground and consequeut, If A (the premisses), then B (the conclusion). Quite possibly, then, we may have, in syllogistic form, conclusions drawn from pre- misses not dvaykata but only ds ém) 1d moat. Science and opinion (8déa) are equally sources of propositions or premisses. If formal consequences be united with real uncertainty of matter, there arises a syllogism in character dialectical. Were the real uncertainty overlooked, the syllogism would be sophistic in charac- ter. Dialectical reasoning, then, dealing with the stage beneath science, may be of service, not only for practice in distinguishing true and false, but as bringing the particulars of each branch of knowledge into closer relation with the first principles special to that branch.® For wherever the particular element as such, the transitory and material, is present, there room is left for opinion, and reasoning is possible, not of the particular as such, but in so far as the particular manifests an underlying universal.® The pro- cesses of dialectic reasoning thus resemble very closely those modes by which the empirical detail, the region of given fact, is treated, viz., induction, example, use of signs and probable indications. For the universal has always its empirical side, and the complete process of scientific proof is a final result for which the way may be prepared by treatment, according to scientific form, of the empirical fact. There are syllogisms of fact as well as syllogisms of reason or ground, and the reason or ground becomes apparent through knowledge of the fact. Occasionally indeed the fact and ground are so immediately connected that transition from one to the other may be at once effected, but generally this is not the case.

Of these intermediate forms of reasoning, the only one calling for

2 On this account the modality is affirmed not to attach to the copula; thus the opposite of ‘‘it is necessary-to-be” is “it is not necessary-to-be,” and not cither “it is necessary-not-to-be,” or ‘it is not-necessary-to-be.”

3 There are obscurities in Aristotle’s doctrine of modals, which remain even after Prantl’s laborious treatment (Ges. d. Logik, i. 104-82). A careful survey is given in Rondelet, Théorie logique des propositions modales, 1861. The definitions of évdexdpuevoy and Suvardv, which have given rise to much diversity of opinion (cf. Prantl, i. 167 sq., as against Waitz, i. 376, and Bonitz, p. 387), are excellently dealt with by Ueberweg, Logik, § 69.

- In this sense only can we recognize the distinction between Aristotle’s Technik and his idea of Apodiktik on which Lange (Logische Studien, 1880) has laid so much stress. What underlics Aristotle’s treatment must never be thrown out of account.

5 Topics, i. 2, §§ 3-6.

§ On this distinction cf, Kampe, Erkenntnisstheorie d. A., pp. 252,258; Heyder, Method, d, A., p. 822,

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comment is induction, of the nature of which something has already been said. The obscure chapter in which the formal analysis of induction is undertaken, a chapter which has much exercised the ingenuity of commentators,! presents difficulties of varied kinds. An opposition is indicated between syllogism and induction, yet induction is treated as a kind of syllogism ; that is, freely inter- preted, induction is so analysed as to show that in it, also, there is the union of general assumption and particular detail which is char- acteristic of syllogistic reasoning. Further, Aristotle seems to waver between induction as a kind of inference, through which we arrive at general principles, and as a species of proof, and his teaching is therefore perplexed by the wart of some clear statement regarding a difficulty in the theory of induction, which is still far from perfect solution. For, according to’

Aristotle, induction as such, starting from the particulars of sense, and proceeding by comparison of similar cases and enumeration of all the similarly constituted mem- bers, never, even when the enumeration is complete, attains to probative force.? It is still a syllogism of fact, not of ground or reason; there is a distinction of kind between the survey of empirical detail, even when complete, and the assertion of causal connexion between the characteristics of the class and its deduced properties. Thus, perception of the law (rd ka@dAov) from induc- tion is a kind of new element in the process ; it is recognition by means of the empirico-critical survey which is the essence of induc- tion. Indnction makes clear only, and does not prove.> If we interpret according to more modern phraseology, this peculiarity may be expressed as the distinctive feature of inductive research based on facts or effects. We donot regard the inquiry as terminat- ing in the establishment of a law until it is possible to reverse the process and show that from the surmised cause the effects do actually follow. Otherwise we havea conclusion of ‘‘ coexistence ” merely—an empirical rule or generalization. If, bearing in mind these sources of difficulty, and also the correlation which for Aristotle always obtains between empirical details and grounds of reason, we consider the example given in the obscure chapter before us, some light may be cast on the exposition there given. The example selected is one touched upon by Aristotle in other two passages, in the treatise De Partibus Animaliwm, and in the Post. Anal., ii, 18.6 As regards the first of these, reference is desirable only to bring out the fact that causal nexus is the ka@dAov in question ; the second is of the utmost importance as clearing up what has always seemed an obscurity in the account of the inductive syllogism. In the chapters 16-18 of Anal. Post., ii., Aristotle considers the relation of cause and effect as the essential basis of proof, and he points out with much clearness the difference between the fact as cause of knowledge and the cause as ground of existence and proof. In some cases cause and effect are so united, so recipro- cate, that we may infer from one to the other. But the doubt arises, may there not be more tlan one cause for any given attribute, in which case all such inferences from effect must become problem- atical. Aristotle’s solution is remarkable, both in itself and in its bearing on the inductive syllogism. Suppose the attribute 8 is found in all

individuals of a class A, and also in individuals of class B, C, &c. In order to discover the cause, investigations must be carried on until we have a defined number of classes A,B,C, &c., in all of which g is found, and which compreliend all cases of the presence of 8. Then that which is also common to A,B,C, &c., may be regarded as the cause of £, say, ¢.g., an attribute a. If this attri- bute a be really the cause of 8, it will enter into its definition ; it will be its definition. There might, however, be a connexion of a and 8 of this universal and reciprocating kind, and yet a might not be the cause in question ; it might be only a fact from which 8 could be inferred ; the real cause y, which gives rise to a, lies in the back- ground. Characteristic of causation, then, is constant reciprocal conjunction of facts. Even if it be admitted, then, that there may be more causes for a phenomenon than one, it will yet be true that each of these causes will be manifested in one class of pheno- mena where there will be the universal reciprocating coexistence that is characteristic of the relation in question. Thus the attribute longevity observable in quadruped animals and in birds may be due to different causes, ¢.g., to absence of gall in the one case, to pre- dominance of solid, dry matter in the other. But in each case there will be a definite species characterized by the constant conjunction

1 Anal. Pr., ii. 23. Cf. Whewell, Camb. Phil. Soc. Trans., v0l.ix., 1896 5 Hamil- ton, Lectures, ii. 358-62 ; Grote, i. pp. 268-74; Heyder, 216-26, Kampe, 189-92.

2 On induction and recognition of similarity, see Topics, i. chap. 18, p. 108b, 7 sq.3 vili. chap. 1, § 14, and chap. 8, § 1 (in these last similarity is viewed as being wider in scope than the basis of induction). That induction implies a complete enumeration, see Anal. Pr., ii. chaps. 23, 24; Anal. Post., ti. chap. 7, §1. That indtiction even when complete is not demonstrative, sce Anal. Post., i. chap. 5.

3 On this distinction see mainly Anal. Post., ii. 13, where a very fine description of deductive and inductive proof occurs.

4 Compare the passages above noted, and see the curious expression used in the discussion regarding the relation of universal and particular in Anal. Pr., ii. 21, p. 67a, 22 sq.

5 Anal. Post., ii. 5, p. 91b, 33, obdé yap 6 émdywv tows amodetxvvaty, add’ dws dyAot Te.

“e De Part. Anim., iv. 2. Cf. Hamilton, Zect., iv. p. 358, n. ii, 16-18, sce the valuable summary by Grote, i. pp. 366-68.

On Anal. Post.,

of the cause and the causatum ; the whole class long-lived animals and the class gall-less animals will coincide.

_ Turning now to the chapter on inductive syllogism, we find induction defined as inference through the minor that the major belongs to the middle. Here evidently major and middle are regarded not as determined by form only but naturally distinct, and we must assume that by niddle term is to be understood the ground or reason of the attribute (major term) characteristic of a defined species or group (the middle term). Were our knowledge complete and scientific, we should be able to express this in apodic- tic form :—whatever animal has no gall is long-lived ; man, horse, inule, &c., are animals having no gall ; therefore they are long-lived. The progress of knowledge, however, may be from the empirical details. We may have given to us the fact of the attribute, long- livedness, in the group of animals, man, horse, &c., and discover that these long-lived animals are also wanting in gall. If then, in accordance with the rules above sketched, there can be discovered a reciprocating relation between want of gall in animals and long- livedness, if we can constitute a class distinguished by conjoint presence of gall-lessness and longevity, we have the basis for an inductive proof. We may infer therefrom that gall-lessness is, 77 this speeies, the cause of longevity. Such a reasoning is founded on particulars given, and as the coexistence is given, the conclusion seems to be immediately drawn ; there does not appear to be media- tion or use of a middle term; nevertheless the middle term is implied, not in the supposition that the two classes reciprocate, but in the transference from empirical coexistence to causal nexus.

Aristotle’s mode of stating this argument has presented so many difficulties of interpretation that various emendations have been proposed. Grote, ¢.g., who has not apprehended why the class long-lived animals should be taken universally,—‘‘ we are,” he says, ‘‘in no way concerned with the totality of long-lived animals,””—suggests an emendation, which makes the essence of the inductive reasoning turn upon the extension of what we know regarding some gall-less animals to all of that class. But this is not the inductive step according to Aristotle. Induction has not to prove or assume that aand 8, found coexisting in some members of a species, coexist in all of them; Aristotle takes this universal coexistence for granted as the basis of the argument. The inductive step is the transference from this universal coexistence to causal nexus. Apodictically, we should say, if a is the cause of 8, then all A which possesses a possesses 8; thus reasoning from cause to causatum. Inductively we say, all A which possesses a has 8 ; therefore ais the cause of 8.’

Induction, as dealing with particulars, starting with the sense data, and resting upon the more evident fact in order to point towards the essential ground or reason, is therefore more persuasive, more palpable, more adapted for popular inquiries, and relatively more apparent. Syllogistic proof, on the other hand, is more strin- gent, and more efficacious in establishing a scientific conclusion or position.

Aristotle’s mode of dealing with induction, in so far at least as any specific process is designated by that term, seems on the surface to diverge widely from modern logical theory, and we look in vain in his analytical researches for consideration of the methods of observation and experiment which has come to be recognized as the essential portion of a doctrine of inductive reasoning. Yet it may fairly be argued that in modern theories the term induction is used with great laxity, so as to cover either all processes connected with scientific method or some one special feature of scientific reasoning, and that the difference betwcen the Aristotelian and modern views

7 The following is the relative portion of chap. 23 of bk. ii. of the Anal. Pr.:— “‘ Now induction and syllogism through induction is the

process of concluding by means of the minor term that the major term is predicable of the middle” (that is to say, of concluding from given facts that an attribute found in all of them is the effect of some otlicr attribute also found in all of them). ‘“ For example, if B be the middle term, A and C the extremes, we show, by means of C, that A is predicable of B; for this is the inductive process, Thus, let A be longlived; B, those wanting gall; C, individual long-lived, as man, horse, mule. Then A is predicated universally of C (that is to say, the attribute A is found in all the examples before us), “ for alsothat which wants gall is long-lived” (that is to say, as a given fact, gall-lessness and longevity in the species, group, before us coexist). ‘“B, wanting gall, thus is predicated universally of C. If then B and C be reciprocating, if C do not extend beyond the middle term” (that is, if we do not find other animals than the long-lived animals enumerated which also are devoid of gall), “it is necessary that A should be predicated of B. For it has been shown previously that if two terms are predicable of the same third, and if the extreme reciprocate witli one of these, then the other of those predicates will be pre- dicable of that with which the first reciprocated ; but it is necessary to know that Cis the complex of all the individual cases.” The last sentencc is cxtremely hard to interpret. The expression 76 dxpov occurring in it is generally the technical word for major term, but as in the syllogism before us the major term is one of the predicates, this signification would secm to contradict the words mpos Oarepov avrev. Hamilton reads ro pécov, which makes the argument intclligible and coherent with the passage apparently referred to in dédecxrar mpdrepoy, Viz., Anal, Pr., ii. 21, p. 68a, 21-25. Probably Aristotle uses ro axpov here as equivalent to C, the dxpov through which the induction proceeds. According to the view taken above, the essence of the Aristotelian induction does not at all lie in the universal- izing of C, but in connecting in one proposition the attributes B and A found to coexist in the group C. There is thus in one sense no middle, for cause is not reached ; in another sense there is, for C is the matcrial link connecting A and B. Aristotle then might naturally use dxpov for C, and assimilate the process of induction to a syllogism in which there was reciprocation of terms. In fact, however, induction regardcd after his fashion results merely in the constitution

of a group or class characterized as possessing two attributes in comnion.

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lies mainly in the matter, not in the form, of the process. For there are numerous hints in Aristotle respecting seientific procedure,! and, if we consider what is peculiar to modern views, we shall find that it consists mainly in the increased fulness and complexity of our fundamental scientific notions, a fulness and complexity resulting from long-eontinued scientific research. Our modern logic of induc- tion has profited mainly by the general advance of scientific method, and tends to increase as these methods, by eonstant contact with facts, become more refined and accurate. The additional cautions or limitations which we now introduce into our statement of the principles of inductive research concern not so much the form of inductive proof as the character and modes of obtaining evidence which is to satisfy the canons or rules of proof. Such limitations become apparent only through actual scientific progress, not by analysis of the form of scientific proof.

18. To Aristotle, as has becn above said, proof is essentially syllo-gistic or deductive incharacter. Not every syllogism is an apodic- tic proof, but all proof is syllogistic. For proof or adequate knowledge is reference of effects to their causes, and the cause is the general element, 7d xa0éAov, which forms the middle term in apodic- tic proof. Now proof by means of the cause or reason implies the existence of the cause; the inquiry why a thing is is useless unless we know or assume that the thing is. If it exists, then the cause or reason of its so existing is that which gives it a definite character or position ; it is, in technical phraseology, the form of the thing. But the form of the thing, regarded apart from the material, acci- dental element essential to its concrete existence, is that which we express in a definition. Proof and definition are thus most closely connected. The terminus to whieh proof tends, not realized in all cases of proof but certainly in the most perfect, is the definition, and, besides, if we closely examine proof, and find that ultimately we can force back the

chain of middle terms up to certain ultimate, primary universals, disclosed by voids, and that the nature of these primary universals is stated in their definition, we see further that definition is connected with proof as the terminus from which proof starts. The exposition of definition is thus the crowning portion of Aristotle's theory of apodictic method.? In it we have brought into close, though not explicit, relation, the fundamental notions on which his logic rests, — the notions of the essence, universal, genus and specific difference. Definition, as concerned with that which is involved in demonstration, the ground or reason, is in cases where the reason and consequent are separable the sum of the demon- stration ; it is the eompressed statement of the connexion between a subject and the attribute demonstrated of it, z.¢., in a syllogism of the first figure, the major term.* Frequently a definition merely states the demonstrated attribute in relation to its subject, without indicating the rational link.4 Such definitions, however, are de- fective, just as the conclusion of a syllogism, if taken wer se, is defective.> A genuine definition is the statement of the essence,

stration, in immediate notions is directly assumed.6 A merely nominal definition or explanation of what a name signifies is but a preparatory stadium in the progress towards real, genetic definition.

Definition, then, like demonstration, rests on the essential or rational ground, the notion of the thing. The rational ground or notion has its empirical aspect ; it determines a class, and thus, just as in demonstration we may have forms of reasoning based primarily on the empirical details, so in framing definitions we may proceed from the empirical class, and may formulate rules for defining which bear special referenee to the genus or body of individuals. Insuch procedure there is always involved the general idea of the essence or notion as the determining universal, and without this general idea the subsidiary methods, induction and division, do not yield seientifie definition.

To frame a definition, then, i.e., to discover the elements whose combination as an essential unity makes up the notion of the things

defined, we select the predicates belonging to the things in question, eee ee

‘ 1 See, for example, the discussions in Topics, i. 17-18; ii. 10-11, on similarity ; 7 Be cl aie poet and inductive methods; in Post. Anal.,

. 13, e€ formation of definition; i ii relation of eisai oeees ; and in Post. Anal., ii. 12, 14-18, on the

it does not seem necessary here to consider in detail the peculiariti

apodictic as these are laid out in the first book of the Post. Anal., os to aeaien the doubts raised regarding definition and proof in the first chapters of the second book. _ The substance of these difficult chapters can be readily summarized. If definition be taken as a finished result, it seems to stand in no relation to proof. and indeed it is hard to discover how it comes about at all. For definition sup- poses that. which is implied in proof, the existence of the thing defined, and moreover, it is in @ special sense a unity, containing no distinction of subject and predicate, whereas such distinction is of the very essence of a demonstrated pro- position. Neither in province, nor in method, nor in result do definition and proof coincide. All this follows, however, from an abstract separation of the form or essence of the thing defined from the concrete nature of the thing. The essence is not to be taken apart; the definition does not pre-exist as a given fact. The essence is the reason of the fact, and is only discoverable when there is the recognized distinction of fact and reason of the fact. We must consider definition in the same manner as being involved in and resulting from the genesis of scicn- tific knowledge.

3 amddeéts Oéoe Siadépovea, Anal. Post., i.8, p. 75b, 31,

4 cuurépacua te arrodeitews, ibid.

5 De Anima, ii. 2, p. 418a, 18 sq.

§ 6 8 rOv duéowy opiopds Bears éari Tod Ti orev avarddeuKTOS. *

but also attaching to other species of the same genus. The com- bination of such predicates which is not found in any other species, which is, therefore, reciprocable with the essence or form of the species, is its definition. The definition, therefore, contains the genus and the specific attribute (or combination of attributes). Of these elements, the genus is the least important; the truly essential factor is the specific differencc, and, in order that our definition should be ultimate, we must follow out the line of specific differ- ence by which a genus may be divided until we reach a final, irre- ducible characteristic or group of characteristics, constituting a lowest species (or natural kind, if one were to employ a term made current by J. 8. Mill). The systematic following out of the specific differences is logical division ; the critical comparison of points of

| similarity in species of the same genus, so as to obtain a higher

generality, has no special title accorded to it, but it resembles the Socratic and Platonic induction (suvaywyf). Division proceeds on the oppositions actually found in nature; and, though, doubtless, the division by dichotomy has formal advantages, it has not, as a process of real cognition, any supreme valuc. ‘lhe.negative as such is the inconccivable, and presents nothing for cognition.? And division is not dependent on exhaustive knowledge; it is not neces- sary that, in order to recognize A as distinct from B, we should know the whole universe of possible objects of cognition. A and B may be recognized as identical or distinct in essence, even though they at the same time possess distinct or identical acciden- tal marks. Knowledge, in other words, turns upon the essential, not upon the numerical universal.® It is only needful, then, that in the systematic process of indicating the elements of definition, all mnst be included that concern the cssence, that the order must be strictly from determining to determined (or from more abstract or general to more concrete or special), and finally that the enumer- ation be complete. The final division or spceeics reached is the notion of the thing, and its expression is the definition.

19. The analytical researches thus manifest themselves as a real theory of knowledge and as forming an integral part of the Aristotelian system. Logical relations are throughout conditioned by the characteristics of the Aristotelian metaphysical conception, and the distinction of the formal or technical from the real in cognition has no place in them. No point is more frequently insisted on by Aristotle than the impossibility of deducing any scientific principles or results from the fundamental axiom of thought, the law of non-contradiction. In the Aristotelian system this axiom appears simply as the generalized expression for the peculiar charaeteristic of thought, its potentiality of truth or falsehood. Such potentiality accompanies thought throughout, and is the mark of its subjective character, but the actuality of thought is something quite distinct, and is only realized throngh the various processes whereby the world of fact is apprehended. Beyond a

ectin e defi _ doubt knowledge has a general aspect ; aud therc is thus possible which in mediated notions is the cause or middle term of the demon- |

a general theory of knowledge, but this is not to be regarded as merely a development from the fundamental axiom of thought. It is the general statement of what constitutes actual cognition, and thus refers on the one hand to the ultimate properties of that which is to be known, on the other hand to the qualities of knowledge as a subjective, though not the less real, fact. For to Aristotle subjective has not the sense which it may be said to have assumed in modern logic, mainly throngh the Kantian analysis. The activity of thought which realizes itself in the consciousness of the individual is not a mere formal process of apprehension, mirroring or depicting reality that is totally distinct from it. It is a reality, one aspect or phase of the total sum of things, and its development is a real process correlative with the development inherent in things as a whole.

At the same time it is impossible to overlook the difficulties which attach to the Aristotelian conception, and the consequent obscurities or perplexities in his logical researches. ‘To remain always true to the fundamental conception of thought as one factor or phase in things, to

trace its forms in such a mode as never to lose sight of its cssential correlation to the development of reality, is in itself the hardest task for any thinker, and presupposes a more completed metaphysic than is to be found in Aristotle. Some of these difficulties may be briefly noted, as they form the turning points of certain later doctrines. The judgment or proposition is taken as the initial, the simplest phase of the activity of thought, and so as having the simplest relation to things. But the distinctions of things which are subjectively seized'in the judgment are too much regarded as given facts, and Aristotle is thus involved in a difficulty respecting the import, the truth or falsity, of the judgment. The presence of this difficulty is specially discernible when he attempts to deal with the temporal reference in the judgmcnt, with the doctrine of opposition, and with the nature of modality. Thus, he notes that the verb, the cssential part of the predicate, has a

7 Just as the dvopa ddpucrov is said to have no significance save as the sum- mary of a proposition, while a negative proposition has significance only in regard to the corresponding positive.

8 The reference is to a theory advanced by Speusippus; see Prantl, i. 85. Aristotle here touches on a logical problem whicn has troubled many logicians. It is the same difficulty that arises when the question of plurality of causes is

temporal significance, but he also notes that in universal judgments there is no reference to any specific time, and also that the copula, the verb is, has no existential meaning. He is thus driven to the enunciation of a view, common among recent logicians, that the judgment is a reficctive or critical act, pronouncing on the truth or falsity of a contemplated separation or conjunction of facts, while, on the other hand, the very contemplation of conjunction or scpara- tion has appeared as the essence of the judgment. So, in dealing with

opposition, he distinguishes contradictories from eontraries, and is inclined to refer the sccond to the given nature of facts, wherein cxtreme oppositions of members falling under the same genus are presented. Modality, likewise, he treats confusedly, for the assignment of the modal relations to the predicate does not sufficiently determine their place in a theory of judgment, nor explain the relation in which they stand to thc judgment as the simplest activity of thought.

Further, in dealing with the quantity of judgments, Aristotle is perplexed by his own theory of what constitutes generality. He is compelled to throw togcther universal judgments of a totally distinct kind,—empirical and rational, as one may call them,—and though the underlying view that empirical universality is the expression of, and is dependent on, rational connexion is made sufficiently clear in the doctrine of proof, it is not carried out to its consequences in the doctrine of judgment. Finally, to note only the crowning difficulty, the theory of proof and of definition turns upon the nature of the essential connexion of attributes in a subject, but the explanation of essence is precisely the lacuna in the system. Indications of a theory of essence are not wanting, but it does not seem possible so to unite them as to form a consistent whole. The greatest obscurity still hangs over the fundamental part of the system, the nature of the rp@ra which are apprehended by voids, of the specifie relation of attributes xa6’abra to their subjects, and of the Ya: apxat from which particular sciences start. That the mpotacets &uecot, so frequently adduced as integral parts of proof, ate analytical judgments! cannot be accepted witbout such qualifications as to render the use of such a term misleading ; but what their precise nature is remains in the Aristotelian system undetermined.

Logic from Aristotle to Bacon and Descartes.

20. The long history of philosophic thought from Aristotle to the beginning of the modern period furnishes no new conception of logic so complete and methodical as to require detailed trcatment, but exhibits alterations in special doctrines, additions, and new points of view numerous enough to account for a certain radical change in the

mode of regarding logic which is, for our present purpose, the only interesting feature. This change may perhaps be expressed not inaccurately as the tendency towards formalizing logic. Gradually logical researches came to have their boundaries extended in one way by the introduction of new mattcr, and natrowed in anothcr by restriction of logical consideration to one special aspect of knowledge. Much in the history of this movement still remains in obscurity, but the general result is sufficiently clear. The periods into which the historical development of logic through- out this long interval may be naturally divided, with their main eharacteristics, are the following.; (1) Zhe Peripatetic School, represented by Theophrastus and Eudemus, following in the main the Aristotelian tradition, but deviating in certain fundamental respects, and on the whole treating the matter of logical research as though it were separate from and independent of the theory of knowledge as awhole. To this school is due the distinct recognition of the hypothetical and disjunctive proposition and syllogism, and the more complete enumeration of the possible valid modes of categorical reasoning. In both cases the additions are made to turn upon purely formal considerations. The hypothetical and disjunctive judgments are treated as given varieties, to be discerned in ordinary language and expression, not as resting upon any fundamentally distinct principle or activity of thought.2 The addition of five indirect moods to those recognized by Aristotle as belonging to the first figure proceeds on the purely. formal ground of difference in position of the middle term in the two preinisses. (2) The Epicurean and Stote Logics, Of these the Epicurean pre- sents no points of interest. The Stoic logic, on the other hand, is the first example of a purely formal doctrine based on and associated with a thoroughly empirical theory of cognition. In essence the Stoic doctrine is identical with that of Antisthencs, above noted, and it is interesting to observe that, under the purely nominalist theory, logic becomes almost identical with the doctrine of expression, or rhetoric. The theory of naming, and that of the

1 As Zeller will have it; see Ph. d. Gr., ii. 2,191, n. Doubtless Aristotle does define an essential attribute as being one contained in the subjeet or one of which the subject notion is an integral part, but this relation

of entering into the definition is not to be identified rashly with the modern view of the analytical relation of subject and predicate.

2 The nature of hypothetical inference and its law are recognized with the greatest distinetness by Aristotle. From his theory of essence as causal nexus, any distinction of kind between an apodictie (eategorical) syllogism and a hypo- thetical of the type contemplated by later logicians was impossible and needless.

conjunction of names in propositions, are the fundamental portions of the body of logic. Naturally the Stoic logicians tended to inercase the bulk of logic by introducing numerous distinctions of language, and by signalizing varieties of judgment dependent on varieties of verbal expression. (8) The acceptation of Logic among the komans. Here there must be distinguished the quasi-rhetorical logic, such as is found in Cicero, which is altogether Stoic in character, and the Aristotelian logic, as developed by Boetius with the additions of the later commentators. In Boetius one notes specially the technical or formal charactcr of the treatment, which was of special importance historically, from the fact that the earlier scholastic writers derived their main knowledge of logic from certain of the treatises of Boetius. (4) The Scholastic Logic. On the details of the scholastic logic it is not necessary to enter, but there must be noted the following points as of interest in determining what may well be called the current conception of the Aristotelian logic in modern times. The earlier scholastics, in possession of but few of Aristotle’s writings, added nothing of importance to the body of logical researches, and the permanent subject of discussion, the nature of universals, did not, through any of its solutions, affect the treatment of logical doctrines. The introduction of the body of the Aristotelian writings was contemporaneous with the introduction of the Arab writings and commentaries into western Europe, and there grew up therewith a more developed treatment of what may be called the psychological element of logic. The logic of the later scholastics is charactcrized by two points of interest, historically unconnected, but having a natural affinity,—the one, the

introduc- tion of an immense mass of subtle distinctions, mainly verbal, making up the body of the Parva Logicalia, the other, the influence of the nominalist conception of thought. The peculiarity of the nominalist view is the severance of immediate apprehension from discursive thought, the assignment of all matter of knowledge to the one, and of all form to the other. But form, nnder this con- ception of discursive thought, can be found only in the generalizing function of signs or names ; accordingly the fundamental processes of logical thought are regarded as so many modes of application of names. The later nominalist logicians were thus naturally led to the cxpenditure of immense subtlety and diligence on the thorny problems of the Parva Logicalia, while at the same time the peculiar inner difficulty of the theory became appareut as its eon- sequences were worked out. (5) The Reaction against Aristotelianism and the Humanist Modification of Logic. Little of positive value for logical theory is offered by the numerous works representing this stage of historical development. Valla, Agricola, and Vives, with much good criticism in general spirit and detail, present a rhetorico-gram- matical logic that resembles most closcly Cicero's eclectic reproduc- tion of Stoicism. Ramus, the only logician of the period with historic renown, contributes really nothing to the history of logic, his innovations consisting mainly in the omission of the most valuable portions of the genuine Aristotclic logic, the insertion of practical and interesting examples, and finally rearrangement or redistribution of the heads under which logical doctrine was ex- pounded. The Ramist school, most numerous and flourishing, produced no logical work of the first importance.

The net result of this whole period was the severance of a cer- tain body of doctrine, formal in character (the theory of second intentions), from theory of knowledge gencrally, and from all the concrete sciences. The boundaries and even the functions of this doctrine remained unfixed, for difference regarding fundamental points of extra-logical theory led to difference in mode of treat- ment, as well as to difference in conceptions of the end and value of logic.

Logie of Bacon and Descartes.

21. Modern reform of logic, by which may be understood the attempt to place logical theory in a more close and living rclation to actual scientific method, begins with Bacon and Descartes. To both the scholastie logic presented itself as the cssence of a thoroughly false and futile method of knowledge. Ncither had the acquaintance with the genuine Aristotelian system requisite in order to distinguish the elements of permanent value from the worthless accretions under which these had been buried, and, as a natural consequence, the vicws of both have a far closer resemblance to the Aristotelian doctrine than might be imagined from the attitude of opposition common to them. Both thinkers were animated by the spirit of reformation in science, and both em- phasize the practical end of all speculation. For both, therefore, logic, which to neither is of high value, appcared to be a species of practical science, a generalized statcment of the mode in which intellect acquires new knowledge, in which the mind proceeds from known to unknown.® But such a conception of logic is, if the expression be permitted, formal ; that is to say, the actual province of logic is not determined thereby, but awaits determination from

3 The first of these is no doubt, as Prantl has laboured to prove, Byzantine in origin, but it still remains doubtful whence the Eastern logiecians draw. The most probable source is the Stoie writings,

4 See note C, p. 803.

5 Comp. Princip. Phil., Pref.; De Aug. Sc., bl. v. chap. 1, 2.

the further idea of the nature of knowledge and the ultimate eon- stitution of that which is tobe known. When this point is reached, a radical divergence presents itself between the views of Descartes and Bacon, consequent on which appears a radically divergent state- ment of the main processes and methods of logical theory,

To Descartes the ideal of eognition is the mathematical, that in which from assured and distinct data we proceed by strict sequence of proof to determine accurately and completely the nature of complex

phenomena. Such an ideal, extended so as to em- brace knowledge as a whole, dominates the whole of the Cartesian speculation, and, as in the case of the Socratic doctrine of know- ledge, is the ground of the Cartesian doubt. Perfect certainty, 7.¢., clearness and distinctness of principles, logical consecutiveness of deduction from them, and exhaustive enumeration of details—such are the characteristics of completed knowledge. There follow naturally therefrom the main proeesses of knowledge :—intwition, by which the simple data and axioms are apprehended ; induetion, or exhaustive enumeration of the elementary factors of any phenomenon ; deduction, or determination of the complex as the necessary result of the eombination of simple factors. To the processes of induction and deduction, when viewed more generally, the titles analysis and synthesis may be given.! On other portions of logical theory Descartes does not enter, and the text-books of the Cartesian school], even the celebrated Port Royal logic, do little more than expound with some freshness such of the older material as seemed capable of harmonizing with the new conception.

Two things only require note in respect to the Cartesian logic, apart from its freshness and completeness ; the one is the obscurity which hangs over the nature of intuition ; the other is the step in advance of the scholastie logic effected in the assimilation of deduction to synthesis. As regards the first, the criteria laid down by Descartes, viz., clearness and distinctness, are unsatisfactory and ambiguous. lt is evident that he implied under these clear and distinct recogni- tion of necessity in the data or principles, but the nature of this necessity is never made clear.? As regards the second, it was of importance to signalize, as against the scholastic view, that the universal in thought or reasoning was not only of the nature of the class notion, that genera and species were not the ultimate universals, but were themselves secondary products, formed by reasoning, and based upon essential connexion of facts. In this Descartes was but returning to the genuine Aristotelian doctrine, but his view has all the advantage derived from a truer and more scientific con- ception of what these connexions in nature really are.

22, What is peculiar in the logic of Bacon springs likewise from the peculiarities of the underlying conception of nature, The inductive method, expounded in the Novwm Organwm, is, however, only part of the Baconian logic, and, since it is commonly regarded as being the whole, a brief statement of what Bacon included under logie may here be given.

Viewing logic as the doctrine which deals with the use and object of the intellectual faculties, Bacon divides it (in this approximating somewhat to the extended division of the Stoic logicians) into (1) the art of inquiry or invention, (2) the art of examination or judg- ment, (8) the art of memory, and (4) the art of elocution or tradition. The third and fourth divisions are nnimportant ; the first and second might be called respectively the theory of the acquisition of knowledge and the theory of evidence or proof. The art of inquiry is subdivided into the art of the discovery of arts and the art of the discovery of arguments. The second of these Bacon regards as identical with the Topics of the Greek and Roman dialectic, and therefore as of comparatively slight value. Of the first there are two main branches :—(A) Experientia Litcrata and (B) Interpretatio Nature. The art of judgment has two subdivisions :—the examination of methods of reasoning —induction and syllogism—which resembles the older analytic; and the examination of errors of reasoning—whether these be sophistical, v.¢., the logical fallacies of the older doctrine, or errors of inter- pretation to be removed by careful criticism of scientific terms, or arising from erroneous tendences of the mind (the doctrine of idola) —which resembles the older treatment of Elencht.

The peculiarity of the Baconian logic, then, must be sought in the processes included under the art of discovering arts or knowledge. Among thesc the syllogism is not included. It isa process with no practical utility ; it involves premisses of which the truth is simply assumed, and consequently its conclusions can have no validity beyond that of the premisses ; it affects to determine the particular from the general, but in fact nature is much more subtle than intellect, and our generalizations, which are but partial abstractions are quite

inadequate to afford exhaustive knowledge of the particular ; it throws no light upon the essential part of cognition as a process

1 See Regulz ad directionem ingenti, Nos. 2,3, and especially 7. The cclebrated rules of speculation (De Methodo) are only a more popular statement of the same processcs,

? His ultimate standard is, no doubt, necessity for a thinking subject. What- cver is so connected with the cxistence of the thinking being that without it this existence is incomprehensible is necessary. But to apply this ideal to any pro- position save the first, the Cogito ergo sum, is for Descartes the fundamental difficulty of his philosophy.

in formation, viz., the method by which we are to obtain accurate notions of things, and judgments based on these notions. More- over, the deductive or syllogistic procedure favours and encourages the tendency to rash generalization, to the formulation ofa universal axiom from few particulars, and to the uncritical acceptance of experience. If syllogism exist at all, there must be a prior process, that of generalizing by rigid and accurate methods from experience itself. Syllogism is not entirely worthless. It is of particular service in some branches of science (¢.g., the mathematical), and generally may be employed so soon as the principles of a science are well established ; but it is a subordinate and secondary method.

The art of discovery, then, is the method of generalizing from experience. What this method shall be depends entirely on the thinker’s conception of experience. Now Bacon’s conception is perfectly definite. Observation presents to us complex natures which are the results of simpler, more general forms or causes. From the complex phenomena these fornis are to be sifted out by a methodical process of analysis and experiment. A general proposition is one stating the connexion between complex natures and their simple forms or canses ; it is, therefore, the result of a graduated process. No doubt there may be generalizations based only on an ingenious comparison of the complex phenomena as they are presented to us ; such a process

Bacon calls Hxperientia Literata, and the maxims recommended for it much resemble the ordinary methods of ex- periment, but truly scientific knowledge is only to be obtained by the complete inductive nethod. The characteristics of this induc- tive method follow at once from the nature of the object in view. The form which is songlt can be detected only by examination of cases in which the given complex effect is present, in which it is absent, and in which it appears in different degrecs or amounts. By a critical comparison of these cascs we may be able to detect, and, were the enumeration exhaustive, we must infallibly detect, by process of exclusion or elimination, a phenomenon constantly present when the effect is present, absent whenever the effect is absent, and varying in degree with the effect. Such a phenomenon would be the form in question,—the cause of the given fact or attribute. Exhaustive enumeration is, of course, an ideal, and therefore the method of exclusion can never be perfectly carried out, but all additional aids have significance only as supplying in part the place of exhaustive enumeration. We may, on thie basis of a wide examination, frame a first generalization (jirst vintage as Bacon metaphorically ealls it), and proceed to test its correctness by carrying out the critieal comparison with it in view. Or we may, under the guidance of our leading principle, take advantage of certain typical cases presented by nature, or force cases by experiment in such a way as to supersede the enumeration. There are prerogative instances, critical phenomena, helpful in diseovery of the cause of a phenomenon. Of other adminicula, or aids to induction, only the titles are given by Bacon, and it would be hazardous to conjecture as to their significance.®

The Baconian logic, then, or at least what is peculiar to it, is thor- oughly conditioned by the peculiarities of the Baconian metaphysic or coneeption of nature and natural processes. As to the novelty of the logic, this to us does not appear to lie in the mere fact that stress is laid upon induction, nor do we think it correct to assign to Bacon the introduction of the theory of induction as an integral portion of logic. But it eonsists in the new view taken of what constitutes the universal in thought, a view which may be inadequate, but which colours and aflects every process of thought, and therefore every portion of logical

theory. It is but a con- sequence of Bacon's narrow view of the cssence of syllogism that he should set induction in opposition to deduction, and regard syllogism as of service only for communication of knowledge. His inductive methods are throughout syllogistie in this respect, that they like all processes of thought involve the combination of universal] and particular. Experience is interpreted, that is to say, viewed under the light of a general idea or notion.

Logic on the Basis of Psychological Empiricism. – Locke, Hume, Mill, Condillac.

23. The universal element in thought which is recognized by Bacon as present received from him no special treatinent. His theory of the nature of knowledge offered no explanation of the origin, significance, and validity of the notions involved in inductive procedure. The Essay on the Human Understanding, which carries out in the domain of inner experience the practical tendency of the Baconian method, supplied from the point of view of individualism the metaphysical theory common to both, a certain psychological theory of the universal element in knowledge, and thereby afforded a new foundation for logical doctrines. The Essay contains, in an unsystematic fashion, much that bears directly on logic (¢.g., the whole discussion on naines, the classification of the signification of

3 Nov. Org., ii. 21. In addition to prerogative instances there are mentioned —supports of induction; rectification of induction ; variation of the investigation according to the nature of the subject; prerogative natures: limits of investiga- tion; application to practice; preparations for investigation; ascending and descending scale of axioms,

judgments, the criticism of syllogistic argument), but of more importance than these detached and direct portions is the general

rinciple which underlies the whole view of human knowledge. This principle is briefly that of psychological genesis. All the com- plex

facts of knowledge are regarded as mechanical compounds due to the coherence of siinple data, the facts of inner and outer sense. The method of Locke is that which underlies and determines all the logical work of one very important school of logicians.

It is not needful to enter into details of Locke's own contributions to the foundation of logic. But it may be pointed out that from his position there were two possible lines of development. In his view the primitive impressions, the facts of inner and outer sense, were in themselves primitive facts of cognition ; they were cogni- tions (it is the very essence of Locke's method to identify a simple impression of sense with the knowledge of a simple sense fact). The processes of abstraction, comparison, 7.¢., judging and reasoning, were exercised upon their data, and these products were, in conse- quence, of a secondary and, so to speak, artificial character. It was natural that a thinker who identified impression of sense with knowledge of a sense fact should maintain that the secondary for- mations of thought (general ideas, general propositions, syllogism) were not indispensable for cognition ; that we could and did reason from particulars to particulars. At the same time Locke admitted the secondary processes as having actual existence, and in one important case (that of the judgment of coexistence, with which may be taken the idea of substance and of real relation) seemed to allow that in judgment something was added to the primitive data. It was possible, then, for development from Locke's position to proceed either by offering an explanation of the added elements, which should be in stricter harmony with the fundamental doctrine of psychological genesis, or by throwing them entirely out of account and concentrating attention on the primitive data as the only materials of cognition. The first is the line taken by Hume, which finds its logical completion in Mill; the second is the line taken by Condillac.

Hume has an easy task so long as he merely subjects Locke's position to negative criticism ; for the added elements, the ideas of substance, relation, cause, &c., are clearly inept and defenceless when the facts to be linked by them are already contemplated as so many completed, isolated cognitions. But where connectedness of cognition is in

question, and where some explanation is demanded of the relations which seem to supply the universal rule in think- ing, Hume's task is not so simple, and his final answer that these relations are psychological growths or products of association is neither satisfactory in itself nor quite in keeping with other portions of his doctrine. In Hume, however, we find the first thorough- going attempt to construct a theory of knowledge on the basis of psychologica empiricism or individualism, and the first contribu- tions to a doctrine of inductive proof as portion of this more com- prehensive theory. Briefly, so far as logic is concerned, Hume offers as explanation of the universal in thought association of ideas, but does not treat of logic specially or in detail.

The complete statement of the theory of knowledge from the po elegiell point of view is that contained in Mill's System of

ogic.

Phe aitn of that work is the exposition of the theory of knowledge. Now knowledge, the term being taken in a wide sense, is charac- terized by one quality mainly, viz., evidentiary force. For every item entering into the sum of our beliefs at any moment, immediate perception being discounted, there may be reasons advanced, adequate or inadequate. The exposition of the relations between beliefs and their evidence or ground is logic, and logic is thus in one sense formal, inasmuch as the relations of evidence and belief are general, not dependent on the special nature of the facts believed, and in another sense real, in that knowledge is conceivable only in strictest relation to the things known.

Now, the exposition of the general uature of grounds of beliet is in fact identical with a theory of the universal element in thought or cognition, and this theory is the essential portion of Mill's logic. It being assumed that the facts with which knowledge is concerned are minds, bodies, states of consciousness, and the relations (coexistence, sequence, similarity) among these states, and that propositions express, therefore, existence, co- existence, sequence, or resemblance, on what is based any inference going beyond a present perception? The

propositions which make up cognition, strictly so called, are not mere expressions of momen- tary states ; they are expressions of belief regarding the more or less constant relations of facts. They are, in fact, conclusions. The theory of proposition and of reasoning is one. On what, then, do such conclusions rest ?

The warrant for any conclusion based upon experience, and referring to experience itself, can be found only in experience or in some principle furnished by experience. It may be shown that evidence for a conclusion is adequate, if we can compare this evidence with the kind of evidence on which a wider conclusion, frequently or constantly verified, rests. This comparison of par- ticular evidence with more general evidence is the preliminary

auswer furnished by Mill. But what is the general evidence referred to, and what is the principle founded on it? The general evidence is the repeated experience of constancy of connexion among groups of phenomena, and the principle founded on it is that of the existence of uniformity or rather of uniformities in nature. The evidence and the principle are purely psychological in character ; that is to say, repeated experience, beginning with familiar cases and extending itself as time goes on, produces, by the natural laws of association, an assured belief that phenomena asa whole, or at least in the main, are connected together in constant, uniform, invariable modes. Such a belief, once established, serves as an ultimate criterion of proof, and as an index for research. We pro- ceed in our investigations in the light of this principle, aud the tests by which we estimate the validity of evidence for any parti- cular inference as to uniformity are generalizcd statements deducible from it. So soon as our evidence is of such a character that, in the case before us, either the inference of uniformity is warranted or the general principle must be held not to apply to this particular case, we have proof as cogent as experience can afford.

The universal in knowledge, then, is this naturally formed assumption regarding the course of nature. The logic of know- ledge is the exposition of the modes in which evidence is obtained, of the tests by

which its validity is estimated, and of the forms in which evidence and conclusion are connected.

The characteristic features of the subordinate processes of proof are at once deducible from this fundamental view. For if the simplest form of inference be, psychologically, the transition effected by association from one particular case to another resembling it, and if the essence of proof consist in comparison of the evidence for any one.conclusion with the type of evidence for the general assumption regarding nature (or at least a wider portion of nature), it is evident that syllogism, in the ordinary acceptation of the term (in which it implies a concrete general proposition, a particular subsumed there- under, and a conclusion), is neither a primitive form of inference nor a valid mode of proof. Doubtless we do in reasoning employ general propositions in order to express the determination of some particulars belonging to the same class, but the general proposition is itself a conclusion, resting on evidence of the kind above described, and the essence of syllogistic reasoning is not the sub- sumption of a particular under a general in which it is included, but the expression of belief that the evidence for the general pro- position is adequate to cover all the particular cases, including those which have not been taken into account in formulating it. The aa premiss of a syllogism is the record of a previous induction, and the syllogistic process, bringing forward a new case, is a valu- able method for testing the adequacy of the previous generalization. As to generalization itself, the basis is evidently to be sought in experience, apprehended by observation and experiment. Did experience present to us isolated phenomena, 7.¢., phenomena so arranged that enumeration of the elementary constituents, whether antecedents or consequents, were possible, then our inductive pro- cedure must be regulated by those canons or axioms which express the kind of evidence already referred to as establishing uniformity. These canons or axioms, however, are, like the Baconian method of exclusion, tests for an ideally perfect experience, and they, there- fore, only lie in the background of actual scientific procedure, which has to employ other processes, both of inference and of proof. For, if we can in no way obtain more than a knowledge of the coexistence of facts, we are unable to bring our evidence into conformity with the inductive

canons, save in the ideal instance in which absolutely exhaustive experience both of positive and negative cases is possible. Inferences as to law or uniforniity of coexistence must here be based on numerical calculation of probability, and the conclusions present themselves in the peculiar numerical form appropriate to proposi- tions of probability. Further, if the phenomena under investigation be complex, so that the canons of neither observation nor experiment are immediately applicable, the process of investigation must of necessity be the combined method of analysis and synthesis: analysis, aided by hypothetical conjecture, formulating such general laws of elementary factors as are known or presumed to exist in the case in question ; synthesis, combining these laws and calculating with greater or less numerical exactness, according to the nature of the matter, the probable combined cffect,—the whole tested by critical comparison of the calculated result with the actual pheno- mena. Here, as one can see, syllogistic procedure appears in its true scientific aspect as the form of thought by which we pass from the simple to the more complex, from the elementary essence or cause to the complex accident or effect. The elementary causes, no doubt, have no more cogent evidence than that which can be afforded by experience viewed in the light of our psyehological assumption of uniformities ; nevertheless the whole procedure of scientific investigation is recognized as being essentially of the type sketched in somewhat imperfect outline by Aristotle.

So far, then, as the logic of Mill is concerned, and apart from the undeniable richness and completeness of knowledge with which the various processes are treated, we note but one fundamentally new feature, namely, the explanation offered of the universal element

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through which alone perceptions are raised into cognitions, through which alone reasoned knowledge is possible. It is the only explana- tion possible on the basis of psychological individualism ; its value, and therefore the value of the systematic deductions from it, must

depend on the aecuracy and coherence of the psychological or meta-physical theory on which it is founded.

24. It was possible, however, to proceed by another route from the position taken up by Locke. If it be held that the elementary impressions, mechanically regarded as somehow arising in mind, are in themselves cognitions, then it is possible to view them as con-taining in themselves all possible cognition. In other words, we may confusedly identify the proposition that knowledge does not extend beyond the field of experience with the very different pro- position that the only items of knowledge are the isolated impres- sions which appear to make up experience. If this identification be accepted (and the conception involved is precisely that under- lying all consistent nominalism from Antisthenes downwards), then the only processes requiring to be taken into account are those whereby clearness and distinctness are introduced into our (possibly) vague perceptions. For these processes analysis is an adequate title. All knowledge, ¢.c., whatever is characterized by clearness, definiteness, consequence, is the analysis of what is given in isolated perceptions. Each perception is itself and is only itself; no judg- ment is possible save that of identity. In other words, if there be judgment at all, it can consist only in the assertion that the unanalysed perception is identical with that into which it is analysed, and as each perception and each analytic portion of a perception may be signified by an arbitrary sign (name or other hieroglyphic), judgment is essentially an affair of naming, a declaration that different names are identical or belong to the same perception. Reasoning is simply the transition from one identity to another, —a more developed result of analysis. Scientific or real knowledge is an accurately framed system of signs, ¢.¢., a collocation of signs which expresses precisely the results of the analysis of com-plex pereeptions. Logic, under this doctrine of knowledge, is merely a statement of the various modcs in which analysis is carried out, of the ways in which names are applied, and of the forms in which names are combined. Such is the theory of logic presented by Condillac.}

Logic on the Basis of Metaphysical Psychology. Leibnitz and Herbart.

25. One development from the psychology of Locke has thus appeared as an extreme formalism, which if carried out consistently must needs assume the aspect of a numerical or mechanical system of computation." It is remarkable that a very similar result was reached by Leibnitz, a thinker who proceeded from a quite opposed psychological conception. The similarity is due to the presence in both theories of a certain abstract principle, intimately though not necessarily connected with the respective psychologies. In place of the single perception which in Condillac's logic is the element to be analysed, tliere appears in Leibnitz's view the single consciousness of the monad (see LetBNiTz, p. 424); in both cases, however, knowledge is assumed to exist there implicitly and to stand in need only of evolution. The methods by which this evolution is to iline form for Leibnitz the substance of a new and all-comprehensive science, '' Scientia Generalis," of which the older logic is but a part.

The characteristics of Scientia Generalis are at once deducible from the two general principles which in Leibnitz's view dominate all our thinking,—the law of sufficient reason and the law of non-contradiction. It must contain a complete account of the modes in which from data conclusions are drawn, and in which from given facts data are inferred, and since the only logical relations are those of identity and non-contradiction, the forms of inference from or to data must be the general modes of combination of simple elementary facts which arc possible under the law of non-contra- diction. The statement of the data of any logieal problem, and the deseription of the processes involved in combining them or in arriving at them, are much assisted by, if not dependent on, the employment of a general characteristic or symbolic art.

The fundamental divisions then of Scientia Generalis, so far at least as its groundwork are concerned (for Leibnitz sometimes in- cludes under the one head all possible applications of the theory) are (1) the synthctical or combinatorial art, the theory of the pro- cesses by which from given facts complex results may be obtained (of these processes, which make up general mathesis, syllogistic and mathematical demonstration are special varieties) ; (2) the analytic or regressive art,

which starting from a complex fact endeavours to attain knowledge of the data from whose combination it arose.?

‘ See Langue de Calcul ; Art de Penser; and Logigque, Cf. Laromigui Lecons de Philos., i. pp. 5-43; and Robert, Les théories (oereiiee . Concitiay, 1869″

? Such as is hinted at by Hobbes, and as is carried out in the various works of Professor Jevons.

- Leibnitz somctimes includes these two under the head of “ Ars Inveniendi,” and places alongside of this, as first part of Scientia Generalis, ‘* Ars Judicandi,”

a division resembling that appearing in Bacon: but the “ Ar, i ey thrown out of account. iil . s he eer oe

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Of the nature of tle sccond portion only a few brief indications are contained in the logical traets and in dctaclicd utterances in the larger works of Leibnitz. When complex combinations are presented, or, in the most gencral form, when the investigation has to start from expericnce, from truths of fact, the work of analysisis endless ; the regress to conditions is practically infinite. Deter- mination of the necessary data cannot in such a case possess more than probable value, but the probabilities may be estimated according to the rules laid down in the progressive or synthetic art.4 The logic of probability is thus recognized as an integral portion of the logical system.

Of the first art, the logical calenlus in particnlar, a somewhat clearer and fuller ontline is given.> The logical calculus implies (1) the statement of data in their ee form, (2) the assignment of the general laws under which combination of these data is pos- sible, (3) the complete exposition of the forms of combination, (4) the employment of a definite set of symbols, both of data and of modes of combination, subject to symbolic laws arising from the laws under which combination is possible. In the Fundamenta Caleuli Ratiocinatoris and

the Non-inelegans Specimen Demonstrandi, somes thing is effected towards filling up the first, second, and fourth of these rubrics, but in no case is the treatment cxhaustive. The simple data, called characters or formule, are symbolized by letters, relations of data by a somewhat complicated and varying system of algebraic signs; for the calculus, or set of operations exercised upon relations given so as to produce new formule, no comprchensive system of symbols is adopted. Formule, relations, and operations take the place of notions, judgments, and syllogism. The general laws of combination of data are stated without much precision. Leibnitz recognizes the law of substitution, notes also what have been called the laws of reduplication and commutativeness, but, in actual realization of his method, employs indifferently the relation of containing and contained or the relation of identical substitution (eequipollence). No attempt is made to develop a complete scheme of possible modes of combination.®

At the root of Leibnitz's universal calculus, as of Condillac's method of analysis, and generally of nominalist logic, there lies a peculiar acceptation of the abstract law of identity. That a thing 1s what it is,—that knowledge of a thing is a single, indivisible, mechanical fact, susceptible only of explication or of expanded statement,—this is the principle dominating logical theories which in other respects may differ widely. Insistance upon this aspect of knowledge or of the object known is the ground for assigning to thought a function purely analytic, whieh is the very keynote of nominalism. It isnot hard to see, however, that so to view the law of identity is to abstract from all the conditions of actual thinking and knowing, and to throw into the assumed simple fact all the complexity which is afterwards to be discovered in it by analysis. The knowledge of a thing is not to be explained in this abstract or mechanieal fashion. Truth does not consist in the empty recogni- tion that ais a, and iu the repetition of this unimportant fact, but in the knowledge of the nature of a, a knowledge which essentially consists in relating @ to its intellectual conditions, in assigning to it a place in the intelligible world. The identity of the thing with itself is a mere aspect of the complex process whereby the thing is cognizcd. It hardly requires to be pointed ont that the minor forms of the same fundamental view, the varions attempts to express

the essence of a judgment as the assertion of identity, are open to the same objection. They take an abstract view of the judgment, and regard as the essential fact that which is but an accessory or adjunct or consequence. Difference, to put it in the bricfest fashion, is no less essential to a judgment than identity.”

26. The view of logic put forward by Herbart, from a mctaphysico-psyehologieal basis resembling that of Leibnitz, agrees in so many respects with that of Leibnitz, although containing no reference to the idea of a logical calculus, that it may be placed under the same head. Logic, according to Herbart, is a purely formal doctrine ; it has to do only with the modes by which clearness, distinctness, and system are introduced among our ideas. Logical forms, then, the notion, judgment, and syllogism, are not to be regarded as having any metaphysical reference; they are not cven to be explained psychologically ; they stand on their own footing as explanatory processes exercised about the representations which under their own natural laws fill up consciousuess, coming and going within the

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4 Op. Ph., pp. 897, 898; ef. generally pp. 84, 93, 343.

z ‘ See soy Op. Ph., pp. 92-114; also the tract ‘De Arte Combinatoria,’ Op, 4 Pp. 6-45.

6 It is interesting to note that Leibnitz signalizes tho distinction between the logical and mathematical senses of a whole, and between the distributive and the collective meaning of quantity ; that he emphasizes the function of the particular Judgment as the negation of its opposed universal; and that he approximates to some modern modes of formulating the judgment (a is b, e.g., he would express as a=ab, or ab is; no a is b, as abd is not). pe Much of the eonfusion which reigns supreme in many modern works on logie is doubtless attributable to a confusion between the nature of the judgment and the result of a judgment. The result of a judgment is always an increased rich- hess of the subject notion ; the subjeet unqualified and the subject qualified by the predicate are doubtless identieal; but it would be

absurd to say, therefore, that the function of the judgment is the assertion of this identity,

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sphere of apperception. According to this view the whole pro- vinee of knowledge is excluded from logic, and it is assumed that knowledge is somehow given, mechanieally, without the co-opera- tion of processes, if not identical with, yet strongly resembling, those recognized as logical. Herbart does not succeed in vindicating an independent place for a purely formal logic.

The Kantian Logie.

927, The critical method, which has so influenced general philo- sophy that all later speculation refers more or less directly to 1t, has at the same time profoundly modified all later conceptions of the sphere and method of logic. From the Kantian philosophy there spring directly the three most important modern doctrines of logical theory, —that which, with many variations in detail, regards logic as a purely formal science, the science of the laws of thought or of the laws under which thought as such operates, and of the forms into which thought as such develops; that which, likewise with many variations, unites logical doctrines with a more general theory of knowledge; and finally that which identifies both logic in the narrower sense and theory of knowledge with an all-comprehensive metaphysic.

It is matter of history that the critical system was developed mainly from the basis of the Leibnitzian logical and metaphysical theories, and it is likewise matter of history that Kant, even in the speculative work which was to so large an extent antagonistic to these theories, remained under the influence of some of their cardinal positions.! In particular the view of logical thought as purely dis- cursive, analytic in character, a view never by Kant harmonized with his general system, is a relic, most significant for the develop- ment of his logic, from the Wolffian reproduction of Leibnitz’s philosophy. This historic basis is not to be lost sight of in attempt- ing to acquire a clear idea of the special place and function assigned by Kant to logical theory.

But a brief reference to the general result of the critical philo- sophy will suffice to introduce the more special treatment of the Kantian logic. Knowledge, or real cognition, which is analysed in the Kritik in reference to its origin and validity, appears, when subjectively regarded, as a compound of intuition and thought, of sense and understanding. ‘The isolated data of sense experience do not in themselves form parts of cognition, but are only cognized when related to the unity of the conscious subject, when the sub- ject, as it may be put, has consciousness of them. This reflex act, resembling in some respects Leibnitz’s apperception, or process of uniting in consciousness, is an act sui generis, not to be mechani- cally conceived or explained. Only through its means do repre- sentations become cognitions. The forms in whieh the synthetic act of understanding is carried out are, as opposed to the intuitive data on which they are exercised, discursive or logical in character. Essentially they are judgments : all acts of understanding are judg- ments, and, as judgments, they imply a general element with which the particular of sense is combined, and in the light of whieh the particular becomes intelligible. 1n ultimate analysis it appears that no particular, whatever be its empirical character, can become an intelligible fact, save when determined through some specific act of understanding, through combination with some specific notion or general element. Combination of particular and general is tls the very essence of understanding, the mark of knowledge as such. In every item of cognition the same elements may be discerned as necessarily present. The consideration of the ultimate modes of intellectualization, of the series of acts by which understanding subsumes the particular, draws the particular into the unity of cognition, may be called in a large sense logic. 1f the considera- tion be specially directed to the mode in which, by means of this combination, knowledge arises, and therefore include discussion of the wide problem regarding the relation between understanding and objectivity in general (the matter of knowledge taken generally), the special title transcendental logic may be used. But if, concentrat- ing attention solely on the kind of operation implied in under- standing, we endeavour to lay out fully the modes in which under- standing proceeds in the construction of knowledge, making abstraction of all inquiries regarding the origin, worth, significance of

knowledge itself, the consideration is of a more general charac- ter, and may receive the title of general logic.? ;

The understanding, then, like everything else, works according to laws, the laws of its own nature. If we abstract from all that may characterize the matter considered, and take into account solely the laws according to which understanding must act, we may con- struet a purely formal doctrine, a theory which is rational both in inatter and in form, for the matter consists of the laws of reason, and the form is prescribed by the very nature of reason,—a demon- strative theory, for nothing ean enter therein which eannot be shown to have its ground in reason,—a completed theory, for although the matter of thought is infinite and infinitely varied, the modes in which the understanding must operate if unity of ee ee Sa

1 See artiele KANT, vol. xiii. pp. 849, 852. 2 It does not seem necessary to advert more in detail to the divisions and sub- divisions of logie drawn out in the Aritik, pp. 86-93 (Hartenstein's ed., 1868).

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cognition is to result, are finite and capable of exhaustive statement, — and a theory developed from its own basis, standing in no need of psychology or metaphysics, but deducible from the mere idea of understanding as that which introduces unity into representations, whether given (empirical) or a priori (pure).

Were this the only determination of the province of logic given by Kant, the question which at once arises as to the possibility of any such indcpendent doctrine would receive an easy solution. For it is evident that logic, as a theory of the form of thought, could consist only of a portion of the more general doctrine, by whatever title that be known, in which the nature of understanding as synthetic aetivity is unfolded. The distinetion on which Kant lays stress between matter and form, a distinction employed by all subsequent writers of his school, is ambiguous and misleading. lf by matter be meant the particular characteristics of the things thought about, in which sense we might speak of judgments of

hysical, chemical, graminatieal matter, and so on, then to say that ogic does not take this into account is perfectly inept. 1f logic be a philosophic discipline at all, a theory in any way concerned with thinking, it is at once evident that it can in no way deal with the specialities of any particular science. But this distinction between matter and form is by no means identieal with another, lying in the background, and too frequently confused with the first,—the distinction of understanding as a faculty per se with its own laws, deducible from its mere notion, and understanding as the concrete real act of thinking. What Kant calls the mere idea of under- standing, and what in other writers of his sehool appears as a definition of thought, is really nothing but a reference to what has presented itself in the wider inquiries of the Kritik as the com- plex nature of the synthetic aetivity of understanding, Kant him- self never attempts to deduce from the notion of understanding the varied characteristics of logical forms, and his followers,—e.g., Hamilton,—when they are consistent, start from concepts as ex- pressing the bare notion of thought, and regard all other forms of thought as combinations of concepts.

But Kant does introduce another element into his treatment of the province of logic, one not original to him, but of the utmost import- ance for later developments from his point of view. He inquires what kind of relations among the elements of thought can form the matter of logical treatment, and defines these as two in number— (1) formal consequence, (2) non-contradietoriness. By formal con- sequence we are to understand the relation between a conclusion and its premisses, no inquiry being raised as to the truth or validity of the premisses. By non-contradictoriness we are to understand that, logically, notions, judgments, or reasonings can be subjected to treat- ment only in regard to the absence of explicit contradiction among the factors entering into them. Thought, which introduces unity and system into experience, must certainly introduce formal con- sequence and preserve analytic truth or correctness. Formal logic, then, treats only of these formal qualities of all Sight of thought.

The detailed treatment of logie, so far as that can be gathered from the very brief summary (Logik, Werke, iii. 269-340), shows with the

utmost clearness how impossible it was for Kant to deduce the forms and relations of thought from the mere notion of under- standing, even when coupled with the principles of formal con- sisteney and consequence. Assuming that understanding is the discursive faculty, the faculty of cognizing the many particulars through the one concept or notion, Kant deals first with concepts (Begriffe) as general or discursive representations. Hc is careful to avoid an error into which many of his followers have fallen, that of regarding Begriffe in a mechanical fashion as a specific kind of Vorstellung, distinguished only by containing a few of the marks making up the single intuitions. He rightly notes that cognition proceeds by subsuming the particulars under the common ele- ment contained in them, and that the geuerality ofthc concept thus rests upon the relation in whieh it stands, as reflective ground of cognition, to the particulars. The characteristics of concepts, as possessing extent and content, are treated briefly, after the fashion familiar in the more detailed logies of his school. It is, however, when the doctrine of judgment is reached that the difficulties of his position appear with greatest distinctness. Judgment is dc- fined ‘‘as the representation of unity in the consciousness of distinct representations, or the representation of the relation of

3 Two at least of the followers of Kant have worked out the system of logie from this poiut of view,—the one, Twesten, in his Logik, insbesondere die Ana- lytik (1825), the other, the late Professor Mansel, in his Prolegomena Logica. Mansel reeognizing the distinetion between the two modes of determining formal logie, adopts the second, and is therefore led, in consistency, to define logic, not as the seienee of the laws and forms of thought, but as the scienee treating of formal thought, or of the formal element in the forms of thought, In other words, he reeognizes that the statement of the forms of thought must be intro- dueed into logie ad extra, from psychology or what not, and that logie, aeeepting these, has to eunsider the formal element (non-eontradictoriness) in them. It is well to have the doctrine brought thus to its ultimate issue, for it is thence apparent that there is no independent scienee ealled logie, but simply one eompre- hensive preeept, which may be ealled logical, viz., avoid eontradictoriness in thought. Illustrations of the ways in which eontradietoriness manifests

itself may be offered, and a useful logical praxis may thus be afforded, but these de not make up a seience or theory.

these, in so far as they make upaconcept.”? But the essential element in the definition—the unity of consciousness or unifica- tion of differences in a notion—is thus left so vague and unde- termined that it is impossible to deduce from it any classification or any peculiarities of judgments, and possible indeed to proceed on two quite distinct lines of research, ‘The expression, indeed, refers to that whieh is the fundamental fact in the critieal sys- tem, the existence of conditions under which only it is possible for detached data of experience to beeome objects of knowledge for the single conscious subject ; aud, had Kant been true to the

rinciples of his system, it would then have becn necessary to — any classification and treatment of judgment on the enume- ration of the funetions of unity in eonscious experience. In the Kriti® emphasis is laid upon the function of unity as the essence of the judgment, but it is a well-known historie faet that Kant makes no attempt to justify in its details the enumeration of such functions on which his divisions rest. His followers in the field of logic,® misconceiving the real relation of form to matter, inter- preted the unity involved in the judgment as being a merely quantitative relation between given notions.‘ There is here involved a twofold error, which has exercised a most pernicious influence on the fortunes of logical theory. For, in the first place, so to view judgment is implicitly to proceed from the assumption of notions as given elements of knowledge, the relations of which are to be discovered by comparison or analysis of what is contained in them. The notion as empirically given thus becomes the fundamental fact ; al} other forms of thought, judgment, and syllogism are regarded as inerely the mechanism by whieh the content of notions is evolved, Such a doctrine puts out of sight the peculiarities of the notion as the product of thought only, inevitably compels a distinction between what we may eall the real processes of thinking whereby notions are formed and the elaborative processes by which notions when formed may be

treated, and, by regarding notions as simplest data, leads back to the old nominalist doctrine aceording to which all thinking is but the compounding and separating of simple elements.® And, in the second place, there is involved in all this the underlying prejudice, which it was the very business of the eritieal system to destroy, the attempt to treat knowledge, and thought, which is an integral part of knowledge, in a purely mechanieal fashion. The Kantian analysis for the first time in the history of philosophy brought into elear light the essential peculiarity of knowledge, the reference of all the manifold details of expericnee to the unity of the thinking subject. Such reference, and _the modes in which it expresses itself, are not to be conceived mechanically, nor ean we regard the products of thought, the notion, judgment, and reasoning, in the same fashion in which, with but partial success, we treat, in psychology, the representations or reproductions in idea of actual fact. The essence of thought, the unity in difference of objects known and subject cognizing, is that which constitutes in its several modes the peculiarity of notions, judgments, and reasonings. The notion is simply the work of thought, looked at, if the expression be allowed, statically. There is no single psychical product, to be treated by the method of ob- servation which is applied in psychology to sensations and ideas, which can be called the notion. Mental facts, which rightly or wrongly psychology deals with after its mechanical fashion, present themselves in a new aspeet when they are regarded as parts, or rather as organic elements, in cognition. If we endeavour to apply the abstracting, isolating method of observation ab extra to them, doubtless only mechanical, abstract, and external relations will manifest themselves as obtaining among them, and there may thus be deduced a mass of abstract formule expressing relations of agreement and disagreement, total or partial coineidence, conflic- tion, intersection, or coexistence and sequence, which have abstract truth, but are in no way adequate to express the genuine nature of thought.

Kant himself proceeds, as was said, by simply assuming, as some- how given, the cardinal forms of unity in consciousness, and, distin- guishing form of judgment from matter by the apparently simple difference between matters united and form of uniting, draws out the types of judgment under the familiar rubrics of quality, quantity,

3 a pa at the treatment of judgment bs sate I y t. reatment of Judgment by Esser (Logik, §§56 and 61 Jakob (Log. u. Met., §§ 189, 194, 201, 202), where the Neds a ieuene an categorical, hypothetical, aud disjunctive flows from a quite arbitrary and arti- en oe Logik, § ce Twesten, Logik, §§ 51-57, and 61; Hamilton, Logie i. 280 sq. £

here be remarked that Hamilton's mode of translating cle Planet olen Krug and Esser, his main authorities for the details of the Kantian logic, clearly shows that he did not attach any special significance to the phrase, unity of con- sciousness, In his view, the unity implied in the judgment A is B was the union of A and B In the notion of a given totality or whole—A being part of B in one aspect, B being part of Ain another, 'This relation of whole and part is quite un-Kantian.

5 It is by this course that the eurious phenomenon of an algebraic or Symbolic logic springing from the Kantian groundwork has come about. The same result follows, indeed, from any view of thought as merely exercised about facts which are already in themselves completed cognitions. Whether we call these notions (with Hamilton) or zpéra (with Antisthenes) or elementary data (with Leibnitz) or simple apprehensions (wlth the nominalists), the result is the same,

relation, and modality. The same assumption of distinctions only to be given by the higher researches of transcendental logie is mani- fested in his treatment of reasoning, the deduction of one judgment from others. Three main types of such deduction are signalized :— (1) deductions of the understanding, in whieh the conelusion follows siinply from change in the form of the given judgment ; (2) deductions of reason, in which the necessity of the deduced proposi- tion is shown by reference to a general rule under which it falls ; (3) deductions of judgment, in which the conclusion is reached by the treatment of given cxperience in reference to a general rule of reflexion upon experience. Under the first of these fall the familiar forms of immediate inference; under the second, syllogism in its three varieties, categorical, hypothetical, and disjunctive; under the third, inductive and analogical reasoning. The understanding, if one may interpret Kant freely, is the process by which the worth of what is given is fixed and determined ; it moves not beyond the given fact, and can therefore subject the fact to no other than formal transformation. The determining judgment or reason is the expression of the fundamental fact in knowledge that all experience is subject to general rules or conditions ; there must therefore be a determination of the particular by the general; there must be ground for subsuming the particular and the universal, The forms of such subsumption and determination of the particular by the general are syllogisms. Syllogism therefore is the mode in which the essence of cognition is made explicit. The reflective judgment is the expression of the tendency to treat the contingent details of this or that given experience after the analogy of the general rule that all

experience is subject to intellectual determinations, This analogy does not necessitate the specific determination of the parti- eular by any specific universal, but serves as general directrix in experiential researches, _It is sufficiently evident that a remodelling of the older logical doctrine such as this rests upon a wider and more comprehensive philosophical view of knowledge as a whole, that such distinctions cannot flow from cither of the principles previously indicated as those on which the formal conception of logic rested, and, finally, that the logical aspeet of these distinctions is forma! in the only true sense of that word, viz., in that the treatment is of necessity general, applicable to all or any thinking.

28, As in the Kantian system there were placed, side by side, two diverse conceptions of logical system, that of transcendental logic, and that of formal logic, without any adequate link of con- nexion between them, so from the Kantian position there diverged two quite distinct schools of logic, the transcendental or meta- physical, and the formal. As regards the second of these, but little requires to be said. The great body of logical treatises written from the Kantian formal point of view contain nothing of interest, In them the traditional logic is handled under the rubries supplied by the Kantian general philosophy, with more or less of purifica- tions from needless detail, according to the acuteness or insight of the writers, with more or less of deviation from the Kantian lines, In but few cases did the real difficulty, that of assigning to formal logic an independent plan and method, lead to a radically fresh treatment. §

The Kantian transcendental logic, being an analysis of the con- ditions under which objectivity in general becomes possible material for cognition, is in a special sense a new theory of thought. For thought‘is the process mediating the unity of the ego and the multi- farious detail of actual experience ; and only through thought, the universal, are objects so determined that they are possible matters of knowledge for a conscious subject. As determinations of objects, the pure elements of thought may be called notions, while the reali- zation of notions in conscious experience is the judgment, wherein the universal of thought and the particular of sense are synthetically united, and the

systematization of experience is the syllogism. Notion, judgment, and syllogism are thus, in the transcendental logic, no bare, abstract forms, but have as their content the pure determinations of objectivity in general. They cannot be conceived inechanically, as mere produets diiiering only in degree of generality and abstractness from the ideas, and connexions of association which appear as due merely to the psychological mechanism of the human consciousness, They are the essential forms of the ultimate synthesis through which knowledge becomes possible, and thus express in their organic system the very nature of thought, ¢.¢., of the thinking subject. In the Kantian doctrine, however, as it developed itself historically, there are various points of view which disturb the harmony of the system as thussketched. Two in parti- cular require special notice, as from these the later attempts ata complete revision of logical theory have taken their origin. (1) eae eee

§ Generally, the formal logician is compclled simply to take the processes of thought as determined in psychology or metaphysics or what not, and to consider certain aspects of them. His science has, therefore, no independent plaec, and no method of development. Independence may be striven after, either by attempt- ing to develop all processes of thought and their logical peculiarities from an initial dctinition of thought solely, or by combining with this definition the view that non-contradictoriucss is the one logical quality, and thus assigning to logic the discussion of the conditions of non-contradiction in thought. Of the first,

Hamilton may be taken as the type; of the seeond, Twesten, Mansel, and Spalding.

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Throughout the Kantian work there appears a constant tendency |

to regard the ego, or central unity of self-consciousness, as merely abstract, as related mechanically, not organically, to the complex of experience in which its inner nature is unfolded. This tendency finds expression in various ways. Thus the synthesis, which has been shown to be the essential feature of cognition, is regarded as on its subjective

side a union of intellectual function and receptivity of sense, and the contributions from either side are viewed as some- how complete in themselves.1 Knowledge, in accordance with this, might be considered to be the mechanical result of the combination or coherence of the two, a combination which in the last resort must appear to the conscious subject as contingent or accidental. (2) Knowledge, the systematic union of universal and particular in experience, is thought as containing in some obscure fashion a cance to the most real world, the realm of things in themselves, and therefore as being, in antithesis thereto, strictly subjective. The processes of thought, by which unity is given to experience, thus manifest themselves as limited in scope, and as being the very ground or reason of the restriction of knowledge to phenomenal in opposition to noumenal reality."

The presence of these two difficulties or perplexities in the Kantian system, which are, indeed, at bottom but one, led to revision of transcendental logic in two directions, The one line proceeded from the analysis of knowledge as the product of intellectual function and receptivity, and, uniting therewith metaphysical conceptions of varied kinds, culminated in a doctrine of cognition which, retaining the distinction between real and ideal as ultimate, endeavoured to show that the forms of the ideal, d.¢., of thought, and the forms of reality were parallel. Logic, under this new conception, appeared as a comprehensive theory of knowledge, the systematic treatment of the modes in which thought, conditioned by its own nature and by the nature of the reality upon which it is exercised, develops into knowledge, 7.¢., of the modes in which a representation of things characterized by universality and evidential force is ob- tained. On the whole this is the position assigned to logic by Schleicrmacher, whose view is followed in essentials, though with many variations in detail, by a large and important school of logical writers.

The second direction may be characterized generally as the at- tempt to develop fully what is involved in Kant's conception of thought as the essential factor of cognition. Any opposition between metaphysic as dealing with the real and logic as dealing with the ideal element in knowledge appears, in this view, as a mere effort of false abstraction.

The very uature of reality is its nature in and for thought. The system of pure determinations of objectivity, which Kant had imperfectly sketched, is not to be regarded as a piece of subjective machinery, because it expresses the inmost con- ditions of intelligence as such. Nothing is more real than the ego, than intelligence or thought. Transcendental logic, or logic which is at the same time metaphysic, is the only discipline to which the title logic by right belongs. For it contains the complete system of the forms in and through which intelligence is realized. The notion, judgment, and syllogism are doubtless forms of thought, but they have their definite content. They are the modes in which the forms of objectivity are realized for intelligence, and are thus at once abstract and concrete. The so-called formal logic is a mere caput mortuum, a descriptive study of some few types of the applica- tion of thought to matters of experience. On the whole this 1s the view of logie developed through Fichte (and in part Schelling) by Hegel, and the Hegelian system shall here be regarded as its com- plete and only representative.

Logic as Theory of Knowledge.

29. The position assigned to logie as theory of knowledge and the range of problems included in it are determined by the general philosophic view of the distinction between the reality to be appre- hended by thought and the subjective nature of thought itself. There may be, therefore, numberless variations in the mode of treating logic with general adherence to the one point of view.* In the Dialektik of Schleiermacher, for example, the fundamental characteristic is the attempt to unite some portions of the Kantian analysis of cognition with Spinozistic metaphysic. Knowledge is regarded as the complex combination of intellect, the formative, unifying, idealizing faculty, and organization or receptivity of sense. The generality or common validity of cognition rests on the uniforin nature of organization and on the identity of all ideas in the one

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T See vol. xiii. pp. 851, 852.

2%t is unnecessary to consider what exactly was Kant's teaching on either of these points, or what the significance of the relative doctrine may be in his system, It is sufficient, for the historical purpose in hand, to indicate the apparent ten- dency of his work, for from this the later developments take their rise.

3 See, for an enumeration of the more prominent members, Ueberweg's Logik, § 34, a work which itself is an admirable exposition from the same point of view.

4 It appears an historic error to identify the point of view here referred to with the Aristotelian. The notion of a paraliclism between the forms of reality and the forms of knowledge is too definite to be covered by the mere expression, whether in Aristotle or in Plato, of the doctrine that knowledge is knowledge of being.

ideal system. The objective worth of cognition is referred on the one hand to the determined connexion between the real universe and the organization through which the individual is part of the real order of things, on the other hand to the ultimate metaphysical arallelism between the system of ideas and reality. The primary orms of knowledge, notion, and judgment, distinct from one another only as being knowledge viewed now as stable now as in process, correspond to the ultimate elements of the real, the per- manent force or substance and its variable manifestations. Syllo- gism and induction, with the subordinate processes of definition and division, analysis and synthesis, are technical modes of the development of notions and judgments, modes by which inchoate notions are rendered definite, by which incomplete judgments are rendered complete.®

That there is much valuable and suggestive material in this mode of regarding logic is undoubted, and in the discussion of isolated forms of knowledge, such as judgment, it is always desir- able that there should be kept in mind the reference to the ultimate eharacter of objectivity. But the whole point of view seems im- perfect and open to such objections as will always present them- selyes when a principle is not

carried out to its fullextent. It may, for propedeutic purposes, be desirable to separate the handling of logical forms from metaphysie, but such separation cannot be ulti- mate. The system of forms of reality to which the forms of know- ledge are assumed to correspond must in some way enter into knowledge, and they eannot enter in as an absolutcly foreign ingredient, to which knowledge has simply to conform itsclf. For, if so, these metaphysical categorics would be discoverable only by an analysis of concrete knowledge, and they would remain as inferences from the nature of cognition, not as data directly known. The cardinal difficulty which appears in all treatments of logic from this point of view is that of explaining how there comes to be known an objective system of things with characteristic forms or aspects, and it is not hard to see that: the acceptance of a reality so formed is but a relic of the pernicious abstraction which gave rise to the Kantian severance of knowledge from noumenal reality. In short the position taken by Schleiermacher and his school, as final standing ground, is but an intermediate stage in the development of that which lay implicit in the critical philosophy.

Moreover, it is hardly possible to assume this point of view with- out tending to fall back into that mechanical view of knowledge from which Kant had endeavoured to free philosophy. *1f there be assumed the severance between real and ideal, it is hardly possible to avoid deduction of all that is characteristic of the ideal order from the observed or conjectured psychological peculiarities of inner experience. The real appears only as ultimate point of reference, but in no other way determines the form of knowledge. The characteristic relations which give content to notions, judgments, and syllogisms are deduced psychologically."?* 1n the long run, it would no doubt be found that the real key to the position is the belief, more or less expressed, that the systematic view of thought as comprehending and evolving the forms of reality is an unattain- able ideal,—that metaphysic, to put it briefly, is impossible. To some extent this is the position taken by Lotze, whose cautious and ever thoughtful expositions are invariably directed to the elucida- tion of the real nodi, the real roots of perplexity or incompleteness of doctrine. In his view logical forms are the modes in which thought works up the material,

supplied in inner experience by the paycholoriadl mechanism of the soul, in conformity to the ultimate presuppositions with the aid of which alone can harmony, or ethical and esthetic completeness, be gained for our conceptions of things. But with this doctrine, which approaches more clearly than any other of the type to the metaphysical logic, there is eoupled the re- serve that any actual point of view from which the development of these presuppositions, their rational explanation, might become possible is unattainable. Our confidence in them is finally of an ethical character, and depends upon our conviction of the ethical end or purpose of all the surroundings within which human life and

5 Perhaps the most complete treatment of logie from this point of view is that of George, Logik als Wissenschaftslehre, 1868. Ueberweg, dissenting from Schleiermacher's view of syllogism and the systematic processes of reasoning, lays out more fully what in his vicw are the aspects of reality corresponding to the typieal forms of knowledge. Trendelenburg endeavours to fill up the gap between real and ideal by emphasizing the community of character between motion, as the ultimate reality, and econstruetiveness in knowledge, the central activity of the ideal.

6 Thus we find in Sehleiermacher (Déal., §§ 132-34) that the ultimate difference of ideal and real is accepted as simple datum. In Ueberweg (Logik, § 8 and passtm) there is continuous reference to an inner order of things, the forms of which are the metaphysical categories, but the actual treatment is altogether. independent of these forms, and we may conjecture that, in the last resort, Ueberweg would have explained the characteristics of logical thinking by reference rather to the psychological mechanism than to a supposed nature of things (see Logik, §§ 40-42), and thus approximated to the position of Beneke rather than to that of Schleiermacher.

7 This tendeney, which appears in Schleiermacher and Ueberweg, and indeed in all the logics of that school (George's Logik, e.g., is hardly to be distinguished from psychology), is prominent in Beneke. It is eurious to note a precisely similar result in the logical theory of Mr H.

Spencer. Mr Speneer supposes him- self to be throughout referring to the nature of reality, but in fact all that is specific in the forms of reasoning developed by him is of psychological origin (sce Pr, of Psych., ii. §§ 802-9).

character is manifested. In logic as in metaphysic we must con- tent ourselves with more or less fragmeutary treatment.}

Logie as Metaphysical.

39. To understand the peculiarities of this, the final conception of logic, we must take into account the ultimate view of knowledge as that in which thought and reality are united, and of philosophy gene- rally as the attempt to develop the whole system of these abstract determinations of thought by which coherence and intelligibility are given to knowledge. In it there is carried ont to the full extent Kant's idea of thought as the ultimate germ of intelligibility.

In the critical system, as we have seen, the fundamental idea was continuously disturbed by the intrusion of doctrines which possessed significance only when the problems were treated from a quite opposed point of view. Thus the abstract separation of conscious experience, regulated according to the conditions of the unity of thought, from a supposed realm of reality involved the consideration of the subject as one portion or item of a me- chanical whole. In other words, the Kantian system proved itself unable to unite in a comprehensive fashion the two ideas of thought as the universal in experience and of thought as the activity or mode of realization of the individual subject. The cen- tral point of view, that which refers all in experience to the unity of thought, was continuously departed from, and asa natural.conse- quence the various forms or modes of thought were treated, not in relation to their ultimate unity, but as isolated facts, to be dealt with by principles resting on a totally opposed doctrine. It is the essence of the Hegelian method to keep continuously in view the conerete unity and totality of thought, to treat each special aspect or determination as an integral portion of an organic whole, a por- tion

which must prove itself unintelligible and contradictory if regarded apart from its relations to the whole, and so to avoid these mechanical separations and abstractions which had proved fatal to the Kantian doctrine. In the devclopment of a method which rests upon and endeavours to retain so comprehensive a point of view, there must of necessity be much that is tentative and imperfect. Differences of opinion regarding the main stages in the development, regarding the qe neal content of any one stage, are quite com- patible with adhesion to the gencral principle of the whole.2 But from this point of view only can justice be done to those forms of thought which have always been regarded as the special material of logical treatment ; from any other, the treatment must be partial, fragmentary, and, so to speak, external. Thus, notion, judgment, and syllogism are not, in this view, treated as merely subjective modes in which the individual consciousness apprehends and works up the material of experience, but as higher, more developed, and therefore richer forms of the determinations of thought in and through which intelligibility of experience is acquired. The whole system of these determinations of thought, the categories, is the matter of logic ; the realization of them in subjective experience, or the treatment of the successive phases of consciousness in which abstract thought comes to be recognized in and by the individual, is the matter of the philosophy of spirit, of which psychology is one portion. Doubt- less the logical treatment may be led up to by tracing the modes in which the full consciousness of the determinations of thought as the essence of reality is attained, but such introduction is propedeu- tic merely, and within the logical system itself the starting- point must be the simplest, least definite of those categories whereby for spirit the realm of fact becomes intelligible.

The nature of the opposition between this view and that of the ordinary logic, which in the main rests npon the principle of indi- vidualist psychology, that the content of knowle ge is derived ad extra, from an entirely foreign world of fact, will become more clear if there be considered specially the treatment which under the two methods is given to the notion. Notions, in ordinary logic, are re- garded as products formed from the data supplied by presentative and representative experience, and the mode of formation as gene- rally

conceived is a continuous process of critical comparison, recognition of differences, similarities, and grouping of like facts. Not only then does the notion present itself as relatively poor and meagre in content, a kind of attenuated individual, not only are the only characteristics presented to the operation of thoucht mechanical and external, but the final product appears as a mere subjective abbreviation of what is given in experience. In the pro- cess, however, even as it is ordinarily conceived, there is more involved than is apparent on the ‘surface. The individuals subjected to the abstracting and generalizing activity of thought are qualified individuals, z.¢., individuals viewed as determined in their own nature and in respect of thought by a whole network of relations, which when stated abstractly are really of the nature of categories. They are individuals only for a unifying intelligence

1 Lotze’s whole view of the genetie connexion of the forms of thought is peculiar to himself, and deserves separate treatment.

2 Hegel himself fully recognizes the tentative character of the numerous divisions and classification of the eategories of thought which make up the sub- stanee of the Logik, and desires that too much Stress be not laid on the formal side of his exposition (sce Logik, i. 29).

which views them under diverse aspects, and these aspects are the blank forms of intelligibility, which it is the very function of logic to consider in system. Moreover, the purely formal acceptation of the notion as a mere mental hieroglyphic or sign stands in sharp contradiction to the view which asa rule accompanies it, and which, for the most part, receives explicit statement in a so-called applied logic or doctrine of method, that in the notion is contained the representation of the essence or truth of reality. It is impossible to retain with any consistency the merely arithmetical or numerical doctrine of the notion, as containing fewer marks than the indi- vidual, of the genus as characterized bya less number of attributes than the species, and so on. Underlying all genuine knowledge, all classification, and therefore all

formation of notions, is the tendency towards the subordination of parts to a law which determines them. The generic attributes are not simply the points of agreement, but the determining characteristics, and the notion of a thing is the explicit recognition of its nature as a particular manifestation of a universal law.

Thus even within the limits of the ordinary logic there are pro- blems which force upon it the reconsideration of the view which regards the notion as merely a mechanically formed psychical fact. Knowledge, no doubt, is only realized subjectively, in and through psychical facts, but the treatment of it in its nature as knowledge, and the treatment of its psychical aspect, are toto genere distinct. The metaphysical doctrine which keeps consistently in view thought as the essence of knowledge in its own nature has therefore to con- template the notion in strictest relation to thought, as one mode in which objectivity as such is apprehended, made intelligible, and, in a very special sense, as the mode in which the nature of thought is made explicit. Thus the notion can only appear as nniting and com- prehending under a new aspect these intellectual determinations whereby things are related to one another in a cognizable system.

The special characteristic of the Hegelian logic, the methodical principle of development of the determinations of thought, re- quires for its full elucidation a longer treatment than is compatible with the scope of a general sketch. But it seems necessary to add a word respecting certain difficulties or objections which apply, not specially to the methodical principle of Hegel’s logic, but generally to the idea of a logic which is at the saine time metaphysic or a treatment of ultimate notions. These objections may be variously put, according to the special point of view assumed by the critic, but they are in the long run dependent on one inode of interpretation of the fundamental antithesis between being, or reality, and thought. For whether we say that it is con- fusion to identify thought-forms with relations of fact, that it is unphilosophical to assume that being of necessity conforms to thought, that thought is purely subjective and knowledge the system of forms in and through which the subjective is brought after its own nature to an adequate representation of objective fact, or point to

phenomena of perception as showing that even adcquate correspondence, not to speak of identity, between subjective and objective must be matter of discussion, or lay stress upon the pro- cedure of science as negativing the preliminary assumption of the logico-metaphysical assumption, we but express in varicd ways a fundamental interpretation of the opposition between reality and knowledge. We assume an initial distinction, the grounds and precise nature of which are never made clear. For the antithesis between thonght and reality is an antithesis in and by means of conscious experience, and is not to be comprehended save through conscious experience. If, indecd, we start with conscious experi- ence as a mechanically formed tertiwm quid, something which arises out of the correlation of an unknown subject and an unknown object, we may certainly retain, as an ever-recurring and insoluble problem, the possibility of cognizing either factor per se. But the problem arises not from the antithesis but from our way of reading or interpreting it. Opposition between subjective thinking and the teal world of fact, slow, tentative, and imperfect development in individual consciousness of knowledge which contains in essential relation the opposed clements, distinction therefore of the meta- physical or real categories which determine the nature of object as knowable from the ideal or logical categories which express more eereed the fashion in which the knowable object is reduced to the subjective form of cognition, are not only perfectly compatible with, but are strictly reasoned conclusions from, the ultimate doctrine that in thought alone is to be found the secret both of knowing and of being. To bring against this doctrine the continu- ous complaint that it assumes an identity which, if it can be proved at all, at least demands proof, is to misunderstand the very notion of identity which plays so important a part in the objection. Not even in the most judicious and thoughtful critics of metaphysical logic, in Lotze for example,? does one find a sufficiently careful dis- tinction between a niere question of nomenclature (z.¢e., whether we shall restrict the title Zogic to the portion of general system which deals with notions, judgments, and syllogism, while reserving for metaphysics all the other inquiries) and the question of theoretical

SSS ee 3 See his Logik (1843), pp. 10, 11, and Zogtk (1874), bk. iii., chaps. 4, 5.

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importance, whether there remains over and above the difference between the niore immediate determinations of thought and its more eomplex or reflective modes an essential difference in knowledge be- tween thought and reality. In less careful erities the oversight simply leads to the contention that we shall always repeat the problem of knowing and being as insoluble, and shall view know- ledge as a meehanical, subjective product.

Many of these objections doubtless result froma very simple fact, more than once alluded to in this article. Particular distinctions, apparently the most elementary, frequently involve and are unin- telligible apart from a developed, though not necessarily consistent or well grounded, conception of things in general. Thus the emphasis laid upon thought as essentially subjective, as being mercly the system of operations whereby the individual brings into order and coherence in his own experience what is furnished ab extra through the natural connexion in which he is placed to the objective world, seems at first sight the most simple and direct con- sequence of the actually given distinction between the individual as one natural unit and the sum of things comprehending him and all others. But, on analysing more elosely the title for applying to ee problems a view which is that of practical life, and

oubtless legitimate and necessary within that sphere, we readily become aware of a whole serics of speculative assumptions implicit in that view, and possibly without any adequate justification. At all events, whether or not the view be ultimately defensible, and in the sanie form in which it is at first assumed, it is unphilosophical to start in the treatment of a difficult and important discussion from principles so ambiguous and undetermined. The practical difference between the individual agent and the external sphere within which his individual operations are realized and which is thercfore treated by him, from his point of view, as external, throws no light per se on the nature of the

ultimate relation between the individual thinker as such and the world within which his thought is exercised. The confusion between ultimate distinctions and practical points of view is productive of most —— consequences not only in logic specially but in philosophy at large.

Criticism of the Chief Logical Schools.

31. It will probably be now apparent that determination of the nature, provinee, and method of logie is, and has always been, dependent on the eonception formed as to the nature of know- ledge. Discussions regarding the precise definition of logie are not mere analytical disputes regarding the best mode of expressing in terms the nature of a subject sufficiently agreed upon ; varia- tions in the treatment of particular portions of logical discipline do not arise from more or less accurate discrimination of the nature and relations of given material ; nor are differences in respect to the amount of logical inatter to be considered mere expressions of difference as to the range of the same fundamental principles. The grounds for divergence are much more deeply seated, ait looking back upon the historical survey of the main conceptions of logical science, it seems quite impossible to hope that by comparison and selection certain common Nae of view or methods may be extracted, to which the title of logical might beyond dispute be applied. The logic, as one may eall it, of each philosophical theory of knowledge is an integral part or necessary consequence of such theory; and its validity, whether in whole or in part, depends upon the completeness and coherence of the explanation of knowledge in general which forms the essence of that theory. Any criticism of a general conception of logie or special application thereof, which does not rest upon criticism of the theory of knowledge implied in it, must be inept and useless, It is not possible to include sucli expanded criticism in an article like the present; there remains therefore only one aspeet of these various logieal schemes which may be subjected to special and isolated examination, viz., the inner coherence of cach scheme as presented by its author. Naturally sueh an examination can be applied only to views which imply the separate existence of logic as a body of doctrine develop- ing into system from its own, peeuliar principles. When it is a fundamental position that logic as such has no

separate existence, but is one with the all-comprehensive doctrine or theory of the ultimate nature of cognition, it is not possible to criticize such con- ception of logic separately ; criticism of logic then becomes criticism of the whole philosophical system. In most of the views brought before us, however, a special place has been assigned to logic; it is therefore possible to apply internal criticism to the more important of these general views, and to eonsider how far the pretensions of logie to an independent position and method are substantiated.

From the foregoing remarks it will also have become apparent that a general classification of logical schools, as opposed to the reference of these to ultimate distinctions of philosophical theory, is impossible. A distribution into formal (subjective), real (empiri- eal, or, as ecrtain German authorities designate it, Hrkenntniss- theoretisch), and metaphysical conceptions of logic is rather con- fusing than helpful. For the formal logics of the Kantian writers, of Hamilton, and of Manscl are distinct, not only from oue another,

but from such equally formal logics as those of Hobbes, Condillac, Leibnitz, Herbart, Ulrici, Boole, De Morgan, and Jevons. Logicas theory of knowledge presents quite special features when handled by Mill, or by Sehleiermacher, Ueberweg, Beneke, and Wnndt. And it cannot even be admitted that the threefold classification affords room, without violence, for the Aristotelian logical researches. There are no points of agreement and difference so unambiguous that by their aid a division can be effected.}

32. Few conceptions of logie contain, with so little real ground, such professions of completeness and independence as that developed in the writings of the Kantian school.2 According to this view, logie isa pure science, having as its special material the form of thought, demonstrative in eharacter and with theorems capable of complete deduction from the elementary principles contained in the very notion of form as opposed to matter of thought. But, when one comes to the examination of the system itself, one finds (a) that the notions of form and matter are much too stubborn to lend them- selves readily to

analysis, and that explanations of what exactly constitutes form fluctuate betwecn a merely negative definition (whatever is not treated in any other science, philosophical or otherwise) and a psychological deduction from the assumed nature of thought ;3 (5) that the really important factor in determining the contents of logical scicnce is psychology, from which much more is borrowed than the mere preliminary definition of thought ; (c) that demonstrative character rests entirely on an abstract interpretation of the laws of identity and non-contradiction ; (d) that throughout the whole system there is not a trace of develop- ment, but merely the reiterated application of the law of identity and contradiction, or of some confused distinction between form and matter, to logical products, the notion, judgment, and syllogism, whose nature, characteristics, and distribution are arbitrarily aceepted from psychology or general criticism or what not. Thus, in the majority of cases, Jogicians who simply followed the lines indicated by Kant introduced into their system, without any criticism, the fundamental distinctions contained in the Krittk d. reinen Vernunft. The fourfold scheme of quantity, quality, relation, and modality was applied without hesitation, though in varied and always artificial fashion, to notions;4 judg- ments were accepted as being eategorical, hypothetical, id dis- junctive in kind, though the differences are altogether foreign to the logical principle applied ; and generally no attempt was made to do more than treat, in an abstract fashion, some aspects of a procedure of thought determined in all its phases by cxtra-logical considera- tions. The inevitable result of such a treatment was the undue pre- ponderance given to the doctrine of notions, which, being viewed after the fashion of Kant as given, completed products, appeared as the ultimate nnits of thought, to be combined, separated, and ay ee together in all the higher proeesses. The peculiarities of the logical system which is commonly associated with the name of Sir W. Hamilton spring entirely from this view of notions. For, if notions be regarded as the elements of thought, then the judgment which elaborates them can only present itself as the explicit state- ment of immediate relations didvordible among notions. These immediate relations reduce themselves, for Hamilton, to one,—the quantitative relation of whole and part,—and, attention being con- eentrated on the extensive reference of concepts, the cightfold scheme of propositional

forms is the natural consequence. To such a scheme the objections are manifold. It is neither coherent in itself, nor expressive of the nature of thinking, nor deduced truly from the general principle of the Hamiltonian logic. For it ought to have been kept in mind that extension is but an aspect of the notion, not a separable fact upon which the logieal processes of elaboration are to be directed. It is, moreover, sufficiently clear that the relation of whole and part is far from exhausting or even adequately repre- senting the relations in which things become for intelligence matters of cognition, and it is further evident that the procedure by which types of judgment are distinguished according to the total or partial reference to extension contained in them assumes a stage and amount of knowledge which is really the completed result of cog- nition, not that with which it starts, or by which it proceeds.5

The utility of basing logical theorems on psychological premisses, a method involved in the procedure of most expositions of formal

! Nor are more detailed classifications, sueh as those of Rosenkranz (Die Modificationen der Logik, 1842), Prantl (Die Bedeutung der Logik, 1849), Rabus (Neueste Bestrebungen, 1880), of serviee, except when historical.

2 Under this head Kant himself, for reasons above given, is not included; the writers referred to are named in Ueberweg (Logik, § 84).

3 Mill's critieism on Hamilton's confused statements regarding forms (Zxam. of Hamilton, 488-454), is perfectly appleable to the generality of the Kantian treatises on logie.

4 See, e.g., Krug, Logik, § 25 sq. v.

5 The extension of a notion has no numerical or quantitative definiteness. To formulate the judgment as expressing definite amounts of extension, therefore, presupposes complete empirical survey of what, by its very cssence, remains incomplete. This is specially noteworthy in the case of Hamilton's particular judgments, A judgment such as on/y some A its all B assumes total and perfect

knowledge of the whole spheres of Aand B. It is in the strictest sense of the word universal, Hamilton, it may be added, finds it completely impossible to work out a eoherent doctrine of syllogism from the point of view taken in the treatment of the judgment,

logic, may well be maticr of doubt. For psychology, as ordinarily conceived, has certainly close relations with logic, but in aim and in point of view is distinctly opposed or at all events subordinate to it, The psychological investigation of thought, if carried out consistently, nmst take one of two forms, either that of description, in which thonght, like any other mental fact, is regarded ab extra as that upon which attention and observation are to be directed,—in which case therefore any relations of thoughts among themselves must be of such an external nature as can be presented in the field of observation; or that of genesis, development, in which the sub- jective processes of mind are viewed as forms of the one great pro- cess whereby knowledge is realized in the individual consciousness. Investigations from the first point of view are diametrically opposed to the logical treatment of thought, for in the latter the essential feature, the reference in the subject, with his mental forms, to an objective order within his experience is eutirely wanting. Such investigation is abstract; it proceeds upon and remains within the limits of a distinction drawn in and for conscious experience, a dis- tinction the grounds, significance, and modes of which require to be treated by a larger and more comprehensive method. Investiga- tions from the second point of view are subordinate to logic in the wider sense, for the treatment of the subjective processes therein is illuminated and determined by the general principles regarding the nature and meaning of conscious experience which it is the sole function of logic to bring forward and establish. The psychology which Hamilton generally has in view is that commonly called empirical, and with his conception of it the two sciences, logic and psychology, are really one.

33. A possible exit from the difficulties or assumptions of the cur- rent Kantian logic may be songht by following out and consistently

applying the hint contained in Kant’s distinction of analytic and synthetic thought, analytic and synthetic truth. It may be said that all thinking involves the fundamental laws of identity and non-contradiction ; that in these laws only is to be found the char- acteristie and most general feature of thought ; that in them only is the form, or element contributed by mind itself, to be detected. Logic would thus be regarded as the explicit statement of the con- ditions of non-contradictoriness in thought, as the evolution of the formal element in thought, and, since in analytie truth only can non-contradictoriness be discovered without material aid, as the theory of analytic thought. Such is the position assigned to logic by Twesten, Mansel, Spalding, and some others, and the conse- quences to which it inevitably leads are sufficiently interesting to require that some special examination should be given to it.

In the first et then, it seems evident that the fundamental distinction implied, that between analytic and synthetic thought, is wrongly conceived. That analysis and synthesis are methods of cognition, differing in many important respects, is undoubted; but such difference lies in a sphere alaggition alien to that within which the present distinction is to be sought. Analytic thought, as here conceived, is only to be understood when taken in reference to the judgment, and then also in reference to a peculiarity in the Kantian doctrine, Kant, emphasizing the principle that judgment is essen- tially the form in which the particular of experience is determined by the universal element of Create, but identifying this universal with a formed concept (resembling, therefore, a class notion), con- templated a class of judgments in which the predicate was merely an explication of the subject notion. Such judgments, had the matter been more fully considered, would have appeared as far from primary, and Kant has himself, in the most unambiguous language, indicated the correct view that analysis is consequent and depend- ent on synthesis,—that analytic judgments, therefore, are merely special a eos of abstracting thought within a sphere already treated, handled, formed by thought. Mansel, too, whose views are generally acute if not profound, has sienalized as the primitive unit of cognition the so-called psychological judgment, which is essenti- ally synthetic in character. © The logical

judgment, in fact, about which his conception of logic centres, is recognized as a posterior act of reflexion, directed npon formed notions, and is not in any way to be regarded as containing what is a common universal feature of all judgments. ;

In the second place, even granting what eannot be maintained, that the process of thought is mere explication of the content of previous knowledge, and that the theory of logie has to do with a comparatively small and subordinate portion of cognition, there is in such a principle no means of development. We may take up in succession class-notions, judgments, reasonings, and in relation to each reiterate, asthe one axiom of logic, that the constituent ele- ments shall be non-contradictory; but such a treatment is only

ossible in relation to a material already formed and organized. he utmost possible value being given to snch a view, logic, under it, could be but a partial and inchoate doctrine.

Finally, there is involved in the doctrine of analytic thought and in the consequences to which attention will next be drawn, B peculiar and one-sided conception of identity or of the principle of identity as an element in thought. Historically this conception has played a most important part : it lies at the root of all homin-

alist logic from Antisthenes downwards, and has found metaphysi- cal expression of the most diverse kinds. TZhat things are what they are is the odd fashion in which a well-nigh forgotten English writer states what is taken to be the universal foundation of all thought and knowledge.!_ The representatives of things in our sub- jective experience, the units of knowledge, may be called notions, and, accordingly, that each notion should be what it is appears as the corresponding logical axiom. The whole process of thought is therefore regarded as merely the explicit statement of what each notion is, and the separation of it by direct or indirect methods from all that it is not. The judgment, essentially the active movement of thought, is reduced to the mere expression of the identity of a notion, and in truth,

were the doctrine consistently carried out, Antisthenes's conclusion that the judgment isa fallacious and inept form of thonght would be the necessary result. When sucha conclusion is not drawn, its place is generally taken by much vague declamation regarding the limited, imperfect, and uncertain character of our knowledge, which is regarded as asymptotically approaching to the adequate determination of truth.

The conception which underlies this view is the abstract separ- ation of thought from things which has been already noted, but the proximate principle is a deduction therefrom. Knowledge or thought is treated externally as a series of isolated units or parts, and the results of cognition—notions, judgments, and reasonings—are viewed as the constituent factors. Thus, e.g., when itis said that a judgment is the expression of an identity, there are possible only two modes of explanation, —the one, that the identity referred to is that between the original notion (subject) as unqualified by its pre- dicates and the same as qualified, in which case manifestly the result of the judgment is taken as being its constituent essence ; the other, that the identity is that of the applicability of distinct names to the same fact, in which case we accept without further inquiry and exclude from logical consideration the processes of thought by which the application of names is brought about, and assume as being the procedure of thought itself that which is its consequence. Under all circumstances, difference is as important an element as identity in the judgment, and to concentrate attention upon the identity is to take a one-sided and imperfect view.

34. So soon, however, as the real nature of thought hag been thrown out of account as not concerned in the processes of logic, so soon as the law of non-contradiction, in its manifold statement, has been formulated as the one principle of logical or formal thinking, there appears the possibility of evolving an exact system of the conditions of 'non-eontradictoriness, The ultimate units of know- ledge, whatsoever we call them, whether notions or ideas of classes or names, have at least one characteristic, —they are what they are, and therefore exclude from themselves whatever is contradictory of their nature.

They are combined positions and negations, that which is posited or negated being left undetermined,—referred, in fact, to matter as opposed to form. With respect to any article of thought, therefore, the only logical requirement is that it shall possess the characteristic of not being self-contradictory, and the only logical question is, what exactly is posited and negated thereby. Complex articles of thought viewed in like manner as complexes of positions and negations may have the same condition demanded of them and the same question put regarding them. A judgment anda syllogism, if narrowly investigated, will appear to be merely com- plex articles of thought, complexes of positions and negations. Pro- ceeding from such a conception there may be treatments more or less systematic and fruitful. In the hands of Kantian logicians, such as Twesten, Mansel, Spalding, and the like, little is effected, for, as the forms of thought are accepted as given and as having their character- istics otherwise fixed (by psychology or critical theory of knowledge), the treatment resolves itself either into repetition, in respect to cach, of the fundamental logical condition, or into the erection of a specific kind of thonght (analytical) which has no other feature save that of correspondence with the said condition. But it is clear that restric- tion by any psychological or critical doctrine of thought is an arbi- trary limitation. It is needful only to regard the operation of thought as establishment of positions and negations, and to de- velop, by whatever method, the systematic results of such a view. Hobbes's doctrine of thought as dealing with names and as essen- tially addition and subtraction of nameable features, Boole's doc- trine of thought as the determination of a class, Jevons's view of thought as simple apprehension of qualities,—any of these will Serve as starting point, for in all of them the fruitful element is the same. The further step that the generalization of the system of thought must take a symbolic form presents itsclf as an imme- diate aud natnral consequence. .

35. By the application of a symbolic method is not to be under- stood what has been practised by many writers on logic—the illus- eg eee eaten 9 ie oe

U John Sergeant. See The Method to Science, by J. S., 8vo, Lond., 1696, pp. 144, 145, This curious book contains much interesting matter. 2 On Condillae's attempt to treat judgments as identitics (or equations) some

excellent remarks will be found in De Trac Ldéologie, iii. 183-143, cf. Duhamel Des Méthodes, i. 89-94, i a Peg

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tration of elementary logical relations by numerical or algebraic signs or by diagrammatic schemata. The expression has the signi- fication which it bears in mathematical analysis, and implies that the general relations of dependence among objects of thought, of whatsoever kind, in correspondence with which operations of per- fectly general character are carried out, shall be represented by sym- bols, the laws of which are determined by the nature of these rela- tions or by the laws of the corresponding operations. The mere use of abbreviations for the objects of treatment is not the application of a symbolic method}; but so soon as the general relations of, or general operations with, these objects are represented by symbols, and the laws of such symbols stated as deductions therefrom, there arises the possibility of a symbolic development or method of treat- ment, which may lead to more or less expanded results according as the significance of the symbolic laws is more or less general. Thus quantity, whether discrete or continuous, prescnts, as an aspect of phenomena, relations of a highly general kind, offers itself as object of operations of a highly general kind, and is therefore peculiarly the subject of symbolic treatment. Currently, indeed, the treat- ment of quantity is assumed to have the monopoly of symbolism, but such an assumption is not self-evidently true, and it is permis- sible to inquire whether matters non-quantitative do not present relations of such generality that they, too, can be symbolically dealt with. It is, however, a further question whether the generality of the relations and therefore the significance of the symbols in such cases, although subject to some special conditions not necessarily involved in the nature of quantity, do not spring from the fact that we treat the matters as quantities of a special kind, and so

insen- sibly find ourselves applying quantitative methods. In other words, it remains to be investigated, after the preliminary definitions and axioms of any symbolic method have bcen laid down, whcther tho conception of thought with which we’start, or a special feature dis- tinctly quantitative in character, has been the truly fruitful element in after-development of the system.?

The first step in any symbolic logic must evidently be the deter- mination of the nature and laws of the symbols, and, as these follow from the nature of the operations of thought, the first step is like- Wise a statement of the essential characteristic of thinking. As above noted, there have been adopted various modes of expressing this characteristic, and in some cases the mode adopted is not one from which any generally applicable symbolic rules of procedure could have followed.* Two only require here to be noted, as repre- senting special views: first, that which proceeds from the idea of thought as essentially the process of grouping, classing, determin- ing a definite set of objects by a mark or notion; and second, that which proceeds more generally from the conception of thought as consisting of a series of self-identical units, to be variously combined in obedicnce to the law of self-identity. Adopting the first view, we find that processes capable of symbolic representation, by the customary algcbraic signs of addition, subtraction, equivalence, multiplication, and division, have a perfectly general significance in reference to the combination, separation, equalization of classes, to the imposition and removal of restriction on a class; that to the symbols there can therefore be assigned a set of general laws; and that any peculiarity of these symbolic laws which differentiates them from the laws of like symbols in mathematical analysis is deducible from the notion of thought with which we started, and is consequently to be carried along with them in all the after develop- ment. Symbolic representation of relations of classes follows with equal directness from the general notion that by any such relation anew group is determined in reference to the original groups, or rather that the position or negation of a new group (or series of groups) is given, definitely or indefinitely, as the result of such a relation.

With the aid of the symbolic laws so reached, the logical problem as such may then be approached. Given any number of logical terms (i.¢., classes, or, as it may be bettcr put, positions and nega- tions) connected together by any relations, to determine completely any one in reference to the others, or to express any one in terms of the others. The symbolic procedure, expounded with marvellous ingenuity and success by Boolc, may take various forms, and may be simplified by many analytical devices, but consists essentially in determining systematically how given positions and negatious,

1 Thus one would not describe Aristotle's use of letters for the terms of his syllogisms, nor the current logical abbreviations of S, P, and M in like case, as being, in any true sense of the word, symbolic. On the subject generally, the instructive work of Mr Venn (Symbolic Logic, 1881) shou!d be consulted. Mr Venn has not only in this work expounded the foundations and main theorems of Boole's logic with a care and skill that leave nothing to be desired, but he has, independently of many rcal contributions to logical analysis, put In its true light the nature of symbolic method in logic. He has rendered it impossible, even for the outsider, to complain that symbolic logic is an arbitrary application of mathe- matical method to logical material.

2 An excellent note on symbolic logic will be found in Lotze, Logik (2d ed., 1880),

. 256-59,

ag Some of these, as, e.g., Lambert's and Ploncquet's, are noted and discussed by Mr Venn (Symbolic Logic, xxxii-xxxvi. and passim).

4 The first is the view taken by Boole (and expounded with great fulness in Venn, as above); the second is that of the brothers Grassmann (in the Formen- tehre, 1872, especially bk. il. Die Begriffslehre oder Logik).

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definite or indefinite, combine with or neutralize one another. A mgr detailed account of these formal processes is beyond our im1ts.

The first question which suggests itself in connexion with Boole's symbolic logic is the necessity or advisability of retaining the reference to classes, or the description of thought as classification. Do the symbolic laws really depend to any extent on the logical peculiarities of class arrangement? Mr Venn, who emphasizes this feature in Boole's scheme, has, however, done good service in leading up to a different explanation. The general reference to objects, which is also noted as implied in all Boole's formule, has nothing to do with the possible difference of conceptualist or materialist doctrines of the proposition, and, in fact, as all distinctions of thing and quality, resemblance and difference, higher and lower, subject and predicate vanish, or are absorbed in the morc general principle underlying the symbolic method, phrases such as classification, extension, intension, and the like should be banished as not perti- nent. Nay, the usual distinctions of quantity and even of quality either disappear or acquire a new significance when they arc brought under the scope of the new principle. '*What symbolic logic works upon by preference is a system of dichotomy, of x and not 2, y and not y, and so forth." ® In other words, quantitative differences require to find expression through some combination of the positions and negations of the elements making up the objects dealt with,' while the usual qualitative distinctions are merged in the position or negation of various combinations.

The whole phraseology then of classification and its allied pro- cesses seems needless when used to denote the simple determination of objects thought. The literal signs express, not ''classes," but units, determined in and for thought as self-identical. For this reason then it appears that the view of the foundations of the symbolic methods of logic taken in Grassmaun's Begrif'slehre is more thoroughgoing, and more closely represents the underlying prin- ciples, than that involved in Boole's formule and expounded in detail by Mr Venn.

Grassmann, as above stated, deduces logical relations as a parti- cular class of the determinations necessarily attaching to all quanti- ties (7.¢., determined contents of thought). Abstraction being madc of all peculiarities which may be due to their special constitution, quantitics exhibit certain formal relations when they are combined (added, subtracted, &c.). Each quantity is a unit of thought, a definite posttwm, and of such units there are but two classes, ele- ments and complexes. Units of thought, which are self-identical, and therefore subject to the specific law that addition of each to itself or multiplication of it by itself yields as result only the original unit, are notions. The theory of notions, therefore, is the development of the general formal relations of units under the special restrictions imposed by their nature.§

There appears very clearly in Grassmann's treatment the essence of the principle on which symbolic logic proceeds. Thought is viewed as simply the process of positing and negating definite con- tents or units, and the operations of logic become methods for rendering explicit that which is in each case posited or negated. To apply symbolic mcthods, we require units as definite as those of quantitative science, and the only laws we can employ are those which spring from the uature of units as definite. Now it seems a profound error to reduce the whole complex process of thinking to this reiterated position of self-identical units. Undoubtedly if we start from any given fact of thought, as, ¢.g., a judgment, and inquire what can be exhibited as involved in it, we have before us a problem of analysis, the solution of which must take form in a series of positions and negations, but our thinking is not therefore as a whole mere analysis. The synthetic process by which con- nexions of thought among the objects of our conscious cxpericnce are established is not the mechanical aggregation of elementary parts. The relations which give intelligible significance to our experience are not simply those of identity and non-identity. It is an altogether abstract and external view of thought, resting in all probability on an obscure metaphysical principle,? that would treat it as in essence the composition and decomposition of elementary atoms, of mpéra, as Antisthenes would have called them. It has, indeed, been imagined that a symbolic logic might be developed which should be independent in all its fundamental axioms of any metaphysical or psychological

assumptions, but this is an illusion. No logical method can be developed save from a most definite con- ception of the essential nature and modus operandi of thinking, and any system of symbolic logic finds it necessary, if it is to be complete and consistent, to adopt some such view as that above criticized, to regard thonght as purely analytic, as dealing with compounds or nn ee

5 Mr Venn' q e again invaluable. Jevons's Principles of Science and Baie Wh peteame Lobe ahould be consulted. Schréder's Operationskreis des Logtkkaiculs contains some very clegant and simple methods.

6 Venn, as above, p. 162. ,

7 Where this is fiattasaiilie, as in the case of the truly particular or inde ter mlnate judgment, symbolic methods encounter almost insurmountable difficultics.

8 See Die Begriffslehre oder Logik (1872), p. 43. Schroder (op. cit.) follows Grassmann, though with the usc of class phrascology.

9 As above noted, p. 800.

units which are themselves highly complex products, only to be formed by a kind of thought not recognized among logical pro- cesses.}

36. Formal logic, then, in the ordinary acceptation of that term, does not appear to furnish any adequate representation of the real process and method of thought. Any logical theory must of necessity be formal, 7.¢., abstract or general, for it can consider only the general elements of thought, not specific knowledge in which are involved the finite, limited relations of one fact or class of facts to another. The distinction between logic and the sciences is there- fore precisely that

between philosophy in general and the sciences. Attempts have been made to include in logical analysis the treat- ment of scientific method, 7.¢., to discuss as matter of logic the varied processes by which scientific results have been attained. It is true that logical consideration must extend to the notions through which scientific experience, like any other, becomes intel- ligible, and, in so far as scientific method is but the application of the laws of knowledge as a whole, it is a possible, nay necessary, object of logical treatment. But to include scientific methodology in particular, the consideration of the mechanical devices by which we strive to bring experience into conformity with our ideal of cognition, the discussion of methods of experiment and observa- tion, under the one head logic is an error in principle, whether we view logic in its theoretical aspect or in reference to a special propedeutic aim. Generalizations on such topics are well-nigh worthless ; they can have vitality and importance only when drawn in closest conjunction with actual scientific work. Tho theory of scientific method is either doctrine of knowledge treated freely or else the application of thought in connexion with actual research and the ascertainment of the principles therein employed. In either case it is not susceptible of abstraction and isolated treat- nent.

37. There remains only, of the possible views noted, that which identified logic with the theory of knowledge, but which so defined theory of knowledge as to distinguish it from metaphysics. Tho designation of logic as theory of knowledge is one to which in words there can be no possible objection. It brings into the foreground what it has been the object of this article, by an historico-critical survey, to establish, that so-called logical laws, forms, and problems are hardly capable of statement, certainly incapable of satisfactory treatment, except in the most intimate connexion with the principles of a theory of knowledge. To include, however, in the signification of this latter term a peculiar concoption of the relation between thinking (knowing) and reality is at once to restrict the scope of logic and to place an arbitrary and, one would say, an ill-founded restriction on the kind of treatment to which logical problems may be subjected. If it be really the function of logic to trace the forms and laws of knowledge, that function is all-comprehensive, and must embrace in its scope all the

fundamental characteristics of experience as ,known. But no characteristic of experience is more palpable than the distinction, drawn within conscious experience, between knowledge and reality. It is impossible then for a theory of knowledge to start with the assumption that these two exist scparately, constituted each after its special fashion, but with a certain parallelism between them. In words one may refer for justification of the assumption to metaphysics, or to psycho- logy, but, in fact, the problem so relogated to some other discipline 1s essentially a logical question, and the method of its solution exactly that which must be applied in the treatment of subordinato logical questions. Practical convenience alone can lead to any separation of the problems which under this view aro referred in part to theory of knowledge and in part to metaphysics. Other and more serious difficulties of the view have besn already com- mented on.?

88. In sum, then, the problems and the methods which compose logic in the strictest sense of that term seem to be one with the problems and methods of the critical theory of knowledge. No other title describes so appropriately as that of ‘logical ” the analysis of knowledge as such, its significance and constitution, in opposition to the*quasi-historical or genetic account for which the title psychological should be retained. The researches to which we would here assign the title “logical” undoubtedly include all that can supply the place of the older metaphysic, but in aim and method are so distinct that the same title cannot be borne by both. To assign so extensive a range to logical investigations enables us to see that the criteria by which at one time or another a narrower province was determined for logic are but partial expressions of the Whole truth, The analysis of knowledge as such, the complete theory of the intelligible elements in conscious experience, does hold a special relation to all other subordinate branches of human thinking, whether philosophic in the ordinary sense of that term or scientific, According as one or other aspect of this relation is made prominent, there comes forward one or other of the various modes for settling the province of logic; but these partial concep.

1 The same fact has been noted in regard to formal logic of the Kantian school,

13, €.g., in Mansel's distinction of psychological and logical judgments, # Above, p. 797.

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tions prove their inadequacy when development is attempted from them, and within the systems constructed in accordance with them there is of necessity continuous reference to inquiries lying beyond the prescribed limits. : er

A certain analysis of some methods of ordinary thinking, based to a very large extent on language, and resembling in many respects grammatical study, has long been current in educational practice as logic, and to those whose conception of the subject has been formed from acquaintance with this imperfect body of rules and formule it may appear a violent and unnecessary extension of the term to apply it to the all-comprehensive theory of knowledge. The reasons, however, are imperative; and, as these would Icad one to deny the right of this elementary practical discipline to the posses- sion of the title, it is desirable to conclude by offering a single remark on the place and function of this currently designated logic.

Not much trouble is required in order to see that the ordinary school or formal logic can lay no claim to scientific completeness. Its principles are imperfect, dubious, and most variously conceived ; it possesses no method by which development from these principles is possible ; it has no criterion by which to test the adequacy of its abstract forms as representations of the laws of concrete thinking. Accordingly it is handled, in whole and in detail, in the most distractingly various fashion, and were it indeed entitled to the honourable designation of logic the prospects of that science might

"well be despaired of. But in fact the school logic discharges a func-

tion for which exhaustiveness of logical analysis is not a requisite. It has a raison @’étre in the circumstance that training to abstract methods must needs be a graduated process, and that, whether as a means towards the prosecution of philosophic study in especial, or as instrument of general educational value, practice in dealing with abstract thoughts must have value. Such elementary practice naturally bases itself on the kinds of distinction apparent in the concrete thinking of those to whom it is applied, and for this reason school logic not only connects itself with and is ina sense the development of grammar and grammatical analysis and synthesis, but may, to a limited extent, include reference to some of the simpler processes of scientific method. In all probability the dis- cord observable among the ordinary treatises on school logic is due to the want of recognition of the true place which can thus be assigned to the subject treated. The doctrine has a propadoutic but not a scientific value. NoTE A.

Histories of Logic.—No complete history of logic, apart from philosophy injgeneral, exists; but of the Aristotelian logic, in its system and in its developinent throughout the ancient and medizval epochs we possess a most adequate history in Prantl’s Geschichte der Logik im Abendlande (i., 1855 5 bs 1861; iii., 1867; iy., 1870), extending to the close of the madizval period,

The following are some of the more important contributions towards a history of logic, whether in independent works or in portions of systematic treatises; most of them, indeed, of small value x—Ramus, Schole Dialec- tice, bk. i. chaps. 1-8; Keckermann, Systema Logice, 1598; Gassendi, Opera, i. 35-66; Fabricius, Specimen elenchicum historix logice, 1699; Walch, Parerga Academica (1721), pp. 453-848 ; Darjes, Via ad Veritatem, appendix, 1755; Buhle, iu Commentat. Soc. Gotting., vol. x.; Fiilleborn, Bci- trage 2. Gesch. d. Phil. (1794), pt. iv. pp. 160-80; Eberstein, Gesch. d. Logik u. Metaphystk bet den Deutschen von Leibnite bis auf ee Lett (2d_ed., 1794), useful as a survey of the Wolftian logics; Calker, Denklehre (1822), pp. 12-198; Bachmann, System der Logik (1828), pp. 569-644; Muss- mann, De Logicx ac Dialecticx notione historica, 1828; Troxler, Logik (1830), vol. ili.; Sigwart, De historia logice inter Grecos usque ad Socratem,

1832; St Hilaire, De la Logique d’ Aristote (1888), ii. pp. 93-312 ; Franck, Esquisse dune histoire de la logiquc, 1838; Reiffenberg, Principes de logique, 1839 (with bibliography); Trcndelenburg, Gesch. d. Kategorienlehre, 1846; Blakey, History of Logic, and Essay on Logic (2d ed., 1848), with bibliographical appen- dix; Hoffmann, Grundziige ciner Geschichte der Begriff der Logik in Deutsch- land von Kant bis Baadcr, 1851; K. Fischer, Logik u. Metuphysik (2d ed., 1865), pp. 16-182, a valuable critique of some modern doctrines ; Rabus, Logik und Metaphystk (1868), i. pp. 123-242, excellent; Ueberweg, System der Logik (4th ed., 1874), pp. 15-66, excellent critical account; Rag- nisco, Storia critica delle Kategorie, 1871, 2 vols.; Rabus, Die neucstcn Bestrebungen aufdem Gebiete der Logik bei den Deutschen, 1880; Harms, Geschichte der Logik, 1881; Venn, Symbolic Logic, 1881 (introduction, and pp. 405-444), a valuable contribution to the history and bibliography of the application of symbolic methods in logic. The only good bibliography of logic is that given by Rabus in his Logik u. Metaphysik,ii. pp. 453-518. Some of the older lexicons, e.g., Lipenius, Bibliotheca Realis (1685), s. vv. “ Logica,” “Organon,” “Dialectica,” contain great store of bibliographical references. A complete bibliography is a desideratum.

NOTE B.

Hindu Systems of Logic.—In almost all the Hindu systems of philosophy, as these are classified by the most recent authorities, indications are to be found of a more or less developed analysis of the process or method of reasoning, and therefore of a certain amount of logical theory. In two systems in particular the logical element is the most prominent feature. The Nydya, or logical doctrine of Gotama, is in a very special sense the Hindu logic, while in the Vaiseschika, or Atomist system of Kanada, there are many expansions of or additions to the Nydya, though the prevailing interest is not logical.

‘The most accessible sources of information regarding the Hindu logic, Colebrooke’s Essays, and Professor M. Miiller’s abstract (in the appendix to Archbishop Thomson’s Laws of Thought), tend to mingle in an undesirable fashion what is special to the N yaya doctrine, and

what is added by Kanada and his followers. In order to appreciate the extent to which the analysis of reasoning has been carried in these early systems, it is advisable to restrict attention to the original exposition of the Nydya.

The aim of Nyaya is the attainment of perfection, of bliss, through know- ledge. But, to have knowledge in a systematic and complete fashion, it is requisite that the individual should know (or should be capable of organizing

his knowledge in reference to) the sixtcen great topics orheads of discussion. These, as enumerated by Gotama are—() proof; (2) the objects of proof; (3) doubt; (4) motive; (5) the illustration or example for discussion; (6) the fiual assertion ; (7) the enumeration of the five members of the final assertion ; (8) confirmatory argument; (9) the conclusion, the defined judgment; (10) the objection; (11) controversy; (12) deceptive counter argument; (13) ap- pareut reason or sophism ; (14) fraud or wilfully deceptive argument, ruse; (15) futile argument or self-contradictory counter argument; (16) conclusive refutation. luspection of these at once shows that they represent stages in dialectic or in the process of clearing up knowledge by discussion. The geucralia, 7.¢., the kinds of proof, described as four in number—sense-percep- tion, inference (either from cause to effect, from effect to cause, or from commtuaity of uature, t.¢., in a wide sense, analogy), comparison (analogy in a stricter significance), tradition,—and the things about which proof may be exercised, under which a twelvefold division is given by Gotama, aud enlarged in endless detail by his commentators, who introduce thereunder much of jxanada’s system, are first laid down as the basis for the whole. Then follows (Nos. 3-6) the progress from doubt, which first calls for reasoning or proof, through motive, to position of the problem in the form of an example or case, and to the general assertion, as having valid grounds. The analysis of the grounds of assertion is then given, and here we have what corresponds more particularly to the syllogism as known to us. Five members are signalized :— (1) the thesis or proposition to be

proved; (2) the reason, or intermediate ground by which the subject of the proposition is linked on to an explanatory principle; (3) the explanatory principle ; (4) the application of this explana- tory principle; (5) the statement of the conclusion as following from the application. Thus, in the example usually given—() thesis, this mountain is fiery; (2) intermcdiate ground, because it smokes; (3) explanatory prin- eiple, whatever smokes is fiery, as, for instance, a hearth; (4) application, thercfore this mountain is fiery; (5) statement of eonelusion, the mountain, then, is fiery, because it smokes. There can be no doubt that in this some- what unsystematic arrangement we have the outlines of syllogistic argument. Considerable obscurity, however, rests over the third member, aud it is only partially cleared up when we proceed to the next topic, which may perhaps be translated confirmatory argument. Here the essence of the argument appears to be a regress from the known mark to the fundamental quality from which it follows. Thus, ¢.g., if it were said the mountain is not fiery, then the argument would be adduced, but the mountain smokes, and what is not fiery does not smoke. Apparently there is involved the assumption that the mark is a necessary consequence of the primary quality, but the cxposi- tion is obscure, and, doubtless, connects itself with the principles of causal connexion recognized by Hindu thinkers. (See Williams, as below, pp. 73-4).

When the conclusion has thus been confirmed, when the negation of the ground has been shown to fail in explaining the observed fact, the thesis may be stated in an absolutc and definitive form (topic 9). The remaining seven topics are then concerned with the discussion which may arise when an opponent brings forward objections to the conclusion. This he must do by. positing his antithesis (10), whercupon issue may be joined (11). Should the adversary be unable to establish his antithesis, he may resort to deceit, bringing forward arguments, illogically arranged and devoid of force (12), which svon leads to the employment of sophisms (18) or merely apparent arguments, and even to deceitful ruses (14). Under these topics the Nydya signalizes and discusses various well-known forms of fallacy. The destruc- tion of all these fallacious arguments reduces the opponent to the employ- ment of futile, irrelevant responses, which undermine his own position (15),

and the exposure of which completes his discomfiture and reduces him to silence (16).

Expositions of this dialectic system are not yet available in such kind and amount as would enable one to do full justice to it. Evidently much patience and a very considerable knowledge of the current philosophical view would be requisite in order to appreciate at their true worth mauy apparently formal,

and in some cases dubious, divisions. Of accounts which may be consulted the following seem the more important :—Colebrooke's Essays on the Religion and Philosophy of the Hindus, from which the expositions in Ritter (Ges. d. Phit., iv. 382 sq.), Hegel (Werke, xiii. 161-167), and Cousin (Histoire Générale, Legon ii.) are taken; Ward's Account of the History, Literature, and Re- ligion of the Hindoos (4 vols. 1811; later editions, with title altered, in 1815, 1817, 1821); Windischmann, Philosophie im Fortgang der Weltgeschichte (1834), specially pp. 1895-1920; M. Muller, appendix to Thomson's Laws of Lhought ; Rosenkranz, Die Modijicationen der Logik (1846), pp. 184-97; Williams, Lndian Wisdom, pp. 71-88; St Hilaire, articles ''Indiens," "Gotama," ' Nyaya," '' Kanada," in the Dictionnaire Philosophique, and translation, with commentary, of part of Gotama's ''Stitras," in the Mémoires de Aeadémie des Sciences Morales et Politiques, tom. iii.

NOTE C.

Ramus.—The logical theories of Ramus acquired for a brief period a facti- tious importance from their connexion with the general revolt agaiust Aris- totelianism, and with the Protestant struggle against the Roman Cathelic authority. In themselves they have no particular value, nor indeed much originality, and the exposition of them by their author, always rather lite- rary than philosophic, adds nothing of strength or interest. 1n comparison with the Aristotelian analysis of the forms and methods of thinking, the few alterations of statement, and generally the thin residuum of logical theory, which characterize

Ramist work, appear as singularly insignificant. Nor have any of the special peculiarities of the Ramist logic exercised influence on the history of logical doctrines. The keenness of the controversy which raged in so many of the centres of learning between the Aristotelians and the total or partial Ramists is explicable only as having reference to differences which were merely symbolized by the apparent difference in logical doctrine.

ln the Protestant universities and seminaries generally the Ramist logic obtained, and for some time kept, a firm footing. 1n Scotland, through Melville, Buchanan, and the earl of Murray, who had been a pupil of Ramus, his system was installed as the orthodox staple of logical training, and such records as remaiu of Scottish university cducation during the troubled 16th century would undoubtedly exhibit the traces of this ncw movement. In England, Cambridge alone, always disposed to reject the authority of Aris- totle, and generally more open to new ideas than the sister university, was a stronghold of Ramism, and, apart from special works of Ramist tendency, the influence of the new doctrine is discernible in the writings of more than one Cambridge alumnus. William Temple, a fricnd of Sir Philip Sidney, and an official of the university, published a volume of Scholia in Raimt Dialecticam, 1591; George Downam, prelector on logic, wrote commentaries In Petri Rami Dialecticam, 1606 ; and Milton, iu 1672, expanded the Dialectica in his Artis Logicw Plenior Institutio. Marlowe's Faustus, and his Massacre of St Bartholomew, show how familiar Ramist phraseology and the persouality of Ramus must have been to an alumnus of Cambridge, while Bacon, with well-grounded objection to much of the Ramist method, expounds the system of logic with unmistakable reference to the Ramist principles and method of arrangement. There is a monograph on Ramus by Ch. Wadding- ton with a good bibliography—Ramus (Pierre de la Ramée): sa Vie, scs Ecrits, et ses Opinions, Paris, 1856—and a slighter work, mainly biographi- cal, by Ch. Desmaze (P. Ramus, Professeur_au Collége de Franee; sa Vie, scs Eerits, sa Mort, 1515-72, Paris, 1864). 1n Lipenius (Bibliotheca Realis, s. v. "Ramus ") will be found a long list of writings for and against the Ramist logic. The history of the movement is also given in Buhle (Geseh. d. newern Phil., ii. 680-702),

Tennemann (Gesch. d. Phil., ix. pp. 420-42), Du Boulay (His. Univer. Paris, tom. iv.), Crevier (Ets. de ?Univ, de Paris, vol. v.), in Jo. Wermannus ab Elswich (Schediasma de varia Aristotelis in seholis Pro- testantium fortuna, §§ 21-29), De Launoy (De Varia Aristot. in Aead. Paris. fortuna, cap. xiii.), and in Bayle (Dictionnaire, s.v.“‘Ramus”). (R. AD.)

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LOGOS. This term is one of the most constant factors in ancient speculation. As it is double-sided, however, expressing both reason and word, the conceptions which it covers differ widely. ‘Taken broadly the doctrine of the Logos may be said to have run in two parallel courses— the one philosophical, the other theological; the one the development of the Logos as reason, the other the develop- ment of the Logos as word; the one Hellenic, the other Hebrew.

1. To the Greek mind, which saw in the world a kdopos, it was natural to regard the world as the product of reason, and reason as the ruling principle in the world. So we find a Logos doctrine more or less prominent from the dawn of Hellenic thought to its eclipse. It rises in the realm of physical speculation, passes. over into the territory of ethics and theology, and makes its way through at least three welkdefined stages. These are marked off by the names of Heraclitus of Ephesus, the Stoics, and Philo.

It acquires its first importance in the theories of Heraclitus, There it is intimately associated with the dominant ideas of a flux in all things, and of fire as the material substrate or. primary form of existence. On the one hand the Logos is identified with yrwy and connected with 8écy, which latter seems to have the function of correct- ing deviations from the eternal law that rules in things. On the other hand it is not positively distinguished either from the ethereal fire, or from the eivapyévn and the dvayxn according to which all things occur. In consistency with his hylozoic doctrine Heraclitus holds that nothing material can

be thought of without this Logos, but he does not conceive the Logos itself to be immaterial. Whether it is regarded as in any sense possessed of intelligence and consciousness is a question variously answered. But there is most to say for the negative. This Logos is not one above the world or prior to it, but in the world and inseparable from it. Man's soul is a part of it. It is relation, therefore, as Schleiermacher expresses it, or reason, not speech or word. And it is objective, not subjective, reason. The process of transition between opposites, in which all things are involved, is a process according to orderly relations and definite measures, and the Logos is the eternal principle of this world-process which shows itself in the form of a constant conflict between opposites. Likea law of nature, objective in the world, it gives order and regularity to the movement of things, and makes the system rational.' Between Heraclitus and the Stoics comparatively little was done in developing a special Logos doctrine. With Anaxa- goras a conception entered which gradually triumphed over that of Heraclitus, namely, the conception of a supreme, intellectual principle, not identified with the world but independent cf it. This, however, was vots, not Logos. In the Platonic and Aristotelian systems, too, the Logos appears. But it is subordinate to other more distinctive conceptions, and laeks the definiteness of a doctrine. With Plato the term selected for the expression of the principle

1 Cf, Schleicrmacher's Werakleitos der Dunkle, &c.; Bernays's Heraclitea ; Gladisch's Heracleitos und Zoroaster.

to which the order visible in the universe is due is vods or copia, not Adyos. It is in the pseudo-Platonic Lpinomis that Adyos appears as a synonym for vovts. In Aristotle, again, the principle which sets all nature under the rule of thought, and directs it towards a rational end, is voids, or the divine spirititself; while Adyos isa term with many senses, used as more or less identical with a number of phrases, of eveka, evepyela, evTehexeta, ovcia, €idos, popdy, &e.

With the Stoics, however, the Logos doctrine reappears in great breadth. It is a capital element in their system. With their teleological

views of the world they naturally predicated an active principle in connexion with it, living in it and determining it. This operative principle is called both Logos and God. It is conceived of as material, and is described in terms used equally of nature and of God. There is at the same time the special doctrine of the Adyos orepparixds, the seminal Logos, or the law of generation in the world, the principle of the active reason working in dead matter. This parts into Adyou orepyarixoi, which are akin, not to the Platonic ideas, but rather to the Adyou évvAou of Aristotle. In man, too, there is a Logos which is his characteristic possession, and which is évé:dOeros, as long as it is a thought resident within his breast, but

mpopopixds when it'is expressed as a word. This distinc- –

tion between Logos as ratio and Logos as oratio, so much used subsequently by Philo and the Christian fathers, had been so far anticipated by Aristotle's distinction between the £m Adyos and the Adyos ev rH Youyn. The Logos of the Stoics is a reason in the world gifted with intelligence, and analogous to the reason in man.!

In the period between the Stoics and Philo there are few names of distinct interest in this connexion. But in the Alexandrian philosophy the Logos doctrine assumes a, lead- ing place, and shapes a new career for itself. The chief representative of this school is the Hellenized Jew, Philo (born about 25 B.c.). With him God is absolute and incorporeal perfection, apprehensible only by reason, and incapable of contact with matter. An intermediate agellt, therefore, is affirmed, the Logos or idea of ideas, This Logos is not eternal in the sense in which God is eternal, but has its being from Him. It is His elder son, as the world is His younger. It resides with God as His wisdom, and is in the world as the divine reason. It is God's instrument in creation and in revelation. Both in the world and in man it is twofold. In man it subsists as the Adyos évdudberos or immanent reason, and as the Adyos mpopopikds Or uttered reason. In the case of the world there is the Logos which has its residence with the arche- typal ideas, and there is the Logos which appears in the form of many Adyou or rational germs of things material, Philo's doctrine is moulded by three forces—Platonism,

Stoicism, and the Old Testament. His Logos is the repre- sentative of the world to God as well as of God to the world. It is described as the " image of God" (cixdy Geot, i. 6) and the « archetypal man" (6 xar' eixéva dvOpwros, i, 427), as the "son of God" and the "high priest" (dpyuepevs, i, 653), as the "first-born son" (Tpwrdyovos, 1. 414), the "man of God" (avOpwros Oe0%, i. 411), &. It wavers all the while between attribute and substance, between the personal and the impersonal.

In the later developments of Hellenic speculation nothing essential was added to the doctrine of the Logos. Philo's distinction between God and His rational power or Logos in contact with the world was generally maintained by the eclectic Platonists and Neo-Platonists, By some of these this distinction was carried out to the extent of predicating (as was done by Numenius of Apamea) three Gods :—the supreme God; the second God, or Demiurge or Logos ;

1 Cf. especially Zeller's Phil. der Gr., 2d ed., vol. iii; or Reichel's translation, The Stoics, Hpicureans, and Sceptics.

and the third God, or the world. Plotinus explained the Adyot as constructive forces, proceeding from the ideas and giving form to the dead matter of sensible things (Hnneads, v. 1, 8, and Richter's Veu-Plat. Studien),

2. The doctrine of the Logos in Hellenic thought thus remains substantially a doctrine of the Logos as reason. The other side, the doctrine of the Logos as word, belongs as essentially to Hebrew thought. The roots of this con- ception lie in the Hebrew Scriptures. The God who is made known in the Old Testament is one who reveals Himself actively in history. He is exhibited, therefore, as speaking, and by His word communicating His will. The word of the God of revelation is represented as the creative principle (Gen. i. 3; Psalm xxxiii. 6), as the executor of the divine judgments (Hosea vi. 5), as healing (Psalm evii. 20), as possessed of almost personal qualities (Isaiah lv. 11; Psalm cxlvii, 15). Along with this comes the doctrine of

the angel of Jehovah, the angel of the covenant, the angel of the presence, in whom God manifests Himself, and who is sometimes identified with Jehovah or Elohim (Gen. xvi. 11, 13; xxxii, 29-31 : Exod. iii 2; xiii, 21), sometimes distinguished from Him (Gen. xxii. 15, &c.; xxiv. 7; xxviii. 12, &c.), and sometimes presented in both aspects (Judges ii., vi; Zech. i.). To this must be added the doctrine of Wisdom, given in the books of Job and Proverbs. As the Word of God is represented in the theocratic sections of the Old Testament as the creative principle of the world, so Wisdom appears with somewhat similar functions in these books. At one time it is exhibited as an attribute of God (Prov. iii. 19). At another it is strongly personified, so as to become rather the creative thought of God than a quality (Prov. viii. 22). Again it is described as proceeding from God as the principle of creation and objective to Him. In these and kindred passages (Job xv. 7, &c.) it is on the way to become hypostatized.

The Hebrew conception is partially associated with the Greek in the case of Aristobulus, the predecessor of Philo, and, according to the fathers, the founder of the Alexandrian school. He speaks of Wisdom in a way reminding us of the book of Proverbs. The pseudo-Solomonic Look of Wisdom (generally supposed to be the work of an Alexandrian flourishing somewhere between Aristobulus and Philo) deals both with the Wisdom and with the Logos. It fails to hypostatize either. But it represents the former as the framer of the world, as the power or spirit of God, active alike in the physical, the intellectual, and the ethical domain, and apparently objective to God. Points of affinity between the Hellenic and Hebrew conceptions are also seen in the books of Maccabees (see, ¢.g., 2 Mace. ili, 38). In these instances, however, and even in Philo, the Hebrew elements are only partially grasped and appropriated. In the Targums, on the other hand, the three doctrines of the word, the angel, and the wisdom of God converge in a very definite conception, In the Jewish theology God is represented as purely transcendent, having no likeness of nature with man, and making no personal entrance into history. Instead of the immediate relation of God to the world the Targums introduce the ideas of the Afémré (word) and the Shechind. This Memra, or, as’‘it is also designated, Dibldrd, is an hypostasis that takes the place of God when direct

intercourse with man is in view. In all those passages of the Old Testament where anthropomorphic terms are used of God, the Memra is substituted for God. The Memra proceeds from God, and retains the creaturely relation to God. It does not seem to have been identified with the Messiah.?

> Cf. the Targum of Onkelos on the Pentateuch under Gen. vii. 16,

xvii, 2, xxi. 20; Exod. xix. 16, &c.; the Jerusalem Targum on Numb. vii. 89, &c.

LOG—

The Hebrew Logos and the Old Testament doctrine reach their climax in the prologue to John's Gospel. The three conceptions of the active Word, the Angel, and the Wisdom of God, which had been fused in the Rabbinical idea of a Memra, meet there in the final grandeur of the Word of God incarnate. The question of the genesis of the Johannine doctrine has been greatly debated. There is a remarkable similarity between John's terms and Philo's. But this is due mainly to the fact that John and Philo made use of the same inherited phraseology for the expression of their several doctrines. The Johannine doctrine is not derived from the Philonic. The Logos of Philo is distinctively reason ; the Logos of John is Word. The one is metaphysical; the other is theological. In Philo the Logos is the divine principle that creates and sustains. In John the Logos who creates also redeems. In Philo the Logos hovers midway between the personal and the impersonal. In John he is a distinct personality. To Philo the idea of an incarnation of God is alien and abhorrent. The heart of John's doctrine is the historical fact that the Word was made flesh.

In many of the early Christian writers, as well as in the hetcrodox schools, the Logos doctrine is influenced by the Greek idea. The Syrian Gnostic Basilides held (aceording to Irenzus, i. 24) that the Logos or Word emanated from the vous, or personified reason, as this latter emanated from the unbegotten Father. The completest type of Gnosticism, the Valentinian, regarded Wisdom as the last of the series of sons that emanated from the original Being or Father, and the Logos

as an emanation from the first two principles that issued from God, Reason (vos) and Truth. Justin Martyr, the first of the sub-apostolic fathers, taught that God produced of His own nature a rational power (Svvapiv twa AoyiKjv), His agent in creation, who now became man in Jesus (Dial. c. T'ryph., chap. 48, 60). He affirmed also the action of the Adyos omepuatixds (Apol. i. 46; ii, 18, &c.). With Tatian (Cohort. ad. Gr., chap. 5, ke.) the Logos is the beginning of the world, the reason that comes into being as the sharer of God's rational power. With Athenagoras (Suppl., chap. 9, 10) He is the prototype of the world and the energizing principle (i3éa xa) évépyea) of things. Theophilus (4d Autolyc., ii. 10, 24) taught that the Logos was in eternity with God as the Adyos évdidGeros, the counsellor of God, and that when the world was to be created God sent forth this counsellor (cduBovros) from Himself as the Adyos mpoopinds, yet so that the begotten Logos did not cease to be a part of Himself. With Hippolytus (Lefut,, x. 32, &c.) the Logos, produeed of God's own substance, is both the divine intelligence that appears in the world as the Son of God, and the idea of the universe immanent in God. The early Sabellians ee Euseb., Hist. Hccl., vi. 33; Athan., Contra Arian,, iv.) held that the Logos was a faculty of God, the divine reason, iminanent in God eternally, but not in distinct per- sonality prior to the historical manifestation in Christ. Origen referring the act of creation to eternity instead of to time, affirined the eternal personal existence of the Logos. In relation to God this Logos or Son was a copy of the original, and as such inferior to that. In relation to the world he was its prototype, the iééa ide@v, and its redeeming pawer (Contra Cels., v. 608; Frag. de Princip., i, 4; De Princip, i. 109, 324).

Literature.—In addition to the histories of philosophy (é.g,, those of Ritter, Ueberweg, Zeller, &c.), the commentaries on Jolin's Gospel (Liieke, Godet, West- eott, &e.), and the systems of Biblieal theology (Ochler, Sehultz, Immer, Weiss, &e.), the following writings deserve special notiee:—Schiirer,' Lehrb. der N.-T. Zeitgeschichie; Hausrath, Meu-Testamentliche Zeiigeschichie; Heinze, Lehre vom Logos in der griechischen Philosophie; Soulier, La Doctrine du Logos; Gfrérer, Philo; Siegfried, Philo, Dachne, Geschichtliche Darstellung der Jiidisch-alexandrinischen Religions-Philosophie; Dorner, History of

the De- velopment of the Doctrine of the Person of Christ ; Huber, Philosophie der Kirchen- vdter; Weber, System der Alt-Synagogalen Paldstinischen Theologie, Grossmann, Quexstiones Philonex. (S. D. F. 8.)

LOGRONO, an inland province of Spain, the smallest of the eight modern divisions of Old Castile, is bounded on the N, by Burgos, Alava, and Navarre, on the E. by Navarre and Zaragoza, on the S. by Soria, and on the W. by Burgos. The area is 1945 square miles, with a popu- lation in 1877 of 174,425. It belongs entirely to the basin of the river Ebro, which forms its northern boundary except for a short distance near San Vicente, and is now navigable throughout the entire length of the province; its drainage takes place chiefly by the rivers Tiron, Oja, Najerilla, Iregua, Leza, Cidacos, and Alhama, all flowing in a north-easterly direction. The portion skirting the

Ebro forms a spacious and for the most part fertile undulating plain, called La Rioja in its western part; but in the south Logrofio is considerably broken up by offshoots from the sierras which separate that river from the Douro, In the east the Cerro de Lorenzo rises to a height of about 7725 feet, and in the south the Pico Santa Ines is upwards of 7380 feet. The mineral resources, which are believed to be considerable, are as yet undeveloped. The products of the province are chiefly cereals, good oil and wine (especially in the Rioja), fruit (except oranges and lemons), silk, flax, and honey. The industries, which are unimportant, include spinning and weaving. Logrofiois traversed by the Ebro valley railway, which connects Miranda del Ebro with Zaragoza; on this line are situated all the towns of the province with a population exceeding 5000—Haro, Logrojio, Calahorra, and Alfaro.

Loerofo, capital of the above province, is situated on the right bank of the Ebro, which is here crossed by a handsome stone bridge of twelve arches, dating from 1138; the surrounding plain is well cultivated and fertile, producing the rich Rioja wine. The city is the seat of the usual provincial authorities, civil and military, It has a theatre, and several

hospitals and convents, The parish church claims great antiquity, The population in 1877 was 13,393; the trade and industries are unim-portant,

The district of Logrofio was in ancient times inhabited by the Berones or Veroncs of Strabo and Pliny, and their Varia is to be identified with the modern suburb of the eity of Logroho now known as Varea or Barea. The place fell into the hands of the Moors in the 8th century, but was speedily retaken by the Christians, and under the name of Lucronius appears with frequency in medieval history. Logroig was the birthplace of the painter Navarrete on ne and of Espartero ; the latter died there on January 9,

1879.

LOGWOOD is a valuable dye-wood, the product of a leguminous tree, Hematoxylon campechianum, native of Central America, and grown also in the West Indian Islands, The tree attains a height not exceeding 40 feet, and is said to be ready for felling when about ten years ald. The wood, deprived of its bark and the sap-wood, is sent into the market in the form of large blocks and billets. It is very hard and dense, and externally has a dark brownish-red colour; but it is less deeply coloured within. The best qualities come from Campeachy, but it is obtained there only in small quantity. A large export trade in logwood of good quality is carried on from Hon- duras and Jamaica, and inferior qualities are exported from St Domingo, Martinique, Guadaloupe, &c. The wood was introduced into Europe as a dyeing substance soon after the discovery of America, but for many years (from 1581 to 1662) its use in England was prohibited by legislative enactment on account of the inferior dyes which at first were produced by its employment.

The colouring principle of logwood exists in the timber in the form of a glucoside, from which it is liberated as hematoxylin or hematin by fermentation. Hematoxylin was first isolated by Chevreul in 1810, and its constitution was subsequently investi- gated by Erdmann, who found it to have the formula C,gH,40,. It forms two crystalline hydrates, the principal combination being with three molecules of

water. This hydrate, C,,H,,0,+3H,0, is a colourless body very sparingly soluble in cold water, but dissolv- ing freely in hot water and in alcohol. By exposure to the air, especially in alkaline solutions, hematoxylin is rapidly oxidized into hgmatein, with the development of a fine purple colour. The reaction consists in the elimination of two atoms of hydrogen, thus :—hematoxylin hydrate (C,,H,,0,+3H,0)+O= hematein (C\¢H,.0,+8H,O)+H,O0. This reaction of hematoxylin is exceed- ingly rapid and delicate, rendering that body a valuable laboratory test for alkalies. 1t is remarkable that the difference of two atoms of hydrogen between colourless hematoxylin and coloured hematcin is precisely that which exists between the white and the blue forms of indigo. By the action of hydrogen and sulphurous acid, hematein is easily reduced to hematoxylin.

Logwood is prepared for use by dyers, &c., in the form of chips and raspings, and as a solid brittle black extract. Chipped log- wood is moistened with water and spread in thin layers till a gentle fermentation sets up, whereby, under the influence of liberated ammonia, hematoxylin is formed from the glucoside. By exposure to the air, through repeated turnings of the mass, hematein is developed from the hematoxylin, and the chips gradually become coated with the brilliant metallic green crystals of hematein. Logwood extract, largely used in calico printing, is obtained from oxidized chips and raspings by lixiviation, the solution being con- centrated at as low a temperature as possible.

The principal use of logwood is for dyeing wool and woollen goods, on which it produces, with various mordants, shades of blue from a light lavender to a dense blue-black, according to the amount of logwood used. It is more employed in combination with other dye-stuffs than as the sole tinctorial agent, the best and most permanent blacks on wool, known as woaded blacks, being first dyed blue in the indigo vat, and finished black with logwood and bichromate of potash. In calico-printing logwood is used to produce steam purples, for the production of which the calico is mordanted with stannate of soda, and

printed with a strong solution of logwood extract thickened with starch. By steaming, the hematein of the logwood combines with binoxide of tin precipitated in the fibre, and thus develops a bright purple colour. Logwood blacks, which are a standard product of print works, are produced by mordant- ing with iron liquor, passing the calico through a logwood solution, and developing and fixing the colour by treatment with a weak solution of bichromate of potash. Logwood blacks assume a bright red tint by the action of dilute acids, a test by which they can readily be distinguished from aniline and other fast blacks. Logwood is also largely used in the preparation of INK (q.v.), and to a small extent in medicine. The imports of logwood into the United Kingdom during the year 1880 amounted to 69,280 tons, the estimated value of which was £192,392.

LOHARDAGA, or Lowarpucaa, a district in the lieu- tenant-governorship of Bengal, India, between 22° 20’ and 24° 39’ N. lat. and 83° 22’ and 85° 56’ E. long., is bounded on the N. by Hazéribagh and Gaya, on the N.W. and W, by Mirz4pur district and Sargujé and Jashpur states, and on the §.E. and E. by Sinhbhim and Manbhim districts. It comprises Chutid NAgpur proper, and the Palamau subdivision. Chuti&é Nagpur is an ele vated table-land, forming the central and south-eastern portion of Lohdrdag4 district; its surface is undulating, and the slopes of the depressions lying between the ridges are cut into terraces covered with rice. PalaAmau, which forms the north-western portion of the district, consists on the east and south of spurs thrown off from the plateaus of Hazaribigh and Chutia Nagpur, while the remainder of the tract is a tangled mass of isolated peaks and long irregular stretches of broken hills. ‘The average elevation of Palamau is about 1200 feet above sea-level, but some peaks rise to over 3000 feet. This part of the district contains no level areas of any extent, except the valleys of the North Koel and Amanat rivers, to which rice cul- tivation is confined. The principal rivers of Lohardaga, are the Subarnarekhé and the North and South Koel. The entire district was probably at one time overgrown with dense forest, but the forest area has been continually dwindling, owing to the spread of cultivation and the practice of girdling the sd/ trees for resin.

The census of 1872 disclosed a total population of 1,237,123

(621,548 males and 615,575 females), spread over an area of 12,044 square miles ; of these only 91 were returned as Europeans and 3 as of mixed race. The aboriginal clement is very strongly repre- sented—the Mundas numbering 163,051; Kols, 132,104 ; and Urdons, 151,810. The most numerous among the semi-aboriginal tribes are—the Bhuiyds, 45,008; Kharwars, 33,573 ; Bhogtas, 38,452; and Dosdadhs, 25,223. The Hindus number 741,952, and Mohammedans 58,211. The Christian population is larger than in any other Bengal district, except the inctropolitan one of the

| to about the first week in October.

Twenty-four Parganas. In 1872 the total Christian population numbered 12,781, of whom 12,687 were natives, nearly all be- longing to the aboriginal tribes of Mundas and Uraons. Most of them are poor, but they possess considerable influence, and are rising in public esteem. The two missions are the German Lutheran and Church of England, which successfully work together side by side. The population is entirely rural, Ranchi town (12,086) being the only place with more than 5000 inhabitants. Rice forms the staple crop ; other crops are wheat, barley, Indian corn, millets, peas, gram, oilseeds, pdn, cotton, and tobacco. Opium cultivation was introdueed in 1869, and in 1874-75 yielded 245 ewts. There are two small tea plantations. Mildew and blights occasionally attack the crops; droughts seldom affect any considerable area, The principal trading place is Garwa in Palamau. Stick lac, resin, catechu, silk cocoons, hides, oil-seeds, ght, cotton, and iron are here collected for exportation; while ricc and other food grains, brass vessels, piece goods, blankets, broad cloth, silk, salt, tobacco, spices, drugs, and beads are brought to market for local consumption. The manufactures consist of shell-lac, inferior articles of brass and iron work, coarse cloth, blankets, mats, baskets,‘rope, and rude pottery. Iron, lime, and soapstone are worked in small quantities; gold is washed by the poorer classes from the sands of the rivers. An important coal-bearing tract, known as the Daltonganj coal- field,

covers an area of nearly 200 square miles, and lies partly in the valley of the Koel river, and partly in that of the Amanat. The net revenue of the district in 1870-71 was £29,900, and the expenditure £22,563. The schools in 1876-77 numbered 303, with 8088 pupils. The climate of the table-land of Chutiad Nagpur is said to be superior to that of any other part of India, except the lower ranges of the Himalayas. The hot weather extends over almost six weeks, commencing about the 20th April, but is never really oppressive. The rainy season lasts from the middle of June The principal diseases are malarious fever and rheumatism of a severe type.

LOIRE (Lat., Liger), the first of the rivers of France in length of course (626 miles) and extent of basin (44,979

| square miles), has its headwaters in the great central

plateau, and is considered to take its rise in the Gerbier de Jonc, in the department of Ardéche, at a height of 4504 feet above the sea,—though the Allier branch, which has its source about 30. miles west, in the department of Lozére, at the foot of Maure de la Gardille, 4668 feet above the sea, has an almost equal course. The two streams continue to run parallel till the upper Loire turns westward and is joined by the Allier in the neighbourhood of Nevers. All the more important affluents of the upper and middle part of the Loire—as the Cher, the Indre, the Vienne, respect- ively 198, 152, and 231 miles in length—have their gather- ing grounds in the central plateau. In the north-east the basin of the Seine comes so close (at one place to within 6 or 7 miles) that the versant towards the Loire has hardly anything to contribute ; and it is not till within 65 miles of the estuary that we find an important tributary, the Maine, bringing down the drainage of the Brittany plateau. At certain seasons the Loire is navigable for ships as far as Nantes (33 miles), for boats as far as La Noirie (other 518 miles), and for rafts as far as Retournac; but for six months of the year navigation is practically impossible.

In the volume of water there is all the irregularity ofa mountain torrent; at the Bec d’Allier, for instance, —the meeting point of the two head streams,—while the maximum current is 358,200 cubic feet per

second, the minimum is 10,600 cubic feet, and above Orleans the range lies between 31,800 and 850. During the drought of summer thin and feeble streams thread their way between the sandbanks of the channel; while at other-times a stupendous flood pours down and submerges wide reaches of land. In the middle part of its course the Loire traverses the western portion of the undulating Paris basin, with its Tertiary marls, sands, and clays, and the alluvium carried off from these renders its lower channel inconstant ; the rest of the drainage area is occupied by crystalline rocks, over: the hard surface of which the water,' undiminished by absorption, flows rapidly into the streams, A fall of from 3 to 4 inches over the whole river basin is sufficient to pour 35,320, 000,000 cubic feet of water into the channels, When the rain is general over the whole area, the floods on the different tributaries reach the main river at different times; but when, throngh any cause, two or more of them arrive at the same time, inundations of the most serious character result. Attempts tocontrol the river must have begun at avery early date, and by the close of the Middle Ages the bed between Orleans and Angers was enclosed by dykes 10 to 18 fect high. In

LOiks

1783 a double line of dykes or éurctes 23 feet high was completed from Bee d'Allier downwards. This great work had, however, the serious defect that the channel was so much narrowed that the embankments are almost certain to give wayas soon as the water rises 16 feet (the average rise is about 14, and in 1846 it was more than 22). In moremodern times the importance of the water-way from the sea to Nantes led to the embanking of the lower part of the course ; but instead of a depth of 16 feet being sccured, as the engineers anticipated, there is no morc at full tide than 13 feet. One of the practical results of this state of matters has been the commercial development of Saint Nazaire and Paimbceuf, and the comparative decline of Nantes as a great shipping port. Besides the gencral embankments of the river, several of the towns along the Loire have constructed special works to defend themselves against the floods ; Tours, the most exposed of all, is surrounded by a circular dyke.

Various schemes for the systematic regulation of the Loire have beeu discussed. It has been proposed to construct in the upper valleys of the several affluents a number of gigantic dams or reservoirs from which the water, stored during flood, could be let off into the river as required. A reservoir of this kind, formed by the engineer Mathieu at the village of Pinay, about 18 miles above Roanne, and capable of retaining from 3500 to 4500 million cubic feet of water, has greatly diminished the furce of the floods at Roanne, and maintained the comparative equilibrium of the current during the dry season. There is a canal (157 miles) along the left bank of the Loire between Roanne and Briare; and the Canal du Berri connects this with the navigable part of the Cher. The Canal du Centre extends from Digoin on the Loire to Chalon on the Sadne; the Canal du Nivernais and tle canals starting from Orleans aud Briare communicate with the Seime; and the Nantes canal opens up the way to Lorient, Brest, and Diuan. The canals of the Sauldre and the Dive (20 and 26 miles respectively) arc mainly for irrigation purposes.

See H. Blerzy, Torrents, fleaves, et canaux de la France (Paris, 1878), and his papers in Rev. des Deux Mondes, February and March

1875.

LOIRE, a department of central France, made up of the old district of Forez and portions of Beaujolais and Lyonnais, all formerly included in the province of Lyonnais, lies between 45° 15’ and 46° 15’ N. lat. and between 3° 40’ and 4° 45’ E. long., and is bounded on the N. by the department of Sadne-et-Loire, on the E. by those of Rhéne and Istre, on the 8. by Ardéche and Haute-Loire, and on the W. by Puy de Déme and Allier. Its extreme length is 78 miles from north-west to south-east, and its extreme breadth from east to west is about 43 miles, the area being 1838 square miles. Until 1790 it constituted a single department along with that of Rhéne. About an eighth part of the whole area belongs to the basin of the Rhone. The Loire, which has a fall within the department from 1365 feet to 886 feet, traverses alternately a series of narrow gorges and of broad plains, the beds of ancient lakes, including that of Forez between St Rambert and Feurs,

and, lower down, that of Roanne. Of its affluents the most important are the Lignon du Nord, the beautiful valley of which has been called “ La Suisse Forezienne,” and the Aix on the left, and on the right the Ondaine (on which stand the industrial towns of Chambon-I’eugerolles and Firminy), the Furens, and the Rhin. To the Rhone the department contributes the Gier, upon which are situated the industrial towns of St Chamond and Rive de Gier, and which forms a navigable channel to the Rhone at Givors. From Mont Pilat descends the Deédme, in the valley of whicli the workshops of Annonay begin. In the west are the Forez mountains, which separate the Loire basin from that of the Allier ; their highest point (Pierre sur Haute, 5381 feet) is 12 miles west from Montbrison. They sink gradually towards the north, and are successively called Bois Noirs (4239 feet), from their woods, and Monts de la Madeleine (3600 to 1640 fect). In the east the Rhone and Loire basins are separated by Mont Pilat (4705 feet) at the north extremity of the Cevennes, and by the hills of Lyonnais, Tarare, Beaujolais, and Charolais, none of which rise higher than 2950 or 3280 feet. The climate of the department varies according to the elevation: on the heights it is cold and healthy, unwholesome in the marshy plain of Forez, mild in the valley of the Rhone. The

annual rainfall is 39°37 inches on the Forez mountains, but only 24°79 at Roanne. More than half of the area consists of arable lands ; one-seventh is occupied by forests, and one-seventh by meadows.

The plains of Forez aud Roanne are the two most important agricultural districts, but the total production of grain within the department is insufficient for the requirements of the population. The pasture lands of Forez support a large number of horned cattle, sheep, goats, and pigs. Fairly good red wine is also grown within the department ; potatoes, leguminous plants, beetroot, hemp, and colza are also cultivated. Poultry are reared, and bee-keeping is a considerable industry. Among the hills replantation has been set on foot. The Bois Noir forests yield good-sized pines and large quantities of wood for mining purposes, The so-called Lyons chestnuts are to a

large extent obtained from Forez ; the woods and pasture lands of Pilat yield medicinal plants, such as mint. The chief wealth of the department, however, lies in the coal deposits in the St Etienne basin, the second in importance in France. The basin, which stretches from south-west to north-east between Firminy and Rive de Gier, is about 20 miles in length and 5 in breadth. In 1881 the output amounted to 3,454,612 tons of coal and anthracite, giving employment to 12,000 workmen below and 5000 above. The presence of coal has naturally encouraged various forms of the metal-working industries, At St Etienne there is a national factory of arms, in which as many as 6000 have been employed; apart from other factories of the same kind carried on by private individuals, the production of hardware occupies 7000 persons ; locks, common cutlery, chain cables for the mines, filcs, and nails are also made. Cast steel is largely manufactured, the aggregate production of all sorts of steel amounting in 1880 to 114,629 tons; the Loire workshops supply the heaviest construc- tions required in naval architecture. The glass iudnstry has its centre at Rive de Gicr. St Htienne employs more than 60,000 persons in the fabrication of silk ribbons, to an annual value of £4,000,000; over and above this must be reckoned the manu- facture of elastic ribbons and laces, and the dressing of raw silks. The arrondissement of Roanne manufactures cotton stuffs upon 11,000 looms, each employing three persons. That of Montbrison produces table linen, In the mountains between Haute-Loire and Puy de Déme the women make black laces and embroidery. The department has numerous flour-mills, paper works, tanyards, boat-building yards, silk-spinning works, and velvet, plush, and hat factories. ‘There are three arrondissements—St Etienne, Montbrison, and Roanne. The capital is St Htienne. The population, 290,903 in 1801, was 590,613 in 1876.

LOIRE, HavutTe-, a department of central France, made up of Velay and portions of Vivarais and Gévaudan, three districts formerly belonging to the old province of Languedoc, of a portion of Forez formerly belonging to Lyonnais, and of a portion of lower Auvergne, is bounded on the N. by Puy de Dome and Loire, on the E. by Loire and Ardéche, on the 8. by Ardéche and Lozére, aud on the W. by Lozére and Cantal, and lies between 44° 40’ and 45° 25’ N. lat. and between

3° 5’ and 4° 30’ E. long., having an extreme length of 68 miles, a maximum breadth of 54 miles, and an area of 1916 miles. It belongs almost wholly to the Loire basin, but a few square kilometres to the north of Mont Mézenc are drained by the Erieux, a tributary of the Rhone, The highest point, Mont Mézenc, on the borders of Ardéche, is 5745 feet; it belongs to the Cévennes system, which sends ramifications throughout the entire department, giving it a mean altitude of 2950 feet. Reckoning from east to west are the Boutiéres, the Mégal.or Meygal, the Velay hills, those of La Margeride, and finally the Luguet. The first mentioned ridge separates Haute-Loire from Ardéche, and ranges from 3280 to 4590 feet; it has a crust of lava thrown out from Mont Mézenc; efforts towards replanta- tion are being made. Meygal presents a series of jagged peaks, recalling the Pyrenees on a small scale. It also has been covered by an immense flow of lava some 37 miles long and 490 feet thick, through which the Loire has forced a passage by means of gorges more than 1600 feet in depth. The highest point of the Meygal properly so called is upwards of 4590 feet. The Velay hills, which separate the Loire from the Allier (mean height about 3300 feet), consist of granitic rocks overlaid with the eruptions of more than one hundred and fifty craters, one of which

is now occupied by the singular lake of Bouchet. West- ward from the Allier are the forest-clad granitic hills of La Margeride, which rise toa height of nearly 5000 feet. The Luguet massif (3300 feet) rises in the north-west of the department on the left bank of the Alagnon, a tributary of the Allier. The river Loire, to which the department owes its name, enters at a point 16 miles distant from its source, and 2923 feet above the level of the sea. Within the 63 miles of its course through the eastern portion of the department, first in a northerly and after- wards in a north-easterly direction, it falls 1565 feet, The Allier, which joins the Loire at Nevers, traverses the western portion of Haute-Loire in a northerly direction, entering at a point 25 miles distant from its source, and 2369 feet above the sea; it traverses a narrow and deep valley overhung by lofty hills, and falls 1090 feet. The chief affluents of the Loire within the limits of the depart- ment

are the Borne on the left, joining it near Puy, and the Lignon, which descends from the Mézenc, between the Boutieres and Meygal ranges, on the right. The climate, owing to the altitude, the northward direction of the valleys, and the winds from the Cevennes, is cold, the winters being long and rigorous. Storms and violent rains are frequent on the higher grounds, and would give rise to serious inundations were not the rivers for the most part confined within deep rocky channels. Two-fifths of the area is occupied by arable lands, one-fifth by natural meadow and by orchards, and a somewhat smaller propor- tion by wood. The rest consists of pasture lands, vine- yards, and uncultivated lands.

Numerous cattle of the celebrated Mézenc breed are reared, and also sheep and mules. The Se raised are wheat, meslin, rye, barley, oats, maize, potatoes (in large quantity), hemp, colza, and second-class wine. ‘The woods yield pine, fir, oak, and beech. Large quantities of aromatic and pharmaceutical plants are found in the Mézenc massif. The department has two coal basins, —those of Brassac and Langeac, both on the Allier; in 1880 their total output was 225,153 tons. Copper, iron, zinc, argentiferous lead, arsenic, antimony, barytes, and fluor spar are also obtained, and there are good quarries of trachyte and limestone, as well as nume- rous unutilized mineral springs. Lace-making in various materials is the most extensive industry, occupying from 100,000 to 130,000 persons, and producing goods to the annual valuc of about £1,000,000. Ribbons and cloth are manufactured to some extent, and silk-dressing, wool-spinning, caoutchouc-making, various kinds of smith work, paper-making, glass-blowing, brewing, wood-sawing, and flour-milling are also carried on. There are three arrondisse- ments—Puy, Brioude, and Yssingeaux ; the capital is Puy. The population in 1876 was 313,721.

LOIRE-INFERIEURE, a maritime department of western I’rance, is made up of a portion of Brittany on the right and of the district of Retz on the left of the Loire, and lies between 46° 45’ and 47° 40’ N. lat. and between 55’ and 2° 32’ W. long., being bounded on the W. by the ocean, on the N. by Morbihan and Ille-et-Vilaine, on the E. by Maine-et-Loire, and on the 8, by Vendée. Its greatest length from east to west

is 76 miles, its greatest breadth 65 miles, and its area 2654 square miles. The surface is very flat, and the highest point, in the north on the borders of Ille-et-Vilaine, is only 377 feet. The line of hillocks skirting the right bank of the Loire, and known as the “sillon de Bretagne,” nowhere attains a heicht of 265 feet ; below Savenay they recede from the river, and the meadows give place to peat bogs. North of St N azaire the Grande Britre, measuring 9 miles by 6, and rising scarcely 10 feet above the sea-level, still supplies old trees which can be used for joiner work; a few scattered villages occur on the more elevated spots, but communica- tion is effected chiefly by means of the canals which inter- sect it. The district on the south of the Loire lies equally low ; its most salient feature is the lake of Grandli

_ r ake o ndlieu, covering an area of 27 square miles, and surrounded by low and marshy ground, but so shallow (6°5 feet at most) that

drainage would be comparatively easy. The Loire has a course of 68 miles within the department ; its width above Nantes varies from 1300 to 3280 feet, and its volume at Nantes, where the tide begins to be felt, is never under 700 cubic metres per second. It has numerous islands. At Paimbceuf it is nearly 2 miles broad, but narrows again opposite St Nazaire before finally entering the ocean. The bed is not sufficiently regular to allow easily the passage of vessels drawing more than 10 feet of water. On the left bank a canal of 9 miles is about to be opened between Pellerin, where the dikes which protect the Loire valley from inundation terminate, and Paimbeuf. The principal towns on the river within the department are Ancenis, Nantes, and St Nazaire (one of the most important conimercial ports of France) on the right, and Paimbceuf on the left. The chief affiuents are on the right the Erdre and on the left the Sévre, both debouching at Nantes. The Erdre has a succession of broad lakes which give it the appearance of a first class river; it forms part of the canal from Nantes to Brest. The Sévre, on the other hand, is hemmed in by picturesque hills ; at the point where it enters the department it flows past the famous castle of Clisson. Apart from the Loire itself, the only navigable channel of importance within

the department is the Nantes and Brest canal already referred to, fed by the Isac, a tributary of the Vilaine, which separates Loire-Inférieure from [Ille-et-Vilaine and Mor- bihan. The climate partakes of the general Armorican character in respect of humidity, but is Girondine in its mildness. At Nantes the mean annual temperature is 54°°7 Fahr., and there are one hundred and twenty-two rainy days, the annual rainfall being 25°6 inches. Of the entire area nearly two-thirds is arable; one-seventh is occupied by meadows; and vineyards, woods, heath, lakes, pools, and marshes occupy the remainder.

The quantity of live stock is considerable :—320,000 horned cattle, 180,000 sheep, 80,000 pigs, 38,000 horses, asses, and mules, Poultry also is reared, and there is a good deal of bee-keeping, Wheat, rye, buckwheat, oats, and potatoes are produced in great abundance; leguminous plants are alee largely cultivated, especially near Nantes. Beetroot, hemp, and chestnuts represent, along with wine and cider, the chief remaining agricultural products. The woods are of oak in the interior and pine on the coast. The department has deposits of tin, lead, and iron, which are hardly wrought, if at all. North-west from Ancenis a little anthracite is obtained from a coal-bed which is a prolongation of that of Anjou. The salt marshes, about 6000 acres in all, occur for the most part between the mouth of the Vilaine and the Loire, and on the Bay of Bourgneuf. The salt manufacture, which as late as 1874 pro- duced 43,475 tons, is now decaying. There are slate quarries in the north-east of the department, and the granite of the sea-coast and of the Loire up to Nantes is quarried for large blocks, while the limestone about Chateaubriant occupies numerous kilns, The industries of the department are well developed : steam-engines are built for Government at Indret, a few miles below Nantes; the forges of Basse-Indre are in good repute for the quality of their iron ; and the production of the lead-smelting works at Couéron amounts to several millions of francs annually. There are also considerable foundries at Nantes, Chantenay, and St Nazaire, and shipbuilding yards at Nantes, St Nazaire, Paimbceuf, and Croisic. Among other industries may be mentioned the preparation of pickles and preserved meats at Nantes, the curing of sardines at Croisic and in the neighbouring communes, salt-refining, the great sugar refinery at Nantes, and the tobacco

manufacture also there. Fishing is prosecuted along the entire coast. Nantes, formerly one of the most important of French ports, has now given way before St Nazaire, the trade of which in 1878 exceeded 1,500,000 tons. The principal imports are coal, colonial wares, wood, metals, manure ; the exports are wine, salt, preserved meats and pickles, flour, refined sugar, and butter. The department is divided into five arrondissements—Nantes, Ancenis, Chateaubriant, Paimbceuf, and St Nazaire; Nantes is the capital. The population in 1876 was 612,972, an increase of 248,667 since 1801.

LOIRET, a department of central France, made up of three districts of the ancient province of Orléanais,— Orléanais proper, Gatinais, and Dunois,—together with portions of the Isle of France and Berri, lies between

47° 30’ and 48° 20’ N. lat. and between 1° 30’ and 3° 8’ E. long., and is bounded on the N. by Seine-et-Oise, on the N.E. by Seine-et-Marne, on the E. by Yonne, on the 8. by Niévre and Cher, on the 8.W. by Loir-et-Cher, and on the N.W. by Eure-et-Loir ; its greatest length, from north-west to south-east, is 75 miles, its greatest breadth, from north to south along the meridian of Paris, 50 miles, and its area 2614 square miles. The name is derived from the Loiret, a stream which issues from the ground some miles to the south of Orleans, and after a course of about 7 miles falls into the Loire; its large volume gives rise to the belief that it is a subterranean branch of that river. The Loire traverses the department by a broad valley which, though frequently devastated by disastrous floods, is famed for its rich tilled lands, its castles, its towns, and its vine- clad slopes. To the right of the Loire are Gatinais (capital Montargis) and Beauce ; the former district is so named from its gdtines or wildernesses, of which saffron is, along with honey, the most noteworthy product ; Beauce, on the other hand, a monotonous tract of corn-fields without either tree or river, has been called the granary of France. Between Beauce and the Loire is the extensive forest of Orleans, which is slowly disappearing before the advances of agriculture. South of the Loire is Sologne, long barren and unhealthy

from the impermeability of its subsoil, but undergoing gradual improvement in both respects by means of pine plantation and draining and manuring operations. The surface of the department presents little variation of level ; the highest point (on the borders of Cher) is 900 feet above the level of the sea, and the lowest (on the borders of Seine-et-Marne) is 220 feet. The watershed on the plateau of Orleans between the basins of the Seine and Loire, which divide Loiret almost equally between them, is almost imperceptible. The lateral canal of the Loire from Roanne stops at Briare; from the latter town a canal connects with the Seine by the Loing valley, which is joined by the Orleans canal at Montargis. The only important tributary of the Loire within the department is the Loiret ; the Loing, a tributary of the Seine, has a course of 40 miles from south to north, and is accompanied throughout first by the Briare canal and afterwards by that of Loing. The Essonne, another important affluent of the Seine, entering Loiret at Malesherbes, takes its rise on the plateau of Orleans, as also does its tributary the Juine. The department has the climate of the Sequanian region, the mean temperature being almost the same as that of Paris; the number of rainy days is one hundred and twenty, and the rainfall varies from 18°5 to 27‘5 inches according to the district, that of the exposed Beauce being smaller than that of the woody Sologne. Two-thirds of the entire area is cultivable ; between one-sixth and one-seventh is under wood ; vineyards occupy one-twentieth ; and the remainder is taken up by meadows, heath, and marsh.

A large number of sheep, cattle, horses, asses, pigs, and goats are reared; poultry, especially geese, and bees are plentiful. The yield of wheat and oats is much in excess of the consumption; the erops of rye, barley, meslin, potatoes, beetroot, colza, and hemp are also very important. Wine is abundant, but of inferior quality. Buek- wheat supports bees by its flowers, and poultry by its seeds. Saffron is another souree of wealth. The woods consist of oak, elm, birch, and pine ; fruit trees thrive in the department, and Orleans is a great centre of nursery gardens. The industries are brick and tile making, and the manufacture of faience, for whieh Gien is one of the most important eentres in Franee. The Briare manufacture of poreelain buttons and pearls employs 1500 workmen. Flour- mills are very numerous. There

are iron and brass foundries, whieh, along with agricultural implement making, bell-founding, and the manufacture of pins, nails, and files, represent the chief metal- working industries. The production of hosiery, wool-spinning, and various forms of wool manufacture are also engaged in. _ A large quantity of the wine grown is made into vinegar (vinaigre d'Orléans). The tanneries produce excellent leather ; and paper-making, sugar-

refining, wax-bleaching, and the manufacture of eaoutelione (in one factory) complete the list of industries. The exports are principally

eorn, flour, wine, vinegar, live-stock, and wood. The four arron-dissements are those of Orleans, Gien, Montargis, and Pithiviers. The capital is Orleans. The population in 1876 was 360,908 an inerease of 70,764 sinee 1801.

LOIR-ET-CHER, a department of central France, con- sists of a small portion of Touraine, but chiefly of portions of Orléanais proper, Blésois, and Dunois, districts which them- selves formerly belonged to Orléanais, It lies between 47° 11' and 48° 8' N. lat. and between 0° 35' and 2° 15' E. long., and is bounded on the N, by Eure-et-Loir, on the N.E. by Loiret, on the 8.E. by Cher, on the S. by Indre, on the S.W. by Indre-et-Loire, and on the N.W. by Sarthe, the greatest length (north-west to south-east) being 78 miles, maximum breadth 31 miles, and the area 2452 miles. Its name is derived from the Loir and the Cher, by which it is traversed in the north and in the south respectively. The Loire divides it into two nearly equal portions, the district on the right of the Loire being known as Beauce, while that on the right of the Loir again is called Perche ; on the left of the Loire is Sologne. 'The surface of Perche is varied, and reaches a maximum heiglit of 840 feet; its woods alternate with hedged fields and orchards, and rapid rivulets water the green valleys. Beauce is a rich agricultural country, where the monotony of the endless fields of corn is broken only by the houses grouped together in villages, or by the stacks which surround them. Sologne was formerly a region of forests, of which that of Chambord is one of the last remains. Its soil, formerly barren and unhealthy, has

been considerably improved within recent years. The Cher and Loir traverse pleasant valleys, occasionally bounded by walls of tufa, in which numerous dwellings have been excavated; the stone ex- tracted, after hardening by exposure to the air, has been used for building purposes in the nearer towns. Within the department the Loir has a course of 56 miles, the Cher of 50, and the Loire of 37. With the help of the Berri canal the last-mentioned is navigable throughont. The chief remaining rivers of the department are the Beuvron, which flows into the Loire on the left, and the Sauldre on the right of the Cher. All these named have a south- westerly course, following the slope of the department. The climate is temperate and mild, and healthy if Sologne be left out of account. The mean temperature ranges between 52° and 53° Fahr., and the rainfall is 25:4 inches. Of the total area more than a half is arable; one-sixth is under wood, and one-sixth is waste; vineyards, meadows, and pasture lands occupy the remainder.

Sheep are extensively reared, and the Perche breed of horses is much sought after for its combination of lightness with strength. There are more than twenty thousand beehives within the depart- ment. Beauce is the most productive district ; in 1878 it yielded 342,000 quarters of wheat, 556,000 of oats, and 1,500,000 bushels of potatoes, besides meslin, rye, barley, buckwheat, bectroot, maize, colza, and hemp. In the same year the production of wine amounted to 27,000,000 gallons, the most valuable being that of Céte du Cher. The forests are an important souree of wealth. Sologne supplies pine and birehwood for furnace fuel, and in the neighbourhood of Blois there are oak, elm, and ehestnut_planta- tions. In the river valleys fruit trees and nursery gardens are numerous. Formerly the speciality of Loir-et-Cher was to supply Europe with gun flints. Building stones, and also elay for bricks and pottery, are also abundant. The chief industries are the manufacture of cloth at Romorantin (where spinning, ribbon- making, and tanning are also earried on), of white leather and gloves at Vendéme, distilling, glass-making, paper-making, pottery- making, and the like. The exports are wine, brandy, vinegar, wood, cloth, wool, leather, grain, legumes, wax, and leeches. Of the eastles which adorn the department the finest and most famous is that of Chambord, near the left bank of the Loire opposite Blois (the eapital). The three

arrondissements are those of Blois, Romor- antin, and Vendéme. In 1876 the population was 272,634, an inerease of 55,721 sinee 1801.

LOJA, or Loxa, a town of Spain, in the province of Granada, lies in a beautiful valley through which flows the Genil, here crossed by a Moorish bridge, about 33 miles

by rail west from Granada. ‘The situation is very steep, and the streets in consequence are extremely crooked and irregular. The castle stands on a rock in the centre of the town, which, from being the key to Granada, was once a place of great military importance. The manufactures of Loja consist chiefly of coarse woollens, silk, paper, and leather. Salt is obtained in the neighbourhood. The population in 1877 was 18,249.

Loja, which has sometimes been identified with the ancient Ilipula, or with the Lacibi (Lacibis) of Pliny and Ptolemy, first clearly emerges in the Arab chronicles of the year 890. It was taken by Ferdinand III. in 1226, but was soon afterwards aban- doned, and did not finally fall under the arms of Castile until May 28, 1486, when it surrendered to Ferdinand and Isabella after a siege.

LOKEREN, a town of Belgium, in the province of East Flanders and district of Termonde, on the Durme (a small but navigable stream by which it communicates with the Scheldt), and 11 miles from Ghent on the railway to Antwerp, which is there joined by the lines to Termonde and Alost, and to Selzaete. It is a busy manufacturing place, with cotton factories, ropewalks, and bleach-works, &c, The church of St Lawrence (17th century) has a fine pulpit, representing Jesus in the midst of the doctors. ‘The population of the commune has increased from 11,960 in 1808 to 17,400 in 1876.

LOKMAN, a name famous in Arabian tradition. The Arabs distinguish two persons of this name. ‘The older Lokman was an ‘Adite, and is

said to have built the famous dyke of Ma’rib. He not only escaped the destruction sent on his nation for their refusal to hear the prophet Hud, but received the gift of a life as long as that of seven vultures, each of which is said to have lived eighty years.) The other Lokman, called “ Lokmén the Sage,” is mentioned in the Koran (xxxi, 11), He is said to have been a Nubian slave, son of “Anka, aud to have lived in the time of David in the region of Elah and Midian (Mastdy, i. 110), but the commentators on the Koran (Abu Sa’tid, ii. 336) make him son of Ba‘ura, the son of Job’s sister or daughter. This form of the legend, and many of the stories told of him (D’Herbelot, s.v., but not those given by Nawawy, p. 526), show Jewish influence on the legend, and Derenbourg (Fables de Logmdn le sage, 1850) has pointed out that Ba‘urd seems to be identical with Beor, and that Lokman corresponds to Balaam, the roots of both names meaning “to swallow,” so that the one may be viewed as a transla- tion of the other. In favour of this identification Deren- bourg advances several important and probably conclusive arguments from Jewish tradition; but in view of the divergent accounts given of Lokman it may be questioned whether Jewish influence created or only modified the Arabic tradition. The grave of Lokman was shown on the east coast of the Lake of Tiberias, but also in Yemen and elsewhere (Yakut, iii, 512; D’Herbelot, s.v.).

The name of Lokman is associated with numerous old verses proverbs, and anecdotes of which Freytag, Arabum Proverbia, gives many examples. The fables which pass under his name, and were first printed by Erpenius (Leyden, 1615), are not mentioned by any Arabic writer. They appear to be of Christian origin, and are mainly derived, though not closely copied, from those of Syntipas and sop. They existed in the 13th century (Derenbourg ut supra). The editions are numerous, the book having been much used as an elementary Arabic reading-book. Those of Rodiger (2d ed. 1839, with glossary) and Derenbourg (1850) claim special mention.

LOLLARDS, Tux, were the English followers of John Wickliffe, and were the adherents of a religious movement which was widespread in the end of the 14th and begin-

L Tabary, i, 240; Abulf., ZZ. A., 20; Damiry, ii. 384. The tradition has various forms. Masudy, iii. 366, 375, gives Lokmdn only the age of one vulture. Further details are given by Caussin de Perceval Essai. The vultures of Lokman, especially the seventh, whose name was Lobad, are often teferred to in Arabic poetry and proverbs,

ning of the 15th centuries, and which to some extent maintained itself on to the Reformation. ‘The name is of uncertain origin: it has been traced to a certain Walter Lollard, but he was probably a mythical personage ; some derive it from doliwm, tares, quoting Chaucer (C. 7’, Ship- man’s Prologue)— ‘* This Lollere here wol prechen us somwhat.. . He wolde sowen soine difficulte Or sprengen cokkle in oure clene corn ;”

but the most generally received explanation derives the words from /ollen or lullen, to sing softly. The word is much older than its English use; there were Lollards in the Netherlands as early as the beginning of the 14th century, who were akin to the Fratricelli, Beghards, and other sectaries of the recusant Franciscan type. The earliest official use of the name in England occurs in 1387 in a mandate of the bishop of Worcester against five ‘ poor preachers,” nomine seu ritu Lollardorum confeederatos, It is probable that the name was given to the followers of Wickliffe because they resembled those offshoots from the great Franciscan movement which had disowned the pope’s authority and separated themselves from, the medizval church. The 14th century, so full of varied religious life, made it manifest that the two different ideas of a life of separation from the world which in earlier times had lived on side by side within the medieval church were irreconcilable. The church chose to abide by the idea of Hildebrand and to reject that of Francis of Assisi; and the revolt. of Ockham and the Franciscans, of the Beghards and other spiritual fraternities, of Wickliffe and the Lollards, were all protests against that decision. Hildebrand’s object was to make church government or polity in all respects distinct from civil government—no civil ruler to touch churchman or church possession for trial or punish- ment, taxation or confiscation ; and, in

the hands of his successors who followed out his principles, the church became transformed into an empire in rivalry with the kingdoms, and of somewhat the same kind, only that its territories were scattered over the face of Europe in dio- cesan domains, convent lands, or priests' glebes, its taxes were the tithes, its nobles the prelates. Francis of Assisi had another ideal. Christians, he thought, could separate themselves from the world, in imitation of Christ, by giving up property, and home, and country, and going about doing good and living on the alms of the people. For a time these two ways of separation from the world lived on side by side in the church, but they were really irreconcilable ; Hildebrand's church required power to en- force her claims, and money, land, position, were all sources of power. Church rulers favoured the friars when they found means of evading their vows of absolute poverty, and gradually there came to be facing each other in the 14th century a great political Christendom, whose rulers were statesmen, with aims and policy of a worldly ambi- tious type, and a religious Christendom, full of the ideas of separation from the world by self-sacrifice and of parti- cipation in the benefits of Christ's work by ap ascetic imitation, which separated itself from political Christianity and called it anti-Christ. Wickliffe's whole life was spent in the struggle, and he bequeathed his work to his followers the Lollards. The main practical thought with Wickliffe was that the church, if true to her divine mission, must aid men to live that life of evangelical poverty by Which they could be separate from the world and imitate Christ, and if the church ceased to be true to her mission she ceased to be a church. Wickliffe was a metaphysician and a theologian, and had to invent a metaphysical theory ——the theory of Dominium—to enable him to transfer, In a way satisfactory to himself, the powers and privileges of the church to his company of poor Christians ; but his

followers, who were not troubled with need of theories, were content to allege that a church which held large landed possessions, collected tithes greedily, and took money from starving peasants for baptizing, burying, and

praying, could not be the church of Christ and his apostles, |

who in poverty went about doing good.

Lollardy, was most flourishing and most dangerous to the ecclesiastical organization of England during the ten years after Wickliffe's death. It had spread so rapidly and grown so popular that a hostile chronicler could say that almost every second man wasa Lollard. Wickliffe left three intimate disciples :—Nicolas Hereford, a doctor of theology of Oxford, who had helped his master to translate the Bible into English; John Ashton, also a fellow of an Oxford college ; and John Purvey, Wickliffe's colleague at Lutter- worth, and a co-translator of the Bible. With these were associated more or less intimately, in the first age of Lollardy, John Parker, the strange ascetic William Smith, the restless fanatic Swynderly, Richard Waytstract, and Crompe; and there must have been a large number of preachers who itinerated through England preaching the doctrines of their master. Wickliffe had organized in Lut- terworth an association for sending the gospel through all England, a company of poor preachers somewhat after the Wesleyan method of modern times. '"'To be poor without mendicancy, to unite the flexible unity, the swift obedicnce of an order, with free and constant mingling among the poor, such was the ideal of Wickliffe's 'poor priests' " (¢f: Shirley, Muse. Ziz., p. xl.), and, although proscribed, these " poor preachers," with portions of their master's translation of the Bible in their hand to guide them, preached all over England wherever they could be heard without detection. The Oxford university and many nobles supported them. Lord Montacute, Lord Salisbury, Sir Thomas Latimer of Braybrooke, and several others had chaplains who were Lollardist preachers ; whilst many merchants and burgesses assisted the work with money. The organization must have been strong in numbers, but only the names of those have come down to us who were seized for heresy, and it is only from the indictments of their accusers that their opinions can be gathered. The preachers were picturesque figures in long russet dress down to the heels, who, staff in hand, preached in the mother tongue to the people in churches and graveyards, in squares, streets, and houses, in gardens and pleasure grounds, and then talked privately with those who had

been impressed. The Lollard litera- ture was very widely circulated,—books by Wickliffe and Hereford and tracts and broadsides,—in spite of many edicts proscribing it. In 1395 the Lollards grew so strong that they petitioned parliament through Sir Thomas Latimer and Sir R. Stury to reform the church on Lol- lardist methods, It is said that the Lollard Conclusions printed by Canon Shirley (p. 360) contain the substance of this petition. If so, parliament was told that temporal possessions ruin the church and drive out the Christian graces of faith, hope, and charity ; that the priesthood of the church in communion with Rome was not the priest- hood Christ gave to his apostles; that the monk's vow of celibacy had for its consequence unnatural lust, and should not be imposed; that transubstantiation was a feigned miracle, and led people to idolatry; that prayers made over wine, bread, water, oil, salt, wax, incense, altars of stone, church walls, vestments, mitres, crosses, staves, were magical and should not be allowed; that kings should; possess the jus episcopale, and bring good govern- ment into the church; that no special prayers should be made for the dead; that auricular confession made to the clergy, and declared to be necessary for salvation, was the root of clerical arrogance and the cause of indul-

were against the principles of the New Testament, and were but murdering and plundering the poor to win glory for kings ; that the vows of chastity laid upon nuns led to child murder; that many of the trades practised in the commonwealth, such as those of goldsmiths and ar- mourers, were unnecessary and led to luxury and waste. These Conclusions really contain the sum of Wickliffite teaching ; and, if we add that the principal duty of priests is to preach, and that the worship of images and going on pilgrimages are sinful, they include almost all the heresies charged in the indictments against individual Lollards down to the middle of the 15th century. The king, who had hitherto seemed anxious to repress the action of the clergy against the Lollards, spoke strongly against the petition and its promoters, and Lollardy never again had the power in England which it wielded up to this year.

If the formal statements of Lollard creed are to be got from these Conclusions, the popular view of their controversy with the church may be gathered from the ballads preserved in the collection of Political Poems and Songs relating to English History, published in 1859 by Mr Thomas Wright for the Master of the Rolls series, and in the Piers Ploughman poems. Piers Ploughman's Creed (see Lane-LAND) was probably written about 1394, when Lollardy was at its greatest strength; the ploughman of the Creed is a man gifted with sense enough to see through the tricks of the friars, and with such religious knowledge as can be got from the creed, and from Wickliffe's version of the Gospels, The poet gives usa "portrait of the fat friar with his double chin shaking about as big as a goose's egg, and the plough-man with his hood full of holes, his mittens made of patches, and his poor wife going barefoot on the ice so that

'her blood followed" (arly English Text Society, vol.

xxx., pref., p. 16); and one can easily see why farmers and peasants turned from the friars to the poor preachers, The Ploughman's Complaint tells the same tale. It paints popes, cardinals, prelates, rectors, monks, and friars, who call themselves followers of Peter and keepers of the gates of heaven and hell, and pale poverty-stricken people, cotless and landless, who have to pay the fat clergy for spiritual assistance, and asks if these are Peter's priests after all, "T trowe Petcr took no money, for no sinners that he sold. . . . Peter was never so great a fole, to leave his key with such a losell."

In 1399 the Lancastrian Henry IV. overthrew the Plantagenet Richard II., and one of the most active partisans of the new monarch was Arundel, archbishop of Canterbury and the most determined opponent of Lollardy. It has been alleged that Henry won his help by promising to do his utmost to suppress the. followers of Wyclif, and this much is certain, that when the house of Lancaster was firmly established upon the throne the infamous Act De comburendo hereticos was 'passed in 1400, and church and state combined to crush the Lollards. John Purvey was seized; William Sautrey (Chartris) was tried, condemned, and burned. The Lollards, far from daunted, abated no effort to make

good their ground, and united a struggle for social and political liberty to the hatred felt by the peasants towards the Romish clergy. Jak Upland (Joln Countryman) took the place of Piers Ploughman, and upbraided the clergy, and especially the friars, for their wealth and luxury. Wickliffe had published the rule of St Francis, and had pointed out in a commentary upon the rule how far friars had departed from the maxims of their founder, and had persecuted the Spirttwales (the Fratricelli, Beghards, Lollards of the Netherlands) for keeping them to the letter (cf. Matthews, Hnglish Works of Wyclif hitherto unprinted, Early Eng. Text Soc., vol. lxxiv., 1880). Jak Upland put all this into rudc nervous

gences and other abuses in pardoning sin; that all wars | English verse : —

- Freer, what charitie is this To fain that whoso liveth after your ordcr Liveth most perfectlie, And next followeth the state of the Apostles In povertie and pennance : And yet the wisest and greatest clerkes of you Wend or send or procure to the court of Rome, . » . and to be assoiled of the vow of povertie.”

The archbishop, having the power of the state behind him, attacked that stronghold of Lollardy the university of Oxford. In 1406 a document appeared bearing to be the testimony of the university in favour of Wickliffe ; its

genuineness was disputed at the time, and when quoted by —

Huss at the couneil of Constance it was repudiated by the English delegates. The archbishop treated Oxford as if it had issued the document, and procured the issue of severe regulations in order to purge the university of heresy. In 1408 Arundel in convocation proposed and carried the famous Constitutiones Thome Arundel intended to put down Wickliffite preachers and teaching. They provided amongst other things that no one was to be allowed to preach without a bishop’s licence, that preachers preaching to the laity were

not to rebuke the sins of the clergy, and that Lollard books and the translation of the Bible were to be searched for and destroyed. He next attempted to purge the nobility of Lollardy. The earlier leaders had died, but there was still one distinguished Lollard, Sir John Oldcastle, in right of his wife Lord Cobham, ‘the good Lord Cobham” of the common people, who had been won to pious living by the poor preachers, and who openly professed the common Lollard doctrines. His chaplain, one of the itinerating preachers, was seized, then his books and papers were taken and burnt in the king’s presence, and later he was indicted for heresy. It is said that at first he recanted, but the abjuration, said to be his, may not be authentic. In the end he was burnt for an obstinate heretic. These persecutions were not greatly protested against ; the wars of Henry V. with France had awakened the martial spirit of the nation, and! little sympathy was felt for men who had deelared that all war was but the murder and plundering of poor people for the sake of kings. Mocking ballads were composed upon the martyr Oldcastle, and this dislike to warfare was one of the chief accusations made against him (comp. Wright’s Political Poems, vol. ii. p. 244). But Arundel could not prevent the writing and distribution of Lollard books and pamplilets. Two appeared just about the time of the martyrdom of Oldcastle—7he Ploughman’s Prayer and the Lanthorne of Light. The Ploughman’s Prayer declared that true worship consists in three things—in loving God, and dreading God, and trusting in God above all other things ; and it showed how Lollards, pressed by persecu- tion, became further separated from the religious life of the church. “Men maketh now great stonen houses full of glasen windows, and clepeth thilke thine houses and churches. And they setten in these houses mawmets of stocks and stones, to fore them they knelen privilich and apert, and maken their prayers, and all this they say is thy worship… . . For Lorde our belief js that thine house is man’s soul.”

The council of Constance (1414-1418) put an end to the papal schism, and also showed its determination to put down heresy by burning John Huss, When news of this reached England the clergy were incited to stil] more vigorous proceedings against Lollard preachers and books, From this time Lollardy appears banished from the fields and streets, and takes refuge in houses and places of con- cealment. There was no

more wayside preaching, but instead there were conventicula occulta in houses, in peas- ants' huts, in sawpits, and in field ditches, where the Bible was read and exhortations were given, and so

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Lollardy continued. In 1428 Archbishop Chichele con- fessed that the Lollards seemed as numerous as ever, and that their literary and preaching work went on as vigor- ously as before. It was found out also that many of the poorer rectors and parish priests, and a great many chaplains and curates, were in secret association with the Lollards, so much so that in many places processions were never made and worship on saints' days was abandoned, For the Lollards if not stamped out were hardened by persecution, and became fanatical in the statement of their doctrines. Thomas Bagley was accused of declaring that if in the sacrament a priest made bread into God, le made a God that can be eaten by rats and mice; that the pharisees of the day, the monks, and the nuns, and the friars, and all other privileged persons recognized by the church: were limbs of Satan; and that auricular confession to the priest was the will not of God but of the devil. And others held that any priest who took salary was excommunicate ; and that boys could bless the bread as well as priests, '

From England Lollardy passed into Scotland. Oxford infected St Andrews, and we find traces of more than one vigorous search made for Lollards among the teaching staff of the Seottish university, while the Lollards of Kyle in Ayrshire were claimed by Knox as the forerunners of the Scotch Reformation.

The opinions of the later Lollards can best be gathered from the learned and unfortunate Pecock, who wrote his elaborate Repressor against the '' Bible-inen," as he calls them, He suinmed up their doctrines under eleven heads: they condemn the having and using images in the churches, the going on pilgrimages to the memorial or ''mynde places" of the saints, the holding of landed possessions by the. clergy, the various ranks of the hierarchy, the framing of ecclesiastical laws and ordinances by papal and episcopal authority, the institution of religious orders, the costliness of ecclesiastical decorations, the

ceremonies of the mass and the sacraments, the taking of oaths, and the maintaining that war and capital punish- ment are lawful. When these points are compared with the Lollard Conclusions of 1895, it is plain that Lollardy had not greatly altered its opinions after fifty-five years of persecution. All the articles of Pecock's list, save that on capital punishment, are to be found in the Conclusions; and, although many writers have held that Wickliffe's own views differed greatly from what have been called the ''exaggerations of the later and more violent Lollards," all these views may be traced back to Wickliffe himself, Pecock's idea was that all the statements which he was prepared to impugn came from three false opinions or ''trowings," viz., that ho governanee or ordinance is to be esteemed a law of God which is not founded on Scripture, that every humble minded Christian nan or woman is able without 'fail and defaut" to find out the true sense of Scripture, and that having done so he ought to listen to no arguments to the contrary ; he elsewhere adds a fourth (vol. i. Pp 102), that if a man be not only meek but also keep God's law he shall have a true understanding of Scripture, even though 'no man ellis teche him saue God." These statements, especially the last, show us the connexion between the Lollards and those mysties of the 14th century, such as Tauler and Ruysbroeck, who accepted the teachings of Nicholas of Basel, and formed themselves into the association of the Friends of God.

The question remains—What was the connexion between the Lollard movement and the Reformation in England? Many writers make Lollardy the forerunner of Reformation teaching ; others, like Mr Gairdner, relying on the facts that the persecution of the Lollards did not rouse the English nation in the way that the martyrdom of Huss excited the Bohemians and that Lollardy had almost faded out of sight in the beginning of the 16th century, admit only a casual connexion between the two awakenings, 'The problem is scarcely one which can be settled by counting the numbers of Lollards convicted at different periods from the beginning to the end of the 15th century, or by pointing to the enthusiasm or indifference of the mass of the English nation to Lolard doctrines. The English Reformation down to the mniddle of Elizabeth's reign was much more a political than a

religious move- ment with the great proportion of English people. Lollardy in its most essential and invariable characteristics had much more in com- mon with medieval religious revivals than with Reformation piety, and Lollard preaching must have had mnch more resemblance to that of Ockham and his recusant F ranciscans than that of Luther, Calvin, or Peter Martyr. But Lollardy did one thing for England which other medieval revivals did not do for the lands in which they

arose; it made the Bible familiar to the people in their mother tongue, aud this must have been a positive preparation for the English Reformation of no ordinary power. May not the great peculiarity of the English Reformation on its religious side, the repeated attempts to give a good version of the Lible from the original tongues into English, by Tyndale, Coverdale, ‘Taverner, Cranmer, the Genevan refugees, and Parker, with the revisions and eombinations of these various translations, on to our present authorized version, have come from the fact that Lollard Bible- men, as Pecoek calls them, had made a good English Bible a necessity for an English reformation of religion ?

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LOMBARD, Peter (c. 1100-1160), bishop of Paris, better known as Afagister Sententiarum, the son of obscure parents, was born about the beginning of the 12th century, at Novara (then reckoned as belonging to Lombardy). After receiving his education in jurisprudence and the liberal arts at Bologna, he removed to France, bearing a recommendation to Bernard of Clairvaux, who first placed him under Lotolf at Rheims, and afterwards sent him to Paris with letters to

Gilduin, the abbot of St Victor. His diligence and talents soon brought him into notice, and ultimately obtained for him a theological chair, which he held for a number of years; during this period he is said to have been the first to introduce theological degrees. On June 29, 1159, he succeeded his former pupil, Philip, brother of Louis VIL. in the bishopric of Paris, but did not long survive the promotion; according to the most trustworthy of the meagre accounts we have of his life, he died on July 20 of the following year.

His famous theological handbook, Sententiarum Libri Quatuor, is, as the title implies, primarily a collection of " sententie patrum." These are arranged (professedly on the basis of the aphorism of Augustine, Lombard's favourite authority, that ''omnis doctrina vel rerum est vel signorum"') into four books, of whieh the first treats of God, the second of the creature, the third of the incar- nation, the work of redemption, and the virtues, and the fourth of the seven sacraments and eschatology. It soon attained immense popularity, ultimately becoming the text-book in almost every theological school, and giving rise to endless eommentaries. A charge of heresy (''nihilianism") was indecd raised against Lombard for a particular view whieh he seemed not remotely to have indicated regarding Christ's human nature, but ncither at the synod of Tours, where the question was first broached in 1163, nor at the subsequent Lateran synod in 1179, docs a condemnation seem to have been obtained. In 1800 the theological professors of Paris agrecd in the rejeetion of sixteen propositions taken from Lombard, but their decision was far from obtaining universal currency.

Besides the Sententi#, Lombard wrote numerous commentaries (e.g., on the Psalms, Canticles, Job, the Gospel Harmony, and the Pauline Epistles), sermons and letters, which still exist in MS. The Glossx sew Commentarius in Psalmos Davidis, first published at Paris in 1533, and the Collectanea in omnes D, Pawli Epistolas (Paris, 1585) have been reprinted by Migne.

LOMBARDS. The history of the Lombards falls into three divisions : —(1) The period before the invasion in 568 a.p.; (2) the Lombard

kingdom in Italy between 568 and 774; (3) the period of their incorporation with the Italian population, and the history of Lombardy and its cities as one of the great provinces of Italy—(a) from the restoration of the empire under Charles the Great (800) to the peace of Constance with Frederick Barbarossa (1183), and (b) from the declaration of independence to the time of the tyrannies and, afterwards, of the French, Spanish, and Austrian rule.

1. The name Zombard is the Italianized form of the national name of a Teutonic tribe, Longobard:, itself an Italian arrangement, based on a supposed etymology of the Teutonic Langbard, Langobardi, the form used when they are first named by Roman writers—Velleius and Tacitus. The etymology which made the name mean Longbeard is too obvious not to have suggested itself to Italians, and

perliaps to themselves (see Zeuss, 95, 109); it is accepted by their first native chronicler, Paul the Deacon, who wrote in the time of Charles the Great. But the name has also been derived from the region where they are first heard of. On the left bank of the Elbe, ‘where Borde or Bord still signifies a fertile plain by the side of a river,” a district near Magdeburg is still called the Zange Borde; and lower down the Elbe, on the same side, about Liineburg, the Bardengau, with its Bardewik, is still found; it is here that Velleius, who accompanied Tiberius in his cam- paign in this part of Germany, and who first mentions the name, places them. As late as the age of their Italian settlement the Lombards are called Bardi in poetical epitaphs, though this may be for the convenience of metre.

Their own legends bring the tribe as worshippers of Odin from Scandinavia to the German shore of the Baltic, under the name of Winali,a name which was given to them in a loose way as late as the 12th century (e.g., by Ordericus Vitalis ; cf. Zeuss, 57). By the Roman and Greek writers of the first two centuries of our era they are spoken of as occupying, with more or less extension at different times, the region which is now Hanover and the Altmark of Prussia. To the Romans they appeared a remarkable tribe: —“ gens etiam Germana

feritate ferocior," says Velleius, who had fought against them under Tiberius ; and Tacitus describes them as a race which, though few in numbers, more than held their own among numerous powerful neighbours by their daring and love of war. In the quarrels of the tribes they appear to have extended their borders ; in Ptolemy's account of Germany, in the 2d century, they fill a large space among the races of the north- west and north. But from the 2d century the name dis- appears,! till it is found again at the end of the 5th century as that of a half Christian tribe on the northern banks of the Danube. How they got there, and what relation these Langobards bore to those who lived in the 1st and 2d centuries on the west bank of the Elbe, we learn little from the vague stories preserved by their traditions ; but they are described (B. G., ii. 14, 15) by Procopius,.a contemporary, as subject to one of the most ferocious of the tribes on the Danube, the Heruli, also a Teutonic tribe, by whose oppression they were driven in despair to a resistance, which ended in the utter defeat and overthrow of their tyrants. We know nothing of the way in which Christianity was introduced among them, probably only among some of their noble families; but they were Arians like their neighbours and predecessors in Italy, the Goths, and like them they brought with them into Italy a hierarchy of bishops, priests, and deacons ; but, while the Gothic Bible of Ulfilas is partially preserved, whatever religious literature the Langobards had in the shape of versions of the Scrip- tures or liturgical forms has utterly perished. They were among the Teutonic tribes which were generally on good terms with the empire, and were encouraged by it in their wars with their more barbarous neighbours. After defeat- ing the Heruli and destroying their tribal organization, the Langobards attacked the Gepidz with equal success, scattering the tribe or incorporating its survivors in their own host. They thus became the most formidable of the Teutonic tribes of the Danube. They had alliances with the distant Saxons, probably a kindred stock, and with the Hunnish Avars of the Danube. Their kings belonged to a royal line, and made marriages with the kings of the Franks and the other German nations. Their wars led them westwards, and for forty years they are said to have occupied Pannonia, the region between the Danube and the valleys of the Drave and Save. Thus following the line of movement of the Goths, they resolved at last to strike for

_ a ere OE 1 Except in the Anglo-Saxon Traveller's Song, of probably between 375-435; see Guest's Znglish Rhythms, 2,77, 88, 87.

the great prize which the Goths had won and lost. Through the eastern passes, and the border land of Friuli, they invaded Italy. It is said that they were invited by Narses, the conqueror of the Goths, in revenge for his ill treatment by the masters whom he had served.

2. In 568 Alboin, king of the Langobards, with the women and children of the tribe and all their possessions, with Saxon allies, with the subject tribe of the Gepide, and a mixed host of other barbarians, descended into Italy by the great plain at the head of the Adriatic, There was little resistance to them. The war which had ended in the downfall of the Goths had exhausted Italy ; it was followed by famine and pestilence; and the Government at Constantinople, away in the East, made but faint efforts to retain the province which Belisarius and Narses had recovered for it. Except in a few fortified places, such as Ticinum or Pavia, the Italians did not venture to encounter the new invaders; and, though Alboin was not without generosity, the Lombards, wherever resisted, justi- fied the opinion of their ferocity by the savage cruelty of the invasion. In 572, according to the tragic tale of the Lombard chronicler, a tale which recalls the story of Candaules in Herodotus, Alboin, the fierce conqueror, fell a victim to the revenge of his wife Rosamond, the daughter of the king of the Gepide, whose skull Alboin had turned into a drinking cup, out of which he forced Rosamond to drink; but the Langobards had already shown themselves in ravaging bands all over Italy, and in the north had begun to take possession. Military chiefs, whom, after the Latin writers, we call " dukes," correspond- ing to the German " Herzog," were placed, or placed themselves, first in the border cities, like Friuli and Trent, which commanded the north-eastern passes, and then in other principal places in Italy; and this arrangement became characteristic of the Lombard settlement. The principal seat of the settlement was the rich plain watered by the Po and its affluents, which was in future to receive its name from them; but their power extended across the

Apennines into Liguria and Tuscany, and then south- wards to the outlying dukedoms of Spoleto and Benevento, The invaders failed to secure any maritime ports such as Genoa, Pisa, Naples, Salerno, Ravenna, or any territory that was conveniently commanded from the sea. Pavia, or, as it was called, Ticinum, the one place which had obstinately resisted Alboin, became the seat of their kings, as it had been one of the seats of the Gothic kingdom.

After the short and cruel reign of Cleph, the successor of Alboin, the Lombards (as we may begin for convenience sake to call them) tried for ten years the experiment of a national confederacy of their dukes, without any king at their head. It was the rule of some thirty-five or thirty-six petty tyrants, under whose oppression and private wars even the invaders suffered, while the Italians were remorse- lessly trodden under foot. With anarchy among themselves and so precarious a hold on the country, hated by the Italian population and by their natural leaders the Catholic clergy, threatened also by an alliance of the Greek empire with their natural and persistent rivals the Franks beyond the Alps, they resolved to sacrifice their turbulent independence to the usnal necessities of the Teutonic invaders which led to the election of a kine, In 584 they chose Authari, the grandson of Alboin, and endowed the royal domain with a half of their possessions, From this time till the fall of the Lombard power before the arms of their rivals the Franks under Charles the Great, the kingly rule continued. Authari, “the Long- haired,” with his Roman title of Flavius, marks the change from the war-king of an invading host to the permanent representative of the unity and law of the nation, and thie increased power of the crown, by the possession of a great

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domain, to enforce its will. The independence of the dukes was surrendered to the king. The dukedoms in the neighbourhood of the seat of power were gradually absorbed, and their holders transformed into royal officers. Those of the northern marches, Trent and Friuli, with tho important dukedom of Turin, retained longer the kind of independence which marchlands usually give where invasion is to be

feared. The great dukedom of Benevento in the south, with its neighbour Spoleto, threatened at one time to be a separate principality, and even to the last resisted, with varying success, according to the personal characters of its dukes, the full claims of the royal authority at Pavia,

The kingdom of the Lombards lasted more than two hundred years, from Alboin (568) to the fall of Desiderius (774),—much longer than the preceding Teutonic kingdom of Theodoric and the Goths. But it differed from the other Teutonic conquests in Gaul, in Britain,in Spain, It was never complete in point of territory; there were always two, and almost to the last three, ecapitals—the Lombard one, Pavia, the Latin one, Rome, the Greek one, Ravenna ; and the Lombards never could get access to the sea, And it never was complete over the subject race : it profoundly affected the Italians of the north ; in its turn it was entirely transformed by contact with them; but the Lombards never overcame the natural repulsion of the two races, and never amalgamated with the Italians till their power as a ruling race was crushed by the victory given to the Roman element by the restored empire of the Franks, ‘The Langobards, German in their faults and in their strength, but coarser, at least at first, than the Germans whom the Italians had known, the Goths of Theodoric and Totila, found themselves continually in the presence of a subject population very different from anything which the other Teutonic conquerors met with among the provincials,—like them, exhausted, dispirited, unwarlike, but with the remains and memory of a great civilization round them, intelligent, subtle, sensitive, feel- ing themselves infinitely superior in experience and knowledge to the rough barbarians whom they could not fight, and capable of hatred such as only cultivated races can nourish, The Lombards who came into Italy with the most cruel incidents of conquest, and who, when they had occupied the lands and cities of Upper Italy, still went on sending forth furious bands to plunder and destroy where they did not care to stay, never were able to overcome tho mingled fear and scorn and loathing of the Italians, They adapted themselves very quickly indeed to many Italian fashions, ‘Within thirty years of the invasion, Authari took the fancy of decking himself with the imperial title of Flavius, even while his bands were

leading Italian captives in leash like dogs under the walls of Rome, and under the eyes of Pope Gregory ; and it was retained by his successor. They soon became Catholics ; and then in all the usages of religion, in church building, in found- ing monasteries, in their veneration for relics, they vied with Italians. Authari's queen, Theodelinda, solemnly placed the Lombard nation under the patronage of St John the Baptist, and at Monza she built in his honour the first Lombard church, and the royal palace near it. King Liutprand (712-744) bought the relics of St Augustine for a large sum to be placed in his church at Pavia. Their Teutonic speech disappeared ; except in names and a few technical words all traces of it are lost. But to the last they had the unpardonable crime of being a ruling barbarian race or caste in Italy. To the end they are "' nefandissimi," execrable, loathsome, filthy. So wrote Gregory the Great when they first appeared. So wrote Pope Stephen IV., at the end of their rule, when stirring up the kings of the Franks to destroy them. Authari's short reign (584-591) was one of renewed effort for con-

quest. It brought the Langobards face to face, not merely with the emperors at Constantinople, but with the first of the great statesmen popes, Gregory the Great (590-604). But Lombard conquest was bungling and wasteful. It was ever ready to lapse into mere plunder and warfare; and when they had spoiled a city they proceeded to tear down its walls and raze it to the ground. But Authari's chief connexion with the fortunes of his people was an important, though an accidental one. The Lombard chronicler tells us a romantic tale of the way in which Authari sought his bride from Garibald, duke of the Bavarians, how he went incognito in the embassy to judge of her attractions, and how she recognized her discuised suitor. The bride was the Christian Theodelinda, and she became to the Langobards what Bertha was to the Anglo- Saxons, and Clotilda to the Franks. She became the mediator between the Lombards and the Catholic Church. Authari, who had brought her to Italy, died shortly after his marriage. But Theodelinda had so won on the Lombard chiefs that they bid her as queen choose the one among them whom she would have for her husband and for king. She chose Agilulf, duke of Turin (592-615). He was not a true Langobard, but a Thuringian. It was the beginning of peace between the Lombards and the Catholic clergy. Agilulf could not abandon his tradi- tional Arianism, and he was a very uneasy neighbour, not only to the Greek exarch, but to Rome itself. But he was favourably disposed both to peace and to the Catholic Church. Gregory interfered to prevent a national con- spiracy against the Langobards, like that of St Brice's day in England against the Danes, or that later uprising against the French, the Sicilian Vespers. He was right both in point of humanity and of policy. The Arian and Catholic bishops went on for a time side by side; but the Lombard kings and clergy rapidly yielded to the religious influences around them, even while the national antipathies continued unabated and vehement. Gregory, who despaired of any serious effort on the part of the Greek emperors to expel the Lombards, endeavoured to promote peace be- tween the Italians and Agilulf; and, in spite of the feeble hostility of the exarchs of Ravenna, the pope and the king of the Lombards

became the two real powers in the north and centre of Italy. Agilulf was followed, after two unim- portant reigns, by his son-in-law, the husband of Theode- linda's daughter, King Rothari (636-652), the Lombard legislator, still an Arian though he favoured the Catholics, He was the first of their kings who did for the Lombards what was done by all the Teutonic conquerors as soon as they felt themselves a nation on Roman soil; he collected their customs under the name of laws,—and he did this, not in their own Teutonic dialect, but in Latin. The use of Latin implies the use of Latin scribes or notaries, and implies that the laws were a notice to the Italians of the usages and rules of their conquerors, which, so far as they applied, were to be not merely the personal law of the Lombards, but the law of the land, aud binding on Lombards and Romans alike. But such rude legislation could not provide for all questions arising even in the shattered and decayed state of Roman civilization. It is probable that among themselves the Italians kept to their old usages and legal precedents where they were not overridden by the conquerors' law, and by degrees a good many of the Roman civil arrangements made their way into the)Lombard code, while all ecclesiastical ones, and they were a large class, were untouched by it.

The precise nature of the relations, legal and political, of the Lombards, as a conquering race, or a military caste, to the Italians is still a sttbject of controversy, owing to the prevailing mixture of clearness and obscurity in the documents of the time. Therc must have been, of course, much change of property; but appearances are conflieting as to the terms on which land generally was held by

he old possessors or the new comers, and as to the relative legal position of the two. Savigny held that, making allowance for the anomalies and usurpation of conquest, the Roman population held the bulk of the land as they had held it before, and were governed byan uninterrupted and acknowledged exercisc of Roman lawin their old municipal organization. Later inquirers, Leo, Troya, and more recently Hegel, have found that the supposition does not tally with a whole

series of facts, which point toa Lombard territorial law ignoring completely any parallel Roman and personal law, to a great restriction of full civil rights among the Romans, analogous to the condition of the rayah under the Turks, and to a reduetion of the Roman occupiers to a class of half-free ‘‘ aldii,” holding immov- able tenancies under lords of supcrior race and privilege, and sub- ject to the sacrifice either of the third part of their holdings or the third part of the produce. Probably something like this, with exceptions and anomalies, represents the state of things, at lcast at first; but it must be remembered that regular and consistcntarrange- ments were very unlikely to have been thought of early in such a conquest as that of the Lombards, that the Romans suffered probably rather from the insolence of barbarians than from the rules of a eoustitutional settlement, and that a conquered race always and naturally exaggerates its own humiliations and grievances, and in this case has the chief telling of the story. It might also be ex- pected that the tribal customs of Tentonic conquerors would be more modified in Italy than elsewhere, by the deeply-rooted traditions and eustoms of the old Roman rule. The Lombards were rougli and harsh, and the Italians never ceased to hate them; but we know by experience how two portions of a population possessed of equal civil rights can hate one another, where they differ in blood and history. The Roman losses, both of property and rights, were likely to be great at first ; how far they continued permanent dur- ing the two centuries of the Lombard kingdom, or how far the legal distinetions between Rome and Lombard gradually passed into desuetudc, is a further question. The legislation of the Lombard kings, in form a territorial and not a personal law, shows no signs of a disposition either to depress or to favour the Roinans, but only the purpose to, maintain, in a rough fashion, striet order and dis- eipline impartially among all their subjects.

From Rothari (0b. 652) to Liutprand (712-744) the Lombard kings, succeeding one another in the irregular fashion of the time, sometimes by descent, sometimes by election, sometimes by conspiracy and violence, strove fitfully to enlarge their boundaries, and contended with the aristocracy of dukes inherent in the original organization of

the nation, an element which, though much weakened, always embarrassed the power of the crown, and checked the unity of the nation. Their old enemies the I'ranks on the west, and the Slavs or Huns, ever ready to break in on the north-east, and sometimes called in by mutinous and traitorous dukes of Friuli and Trent, were constant and serious dangers. By the popes, who represented Italian interests, they were always looked upon with dislike and jealousy, even when they had become zealous Catholics, the founders of churches and monasteries ; with the Greek empire there was chronic war. From time to time they made raids into the unsubdued parts of Italy, and added a city or two to their dominions. But there was no sustained effort for the complete subjugation of Italy till Liutprand, the most powerful of the line. He tried it, and failed. He broke up the independence of the great southern duchies, Benevento and Spoleto. For-a time, in the heat of the dispute about images, he won the pope to his side against the Greeks. Fora time, but only for a time, he deprived the Greeks of Ravenna. Aistulf, his successor, carried on the same policy. He even threatened Rome itself, and claimed a capitation tax. But the popes, thoroughly irritated and alarmed, and hopeless of aid from the East, turned to the family which was rising into power among the Franks of the West, the mayors of the palace of Austrasia. Pope Gregory III. applied in vain to Charles Martel. But with his successors Pippin and Charles the popes were more successful. In return for the transfer by the pope of the Frank crown from the decayed line of Clovis to his own, Pippin crossed the Alps, defeated Aistulf, and gave to the pope the lands which Aistulf had torn from the empire, Ravenna and the Pentapolis (754-756). But the angry quarrels still went on between the popes and

the Lombards. The Lombards were still to the Italians a "foul and horrid" race. At length, invited by Pope Adrian I., Pippin's son Charles once more descended into Italy. As the Lombard kingdom began, so it ended, with a siege of Pavia. Desiderius, the last king, became Charles's prisoner (774), and the Lombard power perished. Charles, with the title of king of the Franks and Lombards, became master of Italy, and in 800 the pope, who had crowned Pippin king of the Franks,

claimed to bestow the Roman empire, and crowned his greater son emperor of the Romans (800).

3. To Italy the overthrow of the Lombard kings was the loss of its last chance of independence and unity. To the Lombards the conquest was the destruction of their legal and social supremacy. Henceforth they were equally with the Italians the subjects of the French king, Charles, the Carolingian king, expressly recognized the Roman law, and allowed all who would be counted Romans to “ profess” it. Latin influences were not strong enough to extinguish the Lombard name and destroy altogether the recollec- tions and habits of the Lombard rule; Lombard law was still recognized, and survived in the schools of Pavia. Lombardy remained the name of the finest province of Italy, and indeed for,a time was the name for Italy itself. But what was specially Lombard could not stand in the long run against the Italian atmosphere which surrounded it, with its countless and subtle forces, social, political, and religious. Generation after generation passed more and more into real Italians. Antipathies, indeed, survived, and men even in the 10th century called each other Roman or Langobard as terms of reproach. Bunt the altered name of Lombard also denoted henceforth some of the proudest of Italians; and, though the Lombard speech had utterly perished, their most common names still kept up the ; ieee that their fathers had come from beyond the \Ips.

But the establishment of the Frank kingdom, and still more the re-establishment of the Christian empire as the source of law and jurisdiction in Christendom, had momentous influence on the history of the Italianized Lombards. The empire was the counterweight to the local tyrannies into which the local authorities established by the empire itself, the feudal powers, judicial and military, necessary for the purposes of government, invariably tended to degenerate. When they became intolerable, from the empire were sought the exemptions, privileges, immunities from that local authority, which, anomalous and anarchical as they were in theory, yet in fact were the foundations of all the liberties of the Middle Ages in the Swiss cantons, in the free towns of Germany and the Low Countries, in the Lombard cities of Italy. Italy ;was and ever has been a land of cities; and, ever since the

downfall of Rome and the decay of the municipal system, the bishops of thie cities had really been at the head of the peaceful and industrial part of their population, and were a natural refuge for the oppressed, and sometimes for the mutinous and the evil doers, from the military and civil power of the duke or count or judge, too often a rule of cruelty or fraud. Under the Carolingian empire, a vast system grew up in the North Italian cities of episcopal “immunities,” by which a city with its surrounding district was removed, more or less completely, from the jurisdiction of the ordinary authority, military or civil, and placed under that of the bishop. These ‘immunities ” led to the temporal sovereignty of the bishops ; under it the spirit of liberty grew more readily than under the military chief, Municipal organization, never quite forgotten, naturally revived under new forms, and with its “ consuls” at the head of the citizens, with its “arts” and “crafts” anl “guilds,” grew up secure under the shadow of the

church. In due time the city populations, free from the feudal yoke, and safe within the walls which in many instances the bishops had built for them, became inpatient also of the bishop’s government. The cities which the bishops had made thus independent of the dukes and counts next sought to be free from the bishops; in due time they too gained their charters of privilege and liberty. Left to take care of themselves, islands in a sea of turbulence, they grew in the sense of self-reliance and independence ; they grew also to be aggressive, quarrelsome, and ambitious. Thus, by the 11th century, the Lombard cities had become “communes,” commonalties, republics, managing their own affairs, and ready for attack or defence. Milan had recovered its greatness, ecclesiastically as well as politically ; it scarcely bowed to Rome, and it aspired to the position of a sovereign city, mistress over its neighbours. At length, in the 12th century, the inevitable conflict came between the republicanism of the Lombard cities and the German feudalism which still claimed their allegiance in the name of the empire. Leagues and counter-leagues were formed; and a confederacy of cities, with Milan at its head, challenged the strength of Germany under one of its sternest emperors, Frederick Barbarossa. The struggle

was terrible. At first Frederick was victorious; Milan, except its churches, was utterly destroyed ; everything that marked municipal independence was abolished in the “rebel” cities; and they had to receive an imperial magistrate instead of their own (1158-62). But the Lombard league was again formed. Milan was rebuilt, with the help even of its jealous rivals, and at Legnano (1176) Frederick was utterly defeated. The Lombard cities had regained their independence; and at the peace of Constance (1183) Frederick found himself compelled to confirm it.

From the peace of Constance the history of the Lombards is merely part of the history of Italy. Their cities went through the ordinary fortunes of most Italian cities. They quarrelled and fonght with one another. They took opposite sides in the great strife of the time between pope and emperor, and were Guelf and Ghibelline by old tradition, or as one or other faction prevailed in them. They swayed backwards and forwards between the powcr of the people and the power of the few; but democracy and oligarchy passed sooner or later into the hands of a master who veiled his lordship under various titles, and generally at last into the hands of a family. Then, in the larger political struggles and changes of Europe, they were incorporated into a kingdom, or principality, or duchy, carved out to suit the interest of a foreigner, or to make a heritage for the nephew of a pope. But in two ways especially the energetic race which grew out of the fusion of Langobards and Italians between the 9th and the 12th centuries has left the memory of itself. In England, at least, the enterprising traders and bankers who found their way to the West, from the 13th to the 16th centuries, though they certainly did not all come from Lombardy, bore the name of Lombards. In the next place, the Lombards, or the Italian builders whom they employed or followed, the “masters of Como,” of whom so mueh is said in the early Lombard laws, introduced a manner of building, stately, solemn, and elastic, to which their name has been attached, and which gives a character of its own to some of the most interesting churches in Italy. (R. W. C.)

LOMBOK (called Tanah Sasak by the natives, and Saliparan or Selaparang by the Balinese, Lombok being properly the name only of

a village on the north-east side), an island of the Hast Indian Archipelago, belonging to the Lesser Sunda group, and separated from Bali by the Strait of Lombok, from Sumbawa by the Strait of Alas. It stretches from about 115° 44’ to 116° 40’ E. long, and from 8° 12’ to 9° 1’S. Jat., and its area is estimated at 2080 square miles. Rising out of the sea with bold and often precipitous coasts, Lombok is mountainous towards the south, and in the north-east contains one of the principal volcanic summits of the whole archipelago—Rindjani or Peak of Lombok, 8688 feet according to Horsburgh’s measurement, 12,379 according to Melvill de Carnbée, and 11,834 according to Smits. There is no active crater in

the island, but in 1815 it suffered severely from the eruption of Tombora on the neighbouring island of Sum- bawa. Of the numerous streams by which it is watered none are navigable except by small boats; among the mountain lakes Segara Anak, lying some 9000 feet above the sea, is noteworthy in point of size. ‘The best harbour is Ampanan (8° 34’ 15” S. lat., 116° 3’ 40” E. long.) on the west coast, often visited by European and American vessels; that of Labuhan Tring farther south is also good, but less frequented. Forest-clad mountains and stretches of thorny jungle alternating with rich alluvial plains, cultivated like gardens under an ancient and elaborate system of irrigation, make the scenery of Lombok exceed- ingly attractive; and to the naturalist it is of particular interest as the frontier island of the Australian region, with its cockatoos and megapods or mound-builders, its peculiar bee-eaters and ground thrushes. Rice is the prin- cipal export ; ponies, skins, ducks’ eggs and other eggs, and edible nests, are also sent from the island. The rajah of Lombok (who has his capital at Mataram, a large village on the west coast, and his country seat at Gunong Sari) is tributary to the susuhunan of Bali and Lombok; he has possession of the whole island, which was formerly divided into the four states of Karang-Asam Lombok on the west side, Mataram in the north-west, Pagarawan in the south-west, and Pagutan in the east. Balinese supremacy dates from the conquest by Agong Dahuran in the beginning of the present century ; the union under a single rajah dates

from 1839. The population is variously estimated. The Woordenboek van Ned. Ind. (1869) gives about 405,000 souls; Behm and Wagner conjecture 100,000 in 1880. The greater proportion are Sassaks, as the Mohammedanized native stock are called; but the dominant Balinese, who still retain their Buddhist creed, may amount to about a twentieth of the whole.

See Zollinger, in Tijdschrift voor Ned. Ind., Jaarg. ii. ; J. P. Freyss, in the Tijdschr. v. Ind. taal- land- en volkenkunde, ix. (3d series); Melvill de Carnbée, in Monitewr des Indes, 1847; W. R. van Hoevell, Reis over Java, &e.; Wallace, Malay Archipelago.

LOMONOSOFF, Mrxuait Vasitievicn (1711-1765), was born in the year 1711, in the village of Denisovka (which in later times has had its name changed in honour of the poet), situated onan island not far from Kholmogori, in the government of Archangel. His father, a fisherman, took the boy as soon as he was ten years of age to assist him in the labours of his calling; but his eagerness for knowledge was unbounded. ‘T’he few books accessible to him he almost learned by heart ; and, seeing that there was no chance of his stock of knowledge being enlarged under the arctic skies of his native place, he resolved to betake himself to Moscow in the best way he could. An op- portunity occurred when he was seventeen years of age, and by the intervention of friends he obtained admission into the Zaikonospasski school. There his progress was very rapid, especially in Latin, and in 1734 he was sent from Moscow together with other promising students to St Petersburg. There again his proficiency, especially in physical science, was remarked by all, and he was one of the young Russians chosen to complete their education in foreign countries. He accordingly commenced the study of metallurgy at Marburg; but, not content with his work under the professors, he now began to write poetry, imitating German authors, among whom he is said to have especially admired Giinther. His Ode on the Taking of Khotin from the Turks was composed in 1739, and attracted a great deal of attention at St Petersburg. During his residence in Germany Lomonésoff married a native of the country, and found it difficult to maintain his increasing

family on the scanty allowance granted to him by the St Petersburg Academy, which, moreover, was

ow] irregularly sent. His circumstances became embarrassed, and he resolved to leave the country secretly, and to return home. On his arrival in Russia, after an adventure with a Prussian recruiting officer which at one time threatened serious consequences, he rapidly rose to distinction, and was made professor of chemistry in the university of St Petersburg ; he ultimately became rector, and in 1764 secretary of state. He died in 1765.

The most valuable of the works of Lomondésoff are those relating to physical science, and he wrote upon many branches of it. He everywhere shows himself a man of the most varied learning. He compiled a Russian grammar, which long enjoyed popularity, and did much to improve the rhythm of Russian verse. Many of his poems are good, but they do not constitute his chicf claim to be remembered. The school upon which he formed himself as a poet was a bad one. We must remember that these were the days of falsely-conceived classicism, and the French taste upon which all the literature of Europe was moulded. His great merit is that he belongs to the glorious band of patriots, which includes such men among Slavs as Dositei Obradovich, Raich, and Primus Truber,— men whose object was to elevate and give dignity to their country,— earnest toilers in the field of national education.

LOMZA, or Lomzua, a government of Russian Poland, is bounded on the N. by Prussia and the Polish government of Suwalki, on the E. by the Russian government of Grodno, on the 8. by the Polish governments of Siedlce and Warsaw, and on the W. by that of Plock. It covers’ an area of 4670 square miles, or 94 per cent. of all Poland. It is mostly flat or undulating, with a few tracts in the north and south-west, where the deeply-cut valleys give a hilly aspect tothe country. Extensive marshes overspread it, especially on the banks of the Nareff, and in the east there are also good forests. Lomza is traversed by the Nareff, which flows from east to south-west, joining the Bég in the south-western corner of the government. The Bég flows along the

southern border, joining the Vistula 20 miles below its junction with the Nareff. The inhabit- ants numbered 501,385 in 1872, the Poles constituting 76 per cent. of the population (or 83 per cent. when the Poles who are mixed with Lithuanians are included), the Jews 14% per cent., and the Germans 2 per cent. Of this population 402,146 belonged in 1870 to the Catholic Church, 10,354 to the Protestant, and 1817 to the Greek and United Churches. In 1878 394,570 were peasants, while only 76,950 belonged to the citizen class, and 11,470 to the nobility (szlachta). In 1877 45 per cent. of the total area, or 1,366,000 acres, were under crops. Stock raising is carried on to some extent (197,900 cattle, 263,700 sheep, and 68,705 horses). The wood trade is an import- ant branch of industry, but manufactures are very imper- fectly developed, the total production in 1873 having been only some £110,000, or 1°3 per cent. of the total for Poland. Lomza produces some wooden wares, spirits, tobacco, and sugar. There is only one railway (between Grodno and Warsaw) ; the Bég is navigable, but only wood is floated down the Nareff. The province is divided into eight districts, of which the chief towns are Lomza (13,860), Pultusk (7950), and Ostrolenka (6900) on the Nareff ; Mazowiec (2750), Ostréw (6300), Makéw (6600), Kolno (4800), and Szczuczyn (4750). Tykocin (5400) and Nasielsk (6250), although not district towns, have lately acquired some importance.

Lomza, capital of the above province, on the Nareff, 80 miles north-east from Warsaw, and 30 miles north from the Chizheff station of the railway between Warsaw and Grodno, had a population in 1872 of 13,860.

Lomza is an old town, one of its churches having been erected before the year 1000. In the 16th century it carried on a brisk trade with Lithuania and Prussia. It was well fortified and had two citadels, but neverthcless had often to suffer from the invasions of Germans and Tartars, and in the 17th century it was twice

plundered by the Cossacks of the Ukraine. In 1795 it fell under the dominion of Prussia, and after the peace of Tilsit it came under

Plates i.

Geology.

Surface.

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LONDON

ONDON, the metropolis of England, and the chief L town of the British empire, is situated on both banks of the river Thames, about 50 miles from its mouth, St Paul's Cathedral being in 51° 30' 48" N. lat. and 0° 5' 48" W. long. The old City of London is wholly included in the county of Middlesex, but the town beyond the City limits extends into portions of three other counties,— namely, Surrey and Kent on the south, and Essex on the east. The area and population of the various govern- mental divisions of London are given below (pp. 821, 822).

Site.—A great part of London is built on sands and gravels belonging to the Drift period, marking the ancient bed of a much larger river than the present Thames. This formation, resting immediately on the London Clay, extends along both banks of the present river, with an average breadth of about 2 miles; but in some parts there is immediately adjoining the banks a considerable breadth of alluvial deposits, or occasionally of artificially constructed embankments. On the north bank the alluvial soil com- prehends the greater part of Westminster; on the south bank it stretches east from Lambeth Bridge, gradually widening toa breadth of about half a mile, and from South- wark to Deptford occupying a still wider area. The sands aud gravels again occur at Greenwich Hospital, but are succeeded by the Greenwich and Woolwich marshes. The Isle of Dogs opposite Greenwich is constructed wholly of artificial embankments, and at one time the area it now occupies formed part of the mouth of the Lea, along whose banks the alluvial formation runs northwards between Bow and Stratford to Stoke Newington, widening to a considerable area at the marshes of West Ham and Plaistow. At Fareham, Battersea Park, Cheapside, Victoria Park, and to the south of Stoke Newington,

there are consider- able areas occupied by brick earth. The London Clay crops to the surface throughout the whole of north-west London, with the exception of a small portion to the south of Regent's Park, which is encroached upon by the sands and gravels, and the summits of Hampstead and Highgate, which are occupied by the silicious sands of the Bagshot series. In west London the Clay extends south to Kensington Gardens, and in north London it occupies part of Islington and the district north of High- bury and Stoke Newington. South of the Thames it encroaches irregularly on Wandsworth, Clapham, Camber- well, and Deptford, and comprehends nearly all the district round Sydenham. The Lower Tertiaries are represented by the Thanet sands at Greenwich and in the neighbour- hood of Deptford, by the Woolwich and Reading beds, which occur at Camberwell, Dulwich, and Lewisham, and by the Blackheath beds, which are.best seen at Blackheath. Chalk, the basement rock of the London basin, and the source of the water supply for the deep wells, only crops to the surface in the neighbourhood of Greenwich.

The original surface of the soil of London has been much altered in the course of generations, the depth of made earth being often very great. At one period the Thames flowed straight from Lambeth to Limehouse, and the greater part of the district now stretching south and east of the river to the range of heights in the neighbourhood of Sydenham and Greenwich was occupied by marshes or shallow lagoons. North of the Thames the greater part of London is built on several ranges of small eminences lying between the river and the northern heights of Hampstead (430 fect), Highgate, and Hornsey. The original city clustered round the eminence now crowned by St Paul's, and formerly intersected by the ravine of the Walbrook.

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To the north and east it was bounded by an extensive fen, from which Finsbury takes its name. To the west was the Fleet river, which flowed from Hampstead in a south- easterly direction to King's Cross, and then more southerly to Clerkenwell, where on account of the steepness of its banks it received the name of Holebourne or Hollowburn. It was

uavigable to King’s Cross, and for a long period formed a convenient and well-protected harbour for the city. A more extended elevation, included in the district now occupied by the Inns of Court, Bloomsbury, and Soho, was bounded on the west by the Tyburn, which rose near the Swiss Cottage and, after an easterly course till reaching the present Regent’s Park, flowed southwards nearly in the line of Marylebone Lane and Bond Street. Tyburn Hill was bounded on the west by the Westbourne; and to the south and west an extensive range of low ground, now included in Westminster, Pimlico, Chelsea, and Kensington, was in early times for the most part covered by water. Westwards the low ground is bounded by Notting Hill, whence an elevated region lying between the smaller eminences and the “northern heights,” and including Primrose Hill, runs in a north-westerly direction to Camden Town, Islingtou, and Highbury. The hilly regions in the neighbourhood of Kensington and Notting Hill formed part of an extensive forest, and St John’s Wood was originally a dense thicket.

GOVERNMENT AND ADMINISTRATION.—At first the Adminis- municipal constitution of London was loose and disjointed trative in its form, resembling that of the shire rather than the story.

town, but even fron the time of Henry I. the independence of its jurisdiction was complete, and the citizens, besides the right of inheritance and tenure not then possessed by the rest of England, enjoyed exemption from the Danegeld and from similar obligations. By the 13th century the later form of the municipality was already shaped in its main features, although at this stage residence in the borough and not membership in a trade guild was the basis of citizenship. This in some respects premature de- velopment of municipal functions has always given to London a peculiar and unique position in respect of muni- cipal government. Its charters, which in early times served as the model for charters to new incorporations, have defied the attacks of reform. The system of government was more heterogeneous and complicated than that of other English towns. London is practically a borough by pre- scription, and its special rights and privileges have made those who possess them distrustful of change. The mere extent of the new city surrounding the old, and the

rapidity of its growth, have also tended to postpone the attempt to grapple with the problem of its government. Until 1855, when the Metropolitan Board of Works was formed, the whole administration of the metropolis was of a medieval character. The City was governed by old charters, con- firmed but not interpreted by a special Act of William and Mary, and the various parishes of the rest of the metro- polis had each its own peculiar system of administration, regulated by local Acts which differed widely in different localities. No direct change of vital importance was made in the constitution and functions of the City corporation by the Metropolis Local Management Act of 1855, but the very existence of the Metropolitan Board implied a certain limitation of its authority, and the additional functions conferred by successive Acts on the Metropolitan Board have in some degree circumscribed its influence. As modified by the Act of 1855, the government of London within what is known as the metropolitan area consists of the City Cor- poration, the Metropolitan Board of Works, and thirty-eight

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vestries and district boards ; while various authorities, to | in the reign of Edward IIL, was ultimately worn only by be afterwards mentioned, exercise jurisdiction in special | a higher grade of the members called liverymen. The matters over the whole area of the metropolis or in separate | extension of London beyond the City limits and changes localities. in trade maxims and in social life have now left them Govern- The City of London, which is a county in itself, and | little more than the shadow of their former authority over ment of with which the borough of Southwark is assimilated, is | trade and manufacture, but a few, such as the fishmongers, Hieety. governed by a lord mayor, twenty-six aldermen, and two | the stationers, the goldsmiths, and the apothecaries, still hundred and six common councilmen, forming a Court of | discharge certain functions in the regulation of their Common Council. This court has a certain independent | several crafts.

Besides administering their charities, many power to enact regulations for the government of the City, | of the companies contribute largely to benevolent objects is entrusted with the management of the finances and thie | of pressing need, and some take an interest in promoting estates of the corporation, elects most of the officials, and | technical instruction, and in various matters relating to controls the police. The City elects a sheriff of Middlesex | their special trade or manufacture; but the business of as well as a sheriff of London; and the lord mayor is | most of them is now chiefly of a ceremonial kind. The elected by the trade guilds in common hall from among the | halls of the companies number thirty-five, and many of aldermen who have served as sheriffs. He is lord lieutenant | them are of interest either from their architectural merits, within the City, the dispenser of its hospitality, the chair- | their antiquarian associations, or the portraits or other man of the courts of the corporation, and holds certain | objects they contain. Their annual assessed value is over other offices, the dignity of which is now almost entirely | £60,000. The hereditary connexion of the companies with nominal. The aldermen, who hold office for life, are | the corporation, their large ownership of property in the chosen by the several wards, each ward electingone. Since | City, and their control over so many charities still enable 1867 the power of election has been enjoyed by all possess- | them to exercise a very great influence in municipal affairs. ing the household and lodger franchise. The Court of | The following list (Table I.) gives details regarding the twelve) Aldermen has the power of appointment to certain offices, | great companies, and six other companies which may be rankcd exercises judicial functions in regard to licensing and in | 2¢xt to them in importance :— disputes connected with the ward elections, has some power : re Dike cl las of disposal over the City cash, and possesses teeta “ae Date.| Situation of fall. | “Freedom. | Admission, control over the City, each alderman being a judge and Great Companies. 2 3. @ d. magistrate for the whole City, and by virtue of his office | | Grocers] 138 | Pos ee) Tio 0 exercising the functions of a justice of the peace. The | | Drapers….....| 1364 | Throgmorton Street | 108 0 0 0 common councillors were chosen originally in the reign of se + ae 1937 ee 637 0 i eee ee a aiesiips, amet tn TOBE wom, |) | A inate arise | tage | Ceteneanle Sassi) ‘e4 “89 | 20 “3 <0 constituted a standing

committee to regulate the affairs of | | Haberdashers Gresham Street …... 84 0 0 # the City, each ward chosing four, six, or eight, according | | FOr v2. Pecinstet |i ie | ae ee to its size. A gradual increase in their number took place | | Vintners …... 363 | Upper ThamesStreet 126 0 0 antal 1840, when it was fixed at two hundred and six. __ tienen 1480 } Mincing Lane…....) 110 11 6 | 10817 0 From the time of Richard II. the election was vested in eee ae ea freemen householders, but it is now regulated by the Act of | | Armourers .. Coleman Street …... 11318 0 | 33 2 6 1867. The Court of Common Hall, formerly the popular | | Coraweiners 222222. oa oe eee 2 ee ee er compen ae WE | genes || tame et |, ap 08 | 20.8 8 | mayor, four aldermen, and the liverymen of the city guilds, and nominates yearly two aldermen, who must previously The corporation of the City of London still retains Special have been sheriffs, for the Court of Aldermen to select one | certain exceptional prerogatives. The lord mayor's court preroga- for the office of lord mayor. The sheriffs are themselves | stil] exercises civil jurisdiction, the two courts of the tives of chosen by the Court of Common Hall, which also appoints | sheriffs' compter survive in the City of London court, and a the chamberlain, the bridge masters, and the city auditors. | the lord mayor exercises the functions of judge in the City The fragmentary and indirect participation in the | central criminal court, which superseded the court of oyer guilds. government of London at present exercised by the livery | and terminer in 1834, and extends beyond the radius of the

companies represents the remnants of an influence which was paramount from the time of Edward III, when enactments were passed which made admission to the freedom of the city dependent on membership in a trade or mystery. Originally established to afford mutual aid to members of their "craft," the guilds of London gradually assumed a certain control over their trade or manufacture, and by the payment of large sums of money obtained various monopolies, with the power to make by-laws for the regulation of their craft. From gifts for charitable purposes, and from entrance money and fines, many of the guilds, on account of the rise in the value of property, have amassed enormous wealth. Within the limits of the City alone the gross annual rental of the land possessed by them is over £500,000, and it is

believed that the land they possess outside its limits is of equal value. At one time their number was over one hundred, but they now number seventy-six, and some represent trades which are extinct. Twelve so-called “great companies” claim pre- cedence over the others, but of these some are not so wealthy as a few of the less highly privileged. The “livery” or dress of the companies, first formally adopted

Metropolitan area. The corporation possesses the sole right to establish markets within 7 miles of the City ; it enjoys a metage of grain, partially commuted in 1872 to a fixed duty chargeable by weight, and applied to the preservation of Epping Forest and other open spaces; and it levies coal and wine duties, continued by various Acts, for defrayment of the cost of public improvements. Most of the work of the corporation is performed by committees; and “ com- missioners of sewers,” under Act of Parliament, have charge of the cleaning, lighting, and paving of the streets.

A large portion of the City income is derived from rents, which City have increased from £3488 in 1692 to £19,199 in 1785, £45,269 accounts.

in 1825, and £117,781 in 1881. In 1692 the City markets were farmed for £3100, the profit being about £2500; in 1785 thcir revenue was £15,631, and the profit £2621; in 1825 these were respectively £58,958 and £52,271; and in 1881 they were £152,816 and £20,911. .The total revenuc of the City in 1692 was £11,658, in 1785 £59,356, and in 1881 £896,688, not including the public and trust accounts, which are regulated by various Acts of Parlia- ment. They include the Bridge-House estate account, the sewers rate, the Metropolitan Board of Works sewers rate, the police rate, the ward rate, aud the duties on coal, wine, and grain. The total charge of the government establishment in 1692 was £3947, and in 1881 it was £51,855, not including £7856 spent in pensions of

Corpora- tion build- ings.

officials. In 1692 the lord mayor received an annual sum of £100 for his care of the markct, and an ancicut fee of £80 out of the chamber. He has nowan annual salary of £10,000, and in addition to this his personal expenses in 1881 amounted to £4433. The salaries of the recorder, the chamberlain, the common sergeant, the town-clerk, and some other officers have risen in a somewhat similar proportion. The City in 1692 spent nothing on special acts of hospitality or on the promotion of literature, science, or art, while its contribution to the poor rates was only £66. It now spends several thousands annually on the reception of eminent persons, while to the London almshouses it in 1881 contributed £1884, to general charitable purposes £5179, for education £5394, for technical instruction £2000, for the Guildhall library and museum £5398, and for music £3027. The debt of the corporation, which is solely connected with the construction of improvements and public markets, was on December 31, 1881, £5,496,150, the money spent for these purposes since 1759 being nearly £10,000,000. The rate- able value of the City and liberties has since 1801 increased seven- fold, having riscn from £507,372 to £3,535,494.

The Guildhall, rebuilt by Dance in 1789, contains the greater part of the walls of the old building of 1411, which

was damaged by the fire of 1666, and also the crypt divided into three aisles by clustered columns of marble sup-

. porting a groined roof richly adorned with carvings. The

Metro- politan Board,

Vestries.

principal front was restored in 1867 in the Gothic style. In addition to the great hall used for state banquets and receptions, the building contains the cominon council cham- ber, the aldermen’s room, and several courts of justice. Adjoining the Guildhall is the free library of the corpora- tion, and a museum of antiquities relating to the City. The Mansion House at the east end of the Poultry, erected in 1740 from the

designs of Dance, is the official residence of the lord mayor. In addition to the justice room and various reception rooms, it contains the Egyptian hall, in which certain special banquets of the lord mayor are held.

By the Metropolis Local Management Act of 1855, the metropolis was divided into thirty-nine vestries or district boards, which elect the forty-five members who form the Metropolitan Board of Works, the city of London electing three members, each of the six great parishes of Islington, Marylebone, St Pancras, Lambeth, St George's (Hanover Square), and Shoreditch two members, and the other dis- tricts one each or one in combination. The board was originally established for the formation and maintenance of main sewers, but later Acts have made it the adminis- trative authority of the metropolis in a great variety of other matters, including the construction of main thorough- fares, the carrying out of great metropolitan improvements, the formation of new streets, the construction and main- tenance of parks, the preservation of commons and open spaces, the maintenance of the fire brigade, and the adminis- tration of certain enactments specially applicable to the metropolitan area. The total sum raised by the board for application to its various purposes since 1856 to 31st December 1881 was £28,689,749, and its net liability on the 31st December 1881 was £13,437,940. The capital required for the execution of great works is raised by the issue of stock bearing interest at the rate of 3% and 3 per cent., which has the same facilities of transfer as the Government stocks, and is redeemable in sixty years from creation. The rate per pound levied by the board has varied very greatly, being 2-09d. in 1856, and as high as 699d. in 1867, while for 1883 it is estimated at 62d. The total net charge in 1880 was £652,213, and for 1882 it is estimated at £715,822. The rateable annual value of property in the metropolis has risen from £11,283,663 in 1856 to £27,386,086 in 1882.

The vestries and district boards are entrusted with the management of local sewers, the lighting, paving, and cleaning of their own thoroughfares, and the removal of nuisances. For paving, except in the

old main thorough- fares, they have power to charge adjoining properties, and in several districts a small income is obtained from

DON [ADMINISTRATION,

realized property. The total amount of money advanced to them on loan by the Board of Works up to 31st November 1881 was £3,631,769, of which £3,297,430 was redeemable by 1929, and £334,338 by 1941. The School Board of London has in regard to education Other

a rating and legislative authority over a district correspond- adminis-

ing with that of the Metropolitan Board of Works. The ie metropolitan police force outside the City limits and within ye. 7 a radius of 12 miles of Charing Cross is under the control of the Home Secretary. The Tower of London is governed by the constable of the Tower, assisted by fifty magistrates, and the borough of Westminster is still under the nominal care of the dean and burgesses. The Metropolitan Asylums Board, the Burial Board, the Thames Conservancy Board, and the Lea Conservancy Board constitute the principal other direct governing authorities having relation to London, but the water and gas companies enjoy monopolies which imply a certain degree of irresponsible authority, and a right of taxation not sufficiently defined and limited. Within an area less than the district of the Board of Works there are ten parliamentary boroughs, which return in all twenty-two members, the City returning four members, and Southwark (from 1295), Westminster (1547), Maryle- bone (1832), Finsbury (1832), Tower Hamlets (1832), Greenwich (1832, extended in 1868), Lambeth (1832), Hackney, (1868), and Chelsea (1868) two each. London University (1868) returns:one member.

GRowTtH AND PopuLAtion.—For some centuries after Growth. the Conquest there are almost no data for an estimate of the extent and population of London, but a great impulse was given to its increase by the settlement of Normans and the opening up of intercourse with the Continent. The statement of Fitzstephen that it furnished, in the reign of Stephen, 60,000 men-at-arms and 20,000 knights cannot be

accepted as applying only to the City. Peter of Blois, under Henry II., only estimated its numbers at 40,000, although he may possibly have referred only to adults (Opera, ed. Giles, vol. ii. p. 85). In any case, previous to the great plague of 1349 it must have numbered at least 90,000, for in that year, according to Stow, as many as 50,000 persons were buried in the cemetery of Spitalcroft, specially consecrated for the purpose. There were severe ravages from the same cause in 1361 and 1369; and the calculation of Chalmers (Comparative Estimate of Great Britain, 1802), founded on the Subsidy Rolls of 1377, shows a population of only 34,971; but the emperor Manuel II., who visited it in 1400, states that it was to be preferred to every city of the West for population, opulence, and luxury (Macpherson, Annals of Commerce, vol. i. p. 611). Notwithstanding the regulations of Eliza- beth for checking its growth, London had by the end of the century advanced considerably beyond its old bound- aries. Giovanni Botero, writing about 1590, classes it with Naples, Lisbon, Prague, and Ghent as possessing about 160,000 inhabitants more or less, while Paris was said to possess over 400,000 inhabitants, The " Bills of Mortality," which were begun in 1592, were in 1604 extended to St Bartholomew the Great, Bridewell Precinct, and Trinity in the Minories, which were partly within the City liberties, and to St Clements Danes, St Giles-in-the- Fields, St James (Clerkenwell), St Catherine (Tower), St Leonard (Shoreditch), St Mary in Whitechapel, St Martin- in-the-Fields, and St Mary Magdalen (Bermondsey). St Mary at the Savoy was added in 1606, and Westminster in 1626. The parishes of Hackney, Islington, Lambeth, Newington, Rotherhithe, and Stepney, which were included in 1636, were, according to Graunt (Observations on the Gills of Mortality, 1676), still country villages in 1672, and indeed occupied an isolated position up to the middle of the 18th century. The result of the census of the

city taken in 1631 is given by Graunt as 130,178, but the sum of his details is 130,268. By 1661 he reckoned it to have increased to 179,000. He also concluded that the population within the limits of the "Bills of Mortality" was 460,000, and that from the beginning of the

century it had increased from 2 to 5. The population of London and its suburbs, excluding Westminster and the distant parishes, he placed at 384,000, or about a fourth less than Paris. Notwithstanding the plague of 1665 and the fire of 1666, London towards the close of the 17th century increased with great rapidity. Evelyn, writing in 1684, states that it had nearly doubled within his own recollection. Sir William Petty, in his Lssay on Political Arithmetic, estimated the population in 1683, including that of Westminster and Southwark, at 696,000, but Gregory King, in his Observations on the State of Ling- land, first published by Chalmers, allowing 53 persons to every house, makes it in 1694, within the limits of the “Bills of Mortality,” only 530,000. From about this period London superseded Paris as the largest city in Europe. During the first half of the 18th century its pro- gress was fluctuating, but on the peace of 1763 a great impulse was given to its prosperity, and after 1780 a rapid rate of progress commenced, which still shows no signs of diminution. Until 1756 there was sufficient space for the Mayfair east of Hyde Park, but by the end of the century the aristocracy had nearly all migrated west from Covent Garden and Soho. Islington was still almost dis- joined from the metropolis, but the great eastern suburbs had become so consolidated as almost to absorb even Hoxton, Bethnal Green, and Stepney. The first census of 1801 included St Pancras, Marylebone, Paddington, Kensington, and Chelsea, but Chelsea was still a solitary suburban retreat, Kensington was little more than “the old court suburb,” Paddington and Westbourne were rural hamlets, and Marylebone and St Pancras had less than one-fourth of their present population. The populous city surrounding Regent’s Park had scarcely any existence before 1820, but by 1830 it as well as Somers Town had become absorbed in the metropolis, especially by additions in the neighbourhood of St Pancras church and London university. Eastwards the most rapid extension had been in the direction of Greenwich, which was now united with Lambeth by a continuous line of houses. Belgravia in the south-west, and Tyburnia to the north of Hyde Park are chiefly the product of the next twenty years. Since that period the suburban districts have in all directions become almost consolidated, and beyond the present limits

of the registrar-general fringes of houses, extending in some instances outside even the 12 miles circuit from Charing Cross, connect the metropolis with populous towns which a few years ago were solitary hamlets. Within the last twenty years the rate of increase of the outer ring of this greater London has been 126°8 per cent., while that of London proper has been only 36:0, its outer ring showing an increase of 63°8 per cent., but its central area a decrease of 13°2,—the decrease in the City being 54°8, in the Strand 30‘5, St Giles 16°3, Holborn 9°5, Westminster 11°9, St George’s (Hanover Square) and Marylebone 4:1, and in the eastern central districts of Whitechapel, St George-in-the-East, and Shore- ditch 9°6, 3:°8, and 2-2 respectively. In these latter districts the decrease has been occasioned chiefly by improvements, but in the central business districts it is almost entirely the result of the substitution of business premises for dwelling-houses. The day census of the City taken in 1866 shows that the number of persons employed daily within its limits was 170,133, and that of 1881 gives a day population of 261,061, while the night popu- lation in 1871 was 74,897 and in 1881 only 50,526. The rapidity of the growth of London is largely due to the peculiar development of its trade and commerce, and is also closely connected with the interest excited by politics and the meetings of parliament. The bonds of connexion between London and England thus pulsate daily with a manifold vitality. London is the emporium of England, the centre of its great monetary transactions, the home of its science, literature, and art, and the yearly resort of its aristocratic and landed proprietor classes. Since the beginning of the century its rate of increase has exceeded that of England generally.

The proportion of inhabitants born outside its limits amounts to Nation- The number of the natives alities.

one-third of its entire population. of European states is in excess of those born in Scotland, and that of the natives of Ircland is about double, while the natives of the counties of England and Wales amount to more than a million. Irishmen by descent may be estimated at about 250,000 persons, Scots 120,000, foreigners 200,000, viz., Asiaties,

Africans, and Amerieans together 45,000, Europeans 155,000 (Germans 60,000, Freneh 30,000, Dutch 15,000, Poles 12,000, Italians 7500, Swiss 5000). The number of Jews is about 40,000. The special foreign district of London is that of Soho; another forcign district lies in the neighbourhood of Rateliff Highway, now St George Strect. The lower-elass Jews inhabit the neighbourhood of Hounds- diteh and Aldgate. The Italian street musicians and vendors of iees form a small eolony near Hatton Garden.

Table I]. shows the percentage of the population of London to Tables of the rest of England, the numbers before 1801 being only approxi- popula mate; Table III. the arcas, houses, and population of London in tion.

TABLE JI.

1600, 1650. 1801. 1821,

Population 180,000 | 350,000 | 550,000 | 600,000 | 864,035 | 1,227,590 | 1,872,365 Percentage to England 3°27 6°26 4) 9°72 10°23 11°78 Tas_e ITI. we) eee ee

1861. 1871, 1881.

Areal – in ; Persons : Persons Inhabited | Popula- Inhabited | Popula- Inhabited | Popula- e Acres. Houses. tion. ae Houses. tion. — Females. Houses. ‘lati. —

: Acre. London Police District, “Greater Londou”.. 441,587 | 434,530 | 3,222,720 7 528,794 | 3,885,641 | 1,819,896 | 2,065,745 | 645,818 | 4,764,312 11 Registration LOMON.....ccccccessssesesseesaseesees 75,362 | 350,421 | 2,803,989 37 417,767 | 3,254,260 | 1,523,151 | 1,731,109 | 486,286 | 3,814,571 61 *Rehool Board nee ae ; 75,490 | 360,065 | 2,818,862 37 419,642 | 3,266,987 | 1,528,318 | 1,738,669 | 488,995 | 3,832,441 51

Parliamentary Boroughs Distriet— City of LOndOD …....ccececsesscseeseeecereeees 668 13,298 112,063 168 9,305

74,897 36,459 38,438 6,493 50,526 76 Borough of Chelsea …....c.2sscesceeeneeeeee 7,028 ong se ee 35,020 258 ,050 112,526 145,524 47,954 366,516 52 7 TISUURViewecsss-cccsssereccoceee|| OsLee 44,363 386,844 5 51,318 452,484 213,259 239,225 59,952 524,480 | 102 ” GYreenwich…....-cscccccecsssore 8,581 aus see eee 26,073 169,361 83,680 85,681 30,842 206,651 24 a HAGE Vsti csccssecccsesce sce 4,700 = a Pe 49,259 | 362,378 | 171,742 | 190,636 | 55,865 417,191 89 3% Lambeth …. 5,655 | 45,252 298,082 53 54,981 379,048 | 177,189 | 201,859 | 69,222 498,967 88 RS Marylebone… 5,429 48,000 436,298 80 52,290 477,532 211,710 265,822 53,863 498,311 92 . South war>k…...ccccossscecsoveee 1,990 25,683 193,443 37 26,965 208,725 104,620 104,105 27,526 221,866 111 #55 Tower Hamlets …....s00+.) 4,097 6 len eae 51,310 391,790 193,549 398,241 55,955 438,910 107 re Westminster …....-sscecesceseee 2,546 26,430 253,985 99 25,434 246,606 115,539 131,067 25,312 228,932 89 Total of Parliamentary Boroughs District …) 45,841 | 334,318 | 2,640,253 381,955 | 3,020,871 | 1,420,273 | 1,600,598 | 432,984 | 3,452,350 75

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1 Exclusive of area under Thames.

Streets.

various governmental divisions; and Table IY. the population of the several registration districts at different periods from 1801. STREETS, BripcsEs, &c.—By the non-adoption of Wren’s plans the opportunity afforded through the great fire was for ever lost of constructing a model capital, and within the City limits the streets are still in many cases confused and intricate. The total absence of plan in the construction of the nucleus of London has doubtless tended to aggravate the confusion outside the old boundaries. The growth of the immense new outer city was, moreover, for ceuturies totally unregulated by the control of any central authority. The principal lines of streets formed along the old public highways are insufficient as main lines of com-

munication for the increased population, and the absence of direct connexion between important points causes traffic to be enormously impeded. The longest line of street communication in London is that which is formed by the junction of the lines of the Edgeware and Uxbridge Roads at the Marble Arch, whence it extends eastward by Oxford Street, Holborn, Newgate Street, Cheapside aud other important City streets, Whitechapel Road, and Mile End Road to Bow. At Cheapside a branch from it runs westward by Fleet Street, the Strand, Haymarket, Piccadilly, and Knightsbridge to Kensington. Much of the effect of the fine architecture of the City streets is totally lost from promiscuous crowding, and the main con- necting streets between the City and the West End dis-

DON

Trafalgar Square, with its fountains, its Nelson column, its statues, and its wide expanse, has an airy and pleasant effect, but the huge erections which surround it are a very miscellaneous group, and few of them are worthy of the site. The clubs and hotels in Pall Mall and its neigh- bourhood represent every variety of Grecian and Italian architecture. The private houses in the more fashionable regions are not remarkable for external beauty, but in summer time flowers and foliage give the West End squares and terraces a bright and pleasant aspect. A special characteristic of London is the enormous space covered by the suburban cottages and villas of the middle classes. Close to the most fashionable regions there are many mean back streets tenanted by workmen, but the principal territories of the working classes are compre- hended in the dense and dreary districts east and south- east of the City. The improvements lately carried out in the City and other central districts, and the substitution of business premises for dwelling houses, have compelled large numbers of these classes to live at a long distance from their work, and also caused undue crowding in the less remote regions. The running of workmen’s trains from the suburbs and the efforts of various private build- ing associations and of the Metropolitan Board, guided by the Artisan and Labourers’ Dwellings Improvement Act, have only partially mitigated these evils.

[STREETS.

Since 1785 the greater part of London within the City Street limits has been rebuilt, and its streets have been much improve- altered, the principal improvements being the reconstruc- ™en*

play, at certain parts, much meanness and incongruity. Regent Street, the most fashionable thoroughfare of

London, possesses ample width, and the splendour of its shops to some extent atones for the plain monotony of its regular architecture. In Oxford Street, which ranks next to it in importance, many buildings of a more ornamental character have lately been erected. Piccadilly, the eastern half of which is occupied chiefly by shops, and the western by dwelling houses and clubs, is a medley of every species of architecture, but is to some extent effective from the

tion of the lines from London Bridge to Finsbury Pave- ment, and from Blackfriars Bridge to Farringdon Road, both intersecting the City from north to south; the re- building of Bartholomew Lane, Lothbury, Threadneedle Street, and Cannon Street from King William Street to St Paul's; and the construction, in conjunction with the Metropolitan Board, of the Holborn Viaduct and of Queen Victoria Street from Blackfriars Bridge to the Mansion

variety of its contrasts, and its outlook to the Green Park, House. The Metropolitan Board now exercises a certain TABLE IV. eee

1801. 1841. 1861. 1871. 1881,

ange Persons Persons Persons * | Population.} to an | Population. | to an Population. | Population. | Population. | to an Acre. Acre. City of London within the walls 63,832 168 54,626 144 44,400 28,098 ae City of London within and without the walls 128,269 192 123,563 185 112,063 74,897 50,526 London City and Westminster……..sessssesessersseeccccccs 981,541 88 345,805 | 108 362,804 318,097 279,458 London City, Westminster, and Southwark 348,179 91 445,261 117 473,540 419,297 501,324 London within the

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BRIDGES. |

control over the formation of new streets, but its powers are hampered by previous circumstances and by various re- strictions. The principal new thoroughfares opened up by the board, besides Queen Victoria Street and the Holborn Viaduct, are Garrick Street, Covent Garden

(1861), South- wark Street (1864), Northumberland Avenue (1876), and Theobald's Road and Clerkenwell Road, begun in 1873 to connect Oxford Street and Old Street. They have also effected extensive improvements in the neighbourhood of Whitechapel, Shoreditch, Park Lane, and Kensington. The more important schemes in contemplation are a new street from Tottenham Court Road to Charing Cross, another fron. Oxford Street to Piccadilly Circus, the widening of Coventry Street, of Gray's Inn Road, and of Tooley Street, and alterations of a less extensive character at Kentish Town, Hackney, and Camberwell. A scheme has been put forth by Government to relieve the pressure at Hyde Park Corner. Altogether up to 31st December 1881 the board have expended in street improvements £6,531,856, of which probably one-third will be defrayed by sales of property. In addition to this over £4,000,000 have been spent on the Thames Embankment and Queen Victoria Street, and the board have contributed about £626,077 to defray local improvements by district boards and vestries, as well as £1,360,500 for artisans' dwellings.

The Thames Embankment, with its marine wall of large

Embank- granite blocks facing the river, supports on the north side

a spacious thoroughfare which forms one of the finest pro- menades in London. The total cost of the various portions of the embankment was over £3,000,000, the greater part of which is being defrayed by the coal and wine duties levied by the City corporation. By the construction (1864-70) of that portion known as the Victoria Embank- ment, stretching from Blackfriars Bridge to Westmin- ster, about 37 acres of land have been reclaimed, of which 19 are occupied by carriage and footways, 74 have been conveyed to adjoining proprietors, and about 8 have been formed into ornamental grounds. The Albert Embank- ment (1865-68), stretching on the south side of the river from Westminster Bridge to Vauxhall Bridge, includes about 9 acres, which are now chiefly occupied by St Thomas's Hospital. The Chelsea Embankment (1871-74), which is the extension of one previously constructed between Vauxhall Bridge and Chelsea Hospital,

involved the reclamation of about 94 acres of ground, now occupied partly by a roadway 70 feet wide, and partly by a flower garden.

There are twelve bridges, other than railway bridges, over the Thames within the metropolitan area, the most easterly being London Bridge and the most westerly Hammersmith Bridge. Three of these, London Bridge, Southwark Bridge, and Blackfriars Bridge, are within the City area. New London Bridge, a noble structure by Rennie, was opened in 1831, having cost £1,458,311. As populous and busy commercial districts extend for several miles to the east of it on both sides of the Thames, it is not only totally inadequate for the requirements of traffic, but is also renloved beyond many convenient lines of communication. On this latter account the proposal to widen it—in itself a very unsatisfactory .plan—has met with almost no sup- port; but a bill promoted by the Metropolitan Board for erecting a high level bridge at the Tower failed also to commend itself to a committee of the House of Commons. Until 1769, when the Blackfriars Bridge was erected, London Bridge stood alone. Old Blackfriars Bridge was replaced in 1869 by the present one of five iron arches resting on granite, erected from the designs of Page at a cost of £320,000. Southwark Bridge, designed by Rennie, 1815-19, consists of three iron arches of great elegance resting on stone piers, and cost £800,000. Partly from

the unsuitability of its approaches, it has not proved of very much service.

The number of passengers and vehicles passing over the London and Blackfriars Bridges in a single day of 1828 is given in the July number of the Monthly Review for that year, and in 1881 similar in- formation was obtained, in regard to the three bridges, for the traffic in the direction of the City. Multiplying these figures by two, we find that the foot passengers crossing London Bridge in 1823 numbered 89,640, while in 1881 they were 157,886, and that the number of vehicles had increased from 6182 to 21,466 ; that over Blackfriars Bridge the

passengers had increased from 61,069 to 87,134, and the vehicles from 4047 to 14,584, while 30,090 pas- sengers and 3560 vehicles passed over Southwark Bridge, the in- crease in the number of passengers over the three bridges being thus 124,401, and of vehicles 28,381. At the earlier date South- wark Bridge was practically unused, but in 1865 the toll was abolished, and the bridge purchased by the corporation for £218, 868. The Metropolitan Toll Bridges Act of 1877 required the Metropoli- tan Board to extinguish the tolls on all the Thames bridges and the bridge over Deptford Creek, and thereafter to repair and maintain them, the county authorities of Middlesex and Surrey paying each £1200 a year towards their maintenance. The bridges freed by the Act were the Charing Cross foot-bridge, for which £98,540 was paid to the South-Eastern Railway; Waterloo Bridge (1811-17), designed by Rennie in a style similar to London Bridge, constructed at a cost of £1,000,000, and purchased for £475,000 ; Lambeth Bridge (1862), built of iron at a cost of £40,000, and purchased for £36,049 ; Vauxhall Bridge (1811-16), similar in form to Southwark Bridge, erected for. over £300,000, and purchased for £225,230 ; Chelsea Suspension Bridge (1858), designed by Page, erected by the Government for £88,000, purchased for £75,000 ; the Albert Sus- pension Bridge (1873) and Battersea Bridge, an old wooden struc- ture, both purchased for £800,000; Wandsworth Bridge for £52,761 ; Putney Bridge (1729), a picturesque old timber structure, for £58,000 ; and Hammersmith Bridge for £112,500. Battersea and Putney bridges are about to be re-erected, and Deptford Creek Bridge is to be widened and improved at a cost of £109,091. The total amount of money spent by the board in connexion with bridges up to 18th December 1881 was £1,479,697. The amount to be paid by the board for their maintenance in 1882 is estimated at £90,502. The river is crossed by many railway bridges, and the Thames tunnel, begun in 1825 and completed in 1848, at a cost of £468,000, for the purposes of traffic, was Wp in 1865 by the Great Eastern Company, and is now used as a railway tunnel. A subway under the Thames from Tower Hill to Tooley Street was constructed in 1869 at a cost of £16,000. The communication in the neighbourhood of the river is greatly facilitated by the frequent passenger steamers.

The cleaning, watering, and paving of the streets are more satis- Main-
factory than might be expected from the fact that each district tenance
Several Acts for paving of streets.

depends solely on its own local authority. the Strand were passed in the 14th century, and in the 16th cen- tury for the streets outside the City. In1614 the citizens began to pave the margins of the streets before their doors, but the middle of the streets were laid with large pebbles very unevenly. In 1661 the money obtained from hackney coach licences, £5 for each an- nually, was applied to keeping them in repair. The use of squared granite blocks, with raised footways, was introduced by Acts of Parliament for Westminster in 1761, and for London generally in 1766. Within the last twenty years asphalt and wooden pavement have been largely substituted for granite in the principal thorough- fares.

Hackney coaches are first mentioned in 1625, when they were
Convey- In 1652 their ances,

kept at inns, and numbered altogether only 20. number was limited to 200, in 1662 to 400, in 1694 to 700, in 1715 to 800, in 1771 to 1000, and in 1799 to 1200. In 1832 the restriction of their number was abolished. The number of cab drivers in 1871 was 10,048, and of cabs 7818, of which 3295 were hansoms and 4523 four-wheelers ; in 1881 the number of drivers was 12,630, and of cabs 9652, of which 5805 were hansoms and ouly 3847 four-whcelers. Omnibuses were first introduced in 1829. Many of the principal streets are too crowded for tramways, but in South London tramcars are more used than omnibuses, and there are also several routes in the northern and eastern districts. The Metro- politan and Metropolitan District Railway lines, which run partly underground, and form almost a complete belt round the ‘‘inner circle” of London, with several branches intersecting it, and others communicating with various suburban lines, have proved invaluable in relieving the throng of vehicles ou the streets, and in affording rapid communication between important points ; but the railway system in and around London has suffered greatly in directness from the absence of a complete plan cmbracing proper connecting

links between the lines of the several companies, Tho annual number of passengers on the Metropolitan Railway is now about 60 millions, The Regent, Grand Junction, and several other canals, besides connecting London with the internal navigation of

Postal districts.

Royal parks.

England, supply a means of transport for heavy goods between various districts of the metropolis.

London is divided into eight postal districts, viz., Eastern Central (E.C.), Western Central (W.C.), Northern (N.), North-Western (N.W.), Western (W.), South-Western (S.W.), South-Eastern (S.E.), and Eastern (E.). In the E.C. district there are twelve deliveries of letters daily, in the town portions of the other districts, which extend to about 3 miles from the General Post-Office, eleven dcliveries, and in the suburban portions six deliveries.

Open Spaces.—London owes the possession of its finest parks rather to accident than to intention, Eastwards and northwards no effort was made to preserve any part of the “delightful plain of meadow land interspersed with flowing streams” mentioned by Fitzstephen, or of the “immense forest of densely wooded thickets,” or of the “common fields” in the great fen, notwithstanding the riot of the citizens in the reign of Henry VIII. against the invasion of their rights by enclosure. Westward, however, the inroads of the builder were interrupted by the royal parks, which, lying adjacent to each other, cover an area of about 900 acres. St James’s Park, 80 acres, transformed from a swamp into a deer park, bowling green, and tennis court by Henry VIII, extended and laid out as a pleasure ground by Charles IL., and rearranged by Nash (1827-29), possesses beautiful combinations of water and foliage. Green Park, 70 acres, lying between St James’s Park and Piccadilly, is unadorned except by rows of trees and by parterres of flowers bordering Piccadilly. Hyde Park, 390 acres, stretches westward

from the district of Mayfair to Kensington Gardens. Originally forming part of the manor of Hyde, which was attached to Westminster Abbey, Hyde Park at the dissolution of the monasteries was taken possession of by Henry VIII. In 1652 the park, which then included a large portion of the ground now joined to Kensington Gardens and extended to 621 acres, was sold for £17,068, 6s. 8d., but in 1660 it was rebought by the Crown, having some time before this become the great "rendezvous of fashion and beauty." It possesses nine principal gateways, of which that at Hyde Park Corner on the south-east aud the Marble Arch on the north-east present the most striking features. The former, designed by Decimus Burton and erected in 1828 at a cost of £17,000, consists of three imposing arches adorned with rilievos copied from the Elgin marbles. The Marble Arch, originally intended as a monument to Nelson, was first erected at a cost of £80,000 in front of Buckingham Palace, and was placed in its present position in 1851. With its fine expanse of grass, its bright flower beds and clumps of shrubbery, its noble old trees, its beautiful ornamental lake the Serpentine, its broad avenues crowded with equipages, its Rotten Row alive with equestrians, its walks lined with thousands of loungers of very various nationalities, professions, and grades of social position, Hyde Park in the height of the season presents a scene which in the brilliancy of its tout ensemble and its peculiarly mingled contrasts can probably be paralleled nowhere else. In the 17th and 18th centuries Hyde Park was a favourite meeting place for duellists, and in the present century has been frequently the scene of great political gatherings. To the west are Kensington Gardens, 360 acres, originally attached to Kensington Palace, and enlarged in the reign of George II. by the addition of nearly 300 acres taken from Hyde Park. They are more thickly planted than the "Park," and also contain an avenue of rare plants and shrubs, and several walks lined with flowering trees. Re- gent's Park in the north-west, 470 acres, occupying the site of Marylebone Park, which in the time of Elizabeth was used as a hunting ground, owes its preservation to the intention of George III. to erect within it a royal palace. It con- tains the gardens of the Zoological Society and of the Royal Botanic Society, as well as the grounds of a few private

villas. The northern half of the park is in summer devoted to cricket ; in the south-east corner there is a flower garden of rather antique design ; and in the south-west a portion bounded on the north by an artificial lake is let to private householders. To the north of Regent's Park there are

about 12 acres of open ground surrounding Primrose Hill, parks.

220 feet, commanding an extensive view of London. Battersea Park, 180 acres, formed (1852-58) at a cost of £312,890, on the south side of the Thames, besides a fine promenade along the banks of the river, several walks and carriage drives bordered with parterres, and a wide expanse for cricket and other amusements, contains a subtropical garden, which during August and September possesses much of the witchery ofan ideal fairy-land. East London, after the enclosure of Finsbury Fields, had no special re- creation ground until the opening of Victoria Park, which was sanctioned by an Act of Parliament in 1842, and was in 1872 increased to about 300 acres. Finsbury Park, 115 acres, formed by the Metropolitan Board of Works from the grounds of Hornsey Wood House at a cost of £112,000 ; Southwark Park, Rotherhithe, 63 acres, formed at a cost of £111,000; West Ham Park in the extreme east, partly purchased by the City corporation ; Greenwich Park (see GREENWICH); and the gardens on the Thames Embankment, with various squares and semi-private gar- dens, sum up the other ornamental open spaces of London.

The Metropolitan Board, under various Acts of Parlia- Public

ment, have secured the exclusive right of the public in several commons and open spaces, which with the parks under their care comprise together an area of 1698 acres, giving with

the royal parks and Battersea Park, Victoria Park, and West

Ham Park a total of over 3000 acres, or about a twenty-fifth part of the whole metropolitan area. The principal public commons are Hampstead Heath, a wild hilly region now encroached on by buildings on all sides except the north and north-west, commanding fine views both of Loudon and the country, and, with its clear bracing air and its unkempt and rugged beauty, breaking on the visitor with all the effect of a sudden surprise; Blackheath Common, 267 acres, a bare sandy expanse to the south of Greenwich Park, containing a good golfing course ; Clapham Common, 220 acres; Wormwood Scrubs, 194 acres; the Tooting Commons, 207 acres; and Plumstead Common, 110 acres. The total sum expended by the Board of Works in the purchase, preservation, and adornment of parks and open spaces up to 3lst December 1881 was £436,760. All the parks and open spaces already mentioned are included in the Metropolitan Board district, but outside this area there is in the neighbourhood of London a large number of uncultivated spaces to which the public have various rights, some of them of an obscure and undefined character. A return made to the House of Commons in 1865 gives the area of public commons within radii of 25 miles and of 15 miles of the metropolis, the area of those within the smaller circuit being 13,301 acres. Of Epping Forest 5600 acres have been secured to the public by the corpor- ation of the City, and in 1871 an Act was passed for the preservation of Putney Heath and Wimbledon Common, but Hounslow Heath, of old the favourite resort of high- waymen, and at one time over 4000 acres in extent, is now nearly all under cultivation. Richmond Park, the grounds of Hampton Court Palace, the gardens at Kew, the fine surroundings of the Crystal and Alexandra Palaces, the cricket grounds at the Oval and Lord’s, may practically be also reckoned among the public parks of London. In addition to this the river Thames itself supplies facilities for recreation which are safe from the inroads of the builder ; and all round the metropolis there are numerous footpaths through the open fields. ; Water Suppty.—For two centuries after the Conquest,

Other

com- mons,

Water supply.

The pre- blem of future

supply,

LO N

London obtained a sufficient supply of pure water partly from the rivers or streams which passed through it and partly from wells sunk into the sands above the chalk. Holywell, Clerk's Well (Clerkenwell), and St Clement's Well (near St Clement's Inn) are mentioned by Fitz-stephen as those "of most note." In 1236 the magis- trates purchased from Gilbert Sandford the liberty to convey the waters of the Tyburn from Paddington in leaden pipes to the city, and a great conduit of lead cas- tellated with stone was begun in West Cheap in 1285, Various other conduits were built in the 14th and 15th centuries, some for the water of the Thames, from which also the inhabitants were supplied by the city company of water-bearers, who brought it in leathern panniers slung on horses. In 1582 a great step in advance was taken by Peter Moris, a Dutchman, the real originator of the Thames water companies, who erected a "'forcier" on an arch of London Bridge to convey the Thames water into the houses in the east end of the city as far as Gracechurch Street ; in 1594 another was erected near Broken Wharf for West Cheap, Fleet Strect, and the district round St Paul's, and in 1610 a third at Aldersgate without the gate. Moris, who obtained the lease of one arch of London Bridge for five hundred years at a rental of 10s. per annum, and two years later the use of another arch, erected for his purpose very ingenious machinery; and the works con- tinued until 1701 in the possession of the family, who after amassing large wealth sold the lease to a company for £30,000, They ultimately occupied four arches, and continued till 1822, when the supply was purchased by the Southwark Company for £10,000. In 1605 an Act was passed for supplying the northern districts from springs near Ware in Herts, This enterprise was in 1609 undertaken by Hugh Myddleton, who, when his funds became ex- hausted in 1612, received the necessary money from James I, on condition of his sharing in the profits. With this assistance the reservoirs at Clerkenwell

sup- plied by the New River were opened in 1613. In 1630 a scheme to bring water to London and West- minster from Hoddesden in Herts was promoted by aid of a lottery licensed by Charles I. on condition that the

WATER SUPPLY. |

| Preference and

Ordinary Capital, | Loan Capital.

ae ee £7,561,526 £2,520,340 £10,081,866 £992,610 £389,258 £603,352 Bas cqucaar tt eaailtete sc oe 9,087,917 3,448,981 12}536,898 12,612,589 1,532,784 610,899 921,885 so peneantmmames 1,526,391 | 928,641 2,455,032 2,474,879 540,174 221,641 | 318,538

Within ten years the inerease of eapital has thus been about 24 per eent., or 22 per eent. per annum, the inerease of the ineome 54 per eent., or 52 per cent. per annum, and of the expenses 57 per eent., or 54% perannum. Thus, while in 1871 there was a eapital of 10 inillions, gaining 6 per cent. profits, in 1881 there was a eapital of 124 millions produeing 7? per eent. Within the last two years the value of the property has been inereasing at a more rapid ratio, ani probably at the rate of £1,250,000 per annum ; but, as on ae- eount of the proposals to buy up the rights of the companies they have at present special reasons for eurtailing expenses and delaying the earrying out of all but essential improvements, it is impossible to know how mueh of the inerease is temporary and artificial.

According to Dr Frankland the water of the Thames and the Lea, notwithstanding the most efficient possible filtra- tion, are, on account of sewage pollution, becoming Icss and less fit for domestic use, about one-half of the water at present supplied being already grossly polluted, and a very large proportion of the remainder occasionally pol- luted. He therefore recommends that the supply of water

Total Capital.

Authorized Average x . : Miles of ai 5 : ‘ o. of |{fouses on} Estimated | Subsidiary Storage. Filtered Storage. Miles of : D ee euepy one é eupply Rs Supplies to} Constant Population : a ” “ , Mains in the C aM iy ie Tleeies, Mouses. | Supply. | Supplied. | 4.4. | Capaclty. | i | Capacity. Metropolis. Charged. N Acres. | Gals, Aeres, Gals. 110,000,000 | Restricted. | 68,000,000 | 72,000,000 | 622,000 186,000 4,600,000 4573 |1,264,350,000 46 150,087,000 7

DON

promoters should pay £4000 per annum into the king’s treasury. Strype, writing in 1720, mentions that “ there is not a street in London but water runs through it in pipes conveyed underground, and from those pipes there is scarce a house whose rent is £15 or £20 per annum but hath the convenience of water brought into it,” while “for the smaller tenements there is generally a cock Or pump convenient to the inhabitants.” In 1721 the Chelsea Water Company began to supply water from the Thames to Westminster and the parts adjacent, and in 1783 the supply of south London was supplemented by the erection of the Lambeth water-works opposite Charing Cross. The Vauxhall Company was established at Vaux- hall Bridge in 1805, the West Middlesex near Hammer- smith in 1806, the East London on the River Lea at Bow in the same year, the Kent on the Ravensbourne at Deptford in 1810, the Grand Junction at the Grand Junction Canal in 1811, and the Southwark at London Bridge in 1822. Tor several years before the interference of parliament the companies had agreed to restrict them- selves to separate localities. The Acts of 1847 required the companies to provide pure and wholesome water for the use of the inhabitants in the districts supplied by them, and also to provide water for general use. An Act passed in 1852 compelled the removal of the companies beyond the tidal limits of the Thames, contained regulations as to rates, enforced thorough filtration, and endeavoured to make provision for a constant supply. The rates, which differ in the various companies, were in some respects amended by the Act of 1871; but, as it fails to guard against claims for back dividends, no sufficient guarantee is provided against the raising of the rates. These are charged chiefly on the value of the houses, but the Acts do not

distinguish with sufficient clearness between the gross annual value and the rental. A proposal in 1880 to purchase the rights of the companies, whose capital was then a little over £12,000,000, for £34,160,000, failed to com- mend itself to a committee of the House of Commons. Their accounts being made up at different periods, it is impossible

to give comparative returns for the companies ; the following are the figures (Table V.), as best they ean be stated, for two years :—

Total

Working Expenditure,

Expenses. Dividends,

Income.

—

£10,137,710

for domestic use should be taken from the springs of the basin before they reach the river. At the present rate of the increase of London the supply required will, however, within forty years exceed that which may be obtainable in the whole Thames basin in times of summer drought, such as may occur in any year, and thus ina future not far distant a means of storage nmiust be provided, or a new source of supply discovered, involving an outlay which would at least double the rates on the present rental. The Kent Company, which obtains its supply from the chalk wells, is the only one possessing wholly unpolluted sources, but the New River Company also obtains about one-tenth of its supply from springs, the remainder being obtained from the Lea. The East London Company ob- tains its supplies from the Lea and Thames, and the other companics from the Thames alone. The following table (VL) gives certain particulars :—

The water com- panies,

Old Licutinc.—From 1416 the citizens of Loudon were methods ynder an obligation to hang out candles between certain of light hours on dark nights for the illumination of the streets ; boas and in 1661 a special Act of Parliament was passed to en- force the custom. The corporation in 1684 granted a licence to Edward Heming, the inventor of oil lamps, for the sole supply of the public lights for twenty-one years, but the duty was then once more assigned to the individual citizens. A second agreement with contractors not proving satisfactory, tle corporation in 1736 obtained from parlia- ment permission to erect liglits where they thought proper, and to levy a rate, which in that year yielded £15,000. Gas-lighting was in 1807 introduced in Pall Mall by the erection of a small apparatus to supply the lamps on the one side of the street, the other being still lighted with oil. In 1810 the Gas Light and Coke Company received a charter permitting it to supply gas to any persons within “thie cities of London and Westminster, and the borough of Southwark,” and as the result of their enterprise West- minster Bridge in 1813 was lighted with gas, and in 1814 the whole of the streets of St Margaret’s parish. The City of London Gas Company was formed in 1817, and soon afterwards other seven companies. After several years’ wasteful competition the companies came to an agreement in 1857 to restrict themselves to separate localities. This led to the Metropolitan Gas Act of 1860, the only effectual provisions of which were those in reference to the quality of the gas. The City of London Gas Act of 1868, limit- ing the price of gas within the City to 3s. 9d. per 1000 feet, except in certain cases, was the only other measure of a restrictive character passed before 1876, and previous to this the companies, by amalgamation, and through the favourable terms on which they were allowed to increase their capital and to raise new shares, had enormously increased the value of their dividends. The Act of 1876, from the provisions of which the London Gas Company is exempt, adopted a sliding scale of dividends, one half of the profits, after a 10 per cent. dividend had been paid, going to the shareholders, the other being applied to reduction in the price of the gas, it being also provided that the price should not be more than 3s. 9d., and that when additions were made to the capital the shares should

be put up to auction. The experimental introduction of the electric light by the commissioners of sewers of the City, and by the Metropolitan Board (for the Thames Embankment and some of the bridges), has led the gas companies to provide better lights in some of the more important streets,

The following table (VII.) will show that the prosperity of the companies} has not been affected by the legislation of 1876, and as yet has not materially suffered from the threatened competition of electric lighting :—

The gas eom- panies.

—F

He naan oo Year io +1) s gee ending eerease — hse es | December from 1874 to

1880, _ 1874, 1880,

£ Sie £ 12,050,719 | 10,482,900 | +1,567,819 10,784,961 | 8,887,286 | +1,897,675 5, 1,595,614 | —329;857 2,058,667 | +1,304,500 1,303,805 329,455 | +974,350

8,032,720 7,246,800 +785,920 3,988,548 3,703,198 +285,345

2,794,858 | 2,767,266 | 4.277599 3,015,444 | 2,914,800 | +1003644 221,271 268,297 —47,026

1,998,254 1,444,996 + 553,258

17,012,025 | 11,6487859 | +.5,363°166 1,124,438 | 1,074,595 +49,843

60,346 54,119 +6,227

1 By amalgamation the eompanies have now been reduced to four: ~— Gas Light and Coke Company, paid up capital £7,515,000 ; South Metropolitan Gas Company, £1,831,990 ; Commercial Gas Company, £675,845 ; London Gas Company, £762,126. ‘

LONDON

[LIcHTING.

Firr ExtrncT1on.—Until 1866 the duty of extinguishing fires Protec. was in the hands of the fire insurance companies, which in 1832 tion from united in support of one brigade for the whole of London, but only fire, kept a comparatively small establishment, in the central districts of the metropolis. The other districts were proteeted by small hand-engines kept up by the parochial authorities according to the 14 Geo. I1I. ce. 78. Since the staff of the fire insurance companies was placed under the care of the Metropolitan Board, the number of stations has been increased from 17 to 53, with 4 floating stations, while 11 movable stations have also been provided ; the number of engines has been increased from 11 steam and 27 manual to 3 float- ing engines, 38 steam land engines, and 115 manual; and the number of men has been increased from 130 to 586, in addition to 68 coaclhmen and pilots. The board has also undertaken the | duty of protecting life from fire, which previous to 1867 was dis- charged by a society supported by voluntary subscriptions, and they at present maintain 137 fire-eseapes, which are stationed during the night in the most prominent parts of the metropolis. ‘The total receipts of the brigade in 1880 was £91,545, and the expenses £88,980, of which £56,021 was defrayed by the board, £10,000 was paid by the treasury, and £21,464 was contributed by the insurance companies, at the rate of £35 for every £1,000,000 insured by them. In 1881 the expenses were over £100,000, of which over £60,000 was defrayed by rates. The number of persons endangered by fire during 1881 was 154, of whom 114 were saved and 40 lost their lives. The following table (VIII.) gives a classification of fires since 1874 :—

Number of Fires. Slight.

1419

1366 p 1466 }

1374

1489

1559

1709

1824

Pereentage,

Serious. Total. Serious Slight.

SANITARY ARRANGEMENTS.—Until 1531 no provision Early | was made for the construction of underground main sewers, S*itary | notwithstanding that in 1290 the exhalations from the Fleet ie overcame the incense burnt at the altars in the neighbour- ~ ing churches, and that in 1307 the river, on account of the accumulation of filth, had become inaccessible for ships,

The Act of Henry III. in 1531, which provided for the appointment of a commission of sewers, was renewed in Commis 1548 by Edward VI., and extended in its application by sion of James I, in 1607 ; and subsequently separate commissions °°Y™ were granted as the population extended to other districts.

The most important work of the old commission of sewers

was the bridging over of the Fleet in 1637. In 1841 this sewer, which drained an area of over 400 acres, was widened at a cost of about £47,000, and at its mouth

an iron culvert was provided which carried its discharge

into the middle of the Thames. Other main sewers were constructed, but the bridging of them over was carried out slowly and in a very imperfect manner. In early times

the nuisances were carried away by the scavengers and

the sewage received into wells, which when full were pumped

into the kennels of the streets. Until 1848 the discharge

of house sewage into the main drainage was forbidden, and

the construction of cesspools enforced, the majority of which

were unprovided with overflow drains, but after 1810 there

was considerable improvement in connexion with the intro- duction of better arrangements for a supply of water. Under the auspices of the Metropolitan Commission of Sewers, created by the Act of 1848, a more satisfactory system of local drainage was enforced; but its action in regard to the main sewage discharge was so dilatory that

the pressure of public opinion led to the Metropolitan Local Management Act of 1855 providing for the creation

of the Metropolitan Board of Works, in which was vested Metro- the care of the main sewers, and to which was entrusted polit the construction of works for their discharge at a distance 7°’ from London regarded as sufficient to prevent the pollu-

tion of the river. Works were commenced in 1859,

and completed in 1865 at a cost of £4,607,000, pro-

LON

viding three lines of intercepting sewers on the north side of the river, which convey the discharge 11 miles below London Bridge, and two lines on the south side, which convey their discharge 4 miles farther down. These works comprise 80 miles of main intercepting sewers, in addition to four pumping stations to raise the sewage from the lower levels. The total length of the main strect sewers entrusted to the board was about 165 miles, one-fifth of which consisted of offensive open sewers, while many of the others were of most defective design or out of repair. The total cost of repairing these sewers, and connecting them

with the new main drainage system, was estimated at £800,000, and works to the value of £750,000 have peen exccuted. The sum expended on main drainage and main sewers up to 31st December 1881 was £5,684,470. The opinion seems to be increasing that the present method of getting rid of the sewage of London is radically wrong, and undoubtedly the sewage discharge may reach propor- tions which may absolutely demand a new supplemental scheme. For the four years ending 1878 the avcrage daily sewage discharge was 1223 millions of gallous, in 1878 it was 157} millions, and it is now estimated at 1&0 millions. ©

HEALTH. |

DON 827

regarded as exceptionally healthy. Although subject occasionally to rapid alternations of temperature, the climate is generally mild and according to the seasons equable, with an early spring and a long autumn. The following table ([X.) gives a summary of Greenwich meteor- ology for thirty-two years, 1849-80 :—

Weekly | Yearly

Movement) Fall of of Air

Mean Dryness Rain in| of Atmo-

Mean Tempera- ture for the Year,

Mean Temperature for Quarters ending in

March.

in Miles.

1811

June. Sept.

60°4

In 1306, when the population did not exceed 50,000, the citizens of London petitioned Edward I. to prohibit the use of sea coal, and he passed a law making the burn- ing of it a capital offence. John Evelyn, in Pumifugium, written in 1661, complains that on account of the increase of coal smoke the gardens no longer bear fruit, and instances various cascs in which the smoke had been pre- judicial to health, but the influence of smoke in increasing fogs and intensifying their evils seems not to have been appreciable. The smoke-producing area has since then increased from about 3 square miles to over 100 square miles, and the average daily consumption of coals in

Smoke and fogs,

Thames The conservancy of the Thames was in 1857 transferred | domestic fireplaces has mounted to about 27,000 tons, or eonserv- from the corporation to a body of twelve, nominated by | in winter probably to 40,000 tons, which in certain states aey- — various authorities, and presided over by the lord mayor; | of the atmosphere produces a cloud of smoke resting for and in 1867 the conservancy of the upper reaches from | days over the central districts of the town, and shutting Staines to Cricklade was vested in a board, of which the | out the sun, even when it does not descend in foggy conservators of the lower reaches formed the majority. | weather as a thick, impenetrable, and partly poisonous Under the auspices of these two boards not only has the | mass of darkness, During the fogs of 1879-80 asthma navigation of the river been wey much improved, but very | increased 220 per cent. and bronchitis 331 per cent., and stringent care has been exercised to prevent its unnecessary | in the week ending February 13, 1882, the death-rate, pollution, In 1868 the Lea was also placed under the | owing to the dense fogs, rose from 27°1 in the previous , control of a conservancy board. The expenses of the boards | week to 35°3, diseases of the respiratory organs rising to are defrayed by tonnage dues, tolls, pier dues, fincs, and | 994, the corrected weekly average of this class of diseases licences, and contributions from the canal and water | being 430. The evil is mainly due to the smoke of companies. 7

: domestic fireplaces. Street The sanitary condition of the strects and houses is under | The death-rate of London has steadily declined since the Death- _ the care of vestrics and district boards, but great variety | beginning of the century, when it was first exceeded by rate and ion. exists in regard to tho efficiency with which the work is | the birth-rate. A record of the hirths and deaths of London to performed. entitled “Bills of Mortality” was made by the parish clerks ~~ Ceme- An Act passed in 1845 provides for the prohibition of interment | in the plague year of 1593, and from 1603 was continued teres. in any of the cemeteries within the metropolitan area by order in | even after the returns had begun to be published by the eonncil, a forbids the construction of new ay _yineo within registrar-general. Though they only included the births of 2 milcs of the metropolis except on the approval of the secretary : > “ of state. The power of constructing cemeteries for their several persons baptized according to the forms of the Church of districts is granted to the vestries, who may borrow money for this England, and the deaths of persons buried im consecrated purpose from the Public Works Loan Commissioners, and are | ground within the parishes included in the “ Bills,” and required i: — a Page for ae Seay eee i. were in many cases very carelessly compiled, they place sioners of sewers for the City of London are the burial board ior | ; . . : the City parishes, The secretary of state has the power to issue it beyond doubt that wae ee when London se regulations in regard to the construction of cemeteries and the exempt from the plague the rate of mortality required a arrangements connected with interment. Aamong the more import- | large immigration from the country to take the placc of ant suburban cemeteries are Kensal Green (in which any eminent | those who died in London. Previous to 1593 the great persons have been interred), Brompton, Hampstead, Highgate, lawiie years were 1349- 1961-and 1366 Abney Park, Nunhead, and Norwood. Pp Ty, ‘ai ma 2 cre ; : ne following table (X.) shows the number of births and deaths Climate, Heatru.—Apart from the deleterious influence of smoke | in the great plague years of the seventeenth eentury, and the

and defective sanitary arrangements, London must be

The average mortality of London in 1881 was 21°6 per 1000, or 1°1 less than that of the twenty other large towns of England, while the rate for England was only 20°5. It is to be remeinbered that London contains a comparatively small proportion of working class population. Its sanitary condition is still very far in advance of that of Paris, where at present the death-rate is about 130 for 100 in London. The registrar-general calculates that according to the density of London its normal death-rate should be much lower than

average annual nmnber for every decade in the 18th century :—

‘Average

, Total Deaths from – Exeess of aie Excess of |} ‘ am Excess of Years, Dest Plague. Births. Deaths. ending s| Deaths. Births. mene Eo s| Deaths. Births. Denttis,

1593 17,844 10,662 4,021 13,823 1710 21,461 15,628 5,888 1760 22,001 17,156 4,845 1608 42,042 36,269 4,789 37,253 1720 23,909 17,111 6,798 1770 24,943 19,784 5,109 1625 54,265 35,417 6,783 47,482 1730 27,492 18,208 9,289 1780 28,851 19,248 4,603 1636 23,359 10,400 9,522 18,837 1740 26,492 16,830 9,662 1790 23,080 21,477 1,603

1665 97,306 68,596 9,967 87,339 1750 25,352 14,457 10,895 |} 1800 | 24,270 22,605 1,665

it is, but, besides the fact that mortality is influenced by other eanses than sanitary arrangements, the extended area augments the evil results of density, and the lesser density in some districts cannot counterbalance the excessive erowding of others. Table XI. gives the annual rate of mortality per 1000 persons living for various periods, and Table XII. the number of births and of deaths from the principal zymotie diseases and from all eanses :—

Marriage- rate.

Provision markets.

TABLE X].—Annual Rate of Mortality, 1851-81.

, Persons et! oa “4 al Ten Years . gece | | sane 3 a * | Mile, 1881. | 1957-60. | 1861-70. | 1871-80. | 185° | Maren, 23°6 943 22‘4 915 | 265

Annual Rate of Mortality per 1000 Persons living.

1880—Quarters ending 18$1—Quarters ending June. Sept. | Dee. Mareh. Dee, 18°8 20-4 =| 20°1 92-7 21-7

TABLE XIJ.—Deaths from Zymotie Diseases and fron all Causes, 1841-81.

The mean marriage-rate for ten years 1870-79 was 19:2, and for 1880 it was 18°1. The percentage of children born out of wedlock in 1880 was 3°9, that for England being 4°8.

MarkETs AND Foop Suppiy.—A regulation passed in 1277 ordained that no market should be kept on London Bridge or elsewhere except in places specially appointed for the purpose, and that no person should buy wares in Southwark that were to be bought in the City. In 1322 a decree was issued by the mayor that none should sell fish or flesh “out of the markets appointed, to wit, Bridge Street, East Cheap, Old Fish Street, St Nicholas shambles, and Stocks market”; and in 1328 a charter was granted to the corporation by Edward ITI., conveying to it the sole right to establish markets within 7 miles’ circuit of the city. In 1345 a proclamation was passed that poultry instead of being sold in lanes cr hostels should be iinet to Leaden Hall, and in the same year it was decreed that butchers and fishmongers should sell in the enclosed place called the “Stokkes,” and not in the king’s highway. After Acts passed in 1351 and 1382 on behalf of aliens and foreigners, all regulations formerly made in reference to the sale of provisions in London were repealed, and the dealers placed under the control of the mayor and aldermen, thus confirming a system of public markets and bazaars even for the retail trade, which remained almost inviolate till the time of Edward VI., up to whose reign there

was, according to Stow, scarcely such a thing as a shop between Westminster and St Paul’s, The system, though now broken up even in regard to provisions so far as the retail trade is concerned, remains intact in regard to the vending of certain provisions wholesale, and still exercises a con- siderable influence on general retail. The principal markets mentioned by Stow are Smithfield, Bartholomew Fair, Leaden Hall, Grass Church (Grace Church) market, chiefly for corn, meal, and cheese; East Cheap flesh market, the adjoining alley to which, Red Rose Lane, had by this time received the less idyllic title of Pudding Lane, on account of the butchers making use of it for the disposal of the offal before transferring it to their dung-boats on the Thames; Newgate market for corn, afterwards for meat ; St Nicholas shambles ; Stocks market, established in 1282 on a place occupied by public stocks, and rebuilt in 1410, for flesh, fish, and poultry; and the fish market in Old Fish Street. He also states that in 1302 bread was sold in Bread Street in the open market. Before the great fire Stocks market was occupied by greengrocers, the important vegetable market at Honey Lane had also been established, and markets, chiefly for meat and fowls, were held at Holborn Bars and outside Temple Bars. The increase of the population led in 1657 to the establishment by Lord Clare of Clare market, which, though now fre- quented only by a very humble class of buyers, was declared a free market by a special Act of Cromwell’s

pesae Deaths from Principal Zymotie Diseases. i a

Total Total Infants Ne 4 ime :

Births. | Deaths. | under one Rona Diph- | Hooping- rincipa

Year. Total. |Smallpox.| Measles. Toa. diets. Cough. Fever. | Diarrhoga.) Cholera. Fi abee 1841-51 665,661 | 523,110 104,461 109,244 8,416 13,011 18,314 18,079 20,890 14,946 15,588 20°9 1851-60 | 864,563 | 610,473 | 133,775 | 129,913 7,150 | 13,766 26,317 22,497 22,597 | 24,700 | 12,886 21:3 1861-70 | 1,067,988 | 736,342 173,454 156,988 8,347 17,338 34,391 5,323 26,550 27,149 30,487 7,403 213 1871-79 | 1,114,685 | 710,869 | 175,662 | 120,908 | 15,076

16,439 18,192 3,792 25,278 12,111 28,824 1,196 17-0 1881 See
81,120 20,907 13,681 475 1,501 3,073 541 3,438 886 3,767 ee 169

parliament, and was for a long time one of the principal markets for all kinds of provisions. Other markets sub- sequently established were those of St James by the earl of St Albans, Bloomsbury by the earl of Southampton, Brook market by Lord Brook, Hungerford market, New- port market, Haymarket, and Mayfair. Newport market for meat still exists, but the others have been gradually superseded. The principal markets now existing are Smithfield (central meat market and poultry market), Leadenhall (poultry and game), Billingsgate (fish), Covent Garden (fruit and vegetables), the cattle markets at Copen- hagen Fields and Deptford, the Bermondsey leather market, ae Cumberland, Smithfield, and Whitechapel hay markets,

A market for horses ‘and cattle was held at Smithfield (Sinooth- Old field) in the time of Fitzstephen, and doubtless long anterior to Smith- this. The priory of St Bartholomew in Smithfield obtained from field Henry II. the privilege of a fair for drapers, which was kept three market. days yearly, originally in the churchyard at a considerable distance from the place occupied by the cattle market, and latterly became a scene of great riot, until it was abolished in 1853. A year later the cattle market was removed to Copenhagen Fields. ‘here were 80 butchers in London and suburbs in 1533, each of whom killed 9 oxen weekly, which in forty-six weeks, none being killed in Lent, would amount to 33,120 yearly. In John Erswick’s Brief Note of the Benefits of Fish Days (1593), it is estimated that 60 butchers, } freemen of the city, killed each 5 oxen weekly, or altogether 300 per week, and that the foreigners or non-freemen killed four times as many, or 1200 weekly, the total number of cattle annually killed being thus 69,000, By Richard II. a law was passed enacting that f no flesh should be killed in London but at Knightsbridge or such like distance from the city, but in the time of Stow the slaughter- houses of the freemen butchers were in Pentecost Lane adjoining St Nicholas shambles and near the Butchers’ Hall. Probably the arrangements in regard to slaughter-houses were then more advanced in London than they are now, for, although sufficient slaughter- houses to dispose of

all the cattle sold at Copenhagen Fields have been erected adjoining the market, a very large number of cattle are still killed in underground cellars, which, notwithstanding the superintendence of the Board of Works under the Slaughter-Houses Act of 1874, are in the majority of cases totally unsuited for the pur- pose. The number of these slaughter-houses before the passing of the Act, when they were licensed by the justices, was 1429; but they have now been reduced to a little over 900. ‘The following table (XIII.) gives the average yearly number of sheep and cattle sold at Smithfield at various periods from 1731 to 1854, when the market was removed :—

Cattle.

1731-1740 95,601

1751-1760 86,271 648,684 || 1847-1851 226,856 | 1,480,614 1791-1800 124,695 757,672 || 1852-1854 266,279 1,521,923 1801-1819 131,318 951,940 || 1854 263,008 1,539,380 ee a ee ee |

Sheep. Cattle. Sheep.

1842-1816

185.529

583,713 1,523,850

The market at Copenhagen Fields, Holloway, covers upwards of Copen- 20 aeres, and was erected at a cost of £441,000, with accommoda- hagen tion for 6616 bullocks, 34,980 sheep, 1425 calves, and 900 pigs. Fields Deptford foreign market, which oecupies the site of Deptford dock- and yard, and was bought for £100,000, has an area of 22 acres. The Deptford following table (XIV.) gives the number of cattle, sheep, and pigs markets. sold at the metropolitan markets since 1870 :—

Central meat market.

Leaden- hall market.

Billings- gate.

MARKETS. |

Cattle.

ben DOM

829

Sheep.

Pigs.

The Central London meat market, opened in Smithfield in 1868 at a eost of about £250,000, to supersede Newgate market, is built in the Italian Renaissance style, with towers at the four corners, and oeeupies about 3 acres, its length being 625 feet and its breadth 240. Below the market area there is a railway terminus. To the west of the meat market another one-third its size was opened in 1875 for poultry and provisions. From 1869 to 1875 the toll received from the meat market increased from £14,220 to £18, 272, or 284 per cent., and with the addition of the poultry and pro- vision market it had inereased in 1880 to £24,310, or 71 per cent. The total amount of meat sold in the market in 1879 was 213,614 tons ; in 1880 the total amount was 221,448 tons, of which 107,326 tons were eountry-killed, 80,905 town-killed, 7381 foreign, and 25,836 American, the amount of American meat in 1876 being only 5513 tons, A large quantity of meat is eonveyed to the butchers direct without entering the market, and several butehers also buy their eattle and get them killed privately. As, moreover, the eattle markets and the meat market supply towns and villages beyond the metropolitan area, there is a double impossibility of forming from these sales an cstimate of the actual amount of butcher’s meat consumed in London.

Leadenhall, which aceording to Stow belonged in 1309 to Sir Hugh Nevillc, and had been used as a market before it eame into the possession of the eity in 1411, was enlarged in 1444 by an addition for a granary in connexion with the eorn market whieh had been removed to it from Cornhill, the clothes market also following before 1503; and before 1553 the foreign butchers who formerly stood in the High Street

off Lime Street had been ordered to take stalls in it. A great part of it in the time of Stow was used as a wool market, but afterwards it became the prineipal provision market in the city; and, according to Pennant, the Spanish ambassador told Charles II. that he believed there was more meat sold in that market than in all the kingdom of Spain. The Leadenhall under- went improvements in 1713 and 1814; and in 1881 a newstructure of elegant design, with an area of 26,900 square fect, and erected at a cost of £50,000, was opened as a market for fowls and game, the principal commodities sold at Leadenhall for many years.

Billingsgate, the great fish market of the metropolis, was from an early period a harbour for small ships and boats, and in the time of Stow had almost superseded its great rival Queenhithe, which was in the possession of the Crown. As it grew in importanee fish stalls were ereeted in its neighbourhood, but the original market for fish was in Fish Strect; and Friday Street, Cheapside, which received its name from being inhabited by fishmongers who served Friday's market, is mentioned as early as 1303. The Aet of 1699, which made Billingsgate a "free market for fish," to some extent inter- fered with the ancient control of the fishmongers, although the enstom of selling fish there had been introdueed long previously. Until 1846 Billingsgate was a mere assemblage of wooden sheds. The building erected in that year was sueeecded by another in 1877, with an area of 39,000 feet instead of 20,000 ; but, on aceount of the deficieney of its communications and its defeetive internal ac- eommodation and arrangements, the market is totally inadequate. Among several abortive efforts to establish other markets for fish was Columbia market, which was eompleted in 1869 by the Baroness Burdett Coutts for over £200,000, and presented as a fish market to the City, but failed to attract salesmen. The City authorities have the intention to utilize the vegetable market in eourse of erection at Smithficldas a fish market, and a scheme is also being promoted for a fish market in the parish of St Paul, Shadwell. A fish and vege- table market has been established by the Great Eastern Railway Company at Canning Town. The quantity of fish brought to London by rail is not given by the markets eommittee prior to 1866, but in 1848 the quantity brought by water alone was 108,739 tons. In 1866 the total brought by water and rail

was 132,004, in 1870 it was 117,193, in 1875 only 94,949, but since 1877, when the new market was opened, it has gradually increascd from 107,168 to 130,629, or nearly 2000 tons less than in 1866, and seareely 12,000

more than were brought in 1848 by water alone, There has of

Home Foreign Supply. Ifome Foreign Supply. Tlome Foreign Supply. a a Sree. |amet ag etro- |° Metro- |... ores etro- | Metro- . ‘ Metro- | Metro- | y…,: ke

politan politan a a Total Total. politan | politan Fee Total Total. politan | politan Ls cee Total.

Cattle | Cattle | ster ‘ai Gtile “| Caie ES | °° Cattle | Cattle |,Cattle | Total.

Market. | Market. BER er Market. | Market. |“ Bi SU Market. | Market Market. 1870 162,831 109,447 109,447 272,278 1,152,193 | 484,555 484,555 | 1,636,748 5,950 5,300 5,300 | 11,250 1871 146,335 122,036 sie’s 122,036 268,371 931,740 | 592,260 ane 592,260 | 1,524,000 7,299 990 : 990 8,289 1872 178,969 70,559 38,426 | 108,985 | °287,954 800,100 | 568,265 | 122,601 | 690,866 | 1,490,966 8,379 40 173 213 8,592 18738 | 181.825 | 113,295 7,090 | 120,885 | 302,210 766,645 | 692,705 | 2,339 | 695,044 | 1,461,689 | 7,795 690 394 | 1,084 | 8,879 1874 186,992 119,080 7,175 | 126,255 313,247 999,185 | 650,350 114 | 650,464 | 1,649,649 5,878 82 16,955 | 17,037 | 22,915 1875 174,445 126,565 29,255 | 155,820 330,265 917,620 | 701,370 | 86,496 | 787,866 | 1,705,486 3,512 13 21,470 | 21,483 | 24,995 1876 189,500 138,075 21,860 | 159,935 349,435 852,680 | 767,930 | 38,714 | 806,644 | 1,659,324 alcergl one 12,578 | 12,573 | 14,894 1877 159,585 41,485 67,817 } 109,302 268,887 719,771 | 60,421 | 697,714 | 785,135 | 1,477,906 1,675 “C0 10,051 | 10,051 | 11,726 1878 173,680 66,170 60,675 | 126,845 300,525 776,780 | 59,070 | 699,911 | 758,981 | 1,535,761 2,370 710 25,575 | 26,285 | 28,655 1879 | 200,210 44.995 } 81,445 | 126,440 | 326,650 807,760 | $7,040 | 662,197 | 749,237 } 1,556,997 | 1,285 535 | 18,949 | 19,484 | 20,769 1880 173,290 50,170 |

120,196 | 170,366 343,056 789,010 | 77,860 | 658,899 | 736,759 | 1,525,769 940 30 28,864 | 23,894 | 24,834

late years been a more rapid inerease in the quantity of water-borne fish, but the amount brought by rail is at present about two-thirds of the whole. Thus, witha population which sinee 1851 has inereased

| by two-fifths, the fish supply has practically remained stagnant,

while, owing to delay iu consequenee of increased pressure of traffic, the fish often deteriorate so as to be unfit for hnman food.

Covent Garden market, for vegetables, fruit, and flowers, whieh oecupies the site of a eouvent garden belonging to Westininster Abbey, seems to have been used as a market very early in the 17th eentury, and it received a considerable impulse from the discontinu- anee of Stocks market on account of the building of the Mansion House and also of Honey Lane market, whieh in 1823 was superseded by the City of London school, while sinee the removal of Hunger- ford market to make way for Charing Cross station it has remained the only vegetable and flower market of importance in the metro- polis, although vegetables of a cheap kind are sold at the Borough and Spitalfields markets, watereresses at Farringdon market, which superseded the Fleet vegetable market in 1824, and potatoes at the station of the Great Northern Railway. Until 1828 Covent Garden market eonsisted of an unsightly array of sheds. The present build- ing, erected by the duke of Bedford, though lately much improved, is quite inadequate for its requirements, while the arrangements for the dis | of mud and refuse are very reprehensible.

Tattersall’s, Knightsbridge, established by SP cleo Tattersall in 1780, is one of the principal marts in England for riding and ee horses, and may be regarded as the headquarters of the turf.

One of the principal difficulties eonneeted with the establishment of new markets in London lies in the ineonvenient railway arrange- ments, which render it impossible to obtain a site that shall have sufficient and direct communieation with the several distriets of

England and with the Continent. The poorer elasses obtain a eheap supply of vegetables and other provisions from eostermongers and itinerant vendors, who either oecupy stands in special localities, espeeially in the East End, and in High Street (Islington), Hamp- stead Road, Edgeware Road, and York Road (Somers Town), ot hawk them through the strects. The eapital possessed in 1861 by these vendors, who then numbered 41,040, was estimated at £40,000, their gross amount of annual trade at £2,700,000, and their annual gains at £900,000. Since that period their numbers, capital, trade, and gains have probably inereased at least one-third.

ComMMERCE AND [npustry.—London, which was a port of some consequence in the time of the Romans, is spoken of by Bede as the "mart of many nations resorting to it by sea and land." The Hanse merchants, protected by a clause of Magna Charta, began in the 13th century to frequent London in large numbers, and, after obtaining liberty in 1236 to land and store the wool imported by them, are supposed to have settled in the Steelyard about

Covent Garden.

Tatter- sall's.

Coster-

mongers,

Growth of

London com- merce.

1250, but as early as the 8th century they had begun to.

frequent Billingsgate, and in 978 King Ethelred had conferred certain privileges on them and on other traders. Probably by the time of Fitzstephen London had become the most renowned mart of the world, with the exception perhaps of Antwerp and Bruges. The foreign merchants received a special charter from Edward I. in 1303, and,

notwithstanding occasional interference with their privi- leges, the Hanse traders, who had erected extensive fac- tories and storehouses near their ‘“ Gildhall,” gradually

‘absorbed the greater portion of the foreign trade of

London, until the incorporation of the Merchant Adven- turers of England, in 1505, for trading in wool to the Netherlands. The trade with the Levant, which had

Present trade.

830

become of some importance in the 15th century, soon largely extended, and commercial intercourse was also opened up with Barbary, Guinea, and Brazil. After the abolition of the special privileges of the Steelyard merchants, the trade in wool was transferred almost entirely to the Merchant Adventurers, the annual export of English wool and drapery to Antwerp and Bruges in 1566 being esti- mated at over £2,000,000. The close of the 16th century was marked by the rapid extension of maritime discovery, and the spirit of enterprise was stimulated by the grant of monopolics to those companies which should first open up communication with undiscovered countries. One of the earliest and most successful of the great maritime companies was the Russian, incorporated in 1553, which, besides estab- lishing an extensive commerce with the ports of Russia, had an overland trade with Persia. The foundation of the Royal Exchange by Gresham in 1566 marked an era in the commercial history of London; and the destruction of Antwerp by the duke of Parma in 1585 left it without a rival as the emporium of Europe. The settlement of many of the Flanders merchants in England gave a great impetus to the manufacture of silks, damasks, and other fine cloths, but from the time of the expulsion of the Steelyard merchants by Elizabeth in 1597 the development of tlie maritime trade of London was solely in the handsof English companies. ‘The incorporation of the Turkey Company in 1579, of the East India Company in 1600, of the Virginia Company in 1606, and of the Hudson’s Bay Company in 1670 must be regarded, not only as the

most important events connected with the ‘growth of the port in the 17th and 18th centuries, but as of prime consequence in relation to the social and political history of England.

In the trade of London there is a large excess of imports over exports, arising from the fact that it is specially a mart, and is removed from proximity to any large manufacturing district. The value in 1880 of the total trade of Liverpool, £191,489,838, was nearly | equal to that of London, which was £194,043,836, but the value of the imports of London excceded those of Liverpool by nearly £34,000,000, while the exports of Liverpool exceeded those of London by about £31,000,000. London has almost a monopoly of the trade with the East Indies and China, and has thus become the chief emporiuin for tea, coffec, sugar, spices, and indigo, and for silks and Eastern manufactures. A great part of the overland trade of London with India has till quite recently been carried on via Southampton, which, and also Folkestone, Newhaven, and Dover, may be regarded as virtually ports of London. The value of the imports of Folkestone, Newhaven, and Dover in 1880 amounted together to £24,485,034, and their exports to only £4,432,244; the imports of Southampton were valued at £9,205,183, and its exports at £9,306,326. In the Mediterranean and Levant trade London has now a powerful rival in Liverpool. From European and Asiatic Turkey London imports corn, dried fruits, madder, and various other special products; from Greece currants and olive oil ; from Italy olive oil, wine, sumach, oranges, and lemons; from Spain wine and dried fruits; from Portugal and the Azores oranges and wine. Nearly the whole of the French trade with England is con- centrated in London, the imports including all the special French manufactures, and large quantities of butter, eggs, vegetables, and corn. It is, however, largely carried on through the southern ports, the value of the imports of silk

Vessels. Tonnage. Men. Vessels,

1701 560 10,165 1850 1791 1,842 30,868 1860 1800 2,666 41,402 1870 1819 4,760 56,948 1881

LONDON

Sailing Vessels.

[cOMMERCE,

to Folkestone in 1880 being £3,614,014, and those of Lon- don only £260,646, while the imports of eggs at Newhaven greatly exceed those of London, as do also the imports of butter and eggs at Southampton. London absorbs thie greater part of the Baltic imports to England, especially timber, corn, cattle, wool, and provisions, the tonnage of the shipping that entered from Germany in 1881 being 634,741, from Belgium 249,161, from Sweden 416,997, from Norway 201,056, from the northern ports of Russia 401,076, and from Denmark 135,634. The tonnage that entered from the southern ports of Russia only amounted to 50,883, but much of this trade is carried on via Southampton. The chief imports from Russia are corn, tallow, timber, hemp, linseed, and wool. The fact that the staple manu- facture of Lancashire is cotton has enabled Liverpool to

_ gain a superiority over London in the United States trade,

with the exception of imports of tobacco from Virginia ; but the shipping that entered London from the Atlantic ports of the United States in 1881 had a burden of 670,079 tons, and from the Pacific ports of 3248 tons. From Central America London obtains its chief supply of the finer woods, and also jalap, sarsaparilla, indigo, coffee, and Peruvian bark, and from South America sugar, hides, india- rubber, coffee, diamonds, and various drugs. From Canada the port receives timber, corn, cattle, and provisions, from the Australian islands wool, oil, gold, copper, tin, provi- sions, and cattle ; and it possesses more than half the trade of England with the West Indies, the principal imports being sugar and molasses, fruit, rum, coffee, cocoa, fine woods, pimento, and ginger.

On acconnt of the burning of the records at the eustom-house, and

the absence of regular parliamentary returns, it is impossible to give and a continuous summary of the progress of the shipping before 1816,

colonial but the following table (XV.) gives the returns of the shipping trade,

engaged in the foreign and eolonial trade in various years from 1693 to that date, and the yearly average for subsequent periods :—

Entered Inwards. Cleared, Vessels. Tonnage. Vessels, Tonnage. 1

| 1693 . 117,387 104,662

1694 135,972 81,148 1750 511,680 179,860 1790 581,095 348,098

1800 ri 796,632 ann 729.554

1816 8:19 629,050 3,077 618,823 1816-20 4,416 804,481 3,604 681,295 1821-30 4,840 888,431 3,623 726,954 1831-40 5,588 1,047,862 4,630 928,744 1841-50 8,018 1,596,453 5,706 1,124,793 1851-60 10,650 2,627,280 7,746 2,030.432 1861-70 11,249 3,938,069 7,909 2,641,745 1871-80 11,435 5,135,225 8,618 4,029,938 1881 10,7635 5,810,043 8,081 4,478,960

re re | Sinee 1873 vessels with ashes and manure have been included

Foreign

|

Coasting

in the coasting trade, and therefore the figures after that date show trade.

much greater progress than has aetually taken place. In 1750 the number employed was 6396, and in 1795 it was 11,964 of 1,176,400

tons. The following table (XVI.) gives details from 1855 :— SSS eee ee Entered, Cleared. | Vessels, Tonnage, Vessels, Tonnage. 1855 | 19,040 2.852,223 8,483 878,182

1860 18.365 8,154,561 8,818 1,077,004 1865 14,923 3,065,380 8,035 1,121,864 1870 12,793 2,849,872 9,125 1,203,592 1874 80,828 – 3,505,449 9,882 1,247,548 1881 – 36,112 4,239,663 10,470 1,453,715

The following table (XVII.) gives the number of vessels registered in the port of London in various years from 1701: —

Steam Vessels, Total.

Vessels, Tonnage. Vessels, Tonnage.

Tonnage.

621,343

869,591 2,911 1,068,587 611,714 9,709 1,118,579

Regis- tered shipping

of ex-

COMMERCE. |

Declared values of the exports from London have been made at various periods, and are now made annually in the statement of the

ports and trade of the United Kingdom. Since 1840 the value has more than

imports.

Docks.

quadrupled, being in that year £11,586,037, from which it gradu- ally rose almost without intermission till it was £60, 232,118 in 1874, but from that year it declined tillin 1879 it was £47,335, 753. In 1880 it again rose to £52,600,929, considerably above the aver- age of the four years 1876-79, which was £49,884, 673, but as much

Principal Articles.

United Kingdom. Port of London. | United Kingdom. Port of London. Animals, living : oxen, bulls, ANd COWS .....0-.sseseeeesereeeroeee No. 77,010 54,079 No. 350,853 . 122,992 Sheep amd]aMDsS, ...ccccccccccenscesccecsecsceeerereereeeenes + $20,219 287,203 5 941,121 679,522 OWROA s.vccdinscesetescsscerccsssrecvesscessncs Tb 9,009,860 6,672,631 tb 23,511,101 20,750,014 (Dig aQ ke nnsaenboogeeadooonsoctonpocooréBasceadbn a 82,767,746 72,784,354 ewts. 1,546,451 1,357,397 Corn : Went … 0.c.cccercocossscsesecsocers qrs. 5,880,953 1,180,903 rf 55,261,924 12,808,355 Tyo? 6: necenpeccenceeenceocbansocuscnocp J apannnecocondenicocetaasinoancoor – 2,112,861 486,4€0 – 11,705,290 1,792,338 Oats… es 2,290,951 1,645,901 13,826,732 9,375,631 IG@EISC eceeeevicnsessesesinceders*sscspccesvsqnciersivsesesstndsnadu«been sinusoas | ay 314,201 56,289 a 2,146,251 555,417 830015) peeppeicecogeocuicbacecocasancen oF 439,834 86,503 of 2,577,133 537,342 Wyre COV .....~~+0006. Receceecserveiressceectitcccen ne = 1,851,762 43.188 39 37,224,733 4,413,708 VGH CURCHINORT 1 OUI) < ccccccecescasseeverasesi.0…00..c0000-ccccnsccesennecacsoseccsassascsccescecase 4g 848,328 408,981 Ib 1,241,788 752,045 Hlinemave UPetteer a tees ccccnacccercrvecscmceencecteosecsesusweesarevencataues Ib 4,707,272 1,960,411 BS 47,653,442 21,417,755 DiaWOSONS , .c.0sccccese seers meeeiosincenceaetes Lecusisenetana scene asereess tons 44,710 22,590 tons 41,349 23,709 Metals } COPPer OVC.....seeeeeeee eee ee ees RconenbsOcn LoLOGaEnNCeSAeHONORE as 97,317 5,802 3 145,475 2,983 Copper, part wrought and part unwrought ……..cssesseeeeees on 11,753 3,778 aH 36,578 10,833 Ti AMWLOUE LIE soos enescatrecessravanseseenesss> aie ewts 58,220 50,110 ewts. 389,967 881,757 Oil: train, blubber, and spermaccti oils… ..... ses tuns 17,029 6,314 tuns 15,231 4,392 PAL TTINO ttt ere Me cccoceedites caaseevsettatscetecsaneesiertrensssneas ewts. 804,326 153,094 ewts. 1,032,823 83,506 (OO AIRWE) Tho poonhnee Goo so DDOseH EDUC DUEDOSIECO SECOoCunahocecaccocespccaasceoccar tuns~~

~~20,859 5,068 tuns 20,260 2,597 Seed oil…….. eeerenesen ee RAL EAR DEC ESE DOCODOELDoCEnEDOCO co enanoanecone ” 12,995 9,022 × 16,754 2,973 Provisions ; bacon and NaniS……-.eeevees cocncns goncacdec aerersoc ewts 326,106 149,236 ewts. 5,334,648 593,179 Teta, GEST | arasconcoonacconcrocesrasoesapecces RRNOCE CECE soceeenneancenne’ % 261,259 113,790 5 1,017,956 126,150 IO Latte rience trates cestosessecttrecoeeretotcesiesceascnressnannscesese’ cas a 173,009 128,045 + 409,267 120,014 Butter… A 840,112 427,942 * 2,326,305 319,252 (i C1 eer oe ECE eriee erecieenti a tencod erocsecod, i 583,283 202,506 RK 1,775,997 257,507 EGGS ccsseeeessescescsscencesceeeeeatcccossecsarseaconcsteencerssessvseecs ences cub. ft. 838,477 245,135 gt. hund. 6,228,405 909,406 Spirits 5 WWM1…….000.-e0. galls. 7,319,673 5,171,824 gulls. 6,107,661 3,873,736 Brand y….csccccssereestecesecceseerensceres 2,842,543 1,547,624 ae 3,006,335 1,880,097 GENEVA ..c.0c-sccrencercrsceeccsscsseccsscesencosecsesersocscosrssnceseenennes <5 635,410 206,160 ” 254,503 67,913 Sugar: unrefincd……. ScoseDSOTLINSdOcnOOsACH Gosnuacentorestetaceessess | ewts, 8,817,276 4,846,152 ewts. 17.001,613 6,509,553 Refined and crush sugar ‘5 345,010 98,281 9 3,036,074 1,396,905 MOIASSCS……0sscercccccenceeseres & 606,503 95,372 6 Ae6 eeenee Ib $8,946,532 $3,711,086 Ib 206,971,570 206,816,609 7 48,936,471 23,483,031 s 59,571,973 26,645,681 “a 2,727,255 1,469,224 + 3,502,928 2,044,738 galls, 12,475,001 9,178,729 galls, 17,385,496 10,682,179 loads 1,275,109 212,381 loads 2,130,541 222,388 SAWN OF SPlit ccccccsssecccccccesecccensensscueeeceseeeceaueeessseaeseganae 2) 1,452,806 411,654 .9 4,116,749 1,203,213 STAMES: cen tecescesconacaerecscorsosesesnscests= — 76,378 27,090 5 103,536 33,729 Wool: sheep and lambs……. ae BOnoseapenecnodocIo: Ib 145,501,651 79,700,315 ib 460,960,907 358,776,758 Alpaca and NAMA… …ssccccseccesseeeeceneeeeceseseeeeeesceeseeestees Ae Fe 2,894,926 31,662 | na 2,548,656 ee~~

Ye ee ae

In the time of Stow, Billingsgate had begun to supersede Quecn- hithe as the principal landing place of the port of London ; but he also gives a list of other ‘‘ common watergates,” and mentions that there were besides “divers private wharfs and keys all along from the east to the west end of the city, where merchants of all nations had landing places, warehouses, ccllars, and stowage of their goods and merchandise.” On account, however, of the attempts made to avoid the payment of customs by the use of private landing places, a royal proclamation of Elizabeth appointed certain quays to be used as general landing places and others for special purposes. After the great fire the limits of the port were declared to be the North Foreland and London Bridge; certain wharves named “‘ legal quays” were appointed for the gencral trade, and others named sufferance wharves were perinitted to be used under certain con- ditions with the special leave of the commissioners. The frontage of the legal quays in 1795 was only 1419 feet, and of the suffer- ance quays about 3500 feet, and so inadequate was the storage accommodation that it would not have sufficed even for the single article of sugar. After the proposal for the establishment of wet docks was made by the West India Company the system was very rapidly extended. The West India docks at the Isle of Dogs were opened in 1802, the London docks at Wapping in 1805, the East India docks at Blackwall in 1806, St Katherine’s docks to the east of the Tower in 1828, the Victoria docks in 1850, and the Millwall docks at the Isle of Dogs in 1868. The West India Company was granted for twenty years a monopoly of the West India trade, the London Dock Company of the trade in wine, rice, and the Kast India Company of the East India and China trade, but in no case were the privileges of the companics renewed. The various docks have at different times undergone improvement and extension to meet modern necessities, the latest addition being the Albert extension of the Victoria dock, opencd in 1880, which affords an additional water space of 70 acres, and is unsurpassed in the com- pleteness of its arrangements by any other dock in the world. The St Katherine’s, London, and Victoria and Albert docks are now held by one company, and the East and West India docks by another, who are adding to their accommodation by the construc- tion of the Tilbury docks specially for ocean steamers, All the great merchandise docks are thus on the north side of the river, —

brandy, tobacco, and |

“OW DORN

831

_ below the average of 1872-75, which was £57,144,480. No return of the value of the imports is given before 1872, when they were | £124,174,141. The value for 1880, £141,442,907, exceeds that of any previous year, the next being that for 1877, £140,332,773, while the average for 1872-75 was £129, 449,956, and for 1876-79 £182,754,772. The following table (XVIII.) gives details of the principal imports for 1860 and 1880, and also a comparison with the United Kingdom in regard to the same articles :-—

1860. |

1&80.

the Commercial docks, which date from 1696, and were reconstructed in 1807, and the Surrey docks (1812), on the south side of the river, being used almost exclusively for timber and grain. ‘The position of St Katherine’s docks renders it impossible to adapt them to modern requirements ; and probably, on account of the increased use of large ocean steamers, all the older docks may soon be super- seded as regards the bulk of the foreign trade, The water area of the docks on the north side of the river, which in 1861 was 272 acres, will soon be 465 acres. The Surrey and Commercial dock, whicli is very complicated in its construction, has a total area, including land and water, of 330 acres. The land and water area (in acres) of the several docks on the north side of the river at present com- pleted or in process of construction is as follows (Table XIX.) :—

St |East and) Victoria) 4)41). Docks. London. Kathe- | West and avail Total. rine’s. | India. | Albert. . Waterss | 40 10 136 173 70 465 Land …..000…! 59 13 210 460 530 1,472 , el ee pee i | amin Total…) 99 | 2 | 346 | 633 600 | (1,937

privilege gave it a great advantage over the other ports of the king-dom. The warehouses of the dock companics, each occupied with their special class of goods, embrace a large portion of the City area, but the rapidity with which goods now pass into consumption renders this kind of dock property at present very unprofitable, and it is probable that very soon many of the warehouses will be turned to other uses.

present Corinthian facade, 490 feet in length, designed by Sinirke, was afterwards added. In the building there is a museum Con- taining various old documents and specimens of articles seized by the custom-house authorities.

association of mariners which received a charter from Henry VIII.

The bonded warchonse system was sanctioned in the port of Lon-Ware- don in 1808, and the exclusive enjoyment for several years of this houses.

The Custom-House in Lower Thames Street was built by Laing, Custom- 1814-17, bnt on account of the subsidence of the central part the house.

Trinity House, Tower Hill, a plain building with an ornamental Trinity facade, erected in 1798 from the designs of Wyatt, is the seat of an House.

The City.

Ex- ehanges,

The Mint,

Banking,

in 1514, and gradually acquired the management of lighthouses and buoys uot only on the Thames but on the whole English coast, be-sides the superintendence of naval arsenals and dockyards. Along with

the corporation of the City it had the conservancy of the Thames, until those authorities were superseded by the Thames Conservancy Board. Its general rights and privileges have also been much curtailed since 1853, when it was put under the partial con- trol of the Board of Trade, but it has still the sole charge of the erection and maintenance of lighthouses and bnoys, the examination of pilots and of navigating lieutenants ; and two of its elder breth- ren act as nautical advisers in the High Court of Admiralty.

The prosperity of that portion of London known as the City is largely due to its proximity to the port, but the rapid development of the trade of the port is closely connected with the increase of London outside the City limits, which is of course dependent on a great variety of causes. The uninterrupted cxtension of the busi- ness and financial transactions of the City, and the connexion of these with the rapid increase of the surrounding population, is sufti- ciently evidenced by the fact that the rateable annual value of the City has risen from about £760 an acre in 1801 to about £5300 an acre in 1881 ; that the net profits under the commercial and mer- cantile schedule D for the combined boroughs of the metropolis (1879-80) amounted to £81,088, 368, of which the profits for the City alone ainounted to £39,263,424, a larger sum than that of the whole seventeen next largest cities and towns of the United King- dom; and that the number of persons entering the City daily during the sixteen hours of business has increased from 657,379 in 1866 to 739,640 in 1881.

The business centre of London is the Royal Exchange, which occupies a commanding position between Threadneedle Street and Cornhill, at the principal convergence of the City thoroughfares. The first building, erected 1565-70 by Sir Thomas Gresham and presented to the City, was destroyed by the great fire, and the second opened in 1669 was also burnt in 1838, The present exchange (1839-44), designed by Tite and erected at a cost of £180,000, is a quadrangular structure with an imposing Corinthian portico at its

rincipal entrance, and encloses a court surrounded by an ambu-

atory. It is in the open central area that the commercial transac- tions take place—the ground floor being oceupied by shops and offices, and the principal floor by insurance companies and “ loyd’s rooms.” The principal exchanges for special articles are the corn exchange in Mark Lane, where the privilege of a fair was originally granted by Edward I.; the wool exchange in Coleman Strect ; the coal exchange adjoining the custom-house, erected in 1849 in the Italian style, and consisting of a rotunda surmounted by a dome; and the auction mart for landed property in Tokenhouse Yard. The metal market is a very important one; and there is also a very large consignment of precious metals and diamonds, the workers in which are chiefly conecntrated in the neighbourhood of Clerkenwell. The Royal Mint, Tower Hill, erected in 1805 on the site of the Cistercian abbey of St Mary, is the only mint in Eng- land for the fabrication of’ gold and silver coins, but bronze coins are chiefly made at Birmingham, and gold coinage is now also ‘manufactured at Sidney and Melbourne.

The unique commercial position of London, and its intercourse with every quarter of the globe, have assisted to make it financially I a more complete sense than it is commercially the metropolis of the world. The stock jobbers and brokers, who according to the City census of 1881 numbered 1682, and who have their offices chiefly in the courts and alleys adjoining the Bank of England and the Royal Exchange, are nearly all members of the stock exchange, for whom the present building in Capel Street was erected in 1801; but there is also an open stock exchange in Lothbury. The earliest approximation to banking transactions in London appeared in the negotiations for loans between Elizabeth and the principal city merchants, but the general adoption of the system was due to the civil war, when the merchants, some of whom had already made use of the Royal Mint as a bank of deposit, and the landed proprietors, began to place their money for the sake of greater security in the hands of the goldsmiths, Some of the private banks now existing, such as Coutts’s and Child’s, date from the 17th century, and a new era in the financial history of London was Inaugurated in 1694 by the foundation of the Bank of England of which a full accouut is given in the article BANKING (vol. iii, p. 816 sq.). Until 1733 the business of the bank was carried on at Grocers’

Hall. The present building, which covers about 4 acres and was enlarged in 1770 and 1788 by Sir Robert Taylor and Sir John Soane, presents to the street a low triangular wall without windows, and almost entirely devoid of ornament except at the north-west corner, which was copied from the temple of the Sibyl] at Tivoli. Until the establishment of the London and Westminster Bank in 1834, the Bank of England was the only joint-stock bank in London. The private and joint-stock banks which have offices in London now number over 150. The principal banks are mem- bers of the Clearing House near Lombard Street, where a daily exchange of drafts or eheques is effected. For the year ending April 30, 1882, the total amount of bills, cheques, &c., paid at the

DON

Clearing House was £6,382,645,000, the largest sum paid in any of the fifteen years for which statistics have been collected, the amonnt for the first year ending 1868 being only £3,257,411,000. The extent of the commercial enterprise of London is strikingly indi- cated by the large number of companics, with their field of operations chietly in foreign countries, which have been projected in the City or have in it their headquarters. companies arc however sometimes only nominal, their real business being wholly confined to London itself.

T INDUSTRY.

The largest manufacturing industry in London is that of brewing, Brewing,

the number of common brewers in 1880 being 110, who made use of 9,955,177 bushels of malt, while of the 412,192 barrels of beer exported from the United Kingdom 286,206 were from London. To supply the breweries with water, wells now require to be sunk below the chalk to the greensand. According to Stow, the brewers in 1585 in London and Westminster, who then remained “ near to the friendly water of Thames,” numbered 26, some of them being foreigners, who first introduced the art of eultivating hops. Among the oldest and most important of the brewerics now existing is that of Barclay, Perkins, &

Co., which covers an area of 12 acres, belonged at one time to Johnson’s friend Thrale, and occupies the site of the old Globe theatre.

Silk-weaving, which received a special impulse from the settle- Miscel- ment of foreign refugees at Spitalfields after the revocation of the laneous edict of Nantes, has within the last fifty years been ina stagnant indus- condition, owing chiefly to the rivalry of Lancashire. ‘The majority tries.

of the other manufactures are carried on in the neighbourhood of the Thames, The ships built in London in 1881, which are principally yachts, numbered 64, but their total tonnage was only 2723, The principal shipbuilding yards are at the Isle of Dogs. Boat-building is extensively carried on at Chelsea and at several other places in the upper reaches of the river. There are large engineering-works at Lambeth and Millwall, potteries and glass- works at Lambeth, Whitefriars, and Sout bwvarl, tanneries at Ber- mondsey, chemical-works on the Lea, paper-works on the Wandle, and sugar bakeries at Whitechapel. The cabinetmakers’ shops are situated principally in the neighbourhood of Shoreditch, but there are several adjoining Tottenham Court Road and Hampstead Road, where upholstery warehouses are very numerous. Lucifer match making gives employment to a large number of women and children in the eastern districts. There are extensive hat manufactories in Lambeth. The special manufactures in different parts of London are too numerous formention. The principal depdts of the carriage- builders are in Long Acre, A large trade in second-hand clothing is done by the Jews at Houndsditch, especially on Sunday morning, and on the same day of the week there are bird and fancy animal fairs at Church Street, Bethnal Green, and at St Andrew’s Street, Bloomsbury, near the Seven Dials. The centre of the wholesale book trade is in Paternoster Row, but some of the principal pub- lishers have their premises in the neighbourhood of Covent Garden and still farther west. Fleet Street is largely occupied with the offices of the London and the provincial daily newspapers, but the office of the Z’imes is in Printing-house Square. The weekly news- papers have their offices chiefly in streets running off the Strand.

poor-law unions, which are governed by boards of guardians, for unions.

the most part elected annually by the householders and owners of property, the number of votes possessed by each owner or house-holder varying from one to six, according to the value of the property. A proportion of the guardians in each union are so ex officio, or are uominated by the Local Government Board. The Act of 1867 authorized the establishment of outdoor dispensaries in any union or parish ; and in twenty-seven of the thirty unions of the metro- polis there aro now forty-seven of these dispensaries, the number of prescriptions made up in the ycar 1880-being over a million. For the maintenance of lunatics and insane poor, of patients suffering from contagious diseases, and of pauper ehildren at school, and for the relief of casual paupers, a metropolitan common poor fund is provided, through the operation of which the cost of maintaining the poor is now equalized, to the extent of 42°3 per cent. of the whole sum applied over the metropolitan area. The good results which have followed, both in lessening expense and diminishing pauperism, especially outdoor pauperism, form a strong argument for the complete equalization of the rates, and the creation of a united poor-law authority for the whole metropolis. The three unions which in 1880 contributed most in aid of the poorer ones were Kensington (£27,705), St George's (£25,299), and the City of London (£61,080); and the three unions most benefited were Holborn (£21,048), Bethnal Green (£19,835), and St Saviour's, Southwark (£23,085); but, as will be secn from

Table XXI. below, great inequality still exists in the rating, and

the rate is gencrally higher in the poorer districts. Each poor-law unlon possesses one or more workhouses, but the accommodation is inadequate, and difficulty in dealing satisfactorily with applicants often follows. Several unions, by the powers granted them under the Act of 1867, have combined into districts to provide infirmaries

for the sick and imbecile, there being now only three unions

The foreign operations of these –

Pavurerism.—London since 1867 has been divided into thirty Poor-law

LON

Bethnal Green, Hampstead, and Lewisham—whose sick are not treated in establishinents under medical supervision. Iu addition to this, the several unions and parishes are combincd into one metropolitan asylums district, with a managing body of sixty members, fifteen of whom are nominated by the Local Government Board. The total number of persons relieved in establishments belonging to the managers of the metropolitan asylums district since the first was opened in 1870 las been more than 1200 in imbecile asylums, nearly 50,000 in hospitals for infectious diseases, aud 1875 on board the ‘‘ Exmouth” training ship, which was estab- lished in March 1876. The paupers’ schools fall to be noticed under another section (sce below, p. 834). The amount of accommodation provided in the various establishments of the unions in July 1870 was 35,093 beds, and in December 1880 it was 53,332 beds. Table XX. gives a summary of the poor rate returns for 1880 ; Table XXI. tle rateable value of the different unions in 1871 and 1881, and the

PAUPERISM. |

DON 833

average pauperism, the amount of adjusted relief, and the rate in the pound for rclief in 1880; and Table XXII. various particulars in reference to metropolitan pauperism for 1871 and 1880.

The aunual income of the various charitable institutions in Charities. London is now over £4,000,000, of which at least three-fourths is spent in London. That of the endowed parochial charities of the City of London in 1865 was £64,500, which by 1881 had increased to £116,960, those of Westminster being in the same years £26,555 and £33,124. The income of the charities of the Livery Companies in 1869

was stated to be £99,027, and now the 1028 charities belonging to the companies have an agercgate income of £185,829, representing a capital value of £4,456,768. The amount spent on education is £65,130, and on doles £108,498. In addition, the charities of the corporation probably possess an annual inconie of £30,000. The parliamentary commission appointed to inquire into the endowed parochial charities of the City of Londou and

TABLE XX.—Summary of Poor Rate Returns for 1880.

Reeeipts.

In Aid of Poor Rates.

“£2,359,437 | £112,385 | £115,651 |£2,587,473| £513,775 | £198,422

Relief of the Poor.

£1,107,651 |£1,817,972

Expenditure.

Partly Con-

From Poor Total 4 g nected with Rates. Treasury Other Receipts. In- Main- Out-Main- ase Total.* Poliee Other the Poor, Subvention. | Receipts. tenance. tenance. | » ouses, &e – Rate. | Purposes.

£110,137

£618,444 | £42,780 £2,590,443

- Including £1876, the difference arising in adjusting the eharge of relief.

TABLE

Rateable Value,

Ratcable Value,

XXI.

Average Pauperism, 1880. Adjusted Relief Rate per £1

Unions. Year eommenced | Year commenced to the Poor, for Relief, 6th April 1871. 6th April 1881, Indoor. Outdoor. 1880. 1880. West District. ES £ & bya CL S@MIOUIGEOM).-2cgyeeccassscccessacaesscseeessseravelecesensass enssese 935,720 1,648,187 1,370 549 92,364 1 3} UREER EN uciscccrsicccccetss+scccecsecessesssolasccseresrturerssscssienacs 280,704 545,854 738 960 31,444 1 7k DMEM LOTINASE Ges o. ssccatsceesreersoonent secetereeeers 938,597 1,189,864 912 734 58,247 1 0% GHGISHEY, .cccsscsnnce sneer 00 : 841,749 465,353 1,186 945 29,826 1 54 St George's …. 1,860,033 29 Close of St Peter Nil. 2,280,929 2,189 1,833 123,110 1 2} Westminster ……..... 623,041 785,466 930 353 42,074 1 23 Total West District …….....0000s 0p 4,979 844 6,915,653 7,325 5,374 377,065 89 North District. a a St eiharyAlobOncieterccsssccctttrressseveers soacsucsessecszessesceze 1,158,979 1,883,987 2,864 1,886 92,549 1 43 SE ReMOrAshctenettercereccs-ecsseters Sctsicis even eee 1,149,817 1,491,461 245 190 21,014 1 13 ERIS COA osorsetedacccssssessocencossecedeaseresssacedsensesesae= 263,915 417,283 3,298 4,442 106,608 1 7% SHMB COM s…0cres-cse Reece ce enonenicceon Seneees epcnnoceod meanee 984,041 1,445,226 Wor 3,203 81,562 1 44 HR BeGLcrTEVaetecss scot ce sosrcock crssaces sectccsseversysecssrecceeense 578,804 942,240 1,266 2,590 54,562 1 43 Total North District……..... acco coeOeeOco necoe 4,135,556 5,680,197 9,464 12,311 356,295 Central District. ee St Giles's and St George's, Bloomsbury …….....04. atsec 307,192 358,418 1,142 766 31,981 111 MELE COMUSHEN Gesecdscecssenseeearieress(ssveences-iely esuesesacs Nil. 18,800 oo0 505 pes a SUN@HGU., conmaetenssessnsceereces Seaigereeeseen 553,066 700,441 885 452 42,476 1 4 MOMBOLN ce.c—: =~ 723,631 ? r Pp Charterhouse …....ecceeeeee oe Nil. f 918,116 areet bs es oe" (Grea SHUN ceeseseccnce-ers= sstaseerse Nil. 15,203 a cen wa ne

London, City of, Petar cm 2,524,775 3,503,035 2,082 2,828 180,777 ee The Temple……..ccce00s. ac F Nil. 34,526 ase zee oe aso MapallCentialei ishisietiasseressanessesceneeeeses 4,108,664 5,543,539 7,666 8,102 : 356,767 East District. SHORCUIEGH) .....00.0sc00s Danes scensiccseeccenmewenccustsenesesssmeytes 440,689 580,411 1,591 1,435 45,377 a) Bethnal Green …... CODD SULCOOEORS CALOCODR DESAI 270,524 857,854 1,785 1,247 31,020 111 Whitechapel ……..ccccsccecseccescetsecsceecees 314,850 370,334 1,350 423 31,843 1 92 St George's in the East ……scscessesssseseee 184,175 199,237 1,485 380 23,639 2 5% [o UST STUER lice or er EDDA TO OLED 256,163 318,469 1,060 348 30,638 21 Mile End, Old Town.. 268,042 335,344 1,228 987 23,655 1 6 IPODIET scscccccccsesceesssasecsesce 447,652 670,476 1,456 1,673 55,063 1 103 THO tal ASG) DISEIICE.....0orscanccccnsccssscnes 2,182,095 2,832,125 9,955 6,493 241,235 South District. St Saviour's ……... Rieter seedieenctiecernesceescecrencesen aeeseen= nic 724,345 939,853 3,330 3,399 77,980 1 9} STAMOS tence ress cscccctecsevescesstecesercesctseccesccesesterss aoe 576,309 775,330 1,907 1,890 65,107 1 83 EMM occ ssc cccveccssetstesstesces sss: ccsecedeccacsssceseccoesssees 919,015 1,284,862 2,395 4,038 95,311 tL 33 Wandsworth and Clapham …….4 Be eet Se sssacacn 694,815 1,183,278 1,294 1,494 66,507 1 4} Camberwell……..~~ss0 ABROLDECODEEOEEDOECOOAE ORD OSLOOLLEROEHEEIES 477,368 803,413 1.598 1,351 53,844 1 8 REPRO CTTOSIET << cos ccvcec icee Demeter ices ceeuicccessbeessseosodecesteens 401,469 617,252 1,836 2,668 §8,495 2 4} Woolwich.... 211,972 279,847 430 903 32,624 1 33 RGAVESHMONID sc achcaweccucaterereeetece sce secess cess caliesnessas 384,805 547,159 1,051 2,642 36,197 2 94 Total of South District..... ac OcrnoCROOCEACOr 4,390,098 6,430,994 13,841 18,385 486,065 Total of the Metropolitan Unions.....0++~~ 19,796,257 27,402,508 48,251 50,665 1,817,427 2 IY a

TABLE XXII.

Total Relief to the Poor Adjusted. a8

1,646,103 1,817,972

Rate per £1 on Rateable Value.

Outdoor Relief.

In-Mainten- ance.

Paroehial Year, a Ag

436,208 513,775

Sue

1 93 1 53

£

412,299 198,422

1871 1880

Ratio per 1000 of Population.

Ratio of Outdoor Rellef to In.

Mean Number of Paupers.

Indoor. Outdoor.

47 27

153,293 98,916

116,554 50,665

36,739

Police.

Prisons.

Elemen- tary schools.

Westminster in the report of 1880 divides them into two classes, — those that are eleemosynary and those that are ecclesiastical. In regard to the first, it statcs that it is impossible to effect a satis- factory combination or readjustment of them under existing cir- cumstances, and, in regard to the second, that they are so far libe- rated by altered circumstances as to require reappropriation to new charitable use.

Crimge.—The London police district, or ‘‘ Greater London,” is divided into two police jurisdictions, that of the metropolitan police, with an area of 440,919 acres, and that of the City police, with an area of 668 acres. The Metropolitan police force, which superseded the night watch in 1830, owes its existence to a bill introduced by Sir Robert Peel, providing for the establishment of a Metropolitan police under the control of the executive government. In 1839 the old watch was abolished within the City limits and a City police force appointed, which, however, is entirely under the control of the common council. There are two police eourts within the City district, viz., Guildhall and Mansion House; and thirteen within the Metropolitan district, viz., Bow Street, Clerkenwell, Great Marl- borough Strect, Marylebone, Westminster, Lambeth, Southwark, Thames (Stepney), Worship Street, Woolwich, Greenwich, Hammer- smith, and Wandsworth. The headquartersof the Metropolitan police are at Scotland Yard. The expenses of the two City police courts in 1880 were £10,031, and those of the Metropolitan police courts were £59,009, of which £10,527 was defrayed by fines and forfeitures. The Metropolitan police have power to regulate the street traffic, to inspect and license cabs, omnibuses, and other publie conveyances, to interfere in abating smoke nuisance, and to inspect common lodging- houses. From 6158 in 1861 the Metropolitan force had in 1880 in- creased to 10,943, or one to every 430 of the population ; the City police force from 628 to 830, or one to every 61 of the population. The increase of the City police force is necessitated wholly by the in-

crease in the number of persons who daily frequent the City, for not only has the night population greatly diminished, but the resident criminal population has become almost extiuct. The number of persons belonging to the criminal classes in the whole police district of the metropolis in 1880 was 2392, or one in 1992 of the popula- tion in 1881 ; the number of known thieves 1385, the number in England being 17,907; the number of indictable offences was 17,835 (of which 1137 occurred in the City), the number in Eng- land being 52,427; and the number of apprehensions 5261 (City 612), the number in England being 22,231. Of indictable offences 49 were murders, 6 attempted murders, 448 attempted suicide, 1150 burglaries, 8918 simple larcenies, 1745 larcenies from the person, and 367 utterances of counterfeit coin; 47 bodies of per- sons found dead and unkuown were photographed and not identi- fied. The number of offences determined summarily within the area of the Metropolitan police district was 125,302, or 11°41 to every policeman, the proportion of indictable offences to every police- man being 6°70. The number of offences determined summarily within the City area was 5649, or only 6°70 to every policeman, while the proportion of indictable offences was only ‘78. ‘The total expense of the Metropolitan police was £1,168,061, or about £106 per man; £451,334 was contributed to the expense from public revenue, and £93,071 was received for special services. The expense of the City police, £90,662 in 1880, is defrayed wholly by rate, and the cost per man is about £109.

The following table (XXIII.) gives details regarding police and crime in the Metropolitan police district since 1871, by which it will be seen that, although compared with the increase of popula- tion the total number of apprehensions has diminished, there has of late years been a considerable inerease in the number of felonies, and that the amount of property lost by felonies has been increasing very seriously :—

Felonies.

Persons jApprelcnsionsf or Drink,

Appre- Total Police – z Proportion! hended é Proportion

Force. a Convicted} Summarily | Number of |, wae or| First L Amount | per 1000 | under oe a per 1000

peo Bay on Trial. | Convicted. | Felonics. fSien mst 088. | Recovered. | of Popu- | Poor Law foes a of Popu- y lation. Acts. : lation. 1871 9,655 71,961 2,655 45,608 16,926 10,054 £77,328 £19,284 4°444 6,142 24,213 6°358 1872 9,761 78,203 2,456 52,472 17,651 10,271 T1794 19,106 4°549 5,676 29,109 7°502 1873 9,883 73,857 2,410 50,441 18,879 10,667 84,009 20,957 4°780 4,786 29,755 7535 1874 9,958 67,703 2,306 45,886 17,814 9,858 77,498 18,429 4°433 4,064 26,155 6°509 1875 10,227 72,606 2,343 49,712 17,093 9,729 99.208 20,492 4°182 3,724 30,976 T5718 1876 10,268 76,214 2,476 51,880 18,893 10,210 135,570 19,998 4°486 4,152 32,328 7676 1877 10,446 77,982 2,571 54,034 20,281 10,462 118,680 21,196 4°557 4,516 32,369 7274 1878 10,477 83,746 2,724 57,038 21,792 10,849 157,283 19,785 4°806 4,430 35,408 7809 1879 10,711 81,385 2,934 54,754 21,891 11,431 101,798 22,460 4°739 4,393 33,892 7-336 1880 10,943 79,490 2,609 50,490 23,920 13,336 129,687 37,881 5°081 4,594 29,888 6°345

The Newgate and Holloway prisons are in the hands of the Court of Aldermen. Newgate, rebuilt after the riots of 1780, is now no longer used for persons awaiting trial in the Central Court. The City prison, Holloway, which is the house of correetion for City prisoners, was erected in 1851 at a cost of nearly £100,000. Bridewell, which occupied the site of a royal palace, and was granted to the city as a house of correction by Edward VI., was discontinued in 1864; the old Fleet prison was abolished in 1844, its site being now occupied by the Memorial Hall of the Congregationalists ; Horse- monger Lane prison was superseded by Wandsworth prison ; and the Marshalsea in Southwark, immortalized by Charles Dickens, had been discontinued long before he wrote. The house of detention for Middlesex is

Clerkenwell, and its houses of correction are Coldbath Fields for male prisoners and Westminster for females. Wands- worth is the prison for Surrey. The convict prisons within the metropolitan area are Brixton, Millbank, Pentonville, Wormwood Scrubs, Woking, and Fulham.

Epucation. — Until the constitution of a School Board for London in 1870, the only special organizations for providing educa- tion to the poorer classes in London were the British and Foreign School Society, founded in 1808, and the National Society, founded in 1811. Many of the parish schools became amalgamated with those of the National Society, but the united efforts of these socie- ties, and also of the Church of England, of the different denomi- nations, and of various promiscuous charitable institutions, failed so completely to meet the necessities of the rapidly increasing popula- tion, that in 1851 the total number of scholars attending public schools was ouly 167,298, and that in 1871 the returns of the voluntary schools showed that there was accommodation for only 262,259 children, or 39 per cent. of the estimated population of school age. By October 1881 the School Board had supplied accommodation for 236,024 children, which with that in voluntary schools gives a total number of places sufficient for 502,095 children in addition to which schools are in the process of erection for upwards of 100,000 more. Up to August 1881, 6838 children were sent to industrial schools at the instance of the board, and the board now possesses three industrial schools under its own manage- ment. The total number of children attending workhouse, separate union, and parochial and district schools in 1880 was 35,223, the amount paid to teachers in these schools being £37,110, The total

expenditure of the School Board for the year ending 25th March 1881 was £1,236,360. The amount paid by rating authorities in 1881-82 was £676,579, the rate in the pound being 6°15d., a less rate than that for 1880-81, which was 6°28d., but in all probability there may for some years be a slight increase. The average cost of the 3129 teachers in 1880 was £128. The gross cost per child has risen from £2, 4s. 9d. in 1874 to £2, 17s. 1d. in 1881, but there will probably be a considerable diminution when the schools become all fully occupied throughout a whole year. The following table (XXIV.) gives a comparison of cost

between the board schools and other schools of London and of England in 1880 :—

Expenditure per Income per Scholar. Education Scholar. Grant per School | Vamntary) ‘scholar. | _ For Total Fees, Wakions. Salary. Cost. Voluntary Schools: | £ s. d. | £ s. d.|£ 5s. d.|£ 5. d.|£ 8. d, Ton ON, etviesscos0e 013 23/0 9 34}015 93/110 01]2 0 103 England 010 93);0 7 3 015 6 1 7 03;114 73 Board Schools : Rates. Pe sciees =|0 8 4 [196 7 | 016 at |/® 3.11) 957 oe ooanamaaynCcS 0 9 0 Ons i 015 73/112 13; 2 1 113

Fitzstephen mentions that in his time the three principal churches Gram- possessed by ancient privilege and dignity celebrated schools, and mar The churches schools.

that other schools were permitted on sufferance. referred to are supposed by Stow to have been St Paul’s Cathedral, St Peter’s at Westminster, and St Saviour’s, Bermondsey, in Southwark. The various other priories and religious houses which were afterwards founded had each its school, though of less fame than the earlier ones. On account of the suppression of the alien ptiories and religions houses by Henry V., Henry VI. in 1445 founded grammar schools at St Martin’s-le-Grand, St Mary-le-Bow, St Dunstan’s in the West, and St Anthony’s, and in the following year others in St Andrew’s, Holborn, All Hallows the Great, St Peter’s, Cornhill, and in the hospital of St Thomas of Acon. The custom of school disputations mentioned by Fitzstephen was con- tinued till the time of Stow, who states that they were restrained on account of the quarrels between the boys of St Paul’s and St Anthony’s. Jn his time the principal schools ‘‘ repairing to these

Higher educa- tion.

SCIENCE. |

exercises ” were St Paul’s, St Peter’s (Westminster), St Thomas of Aeon, aud St Anthony’s. The last-named, which commonly pre- sented the best scholars, and at which Sir Thomas More, Lord Chancellor

Heath, and Archbishop Whitgift received their educa- tion, had, however, latterly greatly decayed. Up to the time of the dissolution of the monasteries education in England had been in the hands of the rcligious houses, but, though many of the grammar schools in London were then discontinued, several were re-erected and re-endowed, and others were added in subsequent years. Of these schools there are now existing St Paul's, St Peter's (West- minster), Christ's Hospital (Blue Coat School), Merchant Taylors' School, Charterhouse, Mercers' School, and the City of London School.

St Paul's School, St Paul's Churchyard, was re-established in 1512 by Dean Colct, for the free education of one hundred and fifty-three poor children, and was endowed with lands whose original annual value was £122, 4s. 74d., but which now yield nearly £6000 yearly. The board of governors consists of thirteen members chosen by the Mercers' Company and nine nominated by the universities. Vacancies on the foundation are filled up by eompetition, and the school fee for the scholars is £20. The course of study, which formerly was ehiefly elassical, is now specially designed to prepare for the army examinations. The site of the school will soon be changed to West Kensington, where grounds to the cxtent of 16 acres have been purchased.

St Peter's School, Westminster, re-endowed by Queen Elizabeth in 1560, provides for 40 queen's scholars on the foundation ; and the school is also attended by about 180 day pupils. Besides six junior exhibitions tenable at school, there are eight exhibitions to Oxford or Cambridge. The management of the school is regulated by the Public Schools' Act of 1868. The school, which is in the Dean's Yard, was formerly the dormitory of the monks of the abbey.

Christ's Hospital (Blue Coat School), Newgate Street, founded by Edward VI. in 1533 on the site of the monastery of Greyfriars, has an annual income of over £60,000, and the number of ehildren on the foundation is about 1180, including 440 at the preparatory school at Hertford, of whom 90 are girls. 'he school is under the management of a court of governors, to which any one may be admitted on payment of

a donation of £500. ‘Ihe education is ehiefly commercial, but four boys are annually sent to the univer- sities. The boys still retain their ancient dress, as well as several peculiar privileges.

Merchant Taylors’ School, which was formerly situated in Suffolk Lane, but in 1875 was removed to the Charterhouse, was founded by the Merchant Taylors’ Company in 1561, and provides for the education of 500 boys annually on payment of 12 guineas in the lower school, and 15 guineas in the upper. The site of the present building was purehased for about £90,000, and the new school-house cost £30,000. The rooms of the pensioners of Charterhouse remain entire, as well as the chapel of the date 1512, the master’s lodge, and the great chamber, the interior of which is a very fine specimen of Elizabethan work.

Charterhouse, formerly a Carthusian monastery and afterwards the seat of the Howards, was purchased by Sir Thomas Sutton, and in 1611 endowed as aschool. On the foundation 80 pensioners are maintained at Charterhouse, and 60 scholars at the school at Godalming, where it was removed in 1872.

The Mercers’ Grammar School, Collegiate Hill, Dowgate, was originally attached to the hospital of St Thomas of Acon, which was sold in 1522to the Mercers’ Company on condition that they main- tained the school. Of the 180 scholars 25 are free.

For the City of London School, founded by the City corporation in 1835, at Milk Street, Cheapside, to supply education to sons of respectable persons, a new building is in course of erection on the Thames embankment. There are preparatory schools in connexion with University College and King’s College.

The University of London, Burlington Gardens, instituted in 1836, and removed in 1869 to its present building in the Italian Renaissance style, is a mere examining body for conferring degrees. University College, Gower Street, founded in 1828 on undenomina- tional principles, supplies instruction in all the branches of educa- tion—including engineering and the fine arts—that are taught in universities,

with the exception of theology, and is attended by over 1500 students. The buildings, the chief feature of which is the Corinthian portico at the main entrance surm ounted bya dome, were enlarged by a wing in 1881, and contain a large library, and the Flaxman gallery, with original models by Flaxman. King's College, erected by Smirke in 1828, and forming the east wing of Somerset House, provides similar instruetion to University College, but with the addition of theology, aud in connexion with the Church of England. At Gresham College, founded in 1597 by Sir Thomas Gresham, and removed to its present building in Basinghall Street in 1843, lectures are given on law, divinity, the sciences, music, and medieine. The lectures of the London Society for the Extension of University Teaching have been instrumental in stimulating to some degree general interest in literary and scientific subjects, and in 1881 were attended by 3030 persons. 'The legal leetures in

connexion with the Inns of Court are noticed in the article Inns oF Court, vol. xiii. p. 68 sq.

Screncr.—The great medical schools owe their fame and success to the attraction which London presents to eminent physicians and surgeons, and to the existence of extensive medical and surgical hospitals, which afford unequalled opportunities for the study of disease. In addition to the university of London, the Royal College of Physicians, founded by Linacre, physician to Henry VII. and Henry VIIL., is an examining body for diplomas in medicine ; and the Royal College of Surgeons, which originated in the livery com- pany of Barber-Surgeons, formed by the incorporation of the surgeons with the barbers in 1540, has similar authority in regard to the practice of surgery. The College of Physicians, originally located in the private house of Linacre in Knight-Rider Street, and after- wards in a building designed by Wren in Warwick Lane, removed to its present site in Trafalgar Square in 1825, where a Greco-Italian strueture was erected from the designs of Smirke at a cost of £30,000. The College of Surgeons, Lincoln's Inn

Fields, erected 1835-37 from the desigus of Barry at a cost of £40,000, contains the Hunterian Museum, purchased by parliament in 1799 (see HUNTER, vol. xii. p. 390), an extensive library, and a lecture theatre. Until the time of John Hunter the medical and surgical education obtainable in London was of a very unsystematic character, and chiefly of a private nature, the provision made for dissection being often of the meagrest kind, while the lectures on dnatomy and surgery were both ineluded in a course of six weeks. Hunter's lectures, first delivered in 1774, had a very influential effect in the development of the medical and surgical schools connected with the hospitals, but their most rapid progress has been during the present century. A full description both of these hospitals and of the hospitals for special diseases will be found in the article ENGLAND, vol. viii. p. 253 sg., and the article Hosrirat, vol. xii, p. 301 sq. Among the other scientific schools of London may be mentioned the Royal School of Mines, Jermyn Street ; the Normal School of Science, South Kensington ; the Royal Veterinary College, Camden Town; the Royal Naval College, Greenwich; the Royal Naval School, New Cross; the Royal Military Academy, Woolwich ; and the School of Practical Engineering at the Crystal Palace. The Guilds of London Institute for the advancement of technical education have lately founded colleges at Finsbury and South Kensington, The foundation stone of the South Kensington Institute was laid in 1882, and the building will be opened in 1884, the cost being £75,000, making a total with the Finsbury College of £102,000, in addition to £20,000 for fittings. The amount contributed by the Livery Companies to the undertaking is £23,000.

The most influential of the scientific societies is the Royal Society, incorporated by Charles II. in 1663. Originally located near Gresham College, Crane Court, it was removed in 1780 to Somerset House, and sinee 1857 it has occupied rooms in Burlington House, Piceadilly. In 1854 old Burlington House, built by Richard Boyle, earl of Burlington, was purchased by the Government for £140,000, and in 1872 a new building in the Renaissanee style was erected for the various societies formerly accommodated in Somerset House, viz., the Chemical Society, the Geological Soeiety (instituted 1807, incorporated 1826), the Society of Antiquaries (1707, 1751), the Royal Astronomical

Society (1820, 1881), and the Linnean Society (1788, 1802). The Royal Geographical Society (1830, 1859), occupy- ing a commodious building in Savile Row, has within the last forty years taken a leading part in promoting geographical discovery. The Royal Asiatic Society (1823) is in Albemarle Strect. The Royal Institution of Great Britain, in the same street, estab- lished in 1799 chiefly for the promotion of research in connexion with the experimental sciences, possesses a large library, a miner- alogieal museum, a chemical and a physical laboratory, and a foundation for a course of lectures. The Socicty of Arts, John Street, Adelphi, established in 1754 and incorporated in 1847, for the encouragement of arts, manufactures, and commerce, offers rewards for new inventions and discoverics, and grants eertifi- cates and prizes for proficiency in commercial knowledge, the industrial arts, musical theory, and domestic economy. Aniong other scientific societies the principal are the Statistical, the Meteorological, the Anthropological, the Entomological, the Numismatic, the Zoological, the Botanic, the Horticultural, the Institute of Civil Engincers, and the Royal Institute of British Architeets. The Zoological Socicty, instituted in 1826, rented in 1828 a portion of Regent's Park, where they established gardens which now contain one of the finest collections of live specimens in the world. The gardens of the Botanic Society, which occupy 18 acres of Regent's Park, are not of a strictly scientific character, being used chiefly for musical promenades and flower shows, and are to be distinguished from the Government gardens at Kew, which are noticed under Kew (q.v.) The Horticultural Society, founded in 1804, possesses large fruit and flower gardens at Chiswick, and in 1861 entered upon a lease of 22 acres of ground, formerly occupied by the Exhibition of 1851, which they laid out at a cost of £50,000, and where they now hold their flower shows and fetes.

Of museums, London possesses two on a scale of unexampled

Medical scliools.

Other seientific sehools.

Scientific societies,

Scientific vastness, the British Museum and the South Kensington Museum. muse- The zoological colleetion of the British Museum is still at Blooms- ums. bury, but the departments of geology, mineralogy, and botany were removed in 1881 to a new building in Cromwell Road, South Kensington, called the British Museum of Natural History. The British Museum at Bloomsbury, and the South Kensington Museum, which are more directly connected with art than science, are noticed under the section Art. The Museum of Practical Geology, Jermyn Street, oceupies a building in the Italian Palazzo style, erected in 1850 by Pennethorne at a cost of £30,000. It was founded in 1835 in connexion with the geological survey of the United Kingdom, and also coutains specially fine collections illustrative of the application of the minerals and metals to the useful arts. In the Patent Office Museum at South Kensington there are many of the original examples of the greatest mechanical inventions of modern times; and the United Service Museum, Whitehall, possesses relics and models illustrative both of the art of war and of the great naval and military achievements of England. The Drama.—According to Fitzstephen, London, ‘instead of showes drama. upon theatres and comical pastimes,” possessed in his time “holy lays and representations of miracles” ; and Stow mentions that in 1891 a play by the parish clerks continued three days to- gether, and that another in the year 1409 lasted eight days, and was ‘‘of matter from the creation of the world.” In the 15th century the secular began to supersede the sacred drama ; its progress in London under Elizabeth and James I. will be touched on below (pp. 846 sg.) After the Restoration the ‘‘king’s servants” who had_ previously oecupied the Globe and Blackfriars played first at the Red Bull, then in Vere Street, Clare Market, and in 1663 removed to the Theatre Royal in Drury Lane. For Daveuant’s company, known as the ‘duke of York’s,” the Lincoln’s Inn theatre was built on an improved plan in 1662, and there for the first time women actors were introduced. The two companies received each special patents in the same year. Before 1672, when Drury Lane theatre was burned, Davenant had removed to a new house built by Wren in Dorset Gardens, at a cost of £8000, and spoken of by Dryden as ‘‘like Nero’s

palace shining all with gold”; and, as the new Drury Lane was far less magnificent in its arrangements, it generally had the worst of the costly competition in which they engaged until the union of the patents in 1682. In 1695 a licence was granted to a new theatre in Lincoln’s Inn Fields, and in 1705 Haymarket theatre was opened, chiefly for Italian opera. The Dorset Gardens theatre was demolished in 1709. In 1738 the Lincoln’s Iun theatre was removed to Covent Garden. The Act of 1787, which forbade the granting of new licences, gave to the patent houses a monopoly of the legitimate drama till 1843 ; but in the smuller houses, such as “ The Little Haymarket” (erected in 1720), the Goodinan’s Fields theatre (1727), Sadler’s Wells (1764), the Lyceum (1795), the Adelphi (about 1800), the Princess’s (1880), the Strand (1831), and St James’s (built by Braham, 1885), the law was evaded by the performance of miscellaneous entertainments. The most striking feature in the dramatic entertainments of London is their variety ; the old dramatic traditions of England, so closely as- sociated with Drury Lane and Covent Garden, now exercise their influence rather in Germany than in London. London at present possesses about thirty theatres, and the plays of the older dramatists are revived only occasionally, chiefly at Drury Lane, the Lyceum, and the Princess’s. Melodrama and the domestic drama win large uppats but many theatres rely chiefly on comedy, farce, or opera- ouffe, Musical Music. —In 1673 the chequered career of English opera in London perform- was first definitely commenced by the performance at Dorset ances, Gardens of Psyche, followed by the Tempest and a little later The Prophets and King Arthur. For some time after the opening of the Haymarket theatre, Italian operas were varied by performances of English opera and the spoken drama, but the increasing success of the new entertainment soon Jed to its exclusive establish- ment. Since 1847 Italian opera has also been established at Covent Garden. English opera has lately been suecessfully revived b Carl Rosa, and Italian opera is also threatened with formidable rivalry by the performance on a scale of unexampled grandeur of

great instrumental works, which previous to this had been com- meneed at subseription concerts conducted by private enterprise, but the orchestral performances at the Crystal Palace are of equal

excellence, and of late years the Richter and Halle concerts have excited a larger amount of general interest. The Monday and Saturday popular concerts for chamber music have been the special means of introducing to London audiences instrumental performers of European fame. By the formation of Henry Leslie's choir in 1855, the standard of refinement and taste in unaccompanied part- singing has been improved throughout England, and besides reviv- ing general interest in glees and madrigals, it has been the principal means of giving currency to the ‘‘ modern part song.” The choir, after the suspension of its performances since 1880, was revived in 1882 ; and there are also in London several local choirs which have attained nearly equal perfection in similar performances. ‘The Bach Society devotes itself to the study aud performance of the unaccompanied music of Bach aud the older composers. The Concert earliest renderings of the great classical compositions are associated rooms. with the Hanover Square rooms, converted into a club house some years ago, and in a less degree with Willis's rooms, built in 1765, which are now used almost solely for balls and public meetings. The only concert-room in London of a convenient size for important performances is St James's Hall, Regent Street and Pieeadilly ; for since the purchase of Exeter Hall, associated with the ‘* May meetings,” by the Young Men's Christian Association, its use is prohibited even to the Sacred Harmonic Society, and the Royal Albert Hall is much too large for the proper realization of the finer effects either of choral, orehestral, or solo performances. This elliptical building in the Italian Renaissance style, erected from the designs of Captain Fowke, was completed in 1871 at a cost of £200,000, and has accommodation for an audience of about 9000 and an orchestra of 1000. The Crystal and Alexandra Palaces, though they present the additional attractions of fine grounds, of scientific and art exhibitions, and of various forms of out-door amusement, base their claims to support in a great measure on their theatrical and musical performances, and, besides the large central halls for promenades, possess separate concert-rooms. The Crystal Palace, Sydenham, which has a total length of 1608 feet, and a width at the nave of 312 feet, and at the central transepts of 3884 feet, was designed by Sir Joseph Paxton, and constructed in 1854, chiefly of iron and glass, out of the materials of the Exhibition building of 1851, at a cost of £1,500,000,

includ- ing the adornment of the grounds, 200 acres in extent, The Alexandra Palace, Muswell Hill, situated in grounds of 800 acres, was completed in 1875, after having been burned down in 1878. It is built of brick in the form of a parallelogram, covering about 74 acres, and consists of a central hall 386 fect by 184, two courts on each side 260 feet in length, and a concert-room and theatre detached from the main building. Miscellaneous concerts and other entertainments are given at the Royal Aquarium, West- minster, which was opened in 1876 at a cost of about £200,000.

In London there are probably a larger number of eminent pro- Musical fessors of the various branches of musie than in any other city of jngtruc- the world, but alinost no provision for public musieal instruction tion. has been made by the state. The Royal Academy of Music, instituted in 1822, and incorporated by royal charter in 1880, receives from Government only an annual grant of £500, and, though attended by over 400 students, chiefly professional, is hampered in its organization and plans by deficieney in funds. The Guildhall School of Music, in which instruction may be commenced at an earlier stage, was established by the corporation of the City in 1879, and is now attended by 1200 students. The National Train- ing School at South Kensington, for which endowments for only five years were provided, is now discontinued, a proposal having been made to supersede it by a Royal College under the presidency of the Prince of Wales, and with endowments sufficient to afford free education to 50 pupils, as well as maintenance and education to 50 others. The Tonic Sol-Fa College, Plaistow, was incorporated in 1875 for the special purpose of training teachers of music for the elementary schools of the country, that method of instruction in music being now used in the majority of schools where syste- matic musical instruction is given.

PAINTING, SCULPTURE, AND THE APPLIED Arts.—The most Art influential and the oldest institution in London connected with galleries. painting and sculpture is the Royal Academy of Fine Arts, founded in 1768, which, besides its annual exhibition of art in its new buildings in Burlington Gardens, Burlington House, erected in 1868-69, in the Italian Renaissance style from the designs of Smirke, has

also organized classes for art instruction. The Society of Painters in Water-Colours, established in 1804, the Society of British Artists, founded in 1822 and incorporated in 1847, and the Institute of Painters in Water-Colours, hold each an annual exhibition. The National Gallery of Paintings originated in the purchase by parliament in 1824 of the colleetion of J. J. Angerstein for £57,000. The present Grecian building by Wilkins in Trafalgar Square (1832-38) was enlarged in 1860 and 1869, and in 1876 a new wing was added by Barry at a

other form of musical composition. The Ancient Concert Society did not find a worthy successor in its special sphere till the estab-

British Museum.

South Ken- sington Museum.

Other muses.

Churches.

Paul’s.

CHURCHES. |

cost of over £80,000. The collection has received many additions both by purchase and bequest, and besides many uoble examples of the old mastcrs, contains some of the finest pictures of the English school, including the magnificent Turner collection. The National Portrait Gallery, the nucleus of which was formed in 1858, was removed to Exhibition Road, South Kensington, in 1870. In the Grosvenor Gallery, New Bond Street, crected by Sir Coutts Lindsay in 1877, there are annual exhibitions of works of art, and occasionally other special exhibitions. Several of the mansions of the nobility contain art galleries, which are open to the public on certain conditions. The most famous of these are perhaps the Grosvenor Gallcry in the residence of the duke of Westminster, and the Bridgewater Gallery in the residence of the earl of Elles- merc.

The British Museum, Bloomsbury, originated in the purchase by Government in 1758 of the collection and library of Sir Hans Sloane, and occupies the site of Montague House. For the recep- tion of the Egyptian antiquities presented by George I. (1801), of the Townley marbles (1805), and of the Elgin marbles (1816), a new wing was added to the building in 1823, but after the present- ation of the king's library by George IV. in the same year, it was resolved gradually to reconstruct the whole building, the first portion being finished in 1828, and the work (except the new reading-room) completed in 1852. The exterior of the building is plain, with the exception of the massive Ionic portico at the principal entrance. The contents of the museum are divided into departments, which are under the charge of a keeper and one or more assistant keepers. The departments still at Bloomsbury are those of Printed Books, Manuscripts, Oriental MSS., Zoology, Oriental Antiquities, Greek and Roman Antiquities, Coins and Medals, British and Medieval Antiquities and Ethnography, and Prints and Drawings. The collection both as a whole and in several departments—especially Greek and Roman Antiquities aud Engravings—is unequalled in the world, and in all the departments a very high degree of com- pletcness has been attained. For the library and reading-room, see LIBRARIES, p. 515.

South Kensington Museum, which is under the direction of the Committee of Council on Education, was originated by the late Prince Consort in 1852. 'The present building, to which the collcc- tion was removed from Marlborough House in 1857, is erected of red brick and terra cotta in the Italian Renaissance style, aud, though still in process of construction and development, includes a fine range of apartments, the interior consisting of courts and corridors of graccful proportions, and decorated with various dcsigns. It contains a collection of objects of ornamental art, both ancient and modern, as applied to manufactures, a national gallery of British art, in addition to the Foster and Dyce collections, and a fine collection of water-colour paintings, an extensive art library, a collection of sculpture chiefly of the Renaissance period, reproductions of ancient sculptures and paintings, and collections of animal products em- ployed in the arts, of substances used for food, and:of matcrials used for building and

construction. Some of the rooms are occupied chiefly by articles on loan. In connexion with the institution there is a National Art Training School, as well as a School of Science and a School of Cookery. The Bethnal Green Museum, a branch of South Kensington Museum, opened in 1872, besides a permanent food collection, and a collection of animal products, is occupied with various collections on loan. The India Muscum, which was removed in 1880 from the India Office to a building in Exhibition Road, South Kensington, and placcd under the care of the South Kensington Museum directors, contains a magnificent collection of every variety of Indian art and manufacture. The Soane Museum, Lincoln's Inn Fields, bequeathed to the nation by Sir John Soane in 1837, contains an architectural library, various models of famous ancient buildings, antique sculptures, gems, vases, and bronzes, and several fine paintings. The Royal Architcctural Muscum, Westminster, founded in 1851, is intended spccially to advance the art of architecture by examples of the works of various nations and times, and by courses of lectures, and drawing and modelling classes.

Cubs. —Sce CxuB, vol. vi. p. 41.

EcciesiasticaAL Buinpines. —Fitzstephen states that in his time there were in London and its suburbs thirteen larger conventual churches besides one hundred and twenty- six lesser parochial ones. Stow gives a list of churches existing when he wrote, mentioning those which he knew to be suppressed or united to others. He gives the names of 125 churches, including St Paul's and Westminster Abbey ; 89 of these were destroyed by the great fire, and only 45 were rebuilt.

St Paul's cathedral occupies the site of a church founded in 610 by Ethelbert. After the destruction of the church by fire in 1087, a new edifice in the Norman style was

commenced, which was forty years in building, and accord- ing to William of Malmesbury “could contain the utmost conceivable multitude of worshippers.” In 1240 a new Pointed Gothic choir was added, and the erection of a lofty tower begun. The work of renovation and adornment was continued until 1315, when the cathedral was declared com- plete. Its dimensions as given by Stow were as follows : — height of steeple 520 feet ; total length of church 720 feet ; breadth 130; and height of the body of the church 150 feet. In 1561 the spire was struck by lightning, and the roof of the church partly destroyed by the fire that ensued. From this time it remained in a dilapidated condition until the reign of Charles I.; and the work of restoration under the direction of Inigo Jones, who added to the west front a Corinthian portico, had not been completed when the building was destroyed by the great fire of 1666. St Paul’s cross, which stood at the north-east corner of the cathedral, was rebuilt by Bishop Kemp in the 15th century, but was removed in 1643, its place being now occupied by a fountain. At the cross great religious disputations were held and papal bulls promulgated, and in its pulpit sermons were preached before the court. The present St Paul’s, erected in 1675-97 from the designs of Sir Christo- pher Wren at a cost of £747,954, is built in the form of a Latin cross, the length being 500 feet, the breadth at the transepts 250 feet, and of the choir and nave 125 feet. The dome, which separates the two transcpts and the nave and choir, rises to a height of 365 feet, or of 404 feet to the top of the cross by which it is surmounted, the height of the interior dome being 225 feet. The principal front to the west consists of a double portico of Corinthian pillars flanked by campanile towers 120 feet in ~~height. The transepts are bounded by semicircular rows of Corinthian pillars. St Paul’s is remarkable chiefly for its massive simplicity and beautiful proportions. The interior is im~~ posing from its vastness, but the designs of Wren for its decoration were never carried out. Some of the monuments of the old building are preserved in the crypt, where are also the tombs of Sir Joshua Reynolds, Dr Samuel Johnson, J. M. W. Turner, Lord Nelson, the duke of Wellington, and other distinguished men, especially admirals and generals.

Westminster Abbey, as the coronation church of the West- sovereigns of England from the time of Harold, and on we

account of its proximity to the seat of English government, has acquired a fame and importance which in a certain sense outvie those of St Paul's. It occupies the site of a chapel built by Siebert, in honour of St Peter, on a slightly elevated spot rising from the marshy ground bordering the Thames. A church of greater pretensions was erected by King Edward about 980; but, this church being partly demolished by the Danes, Edward the Confessor founded within the precincts of his palace an abbey and church in the Norman style, which was completed in 1065, and of which there now only remain the pyx house to the south of the abbey, the substructure of the dormitory, and the south side of the cloisters. 'The rebuilding of the church was commenced by Henry III. in 1220, who erected the choir and transepts, and also a lady chapcl, which was removed to make way for the chapel of Henry VII. The building was practically completed by Edward I., but the greater part of the nave in the Transition style, and vari- ous other improvements, were added down to the time of Henry VII., including the west end of the nave, the deanery, portions of the cloisters, and the Jerusalem chamber; while the two towers at the west end were erected by Wren, who had no proper appreciation ef Gothic. The length of the church, including Henry VII.'s chapel, is 531 feet, or, excluding it, 416 feet, the breadth of the transepts 203 feet, the height of the church 102 feet, and of the towers 225 feet. The choir, where the coronation of

Abbey.

chamber (1376-86), where Edward V. is said to have been Of the churches of the period succeeding that of Wren, the most Later bom and Henry IV. was brought to die, tho sittings of the | notable are St Georgy's, Hanover Square (1724), hy James, wich chime ° = . a > lower house of convocation of the province of Canterbury century made at Mechlin; St Giles-in-the-Ficlds (1734), by Flit- are now held. croft, with tapering spire, and containing the graves of Flaxman can ; : the sculptor and Andrew Marvel ; St Martin-in-the-Fields (1726), Conven- Among the conventual churches existing in the time of Fitz-

by Gibbs, with a fine Corinthian portico, behind which the svire tual stephen, there were destroyed by the fire three, those of St Thomas = one eel lced.: St Mar ntl (17 17), by Gibbs mee x churches of Acon, St John the Baptist, and St Martin-le-Grand, founded ak el re the ~~olll Mo ole: St taal None (1817) of time in 700. Of the other churches there still remain the choir, part | aaedwicker inthe Classic st ay aul taiting® altarnicee presciited *, of Fitz~~ of the nave, and portions of the transepts of the old church of ree vouthowelds ahah: RA Pattens (1822) Lie steeple el stephen. St Bartholomew the Great dating from the foundation of the imitation of the Temple of the Winds, and a very elaborate interior monastery by Rahere, minstrel to Henry I., included in the pre- copied from the Erecthenm at Athens; St Paul's, Covent Garden, sent church, restored 1865-69, which also contains the tomb of its originally designed by Inigo Jones, and restored after a fire in founder; a pointed pier of the old church of St Cathonme Cree, (ities. ihetmordialerd eimnoledttive chiefly in the Gothic style. ep be the conventual church of St Austin's priory of the Holy Of the religious buildings connected with the numerous denomina- Other ae? pa 4 ae ee was rebuilt by Inigo Jones; the | tions and nationalities, few possess exceptional intcrest either of churches vant pe Clerke; 2 7 c o1@ monuments of the. oldvehizchyer St | antiquarian or architectural character. St George's Cathedral, and ames; _verxenwell, built in connexion with the Benedictine Southwark (1848), designed by Pugin, is said to be the largest chapels.

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English sovereigns takes place, is a fine specimen of Early English, with decorations added in the 14th century, and contains among other tombs those of Siebert, king of the East Saxons, Anne of Cleves, and Edmund Crouchback, earl of Leicester. The north transept is occupied princi- pally with monuments of warriors and statesmen, and in the south transept the "poet's corner" contains memorials of most of the great English writers from Chaucer to Thackeray and Dickens. The nave, with its clustered columns, its beautiful triforium, and its lofty and finely proportioned roof, is the most impressive portion of the interior. The monuments in its north and south aisles are of a very

miscellaneous character, and commemorate musicians, men of science, travellers, patriots, and adventurers. The monuments in the chapels of St Benedict, St Edmund, St Nicholas, St Paul, St Erasmus, St John the Baptist, and the Abbot Islip are chiefly to ecclesiastics and members of the nobility. Henry VII.'s chapel, which is remarkable for the fretted vault work of the roof, with its magical fan tracery, contains besides the monument of Henry VII. the tombs of many English sovereigns and their children, and also of various other personages of historic fame. In the chapel of Edward the Confessor are the shrine of Edward the Confessor in Purbeck marble, the altar tomb of Edward I., the coronation chairs of the English sove- reigns, and the stone of Scone, the old coronation seat of the Scottish kings. In the chapter-house (1250) the meetings of the Commons took place before they were transferred to St Stephen's Chapel ; and in the Jerusalem

nunnery 1100, and replaced by the present structure 1788-92 ; the east wall and Norman crypt of the building which in the 15th century replaced the old church of the priory of St John's of Jerusalem, Clerkenwell, founded in 1100, and of which the sonth gate in the Perpendicular style, built in 1504, still remains; and the Temple church, noticed in the article Inns or Court. Of the ancient church of St Savionr's, Southwark, belonging to the priory of St Mary Overy, a few scemingly Anglo-Saxon portions were in- corporated in the building in the Karly English style erected in the 13th century, which has been much disfigured by reconstructions and additions, althongh the beautiful choir, lady chapel, and transepts remain almost entire. The church of St Katherine's

verte was removed in 1825 to make way for St Katherine's ocks.

re-erected by Edward I., and frequently restored, containing a window originally executed by Gouda for Waltham Abbcy, and possessing a large number of monuments to eminent persons; St Olave's, Hart Strect, in the Gothic style, belonging to the 15th century, but much

altcred by restoration, containing a large nnmber of brasses and monuments ; the small church of Trinity in the Minories, formerly connected with a convent founded by Blanche, wife of Edmund Plantagenet, second son of Henry IIL, containing in a state of complete preservation the head of the duke of Suffolk, father of Lady Jane Grey.

That the only important external feature of Wren's churches is Wren's

the tower or stceple is a peculiarity to be explained by the fact churches, —

that the merit of his style consisted more in beauty of general out- line than in claboration of details, that from the amount of money ee at his disposal he was generally compelled to concentrate

is chief attention on a special part of the building, and that on account of the crowding of surrounding buildings the steeple was often the only part of the church that could be made effective. His interiors, however, are finely proportioned. Among his more important churches are St Bride's, Fleet Strect, which possesses one of his finest steeples, and contains the grave of Richardson the novelist ; St Dunstan's-in-thc-East, of which the only portion by Wren now remaining is the steeple, resting on quadrangular columns with a mural crown copied from St Nicholas's, Newcastle ; St James's, Piccadilly, only remarkable for its elaborate interior and a white marble font by Gibbons ; St Lawrence, Jewry ; St Mary-le-Bow, containing the Norman crypt of the old building, which was the first church in the city built on arches (hence the name), and adorned with one of the finest of Wren's steeples, in which are the proverbial ‘‘ Bow Bells"; St Michael's, Cornhill, with Perpendicular tower imitated from that of Magdalen College, Oxford ; St Mary, Aldermary, rebuilt by Wren on the Gothic model of the old church; St Stephen's, Walbrook, with an interior

‘similar to St Paul's ; St Swithin's, Cannon Street, in a wall of

which the famous ‘London Stone" is built; and St Clement Danes, in which Dr Samuel Johnson was accustomed to worship.

Roman Catholic building erected in England since the Reformation ; and Ely Chapel, Holborn, the only remaining relic of the palace of the bishops of Ely, has lately been purchased and restored by the Roman Catholics. Among the chapcls belonging to the Protestant dissenters the best known are perhaps Mr Spurgeon's Tabernacle, the City Temple, and Christ Church, Newington. The Dutch Church in Austinfriars was presented by Edward VI. to Dutch residents in London in 1550 ; the nave is in the Decorated style of the 13th century.

Iambeth Palace, situated near one of the old hithes or landing-Lambeth places of the Thames, came into the possession of the archbishops Palace.

of Canterbury in 1197. The oldest portion of the present building, including the chapel in the Early English style, was erected by

Archbishop Boniface (1244-70), but the Lollards' Tower, in which the Lollards were tortured and the carl of Essex was imprisoned, was built in 1434, and the grcat hall with an elaborate timber roof in 1663. The inhabited portion was erected 1828-48 from the designs of Blore. The adjoining church of St Mary, the oldest part of which dates from the 14th century, contains the tombs of several archbishops, as does also the palace chapel. The library is noticed in LipraRigs, p. 516. .

Other old Of the other churches which escaped the fire the principal are churches. the Chapel Royal, Savoy, rebuilt by Henry VII. on the site of Savoy Palace in connexion with the hospital of St John the Baptist, from 1564 till 1717 used as the parish church of St Mary- lc-Strand, eonstituted a chapel royal in 1773, and restored in 1865 by Smirke after partial destruction by fire; All Hallows, Barking, founded in connexion with the Benedictine convent of Barking, Essex, sone time before Richard I., chiefly Perpendicular and containing several brasses ; St Andrew's Undershaft (1520-32), in the Perpendicular style, with a turreted tower, and containing among other tombs that of Stow the chronicler ; St Giles's, Cripple- gate, founded 1090, rebuilt in the Gothic style after destruction by fire in 1545 (with the exception of the fine tower, added in 1660) where Cromwell was married, and Milton and Fox the martyrologist were buried ; St Helen's, Bishopsgate Street,

founded in connexion with a priory of nuns (1216), chiefly in the Third Pointed style, and containing many brasses and monuments of city dignitaries ; St Margaret's, Westminster, founded by Edward the Confessor,

RoyaL Panaces AND GovERNMENT BuILpINcs.—Stow mentions that in his time there was a large building called the Old Wardrobe in the Old Jewry, very ancient, but of which all that he knew was that it had been alluded to by Henry VI. as his principal palace in the Old Jewry. The palace of Westminster existed at least as early as the Patace reign of Canute, but the building spoken of by Fitzstephen of West- as an "incomparable structure furnished with a breastwork ™inster.

and a bastion" is supposed to have been founded by Edward the Confessor, who built what was afterwards known as the Painted Chamber, and also the apartment afterwards used by the House of Lords. The palace was probably enlarged by William the Conqueror, and William Rufus built the great hall in 1097. The palace suffered severely from fire in 1263 and 1299, and after the great fire of 1512 it was no longer used as a royal residence, and was allowed for a time to fall into decay, with the excep- tion of the great hall. Subsequently it was fitted up and made use of for the meetings of parliament until 1835, when again the whole, with the exception of the great hall, fell a prey to the flames. The apartment in which the House of Commons met was the beautiful St Stephen's chapel, originally built by Stephen. Westminster Hall, which is 290 feet long, 68 feet wide, and 90 feet in height, with a carved timber roof remarkable for its beauty and tlie ingenuity of its construction, is used as the vestibule of the law courts and the Houses of Parliament. According to Stow the "princes" after the destruction of Westminster Palace "lodged in other places about the city, as at Bay- narde's castle (which was destroyed in the great fire), at Bridewell, and Whitehall, sometime called York Place, and sometime at St James's."

Julius Cesar, but the nucleus of the present building was begun in 1078 by William the Conqueror, who erected the part now known as the White Tower to take the place of a portion of the walls and towers of the city which had been washed away by the Thames. ‘This tower was com- pleted in 1098 by William Rufus, who also began the St Thomas Tower and the Traitor’s Gate. Additions were made at various periods, especially by Henry IIL, who used it frequently as a residence; and it now occupies an area of 13 acres surrounded by a moat, constructed in 1190, enclosing a double line of fortifications, behind which is a ring of buildings consisting of various towers, and thie barracks and military stores, while in the centre is the massive quadrangular White Tower, with Norman arches and windows, and adorned with a turret at each corner. The St John’s chapel in this tower is one of the finest and most complete specimens of Norman architecture in Eng- land. The Tower of London has an extensive collection of armour, and is the repository for the regalia of England. The execution of the long list of important political prisoners confined in the Tower took place on the neigh- bouring Tower Hill, and most of them were buried in the chapel of St Peter Ad Vincula.

It was at Bridewell, which occu- pies the site of an old Norman tower, and was for a long time the occasional residence of the kings of England, that

The new palace of Westminster (1840-67), built at a cost of about Houses of £3,000,000 from the designs of Barry, for the Houses of Parliament, Parlia- on the site of the old palace destroyed by fire in 1835, is a vast and ment.

White- hall,

St James’s Palace.

Bucking- ham Palace,

Henry VIII., who, according to Stow, built there “a stately and beautiful house of new,” was staying, on ac- count of the destruction of Westminster Palace, when the interview took place in 1528 between him and his nobles, commemorated in the third act of Shakespeare’s Lenry VITI. After the fall of Wolsey, York House, which from 1248 had been the residence of the archbishops of York, caine into the possession of the crown, and obtained the name of Whitehall. The palace was almost reconstructed by Henry VIIL, who made it his principal residence, and employed Holbein in its decoration ; but a new banqueting hall, erected by James I. in place of the old one burned down in 1615, was the only portion of the building which escaped the destruction caused by fire in 1691 and 1697. This hall, converted into a royal chapel by George I, is a fine specimen of Palladian architecture, and its ceiling is adorned with allegorical paintings by Rubens. Through the banqueting hall Charles I. passed on his way to exe- cution beneath its windows, and Cromwell breathed his last within an apartment of the palace.

St James’s Palace, which after the destruction of Whitehall continued to be the principal royal residence until it was nearly all destroyed by fire in 1809, with the exception of the old gateway, the chapel adjoining, and the presence chamber, was built by Henry VIII. for a country residence instead of Kennington, on the site of an old hospital for lepers founded in the 12th century.

Buckingham Palace, the town residence of Queen Victoria, occupies the site of Buckingham House, purchased by George III. in 1761. The present building in the Classic style was erected 1825-35 by Nash, a west wing with a dull facade 460 feet in length, facing St James’s Park, being added in 1846, and a large ball-room in 1856. The picture gallery contains a specially fine collection of pictures by the great Dutch masters.

Kensington Palace, a favourite residence of several English sovereigns, is noticed under KenstncTon. Marl- borough House, built by the first duke of Marlborough in 1710 from the designs of Wren,

came into the possession of the crown in 1817, aud has been occupied by the Prince of Wales since 1863.

The Tower of London, to the east of the city on the left bank of the Thames, called by Fitastephen the Palatine Tower, was, according to tradition, originally built by

ornate building in the Tudor-Gothic style, covering altogether an area of about 8 acres. Towards the river it presents a very richly adorned and effective fagade. At the north-east corner is the clock- tower, 320 feet in height, resembling the clock-tower at Bruges; above the dome over the central hall a spire rises to the height of 300 feet ; and the Victoria tower, 340 feet, surmounts the royal entrance at the south-west corner. The central hall, which is entered by St Stephen's Porch and St Stephen's Hall, built above St Stephen's Crypt, a portion of the old building, separates the House of Peers, which, along with the royal rooms, occupies the western portion of the building, from the House of Commons, to which the eastern portion is assigned.

The Government offices, situated in Whitehall and Downing Govern- Street, form several miscellaneous groups erccted at different ment The Treasury, offices.

periods and in very various styles of architecture. Whitehall (1737), containing the official residence of the premier, the Education Office, the Privy Council Office, and the Board of Trade, was improved in 1847 by the construction of a new fagade designed by Barry. The Horse Guards, the headquarters of the commander-in-chief, an insignificant building with a central clock- turret, was erected in 1758 on the site of a guard-house built in 1631 for the security of Whitchall. The Admiralty, a plain struc- ture with a Grecian facade, was erected in 1726. The new Public Offices, a fine range of buildings in the Italian style, erected from the designs of Sir Gilbert Seott at _a cost of over £500,000, contain the Home, Foreign, Colonial, and Indian Offices, and various other departments. Somerset House, Strand (1776-86), a large quad- rangular structure, the finest facade of which is that towards the river, occupies the site of a palace founded by Protector Somerset in 1547. It contains the Exchequer and Audit

Office, the Inland Revenue Office, the Office of the Registrar-General, the Admiralty, Register, and the Prerogative Will Office, removed from Doctor's Commons in 1874. The other Government officcs at present occupy unpretentious buildings in various strects, chiefly in the neighbour- hood of Whitehall and Westminster. Heralds' College (College of Arms), the authority in regard to pedigrees and armorial bearings, is located in Queen Victoria Street, in a building re-erccted in 1683 from the designs of Wren. The General Post-Office, St Martin's-le-Grand, City (1825-29), designed by Smirke in the Grecian style, and occupying the site of St Martin's church and abbey, will probably soon be removed farther westwards. The General Telc- graph Office, opposite the Post-Office, was erected 1870-73 at a cost of £450,000. The new Record Office in the Tudor style (1851- 56) is situated in Fetter Lane.

The law courts, which are described in the article ENGLAND, vol. Law viii. p. 261, and were accommodated in Lincoln's Inn and in courts.

buildings adjoining Westminster Hall, where they were first estab- lished in 1224, will soon be all removed to the New Law Courts in the Strand, designcd by Street, and estimated to cost about £500,000.

MeEmorIAts AND STATUES.—The principal monuments are The Monu- Monument (1671-77), a fluted Doric column designed by Wren, and meuts.

erected in commemoration of the great fire, at a cost of £13,700 ; the Nelson Column, Trafalgar Square, by Railton, erected (1843) at a cost of £46,000, a copy in granite from the Temple of Mars Ultor,

Statues.

145 fect im height, crowned with a statue of Nelson by Barry, and having at its base four colossal bronze lions modelled by Sir Edwin Landseer; the Duke of York Column, Carlton Housc Terrace (1883), an

Ionic pillar 124 feet, designed by Wyatt, sur- niounted by a bronze statue by Westmacott ; Westminster Column, erected to the memory of the old pupils of Westminster school who died in the Russian and Indian wars of 1854-59; the Guards Memorial, Waterloo Place, erected in honour of the foot gnards who died in the Crimea; the Albert Memorial, Hyde Park, a highly decorated Gothic structure adorned with numerous rilievos and statues, erected from the designs of Sir Gilbert Scott at a cost of £120,000; Cleopatra's Needle, presented to the Government by Mehemet Ali in 1819, brought from Alexandria in 1878, and erected on the Thames embankment on a pedestal of grey granite. Temple Bar, erected by Sir Christopher Wren (1670-72), was Te- inoved in 1877, but its site is at present occupied by an erection surmounted by a griffin. : The following is a list of the principal public statues :—

Name. Site.

Sculptor.

Hyde Park. St Paul's Churchyard.

Achilles. Anne, Queen,

Westmacott. Bird.

Beaconsfield, Earl of, Parliament Square. Raggi. Bedford, Jolin, Duke of. Russell Square. Westmacott, Bentinck, Lord George. Cavendish Square, Campbell. Burgoyne. Waterloo Place. Boehm. Canning, George. New Palace Yard. Westmacott. Charles I. Charing Cross, Le Sceur, Charles IT. Chelsea Hospital. Gibbons. Clyde, Lord. Waterloo Place. Marochetti. Cobden. Hampstead Road. Wills. Cumberland, Duke of, Cavendish Square. Chew, Derby, Earl of. Parliament Square. Noble.

Fox, Charles James. Bloomsbury Square. Westmacott. . Franklin, Sir John. Waterloo Place. Noble. George III, Somerset House, Bacon,

Do, Cockspur Street. M. C. Wyatt. George IV. Trafalgar Square. Chantrey. Havelock. Trafalgar Square. Behnes. Herbert, Lord. Pall Mall. Foley.

Hill, Rowland. Royal Exchange. O. Ford. James II. Whitehall. Gibbons, Jenner. Kensington Gardens. Marshall, Kent, Duke of. Portland Place. Gahagan, Mill, J. S. Victoria Embankment. Woolner, Napicr, Sir Charles. Trafalgar Square. Adams, Outram, Sir J. Victoria Embankment. Noble. Palmerston, Lord. Palace Yard. Woolner. Peabody, George. Royal Exchange. Story. Peel, Sir Robert. Cheapside. Behnes. Pitt, William. Hanover Square. Chantrey. Prince Consort. Holborn Viaduct. Bacon, Richard I. Old Palace Yard. Marochetti. Sloane, Sir H. Chelsea. Rysbrack, Victoria. Royal Exchange. Lough. Wellington, Duke of. Green Park Arch. Wyatt. Do. Tower Green. Milnes. Do. Royal Exchange. Chantrey. William IT. St Jumes's Square. Bacon. William IV, King William Street. Nixon,

(T. F. H.)

History.

_ Brivis anp Roman (ro 449 A.D.).—Bishop Stillingfleet, writ- ing of London, stated that after the fullest inquiry he was in- clined ‘‘to believe it of a Roman foundation, and no older than the time of Claudius” (Origines Brit., 1685, p. 48); and several antiquaries and historians hold the same opinion. Although Geofirey of Monmouth's vision of a great British city of Troynovant, founded by Brut, a descendant of Aineas, must be relegated to the limbo of myths, we need not necessarily dispute the existence of a British London. There can be little doubt that the name of London has a Celtic origin, and therefore there is probably a grain of truth in Geoffrey's fanciful description.. The place was probably very small, but it must have been chosen for its com- manding position on the banks of a fine river, and there may be some truth in the assertion that one Belinus formed a port or haven on the site of the present Billingsgate, although it does not follow that ‘he also made a gate of wonderful structure,” or ‘‘over it built a prodigiously large tower ” (Historia, lib. iii, cap. x.), What a British town was like we learn from Julins Cesar, who tells us that it

‘‘was nothing more than a thick wood, fortified with a ditch and rampart, to serve as a place of retreat against the incursions of their enemies ” (De Bello Gallico, vy. 21). We may therefore Inlagine a clearing out of the great forest of Middlesex, extending probably from the site of St Paul’s Cathedral to that of the Bank of England, with the dwellings of the Britons spread about the higher ground looking down upon the Thames, The late Mr Thomas Lewin believed that London had attained its prosperity before the

‘ Dr Guest affirmed that the notion of a British town having “ preceded the Roman camp has no foundation to rest upon, and is inconsistent with all we know of the early geography of this part of Britain” (Archeological Journal, vol. xxiii, p. 180); and Mr J. R. Green in his lately published work, The Making of England, expresses the same opinion (p. 101). This was not, however, Mr Kemble’s belief, for he held that it was difficult to believe that Cair Lunden was an unimportant place even in Crsar’s day (Saxons in England, vol. ii. p. 266).

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Romans came, and held that it was probably the capital of Cassi-vellaunus, which was taken and sacked by Julius Cesar. Not satisfied with affirming the existence of a British London, he went further, and indicated its extent. On the hill situated between the river Flete on the west and the Wallbrook on the east was seated the British town. The western gate was Ludgate and the eastern Dowgate, and much of Mr Lewin’s argument rests upon the fact that these two names are of British origin (Archgologia, vol. xl. p- 59). The origin of London will probably always remain a snb- ject of dispute, for want of decisive facts. A negative fact is that few if any remains of an earlier date than the Roman occupation have been discovered ;? but, on the other hand, London could scarcely have come to be the important commercial centre described by Tacitus if it had only been founded a few years previously, and after the conquest of Claudius. Now there can be no doubt that the Britons made considerable progress during the period

between Julius and Claudius, and it seems upon the whole highly probable that London as a British settlement may have come into existence then. There is some reason to believe that there were two settlements, one on the north and the other on the south bank of the Thames. If so they would be within the territories of distinct and possibly hostile tribes. There might be a ferry, and even, as we shall mention presently, a bridge of some description towards the close of the period, but this point will come before us again.

The Roman occupation of Britain extended over a period equal to that which has elapsed since Henry VIII.'s reign. AS ssn these centuries (43-409 A.D.) there was ample time for cities to grow up from small beginnings, to overflow their borders, and to be more than once rebuilt. The earliest Roman London must have been a comparatively small place, but it probably contained a railitary fort intended to cover the passage of the river. The mouth of the Thames was then only a few miles off, large portions of what are now the counties of Kent and Essex being marshes overflowed with water. The original investigations of Sir Christopher Wren led him to take this view, and he expressed the opinion that 'the whole country between Camberwell Hill and the hills of Essex might have becn a great frith or sinus of the sea, and much wider near the mouth of the Thames, which made a large plain of sand at low water, through which the river foundits way. This mighty broad sand (now good meadow) was restrained by large banks still remaining, and reducing the river into its channel ; a great work, of which no history gives account; the Britons were too rude to attempt it, the Saxons too much busied with continual wars; he concluded therefore it was Roman work" (Wren's Parentalia, p. 285). The opinion that these embankments are Roman work is the one generally held, but so greatly does opinion vary on all these points that some have supposed that they were not built until the reign of Henry V1.3 Neither Strabo nor the elder Pliny alludes to London, although they wrote on Britain, and the name does not occur in literature until used by Tacitus. That author distinctly says that London had not in 61 A.D. been dignified with the name of a colony (Annal., xiv. 33). The Roman general Paullinus Suetonius, after marching rapidly from Wales to put down a serious insurrection, found Londinium unfitted

for a tee of operations, and therefore left the place to the mercy of Boadicea, who entirely destroyed it and killed the inhabitants in large numbers. When Tacitus wrote, Verulamium and Camulodunum possessed mints, but Londinium was not so distinguished. Subsequently, however, it became a place of mintage. When the British power was finally destroyed London again grew into importance, and we find it holding an important position in the Itinerary of Antoninus, Londinium being either a starting-point or a terminus in nearly half the routes described in the portion devoted to Britain. Ptolemy mentions Londinium, but places it on the south side of the Thames; this may merely be a mistake on Ptolemy's part, but it seems more probable that he referred more particularly to Southwark, which, as has been already pointed out, may have had a distinct origin from the Londinium of the north bank of the river. Londininm was plundered in the reign of Diocletian and Maximian by the army of the usurper ee ee a eS eel

2 General Pitt Rivers (then Colonel Lane Fox) discovered in 1867 certain piles in excavations near London Wall and Sonthwark Street, possibly the remains of pile buildings, which he made the subject of a paper read before the Anthropo- logical Society of London (Journal, vol. v. pp. lxxi-Ixxx). These piles averaged 6 to 8 inches square, others of a smaller size were 4 inches by 3 inches, and one or two were as much as a foot square. They were found in the peat just above the virgin gravel, and with them were found the refuse of kitchen middens, broken pottery, &c., of the Roman period, but there was no superstructure. There is not much here upon which to found a theory, but nevertheless the fact is a valuable item of evidence in a very complicated question. If, as seems certain, these piles are remains of pile dwellings, there is every reason to believe that they were sunk by the Britons rather than by the Romans, and General Rivers thinks it probable that they are the remains of fhe British capital of Cassivellaunus, situated in the marshes, and of necessity built on piles.

3 Sir George Airy holds that the embankment of the lower reaches of the Thames could not have been undertaken until after the construction of Old London Bridge, as when that was built the tide must have been small (Proc. Inst. Civ. £ng., vol. xlix. p. 120), It is evident that, when

the tidal water covered half a mile on both banks of the Thames for a distance of 30 miles, the river proper must have been considerably shallower than at present. Mr J. B. Redman calculated that the quantity of water shut out by the embankments equalled from five-eighths to three-fourths of the present tidal column (Proc. Inst. Civ. £ng., vol. xlix. p. 67),

HISTORY. |

Allectus, but before the Franks who chiefly formed this army could fly Constantius sailed up the Thames and disembarked under the walls of the city, thus taking them by surprise. Under Julian London was the headquarters of Lupicinus in his campaign against the Scots and Picts; and in the reign of Valentinian, Ammianus tells us, Theodosius came to London from Boulogne to mature his plan for the restoration of the tranquillity of the province. It is on this occasion that Ammianus speaks twice of Londinium as an ancient town, to which the title of Augusta had been accorded. By the anonymous chorographer of Ravenna it is called Londinium Augusta. As Theodosius is said to have left Britain in asound and secure condition, with its dilapidated places restored, it has been supposed that to him was due the wall of the later Londinium. According to old tradition, however, Constantine the Great walled the city at the request of his mother Helena, who was said to be a native of Britain. Jn spite of these various references we should know very little of Roman London if it had not been that a large number of excavations have been made in different parts of the city, which have disclosed a considerable amount of early history.! These go to prove that the early city occupied a somewhat small area, for it has been discovered that the site of the Royal Exchange was originally a gravel-pit, and had then become a dirty pond outside the walls used as a receptacle for refuse. Cemeteries also once existed in Cheapside, on the site of St Paul’s, close to Newgate, and various other places known to have been included in the later Roman London. As it was illegal in Roman times to bury within the walls, these places must at one time have been extra-mural. Among the large number of important sepulchral remains lately found by Mr Taylor in Newgate Street were several ossuaria, or leaden vessels for the reception of the calcined

bones of the dead. Little attention had been paid to these objects until Mr Roach Smith specially alluded to them in an article on ‘‘ Roman Sepulchral Remains discovered near the Minories, London” (Collectanea Antiqua, iii. 45-62). Subsequently Mr Smith wrote a very elaborate article on ‘‘Roman Leaden Coffins and Ossuaria”’ (Zbid. ,;vii. 170-201), in which he refers to the wealth of the British mines as one of the chief incentives to the conquest of the country by the Romans, and points out that the large use of the costly metal, lead, ‘‘ manufactured with such skill and so profusely as to supply not only the inhabitants of the towns, but those of villages and villas, with one of the daily requisites of advanced civilization,” proves the prosperity and even luxury of the province. When Sir Christopher Wren was making excavations for his building of Bow Church he sunk about 18 feet deep through made ground, when he came upon ‘‘a Roman causeway of rough stone, close and well-

rammed, with Roman brick and rubbish at the bottom for a |

foundation, and all firmly cemented.” In consequence of this discovery the great architect came to the conclusion, which was corroborated by other reasons, that the causeway he had found continued for the whole length of the town, and formed the northern boundary —‘‘the breadth then north and south was from the causeway now Cheapside to the river Thames, the extent east and west from Tower Hill to Ludgate, and the principal middle street or Praetorian Way was Watling Street” (Parentalia, p. 265).

Although it is generally agreed that this early Roman city was comparatively small, and in form an oblong square(a Londinium quadratum), its exact situation must be a matter of conjecture. The late Mr Arthur Taylor marked out a district which should be bounded on the west by the Walbrook, on the east by Billingsgate, and on the south by the elevation of the bank of the Thames,— the northern boundary to be a line drawn below Lombard Street and Cornhill. Cannon Street and East Cheap would pass straight through the centre of this enclosure, with the other streets north and south (Archxologia, xxxiii. 101). In corroboration of his views, Mr Taylor lays stress on the fact that no

funereal urns have been discovered in the district he has marked out, Mr Roach Smith agrees generally with Mr Taylor, but includes a rather larger area. He writes—‘“I should be inclined to place the northern wall somewhere along the course of Cornhill and Leaden- hall Street ; the eastern, in the direction of Billiter Street and Mark Lane ; the southern, in the line of Upper and Lower Thames Street; and the western, on the eastern side of Walbrook. This suggested plan will give the form of an irregular square, in about the centre of each side of which may be placed the four main gates corresponding with Bridge Gate, Ludgate, Bishopsgate, and Aldgate ” (Jllust. of Roman London, p. 14). The late Mr W. H. Black, like his predecessors, takes the Walbrook as a boundary, but, instead of making it the western limit, he makes it the eastern boundary, and places his western line at Ludgate. Newgate Strect and Cheapside form the main thoroughfare of his city (Archxo- logia, xl. 41), Although Mr Black argues his case with ability, his view is open to two principal objections,—(1) it leaves the site of London Bridge outside the enclosure, and (2) cemeteries have been

1 A chronological list of the tesselated pavements discovered in London between 1681 and 1864 is given in a paper of the late Sir William Tite (Archeologia, vol. xxxix. p. 491). It is impossible to say how much more remains hidden many feet below the modern streets.

discovered within the proposed limits. As to the date when the limits of this early London were lost sight of in the larger area of the better known Roman city, we have hardly sufficient data even to hazard a eonjecture. There is rcason to believe, as already stated, that the site of the Royal Exchange was outside the city until the early part of the 3d century, because coins of Vespasian, Domitian, and Severus have been found among the refuse of the gravel-pit. Mr Roach Smith suggests, however, that as no coins of the period between Domitian and Severus were found it is just possible that the plated denarius of the latter emperor may not have been found in the pit itself, but in the vicinity of

the houses which were built over the pit in subsequent years. On the other hand, Sir William Tite, in describing the tesselated pavement found in 1854 on the site of the Excise Office (Bishopsgate Street), expresses the opinion that the finished character of the pavement points to a period of security and wealth, and fixcs on the reign of Hadrian (117-138 a.p.), to which the silver coin found on the floor belongs, as the date of its foundation. Of course this is not conclusive, as the pavement might have belonged to a villa outside the walls, but Sir William Tite places it within them. When the line of the walls which continued until the great fire was first planned out it is impossible to say with any certainty. Some antiquaries hold the opinion that these walls were post-Roman ; but this is not the view of Mr Roach Smith, one of our greatest authorities. Mr J. E, Price, after describing ‘‘a bas- tion of London wall” discovered in Camomile Street, Bishopsgate, arrives at ‘‘thetconclusion that these interesting relics are portions of a Roman sepulchral monument which, falling into decay, became, as years rolled on, a suitable quarry for medieval builders, providing froni its position on the spot convenient materials for the erection of a structure requiring such solidity and strength as would a bas- tion to the city wall.” In describing the outline of the Roman city it is impossible to make ourselves intclligible unless we use names adopted subsequently. The line of the wall runs straight from the Tower to Aldgate, where it bends round somewhat to Bishops- gate. It is bordered on the east by the Minories and Houndsditch.. One of the finest remaining portions of the old wall was hidden from view a few years ago when some large buildings were erected round it. The line from Bishopsgate ran eastward to St Giles’s churchyard, where it turned to the south, as far as Falcon Square, again westerly by Aldersgate under Christ’s Hospital towards Gilt- spur Street, then south by Ludgate, and then down to the Thames, Mr Roach Smith points out that this enclosure gives dimensions far greater than those of any other Roman town in Britain. In 1843 a portion of the old wall was exposed to vicw in Playhouse Yard, Blackfriars, when a Roman monument erected to a ‘‘speculator” of the second legion, named Celsus, was discovered. On the same line further north Sir Christopher Wren, while building St Martin’s,

| Ludgate, found a similar sepulchral monument ‘‘in the vallum of

the pretorian camp” to the memory of Vivianus Marcianus, a soldier of the second legion (Parentalza, p. 266). In the year 1276 the old wall south of Ludgate was pulled down and a new one built to enclose a larger circuit further west for the benefit of the Black Friars. There appear to be strong reasons for believing that a wall ran along the south, and that the Romans did not consider the river sufficient protection. William Fitzstephen, a monk of the 12th century, lis wrote the earliest description of London, men- tions the walls and tower in the south, and Sir Christopher Wren also alludes to the colony being walled next the Thames (Parentalia, p. 265). The line from Lower Thames Street to Temple Street has

een retrieved from the river by embankments, and in certain parts of the line the embankment was formed by substantial walling, such being found at the foot of Fish Street Hill, at the end of Queen Street, and from Broken Wharf to Lambeth Hill (Tite’s Catalogue of Antiquities found in the Excavation at the New Royal Exchange, 1848, p. xxiv). Mr Roach Smith writes—‘“‘ It was from 8 to 10 feet thick, and about 8 deep, reckoning the top at 9 feet from the present street level, and composed of ragstone and flint, with alternate layers of red and yellow, plain and curve-edged tiles, cemented by mortar as firm and hard as the tiles, from which it could not be separated. For the foundation strong oaken piles were used, upon which was laid a stratum of chalk and stones, and then a course of hewn sandstones from 8 to 4 feet long, by 24 in width” (Archeological Journal, i, 114). The names of the gates give us no clue as to which of them existed in Roman times, but we cannot doubt that the chicf traffic was carried through the city from Ludgate to Aldgate, although some antiquaries have supposed that Newgate was the chief gate on the west, side, leading as it would to Holborn, where Roman remains have been discovered. Bishopsgate must have been the principal outlet to the north. Mr Roach Smith has suggested that outside Newgate there was an amphitheatre built into a hill on the rising ground near what was lately the Little Old Bailey. He had often noticed the precipitous descent from Green Arbour Lane opposite Newgate into Scacoal Lane

and the level space by Fleet prison, and he presumed it to have been an excavation in the side of the hill. Many a smaller town than Londinium possessed a theatre in Roman times (Afiddle-

sex Arch. Trans., i. 33). The name Newgate is signifieant of its recent erection, and it has been remarked that it stands alone among the gates as not being attached to a ward bearing the same name. It is mentioned in an ordinance of Edward I., where it is connected with Ludgate. ;

A question arises as to the arrangement of the area included within the walls, the course of which has already been traced. There is a strong preponderanee of evidence against the belief that the present line of streets follows that of Roman London to any eonsiderable extent. Sir William Tite gave reasons for believing that Bishopsgate Street was not a Roman thoroughfare (A7‘chzo- logia, xxxvi. 203), and in the late excavations in Leadenhall Mr Loftus Brock found remains of a building which he supposed to be a basilica, apparently crossing the present thoroughfare of Graec- chureh Street. Sir William Tite agreed with Dr Stukeley’s sugges- tion that on the site of the Mansion House (furmerly Stocks market) stood the Roman fornm, and he states that a line drawn from that spot as a centre would pass by the pavements found on the site of the Excise Office. Besides the forum, Dr Stukeley suggested the sites of seven other public buildings,—the Arz Palatina, guarding the south-eastern angle of the city, where the Tower now stands, the grove and temple of Diana on the site of St Paul’s, an episcopal residence, &c. No traces of any of these buildings have been found, and they arc therefore purely conjec- tural. As to the temple of Diana, Wren formed an opinion strongly adverse to the old tradition of its existence (Parentalia, p- 266). Although we know thatthe Christian church was established in Britain during the later period of Roman domination, there is little to be learnt respecting it, and the Bishop Restitutus who is said to have attended a council on the Continent is a somewhat mythical character,

After the walls the most important points for consideration in relation to Roman London are (1) the existence of a bridge, and (2) the purpose of the London Stone.

1. Dion Cassius, who lived in the early part of the 3d century (Hist. Rom., lib. 1x. c. 20), states that there was a bridge over the Thames at the time of the invasion of Claudius (48 A.D.), but he places it a little above the mouth of the river (‘higher up”). The position is vague, but, as already stated, the mouth of the Thames in these early times may be considered as not far from where London Bridge now stands. Sir George Airy holds that this bridge was not far from the site of London Bridge (Proceedings of Institut. Civil Engineers, xlix. 120), but Dr Guest was not prepared to allow that the Britons were able to construct a bridge over a tidal river such as the Thames, some 300 yards wide, with a difference of level at high and low water of nearly 20 feet. He therefore suggested that the bridge was coustructed over the marshy valley of the Lea, probably near Stratford. It needs some temerity to differ from so great an authority as the late Dr Guest, but it does strike one as rather surprising that, having accepted the fact of a bridge made by the Britons, he should deny that these Britons possessed a town or village in the place to which he supposes that Aulus Plautius retired. It may be considered certain that there was no bridge over the Thames in the time of Julius Cesar; for he would not have marched his troops all the way to Coway Stakes in search of a ford if he could have crossed by a bridge at London.

As the Welsh word for ‘‘ bridge” is “ pont,” and this was taken directly from the Latin, the inference is almost conclusive that the Britons acquired their knowledge of bridges from the Romans. Looking at the stage of culture which the Britons had probably reached, it would further be a natural inference that there was no sueh thing as a bridge anywhere in Britain before the Roman occupation ; but, if Dion’s statement is correct, it may be suggested as a possible explanation that the increased intercourse with Gaul during the hundred years that elapsed between Julius Cesar’s raids and Claudius Cexsar’s invasion may have led to the construction of abridge of some kind across the Thames at this point, through the influence and under the guidance of

Roman traders and engineers. If so, the word ‘ pont” may have been borrowed by the Britons before the commencement of the Roman_ occupation. stronger are the reasons Roman times.

e . . K t which I cannot but think pointed towards the site of Old Wehidon

Bridge, both from its central situation, from the general absence of the foundations of buildings in the approaches on the northern side and from discoveries recently made in the Thames on the line of the old bridge” (Archeologia, xxix. 160). Mr Smith has, however still stronger arguinents, which he states as follows :—* Throughout the entire line of the old bridge, the bed of the river was found to contain ancient wooden piles; and, when these piles, subsequently to the erection of the naw bridge, were pulled up to deepen the channel of the river, many thousands of Roman coins, with abund-

ance of broken Roman tiles and pottery, were discovered, and immediately beneath some of the central piles brass medallions of Aurelins, Faustina, and Commodus. Al! these remains are indica- tive of a bridge. The enormous quantities of Roman coins may be aecounted for by consideration of the well-known practice of the Romans to make these imperishable monuments subservient towards perpetuating the memory, not only of their conquests, but also of those publie works which were the natural result of their successes in remote parts of the world. They may have been deposited either upon the building or repairs of the bridge, as well as npon the accession of a new einperor”’ (Archeological Journal, i. 113).

2. The ‘‘ London Stone” has very generally been supposed to be a “nilliarium” or central point for measuring distances, but Sir Christopher Wren believed it was part of some more considerable monuments in the forum, and his reason for this belief was that “‘in the adjoining ground on the south side (upon digging for cellars after the

great fire) were discovered some tesselated pavements and other extensive remains of Roman workmanship and buildings" (Parentalia, pp- 265, 266). King, in his Munimenta Antiqua, writes—‘‘ London Stone, preserved withsuch reverential care through so many ages, and now having its top encased within another stone in Cannon Street, was plainly deemed a record of the highest antiquity of some still more important kind; though we are at present unacquainted with the original intent and purport for which it was placed. It is fixed at present close under the south wall of St Swithin's Church, but was formerly a little nearer the channel facing the same place, — which seems to prove its having had some more ancient and peculiar designation than that of having been a Roman milliary, even if it – were ever used for that purpose afterwards. It was fixed deep in the ground, and is mentioned so early as the tine of Athelstan, king of the West Saxons, without any particular reference to its having been considered asa Roman milliary stone." Holinshed (who was followed by Shakespeare in 2 Henry VI., act 4 se, 6) tells us that when Cade, in 1450, forced his way into London, he first of all proceeded to London Stone, and having struck his sword upon it, said in reference to himself and in explanation of his own action, "‘ Now is Mortimer lord of this city." Mr H. C. Coote, in a paper published in the Z'rans. London. and Middlesex Arch. Soc. for 1878, points out that this act meant soinething to the mob who followed the rebel chief, and was not a piece of foolish acting. Mr G.L. Gomme (Primitive Folk-Moots, pp. 155, 156) takes up the matter at this point, and places the tradition implied by Cade's significant action as belonging to times when the London Stone was, as other great stones were, the place where the suitors of an open-air assembly was accustomed to gather together and to legislate for the government of the city. Corroborative facts have been gathered from other parts of the conntry, and, although more evidence is required, such as we have is strongly in favour of the supposition that the London Stone is a prehistoric monument.

Saxon (449-1066).—At the beginning of the 5th century the Roman legions left Britain. From this period to the arrival of the Saxons there was a space of time when the Briton was left alone, and there is no reason to believe that London ceased to be the important commercial

town which it had grown to be. After the Saxon invasion we do uot hear of the city being ravaged, and it possibly held its own under the various vicissi. tudes it had to pass through, although Dr Guest writes that “good reason may be given for the belief that even London itself for a while lay desolate and uninhabited” (Archxological Journal, xix. 219). About 449 or 450 the invaders first scttled in Britain, and in 457 Hengist and Asc fought against the Britons at Crayford, driving them out of Kent, The vanquished fled to London in great terror, and apparently found a shelter there.! The Saxons disliked walled towns, and in many instances they destroyed those which they conquered. This was not done in London, and it is just possible that the Britons may have been able to purchase their freedom from destruction. We have, however, little or no data upon which we can form an opinion. Mr Kemble wrote of towns generally that the Saxons neither cared to take possession of them nor took the trouble to destroy them. They enslaved the inhabitants or expelled them, as a mere necessary pre-caution and preliminary to their own peaceable possession (Saxons tm England, ii. 296). The only question is whether London, being an exceptional city, had an exceptional fate. Along the banks of the Thames are several small havens whose names have remained tous, such as Rotherhith, Lambhith (Lambeth), Chelchith (Chelsea), and it is not unlikely that the Saxon who would not Settle in the city itself associated himsclf with these small open spots. Places were thus founded over a large space which otherwise might have remained unsettled. At what time the

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‘ If the London-burg here mentioned in the Saxon Chronicle is not London south of the Thames (or Southwark), the fugitives must have crossed the river, and if so this is additional reason for believing that there was then a bridge. The same reasoning will apply to what is related further on, of the Dancs crossing to Swrey in the year 85], as it is not likely that a ferry would suffice on thesc

Occasions. Moreover, a bridge is shortly after specially mentioned by the chronicler,

Saxons got over their repugnance and settled in London we cannot say, but the city is described by Bede as being in 604 the inetropolis of the Kast Saxons, and an emporium of many peoples who came to it by sea and land. The relics of Roman London are, as we have already seen, very numerous ; but we know nothing of the inhabitants. There is little human interest in the history. When we come to Saxon London this position is reversed. There are no remains worthy of notice, but there is abundance of life. London appears to have held a very exceptional position, and to have been somewhat like a German free city. The Londoner within his strong walls defied the invader, and the Dane frequently attempted to conquer the city in vain. Mr Freeman does justice to the stout heart of the Londoner, and calls London during this period “the stronghold of English freedom.” The Saxon Chronicle has little to tell of London between the 5th and 9th centuries. The great change accomplished by Augustine, in converting the Jutes and the Saxons to Christianity, is recorded in a few short lines ; and we are told that in the year 604 Augustine consecrated two bishops, Mellitus and Justus, and that Ethelbert, king of Kent, gave Mellitus a bishop’s see at London, then a part of the kingdom of the East Saxons, whose king, Siebert, was a tributary of his uncle the king of Kent. What became of the cathedral which we inay suppose to have existed in London during the later Roman period we cannot tell, but we may guess that it was destroyed by the heathen Saxons. Bede records that the church of St Paul was built by Ethelbert, and from that time to this a cathedral dedicated to St Paul has stood upon the hill looking down on Ludgate, Mellitus became archbishop of Canterbury, and was succeeded in the see of London by Cedda, who was succeeded by Wina. Then came Theodore, archbishop of Canterbury, better known as tho sainted Erkenwald, whose shrine was one of the chief glories of old St Paul’s. He died on April 30, 693, a day which was kept in memory in his cathedral by special offices. We must now pass over nearly a century and a half to the time when the Danes were harassing the country after the death of Egbert. The chronicler records that in the year 839 there was a great slaughter at London, but he givesno particulars. In 851 the Danes plundered the city and made themselves masters of it, Sharon

Turner quotes a conveyance of a place in London dated 857, which gives a slight piece of local information (Anglo-Saxons, ii. 575). The name of the place was Ceolmandingehaga, and it was situated not far from the West Gate. We cannot tell whether Ludgate was meant or some other gate which marked the extent of the liberties on the west. In 871 the chronicler affirms that Alfred fought nine great battles against the Danes in the kingdom south of the Thames, and that the West Saxons made peace with them. In the next ycar the Danes went from Reading to London, and there took up their winter quarters. Then the Mercians made peace with them. In 886 Alfred overcame the Danes, restored London to its inhabitants, rebuilt its walls, reannexed the city to Mercia, and committed it to Ethelred, alderman of Mercia. ‘Then, as the chronicler writes, ‘Fall the Angle race turned to him (Alfred) that were not in bondage of the Danish men.” Iu 896 the Londoners came off victorious in their encounters with the Danes. The king obstructed the river so that the enemy could not bring up their ships, and they therefore abandoned them, ‘The Londoners broke up some, and brought the strongest and best to Landon, In 912 Ethelred, the alderman of the Mercians, who liad becn placed in authority by Alfred, died, and Edward the Elder took possession of London and Oxford, ‘and all the lands which thereto belonged.” Again we find a break in the continuity of the history, and pass on to the year 959, when King Edgar gave Dunstan the bishapric of Worcester, and afterwards that of London. In 962 there was a great fevcr and mortality in London, and St Paul’s was burnt. It was, however, founded again in the same year. In the reign of Ethelred II, the Danes were more successful in their operations against London, but the inhabitants resisted stoutly, Snorre the Icelander tells us that the Danes fortified Southwark with ditch and rampart, which the English assailed in vain. In 982 London was burnt, and in 994 Olaf and Swein (the father of Canute) came with nincty-four ships to besicge it. They tried to set the city on fire, but the townsmen did them more harm than they ‘‘ever weened,”” The chronicler piously adds that ‘‘the holy Mother of God on that day manifested her mercy to the townsmen, and delivered them from their focs.” The Danes went from the town and ravaged the neighbourhood, so that in the end the king and his witan agreed to give sixteen thousand pounds to be relieved of the presence of the enemy,

In the year 1009 the Danes frequently attacked London, but they had no success, and fared ill in their attempts. The Londoners with- stood Swein in 1013, but in the end they submitted and gave him hostages. Threc years after this, Ethelred died in London, and such of the witan as were there and the townsmen chosc Edmund Ironside for king, although the witan outside London had elected Canute. Canute's ships were then at Greenwich on their way to London, where they soon afterwards arrived. The Danes at once set to work to dig a great ditch by Southwark, and then dragged their ships through to the west side of the bridge. They were able after

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this to kecp the inhabitants from either going in or out of the town. In spite of all this, after fighting obstinately both by land and by water, the Danes had to raise the siege of London, and take the ships to the river Orwell. After a glorious reign of seven months Edmund died in London, and Canute became master of England. The tribute which the townsmen of London had to pay was £10,500, about one-seventh of the amount which was paid by all the rest of the English nation. This shows the growing importance of the town. From this time there appears to have been a permanent Danish settlement in London. There is but little more to be said of the history of Saxon London than that Edward the Confessor held his witanagemét there, and built and consecrated the Abbey of Westminster. During the later part of the Saxon period West- minster (originally Thorney Island) had been growing into some importance. 'Tradition affirmed that on the site of Westminster Abbey a temple of Apollo once stood, which was destroyed by an earthquake in the reign of the emperor Antoninus Pius. Out of the ruins King Lucius founded a church, 170 a.p. Sir Christopher Wren imagined that the monks, finding that the Londoners pretcnded to a temple of Diana where St Paul's now stands, did not wish to be behind hand in antiquity (Parentalia, p. 296). The figment respecting King Lucius is of about cqual authority. There is more reason for believing that Siebert, king of the East Saxons, may have

built, as Stow says he did, ‘‘a church to the honour of God and St Peter, on the west side of the city of London.” His sons relapsed into idolatry, and left the church to the mercy of the Danes. Inacharter of King Edgar, dated 951, the original boundary of Westminster is clearly defined, This chartcr is marked by Kemble as doubtful (Codex Dipl., dlxix.); but, if not of the date given, it is believed by competent authorities to be of great antiquity, Edward the Confessor took a particular interest in Westminster, and occupied much time in superintending the erection of anew church there. On Childermas Day (December 28) 1065 the monastery was consecrated, and on the following “ twelfth inass eve” the king died, being buried on the next day in the new church. The abbot of Westminster’s manor is fully described in Domesday, but there is no mention of a palace, so that it has been conjectured that the Confessor lived in the monastery itself. With regard to the buildings of London we are left to conjecture. As several of the Saxon kings lived in the city, we must conclude that they possessed a palace of some kind, and around this other build- ings would arise. A port such as London naturally drew foreigners from all parts, and various communities of these strangers are believed to have settled here as early as the 8th century. With regard to the government of the city it is generally supposed that many of its institutions are due to Alfred the Great, although Mr Coote with great ingenuity traces them back to the ordinances of the Roman municipium. The faious dooms of the city of London (Athelstan) are stated in the preamble to be the ordinance of ‘*the bishops and the reeves belonging to London.” William the Conqueror’s charter, which he grauted’soon aftcr his accession, is addressed to William the bishop and Godfrey the portreeve. The office of portreeve had then been long established, although we know but little of its origin. It was usually an office of popular election, but the king often interfered in the appointment. Considerably more than a century had elapsed after the Conquest before the title of portreeve gave way to that of mayor, as the designation of the chicf officer of the city of London.

NorMAn (1066-1154).—After the battle of Hastings certain of the defeated chiefs retired upon London and urged the men in power to resist the Norman, and set up Edgar Atheling as king, which, as the

Saxon chronicler says, ‘*was indeed his natural right.” On hearing of this action William marched towards London, and was attacked by the Saxon party at Southwark, who were repulsed by the Norman horse, but with such loss to the latter that William thought it imprudent to lay siege to the city at that time. The Londoners began now to see the hopclessness of their cause, and Archbishop Eldred, and Edgar, and Earls Edwin and Morkere, and ‘‘the best men of London” repaired to Berkhampstead, whcre they submitted themselves and swore fealty to the Conqueror. Onc of the earliest acts of the Conqucror was to commence the crection of a citadel which should overawe the citizens and give him the command of the city. Some writers have supposed that King Alfred erected a palace or castle on the site of the Tower, but without sufficient authority, and a writer in the Quarterly Review fart. ‘‘ Middlesex,” vol. cl. p. 48 note) says, ‘‘ the Towcr almost cer- tainly stands on foreshore which was not dry land before the Conquest.” As the Tower was situated at the eastern limit of the city, so not far from the westeru extremity was built a strong fortification called Baynard’s Castle after its founder Baynard, one of the followers of the Conqueror. In the sccond year of his reign William granted the remarkable charter written in Anglo-Saxon which still exists among the archives of the city of London. There are but four lines and a quarter, and the size of the slip of parch- ment is only 6 inches by linch. It runs thus—‘‘ William the king greets William the bishop, Godfrey the portreeve, and all the bur- | gesses within London, both French and English. And I] grant that

they be all law-worth, as they were in Edward the king’s days. And I will that each child be his father’s heir after his father’s days. And I will not suffer that any man do you wrong, God keep you.” William Stigand, the bishop of London, was a Norman, and possibly had some influence with the king in obtaining this charter. A wonderful improvement in the appearance of the cities of the country almost immediately followed the advent of the civilizing Norman. Within a few years the whole area of London must have been changed, and handsome buildings arose as if by magic in all parts of the city. Many

Normans had settled in London during the reign of Edward the Confessor, but after the Conquest they swarmed in and naturally became the dominant party. In August 1077 occurred a most extensive fire, such a one, says the Chronicle, as ‘‘never was before since London was founded.” This constant burning of large portions of the city is a marked feature of its early history, and we must remember that, although stone buildings were rising on all sides, these were churches, monasteries, and other public edifices; the ordinary houses remained as before, small wooden structures. The White Tower, the famous keep of the Tower of London, was commenced by Gundulph, bishop of Rochester, about the year 1078. In 1083 the old cathedral of St Paul’s was com- menced on the site of the church which Ethelbert is said to have founded in 610. But four years afterwards the chronicler tells us ‘‘ the holy monastery of St Paul, the episcopal see of London, was burnt, and many other monasteries, and the greatest and fairest part of the whole city.” In this same year (1087) William the Con- queror died. In 1090 a tremendous hurricane passed over London, and blew down six hundred houses and many churches. The Tower was injured, and a portion of the roof of thechurch of St Mary-le-Bow, Cheapside, was carried off and fell some distance away, being forced into the ground as much as 20 feet, a proof of the badness of the thoroughfares as well as of the force of the wind. William Rufus inherited from his father a love for building, and in the year 1097 he exacted large sums of moncy from his subjects with the object of carrying on some of the undertakings he had in hand. These were the walling round of the Tower, the rebuilding of London Bridge, which had been almost destroyed great work with which his name is most Westminster Hall. In 1100 Rufus was slain, and Henry I. was crowned in London. This king granted to the citizens their first real charter, in which he promised to observe the laws of the Confessor and to redress many special grievances ; but he paid little attention to his engagements, and constantly violated the articles of his charter. When Stephen seized the crown on the death of Henry I., he tried successfully to obtain the support of the people of London. He published a charter confirming in general terms the one granted by Henry, and cominanding that the good laws of Edward the Confessor should be observed. ‘The citizens, however, did not obtain their rights

without paying for them, and in the year 1139 they paid Stephen one hundred marks of silver to enable them to choose their own sheriffs. In this reign the all-power- fulness of the Londoners is brought very prominently forward. Stephen became by the shifting fortune of war a prisoner, and the empress Matilda might, if she had had the wisdom to favour the which was hers by right of birth. She, however, made them her enemies by delivering up the office of Justiciary of London and the sheriffwick to her partisan Geoffrey, of reduce the citizens to the enslaved condition of the rest of the country. This made her influential enemies, who soon afterwards replaced Stephen upon the throne. The Norman era closes with the death of Stephen, 1154.

generally associated,

St Martin-le-Grand within Aldersgate was founded in the year 1056, and its rights were confirmed by the Conqueror in the second year of his reign. _He gave the dean and secular priests more land, and added to their privileges.

dedicated to!St Leonard, near Bromley, was founded in the rei William the Conqueror by William, is PETE Se oe

Bermondsey to the other benefactions of this fortunate monastery which became very powerful, and was frequently used as a royal religious houses were established In the year 1100, viz., the Knights Hospitallers of St John of Mary for nuns of the Benedictine (It was said that the number of monasterics built in the reign of Henry I. was so grcat that almost all the labourers became

LONDON

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bricklayers and carpenters, and there was some discontcnt in con- sequence. Matilda or Maud, the wife of Henry I., was much interested in the foundation of these ee houses. She estab- lished the priory of Holy Trinity, called Christ Church, which was situated to the north of Aldgate, in 1108, and about 1110 two hospitals, one for lepers at St Giles's-in-the-Fields, and the other for cripples at Cripplegate. The priory of St Bartholomew was founded a few years earlier, and the Benedictine nunnery of St John the Baptist at Halliwell near Shoreditch soon afterwards. The Knights Templars made their first habitation in the neigh bour- hood of London in 1118, and did not remove from Holborn to Fleet Street until nearly seventy years afterwards. The royal hospital of St Katherine's at the Tower was originally founded by Matilda, wife of King Stephen, and the famous St Stephen's chapel at West- minster owes its origin to the king himself. It was, however, rebuilt by Edward II. It will be seen from the above list that a large proportion of these buildings were outside the walls, and this shows how extensive the outskirts of the city had become in Nerman times. No doubt many of these religious persons sought out somewhat quiet neighbourhoods, but around each of them would naturally grow up villages formed by those who were chiefly dependent upon the monks and nuns.

PLANTAGENET (1154-1485), — Henry II. appears to have been to a certain extent prejudiced against the citizens of London on account of their attitude towards his mother, and he treated then with some severity. On several occasions he exacted large sums from the city, which, although they were euphemistically styled dona, can- not be considered as free gifts, The severity appears to have been necessary, and was attended with good results. The streets were in a most dangerous condition at night, and bands of a hundred and more would sally forth to rob the houses of the wealthy. In 1175 some of these men were taken prisoners, and one of them was found to be a citizen of good credit and considerable wealth named 'John the Olde." He offered the king five hundred marks for his life, but Henry was inflexible, and after the man had been hanged the city became morc quiet. In 1176 the rebuilding of London Bridge with stone was commenced by Peter of Cole- church. This was the bridge which after

much subsequent tinker- ing was pulled down early in the present century, It consisted of twenty stone arches and a drawbridge. There was a gateliouse at each end and a chapel or crypt in the centre, dedicated to St Thomas of Canterbury, in which Peter of Colechurch the architect was buried in 1205. In 1184 the Knights Templars removed from Holborn to the New Temple in Fleet Street, and in the following year the beautiful Temple church was built. All this activity of building proves that the citizens were wealthy and their city handsome. This is corroborated by the interesting work of Fitzstephen, the monk of Canterbury, which was written at this time. Fitzstephen has left us the first picture of London, and a very vivid one itis. He speaks of its wealth, commerce, grandeur, and magnificencc,—of the mildness of the of the gardens, the sweet, clear, and salubrious springs, the flowing streams, and the pleasant clack of the water- mills. Even the vast forest of Middlesex, with its densely wooded thickets, its coverts of game, stags, fallow deer, boars, and wild bulls is pressed into the description to give a contrast which shall enhance the prosperous beauty of the city itself. Fitzstcphen's account of the sports of the people is particularly interesting, He tells how, when the great marsh that washed the walls of the city on the north (Moorfields) was frozen over, the young men went out to slide and skate and sport onthe ice. Skates made of bones have been dug up of late years in this district. This sport was allowed to fall into disuse, and was not again prevalent until it was intro- duced from Holland after the Restoration. In the first year of Richard I. the court of aldermen ordained that for the future houses should not be built of wood, but that they should have an outside wall of stone raised 16 feet from the ground, and be covered with slate or baked tile. This ordinance must have fallen into desue- tude, for the houses continued largely to be built of wood. We learn that most of the houses were plastered and whitewashed. One of the earliest objections which the Londoners made to the use of sea-coal was that the smoke from it blackened the white walls of their buildings. The first mayor of London was Henry Fitz Alwin, who was elected in 1189, and held the office until 1212,1

London had to pay heavily towards Richard's ransom ; and, when the king made his triumphal entry into London after his release from

imprisonment, a German nobleman is said to have remarked that had the empcror known of the wealth of England he would have insisted on a larger sum. The Londoners were the more glad to welcome Richard back in that the head of the regency, Longchamp, bishop of Ely, was very unpopular from the encroachments he made upon the city with his works at the Tower. The first charter by which the city claims the jurisdiction and conservancy of the river

1 He was first admitted to the chicf magistracy as bailiff, and there appears to have been considerable variety in the titles used at this time. We learn from the ae that the chief officer was sometimes called “ justiciar ” and ‘‘ cham-

rlain.” ;

Thames was granted by Richard J. John granted several charters to the city, and it was expressly stipulated in Magna Charta that the city of London should have all its ancient privileges and free customs. The citizens opposed the king during the wars of the barons. In the year 1215 the barons having received intelligence secretly that they might enter London with ease through Aldgate, which was then in a very ruinous state, removed their camp from Bedford to Ware, and shortly after marched into the city in the night-time. Having succeeded in their object, they determined that so important a gate should no longer remain in a defenceless condition. They therefore spoiled the religious houses and robbed the monastery coffers in order to have means wherewith to rebuild it. Much of the material was obtained from the destroyed houses of the unfortunate Jews, but the stone for the bulwarks was ob- tained from Caen, and the small bricks or tiles from Flanders. The church of St Mary Overy (now St Saviour’s), Southwark, was begun in the year 1208, and in 1221 the foundation stone of the lady chapel at Westminster Abbey was laid by Henry III. We have alluded to the great change in the aspect of London and its sur- roundings made during the Norman period by the establishment of a large number of monasteries. A still more important change in the configuration of the interior of London was madoin the 13th century,

when the various orders of the friars established themselves there. The Benedictine monks preferred secluded sites; the Augustinians did not cultivate seclusion so strictly ; but the friars chose the interior of towns by preference. The Black, Preaching, or Dominican Friars settled near Holborn, in what was afterwards Lincoln's Inn, in 1221, and removed to the ward of Castle Baynard in 1276, when the city wall was rebuilt to enlarge their boundaries, The district where the friary was built still retains its name. In 1224 John Iwyn or Ewin made over to the Grey Friars (or Franciscans) an estate situated in the ward of Farringdon Within and in the parish of St Nicholas in the Shambles, and on this site the first convent of the order was erected. The site is now occupied by the Blue Coat School. In 1241 the White Friars or Carmelites settled in a precinct or liberty between Fleet Street and the Strand which still retains their name. In 1258 the Austin Friars or Friars Eremites were founded in Broad Street ward, and the last of these friaries to be established was that of the Crutched or Crossed Friars in 1298. By the establishment of these religious houses two-thirds of the entire area of London was oceupied by convents and hospitals. This is the most marked characteristic of Plantagenet London. We have no record of the date at which Temple Bar first marked out the ex- tent of the liberties of the city, but as late as the end of the 14th century Fleet Street was described as being in the suburbs. Dur- ing the Norman period the road from the city to Westminster was quite open, but soon afterwards a commencement was made in building. The Savoy was built in 1245 by Peter, earl of Savoy and Richmond, uncle of Eleanor, wife of Henry III.; and in this king's reign the friars of the order of St Mary de Arena are supposed to have established themselves near the site of Durham House (now the Adelphi). About the same time William Marshal, earl of Pem- broke, founded and endowed a hospital and convent called St Mary Rouncivale at the village of, Charing, so that in Henry III.'s reign there must have been several houses on the line of route to West- minster. Fitzstephen describes the latter place as follows :—" On the west also, higher up the bank of the river, the royal palace rears its head, an incomparable structure, furnished with a breastwork and bastions, situated in a populous suburb, at a distance of two miles from the city." In the reign of Edward I. the mayor offended the king, and the citizens were for a time deprived of their right of

electing their chief magistrate. Gregory de Rokesley the mayor, the sheriffs, the aldermen, and other dignitaries of the city were summoned to appear on the 29th June 1285 before John de Kirkeby, treasurer, and the other justiciars of the king in the Tower of London for the purpose of holding inquests there. Now the mayor held that he was not bound to answer such a summons as this unless he had forty days' notice, so he resigned his mayoralty at Allhallows, Barking, and delivered the common seal of the city to Stephen Aswy and other aldermen and then entered the Tower with the rest as an alderman only. This action incensed the king greatly, and John de Kirkeby was commanded to take over the mayoralty, a warden being appointed by the royal authority. This arrangement continued until 1297, when Edward granted the prayer of the citizens, and allowed them again to elect a mayor. Royal wardens had filled the mayor's seat from 1265 to 1268, but in the first charter of Edward I. the following concession was made :—"Also that the liberties of the city of London shall not be taken into the hand of his lordship the king for any personal trespass or personal judgment of any officer of the said city ; and that no warden shall in the same on such pretext be appointed" (Liber Albus, trans- lated by Riley, pp. 14, 181). In 1285 the first attempt was made to supply London with water artificially, and the great eonduit in West Cheap (or Cheapside) was commenced. This lead cistern, which was castellated with stone, was supplied with water conveyed in leaden pipes from Tyburn. Soon afterwards a nobler building was erected in Cheapside. In 1290 the beloved Eleanor of Castile

died, and her husband erected stone crosses where her body had rested. Two of these crosses were in London, and there is some little difficulty in understanding why the two stations were so near each other. It has been suggested that the body really rested at St Paul's Cathedral. Cheapside Cross was erected by Michael of Canterbury, and cost £300, and Charing Cross, the most sumptuous of the series, cost £450. It was

commenced by Richard de Crundale, aud completed after his death by Roger de Crundale. In this same year (1290) the Jews were expelled from England. The district in London in which they had lived since William the Conqueror's day came to be called the Old Jewry, but when the Jews returned to England after many centuries of exile most of them settled in the neighbourhood of Aldgate.

Smithfield is mentioned by Fitzstephen as a market for horses, and from this writer we obtain its correct etymology (the smooth field). As early as the reign of Henry III. it had become known as the place for executions. Close by a grove of elm trees that gave their name to the place Sir William Wallace was executed in the year 1305, and there also Mortimer experienced a similar fate five and twenty years afterwards. The history of Smithfield from that day has been a record of executiens, jousts, and markets.

In 1313 the celebrated order of the Knights Templar fell, and Edward II. gave their house in Fleet Street to Aymer de Valence, earl of Pembroke. At the earl's death the property passed to the Knights of St John of Jerusalem, who leased the Inner and Middle Tcmples to the students of the common law and the Outer Temple to Walter Stapleton, bishop of Exeter, and lord treasurer. The Charterhouse stands on a piece of ground which had been used in 1349 as a burial-place for the thousands who died in that year of the plague. In 1371 Sir Walter Manny founded there a priory of Car- thusian monks.

One of those pageants for which the streets of London were so famous took place in 1356 when Edward the Black Prince brought the French king John a prisoner from the battle of Poitiers. It is not necessary to do more than allude to this here, as the incident is a part of English history.

We have now arrived at the pcriod of one of the greatest Lon- doners that ever lived. The vife of Geoffrey Chaucer throws a living interest around the several places with which he was associ- ated. His father was a vintner in Thames Street, the garden of whose house was bounded by the Wall Brook. In 1874 Chaucer was appointed comptroller of the customs, and in the same year he went to live in the

dwelling-house above the gate of Aldgate. In 1389 he was appointed clerk of the works at Westminster, the Tower of London, and other places. In March 1390 we find him on the Thames bank repair commission, and in May of the same year he was employed in setting up scaffolds in Smithfield for Richard If. and his queen (Anne of Bohemia) to see the jousts at that place. His duties took him to the mews for the king's falcons at Charing Cross, and in 1390 he was robbed of some of the king's money on the high road at Westminster. We thus see that traces of the " morn- ing star of English poetry" are to be found in all parts of London.

In 1381 another of the stirring incidents of English history occurred in London. The threatening insurrection of Wat Tyler was suppressed when the leader was killed by Sir William Wal- worth in Smithfield. Before that the rebels had done great damage to property in London and Southwark. About this time two very important public works were commenced. Westininster Hall was repaired by Richard II. in 1397; the walls were carried up 2 feet higher, the windows were altered, and a new roof con- structed. In 1411 the Guildhall was built, and the courts were re- moved from Aldermanbury.

During the troubles of the 15th century the authorities had seen the necessity of paying more attention to the security of the gatcs and walls of the city, and when Thomas Nevill, sou of Thomas, Lord Fauconbergh, made his attack upon London in 1471 he ex- perienced a very spirited resistance. He first attempted to land from his ships in the city, but the Thames side from Baynard's Castle to the Tower was so well fortified that he had to seck a quieter and less prepared position, He then set upon the several gates in succession, and was repulsed at all. Onthe 11th of May he made a desperate attack upon Aldgate, followed by 500 men. He won the bulwarks and some of his followers entered into the city, but the portcullis being let down these were cut off from their own party and were slain by the enemy. The portcullis was drawn up, and the besieged issued forth against the rebels, who were soon forced to fly.

When Richard, duke of Gloucester, laid his plans for seizing the crown, he obtained the countenance of the lord mayor, Sir Edmund Shaw, whose brother Dr Shew praised Richard at Paul's Cross. Crosby Hall, in Bishopsgate Street, then lately bnilt, was made the lodging of the Protector. There he acted the accessible prince in the eyes of the people, for the last of the Plantagenets was another of the usurpers who found favour in the eyes of the men of London. His day, however, was short, and with the battle of Bosworth ends Plantagenet London,

Tupor (1485-1603).—It was during this period that the first maps of London were drawn. No representation of the city earlier than the middle of the 16th century has been discovered, although it seems more than probable that some plans must have been produeed at an earlier period. The earliest known view is the drawing of Van den Wyngaerde in the Bodleian Library (dated 1550). The so-called Aggas map is a few years later in date; Braun and Hagenberg's map was published,in 1572-73 ; and Norden's maps of London and West-minster are dated 1593. These maps were pasted upon walls, and must have been largely destroyed by ordinary wear and tear. It is curious that the only two existing copies of Aggas's map? were published in the reign of James I., although apparently they had not been altered from the earlier editions of Elizabeth's reign which have been lost. By the help of these maps we are able to obtain a very clear notion of the extent and chief characteristics of Tudor London. Henry VII. did little to connect his name with the history of London with the exception of the crection of the exquisite speeimen of florid Gothie at Westminster Abbey, which is known by his name. Soon after this king obtained the throne he bor- rowed the sum of 8000 marks from the city, and moreover paid it at the appointed time. The citizens were so pleased at this somewhat unexpected occurrence that they willingly lent the king £6000 in 1488, which he required for military preparations against France. In 1497 London was threatened by the rebels favourable to Perkin Warbeck, who encamped on Blackheath on the 17th of June. At first there was a panic among the citizens, but subsc- quently the city was placed in a proper state of defence, and the king himself encamped

in St George's Fields, On June 22 he entirely routed the rebels; and some time afterwards Perkin Warbeck gave himself up, and was conducted jn triumph through London to the Tower, ;

About this time and in several subsequent years the sweating sickness raged in London, This disease (Sudor Anglicus) was considered peculiar to England, The sanitary condition of the houses at the time must have been most deplorable, and the plague and other diseases were constantly reappearing until the great fire cleared away all the abominable buildings that formed centres of infection.

During the reign of Henry VII, as well as during that of his son London was constantly the scene of gorgequs pageants. In 1512 the greater part of the palace of Westminster was burnt, and Henry VIII. had no suitable residence until 1529, when he abtained Wolsey's magnificent house called York Place, and named it Whitehall. That much of the present London was at this time in a wild and uneultivated condition is proved by a proclamation of Henry VIII., the object of which was "to preserve the partridges, pheasants, and herons from his palace at Westminster to St Giles's- — from thence to Islington, Hampstead, and Hornsey

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As the chief feature of Norman London was the foundation of monasteries, and the chief feature of Plantagenet London was the establishment of friaries, so Tudor London was specially characterized by the suppression of the whole of these religious houses, and also of the almost numberless religious guilds and brotherhoods. When we remember that about two-thirds of the area of London was occupied by these establishments, and that about a third of the inhabitants were monks, nuns, and friars, it is easy to imagine how great must have been the disorganization caused by this root and

branch reform. One of the earliest of the religious houses to be |

suppressed was the hospital of St Thomas of Acon (or Acre) on the north side of Cheapside, the site of which is now oceupied by Mercers'

Hall. The larger houses goon followed, and the Black, the White, and the Grey Friars, with the Carthusians and many others, were all condemned in November 1638, 2

Love of show was so marked a characteristic of Henry VIII. that we are not surprised to find him enconraging the citizens in the Same expensive taste. On the oecasion of his marriage with Catherine of Aragon the city was gorgeously ornamented with rich silks and tapestry, and Goldsmiths' Row (Cheapside) and part of Cornhill were hung with golden broeades. When on the eve of St John's Day, 1510, the king in the habit of a yeoman of his own guard saw the famous march of the city watch, he was so delighted that on the following St Peter's Eve he again attended in Cheapside to see the march, but this time he was accompanied by the queen and the principal nobility. The cost of these two inarches in the year was very considerable, and, having been suspended in 1528 on account of the prevalence of the Sweating sickness, they were soon afterwards forbidden by the king, and discontinued during the remainder of his reign. Sir John Gresham, mayor in 1548, revived SS

ues A map of London engraved on copper-plate, dated 1497," whieh w the eatalogue of Ferdinand's Races es fo eps abou 1518-25, the Cathedral Library at Seville, unehias #76 cles E Pawn if econ ba? ae. . ieee aeperly oat by topographers, although possibly there hot exteall Fees Gentes: Len cn ieee that we possess, for the town did

? One is in the Guildhall Librar and tl si i horace Collese, Gommrace y, and the other among the Pepysian maps in

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the march of the city watch, whieh was made more splendid by the addition of three hundred light horsemen raised by the citizens for the king's service. —

The best mode of utilizing the buildings of the suppressed religious houses was a difficult question left unsolved by Henry VIII. That king, shortly before his death, founded St Bartho- lomew's Hospital, "for the continual relief and help of an hundred sore and diseased," but most of the large buildings were left unocenpied to be filled by his successor. The first parliament of Kdward's reign gave all the lands and possessions of colleges, chantries, &c., to the king, when the different companies of London redeemed those which they had held for the payment of priests' wages, obits, and lights at the price of £20,000, and applied the rents arising from them to charitable purposes. In 1550 the citizens purehased the manor of Southwark, and with it they became possessed of the monastery of St Thomas, whieh was enlarged and prepared for the reception of ''poor, sick, and helpless objects." Thus was founded St Thomas's Hospital, which was moved to Lambeth in 1870-71, Shortly before his death Edward founded Christ's Hospital in the Grey Friars, and gave the old palace of Bridewell to the city ''for the lodging of poor wayfaring people, the correction of vagabonds and disorderly persons, and for finding them work." On the death of Edward VI, Lady Jane Grey was received at the Tower as queen, she having gone there by water from Durham House in the Strand. The citizens, however, soon found out their mistake, and the lord mayor, aldermen, and recorder proclaimed Queen Mary at Cheapside. London was then gay with pageants, but when the queen made known her intention of mar- tying Philip of Spain the discontent of the country found vent in the rising of Sir Thomas Wyat, and the city had to prepare itself against attack, Wyat took possession of Southwark, and expected to have been admitted into London; but finding the gates shut against him and the drawbridge cut down he marched to Kingston, the bridge at which place had been destroyed. This he restored, and then proceeded towards London. In consequence of the break down of some of his guns he imprudently halted at Turnham Green. Had he not done so it is probable that he might have obtained possession of the city. He planted his ordnance on Hay Hill,

and then marched by St James's Palace to Charing Cross. Here he was attacked by Sir John Gage with a iomnat men, but he repulsed them and reached Ludgate without further opposition. He was disappointed at the resistance which was made, and after musing a while 'upon a stall over against the Bell Savadge Gate" he turned back. His retreat was cut off, and he surrendered to Sir Maurice Berkeley. We have somewhat fully described this historical incident here beeause it has an important bearing on the history of London, and shows also the small importance of the districts out- side the walls at that period. ;

We now come to consider the appearance of London during the reign of the last of the Tudors. At no other period were so many great men associated with its history; the latter years of Eliza- Deth's reign are specially interesting to us because it was then that Shakespeare lived in London, and introduced its streets and people into his plays. In those days the frequent visitation of plagues made men fear the gathering together of multitudes. This dread of pestileuce, united with a puritanic hatred of plays, made

_ the citizens do all they could to discountenance theatrical entertain-

ments. The queen acknowledged the validity of the first reason, but she repudiated the religious objection provided ordjnary eare was taken to allow ''such plays only as were fitted to yield honest recreation and no example of evil." On April 11, 1582, the lords of the council wrote to the lord mayor to the effect that, as ''her Majesty sometimes took delight in those pastimes, it had becn thought not unfit, haying regard to the season of the year and the clearance of the city from infection, to allow of certain companies of players in London, partly that they might thereby attain more dexterity and perfection the better to content her Majesty " (Analytieal Index to the Remembrancia). When theatres were established the lord mayor took care that they should not be built within the city, The '*Theatre" and the "Curtain" were situated at Shoreditch'; the '' Globe," the " Rose," and the '' Hope" on the Bankside; and the Blackfriars theatre, although within the walls, was without the city jurisdiction,

In 1561 St Paul’s steeple and roof were destroyed by lightning, and the spire was never replaced. This circumstance allows us to test the date of certain views; thus Wyngaerde’s map has the spire without it. In 1566 the first stone was laid of the ‘‘ Burse,* whieh owed its origin to Sir Thomas Gresham, and in 1571 Queen Elizabeth changed its name to the Royal Exehange, **so to be called from thenceforth and no otherwise.’’ .

& _proclamation was issucd in 1580 prohibiting the erection Within 3 miles of the city gates of any new houses or tenements “where no former house hath been known to have been.” Ina subsequent proclamation the queen commanded that only one family should live in one house, that empty houses erected within Seven years were not to be let, and that unfinished buildings on new foundations were to be pulled down. In spite of these restrictions

London continued to grow. In 1568 a conduit was constructed at Dowgate for the purpose of obtaining water from the Thaines, and in 1580 Peter Moris, an ingenious Dutchman, brought his scheme for raising the Thames water high enough to supply the upper parts of the city under the notice of the lord mayor and aldermen, and in order to show its feasibility he threw a jet of water over the steeple of St Magnus’s Church (see p. 825). The maps show us much that remains somewhat the same as it was, but also much that has greatly altered. St Giles’s was literally a village in the fields; Piccadilly was ‘‘ the waye to Redinge,” Oxford Strect ‘‘ the way to Uxbridge,” Covent Garden an open field or garden, and Leicester Fields lammas land. Moorfields was drained and laid out in walks in Elizabeth’s reign. At Spitalfields crowds used to congregate on Easter Monday and Tuesday to hear the Spital sermons preached from the pulpit cross. The ground was origiu-ally a Roman cemetery, and about the year 1576 bricks were largely made from the clayey earth, the recollection of which is kept alive in the name of Brick Lane. Citizens went to Holborn and Bloomsbury for change of air, and houses were there prepared for the reception of

children, invalids, and convalescents. In the north were sprinkled the outlying villages of Islington, Hoxton,

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Sruart (1603-1714).—The Stuart period, from the accession of James I. to the death of Queen Anne, extends over little more than a century, and yet greater changes occurred during those years than at any previous period. The early years of Stuart London may be said to be closely linked with the last years of Elizabethan London, for the greatest men such as Raleigh, Shakespeare, and Ben Jonson lived on into James's reign. Much of the life of the time was then in the City, but the last years of Stuart London take us to the 18th century, when social life had permanently shifted to the west end. In the middle of the period occurred the civil wars and then the fire which changed the whole aspect of London. When James came to the throne the term suburbs had a bad name, as all those disreputable persons who could find no shelter in the city itself settled in these outlying districts. Then the line of the Strand was almost the only respectable outskirt. Stubbs denounced suburban gardens and garden houses in his Anatomy of Abuses, and another writer observed ‘‘ how happy were cities if they had no suburbs.”

The preparations for the coronation of King James were inter-

and Clerkenwell. The Strand was filled with noble mansions washed by the waters of the Thames, but the street, if street it could be called, was little used by pedestrians. Londoners fre- quented the river, which was their great highway. The banks were crowded with stairs for boats, and the watermen of that day answered to the chairmen of a later date and the cabmen of to- day. When Shakespeare and his companions went to act at the Globe Theatre they did not cross London Bridge, but

took boat at Blackfriars Stairs, and were landed opposite at the Paris Garden Stairs on the Bankside. The Bankside was of old a favourite place for entertainments, but two only—the bull-baiting and the bear-baiting—were in existence when Aggas's map was first planned. On Norden's map,? however, we find the gardens of Paris Garden, the bearhouse, and the playhouse.

The settled character of the later years of Elizabeth's rcign appears to have caused a considerable change in the habits of the people. Many of the chief citizens followed the example of the

courtiers, and built for themselves country residences in Middlesex, Essex, and Surrey'; thus we learn from Norden that Alderman Roe lived at Muswell Hill, and we know that Sir Thomas Gresham built a fine house and planned a beautiful park at Osterley.

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Norden's Map of Tudor London.

rupted by a severe visitation of the plague, which killed off as many as 30,578 persons, and it was not till March 15, 1604, that the king, the queen, and Prince Henry passed triumphantly from tho Tower to Westminster. The lord mayor's shows, which had been discontinued for some years, were revived by order of the king in 1609. The dissolved monastery of the Charterhouse, which had been bought and sold by the courtiers several times, was obtained from Thomas, earl of

Suffolk, by Thomas Sutton for £13,000. The new hospital chapel and schoolhouse were commenced in 1611, and in the same year Sutton died. Somerset House was occupied by Anne of Denmark, and in 1616 James I. commanded it to be called Denmark House. In 1619 Inigo Jones commenced the Banqueting House at Whitehall, which was only part of a proposed vast palace, but which has remained to our time to be one of the chief ornaments of the town. The fatal vespers at Blackfriars threw a gloom over the year 1623. A large and mixed congregation of

1 This map of London by Norden is dated 1593, as stated above. The same

topographer published in his Afiddiesex a map of Westminster as well as this one of the City of London. <

Protestants and Roman Catholics had gathered together one Sunday evening at the house vf Count de Tillier, the French ambassador, to hear Father Drury (a converted Protestant) preach. As many as were able crowded into the room on the upper floor for that purpose, but those who could not get in were fain to remain on the floor below and listen to a preacher on the sacrament of penance. The floors both gave way, and a large number of persons were precipitated to a great depth and killed, both preachers being among the dead. With the death of James I. in 1625 the older history of London may be said to have closed. During the reign of his successor the great change in the relative positions of London within and without the walls had commenced. Before going on to consider the chief incidents of this change it will be well to refer to some features of the social life of James’s reign. Ben Jonson places one of the seenes of Every Man in his Humour in Moorfields, which at the time he wrote the play had lately been drained and laid out in walks. Beggars frequented the place, and travellers from the village of Hoxton, who crossed it in order to get into London, did so with as much expedition as possible. Adjoining Moorfields were Finsbury Fields, a favourite practising ground for the archers. Mile End, a common on the Great Eastern

Road, was long famous as a rendezvous for the troops. These places are frequently referred to by the old dramatists ; Justice Shallow boasts of his doings at Mile End Green when he was Dagonet in Arthur's Show. Fleet Street was the show-place of London, in which were exhibited a constant succession of puppets, naked Indians, and strange fishes. The great meeting-place of Londoners in the day-time was the nave of old St Paul's. transacted business in the aisles, and used the font as a counter upon which to make their payments; lawyers received clients at their several pillars ; and masterless serving-men waited to be en- gaged upon their own particular bench. Besides those who came on business there were gallants dressed in fashionable finery, so that it was worth the tailor's while to stand behind a pillar and fill his table-books with notes. The middle or Mediterranean aisle was the Paul's Walk, also called the Duke's Gallery from the erroneous supposition that the tomb of Sir Guy Beauchamp, earl of Warwick, was that of the ''good"" Humphrey, duke of Gloucester. After the Restoration a fence was erected on the inside of the great north door to hinder a concourse of rude people, and when the cathedral was being rebuilt Sir Christopher Wren made a strict order against any profanation of the sacred building. Another of the favourite haunts of the people was the garden of Gray's Inn, where the choicest society was to be met. There, under the shadow

of the elm trees which Bacon had planted, Pepys and his wife | constantly walked. \ Mrs Pepys went on one occasion specially to | observe the fashions of the ladies because she was then '' making |

some clothes."

In those days of public conviviality, and for many years after- wards, the taverns of London held a very important place. The Boar's Head in Great Eastcheap was an inn of Shakespeare's own

Crowds of merchants with their hats on |

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[HISTORY.

Charles I. and his councillors were filled with the same fear of the increasing growth of Loudon which showed itself in the pro- hibitory proclamations of his two predecessors. In 1680 a pro- clamation was issued in which ‘‘ the erection of any building upon a new foundation, within the limits of 3 miles from any of the gates of the City of London, or palace of Westminster,” was forbidden. The privy council in the following year put this question to the lord mayor—‘‘ What number of mouths are esteemed to be in the City of London and the liberty ?”—the auswer to which was 130, 268. These prohibitions were not allowed to remain a dead letter, and in 1632 Mr Palmer, a large landholder in Sussex, was fined by the Star Chamber in the sum of £1000 for living in London beyond the period prescribed in the proclamation of June 20th of that year. In April 1635 information was filed against Sir John Suckling the poet and others in the Court of Star Chamber for continuing to reside in London and Westminster. It was during this reign that the first great exodus of the wealthy and fashionable was made to the West End. The great square or piazza of Covent Garden was formed from the designs of Inigo Jones about 1632, The neigh- bouring streets were shortly afterwards built, and the names of Henrietta, Charles, James, King, and York Streets were given after members of the royal family. Great Queen Street, Lincoln’s Inn Fields, was built about 1629, and named in honour of Henrietta Maria. Lincoln’s Inn Fields had been planned sonie years before.

When the civil war broke out London took the side of the parliament, and an extensive system of fortification was at oncc projected to protect the town against the threatened attack of the royal army. A strong earthen rampart, flanked with bastions and redoubts, surrounded the City, its liberties, Westminster and Southwark, making an immense enclosure. Mount Street, Gros- venor Square, marks the spot of one of these fortifications called Oliver’s Mount. In 1650 Cromwell allowed the Jews to return to England after a banishment of centuries, and those who settled in Loudon mostly chose the neighbourhood of

Aldgate as a place of residence. With the Restoration the separation of fashionable from city life became complete, and the West End grew into a formidable rival of the older London. In 1635 the game of pall mall was at in St James's Fields, on the site of St James's Square and

all Mall, but during the Commonwealth this was discontinucd, and some houses were built round about. The square was planned out in 1668, and it soon became the most fashionable place in London. A mall was then prepared in St James's Park which still retains its name. About the same time the great houses in Piccadilly were built. Clarendon, Berkeley, and Burlington Houses all appeared on the north side of that street about 1665.

London had been ravaged by plague on many former occasions, but the pestilence that commenced in December 1664 will ever live in history as ''the Plague of London." On the 7th of June 1665 Samuel Pepys for the first time saw two or three houses marked

| with the red cross and the words '' Lord, have mercy upon us," on

| the doors,

day, and the characters he introduces into his plays are really his |

own contemporaries. The '' Mermaid" is sometimes described as in Bread Street, and at other times in Friday Street and also in Cheapside. We are thus able to fix its exact position; for a little to the west of Bow church is Bread Street, then came a block of houses, then Friday Street. It was in this block that the '* Mermaid" was situated, and there appear to have been en- trances from each street. What makes this fact still more certain is the circumstance that a haberdasher in Cheapside living ''twixt Wood Street and Milk Street," two streets on the north side op- posite Bread and Friday Streets, described himself as '* over against the Mermaid tavern in Cheapside." The Windmill tavern occu- ples @ prominent position in the action of Every Man in his Humour. The Windmill stood at the corner of the old Jewry towards Lothbury, Street. The Mitre in' Fleet Street, so intimately associated with Dr Johnson, also existed at this time. It is mentioned ina comedy entitled

Ram Alley (1611), and Lilly the astrologer frequented it in 1640. At the Mermaid Ben Jonson may be supposed to have had such rivals as Shakespeare, Raleigh, Beaumont, Fletcher, Carew, Donne, Cotton, and Selden, but at the Devil in Fleet Street, where he started the Apollo Club, he was omnipotent. Herrick, in his well-known Ode to Ben, mentions several of the inns of the day. Under James I. the theatre, which established itself so firmly in the latter years of Elizabeth, had still further increased its influence and to the entertainments given at the many playhouses may be added the masques so expensively produced at eourt and at the inns of law. In 1613 ‘* The Masque of Flowers” was presented by the members of Gray’s Inn in the Old Banqueting House in honour of the marriage of the infamous Carr, earl of Somerset, and the equally infamous Lady Frances, daughter of the earl of Suffolk.

The entertainment was prepared by Sir Francis B about £2000. sila i meis bacon at a cost of

‘ Various changes in the names of the taverns are made in i iti

: the folio editio ee (1616) from the quarto (1601) ; thus the Mermaid of the quarto Deooaes

1¢ Windmill in the folio, and the Mitre of the quarto is the Star of the folio,

and the Mitre close by the Mermaid in Bread |

The deaths daily increased, and business was stopped. Grass grew in the area of the Royal Exchange at Whitchall, and in

_ the principal streets of the city. On the 4th of September, 1665,

Pepys writes an interesting letter to Lady Carteret from Wool-

| wich:—‘*I have stayed in the city till above 7400 died in one

week, and of them about 6000 of the plague, and little noise heard day or night but tolling of bells." ... The plague was scarcely stayed before the whole city was in flames, a calamity of the first maguitude, but one which in the end caused much good, as the seeds of disease were destroyed, and London has never since been visited by such an epidemic. On the 2d of September 1666 the fire broke out at one o'clock in the morning at a house in Pudding Lane. A violent east wind fomented the flames, which raged with fury during the whole of Monday and great part of Tuesday. On Tuesday night the wind fell somewhat, and on Wednesday the fire slackened. On Thursday it was extinguished, but on the evening of that day the flames again burst forth at the Temple. Some houses were at once blown up by gunpowder, and thus the fire was finally mastered. Many interesting details of the fire are given in Pepys's Diary. The distress of those who were made houseless by this calamity was great. The river swarmed with vessels filled with per- sons carrying away such of their goods as they were able to save. Some fled to the hills of Hampstead and Highgate, but Moorfields was the chief resort of the houseless Londoner. Soon paved streets and two-story houses were seen in that swampy place. The people bore their troubles heroically, and Henry Oldenburg, writing to the Hon. Robert Boyle on September 10, says,‘‘ the citizens, instead of complaining, discoursed almost of nothing but of a survey for rebuilding the city with bricks and large streets." Within .a few days of the fire three several plans were presented to the king for the rebuilding of the city, by Christopher Wren, John Evelyn, and Robert Hooke. Wren proposed to build main thorongh- fares north and south, and east and west, to insulate all the churches in conspicuous positions, to form the most public places into large piazzas, to unite the halls of the twelve chief companies Into one regular square annexed to Guildhall, and to make a fine quay on the bank of the river from Blackfriars to the

Tower. His streets were to be of three magnitudes—90 feet, 60 feet, and 30 feet wide respectively. Evelyn's plan differed from Wren's chiefly in proposing a strect from the church of St Dunstan's in the

East to the cathedral, and in having no quay or terrace along the river. In spite of the best advice, however, the jealousies of the citizens prevented any systematic design from being carried out, and in consequence the old lincs were in almost every case retained. But, though the plans of Wren and Hooke were not adopted, it was to these two fellows of the Royal Society that the labour of rebuilding London was committed. Wren's great work, which has covered his name with renown, was the erection of the cathedral of St Paul's, and the many churches ranged round it as satellites. Hooke's task was the humbler one of arranging as city surveyor for the building of the houses. He laid out the ground of the several proprietors in the rebuilding of the city, and had no rest early or late from persons soliciting him to set out their ground for them at once. The first great impetus of change in the con- figuration of London was given by the great fire, and Evelyn records and regrets that the town in his time had grown almost as large again as it was within his own meniory. Although for several centuries attempts had heen made in favour of building houses with brick or stone, yet the carpenters continued to be the chief house- builders. As late as the year 1650 the Carpenters' Company drew

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up a memorial in which they ''gave their reasons that tymber buildings were more commodious for this citie than brick buildings were."" The Act of Parliament ''for rebuilding the city of London" passed after the great fire, gave the coup de grace to the carpenters as house-builders. After setting forth that '' building with brick was not only more comely and durable, but also more safe against future perils of fire," it was enacted ''that all the outsides of all buildings in and about the city should be made of brick or stone, except doorcases and window

frames, and other parts of the first story to the front between the piers," for which substantial oaken timber might be used ''for conveniency of shops." A third severe blow in addition to the plague and the fire overtook London in the reign of Charles II. The king and his brother had long entertained designs against the liberties of the city, and for the purpose of crushing them two pretexts were set up—(1) that a new rate of market tolls had been levied by virtue of an act of common council, aud (2) that a petition to the king, in which it was alleged that by the prorogation of parliament public justice had been interrupted, had been printed by order of the Court of Common Council. Charles directed a writ quo warranto against the corporation of London in 1683, and the Court of King's Bench declared its charter forfeited. Soon afterwards all the obnoxious aldermen were displaced and others appointed in their room by royal commission.

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London in 1720. Reduced Facsimile of Map by J. Senex.

A new lord mayor and recorder and new sheriffs were appointed in the same manner. This decision of the Court of King's Bench was reversed in 1690. In the winter of 1683-84 a fair was held for some time upon the Thames. The frost, which commenced about seven weeks before Christmas and continued for six weeks after, was the greatest on record; the ice was 11 inches thick.

The revocation of the edict of Nantes in October 1685, and the consequent migration of a large number of industrious French Pro- testants, caused a considerable growth in the east end of London. The silk manufactories at Spitalfields were then established.

During the short reign of James II. the fortunes of the city were at their lowest, and nowhere was the arrival of the prince of Orange niore welcomed. One of the first acts of James was to cause an indictment for high treason to be prepared against Alderman Cornish, who had been a zealous supporter of the Exclusion Bill. Sir John Eyles, who had never been sheriff nor was even a freeman of the city, was appointed lord mayor by the king in 1688 in suc- cession to Sir John

Shorter. When James found the danger of his position, and learned that William had landed, he sent for the mayor and aldermen and informed them of his determination to restore the city charter and privileges.

William III. cared little for London, the smoke of which gave him asthma, and when a great part of Whitehall was burnt in 1691 he purchased Nottingham House and made it into Kensington

Palace. For eonvenience of communication with London he had a broad road made through Hyde Park, which was lighted by lanterns at night. Kensington was then an insignificant village, but the arrival of the court soon caused it to grow in importance.

Although the spiritual wants of the city were amply provided for by the churches built by Sir Christopher Wren, the large districts outside the City and its liberties had been greatly neglected. The Act passed in the reign of Queen Anne for building fifty new churches (1710) not only helped to supply this want, but also gave a special architectural character to the suburbs.

EIGHTEENTH CENTURY.—With the accession of George I. a considerable change in the habits of all classes was introduced. At no previous time probably was public taste so low or manners more depraved. These two evils naturally were felt over the whole kingdom, but nowhcre was their baneful influence more apparent than in the capital. Public buildings of the most tasteless char- acter were raised, and streets of private houses were built that were positively painful in their ugliness. London thus grew to be the ugliest of cities, a character which it is only now beginning to throw off. London had gradually grown up by the side of the Thames and extended itself along the river’s banks, which were skirted by a succession of handsome palaces. The inhabitants moved from place to place in boats, and the river was the chief highway. In the 18th century this state of things had ceased,

and other parts of the town were more largely built upon. The ink bieints used coaches and chairs more than boats, and the banks of the river were neglected. London eould no longer be seen as a whole, and it grew into a mere collection of houscs. In spite of all this the 18th century produced some of the most devoted of Londoners,—men who considered a day lived out of London as one lost out of their lives. Of this class Dr Johnson and Hogarth are striking examples. ‘The exhibitions of vice and cruelty that were constantly to be seen in the capital have been reproduced by Hogarth, and had they not been set down by so truthful au observer it would have been almost impossible to belicve that such enormitics could have been committed in the streets of a great city. A few days after his accession George I. addressed the representatives of the city in these words—‘‘I have lately been made sensible of what consequence the city of London is, and therefore shall be sure to take all their privileges and interests into my particular protec- tion.” On the following lord mayor’s day the king witnessed the show in Cheapside and attended the banqnet at Guildhall. Queen Anne and the first three Georges were all accommodated, on the occasions of their visits to the City to see the show, at the same house opposite Bow church. In the time of Queen Anne and George I. David Barclay (the son of the famous apologist for the Quakers) was an apprentice in the house, but he subsequently became master, and had the honour of receiving George IJ. and George III. as his guests. There was a large balcony extending along the front of the house which was fitted with a canopy and hangings of crimson damask silk. The building, then numbered 108 Cheapside, was pulled down in 1861. In September 1720 the bursting of the South Sea Bubble created the most fearful panic that London has ever seen. Trade was at a standstill, and many of the chief merchants, goldsmiths, and bankers stopped payiment, thus causing ruin to numberless families.

Early in the 18th century there was a considcrable extension of building operations in the West End. About the year 1716 the earl of Burlington commenced building on the Ten Acres Field at the back of the gardens of Burlington House, and shortly after- wards the City authorities, who were proprietors of the Conduit Mead (containing 27 acres), followed his example. On June 1, 1717, the Weekly Jowrnal

announced that ‘‘ the new buildings between Bond Street and Mary-Ic-Bone go on with all possible diligence, and the houses even lct and sell before they are built.” The parish of St George’s, Hanover Square, was constituted in 1725. In 1715 Cavendish Square and the neighbouring streets had been planned out, but it was several years before the plan was completed. The foundation stone of Harcourt House (duke of Portland’s) on the west side of the square, which is now about to be destroyed, was laid in 1722; and the north side, which was originally intended to be occupied by the mansion of the duke of Chandos, was still unfinished in 1761. St Peter’s chapel in Vere Street, originally Oxford chapel, was built by Gibbs about 1724.

Still, however, the north of London remained unbuilt upon, and the open character of this part is well shown in the map given above. In 1756 and for some years subsequently the land behind Montague House (now the British Museum) was occupied as a farm, and when in that year a proposal was made to plan ont a new road the tenant and the duke of Bedford strongly opposed it. In 1772 all beyond Portland Chapel in Great Port- land Street was country. Portman Square was laid out about 1764, but it was nearly twenty years before the whole was finished. It was built on high ground with an open prospect to the north, which gave it a name as a peculiarly healthy patt of London. Mrs Montagu called it the Montpellier of England, and said she ‘‘never enjoyed such health as since she came to live in it.” In a map of London dated 1773 the villages of Hackney Stepney, Islington, Hoxton, Pancras, Marylebone, Paddington, Knightsbridge, and Chelsea are all shown as country outskirts of the town. Bedford House in Bloomsbury Square had its full view of Hampstead and Highgate from the back, and Quecn’s Square was built open to the north in order that the inhabitants might obtain the same prospect. Dr Heberden recommended South Lambeth as a health resort on account of its situation on the banks of a tidal river with the south-west wind blowing fresh from the country and the north-east softened by blowing over the town.

In 1737 the Fleet ditch between Holborn Bridge and Fleet Bridge was covered over, and Stocks market was removed from the site of the

Mansion House to the present Farringdon Street, and called Fleet market. On October 25, 1789, the first stone of the Mansion House was laid. Previously the first magistrates lived in several different houses. In 1750 Westminster Bridge was opened for passengers, and London Bridge ceased to be the only means of cross- ing the Thames at London. Blackfriars Bridge followed in 1769 A frost almost as severe as the memorable one of 1683-84 occurred in the winter of 1739-40, and the Thames was again the scene of a busy fair. In 1758 the houses on London Bridge were cleared away and in 1760-62 several of the city gates were taken down and sold. Moorgate is said to have fetched £166, Aldersgate £91, Aldgate £177, Cripplegate £90, and Ludgate £148. The statue of Queen Elizabeth

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which stood on the west side of Ludgate was purchased by Alder- man Gosling and set up against the east end of St Dunstan's church in Fleet Street, where it still remains.

The need of improving and opening out mauy of the strects of London was felt in the 18th century, but little or nothing was done, and the work was left to be accomplished in the present century. John Gwynn, a friend of Dr Johnson, paid considerable attention to this subject, and published in 1766 a work entitled London and Westminster Improved, Illustrated by Plans. Many of the anthor's suggestions have not been carricd out, although they would often have been improvements upon what has been since attempted. Of such alterations as have subsequently been exccuted we may note here the widening of Swallow Strect, a much-needed improvement, which was not carried out until the beginning of the present cen- tury, a square where Trafalgar Square now stands and some straight streets on the site of Durham House now the Adelphi, anda bridge where Waterloo Bridge was afterwards built.

Robert Adam and his brothers, Scotsmen who came to London uuder the protection of the earl of Bute, made a considerable im- provement in the appearance of certain parts of London during the second half of the 18th century by the adoption of a combined system of architecture,

in which several separate houses were grouped together to give the appearance of a continuous building. The Adelphi and Portland Place still remain good examples of their system. The brothers Adam were leaders in the revival of taste, and the interiors of their buildings are executed with much elegant detail. We have now come toa period when London outside the City may be considered as more important in many points than London within the liberties. ‘* Why sir,” said Dr Jolnson to Bos- well, ‘‘ Fleet Street has a very animated appearance, but I think the tide of human existence is at Charing Cross.” This speech was made in 1775, and in spite of the vast incrcase of London in every direction Charing Cross still retains this pre-eminent position.

The latter years of the 18th century were somewhat troublous ones for London, but it is only necessary here to barely mention the divisions between the court and the City relating to the election of Wilkes, aud the Gordon riots of 1780, when the gates of Newgate were thrown open, and much property was destroyed by the mob.

NINETEENTH CENTURY.—It is impossible to give here anything like a full account of the history of London during the 19th century. Since 1800 the City itself has been almost entirely re- built, and the suburbs on all sides have been vastly extended. Russell Square was built about 1804, and the district north of Bloomsbury was laid out at the same time. Bloomsbury Square had been built in 1665, and Bedford Square at the end of the 18th century. Alexander Gibson Hunter, in a letter to Constable the publisher written in March 1807, says, ‘‘ Young Faulder and I walked over all the duke of Bedford’s new feuing grounds, Russell Square, Tavistock Place, Brunswick Square, &c. The extent of them, and the rapidity of the buildings, is beyond all comprehen- sion.” Bedford and Russell Squares were for some years the favoured place of residence for the judges. To show how late has been the growth north of the New Road we may mention that at the beginning of the century grapes were ripened by the sun in the open air in gardens in Gower Street, and twenty five dozen of nec tarines were gathered in 1800 from three completely exposed trees in a garden in Upper Gower Street. Still later the richest flavoured celery was gathered in abundance in the same place. When duel- ling was in

fashion the duellists naturally chose out the most un- frequented places, and we thus obtain an idea where these places were situated. Chalk Farm for some years rivalled in popularity Wimbledon Common, where the duke of York fought Colonel Lennox in 1789, Battersea Fields, where the duke of Wellington fought the earl of Winchelsea in 1829, and Putney Heath, where Pitt met Tierney in 1798, and Castlereagh and Canning fought in 1809. As late as 1843 a duel was fought at Chalk Farm between Lieutenant Monro and Colonel Fawcett, when the latter was killed.

In 1806 London saw the public funerals of three of England's greatest men. On the 8th February the body of Nelson was borne with great pomp from the Admiralty to St Paul's Cathedral, where it was interred in the presence of the prince of Wales and the royal dukes. Pitt was buried on 22d February, and Fox on the 10th October, both in Westminster Abbey.

The first exhibition of Winsor's system of lighting the streets with gas took place on the king's birthday (June 4) 1807, and was made in a row of lamps in front of the colonnadc before Carlton House. Fins- bury Square was the first public place in which gas lighting was actually adopted, and Grosvenor Square the last. On October 11, 1811, the first stone of Waterloo Bridge was laid, and on June 18, 1817, it was publicly opened. Southwark Bridge was opened in April 1819, and new London Bridge, the first stone of which had been laid on June 15, 1825, on August 1, 1831. West- minster and Blackfriars Bridges have been rebuilt within the last few years, and thus not one of the London bridges dates back farther than the present century. One of the greatest improve- ments in the West End was the formation of Regent Street, intended as a communication between Carlton House and the Regent's Park,

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which had been planned in 1812. An Act of Parliament was obtained in 1813 for the purpose of carrying out Nash's design. In the winter of 1813-14 the Thames was again frozcn over. The frost commenced on the eveniug of December 27, 1818, with a thick fog. After it had lasted

for a month, a thaw of four days, from the 26th to the 29th of January, took place, but this thaw was succeeded by a renewal of the frost, so severe that the river soon became one immovable sheet of ice. There was a street of tents called the City Road, which was daily thronged with visitors. The fashionable Belgravia was built about 1825, over the squalid Five Fields, long known as a dangerous district. Belgrave Square was commenced in 1825, and Haton Square was set out in 1827, but not wholly completed until 1853. It was about 1829, soon after Carlton House was pulled down, that the line of palatial club-houses in Pall Mall was commenced. In 1827 the Turnpike Act came into operation, and twenty-seven turnpikes were removed in one day. In 1838 the second Royal Exchange was destroyed by fire ; andon October 28, 1844, the Queen opened the new Royal Exchange, which was built by Mr (afterwards Sir William) Tite. On April 27, 1840, the first stone of the new Houses of Parliament to be erected by Charles Barry was laid on the site of the old build- ings which had been burnt in October 1834. An Act of Parliament was passed in 1847 for the purpose of widening and lengthening Cannon Street, and subsequently the street was extended to St Paul's Churchyard. In 1848 London was in danger from the threatened attack of the Chartists, and defensive preparations were extensively arranged. On the 10th of April, the mob having met on Kennington Common, was prevented from returning to London over the bridges, and no more was heard of anyrising. The Great Exhibition of 1851 brought a larger number of visitors to London than had ever been in it before at one time. In 1852 the duke of Wellington's lying in state at Chelsea Hospital, and his public funeral at St Paul's, were two of the grandest London sights of the present century. On the occasion of the marriage of the Prince of Wales, the streets of London were illuminated as they never had been before. In 1864 Queen Victoria Street, a new thoroughfare from Blaekfriars Bridge to the Mansion House,

was begun, and in 1870 the northern shore of the river was | embanked. 'The erection of the Thames Embankment, which was |

carried out at great expense, has shown itself to be the greatest improvement ever made in London. The river, whieh had been too

ornament of London as well as the cause of its prosperity.

Perhaps the most distinguishing characteristic of London life in the latter half of the 19th century is the rush of Londoners which takes place each day after business hours from the centre of the town to the outskirts. This daily exodus has been chiefly caused by the facilities offered by the various railway companies. The first emigration of the London merchants westward was about the middle of last century, but only those who had already secured large for- tunes and possessed the highest reputations ventured as far as Hatton Garden. At the beginning of the present century it had become common for the tradesmenof the City to live away from their businesses, but it was only about thirty years ago that it became at all usual for those in the West End to do the same.

One point worthy of special mention in connexion with the modern growth of London is the larger use of stone in building than at any previous period. The reason of this is that the inerease in the value of land has made it worth the builder's while to spend more moncy on the building he raises. We might parody the remark on Augustus's influence in Rome and say—the 19th century found London brick and will leave it stone.

Literature.—The books written upon London are so numerous that they would form a library by themselves; it is impossible here to do more than indieate some

of the most important. The earliest deseription of London is that written by Fitz- stephen, in the reign of Henry J1., but first printed with Stow's Survey in 1598. Arnold's Chronicle, or the Customs of London, was first published in 1502, The first history was A Survey of London, by John Stow, 1598, 1603. The anthor died in 1605, and his work was continued by Anthony Munday and others (1618, 1633), and in the next century by J. Strype (1720, 2 vols. fol.; 1754-55, 2 vols. fol.). This last edition remains the standard history, and the remarks of Strype are very often quoted as those of Stow. E. Hatton's Vew View

of London (1708) is very useful on account of its alphabetical list of streets, &c. Maitland's [History of London was first published in 1 vol. folio in 1739, and was republished in 1756, 1760, 1769, and 1775—each cdition in 2 vols. folio, the last being edited by the Rey. J. Entick. Entick had himself published previously A Wistory and Sur- vey of London, &c,, 1766. A New and Complete Iistory and Survey of the Cities of London and Westminster, &c., by a socicty of gentlemen, revised by H. Chamberlain, appeared in 1770, and again, revised by W. Thornton, &c., in 1784; A New History of London, by J. Noorthouck, in 1773; and A New and Universal ITistory, &c., of London and Westminster, &c., in 1775, fol. The first edition of Pennant's London, the most popular book ever written upon the subject, appeared in 1790. 1t has becn frequently reprinted, and an index to the 4th edition was compiled by T. Downes, and published in 1814. A German translation was pub- lished at Nuremberg in 1791. Antiquities of London and tis Environs, by Jolin T. Smith, appeared in 1791-1800. Smith also published Antiquities of the City of Westminster, 1807, new edition, 1887, 4to; Ancient Topography of London, 1815; Vagabondiana, 1815-17; Cries of London, 1839; and Antiquarian Rambles in the Streets of London, edited by C. Mackay, 1846, Other works are J. P. Malcolm's Londinium Redivivum, or an Ancient History and Modern Descrip- tion of London, 1803-7; Anecdotes of the Manners and Customs of London during the 18th Century, 1808, 1810; and Anecdotes from the Roman Invasion to 1700, 1811; David Hughson's [E. Pugh's] London, 1806-9, and Walks through London, 1817; B. Lambert's History and Survey of London, 1806; Microcosm of London, 1808-9; H. Hunter's J/istory of London, 1811, 4to; Beauties of England and Wales, 1814-16, vol. x., 'London and Middlesex"; R. Wilkinson's Londina Ilustrata, 1819; Thomas Allen's History and Antiquities of London, West- minster, and Southwark, 1827-29, a most valuable work, with much informa- tion not to be found elsewhere; and E. W. Brayley's Londiniana, 1829. London (edited by Charles Knight, 1841-44; revised by E, Walford, 1875-77) contains articles of considerable interest, but tliese are badly arranged, and the whole work is incomplete. Leigh Hunt's The Town (1848 ; new cd., 1859) is an interesting work, but without original research. A Handbook for London (by Peter Cunningham, 1849 ; new ed., 1850) is an indispensable work of the

highest value ; a new cdition has been promised by Mr Murray for many years, The various works on London by J. H. Jesse and John Timbs are interesting, but wanting in accuracy. The Curiosities of London by the latter is of value. Cassell's Old and New London (1873-78, in 6 vols. 8vo; vols. iii. by Walter Thornbury, vols. iii.—vi. by E. Walford) is of special valne on account of the illustrations, many of them copied from Mr Crace's collection. Dickens's Dictionary of London is a useful handbook for London as it is. Besides these general works there are several Chronicles of London at various periods, some of which have been published by the Camden Socicty. The Transactions of the London and Middlesex Archxo- logical Society contain papers on various places in London. Newcourt's Reper- torium Ecclesiasticum Parochiale Londinense (1708-10) still contains the best history of the parishes of London. On Roman remains the chief works are An

f ; F us i | Account of some Roman Urns digged up near Bishopsgate, by J. Woodward, 1713; long neglected, was again raised to its natural position as the chief |

and Illustrations of Roman London, by C. Roach Smith, 1859.

The best books on the environs as a whole are D. Lysons's Environs of London, 1792-96 ; Parishes in Middlesex not included in the Environs, 1800 ; James Thorne's Tlandbook to the Environs of London, 1876 ; and W. lWowitt's The Northern ITeights of London, 1869.

The titles of the leading works on special subjects are subjoincd under the seve- ral heads :—Cuanitizs.—A. Highmorc, Pietas Londinensis—Ilistory of Public Charities in London, 1814; and Herbert Fry, Royal Guide to the London Charities (annual). CHuRCcHES—The Churches of London, by George Godwin, assisted by J. Britton, 1839; and Guide to the Churches of London and its Suburbs, by Charles Mackeson (annual). Cumate.—Luke Howard, The Climate of London, 1818-20 ; 2d ed., 1833. Companizs.—William Herbert, History of the Twelve Great Livery Companies of London, 1837. Separate histories have been also written of the fol- lowing companies :—Artillery (Highmore, 1804; Raikes, 1878); Carpenters' (Jupp, 1848); Coopers' (Firth, 1848)

; Founders' (Williams, 1867); Grocers' (J. B. Heath, 1829, 1854); lronmongers' (Nicholl, 1866) ; Leathersellers' (Black, 1871); Merchant Taylors' (Clode, 1875). Inns or Court.—William Herbert, Antiquities of the Inns of Court and Chancery, 1804, Mustcrpatity.—J. F. B, Firth, Municipal London, 1876,8vo. Parxs.—Jacob Larwood, The Story of the London Parks, 1872. Poxice.—Patrick Colquhoun, Treatise on the Police of the Metropolis, 1796; 8th ed., 1806. Poor.—H. Mayhew, London Labour and the London Poor, 1851; Greenwood, The Wilds of London, 1874. PoruLaTION.—Graunt's Observations on the Bills of Mortality, 1876, Prisons.—Hepworth Dixon, London Prisons, 1851. THEATRES.—E. W. Brayley, Historical and Descriptive Accounts of the Theatres of London, 1826. Water.—W. Matthews, ITistorical Account of the Waterworks of London, 1835; J. Prestwich, Geological Inquiry respecting ti:e Water-bearing Strata of the Country round London, 1851.

There is no complete catalogue of books relating to London, but useful lists wi 1 be found in Anderson's Book of British Topography, 1881, and in Lowndes 3 Bibliographer's Manual, 1860. (1. B. W.)

LONDON, a city and port of entry in the Dominion of Canada, the chief town of the county of Middlesex, Ontario, and the see both of a Roman Catholic bishop and of the Anglican bishop of Huron, lies 25 miles north of Lake Erie and 32 miles south-east of Lake Huron, in the midst of a fine agricultural country in the angle made by the confluence of the two branches of the Thames. It is a station on the main line of the Great Western Railway, and the terminus of a branch of the Grand Trunk Railway from St Mary's, a line from Port Stanley on Lake Erie, and the London, Huron, and Bruce Railway. The local nomenclature of London js in great measure a reproduction of that of the great city whose name it has ambitiously borrowed: the Thames is again spanned by a Westminster and a Blackfriars Bridge, and it has a Hyde Park, a

Covent Garden Market, a Crystal Palace, a Tower of London (its jail and court-house), a St Paul's Cathedral, with Pall Mall, Piccadilly, Cheapside, &c. Among the more important buildings are the city-hall,

the court-houses, the city hospital, the lunatic asylum, the orphan asylum, the Roman Catholic convent. The educational institutions include the Collegiate Institute, Hellmuth Ladies' College, the Academy of the Sacred Heart, and the newly-founded Western University. The chief industry is oil-refinng— the crude oil being brought from Enniskillen wells, a distance of 40 miles. There are also railway-car works, boiler and stove and other iron works, and chemical works ; and furniture, farming implements, carriages, and waggons are manufactured on an extensive scale. The value of the imports has increased from £176,400 in 1861 to £522,391

in 1881; and the value of the exports from £76,000 to £131,141. Three daily and five weekly newspapers and three monthly periodicals issue from the local press. The city is divided into seven wards, and is governed by a mayor and aldermen. First laid out in 1825-6, it returned a member in 1836, and was incorporated in 1840, The population was 15,826 in 1871, and 19,746 in 1881; but the East, West, and South London suburbs—really part of the city, though not yet included within the municipal boundaries—have a population of upwards of

10,000.

LONDONDERRY, a maritime county in the province of Ulster, Ireland, is bounded on the N. by the Atlantic, on the W. by Lough Foyle and Donegal, on the E. by Antrim and Lough Neagh, and on the S. by Tyrone. It has an irregular oval form, its greatest length being about 50 miles, and it greatest breadth about 40. The area comprises 513,388 acres, or about 802 square miles. The county consists chiefly of river valleys surrounded by elevated table-lands rising occasionally into mountains, while on the borders of the sea-coast the surface is generally level. The principal river is the Roe, which flows north-wards from the borders of Tyrone into Lough Foyle below Newtown-Limavady, and divides the county into two unequal parts. Further west the Faughan also falls into Lough Foyle, and the river Foyle passes through a small portion of the country near its north-western boundary. In the south-east the Moyola falls into Lough Neagh, and the Lower

Bann from Lough Neagh forms for some distance its eastern boundary with Antrim. The only lake in the county is Lough Finn on the borders of Tyrone, but Lough Neagh, which is included in Antrim, forms for about 6 miles its south-eastern boundary. The valley of the Roe is a line of division between two entirely different geological structures. To the east there is a basaltic tract in all respects similar to that in Antrim, except that on the Londonderry side of the Bann the dip of the strata is reversed and lies north-east. At Benyevenagh, which has an elevation of 1262 feet, the basalt reaches a thickness of 900 feet. It is succeeded by chalk lias, limestone, and red sandstone, the whole resting on primitive rock, The remainder of the county consists chiefly of mica-slate and primitive limestone, and includes the mountain of Sawel, with an elevation of 2236 feet, as well as other eminences approaching 2000 feet in height. Hornblende and granite frequently emerge above the slate, and limestone is not uncommon. Sandstone crops to the surface throughout nearly the whole of the valley of the Roe. Fine rock crystals are found in Finglen, near Dun- given, and in several other districts, Tron was at one time worked at Slieve Gullion, and is obtained in abund- ance in the bogs, There are a few unimportant veins of copper and lead.

Agriculture.—The excessive rainfall and the cold and uncertain climate are unfavourable for agricultural opera- tions, and except in the valleys the soil is unsuitable for tillage. In the basalt region large tracts are partially submerged, and the hard and firm portions consist chiefly of rock. Along the sea-coast there is an extensive district of red clay formed by the decomposition of sandstone, and near the mouth of the Roe there is an extensive tract of a marly nature. Along the valleys the soil is often very fertile, and the elevated districts of the clay-slate region afford rich pasture for sheep.

In 1880 181,289 acres were under tillage, 206,044 were astur 5305 plantation, and 120,451 waste. The total number of toa in the same year was 17,351, of which 1377 were under 1 acre, More than half of the total number were included in those between bs and 15 acres and those between 15 and 30 acres, which numbered 5467 and 4848

respectively. The following table shows the area under the principal crops in 1855 and 1881 —

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Oi: | | Other , Meadow : Whieat.| Oats. 4 Potatoes.| Turnips.| Green| Flax.{ and Total. ve Cereals. ‘ Crops. Clover.

185:| 3,201 {91,990| 2,084 11,451 | 1,454 {11,795 | 20,379 174,337 1881] 1,817 |74,680} 3,102 12,491 | 3,390 |18,939] 38,062 {186,918

The inercase in the area under crops is due chiefly to the increase in that under flax and meadow, although there is an increase in all other crops except wheat and oats,

The number of horses since 1855 has increased very slightly— from 20,331 to 20,749, of which 17,053 were used for agricultural purposes, Cattle in 1855 numbered 102,185, and in 1881 only 96,693, an average of 25 to every 100 acres under cultivation, the average for Ireland being 25°8. The number of milch cows was 39,398. Sheep numbered 29,888 in 1855, and 30,161 in 1881, pigs in the same years numbering 22,828 and 23,946. Goats in 1881 numbered 4666, and poultry 368,436.

According to the latest return, the land in 1873 was divided amongst 2178 proprietors possessing 511,838 acres, with a total annual value of £364,732, the annual value per acre being 14s, 34. Of the owners about 36 per cent. possessed less than 1 acre. As many as 153,419 acres were possessed by the Irish Society and seven of the livery companies of London—the Irish Society possessing 6075 acres; the Drapers’ Company, 27,025; the Fishmongers’, 20,509; the Grocers’, 11,638 ; the Ironinongers’, 12,714; the Mercers’, 21,241; the Salters’, 19,445; and the Skinners’, 34,772. In addition to this Sir H. H. Bruce owned 20,801 acres, S. C. Bruce 18,651, the representatives of T. R. Richardson 18,159, Church Temporalities Commissioners 18,413, C. S. M‘Causland 12,886, and J. B. Beres- ford 10,420.

Manufactures.—The staple manufacture of the county is linen. In 1880 the number of scutching mills was 185. The manufacture of coarse earthenware is also carried on, and there are large distilleries and breweries and some salt-works. There are important fisheries of salmon and eels on the Bann.

failways. —The only railways in the county are those which skirt its northern and western boundary,—the Belfast and Northern Counties line passing by Cookstown and Coleraine to Londonderry, and another line connecting Londonderry with Enniskillen.

Administration and Population.—The county comprises 6 baronics, with 43 parishes and 1202 townlands. It is in the north- west circuit. Assizes are held at Londonderry, and quarter sessions at Coleraine, Londonderry, Magherafelt, and Limavady. Within the county there are 14 petty sessions districts. It includes two poor-law unions and portions of other three. Londonderry is in the Belfast military district and Omagh subdistrict. The county is represented in parliament by two members, and the boroughs of Londonderry (28,947) and Coleraine (6684) by one each. The population of the county, which in 1760 was only 46,182, had increased by 1821 to 198,869, and by 1841 to 222,461, but in 1851 had diminished to 192,269, in 1871 to 173,906, and in 1881 to 164,714, of whom 79,188 were males and 85,576 females, From the Ist May 1851 to 31st December 1881 the number of emigrants was 73,725. For every 1000 of the population the death-rate in 1880 was 19°2, the marriage-rate 4°2, and the birth-rate 23-2,

History and Antigquities.—At an early period the county was inhabited by the O'Cathans, or O'Catrans, who were tributary to the O'Nials or O'Neils. Towards the close of the reign of Elizabeth the county was seized with the purpose of checking the power of the O'Neils, when it received the name of Coleraine, having that town for its capital. In 1609, after the confiscation of the estates of the O'Neils, the citizens of London obtained possession of the towns of Londonderry and Coleraine and adjoining lands, 60 acres out of every 1000 being assigned for church lands, and certain other portions to three native Irish gentlemen. The common council of London undertook to expend £20,000 on its reclaination, and elected a body of twenty-six for its management, who in 1613 were incorporated as the Irish Society, and retained possession of the towns of Londonderry and Coleraine, the remainder of the property being divided among twelve of the great livery companies of the city. Notwithstanding the expenditure of large sums by these companies in its management, their estates were afterwards sequestrated by James I., and in 1637 the charter of the Irish Society was cancelled. Cromwell restored the society to its former position, and Charles II. at the Restoration granted it anew charter, and confirmed the' companies in the possession of

their estates. In the insurrection of 1641 Moneymore was seized by the Irish, and Magherafelt and Bellaghy, then called Vintner's Town, burned, as well as other towns and villages. The most remarkable ancient ruin is that of the Cyclopean fortress of the Giant's Sconce or Ring, situated in the pass between Drumbo and Lar- gantea, the interior of which, 600 feet in diameter, is partly hollowed out of a knoll of basalt, by which it is enclosed on ail Sides except the north-east, where it is defended by a wall of great thickness, with access for only one person in a stoo ing posture. The most remarkable of the Druidical circles is that at Slacht

Manus. There area large number of artificial caves. The most ancient castle of -Irish origin is that of Carrieckreagh ; and of the castles erected by the English those of Dungiven, Salterstown, and Muff are still in good preservation. The old abbey of Dungiven,

founded in 1109, and standing on a rock about 200 fect above tho —

river Roe, is a very picturesque ruin.

LoNDONDERRY, or DERRY, a county of a city, parlia- mentary borough, and the chief town of the county of Londonderry, is situated on an eminence rising abruptly from the west side of the river Foyle to the height of about 120 feet, 4 miles from the junction of the river with Lough Foyle, and 80 miles north-north-west of Belfast. It is still surrounded by an ancient rampart about a mile in circumference and having seven gates, but the buildings now extend considerably beyond this boundary. The sum- init of the hill, which is at the centre of the town, is occupied by a quadrangular area from which the main streets, which for the most part are spacious, diverge at right angles. Some of the original houses with high pyramidal gables remain, but they have been much modernized. The river is crossed by an iron bridge 1200 feet in length. The cathedral in the Later English style, and consisting of nave and aisles separated by pointed arches, with tower and spire at the west end, was completed in 1633 ata cost of £4000, contributed by the city of London. The building is 240 feet in length with a breadth of

62 feet, and the height of the tower and spire is 228 feet. The spire was added in 1788, when the old tower was raised 21 feet, and in 1802 the spire was rebuilt. The bishop's palace, erected in 1716, occupies the site of the abbey founded by Columba. The abbot of this monastery, on being made bishop, erected in 1164 Temple More or the "Great Church," one of the finest buildings in Ireland previous to the Anglo-Norman invasion. The original abbey church was called the ‘‘ Black Church," but both it and the ‘‘Great Church" were demolished in 1600, and their materials used in fortifying the city. There isa large Roman Catholic cathedral. The court-house was completed in 1824 at a cost of about £34,000. For the free grammar school, founded in 1617, a new building was erected in 1814 ata cost of over £14,000. There area uumber of charitable foundations. The staple manufac- ture of the town is linen, and there are also shipbuilding yards, iron-foundries, saw-mills, manure-works, distilleries, breweries, and flour-mills. The salmon fishery on the Foyle is also very valuable. The river affords facilities for a secure and commodious harbour, its greatest depth being 33 feet, with a depth of 12 feet at low water. The port has a considerable coasting trade with Great Britain, exporting agricultural produce and provisions. For the last five years its imports have averaged over £600,000 (chiefly grain and provisions), and its exports, which vary very greatly, over £10,000. In 1880 the number of vessels that entered the port was 1569, with a total tonnage of 335,544, the number that cleared 1452, with a tonnage of 326,178. Londonderry returns one member to parlia- iment, The population of the city, which in 1857 was 19,399, had increased in 1871 to 25,242, and in 1881 to

28,947.

Derry, the original name of Londonderry, is derived from Doire, the ‘‘place of oaks." It owes its origin to the monastery founded by Columba in 546. From the 9th to the 11th century the town was frequently in the possession of the Danes, and was often burned and devastated, but they were finally driven from it by Murtagh O'Brien about the beginning of the 12th century. In 1311 it was granted by Edward II. to Richard de Burgo. After the Irish Society of London obtained possession of it, it was in 1613 ineor- porated under the name

of Londonderry. The fortifications, which were begun in 1600, were completed in 1618 at a cost of nearly £9000. Its charter was confirmed in 1662 by Charles II. From April 18, 1690, the Protestants of the north defended themselves within its walls against James II. until the siege was raised in the following August. See the History by Hempton (1861).

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LONDONDERRY, Rosert STEWART, SECOND Marquis or (1769-1822), better known by his courtesy title of Viscount Castlereagh, which he held until the last year of his life, the statesman who brought about the union with Ireland, who was foreign minister for ten eventful years, who represented England at the congress of Vienna, and who was the recognized leader of the aristocratic and reactionary party which owed its being to the excosses of the French Revolution, was born on June 18, 1769, and was thus one year older than his great rival George Canning. His father, Robert Stewart of Ballylawn in the county of Londonderry, and Mount Stewart in Down, had represented the latter county in two Irish parliaments; and his marriage with Lady Sarah Seymour Conway, daughter of the earl of Hertford, in 1766, had brought him into connexion with many of the great Whig families of England, as did also his second marriage with the eldest daughter of Lord Camden. His elder son, the future minister, was educated at a school in Armagh, and pro- ceeded in 1786 to St John's College, Cambridge. He spent only a single year at the English university, and was on his grand tour through Europe when he was sum- moned home by his father, who had just been created Lord Londonderry in the peerage of Ireland, to stand for the county of Down as the candidate of the smaller landholders against the influence of the marquis of Downshire. The election cost the new Lord Londonderry £60,000, a sum which crippled him for his whole life. But he was success- ful, and the young Stewart entered the Irish parliament as one of the few really independent members who sat there, bound by no ties to a great lord, but the representative of three thousand freeholders of the richest county of the most educated province of Ireland. He joined the opposi- tion, like his father before him, and eagerly pressed for the extension

of the franchise to the Roman Catholics, even going so far, said his enemies later, as to become a con- tributor to the Vorthern Star of Belfast, the organ of the seditious party in Ulster; but the great events of the French Revolution soon showed their influence on his opinions, as on those of most landed proprietors. His thoughts on politics already clearly pointed towards the necessity of a union between England and Ireland, a necessity by this time obvious to all political thinkers and practical politicians. But for the time he held firmly to the popular side, voting for the removal of Catholic dis- abilities, and the right of Irishmen to trade with India. At last, however, Lord Camden came over to Ireland, in March 1795, as lord-lieutenant, with Mr Pelham as his secretary, on a mission to tell the Catholics and reformers that they must expect no further relief and no further reform. He took much notice of his sister's step-son, young Robert Stewart, who was quite willing to be won over from the opposition, and who had in the previous

_year married Lady Emily Hobart, daughter of the late

earl of Buckinghamshire, and near relative of many great political personages. Lord Camden used his influ- ence to obtain for his brother-in-law a viscountcy as Viscount Castlereagh in October 1795, and in the follow- ing August an earldom as earl of Londonderry. In that same August 1796 he made Robert Stewart, who by his father's promotion had become Viscount Castlereagh, keeper of his signet, an honorary post which merely marked his accession to the Government, and in February 1797 acting secretary in the place of Mr Pelham. Taking office at a time when everything was at the height of confusion, Lord Castlereagh soon began to show his splendid ad- ministrative genius, which, indeed, consisted in his "infinite capacity for taking pains" and careful mastery of details. During the rebellion of 1798, when Lord Camden resigned in panic, Castlereagh showed all the qualities of a splendid

minister of police, and heartily co-operated with the wise measures of Lord Cornwallis, by which the rebellion was soon brought to an end.

He was equally useful to Corn- wallis in the second part of his mission to Ireland, namely, the union with England, The measure was to be carricd ; the means were bribery whether in honours or in money. The details of the passage of the measure through the House can be studied in the correspondences of Corn- wallis and Castlereagh, in which appear clearly the utter disgust of Cornwallis at the work he was doing and the country he was in, and Castlereagh's pride in his success- ful manipulation of men. The Union carried (1800), then came the fulfilment of promises made to secure support or disarm opposition, and first in importance those to the Catholics. It was thoroughly understood between Pitt, Cornwallis, and Castlereagh that full rights of citizenship were to be given to the Catholics as a reward for the loyal behaviour of the greater men during the rebellion, and to induce them not to oppose the Union. But the promise was not fulfilled. Pitt had indeed pro- mised to carry the measure; but the king's conscience was worked upon by Lord Loughborough, and to Pitt's surprise and disgust his resignation was accepted, and im- mediately followed by that of the abler half of the cabinet, and necessarily of Cornwallis and Castlereagh. With his resignation ends the first epoch of Castlereagh's political life. On very many occasions in his correspondence Corn- wallis mentions him with warm praise of his ' talents, temper, and judgment," and only qualifies his opinion in one place, when he says, on July 3, 1800, that " Littlehales very much surpasses Lord Castlereagh in the private management of mankind from his good humour and kind attention to everybody." Here Cornwallis touches the greatest political fault of Castlereagh, which destroyed his popularity and ruined his reputation—his want of sympathy for human weaknesses.

Castlereagh was sworn of the English privy council in December 1799, and returned to the first united parliament for the county of Down. He had no intention of per- manently losing office by his advocacy of the Catholic claims, and therefore, instead of going into violent opposi- tion like Canning and others of the late administration, he supported the weak Addington ministry, and in June 1802 was appointed president of the Board of Control. On Pitt's return to power in December 1804 he kept Castlereagh in office, and in 1805 made him

secretary of state for war and the colonies, as well as president of the Board of Control. For the six months he held the war office he was Pitt's right hand in administration, as Canning was in debate. He now prepared a great expedition of thirty thousand men, who were to land in Hanover and make a diversion in northern Germany in favour of the Russians and Austrians. The expedition was too late to be of any use, but it deserves notice as illustrating Castlereagh's favourite idea that England should carry on "grande guerre," which was to appear to a greater extent later. His present tenure of office was but short, for Pitt's Government resigned on his death in J anuary 1806.

When Pitt died, Castlereagh was prime mover in the attempt to make Lord Hawkesbury premier, and when that failed, sooner than give up all hope of place, he declared that he and his friends "looked to" Lord Grenville. Grenville, however, formed his ministry of 'Call the talents" out of the sections which followed Fox, Windham, and Sidmouth. The opposition was led in the House of Commons by Castlereagh and Canning. Now began the close association of these two celebrated men, each of whom hoped to lead the Tory party, and who did So in turn, both Irishmen from the same county of Londonderry, both in the prime of life, and distinguished

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—the one for his surpassing eloquence, the other for his administrative powers. Each rival despised the other: Castlereagh, conscious of his high birth and noble con- nexions, looked down on the son of the actress ; Canning, conscious on his side of his great talents for debate, looked down on the clumsy debater and laborious parliamentary tactician, who looked to governing the country rather by a careful manipulation of boroughs and patronage than by eloquence and statesmanship. Castlereagh again, proud of his position as an ex-cabinet minister, pretended to lead Canning, who had held but inferior posts; while Canning, in his ardent devotion to the memory of Pitt, sneered at the man who had taken a seat in Addington's cabinet. This rivalry was increased almost to personal dislike by the marriage of Castlereagh's sister to the son and heir of that uncle of Canning's,

Paul, in whose favour his own father had been disinherited, and who some years later was made Lord Garvagh. The rivals were not long in opposition, the new ministry resigning in 1807. The duke of Portland formed a new administration on strictly anti-Catholic principles, in which Castlereagh and Canning, both advocates of the Catholic claims, were secretaries of state, the former for war and the colonies, the latter for foreign affairs. During the two years they remained in office together each chafed at the other. The chief events connected with the war office during this tenure of office were the expeditions to Copenhagen, the Penin- sula, and Walcheren. Of the Copenhagen expedition the chief credit or discredit must rest with Canning, but the merits of its execution rest entirely with Lord Castlereagh, who showed himself a war minister far superior to Dundas and Windham, and despatched in perfect secrecy a large military and naval expedition, which was swiftly and entirely successful. On the subject of the Portuguese expedition and the assistance to be afforded to the Spanish insurgents, the two secretaries were of different opinions. Canning sent the Spaniards officers, money, and arms in profusion, but was reluctant to send a great army, while Castlereagh planned the Portuguese expedition, chose Sir A. Wellesley to command it, and deserves the credit of Vimiera. Napier in his Peninsular War proves how wrong Canning was, how impossible it was to organize out of the Spaniards a force able to resist Napoleon, and how right Castlereagh was in believing in the efficacy of a British army. The Walcheren expedition went far utterly to ruin Castlereagh's reputation, and completed the difference between Canning and himself. Yet the conception was good. Castlereagh prepared the expedi- tion with skill and secrecy, though with slight regard for men's lives, as appeared in his choice of the unhealthy island of Walcheren for debarkation, in his refusal to send enough doctors or hospital ships, and in his appointment of Lord Chatham to command in chief. In this appoint- ment of Chatham appears the radical vice of his war administration: he looked before giving a command on active service to parliamentary influence, not tried ability. The failure of the expedition brought about a crisis in the cabinet. In April 1809 Canning had sent in his resigna- tion to the duke of Portland, declaring that he could no longer serve with Castlereagh, but the matter was put off from time to time, and at

length Canning consented to wait till the Walcheren expedition was over. In September he insisted once for all that something must be done, and then for the first time Castlereagh heard that his dismissal had been determined on for some months. He was naturally indignant, and, being unable to challenge Lord Camden, his benefactor, who had really behaved worst to him, or the old duke of Portland, he challenged Canning, who had throughout protested against the manner in which Castlereagh had been treated. On September 21 they met

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on Putney Heath, when Canning was slightly wounded

in the thigh, and Castlereagh had a button shot off his-

coat. After this duel both resigned, and remained out of office two years, but Castlereagh did not intend to remain so, and through the influence of his aunt, old Lady Hertford, with the prince regent he was, after the refusal of Canning, offered the secretaryship of state for foreign affairs in March 1812 in theroom of Lord Wellesley. On Perceval's assassination in May 1812, the leadership of the House of Commons was given to Castlereagh. 'The first ten years of Lord Liverpool's administration were the palmy days of the Tory aristocracy, and during them Lord Castlereagh was the guiding spirit of foreign policy in the cabinet, and the faithful interpreter of Lord Sidmouth's home policy in the House of Commons. Once in power, he perceived that Napoleon must be beaten in Germany, and that, though Lord Wellington's army in Spain must be supported to maintain the credit of English soldiers, and occupy as many French troops as possible, the important point was for the Russian and Prussian monarchs to be joined by the Austrian emperor, and follow up the blow Napoleon had dealt himself in his invasion of Russia. To bring Austria into the field, manage the crown prince of Sweden, maintain the alliance of the great powers and the harmonious work- ing of their armies and policies, Castlereagh gave the

English ambassadors at the courts of Austria, Russia, and |

Prussia, full powers to correspond with each other, and follow the allied forces. The ability with which these instructions were carried out is to be read in the history of the whole campaign of 1813, and of the congresses of Mannheim and Frankfort. When the allies entered France, Castlcreagh himself left England to attend the congress of Chatillon. He remained with armies of the allies, entered Paris with them, and signed the preliminaries of peace. Great was the applause he received on his return from the people, and above all in the House of Commons. The prince regent made him a Knight of the Garter, an honour which had ouly been conferred on two commoners, Sir R. Walpole and Lord North, for tlie last two hundred years, and when the allied sovereigns visited London they treated him with marked favour, so that it was no wonder, when he started to take his seat as British plenipotentiary at the congress of Vienna, he believed himself to be a great diplomatist. That he was mistaken in this was conclu- sively proved by that congress where, as Von Gentz said, England could have done anything, and did nothing. Throughout he supported Metternich, partly because Metternich's nature had mastered him, but more because he had imbibed a blind distrust of Russia. When the return of Napoleon from Elba put an end to the quarrels which were nearly ending in a general war between Prussia and Russia on the one side and England, France, and Austria on the other, and united all parties against him, Castlereagh returned to England, and expressed his confidence in a speedy termination of the new struggle, which indeed was closed at Waterloo. He signed the second peace of Paris on behalf of England, and on his return his father was created marquis of Londonderry. From this time his career can be sketched very shortly. At home the grand harvest of 1815 was followed by very bad ones, and great discontent existed both among the agricultural and manufacturing classes. The Government pursued the same tactics which had in 1793 united nearly all the upper classes in a fever of reaction ; they established a secret committee which declared the existence of a wide- spread conspiracy, and it was often their spies who threw into the meetings of the discontented sufficient politics to make them look like conspiracies. 'The bad feeling existing came to a climax with the Peterloo massacre, and Lord Sidmouth introduced his Six Acts to check a network

of conspiracies which mostly did not exist. Castlereagh had to introduce the Six Acts in the House of Commons, and as usnal spoke of the people with the air of hauteur and contempt which made him so particularly obnoxious to them. His foreign policy during these years was chiefly inspired by a real desire to maintain the peace of Europe, which he believed was only to be preserved by the harmony of all the monarchs and their foreign ministers, and to preserve this harmony he was so loth to differ from them on any subject that it was commonly believed among the people that he had signed the Holy Alliance. At the congress of Aix-la-Chapelle in 1818 it was for this reason that he recommended that France should be freed from the army of occupation. The death of George III. in January 1820 made no difference to Castlereagh, who was greatly in the favour of the new king, and who had no difficulty in supporting the Bill of Pains and Penalties against the queen. Scarcely was the excitement of the queen's trial and the king's coronation over, when Lord Loudonderry, for he had succeeded to that title in this very year, accompanied the king to Hanover in October 1821 to discuss the revolutions in Greece and Spain with The interviews which then took place are fully described in Metternich's Autobiography (vol. iii. pp. 552-560), and exhibit clearly the paramount influence of Metternich over Lord Londonderry, whom he persuaded to take part in a congress at Verona in the following year. While he was making preparations to start, he became possessed by many strange delusions, which clearly indicated that his mind was unhinged by over work, as it had been once before after the passing of the Union with Ireland. This soon became obvious to every one; the king noticed it; and the duke of Wellington sent a physician down to Foots Cray to see him. The doctor found him suffering from melancholia, and ordered his razors to be taken away, but in spite of all precautions he procured a penknife and committed suicide on August 12,1822. His body was conveyed to London to be buried in Westminster Abbey, and just as it was being lowered into the grave a cry of exultant hatred arose from that rabble he had so despised.

Castlereagh's character illustrates the strange difference which in corrupt times can exist between public and private morality. In private life he was a strictly honourable and affectionate man; he was a good husband, a good son, a good brother, and a good master ; but even in his private relations that want of warmth which made Cornwallis declare he was utterly unlike an Irishman, and Wilberforce liken him to a fish, seems to have existed, and seems to have been part of his temperament. In public life he played quite a different part, and, though he had one or two firm political principles, as appears in his steady advocacy of Catholic emancipation, he seems as a rule to have regarded politics as a game, in which all means were fair to win, and very extraordinary some of his mcans appear to be, Though a very bad and confused speaker, he was very successful as a parliamentary leader, from the care with which he used his patronage, and the amount of votes he won by it. While not a great diplomatist, as the mastery Metternich obtained over him clearly proved, as an administrator he deserves the highest praise, steadily punctual to his work, never allowing arrears to accumulate, and never neglecting a detail; but his parlia- mentary necessities stood in his way: every appointment was given from a party point of view, and if, as in the case of Sir A. Wellesley, chance sometimes led him right, jobbing more often led him wrong. But the chief interest which centres in Lord Londonderry is that he was the last leader of an extinct class. The old aristocrats who lived by politics, and thought all means fair in politics, are gone

for ever, and with Londonderry's death the unnatural tension of the reaction from the excesses of the French Revolution ceased, and modern Conservatism, containing indeed many prejudices and an exaggerated admiration for what is fixed, came into being with its real sympathy for all mankind, which the old Tories, and more especially Lord Londonderry, would have despised.

The best materials for studying Londonderry's life and opinions are his Despatches edited by his brother, the third marquis, in 12 volumes. They are, however, very ineomplete from the loss of the most valuable

at sea in the wreek of the ship which was taking Mr Turner, Lord Londonderry's chosen biographer, to India. The Cornwallis Correspondence for his Irish work, and the supplemen- tary Wellington Despatches should also be used. Alison's Lives-of Lord Castlereagh and Sir Charles Stewart are interesting reading, but abound with that eclebrated author's usual faults, and should be corrected by Walpole's History of England from 1815. Of con- temporary diaries, Rose's, Lord Colchester's, Romilly's, and Wilber- foree's with Pellew's Life of Lord Sidmouth, should be consulted, and Metternieh's Autobiography for the later foreign policy. Mr Thorn- tou has-a short biography in his Lives of the Forcign Secretaries from 1800, which is chiefly valuable from his aceess to the nnpublished memoranda of Lord Bexley, who as Mr Vansittart was chancellor of the exchequer, and helped to lead the Commons from 1812 to 1822. (H. M. 8.)

LONG, Grorcg, an English scholar (1800-1879), was born at Poulton in Lancashire, on the 4th of November 1800. From Macclesfield grammar school he went to Trinity College, Cambridge, in 1818. He was elected Craven university scholar in 1821, together with Lord Macaulay and Professor Malden, took his degree in 1822 as wrangler and senior chancellor's medallist, and the next year gained a fellowship over the heads of his two distin- guished rivals. In 1824 Long went out to be professor of ancient languages in the new university of Virginia. 'There he married his first wife, the widow of Colonel Selden. In 1828 he returned to England to accept the Greek professorship in the newly-founded university of London. His introductory lecture in 1828 was followed in 1830 by another entitled Observations on the Study of the Latin and Greek Languages. The etymological appendix to this lecture is of interest in the history of classical philology in England, as illustrating the scientific com- parative method of teaching the Greek and Latin languages first adopted in the London university by himself and his colleague, Professor Key. He published a Summary of Herodotus (1829), and editions of Herodotus (1830-33) and Xenophon's Anabasis (1831). He was one of the founders of the Royal Geographical Society in 1830, and was for twenty years a member of the council, or officer of the society; in the same year he joined the committee of the Society for the

Diffusion of Useful Knowledge, and was till 1846, when the society was dissolved, one of its most active workers, In 1831 he resigned his professorship and became editor of the society's Quarterly Journal of Education (1831-35), for which he wrote many articles. He wrote for the society's Library of Entertaining Knowledge the two volumes of 7he Britsh Museum: Egyptian Antiquities (1832-36), and edited, improved, and wrote parts of the companion volumes Lilgin and Phigaleian Marbles (1833) and Townley Marbles (1836). He plauned and edited for the Library of Useful Knowledge a Geography of America and the West. Indies (1841), of which he wrote a small part, anda Geography of Great Britain: Part I. England and Wales, part of which he also wrote himself. He contributed two maps of Egypt and Persia, ancient and modern, to the society's Atlas (1831), From 1833 to 1846 he was engaged on the great labour of his life, the editing of the twenty-nine volumes of the Penny Cyclopedia, to which he was also an extensive contributor of articles. The committee appointed Long and Charles Knight editors, but after the publication of a few numbers Knight took no part in the superintend-

ence of the work, and all the editorial labour was done by Long.

A more colossal and the final venture of the society was its Biographical Dictionary, of which Long was also ap- pointed editor. He wrote numerous articles in the seven volumes which appeared (1842-44), but the great expense did not allow it to proceed beyond the letter A. Long was also a member of the committee of the Society for Central Education, instituted in London in 1837, and con- tributed two essays to its Second and Third Publications (1838-39). In 1837 he was called to the bar at the Inner Temple. He accepted in 1842 the professorship of Latin in University College, vacated by his friend Mr Key, which he resigned in 1846, on being appointed by the benchers of the Middle Temple their reader on jurisprudence and thie civil law. Zwo Discourses delivered in the Middle Temple Hall, with an Outline of the Course, were published in 1847. He wrote all the articles on Roman law in the Dictionary of Greek and Roman Antiquities, edited

by Dr William Smith (1842), and contributed also to the companion Dictionarres of Biography (1844-49) and Geography (1854— 57). His translation of thirteen of Plutarch's Lives, with copious notes, first came out in five of Knight's weekly volumes under the title of Zhe Civil Wars of Rome (1844- 48). He planned and edited Knight's Polttical Dictionary (1845-46), a revision of articles from the Peany Cyclo- pedia. Knight published in parts his story of France and its Revolutions, 1789-1848 (1850).

In 1849 he left London and went to Brighton College, where he was classical lecturer until midsummer 1871. He was an excellent teacher, and was beloved by both masters and pupils. Whilst-here he edited, at first jointly with the Rev. A. J. Macleane, and after that gentleman's death

'by himself, the Bibliotheca Classica series, to which he

himself contributed the edition of Cicero's Orations (1851- 62), a task for which his legal knowledge eminently quali- fied him. He also revised, making many corrections and additions, Macleane's editions of Juvenal and Persius (1867) and Horace (1869). He made for Bell's Grammar School Classics editions, with introductions and notes, of Cicero's De Senectute and De Amicitia, with a selection from his Fpistole (1850), Ceesar's Gallic War (1853), and Sallust's Catilina and Jugurtha (1860). He also edited an Atlas of Classical Geography (1854). His translation of the Thoughts of the Emperor M. Aurelius Antoninus was pub- lished in 1862. The same year appeared anonymously the amusing and instructive little volume called An Old Man's Thoughts about Many Things. He was sixty-four when he issued the first of the five large octavo volumes of his Decline of the Roman Republic. In 1871 he resigned his post at Brighton College, and retired to Portfield, Chichester, to take a rest well-earned but from labours ill-rewarded. In 1873 the Queen, on the recommendation of Mr Gladstone, granted him a pension of £100 a year. At Portfield he completed his Roman Jlistory (1874), and translated 7'he Discourses of Epictetus, with the Encheiridion and Frag- ments (1877). This was

the last work of his laborious and useful life. He died after a long aud painful illness on the 10th of August 1879.

In addition to the works already noticed, Long was the author of two papers in the Journal of the Royal Geographical Society, a few in the early numbers of the Penny Magazine, and several in the Classical Muscwm and English Journal of Education. He also wrote on "'Grammar Sehools," in Knight's Store of Knowledge.

Long has exereiscd by his writings, and indirectly through some of his London university pupils, a wide influence on the teaching of the Greek and Latin languages in England. The pub- lieation of the Bibliotheca Classica (begun in 1851) did tmportant serviee, and set English seholars an excellent example, at a time when editions with English notes containing aceurate learning

and sound seholarship were, with very few exceptions, not to be found, Some of the volumes of this series still remain the standard

English editions. In the knowledge of Roman law Long stood by 'himself amongst English scholars, and his well-known articles on that subject were the first valuable contribution to the study from any English writer. He had also a profound knowledge of ancient geography. He was an excellent French, German, and Italian scholar, and also read Spanish. His extensive and accurate learning may be explained from the combination of a tenacious memory with a clear judicial intellect. His character was as ele- vated as his intellect. Its simplicity and manly independence may be seen partly in his writings. His faculty for discriminating evidence and his strong common sense appear in everything that he wrote. (H. J. M.)

LONG BRANCH, a fashionable seaside resort of the United States, in Ocean township, Monmouth county, New Jersey. 'The old village lies about a mile inland, but the watering-place proper is for the most part situated on the bluffs and plateau immediately above the beach. The bathing-grounds are excellent; there are fine drives along the beach in

the vicinity ; upwards of twenty thou- sand. visitors can find accommodation in the hotels alone, of which there are no less than thirty-three ; and there are besides hundreds of private residences occupied mainly by the wealthier classes from New York and Philadelphia. Since 1874 it can be reached directly from New York both by railway and by steamers. Long Branch has a corporation of seven commissioners. Its permanent popu- lation in 1880 was 3833, in 1882 about 5000. ©

LONGEVITY is a term that may be applied to express either the length or duration of life of any organism, or the prolongation of life toan advanced age. ‘The first meaning is the more scientific of the two, as it may be applied to the duration of the life of any organism, although that duration may be relatively short ; thus, we may contrast the longevity of the mould which lives only a few hours with that of the forest tree which has survived for centuries, or the longevity of the ephemeral insect with that of an eagle or a swan, whose lives may be prolonged to over a century. On the other hand, the second meaning is the more common, as when an instance of very advanced age is spoken of as an example of great longevity.

The information we possess as to the natural duration of life of the lower forms of plants and animals is very meagre, and it can scarcely be asserted that in all there is a natural period of life. A simpleorganism composed of cells, or even one more complicated but still having the organs necessary to life constructed upon a simple type, may continue to live and grow so long as external conditions are favourable. There may be no tendency to decay of tissue inherent in the organism, so that life may be prolonged until a change in external conditions, quickly or slowly, so affects the processes of nutrition as to make the continuance of life impossible beyond a certain time. It is also highly probable that in both the animal and vegetable worlds comparatively few individuals are permitted to live undisturbed for a sufficient length of time to allow any inherent tendencies to decay to show themselves. In the struggle for existence few individuals even reach maturity ; at an early period they are used to support the lives of other and perhaps stronger organisms.

Excluding the lower forms of plants, as to the duration of whose lives we know nothing, the higher plants may be classed, according to duration of life, as follows :—annuals, or semi-annuals, which grow up in spring and die in autumn ; béennials, which die at the end of the second year ; and perennials, the duration of which may last from four to thousands of years. Succulent plants have a short life, lasting only one or two years ; the formation of wood is necessary for prolonged vegetable existence. It has been pointed out that strongly scented plants have often a longer duration of life than those destitute of smell. Thus thyme, mint, hyssop, marjoram, sage, &c., can live for two years or longer ; whilst lettuce, wheat, oats, barley, live no more

than a year. Trees of rapid growth, such as fir, birch, horse-chestnut, form soft wood, and have a comparatively short life; whilst hard-wood trees, such as the oak, grow slowly and live long. It is not, however, an invariable rule that trees yielding hard wood live longest. The beech, cypress, Juniper, walnut, and pear all form hard wood, but they do not live so long as the lime, which forms a softer wood. ‘Trees which are long in producing leaves and fruit, and which also retain these for a long time, live longer than those in which these changes occur quickly. Fruit- bearing trees, producing a sour harsh fruit in the wild state, have longer lives than those bearing sweet fruits in the cultivated state. By skilful pruning, or lopping off the branches and buds, the term of life of even short-lived plants may be lengthened.

According to Hufeland, the chance any plant has of attaining a great age depends on the following conditions : —(1) it must grow slowly; (2) it must propagate slowly and late in life; (3) it must have a certain degree of solidity and hardness in its organs, a sufficiency of wood, and the sap must not be too watery ; (4) it must be large and have a considerable extent of surface ; and (5) it must rise into the atmosphere. If we view a tree as consisting of an enormous number of buds clustered on a conimon stem in which the vessels or channels for the circulation of the sap remain pervious, and in which also new wood is formed annually, there seems to be no limit to age, provided external

conditions are favourable. Many large trees have reached a vast age, as shown by the following table compiled by De Candolle :—

Years. Years. Elm (Ulimus campestrts)..o…ccrsoeeee 835 | Oriental plane (Platanus orientalis) 720 Cypress (Cupressus sempervirens).. 850 | Cedar (Cedris Libant).....ccccrseseers 800 Cheirostemon platanoides …....se006 400 | Lime (Tilia europea)... 1076-1147 UV VACHCCOPA LEIA ie seen cece ses vcss.0<5 Ue Oak (Quercus Robur) ... 810, Hi pe Larch (Larix europxa) ..... OD ; , 145 Giacinte (Castanea VESCA) ...0.0…008 600 Yew (Taxus baccata) ..».... { 2588, 2880 . Orange (Citrus Aurantium) ..... 630 | Taxrodium distichum….ccccceee 3000-4000 Palms (Ceroxylon and Cocos)... 600-700 | Baobob (Adansonia digitata) or… 5000 Olive (Olea CUrOPiHd) .oecccesesevesceees 700

In the animal kingdom there is great variety as regards the duration of life, but no accurate data have yet been collected. Certain Jnfusoria have keen watched during the whole period of their existence, which has not lasted more than forty-eight hours; on the other hand, Actinix, or sea anemones, may live to a long age, as shown by the case of a specimen of Actinia mesembryanthemum, still alive in Edinburgh, which belonged to Sir John Dalyell, and which must be at least about seventy years of age. It is highly probable that cold-blooded animals, such as fishes, frogs, toads, in which tissue-changes go on with extreme slowness, especially during a period of muscular inactivity, may live for many years. In the imperial fish-ponds of ancient Rome lampreys were said to have attained their sixtieth year ; pike and carp have been ascertained to live a hundred and fifty years; tortoises have reached the age of one hundred years ; and it is alleged by natives of India that the crocodile may live for at least a hundred years, and that there seems to be no limit to its time of growth. Many birds have a long period of life. Eagles and crows have been known to live a hundred years, and parrots have been kept in confinement for sixty years. Peacocks attain an age of twenty years; barn-door fowls live for a much shorter period, from six to twelve years. Small birds seem to have shorter lives than large ones. Blackbirds, gold- finches, and canaries have been known to live for twenty years ; but many of the smaller birds attain an age of only five or six years.

Amongst mammals, the elephant is supposed to attain the greatest ‘age, reaching above a hundred years; the camel generally lives to fifty years, and may live to eighty ; the horse does not live more than forty years; the deer, thirty years; the ox, fifteen to twenty years ; sheep, goats,

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foxes, hares, rabbits, from seven to ten years ; and dogs and pigs from fifteen to twenty years Certain general state- ments may be made, which do not deserve to be termed laws, but which briefly express relations that undoubtedly exist in many cases between the degree of longevity enjoyed by any species of animal and the conditions of its existence.

1. A relation can often be traced between the duration of life and the time of the development of the animal zn utero. To this statement there are many exceptions, as will be apparent from the following table, in which the periods of gestation are given on the authority of Professor Owen (Comp. Anat. and Phys. of Vertebrates, vol iii.) :—

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38 «| SS ul | npevtt

348 2! Longevity 38 2 Longevity SS o

= 2 Q| in Years. Name. 3 @A| in Years.

aos aos

Marmoset….s0. +000 Lemur albifrons…

Not known.

15-20 56 15-20

Not known. Not known.

seoeee

evecec cccceess LOY fF DU — |t UD ccoacccessccccecccoce

eeccceses

Fallow Deer …. Hippopotamus ….

NOCLUA) os. .000e Krangaroo …....-.+

In the case of birds no relation of this kind can be discovered. For times of incubation of many birds see Owen, op. cit., vol. ii. p. 257.

2. It would appear that the sooner a being attains maturity the sooner it propagates, and the shorter will be the duration of its life. The reproductive act may be regarded as the culminating act of the organism, requiring the highest degree of vitality, and involving the largest expenditure of energy. This act will therefore be performed when the organism has reached maturity ; in some cases the animal reaches maturity late, in other cases early ; but in all the epoch of maturity may be taken as about a fifth part of the whole duration of life. Thus the elephant and the human being do not reach maturity till say the twentieth year, and the period of longevity is about a hundred years ; the horse, ass, and bull are mature in the third or fourth year, and live from fifteen to twenty years ; sheep come to maturity in the second year, and live from eight to ten years; whilst rabbits and guinea pigs are mature within one year, and live only from four to five years, Here again there are exceptions, as, for example, the cat is mature before the end of the first year, and still it may live to the age of twenty years. Much information is still required on these points before a law can be formulated.

The question of longevity, however, probably presents the greatest interest in its relation to man. It is still a popular belief that the earliest inhabitants of the world possessed an incredible strength, were of an enormous size, and lived to a very great age ; and the ages of the

patriarchs before the flood are often taken literally, although the con- ditions making such long lives possible are at variance with those of human existence at the present day. In ancient history there are instances given of heroes who attained the age of several hundred years, but these must be regarded as mythical. For an interesting account of these, see Hufeland's Art of Prolonging Life, p. 62 sq.

The following are a few instances of extreme longevity which have been placed on record :—Margaret Patten 137 ; the countess of Desmond, 145; Thomas Parr, 159 – Thomas Damme, 154; John Rovin, 172; and ' Peter Torton, 185. There can be little doubt that the ages of these persons have been much exaggerated. They lived at a time when no accurate chronological records were kept, and when it was the habit to fix the dates of occur- rences by comparing them in the memory with other events believed to have happened about the same time. Thus

there were many sources of fallacy, although the narrators no doubt believed their statements to be quite accurate. Still these were instances of prolongation of human life far beyond the usual limits, and there is no reason for doubting that they all lived till they were upwards of a hundred years of age.

Perhaps the best authenticated instance of this kind is that of the famous Thomas Parr of Shropshire. '' He was a poor far- mer's servant, and obliged to maintain himself by daily labour. When above one hundred and twenty years of age he married a widow for his second wife, who lived with him twelve years, and who asserted that during that time he never betrayed any signs of infirmity of age. Till his one hundred and thirtieth year he per- formed all his usual work, and was accustomed even to thresh. Some years before his death his eyes and memory began to fail, but his hearing and senses continued sound to the last. In his one hundred and fifty-second year his fame had reached London ; and, as the king was desirous of seeing so great a rarity, he was induced to take a journey thither. This, in all probability, shortened his existence, which he otherwise might have

preserved some years longer ; for he was treated at court in so royal a manner, and his mode of living was so totally changed that he died soon after, at London, in 1635. He was one hundred and fifty-two years and nine mouths old, and had lived under nine kings of England. What was most remarkable in regard to this man is that, when his body was opened by Dr Harvey (the discoverer of the circulation of the blood), his internal organs were found to be in the most perfect state, nor was the least symptom of decay to be discovered in them. His cartilages even were not ossified, as is the case in all old people. The smallest cause of death had not yet scttled in his body ; and he died merely of a plethora, because he had been too well treated." — Hufeland, p. 71.

The late Sir George Cornewall Lewis attempted to show that all such narratives were so inaccurate as to reduce the ages of the parties to something under a hundred years, and he was disposed to think that there had been no instance of a human being attaining the age of a hundred years. But subsequent cases have shown that a few have attained that great age. In these cases the evidence has not been of a collateral kind, nor has it depended on human memory, but it has been established by written records. Scarcely a year passes without instances occurring in which the evidence that the deceased attained a hundred years cannot be controverted, and there is no doubt that, when a sufficient time from the beginning of the system of registration of births has elapsed, such cases will be more common.

The average duration of life in Europe is about thirty- four years. It oscillates between 28°18 years (Prussia) and 39°8 years (Schleswig-Holstein, Lauenburg). In Naples it is quoted at 31:65 years. This falls far short of the possible longevity, a circumstance chiefly to be accounted for by the great mortality in the early years of life. According to De Quatrefages, the duration of life is almost universally the same amongst the best known peoples. Laplanders live to a great age, men of from seventy to ninety years of age being commou among them. The American Indians have apparently as long a life, on the average, as the white men living in the same locality. It would appear to be the same in the case of the negro. Prichard quotes from an

official document of the State of New Jersey, showing that the census gave one negro centenarian in the 1000, but ouly one white centenarian in 150,000 ; on the other hand, the negro of the Senegal ages early, aud does not live long. In his native place he is exposed to unhealthy influences which tell upon him, although he resists the bad effects of these longer and better than the white man; but when he is transplanted to America he enjoys a longer life.

The manner of life and nature of the occupation, apart from hereditary and special causes, have a most important influence on the duration of life. Few emperors or kings have attained the age of eighty ; and, of more than three hundred popes, only six have exceeded the age of eighty. It

would seem that brain work is not unfavourable to longevity. It is almost proverbial that statesmen and judges often reach an advanced age. Many men famous in literature and science have lived to an old age. Thus from fifty to sixty we have Tasso, Virgil, Shakespeare, Moliére, Dante, Pope, Ovid, Horace, Racine, Demosthenes ; from sixty to seventy, Lavater, Galvani, Boccaccio, Fenelon, Aristotle, Cuvier, Milton, Rousseau, Erasmus, seventy to eighty, Dryden, Petrarch, Linneus, Locke, Handel, Galileo, Swift, Roger Bacon, Charles Darwin ; from eighty to ninety, Thomas Carlyle, Young, Plato, Buffon, Goethe, Franklin, Sir W. Herschel, Newton, Vol- taire, Halley; and from ninety to one hundred, Sophocles, Leeuwenhoek, Michelangelo, Titian. Physicians are often long lived: Boerhaave, Haller, Gall, Darwin, Van Swieten, Fallopius, Jenner, Cullen, Galen, and Spallanzani died between seventy and eighty years of age, and Harvey, Duhamel, Pinel, Morgagni, Heberden, and Ruysch be- tween eighty and ninety; whilst the father of medicine, Hippocrates, is credited with one hundred and nine years.

A valuable set of statistics have been collected by Hirt (Die Krankheiten der Arbeiter) regarding the influence of trades on longevity. An abstract of these will be found in Buck’s Hygiene and Public Health, vol. ii. pp. 71, 72.

The best indication of longevity in a community is given by the expectation of life from any given age. It is obtained by adding together the number of years which the entire population live from any specified age, and dividing the resulting total “years of life” by the number living at the year of age for which the expectation of life is desired (Lnglish Life Table, p. xxxili). Thus we may find the duration of the portion of human life which an individual at any age may expect to enjoy. Such calcula- tions are of great value in connexion with assurance, and indeed in all pecuniary transactions in which the value of life contingencies are taken into account. They are the bases of all systems of life assurance. Life assurance companies have now been able to collect sufficient numbers of cases of their own experience on which to find trust- worthy calculations showing the expectation of life at different ages. Such tables have really been compiled from selected cases, namely, from those who have assured, and consequently differ somewhat from those compiled on the broader data obtained from the whole population. The following table, derived from both sources of informa- tion, is given briefly to indicate the expectation of life, or the longevity, from various ages, reference being made for details to the article Insurance. The table to be read thus: a person at thirty years of age has an average expectation of living 33°3 years longer, or of attaining the age of 63:3 years.

Combined i | Combined Ages nh Pepamionsect | Ages. earns. a | Hane eo! : me i re = nglis

Farr, 1838-54. ‘Offices, 1843. Farr, 1838-54. Offices 1843. To | 40-9 = | 6 | Ges 13°77 10 47°4 48°36 || 70 Sif 8°54 20 39°9 41°49 | 80 Sil 4°78 30 33°3 34°43 90 29 PIL 40 26.7 27°28 95 2°2 1:28

: 20°18

What are the physiological conditions in the human being that determine longevity ? In the first place, there is the influence of heredity. Certain peculiarities of tissue are transmitted from parent to offspring that determine whether or not the tissue will remain for a lengthened period of time in a normal condition, or whether it will quickly yield to external influences and take on an abnormal action. As

the life of the body is really the sum of the lives of its constituent parts, or in other words,

Cervantes; from |

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of the cellular elements composing it, it is evident that

‘anything affecting the healthy action of these elements

will affect the life of the body as a whole. In some individuals the tissues have what may be termed a hereditary taint, by which is meant a want of stability, so that they pass readily from a normal into an abnormal condition ; and this is unfavourable to longevity.

In the next place, even healthy tissues capable of resist- ing ordinary influences, may be unable to resist long- continued unfavourable conditions. In course of time slow changes begin in the tissue ; these in turn affect the organ in which the tissue exists, and the organ, by improperly performing its functions, injures the organism. Thus it is that habitually breathing an impure atmosphere, eating improper food, saturating the body with drugs or with alcohol, over-exerting the nervous system by excitement or prolonged brain-work or worry, and sexual excesses de- bilitate the body by working slow but sure changes in the tissues which will inevitably tell upon the longevity of the individual.

But even in the most favourable conditions there seems to be a limitation to the healthy action of tissues, and old age comes on. Whether this is or is not the result of long hereditary transmission it is not of much practical import- ance to ask, as it isa state of things all flesh is heir to. But, if it be hereditary, as is highly probable, there is the satisfaction of knowing that hereditary states can be slowly

influenced by individuals living in the best possible con- ditions and transmitting the influences of good moral and physical hygiene. If bad hereditary qualities are trans- mitted, good qualities have even a better chance of being perpetuated, as they favour the individual in the struggle for existence. Thus a race which has a low degree of longevity may acquire, by persistent attempts to live in the best conditions, a long average duration of life. This is also true, though to a less extent, of an individual life.

Fach tissue has a life of its own; it is developed, reaches maturity, declines, and dies. It may be replaced by successive generations of similar tissues, but the power of reproduction of tissue becomes weakened, and by slow degrees the tissue may disappear, or it may become so altered as to be quite unlike what it was at first. By these tissue-changes functional changes of great importance to the body are brought about. Thus, as age comes on, the blood becomes poorer ; respiration is less active; the vital capacity of the chest, that is the working-quantity of air, is diminished ; the temperature of the body is slightly increased, so that the aged are more sensitive to cold ; the digestive organs are less vigorous ; the walls of, the arteries become hardened by earthy matter, and lose their elasticity ; the veins become dilated, and the circulation is not efficiently performed ; the teeth decay and disappear ; the cartilages become calcified and hard ; the skin is shrivelled and dry, and cutaneous respiration and excretion are less perfect ; the hair whitens or falls off; the stature and the weight diminish. By and by muscular movements are less energetic and less precise ; the hands tremble and the head shakes ; and there is a tottering gait. The cartilages of the larynx ossify, the vocal cords lose their elasticity, and the voice becomes a shrill treble. Then the involuntary muscular tissues are affected so that the bladder is less powerful and defecation is feeble. The transparent media of the eye become dimmed, the near point of vision is pushed back so that the old man becomes presbyopic, or far-sighted, and the power of accommodation, or focussing of the eye, is entirely lost ; the delicate mechanism of the drum and bones of the ear is impaired, so that deafness results ; and even touch becomes less delicate. Slowly the

intellectual faculties become weakened, the emotions are blunted, and the memory becomes by degrees less

trustworthy, and at last vanishes. Much of the time is | France, Italy, Spain, Germany, Holland, or ne now spent in sleep, and unless some intercurrent disease learning languages, for which he had ae “ = e snaps the thread of life there is a slow ebbing of existence drinking in the spirit of the history and life o these into natural death. Essentially these phenomena are due | countries. For an American, while still in a “plastic state, to delicate changes in the tissues, visible only with the | to spend much time in Europe is a doubtful and, not aid of the microscope. These changes are those of wasting | unfrequently, a disastrous experiment, unfitting him for a or atrophy, meaning a failure of nutrition, or fatty changes, | useful, contented life in his own country. The effect of or those caused by infiltration into the tissue of earthy Longfellow’s visit was twofold. On the one hand, it matter, which soon destroys its healthy functions. widened his sympathies, gave him confidence in himself, Literature.—Elliotson, Human Physiology; Wufeland, Art of | and supplied him with many poetical thenies ; on the Prolonging Life; P. Flourens, De la Longévité Humaine, et de | other, it traditionalized his mind, coloured for lim the Ue Cuan Eee ie ae gee: | ee eg ey eis, ol. of pure light of nature, and rendered him in some measure > : OW 3 «6 ° . eee: Romine ioe aie Health a age, by a Physician, | Unfit to feel or express the spirit of American nature and London, 1829; Sir G. Cornewall Lewis’s Letters; Thoms, On Lon- | life. His sojourn in Europe fell exactly in the time when, gevity. (J. GM.) | in England, the reaction against the sentimental atheism of Shelley, the pagan sensitivity of Keats, and the sublime,

HENRY WADSWORTH LONGFELLOW. Satanic outcastness of Byron was at its height ; when, in

Copyright, 1882, by Thomas Davidson. the Catholic countries, the negative exaggerations of the

aT _| French Revolution were inducing a counter current of (ile cen ee aay ye ne ite an (ee positive faith, which threw men into the arms of a half-

. i 1 half-ssthetic medievalism; and when, in on the 27th February 1807, at Portland, now the capita] | S°otimenta. . : ; 2 ?, OF WeBiage of Maths to which bis ancestor, William | Germany, the aristocratic paganism of Goethe was being Longfellow, immigrated, in 1678, from English Hamp- swept aside by that tide of dutiful, romantic patriotism shire. His father was Stephen Longfellow, a lawyer and which flooded the country, as soon as it began to feel that United States congressman, and his mother, Zilpha Wads- | 1% still existed atter ae nan semen bye Nee oleon's i worth, a descendant of John Alden and of "Priscilla, the | Chariot. When, in 1829, he returned to assume his duties Purina maiden" / at Bowdoin College, he saw the world and man no longer

Longfellow's external life presents little that is of | 2 the clear effulgence of nature, but in the subdued and stirring interest. It is the life of a mod est, deep-hearted tinted light that comes through painted cathedral windows,

crema, whons Mghe ambition waste a peas [oF 0 fhe relsad nays that fll trom sommumbul man, and, through sympathy and love, to he p others to a ° . ' be the same. His boyhood was spent mostly in his native a Pe ee ie pes ae = P cancer game toi town, which he never ceased to love, and whose beautiful fir ; a TaeGl ° f i f ne pee i sammening itp Ye has debe io hs | i smal volume of randains rem the Soi em ost Youth. ere he grew up in m : of faa ae peace, which was but sie Brean, and that poetry of Spain, and then part of Outre-Mer, a youthfully an event which made a deep impression on him—the war | Pullient work, for which a fitting title would have been of 1812. He never forgot "Poetry and Truth from my Travels." The latter con- 'the sea-fight far away, tained some translations from the French, and was com- How it thundered o'er the tide, pleted in 1835. And the dead captains as they lay In 1835 Longfellow was chosen to succeed George In tee pile ae tranquil bay, Ticknor as professor of modern languages and belles- Bite ae ee ee' ed: lettres in Harvard College, Cambridge,

Mass., the oldest e “tranquil bay” is Casco Bay, one of the most | and most illustrious institution of higher learning in the beautiful in the world, studded with bold, green islands, | country. On receiving this appointment, he paid a second well fitted to be the Hesperides of a poet’s boyish dreams. | visit of some fifteen months to Europe, this time devot- ra early age of fourteen Longfellow entered Bowdoin ing special attention to the Scandinavian countries and ; ire at Brunswick, a town situated near the romantic | Switzerland. During this visit he lost his wife, who died alls of the Androscoggin river, about 25 miles from | at Rotterdam, November 29, 1835. The poet speaks of Portland, and in a region full of Indian scenery and | her in “ Footsteps of Angels” as legend. Here he had aniong his classfellows Nathaniel ‘‘the Being Beauteous Hawthorne, George B. Cheever, and J. 5. O Abbott. Who unto my youth aeeyeen, During the latter years of his college life he contributed to More than all things else to love me, And is now a saint in heaven.”

On his return to America in 1836, Longfellow took up his residence in Cambridge, and began to lecture and write. In his new home he found himself amid surroundings entirely congenial to him. Indeed, there are few places in the world which a man of learning, refinement, sociability, and liberal views would rather choose for a residence than Cambridge. Its spaciousness and free rural aspect, its old graveyards and towering elms, its great university, its cultivated society, for admission to which unabsorbed wealth is a positive disqualification, and its vicinity to humane, substantial, busy Boston, are all attractions for sucha man. In 1837~38 several essays of Longfellow’s appeared in the North American Review, and in 1839 he published Hyperion, and his first volume of original poetry, entitled Voices of the Night. The former, a poetical account of his travels, had, at the time of its

1825, at the age of eighteen, with honours, among others

better to qualify himself for this appointment, he came to Europe and Spent three years and a half travelling in

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publication, an immense popularity, due mainly to its sentimental romanticism. At present few persons beyond their teens would care to read it through, so unnatural and stilted is its language, so thin its material, and so con- sciously mediated its sentiment. Nevertheless it has a certain historical importance, for two reasons—(1) because it marks that period in Longfellow's career when, though he had left nature, he had not yet found art, and (2) because it opened the sluices through which the flood of German sentimental poetry flowed into the United States —a flood whose waters, after forty years, are not yet assuaged. The Vovces of the Night contains some of his best minor 'poems, ¢g., "The Psalm of Life" and '"' Footsteps of Angels." In 1841 Longfellow published a small volume of Lallads and other Poems, containing some of his most popular pieces, ¢eg., "The Skeleton in Armour," "The Wreck of the Hesperus," ''The Village Blacksmith," "To a Child," '"'The Bridge," '" Excelsior." In 1842 he paid a third brief visit to Europe, spending the summer on the Rhine. During his return-passage across the Atlantic he wrote his Poems on Slavery, which he published the same year, with a dedication to Channing. These poems went far to wake in the youth of New Eng- land a sense of the great national wrong, and to prepare them for that bitter struggle in which it was wiped out at the expense of the lives of so many of them. In 1843 he married again, choosing this time Miss Frances E. Appleton of Boston, a daughter of Hon. Nathan Appleton, one of the founders of Loweii, and a sister of Thomas G. Appleton, himself no mean poet.

About the same time he bought, and fixed his resi- dence in, the house in which he had formerly only been a lodger, an old "revolutionary house," built about the beginning of last century, and occupied by General Washington at the time when he took command of the United States army in 1776. This quaint old wooden house, which stands in the midst of a large garden full of splendid elms, continued to be his chief residence till the day of his death. Of the lectures on Dante which he delivered about this time, James Russell Lowell says :— 'These lectures, illustrated by admirable translations, are remembered with grateful pleasure by many who were thus led to learn the full significance of the great Christian poet." Indeed, as a professor,

Longfellow was eminently successful. Shortly after the Poems on Slavery, there ap- peared in 1843 a more ambitious work, The Spanish Stu- dent, a kind of sentimental ‘‘ Morality,” without any special merit but good intention. If published nowadays it would hardly attract notice; but in those gushing, emotion- craving times it had considerable popularity, and helped to increase the poet’s now rapidly widening fame. A huge collection of translations of foreign poetry edited by him, aud entitled Zhe Poets of Hurope, appeared in 1845, and, about the same time, a few minor poems—songs and sonnets—under the title Zhe Belfry of Bruges. In 1847 he gave to the world the greatest of all his works, and the one which will carry his name down to posterity— Evangeline, a Tale of Acadie. It was, in some degree, an imitation of Goethe’s Hermann and Dorothea, and its plot, which was derived from Hawthorne’s American Note- Books, is even simpler than that of the German poem, not to say much more touching. At the violent removal by the British Government of a colony of French settlers from Acadie (Nova Scotia) in 1755, a young couple, on the very day of their wedding, got separated and carried in different directions, so that they lost all trace of each other. The poem describes the wanderings of the bride in search of her lover, and her final discovery of him as an old man on his death-bed, in a public hospital which she had entered asa nurse. Slight as the story is, it is worked out into

one of the most affecting poems in the language, and gives to literature one of its most perfect types of womanhood and of “‘affection that hopes and endures and is patient.” Though written in a metre deemed foreign to English ears, the poem immediately attained a wide popularity, which it has never lost, and secured to the dactylic hexameter a recognized place among English metres.

In 1849 Longfellow published a novel of no great merit, Kavanagh, and also a volume of poems entitled The Seaside and the Fireside, a title which has reference to lis two homes, the seaside one on the charming peninsula of Nahant, the fireside one in Cambridge. One of

the poems in this collection, “ Resignation,” has taken a permanent place in literature; another, “ Hymn for my Brother’s Ordination,” shows plainly the nature of the poet’s Christianity. His brother, the Rev. Samuel Long- fellow, is a minister of the Unitarian Church.

Longfellow’s genius, in its choice of subjects, always oscillated between America and Europe, between the colonial period of American history and the Middle and Romantic Ages of European feeling. When tired of the broad daylight of American activity, he sought refuge and rest in the dim twilight of medizeval legend and German sentiment. In 1851 appeared The Golden Legend, a long lyric drama based upon Hartmann von Aue’s beautiful story of self-sacrifice, Der arme Jeimrich. Next to Evangeline, this is at once the best and the most popular of the poet’s longer works, and contains many passages of great beauty. Bringing his imagination back to America, he next applied himself to the elaboration of an Indian legend. In 1854 he resigned his professorship. In the following year he gave to the world the Indian Edda, 7’he Song of Hiawatha, a conscious imitation, both in subject and metre, of the Finnish epic, the Kalevala, with which he had become acquainted during his second visit to Europe. The metre is monotonous and easily ridiculed, but it suits the subject, and the poem is very popular. In 1858 appeared The Courtship of Miles Standish, based on a charming incident in the early history of the Plymouth colony, and, along with it, a number of minor poems, included under the modest title, Birds of Passage. One of these is “ My Lost Youth.”

‘Two events now occurred which served to cast a gloom over the poet’s life and to interrupt his activity,—the outbreak of the civil war, and the tragic fate of his wife, who, having accidentally allowed her dress to catch fire, was burnt to death in her own house in 1861. It was long before he recovered from the shock caused by this terrible event, and in his subsequent published poems he never ventured even to allude to it. When he did in some measure find himself again, he gave to the world his charming Zales of a Wayside Jnn (1863), and then a “second flight” of his Birds of Passage. Among the latter is a poem entitled “The Children’s Hour,” which affords a glance into the home

life of the widowed poet, who had been left with five children—two sons, Ernest and Charles, and three daughters,

‘*Grave Alice, and laughing Allegra, And Edith with golden hair.”

The Birds of Passage was succeeded by a small volume entitled Flower de Luce (1866), which contains, among other fine things, the beautiful “threnos” on the burial of Hawthorne, and “The Bells of Lynn.” Once more the poet sought refuge in medival life by completing his translation of the Divina Commedia, parts of which he had rendered into English as much as thirty years before. This work appeared in 1867, and gave a great impulse to the study of Dante in America. It is a masterpiece of literal translation. Next came the Vew England Tragedies (1868), and The Divine Tragedy (1871), which found no large

public. In 1868-69 the poet visited Europe, and was everywhere received with the greatest honour. In 1872 appeared Three Books of Song, containing translated as well as original pieces, in 1873 Aftermath, in 1874 The Hanging of the Crane, and in 1875 The Mask of Pandora, and other Poems. Among these “other poems” were “ The Hanging of the Crane,” “ Morituri Salutamus,” and “A Book of Sonnets.” Zhe Mask of Pandora is a proof of that growing appreciation of pagan naturalism which marked the poet’s later years. ‘Though not a great poem, it is full of beautiful passages, many of which point to the riddle of life as yet unsolved, a conviction which grew ever more aud more upon the poet, as the ebulliency of romanticism gave way to the calm of classic feeling. In the ‘‘ Book of Sonnets” are some of the finest things he ever wrote, especially the five sonnets entitled “Three Friends of Mine.” These “three friends” were Cornelius Felton, Louis Agassiz, and Charles Sumner, whom he calls

‘¢The noble three, Who half my life were more than friends to me.”

The loss of Agassiz was a blow from which he never entirely recovered ; and, when Sumner also left him, he wrote— ‘*Thou hast

but taken thy lamp and gone to bed ; I stay a little longer, as one stays To cover up the embers that still burn.”

He did stay a little longer; but the embers that still burnt in him refused to be covered up. He would fain have ceased writing, and used to say, “It’s a great thing to know when to stop”; but he could not stop, and did ;not stop, till the last. He continued to publish from time to time, in the magazines, poems which showed a clearness of vision and a perfection of workmanship such as he never had equalled at any period of his life. Indeed it may be said that his finest poems were his last. Of these a small collection appeared under the title of Keramos, and other Poems (1878). Besides these, in the years 1875-78 he edited a collection of Poems of Places in thirty-one small volumes. In 1880 appeared Ultima Thule, meant to be his last work, and it was nearly so. In October 1881 he wrote a touching sonnet on the death of President Garfield, and in January 1882, when the hand of death was already upon him, his last poem, Hermes Trismegistus, in which he gives utterance, in language as rich as that of the early gods, to that strange feeling of awe without fear, and hope without form, with which every man of spotless life and upright intellect withdraws from the phenomena of time to the realities of eternity.

In the last years of his life he suffered a great deal from rheumatism, and was, as he sometimes cheerfully said, “never free from pain.” Still he remained as sunny and genial as ever, looking from his Cambridge study windows across the Brighton meadows to the Brookline hills, or enjoying the “free wild winds of the Atlantic,” and listen- ing to “The Bells of Lynn” in his Nahant home. He still continued to receive all Visitors, and to take occasional runs up to Castine and Portland, the homes of his family. About the beginning of 1882, however, a serious change took place in his condition, and he was obliged to withdraw from the public gaze. Dizziness and want of streneth confined him to his room for some time, and, although after some weeks he partially recovered, his elasticity and powers were gone. He now acknowledged the receipt of letters with a printed form. Aé last the end came. On the 19th March he was seized with violent paroxysms of vomiting and pain, which continued until the 22d, when his mind began to wander.

The 23d was passed in a torpid condition, which, though it vanished on the morning of the 24th, returned in the course of the day, and passed by insensible degrees, into the profound sleep of death.

LONG FPF ETO Ww

The poet was buried on the 26th, near his “ three friends,” in Mount Auburn cemetery. The regret for his loss was universal ; for no modern man was ever better loved or better deserved to be loved.

Longfellow was made an LL.D. of Bowdoin College in 1828, at the age of twenty-one, of Harvard in 1859, and of Cambridge (England) in 1868, and D.C.L. of Oxford in 1869. In 1873 he was elected a member of the Russian Academy of Science, and in 1877 of the Spanish Academy.

In person, Longfellow was rather below middle height, broad-shouldered, and well built. His head and face were extremely handsome, his forehead broad and high, his eyes full of clear, warming fire, his nose straight and graceful, his chin and lips rich and full of feeling as those of the Praxitelean Hermes, and his voice low, melodious, and full of tender cadences. His hair, originally dark, became, in his later years, silvery white, and its wavy locks combined with those of his flowing beard to give him that leonine appearance so familiar through his later portraits. Charles Kingsley said of Longfellow’s face that it was the most beautiful human face he had ever seen. And many agreed with him.

In trying to form an estimate of Longfellow, we are not obliged, as in the case of so many other poets, to distinguish the poet from the man, or to degrade the nature of the former by making it an excuse for the foibles of the lattcr. In Longfellow; the poet was the flower and fruit of the man. His nature was essentially poetic, and his life incomparably the greatest of his poems. Those who knew only the poems he wrote could form but a faint notion of the harmony, the sweetness, the manliness, and the tenderness of that which he lived.

Of the two orders of poets distinguished by Aristotle—that of the inspired or plastic, and that of the versatile or observant—Longfellow belonged distinctly to the latter. Nature did not come to him as to a Pythia seated on a tripod, and fill him with passion expressible only in rhythinic prophecy ; she did not even call him as a private secretary, and dictate to him her secrct messages of love and tenderness, justice and watchfulness, freedom and immortality. He went to nature, sometimes as the Angel of the Annunciation, revealing to her that she was pregnant with divinity, sometimes as a priest pronouncing a benediction over her. What he would have been as a poet, if, instead of visiting Europe in early life and drink- ing in the spirit of the Middle Age under the shadows of cathedral towers, that point upwards to a world above nature, and backwards to a time when that world darkened the face of nature, he had, like Whittier, grown old amid the uncathedralled paganisms of American secnery and life, we can only guess from his earlier poems, which are as naturalistic, fresh, and unmystical as could be desired; but certain it is that, from his long familiarity with the medieval view of nature, and its semi-pagan offspring, the romantic view, he was brought, for the greater part of his life, to look upon the world of men and things either as the middle scene of a miracle play, with a heaven of rewarding happiness above and a purgatory of purifying pain below, or else as a garment concealing, while it revealed, spiritual forms of unfathomed mystery. During this time he could hear "' the trailing garments of the night sweep through her marble halls," and see 'the stars come out to listen to the music of the seas." Later on, as he approached his second youth (he was spared a second childhood), he tended to a more pagan view. About the time when he was writing The Mask of Pandora, he could see "in the sunset Jason's ficece of gold," and hear ''the waves of the dis- tracted sea piteously calling and lamenting" his lost friend. But through all the periods of his life his view of the world was esscn- tially religious -and subjective, and, consequently, his manner of dealing with it hymnal or lyric. This fact, even more than his merits as an artist, serves to account for his immense popularity. Too well-informed, too appreciative, and too modest to deem him- self the peer of the 'grand old masters," or one of ''those far stars that come in sight once in a century," he made it his alm to write something that should ''

make a purer faith and manhood shine in the untutored heart," and to do this in the way that should best reach that heart. This aim determined at once his choice of sub- jects and his mode of treating them.

The subjects of Longfellow's poctry are, for the most part, aspects of nature as influencing human feeling, either directly or through historical association, the tender or pathetic sides and incidents of life, or heroic deeds preserved in legend or history. He hada special fondness for records of human devotion and self-sacrifice, whether they were monkish legends, Indian tales, Norse drdpas, or bits of American history. His mode of treatment, as we have already said, is subjective and lyric. No matter what form his works

assume, whether the epic, as in ‘‘ Evangeline," ‘‘ The Courtship of Miles Standish," and ‘‘ Hiawatha," the dramatic, as in ‘‘ The Spanish Student," ‘The Golden Legend," and ‘‘The Mask of Pandora," or the didactic, as in ‘‘The Psalm of Life" and many of the minor poems ; they are all subjective. This is not the highest praise that can be given to works of art; but it implies less dis- praise in Longfellow's case than in almost any other, by reason: of his noble subjectivity.

If we look in Longfcllow's poetry for originality of thought, pro- found psychological analysis, or new insights into nature, we shall be disappointed. Though very far from being hampered by any dogmatic philosophical or religious system of the past, his mind, until near the end, found sufficient satisfaction in the Christian view of life to make it indifferent to the restless, inquiring spirit of the present, and disinclined to play with any more recent solution of life's problems. He had no sympathy with either scepticism or formal dogmatism, and no need to hazard rash guesses respecting man's destiny. He was willing to say—

- J do not know; nor will I vainly question Those pages of the mystic book which hold The story still untold, But without rash

> conjecture or suggestion Turn its last leaves in reverence and good heed, Until ‘The End’ I read.”

He disliked the present psychological school of art, believing it to be essentially morbid and unhealthy. He had no sympathy with the tendency represented by George Eliot, or with any attempt to be analytic in art. He held art to be essentially synthetic, creative, and manifesting, not analytic, destructive, or questioning. Hence he never strove to draw from nature some new secret, or to show in her relations never discovered before. His aim was to impress upon her familiar facts and aspects the seal of his own gracious nature. And in this no one ever succeeded better. ‘‘The light of the life of him is on all past things.” For this reason, while his poems never revcal to us a new meaning in nature or show us a new spring of hope in man, they make us love both better than we did before. Though he never raised the curtain that hides the stage upon which the physical and moral powers of nature rehcarse the drama of human life, yet he opens our ears to the notes of the orchestra that sits before the stage and plays the overture ; and, as we listen to these notes, there rise before us touching pictures of love, and faith, and devotion, until we find ourselves melted down and sim- plified into little children, whereof is the kingdom of heaven.

We have said that Longfellow’s protracted residence in Europe in some degree unfitted him for expressing the new life of the American republic ; and this is true. He was essentially a poet of the past, not, like Lowell, a grasper and moulder of the present, or like Whitman, a John the Baptist of the future. But, just as Dante summed up the ages of faith, and Shakespeare the ages of feudalism, so Longfellow has summed up the period of transition from these to the ages of truth and liberty—a period in which the killing letter of Christian womanliness and pagan manliness has slowly been yielding to their vivifying spirit, and preparing the way for that simple humanity of which he was the earnest and the type.

As a man, Longfellow was almost perfect, as much so as it is | of the county there is an interpolation, between the two

ever given to human nature to be. A man in intellect and courage, yet without conceit or bravado; a woman in sensibility and tender- ness, yet without shrinking or weakness ; a saint in purity of life and devotion of heart, yet without ascetism or religiosity; a knight-errant in hatred of wrong and contempt of baseness, yet without self-righteousness or cynicism ; a prince in dignity and courtesy, yet without formality or condescension ; a poet in thought and feeling, yet without jealousy or affectation ; a scholar in tastes and habits, yet without aloofness or bookishness ; a dutiful son, a loving husband, a judicious father, a trusty friend, a useful citizen, and an enthusiastic patriot,—he united in his strong, transparent humanity almost every virtue under heaven.

was never too busy to see a caller, to answer a letter, or to assist, | by word or deed, any one that needed assistance. His courtesy to |

all visitors, even to strangers and children who called to look at him, or who, not venturing to call, hung about his garden-gate in order to catch a glimpse of him, was almost a marvel. He always took it for granted that they had come to see Washington’s study, and, accordingly, took the greatest interest in showing them that. He never, as long as he could write, was known to refuse his autograph, and so far was he from trying to protect himself from intruders that he rarely drew the blinds of his study windows at night, though that study was on the ground floor and faced the street. His acts of charity, though performed in secret, were neither few nor small. Of him it may be said with perfect truth, ‘‘He went about doing good”; and not with his money mercly, but also with his presence

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and his encouragement. To how many sad hearts did he come like an angel, with the rich tones of his voice waking harmonics of hope, where before there had been despair and silence? How many young literary people, disappointed at the unsuccess of their first attempts, did he comfort and spur on to renewed and higher efforts! How careful he was to quench no smoking flax! How utterly free he was from jealousy or revengefulness! While poor, morbid Edgar Allan Poe was

writing violent and scurrilous articles npon him, accusing him of plagiarism and other literary mis- demeanours, he was delivering enthusiastic lectures to his classcs on Poe's poetry. His charity was unbounded. Once when the present writer proposed to the president of the Harvard University Visiting Committee that Longfellow should be placed on that committee, the president replied: ''What would be the use? Longfellow could never be brought to find fault with anybody or anything." And it was true. His whole life was bathed in that sympathy, that love which suffers long and envies not, which for- gives unto seventy times seven times, and as many more if need be. Even in his last years, when loss of friends and continual physical pain made life somewhat ''cold, and dark, and dreary" for him, he never complained, lamented, or blamed the arrangements of nature, and the only way in which it was possible to know that he suffered was through his ever increasing delight in the health and strength of youngermen. His whole nature was summed up in the lines of his favourite poet ;

"Luce intellettual, piena d'amore, Amor di vero ben, pien di letizia, Letizia che trascende ogni dolzore." (T. DA.)

LONGFORD, an inland county of Leinster, Ireland, is bounded on the N.W. by Leitrim, N.E. by Cavan, E. by Westmeath, S. by Westmeath and Meath, and W. by Lough Ree aud Roscommon. With the exception of Carlow, Louth, and Dublin, it is the smallest county in Ireland, its greatest length being about 28 miles, its greatest breadth about 20, and the total area comprising 269,409 acres, or abont 421 square miles.

The general level surface of the country is broken occasionally by low hills, which cover a considerable area at its northern angle. 'The principal rivers are the Camlin, which rises near Granard, and flows past Longford to the Shannon, and the Inny, which, entering the county from Westmeath, crosses its southern corner, and falls into Lough Ree. Lough Ree is partly included in Longford, and the other principal lakes are Lough Gownagh, Derry- lough, Lough Drum, and Lough Bannow. The Royal canal intersects the county. The southern division of the county, bounded partly by the Camlin, belongs to the great limestone

plain of Ireland, and the northern division is occupied chiefly by clay-slate and greywacke. In the west

divisions, of yellow sandstone and conglomerate. Isolated hills of sandstone occur at Slievegauldry and at Ballymahon, on both sides of the Inny. Marble of fine quality has been raised near Ledwithstown. In the north indications of iron are abundant, and there are also some traces of lead. Agriculture.—The climate is somewhat moist and cold, partly owing to the large extent of marsh and bog. The soil in the southern districts resting on the limestone is a deep loam well adapted for pasture, but in the north it is often so thin and poor as to be incapable of reclamation. In 1881 there were 74,876 acres under tillage, 125,888 pasture, 3697 plantation, and 51,833 waste. The total number of holdings in 1880-was 8682, of which 685 were less than 1 acre. More than one-half of the total number were included in those betwecn 5 and

15, and 15 and 30 acres in extent, which numbered respectively 2482 and 2658. The following table shows the arcas under the

principal crops in 1855 and in 1881 :—

Other Other Meadow ee Wheat.| Oats. ; Potatoes.) Turnips.| Green| Flax.) and otal, Cereals. 5 Crops. Clover.

1855} 2,253 | 38,841] 328 16,258 2,730 936 | 262 } 20,156 | 81,764
1881} 307 | 18,670} 233 13,108 2,621 | 1,792) 236 | 37,899

The total number of horses in 1881 was 6856, of which 4253 were used for agricultural purposes ; of cattle 51,547, of which 16,212 were milch cows; of sheep, 24,140 ; of pigs, 17,900; and of poultry, 982,324. There were 3066 asses and 670 mules. According to the latest return, the land was divided among 486 proprietors possess-

ing 256,668 acres, with an annual rateable value of £151,739, the average rateable value per acre being 11s. 10d. The average size was

588 acres, and 14 per cent. possessed less than 1 acre. The largest owners were Colonel King Harman, 28,779 acres; earl of Granard, 14,978; Lord Annaly, 12,160 ; George Maconchy, 10,319.

Manufacturcs.—These are confined almost entirely to coarse woollen and linen cloth.

Railways.—One branch of the Midland Great Western Railway skirts the eastern boundary of the county, and another passes through its centre to Longford. ;

Administration and Population.—The county includes 6 baronies, with 26 parishes and 891 townlands. It is in the north- west circuit. Assizes are held at Longford, and quarter sessions at Ballymahon, Granard, and Longford. There is one poor-law union wholly within the county, with portions of other two. It is in the Dublin military district and Birr subdistrict. There are barracks for infantry and cavalry at Longford. The county returus two members to parliament.

The only town of any importance is the county town, Longford. From 25,142 in 1760 the population of the county gradually in- creased till in 1841 it was 115,491, but since then it has diminished to 82,348 in 1851, 64,501 in 1871, and 61,009 in 1881, of whom 30,770 were males and 30,239 females. From 1st May 1851 to 31st December 1881 the number of emigrants was 40,726. For the ten years 1871-81 the marriage-rate per 100 of the population was 4, the birth-rate 24:3, and the death-rate 16. In 1881 2371 per cent. of the population above five years of age were illiterate, the percentage in 1871 being 32. The Roman Catholics formed 91 per cent. of the population in 1881, and the Episcopalians 8.

History and Antiquitics.—The early name of Longford was Analé or Annaly, and it was a principality of the O’Farrels. Along with the province of Meath, in which it was then included, it was granted by Henry II. to Hugh de Lacy, who planted in it an English colony. On the division of Meath into two counties in 1543, Annaly was included in West Meath, but in the 11th of Elizabeth it was made shire ground under the name of Longford, and included in the pro- vince of

Connaught, from which it was transferred to Leinster in the 27th of the same reign.

The principal antiquarian ruin is the Danish rath called the Moat of Granard, at the end of the main street of the town, and occupying a position 593 feet above sea-level. There are monastic remains at Ardagh, Longford, Moydow, Clone, Derg, Druimchei, and Killinmore, as well as on several of the islands of Lough Ree. The principal old castles are those of Rathcline near Lanesborough, and Ballymahon, Burnacor, and Castlecor on the Inny. The principal modern seats are those of Carrickglass on the Camlin, and Castle Forbes, the seat of the earl of Granard. Oliver Gold- smith was born at Pallas, a village near Ballymahon, in this county.

Lonerorp, the chief town of the above county, is situ- ated on the river Camlin, and on a branch of the Midland Great Western Railway, 75 miles west-north-west of Dublin. The principal buildings are the parish church in the Grecian style, St Mell's Roman Catholic cathedral (one of the finest Roman Catholic churches in Ireland), the court- house, the market-house, and the county jail. Of the old castle and of the Dominican abbey there are slight remains. The town has a considerable trade in grain, butter, and bacon. There are corn-mills, a spool factory, and tanneries, The population in 1871 was 4375, and in 1881 it was 4380.

The ancient name of the town was Athfada, and it is said to occupy the site of a monastery founded by St Idus, a disciple of St Patrick. The town obtained a fair and market from James les and a charter of incorporation from Charles II., as well as the

right to return two members to parliament. It was disfranchised at the Union.

LONGINUS, a philosophical critic of great eminence, and one of the brightest spirits of antiquity, uniting Greek subtlety with Roman fervour, flourished in the 3d century, aud is known to have perished under sentence of the emperor Aurelian in 273 a.p. He forms one of the last brilliant cluster of pagan literati; and Porphyry, round whom it

centred, was the pupil of Longinus. As Porphyry is known to have been born in 233, it is probable that his preceptor, who could not have been less than twenty years his senior, may have been born about 210 a.p. The main authority for the facts of his life is a notice in Suidas, where we find it stated in a preface to alist of his writings that “ Longinus Cassius, philosopher, preceptor of Porphyry the philosopher, a learned scholar and critic, lived in the time of the emperor Aurelian, and was cut off by him as

having conspired with Zenobia, the wife of Odenathus.” From the same authority we learn that Phronto, the rhetorician of Emesa in Syria, was his uncle, and that Phrontonis, sister of Phronto, was mother to Longinus, who thus became heir to his uncle Phronto. As to his birthplace there is no tradition, but it is probable that he was a native of Syria, possibly of Emesa, to which his uncle belonged. He tells us, as we learn from fragments of his works, that he enjoyed great advantages in travel and education, that his parents, being rich, took him to travel and he saw much of the world, and that he studied at Athens under Phronto, at Alexandria under Ammonius Saccas and the pagan Origenes, and at Rome under Plotinus and Amelius. The Neo-Platonic philosophy was then in the ascendant, but Longinus did not embrace the new speculations which Plotinus was then developing, and continued a Platonist of the old type. Hence the sting of a sarcasm attributed to Plotinus—“ Longinus may be a philologer, but he is no philosopher.” Longinus does not appear to have reciprocated the sarcastic feeling, for we have still extant a fragment of a letter in which he asks Porphyry to come to Pheenicia and to bring with him the treatises of Plotinus, for, he observes, though he does not feel much attraction for the subjects, he yet likes the man. The reputation which Longinus acquired by his learning was immense; it was of him that Eunapius first used the expression that has since become proverbial “a living library ”—in modern phrase, a walking encyclopedia.

The most conspicuous event of his life was also the most tragic in its consequences. He became secretary to Zenobia, the widowed queen of

Palmyra, who acquired from him a knowledge of Greek, and made him her chief counsellor in state affairs. In this capacity he favoured the policy by which she aimed at independence of the Roman empire, encouraged, doubtless, to do so by the recent fate of Valerian, and by the feebleness of the tenure by which Rome held the Syrian provinces. Aurelian, how- ever, crushed the pretension, and, while Zenobia lost her power and was led captive to Rome, Longinus paid the forfeit of his life. According to Zosimus, Zenobia sought to exculpate herself with Aurelian by laying the whole blame on her adviser. He died bravely, not seeking to escape his fate by suicide as a Stoic might have done, but following the example of Socrates and the precept of Plato, to whose philosophy he adhered.!

The remains of Longinus that have come down to us, unfortunately scanty, are partly fragments of letters and extracts from criticisms on points of diction; and they bear out the impression we derive from the historical notices of the man. He is vivid and yet minute, lively and penetrating, and his observations show taste, learning, and judgment. Among the most notable of the fragments we have a defence of the Platonic doctrine of the soul as a distinct essence from the body, which defines clearly his philosophical position.

It only remains to advert in a few words to the remarkable pro- duction called the Z’reatise on the Sublime, which has usually passed current as a work of Longinus. This remarkable work, which is among the most notable productions of ancient criticism, second only in importance to the Poetics of Aristotle, and superior to that work in luminous beauty and sense of form, cannot be with certainty ascribed to Longinus, although the internal evidence favours the usual ascription. Ofthe.two most startling difficulties the first is the absence of any mention of a treatise rep) ous in the list by Suidas. Theenumerationis, however, incomplete, and the phrase ‘‘many other works,” with which it closes, may be held to cover much. A more

formidable difficulty is the circumstance that in the most important eee ee eee

1 It is probable that he owed part of his political fervour to the influence or inheritance of the name “ Cassius,” from whatever souree this surname was derived. The associations of this name were distinctly oe and even regicidal, as seen in Caius Cassius and in Cassius

erea.

manuscript (that in the Paris Library, No. 2036, of the 10th century) the heading is Arovvalov } Aoyytvov, giving thus an alternative author ‘* Dionysius,” and in the other important MS., the Laurentian at Florenee, the title is ’Avwydmov, implying that the author was unknown. According to Vaucher (Ztudes, p. 134) this title is not the original one, and there are traces of an earlier title Aoyyivou, which had formed the superseription. Full information as to thie critical question will be found in the editions of A. E. Egger (Longint que supersunt, Paris, 1837), Vaucher’s Etudes Critiques sur le Traité du Sublime et sur les écrits de Longin, Geneva, 1854, and Otto Jahn’s Arovuctov 4 Aoyylvov wep) tous de Sublimitate Libellus, Bonn, 1867. Vaucher ascribes the treatise to Plutarch, but the evidence negatives that supposition, and, although there are difficulties in ascribing the work absolutely to Longinus, as Boileau and Gibbon and the critics of last century traditionally assumed, there is no other name than that of Longinus that presents so many concurring circumstances, to justify provisionally the current ascription. The fragments that remain of the undoubted works of Longinus are largely characterized by the same lively force and epigrammatic tersencss- which distinguish the treatise, ‘‘On the Sublime.” The translations of this treatise into all the European tongues have been almost innumerable, including the famous one by Boileau, which rendered the work the favourite text-book of the belle- lettristic critics in the last century. The most important English translations are by William Smith, 1739, frequently reproduced ; Hathaway, 1834; Spurdens, 1836. (W. D. G.) LONG ISLAND, an island with an area of 1682 square

miles lying off the coast of the United States, between

Harbour Hill, 384; John M. Clarke's Hill, 326. From the foot of the hills southward stretches a vast nearly level plain, with an average height of 70 feet, and consisting of post-glacial stratified sand and gravel; and across this run a large number of shallow parallel watercourses, remarkable mainly for the regularity with which they present an elevated bank on the western side and a long declivity on the eastern. Onthe northern side of the range the surface is very uneven, some of the elevations exceeding 200 feet, and deep fiord valleys stretching down to the sound, and forming a series of excellent harbours. The glacial drift of Long Island is of immense depth, and contains a wonderful number of boulders. "At tle eastern extremity," says Lyell on the authority of Mather, " they are of such kinds of granite, gneiss, mica, slate, greenstone, and syenite as may have come across the sound from parts of Rhode Island. Opposite the mouth of the Connecticut river they are of such varieties of gneiss and hornblende slate as correspond with the rocks of the region through which that river passes. Still further west they consist of red sand-stone and conglomerate and the trap of that country, and lastly, adjoining the city of New York, we find serpentine, red sandstone, and various granitic and crystalline rocks

Map of Long Island.

40° 33' and 41° 10' N. lat., and forming part of the State of New York. While the length from east to west is about 120 miles, the width nowhere exceeds 24 miles, and in some places falls to 12 or 15. The western end is separated from the city and State of New York by the East River, which is nowhere more than three quarters of a mile in breadth, and has been spanned by a great suspension bridge ; but between the main body of the island and the mainland (Connecticut, Rhode Island) lies Long Island Sound, widening out to a breadth of 20 miles. The sound, however, is comparatively shallow, the depth in the eastern and seaward portion being usually under 200 feet, while in the portion west of Connecticut river it is nowhere more than 170 feet, and in general only 75-100 feet. Geologic- ally the island is very

interesting, consisting, as it does for the most part, of an immense morainal deposit of glacial drift. A range of hills extends with some interruptions for about 60 miles in the line of its longer axis, varying in height from 150 to 384 feet above sea-level. Fort Pond Hill for instance is 194 feet; Neapeague, 135; Amagansett, 161; Shinecock, 140; Osborn's Hill, near Riverhead, 293; Ruland's, south of Coram, 340; West Hills (Jane's Hill), 354; Layton's Hill, 380; Westbury, 260; Hempstead

which have come from the district immediately to the north." One of the boulders near Manhasset measures 54 feet long and 40 feet wide, and rises 16 feet above the level of the soil. Of the numerous lakelets scattered throughout Long Island it is enough to mention Ronkon-koma, near Lakeland, the waters of which are said to decrease and increase in regular periods of four years. Much of the surface of the country is still covered with wood—oak, hickory, and chestnut growing freely on the unmodified drift, and pine forests extending for about fifty miles through the sandy plains. A good rich loam abounds in the northern districts, and the lighter soils of the south are easily rendered productive. Marketgardening especially is carried on with success. The climate is comparatively mild, the mean annual temperature being 49° to 51°, the maximum for the' year between 95° and 100°, and the minimum 4° to 8°. The average rainfall is about 42°] inches. Towards its western end more especially, the northern coast of Long Island presents a number of important bays—Glen Cove, Oyster Bay, Huntington Bay, Smithtown Bay, &c.; the western extremity is deeply bifurcated by a very irregular inlet, broken up by various islands into Gardiner's Bay, Little Peconic, and Great XIV. — 109

866

Peconic; and along a large part of the southern coast stretches a remarkable series of lagoons, formed by a line of dunes varying in breadth from 4 to 1 mile, and connected at various points with the ocean. These last—of which the most important is Great South Bay, 40 miles long by about 5 or 6 miles wide—are of great service to the island, and an Act has been passed to increase their utility by

connecting them by canals. Coney Island and Rockaway Beach, the most frequented of the many seaside resorts in the Island, lie near the south-western extremity. As regards both birds and fishes, Long Island seems a kind of meeting place between the arctic and the equatorial species. In winter, for instance, it is visited by the eider-duck, the little white goose, the great cormorant, and the auk, in summer by the turkey buzzard, the swallow-tailed kite, and the fork-tailed flycatcher. A few deer are still to be found; and various tracts of country and islands in the great bays are stocked with game and fish by sportsmen's clubs, The east portion of the island is one of the chief seats of the menhaden fisheries, and the oyster beds of both the north and the south coast are of great value, Those of the Great South Bay (furnishing, amongst others, the famous "blue points") alone give. employment in the season to 1500 fishermen. (See E. Ingersoll, "The Oyster Industry," in the Zenth Census publications of the United States, 1881.)

Administratively Long Island consists of King's County (72 square miles), Queen's County (410), and Suffolk (1200), which in 1880 had the following population:—

King's .s..c.0s. 599,549 | 289,289 | 310,260 | 411,295 | 188,254 | 590,278 | 9,271 Queen's…....4. 90,547 | 45,760| 44,787) 68,556| 213991| 86,707| 31840 Suffolk vs… 53,926 | 26,759} 27,167| 48,319| 5°607| 51,473| 2'453

Of the thirteen or fourteen Indian tribes living in the island at the time of its discovery, the only remnants are about fifty Shine- cocks and Montauks.

Besides Brooklyn, which had 566,689 inhabitants, King's County contained Flatbush town, 7634; Flatlands town, 3127 ; Gravesend town (including Coney Island village), 8676; 18,681; and New Utrecht town, 4742. In Queen's county are Flushing town, 15,919 ; Hempstead town (including East Rocka- way, Garden City, and sixteen other villages), 18,160; Jamaica town, 10,089 ; Long Island City, 17,129; Newtown town, 9798; North Hempstead town, 7562; and Oyster Bay town, 11,928. In Suffolk there are no cities, and none of the villages have 500 inhabitants. The "towns" are Babylon, Brookhaven, East

Hampton, Hunting- ton, Islip, Riverhead, Shelter Island, Smithtown, Southampton, and Southhold. Garden City was built by A. T. Stewart as a model suburban settlement, and contains a fine cathedral, Hicksville is assoeiated with the memory of Elias Hieks the Quaker missionary. Sag Harbour was formerly a great whaling station, and still main- tains a good coasting trade. Five miles from Flushing is Creedmore rifle range, the finest in the United States. On Gardiner's Island the pirate Kidd concealed the treasures partly recovered by the governor of Massachusetts in 1699.

established Southold, Southampton, Easthampton, Hempstead, Huntington, Oyster Bay, Smithtown, Islip, &c. charter granted by James I. in 1620 expressly excluded territory actually possessed or inhabited by any other Christian prince or state, the grantees in 1635 conveyed to the earl of Stirling among other lands the island of Matowaeks or Long Island. A treaty concluded between Dutch and English at Hartford (Connecticut) in 1650 surrendered to England all the land south of Oyster Bay ;

the states-general of Holland in

the English Government. Long Island was included in the territory assigned to the duke of York in 1663-64, and in 1664 an English squadron conquered the Dutch in time of peace, and set up a government in the duke's name. When the Dutch governor, who had recovered New York in 1673 Issued a proclamation requiring the submission of the Long Island towns, they all obeyed except the three most eastern ; Sat the treaty of Westminster in 1674 left Long Island to the English, and it became a regular colony of the crown. In the beginning of the

New Lots town,

war of American independence, Long Island naturally played a prominent part. The efforts made by Washington to defend it were

frustrated by the British under Cornwallis in 1776, and it re- mained in their hands till the close of the contest. .

LONG ISLAND CITY, a city of the United States, the capital of Queen's County, New York, situated on the west coast of Long Island, and separated from New York by the East River and from Brooklyn by the Newtown Creek. The area, which includes what were the post villages of Astoria, Newtown, and Ravenswood, measures 3 miles from east to west and 5 miles from north to south, and the general plan of the place is constructed on a spacious scale. The river frontage extends to about 10 miles. Hunter's Point, as the south-west portion is called, contains the terminal depdts of several railway lines, exten- sive warehouses for the storage of petroleum, and a variety of industrial establishments—such as granite- works, chemical works, engine-works. In the Astoria district there are factories for pianos, carriages, and carpets. Long Island City dates from 1870; in 1874 its population was about 16,000, and in 1880 17,117.

LONGITUDE. See Gzocrapny (Maruemaricat) and TIME,

LONGOMONTANUS, or Lonezserc, Curistran (1562-1647), a Danish astronomer, was born at Longberg, a village of Jutland, in Denmark, on the 4th of October 1562, Having, when only eight years old, the misfortune to lose his father, who was only a poor labourer, he was taken charge of by a maternal uncle, through whose in- fluence he received lessons from the clergyman of the place. Although, owing to the poverty of his parents, the instruc- tion which he had received up to this time had been of the most elementary kind, his aptitude for learning was so great that, under the tuition which he now received, he made rapid progress in his studies, especially in the mathe- matical sciences, for which he acquired an intense liking. His mother, however, was unable to pay any longer for his education, and he was reluctantly compelled to return home to workin the fields. By improving every opportunity which his laborious life now permitted, he was still enabled to pursue, to some extent, his favourite studies. This state of matters continued for some time; but his intense thirst for knowledge, and the uncalled-for jealousy of his friends, led him in 1577 to steal

away from home, to try his fortune in the world. Accordingly, at the age of fifteen, he went to Wiborg, a town about 12 miles distant from his native village. There he spent eleven years, dividing his time between attending the lectures of the professors in the college of that town, and working in the fields. By this means he was able not only to earn a sufficient liveli- hood, but also to defray the expenses of his education; and his close application to study soon enabled him to acquire considerable knowledge of literature and of the sciences. In 1588, at the age of twenty-six, he removed to Copenhagen, where his great abilities speedily secured for him the esteem and admiration of the professors in the university of that town. By this means he was brought under the notice of the eminent astronomer Tycho Brahe, who received him very kindly, and ultimately appointed him his assistant. He remained with Tycho Brahe for eight years in the island of Hoene, and during that time rendered him such valuable services in his astronomical observations and calculations, that, when Tycho Brahe settled in Germany, he invited Longomontanus to ac- company him. This offer he accepted; but having shortly afterwards expressed to Tycho Brahe his desire to return to his native country, the latter at once furnished him, not only with excellent testimonials, but also with money for his journey. On his return to Denmark he made a long detour in order to visit the places whence Copernicus

had made his celebrated astronomical observations. On his arrival at Copenhagen, he found a patron in the person of Christian Friis, chancellor of Denmark, who gave him employment in his household. He continued in this situa- tion till 1603, when he received the appointment of rector of the college of Wiborg. Two years later (1605) he was elected to the chair of mathematics in the university of Copenhagen. This appointment he held till his death, on the 8th of October 1647. Longomontanus, although one of the best astronomers of his age, inherited some of its worst prejudices. A firm believer in astrology, he held, among other things, that comets were messengers of evil. He also imagined that he had squared the circle. He found that the circle whose diameter is 43 has for its circumference the square root of

18252,—which gives a PAG os. + es for the value of z. Pell and others endeavoured to prove that he was mistaken, but they failed to convince him of his error. He refers to his imagined discovery in almost all his published works, and defends his position with great zeal.

The following is a list of his more important works in mathe- matics and astronomy, with the dates of their first publica- tion :— Systematis Mathematici, &c., 1611; Cyclometria e Lunulis reeiproce demonstrata, &., 1612; Disputatio de Eclipsibus, 1616; Astronomia Danica, &e., 1622; Disputationes quatuor Astrologice, 1622; Pentas Problematum Philosophi#, 1623; De Chronolabio Historico, seu de Tempore Disputationes tres, 1627; Geometria quesita XIIT. de Cyclometria rationali et vera, 1631; Inventio Quadrature Cireuli, 1684; Disputatio de Matheseos Indole, 1636 ; Coronis Problematicea ex Mysteriis triwm Numerorum, 1637 ; Proble- mata duo Geometriea, 1638 ; Problema contra Paulum Guldinum de Cireuli Mensura, 1638 ; Introductio in Theatrum Astronomicum, 1639; Rotundi in Plano, &c., 1644; Admiranda Operatio triwm Numerorum 6, 7, 8, &c., 1645; Caput tertium Libri primi de absoluta Mensura Rotundi plani, &c., 1646.

LONGUEVILLE, ANNE GENEVIEVE, DUCHESSE DE (1619-1679), who played the greatest part in the troubles of the Fronde, and whose name has come down to posterity as the brilliant intriguer in politics in her early and the pious protectress of the nuns of Port Royal in her later years, was the only daughter of Henri de Bourbon, Prince de Condé, and his wife Charlotte Marguerite de Montmorency, and the only sister of Louis, the great Condé. She was born on August 28, 1619, in the prison of Vincennes, into which her father had been thrown for opposition to Marshal D’Ancre, the favourite of Marie de’ Medici, who was then regent in the minority of Louis XIII. She was educated in the convent of the Carmelites in the Rue St Jacques at Paris, which had been recently established under the influence of St Teresa’s reforms by nuns of the strictest piety, whose teaching she never en- tirely forgot. Her early years were clouded by the execu- tion of the young and brilliant Duc de Montmorency, her mother’s only brother, for intriguing against the great Richelieu in 1631, and that of

her mother’s cousin the Comte de Montmorency Boutteville for duelling in 1635 ; but, in spite of their sorrow, her parents made their peace with Richelieu, and when she was introduced into society in 1635 she found plenty of court gaiety to enjoy. She soon became one of the bright particular stars of the Hotel Rambouillet, where all that was learned, witty, and gay in France used to assemble, and which had not yet degene- rated into the meeting place of those préczewses whom Moliére was to laugh out of existence. It was first proposed to marry her to the young Prince de Joinville, and thus unite the Guises and Condés, but he died in 1639, and her parents could only find for her husband the Duc de Longue- ville, a prince of the blood indeed, and governor of Nor- mandy, but a widower, and twice her age. The marriage could not be a happy one, but the young duchess long re- mained faithful to him, and bore him four children. After Richeliew’s death her father became chief of the council of regency during the minority of Louis XIV., her brother

Louis won the great victory of Rocroy in 1643 (see Conp&), and the duchess became of political importance. In 1647 she accompanied her husband to Miinster, where he was sent by Mazarin as chief envoy, and where she charmed the German diplomatists who were making the treaty of West- phalia, and was addressed as the “goddess of peace and concord.” On her return she fell in love with the Duc de la Rochefoucauld, the author of the Maxims, who made use of her love to obtain influence over her brother, and thus win titles and honours for himself. She was the guiding spirit of the first Fronde, when she brought over Armand, Prince de Conti, her second brother, and her husband to the malcontents, but she failed to attract Condé himself, whose loyalty to the court overthrew the first Fronde. However, La Rochefoucauld won the titles he desired. The second Fronde was again her work, owing to her lover’s disgust at losing his new honours, and in it she played the most pro- minent part in attracting to the rebels first Condé and later Turenne (see ConDE). It is not necessary to give the whole history of the wars of the Fronde, which is detailed else- where, but it must be noticed that the duchess herself only niingled in

politics to please her lover, and gain his ends. In the last year of the war she was accompanied into Guienne by the young and handsome Duc de Nemours, her intimacy with whom gave La Rochefoucauld an excuse for abandoning her, and who himself immediately returned to his old mistress the Duchesse de Chevreuse. Thus aban- doned, and in disgrace at court, the duchess betook herself to religion. She accompanied her husband to his govern- ment at Rouen, and devoted herself to good works. She took for her director M. Singlin, so famous in the history of Port Royal, and from that time began her new religious life. Till 1663 she chiefly lived in Normandy, when her husband died, and she came to Paris. There she became more and more Jansenist in opinion, and her piety and the remem- brance of her influence during the disastrous days of the Fronde, and above all the tender love her brother, the great Condé, bore her, made her a conspicuous figure. The king pardoned her, and in every way showed the respect he had for her. She became the great protectress of the Jansenists ; it was in her house that Arnauld, Nicole, and De Lane were protected ; and to her influence must be in great part attributed the release of De Sacy from the Bastille, the introduction of Pomponne into the ministry and of Arnauld to the king. Her famous letters to the pope are part of the history of Port Royat (q.v.), and as long as she lived the nuns of Port Royal des Champs were left in safety. Through the latter years of her life she had, despite the honour in which she was held, much to bear. Her elder son resigned his title and estates, and became a Jesuit under the name of the Abbé d’Orleans, while the younger, after leading a very debauched life, was killed, bravely leading the attack in the passage of the Rhine in 1673. As her health failed she devoted herself more and more to religion, and hardly ever left the convent of the Carmelites in which she had been educated. On her death in 1679 she was buried with great splendour by her brother Condé, and her heart, as she had directed, was sent to the nuns of that Port Royal des Champs which she had so greatly protected and defended. Her life is note- worthy, both from the harm she did in the turbulent days of the Fronde, though she acted, hardly knowing what she did, from love rather than from selfish ambition, and also from the greatness of her penitence, when her protection of Port Royal more than redeemed her fame, and gave her a title to the grateful

remembrance of all who reverence true piety and learning more than the artificial glitter of the reign of the “grand monarque.”

The chief authority for Madame de Longueville’s life is a little book in two voluines bv Villefore the Jansenist, published in 1738,

Cousin has devoted four volumes to her, which, though iminensely diffuse, give a vivid picture of her time. Her connexion with Port Royal should be studied in Arnauld’s Memvirs, and in the different histories of that institution. .

LONGUS, the Greek romancer. Nothing is known of the life ofthe author of Daphnis and Chloe, and it is only inferred from some apparent imitations of the Mthiopica of Heliodorus that he wrote after the time of Theodosius. He may therefore be placed in the 5th century. His position in literature is interesting and hot unimportant: he represents the romantic spirit of expiring classicism, the yearning of a highly artificial society for primitive sim- plicity, and the endeavour to create a corresponding ideal. The little idyl in the seventh oration of Dion Chrysostom is a beautiful example of this tendency three centuries before Longus, and the letters of Synesius, nearly in his own day, attest a genuine feeling for nature and a country life. In its literary aspect, nevertheless, this movement has little in common with the return to pure nature which inspired a Wordsworth, or the realism of George Sand’s delineations of the peasantry of Berri. Longus’s style is rhetorical, and his shepherds and shepherdesses are wholly conventional. It is no small credit to him to have achieved so purely ideal a delineation with so little apparent affecta- tion, and without any of the tediousness of almost all inodern pastoral writers. If unable to blend the reality and ideality of the pastoral life as Shakespeare has done in As You Like It and The Winter’s Tale, he has neverthe- less imparted real human interest to a purely fanciful picture, and shows no little’ knowledge of human nature in his delineation of the growth of a passionate attachment between two innocent children. Daphnis and Chloe were probably the prototypes of Paul and Virginia ; and, not- withstanding the naiveté of some details, the Greek has a decided

advantage over the Frenchman in the simplicity and sincerity which constitute the true modesty of nature. As an analysis of feeling, Daphnis and Chloe makes a nearer approach to the modern novel than its chief rival among Greek erotic romances, the Aithiopica of Heliodorus, where the attraction mainly consists in the ingenious succession of incidents.

Longus has found an*incomparable translator in Amyot, bishop of Auxerre, whose French version, as revised by Paul Lonis Courier, is better known than the original. It appeared in 1559,

thirty-nine years before the – publication of the Greek text «at Florence by Alamanni.

The chief subsequent editions are those by °

Jungermann (Hanau, 1603), Villoison (Paris, 1778, which first gave a standard text), Courier (Rome, 1810, the first entirely com- plete edition), Seiler (Leipsic, 1835), and Piecolos (Paris, 1866), pronounced by M. Pons the ne plus ultra of accuracy. Pons's account of the literature and bibliography of the subject, appended to his edition of Courier's version (1878), is very careful and com plete. There arc English translations by Thornley, Craggs, and Le Grice, the last with omissions. The illustrated editions, generally of Amyot's version, are very numerous, and some are very beautiful. Prudhon's designs are especially celebrated.

LONS-LE-SAULNIER, capital of the department of Jura, France, is situated at a distance of 275 miles by rail from Paris, on the Valliére, a small tributary of the Sadne, about 820 feet above the sea-level, at the point where the Besangon, Lyons, and ChAlon-sur-Saéne railways converge. It is pleasantly surrounded by vine-clad hills from 300 to 500 feet in height, consisting of lower spurs of the Jura chain. It owes its name to its salt-pits, which have been used from a very remote period ; the large quantities of ashes derived from the wood burnt in the 'process of evaporation are extensively utilized in agriculture.

Since — 1839 there has been an establishment for the use of the mineral waters. The principal industry of the place is the manufacture of sparkling wines, the Etoile growth being. the best for this purpose. There is also a foundry, in addition to printing establishments, tanneries, distilleries, brush factories, and manufactures of coverlets and carpets. About a mile to the west of the town are the salt-mines of Montmorot, employing one hundred and fifty workmen ; the bed of rock salt, which lies at a depth of 400 feet, and is nearly 100 feet thick, yields about 9500 tons of pure salt yearly, 885 tons of sulphate of soda, and 300 tons of chloride of potassium. Lons-le-Saulnier possesses no build- ings of special interest ; one of the public squares contains a statue of Lecourbe, and there is a museum containing Gallo-Roman antiquities and various works of art. The library, which like the museum is in the town-hall, has 20,000 volumes. The population in 1876 was 11,371.

Lons-le-Saulnier, originally a Gallic town, was fortified by the Romans, destroyed by the barbarians, and, afterwards rebuilt and extended, belonged for a long time during the medixval period to the powerful house of Chalon, a younger branch of that of Burgundy. It was burned in 1864 by the English, and again in 1637, when ‘it was seized by the duke of Longueville for Louis XIII. It became definitively French in 1674. It was there that the meeting between Ney and Napoleon took place, on the return of the latter from Elba, on March 81, 1815. Rouget de1’Isle, the author of the Marscillaise Hymn, was born at Montaigu near this town.

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DICTIONARY

OF .

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XV Cain

EDINBURGH: ADAM AND CHARLES BLACK

MDCCCLXXXIII

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ENCYCLOPADIA BRITANNICA.

Li Om)

Ca (formerly called LanrERoo), a round game of

cards. Loo may be played by any number of persons; from five to seven makes the best game. ‘“ Three-card loo” is the game usually played. A pack of fifty-two cards is required. The players being seated, the pack is shuffled and a card dealt face upwards to each. The player to whom a knave falls has the first deal, the player to his left deals next, and so on in rotation. Each player is entitled to a deal, 7.e., the game should not be abandoned till it returns to the original dealer; but, if there is a loo in the last deal of a round, the game continues till there is a hand without aloo. The pack is cut to the dealer, who deals three cards to each player and an extra hand called miss, The dealer turns up the top of the undealt cards for trumps. ‘The dealer is sometimes permitted to deal the cards in any order he pleases; but the best rule is to require that the cards be dealt one at a time in rotation, as at whist. During the deal each player contributes to the pool a sum previously agreed upon, the dealer contributing double, The unit for a single stake should be divisible by three without a remainder, eg., three counters or three pence. The players are bound to put in the stake before the deal is completed ; sometimes a penalty is enforced for neglect. The deal being completed and the pool formed, each player in rotation, beginning from the dealer’s left, looks at his cards, and declares whether he will play, resign, or take miss. If the former, he says “I play.” If he takes miss he places his cards face dowawards in the middle of the table, and takes up the extra hand. If he resigns, he similarly places his cards face downwards in the middle of the table. If miss is taken, the subsequent players only have the option of playing or resigning. A player who takes miss must play. Those who have declared to play, and the one—if there is one—who has taken miss, then play one card each in rotation, beginning from the dealer’s left, the cards thus played constituting a trick. The trick is won by the highest card of the

suit led, or, if trumped, by the highest trump, the cards ranking as at whist. The winner of the trick leads to the next, and so on, until the hand is played out. The cards remain face upwards in front of the persons playing them.

_ Rules of Play.—lf the leader holds ace of trumps he must lead it (or king, if ace is turned up). If the leader has two trumps

he must lead one of them, and if one is ace (or king, ace being turned up) he must lead it. With this exception the leader is not bound to lead his highest trump if more than two declare to play ; but if there are only two declared players the leader with more than one trump must lead the highest. Except with trumps as above stated he may lead any card he chooses. The subsequent players must head the trick if able, and must follow suit if able. Holding none of the suit led, they must head the trick with a trump, if able. Otherwise they may play any card they please. ‘The winner of the first trick is subject to the rules already stated respecting the lead, and in addition he must lead a trump if able (called trump after trick).

When the hand has been played out, the winners of the tricks divide the pool, each receiving one-third of the amount for each trick. If only one declared to play, the dealer plays miss either for himself or for the pool. If he plays for the pool he must declare before seeing miss that he does not play for himself. Any tricks he may win, when playing for the pool, remain there as an addition to the next pool.

If each declared player wins at least one trick it is a single, t.c., a fresh pool is made as already described; but if one of the declared players fails to make a trick he isJooed. Then, only the player who is looed contributes to the next pool, together with the dealer, who puts ina single stake. If more than one player is looed, each has to contribute. At wnlimited loo each player looed has to put in the amount there was in the pool. But it is generally agreed to limit the loo, so that it shall not exceed a certain fixed sum. Thus, at eighteen-penny loo, the loo is generally limited to half a guinea. If there is less than the limit in the pool the payment is regulated as before ; but if there is more than the limit, the loo is the fixed sui agreed on.

The game is sometimes varied by forces, i.e, by compelling every one to play, either whenever there is no loo the previous deal (a single), or

whenever clubs are trumps (club law). When there is a force no miss is dealt. Jrish loo is played by allowing declared players to exchange some or all of their cards for cards dealt from the top of the pack. There is no miss, and it is not com- pulsory to lead a trump with two trumps, unless there are only two declared players. At five-card loo each player has five cards instead of three, and a single stake should be divisible by five. Pam (knave of clubs) ranks as the highest trump, whatever suit is turned up. There is no miss, and cards may be exchanged as at Irish loo. If ace of trumps is led, the leader says ‘‘ Pam be civil,” when the holder of that card must pass the trick if he can do so without revoking. A flush (five cards of the same suit, or four with Pam) loos the board, i.¢., the holder receives the amount of a loo from every one, and the hand is not played. A trump flush takes precedence of flushes in other suits. If more than one flush is held, or if Pam is held, the holder is exempted from payment. As between two flushes which do not take precedence, the elder hand wins.

Declaring to Play, and Playing (threc-card loo).—Play on two trumps. The first to declare should play on an honour in trumps

and an acein plain suits. Play also on king of trumps; but some players throw up king of trumps single unless with it another king or a guarded queen is held. Also play on one trump with two other cards as high as qucens ; some players throw up this hand. Molding a trump and two aces, lead the trump if three others declare to play ; but otherwise lead an ace. Do not play on a hand without a trump ; except, play on any cards that give a reasonable chance of a trick, or take miss, if the amount in the pool is considerable, and the loo is limited. If the number of players is less than five, or if several throw up, weaker hands may be played ; on the other side, if several have declared to play, only a very strong hand should be risked. If there are only three left in, all others having thrown up, miss should be taken, but not when there are more than two to follow the player whose turn.it is to declare. Laws of Loo.—These vary greatly, and should be agreed on before commencing to play. The ordinary rules, which loo the player for nearly cvery error, are very bad. The following are based on the

laws of the late Blenheim Club. 1. First knave deals. 2. Each player has a right to shuffle. 3. The player to the dealer's right cuts the pack. 4. The dealer must deliver the cards, one by one, in rotation, as at whist, and must deal one card for miss at the end of each round; he must turn up the top card of the undcalt cards for trumps. 5. If the dealer deals without having the pack cut, or shufiles after it is cut, or deals except as provided in law 4, or deals two cards together and then deals a third without rectifying the error, or exposes a card, or deals too many cards, he forfeits a single to the pool, and deals again. 6. The player to the left of the dealer deals next. If a player deals out of turn, he may be stopped before the trump card is turned, otherwise the deal stands good, and the player to his left deals next. 7. Players must declare to play in rotation, beginning to the dealer's left. A player looking at his cards before his turn forfeits a single to the pool. 8. A player who declares before his turn, or who exposes a card, forfcits a single to the pool, and must throw up hishand.?_ 9. If a declared player exposes a card before his turn to play, or plays out of turn, or before all have declared, or detaches a card so that it can be named by any other declared player, or revokes, he must leave in the pool any tricks he may make, and forfeit four times the amount of asingle. If he makes no trick he is looed, and there is no further penalty. 10. Ifthe leader holds ace of trumps and does not lead it (or king, ace being turned up), or if he holds two trumps and does not lead one, or the highest of two or more trumps when there are only two declared players (unless his cards are sequence cards or cards of equal value), or if a player does not head the trick when able, or if he does not lead trump after trick (if he holds a trump), he is liable to the same penalty as in law 9.2 11. In case of revokes or errors in play the hand must be replayed if so desired by any one except the offender. 12. The place of an aftercomer is decided by dealing a card between every two of the players. The aftercomer sits where the first knave falls. (H. J.)

LOOCHOO. See LEw-cuew Isuanps.

LOOM. See WzavING.

LOOM, or Loon (Icelandic, Zémr), a name applied to water-birds of three distinct Families, all remarkable for their clumsy gait on land. The first of them is the Colymbidx, to which the term Diver (g.v.) is nowadays usually

restricted in books; the second the Podicipedide, or GREBES (see vol. xi. p. 30); and the third the Alcidz. The form Loon is most commonly used both in the British Islands and in North America for all the species of the genus Colymbus, or Hudytes according to some ornitho- logists, frequently with the prefix Sprat, indicating the kind of fish on which they are supposed to prey; though it is the local name of the Great Crested Grebe (Podiceps cristatus) wherever that bird is sufficiently well known to have one; and, as appears from Grew (Mus. Reg. Soc.,p.69), it was formerly given to the Little Grebe or Dabchick (P. fluviatilis or minor) as well. The other form Loom seems

? The law which loos a player for misdealing is atrocious, and should always be opposed.

? Forfeits of a single go to increase the pool already formed, and see note to law 5.

3 Tricks left in the pool and fines under laws 9 and 10 go to the next pool and not to the pool already formed. Many players inflict the penalty of a loo for the offences named in laws 9 and 10 5 but the rule above, as played at the Blenheim, is the best.

- The word also takes the form ‘‘ Lumme” (fide Montagu), and, as Professor Skeat observes, is probably connected with lame. The signification of loon, a clumsy fellow, and metaphorically a simpleton, is obvious to any one who has seen the attempt of the birds to which the name is given to walk.

more confined in its application to the north, and is said by Mr T. Edmonston (Ztym. Gloss. Shetl. and Orkn. Dialect, p. 67) to be the proper name in Shetland of Colymbus septentrionalis®; but it has come into common use among Arctic seamen as the name of the species of Guillemot (Alea arra or bruennichi) which in thousands throngs the cliffs of far northern lands, from whose (hence called) ‘‘“loomeries” they obtain a considerable stock of wholesome food, while the writer believes he has heard the word locally applied to the RazorBILu (g.v.). (A. N.)

LOPE DE VEGA. See Vzeca Carpio.

LOPEZ, Cartos Antonio (1790-1862), a Paraguayan ruler of great ability, born at Asuncion, November 4, 1790, was educated in the ecclesiastical seminary of that city, and by his ability attracted the hostility of the dictator, Francia, in consequence of which he was forced to keep in hiding for several years. He acquired, however, by study, so unusual a knowledge of law and governmental affairs that, on Francia's death in 1840, he soon acquired an almost undisputed control of the Paraguayan state, which he maintained uninterruptedly until his own death in 1862. He was successively secretary of the ruling military junta (1840-41), one of the two consuls (1841-44), and president with dictatorial powers (1844-1862) by succes- sive elections for ten and three years, and in 1857 again for ten years, with power to nominate his own successor. Though nominally a president acting under a republican constitution, he ruled despotically, the congress assembling only rarely and on his call, and then only to ratify his decrees. His government was in general directed with wise energy towards developing the material resources and strengthening the military power of the country. His jealousy of foreign approach several times involved him in diplomatic disputes with Brazil, England, and the United States, which nearly resulted in war, but each time he extricated himself by skilful evasions. Paraguay rapidly advanced under his firm and, on the whole, patriotic administration. He died September 10, 1862.

LOPEZ, Francisco SoLano (1826-1870), eldest son of Carlos Antonio Lopez above noticed, was born near Asuncion, Paraguay, July 24, 1826. During his boyhood his father was in hiding, and in consequence his education was wholly neglected. Soon after his father's accession to the presidency, Francisco, then in his nineteenth year, was made commander-in-chief of the Paraguayan army, during the spasmodic hostilities then prevailing with the Argen- tine Republic. After receiving successively the highest offices of the state, he was sent in 1853 as minister to England, France, and Italy, to ratify formally treaties made with these powers the previous year. He spent a year and a half in Europe, and succeeded in purchasing large quantities of arms and military supplies, together with several steamers, and organized a project for building a railroad and establishing a French colony in Paraguay. He also formed the acquaintance of Madame Lynch, an Irish adventuress of many talents and popular qualities, who became his mistress, and strongly influenced his later

ambitious schemes. Returning to Paraguay, he became in 1855 minister of war,and on his father's death in 1862 at once assumed the reins of government as vice-president, in accordance with a provision of his father's will, and called a congress by which he was chosen president for ten years. He had long cherished ambitious designs, and now set himself to enlarge the army, and purchase in Europe large quantities of military stores. In 1864 he began open aggression on Brazil by demanding, in his self-styled capacity of " protector of the equilibrium of the La Plata," that Brazil should abandon her armed interference in a

5 Dunn and Saxby, however, agree in giving « Rain-Goose " as the name of this species in Shetland.

revolutionary struggle then in progress in Uruguay. No attention being paid to his demand, he treacherously seized a Brazilian merchant steamer in the harbour of Asuncion, and threw into prison the Brazilian governor of the pro- vince of Matto Grosso who was on board. In the follow- ing month (December 1864) he despatched a force to invade Matto Grosso, which seized and sacked its capital Cuyab4, and took possession of the province and its diamond mines. Lopez next sought to send an army to the relief of the Uruguayan president Aguirro against the revolutionary aspirant Flores, who was supported by Brazilian troops. The refusal of the Argentine president, Mitre, to allow this force to cross the intervening province of Corrientes, was seized upon by Lopez as an occasion for war with the Argentine Republic.

A congress, hastily summoned and composed of his own nominees, bestowed upon Lopez the title of marshal, with extraordinary war powers, and on April 13, 1865, he declared war, at the same time seizing two Argentine war- vessels in the bay of Corrientes, and on the next day occupied the town of Corrientes, instituted a provisional government of his Argentine partisans, and summarily announced the annexation to Paraguay of the provinces of Corrientes and Entre Rios. Meantime the party of Flores had been successful in Uruguay, and that state on April 18 united with the Argentine Republic in a declaration of war on Paraguay, the news of the treacherous proceed- ings of Lopez having then but just reached Buenos

Ayres. On May lst Brazil joined these two states in a secret alliance, which stipulated that they should unitedly prosecute the war “until the existing government of Paraguay should be overthrown,” and “until no arms or elements of war should be left to it.” This agreement was literally carried out.

The war which ensued, lasting until April 1, 1870, was on the largest scale of any that South America had experienced, and was carried on with great stubbornness and with alternating fortunes, though with a steadily increasing tide of disasters to Lopez (see Paracuay). In 1868, when the allies were pressing him hard before the various strongholds still remaining to him in Paraguay, his mind, naturally suspicious and revengeful, led him to conceive that a conspiracy had been formed against his life in his own capital and by his chief adherents. His bloodthirsty rage knew no bounds. In a short time several hundred of the chief Paraguayan citizens were seized and executed by his order, including his brothers and brothers-in-law, cabinet ministers, judges, prefects, military officers of the highest grade, the bishops and priests, and nine-tenths of the civil officers, together with more than two hundred foreigners, among them several members of the different diplomatic legations.

Lopez was at last driven with a mere handful of troops to the northern frontier of Paraguay, where on April 1, 1870, he was surprised by a Brazilian force and killed as he was endeavouring to escape by swimming the river Aquidaban. His ill-starred ambition had in a few years reduced Paraguay from the prosperity which it had enjoyed under his father to a condition of hopeless weakness, and it has since remained a virtual dependency of Brazil.

LORCA, a town of Spain, in the province of Murcia, on the right side of the Sangonera (here called the Guada- lentin), by which it is separated from the suburb or quarter of San Cristobal. It is situated about 38 miles west from Cartagena, and 37 south-west from Murcia, at the foot of the Sierra del Cafio, The principal buildings are the col- legiate church of San Patricio, with a Corinthian facade, and the parish church of Santa Maria, in the Gothic style. The principal manufactures are soda, saltpetre, gunpowder, and cloth ; the trade, apart from that which these articles

involve, is insignificant. The population of the munici- pality was 52,934 in 1877.

Lorca (Arab. Lurka) is the Eliocroca of the Itin. Ant., and pro- bably also the Zlorci of Pliny (iii. 3). It was the key of Murcia during the Moorish wars, and was frequently taken and retaken. On April 30, 1802, it suffered severely by the bursting of the reservoir known as the Pantano de Puentes, in which the waters of the Guadalentin were stored for purposes of irrigation ; the Barrio de San Cristobal was completely ruined, and more than six hundred persons perished in the disaster. In 1810 it suffered greatly from the French.

LORENZO MARQUES, or Lourenco Manrquzs, the chief place, and indeed the only European settlement, in the district of its own name in the Portuguese province of Mozambique in south-eastern Africa, is situated on Delagoa Bay, at the mouth of the Lorenzo Marques or English River, in 25° 58’S. lat. and 32° 30’ E. long. At the time of Mr Erskine’s visit in 1871 it was a poor place, © with narrow streets, fairly good flat-roofed houses, grass huts, decayed forts, and rusty cannon, enclosed by a wall 6 feet high recently erected and protected by bastions at intervals. In 1878 Governor Castelho returned the white population of all the district (whose area is estimated at 210,000 square miles) as 458, and the natives as from 50,000 to 80,000. A commission sent by the Government in 1876 to drain the marshy land near the settlement, to plant the blue gum tree, and to build a hospital and church, only partly accomplished its task, and other commissions have succeeded it. In 1878-79 a survey was taken for a railway from Lorenzo Marques to the Transvaal (see Bol. da Soc, de Geogr. de Lisboa, 1880), and the completion of this enterprise will make the settlement (which already possesses the best harbour on the African coast between the Cape and Zanzibar) a place of considerable importance. It became a regular port of call for the steamers of the British India Steam Navigation Company in 1879, and for those of the Donald Currie line in 1880. Since 1879 it is also a station on the telegraph line between Aden and South Africa. Both Germany and England maintain consular agents in the settlement.

See Denacoa Bay, vol. vii. p. 40; and Lobo de Bulhaes, Les Colonies portugaises (Lisbon, 1878).

LORETO, a city in the province and circondario of Ancona, Italy, is situated some 15 miles by rail south-west from Ancona on the Ancona-Foggia railway, 16 miles north-east from Macerata, and 3 from the sea It lies upon the right bank of the Musone, at some distance from the railway station, on a hill-side commanding splendid views from the Apennines to the Adriatic. The city itself consists of little more than one long narrow street, lined with booths for the sale of rosaries, medals, crucifixes, and similar objects, the manufacture of which is the sole industry of the place. The population in 1871 was only 1241; but, when the suburbs Montereale, Porta Marina, and Casette are included, the population is given as 4755, that of the commune being 8083. The number of pilgrims is said to amount to about 500,000 annually. The principal buildings, occupying the four sides of the piazza, are the college of the Jesuits, the Palazzo Apostolico (designed by Bramante), and the architecturally insig- nificant cathedral church of the Holy House (Chiesa della Casa Santa). The handsome facade of the church was erected under Sixtus V., who fortified Loreto and gave it the privileges of a town (1586) ; his colossal statue stands in the middle of the flight of steps in front. Over the principal doorway is a life-size bronze statue of the Virgin and Child by Girolamo Lombardo ; the three superb bronze doors executed under Paul V. (1605-21) are also by Lombardo, his sons, and his pupils. The richly decorated campanile, by Vanvitelli, is of great height ; the principal bell, presented by Leo X. in 1516, weighs 11 tons. The

interior of the church has mosaics by Domenichino and Guido Reni, a beautiful bronze font and other works of art; but the chief object of interest is the Holy House itself, which occupies a central place. It is a plain brick build- ing, measuring 28 feet by 12), and 134 feet in height ; it has a door on the north side and a window on the west ; and a niche contains a small black image of the Virgin and Child, in Lebanon cedar, and richly adorned with jewels. St Luke is alleged to have becn the sculptor ; its workmanship suggests the latter half of the 15th century. Around the Santa Casa is a lofty

marble screen, designed by Bramante, and executed under Popes Leo X., Clement VII., and Paul IIL, by Andrea Sansovino, Girolamo Lombardo, Bandinelli, Guglielmo della Porta, and others. The four sides represent the Annunciation, the Nativity, the Arrival of the Santa Casa at Loreto, and the Nativity of the Virgin respectively. The treasury of the church contains a large variety of rich and curious votive offerings.

The legend of the Holy House, by which Loreto became what has been not inappropriately called the Christian Mecca, scems to have sprung up, how is not exactly known, at the close of the crusad- ing period, It is briefly referred to in the Ltalia Illustrata of Flavius Blondus, secretary to Popes Eugenius IV., Nicholas V.,Calixtus III., and Pius II. (ob. 1464); it is to be read in all its fulness in the ‘*Redemptoris mundi Matris Ecclesie Lauretana historia,” by a ccrtain Teremannus, contained in the Opera Omnia (1576) of Bap- tista Mantuanus. According to this narrative the house at Nazareth in which Mary had been born and brought up, had received the annunciation, and had lived during the childhood of Jesus and after His ascension, was converted into a church by the apostles, and worship continued to be held in it until the fall of the kingdom of Jerusalem. Threatened with destruction by the Turks, it was carried by angels through the air and deposited (1291) in the first instance on a hill at Tersato in Dalmatia (some miles inland from Zengg), where an appearance of the Virgin and numerous iniraculous cures attcstcd its sacredness, which was confirnied by investigations made at Nazarcth by messengers from the governor of Dalmatia. In 1294 the angels carried it across the Adriatic to a wood near Recanati; from this wood (lauretum), or from the name of its proprietrix (Laureta), the chapel derived the name which it still retains (‘‘sacellum gloriose Virginis in Laureto’’). From this spot it was afterwards (1295) removed to the present hill, one other slight adjustment being required to fix it in its actual site. Bulls in favour of the shrine at Loreto were issued by Sixtus IV. in 1491 and by Julius II. in 1507, the last alluding to the translation of the house with some caution (‘‘ ut pie ereditur et fama est”), The recognition of the sanctuary by subsequent pontiffs has already been alluded to. In the end of the 17th century Innocent XII. appointed a ‘‘missa cum officio proprio” for the feast of the Translation of the Holy House, and the Festum Translationis Alms Domus Lauretane B. M. V. is still enjoined in the Spanish Breviary as a ‘‘ duplex majus” (December 10), In the sixth lesson it is stated that “the house

in which the Virgin was born, having been consecrated to the divine mysteries, was by the ministry of angels removed from the power of the infidels first to Dalmatia and afterwards to the Lauretan field during the pontificate of Celestine V. That it is the identical house in which the Word was made flesh and dwelt among men is attested by papal docu- ments, by the veneration of all the world, by continued miracles, and by the grace of heavenly blessings.”

LORIENT, capital of an arrondissement in the depart- ment of Morbihan, and of one of the five maritime prefectures of France, a military port and fortified place, stands on the right bank of the Scorff, at its confluence with the Blavet, in 47° 45’ N. lat. and 3° 31’ W. long., on the railway line from Nantes to Brest, at a distance of 117 miles from the former and 111 from the latter. The town, which is modern and regularly built, contains no buildings of special architectural or antiquarian interest; it derives all its importance from its naval establishments lining the right bank of the river, which include sail-making works, cooperages, and shops for all kinds of ship carpentry. The rope-work forms a parallelogram more than 1000 feet in length by 100 broad. The foundries, fitting shops, and smiths’ shops are on an equally extensive scale, the forges numbering eighty-four. Of the graving docks the largest is 509 feet in length, about 98 in breadth, and more than 26 feet in depth below low-water mark. The Prée, an

area of 40 acres reclaimed from the sea, contains boatbuild- ing yards, steam saw-mills, and wood stores; a floating bridge 900 feet long connects it with the shipbuilding establishments of Caudan, which occupy the peninsula formed by the confluence of the Scorff and the Blavet. Apart from its naval constructions, in which Lorient holds the first rank in France, it has an important place in the manufacture of marine artillery. Private industry is also engaged in engine making. ‘The trade in fresh fish and sardines within the arrondissement reaches an annual value of 35 millions of francs. South from the town, also on the Scorff, is the harbour, which comprises a dry dock and a wet dock, measuring about 1650 feet by 200. The road- stead, formed by the estuary of the Blavet, is accessible to vessels of the largest size; the entrance, 3 or 4 miles south from Lorient, which is defended by numerous forts, is marked on the east by the peninsula of Gavre (an artillery practising ground) and the fortified town of Port Louis;

on the west are the fort of Loqueltas, and, higher up, the battery of Kernevel. In the middle of the channel is the granite rock of St Michel, occupied by a powder magazine. Opposite it, on the right bank of the Blavet, is the mouth of the river Ter, with fish and oyster breeding establishments, from which 10 millions of oysters are annually obtained. Above Lorient on the Scorff, here spanned by a suspension bridge, is Kerantrech, a pretty village surrounded by numerous country houses. The population of Lorient in 1876 was 35,165, including 6860 of the military and official class.

Lorient has taken the place of Port Louis as the port of the Blavet. The latter stands on the site of an ancient hamlet which was fortified during the wars of the League and handed over by Mercceur to the Spaniards. After the treaty of Vervins it was restorcd to France, and it received its name of Port Louis under Richelieu. Some Breton merchants trading with the Indies had established themselves first at Port Louis, but in 1628 they built their warehouses on the other bank. The Compagnie des Indes, created in 1664, took possession of these, giving them the name of Lorient. In 1745 the company, then at the acme of its prosperity, owned thirty-five ships of the largest class and many others of con- siderable size. The failure of the attempt of the English under Lestock against Lorient is still commemorated by the inhabitants by an annual procession on the first Sunday of October. The decadence of the company dates from 1753. In 1782 the town was acquired by purchase by Louis XVI., on the bankruptcy of its former owners, the Rohan-Gueméné family.

LORRAINE (Lotuarinera, LoTHRINGEN) is geogra- phically the extensive Austrasian portion of the realm allotted by the partition treaty of Verdun in August 843 to the emperor Lothair I., and inherited by his second son, King Lothair II, 855-869, from whose days the name Stegnum Lothari first arose. This border-land between the realms of the Eastern and Western Franks in its original extent took in most of the Frisian lowlands between the mouths of the Rhine and the Ems, and a strip of the right shore of the Rhine to within a few miles of Bonn. In the neighbourhood of Bingen it receded from the left shore of the river so as to exclude the dioceses of Worms and Spires, but to admit a certain connexion with Alsace. Towards the west it included nearly the whole ter- ritory which is watered by the

rivers Moselle and Meuse, and spread over the dioceses of Cologne, Treves, Metz, Toul, Verdun, Liége, and Cambrai. Hence this artificial realm embraced, broadly speaking, almost all modern Holland and Belgium (with the exception of Flanders), part of the Prussian Rhine provinces, and what is still called Lorraine, partly French and partly German, divided, however, from Alsace and the Palatinate by the natural frontier line of the Vosges and the Haardt mountains. Its inhabitants were soon called Hlothari, Lotharienses, Lotharingi. Lo- tharingia, as the designation of the country, hardly appears before the middle of the 10th century.

Up to this time Lorraine had belonged alternately to

the eastern and the western kingdom ever since Louis the German and Charles the Bald divided the realm of Lothair II. more ethnographically by the treaty of Meersen, August 8, 870. After the deposition in 887 of the emperor Charles IIT., who for a short time appeared at the head of the three reunited realms, the country still remained distinct, though the invasions of the Northmen and feudal disintegration creeping in from the west vied to tear it to pieces. Yet the emperor Arnulf, after his success against the Scandinavians, restored some order, and made his son Zwentebulch king over that part of the empire in 894. But he never overcame the difficulties inherent in a country peopled by Franks, Burgundians, Almains, Frisians, and Scandinavians, speaking various Romance and Teutonic dialects, the western group being evidently attracted by the growth of a French, the eastern by that of a German nationality. King Zwentebulch quarrelled with certain powerful lords, offended mortally the bishops, especially that of Treves, and finally lost his life in battle on the 13th August 900. In the days of Louis the Child, the last of the eastern Carolings, there rose to ducal dignity Reginar Long-neck, count of Haspengau, Hennegau, or Hainault, who owned a number of fiefs and monasteries in the diocese of Liége. He found it profitable to adhere to Charles, king of the Western Franks, especially after Louis’s death in 911. His son Gisilbert from 915 began to rule the Lotharingiaus likewise in opposition to Conrad I. and Henry I., who were the successors of Louis the Child, with the exception, however, of Alsace and the Frisian districts, which now separated, definitively to remain

with the German kingdom. By the treaty of Bonn (921) the Lotharingian duchy was ceded formally to France, until Henry I., profiting by the disunion between Charles the Simple and his rivals, subdued Gisilbert and his dominion (925), and about 928 returned it to him with the hand of his daughter as a member of the German kingdom, though rather more independent than other duchies. Its western frontier now appears to have extended up to the Dutch Zealands.

Henry's son, the great Otto J., when his brother rebelled in conjunction with Eberhard and Gisilbert, the dukes of Franconia and Lotharingia, beat and anuihilated these two vassals (939), and secured the latter country by a treaty with the French king Louis: IV., who married Gisilbert's widow, entrusting it consecutively to his brother Henry, to a Duke Otto, and from 944 to Conrad the Red, his son-in-law. Chiefly with the help of the Lotharingians he invaded France in order to reinstate the king, who had been dethroned by his proud vassals. But a few years later, when Liudulf, the son of King Otto and the English Edith, and Duke Conrad, discontented with certain measures, rose against their father and lord, the ever- restless spirit of the Lotharingians broke out into new commotions. The stern king, however, suppressed them, removed both his son and his son-in-law from their offices, and appointed his youngest brother, the learned and statesmanlike Brun, archbishop of Cologne and chancellor of the realm, to be also duke or, as he is called, archduke of Lotharingia. Brun snatched what was still left of demesne lands and some wealthy abbeys like St Maximine near Treves from the rapacious nobles, who had entirely converted the offices of counts and other functionaries into hereditary property. He presided over their diets, enforced the public peace, and defended with their assistance the frontier lands of Germany against the pernicious influence of the death struggle fought between the last Carolings of Laon and the dukes of Paris. Quelling the insurrections of a younger Reginar in the lower or ripuarian regions, he admitted a faithful Count Frederick, who possessed much land in the Ardennes, at Verdun, and at Bar, to ducal

dignity. Although the emperor, after Brun's early death, October 10, 965, took the border-land into his own hands, he connived, as it appears, at the beginning of a final division between an upper and a lower duchy,—leaving

the first to Frederick and his descendants, while the other, administered by a Duke Gottfrid, was again disturbed by a third Reginar and his brother Lambert of Louvain. When Otto II. actually restored their fiefs to them in 976, he nevertheless granted the lower duchy to Charles, a son of the Caroling Louis IV., and his own aunt Gerberga. Henceforth there are two duchies of Lorraine, the official name applying originally only to the first, but the two dignitaries being distinguished as Dux Mosellanorum and Dux Ripuariorum, or later on Dux Metensis or Barrensis and Dux Lovantensis, de Brabantia, Bullionis, or de Limburg. Both territories now swarmed with ecclesiastical and temporal lords, who struggled to be independent, and, though nominally the subjects of the German kings and emperors, frequently held fiefs from the kings and the grand seigneurs of France.

Between powerful vassals and encroaching neighbours the imperial delegate in the lower duchy could only be a still more powerful seigneur. But Duke Charles became the captive of the bishop of Laon, and died in 994. His son, Duke Otto, dying childless (1004), left two sisters married to the counts of Louvain and Namur. Between 1012 and 1023 appears Duke Gottfrid L, son of a count of Verdun, and supporter of the emperor Henry II., who, fighting his way against the counts of Louvain, Namur, Luxemburg, and Holland, is succeeded by his brother Gozelo I., hitherto margrave of Antwerp, who since 10338, with the emperor’s permission, ruled also Upper Lorraine, and defended the frontier bravelyagainstthe incursions of Count Odo of Blois, the adversary of Conrad II. At his death (1046) the upper duchy went to his second son Gottfrid, while the eldest, Gozelo II., succeeded in the lower, until he died childless (1046). But Gottfrid II. (the Bearded), an energetic but untrustworthy vassal, rebelled twice in alliance with King Henry I. of France and Count Baldwin V. of Flanders against the emperor Henry V., who opposed a union of the duchies in such hands. Lower Lorraine therefore was given (1046) to Count Frederick of Luxemburg, after whose death (1065) it was nevertheless held by Gottfrid, who in the mean time, being banished the country, had married Beatrice, the widow of Boniface of Tuscany, and acted a prominent part in the affairs of Italy. As duke of Spoleto and champion of the Holy See he rose to great importance during the turbulent minority of Henry IV. When he died December 21, 1069, his son Gottfrid IIT., the Hunch- backed, succeeded in the lower duchy, who for a short time was the husband to

Matilda of Canossa, the daughter of Boniface and Beatrice. Soon, however, he turned his back on Italy and the pope, joined Henry IV., fought with the Saxon rebels and Robert of Flanders, and in the end was miserably murdered by an emissary of the count of Holland, February 26, 1076. Conrad, the emperor's young son, now held the duchy nominally till it was granted 1088 to Gottfrid IV., count of Bouillon, and son of Ida, a sister of Gottfrid III., and Count Eustace of Boulogne, the hero of the first crusade, who died king of Jerusalem in 1100. After him Henry, count of Limburg, obtained the country; but, adhering to the old emperor in his last struggles, he was removed by the son in May 1106 to make room for Gottfrid V., the great-grandson to Lambert I., count of Lorraine, a descendant of the first ducal house, which had been expelled by Otto the Great. Nevertheless he joined his predecessor in rebellion against the emperor (1114), but returned to his side in the war about the see of Lidge. Later on he opposed King Lothair ITJ., who in turn supported Walram, son of Henry of Limburg, but died in peace with Conrad

IIl., January 15, 1139. His son Gottfrid VI. was the last duke of Lower Lorraine, and second duke of Brabant. Henceforth the duchy split definitely into that of Limburg, the inheritance of the counts of Verdun, and that of Louvain or Brabant, the dominion of the ancient line of the counts of Haspengau. Various fragments remained in the hands of the counts of Luxemburg, Namur, Flanders, Holland, Juliers, &c.

Upper Lorraine, a hilly table-land, is bordered on the east by the ridge of the Vosges, on the north by the Ardennes, and on the south by the table-land of Langres. Towards the west the open country stretches on into Champagne. The Meuse and the Moselle, the latter with its tributaries Meurthe and Saar, run through it from S.E. to N.W. in a direction parallel to the ridge of the Argonnes. In this country Duke Frederick was succeeded by his son and grandson till 1033. Afterwards Gozelo I. and Gottfrid the Bearded, Count Albert of Alsace and his brother or nephew Gerard, held the duchy successively under very insecure circumstances. The ducal territories were even then on all sides surrounded and broken in upon, not only by those of the three bishops, but also by the powerful counts of Bar.

Moreover, when in 1070 a new dynasty was established in Theodoric, son of Count Gerard of Alsace, his brother Gerard of Vaudemont became the founder of a separate line. The former political and feudal ties still connected the duchy with the empire. The bishops were the suffragans of the archbishop of Treves, who rose to be one of the prince-electors. The dukes, however, de- scending from Theodoric in the male line, though much weakened by the incessant dilapidation of their property, for two centuries adhered generally to the emperor. Duke Simon I. was step-brother of the emperor Lothair ITI.; his son Matthew I. intermarried with the Hohenstaufen family. His son and grandsons appear traditionally on the side of Henry VI., Philip, Frederick II., and but rarely prefer the Welfish opponent. Later on Theobald II. and Frederick IV. supported Albert and Frederick of Austria against Louis the Bavarian. Yet during the same age French feudalism and chivalry, French custom and language, advanced steadily to the disadvantage of German policy and German idioms amongst knights and citizens. King Philip Augustus already promoted Frenchmen to the sees of Cambrai, Verdun, and Toul. Though remaining a fief of the empire, the duchy of Lorraine itself, a loose accumulation of centrifugal elements, was irresistibly attracted by its western neighbour, although the progress of French mouarchy for a time was violently checked by the English invasion. Duke Rudolf, a great grandson of Rudolf of Hapsburg, died at Crécy among the French chivalry, like his brother-in-law the count of Bar. To his son John, who was poisoned at Paris (1391), Charles, called the Bold, succeeded, while his brother Frederick, who was slain at Agincourt, had annexed the county of Vaudemont by right of his wife. Charles, who died in 1431 without male issue, had bestowed his daughter Isabella in marriage on René, count of Anjou, and titular king of Naples, Sicily, and Jerusalem, and also a French vassal for fragments of the duchy of Bar, and the fiefs of Pont & Mousson and Guise. However, when he obtained by right of his wife the duchy of Lorraine, he was defeated by Anthony, the son of Frederick of Vaudemont. But by his daughter Tolanthe marrying Frederick II., Count Anthony’s son and heir, the duchies of Lorraine and Bar were in the end united by René II. with the county of Vaudemont and its dependencies Aumale, Mayenne, and Elbceuf, In the mean- time all these prospects were nearly annihilated by the conquests of Charles of Burgundy, who evidently had chosen Lorraine to be the keystone

of a vast realm stretching from the North Sea to the Mediterranean. This new border

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empire, separating Germany from France, fell almost in- stantly to pieces, however, when the bold Burgundian lost his conquests and his life in the battle of Nancy, January 4, 1477. After this the duchy tottered on, merging ever more into the stream of French history, though its bishops were princes of the empire and resided in imperial cities. At the death of René II. (1508), his eldest son Anthony, who had been educated in the court of France, inherited Lorraine with its dependencies. The second, Claude, was first duke of Guise, and the third, John, alternately or conjointly with his nephew Nicolaus, bishop of Metz, Toul, and Verdun, better known as the cardinal of Lorraine. Still the old connexion reappeared occasionally during the French wars of the emperor Charles V. In 1525 the country was invaded by German insurgents, and Lutheran- ism began to spread in the towns. When Maurice, elector of Saxony, and the German princes rose against the emperor (1552), they sold the three bishoprics and the cities of Toul, Metz, and Verdun, as well as Cambrai, to King Henry II., and hailed him as imperial vicar and vindex libertatis Germaniz. In vain did Charles V. lay siege to Metz for nearly three months; the town, already entirely French, was successfully defended by the duke of Guise. German heresy also lost its hold in these territories owing to the Catholic influence of the house of Guise, which ruled the court of France during an eventful period. Charles II., the grandson of Duke Anthony, who as a descendant of Charles the Caroling even ventured to claim the French crown against the house of Bourbon, had by his wife, a daughter of King Henry II, two sons. But Henry, the eldest, brother-in-law to Henry of Navarre, leaving no sons, the duchy at his death, July 31, 1624, reverted to his brother Francis, who, on November 26, 1625, resigned it in favour of his son Charles III., the husband of Duke Henry’s eldest daughter. Siding against Richelieu with the house of Austria and Duke Gaston of Orleans, Charles, after being driven out by the French and the Swedes, resigned the duchy, January 19, 1634; and like the three bishoprics it was actually allotted to France by the peace of Westphalia. The duke, however, after fighting with the Fronde, and with Condé and Spain against Turenne and Mazarin, and quarrelling in turn with Spain, was

nevertheless reinstated by the treaty of the Pyrenees (1659) under hard conditions. He had to cede the duchy of Bar, to raze the fortifications of Nancy, and to yield the French free passage to the bishoprics and Alsace. But, restless as ever, after trying to be raised among the princes of the blood royal in return for a promise to cede the duchy, he broke again with Louis XIV., and was expelled once more together with his nephew and heir Charles IV. Leopold. Both fought in the Dutch war on the German side in the vain hope of reconquering their country. When Charles IV. after his uncle's death refused to yield the towns of Longwy and Nancy according to the peace of Nimeguen, Louis XIV. retained the duchy, while its proprietor acted as governor of Tyrol, and fought the Turks for the emperor Leopold I., whose sister he had married. In the next French war he commanded the imperial troops. Hence his son Leopold Joseph, at the cost of Saarlouis, regained the duchy once more by the treaty of Ryswick (1697). This prince carefully held the balance between the contending parties, when Europe struggled for and against the Bourbon succession in Spain, so that his court became a sanctuary for pretenders and persecuted partisans. His second son Francis Stephen, by a daughter of Duke Philip of Orleans, and his heir since 1729, surrendered the duchy ultimately, owing to the defeat of Austria in the war for the Polish crown (1735). This being lost by Stanislaus Leszezynski, the father-in-law of Louis XV., the usufruct of Lorraine and a comfortable residence at Nancy were granted to the

Polish prince till his death (1766). And now for more than a century all Lorraine and Alsace up to the Rhine were French. Meanwhile Francis Stephen, since 1736 the husband of Archduchess Maria Theresa, had obtained in compensation the grand-duchy of Tuscany, where the last of the Medici died in 1737. He became his wife's coregent in the Austrian provinces (1740), and was elected king of the Romans and crowned emperor 1745, the ancestor of the present rulers of Austria. When in the recent Franco- German war both Strasburg and Metz were taken by the German troops after a gallant defence, the French had to submit in the peace of Frankfort, May 10, 1871, to the political and strategical decisions

of the conquerors. Old German territory, all Alsace, and a portion of Lorraine, the upper valley of the Saar, the strong fortresses of Diedenhofen (Thionville) and Metz on the Moselle, with the surrounding districts, viz., the greater part of the Moselle and the Meurthe departments, where here and there German is still the language of the inhabitants, were the spoils of victory. They are now united and administered

in all civil and military matters as an imperial province of

the new German empire.

See Calmet, Histoire Ecclesiastique ct civile de la Lorraine, 3 vols.; Mascov, Dissertatio de nexw Lotharingi#g regni cum imperito Romano Germanico ; Usinger, “ Das deutsche Staatsgebiet bis gegen Ende des eilften Jahrhunderts,” Hist. Zeitschrift, xxvil. 874; Waitz, Deutsche Verfassungsgeschichte, vols. v.-vii.; Giesebrecht, Geschichte der Deutschen Kaiserzeit, vols. i.-v. ; Henri Martin, Histoire de Franec, 17 vols.; Ranke, Deutsehe Geschichte im Zettalter der Reformation, 6 vols.; Ranke, Franzsische Geschichte, 5 vols.; A. Schmidt, Hlsass und Lothringen, Naehwets wie diese Provinzen dem deutschen Reiehe verloren gingen, 1859. (R. P.)

LORY, a word of Malayan origin signifying Parrot,! in general use with but slight variation of form in many European languages, is the name of certain birds of the order Psztttact, mostly from the Moluccas and New Guinea, which are remarkable for their bright scarlet or crimson colouring, though also, and perhaps subsequently, applied to some others in which the plumage is chiefly green. The “ Lories” have been referred to a considerable number of genera, of which Lclectus, Lorius (the Domicella of some authors), Hos,and Chalcopsittacus may be here particularized, while under the equally vague name of “ Lorikeets” may be comprehended the genera Charmosyna, Loriculus, and Coriphilus. By most systematists some of these forms have been placed far apart, even in different families of Psittact, but Garrod has shown (Proc. Zool. Society, 1874, pp. 586-598, and 1876, p. 692) the many common characters they possess, which thus goes some way to justify the relationship implied by their popular designation. The latest and perhaps the most complete account of these birds is to be found in the first part of Count T. Salvadori’s

1 The anonymous author of a Vocabulary of the English and Malay Languages, published at Batavia in 1879, in which the words are professedly spelt according to their pronunciation, gives it ‘‘ looree.”’ Buffon (Hist. Nat. Oiseaux, vi. p. 125) states that it comes from the bird’s cry, which is likely enough in the case of captive examples taught to utter a sound resembling that of the name by which they are commonly called. Nieuhoff (Voyages par mer et par terre a differents eux des Indes, Amsterdam, 1682-92) seems to have first made the word ‘‘ Lory’? known (ef. Ray, Synops. Aviuwm, p. 151). Crawfurd (Dict. Engl. and Malay Languages, p. 127) spells it ‘‘nori” or ‘‘nuri”; and in the first of these forms it is used, says Dr Finsch (Die Papageien, ii. p. 782), by Pigafetta. Aldrovandus (Ornithologia, lib. xi. cap. 1) noticed a Parrot called in Java ‘‘ nor,” and Clusius (Hzxotica, p. 364) has the same word. This will account for the name ‘‘noyra” or ‘‘ noira” applied by the Portuguese, accord- ing to Buffon (wt supra, pp. 125-127); but the modern Portuguese seem to call a Parrot generally ‘‘ Louro,” and in the same language that word is used as an adjective, signifying bright in colour. The French write the word ‘‘ Loury ” (cf. Littré, sub voce). The Lory of colonists in South Africa is a Touracoo (¢.v.); and King Lory is a name applied by dealers in birds to the Australian Parrots of the genus Aprosmictus.

Ornitologia della Papuasia e delle Molucche, published at Turin in 1880, though he does not entirely accept Garrod’s arrangement. Of the genus Hclectus the Italian naturalist admits five species, namely, /. pectoralis and LH. roratus, (which are respectively the polychlorus and grandis of most authors), H. cardinalis (otherwise intermedius), E. wester- mani, and #. cornelia—the last two from an unknown habitat, though doubtless within the limits of his labour, while the first seems to range from Waigiou and Mysol through New Guinea, including the Kei and Aru groups, to the Solomon Islands, and the second is peculiar to the Moluccas and the third to Bouru, Amboyna, and Ceram. Still more recently Dr A. B. Meyer has described (Proc. Zool. Society, 1881, p. 917) what he considers to be another species, #. rvedeli, from Cera or Seirah, one of the Tenimber group, of which Timor Laut is the chief, to the south-west of New Guinea.2 Much interest has been excited of late by the discovery in 1873, by the traveller and naturalist last named, that the birds of this genus possessing a red plumage were the females of those wearing green feathers. So unexpected a

discovery, which was announced by Dr Meyer on the 4th of March 1874, to the Zoological and Botanical Society of Vienna,? naturally provoked not a little controversy, for the difference of coloration is so marked that it had even been proposed to separate the Green from the Red Lories generically 4; but now the truth of his assertion is generally admitted, and the story is very fully told by him in a note contributed to Gould's Birds of New Guinea (part viii, 1st October 1878), though several interesting matters therewith con- nected are still undetermined. Among these is the question of the colour of the first plumage of the young, a point not without important signification to the student of phylo- geny.°

Though the name Lory has long been used for the species of Hclectus, and some other genera related thereto, some writers would restrict its application to the birds of the genera Lorius, Los, Chalcopsittacus, and their near allies, which are often placed in a subfamily, Loriinz, belonging to the so-called Family of Zrichoglosside, or ‘‘ Brush- tongued ” Parrots. Garrod in the course of his investiga- tions on the anatomy of Pszttact was led not to attach much importance to the structure indicated by the epithet ‘“brush-tongued,” stating (Proc. Zool. Society, 1874, p. 597) that it “is only an excessive development of the papille which are always found on the lingual surface.” The birds of this group are very characteristic of the New- Guinea Subregion,® in which occur, according to Count Salvadori, ten species of Lorius, eight of Los, and four of Chalcopsittacus ; but none seem here to require any further notice,’ though among them, and particularly in the genus os, are included some of the most richly-coloured birds to be found in the whole world; nor does it appear that more need be said of the so-called Lorikeets. (A. N.)

LOS ANGELES, a city of the United States, the capital of Los Angeles county, California, is situated in the low- land between the Sierra Madre and the Pacific, about 17 miles from the coast, on the west bank of a stream of its

2 There seems just a possibility of this, however, proving identical with either £. westermani or EL. cornelia—both of which are very rare in collections.

3 Verhandl. 2.-b. Gesellsch. Wien, 1874, p. 179 ; and Zool. Garten, 1874, p. 161.

4 Proe. Zool. Soetety, 1857, p. 226.

5 The chemical constitution of the colouring matter of the feathers in Eclectus has been treated by Dr Krukenberg of Heidelberg (Vergl. physiol. Studien, Reihe ii. Abth. i. p. 161, reprinted in Mittheil. Orn. Vereines in Wien, 1881, p. 88).

6 They extend, however, to Fiji, Tahiti, and Fanning Island.

7 Unless it be Oreopsittacus atfaki, of New Guinea, remarkable as ee only Parrot known as yet to have fourteen instead of twelve rectrices,

own name, It lies 483 miles by rail south-south-east of San Francisco on the Southern Pacific Railroad, and is connected by branch lines with Wilmington, Santa Monica (both on the coast), and Santa Ana. As the centre of a fine orange and grape growing country, and a resort for invalids, Los Angeles is a place of some importance ; and since the opening of the railways it has been in full prosperity, the old adobe buildings rapidly giving place to more substantial structures. Founded in 1781 by the Spaniards, it received the name “Town of the Queen of the Angels” (Pueblo de la Reina de los Angeles) as a tribute to the beauty and pleasantness of the spot. It was the capital of the Mexican state of California from 1836 to 1846, in which latter year it was captured by United States forces. The population has increased from 5728 in 1870 to 11,311 in 1880.

LOT, the ancestor of Moab and Ammon, was the son of Haran and grandson of Terah, and accompanied his uncle Abraham in his migration from Haran to Canaan. At Bethel! Lot separated from Abraham, and, while the uncle went on to Hebron, the nephew settled in the district of Sodom. When Jehovah was about to destroy Sodom and the other cities of the plain two divine messengers appeared, spent the night in Lot’s house, and next morning led Lot, his wife, and his two unmarried daughters out of the city. His wife looked back and was changed to a pillar of salt,? but Lot with his

two daughters escaped first to Zoar and then to the mountains east of the Dead Sea, where the daughters, supposing themselves the only survivors of the catastrophe that had destroyed their home, planned and executed an incest by which they became mothers. ‘The sons were the ancestors of Ammon and Moab. Such is the outline of the Jahvistic history of Lot, which the priestly narrator epitomizes in a few words, the only statement peculiar to his narrative being that in Gen. xi. 27-32. The account of Chedorlaomer’s invasion and of Lot’s rescue by Abraham belongs to an independent source, the age and historical value of which has been much disputed. See on the one hand Ewald, Geschichte, vol. i, and Tuch in his Genesis, and in an essay originally published in Z.D.M.G., vol. i., and reprinted in the second edition of his Genesis, and on the other hand the essay in Noéldeke, Untersuchungen, and Wellhausen, ut supra, p. 414.

The name Lot (nid) signifies ‘‘a veil,”” which has led Goldzicher, Mythologie, p. 216 sq., to the arbitrary hypothesis that the story of Lot and his daughters is a myth about the night. Lot and his daughters passed into Arabic tradition from the Jews. The daughters are named Zahy and Ra‘wa by Mas‘fdy, ii. 139; but other Arabian writers give other forms.

LOT, a south-westerly department of central France, corresponding to what was formerly known as Quercy (the country of the Cadurci), a district of the old province of Guyenne, is situated between 44° 12’ and 45° 5’ N. lat., and between 1° and 2° 12’ E. long., and is bounded on the N. by Corréze, on the W. by Dordogne and Lot-et-Garonne, on the 8. by Tarn-et-Garonne, and on the E. by Aveyron and Cantal. Its extreme length, from north-east to south-west, is about 52 miles, and its breadth from north-west to south-east 31 miles, with an area of 2013 square miles. It slopes towards the south-west, from a maximum altitude of 2560 feet on the borders of Cantal to a minimum of 213 feet at the point where the river Lot quits the department, through a wide geological range beginning with primary rocks (granite, gneiss, mica-schists),

1 Jn Gen. xii. 10 sg., where Abraham’s visit to Egypt is recorded, there is no mention of Lot, and Wellhausen (Jahrb. f. D. Theol., 1876, p. 418) has made it probable that this episode is no part of the Jahvistic narrative, to which the history of Lot mainly belongs.

2 Such a pillar in the neighbourhood of Usdum is described by ive Narrative, p. 307. See also Robinson, Bib. Res., 2d ed., TiO Ss

which are succeeded by lias, oolitic limestone (occupying the greater portion of the area), chalks, and finally by Tertiary formations. The Lot, which traverses it from east to west, is navigable for the whole distance (78 miles) with the help of locks; its principal tributary within the department is the Célé (on the right). In the north of the department the Dordogne has a course of 37 miles ; among its tributaries are the Cére, which has its rise in Cantal, and the Ouysse, a river of no great length, but remarkable for the abundance of its waters. The streams in the south of Lot all flow into the Tarn. By the Dordogne and Lot the surface is divided into a number of limestone plateaus known by the name of “causses”; that to the north of the Dordogne is called the Causse de Martel ; between the Dordogne and the Lot is the Causse de Gramat or de Rocamadour ; south of the Lot is the Causse de Cahors. These “causses,” owing to the rapid disappearance of the rain through the faults in the limestone, have for the most part an arid appearance, and their rivulets are generally mere dry beds; but their altitude (from 700 to 1300 feet, much lower therefore than that of the similar plateaus in Lozére, Hérault, and Aveyron) admits of the cultivation of the vine; they also yield a small quantity of maize, wheat, oats, rye, and potatoes, and some wood. ‘The deep interven- ing valleys are full of verdure, being well watered by abund- ant springs supplied by drainage from the plateaux above. The climate is on the whole that of the Girondine region ; the valleys are warm, and the rainfall is somewhat above the average for France. The difference of temperature between the higher parts of the department belonging to the central plateau and the sheltered valleys of the south-west is con- siderable. Of the entire area of the department 691,920 acres are arable, 222,402 are forest land, 168,038 are occupied by vineyards, 64,250 are heath, and 61,778 are meadow. Sheep are the most abundant kind of live stock ; but pigs, horned cattle, horses, asses, and mules, and goats are also reared, as well as poultry in large quantities, and bees. Wine is the principal product of the department, the most valued being that of Cahors or Céte du Lot. It is used partly for blending with other wines and partly for local consumption. The north-east cantons supply large quantities of chestnuts ; apples, cherries, and peaches are common, and the department also grows tobacco and supplies truffles. The iron, lead, aud

zinc deposits are unimportant. Marble, millstones, limestone, and clay are obtained to some extent, but phosphate of lime is the most valuable mineral product of Lot. The manufactures are inconsiderable; but there are numerous mills, and wool spinning and carding as well as cloth making, tanning, currying, brewing, and agricultural implement making are carried on to some extent. The exports consist of grain, flour, wine, brandy, live stock, nuts, truffles, prunes, tobacco, wood, phosphate of lime, leather, and wool. The popu- lation in 1876 was 276,512. The three arrondissements are Cahors, Figeac, and Gourdon; there are twenty-nine cantons aud three hundred and twenty-three communes. LOT-ET-GARONNE, a department of south-western France, made up of Agenais and Bazadais, two districts of the former province of Guyenne, and Condomois and Lomagne, formerly portions of Gascony, lies between 43° 50’ and 44° 45° N. lat., and 1° 7’ E. and 8’ W. long., and is bounded on the W. by Gironde, on the N. by Dordogne, on the E. by Lot and Tarn-et-Garonne, on the 8. by Gers, and on the S.W. by Landes; its extreme length from south-west to north-east is 62 miles, and it has an area of 2067 square miles. The Garonne, which traverses the department from south-east to north-west, divides it into two unequal parts; in that to the north the slope is from east to west, while in that to the south it is directly from south to north. A small portion in the south-west belongs

to the sterile region of the Landes; the valleys of the Garonne and of the Lot (its greatest affluent here) on the other hand are proverbial for their fertility. The wildest part is in the borders of Dordogne, where oak, chestnut, and beech forests are numerous; the highest point is also here (896 feet), The Garonne, where it quits the depart- mnent, is only some 33 or 36 feet above the sea-level ; it is navigable throughout, with the help of its lateral canal, as also are the Lot and Bayse with the help of locks. The Dropt, a right affluent of the Garonne in the north of the department, is also navigable in the lower part of its course. The climate is that of the Girondine region, the mean temperature of Agen being 56°°6 Fahr., or 5° above that of Paris; the rainfall (31°5 inches) is also above the average of France. Of the entire area 741,342 acres are arable, 210,047 are vineyard, 172,980 under wood, 85,254 natural meadow, and 56,836 waste. Horned cattle are the chief live

stock ; next in order come pigs, sheep, horses, asses, aud mules, and a small number of goats. Poultry and bees are also reared. Its wines and its cereals are a great source of wealth to the department ; in 1875 488,000 quarters of grain and 14,000,000 gallons of wine were produced. Potatoes, beetroot, pulse, and maize are also largely grown ; next come rye, barley, meslin, and buckwheat. In 1877 7759 acres produced 6,838,849 fb of tobacco, worth upwards of two million francs. Colza, hemp, and flax are also extensively cultivated, The fruit harvest (nuts, chestnuts, apricots) is large and valuable, the prunes which take their name from Agen being especially in demand. The forests in the south-west supply pine wood and cork. The forges, high furnaces, and foundries of the department are important; brazier's ware is also produced ; and there are workshops for the manufacture of agricultural implements and other machines. The making of plaster, lime, and hydraulic cement, of tiles, bricks, and pottery, of confectionery and other eatables, and brewing and distilling, occupy many of the inhabitants. At Tonneins there is a national tobacco manufactory, and the list of industries is completed by the mention of boatbuild- ing, cork cutting, hat and candle making, wool spinning, weaving of woollen and cotton stuffs, tanning, paper making, oil making, and flour and sawmilling. In 1876 the population was 316,920 (1100 Protestants). 'The inhabitants speak a patois in which elegant and graceful works have been written, such as the poems of JASMIN (q.v.). The arrondissements are four,—Agen, Marmande, Nérac, and Villeneuve; and there are thirty-five cantons and three hundred and twenty-five communes.

LOTHAIR I., Roman emperor, eldest son of Louis the Pious, was born in 795. Ata diet held at Aix-la-Chapelle in 817 he received Austrasia with the greater part of Germany, and was associated with his father in the empire, while separate territories were granted to his brothers Louis and Pippin. This arrangement being modified in favour of Louis's youngest son Charles (afterwards Charles the Bald), the three brothers repeatedly rebelled, and for a time Lothair usurped supreme power. After the death of Louis in 840, Lothair, as his successor, claimed the right to govern the whole empire. His brothers Louis and Charles (Pippin being dead) united against him, and in 841 he was defeated in the great battle of Fontenay. On the 11th of August 843 the war was brought to an end by the treaty of Verdun, by which Lothair was con- firmed in the imperial title, but received as his immediate territory only Italy (which he had raled from 822) with a long narrow

district reaching past the Rhone and the Rhine to the North Sea. His subsequent reign was full of trouble, for many of his vassals had become virtually independent, and he was unable to contend successfully with the Norsemen and the Saracens. In 855, weary of

i the cares of government, he divided his kingdom among his sons, and retired to the monastery of Pritm, where he died on the 28th of September of the same year.

As

emperor he was succeeded by his son Louis II. LOTHAIR tar Saxon, German king and Roman

emperor, was originally count of Suplinburg. In 1106 he

was made duke of Saxony by the emperor Henry V., against whom he afterwards repeatedly rebelled. After

the death of Henry V. in 1125, the party which supported

imperial in opposition to papal claims wished to grant the crown to Duke Frederick of Swabia, grandson of Henry IV. The papal party, however, headed by Archbishop Adalbert of Mainz, managed to secure the election of Lothair, who obtained their favour by making large con- cessions by which he was afterwards seriously hampered. In 1133 he was crowned emperor in Rome by Innocent IL., whom he had supported in a disputed papal election,

In later times the church pretended that he had done

homage to the pope for the empire, but what he really

received in fief was the hereditary territory of the Countess Matilda. Meanwhile he had been engaged in bitter strife with the Hohenstaufen family, from whom he had demanded the allodial lands which they had inherited from the emperor Henry V. Duke Frederick of Swabia, and his brother Conrad, had resisted these pretensions ; and Conrad had even been

crowned king in Milan. The quarrel was ultimately settled by the lands in dispute being granted in fief to the house of Hohenstaufen. In order to strengthen his position, Lothair had given his daughter Gertrude (a child of eleven) in marriage to Henry the Proud, duke of Bavaria, whom he made also duke of Saxony. Henry was further euriched by receiving the hereditary and imperial territories of the Countess Matilda, so that the Guelphs became by far the most powerful family in the empire. Lothair secured other important adherents by giving North Saxony (afterwards Brandenburg) to Albert the Bear, and Thuringia (which he took from Landgrave Hermann) to Count Louis. In his relations to the neighbouring populations Lothair acted with great vigour. The duke of Bohemia and the duke of Poland were compelled to do homage, and the margraviate of Meissen and the county of Burgundy he gave to two of his supporters, the former to Count Conrad of Wettin, the latter to Duke Conrad of Zahringen. The kingdom of the Abotrites he granted to the Danish king Cnut; and Cnut's successor Magnus was forced to accept it as a fief of the empire. In 1136 Lothair undertook a second expedition to Italy for the defence of Pope Innocent Il. against Roger of Sicily, and after accomplishing his object he died on the 3d of December 1137, in an Alpine hut near Trent, on his way back to Germany. During his reign the papacy gained ground in its rivalry with the empire, but he displayed courage and resource in maintain- ing the rights of the crown against all his secular opponeuts. See Gervais, Politische Geschichte Deutschlands unter der Regierung der Kaiser Heinrich V. und Lothar IIL, 1841-42; Jaffe, Geschichte des deutschen Reichs unter Lothar dem Sachsen, 1843. LOTHIAN, Lotuens, Laoponsa, a name whose origin is unknown,! now preserved in the three Scottish counties of East, West, and Mid Lothian —Happineron, LINLITHGOW, and EDINBURGH (¢.¥.)—originally extended from the Forth tothe Tweed. The Forth separated it from Celtic Alba, and the Tweed from the southern part of Bryneich (Bernicia). Its western boundaries appear to have been the Cheviots and the Lowthers. After the Anglo-Saxon migration it formed part of the Anglian kingdom of Northumberland, founded by Ida the Flame-bearer in 547, which in its

1 Loth, son of Anna, the sister of Arthur, a Scottish consul and lord of Laudonia (Fordun, iii. 24), the Liew of the Arthurian legend (Skene, Four Books of Wales, chap. iv.), is, of course, an eponymus.

widest extent, under the powerful Northumbrian kings of the 7th century, reached from the Humber to the Forth. A different but allied branch of the Angles settled along the tributaries of the Tweed, and the Cheviot, Lowther, Moorfoot, and Pentland (Pictish) hills separated the colon- ists of southern Scotland from the British kingdom of Strath Clyde or Cunibria. he victories of Catraeth (596) and Degsastan (603) in the reigu of Ethelfrith represent the close of the struggle which drove the British orCumbrian Celts (Cymry) into the western hill country, afterwards known as Westmoreland and Cumberland, and the Picts t» the north of the Forth and Clyde, so that Anglian Northumberland secured the former river as its northern boundary, and even for a ‘time threatened to pass it. Edwiu of Deira (617-33), the chief king of England in his time, probably founded Edinburgh, although its Celtic name Dun Eden has been thought by some to suggest a different derivation. Egfrid at the close of the 7th ceutury established an Anglian bishop at Abercorn on the Forth, but was defeated and slain at Nechtansmere, or Dunnichen, in Forfarshire by the Pictish king Brude (685), and Trumwine the bishop at Abercorn was forced to retire to Whitby. In the 8th century the Northumbrian kings were engaged in a conflict with Mercia, and in 827 the supremacy of Egbert, the founder of the West Saxon monarchy, was acknowledged, although on the part of the Northumbrians the recognition must have been at first almost nominal, for it was not until more than a century later that Athelstan, by the victory of Brunanburg (937) over the allied Welsh, Scots, and Northumbriau Danes, really extended the boundaries of the Wessex kingdom over the greater part of Northumbria, which was reduced to an earldom by Edred in 954. Athelstan had in 934 ravaged Scotland north of the Forth, and must for a time have reduced Lothian, the northern district of Northumber- land, but it does not appear that either he or any of his successors liad real sovereignty over Lothian, which was left to the rule of Northumbrian earls, sometimes of Anglian aud at other times of Danish race. Its population continued Anglian, as is proved by the fact that there are no Danish monuments and few Danish place names between the Tweed and the Forth. The Scottish Celts, like the English Anglo-Saxons, were during this period occupied with warding off

the Danes and Norsemen, but about the middle of the 9th century Kenneth Macalpine united the Scottish and Pictish kingdoms, and fixed the capital at Scone. This monarch is said by the Pictish chronicle to have six times invaded Saxony (the name given by the Celts to the Anglo-Saxon territory), and to have burnt Dunbar and Melrose. The Auglians of Northumbria had been converted to Christianity by Paulinus in 627, and reconverted by a Celtic mission from lona between 635 and 651 under Aidan, who planted a mission station —a southern Iona—on the Holy Island, and became first bishop of Lindisfarne. Cuthbert, one of his successors in this bishopric, which had become Anglian and conformed to the Roman ritual and discipline after the council of Whitby (664), has the credit of spreading the gospel in Lothian, where he had been first monk and then prior of the recently founded monastery of Melrose.

About the middle of the 10th century (954-62) Edinburgh was abandoned by the Northumbrian Angles and occupied by Indulph, son of Constantine, king of the Scots. According to John of Wallingford and Roger of Wendover, Edgar the West Saxon king ceded in 966 Lothian to Kenneth III., son of Malcolm I., on condition that he should do homage for it and give pledges not to deprive the people of that region of their ancient customs, and that they should still retain the name and language of the Augles. This cession, which is not in the older

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chronicles, has been matter of controversy between Freeman (Norman Conquest, i., note B, p. 610), who accepts the statement, and E. W. Robertson (Scotland under her Early Kings, i. 390) and Skene (Celtic Scotland, i. 370), who reject it upon what appear better grounds. But the dispute is of small importance, as it is admitted on the authority of Simeon of Durham that, whether or not it was then ceded on condition of homage, it was annexed to Scotland by conquest in 1018 in cousequence of the victory at Carham by Malcolm the son of Kenneth over the Northumbrian earl Eadulf Ciudel,—“ Hoc modo,” says Simeon writing before 1129, ‘Lodonium adjectum est regno Scotiz.” Canute and William the Conqueror made temporary conquests of Scotland including Lothian, and homage of various kinds was rendered to them and other Norman monarclis, but there

is no trace of any special homage for Lothian except in two dubious charters by Edgar to William Rufus, so that it seems certain that from the beginning of the 11th century it was an integral part of Scotland. Freeman, in his //istorical Geography, styles it an English earldom, but it is never so called in any authentic record. While it was an integral part of Scotland its population was recognized as a distinct branch of the Scottish nation, and the men of Lothian are frequently separately named, as in the contemporary account of the Battle of the Standard (1138). It also retained its language, customs, and laws, which were those of the Angles of Northumbria. Although united in civil government to Scotland, Lothian, or at least many places in it, continued ecclesiastically subject to the see of Durham, which had succeeded that of Lindisfarne, until the beginning of the 12th century (Stubbs and Haddan, Concilia, ii. p. 161), but it then came under the bishop of St Andrews, and was divided into three rural deaneries, the Merse, Haddington, and Linlithgow, with an arch- deacon of Lothian, who first distinctly appears under that name at the commencement of the 13th century.

The division of Scotland into shires was probably made by David I., and Lothian included the shires of Berwick or the Merse (the march or borderland, as English Mercia and Spanish Murcia), Roxburgh, and Edinburgh, which included the constabularies of Haddington and Linlithgow, afterwards erected into separate counties. Its principal burghs — Berwick, Roxburgh, and Edinburgh — formed along with Stirling the court of the four burghs, whose laws were collected by David I. (“ Leges Quatuor Burg- orum,” Act. Parl. Scot., i. 327), and whose meeting-place was Haddington, but the frequent occupation of Berwick and Roxburgh by the English caused Lanark and Linlithgow to be substituted, and the place of meeting to be changed to Stirling in 1368. The convention of royal burghs may be traced back to this court.

The independence of Scotland, including Lothian, though frequently disputed by the English sovereigns, was always maintained by the Scotch, except when surrendered by William the Lion as a prisoner by the treaty of Falaise 1174, cancelled by Richard I. in 1189. It was finally acknowledged by Edward I. in the treaty of Brigham, but after the death of the Maid of Norway this acknowledg- ment was repudiated, and it was only finally

established by the war of independence, and definitely recognized in the treaty of Northampton in 1328.

By a singular but fortunate series of events, of which the first was the marriage of Malcolm Canmore with the Saxon princess Margaret, Lothian, the Anglian part of the Scottish kingdom, though its borderland, became its centre. Edinburgh, its chief town, was from that time a favourite residence of the court, aud under the Stuart kings became the capital of the kingdom. Its language, the dialect of northeru England, became the basis of the Lowland Scots,

at first called Inglys or English, but afterwards Scotch, when Celtic, Erse, or Gaelic had ceased to be spoken in the lowland districts, in distinction from southern English. Its customary law, with additions prior to the war of in- dependence of Norman feudal institutions from England, is the basis of those parts of the common law of Scot- land which are not taken from Roman jurisprudence. And it was from Lothian that Anglo-Saxon and Anglo- Norman civilization radiated to the remotest parts of the Highlands and Islands. (3. M.) LOTTERIES. The word lottery has no very definite signification. It may be applied to any process of determining prizes by lot, whether the object be amuse- ment, or gambling, or public profit. In the Roman Satur- nalia and in the banquets of aristocratic Romans the object was amusement; the guests received apophoreta. The same plan was followed on a magnificent scale by some of the emperors. Nero excited the people by giving such prizes as a house or a slave. Heliogabalus introduced an element of absurdity,—one ticket for a golden vase, another for six flies. This amusing custom descended to the festivals given by the feudal and merchant princes of Europe, especially of Italy; and it afterwards formed a prominent feature of the splendid court hos- pitality of Louis XIV. In the Italian republics of the 16th century the lottery principle was applied to encourage the sale of merchandise. ‘The lotto of Florence and the seminario of Genoa are well known, and Venice estab- lished a monopoly and drew a considerable revenue for the state. The first letters patent for a lottery in France were granted by Francis I., and in 1656 the Italian Tonti (the originator of “ Tontines”’) opened another for the building of a stone bridge

between the Louvre and the Faubourg St Germain. The institution became very popular in France, and gradually assumed an important place in the Government finance. The par- liaments frequently protested against it, but it had the support of Mazarin, and Pontchartrain by this means raised the expenses of the Spanish Succession War. Necker, in his Administration des Finances, estimates the public charge for lotteries at 4,000,000 livres per annum. There were also lotteries for the benefit of religious com- munities and charitable purposes. Two of the largest were the Loteries de Piété and des Enfans Trouvés. These and also the great Loterie de l'Ecole militaire were practically merged in the Loterte Royale by the famous decree of 1776, suppressing all private lotteries in France. The financial basis of these larger lotteries was to take ;%ths for expenses and benefit, and return $%ths to the public who subscribed. The calculation of chances had become a familiar science. It is explained in detail by M. Caminade de Castres in Enc. Méth. Finances, ii., s. v. " Loterie." The names of the winning numbers in the first drawing were (1) extrait, (2) ambe, (3) terne, (4) quaterne, (5) quine. After this there were four drawings called primes gratuites, The extrart gave fifteen times the price of the ticket; the quine gave one million times the price. These are said to be much more favourable terms than were given in Vienna, Frankfort, and other leading European cities at the end of the 18th century. There is no doubt that lotteries had a demoralizing effect on French society. They were de- nounced by the eloquent bishop of Autun as no better than the popular games of belle and biribi; they were condemned on financial grounds by Turgot ; and Con- dillac compared them to the debasement of money which was at one time practised by the kings of France. The Loterie Royale was ultimately suppressed in 1836. Under the law of 29th May 1844 lotteries may be held for the assistance of charity and the fine arts. The Société du Credit Foncier, and many of the large towns, are per-

initted to contract loaus, the periodical repayments of which are determined by lot. This practice, which is prohibited in Germany and England, resembles the older system of giving higher and lower rates of interest for money according to lot. Lotteries were suppressed in Belgium in 1830, but they still figure largely in the State budgets of Germany, Holland, Spain, and Italy.

In England the earliest lotteries sanctioned by Govern- ment were for such purposes as the repair of harbours in 1569, and the Virginia Company in 1612. In 1696 by the Act 10 & 11 Will III. c. 17 lotteries, with the exception of the Royal Oak lottery, were prohibited as common nuis- ances, by which children, servants, and other unwary persons had been ruined. This prohibition wasin the 18th ecntury gradually extended to illegal insurances on marriages and other events, and to a great many games with dice, such as faro, basset, hazard, except back- gammon and games played in the royal palace. In spite of these prohibitions, the Government from 1709 down to 1824 showed a bad example to the nation by annually raising considerable sums in lotteries authorized by Act of Parliament. The prizes were in the form of terminable or perpetual annuities. The £10 tickets were sold at a premium of say 40 per cent. to contractors who resold them in retail (sometimes in one-sixteenth parts) by ‘“morocco men,” or men with red leather books who travelled through the country. As the drawing extended over forty days, a very pernicious system arose of insuring the fate of tickets during the drawing for a small premium of 4d. or 6d. This was partly cured by the Little Go Act of 1802, 42 Geo. ILI. c. 119, directed against the itinerant wheels which plied between the state lotteries, and partly by Perceval’s Act in 1806, which confined the drawing of each lottery toone day, From 1793 to 1824 the Govern- ment made an average yearly profit of £346,765. Cope, one of the largest contractors, is said to have spent £36,000 in advertisements in a single year. The English lotteries were used to raise loans for general purposes, but latterly they were confined to particular objects, such as the improvement of London, the disposal of Cox’s museum, the purchase of Tomkin’s picture gallery, &c. Through the efforts of Lyttleton and others a strong public opinion was formed against them, and in 1826 they were finally prohibited. An energetic proposal to revive the system was made before the select committee on metropolitan im- provements in 1830, but it was not listened to. By a unique blunder in legislation, authority was given to hold a lottery under the Act] & 2 Will. IV. c. 8, which pro- vides a scheme for the improvement of the city of Glasgow. These ‘Glasgow lotteries” were suppressed by 4 & 5 Will. IV. c. 37. The statute law in Scotland is the same as in England. At common law in Scotland it is probable that all lotteries and raffles, for whatever purpose held, may be indicted as nuisances, The art unions are sup- posed to be protected by a special statute.

The American Congress of 1776 instituted a national lottery. The scheme was warmly advocated by Jefferson and other statesmen, and before 1820 at least seventy Acts were passed by Congress authorizing lotterics for various public purposes, such as schools, roads, &c.,—about 85 per cent. of the subscriptions being returned in prizes. A sounder opinion now prevails on this subject in America.

The only systematic work on this subject is the Critique hist. pol. mor. econ. et comm. sur les loteries ane. et. mod. spirituelles et temporelles des Etats et des Eglises, Amsterdam, 1697, 8 vols., by the Bolognese historian Gregorio Leti. The subject is also dealt with by J. Dessaulx in his work De la passion du jeu depuis les anciens temps jusqu' & nos jours, Paris, 1779. (W. C. 8.)

LOTUS-EATERS (Greek Awrogdyor) were a Libyan tribe known to the Greeks as early as the time of Homer. Werodotus (iv. 177) describes their country as in the

Syrtic district, and says that a caravan route led from it to Egypt. The lotus still grows there in great abundance. It isa prickly shrub, the jujube tree, bearing a fruit of a sweet taste, compared by Herodotus to that of the date ; it is still eaten by the natives, and a kind of wine is made from the juico (see JusuBE). Marvellous tales were current among the early Greeks of the virtues of the lotus, as we see in Odys., ix. 84. When Ulysses comes to the coast many of his sailors eat the lotus and lose all wish to return home. The idea has been worked up by Tennyson in a very fine poem. This lotus must not be confounded with the Egyptian plant, a kind of water-lily that grows in the Nile. See Ritter, Erdkunde, i.; and Heeren, Jdeen, ii, or in Wistorical Researches, &e.

LOTZE, Rupoteu Hermann, one of the most eminent philosophers of our age, was born May 21, 1817, in Bautzen, in the kingdom of Saxony, and died at Berlin lst July 1881. The incidents of the life of a philosopher, especially if his career has been exclusively an academic one, are usually passed over as unimportant. In external events no life could be less striking than that of Lotze, who, moreover, was of a retiring disposition, and was forced through delicate health to seclude himself from even such external

excitement and dissipation as the quiet university town of Géttingen, where he passed nearly forty years of his life, might afford. His interests on the contrary, as exhibited in his various writings, are most universal; and in a surprising degree he possessed the power of appreciat- ing the wants of practical life, and the demands of a civili- zation so complicated as that of our age, so full of elements which have not yet yielded to scientific treatment. But, although in his teachings he rose more than most thinkers beyond the temporary and casual influences which sur- rounded him, it was significant for the development of his ideas that the same country produced him which gave to Germany Lessing and Fichte, that he received his education in the gymnasium of Zittau under the guidance of eminent and energetic teachers, who nursed in him a love and tasteful appreciation of the classical authors, of which in much later years he gave a unique example in his masterly translation of the Antigone of Sophocles into Latin, and that, himself the son of a physician, he went to the university of Leipsic as a student of philosophy and natural sciences, but enlisted officially as a student of medicine. He was then only seventeen. It appears that thus early Lotze's studies were governed by two distinct interests and emanated from two centres. The first was his scientific interest and culture, based upon mathematical and physical studies, under the guidance of such eminent representatives of modern exact research as E. H. Weber, W. Volckmann, and G. T. Feclimer. The others were his eesthetical and artistic predilections, which were developed under the care of C. H. Weisse. To the former he owes his appreciation of exact investigation and a complete knowledge of the aims of science, to the latter an equal admiration for the great circle of ideas which had been cultivated and diffused through the teachings of Fichte, Schelling, and Hegel. But each of these aspects, which early in life must have been familiar to him, exerted on the other a tempering and modifying influence. The true method of science which he possessed forced him to con- demn as useless the entire form which Schelling's and Hegel's expositions had adopted, especially the dialectic method of the latter, whilst his love of art and beauty, and his appreciation of moral purposes, revealed to him the existence beyond the phenomenal world of a world of values or worths into which no exact science could pene- trate. Itis evident how this initial position at once defined to him a variety of tasks which philosophy had to perform. First there were the natural sciences themselves only just

emerging from an unclear conception of their true method, — especially those which studied the borderland of physical and mental phenomena, the medical sciences, pre-eminently that science which has since become so popular, the science of biology. Lotze's first essay was his dissertation De future biologie principibus philosophicis, with which he gained (1838) the degree of doctor of medicine, after having only four months previously got the degree of doctor of philosophy. Then, secondly, there arose the question whether the methods of exact science sufficed to explain the connexion of phenomena, or whether for the explana- tion of this the thinking mind was forced to resort to some hypothesis not immediately verifiable by observation, but dictated by our higher aspirations and interests. And, if to satisfy these we were forced to maintain the existence of a world of moral standards, it was, thirdly, necessary to form some opinion as to the relation of these moral standards of value to the forms and facts of phenomenal existence. These different tasks, which philosophy had to fulfil, mark pretty accurately the aims of Lotze's writings, and the order in which they were published. But, though he laid the foundation of his philosophical system very early, in his Metaphystk (Leipsic, 1841) and his Logik (1843), and commenced lecturing when only twenty-two years old on philosophical subjects, in Leipsic, though he accepted in 1844 a call to Gottingen to fill the chair of philosophy which had become vacant through the death of Herbart, he did not proceed to an exhaustive development of his peculiar views till very much later, and only during the last decade of his life, after having matured them in his eminently popular lectures, did he with much hesitation venture to present lus ideas in something like a systematic form. The two small publications just referred to remained unnoticed by the reading public, and Lotze became first known to a larger circle through a series of works which had the object of establishing in the study of the physical and mental phenomena of the human organism in its normal and diseased states the same general principles which had been adopted in the investigation of inorganic phenomena. These works were his Allgemeine Pathologie und Therapie als mechanische Naturwissenschaflten (Leipsic, 1842, 2d ed. 1848), the articles " Lebenskraft" (1843) and "'Seele und Seelenleben" (1846) in Rud. Wagner's LHandwérterbuch der Physiologie, his Allgemeine Physiologie des Kérperlichen Lebens (Leipsic, 1851), and

his Mfedizinische Psychologie oder Physiologie der Seele (Leipsic, 1852). When Lotze came out with these works, medical science was still much under the influence of Schelling's philosophy of nature. The mechanical laws, to which external things were subject, were conceived as being valid only in the inorganic world ; in the organic and mental worlds these mechanical laws were conceived as being disturbed or overridden by other powers, such as the influence of final causes, the existence of types, the work of vital and mental forces. This confusion Lotze, who had been trained in the school of mathematical reasoning, tried to dispel. The laws which govern particles of matter in the inorganic world govern them likewise if they are joined into an organism. A phenomenon a, if followed by 6 in the one case, is followed by the same 6 also in the other case. Final causes, vital and mental forces, the soul itself can, if they act at all, only act through the inexorable mechanism of natural laws. If a is to be followed by d and not by 6, this can only be effected by the additional existence of a third something c, which again by purely mechanical laws would change } into d. As we therefore have only to do with the study of existing complexes of material and spiritual phenomena, the changes in these must be explained in science by the rule of mechanical laws, such as obtain everywhere in the world, and only by such. One of the results of these

investigations was to extend the meaning of the word mechanism, and comprise under it all laws which obtain in the phenomenal world, not excepting the phenomena of life and mind. Mechanism was the unalterable connexion of every phenomenon a with other phenomena 8, ¢, d, either as following or preceding it ; mechanism was the inexorable form into which the events of this world are cast, and by which they are connected. The object of those writings was to establish the all-pervading rule of mechanism. But the mechanical view of nature is not identical with the materialistic. In the last of the above-mentioned works the question is discussed at great length how we have to consider mind, and the relation between mind and body ; the answer is—we have to consider mind as an immaterial principle, its action, however, on the body and vice versa as purely mechanical, indicated by the fixed laws of a psycho-physical mechanism. These doctrines of Lotze— though pronounced with the

distinct and reiterated reserve that they did not contain a solution of the philosophical question regarding the nature, origin, or deeper meaning of this all-pervading mechanism, neither an explanation how the action of external things on each other takes place nor yet of the relation of mind and body, that they were merely a preliminary formula of practical scientific value, itself requiring a deeper interpretation—these doctrines were nevertheless by many considered to be the last word of the philosopher who, denouncing the reveries of Schelling or the idealistic theories of Hegel, established the science of life and mind on the same basis as that of material things. Published as they were during the years when the modern school of German materialism was at its height,! these works of Lotze were counted among the opposition literature which destroyed the phantom of Hegelian wisdom and vindicated the independent and self- sufficing position of empirical philosophy. Even philo- sophers of the eminence of J. H. Fichte (the younger) did not escape this misinterpretation of Lotze's true meaning, though they had his Metaphysik and Logik to refer to, though he promised in his Ad/gemeine Physiologie (1851) to enter in a subsequent work upon the "bounding province between zsthetics and physiology," and though in his Medicinische Psychologie he had distinctly stated that his position was neither the idealism of Hegel nor the realism of Herbart, nor materialism, but that it was the conviction that the essence of everything is the part it plays in the realization of some idea which is in itself valuable, that the sense of an all-pervading mechanism is to be sought in this that it denotes the ways and means by which the highest idea, which we may call the idea of the good, has volun- tatily chosen to realize itself.

Tle misinterpretations which he had suffered induced Lotze to publish a small pamphlet of a polemical character (Streitschriften, Leipsic, 1857), in which he corrected two mistakes. The opposition which he had made to Hegel's formalism had induced some to associate him with the materialistic school, others to count him among the followers of Herbart, the principal philosopher of eminence who had maintained a lifelong protest against the development which Kani's doctrines had met with at the hands of Fichte, Schelling, and Hegel. lLotze publicly and formally denied that he belonged to the school of Herbart, though he admitted that historically the same doctrine which might be considered the forerunner of Herbart's teachings might lead to his own views, viz., the monadology of Leibnitz.

When Lotze wrote these explanations, he had already given to the world the first volume of his great work,

1 See Vogt, Physiologische Briefe, 1845-47; Moleschott, Der Kreislauf des Lebens, 1852; Biichner, Kraft und Stoff, 1855.

Mikrokosmus (vol. i. 1856, vol. ii, 1858, vol. ili, 1864 ; 3d ed., 1876-1880). In many passages of his works on pathology, physiology, and psychology Lotze had distinctly stated that the method of research which he advocated there did not give an explanation of the phenomena of life and mind, but only the means of observing and connecting them together; that the meaning of all phenomena, and the reason of their peculiar connexions, was a philosophical problem which required to be attacked from a different point of view; and that the significance especially which lay in the phenomena of life and mind would only unfold itself if by an exhaustive survey of the entire life of man, individually, socially, and historically, we gain the necessary data for deciding what meaning attaches to the existence of this microcosm, or small world of human life, in the macrocosm of the universe. This review, which extends, in three volumes, over the wide field of anthropology, beginning with the human frame, the soul, and their union in life, advancing to man, his mind, and the course of the world, and concluding with history, progress, and the connexion of things, ends with the same idea which was expressed in Lotze's earliest work,—M/. etaphysik, The view peculiar to him is reached in the end as the crowning con- ception towards which all separate channels of thought have tended, and in the light of which the life of man in nature and mind, in the individual and in society, had been surveyed. This view can be briefly stated as follows. Everywhere in the wide realm of observation we find three distinct regions,—the region of facts, the region of laws, and the region of standards of value and worth. These three regions are separate only in our thoughts, not in reality. To comprehend the real position we are forced to the conviction that the world of facts is the field in which, and that laws are the means by which, those higher standards of moral and eesthetical value are being realized ; and such a union can again only become intelligible through the idea of a personal Deity, who in the creation and preservation of a world has voluntarily chosen certain forms and laws, through the natural operation of which the ends of His work are gained.

Whilst Lotze had thus in his published works closed the circle of his thought, beginning with a conception meta- physically gained, proceeding to an exhaustive contempla- tion of things in the light it afforded, and ending with the stronger conviction of its truth which observation, experience, and life could afford, he had all the time been lecturing on the various branches of philosophy according to the scheme of academical lectures transmitted from his predecessors. Nor can it be considered anything bnt a gain that he was thus induced to expound his views with regard to those topics, and in connexion with those problems, which were the traditional forms of philosophical utterance. His lectures ranged over a wide field: he delivered annually lectures on psychology and on logic (the latter including asurvey of the entirety of philosophical research under the title Lncyclopddie der Philosophie), then at longer intervals lectures on metaphysics, philosophy of nature, philosophy of art, philosophy of religion, rarely on history of philosophy and ethics. In these lectures he expounded his peculiar views in a stricter form, and during the last decade of his life he embodied the substance of those courses in his System der Philosophie, of which only two volumes have appeared (vol. i. Logik, 1st ed., Leipsic, 1874, 2d ed., 1880; vol. ii, Metaphysik, 1879). The third and concluding volume, which was to treat in a more condensed form the principal problems of practical philo- sophy, of philosophy of art and religion, did not appear. A small pamphlet on psychology, containing the last form in which he had begun to treat the subject in his lectures (abruptly terminated through his death) during the sum-

mer session of 1881, has been published by his son. Appended to this volume is a complete list of Lotze’s writings, compiled by Professor Rehnisch of Gottingen.

To understand this scries of Lotze’s writings, it is necessary to start with his definition of philosophy. This is given after his exposition of logic has established two points, viz., the existence in our mind of certain laws and forms according to which we connect the material supplied to us by our senses, and, secondly, the fact that logical thought cannot be usefully employed without the assump- tion of a further set of connexions, not

logically necessary, but assumed to exist between the data of experience and observation. These connexions of a real not formal character are handed to us by the separate sciences and by the usage and culture of everyday life. Language has crystallized them into certain definite notions and expressions, without which we cannot proceed a single step, but which we have accepted without knowing their exact meaning, much less their origin. In consequence the special sciences and the wisdom of common life entangle themselves easily and frequently in contradictions. ‘A problem of a purely formal eharacter thus presents itself, viz., this—to try to bring unity and harmony into the scattered thoughts of our general culture, to trace them to their primary assumptions and follow them into their ultimate consequences, to connect them all together, to remodel, curtail, or amplify them, so as to remove their apparent contradictions, and to combine them in the unity of an harmonious view of things, and especially to make those conceptions from which the single sciences start as assumptions the object of research, and fix the limits of their applicability. This is the formal definition of philosophy. Whether an harmonious conception thus gained will represent more than an agreement among our thoughts, whether it will re- present the real connexion of things, and thus possess objective not merely subjective value, cannot be decided at the outset. It is also unwarranted to start with the expectattou that everything in the world should be explained by one principle, and it is a needless restriction of our means to expect unity of method. Norare we able to start our philosophical investigations by an inquiry into the nature of human thonght and its capacity to attain au objective knowledge, as in this case we would be actually using that instrument the use- fulness of which we were trying to determine. The main proof of the objective value of the view we may gain will rather lie in the degree in which it succeeds in assigning to every clement of culture its due position, or in which it is able to appreciate and combine different and apparently opposite tendencies and interests, in the sort of justice with which it weighs our manifold desires and aspirations, balancing them in due proportions, nor sacrificing to a one-sided principle any truth or conviction which experience has proven to be useful and necessary. The investigations will then naturally divide themselves into three parts, the first of which deals with those to our mind inevitable forms in which we are obliged to think about things, if we think at all (metaphysics), the second being devoted to the great region of facts, trying

to apply the results of metaphysics to these, specially the two great regions of external and mental phenomena (cosmology and psychology), the third dealing with those standards of value from which we pronounce our esthetical or ethical approval or disap- proval. In each department we shall have to aim first of all at views clear and consistent within themselves, but, scecondly, we shall in the end wish to form some general idea or to risk an opinion how laws, facts, and standards of value may be combined in one compre- hensive view. Considerations of this kind will naturally turn up in the two great departments of cosmology and psychology, or they may be delegated to an independent research under the name of religious philosophy. We have already meutioned the final con- ception in which Lotze's speculation culminates, that of a personal Deity, Himself the essence of all that merits existence for its own sake, who in the creation and government of a world has voluntarily chosen certain laws and forms through which His ends are to be realized. We may add that according to this view nothing is real but the living spirit of God and the world of living spirits which He has created; the things of this world have only reality in so far as they are the appearance of spiritual substance, which un- derlies everything. It is natural that Lotze, having this great and final conception always.before him, works under its influence from the very beginning of his speculations, permitting us—as Wwe progress—to gain every now and then a glimpse of that inter- een of things which to him contains the solution of our diffi- culties.

The key to Lotze's theoretical philosophy lies in his metaphysics, to the exposition of which important subject the first and last of his larger publieations have been devoted. To understand Lotze's philosophy, a careful and repeated perusal of these works is abso- lutely necessary. The object of his metaphysics is so to remodel the current notions regarding the existence of things and their connexions with which the usage of language supplies us as to make them consistent and thinkable. The further assumption that the modified notions thus gained have an objective meaning,

and that they somehow correspond to the real order of the existing world which of course they ean never actually describe, depends upon a general confidence which we must have in our reasoning powers, and in the

significance of a world in which we ourselves with all the necessary courses of our thoughts have a place assigned to them in harmony with the whole. The object therefore of these investigations is opposed to two attempts frequently repeated in the history of philosophy, viz. :—(1) the attempt to establish general laws or forms, which the development of things must have obeyed, or which a Creator must have followed in the creation of a world (Hegel) ; and (2) the attempt to traee the genesis of our notions, and decide as to their meaning and value (modern theories of know- ledge). Neither of these attempts is practicable. The world of many things surrounds us ; our notions, by which we manage correctly or incorrectly to deseribe it, arealso ready made. What remains to be done is, not to explain how such a world manages to be what it is, nor how we came to form these notions, but merely this—to expel from the circle and totality of our conceptions those abstract notions which are inconsistent and jarring, or to remodel and define them so that they may constitute a consistent and harmonious view. In this

. endeavour Lotze discards as useless and untenable many favourite

conceptions of the school, many crude notions of everyday life. The course of things and their connexion is only thinkable by the assumption of many things the reality of which (as distinguished from their existence in our thoughts) can be conceived only as a multitude of relations. This, standing in relation to other things, gives to a thing its reality. And the nature of this reality again can neither be consistently represented as a fixed and hard substance nor as an unalterable something, but only as a fixed order of recur- rence of continually changing events or impressions. But, further, every attempt to think clearly what those relations are, what we really mean, if we talk ofa fixed order of events, forces upon us the necessity of thinking also that the ditferent things which stand in relations or the different phases which follow each other cannot be merely externally strung together or moved about by some indefinable external power, in the form of some predestination or inexorable fate. The things themselves which exist and their changing phases must stand in some internal connexion ; they themselves must be active or passive, capable of doing or suffering. This would lead to the view of Leibnitz, that the world consists of monads, self-sufficient beings, leading an inner life. But this idea involves the further conception of Leibnitz, that of a pre-established harmony, by which the

Creator has cared to arrange the life of each monad, so that it agrees with that of all others. This conception, according to Lotze, is neither necessary nor thoroughly intelligible. Why not interpret at once and render intelligible the conception of everyday life originating in natural science, viz., that of a system of laws which governs the many things? But, in attempting to make this conception quite clear and thinkable, we are forecd to represent the connexion of – things as a universal substance, the essence of which we conceive as

.a system of laws which underlies everything and in its own self

connects everything, but imperceptible, and known to us merely through the impressions it produces on us, which we call things. A final reflexion then teaches us that the nature of this universal and all-pervading substance can only be imagined by us as some- thing analogous to our own mental life, where alone we experience the unity of a substance (which we eall self) preserved in the multitude of its (mental) states. It also becomes clear that only where such mental life really appears need we assign an inde- pendent existence, but that the purposes of everyday life as well as those of scicnce are equally served if we deprive the material things outside of us of an independence, and assign to them merely a connected existence through the universal substance by the action of which alone they can appear to us.

The universal substance, which we may call the absolute, is at this stage of our investigations not endowed with the attributes of a personal Deity, and it will remain to be seen by further analysis in how far we are able—without contradiction—to identify it with the object of religious veneration, in how far that which to metaphysics is merely a postulate can be gradually brought nearer to us and become a living power. Much in this direction is said by Lotze in various passages of his writings; anything complete, however, on the subject is wanting. Nor would it seem as if it could be the intention of the author to do much niore than point out the lines on which the further treatment of. the subject should advance. The actual result of his personal inquiries, the great idea which lies at the foundation of his philosophy, we know. It ma be safely stated that Lotze wonld allow much latitude to individual convictions, as indeed it is evident that the empty notion of an absolute can only become living and significant to us in the

same degree as experienceand thought have taught us to realize the scriousness of life, the significance of creation, the value of the beautiful and the good, and the supreme worth of personal holiness. To endow the universal substance with moral attributes, to maintain | that it is more than the metaphysical ground of everything, to say it is the perfect realization of the holy, the beautiful, and the good,

can only have a meaning for him who fecls within himself what real not imaginary values are clothed in those expressions.

We have still to mention that esthetics formed a principal and favourite study of Lotze's, and that he has treated this subject also in the light of the leading ideas of his philosophy. Sec his essays Ueber den Begriff der Schinhett, Gottingen, 1845, and Ueber Bedingungen der Kunstschinheit, ibid., 1847 ; and especially his Geschichte der Aisthetik in Deutschland, Munich, 1868.

Lotze's historical position is of much interest. Though he disclaims being a follower of Herbart, his formal definition of philosophy and his conception of the object of metaphysics are similar to those of Herbart, who defines philosophy as an attempt to remodel the notions given by expericnce. In this endeavour he forms with Herbart an opposition to the philosophies of Fichte, Schelling, and Hegel, which aimed at objective and absolute knowledge, and also to the criticism of Kant, which aimed at determining the validity of all human knowledge. But this for- mal agreement involves material differences, and the spirit which breathes in Lotze's writings is more akin to the objects and aspirations of the idealistic school than to the cold formalism of Herbart. What, however, with the idealists was an object of thought alone, the absolute, is to Lotze only inadequately definable in rigorous philosophical language; the aspirations of the human heart, the contents of our feelings and desires, the aiins of art, and the tenets of religious faith miust be grasped in order to fill the empty idea of the absolute with meaning. These manifestations of the divine spirit again cannot be traced and understood by reducing (as Hegel did) the growth of the human mind in the individual, in society, and in history to the monotonous rhythm of a speculative schematism ; the essence and worth

which is in them reveals itself only to the student of detail, for reality is larger and wider than philosophy ; the problem, ‘‘ how the one can be many,” is only solved for us in the numberless examples in life and, experi- ence which surround us, for which we must retain a lifelong interest, and which constitute the true field of all useful human work. This conviction of the emptiness of terms and abstract notions, and of the fulness of individual life, has enabled Lotze to combine in his writings the two courses into which German philosophical thought had been moving since the death of its great founder, Leibnitz. We may define these courses by the terms esoteric and exoteric,—the former the philosophy of the school, cultivated principally at the universities, trying to systenatize every- thing and reduce all our knowledge to an intelligible principle, losing in this attempt the deeper ineaning of Leibnitz’s philosophy ; the latter the philosophy of general culture, contained in the literature of the classical period, in the unsystematic writings of Lessing, Winkelmann, Goethe, Schiller, and Herder, who more or less expressed their indebtedness to Leibnitz. Lotze can be said to have brought philosophy out of the schoolroom into the market of life. By understanding and combining what was great and valuable in those divided and scattered endeavours, hehas become the true successor of Leibnitz, and his philosophy will no doubt attain that universal celebrity which was attained by the monadology and the system of pre-established harmony.

The age in which Lotze lived and wrote in Germany was not one peculiarly fitted to appreciate the position he took up. Fre- quently misunderstood, yet rarely criticized, he was nevertheless greatly admired, listened to by devoted hearers, and read by an increasing circle. But no watchword of easy currency, no ready Shibboleth, attracts or helps to combine this increasing circle to the unity of a philosophieal school. The real meaning of Lotze’s teaching is reached only by patient study, and those who in a larger or narrower sense call themselves his followers will probably feel themselves indebted to him more for the general direction he has given to their thoughts, for the tone he has imparted to their inner life, for the seriousness with which he has taught them to eonsider even smal] affairs and practical duties, and for the inde- struetible eonfidence with which his philosophy permits them to disregard the materialism of science, the scepticism of shallow culture, the disquieting results of philosophical and historical

eriticism. It is not unlikely that the present phase of English thought will more easily assimilate the valuable elements of Lotze's philosophy, as indeed fragments and beginnings of a similar view exist already in English literature. Wherever his writings are widely read and appreciated, it will be on account of the great moral influence which. his philosophy exerts in common with some systeins of the past, but almost alone among the systems of the day. (dis Ae avi)

LOUDOUN, capital of an arrondissement in the depart- ment of Vienne, France, stands on an eminence of 320 feet, overlooking a fertile plain, 45 miles (by rail) south- west from Tours. It was formerly surrounded by walls, of which only two towers and a single gateway now remain. Of the old castle which was destroyed under tichelieu, and of which the site is now turned into a public

promenade, a fine old rectangular donjon of the 12th century has been preserved; at its base traces of Roman constructions have been found, with fragments of porphyry pavement, mosaics, and mural paintings, The Carmelite convent, now occupied by the Brethren of Christian Doctrine, was the scene of the trial of Urban Grandier, who was burnt alive fur witchcraft in 1634 (see Bayle's Dictionnaire) ; the old Byzantine church of Sainte Croix, of which he was curé, is now used asa niarket. There are several curious old houses in the town. Lace making and candle making are the chief industries, and there is a con- siderable trade in grain and flour. Before the revocation of the edict of Nantes the inhabitants numbered, it is said, more than 12,000; in 1876 the population was 4522.

LOUGHBOROUGH, the second town in Leicestershire,

England, on the Midland Railway, 11 miles from Leicester

"and 14 from Nottingham. In 1881 its three parishes had a population of 14,733. A large tract of meadow laud lies between the town and the river Soar, which is connected with the town by two canals,—the Loughborough canal, formed in 1776, and the Leicester canal, opened in 1791. On the Charnwood Forest side of the town there were once extensive parks. The open ficlds in the lordship were enclosed in 1762. The town hasan excellent market-place, and is in the centre of a rich agricultural district. Its malt was

once of special note. The old parish church of All Saints stands on rising ground, and is a conspicuous object for many miles round ; the church itself (restored in 1862) is of the Decorated style, and dates from the 14th century ; the tower is Perpendicular. Emmanuel church was com- pleted in 1837, and Holy Trinity in 1878. The Roman Catholic chapel was built in 1833, and the extensive Early English convent, since enlarged, in 1850. The town-hall and corn exchange, in the market-place, were erccted in 1855, and the cemetery and its elegant church date from 1857. The grammar school is a Tudor structure, standing in some 15 acres of ornamental grounds and walks ; it owes its origin to Thomas Burton's charity, in 1495. The pre- sent buildings were erected in 1852, and the new scheme was devised under the Grammar School Act of 3 & 4 Vict. The girls' grammar school, in the Early English style, was erected in 1879. The other public buildings comprise a dispensary and infirmary (built at the cost of Mr and Miss Herrick in 1862), local board offices, police station, schouls, and nonconformist chapels. There are several large hosiery factories. Lace wasa staple trade until 1816 (see HeatH- coat). Bell-founding was introduced in 1840, and Messrs Taylor cast here in 1881 the great bell for St Paul's, London (174 tons). Tron-foundries, dye-works, and horti- cultural glass-works also provide employment.

The town is mentioned under the name of Lueteburne in Domes- day Book. William the Conqueror gave the town and manor to Hugh Lupus, from whom they . to the more famous Despensers. They were held by the Beaumonts from 1326 to 1464, when they passed into the Hastings family, rcturning to them, after several changes of ownership, in 1554. Lord Moira sold the manor in 1818, and the major part of the manorial rights have now been purchased by the local board. The title of Baron Hastings of Loughborough was given to Sir Edward Hastings in 1558, and to Colonel Henry Hastings in 1643. Alexander Wedderburn, when made lord ehaneellor, assumed the title of Lord Loughborough, in 1780.1 John Cleaveland, the royalist poet, was born-here in 1618 ;

John Howe, the Puritan divine, in 1630; and Richard Pulteney, the botanist, in 1730.

See Thomas Pochin's LZistorical Description, 1770 (vol. viii. of Bibliotheca Topo- graphica Britannica); Potter's Walks Round Loughborough; Wood's Plan of Loughborough, 1857; W. G. Dimock Fletcher's Parish Registers, 1873, Rectors of Loughborough, and Llistorical Handbook, 1881,

LOUIS I, Roman emperor (called "der Fromme," also "le Débonnaire"), was born in 778. He succceded his father Charlemagne in 814, having in the previous year

1The present eourtesy title borne by the eldest son of the earl of Rosslyn was taken from Loughborongh in Surrey, in 1795.

been declared co-regent. At the beginning of his reign he excited high anticipations by the earnestness with which he attacked the abuses that had accumulated during the later years of Charlemagne's sovereignty. The licentious- ness which prevailed at court he sternly suppressed ; he punished counts who were proved to have misused their authority ; and he sought to reform the manners both of the secular and of the regular clergy. The Saxons and the Frisians, who, although conquered, had never cordially accepted Frankish rule, were conciliated by mild and generous treatment. A period of trouble and confusion, however, was opened in 817, when Louis, anxious to establish the order of succession, declared his eldest son Lothair his successor, and made him co-regent, granting him Austrasia with the greater part of Germany. The younger sons of Louis, Pippin and Louis, received, the former Aquitania, the latter Bavaria, Boliemia, Carinthia, and the subject Slavonic and Avar territories. This arrangement was resented by Bernard, king of Italy, the emperor's nephew, who forthwith rebelled. He was soon captured, and condemned to the loss of his sight, while his kingdom was transferred to Lothair. After the death of Bernard, the emperor, who was a man of a gentle and sensitive temper, bitterly repented the harsh punishment which he had sanctioned, and, being further depressed by the death of his first wife, he proposed to resign the crown and retire to a monastery. He was induced to abandon this intention, and (in 819) to marry Judith, the beautiful daughter of Count Welf of Bavaria. In 829 he made a new division of the empire in favour of Charles (afterwards Charles the

Bald), his son by his second wife. The three brothers, deeply dissatisfied, combined to declare war against him, and at Compiégne he was taken prisoner. The empress Judith was condemned to the cloister for alleged infidelity to her husband, and Louis was virtually deposed. Pippin and the younger Louis, suspecting that Lothair meant to usurp exclusive authority, changed their policy, and at a diet in Nimeguen the emperor was restored. Soon afterwards he provoked fresh disturbance by granting Aquitania, the territory of Pippin, to Charles, and in 833 the army of the three brothers confronted that of their father near Colmar. When Louis was negotiating with Pope Gregory IV., who had crossed the Alps in the hope of restoring peace, his troops were persuaded to desert him, and on the Liigenfeld (‘“ the field of lies”) he was obliged to surrender to his sons. The empress was sent to Italy, her son to the monastery of Priim, and at Soissons Louis not only abdicated, but made public confession of his sins, a long list of which he read aloud. Again the arrogance of Lothair awoke the distrust of his brothers, and they succeeded in reasserting the rights of the emperor, whose sufferings had excited general sympathy. He went through the ceremony of coronation a second time, and Lothair found it necessary to confine himself to Italy. After the death of Pippin in 838 Louis proposed a scheme by which the whole empire, with the exception of Bavaria, would have been divided between Charles and Lothair, to whom the empress had been reconciled. The younger Louis prepared to oppose this injustice, and he was supported by the people of Aquitania in the interest of Pippin’s sons. A diet was summoned at Worms to settle the dispute, but before it met the emperor died on an island in the Rhine near Mainz, on the 20th of June 840. He had capacities which might have made him a great churchman, but as a secular ruler he lacked prudence and vigour, and his miis- management prepared the way for the destruction of the empire established by his father. His son Lothair I suc- ceeded to the imperial title.

See Funck, Ludwig der Fromme, 1832 ; and Simson, Jahrbitcher des Frénkischen Reiches unter Ludwig dem Frommen, 1874-76.

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LOUIS II., Roman emperor, grandson of the preceding, was born about 822 and crowned king of Lombardy in 844. From 849 he shared the imperial

title with his father, Lothair I., being crowned at Rome by Leo IV. in 850. He succeeded to the undivided but almost entirely nominal dignity in 855. On the death of his childless brother, Lothair of Lorraine, in 869, the inheritance was seized and shared by his uncles Charles the Bald and Louis the German; the pope, however, espoused the cause of the emperor, crowning him king of Lorraine in 872. Louis II. died in 875, and the imperial crown was forth- with bestowed on Charles the Bald.

LOUIS III., Roman emperor, surnamed “The Blind,” was the son of Boso, king of Provence, and, through his mother, grandson of the emperor Louis II. He was born about 880, called to the throne of Provence in 890, and crowned emperor in succession to Berengar I. at Rome in 901. In 905, while residing at Verona, he was surprised by his discrowned rival, blinded, and ultimately sent back to Provence, where he lived in inactivity and comparative obscurity until 929.

LOUIS tue Cuixp, though he never actually received the imperial crown, is usually reckoned as the emperor Louis ITI. or Louis IV. He was the son of the emperor Arnulf, was born in 893, and succeeded to the throne of Kast Francia or Germany in 900, when he was six years of age. During his brief reign Germany was desolated by the Hungarians, who invaded the country year after year, defeating every force that ventured to oppose them. At the same time the kingdom was weakened by internal strife. The result of the prevailing anarchy was that the imperial constitution established by Charlemagne broke down, and Germany was gradually divided into several great duchies, the rulers of which, while acknowledging the supremacy of the king, sought to become virtually independent. Louis, the last of the Carolingian race in Germany, died in 911.

LOUIS IV. (or V.), “the Bavarian,” German king and Roman emperor, was born in 1286. He was the son of the duke of Bavaria, and in 1314, after tle death of the emperor Henry VII., was elected to the throne by five of the electors, the others giving their votes for Frederick, duke of Austria. This double election led to a civil war, in which Frederick was supported by the church and by many nobles, while the inhabitants of the great cities rallied round Louis. In 1322 Louis gained the battle of Miihldorf, taking Frederick prisoner; but the war still went on. Pope John XXII. excommunicated Louis

in 1324 ; whereupon, wishing to bring the conflict to an end, Louis offered to liberate Frederick on condition that he would withdraw his claim to the throne, and restore the cities and imperial lands seized by his party in Swabia. Frederick, finding that the obstinacy of his brother, Duke Leopold, would render it impossible to fulfil these terms, returned to cap- tivity; and Louis was so touched by his magnanimity that he proposed that they should share the responsibilities of government, The plan was tried but did not succeed, and was virtually abandoned before Frederick's death in 1330. In 1327 Louis had gone to defend his rights in Italy, where he was crowned emperor by Pope Nicholas V., whom he supported in opposition to Pope John XXIL Returning to Germany in the year of Frederick's death, he made peace with the house of Austria, but John XXIL refused to be conciliated, and his successor Benedict XII., acting in part under the influence of France, continued the struggle. Irritated by the revival of papal pretensions which no longer commanded respect in Germany, the elec- tors met at Rhense, and on the 15th of July 1338, issued an important declaration to the effect that the emperor derived his right to the German and imperial crowns, not from the pope, but from the electors by whom he was

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appointed. As the representative of national independence, | Rheims under the title of "king of the French, by the Louis might have made himself one of the most popular mercy of God and the election of the people" (December of the emperors, but he excited bitter jealousies by his | 8, 877). In the following year (September 7) he availed grasping and unscrupulous disposition. By his marriage himself of the presence of Pope John VIII. at Troyes to

with Margaret, the sister of Count William of Holland, he secured Holland, Zealand, Friesland, and Hainault; and he obtained the mastery of Tyrol by separating the heiress, Margaret Maultasch, from her husband, a son of John, the powerful king of Bohemia, and making her the wife of his own son Louis, to whom (in 1322) he had granted the march of Brandenburg. The enemies he thus created were reinforced by Pope Clement VI., who not only excom-

municated him again, but (in 1346) persuaded a party of °

the electors to appoint a new king. Their choice fell on Charles, margrave of Moravia, the son of King John of Bohemia, who at once made an unsuccessful attempt to recover Tyrol. The outbreak of a new civil war was prevented by the sudden death of Louis at a bear hunt near Munich, on the 11th of October 1347. The conflict between the papacy and the empire was practically closed during the reign of Louis, and he marked an epoch by his encouragement of the cities in opposition to the princes and nobles.

See Mannert, Kaiser Ludwig IV., 1812; Fr. von Weech, Kaiser Ludwig der Baier wnd Konig Johann von Béhmen, 1860; and Dobner, Die Auseinandersetzung zwischen Ludwig IV. dem Baier und Friedrich dem Sehinen von Ocsterreieh, 1875.

LOUIS tur Germany, son of the emperor Louis I., was born in 804. In the first partition of the empire in 817 he received Bavaria, Bohemia, Carinthia, and the subject territories on his eastern frontier. Displeased by later schemes of partition in favour of his half-brother Charles,

against the emperor, and he was in the field in defence of his rights when his father died. After the emperor’s death in 840, Louis and Charles united against Lothair, whom they defeated in the battle of Fontenay, and in 843 Louis received by the treaty of Verdun the whole of Germany to the east of the Rhine, with Mainz, Spires, and Worms on the left bank. He was a wise and vigorous ruler, but his forces were inadequate to protect the northern part of his kingdom against the Norsemen, and he was not always successful in his wars with Slavonic tribes. In 858 he invaded West Francia, which he hoped to unite with East

stronger than Louis had supposed, and he was obliged to retreat.

crowned at Metz; but in the following year, by the treaty of Mersen, the eastern half of the country was ceded to Louis. Louis expected to receive the imperial crown after the death of the emperor Louis IJ. Charles, however, outwitted him, and Louis was attempting to avenge this supposed wrong when he died at Frankfort on August 28, 876. East Francia and West Francia were again united under Charles the Fat; but, as Louis was the first sovereign who ruled over the Germans, and over no other Western people, he is generally considered the founder of the German kingdoni.

See Diimmler, Geschichte des Ostfrinkischen Reichs, 1862.

LOUIS L, king of France, surnamed Le Débonnaire or the Pious. See Francs, vol. ix. p. 533; Germany, vol. x. p. 480 ; and Louis L., emperor, supra.

LOUIS IL, surnamed Le Bégue or the Stammerer, the son of Charles I. (‘The Bald”) by Irmentrud of Orleans, and the grandson of Louis the Pious, was born on November 1, 846. On the death of his elder brother Charles, the second son of Charles the Bald, he was con- secrated king of Aquitania in 867, and ten years afterwards he succeeded his father, being crowned by Hincmar of

_ obtain a fresh consecration. a feeble and ineffectual reign of eighteen months, on

_ Channel and consecrated in 936.

_he became involved in a struggle with Otto I. (

| t”) of bout Lorrai hich had transferred he associated himself with his brothers Lothair and Pippin | ae ees See eS eee ee

When Lothair of Lorraine died in 869, his king- | invasions of France.

dom was seized by Charles, who caused himself to be |

He died at Compiégne, after

April 10, 879.

LOUIS IIL, son of the preceding by Ansgarde, daughter of Count Hardouin of Brittany, was born about the year 863, and in 879 was designated by his father sole heir to the French throne. It was decided among the nobles, however, that the inheritance should be divided between Louis and his younger brother Carloman, the former receiving Neustria, or all France north of the Loire, and

‘the latter Aquitania and Burgundy. On the Loire and

elsewhere the two brothers inflicted several defeats on the Northmen (879-881) ; but in 882 Louis succumbed to the fatigues of war, leaving his inheritance to Carloman. LOUIS IV., surnamed D'Outremer (Transmarinus), son of Charles III. ('The Simple ") and grandson of Louis IL, was born in 921. In consequence of the disasters which befell his father in 922, Louis was taken by his mother Odgiva, sister of Athelstan, to England, where his boy- hood was spent,—a circumstance to which he owes his surname. On the death of Raoul or Rodolph of Burgundy, who had been elected king in place of Charles, the choice of Hugh the Great, count of Paris, and the other nobles, fell upon Louis, who was accordingly brought over the His de facto sovereignty, In 939 "

however, was confined to the countship of Laon.

its allegiance to him; the victory remained at last with

| the emperor, who married his sister Gerberga to Louis. _ After the death of William Longsword, duke of Normandy, _ Louis endeavoured to strengthen his influence in the duchy

by obtaining possession of the person of Richard the infant heir, but a series of intrigues resulted only in his own captivity at Rouen in 944, from which he was not released in the following year until he had agreed to surrender Laon to his powerful vassal Hugh the Great. By the interposition of Otto, the brother-in-law of Louis, Hugh, who for some years had effectually resisted both the carnal

ae | resources of the empire and the spiritual weapons of the Francia, his own state; but Charles the Bald proved to be | – 4 4

church, was at last persuaded to restore Laon. The last. years of this reign were marked by repeated Hungarian Louis died in 954, and was succeeded by his son Lothaire.

LOUIS V., Le Fainéant, son of Lothaire and grandson of Louis IV., the last of the Carolingian dynasty, was born in 966, succeeded Lothaire in March 986, and died in May 987. He was succeeded by Hugh Capet.

LOUIS VI., surnamed Le Gros, L’Eveillé, and Le

| Batailleur, the son of Philip I. of France and Bertha of

Holland, was born about 1078, was associated with his father in the government in 1100, and succeeded him in 1108. For some account of his character, and of the events of his reign, see FRANCE, vol. ix. pp. 538, 539. He died on August 1, 1137.

LOUIS VIL, Le Jeuneand Le Pieux, gon of Louis VI., was born in 1120, and was associated with his father on the death of his elder brother Philip in 1131, being crowned at Rheims on October 25 by Pope Innocent II. He succeeded to the undivided sovereignty in 1137, the news of his father’s death reaching him as he was engaged at Poitiers in the festivities connected with his unlucky marriage to Eleanor of Aquitania. In 1141 he made an unsuccessful attempt to assert his rights as duke of Aquitania over the countship of Toulouse, and in 1142 he fell into a vehement quarrel with Pope Innocent II., who

had presumed too much on the piety of the well brought- up young prince by appointing a nephew of his own to the archbishopric of Bourges. In the course of the contest Louis, who had been excommunicated, pursued the new archbishop into the territory of the count of Champagne, and stormed Vitry, in the sack of which the cathedral was burned, causing the death of three hundred persons who had taken refuge within its walls (1143). Louis, horror- struck, made peace with the pope and his secular adversary, but found that nothing less than a pilgrimage to the Holy Land would suffice to expiate his offence. The capture of Edessa and the massacre of the Christians in 1144 led to the preaching of the second crusade by St Bernard, and in 1147 the king, leaving the regency in the hands of the Abbé Suger and Raoul, count of Vermandois, set out for the East, accompanied by his queen, a large company of nobles, and twenty-four thousand men. The disastrous results of the expedition, personal, domestic, and public, have already been recorded in the article FRaNncE (vol. ix. p. 540), where also

his long struggle with Henry II. of England, which terminated only in 1178, is briefly described. In 1178 he made a pilgrimage to the tomb of St Thomas of Canterbury on behalf of his eldest son Philip Augustus, then dangerously ill, and in the following year he associated him with himself in the sovereignty. Louis died on September 18, 1180.

LOUIS ;VIIL, surnamed Le Lion, born on September 5, 1187, was the son of Philip Augustus, whom he suc- ceeded in July 1223. In 1200 he had married Blanche of Castile, the granddaughter of Henry II. of England, and in virtue of this connexion he received from the English barons in 1216 an offer of the crown, which he accepted. Landing in England in May, he achieved several military successes, but retired early in 1217; later in the same year he renewed the attempt to make good his claims, but finally quitted English soil in September. He next took charge of the war against the Albigenses with varying success; it continued after his accession to the throne, and ultimately proved fatal to him. He died, most probably of pestilence, shortly after the capture of Avignon, at Montpensier in Auvergne on November 8, 1226, and was succeeded by his son Louis IX.

LOUIS IX., Saint (1215-1270). See Francz, vol. ix. pp. 542, 543, He was canonized by Boniface VIII. in 1297, and is commemorated in the Roman Catholic Church on August 25 or 26. He was succeeded by his son Philip IIL

LOUIS X., Le Hutin, was the eldest son of Philip IV. (the Fair) and Joan of Navarre, and was born in 1289. He succeeded his mother in the kingdom of Navarre and countships of Champagne aud Brie in 1305. Historians are not agreed as to the origin of the surname (‘The Quarreller”) by which he is known in France, but it seems with most probability to commemorate the wild and boisterous character of his youth, He succeeded his father in 1314, and died, after a short and unimportant reign of less than two years, in June 1316. He was succeeded by his brother Philip V.

LOUIS XL, son of Charles VII. and Mary of Anjou, was born at Bourges on July 3, 1423. His jealous, ambitious, and restless character early manifested itself in the attitude of opposition he assumed to his father’s mistress Agnes Sorel, and in the part he took (1439) as leader of the “Praguerie,” as the league formed by the nobles against the introduction of

a standing army was called. Though pardoned by his father in 1440 after the failure of the attempt, he never thenceforward enjoyed any of his confidence. He distinguished himself in the years immediately following in several military expeditions, but finally settled (1446) in his apanage of Dauphind, where

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he acted with great independence, until in 1456 Charles, irritated by the intrigues of his son, intimated his intention of himself resuming the government of that province. Not waiting the arrival of the army which had been sent to take possession, Louis fled for protection to his uncle the duke of Burgundy, who assigned him a pension and a residence at Nieppe near Brussels. The death of Charles on July 22, 1461, permitted his return to France, where he was crowned at Rheims as Louis XI. in the following month, For the leading events of the three periods of his reign the reader is referred to FRANCE, vol. ix. pp. 552, 553. He died at Plessis-lés-Tours on August 30, 1483, and was succeeded by his son Charles VIII.

LOUIS XII. was born at Blois in 1462. His father was Charles, duke of Orleans, the grandson of Charles V. and the cousin of Charles VII., who spent twenty-five years of captivity in England, and who still holds an honourable place on the roll of French poets. Louis himself was for three years (1487-90) the prisoner of his second cousin, Charles VIII., in the castle of Bourges, but afterwards seconded his ambitious schemes faithfully and well, and on his death (1498) succeeded him, taking the titles of king of France, Jerusalem, and the Two Sicilies, and duke of Milan. For the events of his reign see Francs, vol. ix. pp. 554,555. Hedied on January 1, 1515, and was succeeded by Francis I.

LOUIS XIIL, the son of Henry IV. and Mary de’ Medici, was born at Fontainebleau on September 27, 1601, and succeeded his father on May 14, 1610, his mother mean- while availing herself of the confusion caused by the assassination to seize the regency. For some years the affairs of the kingdom were directed by the council of regency in which the Florentine Concini, created Marquis d’Ancre and a marshal of France, was the most promineut figure. After the assassination of D’Ancre in 1617, Marshal Luynes, the favourite of the weak young king, held the reins of power for

about four years; his death of camp fever in the end of 1621, in the course of the Huguenot campaign, left Louis free to assert bis own independence, which he did by carrying on the war with some vigour until its termination in the peace of Montpellier (1622). In 1624 Richelieu entered the council of state, and guided the affairs of Louis and of France for the next eighteen years (see Francy, vol. ix. pp. 568-571). Louis, who died at St Germain-en-Laye on May 14, 1643, was married at the age of fourteen (December 1615) to Anne of Austria, daughter of Philip III. of Spain ; but his eldest son, who succeeded him as Louis XIV., was not born until twenty-three years afterwards.

LOUIS XIV., surnamed Le Grand, the elder son of the preceding, was born at Saint-Germain-en-Laye on September 16, 1638, succeeded to the throne of France in his fifth year, was declared of age in September 1651, and was crowned on June 7, 1654, His marriage with the infanta Maria Theresa of Austria, daughter of the Spanish Philip IV., was solemnized at St Jean-de-Luz on June 9, 1660. On the death of Mazarin in 1661 Louis XIV. began his true reign, the leading events of which will be found recorded in the article FRaNncE (vol. ix. p. 574-584). He died at Versailles on September 1, 1715. Of his legitimate children by Maria Theresa, only one, Louis the Dauphin (1661-1711), reached manhood; he was married to a Bavarian princess by whom he had three sons—Louis the Dauphin, duke of Burgundy, who was the father of Louis XV. ; Philip, duke of Anjou, afterwards Philip V. of Spain ; and Charles, duke of Berri.

LOUIS XV., great-grandson and successor of the pre- ceding, born at Versailles on February 15, 1710, was the third son of Louis, duke of Burgundy. His father became dauphin in 1711, and died in 1712, and he him-

self succeeded to the throne of France on September I, 1715. His majority was declared in February 1723, and on September 5, 1725 (his cousin, to whom he had been engaged since 1721, having been sent back to Spain), his marriage to Maria Leczinski of Poland, his senior by seven years, was solemnized at Fontainebleau. This union continued to subsist after a fashion until the queen’s death in 1768; but the successive relations of the king with

De Chateauroux, De Pompadour, and Du Barry are elements of much greater interest and importance to the student of his reign. His surname of “ Le Bien-aimé” is said to date from August 1744, when he was seized with a dangerous illness at Metz; the people of Paris rushed in crowds to the churches to pray for his recovery, nor could they sleep, eat, or enjoy any amusement until the ‘‘ well- beloved king” was out of danger. He died of small-pox on May 10, 1774, having been predeceased for some years by his only son Louis. His successor was his grandson Louis XVI. For his reign see FRANCE (vol. ix. pp. 584—

593).

LOUIS XVI, third son of Louis the Dauphin, and grandson of Louis XV., was born at Versailles on August 23, 1754, was married to Marie Antoinette, archduchess of Austria, at Versailles, on May 16, 1770, succeeded his grandfather on May 10, 1774, and was beheaded on January 21,1793. See France (vol. ix. pp. 593-604).

LOUIS XVIL, titular king of France, the third son of Louis XVI. and Marie Antoinette, was born at Versailles on March 27, 1785, became dauphin in June 1789, was proclaimed king after the execution of his father, was recognized as such by the Governments of England and Russia, but died in captivity in the Temple, Paris, June 8,

1795.

LOUIS XVIIL, brother of Louis XVI., was the fourth grandson of Louis XV., and was born at Versailles on November 17, 1755, receiving at his birth the title of count of Provence. During the earlier stages of the revolutionary struggle he showed considerable sympathy with the popular party, but in June 1791 he found it necessary to withdraw to Coblentz, and subsequently he took some part in the operations of the army of Condé. He was at Hamm in Westphalia when tidings of his brother’s murder arrived, and lost no time in proclaiming the succession of his nephew Louis XVII., himself being recognized as regent. In June 1795 he succeeded to the regal title ; after several years of involuntary wandering he found an asylum in England from October 1807 till April 1814, when he re-entered France. He only once left it again, during the “ Hundred Days” (March to June 1815);

his death took place at Paris on September 18, 1824. For his reign, see France (vol, ix. pp. 617-619). He was succeeded by his brother Charles X.

LOUIS-PHILIPPE, king of the French, was born at the Palais Royal, Paris, on October 6, 1773. His father was Louis-Philippe-Joseph, duke of Orleans, a descendant of the younger brother of Louis XIV., and by his mother he derived his origin from the Comte de Toulouse, the legitimized son of Louis XIV. and Madame de Montespan. At his birth he received the title of duke of Valois; and after 1785, when his father succeeded to the Orleans title, he himself bore that of duke of Chartres. In 1781 Madame de Genlis was appointed his “gouverneur.” From 1789 onwards he manifested sincere sympathy with the new ideas then gaining currency, and in June 1791 he joined at Vendéme the regiment of dragoons of which he had been colonel since 1785. In 1792 he took part in the battles of Valmy and Jemmapes, holding high military rank under Kellermann and Dumouriez ; in the following year he was present at the bombardment of Venloo and of Maestricht, and showed remarkable courage at Neerwinden. Proscribed

along with Dumouriez, he entered upon a period of twenty- one years of exile from France, spent partly in Switzerland and other European countries, partly in the United States and in the Spanish American colonies. By the execution of his father he became duke of Orleans in 1793; and he was married to Marie Amélie, daughter of Ferdinand IV. of Naples, at Palermo, on November 25, 1809. In April 1814 he returned to Paris, where his old military rank and the property of his father were restored to him; the “Hundred Days” in 1815 condemned him to a renewed but much briefer exile ; during the reign of Louis XVIII. he was regarded with some jealousy by the court on account of his liberal opinions, but enjoyed greater favour under Charles X.; immediately after the three days of July 1830 he was called to exercise the functions of “lieutenant- general of the kingdom,” and on August 9 he accepted the title of king of the French. For his reign see FRANCE (vol. ix. p. 620-622). Escaping in disguise from Paris at the Revolution of 1848, he on March 3 reached England, where Claremont was his home until his death on August

26, 1850.

LOUISA (1776-1810), queen of Prussia, was born March 10, 1776, in Hanover, where her father, Duke Charles of Mecklenburg-Strelitz, was commandant. After the death of her mother, who was by birth a princess of Hesse-Darmstadt, she was entrusted to the care of a Friulein von Wolzogen, and afterwards to that of her grandmother, the landgravine of Hesse-Darmstadt. During the period of the revolutionary wars, she lived for some time with her sister Charlotte, the wife of Duke Frederick of Saxe-Hildburghausen. In 1793 she met at Frankfort the crown prince of Prussia, afterwards King Frederick William IIL, who was so fascinated by her beauty, and by the nobleness of her character, that he asked her to become his wife. On April 24 of the same year they were betrothed, and on the 24th of December they were married. As queen of Prussia she commanded universal respect and affection, and nothing in Prussian history is more pathetic than the patience and dignity with which she bore the sufferings inflicted on her and her family during the war between Prussia and France. After the battle of Jena she went with her husband to Konigsberg, and when the battles of Eylau and Friedland had placed Prussia absolutely at the mercy of France, she made a personal appeal to Napoleon at his headquarters in Tilsit, but without success. Early in 1808 she accompanied the king from Memel to Kénigs- berg, whence, towards the end of the year, she visited St Petersburg, returning to Berlin on the 23d of December 1809. During the war Napoleon, with incredible bru- tality, attempted to destroy the queen’s reputation, but the only effect of his charges in Prussia was to make her more deeply beloved. On the 19th of July 1810 she died in her husband’s arms, while visiting her father in Strelitz. No other queen in modern times has been more sincerely mourned. She was buried in the garden of the palace at Charlottenburg, where a beautiful mausoleum, containing a fine recumbent statue by Rauch, was built over her grave. In 1840 her husband was buried by her side. The Louisa Foundation (Luisenstift) for the education of girls was established in her honour, and in 1814 Frederick William III. instituted the Order of Louisa (Luisenorden). On the 10th of March 1876 the Prussian people celebrated the hundredth anniversary of her birth, and it was then decided to erect a statue of Queen Louisa in the Thiergarten at Berlin.

See Adami, Luise, Kénigin von Preussen, 7th ed., 1875 ; Engel, Kénigin Luise, 1876; Kluckhohn, Luise, Koénigin von Preussen, 1876; Mommsen

and Treitschke, Kénigin Luise, 1876; in ha Hudson, Life and Times of Lowisa, Queen of Prussia,

1874.

Plate I.

20

LOUISIANA

Copyright, 1882, by Henry Gannett. Wi gms ae one of the Southern States of the American

Union, situated on the lower course and debouche- ment of the Mississippi river. It is bounded 8. by the

Bound- Gulf of Mexico, W. by Texas, N. by Arkansas, and E. by

aries and Mississippi.

extent.

Surface.

Rivers.

Its western boundary is a line through the middle of Sabine lake and river, as far north as the 32d parallel, whence it follows the meridian of the point of intersection of the river with that parallel. The northern boundary is the parallel of 33°. The eastern boundary is the mid-channel of the Mississippi river, as far south as the 31st parallel, whence it follows that parallel eastward to the middle of Pearl river, and passes down that stream to the Gulf. The area of the State, according to a late de- termination made by the Census Bureau, is 48,720 square miles, of which 1060 consist of land-locked bays, 1700 of inland lakes, aud 540 of river surface, leaving 45,420 square miles as the total land area of the State.

The average elevation of the State is only 75 feet, and no part of it reaches 500 feet above sea-level. The most elevated portion is near its northern border. The surface is naturally divided into two parts—the upland, and the alluvial and coast swamp regions. ach of the larger streams, as well as a large proportion of the smaller ones, is accompanied by a belt of bottom land, of greater or less width, lying low as regards the stream, and liable to over- flow at times of high water. These bottom lands form collectively what is known as the alluvial region. It extends in a broad belt down the Mississippi, from the mouth of the Ohio to the Gulf of Mexico, and up the Ouachita and its branches and the Red River, to and beyond the limits of the State. Its breadth along the Mississippi within this State ranges from 10 to 50 or 60 miles, and that along the Red River and Ouachita has an average breadth of 10 miles. Through its great flood-plain the Mississippi river winds upou the summit of a ridge formed by its own deposits. In each direction the country falls away in a succession of minor undulations, the summits of the ridges being occupied by the streams and bayous. Nearly all of this vast flood-plain lies below the level of high water in the Mississippi, and, were it not for the protection afforded by the levees, with which most of the course of the stream is lined, every considerable rise of its waters would inundate vast areas of fertile and cultivated land.

Stretching along the coast, and extending inland to a varying distance, ranging from 20 to 50 or even 60 miles, is a low, swampy region, the surface of which is diversified only by the slight ridges along the streams and bayous which traverse it, by occasional patches of slightly elevated prairie, and by live oak ridges. It is in and along the borders of this coast swamp region that most of the sugar- cane and rice produced in the State are grown.

The low regions of Louisiana, including the alluvial lands and the coast swamps, comprise about 20,100 square miles, or nearly one-half the area of the State. The remainder consists of uplands of prairie and forest. The borders of these uplands are generally defined by lines of bluffs of no great height.

The principal rivers are the Mississippi, which flows nearly 600 miles through and along the border of the State, the Red River, the Ouachita or

Washita, Sabine, and Pearl, all which, excepting the last, are navigable at all stages of the water. Besides those streams which may properly be called rivers, the State is intersected by “bayous,” several of which are of great importance both for navigation and for drainage. They may be characterized as secondary outlets of the rivers. Among them may be mentioned

LOWVI#TAR.

Achafalaya Bayou, Bayou la Fourche, and Bayou Beeuf. The signification of the name has, however, been extended, so that many rivers in this region, particularly if they have sluggish courses, are known as bayous. The alluvial portion of the State, particularly below the mouth of the Red River, is a perfect network of these bayous, whicli serve, in time of flood, to carry off the invading surplus waters.

The lakes of the State are mainly comprised in three Lakes.

classes. First come the lagoons of the coast, many of which are merely land-locked bays, whose waters are salt, and which rise and fall with the tides. Of this class are Pont- chartrain, Borgne, Maurepas, and Sabine, and indeed all or nearly all those situated in the region of the coast swamps. These are simply parts of the sea which have escaped the filling-in process carried on by the great river and the lesser streams. A second class, large in numbers but small in area, is the result of “cut-offs” and other changes of channel in the Mississippi, and, to a small extent, in the Red River. The part of the river left by this change of channel becomes gradually isolated from the stream by the deposit of silt along the borders of the latter, thus chang- ing what were formerly windings of the river into crescent- shaped lakes. A third class may be mentioned, namely, those upon Red River and its branches which are caused by the partial stoppage of the water by the “raft” above Shreveport. These are, of course, much larger at flood season than at other times, and, it may be added, have been much reduced in size by the cutting of a channel through the raft.

The climate of the State is semi-tropical; the mean Climate.

annual temperature ranges from 60° to 75°, changing ap- proximately with the latitude. The mean temperature of the hottest month is about 85°, while

that of the coldest month ranges in different parts of the State from 45° to 60°. The temperature rarely, if ever, falls below 0° Fahr., while the heats of summer reach 105° in some parts. The rainfall is very heavy along the coast, exceeding 60 inches annually, but decreases inland, and is not more than 50 inches in the northern districts.

This large amount of moisture, together with the high Vegeta- temperature and the fertile soil, suffices to cover the greater 40″

part of the State, and particularly the alluvial regions and the coast swamps, with the most luxuriant sub-tropical vegetation, both arborescent and herbaceous. Much of the latter region is covered with lofty cypress trees, from which hang festoons of Spanish moss. The most common species of the alluvial regions and the drier portions of the coast swamps are live and other species of oaks, sweet gum, magnolia, the tulip tree, black walnut, pine, and cedar. Along the streams in the alluvial region are found willows, cotton-woods, basket oaks, and other species of similar habitat. For the beauty and fragrance of its flowers Louisiana is justly celebrated. Its bottom lands and its upland prairies are decked with them in tropical profusion. Prominent among them in abundance are roses, magnolias, jasmines, camellias, and oleanders. Most fruits common to a semi-tropical region are to be found here, either native or cultivated, such as oranges, olives, figs, peaches, and plums.

The forests cover a very considerable portion of the area Forests.

of the State, and are destined in the future to form an important element of its wealth, although up to the present time the lumber interest has not been very extensively de- veloped. The most valuable timber is that of the long-leaved pine (Pinws australis) and the short-leaved pine (Pinus mitis), These are mainly confined to the upland regions, being nowhere found in the alluvial or coast sec- tions. The north-western part of the State is occupied by the short-leaved pine, while the long-leaved pine is found

Fauna.

Geology,

Minerals,

Agrieul- ture.

Com- maunica- ~ tion.

LOU sera Na

21

mainly in iarge masses north and south of the Red River, | cost of construction $44,869,342. The gross returns for 1880 were

and also in the east of the State.

The native fauna of the State resembles in its general features that of the other Gulf States. Large quadrupeds are comparatively rarely met with, although occasionally there are seen black bears and wolves, and in the swamps an occasional panther. Smaller quadrupeds, such as raccoons, squirrels, wild cats, opossums, &c, are still common. Every bayou contains alligators ; and reptiles of various species, such as turtles, lizards, horned toads, rattle- snakes, and moccasin snakes, are abundant. The avifauna of the State is varied and abundant, comprising eagles, vultures, hawks, owls, pelicans, cranes, turkeys, geese, part- ridges, ducks, &c., besides numberless smaller species, many of these, as in other parts of the world in the same latitude, being brilliant of plumage, but harsh of voice.

The surface geology inits general outlines is very simple. The whole alluvial region and the coast swamps, besides a considerable portion of the prairie and pine flats bordering upon the lowlands, are of the most recent or Quarternary formations, while the remainder of the State, comprised mainly in the region west of the Ouachita and Calcasieu rivers, is Tertiary, with the exception of a few very small islands of the Cretaceous formation in the north-western part of the State.

In the Tertiary region are found small quantities of iron ore, and an indifferent brown coal, But the only important mineral product of the State is rock salt ; the deposit upon Petite Anse Island, in the coast swamp region,

has been extensively worked, and produces a very high quality of salt. In 1880 its production was 312,000 bushels.

The principal industry of the State is agriculture, and in that cotton takes the first place. Out of a total area of tilled land of two and a half million acres, more than one-third was plauted iu 1879 with cotton. The total production was 508,569 bales, an average of ‘59 of abale peracre. Louisiana stood seventh in the list of cotton-producing States, being exceeded by Mississippi, Georgia, Texas, Alabama, Arkansas, and South Carolina. The cotton crop is cultivated both in the alluvial and the upland regions. In the former there were raised in 1879 282,390 bales, on 364,790 acres, an average yield per acre of ‘77 of a bale. In the latter region 498,080 acres were planted, giving a total yield of 225,385 bales, an average of ‘45 of a bale per acre. The great depth and fertility of the alluvial soils are strikingly illustrated by these average yields. In the coast swamp region but little cotton is cultivated,—the total Sings ms these parishes, as-reported by the census, being but

ales,

The production of other agricultural products, as given by the census of 1880, is as follows :—

MEMEO NE ca coscvesscsssscsisdeevessssancdicssavsvee Bush. 9,906,189 MESpeceitsst tes -cockanstnbccecess

Sugar cane = PMEIP ROS «.:escssecessasccsss sees) OANBs 11,696,248 IMG OMNOPHEOGS! .....cecccccssscsccaessesseseonsescnee Bush. 1,318,110 Fis cgcecesdeassnoccoOcgd EB Ge LORE UCCLOHOOCoEaCOGABELA Ib =. 23,189,038 PUD HEC Onccmstcstenersascssetaceecccssccasescesesnceens nA 55,954

Rice is cultivated almost entirely in the lower coast region, on the margin of the swamps, upon their prairie islands, and in the alluvial region south of Red River.

With the exception of its navigable streams, the State is not well supplied with the means of transportation. The only railroads of importanee are—the

Chicago, St Lonis, and New Orleans, which conneets New Orleans with Cairo, Illinois; the Louisiana and Texas Railroad (Morgans), whieh runs from New Orleans westward to Vermillionville, and thence northward to Cheneyville; the Louisiana Western Railroad, from Vermillionville to Orange in Texas; the New Orleans and Paeific Railroad, from New Orleans to Shreveport ; and the Vicksburg, Shreveport, and Pacific Railroad, running from Delta to Monroe. Besides these there are several minor lines. The total length of railroad is 6324 miles, and the

1 Of these two speeies of trees, Professor Sargent, of the United States Census Bureau, estimates that there were standing on June 1, 1880, 26,558,000,000 feet of the long-leaved and 21,625,000,000 feet of the short-leaved speeies. The eut of the former for the eensus year was 61,882,000, and of the latter 22,709,000 feet, the total cut being but ‘2 per eent. of the amount standing. There is every probability, “however, that the rate of destruetion will increase greatly in the future.

$3,238,318, and the net returns $984, 497.

Louisiana, like the other Southern States, has latterly made Mann- great advances in the manufacture of home products. In 1880 faetures, there were 120 looms and 6096 spindles, which used 1354 bales of raw cotton.

The banking interest is not extensive, as will be seen from the Banking, following statement, from the report of the comptroller of the cur- rency in 1880:—

| Number. Capital. | National banks 00… .0..ssssessrsssseees 7 $2,875,000 PUCECHOAIUGH . \eacsssssssecvennscasessesececvcct 3 2,723,698 Private bankers 8 53,333

5,652,031

The number and circulation of newspapers and pcriodicals for 1880 are as follows:—

Number. Circulation. DPRUNIGS rs cacten er cetecsesecless-sse 13 38,765 Weeklies, semi-weeklics, &e.. rc 97 95,115 MOMOTIBIIIGOS «5. cccsess-cccceesoesescecteeces cts 2 950

According to the census of 1880, the population of the State Popula- was 939,946. This was divided nearly equally between the sexes, tion. females being but slightly in excess. The proportion of the popu- lation which was of foreign birth was very small, being but 5°5 per cent., while in respect of race, the negro element outnumbered

the whites, being 51°5 per cent. of the total population. The

following table gives the number in each of the above classes:— RPA O) cs csnsacease Creocoononoacnc” 468,754 White …..<. eeeeseceeeecceens eee 454,954 Female eee 471,192 Coloured +». 483,655 Native … ... 885,800 Chinese.. 489 Foretgn …...000 Sasenessecece 54,146 INGIGH c2.2.

The following table exhibits the growth of the State in popu- lation since it became a portion of the United States:—

Per | Density Cent. of jof Popu-

Per | Density Cent. of jof Popu-

Population. Population.

Increase. | lation. Increase.| lation.

76,556 517,762 114

152,923 708,002 15°6 215,739 726,915 16°0 352,411 939,946 20°6

The principal cities are New Orleans, with a population of 216,090; Shreveport, in the north-western corner, population 8009 ; and Baton Rouge, the State capital, 7197 2

The State is fairly well provided with the means of education. Educa. School attendance, however, is not very general. Out of a popu- tion. lation of 330,930 between the ages of six and sixteen, 78,528 were enrolled in public schools, and the estimated average attendance was 50,248, or less than one-sixth. There are in the State seven colleges, with 49 instructors and 786 students.

As in the other States of the Union, the government is distri- Adminis-

buted among the executive, legislative, and judicial departments. tration. The executive is represented by the governor, lieutenant-gover- nor, secretary of state, State treasurer, auditor of public accounts, attorney-general, and superintendent of instruction—all these offices being elective, and the period of incumbency four years. The legislative power is vested in a general assembly consisting of two branches, the lower one being the house of representatives and the upper one the senate. The members of the former body are elected every two years, and the number is by law never to exceed 120 nor be less than 90. The members of the senate are elected for four years. The number of senators is fixed at 36, and the senatorial districts are apportioned according to the population. The judicial power is vested in a supreme court, district and parish courts, and justices of the peace. Thesuprenie court, except in cascs specially provided for by law, has appellate jurisdietion only. Itis composed of one chief justice and four associate justices. These are appointed by the governor, by and with the advice and consent of the senate, and hold office for a term of eight years, The State is divided by the legislature into judicial districts, in eaeh of which there isa district court. The number of districts in the State cannot by law be less than twelve nor more than twenty. The district judges are elected

by the voters of the district, and hold office for four years. Each parish has its own court. The parish judge is elected by the voters of the parish, and holds his office for two years. In addition to this each parish elects a certain number of justices of the peaee with power to try minor cases. The Statc is divided into fifty-eight parishes (equivalent to connties), and each of these into a certain callaloos of police jury wards which are designated by their numbers,

2 The eapital was removed from New Orleans to Baton Rouge in

1880,

Finance.

History,

22

Louisiana is represented in the National Congress by two senators who are chosen by the legislature of the State for a term of six years, and by six representatives who are chosen for a term of two years by the voters of the several representative districts,

The following table, compiled from the returns of wealth, debt, and taxation of the tenth United States census, shows the financial

condition of the State in 1880.

Valuation (Assessed)— Real estate …....

secseecsereeceee $122,362,297

Personal property 37,800,142 i er emer or 93,437,640 IBAYIGH) c.c-s<-~ 1,107,951 Municipal 18,320,361 cs Ne Reet So. dsc 1,171,084 IPRBIS HU ecteseccccccecseccesessccnescsessaasvrsrscsvesns-seesns 710,573 Miunicipal…..cccccccssccccccccscccccarcnrecsnecececessssces eres 1,914,219

History. —The early history of the exploration of Louisiana forms one of the most interesting chapters in the annals of the country. It was first visited

in 1541 by De Soto, of the Spanish Govern- ment service. This daring explorer, landing on the coast of Florida, made his way through the pathless forests and almost impassable swamps to the Mississippi, and even penetrated many leagues west of it, finally leaving his bones upon its shores. In 1673 Marquette and Joliet, starting from the settlements in Canada, descended the great river from northern Illinois to the mouth of the Arkansas. In 1682 La Salle descended the Mississippi, also starting from the French settlements in the Canadas. He navi- gated the river from the mouth of the Illinois to the Gulf. Re- turning to France, he originated a scheme for colonizing the country, and succceded in obtaining from France the desired concessions, and in collecting a company of colonists, which set sail from Rochelle on the 24th of July 1684. Owing to the difficulty of obtaining correct longitudes at sea, the vessc] missed the mouth of the Mississippi, and finally landed on the shore of Matagorda Bay, in Texas, where they established a colony. From this point La Salle started to make his way overland to Canada, but was treacher- ously murdered by his companions. Shortly after his death the colony disappeared.

The first successful attempt at settlement within the State was made by the French under the ea Iberville in 1700. The colony was located at a point on the Mississippi about 38 miles below the present site of New Orleans, now known as ‘ Poverty Point.” At first it was by no means prosperous, and it was only after the treaty of Utrecht that it appcars to have gained ground. At that time there were not over five hundred Europeans in the whole territory of Louisiana as then constituted; the greater part were in what is now the State of Louisiana, the others being seattered at a few little posts along the Mississippi and Illinois rivers. Immediately after the treaty of Utrecht the king of France granted the whole territory of Louisiana to Antoine Crozat, ceding to him all the territories watered by the Mississippi and its tributaries below the mouth of the Illinois, with all the privileges of hunting, fishing, commerce, mining, &c., which might arise in this new territory. Crozat appointed Cadillac governor of the colony. Affairs, however, went badly under the new administration, and after a succession of governors, the whole district fell into the hands of John Law, the originator of the famous ‘‘ Mississippi scheme.” Desiring to control, among other commercial monopolies, the colony of Louisiana, Law found it an easy matter to obtain the charter and privileges from Crozat, who was only too glad to relinquisl:

them in his favour. A company was formed under the name of the ‘‘ Western Company.” Grants made to it were for twenty-five years. Subscribers to the stock were allowed to pay three-fourths of the purchase money in the depreciated bonds of France, one-fourth only of the subscription being asked for in coin. Bienville, brother of Iberville, and a man possessing great influ- ence in the colony, was appointed governor. One of his first acts was to found the city of New Orleans on its present site, During the year 1718 7 vessels were sent out with stores and emigrants, numbering in all about 1500 persons. The following year 11 ships were despatched, and 500 negroes from the Guinea coast were im- ported. In 1721 1000 white emigrants arrived, and 1367 slaves.

In the meantime the Western Company had obtained from the regent power to join with it the East India Company grants, and its name was changed fo that of the India Company. This inflated scheme burst in due time, but the misfortunes of the company did not check the prosperity of the colony. The year 1721, which was that following the financial ruin of the former, witnessed the greatest immigration to the colony which it had ever received. The company retained its organization and its grant of Louisiana until 17382, when the province reverted to the crown. At that time the population of the colony was said to have been 5000 whites and 2000 slaves ; but a census taken fifteen years later shows a population of only 4000 whites.

In 1762, by a secret treaty, the province was transferred from France to Spain. This treaty was not made public till a year and a half after it was signed, and Spain did not obtain possession

until 1769. Meanwhile, in February 1763, by a treaty made between France and Spain on the one hand and Great Britain and Portugal on the other, the portion of Louisiana lying east of the Mississippi from its source to the river Iberville, and thence along the middle of the Iberville and the lakes Maurcpas and Pontchar- train to the sea, was ceded to Great Britain. In this treaty, by implication, Louisiana was made to extend to the sources of the Mississippi, and this is the view commonly held. The province was

governed by Spain till the year 1800, in the meantime making little or no progress owing to the narrow and oppressive policy pursued towards it by the home government. By the treaty of 1783 with Great Britain, the United States were placed in possession of the eastern bank of the Mississippi river, as far down as the 31st degree of latitude, while Spain held possession of the other bank, and had complete possession of the river below the 31st parallel.

From the time of the first settlement in the valley of the Missis- sippi and its tributaries, the importance of the river as a means of transportation to the scaboard, and the almost absolute necessity of possessing the country about its mouths, were recognized by the United States. As settlements increased in the valley and spread down the river, and as the hostile policy of Spain became more and more plainly developed, the feeling of the settlers became stronger against the restrictions of the Spanish Government. In 1800, however, Spain ccded the territory back to France, and in 1803 it was sold to the United States by Napoleon, in order to prevent it from falling into the hands of Great Britain. The price was 60,000,000 frances, with a stipulation that the United States should assume the claims of its citizens against France (French spoliation claims), which were estimated to amount to $3,750,000. ‘The pro- vince which thus camc into the possession of the United States was of vast though ill-defined territorial extent.

In 1804 nearly all of what is now the State of Louisiana was erected into a territory, under the name of Orleans. In 1810 this was increased by the addition of the south-eastern portion, east of the Mississippi river, and in 1812 it was admitted as a State under its present name, and with its present boundaries. During the war with Great Britain, which followed shortly after, a battle was fought for the possession of New Orleans, between the British forces under Pakenham and the Amcrican army under Jackson, in which the former were signally defeated. Up to 1860 the development of the State was very rapid, especially in the direction of agriculture and commerce.

Upon the outbreak of the civil war the State promptly joined its fortunes with the Southern Confederacy. Its act of secession from the Union was passed December 23, 1860, and from that time until the final suppression of the rebellion the State government was in the hands of the Confederates,

although for the last two years of the war its territory was held in the main by the Federal forces. In the early part of the war the State suffered but little, but in April 1862 Admiral Farragut with a powerful fleet succeeded in passing Forts Jackson and St Philip, which defended the approaches to New Orleans, and captured the city, thus compelling the evacuation of the forts. The navigation of the Mississippi being secured by this means and by operations from the north, the State was at the mercy of the Federal Government. At the close of the war, on the reorganization of the State government, the administration fell into the hands of the ignorant negro classes led by unscrupulous whites, and an unfortunate state of affairs ensued, which was brought to an end only by the arbitrary and forcible assumption of power by the better elements of society. This occurred in 1877, and since that time the State has prospered markedly in all material respects. (H. G.)

LOUISVILLE, the sixteenth city of the United States in population, and the most important place in the State of Kentucky, is situated on the south bank of the Ohio river, in 38° 3’ N. lat. and 85° 30’ W. long. The river is here interrupted by a series of rapids which, except at high water, oblige the steamboat traffic to make use of the Louisville and Portland Canal (24 miles long, constructed in 1833). The city, which has an area of 13 square miles, and a water front of 8 miles, occupies an almost level site about 70 feet above low-water mark. Its plan is regular and spacious, and, in the residential portions the houses, for the most part, have lawns and gardens in front. Among the public buildings of importance may be men- tioned the city-hall, the court-house, the public library, the female high school, the industrial exhibition building, the Roman Catholic cathedral, and the State school for the blind.

From the time of the introduction of steam navigation upon the Ohio by Fulton in 1812, Louisville rapidly gained in iraportance as a centre of river trade. Owing to its

position at the “falls of the Ohio,” which obstruction long made necessary the transfer of goods at this point, the city became an important depét of supplies for the cotton-grow- ing States lying immediately to the south. The

owners of plantations in those States devoted themselves wholly to the culture of cotton, and relied upon Kentucky for supplies of wheat, Indian corn, oats, and the like cereals, for the hempen bagging and rope used in baling the cotton, and for mules and horses, large droves of which were annually driven south from Louisville. The city was also for many years one of the principal points in the United States for pork-packing.

After the close of the civil war, the development of Kentucky, as of the South generally, entered new channels. Largely increased facilities of railway transportation, while bringing Louisville into more direct competition with Cincinnati, St Louis, and Chicago, resulted in a marked increase of both its commercial and manufacturing interests, notwithstanding the decline of the river trade. The ex- tensive tobacco crop of Kentucky, with much of that grown

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in neighbouring States, now finds a market at Louisville, instead of at New Orleans as formerly ; and it has become probably the largest market in the world for leaf tobacco, 68,300 hogsheads of which, of an aggregate value exceed- ing $5,000,000, were sold here during 1881. The manu- facture of whisky is also important, this, with that of tobacco, paying to the Federal Government nearly $3,000,000 annually in revenue taxes, in the Louisville district. Pork-packing employs a capital of $2,520,000, and the tanning of leather $1,704,000, this industry being twenty times larger than before the war, and the product, especially of sole-leather, being in high demand. The manufacture of agricultural and mechanical imple- ments employs $1,915,000 capital, the plough factories, which produce 125,000 ploughs annually, being among the largest in the United States. Steam-power is chiefly eniployed, the available water-power of the rapids having been neglected. The greater part of the coal consumed by the factories is brought down the Ohio from Pittsburg. The mountainous eastern portion of the State, rich in vast

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Plan of Louisville.

deposits of both coal and iron, is now penetrated by several | bank of the Ohio, in the State of Indiana.

railroads, and others are being constructed, whose influence in developing this mineral wealth will add largely to the prosperity of the city.

The reports of the United States census of 1880 give the following summary of the industries of the city :—

1880,

1,191

Number of hands employed

Capital invested

Wages paid

Value of material….

7,396

$5,023,491 2,120,179 7,896,891 14,135,517

11,589

$11,129,291 4,464,040 10,369, 556 20,364,650

21,937

$20,864,449 5,765,387 22,362,704 35,908, 338

Value of product ….

The Louisville and Nashville Railway, opened in 1859, controls, under one management, nearly 4000 miles of connected lines, reaching New Orleans, Pensacola, and Savannah, Various other lines contribute to make Louis- ville an important railway centre.

A bridge across the river, 52182 feet long between abutments, with twenty- seven spans, and admitting the free passage of steamboats at high water, affords con- tinuous railway transit, and connects the city with the thriving towns of New Albany (population 16,423) and Jeffersonville (population 9357), situated on the opposite

A second rail- way bridge, having waggon-ways and foot-ways in addition, is now (1882) building.

Louisville is provided with adequate water-works, gas- works, &c. The famous Dupont artesian well, 2066 feet deep, has a flow of 330,000 gallons per day, with a force of ten horse-power, its water resembling slightly that of the Kissengen and Blue Lick (Ky.) springs. Although once regarded as unhealthy, the city has now an effective system of sewerage, and is in good sanitary condition.

The public school system is sustained at an annual expense of over $300,000, abundant separate provision being made for coloured children. There are four medical colleges, having a large attendance and reputation, and numerous private seminaries and schools. Among the newspapers published at Louisville the Courier Journal deserves men- tion both for its early connexion with George D. Prentice, and as a leading representative of the best order of American journalism. There are four other dailies (two English and two German), besides thirteen weekly sheets.

Louisville is a port of entry for foreign imports, which aggregate annually about $125,000. The city is governed by a mayor, elected every third year, with a board of alder- men and a common council, the former containing one, and the latter two representatives of each of the twelve wards. The population in 1830 was 10,341; in 1840, 21,210; in 1850, 43,196; in 1860, 68,033; in 1870, 100,753 ;

and in 1880 it was 123,758. This last total includes 20,905 persons of colour and 23,156 foreigners, the larger proportion of the latter being Germans.

It was in 1778 that Colonel George Rogers Clarke, on his way down the Ohio, left a company of settlers who took possession of Corn Island (no longer existing), near the Kentueky shore above the falls ; and in the following year the first rude cluster of cabins appeared on the site of the present city. An Act of the Virginian lecislature in 1780 gave the little settlement the rank of a town, and called it Louisville in honour of Louis XVI. of France, then assisting the American colonies in their struggle for independenee. The rank of city was conferred by the Kentucky legislature in 1828.

LOULK, an old town of Portugal, in the district of Faro and province of Algarve, is beautifully situated in an inland hilly district about 5 miles to the north-west of the port of Faro. It is surrounded by walls and towers dating from the Moorish period, and the principal church is large and fine. The special industry of the place is basket-making. The population in 1878 was 14,862. The neighbouring church of Nuestra Senhora da Pietade is a favourite resort of pilgrims. a,

LOURDES, capital of a canton, and seat of the civil court of the arrondissement of Argelés, in the department of Hautes-Pyrénées, France, lies 12 miles by rail south- south-west of Tarbes, on the right bank of the Gave de Pau, and at the mouth of the valley of Argelés. It has grown up around what was originally a Roman castellum, and subsequently a feudal castle, picturesquely situated on the summit of a bare scarped rock. Near the town are marble quarries employing six hundred workpeople; and forty slate quarries give occupation to two hundred and sixty more. The pastures of the highly picturesque neighbourhood support the race of milch cows which is most highly valued in south-western France. The present fame of Lourdes is entirely associated with the grotto of Massavielle, where the Virgin Mary is believed in the Catholic world to have revealed herself repeatedly to a peasant girl in 1858; the spot, which is resorted to by multitudes of pilgrims from all quarters of the world, is now marked by a large church above the grotto, consecrated in 1876 in presence of thirty-five cardinals and other high ecclesiastical dignitaries. There is a considerable trade in rosaries and other “objets de piété,” as well as in the wonder-working water of the fountain, for which a miraculous origin is claimed. Not far from the grotto of Massavielle are several other caves where prehistoric remains, going back to the Stone Age and the period of the reindeer, have been found. The population of Lourdes in 1876 was 5470.

LOUSE, a term applied indiscriminately in its broad sense to all epizoic parasites on the bodies of other animals. From a more particular point of view, however, it is strictly applicable only to certain of these creatures that affect the bodies of mammals and birds. The former may be con- sidered as lice proper, the latter are commonly known as bird-lice (although a few of their number infest mammalia). Scientifically they are now generally separated into Anoplura and Mallophaga, although some authors would

include all under the former term. In the article Inszots it has been shown that modern ideas tend towards placing the Anoplura as degraded members of the order Hemiptera, and Mallo- phaga as equally degraded Pseudo-Neuroptera, according to the different formation of the mouth parts. Both agree in having nothing that can be termed a metamorphosis ; they are active from the time of their exit from the egg to their death, gradually increasing in size, and undergoing several moults or changes of skin; but it should be remembered that many insects of the hemimetabolic division would scarcely present any stronger indications of metamor-

phoses were it not for the usual outgrowth of wings, which are totally wanting in the lice.

LOU—LOU

The true lice (or Anoplura) are found on the bodies of many mammalia, and, as is too well known, occasion by their presence intolerable irritation. The number of genera is few. Two species of Pediculus are found on the human body, and are known ordinarily as the head-louse (P. capitis) and the body-louse (P. vestiment?) ; some appear to recognize a third (P. tabescentium), particularly affect- ing persons suffering from disease, burrowing (at any rate when young) beneath the skin, and setting up what is termed ‘phthiriasis” in such a terrible form that the unhappy victims at length succumb to its attacks ; to this several historical personages both ancient and modern are said to have fallen victims, but it is open to very grave doubts whether this frightful condition of things was due to other than the attacks of myriads of the ordinary body- louse. P. capitis is found on the head, especially of children. The eggs, laid on the hairs, hatch in about eight days, and the lice are full grown in about a month. Such © is the fecundity of lice that it is asserted by Leeuwenhoek that one female (probably of P. vestimenti) may in the course of eight weeks witness the birth of five thousand descendants. Want of cleanliness undoubtedly favours their multiplication in a high degree, but it is scarcely necessary here to allude to the idea once existing, and probably still held by the very ignorant, to the effect that they are directly engendered from dirt. The irritation is caused by the rostrum of the insect being inserted into the skin, from which the blood is rapidly pumped up. Attempts have been made to prove that the head-

louse (and, in a smaller degree, the body-louse) is liable to slight variation in structure, and also in colour, according to the races of men infested. This was probably first enunciated by Pouchet in 1841, and the subject received more ex- tended examination by Andrew Murray in a paper published in the Z'ransactions of the Royal Society of Edinburgh in 1861 (vol. xxii. pp. 567-577), who apparently shows that some aniount of variation does exist, but there is yet need for further investigation. That lice are considered bonnes bouches by certain uncivilized tribes is well known. It would be out of place to discuss here the possible interpre- tation of the Biblical reference to "lice" (cf. Exodus viii. 16, 17). A third human louse is known as the crab-louse (Phthirius pubis) ; this disgusting creature is found amongst the hairs on other parts of the body, particularly those of the pubic region, but probably never on the head ; although its presence may geuerally be looked upon as indicating dissolute association, it should not be regarded as always resulting therefrom, as it may be accidentally acquired by the most innocent. The louse of monkeys is now generally considered as forming a separate genus (Pedicinus), but the greater part of those infesting domestic and wild quadrupeds are mostly grouped in the large genus //ematopinus, and very rarely is the same species found on different kinds of animals; one species is found on the seal, and even the walrus does not escape, a new species (Z/. trichecht) having been recently discovered affecting the axille (and other

arts where the skin is comparatively soft) of that animal.

The bird-lice (or Jfallophaga) are far more numerous in species, although the number of genera is comparatively small. With the exception of the genus Trichodectes, the various species of which are found on mammalia, all infest birds (as their English name implies). As the mouth parts of these creatures are not capable of being extended into a sucking tube, but are clearly mandibulate, it appears probable that they feed more particularly on the scurf of the skin and feathers ; nevertheless great irritation must be caused by their presence, for it is notorious that cage-birds, much infested, will peck themselves to such an extent as to cause death in their endeavours to get rid of the parasites. Several hundred species are already known. Sometimes

two or three species (ordinarily of different genera) infest |

the same species of bird, and the same species of Jouse is not often found in different birds, unless those latter happen to be closely allied. But in aviaries and zoological gardens such cases do occasionally occur, as is natural under the circumstances. ‘These are analogous to the occasional presence of the flea of the cat, dog, domestic fowl, &c., on man ; temporary annoyance is caused thereby, but the conditions are not favourable for the permanent location of the parasites, Notwithstanding the marked preference shown by a special kind of bird-lice for a special host, there is also a marked preference shown by the individual species of certain genera or groups of lice for allied species of birds, which bears upon the question of the possible variation of human lice according to the race infested.

Literature. —The following works are the most important :— Denny, Monographia Anoplurorum Britanniz, London, 1843 ; Giebel, Insecta Epizoa (which contains the working-up of Nitzsch’s posthumous materials), Leipsic, 1874; Van Beneden, Animal Parasites, London, 1876 ; Piaget, Les Pédieulines, Leyden, 1880 ; Mégnin, Les Parasites et les Maladies Parasitaires, Paris, 1880.

LOUTH, a maritime county in the province of Leinster, Ireland, is bounded on the N.E. by Carlingford Bay and the county of Down, E. by the Irish Sea, 8. W. by Meath, and N.W> by Monaghan and Armagh. It is the smallest county in Ireland, the area comprising 202,124 acres, or 316 square iniles.

The greater part of the surface is undulating, with occasionally lofty hills; and in the north-east, on the borders of Carlingford Bay, there is a range of mountains approaching 2000 feet in height. Many of the hills are finely wooded, and towards the sea-coast the scenery, in the more elevated districts, is strikingly picturesque. The northern mountains are composed of felspathic and pyroxenic rocks. The lower districts rest chiefly on clay-slate and limestone. With the exception of the promontory of Clogher Head, which rises abruptly to a height of 180 feet, the sea-coast is for the most part low and sandy. The narrow and picturesque bay of Carlingford is

navigalle beyond the limits of the county, and the bay of Dundalk stretches to the town of that name and affords convenient shelter fora harbour. The principal rivers are the Fane, the Lagan, the Glyde, and the Dee, which all flow east- wards. None of these are navigable, but the Boyne, which fornis the southern boundary of the county, is navigable for large vessels as far as Drogheda.

Agriculture.—In the lower regions the soil is a very rich deep mould, admirably adapted both for cereals and green crops. The higher mountain regions are covered principally with heath. Agriculture generally is in an advanced con- dition, and the farms are for the most part well drained.

In 1880 there were 97,954 acres, or nearly one-half of the total area, under tillage, while 74,944 were pasture, 4585 plantations, and 24,135 waste. The total number of holdings in 1880 was 8216, of which 1294 were less than 1 acre in extent. No less than 5340 were below 15 aeres in extent, and of these 2486 were between 5

and 15 acres. The following table shows the areas under the prin- cipal crops in 1855 and 1881 :—

Other Meadow

Other Ad

Cereals.

Crops.

9,235 | 2,548

11,356 9,906 | 1,696 | 1,307 | 22,581

Between 1855 and 1881 horses have diminished from 12,133 to 10,810, of which 7394 are used for agricultural purposes. The number of cattle has increased only slightly, from 32,107 to 34,739, of which 8728 are milch cows. Sheep in 1855 numbered 31,712, and 33,362 in 1881. Pigs in 1881 numbered 10,471, and poultry 241,446. According to the last return the land

was divided among 1279 proprietors, who possessed 200, 287 aeres, with an annual rate- able value of £209,090, or 20s. 10d. per acre. Of the owners, 45 per cent. possessed less than 1 acre, and the average size of the

properties was 156 acres. The largest proprietors were Lord Cler- mont, 20,369 aercs ; Viscount Masserene, 7193; A. H. Smith Barry, 6239 ; Colonel J. C. W. Fortescne, 5262 ; and Lord Bellew, 5109.

Manufactures and Trade.—Sheetings and coarse linen cloth are manufactured in some places. Many of the inhabitants are engaged in deep-sea fishing, and there is a very valuable oyster fishery in Carlingford Bay. At Newry, Drogheda, and Dundalk a consider- able coasting trade is carried on.

Railways.—The county is intersected from north to south by the Dundalk and Belfast line, and the Irish North-Western line passes westwards from Dundalk to Enniskillen.

Administration and Population.—The county includes 6 baronies, 64 parishes, and 674 townlands. It is in the north-eastern circuit. Assizes are held at Dundalk, and quarter sessions at Ardee, Drogheda, and Dundalk. There are ten petty sessions districts within the county anda portion of one. It includes portions of the three poor-law unions of Ardee, Drogheda, and Dundalk. With the exccption of Drogheda, which is in the Dublin military district, the county is in the Belfast military district ; and there are barracks at Dundalk. Besides the two members at present returned by the county, and one member by each of the boroughs of Drogheda and Dundalk, Louth in the Irish parliament was represented by an additional member for each of the boroughs of Drogheda and Dundalk, and by two members for each of the boroughs of Ardee, Carlingford, and Dunleer. The principal towns are Drogheda (14,662) and Dundalk (12,294). In 1760 the population was esti- mated at 67,572, which in 1841 had increased to 128,347, but in 1851 had diminished to 108,018, in 1871 to 84,021, and in 1881 to 78,228, of whom 38,241 were inales and 39,987 females, From 1st May 1851 to 31st December 1881, the number of emigrants was 33,521, a pereentage of 37°2 of the average population during that period. The marriage rate to every

1000 of estimated population in 1880 was 3°4, the birth rate 23°5, and the death rate 21°4.

History and Antiquities.—In the time of Ptolemy, Louth was inhabited by the Voluntii. Subsequently it was inclnded in the principality of Orgial or Argial, which comprehended also the greater part of Meath, Monaghan, and Armagh, A subordinate territory which included Louth was known as Hy-Conal and Machuire- Conal. The chieftain of the district was conquered by John de Courey in 1183, and in 1210 that part of the territory now known as Louth was made shire ground by King John, and peopled by atl settlers. Until the time of Elizabeth it was included in

Ister.

In the county there are a large number of antiquarian remains of special interest. There are ruins of Druidical altars at Balrighan and Carriek Edmond, and of a Druidical temple at Ballinahatrey near Dundalk. The round tower at Monastcrboice is in very good preser- vation, and there are remains of another at Dromiskin. The most remarkable cromlechs are those on Killin Hill and at Ballymas- canlan. At Killin Hill there is an extraordinary fort ealled Haghs- na-ain-eighe, or ‘‘the one night’s work”; and near Ballymascanlan is Castle Rath, surrounded by lesser raths, and having a remarkable tumulus in its vicinity. About 2 miles from Dundalk there is a very aneient structure, the origin of which has been much discussed. Near Balrighan there is a curious artificial cave. A large number of spears, swords, axes of bronze, gold ornaments, and other relics of antiquity have been discovered. There are a great number of Danish and other old forts. Originally there are said to have been no fewer than twenty religious houses within the county. Of these there are interesting remains at Carlingford; at Faughart, where is also to be seen St Bridget’s stone and pillar ; at Mellifont, the arehitecture of which is specially beautiful and elaborate ; and at Monasterboice, where there are two crosses, one of which, St eee is the most ancient and most finely decorated in Ire- and.

LOUTH, a municipal borough and market-town of Lincolnshire, England, is pleasantly situated on the river Lud, and on a branch of the Great Northern Railway, 25 miles east-north-east of Lincoln. By means of a canal, completed in 1763, at a cost of £28,000, there is water communication with

Hull. The town is about a mile in length, and is well built and paved. The church of St James, completed about 1516, in the Later English style, with a spire 288 feet in height, is one of the finest ecclesiastical buildings in the county. There are an Edward VI. grammar school, which is richly endowed, a commercial school founded in 1676, and a national school. The other public buildings include a town-hall, a corn exchange, and a market-hall. In the vicinity are the ruins of a Cistercian abbey, founded in 1139. The industries in- clude the manufacture of carpets, tanning, iron-founding, brewing, malting, lime burning, and rope and brickmaking.

The population, which in 1851 was 10,467, had increased in 1871 to 10,500, and in 1881 to 10,690. ro. 7

Louth is a corruption of Luwdd, the ancient name of the river Lud. It received a are of incorporation from Edward VI. In 1536 the town took part in the ‘‘ Pilgrimage of Grace,” on which account the vicar was executed at Tyburn. Alfred and Charles Tennyson were educated at the grammar school, and their little volume en- titled Poems by Two Brothers was published by a Louth bookseller, whose shop still exists.

LOUVAIN, a town of Belgium in the province of |

Brabant, 18 miles east of Brussels, on the Liége and Cologne Railway, and on the river Dyle. The population in 1880 was 34,700. Louvain possesses some fine specimens of Gothic art,—the town-hall, which displays a

wealth of decorative architecture almost unequalled on the | Continent, and the collegiate church of St Pierre, with |

some fine sculptures and panels by Quentin Matsys. The general aspect of the town to the casual observer is dull

_ the niece of the chancellor Aligre.

and cheerless; the newer portions, extending between the |

town-hall and station, consist of broad streets of monotonous regularity, while the old medizval quarter, despite its historic interest, is somewhat dingy and lifeless. Louvain has a market for corn and cattle as well as for cloth wares ; wood carving is also carried on; but the chief industry of the locality is brewing, the Louvain beer, a lemon-coloured frothy beverage, being held in high repute in the country. In the world of science Louvain holds honourable rank, having a celebrated university, an academy of painting, a school of music, extensive bibliographic collections, a museum of natural history, and a botanical garden. The university, a stronghold of the Roman Catholic faith, was first instituted in 1425, and soon grew famous among the learned of all nations. In the 15th and 16th centuries not less than six thousand students flocked thither yearly, and it became the nursery of many illustrious men. Swept away for a time by the first French Revolution, it was re- established in 1835; and, though less conspicuous than in bygone ages, and more generally confined to the instruction of the youth of Belgium, it is yet of considerable importance in the country as the only Catholic university, and one of the main supports of the Conservative party.

Like Bruges and many other Flemish towns, Louvain was at one

and oue of the principal markets of the Continent. spirit of the people, their frequent outbreaks against their rulers, and in particular the massacre of the patricians in 1878, were the chief causes of itsdecline. Duke Wenccslaus of Brabant, in a spirit of revenge after the last-mentioned rising, imposed so heavy taxes upon the people that they emigrated in large numbers. A hundred thousand weavers left the country, carrying abroad, mainly to England, the secrets of their trade ; and from that period the material prosperity of Louvain has steadily diminished.

LOUVIERS, capital of an arrondissement in the de- partment of Eure, France, is pleasantly situated, in a green

valley surrounded by wooded hills, on the Eure (here |

divided into many branches), 71 miles west-north-west from Paris, and some 13 miles from Rouen and Evreux. The old part of the town, built of wood, stands on the left bank of the river; the more modern portions, in brick and hewn stone, on the right. There are several good squares, and the place is surrounded by boulevards. The Gothic church of Notre Dame has a fine square tower, recently restored, and a portal which ranks among the richest and most beautiful works of the kind produced in the 15th century ; it contains several interesting works of art. The chief industry of Louviers is the cloth and flannel manu- facture. There are also nineteen wool-spinning mills, five fulling mills, and important thread factories ; and paper- making, tanning, currying and tawing, dyeing, and bleach- ing are also carried on. The town has a court of first instance, a tribunal of commerce, chambers of manufactures and agriculture, and a council of prudhommes. The population in 1876 was 10,973.

Louviers was originally a villa of the dukcs of Normandy ; its cloth-making industry first arosc in the beginning of the 13th cen- tury. It changed hands once and again during the Hundred Years' War, and from Charles VII. it received extensive privileges, and the title of Louviers le Franc for the bravery of its inhabitants in driving the English from Pont de l'Arche, Verneuil, and Harcourt. It passcd through various troubles successively at the period of the '"'ligue du bieu public" under Louis XI., in the religious wars (when the parliament of Rouen sat for a time at Louviers), and in the wars of the Fronde. Its industries nevertheless developed stcadily ; before the Revolution its production of cloth- amounted to 3000 picces annually, in 1837 the number had risen to 15,000, and

| it is still greater now.

LOUVOIS, Francots MicHEL LE TELLIER, MARQUIS DE (1641-1691), the great war minister of Louis XTV., was born at Paris on January 18, 1641. His father, Michel le Tellier, sprung from a bourgeois family of Paris, but had attached himself to the parlement of Paris, and married He won the favour of De Bullion, the superintendent of finances, and through

_him obtained the intendancy of Piedniont, where he made | the acquaintance of Mazarin.

He was Mazarin's right hand through the troublous times of the Fronde, and was the medium of communication between him and the queen, when the cardinal was in nominal disgrace at Briihl. He had been made secretary of state in 1643, and on the death of Mazarin was continued in his office. Like Colbert and unlike Fouquet he recognized the fact that Louis intended to govern, and by humouring his master's passion for knowing every detail of personnel and administration he gained great favour with him. He married his son to a rich heiress, the Marquise de Courtenvaux, and soon began to instruct him in the management of state business. The young man speedily won the king's confidence, and in 1666 was made secretary of state for war in his father's room. His talents were perceived by the great Turenne in the short war of the Devolution (1667-68), who gave him instruction not so much in the art of war as in the art of providing armies. The peace of Aix-la-Chapelle signed,

_Louvois devoted himself to the great work of organizing the French army. The years between 1668 and 1672,

says Camille Rousset, ‘‘ were years of preparation, when Me)

any other Fle _Lionne was labouring with all his might to find allies, time a great and flourishing city, with a population of 200,000 souls, |

The turbulent |

Colbert to find money, and Louvois soldiers for Louis.” Louvois's work was not the least important of the three. Till then armies were either bodies of free lances collected round a particular general and looking to him for pay, or a sort of armed militia, who looked on soldiering as an interlude, not a profession. Louvois understood the new

condition of things, and organized a national standing

army. In his organization, which lasted almost without a

| change till the period of the French Revolution, the leading

points must be noted, First among them was the almost forcible enrolment of the nobility and gentry of France, which St Simon so bitterly complains of, and in which Louvois carried out part of Louis's measures for curbing

_ the spirit of independence by service in the army or at court.

Then must be mentioned his elaborate hierarchy of officers, the grades of which with their respective duties he estab- lished for the first time, and his new system of drill, per- fected by Martinet. Besides the army itself, he organized for its support a system of payment and commissariat, and a hospital system, which made it more like a machine, less dependent on the weather, and far superior to the old German system. Further, with the help of Vauban he formed a corps of engineers, and lastly, to provide the deserving with suitable reward, and encourage the daring, he reorganized the military orders of merit, and founded the Hotel des Invalides at Paris. The success of his measures is to be seen in the victories of the great war of 1672- 1678, in which his old instructor Turenne was killed. After the peace of Nimeguen in 1678, Louvois was high

in favour, his father Michel le Tellier lad been made chancellor, and his only opponent Colbert was in growing disfavour. The ten years of peace between 1678 and 1688 were distinguislied in French history by the rise of Madame de Maintenon, the capture of Strasburg, and the revocation of the edict of Nantes, in all of which Louvois bore a pro- minent part. The surprise of Strasburg in 1681 in time of peace, in pursuance of an order of the chamber of reunion, was not only planned but executed by Louvois and Monclar, aud after the revocation of the Edict of Nantes he claims the credit of inventing the dragonnades. Colbert died in 1683, and had been replaced by Le Pelletier, an adherent of Louvois, in the controller-generalship of finances, and by Louvois himself in his ministry for public buildings, which he took that he might be the minister able to gratify the king's two favourite pastimes, war and build- ings. Louvois was able to superintend the successes of the first years of the war of 1688, but died suddenly of apoplexy after leaving the king's cabinet on July 16, 1691. His sudden

death caused a suspicion of poison, and struck everybody with surprise. ‘He is dead,” writes Madame de Sevigné, “that great minister, that important man, who held so grand a position, and whose d/oz spread so far, who was the centre of so much.” “ Tell the king of England,” said Louis the next day, “that I have lost a good minister, but that his affairs and mine will go none the worse for that.” He was very wrong; with Louvois the organizer of victory was gone. Great war ministers are far rarer than great generals. French history can only point to Carnot as his equal, English history only to the elder Pitt. The comparison with Carnot is an instructive one: both had to organize arinies out of old material on a new system, both had to reform the priuciple of appointing officers, both were admirable contrivers of campaigns, and both devoted themselves to the material well-being of the soldiers. But in private life the comparison will not hold; Carnot was a good husband, an upright man, auda broad minded thinker and politician, while Louvois married for money and lived opeuly with various mistresses, most notoriously with the beautiful Madame de Courcelles, used all means to over- throw his rivals, and boasted of having revived persecution in his horrible system of the dragonnades.

The principal authority for Louvois’s life and times is Camille Rousset’s Histoire de Lowvois, 4 vols., 1862-68, a gr at work founded on the 900 volumes of his despatches at the Depét de la Guerre. Saint Simon from his class prejudices is hardly to be trusted, but Madame de Sevigné throws many bright side-lights on his times. Testament Politique de Lowvois (1695) is spurious.

LOVAT, Simon Fraser, Baron, a famous Jacobite intriguer, executed for the part which he took in the rebellion of 1745, was born about the year 1676, and was the second son of Thomas, afterwards twelfth Lord Lovat. He was educated at King’s College, Aberdeen, and there seems reason to believe that he was there no negligent student, as his correspondence afterwards gives abundant proof, not only of a thorough command of good English and idiomatic French, but of such an acquaintance with the Latin classics as to leave him never at a loss for an apt quotation from Virgil or Horace. Whether Lovat ever felt any real principle of loyalty to the Stuarts or was actuated throughout merely by what he supposed to be self-interest it is difficult to determine, but that he was a born traitor and deceiver there can

be no doubt. One of his first acts on leaving college was to recruit three hundred men from his clan to form part of a regiment in the service of William and Mary, in which he himself was to hold a command,— his object being, as he unhesitatingly avows, to have a body of well-trained soldiers under his influence, whom at a moment's notice he might carry over to the interest of King James. Among other wild outrages in which hewas engaged about this time was a rape and forced marriage committed on

the widow of a previous Lord Lovat with the view appar- ently of securing his own succession to the estates ; and it is a curious instance of his plausibility and power of influenc- ing others that, after being subjected by him to the most horrible ill-usage, the woman is said to have ultimately become seriously attached to him. A prosecution for his violence, however, having been instituted against him by Lady Lovat's family, Simon found it prudent to retire first to his native strongholds in the Highlands, and afterwards to France, where he at length found his way in July 1702 to the court of St Germains. One of his first steps towards gaining influence there seems to have been to announce his conversion to the Catholic faith, He then proceeded to put the great project of restoring the exiled family into a practical shape. Hitherto nothing seems to have been known among the Jacobite exiles of the efficiency of the Highlanders as a military force. But Lovat, who was of course well acquainted with their capabilities, saw that, as they were the only part of the British population accus- tomed to the independent use of arms, they could be at once put in action against the reigning power. His plan there- fore was to land five thousand French troops at Dundee, where they might reach the north-eastern passes of the Highlands in a day's march, and be in a position to divert the British troops till the Highlands should have time to rise. Immedi- ately afterwards five hundred men were to land on the west coast, seize Fort William or Inverlochy, and thus prevent the access of any military force from the south to the central Highlands. The whole scheme affords strong indication of Lovat's sagacity as a military strategist, and it is observable that luis plan is that which was continuously kept in view in all the future attempts of the Jacobites, and finally acted on in the last outbreak of 1745. The advisers of

the Pretender seem to have been either slow to trust their astute coad- jutor or slow to comprehend his project. At last, however, he was despatched on a secret mission to the Highlands to sound tliose of the chiefs who were likely to rise, and to ascertain what forces they could bring into the field. He very soon found, however, that there was little disposition to join the rebellion, and he then made up his mind to secure his own safety by revealing all that he knew to the Government of Queen Anne. Having by this means ob- tained a pardon for all his previous crimes, he was sent back to France to act as a spy on the Jacobites. On returuing to Paris suspicions soon got afloat as to his pro- ceedings, and in the end he was committed close prisoner in the castle of Angouléme, where he remained for nearly ten years, or till November 1714, when he made his escape to England. For some twenty-five years after this he was chiefly occupied in lawsuits for the recovery of his estates and the re-establishment of his fortune, in both of which objects he was successful. The intervals of his leisure were filled up by Jacobite and Anti-Jacobite intrigues, in which he seems to have alternately, as suited his interests, acted the traitor to both parties. But he so far obtained the confidence of the Government as to have secured the appointments of sheriff of Inverness and of colonel of an indepeudent company. His disloyal practices, however, soon led to his being suspected ; and he was deprived of both his appointments, When the rebellion of 1745 broke out, Lovat acted with his characteristic duplicity. He re- presented to the Jacobites—what was probably in the main true—that though eager for their success his weak health and advanced years prevented him from joining the standard of the prince in person, while to the Lord President Forbes he professed his cordial attachment to the existing state of things, but lamented that his headstroug son, in spite of all his remonstrances, had insisted on joining the Pre- tender, and succeeded in taking with him a strong force from the clan of the Frasers. The truth was that the poor

lad was most unwilling to go out, but was compelled by his father to do so. Lovat’s false professions of fidelity did not of course long deceive the Government, and after the battle of Culloden he was obliged to retreat to some of the wildest recesses of the Highlands, after seeing from a distant height his proud castle of Dounie delivered to the flames by the royal army.

Even then, however, broken down by disease and old age, carried about on a litter and unable to move without assistance, his mental resources did noé fail him; and in a conference with several of the Jacobite leaders he proposed that they should raise a body of three thousand men, which would be enough to make their moun- tains impregnable, and at length force the Government to give them advantageous terms. The project, though by no means a chimerical one, was not carried out, and Lovat, after enduring incredible hardships in his wanderings, was at last arrested on an island in Loch Morar close upon the west coast. He was conveyed in a litter to London, and after a trial of five days sentence of death in “the ordinary brutal form peculiar to England ” was pronounced upon him on the 19th of March 1747. His execution took place on the 9th of April following. His conduct to the last was dignified and even cheerful,—his humour, his power of sarcasin, and his calm defiance of fate never deserting him. Just before submitting his head to the block he repeated the line from Horace— ‘* Dulce et decorum est pro patria mori.”

LOVE-BIRD, a name somewhat indefinitely bestowed, chiefly by dealers in live animals and their customers, on some of the smaller short-tailed Parrots, from the remark- able affection which examples of opposite sexes exhibit towards each other, an affection popularly believed to be so great that of a pair that have been kept together in captivity neither can long survive the loss of its partner. By many systematic ornithologists the little birds thus named, brought almost entirely from Africa and South America, have been retained in a single genus, Psettacula, though those belonging to the former country were by others separated as Agapornis. This separation, however, was by no means generally approved, and indeed it was not easily justified, until Garrod (Proc. Zool. Society, 1874, p. 593) assigned good anatomical ground, afforded by the structure of the carotid artery, for regarding the two groups as distinct, and thus removed what had seemed to be the almost unintelligible puzzle presented by thie geographical distribution of the species of Pszttacula in a large sense, though Professor Huxley (op. czt., 1868, p. 319) had indeed already suggested one way of meeting the difficulty. As the genus is now restricted, only one of the six species of Psittacula enumerated in the Nomenclator Avium of Messrs Sclater and Salvin is known to be found outside of the Neotropical Region, the exceptional instance being the Mexican P. cyanopygia, and not one of

the seven recognized by the same authors as forming the very nearly allied genus Urochroma. On the other hand, of Agaporms, from which the so-called genus Poliopsitta can scarcely be separated, five if not six species are known, all belonging to the Ethiopian Region, and all but one, A. cana (which is indigenous to Madagascar, and thence has been widely disseminated), are natives of Africa. In this group probably comes also Psittinus, with a single species from the Malayan Subregion. These Old-World forms are the “Love-birds” proper; the others scarcely deserve that designation, and still less do certain even smaller Parrots, the very smallest indeed of the Order Psittact, included in the genera Cyclopsitta and Nasiterna, which are peculiar to the Australian Region, though on account of their diminutive size they may here be just mentioned by name, but their real affinity remains to be determined. (Rea)

LOV—LOV

LOVELACE, Ricwarp (1618-1658), English poet, was born in 1618. On the father’s side he was a scion of a Kentish family, and inherited a tradition of military distinction, maintained by successive generations from tlic time of Edward III. His mother’s family was legal ; her grandfather had been chief baron of the exchequer. Lovelace’s fame has been kept alive by a few songs and the romance of his career, and his poems are commonly spoken of as careless improvisations, aud merely the amusements of an active soldier. But the unhappy course of his life gave him tore leisure for verse-making than opportunity of soldiering. Before the outbreak of the civil war in 1642 his only active service was in the bloodless expedition which ended in the Pacification of Berwick in 1640, By that time he was one of the most distinguished of the company of courtly poets gathered round Queen Henrietta, and influenced as a school by coutemporary French writers of vers de société. Lovelace had probably a more serious and sustained poetical ambi- tion than any of them. He wrote a comedy, Zhe Scholar, when he was sixteen, and a tragedy, Zhe Soldier, when he was one and twenty. From what he says of Fletcher, it would seem that this dramatist was his model, but only the spirited prologue and epilogue to his comedy have been preserved. When the rupture between king and parlia- ment took place, Lovelace was committed to the Gatehouse at Westminster for presenting to the Commons a petition from Keutish royalists in the king’s

favour. It was then that he wrote his most famous song, “To Althza from Prison.” He was liberated on bail of £40,000,—a sign of his importance in the eyes of the parliament,—and throughout the civil war was a prisoner on parole, with this security in the hands of his enemies. His only active service was after 1646, when he raised a regiment for the French king, and took part in the siege of Dunkirk. Returning to England in 1648, he was again thrown into prison. During this second imprisonment, he collected and revised for the press a volume of occasional poems, many if not most of which had previously appeared in various publications. The volume was published in 1649 under the title of Lucasta, his poetical name—contracted from Lux Casta—for Lucy Sacheverell, a lady who married another during his absence in France, on a report that he had died of his wounds at Dunkirk. The last ten years of Lovelace’s life were passed in obscurity. His fortune had been exhausted in the king’s interest, and he is said to have been supported by the generosity of more fortunate friends. He died, according to Aubrey, ‘“‘in a cellar in Longacre.” A volume of Lovelace’s Posthume Poems was published in 1659 by one of his brothers. They are of very inferior merit to his own collection.

The world has done no injustice to Lovelace in neglecting all but a few of his modest offerings to literature. But critics often do him injustice in dismissing him as a gay cavalier, who dashed off his verses hastily and cared little what became of them. It is a mistake to class him with Suckling; he has neither Suckling’s easy grace nor his reckless spontaneity. We have only to compare the version of any of his poems in Lucasta with the form in which it originally appeared to see how fastidious was his revision. In many places it takes time to decipher his meaning. The expression is often elliptical, the syntax inverted and tortuous, the train of thought intricate and discontinuous. These faults—they are not of course to be found in his two or three popular lyrics, ‘‘ Going to the Wars,” ‘‘To Althea from Prison,” ‘‘‘The Scrutiny ”—are, however, as in the case of his poetical master, Donne, the faults not of haste but of over-elaboration. His thoughts are not the first thoughts of an improvisatore, but thoughts ten or twenty stages removed from thie first, and they are generally as closely packed as they are far-fetched. Lovelace is not named by Johnson among the ‘‘ metaphysical poets,” but in elaboration of workman- ship as well as in intellectual force he comes nearer than any other disciple to the founder of the school. His

most far-fetched con- ceits are worth the carriage, and there is genuine warmth in them. The wine of his poetry is a dry wine, but it is wine, and not an

artificial imitation. His career as a dramatist was checked by the suppression of the stage ; if he had been born thirty years earlier or thirty years later, Fictcher or Congreve would have had in him a nowerful rival. The most recent edition of his poems is that by W. C. Hazlitt, in 1864.

LOVER, Samuet (1797-1868), novelist, artist, song- writer, and musician, was born in Dublin in 1797. His father was a member of the stock exchange. Lover began life as an artist, and was elected an academician of the Royal Hibernian Society of Arts—a body of which he afterwards became secretary. He acquired repute as a miniature painter; and a number of the local aristocracy sat to him for their portraits. His love for music showed itself at a very early age. Ata dinner given to the poet Moore in 1818 Lover sang one of his own songs, which elicited special praise from Moore. Oneof his best known portraits was that of Paganini, which was exhibited at the Royal Academy. He attracted attention as an author by his Legends and Stories of Ireland (1832), and was one of the first writers for the Dublin University Magazine. He went to London about 1835, where, among others, he painted Lord Brougham in his robes as lord chancellor. His varied gifts rendered him very popular in society ; and he appeared often at Lady Blessington’s evening receptions. There he sang several of his sougs, which were so well received that he published them (Songs and Ballads, 1839). Some of them illustrated Irish superstitions, among these being “ Rory O’More,” “The Angel’s Whisper,” “The May Dew,” and ‘The Four- leaved Shamrock.” In 1837 appeared Rory O’More, a National Romance, which at once made him a great reputation as a novelist ; he afterwards dramatized it for the Adelphi Theatre, London. In 1842 was published his best known work, Handy Andy, an Irish Tale. Mean- while his multifarious pursuits had seriously affected his health; and in 1844 he gave up writing for some time, substituting instead public entertainments, called by him ‘Trish Evenings,” illustrative of his own works and his powers as a musician and composer. These were very successful both in Great Britain

and in America. In addition to publishing numerous songs of his own, Lover edited a collection entitled Zhe Lyrics of Ireland, which appeared in 1858. He died on July 6, 1868. Lover was remarkable for his versatility; but his fame rests mainly on his songs and novels; the latter are full of sunny Irish humour, and teem with felicitous pictures of national life. Besides those already mentioned he wrote Treasure Trove (1844), and Metrical Tales and Other Poems (1860).

LOWELL, the twenty-seventh city in population of the United States, in Middlesex county, Massachusetts, at the junction of the Concord and Merrimack rivers, 26 miles north-west from Boston. It is often called the “Spindle City,” and the ‘Manchester of America,” because of the extent of its cotton manufacture. The principal source of its water-power is Pawtucket Falls in the Merrimack, and steam is employed as an auxiliary to the amount of 19,793 horse-power. The first cotton-mill was started in 1823, when the place was the village of East Chelmsford. In 1826 it was made a town, and named Lowell in memory of Francis Cabot Lowell, from whose plans it had been developed, but who died in 1817. It was incorporated as a city in 1836. It originally comprised 2885 acres, but by annexation from neighbouring towns its area has bee increased to 7615 acres, or 11°8 square miles. The popu- lation, which in 1836 was 17,633, was 40,928 in 1870, and 59,485 in 1880 (males, 26,855 ; females, 32,630), and in 1882 was estimated at 64,000. :

The following table shows the extent of the principal manufacturing companies in 1882 :—

a

Company. eo Looms, | Spindles. roi . a Merrimack ..s.scce sees ~~e 1823 | 4,267 | 153,552 | 3,300 | 947,000 Elamllitonhescccnsscewceen 1825 | 1,597 | 59,816 | 1,387 | 364,000 Appleton. .....000~~ 1828 11,228, 45,000! 820 | 285,000 IDOO. Sannesecpensoesorne | lksktsl 392| 24,750|1,700} 48,000 IMM CGCSEX. + ..55. 26. aeons 1830 250 | 18,640; 8386] 25,000 Tremont and Suffolk..| 1832 | 2,700 | 94,000 | 1,500 | 550,000 ETIWHEM CCl c cs sicssees cee 1833 | 2,360 | 100,000 | 2,130 | 425,000 oothwerrnapeaccscse-cssn 1836 | 3,600 | 127,000 | 1,875 | 650,000 Massachusetts ……..... 1840 | 3,658 | 119,528 | 1,717 | 907,000

The capital invested is $17,300,000 ; number 153; spindles, 806,000; looms, 20,521; females employed, 12,809; males, 9750; yards per year, cotton 209,056,000, woollen 8,335,000, carpetings 2,700,000; shawls, 350,000 ; hosiery per year, 13,695,520 pairs; cotton consumed annually, 34,087 tons; clean wool, 11,750,000 ib; yards cotton dyed and printed, 97,240,000; coal consumed,

of mills,

80,000 tons. ‘There are many secondary industries con- nected with the cotton manufacture, including the making of machinery, elastic and leather goods, tools, boilers, &c., and also a number of small factories for the production of cartridges, chemicals, wire cloth, paper, doors, sashes, blinds, and carriages. The Lowell machine-shop employs 1400 men in the manufacture of machinery, and consumes 9800 tons of iron and steel annually. Lowell has 90 public day schools, 6 evening and 4 technical schools, a reform school, and 2 parochial schools. The principal public buildings are the city-hall, court-house, Middlesex county jail, Green school-house, and St John’s Hospital. There are 7 national banks with a total capital of $2,500,000, and 6 savings banks with deposits of $11,600,000. The religious congregations number 35, all but three of which own their places of worship. The two largest Roman Catholic churches, St Patrick’s and the Church of the Immaculate Conception, are among the finest in the State. Seven railroads connect Lowell with the railroad system of the country. The benevolent institutions include a home for young women and children, and one for aged women, 2 orphanages, and 3 hospitals. There are 2 reading-rooms, 5 daily newspapers (one French), 6 weeklies, and 4 public libraries. Lowell was early famed for the high character of its operatives, who for some years published a periodical of considerable literary merit called Zhe Lowell Ofering, which was, it is believed, the only publication of the kind ever sustained by workpeople. Many of the young women rose to positions of prominence in American society, and at least one, Miss Lucy Larcom, is known to readers on both sides of the Atlantic by her contributions to leading magazines.

In 1843 Charles Dickens visited the place, and devoted a chapter of his American Notes to its praise. The manufacturers have from the first

provided for the moral and social as well as the physical wellbeing of their operatives, so that labour troubles have been exceedingly rare in Lowell. The corporation boarding-houses are model dwellings for the workpeople. The first blood shed in the American civil war was that of two Lowell young men, Luther C. Ladd and A. O. Whitney, who were killed by a inob while their regiment was passing through the streets of Baltimore, on the way to the defence of Washington, April 19, 1861. In their honour a granite monument has been erected in Merrimack Street, and in the same enclosure isa bronze statue of Victory by the German sculptor Rauch to commemorate the triumph of the Northern cause.

The assessed valuation in May 1881 was $42,785,434 an increase of $3,108,035 since 1879); the net debt December 31, 1881, was $1,992,868, of which $1,565,539 was on account of the introduction of water in 1873.

Lowell is divided into six wards, and is governed by a j

mayor, a board of eight aldermen, and a common council of twenty-four menibers.

LOWESTOFT, a watering-place, seaport, and market- town of Suffolk, England, is picturesquely situated ou a lofty declivity, which includes the most easterly point of land in England, 23 miles south-west of Norwich by rail. Previous to the opening of a railway, it was only a small fishing village, but since then it has risen to some importance as a seaport, while its picturesque situation, and its facilities for sea-bathing, have rendered it a favourite watering-place. The church of St Margaret, in the Later English style, with tower and spire, possesses a very ancient font. There are a town-hall, a county-hall, two foundation schools, a large general hospital, and a number of charities. Along the shore there is a fine esplanade, and a new park was opened in 1874. Two piers 1300 feet in length enclose a harbour of 20 acres, which is much used as a harbour of refuge. For the last five years the average value of the foreign and colonial imports has been over £100,000, and the exports have been valued at about £5000. The fisheries of Lowestoft are of some importance, and there are shipbuilding yards, oil and

flour mills, and rope-works. The population of the urban sanitary district in 1871 was 15,246, and in 1881 it had increased to 19,597.

LOWICZ, a town of Russian Poland, on the Bzura river, in the government of Warsaw, 54 miles by rail west from the capital, on the line between Skiernewice and Bromberg. It has lately become a centre of manufacture and trade, and the population (6650 in 1872) is rapidly increasing. Its fairs are important as regards the trade in horses and cattle. In tle immediate neighbourhood are situated the hamlet Liczcowice, which has a beetroot sugar factory, and the rich estates Nieboron and Villa Arcadia of the Radziwill family.

LOWTH, Rosert (1710-1787), bishop of London, was born at Buriton, Hampshire, or, according to other authori- ties, in the Close of Winchester, on November 27, 1710. He was the younger son of Dr William Lowth (1661-1732), rector of Buriton, a man of considerable learning, author of A Vindication of the Divine Authority and Inspiration of the Old and New Testaments (1692), Directions for the Profitable Reading of the Holy Scriptures (1708-26), and A Commentary on the Prophets (4 vols., 1714). Robert was educated on the foundation of Winchester College, and in 1730 was elected to a scholarship at New College, Oxford, where he took his degree of M.A. in 1737. In 1741 he was appointed professor of poetry, and it was in this capacity that he delivered the Prelectiones Academicx de Sacra Poest Hebrxorum, afterwards published in 1753. Bishop Hoadly appointed him in 1744 to the rectory of Ovington, Hampshire, in 1750 to the archdeaconry of Winchester, and in 1753 to the rectory of East Woodhay, also in Hampshire. In 1754 he received the degree of doctor of divinity from his university, and in the follow- ing year he went to Ireland along with the duke of Devonshire, then lord-lieutenant, as first chaplain. Soon afterwards he declined a presentation to the see of Limerick, but accepted a prebendal stall at Durham and the rectory of Sedgfield. In 1758 he published his Life of William of Wykeham, which was followed in 1762 by A Short Introduction to English Grammar. In 1765, the year of his election into the Royal Societies of London and Gottingen, he engaged in a hot war of pamphlets with Warburton on a now obsolete question about the relations between the book of Job and the Mosaic economy ; and (Gibbon being judge), “ whatsoever might be the merits of an insignificant

controversy, his victory was clearly established by the silent confession of Warburton and his

slaves.” In June 1766 Lowth was promoted to the see of St David’s, whence about four months afterwards he was translated to that of Oxford, where he remained till 1777, when he became bishop of London. This last appointment he continued to hold until his death, having declined the archbishopric of Canterbury in 1783. In 1778 ap- peared his last work, /saiah, a new Translation, with a Preliminary Dissertation, and Notes, Critical, Philological, and Explanatory. He died at Fulham on Noveniber

1787.

The Prelcetiones exercised a great influence both in England and on the Continent. Their chief importance lay in the idea of look- ing at the sacred poetry as poetry, and examiuing it by the stand- ards applied to profane literature. Lowth’s esthetic criticism was that of the age, and is now in great part obsolete, a more natural method having been soon aftcr introduced by Herder. The prin- cipal point in which Lowth’s influence has been lasting is his doctrine of poctic parallelism, and even here his somewhat mechani- cal classification of the forms of Hebrew sense-rhythm, as it should rather be called, is open to serious objections. The Prelectiones reached a second cdition in 1763, and were republished with notes by J. D. Michaelis in 1770; both text and notes were translated by G. Gregory (1787 ; 4th cd., 1839). The Oxford edition of the original (1821) contains additions by Rosenmiiller, Richter, and Weiss. The editions of Lowth’s Jsaiah have been numerous (18th ed., 1842), but the book is now much less read than the Preileetiones. A vol- ume of Sermons and other Remains, with memoir by Hall, was published in 1834, and there is a comparatively recent cdition of the Popular Works of Robert Lowth, 8 vols., 1843.

LOYALTY ISLANDS, a group in the South Pacific, about 60 miles east of New Caledonia, consisting of Uvea or Uea (the northmost), Lifu, Toka and several small islands, and Mare or Nengone. ‘They are coral islands of comparatively recent elevation, and in no place rise more than 250 feet above the level of the sea. Lifu, the largest, is about 50 miles in length by

25 in breadth. Enough of its rocky surface is covered with a thin coating of soil to enable the natives to grow yams, taro, bananas, &c., for their support ; cotton thrives well, and has even been ex- ported in small quantities, but there is no space available for its cultivation on any considerable scale. Fresh water, rising and falling with the tide, is found in certain large caverns, and, in fact, by sinking to the sea-level a supply may be obtained in any part of the island. The popula tion, about 7000, is on thie decrease. The island called Neugone by the natives and Mare by the inhabitants of the Isle of Pines is about 80 miles in circumference, and contains about 6000 souls. Uvea, the most recent part of the group, consists of a circle of about twenty islets enclos- ing a lagoon 20 miles in width; the largest is about 30 miles in length, and in some places 3 miles wide, and the next largest is about 12 miles in length, The inhabitants, numbering about 2500, export considerable quantities of cocoa-nut oil.

The Loyalty islanders are classed as Melanesian ; the several islands have each its separate language, and in Uvea the one tribe uses 2 Samoan and the other a New Hebridean form of speech.. Captain Cook passed to the east of New Caledonia without observ- ing the Loyalty group ; but it was discovered soon afterwards, and Dumont D'Urville laid down the several islands in his chart. For many years after their discovery the natives had a bad repute as dangerous cannibals. Christianity was introduced into Mare by native teachers from Rarotonga and Samoa; missionaries were settled by the London Missionary Society at Mare in 1854, at Lifu in 1859, and at Uvea in 1865 ; Roman Catholic missionaries also arrived from New Caledonia; and in 1864 the French, con- sidering the islands a dependency of that colony, formally insti- tuted a commandant. An attempt was made by this official to put a stop to the English inissions by violence ; but the report of his conduct led to so much indignation in Australia and in England that the emperor Napoleon, on receipt of a protest from Lord Shaftcsbury and others, caused a commission of inquiry to be ap- pointed, and free liberty of worship to be secured to the Protcstant missions. A new persccution of the Christians in Uvea, during 1875, called forth a protest on the part of the English Government, and matters appear to have since improved.

See W. Gill, Gems from the Cora! Islands, new edition, 1871; S. Macfarlane, Story of the Lifu Mission, 1878.

LOY—LUB

LOYOLA, Ienatius Dz, St. Inigo, the youngest son of Beltran de Loyola, was born in 1491 at the castle of Loyola, the family seat, situated on the river Urola, about a mile from the town of Azpeitia, in the province of Guipuzcoa, Spain. He died at Rome on July 31, 1556, was beatified by Paul V. in 1609, and canonized along with Francis Xavier by Gregory XV. on March 13, 1623, the bull being published by Urban VIII. on August 6. His festival (duplex) is observed on July 31. See Jzsurrs.

LOZERE, a department of south-eastern France, but belonging to the great central plateau, is composed of almost the whole of Gévaudan and of some parishes of the old dioceses of Alais and Uzés, districts all formerly included in the province of Languedoc. It lies between 44° 6’ and 44° 58’ N, lat., and between 2° 58’ and 4° E. long., and is bounded on the N.W. by Cantal, on the N.E. by Haute-Loire, on the E. by Ardéche, on the S.E. by Gard, and on the S.W. by Aveyron, having an extreme length of 65 miles, an extreme breadth of 50, and an area of 1996 square miles. Lozére is mountainous throughout, and its average elevation makes it the highest of all the French departments. It has three distinct regions—the Cevennes to the south-east, the “causses” to the south- west, and the mountain tracts which occupy the rest. The Cevennes, forming the watershed between the Garonne and Loire basins to the west and that of the Rhone to the east, begin (within Lozére) with Mount Aigoual, which rises to a height of more than 5100 feet; parallel to this are the mountains of Bougés, a range between the rivers Tarn and Tarnon, bold and bare on its southern face, but falling gently away with wooded slopes toward the north. To the north of the Tarn is the range of Lozére, including the peak of Finiels, the highest point of the department (5584 feet). Further on occurs the broad marshy plateau of Montbel, from which the water drains southward to the Lot, northwards to the Allier, eastward by the Chassezac to the Ardéche. From this plateau extend the mountains of La Margeride, a long series of undulating granitic table- lands partly clothed with woods of oak, beech, and fir, and partly covered with pastures, te which the flocks are brought up

from lower Languedoc in summer. The highest point (Mount de Randon) is 5098 feet. Adjoin- ing the Margeride hills on the west is the volcanic range of Aubrac, an extensive pastoral district where horned cattle take the place of sheep; the highest point is 4826 feet. The “causses” of Lozére, having an area of about 483 square miles, consist of extensive calcareous tracts, fissured and arid, but separated from each other by deep and well-watered gorges, whose freshness aud beauty are in pleasant contrast with the desolate aspect of the plateaus, ‘The ‘“causse” of Sauveterre, between the Lot and the Tarn, ranges from 3000 to 3300 feet in height ; that of Méjean has nearly the same average altitude, but has peaks some 1000 feet higher. Between these two ‘“‘causses” the Tarn flows through a series of landscapes which are among the most picturesque and grand in France. The Lot and the Tarn, the two most important tributaries of the Garonne, both have their sources in this department, as also have the Allier, the two Gardons, which unite to form the Gard, the Céze, and the Chassezac with its affluent the Altier. The climate of Lozére varies greatly with the locality. The mean temperature of Mende, the capital, is below that of Paris ; that of the mountains is always low, but in the ‘‘ causses ” the summer is scorching and the winter severe; in the Cevennes the climate becomes mild enough at their base (656 feet) to permit the growth of the olive. Rain falls in violent storms, causing disastrous floods. On the Mediterranean versant there are 78°7 inches, in the Garonne basin 45°5, and in that of the Loire only 27-95. The

general character of the department is pastoral; only one- fourth of the area is occupied by arable land ; 91,500 acres are meadow, 155,700 wood, and 90,000 chestnut plantation, The number of sheep (which is doubled in summer) is 300,000; there are 50,000 head of cattle; and pigs, goats, horses, asses, and mules are also reared. Bees are also kept, and, among the Cevennes, silkworms. The export of chestnuts from the Cevennes is considerable. Rye is the chief cereal; but oats, wheat, meslin, barley, and many potatoes are also grown. Great care is bestowed on cultivation in the valleys adjoining the Ardéche; fruit trees and leguminous plants are irrigated by small canals (“‘béals”) on terraces which have been made or are maintained with much labour. The department yields argentiferous lead

(Villefort), slates, and mineral waters, among which those of Bagnols are most frequented. The exportation of its antimony, manganese, marble, and lithographic stones is undeveloped as yet. The tufa of Mende is well adapted for building purposes. The manu- factures are unimportaut. The population in 1876 was 138,319, having decreased by 5000 since 1801, and by a still greater number since the end of the 17th century. There are about 20,000 Protestants. The arrondissements are three (Mende, Florac, and Marvejols), the cantons twenty-four, and the communes one hundred and ninety- at,

LUBECK, a free city of Germany, situated in 53° 52’ N, Jat. and 10° 41’ E. long., on a gentle ridge between the rivers Trave and Wakenitz, 10 miles S.W. of the mouth of the former, and 40 miles by rail N.E. of Hamburg. Old Liibeck, the chief emporium of the Slav inhabitants of Wagria (East Holstein), stood on the left bank of the Trave, where it is joined by the river Schwartau, and was ulti-

Plan of Liibeck.

. Pitching Yard. if . Citadel. Tivoli. 8.

St Peter’s Church, . Church of St Agidius. Church of St Anne.

Hospital zum Heiligen | 12. Geist. 13

St Catharine’s Churc”. | 14.

2 Or He GO NO

. ‘*Chimborasso” Tower. | 9. St Mary’s Church. 15. Orphanage, Custom House. 10, Exchange. 16. Cathedral. . St James’s Church. 11. Town-Hall.

mately destro ed in 1138. Five years later Count Adol- phus II. of Holstein founded new Liibeck, a few miles farther up, on the peninsula Buku, where the deep current of the Trave is joined on the right by the Wakenitz, the broad emissary of the Lake of Ratzeburg. A most excel- lent harbour, well sheltered against pirates, it became almost at once a successful competitor for the commerce of

the Baltic. Its foundation coincided with the beginning of the general advance of the Low Gerinan tribes of Flanders, Friesland, and Westphalia along the southern shores of the great inland sea,—the second great emigration of the culonizing Saxon element. In 1140 Wagria, in 1142 the country of the Polabes (Ratzeburg and Lauenburg), had been annexed by the Holtseetas (the Transalbingian Saxons). From 1166 onwards there was a Saxon count at Schwerin. Frisian and Saxon merchants from Soest, Bardewieck, and other localities in Lower Germany, who already navigated the Baltic and had their factory in the distant isle of Goth- land, settled in the new town, where Wendish speech and customs never entered. About 1157 Henry the Lion, duke of Saxony, forced his vassal, the count of Holstein, to give up Liibeck; and in 1163 he removed thither the tottering episcopal see of Oldenburg (Stargard), founding at the same time the dioceses of Ratzeburg and Schwerin. He issued the first charter to the citizens, aud deliberately constituted them a free Saxon community having its own magistrate, an inestimable advantage over all other towns of his dominions. He invited the traders of the towns and realins of the north to visit his new market free of toll and custom, provided his subjects were promised similar privileges in return. From the very beginning the king of Denmark granted them a settlement for their herring fishery on the coast of Schoonen. Adopting the statutes of Soest in Westphalia as their code, Saxon merchants exclusively ruled the city. In concurrence with the duke's reeve they recognized only one right of judicature within the town, to which nobles as well as artisaus had to submit. Under these circumstauces the population grew rapidly in wealth and influence by land and sea, so that, when Henry was attainted by the emperor, who had come in person to besiege Liibeck, Barbarossa, "in consideration of its re- venues and its situation on the frontier of the empire," fixed by charter, dated September 19, 1188, the limits, and en- larged the liberties, of the free town. Evil times, however, were in store when the Hohenstaufen dynasty became more and more involved in its Italian projects. In the year 1201 Liibeck was conquered by Waldemar IT. of Denmark, who prided himself on the possession of such a city. But in 1223 it regained its liberty, after the king had been taken captive by the count of Schwerin. In 1226 it was incorporated as an independent city of the empire by Fre- derick II., and

took an active part with the enemies of the Danish king in the victory of Yornhévd, 1227. The citizens, distinguished by the firmness and wisdom with which they pursued their objects, and fully conscious that they were the pioneers of civilization in the barbarian regions of the north-east, repelled the persistent encroachments of their dynastic neighbours alike in Holstein and in Mecklenburg. On the other hand their town, being the principal emporium of the Baltic by the middle of the 13th century, acted as the firm ally of the Teutonic knights in Livonia. Genera- tion after generation of crusaders embarked to fonnd new cities and new sees of Low Gerinan speech among alien and pagan races; and thus in the course of a century the commerce of Liibeck had fully supplanted that of West- phalia. In close connexion with the Germans at Wisby, the capital of Gothland, and at Riga, where they had a house from 1231, the people of Liibeck with their armed vessels scoured the sea between the Trave and the Neva. They were encouraged by papal bulls in their brave contest for the rights of property in wrecks, and for the protection of shipping against pirates and slave-hunters. Before the close of the century the statutes of Liibeck were adopted by most Baltic towns having a German population, and Wisby raised her protest in vain that the city on the Trave had become the acknowledged court of appeal for nearly all these cities, and even for the German settlement in

Russian Novgorod. In course of time more than a hun- dred places were embraced in this relation, the last vestiges of which did not disappear until the beginning of the 18th century. Hitherto only independent merchants, individual Westphalian and Saxon citizens, had flocked together at so many out-lying posts. From about 1299 Liibeck presided over a league of cities, Wismar, Rostock, Stralsund, Greifswald, and some smaller ones, commonly called the Wendish towns. A Hansa of towns became heir to a Hansa of traders simultaneously on the eastern and the western sea, after Liibeck and her confederates had been admitted to the same privileges with Cologne, Dortmund, and Soest at Bruges and in the Steelyards of London, Lynn, and Boston. Such progress of civic liberty and federal union held its own, chiefly along the maritime outskirts of the empire, rather against the will of king and emperor. Nevertheless Rudolf of Hapsburg and several of his successors issued new charters to Liibeck, Charles IV., who, like his son

after him, deliberately opposed all confederacies of the Franconian and Swabian towns in Upper Germany, surrendered to the municipal goverpment of Liibeck the little that remained of imper?al jurisdiction by transferring to them the chief responsibility for preserving the public peace within the surrounding territories. Under these circumstances the citizens, like independent members of the empire, stood valiantly together with their sister towns against encroaching princes, or joined the princes against the lawless freebooters of the nobility. As early as 1241 Liibeck, Hamburg, and Soest had combined to secure their common highways against robber knights. Solemn treaties to enforce the public peace were concluded in 1291 and 1338 with the dukes of Brunswick, Mecklen- burg, and Pomerania, and the counts of Holstein. From Liibeck families, the descendants of Low German immigrants with a certain admixture of patrician and even junker blood, arose 2 number of wise councillors, keen diplomatists, and brave warriors to attend almost incessantly the many diets of the league, to decide squabbles, petty or grave, of its meinbers, to interfere with shrewd consistency when the authorities in Flanders, or king and parliament in England, touched their ancient commercial privileges, to take the command of a fleet against the kings of Norway or Denmark. Though the great federal armament against Waldemar IV., the destroyer of Wisby, was decreed by the city representatives assembled at Cologne in 1367, Liibeck was the leading spirit in the war which ended with the surrender of Copenhagen and the glorious peace concluded at Stralsund on 24th May 1370. Her burgomaster, Brun Warendorp, who commanded in person the combined naval and land forces, died bravely in harness. In 1368 the seal of the city, a double-headed imperial eagle (which in the 14th century took tle place of the more ancient ship), was expressly adopted as the common seal of the con- federated towns (civitates maritime), some seventy of which had united to bear the brunt of the strife. By and by, however, towards the end of the 15th century, the power of the Hanseatic League began slowly to decline, owing to the rise of Burgundy in the west, of Poland and Russia in the east, and the emancipation of the Scandinavian kingdom from the fetters of the union of Calmar. Still Liibeck, even when nearly isolated, strove manfully to preserve its predominance in a war with Denmark (1501-12), sup- porting Gustavus Vasa in Sweden, lording it over the north of Europe during the years 1534 and 1535 in the person of Jiirgen Wullenwever, the democratic burgomaster, who professed the most advanced principles of the

Reformation, and engaging with Sweden in a severe naval war (1563-70). Before the end of the century the old privileges of the London Steelyard were definitely suppressed by Elizabeth. As early as 1425 the regular

LU B shoals of herring, a constant source of early wealth, began to forsake the Baltic waters. Later on, by the discovery of a new continent, general commerce was diverted into new directions. Finally, with the Thirty Years' War, mis- fortunes and ruin came thick. The last Hanseatic diet met at Liibeck in 1630, shortly after Wallenstein's unsuccessful attack on Stralsund; and froin that time merciless sovereign powers stopped free intercourse on all sides. Danes and Swedes battled for the possession of the Sound and its heavy dues. The often changing masters of Holstein and Lauenburg abstracted much of the valuable landed property of the city and of the chapter of Liibeck. Still, towards the end of the 18th century, there were signs of improvement. Though the Danes temporarily occupied the town in 1801, it preserved its freedom and gained some of the chapter lands when the imperial constitution of Germany was broken up by the Act of February 25, 1803. Trade and commerce prospered marvellously for a few years. But in November 1806, when General Bliicher, retiring from the catastrophe of Jena, had to capitulate in the vicinity of Liibeck, the town was taken and sacked by the enemy. Napoleon annexed it to the empire in December 1810. But it rose against the French, March 19, 1813, was reoccupied by them till the 5th December, and was ultimately declared a free and Hanse town of the German Confederation by the Act of Vienna, June 9, 1815. The Hanseatic League, however, having never been officially dissolved, Liibeck still enjoyed its traditional connexion with Bremen and Hamburg. In 1853 they sold their common property, the London Steelyard. Till 1866 they enlisted by special contract their military contingents for the German Confederation. Down to the year 1879 they had their own court of appeal at Liibeck. The town, however, joined the Prussian Customs Union as well as the North German Union in 1866, profiting by the final retirement from Holstein and Lauenburg of the Danes, whose interference had prevented as long as possible a direct railroad between Liibeck and Hamburg.

Liibeck through many changes in the course of eight centuries has preserved its republican government. At the first rise of the town, justice

was administered to the inhabitants by the vogt (reeve) of the count. Simultaneously with the incorporation by Henry the Lion, who presented the citizens with the privileges of mint, toll, and market of their own, there appears a magistracy of six persons, elected probably by the reeve from the sehdffen (seabini, probit homines). The members of the town council had to be freemen, born in lawful wedlock, in the enjoyment of free property, and of unstained repute. Vassals or servants of any lord and tradespeople were excluded, A third of the number had annually to retire for a year, so that two-thirds formed the sitting, the other third the reposing council. By the middle of the 18th een- tury there were two burgomasters (magistri burgensium, magistri eivium, proconsules). Meanwhile the number of magistrates (con- sules) had largely increased, but was indefinite, ranging from twenty to forty and upwards. The council appointed its own officers in the various branches of tle administration,—chancellor, chaplain, surgeon, stadesserivere (recorders), notaries, secretaries, marshal, con- stable, keeper of the ordnance, messengers, watclimen. In the face of so much self-government the vogt by and by vanished completely. He is by no means to be confounded with the rector, a neighbouring prince, whom the Liibeckers occasionally adopted as their honorary guardian. There were three classes of inhabitants—full freemen, half freemen, guests or foreigners. People of Slav origin being considered unfree, all intermarriage with them tainted the blood. Hence nearly all surnames point to Saxon, especially Westphalian, and even Flemish descent.

Since the end of the 13th century the city has been entered by the same gates and traversed by the same streets as at the present day. Stately churclics of the Gothic order in glazed brick rose slowly,—last not least St Mary’s or Die Rathskirehe close to the Rathhaus (town-hall) and the spacious market-place with its long rows of booths and the pillory. Within its precincts is the Dom (cathedral) dedieated to St Nicholas, the patron saint of navigators; in Protestant times down to 1803 the secnlarized chapter was generally presided over by a prince of the ducal house of Gottorp. There were magnificent convents of the Domi- nicans, the Franciscans, and the nuns of St Clara. The population,

when the city and the Hansa were iu full power about 1400, can seatcely have been under 80,000. But such prosperity was not obtained by foreign commerce alone, though this was the principal occupation of the upper classes :—the Junker or Zirkel company, a sott of patriciate (since 13879); the merchant company, also patricians, but mostly “rentiers”; the ‘‘nations” of the Ber- genfahrer, Schonenfahrer, Novgorodfahrer, Rigafahrer, Stoekholm- Jehrer. From the very beginuing various tradespeople and handi- craftsmen had settled in the town, all of them freemeu, of German pateutage, and with property and houscs of their own. ‘Though not eligible for the eouncil, they shared to a certain extent in the self-government through the aldermen of each corporation (amt, officium, guild), of which some appear as early as the statutes of 1240, and many more arise and disappear in course of time under authority of the council and the guidance of certain police magistrates (wettcherren). A uumnber still exist, and own their old picturesque gable houses. The rolls of nearly al) have been kept most carefully. Naturally there arose much jealousy between the guilds and the aristocratic companies, which exclusively ruled the republic. After an attempt to upsct the merehants had been suppressed in 1384, the guilds succeeded under morc favourable cir- cumstances in 1408. ‘The old patrician council left the city to appeal to the Hansa and to the imperial authorities, while a new council, elected chiefly from the guilds, with democratic tenden- cies, took their place. In 1416, however, there was a coinplete restoration, owing to the interference of the confedcrated cities and of two kings of the Romans, Rupert and Sigismund. The aristo- etatic government was expelled a second time when democracy and religious sectarianism got the upper hand under the dictatorship of Wullenwever, till the old order of things was once more re-estab- lished in 1535. Nevertheless the medieval churcli had been finally supplanted by the Lutheran Reformation, and the tendency to increase the political privileges of the commonalty appeared again and again. In the constitution of 1669, under the pressure of a great public debt, the seven upper companies yielded to (8) the Gewandsehnetder (merchant tailors), (9) the grocers, (10) the brewers, (11) the mariners, and (12) the combined four great guilds, viz., the smiths, bakcrs, tailors, and shoemakers, a specified share in the financial administration. Nevertheless they continued to choose the magistrates by co-optation among themselves. Three of the four burgomasters and two of the senators, however, henceforth had to be graduates in law. Their

constitution, set aside only during the French ascendency, has subsequently been slowly reformed. From 1818 senatorial and civic deputies joined in the administration of an annual budget of income, expenditure, and publicdebt. But the reform committee of 1814, of which the object was to substitute for the rule of the old companies a wider participation of the citizens in their common affairs (most of the learned professions, many proprietors, and the suburban population being without any representation), had made very little progress, when under the pressure of the events of the year 1848 a representative assembly of one hundred and twenty members, elected by universal suffrage, obtained a place beside the senatorial government. By the consti- tution of the 29th December 1851 the senate, for which all citizens above thirty years of age are eligible, has at present fourteen members. Eight must be taken from the learned professions, of whom six have to be lawyers, while of the rest five ought to be mereliants, Every second year the offices and departments are re- distributed, to be in most cases administered conjointly with deputies of the assembly. The president of the senate, chosen for two years, retains the old title of burgomaster. The members of the assembly, which partieipates in all public affairs, are elected for six ycars, and must be summoned at least six times a year, while a committee of thirty members meets every fortnight simultaneously with the periodical sessions of the senate. These truly democratie iustitutions have becn scarcely at all modified by the resuscitation of the German empire under the king of Prussia. But evidently the ancient republic has lost some important attributes of a sovereign state by giving up its own military contingent, its right of levying customs, its eoinage, its postal dues, its Judicature, to the new national empire. On the other hand, it has preserved its municipal self-governinent and its own territory, the inhabitants of which now enjoy equal political privileges with the citizens. The territory, of about 54 German square miles (116 Eng. sq. m.), partly extends towards the mouth of the river Trave, where thie borough of Travemiinde has been the property of Liibeck since 1329, and partly consists of numerous villages, manors, farms, and corn, pasture, and forest lands scattered over the adjoining portions of the duchies of Holsteinand Lanenburg. The manor on orough of Bergedorf on the Elbe, 14 German square miles, loug held by Liibeck in common with Hamburg, was ceded to the latter by treaty of Ist Jnly 1867. The lands which remain to Liibeck are thinly peopled, for, according to the census of 1875, of the total of 56,912 inhabitants 44,799

lived in Liibeck itself, The vast majority, 55,693, are Lutheran Protestants, whose service con- tinues in the magnificent eity churches, the cathedral, twe parishes at Travemiinde, and the four country parishes. A cclebrated high

school (gymnasium) is situated in the spacious buildings of St Catharine, formerly the house of the Franciscans. The ¢ aritable institutions enjoy a large, well-administered property, chicfly the lands of the monastery of St John and the hospital of the Holy Ghost. Since 1789 there has existed a ‘Gesellschaft zur Befér- derung Gemeinniitziger Thitigkeit,” with a branch union for the history and the antiquities of Liibeck, which has collected a valu- able museum and promotes important historical publications, the materials of which are kept in the most unique municipal archives in existence. The income and expenditure of the Liibeck budget of 1881 balance with 2,789,382 marks; the public debt amounts to 23,804,913 marks. ;

The manufactures of the town are numerous, but not large or im- portant (woollen, linen, cotton, and silk goods, leather wares, hard- ware, tobacco, and preserves). The commerce, on the other hand, is considerable, the chief exports being corn, cattle, wool, timber, and iron ; while wines, silks, cottons, hardware, colonial products, and dye-stuffs are imported. There is regular steamiship communi- cation with Copenhagen and the Baltic ports, and four lines of railway converge in Liibeck. Since the deepening of the Trave (1850-54) sea-going ships can come up to Liibeck itself; formerly they required to unload at Travemiinde. In 1878 the local ship- ping of Liibeck amounted to 46 vessels of 10,223 aggregate tonnage (27 steamers, 1504 horse-power, 6463 tons). In 1877 2302 vessels (981 steamers) with a tonnage of 301,910 entered, and 2332 vessels (979 steamers) with a tonnage of 307,567 cleared the port.

See Codex, Diplomaticus Lubecensis, 6 vols., 1843-81; C. W. Pauli, Libeckische Zustdnde zum Anfang des vierzehnien Jahrhunderts, 1847; Waitz, Liibeck unter Jiirgen Wullenwever, 8 vols., 1855, 1856; W. Mansel’s

“ Liibeck,” in Bluntschli und Prater, Deutsches Staatswérterbuch, iv. p. 731; Wehrmann, Die dlteren Liibeckischen Zunftrollen, 1872; D. Schafer, Die Hansestédte und Konig Walde- mar von Ddénemark, 1879. (RP?)

LUBLIN, a town of Russian Poland, capital of the province of same name, 60 miles south-east of Warsaw, on the Bistrzyca, a tributary of the Wieprz. It is the most important town of Poland after Warsaw and Lodz. It has an old citadel, many churches, and several educational and charitable institutions, and it is the see of a bishop. Lublin is one of the chief centres of the manufacture of thread-yarn and of linen and hemp goods (to the value of more than £250,000), as well as of woollen stuffs; there is also an active trade in corn and cattle. The three annual fairs have a certain importance for the neighbouring district. The population in 1873 was 28,900, and is rapidly increasing.

The date of the foundation of Lublin is unknown, but it was in existence in the 10th century, and has a church which is said to have been built in 986. During the time of the Jagellons it was the most important city between the Vistula and the Dnieper, hay- ing 40,000 inhabitants (70,000 according to other authorities), and keeping in its hands all the trade with Podolia, Volhynia, and Red Russia. Indeed, the present town is surrounded with heaps of ruins, which prove that it formerly covered a much larger area. But it was frequently destroyed by the inroads of Tartars and Cossacks. In 1568 and 1569 it was the seat of the stormy con- vention at which the union between Poland and Lithuania was decided. In 1702 another convention was held in Lublin, in favour of Augustus II. and against Charles XII., who carried the town by assault, giving it over to his army to be plundered, and stayed for six weeks at Jacobowice, the estate of Prince Lubomirsky, in the immediate neighbourhood. In 1831 Lublin was taken by the Russians after a battle. The whole surrounding country is rich in historical reminiscences of the struggle of Poland for inde- pendence.

LUBRICANTS are fluids which are interposed between solid machine surfaces that are required to slide on each other. The object is to lessen the friction, which is injurious both in wearing away the surfaces, and thus destroying the fit between them, and in dissipating and rendering useless part of the energy transmitted through the machine. The difference between

the wear on unlubricated and that on lubricated surfaces is so serious that a comparison between the cost of lubrication and the money saving in avoidance of repairs is superfluous. But the difference In wear when two different lubricants are used is not very great, and the proper choice between the two lubricants depends on a comparison of their cost with the amount of working power they save from dissipation. Tf the price of oil per gallon, inclusive of wages for its application to the journals, &c., be p; if, in order to

lubricate as well as can be done with this oil any one working surface or set of such surfaces, it is necessary to use the fraction g of a gallon of oil per hour; if, with the use of this quantity of the oil, there is still wasted in friction at these surfaces H horse-power ; and if the cost in fuel, water, wages, repairs, &c., of the working energy is P per hour per horse-power; then the money loss per hour caused by the friction is pg-+PH. By comparing the values of this quantity for two oils, it can be determined which it is more advantageous to use. Of the commonly used oils, the higher priced are much more efficient as lubricants. If two oils of which the same amount requires to be used have the prices p, and p,, and allow H, and H, horse-power to be wasted, then the money advantage to be gained per hour by using the first (the higher priced) rather than the second is P(H, —-H,) -(p, —p,)g. This is positive if H,-Hy_ 4-2» ite

If this inequality is found not to be true in any special comparison, then the cheaper oil should be used. P varies from #d. to over 14d., according to the class of engine aud boiler and to the good or bad management of the works, while p,—y., in comparing the extremes of cheap and expensive commercial lubricants, amounts to 2s. 6d. or more.

To compare the advantages of using a larger or smaller amount of the same oil, let g, and g, be the quantities used, and the resulting wastes of horse-power be H, and

H,. Then the use of the larger quantity g, will be economical if ns P(H,-H,)-plg,- 9:)>0; or 2252. (Hy 1) ~ PA – J2)> or 1-9 7?

Considering the meaning of this inequality in the two cases of a high-priced and of a low-priced oil, in the

H, – H. 21 has also a

former case 5 has a larger value, while

larger value than in the latter case. In both cases this latter fraction decreases with increase of g,; but it de- creases more rapidly in the case of a high-priced than in that of a low-priced oil, because the former is a better lubricator. Thus with the dearer oil the limit beyond which it is uneconomical to increase the consumption of oil is reached sooner than with the cheaper, and it follows that of the cheaper oils it is best to use a large quantity, while of the dearer a smaller amount is what is most use- fully employed. If the law according to which H varies with g be found for any oil, by experiment or otherwise, then the exact most economical quantity can be found by differentiating pg + PH with respect to g, and equating the differential coefficient to zero; thus

dH, j : : when 7, 38 expressed in terms of g, gives this most econo-

mical value of g. An example of the actual values of the quantities involved in these formulas is given by an experiment by Van Cleve on a journal 6 inches in diameter by 7 inches long, in which the coefficient of friction was found to be about ‘077, and there was wasted 3-4 horse- power when ‘023 of a gallon was used per hour.

Of the animal oils and fats suitable for lubrication those commonly used are sperm, lard, neats-foot, tallow, and common whale oil. Of vegetable oils olive, cotton-seed, and rape-seed are extensively employed, the first mostly in those countries where the olive is grown, and generally in the pure condition, while the last two are more used for mixing with higher classand more expensive oils. Various fish oils are also much used, and mineral oils now form a

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large proportion of the many lubricating compositions that are in use. For machinery where considerable pressure is exerted between the bearing surfaces the mineral oils are too thin, or, as it is termed, are too wanting in “ body ” to be quite suitable without being mixed with an animal or vegetable oil, Unlessa lubricant has considerable ‘“ body ” it is quickly pressed out of the bearing, and an unnecessarily rapid supply has to be provided. The same oil may be used several times over, and several ingenious designs of bearings for rotating shafts, such as Player Brothers’ or Taylor & Challen’s, whereby the shaft itself as it runs round continually pumps up again to the top of the bearing the oil that has once been used, have been very successful in practice. If an automatic arrangement of this sort is not employed, the oil dripping from the bearing should be collected in a pan and used again to fill the oil-cups. The oil gets gradually worn out as a lubricant by becoming filled with dirt, partly the dust of the atmosphere and partly the minute iron and brass dust that is continually rubbed off the bearing surfaces. Oils that have been used two or three times can be to a certain extent repurified by washing in a solution of carbonate of soda or potash and chloride of calcium in boiling water. But it must not be supposed that with repurification an oil may be used an indefinite time as a lubricant. A large portion of it is

actually evaporated by the heat caused by the friction at _ ber of pairs of surfaces, of oil.

the journal, and the unevaporated portion seems to undergo some chemical change injurious to its lubricating properties. Vegetable oils are peculiarly rich in volatile constituents, and it is this fact probably, even more than the greater cheapness of mineral oils, that has led to the largely in- creased use of the latter in the lubrication of machinery.

The quality of an oil may be tested by chemical analysis ; by measurement of density and viscosity ; by observation of the temperature necessary for ignition in the atmo- sphere, or, as it is called, the “ flashing” temperature ; by observation of the succession of figured patterns produced when a single drop of the oil is let fall upon the surface of pure water in a clean dish; by the measurement of the temperatures to which a journal rises when running at different speeds and under different pressures, and when supplied with a

given amount of the Jubricant per minute ; and by the measurement of the coeflicient of friction at the same journal with varying speeds of rotation and pressures. The last two methods of test are the most interesting and directly useful from a mechanical point of view, 2.¢., considering the oil as a lubricant siinply.

The machine designed and used by Professor Thurston of the Stevens Institute of technology is tle best that has yet been con- structed to carry out these tests. In it a spindle is revolved in horizontal bearings by a belt from the main shaft of the workshop of the Institute. On the overhanging end of this spindle is formed a journal from which is hung a heavily-weighted rod. The bear- ings in this rod by which it hangs on the journal are of brass, and the two halves are pressed down upon the journal with any desired pressure by means of a spiral spring placed in the centre of the rod. The weight of this pendulum prevents it revolving along with the spindle, but the friction at the journal deflects the pendulum from the vertical through an angle whose sine is a measure of the fric- tional effort. There is also inserted in the bearings a thermometer by which the effect of the friction in increasing the temperature is observed. With this machine Professor Thurston has obtained extremely interesting results regarding the variation of the coeffi- cient of friction with temperature, pressure, and velocity of rubbing. These are summarized as follows. With great intensity of pressure and low velocity, the friction increases as the temperature is raised; but for each low velocity the rate of increase of friction with tem- perature becomes slower as the pressure diminishes, and becomes zero at a certain limit of pressure which is higher the higher the velocity is. With high velocities the variation of friction with temperature is in the opposite direction within the limits of pressure commonly used. Again at a given temperature and a given pres- sure the friction first decreases very rapidly with increase of velocity, and then above a certain limit of velocity increases again slow] with further increase of velocity. The limit of velocity at whic

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the direction of variation changes from negative to positive does not appear to depend on the intensity of pressure, but the change occurs at much lower velocity-limits with low than with high tem- peratures. Thirdly, with a given

temperature and a given velocity the coellicient of friction, i.c., the ratio of friction to normal pres- sure, at first decreases rapidly with increase of pressure at low pressures, and then at higher pressures increases again with the pressure. This law seems to hold for all temperatures and all velocities ; but how the limit of pressure at which the variation changes in direction is altered by alteration of temperature and velocity is not as yet certainly determined.

_ It is thus seen that the variation of friction at lubricated journals is extremely complicated, and has noresemblance to the simple law of constant proportionality betwecn the friction and the normal pressure which until lately was commonly believed to hold good for unlubricated flat surfaces. This simple law is really true for many unlubricated surfaces and through a tolerably wide range of cou- ditions, but is not true for all such surfaces, or under all, and especially extreme, conditions of pressure, velocity, and temperature.

Professor Thurston has endeavoured to represent these results in algebraic formule, but the number of his experiments seems hardly sufficient to establish any general mathematical law which will be true under all circumstances, and the particular formule which he has adopted give values differing very considerably from those given by some of his experiments.

The friction at a lubricated journal depends really much more on the viscosity of the lubricant than on the frictional propertics of either of the solids, which never come in contact when the lubri- cation is carefully attended to. The layer of oil immediately in contact with either solid probably does not move at all relatively to the solid. The rubbing, therefore, in all probability takes place between two surfaces, or rather between an indefinitely large num- The viscosity of the oil, which hinders this relative motion, is, however, very likely affected by the adhesive force between the solid and liquid surfaces, because, especially if the intensity of bearing pressure be great and the film of lubricant consequently very thin, some at least of the liquid ad will take place within the sphere of action of the cohesive

orces.

It is of the greatest importance in order to secure economy in the use of lubricants to maintain the supply to each journal at a con- stant uniform rate. ‘To effect this, numberless ‘‘ automatic lubri- cators” have becn invented. The common syphon oil-cup is very efficient so long as the rate of working is steady; but the supply does not automatically vary with the requirements. The ‘‘ needle” lubricator allows the oil to flow down to the journal through a small straight tube in which is placed a wire which nearly blocks up the tube. When the wire is motionless the dimensions of the space between the wire and the tube are capillary, and no oil flows. When the shaft runs, however, its surface scraping on the end of the wire throws it into continual vibration, and this allows a slow stream of oil to pass downwards which is automatically regulated in accordance with the speed of revolution. The necessity of very perfect lubrica- tion of the cylinders of gas engines, which run ata high speed and at a high temperature, has led to the adoption by Messrs Crossley Brothers of an extremely neat and perfect arrangement. A small crank on theend of a spindle, driven at a rate proportional to that of the engine, has suspended from the crank pin a short wire pendulum. At the lower part of the revolution this pendulum dips into a basin of oil and lifts a drop from it. In the upper half of the circular motion, the wire is dragged over a little scraper extending over the open mouth of a pipe. ‘This scrapes the drop off the pendulum, and the drop falls from the scraper into the tube, along which it flows to the surface to be lubricated. The number of drops is thus accu- rately proportioned to the speed of the engine, and the size of drop can be varied by using smaller or larger wire for the pendulum.

Table of Coefficients of Friction on Cast-Iron Journals at Tempera- ture 70° F. and Velocity 750 Feet per Minute (from Tharston).

Pressure in fb per sq. in,

Name of Oil. =

16.

Natural Summer Sperm……..... 5 Winter

Bleached ,, asuunnese®

Natural Summer Whale.

Winter Lard…...

Refined Cotton Seed ….....s…0 Rape Seed ….....0.s:seesesseeee Menhaden

Other mineral oils than the kerosine and paraffin give a smaller coefficient. For mineral oils generally the lowest coefficient appears to occur at from 30 to 40 Ib pressure per square inch. The supply

of oil in the experiments was intermittent, and must have been in- sufficient for the best lubrication.

Table of Coefficients of Friction between Stecl Journals and Bronze le ae lubricated with Sperm Oil, and run at different Pres- sures, Velocities, and Temperatures (from Thurston).

Veloeity in feet per minute.

30. 100, 250.

500.

Press. tb | Press. ib per sq. in.|per sq. in. .| 200. 100. }

Press. ib per Press. tb per

sq. in. 200. 100.’ 50. | 4. | 200.) 100.} 50. 1050 |:025 |-012 |-125 t “016 |:005 [007 |-125 |-008 |-002 |-003 |-063 |- 010 |°004 |“006 |-094 |-004 |°002 }-003 |-063 |- “005 |:003 |004 |094 |-004 |-002 |-003 |-063 |°

“004 * 005 |-004 |- 006 |:005 |* +007 |-006

005

The journal upon which the above results were obtained was 1} inches in diameter and 1 inches Jong. With a larger journal the results would probably not be exactly the same. (R. EL 82”)

LUCAN. Marcus Annazus Lucanus, the most emi- nent Roman poet of the silver age, grandson of the rhetorician Seneca and nephew of the philosopher, was born at Corduba, November 3, 39 a.p. His father, Lucius Annzeus Mela, had amassed great wealth as imperial pro- curator for the province. In a memoir by an anonymous

grammarian, who may have abridged Suetonius, Lucan is

said to have been taken to Rome at the age of eight months, to have displayed remarkable precocity, and to have incurred the displeasure of Nero by overcoming him in a poetical contest. The latter statement seems to be founded upon a misapprehension of a passage in Statius’s Genethliacon Lucant ; but it is certain that Nero, whether from jealousy, as Tacitus affirms, or on account of the republican spirit of Lucan’s poetry, forbade him to recite in public, and that his indignation made him an accomplice in the conspiracy of Piso, 65 A.D. Upon the discovery of the plot he is alleged to have endeavoured to purchase safety by impeach- ing his own mother (“ hoping,” says his translator Gorges quaintly, “that this impiety might be a means to procure pardon at the hands of an impious prince”), The state- incnt, however, of Tacitus, that letters were forged in his name to implicate his father, warrants the suspicion that the evidence against his mother may also have been fabri- cated. Failing to obtain a reprieve, he caused his veins to be opened, and expired with great courage, repeating a passage from his Pharsalia descriptive of the death of a wounded soldier (“‘ Lucan by his death approved,” Shelley’s Adonais). His father was involved in the proscription, his mother escaped, and his widow Polla Argentaria sur- vived to receive the homage of Statius under Domitian. Besides his principal performance, Lucan’s works included juvenile poems on the descent of Orpheus and the ransom of Hector, an unfinished tragedy on the sub- ject of Medea, and numerous miscellaneous pieces. The Carmen ad Pisonem sometimes attributed to him is now more commonly ascribed to Saleius Bassus. His minor works have perished, but all that the author wrote of the Pharsalia has come down to us. It would probably have concluded with the

battle of Philippi, but breaks off abruptly as Czesar, beset by foes, is about to plunge into the harbour of Alexandria. This incompleteness should not be left out of account in the estimate of its merits, for, with two capital exceptions, the faults of the Pharsalia are such as revision might have mitigated or removed. No such pains, certainly, could have amended the deficiency of unity of action, or supplied the want of a legitimate protagonist. The Pharsalia follows history with inevitable servility, and is rather a metrical chronicle than a true epic. If it had been completed according to the author's design, Pompey, Cato, and Brutus must have successively enacted the part of nominal hero, while the real hero is the arch enemy of liberty and Lucan, Cesar. Yet these defects,

though glaring, are not fatal or peculiar to Lucan. The real hero of Paradise Lost, it has been repeatedly observed, is no other than Satan; and Shakespeare him- self succeeded no better than Lucan in preserving unity of action when he wrote his Julius Cesar. The false taste, the strained rhetoric, the ostentatious erudition, the tedious harangues and far-fetched or commonplace reflexions so frequent in this singularly unequal poem, are faults much more irritating, but they are also faults capable of amend- ment, and which the writer might not improbably have removed. As pointcd out by Dean Merivale, the bom-

| bastic style of composition which prevailed under Nero

yielded to a more sober taste under the Flavian dynasty ; and the lapse of time would have contributed to mellow the poet's immaturity and chasten the ardour of tempera- ment which made him essay great themes "ante annos Culicis Maroniani." Great allowance should also be made for the difficulties the highest genius must encounter when emulating predecessors who have already carried art. to its last perfection, and thus necessitated to choose between mere imitation and a conscious effort after originality. Lucan's temper could never have brooked the former course; his versification, no less than his subject, is entirely his own; he avoids all resemblance to his great predecessor with a persistency which can only have resulted from deliberate purpose, while largely influenced by the declamatory school of his grandfather and uncle. Hence his partiality for

finished antithesis, contrasting strongly with his generally breathless style and turbid diction. Quintilian sums up both aspects of his genius with pregnant brevity, "'Ardens et concitatus et sententiis clarissimus," adding with equal justice, ' Magis oratoribus quam poetis annumerandus." lLucan's oratory, however, frequently rises into the region of poetry, especially where it sets forth ideas essentially sublime, and impressive in the mere statement. Such are the apotheosis of Pompey at the beginning of the ninth book, and tlie passage in the same book where Cato, in the truest spirit of the Stoic philosophy, refuses to consult the oracle of Jupiter Ammon. The exordium of the poem, and the portraits of Cesar and Pompey, are examples of oratory blazing up into poetry, as a wheel takes fire by friction. In some cases Lucan's rhetoric is frigid, hyperbolical, and out of keeping with the character of the speaker, as in Czesar's address to his legions before Pharsalia; in general, however, it may be said that the more he is of an orator or a moralist the more he is of a poet. If this denotes that his genius was not essentially and in the truest sense poetical, the same may be said of © Dryden and Pope; and it at least proves him to have been in harmony with the living forces of his age, in which rhetoric was a note of culture and philosophical humani- tarianism a growing idea, while poetry, though widely cultivated, was becoming more and more a mere orna- mental accomplishment. This is not the case with Lucan;

his theme has a genuine hold upon him; in the age of

Nero he celebrates the republic as a poet with the samc energy with which in the age of Cicero he might have de- fended it as an orator. But for him it might almost have been said that the Roman republic never inspired a Roman oet.

Lucan never speaks of himself, but his epic speaks for him. The author of the Pharsalia must have been endowed with no common ambition, industry, and self- reliance, an enthusiastic though narrow and aristocratic patriotism, and a faculty for appreciating magnanimity in others which is at least some presumption that he possessed it himself. He probably bore a strong family resemblance to his uncle Seneca ; but the only personal trait positively known to us is his conjugal affection, a characteristic of Seneca also.

Lucan, together with Statius, was preferred even to Virgil in the Middle Ages. So late as 1493 his com- mentator Sulpitius writes :—‘‘ Magnus profecto est Maro, magnus Lucanus ; adeoque prope par, ut quis sit major possis ambigere.” Shelley and Southey, in the first trans- port of admiration, thought Lucan superior to Virgil ; Pope, with more judgment, says that the fire which burns in Virgil with an equable glow breaks forth in Lucan with sudden, brief, and interrupted flashes. In general, notwith- standing the enthusiasm of isolated admirers, Lucan has been unduly neglected, but he has exercised an important influence upon one great department of modern literature by his effect upon Corneille, and through him upon the classical French drama.

The most celebrated editions of Lucan are those by Oudendorp (1728), Burmann (1740), and Weber (1829). Bentley’s emendations are brilliant, but unsafe. The most elaborate eriticism is that in Nisard’s Etudes sur les Pottes Latins de la Décadence, stern to the poet’s defects and unkind to his deserts. Dean Merivale has sonic excellent observations in his History of Imperial Rome, chaps. liv. and Ixiv. Brebeuf’s French version is celebrated. Christopher Marlowe, a kindred spirit, translated the first book of the Pharsalia into English, and there are other old versions by Sir Ferdinand Gorges and Thomas May. The latter’s supplement is one of the best examples of modern Latin versification. Gorges’s translation is in oetosyllabic verse, and very curious. by Rowe, is one of the most successful translations in our language. It is somewhat too diffuse, but as a whole reproduces the vehemence and animation of the original with a spirit that leaves little to be desired. @RaG.

LUCANIA, in ancient geography, was the name given to a province of Southern Italy, extending from the Tyrrhenian Sea on the west to the Gulf of Tarentum on

the east, while to the north it adjoined Campania,

Samnium, and Apulia, and to the south was separated by a comparatively narrow isthmus from the province of Bruttium, which forms the southern extremity of Italy. It thus comprised the modern province of the Basilicata, together with the greater part of the Principato Citeriore and a small portion of Calabria. The precise limits were the river Silarus on the north-west, which separated it from Campania, and the Bradanus, which flows into the Gulf of Tarentum, on the north-east ; while the two little rivers Laus and Crathis, flowing from the ridge of the Apennines to the sea on the west and east, marked the limits of the province on the side of Bruttium.

Almost the whole of the province thus limited is occupied by the rugged masses of the Apennines, whicli in this part of Italy can hardly be said to constitute a range of mountains so much as-a group of lofty inasses, huddled together in a very irregular manner. The main ridge, however (if it be taken as determined by the watershed), approaches much more nearly to the western sea than to the Gulf of Tarentuim, and is continued from the lofty knot of mountains immediately on the frontiers of Samnium, nearly due south, till it approaches within a few miles of the Gulf of Policastro, and thenceforward is separated from the sea by only a narrow interval till it enters the province of Brnttium. Just within the frontier of Lucania rises the very lofty group of Monte Pollino, the highest summit of which attains to an elevation of above 7000 feet, the greatest that is found in the southern Apennines. Towards the east the mountains descend by a much more gradual slope to the Gulf of Tarentum, constituting long ridges of hills which subside by degrees to the strip of plain that immediately adjoins the shores of the gulf. This narrow strip is somewhat wider from the mouth of the Bradanus to that of the Siris, and again expands to a considerable extent at the mouth of the Crathis, but between the two a group of rugged hills descends quite to the sea, and forms the headland of Roseto. The consequence of this constitu- tion is that while the rivers which flow to the Tyrrhenian Sea are of comparatively little importance, those that

The standard English version, –

descend towards the Gulf of Tarentum have much longer courses, and attain to a considerable magnitude. Of these the most important are—the Bradanus (still called Bradano), which rises near Potentia, and enters the gulf just to the north of the ruins of Metapontum; the Casuentus (Basiento), which has a course almost exactly parallel with the preceding ; the Aciris or Agri; and the Siris or Sinno. The Crathis, which forms at its mouth the southern limit of the province, belongs almost wholly to Bruttium, but it receives a tributary, the Sybaris (Coscile), which flows from the mountains of Lucania. The only considerable stream on the western side of Lucania is the Silarus or Sele, which constitutes its northern boundary, and has two important tributaries in the Calor or Calore, and the Tanagrus, which joins it from the south, after flowing through one of those trough-like upland valleys so characteristic of the Apennines.

The province of Lucania was so called from the people of that name, by whom it was conquered about the middle of the 5th century B.c. Previous to that period it was included under the general name of CEnotria, which was applied by the Greeks to the whole of the southernmost portion of Italy. The mountainous regions of the interior were occupied by the tribes known as Cinotrians and Chones, while the coasts on both sides were occupied by Greek colonies, which attained to great power and pro- sperity, and doubtless exercised a kind of protectorate over the interior also. (See Gracia Macna.) The Lucanians were a Sabellian race, an offshoot of the Samnites of Central Italy, who pressed downwards towards tlie south until they gradually conquered the whole country (with the exception of the Greek towns on the coast) from the borders of Samnium and Campania to the southern extremity of Italy, Subsequently, however, the inhabitants of the peninsula which forms the extreme south (now known as Calabria) broke out into insurrection, and under the nanle of Bruttians succeeded in establishing their independence, after which the Lucanians became confined within the limits already described. After this time we find them engaged in hostilities with the Tarentines, and with Alexander, king of Epirus, who was called in by that people to their assistance, 326 B.c. It was immediately

after this that they first entered into relations with Rome, with which they were sometimes in alliance, but more frequently engaged in hostilities, during the long-continued wars of the Romans with the Samnites. On the landing of Pyrrhus in Italy (281 B.c.) they were among the first to declare in his favour, aud in consequence found themselves exposed to the full brunt of the resentment of Rome when the departure of Pyrrhus left his allies at the mercy of the victorious Romans. It was not, however, till after several campaigns that they were reduced to complete subjection (272 3.c.). Notwithstanding this lesson, the Lucanians again espoused the cause of Hannibal during the Second Punic War (216 B.c.), and their territory became the theatre of war during several successive campaigns, and was ravaged in turn by both contending armies. It is clear that the country never recovered the effects of these disasters, and under the Roman government Lucania fell into a state of complete decay, to which the Social War (90-88 3.c.) appears to have given the finishing stroke. In the time of Strabo the Greek cities on the coast, once so rich and flourishing, had fallen into utter insignificance, and the few towns of the interior were poor places of no importance. A large part of the province was given up to pasture, and the mountains of the interior were covered with vast forests, which abounded in wild boars, bears, and wolves.

The towns on the east coast, adjoining the Gulf of Tarentum, were—Mctapontum, a few miles south of the Bradanns ; Heraclea,

at the mouth of the Aciris ; and Siris, on the river of the same name. Close to its southern frontier stood Sybaris, which was destroyed in 510 B.c., but subsequently replaced by Thurii, founded within a few miles of the same site. On the west coast stood Posidonia, known under the Roman government as Pestum, immediately south of the Silarus; below that came Elea or Velia, Pyxus, called by the Romans Buxentum, and Laus, near the frontier of the province towards Bruttium. Of the towns of the interior, none of which ever attained to any importance, the most considerable was Potentia, still called Potenza, and now the capital of the Basilicata, To the uorth, near the frontier of Apulia, were Acheruntia and Bantia ; while due south from Potentia was Grumentum, and still farther in that direction were

Nerulum and Muranum. In the upland valley of the Tanagrus were Atina, Forum Popilii, and Consilinum ; Eburi (Eboli) and Volceii (Buccino), though to the north of the Silarus, were also included in Lucania, _ : For administrative purposes under the Roman empire, Lucania was always united with Bruttium. The two together constituted the third region of Augustus. (E. H. B.)

LUCARIS, Cyrititus (c 1572-1638). CuuRCH, vol. xi. p. 158.

LUCAS or Lrypen (c. 1494-1533) was born at Leyden, whiere his father Hugh Jacobsz gave him the first lessons in art. He then entered the painting-room of Cornelis Engelbrechtszen of Leyden, and soon became known for his capacity in making designs for glass, engraving copper- plates, painting pictures, portraits, and landscapes in oil and distemper. According to Van Mander he was born in 1494, and painted at the age of twelve a Legend of St Hubert, for which as many florins were paid to him as he numbered years. He was only fourteen when he finished a plate representing Mohammed taking the life of a friar, and at fifteen he produced a series of nine plates for a Passion, a Temptation of St Anthony, and a Conversion of St Paul. The list of his engravings in 1510, when, according to Van Mander, he was only sixteen, includes a celebrated Ecce Homo, Adam and Eve expelled from Paradise, a herdsman and a milkmaid with three cows, and a little naked girl running away from a barking dog. It will be seen to what a variety of tastes the youthful artist was asked to cater. Whatever may be thought of the tradition embodied in Van Mander’s pages as to the true age of Lucas of Leyden, there is no doubt that, as early as 1508, he was a master of name as a copper-plate engraver, and had launched his boat in the current which in those days led to wealth and to fame. The period of the great masters of etching, which had not yet come for Holland, was being preceded by the period of the great masters in the use of the graver. It was the time when art readily found its patrons amongst the large public that could ill afford to buy pictures, yet had enough interest in culture to wish to educate itself by means of prints. Lucas of Leyden became the representative man for the great public of Holland as Diirer became the representative man for the great public of Germany ; and a rivalry grew up between the two engravers, which came to be so close that on the neutral market of Italy the products of each were all but evenly quoted. Vasari

devoted almost equal attention to both, affirming indeed that Diirer surpassed Lucas as a designer, but that in the use of the graver they were both unsurpassed, a sentence which has not been reversed by the criticism of ourday. But the rivalry of the two artists was friendly. About the time when Diirer visited the Netherlands Lucas came to Antwerp, which then flourished greatly as an international mart for productions of the pencil and the graver, and it is thought, not without reason, that he was the master who took the freedom of the Antwerp guild in 1521 under the name of Lucas the Hollander. In the diary which Diirer faithfully kept during his travels in the Low Countries, we find that at Antwerp he met Lucas, who asked him to dinner, and that Diirer accepted the invitation, and was much surprised at the smallness of the Dutchman’s stature, But he valued

See GREEK

| the art of Lucas at its true figure, and exchanged the Dutchman’s prints for eight florins’ worth of his own. In course of time Lucas rose to more than a competence. In 1527 he made a tour of the Netherlands, giving dinners to the painters of the guilds of Middleburg, Ghent, Malines, and Antwerp. He was accompanied during the trip by Mabuse, whom he imitated in his style as well as in his love of rich costume. But festive cheer and banquets disagreed with Lucas. On his return home he fell sick and remained ailing till his death in 1533, and when he died he did so with the firm belief that poison had been administered to him by some envious comrade.

As an engraver Lucas of Leyden deserves his reputation. He has not the genius, nor had he the tact, of Diirer; and he displays more cleverness of expression than skill in distribution or refincment in details. But lis power in handling the graver is very great, and some of his portraits, especially his own, are equal to anything that was done by the master of Nuremberg. Much that he accomplished as a painter has been lost, because he worked a good deal upon cloth in distemper. But some pictures have been preserved which fairly manifest the influences under which he became productive. In 1522 he painted the Virgin and Child with the Magdalen and a kneeling

donor, now preserved in the gallery of Munich. His manner was then very much akin to that of Mabuse. The Last Judgment in the town-hall, now the town-gallery of Leyden, is com- posed on the traditional lines of Cristus and Memling, furnished with monsters in the style of Jerome Bosch, and figures in the stilted attitudes of the South German school ; the scale of colours in yellow, white, and grey is at once pale and gaudy; the quaintest contrasts are produced by the juxtaposition of alabaster flesh in females and bronzed skin in males, or black hair by the side of yellow, or rose-coloured drapery set sharply against apple-green or black, yet some of the heads are painted with great delicacy and modelled with exquisite feeling. Dr Waagen gave a most favourable opinion of a triptych now at the Hermitage at St Peters- burg, executed, according to Van Mander, in 1531, representing the blind man of Jericho healed by Jesus Christ in the presence of the apostles. Here too the great German critic observed the union of faulty composition with great finish and warm flesh-tints witli a gaudy scale of harmonies. The same defects and qualities will be found in such specimens of the master's art as are still preserved in public collections, amongst which may be mentioned the Card Party at Wilton House, the Penitent St Jerome in the gallery of Berlin, and the hermits Paul and Anthony in the Lichtenstein collection at Vienna.

A few days before his death Lucas van Leyden was informed of the birth of a grandson, firstborn of his only daughter Gretchen. Gretchen's fourth son Jean de Hoey followed the profession of his grandfather, and became well known at the Parisian court as painter and chamberlain to the king of France, Henry IV.

LUCCA, a city of Northern Italy, the chief town of a province, an archiepiscopal see, and the seat of a court of assize, lies 13 miles by rail north-east of Pisa, in 43° 50' N. lat. and 10° 28' E. long, Situated 50 feet above the level of the sea, in the valley of the Serchio, the city looks out for the most part on a horizon of hills and mouniains. The fortifications—pierced by four gates—were commenced in 1504 and completed in 1645, and long ranked among the most remarkable in the peninsula. The city has a well-built and substantial appearance, its chief attraction lying in the numerous churches, which belong in the main to a well-marked basilican type, and present richly decorated exteriors, fine apsidal ends, and

quadrangular campaniles. The cathedral or church of St Martin was begun in 1063 by Bishop Anselm ; but the great apse with its tall columnar arcades is probably the only remnant of the early edifice. The west front, “built during the first forty years of the 13th century, consists of a vast portico of three magnificent arches, and above them three ranges of open galleries covered with all the devices of an exuberant fancy.” The ground plan isa Latin cross, the nave being 273 feet in length and 84 feet in width, and the transepts 117 feet in length. In the nave is a little octagonal temple or chapel built (1484) by Matteo Civitali, which serves as a shrine for the most precious of the Lucchese relics, a cedar-wood crucifix, carved, according to the legend, by Nicodemus, and miraculously conveyed to Lucca in 782. The Sacred

Countenance (Volto Santo), as it is generally called, because the face of the Saviour is considered a true likeness, is only shown thrice a year. The beautiful tomb of Maria Guinigi is described by Ruskin, Modern Painters, ii. The church of Saint Michael, founded in the 8th century, and built of marble within and without, has a lofty and magnificent western fagade (1188)—an architectural screen rising much above the roof of the church. St Frediano or Frigidian dates originally from the 7th century ; the front (of the 13th century) occupies the site of the ancient apse ; in one of its-chapels is the tomb of Santa Zita, patroness of servants and of Luccaitself. San Giovanni (originally of

the 12th century), San Romano (rebuilt in the 17th century,’

by Vincenzo Buonamici), and Santa Maria Forisportam (of the 13th century) also deserve to be mentioned. Among the secular buildings are the old ducal palace, begun in 1578 by Ammanati, and now the residence of the prefect and seat of the provincial officers and tle public picture gallery ; the Palazzo Pretorio, or former residence of the podesta, now the seat of the civil and correctional courts ; the palace, erected in the 15th century by a member of the great Guinigi family, and now serving as a poor- house; and the 16th ceutury palace of the Marquis Guidiccioni, now used as a depository for the archives. The principal market-place in the city (Piazza del Mercato) has taken possession of the arena of the ancient amphi-

theatre, the arches of which can still be seen in the surrounding buildings. Besides the academy of sciences just mentioned, which dates from 1584, there are several institutions of the same kind—a royal philomathic academy, a royal academy of arts, and a public library of 50,000 volumes. The silk manufacture, which was introduced at Lucca about the close of the 11th century, and in the early part of the 16th became for a time the means of subsistence for 30,000 of its inhabitants, now gives employment (in reeling and throwing) to only about 1500. The bulk of the population is engaged in agricul- ture. In 1871 the city had 21,286 inhabitants. The com- mune has increased from 61,175 in 1834 to 68,063 in 1881.

Lucca (Latin, Luca) is probably a place of Ligurian origin. First mentioned as the place to which Sempronius retired (218 B.c.) before the victorious Hannibal, it passes out of sight again till 177, when it became the seat of a Roman colony. In the time of Julius Cesar it is frequently heard of as a town in his province of Cisalpine Gaul and Liguria, to which he repaired for consultation with his political associates. By Augustus it was transferred to Etruria. Though plundered and deprived of part of its territory by Odoacer, Lucca appears as an important city and fortress at the time of Narses, and under the Lombards it was the residence of a duke or marquis and had the privilege of a mint. The dukes gradually extended their power over all Tuscany, but after the death of the famous Matilda the city began to constitute itself an independent community, and in 1160 it obtained from Welf VI., duke of Bavaria and marquis of Tuscany, the lordship of all the country for 5 miles round. Internal discord afforded an opportunity to Uguccione della Faggiola to make himself master of Lucca in 1314; but the Lucchese expelled him two years afterwards, and handed over their city to Castruccio, under whose masterly tyranny it became ‘‘for a nioment the leading state of Italy.’’ Occupied by the troops of Louis of Bavaria, sold to a rich Genovese Gherardo Spinola, seized by John, king of Bohemia, pawned to the Rossi of Parma, sold to the Florentines, surrendered to the Pisans, nominally liberated by the emperor Charles IV., and governed by his vicar, Lucca was sub- jected to endless vicissitudes, but managed, at first as a democracy, and after 1628 as an oligarchy, to maintain ‘‘ its independence along- side of Venice and Genoa, and painted the word Libertas on its banner till the French Revolution.” In the beginning of the 16th century one of its leading citizens, Francesco Burlamacchi, made a noble attempt to give

political cohesion to Italy, but perished on the scaffold (1548); his statue by Ulisse Cambi was erected on the Piazza San Michele in 1863. As a principality formed in 1805 by Napoleon in favour of his sister Elisa and her husband Baciocchi, Lucca was for a few years wonderfully prosperous. It was occupied by the Neapolitans in 1814; from 1816 to 1847 it was governed as a duchy by Maria Luisa, queen of Etruria, and her son Charles Louis ; and it afterwards formed one of the divisions of Tuscany.

The bishops of Lucca, who can be traced back to 347, gradually

acquired a variety of exceptional marks of distinction, such as the pallium in 1120, and the archiepiscopal cross from Alexander IT. ; and at length in 1726 Benedict XIII. raised their see to the rank of an archbishopric, without suffragans.

See Memorie per servire alla storia del ducato di Lucca, published by the Lucca Academy ; Mazzarosa, Storia dé Lucca, Lucca, 1833; Repetti, Dizionario della Toscana, Florence, 1835; Freeman, Hist. and Arch. Sketches, London, 1876.

LUCCA, Barus or (Bacni p1 Lucca, formerly Bacno A CorsENa), a commune of Italy in the province of Lucca, containing a number of famous watering-places. They are situated in the valley of the Lima, a tributary of the Serchio ; and the district is known in the early history of Lucca as the Vicaria di Val di Lima. Ponte Serraglio (16 miles to the north of Lucca) is the principal village ; but there are warm springs and baths also at Villa, Docce Bassi, Bagno Caldo, &c. Bagno a Corsena is mentioned in 1284 by Guidone da Corvaia, a Pisan historian (Muratori, vol. xxii.); and by the 16th century the waters had attained great celebrity. Fallopius, who gave them credit for the cure of his own deafness, sounded their praises in 1569 ; and they have been more or less in fashion since. The temperature of the water varies from 96° to 133° Fahr.; in all cases it gives off carbonic acid gas, and contains lime, magnesium, and sodium products. In the village of Bagno Caldo there is a considerable hospital, constructed largely at the expense of Nicholas Demidoff in 1826. The population of tle commune was 11,000 in 1881.

LUCENA, a town of Spain, in the province of Cordova, 37 miles south-south-east from that city, and 11 miles by road south-east from the Aguilar station of the Cordova- Malaga Railway. It is pleasantly situated on the Cascajar, a minor tributary of the Genil, in a district that produces oil, wine, and cereals in great abundance, and affords excellent pasture. The parish church, which is large but not otherwise remarkable, dates from the beginning of the 16th century. The chief industries are the manufacture of hardware and pottery, bronze lamps being a specialty of Lucena, and also the large earthenware jars (tinajas) used throughout Spain for the storage of oil and wine. There is considerable trade in the produce of the neighbourhood, and the horse mart is famous throughout Andalusia. The population in 1877 was 19,540. Lucena was taken from the Moors early in the 14th century ; it was in the attempt to recapture it that King Abu ‘Abdallah (Boabdil) of Granada was taken prisoner in 1483.

LUCERA, a city of Italy, in the province of Foggia, on a hill in the midst of the Apulian plain, lies 10 miles west- north-west of Foggia. Although a busy and flourishing place, with 14,014 inhabitants in 1871, Lucera is mainly of historical interest. The cathedral, erected on the ruins of the magnificent mosque, is a fine Romanesque building with Gothic features ; and the castle, whose imposing ruins still crown the hill to the north of the town, was formerly the grandest of all the strongholds possessed by the Hohen- staufen emperors to the south of the Alps.

By a Greck tradition the foundation of Luceria was assigned to Diomede, and the statue in its temple of Minerva passed as the authentic Palladium ; but the place would seem to be really of Oscan rather than Daunian origin. The Romans were marching to the relief of Luceria when they suffered the defeat at the Caudine Forks ; they effected its capture in 320 B.c.; and when they re- covered it in 314 they slew a great part of the inhabitants, and introduced a powerful body of colonists. During the Second Punic War the city was the headquarters of the Apulian cam- paigns. It continued to exist asa place of some mark down through the empire, and is mentioned by Pliny as a colony. Destroyed (663 A.D.) by the emperor Constans, who had recovered it fron the Lombards, it was shortly after restored, and in 1227 it was raised to more than its former prosperity by Frederick II., who settled there a great body of his Saracen followers from Sicily, and thus increased

its population to about 77,000. The Mohammedan colony, however, was brought to ruin by the hostility of Charles I. and II. of Anjou. Previous to 1806 Lucera was the adininistrative

centre of the two provinces Basilicata and Molise. See W. Lang, in Im Neuen Reich, Dec. 1877.

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LUCERNE (German, Luzern), a canton of Switzerland lying north-west of the central mass of the Swiss Alps, having the canton of Aargau to ths north, Bern to the west and south, and the small cantons of Zug, Schwyz, and Unterwalden on the east and south-east sides. Like most of the Swiss cantons its form is very irregular, and it includes, besides a part of the Lake of Lucerne, the Lakes of Sempach and Baldegg, and several smaller sheets of water. To this circumstance is probably due the dis- crepancy in the various estimates of the area, which range from 498 to 585 square miles. The greater part of its territory lies in the low hilly region of north-western Switzerland, most of which is under cultivation ; but it has one considerable valley, the Entlebuch, enclosed by mountains, several of which exceed 5000 feet in height, which is devoted to pasturage. The only considerable inountain in the canton is the Pilatus, a steep jagged ridge with numerous peaks, the highest of which is 7290 feet above the sea, forming the boundary between this and the canton of Unterwalden. The only river is the Reuss, which issues from the Jake at the town of Lucerne, but soon turns abruptly to the north-east, and passes the boundary of the canton. Of many smaller streams that water its surface, the most important is the Little Emme, which drains the Entlebuch and its tributary valleys. The soil is moderately fertile, and produces good crops of cereals, but the vine is grown only in a few exceptionally favourable situations. Some of the higher valleys, espe- cially the Entlebuch, are mainly devoted to pasture, and furnish cheese and butter in considerable quantities, of which the surplus is exported. The population in Decem- ber 1880 was 134,806, of whom all but 5634 were Roman Catholics. The language is exclusively German, and the people belong to the Teutonic stock. Excepting the inhabitants of the town of Lucerne, they are mainly employed in agriculture. The men of the Entlebuch, leading a pastoral life and little exposed to intercourse with

strangers, have preserved more of the original simplicity of manners and costume than is now often found elsewliere in Switzerland. They are famed for their strength and skill in wrestling and other athletic exercises, as may be seen at the Schwingfeste, still frequently held in that district.

Like the rest of northern Switzerland, Lucerne was subject to the house of Austria until 1332, when its people joined the league of the forest eantons, Uri, Schwyz, and Unterwalden, thus forming the fourth in date of the confederation. They bore their share in the brilliant victory of Sempach, fought in 1386 near the village of that name, and in 1402 acquired the Entlebuch by purchase from the Austrian duke. The government was until the end of the 18th century an oligarchy in the hands of a few families, but in 1798 the French invasion substituted democratic institutions. These, with several changes all tending to give more complete power to the people, have continued to the present time. The constitution now in force dates from the 17th February 1869, and is based on the prineiple which prevails throughout the whole of Switzerland, that the sovereign power is vested exclusively in the people, but may be exercised either directly or through delegates elected by universal suffrage. Lucerne formerly sent a contingent uf 1734 men to the federal army, but according to the latest return the number of men belonging to the canton on the rolls (in 1879) was 5176. In 1846 Lucerne took a leading part in the formation of the Sonderbund, a league of several of the Catholic cantons to oppose forcible resistance to the decree of the federal government for the expul- sion of the Jesuits from Switzerland. In the brief campaign that ensued in the following year, the forces of the Sonderbund were utterly routed, and after a few days the conflict ceased. Since that date the eanton seems to have enjoyed complete internal tranquillity. Lueerne has produced a fair as ae of men who have distin- guished themselves in science, literature, philosophy, and art. Among many others whose reputation is confined to their own country, the names of the naturalists Cappeler and Lange, the

historians Etterlin and Balthasar, and the philosopher Troxler have acquired more permanent reputation.

LucErRNgE, the chief town of the Swiss canton of that name, stands on both banks of the Reuss, where that river issues from the north-west end of

the chief arm of

LUCERNE

the lake of Lucerne. The position of the town is singu- larly beautiful. Beyond the lower hills, rich with plant- ing and cultivation, which slope towards the shores of the lake and the river, loftier summits of very varied form rise in the background. Most prominent of these is the many-peaked Pilatus, only about 7 miles distant, while the double summit of the Mythen, at the opposite end of the lake, is flanked by other less imposing summits, amongst which the Righi draws attention, owing to the fame of its panoramic view. The picturesque aspect of the town is much enhanced by the ancient walls, now partly removed, and the circular or octagonal towers which surround it. One of these, called the Wasserthurm, rising from the water's edge, is said to have served as a lighthouse (lucerna), and to have originated the name of the town and canton, The town appears to owe its origin to a Benedictine monastery which stood on the site of the present Hofkirche. The buildings which clustered round gradually increased, until, early in the 14th century, the walls were erected for protection, and bridges were carried across the river. The Rathhaus, which is the seat of the cantonal Government, is an ancient building adorned with wood carving and quaint pictures. In a large hall are pre- served the portraits of the chief magistrates (Schultheissen) from the earliest times to the year 1814. The libraries of Lucerne are said to possess the most complete and important collection of documents connected with the history of Switzerland during the Middle Ages. The town library, now in the museum, contains about 12,000 volumes, and is especially rich in manuscript chronicles. The cantonal library, reckoned at over 80,000 volumes, with many incunabula, was chiefly formed from the libraries of suppressed monasteries. Other curious books are to be found in the library of the Capuchins at Wesemlin outside the town.

Besides two modern bridges which span the river, there are two wooden causeways, roofed over, and passable only on foot, which auciently served the wants of the inhabi- tants; a third, the longest of all, was removed in the pro- gress of modern improvements. Of those remaining, the more ancient, called the Miihlbriicke, was adorned with illustrations of the "Dance of

Death," a favourite subject with German and Swiss medizval artists; though much injured by time, they are still visible. The other wooden bridge—the Kapellbriicke—is decorated with numerons paintings representing events in Swiss history and in the lives of Saints Leodegar and Mauritius, the patrons of the city. The principal church, which has little architectural merit, possesses a fine organ. Along with various religious and charitable institutions which seem fully adequate to the wants of the population, a museum has been opened of late years which, among various other objects, contains an interesting archeological collection, going back to the prehistoric period, and including relics of historical interest, such as trophies taken on the field of Sempach, formerly preserved in the arsenal. The town contains one object of genuine artistic interest—the colossal lion designed to commemorate the men of the Swiss guard who fell in the defence of the Tuileries in Paris on the 10th August 1792. The idea, which might easily have led an inferior artist into extravagance and vulgarity, was well suited for the simple and manly genius of Thorwaldsen, who supplied the model; and, although the execution is necessarily somewhat rude, the effect is touching and impressive. In an architectural point of view the most notable part of the town is the wide quay formed on land reclaimed from thie lake in 1852, planted on one side with trees, and on the other showing a succession of those great hotels which everywhere in Switzerland have been built to accommodate and to tempt the strangers who annually resort to the

country. This constant flow of visitors has led to a large increase of population; that of Lucerne, which twenty years before was little over 10,000, was 17,850 at the census of 1880. (3. B.) LUCERNE, Lake or, the name given by foreigners to the Vierwaldstattersee, or lake of the four forest cantons of Switzerland. Only a small portion of its shores lie within the canton of Lucerne, but the name has been taken from the most considerable town which it approaches. Lying on the north-west side of the Alps of central Switzerland, this lake has extraordinary interest for the physical geographer, for the lover of natural scenery, and for all who feel sympathy with the story of Swiss independence. Like most of the other Alpine lakes, it lies altogether among the Voralpen, or outer ranges of the

Alps, but is remarkable for the extreme irregularity of its form, which suggests problems of much difficulty to the orographer. The great majority of the Alpine lakes occupy depressions cr excava- tions in a single line of valley ; and, so far as their form is concerned, the facts appear to be equally reconcilable with the views of those geologists who believe the lake basins to have been hollowed out by great glaciers as

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Plan of Lake of Lucerne.

which refer their origin to disturbances of relative level, and restrict the action of the ancient glaciers to a secondary part in the result. The Lake of Lucerne, however, appears to occupy portions of four different valleys, orographically distinct, andconnected only by narrow and tortuous channels, Commencing at its eastern extremity, we have the portion called the Bay of Uri, which at its southern end receives the considerable stream of the Reuss, bearing down the drainage of the Alps adjoining the pass of St Gotthard. This extends from south to north about 8 miles, with an average breadth of less than 2 miles, enclosed between steep limestone mountains rising from 4000 to 5000 feet above its surface. At the north end of the Bay of Uria low tract, only a few miles in width, divides the shore of the lake from the little Lake of Lowerz, and another similar tract divides the latter from the Lake of Zug, so that it seems natural to conclude that if the Bay of Uri had been excavated by ice action it would have retained its original direction and carried the waters of the Reuss to the Lake of Zug. In point of fact the channel of the lake is bent abruptly westward round the promontory of Treib, and extends in the same direction nearly 10 miles, with the local designation of Buochsersee. But this channel is closed at its western end by a low neck of land, and the passage for navigation is through a narrow strait, less than half a mile wide, which connects the Buochsersee, lying south of the Biirgenstein and the Vitznauerstock, with a third basin occupying the bottom of the valley which lies

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north of those ridges. Proceeding westward along this latter portion of the lake, we find two deep bays, several miles in length, opening on either

hand, while a third extends somewhat north of west to the town of Lucerne. The bay on the left hand, opening towards the south-west, is called the Alpnachersee, while that on the opposite or north-east side is the Bay of Kiissnacht. At the central point where these meet it is seen that they lie in a continuous line of valley extending from the Briinig Pass to the Lake of Zug, as the Bay of Kiissnacht is separated from the latter only by a low isthmus. Those who refuse to regard glaciers as the chief agents in the excavation of lake basins ask how it can be supposed that a glacier from the valley of the Reuss could have accomplished the hollowing out of the middle portions of the lake, and further inquire whether the glacier from the valley of Sarnen, which is supposed to have excavated the bays of Alpnach and Kiissnacht, should not have also cleared away the isthmus between the latter and the Lake of Zug, leading the drainage of the lake in that direction. The question as to the true origin of lake basins in the Alps cannot be satisfactorily discussed until their forms have been determined by numerous and accurate soundiugs, and this has as yet been done for the Lake of Como alone. The greatest depth hitherto measured in the Lake of Lucerne is 1040 feet, but no connected series of soundings appear to have as yet been made, The mean height of the surface above the sea-level is 1437 feet, or 68 feet higher than the Lake of Zug. :

The irregularity of its form is the chief cause of the unequalled variety which characterizes the scenery of the Lake of Lucerne, but the geological structure of the moun- tains that enclose it much enhances the effect. Its eastern portion lies amid the Secondary limestone rocks which are everywhere in the Alps marked by sharp peaks and ridges and precipitous crags; the middle part is enclosed by great inasses of Tertiary conglomerate, called in Switzerland Nagelfluhe, which constitutes such mountains as the Righi and the Biirgenstein, showing steep faces with gently sloping summits ; while the western extremity is surrounded by swelling hills richly planted and dotted with bright looking hamlets or solitary farm-houses. The forests which once covered the greater part of this region, and give the local designation to the four original cantons of Switzerland, have been extensively thinned, but enough yet remain to add another element to the charms of the scenery. Vine- yards with their formal rows of stakes are scarcely seen ou the shores of the lake, but orchards surround most of the houses, and the walnut grows to great perfection. Lucerne is the only town

on the lake. Altdorf, the chief town of Uri, stands nearly 2 miles from the head of the Bay of Uri, and Schwyz, capital of the canton of that name, is more than 3 miles from the shore; but since the introduction of steam navigation several of the villages on its coast have largely increased in population.

Modern scepticism has thrown doubt upon many of the details in the popular history of the origin of Swiss independence ; but it is certain that the shores of this lake nurtured the men who com- menced the heroic efforts that secured freedom for their country. Here, at the beginning of the 14th century, in an age when nearly all Europe was in the hands of feudal oppressors, a handful of mountaineers drove out the local tyrants and levelled their strong- holds, and a few years later, on the fields of Morgarten and Sem- pach, confronted and put to flight the chivalry of Austria. The man who can visit unmoved the Griitli, the spot, overlooking the Bay of Uri, consecrated by popular tradition as the scene of the first meet- ing of the confederates on the night of the 7th October 1307, must

be devoid of all sense of the sublime in natural scenery and of the heroic in human action. (J. B.)

LUCIA, or Lucy, St, was a noble Christian virgin of Syracuse, who lived in the reign of Diocletian. Her mother, having been miraculously cured of an illness at the

sepulchre of St Agatha in Catania, was persuaded by Lucia | have been somewhat largely professed in Syria at the close

to distribute all her wealth to the poor.

her to Paschasius the prefect, who ordered that she should be taken away and subjected to shameful outrage. But it was found that no force which

could be applied was able to move her from the spot on which she stood; even boiling oil and burning pitch had no power to hurt her, until at last she was slain with the sword. Such in substance is the narrative of the appropriate lessons given in the Roman Breviary for the festival of St Lucia on December 13 (duplex); a later legend represents her as having plucked out her eyes when they threatened to become a snare to her lover, and as having had them after- wards restored to her more beautiful than before. In art she 1s represented as suffering martyrdom, as bearing her eyes on a Salver, or as carrying a flaming lamp in her hand ; in the last case she is the type of celestial light or wisdom (comp. Dante, Jnf., ii; Purg., ix.; Par., xexii:). oSlte Ws invoked in cases of eye-disease, and is also regarded as the patroness of the labouring poor.

LUCIAN, one of the principal essay-writers (Aoyoypédor) and satirists of the post-Christian era, the silver age of Greek literature, was born at Samosata on the Euphrates in northern Syria! We have no indication of the precise date of his birth, but it is probable that he flourished about or after the middle of the 2d century, as he mentions Marcus Aurelius and his war with the German Marco- manni and Quadi (170-74 a.p.) in his Alexander (§ 43). He tells us in the Somnium or Vita Luctani, § 1, that his means being small he was at first apprenticed to his maternal uncle, a statuary, or rather sculptor of the stone pillars called Herme.? When a schoolboy he had been in the habit of scraping the wax from his tablets and using it for moulding or modelling little figures of dogs, horses, or men. Having made an unlucky beginning by breaking a marble slab, and having been well beaten for it, he absconded and returned home. Here he had a dream or vision of two women, representing Statuary and Literature. Both plead their cause at length, setting forth the advantages and the prospects of their respective professions ; but the youth chooses Iladefa, and decides to pursue learning. For some time he seems to have made money as a frrwp, following the example of Demosthenes, on whose merits and patriotism he expatiates in the dialogue Demosthenis Encomium. It is clear from his numerous writings that he was very familiar with the rival schools of philosophy, and he must have well studied their teachings ; but he lashes them all alike, the Cynics, perhaps, being the chief object of his derision A large number of philosophers, both ancient and contemporary, are mentioned by name, nearly always in ridicule or disparagement. Lucian was not only a sceptic;

he was a scoffer and a downright unbeliever. He felt that men's actions and conduct always fall far short of their professions, and therefore he concluded that the professions themselves were worthless, and a mere guise to secure popularity or respect. Of Christianity he shows some knowledge, and it must

= He mentions it only once, in the treatise m@s Sef loroptay ovy- 'pape, where he speaks of thy euhv warpida Ta Sauduata (§ 24). Ly aaa (§ 18), he speaks of himself as Zvpos t&v 'Ewevppa- TLOLWY,

- The words &pioros EppoyAdoos elvar Soxav (§ 8) are probably

satirical, and really mean patAos, '' second-rate," for it is clear that he disliked his uncle. 3 Tbid., § 2. ; * Hence Diogencs is made to say in Piscator, § 23, intp &ravras UBpicpat, sc. mpos Aovxidvov. In Biwy mpaots (p. 551) the samc philosopher asserts that ''any one will be looked up to and get a reputation if only he has impnudence and abuse.'' At the auction Diogenes is valued at twopence ($11). That Lucian had practised in law courts, and turned his eloquence afterwards against the philo- sophers, is asserted in Piscat., § 25,

The youth to | of the 2d century.° whom the daughter had been betrothed forthwith denounced | dialogue so called is generally

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In the Philopatris, though the regarded as spurious, there is a statement of the doctrine of the Trinity,® and the "Galilean who had ascended to the third heaven" (§ 12), and "renewed" (dvexatvicev) by the waters of baptism, may possibly allude to St Paul. The doctrines of the Adyos and the 'Light of the world," and that God is in heaven making a record of the good and bad actions of men,' seem to have come from the same source, thougli the notion of a written catalogue of human actions to be used in judgment was familiar to Auschylus and Euripides.

As a satirist and a wit Lucian stands without a rival. In these respects he may be said to occupy in prose litera- ture the unique position which Aristophanes holds in Greck poetry. But whether he is a mere satirist, who

laughs while he lashes, or a misanthrope, who hates while he derides, is not very clear. In favour of the former view it may be said that the two main objects of his ridicule are mythology and the sects of philosophy; in favour of the latter, his bitter exposure of imposture and chicanery in the Alewander, and the very severe attacks he makes on the "'humbug" of philosophy,® which he every- where assails with the most acrimonious and contemptuous epithets.

As a writer Lucian is fluent, easy, and unaffected, and a close follower of the best Attic models, such as Plato and the orators. His style is simpler than Plutarch's, and some of his compositions, especially the Dealogues of the Gods (pp. 204-287) and of the Marine Deities (288-327), aud, above all, the Dialogues of the Dead (329-454), are models of witty, polished, and accurate Greek composition. Not less clever, though rather lax in morality, are the éroxpexor Suddoyor (pp. 280-325), which remind us somewhat of the letters of Alciphron. The sarcasms on the popular mythology, the conversations of Pluto, Hermes, Charon,

_and others of the powers in Hades, show a positive disbelief

of any future state of existence. The model Lucian followed in these dialogues, as well in the style as in the sparkling and playful repartee, was the Platonic conversa- tions, founded on the drama, of which the dialogue may be – called the prose representative. Aristotle never adopted it, perhaps regarding it as beneath the true dignity of philosophy. The dialogue, in fact, was revived and improved by Lucian,® the old traditions of the Aoyoro.i and Aoyoypégdor, and above all, the immense influence of rhetoric as an art, having thrown some discredit on a style of composition which, as introduced by Plato, had formed quite a new era in Greek prose composition. For rhetoric loved to talk, expatiate, and declaim, while dialectic strove to refute by the employment of question and answer, often in the briefest form.

In his language, as tested by the best classical models, Lucian is at once elegant and correct. But he occasionally indulges in idioms slightly solecistic, as in the use of Kay

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5 In the Alexandrus (§ 25) we are told that the province of Pontus, due north of Syria, was ‘‘ full of Christians.”’

6 § 12, SbyueSovTa Gedy péyav kuBporoy odpaviwva, vidy Marpds, Tlvedua ex marpds exmopevduevor, ev ex rpiiv Kal e& Evds tpla, a passage which bears on the controverted procession ‘a Patre Filioque.”

7 Ibid., $18. Zsch., Hum., 265, deAToypdpy dt mavt emang ppevi,

8 At p. 792 Hermotimus says to Lycinus (who must be assumed to represent Lucian himself), bBprorhs del od, Kat ovx ofS 8 Tt wabuy piceis Prrocopiay Kal és rots pirocopoiytas anookamrets. In Tcaromenippus (§ 5) he says he always guesscd who were the best physical philosophers ‘‘by their sour-faced looks, their paleness of complexion, and the length of their beards.” See also ibid., § 29.

9 He says (speaking as Xdpos in Bis accusatus, § 34) that he found dialogue somewhat out of repute from the too numerous questions (i.e, employed by Plato), and brought it up to a more human and natural standard, substituting banter and repartec for dialectic quibbles and close logical reasoning.

(xai dv) with a future or even an imperative, ~% in place of od, the particle av misplaced or wrongly added, and a subjunctive mood instead of an optative.1 Nevertheless, he evinces a perfect mastery over a language as wonderful in its inflexions as in its immense and varied vocabulary ; and it is a well-merited praise of the author to say that to a good Greek scholar the pages of Lucian are almost as easy and as entertaining as an English or French novel. In this respect they form a contrast with the somewhat “crabbed ” style of Plutarch, many of whose moral treatises are by no means easy reading.

Of course Greek, like every other language, is progressive, aud the notion of fixing it to any given period as absolutely the best is quite arbitrary. We shall not be surprised at finding in Lucian some forms and compounds which were not in use in the time of Plato or Demosthenes. Thus, he has tzepetdets for trepopas (p. 99), wemweppéevos as the participle of the

perfect passive of réu7rw (p. 240), éveéoete the perfect of évocw (p. 705), to which a purist would object; and there are occasional tendencies to Latinism which can hardly surprise us. From a writer living under Roman rule we may expect some Latin words in his vocabulary, as Saxépdws for Sacerdos, and Roman names like Méyvos, Kedods, Kédnp (Celer), “PovrtAAlavos, &e. In the Lexiphanes a long passage is read from a treatise composed in words of the strangest and most out-of-the-way form and sound, on hearing which Lucian pretends to be almost driven crazy (p. 342). His own sentiments on the propriety of diction are shown by his reproof to Lexiphanes (§ 24), “if anywhere you have picked up an out-of-the-way word, or coined one which you think good, you labour to adapt the sense of it, and think it a loss if you do not succeed in dragging it in somewhere, even when it is not really wanted.” The free use of such a vocabulary? even in satire shows Lucian’s intimate knowledge of the spurious bombast which had begun to corrupt the classic dialect.

Lucian founded his style, or obtained his fluency, from the successful study of rhetoric, by which he appears to have made a good income from composing speeches which attracted much attention.? At a later period in life he seems to have held a lucrative office in Egypt. When he ‘fall but had one foot in Charon’s boat” (he says in Apologia, § 1), “he lent his neck to be bound by a golden collar.” This office was to register the actions and verdicts of the law courts,—he was a kind of “ Master of the Rolls,” who had the custody of the state documents, and received his salary directly from the king (idéd., § 12). He speaks of the emoluments as od cpuxpods pods dAAG ToAUTEAQYTOS. We do not know the date of Lucian’s death, but he may have lived till about 200 a.p.

The extant works of this writer are so numerous that of some of the principal only a short sketch can be given. To understand them aright we must remember that the whole moral code, the entire “duty of man,” was included, in the estimation of the pagan Greek, in the various schools of philosophy, As these were generally rivals, and the systems they taught were more or less directly antagonistic, truth presented itself to the inquirer, not as one, but as manifold. The absurdity and the impossibility of this forms the burden of all Lucian’s writings. He could only aS ae eee

? Thus in p. 591, rpocAduevor tiva et aadvrey boris &piora Kary- yophioa by doxy, either boris by &picra SonH or doris kpiora by doxoln is required by the laws of Attic Greek.

? In describing a banquet Lexiphanes says (§ 7), moThpia S¢ exerto mavToia ém) ris SeApwidos tpawé(ns, 5 kpuiuérwmos Kad TpunAls Mevtopoupyns ebAaBH Exovoa Thy Képkoy Kad BouBUAros Kal Seipoxd- WeAXov kal ynyev| TOAAG ofa Onpixans Srra, evpvxady re kal Ara eboroua, Th pev Doxander, ra 5¢ Kyidd0ev, wévra pévrot avenopdpnta Kat SuevdorTpaxa.

® Bis accusat. (§ 27), where Rhetoric declares she had enriched him, Tpotka ob uixpay eweceveyKapevn ToAAOYS Kad Oavpactous Adyous.

form one conclusion, viz., that there is no such a thing as truth,

One of the best written and most amusing treatises of antiquity is Lucian's Z'rwe History, which forms a rather long narrative in two books, It is composed, he says in a brief introduction, not only as a pastime and a diversion from severer studies, but avowedly as a satire (ovk akwnwdytws, p. 71) on the poets and logographers who have written so many marvellous tales, roAAa tepdoria Kat pvb0dn. He names Ctesias and Homer; but Hellanicus and Herodotus, perhaps other Aoyorotoé still earlier, appear to have been in his mind. The only true statement in his Zistory, he wittily says (p. 72), is that it contains nothing but lies from beginning to end.

The main: purport of the story is to describe a voyage to the moon. He set out, he tells us, with fifty companions, in a well-provisioned ship, from the " Pillars of Hercules," intending to explore the western ocean, After eighty days rough sailing they came to an island on which they found a Greek inscription, "This was the limit of the expedition of Heracles and Dionysus"; and the visit of the wine-god seemed attested by some miraculous vines which they found there. After leaving the island they were suddenly carried up, ship and all, by a whirlwind into the air, and on the eighth day came in sight of a great round island shining with a bright light (p. 77), and lying a little above the moon. In a short time they are arrested

by a troop of gigantic “ horse-vultures ” (irméyvrot), and brought as captives to the “man in the moon,” who proves to be Endymion. He is engaged in a war with the inhabitants of the sun, which is ruled by King Phaethon, the quarrel having arisen from an attempt to colonize the planet Venus (Lucifer). The voyagers are enlisted as “ Moonites,” and a long description follows of the monsters and flying dragons engaged in the contest. A fight ensues, in which the slaughter is so great that the very clouds are tinged with red (p. 84). The long descrip- tion of the inhabitants of the moon is extremely droll and original, and has often been more or less closely imitated. After descending safely into the sea, the ship is swallowed by a huge “‘sea serpent” more than 100 miles long. The adventures during the long confinement in the creature’s belly are most amusing; but at last they sail out through the chinks between the monster’s teeth, and soon find themselves at the “Fortunate Islands.” Here they meet with the spirits of heroes and philosophers of antiquity, on whom the author expatiates at some length. The tale comes to an abrupt end with an allusion to Herodotus in the promise that he ‘will tell the rest in his next books.” The story throughout is written in easy and elegant Greek, and shows the most fertile invention.

Another curious and rather long treatise is entitled Aovxtos 7) 6vos. The authorship is regarded as doubtful; the style, as it seems to us, does not betray another hand. Parts of the story are coarse enough; the point turns on one Lucius visiting in a Thessalian family, in which the lady of the house was a sorceress, Having seen her changed into a bird by anointing herself with some potent drug, he resolves to try a similar experiment on himself, but finds that he has become an ass, retaining, however, his human senses and memory. The mistake arose from his having filched the wrong ointment; however, he is assured by the attendant, Palestra, that if he can but procure roses to eat, his natural form will be restored. In

the night a party of bandits break into the house and ee eee

*In p. 127 he says that he saw punished in Hades, more severely than any other sinners, writers of false narratives, among whom were Ctesias of Cnidus and Herodotus. Yet in the short essay inscribed

Herodotus, p. 831, he wishes it were possible for him to imitate the many excellencies of that writer,

carry off the stolen goods into the mountains on the back of the unfortunate donkey, who gets well beaten for stumbling on the rough road. Seeing, as he fancies, some roses in a garden, he goes in quest of them, and again gets beaten as a thief by the gardener (p. 585). After many adventures with the bandits, he attempts to run away, but is caught. A council is held, and he is condemned to die alony with a captive girl who had essayed to escape on his back. Suddenly, however, soldiers appear, and the bandits are arrested (p. 595). Again the ass escapes “to the great and populous city of Beroea in Macedonia” (p. 603). Here he is sold to a strolling conjurer, afterwards to a market- gardener; and both experiences are alike painful. Again he passes into the possession of a cook, where he gets fat and sleek on food more suited to his concealed huinanity than the hard fare he has of late lived upon (p. 614). At last, during an exhibition in the theatre, he sees some roses being carried past, and, making a successful rush to devour them, he recovers his former shape. ‘I am Lucius,” he exclaims to the wondering president of the exhibition, “and my brother’s name is Caius. It was a Thessalian witch that changed me into a donkey.” Thus all ends well, and he returns safe to his country. Droll and graphic as many of the adventures are, they but too clearly show the profligate morals of the age.

The treatise On the Syrian Goddess (Mylitta, the moon- goudess, the Semitic Venus) is written in the Ionic dialect in imitation perhaps of the style of Herodotus, though the resemblance is by no means close. The writer professes to be an Assyrian (p. 452), and to describe the wonders in the various temples of Palestine and Syria; he descants on the eunuchs of Syria and the origin of the self-imposed privation of manhood professed and practised by the Galli. The account of the temples, altars, and sacrifices is curious, if really authentic; after the manner of Pausanias it is little more than a list, with the reasons in most cases added, or the origin of the custom explained.

De Morte Peregrint is a narrative of one Proteus, a Cynic, who after professing various doctrines, and among them those of Christianity, ended

his own life by ascending a burning pyre (p. 357).! The founder of the Christian religion is described (p. 334) as “the man who had been crucified (or fixed to a stake, évacxoAomicbévra) in Palestine,” and as one “still worshipped for having introduced a new code of morals into life.” The zeal of the early converts is shown by their flocking to the prison when Proteus had been arrested, by the sympathy conveyed from distant cities of Asia (p. 336), by contributions of inoney for his support, and by their total indifference to life; for “‘the poor wretches have persuaded themselves that they will live for ever.” The founder of the religion, “‘that first lawgiver of theirs,” says Lucian, “‘made them believe that they are all brothers when once they have abjured the gods of Greece and worshipped the crucified man who is their teacher, and have begun to live according to his laws” (p. 337).

Bis accusatus is a dialogue commencing with a satire on the folly of the popular notion that the gods alone are happy. Zeus is represented as disproving this by enume- rating the many and heavy duties that fall to their lot in the government of the world, and Hermes remarks on the vast crowds of philosophers of rival sects, by whose influence the respect and worship formerly paid to the gods have seriously declined. A trial is supposed to be held under the presidency of the goddess Acky, between the Academy, the Porch, the schools of the Cynics and Epicureans, and Pleasure, Revelry, Virtue, Luxury, é&c., as variously impugned or defended by them. Then Conversa-

1 It is open to controversy whether he was not a martyr at the stake.

tion and Rhetoric come before the court, each having an action for defamation to bring against Syrus the essayist, who of course is Lucian himself (p. 823). His defence is heard against the charges of both, and in both cases he is triumphantly acquitted. This essay is brilliant from its clever parodies of Plato and Demosthenes, and the satire on the Socratic method of arguing by short questions and answers.

The Lover of Lying (PiAopevdys) discusses the reason why some persons seem to take pleasure in falsehood for its own sake, and when there is

nothing to be gained by it. Under the category of lying all mythology (eg., that of Homer and Hesiod) is included, and the question is asked, why the hearers of such stories are amused by them? Quack remedies, charms, and miraculous cures are included among the most popular kinds of falsehood ; witchcraft, spiritualism, exorcism, expulsion of devils, spectres, are discussed in turn, and a good ghost story is told in p. 57. An anecdote is given of Democritus, who, to show his disbelief in ghosts, had shut himself up in a tomb, and when some young men, dressed up with death's heads, came to frighten him at night; and suddenly appeared to him while he was engaged in writing, he did not even look up, but called out to them, "Stop your joking" (p. 59). This treatise, a very interesting one, concludes with the reflexion that truth and sound reason are the only remedies for vain and superstitious terrors.

The dialogue Navigium seu Vota (IlAotov 7 ebdxat) gives an apparently authentic account of the measurements and fittings of an Egyptian ship which has arrived with a cargo of corn at the Pirzeus, driven out of its course to Italy by adverse winds. The full length is 180 feet, the breadth nearly 50, the depth from deck to the bottom of the hold 43 feet. The "wishes" turn on a party of friends, who have been to see the ship, declaring what they would most desire to possess. One would have the ship filled with gold, another a fine house with gold plate; a third would be a "tyrant" with a large force devoted to his interests ; a fourth would like to make himself invisible, enter any house that he pleased, and be transported through the air to the objects of his affection. After hearing them all, the first speaker, Lycinus (Lucian), says that he is content with the privilege of laughing heartily at the vanity of human wishes, especially when they are those of professed philosophers.

The dialogue between Philo and Lycinus, Conwiviwm seu Lapithe, is a very amusing description of a banquet, at which a party of dignified philosophers quarrelled over their viands at a marriage feast, and came to blows. The style is a good imitation of Plato, and the scene reminds one of the " clients' dinner" in the fifth satire of Juvenal. One of the party is so irritated by taunts that he flings a goblet half full of wine at the head of another, who retorts by spitting in the face of the aggressor (p. 441). Matters come to a climax by the attempt of one of the guests, Zenothemis, to secure for

himself a fatter fowl which had been served to his next neighbour Hermon. Each seizes his bird and hits the other with it in the face, at the same time pulling his beard. Then a general fight ensues, and serious wounds are inflicted. The story is, of course, a satire on philosophy, the favourite topic of a writer who believed neither in gods nor in men.

The Piscator, a dialogue between Lucian, Socrates, Pythagoras, Empedocles, Plato, and others, commences with a general attack on the author as the enemy of philosophy. Socrates proposes that the culprit should be tried, and that Philosophia should assist in the prosecution. Lucian declares that he does not know where such a person lives, long as he has been looking for her (§ 11). She is found at last, but declares Lucian has never disparaged

her, but only impostors and pretenders under her name (§ 15). He makes a long defence (pp. 598-606), abusing the philosophers in the sort of language in which some schools of theologians abuse the monks of the Middle Ages (§ 34). The trial is held in the Acropolis of Athens, and the sham philosophers, dreading a verdict against them, tlirow themselves from the rock. A Cynic flings away his scrip in the hurry, and on examination it is found to contain, not books or loaves of bread, but gold coins, dice, and fragrant essences (§ 44). The title of Fisherman is given to this witty treatise, because at the end Lucian baits his hook with a fig and a gold coin, and catches gluttonous strollers in the city while seated on the wall of the Acropolis.

The Voyage Home (Kardm)ovs) opens with the com- plaint that Charon’s boat is kept waiting for Hermes, who soon appears with his troop of ghosts to be ferried over the infernal river. Among them is a r¥pavvos, one Megapenthes, who, as his name is intended to express, mourns greatly over the life he has just left. Amusing appeals are made by other souls for leave to return to life, and even bribes are offered to the presiding goddess of destiny, but Clotho is, of course, inexorable. ‘The moral of the piece is closely like that of the parable of Dives and Lazarus: the rich and prosperous bewail their fate, while the poor and afflicted find rest from their troubles, and have no desire to return to them. The rvpavvos here is the man

clothed in purple and fine linen, and Lucian shows the same bitter dislike of tyrants which Plato and the tragic writers display. The heavy penalty is adjudged to Megapenthes that he may ever remember in the other world tlie misdeeds done in life.

The Sale of Lives is an auction held by Zeus to see what price the lives of philosophers of the rival sects will bring. A Pythagorean, who speaks in the Ionic, first undergoes an examination as to what he can teach, and this contains an enuineration of the doctrines usually ascribed to that sect, including metempsychosis. He is valued at 7s. 6d., and is succeeded by Diogenes, who avows himself the champion of truth, a cosmopolitan (§ 8), and the enemy of pleasure. Socrates brings two talents, and is purchased by Dion, tyrant of Syracuse (§ 19). Chrysippus, who

gives some specimens of his clever quibbles,! is bought for –

fifty pounds, Aristotle for nearly a hundred, while Pyrrho the sceptic (or one of his school), who professes to " know nothing," brings four pounds, "because he is dull and stupid and has no more sense than a grub" (§ 27). But the man raises 2 doubt, "whether or not he has really been bought," and refuses to go with the purchaser till he has fully considered the matter.

Timon is a very amusing and witty dialogue. The misanthrope, once wealthy, has become a poor farm- Janbourer, and reproaches Zeus for his indifference to the injustice of man. Zeus declares that the noisy disputes in Attica have so disgusted him that he has not been there for a long time (§ 9). He tells Hermes to conduct Plutus to visit Timon, and see what can be done to help him. Plutus, who at first refuses to go, is persuaded after a long conversation with Hermes, and Timon is found by them digging in his field (§ 31). Poverty is unwilling to resign her votary to wealth ; and Timon himself, who has become a thorough misanthrope, objects to be made rich again, and is with difficulty persuaded to turn up with his mattock a crock of gold coins. Now that he has once more become rich, his former flatterers, who had long left

1 Hg., § 25, '* A stone is a body; a living creature is a body ; you are a living creature ; therefore you areastone." Again: 'Is every body possessed of life?" ''No." 'Is a stone possessed of life?" No." 'Are you abody?" '*

Yes.” ‘A living body?” “Yes.” §* Then, if a living body, you are not a stone.”

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him, come cringing with their congratulations and respects, but they are all driven off with broken heads or pelted with stones. Between this dialogue and the Plutus of Aristophanes there are many close resemblances.

ITermotimus (pp. 739-831) is one of the longer dialogues, Hermotimus, a student of the Stoic philosophy for twenty years (§ 2), and Lucian (Lycinus) being the interlocutors. The long time—forty years at the least—required for climbing up to the temple of virtue and happiness, and the short span of life, if any, left for the enjoyment of it, are discussed. That the greatest philosophers do not always attain perfect indifference, the Stoic ultimatum, is shown by the anecdote of one who dragged his pupil into court to make him pay his fee (§ 9), and again by a violent quarrel with another at a banquet ($11). Virtue is compared to a city with just, and good, and contented inhabitants ; but so many offer themselves as guides to the right road to virtue that the inquirer is bewildered (§ 26). What is trnth, and who are the right teachers of it, still remains undetermined. The question is argued at length, and illustrated by a peculiar custom of watching the pairs of athletes and setting aside the reserved combatant (zapedpos) at the Olympian games by the marks on thie ballots (§§ 40-43). This, it is argued, cannot be done till all the ballots have been examined ; so a man cannot select the right way till he has tried all the ways to virtue. But to know the doctrines of all the sects is impossible in the term of a life (§ 49). To take a taste of each, like trying a sample of wine, will not do, because the doctrines taught are not, like the crock of wine, the same throughout, but vary or advance day by day (§ 59). A suggestion is made (§ 68) that the searcher after truth should begin by taking lessons in the science of discrimination, so as to be a good judge of truth before testing the rival claims. But who is a good teacher of such a science? (§ 70). The general conclusion of this well-argued inquiry is that philosophy is not worth the pursuit. “If I ever again,” says Hermotimus, “meet a philosopher on the road, I will shun him as [would a mad dog.”

The Alexander or False Prophet is a severe exposure of a clever rogue who seems to have incurred the personal enmity of Lucian (pp. 208-265). Born at Abonoteichus in Bithynia, a town on the southern shore of the Euxine, le is denounced as having filled all the Roman province of Asia with his villainy and plundering. Handsome, clever, and unprincipled, he had been instructed in the arts of imposture by one of the disciples of Apollonius of Tyana. Trusting to the natural credulity of Asiatics (§ 9), he sets up an oracle in his native town, having buried some brazen tablets which pretended that Asculapius would be wor- shipped in a temple there. A long account is given of the frauds and deceptions of this pretended hierophant, and the narrative ends with his treacherous attempt to drown Lucian off the coast of Amastris by a secret order given to the pilot,—a design which was frustrated by the honesty of the man (§ 56).

The Anacharsis is a dialogue between Solon and the Scythian philosopher, who has come to Athens on purpose. to learn the nature of the Greek institutions. Seeing the young men performing athletic exercises in the Lyceum, he expresses his surprise at such a waste of energy and the endurance of so much useless pain. This gives Socrates an opportunity of descanting at length on training as a discipline, and emulation as a motive for excelling. Love of glory, Solon says, is one of the chief goods in life. The argument is rather ingenious and well put ; the style reminds us of the minor essays of Xenophon.

In all, one hundred and twenty-four extant treatises of Lucian (excluding about fifty epigrams and two iambic poems of no great merit) are considered genuine. We have given a brief account of

some of the longest and best, but many others, ¢.g., Prometheus, Menippus, Life of Demonax, Toxaris, Zeus Tragedus, The Dream or the Cock, Iearomenippus (an amusing satire on the physical philosophers), are of considerable literary value. The exeellent edition of C, Jaeobitz, in the Teubner series, which is furnished with a very complete index, places the text in the student’s hand in amueh more satisfactary state than has yet fallen to the lot of Plutarch in his Opera Moralia. (ey, FARE?)

LUCIAN, the martyr, was born, like the famous heathen writer of the same name, at Samosata. His parents, who were Christians, died when he was in his twelfth year. In his youth he studied under Macarius of Edessa, and after receiving baptism he adopted a strictly ascetic life, and devoted himself with zeal to the continual study of Scripture. Settling at Antioch, he became a presbyter, and, while supporting himself by his skill as a swift writer, became celebrated as a teacher, pupils crowding to him from all quarters, so that he is regarded as the founder of the famous theological school of Antioch. He did not escape suspicion of heresy, and is represented as the con- uecting link between Paul of Samosata and Arius. Indeed, on the deposition of the former, he was excluded from ecclesiastical fellowship by three successive bishops of Antioch, while the latter seems to have been among his pupils (Theodoret, HZ. #., i. 38, 4). He was, however, restored before the outbreak of persecution, and the reputation won by his high character and learning was confirmed by his courageous martyrdom. He was carricd to Nicomedia before the cruel Maximin, and persisting in his faith perished 312 a.D., under torture and hunger, which he refused to satisfy with food offered to idols. His remains were conveyed to Drepanum in Bithynia, and under Constantine the town was founded anew in his honour with the name of Helenopolis, and exempted from taxes by the emperor (327 a.p., see Chron. Pasch., Bonn ed., p. 527), Here, on the day after Epiphany 387 a.p. (the day on which his martyrdom was commemorated), Chrysostom delivered the panegyrical homily from which, with notices in Eusebius (//. Z., ix. 6), Theodoret (Joc. cit.), and the other ecclesiastical historians, the life by Jerome (Vir, il., cap. 77), but especially from the account by S. Metaphrastes (cited at length in Bernhardy's notes to Suidas, s.v. vofever), the facts above given are derived. See also, for the celebration of his day in the Syriac churches, Wright, Cat. of Syr. MSS., p. 283.

Jerome says, ‘‘ Feruntur eius de Fide libelli et breves ad non- nullos epistole ”; but only a short fragment of one epistle remains (Chron. Paseh., p. 516). The authorship of a confession of faith ascribed to Lucian and put forth at the semi-Arian synod of Antioch (341 A.D.) is questioned. Lucian's most important liter- ary labour was his edition of the Septuagint corrected by the Hebrew text, which, according to Jerome (Adv. Ruf., ii. 77), was in current use from Coustantinople to Antioch. That the edition of Lueian is

represented by the text used by Chrysostom and Theodoret, as well as by certain extant MSS., such as the Arundclian of the British Museum, was proved by F. Field (Prol. ad Origenis Hexapla, cap. ix.), who points out that Lucian filled up lacune of the Septuagint text as compared with the Hebrew from the other Greek translations, that his method was harmonistic, and that he sometimes indulged in paraphrastic additions and other changes. Before the publication of Field's Heaapla, Lagarde had already directed his attention to the Antiochian text (as that of Lucian may be called). See his Symmieta (ii. 142), and Ankiindigung einer newen Ausg. d. gr. Uebersetzwng des A. 7'. (1882), in which an edition of this recension is promised, and the means for effecting it described. The accomplishment of this task may be looked to as the first

en in the process of tracing backwards the history of the Septua- gint.

From a statement of Jerome in his preface to the gospels it seems probable that Lucian had also a share in fixing the Syrian recension of the New Testament text, but of this it is impossible to speak with certainty. Compare the introductory volume of West-

cott and Hort's New Testament, p. 138,

LUCIFER, bishop of Cagliari (hence called Calaritanus or rather Caralitanus), an ardent supporter of the cause of Athanasius, after the unfavourable result of the synod

of Arles in 353 volunteered to go to the court and endeavour to obtain a new and impartial council; he was accordingly sent by Pope Liberius, along with Pancratius the presbyter and Hilarius the deacon, but did not suc- ceed in preventing the condemnation of Athanasius, which was renewed at Milan in 355. For his own persist- ent adherence to the orthodox creed he was banished to Germanicia in Commagene; he afterwards lived at Eleutheropolis in Palestine, and finally in the upper Thebaid. His exile came to an end with the publication of Julian's edict in 362. From 3638 until his death in 371 he lived at Cagliari in a state of voluntary separation from ecclesiastical fellowship with his former friends Eusebius of Vercelli,

Athanasius, and the rest, on account of their mild decision at the synod of Alexandria in 362 with reference to the treatment of those who had unwillingly Arianized under the persecutions of Constantius. The Luciferian sect thus founded did not continue to subsist long after the death of its leader. It is doubtful whether it ever formulated any distinctive doctrine ; certainly it developed none of any importance. The memory of Lucifer is still cherished in Sardinia; but, although popu- larly regarded there as a saint, he has never been canonized.

The controversial writings of Lucifer, dating from his exile, are chiefly remarkable for their passionate zeal and for the boldness and violence of the language addressed to the reigning emperor, whom he did not seruple to eall the enemy of God and a second Saul, Ahab, and Jeroboam. Their titles, in the most probable chrono- logical order, are De non pareendis in Dewm delinquentibus, De regibus apostaticis, Ad Constantiwm Augustum pro Athanasio libri v., De non eonveniendo ewm heretieis, and Moriendum esse pro Filio Det. Their quotations of Scripture are of considerable value to the critical student of the Latin text before Jerome. They were first eolleeted and edited by Tilius (Paris, 1586), and afterwards re- printed in the Bibliotheca Patrum (1618); the best edition is that of the brothers Colet (Venice, 1778).

LUCILIUS. Among the early Roman poets, of whose writings only fragments have been preserved, Lucilius was second in importance to Ennius. If he did not, like the epic poet of the republic, touch the imagination of his country- men, and give expression to their highest ideal of national life, he exactly hit their ordinary mood, and expressed the energetic, critical, and combative temper which they carried into political and social life. He was thus regarded as the most genuine literary representative of the pure Roman spirit. The reputation which he enjoyed in the best ages of Roman literature is proved by the terms in which Cicero and Horace speak of him. Persius, Juvenal, and Quintilian vouch for the admiration with which he was regarded in tue first century of the empire. The popularity which he enjoyed in his own time is attested by the fact that at his death in 102 3.c., although he had filled none of the offices of state, he received the honour of a public funeral.

His chief claim to distinction is his literary originality. He alone among Roman writers established a new form of composition. He may be called the inventor of poetical satire, as he was the first to impress upon the rude inartistic medley, known to the Romans by the name of satura, that character of aggressive and censorious criticism of persons, morals, manners, politics, literature, &c., which the word satire has ever since denoted. In point of form the satire of Lucilius owed nothing to the Greeks. It was a legitimate development of an indigenous dramatic enter- tainment, popular among the Romans before the first introduction of the forms of Greek art among them; and it seems largely also to have employed the form of the familiar epistle which circumstances had developed among them about the time when Lucilius flourished. But the style, substance, and spirit of his writings were apparently as original as the form. Heseems to have commenced his

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poetical career by ridiculing and parodying the conventional language of epic and tragic poetry, and to have used in his own writings the language commonly employed in the social intercourse of educated men. Liven his frequent use of Greek words, phrases, and quotations, reprehended by Horace, was probably taken from the actual practice of men, powerfully stimulated by the new learning, who found their own speech as yet inadequate to give free expression to the new ideas and impressions which they derived from their first contact with Greek philosophy, rhetoric, and poetry. Further, he not only created a style of his own, but, instead of taking the substance of his writings from Greek poetry, or from a remote past, he treated of the familiar matters of daily life, of the personal interests and peculiarities of himself or his contemporaries, of the politics, the wars, the government of the provinces, the administration of justice, the fashions and tastes, the eating and drinking, the money-niaking and money-spend- ing, the scandals and vices, the airs and affectations, which made up the public and private life of Rome in the last quarter of the second century before our era. This he did in a singularly frank, independent, and courageous spirit, with no private ambition to serve, or party cause to advance, but with an honest desire to expose the iniquity or incom- petence of the governing body, the sordid aims of the middle class, and the corruption and venality of

the city mob. There was nothing of stoical austerity or of rhetorical indignation in the tone in which he treated the vices and follies of his time. His character and tastes were much more akin to those of Horace than of either Persius or Juvenal. But he was what Horace was not, a thoroughly good hater ; and he lived at a time when tle utmost freedom of speech and the most unrestrained indulgence of public and private animosity were the characteristics of men who took a prominent part in affairs. Although Lucilius took no active part in the public life of his time, he regarded it in the spirit, not of a recluse or a mere stndent of books, but of a man of the world and of society, as well as a man of letters. His ideal of public virtue and private worth had been formed by intimate association with the greatest and best of the soldiers and statesmen of an older gener- ation.

The dates assigned by Jerome for his birth and death are 148 and 103 or 102 3.c. But it is impossible to reconcile the first of these dates with other facts recorded of him. We learn from Velleius that he served under Scipio at the siege of Numantia in the year 134 3.0. We learn from Horace that he lived on the most intimate terms of friendship with Scipio and Lelius, and that he celebrated the exploits and virtues of the former in his satires. Fragments of those books of his satires which seem to have been first given to the world (books xxvi,—xxix.) clearly indicate that they were written in the lifetime of Scipio. Some of these bring the poet before us as either corresponding with, or engaged in controversial conversation with, his great friend. One line—

‘* Pererepa pugnam Popilli, facta Corneli cane—” in which the defeat of M. Popillius Lenas, in 138 z.c., is contrasted with the subsequent success of Scipio, bears the stamp of having been written while the news of the capture of Numantia was still fresh. It is in the highest degree improbable that Lucilius served in the army at the age of fourteen ; itis still more unlikely that he could have been admitted into the familiar intimacy of Scipio and Leclius at that age. It seems a moral impossibility that between the age of fifteen and nineteen—i.ec., between 133 B.c. and 129 B.c, the year of Scipio’s death—he could have come before the world as the author of an entirely new kind of composition, and one which, to be at all successful, demands especially maturity of judgment and

experience. It may further be said that the well-known words of Horace, in which he characterizes the vivid portraiture of his life, character, and thoughts, which Lucilius bequeathed to the world, ‘quo fit ut omnis Votiva pateat veluti descripta tabella Vita senis,” }

lose much of their force unless sents is to be taken in its ordinary sense,—which it cannot be if Lucilius died at the age of forty-six. Two explanations have been given of the error. One is that, from a similarity in the names of the consuls for the years 180 and 148 B.c., Jerome had con- fused the one year with the other, and thus that the date of the birth of Lucilius must be thrown back thirty-two years. He would thus have been nearly fifty when he served at Numantia, and when he first began to write satire. But the terms which Horace applies to the intimacy of Lucilius and Scipio, such as ‘‘discincti ludere,” indicate the relations of an older to a much younger man ; and the verve and tone of his satires are those of a man not so far advanced in years as he would have been if born in the year 180 Bc. A simpler explanation of the error is sup- ported by Mr Munro, in the Journal of Philology, No. xvi. He supposes that Jerome must have written the words “anno xlvi” for “anno lxiv” or “Ixvi”; which would make the birth of Lucilius eighteen or twenty years earlier than that usually assigned. Lucilius would thus have been about thirty-three or thirty-five years of age when he served at Numantia, and two or three years older when he gave his first satires to the world. As he lived for about thirty years longer, and as he seems to have con- tinued the composition of his satires during most of what remained of his life, and as it was his practice to commit to them all his private thoughts, the words of Horace would naturally and truthfully describe the record of his observation and experience between the age of thirty-five and his death. His birthplace was Suessa Aurunca in Campania, from which circumstance Juvenal describes him as “magnus Aurunce alumnus.” He belonged to the equestrian order, a fact indicated by Horace’s notice of himself as “infra Lucili censum.” He was granduncle to Pompey, on the mother’s side. Though not himself belonging to any of the great senatorian families, he was in a position to associate with them on equal terms, and to criticize them with independence. And this circum- stance contributed to the boldness, originality, and thoroughly national character of

his literary work, Had he been a “semi-Grecus,” like Ennius and Pacuvius, or of humble origin, like Plautus, Terence, or Accius, he would scarcely have ventured, at a time when the senatorian power was strongly in the ascendant, to revive the rdle which had proved ‘disastrous to Nevius; nor would he have had the intimate knowledge of the political and social life of his day which fitted him to be its painter. Another circumstance determining the bent of his mind to satire was the character of the time in which he began the work of his life. The origin of Roman political and social satire is to be traced to the same disturbing and disorganiz- ing forces which led to the revolutionary projects and legislation of the Gracchi.

The remains of Lucilius extend to about eleven hundred lines. But mueh the largest number of his fragments are uneonnected lines, preserved by late grammarians, as illustrative of peeuliar verbal usages. He was, for his time, a voluminous as well asa very diseursive writer. He left behind him thirty books of satires, and there is reason to believe that each book, like the books of Horace and Juvenal, was composed of different pieces. The order in which they were known to the grammarians was not that in whieh they were written. The earliest in order of composition were probably

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1«* And so it happens that the whole life of the old man stands clearly before us, as if it were represented on a votive picture.”

those numbered from xxvi. to xxix., which were written in the trochaic and iambic metres that had been employed by Ennius and Pacuvius in their Satwrw. In these he made those criticisms on the older tragic and epic poets of which Horace and other ancient writers speak. In them too he speaks of the Numantine War as recently finished, and of Scipio as still living. Book i., on the other hand, in which the philosopher Carneades, who died in 128 B.c., is spoken of as dead, must have been written after the death of Scipio. With the exception of books xxvi.—xxix., and one satire in which he seems to have made an experiment in the unfamiliar elegiac metre, all the satires of Lucilius were written jin hexameters. So far as an opinion can be formed from a number of uneonnected fragments, he seems to have written the

trochaic tetrameter with a smoothness, clearness, and simplicity which he never attained in handling the hexameter. The longer fragments produce the impression of great discursiveness and care- lessness, but at the same time of considerable force. The words of Horace, ‘‘fluere lutulentum,” seem exactly to express the character of his style. He appears, in the composition of his various pieces, to have followed no settled plan, but to have treated cverything that occurred to him in the most desultory fashion, sometimes adopting the form of dialogue, sometimes that of an epistle or an im- aginary discourse, and often to have spoken in his own name, giving an account of his travels and adveutures, or of amusing scenes that he had witnessed, or expressing the results of his private medita- tions and experiences. Like Horace he largely illustrated his own observations by personal anecdotes and fables. The fragments elearly show how often Horace has imitated him, not only in expression, but in the form of his satires (see for instance i. 5 and ii. 2), in the topics which he treats of, and the class of social vices and the types of character which he satirizes. For students of Latin literature, the chief interest of studying the fragments of Lucilius consists in the light which they throw on the aims and methods of Horace in the composition of his satires, and, though not to the same extent, of his epistles. But they are important also as materials for linguistic study ; and they have a considerable his- torical value as throwing light on the feeling, temper, circum- stances, and character of a most interesting time, of which there is scarcely any other contemporary record.

The best edition of the Fragments is that of L. Muller (1872). A collection of them by Lachmann has appeared since his death. The emendation of these fragments still employs the ingenuity of both German aud English scholars. Important contributions to the subject have been made by Mr Munro in the Journal of Philology. (W. Y.S.)

LUCIUS, the name of three popes.

Lucius I., whose pontificate of about eight months (253-54) fell between those of Cornelius and Stephen I, had been one of the presbyters who accompanied Cornelius when he withdrew from Rome. After his own election also he appears to have lived for some time in exile, but ultimately to have been permitted to return. No facts of his official life have been

recorded, but he is referred to in several letters of Cyprian as having been in agreement with his predecessor Cornelius in preferring the milder view on the question as to how the penitent lapsed should be treated. The manner of his death is uncertain; ac- cording to some accounts he was decapitated. In the Catalogus Inberianus and in the Catalogus Corbeiensis he is said to have been pope for more than three years; but there can be no doubt of the correctness of the statement of Eusebius, that his pontificate was of less than eight months' duration. Like all the early popes he has been canonized in the Church of Rome; and he is commemorated as a martyr on March 4.

Lucius II. (Gherardo de Caccianimici), a Bolognese, succeeded Celestine II. on March 4, 1144. Soon after his accession the people of Rome chose a patrician, for whom they claimed the temporal sovereignty; Lucius at the head of the oligarchical party appealed to arms, and perished in an attempt to storm the Capitol on February 25, 1145, He was succeeded by Eugenius ITI.

Lucius III. (Ubaldo Allucingoli), a native of Lucca, was bishop of Ostia and Velletri when he was chosen to succeed Alexander ITI. on September 1, 1181. For six months he lived at Rome, but in March 1182 he was driven forth by rebellion, and resumed his abode at Velletri; he afterwards lived at Anagni, and finally at

Verona. While at the last-named place he pronounced sentence of excommunication against the Cathari, Paterines, Humiliati, Waldensians, and Arnoldists in 1184; but "left the papal thunders to their own unaided effects." He died at Verona on November 25, 1185, and was suc- ceeded by Urban III.

LUCKE, Gottrriep CHristTIAN Friepricn (1791- 1855), theologian, was born on August 24, 1791, at Egeln near Magdeburg, where his father was a merchant, received his early education at the Magdeburg gymnasium, and studied theology at Halle and Gottingen (1810-13). In 1813 he became repetent at Gottingen, and in 1814 he

received the degree of doctor in philosophy from Halle ;

in 1816 he removed to Berlin, where he became licentiate in theology, and qualified as “ privatdocent.” He soon became intimate with Schleiermacher and De Wette, and was associated with them in 1818 in the redaction of the Theologische Zeitschrift. Meanwhile his lectures and publications (among the latter a Grundriss der Neutestamentlichen Hermeneutik, 1816) had brought him into considerable repute, and he was appointed professor extraordinarius in the new university of Bonn in the spring of 1818; in the following autumn he became professor ordinarius, From Bonn, where he had Augusti, Gieseler, and Nitzsch for colleagues, he was called to Gottingen to succeed Stiiudlin in]827. Here he remained, declining all further calls elsewhere, as to Erlangen, Kiel, Halle, Tiibingen, Jena, and Leipsic, until his death, which occurred on February 14, 1855.

Liicke, who was one of the most learned, many-sided, and influ- ential of the so-called ‘‘mediation” school of evangelical theo- logians, is now known chiefly by his principal work, an Lxposition of the Writings of St John, of which the first edition, in four volumes, appeared in 1820-32 ; it has since passed through two new and improved editions (the last volume of the third edition by Bertheau, 1856). He is one of the most intelligent maintainers of the Johannine authorship of the Fourth Gospel ; in connexion with this thesis he was one of the first to argue for the early date and non-apostolic authorship of the Apocalypse.

LUCKENWALDE, a busy little town of Prussia, in the province of Brandenburg, district of Potsdam, lies on the river Nuthe and on the Berlin and Anhalt Railway, 30 miles to the south-west of Berlin. Its cloth and wool manu- factories are among the most extensive in Prussia, and it also contains cotton-printing works, dye-works, machine shops, and numerous other industrial establishments. The population in 1880 was 14,706. The site of Luckenwalde was occupied in the 12th century by a Cistercian monastery, but the village did not spring up till the reign of Frederick the Great. It was made a town in 1808.

LUCKNOW, a district of Oudh, in the division or commissionership of Lucknow,! under the jurisdiction of the lieutenant-governor of the North-Western Provinces, India, lying between 26° 30’ and 27° 9’ 30” N. lat., and between 80° 36’ and 81° 15’ 30” E. long., is bounded on the N. by Hardoi

and Sitdpur districts, on the E. by Bara Banki, on the S. by Rai Bareli, and on the W. by Unao. The general aspect of the country is that of an open champaign, well studded with villages, finely wooded, and in parts most fertile and highly cultivated. In the vicinity of rivers, however, stretch extensive barren sandy tracts (bhdér), and there are many large sterile wastes of saline efflorescence (wsdér). The country is an almost dead level throughout, the average slope, which is from north- west to south-east, being less than a foot per mile. ‘The – principal rivers are the Gumti and the Sai, with their

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1 Lueknow division lies between 26° 9’ and 27° 21’ 5” N. lat. and between 80° 5’ and 81° 54’ E. long., comprises the three distriets of Lueknow, Unao, and Bara Banki, and has an area of 4480 square miles, of which 2520 are returned as under eultivation. The popula- tion in 1869 was 2,838,106, viz., 2,449,763 Hindus, 383,260 Mo- hammedans, 4309 Europeans, and 784 Eurasians.

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tributaries. The former enters the district from the north, and, after passing Lucknow city, turns to the east and enters Bara Banki. The Sai forms the south-west bound- ary of the district, running almost parallel with the Gumti.

The census of 1869 returned the population of the district at 970,625. Recent changes and transfers to and from other districts have, however, taken place. Allowing for these, Lucknow contains (according to the census of 1869) a population of 789,465 persons (416,960 males and 372,505 females), spread over an area of 965 square miles. Hindus number 614,276 ; Mohammedans, 167,184; Christians, 4982; the remainder being made up of unclassified prisoners and jail officials. Four towns contain a population ex- ceeding 5000 inhabitants, viz., Lucknow city, Amethi (7182), Kakori (8220), Malihabad (8026). The estimated area under culti- vation is returned at 547 square miles. Three harvests arc reaped in the year, viz., the rabé in spring, comprising wheat, barley, gram, peas, gwjat (a mixture of wheat and barley), and birra (a mixture of barley and gram) ; the kharif in

the rainy season, comprising rice, millets, sdnwdan, mandwd, kékun, and Indian corn; and the henwat in the autumn, consisting of joar, bdjra, mash, mung, moth, masér, and lobia. In addition, there are valuable crops of tobacco, opium, cotton, spices, and vegetables. Irrigation is carricd on by means of rivers, tanks, and wells. The cultivators are almost all deeply in debt, and under advances of seed grain from their land- lords. Wages have remained stationary in the country, but have decreased in the city owing to its diminished wealth and population since the departure of the Oudh court. The price of food, on the other hand, has materially risen of late years. When not paid in grain, an ordinary agricultural labourer receives about 14d. a day. Artisans, such as smiths and carpenters, receive 44d. a day for work in their own villages, or 6d. a day if called away from their homes. Famines have occurred in Lucknow in 1769, 1784-86, and 1837, and severe scarcities in 1861, 1865-66, 1869, and 1873—all caused by drought. The district is well provided with communications by road, river, and railway. Three imperial lines of road branch out south, east, and north to Cawnpur, Faizabad, and Sitapur, metalled and bridged throughout, and comprising, exclusive of the roads in Lucknow city and cantonments, a length of about 500 miles. There are algo seven principal local lines of road. River communication is not much used. The line of railway is comprised in the Oudh and Rohilkhand railway system. The entire length of railway communication is 52 miles. Manufactures are mainly confined to Lucknow city. In the country towns are a few weavers, dyers, bangle-nakers, brass-workers, and potters. Cotton weaving has greatly declined since the introduction of European piece-goods. The principal imports are food-stuffs, piece-goods, arms, hardware, glass, crockery, and salt; while muslins, embroidery, cotton prints, brass vessels, lace, tobacco, &c., are exported. The district is ad- ministered by a deputy commissioner, aided by a magistrate in charge of the city, and a second in the cantonments, one or two assistant commissioners, three extra-assistant commissioners, three tahsilddrs, and four honorary magistrates. Besides, there are a civil judge and a small-cause court judge, who have no criminal or revenue powers. ‘The total imperial and local revenue of Lucknow district in 1871-72 amounted to £162,926, and the expenditure to £70,534 ; the Government land revenue was £70,580. Excluding Lucknow city, the schools consist of one Anglo-vernacular middle class, five vernacular middle class, and seventy-one primary schools. The prevailing endemic diseases are fevers,

skin diseases, and bowel complaints. Cholera isseldom absent. Small-pox is also an annual visitant. The average annual rainfall is 37°6 inches, and the mean annual temperature 78°°8 Fahr.

Lucknow, capital of the above district, and of the pro- vince of Oudh, in 26° 52’ N. lat., 80° 58’ E. long., is distant from Cawnpur 42 miles, from Benares 199 miles, and from Calcutta 610 miles, and has an area of 13 square miles. It ranks fourth in size among Indian cities, being only surpassed by the presidency capitals of Calcutta, Madras, and Bombay. It stands on both banks of the Gumti, mostly on the western side, the river being spanned by four bridges, two of them built by native rulers and two since the British annexation in 1856. Viewed from a distance, the city presents a picture of unusual magni- ficence and architectural splendour, which fades on nearer view into something more like the ordinary aspect of a crowded Oriental town. From the new bridge across the Gumti, the city seems to be embedded in trees. High up the river the ancient stone bridge of Asaf-ud-dauld crosses the stream. To its left rise the walls of the Machi Bhawan fort, enclosing the Lachman ¢é/é (Lach- man’s hill), the earliest inhabited spot in the city, from

which it derives its modern name. Close by, the immense Imaémbara, or mausoleum of Asaf-ud-daulé, towers above the surrounding buildings. Farther in the distance, the lofty minarets of the Jamé Masjid or “cathedral mosque ” overlook the city ; while nearer again, on the same side of the river, the ruined walls of the residency, with its memorial cross, recall the heroic defence made by the British garrison in 1857. In front, close to the water’s edge, the Chattar Manzil palace, a huge and irregular pile of buildings, crowned by gilt umbrellas, glitters gaudily in the sunlight ; while to the left, at some little distance, two mausoleums flank the entrance to the Kaisar Bagh, the last of the overgrown palaces built by the exiled dynasty of Oudh. Still more picturesque panoramas may be obtained from any of the numerous towers and cupolas which abound in every quarter. But a nearer examination shows that Lucknow does not correspond in its interior arrange- ments to its brilliant appearance from a little distance. Nevertheless, many of its streets are broader and finer than those of most

Indian towns; and the clearance effected for military purposes after the mutiny has been instrumental in greatly improving both the aspect and the sanitary condition of the city. A glacis half a mile broad surrounds the fort; and three military roads, radiating from this point as a centre, cut right through the heart of the native quarter, often at an elevation of some 30 feet above the neighbouring streets. Three other main roads also branch out from the same point, one leading across the bridge, and the others along the banks of the Gumti. The residency crowns a picturesque eminence, the chief ornament of the city, containing, besides many ruined walls, an old mosque and a magnificent banyan tree. An artificial mound rises near at hand, its sides gay with parterres of flowers, while in the rear, half hidden by the feathery foliage of gigantic bamboos, the graveyard covers the remains of some 2000 Europeans, who perished in 1857. The cantonments lie 3 miles to the south-east of the city.

The population of Lucknow, including the cantonments, was returned by the census of 1869 at 284,779. The native civil popu- lation consisted of 273,126, viz., 161,739 Hindus and 111,387 Mohammedans. There were also 3648 native soldiers, 4222 Europeans, 760 Eurasians, and 3023 prisoners and jail officials. The traffic of Oudh flows southwards through Lucknow to Cawnpur. Large quantities of grain and timber come in from the trans-Gogra districts to the north, while raw cotton, iron, and imported goods from the south and east are sent in exchange. In 1869-70 goods to the value of nearly three quarters of a million sterling paid taxes at the octroi office. The chief municipal taxable articles are food stuffs, ght, gér or molasses, sugar, spices, oilseeds, and tobacco; besides a large quantity of European manufactured articles brought into the town. Of the total municipal revenue in 1870—71 (£20,018), £16,230 was derived from octroi. Lucknow muslins and other textile fabrics have a high reputation. Gold and silver brocade, however, forms the leading manufacture. It is used for the numerous purposes of Indian pomp, and has a considerable market even inEurope. The gorgeous needlework enibroidery upon velvet and cotton, with gold thread, thread and coloured silks, furnishes employment tomany hands. Lucknow jewellery, once very famous, has declined since the departure of the native court. Glass work and moulding in clay still maintain their original excellence. A Kashmiri colony has introduced a small manufacture of shawls. The Oudh and Rohilkhand Railway, with its branches, has a

central station in Lucknow, and gives direct communication with Benares, Bareilly, and Cawnpur, as well as connecting with the great trunk lines to Calcutta, Bombay, and the Punjab. Before the amalga- mation of Oudh with the North-Western Provinces in 1877, Luck- now formed the residence of the chief commissioner and his staff, and it still ranks as the headquarters of officials whose authority extends ovcr the whole province. The principal medical institu- tions are the King's hospital, Balrampur hospital, Government dis- pensary and lunatic asylum. The leading educational establish- ments are the Canning college, Martinitre college, Ward's institu- tion, Loretto convent, and a number of schools under the charge of the Church of England and American missions.

History.—The most interesting event in the modern history of Lucknow is the siege during the mutiny of 1857-58. Symptoms.

of disaffection oceurred as early as April 1857, and Sir Henry Lawrence immediately took steps to meet the danger by fortifying the residency and accumulating stores. On the night of the 30th May the expected insurrection broke out; the men of the 71st regiment of native infantry, with a few from the other regiments, began to burn the bungalows of their officcrs, and to murder the inmates, but were dispersed by the European force and fied towards Sit4pur. Though the city thus remained in the hands of the British, the symptoms of disaffection amongst the remaining native troops were unmistakable, and on June 11 the military police and native cavalry broke into open revolt, followed on the succeeding morning by the native infantry. On the 20th news of the fall of Cawnpur arrived ; and on the 29th occurred the failure of Lawrence's attack upon the advancing enemy, in consequeuce of which the British troops fell back on Lucknow, abandoned the Machi Bhawan, and concentrated all their strength upon the resi- dency. The siege of the enclosure began upon July 1. Three uu- successful assaults were made by the mutineers on July 20, August 10, and August 18 ; but meanwhile the British within were dwind- ling away. On September 5 news of the relieving force under Outram and Havelock reached the garrison, and on the 22d the relief arrived at the Alambagh, a walled garden on the

Cawnpur road held by the enemyin force. Havelock stormed the Alambagh, and on the 25th fought his way with continuous opposition through the narrow lanes of the city. On the 26th he arrived at the gate of the residency enclosure, and was welcomed by the gallant defenders within. The sufferings of the besieged had been very great ; but even after the first relief it became clear that Lucknow could only be temporarily defended till the arrival of further reinforcements should allow the garrison to cut its way out. Night and day the enemy kept up a continual firing against the British position, while Outram, who had reassumed the command which he yielded to Have- lock during the relief, retaliated by frequent sorties. Throughout October the garrison continued its gallant defence, and a small party, shut up in the Alambagh, and cut off unexpectedly from the main body, also contrived to hold good its dangerous post. Mean- while Sir Colin Campbell's force had advanced from Cawnpur, and arrived at the Alambagh on the 10th of November. The Alambagh, the Dilkusha palace, south-east of the town, the Martiniére, and the Sikandra Bagh, the chief rebel stronghold, were successively carried in the course of the six following days, and the second relief was suc- cessfully accomplished. Even now, however, it remained impos- sible to hold Lucknow, and Sir Colin Campbell determined, before undertaking any further offensive operations, to return to Cawnpur with his army, escorting the civilians, ladies, and children rescued from their long imprisonment in the residency, with the view of forwarding them to Calcutta. On the morning of the 20th Nov- ember the troops received orders to march for. the Alambagh ; and the residency, the scene of so long and stirring a defence, was aban- doned for a while to therebel army. Outram with 3500 men held the Alambagh until the commander-in-chief could return to recapture the capital. The rebels in great strength again surrounded the greater part of the city, for a circuit of 20 miles, with an external Ine of defence. On the 2d of March 1858 Sir Colin Campbell found himself free enough in the rear to march once more upon Lucknow. He first occupied the Dilkusha, and posted guns to command the Martinicre. On the 5th Brigadier Franks arrived with 600C men; Outram's force then crossed the Gumti, and advanced from the direction of Faizibad, while the main body attacked from the south- east. After a week's hard fighting, March 9-15, the rebels were completely defeated, and their posts captured one by one. LUCRETIUS (T. Lucrzrtus Carus), more than any of the great Roman writers, has acquired a new

interest in the present day. This result is due, not so much to a truer perception of the force and purity of his style, of the majesty and pathos of his poetry, or of the great sincerity of his nature, as to the recognition of the relation of his subject to many of the questions on which speculative curlosity 18 now engaged. It would be misleading to speak of him, or of the Greek philosophers whose tenets he expounds, as anticipating the more advanced scientific hypotheses of modern times. But it is in his poem that we find the most complete account of the chief effort of the ancient mind to explain the beginning of things, and to understand the course of nature and man's relation to it. Physical philosophy in the present day is occupied with the same problems as those which are discussed in the first two books of the De Rerum Natura. The renewed curiosity as to the origin of life, the primitive condition of man, and his progressive advance to civiliza- tion finds an attraction in the treatment of the same subjects in the fifth book. The old war between science

and theology, which has been revived in the present generation, is fought, though with different weapons, yet in the same ardent and uncompromising spirit throughout the whole poem, as it is in the writings of living thinkers. In comparing the controversies of the present day with those of which we find the record in Lucretius, we are reminded of the poet's own description of the war of elements in the world,— " Denique, tantopere inter se cum maxiina mundi

Pugnent membra, pio nequaquam concita bello,

Nonne vides aliquam longi certaminis ollis

Posse dari finem ?" }

But this concurrence with the stream of speculation in the present day is really the least of his permanent claims on the attention of the world. His position both among ancient and modern writers is unique. No one else comn- bines in the same degree the contemplative enthusiasm of a philosopher, the earnest purpose of a reformer and moral teacher, and the profound pathos and sense of beauty of a great poet. He stands alone among

his countrymen as much in the ardour with which he observes and reasons on the processes of nature as in the elevation of feeling with which he recognizes the majesty of her laws, and the vivid sympathy with which he interprets the manifold variety of her life. It would have been an instructive study to have traced some connexion between his personal circumstances and the iutellectual and moral position which he holds. We naturally ask what influence of teachers in Rome or Athens first attracted him to this study and observation of natural phenomena, what early impressions or experience gave so sombre a colouring to his view of life, how far the delight, so strange in an ancient Roman, which he seems to find in a kind of recluse communion with nature, and the spirit of pathetic or indignant satire in which he treats the more violent phases of passion and the more extravagant modes of luxury, was a recoil from the fascination of pleasures in which his con- temporaries and equals freely indulged. We should like also to know how far the serene heights which he professed . to have attained procured him exemption from or allevia- tion of the actual sorrows of life. But such questions, suggested by the strong interest which the impress of personal feeling and character stamped on the poem awakens in the reader, can only be raised ; there are no ascertained facts by which they can be settled. ‘There is no ancient poet, with the exception of Homer, of whose history so little is positively known. Unlike Catullus, Horace, Virgil, Cicero, Tacitus, and nearly all the great Roman writers, he is absolutely silent on the subject of his own position and fortunes. Nor is this silence com- pensated by any personal reference to him in the works of his two eminent contemporaries by whom the social life of their age is so amply illustrated, Cicero and Catullus, although it is certain that each of them read his poem almost immediately after it was given to the world. The great poets of the following ages were influenced by his genius, but they tell us nothing as to his career. So con- sistently does he seem to have followed the maxim of his master, ‘“ Pass through life unnoticed,” and to have realized, in the midst of the excited political, intellectual, and social life of the last years of the republic, the ideal of those ‘‘ who do not wish to be known even while living.” ?

Our sole information concerning his life is found in the brief summary of Jerome, written more than four centuries after the poet’s death. Scholars are

now agreed that in these summaries, added to his translation of the Eusebian

1 “Tn fine, as the mightiest members of the world are battling fiercely together in an unhallowed feud, seest thou not that some end of the long warfare may be reached by them ?”

2 Quoted from Pliny by M. Martha in Le Poéme de Lucréce.

Chronicle, Jerome followed, often carelessly and inaccurately,

the accounts contained in the lost work of Suetonius De |

Viris Illustribus. But that work was written about two centuries after the death of Lucretius; and, although it is likely that Suetonius used the information transmitted by earlier grammarians, there is nothing to guide us to the original sources from which the tradition concerning the life of Lucretius was derived. The strange character of the story which has been transmitted to us, and the want of any support to it from external evidence, oblige us to receive it with a certain reserve.

According to this account the poet was born in the year 94 B.c.; he became mad (‘in furorem versus”) in conse-

quence of the administration of a love-philtre; and after | composing several books in his lucid intervals, which were | subsequently corrected by Cicero, he died by his own hand

in the forty-fourth year of his age. The statement of Donatus in his life of Virgil, a work also based on the lost work of Suetonius, that Lucretius died on the 15th of October 55 B.c., the same day on which Virgil assumed the toga virilis, is inconsistent either with the date assigned for the poet’s birth or with the age at which he is said to have died. A single mention of the poem (which from the condition in which it has reached us may be assumed to have been published posthumously) in a letter of

Cicero’s, written early in 54 B.c., is confirmatory of the |

date given by Donatus as that of the poet’s death. Similar errors in chronology are common in the summaries of Jerome ; and, where there is an inconsistency between the date assigned for the birth of any author and the age at which he is said to have died (as, for instance, in the case of Catullus), there are grounds for believing that the error lies in the first date. Taking the statements of Donatus and of Jerome together, we may consider it probable that Lucretius died in the October of 55 3.c., in the forty-fourth year of his age, and that he was born either late in the year 99 B.o, or early in the year 98 B.c. He would thus be about seven years younger than Cicero, a year or two younger than Julius Crsar, about the same age as

Memmius, to whom the poem is dedicated, and about |

fifteen years older than Catullus and Calvus, the younger poets of his generation, from whom he is widely separated both byhis more archaic style and rhythm and by the greater

character. ‘The other statements of Jerome have been questioned or disbelieved on the ground of their intrinsic improbability. They have been regarded as a fiction invented in a later time by the enemies of Epicureanism, with the view of discrediting the most powerful work ever produced by any disciple of that sect. It is more in conformity with ancient credulity than with modern science to attribute a permanent tendency to derangement to the accidental administration of any drug, however potent. A work characterized by such strength, consistency, and con- tinuity of thought is not likely to have been composed “per intervalla insaniz.” Donatus,in mentioning the poet’s

death, gives no hint of the act of suicide. The poets of the |

Augustan age, who were deeply interested both in his

philosophy and his poetry, are entirely silent about the |

tragical story of his life. Cicero, by his professed anta- gonism to the doctrines of Epicurus, by his inadequate appreciation of Lucretius himself,

and by the indifference which he shows to other contemporary poets, seems to have been neither fitted for the task of correcting the unfinished work of a writer whose genius was so distinct from his own, nor likely to have cordially undertaken such a task,

Yet these considerations do not lead to the absolute rejection of the story as a pure invention of a hostile and uncritical age. The evidence afforded by the

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poem rather leads to the conclusion that the tradition contains some germ of fact. We need not attach any importance to the supposed efficacy of the love-philtre in producing mental alienation, nor are we called upon to think of Lucretius as one liable to recurring fits of insanity, in the ordinary sense of the word. But it is remarkable, as was first observed by Mr Munro, his English editor, that in more than one passage of his poem he writes with extraordinary vividness of the impression produced both by dreams and by waking visions. It is true that the philosophy of Epicurus put great stress on these, as afforcing the explanation of the origin of supernatural beliers. But the insistence with which Lucretius returns to ths subject, and the horror with which he recalls the effects of such abnormal phenomena, suggest the inference that he himself may have been liable to such hallucinations, which are said to be consistent with perfect sanity, though they may be the precursors either of madness or of a state of despair and melancholy which often ends in suicide.! Other passages in his poem, as, for instance, the lines

‘* Nos agere hoc autem, et naturam queerere rerum, Semper et inventam patriis exponere chartis,”?

where he describes himself as ever engaged, even in his dreams, on his task of inquiry and composition, produce the impression of an unrelieved strain of mind and feeling, which may have ended in some extreme reaction of spirit, or in some failure of intellectual power, from the conscious- ness of which he may, in accordance with examples which he himself quotes, have taken refuge in suicide. But the strongest confirmation of the existence of some germ of fact in the tradition is found in the unfinished condition in which the poem has reached us. The subject appears indeed to have been

fully treated in accordance with the plan sketched out in the introduction to the first book. But that book is the only one which is finished in style and in the arrangement of its matter. In all the others, and especially in the last three, the continuity of the argu- ment is frequently broken by passages which must have been inserted after the first draft of the arguments was written out. Thus, for instance, in his account of the transition from savage to civilized life, he assumes at v. 1011 the discovery of the use of skins, fire, &c., and the

. . ent -‘ | first beginning of civil society, and proceeds at 1028 to seriousness of his art and the more earnest dignity of his | 6 5 4 .

explain the origin of language, and then again returns, from 1090 to 1160, to speculate upon the first use of fire and the earliest stages of political life. These breaks in the continuity of the argument show what might also be inferred from frequent repetitions of lines which have appeared earlier in the poem, and from the rough work- manship of passages in the later books, that the poem could not have received the final revision of the author, and must have been given to the world by some editor after his death. Nor is there any great difficulty in believing that that editor was Cicero. It is not necessary to press the meaning of the word “emendavit” as applied to the task fulfilled by him. Cicero certainly was incap- able of “ improving ” any of the poetry of Lucretius, and the slight mention which he makes of the poem in a letter to his brother (“‘ the poem of Lucretius is, as you describe it, a work not of much genius but of much art ”*) seems to imply that he was not very capable of appreciating it. But other motives, besides appreciation of the poet’s genius or sympathy with his doctrines, may have induced

1 Cf. Fortnightly Review, September 1878.

2 “While I seem to be ever busily plying this task, to be inquiring into the nature of things, and to be expounding my discoveries by writings in my native tongue.”

3The reading is so uncertain that it is doubtful whether it is the claim of genius or of art that Cicero refuses to concede. Some inter- pretations of the passage imply that he conceded both.

him to undertake a task which has not been very success- fully performed. It may be remarked further that scepticism as to statements about their lives is less warranted in the case of the great Roman than of the great Greek writers, from the fact that the work of criticism. went on at Rome contemporaneously with the progress of original creation, and that the line of gram- mariaus and commentators by whom these statements were transmitted continued unbroken almost from the first beginning of Latin literature.

We find in the instance of nearly all the other Latin poets, even of the most obscure among them, that their birthplace has been recorded, and it has often been remarked that Latin poetry was an Italian and provincial rather than a purely Roman product. From the absence of any claim on the part of any other district of Italy to the honour of having given birth to Lucretius it is inferred that he was an exception to the rule, and was of purely Roman origin. No writer certainly is more purely Roman in personal character and in strength of understanding. He seems to speak of Rome as his native state in such expressions as “ patriai tempore iniquo,” “ patrii sermonis egestas,” and “ patriis chartis.” His silence on the subject of Roman greatness and glory as contrasted with the prominence of these sub- jects in the poetry of men of provincial birth such as Ennius, Virgil, and Horace, may be explained by the principle that the familiarity of long-inherited traditions had made the subject one of less wonder and novelty to him. ‘The Lucretian gens to which he belonged was one of the oldest of the great Roman houses, nor do we hear of the name, as we do of other great family names, as being diffused over other parts of Italy, or as designating men of obscure or servile origin. It seems from the evidence of the name, confirmed by the tone in which he writes, as probable as any such inference can be that Lucretius was a member of the Roman aristocracy, belong- ing either to a senatorian or to one of the great equestrian families, living in easy circumstances, and familiar with the spectacle of luxury and artistic enjoyment which the great houses of Rome and the great country houses in the most beautiful parts of Italy presented. If the Roman aristocracy of his time had lost much of the virtue and of the governing qualities of their ancestors, they showed in the last years before the establishment of

monarchy a taste for intellectual culture which might have made Rome as great in literature asin arms and law, if the republic could have continued. Thediscussions which Cicero puts in the mouth of Velleius, Cotta, &c., indicate the new taste for philosophy developed among members of the governing class during the youth of Lucretius; and we hear of eminent Greek teachers of the Epicurean sect being settled at Rome at the same time, and living on terms of intimacy with them. The inference that Lucretius he- longed to this class, and shared in the liberal culture which it received, is confirmed by the tone in which he addresses Memmius, a man of an eminent senatorian family, and of considerable oratorical and poetical accom- plishment, to whom the poem is dedicated. His tone to Memmius is quite unlike that in which Virgil or even Horace addresses Meecenas. He addresses him as an equal; he expresses sympathy with the prominent part his friend played in public life, and admiration for his varied accomplishment, but on his own subject claims to speak to him in the tones of authority.

Although our conception of the poet's life and circum- stances 1s necessarily vague and meagre, yet his personal force is so remarkable and so vividly impressed on his poem, and his language bears so unmistakably the stamp of sincerity, that we seem able to form a consistent

idea of his tastes and habits, his sympathies and convic- tions, his moral and emotional nature. If we know nothing of the particular experience which determined his passionate adherence to the Epicurean creed and his attitude of spiritual and social isolation from the ordinary course of Roman life and belief, we can at least say that the choice of a contem- plative life was not the result of indifference to the fate of the world, or of any natural coldness or even calmness of temperament. In some of his most powerful poetry, as in the opening lines of the second and of the third books, we can mark the strong recoil of a humane and sensitive spirit from the horrors of the reign of terror which he witnessed in his youth, and from the anarchy and confusion which prevailed at Rome during the later years of his life ; while his vivid realization of the pains and disappointments of passion, of the unsatisfying nature of all violent emotion, and of the restlessness and

weariness of life which excessive luxury entails, suggest at least the inference that he had not been through his whole career so much estranged from the social life of his day as he seems to have been in his later years. Passages in his poem attest his familiarity with the pomp and luxury of city life, with the attractions of the public games, and with the pageantry of great military spectacles. But much the greater mass of the illustrations of his philosophy scattered through the poem indicate that, while engaged in its composition, and in the studies preparatory to it, he must have lived in the country or by the sea-shore, and that he must have passed much of his time in the open air, exercising at once the keen observa- tion of a naturalist and the contemplative vision of a poet. He shows a fellow feeling with the habits and moods of the animals associated with human toil and adventure. He seems to have found a pleasure, more congenial to thie modern than to the ancient temperament, in ascending mountains or wandering among their solitudes (vi. 469, iv. 575). References to companionship in these wanderings, and the well-known description of the charm of a rustic meal (ii. 29) enjoyed with comrades amid beautiful scenery and in fine weather, speak of kindly sociality rather than of any austere separation from his fellows. Other expressions in his poem (eg., iii. 10, &c.) imply that he was an ardent student of books, as well as a sympathetic observer of outward phenomena. Foremost among these were the writings of his master Epicurus ; but he had also an intimate knowledge and appreciation of the philosophical poem of Empedocles, and at least an acquaintance with the works of Democritus, Anaxagoras, Heraclitus, Plato, and the Stoical writers. Of other Greek prose writers he knew Thucydides and Hippocrates ; while of the poets he expresses in more than one passage the highest admiration of Homer, whom he has imitated in several places. Next to Homer Euripides is most frequently reproduced by him. There is an evident struggle between the impulses of his imaginative temperament, prompting him to recognize the supremacy of the great masters in art and poetry, and the influence of the teach- ing of Epicurus, in accordance with which the old poets and painters of Greece are condemned as the authors and propagators of false ideas both of nature and the gods. But his poetical sympathy was not limited to the poets of Greece. For his own countryman Ennius he expresses an affectionate admiration ; and he imitates his language, his rhythm, and his manner in many places. The fragments of the old tragedian Pacuvius and of the satirist Lucilius show that Lucretius had made use of their expressions

and materials. In his studies he was attracted by the older writers, both Greek and Roman, in whose masculine temperament and understanding he recognized an affinity with his own. He had a most enthusiastic admiration for genius, especially when exercised in the investiga:

tion and discovery of truth. His devotion to Epicurus seems at first sight more difficult to explain than his enthusiasm for Empedocles or Ennius. Probably he found in his calmness of temperament, in his natural or acquired indifference to all violent emotion, even in his want of imagination, a sense of rest and of exemption from the disturbing influences of life which the passionate heart of the poet denied himself; while in his physical philosophy he found both an answer to the questions which perplexed him and an inexhaustible stimulus to his intel- lectual curiosity. The combative energy, the sense of superiority, the spirit of satire, characteristic of him asa Roman, unite with his loyalty to Epicurus to render him not only polemical but intolerant and contemptuous in his tone toward the great antagonists of his system, the Stoics, whom, while constantly referring to them, he does not condescend even to name. With his admiration of the genius of others he combines a strong sense of his own power. He is quite conscious of the great importance and of the difficulty of his task; but he feels his own ability to cope with it. He has the keenest capacity for intel- lectual pleasure, and speaks of the constant charm which he found both in the collection of his materials and in the exercise of his art. If his mind was overstrained by the incessant devotion to his task of which he speaks, he allows no expression of fatigue or discouragement to escape from him. The ardour of study, the delight in contemplative thought, the “sweet love of the muses,” the “great hope of fame,” all combined to bear him buoyantly through all the difficulties and fatigues of his long and _ lonely adventure.

It is more difficult to infer the moral than the intellectual characteristics of a great writer from the personal impress left by him on his work. Yet it is not too much to say that there is no work in any literature that produces a profounder impression of sincerity. No writer shows a juster scorn of all mere rhetoric and exaggeration. This is one of the main causes of the spell

which the poem exercises over us. By no Stoic even could the doctrine of independence of the world, and of the superiority of simplicity over show and luxury, be more forcibly and consistently inculcated. No one shows truer courage, not marred by irreverence, in confronting the great problems of human destiny, or greater strength in triumphing over human weakness. No one shows a truer humanity and a more tender sympathy with natural sorrow. In reverence for the sanctities of human affection, Virgil alone is his equal, nor is it an unlikely surmise that it was to the power of this sentiment, and the influence which it had on his relation with others, that he owed the cognomen of “Carus”! or the “ beloved.”

The peculiarity of the poem of Lucretius, that which makes it unique in literature, is that it is a reasoned system of philosophy, written in verse. The subject was chosen and the method of exposition adopted, not primarily with the idea of moving and satisfying the imagination, but of communicating truth. The prosaic title De Rerum Natura, a translation of the Greek wept dicews, implies the subordination of the artistic to a speculative motive. As in the case of nearly all the great works of Roman literary genius, the form of the poem was borrowed from the Greeks. The rise of speculative philosophy in Greece was coincident with the beginning of prose composition, and many of the earliest philosophers gave their thoughts to the world in the prose of the Ionic dialect; others however, and especially the writers of the Greek colonies in Italy and Sicily, expounded their systems in continuous poems composed in the epic hexameter. These writers al

1 Cf. Martha, Le Poéme de Lucréce, p. 28.

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flourished in the beginning and first half of the 5th century B.c.,—the great awakening time of the intellectual, imaginative, and artistic faculties of the ancient world. The names most famous in connexion with this kind of poetry are those of Xenophanes and Parmenides, the Eleatics, and that of Empedocles of Agrigentum. The last was less important as a philosopher, but greater than the others both as a poet and a physicist. On both of these grounds he had a greater attraction to Lucretius. The fragments of the poem

of Empedocles show that the Roman poet regarded that work as his model. In accord- ance with this model he has given to his own poem the

form of a personal address, he has developed his argument

systematically, and has applied the sustained impetus of epic poetry to the treatment of some of the driest and abstrusest topics. Many ideas and expressions of the Sicilian have been reproduced by the Roman poet; and the same tone of impassioned solemnity and melancholy seems to have pervaded both works. But Lucretius, if less original as a thinker, was probably a much greater poet than Empedocles. With the speculative enthusiasm of the Greeks he combines, in a remarkable measure, the Italian susceptibility to the charm of nature, and the greater humanity of feeling which belongs to a more advanced stage of human history. But what chiefly distinguishes him from his Greek prototypes is that his purpose is rather ethical than purely speculative. He shares with them the delight in inquiry and discovery ; but the zeal of a teacher and reformer is more strong in him than even the intel- lectual passion of a thinker. His speculative ideas, his moral teaching, and his poetical power are indeed inter- dependent on one another, and this interdependence is what mainly constitutes their power and interest. But of the three claims which he makes to immortality,— '** Primum quod magnis doceo de rebus, et artis Religionum animum nodis exsolvere pergo,

Deinde quod obscura de re tam lucida pango Carmina muszo contingens cuncta lepore,—''?

that which he himself regarded as supreme was the second, —the claim of a liberator of the human spirit from the cramping bonds of superstition.

This purpose is announced by him over and over again, as for instance at the beginning of the argument in the first, second, third, and sixth books. The main idea of the poem is the irreconcilable opposition between the truth of the laws of nature and the falsehood of the old superstitions, But it is not merely by the intellectual opposition between truth and falsehood that he is moved. The happiness and the dignity of life are regarded by him as absolutely dependent on the acceptance of the true and the rejection of the false doctrine. The ground of his extravagant eulogies of Epicurus is that he

recognized in him the first great champion in the war of liberation, and in his system of philosophy he believed that he had found the weapons by which this war could be most effectually waged. Follow- ing in his footsteps, he sets before himself the aim of finally crushing that fear of the gods and that fear of death resulting from it which he regards as the source of all the human ills. Incidentally he desires also to purify the heart from other violent passions which corrupt it and mar its peace. But the source even of these—the passions of ambition and avarice—he finds in the fear of death; and that fear he resolves into the fear of eternal punishment after death.

The selection of his subject and the order in which it is treated are determined by this motive. Although the title

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2 “ First, by reason of the greatness of my argument, and my pur- pose to set free the mind from the close-drawn bonds of superstitions 5 next, because on so dark a theme I write such lucid verse, casting over all the charm of poesy.”

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of the poem implies that it is a treatise on the “ whole nature of things,” the aim of Lucretius is not to treat exhaustively the whole of natural sctence, recognized in the Epicurean system, but only those branches of it which are necessary to clear the mind from the fear of the gods and the terrors of afuture state. In the two earliest books, accordingly, he lays down and largely illustrates the first principles of being with the view of showing that the world is not governed by capricious agency, but has come into existence, continues in existence, and will ultimately pass away in accordance with the primary couditions of thie elemental atoms which, along with empty space, are the only eternal and immutable substances. These atoms are themselves infinite in number but limited in their varieties, and by their ceaseless movement and combinations during infinite time and through infinite space the whole process of creation is maintained. In the

third book he applies the principles of the atomic philosophy to explain the nature of the mind and vital principle, with the view of showing that the soul perishes with the body. In the fourth book he discusses the Epicurean doctrine of the «“ simulacra,” or images, which are cast from all bodies, and which act either on the senses or immediately on the mind, in dreams or waking visions, as affording the explanation of the belief in the continued existence of the spirits of the departed. ‘he fifth book, which has the most general interest, professes to explain the process by which the earth, the sea, the sky, the sun, moon, and stars, were formed, the origin of life, and the gradual advance of man from the most savage to the most civilized condition. All these topics are treated with the view of showing that the world is not itself divine nor directed by divine agency. The sixth book is devoted to the explanation, in accordance with natural causes, of some of the more abnormal phenomena, such as thunderstorms, volcanoes, earthquakes, &c,, which are special causes of supernatural terrors.

It would be impossible, within the limits of this article, to give any detailed account or criticism of an argument which is carried on, with the interruption only of occasional episodes, in which the moral teaching of the poet is enforced, through a poem extending to between six and seven thousand lines, Readers who are especially inter- ested in the science of Lucretius will find the subject clearly treated in chapter v. of Lange’s History of Materval- ism. The consecutive study of the argument produces on most readers a mixed feeling of dissatisfaction and admiration. They are repelled by the dryness of much of the matter, the unsuitableness of many of the topics dis- cussed for poetic treatment, the arbitrary assumption of premisses, the entire failure to establish the connexion between the concrete phenomena which the author pro- fesses to explain and these assumptions, and the errone- ousness of many of the doctrines which are stated with dogmatic confidence. On the other hand they are con- stantly impressed by his poWer of reasoning both de- ductively and inductively, by the subtlety and fertility of invention with which he applies analogies, by the clear- ness and keenness of his observation, by the fulness of matter with which his mind is stored, and by the cousecu- tive force, the precision, and distinctness of his style, when employed in the processes of scientific exposition. The first two books enable us better than anything else in ancient literature to appreciate the boldness and, on the whole, the

reasonableness of the ancient mind in forming hypotheses on great matters that still baffle the investiga- tions of science. The third and fourth books give evidence of acuteness in psychological analysis ; the fourth and sixth of the most active and varied observation of natural pheno- mena; the fifth of original insight and strong common sense in conceiving the origin of society and the progressive

advance of man to civilization. But the chief value of Lucretius as a thinker lies in his firm grasp of speculative ideas, and in his application of them to the interpretation of human life and nature. It is in this application that the most powerful interest of his poetry lies. All pheno- mena, moral as well as material, are contemplated by him in their relation to one great organic whole, which he acknowledges under the name of ‘“‘ Natura dzedala rerum,” and the most beneficent manifestations of which he seenis to symbolize and almost to deify in the “ Alma Venus,” whom, in apparent contradiction to his denial of a divine interference with human affairs, he invokes with prayer in the opening lines of the poem. In this conception of nature are united the conceptions of law and order, of ever-changing life and interdependence, of immensity, individuality, and all-pervading subtlety, under which the universe is apprehended both by his intelligence and his imagination.

Nothing can be more unlike the religious and moral attitude of Lucretius than the old popular conception of him as an atheist and a preacher of the doctrine of pleasure. It is true that he denies the two bases of all religion, the doctrines of a supernatural government of the world and of a future life. But his arguments against the first are really only valid against the limited and unworthy concep- tions of divine agency involved in the ancient religions ; his denial of the second is prompted by his vivid realization of all that is meant by the arbitrary infliction of eternal torment after death. His war with the popular beliefs of his time is waged, not in the interests of licence, but in vindication of the sanctity of human feeling. The great and cardinal line of the poem,

‘«¢Tantum religio potuit suadere malorum,”

is elicited from him as his protest against the wicked and impious sacrifice of Iphigenia by the hand of her father. But in his very denial of a cruel, limited, and capricious agency of the gods, and in his imaginative recognition of an orderly, all-pervading, all-regulating power,—+the " Natura deedala rerum,"—we find at least a nearer approach to the higher conceptions of modern theism than in any of the other imaginative conceptions of ancient poetry and art, unless we include the hymn of Cleauthes among the utter- ances of poets. But his conception even of the ancient gods and of their indirect influence on human life is more worthy than the popular one. They are conceived of by him as living a life of eternal peace and exemption from passion, in a world of their own ; and the highest ideal of man is, through the exercise of his reason, to realize an image of this life, "' Ut nil impediat dignam dis degere vitam." Although they are conceived of as unconcerned with the interests of our world, yet influences are supposed to emanate from them which the human heart is capable of receiving and assimilating. The effect of unworthy conceptions of the divine nature is that they render a man incapable of visiting the temples of the gods in a calm spirit, or of receiving the emanations "divins: nuntia pacis" in peace- ful tranquillity. '' Nec delubra deum placido cum pectore adibis, Nec de corpore que sancto simulacra feruntur In mentis hominum divine nuntia pacis Suscipere hac animi tranquilla pace valebis." * It is in no iconoclastic spirit that he regards even the temples and solemn rites of the gods, except when he finds the acts of worship tainted with ''the foul stain of super-

1 " Nor wilt thou approach the temples of the gods with a calm spirit, nor wilt thou be able, in tranquil peace of heart, to receive those images which are borne from their holy bodies into the minds of men, carrying tidings of the divine peace "' (vi. 75-78).

stition." Thus he describes with a grave solemnity of feeling the procession of the image of Cybcle through the cities of men, and acknowledges the bencficent influence of the truths symbolized by that procession. The supposed "athcism" of Lucretius proceeds from a more dceply reverential spirit than that of the majority of professcd believers in all times.

His moral attitude is also far removed from that either of ordinary ancient Epicureanism or ordinary moderu materialism. Though he acknowledges pleasure to be the law of life,—‘ dux vite: dia voluptas,”—yet he is far from regarding its attainment as the end of life. What man needs is not enjoyment, but “peace and a pure heart.”

‘¢ At bene non poterat sine puro pectore vivi.”

The victory to be won by man is the trinmph over fear, ainbition, passion, luxury. With the conquest over these nature herself supplies all that is needed for happiness. Self-control and renunciation are the lessons which he preaches with as much fervour and as real conviction as any of the preachers of Stoicism. ‘‘ Great riches consist in living plainly with a contented spirit ”—

‘* Divitise grandes homini sunt vivere parce AEquo animo.”

As was mentioned above, it is uncertain whether the short criticism of Cicero (‘ Lucretii poemata,” dc.) con- cedes to Lucretius the gifts of genius or the accomplishment of art. Readers of a later time, who could compare his work with the finished works of the Augustan age, would, if they refused his claim to the full possession of the two necessary constituents of the greatest poets, have certainly disparaged his art rather than his power. But with Cicero it was different. He greatly admired, or professed to adinire, the genius of the early Roman poets, while he shows that indifference to the poetical genius of his younger contemporaries which men who have formed their taste for poetry in youth, and whose own intellectual interests have been practical and political, often do to the new ideas and new modes of feeling which an original poet brings into the world. On the other hand, as one who had himself written many verses in his youth, and as one of the greatest masters of style who have ever lived, he could not have been insensible to the immense superiority in rhythmical

smoothness which the hexameter of Lucretius has over that |

of Ennius and Lucilius. And no reader of Lucretius can doubt that he attached the greatest importance to artistic execution, and that he took a great pleasure, not only in propelling “the long roll of his hexameter” to its

culmi- nating break at the conclusion of some weighty paragraph, but also in producing the effects of alliteration, assonance, &c., which are so marked a peculiarity in the style of Plautus and the earlier Roman poets. He allows his taste for these tricks of style, which, when used with moderation by writers of a more finished sense of art such as Virgil and even Terence, have the happiest effect, to degenerate into mannerism. And this is the only drawback to the impression of absolute spontaneity which his style produces. But those who recognize in him one of the most powerful and original poetical forces which have appeared in the world feel, when they compare him with the greatest poets of all times, that he was unfortunate in living before the natural rudeness of Latin art—the “traces of the country,” which continued to linger “in rude Latium ” down to the time of Horace—had been successfully grappled with. His only important precursors in serious poetry were Ennius and Lucilius, and, though he derived from the first of these an impulse to shape the Latin tongue into a fitting vehicle for the expression of elevated emotion and imagina- tive conception, he could find in neither a guide to follow in the task he set before himself. He had thus, in a great

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measure, to discover the way for himsclf, and to act as the pioncer to thuse who came after him. ‘The difficulty and novelty of his task enhances our sense of his power. His finest passages are thus characterized by a freshness of feeling and enthusiasm of discovery, as of one ascending, alone and for the first time, the ‘ pathless heiglits of the Muses.”! But the result of these conditions and of his own inadequate conception of the proper limits of his art is that more than in the case of any other work of genius his best poetry is clogged with a great mass of alien matter, which no treatment in the world could have made poetically endurable. If the distinction suggested by a brilliant living poet and critic between the Titans and the Olympians of literature be a valid one, it is among the former certainly that Lucretius is to be classed.

The genius of Lucretius, as of all the greatest pocts, does not reveal itself as any mere isolated or exceptional faculty, but as the impassioned and

imaginative movement of his whole moral and intellectual being. It is the force through which the sincerity and simplicity, the reverence, the courage, the whole heart of the man have found an outlet forthemselves. It is also the force from which both his speculative and his observant faculty derive their most potent impulse. His poetical style is as simple, sensuous, and passionate as that of the poets who reproduce only the immediate appearances and impressions of the world of nature aud of human feeling. But it assumes a more majestic and elevated tone from the recognition of the truth that the beauty of the world, the unceasing life and movement in nature, the destructive as well as the bene- ficent forces of the elements, the whole wonder and pathos of human existence, are themselves manifestatious of secret invisible agencies and of eternal and immutable laws.

The fullest account of the MSS. and of the various editions of Lucretius, and of the influence which he exercised on the latcr poets of Rome, is to be found in the introductions to the critical and explanatory notes of Mr Munro's edition of the poct, a work recog- nized as the most important contribution to Latin scholarship made in England during the present century. For scholars that edition contains all that is needed for the full understanding of the author. For those who are not classical scholars, the work of C. Martha, Lc Poéme de Luecréce, may be recommended, as containing an interesting and eloquent estimate of the genius of the poet, and of his moral, religious, and scientific position. Among recent English works on the author, an essay, by Professor Veitch, and one by Mr J. A. Symonds, are especially good. The subject is also discussed at length in chaps. xi.-xiv. of the Roman Poets of the Republic, by Professor Sellar. (WV. YS:)

LUCULLUS. The Luculli appear in Roman history snortly after the close of the second Punic war. They belonged to the Licinian ‘‘ gens,” a plebeian house which became noted for its special ability in amassing wealth. By far the most famous of its members was Lucius Licinius Lucullus, surnamed Ponticus from his victorious campaigns in Asia Minor against one of the most formidable enemies Rome ever encountered, the great Mithridates, king of Pontus. His father had held an important military com- mand in Sicily, but on his return to Rome he was considered to have acquitted

himself so discreditably that he was pro- secuted on a charge of bribery and corrupt practices, and was coudemned to exile. His mother was Cecilia, of the family of the Metelli, and was the sister of the distinguished Metellus Numidicus. The career of Lucullus coincides with the first half of the lst century B.c. It appears that he was rather senior to Pompey, who was born in 106 Bo. We hear of him when quite a young man as making a determined though unsuccessful attempt to avenge his father's downfall on the author of the prosecution, and this won him credit and popularity. Early in life he attached himself to the party of Sulla, and to that party

1 « Avia Pieridum peragro loca, nullius ante Trita solo."

he remained constant to his life's end. Sulla's favourable notice was secured by good military service in the so-called Social War, which finally completed the subjugation of Romie's Italian allies and in fact of the whole peninsula. In 88 B.c. came the great Mithridatic war in the Kast, with the direction of which Sulla was charged. In that year the young Lucullus went with him as his quzstor to Greece and Asia Minor, and, while Sulla was besieging Athens, he raised a fleet and drove Mithridates out of the Mediterranean. He won a brilliant victory off Tenedos, and it seems probable that, had he been as faithful to Rome as he was to Sulla and his party, he might have ended a perilous war. But, like many of his contemporaries, Lucullus was too much of a party man to be a genuine patriot.

In 84 B.c. peace was concluded with Mithridates, and the great king had to cede the Greek islands and a large part of his Asiatic possessions, and was practically reduced to the position of a mere Roman dependant. Sulla returned to Rome, while Lucullus remained in Asia, and by a series of wise and generous financial reforms laid the foundation of the future wealth and prosperity of the province. The result of his policy was that he stood particularly well with the provincials, but unfortunately for himself made a host of enemies among the powerful class which farmed the public revenue. He was in Asia till 80 Bc, and then returned to Rome as curule edile, in which capacity he exhibited together with his colleague, his brother Marcus, games which were long remembered by the citizens of Rome for

their exceptional magnificence. We may infer that thus early in life he had found the means of acquiring an immense fortune, which throughout his whole career it was his delight lavishly to display. Soon afterwards he was elected praetor, and was next appointed to the pro- vince of Africa, where again he won a good name as a just and considerate governor. In the year 74 B.c. he became consul, with Aurelius Cotta as his colleague. An attempt was made at this time by a leader of the democratic party to repeal the legislation of Sulla, and its failure appears to have been mainly due to the strenuous efforts of Lucullus.

The East was now again unsettled, and Bithynia, which had been bequeathed to Rome by its king Nicomedes, was threatened by Mithridates. The new province with the cominand of the fleet fell to Cotta, but Lucullus was called to lead the armies of Rome against this dangerous enemy. In 74 B.c. he was in Asia at the head of a force of about 30,000 foot and 2000 horse. The king of Pontus was already on Roman ground in Bithynia, and Cotta was shut up in Chalcedon on the Propontis by a vast host of 150,000 men. The enemy's fleet had forced its way into the harbour, and had burnt all the Roman vessels lying at anchor. The advance of Lucullus, however, forced the king to raise the siege and retire along the sea-coast, till he halted before the strong city of Cyzicus, the key of Asia, as it was called, built on an island at a little distance from the mainland, with which it was connected by a bridge. All the attempts of Mithridates on the place were foiled by a gallant defence, and it was not long before Lucullus took up a threatening position in the rear of his army, which cut off all his land communications and left him only master of the sea. Bad weather and violent storms and scant supplies soon drove the king from the walls of Cyzicus, and his vast army was dispersed without having had the chance of fighting a single pitched battle. His fleet too, which as yet had had the command of the /Egean, was soon afterwards destroyed by Lucullus, and thus his whole power for offensive warfare had completely collapsed. He himself withdrew into his own proper territory, and all that the Roman general had to fear was that he might bafile pursuit by a flight eastward into the

remote wilds of Armenia. However, in the autumn of 73 B.c., Lucullus pushed into the heart of Pontus far beyond the Halys, the limit of the famous Scipio's advance east- ward, and continued his onward march, regardless of the murmurs of his weary soldiery, to Cabeira or Neoceesarea (now Niksar), where the king had gone into winter quarters with a vague hope that his son-in-law, Tigranes, the powerful king of Armenia, and possibly even the Parthians, might, for their own sakes, come to his aid against a common foe. It was by a very toilsome march through difficult roads that the Roman army at last reached Cabeira, to find themselves confronted by a greatly superior force. But the troops of Mithridates were no more a match for the Roman legionaries than were the Persians for Alexander, and a large detachment of his army was decisively cut up by one of Lucullus's lieutenant-generals. The king decided on instant retreat, but the retreat soon became a disorderly flight, and Lucullus, seizing the moment for attack, annihilated his enemy, Mithridates himself escaping with difficulty over the mountain range between Pontus and Cappadocia into Lesser Armenia. He found a sort of refuge in the dominions of Tigranes, but he was in fact detained as a prisoner rather than received as an honoured friend and ally.

Pontus thus, with the exception of some of the maritime cities, such as Sinope, Heraclea, and Amisus, which still clung to the king under whom they had enjoyed a free Greek constitution, became Roman territory. Two years were occupied in the siege and capture of these strongholds, while Lucullus busied himself with a general reform of the administration of the province of Asia. His next step was to demand the surrender of Mithridates and to threaten Tigranes with war in the event of refusal. He had indeed no direct authority from the home government to attempt the conquest of Armenia, but he may well have supposed that in invading the country he would be following out Sulla's policy, and securing Rome in the East from a serious danger. Nor was it unnatural that there should be a fascination in the idea of winning renown in the distant and almost unknown regions beyond the Euphrates. In the spring of the year 69 B.c., at the head of only two legions, which, it appears, by no means liked the hardships of the expedition, he marched through Sophene, the south- western portion of Armenia, crossed the Tigris, and pushed on to the newly-built royal city, Tigranocerta, situated on one of the affluents of that river. A motley host,

made up out of the tribes bordering on the Black Sea and the Caspian, hovered round his small army, but failed to hinder him from laying siege to the town. On this occasion Lucullus showed consummate military capacity, contriving to maintain the siege and at the same time to give battle to the enemy with a force which must have been inferior in the ratio of something like one to twenty. According to his own account he put the Armenians to rout with a loss of five Roman soldiers, leaving 100,000 dead on the field of battle. The victory before the walls of Tigranocerta was undoubtedly a very glorious one for the arms of Rome, and it resulted in the dissolution of the Armenian king's extensive empire. There might now have been peace but for the interference of Mithridates, who for his own sake pressed Tigranes to renew the war and to seek the aid and alliance of Parthia. The Parthian king, how- ever, was disposed to prefer a treaty with Rome to a treaty with Armenia, and desired simply to have the Euphrates recognized as his western boundary. Mithridates next appealed to the national spirit of the peoples of the East generally, and endeavoured to rouse them to a united effort against Roman aggression. He hoped to crush his enemy amid the mountains of Armenia, and indeed the position of Lucullus was highly critical. The home government

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was for recalling him, and seemed to think little of his splendid successes ; and his little army, which one might have been supposed would have been proud of their general, was on the verge of mutiny. One can hardly understand how under such circumstances Lucullus should have per- sisted in marching his men northwards from Tigranocerta over the high table-land of central Armenia, with the enemy's cavalry aud innumerable mounted archers hanging on his columns, in the hope of reaching the distant Artaxata on the Araxes. The vexation of his troops broke out into an open mutiny, which compelled him to recross the Tigris into the Mesopotamian valley. Here, on a dark tem- pestuous night, he surprised and stormed Nisibis, the capital of the Armenian district of Mesopotamia, and in this city, which yielded him a rich booty, he found satis- factory winter quarters.

Meantime Mithridates was again in Pontus, and the Roman forces which had been left there were soon over- whelmed. In one disastrous engagement

at Ziela the Roman camp was taken and the army slaughtered to a man. lLucullus was still thwarted by the mutinous spirit of his troops, and after all his brilliant achievements he was obliged to pursue his retreat into Asia Minor with the full knowledge that Tigranes and Mithridates were the unresisted masters of Pontus and Cappadocia. The work of eight years of war was undone. Commissioners sent from Rome to settle the affairs of the East had to report to the senate that a large part of Asia Minor was in the enemy's hands. In the year 66 B.c. Lucullus was recalled, and superseded in his command by Pompey.

He had indeed fairly earned by his brilliant victories the honour of a triumph, but he had powerful enemies at Rome, and charges of maladministration, to which no doubt his imniense wealth gave no unreasonable colour, caused it to be deferred for three years. In 63 B.c., however, it was celebrated with extraordinary magnificence. By this time Lucullus seems to have felt that he had done his work. He had little taste for the increasingly turbulent political contests of the time, and, with the exception of occasional appearances in public life, he gave himself up to elegant luxury, with which, however, he combined a sort of dilettante pursuit of philosophy, literature, and art. Cicero, who was on terms of close intimacy with him, always speaks of him with enthusiasm and in terms of the highest praise. Lucullus is with him a v7 fortissimus et clarissimus, and a man too of the highest and most refined intellectual culture. As a provincial governor, in his humane consideration for the conquered and his statesmanlike discernment of what was best suited to their circumstances, he was a man after Cicero's own heart. In this respect he reminds us of the younger Pliny. Very possibly Cicero may have spoken too flatteringly of him, but we cannot think his praise was altogether undeserved.

As a soldier, considering what he achieved and the victories he won with but small forces under peculiarly unfavourable conditions, he must have been a man of no ordinary capacity. It is true that he does not seem to have had the confidence of his troops to the extent to which a great general ought to possess it, and it is just possible that he may have erred on the side of an excessive aristocratic hauteur, which to his men may have looked like a selfish indifference to their hardships. Butit is also possible that out of a strict regard to the lives and property of the provincials he may have been

too strict a discipli- narian for the taste of the soldiers. Some of his unpopu- larity, it is pretty certain, was due to the restraints which he had put on the rapacity of the capitalists, who thought themselves aggrieved if they could not make rapid and enormous fortunes by farming the revenue of the rich pro- vinces of the East. We can hardly doubt that with very

decided aristocratic feeling and thorough devotion to his political party Lucullus combined much generous upright- ness and kindliness of heart.

‘ His name calls up before the mind visions of boundless luxury and magnificence, and among the Roman nobles who revelled in the newly acquired riches of the East Lucullus, it is certain, stood pre-eminent. His park and pleasure grounds in the immediate vicinity of the capital were the wonder and admiration of his own and of the succeeding age. Pompey is said to have styled him the Roman Xerxes, in allusion, not only to his splendour, but also to the costly and laborious works to be seen in his parks and villas at Tusculum, near Naples, where rocks and hills had been pierced at an almost infinite expense. On one of his luxurious entertainments he is said to have spent upwards of £2000. Far the most pleasing trait in his character is the liberal patronage which he gave more especially to Greek philosophers and men of letters, and the fact that he collected a vast and valuable library, to which such men had free access. On the whole we may take Lucullus to have been a man who in many respects rose above his age, and was a decidedly favourable speci- men of a great Roman noble.

Of his latter years but little is recorded. He had, as we have seen, almost wholly retired from public life. It appears that he sank into a condition of mental feebleness and imbecility some years before his death, and was obliged to surrender the management of his affairs to his brother Marcus. The usual funeral panegyric was pronounced on him in the Forum, and the people would have had him buried by the side of the great Sulla in the Campus Martius, but he was laid at his brother’s special request in his splendid villa at Tusculum.

The best account of Lucullus’s campaign in the East is to be found in Momnisen’s History of Rome, bk. v. chap. 2. Our knowledge of him is

drawn mainly from Plutarch, Appian's AMithridatic War, the epitomes of the lost books of Livy, and very frequent allusions to him in Cicero's works. (W. J. B.)

LUDDITES, Tue, were organized bands of rioters for the destruction of machinery, who made their first ap- pearance in Nottingham and the neighbouring midland districts of England about the end of 1811. The origin of the name is curious, and is given as follows in the Life of Lord Sidmouth (vol. ili. p. 80). In 1779 there lived in a village in Leicestershire a person of weak intellect, called Ned Lud, who was the butt of the boys of the village. On one occasion Lud pursued one of his tormentors into a house where were two of the frames used in the stocking manufacture, and, not being able to catch the boy, vented his anger on the frames. Afterwards, when- ever any frames were broken, it became a common saying that Lud had done it. It is curiousalso that the leader of the riotous bands took the name of General Lud. The Luddite riots arose out of the severe distress caused by commercial depression and the consequent want of employ- ment. They were specially directed against machinery because of the widespread prejudice that its use directly operated in producing a scarcity of labour. Apart from the prejudice, it was inevitable that the economic and social revolution implied in the change from manual work to work by machinery should give rise to great misery by upsetting all the old industrial habits and arrangements. The riots began at Nottingham, in November 1811, with the destruction of stocking and lace frames, and, continu- ing through the winter and following spring, spread into Yorkshire and Lancashire. They were met by severe repressive legislation,—a notable feature in the opposition to it being Lord Byron's speech in the House of Lords, the first which he delivered there. In 1816 the rioting was resumed, through the fearful depression that followed on the European peace, aggravated by one of the worst of

recorded harvests, when wheat rose from 52s. 6d. to 103s. a quarter (in Yorkshire it was more than a guinea a bushel), when the corn was still green in October, and the potato crop was a failure. In that year, though the centre

of the rioting was again in N ottingham, it extended over almost the whole kingdom, and took more decidedly the form of a general discontent and seditious restlessness. The rioters were also thoroughly organized. While part of the band with extraordinary quickness and thoroughness destroyed the machinery in the houses, sentinels were posted to give warning of the approach of the military and police ; and all had generally disappeared before the least risk of discovery. Under the influence of vigorous re-pressive measures, and especially of reviving prosperity, the spirit of rioting ere long died out.

See the Annual Register for the years concerned ; Life of Lord Sidmouth, by the Hon. George Pellew, dean of N orwich, vol. iii. ; and Spencer Walpole, History of England, vol. i.

LUDHIANA, a district in the lieutenant-governorship of the Punjab, India, lying between 30° 33’ and 31° 1’ N. lat. and between 75° 24’ 30” and 76° 27’ E. long., is bounded on the N. by the Sutlej river, on the E. by Umballa (Ambala) district, on the S. by Patiala, NAbha, and Maler Kotla states, and on the W. by Firozpur district. The surface of Ludhiana consists for the most part of a broad plain, without hills or rivers, and stretching north- ward from the native borders to the ancient bed of the Sutlej. The soil is composed of a rich clay, broken by large patches of shifting sand. On the eastern edge, towards Umballa, the soil improves greatly, the clay being here surmounted by a bed of rich mould, suitable for the cultivation of cotton and sugar-cane. Towards the west the sand occurs in union with the superficial clay, and forms a light friable soil, on which cereals form the most profitable crop. Even here, however, the earth is so retentive of moisture that good harvests are reaped from fields which appear to the eye mere stretches of dry and sandy waste, but are covered, after the autumn rains, by waving sheets of wheat and millet. These southern uplands descend to the valley of the Sutlej by an abrupt terrace, which marks the former bed of the river. The principal stream has now shifted to the opposite side of the valley, leaving a broad alluvial strip, 10 miles in width, between its ancient and its modern bed. The Sutlej itself is here only navigable for boats of small burden. A branch of the Sirhind Canal, now in course of construction, will irrigate a large part of the western pargands. At present

irrigation is almost entirely confined to wells. The district is singularly bare of trees.

The census of 1868 returncd a total population of 583,245 persons (319,342 males and 263,903 females), spread over an area of 1359 square miles, inhabiting 879 villages and towns, and 151,934 houses. Hindus numbered 219,371; Mohamniedans, 206,603; Sikhs, 95,463 ; and “others,” 61,858. In ethnical classification the Jats rank first, both in number (205,304) and in agricultural importance ; they form one-third of the total population, and nearly two-thirds of the cultivating class. The Gujars come next with 30,009 persons. Rajputs number 23,961, and cluster thickly in the fertile strip along the bank of the Sutlej. Though they hold the richest portion of the district, they are but careless and improvident cultivators. Brahmans number 21,165, but their social importance is small, and they own but asingle village. The mercantile classes are repre- sented by 15,251 Kshattriyas and 8174 Banias. There are also 5549 Kashmiris, employed in weaving shawls and woollen goods. Four towns were returned in 1868 as containing upwards of 5000 inhabitants, viz., Ludhiana, 39,983 ; Raikot, 9165 ; Jagrdon, 7096 ; and Machiwara, 6062. Ludhiana is a flourishing agricultural dis- trict in spite of the general unpromising appearance of its soil, a result mainly attributable to the untiring diligence of its Jat culti- vators. Almost all the available land has been brought under the plough, and in many villages no waste land is left for pasturage, the cattle being fed from cultivated produce. Under rabtor spring crops there were in 1872-73 198,279 acres of wheat, 30,620 of barley, 162,649 of gram, and 576 of poppy. The kharif or rain crops comprised 129,589 acres of jodr, 49,047 of Indian corn, 55,293 of

moth, and 15,894 of cotton.

In spite of their industrious habits, many of the peasantry are deeply in debt, and the rate of interest is high. Most of the land is held by tenants-at-will. Agricultural labourers are paid in grain; in the towns, unskilled labour is paid at the rate of from 3d. to 44d. perdiem. Ludhiana is comparatively free

from danger of actual famine, though it suffers much from drought. The exports, of which the annual value is estimated at £377,120, are chiefly confined to grain, cotton, wool, saltpetre, and indigo ; the principal imports (£365,552) are English goods, spices, and red madder dye. Manufactures include shawls, pashmina cloth, stockings, gloves, cotton goods, furniture, carriages, and fire- arms. Eight large silk factories and upwards of four hundred private silk-looms give employment to over three thousand persons. Com- munication is afforded by the Sind, Punjab, and Delhi Railway, which runs through the centre of the district, and by several lines of good metalled roads.

The administrative staff of the district comprises a deputy com- missioner, with an assistant and two extra assistants, a small-cause court judge, and three tahstlddrs, besides the usual medical and con- stabulary officers. The total revenue in 1872-73 was £108,795, of which £85,215 was contributed by the land tax. Education in 1878 was afforded by 184 schools, of which 68 were in receipt of Government grants in aid; the total number of enrolled pupils was 6733. Inthe upland portion of the district the atmosphere is dry and healthy; in the Sutlej valley, however, the air is extremely noxious after the rainy scason floods, and fever prevails often in an epidemic form; ophthalmia is also common. The mean temperature in 1872 was 87°°59 Fahr. in May, 85°°67 in July, and 54°°85 in December, the maximum being 117°, and the niini- mum 81°. The average annual rainfall is 28 inches.

History.—Though the present town of Ludhiana dates no farther back than the 15th century, other cities in the district can claim a much greater antiquity. At Sunet, close to the modern station, are ruins of an extensive brick-built town, whose greatness had already passed away before the period of Mohammedan invasion ; and the old Hindu city of Machiwara is of still earlier date, being mentioned in the Mahkdbhdrata. During the Mussulman epoch, the history of the district is bound up with that of the Rais of Raikot, a family of converted Rajputs, who received the country as a fief under the Sayyid dynasty, about the year 1445. The town of Ludhiana was founded in 1480 by two of the Lodi race (then ruling at Delhi), from whom it derives its name, and was built in great part from the prehistoric bricks of Sunet. The Lodis continued in possession until 1620, when it again fell into the hands of the Rais of Raikot. Throughout the palmy days

of the Mughal empire the Réikot family held sway, but the Sikhs took advantage of the troubled period which accompanied the Mughal decadence to estab- lish their supremacy south of the Sutlej. Several of their chieftains made encroachments on the domains of the Rais, who were only able to hold thcir own by the aid of George Thomas, the famous adventurer of Haridna. In 1806 Ranjit Sinh crossed the Sutlej and reduced the obstinate Mohammedan family, and distributed their territory amongst his own co-religionists. Since the British occupa- tion of the Punjab Ludhiana has grown in wealth and population, but its history has been uneventful.

LupHIANA, the chief town and headquarters station of Ludhiana district, is situated on the south bank of the old bed of the Sutlej, 8 miles from the present bed of the river, in 30° 55’ 25” N. lat. and 75° 53’ 30” E. long. The population in 1868 was 39,983, viz., Mohammedans, 27,860; Hindus, 10,208; Sikhs, 45; Christians, 79 ; “others,” 1791. The Kashmiris retain their hereditary skill as weavers of shawls and pashmina cloth, the value of the quantity exported in 1871-72 being retumed at £13,350. Shawls of the soft Rampur wool, cotton cloths, scarfs, turbans, furniture, and carriages also form large items in the thriving trade of the town. Since the open- ing of the railway Ludhiana has become a great central grain mart, having extensive export transactions both with the north and south. The American Presbyterian Mission has a church and school, with a small colony of native Christians. The town bears a bad reputation for un- healthiness.

LUDLOW, a municipal and parliamentary borough and market-town of Shropshire, England, is situated at the junction of the Teme and Corve on the borders of Here- fordshire, 27 miles south-east from Shrewsbury and 10 north from Leominster. The old castle, on an eminence above the Teme, presents an imposing and massive appearance, the Norman towers and the greater part of the walls being

still complete. The parish church of St Lawrence, a fine cruciform structure in the Gothic style, with a lofty central tower, dates from the reign of Edward III.; it was restored in 1859-60. The grammar school, founded in the reign of John, was incorporated by Edward IL. The other principal public buildings are the guild-hall, the town-hall and market-house, and the public rooms, which include the assembly-rooms and a museum of natural history. Tanning and malting are carried on to a small extent, and there are also flour-mills. The population of the municipal borough (280 acres) in 1871 was 5087, and in 1881 5035. The population of the parliamentary borough (1371 acres) in the same years was 6203 and 6663.

Ludlow is said to have cxisted as a British town under the name of Dinan. After the Conquest it was granted to Roger de Montgomery, who is said to have been the founder of the castle. For some time the castle was a royal residence, and from the reign of Henry VIII. to that of William III. it was the seat of the council of the marches. Inthe reign of Charles I. it was garrisoned for the king, but it surrendered to the parliamentary forces in June 1646. The town had a charter of ineorporation at a very early period, which was confirmed by Edward IV-

LUDLOW, Epmunp (1620-1693), was born at Maiden Bradley, Wiltshire, in 1620, of an ancient and honourable family. He studied at Trinity College, Oxford (where he took his B.A. degree in 1636), and at the Temple. When the war broke out he engaged as a volunteer in the life guard of Lord Essex, consisting of one hundred gentlemen. His first essay in arms was at Worcester, his next at Edge- hill. He was made governor of Wardour Castle in 1643, which place he surrendered on honourable terms after ten months' siege. On being exchanged soon afterwards, he engaged as major of Sir A. Haslerig's regiment of horse, in which capacity he did good service in the western counties. He was present at the second battle of New- bury, October 1644. In 1645 he was elected M.P. for Wilts in the room of his father Sir Henry Ludlow, and attached himself inflexibly to the republican party. In 1648 he was one of a committee of six who arranged the violent action known as Pride's Purge. He was one of the king's judges, and put his hand to the warrant for his execution. In January 1651 Ludlow was sent into Ireland as lieutenant-general of horse, holding also a civil com- mission.

Here he spared neither health nor money in the public service. TIreton, the deputy of Ireland, died 27th November 1651, and for six months Ludlow held the chief place, which he then resigned to Fleetwood. Though disapproving of Cromwell's action in dissolving the Long Parliament, he maintained his employment, but when Cromwell was declared Protector he declined to acknowledge his authority, and was soon after recalled to England. He refused the Protector face to face when ordered to submit to his government, and in December 1655 retired to his own house in Essex. After Oliver Cromwell's death Ludlow was returned for the borough of Hindon, and took his seat in Richard's parliament in 1659. He sat also in the restored Rump, and was a member of its councilof state andof the committee of safety after its second expulsion. He also held office for a short time in Ireland. After the Restoration, finding that his life was in danger, he left England, in September 1660, and travelled through France and Geneva, and thence to Vevey, then under the pro- tection of the canton of Bern. There he spent the rest of his long life unmolested, to the great credit of the Government of that canton, which had also extended its protection to other regicides. He was, however, in constant danger from Cavalier assassins. He steadily refused during thirty years of exile to have anything to do with the desperate enter- prises of republican plotters. But in 1689 he returned to England, hoping to be employed in Irish affairs. He was, however, known only as a regicide; and an address from

the House of Commons was presented to William IIT. by Sir Edward Seymour, requesting the king to issue a pro- clamation for his arrest. Ludlow escaped again, and returned to Vevey, where he died in 1693, aged seventy- three, and where a monument raised to his memory by his widow is still to be seen in the church of St Martin. Over the door of the house in which he lived was placed the inscription '"Omne solum forti patria, quia Patris." His memoirs, extending to the year 1688, were published in 1698-99 at Vevey.

LUDOLF, or LeutHo.r, Hios (1624-1704), a learned Orientalist, was born at Erfurt on June 15, 1624. At an early age he manifested a passion for the acquisition of foreign tongues; and after exhausting the imperfect

educational resources of his native place he went in 1645 to Leyden, where for upwards of a year he was the pupil of Erpenius, Golius, and other linguists. Having received an appointment as tutor, he afterwards travelled in France (where he became acquainted with Bochart at Caen) and in England, and in 1649 he was commissioned by the Swedish ambassador at the French court to go to Rome in quest of certain papers which had been lost, and which Queen Christina wished to recover. In this mission he was unsuccessful, but while in Italy he became acquainted with four Abyssinians, from whom he acquired his know- ledge (at that time unique) of Ethiopic. In 1652 he entered the diplomatic service of the duke of Saxe-Gotha; in this he continued (acting also for some time as tutor to the young princes) until 1678, when he retired to Frankfort-on-the-Main. At the conferences held there in 1681 and 1682 he held a commission to act for the dukes of Saxony. In 1683 he visited England to promote a cherished scheme for establishing trade with Abyssinia, but his efforts were unsuccessful, chiefly through the bigotry of the authorities of the Coptic Church. Return- ing to Frankfort in 1684, he gave himself wholly to literary work, which he continued almost to his death on April 8, 1704. In 1690 he had the honour to be appointed president of the “Collegium Imperiale Historicum.”

His works, of which a complete list will be found in Chanffepié’s Dictionnaire, include Historia Ethiopica (fol. 1681), with Commcn- tarius ad Hist. Eth. (1691), and Appendix (1693); Grammatica Amharicz Linguex, que vernacula est Habessinorum, 1698 ; Lexicon Amharico-Latinum, 1698; Lexicon Ethiopico-Latinuwm, of which the first edition was published in London in 1661, but with many inaccuracies for which Ludolf refused responsibility (a second edition appeared at Frankfort in 1699); Grammatica Lingue Ethiopice (London, 1661; Frankfort, 1702). Ludolf holds a very high place among the older Orientalists, and his works on Ethiopic in particular continued to be the standard text-books till they were superseded by those of Dillmann.

LUDWIGSBURG, the second royal residence of Wiirt- emberg, is situated 9 miles to the north of Stuttgart and 14 miles from the Neckar. It was laid out at the begin- ning of last century by Duke Eberhard Ludwig as a rival to Stuttgart, and was greatly enlarged by Duke Charles, who resided there from 1764 to 1785. Constructed as the adjunct of a palace, the town bears

the impress of its artificial origin, and its straight streets and spacious squares have a dull and lifeless appearance. Its main importance now consists in its being the chief military depot of Wiirtemberg, as which it contains extensive barracks, a cannon foundry, an arsenal, and a military academy. ‘The royal palace, one of the largest and finest in Germany, stands in a beautiful park, and contains a portrait-gallery and the burial vault of the sovereigns of Wiirtemberg. Among the other prominent buildings are four churches and several educational and charitable insti- tutions, Ludwigsburg also carries on manufactures of organs, woollen and linen cloth, japanned tin-wares, picture frames, and chicory. In 1880 it contained 16,100 inhabitants, about one-fourth of whom belonged to the

garrison. David Strauss, author of the Life of Jesus, was a native of Ludwigsburg. In the vicinity is the beautiful royal chateau of Monrepos, connected with the park of Ludwigsburg by a fine avenue of limes.

LUDWIGSHAFEN. See MANNHEIM.

LUGANO, a town of Switzerland, which divides with Locarno and Bellinzona the first rank in the canton of Tessin (Ticino). It stands on the shore of the lake of the same name, on a narrow strip of Swiss territory which projects into Lombardy and is everywhere close to the Italian frontier. ‘The prosperity of the town is due to its position on the main line of land communication between Milan and the pass of the St Gotthard, and the facility of intercourse by land and water, whether for legitimate or contraband trade, between this outlying fragment of Switzerland and the rich region that surrounds it. The buildings are not remarkable, but the church of Santa Maria degli Angioli contains several important pictures by Luini, a native of the adjoining district. The monastery to which the church formerly belonged is now converted into a large hotel. During the struggle of the people of northern Italy to expel the Austrians from Lombardy, between the years 1848 and 1866, Lugano served as head- quarters for Mazzini and his followers. Books and tracts intended for circulation throughout Italy were produced there, and at the neighbouring village of Capolago, on a large scale, and the efforts of the Austrian police to check their circulation were completely powerless. The popula- tion is Italian in

character and features, and the Italian tongue is exclusively spoken. On the quay is a statue of Tell by Vela, and there are other works by the same eminent sculptor, a native of the canton, in private grounds near the town. About 2 miles distant, and nearly due south, a steep hill—called Monte Salvatore—rises more than 2000 feet above the surface of the lake, and commands a fine panoramic view, limited in some direc- tions by the higher mountains on the opposite side of the lake, but extending in one direction to Monte Rosa, and in another to the cathedral of Milan.

LUGANO, Lake or (sometimes called Lago Ceresio by the Italians, from the Roman name Lacus Ceresius), situated partly in Lombardy and partly in the Swiss canton Tessin or Ticino, takes its ordinary name from the town of Lugano, the only considerable place on its banks. Its form is very irregular, and has been compared to a sickle, a fish-hook, and various other objects. It lies altogether amidst the outer ranges of the Alps that divide the basin of the Ticino from that of the Adda, where the calcareous strata have been disturbed by the intrusion of porphyry and other igneous rocks. It is not connected with any considerable valley, but is fed by numerous torrents in various directions issuing from short glens in the sur- rounding mountains, and is drained by the Tresa, an unimportant stream that flows westward into the Lago Maggiore. The surface of the lake is 889 feet above the sea, and the form of its bed seems to be very irregular. In some parts soundings of more than 1000 feet have been taken, while in one place the lake is so shallow that a causeway half a mile in length, supporting the road and the railway, has been carried from shore to shore. The scenery is of a varied character: in great part, and especi- ally in the north-east arm extending from Lugano to the Lombard village of Porlezza, the lake is enclosed between mountains that rise steeply to a height of some 2000 feet from the water’s edge, while on its southern and western

branches it is encompassed by gently swelling hills rich with the luxuriance of Italian vegetation.

LUGANSK, a town of Russia, in the government of Ekaterinoslaff, district of Slavianoserbsk, 300 miles to the eastward of the capital of the province, is connected by a

branch with the railway between Kharkoff and Azoff, as well as with other towns and iron-works of the Donetz coal-inines district. It stands on the sinall river Lugan, 10 miles from its junction with the northern Donetz, in the Lugan mine district, of which it is the chief town. This district, which comprises the important coal-mines of Lisi- tchansk and the anthracite mines of Gorodische, occupies an area of about 110,000 acres on the banks of the Donetz river, and has a population of more than 15,000. Although it is mentioned in Russian history as early as the 16th century, and coal was discovered in it at the time of Peter I., it was not until 1795 that an Englishman, Gascoyne or Gaskoin, established its first iron-work for supplying the Black Sea fleet and the southern fortresses with guns and shot. This proved a failure, owing to the great distance from the sea, and the manufacture of supplies for the navy was suspended ; but during the Crimean war the iron-works of Lugan again largely produced shot, shell, and gun-carriages. Since 1864 agricultural implements, steam-engines, and the various machinery required for beetroot sugar-works, dis- tilleries, &c., have been the chief manufactures. The Lugan works, which employ about 1200 men, are the chief centre for smelting the ores of the neighbouring iron-mines. The town is the seat of the mining authorities for the district, and has a first-class meteorological and magnetic observa- tory. The 11,000 inhabitants of Lugansk also carry on a very active trade in cattle, tallow, wools, skins, linseed, wine, corn, and manufactured wares. The weekly fairs are much frequented. There are also in the town many tallow- melting works, and the smith trade is largely carried on. LUGO, a maritime province of Spain, one of the four into which Galicia has since 1833 been divided, is bounded on the E. by Oviedo and Leon, on the 8. by Orense, on the W. by Pontevedra and Corujia, and on the N. by the Atlantic. Its extreme length from north to south is about 98 miles, its breadth 58, and the area 3787 square miles. The coast, which extends for about 40 miles from the estuary of Rivadeo to Cape Vares, is extremely rugged and inaccessible, and few of the inlets that exist, except those of Rivadeo and Vivero, admit vessels of any size. The province, especially in the north and east, is moun- tainous in its character, being traversed by the great Cantabrian chain and its offshoots ; the sierra by which it is separated from Leon attains in some places a height of 6000 feet. A large part of the area is drained by the Mifio, which rises on the western slope of the Sierra de Meira, and follows a southerly direction until it is joined by the Sil; the latter for a considerable

distance forms the southern boundary of the province. Of the rivers of the northern versant the most important are the Navia (which has its lower course through Oviedo), the Eo (for some distance the boundary between the two provinces), the Masma, the Oro, and the Landrobe. The Eume, one of the rivers of Corufia, and the Ulla, which separates that province from Pontevedra, both have their rise on the western slopesof Lugo. Some of the northern valleys even, in their lower portions, are fertile, and yield not only corn but fruit and wine, but the principal agricultural wealth is on the Mifio and Sil, where rye, maize, wheat, legumes of various kinds, flax, hemp, and a little silk are produced. The hills are comparatively well wooded. Iron is found at Caurel and Incio, antimony at Castroverde and Cervantes, argentiferous lead at Riotorto; and there are quarries of granite, marble, and various kinds of slate and building stone. Linen and woollen cloths are manufactured, but to an insignificant extent, and the trade of the province is unimportant. The internal communications are still very imperfect. There is only one railway, that connecting Lugo with Corufia ; but connexions with Leon (Brajiuelas)

and with Orense are in contemplation. The total popula- tion in 1877 was 410,387, being a decrease of 22,129 since 1860. There are ten towns with a population over 10,000 —Chantada, Fonsagrada, Lugo, Mondofiedo, Monforte, Panton, Sarria, Savifiao, Villalba, and Vivero.

Luco, the capital of the above province, stands on a small hill near the northern bank of the river Mifio, at a height of 1930 feet above the level of the sea, 60 miles south-west from Corufia, and 353 north-west from Madrid, on the highway between these two cities. With the former it is continuously connected by rail. The form of the town, which is nearly quadrangular, is defined by a massive Roman wall, from 30 to 40 feet in height and 20 feet thick, with projecting semicircular towers which, prior to the civil war in 1809, were eighty-five in number ; it now serves aS a promenade, commanding an extensive and delightful prospect. The principal public places are the Plaza de la Constitucion, a spacious arcaded square, the Plaza de San Domingo, the Plaza del Hospital, and the busy Plaza del Campo, where fairs and markets are held. The most important of

the public buildings is the Gothic cathedral on the south side of the town; it dates from the 12th century, but was modernized in the 18th, and possesses no special architectural merit. Other churches are those of the Capuchins and that of San Domingo ; the only other buildings of note are the episcopal palace, the secondary school, the hospital, and the prison. The principal industries are tanning, and the manufac- ture of linen cloth and of cream of tartar; there is some trade in silk wares. About a mile to the south of the town, ou the left bank of the Miiio, are the famous hot sulphur baths of Lugo; the bathing house dates from 1847. The population of the ayuntamiento in 1877 was

18,909.

Lugo (Lucus Augusti) was made by Augustus the seat of a con- ventus juridicus. Its sulphur baths were even then well known. It suffered greatly in the 5th century, during the Moorish wars, and, more recently, during the war of independence. The bishopric dates from a very early period, and it is said to have acquired metropolitan rank in the middle of the 6th century; it is now suffragan to Santiago.

LUGOS, a market-town of Hungary, capital of the trans-Tisian county of Krassé, is situated on the Temes, and on the railway from Temesvdr to Karansebes, 32 miles east-south-east of the former, in 45° 41’ N. lat., 21° 53’ E. long. The two main portions of the town, separated by the river, and named respectively Német- (German) Lugos and Roman- (Roumanian) Lugos, are connected by a wooden bridge 312 feet in length. Lugos is the seat of a*Greek Catholic (Roumanian) bishopric, of royal and circuit courts of law, and of the usual bureaus of a county administration. The public and other buildings include Greek Orthodox, Greek Catholic, Roman Catholic, and Lutheran churches, a synagogue, a royal upper gymnasium (founded in 1823), a Minorite convent, an episcopal palace, the barracks, and the ruins of a castle. The surrounding country is moun- tainous and well-wooded, and produces large quantities of grapes and plums. In 1880 the population was 11,287, of whom 3476, chiefly Germans, were in Német-Lugos, and 7811, Roumanians, with a few Slavonians and Magyars, in Roman-Lugos.

Lugos was once a strong fortress and of greater relative im- portance than at present. During the 16th and 17th centuries it suffered much at the hands of

the Turks. At the close of the Hungarian revolutionary war (August 1849) it was the last resort of Kossuth and several other leaders of the national cause previous to their escape to Turkey.

LUINI, Brernarprno, the most celebrated master of the Lombard school of painting founded upon the style of Leonardo da Vinci, was born at Luino, a village ou the Lago Maggiore, towards 1465. He himself wrote his name as “ Bernardin Lovino,” but the spelling “ Luini” is

now very generally adopted. Few facts are known regard- ing the life of this illustrious and delightful painter, and it is only since a comparatively recent date that he has even been credited with the production of his own works, aud with the fame thereto appertaining, as many of them had, in the lapse of years and laxity of attribution, got assigned to Leonardo. It appears that Luini studied painting at Vercelli under Giovenone, or perhaps under Lo Scotto. He reached Milan either after the departure of Da Vinci in 1500, or shortly before that event; it is thus left uncertain whether or not the two artists had any personal acquaintance, but Luini was at any rate in the painting-school established in Milan by the great Floren- tine. Inthe latter works of Luinia certain influence from the style of Raphael is superadded to that, far more pro- minent and fundamental, from the style of Leonardo; but there is nothing to show that he ever visited Rome. His two sons are the only pupils who have with confidence been assigned to him; and even this can scarcely be true of the younger, who was born in 1530, when Bernardino was well advanced in years, and was not far from the close of his career. Gaudenzio Ferrari has also been termed his disciple. One of the sons, Evangelista, has left little which can now be identified; the other, Aurelio, was accomplished in perspective and landscape work. There was likewise a brother of Bernardino, named Ambrogio, a competent painter. Bernardino, who hardly ever left Lombardy, had some merit as a poet, and is said to have composed a treatise on painting. The precise date of his death is unknown; he may perhaps have survived till about 1540. A serene, contented, and happy mind, naturally expressing itself in forms of grace and beauty, seems stamped upon all the works of Luini. The same character is traceable in his portrait, painted in an upper group in his fresco of Christ

Crowned with Thorns in the Ambrosian library in Milan,—a venerable bearded person- age. The only anecdote which has been preserved of him tells a similar tale, It is said that for the single figures of saints in the church at Saronno he received a sum of money equal to 22 frances per day, along with wine, bread, and lodging ; and he was so well satisfied with this re- muneration that, in completing the commission, he painted a Nativity for nothing.

Along with this natural sweetness of character, a dignified suavity is the most marked characteristic of Luini's works. They are constantly beautiful, with a beauty which depends at least as much upon the loving self-withdrawn expression as upon the mere refinement and attractiveness of form. This quality of expression appears in all Luini's productions, whether secular or sacred, and imbues the latter with a peculiarly religious grace—not ecclesiastical unction, but the devontness of the heart. His heads, while extremely like those painted by Leonardo, have less subtlety and involution and less variety of expression, but fully as much amenity. He began indeed with a somewhat dry style, as in the Pieta in the church of the Passione; but this soon developed into the quality which distinguishes all his most renowned works ; although his execution, especially as regards modelling, was never absolutely on a par with that of Leonardo. Luini's paintings do not exhibit an impetuous style of execu- tion, and certainly uot a negligent one; yetit appears that he was in fact a very rapid worker, as his picture of the Crowning with Thorns, painted for the College del S. Sepolcro, and containing a large number of figures, is recorded to have occupied him only thirty-eight days, to which an assistant added eleven. His method was simple and expeditious, the shadows being painted with the pure colour laid on thick, while the lights are of the same colour thinly used, and mixed with a little white. The frescos

exhibit more freedom of hand than the oil pictures ; and they are on the whole less like the work of Da Vinci, having at an early date a certain resemblance to the style

of Mantegna, as later on to that of Raphael. Luini's colouring is mostly rich, and his light and shade forcible.

Among his principal works the following are to be mentioned. At Saronno are frescos painted towards 1525, representing the lifc of the Madonna—her Marriage, the Presentation of the Infant Saviour in the Temple, the Adoration of the Magi, and other inci- dents. His own portrait appears in the subject of the youthful Jesus with the Doctors in the Temple. This series—in which some comparatively archaic details occur, such as gilded nimbuses—was partly repeated from one which Luini had executed towards 1520 in S. Croce. In the Brera Gallery, Milan, are frescos from the suppressed church of La Pace and the Convent della Pelucca,—the former treating subjects from the life of the Virgin, the latter, of a classic kind, more decorative in manner. The subject of girls playing at the game of ‘‘hot-cockles,” and that of three angels depositing St Catherine in her sepulchre, are particularly memor- able, each of them a work of perfect charm and grace in its way. In the Casa Silva, Milan, are frescos from Ovid’s Metamorphoses. The Monastero Maggiore of Milan (or church of 8. Maurizio) is a noble treasure-housc of Luini’s art,—including a large Crucifixion, with about one hundred and forty figures; Christ Bound to the Column, between figures of Saints Catherine and Stephen, and the founder of the chapel kneeling before Catherine ; the Martyr- doin of this Saint; the Entombment of Christ ; and a large number of other subjects. In the Ainbrosian library is the fresco (already mentioned), covering one entire wall of the Sala della S. Corona, of Christ Crowned with Thorns, with two executioners, and on each side six members of a confraternity ; in the same building the Infant Baptist Playing with a Lamb; in the Brera, the Virgin Enthroned, with Saints, dated 1521; in the Louvre, the Daughter of Herodias receiving the Head of the Baptist ; in the Esterhazy Gallery, Vienna, the Virgin between Saints Catherine and Barbara; in the National Gallery, London, Christ Disputing with the Doctors. Many or most of these gallery pictures used to pass for the handiwork of Da Vinci. The same is the case with the highly celebrated Vanity and Modesty in the Sciarra Palace, Rome, which also may nevertheless in all probability be assigned to Luini. Another singularly beautiful picture by him, which seems to pass almost entirely unobserved by tourists and by writers, is in the Royal Palace in Milan—a large composition of Women Bathing. That Luini was also pre-eminent as a decorative artist is shown by his works in the Certosa of Pavia.

LUKE, whose name is traditionally attached to the Third Gospel, appears to have been one of the com- panions of Paul, being mentioned as such in Col. iv. 14, Philem. 24, and 2 Tim. iv. 11; even if, as some critics suppose, these epistles were not written by Paul himself, they are at any rate likely to have preserved the local colouring. Assuming, as is probable, that the same person is intended in all three passages, we gather (1) that Luke was not a born Jew, since in Col, iv. 11, “those who are of the circumcision” appear to be separated from those, among whom is Luke, who are mentioned afterwards (but there is nothing to determine the question, which has since been raised, whether he had been a Jewish proselyte or a Gen- tile), and (2) that he was a physician. There was an early belief, first mentioned by Irenzeus, that he is spoken of, though not mentioned by name, in 2 Cor. viii, 18, as ‘“‘the brother whose praise is in the gospel throughout all the churches”; and the subscription of that epistle in some MSS., and in the Peschito and other versions, embodies this belief. Of his birth and country nothing is positively known ; but it is a possible inference from his name Lucas, which is a contraction of Zucanus (the full form occurs in some early MSS. of the Itala), that he was of Italian (Lucanian) descent.

From the time of Irenzus, whose testimony is soon followed by that of Clement of Alexandria, Tertullian, and Origen, this companion of Paul has generally been con- sidered to be the author of the third canonical Gospel and of the Acts of the Apostles; but no other facts are mentioned by early writers as to his personal history, except such as may be gathered from the writings which are attributed to him. Tertullian, for example, speaks of

him as “non apostolus sed apostolicus,” and as “ posterioris apostoli sectator” (Adv, Marcion., 4, 2) ; and the Muratorian fragment says that he had not seen the Lord in the flesh. The most important of these biographical inferences are those which were made by Eusebius, who, translating, or mistranslating, wapykoAoviykdT. mw&or, in the preface to the Gospel, by “having accompanied all,” «ae, the “¢ eyewitnesses and ministers of the word,” infers that Luke was a companion not of Paul only but also of the other apostles, and, probably referring to Acts xiii. 1, says that he was “one of those from Antioch.”! These inferences of Eusebius are further

elaborated by Jerome, who adds, without quoting any authority, that he wrote the Gospel in Achaia or Boeotia (many MSS. have Bithynia), and the Acts at Rome.?

Those who accept this tradition of his having been the author of the Acts of the Apostles usually infer from the sections of that work in which the pronoun “we” is employed that he accompanied Paul on part of his second and third missionary journeys, and also on his voyage to Rome. The first of these sections begins with the apostle’s determination to go into Macedonia, and ends when he has left Philippi (Acts xvi. 10-40); the second begins when the apostle returns to Philippi, and ends with his arrival at Jerusalem (Acts xx. 6-xxi. 18); the third begins with his sailing from Czesarea, and ends with his arrival at Rome (Acts xxvii. 1-xxvill. 16). Even some of those who assign the greater part of the book to a much later date think that these sections may be extracts from an original diary of a companion of Paul, and that this companion may have been Luke. Others, however, think it improbable that Luke, without being specially mentioned either in them or elsewhere, should have accompanied Paul on his voyage to Rome, and assign these sections to Timothy, or Titus, or Silas (some have added the very improbable conjecture that Luke and Silas are the same person).

The other biographical details which are found in patristic litera- ture, and which are not inferences from the New Testament, rest upon no certain evidence, and are frequently at variance not only with one another but also with earlier documents. _ It is sometimes stated that he was one of the seventy disciples; this statement is found in Epiphanius (Heres., li. 11), in pseudo-Origen (De recta in Deum fide, ed. De la Rue, vol. i. p. 806), in Gregory the Great (Moral. i. 1), and elsewhere ; but it is inconsistent, not only with Tertullian and the Muratorian fragment, but also with the clear in- ference from the preface to the Gospel that its author was not him- self an eyewitness of what he narrates. It is also stated that he was one of the two disciples who went to Emmaus (S. Greg. Magn., Moraf*i. 1; Paul. Diacon., Homil. 59 in Natali S. Luce ; and others); but this statement is discredited by the same facts as the preceding. Like all the other disciples whose names are mentioned in the New Testament, he is said to have gone forth as a preacher of the gospel ; but statements vary widely as to the place in which he preached : Gregory of Nazianzus says Achaia ; Epiphanius says

Dalmatia, Gaul, Italy, and Macedonia ; @cumenius says Africa ; later legends mention his having been at Enns in Austria (Hansiz, Germ. Sacra, vol. i. p. 15). And also, like most of the other early disciples, he is said not only to have preached the gospel but also to have suffered death for its sake. Gaudentius of Brescia says that this occurred at Patra in Achaia, and Nicephorus specifies as the manner of his martyrdom that he was hung on an olive tree. But elsewhere it is stated or implied that he died an ordinary death, either at Thebes in Beotia (Martyrol. Basil.), or in Bithynia (Paulus Diaconns, Isidore of Seville, and the Martyrologics of Ado and Usuardi). Most traditions agree in stating that his body was transferred by Constantius to Constantinople (‘‘Chron. Hieron.,” ap. Mai, Nov. Script. Coll; Prosper Aquitanns, Paulus Diaconus, Nicephorus, and others), but its place of burial seems to have been for- gotten, and Procopius (De edif. Justin., i. 4) mentions that it was discovered in Justinian’s time in digging the foundations of a new

1 Some have thought that, like the persons who are mentioned by Origen, Comm. in Rom., chap. x. (vol. iv. p. 686, ed. De la Rue), Eusebius here confuses the two names Lucas and Lucius,

2 De Viris Illustr., chap. vii.; Comm. in Matth., pref., vol. vii. p. 3.

church ; & subsequent tradition stated that it was afterwards removed to Italy, and in the 15th century Pius II. commissioned Cardinal Bessarion to decide upon a violent controversy between the Minorite monastery of S. Job at Venice and the Benedictine monastery of 8. Giustina at Padua, each of which claimed to pos- sess the perfect relics of the evangelist.

A late tradition represents Luke to have been a painter as well as a physician ; the tradition first appears in a doubtful fragment of an author of doubtful date, Theodorus Lector (printed in H. Valois’s edition of Theodoret, p. 618), who mentions that the empress Eudocia sent to Pulcheria, from Jerusalem to Constantinople, a picture of the Virgin painted by Luke. The same story is mentioned in an almost certainly spurious oration of John of Damascus (Orat. in Constant. Copron., c. 6., vol. i. p. 618, ed. Le Quien) ; and the first certain authorities for the tradition are

Symeon Metaphrastes and the Afenologiwm of Basil the younger, both of which belong to the 10th century. not of much earlier growth is proved by the fact that, if it had ex- isted, it could not fail to have been largely used in the iconoclastic controversy.

The martyrologies and calendars for the most part agree in fixing Luke's festival on October 18; but a doubt is expressed whether that day should be regarded as the anniversary of his birth or of the translation of his remains to Constantinople.

In Christian art he is usually symbolized by an ox (with reference to Ezekiel i. 10, Revelation iv. 7), on the significance of which symbol various statements were made by both Eastern and Western writers (some of them will be found quoted by Ciampini, Vet. Monum., vol. i. 192). (E. HA.)

LUKE, Gosprt or. See Gospets.

LUKOW, a town of Russian Poland, in the province of Siedlce, 60 miles by rail to the west of Brest-Litovsky. Owing to its situation on the railway and in the centre of a rich district, it is rapidly developing. The population is

11,050.

LUKOYANOFF, a district town in Russia, in the government of Nijni-Novgorod, 108 miles south-south-east of the chief town of the government, on the highway to Saratoff, at the sources of the Tesha river, tributary of the Oka. It is situated in a district where agriculture is carried on to a large extent, corn being sold to distilleries, and hemp exported, while the extensive forests furnish materials for the production of wooden wares. Wooden spoons, buckets, sledges, carts,implements for linen weaving, are made in large quantities by the peasants of the neigh- bouring villages, and exported to the steppe provinces of southern Russia ; and there is also considerable trade in timber, felts, fishing nets, nails, &c. Population 9600.

LULLY, Giovanni Battista (1633-1687), was born in Florence, and joined in 1650, as a violinist, the orchestra of the French court. Though friendless and in a foreign country, his genius soon opened for him a road to honours and wealth. He was appointed director of music to: King Louis XIV., and

director of the Paris opera. The influence of his music was so great as to produce a radical revolu- tion in the style of the dances of the court itself. Instead of the slow and stately movements, which had prevailed until then, he introduced lively and rhythmically quick ballets. Having found a congenial poet in Quinault, Lully composed twenty operas, which met with a most enthusiastic reception from a delighted public. He effected important improvements in the composition of the orchestra, into which he introduced several new instru- ments. Lully enjoyed the friendship of Moliére, for some of whose best plays he composed illustrative music. His Muserere, written for the funeral of the minister Sequier, is a splendid work of genius; and very re- markable are also his minor sacred compositions. On his death-bed he wrote Bisogna morire, peccatore. Lully's right to be numbered among the most original and the best musicians is undoubted. His music is full of the most charming and enthralling forms of Italian melody ; and the fact of its being even now performed, after the lapse of so many years, is proof sufficient of its inherent beauty and intrinsic worth.

That the tradition is.

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LULLY, Raymonp (1235-1315), the inventor of a fantastic system of logic by which Mohammedans should be converted to Christianity, was born at Palma, in the island of Majorca, in 1235, His father had been born at Barcelona, and belonged to a distinguished Catalonian family ; but for his services in helping to recover the Balearic islands from the Saracens he was rewarded with a gift of land in the conquered territory, and the paternal estates descended to his enthusiastically-minded son. The younger Lully, however, showed at first but little of the speculative tendencies which he afterwards developed, and his early years were spent in the gaiety and even profligacy of a courtier in the service of James II., of Aragon, who appointed him grand seneschal of the isle. He married, but notwithstanding sought the reputation of a gal- lant, and was mixed up in more than one intrigue. Something, however, of the nature of a cancer, which attacked one of the objects of his passion, Signora Ambrosia,—such is the way in which we are asked to account for his " conversion,"—affected him so deeply that he abandoned in his thirty-second year his licentious life, and, having

distributed the greater portion of his goods to his family and the poor, he withdrew to the retirement of a cell on Mount Randa, the only part of his property which he had reserved for himself. Visions of a crucified Saviour and like phenomena confirmed him in his devotion to the cause of Christ, and in the course of a nine years' retreat on Randa he came to regard himself as commissioned by God to refute the errors of Mohammed.

This missionary call became henceforth the actuating principle in Lully's life. To realize it, he went to Paris in his fortieth year, to prosecute the study of Latin and logic ; and, with a view to becoming familiar with the language of the infidels, he engaged the services of an unlettered Arabian, who, finding that Lully was seeking to demolish the faith of Islam, attempted to assassinate his master. This need of acquiring a knowledge of the language of the church's adversary became itself now one of Lully's favourite ideas. In 1286 he began a series of visits, which he made to Rome to induce the supreme pontiff to found colleges for the study of Arabic; but the small success which would attend his efforts in this direction was fore- shadowed by the death of Honorius (then pope) before he could attain an audience of him. Meanwhile Lully had become discontented with the methods of science com- monly in use, and had set himself to construct his "great art," a method which, by mechanically presenting all the predicates which could attach to any subject, was adapted to answer any question on any topic, and would (its author imagined) by the cogency of its inferences necessarily con- vert the heathen. His natural enthusiasm respecting the consequences of this art were strengthened by revelations (as he judged them) of the co-operation of God in his designs, and he gave himself up, with the fervour of a divinely appointed missionary, to the work of spreading a knowledge of his "great art" in every country. He expounded it at Paris and Montpellier in 1286, and after a visit to Pope Nicholas, to solicit his help in founding linguistic colleges, and a serious illness at Genoa, brought on apparently by an isolated fit of nervous cowardice in face of the dangers he was going to encounter, he sailed to Tunis, to apply his new method to the errors of Mohammedanism. At Tunis his attacks upon the religion of the country led to his being cast into prison, and it was only by the mediation of a sheikh, who had _ been impressed by the earnestness of the Christian preacher, that he managed to escape to sea, not without the roughest treatment at the hands of the mob, and find his way to Naples.

A new influence was brought to bear on Lully’s life at

Naples.

Armaud de Villeneuve, and acquired, we may believe, not

only that skill in transmuting metals for which Lully himself became in popular tradition famous, but imbibed also something of that spirit which brought down the censure of the church on Villeneuve for maintaining that medicine and charity were more pleasing to God than religious services. For the next few years the scene of Lully’s labours was continually changing. He made an unsuccessful attempt to interest Pope Boniface in the inissionary colleges which he wished to see established, and similar appeals to the kings of France and Cyprus met with no more favourable a response. From Cyprus Lully proceeded (1306) to Bougiah in Africa, and repeated the experiences he had already had at Tunis. But, though Mohammedanism showed little disposition to welcome the “ oreat art” and its author, the European world had mean- while begun to show itself more favourably disposed towards Lully’s projects. In 1297 he had received at Montpellier, from the general of the Franciscans, letters recommending him to the superiors of all Franciscan houses ; and in 1309 his “art ” was publicly approved by a decree of the university of Paris. Emboldened perhaps by such recog- nition, he appeared before the council of Vienne in southern France in 1311, and petitioned the assembled fathers to reduce the different and often-contending religious orders to one great order serving simply under Christ, and to meet Mohammedanism abroad and Averroism at home by founding colleges for the study of Arabic. Nothing would seem to have come directly of these petitions, but we may perhaps trace their result in some chairs of Syriac and Arabic which Clement V. instituted at Rome, and in a college for training Franciscans in Oriental languages which James of Aragon established in Majorca. Lully was now nearly eighty years of age, but his zeal in com- bating the foes of Christianity did not abate. He sailed again for Africa, and received the martyr’s crown, which would seem to have become the ambition of his life. At Bougiah he again proclaimed the doctrines of the church, and his preaching raised such a tumultuous attack that although he managed to get on board a Genoese vessel, he succumbed

during the voyage to the injuries he had received, and died in sight of his native town of Palma

(1315).

During his lifetime Lully composed a vast number of treatises, some of whieh have never yet been printed. They were written

partly in Latin, partly in Catalonian, Lully deserving mention as |

one of the first in medieval times who tried to find a national ex- pression for philosophy in the language of the country. Some of these works inay be described as dealing with apologetic theology, ¢.g., the Liber de Gentili et Tribus Sapientibus, in which a Jew, Christian, and Saracen explain the nature of their faith, or the Disputatio Fidelis et Infidelis; others again relate to dogmatic divinity, ¢.g., Liber de XIV. Articulis, De Deo et Jesu Christo ; a third elass refer to particular questions of logic, e.g., De Prima et Secunda Intentione, Ars Inveniendi Particularia in Universalibus, De Venatione Medii; and a large number are repnted to deal with questions of alehemy. But the ‘‘ Great Art” of discovery itself is the subject of most ot Lully’s treatises. Soit is with the Ars Demon-

strativa, Compendium Artis Demonstrative, Ars Universalis, Ars |

Inventiva Veritatis, De Auditu Cabbalistico, Ars Magna et Ultima.

And even when Lully is engaged with such treatises as the

Trincipia Medieine or Prineipia Juris it is to the universal key

es one which the great art supplies that he invariably falls ack.

The reasonablencss and demonstrability of Christianity is the assumption underlying the exercise of this great method. Nothing, Lully holds, interferes more with the spread of Christianity than the attempt of its advocates to present its doctrines as undcmon- strated and undemonstrable truths; the very difference between Christianity and Antiehrist lies in the fact that the former can prove the truth of its beliefs; and the glory of the

faith, repeats the Liber Magnus Contemplationis, is not that it maintains the indemonstrable but simply the supersensuous. The demonstration, however, which is wanted in the service of Christianity is not, Lully thinks, that of the ordinary logic; we require a method

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He made the acquaintance of the alchemist ,

which will reason not only from effect to cause, or from cause to effect, but per equiparantiam, and show that contrary attributes can eoexist together in one subject. This method, however, must be real, not merely formal and subjective ; it must deal not only with the second intentions, but rather with the first intentions, that is, the things themselves. The great art in fact goes beyond logic and metaphysic ; as a universal topic it provides a universal art of discovery, and contains the formule to which every demonstration in every science can be reduced. This ars tnvestigandi, however, turns out to be not so mueh a key to all possible knowledge as a tabulation of the different points of view from which propositions may be framed about various objccts—a mechanical contrivance for finding out the different ways in which categories apply to things. Just, Lully thought, as by knowing the typical terminations of cases and tenses we could infleet and conjugate any word whatever, so by a knowledge of the different types of existence and their possible combinations as portrayed by his mnethod we should possess impli- citly a knowledge of the whole of nature.

The great art accordingly begins by laying down an alphabet according to which the nine letters from B to K stand for the dif- ferent kinds of substances and attributes. Thus, in the series of substances, B stands for God, C angel, D heaven, E man, and so on; in the series of absolute attributes, B represents goodness, C great- ness, D duration; or again, iu the nine questions, B stands for Utrwm, C for Quid, D for De quo. The manipulating of these letters in such a way as will show the relationship between different subjects and predicates constitutes aceordingly the peculiarity of the ‘‘new art,” this manipulation being effected by the help of certain so-called ‘‘fioures.” The construction of these figures varies somewhat in different parts of Lully’s writings, but their general character is always the same. Circles and other mathematical figures divided into

seetions and marked by Lully's symbolical letters are so arranged, sometimes with the help of different colours, as to show the possible combinations of which the letters are capable. Thns for example one figure exhibits the possible eombination of the attributes of God, another the possible conditions of the soul, and soon. These figures are fenced about by various definitions and rules, and their use is further specified by various ''evacuations" and ** multiplications" which show us how to exhaust and draw out all the possible combinations and sets of questions which the terms under consideration can admit. When so '' multiplied," the fourth figure is, Lully himself says, that by which other sciences can be most easily and rapidly acquired ; and it may accordingly be taken as no unfair specimen of Lully's method. This fourth figure then is simply an arrangement of three concentric circles (made of tin or pasteboard) each divided into nine sections B,C, D, &c., and so eon- structed that while the upper and smaller circle remains fixed, the two lower and outer revolve round it. Taking then the letters in the sense of the series which seems most fitted for the subject under discussion, we are enabled by making the outer circles revolve to find out the possible relationships between different conceptions and elucidate the agreement or disagreement which subsists between thein, while, at the same time, we discover the intermediate terms (in the middle circle) by which they are to be connected or discon- nected.

The weakness of Lully's art is the weakness of every system whieh pretends, as Bacon's also did, to equalize all intellects, and provide a method which will produce discovery as surely as compasses will construct a circle. But it would be unfair to say that Lully sup- posed that thinking and reasoning could be reduced to a mere rotation of pasteboard circles. The real valuc of his art lies not in being au a priori compendium of knowledge but a method of in- vestigation—a tabulation of the different sides from which a ques- tion must be regarded, and in embodying the ideal which science puts before herself of finally bringing all coneeptions into unity and correlation. It is easy, with the Port-Royal logic, to speak of Lully's art as merely enabling us "'to talk without judgment of that which we do not know"; but in his conception of scientific method as tending to the glory of God and the good of man, in his departure from the school logic and his wish for a real interpre- tation of nature, in his conception of a universal method and his application of the vernacular languages to

philosophy, he appears as a precursor of Bacon himself. And in his assertion of the place of reason in religion, in his demand that a rational Christianity should be presented to heathendom, in his missionary zcal and his project of linguistic colleges, Lully, with all his quixotic character, goes far beyond the ideas and the aspirations of the century in which he lived.

A few of Lully's works were published by Zetzner in 1598 and frequently re- printed ; but the first systematic edition was begun by Salzinger in 1721, and after Salzinger's death completed in 1742, This edition is norinally in 10 vols., but vols. vii. and viii. were never published. In addition to older works, such as Perroquet (1667) a:d Nic. de Hanteville (1666) and the Acta Sanctorum (vol xxiv.), the best account of Lully's life is to be found in an article by Delecluze in the Revue d. d. Afondes for 1840, and the fullest account of his method in Prantl, Geschichte d. Logik, iii, 145-177, and Erdmann, Grundriss d. Gesch. d. Philosophie, i, $206. The philological importance of Lully's writings is brought out by a peers Raymond Lull und die Anfange d. Catalonischen Hina cw

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LUMBAGO, a term in medicine applied toa painful ailment affecting the muscles of the lower part of the back, generally regarded as of rheumatic origin. An attack of lumbago may occur alone, or be associated with rheumatism in other parts of the body at the time. It usually comes on by a seizure, often sudden, of pain in one or both sides of the small of the back, of a severe cutting or stabbing character, greatly aggravated on movement of the body, especially in attempting to rise from the recumbent posture, and also in the acts of drawing a deep breath, coughing, or sneezing. So intense is the suffering that it is apt to suggest the existence of inflammation in some of the neighbouring internal organs, such as the kidneys, bowels, &e., but the absence of the symptoms specially character- istic of these latter complaints, or of any great constitu- tional disturbance beyond the pain, renders the diagnosis a matter of no great difficulty. Lumbago seems to be brought on by exposure to cold and damp, and by the other exciting

causes of rheumatism. Sometimes it follows a strain of the muscles of the loins. The attack is in general of short duration, but occasionally it continues for a long time, not in such an acute form as at first, but rather as a feeling of soreness and stiffness on movement. The treatment includes that for rheumatic affections in general (see RuzUMATIsM) and the application of local remedies to allay the severe pain. Of these the best are hot fomentations with turpentine or laudanum applied by means of flannel or spongio-piline to the part ; or the rub- bing in, if this can be borne, of stimulating liniments, such as those of opium, belladonna, chloroform, aconite, &c. The old and homely plan of counter-irritation by applying a heated iron to the part with a sheet of brown paper interposed is often beneficial in chronic cases, as is also, on similar principles, Corrigan's button cautery. The sub- cutaneous injection of morphia or atropia is called for when the attack is very severe and prevents sleep.

LUMP-SUCKER, or Lump-risu (Cyclopterus lumpus), a marine fish, which with another genus (Liparis) forms a small family (Dzscobolz) closely allied to the Gobies (see Gozy). Like niany fishes of the latter family, the lump- suckers have the ventral fins united into a circular concave disk, which, acting as a sucker, enables them to attach them- selves firmly to rocks or stones. The body of the lump- sucker (properly so called) is short and thick, with a thick and scaleless skin, covered with rough tubercles, the larger of which are arranged in four series along each side of the body. The first dorsal fin is almost entirely concealed by the skin, appearing merely as a lump on the back. The lump-sucker inhabits the coasts of both sides of the North

Atlantic ; it is not rare on the British coasts, but becomes ©

more common farther north. It is so sluggish in its habits that individuals have been caught with sea-weed growing on their backs. In the spring the fish approaches the shores to spawn, clearing out a hollow on a stony bottom in which it deposits an immense quantity of pink-coloured ova. Fishermen assert that the male watches the spawn until the young are hatched, a statement which receives confirmation from the fact that the allied gobies, or at least some of them, take similar care of their progeny. The vernacular name, ‘‘cock and hen paddle,” given to the lump-fish on

some parts of the coast, is probably expressive of the difference between the two sexes in their outward appearance, the male being only half or one-third the size of the female, and assuming during the spawning season a bright blue coloration, with red on the lower parts. This fish is generally not esteemed as food, but Faber (Jesch. Islands, p. 53) states that the Icelanders consider the flesh of the male asa delicacy.!_ Very peculiar is the structure

~1The © cock-padle" was formerly esteemed also in Scotland, and figures in the Antiquary, chap. xi.

of the bones, which are so soft, and contain so little inorganic matter, that the old ichthyologists placed the lump-sucker among the cartilaginous fishes.

LUND, a town of Sweden, in the lin of Malmohus, lies at a distance of 10 miles by rail north-east from Malmo. It is chiefly remarkable for its university, the second in Sweden, founded by Charles XI. in 1666, with faculties of philosophy, law, medicine, and theology ; the number of students ranges from 500 to 600. The library contains about 100,000 volumes and 2000 MSS., and there are valuable collections in archeology and natural history. Among the more distinguished of its professors may be mentioned the names of Puffendorf and the poet Tegner. Linnzeus was one of its alumni. The cathedral, a Byzantine structure, dedicated to St Lawrence, and said to be on the whole the finest church in Scandinavia, was founded about the middle of the 11th century, and consecrated in 1145. The crypt under the transept and choir is one of the largest in the world. The town has little else of interest to show. The statue of Tegner stands in the Tegner's Plats, and the house in which he lived from 1813 to 1826 is indicated by a stone slab with an inscription. The manufactures of Lund (woollen cloth, leather, tobacco, sugar, &c.) are unim- portant. The population in December 1878 was 13,611.

Lund (Londinuwm Gothorwm), the " Lunda at Eyrarsundi"' of the Egil's Saga, was in Egil's time (about 920 a.p.) a place of con- siderable importance ; one gathers that, if not actually a seaport, it was at least nearer the Sound then than at present. In the middle of the 11th century it was made a bishopric, and in 1108 it was adyanced to the dignity of an archiepiscopal see, the arch- bishop receiving primatial rank over all

Scandinavia in 1163. The archbishop of Upsala is now primate of Sweden, Lund since 1536

having been reduced to the rank of an ordinary bishopric, and lost its quondam title of "* Metropolis Daniz."

LUNEBURG, the chief town of a district in the Prussian province of Hanover, is situated near the foot of a smal] hill named the Kalkberg, and on the river Ilmenau, 14 miles above its confluence with the Elbe, and 30 miles to the south-east of Hamburg. Numerous handsome medieval buildings testify to its former prosperity, and part of the old town-wall also still survives. Of its four churches three—those of St John, St Nicholas, and St Michael—are large and fine Gothic edifices of the 14th and 15th centuries. The principal secular buildings are the town-house, a huge pile dating from the 13th to the 18th century, the old palace, and the convent of St Michael, now converted into a school. Liineburg owes its import- ance chiefly to the gypsum and lime quarries of the Kalkberg, which afford the materials for its cement works, and to the productive salt-spring at its base. Hence the ancient saying, which, grouping with these the commercial facilities afforded by the bridge over the Ilmenau, ascribes the prosperity of Liineburg to its mons, fons, pons. The industries of the town also include the making of iron- ware, soda, and haircloth. Population in 1880, 19,045.

Liineburg existed as early as the days of Charlemagne, but did not become of any importance till after the erection of a couvent and a castle on the Kalkberg in the 10th century. The decisive event, however, in fixing its future development was the destruction, in 1189, of Bardewieck, situated on the Ilmenau below Liineburg, and then the chief commercial town in North Germany. Liineburg inherited its trade, and subsequently appears as one of the leading towns in the Hanseatic League. From 1267 to 1369 it was the capital of an independent principality of its own name, and it was afterwards frequently involved in the quarrels of the Guelphic princes. It reached the height of its prosperity in the 15th century, and even in the 17th was the depdét for all the merchandise ex- ported from Saxony and Bohemia to the mouth of the Elbe. The German war of liberation in 1813 was begun by an engagemen : with the French under General Morand near

Liincburg. Liineburg gives its name to the Liineburger Haide or Liineburg Heath, an im-

mense tract of moorland occupying the greater part of eastern Hanover.

Compare Volger, Fiihrer durch die Stadt Liineburg and Urkundenbuch der Stadt Lineburg ; also the Alterthtimer der Stadt Liineburg, 1852-72

LUNEVILLE, the chief place of an arrondissement in the department of Meurthe and Moselle, France, 240 miles east of Paris by rail on the line to Strasburg, stands in the midst of meadows between the Meurthe and the Vezouze a little above their confluence. It is a handsome town regu- larly built. The chateau, designed early in the 18th century by the royal architect Boffrand, was the favourite residence of Duke Leopold of Lorraine, where he gathered round him the academy composed of eminent men of the district. It is now a cavalry barrack. Lunéville has always been an important cavalry station, and has a riding school where two hundred horsemen can exercise at the sametime. The church of St Jacques, with its two towers, dates from the same period as the chateau. The church of St Maur, in the Byzantine style, is but thirty years old. The dis- trict round Lunéville is mainly agricultural, and the town has a fine corn exchange. The manufactures include pottery, embroideries, gloves, cotton cloth, and cooking stoves. There are starch works and gypsum kilns, and a considerable trade in grain, flour, hops, and other agricul- tural produce. The population in 1876 was 16,041.

The name of Lun¢ville is dcrived from an ancient cult of Diana. A sacred fountain and medals with the effigy of this goddess have been found at Leormont, some 2 miles cast of the town. Lunéville formed part of Austrasia, and after various changes fell to the crown of Lorraine. A walled town in the Middle Ages, it suffered in the Thirty Years’ War and in the campaigns of Louis XIV. from war and its consequences—plague and famine. The town flourished again under Dukes Leopold and Stanislas, on the death of the latter of whom, which took place at Lunéville, Lorraine was

united to France (1766). The treaty of Lunéville between France and Austria (1801) confirmed the former power in the possession of the left bank of the Rhine. The town was the birthplace of the

empcror Francis, husband of Maria Theresa, and of the painter Jean Girardet.

LUPERCALIA, one of the most remarkable and interesting Roman festivals. Its origin is attributed to Evander, or to Romulus before he founded the city, and its ceremonial is in many respects unique in Roman ritual. In front of the Porta Romana, on the western side of the Palatine hill, close to the Micus Ruminalis and the Casa Romuli, was the cave of Lupercus ; in it, according to the legend, the she-wolf had suckled the twins, and the bronze wolf which is still preserved in the Capitol was placed in it in 296 B.c. But the festival itself, which was held on February 15th under the direction of the famen dialis, contains no reference to the Romulus legend, which is probably later in origin (see Mommsen in /Zermes, 1881). The celebrants, who were called Luperci, offered in sacrifice goats and a dog; the flamen dialis himself was forbidden to touch either kind of animal, and it can hardly be doubted that the Lupercal sacrifice is older than the prohibition. After the sacrifice two of the Luperci were led to the altar, their foreheads were touched with a bloody sword, and the blood wiped off with wool dipped in milk ; then the ritual required that the two young men should laugh. The sacrificial feast followed, after which the Luperci cut thongs from the skins of the victims and ran in two bands round the walls of the old Palatine city, striking the people who crowded near. A blow from the thong prevented sterility in women. These thongs were called Mebrua, the festival Februatio, and the day Dies Februetus; hence arose the name of the month February, the last of the old Roman year. The nearest analogy in the Roman religion to the Lupercalia is the occasional Amburbium, in which the victims were led round the walls of Rome and then sacrificed. The Lupercalia was associated with the circuit of the Palatine city, which had been a city long before the seven-hilled Rome, and the line of the old Palatine walls was marked with stones for the Luperci to run round. Unger has proved that the festival was originally a rite peculiar to the tribe of the Ramnes, the old dwellers on

the Palatine, and that it was' in the 3d century B.o. widened to a festival of the whole city. It is probable that then the whole ceremonial was modified ; the Luperci, who were originally chosen from the Ramnes alone, were chosen from the whole body of the Equites, the people assembled round the hill,and the ceremony of scourging to avert sterility was added. Originally therefore the Luperci simply encompassed the walls as the victims did at the Amburbium, and the ceremonial connected with the two young men has generally been taken as a proof that they were at one time actually sacrificed after being led round the walls, and that a vicarious sacrifice was afterwards substituted for the ancient human offering. The Luper- calia was therefore a ceremony of purification performed for the walls and for the whole of the old Palatine city, from which it follows that it was dedicated to the peculiar god of that city. In early time the name of the god was kept strictly secret, as it was unsafe that an enemy should know it and be able to invoke him. Hence arise many conflicting statements as to the name. In later times, when the bonds of early religion were relaxed, the name became known. The god was, as Livy relates, Inuus, an old Italian deity known chiefly in southern Etruria, where there existed two towns named Castrum Inui. He was a form of the supreme heaven-god, very like Mars in character, and the rites with which his anger was averted may be compared with those of Zeus on Mount Pelion or with the Maimacteria in Athens. The Luperci were divided into two collegia called Quintiliani or Quinetiales (the form is doubtful, see Mommsen, J?ém. Forsch., i. 17) and Fabiani; at the head of each was a magister. In 44 B.c. a third collegium, Juliani, was instituted in honour of Julius Cesar, the first magister of which was M. Antony.

This account follows in almost every particular that of Unger (Rhein. Mus., 1881). He derives Lupercus from wa and parco in the old sense of restrain, and Inuus from a root seen in avis inubra or inebra, avalvoua, &c., meaning to avert or prohibit, and sees in the festival a national ceremony of the Palatine city, not with Marquardt (Rim. Staatsverw., iii. 421) a widened gentile cultus of the Fabri and Quinctii or Quintilii,

LUPINE, Lupinus, L., a genus, of over eighty species, of the tribe Genistex of the order Leguminose. Species with digitate leaves range along the west

side of America from British Columbia to Bolivia, while a few occur in the Mediterranean regions. A few others with entire leaves are fouud in South Carolina, the Cape, and Cochin- China (DC., Prod., ii. p. 406; Benth. and Hook., Gen. Pi., i 480). The leaves are remarkable for ‘sleep- ing” in three different ways. From being in the form of a horizontal star by day, the leaflets either fall and form a hollow cone with their bases upwards (LZ. pilosus), or rise and the cone is inverted (Z. luteus), or else the shorter leaflets fall and the longer rise, and so together form a vertical star (many sp.) ; the object in every case being to protect the surfaces of the leaflets from radiation (Darwin, Movements of Pl., p. 340). The flowers are of the usual ‘‘ napilionaceous” or pea-like form, blue, white, purple, or yellow, in long terminal spikes. The stamens are mona- delphous and bear dimorphic anthers. The species of which earliest mention is made is probably LZ. Termis, Forsk., of Egypt. This is possibly the épéBwos-of Homer (Z1., xiii. 589). It is no longer found in Greece, but is extensively cultivated in Egypt. Its seeds are eaten by the poor after being steeped in water to remove their bitter- ness; the stems furnish fuel and the best charcoal for gunpowder (Pick., Chron. List. of Pl., 183). Two other species appear to have been cultivated by the ancients, LL. sativus (albus, L.) allied to LZ. Termis, and L. hirsutus, L., this latter only about Sparta (Pick., Zc, p. 202); Z. angustifolius, L., was a corn-field weed, the @épyros aypuos

of Dioscorides, The Gépyos epos was used to counteract the effects of drink (Athen., 55,C.). The seeds were used as money on the stage (Plaut., Pon., 3, 2, 20; Hor., Ep., i. 7, 23). Z. albus, L., was also cultivated asa field lupine, the Z. sativus of the Romans, referred to by Cato, &. R., 34, 2; Virgil, Georg., i. 75; Pliny, xviii. 36; &. In 1597 Gerard (Herball, p. 1042) writes : —“ There be diuers sortes of the flat Beane called Lupine, some of the garden, and others wild”; and he figures three species, Z. sativus (now L, albus, L.), LZ. luteus, L., and L. varius, L. Few species are in cultivation now, but the varieties are very numerous (see Paxton’s Bot. Dict, p. 345; Hemsley’s Hand. of Hardy Trees, &., p. 115) Of species now grown, J. albus, L., is still extensively cultivated in Italy, Sicily, and other Mediterranean countries for forage, for ploughing in to enrich the land, and for its round flat seeds, which form an article of food. This, as well as the

other two mentioned by Gerard, have been superseded as garden flowers by the American species, e.g., Z. arboreus, Sins, and ZL. polyphyllus, from California; LZ. versicolor and LZ. tomentosus, from Peru.

LURAY CAVERN, in Page county, Virginia, United States, 39° 35’ N. lat. and 78° 17’ W. long, is 1 mile west of the village of Luray, on the Shenandoah Valley Railroad. The valley, here 10 miles wide, extends from the Blue Ridge to the Massanutton mountain, and displays remarkably fine scenery. These ridges lie in vast folds and wrinkles ; and elevations in the valley are often found to be pierced by erosion. Cave Hill, 300 feet above the water-level, had long been an object of local interest on account of its pits and oval hollows, or sink-holes, through one of which, August 13, 1878, Mr Andrew J. Campbell and others entered, thus discovering the extensive and beautiful cavern now described.

Geologically considered, the Luray cavern does not date beyond the Tertiary period, though carved from the Silurian limestone. At some period long subsequent to its original excavation, and after many large stalactites had grown, it was completely filled with glacial mud charged with acid, whereby the dripstone was eroded into singularly grotesque shapes. After the mud had been mostly removed by flow- ing water, these eroded forms remained amid the new growths. To this contrast may be ascribed some of the most striking scenes in the cave. The many and extra- ordinary monuments of aqueous energy include massive columns wrenched from their place in the ceiling and pro- strate on the floor; the hollow column 40 feet high and 30 feet in diameter, standing erect, but pierced by a tubular passage from top to bottom; the leaning column, nearly as large, undermined and tilting like the campanile of Pisa; the organ, a cluster of stalactites dropped points downward and standing thus in the room known as the cathedral ; besides a vast bed of disintegrated carbonates left by the whirling flood in its retreat through the great space called the Elfin Ramble.

The stalactitic display exceeds that of any other cavern known, and there is hardly a square yard on the walls or ceiling that is not thus ornamented. The old material is yellow, brown, or red; and its wavy surface often shows layers like the gnarled grain of costly woods. The new stalactites growing from the old, and made of hard carbon- ates that had already once been

used, are usually white as snow, though often pink, blue, or amber-coloured. The size attained by single specimens is surprising. The Empress Column is a stalagmite 35 feet high, rose-coloured, and elaborately draped. The double column, named from Professors Henry and Baird, is made of two fluted pillars side by side, the one 25 and the otber 60 feet high, a mass of snowy alabaster. Several stalactites in the Giant Hall exceed 50 feet in length. The smaller pendents are in-

numerable ; in the canopy above the Imperial Spring it is estimated that 40,000 are visible at once.

The ‘“ cascades” pointed out are wonderful formations like foaming cataracts caught in mid-air and transformed into milk-white or amber alabaster. The Chalcedony Cascade displays a variety of colours. Brand’s Cascade, which is the finest of all, being 40 feet high and 30 feet wide, is unsullied and wax-like white, each ripple and braided rill seeming to have been polished.

The Swords of the Titans are monstrous blades, eight in number, 50 feet long, 3 to 8 feet wide, hollow, 1 to 2 feet thick, but drawn down to an extremely thin edge, and filling the cavern with tones like tolling bells when struck heavily bythe hand. Their origin and also that of certain so-called scarfs and blankets exhibited is from carbonates deposited by water trickling down a sloping and corrugated

Scale 290 feet to the inch.

Luray Cavern.

1, The Vestibule. 13, Saracen’s Tent. 25. Helen’s Scarf.

2, Washington’s Pillar. 14. The Organ 26, Chapman’s Lake.

3. Flower Garden, 15. Tower of Babel. 27. Broaddus Lake.

4, Amphitheatre, 16. Empress Column. 28. Castles on the Rhine.

5. Natural Bridge. 17, 6. Fish Market. 18, 7. Crystal Spring. 19, 8. Proserpine's Pillar, 20.

Hollow Column, 29. Imperial Spring. Henry-Baird Column. 30, The Skeleton. Chalcedony Cascade. 381. The Twin Lakes, Coral Spring. 32. The Engine Room.

9. The Spectral Column, 21. The Dragon. 33. Miller's Room. 10. Hovey's Balcony. 22. Bootjack Alley. 34, Hawes Cabinet. 11. Oberon's Grot. 23. Scaly Column, 35. Specimen Avenue, 12. Titania's Veil. 24, Lost Blanket. 36. Proposed Exit.

surface. Sixteen of these alabaster scarfs haug side by side in Hovey's Balcony, three white and fine as crape shawls, thirteen striated like agate with every shade of brown, and all perfectly translucent. Down the edge of each a tiny rill glistens like silver, and this is the ever-plying shuttle that weaves the fairy fabric.

Streams and true springs are absent, but there are hundreds of basins, varying from 1 to 50 feet in diameter, and from 6 inches to 15 feet in depth. The water in them is exquisitely pure, except as it is impregnated by the carbonate of lime, which often forms concretions, called, according to their size, pearls, eggs, and snowballs. A large one is known as the cannon ball. On fracture these spherical growths are found to be radiated in structure.

Calcite crystals, drusy, feathery, or fern-like, line the sides and bottom of every water-filled cavity, and indeed constitute the substance of which they are made. Varia- tions of level at different periods are marked by rings, ridges, and ruffled margins. These are strongly marked about Broaddus Lake, and the curved ramparts of the Castles on the Rhine. Here also are polished stalag- mites, a rich buff slashed with white, and others, like

huge mushrooms, with a velvety coat of red, purple, or olive-tinted crystals. In some of the smaller basins it sometimes happens that when the excess of carbonic acid escapes rapidly there is formed, besides the crystal bed below, a film above, shot like a sheet of ice across the sur- face. One pool 12 feet

wide is thus covered so as to show but a third of its surface. The quantity of water in the cavern varies greatly at different seasons. Hence some stalactites have their tips under water long enough to allow tassels of crystals to grow on them, which, in a drier season, are again coated over with stalactitic matter; and thus singular distortions are occasioned. Contiguous stalactites are often inwrapped thus till they assume an almost globular form, through which, by making a section, the primary tubes appear. Twig-like projections, lateral out- growths, to which the term helictite has been applied, are met with in certain portions of the cave, and are interesting by their strange and uncouth contortions. Their presence is partly due to the existence of a diminutive fungus peculiar to the locality, and designated from its habitat Mucor stalactitis, ‘The Toy-Shop is an amusing collection of these freaks of nature.

The dimensions of the various chambers included in Luray Cavern cannot easily be stated, on account of the great irregularity of their outlines. Their size may be seen from the diagram on p. 67. But it should be under- stood that there are several tiers of galleries, and the vertical depth from the highest to the lowest is 260 feet. The tract of 100 acres owned by the Luray Cave Company covers all possible modes of entrance; and the explored area is much less than that.

The waters of this cavern appear to be entirely destitute of life; and the existing fauna is quite meagre, comprising only a few bats, rats, mice, spiders, flies, and small centi- pedes. When the cave was first entered, the floor was covered with thousands of tracks of raccoons, wolves, and bears, —most of them probably made long ago, as impres- sions made in the tenacious clay that composes most of the cavern floor would remain unchanged for centuries. Layers of excrementitious matter appear, and also many small bones, along with a few large ones, all of existing species. The traces of human occupation as yet discovered are pieces of charcoal, flints, moccasin tracks, and a single skeleton imbedded in stalagmite in one of the chasms, esti- mated to have lain wherefound fornot morethan five hundred years, judging from the present rate of stalagmitic growth.

The temperature is uniformly 54° Fahr., coinciding with that of the Mammoth Cave, Kentucky. The air is very pure, and the avenues are not

uncomfortably damp.

The portions open to the public are now lighted by electric lamps. The registered number of visiters in 1881 was 12,000. (H. ©. HL)

LURGAN, a market-town in the county of Armagh and province of Ulster, Ireland, is situated a few miles south of Lough Neagh, and 20 miles south-west of Belfast by rail. It consists principally of one spacious and well-built street. finely proportioned tower. The other principal public buildings are the town-hall, the mechanics' institute, the model school, and the linen-hall. Contiguous to the town is Brownlow House, a fine Elizabethan structure, the seat of Lord Lurgan. Of late years the linen trade of the town has much increased, and there are also tobacco factories and coach factories. From 7774 in 1861 the population increased in 1871 to 10,632, but in 1881 it was only 10,184.

Lurgan was built by William Brownlow, to whom a grant of the town was made by James I. In 1619 it consisted of forty-two houses, all inhabited by English settlers. It was burned by the insurgents in 1641, and again by the troops of James lI. After its restoration in 1690 a patent for a market and fair was obtained.

The parish church of Shankill has a'

LUR—LUR

LURISTAN, or LUrisrAv, a province of western Persia, with ill-defined limits, but lying mainly between 31° and 33° N. lat. and between 47° and 52° E. long., and bounded N. and E. by Irak-Adjemi, S. by Farsistan, W. by Khuzis- tan and the Turkish vilayet of Baghdad. It thus stretches north-west and south-east some 260 miles, with a mean breadth of 70 miles and an area of rather less than 20,000 square miles. The surface is mostly mountainous, being occupied in the west by the Pusht-i-koh range, which forms the frontier line towards Turkey, in the east by the Bakhtiari (Zagros) range, which runs north- west and south-east, thus connecting the Kurdistan with the Kuh-Dinar or Farsistan highland systems. Between the parallel Pusht-i-koh and Bakhtiari chains there stretch some naturally fertile plains and low hilly districts, which, however, are little cultivated, although well-watered

by the Karun, Dizful, and Kerkhah, the three chief rivers of the province. There are two main divisions— Luri Buzurg, or “Great Luristan,” comprising the Bakhtiari highlands westwards to river Dizful, and Luri Kuchak, or ‘Little Luristan,” stretching thence to Khuzistan and Turkey. The latter is again divided into the Pesh-koh and Pusht-i-koh districts (‘‘before” and “behind” the mountains), and notwithstanding its name is by far the most populous and productive of the two. From the 12th to the 17th century it formed an independent principality under hereditary rulers with the title of ‘“‘atabeg,” the last of whom was deposed by Shah Abbas, and the government transferred to Husen Khan, chief of the Faili tribe, with the title of “vali.” His descendants are still at the head of the administration ; but the power of the valis has been much reduced since the transfer of the Pesh-koh district to Kirmanshah.

Luristan takes its name from the Luri,!.a semi-nomad people of Iranian stock and speech, who still form the vast majority of the population. Great uncertainty has hitherto prevailed regarding the nomenclature, the main divisions and the true affinity of the Luri to the other branches of the Iranian family. Thus, from the name of the present ruling clan all the tribes of Luri Kuchak are com- monly spoken of as “ Faili,’”’ a term which is now rejected by the Pesh-koh tribes, and which, if used at all as a general ethnical expression, ought to be restricted to those of Pusht-i-koh, still under the rule of the vali. The classifications of Layard, Rawlin- son, and A. H. Schindler differ materially, while contradictory statements are made by well-informed writers regarding the physi- cal and linguistic relations of the Luri to the neighbouring Kurds and Persians. From a careful consideration of the available evidence it would appear that the Luri are the true aborigines of their present domain, where they occupy an intermediate position between the Kurds and Persians, but resembling the former much more than the latter in speech, temperament, social habits, and physical appearance. Although they themselves reject the name of Kurd, the two languages are essentially one, so that the natives of Kirmanshah and Dizful have little difficulty in conversing together. Like the Kurds, they are also of a restless and unruly disposition, averse from a settled life, still dwellers in tents, mostly owners of floeks and herds, holding agriculture in contempt, and of predatory habits. ‘‘ In appearance the Bakhtiari look rather fierce, owing probably to the mode of life they lead ; tlie features of their face are

cast in a rough mould, but although coarse they are in general regular. Their black eyeslook wild and cxpressive, and the two black tufts of hair behind their ears give them, if possible, a still darker appearance. They are muscular built, and are chiefly of a middle stature" (E. Balfour), In a word, the Luri must be classed anthropologically in the same group as the Kurds. They are excellent stock breeders, and their horses and mules are regarded as the very best in Persia. Of the mules, about a thousand are annually exported to the surrounding provinces. Most of the hard work is left to the women, who tend the flocks, till the little land under cultivation, tread out the corn, and weave the carpets, black goat-hair tents, and horse cloths for which Luristan is famous. The men put their hands to no useful work, go about armed, and arc always ready for a foray. Their constant intertribal feuds render the country unsafe for trade and travel, while their revolts against the central government often cause a total interruption of communi-

1 Not to be eonfounded with the Luwri or Lori of Baluchistan and Sind, tinkers, bards, strolling minstrels, &c., betraying a ‘‘ marked affinity to the Gipsies of Europe" (Pottinger).

cation between the several districts. This evil, however, has some- what abated since the tribal chiefs have been compelled to give hostages as security for their good behaviour.

Outwardly Mohammedans of the Shiah sect, the Lui show little veneration either for the Prophet or the Koran, Their religion seems to be a curious mixture of Ali-Iahism, involving a belief in succes- sive incarnations and the worship of the national saint, Baba Buzurg, combined with many mysterious rites, sacrifices, and secret meetings certainly anterior to Islam, and possibly traceable to the ancient rites of Mithras and Anaitis.

The chiefs enjoy almost unlimited authority over their subjects, and the tribal organization is strongly marked by the feudal spirit.

The total population of Luristan is about 320,000, and the average revenue nearly £40,000 sterling.

LUSATIA (German, Zausitz) is a common name applied to two neighbouring districts in Germany, Lusatia Superior and Lusatia Inferior (Oberlausitz and Niederlausitz), belong- ing in part to Prussia and in part to Saxony. The country now known as Upper Lusatia was occupied in the 7th century by the Milcieni, a Slavonic tribe. In the 10th century it was annexed to the German kingdom by the margraves of Meissen, and from this time for several centuries it was called Budissin (Bautzen), from the name of the principal fortress. In the 11th and 12th centuries Budissin changed hands several times, being connected at different periods with Meissen, Poland, and Bohemia. The emperor Frederick I. granted it in 1158 to King Ladislaus of Bohemia, and under him and his immediate successors it was largely colonized by German immigrants. Between 1253 and 1319 it belonged to Brandenburg, to the margrave of which it was given in pledge by King Ottocar II. of Bohemia ; and in 1268 it was divided into an eastern and a western part—Budissin proper and Gérlitz. In 1319 Budissin proper was restored to Bohemia, which also recovered Ciérlitz in 1346. It was during this period that the fortunes of Budissin were associated with those of the country afterwards called Lower Lusatia, but originally Lusatia. It was inhabited by a Slavonic tribe, the Lusici, and reached in the earliest times from the Black Elster to the Spree. The Lusici were conquered by Margrave Gero in 963, and their land was soon formed into a separate march, sometimes attached to, sometimes independent of, the march of Meissen. In 1303 it passed, as Budissin had done, to Brandenburg, and in 1373, after several changes, it fell into the hands of the emperor Charles IV. as king of Bohemia. During the Hussite wars the people of Lusatia and Budissin remained loyal to the Roman Catholic Church, and in 1467 they recognized as their sovereign King Matthias of Hungary. Twenty-three years later they were again united to Bohemia, but in the meantime they had received from the Hungarian Government the names which they have since retained. In the 16th century the Reformation made way rapidly in Upper Lusatia, and the majority of the people became Protestants. The two countries were conquered in 1620, with the sanction of Ferdinand IL, by the Saxon elector, John George I., to whom they were ceded in 1635, the emperor as king of Bohemia retaining a certain supremacy for the purpose of guarding the rights and privileges of the Roman Catholic Church, In 1815 the whole of Lower Lusatia and the half of Upper Lusatia were transferred from Saxony to Prussia. Lower Lusatia has 395,800 inhabitants, of whom 50,000 are

Wends; the portion of Upper Lusatia belonging to Prussia has 243,500 inhabitants,of whom 32,000 are Wends. There are 300,000 inhabitants, including 50,000 Wends, in Saxon Upper Lusatia. Laws relating to Upper Lusatia, which are passed by the Saxon Parliament, must still be submitted to the Lusatian diet at Bautzen.

LUSHAI or KUKI HILLS, a wild and imperfectly known tract of country on the north-eastern frontier of India, extending along the southern border of the Assam

district of C4ch4r and the eastern border of the Bengal district of Chittagong. On the east, the Lushai Hills stretch away into the unexplored mountains of Independent Burmah. This extensive region is occupied by a numerous family of tribes known to us indifferently as Lushdis or Kukis. All these tribes are nomadic in their habits, and subject to successive waves of migration. It is said that at the present time the entire race of the Lushdis is being forced southwards into British territory under pressure

from the Soktis, a tribe advancing upon them from Inde-

pendent Burmah. The principal characteristic common to

all the Lushdis, and in which they markedly differ from the other tribes on the Assam frontier, is their feudal organization under hereditary chiefs. under the military command of a chief, who must come of a certain royal stock. The chief exercises absolute power in the village; and his dignity and wealth are maintained by a large number of slaves and by fixed contributions of labour from his free subjects. according to the nomadic system of tillage on temporary clearings in the jungle; but the main occupation of the people is hunting and warfare

Each village is

Cultivation is carried on

From the earliest times the Lushdis have been notorious for their

sanguinary raids into British territory, which are said to be instigated by their desire to obtain human heads for use at their

funeral ceremonies. The first of which we have record was in 1777. In 1849 a colony of Lushdis settled within Cachar, was attacked by their independent kinsmen, and forced to migrate northwards across the Bardk river, where they now live as peaceable British subjects, and are known as ‘Old Kukis.” In 1860 raid was made upon Tipperah district, in which 186 Bengali villagers were massacred and 100 carried away into captivity. Retributive expeditions, consisting of small forces of sepoys, were repeatedly sent to punish these raids, but, owing to the difficult nature of the country and the fugitive tactics of the enemy, no permanent advantage was gained. At last the disturbed state of the frontier attracted the attention of the supreme government. A military demonstration in 1869 had entirely failed in its object. Relying upon their belief in the impracticable character of their native country, the Lushais made a series of simultaneous attacks in January 1871 upon British villages in Céchar, Sylhet, and Tipperah, as well as on the independent state of Manipur. The outpost of Monierkhal repelled a number of attacks, lasting through two days, made by a second body of Lushais from the eastern tribes, who

finally retired with a large amount of plunder, including many coolies and guns. vigorous effort to stop those inroads, once and for all. A punitive expedition was organized, composed. of two Gurkha battalions, two

Lord Mayo, the viceroy, resolved to make a

Punjab and two Bengal native infantry regiments, two companies of sappers and miuers, and a detachment of the Peshawar mountain

battery. This little army was divided into two columns, one

advancing from COdchér and the other from the Chittagong side. Both columns were completely successful. The resistance of the Lushdis, though obstinate in parts, was completely overcome, and

the chiefs made their personal submission and accepted the terms

offered them. Upwards of one hundred British subjects were liberated from captivity. The actual British loss in fighting was very small, but a large number of soldiers and camp-followers died from cholera. Since this expedition, the Lushdis have remaincd quiet along the entire frontier, and active measures have been taken to open commercial intercourse between them and the people of the plains. Many bdzdrs have been established for this purpose, and trade by barter is now freely carried on.

LUSTRATION is a term that includes all the methods of purification and expiation among the Greeks and Romans. Among the Greeks there are two ideas clearly distinguishable—that human nature must purify itself from guilt before it is fit to enter into communion with God or even to associate with men (kafaipw, cafapors), and that guilt must be expiated voluntarily by certain processes which God has revealed in order to avoid the punishment that must otherwise overtake it (iAacpds). It is not possible to make such a distinction among the Latin terms lustratio, piacula, piamenta, cerimonix, and even among the Greeks it is not consistently observed. The conception of sin never reached a high moral standard, and the methods of lustration are purely ritualistic. Guilt and

impurity arose in various ways; among the Greeks, besides the general idea that man is always in need of purification, the species of guilt most insisted on by religion are incurred by murder, by touching a dead body, by sexual intercourse, and by seeing a prodigy or sign of the divine will. The last three of these spring from the idea that man had been without preparation and in an improper manner brought into communication with God, aud was therefore guilty. The first, which involves a really moral idea of guilt, is far more important than the others in Hellenic religion. Among the Romans we hear more of the last species of impurity ; in general the idea takes the form that after some great disaster the people become convinced that some guilt has been incurred somewhere and must be expiated. The methods of purification cousist in ceremonies performed with water, fire, air, or earth, or with a branch of a sacred tree, especially of the laurel, and also in sacrifice and other ceremonial. Before entering a temple the worshipper dipped his hand in the vase of holy water (epippavrnpiov, agua lustralis)

which stood at the door; before a sacrifice bathing was a common kind of purification; salt-water was more efficacious than fresh, and the celebrants of the Eleusinian mysteries bathed in the sea (dAade pvorar) ; the water was more efficacious if a firebrand from the altar were plunged in it. The torch, fire, and sulphur (76 Oefov) were also powerful purifying agents. Purification by air was most frequent in the Dionysiac mysteries; puppets suspended and swinging in the air (oscilla) formed one way of using the lustrative power of the air. Rubbing with sand and salt was another excellent method. The sacrifice chiefly used for purification by the Greeks was a pig; among the Romans it was always, except in the Lupercalia, a pig, a sheep, and a bull (swovetawrilia). In Athens a purificatory sacrifice and prayer was held before every public meeting ; the Maimacteria in honour of Zeus Meilichios was an annual festival of purification, and several other feasts had the same character. On extraordinary occasions lustrations were performed for a whole city. So Athens was purified by Epimenides after the Cylonian massacre, and Delos in the Peloponnesian War. In Rome, besides such annual ceremonies as the Ambarvalia, Lupercalia, Cerealia, Paganalia, &c., there was a lustration of the fleet before it sailed, and of the army before it marched. Part of the ceremonial always consisted in leading or carrying the victims round the impure persons or things. After any disaster the lustratio classium or exercitus was often again performed, so as to make certain that the gods got all their due. The Amburbiwm was a similar ceremonial performed for the whole city on occasions of great danger or calamity. Ambilustrium was the purificatory ceremony, consisting in sacrifice and prayer, performed after the regular quin- quennial census of the Roman people.

LUTE. The European lute is derived in form and name from the Arabic “el “fd,” “the wood,” the consonant of the article “el” having been retained in the European languages for the initial of the name (French, luth ; Ital., liuto; Span., laud; German, Laute; Dutch, lwit). The Arab instrument, with convex sound-body, pointing to the resonance board or membrane having been originally placed upon a gourd, was strung with silk and played with a plectrum of shell or quill) It was adopted by the Arabs from Persia, the typical instrument being the two-stringed “‘tanbur,” and ultimately found its way to the West at the time of the crusades. The modern Egyptian “‘tid” is the direct descendant of the Arabic lute, and, according to Lane, is strung

with seven pairs of catgut strings played by a plectrum. A specimen at South Kensington, given by the Khedive, has four pairs only, which appears to have been the old stringing of the instrament. When frets are

employed they are of catgut disposed according to the Arabic scale of seventeen intervals in the octave, consist- ing of twelve limmas, an interval rather less than our equal semitone, and five commas, which are very small but quite recognizable differences of pitch.

The lute family is separated from the guitars, also of Eastern origin, by the formation of the sound body, which is in all lutes pear-shaped, without the sides or ribs neces- sary to the structure of the flat-backed guitar and cither. Observing this distinction, we include with the lute the little Neapolitan mandoline of 2 feet long, and the large double- necked Roman chitarrone, which not unfrequently attains to a length of 6 feet. Mandolines are partly strung with wire, and are played with a plectrum, indispensable for metal or short strings. Perhaps the earliest lutes were so played, but the large lutes and theorbos strung with catgut have been invariably touched by the fingers only, the length permitting this more sympathetic means of producing the tone.

The Neapolitan is the best known mandoline ; it was indicated by Mozart in the score of Don Giovanni, to accompany the famous serenade. The four pairs of strings are tuned like the violin, in fifths :—

a Cv —,

“Y

The Milanese is larger, and has five and six pairs :—

———————— aa ore Se = ee —— age — sae se

The mandola or mandore is larger than either, with eight pairs of strings. This name has been derived from the Italian word, similarly spelled but differently accented, signifying almond, which the mandola is supposed to resemble in shape, but ban, man, pan, and tan are first syllables of lute and guitar instruments met with all over the world, the oldest form of which is

the borrowed Greek “* ravOotpa,” an Asiatic word, which the Arabs changed to ‘“‘tanbur.” Preetorius (Organographia, Wolfenbiittel, 1619, a scarce work, of which the only copy in Great Britain is in the Advocates’ Library, Edinburgh), writing when the lute was in universal favour, mentions seven varieties distinguished by size and tuning. The smallest would be larger than a mandoline, and the melody string, the ‘ chan- terelle,” often a single string, lower in pitch. Pretorius calls this an octave lute, with the chanterelleC or D. The two discant lutes have respectively B and A, the alto G, the tenor E, the bass D, and the great octave bass G, an octave below the alto lute which may be taken as the model lute cultivated by the amateurs of the time. The bass lutes were most likely theorbos, that is, double-necked lutes, as described below. The accordance of an alto lute was

: rd ———-

: os Be ee founded upon that of the original eight-stringed European lute, to which the highest and lowest notes had, in course

of time, been added. A later addition was the F222

i

also on the finger-board, and bass strings, double or single,

known as diapasons, which, descending to the deep C of the violoncello, were not stopped with the fingers. The diapasons were tuned as the key of the piece of music required. The illustration represents an Italian instrument made by one of the most cele- brated lute makers, Venere of Padua, in 1600; it is 3 feet 6 inches high, and has six pairs of unisons and eight single diapasons. The finger- board, divided into approxi- mately equal half tones by the frets, as a rule eight in number, was often further divided on the higher notes, for ten, eleven, or, as in the woodcut, even twelve, seimi- tones. The head, bearing the tuning pegs, was placed at an obtuse or a right angle to the neck, to increase the bearing of the strings upon the nut, and be convenient for sudden requirements of tuning dur- ing performance, the

trouble of keeping a lute in tune being proverbial. —<= aS The lute wasin general use — Lute, by Venere of Padua. during the 16th and 17th centuries. In the 18th it declined ; still the great J. S. Bach wrote a “ partita ” for it, which remains in manuscript. The latest date we have met with of an engraved publication for the lute is 1760. The large double-necked lute, with two sets of tuning pegs, the lower for the finger-board, the higher for the diapason strings, was known as the theorbo; also, and especially in England, as the archlute; and, in a special form, the neck being then very long, as the chitarrone. Theorbo and chitarrone appear together at the close of the 16th century, and their introduction was synchronous with the rise of accompanied monody in music, that is, of the oratorio and the opera. Peri, Caccini, and Monte- verde used theorbos to accompany their newly-devised recitative, the invention of which in Florence, from the im- pulse of the Renaissance, is well known. The height of a theorbo varied from 3 feet 6 inches to 5 feet, the Paduan being always the largest, excepting the Roman 6-feet long chitarrone. These large lutes had very deep notes, and doubtless great liberties were allowed in tuning, but the strings on the finger-board followed the lute accordance already given, or another quoted by Baron (Untersuchung des Instruments der Lauten, Nuremberg, 1727) as the

old theorbo or “ violway” (see Mace, Musick’s Monument, London, 1676) : —

We find again both these accordances varied and traus- posed a tone higher, perhaps with thinner strings, or to accommodate local differences of pitch; Praetorius recom- mends the chanterelles of theorbos being tuned an octave lower on account of the great strain. By such a change, another authority, the Englishman Thomas M ace, says, the life and spruceness of airy lessons were quite lost. ‘The theorbo or archlute had at last to give way to the violon- cello and double bass, which are still used to accompany the “recitativo secco” in oratorios and operas. Handel wrote a part for a theorbo in Lsther (1720); after that date it appears no more in orchestral scores, but remained in private use until nearly the end of the century.

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We cannot refrain from admiring the beauty of decora- tion of ivory, mother of pearl, and tortoiseshell, the charac- teristic patterning of the ‘“‘ knots” or ‘‘ roses” in the sound- boards, all of which was so well allied with the extremely artistic forms of the different lutes, rendering them, now their musical use is past, objects of research for collections and museums. The present direction of musical taste and composition is adverse to the cultivation of such tenderly sensitive timbre as the lute possessed. The lute and the organ share the distinction of being the first instruments for which the oldest instrumental compositions we possess were written. It was not for the lute, however, in our pre- sent notation, but in tablature, “lyrawise,”a system by which «‘s many lines were drawn horizontally as there were pairs of strings on the finger-board, the frets being distinguished by the letters of the alphabet, repeated from A for each line. This was the English manner; the Italian was by numbers instead of letters. The signs of time were placed over the stave, and were not repeated unless the mensural values changed.

Consult Grove’s Dictionary of Music, arts. ‘* Lute,” ‘‘Frets” ; Stainer and Barrett’s Dictionary of Music, “Tablature”; and

the admirable museum catalogues of Carl Engel (South Kensington), G. Chouquet (Paris), and Victor Mahillon (Brussels), (A. J. H.)

LUTHER (1483-1546). First Period (1483-1517). —Martin Luther (Lyder, Liider, Ludher—from Lothar, some say) was born at Hisleben in the county of Mansfeld, in Thuringia, on the 10th of November 1483. His father Hans Luther, a slate-cutter by trade, belonged to a family of free peasants. His mother was Margaret Lindeburn. Hans Luther had left Méhra, his native village, and liad come to Eisleben to work as a miner. When Martin was six months old he went to Mansfeld and set up a forge, the small profits of which enabled him to send his son to the Latin school of the place. There the boy so distin- guished himself that his father determined to make him.a lawyer, and sent him for a year to a Franciscan school at Magdeburg, and then to Eisenach near Mohra. There Luther, with other poor scholars, sang for alms in the streets, and his fine tenor voice and gentle manners attracted the attention and gained for him the motherly care of Ursula Cotta, the wife of the burgomaster of Eisenach. From Eisenach he went in his eighteenth

year to the high school of Erfurt, where his favourite master was the humanist Trutwetter, who taught him classics and philosophy. He took his bachelor's degree in 1502, and his master's in 1505. At Erfurt the preaching of the town's pastor Weisemann made a deep impression on his mind, as did the preacher's frequent exhortations to study the Scripture. Luther tells us that he sought in vain for a whole Bible, and that he could only get portions to. read. A dangerous illness, the death of a near friend, together with other circumstances, so wrought on his pious, seusitive nature that in spite of father and family he resolved to give up all his prospects and become a monk. He entered the Augustinian convent at Erfurt in June 1505, taking with him Plautus and Virgil, the solitary mementos of the life he had abandoned. His first years of monastic life were spent in fierce mental struggle. He had found a whole Bible and read it diligently, but it did not bring him peace. The feeling of universal human sinfulness, and of his own, was burnt into him both by his dogmatic studies and by his reading of the Scripture. He lived a life of the severest mortification, and invented continually new forms of penance, and all the while heart and head alike told him that outward acts could never banish sin. 'I tormented myself to death," he said, "to make my peace with God, but I was in darkness and found it not." The vicar- general of his order, Staupitz, who had passed through somewhat similar experiences, helped him greatly. 'There

is no true repentance," he said, "but that which begins with the love of righteousness and of God. Love Him then who has first loved thee." Staupitz had been taught

heart religion by the mystics, and he sent Luther to the |

sermons of Tauler and to the Theologia Germanica.

When Luther regained his mental health, he took courage |

to be ordained priest in May 1507, and next year, on the recommendation of Staupitz, the elector of Saxony appointed him professor in the university of Wittenberg, which had been founded in 1502. While in the monastery Luther had assiduously pursued his studies, and his severe mortifications

and penances had never interrupted his theological work. He read all the great scholastic theo- jogians, but Augustine was his master in theology, while Erfurt studies under Trutwetter doubtless made him pore over Occam (“mein lieber Meister,” as he afterwards fondly called him) till he got his bulky folios by heart. He began by lecturing on Aristotle; and in 1509 he gave Biblical lectures, which from the very first were

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They make plain these three things :—(1) there may be some good in indulgence if it be reckoned one of the many ways in which God’s forgiveness of sin can be proclaimed ; (2) the external signs of sorrow are not the real inward repentance, nor are they as important as that is, and no per- mission to neglect the outward expression can permit the neglect of true repentance ; (3) every Christian who feels true sorrow for sin is there and then pardoned by God for Christ’s sake without any indulgence ticket or other human contrivance. And in his sermons on indulgence Luther declared that repentance consisted in contrition, confession, and absolution, and that contrition was the most important, and in fact the occasion of the other two. If the sorrow be true and heartfelt, confession and pardon will follow. The inward and spiritual fact of sorrow for sin, he thought, was the great matter; the outward signs of sorrow were good also, but God, who alone can pardon, looks to the inward state. These theses, with the sermons explaming them, brought Germany face to face with the reality of

a power in the university. His class-room was thronged ; his fellow-professors were students. Staupitz forced him also to preach; and his marvellous eloquence, felt to be from the heart, attracted great crowds of hearers. The year 1511 brought an apparent interruption, but

blasphemy in the indulgences. Luther’s public life had opened ; the Reformation had begun.

Second Period (1517-1524).—Pilgrims who had come Luther to Wittenberg to buy indulgences returned with the theses preach- of Luther in their hands, and with the impression of his *

in fact only a new development, of Luther's character and knowledge of the world. He went to Rome, probably in fulfilment of an old vow, and the journey was a marked event in his life. He went up in true pilgrim spirit, a medieval Christian, and he came back a Pro- testant. The pious German was horrified with what he saw in Rome, and he afterwards made telling use of what he had seen in various tracts, and notably in his address to the German nobles. He tells us that at Wittenberg he had pondered over the text, "(The just shall live by faith," that while in Rome the words came back to him, and that on his return journey to Germany the evangelical meaning of the phrase rushed into his mind. On his return to the university he was promoted to the degree of doctor of divinity, in October 1512. The oath he had to take on the occasion "'to devote his whole life to study, and faith- fully to expound and defend the holy Scripture," was to him the seal of his mission. He began his work with lectures on the Psalms, and then proceeded to comment on the epistles of Paul to the Romans and Galatians, enforcing especially his peculiar views of the relations between law and gospel. His lectures and his sermons were attended by great audiences, and disciples gathered round him. As early as 1516 his special principles were publicly defended at academical disputations. Staupitz made him district-vicar of his order for Meissen and Thuringia. He made short preaching tours, and his in- fluence was felt far beyond Wittenberg. When the plague came to that university town he remained at his post when others fled. Then came 1517, the year of the Reformation. The new pope, Leo X., had sent agents through Germany to sell indulgences, and had chosen John Tetzel, a Dominican monk, for Saxony. Luther, who had passed through deep soul-struggles ere he won pardon, knew that God's forgive- ness could not be purchased for money, and thundered against Tetzel and his indulgences from Wittenberg pulpit. He wrote anxiously to the princes aud bishops to refuse

powerful evangelical teaching in their hearts. The national mind of Germany took up the matter with a moral earnest- ness which made an impression, not only upon the princes, but even upon bishops and monks, At first it seemed as if all Germany was going to support Luther. The traffic in indulgences had been so shameless that all good people and all patriotic Germans had been scandalized. But Luther had struck a blow at more than indulgences, although he scarcely knew it at the time. In his theses and

explanatory sermons he had declared that the inward spiritual facts of man's religious experience were of infinitely more value than their expression in stereotyped forms recognized by the church, and he had made it plain too that in such asolemn thing as forgiveness of sin man could go to God directly without human mediation. Pious Christians since the day of Pentecost had thought and felt the same, and all through the Middle Ages men and. women had humbly gone to God for pardon trusting in Christ. They had found the pardon they sought, and their simple Christian experience had been sung in the hymns of the medizval church, had found expression in its prayers, had formed the heart of the evangelical preaching of the church, and had stirred the masses of people in the many revivals of the Middle Ages. But those pious people, hymn-writers, and preachers had not seen that this inward experience of theirs was really opposed to a great part of the ecclesiastical system of their day. The church had set such small store by that inward religious experience that the common speech of the times had changed the plain meanings of the words "spiritual," "sacred," "holy." A man was "spiritual" if he had been ordained to office in the church; money was "spiritual" if it had been given to the church ; an estate, with its roads, woodlands, fields, was "spiritual" or "holy" if it belonged to a bishopric or abbey. And the church that had so degraded the meaning of "spiritual" had thrust itself and its external machinery in between God and the worshipper, and had

The the pardon-seller a passage through their lands. When | proclaimed that no man could draw near to God save ea Tetzel got to Jtiterbogk near Wittenberg, Luther could | through its appointed ways of approach. Confession was theses, Stand it no longer. He wrote out ninety-five propositions | to be made to God through the priest ; God spoke pardon

or theses denouncing indulgences, and on the eveeof All Saints, October 31, nailed the paper to the door of the Castle church. In a short time all Germany was ablaze. These ninety-five theses are one continuous harangue against the doctrine and practice of pardon-selling, but they do not openly denounce indulgence in every form.

only in the priest's absolution. When Luther attacked indulgences in the way he did he struck at this whole system.

Compelled to examine the ancient history of the church, he soon discovered the whole tissue of fraud and imposture by which the canon law had from the 9th century down-

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wards been foisted upon the Christian world. There is scarcely any essential point in ancient ecclesiastical history bearing upon the question of the invocation of saints, of clerical priesthood, of episcopal and metropolitan preten- sions, Which his genius did not discern in its true light. Whatever Luther denounced as fraud or abuse, from its contradiction to spiritual worship, may be said to have been openly or tacitly admitted to be such. But what produced the greatest effect at the time were his short popular treatises, exegetical and practical—his Interpretation of the Magnificat or the Canticle of the Virgin Mary, his Exposition of the Ten Commandments, and of the Lord's Prayer. The latter soon found its way into Italy, although without Luther's name, and has never been surpassed either in genuine Christian thought or in style. He resolved also to preach throughout Germany, and in 1518 appeared at a general meeting of his order at Heidelberg. There he held a public disputation on certain theses called by him paradoxes, in which he strove to make apparent the contrast between the external view of religion taught by the schoolmen and the spiritual view of gospel truth based upon justifying faith, He made many disciples on this occasion, of whom perhaps the most notable was Martin Bucer. On: his return to Wittenberg in May 1518, Luther wrote and published an able and moderate exposition of the theses, and sent it to some of the German bishops. He proclaimed the need for a thorough reformation of the church, which he thought could only be effected, with the aid of God, by an earnest co-operation of the whole of Christendom. This energy awakened opponents. Conrad Wimpina at Frankfort, Hoogstraten at Cologne, Sylvester Trierias at Rome, and above all John Eck, an old fellow student, at Ingolstadt, attacked his theses, and discovered heresy in them. The result was that Luther was summoned to appear before the pope at Rome, but the elector of Saxony intervened, and | got the matter so arranged that Luther was cited to : appear beforo the pope's legate at Augsburg. At The pope was unwilling to quarrel with Germany, Augsburg where the whole people seemed to be supporting Luther, oefore the and the cardinal legate James de

Vio of Gaeta, commonly oe ealled Cajetan, was told to be conciliatory. Luther went to Augsburg on foot, and presented himself before the legate, but the interview was not a successful one. The cardinal | began by brow-beating the monk, and ended by being i somewhat afraid of him. ‘TI can dispute no longer with this beast,” he said; “it has two wicked eyes and marvellous thoughts in its head.” Luther could not respect either the learning or the judgment of Cajetan. He left Augsburg by stealth, afraid of capture, condemned, | but appealing “from the pope ill-informed to the pope to-be-better-informed.” On his return to Wittenberg he found the elector in great anxiety of mind, in consequence of an imperious letter from the cardinal, and offered to leave Saxony for France. The elector, however, allowed him to remain, and the pope sent another legate tu settle | the affairs of Germany. This was Carl von Miltitz, a | native of Saxony, a man of the world, and no great theologian. He resolved to meet Luther privately, and did so in the house of Spalatin, court preacher to the elector of Saxony. In his interview with Cajetan Luther had refused to retract two propositions—that the treasury of indulgences is not filled with the merits of Christ, and that he who receives the sacrament must have faith in the grace offered to him. Miltitz made no such demands. He apparently gave up Tetzel and the indulgences, agreed with much of Luther’s theology, but insisted that he had not been respectful to the pope, and that such conduct weakened the authority which rightly belonged to the church, He wished Luther to write to the pope and

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apologize. Luther consented. It was further arranged that both parties weré to cease from writing or preaching on the controverted matters, and that the pope was to commission a body of learned theologians to investigate. Luther accordingly wrote to the pope, telling him that he “freely confessed that the authority of the church was superior to everything, and that nothing in heaven or on earth can be preferred before it save only Jesus Christ, who is Lord over all.” This was in March 1519. Mean- while Luther had appealed from the pope to a general council to be held in Germany. In the end of 1518 a papal bull concerning indulgences had appeared, confirming

the old doctrine, without any reference to the late dispute. The years 1519, 1520, 1521 were a time of fierce but triumphant struggle with the hitherto irresistible Clurch of Rome, soon openly supported by the empire. The first of these years passed in public conferences and disputations. Luther had promised Miltitz to refrain from controversy, on the understanding that his adversaries did not attack him, and he kept his word. But his old antagonist John Leipsic Eck published thirteen theses attacking Luther, and ‘ispute-challenged Andrew Bodenstein of Carlstadt, a friend and “°™ colleague of Luther, to a public disputation, Luther instantly replied to Eck’s theses, and the disputation between Carlstadt and Eck was immediately followed by one between Eck and Luther. In this famous Leipsic disputation the controversy took a new shape. It was no longer a theological dispute ; it became a conflict between two opposing sets of i a es affecting the whole round of church life. Luther and Hck began about indulgences and penance, but the debate soon turned on the authority of the Roman Church and of the pope. Eck maintained the superiority of the Roman Church and of the pope as successor of St Peter and vicar-general of Christ. His argument was “no pope no church.” Luther denied the superiority of the Roman Church, and supported his denial by the testimony of eleven centuries, by the decrees of Nicza, by the Holy Scriptures. He maintained tliat the Greek Church was part of the church of Christ, else Athanasius, Basil, and the Gregories were outside Christianity. The pope has more need of the church, he said, than the church has of the pope. Eck retorted that these had been the arguments of Wickliffe and of Huss, and that they had been condemned at the council of Constance. Luther refused to admit that the condemnation was right ; Eck refused to debate with an opponent who would not abide by the decision of cecumenical councils ; and so the disputation ended. But Luther immediately afterwards completed his argument and published it. He asserted that he did not mean to deny the bishop of Rome’s primacy, provided the pope kept his own place as servant of the church, but that he did mean to deny that there could be no church apart from the pope. The church, he said, is the communion of the faithful, and consists of the elect, and so never can lack the presence of the Holy Spirit, who is not always with popes and councils. This church, he declared, is invisible, but real, and every layman who is in it and has Holy Scripture and holds by it is more to be believed than popes or councils, who do not. This Leipsic disputation had very important consequences. On the one hand, Eck and his associates

felt that Luther must now be put down by force, and pressed for a papal bull to condemn him; and Luther himself, on the other hand, felt for the first time what great consequences lay in his opposition to the indulgences. He saw that his Augustinian theology, with its recognition of the heinousness of sin, and of the need of the sovereign grace of God, was incompatible with the whole round of medieval ceremonial life, proved it to be impossible for men to live perfectly holy lives, and so made saints and saint worship and relics and pilgrimages AV. — 10

impossible things. He saw the uselessness of the monastic life, with its vigils and fasts and scourgings. These things were not helps, he saw, but hindrances to the true religious life. The Leipsic disputation made Luther feel that he had finally broken with Rome, and it made all Germany see it too, and raised the popular enthusiasm to a white heat. The people of the towns declared their sympathy with the bold monk. Ulrich von Hutten and the German humanists saw that this was more than a monkish quarrel, and recognized Luther as their leader. Franz von Sickingen and the free knights hailed him as a useful ally. Even the poor down-trodden peasants hoped that he might be a luckier leader than Joss Fritz, and that he might help them to free themselves from the unbearable miseries of their lot. I.uther became the leader of the German nation after the Leipsic disputation.

During 1520 the first great political crisis occurred, on the occasion of the death of Maximilian, and ended fatally, in consequeuce of the want of patriotic and political wisdom among the German princes. Ranke has pointed out the political elements which then existed for creating a Germany as free and independent as France or England ; and Justus Moser of Osnabruck had long before truly declared, “If the emperor at that time had destroyed the feudal system, the deed would have been, according to the spirit in which it was done, the grandest or the blackest in the history of the world.” Méser means that if the emperor had embraced the Reformed faith, and placed himself at the head of the lower nobility and cities, united in one body as the lower house of a German parliament, this act would have saved Germany. Probably some such idea was in the mind of the archbishop of Treves when he proposed that Frederick, the elector of Saxony, should be

chosen emperor. Frederick might have carried out this policy, just because, if elected, he had nothing to rely upon except the German nation, then more numerous and powerful than it has been since; but he had not the courage to accept a dignity which he supposed to require for its support a more powerful house than his own. Charles, the son of Maximilian, was elected emperor, and that election meant the continuation of a medisval policy in Germany.

Meanwhile Luther was at Wittenberg continuing his course of preaching, lecturing, and writing. The number of matriculated students had increased from 232 in 1517 to 458 in 1519, and to 579 in 1520; but large numbers besides these came to hear Luther. The study of Greek and Hebrew was diligently carried on, and the university was in a most flourishing state. Some of the finest produc- tions of Luther's pen belong to this period,—his Sermons on the sacraments, on excommunication, on the priesthood, on good works, his Address to the Christian Nobility of the German Nation on the Reformation of Christendom, and The Babylonian Captivity of the Church. The address to the German nobles, published on June 26, 1520, created a great deal of excitement not only in Germany but beyond it. It was this appeal which first made Zwingli feel in sympathy with Luther, who showed in this little book that the Romish doctrine of two estates, one secular and the other spiritual, was simply a wall raised round the church to prevent reform, All Christians are spiritual, he said, and there is no differenceamong them. The secular power is of God as well as the spiritual, and has rule over all Christians without exception,—pope, bishops, monks, and nuns. He also appealed to the people to prevent so much money going out of the kingdom to Italy. "Why," he said, "should 300,000 florins be sent every year from Germany to Rome?" His address raised the cry of Germany for the Germans, civil government uncontrolled by ecclesiastics, a married clergy, while he called for a

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national system of education as the foundation of a better order of things. 'The most important work of the time, however, was the Babylonian Captivity of the Church of God (October 1520), in which he boldy attacked the papacy in its principles. The main thought in the book is expressed in

the title. The catholic church had been taken into bondage by the papacy, as the Jewish people were taken to Babylon, and ought to be brought back into freedom. Luther described the sacraments, real and pre- tended, and showed how each had been carried into cap- tivity and ought to be delivered. He concluded in a very characteristic fashion. ‘I hear that bulls and other papis- tical things have been prepared, in which I am urged to recant or be proclaimed a heretic. If that be true, I wish this little book to be part of my future recantation.” The printing press sent thousands of these books through Germany, and the people awaited the bull, armed before- hand against its arguments. The bull was published at Luther Rome on July 15, 1520. It accused Luther of holding excom- the opinions of Huss, and condemned him. Eck brought atell it to Leipsic, and published it there in October. It was posted up in various German towns, and usually the citizens and the students tore it down, At last it reached Luther. He answered it in a pamphlet, in which he called it the execrable bull of Antichrist, and at last he proclaimed at Wittenberg that he would publicly burn it. On December He 10, 1520, at the head of a procession of professors and burns students, Luther passed out of the university gates to the thea market-place, where a bonfire had been laid. One of the ae professors lighted the fuel, and Luther threw the bull on the flames; a companion flung after it a copy of the canon law. Germany was henceforth to be ruled by the law of the land, and not by the law of Rome. The news flashed over all Germany, kindling stern joy. Rome had shot its last bolt; if Luther was to be crushed, only the emperor could do it. On December 17th Luther drew up before a notary and five witnesses a solemn protest, in which he appealed from the pope toa general council. This protest, especially when we take it along with other future acts of Luther, meant a great deal more than many historians have discerned. It was the declaration that the Christian community is wider than the Roman Church, and was an appeal from later medieval to earlier mediseval ideas of catholicity. In the times immediately preceding the Reformation, the common description of Christian society was social life in communion with the bishop of Rome, but in the earlier Middle Ages Christian society had also been defined to be social life within the holy Roman empire. For the Roman empire had imposed on all its subjects a creed, and to that extent had made itself a Christian community. The cecumenical council was the ecclesiastical assembly and final court of appeal for this society, whose limits were determined by the boundaries of the medizval empire, and

Luther by this appeal not only declared that he could be a catholic Christian without being in communion with Rome, but secured an ecclesia- stical standing ground for himself and his followers which the law could not help recognizing. It was an appeal from the catholic church defined ecclesiastically to the catholic church defined politically, and foreshadowed the future political relations of the Lutheran Church.

The pope had appealed to the emperor to crush heresy in Germany, and Charles V., with his Spanish training and his dreams of a restored medizeval empire, where he might reign as vicar of God circa civilia, had promised his aid. He had declared, however, that he must pay some regard to the views of Frederick of Saxony, from whom he had received the imperial crown, and had in the end resolved to summou Luther before the diet to be held at Worms. The diet was opened by Charles in January 1521, and the

Before the } emperor

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papal nuncio Hieronymus Alexander (afterwards archbishop of Brindisi and cardinal) urged first privately and then publicly in the diet that Luther should be condemned un-

_ heard, as one already tried and convicted by the papal

bull. He threatened the Germans with extermination, it is said, in case of their refusal to accede to his requests,—- “We shall excite the one to fight against the other, that all may perish in their own blood,”—a threat to which the whole subsequent history of Germany offers the commen- tary. But the princes had their own quarrel with Rome, and urged besides that it would be unfair to condemn a man unheard and untried. A committee appointed by the diet presented a list of one hundred grievances of the German nation against Rome. This startled the emperor, who, instead of ordering Luther’s books to be burned, issued only a provisional order that they should be delivered to the magistrate. He then sent to summon Luther before him, and granted him a safe conduct to and from the diet. In April Luther set out for Worms. Before leaving Wittenberg he had devised with his friend Lucas Cranach the artist what he called “a good book for the laity,” a series of

woodcuts depicting contrasts between Christ and the pope, with explanations in pithy German:— Christ washing the disciples' feet on one page, the pope holding out his toe to be kissed, on the other; Christ bearing his cross, the pope carried in state through Rome on men's shoulders ; Christ driving money-changers out of the temple, the pope selling indulgences, with piles of money before him; andso on. Luther went to Worms, believing that he was going to his death. Everywhere on the road he saw the imperial edict against his books posted up, yet his journey was in some sort a triumphal progress; the people came out in crowds to meet him, and at Erfurt the herald gave way to the universal request, and, against his instructions, permitted Luther to preach. On the 16th Luther entered the imperial city amidst an immense con- course of people. Next day he was brought before the diet. When the hour approached he fell on his knees, and uttered in great agony a prayer such as can only be pro- nounced by a man filled with the spirit of Him who prayed in Gethsemane. When he appeared before the diet oo was asked by John Eck, an official of the archbishop of Treves (to be distinguished from Eck the theologian), whether the books piled on a table were his, and whether he would retract what was written in them. Luther acknowledged his writings, and requested that as the matter written con- cerned the highest of all subjects, the word of God and the welfare of souls, he might have time for consideration before he answered the second question. His request was granted, and he retired. Luther's resolution had been taken before he appeared at the diet; he only desired to convince friends as well as foes that he did not act with precipitation at so decisive a moment. The next day he employed in prayer and meditation, making a solemn vow upon a volume of Scripture to remain faithful to the gospel, should he have to seal his confession with his blood. When he was again brought before the diet, he answered at great length, dividing his writings into three kinds :— (1) those in which he had written about faith and morals in such fashion that even his opponents admitted that what he had said was worth reading: he could not retract these ; (2) those in which he had condemned the papacy and popish doings, which had ruined Christendom body and soul: to retract these would be mean and wicked, and he would not; (3) those in which he had attacked private persons with perhaps niore vehemence than was right: he would not retract, but would readily listen to any one who pointed out errors. He spoke in German with

earnestness and force, but the emperor and his followers scarcely understood him, and he was asked to repeat his answer in

Latin. He did so, and the papal party were irritated ; the official declared that they were not there to make dis- tinctions or to discuss things which had been long ago settled by councils; let the accused say whether he recanted or not. Luther answered, “Well then, if your imperial majesty and your graces require a plain answer, I will give you one of that kind without horns and teeth. It is this. I must be convinced either by the witness of Scripture or by clear arguments, for I do not trust either pope or councils by themselves, since it is manifest that they have often erred and contradicted themselves—for I am bound by the Holy Scriptures which I have quoted, and my con- science is held by the word of God. I cannot and will not retract anything, for to act against conscience is un- safe and unholy. So help me God. Amen.” Eck asked him whether he actually meant to say that general councils had erred. Heanswered that he declared, and that openly, that councils had erred several times, that the council of Constance had erred. Eck replied that he surely did not mean to say that general councils had erred. Luther persisted that he could prove that they had erred in many places. The emperor made a sign to end the matter, and Luther said, “‘I can do nought else. Here stand I. God help me. Amen.” He went back to his lodgings in deep depression of spirit, but was comforted on learning that the elector had told Spalatin, ‘Doctor Martin has spoken well in Latin and in German before the emperor and all the princes and estates of the empire ; only he is too keen for me.” Luther’s answer created very various feelings among those who heard him. The Italians and Spaniards wished the safe conduct revoked, and Luther burnt at once. Most of the Germans resolved to protect him at all hazards. The emperor deliberated for a day, and then declared that he meant to permit Luther to return safely from the council, but that his opinions were to be con- demned, and all who clung to them punished for the future. But the proposal to cancel the safe conduct had roused the people. There were threatenings of insurrec- tions of the peasants, and of Sickingen and the knights ; and the emperor, to allay the feeling, resolved that three days should be given to Luther to reconsider what he had said. Theologians came to argue with him, and to induce him to

make some recantation, but in vain. At last the edict of the diet was pronounced, in which Luther was condemned in the severest terms, and placed under the ban of the empire. This meant that when his safe conduct expired he was an outlaw, and that all people were for- bidden to give him food or fire ‘or shelter. His books were to be burnt, his gouds confiscated, and his adherents punished. Whoever disobeyed the edict incurred the ban of the empire.

Frederick the elector of Saxony thought that Luther’s At the life was no longer safe, as in twenty-one days his safe Wart- Luther was hurried away from >

conduct would expire. Worms, and as he travelled back to Wittenberg he was stopped near Eisenach by a band of armed knights, and carried to the fortified castle of the Wartburg above Hisenach by Frederick’s orders. The elector’s fears, as matters turned out, were exaggerated. Germany was in no mood to give Luther up, and there were threatenings of risings when he disappeared, only appeased when it was whispered about that he was in friendly keeping. Luther remained at the Wartburg, dressed as a knight, ordered to let his beard grow, and bearing the name Junker George, for ten months, and made use of his enforced leisure to begin what was perhaps his greatest literary work, his translation of the Scriptures from the original texts. The New Testament was almost entirely his own work. He used for the text Erasmus’s fourth edition, and took incredible pains with his work. Some of his MS. still

survives, and shows that he corrected and recorrected with great pains. Some passages were altered at least fifteen times. He often felt at a loss for want of technical knowledge, and laid all his friends under contribution. Thus, when in difficulty about the trans- lation of Rev. xxi. he wrote to Spalatin to ask for names and descriptions of all the precious stones men- tioned. When engaged in the translation of the descrip- tions of the slaughter of beasts for sacrifice, he got a butcher to kill some sheep for him, that he might learn what every part of a sheep was called. His aim was to re- produce the tone and spirit of the original as far as he possibly could. No fine courtly words, he said to Spalatin ; this book can only be explained in a

simple popular style. It must be understood by the mother in the house, by the children in the streets, and by the ‘common man in the market.” The translation of the New Testament was first published on September 21, 1522, and a second edition ap- peared in October. By choosing the Franconian dialect in use in the imperial chancery, Luther made himself intelli- gible to those whose vernacular dialect was High German or Low German, and his Bible is still the standard of the German tongue, and has preserved unity of language, literature, and thought to the German uation during its political disintegration. The translation of the Old Testament, begun in the same year, was a much more tedious task, and Luther was assisted in it by what Matthesius calls a private Sanhedrim. The friends met once a week, several hours before supper, in the old Augustinian monastery at Wittenberg, which had become Luther’s house. Bugenhagen, Justus Jonas, Melanchthon, Aurogallus, Roser, and several Jewish rabbis made the “Sanhedrim.” Luther thus describes the work: ‘‘ We are labouring hard to bring out the prophets in the mother- tongue. Ach Gott! what a great and difficult work it is to make the Hebrew writers speak German! They resist it so, and are unwilling to give up their Hebrew existence and become like Germans.” At the Wartburg Luther was ill in health and somewhat troubled in mind. He had been ill before he was summoned to Worms, and his long journey in the waggon with its cloth tent, the excitement at Worms, and the solitude at the Wartburg had enfeebled him; but his literary activity was untiring. He wrote short commentaries on the 68th Psalm and on other portions of Scripture, and a set of homilies intended to guide evangelical preachers, the Kirchen-postille. He also wrote one or two short treatises on worship, on the mass, on confession, and on monkish vows, intended to guide tlie reformed churches in the rejection of superstitious usages. Up to this time there had been no change in the church ser- vices. The true doctrine of the gospel had been preached in Germany, and Romish rites and ceremonies had been exhibited as abuses, but not a single word or portion of these ceremonies had been changed, and Luther felt that the time had come to bring the preaching and the usages into harmony with each other. In the midst of these labours news came to him that Germany was threatened , with a new sale of indulgences. The cardinal archbishop of Mainz, Albert of Brandenburg, unable to pay the 26,000 ducats due to Rome for his pallium, had resolved to raise the money by indulgences, Luther wrote a fierce tractate Against the New Idol at Halle. The archbishop

getting word of this, sent to Frederick asking him to restrain Luther from attacking a brother-elector, and Frederick wished Luther to desist. He was indignant, but at the request of Melanchthon he agreed to lay the treatise aside until he had written to the archbishop. “Put down the idol within a fortnight, or I shall attack you publicly,” he wrote; and the archbishop in reply thanked Luther for his Christian brotherly reproof, and

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promised, “ with the help of God, to live henceforth as a pious bishop and Christian prince.”

Luther’s absence from his congregation, his students, Back and his friends and books at Wittenberg weighed heavily Witte

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upon him, and he began to hear disquieting rumours. Carlstadt and other friends at Wittenberg were urging on the Reformation at too rapid a rate. Their idea was that everything in worship not expressly enjoined in the Bible should at once be abolished. The churches were to be stripped of crucifixes, images of saints, and the ritual of the mass; the festivals of the Christian year were to be neglected, the monastic life put down by force; and some even wished it ordained that all clergymen should be married. To Luther all this seemed dangerous, and sure to provoke a reaction; the changes insisted upon were to him matters of indifference, which might be left to the individual to do or leave undone as he pleased. Auricular confession, the reception of the Lord’s Supper under both forins, pictures in churches, the observance of festivals and fasts, and the monastic life were adzaphora. He wrote earnestly warning his friends against rashness and violence, and he was anxious and distressed. Still he held out patiently till events occurred which called for his presence. Certain men claiming to be prophets, Nicolaus Storch, a weaver, and his disciple Thomas Miinzer, belonging to the village of Zwickau, near the Erzgebirge on the borders of Bolemia, preached wildly a thorough- going reformation in the church and the banishment of priests and Bibles. All believers were priests, they said, and all the faithful had the Holy Spirit within them, and did not need any such external rule as Holy Scripture. They were banished from Zwickau,

and came to Wittenberg, where Carlstadt joined them. Fired by their preaching, the people tore down the images in the churches and indulged in various kinds of rioting. Luther felt he could remain no longer in hiding. He wrote to the elector telling him that he must quit the Wartburg, and at the same time declaring that he left at his own peril. “You wish to know what to do in the present troublesome circumstances,” he said. ‘Do nothing. As for myself, let the command of the emperor be executed in town or country. Do not resist if they come to seize and kill me; only let the doors remain open for the preaching of the word of God.” He was warned that Duke George of Saxony, a violent enemy of the Reformation, was waiting to execute the sentence of the ban. “Tf things were at Leipsic as they are at Wittenberg,” he said, “I would go there, if it rained Duke Georges for nine days running, and every one of them nine times as fierce as he.” He left the Wartburg, suddenly appearing in Wittenberg on March 3, 1522, and plunged at once into the midst of struggles very different from those which he had hitherto so victoriously overcome. He found things in a worse state than he had feared; even Melanchthon had been carried away. Luther preached almost daily for eight consecutive days against Carlstadt and the fanatics from Zwickau, and in the end he prevailed and the danger was averted. His theme was that violence does no good to God’s word; there are in religion matters of indifference. ‘The Word created heaven and earth and all things; the same Word must also now create, and not’ we poor sinners. Summa summarum, I will preach it, I will talk of it, I will write about it, but I will not use force or compulsion with any one.” ‘In this life every one must not do what he has a right to do, but must forego his rights, and consider what is useful to his brother. Do not make a ‘must be’ out of a ‘may be,’ as you have now been doing, that you may not have to answer for those whom you have misled by your uncharitable liberty.” Storch and Miinzer, sincere though misguided men, sought an interview with him. They laid

and the diet, at Nurem- berg.

their claims for support before him; they said that they were inspired and could prove it, for they would tell him what then passed through his mind.

Luther challenged them to the proof. ‘You think in your own heart that my doctrine is true,” said one of them impressively. “Get thee behind me, Satan,” exclaimed Luther, and dismissed them. “They were quite right,” he said to his friends afterwards; “that thought crossed my mind about some of their assertions. A spirit evidently was in them ; but what could it be but the evil one?”

When Charles V. had laid Luther under the ban of the empire, he had undoubtedly been greatly influenced by political considerations. Francis I. of France and Charles of Spain were rivals, and the whole of the European policy of the time turns on this rivalry. The opponents schemed to attract to themselves and to divert from their neighbour the two outside powers of England and the papacy, and in 1521 it was the poliey of Charles to win alliance with the pope. ‘The Germans saw that they were being sacrificed in this game of statecraft, and there was no great willingness even among Roman Catholics to put the edict of Worms in force. Luther at the Wartburg and at Wittenberg was protected by the national feeling of Germany from attack. The diet of the empire met in 1522 at Nuremberg, and the new imperial council, which ruled in the emperor’s absence, and very fairly represented the popular feeling in Germany, was in no mood to yield to the papacy. Leo X. had died, and his successor Adrian VL, an orthodox Dominican and an advocate for reforma- tion in thecloisters and in the lives of the clergy, proposed to begin reformation by crushing the German heresy. He instructed his nuncio to the diet to demand the exccution of the edict of Worms. ‘The imperial council refused until

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Finally it was resolved that a diet to be held at Spires was to decide upon the religious differences. But between Nuremberg and Spires an event occurred, the revolt of Sickingen and the knights, which was destined to work harm to the Reformation. The diet of Spires met, and, many of the members being inclined to connect Sickingen and Luther, there was a strong feeling against the Reformation, but the feeling was not strong enough to induce the diet to comply with the demands of the legate Campeggio and revoke the decisions of Nuremberg, and it refused to execute the edict of Worms. Campeggio, how- ever, was able to separate

Germany into two parties, and this separation became apparent at the convention of Ratisbon, where Bavaria, Austria, and other South-German states resolved to come to separate terms with the papacy. The curia promised to stop a number of ecclesiastical extortions and indulgences, to make better appointments to benefices, and to hand over some of the ecclesiastical estates to the Austrian and Bavarian princes ; while the states promised to set aside the gravamina, and to permit no toleration of the new doctrines. On the other hand, many states which had kept aloof from the Reformation now joined it, and declared against the seven sacraments, the abuses of the mass, the worship of saints, and the supremacy of the pope. The emperor's brother and suc- cessor Ferdinand was a bitter foe to the Reformation, aud urged persecution. Four Augustinian monks at Antwerp were the first martyrs ; they were burnt on Ist July 1523. Ferdinand began the bloody work of persecution in tlie hereditary states of Austria immediately after the conven- tion of Ratisbon. At Passau in Bavaria, and at Buda in Hungary, the faggots were lighted. The dukes of Bavaria followed the saine impulse.

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the grievances of Germany were heard and redressed. They spoke of concordats broken and papal pledges unful- filled, and finally they demanded a free cecumenieal council to be held in Germany within a year, which should settle abuses, and until it met they wished the creed to be an

Luther's literary activity during these years was unparal- Luther's leled. In 1522 he published, it is said, one hundred and writings thirty treatises, and eighty-three in the following year, among ae

: gets sce tli them the famous Contra Henricum regem Anglix, in which, penal

open question. The nuncio found that the pulpits of the free imperial city were filled with preachers, mostly monks, who were making the city resound with gospel preaching. He asked the diet at least to arrest the preachers ; the diet pleaded ineompetence. He proposed to seize them himself in the pope's name ; the magistrates threatened to release them by foree, and the nuncio had to desist. The diet then presented a hundred

gravamina or subjects of complaint which the German nation had against the papacy, including in the list indulgences, dispensations bought for money, absentee bishops and other ecclesiastics, the use of bans and interdicts, pilgrimages, exeessive demands for money, and the decisions of matrimonial cases in ecclesi- astical courts. The complaint was an expansion of Luther's address to the German nobles, The nuncio could do nothing, and was forced to accept by way of compromise a decision from the diet that only the verwm, purum, sincerum, et sanctum evangelium was to be preached in Germany. Nuremberg reversed the edict of Worms. Next year the diet met again at Nuremberg, and the new pope, Clement VIL, sent the celebrated cardinal-legate Lorenzo Campeggio to demand the execution of the edict of Worms. The diet asked in return what had become of the hundred grievances of the German nation, to which Rome had never deigned to return ananswer. Campeggio declared that at Rome the document had been considered merely as a private pamphlet ; on which the diet, in great indignation, insisted on the neeessity of an cecumenical council, and proceeded to annul the edict of Worms,— declaring, however, in their communication to the pope, that it should be conformed to as much as possible, which with respect to many cities and princes meant not at all

after having dealt mercilessly with the royal controversialist, he exclaims, "I cry 'Gospel! Gospel! Christ! Christ!' and they ceasenot to answer 'Usages! Usages! Ordinances ! Ordi- nances! Fathers ! Fathers!' The apostle St Paul annihilates with a thunderstorm from heaven all these fooleries of Henry." His principal work, however, during these years was the publication of certain short tracts upon worship and its reform, followed by various directories for public worship, which afterwards served as a model for the numerous Lutheran Church ordinances. In 1522, while Luther was still in the Wartburg, Carlstadt had published for the church at Wittenberg an ordinance for directing the government and worship of the church. It was very brief, but very revolutionary (cf. Richter's Hvangel, Kurchen- ordnungen, vol. ii. p. 484). This was withdrawn after Luther's return; but the Reformer felt that the time had come for a definite reform of public worship and for pub- lishing his views upon the subject. Accordingly, after a series of tracts in 1522 upon religious and monastic vows, the abolition of private masses, the Lord's Supper under both forms, saint worship, the so-called spiritual estate, and the married life, he

published in 1523 Z’he Order of the Worship of God. He was, as usual, conservative, and made as few changes as possible in the form of service, caring only to give full place to prayer and the reading and preaching of the word. The order of worship was followed by the Formula Missx, published in Latin, but at once translated into German by Paul Speratus, in which the ancient form was as much preserved as is consistent with evangelical doctrine. Luther was of opinion that the more difficult introits should be removed from the order of the Eucharist, and simpler hymns put in their place, and he also was strongly in favour of the singing of hymns in the

Revolt under Sickin- gen,

common worship. ‘This led to the publication in 1524 of a sinall collection of church hymns, which was Luther’s first German Church Hymn-book, and which was the beginning of the wonderfully rich German Protestant hymnology. In thesame year Luther translated the order of baptism, and published it under the title of Das T’auf- Biichlein. He also drew up a directory for public worship for Leisnig (cf. Richter, op. cét., vol. i.), The hymn-book was followed by a prayer-book, and by the publication of a short summary of the heads of Christian truth fitted for the instruction of the ‘“rud2 common man.” Luther’s catechism for children completed this series of works, intended to aid worship, public and private. Notwithstanding this immense amount of literary work, Luther found time to make preach- ing tours, and visited in this way Altenburg, Zwickau, Eilenburg, Erfurt, Weimar, and many other places, and was cheered by the progress of the Reformation throughout North Germany. About this time also he sent a powerful address to the municipal councils of the German towus, exhorting them to cstablish everywhere Christian schools, both elementary and secondary. ‘Oh my dear Germans,” he exclaimed, “the divine word is now in abundance offered to you. God knocks at your door; open it to Him ! Forget not the poor youth… ‘The strength of a town does not consist in its towers and buildings, but in count- ing a great number of learned, serious, honest, and well- educated citizens.” He tried to impress upon them the necessity for the highest education, the knowledge of Greek and Hebrew, by showing how serviceable such learn- ing had been to lim in his attack upon

the abuses of Rome. He also appealed to the princes and cities to help the gospel and the Reformed churches; but church rule and church maintenance could not be fixed on a legal basis until much later.

Here we conclude this first glorious period of Luther's life. The problem to be solved was not to be solved by Luther and by Germany ; the progressive vital element of reformation passed from Germany to Switzerland, and through Switzerland to France, Holland, England, and Scotland. Before he descended into the grave, and Germany into thraldom, Luther saved, as much as was in him, his country and the world, by maintaining the fundamental principles of the Reformation against Melanchthon's pusillanimity ; but three Protestant princes and the free cities were the leaders. The confession was the work of Melanchthon ; but the deed was done by the laity of the nation. The German Reformation was made by a scholastically trained monk, seconded by professors ; the Swiss Reformation was the work of a free citizen, an honest Christian, trained by the classics of antiquity, and nursed in true hard-won civil liberty. Luther's work was continued, preserved, and advanced bythe work of the Swiss and French Reformers. The monk began ; the citizen finished. If the one destroyed Judaism, the other converted paganism, then most powerful, both as idolatry and as irreligious learning. But as long as Luther lived he did not lose his supremacy, and he deserved to keep it. His mind was universal, and therefore catholic in the proper sense of the word.

Third Period (1525-1546). In this third period the epic of Luther's life was changed into tragedy ; the revolt of the knights under Sickingen, the Anabaptist tumults, and the peasants' war in the Black Forest alienated the sympathies of many from the Reformation, and Tesulted in a divided Germany (see vol. x. p. 498, vol. i. p. 786). From Sickingen's rising Luther sedulously kept himself aloof, but the insurgent had more than once proclaimed himself on Luther's side, and that was enough to make many of the princes resolve to have nothing to do with reform. The convention of Ratisbon was the result of Sickingen's abortive revolt. The Anabaptists have to

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do with Luther's history mainly in so far as his contact Ana.

with them modified aud gave final shape to his doctrine baptist of baptism. In his tract on the Sacrament of Baptism, “nults 1519, Luther distinguishes carefully between the sign and the thing signified. The ordinance is just the sign, the thing signified is the death to sin, the new birth, and a new life in Christ. This new life goes on here on earth, so does the death to sin. Believers die daily to sin, not once for all in baptism, and their life in Christ is not a full life whilst earth’s life lasts ; and so baptism is merely a’sign of what is never really accomplished till after death. In the Babylonian Captivity of the Church of God, 1520, Luther adopted a view not unlike Calvin’s. He said that God’s word was always more than a statement, it was also a promise. Baptism was therefore a seal or pledge, a promise that what was significd by the ordinance would be bestowed. Only unbelief can rob the baptized of the benefits of their baptism and make the ordinance of none effect. But after Luther came in contact with the Anabaptists he departed from this simple theory, for he thought that he could not justify infant baptism upon it,

and so in his Sermon on Baptism, 1535, he introduced a third theory, which approached much nearer to medieval views. He explained that in the ordinance of baptism God through His word so works on the water in the sacrament that it is no longer mcre water, but has the power of the blood of Christ in some mysterious fashion. Luther then asked if faith was required for the worthy partaking of the sacrament, and he felt obliged to confess that the faith of the recipient was not needed. This sermon marks Luther’s reaction towards ideas he had abandoned in 1519-20.

More important was the connexion between the Lutheran Peasants

movement and the peasant revolt. The first coalitions of war

the peasants against the intolerable rapacity and cruelty of ,

the feudal aristocracy had begun before the close of the .

15th century. But all the oppressed inclined towards)

Luther, and the oppressors, most of whom were sovcreigns, ; |

bishops, and abbots, towards the pope. The struggle in the

peasants' war was really between the reforming and the papist

party, and it could easily be foreseen that Luther would

be dragged into it. As early as January 1525 the revolu-

tionary movement had extended from the Black Forest into

Thuringia and Saxony, and the peasants were eagerly | looking to Luther for help. The more moderate party published their programme in twelve articles, with a very remarkable preface, in which they stated that they did not wish for war, and asked nothing that was not in accord- ance with the gospel. These articles were the following :— (1) the whole congregation to have power to elect their minister, and if he was found unworthy to dismiss him ; (2) the great tithe, 2.e, the legal tithe of corn, to be still payable for the maintenance of the pastor, and what is over to go to support the poor ; the small tithes to be no longer payable ; (3) serfdom abolished, since Christ has redeemed us all by His precious blood ; (4) game, fish, and fowl to be free as God created them ; (5) the rich have appropriated the forests, this to be rearranged ; (6) compulsory service to be abolished—wages for work ; (7) peasant service to be limited by contract, and work done above contract to be paid for; (8) fair rents; (9) arbitrary punishments abolished ; (10) the commons restored; (11) the right of heriot, z.¢., the right of the lord to take the vassal's best chattel, to be abolished ; (12) all these propositions to be tested by Scripture, and what cannot stand the test to be rejected. Most impartial historians have declared that their demands were on the whole

just, and most of them have become law in Germany. The words of Scripture brought forward by the peasants prove clearly that Luther's preaching of the gospel had acted, not asan incentive, but

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as a corrective. The peasants declared their desire to uphold the injunctions of the gospel, peace, patience, and union. Like the Puritans in the following century, the peasants say that they raise their voice to God who saved the people of Israel; and they believe that God can save them from their powerful oppressors, as he did the Israelites from the hand of Pharaoh. Luther evidently felt himself appealed to. The crisis was difficult, and, in spite of what has been said in his defence, he failed, as he failed afterwards in the conference with the Swiss deputies at Marburg. Had Luther thrown the weight of his in- fluence into the peasants' scale, and brought the middle classes, who would certainly have followed him, to the side of the peasants, a peaceful solution would in all probability have been arrived at, and the horrors of massacre averted. But Luther, bold enough against the pope or the emperor, never had courage to withstand that authority to which he was constantly accustomed, the German prince. He began by speaking for the peasants in his address to the lords, and had courage enough to tell them some plain truths, as when he said that some of the twelve articles of the peasants are so equitable as to dishonour the lords before God and the world, when he told them that they must not refuse the peasants' demands to choose pastors who would preach the gospel, and when he said that the social demands of the peasants were just, and that good govern- ment was not established for its own interest nor to make the people subservient to caprice and evil passion, but for the interest of the people. 'Your exactions are intoler- able," he said, "'you take away from the peasant the fruit of his labour in order to spend his labour upon your finery and luxury." He was courageous enough also in asking the peasants to refrain from violence, and in telling them that they would put themselves in the wrong by rebellion. But what Luther did not see was that the time for good advice had gone by, and that he had to take his stand on one side or the other. He trusted too much in fine language. His advice that arbiters should be chosen, some

from the nobility and some from towns, that both parties should ‘give up something, and that the matter should be amicably settled by human law, came ten months too late. The bloody struggle came ; the stream cf rebellion and destruc- tion rolled on to Thuringia and Saxony, and Luther apparently lost his head, and actually encouraged the nobles in their sanguinary suppression of the revolt, in his pamphlet entitled Against the Murdering, Robbing Rats of Peasants, where he hounds on the authorities to ‘stab, kill, and strangle.” The princes leagued together, and the peasants were routed everywhere. One army, with neither inilitary arms nor leaders, was utterly routed at Franken- hausen, another in Wiirtemberg. Fifty thousand were slain or butchered by wholesale executions. Among this number many of the quietest and most moderate people were made victims in the general slaughter, because they were known or suspected to be friends of the Reformation and of Luther, which indeed all the citizens and peasants of Germany were at that time. None felt more deeply, when it was too late, this misery, and what it involved in its effects on the cause of the gospel in Germany, than Luther; and he never recovered the shock. He thus unburdens his soul at the close of this fatal year, which crushed for centuries the rights and hopes of the peasants and labourers, and weakened the towns and cities, the seats of all that was best in the national life,—‘“ The spirit of these tyrants is powerless, cowardly, estranged from every honest thought. They deserve to be the slaves of the people ;” and in the next year—‘‘I fear Germany is lost ; it cannot be otherwise, for they will employ nothing but the sword.”

The prospect was dark enough for the Reformer.

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Ferdinand of Austria and the duke of Bavaria were imprisoning and slaying Christians on account of the gospel. The emperor, fresh from his victory at Pavia, and the pope were combining to crush the Reformation, and it was rumoured that the kings of France and England were to lend their aid. The convention of Ratisbon had resulted in a Roman Catholic league in which Duke George of Saxony, Albert elector-archbishop of Mainz, and the duke of Brunswick were the leaders. Luther also found that the war had

demoralized the Protestant congregations, and that they were becoming ignorant and savage. And in May 1525 the elector Frederick died.

It was under such auspices that Luther decided at last

Luther’s

to take a wife, as he had long advised his friends among marriage.

the priests and monks to do. He married Catherine von Bora, a lady twenty-four years of age, of a noble Saxon family, who had left her convent together with eight other sisters in order-to worship Christ without the oppression of endless ceremonies, which gave neither light to the mind nor peace to the soul. The sisters had lived together in retirement, protected by pious citizens of Torgau. Luther married her on June 11, 1525, in the presence of Lucas Cranach and of another friend as witnesses. Catherine von Bora had no dowry, and Luther lived on his appoint- ment as professor; he would never take any money for his books. His marriage was a happy one, and was blessed with six children. He was a tender husband, and the most loving of fathers. In the close of the year 1525 Luther was engaged in controversy with Erasnius on the freedom of the will.

The princes who were friendly to the Reformation gradually gained more courage. The elector John of Saxony established the principle in his state that all rites should be abrogated which were contrary to the Scriptures, and that the masses for the dead be abolished at once. The young landgrave Philip of Hesse gained over the son of the furious Duke George to the cause of the Reforma- tion. Albert, duke of Prussia, had established it at Konigsberg, as hereditary duke, abolishing the vows of the order whose master he had been, saying :—“ There is only one order, and that is Christendom.” At the request of the pope, Charles placed Albert under interdict as an apostate monk. The evangelical princes found in all these circumstances a still stronger motive to act at Augsburg as allies in the cause of the evangelical party ; and when the diet opened in December 1525 they spoke out boldly :—“ It is violence which brought on the war of the peasants. If you will by violence tear the truth of God out of the hearts of those who believe, you will draw greater dangers and evils upon you.” The Romanist party was startled. ‘The cause of the holy faith” was adjourned to

the next diet at Spires. The landgrave and the elector made a formal alliance in February 1526 at Torgau.

Luther, being consulted as to his opinion, felt helpless. “You have no faith; you put not your trust in God; leave all to Him.” ‘The landgrave, the real head of the evangelical alliance, perceived that Luther’s advice was not practical—-that Luther forsook the duty of self-defence and the obligation to do one’s duty according to the dictates of reason, in religious matters as well as in other political questions. But the alliance found no new friends. Germany showed all her misery by the meanness of her princes and the absence of any great national body to oppose the league formed by the pope, the emperor, and the Romanists throughout Europe. The archbishop of Treves preferred a pension from Charles to the defence of the national cause. The evangelically-disposed elector of the palatinate desired to avoid getting into trouble. The imperial city of Frankfort, surrounded by open

Progress of the Reforma- tion.

Diet of Spires,

1526.

enemies and timid friends, declined to accede to the alliance. There was more national feeling and courage in tho Anglo-Saxon north of Germany. The princes of Srunswick, Luxemburg, Mecklenburg, Anhalt, and Mans- feld assembled at Magdeburg, and made a solemn and heroic declaration of their resolution “to pledge their estates, lives, states, the holy word of God, relying on Almighty God, as whose instruments they would act.” The town of Magdeburg (which then had about three times as many inhabitants as now) and Duke Albert of Prussia adhered to the alliance. The league doubled its efforts. Charles, strong and

rendered safe by the peace of Madrid concluded with

Francis, sent word from Seville in March 1526, through the Romish Duke Henry of Brunswick, that he would soon

come himself to crush the heresy. Luther saw the dangers crowding around him; his advice was,—“ Weare threatened with war; let us force our enemies to keep the peace, con- quered by the Spirit of God, before whose throne we must now combat with the arms of prayer; thatis the first work

to be done.”

The emperor commissioned his brother Ferdinand to preside at the diet of Spires and carry out his wishes. But before the diet met Francis and the pope had formed a league against him, and Charles had commissioned Count Frundsberg to levy an army of Germans to fight against the pope, while Ferdinand was called to Hungary to main- tain against the Turks and others the kingdoms of Hungary and Bohemia, bequeathed to him by King Louis after the

battle of Mohacz. When the diet at Spires met (June 1526),

after some deliberation a proposition presented by the free cities was accepted that until a general council met ‘‘ every

state shall live, rule, and bear itself as it shall be ready to answer for to God and his imperial majesty,”—a decision which foreshadowed the famous Augsburg formula cujus regio ejus religio, the principle on which the German Protestant church was afterwards legally based. The Reformation had thus the three years, 1526-1529, to organize and consolidate itself, The man of Germany at that time among the princes was Philip, landgrave of Hesse, and he was taught what to do by a citizen James Sturm, the deputy of Strasburg at Spires. Sturm had con- vinced Philip that the basis of the true evangelical church was the acknowledgment of the self-government of the church by synods composed of the representatives of the whole Christian people ; and this was embodied in the first Protestant constitution, the Reformatio ecclesiarum Hassix juata certissimam sermonum Det regulam ordinata.| The constitution acknowledged the episcopal element, but not episcopal rule; the jus episcopale was invested in the Christian community, and the flock of Christ were to hear only the voice of their shepherd Christ. Bishops and deacons were to be elected by the Christian people ; bishops were to be consecrated by imposition of the hands of three bishops, and deacons instituted by the imposition of the hands of elders;

while elders were associated with the pastors in the pastoral care of the congregation. A goueral or land synod was to be held annually, consisting of the pastor of each parish and of pious men elected from the various congregations, and there were provisions made for provincial and congregational synods. Three men were to be elected annually to exercise the right of visita- tion. ‘This was afterwards found to be inconvenient, and six and then thirteen superintendents for life were sub- stituted. This board of superintendents became afterwards an oligarchy, and at last a mere instrument of state, overriding the original democratic constitutions of the

1 See Richter, Hvang. Kirchenordnungen, i. p. 56; and Lechler, Gesch. d. Presb. u. Synod. Verfassung, p. 14.

and subjects for the maintenance of

church, a consequence of the disruption of Germany and of the paralysis of all national institutions. Luther had in 1523 and 1524 professed principles almost identical with those established in 1526 in Hesse. His action ceased there; after the peasants’ war he abandoned his more liberal ideas, and insisted on leaving everything to the princes, and what could a people do cut up into four hundred sovereignties? Luther never acknowledged Ceesaropapism or Erastianism as a principle and as a right. He considered the rights of the Christian people as a sacred trust provisionally deposited in the hands of the princes their representatives. ‘“ Where,” he asked, “ are the people to form the synods? I cannot find them.” It was Melanchthon’s influence that facilitated the despotic system and hampered the thorough reform of the forms of worship. Luther withdrew from a sphere which he felt was not his. He busied himself during these years with plans to improve and simplify the church services at Wit- tenberg. Some portions of the music in the communion service were too difficult for the people. Luther induced the elector to provide music teachers, and also to permit a simpler service. This led to the German Mass and Order of Worship for Wittenberg. The churches too throughout electoral Saxony were becoming better attended, and Luther had to consider and devise plans for church exten- sion and supervision. His letters to Philip of Hesse, disapproving of the new constitution of the church there, show how jealous he had become of the

entrance of democratic ideas. He asked the elector of Saxony to take charge of the church within his dominions, and Melanch- thon's articles for the visitation of the churches in Saxony, which foreshadowed the Lutheran consistorial organization, show that Luther distinctly contemplates the transfer of the jus episcopale to the princes and magistrates. It is true that he called these magistrates WVothebischéfe, but he could not see any other solution of the difficulty, and undoubtedly from the legal point of view it was easy to transfer the right of supervision from one external authority to another, and difficult to hand it over from the bishops to the congregation. The new ecclesiastical organization adopted'in Hesse and electoral Saxony had the effect of making the archbishop of Mainz renounce in 1528 the spiritual jurisdiction he had hitherto exercised over these two districts.

Meanwhile the emperor had been again successful in his Diet of political schemes. His German army under the Constable ye Bourbon and General Frundsberg had seized upon Italy "~~ and had sacked Rome, and again he had brought the pope and Francis to terms. It only remained to subdue the Reformation, and the medieval empire might be restored.

He first sent a dispatch saying that the edict of Worms wus to be held asin force. When the diet met at Spires in 1529, the imperial commissioners forbade the celebration of worship according to the reformed usage in churches, aud afterwards in the houses of the elector and of the landgrave. The Act of Toleration of 1526 was to be abrogated. The diet appeared to be hopelessly divided, a majority with the emperor and a minority with the elector and the landgrave, and the majority passed an edict which amounted to this that where the edict of Worms could not be executed without fear of revolution no further reforms were to be allowed. The minority prepared aThep protest. 'The diet has overstepped its authority," they ba said; "our acquired right is that the decree of 1526, alien. unanimously adopted, remains in force until a council can be convened. Up to this time the decree has maintained the peace, and we protest against its abrogatiou." Ferdinand, who represented his brother, assured the princes that nothing remained for them but to submit ; he threatened the free cities with the loss of their privileges

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ik UT and with an interdict, and he left the diet while the evangelical members were deliberating. In spite of these threats the protest was signed by John of Saxony, George of Brandenburg, Ernest of Liineburg, Philip of Hesse, and Wolfgang of Anhalt among the princes, and by the representatives of the free cities of Strasburg, Nuremberg, Ulm, Costnitz (Constance), Lindau, Memmingen, Kempten, Nordlingen, Heilbronn, Reutlingen, Isny, St Gall, Weissen- burg, and Windsheim. This celebrated protest of April 15, 1529, from which comes the name Protestant, is one of the noblest documents of Christian history. The protest- ing princes and cities claimed as their right as Germans the sacred duty freely to preach the word of God and the message of salvation, that all who would hear it might join the community of believers. It was also an earnest of true evangelical union; for it was well known that most of the cities were more inclined towards Zwingli’s than towards Luther’s view of the sacrament.

If this great act be considered impartially, it is im- possible not to see that neither Luther nor Melanchthon was the real leader of the time. Luther had no real com- prehension of what had to be done in Germany to preserve the gospel from destruction. He had shown little sym- pathy with the first attempt made in Hesse at the self- government of the church; still less did he see the importance of the protest at Spires, and of the unity it gave to the evangelical cause. It was evident that nothing but the inroad of the Turks had saved the Protestant princes after the diet, and that Charles was so far master of Germany as to make it impossible for Germany to become a Protestant nation. The Protestants were lost unless they strengthened the alliance which they had just founded at Spires. But Luther disliked such alliances; he dissuaded the elector from sending deputies to the meeting agreed to be held at Smalkald, and when the Saxon depu- ties prevented any business being done he was proud of the result. This apparent blindness and perversion of mind requires explanation. Luther lived under the shadow of the Middle Ages, and had been trained in scholastic law as well as in scholastic theology. To the medieval jurist the emperor was the impersonation of all social order and moral law ; he was the vicarof God. In the later Middle Ages the jurists had exaggerated this sacredness of the emperor, and had done so quite naturally in order to protect civil law from

canon law, and to uphold the state against the church. Luther could throw off scholastic theology, but he could not throw off that scholastic jurisprudence that all his medieval heroes, Occam, Wickliffe, and Huss had found so useful in their attacks on the papacy, and that Luther himself had found so serviceable when he ap- pealed from the church defined by the pope to the church defined by the empire. He could not bear to think of an alliance against the holy Roman empire. Luther too had been trained in the school of Tauler and the Theologia Germanica, and partook greatly of their quietism. “ Suffer God to do His work in you and about you” was their motto. There was a theological scruple also at the bottom of Luther’s opposition to a vigorous Protestant alliance and a national attitude. This betrayed itself, first, in an un- casiness about Zwingli’s rising influence in Germany, and, secondly, as a doctrinal idiosyncrasy respecting the sacra- ment of the Eucharist. Philip of Hesse saw through this instantly, and said, “I see they are against the alliance on account of these Zwinglians; well, let us see whether we cannot make these theological differences disappear.”

When Luther was raised above himself by the great problem before him in that glorious period of action from 1518 to 1524, he had considered the sacrament as a part of the services of the church, and a secondary matter com- pared with the right view of faith or the inward Christianity

which implics necessarily an unselfish belicving and thank- ful mind. He was convinced that there was no virtue inherent in the elements apart from the communion, and it was a matter indifferent how the spirituality of the action and the real presence, even the transubstantiation, might be reconciled with faith. But the peasants’ war and Carl- stadt’s mystical enthusiasm alarmed him. Where was this to lead to, he asked, and he seems to have settled down into a great resolve to abide by the tradition of the church, and alter as little as possible provided room was found for the exercise of living faith. So when he felt called upon to form a theory of the doctrine of the sacrament of the Eucharist he went back to his scholasticism to find there some theory which should be traditional and yet afford room for the spiritual priesthood of all believers, and for the exercise of faith on the promises of God. He found it in the writings of that schoolman whom

he more than once calls ‘“‘his dear master,” the daring Englishman William of Occam. ‘Transubstantiation, the Romish doctrine, offended Luther in his two essential requirements: it demanded a miracle which could be performed by a priest only, and this miraculous power so separated clergy from laity that it denied the spiritual priesthood of all believers; and, when the elements had been made by the priest’s creating word the body and blood of the Lord, their supernatural efficacy, apart from the faith of the communicant, imparted grace. Occam had championed a theory which in some form or other had been in the church since the 10th century at least, and which openly rejected one of these stumbling blocks, and, as Luther saw, really did away with the other also. According to Occam’s scholastic distinctions, matter can be present in two ways—(1) when it occupies a distinct place by itself, excluding every other body, e.g., two stones mutually exclude each other, and (2) when it occupies the same space as another body at the same time. Every- thing which is omnipresent or ubiquitous must be able to occupy the same space as other things, else it could not be ubiquitous. Christ’s resurrection body, said Occam, had this power when our Lord appeared among His disciples while they were in a room with tlhe doors shut; at a certain moment of time it anda portion of door or wall must have been in the same place at the same time ; and besides Christ’s body is ubiquitous. It is therefore in the elements bread and wine, in, with, and under them. Luther took over this doctrine from Occam without altera- tion, The very illustrations he uses in his Bekenntniss vom Abendmahl are taken almost verbatim from Occam, De Altaris Sacramento. From this it followed that con- substantiation involved no miracle. Christ’s body was not brought into the elements by the priest; it was there natur- ally. But its presence in these elements on sacramental occasions brought with it a blessing, and imparted grace, not because of the presence, but because God had promised that this particular presence of the everywhere present body of Christ would bring blessings to the faithful partaker. Occam’s theory of consubstantiation fulfilled all Luther’s wants, and above all it involved no explaining away of the plain meaning of the sentence, “ This is my body,” such as had offended him in Carlstadt. It is easy to see therefore how Luther was alarmed at Zwingli. The Swiss Reformer seemed to attack everything that Luther prized. He did not care for tradition or church usage ; he seemed engaged in a rationalistic attack on the presence of Christ in the church, and on the word of God, and so he was guilty, in

Luther’s estimation, both of self-confidence and of a rationalism. On the other hand, Zwingli could not under- stand what Luther meant; and yet he was anxious to unite with him, and was willing to leave this one difficulty an open question. It was in these circumstances—suspiciou on the part of Luther, blank amazement on the part of a. = a0

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Marburg Zwingli—that Philip of Hesse induced the Swiss and the

confer- ence.

Diet of Augs- burg and the Augs- burg confes- sion.

German theologians to meet at Marburg. Luther was gloomy and suspicious, “‘as he had never been seen before,” a friend said. ‘The frank declarations of the Swiss Reformers soon cleared away all shadows of difference and dissent on all points but one, and fourteen articles defining the chief heads of Christian doctrine were adopted by both parties. Then came the discussion on the fifteenth, thie doctrine of the Eucharist. Luther took a piece of chalk and wrote upon the table Moc est corpus meum, and when worsted in argument, as he usually was, appealed to the sentence. The discussion, which lasted four days, however, resulted in the parties recognizing exactly where the point of difference lay, and in reducing it to its smallest dimen- sions. Both declared that they agreed in recognizing the Eucharist to be a sacrament of the true body and blood of Christ, and that a spiritual partaking of this body was a means of grace. They differed whether the trne body and blood of Christ were corporeally in the sacrament, It was hoped that time would bring about alliance if not agree- ment, but Luther was obstinate. ‘Submit yourselves, believe as we do, or you cannot be acknowledged as Chris- tians.” He refused Zwingli’s hand; ‘‘ You have another spirit from us,” he said, meaning that there was no objec- tive basis of faith between them owing to what he thought to be Zwingli’s rationalism. The result was a sad one, but Zwingli was to some extent a gainer; his view be- came naturalized in Germany, where Swabia adopted it, as did many of the imperial cities, and Philip of Hesse indicated that he preferred it.

The Marburg conference was a sad prelude to thie decisive diet to be held at Augsburg in 1530. The new diet was anxiously awaited. Charles had made known his intention to be present, and that he intended to enforce obedience to the edict of Worms, He entered Augsburg with great magnificence, and was in fact at the zenith of his power. He had broken the might of France, hunibled the papacy, been crowned at Bologna, reor- ganized Italy, and driven back the Turk. His only remaining task, and it seemed easy, was to crush the Reformation. He first summoned before him the pro- testing princes and asked them to withdraw the protest. This they refused to do; they had a clear constitutional right, founding on the decision of Spires, to resist the emperor, and they resolved to exercise it. Divine ser- vice after Lutheran fashion was held at their quarters, and they refused to join in the procession of the host at the festival of Corpus Christi. Meanwhile Luther, Melanchthon with him, was at Coburg, near enough at hand for consultation and yet beyond the emperor's reach, Melanchthon was preparing a confession with a defence, the so-called Apology, in case the emperor should require a statement of their doctrines, Luther was writing commentaries on the Psalms and the prophets, and was also preparing a popular edition of Msop's Fables. He also wrote comforting letters to the elector, and addressed one of his most powerful writings to the Roman Catholic clergy assembled in the diet at Augsburg. Melanchthon was sent for to consult about the confession which the emperor had asked for, and Luther remained alone at Coburg full of anxiety, for he knew his friend's helpless- ness in the actual bustle of life. When Melanchthon got to Augsburg he really became a source of weakness. He induced the elector for the sake of peace to give up the services in the Franciscan church, and the Protestant preachers left the town in despair. Luther all the while had been quiet, waiting in patience; but this was too much for him, and he wrote to encourage the elector to resist. At length the Protestants were asked to present their con- fession. The emperor ordered it to be readin Latin. "No,"

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said the elector, 'we are Germans and on German ground, I hope therefore your majesty will allow us to speak Ger- man." When the vice-chancellor of

the elector, Dr Christian Baicr, had read the first part of the confession, which ex- pounds the principles of the Reformation, and in particular the doctrine of justification by faith, ‘that faith which is not the mere knowledge of an historical fact, but that which believes, not only the history, but also the effect of that history upon the mind,” it is said that an indescribable effect was produced upon the assembly. The opponents felt that there was a reality before them which they had never imagined ; and others said that such a profession of faith by such princes was a more effectual preaching than that which had been stopped. “Christ,” said Jonas, “is in the diet, and he does not keep silence ; the word of God is indeed not tobe bound.” The Roman Catholic theologians present answered the confession, and then the emperor engaged Protestant and Roman Catholic theologians in negotiations in which Melanchthon soon showed his yield- ing character, even granting that the Protestants might acknowledge the jurisdiction of the bishops and _ the supremacy of the pope. At this critical moment Luther’s indignation found vent. “I understand,’ he wrote to Melanchthon, “ that you have begun a marvellous work, to make Luther and the pope agree together, but the pope will say that he will not, and Luther begs to be excused. Should you, however, after all succeed in your affair, I will follow your example and make an agreement between Christ and Belial. Take care that you give not up justification by faith ; that is the heel of the seed of the woman to crush the serpent’s head. Take care not to acknowledge the jurisdiction of the bishops; they will goon take all. In short, your negotiations have no chance of success unless the pope will renounce papacy.” The Romanists fortunately demanded too much. Not even Melanchthon could yield the acknowledgment of private masses, of auricular confession, and of the meritorious character of good works; and the negotiations ceased, While they were in progress the emperor tried to intimidate the princes by calling the imperial troops into the free city of Augsburg and closing the gates. The landgrave escaped, and this frightened the Catholics. Unfortunately the Pro- testants had confessed their want of union by presenting three confessions of faith :—the Lutherans had presented the Augsburg confession ; Strasburg, Constance, Memmin- gen, and Lindau, which sympathized to some extent with Zwingli, presented the Confessio Tetrapolitana ; and Zwingli had sent a confession which was not, however, laid before the diet. The diet broke up with the final decision that the Protestants should have till next spring to consider whether they would

voluntarily return to the church, and that, if they proved obstinate, then measures would be taken for their extermination.

To the student of Luther's life the diet of Augsburg is noteworthy chiefly because it was the occasion of the com- position of the Augsburg confession, or Azgustana, which afterwards became the symbol or confession of faith for the Lutheran Church. It was prepared by Melanchthon, founding on the fifteen articles of the Marburg conference, on the seventeen articles of Schwabach, and on the articles of Torgau. These various sets of articles had been written by Luther, and therefore the Augsburg confession was strictly Luther's own. It consists of two parts—one dogmatic, in twenty-one articles, which states the principal doctrines of the evangelical church, beginning with the Trinity and ending with the worship of saints; and the other in seven articles, rejecting the celibacy of the clergy, the sacrifice of the mass, auricular confession, ceremonial feasts and fasts, monastic vows, and the secular jurisdic- tion of bishops. It was signed at Augsburg by John of

'league.

'Luther's later

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in Ue Saxony, George of Brandenburg, Ernest of Liineburg, Philip of Hesse, and Wolfgang of Anhalt, and by the representatives of the towns of Nuremberg and Reutlingen, and during the sitting of the diet by the representatives of Kempten, Heilbronn, Windsheim, and Weissenburg.

The edict of the diet was published on November 19, and the Protestant princes, after having overcome the resistance of Luther, met for conference at Smalkald on Christmas 1530, and formed an armed league for mutual defence. It had been declared that the edict would be put into execution in the spring of 1531, but when the time came the emperor had other work on

hand: France had become troublesome, and the Turks were again moving. He found also that he could not count on the support of the Roman Catholic princes in the suppression of the Protestants. In presence of danger the Zwinglians and Lutherans showed a united front, and the Smalkald league grew to be a formidable power. The emperor resolved to come to terms with his Protestant subjects, and the result was the religious peace or rather truce of Nuremberg, which left things as they were until a geueral council should settle matters. The years following this peace of Nuremberg were comparatively prosperous to the Reformation. The Smalkald league was the only organ- ized power in Germany, and very effectually prevented the oppression of Protestants by Roman Catholics. Year by year their numbers increased, and Luther saw thie evangelical cause prospering. First Wiirtemberg was won back for young Duke Christopher, who had become a Protestant, and found on his entry to his dukedom that his people were already secret Protestants. In northern and central Germany whole districts embraced the evangelical doctrines. Electoral Brandenburg and ducal Saxony had received Protestant rulers, who found their people more than willing to accept the creed of their new sovereigns. At last the only large states that were able to maintain a firm front against the Lutheran doctrines were Austria, Bavaria, the Palatinate, and the great ecclesiastical pro- vinces on the Rhine, and even in these regions visitations of the churches had shown that the people were forsaking the old faith. It appeared that a more serious defection than any might at any moment be made. The elector-archbishop of Cologne showed signs of abandoning the Roman Catholic faith and secularizing his vast episcopal territories, and this threatened defection made Charles bestir himself. If the elector became a Protestant the Lutherans would be in a majority in the electoral college, and a Protestant emperor might he elected.

During all these years Luther was quietly at work at Wittenberg, lecturing, preaching, and writing. At first he felt anxious lest civil war should break out, and he had scruples about many of the doings, and even about the very existence, of that league which was really giving the land peace. Under Philip of Hesse the Reformation was assuming a national and political shape which alarmed Luther, who was more than ever content to keep out of public life and keep himself to his books. He began publishing his lectures on various portions of Scripture, on the Epistle to the Galatians and

on the Psalms of Degrees. He wrote one or two controversial tracts, mainly to show how the Reformed could not accept the conditions offered by the Roman Catholics at Augsburg. In 1534, to his great joy, the first complete translatiou of the whole Bible was published, and next year appeared a new edition of the Wittenberg hymn-book, containing several new hymns. Philip of Hesse, notwithstanding the failure of the con- ference at Marburg, still thought that something might be done to remove the theological differences between Switzerland and Saxony, or at least between Swabia,

and of South Germany had by their publications made this somewhat easier. The confession of Basel, drafted by Cicolampadius (1531), revised by Myconius, and published by the magistracy of Basel, had declared that in the Lord's Supper Chiist is the food of the soul to everlasting life, and Bucer and the other South-German divines were anxious for a union. Philip of Hesse, Bucer, and Melanchthon met in conference at Cassel to arrange preliminaries, not without suspicion on Luther's part, for he could not trust Melanchthon at a conference, and, as he remarked to Justus Jonas, he hated trimmers above all men on the earth'sround. The result, however, was better than he had hoped for. Bucer drew up a short confession which was to be submitted to the Wittenberg theologians, and was favourably received by them, and the South German theologians were invited to a further conference at Wittenberg. The meeting very fairly represented all the German states, and the result was the document known as the Wattenberg Concordia. This document, mainly drawn up by Bucer and Melanchthon, contains a statement of the doctrine of the sacrament of the supper expressed according to the Lutheran formula, with the declaration that unworthy or faithless partakers really do not participate in the sacrament. Melanchthon and Bucer had used too much diplomatic skill in drawing up the formula, for the essential differences between the Wittenberg and the Strasburg school were not really faced and explained ; they were covered over with ambiguous language. Nor could the document be accepted by the Swiss; but for a time it seemed as if a satisfactory basis of peace had been established. The general satisfaction was increased by the publication of the First Helvetic Confession, which, while stating the doctrine of the sacrament of the supper in a manner essentially Zwinglian, laid special

emphasis on the real spiritual presence of Christ in the elements. Luther in a letter to Meyer, burgomaster of Basel, and also in his answer to the Reformed cantons, acknowledged the earnest Christianity of the confession, and promised to do his best to promote union with the Swiss. It is sad to think that only three years later his old animosity to Zwingli and his countrymen broke out again in his book against the Turks, and that he renewed the sacramental controversy with even more than the old fury in his Short Confession of the Holy Sacrament, published in 1544. This first Helvetic confession was drawn up, however, for another purpose than to appease the Wittenberg theologians. Charles V. was urging the pope to call a general council to end the disputes within the Christian church, and it seemed so probable that a council would meet that the Protestants were everywhere preparing themselves by doctrinal statements for taking their share in its work. The German princes and their theologians were also greatly exercised about this council, and the thought of it and how Protestants should bear themselves in its presence was filling Luther's mind. He wrote several short papers on the subject in the years 1534-39, begin- ning with the Corvocatio Concilit liberi and ending with Von den Concilits und Kirchen. The pope, Paul IIL, yielding to the pressure of the emperor and of such liberal Roman Catholics as Vergerius, his legate in Germany, called a council to meet in May 1537 at Mantua, and invited the Lutherans to be present. The Lutheran princes and theologians felt compelled to face the question whether they could or could not accept the invitation, and Luther, at the request of the elector of Saxony, prepared a creed to be used as a basis of negotiations. This was submitted to the princes and theologians assembled at Siwalki: and was in substance adopted by them. It is called the Smalkald Articles, and is important because in its state-

Strasburg, and Wittenberg. The divines of Switzerland | ment of the doctrine of the sacrament of the supper it

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repudiates the Wittenberg Concord. The princes decided tat they would have nothing to do with a council which did not meet on German soil. The emperor, alarmed at the progress of Protestantism, and at the united front

shown by German Protestants, and troubled by the refusal of the pope to consent to a council to be held out of Italy, strove to bring Protestants and Roman Catholics together by means of religious conferences. The first of these, held at Hagenau, came to nothing. Next year (1541) the conference was renewed at Worms, when the Roman Catholic party promised reforms on condition that the Protestants first submitted to the pope. This condition could not be accepted. Representatives met the same year at Ratisbon, and here the conference was wrecked on the doctrine of transubstantiation, but the diet re- newed the terms of the edict of Nuremberg of 1532—the Ratisbon Interim. It was felt by all parties that this provisional state of matters must come.to an end some time, and that the Protestants must either be allowed to have their own way or win it by fighting. The emperor was not ready for war, and at the diet at Spires in 1544 it was agreed that the Protestants were to maintain their rights until a general council met. Whatever hopes they might have from such a council were soon dissipated. The council of Trent was opened that year, and its earliest acts were to refuse to pass the conciliatory measures pro- posed by some of the liberal Roman Catholics. The em- peror still temporized and promised reforms, if not by a council then by a national assembly, and many of the Protestants, Luther among them, still hoped that matters might settle themselves without civil war. This hope inspired what was called the Wittenberg Reformation, a document setting forth how near the evangelical church might approach the Roman Catholic and still retain the truths it had upheld. The year 1546 began, however, with unmistakable indications that Charles was now ready to strike a decisive blow.

Luther had been suffering much during the last few years, and he felt his end to be near. In the month of January 1546 he undertook a journey to Eisleben in very inclement weather, in order to restore peace in the family of the counts of Mansfeld; he caught a violent cold, but preached four times, and took all the time an active part in the work of conciliation, On the 17th of February he felt that his release was at hand; and at Eisleben, where he was born, he died, in faith and prayer, on the following day. Nothing can be more edifying than the scene pre- sented by the last days of Luther, of which we have the most authentic and detailed accounts. When dying, he collected his last strength and offered up the following prayer :—‘ Heavenly Father, eternal, merciful God, thou hast revealed to me Thy dear

Son, our Lord Jesus Christ. Him I have taught, Him I have confessed, Him I love as my Saviour and Redeemer, whom the wicked persecute, dishonour, and reprove. Take my pcor soul up to Thee!" Then two of his friends put to him the solemn question,—"“‘ Reverend Father, do you die in Christ and in the doctrine you have constantly preached?" He answered by an audible and joyful "Yes"; and, re- peating the verse, "Father, into thy hands I commend my spirit," he expired peacefully, without a struggle, on

the 18th of February 1546, at four o'clock in the after- noon.

The books on the life and work of Luther are so very numerous that it is impossible to do more than mention one or two. The best editions of Luther's works are (1) the Wittenberg, 1539-58, 19 vols. folio (7 in Latin and 12 in German; Melanclithon wrote the prefaces, and inserted a life of Luther in the beginning of the 2d vol.) ; (2) Walch's edition, 24 vols. 4to, 1740-58 ; (3) the Erlangen edition, 65 vols. and 2 vols. of indices, in all 67 vols., in German, and 33 vols. in Latin, and not yet complete, 1826-73; (4) the last

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edition is from Frankfort-on-the-Main, publishing at the expeuse of the Prussian Government. ;

Luther's letters have been collected and edited by (1) De Wette and Seidemann, Z. Briefe, 6 vols., 1825-56; (2) this emendated by Burkhardt, Luther's Briefweehsel, 1866 ; (3) Seidemann, Luther- briefe, 1859.

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1875. ‘The last is the best ; it has been summarized for popular reading in one volume, with interesting illustrations, 1882.

The Times of Luther.—(1) Ranke, Deutsche Geschichte im Zeitalter d. Ref., 6 vols., Ist ed. 1839-47, reached a 6th ed., Eng. transl. by Sarah Austin, 1845-47 ; (2) Loscher, Reformations Akta, Leipsic, 1720; (3) Hiusser, The Period of the Reformation, 2 vols., 1878 ; (4) Scebohm, Era of the Protestant Revolution, 1877 (a very short but good and clear summary of events). (T. M. L.)

LUTHERANS are that body of Christians who adopted the principles of Martin Luther in his opposition to the Roman Church, to the Swiss theologians, and to the sectaries of Reformation times. They called thentselves ‘‘ Evan- gelical” in distinction from the ‘‘ Reformed” or followers of Calvin, and formed one of the two great divisions of the Reformation Church. In the early days of controversy the stricter Lutherans held it to be their peculiar function to preserve the status religzonis in Germania per Lutherum instauratus and to watch over the depositum Jesu Christi which Luther had left in their charge. Luther himself was much more fitted to be a reformer and preacher than an exponent of a scheme of theology or the organizer of an ecclesiastical system. His wonderfully sympathetic nature was easily moved, and his own liking and disliking ruled him too strongly to make him able to expound in calm fashion the whole round of theology, giving to each doc- trine its proper place in the system. His nominalist train- ing, his quietism got from the mystics of the 14th and 15th centurics, his occasional fits of morbid melancholy, all kept him from looking at the whole system of Christian doc- trine, and made him intensify the value and importance of special aspects of truth. The early Lutheran theology reflected the character of itsfounder. It lacked systeinatic completeness, more especially in its failure to construct a comprehensive doctrine of the work of the Holy Spirit, and itswayed from side to side in violent controversies, until at length out of the conflicts emerged the Form of Concord, which, it was hoped, would succeed in pacifying the church. The dogmatic symbols of the Lutheran Church are usually said to include nine separate creeds, three of which are taken from the early Christian Church while six are the production of the 16th century. They are the Apostles’ Creed, the Niceeo-Constantinopolitan Creed in its Western form

(i.e, with the jiliogue), the so-called Athanasian Creed, the Augsburg Confession or Confessio Augustana, the Apology for the Augsburg Confession, the Smalkald Articles, Luther's two Catechisms, and the Form of Con- cord. 'These rine confessions together make up the Leber Concordiz of the Lutheran Church; but only the three pre-Reformation creeds and the Augsburg confession are recognized by all Lutherans. lLuther's catechisms, espe- cially the shorter of the two, have been almost universally accepted, but the Form of Concord was expressly rejected by many Lutheran churches. The Augsburg Confession and Luther's Shorter Catechism may be said to contain the distinctive principles of Lutheranism which all Lutherans unite to maintain, but, as the principal controversies of the Lutheran Church all arose after the publication of the Augsburg Confession, and were fought out between men who united in accepting that symbol, it docs not contain

all that is distinctively Lutheran. The Augsburg Confes- sion itself perhaps owed its universal recognition to the fact that it existed in two forms which vary slightly in the way in which they state the doctrine of the sacrament of the supper, the var~ata and the invariata; and this also bears witness to the lack of dogmatic coherence which is a characteristic of Lutheranism, Melanchthon's Hypotyposes or Theological Commonplaces (first published in 1521) may also rank along with these creeds as an authoritative ex- position of Lutheran theology ; and the changes it under- went in its successive editions show the incompleteness of

the system.

The earliest controversy which divided the Lutheran Church arose in Luther's lifetime and lasted till 1560 (1537-60). It sprang out of differences of opinion about the precise meaning to be attached to the term law in Luther's famous distinction between law and gospel. According to Luther, and the distinction runs through all Lutheranism, law and gospel are the two factors which bring home to the individual experience tlie knowledge of salvation. Law is the rule of life given by God and accompanied by threaten- ing and promise, which counts on fulfilment froin selfish motives, threatens, terrifies, and so produces contrition ; while the gospel, which is

the message of salvation, comes after thc law has done its work, and soothes. In this description the term law has a distinct and definite meaning ; it signifies legal injunction or command ; and Luther and his followers were accustomed to say, using law in this definite way, that Christ was not under the dominion of the law, and that Christ's people are also free from its restraints. They said that belicvers ascend to the Christian life only when they have transcended a rule of life which counts on selfish motives for obedience. The word law manifestly means more than Luther put into this definition, and certain Lutherans who accepted Luther's distinction between law and gospel did not understand his limita- tion of the term law, and taught that believers were not bound by the moral law. These antinomians, of whom Agricola was chief, took Luthcr's statements about law in the sense of legal injunction, and applicd them to law in the sense of ethical rule. The con- fusion perplexed the Lutheran Church for more than twenty years.

The debates which harassed the Reformed Church in the Armi- nian controversy, and the Roman Catholic Church in the Jansenist controversy, appeared in the Lutheran Church in three separate disputes lasting from about 1550 to 1580. In these discussions the stricter Luthcrans were on the one side and Melanchthon with his followers on the other. The first dispute was about the relation of good works to conversion. George Major, founding on an ex- pression in Melanchthon's Commonplaces (ed. 1543), said that good works were both necessary and useful to holiness. He was attacked by Mat. Flacius and Nic. Amsdorf, and after a long and tedious discussion, in the course of which it was made plain that both sides were sadly in want of general principles to guide them, and that important words were used ambiguously, George Major's proposition was condemned because it savoured of Pelagianism. The problem took a new forin in the Synergist controversy, which discussed the nature of the first impulse in conversion, and in the controversy about original sin which followed. Pfeffinger taught that the first Impulse in conversion came from grace and was due to the Holy Spirit, but he said that this impulse and its effect might be com- pared with the reviving of a man apparently dead. According to the strict Lutherans the sinner was not apparently but actually dead, and grace was not merely the occasion, it was also the actual cause, of the new life. Flacius, who had made this last assertion, which seemed to be generally

approved of, started a fresh controversy by his assertion that sin was part of the substance of man in his present natural conditiou, and that man was no more able to co- operate with grace in conversion than was a stick or a stone. This was contradicted by Striegel, a follower of Melanchthon, who asserted that sin had not totally destroyed man's ethical nature, but that grace by its action changed what was morally insensible into what was morally living and sensible, so that there could be ee pctnel synergy or co-operation between God's grace and man's will.

The controversy raised by Andrew Osiander was much more im- portant, and revealed the lack in Lutheranism of a systematic doctrine of the work of the Holy Spirit. Osiander felt that Lutheran dogmatic had omitted to make adequate answer to a most important practical question in theology, how Christ's death on the cross could be so brought into connexion with each individual believer as to be the ground of his actual justification. The medixval church had spanned the centuries by their doctrine of the prolonga- tion of Christ's death throughout time in the sacrifice of the mass, but he could not see any such real connexion of time in Luther's theology. He proposed to get rid of the difficulty by saying that Justification is a real work in the believer done by that same Christ who had died so many centuries before. He distinguished between

redemption, which he said was the result of the historical work of Christ upon the cross, and justification, which was another work of the same Redecmer within the individual, and was the influenee renewed daily of the Saviour upon each believer. The controversy which followed was full of ambiguitics and misunderstandings, but out of it rose two distinct theories, one of which was generally adopted by the Lutherans, while the other has become a character- istic of Reformed or Calvinist theology. Striegel declared that the principal effect of the work of Christ upon the cross was to change the attitude of God towards the whole human race, and that in consequence whenever men come into being and have faith they can take advantage of that change of attitude, the ground of their assurance being that because of what Christ did God regards all men benevolently. Calvinist divines, on the other hand, found in Osiandev's criticism the starting point

of that close connexion between Christ's work and His redeemed which is expressed in the doctrine of the limited reference in the atonement.

These controversies all implied more or less vagucness in the earlier dogmatic teaching of _—— Others, however, arose from what may be called the distinctive teaching of Luther upon the sacra- ment of the Lord's Supper and what was implied therein. In the article LUTHER it is stated that Luther, at least after the peasants' war, held strongly a theory of the connexion between the elements (the bread and wine) and the body and blood of Christ in the sacra- ment of the supper which has been called consubstantiation, and that this theory depended not merely on certain scholastic defini- tions of bodily presence but also on the supposition that the attri- bute of ubiquity belonged to the glorified body of Christ. A large numbcr of Lutherans, followers of Melanclithon, were inclined to depart from these views and approach the more reasonable opinions of Calvin, and this occasioned controversies about Crypto-Calvinism and about Christology. The university of Jena was the theological headquarters of the stricter Lutherans, while Wittenberg was the centre of the Philippists or Crypto-Calvinists, as the followers of Melanclithon were called. At first the controversy mainly gathered round the questions of the corporeal presence, the oral manducation, and the literal eating of Christ's body by unbelievers as well as by the truly faithful, but it soou included discussions on the person of Christ, and into these discussions Reformed theologians were brought. The result was various conferences at Maulbronn (1564), which only confirmed both parties in their peculiar opinions ; at Dresden (1571), where the Lutheran theologians of Wittenberg and Leipsic renounced the doctrine of the ubiquity of Christ's body and agreed with the Calvinists; and elsewhere. It seemed as if the Lutheran Church was about to fall in pieces.

Out of these disputes came the Form of Concord, due principally to Jacob Andree of 'Ttibingen, to Martin Chemnitz of Brunswick, and to Nicolas Selnecker of Leipsic. Various theological conferences were held, and various articles of agreement more or less successful were framed, of which the most notable was the Z'orgaw Rook of 1576 ; and at last in 1577 the Form of Concord was published, and after inuch discussion and negotiation was adopted by most of the Lutherans in Germany. Its recognition was mainly due to the exertions of Augustus, elector of Saxony It was also

adopted by the Lutheran ditties of Sweden in 1593, and of Hungary in 1597. It was rejected by the Lutheran Church of Denmark and by the churches of Hesse, of Anhalt, of Pomerania, and of several imperial cities. It was at first adopted and afterwards rejected by Brunswick, by the Palatinate, and by Brandenburg. The German churches which refused to adopt it became for the most part Reformed or Calvinist ; and the Form of Concord, which ended the more violent theological controversies among the Lutherans, greatly decreased their numbers and territorial extent.

The divided state of Germany in the 16th century, aided by the maxim of the peace of Augsburg which gave Protestantism a legal standing, and by the consistorial system of ecclesiastical rule which followed in consequence, divided the Lutherans in Germany into a number of separate churches as numerous as the principalities. At the peace of Augsburg the adherents to the Augsburg Confession were recognized legally as having a right to exist within the German empire, and the power of determining whether the Roman Catholic or Luthcran confessions should be the recognized creed of the state was left, with some reservation, in the hands of the supreme civil authority in each separate principality (cujus regio ejus religio). This virtually gave the direction of the church of each German state into the hands of the supreme civil power therein ; it bclonged to the princcs in the various principalities and to the muuicipal councils in the free imperial cities. This legal recognition of the supreme authority of the civil power in ecclesi- astical affairs was intensificd by the adoption in the Lutheran Church of the consistorial system of church government, which was the distinctive mark of the Lutheran as opposed to the Reformed Church. The consistorial system took a great variety of forms, but it had one common characteristic: it simply transferred the jus episcopale from the bishops to the civil authorities, and, as the bishops ruled their dioceses in ecclesiastical and other matters by means of councils er consistories appointed by themselves, so in the

Lutheran Chureh these old episcopal consistories were transformed into councils whose members were appointed by the civil rulers. Thus each petty German state had its own church with its special organization and

peculiar regulations. Richter in his Lvangelisehe Kirchenordnungen des 16ten Jahrhunderts (2 vols., 1846) hascollected more than one hundred and eighty separate constitutions of churches adhering to the Augsburg Confession.' This minute subdivision makes it almost impossible to recognize any unity in the Lutheran Church save what comes from the profession of a common creed. The publication of the Form of Concord drew the strict Lutherans more together, and set over against them in Germany a Calvinist Church, and the divided state of Protestantism greatly weakened its strength in the religious wars of the 17th century. As the smaller German states came together in larger principalities the awkwardness of the separate Protestant churches was more keenly felt. Many attempts were made by conferences, as at Leipsic (1631), Thorn (1645), Cassel (1661), to unite Lutherans and Reformed, though without success. At length the union of the two churches was effected mainly by the force of the civil authority in Nassau (1817), in Prussia (1817), in Hesse (1823), in Anhalt Dessau (1827). These unions for the most part aimed, not at in- corporating the two churches in doctrine and worship, but at bringing under one government the two confessions, and permitting every congregation to use at pleasure either the Lutheran or the Heidelberg Catechism. They were sometimes accompanied, as in Prussia, by a separationof the stricter Lutherans, who formed themselves into dissenting churches. The separation in Prussia was caused mainly by a new liturgy which Frederick William III. forced on the church, and which the dissenters or Old Lutherans refused to use. The divisions caused in this way were at first repressed but were afterwards tolerated, and have reproduced them- sclves in the flourishing Lutheran Church of the United States. See Ritschl, ‘‘ Die Entstehung der Lutherischen Kirche ” (Zeitseh. fiir Kirchengesehichte, i. 1); Hundeshagen, Bettrige zur Kirchenver- fassungs Geschichte, &c., 1864; Dorner's History of Protestant Theology; Hering, Gesehichte der kirehlichen Unionsversuche seit die Reformation, 1886-88 ; Sack, Die Evangelische Kirche und die Union, 1861. (T. M. L.)

LUTON, a market-town and municipal borough of Bedfordshire, England, is situated in a fine valley near the source of the Lea, 31 miles north-west of London. The parish church of St Mary, dating from the 14th ceutury, a very fine building in the Decorated Norman and Later English styles, contains a large number of old monuments and brasses. Its entire length is 182 feet,

the width of nave and aisles 57 feet, and the width of the transepts from north to south 101 feet. On the process of restoration, begun in 1865, £6000 has been expended, The otlier principal public buildings are the town-hall, the corn exchange, tle court-house, and thie plait hall. Luton is the principal seat of the straw-plait manufacture in England. The industry originated in the colony of straw-plaiters transplanted by James J. from Scotland, whither they had been brought from Lorraine by Queen Mary. Though the town is very ancient, it was first incorporated in February 1876. The population, which in 1871 was 17,317, was 23,959 in 1881.

LUTZK, a district town of Russia, in the government of Volhynia, on the Styr, 162 miles west-north-west of Szitomir, and 5 miles from the Kivertzy station of the railway between Kieff and Brest-Litovsky. It is a very old town, supposed to have been founded in the 7th century ; in the 11th century it was known under the name of Luchesk, and was the chief town of an independent principality. In the 15th century it was the seat of a bishop, and became a wealthy town, but during the wars between Russia and Poland in the second half of the 16th century, and especially after the extermination of its 40,000 inhabitants, it lost its importance. In 1791 it was taken by Russia. It is now a rather poor town, situated in an unfertile district, and its 11,500 inhabitants, many of them Jews, live mainly by shipping goods on the Styr.

LUXEMBOURG, Francois Henri DE MontMoRrENCcyY- BovutTevitte, Duc pE (1628-1695), marshal of France, the comrade and successor of the great Condé, was born at Paris on January 8, 1628. His father, the Comte de Montmorency-Boutteville, had been executed six months

before his birth for killing the Marquis de Beuvron ina duel, but his aunt, the Princesse de Condé, recognizing in him the last male heir of her great family De Montmorency, took charge of him, and educated him with her son, the Duc d’Enghien. The young Montmorency attached him- self enthusiastically to his cousin, and shared his successes and reverses throughout the troubles of the Fronde. He returned to France in 1659 and was pardoned, and Condé, who was then much attached to the Duchesse de ChAtillon, Montmorency’s sister, contrived the marriage of lis adherent and

cousin to the greatest heiress in France, the Princesse de Tingry, after which he was created Duc de Luxembourg and peer of France. At the opening of the war of the devolution, 1667-68, Condé, and consequently Luxembourg, had no command, but in the second campaign he served as one of Condé's lieutenants in the conquest of Franche Comté. During the four years of peace which followed the peace of Aix-la-Chapelle, Luxembourg diligently cultivated the favour of Louvois, and in 1672 received orders to commence hostilities with the Dutch. He defeated the prince of Orange, whom he was to beat again and again, at Woerden, and ravaged Holland, and in 1673 made his famous retreat from Utrecht with only 20,000 men in face of 70,000, an exploit which placed him in the first rank of generals. In 1674 le was made captain of the gardes du corps, and in 1675 was made marshal of France. In 1676 he was placed at the head of the army of the Rhine, but failed to keep the duke of Lorraine out of Philipsburg ; in 1677 he stormed Valenciennes ; and in 1678 he defeated the prince of Orange, who attacked him at St Denis after the signature of the peace of Nimeguen. His reputation was now at a great height, and it is commonly reputed that he quarrelled with Louvois, who managed to mix him up in the confessions of the poisoners, and get him sent to the Bastille. Rousset in his Z/stoire de Louvois has, however, shown that this quarrel is probably apocryphal. There is no doubt that Luxembourg spent some months of 1680 in the Bastille, but on his release took up his post at court as capitaine des gardes, and was in no way dis- graced. When the war of 1690 broke out, the king and Louvois also recognized that Luxembourg was the only general they had fit to cope with the prince of Orange, and accordingly he was put in command of the army of Flanders. On July 1, 1690, he defeated the prince of Waldeck at Fleurus with the loss of 14,000 men and 49 pieces of cannon. In the following year he com- manded the army which covered the king, who was besieging Mons, and defeated William III. of England at Leuze on September 18, 1691. Again in the next cam- paign he covered the king's siege of Namur, and utterly defeated William at Steenkerk on June 5, 1692; and on July 29, 1693, he won his greatest victory over his old adversary at Neerwinden, in which he took 76 pieces of cannon and 80 flags. No wonder he was received with enthusiasm at Paris by all but the king, who looked coldly on a relative and adherent of the Condés. He conceived himself strong enough to undertake an enterprise which St Simon describes at length in the first volume of his Memoirs : instead of ranking as eighteenth

peer of France according to his patent of 1661, he claimed through his wife to be Duc de Piney of an old creation of 1571, which would place him second on the roll. The whole affair is described with St Simon's usual keen interest in all that concerned the peerage, and was chiefly checked through his assiduity. In the campaign of 1694, possibly owing to this check, Luxembourg did but little in Flanders, except his well-known march from Vignamont to Tournay in face of the enemy. On his return to Versailles for the winter he fell ill, and died on January 4, 1695. In his

last moments lie was attended by the famous Jesuit priest Bourdaloue, who said on his death, "I have not lived his life, but I would wish to die his death." The holy father certainly had uot lived like Luxembourg, whose morals were conspicuously bad even in those times, and whose life had shown very slight signs of religious conviction. But as a geueral he was Condé's grandest pupil. Utterly slothful, like Condé, in the management of a campaign, and therein differing from Turenne, at the moment of battle he seemed seized with happy inspirations, against which no ardour of William's and no steadiness of Dutch or English soldiers could stand. His death and Catinat's disgrace close the second period of the military history of the reign of Louis XIV., and Catinat and Luxembourg, though inferior to Condé and Turenne, were very far superior to Tallard and Villeroi. He was distinguished for a puugeut wit. One of his best retorts referred to his deformity. 'I never can beat that cursed hump- back," William was reputed to have said of him. '" How does he know I have a hump?" retorted Luxembourg, "he lias never seen my back." He left four sons, the youngest of whom was a marshal of France as Maréchal de Moutmorency.

Sec the various memoirs and histories of the time. There are some interesting facts in Desormcaux's Histoire de la Maison de Montmorency. Camille Roussct's Lowvois should also be studied.

LUXEMBURG, a grand-duchy of Europe, governed under a special constitution by the king of the Netherlands, is bounded on the N. and E. by Rhenish Prussia, S. by Lorraine and the French department Meurthe-et-Moselle, and W. by Belgian Luxemburg. It measures 32 miles from Hartelingen to Rosport, both on the Sure, and 50 miles from Rumelange in

the south to Weiler in the north. The surface contains 639,000 acres (998 square miles), of which 293,554 acres are arable, 61,033 meadow- land, 143,812 woodland, 54,135 coppice, and 540 vine- yards, The hills in the south of the duchy are a con- tinuation of the Lorraine plateau; and the northern districts are crossed in all directions by outrunners from the Ardennes. With the exception of the Chiers, which flows into the Meuse near Sedan after a course of 50 miles, the streams all drain into the Moselle, which forms the boundary between Luxemburg and the Rhine province for about 20 miles. The Sure or Sauer, the most important stream in the duchy, rises at Vaux-les-Rosiéres in Belgian Luxemburg, crosses the duchy, and forms the eastern boundary from the confluence of the Our till it joins the Moselle after a course of 50 miles, during which it receives the Wiltz, the Woltz, the Alzet, &c. At Mondorf there are miueral wells and a bathing establishment. The soil of Luxemburg is generally good; the southern districts are on the whole the most fertile as well as the most populous. Building materials of all sorts are obtained throughout the duchy, and in the south there is iron-ore of fair quality— the mining area at present occupying from 8000 to 10,000 acres, Galena is worked on the frontier between Ober- wampach and Longville, and antimony at Gésdorf near Wiltz. Since 1842 Luxemburg has been included in the Zollverein, and its principal dealings are, consequently, with Germany. Besides the iron furnaces,—situated all of them in the south near the Lorraine plateau,—the industrial establishments of the country comprise a large number of tanneries, a dozen weaving factories, an Important glove-making factory, a pottery, paper-mills for all sorts of paper, breweries and distilleries, and two sugar refineries. A German patois mixed with French words is spoken throughout the country; but French, which is universally employed by the commercial com- munity, is also the common speech of all classes on the French and Belgian frontiers. Though perfect liberty

of worship prevails, Roman Catholicism is almost the sole form of religion in the duchy, the only dissenters worthy of note being the Protestant Prussian employés and about three hundred Jewish families. The government is in the hands of the grand-duke, who sanctions and promulgates the laws. Between 1850 and 1879 the king of the Netherlands

was represented in his grand-ducal func- tions by his brother Prince Henry; but since the prince’s death he has resumed the personal direction of affairs. The grand-duchy is a neutral and independent state, and its crown hereditary in the Nassau family (Treaty of London, March 11, 1867). A house of representatives and a council of state, named by the grand-duke, compose the administrative body. The representatives, to the number of forty-four, are chosen by the people in the pro- portion of one for from 4000 to 5500 inhabitants. No law can be passed without the consent of the house of representatives. Bills are introduced by the grand-duke, but the house has also the right of initiative. A single battalion (150) of Luxemburg chasseurs composes the grand-ducal army,—all voluntary recruits. The gendar- merie also consists of about 150 men. There are two courts of first instance in the duchy,—one at Luxemburg, the other at Diekirch,—and a high court and a court of appeal, both at Luxemburg. Criminals appear before the court of assize at Luxemburg. By grand-ducal decree the order of the Crown of Oak was instituted for the duchy, December 29, 1841, and that of the Golden Lion, February 5, 1858. The communal councils are under the supervision of the district commissioners, who are subject in turn to the minister of the interior. The administration of the town of Luxemburg depends immediately on the Govern- ment. Education is in a flourishing state: there are 642 primary schools attended by 31,000 pupils; Luxemburg has a normal school and an atheneum; Diekirch and Echternach have each a gymnasium. The bishopric of Luxemburg, containing 13 diaconates, subdivided into 253 parishes, holds its authority directly from the Holy See. From 6,000,000 to 7,000,000 francs is the annual amount of the state budget, and the public debt was 12,000,000 francs in 1863. Since 1854 there has been a grand-ducal bronze coinage.

The following table shows the administrative divisions and the population (total, 205,158) according to the census of 1875.

Districts. Cantons,

Luxemburg. Capellen

18.519 Wencepeco ocoporeccood Mersch

Echternach …..... Grevenmacher

Luxemburg.

Grevenmacher …....

Diekirch Redingen….

Wiltz

Next to the capital come Echternach with 3920, and Diekirch with 3130 inhabitants,—both worthy of note for their blast fur- naces, At Echtcrnach an annual procession is held in honour of St Willibrord, dating from 1374. Grevenmacher is the centre of a great wine district.

The Luxemburg territory as well as the country of Ardenne was included in Belgica Prima at the first division of Gaul by Augustus in 27 B.¢c. ; during the Frankish period it formed part first of Austrasia, then of Lorraine, and then of Lower Lorraine. On the dismemberment of ancient Austrasia the countship of Ardenne fell to Ricuin ; and, when after Ricuin's death his children divided his possessions, Ardenne proper was obtained by Count Sigfried (Sigefroi). The county of Luxemburg, as Ardenne came to be called after the chief town, was raised to be a duchy in 1354, and existed as an independent state till 1451, when it was seized by Philip, duke of Burgundy. The dynasty which he displaced had been ambitious and active, and had, in the person of Henry VII., attained the imperial dignity, and in that of John ascended the throne of Bohemia. As a Burgundian possession Luxemburg

came to the house of Austria, and, after forming part of the areh- duehy governed by Albert and Isabella, 1598-1632, followed the fate of the Spanish Netherlands till it was eeded by the treaty of Utreeht to the house of Hapsburg. It was deprived of Thionville, Montmedy, Damvilliers, Ivoix, and Marville by the treaty of the Pyrenees (1659) in favour of Franee ; and Louis XIV. oecupied the town and great part of the provinee from 1684 till the treaty of Ryswiek (1697). Seized by the French in 1798, it went in the main to form the department of Foréts. On the 16th March 1815 William I. declared himself king of the Netherlands and duke of Luxemburg, and his

claims were sanctioned by the treaty of Vienna, —Luxemburg being eonsidered eompensation for the loss of the small principalities of Hadamar, Siegen, Dietz, and Nassau- Dillemburg, the surrender of which to Prussia had deprived William of his place in the Germanic confederation. The fortress was assigned to the confederation itself, and was garrisoned by six thousand inen, of whom one-fourth belonged to the grand-duke and three-fourths to the confederation. From the reeognition of Belgian independence in 1830 to the treaty of London in 1839, matters were still more complicated ; there were two governments In Luxemburg—one at Luxemburg, aeting for the grand-duke, and the other at Arlon, acting for Belgium. By the treaty of London about 1218 square miles of the duchy with 149,571 inhabitants were trans- ferred to Belgium, the German eonfederation and King William being compensated with parts of Limburg. On the dissolution of the eonfederation the duehy beeame free from its eonnexion with Germany, but the fortress remained in the hands of Prussia. A diplomatie eontest for possession of the duehy took place between France and Prussia ; and the matter beeaie the object of a special eonference of the plenipotentiaries of the great powers, Holland, Belgium, and Italy, in 1867. The result was that the neutrality of Luxemburg was guaranteed and the military importance of the town destroyed. The actual demolition of the fortifieations evacnated by the Prussians in September 1867 did not take place till 1872.

See Bertholet, Hist. du duché de Luxembourg, Luxemburg, 1741-43 ; Vander- maelen, Dict. géogr. du Luxembourg, Brussels, 1888 ; Schitter, Kv it. Erorterungen tiber die frith. Gesch, der Grafschaft Luxemburg, Luxemburg, 1859; Grovig, Luxemburg, Land und Volk, Luxemburg, 1867.

LuxemBure, the capital of the grand-duchy, lies 34 miles north of Metz aud 25 south-west of Treves, in a position as remarkable for natural beauty as for military strength. The main part of the town is built on a rocky table-land terminating precipitously towards the north-east and south ;

Joun Swain FC,

Plan of Luxemburg.

the modern portions, known as Pfaffenthal, Clausen, and Grund, lie 200 feet below, in the valley of the Alzette. Till their demolition in terms of the treaty of 1867 the fortifications, on which the engineers of three centuries had expended their skill, were the great feature of the place; in point of strength they ranked, according to Carnot, second only to those of Gibraltar, and like them they were to a great extent hewn out of the solid rock. The site is now occupied partly by a fine public park, partly by new districts of handsome houses, which give

castle presented to the abbey at Treves by Charles Martel. town grew up in the course of the 10th century, and soon began to surround itself with walls; but it was not till 1503 that a regular system of fortifieations was eommeneed, and the prineipal features of the modern fortress were due to Vauban, who aeceompanied Créqui in his capture of the place in 1664. made to the works in 1728-34.

LUXEMBURG

the city more of the outward appearance of a capital.

Among the buildings of historical interest are the cathedral –

of Notre Dame, erected by the Jesuits in 1613; the church of St Michel, dating from 1320; the Government-house, built in 1443, and still regularly occupied by the legislative assemblies ; the town-house, built in 1830; the law courts, dating from 1565, but serving till 1795 as the residence of the governor of Luxemburg; and the atheneum, built in 1594, and now (1882) attended by 500 to 660 pupils. The population of the city and suburbs, which was 15,930 in 1875, is now estimated at 19,000.

Luxemburg (formerly ealled Liitzelburg) appears in 738 as a The

Extensive additions were

Sce Coster, Gesch. der Festung Luxemburg, Luxemburg, 1869.
LUXEMBURG, a province of the kingdom of Belgium,

lying at the south-eastern extremity of the country, and bounded N. and W. by the provinces of Li¢ge and Namur, S. by France, and E. by Prussia and by the grand-duchy of Luxemburg, from which it was separated in 1839. the largest and most thinly populated of the Belgian pro- vinces,—75 miles in length, 30 in breadth; the population is 204,000. The ground is high, averaging 1200 feet above sea-level, and rising in parts over 2000. The soil is

It is

dry and slaty, with occasional sand and limestone. The aspect of the country is a succession of broad tracts of table-land or plateaus covered with wood or heather, and intersected by wide and deep valleys; these contain streams, half-dry during the summer, but quickly changed to sweep- ing torrents by rain or melting snow. Peat is found on. the hills, and occasional morasses, known by the name of ‘“hantes fanges,” are to be met with on the tops of the highest mountains. The whole district is comprised within the region of Ardennes. The agricultural produce is poor ; the various breeds of horses, cattle, sheep, d&vc., are remark- ably small, though they all possess individual qualities of endurance or their flesh of flavour; the hams are re- nowned. ‘The forests abound in game of all kinds; red deer are plentiful, and wild boars have of late become so abundant as to be a serious nuisance. The mineral productions are worthy of note. Iron is found in the valley of the Ourthe, and also farther south near Arlon; lead is extracted at Longwilly, manganese at Biham, zinc at Longwilly and Bleid Building stone is to be had throughout the province, and is generally employed, brick houses being the exception. There are quarries of grey and rose-coloured marble at Wellin, and extensive slate quarries on the banks of the Semois, the Sure, and the Salm. ‘The trade in wood and bark is considerable, and there are some important tanneries, as well as iron-works, paper-mills, and limekilns. The principal rivers are the Semois, the Lesse, and the Ourthe, affluents of the Meuse, and the Sure, which flows into the Rhine; of these the Ourthe alone is navigable for a few miles down from Barvaux. ‘There are no canals in the province, so that Luxemburg is entirely dependent on railways for its traffic. The Brussels and Basel line runs through the whole pro- vince, with a station at Arlon, the capital ; and branch lines have been established to connect the principal markets, Marche, Durbuy, Bastogne,

Virton, &c., with the main artery. The language spoken by the inhabitants is French, with an admixture of Walloon dialect and an inferior kind of German on the borders of the grand-duchy. The king of the Belgians and his brother the count of Flanders possess summer residences, with extensive forest lands, in the province of Luxemburg.

LU X-—-LYC

LUXOR, more properly El-Aksur, ‘‘ The Castles” (plur. pauc. of kasr), a village on the Nile, 450 miles above Cairo, occupies part of the site of the ancient Thebes, and has its name from the ruins described in vol. vii. p. 777. The village is also called Abu’l Hajj4j from the patron saint whose tomb is mentioned by Ibn Batuta, i. 107, ii, 253. See also Yakut, i 338. Luxor is the centre for visitors to the ruins of and about Thebes, and -is increasingly frequented by travellers and invalids in the winter season, being the only place above Osyfit (Saytt) provided with hotel accommodation suitable for Europeans. The district is the seat of an extensive manufacture of forged antiques, often very skilfully made.

LUZON, or Lucon. See PuiLippine IsLANDs,

LYCANTHROPY is a term used comprehensively to indicate a belief, firmly rooted among all savages, and lingering in the form of traditional superstition among peoples comparatively civilized, that men are in certain circumstances transformed temporarily or permanently into wolves and other inferior animals. In the European history of this singular belief, wolf transformations appear as by far the most prominent and most frequently recurring instances of alleged metamorphosis, and consequently in most European languages the terms expressive of the general doctrine have a special reference to the wolf. Examples of this are found in the Greek AvxdvOpwros, Russian volkodldk, English were-wolf, German wdhrwolf, French lowp-garow. And yet general terms (¢.g., Latin, versipellis; Russian, dboroten ; Scaudinavian, hamrammr ; English, turnskin, turncoat) are sufficiently numerous to furnish some evidence that the class of animals into which metamorphosis was possible was not viewed as a restricted one. It is simply because the old English general terms have been long diverted from their original signification that the word “lycanthropy” has recently

been adopted in our language in the enlarged sense in which it has been defined above.

There are two unfailing characteristics of lycanthropous belief :—(1) there can nowhere be a living belief in con-

temporary metamorphosis into any animal which has ceased.

to exist in the particular locality ; (2) belief in metamor- phosis into the animal most prominent in any locality itself acquires a special prominence. These characteristics apart, the phenomena of lycanthropy exhibit a very con- siderable diversity in their nature.

Throughout the greater part of Europe the were-wolf is preferred on the principles just noted. There are old traditions of his existence in England, in Wales, and in Ireland. In southern France, the Netherlands, Germany, Lithuania, Bulgaria, Servia, Bohemia, Poland, and Russia he can hardly be pronounced extinct now. In Denmark, Sweden, Norway, and Iceland the bear com- petes with the wolf for pre-eminence. In Persia the bear is supreme, in Japan the fox ; in India the serpent vies with the tiger, in Abyssinia and Bornou the hyena with the lion, in eastern Africa the lion with the alligator ; in western Africa the leopard is per- haps most frequently the form assumed by man, among the Abipones the tiger, among the Arawaks the jaguar, and so on. In none of these cases, however, is the power of transformation limited exclusively to the prominent and dominant animal.

The most familiar phase of the superstition is also the latest and most sophisticated. It was no belief in mere transformation ; the transformation here was accomplished by Satanic agency voluntarily submitted to, and that for the most loathsome ends, in particular for the gratification of a craving for human flesh. ‘The were-wolves,” writes Richard Verstegan (Restitution of Decayed ntellugence, 1628), “are certayne sorcerers, who having annoynted their bodies with an oyntment which they make by the instinct of the devill, and putting on a certayne inchaunted girdle, doe not onely unto the view of others seeme as wolves, but to their owne thinking have both the shape and nature of wolves, so long as they weare the said girdle.

And they do dispose themselves as very wolves, in wourry- ing and killing, and most of humane creatures.” Such were the views about lycanthropy current throughout the continent of Europe when Verstegan wrote. Trance in particular seems to have been infested with were-wolves during the 16th century, and the consequent trials were very numerous. In some of the cases,—e.g., those of the Gandillon family in the Jura, the tailor of Chalons, and Roulet in Angers, all occurring in the year 1598, —there was clear evidence against the accused of murder and cannibalism, but none of association with wolves; in other cases, as that of Gilles Garnier in Déle in 1573, there was clear evidence against some wolf, but none against the accused ; in all the cases, with hardly an exception, there was that extraordinary readiness in the accused to confess and even to give circumstantial details of the metamor- phosis, which is one of the most inexplicable concomitants of medieval witchcraft. Yet, while this lycanthropy fever, both of suspectors and of suspected, was at its height, it was decided in the case of Jean Grenier at Bordeaux, in 1603, that lycanthropy was nothing more than an insane delusion. From this time the loup-garou gradually ceased to be regarded as a dangerous heretic, and fell back into his pre-Christianic position of being simply a ‘‘man-wolf- fiend,” as which he still survives among the French peasantry. In Prussia, Livonia, and Lithuania, according to the bishops Olaus Magnus and Majolus, the were-wolves were in the 16th century far more destructive than ‘‘ true and natural wolves,” and their heterodoxy appears from the assertion that they formed “an accursed college” of those “ desirons of innovations contrary to the divine law.” In England, however, where at the beginning of the 17th century the punishment of witchcraft was still zealously prosecuted by James I., the wolf had been so iong extinct that that pious monarch was himself able (Demo- nologie, lib. iii.) to regard “ warwoolfes” as victims of delusion induced by ‘a uaturall superabundance of melancholie.” Only small creatures, such as the cat, the hare, and the weasel, remained for the malignant sorcerer to transform himself into; but he was firmly believed to avail himself of these agencies. Belief in witch-animals still survives among the uneducated classes in parts of the United Kingdom.

The were-wolves of the Christian dispensation were not, however, all heretics, all viciously disposed towards mankind. ‘According to Baronius, in the year 617, a number of wolves presented themselves at a monastery, and tore in pieces several friars who entertained heretical opinions. ‘The wolves sent by God tore the sacrilegious thieves of the army of Francesco Maria, duke of Urbino, who had come to sack the treasure of the holy house of Loreto. A wolf guarded and defended from the wild beasts the head of St Edmund the martyr, king of England. St Oddo, abbot of Cluny, assailed in a pilgrimage by foxes, was delivered and escorted by a wolf”! Many of the were-wolves were most innocent and God-fearing persons, who suffered through the witchcraft of others, or simply from an unhappy fate, and who as wolves behaved in a truly touching fashion, fawning upon and protecting their benefactors. Of this sort were the “ Bisclaveret” in Marie de France’s poem (c. 1200), the hero of “ William and the Were-wolf ” (translated from French into English about 1350), and the numerous princes and princesses, knights and ladies, who appear temporarily in beast form in the Mchrchen of the Aryan nations generally. Nay the power of transforming others into wild beasts was attributed not only to malignant sorcerers, but also to Christian saints. ““Omnes angeli, boni et mali, ex virtute naturali habent

1 A. de Gubernatis, Zoological Mythology, 1872, vol. ii. p. 145. V. — 12

potestatem transmutandi corpora nostra,” was the dictum of St Thomas Aquinas. A Russian story tells how the apostles Peter and Paul turned an impious husband and wife into bears ; St Patrick transformed Vereticus, king of Wales, into a wolf; and St Natalis cursed an illustrious Trish family, with the result that each member of it was doomed to be a wolf for seven years. In other tales the divine agency is still more direct, while in Russia, again, men are supposed to become were-wolves through incurring the wrath of the devil.

There is thus an orthodox as well as a heterodox were- wolf; and, if a survey be taken of the lycanthropous beliefs of non-Christian peoples, this distinction among shape- changers will be equally obvious. The gods of ancient mythology, Hindu, Persian, Greek, and Teutonic, had an apparently unlimited power of assuming animal forms. These gods, moreover,

constantly employed themselves in changing men and women into beasts, sometimes in punishment of crime, sometimes out of compassion, and sometimes from pure voluptuousness. Thus Kabandha was changed by Indra into a monster, Trisanku by the sons of Vasishtha into a bear, Lycaon by Zeus into a wolf, Callisto into a bear, Io into a heifer; the enemies of Odin became boars, and so on. It is admittedly difficult to trace the original meaning of these legends, but the alleged metamorphosis of a god is at times clearly associated with his worship under the form of the animal he turned into in the region where the metamorphosis was said to have occurred. Indra in the form of a bull encountered the monster Vritra, and released the cows he had stolen; Indra was invoked asa bull, and to him the bull and the cow were sacred among the Hindus. Derketo became a fish near Ascalon ; a fish-goddess identified with her was worshipped in Syria, and the fish sacred to her were not eaten. Poseidon, the inventor of horses, was, as a horse, the father of the steeds Arion and Pegasus, and the horse was sacred to him. Jupiter Ammon appeared as a ram in the deserts of Libya; in Libya he had an oracle where the ram was sacred to him, and his image wore rain's horns. So too metamorphosis by gods is in some cases connected with local traditions. The Arcadians, or bear- tribe, sprang from the were-bear Callisto ; the Lycians, or wolf-tribe, were wolves when they conducted to the river Xanthus the were-wolf Leto, mother of the Lycian Apollo, Turning from the gods to the heroes of classical romance, we find traditions more interesting and more instructive, because they must have some real historical foundation. Yet they also abound in episodes of beast mothers and beast fathers, and also of lycanthropy proper. Cyrus was suckled by a bitch, the Servian hero Milosh Kobilitch by a mare, the Norse Sigurd by a hind, the German Dieterich and the Latin Romulus by wolves; the pro- genitor of the Merovingian kings was a bull, of the Danish royal race a bear; Sigmund and Sinfiotli in the Volswnga Saga become wolves, Nagli in the Lyrbyggia Saga a boar. The Berserkir of Iceland asserted their ability to become bears and wolves, and dressed themselves in the skins of these animals; their existence, their garb, and their pretensions are historical facts. In the Sanskrit epic, the Mahabharata, the hero Puloman becomes a wild boar to carry off the wife of Bhrigu; the house of Brabant traced its origin to a transformed swan. Beast-form is, however, in mythology proper far oftener assumed for malignant than for benignant ends; indeed the heroes and anthropo- morphic gods of the great religious systems are

principally distinguished for their victories over the semi-human semi-bestial demons. The bull Indra fights the demon serpent Vritra, and so forth; the Theban Cadmus, the Russian Ivan, the Norse Sigurd, all encounter dragons or serpents, which possess human characteristics. In most of such

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cases indeed the human as well as the beast form ig distinctly attributed to the demon.

It is because they may after all be properly associated with the undoubted phenomena of modern savage life that these facts of ancient mythology are here alluded to, Among savages there is the most confident belief in metamorphosis,—metamorphosis effected for the most salutary and for the most baneful ends. In the neighbour- hood of Tette on the Zambesi every chief is credited with the power of assuming lion shape; every lion is respected as being a transformed chief or the spirit of a chief departed. Moreover, there is a special class of “doctors” or medicine-men, known as “ pondoros,” scattered through the villages, who pretend to powers of metamorphosis, and thus are regarded with both respect and dread ; their kindly disposition they display by hunting for the community in lion shape, and then bringing home the game. Among the Arawaks of Guiana, the Kandhs of Orissa, and the Jakuns of the Malay peninsula, beast form is said to be assumed by those desiring to avenge themselves justly on enemies, Beast-parents and cases of women alleged to have borne beast children are also familiar to savages. But this is only one side of the picture. The “ kanaima- tiger” (2.c., man-jaguar) of Arawak may be possessed by the spirit of a man devoted to bloodshed and cannibalism ; “there is,” writes the Rev. Mr Brett, “no superstition more prevalent among the Indians than this, and none which causes more terror.” In Ashango-land, where there are distinct traces of animal worship, a were-leopard was at the time of Du Chaillu’s visit charged with murder and metamorphosis, and, confessing both, was slowly burnt to death, quite in the style of medieval Europe Similar occurrences have been known among the Kols (of Chutia- Nagpur) and among the Arabs.

The expedients supposed to be adopted for effecting change of shape may here be noticed. One of the simplest apparently was the removal of

clothing, and in particular of a girdle of human skin, or the putting on of such a girdle,—more commonly the putting on of a girdle of the skin of the animal whose form was to be assumed. This last device is doubtless a substitute for the assumption of an entire animal skin, which also is frequently found. In other cases the body is rubbed with a magic salve. To drink water out of the footprint of the animal in question, to partake of its brains, to drink of certain enchanted streams, were also considered effectual modes of accomplishing metamorphosis. Olaus Magnus says that the Livonian were-wolves were initiated by draining a cup of beer specially prepared, and repeating a set formula. Mr Ralston in his Songs of the Russian People gives the form of incantation still familiar in Russia. Various expedients also cxisted for removing the beast-shape. The simplest was the act of the enchanter (operat- ing cither on himself or on a victim) ; another was the removal of the animal girdle. To kneel in one spot for a hundred years, to be reproached with being a were-wolf, to be saluted with the sign of the cross, or addressed thrice by baptismal name, to be struek three blows on the forehead with a knife, or to have at least three drops of blood drawn were also effectual cures. The last-mentioned . was quite essential to the subsistence of the superstition. Its absurdity would have much sooner appeared, but for the theory that, directly the were-wolf was wounded, he resumed his human shape ; in every case where one aceused of being a were-wolf was taken, he was certain to be wounded, and thus the difficulty of his not being found in beast form was satisfactorily disposed of.

The foregoing types of lycanthropy, in which the divine or diabolical agency is always emphasized, are presumably less primitive than those cases in which super- human agency is not so prominent. The following cases, therefore, seem to be more intimately connected with the origin of the belief. (1) The Kandhs believe “natural tigers to kill game only to benefit men, who generally find it but partially devoured and share it; while the tigers which kill men are either Tari (a goddess), who has assumed the form of a tiger for purposes of wrath, or men who, by the aid of a god, have assumed the form of tigers, and are called ‘mleepa tigers.” A distinction was previously drawn between friendly and hostile lycanthro-

pists ; here a distinction is drawn between friendly and hostile tigers, and lycauthropy is introduced to explain the cases of hostility. Again (2) in the native literature of modern savages there constantly occur stories of the “Beauty and the Beast” type, so distinctly resembling those of the Aryan JMdhrcehen as to indicate identity of origin; but, while in the Aryan story the beast-form of the hero or heroine is generally at last removed, in the savage story the incongruity of the beast-form is scarcely realized, and the Indian lover lives happily with his beaver pride, the Zulu maiden with her frog husband. And (3) in many instances the power or necessity of transformation is ascribed, not to individuals, but to clans or nations. Thus the aboriginal Naga tribes of India seemed to the Aryans to take the form of serpents; the Neuri seemed to the Scythians, and the Hirpini to the Romans, to become wolves, as also did the native Irish of Ossory to the early Christian priests ; the Abyssinians credit the Buda caste (blacksmiths and potters of alien stock) with ability to become hyzenas at pleasure ; the Berserkr-rage of Iceland is perpetuated in the modern Scandinavian belief that Lapps aud Finns can take the form of bears. In mcdizeval times Blois had a special celebrity for were-wolves, and persons named Garnier or Grenier were generally assumed to be lycanthropists.

When we find that these three distinct classes of primitive facts regarding lycanthropy are all referable to a common origin, there seems good reason for regarding that as being in truth the origin of lycanthropous belief. And thus we are led to refer lycanthropy to the more general facts of primitive Torrmism (g.v.), for the facts recited are as undoubtedly characteristic of the latter as of the former. Where the totem is an animal, it is regarded as the ancestor of the tribe ; all animals of its species are revered, and are never willingly killed; however dangerous to life, they are feigned by the tribe to be friendly to them, and hostile only to their enemies. Apply- ing these facts to the foregoing lycanthropous phenomena in order, we observe (1) that the tiger is a totem god among the Kandhs; consequently he reserves his wrath for their enemies. Individual enemies would, however, be ercated whenever an individual Kandh had the blood- feud against another, for then his totem was bound to aid him. Such we saw was in fact the Kandh explanation of the wrath of the totem. The development of sorcery would naturally lead to

the utilization of the totem as assistant in it also. The Arawak “kanaima” is both lawful avenger and cruel sorcerer; and from a similar reason probably did the wolf or were-wolf in Europe become a synonym for outlaw. The outlaw was at first simply the peaceless man—the man who preferred vendetta to money composition for injuries,—as he was originally bound to do, subsequently entitled to do, and finally prohibited from doing. (2) The beast-hero of savage story ceases to be strange when we learn that ‘a beaver,” “a dog,” “a grizzly bear,” mean respectively a person of a tribe having the animal in question for totem. And so too (3) with the third class of phenomena which contem- plates tribes turned into beasts. The Nagas had the serpent for totem ; apparently the Hirpini, and the native Irish in many districts, had the wolf; they certainly venerated and worshipped that animal. The Lapps are known to worship the bear. Blois means the “city of wolves.” Doubtless all cases of this sort admit of similar explanation,

The doctrine of lycanthropy or metamorphosis of living men

must be distinguished from the doctrine of metempsychosis or trans-migration of souls. It no doubt was usual to conclude that the

1 The Watusi of East Africa distinctly describe all wild beasts save their own totem-animals as enemy-scouts.

souls of cataleptic and epileptic patients sojourned temporarily in animals, while the patients were unconscious; but this phase of lycanthropy is too rare and too abnormal to be associated with the origin of the superstition. Transmigration after death, involving the belicf in a future state, raiscs questions as puzzling as docs lycanthropy itself, and questions quite of a different kind, because in normal lycanthropy the change effected is an actual corporcal one. Mr Tylor therefore throws little light on the origin of lycan- thropy when he connects it with meteinpsychosis. In the form familiar to us it doubtless involves the doctrine of ‘animism ”—the doctrine that animals, plants, and things are prompted to action by spirits similar to those possessed by men ; but, whether lycanthropy is simply a special application of a general doctrine of animism, and is not rather one of the earliest advances from a blind totemism to a general animistic theory, may

fairly be questioned. This at least seems plain: animism, apart from totemism, is not itself sufficient to explain lycanthropy, for even animistic beliefs are not developed abnormally, but along lines predetermined by circumstances. Mr Tylor's vicws are, however, so cautiously and so suggestivcly expressed as to deserve close study. Hardly so satisfactory are the other theories on the subject, which, passing over varia- tions in detail, fall into two classes—the mythological and the rationalistic. On the former view, now upheld by a large school of inquirers, the ancient Aryan myths, and their modern reprcsen- tatives the Mdahrchen, are regarded as imaginative descriptions (principally due to the use of metaphorical language) of the great elemental powers and changes of nature. On such a vicw the occurrence of shape-changing gods and heroesis simple and natural, so long as the persons arc purely mythical, because thus far nothing need be deemed strange or unnatural. But the theory breaks down when it ventures on elucidation of historical facts. It seems vain to conteud, — although it is contended,—that ‘‘ the terrible delusion of lycanthropy arose from the mere use of an equivocal word" (Avxos, "wolf," for Aevxds, ‘‘shining"). Attempt to substantiate in detail this explanation of history is absolutely fatal. ‘‘ Whence," it is asked, "came the notions that men were changed into wolves, bears, and birds, and not into lions, fishes, or reptiles?" and the triumphant reply is that the first-named animals were selected for glossiness or luminosity of coat.? Consequently, if transformation into the other animals was also believed in, the theory stands self-refuted. Now Hippomenes and Atalanta were for impiety turned into lion and lioness, Cadmus and Harmonia into serpents ; and these cases of transformation have almost as intimate an association with the historical belief in men-lions and men-scrpents as the case of Lycaon (mythologically =the shiner, the sun) has with lycanthropy. Cognate to the mythological doctrine is the doctrine of the per- sonification as demons of all obstacles which men have encountered in the long struggle for existence, among these the wilder and more savage animals. This is just a one-sided animism; it is inadequate to explain how the savage beasts so often became mild and gentle men. ‘The rationalistic theories are open to the same objections : to account for divine and benignant lycanthropists they have to be supplementcd by the mythological theories ; they thcinsclves deal exclusively with the more repulsive characteristics. The most recent cxponent of the rationalistic theory is Mr Baring Gould, who rests his case

on a proof of the facts that there is ‘‘ an innate craving for blood implanted in certain natures, restrained under ordinary circumstances, but breaking forth occasionally, accompanicd with hallucination, leading in most cases to cannibalism.” That cau- nibalism and craving for blood had a natural (though not a neces- sary) connexion with lycanthropy, if it originated among savages, need not be disputed ; but Mr Baring Gould’s instances, drawn from medieval European history, are undoubtedly exceptional. Hallucination, however, has been accepted as sufficient explana- tion of lycanthropy by many eminent authorities, besides Mr Gould, and raises a graver question. Belief in transformation into beasts has been acknowledged as a distinct type of monomania by medical men since the days of Paulus Mgineta (7th century) at least; but even in madness there is method, and insane delusions must reflect the usages and beliefs of contemporancous society. Here the weakness of the case appears. Mr Gould, for instance, merely states that the victims were rustics, and wolves the chief terror of their homesteads, an explanation valid only on the assumption that the idea of mctamorphosis was already familiar, —an assumption, that is, of the whole inatter at issue. Bcsides, it is the popular, not the individual, belief in transformation that is strange ; to trace its origin to insane delusion makes it stranger still, for sane men are particularly sceptical regarding the reality of the impressions of the insane. Sane men, moreover, believed in transformation, not only into malignant wolvcs, but also into harm- less cats and hares, which in consequence became malignant and dangerous. How can the rationalistic theory account for a pheno- menon like this? On the whole, there seems little doubt that, whether the origin of lycanthropy rests in totemisin or not, Mr

2 Sir G. W. Cox, The Mythology of the Aryan Nations, London, 1870, vol. i. pp. 63 note, 231, 363, 459 ; vol. ii. p. 78 note.

Plate IT.

2

Tylor is right in referring lycanthropous insane delusions to an antecedent belief in lycauthropy, instead of ascribing lycanthropy to insane delusions.

Literature.—In the numcrous medieval works directed to the study of sorcery and witchcraft, the contemporaneous phases of lycanthropy occupy a pro- mincnt placc. In addition to the authors who have been alrcady mentioned, the following nay be namcd as giving special attention to this subject :—Wier, De Prestigtis Demonum, Amsterdam, 1563; Bodin, Démonomanie des Sorciers, Paris, 1580; Boguet, Discours des Sorciers, Lyons, 2d ed. 1608; Lancre, Tableau de UInconstance de Mauvais Anges, Paris, 1613; Psellus, De Operatione Demonum, Paris, 1615 ; sec also Glanvil, Sadducismus Triumphatus, for the English equi- valents of lycanthropy. Treatises solely confined to lycanthropy are rare both in mcdiwval andin modern times; but a few are well known, as, for instance, those of Bourquelot and Nynauld, De la Lycanthropie, Paris, 1615.; Hartz, De Werwolf, Stuttgart, 1862; Baring Gould, The Book of Were-wolves, London, 1865. Incidentally, however, lycanthropy has engaged the attention of a large number of writers, most of whom theorizc regarding its origin. An exhaustive enumera- tion of thesc cannot be here attempted ; but the following works will be found particularly instructive :—Grimm, Deutsche Mythologie, vols. ii. and iti., 4th ed., Berlin, 1878; Welcker, Kleine Schriften, vol. iii., Bonn, 1850; Waitz, Anthropo- logie, vol. ii., Leipsic, 1860; Dasent, Popular Tales from the Norse (Introduction), Edinburgh, 1859; Afanasief, Poeticheskiya Vozeryentya Slavyan na Prirodu, vol. iii., Moscow, 1869; Tylor, Primitive Culture, vol. i., London, 1871, and Anthropology, chap. xiv. and xv., London, 1881; Gubernatis, Zoological Mythology (especially chaps. xi. and xil.), London, 1872; Ralston, Songs of the Russian People, London, 1872; Laisnel de la Salle, Croyances et Legendes du Centre de la France, Paris, 1875 ; Conway, Demonology and Devil Lore, vol. i., London, 1879. For the medical aspects of lycanthropy, consult the Asylum Journal of Mental Science, vol. iii. p- 100 (Dr D. H. Tuke), and authorities there cited. (J. F. M‘L.)

LYCAON, son of Pelasgus or of Aizeus, was the mythical first king of Arcadia, who founded the first city Lycosoura and the worship of Zeus on Mount Lyceus. He, or his fifty impious sons, entertained Zeus and set before him a dish of human flesh; the god pushed away the dish in disgust and overturned the table at a place called Trapezus. In punishment either lightning slew the king and his sons, or they were turned into wolves. Pausanias (viii. 2) says that Lycaon sacrificed a child to Zeus, and was

during the sacrifice turned into a wolf. Henceforth the story ran—a man was turned into a wolf at each annual sacrifice to Zeus Lyceus, recovering his human form after ten years if he had not during that time eaten human flesh. Tvycaon is evidently the Lyczan form of a very common conception, viz., the divine first man, whose life is the heavenly fire, who comes to earth and returns to heaven as the lightning. The oldest city, the oldest cultus, and the first civilization of Arcadia are attributed to him. The mysterious cultus and the human sacrifices, which continued apparently through the historical period (Paus., viii. 38), of Zeus Lyczeus have moulded the legends of the Lycman first man and first king. Moreover his name, which is connected with that of the mountain, suggested a derivation from Av«Kos, wolf; and legends analogous to those of the Teutonic were-wolf (see Lycan- THROPY) naturally grew round him.

LYCAONIA, in ancient geography, was the name given to a province in the interior of Asia Minor, north of Mount Taurus. It was bounded on the E. by Cappadocia, on the N. by Galatia, on the W. by Phrygia and Pisidia, while to the 8. it extended to the chain of Mount Taurus, from which it was, however, in part separated by Isauria, though some writers included that district in Lycaonia, Its boundaries appear indeed to have varied at different times, as was the case with all the nations of Asia Minor. The name is not found in Herodotus, but Lycaonia is men- tioned by Xenophon as traversed by Cyrus the younger on his march through Asia. That author, however, de- scribes Iconium, one of the principal cities of Lycaonia, as included in Phrygia. Bunt in Strabo’s time the limits of the province were more clearly recognized, though Isauria was by some authors considered as a part of Lycaonia, by others as a distinct province. Ptolemy, on the other hand, includes Lycaonia as a part of Cappadocia, with which it may have been associated by the Romans for administrative purposes ; but the two countries are clearly distinguished both by Strabo and Xenophon.

Lycaonia is well described by Strabo as a cold region of elevated plains, affording pasture to wild asses and to sheep. It in fact forms a part of the great table-land which con- stitutes the whole interior of Asia Minor, and has through-

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out its whole extent an elevation of more than 3000 feet above the sea. It suffers, moreover, severely from the want of water, aggravated by the abundance of salt in the soil, so that the whole northern portion of the province, extending from near [conium to the salt lake of Tatta, and the frontiers of Galatia, was almost wholly barren. Other | portions of the country, however, notwithstanding the deficiency of water, were well adapted for feeding sheep, so that Amyntas, king of Galatia, to whom the district was for atime subject, maintained there not less than three hundred flocks, which brought him in a large revenue.

Though the greater part of Lycaonia is a broad open plain, extending as far as the underfalls of the Taurus, its monotonous character is interrupted by some minor ranges, or rather groups of mountains, of volcanic character, of which the Kara Dagh in the southern portion of the district, a few miles north of Karaman, rises to a height of above 8000 feet, while the Karadja Dagh, to the north-east of the preceding, though of very inferior elevation, presents a striking range of volcanic cones. The mountains in the north-west of the province, near Iconium and Laodicea, on the other hand, are the termination of the great range of the Sultan Dagh, which traverses a large part of Phrygia.

The Lycaonians appear to have been in early times to a great extent independent of the Persian empire, and were like their neighbours the Isaurians a wild and lawless race of freebooters; but their country was traversed by one of the great natural lines of high road through Asia Minor, from Sardis and Ephesus to the Cilician gates, and a few considerable towns would naturally grow up along this line of route. The most important of these was Iconium, in the most fertile spot in the province, of which it has always continued to be the capital. It is still called Konieh. A little farther north, immediately on the frontier of Phrygia, stood Laodicea (Ladik), called Combusta, to distinguish it from the Phrygian city of that name; and in the south, near the foot of Mount Taurus, was Laranda, now called Karaman, which has given name to the province of Karamania. Derbe and Lystra, which appear from the Acts of the Apostles to have been considerable towns, were apparently situated in the same part of the district,

but their sites have not been identified. The other towns mentioned by ancient writers were insignificant places.

The Lycaonians appear to have still retained a distinct nationality in the time of Strabo, but we are wholly in the dark as to their ethnical affinities, or relations to the tribes by which they were surrounded. The mention of the Lycaonian language in the Acts of the Apostles (xiv. 11) is evidently only intended to designate the vernacular tongue, as opposed to Greek, and cannot be regarded as any proof that they spoke a different language from their neighbours the Phrygians or Cappadocians,

LYCIA, in ancient geography, was the name given to a Platell

district in the south-west of Asia Minor, occupying the portion of the coast between Caria and Pamphylia, and extending inland as far as the ridge of Mount Taurus. The region thus designated is one strongly marked by nature, as constituting a kind of peninsula or promontory projecting towards the south from the great mountain masses of the interior. It was also inhabited from a very early period by a distinct people, known to the Greeks as Lycians, but whose native name, according to Herodotus, was Termile, or (as it is written by Hecatzus) Tremilz, and this is con- firmed by native inscriptions, in which the name is written Tramilz. Herodotus tells us also that they were not the original inhabitants of the country, which was previously occupied by the Milyans, and this is rendered probable by the fact that a people of that name was still found in the rugged mountainous district in the north-east, who appear to have always continued distinct from the Lycians. But

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the statement of the same historian that they originally came from Crete is in the highest degree improbable ; aud the attempts to connect them with the Greek legendary history through Sarpedon and Lycus, a son of Pandion, may be safely rejected as mere fictions.

The Lycians alone among the nations in the west of Asia Minor preserved their independence against the kings of Lydia; but after the fall of the Lydian monarchy (in 546 3.c.) they were subdued by Harpagus, the general

of Cyrus, though not till after an obstinate resistance in which Xanthus, their chief city, was utterly destroyed. But, though they were from this time nominally subject to Persia, they appear to have enjoyed a considerable amount of independence, which they afterwards maintained by join- ing the Athenian maritime league. They were conquered almost without resistance by Alexander, and thus passed under the Macedonian dominion, sometimes of the Ptolemies, sometimes of the Seleucidans. But through all these vicissitudes, as well as after their ultimate sub- mission to the Roman power, they continued to preserve their federal institutions, which remained unimpaired, in form at least, as late as the time of Augustus. Strabo, who has preserved to us an account of their constitution, which he regards as the wisest form of federal government with which he was acquainted (a judgment confirmed by the high authority of Montesquieu), tells us that the league consisted of twenty-three cities in all, of which the six principal were Xanthus, Patara, Pinara, Olympus, Myra, and Tlos, These six had each three votes in the general assembly ; of the remaining cities the more considerable had each two votes, and the rest only one, The payment of taxes and other public burthens were apportioned in the same manner, and the choice of the supreme magistrate, who was styled Lyciarch, and the other magistrates of the league rested with the federal assembly. At the same time the internal affairs of each city were managed by a senate or council (Boule), and a general assembly of the people (Demos),‘in the same manner as was usual with Greek cities. This system of government continued to subsist under the Roman empire, though of course subject to the control as well as protection of the sovereign power; but in the time of Claudius dissensions among the separate cities afforded a pretext for the intervention of Rome, and Lycia became formally annexed to the Roman empire. It was at first united in the same province with Pamphylia; but in the reign of Theodosius it was constituted a separate province.

Almost the whole of Lycia is a rugged mountainous country, traversed by offshoots and branches of the great range of Mount Taurus, which occupies the whole interior or northern part of the district, and sends down to the sea great arms or brauches, constituting lofty promontories. The consequence is that the coast, though less broken and irregular than that of Caria, is indented by a succession of bays,—the most marked of which is that called in ancient times the Glaucus Sinus, now the Gulf of Macri, in the extreme

west of the province, and separating Lycia from Caria. A number of smaller bays, and broken rocky headlands, with a few small islets lying off them, constitute the coast-line from thence to the south-eastern promontory of Lycia, formed by a long narrow tongue of rocky hill, known in ancient times as the Sacred Promontory, with three small adjacent islets, called the Chelidonian islands, which was regarded by some ancient geographers as the commencement of Mount Taurus—an opinion justly con- troverted by Strabo. But it really forms an important point in the geography of Asia Minor, where the coast trends abruptly to the north till it reaches the confines of Pamphylia. It was believed by Strabo to be directly opposite to Canopus in Egypt, and to be the point where the interval between the two continents was the shortest.

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Though the mountain ranges of Lycia may all be con- sidered as in reality offshoots of Mount Taurus, several of them in ancient times were distinguished by separate names. Such were Mount Deedala in the west, adjoining the Gulf of Macri, Mount Cragus on the sea-coast, west of the valley of the Xanthus, and Mount Massicytus nearly in the centre of the region, rising to a height of 10,000 feet, while Mount Solyma in the extreme east, above Phaselis, rises abruptly from the sea to an elevation of 7800 feet. The steep and rugged pass between this mountain and the sea, called the Climax, or Ladder, was the only direct communication between Lycia and Pamphylia.

The only two considerable rivers in Lycia are (1) the Xanthus, which descends from the central mass of Mount Taurus, and flows through a narrow valley till it reaches the city of the same name, below which it forms a plain of some extent before reaching the sea, and (2) the Limyrus, which enters the sea near Limyra. The Arycandus and the Andriacus, which are intermediate between the two, are much less considerable streams, and do not flow from the central chain. The small alluvial plains at the mouths of these rivers are the only level ground in Lycia ; but the slopes of the hills that rise from thence towards the moun- tains are covered with a rich arborescent vegetation of the most beautiful character. (See the description of it by Forbes, quoted in Asta Minor, vol. ii. p. 709.) The upper valleys and

mountain sides afford good pasture for sheep, and the main range of Mount Taurus encloses several extensive yailahs or upland basin-shaped valleys of the peculiar kind so characteristic of that range throughout its extent (see Asta Minor, p. 704).

It is very difficult to determine the limits of Lycia towards the interior; and the boundary seems to have varied repeatedly at different times. The high and cold upland tract to the north-east, called Milyas (which was supposed to retain some remains of the aboriginal popula- tion of Lycia), was by some writers included in that pro- vince, though it is naturally more connected with Pisidia. A similar tract to the west of this, and also situated to the north of the watershed of Mount Taurus, was termed Cabalia; but this had no natural connexion with Lycia, nor was in early times ever politically united with it, the four cities that were situated in this region—Cibyra, with its dependent towns of Gnoanda, Balbura, and Bubon— having always formed a separate league or Tetrapolis, which had no connexion with the Lycian league. It was not till after their annexation to Rome that Cibyra, with the district adjoining it, termed the Cibyratis, was united to Phrygia, while the three other towns above enumerated were annexed to Lycia.

According to Artemidorus (whose authority is followed by Strabo), the towns that formed the Lycian league in the days of its integrity were twenty-three in number; but Pliny tells us that Lycia once possessed seventy towns, of which only twenty-six remained in his day. Recent researches have fully confirmed the fact that, notwithstand- ing its rugged character, the sea-coast and the valleys that ran up into the interior were thickly studded with towns, which in many cases are proved by existing remains to have been places of considerable importance. The names have been for the most part identified by means of inscriptions, and we are thus enabled to fix the position of the greater part of the cities that are mentioned in ancient authors. On the Gulf of Glaucus, near the frontiers of Caria, stood Telmessus, an important place, while a short distance from it in the interior were the small towns of Deedala and Cadyanda. At the entrance of the valley of the Xanthus were Patara, Xanthus itself, and, a little higher up, Pinara on the west and Tlos on the east side of the valley, while Araxa stood at the head of the valley, just at the foot of

the pass leading into the interior. Sidyma, on the slope of Mount Cragus, seems also to have borue the name of the mountain, as was also the case with Massicytus, if there was really a city of the name at all. Myra, one of the most important cities of Lycia, occupied the entrance of the valley of the Andriacus; on the coast between this aud the moutli of the Xanthus stood Antiphellus, while in the interior, at a short distance, were found Phellus, Cyanew, and Candyba. In the alluvial plain formed by the outlets of the rivers Arycandus and Limyrus stood Limyra, and encircling the same bay the three small towns of Rhodiapolis, Corydalla, and Gage. Arycanda com-imanded the upper valley of the river of the same name. On the east coast stood Olympus, one of the cities of the league, though it could never have been more than a small town, while Phaselis, a little farther north, which was a much more important place, never belonged to the Lycian league, and appears to have always maintained an independent position. We have thus in all twenty-one towns of which the sites have been ascertained, but the occurrence of other considerable ruins, to which no names can be attached with auy certainty, confirms the statement of Pliny as to the great number of the Lycian towns.

The cold upland district of the Milyas appears never to have contained any town of importance. Podalia seems to have been its chief place. Between the Milyas and the Pamphylian Gulf was the lofty mountain range of Solyma, which was supposed to derive its name from the Solymi, a people mentioned by Homer in connexion with the Lycians and the story of Bellerophon. No such name was known in historical times as an ethuic appellation, but they were supposed by some writers to be the same people with the Milyans, while others regard them as a distinct people of Semitic origin. It was in the flank of this mountain, near a place called Deliktash, that the celebrated fiery source called the Chimera, which gave rise in ancient times to so many fables, was found. It has been visited in modern times by Captain Beaufort, Messrs Spratt and Forbes, and other travellers, but is merely a stream of inflammable gas issuing from crevices in the rocks, such as are found in several places in the Apennines. No traces of recent volcanic action exist in Lycia.

Few parts of Asia Minor were less known in modern times than Lycia until a very recent period. Captain Beaufort was the first to visit scveral places on the sca-coast, and the remarkable rock- hewn tombs of Telmessus had been already described by Dr Clarke, butit was Sir Charles Fellows who first discovered and drew atten- tion to the extraordinary richness of the district in ancient remains, especially of a sepulchral character. His two visits to the country, in 1838 and 1840, were followed by a more regular expedition sent out by the British Government in 1842 for the purpose of transport- ing to England the valuable monuments now in the British Museum, while Lieutenant (now Admiral) Spratt and Professor Edward Forbes explored the interior of the district, and laid down its physical features on an excellent map. The monuments thus brought to light are certainly among the most interesting of any that have been discovered in Asia Minor, and, while showing the strong influence of Greek art, both in their architecture and sculp- ture, prove also the existence of a native architecture of wholly distinct origin, especially in the rock-cut tombs, some of which present a strange resemblance to our English Elizabethan style, while others distinctly evince their derivation from the simple construction of the mud and timber built cottages of the natives. But the theatres that are found in almost every town, some of them of very large size, are alone sufficient to attest the pervading influence of Greek civilization ; and this is confirmed by the sculptures, which are for the most part wholly Greek. None of them, indeed, can be ascribed to a very early period, and hardly any trace can be found of the influence of Assyrian or other Oriental art.

One of the most interesting results of these recent researches has been the discovery of numerous inscriptions in the native language of the country, and written in a character, or at least an alphabet, before unknown, and which appears to have been peculiar to Lycia. A few of these inscriptions are fortunately bilingual, in Greek’ and Lycian, which has afforded aclue to their partial interpretation, and

the investigations of Mr Daniel Sharpe in the first instance, followed by the more mature essays of Moritz Schmidt and Savelsberg, have established the

fact that the Lycian language belonged to the great Aryan family, and had close affinities with the Zend. The alpha- bet in which the inscriptions are written is obviously derived from the Greek, no less than twenty-four of the letters being identical, while most of the additional letters appear to have been invented in order to express vowel sounds which were not distinguished in Greek. None of the Lycian inscriptions, however, any more than the sculptures, can lay claim to a high antiquity. It is remarkable that the Greek alphabet upon which it was founded appears not to have been the Ionic alphabct which was in general use in Asia Minor, but was more akin to the Doric alphabet in use in the Pelo- ponnese,

For these modern researches see A Journal written during an Excursion in Asia Minor, London, 1839, by Sir Charles Fellows; An Account of Discoveries in Lycia, by the same author, London, 1841; Travels in Lycia, Milyas, and the Cibyratis, by Lieutenant Spratt and Professor Edward Forbes, 2 vols., London, 1847 ; Moritz Schmidt, Neue Lykische Studien, Jena, 1869; Savelsberg, Beitriige zur Enizifferung der Lykischen Sprachdenkmdler, Bonn, 1874. (E. 11. B.)

LYCOPHRON was a Greek poet who flourished at Alexandria in the time of Ptolemy Philadelphus (285-47 B.C.). He was born at Chalcis in Eubcea, and was the son of Lycus. He wrote a number of tragedies, forty-six or sixty-four, and Suidas gives the title of twenty of them, Only a few lines are preserved of these works, which gained him a place in the Pleiad of Alexandrian tragedians. He was entrusted by Ptolemy with the task of arranging the comedies in the Alexandrian library, and out of this work grew his treatise wept kwpywdias, in at least eleven books, It seems to have treated of the history of comedy, of the lives of the comic poets, and of various topics subsidiary to the proper understanding of their poems, but nothing has been preserved of the work. One of his poems called Cassandra, containing 1474 lines of iambic, has been pre- served entire. It is in the form of a prophecy uttered by Cassandra, and relates the later fortunes of Troy and of the Greek and Trojan heroes. References to various events of mythic and of later time are introduced, and the poem ends with a reference to Alexander the Great, who was to unite Asia and Europe in his world-wide empire. The style, as befits a prophecy, is so enigmatical as to have pro- cured for Lycophron, even among the ancients, the title of the

“obscure” (6 oxorewds). The poem is evidently in- tended to display the writer’s knowledge of obscure names and uncommon myths; it is full of unusual words of doubtful meaning gathered from the older poets, along with many long-winded compounds coined by the author. It has none of the qualities of poetry, and was probably written not for the enjoyment of the public but as a show- piece for the Alexandrian school. It was very popular in the Byzantine period, and was read and commented on very frequently ; the collection of scholia by I. and J. Tzetzes is very valuable, and the MSS. of the Cassandra are numerous. A few neat and well-turned lines which have been preserved from Lycophron’s tragedies show a much better style; they are said to have been much ad- mired by Menedemus of Eretria, although the poet had ridiculed him in a satyric drama. Lycophron is also said to have been a skilful writer of anagrams, a reputation which does not speak highly for his poetical character.

Two passages of the Cassandra, 1446-50 and 1226-82, in which the career of the Roman people and their universal empire are spoken of, could evidently not have been written by an Alexan- drian poet of 250 B.c. Hence it has been maintained by Niebuhr and others that the poem was written by a later poet mentioned by Tzetzes, but the opinion of Welcker is generally counted more probable, that these paragraphs are a later interpolation : a pro- phetic poem is peculiarly liable to have additions inserted, and the Roman rule was the most natural subject to add.

See Welcker, Griech. Trag.; Konze, De Lyeophronis Dictione ; and Bernhardy’s and other histories of Greek literature.

LYCOPODIUM. This and Selaginella are the two chief genera of the order Lycopodiaceex or club mosses. They are flowerless herbs, and mostly creeping ; but during the period of the development of coal plants members of this

order attained to the dimensions of lofty trees. A remark- able bed of Scotch coal called the “ better bed” was found on microscopical examination to be almost entirely com- posed of the spores and sporanges of some “lycopod.” There are one hundred species, which occur in all climates, five being

British. The leaves of lycopodium are for the most part small, and thickly cover the stem and branches. The “fertile” leaves are arranged in cones, and bear sporanges in their axils, containing spores of one kind only (of two kinds in Selaginella). The prothalliuin developed from the spore is a subterranean mass of tissue of considerable size, and bears the male and female struc- tures (antheridia and archegonia). See Mucrographic Dict.; Le Maout and Decaisne’s Desc. and Anal. Bot., Eng. ed., p. 911; and Sach’s Z’ext-book of Bot., Eng. ed., p. 400 s9. Gerard, in 1597, described two kinds of lycopodium (Zerball, p. 1373) under the names Jfuscus denticulatus and Muscus clavatus (L. clavatum, L.) as “ Club Mosse or Woolfes Clawe Mosse,” the names being in Low Dutch, ‘Wolfs Clauwen,” from the resemblance of the elub-like or claw-shaped shovts to the toes of a wolf, “whereupon we first named it Lycopodion.” Gerard also speaks of its emetic and many other supposed virtues. L. Selago, L., and L. catharticum, Iook., of South America, have been said to be, at least when fresh, cathartic; but, with the exception of the spores (‘‘lyco- podium powder ”), lycopodium as a drug las fallen into disuse. The powder is used for rolling pills in, as a dusting powder for infants’ sores, &c. It is highly in- flammable, and is used in pyrotechny and for artificial lightning on the stage. If the hand be covered with the powder it cannot be wetted on being plunged into water. Another use of lycopodium is for dyeing ; woollen cloth boiled with species of lycopodium, as L. clavatum, becomes blue when dipped in a bath of Brazil wood.

LYCURGUS, a famous Spartan lawgiver. As even the ancients themselves differed so widely in their accounts of Lycurgus that Plutarch could begin his life by saying that he could assert absolutely nothing about him which was not controverted, it is not surprising that modern historical criticism has been disposed to relegate hii wholly into the region of pure myth. One tradition would put him as far back as the age of Troy; another would connect him with Homer; while Herodotus implies that he lived in the 10th century B.c. It is now usual, on the strength of a passage in Thucydides (bk. i. chap. 18), whicli represents Sparta as having enjoyed a well-established political constitution for as much as four hundred years before the Peloponnesian war, to assign him to the 9th century B.c., and to accept him as a real historical person. But as to the character and result of his legisla- tive work there still remain very conflicting opinions, due to the

circunistance that such data as we possess are susceptible of exceedingly diverse inferences and inter- pretations. Plutarch's life, which is the fullest and most detailed account we have of him, is not merely the com- pilation at second hand of a late age (2d century), but also abounds in statements which any one with any knowledge of the early growth of political societies feels to be inherently improbable. Grote prefers on the whole to be guided by what may be fairly inferred from the allusions to his legislation in Aristotle, as being one of our earliest sources of information and certainly the most philosophical estimate of his work. With Thirlwall he takes him to have been a real person, and assumes that he was the instrument of establishing good order among the Spartans, hitherto, according to Herodotus, the most lawless of mankind, and of thus laying the foundations of Spartan strength and greatness.

The traditional story was that when acting as guardian

to his nephew, Labotas, king of the Spartans, he imported his new institutions from Crete, in which a branch of the Dorian race had for a considerable period settled themselves. It was said that he had travelled widely, and gathered political wisdum and experience in Egypt and even in India. With the support of the Delphic oracle, which was specially revereuced by Dorians, he was able to accom- plish his work and to regulate, down to the smallest details, the entire life of Sparta. He lived to see the fruit of his labour, and, having bound his fellow countrymen to change nothing in his laws till his return, he left then for Delphi, and was never seen by them agiin. The oracle declared that Sparta would prosper as long as she held fast by his legislation, and upon this a temple was built to his honour, and he was worshipped as a god.

It was the fashion with writers like Plutarch, from whom our notions of Lycurgus have been mainly derived, to represent the Spartan lawgiver as the author of a wholly new set of laws and institutions. It need hardly be said that any such view has long been abandoned, and that Lycurgus's work, great as it no doubt was, did not gu beyond formulating what already existed in germ, and was in fact the peculiar heritage of the Spartans as members of the Dorian race. It has been contended that the laws of Sparta

were the typical Dorian laws, and that Sparta herself was the special representative, politically and socially, of the Dorian race. It appears, however, to have been the general view of the Greeks themselves that many of her most important institutions, more especially the severity of her military training and of her home- discipline, were peculiar to Sparta, and were by no means shared by such states as Corinth, Argos, Megara, all of Dorian origin. Grote lays great stress on this point (Listory of Greece, chap. vi.), and maintains that it was the singularity of the Spartan laws which made such a deep impression on the Greek mind. The truth indeed seems to be that Sparta's political organization in its main lines was of the Dorian type, and resembles the pictures given us in the Homeric poems, but that much in her social life aud military arrangements was absolutely unique. It is here that in all probability may be traced the genius and fore- sight of Lycurgus, and he may thus well deserve the credit of having started Sparta on a new career.

The council of elders (gerousia, or senate), a distinctive feature of the Hellenic states generally, must have existed at Sparta long before Lycurgus, nor is it at all certain that he fixed its number at twenty-eight, the two kings who sat and voted in it making it up to thirty members. It was elected from the people from candidates who had reached the age of sixty, and a senator once elected was a senator for life. It united the functions of a deliberative assembly and of a court of justice, and it prepared measures which were from time to time submitted to periodical assemblies of the people, which, however, had simply to accept or reject, without any power of amendment or criticism. So far the constitution of Sparta was distinctly oligarchical. The two kings, whose office was hereditary, and whose de- scent was from the famous family of the Heraclids, had but very limited political powers, and, with some few excep- tions, even little more than ordinary senators. They owed their position and prerogatives to the religious sentiment of the people, which reverenced their noble and quasi- divine origin, and accepted them as legitimately the high priests of the nation, and as specially qualified in great eiergencies to consult the Delphic oracle and receive its answers. An ample royal domain was assigned to them, and some rather delicate legal matters, such as the bestow- ment of the hand of an orphan heiress, were entrusted to their discretion. By far the most important of their duties was the comniand of the army on a foreign expedi-

tion, with, however, the assistance of a council of war. In fact they closely resembled at all points the kings of the heroic age, and the honour and reverence in which they were held was far greater than their actual power, which really was curtailed within such narrow limits that it was not possible for them to establish anything like a tyranny or despotism.

One great check on the kings was a board of magistrates, annually elected by the people, termed ephors, a name not confined to Sparta, whence we may fairly infer that this institution also by no means owed its origin to Lycurgus, A comparison has been suggested between the Spartan ephors and the tribunes at Rume. Both were certainly popular magistrates, and as it was at Rome, so too at Sparta, at any rate in her later days, these magistrates made them- selves the great power in the state. There was a form of ancient oaths between the king and the ephors, the king swearing that he would respect the established laws, and the ephors swearing that on that condition he should retain his authority and prerogatives. The unanimous view of antiquity was that it was the special business of the ephors “to protect the people and restrain the kings.” We gather from passages in Thucydides that they had in his time great political influence, and in the time of Aristotle they had attained such a position that he says they did not choose to conform themselves to the strict discipline prescribed to Spartan citizens. Although the king took the command in war, it was for the ephors to say when war should be made, and on what terms peace should be concluded. Any public magistrate, the kings not excepted, was liable to be called to account by them, while they themselves seem to have been irresponsible. Of course the fact that they were annually elected necessitated a general conformity in their policy to the popular will. But so great and arbitrary were their powers that Plato hints that the Spartan consti- tution might be almost described as a tyranny. Indeed they were to Sparta what the House of Commons is to England, “the moving spring,” as Arnold says (Thucy., App. II.), of the whole Spartan government.

Of the institutions we have described, not one, as we have seen, was peculiar to Sparta, or, it may be inferred, due to Lycurgus. They were indeed all connected by tradition with his name, and we may believe that he

did his best to put them on a sound basis, though, as to the ephors, there is reason to think that they formed no part of the original Spartan constitution. One thing is certain that there was a permanence about Lycurgus's work, what- ever it may have been, to which Sparta's long freedom from revolution was unanimously attributed. She owed this no doubt mainly to her peculiar social customs and usages, and it is here that in the opinion of both Grote and Thirl- wall we must specially look for the reforming hand of Lycurgus.

It was of the first importance that the Spartan should be an efficient soldier. He was a conqueror in the midst of a subject population, to which he stood in the same relation in which the Norman for a time at least stood to the Saxon. This subject population was made up of two classes, the Periceci (dwellers round the city) and the Helots, the first being freemen and proprietors scattered throughout the townships and villages of Laconia, with some powers of local self-government, but with no voice in the affairs of the state, while the latter were simply serfs, attached to the soil which they cultivated, like the villein of the feudal period, for Spartan proprietors, to whom they paid a rent equivalent, it is said, to half of the entire pro- duce. Their condition, though a humble and in some respects a degraded one, was at least free from the worst incidents of slavery, as they lived with their wives and families, and could not be sold out of the country. Thus

they must have felt themselves an integral part of the state, which employed them in military service, and rewarded them from time to time with the gift of freedom. Still, as an oppressed class, they often gave uneasiness to Sparta, and on one memorable occasion, recorded by Thucydides (iv. 80), as many as two thousand of them were treacher- ously and secretly massacred for reasons of state expediency. There was even a regular and legalized system of thinning their numbers by stealthy assassination, known as the " erypteia," and carried into effect by young Spartans who were annually commissioned to range the country with daggers for this horrible purpose. If under ordinary circumstances the frugal and industrious Helot might exist in tolerable comfort and even hope for freedom, he must have been made to feel that it was exceedingly dangerous to be too aspiring, and

the inferiority of lus condition was clearly marked by a distinctive dress which he dared not lay aside, any more than he might presume to sing any of the national songs of Sparta.

It was by the toil of the Helots that the Spartan was

enabled to live, as we should say, the life of a gentleman, devoting himself to hunting and military exercises along with some slight admixture of mental culture, based mainly on music and poetry. It was not, however, a life of ease and enjoyment. His physical training was proverbially severe, From the age of seven he was put under a rigorous state discipline which inured him to the patient endurance of the most extreme hardships. The ideal at which he was specially taught to aim was a calm passive fortitude, which implied that he lived solely for the state. Spartan youths would compete with each other in submitting themselves to the lash before the altar of the goddess Artemis, and would, it is said, sometimes suffer even to death without any visible emotion. The story that they were habitually trained to theft means that they had licence to roam the country and forage for food, which they were expected to carry off without detection. In every way they were trained to feel themselves at home amid peril and hardship. The Spartan woman, whose business it was to be the mother of brave and robust children, was naturally held in great honour, and according to Aristotle had at least in his time great influence on public affairs. The maiden was trained in much the same fashion as the youth, and was exercised in running, wrestling, and boxing, and thus at Sparta there was a much freer intermingling of the sexes than in any other Greek state. In this respect Spartan fashions of life seem to have been altogether peculiar to Spartans. The effect of such a traiming on the women would as a matter of course be to give them masculine senti- ments and aspirations, and we can well understand what regard would be paid to their praise or censure. The position of women in Sparta takes us back to the old heroic ages, and reminds us of many passages in the poems of Homer.

One of the features of Spartan life, in thorough harmony with its general purpose and tenor, was the public mess, the “syssitia,” according to the Greek phrase. Every citizen was bound to be a member of the mess, which was arranged in a number of joint tables, each providing from his allot-

ment of land a prescribed quota of provisions, with wine and game from the public forests, and the guests being distributed into parties of fifteen persons, and chosen by ballot. Attendance at the mess was strictly enforced, and even the kings were not permitted to excuse themselves. The claims of the state on her citizens, and the duty of obedience to state discipline, were thus kept perpetually present to the Spartan's mind.

With trade and industrial occupations, even agriculture, the Spartan had nothing to do, all this being left to the Periceci and Helots. We might have anticipated that such

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would be the case with a military aristocracy. The story that Lycurgus restricted Sparta to an iron coinage can- not well be reconciled with the fact that silver money was not in use among the Greeks till a century after his time.

The organization of the Spartan army was always greatly admired by the ancients. Xenophon praises its system of tactics for "an admirable simplicity in the midst of seeming intricacy," and in Thucydides (v. 66) we have it described as based on an elaborate graduation of authority, by means of which the general's orders were transmitted to the rank and file with the utmost promptitude and accuracy. The strength of the army consisted mainly in infantry, every Spartan being a heavy-armed soldier, and the light troops being made up out of the Periceci and Helots. The Spartan cavalry never had much repute, and it was always regarded as a decidedly inferior branch of the service. Nor did they seriously apply themselves to sieges or to sea warfare. Though a brave, they were a very cautious and wary people, and all their military operations were conducted with extreme secrecy. It was a fixed principle with them not to engage the same enemy with needless frequency, and not to carry a pursuit further than victory really required. Anything like cowardice was a disgrace which reduced a citizen to the condition of an outcast. " With it or on it" were the words with which the Spartan mother would bid her son return when he left home with his shield to fight for Sparta.

Lycurgus is fairly described by Grote (Hist. of Greece, chap. 6) as “the founder of a warlike brotherhood rather than the lawgiver of a politicalcommunity.” The Spartan was to be almost wholly estranged from home ties, and to live only for the state. His training, though admired both by Plato and Aristotle as directed towards a noble ideal, was felt by them to be very imperfect, inasmuch as it cultivated only one side of human virtue and contemplated the circumstances of a camp or a garrison rather than of a state organized on a really perfect basis.

With the reforms of Lycurgus Plutarch connects a sweeping readjustment of the entire system of landed pro- perty, whereby Laconia was parcelled out into 39,000 equal lots, 9000 being assigned to Spartan citizens, and the remainder to their free subjects, the Periceci. It was the fashion with certain ancient writers to assume some such measure in the case of every early legislator or reformer. But it is to be noted that we have no hint of any such repartition of land by Lycurgus till we come to Plutarch, and this fact so much impressed Grote that he utterly rejects the story. All historical evidence, he maintains, points to great inequalities of property among the Spartans from the earliest times, and is therefore irreconcilable with any such belief. Here indeed he seems to be on sure ground, but it may be quite possible that even with equal lots of land there were decided ine- qualities in wealth. ‘There may have been citizens rich in flocks and herds pastured on common ground, of which, we have reason to believe, there was considerable extent. Plutarch’s account is favoured by the fact that equal distributions of land were often made in early days by conquering peoples. The question is one on which it seems impossible to arrive at a certain and definite con- clusion, Possibly, as has been suggested by M. Laveleye, some old tradition of an equality of landed property may have been the origin of the belief that a redivision into equal portions was a part of the system of Lycurgus.

There was, however, an equality which he certainly did attempt to establish. Every Spartan, rich or poor, had to submit to the same hard discipline and to aim at the same ideal. The attempt was not altogether unsuccessful, though the subsequent history of Sparta shows that several

of her citizens fell so far short of it as to disgrace them- selves by actual dishonesty in the public service. But we may fairly credit Lycurgus with a work which laid deep the foundations of a very remarkable and at times a truly noble patriotism both in the men and women of Sparta. _ The best accounts of Lycurgus and his legislation will be found in Grote's and Thirlwall's histories, and in Miiller's Dorians. The chief original sources from which our knowledge of the subject is derived are the writings of Plutarch and Xenophon, and Aristotle's Politics. (W. J. B.) LYCURGUS, one of the ten great Attic orators, was born about 396-93 p.c. His father was named Lycophron, and he belonged to the old Attic family of the Eteobutade. He is said to have been a pupil both of Plato and of Isocrates. His early career is quite unknown, but after the real character of the great struggle with Philip of Macedon was becoming manifest he was recognized along with Demosthenes and Hyperides as one of the chiefs of the national party. He left the care of external relations to his colleagues, and devoted himself to the internal organization and the financial administration of the state. He managed the finances of Athens for twelve successive years, being chosen tapias tis Kowns mpooddov, probably in 341 3.c., for a term of four years, and in the two succeeding terms, when the actual office was forbidden him by law, directing it through a nominal official chosen from his party. Part of one of the deeds in which he rendered account of his term of office is still preserved in an inscription (Corp. Inscr. Gr., 1. No. 247; Corp. Inser. Att., ii. pt. 2, No. 289). During this time 18,900 talents passed through his hands, and he raised the public income to 1200 talents yearly. His integrity and his skilful management were highly appreciated by the people, who refused to deliver him up when Alexander the Great demanded his surrender ; many private persons deposited money under his charge. He was also appointed to various other offices connected with the preservation and improvement of the city. He was very strict in his superintendence of the public morals, and passed a sumptuary law to restrain extravagance. On the other hand he showed a noble and liberal spirit in all that concerned public expenditure ; he did much to beautify and improve the city by fine buildings; and he passed a famous law ordering that statues of the three great tragedians should be erected, and that a careful edition of their tragedies should be made and preserved among the state archives.

Lycurgus was a man of action and not of words: his orations, of which fifteen were published, are criticized by the ancients for their awkward arrangement of matter, harshness of style, and the ten- dency to digressions about mythology and past history, while the noble spirit and the lofty morality that breathe through them are highly praised. Only one of the orations, that against Socrates, has becn prescrved, and fully bears out the criticism of the ancicnts. He was cvidently one of the last examples of the finest Athenian type—full of religious feeling, as became one of the Etcobutade, the family in which the priesthood of Athene Polias was hereditary, proud of the history and the religion of his country, and resolved to act worthily of it and to make others do the same, severe and stern in his treatment of offenders and frequently prosecuting them in the public courts, but generous and liberal in all that concerned the glory of Athens.

LYDGATE, Jonny, a monk of Bury St Edmunds, was the most famous English poet of the 15th century. He isa standing refutation of a popular notion that the extra- ordinary collapse of English poetry after Chaucer dis- appeared from the stage was due to the unsettled state of public affairs. The exact dates of his birth and death are not ascertained, but he began his occupation as a verse- maker before Chaucer's death, and probably ended it several years before the Wars of the Roses broke out. Public affairs were not more unsettled during his lifetime than during the lifetime of Chaucer. Like Chaucer,

Lydgate enjoyed the patronage of the royal family. He was the "poet laureate" of his generation. He translated Benoit de St Maure's History of Troy 'at the command- ment " of Henry V.; he wrote a poem on the battle of Agincourt ; the coronation of Henry VII. furnished him with another theme; the 'Good Duke Humphrey" of Gloucester '' commanded " his translation of Bochas upon the Fall of Princes. The monk of Bury was in short a professional poet. According to Warton lie opened a school in his monastery for teaching the sons of the nobility the arts of versification and the elegancies of composition, and it would seem from the character and the variety of the pieces attributed to him—" disguisings," ''mummings," lives

of saints, translations of standard works, devotional pieces in metre, metrical paraphrases of proverbs—that he was ready to write to order on any theme submitted to him. Lydgate attracted a good deal of attention from our early printers and antiquaries, his Fall of Princes being reprinted four times before the accession of Elizabeth. The fact that it was the largest poem in English of a tragic cast may have had something to do with the popularity of this work. The Story of Thebes, based on Statius and Boccaccio, is generally supposed to have been one of his first essays. It is told as one of the Canterbury tales,— the poet in his prologue feigning himself to have joined Chaucer's pilgrims at Canterbury, and recited this tale at the host's command as they rode back. Possibly more than one of two hundred and fifty-one separate poems, most of them short, ascribed to Lydgate by Ritson, have been ascribed to him on very slender authority. But the works undoubtedly his are so commonplace in thought and sentiment, and so clumsy in execution,—with all allowance for transcribers' errors and imperfect editing,— that no injustice can have been done to his reputation by attributing any doggerel to his facile pen. He was evidently a great reader of poetry, a scholar accomplished in amount, had probably a large indiscriminate enjoyment of poetry, and probably also a boisterous enjoyment of his own facility in building up stanzas. His own mental life was probably the reverse of dull. But, like many another self-satisfied versifier, he is the cause of dulness in others. In reading him with his own contented spirit, one catches some faint reflexion of the gleeful happiness with which he seems to have poured out his abundant store of thrice-repeated phrases and images. Of artistic sensibility he was entirely destitute. He claims our sympathy by his warm admiration for Chaucer, but admiration gave him no share of Chaucer's economy of touch, rapid vivacious movement, and subtle wit. His lines are eked out by tautologous aud feeble epithets, and garrulous repetitions— 'as clerkes can you tell," "in bookes as I rede," "the story saith certain," "the story can devise," "the story can reherse," '' the story specifies," "the story maketh mind." Something is expressed in learned terms, and then the same thing is repeated ''in plain English." Lydgate is seen at his best in his illustrations of proverbs and maxims of homely morality, and by far his most successful metre is a stave of eight four-beat lines with a rhyme from the first half recurring in the second. A Saterical Balad on the Times, with the refrain "So as the crab gothe forwarde "; A Satirical Description of lis Lady, with

the refrain “When she hath on hire hood of green”; A Lover’s Com- plaint ; Thonke God of Alle; and Make Amendes—all in this metre—are among the most favourable specimens of his powers. A line of five accents seems always to have driven him into prolixity. Zhe London Lackpenny, to the refrain of “ But for lack of money I might not speed,” the best known of his humorous poems, is also in four-beat lines, though there are seven lines in the stanza. Lydgate’s copiousness of detail in describing customs,

dresses, architecture, as well as in making literary com- parisons, render his verses useful as materials for the historian; but in artistic skill he is a sad falling off from Chaucer. Personally he seems to have been a lively monk enough. In his Zestament he makes confession to having been a terrible boy, “ disposed to many unbridled passions.” He fought with his schoolfellows, and scoffed and made mouths at them “like a wanton ape” ; he played truant, and “forged leesings” in excuse; neither hedge nor wall could keep him out of orchards ; he “told cherry-stones ” when he ought to have been at church, and threw his paternoster and his creed at the cock. Highly decorous respectable old men often take a pleasure in looking back, ag Justice Shallow did, to the follies of their youth, and perhaps exaggerating them, but there is nothing in Lydgate’s confession inconsistent with his poetry. A dull writer is generally a person of high animal spirits; only that could sustain him through platitudes which other people find so dreary. (Ww. M.)

LYDIA. very exactly, partly because they varied at different times, partly because we are still but imperfectly acquainted with the geography of western Asia Minor. The name is first found, under the form of Luddi, in the inscriptions of the Assyrian king Assur-bani-pal, who received tribute from Gyges about 660 B.c. In Homer we read only of Mzonians (11., ii. 865, v. 43, x. 431), and the place of the Lydian capital Sardes is taken by Hyde (J/., xx. 385), unless this was the name of the district in which Sardes stood (see Strabo, xiii. p. 626)! The earliest Greek writer wlio mentions the name is Mimnermus of Colophon, in the 37th Olympiad. According to Herodotus (i. 7), the Meiones (called Mzeones by other writers) were named Lydians after Lydus, the son of Attys, in the mythical epoch which

preceded the rise of the Heraclid dynasty. In historical times, however, the Meeones were a tribe inhabiting the district of the Upper Hermus, where a town called Meonia (now Jfennen) existed (Pliny, V. A, v. 30; Hierocles, p. 670). The Lydians must originally have been an allied tribe which bordered upon them to the north-west, and occupied the plain of Sardes or Magnesia at the foot of Tmolus and Sipylus. They were cut off from the sea by the Greeks, who were in possession, not only of the Bay of Smyrna, but also of the country north of Sipylus as far as Temnus, in the Boghaz, or pass, through which the Hermus forces its way from the plain of Magnesia into its lower valley.? _Inan Homeric epigram the ridge north of the Hermus, on which tlhe ruins of Temnus lie, is called Sardene. Northward the Lydians extended at least as far as the Gygeean Lake (Lake Coloe, now Mermereh), and the Sardene range (now Dumanly Dagh). The plateau of the Bin Bir Tepé, on the southern shore of the Gygeean Lake, was the chief burial-place of the inhabitants of Sardes, and is still thickly studded with tumuli, among which the ‘tomb of Alyattes” towers to a height of 260 feet. Next to Sardes, Magnesia ad Sipylum was the chief city of the country, having taken the place of the ancient Sipylus, now probably repre- sented by an almost inaccessible acropolis discovered by Mr Humann not far from Magnesia on the northern cliff of Mount Sipylus. In its neighbourhood is the famous seated figure of “ Niobe” (Z1., xxiv. 614-17), cut out of the rock, and probably intended to represent the goddess Cybele, to which the Greeks attached their legend of Niobe. According to Pliny (v. 31), Tantalis, afterwards swallowed up by earthquake in the pool Sale or Saloe, was the ancient name of Sipylus and “the capital of Meonia” (Paus., vil. 24; Strabo, xii p. 579).

1 Pliny (v. 30) makes it the Mzonian name. 2 See W. M. Ramsay in the Journal of Hellenic Studies, ii, 2.

It is difficult to fix the boundaries of Lydia Plate,

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Under the Heraclid dynasty the limits of Lydia must have been already extended, since according to Strabo (xiii. p. 590), the authority of Gyges reached as far as the Troad, and we learn from the Assyrian inscriptions that the same king sent tribute to Assur-bani-pal, whose dominions were

bounded on the west by the Halys. But under the Mermnads Lydia became a maritime as well as an inland power. ‘The Greek cities were conquered, and the coast of Ionia included within the Lydian kingdom. The successes of Croesus finally changed the Lydian king- dom into a Lydian empire, and all Asia Minor westward of the Halys, with the exception of Lycia, owned the supre- macy of Sardes. Lydia never again shrank back into its original dimensions. After the Persian conquest the Meander was regarded as its southern boundary, and in the Roman period it comprised the country between Mysia and Caria on the one side and Phrygia and the Atgean on the other.

Lydia proper was exceedingly fertile. The hill-sides were clothed with vine and fir, and the rich broad plain of Hermus produced large quantities of corn and _ saffron. The climate of the plain was soft but healthy, though the country was subject to frequent earthquakes, The Pactolus, which flowed from the fountain of Tarne in the Tmolus mountains, through the centre of Sardes, into the Hermus, was believed to be full of golden sand ; and gold mines were worked iu Tmolus itself, though by the time of Strabo the proceeds had become so small as hardly to pay for the expense of working them (Strabo, xiii. 591). Meonia on the east contained the curious barren plateau known to the Greeks as the Catacecaumene or Burnt country, once a centre of volcanic disturbance. The Gygzean lake (where remains of pile dwellings have been found) still abounds with carp, which frequently grow to a very large size.

Herodotus (i. 171) tells us that Lydus was a brother of Mysus and Car. The statement is on the whole borne out by the few Lydian, Mysian, and Carian words that have been preserved, as well as by the general character of the civilization prevailing among the three nations. The language, so far as can be judged from its scanty remains, was Indo-Kuropean, and more closely related to the western than to the eastern branch of the family. The race was probably a mixed one, consisting of aborigines and Aryan immigrants. It was characterized by industry and a commercial spirit, and, before the Persian conquest, by bravery as well.

The religion of the Lydians resembled that of the other civilized nations of Asia Minor. It was a nature-worship, which at times became wild and

sensuous. By the side of the supreme god Medeus stood the sun-god Attys, as in Phrygia the chief object of the popular cult. He was at once the son and bridegroom of Cybele or Cybebe, the mother of the gods, whose image carved by Broteas, son of Tantalus, was adored on the cliffs of Sipylus (Paus., iii. 22). Like the Semitic Tammuz or Adonis, he was the beautiful youth who had mutilated himself in a moment of frenzy or despair, and whose temples were served by eunuch priests. Or again he was the dying sun-god, slain by the winter, and mourned by Cybele, as Adonis was by Aphrodite in the old myth which the Greeks had borrowed from Phoenicia. This worship of Attys was in great measure due to foreign influence. Doubtless there had been an ancient native god of the name, but the associated myths and rites came almost wholly from abroad. The Hittites in their stronghold of Carchemish on the Euphrates had adopted the Babylonian cult of Istar (Ashtoreth) and Tammuz-Adonis, and had handed it on to the tribes of Asia Minor. The close resemblance between the story of Attys and that of Adonis was the result of a common

origin. The old legends of the Semitic East had come to the West through two channels. The Phoenicians brought tllem by sea and the Hittites by land. But though the worship of Makar or Melkarth on Lesbos (J/., xxiv. 544) shows that the Pheenician faith had found a home on this part of the coast of Asia Minor, it could have had no influence upon Lydia, which, as we have seen, was cut off from the sea before the rise of the Mermnads. It was rather to the Hittites that Lydia, like Phrygia and Cappadocia, owed its faith in Attys and Cybele. The latter became “the mother of Asia,” and at Ephesus, where she was adored under the form of a meteoric stone, was identified with the Greek Artemis. Her mural crown is first seen in the Hittite sculptures of Boghaz Keui on the Halys, and the bee was sacred to her. A gem found near Aleppo represents her Hittite counterpart standing on this insect. The priestesses by whom she was served are depicted in early art as armed with the double-headed axe, and the dances they performed in her honour with shield and bow gave rise to the myths which saw in them the Amazons, a nation of woman-warriors. The pri-Hellenic cities of the coast—Smyrna, Samorna (Ephesus), Myrina, Cyme, Priene, and Pitane—were all of Amazonian origin, and the first three of them have the same

name as the Amazon Myrina, whose tomb was pointed out in the Troad. The prostitution whereby the Lydian girls gained their dowries (Herod., i. 93) was a religious exercise, as among the Semites, which marked their devotion to the goddess Cybele. In the legend of Hercules, Omphale takes the place of Cybele, and was perhaps her Lydian title. Hercules is here the sun-god Attys in a new form; his Lydian name is unknown, since E. Meyer has shown (Z. D. M. G., xxxi. 4) that Sandon belongs not to Lydia but to Cilicia. By the side of Attys stood the moon-god Manes or Men.

According to the native historian Xanthus (460 B.c.) three dynasties ruled in succession over Lydia. The first, that of the Attyads, is wholly mythical. It was headed by a god, and included geographical personages like Lydus, Asies, and Meles, or such heroes of folk-lore as Cambletes, who devoured his wife. To this mythical age belongs the colony which, according to Herodotus (i. 94), Tyrsenus, the son of Attys, led to Etruria. Xanthus, however, puts. Torrhebus in the place of Tyrsenus, and makes him the eponym of a district in Lydia. There was no connexion between the Etrurians and Lydians in either language or race, and the story in Herodotus rests solely on the sup- posed resemblance of Tyrrhenus and Torrhebus, It is doubtful whether Xanthus recognized the Greek legends which brought Pelops from Lydia, or rather Meeonia, and made him the son of Tantalus. The legends must have grown up after the Greek colonization of A®olis and Ionia, though Dr Schliemann’s discoveries at Mycenze have shown a certain likeness between the art of early Greece and that of Asia Minor, while the gold found there in such abundance may have been derived from the mines of Tmolus. The second dynasty wasalso of divine origin, but the names which head it prove its connexion with the distant East. Its founder, a descendant of Hercules and Omphale, was, Herodotus tells us (i. 7), a son of Ninus and grandson of Belus. The Assyrian inscriptions have shown that the Assyrians had never crossed the Halys, much less known the name of Lydia, before the age of Assur- bani-pal, and consequently the old theory which brought the Heraclids from Nineveh must be given up. But we now know that the case was otherwise with another Oriental people, which was deeply imbued with the elements of Babylonian culture. The Hittites had overrun Asia Minor and established themselves on the shores of the Aigean before the reign of the Egyptian king Ramses IT.

The subject allies who then fight under their banners include the Masu or Mysians and the Dardani of the Troad from Iluna or Ilion and Pidasa (Pedasus); and, if we follow Brugsch, Iluna should be read Mauna and identified with Mzeonia. At the same time the Hittites left me- morials of themselves in Lydia. Mr G. Dennis has dis- covered an inscription in Hittite hieroglyphics attached to the figure of ‘ Niobe” on Sipylus, aud a similar inscription accompanies the fignre (in which Herodotus [ii. 106] wished to see Sesostris or Ramses IL.) carved on the cliff of Karabel, the pass which leads from the plain of Sardes to that of Ephesus. We learn from Eusebius that Sardes was first captured bythe Cimmcrians 1078 B.c.; and, since it was four centuries later before the real Cimmerians appeared on the horizon of history, we may perhaps find in the statement a tradition of the Hittite conquest. Possibly the Ninus of Herodotus points to the fact that Carchemish was called “the old Ninus” (Amm. Marc., xiv. 8), while the mention of Belus may indicate that Hittite civilization came from the land of Bel (see Sayce, Zrans. Soc. Biblical Arch., vii. 2). At all events it was when the authority of the Hittite satraps at Sardes began to decay that the Heraclid dynasty arose, According to Xanthus, Sadyattes and Lixus were the successors of Tylon the sonof Omplhale. After lasting five hundred and five years, the dynasty came to an end in the person of Sadyattes, as he is called by Nicolas of Damascus, whose account is doubtless derived from Xanthus. ‘The name Candaules given him by Herodotus meant “dog-strangler,” and was atitle of the Lydian Hermes. Gyges, termed Gugu in the Assyrian inscriptions, Gog in the Old Testament, put him to death and established the dynasty of the Mermnads 690 B.c, (Euseb., 698 B.c,). Gyges initiated a new policy, that of making Lydia a maritime power; but his attempt to capture Old Smyrna was unsuccessful. Towards the middle of his reign the king- dom was overrun by the Cimmerians, called Gimirre in the Assyrian texts, Gomer in the Old Testament, who had been driven from their old seats on the Sea of Azoff by au invasion of Scythians, and thrown upon Asia Minor by the defeat they had suffered at the hands of Esar-haddon. The lower town of Sardes was taken by them, and Gyges turned to Assyria for aid, consenting to become the tributary of Assur-bani-pal or Sardanapalus, and sending him among other presents two Cimmerian chieftains he had himself captured in battle (about 660 B.c.). no one could

be found in Nineveh who understood the language of the ambassadors. A few years later, Gyges joined in the revolt against Assyria, which was headed by the viceroy of Babylonia, Assur-bani-pal's own brother. The Ionie and Carian mercenaries he despatched to Egypt en- abled Psammetichus to make himself independent. Assyria, however, was soon avenged. The Cimmerian hordes re- turned, Gyges was slain in battle after a reign of thirty- eight years, and Ardys his son and successor returned to his allegiance to Nineveh. The second capture of Sardes on this occasion was alluded to by Callisthenes (Strabo, xiii. p. 627). Alyattes the grandson of Ardys finally succeeded in extirpating the Cimmierians, as well as in taking Smyrna, and thus providing his kingdom with a port. The trade and wealth of Lydia rapidly increased, and the Greek towns fell one after the other before the attacks of the Lydian kings, Alyattes's long reign of fifty-seven years saw the foundation of the Lydian empire. All Asia Minor west of the Halys owned his sway, and the six years' contest he carried on with the Medes was closed by the marriage of his daughter Aryenis to Astyages, and an intimate alliance between the two empires. The Greek cities were allowed to retain their own institutions and government on condition of paying taxes and dues to the Lydian monarch, and the proceeds of their commerce thus

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The result was that the king of Lydia became the richest prince of his age.

flowed into the imperial exchequer.

Alyattes was succeeded by Croesus, who had probably already for some years shared the royal power with his father, or perhaps grandfather, as Floig] thinks (Geschichte des semitischen Alterthums, p. 20). He reigned alone only fifteen years, Cyrus the Persian, after an indecisive battle on the banks of the Halys, marching upon Sardes, and capturing both acropolis and monarch before his allies could come to his help (Euseb., 546 3B.c.). The place where the acropolis was entered was believed to have beeu

overlooked by the mythical Meles when he carried the | lion round his fortress which made it invulnerable ; it was

really a path opened by one of the landslips which have reduced the sandstone cliff of the Acropolis to a mere shell, and threaten in a few years to carry it altogether into the plain below. The overthrow of Croesus gave rise to many legends among both Lydians and Greeks, and he was held to have escaped death at the conqueror's hands through the intervention of the gods. The revolt of the Lydians under Pactyas, whom Cyrus had appointed to collect the taxes, caused the Persian king to disarm them, though we can hardly credit the statement that by this measure their former warlike spirit was crushed. Sardes now became the western capital of the Persian empire, and its burning by the Athenians was the indirect cause of the Persian War. After Alexander's death, Lydia passed to Antigonus ; then Achzeus made himself king at Sardes, but was defeated and put to death by Antiochus. The country was pre- sented by the Romans to Eumenes, and subsequently formed part of the proconsnlar province of Asia. By the time of Strabo (xiii. p. 631) its old language was entirely supplanted by Greek.

The Lydian empire may be described as the industrial power of the ancient world. The Lydians were credited with being the inventors, not only of games such as dice, huckle-bones, and ball (Herod., i. 94), but also of coined money. The oldest known coins are the electrum coins of the earlicr Mermmnads (Madden, Coins of the Jews, pp. 19-21), stamped on one side with a lion's head or the figure of a king with bow and quiver ; these were replaced by Creesus with a coinage of pure gold and silver. To the latter monarch were probably due the earliest gold coins of Ephesus (Head, Coinage of Ephesus, p. 16). Mr Head has shown that the electrum coins of Lydia were of two kinds, one weighing 168°4 grains for the inland trade, and another of 224 grains for the trade with Ionia. The standard was the silver ‘‘ mina of Carchemish,” as the Assyrians called it, which contained 8656 grains. Origin- ally derived by the Hittites from Babylonia, but modified by themselves, this standard was passed on to the nations of Asia Minor during the period of Hittite conquest, but was eventually superseded by the Phcenician mina of 11,225 grains, and continued to survive only in Cyprus and Cilicia. The inns, which the Lydians were said to have been the first to establish (Herod., i. 94), were connected with their attention to

commercial pursuits. Their literature has wholly perished, and the only speciinen of their writ- ing we possess is on a marble base found by Mr Wood at Ephesus (Sehliemann, Jos, p. 698). They were celebrated for their music and gymnastic exereises, and their art formed a link between that of Asia Minor and that of Greece. A marble lion at Achmetly re- presents in a modified form the Assyrian type, and the engraved gems found in the neighbourhood of Sardes and Old Smyrna resemble the rnde imitations of Assyrian workmanship met with in Cyprus and on the coasts of Asia Minor. For a description of a pectoral of white gold, ornamented with the heads of animals, human faces, and the figure of a goddess, discovered in a tomb on T'molus, see Academy, January 15, 1881, p. 45. Lydian sculpture was probably similar to that of the Phrygians as displayed at Doghanly, Kumbet, and Ayazin, a necropolis lately discovered by Mr Ramsay. Phallic emblems, for averting evil, were plentiful ; even the summit of the tomb of Alyattes is crowned with an enormous one of stone, about 9 feet in diameter. The tumulus itself is 281 yards in diameter and about half a mile in circumference. It has been partially excavated by Spiegelthal and Dennis, and a sepulchral ehamber discovered in the middle, composed of large well-cut and highly polished blocks of marble, the chamber being 11 feet long, nearly 8 fect broad, and 7 feet high. Nothing was found in it except a few ashcs and a broken vase of Egyptian alabaster. The stone basement which, according to Herodotus, formerly surrounded the mound has now disappeared. (A. H. 8.)

LYELL, Str Cuarues (1797-1875), one of the greatest of geological thinkers, was the eldest son of Charles Lyell of Kinnordy, Forfarshire, and was born November 14, 1797, on the family estate in Scotland. His father was a man of literary and scientific tastes, known both as a botanist and as the translator of the Veta Nuova and the Convito of Dante. From his boyhood Lyell had a strong inclination for natural history, especially entomology, a taste which le was able to cultivate in the New Forest, to which his family had removed soon after his birth. He was educated chiefly at Midhurst, and then at Exeter College, Oxford, where the lectures of Dr Buckland first opened out to him that field of geological study which became the passion of his life. After taking his degree in 1821, he entered

Lincoln’s Inn, and in 1825, after a delay caused by chronic weakness of the eyes, he was called to the bar, and went on the western circuit for two years. During the whole of this time, though not neglecting his profession, he was slowly gravitating towards the life of a student of science. In 1819 he had been elected a member of the Linnean and Geologi- cal Societies, communicating his first paper, ‘On the Marls of Forfarshire,” to the latter society in 1822, and acting as one of the honorary secretaries in 1823. In that year he went to France, with introductions to Cuvier, Humboldt, and other men of science, and in 1824 made a geological tour in Scotland in company with Dr Buckland. In 1826 he was elected a fellow of the Royal Society, from which in later years he received both the Copley and Royal medals ; and in 1827 he finally abandoned the legal profession, and devoted himself to geology.

Long prior to this, however, he had already begun the sketch of his principal work, Zhe Principles of Geology. The subsidiary title, ‘An Attempt to Explain the Former Changes of the Earth’s Surface by Reference to Causes now in Operation,” gives the keynote of the task to which Lyell devoted his life, and in pursuance of which he made geological tours over large portions of the Continent, and in later years to Madeira and to the United States and Canada. The journey undertaken with Murchison in 1828 was especially fruitful in results, for not only did it give rise to two joint papers on the volcanic district of Auvergne and the Tertiary formations of Aix-en-Provence, but it was apparently while examining Signor Bonelli’s collection of Tertiary shells at Turin, and subsequently when (after parting with Murchison) he studied the marine remains of the Tertiary rocks of Ischia and Sicily, that Lyell conceived the idea of dividing the Tertiaries into three or four principal groups, characterized by the proportion of recent to extinct species of shells. To these groups, after consult- ing Dr Whewell as to the best nomenclature, he gave the names now universally adopted—Eocene (dawn of recent), Miocene (less of recent), and Pliocene (more of recent) Upper and Lower; and with the assistance of M. Deshayes, who had arrived by independent researches at very similar views, he drew up a table of shells in illustration of this classification. The first volume of the Principles of Geo- logy appeared in 1830, and the second in January 1832. Received at first with considerable opposition, at least so far as its leading theory was concerned, the work had ulti- mately a great success, and it had already

reached a second edition in 1833 when the third volume, dealing with the successive formations of the earth's crust, was added.1

In August 1838 Lyell published the Mlements of Geology, which, from being originally an expansion of the

1 Between 1830 and 1872 eleven editions of this work were pub- lished, each so much enriched with new material and the results of riper thought as to form a complete history of the progress of geology during that interval. Only a few days before his death Sir Charles finished revising the 12th edition, which appeared in 1876.

fourth book of the Principles, became a standard work of reference in stratigraphical and paleontological geology. This book went through six editions in Lyell's lifetime (some intermediate oues being styled Manual of Elementary Geology), and in 1871 a smaller work, the Student's Elements of Geology, was based upon it. His third great work, Zhe Antiquity of Man, appeared in 1863, and ran through three editions in one year. In this he laid before the world a general survey of the arguments for man's early appearance on the earth, derived from the dis- coveries of worked flint implements in Post-Pliocene strata in the Somme valley and elsewhere, and in it also he first gave in his adhesion to Darwin's theory of the origin of species. A fourth edition appeared in 1873.

While thus occupied with his writings, Lyell lost no opportunity. of carrying out original investigations, and whenever absent from his literary work in London was always to be heard of in the field either in England or on the Continent. In 1831 he held for a short time the post of professor of geology at King's College, London, and delivered while there a highly appreciated course of lectures, which became the foundation of the Elements of Geology. In 1832 he married Mary, eldest daughter of Leonard Horner, who became thenceforward associated with him in all his literary and scientific labours, aiding him sub- stantially with her ready intellect, and by her pre-eminent social qualities making his home a centre of attraction to all men of talent, In 1834 he made an excursion to Den- mark and Sweden, the result of which was his celebrated paper to the Royal Society, 'On the Proofs of the Gradual Rising of Land in Certain Parts of Sweden," and another to the Geological Society, "On the Cretaceous and Tertiary Strata of Seeland and

Méen.” In 1837 he was again in Norway and Denmark, and in 1841 he spent a year in travelling through the United States, Canada, and Nova Scotia. This last journey, together with a second one to America in 1845, when he visited Boston, Philadelphia, New Orleans, and the alluvial plain of the Mississippi, gave rise, not only to numerous original papers, but also to the publication of two works not exclusively geological, Travels in North America (1845) and A Second Visit to the United States (1849). In the second work especially he did much to promote good feeling between England and America, by showing a just appreciation of American society and institutions. It was in the course of these journeys that he estimated the rate of recession of the falls of Niagara, and of the annual average accumulation of alluvial matter in the delta of the Mississippi, and studied those vegetable accumulations in the ‘Great Dismal Swamp” of Virginia, which he afterwards used in illustrat- ing the formation of beds of coal. He also studied with great care the coal-formations in Nova Scotia, and dis- covered in company with Dr Dawson of Montreal the earliest known land shell, Pupa vetusta, in the hollow stem of a Stgillaria. But it was chiefly in bringing a thorough knowledge of European geology to bear upon the more widely extended and massive formations of the North American continent that Lyell rendered immense service to geologists on both sides of the Atlantic.

Besides these Transatlantic journeys Lyell undertook geological excursions at different times to all parts of the British Isles, to Belgium, Switzerland, Germany, Spain, Madeira, and Teneriffe, in which latter islands, which he visited in company with G. Hartung, he accumulated much valuable evidence on the age and deposition of lava-beds and the formation of volcanic cones. He also revisited Sicily in 1858, when he made such observations upon the structure of Etna as entirely refuted the theory of “craters of elevation” upheld by Von Buch and Elie de Beau- mont (see Roy. Soc. Proc., 1859).

Lyell received the honour of knighthood in 1848, and was created a baronet in 1864, in which year he was president of the British Association, meeting at Bath. His services to the science of geology were now universally

recognized both at home and abroad, and he was a member of almost every Continental and American Society. He was elected corresponding member of the French Institute and of the Royal Academy of Sciences at Berlin, and was created a knight of the Prussian Order of Merit.

During the latter years of his life his sight, always weak, failed him altogether, and he became very feeble. He died on February 22, 1875, in his seventy-eighth year, and was buried in Westminster Abbey. His funeral was attended by an immense concourse of public men, all his personal friends ; for by young and old the veteran master of geology was deeply loved and revered. His gentle nature, his intense love of truth, his anxiety to help and encourage those who cultivated his favourite science, en- deared him to all who approached him; while the extreme freshness of his mind kept him free from that dogmatism which is so often the accompaniment of old age, and enabled him to accept and appreciate heartily the work of younger men.

In order to appreciate justly the influence of Lyell's works upon the geology of the 19th century, it is necessary to bear in mind what was the state of knowledge upon this subject at the time when he entered the field in 1822. The rival schools of Werner and Hutton were then at the height of their famous contest, and, while the vehe- ment discussions between the Neptunists and Vulcanists gave an impetus to the study of rock-masses, the one true principle upon which Hutton himself had so strongly insisted had dropped into oblivion, namely, that " in examining things present we have data from which to reason with regard to what has been,"' and that there- fore we have no need to imagine other causes than those now in action to account for tlic past. Meanwhile a reaction against the speculative discussions which had so long occupied the world inclined many of the leaders of geological study to confine them- selves to the collection of facts, and the science became for a time a mere branch of mineralogy, which, though most valuable in laying a true foundation, was quite inadequate to deal with the earth's history, since it took little or no account of organic re- mains, and their real significance was not in the least understood. Both in England and France, however, materials were being ac- cumulated which prepared the way for a wider basis. In 1799 William Sinith, travelling over England, first grouped the for- mations according to the fossils contained in them, and in 1815 he published his geological map of England, thus making

the first step in stratigraphical geology; and almost simultaneously, in 1812, Cuvier's restorations of the extinct mammalia of the Paris basin, and Lamarck's classification of recent and fossil shells, gave the first impulse to paleontology. But the older schools of geologists, hampered by preconceived theories, were not prepared to make full use of the new facts. Cuvier himself, while insisting on the value of fossils in the chronology of the earth, yet retained all the old notions of sudden and violent convulsions, attributing the destruc- tion of the fauna of the Paris basin to the deluge, or to the bursting of lakes caused by a sudden revolution of the globe ; and in like manner Buckland, Sedgwick, and their compeers still explained everything by the diluvial theory, attributing the erratic blocks strewn over the Continent to the universal deluge, and accepting as demonstrated Elie de Beaumont's theory of the sudden elevation of mountain chains. Sedgwick in his address to the Geological Society in 1834 even spoke confidently of the extinct forms in geological strata as "indications of change and of an adjusting power alto- gether different from what we commonly understand by the laws of nature."

To shake off the influence of preconceived opinions such as these there was needed a fresh impartial mind capable of appreciating the evidence which had been accumulating during the past thirty years, and especially alive to the discoveries of paleontology. These requisites were found in Lyell. His early study of natural history gave him advantages possessed by few of his contemporaries, while the clear insight and calm judgment for which he was thus early remarkable led him alone of the younger school of geologists to grasp the truth enunciated by Hutton of the power of gradual changes to produce great results if only time enough be allowed. This truth he illustrated with such a wealth of facts, derived from his own observation and that of others, that in the first edition of the Principles we find sketched in broad outline, and demonstrated by actual examples, nearly all those fundamental truths which, though often velicmently opposed at the timc, have now become so much

the accepted basis of geology that itis difficult to realize how novel they were in 1830.

_ Even the opening historical chapters cut boldly at the root of catastrophic geology by showing how the prejudices concerning the short duration of past time on the globe had led men to the mistaken conclusion that ‘‘centuries were implied where the characters imported thousands, and thousands where the language of nature signified millions”; and the arguments for the uniform action of nature followed with overwhelming force, as Lyell pro- ceeded to lay under contribution all countrics of the world to show how the facc of the earth is now being altered by rivers, torrents, springs, currents and tides, volcanoes and earthquakes.

In the second volume the changes in the organic world were used to teach the same lesson. The proofs of extinction of specifiz forms in historical times were accumulated to explain that the presence of extinct forms in geological formations was the effect of gradual causes and not of sudden and violent catastrophes, while the tranquil imbedding of organic remains now in progress was used to strengthen the previous argument derived from in- organic causes for the slow and gradual accumulation of fossiliferous strata. It was in this volume that Lyell made in 1830 his cele- brated attack upon Lamarck’s theory of the transmutation of species, and, though this has often been held as a want of appreciation on his part of the arguments of the great naturalist, yet, as we shall see presently, it was really a curious illustration of the impartiality of Lyell’s mind (though acting under what he himself would have called the influence of ‘‘inherited belief”) that this theory, so eminently calculated to harmonize with his own views of the power of minute causes to work appreciable change, was rejected by him because it rested upon an assumption of a law of innate progressive development, which could not be shown to be in accordance with natural facts.

The third volume of the Principles, which did not appear till two years later, completed the task which Lyell had set himself, by interpreting the fragmentary record which remains to us of the successive geological formations of the earth’s crust with their imbedded remains and the associated volcanic rocks, and thus re- storing as far as possible the past history of the earth. Through all its successive editions this volume has remained the standard text-book of geological history, as its two predecessors have of the philosophical principles of the science.

So immediate was the effect of this remarkable work that from the time of its publication the earlier cosmogonies disappeared from the field, and even Cuvier's Theory of the Earth never reached another edition. Yet, although geologists began insensibly to follow the lines which Lyell had marked out, they were long in receiving the principles upon which these were founded. Sedgwick, in the address already quoted, whilc pronouncing a eulogy on the book as a whole, regretted that ‘‘ from the very title-page of his work Mr Lyell seems to stand forward as the champion of a great leading doctrine of the Huttonian hypothesis,” ¢.¢., the explanation of former changes by reference to causes now in operation; and Lyell's oldest friend and fellow-labourer Murchison reniained to the last the exponent of the converse truth, that we have no evidence forbidding the possibility of a greater intensity of the forces in action during past periods. This form of catastrophic geology has indeed always prevailed upon the Continent, and still does so in a great degree. There is, how- ever, nothing necessarily antagonistic in the two theories; and, if Lyell in his earlier years accentuated perhaps somewhat too strongly the necessity for making unlimited drafts upon the ‘‘ bank of time,” as he often called it, to the exclusion of intensified vol- canic or aqueous action, it was because he had to combat the opposite and deeply rooted error.

Between the year 1853, when the 9th edition of the Principles was published, and 1863, when he ‘‘ read his recantation,” as he himseif would sometimes express it, in the Antiquity of Alan, the discovery of the flint implements associated with bones of extinct mammalia at Abbeville, and subsequently in the valley of the Thames and else- where, threw an entirely new light upon the data of human existence upon the earth, allowing far more time for the develop- ment of the numerous varieties of mankind than had hitherto been supposed possible. In conjunction with these discoverics came also the evidence adduced by Darwin and Wallace of the action of natural causes in producing modifications in living forms,—thus applying the very same principle to organic life which Hutton and Lyell ha

used to explain the gradual modification of the earth's surface. Then

it was that Lyell, who had rejected Lamarck's theory because it rested on a purely imaginary law of innate progressive development, at once accepted

“natural selection” asa vera causa helping to explain those evidences of the gradual change in organic forms pre- sented in successive geological formations. By recognizing the value of the new principle, and incorporating its results in his Principles, Lyell completed in 1872 in a fuller sense than he had contemplated in 1850 the task of “ explaining former changes of the earth’s surface (including the history of its living inhabitants) by reference to causes now in action”; while at the samc timc he gave to his original conception that clement of expansion and pliability which

was alone needed to ensure its continued influence and the per- manent celebrity of its author.

Besides his books, Lyell eontributed seventy-six geologieal papers to various societies. The only authorities yet published for his llfe are Life and Letters of Sir Charles Lyell, 1881, edited by Mrs Lyell, and the obituary notices in 1875 at the Royal and other Soeieties.

A.B. B. LYLY, or Litty, or Ly.iz, Joun (1553-1606), the famous author of Huphues, was born in Kent in 1553 or 1554. At the age of sixteen, according to Wood, he became a student of Magdalen College, Oxford, where in due time he proceeded to his bachelor’s and master’s degrees (1573 and 1575), and from whence we find him in 1574 applying to Lord Burghley “ for the queen’s letters to Magdalen College to admit him fellow.” ‘The fellow- ship, however, was not granted, and Lyly shortly after left the university. He complains of what seems to have been a sentence of rustication passed upon him at some period in his academical career, in his address to the gentlemen scholars of Oxford affixed to the second edition of the first part of Huphues, but in the absence of any further evidence it is impossible to fix either its.date or its cause. If we are to believe Wood, he never took kindly to the proper studies of the university. ‘For so it was that his genius being naturally bent to the pleasant paths of poetry (as if Apollo had given to him a wreath of his own bays without snatching or struggling) did in a manner neglect academical studies, yet not so much but that he took the degrees in arts, that of master being compleated 1575.” After he left Oxford, where he had already the reputation of “a noted wit,” Lyly seems to have attached himself to Lord Burghley. “This noble man,” he writes in the

“ Glasse for Europe,” in the second part of Huphuwes (1580), “I found so ready being but a straunger to do me good, that neyther I ought to forget him, neyther cease to pray for him, that as he hath the wisdom of Nestor, so he may have the age, that having the policies of Ulysses he may have his honor, worthy to lyve long, by whom so many lyve in quiet, and not unworthy to be advaunced by whose care so many have been preferred.” Two years later we possess a letter of Lyly to the treasurer, dated July 1582, in which the writer protestsagainst some undefined accusation which had brought him into trouble with his patron, and demands a personal interview for the purpose of clearing his character. What the further relations between them were we have no means of knowing, but it is clear that neither from Burghley nor from the queen did Lyly ever receive any substantial patronage. In 1578 he began his literary career by the composition of Huphues, or the Anatomy of Wit, which was licensed to Gabriel Cawood on December 2, 1578, and published in the spring of 1579. In the same year the author was incorporated M.A. at Cambridge, and possibly saw his hopes of court advancement dashed by the appoint- ment in July of Edmund Tylney to the office of master of the revels, a post at which, as he reminds the queen some years later, he had all along been encouraged to “aim his courses.” Huphues and his England appeared in 1580, and, like the first part of the book, won immediate popularity. For a time Lyly was the most successful and fashionable of English writers. He was hailed as the author of “‘anew English,” as a “‘raffineur de |’Anglois ;” and, as Edmund Blount, the editor of his plays, tells us in 1632, “that beautie in court which could not parley Euphuism was as little regarded as she which nowe there speakes not French.” After the publication of Huphues, however, Lyly seems to have entirely deserted the novel form himself, which passed into the hands of his imitators, and to have thrown himself almost exclusively into play-writing, probably with a view to the mastership of revels whenever a vacancy should occur, Hight plays by him were probably acted before the queen by the children of the Chapel Royal and the children of St Paul’s between the years 1584 and 1589, one or two of them being repeated before a popular

audience at the Blackfriars Theatre. Their brisk lively dialogue, classical colour, and frequent allusions to persons and events of the day maintained that popularity with the conrt which Luphues had won. In 1589 Lyly published a tract in the Martin Marprelate controversy, called Pappe with an hatchet, alias a jigge for my Godsonne ; Or Crack me this nut ; Or a Countrie Cuffe, éc.1 About the same time we may probably date his first petition to Queen Hlizabeth. The two petitions, transcripts of which are extant among the Harleian MSS., are undated, but in the first of them he speaks of having been ten years hanging about the court in hope of preferment, and in the second he extends the period to thirteen years. It may be con- jectured with great probability that the ten years date from 1579, when Edmund Tylney was appointed master of the revels with a tacit understanding that Lyly was to have the next reversion of the post. “I was entertained your Majestie’s servaunt by your own gratious favor,” he says, ‘‘strengthened with condicions that I should ayme all my courses at the Revells (I dare not say with a promise, but with a hopeful Item to the Revercion) for which these ten yeres [have attended with an unwearyed patience.” But in 1589 or 1590 the mastership of the revels was as far off as ever,—Tylney in fact held the post for thirty-one years,—and that Lyly’s petition brought him no compensa- tion in other directions may be inferred from the second petition of 1593. Thirteen yeres your highnes servant but yet nothing. Twenty freinds that though they saye they will be sure, I finde them sure to be slowe. A thousand hopes, but all nothing; a hundred promises but yet nothing. Thus casting up the inventory of my friends, hopes, promises, and tymes, the swmma totalis amounteth to just nothing.” What may have been Lyly’s subsequent fortunes at court we do not know. Edmund Blount says vaguely that Elizabeth “graced and rewarded” him, but of this there is no other evidence. After 1590 his works steadily declined in influence and reputation; other stars were in possession of the horizon ; and so far as we know he died poor and neglected in the early part of James I.’s reign. He was buried in London at St Bartholomew the Less on November 20, 1606. He was married, and we hear of two sons and a daugliter.

Comedies.—In 1632 Edmund Blount published ‘‘ Six Court Come- dies,” including Endymion, Sappho and Phao, Alexander and Cam- paspe, Midas,

Mother Bombie, and Gallathea, To these should be added the MVoman in the Moone (Lyly's earliest play, to judge from a passage in the prologue and therefore earlier than 1584, the date of Alexander and Campaspe), and Love's Meta- morphosis, first printed in 1601. Of these, all but the last are in prose. 4 Warning for Faire Women (1599) and The Maid's Metamor- phosis (1600) have been attributed to Lyly, but on altogether insuffi- cient grounds. The first editions of all these plays were issued between 1584 and 1601, and the majority of then: between 1584 and 1592, in what were Lyly's most successful and popular years. His importance as a dramatist has been very differently estimated. Prof. Minto denies him any appreeiable influence upon our literature, while Professor A. Ward, on the other hand, rightly believes his work to have had a great effeet upon the development of dramatic dialogue, and the prose drama in gencral. Lyly's dialogue is still a long way removed from the dialogue of Shakespeare. But at the same time it is a great advance iu rapidity and resource upon any- thing which had gone before it ; it represents an important step in English dramatic art.. His nimbleness, and the wit which struggles with his pedantry, found their full development in the dialogue of Twelfth Night and Much Ado about Nothing, just as '*' Marlowe's mighty line" led up to and was eclipsed by the majesty and music of Shakespearian passion. One or two of the songs introduced into his plays are justly famons, and show a real lyrical gift. Nor in estimating his dramatic position and his effect upon his time must it be forgotten that his classical and mythological plots, flavourlcss

1 The evidenee for his authorship may be found in Gabriel Harvcy's Pierce's Supererogation (written November 1589, published 1593), in Nash's Have with you to Saffron Walden (1596), and in various allusions in Lyly's own plays. See Fairholt's Dramatic Works of John Lilly, vol. i. p. 20.

and dull as they would be to a modern audience, were charged with interest to those courtly hearcrs who saw in Midas Philip I1., Elizabeth in Cynthia, and perhaps Leicester's unwelcome marriage with Lady Sheffield in the love affair between Endymion and Tellus which brings the former under Cynthia's displeasure. As a matter of fact his reputation and popularity as a

play-writer were consider- able. Gabriel Harvey dreaded lest Lyly should make a play upon their quarrel ; Meres, as is well known, places him among “ the best for comedy ;” and Ben Jonson names him among those foremost rivals who were “ outshone” and outsung by Shakespeare.

Euphues.—It was not, however, as a dramatist, but as the author of Euphues, that Lyly made most mark upon the Elizabethan world. His plays amused the court circle, but the ‘‘new English” of his novel threatened to permanently change the course of English style. The plot of Zuphues is extremelysimple. The hero, whose name inay very possibly have been suggested by a passage in Ascham’s Sehool- master, is introduced to us as still in bondage to the follies of youth, “preferring fancy before friends, and this present humour before honour to come.” His travels bring him to Naples, where he falls in love with Lucilla, the governor’s light-minded daughter. Lucilla is already pledged to Euphues’s cad bbilart tas, but Euphues’s passion betrays his friendship, and the old lover finds himself thrown over by both friend and mistress. Euphues himself, however, is very soon forsaken for a more attractive suitor. He and Philautus niake up their quarrel, aud Euphues writes his friend ‘‘a cooling card,” to be ‘‘ applied to all lovers,” which is so severe upon the fair sex that Lyly feels it necessary to balance it by a sort of apolog addressed ‘‘to the grave matrons and honest maidens of Italy.” Euphues then leaves Naples for his native Athens, where he gives himself i p to study, of which the first fruits are two long treatises — the first, ‘‘ Euphues and his Ephebus,” a disquisition on the art of education addressed to parents, and the second, ‘‘ Euphues and Atheos,” a discussion of the first principles of religion. The remainder of the book is filled up with correspondence between Euphues and his friends. We have letters from Euphues to Phil- autus on the death of Lucilla, to another friend on the death of his daughter, to one Botonio ‘‘to take his exile patiently,” and to the youth Alcius, remonstrating with him on his bad behaviour at the university. Finally a. pair of letters, the first from Livia “‘at the emperour’s court to Euphues at Athens,” answered by ‘‘Euphues to Livia,” wind up the first part, and announce to us Euphues’s intention of visiting England. An address from Lyly to Lord Delawarr is affixed, to which was added in the second edition ‘©An Address to the Gentlemen Scholars of England.”

Euphues and his England is rather longer than the first part. Euphues and Philautus travel from Naples to England. They arrive at Dover, halt for the night at Fidus's house at Canterbury, and then proceed to London, where they make acquaintauce with Surius, a young English gentleman of great birth and noble blood ; Psellus, an Italian nobleman reputed ‘‘great inmagick”; Martius, an elderly Englishman; Camilla, a beautiful English girl of insignificant family; Jady Flavia and her niece Fraunces. After endless corre- spondence and conversation on all kinds of topics, Euphues is recalled to Athens, and from there corresponds with lis friends. ‘* Kuphues' Glasse for Europe” is a flattering description of Eng- land sent to Livia at Naples. It is the most interesting portion of the book, and throws light npon one or two points of Lyly's own biography. The author naturally seized the opportunity for paying his inevitable tribute to the queen, and pays it in his most exalted style. ‘‘O fortunate England that hath such a queene, ungratefull if thou praye not for hir, wicked if thou do not love hir, miserable if thou lose hir!”—and so on. The book ends with Philautus's announcement of his marriage to Fraunces, upon which Euphues sends characteristic congratulations and retires, ‘‘ tormented in body and grieved in mind,” to the Mount of Silexedra, ‘‘ where I leave him to his musing or Muses.”

Such is a brief outline of the book which for a time set the fashion for English prose. Two editions of each part appeared within the first year after publication, and thirteen editions of both are enumerated by Mr Arber up to 1636, after which, with the exception of a modernized version in 1718, Huphwes was never reprinted until 1868, when Mr Arber took it in hand. The reasons for its popularity are not far to seek. As far as matter was con- cerned it fell in with all the prevailing literary fashions. Its long disquisitions on love, religion, exile, women, or education, on court life and country pleasures, handled all the most favourite topics in the secularized speculation of the time ; its foreign background and travel talk pleased a society of which Lyly himself said “trafic and travel hath woven the nature of all nations into ours and made this land like arras full of device which was broadcloth full of workiman- ship ;” and, although Lyly steered clear in it of the worst classical pedantries of the day, the book was more than sufficiently steeped in classical learning, and based upon classical material, to attract a literary circle which was nothing if not humanist. A large pro-

portion of its matter indeed was drawn from classical sources. The general tone of sententious moralizing may be traced to Plutarch, from whom the treatise on education, ‘‘Euphues and his Ephcebus,”

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and that on exile, ‘‘ Letter to Botonio to take his exile patiently,” are literally translated, as well asa number of otlier shorter passages either takcn direct from the Latin versions or from some of the numerous English trauslations of Plutarch then current. The in- numerable illustrations based upon a kind of pseudo natural history are largely taken from Pliny, while the mythology is that of Virgil and Ovid.

It was not the matter of Euphues, however, so much as the style whicli made it famous. The sources of Lyly’s peculiar style have only recently been satisfactorily traced by a German scholar, Dr Landmann, whose interesting aud well arranged pamphlet we need do little more than suinmarize (Landmann, Der Huphuismus, sein Wesen, seine Quelle, seine Gesehichte, &c., Giessen, 1881). What, asks Dr Landmann, is Euphuism, properly so called? The term till now has been generally used as if it included all the affected modes of speaking and writing in vogue in England during the 16th century. It has even been made to cover all the corrup- tion of English taste from Surrey to Dryden ; and the common mode of explaining it has been to say that it was a mere ‘‘ exagger- ation of the Italianating taste which had begun with the revival of our poetical literature” under Henry VIII. In reality, however, Euphues has very little to do with the other affectations of the time. Its chief characteristics, to quote Dr Landmann, are “a peculiar combination of antithesis with alliteration, assonance, rhyme, and play upon words, a love for the conformity and correspondence of parallel sentences, and a tendency to aceumulate rhetorical figures, such as climax, the rhetorical question, objections and refutations, the repetition of the same thought in other forms, &c.” ‘To this may be added constant references to antiquity and a great fondness for comparisons drawn from a sort of fabulous natural history. On the other hand the style is free from what Puttenham calls “mingle mangle,” that is to say, from the pedantic and indiscri- minate use of foreign or Latinized words, and also from the hyper- bolical extravagances of the Petrarchians.

Lyly’s peculiarities are those of syntax and construction rather than of phraseology. Compared to that of the Surrey school, his diction is simple and direct, and he himself declares that he does not pretend to please those ‘‘ Englishmen who desire to heare finer speech than the lan- guage will allowe,” that is to say, the Iovers of the Italianate circumlocutions which ruled English poetry from Surrey to Spenser. His work then is not simply to be regarded as the outcome of the classical and Italian influence at work in England since the begin- ning of the century. It has individual features which have to be accounted for, and which have now been traced with certainty by Dr Landmann to the influence of one foreign author—Don Antonio de GUEVARA (q.v.). Guevara’s chief work was El Libro Aureo de Mareo Aurclio (1529),—a sort of historical romance based upon Plutarch and upon Marcus Aurelius’s Meditations, the object of which was to produce a ‘‘ mirror for princes,” of the kind so popular throughout the Renaissance. Within the year of its publication Guevara issued an enlarged edition of his book, calling it Libro del Emperador Marco Aurelio con relox de Principes ; and a number of fresh editions and of translations into almost every European lan- guage followed. The book became almost immediately popular in England. The first cdition, or rather a French version of it, was translated into English by Lord Berners in 1531, and published in 1534. Before 1560 twelve editions of Lord Berners’s translation had been printed, and before 1578 six different translators of this and later works of Guevara had appeared. The translation, however, which had most influence upon English literature was that by North, the well-known translator of Plutarch, in 1568, called The Dial for Princes, Compiled by the Reverend Father in God Don Antony of Guevara, Byshop of Guadix, &e., Englished out of the Frenche by Th. North. It was from this book, and from certain other translations from Guevara, of which a full account will be found in Dr Land- mann’s painphlet, that Lyly borrowed lis peculiar style, and even a certain small proportion of his material. The sententious and anti- thetical style of the Dial for Princes is substantially that of Euphues, though Guevara on the whole handles it better than his imitator, and has many passages of real force and dignity. The general plan of the two books is also much the same. In both the biography is merely a peg on which to hang moral disquisitions and treatises. The use made of letters is the same in both. Even the names of some of the characters are similar. Thus Guevara’s Lucilla is the flighty daughter of Marcus Aurelius. Lyly’s Lucilla is the

flighty daughter of Ferardo, governor of Naples ; Guevara's Livia is a lady atthe court of Marcus Aurelius, Lyly's Livia is a lady at the court "of the emperor," of whom no further description is giveu. The 9th, 10th, 11th, and 12th chapters of the Dial for Princes sug- gested the discussion between Euphues and Atheos. The letter from Euphues to Alcius is substantially the same in subject and treatment as that from Marcus Aurelius to his nephew Epesipo. Both Guevara and Lyly translated Plutarch's work De Edueatione Liberorum, Lyly, however, keeping closer than the Spanish author to the original. The use made by Lyly of the university of Athens was an anachronism in a novel intended to describe his own time. He borrowed it, however, from Guevara, in whose book a university

of Athens was of course entirely in place. The 'cooling card for all fond lovers" and the address to the ladies and gentlemen of Italy have their counterparts among the miscellaneous letters by Guevara affixed by North to the Dial for Princes; and other instances of Lyly's use of these letters, and of two other treatises by Guevara on court and eountry life, could be pointed out.

" Lyly was not the first to appropriate and develop the Guevaristie style. The earliest book in whieh it was fully adopted was A petite Pallace of Pettie his Pleasure, by, George TPettie, which appeared in 1576, a production so closely akin to Euphucs in tone and style that it is difficult to believe it was not by Lyly. Lyly, however, carried the style to its highest point, and made it the dominant literary fashion. His principal followers in it were Greene, Lodge, and Nash, his principal opponent Sir Philip Sidney; the Arcadia in fact supplanted Huphucs, and the Enphuistie taste proper may be said to have died out about 1590 after a reigu of some twelve years. According to Drayton it was Sidney's chief merit that—

"He did first reduee Our tongue from Lillie's writing then in use, Talking of Stones, Stars, Plants, of Fishes, Vlyes, Playing with words and idle similies, As th' English Apes and very Zauies be Of everything that they doe heare and see, So imitating his rediculous trieks They spake and writ all like meere lunatiques."

Shakespeare, Dr Landmann maintains, cannot strictly speaking be said to have ridiculed Kuphuism. Love's Labour Lost is a ecari- cature of the Italianate and pedantic fashions of the day, not of the peculiar style of Huphucs, The only certain allusion in Shakespeare to the characteristics of Lyly's famous book is to be found in Henry IV., where Falstaff, playing the part of the king, says to Prince Hal, 'Harry, 1 do not only marvel where thou spendest thy time, but also how thou art accompanied ; for, thongh the camomile tlic inore it is trodden on the faster it grows, yet youth the more it is wasted the sooner it wears." Here the pompous antithesis is evilently meant to caricature the peculiar Kuphuistie sentence of court par- lance. That Shakespeare indeed was well acqnainted with what was the court manual of his youth, and at times reproduces both ideas and phrases froin it, has been amply proved by Mr Rushton, the German critic Hense, and others, but there is no evidence of antagonism between the two writers. It might have been otherwise had Lyly's Euphuism affected his plays. But these show little or no trace of Guevara's influence ; their faults are the eommon faults of Elizabethan writing, from many of which Shakespeare himself was not free.

See Luphucs, from early editions, by Edward Arber, 1868 ; Pro- fessor Ad. Ward's English Dramutic Literature, i. 151; Collier's History of Dramatic Poctry, iii. 172; John Lilly and Shakespeare, by C. C. Hense in the Jahrbuch der deutschen Shakesp. Gesellschaft, vols, vii. and viii. (1872, 1878); F. W. Fairholt's Dramatic Works of John Lilly, 2 vols., 1858; Shakespeare's Euphuism, by W. L. Rushton ; '"'Euphuism" in the Quarterly Review, 1861. (M. A. W.)

LYMINGTON, a municipal and parliamentary borough and seaport town of Hampshire, England, is situated on the Lym at its entrance to the Solent opposite the Isle of Wight, 94 miles south-west of London and 15 south of Southampton. The parish church, dedicated to St Thomas a Becket, is an irregular structure, dating from the reign of Henry VI., but frequently restored. There are two grammar schools and several charities. The manufacture of salt and of Epsom salts has been declining for some years. A building yard here has turned out some of the most famous racing yachts. In summer the town is much frequented for sea-bathing. Lymington in Domesday is called Lentune, changed afterwards to Limentum. It was a

borough by prescription, and received a grant of incor- poration from James I. From the 27th of Elizabeth till 1867 it returned two members to parliament, and it still returns one. The population of the municipal borough (141 acres) was 2431 in 1881, and that of the parliamentary borough (4769 acres) 5462.

LYNCHBURG, a city in Campbell county, Virginia, U.S., is finely situated on the rising ground to the south of the James river 144 miles by rail, west by south of Richmond. Having excellent facilities of communication by the Richmond and Allegheny, the Norfolk and Western, and the Virginia Midland Railways, together with the James River canal, and possessing abundant water-power and immediate access to coal and iron, Lynchburg has become the seat of no small commercial and industrial

‘punishment was usually death by hanging.

activity. The tobacco trade, which formerly rendered it the wealthiest city of its size in the United States, except New Bedford, Mass., is still the staple; there are about eighty factories in the town, and the amount of tobacco sold in 1870-71 was 17,425,439 ib, while in 1880-81 it was 26,000,000 Ib. Most of the operatives are negroes— men, women, and children all being employed. The local iron-works and flour-mills are of some importance, and large niachine-shops are maintained at Lyncliburg by the Norfolk and Western Railway. Two reservoirs, constructed in 1828 and 1878, supply the town with water. The population was 8067 in 1850, 6853 in 1860, 6825 (8353 coloured) in 1870, and 15,959 in 1880,

The town dates from 1786, and derives its name from a Mr Lynch who served in the war of independence and is erroneously credited by some with the origination of the term Lynch law. It was incor- porated as a city in 1805. During the civil war it was a point of great importance to the Confederates as a base of supplies.

LYNCH LAW, a term used in the United States to characterize the action of private individuals, organized bodies of men, or disorderly mobs, who, without legal authority, proceed to punish by hanging or otherwise real or

suspected criminals, without a trial according to the ordinary forms of law. The origin of the term is doubt- ful. American lexicographers generally refer it to the practice of a Virginia farmer of the 17th century, named Lynch, who, when he caught a wrongdoer, was wont to tie him to a tree and flog him, without waiting to summon the officers of the law. He is also said to have acted, by request of his neighbours, though without any legal authority, as a judge in the summary trial of persons accused of crime. Others trace the origin of the name to the act of James Fitzstephen Lynch, mayor and warden of Galway, Ireland, in 1493, who is said to have "hanged his own son out of the window for defrauding and killing strangers, without martial or common law, to show a good example to posterity." Others trace it still further to the old Anglo-Saxon verb dinch, meaning to beat with a club, to chastise, &c., which they assert has survived in this cognate meaning in Anlerica, as have many other words and expressions long obsolete in Great Britain. While lynch law does not prevail in the old and well-settled States of the Union, and is almost universally deprecated, it is sometimes resorted to even in these States, in times of great popular excitement, or when the legal penalty seems disproportioned to the enormity of the offence. For exaniple, the practice of lynching is said to have increased in Wisconsin since the abolition of the death penalty by law. Lynch law prevailed to a large extent in the early history of California, Oregon, Nevada, Kansas, Colorado, and other western States and Territories, and during the border troubles attending the outbreak of the civil war. Bodies of citizens, organized secretly or openly under the well-known names of " vigilance committees," '" vigilantes," "regulators," "law-and-order-men," &c., punished with summary severity, and generally with wise discretion, horse thieves, highway robbers, burglars and swindlers, as well as murderers. Certain rude forms of trial were generally observed, but acquittals were rare, and the The practice, however barbarous under the conditions of well-settled government and society, has its justification in necessity in the newly-settled districts, frontier towns, and mining camps, where a rapid and extraordinary influx of popula- tion has preceded the establishment of civil government, or where the assembling of a large number of bold and hardened desperadoes has enabled them to defy the legally constituted authorities, and to commit crime at will, until suppressed by the voluntary and concerted action of the order-loving portion of the community.

LYNDHURST, Joun Srveveton Coprey, Baron (1772-1863), four times lord chancellor of England, was born at Boston, New England, in 1772. His father, son of an Englishman, but also a native of Boston, was a painter of very considerable note, who settled in London just before the commencement of the war of American independence. The son studied at Cambridge, where he was second wrangler and fellow of Trinity. Called to the bar in 1804, he gained a considerable practice; but it was not till 1817 that he began to come tothe front. In that year he was one of the counsel for Dr Watson, tried for his share in the Spa Fields riot. On this occasion Copley so distinguished himself as to attract the attention of Castlereagh and other Tory leaders, under whose patronage he entered parliament, and was advanced to the highest legal positions, becoming solicitor-general in 1819, attorney- general in 1824, and lord chancellor in 1827, with the title of Lord Lyndhurst. Before being thus taken up by the Tories, Copley was a man of the most advanced views, arepublican and Jacobin ; and his accession to the Tories naturally excited a good deal of comment, which he bore with the greatest good humour. He gave a brilliant and eloquent but by no means rancorous support to all the reactionary measures of his chief. The same year that he became solicitor-general he married a fashionable wife, and began to take a conspicuous place in society, in which his noble figure, his ready wit, and his never-failing bonkomie made him a distinguished favourite.

As solicitor-general he took a prominent part in the trial of Queen Caroline. To the great Liberal measures which marked the end of the reign of George IV. and the beginning of that of William IV. he gave a vigorous opposition, During the Melbourne administration from 1835 to 1841 he figured conspicuously as an obstructionist from his seat in the House of Lords.‘ In these years it was a frequent practice with him, before each prorogation of parliament, to entertain the House with a “review of the session,” in which he mercilessly attacked the Whig Government. His former adversary Lord Brougham, now ineffably disgusted at his treatment by the Whig leaders,

soon became his most powerful ally in opposition; and the two dominated the House of Lords. Throughout all the Tory Governments from 1827 Lyndhurst held the chancellorship ; and in the Peel administration (1841-46) he resumed that office for the fourth and last time. As Peel never had much confidence in Lyndhurst, the latter did not exert so great an influence in the cabinet as his position and experience entitled him todo. But he continued a loyal member of the party. As in regard to Catholic emancipation, so in the agitation against the corn laws, he opposed reform till his chief gave the signal for concession, and then he cheerfully obeyed. After 1846 and the disintegration of the Tory party consequent on Peel's adoption of free trade, Lord Lyndhurst was not so assiduous in his attendance in parliament. Yet he con- tinued to an extreme old age to take a lively interest in public affairs, and occasionally to astonish the country by the power and brilliancy of his speeches. That which he made in 1853, in denunciation of the aggressive policy of the Russian emperor Nicholas, made a sensation in Europe ; throughout the Russian war he was a strong advocate of the energetic prosecution of hostilities. In 1859 he denounced with his old energy the restless ambition of Napoleon III. When he was released from the trammels of an official position, he came forward somewhat as the advocate of liberal measures. He strenuously supported the admission of Jews into parliament; his second wife was a Jewess. Under the influence of Mrs Norton he appeared also as the advocate of women's rights in questions of divorce. At the age of eighty-four he passed

the autumn at Dieppe, "helping to fly paper kites, and amusing himself by turns with the writings of the Greek and Latin fathers on divorce and the amorous novels of Eugene Sue." His last speech, marked by " his wonted brilliancy and vigour," was delivered in the House of Lords at the age of eighty-nine. He died in 1863, in his ninety-second year. The impression we have of Lyndhurst from Lord Campbell's memoir is that of a man with rather an easy conscience in political life, not too scrupulous in his attention to judicial duties, but possessed of a fine and noble presence, a ready wit, an unfailing sweetness of temper, and a real kindness and charm of manner that won the hearts of men.

See Lives of the Lord Chancellors of England, vol. viii. (Lords Lyndhurst and Brougham), by Lord Campbell, 1869. Campbell was a personal friend, but a political opponent.

LYNDSAY, Sire Davin (c. 1490-1555), for about two centuries and a half perhaps the most popular poet of Scotland, was born about 1490, probably either at the family estate of The Mount, in the parish of Monimail, near Cupar in Fife, or at Garleton near Haddington in East Lothian, where the ruins of an old mansion house of the Lyndsays still remain. Little is known of his boyhood, but he is understood to have entered the university of St Andrews about 1505, and he became one of the incorporati of St Salvator's College in 1508 or 1509. After leaving college there is reason to think that he went abroad fora year or two, visiting, it is supposed, both France and Italy; but of this there is no certain information. In 1511 he must have been attached in some way to the court of James IV., as in the October of that year an entry appears in the royal treasurer's accounts for the sum of £3, 4s. for " blue and yellow taffities to be a play coat to David Lyndsay for the play playit in the king and queen's presence in the Abbey of Holyrood,"—-so that even at that early period Lyndsay would seem to have developed his taste for masques and mummeries, play-acting and tale-telling. After this his name occurs in the treasurer's accounts for a regular salary of £40 a year; and on the birth of James V. in 1512 he was appointed to be the personal attendant of the young prince, in which situation he remained till James had attained his twelfth year in 1524—sometimes under the title of "keeper of the kingis grace," sometimes as the "kingis maister usher," and sometimes as "the kingis maister of houshald," but throughout with the yearly salary of £40. Lyndsay's close connexion with the court led to his being present at the remarkable scene just before Flodden, in the church of Linlithgow, when the so-called apparition came in "calling loudly for the king," and, after warning him against proceeding on his ill-judged expedition against England, vanishing away ''as it had been a blink of the sun or ane whiss of the whirlwind." The incident is related both by Pitscottie and by Buchanan, expressly on the authority of Sir David; and Tytler shrewdly remarks that possibly Lyndsay knew more of the affair than he cared to confess, a conjecture which both Lyndsay's well-known prudence and sagacity in political affairs and his skill in arranging masques and stage plays renders exceedingly probable. In 1522 Sir David married

Janet Douglas, of whom we know nothing except that she also was attached to the king's court, and was employed as sempstress to "his grace,"—various payments to her being entered in the accounts for her diligence in the humble office of "sewing the kingis sarkis." It is evident from many passages in Lyndsay's poems that his good sense and sweet temper, his varied accomplishments, and his skill in mingling amusement with instruction had greatly endeared him to the young king, and it would have been well for James if he had never listened to other and worse counsels than those of his wise and affectionate ''maister usher."

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It is to the credit of the king, however, aud characteristic of the generous disposition of the earlier Stuarts, that he never forgot or forsook the friend of his infant and boyish years. For when he fell under the power of the Douglases in 1524, and when Lyndsay had to take his dismissal from court, James took care that his salary should continue to be paid him; and no sooner did he escape from their domination than Lyndsay was at once recalled, and the appointment of lyon-king conferred upon him. This was in 1529, and it is a remarkable proof of the reputation which Lyndsay had by this time acquired for prudence and sterling practical ability that he was at various times sent abroad in connexion with embassies from Scotland. In 1531 he went to the Netherlands to renew the com- mercial treaty with that country. On this occasion the embassy had a personal interview with the emperor Charles V., and the mission was perfectly successful. A few years afterwards (in 1536) he formed one of the envoys sent to France to conclude a treaty of marriage between the Scottish king and Marie de Bourbon, daughter of the Duc de Vendéme. It is evident therefore that Lyndsay's position and employments must have enabled him to gather much experience of life, and to obtain a somewhat varied knowledge both of men and things. His last sad office to his beloved sovereign was to attend at his bedside when the poor king was dying of a broken heart at Falkland, in December 1542. Lyndsay survived the king about thirteen years. At the time of Cardinal Beaton's assassination he held a seat in parliament as commissioner for the burgh of Cupar. In 1548 he was despatched to Denmark to negotiate a free trade, particularly in grain, for the Scottish merchants, which was readily granted. Mr Laing, on the authority of au

entry in the Privy Seal Register, states that his death must have taken place early in 1555.

When Lyndsay was driven from the court by the advent of the Douglases to power, he no doubt felt it as a bitter misfortune and a disappointment of all his highest hopes. But we are greatly mistaken if he did not ere long come to regard it in a very different light. Like most men of genius, he had evidently two sides to his character. one side he had a taste for pleasure, sociality, pageantry, and frivolous amusements ; and a few years more of these might have deadened his nature to everything else, and converted him into a mere dangler after royalty. But he had also elements of a better kind. He was well educated and accomplished ; he had read somewhat extensively, and was master of most of the knowledge to be had in books at that time. He had seen not a little of the world, both in Scotland and in foreign countries ; he was an acute dis- cerner of character, and had both knowledge of and skill in affairs. Now then was just the time for a man like him, arrived at the full maturity of his intellect, to turn all these varied acquisitions to account. Lyndsay therefore, we may infer, retired to his country seat, either at The Mount, or as we fancy more likely to Garleton (that he might be more within call should a change take place in the political situation at Edinburgh), and there, after the first dull pang of disappointment was over, he doubtless found that there was no lack of subjects to engage his best thoughts. One of the great crises in the history of Europe and in the progress of human thought had just arisen. The trumpet of the Reformation had been sounded in Germany, and its reverberation had already been heard in Scotland, where both political and ecclesiastical disorder had nearly reached their worst, and were becoming the source of deep anxiety and desire for redress to all good men. For Lyndsay, therefore, there was something else to do than to brood moodily over his own private griefs). He had to make up his mind on a variety of great public questions, as well perhaps as to settle the great personal question of his own

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religious faith ; andin his earliest work, The Dreme, which seems to have been composed at this time, we have a somewhat vivid picture of the turn

his thoughts took.

He represents himself as having spent the long winter night with- out sleep, ‘‘ through heavy thought, remembering of divers thingis gone.” On getting up and walking out, he finds the dull winter season, with its bitter blasts and sharp sleety showers, but ill-fitted to console him, and only too much in harmony with his own melan- eholy. He goes down to the sea-shore, but things are no better there; for the ‘‘ weltering of the waves” at onee associates itself in his mind with ‘‘ this false warld’s instability.” Thus far, then, his meditations seem to have had a merely personal reference. But by and by, on retiring into a cave near the shore, he falls into a tranee, in which his thoughts take a wider range. The miserable state of his country, from misgovernment on the part of its rulers and the viees of both clergy and laity, fills his mind, and, reflecting on the ultimate fate of sueh inen, he finds himself in the twinkling of an eye in hell, where he sees wicked popes, kings, conquerors, prinees, and lords temporal, with no end of ehurchmen, ‘‘mansworn mer- chants,” ‘‘ unleil laboraris,” eraftsmen “‘ out of number,” “ hurdaris of gold and common oceararis,” all ‘‘tormentit with pains intoler- able.” Then, leaving this ‘‘dolorous dongeon,” he has a passing sight of purgatory, though apparently with some misgiving as to its reality, his significant remark being—

“ Sic things to be great clerkis does conclude,

Howbeit my hope stands most in Christis blood.” Proceeding then to the realms of bliss, he sees something of the rewards of good and just rulers and righteous men; and by and by returning to the earth, and at length looking down upon Scotland, he sees a region both good and fair, its seas abounding in fish, its mountains eovered with pasture, the valleys fit for corn, the forests full of game, mines with gold and silver, the people fair, intelligent, strong, and noble-minded,—and yet with all this, the eountry poor and the inhabitants miserable. What could be the eause? and the answer given is that the realm wants good government, impartial administration of justice, and freedom from war and discord. Vicw- ing the country all over—on the borders

“ Betwixt the Merse and Lochmaben,

He could not knaw a leil man from a thicf.

To show their reif, theft, murther and mischief,

And vicious works, it would infest the air." In the Highlands it was no better :—

"Unthrift, sweirness, falset, poverty, and strife

Put policy in danger of her life."

And even in the Lowlands, where better things might be expceted, it was impossible for a poor man to live by his industry. If he settled in the towns, ''singular profet" (by which we understand him to mean the system of monopolies and of elose trade eorpora- tions, whieh everywhere prevailed) '' gart him soon dislodge." And if he attempted to get redress to his wrongs there was no help for him anywhere. The spiritual state, plunged in simony, covetous- ness, pride, ambition, sensuality, and the love of pomp and pleasure, '*held him at disdain"; and among the nobility and gentry "liberality and lawté both are lost," knightly eourage is '' turnit in brag and boast," and disorder and civil war have produced a state of things in whieh 'there is nocht else bot ilk man for himself." The moral of the whole is—'' Woe to the land that has ouer young ane king !"—"'' there sall na Seot have eomforting till that I see the eountry guided by wisdom of ane gude auld prudent king." The poet is then awakened by the sound of eannon from a ship of war approaeh- ing the eoast, the suggestion, as we imagine, being that the existing state of things can only end in violenee and uproar, in tumult and rebellion, most probably in foreign invasion and revolution.

On the whole Zhe Dreme appears the most finished and artistic of Lyndsay's works. It has a tone of greater seriousness, bears the marks of more care and elaboration in the composition; and, though it has a good deal of the crudeness of a first attempt, we think we can discover an effort at least at a finer proportion and harmony of parts than in any of his subsequent poems. In its subject- matter it strikes the keynote of almost all that he after- wards wrote. The evils, the wrongs, the misgovernment of his country evidently filled his whole soul with grief, indignation, and the desire for reform; and we almost doubt if there is to be found anywhere

except in the old Hebrew prophets a purer or more earnest breathing of the patriotic spirit. Indeed if we may judge from the motto prefixed to his Dreme we should almost fancy that he had made them his model :— Prophetias nolite spernere. Omnia autem probate: quod bonum est tenete. Lyndsay accordingly is to be judged of less as a poet than asa great political

and ecclesiastical reformer. That his works are written in verse is merely incidental. Though not destitute of poetical genius, this was scarcely the special characteristic of his mind. His greatest work, and the only one to which it is necessary here to make further allusion, was his Satire of the Three Estates. It is a drama, and may be said to be in some respects one of the most remarkable that ever was written. The dramatis persone are chiefly allegorical, and under the names of Rex Humanitas, Wantonness, the Vices (Flattery, Falset, and Deceit) in the habit of friars, King Correction, Good Counsel, Temporality, Sensuality, Chastity, Verity, John the Com- monweal, &c., the most bitter and unsparing exposure is made of the wickedness and corruption of all classes of the community. King, clergy, lords, merchants, craftsmen —no one escapes the severest censure and the most unmitigated ridicule. And yct this extraordinary produc- tion was acted on the borough muir of Edinburgh before the king himself, many of the highest nobility and clergy, and an immense crowd of all classes of the people. How the author escaped being torn in picces by the mob or burnt at the stake by the ruling powers it is difficult to understand. Perhaps the explanation is that each class saw every other brought undcr the lash equally with itself, and felt consoled for its own shame by enjoying the infliction visited on its neighbours. Very likely too the grotesque wit and the fun with which the serious matter of the play was so largely spiced charmed the audience into good humour, and left them unable to think of vengeance. It may be somewhat confidently inferred too that the dramatist so exactly expressed the public feel- ing of the time as to the evils and corruption under which the state was rapidly going to destruction that, even when his stinging reproachcs most nearly touched themselves, their consciences were smitten and they were compelled to assent to the perfect truth and justness of his rebukes. But be this as it may, there can hardly be a doubt that this most singular drama formed one of the chief means by which the way was paved

for the Reformation afterwards carried out by Knox and his coadjutors.1_ One thing is especially remarkable in Lyndsay's politics both civil and ecclesiastical, that, hopeless and depressing as the condition of the country must have been to aman like him, his opinions never end in mere negations, but are throughout constructive in their character. And yet more thorough-going radicalism it would be difficult elsewhere to find. He does not for example scruple to declare that kings who govern ill should be deposed. This, however, was merely a speculative opinion, and it is of more interest to ascertain what his practical suggestions were. Among them we find the following :—that the king should on no account attempt to do anything without the advice of his council and parliament ; that John the Commonweal should have a greater voice in parliament, 2. in our modern phrase, that there should be a considerable extension of the franchise; that (as already mentioned) all close corporations and monopolies should be abolished ; that temporal lands should be set in feu to the tenants on condition of their duly rendering the prescribed services to the state, a measure not very dissimilar in principle (if we understand it aright) to that lately introduced into Ireland ; that lords should be responsible for thieves who find refuge on their lands, and make restitution to the poor who have been plundered by them; that courts of justice should be established in the remoter parts of the country, such as Elgin and Inverness, in order to avoid the expense attendant on the transference of pleas to the metropolis, and, to provide for their maintenance, the nunneries in that quarter to

1 See Ellis, Original Letters, 34 series, vol. iii. p. 280 ; and Row,

History of tae Kirk ef Scotland, p. 7.

be abolished and their revenues sequestrated, the reason given being—‘«Thir wanton nuns arc na way hecessair Till common-weill, nor yet to the glorie Of Christis kirk, thocht they be fat and fair, And als that fragile order feminine Will nocht be missit in Chiist's religion."

No less stringent and sweeping are his proposals for the reform of the church. The religion of Christ must be purged of all deceit and hypocrisy. The consistorial courts are to have no jurisdiction in matters temporal. No

clergyman is to be admitted to office unless duly qualified in learning and piety. Celibacy is to be abolished. Bishops and priests must be compelled to preach regularly and “take better tent to souls under their dominion.” Benefices are not to be purchased either from prince or pope, nor is moncy to be permitted to go to Rome for bulls and pleas. Pluralities and patronage are to be abolished, residence is to be enforced, and the people are to have a voice in the choice of their spiritual guides. In fact many of Lyndsay’s proposals of reform lave quite a modern look, and this perhaps explains in some degree the long-continued popularity of his works among his country-men, which otherwise it is rather difficult to account for. They have none of the chivalric spirit-stirring power of many of our ancient songs and ballads, none of the tender love and melancholy which form the charm of Burns’s lyrics, none of the joyous abandon of convivial or amorous ditties, and none of the fascination which springs from well-con- structed tales or narrative poems, like those of Chaucer or Scott. It is difficult to suppose that even the humour which pervades them, seldom of the most refined kind and often very much the reverse, can have been in any great degree pleasing to readers of a later age than the author’s own. ‘The only explanation, we suspect, is tliat Lyndsay’s intense and uncompromising love of liberty, his strong sympathy with the poor, his love of justice, his keen hatred of tyranny, wrong, and oppression, and his shrewd common sensc easily found a responsive chord in Scottish bosoms. Nor was the interest which his works so long retained among the Scottish peasantry merely of a senti-mental kind. For many of the evils against which he directed his severest invectives continued long afterwards to afflict his country, and even when somewhat changed in their aspect still reappeared in analogous forms or character. Prclatic usurpation and cruelty were as rife as ever in the century which succeeded that in which Lyndsay wrote ; aristocratic venality and heartlessness have perhaps even yet hardly ceased out of the land ; church patronage, always hateful to religious-minded Scotsmen, was hardly abolished before it was reimposed. And then such inci- dents as the massacre of Glencoe, the union with England, a measure intensely disliked by the great mass of the Scottish people, the infamous treatment of the Darien colonization scheme, the barbarities which followed the two Jacobite rebellions, the deprivation up to 1832 of any true parliamentary representation, and the continuance of close municipal and trade

corporations, all tended to keep up a bitter sense of wrong to which Lyndsay's satires gave point and expression.

The best accessible editions of Lyndsay's works are those of George Chalmers, in 8 vols., London, 1806, and of David Laing, also in 8 vols., Edinburgh, 1879. These, with the Early English Text Society's edition, leave little to be desired for the establishment of a correct text, and for purely antiquarian illustration. In Warton's History of English Poetry, and in Irving's History of Scottish Poetry, good critical estimates will be found of Lyndsay's place as a poet. It is possible, however, that something yet remains to be donc in order to determine his exact position as a great political and religious reformer, and to illustrate the effect

which his works have had in directing popular feeling and opinion in Scotland. (J. T. BED)

LYN—LYN

LYNN, a city in Essex county, Massachusetts, U.S., situated near the north end of Massachusetts Bay, on a harbour formed by the peninsula of Nahant, 10 miles north-east of Boston, with which it is connected by dif- ferent lines of railway. The bulk of Lynn is built on the low grounds near thesea; but in the north-east the eleva- tion is greater, and behind the city proper there is a range of porphyritic hills dotted with villas, Most of the houses are of wood, those of the main thoroughfare—Market Street—of brick. The city hall, a substantial erection of brick and brown stone, is considered one of the finest buildings of its class in New England. It contains thie free public library, founded in 1862, and numbering 29,126 volumes in 1880. It was at Lynn thiat the first smelting-works in this part of the country were estab- lished, in 1643; but the place has long been famous rather for the making of boots and shoes, a department, indeed, in which it has hardly a rival in the world. This trade was introduced in 1750 bya Welshman, Jolin Adam Dagyr; in 1767 the output was 80,000 pairs ; in 1810, 1,000,000 pairs ; in 1865, 5,360,000; in 1868 upwards of 10,000,000; and in 1880, 16,276,380,—the greater proportion being cheap shoes for women and children. About twelve thousand hands are employed, though labour-saving machinery is freely introduced. Another industry of great local importance is the tanning and dressing of sheep and goat skins, and the making of morocco leather. The

population was 6138 in 1830, 14,257 in 1850, 28,233 in 1870, and 38,284 in 1880.

The foundation of the town belongs to 1629 ; and the name was given in memory of Lynn Regis in England, the home of its first pastor. It obtained incorporation as a city in 1850 ; Swampscott

and Nahant, which it then included, were rendered independent in 1852 and 1853 respectively.

LYNN REGIS, Kine's Lyny, or Lynn, a parliamentary and municipal borough and seaport of Norfolk, England, is situated on the Great Ouse, about 2 miles from tlie Wash, and on several railway lines, 100 miles north of London and 48 west-north-west of Norwich. On the land side the town was formerly defended by a fosse, and there are still considerable remains of the old wall, including a handsome Gothic structure, known as the "South Gates." The streets are generally narrow and winding ; some of the dwelling-houses are very ancient. The public walks form a fine promenade, and in the centre of them stands a quaint octagonal chapel called the Red Mount, at one time much frequented by pilgrims, The church of St Margaret's, formerly the priory church, is a fine Gothic building with two towers at the west end, one of which was formerly surmounted by a spire blown down in 1741. St Nicholas chapel, at the north end of the town, is also of medizval date, and contains many interesting memorials of the past. All Saints church is a beautiful aud ancient cruciform structure. At the grammar school, founded in the reign of Henry VIII., Eugene Aram was at one time usher. There are also national schools, a British school, and several charities. Among the other public buildings are the guildhall, with Renaissance porch, the corn exchange, the custom-house, and the athenaum. The shipping trade is steadily progressing, and there is now regular steam communication with Hamburg. The prin- cipal exports are corn, wool, and oilcake, and the principal imports, coal, timber, linseed, and manufactured goods. The total value of the exports in 1880 was £1,152,456, the average fur the four years 1876-79 being £967,958, and for four years 1872-75 £519,479. The value of the exports in 1880 was £366,649, the average value for 1876-79 being £251,491, and for 1872-75 £140,974. The Alexandra dock, opened in 1869, has a water area of 67 acres, with an

average depth of 31 fect. The fisheries of the town are important, and there are also breweries,

corn-mills, iron and brass foundries, agricultural implement manufactories, shipbuilding yards, rope and sail works, and tobacco manufactories. The population of the borough in 1871 was 16,562, and in 1881 it was 18,475.

Lynn is supposed to have been a British town, and was known asa port before the Norman invasion, after which it became the possession of the bishops of Norwich, and was known as Lynn Episcopi. After the suppression of the monasteries it came into the hands of Henry VIII., and its name was changed to Lynn Regis or King's Lynn. The town was taken by the parliamentary forces in 1643. It received its first charter from King John, but its first governing charter from Henry VIII. Since the 23d of Edward I. it has returned two members to parliament.

LYNX, a name now appropriated to several animals forming a small section of the cats or genus Felis. It is not quite certain to which of these, if to any of them, the Greek name Avyé was especially applied, though it was more probably the caracal than any of the northern species. The so-called lynxes of Bacchus were generally represented as resembling panthers rather than any of the species now known by the name. Various fabulous properties were attributed to the animal, whatever it was, by the ancients, that of extraordinary powers of vision, including ability to see through opaque substances, being one; whence the epithet '"lynx-eyed," which has survived to the present day, although having no foundation in fact.

There are two forms of cats which are now called lynxes.

1. The caracal or Persian lynx, Felis caracal, an animal about the size of a fox, is of slender build, with a mode- rately long tail, reaching down to the heels. It is of a uniform vinous or bright fulvous brown colour above, and is paler, sometimes almost white, beneath. It is quite or almost entirely unspotted. The tail has a black tip, and the ears are black externally, long and upright, pointed, and surmounted by a pencil of fine black hairs. It in-

habits Central and North-West India, Persia, Arabia, Syria, and the greater part of Africa.

2. The name lynx is given to various species or varieties of animals found in the northern and temperate regions of both the Old and New World, all of moderate size, that is, smaller than the lions, tigers, and leopards, and larger than the true cats, with long limbs, short stumpy tail, ears tufted at the tip, and pupil of the eye linear when contracted. Their fur is generally long and soft, varying, however, according to season and locality, and always longish upon the cheeks. ‘Their colour is always light brown or grey, and generally more or less spotted with a darker shade. The naked pads of the feet are more or less covered by the hair that grows betweenthem. The skull and skeleton does not differ markedly from those of the other cats, but the small anterior upper premolar tooth found in many other species is usually wanting. Their habits are exactly those of the other wild cats; they are excelled by none in the untameable savageness of their disposition. They capture their prey in the same manner, either lying in wait, or noiselessly stealing within reach, and then making a sudden rush or spring upon it. Their food consists of any mammals or birds which they can overpower. In inhabited countries they commit extensive ravages upon sheep, lambs, and poultry. They generally frequent rocky places and forests, being active climbers, and passing much of their time among the branches of the trees. Their skins are of considerable commercial value in the fur trade.

Zoologists are by no means agreed at present as to the specific distinctions, if any really exist, between the various modificatious of this group. As many as eight species are sometimes recognized, four belonging to the Old and four to the New World. The former are Felis lynx, of Scandi- navia, Russia, northern Asia, and till lately the forest regions of central Europe (it has not inhabited Britain during the historic period, but its remains have been found

in cave deposits of Pleistocene age); F. cervaria, Siberia ; F. pardina, Turkey, Greece, Sicily, Sardinia, and Spain ; and F. isabellina, Tibet. The American varieties are J’. canadensis, the most northern species, and J’, rufa, the

From a Drawing by Wolf in Elliot’s Monograph of the Felidz.

European Lynx.

American wild cat or bay lynx, extensively distributed from the Atlantic to the Pacific throughout nearly the whole latitude of the United States, but replaced in Texas and southern California by / maculata, and in northern Oregon and Washington territory by F. fasciata.

In both cases, as might be supposed, specimens obtained from the more southern climates are shorter in their fur, more brightly coloured, and more distinctly spotted than those from colder regions. When only a few individuals of each most markedly different form are examined thie distinctions are sufficiently evident, The occurrence, however, of transitional or intermediate forms makes it extremely difficult to draw the line between the different varieties or species, or to assign definite characters by which they can be separated. Wherefore it is best at present to accept the so-called species as only provisional, and wait until more abundant materials, with fuller knowledge of the localities from which they are derived, and of the variations due to age, sex, season, and climate, have been more carefully studied. We shall then probably come to the conclusion that all the existing forms of northern lynxes, whether American or Eurasian, belong to what may fairly be called a species, which is becoming by degrees differentiated into several more or less strongly marked local varieties. (W. H. F.)

LYONS (French, Lyon), in political, commercial, in- dustrial, and military importance, as well as in point of size, the second city of France, formerly the capital of Lyonnais, and now the chief town of the department of Rhone, seat of a court of appeal and of a military govern- ment, and a fortified place, is situated at the confluence of the Rhone and the Sadne, in 45° 46’ N. lat. and 4° 49’ 19” E. long., at an altitude above the sea varying from 540 to rather more than 1000 feet. The population of the city and liberties in 1876 was 342,815. The rivers, both flow- ing south, are separated by the hill of Croix-Rousse. On the right the Saéne is bordered by the scarped heights of Fourviéres, St Irénée, and Ste Foy, leaving room only for the quays and one or two narrow streets; this is the oldest part of the city.

Where it enters Lyons the Saéne has on its right the faubourg of Vaise and on its left that of

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of the hill of Croix-Rousse, come the principal quarters of

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Serin, whence the ascent is made to the top of the hill of Croix-Rousse. The river next takes a semicircular sweep around the hill of Fourvitres (410 feet above it), which is fully occupied by convents, hospitals, and seminaries, and has at its summit the famous church, the resort of 1,500,000 pilgrims annually. From this point the best view of the entire city is obtained. First the busy Sadne is seen with its thirteen bridges and animated quays. Next, on the peninsula between the two rivers at the foot

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Plan of Lyons.

1. Pont St Clair. 14, Pont Nemours. 28, Notre Dame de Four- 2. Pont Morand. 15, Pont de Serin. vitres. 8. Pont du Collége. 16. Pont du Port Monton. | 29. Palais de Justice, 4, Pont Lafayette. 17, Pont de la Gare. 30. St John’s Church. 5. Pont de l’H6tel-Dieu. | 18. Jardin des Plantes. 31. Hospice de TAnti- 6. Pont de la Guillotitre. | 19. St Polycarpe. ee : mee Tle 7 s 20. Condition des Soies. 2. Jewish Synagogue. g_f Fonts Napoleon. 21, La Martiniére. 33, Hotel Dieu, 9. Pont du Mulatiére. 22. Opera House. 34. Hospice de la Charité. 10. Pont d@’Ainay. 23. Hotel de Ville. 35. Eglise d’Ainay. 11. Pont St Georges 24. Palais des Arts. 86. Great Seminary. 12. Pont Tilsitt. 25. Lycée. 387. St Just. 13. Pont du Palais de|26. Bourse. 38. St Irénée. Justice. 27. Protestant Church. 39, Arsenal

the town: the Terreaux, containing the hdtel de ville, the prefecture, and the chief commercial establishments ; Bellecour with its large open square, one of the finest in Europe ; and the aristocratic Quartier de Perrache. The Rhone and Sadne formerly met here, till, a hundred years ago, the sculptor Perrache reclaimed from the rivers the quarter which bears his name; on the peninsula thus formed stands the principal railway station. Here too are the docks of the Sadéne, factories, the arsenal, gas-works, prisons, and the slaughter-house.

LYONS

The Rhone, less confined than the Sadne, flows swiftly in a wide channel, broken when the water is low in spring by pebbly islets. On the right hand it skirts first St Clair, sloping upwards to Croix-Rousse, and then the districts of Terreaux, Bellecour, and Perrache; on the left it has a low-lying plain, subject to disastrous inundations, occupied by the Parc de la Téte d'Or and the quarters of Brotteaux and Guillotigre. The park, defended by the Grand Camp embankment, comprises 282 acres, and con- tains a zoological collection, botanical and pharmaceutical gardens, and the finest greenhouses in France, with unique collections of orchids, palm-trees, and Cycadacex. Brot- teaux is a modern town with boulevards and regular streets, and in this direction Lyons is extending every year. In the old districts there is no room for growth; they are crowded with old buildings of eight or ten stories, or even more, and it has been the task of the last thirty years to open them up by means of thoroughfares. Guillotiére, to the south, is a workmen's quarter of wretched houses.

he Rhone is lined with broad quays, and crossed by ten fine bridges, two of them for railway traffic. On the right bank stand the lycée and the public library, the Hétel Dieu, the military hospital, and the Hospice de la Charité ; on the left bank is the long range occupied by the medical faculty. In the east of Guillotitre the Geneva railway skirts the artillery barracks.

Northward from Fourviéres appear the green slopes of Mont d'Or, descending towards the Saéne by pleasant glades sprinkled with villas ; to the east, beyond the some- what monotonous plain, stretch the mountains of Savoy and Dauphiné; to the south, below the confluence of the Rhone and

the Saéne, the river traverses a rich landscape to pass out of sight at the foot of Mont Pilat ; and to the west the horizon is bounded by the Forez hills.

Since 1852 the communes of Croix-Rousse and Guillotiére have been united with Lyons. The Rhone and the old fortifications, which, on the right bank of the Sadne, stretched in an unbroken line from the rock of. Pierre Scize below Vaise to the bridge of Ainay, continued by those now replaced by the Croix-Rousse boulevard, marked the boundaries of the ancient city. The line of Croix-Rousse has now been thrown forward to the north, and further strengthened by Forts Caluire and Montessuy. On the left bank of the Rhone stand Forts Téte d'Or, Charpennes, Brotteaux and Part-Dieu, Villeurbanne, Lamotte, Colombier, and Vitriolerie. On the right bank of the Sadne Forts Ste Foy, St Irénée, Loyasse, Vaise, and Duchére completed the defensive system of Lyons previous to 1870; but since that date the dominant points of the neighbourhood have begun to be crowned with batteries and redoubts ; but only Forts Brou and Feyzin on the left bank of the Rhone, St Genis on the right bank, Mont Verdun on Mont d'Or, and Vencia are finished.

Of the ancient buildings in Lyons, Fourviéres is the one which attracts most visitors. It derives its name from the ancient forum (forum vetus), whose site it occupies. The first chapel, dedicated to the Virgin, was erected in the end of the 9th century. Consecrated afterwards to St Thomas of Canterbury, and then made a collegiate church, Notre Dame de Fourviéres was created superior of twenty-five villages by Louis XI., on occasion of his visit in 1476. Laid waste by the Protestants, plundered at the Revolution, it began to be visited again in 1804, and in 1805 Pope Pius VII., returning from the coronation of Napoleon, ascended thither to give his benediction to the city —a ceremony renewed from year to year with great pomp. The church tower, 172 feet high, is surmounted by a statue of the Virgin in gilded bronze, 18 feet high, turned towards the town; on the pedestal are bronze plates with inscriptions assigning to the Virgin the credit of ending the

plague of 1643, and of preserving the town during the cholera epidemics of 1832, 1835, and 1850. The first stone of a magnificent new church was laid in 1872. The crypt, 219 feet by 62, is as yet the only portion finished. At thé

foot of Fourvitres, on the right bank of the Saéne, lies the metropolitan church of St John (the archbishop of Lyons is primate of all Gaul). The choir belongs to the early years, the transept to the close of the 12th century ; the building of the nave, carried on during the next three hundred years, was completed only in 1480. In one of the two towers there is a bell weighing nearly 10 tons. To the right and left of the altar stand two crosses preserved since the council of 1274 as a symbol of the union then agreed upon between the Greek and Latin Churches. St Martin d'Ainay, in the Perrache quarter, is the oldest church in Lyons, dating from the beginning of the 6th century; the chapels of the apse are adorned by paint- ings by Flandrin. St Nizier, in the heart of the city, was the first cathedral of Lyons; and the crypt in which St Pothinus officiated still exists. The present church is a Gothic edifice of the 15th century, with the exception of the porch, constructed by Philibert Delorme. In the crypt of the church of St Irenzeus are the tomb of that saint and a vast quantity of bones, alleged to be those of 19,000 martyrs put to death in the persecution of Severus. The Place Belleconr is adorned west and east by two monumental facades originally erected after plans by Mansard, but destroyed in 1793, and rebuilt under the consulate in a somewhat modified style. In the middle stands an equestrian statue of Louis XIV. by Lemot. The Rue de VHétel de Ville, connecting the Place Bellecour and the Place des Terreaux, and the Rue de la Republique running parallel with it are among the finest streets of the modern city. The east side of the Place des Terreaux (so called from the "terreaux" now occupying the place of the canal which formerly connected the Rhone and the Sadne) is formed by the hétel de ville, which, however, turns a better front in the opposite direction towards the theatre; the south is occupied by the Palais St Pierre (formerly a convent), which gives accommodation to the faculties of science and literature, and to the school of fine arts, the picture gallery, the museums of sculpture, archeology and natural history, and the art library. In the Rue de la Republique, between Place de la Bourse and Place des Cordeliers, each of which contains one of its highly ornamented fronts, stands the building occupied by the exchange and the commercial court. The former has its offices on the ground floor round the central glass-roofed hall ; besides the court, the upper stories accommodate the council of prud'hommes, the chamber of commerce, and the industrial museum. The palais de justice, a fine building with a Corinthian colon- nade, on the right bank of the Saéne, occupies the site of the palace of the

counts of Forez. A statue of Jacquart the inventor stands in Place Sathonay, and one of Marshal Suchet in Place Tholozan.

The Academy of Lyons has the five faculties of Catholic theology, science, literature, medicine and pharmacy, and law, with two lyceums, and a number of schools; and the Catholic institute has three faculties—law, science, and theology. The school of fine arts was founded in the 18th century to train competent designers for the textile manu- factures, but has also done much for painting and sculpture. The veterinary school of Lyons, instituted in 1761, was the first of its kind in Europe ; its laboratory for the study of comparative physiology is admirably equipped. L'Kcole la Martiniére (founded by the legacy of Claude Martin) furnishes gratuitous teaching of the sciences and industrial arts. The school of commerce and the Lyons central school complete the list of institutions for industrial education.

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Besides the Académie des Sciences, Belles Lettres, et Arts (founded in 1700), Lyons possesses societies of agriculture, natural history, useful arts and sciences, geography, and horticulture. ;

The Hétel Dieu, instituted in the beginning of the 6th century by King Childebert, is still one of the chief establishments of its kind in the city, aud contains 929 beds. Its facade, fronting the Quai du Rhone for 1060 feet, was commenced according to the designs of Soufilot, architect of the Pantheon at Paris. The Hospice de la Charité and the military hospital are a little larger than the Hétel Dieu. The Hospice de l'Antiquaille, at Fourviéres (2000 beds), occupies the site of the ancient palace of the preetorian prefects, in which Germanicus, Claudius, and Caracalla were born. Lyons has many other benevolent institutions, and is also the centre of the operations of the Propagation de la Foi.

The museum is one of the best provincial collections in France, alike in its ancient, medieval, and modern depart- ments. Among the Gallo-Roman inscriptions, in which it is particularly rich, are the bronze tables discovered at Lyons in 1528, which contain the speech of the emperor Claudius in regard to the admission of the citizens of Gallia Comata into the Roman

senate. The numismatic collection (30,000 pieces) includes a series of the coins struck at Lyons from 43 B.c, to 1857, There is a special gallery of works of Lyonese painters ; and the Bernard collection of about 300 pictures is kept entire.

The museum of natural history (for which a new build- ing is to be erected in the Parc de la Téte d'Or) contains a zoological department ranking next to that of Paris, and mineralogical, geological, and anthropological sections — the last enriched with specimens from the classic site of Solutré (Sadne and Loire). The museum of art and industries, founded in 1864 by the chamber of commerce, is divided into three sections, the first intended to illustrate the various conceptions of the beautiful formed by different peoples, the second to show the whole method of the textile industry, and the third to give an historical con- spectus of woven textures. The Guimet Museum, in a special building in the Téte d'Or, consists of objects brought from the extreme East (mainly by M. Emile Guimet) and designed to facilitate the comparative study of religions, especially those of the Eastern world. Since 1880 the institution has published its Annales, consisting of original essays or translations of foreign works.

The library of the school of arts contains 65,000 volumes and 22,000 engravings, and the town library 108,000 volumes and 1300 manuscripts,— about 600 of the printed works being incunabula, and 25 of the MSS. belonging to the Carlovingian period. In the latter institution is the great terrestrial globe made at Lyons in 1701, indicating the great African lakes, the rediscovery of which has been one of the events of the present century.

Under the Romans Lyons was admirably provided with water. Three ancient aqueducts on the Fourvieres level, from Montroman, Mont d'Or, and Mont Pilat, can still be traced ; and the last was no less than 52 miles long, and capable of supplying 11,000,000 gallons per day. Magni- ficent remains of this work may be seen at St Irénée and Chaponost. Traces also exist along the Rhone of a subterranean canal conveying the water of the river to a naumachia. At present the water supply of Lyons is obtained from the Rhone by powerful hydraulic engines situated above the town, which raise the water to the Montessuy and the Fourviéres plateaus, 456 feet above the

low level of the river. The reservoirs are capable of supplying 1,765,829 cubic feet of water per day.

Agrippa made Lyons the starting-point of the principal Roman roads throughout Gaul; and it still remains an

LY ON

important centre in the general system of communication. The Sadne above the town and the Rhone below have large barge and steamboat traffic; and the latter river above the town may be used by steamboats during summer as far as Aix in Savoy. Navigation, however, is often interrupted, even below the town, by the lowness of the water, and a canal is projected to remedy this defect. The current of the Sadne is less rapid than that of the Rhone, and is controlled by weirs.

The railway from Paris to Marseilles has two stations (Vaise and Perrache) in Lyons; and the line from Lyons to Geneva two (Brotteaux and St Clair), The Montbrison line starts from St Paul, on the right of the Saéne. The terminus of Part-Dieu for the newly-opened East of Lyous line is between Perrache and Brotteaux. Within the town there are two rope railways,—tle first mounting to Fourviéres, and the second, popularly called the jicedle, from Rue Terme to Croix-Rousse.

In a city of such importance as Lyons the number of industries is naturally large, but by far the most extensive of them. all is the silk manufacture. Derived from Italy, this industry rapidly developed under tlhe patronage of Francis I., Henry II., and Henry IV.; and from time to time new kinds of fabrics were invented—silk stuffs woofed with wool or with gold and silver threads, shawls, watered silks, poplins, velvets, satinades, moires, &c, In thie beginning of the present century Jacquart introduced Mis famous loom by which a single workman was enabled to produce elaborate fabrics as easily as the plainest web, and by changing the “cartoons” to make the most different textures on the samelooms. In the 17th century the silk manufacture employed at Lyons 9000 to 12,000 looms. After the revocation of the edict of Nantes the number sank to 3000 or 4000; but after the Reign of Terror was past it rose again about 1801 to 12,000. At present there are about 70,000 in operation when no great commercial crisis comes to

diminish production, giving employment to about 140,000 weavers. There are also a_ large number of persons engaged in the silk-worm hatcheries established in L'rance. The workmen live for the most part in the Croix-Rousse quarter, but many of them inhabit the outskirts. 'The mean annual value of the silk goods manufactured is estimated at 375,000,000 frances (£15,000,000),—250,000,000 representing the value of the raw material and 125,000,000 the value of the labour. In- cluding the purchase of raw materials and the sale of the manufactured goods, the silk trade gives a total turnover of 1000 million francs (£40,000,000). A special office (known as La Condition des Soies) determines the weight and nature of the silk. Extensive dye-works, cliemical works, breweries, pork factories, engineering works, print- ing establishments, and hat factories represent the second- ary industries of the place. A large trade is carried on in chestnuts brought from the neighbouring departments, and known as marrons de Lyon.

The earliest Gallic occupants of the territory at the confluence of the Rhone and the Sadne were the Segusians. In 590 B.c., some Greek refugees from the banks of the Héranlt, having obtained per- mission of the natives to establish themselves beside the Croix Ronsse, called their new town by the Gallic name Lugdunum; and in 43 B.c. Munatius Plancus brcnght a Roman colony to Fourvieres from Vienne. This settlement soon acqnired importance, aud was made by Agrippa the starting point of four great roads. Augustus, besides building aqueduets, temples, and a theatre, gave it a senate and made it the seat of an annual assembly of deputies from the sixty cities of Gallia Comata. Under the emperors the colony of Forum Vetus and the municipium of Lugdunum were united, receiving the jus senatus. The town was burnt by Nero in 59 4.D., and afterwards rebuilt by him in a much finer style ; it was also adorned by Trajan, Adrian, and Antoninus. The martyrdom of Pothinus and Blandina occurred under Marcus Aurelius (177 A.D.), and in 197 a still more savage persecution of the Christians took plaee under Septimins Severus, in whieh Ireneus, according to

gome authors, perished. After having been ravaged by the bar- barians and abandoned by the empire, Lyous in 478 beeame eapital of the kingdom of

the Burgundians. It afterwards fell into the hands of the Franks, and suffered severely from the Saracens, but revived under Charlemagne, and after the death of Charles the Bald was made the eapital of the kingdom of Provence. From 1024 it was a fief of the emperor of Germany. Subsequently the superiority over the town was a subjeet of dispute between the archbishops of Lyons and the counts of Forez; but the royal supremacy was finally established under Louis IX. and Philip the Handsome. The citizens were constituted into a commune ruled by freely elected consuls (1320). In the 13th century two ecclesiastical councils were held at Lyons—one in 1245, presided over by Innocent IV., at which the emperor Frederick II. was deposed; the second, the ceumenical, under the presidency of Gregory X., in 1274, at which five hundred bishops met. Pope Clement V. was crowned here in 1805, and his suceessor John XXII. elected in 1316. The Protestants obtained possession of the place in 1562 ; their acts of violence were fiercely avenged in 1572 after the St Bartholomew massaere. Under Henry III. Lyons sided with the League ; but it pronouneed in favour of Henry IV. In 1793 it rose against the Convention, but was eom- pelled to yield to the army of the republie after enduring a sicge of seven weeks (October 10). ‘Terrible chastisement ensued: the name of Lyons was changed to that of Ville-affranchie ; the demoli- tion of its buildings was set about on a wholesale seale ; and vast nunibers of the proscribed, whom the seaffold had spared, were butchered with grape shot. The town resumed its old name after the fall of Robespierre, and the terrorists in their turn were drowned in large numbers in the Rhone. Napoleon rebuilt the Place Bellecour, reopened the ehurches, and made the bridge of Tilsitt over the Sadne between Bellecour and the eathedral. In 1814-15 Tyne was oceupied by the Austrians, under the government of Louis Philippe, and in 1870-71 there were several bloody émeutes ; in 1856 a disastrous flood laid waste the Brotteaux and rendered 20,000 persons homeless. An international exhibition was held here in 1872. Among the many distinguished natives of Lyons may be mentioned Germanicus and the emperors Claudius, Mareus Aurelius, and Caracalla; Ampére the physicist; Rieherand, Ré- eanlier, and Bonnet; De Jussieu the naturalist, J. B. Say the economist, Baréme the matheniatieian, Suchet the marshal, Roland the Girondin, and Jaequard the inventor. (G. ME.) LYONS, Epmunp Lyons, Lorp (1790-1858), British admiral, was descended from a family connected with An- tigua, and previously with Cork, and was born at

Burton near Christchurch, Hampshire, 21st Noveniber 1790. He entered the navy at an early age, and served in the Mediter- ranean, and afterwards in the East Indies, where in 1810 he won promotion by distinguished bravery. He became post-captain in 1814, and in 1828 commanded the "' Blonde " frigate at the blockade of Navarino. He took part with the French in the capture of the castle of Morea, receiving for his conduct the orders of St Louis of France and of the Redeemer of Greece. Shortly before his ship was paid off in 1835 he was knighted. From 1840 till the out- break of hostilities with Russia Lyons was employed on the diplomatic service, being minister plenipotentiary to the court of Greece until 1849, then until 1851 ambassador to the Swiss cantons, whence lie was transferred to a similar position at Stockholin. On the outbreak of the war with Russia he was appointed second in command of the British fleet in the Black Sea under Admiral Dundas, whom he succeeded in the chief command in 1854. As admiral of the inshore squadron he had the direction of the landing of the troops in the Crimea, which he conducted with marvellous energy and despatch. According to Kinglake, Lyons shared the "intimate counsels" of Lord Raglan in regard to the most momentous questions of the war, and throughout the Crimean campaign he toiled, with a " painful consuming passiou," to guard against disaster, to clear away over- powering difficulties and obstacles, and to win the final purpose of the expedition. His actual achievements in battle were principally two—the support he rendered with ; 2 Dey pps : his guns to the French at the Alma in attacking the left flank of the Russians, and the bold and brilliant part he took with his ship the "Agamemnon" in the first bombardment of the forts of Sebastopol ; but his constant Vigilance, his multifarious activity, and his suggestions and counsels were much more advantageous to the allied

cause than his specific exploits. In 1855 he was created vice-admiral, and at the conclusion of the war he was, in Juue 1856, raised to the peerage with the title of Lord Lyons of Christchurch. He died November 23, 1858.

LYRA, Nicozaus DE (c. 1270-1340), a well-known medizeval commentator, was a native of Lyre, near Evreux, Normandy, and was born most probably about 1270; at least he was still young when in 1291 he

entered the Franciscan order at Verneuil. He afterwards studied at Paris, and became doctor of theology and a successful teacher there. In 1325 he became provincial of his order for Burgundy ; and on October 23, 1340, he died at Paris.

Lyra (Lyranus) was the author of a controversial treatise against the Jews, entitled De Messia, ejusque adventu preterito, and of a Tractatus de idoneo ministrante et suscipiente sancti altaris sacramen- éum, but by far his most important work is the Postille perpetuzx, sive brevia commentaria in universa Biblia, first printed at Rome (5 vols. fol., 1471-72), aud often subsequently. It may be said to mark the first beginnings of a school of natural exegesis ; for, though recognizing the old doctrine of a fourfold sense—

“ Litera gesta docet, quid credas allegoria, Moralis quid agas, quo tendas anagogia “—

Lyra explicitly maintained and sought to give effect to the prin- eiple that the foundation of every mystical exposition must first be firmly laid by aseertaining the literal meaning. His qualities as an interpreter of Seripture included, besides comparative freedom from dogmatic prepossession, a good knowledge of Hebrew and a fair acquaintauee with Greek. Luther was aequainted with his com- nientaries, and it is through the influence of Rashi upon Lyra that so many traces of the exegesis of that rabbi are found in Luther’s writings ; hence the oft-quoted saying, ‘‘Si Lyra non lyrasset, Lutherus non saltasset.” See vol. xi. p. 601.

LYRE. Of all musical instruments the lyre has been the most associated with poetry, the recitations of Greeks having been accompanied by it. Yet the lyre was not of Greek origin ; no root in the language has been discovered for Avpa, although the special names bestowed upon varieties of the instrument are Hellenic. We have to seek in Asia the birthplace of the genus, and to infer its introduction into Greece through Thrace or Lydia. The historic heroes and improvers of the lyre were of the Zolian or Ionian colonies, or the adjacent coast bordering on the Lydian empire, while the mythic masters, Orpheus, Muszeus, and Thamyris, were Thracians. Notwithstanding the Hermes tradition of the invention of the lyre in Egypt,

the Egyptians seem to have adopted it theniselves from Assyria or Babylonia.

To define the lyre, it is necessary clearly to separate it from the allied harp and guitar, both, as far as we have record, instruments of as great antiquity. In its primal form the lyre differs from the harp, of which the earliest, simplest notion is found in the bow and bowstring; while the guitar (and lute) can be traced back to the typical “nefer” of the fourth Egyptian dynasty, the fretted finger-board of which, permitting the production of different notes by the shortening of the string, is as different in conception from the lyre and harp as the flute with holes to shorten the column of air is from the syrinx or Pandean pipes. The frame of a lyre consists of a hollow body or sound-chest (7 xetov). From this sound-chest are raised two arms (7yyels), which are sometimes hollow, and are bent both outward and forward. They are bound near the top by a crossbar or yoke (fvyov, Cvywpa, or, from its having once been a reed, xaAapos). Another crossbar (udyas, troAvpiov), fixed on the sound-chest, forms the bridge which transmits the vibrations of the strings. The deepest note was the farthest from the player ; but, as the strings did not differ much in length, more weight may have been gained for the deeper notes by thicker strings, as in the violin and similar modern instruments, or they were tuned with slacker tension. The strings were never of wire, the drawing of which was unknown to the nations of antiquity, but of gut (xopd7, whence chord). They were

stretched between the yoke and bridge, or to a tailpiece below the bridge. There were two ways of tuning: one was to fasten the strings to pegs which might be turned

(xdAAaBot, kddAomes) ; the other was to change the place of |

the string upon the crossbar; probably both expedients were simultaneously employed. It is doubtful whether 4 xopdoréves meant the tuning key or the part of the instrument where the pegs were inserted. The extensions of the arms above the yoke were known as xépara, horns.

The number of strings varied at different epochs, and possibly in different localities, four, seven, and ten having been favourite numbers. They were, as already said, used without a finger-board, no Greek description or representa- tion having ever been met with that can be construed as referring to one. Nor was a bow possible, the flat sound- board being an insuperable impediment. The plectrum, however (zAjxrpov), was in constant use at all times. It was held in the right hand to set the upper strings in vibration (kpéxew, Kpovey 7G wAyKTpw); at other times it hung from the lyre by a ribbon. The fingers of the left hand touched the lower strings (acu).

With Greek authors the lyre has several distinct names ; but we are unable to connect these with anything like certainty to the varieties of the instru- ment. Chelys (xéAvs, "' tortoise") may | mean the smallest lyre, which, borne by saaee eee he one arm or supported by the knees, offered in the sound-chest a decided resemblance to that familiar animal. That there was a difference between lyre and cithara (x@dpa) is certain, Plato and other writers separating them. Hermes and Apollo had an altar at Olympia in common because the former had invented the lyre and the latter the cithara. Perhaps the lyre and chelys on the one hand, and the cithara and phorminx on the other, were similar or nearly identical. Apollo is said to have carried a golden phorminx. But lyre has always been accepted as the generic name of the family, and under- stood to include all varieties. The large lyre was sup- ported by a strong ribbon slung over the player's shoulder, passing through holes beneath the yoke in the arms of the instru- ment, and caught by the player's left hand, the euds hanging in a sash-like fashion. This cithara, or, it may be, phorminx (pdppryé, " port- able lyre"), is fre- quently, by the vase painters, de- lineated as so held, —the plectrum, at- tached by another ribbon, being re- presented, when not in use, as

Fia, 1.—Chelys, from a vase in the British Museum, where also are fragments of such an instrument, the back of which is of shell.

Dee Ur

en in- : : ' pendent, or as in- yc, 2.—Cithara or Phorminx, from a vase in

terlaced between the strings.

: Passing by the story of the discovery of the lyre from a vibrating tortoise-shell by Hermes, we will glance at the

the British Museum.

Best period of Greek art.

LYRE

real lyres of Egypt and Semitic Asia. The Egyptian lyre is unmistakably Semitic. The oldest representation that has been discovered is in one of the tombs of Beni Hassan, the date of the painting being in the 12th dynasty, that is, shortly before the invasion of the shepherd kings. In this painting, which both Rosellini and Lepsius have reproduced, an undoubted Semite carries a seven or eight stringed lyre of fan-shaped form. The instrument has a four-cornered body and an irregular four-cornered frame above it, and the player carries it horizontally from his breast, just as a modern Nubian would his kissar. He plays as he walks, using both hands, a plectrum being in the right. This ancient lyre, dat- ing 2000 B.c., exists to this day in a remarkable speci- men preserved in the Berlin Museum (fig. 3), and is found again in form as well as in manner of holding in the Assyrian lyre of Khorsabad. During the rule of the shepherds the lyre became naturalized in Egypt, and in the 18th dynasty it is frequently de- picted, and with finer grace of form. In_ the 19th and 20th dynasties thelyre

is sometimes still more slender, or Fic. 3.—Egyptian Lyre now at Berlin. Drawn is quite unsym- by permission of Director-General Schone.

metrical and very strong, the horns surmounted by heads of animals as in the Berlin one, which has horses’ heads at those extremities. Prokesch copied one in the ruins of Wadi Halfa, splendid in blue and gold, with a serpent wound round it. The Egyptians always strung their lyres fan-shaped, like the modern Nubian kissar. Their paintings shew three to eight or nine strings, but the painters’ accuracy may not be unimpeachable; the Berlin instrument had fifteen, The three-stringed lyre typified the three seasons of the Egyptian year—the water, the green, and the harvest; the seven, the planetary system from the moon to Saturn. The Greeks had the same notion of the harmony of the spheres.

There is no evidence as to what the stringing of the Greek lyre was in the heroic age. Plutarch says that Olympus and Terpander used but three strings to navy ty | their recitation. As the four strings led to seven and eight by doubling the tetrachord, so the trichord is connected with the hexachord or six-stringed lyre de- picted on so many archaic Greek vases. We cannot insist on the accuracy of this representation, the vase painters being so little mindful of the complete expression of details ; yet we may suppose their tendency would be rather to imitate than to invent a number. It was their constant practice to represent the strings as being damped by the fingers of the left hand of the player, after having been struck by the plectrum which he held in the right hand. Before the Greek civilization had assumed its historic form, there was likely to be great freedom and independence of different locali- ties in the matter of lyre stringing, which is corroborated by the antique use of the chromatic (half-tone) and enharmonic (quarter- tone) tunings, pointing to an carly exuberance, as in language when nations are young and isolated, and perhaps also to an Asiatic bias towards refinements of intonation, from which came the xpéar the hues of tuning, old Greek modifications of tetrachords entirely disused in the classic period. The common scale of Olympus

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remained, a double trichord which had served as the scaffolding for the enharmonic varieties.

We may regard the Olympus scale, however, as consisting of two tctrachords, eliding one interval in each, for the tetrachord, or

geries of four notes, was very early adopted as the fundamental principle of Greek music, and its origin in the lyre itself appears sure. The basis of the tetrachord is the employment of the thumb and first three fingers of the left hand to twang as many strings, the little finger not being used on account of natural weakness. As a succession of three whole tones would form the disagreeable and untunable interval of a tritonus, two whole tones and a half-tone were tuned, fixing the tetrachord in the consonant interval of the perfect fourth. This succession of four notes being in the grasp of the hand

was called cvAAaBh, just as in language a group of letters incapable of further reduction is called syllable. In the combina- tion of two syllables or tetrachords the modern diatonic scales resemble the Greek so-called disjunct scale, but the Greeks knew nothing of our categorical distinctions of major and minor. We might call the octave Greek scale minor, according to our descend- ing minor form, were not the keynote in the middle the thumb note of the deeper tetrachord. The upper tetrachord, whether starting from the keynote (conjunct) or from the note above (disjunct), was of exactly the same form as the lower, the position of the semitones being identical. The semitone was a limma (Aciupa), rather less than the semitone of our modern equal temperament, the Greeks tuning both the whole tones in the tetrachord by the same ratio of 8:9, which made the major third a dissonance, or rather would have done so had they combined them in what we call harmony. In melodious sequence the Greek tetrachord is decidedly more agreeable to the ear than the cor- responding series of our equal temperament. Aud although our scales are derived from combined tetrachords, in any system of tuning that we employ, be it just, niean-tone, or equal, they are less logical than the conjunct or disjunct systems accepted by the Greeks. But modern harmony is not compatible with them, and could not have arisen on the Greek melodic lines. The conjunct scale of seven notes

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attributed to Terpander, was long the norm for stringing and tuning the lyre. When the disjunct scale

the octave scale attributed to Pythagoras, was admitted, to preserve the time-honoured seven strings one note had to be omitted ; it was therefore customary to omit the C, which in Greek practice was a dissonance. The Greek names for the strings of seven and eight stringed lyres, the first note being highest in pitch and nearest the player, were as follows:—Nete, Parancte, Paramese ; Mese, Lichanos, Parhypate, Hypate; or Nete, Paranete, Trite, Paramese; Mese, Lichanos, Parhypate, Hypate,—the last four from Mese to Hypate eg finger tetrachord, the others touched with the plectrum. The highest string in pitch was called the last, vedry ; the lowest in pitch

was called the highest, irdry, because it was, in theory at least, the longest string. The keynote and thumb string was peon, middle ; the next lower was Alyavos, the first finger or lick- finger string ; tpivn, the third, being in the plectrum division, was also known as dée7a, sharp, perhaps from the dissonant quality which we have referred to as the cause of its omission. The plect- rum and finger tetrachords together were d:aracGy, through all ; in the disjunct scale, an octave.

_in transcribing the Greek notes into our notation, the absolute pitch cannot be represented ; the relative positions of the semitones are alone determined. We have already quoted the scale of Pythagoras, the Dorian or true Greek succession :—

Shifting the semitone one degree upwards in each tetrachord, we have the Phrygian

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Another degree gives the Lydian

baer PE

which would be our major scale of E were not the keynote A. The names imply an Asiatic origin. We will not pursue further the much debated question of Greek scales and their derivation ; it will suffice here to remark that the outside notes of the tetrachords were fixed in their tuning as perfect fourths,—the inner strings being, as stated, in diatonic sequence, or when chromatic two half-

tones were tuned, when enharmonic two quarter-tones, leaving respectively the wide intervals of a minor and major third, and both impure, to complete the tetrachord. (As di, B.)

LYRE-BIRD, the name by which one of the most remarkable feathered inhabitants of Australia is commonly known, the Menura superba or M. nove-hollandiz of orni- thologists. First discovered, January 24, 1798, on

the other side of the river Nepean in New South Wales by an exploring party from Paramatta, under the leadership of one Wilson, a single example was brought into the settle- ment a few days after, and though called by its finders a ‘Pheasant ”—from its long tail—the more learned of the colony seem to have regarded it as a Bird-of-Paradise.! A specimen having reached England in the following year, it was described by General Davies as forming a new genus of birds, in a paper read before the Linnean Society of London, November 4, 1800, and subsequently published in that Society’s Transactions (vi. p. 207, pl. xxii.), no attempt, however, being made to fix its systematic place. Other examples were soon after received, but Latham, who considered it a Gallinaceous bird, in 1801 knew of only five havingarrived. The temporary cessation of hostilities in 1802 permitted Vieillot to become acquainted with this form, though not apparently with any published notice of it, and he figured and described it in a supplement to his Oiseaux Dorés as a Bird of Paradise (ii. pp. 30 sq., pls. 14-16), from drawings by Sydenham Edwards, sent him by Parkinson, the manager of the Leverian Museum.?

It would be needless here to enter at any length on the various positions which have been assigned to this singular form by different systematizers—who had to judge merely from its superficial characters. The first to describe any portion of its anatomy was Eyton, who in 1841 (Ann. Nat. Iistory, vii. pp. 49-53) perceived that it was truly a member of the Order then called Jnsessores, and that it presented some points of affinity to the South American genus Pteroptochus ;* but still there were many who could not take advantage of this step in the right direction. In 1867 Professor Huxley stated that he was disposed to divide his very natural assemblage the Coracomorphe (essentially identical with Eyton’s Jnsessores) into two groups, “ one containing Menura, and the other all the other genera which have yet been examined” (Proc. Zool. Soc., 1867, p. 472)—a still further step in advance* In 1875 the present writer put forth the opinion in this work (Brrps, vol. iii. p. 471) that Menura had an ally in another Australian form, Atrichia (see ScruB-BirD), which he had found to present peculiarities hitherto unsuspected, and accordingly regarded them as standing by themselves, though each constituting a distinct Family. This opinion was partially adopted in the following year by Garrod, who (Proc. Zool. Society, 1876, p. 518) formally placed these

1 Collins, Account of New South Wales, ii. pp. 87-92 (London, Wy Tek called the bird ‘* Le Parkinson” ! and hence Bechstein, who seems to have been equally ignorant of what had been published in England concerning it, in 1811 (Kurze Uebersicht, &c., p. 134), desig- nated it Parkinsonius mirabilis!! Shaw also, prior to 1813, figured it (Nat. Afiscellany, xiv. p. 577) under the name of Paradisea parkin- soniana. The name ‘‘ Menura lyra, Shaw,” was quoted by Lesson in 1831 (Tr. d’ Ornithologie, p. 473), and has been repeated by many copyists of synonymy, but the present writer cannot find that such a name was ever applied by Shaw. Vieillot’s principal figure (ut supra), which has a common origin with that given by Collins, has been exten- sively copied, in spite of its inartistic not to say inaccurate drawing. It is decidedly inferior to that of Davies (ut supra), the original describer and delineator.

3 He subsequently (Osteol. Avium, pp. 97, 98, pl. 3, F and pl. 14) described and figured the skeleton.

4 Owing to the imperfection of the specimen at his disposal, Professor Huxley’s brief description of the bones of the head in AMfenwra is not absolutely correct. A full description of them, with elaborate figures,

is given by Professor Parker in the same Society’s Transactions (ix. pp. 306-309, pl. lvi. figs. 1-5).

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two genera together in his group of Abnormal Acromyodian Oscines under the name of Menurine ; but the author sees no reason to change his mind, and herein he‘is corroborated by Mr Sclater, who has recently (Jbis, 1880, p. 345) recognized at once the alliance and distinctness of the Families Menuride and Atrichiide, forming of them a group which he calls Psewdoscines.

Since the appearance in 1865 of Gould’s Handbook to the Birds of Australia, little if any fresh information has been published concerning the habits of this form, and the account therein given must be drawn upon for

what here follows. Of all birds, says that author, the Menura is the most shy and hard to procure. He has been among the rocky and thick “brushes ”—its usual haunts—hearing its loud and liquid call-notes for days together without get- ting sight of one. Those who wish to see it must ad- vance only while it is occupied in singing or scratching up the earth and leaves; and to watch its actions they must keep perfectly still—though where roads have been made through the bush it may be more often observed and even approached on horseback. The best way of procuring an example seems to be by hunting it with dogs, when it will spring upon a branch to the height of 10 feet and afford an easy shot ere it has time to ascend further or escape as it does by leaps. Another method of stealing upon it is said to be practised by the natives, and is attained by the hunter fixing on his head the erected tail of a cock-bird, which alone is allowed to be seen above the brushwood. The greater part of its time is said to be passed upon the ground, and seldom are more than a pair to be found in company. One of the habits of the cock is to form small round hillocks, which he constantly visits during the day, mounting upon them and displaying his tail by erecting it over his head, drooping his wings, scratching and pecking at the soil, and uttering various cries—some his own natural notes, others an imitation of those of other animals. The wonderful tail, his most characteristic feature, only attains perfection in the bird’s third or fourth year, and then not until the month of June, remaining until October, when the feathers are shed to be renewed the following season. The food consists of insects, especially beetles and myriapods, as well as snails. The nest is always placed near to or on the ground, at the base of a rock or foot of a tree, and is closely woven of fine but strong roots or other fibres, and lined with feathers, around all which is heaped a mass, in shape of an oven, of sticks, grass, moss, and leaves, so as to project over and shelter the interior structure, while an opening in the side affords entrance and exit. Only one egg is laid, and this of rather large size in proportion to the bird, of a purplish-grey colour, suffused and blotched with dark purplish-brown.!

Incubation is believed to begin in July or August, and the young is hatched about a month later. It is at first covered with white down, and appears to remain for some weeks in the nest. How much more is needed to be known for a biography of this peculiar and beautiful creature may be inferred by those who are aware of the diligence with which the habits of the much

more easily observed birds of the northern hemisphere have been recorded, and of the many interesting points which they present. It is greatly to be hoped that so remarkable a form as the Lyre-bird, the nearly sole survivor apparently of a very ancient race of beings, will not be allowed to become extinct—its almost certain fate so far as can be Judged—without many more observations of its manners

4 Ths nest and egg of Menura alberti, now in the British Museum, are figured in Proc. Zool. Society, 18538, Aves, pl. 58. The egg of M. victoriz is represented in Journ, Jir Ornithologie, 1856, pl. ii. fig. 18, under the name of I. superba, but the real egg of that species does not seem to have been figured at all.

being made and fuller details of them placed on record. The zoologists of Australia alone can do this, and the zoologists of other countries expect that they will.

Several examples of Menura have been brought alive to Europe, but none have long survived in captivity. Indeed a bird of such active habits, and requiring doubtless facilities for taking violent exercise, could not possibly be kept long in confinement until the method of menageries is vastly improved, as doubtless will be thé case some day, and, we may hope, before the disappearance from the face of the earth of forms of vertebrate life most instructive to the zoologist.

Three species of Menwra have been indicated—the old M. superba, the Lyre-bird proper, now known for more than eighty years, which inhabits New South Wales, the southern part of Queensland, and perhaps some parts of the colony of Victoria; WM. victoriz, separated from the former by Gould (Proc. Zool. Soc., 1862, p. 23), and said to take its place near Melbourne; and JM. alberti, first described by C. L. Bonaparte (Consp, Avium, i. p. 215) on Gould’s authority, and, though discovered on the Richmond river in New South Wales, having apparently a more northern range than the other two. All those have the apparent bulk of a hen Pheasant, but are really much smaller, and their general plumage pp, ‘ is of a sooty brown, relieved by rufous on the chin, throat, some of the wing-

feathers, and the tail- coverts. The wings, consisting of twenty-one remiges, are rather short and rounded ; the legs? and feet very strong, with long, nearly straight claws. In the immature and female the tail is somewhat long, though affording no very remarkable character, except the possession of sixteen rectrices; but in the fully-plumaged male of M. superba and M. victoriz it is developed in the extraordinary fashion that gives the bird its common English name. The two exterior feathers (fig. 1, a, 6) have ASI the outer web very narrow, the rig : inner very broad, and they curve im at first outwards, then somewhat inwards, and near the tip outwards again, bending round forwards so as to present a lyre-like form. But this is not all; their broad inner web,

Fig. 2.

which is of a lively chestnut colour, is apparently notched at regular intervals by spaces that, according to the angle at which they are viewed, seem either black or transparent; and this effect is, on examination, found to be due to the barbs

Fig. 3.

? The metatarsals are very remarkable in form, as already noticed by Eyton (loc. cit.), and their tendons strongly ossified.

Date of birth,

LYS—LYS

at those spaces being destitute of barbules. The middle pair of feathers (fig. 2, a, >) is nearly as abnormal. These have no outer web, and the inner web very narrow; near their base they cross each other, and then diverge, bending round forwards near their tip. The remaining twelve feathers (fig. 3) except near the base are very thinly fur- nished with barbs, about a quarter of an inch apart, and those they possess, on their greater part, though long and flowing, bear no barbules, and hence have a hair-like appearance. The shafts of all are exceedingly strong. In the male of J. alberti the tail is not only not lyriform, but the exterior rectrices are shorter than the rest. (a. N.)

LYSANDER was the leading spirit of Lacedemonian policy at the end of the Peloponnesian War. He is said by A‘lian and Athenzus to have been of servile origin, and by Plutarch to have belonged to a Heraclid family. His father was named Aristoclitus or Aristocritus. He first appears in history when sent to command the fleet on the Tonian coast in 407 B.c. The story of his skilful diplomacy, of his influence with Cyrus the younger, of his naval victory at Notium, of his quarrel with his successor Callicratidas in 406, of his reappointment in 405, of the decisive victory at Aigospotami, and of the capitulation of Athens in 404, belongs to the history of Greece. After his return to Sparta his pride and vanity became boundless; he was celebrated by poets, and even worshipped in some places asagod. ‘The restraint of life in Sparta, and the enemies whom he had there, were irksome to him, and he soon went to Asia Minor. He had established in all the Greek cities associations which maintained an oligarchical govern- ment, and his power over them was so great as to increase the jealousy felt for him at home. He was recalled to Sparta, and the machinations of the Persian satrap Pharnabazus brought him into danger. He had soon after the triumph of being sent with an army to support the oligarchy in Athens; but the king (Pausanias) was sent after him with a second army, and made terms with the re- stored Athenian democracy. When King Agis died in 398, Lysander worked to secure the succession for Agesilaus, but after two years he found that he had helped his most dangerous enemy. He began to concert revolutionary schemes, but had not proceeded to any overt act when he was sent with an army into Beotia. He did not wait the arrival of Pausanias with an auxiliary army, but attacked Haliartus, and was slain in the battle, 395 B.c. He was buried on the road from Delphi to Cheronea, and a monument was erected on his tomb. It is to his credit that, after the power and opportunities he had enjoyed, he died a poor man.

LYSIAS, whose name follows those of Antiphon and Andocides on the list of the ten Attic orators, marks an important stage in the development of Greek literary prose, and is, in his own province, one of its most perfect masters. He never acquired the Athenian citizenship, but most of his years were passed at Athens; and his life has the interest of close personal association with the most criti- cal period in the history of the Athenian democracy.

His extant work belongs to the space from 403 to 380 B.c., but the date of his birth is uncertain. Dionysius of Halicarnassus, and the author of the life ascribed to Plutarch, give 459 B.c, This date was evidently obtained by reckoning back from the foundation of Thurii (444 B.C.), since there was a tradition that Lysias had gone thither at the age of fifteen. Modern critics would place his birth later,—between 444 and 436 B.c.,—because, in Plato's Republic, of which the scene is laid about 430 z.c., Cephalus, the father of Lysias, is among the dramatis persone, and the emigration of Lysias to Thurii was said to have followed his father's death. The latter statement, however, rests only on the Plutarchic life ; nor can Plato's

dialogue be safely urged as a minutely accurate authority for a biographical detail. We must be content to say that, while the modern view avoids some difficulties, the higher date assigned by the ancient writers is not inconsistent with any ascertained fact, while it agrees better with the tradition that Lysias reached, or passed, the age of eighty. On the other view, all traces of his industry, previously un- remitting, would cease abruptly at the age of sixty-six.

Cephalus, the father of Lysias, wasa native of Syracuse. Life to On the invitation of Pericles he had settled at Athens as 418 B.c.

a "resident alien" (yérouxos). The opening scene of Plato's Ltepublic is laid at the house of his eldest son, Polemarchus, in the Peirzeus. Cephalus complains that the visits of Socrates have been rare of late, and expresses the hope that he will come oftener, and without ceremony, as to intimate friends. The tone of the picture warrants the inference that the Sicilian family were well known to Plato, and that their houses must often have been hospitable to such gatherings as the Republic supposes. Thus we have an indirect, but very interesting, confirmation of the phrase used by Dionysius in regard to Lysias—" he grew up in the society of the most distinguished Athenians."

At the age of fifteen—when Cephalus, according to the Plutarchic life, was now dead—Lysias removed from Athens to Thurii, the Athenian colony newly planted on the Tarentine Gulf, near the site of the ancient Sybaris.

There the boy may have seen the historian Herodotus,— another of Thurii's early residents,—now a man in middle life ; and it pleases the imagination to think that, in their new Italian home, a friendship may have grown up between these two, neither of them an Athenian by birth, yet alike in a simple grace which Athens loved, and alike also in the love which they bore to Athens. At Thurii Lysias is said to have commenced his studies in rhetoric,—doubtless under a master of the Sicilian school,—possibly, as tradition said, under Tisias, the pupil of Corax, whose name is associated with the first attempt to formulate rhetoric as an art. In 413 Bc. the Athenian armament in Sicily suffered that crushing disaster which at the moment seemed to imperil the existence of Athens itself. The desire to link famous names is curiously illustrated by the ancient ascription to Lysias of a rhetorical exercise purporting to be a speech in which the captive general Nicias appealed for mercy to the Sicilians. The terrible blow to Athens quickened the energies of an auti-Athenian faction at Thuni. Lysias and his elder brother Polemarchus, with three hundred other persons, were " accused of Atticizing " (Arricicpov éyxAnOetor),—a charge which, under the circumstances, implies an honourable loyalty. They were driven from Thurii.

Lysias and Polemarchus now settled at Athens (412 B.c.), 412-404.

They were rich men, having inherited property from their father, Cephalus ; and Lysias claims that, though merely resident aliens, they discharged public services with a liber- ality which shamed many of those who enjoyed the franchise (ory Suolws petorkotytas domep adrot éroAtTevorTo, In Eratosth., § 20). The fact that they owned house property shows that they were classed as igoredcis, 2.¢., foreigners who paid only the same tax as citizens, being exempt from the special tax (yero/kiov) on resident aliens. Polemarchus occupied a house in Athens itself, Lysias another in the Peirzeus, near which was their shield manu- factory, employing a hundred and twenty skilled slaves. This life of comparative peace and prosperity was broken up by the defeat of Athens at Aigospotami (405 B.c.). In the next spring Athens surrendered to Lysander. The Thirty Tyrants were established at Athens under the protec- tion of a Spartan garrison. One of their earliest measures was an attack upon the resident aliens, who were represented as disaffected to the new government. As foreign residents

403-380.

Char- acter of the man and of his work.

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successful in commerce, the Attic metotkot were exposed at such a time to perils like those of the Jews in a medieval city, or in modern Russia. Lysias and Polemarchus were on « list of ten singled out to be the first victims. Polemarchus' was arrested, and received "the usual message" (7d

After the expulsion of the Thirty Tyrants, the democracy was formally restored in the autumn of 403 B.c. Lysias appears to have rendered valuable services to the exiles during the reign of the tyrants, both by his own liberality and by procuring aid from other quarters. Thrasybulus now proposed that these services should be recognized by the bestowal of the citizenship. The proposal happened to be informal in one particular. The senate of five hun- dred had not yet been reconstituted, and hence the measure could not be introduced to the ecclesia by the requisite "preliminary resolution" (rpofovAeva) of the senate. On this ground it was successfully opposed; and Lysias missed the reward which he had so well earned. That passage of his "OAvpmaxds (§ 3) in which he claims to give advice as a good citizen seems to breathe the feeling that, if he was still but an alien at Athens, he was at least a true woAirys of Greece.

The last chapter of his life now opens. He is no longer the wealthy merchant, superintending his shield manu- factory in the Peirzeus. The pillage by the tyrants, and his own generosity to the Athenian exiles, had probably left him poor. He now appears as a hard-working member of a new profession—that of writing speeches to be delivered in the law-courts. The thirty-four compositions extant under his name are but a small fraction of those which the ancient world possessed. From 403 to about 380 b.c. his industry must have been great and incessant. The notices of his personal life in these years are scanty. In 403 he came forward as the accuser of Eratosthenes, one of the Thirty Tyrants, and delivered the splendid oration which we possess. This was his only direct contact with Athenian politics. The story that Lysias wrote a defence for Socrates, which the latter declined to use, probably arose from a confusion. Several years after the death of

Socrates the sophist Polycrates composed a declamation against him; and to this Lysias replied with a defence of the philosopher. A more authentic tradition represents Lysias as having spoken his own “Olympiacus” at the Olympic festival of 388 B.c. The occasion was one of peculiar interest. Dionysius I., tyrant of Syracuse, had sent to the festival a magnificent embassy. Tents embroidered with gold were pitched within the sacred enclosure ; and the wealth of Dionysius was vividly brought before the minds of the Panhellenic concourse by the number of chariots which he had entered for the most costly and brilliant of the Olympic contests. This was the moment at which Lysias lifted up his voice to denounce Dionysius as, next to Artaxerxes, the worst enemy of Hellas, and to impress upon the assembled Greeks that one of their foremost duties was to deliver Sicily from a hateful oppression. The latest work of Lysias which we can date (a fragment of a speech “ F’or Pherenicus”) belongs to 381 or 380 B.c. He probably died in or soon after 380 B.c.

_ The qualities of the man are expressed in his work ; indeed, it is through this, rather than through the recorded facts of his biography, that he becomes a living person to us. It is a kindly and genial nature which we see reflected there,—warm in friendship, loyal to country,—with a keen perception of character, and a fine, though strictly con- trolled, sense of humour. The literary tact which is so

remarkable in the extant speeches is that of a singularly flexible intelligence, always obedient to an instinct of gracefulness. Among the earlier artists of Greek prose Lysias owes his distinctive place to the power of concealing his art. The clients of the professional ‘ speech-writer,” like those of the modern advocate, might be of all sorts and conditions. ‘The modern advocate, however, speaks in his own person. The Athenian “logographer” merely wrote the speech which his client delivered. It was obviously desirable that such a speech should be suitable to the age, station, and circumstances of the person into whose mouth it was put. Lysias was the first disciple of Greek rhetoric who succeeded in making this adaptation really artistic. He aimed, not merely at impressive effect in eloquence, pathos, or argument, but at dramatic propriety. Hence it was absolutely

essential for him to abandon the stiff and monotonous splendour of the earlier and cruder rhetoric. He could not achieve his purpose unless he brought his art into harmony with the ordinary idiom of everyday life. His client must appear to be speaking as the citizen, who was not a professed rhe- torician, might conceivably speak. lLiysias achieved this reconciliation with a skill which can be best appreciated if we turn from the easy flow of his graceful language to the majestic emphasis of his predecessor Antiphon, or to the self-revealing art of his successor Iseus. Translated into terms of ancient criticism, the achievement of Lysias is described by saying that he became the model of the "plain style" (icyvds xapaxrnp, ixxvy, AUTH, apedHs A€Lis; genus tenue or subtile). From the latter part of the 4th century B.c. onwards, Greek, and then Roman, critics distinguished three styles of rhetorical composition—the "' orand" (or " elaborate"), the 'plain," and the " middle." These epithets were relative to the language of daily life—the "plain" being nearest to this, and the "orand" furthest from it. Greek rhetoric began in the "orand" style; then Lysias set an exquisite pattern of the "plain"; and Demosthenes might be considered as having effected an almost ideal compromise. We moderns perhaps cannot fully seize that nameless and undefinable grace (xapis) of Lysias which the Greek critic of the Augustan age indicates in such striking words :—

'' When I am puzzled about one of the speeches ascribed to him," says Dionysius, ''and when it is hard for me to find the truth by other marks, I have recourse to this excellence, as to the last piece on the board. Then, if the graces of speech seem to me to make the writing fair, I count it to be of the soul of Lysias ; and I care not to probe the question further. But if the stamp of the lan- guage has no winningness, no loveliness, I am chagrined, and sus- pect that, after all, the speech is not by Lysias ; and I do no more violence to my instinct (obxér: BidCopar thy &Aoyor alcOnow), even though in all else the speech seems to me clever and well finished, — believing that to write well, in special styles other than this, is

given to many men, but that to write winningly, gracefully, with loveliness, is the gift 6f Lysias" (Dionys., De Lys., ii.).

The more salient traits of the Lysian style can be Style.

recognized by all. The vocabulary is pure and simple. Most of the rhetorical “figures” are sparingly used,— except such as consist in the parallelism or opposition of clauses. The taste of the day,—not yet emancipated from the influence of the Sicilian rhetoric,—probably demanded a large use of antithesis as an essential condition of impressive speaking. Lysias excels in vivid description ; he has also a happy knack of marking the speaker’s character by light touches. The structure of his sentences varies a good deal according to the dignity of the subject. He has equal command over the “periodic”. style (xareorpapy.evn défs) and the non-periodic or “ continuous” (cipopevy, SiaAeAvévy)—using now one now the other, or blending them, according to circumstances. His disposi- tion of his subject-matter is always simple. The speech has usually four parts,—introduction (spoottov), narrative

Works.

of facts (Supyyots), proofs (xiores), which may be either external, as from witnesses, or internal, derived from argument on the facts, and, lastly, conclusion (émiAoyos). It is in the introduction and the narrative that Lysias is seen at his best. In his greatest extant speech—that « Against Eratosthenes”—and also in the fragmentary “Olympiacus,” he has pathos and fire; but these were uot characteristic qualities of his work. In Cicero’s judg- ment, Demosthenes was peculiarly distinguished by force (vis), /Eschines by resonance (sonitus), Hyperides by acuteness (acumen), Isocrates by sweetness (swavitas) ; the distinction which he assigns to’ Lysias is subézztas, an Attic refinement,—which, as he elsewhere says, is often joined to an admirable vigour (lacertz), (Cic., De Or., ili. 7, § 28; Brutus, § 64). The judgment is interesting as showing how a Roman critic of unquestionable competence recognized the peculiar place of Lysias in the development of Greek oratory. Nor was it oratory alone to which Lysias rendered service ; his work had an important effect on all subsequent Greek prose, by showing how perfect elegance could be joined to plainness. Tere, in his artistic use of familiar idiom, he might fairly be called the Euripides of Attic prose. And his style has an additional charm for modern readers,

because it is employed in describing scenes from the everyday life of Athens.!

Thirty-four speeches (of which three are fragmentary) have come down under the name of Lysias; no fewer than one hundred and twenty-seven more, now lost, are known from smaller fragments or from titles. In the Augustan age four hundred and twenty-five works bore his name, of which more than two hundred were allowed as genuine by the eritics. The enormous number of aseriptions indieates that Lysias was reputed to have been a fertile writer. Our thirty-four works may be classified as follows :—

A. Evrpgictic.—1. Olympiacus, xxxiii., 388 3B.c.; 2. Epita- phius, ii. (purporting to have been spoken during the Corinthian War; certainly spurious), perhaps eomposed about 380-340 B.c.

B. DEwBERATIVE.—Plea for the Constitution, xxxiv., 403 B.c.

C. Forrnsic, in Pusuic Cavusres.—I. Relating to Offences directly against the State (ypadal dnpoclwy adinnudrwy) ; such as treason, malversation in office, embezzlement of public moncys. 1. For Polystratus, xx., 407 B.c.; 2. Defenee on a Charge of Taking Bribes, xxi., 402 B.c.; 8. Against Ergocles, xxviii., 389 B.c.; 4. Against Epierates, xxvii., 389 B.c.; 5. Against Nicomachus, xxx., 399 n.c.; 6. Against the Corndealers, xxii., 386 B.c. (?) II. Cause relating to Unconstitutional Procedure (ypaph mapavéuwv). On the Property of the Brother of Nicias, xviii., 395 B.c. I1I. Causes relating to Claims for Money withheld from the State (amoypapal). 1. For the Soldier, ix. (probably not by Lysias, but by an imitator, writing for a real cause), 394 B.C. (2) ; 2. On the Property of Aristo- phanes, xix., 387 B.c.; 3. Against Philoerates, xxix., 389 B.c. IV. Causes relating toa Scrutiny (Soximacta) ; especially the Scrutiny, by the Senate, of Officials Designate. 1. Against Evandrus, xxvi., 382 B.c.; 2. For Mantitheus, xvi., 392 B.c.; 8. Against Philon, xxxi., between 404 and 395 8.c.; 4. Defence on a Charge of Secking to Abolish the Democracy, xxv., 401 B.c.; 5. For the Invalid, xxiv., 402 B.c. (2) V. Causes relating to Military Offences (ypapad Aurota- tlov, &orparetas). 1. Against Aleibiades, I. and II. (xiv., xv.), 395 Bc. VI. Causes relating to Murder or Intent to Murder (ypapal pdvov, rpadparos éx mpovolas). 1. Against Eratosthenes, xil., 403 B.c.; 2. Against Agoratus, xiii., 399 B.c.; 3. On the Murder of Eratosthenes, i. (date uncertain) ; 4.

Against Simon, iii., 393 B.c.; 5. On Wounding with Intent, iv. (date uncertain). VI. Causes relating to Impiety (ypapal aoeBelas). 1. Against Ando- eides, vi. (certainly spurious, but perhaps eontemporary) ; 2. For Callias, v. (date uncertain); 8. On the Sacred Olive, vii., not hbe- fore 395 B.c.

D. Forensic, in Privare Causes.—I. Action for Libel (8txn kaxnyoptas). Against Theomnestus, x., 384-3 B.c. (the so-called seeond speech, xi., is merely an epitome of the first). Il. Action by a Ward against a Guardian (Stun érirporijs). Against Diogeiton, Xxxii., 400 B.c. III. Trial of a Claim to Property (8:a5ixacta). On the Property of Eraton, xvii., 397 B.c. IV. Answer to a Special Plea (pds wapaypaphv). Against Pancleon, xxiii. (date uneertain).

E. Muiscrtnanzovs.—1. To his Companions, a Complaint of Slanders, viii. (certainly spurious); 2. The épwrixds in Plato's Phedrus, pp. 230 E-234. This has generally been

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1 For a detailed account of the life, the style, and the works of Lysias, the reader is referred to Jebb, The Attic Orators from Antiphon to Iseus, vol, i. pp. 142-316.

regarded as Plato's own work ; but the certainty of this conclusion will be doubted by those who observe (1) the elaborate preparations made in the dialogue for a recital of the épwridés which shall be verbally exact, and (2) the closeness of the eriticism made upon it. If the satirist were merely analysing his own eomposition, such eriticism would have little point. Lysias is the earliest writer who is known to have eomposed éepwrixol; it is as representing both rhetorie and a false pws that he is the objeet of attack in tho Phedrus.

F. FracmMrnts.—Three hundred and fifty-five of these are collected by Sauppe, Oratores Attici, ii. 170-216. Two hundred and fifty-two of them represent one hundred and twenty-seven speeches of known title ; and of

six the fragments are eomparatively large. Of these, the fragmentary speech ‘‘ For Pherenieus” belongs to 381 or 380 B.c., and is thus the latest known work of Lysias.

In literary and historieal interest, the first place among the ex- tant speeehes of Lysias belongs to that ‘‘ Against Kratosthenes” (403 B.c.), one of the Thirty Tyrants, whom Lysias arraigns as the murderer of his brother Polemarehus. The speech is an eloquent and vivid picture of the reign of terror which the thirty established at Athens; the concluding appeal, to both parties among the citizens, is especially powerful. Next in importanee is the speeeh ** Against Agoratus” (399 B.c.), one of our ehief authorities for the internal history of Athens during the months which immediately followed the defeat at Aigospotami. The ‘‘ Olympiaeus ” (388 B.C.) is a brilliant fragment, expressing the spirit of the festival at Olym- pia, and exhorting Grecks to unite against their eommon foes. The *¢ Plea for the Constitution ” (403 B.c.) is interesting for the manner in which it argues that the wellbcing of Athens—now stripped of empire—is bound up with the maintenanec of democratic prineiples. The speech “ For Mantitheus ” (892 3.0.) is a graceful and animated elie of a young Athenian iaeds, making a spirited defence of his honour against the eharge of disloyalty. The defenee ‘‘For the Invalid” is a humorous eharaeter-sketeh. The speech ‘‘ Against Paneleon ” illustrates the intimate relations between Athens and Plata, while it gives us some picturesque glimpses of Athenian town life. The defence of the person who had been eharged with destroy- ing a nwria, or sacred olive, places us amidst the country life of Attica, And the specech “ Against Theomnestus ”’ deserves attention for its curious evidence of tlie way in which the ordinary vocabulary of Athens had changed between 600 and 400 B.c.

All MSS. of Lysias yet collated have been derived, as H. Sauppe first showed, Biblio-

from the Codex Palatinus X (licidelberg). The next most valuable MS. is the Laurentianus C (15th century), which I. Bekker chicfly followed. Speaking gene- rally, we may say that these two MSS. are the only two whieh carry much weight where the text is seriously corrupt. In Oratt. i-ix. Bekker occasionally consulted eleven other MSS., most of which contain only these

nine speeches : viz., Marciani F, G, I, K (Veniec) ; Laurentiani D, E (Florence); Vatieani M, N; Parisini U, V; Urbinas O.

Lysias in Oratores Attici, ed. I. Bekker, 1828; ed. G. S. Dobson, with variorum notes, 1828; ed. J. G. Baiter and Hermann Sauppe, 1850, In Teubner's series, ed. Carl Scheibe, Ist ed. 1852, 2d ed. (based on C. L. Kayser's collation of X), 1876. Text, ed. Cobet, 1863, Selections from Lysias and Aischines, ed. Bremi, 1826. Selections from Lysias, ed. Rauchenstein, 1864; ed, Frohberger, 1868 ; ed, Jebb, in Selections from the Attic Orators, 1880. German translation, with notes, by Baur (1869); and of selections, by Westermann (1869). (R. C. J.)

LYSIMACHUS, son of Agathocles, a Thessalian in the service of Philip of Macedon, was born about 361 B.c. During Alexander's campaigns he was one of his im- mediate bodyguard; he distinguished himself in India, and was appointed a trierarch when Alexander constructed his fleet on the Hydaspes. After the death of Alexander, Lysimachus was appointed to the government of Thrace and the district about the Chersonese. Fora long time the Odrysians under their king Seuthes caused him so much trouble that he could take very little part in the struggles of the rival satraps; but in 316 he joined the alliance which Cassander, Ptolemy, and Seleucus made against Antigonus. In 309 he founded Lysimachia in a commanding situation on the neck connecting the Chersonese with the mainland. He followed the example of Antigonus in taking the title of king. When in 302 tle second alliance between Cassander, Ptolemy, and Seleucus was made, Lysimachus, reinforced by troops from Cassander, entered Asia Minor, where he met with little resistance. On the approach of Antigonus he retired into winter quarters near Heraclea, marrying its widowed queen Amastris, a Persian princess. Seleucus joined him in 301, and the decisive battle was fought in the plain of Ipsus ; Antigonus was slain, and his dominions divided among the victors, Lysimachus receiving the greater part of Asia Minor. Feeling that Seleucus was becoming dangerously great, he now allied himself with Ptolemy, marrying his

daughter Arsinoe. Amastris returned to Heraclea. During the absence of Antigonus's son Demetrius in Greece, Lysimachus seized his towns in Asia

Minor and rebuilt Ephesus, calling it Arsinoe. He tried to carry his power beyond the Danube, but was defeated and taken prisoner by the Getz, who, however, set him free on amicable terms. After Demetrius had entered Macedon to help Alexander against his brother Antipater, and by murdering the former had gained possession of the whole country, he invaded Thrace, but had to retire in consequence of a rising in Boeotia, and an attack from Pyrrhus of Epirus. In 287 Lysimachus and Pyrrhus invaded Macedon. Demetrius marched against Pyrrhus, thinking the Mace- donians would not fight against Lysimachus, one of Alexander's companions in arms; but his army went over to Pyrrhus, and he was obliged to fly. Lysimachus claimed a share of the kingdom and received it. Demetrius, cross- ing into Asia Minor, seized Caria and Lydia, but Agathocles, the son of Lysimachus by an Odrysian princess, was sent against him, and forced him to retreat into the territory of Seleucus, who obliged him to surrender. Lysimachus attacked Pyrrhus and Demetrius's son Antigonus, now his ally, and forced Pyrrhus to give up part of Thessaly and the whole of Macedon. Amastris had been murdered by her two sons, and Lysimachus resolved to avenge her; he got them into his hands on pretence of friendship and put them to death. On his return Arsinve asked the gift of Heraclea, and he granted her request, though he had promised to free the city. In 284 Arsinoe, desirous of gaining the succession for her sons in preference to Agathocles, intrigued against him with the help of her brother Ptolemy Ceraunus ; they accused him of conspiring with Seleucus to seize the throne, and he was put to death. To remove the disquietude of the Egyptian court, Aga- thocles being the husband of Ptolemy's daughter Lysandra, Lysimachus married his daughter Arsinoe to the young Ptolemy Philadelphus. The widow of Agathocles fled to Seleucus, and war between the latter and Lysimachus soon followed. In 281 the decisive battle took place at the plain of Corus, the exact situation of which is doubtful ; Lysimachus was killed; after some days his body was found on the field watched by a faithful dog.

Lysimachus was a man of distinguished bravery and great per- sonal strength ; on one occasion he had killed a lion single-handed, though at the cost of fearful wounds. He did not rise to political importance till after the battle of Ipsus. Tenacious and insatiate, he framed schemes of aggrandisement till his death, and in pursuit of the schemes his craft suggested he was ready to sacrifice even his

own family.

LYSIPPUS, a Greek sculptor whose professional activity falls between the years 372 and 316 Bc. In addition to the sketch with accompanying illustrations of his style given under ARCHOLOGY (vol. ii. p. 361, figs. 9 and 11), it may here be stated that the head of Alexander the Great (fig. 11 just referred to) is now admitted to be the best existing representation of the style of Lysippus in portrait sculpture. When we read of successful portraits by him of Socrates and Aisop, as well as of Alexander, we are driven to believe that one of the forces of which he was conscious within himself was that of seizing the spiritual expression and making it illumine faces and forms which under other conditions would be more or less repulsive. This in fact is confirmed by the head of Alexander in the British Museum (fig. 11 supra). But with the possession of this force it is difficult to reconcile the tradition of his having taken as his model the Doryphorus of Polycletus, the style of which may be seen in the bronze statuette fig. 6 in the article ARCHOLOGY, and, to a less extent, in fig. 7 of the same article. There everything turns on the refinements of physical form. It is admitted that Lysippus introduced great changes in the accepted rules for the proportions of

the human figure, and from a number of sculptures traceable to his time, or shortly after his time, it is not only obvious but strikingly in contrast with earlier works that the legs are made long and massive while the body is proportion- ately shortened, though still retaining a very powerful rendering of the forms. Among the best examples of this are two bronze statuettes of Neptune and Jupiter in the British Museum found at Paramythia in Epirus, or, less satisfactory, the larger brouze of Hercules from Byblus, also in the British Museum. In these cases the limbs and various parts of the figure are studied with extreme skill worthy of the best time. Yet the combined effect is such as to do away with the impassive beauty which is ascribed to Polycletus, and to replace it witha beauty of expression so far as was consistent with powerful physical form. One of his works famed in antiquity was a bronze statuette of Hercules, called Epitrapezius, because, as the story goes, Alexander the Great carried it with him to be placed

always on his table. A copy of this, in stone, enlarged somewhat from the original, was obtained by the British Museum from Babylonia in 1881. It is signed with the name of an artist, Diogenes, apparently otherwise un-known, and it bears clearly the evidence of having been copied from a work in bronze. But except in the face, which is carefully executed (‘“ argutize operum custodite in minimis quoque rebus” is said of Lysippus by Pliny, Wat. Iist., xxxiv. 65), the sculpture is poor and could not be quoted as illustrating any particular style of art, though not inconsistent with the characteristics of Lysippus) With reference to the marble statue of Alexander the Great in Munich, standing with one foot raised on a helmet, it is clear that this affected attitude, which occurs in several other existing statues, such as the so-called Jason in Lansdowne House, cannot fairly be traced to the invention of Lysippus, since it is to be found twice on the frieze of the Parthenon. At the same time the merit may belong to him, as has recently been claimed, of having first applied this attitude in producing a new type of the god Neptune for his temple on the isthmus of Corinth. It was a bolder step to apply this attitude to a draped female figure as in the existing statues of the Muse Melpomene standing with one foot raised on a rock, and if this was really introduced into art by Lysippus it would confirm to some extent his reputation for novelties of representation. But at present we cannot do more than say that he is known to have niade a group of the Muses for the town of Megara, and that several statues still exist representing a Muse in an attitude corresponding with that of the Alexander in Munich, which is reasonably inferred to be a copy from a work of Lysippus. If it could be proved that in these cases Lysippus had worked upon Athenian types, we should then understand how it happens that in.some respects he was in ancient times classed with the Athenian Praxiteles (Quintilian, xii. 10, 9, “ad veritatem Lysippum ac Praxi- telem accessisse optime affirmant”), and is still compared with him so far as the remaining works of both, or copies therefrom, enable a comparison to be made.

See Kekulé, Ueber den Kopf des Praxitelischen Hermes, Stuttgart, 1881; Lange, Das Motiv des aufgestiitaten Fusses, Leipsic, 1879.

LYTE, Henry Francis (1793-1847), a well-known hymn-writer, was born at Kelso, June 1, 1793, received his early education in Ireland, and entered

Trinity College, Dublin, in 1812, becoming a scholar of that college in the following year. Having entered deacon's orders in 1818, he for some time held a curacy near Wexford. He did not long remain in Ireland, however, chiefly because of infirm health; and, coming to England, after several changes he finally, in 1823, settled in the parish of Brixham, where he laboured until fatal illness inter- rupted his work. In 1844 his health, uever robust,

gave way; and he died at Nice on the 20th November,

1847.

Lyte's first work was Tales in Verse illustrative of several of the Petitions in the Lord's Prayer, which was completed during a period of rest at Lymington, but was not published till the year 1826 ; it drew a word of warm commendation from a competent critic in the Noctes Ambrosiane. He next published a volume of Poems, chiefly Religious, in 1833, and in the following year a little collection of psalms and hymns entitled The Spirit of the Psalms. These pro- ductious were drawn froin various sources, but many were his own ; and the idea of the book was to express, in language spccially accordant with Christian experience, the leading thonghts contained in the Psalter. Probably one of the best productions of Lyte's pen wasa finely appreciative memoir of Henry Vaughan, the "Silurist,' which he prefixed to an edition of his works. After his death, a volume of Remains with a memoir was published, and the poems contained in this, with those in Poems, chiefly Religious, were after- wards issued in one volume. In the region of pure poetry Lyte cannot be said to have taken any special rank ; refinement and pathos, rather than great imaginative power, were the chief marks of his work. As a divine he was evangclical in doctrine, but his ecclesiastical sympathies were with the Oxford school; as a preacher he was simple, earnest, and graccful in style; but his chief claim to remembrance lies in the beauty and spiritual elevation of his hymns, some of which may be said to have become classical. The best known are " Abide with mc! fast falls the eventide''; "' Jesus, I my cross have taken"; " Praise, my soul, the King of Heaven "; and '* Pleasant are thy courts above."

LYTTELTON, Georcs, Lorp (1709-1773), statesman and man of letters, born at Hagley, Worcestershire, in 1709, was adescendant of the great THomAs DE LITTLETON (q.v.), and the eldest son of Sir Thomas Lyttelton, Bart., who at the Revolution of 1688 and during the following reign was one of the ablest Whig debaters of the House of Commons. Lyttelton was educated at Eton and Oxford, and in 1728 set out on the grand tour, spending consider- able periods at Paris and Rome. On his return to England he sat for Okehampton, Devonshire, beginning public life in the same year with Pitt; and from 1744 to 1754 he held the office of a lord commissioner of the treasury. In 1755 he succeeded Legge as chancellor of the exchequer, but in the following year he quitted office, on which oc- casion he was raised to the peerage as Lord Lyttelton, baron of Frankley, in the county of Worcester. In the political crisis of 1765, before the formation of the Rock- ingham administration, it was at one time suggested that he might be placed at the head of the treasury, but he firmly declined to take part in any such scheme. The

closing years of his life were devoted chiefly to literary:

pursuits. He died on August 22, 1773.

Lyttelton's earliest publication (1735), Letters from a Persian in England to his Friend at Ispahan, appeared anonymously. Much greater celebrity was achieved by his Observations on the Conversion and Apostleship of St Paul, also anonymous, published in 1747. It takes the form of a letter to Gilbert West, and is designed to show that St Paul's conversion is of itself a sufficient demonstration of the divine character of Christianity. The drift of the argument is that it is equally ineonceivable that the apostle could have been the vietim or the originator of a cheat, and that therefore he must have been divinely inspired. It is interesting to know that Dr Johnson regarded the work as one ''to which infidelity has never been able to fabricate a specious answer." Lord Lyttelton's Dialogues of the Dead, a creditable performance, though hardly rivalling either Lucian or Landor, appeared in 1760. His History of Henry IT. (1764-67), the fruit of twenty years' labour, is not now cited as an authority, but is painstaking and fair. Lyttelton was also a writer of verse; his Afonody on his wife's death has been praised by Gray for its elegiac tenderness, and his Prologue to the Coriolanus of his

friend Thomson shows genuine feeling. He was also the author of the well-known stanza in the Casile of Indolence, in which the poet himself is described. _A complete col- lection of the Works of Lord Lyttelton was published after his death by his nephew, G. E. Ayscough. See Memoirs and Corre- spondence of Lord Lyttelton, 1734-1773 (2 vols., 1845).

LYTTON, Epwarp Georce Earte Lytton BuLWER Lytton, Baron (1805-1873), novelist, dramatist, poet, politician, miscellaneous essayist, the most versatile writer and one of the most active and widely discursive theorizers of his generation, was born in May 1805, the youngest of

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the three sons of General Bulwer, of Heydon Hall and Wood Dalling, Norfolk. He was a few months younger than Benjamin Disraeli; the two lives acted not a little one on the other, and offer many curious points of like- ness and contrast. Bulwer's father died when he was two years old ; the care of the boy devolved on his mother, one of the Lyttons of Knebworth, Hertfordshire, whose name he afterwards assumed. To this devoted and accomplished mother he always expressed the warmest gratitude for his early training. He was not sent to a public school ; he was educated privately.

In his -novels and essays he often discusses the advantages and disadvantages of public schools. One thing is tolerably certain—that if he had been sent to a public school he would not have published at the age of fifteen a volume of poems (Jsmael, an Oriental Tale, with other Poems, 1820). Generous sentiment and eager love of fame are more conspicuous in these juvenile productions than metrical faculty. One of the poems dwells warmly on the ancient glories of the house of Lytton; the volume as a whole is dedicated to "the British public—that generous public who have always been the fosterers of industry or genius, who have always looked forward from the imperfections of youth to the fruits of maturity." The youthful poet criticizes Byron from the point of view of a respectable household ; but, though he seems to have been taught to make Pope, Gray, and Collins his models, the Byronic influence is very apparent both in phrase and in sentiment. In the local colouring of the ' Oriental Tale " he gives promise, afterwards amply fulfilled, of painstaking study of his materials; and

‘‘Geraldine, or the Fatal Boon,” gives a good foretaste of his fertility in the invention of romantic incident.

At Cambridge, in 1825, Bulwer won the chancellor’s medal with a poem on “Sculpture.” In 1826 he printed for private circulation Weeds and Wild Flowers. In 1827 he published O’Neill, or the Rebel, a romance, in heroic couplets, of patriotic struggle in Ireland, dedicated to Lady Blessington. These juvenilia, and also a metrical satire, The Siamese Twins, issued in 1831, he afterwards ignored, describing Zhe New Timon as his first publication in verse, with the exception of his dramas and translations from Schiller.

Bulwer’s first romance, Falkland, published anonymously in 1827, was in the vein of fantastic German romance popular at the beginning of the century, and did not bring him the fame that he coveted so ardently. It was other- wise with Pelham, published in the following year. In this he went with the native stream of fiction, and at once made himself felt as a power. For two or three years before he wrote Pelham, the books of the season had been novels of remarkable freshness and brilliancy dealing with fashionable life—Plumer Ward’s now forgotten but then much-talked-of Z’remaine, Theodore Hook’s Sayings and Doings, Lister’s Granby, Disraeli’s Vivian Grey. With these brilliant celebrities Bulwer, always a chivalrous emulator of whatever was famous, entered into direct com- petition, and at once became at least their equal in popular favour. If we compare this his first novel with any of his last productions, he strikes us as having attained at a bound to the full measure of his powers. That he wrote Pelham at twenty-two is a much more remarkable fact than that he wrote ballads at five. The plot is not perhaps so closely woven together as in The Parisians, but the variety of character introduced from high life, low life, and middle life is quite as great. He had evidently been fascinated by Wilhelm Meister, and the central purpose of his story is to run the hero through an apprenticeship like Wilhelm’s. All kinds of human beings and all their works are interest- ing to Pelham, the man of fashion, the bustling statesman,

the selfish epicure, the retiring scholar, the reckless rogue and vagabond, the melodramatic Byronic man of mystery ; and his adventures are so contrived as to bring him in contact with many different types. The novel might have been called The Londoners ; most of the criticisms of life and books in England and the English, published in 1833, may be found in Pelham, delivered through the mouths of various characters. These characters are great talkers; no subject, from a rare dish or a nicety of costumé to a painting or a philosophical treatise, is strange to them. And, curiously enough, the judgments of the youth of twenty-two are as mature, as large, catholic, generous, widely sympathetic, as those of the sage of sixty-six, and his knowledge of men and books hardly less extensive. Pelham displayed—in the literal sense of the word—

extraordinary vivacity of intellect and range of interest. |

The author was yet to prove that with his wonderful | powers of reading, observing, and reflecting was combined

a faculty rarely found in union with such gifts, untiring rapidity of production. In the preface to his juvenile '"Tsmael," he speaks of a habit of his never to leave any- thing unfinished, and during his long life he began and finished many works in many different veins. Pelham was followed in quick succession by The Disowned (1828),

Devereux (1829), Paul Cliford (1830), Hugene Aram and |

Godolphin (1833). Bulwer was deeply impressed with German theories of art ; all these novels were novels with a purpose, moral purpose, psychological purpose, historical purpose. To embody the leading features of a period, of a phase of civilization, to trace the influence of circum- stance on character, to show how the criminal may be reformed by the development of his better nature, and how men of fine nature may be led stage by stage into crime, to explain the secrets of success and failure in life —these, apart from the purely dramatic object of exhibiting inward struggles between the first conceptions of desires and their fulfilment, and between triumph and retribution, were his avowed aims as a novelist. He did not leave his purposes to the interpreter; he was a critic as well as a creator, and he criticized his own works frankly, and laboured to admit

other critics to a fair point of view. It was perhaps a tribute to the intrinsic interest of his plots, characters, and

descriptions that he was under the necessity of begging |

attention to these higher aims. In Zhe Pilgrims of the Rhine (1834), a work of graceful fantasy, in which some of his most acute observations on human life are incorporated with the sayings and doings of elves and fairies, an ambitious author is made to complain that ‘the subtle aims that had inspired him were not perceived,” and that he was often approved for what he condemned himself. The Pilgrims, charmingly written in many passages, was too German in its combination of serious thought and mundane personages with fairies to be heartily welcomed by the English public. Bulwer was more successful in another attempt to break new ground in The Last Days of Pompeu (1834) and Rienzi (1835). No historical romances dealing with times and scenes so remote were ever more widely popular in England, and in aiming at popularity the author laboured hard to secure historical accuracy. In Athens, ats Rise and Fall (1836), we re- ceived in the form of historical essays what had probably been acquired industriously as materials for romance. Two romances from Spanish history, Leila and Calderon, published in 1838, aimed at a less realistic treatment, and, with all their purely literary excellences, were not so popu- lar. In Ernest Maltravers (1837) and its sequel Alice, or The Mysteries (1838), the novelist returned to English ground and psychological and social problems —“ the affliction of the good, the triumph of the unprincipled.” Critics to whom he failed to make the full purpose of

_ stamp duties.

TON

these works apparent in the execution complained of the low tone of their morality, a fair complaint concerning most exhibitions of vice as a warning.

To his other literary labours Bulwer superadded for some time the editorship of a magazine. He succeeded Campbell as editor of Zhe New Monthly in 1833. In 1838 he projected a magazine called Zhe Monthly Chronicle, and coutributed to it as a serial story the fantastic romance

“‘Zicci.” The magazine expired before the story was com- pleted, and it was afterwards developed into Zanoni, a romance of which he was himself especially proud, and which suffered in public estimation from being tried by realistic standards.

During the most productive period of his literary life Bulwer was an eminent member of parliament. He was returned for St Ives in 1831, aud sat for Lincoln from 1832 to 1841. He spoke in favour of the Reform Bill, and took the leading part in obtaining the reduction, after vainly trying to procure the repeal, of the newspaper His support of the Whigs in parliament, and by a pamphlet on “the crisis” when they were dismissed from office in 1834, was considered so valuable that Lord Melbourne offered him a place in the administra- tion. His intimacy with Radical leaders at this period exposed him to an undeserved charge of tergiversation when later in life he was a member of a Conservative Govern- ment. Charles Buller and Charles Villiers were among his friends at Cambridge ; he was an admiring student of Bentham ; Mill’s Hssay on Government was the text-book on which was founded ‘“ Pelham’s ” instruction by his uncle in the principles of politics ; J. 8. Mill contributed the substance of the appendices to England and the English, on Bentham and Mill; Godwin suggested to him the subject and some part of the plot of Hugene Aram; he even succeeded in winning the good opinion of Miss Martineau ; but we have only to read his speech in favour of the Reform Bill to see that it was the situation that had changed and not the man when he assailed the repeal of the corn laws, and took office under Lord Derby. Bulwer’s leading political aim, like his leading artistic aims, was early formulated, and the formula governed all his political reasoning : it was to “ aristocratize the community,” “to elevate the masses in character and feeling to the standard which conservatism works in aristocracy,” a standard not of wealth or pedigree but of “superior education, courte- ous manners, and high honour.” Hence it was “social reforms” from first to last that enlisted his interest, and he sought the motive power for these reforms in the public spirit of the classes enfranchised by the Reform Act of 1832.

There was a slight break in Bulwer’s career as a novelist between 1838 and 1847. During this interval he ap- plied himself enthusiastically to play writing,—Macready’s management of Covent Garden having inspired men

of letters with the hope of reconciling poetry with the stage. In 1836 he had produced The Duchess of La Valhére. It was a failure. But in 1838 and the two following years he produced three plays which have kept the stage ever since—The Lady of Lyons, Richelieu, and Money. In his plays as in his novels definite theory preceded execution. The principles on which he wrote his plays were laid down in his chapter on the drama in Hugland and the English. For many of the details of stagecraft, all-important to success under any principles, he is said to have been indebted to Macready. No Englishman not himself an actor has written so many permanently successful plays as Bulwer Lytton, and this is another instance of his extraordinary plasticity of mind and practical insight. Thirty years afterwards, in 1869, he turned his thoughts again to writing for the stage, recast an old failure with a

iy new title The Rightful Heir, and produced a new comedy, Walpole. Neither was a success.

From 1841 to 1852 Bulwer (he assumed his mother's name of Lytton on succeeding to her estates in 1843) had no seat in parliament. But the issue of novels and romances was not so rapid as it had been in the full energy of his youth. Before 1849, when he opened a new vein with The Caxtons, he produced five works in his familiar vein :—WNight and Morning (1841, in which the influence of Dickens is traceable), Zanont (1842), The Last of the Barons (1843, the most historically solid, and perhaps the most effective of his romances), Lucretia, or the Children of the Night (1847; moral purpose —to exhibit the horrors caused by the worship of money; popular effect—disgust at these horrors, and indignation at the author's sentiment as morbid), Harold, The Last of the Saxon Kings (1848).

The cause of the comparative infertility of this period in prose fiction probably was that Lytton was now makiug a determined effort to win high rank as a poet. He published a volume of puems in 1842, a volume of transla- tions from Schiller in 1844, The New 7%imon, a satire, in 1845.4 Then came the work on which mainly Lytton rested his pretensions, King Arthur, a romantic epic. "I ani unalterably convinced," he said, '' that on this founda- tion I rest the least perishable monument of those thoughts and those labours which have made the life of my life." But King Arthur fell

flat. The verse, the six-lined stave of elegiac quatrain and couplet, lacks charm and variety; the incidents are monotonous, the personages uninteresting, the plot unexciting, and the allegory obscure. St Stephen's, a gallery of parliamentary portraits from the time of Queen Anne, was a kind of metrical composition that lay more within his powers. In this the satire is keen-edged, the admiration just and generous. It was published in 1860. The Lost Tales of Miletus (1866) and a translation of Horace's Odes (1869) were Lytton's last essays in verse.

In the skill with which he sustained a new style in Zhe Caxtons (1848) Lytton gave a more convincing proof of his versatility. This imitation of Sterne (by no means a servile imitation, rather an adaptation of Sterne's style and vharacters to the circumstances of the 19th century) ap- peared anonymously in Blackwood's Magazine, and made a reputation before the authorship was suspected. My Novel (1853) and What will He Do with It? (1858) continued in the same strain. The sub-title of Jfy Novel, " Varieties of English life," shows still operative the same purpose that we findin Pelham, but the criticism of the " Varieties " is more polemical in spirit. There is more than a shade of defiance in his praise of the virtues of a territorial aristocracy, and a strong spice of hostility to the vulgarities of the manufacturers who threatened to push them from their stools. There isa blindness to defects in the one case and to merits in the other quite foreign to the broad sympathies of the dandy Pelham; Caxton paints the ideal best of the one class and the ideal worst of the other. In these, as in all Lytton's novels, the characters are placed on the stage and described ; they are not left to reveal themselves gradually in action.

Lytton returned to parliament in 1852 as member for Hertfordshire, and sat on the Conservative side. Early in life he had decided in his mind against the reduction of the corn duties, and, unchanged in 1851, he addressed a "Letter to John Bull," enlarging on the dangers of their repeal. Incapable of failure in any intellectual exercise that he set his mind to, he was an effective speaker ; but the effort was against nature: he could speak only under extreme excitement or after laborious preparation, and he

1 A feeble attack in the last on Mr Tennyson's poetry provoked a brusque but powerful reply from the enraged laureate, aimed at his assailant's

person.

never took a high place among parliamentary orators. He was colonial secretary in Lord Derby's Government from 1858 to 1859, and threw himself industriously into the duties of his office. He was raised to the peerage as Baron Lytton in 1866.

That he had not forgotten his power of moving the sense of melodramatic and romautic mystery when he adopted the more subdued style of The Caxtons, Lytton proved by A Strange Story, contributed to All the Year Round in 1862. A serial story of the kind made a new call on his resources, but he was equal to it, and fairly rivalled the school of Dickens in the art of sustaining thrilling interest to the close.

When he died, in January 1873, after a short painful illness, two works of high repute, The Coming Race and The Parisians, were not acknowledged, and were only vaguely suspected to be his. They had freshness enough to be the work of youth, and power enough to shame no veteran. These two books, the fable and the novel, are classed by Lytton's son and successor in the the title with the romance of Kenelm Chillingly, left completed at his death, as forming a trilogy, animated by a common purpose, to exhibit the influence of "'modern ideas" upon character and conduct. The moulding force whose operation is traced in The Parisians is the society of imperial and democratic France, in Chillingly the society of England in relation to its representative institutions. The leading purpose is kept well in view throughout both works, and the tendencies to corruption analysed and presented with admirable skill ; but the theorist has omitted from his problem certain important regenerating and safeguarding factors in the large world outside the pale of society. Problems and theories apart, these last works show no falling off of power ; he is as vivid as ever in description, as fertile as ever in the invention of humorous and melodramatic situa- tion. If he had been content to abandon his purpose in Chillingly, and end with the first volume by some such commonplace contrivance as giving " motive power" to his hero in the love of Cecilia Travers, it would have been the most perfect of his works in unity of humorous senti- ment. The veteran

author died in harness,—two novels all but completed ; another, an historical romance, Pauwsanias the Spartan, outlined and partly written.

The fact that in the fiftieth year of his authorship, after publishing at least fifty separate works, most of them popular, Lord Lytton had still vigour and freshness enough to make a new anonymous reputation with 7'he Coming Race would seem to indicate that critics had not fairly gauged his versatility, and also that an erroneous fixed idea had been formed of his style. The explanation prob- ably is that even after the publication of Zhe Caxtons he was thought of in connexion with that school of melodramatic romance of which he was indisputably the leader, if not the founder, and that heavily loaded rhetorical style which was made ridiculous by his imitators. ‘‘ Every great genius," one of his characters is made to say, ‘‘ must deem himself alone in his conceptions. It is not enough for him that these conceptions should be approved as good, unless they are admitted as inventive." Invention and originality are matters of degree, and, though no one can deny that Lytton possessed great inventive powers, he did not put that individual stamp on his work without which no writer is entitled tu a place in the foremost rank. He was not self-centred enough; he was too generally emulous to win the highest individual distinction. But his fresh- ness of thought, brilliancy of invention, breadth and variety of portraiture, gave liim a just title to his popularity, and, with all allowance for superficial affectations, his generous nobility of sentiment made his influence as wholesome as it was widespread. (WwW. M.)

M

THE letter M denotes a nasal sound, which varies M. little, if at all, in different languages.

Nasal sounds are produced as follows. The breath— turned into voice at its passage through the glottis—does not pass out wholly through the mouth. Part of it is diverted behind the soft palate, and so through the nostrils ; the remainder passes through the mouth-cavity, and is there completely checked at some point of its course. When that check is taken away, we hear, not the sonant which would have been produced if all the breath had passed

through the mouth, but a nasal varying in nature according to the part of the cavity where the check of the tongue or the lips has been applied. There may be as many definite nasal sounds in any language as there are recognized classes of consonants, as guttural, palatal, dental, labial. In Sanskrit there were even five nasal sounds so clearly differentiated that each had a special symbol to denote it; the cerebral class of sounds (produced by turning the tip of the tongue slightly back against the middle of the palate) had its nasal as well as each of the other four classes above mentioned. In English we have three sounds, but only two simple symbols, m and x ; for the guttural nasal heard in sing, &c., we employ the digraph ng. Spanish has a palatal nasal.

The nasal sound denoted by M is the labial nasal. It corresponds to the sonant b-sound ; for each of them the lips are completely closed, and if no voice were diverted through the nostrils a b-sound only would be heard when the lips are opened; all the organs of the mouth are in exactly the same position for one sound as for the other, but, tle soft palate being lowered, the voice is divided in its egress. Hence we see why a man who has a cold pronounces m as 6; the voice cannot get through the nostrils, which are blocked up; it must therefore escape mainly or entirely through the lips, and so produce a b-sound. Therefore, instead of “talking through his nose,” as the phrase goes, such a person tries to talk through his nose, but cannot.

The symbol M stands in numeration for 1000. ALPHABET.

MAAS. See MEuseE.

MABILLON, Jean (1632-1707), the learned and dis- criminating historian of the Benedictine order, was born at the village of Saint Pierremont, Champagne (now in the department of Ardennes), on November 23, 1632. He received his early education from an uncle who held the post of village curé in the neighbourhood, and afterwards he went to Rheims, where, in 1653, he entered upon his noviciate in the Benedictine Abbey of Saint Remy, taking the vows in the following year. The following four years were spent at various houses of the order, to which he was sent on account of his health, impaired by excessive study. From 1658 to 1663 he was at Corbie, and in 1664 he assisted Chantelon at Saint Denis in the preparation of a new

edition of the works of St Bernard. Shortly after- wards he was removed to Saint-Germain-des-Prés, and charged with the task of editing materials which had already been amassed for a general history of the Benedic- tine order. While engaged on this work (Acta Sanctorum ordinis S. Benedicti in sxculorum classes distributa), the publication of which, in 9 vols. folio, extended from 1668 to 1701, he made several journeys, for literary research, into Germany and Italy, as well as into the provinces of France ; amongst the more important of the numerous monographs to which his investigations gave rise, the work

See

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De ke Diplomatica, which appeared in 1681, deserves special mention (see DipLomatics). Mabillon died at Saint-Germain-des-Prés, on December 27, 1707.

For a complete list of his works reference may be made to Bayle's Dietionnaire, or to the Biographie Générale. They include, be- sides those mentioned above, Vetera Analecta, 1675-85 (a work similar in character to the Miscellanea of Baluze); Animadversioncs in Vindieias Kempenses, 1677 (in which he claims the Jmitatio for Gersen); De Liturgia Gallicana, 1685; Museum Italicum, 1687-89 ; and Annales Ordinis S. Benedieti, 6 vols. fol., 1708-89.

MABINOGION. See Cettic LITERATURE, .vol. v. p.

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MABUSE. See Gossart.

MACAO (A-Ma-ngao, " Harbour of the goddess A-Ma"; Portuguese, Jfacaw), a Portuguese settlement on the coast of China, in 22° N. lat. and 132° E. long., consists of a tongue of land 14 square miles in extent, running south-south-west from the island of Hiang Shang (Portuguese, Angam) on the western side of the estuary of the Canton river. Bold and rocky hills about 300 feet in height occupy both extremities of the peninsula, the picturesque-looking city, with its flat-roofed houses painted blue, green, and red, lying in the far from level stretch of ground between. The forts are effective additions to the general view, but do not add much to the real strength of the place. Along the east side of the peninsula runs the Praya Grande, or Great Quay, the chief promenade in Macao, on which stand the governor's palace, the administrative offices, the consulates, and the leading commercial estab- lishments. The church of St Paul, erected between 1594 and 1602, the seat of the Jesuit college in the 17th century, was destroyed by fire in 1835. The Hospital da Misericordia (1569) was rebuilt in 1640. The Camoens grotto—where the exiled poet found leisure to celebrate the achievements of his ungrateful country—lies in a secluded spot to the north of the town, which has been partly left in its native wildness strewn with huge granite boulders and partly transformed into a

fine botanical garden. In 1871 there were in Macao 5375 persons of European birth or extraction, 53,761 Chinese living on land and 10,268 in boats. Half-castes are very numerous. Though most of the land is under garden cultivation, the mass of the people is dependent more or less directly on: mercantile pursuits; for, while the exclusive policy both of Chinese and Portuguese which prevented Macao becoining a free port till 1845-46 allowed what was once the great emporium of European commerce in eastern Asia to be outstripped by its younger and more liberal rivals, the trade of the place is still of very considerable extent. Since the middle of the century indeed much of it has run in the most questionable channels: the nefarious coolietraffic gradually increased in extent and in cruelty from about 1848 till it was prohibited in 1874, and much of the actual trade is more or less of the nature of smuggling. The total value of exports and imports was in 1876-77 upwards of £1,536,000. Commercial intercourse is most intimate with Hong-Kong, Canton, Batavia, and Goa. The pre-paration and packing of tea is the principal industry in the town. Thecolonial revenue, which is largely recruited by a tax on the notorious gambling tables, increased from 104,643 dollars in 1856-57 to 380,012 in 1872-73, while the expenditure rose from 69,757 to 266,344. –

In 1557 the Portuguese were permitted to erect factories on the peninsula, and in 1578 the Chinese built the wall across the isthmus which still cuts off the barbarian from the rest of the island. Jesuit missionaries established themselves on the spot, and in 1580 Gregory XIII. constituted a bishopric of Macao.

organized in 1583, and in 1628 Jeronimo de Silveira became first royal governor of Macao. Still the Portuguese remained largely under the control of the Chinese, who had never surrendcred their territorial rights and iaintained their authority by means of mandarins,—these insisting that even European criminals should be placed in their hands. Ferreira do Amaral, the Portuguese governor, put an end to this state of things in 1849, and left the Chinese officials no more authority in the peninsula than the representatives of other foreign nations; and, though his antagonists procured his assassination (August 22d), his successors have succeeded in carrying out

his policy. The Chinese Govern- ment has hitherto refused (notably in 1862) to recognize the terri- torial claims of the Portuguese ; but the European powers treat Macao as de fucto a colonial possession, and not only the governor, the president of the courts, and other Portuguese officials, but even the Chinese magistrates, are directly appointed by the king of Portugal. For a short time in 1802, and again in 1808, Macao was occupied by the English as'a precaution against seizure by the French.

See De Beauvoir, Voyage Round the World, 1870; Wiselius, ' Macausche toestanden," in 7ijds. van het Aardr. Gen., 1877 ; Relatorio e documentos sobre a abolig¢do da emigragdo de Chinas contratados em Macau, Lisbon, 1874; English

parliamentary papers on the coolie trade, 1874; Biker, Afem. sobre o estabeleci- mento de Mucau, Lisbon, 1879,

MACARONI (from dialectic Italian maccare, " to bruise or crush ") is a preparation of wheat originally peculiar to Italy, in which country it is an article of food of national importance. The same substance in different forms is also known as vermicelli, pasta or Italian pastes, taglioni, fanti, &c. These substances are prepared from the hard semi-translucent varieties of wheat which are largely culti- vated in the south of Europe, Algeria, and other warm regions, and which are distinguished by the Italians as grano duro or grano da semolino, Hard wheats are much richer in gluten and other nitrogenous compounds than the soft or tender wheats, and their preparations are more easily preserved, to which conditions their suitability for the manufacture of Italian pastes are mainly due. The various preparations are met with in the form of fine thin

threads which constitute vermicelli, so called from its.

thread-worm like appearance, thin sticks and pipes (macaroni), small lozenges, stars, disks, ellipses, &c. (pastes), and ribbons, tubes, and other fanciful forms. These various forms are prepared in a uniform manner from a granular meal of hard wheat which itself, under the name of semolina or semola, is a commercial article. The semolina is thoroughly mixed and incorporated into a stiff paste or dough with boiling water, and in the hot condition it is placed in a strong metallic cylinder, the end of which is

closed with a thick disk pierced with openings which correspond with the diameter or section of the article to be made. Into this cylinder an accurately fitting plunger or piston is introduced, and by very powerful pressure it causes the stiff dough to squeeze out through the openings in the disk in continuous threads, sticks, or pipes, as the case may be. When pipe or tube macaroni is being made, the openings in the disk are widened internally, and mandrels, the gauge of the tubes to be made, are centred inthem. In making pastes the cylinder is laid horizontally, the end is closed with a disk pierced with holes having the sectional form of the pastes, and a set of knives revolves close against the external surface of the disk, cutting off the paste in thin scctions as it exudes from each opening. Macaroni is dried rapidly by hanging it in long sticks or tubes over wooden rods in stoves or heated apartments through which currents of air are driven. It is only genuine macaroni, rich in gluten, which can be dried in this manner ; spurious fabrications made with common flour and coloured to imitate the true material will not bear their own weight. Imitations must therefore be laid out flat and dried slowly, during which they very readily split and break up, while in other cases they become mouldy on the inside of the tubes. rue macaroni can be distinguished by observing the flattened mark of the rod over which it has becn dried within the bend of the tubes ;

it has a soft yellowish colour, is rough in texture, elastic, and hard, and breaks with a smooth glassy fracture. In boiling it swells up to double its original size without becoming pasty or adhesive, maintaining always its original tubular form without either rupture or collapse. It can be kept any length of time without alteration or deteriora- tion, and it is on that account, in many circumstances, a most convenient as well as a highly nutritious and healthful article of food. In its various forms it is principally used as an ingredient in soups, and for the preparation of puddings, with cheese, &c. Many of the good qualities of genuine macaroni may be obtained by enriching the flour of common soft wheat with gluten obtained in the prepara- tion of wheaten starch, and procecding as in the case of semolina. Such imitations, and others of inferior quality, are extensively made both in France and Germany.

MACARTNEY, Grorcr Macartney, Ear or (1737- 1806), was descended from an old Scotch family, the Macartneys of Anchinleck, who had settled in 1649 at Lissanoure, Antrim, Ireland, where he was born May 13, 1737. After graduating at Trinity College, Dublin, in 1759, he became a student of the Inner Temple, London. Appointed envoy-extraordinary to Russia in 1764, he suc- ceeded in negotiating an alliance between England and that country. After for some time occupying a seat in the English parliament, he was in 1769 returned for Armagh in the Irish parliament, in order to discharge the duties of chief secretary for Ireland. On resigning this office he received the honour of knighthood. In 1775 he became governor of Granada, in 1780 governor of Madras, and in 1785 he was appointed governor-general of Bengal, but, his health demanding his return to England, he declined to accept office. After being created earl of Macartney in the Irish peerage, he was appointed in 1792 the first envoy of Britain to China. On his return from a confidential mission to Italy he was raised to the English peerage in 1796, and in the end of the same year was appointed governor of the newly acquired territory of the Cape of Good Hope, where he remained till ill health compelled him to resign in November 1798. He died at Chiswick, Surrey, 31st March 1806.

An account of Macartney's embassy to China, by Sir Gcorge Stauuton, was published in 1797, and has been frequently re- printed. See also Life and Writings of Lord Macartney, by Barrow, 2 vols., London, 1807.

MACASSAR. See Crzses, vol. v. p. 288.

MACAULAY, Tuomas Basineton Macautay, Lorp (1800-1859), was born at Rothley Temple, Leicestershire, on the 25th of October 1800. His father, Zachary Macaulay, had been governor of Sierra Leone, and was in 1800 secretary to the chartered company who had founded that colony. Happy in his home, the boy at a very early age gave proof of a determined bent towards literature. Before he was eight years of age he had written a Compendium of Universal History, which gave a tolerably connected view of the leading events from the creation to 1800, and a romance in the style of Scott, in three cantos, called the Battle of Cheviot. Ata little later time the child composed a long poem on the history of Olaus Magnus, and a vast pile of blank verse entitled Fingal, a Poem in Twelve Books.

The question between a private and a public school was anxiously debated by his parents, and decided in favour of the former. The choice of school, though dictated by theological considerations, was a fortunate one. Mr Preston of Little Shelford enjoyed the confidence of Mr Simeon, but was himself a judicious tutor ; and at his table, where master and pupil dined in common, not only the latest Cambridge topics were mooted, but university ambitions and ways of thought were brought home to the boys.

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In October 1818 young Macaulay went into residence at Trinity College, Cambridge. Here he revelled in the possession of leisure and liberty, which he could not forego for the sake of those university honours which at that day were only to be obtained by a severely exclusive course of mathematical study. But he succeeded in obtaining the prize which in his eyes was the most desirable that Cambridge had to give, viz. a fellowship at Trinity. A trifling college prize for an essay on the character of William III. was awarded to an essay by young Macaulay, which may be regarded as the first suggestion and the earnest of his future History.

In 1826 Macaulay was called to the bar and joined the northern circuit. But after the first year or two, during which he got no business worth mention, he gave up even the pretence of reading law, and spent many more hours under the gallery of the House of Commons than in the court. His first attempt at a public speech, made at an anti-slavery meeting in 1824, was described by the Edinburgh Review as “a display of eloquence of rare and matured excellence.” His first considerable appearance in print was in No. 1 of Knight’s Quarterly Magazine, a periodical which enjoyed a short but brilliant existence, and which was largely supported by Eton and Cambridge. In August 1825 began Macaulay’s connexion with the periodical which was to prove the field of his literary reputation. The Hdinburgh Review was at this time at its height of power, not only as an organ of the growing opinion which leant towards reform, but as a literary tribunal from which there was no appeal. The essay on Milton, though so crude that the author said of it that “it contained scarcely a paragraph such as his matured judgment approved,” created for him at once a literary reputation which suffered no diminution to the last, a reputation which he

established and confirmed, but which it would have been hardly possible to make more con- spicuous. Murray declared that it would be worth the copyright of Childe Harold to have Macaulay on the staff of the Quarterly Review. Robert Hall, writhing with pain, and well-nigh worn out with disease, was discovered lying on the floor employed in learning by aid of grammar and dictionary enough Italian to enable him to verify the parallel between Milton and Dante. The family breakfast table was covered with cards of invitation to dinner from every quarter of London.

The sudden blaze of popularity kindled by a single essay, such as are now produced every month without attracting any notice, is partly to be explained by the dearth of literary criticism in England at that epoch. For, though a higher note had already been sounded by Hazlitt and Coleridge, it had not yet taken hold of the public mind, which was still satisfied with the feeble apprecia- tions of the Letrospective, or the dashing and damnatory improvisation of Wilson in Blackwood or Jeffrey in the Edinburgh. Still, after allowance made for the barbarous partisanship of the established critical tribunals of the period, it seems surprising that a social success so signal should have been the consequence of a single article. The explanation is to be found in the fact that it had been dis- covered at the same time that the writer of the article on Milton was, unlike most authors, also a brilliant converser. There has never been a period when an amusing talker has not been in great demand at London tables; but at the date at which Macaulay made his début witty conversa- tion was studied and cultivated as it has ceased to be in the more busy age which has succeeded. At the university Macaulay had been recognized as pre-eminent for talk and companionship among a circle of young_men of talents so brilliant as were Charles Austin, Romilly, Praed, Villiers, and others. He now displayed these gifts on a wider

. Continental travel.

theatre. Crabb Robinson’s diary, under date 1826, records the judgment of one who had been in the constant habit of hearing the best talk of the London of his day. Such as he was in 1826 Macaulay continued to be to the end. In Lord Carlisle’s journal, under date 27th June 1843, we read—

Breakfasted with Hallam, John Russell, Macaulay, Everett, Van de Weyer, Hamilton, Mahon. Never were such torrents of good talk as burst and sputtered over from Macaulay and Hallam.” Again, 11th October 1849, “the evening went off very pleasantly, as must almost always happen with Macaulay. He was rather paradoxical, as is apt to be his manner, and almost his only social fault. The greatest marvel about him is the quantity of trash he remembers.” In March 1850 Lord Carlisle records—“ Macaulay’s flow never ceased once during the four hours, but it is never overbearing.”

Thus launched (1825) on the best that London had to give in the way of society, Macaulay accepted and enjoyed with all the zest of youth aud a vigorous nature the oppor- tunities opened for him. He was courted and admired by the most distinguished personages of the day. He was admitted at Holland House, where Lady Holland listened to him with deference, and scolded him with a circum- spection which was in itself a compliment. Rogers spoke of him with friendliness, and to him with affection, and ended by asking him to name the morning for a breakfast party. He was treated with almost fatherly kindness by ** Conversation ” Sharp.

Thus distinguished, and justifiably conscious of his great powers, it was not unnatural that Macaulay’s thoughts should take the direction of politics, and his ambition aspire to a political career. But the shadow of pecuniary trouble early began to fall upon his path. When he went to college his father believed himself to be worth £100,000, and declared his intention of making him, in a modest way, an eldest son. But commercial disaster overtook the house of Babington and Macaulay, and the son now saw himself compelled to work for his livelihood. His Trinity fellowship of £300 a year became of great consequence to him, but it expired in 1831; he could make at most £200 a year by writing ; and a commissionership of bankruptcy, which was given him by Lord Lyndhurst in 1828, and which brought him in about £400 a year, was swept away, without compensation, by the ministry which came into power in 1830. Macaulay now found himself a poor man, aud was reduced to such straits that he had to sell his Cambridge gold medal.

In February 1830 the doors of the House of Commons were opened to him in the only way in which a man without fortune could enter them, through

what was then called a “pocket borough.” Lord Lansdowne, who had been struck by two articles on Mill (James) and the Utilitarians, which appeared in the Hdinburgh Review in 1829, offered the author the seat at Calne. The offer was accompanied by the express assurance that the noble patron had no wish to interfere with his freedom of voting. He thus entered parliament at one of the most exciting moments of English domestic history, when the compact phalanx of reactionary administration which for nearly fifty years had commanded a crushing majority in the Commons was on the point of being broken by the grow- ing strength of the party of reform. Macaulay made his maiden speech on 5th April 1830, on the second reading of the bill for the removal of Jewish disabilities. In July the king died and parliament was dissolved ; the revolution took place in Paris. Macaulay, who was again returned for Calne, visited Paris, eagerly enjoying a first taste of On lst March 1831 the Reform Bill was introduced, and on the second night of the debate Macaulay made the first of his reform speeches. It was a

signal success. Sir Robert Peel said of it that “ portions were as beautiful as anything I have ever heard or read.”

Encouraged by this first success, Macaulay now threw himself with ardour into the life of the House of Commons, while at the same time he continued to enjoy to the full the social opportunitics which his literary and _ political eclebrity had placed within his reach. For these reasons he dined out almost nightly, and spent many of his Sundays at the suburban villas of the Whig leaders, while he continued to supply the Ldinburgh Revew with a steady series of his most elaborate articles. On the triumph of Earl Grey’s cabinet, and the passing of the Reform Act in June 1832, Macaulay, whose eloquence had signalized every stage of the conflict, became one of the commissioners of the Board of Control, and applied himself to the study of Indian affairs. His industry was untiring, and the amount of intellectual product which he threw off very great. Giving his days to India and his nights to the House of Commons, he could only devote a few hours to literary composition by rising at five when the business of the House had allowed of his getting to bed in time on the previous evening. Between September 1831 and December 1833 he furnished the Review with the

following articles :—‘ Boswell’s Life of Johnson”; ‘“ Lord Nugent’s Hampden”; “Burleigh and his Times”; ‘‘ Mirabeau” ; “Horace Walpole”; ‘‘ Lord Chatham”; besides writing his ballad on the Armada for one of the Albums, annual publications of miscellanies then in fashion.

In the first reform parliament, January 1833, Macaulay took his seat as one of the two first members for Leeds, which up to that date had been unrepresented in thie House of Commons. He replied to O’Connell in the debate on the address, meeting the great agitator face to face, with high, but not intemperate, defiance. In July he defended the Government India Bill in a speech of great power, and to his aid was greatly due the getting the bill through committee without unnecessary friction. When the abolition of slavery came before the House as a practical question, Macaulay had the prospect of being placed in the dilemma of having to surrender office or to vote for a modified abolition, viz., twelve years’ apprentice- ship, which was proposed by the ministry, but condemned by the abolitionists. He was prepared to make thie sacrifice of place rather than be unfaithful to the cause to which his father had devoted his life. He placed his resignation in Lord Althorp’s hands, and spoke against the ministerial proposal. But the sense of the House was so strongly expressed as unfavourable that, finding they would be beaten if they persisted, the ministry gave way, and reduced apprenticeship to seven years, a compromise which the abolition party accepted; and Macaulay remained at the Board of Control.

While he was thus growing in reputation, and advancing his public credit, the fortunes of the family were sinking, and it became evident that his sisters would have no provision except such as their brother might be enabled to make for them. Macaulay had but two sources of income, both of them precarious—office and his pen. As to office, the Whigs could not have expected at that time to retain power for a whole generation ; and, even while they did so, Macaulay’s resolution that he would always give an independent vote made it possible that he might at any moment find himself in disagreement with his colleagues, and have to quit his place. As to literature, he wrote himself to Lord Lansdowne (1833), “it has been hitherto merely my relaxation ; I have never considcred it as the means of support. I have chosen my own topics, taken my own time, and dictated my own

terms. The thought of becoming a bookseller's hack, of spurring a jaded fancy to reluctant exertion, of filling sheets with trash merely

that sheets may be filled, of bearing from publishers and editors what Dryden bore from Tonson and what Mackintosh bore from Lardner, is horrible to me." Though pennyless, Macaulay could never be accused of playing the gaime of politics from selfish considerations. But it was impossible that, circumstanced as he was, he should not look with anxiety upon his own future and that of his sisters,— sisters who had been, and who had deserved to be, the intimate confidants of all his thoughts and doings, and to whom he was attached by the tenderest affection. He was thercfore prepared to accept the offer which was made him of a seat in the supreme council of India, a body which had bcen created by the India Act he had himself been instrumental in passing. The salary of the office was fixed at £10,000, an income out of which he calculated to be able to save in five years a capital of £30,000. His sister Hannah accepted his proposal to accompany him, and in February 1834 the brother and sister sailed for Calcutta.

Macaulay's appointment to India occurred at the critical moment when the government of the company was being superseded by goverument by the crown. His knowledge of India was, when he landed, but superficial. But at this juncture there was more need of statesmanship directed by general liberal principles than of a practical knowledge of the details of Indian administration. Macaulay's presence in the council was of great value; his minutes are models of good judgment and practical sagacity. The part he took in India has been described as "the applica- tion of sound liberal principles to a government which had till then been jealous, close, and repressive." He vindi- cated the liberty of the press; he maintained the equality of Europeans and natives before the law ; and as president of the committee of public instruction he inaugurated that system of national education which has since spread over the whole of the Indian peninsula.

A clause in the Indian Act of 1833 occasioned the appointment of a commission to inquire into the juris- prudence of our Eastern empire. Macaulay was appointed president of that commission. The draft of a penal

code which he submitted became, after a revision of many years, and by the labour of many experienced lawyers, that criminal code under which law is now administered throughout the empire. Of this code Sir James Stephen says that ‘it reproduces in a concise and even beautiful form the spirit of the law of England, in a compass which by comparison with the original may be regarded as almost absurdly small. The Indian penal code is to the English criminal law what a manufactured article ready for use is to the materials out of which it is made. It is to the French Code Pénal, and to the German code of 1871, what a finished picture is toasketch. It is simpler and better expressed than Livingston’s code for Louisiana ; and its practical success has been complete.”

As might be expected, Macaulay’s enlightened views and measures drew down on him the abuse and _ ill-will of Anglo-Indian society in Calcutta and the Mofussil. Fortunately for himself he was enabled to maintain a tranquil indifference to political detraction by withdrawing his thoughts into a sphere remote from the opposition and enmity by which he was surrounded. Even amid the excitement of his early parliamentary successes literature had balanced politics in his thoughts and interests. Now in his exile, for such he felt it to be, he began to feel more strongly each year the attraction of European letters and European history. He writes to his friend Ellis, “TI have gone back to Greek literature with a passion astonishing to myself. I have never felt anything like it. I was enraptured with Italian during the six months which I gave up to it ; and I was little less pleased with Spanish.

But when I went back to the Greek I felt as if I had never

known before what intellectual enjoyment was.” In thirteen months he read through, some of them twice, a large part of the Greek and Latin classics. The attention with which he read is proved by the pencil marks and corrections of press errors which he left on the margin of the volumes he nsed.

The fascination of these studies produced their inevitable effect upon his view of political life. He began to wonder what strange infatuation leads

men who can do something better to squander their intellect, their health, and energy on such subjects as those which most statesmen are engaged in pursuing. He was already, he says, “more than half determined to abandon politics and give myself wholly to letters, to undertake some great historical work, which may be at once the business and the amusement of my life, and to leave the pleasures of pestiferous rooms, sleep- less nights, and diseased stomachs to Roebuck and to Praed.”

In 1838 Macaulay and his sister Hannah, who had now become Lady Trevelyan, returned to England. He at once

he became secretary at war, with a seat in the cabinet in diverted him for a time from prosecuting the plan he had

time. In less than two years the Melbourne ministry fell, and Macaulay was liberated from having to support a Government wretchedly weak, and maintaining its struggle for bare existence.

He returned to office in 1846, in Lord John Russell’s administration. But it was in an office which gave him leisure and quiet rather than salary and power—that of paymaster-general. contact with official life and the obligations of parliamen- tary attendance were even of benefit to him while he was

| that year. already formed of a great historical work. But only for a

‘ malady which in the end proved fatal.

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M-A @A VU eee

forehead downwards wheu a burst of humour was coming, his massive features and honest glance suited well with the

‘manly sagacious sentiments which he set forth in his sonorous voice and in his racy and intelligible language.

To get at his meaning people had never the need to think twice, and they certainly had seldom the time.”

But, great as was his enjoyment of literary society and books, they only formed his recreation. In these years he was working with unflagging industry at the composition of his Zistory. His composition was slow, his corrections both of matter and style endless; he spared no research to ascertain the facts. He sacrificed to the prosecution of his task a political career, House of Commons fame, the allurements of society. The first two volumes of the ilstory of England appeared in December 1848. The success was in every way complete beyond expectation. The sale of edition after edition, both in England and the United States, was enormous.

In 1852, when his party returned to office, he refused

| a seat in the cabinet, but he could not bring himself to entered parliament as member for Edinburgh. In 1839 |

decline accepting the compliment of a voluntary amende

_which the city of Edinburgh paid him in returning him Lord Melbourne’s ministry. His acceptance of office |

at the head of the poll at the general election in July of He had hardly accepted the summons to return to parliamentary life before he was struck down by the This first betrayed itself in deranged action of the heart; from this time forward till his death his strength continued steadily to

sink. ‘The process carried with it dejection of spirits as

its inevitable attendant.

The thought oppressed him that

the great work to which he had devoted himself would

remain a fragment. His duties were very light, and the –

engaged upon his J/istory. In the sessions of 1846-47 he |

spoke only five times, and at the general election of July 1847 he lost his seat for Edinburgh upon issues which did

not reflect credit upon that constituency. Over and above >

any political disagreement with the constituency, there was the fact that the balance of Macaulay's faculties had now passed to the side of literature. Lord Cockburn wrote in 1846, "the truth is, Macaulay, with all his knowledge, talent, eloquence, and worth, is not popular. He cares more for his J/¢story than for the jobs of con- stituents, and answers letters irregularly and with a brevity deemed contemptuous." At an earlier date he had relished

went forward and absorption in the work of composition

had no longer the nerve to brace himself to the social efforts required of one who represents a large constituency.

Macaulay retired into private life, not only without regret, but with a sense of relief.

house visits, but he still enjoyed close and constant inter- course with a circle of the most emineut men that London then contained. At that time social breakfasts were in vogue. Macaulay himself preferred this to any other form of entertainment. Of these brilliant reunions nothing has been preserved beyond the names of the men who formed them,—Rogers, Hallam, Sydney Smith, Lord Carlisle, Lord Stanhope, Nassau Senior, Charles Greville, Milman, Panizzi, Lewis, Van de Weyer. His biographer thus describes Macaulay's appearance and bearing in conversation : « Sitting bolt upright, his hands resting on the arms of his chair, or folded over the handle of his walking-stick, knitting his eyebrows if the subject was one which had to be thought out as he went along, or brightening from the

He gradually withdrew from | general society, feeling the bore of big dinners, and country- |

Once again, in June 1853, he spoke in parliament, and with effect, against the exclusion of the Master of the Rolls from the House of Commons, and at a later date in defence of competition for the Indian civil service. But he was aware that it was a grievous waste of his small stock of force, and that he made these efforts

at the cost of more valuable work.

In November 1855 vols. iii. and iv. of the Hzstory appeared. No work, not being one of amusement, has in our day reached a circulation so vast. During the nine years ending with the 25th June 1857 the publishers (Longmans) sent out more than 30,000 copies of vol. 1;

-in the next nine years more than 50,000 copies of the

| 1875 more than 52,000 copies.

same volume; and in the nine years ending with June Within a generation of

its first appearance upwards of 140,000 copies of the crowds and the excitement of ever new faces; as years |

_ Kingdom alone. took off the edge of his spirits, he recoiled from publicity. | He began to regard the prospect of business as worry, and |

did not prevent six rival translations in German.

History will have been printed and sold in the United In the United States no book except the Bible ever had such a sale. On the Continent of Europe, the sale of Tauchnitz editions was very large, a sale “ The History has been published in the Polish, Danish, Swedish, Hungarian, Russian, Bohemian, Italian, French, Dutch, Spanish languages. Flattering marks of respect were heaped upon the author by the foreign Academies. His pecuniary profits were on a scale commensurate with the

reputation of the book: the cheque for £20,000 has

become a landmark in literary history.

In May 1856 he quitted the Albany, in which he had passed fifteen happy years, and went to live at Holly Lodge, then, before it was enlarged, a tiny bachelor's dwelling, but with a lawn whose unbroken slope of verdure gave it the air of a considerable country house. In the following year (1857) he was raised to the peerage by the title of Baron Macaulay of Rothley. ~'It was," says Lady Trevelyan, "one of the few things that everybody approved ; he en- joyed it himself, as he did everything, simply and cordially." It wasa novelty in English life to see eminence which was neither that of territorial opulence nor of political or mili-

MV AnCLA-U bakery

tary services recognized and rewarded by elevation to the peerage. ;

The distinction came just not too late. Macaulay's health, which had begun to give way in 1852, was every year visibly failing; in May 1858 he went to Cambridge for the purpose of being sworn in as high steward of the borough, to which office he had been elected on the death of Earl Fitzwilliam. When his health was given at a public breakfast in the town-hall, he was obliged to excuse himself from speaking on the ground of inability. His nephew, who was in attendance upon him on the occasion, records that "it was already apparent that a journey across Clare Bridge and along the edge of the great lawn at King's, performed at the rate of 4 mile in the hour, was an exertion too severe for his feeble frame." In the Upper House he never spoke. Absorbed in the prosecution of his historical work, he had grown indifferent to the party politics of his own day. Gradually he had to acquiesce in the conviction that, though his intellectual powers remained to him unimpaired, his physical energies would not carry him through the reign of Anne; and, though he brought down the narrative to the death of William IIL, the last half volume wants the finish and completeness of the earlier portions.

The winter of 1859 was very severe, and hastened the eud. He died on 28th December, and on 9th January 1860 was buried in Westminster Abbey, in Poet's Corner, near the statue of Addison.

Lord Macaulay was never married. A man of warm domestic affections, he found their satisfaction in the attachment and close sympathy of his sister

Hannah, the wife of Sir Charles Trevelyan. Her children were to him as his own. Macaulay was a steadfast friend, and a generous enemy. No act inconsistent with the strictest honour and integrity has ever been imputed to him. When a poor man, and when salary was of consequence to him, he twice resigned office rather than make compliances for making which he would not have been severely blamed. In 1847, when his seat in parliament was at stake, he would not be persuaded to humour, to temporize, even to conciliate. He took a lofty tone, and haughtily rebuked the Edinburgh constituency for their bigotry. He had a keen relish for the good things of life, and desired fortune as the means of obtaining them; but there was nothing mercenary or selfish in his nature. When he had raised himself to opulence, he gave away with an open hand, not seldom rashly. His very last act was to write a letter to a poor curate, enclosing a cheque for £25. The purity of his morals was not associated, as it not unfrequently is, with a tendency to cant, or parade of religious phrases.

The lives of men of letters are often records of sorrow or suffering. The life of Macaulay was eminently happy. ‘Till the closing years 1857-59, when his malady had begun to tell upon his strength, he enjoyed life with the full zest of healthy faculty, happy in social intercourse, happy in the solitude of his study, and equally divided between the two. For the last fifteen years of his life he lived for literature, as none of our eminent men since Gibbon have done. His writings were remunerative to him far beyond the ordinary measure, yet he never wrote as the professional author writes. He lived in his historical researches; his whole heart and interest were unreservedly given to the men and the times of whom he read and wrote. His command of litcrature was imperial. Beginning with a good classical foundation, he made himself familiar with the lnaginative, and then with the historical, remains of Greece and Rome. He went on to add the literature of his own country, of Franee, of Italy, of Spain. He learnt Dutch enough for the purposes of his history. He read German, but for the literature of the northern nations he had no taste, and of the erudite labours of the Germans he had little knowledge and formed an inadequate esti- mate. The range of his survey of human things had other limit- ations more considerable still. All philosophical speculation was alien to his mind; nor does he seem aware of the degree in which such speculation has influenced the progress of humanity. A large

—the largest—part of ecclesiastical history lay outside his historical view. Of art he confessed himself ignorant, and even refused a

request which had been made him to furnish a critique on Swift's poetry to the Edinburgh Review. Lessing's Laocoon, or Goethe's criticism on Hamlet, "filled" him ‘‘ with wonder and despair."

Of the marvellous discoveries of science which were succeeding each other day by day he took no note; his pages contain no refcr- ence to them. It has been told already how he recoiled from the mathematical studies of his university. These deductions made, the circuit of his knowledge still remains very wide,—as extensive per- haps as any human brain is competent to embrace. His literary outfit was as complete as has ever been possessed by any English writer ; and, if it wants the illumination of philosophy, it has an equivalent resource in a practical acquaintance with affairs, with administration, with the interior of cabinets, and the humour of popular assemblies. Nor was the knowledge merely stored in his memory ; it was always at his command. Whatever his subject, he pours over it his stream of illustration, drawn from the records of all ages and countries. ‘‘ Figures from history, ancient and modern, sacred and secular; characters from plays and novels, from Plautus down to Walter Scott and Jane Austen ; images and similes from poets of every age and every nation; shrewd thrusts from satirists, wise saws from sages, pleasantries caustic or pathetic from humorists,—all these fill Macaulay's pages with the bustle and variety of some glittering masque and cosmoramic revel of great books and heroical men. His style is before all else the style of great literary knowledge." His Hssays are not merely instructive as history ; they are, like Milton's blank verse, freighted with the spoils of all the ages. They are literature as well as history. In their diversified contents the Zssays are a library by themselves ; for those who, having little time for study, want one book which may be a substitute for many, we should recommend the Essays in preference to anything else.

As an historian Macaulay has not escaped the charge of partisan- ship. He was a Whig ; and in writing the history of the rise and triumph of Whig principles in the latter half of the 17th century he identified himsclf with the

cause. But the charge of partiality, as urged against Macaulay, means morc than that he wrote the his- tory of the Whig revolution from the point of view of those who made it. When he is describing the merits of friends and the faults of enemies, his pen knows no moderation. He has a constant tendency to glaring colours, to strong effects, and will always be striking violent blows. He is not merely exuberant, but excessive. There is an overweening confidence about his tone ; he expresses himself in trenchant phrases, which are like challenges to an oppo- nent to stand up and deny them. His propositions fore no quali- fications. Uninstructed readers like this assurance, as thcy like a physician who has no doubt about their case. But a sense of distrust grows upon the more circumspect reader as he follows page after page of Macaulay's categorical affirmations about matters which our own experience of life teaches us to be of a contingent nature. We inevitably think of a saying attributed to Lord Melbourne, ''I wish I were as cock-sure of any one thing as Macaulay is of everything." Macaulay's was the mind of the advo- cate, not of the philosopher ; it was the mind of Bossuet, which admits no doubts or reserves itself and tolerates none in others, and as such was disqualified from that equitable balancing of evidence which is the primary function of the historian. It was a fortunate circumstance that rhetoric so powerful was enlisted in the consti- tutional cause,—that Macaulay was, as he himself has said of Bishop Burnet, '' a strong party man on the right side."

Macaulay, the historian no less than the politician, is always on the side of justice, fairness for the weak against the strong, the oppressed against the oppressor. But though a Liberal in practical politics, he had not the reformer's temperament. The world as it is was good enough for him. The glories of wealth, rank, honours, literary fame, the elements of a vulgar happiness, made up his ideal of life. A successful man himself, every personage and every cause is judged by its success. ''The brilliant Macaulay," says Emerson, '' who expresses the tone of the English governing classes of the day, explicitly teaches that ' good' means good to eat, good to wear, material commodity." Macaulay is in accord with the aver- age sentiment of orthodox and stereotyped humanity on the relative values of the objects and motives of human endeavour. Aud this commonplace materialism is one of the secrets of his popularity, and one of the qualities which guarantee that that popularity will be enduring.

Macaulay’s whole works have been collected by his sister, Lady Charles Trevelyan, in cight volumes. The first four volumes are occupied by the History; the next three contain the Hssays, and the Lives which he contributed to the Hncyclopadia Britannica. In vol. viii. are collected his Speeches, the Lays of Ancicnt Rome, and some miscellaneous pieces. His life has been written by his nephew, George Otto Trevelyan (2 vols., London, 1878), and is one of the best biographies in the language. His diary remains in MS. in the hands of his family. It is to be hoped that nicasures will be taken to secure this valuable record from the fate that has overtaken so many private diaries, and thus impoverished the sources of English history. (M. P.)

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MACAW, or, as formerly spelt, Maccaw,? the name given to some fifteen or more species of large, long-tailed birds of the Parrot Family, natives of the Neotropical Region, and forming a very well-known and easily-recog- nized group to which the generic designation Ara is usually applied by ornithologists, though some prefer: for it Macrocercus or Sittace. Most of the Macaws are remarkable for their gaudy plumage, which exhibits the brightest scarlet, yellow, blue, and green in varying proportion and often in violent contrast, while a white visage often adds a very peculiar and expressive character.?_ With one ex- ception the known species of Ava inhabit the mainland of America from Paraguay to Mexico, being especially abundant in Bolivia, where no fewer than seven of them (or nearly one half) have been found (Proc. Zool. Soc., 1879, p. 634). The single extra-continental species, A. tricolor, is one of the most brilliantly coloured, and is peculiar to Cuba, where, according to Dr Gundlach (Ornitologia Cubana, p. 126), its numbers are rapidly decreasing, so that there is every chance of its becoming extinct.?

It will perhaps be enough here to dwell on the best known species of the group, and first the Blue-and-yellow Macaw, A. ararauna, which has an extensive range in South America from Guiana in the east to Colombia in the west, and southwards to Paraguay. Of large size, it is a bird to be seen in almost every zoological garden, and is very frequently kept alive in private

houses, for its temper is pretty good, and it will become strongly attached to those who tend it. Its richly-coloured plumage, sufficiently indicated by its common English name, has the additional reconimendation of supplying feathers which are eagerly sought by salmon-fishers for the making of artificial flies. Next may be mentioned the Red-and-blue Macaw, A. macao, which is even larger and more gorgeously clothed, for, besides the colours expressed in its ordinary appellation, yellow and green enter into its adornment. It inhabits Central as well as South America as far as Bolivia, and is also a common bird in captivity, though perhaps less often seen than the foregoing. The Red-and-yellow species, A. chloroptera, ranging from Panama to Brazil, is smaller, or at least has a shorter tail, and is not quite so usually met with in menageries. The Red-and-green, A. militaris, smaller again than the last, is not unfrequent in confine- ment, and presents the colours of the name it bears. This has the' most northerly extension of habitat, occurring in Mexico and thence southwards to Bolivia. All the other

1 Thus Willughby, Ornithologia, p. 73 (1676); but an earlier form of the word is found in the ‘‘ great blew and yellow Parrat called the Machao, or Cockatoon” of Charleton, Onomasticon, p. 66 (1668). Its derivation is shown by De Laet, who, in his description of certain Brazilian birds (Novus Orbis, ed. 1633, p. 556), has ‘‘ inter alios (sc. Psittacos] excellunt magnitudine & pulchritudine, quos barbari Araras & Macaos vocant,” and again (loc. cit.) ‘ Tertium locum meretur Araruna vel Machao.’’ Webster, in his dictionary, says that Macaw, ‘‘ written also Macao,” is ‘‘ the native name in the Antilles,” but gives no authority for his statement, which, considering that one West Indian island only is known to possess a Macaw (and that in that island the bird is known as Guacamayo), is very unlikely. Some of the older writers, Buffon (Oiseaux, vi. p. 278) for instance, say that Makavouanne was the name given by natives of Guiana to one species of Macaw found in that country ; but the Antillean origin of the name cannot at present be accepted.

? This serves to separate the Macaws from the long-tailed Parrakcets of noe New World (Conwrus), to which they are very nearly allied.

There is some reason to think that Jamaica may have formerly possessed a Macaw (though no example is known to exist), and if so it was most likely

a peculiar species, Sloane (Voyage, ii. p. 297), after describing what he calls the ‘‘ Great Maccaw ” (A. ararauna, to be spoken of above), which he had seen in captivity in that island, men- tions the ‘‘ Small Maccaw”’ as being very common in the woods there, and Mr Gosse (Birds of Jamaica, p. 260) gives, on the authority of Robinson, a local naturalist of the last century, the description of a bird which cannot be reconciled with any species now known though it must have cvidently been allied to the Cuban A. tricolor. .

species are comparatively rare in a reclaimed condition. Four of them, A. hyacinthina, A. leari, A. glauca, and A. spixi, are almost entirely blue, while in A. manilata and A. nobilis the prevailing colour is green, and A. severa is green and blue.

As is the case with most Neotropical birds, very little is known of the life history of Macaws in a state of nature. They are said to possess considerable power of flight, rising high in the air and travelling long distances in search of their food, which consists of various kinds of fruits; but of any special differences of habit we are wholly ignorant. The sexes appear in all cases to be alike in colouring, and the birds, though constantly paired, are said to live in companies. As with others of the Order Pscttaci, the nest is made in a hollow tree, and the eggs, asserted to be two in number, are white without any lustre. Of the habits of these birds in confinement it is needless to speak, as they are so extremely well known. If caged, their long tail- feathers are sure to suffer, but chained by the leg toa perch, Macaws seem to enjoy themselves as well as any captive can, and will live for many years.

In our present state of ignorance as to the best mode of classifying Parrots, it would be premature to hazard any guess as to the place occupied in the Order by the genus Ara. (A. N.)

MACBETH, Macseruap, or Macsepa, son of Finnlaech, was king of Scotland from 1040 to 1057. He had previously been “mormaer” of Moravia or Moray; and his predecessor on the throne was Duncan, son of Crinan, and grandson of Malcolm, whom he slew (according to some accounts at “ Bothgowan,” said to have been near

Elgin). Macbeth's wife was Gruoch, a descendant of the royal house. Of the events of his reign almost nothing is known. The ecclesiastical records of St Andrews bear

that he and his wife, "rex et regina Scotorum," made over certain lands to the Culdees of Lochleven; and in 1050 he appears to have visited Rome, perhaps to obtain absolu- tion for the murder of Duncan. The sons of Duncan, who had taken refuge with their uncle Siward, earl of Northumberland, brought about an invasion of Scotland in 1054; a battle was fought at Dunsinnane with indecisive results, but three years afterwards Macbeth fell at Lumphanan in Aberdeenshire (August 15, 1057). The war was continued for some time in the interests of a certain Lulach, the son of Queen Gruoch by a former marriage ; but he too was slain in Strathbogie in March 1058, and Malcolm, the son of Duncan, ascended the throne.

See Skene, Celtic Scotland, vol. i. chap. 8; and compare Burton (History of Scotland, vol. i. chap. 10 ad fin.), who gives special prominence to the circumstance that when the genealogy of the Scottish kings is traced upwards the first break in the hereditary succession occurs when Macbeth is reached; the break of con- tinuity at this point becomes all the more prominent when it is found that the father of Macbeth's successor had occupied the throne. 'This had to be accounted for, and the easiest way was by treating the intruder as a 'usurper.' The loyal monks of the 15th century looked on a usurper with horror. Being so placed in the scat of political infamy, we have perhaps the reason why so many events, natural and supernatural, caine to cluster round the career of Macbeth." It is most probable that Shakespeare's only source for the tragedy of Macbcth was the Chronicles of Holinshed (derived from John of Fordun and Hector Boece).

MACCABEES. The name Maccabee (Maxxafatos) is properly and originally the distinguishing surname of Judas, son of Mattathias, the first great hero of the Jewish revolt against Antiochus Epiphanes. The source of the name is uncertain, but it is most natural to connect it with 32, "hammer," and so the Syriac writes the name with p not >. Ewald (Gesch., iv. 403) is doubtless right in arguing from 1 Mac. vi. 43, &c., that the surnames of the sons of Mattathias were simply distinguishing epithets which they bore in ordinary life, and in this light

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‘hammerman ” appears as a natural surname enough, the occasion of which it would be vain to inquire into.! From Judas the name was in later times extended to the whole family, or to the party it represented, or even, as in the title of 3 Maccabees, to other contenders or sufferers for the faith of Israel in the Greek period. The more cor- rect name of the family was Hasmoneans, ’Ao[c]apmvaior, spun m2 (Tgm. Jon. on 1 Sam. ii. 4). According to Josephus, Ant., xii. 6, § 1, this name is taken from Asamonzeus, the grandfather of Mattathias. Modern writers have suggested a connexion with the town Heshmon (Josh. xv. 27) or with D°3DWN, magnates, in Psalm xviii. 31 [32]. The history of the Hasmoneans is given in IsraEL (vol. xiii. p. 421 sg.); in the appended genealogical tables (after Schiirer) the dates are those of the death of each individual in years B.C. eg (166).

| Jonathan

(143).

| Eleazar

(163-2).

J sce

(160).

| John, slain in the troubles after the death of Judas.

Simon

(135).

John Hyrcanus I.

(105),

1

Alexander

| Aristobulus I, Salome (104). Janneus (78) i Alexandra (69).

| | Hyreanus Ii. (30), Aristobulus IT. (49). |

| | Alexandra (28) y Alexander (49), Antigonus (37).

| Mariamme (29), the wife of Herod.

The chief authorities are 1 and 2 Maccabees (sce next article) and Josephus. For details as to other sources see Schiirer's Neutcsta- mentliche Zeitgeschichte, which gives also a good summary of the history. Of other works subsequent to Ewald's Geschichte, vol. iv., it is enough to name Derenbourg, Histoire dc la Palestine (1867), and Wellhausen's Pharisdcr and Sadduwedcr (1874). For the coins of the Hasmoneans see Madden, Coins of the Jews, 1881.

MACCABEES, Booxsor. Two books of this name are included among the Apocrypha of the English Bible, as they had formerly been in the Vulgate, and were accepted as canonical by the council of Trent. A third book is usually included in editions of the Septuagint, and is found in common with books iv. and v. in the Syriac, but never took a place in Latin Bibles; a fourth is found in some MSS. of the Septuagint (including the Sinaitic and Alexandrian—the Vatican does not contain the Maccabee books) and also in MSS. of Josephus, and has been printed in both connexions.

1 Maccabees was originally written in Hebrew, as ap- pears, not only from the testimony of Jerome (Prol. Gal.), who had seen the Hebrew text, but from internal evi- dence. Josephus, however, already used the Greek,? and no trace of the Semitic original survives except the proble- matical title recorded by Origen (ap. Eus., ZZ. Z., vi. 25).3

| Aristobulus (35).

1 One theory which has had much acceptance is that the name is made up of the initials of the first words of Exod. xv. 11. This is a pure guess, and requires the spelling ‘3519 or ‘N33! found in the late work of Jos. ben Gorion. Equally unproved is the guess of S. J. Curtiss, resting on the Latin spelling Machabeus, that the word is properly from M35, Isa. xtiii. 17, the ‘‘ quencher” or ‘‘quetler” (The Name Machabee, Leipsic, 1876).

? Such at least is the current view (see Grimm, p. xxvil sq.). J. D. Michaelis in his German translation of 1 Mac. argued that Josephus used the original ; and a modified form of this view, viz., that he used a anonymous source resting on the original, has been put forth by Destinon (Quellen des Fl. Josephus, Kiel, 1882).

3 This title is usually given oapB}@ capBave 2d, and the attempts at decipherment, none of which are satisfactory (see Grimm’s Com., p- XVI1; Derenbourg, La Palestine, p. 450 sq.), proceed from it. Heinichen, however, reads oap8}0 caBavaréA, on overwhelming MS.

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| The book gives the history of the national movement in

Juda from the accession of Antiochus Epiphanes (175 B.c.) to the murder of Simon (135 B.c.), in a plain and honest style, and evidently from good information. When the book was written there already existed a history of the reign or high priesthood of John Hyrcanus, to which the author refers for the continuation of his narrative. On the other hand, the friendly tone in which he always speaks of the Romans seems to justify the inference that he wrote before 63 B.c.*

2 Maccabees, covering the history from 176 B.c. to the victory over Nicanor (160 8.c.), is much inferior in value. Tt begins with two epistles which are certainly forgeries, and then proceeds to the task of summarizing in one book

| the five books of a certain Jason of Cyrene on the war of

liberation against Antiochus Epiphanes. The narrative is a useful supplement to that in the first book, but is not nearly so trustworthy, and can never claim the preference where the two are in conflict. Geiger has shown that in 2 Maccabees the history is coloured and distorted by sym- pathy with the Pharisees, who became the bitter enemies of the Hasmoneans (Urschrift und Uebers., book i. § 4).

3 Maccabees records a persecution of the Alexandrian Jews by Ptolemy IV. Philopator, with the ultimate re- pentance of the tyrant. It is quite unhistorical, and the local feast of the Alexandrian Jews, of which it professes to explain the origin (vi. 36), is connected by Josephus (Cont. Ap., ii. 5) with an event that took place under Ptolemy Physcon. Ewald's conjecture that the story con- tains a hidden reference to the emperor Caius (Gesch., iv. 611 sq.) has found considerable favour. It seems strange that this book should ever have found entrance in Christian circles. It had, however, considerable accept- ance in the Eastern Church.

4 Maccabees, also known by the title epi airoxpdéropos Noyicpov, "on the sovereignty of reason," was ascribed to Josephus by Eusebius and Jerome. This opinion is now given up, and nothing certain can be said of its origin. It is a not uninteresting specimen of a Jewish philosophical theme composed under Stoic influence. The author illus- trates the sovereignty of pious reason over the passions by | historical examples, and is thus led to give anecdotes from the time of the Maccabees.

Fritzsche's edition of the Apocrypha (1871) is the best, and con- tains the four books of Maccabees. Grimm's commentary on 1 Mac. appeared in 1853, on the other three books in 1857. There is also a commentary on 1 Mac. by Keil, 1875. On 4 Mac. there isan elaborate study by Freudenthal, Die Fl. Josephus bcigelegte Schrift Ueber die Herrschaft der Vernunft, Breslau, 1869. For further literature see Sehiirer, NTliche Zecitgeschichte (1874), pp. 19, 650 sq., and his excellent article ‘‘ Apokryphen ” in Herzog-Plitt, #. £., vol. i. An Arabic ‘‘ Book of Maccabees," giving a compend of

| Jewish history from the affair of Heliodorus to the last part of

Herod's reign, is printed in the Parisand London Polyglotts. A so- called ‘‘ Fifth Book of Maccabees" is also contained in the great Ambrosian Peshito.

It is in fact the sixth book of Josephus De Bello Judaico.

MACCLESFIELD, a municipal and _ parliamentary borough and market-town of Cheshire, England, is situated on a declivity near the borders of what is still known as the Macclesfield Forest, 17 miles south-south-east of Manchester, and 37 east-north-east of Chester. It consists

ee. ——eeEEeE—ee authority, and in the Nitrian MS. used by Lagarde for his cdition of the Syriac Apocrypha (¢f. Wright's Cat., i. 98), the title runs

Dose NYID NDAD KY md PIPNIT NAPOT NOT NID. This seems to confirm Heinichen's rcading (Y and J being easily inter- changed in Syrian MSS.). The sense may be ‘‘ the prince of the house which God hath built up.” ;

4 Ewald (@esch. iv. 486) and before him Whiston conjectured that Josephus did not possess the last part of the book. Destinon (ut supra, p. 80 sg.) develops this conjecture, and believes that the book originally ended with the liberation of Judea under Simon, and that the interval between this book and the annals of Hyrcanus was filled up later.

of four principal streets, which meet in the market-place, and within the last twenty years has undergone great im- provements. The old church of St Michael, on the brow of the hill, was founded by Eleanor, queen of Edward L., in 1278, and in 1740 was partly rebuilt and greatly enlarged. The lofty steeple by which its massive tower was formerly surmounted was battered down by the parliamentary forces during the civil war. Connected with the church there are two chapels, one of which, Rivers Chapel, belonged to a college of secular priests founded in 1501 by Thomas Savage, afterwards arch- bishop of York. Both the church and chapels contain several ancient monuments. For the free grammar school, originally founded in 1502 by Sir John Percival, and refounded in 1552 by Edward VI., a new building was erected in 1856 at a cost of £3000. A commercial school was erected in 1840 out of the funds of the grammar school. Among the other public buildings are the town-hall in the Grecian style (1823-24), with a new frontage (1869-70), the union workhouse (1843-44), the county lunatic

asylum (1868-71), and the infirmary (1872). The neighbouring castle of the duke of Buckingham was the residence of Duke Humphrey in the 15th century. Originally the trade of Macclesfield was principally in twist and silk buttons, but this has been completely superseded by the manufacture of all kinds of silk. The first mill for silk-throwing was opened in 1756, and the manufacture of broad silks was introduced in 1790. Besides this staple trade, there are various textile manu- factures and extensive breweries. The population of the municipal borough (3235 acres) in 1871 was 35,540, and of the parliamentary borough (3272 acres) 35,570. In 1881 the numbers were 37,514 and 37,620.

Previous to the Conquest, Macclesfield constituted a portion of the royal demesne of the earls of Mercia. At Domesday it was in- cluded in the carldom of Chester, and after the abolition of that jurisdiction it relapsed to the crown. In 1261 it was made a borough, and in 1678 it obtained incorporation from Charles II. It has returned two members to parliament since the first Reform Act, and its boundary was enlarged in 1868.

M‘CLURE, Str Rozert Joun Le Mesurier, the discoverer of the North-West Passage, was born at Wexford, January 28, 1807, and died in London, October 17, 1873. He was the posthumous son of one of Abercrombie’s captains, and spent his childhood under the care of his godfather, General Le Mesurier, hereditary governor of Alderney. Schooled in Arctic exploration by his service under Captain Back on board the “ Terror,” he was first lieutenant of the “ Enterprise ” during the Franklin search expedition (1848-49), and in 1850 was placed in command of the expedition which, battling with the frozen sea for four years, succeeded in passing from ocean to ocean to the north of the American continent. M‘Clure was knighted on his return, and received gold medals from the English and the French geographical societies. During the Canadian insurrections of 1836-38 he had performed some gallant exploits on the lakes,—on one occasion, in the eagerness of pursuit, infringing the territory of the United States; and between 1856 and 1861 he rendered good service in the Chinese war at the storming of Canton, &c. His latter years were spent in a quiet country life. He was appointed Commander of the Bath in 1859, and had attained the rank of vice-admiral on the retired list. See Admiral Sherard Osborn, Zhe Discovery of a North-West Passage.

M‘CRIE, Tuomas (1772-1835), was born at Dunse or Duns in Berwickshire, Scotland, November 1772. He studied in Edinburgh University, and thereafter in the divinity hall at Whitburn. In 1796 he was ordained minister of the Second Associate Congregation, Edinburgh, the place of worship being in the Potterrow.

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At an early period in its history the Secession Church in Scotland had been divided by a controversy about the burgess oath into Burghers and Antiburghers; but towards the close of the century the Antiburgher Synod, to which M‘Crie belonged, showed symptoms of a disposition to qualify adherence to the subordinate standards of the Church of Scotland on such points as the magistrate’s power circa sacra and national covenanting, and a new historical manifesto was prepared called The Narrative and Lestimony, which was adopted as a term of communion by the general synod in 1804. M‘Crie was one of those who protested against this departure, as they deemed it, from Secession principles, and, declining to acknowledge the jurisdiction of the synod, constituted themselves into a presbytery under the name of “The Constitutional Associate Presbytery.” M‘Crie was in consequence deposed by the Associate Synod, and his congregation withdrew with him toa place of worship in the south side of the town, in which he officiated to the close of his life.

From the time of his settlement in Edinburgh, M‘Crie devoted himself to historical investigations into the history, constitution, and polity of the churches of the Reforma- tion; and the first ripe fruits of his study were given to the public in November 1811 in the form of The Life of John Knox, containing illustrations of the History of the Reformation in Scotland, which procured for the author the degree of D.D. from his alma mater, an honour con- ferred then for the first time upon a Scottish dissenting minister. At the solicitation of his friend Andrew Thomson, M‘Crie became a contributor to The Edinburgh Christian Instructor, and in three successive numbers for 1817 he subjected Sir W. Scott’s Zales of my Landlord to a criticism which took the form of a Vindication of the Covenanters. Preserving the continuity of his historical studies, he followed

up his first work with Zhe Life of Andrew Melville, 1819. Negotiations for union between the Burghers and Antiburghers resulted, in 1820, in the formation of the United Secession Synod, and called forth from Dr M‘Crie Zwo Discourses on the Unity of the Church, her Divisions, and their Removal, in which what he considered to be the fallacious and unscriptural character of the plan for union adopted by the United’ Synod is pointed out. Several of his former brethren among the Antiburghers, dissatisfied with the union of 1820, had formed themselves into a separate synod, and between these and the Constitutional Presbytery a union was formed in 1827, the uniting bodies assuming the name of the Associate Synod of Original Seceders, of which branch of the Secession in Scotland M‘Crie continued through the rest of his life the best known representative. In 1827 he published a History of the Progress and Suppression of the Reformation in Italy in the 16th century, and in 1829 a similar History of the Reformation in Spain.

Great as was his absorption in historical research, it did not prevent his taking a lively interest in the leading questions of the day ; in pamphlets and on the platform he maintained his convictions, not always popular, on such matters as Greek independence, Catholic emancipation, the “‘ Marrow” and “ Voluntary” controversies, Irish education, and church patronage. His evidence on the last-named matter before a committee of the House of Commons is contained in the parliamentary publications of 1834.

The latest literary undertaking of M‘Crie was a life of John Calvin. Although he had been gathering material for this project for several years, it was not tilla late period of his life that, stimulated by the assistance of his son John, then in Geneva, he seriously addressed himself to the task. Only three chapters of the work were completed when the writer was struck down by apoplexy. He died on the 5th of August 1835.

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In addition to the works the titles of which have been already given, Dr M‘Crie published the following:—(1) The Duty of Chris- tian Societies towards cach other, a Sermon, 1797 (afterwards sup- pressed by the author, now extremely scaree); (2) Statement of the Difference between the Profession of the Reformed Church of Scotland and the Profession

contained in the New Testimony adopted by the General Associate Synod, 1807; (3) Free Thoughts on the late Religious Celebration of the Funeral of the Princess Charlotte, 1817 ; (4) Memoirs of Veiteh and Brysson, 1825; (5) What Ought the General Assembly to do at the Present Crisis? 1833. The posthu- mous publications are—(1) Sermons, 1836; (2) Lectures on the Book of Esther, 1838 ; (3) Miscellaneous Writings, 1841; (4) The Early Years of John Calvin, a Fragment, 1880.

An estimate of the services and a graphic description of the personal appearance of Dr M‘Crie are to be found in The Headship of Christ (pp. 77-129), and in Aly Schools and Schoolmasters (chap. xvi.), both by Hugh Miller.

MACCULLAGH, James (1809-1846), one of the most elegant geometers of modern times, was born in 1809, near Strabane, Ireland. After an exceptionally brilliant under- graduate career in Trinity College, Dublin, he was elected fellow in 1832. From 1832 to 1843 he held the chair of mathematics ; and during his tenure of this post, for which he was specially fitted, he improved in a most marked manner the position of his university as a mathematical centre. In 1843 he was transferred to the chair of natural philosophy, for which he was not nearly so well qualified. Overwork, mainly on subjects beyond the natural range of his powers, induced mental disease; and he died by his own hand in 1846. His Works have been published in a collected form (Dublin University Press Series, 1880). Their distinguishing feature is the geometry,—which has rarely been applied either to pure space problems or to known physical questions such as the rotation of a rigid solid or the properties of Fresnel’s wave-surface with such singular elegance. In this respect his work takes rank with that of Poinsot. No higher praise could be given. One specially remarkable geometrical discovery of Mac- cullagh’s is that of the “modular generation of surfaces of the second degree”; and a noteworthy contribution to physical optics is his “theorem of the polar plane.” But his methods, which, in less known subjects, were almost entirely tentative, were altogether inadequate to the solu- tion of the more profound physical problems to which his attention was mainly devoted, such as the theories of double refraction, of crystalline reflexion, &c. Here not only are the utmost powers of analysis

required, but also the high- est physical knowledge ; and in consequence Maccullagh's

.. work was entirely overshadowed by that of contemporaries,

such as Cauchy and Green. See, on this point, Stokes's "Report on Double Refraction" (B. A. Leport, 1862). The story of his later days painfully suggests the compari- son of a high-bred but slight racer tearing itself to pieces in the vain endeavour to move a huge load, which a traction- engine could draw with ease and promptitude. He wasted, on problems altogether beyond his strength, powers of no common order, which, had they only been suitably directed, might have immensely extended our knowledge. Such, at least, is the estimate which we cannot avoid forming from a perusal of his published works. He had '" conical refraction" in his hand for years without knowing its value. The reader who wishes to see the other side of the ques- tion (Maccullagh represented as standing to Fresnel in the same relative position as Newton to Kepler) is referred to the Proceedings of the Royal Society, vol. v. p. 712 (1847).

MACCULLOCH, Horatio (1805-1867), Scotch land- scape painter, was born in Glasgow in 1805. An early friendship with Sir Daniel Macnee, and William Leitch, the water-colourist, was the means of turning the lad's attention to art, which he studied for a year under John Knox, a Glasgow landscapist of some repute, with whom Macnee was apprenticed at the time. After leaving the studio of Knox, we find him engaged at Cumnock, paint-

ing the ornamental lids of snuff-boxes in the manufactory of the Messrs Smith, and afterwards he was employed in Edinburgh by Lizars, the engraver, to colour the illustrations in Selby's British Birds and similar works. Meanwhile he was diligently prosecuting his studies in higher walks of art, and working unweariedly from nature, greatly influenced in his early practice by the water- colours of H. W. Williams,—" Grecian Williams" as he was called,—whose works had a charm for the young painter after the drier and more elaborate method of his first master. Returning to Glasgow in some four or five years, he was employed by Mr Lumsden, the lord provost, on several large pictures for the decoration of a public hall which

he had erected in St George's Place, and he did a little as a theatrical scene-painter in Kilmar- nock and other provincial towns. About this time he was greatly impressed with a picture by Thomson of Dud- dingston, and upon the works of this artist, the greatest Scottish landscapist that had yet appeared, the art of Macculloch may be said to have beenfounded. Gradually he asserted his individuality, and formed his own style on a closer study of nature than had been possible to his predecessor, and his works form an interesting link of connexion between the old world of Scottish landscape and the new. By its love of elaborate and balanced com-positions, by its choice of noble and exceptional scenes, his art connects itself with that of sixty years ago; by its brilliant and varied colouring, by its care for detail, it differentiates itself from the quietude and the stately abstraction of the older landscape. In 1829 Macculloch first figured in the Royal Scottish Academy's exhibition, with a View of the Clyde, and, year by year, till his death on the 24th of June 1867, he was a liberal contributor to its displays. In 1838 he was elected a member of the Scottish Academy, and came to reside in Edinburgh, where his genial manners gathered round him a large and appreciative circle of the artists and litterateurs of the city.

Among the more important of the long series of landscapes which he produced, subjects almost exclusively from Scottish seenery, may be mentioned—Moonlight Deer Startled, 1840; Moor Scene, Sunset, 1841; A Dream of the Highlands, 1844; Inversnaid Ferry, Loch Lomond, 1847; A Highland Deer Forest, 1856 ; Ben Venue from Silver Strand, 1862; and Bothwell Castle, 1863. Several works by Maceulloch were engraved by William Miller and William Forrest, and a volume of photographs from his

landscapes, with an excellent biographical notice of the artist by Alexander Fraser, R.S.A., was published in Edinburgh in 1872.

MACCULLOCH, Joun (1773-1835), one of the most eminent geologists of his time, descended from the Maccullochs of Nether Ardwell in Galloway, was born in Guernsey, 6th October 1773, his mother being a native of that island. Having displayed remarkable powers as a boy, he was sent to study medicine in the university of Edinburgh, took his diploma there, and entered the army as assistant surgeon. Attaching himself to the artillery, he became chemist to the Board of Ordnance (1803), and thus began relations

with the Government which materially affected his future career. He still continued, however, to practise for a time as a physician, and then resided at Blackheath. In the year 1811 he communicated his first papers to the Geological Society. They were devoted to an elucidation of the geological structure of Guernsey, of the Channel Islands, and of Heligoland. The evidence they afforded of his capacity, and the fact that he already had received a scientific appointment, probably led to his being selected by Government to make some geological and mineralogical investigations in Scotland. He was asked to report upon stones adapted for use in powder-mills, upon the suitability of the chief Scottish mountains for a repetition of the pendulum experiments previously con- ducted by Maskelyne and Playfair at Schiehallion, and on

the deviations of the plumb-line along the meridian of the Trigonometrical Survey. In the course of the explorations necessary for the purposes of these reports he made extensive observations on the geology and mineralogy of Scotland. He formed also a collection of the mineral productions and rocks of that country, which he presented to the Geological Society in 1814. At that time compara- tively little had been done in the investigation of Scottish geology. Finding the field so entirely his own, and so full of promise, he devoted himself to its cultivation with great ardour. One of his earliest and most important labours was the examination of the whole range of islands along the west of Scotland, at that time not easily visited, and presenting many obstacles to a scientific explorer. The results of this survey appeared (1819) in the form of his Description of the Western Islands of Scotland, including the Isle of Man (2 vols. 8vo, with an atlas of plates in 4to), which forms one of the classical treatises on British geology. He continued to write papers, chiefly on the rocks and minerals of Scotland, and had at last gathered so large an amount of information that the Government was prevailed upon in the year 1826 to employ him in the preparation of a geological map of Scotland. From that date up to the time of his death he returned each summer to Scotland and traversed every district of the kingdom, inserting the geological features upon Arrowsmith’s map, which was the only one then available for his purpose. He lived to complete this great labour, and to prepare also a small volume explanatory

of the map, but he died before these were published in 1836. Among his other works the following may be mentioned :—A Geological Classification of Rocks, with Descriptive Synopses, comprising the Elements of Geology, 1 vol. 8vo, 1821; The Highlands and Western Islands of Scotland, in a series of letters to Sir Walter

Scott, 4 vols. 8vo, 1824; A System of Geology, with a |

Theory of the Earth and an examination of its Connexion with the Sacred Records, 2 vols. 8vo, 1831. His versatility of acquirement was shown by the publication also of works on malaria, remittent and intermittent diseases, the art of making wines, natural and revealed religion, besides numerous memoirs in various departments of natural history and antiquities. During a visit to Cornwall he was killed by being dragged along in the wheel of his carriage, 21st August 1835.

Dr Macculloch's name will ever be regarded with honour as one of the pioneers of geology in Britain. Essentially a mineralogist and petrographer, he was the first to trace out with some approach to truth the general distribution of the various rock-formations of Scotland. His temperament unhappily led him to look with jealousy and mistrust upon the labours of some of his more illus- trious contemporaries, and even to ignore them in his published writings. In particular he appears to have been irritated by the rapid advances made by paleontological geology, and the increas- ingly large placc given to that department of the science, while his own favourite domain of minerals and rocks was proportionately neglected. His feelings of dissent were strongly expressed in the posthumous memoir to accompany his map of Scotland ; but their bitterness may in part be attributed to the influence of failing health. Much hostile criticism was expended on his description of the manners and customs of the Highlanders, which were certainly amusing and picturesque, though sometimes his love of an effective period seems to have led him to exaggcration. The way in which he was appointed to conduct a geological survey of Scotland, unknown to the public bodies of that country, also led to considerable oppo- sition. But the solid services rendered by Macculloch to the progress of geology must be regarded as far outweighing any objections that have been made to his literary work or peculiarities of character.

M‘CULLOCH, Joun Ramsay (177 9-1864), a distin- guished writer on political economy and statistics, was born on Ist March 1779, at Whithorn in Wigtownshire. His family belonged to the class of “ statesmen,” or small landed proprietors. Having received his early education from his maternal grandfather, a Scotch clergyman, he came to Edin- burgh, and was for some time employed there as a clerk

in the office of a writer to the signet. But, the Scotsman newspaper having been established at the beginning of 1817, M‘Culloch sent a contribution to the fourth number, the merit of which was at once recognized ; he soon became connected with the management of the paper, and during 1818 and 1819 acted as editor. Most of his articles in the Scotsman related to questions of political economy, and he delivered lectures in Edinburgh on that science. He now also began to write on subjects of the same class in the Edinburgh Review, his first contribution to that periodical being an article on Ricardo’s Principles of Political Economy in 1818. Within the next few years he gave both public lectures and private instruction in London on political economy, and had amongst his hearers or pupils many persons of high social position, and some who were important in the political world. In 1823 he was chosen to fill the lectureship established by subscription in honour of the memory of Ricardo. A movement was set on foot in 1825 by Jeffrey and others to induce the Government to found in the university of Edinburgh a chair of political economy, separate from that of moral philosophy, the intention being to obtain the appointment for M‘Culloch, This project fell to the ground ; but in 1828 he was made professor of political economy in the London University. He then fixed his residence permanently in London, where he continued his literary work, being now one of the regular writers in the Ldinburgh Review. Indeed it appears from a letter of his to Macvey Napier in 1830 that he regarded himself, though Napier did not admit the justice of the claim, as entitled to be the sole contributor of economical articles to the Review. In 1838 he was appointed comp- troller of Her Majesty’s Stationery Office; the duties of this position, which he held till his death, he discharged with conscientious fidelity, and introduced important re- forms in the management of the department. Sir Robert Peel, in recognition of the services he had rendered to political

science, conferred on him a literary pension of £200 per annum. He was elected a foreign associate of the Institute of France (Academy of Moral and Political Sciences). He died, after a short illness, on 11th November 1864, in the seventy-sixth year of his age. To his personal character and social qualities very favourable testimony is borne by those who knew him best. In general politics he always remained a Whig pure and simple; though he was in intimate relations with James Mill and his circle, he never shared the Radical opinions of that group.

M‘Culloch cannot be regarded as an original thinker on political economy. He did not contribute any new ideas to that science, or introduce any noteworthy correction of the views, either as to method or doctrine, generally accepted by the dominant school of his day. But the work he did must be pronounced, in relation to the wants of his time, a very valuable one. It was at an important crisis that he appeared in the field of economical discussion. The principles of free trade had been powerfully asserted before the public in the celebrated petition of the merchants of London, drawn up by Mr Tooke and presented to parliament by Mr Alexander Baring in 1820. Political economy, to which the bullion con- troversy had previously attracted much attention, was more and inore engaging the minds of political writers and of statesmen. But the new views had to encountcr fierce and sometimes un- scrupulous opposition. The Edinburgh Review was the principal organ of the reformers, and was maintaining, when M‘Culloch became a writer in it, an cnergetic warfare against the policy founded on the mercantile theory of wealth. Naturally endowed with strong sense and sagacity, and possessing a rare capacity for arduous and prolonged mental exertion, he threw himself, with the ardour of conviction, into the great struggle. There can be no doubt that his labours on the whole contributed largely to the diffusion of just ideas on the economic questions then under debate, and to the right direction of the national legislation with respect to them. It must at the same time be admitted that his treat- ment of the subjects with which he dealt is not marked by any special breadth or elevation. He adopted too hastily the theoretic exaggerations of some of Smith’s successors, and exhibited in full measure their habitual deadness, in the study of social questions,

to all but material considerations. In his evidence before the parliamentary committee on the state of Ircland in 1825 he stated opinions, afterwards more fully asserted in the Edinburgh Review, on the subject of Irish absenteeism, which tendcd to disgust persons of intelligence and right feeling with a science which, as intcrpreted by him, seemed to lead to practical absurdities, and in other quarters had, it is to be feared, the effect of supplying a plausible excuse for carelessness on the part of the rich and great with respect to the inferior classes of society. These opinions could not be justified even on strictly economic grounds, as has since been shown by Longfield and Senior, M‘Culloch had in him an element of intellectual wilfulness or perverse self-assertion, compared by his friends and admirers to the despotic dogmatism of Johnson, which both in conversation and in his writings led him into the euuncia- tion and defence of paradoxes; anotable cxaniple of this is furnished by the obstinacy with which to the last, in the teeth of evidence, he clung to the doctrine of the impolicy of cheap postage. M‘Cullochi was deficient in literary taste, and never attained any high degrce of excellence in style. His cxpression is often slipshod, and a certain coarseness in his images sometimes throws an air of vulgarity over his pages. His name will probably be less permanently associated with anything he has written on economic science, strictly so called, than with his great statistical and other compila- tions. His Dictionary of Commerce and Commercial Navigation aud his Statistical Account of the British Empirc—however they may be expanded and altered, as they have already been, in succes- sive cditions—will long remain imposing monuments of his cxtensive and varied knowledge and his indefatigable industry. Anothcr useful work of reference, also the fruit of wide erudition and much labour, is his Literatwre of Political Economy. Though weak on the side of the foreign literature of the science, it is very valuable as a guide to British writers, and, in relation to its entire field, has not yet been superseded by any English book.

The following is as complete a list of his publications as it has been found possible to form :—An Essay on the Reduction of the Interest on the National Debt, 1816; An Essay on the question of Reducing the Interest on the National Debt, 1816; A Discourse on the Rise, Progress, Peculiar Objects, and Importance of Political Economy, 1824; the article PottticaL Economy in the supplement to the 6th edition of the Encyclopedia

Britannica, afterwards enlarged intg The Principles of Political Econony, with a sketch of the Rise and Progress of the Science, 1830, and again 1843, 1849 (translated into French by Augustin Planche, 1851); Dictionary, Practical, Theoretical, and Iistorical, of Commerce and Com- mercial Navigation, 1832; Statistical Account of the British Empire, 1837; Dictionary, Geographical, Statistical, and Mistorical, of the various Countries, Places, and Natural Objects in the World, 1841-42 (several editions of the last three have since appeared, and the first two of them have been reprinted in the United States, and translated into foreign languages); Statements illustrative of the Policy and probable Consequences of the proposed Repeal of the existing Corn- Laws and the Imposition in their stead of a moderate Fixed Duty on Foreign Corn, 1841; Memorandums on the proposed Importation of Foreign Beef and Live Stock, 1842; A Treatise on the Principles and Practical Influence of Taxation and the Funding System, 1845; The Literature of Political Economy, 1845 ; A Treatise on the Succession to Property Vacant by Death, 1848 ; Treatise on the Circumstances which determine the Rate of Wages and the Condition of the Labouring Classes, 1851 (an earlier edition had appeared anonymously in 1826); Considerations on Partnership with Limited Liability, 1856 ; perfaces and notes to a sclect collection, in 4 vols, of scarce and valuable economical tracts, reprinted at Lord Overstone's expense, 1856-59, He united in one volume (2d ed., 1859) a number of his minor Treatises and Essays on subjects connected with Economic Policy, many of which had appeared as articles in the Encyclopedia Britannica. He also printed, for private distribution amongst his friends, a catalogue of his library,—whicli contained a fine collection of books on his own spccial subjects,—adding critical and bio- graphical notices. He had edited in 1828 Smith's Wealth of Nations, with a life of the author, an introductory discourse, notes, and supplemental dissertations ; this work he greatly enlarged and improved in the editions of 1838 and 1850. In 1846 he edited Ricardo's works, with a notice of the life and writings of the author. (J. K. 1)

MACDONALD, Enenne-J acquus-JosEpH-ALEXANDRE (1765-1840), duke of Taranto, and marshal of France, was born at Saucerre on November 17, 1765. His father came of an old Jacobite family, which had followed James Il. to France, and was a near relative of the celebrated Flora Macdonald (1722-1790), the heroine whose courage and fidelity were at

one critical period the sole means by which Prince Charles Edward was enabled to elude his enemies after the defeat of Culloden in 1746. In 1784 Macdonald Joined the legion raised by the second Marshal Maillebois to support the revolutionary party in Holland against the Prus- Slans, and after it was disbanded lie received a commission in the regiment of Dillon. On the breaking out of the Revolution, the regiment of Dillon remained eminently loyal, nearly all its officers emigrating with the princes, with the exception of Macdonald, who was in love with a Mademoiselle Jacob, whose father was enthusiastic for the doctrines of the Revolution. His love was successful, and directly after his marriage he was appointed aide- de-camp to General Dumouriez. He also distinguished himself at Jemmapes, aud was promoted colonel in 1794. He refused to desert to the Austrians with Dumouriez,

and as a reward was made general of brigade, and appointed to command the leading brigade in Pichegru's invasion of Holland. His knowledge of the country proved most useful, and he was instrumental in the capture of the Dutch fleet by the French hussars. In 1797 he was made general of division, and transferred first to the army of the Rhine and then to that of Italy. When he reached Italy, the peace of Campo Formio had been signed, and General Bonaparte had returned to France ; but, under the direction of Berthier, Macdonald first occupied Rome, of which he was made governor, and then in conjunction with Cham- pionnet he defeated General Mack, and revolutionized the kingdom of Naples under the title of the Parthenopxan Republic. When Suwaroff invaded northern Italy, and was winning back the conquests of Bonaparte, General Macdonald collected all the troops in the peninsula and moved northwards. With but 30,000 men he attacked, at the Trebbia, Suwaroff with 50,000, and after three days' fighting, during which he held the Russians at bay, and gave time for Moreau to come up, he retired in good order to Genoa. After this gallant behaviour he was made governor of Versailles, and acquiesced in, if he did not co-operate in, the events of the 18th Brumaire. In 1800 he received the command of the army in Switzerland which was to maintain the communications between the armies of Germany and of Italy. He carried out his orders to the letter, and at last, in the winter of 1800-1, he was ordered to march over the Spliigen

Pass. This achieve- ment is fully described by Mathieu Dumas, who was chief of his staff, and is at least as noteworthy as Bonaparte's famous passage of the Saint Bernard before Marengo, though followed by no such successful battle. On his return to Paris he married the widow of General Joubert, and was appointed Freuch plenipotentiary in Denmark. Returning in 1805 he associated himself with Moreau, and incurred the dislike of Napoleon, who did not include him in his first creation of marshals. Till 1809 he re- mained without eniployment, but in that year Napoleon, hard pressed at Aspern, gave Macdonald the command of a division in the army of the viceroy of Italy which was to march from Italy to his help. He led the army from Italy till its junction with Napoleon, and at Wagram commanded the attack on the Austrian centre which won the victory. Napoleon made him marshal of France on the field of battle, and presently created him duke of Taranto. In 1810 he served in Spain, and in 1812 he commanded the left wing of the grand army for the invasion of Russia. After sharing in the battles of Liitzen and Bautzen, he was ordered to invade Silesia, where Bliicher defeated him with great loss at the Katzbach. After the terrible battle of Leipsic he was ordered with Prince Poniatowski to cover tle evacuation of Leipsic, and after the blowing up of the bridge, he managed to swim the Elster, while Poniatowski was drowned. During the defen- sive campaign of 1814 Macdonald again distinguished him- self, and was one of the marshals sent by Napoleon to take his abdication in favour of his son to Paris. When all were deserting their old master, Macdonald remained faithful to him. Macdonald was directed by Napoleon to give in his adherence to the new régime, and was presented by him with the sabre of Murad Bey for his fidelity. He was made a peer of France at the Restoration, and, having once passed his word to the new order of things, remained faithful during the Hundred Days. In 1816 he became chancellor of the Legion of Honour, a post he held till 1831, and took a great part in the discussions in the House of Peers. In 1823 he married Mademoiselle de Bourgony, and at last had a son, Alexander, who succeeded on his death in 1840 as duke of Taranto. From 1830 his life was spent in retirement at his country place Courcelles,

Plate III.

Macdonald had none of that military genius which distinguished Davoust, Masséna, and especially Ney, nor of that military science conspicuous in Marmont and St Cyr, but nevertheless his campaign in Switzerland gives him a rank far superior to such mere generals of division as Oudinot and Dupont. This capacity for independent command made Napoleon, in spite of his defeats at the Trebbia and the Katzbach, trust him with large corps d'armée till the end of his career. As a man, his charactcr cannot be spoken of too highly ; no stain of cruelty or faithlessness restson him. He retained always the frank honour of a soldicr of fortunc ; but he never forgot that he was a gentleman, or disgraced the new nobility of Napoleon by ridiculous pretensions. ib aes

Macdonald was especially fortunate in the accounts of his military exploits, Mathieu Dumas and Scgur having been on his staff in Switzerland. See Dumas, Lvénements Militaires ; and Ségur's rare tract, Lettre sur la campagne du Général Maedonald dans les Grisons en 1800 et 1801 (1802). Also consult Pelet's excellent Campagne de 1809, and Ségur's loge (1842).

MACDONALD, Lawrence (1798-1878), sculptor, was born at Gask, Perthshire, Scotland, in 1798, and in early life served as a mason's apprentice. Having shown an aptitude for stone carving, he went while still a youth to Edinburgh as an art student at the Trustees' Academy, finding at the same time a good deal of occasional employ- ment in carving coats of arms and other ornamental figures on the gateways or walls of country houses. By the help of friends he was enabled to visit Rome, whence, after a stay of two or three years, he returned to Edinburgh in 1826. During the next few years he executed a consider- able number of commissions for busts, and also devoted a good deal of time to the designing of ideal subjects, in which branch of his art, however, the public interest was comparatively slight. From 1832 until his death on March 4, 1878, his home was in Rome; during the long period of forty-six years his chisel never rested, and the number of. works that issued from his studio, chiefly in the department of portrait sculpture, was very great. Among his ideal works may be mentioned Ulysses and his Dog Argos, Andromeda chained to the Rock, Eurydice, Hya- cinth, a Siren, and a Bacchante. His busts, while excellent as likenesses, are remarkable for purity and dignity of style ; and

the ideal works are at once full of grace and carefully correct in form, design, and treatment.

MACEDONIA, when that name is taken in its widest signification, is the country between Thrace on the east and illyria on the west, bounded on the 8. by Thessaly and the Augean Sea, and on the N. by the lands which belong to the basin of the Danube. The most definite limit in its physical geography is that towards Illyria, where the Scardus range, which still bears the name of Schar, forms a continuous barrier between the two countries; on the side of Thessaly also, Mount Olympus and the Cambunian mountains constitute a well-marked frontier. In the other two directions its natural limits are less clearly defined. Towards the east, during the greater part of its history, the river Stryinon was regarded as its proper boundary ; but after the foundation of the city of Philippi it encroached on Thrace, and extended as far as the river Nestus, or even Mount Rhodope. With regard to the features of the country immediately to the north of Macedonia a misconception long prevailed, which has only of late years been dispelled by geographical research. Owing to a misinterpretation of a passage in Strabo (vii. fragm. 10; cf. vii. 5, 1), it was long believed that the country between the Danube and the Augean was divided in the middle by a lofty range of mountains, which formed a continuation of the main chain of the Alps as far as the Euxine ; and this mistake is perpetuated in many of our maps at the present day. But since this district has been explored, first by Grisebach, and afterwards by Von Hahn, it has been known that along one important portion of this supposed line, directly to the north of Macedonia and south-east of the modern principality of Servia, the hills

do not rise to any considerable elevation, and that affluents of the Margus (Morava), which flows into the Danube, and of the Axius (Vardar), which runs to the Aigean, rise close together in the upland plain of Kossova, the scene of the great battle in which the Servian monarchy was overthrown by Sultan Amurath J. in 1389. This watershed may be regarded as the northern boundary of Macedonia. But the extended limits which have here been given did not belong to the district that bore that name in early times, The original Macedonia was confined to the inland region west of the Axius,

between that river and the Scardus mountains, and did not include the northern portion, which was known as Peonia, or the coast-land which, together with the eastern districts, was inhabited by Thracian tribes, and was regarded by the Greeks at the time of the Peloponnesian war as part of Thrace. The people of this country. were not Hellenic, though its rulers ultimately succeeded in claiming that title for themselves, at the time when Alexander I, was admitted as a com- petitor at the Olympic games. The same thing may be said of the land itself, the appearance of which presents many points of contrast to that of Greece proper. Instead of the delicate, bright, and varied scenery of that country, with its clear atmosphere and sharp outlines, we find in Macedonia broad masses of mountains, extensive sweeps of lowland, and uniformity of colour. The climate of the inland regions also is severe, so that the cypress and other trees which flourish in Greece will not grow there.

The river Axius divides Macedonia into two parts, the eastern of which resembles the neighbouring country of Thrace in the irregularity of its surface; but in the western part there is a succession of valley-plains, generally elevated themselves, though deeply sunk among the rocky walls that surround them. These lie under the flanks of Mount Scardus, and differ in a still more striking manner from the country of Illyria on the furthcr side of that chain, which is made up of a number of irregular, and usually narrow, river-valleys, separated from one another by rugged mountains. The characteristics of these valley- plains are the well-defined basins in which they lie, their rich alluvial soil, and the river which waters each of them respectively, and in each case makes its exit through a narrow passage, which is its only means of escape. The northernmost and smallest of these is now called the Tettovo, and from it the main stream of the Axius issues. At the southern extremity of this a branch detaches itself from the Scardus, and bending southward forms an import- ant secondary chain, which is continued until, under the name of Bermius, it approaches Mount Olympus. ‘This branch, in the upper part of its range, forms the eastern boundary of the second and most important valley-plain, that of Pelagonia (now the plain of Monastir), from which the Erigon (Czerna) forces its way to join the Axius. This plain, which is 40 miles in length by 10 in breadth, and 1500 feet above the sea, was one of the primitive seats of the Macedonian race, and was suited for developing a hardy yet thriving population which

might afterwards become a great people. Here is laid the scene of the story of the foundation of the Macedonian monarchy, which Herodotus has related (viii. 137, 138). According to this, three brothers of the family of the Temenide of Argos, having entered the service of the king of the country, and having been defrauded by him of their wages, made their escape in a romantic manner, the narrative of which contains numerous fabulous incidents, and ultimately conquered all Macedonia. The southern part of this plain was called Lyncestis, and was the scene of the encounter between Brasidas and the Illyrians, which Thucydides has described (iv. 124-28); the famous retreat of that general was made by the pass at its south-eastern extremity.

MACHDONIA

Between Lyncestis and the lowlands, near the coast, is a lake district of somewhat inferior elevation, which bore the name of Eordea. Again, to the southward of Pelagonia is another extensive plain, from which the Haliacmon (Vistritza) draws its waters; that river ulti- mately breaks through the Bermian range behind Berrhoea (Verria), and flows into the Thermaic Gulf. The coast district between the Haliacmon and Olympus, as well as the sea-slopes of that mountain, formed Pieria, the original home of the Muses. The chief cities of Pieria were Pydna, where Perseus, the last king of Macedon, was defeated by the Romans, and Dium. From this neigh- bourhocd to the head of the Thermaic Gulf a vast maritime plain extended, which was intersected by the Lydias and the Axius, as well as the Haliacmon.

The Scardus chain, which has been spoken of as separating Macedonia from Illyria, is the northern continuation of Pindus, and the two together form a well-defined backbone, which may be compared to the spina of an ancient circus. At its northern extremity, where it rises from the plain of Kossova, stands a lofty peak, which, to carry out the comparison, may be called the meta or goal of the circus. This summit, which reaches a height of between 7000 and 8000 feet, had no name in antiquity, but is now known by the Slavonic appellation of Liubatrin, or the “Lovely Thorn.” The mountain wall which starts from it presents a most impos- ing appearance from every point of view, and is broken through at only one point, where

the river now called Devol, rising on its eastern side, divides it to its base as it flows to the Adriatic. Here the chain of Scardus ends, and that of Pindus commences. Northward of this it is crossed by two passes,—one near the headwaters of the Axius, between the modern towns of Prisrend and Calcandele ; the other farther to the south, leading from the head of the Lacus Lychnitis (Lake of Ochrida) into the Pelagonian plain. At the southern end of this plain another chain diverges from Scardus, and takes an easterly direction through Macedonia; in the region between the Strymon and Nestus this was called Orbelus, and between it and the sea lies Mount Pangzus, which was famed for its gold and silver mines.

The rivers of this country, notwithstanding that they are larger than any that are fuund in Greece proper, can hardly be called navigable, though barges are floated down them at the present day. The Axius, which is the most important, is celebrated by Homer, on account of its fertilizing water, as “the fairest stream that flows in all the earth” (//., ii. 850), and the valley in which it runs must always have formed a line of communication between the barbarous districts of the interior and the sea. The point of demarcation between the uplands and the lowlands is marked by the Stena, or, as it is now called, the Iron Gate (Demir Kapu) of the Vardar. Here the river cuts through at right angles the mountains that join the Scardus and Orbelus ranges, and forms a deep ravine, through which it rushes in rapids for the distance of a quarter of a mile, beneath steep cliffs that rise to the height of 600 or 700 feet above ; and traces of groovings in the rocks are visible, where a passage has been made in ancient times. At the point in its upper course where it receives its northern tributaries, and begins to bend towards the south, stood the town of Scupi, the name of which was changed by the Byzantines into Scopia, or “the look-out place,” and has now been corrupted into Uskiub. The importance of this consisted in its neighbourhood to the pass over the Scardus, by which the barbarian tribes to the west used to descend into the more level and fertile country, and in its commanding the principal line of traffic. Between Scupi and the Stena, at the confluence of the Axius aud the

Erigon, was Stobi, the ruins of which have recently been discovered by M. Heuzey, of the French ‘ Mission de Macédoine.” This town was in Roman times the meeting- poiut of four great roads—one from the Danube by Scupi; another from Sardica, near the modern Sophia, to the north-east; a third from Heraclea (Monastir) to the south-west ; and a fourth from Thessalonica. The Strymon (Struma) follows a direction nearly parallel to the Axius in eastern Macedonia, and, after passing through the chain of Orbelus, enters the rich plain of Serrhe (Seres), and flows into the Lake of Prasias or Cercinitis, shortly after emerging from which it reaches the sea. On the shores of the Lake Prasias were a number of lacustrine habitations which Herodotus has described, corresponding in their general features to those of which so considerable remains have recently been discovered in Switzerland and elsewhere. At the point where the Strymon leaves the lake was built the important town of Amphipolis, which was surrounded on three sides by the river, thus occupying a very strong position. It was founded by the Athenians in 437 B.c., and was valuable on account of its neighbourhood to the mines of Pangseus, and as furnishing a large supply of tintber. Its port, at the niouth of the Strymon, was called Eion. The ancient capital of Macedonia, Aige or Edessa (Vodena), stood at the point where the passes from Lyncestis and Eordea emerge into the lower country. Its situa- tion seems to suggest dominion; for, while it has at its back all the resources of the richest districts, the view from it embraces the wide maritime plain, the mighty mass of Olympus, and a portion of the Thermaic Gulf. The site, which resembles that of Tivoli, is one of ex- treme beauty, for below the level table of land on which the city is built the rock falls some 200 feet in steep precipices, and the river which passes through it, a tributary of the Lydias, divides into a number of smaller streams, which plunge at various points in cascades down the cliffs. When Philip of Macedon transferred the seat of government to Pella, Edessa continued to be the national hearth of the race, and the burial-place of their kings. Pella, the later capital, occupied a much inferior position, being on low hills at the edge of au extensive marsh in the middle of the maritime plain. This was naturally an unhealthy site, and its only strength lay in its swampy surroundings ; so that its nearness to the sea must have been its chief recommendation. The place is now deserted, but the name of Pel is still attached to its vicinity. In Roman times Thessalonica became the chief centre of these parts, which at all times it deserves to be, for it is admirably

placed for purposes of communication and trade, as it lies on the innermost bay of the Thermaic Gulf, and forms the natural point of transit for exports and imports. Its appearance recalls that of Genoa, from the way in which the houses rise from the water's edge, and ascend the hill-sides behind. This city was the terminus of the Via Egnatia, the great Roman road which joined the Adriatic and the A'gean, and formed the main line of com- munication between the West and the East. Starting from Dyrrhachium, it threaded the defiles of Illyria, and, passing the Lacus Lychnitis, crossed the Scardus by the southiern- most of its two passes, which descends on Heraclea ; thence it traversed Lyncestis and Eordza, till it reached Edessa, and finally crossed the plain to Thessalonica.

It remains to speak of the maritime district of Macedonia, called Chalcidice, which projects like a trident into the north of the A'gean between the Thermaic and Strymonic Gulfs. When seen on the map, it strikingly resembles the Peloponnese in miniature, from its three southern proniontories, with deep intervening bays, and the massive breadth of ground from which these spring. This resemblance is still further borne out in the form of

the mountains and their vegetation ; and in most respects it corresponds so well to what the Greeks desired for their settlements that we cannot be surprised at finding its shores fringed with Hellenic colonies. Several of these were founded from Chalcis in Eubcea, which city gave its name to the district ; but the important town of Potidea was a Corinthian colony. The most eastern of the three peninsulas, that of Act, is far the highest, and rises from its isthmus until it forms a steep central ridge, which gradu- ally attains the height of 4000 feet, and finally throws up the vast conical peak of Mount Athos (6400 feet). The isthmus, which is about a mile and a half broad, still shows traces of the canal made by Xerxes for the passage of his fleet, in order to avoid the dangers of shipwreck on the rocks of Athos, which had destroyed the expedition of Mardonius. On the land side of the isthmus stood the city of Acanthus. Separated from Acte by the Singitic Gulf was the promontory of Sithonia, with the town of Toronc; and still

farther to the west, beyond the Toronaic Gulf, was that of Pallene. The former of these, though of lower elevation than Acte, is intersected by a well-marked ridge ; but the latter is almost levcl, and from the traces of volcanic action that are found there was called by the Greeks Phlegra, and was said to have been the scene of the conflict between the giants and the gods. On the southern side of Pallene were the towns of Mende and Scione, and its isthmus was occupied by Potidea, near which, at the head of the Toronaic Gulf, stood Olynthus. The Greek cities on this coast were a continual thorn in the side of the Macedonian monarchs, and caused them to take part against Athens during the Peloponnesian War. The northern part of Chalcidice is mountainous, and beyond these mountains is a considerable depression, in which lies the Lake of Bolbe.

Macedonia first comes into notice in history in the reign of Amyntas (about 500 B.c.) and in that of his son Alexander, who was king at the time of Xerxes's invasion of Grecce. But whatever historical interest attaches to it is due rather to the great empire which sprang from it than to the importance of the country itself. During the Peloponnesian War we notice it chiefly as it affects the principal contending parties, but in the time of Demosthenes it

attracts our attention as furnishing the keynote of the policy of tliat –

statesman, and being the proximate cause of the overthrow of Greek liberty. After the MAcrDONIAN EMPIRE (g.2.) was subjugated by the Romans in 168 B.c., the country was left with a nominal autonomy, but lost its national unity by being divided into four districts, which were separated from one another by rigid political and social limita- tions. Before long it was reduced to the form of a proyince, and this, at the division of the provinces in the time of Augustus, was assigned to the senate. Thenceforward it followed the fortunes of the Roman empire, and, after the partition of that dominion, of the eastern branch of it. In the time of Alaric it was frequently plun- dered by the Goths, and in the interval which elapsed between Justinian I. and Heraclius a considerable part of it was colonized by Slavonians. During the prosperous period of the great Bulgarian monarchy in the 10th century a large portion of Macedonia was included in that kingdom. After that age extensive depopulation must have ensued, for in

the 11th and 12th centuries colonies of various tribes of Asiatic origin—Uzes, Turks, and Patzinaks—were established there by the emperors of Constantinople. In the par- tition of the Hastern empire, which followed the capture of that city by the Latins at the time of the fourth crusade, in 1204, Mace- donia was assigned to Boniface, marquis of Monferrat, who assumed the title of king of Saloniki. This kingdom in turn was brought to an end in 1224 by the Greek despot of Epirus, Theodore I., and by him a Greek empire of Thessalonica was founded, which for a time seemed likely to become the heir of the Byzantine power, but afterwards was merged in that of Nicwa, and on the recapture of Sa antioaple by Michael Palzologus once more formed part of a united Greek empire. In the latter half of the 14th century the greater part of Macedonia was in the possession of the Servians, whose kingdom was now at the height of its power ; but before the middle of the 15th it had passed into the hands of the Ottoman Turks, by whom it has been held ever since. At the present day the population of the inland part of the country is mainly composed of Bulgarian Christians, mixed with Turks, while the Greeks

occupy the coasts, the whole of Chalcidice, the plain of Seres, and some other districts. ae)

MACEDONIAN EMPIRE, Tue. The attention of the Greeks was drawn at an early time to the danger that the northern tribes might combine to invade the south. Sitalces, king of Thrace, spread great alarm by an inroad during the Peloponnesian War, but the real peril was from Macedonia rather than from Thrace. The Macedonians had been gradually pushing their way down towards the coast, and, though Alexander I. was a vassal of Xerxes, the retreat of the Persians, 478 B.c., left these hardy tribes free. They were still in a primitive state, mountain shepherds, ill clothed and ill housed, many of them clad only in skins. They wore the kausia or broad-brimmed hat; they ate and drank from wooden platters and cups; they differed little from what they had been when the first Perdiccas came to the country, when the king’s wife“baked cakes with her own hand on the hearth. But the peasants were freemen, not serfs like the Penestee of Thessaly. It was still neces- sary for the young warrior to slay a foe before he could take his place in the tribe;

and Cassander had to sit instead of reclining at the banquet of his father Antipater, because he had not yet killed a wild boar. The drunken bouts at these banquets led to some of the deeds which are a blot on the fame of both Philip and Alexander. The king held large domains, and had a choice body of “ com- panions” around him, but the warriors used much freedom of speech towards him, and the chiefs could only be condemned by the assembled host. When, however, any one was thus convicted of treason, his kindred were also put to death. If any blood guilt was incurred, a dog was cut in two and the soldiers passed between the halves laid out in the open air, that so they might be purified. There were still but few towns, or even strongholds, to which the people could fly when the Illyrians came in over Mount Berinius from the west, or the Thracians across the Stry- mon from the east, or the Paonians down the river Axius from the north. The western tribes too were at this time being pushed onward into Macedonia by a migration of the Gauls. Archelaus, son of Perdiccas II., however, built forts, cut straight roads, and collected horses and arms. The cavalry of the richer landowners was good ; but the foot soldiers were armed only with wicker shields and rusty swords. Archelaus also courted the friendship of leading Athenian statesmen, philosophers, and poets; and Jater on the Athenian general Iphicrates did essential service to the royal house.

But the advance made by Archelaus, who died 599 B.c., was almost all lost before Philip II. came to the throne, and the kingdom was reduced to a narrow district round Edessa, shut out from the sea by Greek cities. Olynthus, the chief of these cities, had in the reign of Philip’s father, Amyntas IT., induced many places to make themselves in- dependent of the king, but the jealousy of Sparta proved fatal to the Olynthian confederacy, and destroyed what would have been a bulwark against the barbarians of the north (379).

Philip himself had the best of all trainings, that of ad- versity. During the reign of his eldest brother Alexander IT., Pelopidas took hostages for the fidelity of Macedonia, and among them was Philip, then about fifteen years old. He remained two or three years at Thebes, profiting by literary training, and above all by the living example of Epaminondas, the ablest organtzer and most scientific tactician of the age, who had trained the soldiers that broke through the Spartan line at Leuctra. When Philip returned home, his

brother Perdiccas III. entrusted hin with the government of a district, where he organized a force on the Theban model. On the death of Perdiccas, though he left an infant son Amyntas, Philip was called to the throne (359), for the reign of a child in an early state of society means anarchy. Philip's energy soon made itself

felt. He fortified a new capital, Pella, safe amidst its lake-like marshes, from which he could act against the coast. Greece was at the moment completely disorganized. Sparta had lost, not only her supremacy over the other Greek states, but the control over Messenia and Arcadia, which leant on Thebes for defence against her revenge. Thebes had incurred odium from her conduct towards the free cities of Boeotia, was at feud with Athens, and had but a precarious hold over Phocis and Thessaly; while Thessaly itself, after the fall of the tyrants of Phers, was a prey tointernalfeuds. Athens was the first to come into collision with Philip, owing to her holding possessions on the coast of Macedonia and Thrace, whence she procured ship timber and naval stores. Philip had conciliated her

for the time by withdrawing his troops from Amphipolis,

her old colony in the bend of the river Strymon, while he was driving off the Illyrians and reducing the tribes to the west as far as the Lake Lychnitis. But Athens was at this moment threatened by the revolt of her allies which led to the Social War, and so lost the chance of reoccupy- ing Amphipolis while Philip was busied in the interior. The moment his hands were free, he retook the place, which was all-important to him, as it was not only the most convenient maritime station in Thrace, but also threw open to him all the country east of the Strymon, and especially the gold region near Mount Pangzus, the productive country facing the island of Thasos; and to secure his conquests he founded a new city in the interior ealled Philippi. His gold coins, struck on the Attic standard, soon became well known, and even the early gold coins of distant Britain copied the types of the Macedonian money. He also took Pydna and Potidza, thus depriving Athens of her hold on the Thermaic Gulf, while the occupation of Methone opened the way into Thessaly. Moreover, the Social War had not yet ended when the disastrous Sacred War began, which added religious to political enmity, and

benefited only the aggressor from the north. The Amphictyonic League was called into activity to crush the Phocians, who in their despair seized Delphi, and by the use of its treasures collected troops enough to hold Thebes in check for some years. It was the misfortune of Greece that there had arisen mercenary bands, like the condottieri of medizeval Italy, who hired themselves out to any one that would employ them. The citizens became more averse to service as civilization increased, and the work of war was now done by alien hands. Only astanding army could face the standing army of Macedonia, but the industrious and refined citizens naturally disliked continuous service, and it was long before even Demosthenes could arouse Athens to the necessity of the struggle. He was opposed by the old statesmen, by honest men such as Phocion (whose peace policy, however expedient after Cheronea, was impolitic during most of Philip's reign), and by others whom Philip had bribed—for he loved to "plough with a silver plough- share." The Sacred War gave Philip a pretence for interfering on behalf of the Delphic god. He drove the Phocian mercenaries from Thessaly, incorporated the ex- cellent Thessalian cavalry in his army, and gained a good naval position on the Gulf of Pagasz (Volo), the great inlet and outlet for the trade of the country. 'This also opened the way to Eubcea, for the possession of which, however, Athens struggled hard. It was on the Gulf of Pagase that Demetrias was afterwards founded, which, with Chalcis and Corinth, became the "fetters of Greece." Philip also laid a strong hand on Epirus, occupied Acarnania, won over the A®tolians by the gift of Naupactus, and thus hemmed in Athens on the land side. It is true that, when he marched on Thermopyle, B.c. 352, a sudden effort of the Athenians enabled them to reach the pass in

time to arrest his progress, and save the Phocians for a while ; but Philip had now a large seaboard, and he pro- ceeded to increase his fleet, to extend his dominion in Thrace on both sides of the Hebrus, and secure it by the founda- tion of Philippopolis, Calybe, Bercea, and Alexandropolis, while the Greek colonies along the Euxine up to Odessus sought his alliance. There was worse to come, for Philip by the year 347 had destroyed Olynthus and thirty-one other free cities in Chalcidice, and sold their inhabitants as slaves, a calamity such as had not happened since the

invasion of Xerxes, This struck terror into all the south country, and we find Isocrates, once the champion of Panhellenic freedom, proclaiming Philip the arbiter of Greece, and advising him to use his power for the purpose of conquer- ing Persia. He found himself bitterly deceived, and “that dishonest victory at Cheeronea, fatal to liberty, killed with report that old man eloquent.” The Thebans were still unwilling to combine with Athens, and even called in Philip to end the Sacred War. This gave him the command of Thermopyle, and the means of marching into Beeotia and Attica, while the destruction of the Phocians spread the terror still more widely. Philip now became the recognized religious leader of the Amphictyonic League, and began to interfere authoritatively in the Peloponnese. He was also preparing to master the Bosphorus and the Hellespont, the outlets from the Euxine into the Agean, through which the main supplies of corn came from the country north of the Euxine to Athens, which therefore laid great stress on the possession of the Chersonese. Once again Athens gained a success when she sent Phocion to relieve Byzantium from his attack (339). The Greek cities began again to lean on her, and her trade increased owing to the. destruction of Olynthus by Philip, and of Sidon by the Persian king Ochus. The Greeks too began to see that Philip’s allies were being swallowed up one by one. Philip himself, when returning through the passes of Hemus from an attack on the Scythian king, who ruled between the mountains and the Danube, suffered heavily from a surprise by the Triballi. But a second Sacred War against the Locrians of Amphissa, caused by A‘schines’s troublesome activity, again brought Philip into the heart of Greece. He fortified Elatea in Phocis, and demanded a passage through Beeotia to attack Athens. On this Demosthenes won his greatest triumph, when he induced Thebes to join in the struggle for freedom and independence; and, though the patriots were defeated at Cheronea, 338 z.c., yet their blood was not shed in vain; their example has told on all future time. Philip used his vicfory moderately, for he wished to leave Greece quiet behind him when he crossed into Asia to assail the great king. He garrisoned the citadel of Thebes, and demanded from Athens an acknowledgment of his leadership in the national war against Darius ; and a congress at Corinth recognized him as its chief, and arranged what contingents were to be sent from each state. His assassination in 336, at the early age of forty-seven, hardly delayed the execution of the plan, for he was succeeded by Alexander, who combined the qualities of a king of the

heroic ages with all that Greek training could give. Though the Macedonians had a dialect of their own, yet they had neither language for communicating with others nor any literature except what they derived from Greeks, and Philip had taken care to give his son even a better training than he had received himself. Alexander was also as prompt and cruel as his father. He at once rid himself of his cousin and brother- in-law Amyntas and other kinsmen and possible com- petitors for the throne, or persons otherwise dangerous. Then he dealt some heavy blows against the barbarians east, north, and west, some of whose chiefs he took for further security with him into Asia. He was just south

of Lake Lychnitis, on the western side of the range of Scardus or Pindus, when the news reached him that the exiles had roused Thebes to arms, and were besieging his garrison in the Cadmeia or citadel. Striking through a cleft in the main range of mountains, through which the Devol flows, and marching south along the Haliaemon and over the Cambunian ridge, which joins Pindus to Olympus, he reached Beeotia in less than a fortnight, stormed Thebes, sold the citizens as slaves, and destroyed the place. The citadel alone remained as a Macedonian fortress, until Cassander rebuilt the city. Amidst the general terror, Alexander thought it wisest to follow his father’s policy here also, and be content with his election as captain-general by the congress of Corinth.

He left Antipater as regent, and at once crossed the Hellespont to Sestus in the spring of 334, before the Persian fleet was ready to intercept him, or the main Persian army had been embodied. What information had he as to the regions beyond the Taurus and beyond the Tigris, and still more as to the great table-land of Asia extending from Persia to the Indus? He had the Anabasis of Xenophon, and perhaps the Persian history of Ctesias, but he must have relied mainly on information derived from Greeks who had been in the Persian service, or who had traded in the interior. But he knew one thing for certain, that no force in Asia could resist Philip’s veteran army. Thilip had formed the local battalions of militia into the phalanx, arrayed sixteen deep, and armed with long two-handed pikes (sarissx); and this steady body of pikemen, with the veterans in the front ranks, had borne

down on the open plain of Chzronea the resistance of the Greek hoplites, who were only armed with a much shorter spear. The phalanx was supported on the flanks by the light infantry of the guard (hypaspists), by targeteers (peltasts) trained after the plan of Iphicrates, by light lancers, and by a strong body of heavy cavalry, headed by the king's companions, and fighting with the short thrust- ing pike. It was the charge of the cavalry led by Alexander in person, at the head of the ''agema" or royal squadron, that decided all his battles. It seems strange, however, to us to hear that the men had neither saddles nor stirrups, nor were the horses shod. The fine native army was largely reinforced by barbarian archers, darters, and slingers, and by regiments of Greek mercenaries ; and this systematic combination of different arms and kinds of troops was supported by field and siege artillery of an improved type. Later on, when the main Persian army was broken up, Alexander added to the number of light troops, and made the regiments smaller and more flexible. Philip had moulded his country into a military monarchy, and turned the nobles into a caste of officers. All its strength was devoted to the one object of war, and it became for the time an overmatch for all its neighbours. On the other hand, Persia had deprived the subject peoples of national life and spirit ; the retreat of the Ten Thousand had shown how useless her native levies were, and now her defence rested almost entirely on e@ force of Greek troops under the able Rhodian general Memnon. The Orientals fought mainly with missiles, and were little suited for close combat hand to hand. The Persian satraps, however, had around them some choice horsemen, armed with missile javelins and with scimitars; and they insisted, against Memnon's advice, on fighting at the Granicus, which flows northward from Ida into the Propontis, but is every-where fordable. A sharp cavalry action at the passage of the river (334 3B. ¢.) gave Alexander all Asia Minor, and the completeness of his victory might seem to justify Livy's saying that he "did but dare to despise an empty show," and the words attributed to his uncle, Alexander of Epirus, that he himself had found the men's chamber in Italy while

'the Pheenician fleet in the Persian service to retire.

MACEDONIAN EMPIRE

his nephew had found the women’s in Asia. The Greeks had long been conscious of their superiority. ‘They might,” said Aristotle, “‘ govern the world, could they but combine in one political society.” Agesilaus of Sparta and Jason of Phere had already planned the attack on Persia, and the liberation of the Asiatic Greeks; and Alexander acted in the full consciousness that he was extending Greek rule. and civilization over the East. At the news of the battle. on the Granicus, Sardis surrendered. It was the centre to which all the routes converged, but Alexander did not (like Cyrus the younger) at once push on into the heart of the empire along the great road that led from Sardis to Susa. His object was to secure a firm base of operations, by occupying the line of coast round the Aigean, and forcing The Greek colonization of Asia Minor had prepared the way for him ; the Greek cities along the western and southern coast threw open their gates, and Alexander restored their popular constitutions. He even recognized the Lycian con- federation. Memnon was only able to organize a resist- ance at Miletus and Halicarnassus. Bnt his real plan was to put troops on board his ships and raise Greece against the Macedonian yoke, especially as the Athenian fleet was still more than a match for that of Alexander. But when Memnon died there was no one left to carry out this able plan, and Darius threw away his best chance by recalling the troops. Then Alexander marched up northwards from Lycia through Pisidia and Phrygia to Gordion on the Sangarius, whence the main road led east across the Halys and through Cappadocia to Cilicia, between the passes of Mount Taurus and those of Mount Amanus. Here Darius tried to throw his army across the Greek line of communi- cation with their supplies, but his host, crowded together in the narrow ground on the river Pinarus near Issus, was hopelessly defeated. The modern name of the Gulf of Issus, “Iskenderun,” still preserves the memory of Alexander. Then Parmenio, Alexander’s second in com- mand, pushed on and took Darius’s treasures and stores at Damascus. Again, however, Alexander deferred his march inland till he had mastered Phcenicia and Egypt, and so gained the command of the sea in the eastern basin of the Mediterranean. Only the brave freemen of two fortified cities, Tyre and Gaza, held out; and when the Pheenician and Cyprian fleet transferred its allegiance to the invader their only effective weapon was wrested from the hands of the Persians. The occupation of Cyprus and Egypt had been one of the boldest conceptions of the age of Pericles and Cimon, and its success would have secured the supremacy of Greek

commerce. As the Persians had persecuted the Egyptians for their worship of animals, Egypt welcomed the deliverer, and recognized him as the son of Ammon; while the Greek colonies of Cyrene and its Pentapolis sent to tender submission. Alexandria was founded on the seaboard ag a new centre of commerce, from which it was easy to communicate with the Govern- ment and with all parts of the empire. The protecting island of Pharos gave the means of forming two good harbours on a coast elsewhere harbourless; while Lake Mareotis, communicating by canals with the Nile, enabled produce to be easily brought down from the interior.

At last the time was come for delivering the final blow to Persia. Alexander passed the Euphrates at Thapsacus (‘the passage”), and then marched north-east through the hilly country by Nisibis, to avoid the hot desert of Mesopotamia. He crossed the Tigris unopposed, and defeated Darius’s hosts at Gaugamela. The long struggle of two hundred years between Greece and Persia was at anend. The victory converted Alexander into the great king, and Darius into a fugitive pretender; and Babylon and Susa submitted. At Babylon Alexander sacrificed

to the native gods, as he liad done elsewhere, and this admixture of the religions of all countries largely influenced the later phases of heathenism. The priests recognized the Greek kings, and the later cuneiform inscriptions com- niemorate Seleucus and Antiochus. When Euemerus’s view spread, that the gods were only deified men, a fusion _of religions became still easier, The worship of the Sun- god and of Osiris, the god of the dead (especially under his Grecized form at Sinope as Serapis), extended far and wide. In administering these countries, Alexander separated the civil, military, and financial functions, and, where natives were left in office, entrusted taxation and military command to Macedonians. The great power of the satraps had weakened the central government of Persia, and Alexander adopted a wiser plan, but his generals restored the old system after his death. The Persian treasures, dispersed by the conquest, gave a fresh stimulus to commerce, especially as Persia was rich in gold, which was scarce in the West. Alexander had already prepared the way for a universal currency by coining silver didrachms and tetradrachms after the

Attic standard, which became current coinage over most of the East; the Ptolemies, however, adopted the Phcenician standard for Egypt. Up to this point the countries conquered admitted of being more or less assimilated and Hellenized; but, when Alexander penetrated through the passes that led up to Persepolis in Persia, and thence to Ecbatana in Media, and again north to secure the defiles that led down to the Caspian, and so skirting the southern flank of the range of Elburz to Hecatompylus in Parthia, the centre of the roads leading to Hyrcania (at the south-east of the Caspian), to Bactria, and to Ariana, and then from Kandahar northwards to Cabul, and through the mighty range of the Hindu- Kush to Bactria (Balkh) south of the Oxus, and Sogdiana (Bokhara) between that river and the Jaxartes, and at last as far as the Indus and the Punjab, bis route lay through tribes that still possessed their native strength and power of resistance to foreign influence, though for the moment overborne by the superiority of the Western arms. Alexander saw the danger, and met it by settling Greek colonists in new cities which were to serve as military posts, depdts of commerce, and centres from which to Hellenize the country districts ; and many of them are still important points in the East, though the desert has spread, and robber hordes have stopped some of the old caravan routes. Such places are Merv, Herat, Kandahar, Cabul, Samarkand, Khojend. Bactria and Sogdiana were to serve as a frontier against the wild hordes of the north, and thus Alexander’s measures determined the fortune of Transoxiana for centuries. Some native rulers also were left to form a sort of barrier in front of the empire tothe north and east. Alexander laid the main stresson securing the great rivers, the Euphrates and the Tigris, the Oxus and Jaxartes, the Indus and Hydaspes. In Greece itself the Macedonian kings upheld tyrants or oligarchies, but here freer muuicipal constitutions were allowed to attract colonists. Alexander further planned to fuse the noble Persian race with the Greeks by intermarriage, and by giving the Persians equal rights in the army and the administration. Common service in these was the best means for Helleniz- ing the natives. This was a more generous plan than Aristotle’s advice as to the way of ruling barbarians would have led to; but Alexander saw that the Eastern peoples were not barbarians like the Illyrians. The culture of Egypt reached far back ; the astronomy and art of Babylon could not be despised; the religions of Persia and India afforded matter of interest to Greek inquiry. These lands of ancient civilization might teach as well as learn some- thing from Greece.

The Eastern nations responded to the touch, and Persian legend to this day preserves the name

of Iskander among the names of their national heroes. Alexander's conquests were to be justified by the result, by the union of East and West, and the diffusion of Western civilization over Asia. Even India should feel something of the new influence. Alexander would have made the nations into one. An old writer says, " The elements of the nations' lives were mixed together as in a love cup, and the nations drank of the same cup, and forgot their old enmity and their own weakness " (Plut., De Fort. Alex., i. 6). There is, it is true, a reverse to the picture. The oppressive conduct of many of the Macedonians thus suddenly put into power was an evil omen of what might happen if their chief was removed; and, if the East was becoming Hellenized, yet Alexander became in turn Orientalized. Could he remain a Western king and also an Oriental despot? a Greek and a Persian? It might be good policy, but Philip's old generals could not help show- ing their disgust, and Clitus and others paid for it with their lives. The Greek states also felt the difference. Just before his death Alexander required them to worship him as a god, and, without any regard to the rules agreed on at the congress of Corinth, forbade the federal meetings of the Achzeans and Arcadians, and issued a decree restoring all exiles to the various states. Greece became practically a province of the Eastern empire, and the patriots who had maintained the fight for freedom were more than justified by the ruin that came on Greece through Alexander's successors. Even if he himself had not been spoilt by success and absolute power, yet he was but a lucky accident. And, though the Hellenizing influence spread over much of the East in a way to which there has been but one parallel, the mixture of German and Roman elements when the barbarians invaded the empire, yet Alexander's conquests, while they Hellenized Asia, tended to Asiatize Hellas; they put an end to the genuine Hellenic spirit, to its productive genius and consummate literary and artistic excellence, as well as to its political frecdom. The New Comedy shows how national life and public interests had died out ; with all its fine psychological analysis it does but dwell on the characters and situations of daily life and purely domestic feelings. But the braggart soldier is now a common character in the play,

and slavery plays a greater part than ever. Last of all, Alexander marched along the Cabul river, and through the pass of Jellalabad to the passage of the Indus by Attock; but when he reached the Hyphasis (Sutlej) the weary troops refused to cross it and press on to the Ganges. He then sent Nearchus down the Indus, to sail round to the mouth of the Euphrates, and explore a route for traffic across the Indian Ocean. Nearchus profited by the monsoons, which thus becaine known to the Greek sailors. The king himself went down the river to see the great southern ocean with its strange tides, and he planned that an Alexandria on the Indus should communicate with the Alexandria of the Nile valley by an intermediate harbour on the Euphrates. He further planned the circumnavigation of Arabia, if not of Africa also, and a voyage to the north of the Caspian. At the same time Pytheas of Marseilles was exploring the British and Baltic seas. This enlarged and systematic exploration of the earth, combined with increased means of communication among its inhabitants, was beneficial to civilization, if we may define growth in civilization as growth in the amount of services rendered to each other in civil society. The record kept by Alexander's quarter- masters (bematiste) of the length of his marches gave succeeding geographers important information ; and it was more useful to Eratosthenes than the vague descriptions in the historians, who were striving after literary effect, and some of whose accounts were very legendary, for legends soon clustered round the name of the great con-

queror. Alcxander scems also to have had a description (anagraphe) of the empire drawn out. After his return through the desert of Baluchistan, along the Indian Ocean, he devoted himself to consolidating the internal administration and checking the oppression exercised by his officers; but he was planning new conquests in the West, from all parts of which he had received ambassadors, when he died of marsh fever at Babylon (323 B.c.), at the early age of thirty-two.

All attempts to keep his empire together inevitably failed, but his work was done, since, whether for good or evil, the Hellenizing of the East determined the whole course of history. The army resolved that his child (not yet born) by his Bactrian wife Roxane, and his imbecile half-brother,

Philip Arideus, should bear rulejointly. First Perdiccas was named regent, but the generals began to combine against him, and he perished in trying to reduce to obedience Ptolemy, the satrap of Egypt, the man who saw most clearly and earliest the tendency of events. Then Antipater, who had with difficulty defeated the gallant attempt of the Greeks under the leadership of Athens to regain their freedom in the Lamian War, was made regent. On his deathbed he transferred the office to Polysperchon, who soou proved unequal to his task, and even gave up Phocion, the leader of the Macedonian party at Athens, to death. Antigonus, the commander-in-chief in Asia, destroyed Eumenes, who was faithful to the royal house but was a Greek from Cardia and not a Macedonian. He then tried to reunite the satrapies; but Ptolemy of Egypt, Lysimachus of Thrace, and Seleucus of Babylon combined with Cassander of Macedon against him, and he fell (301 Bo.) at the battle of Ipsus in Phrygia. This decided the final break up of the empire. Several native princes retained their dominions and formed a kind of neutral zone between the new kingdoms, and the Getz on the Danube maintained themselves against Lysimachus, The customary feuds in the royal house, and its intrigues with the generals, soon led it to destruction. Roxane, the mother of the child Alexander, began by murdering Alexander's other wife Statira, the daughter of Darius. Alexander's Epirote mother Olympias killed Philip Arideus and his wife Eurydice, and Cassander killed Olympias herself, and afterwards Roxane with her son. There were similar feuds and murders in the houses of all Alexander's successors, except the early Antigonids. Their marriages, like those of Philip and Alexander, were of a very Oriental character; and "in these families," says Plutarch, "murders of sons, mothers, and wives were frequent, murders of brothers were even common as a necessary precaution for safety." The generals assumed the title of king after Demetrius's defeat of Ptolemy off Cyprus (307 8.c.), and their example was followed by Agathocles at Syracuse, and Dionysius at Heraclea on the Euxine. Demetrius, after his father's death at Ipsus, fled to Greece, and occupied much of the country. His viceroy in Boeotia was the historian Hieronymus of Cardia, the friend and fellow-citizen of Eumenes. Demetrius for a time even gained Macedonia, but his Oriental rule disgusted the people, and he had to fly to Seleucus, who married his daughter Stratonice. Scleucus detained him under honourable guard till his death, perhaps with some idea of using his help if the balance of power should again be threatened. When

an empire breaks up, old geographical relations make themselves felt, the great masses and divisions of the land exert their influence and affinities of race begin to show their old power, the natural boundaries of mountain and river tend to reappear ; and so it proved now. After Cassander's death, and the defeat of Lysimachus by Seleucus, Seleucus reorganized Asia by breaking up the twelve large satrapies into more than seventy districts of a

more manageable size. He then crossed to Europe to re- unite Macedonia to Asia, but was murdered by Ptolemy Ceraunus, eldest son of Ptolemy of Egypt—who had chosen his second son Philadelphus as his heir instead of the wild Ceraunus, Seleucus's death ended the generation of Alexander's generals. A new state of things followed. Ceraunus fell in battle against the invading Gauls, whose migrations gave a final blow to the old system. Part of the Gauls passed on into Greece, where the free states destroyed them, while others crossed into Asia and occupied the conntry named from them Galatia, 276 B.c. Lastly, after Pyrrhus of Epirus, whose sister Deidamia married Demetrius, had more than once nearly gained possession of Macedonia, Antigonus Gonatas, the son of Demetrius, finally secured the succession, and restored the wasted realm to the position of one of the great kingdoms by the side of Egypt and Syria. The last struggle of Athens against him in the war of Chremonides (a pupil of Zeno of Citium) proved fruitless. He also regained the Macedonian frontier on the side of Epirus as it had been in Philip's time, and the Aous became the boundary towards the Dardanians on the north-west. Of the kingdom thus restored his family retained possession till Perseus was overthrown by the Romans at the battle of Pydna (168 3.c.), but the later kings wasted their strength in useless wars instead of doing what miglit have been done, conquering and Hellenizing the country up to the Danube. The Epirote kings Alexander and Pyrrhus had striven to found a new military empire in Italy, but in vain. The Apennines can be seen from the coast of Epirus, and these kings were always stretching eager hands over the sea to the new lands in the West, but their power proved unequal to the task, and Pyrrhus's position in history is mainly important because his expedition brought Greece and Italy into close connexion. His geniality of character impressed his contemporaries, and has left its impress on Roman and Greek legend.

In Asia Seleucus had in vain tried to preserve the most easterly provinces, for the Eastcrn nature had at once begun to react against the Macedonian conquest, and the Seleucid kingdom had no true centre or natural limits. Sandra- cottus, a native chief, founded a great kingdom in India with Indian and “ Javanic”(Ionian,?.e.,Greek) support; and Seleucus, after one campaign, gave up the eastern districts as far as the Paropamisadz west of Cabul. Sandracottus was perhaps supported by the Brahmans whom Alexander had opposed, but the Punjab has witnessed more than one revolt against the system of caste, which had its stronghold in the valley of the Ganges; and Buddhism soon became predominant in the new kingdom. The edicts of Asoka, the second successor of Sandracottus, which made Buddhism the state religion (though Brahmanism was tolerated), mention Antiochus Ptolemy and Antigonus (see Iyp1a, vol. xii. p. 787, for a full account); and Buddhist missionaries began to spread the faith westwards as well as to the south, and some knowledge of the cycle of Eastern story and fable was communicated to the Greeks. But we have not the materials for estimating the influence exercised in Asia by the Greeks on the new kingdom. Similarly a Greeco- Bactrian kingdom, which was made independent by Theodotus or Diodotus about 256 B.c., lasted for two centuries. Many of its coins have been found with legends at first purely Greek, but becoming gradually barbarized. Some of the early ones resemble the gold coins of Antiochus IT. of Syria, who ruled just before Diodotus made the new state independent. After the first five kings, however, the legends are in Prakrit as well as in Greek. The caravan routes were long kept open, and in this way trade with China was maintained, and silk and other Chinese commodities reached Europe. Farther west

native Persian chicfs became practically independent, such as Atropates in the Median district, called from him Atropatene, and elsewhere ; for the clan system was suited to these districts, and they preserved the system of Zoroaster till Artaxerxes (Ardshir) restored the Persian monarchy, 226 a.p. (see Persia). But even here Greek influence lasted on ; nor when Arsaces, about 250 3.c., had set up the kingdom of Parthia and made Hecatompylus his capital, did that influence die out in Parthia. Even the new cities founded by the Parthian kings, such as Dara, were on the Greek model, and largely

inhabited by Greeks ; and some of the chief cities retained Greek municipal constitutions, such as Ctesiphon, which took the place of Seleucia on the Tigris as Seleucia had taken the place of the old capital Babylon— ‘ Of later fame, Built by Emathian or by Parthian hands,

The great Seleucia, Nisibis, and there Artaxata, Teredon, Ctesiphon.”

So again in Asia Minor native chiefs began to rule in Armenia, Bithynia, Cappadocia, Paphlagonia, and Pontus ; and some of them, such as the Cappadocian princes of the Mithridatic family, who afterwards ruled at Amasia, claimed descent from the royal Achzemenid house of Persia, or from leading Persian houses. They, as well as the princes of Pontus, intermarried with the house of Seleucus, to which their help was important. Bithynia and Pontus had an era of independence, from which they reckoned their dates just as the Syrian kings did from the return of Scleucus to Babylon. The independence of Judea under the Maccabees was established at a later time (see IsRaEL). All these were subject to the Hellenizing influence of the Greek towns; and the Greek language spread everywhere, even among the Galatians, as we see by the inscriptions. Nicomedes of Bithynia founded Nicomedea in 264 B.c., as a Greek town ; it soon rivalled Nicaza in importance, and we owe to it Arrian, the historian of Alexander. The barbaric princes often took wives, ministers, officers, en- gineers, literati, artists, actors, and intermediate agents of all kinds from some neighbouring Greek city, a custom which had begun before the time of Alexander, as we see in the case of Mausolus of Caria. In Pergamon, about 238 B.C., Phileteerus, by the help of the royal treasure, made him- self independent, and under Eumenes and Attalus the little state showed much political skill in trimming the balance of power between the neighbouring dynasties. Attalus took the title of king after a victory over the Galatians on the Caicus, and this victory was commemorated by the Gigantomachia around the famous altar lately discovered at Pergamon (see Conze, Beschreibung der Pergamenischen Bildwerke ; Overbeck, Geschichte der Griechischen Plastik, 3d ed.). He also sent commemorative statues to Athens ; one of which, long celebrated as the Dying Gladiator, is now seen to be the portraiture of a dying Gaulish chief. Greek art, transplanted from Athens and the Peloponnese to Pergamon and Rhodes, though it had ac- quired a somewhat florid tinge, was yet not unworthy of its descent from

the schools of Phidias and Lysippus, and owing to the close alliance of these two cities with Rome, as against Macedon and Syria, this revived Greek art found its way to Italy. Pergamon also became a centre of Greek learning only second to Alexandria; and, when Ptolemy cut off the supply of papyrus from Egypt, Crates of Mallus in Cilicia (whose name was only second to that of Aristarchus) is said to have revived the old Asiatic use of “parchment ”—a name which itself preserves the memory of Pergamon. Papyrus, it is true, remained the usual material for books till about the 4th century, when the Christian Church finally adopted the new material due to the invention of Crates (see Birt, Das antike Buchwesen),

All along the coast also a number of Greck citics acquired practical independence owing to the division of power among the princes, Greek as well as native, who were further kept in check by the invading Gauls. Such were the cities of Byzantium, Cyzicus, Heraclea, Sinope, and Olbia on the north-west of the Black Sea, and Panticapseum or Bosporus between that sea and the Palus Mzotis. The true Greek spirit survived above all in Rhodes, as it did also at Massalia in the West. All the more did the Syrian kings strive to maintain their power by founding cities under their own rule, which were made attractive to new colonists by something of municipal independence, with the right to bear arms, to coin money, and to manage their own judicial affairs. Each city had its demus, senate, archons, and generals. There were four of these great cities in Syria itself :—two inland, Antioch on the Orontes, the greatest commercial entrepdt in the East, and Apamea, the military centre of the kingdom ; two on the coast, Seleucia, with its rock fortress to serve as a refuge in time of trouble, and farther south Laodicea on the sea, among its rich vineyards. They were all named after the royal family. Other towns were named from places in Greece or Macedonia, such as Achaia, Amphipolis, Apollonia, Arethusa, Astacus, Bercea, Callipolis, Chalcis, Edessa, Herza, Larissa, Maronea, Oropus, Pella, Perinthus, Tegea ; for the oppressed Greeks of Grecce itself and of Magna Grecia here found an outlet for their energy. Some military colonies were planted on the west and south of Galatia, to keep the Gauls in check, and guard the roads leading from Phrygia, the centre of the commerce of Asia Minor, to the towns on the coast; such were Antioch in Pisidia, Apamea

Cibotus, Synnada, and Thyatira. Even Palestine, notwithstanding the temporary success of the Maccabees, was full of Greek towns like the later Caesarea, and the manufacturing population used the Greek language. We have some traces of the state of things in the Lconomics, a work of this period, though falsely attributed to Aristotle ; and the later political literature shows that men had a clear idea of the aims and means of the politics of the day, and that diplomacy and international law had considerably developed. Thus a large influx of new Hellenic blood was poured into tle lands on this side of the Tigris, into Asia Minor, Mesopotamia, and Syria ; during the century after Alexander's death nearly two hundred cities were founded, and the Greek race became predominant in western Asia, though of course it was differentiated by the various peoples which it undertook to assimilate, and by which it could not but be influenced in turn, especially as the princes found it necessary to conciliate them. The historians of the time are mostly lost ; but many inscriptions survive which show what a blending of populations took place. One gives us a rescript of Antigonus on incorporating the people of Lebedus with the Teians. Another shows that Magnesia became absorbed in Smyrna, now restored after it had long lain waste. Others tell us that places like Erythre and IJasus recovered somcthing like independence owing to the needs of the Syrian kings. Amidst the feuds of the great powers the Ionian states recovered their freedom, and were able to form a kind of federal union. Similarly we hear of the community (xowéyv) of Bithynia, of Asia, and the like. A new life of a somewhat different kind from the old Greek life in politics, religion, and science dates from the revolution effected by Alexander's conquests, though in the lower strata of the country population old beliefs still had some hold, as is evident by what Pausanias found existing even in his day in Greece itsclf. But old distinctions tended to vanish away, only that between poor and rich acquired still greater force, material interests became predominant. We see also that in the manufacturing towns the workmen had formed benefit societics,

and secret or public associations of various kinds. And it was in these commercial centres, with their somewhat cosmopolite character, free from old prejudices and ideas, that Christianity found an early home. Greek

freedom made a great impression in the Hast. The Greeks had no system of castes, no close priesthood, no sacred books like those of India to limit their development ; their views may almost be called cosmopolitan, and the distinction between ‘“‘Greeck” and “ barbarian” already tended to disappear, as Alexander perhaps had wished. Attic speech became the basis of the new written language, and, with Attic custonis, prevailed at the courts of Alexandria and Babylon, of Bactra and Pergamon. Attic plays were acted at Ctesiphon down to Roman times; and the later rhetoricians and sophists imitated the masters of Attic oratory. The Greek view as to Philip and Alexander was thus enabled to hold its own against the prevailing Macedonian tone on these matters, especially when Macedonia lost its leading position, for that country produced only soldiers—with the exception of Marsyas of Pella, and of King Ptolemy, who wrote with true military brevity an account of Alexander’s campaigns, which Arrian wisely preferred to the more romantic account of Clitarchus. But, though the towns became Hellenized, yet the Hellenistic populations did not possess the highest qualities of the Greek mind, as the surrounding elements and the climate naturally wrought some alteration. Polybius looked with surprise at the Greeks settled in Alexandria. The living forces of Greece —its productive genius, self-organizing power, and active spirit of political life—were weakened and gradually lost their energy. The Attic language became the Hellenistic, Attic eloquence received a florid Asiatic tinge (though fEschines himself taught at Rhodes), but true eloquence can only flourish, as Tacitus points out, in a free state. Literature and art lost their connexion with a true national life. Architecture took another character, and the plastic art of Pergamon, though derived from Athens, and that of Rhodes, though derived from the Sicyonian school, through Chares of Lindus (who modelled the Sun-god, known as the “ Colossus”), had lost the self-restraint and dignity of the highest Greek art. But the suppression of political freedom turned the force of the Greek mind all the more strongly into other channels, and science and criticism, and speculation and literary history, made a great advance. Considerable schools were opened at Tarsus and other centres of commerce. As the free state lost its power over the mind, men had recourse to philosophy, and regained in mental fortitude and independence the outward freedom they had lost. Then this feeling reacted on politics, anda generation of patriots like Philopcemen arose, worthy to represent Greece in these her last days. The new teaching of freedom came

forth, as was right, from Athens; it was the followers of Arcesilaus, the founder of the new Academy, who freed Megalopolis from its tyrant. The later developments of philosophy were mainly due to Zeno of Citium in Cyprus, and to Epicurus, who finally tauglit at Mytilene and Lampsacus; but Athens was still the chief home of their teaching. The writings of the great philosophers of this age, however, are mostly lost to us, as well as those of the historians, and after Aristotle there is a strange gap in the tradition up to the Christian era. The Greeks now wished to know the early history of the East, and the Eastern peoples wished to make their history known to the great literary nation. Hence Berosus wrote the history of Babylon for Antiochus II., from the archives in the temple of Belus, Manetho that of Egypt for Ptolemy Philadelphus, Menander of Tyre that of Phoenicia, and Jewish writers the history of their race and religious views, which are finally summed up for us by Philo and Josephus. The sacred books of Egypt, Palestine, and

| Persia were to be found in the Alexandrian library, and the religious syncretism that resulted from the mixture of races prepared the way for monotheism and for Christianity. The astrology, however, and divination of the East in turn made their way among the Greeks, and led to curious superstitions, and a whole literature of Sibylline books and similar forgeries sprang up. Christianity itself spread chiefly in the Hellenized towns ; the country districts were much longer in feeling the new influence.

It was in Egypt, however, that Hellenism was perliaps most highly developed. The Ptolemies gained Cyrene and Cyprus, and struggled hard with the Syrian kings for the possession of Phcenicia ; Palestine was as of old the battle- field for the king of the north and the king of the south. The Ptolemies even held Seleucia at the mouth of the Orontes for some time. The history of these times is lost in its detail; the only thing certain is the spread of the Hellenistic spirit in the East. Many Jews were trans- planted to Alexandria and Cyrene, occupied large quarters of those cities, and had full civil rights. The Ptolemies also pushed south into Ethiopia, and the African elephants which they trained for war enabled them to oppose the Syrian army with its Indian elephants. A Greek inscrip- tion at Adulis, though of

later origin, commemorates the conquests of the third king of this line. These kings also secured the route down the Red Sea, reopened the old canal of Necho leading from the Nile into that sea, founded Arsinoe and other important towns, and made discoveries — on the route to India. The new information thus gained was recorded in the geographical works of Agatharcides of Cnidus and Artemidorns of Ephesus. The old trade of Egypt had chiefly consisted in the export of corn; now the wares of Arabia, South Africa, and India came through Egypt to Europe, and ships of Alexandria became frequent visitors to the western waters. Even in Asia Minor Egypt won influence as Syria lost it, and a court poet (perhaps Theocritus) was justified in praising the Egyptian king who was master of the sea. The carrying trade had fallen largely into the hands of Egypt from the time when the war between Seleucus and Antigonus stopped the trade of the caravans by land, and the import and export duties formed a large part of the Egyptian revenues. After the return of Pyrrhus from Italy, Philadelphus even made a treaty with Rome. The Sicilian Greeks might be rivals in trade, but the Italians were good customers, and produced the excellent wool which was invaluable for the Egyptian manufactures, as the cultivation of cotton in Egypt had but begun. Puteoli, the first really good port to the south of Rome, was the chief centre of the trade even at this early. time. The Egyptian trade was concentrated in Alexandria, which thus became one of the greatest cities on the earth. Science flourished there, and men like Archimedes came thither to study. Much of what was done was done forever. No mathematician has to redemonstrate the problems of Euclid. Geography was founded by Eratosthenes of Cyrene on a mathematical and astronomical basis; he first calculated the magnitude of the earth by measuring an arc of the meridian, the process employed at the present day. Modern astronomy too is the natural development of the work of Hipparchus and Ptolemy. Erasistratus and Herophilus investigated the structure and functions of the valves of the heart, and the nerves of sensation and motion, and a close connexion was thus formed between anatomy and medicine. The Museum, a sort of college, numbered Eratosthenes, Callimachus, Aristophanes, and Aristarchus aniong its members. They fixed the text of the classical writers on critical principles, and grammar assumed the form itkept for centuries. Poetry itself had a kind of second summer with Callimachus and Apollonius Rhodius, and, under Sicilian influences, with

Theocritus, Bion, and Moschus. All the knowledge of the past was treasured up for transmission to a future age.

There was no more unity among the Macedonian monarchies than there had been amoung the free cities of Greece, and the kings were even less able to combine against Rome than the republics against Philip. When Philip V. tried to keep the Romans out of Greece, he met with no support from Antiochus the Great, and was defeated by Flamininus at Cynoscephale, 197 B.c. Antiochus in turn had no help from Philip when Scipio crossed into Asia and defeated the Syrian army at Magnesia, 190 B.c. Last of all, Perseus was overthrown at Pydna (168 Bc.), while Antiochus Epiphanes was trying to plunder Egypt; and Macedonia was divided into four districts, like those out of which the kingdom had been originally formed—Amphipolis, Thessalonica, Pella, Pelagonia. The Romans in many respects carried on the work of spreading Greek culture. They gave the Greek cities of Asia a freer scope for their action on the country; they united the whole Greek race, east and west, under one rule, and opened out the world to their enterprise. We meet with many great names in this later age, such as Posidonius at Rhodes, Galen at Pergamon, Strabo at Amasia. Epictetus was a Greek slave from Phrygia. Cappadocia became so thoroughly Greek that the church itself owed to it such men as Basil and Gregory. The Greek influence even spread to Palmyra in the desert, and its ruin in the third century marks the first great check sustained by Hellenism. But under the rule of Rome it may almost be said that the primitive unity of the Greeco-Italian race was restored, and the work of the Macedonian conqueror completed in western Asia,

This article is mainly based on Grote’s Greece, and Droysen’s Hellenismus, 2d ed., 1877. For more detailed accounts and for the personal history see ALEXANDER, ANTIGONUS, ANTIOCHUS, ANTIPATER, &c. The original authorities are collected in Didot’s Historict Greci, and his Arrianus, 1877. (C. W. BO.)

MACEDONTUS, a deacon, was raised to the patriarchate of Constantinople as successor of Eusebius of Nicomedia by the Arian bishops in 341 a.p., while the orthodox party elected Paul, whom Eusebius had superseded. The

partisans of the two rivals involved the city ina tumultuous broil, murdered Hermogenes, the general whom Constantius II., during his own absence, had empowered to preserve order, and were not quelled until the emperor himself returned to the city and banished Paul. Macedonius was recognized as patriarch in 342. In that year Paul again returned, and was again banished, and Macedonius, amid much tumult and bloodshed, was forcibly installed in his see by the imperial troops. Compelled by the intervention of Constans in 348 to confine his authority again to one church, and to resign the patriarchate in favour of his former opponent, he was reinstalled in 350. Hethen took vengeance on his opponents by a general persecutiou of the adherents of the Nicene creed. In 356 he occasioned a disastrous and bloody tumult in Constantinople by causing the ashes of Constantine the Great to be removed from the dilapidated church of the Apostles to that of St Acacius. In 359, on the division of the Arian party into Acacians (or pure Arians) and semi-Arians, Macedonius adhered to the latter, and in consequence was expelled from his see by the council of Constantinople in 360. He now became avowed leader of the sect of Pneumatomachi, Macedonians, or Marathonians, whose distinctive tenet was that the Holy Spirit is but a divine influence pervading the universe and not a person distinct from the Father and the Son. He did not long survive his deposition.

MACEIO, or Macayo, a city of Brazil, the chief town of the province of Alagoas, and one of the ports open to foreign trade, is situated about 150 miles south of Pernambuco, in 9° 39’S. lat., on an eminence about a mile from the shore,

in the midst of luxuriant vegetation. It possesses a fine cathedral and an elegant house of assembly, as weil as a cotton inspection office and acustom-house. Asits harbour at Jagudra on the coast is but slightly protected by reefs and a small peninsula, and the water deepens slowly from the sandy beach, vessels cannot approach the piers (of which there are several), and have to be discharged and loaded by lighters. ‘Trade, however, is on the increase, and will develop largely on the completion of the railway to the interior. In 1880 44 British and 35 foreign vessels entered, with a burden respectively of 17,624 and 10,482 tons ; and cotton and sugar were

exported to the amount of 4181 and 27,810 tons. In 1839 the town became the provincial capital instead of Alagoas. The population is about 20,000.

MACERATA, a city of Italy, the chief town of a pro- vince, a bishop's see, and the seat of a court of appeal, lies 22 miles south of Ancona, and 17 miles by road west of Civita Nova, the nearest station on the East Coast Railway. Crowning the top of a hill about 1300 feet in height with a picturesque mass of buildings enclosed by walls and towers, Macerata looks out over the Adriatic and the valleys of the Potenza and the Chienti. The cathedral is a modern structure of but little interest; but some of the churches, and especially some of the palaces, —Palazzo dei Torri, Palazzo Bonaccorsi, &c.,—are fine pieces of architec- ture; and at a short distance from the town stands the beautiful S. Maria delle Vergini, designed by Galasso da Carpi, but often attributed to Bramante. Besides the university, Macerata contains a communal library founded by Leo XII., and, in the municipal buildings, a collection of antiquities from Helvia Ricina, Its infant schools were the first established in the papal states. Glass and pottery are among the manufactures, and three fairs are held yearly. The population of the commune has increased from 19,283 in 1861 to 20,219 in 1881 ; that of the town was 10,065 at the former date,

Macerata, as well as Recanati, was founded by the inhabitants of Ricina after the destruction of their city by Alaric in 408. During the Lombard period it was a flourishing town ; but it was from com-

arative insignificance that it was raised by Nicholas IV. to be the

eatof the governors of the March. By the viceroy of Frederick II. it was enclosed in the 13th century by a new line of walls more than 24 miles in circuit ; and in the troubles of the next two hundred years it had frequent occasion to learn thcir value. For the most part it remained faithful to the popes, and in return it was rewarded by a multitude of privileges. Though in 1797 the inhabitants opened their gates to the French, two years afterwards, when the country people took refuge within the walls, the city was taken by storm and delivered to pillage. 'The bishopric of Macer- ata dates from the suppression of the see of Recanati (1320). Crescimbeni, the poet of the 13th century, his namesake the founder of the Arcadian Academy at Rome, and Matteo Ricci, the Chinesc missionary and scholar, were natives of the city.

MACGILLIVRAY, Witii1am (1796-1852), a writer on several branches of natural science, but best known as an ornithologist, was born in 1796. He studied as an arts student in King's College, Aberdeen, graduating M.A. in 1815, and also studied medicine, but did not complete the latter course. In 1823 he became assistant to the professor of natural history in Edinburgh University ; and in 1831 he was appointed curator of the museum of the Royal College of Surgeons in Edinburgh. In 1841 he became professor of natural history and lecturer on botany in Marischal College, Aberdeen. He died in 1852. He possessed a wide and comprehensive knowledge of natural science in its various departments, gained no less from personal observations in the course of frequent excursions through different parts of Scotland than from a study of the collections under his charge in Edinburgh and of books. His industry and extensive knowledge are amply shown in his published works. He contributed numerous articles on the zoology, botany, and geology of Scotland to the scientific journals

in Edinburgh, to the Magazine of Botany and Zoology, and to the Transactions of the British Association. He also assisted Audubon in his classical works on the Birds of America; and he edited Withering's British Botany.

His larger works are numerous, and include biographies (of Humboldt, and of zoologists from Aristotle to Linnzus), Text-books of Botany, of Geology, and of Conchology, a History of British Quadrupeds, a History of the Mollusca of Aberdeen, Banff', and Kincardine, a Manual of British Ornithology, and a History of British Birds, in 5 vols., 1837-52, The last work holds a high rank from the excellent descriptions of the structure, habits, and haunts of birds, and from the use in classification of characters afforded by their internal organs. In 1850 he spent some time in the Highlands of Aberdeenshire. The results are embodied in the Natural History of Deeside, published after his death by command of the queen.

He made considerable collections, alike for the instruc- tion of his students and to illustrate the zoology, botany, and geology of the parts of Scotland

examined by him, especially around Aberdeen. His success in enlisting the interest and co-operation of his students is shown by the assistance acknowledged by him in his work on the mollusca of that district. His devotion to his favourite sciences made him apt to be careless of risk to health, and seems to have led to the illness that proved fatal. Though his reputation rests chiefly on his works on birds and on moliusca, his other writings are also of interest and value. In some respects he was in advance of most of his con- temporaries, ¢.g., in the opinions in regard to species published in his Zewt-book of Botany (pp. 210, 211) in

1840.

His reputation might have been greater as a specialist had he restricted his investigations within narrower limits, but this he was prevented from doing as much by the wide range of subjects that he had to teach as by his natural inclination. He had to encounter great difficulties in ascertaining what had been already accomplished by naturalists elsewhere from the want of a good lib- rary and of named collections for reference. To this fact may be traced a tendeney to regard as undescribed and to name whatever animals he was unable to identify from books within his reach, as well as occasional apparent neglect of work done by others and sonie peculiar views on nomenclature and classification.

Throughout his life pecuniary difficulties, in part arising from the publication of his books, pressed on him; and to this it was probably due, at least in part, that, despite an amiable nature, he at times expressed himself in controversy in a way that made him keen opponents. His books show that from all troubles he found relief in tracing the proofs of wisdom and of goodness in nature. Throughout his was a laborious life, and just before his death he eompleted his History of British Birds, an enduring and worthy memorial of an earnest and true-hearted naturalist.

His family inherited a taste for similar pursuits. One son, John, contributed several articles to magazines on the natural history of Scotland, and published an aceount of the voyage round the world of H.M.S. “ Rattlesnake,” on board which he was naturalist. Another son, Paul, published an Aberdeen Flora in 18538.

MACHIAVELLI, Niccord (1469-1527), was born at Florence on the 3d of May 1469. His ancestry claimed blood relationship with the lords of Montespertoli, a fief situated between Val di Pesa and Val d'Elsa, at no great distance from the city. In 1393 the castle of Montespertoli became the property of Niccold's great-grandfather. At this date the Machiavelli, like other nobles of the Florentine contado, had been absorbed into the body of the burghers, and had begun to seek distinction as officers of the republic. They counted numerous priors and gonfaloniers of justice in the generations which preceded the illustrious secretary, Niccold's father, Bernardo, who was born in 1428, followed the profession of a jurist. He held landed property, chiefly near the village of San Casciano, which was worth, according to a recent calculation, something like £250 a year of our money. His son, though not wealthy, was never wholly dependent upon official income.

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Of Niccold's early years and education little is known. He is said to have studied under the grammarian Marcello Virgilio Adriani ; and his works show wide reading in the Latin and Italian classics. But it is almost certain that he had not mastered the Greek language. In that age of humanistic erudition, it is noticeable that the three most eminent writers of the Renaissance—Machiavelli, Ariosto, and Guicciardini—owed their training to the literature of their own nation. To the defects of Machiavelli's education, as it appeared to men of Giovio's stamp, we may, in part at least, ascribe the peculiar vigour of his style and his speculative originality. He is free from the scholastic trifling and learned frivolity which tainted the rhetorical culture of his century. He made the world of men and things his study, learned to write his mother- tongue with idiomatic conciseness, and nourished his imagination on the masterpieces of the Romans. Machia- velli shared the enthusiasm of his race and period for antiquity ; but the antiquity he worshipped was confined to the commonwealth of Rome. Not the arts, the letters, and the philosophy of the Greeks, but the Latin histories in which the statecraft and organization of the Romans are described, arrested his attention. His habit of thought is marked throughout by a strong Latin bias.

The year 1494, the year of Charles VIII.'s invasion and of the Medici's expulsion from Florence, saw Machiavelli's first entrance into public life. He was appointed clerk in the second chancery of the commune under his old master Marcello Virgilio Adriani. Early in 1498 Adriani became chancellor of the republic, and Machiavelli received his vacated office with the rank of second chancellor and secrc- tary. This post he retained till the year 1512. The masters he had to serve were the Dieci di Liberti e Pace, who, though subordinate to the signoria, exercised a sepa- rate control over the departments of war and the interior. They sent their own ambassadors to foreign powers, trans- acted business with the cities of the Florentine domain, and controlled the military establishment of the commonwealth. The next fourteen years of Machiavelli's life were fully occupied in the voluminous correspondence of his bureau, in diplomatic missions of varying importance, and in the organization of a Florentine militia. It would

be tedious and uninstructive to follow him through all his embassies to petty courts of Italy, the first of which took place in 1499, when he was sent to negotiate the continuance of a loan to Catherine Sforza, countess of Forliand Imola. A more important mission followed in 1500, when Machiavelli travelled into France, to deal with Louis XII. about the affairs of Pisa. It is enough to say in general that these embassies were the school in which Machiavelli formed his political opinions, and gathered views regarding the state of Europe and the relative strength of nations, They not only introduced him to the subtleties of Italian diplomacy, but also extended his observation over races very different from the Italians in their social and consti- tutional development. He thus, in the course of his official business, gradually acquired principles and settled ways of thinking which he afterwards expressed in writing. He was at no time a philosopher or man of letters by profession, and when he came to write he gave to the world the con- densed result of practical experience, combined with medi- tations on the Latin historians, rather than a methodical system.

His office obliged him from time to time to draw up proposals and memorials on questions of the day, which he presented to the Dieci. One of these, on the affairs of Pisa, belongs to 1499; a second, on the condition of Pistoia, to 1501; a third, of more general importance, on the right way of dealing with the rebels of Valdichiana, to 1502. In this last-named document some of the points of

view which stamp his later works with a distinctive character emerge into prominence. We find him seeking parallels and precepts in Roman history, laying down the axiom that human nature is identical throughout the ages, exposing the futility of half measures, and finally appealing to Cesare Borgia as a model of political sagacity. It is clear from this brief and early composition that Machiavelli had already formed the habits of thought which dis- tinguish him. He has begun to idealize Borgia’s policy. He interweaves historical reflexions with eontemporary analysis, using the past to illustrate the present, and expounding practical doctrine from texts derived from Livy. There is also noticeable the uncompromising spirit of the man, who was destined afterwards in the Principe to subordinate all

minor considerations of morality and conduct to the one object of political attainment.

In the year 1502 Machiavelli married Marietta Corsini, the wife who bore him several children, with whom, in spite of his own infidelities, he lived on good terms, and who survived him twenty-six years. In the same year Piero Soderini was chosen gonfalonier for life, in accordance with certain changes in the constitution of the state, which were intended to bring Florence closer to the Venetian type of government. This was an important event in Machiavelli's career, for he now became intimately connected with Soderini, assisted him in carrying out his policy, suggested important measures of military reform which Soderini adopted, and finally was involved in ruin by his fall. Machiavelli, it may be said in passing, had the qualities of a good servant and a practical official He remained faithful to Soderini through the difficulties of his later years of power, and spoke well of him subsequently. Yet he was a severe critic, blaming the gonfalonier for weakness of administration and half measures; and, when he died, he indulged in a sarcastic epigram on his old master which does less honour to his loyalty than to his wit.

The year 1502 was marked by yet another decisive incident in Machiavelli's life. In October he was sent, much against his will, as envoy to the camp of Cesare Borgia, or duke of Valentino, as he was now called. The duke was then in Romagna, and it was Machiavelli's duty to wait upon and watch him. He was able now to observe those intricate intrigues which culminated in Cesare's seizure of Sinigaglia and the treacherous murder of his disaffected captains. From what remains of Machiavelli's letters to the Dieci during this period, and from his tract upon the Modo tenuto dal Duca Valentino nell? ammazzare Vitellozzo Vitelli, we are able to appreciate the actual relations which existed between the two men, and the growth in Machiavelli's mind of a political ideal based upon his study of the duke's character. Machiavelli was @ mere spectator and critic, by no means an adviser of the duke. He seems to have been even weary and uneasy in the network of hypocrisy and crime in which he found himself,—refreshing his spirits with jocular letters to his private friends, and with the study of a Plutarch which they sent him. He was also able to stigmatize the Borgia's conduct from a conventional point of view, as is proved by his calling him a

“basilisk” and “hydra” in his Decennali. Yet he conceived the strongest admiration for his combination of audacity with diplomatic prudence, for his adroit use of cruelty and fraud, for his self-reliance, avoidance of half measures, employment of native troops, and firm administration in conquered pro- vinces, More than once, in letters to his friend Vettori, no less than in the pages of the Principe, he afterwards expressed his belief that Cesare Borgia’s behaviour in the conquest of provinces, the cementing of a new state out of Scattered elements, and the dealing with false friends or doubtful allies, was worthy of all commendation and of

scrupulous imitation. Hydra and basilisk were terms, not of reproach, but of panegyric, on the lips of the writer who warned his prince to acquire the nature of the fox and of the lion, who spoke familiarly of frodi onorevoli, scelleratezze glortose, and whose conception of Vertu was self-reliant ability. As he watched Cesare Borgia at this, the most brilliant period of his adventurous career, the man became idealized in his reflective but imaginative mind. Round him, as a hero, he allowed his own conceptions of the perfect prince to cluster. There was so much in the conduct of the duke which exactly fitted with those conceptions, so much of that ideal had conversely been derived at first hand from the duke himself, that the hero and the adven- turer were, as it were, confounded. That Machiavelli separated the actual Cesare Borgia, whom he afterwards saw, ruined and contemptible, at Rome, from this radiant creature of his political fancy, is probable. That the Cesare of history does not exactly match the Duca Valentino of Machiavelli’s writings is certain. Still the fact remains that henceforth Machiavelli cherished the ideal image of the statesman which he had modelled upon Cesare, and called this by the name of Valentino.

On his return to Florence early in January 1503, Machiavelli began to occupy himself with a project he had long since formed, and which his recent attendance upon Cesare Borgia had strengthened in his mind. The duties of his office obliged him to study the conditions of military service as they then existed in Italy. He was familiar with the disadvantages under which republics laboured when they engaged professional captains of adventure and levied mercenary troops. The bad faith of the condottiere

Paolo Vitelli (beheaded at Florence in 1499) had deeply impressed him. In the war with Pisa he had observed the insubordination and untrustworthiness of soldiers gathered from the dregs of different districts, serving under egotistical and irresponsible commanders. His reading in Livy taught him to admire the Roman system of employ- ing armies raised from the body of the citizens; and Cesare Borgia's method of gradually substituting the troops of his own duchy for aliens and mercenaries showed him that this plan might be adopted with success by the Italians. He was now determined, if possible, to furnish Florence with a national militia. The gonfalonier Soderini entered into his views. But obstacles of no small magni- tude arose. First came the financial difficulties in which the Government was then involved. The suspicion and – jealousy of the Florentines had also to be encountered. Some of them feared lest Soderini, if he armed the common- wealth, would aspire to tyranny. All alike were adverse to arming the population of subject cities like Arezzo and Cortona; for it must be remembered that an Italian republic ruled its province with the despotism of an autocrat, and the towns beneath its sway were always panting for independence. The question of money was immediately pressing. Early in 1503 Machiavelli drew up for Soderini a speech, Discorso sulla provisione del Danaro, in which the duty and necessity of liberal expenditure for the protection of the state were expounded upou principles of sound ee philosophy. Between this date and the last month of 1506 Machiavelli laboured at his favourite scheme, working out memorials on the subject for his office, and suggesting the outlines of a new military organization. On the 6th of December 1506 his plan was approved by the signory, and a special ministry, called the Move di Ordinanza e Milizia, was appointed. Machiavelli immediately became their secretary, The country districts of the Florentine dominion were now divided into departments, and levies of foot soldiers were made in order to secure a standing militia, A commander- in-chief had to be chosen for the new troops. Italian

jealousy shrank from conferring this important office on a Florentine, lest one member of the state should acquire a power dangerous to the whole. The choice of Soderini and Machiavelli fell, at this juncture, upon an extremely ineligible person, none other than Don Micheletto, Cesare

Borgia’s cut-throat and assassin. It is necessary to insist upon this point, since it serves to illustrate a radical infirmity in Machiavelli’s genius. While forming and promoting his scheme, he was actuated by principles of political wisdom and by the purest patriotism. But he failed to perceive that such a ruffian as Micheletto could not inspire the troops of Florence with that devotion to their country and that healthy moral tone which should distinguish a patriot army. Here, as elsewhere, he revealed his insensibility to the ethical element in human nature. Knowing that Don Micheletto had worked well for Cesare Borgia, accustomed to disregard private morality as in- significant in public conduct, he was satisfied to entrust the discipline and education of his raw militia to a notorious villain. His indifference to personal ethics led him now into a practical blunder, as it afterwards vitiated his political writings with a philosophical error. Meanwhile Italy had been the scene of memorable events, in most of which Machiavelli took some part. Alexander VI. had died suddenly of fever. Julius II. had ascended the papal chair. The duke Valentino had been checked in mid-career of conquest. Machiavelli was sent to Rome during the conclave, when he renewed his inter- course with Cesare Borgia. On this occasion he seems to have felt nothing but contempt for the hero of his dreams, who had sunk into insignificance and almost abject submission. The collapse of the Borgias threw Central Italy into confusion; and Machiavelli had, in 1505, to visit the Baglioni at Perugia and the Petrucci at Siena. In the following year he accompanied Julius upon his march through Perugia into the province of Emilia, where the fiery pope subdued in person the rebellious cities of the church, Upon these embassies Machiavelli represented the Florentine Dieci in quality of envoy. It was his duty to keep the ministry informed by means of frequent despatches and reports. All this while the war for the recovery of Pisa was slowly dragging on, with no success or honour to the Florentines. Machiavelli had to attend the camp and provide for levies amid his many other occupations. And yet he found time for private literary work. In the autumn of 1504 he began his Decennali, or Annals of Italy, a poem composed in rough terza rima, and now remembered only for one line describing the

courage of Piero Capponi, when he defied Charles VIII. to his face in 1495 :—

‘* Lo strepito dell’ armi e de’ cavalli, Non poté far che non fosse sentita La voce d’un Cappon fra cento Galli.”

About the same time he composed a comedy on the model of Aristophanes, which is unfortunately lost. It seems to have been called Le Maschere. Giuliano de’ Ricci tells us it was marked by stringent satire upon great eccle- siastics and statesmen, no less than by a tendency to “ascribe all human things to natural causes or to fortune.” That phrase accurately deséribes the prevalent bias of its author’s mind.

_ The greater part of 1506 and 1507 was spent in organiz- ing the new militia, corresponding on the subject, and scouring the country on enlistment service. But at the end of the latter year European affairs of no small moment diverted Machiavelli from these humbler duties. Maxi- milian was planning a journey into Italy in order to be crowned emperor at Rome, and was levying subsidies from the imperial burghs for his expenses. The Florentines thought his demands excessive. Though they already

had Francesco Vettori at his court, Soderini judged it advisable to send Machiavelli thither in December. He travelled by Geneva, all through Switzerland, to Botzen, where he found the emperor.

This journey was an important moment in his life. It enabled him to study the Swiss and the Germans in their homes ; and the report which he wrote on his return, Rapporto di Cose della Magna, reckons among his most effective political studies. Instead of con- fining his attention to the analysis of parties or the portraits of eminent persons in the countries he had traversed, Machiavelli strove to estimate the essential elements of national success or failure. The antique sobriety of the Swiss, their absolute equality and inde- pendence, their efficient national militia, inspired him with snch admiration that henceforth the Swiss appeared to him the model of modern nations and the most formidable among the neighbours of the Italians. He pointed out that the strength of Germany lay in the free cities, while the emperor was weakened, not only by his own indecisive character and want of funds, but by the jealousy of the feudal princes. The German princes, the burghs, and the empire being ill-accorded, and the Swiss being hostile to all

alike, this vast nation lacked the force which its excellent morality, sober living, and vigorous military organization ought to have secured it. What is most remarkable in Machiavelli's report is his concentrated effort to realize the exact political weight of the German nation, and to penetrate the causes of its strength and weakness. He attempts to grasp the national character as a whole, and thence to deduce practical conclusions. Certain mistakes he undoubtedly made. He treated the Swiss, for example, too much as though they were a part of Germany. He exaggerated the simplicity and sobriety of the race at large, seemingly inspired by Tacitus, and inflamed in his own imagination by sympathy with a people who realized his cherished dreams of national health. His indifference to ecclesi- astical questions prevented him from discerning the erisis of the Reformation, which was on the verge of precipitating Germany into the discord of religious wars. Yet, allowing for these drawbacks, we are astonished by the insight into details and the co-ordinating faculty which enabled this Italian to draw so discriminating and animated a portrait of the Germans for the benefit of his republic.

The same great qualities are noticeable in his Ritratti delle Cose di Francia, which he drew up after an embassy to Louis XII. at Blois in 1510. These notes upon the French race are more scattered than the report on German affairs. But they reveal no less acumen combined with imaginative penetration into the very essence of national existence. He points out that the special strength of France lies in her centralization, The monarch is surrounded by obedient feudal vassals, the most powerful of whom are of the royal blood. They in their turn draw their wealth from the people. Feudalism, an element of discord in Germany, has been converted into monarchy, and become the eohesive bond of society in France. On the other hand, this centralization contains a grave element of danger for the future of France. The people are ground down and have no liberty. Machiavelli points out how, in these circum- stances, the pith of the French army is its chivalry, and why the king is always obliged to hire German and Swiss infantry for his wars. The Ritratti abound in pointed observations upon the French character which is well contrasted with that of the Spaniards. But what constitutes the originality of this tract is Machiavelli's determination to realize to himself and to his readers the political value of the French people as a whole, and thus to form a solid basis for judging of its probable behaviour in the future. In this case, as in the case of Germany, he attempts

to estimate the physical, moral, and intellectual capacity of an antagonist with whom his eountry has to grapple. It may be said that, with France as with Germany, he wholly omits the possibilities of religious perturbation. :

While engaged upon this topic, it may be well to mention that Machiavelli displayed exactly the same force of analysis in laying bare the central causes of weakness in Italy itself. The disarma- ment of the population by selfish despots and indolent republics; the consequent growth of a vicious mereenary system; the dis- memberment of the nation into petty, mutually jealous parcels, due for the most part to the selfishness of Rome; the loss of antique sobriety in manners, and the almost total corruption of the people, fostered and encouraged by their debauched spiritual leaders, —these, he says, are the causes which have made Italy ‘‘more enslaved than the Hebrews, more downtrodden than the Persians, more disunited than the Athenians.” This is not the place to discuss his policy for the Italians. Suffice it to say that the same method which he applied to Germany and France supplied him with general conclusions about Italy, and enabled him to view with a truly terrible clairvoyance that desperate disease of his country for which he afterwards invented remedies as desperate.

Machiavelli returned from Germany in June 1508. The rest of that year and a large part of 1509 were spent in the affairs of the militia and the war of Pisa. Chiefly

through his exertions the war was terminated by the surrender of Pisain June 1509. Meanwhile the league of Cambray had disturbed the peace of Italy, and Florence found herself in a perilous position between Spain and France. Soderini’s Government grew weaker. The Medicean party lifted up its head. To the league of Cambray succeeded the Lega Santa. The battle of Ravenna was fought, and, the French retired from Italy. The Florentines had been spectators rather than actors in these great events. But they were now destined to feel the full effects of them. The cardinal Giovanni de’ Medici, who was present at the battle of Ravenna, brought a Spanish army into Tuscany. Prato was sacked in the August of 1512. Florence, in extreme terror, deposed the gonfalonier, and opened her gates to the princes of the house of Medici.

The Government on which Machiavelli depended had fallen, never to rise again. The national militia in which he placed unbounded confidence had proved inefficient to protect Florence in the hour of need. He was surrounded by political and personal enemies, who regarded him with jealousy as the ex-gonfalonier's righthand man. Yet at first it appears that he still hoped to retain his office. He showed no repugnance to a change of masters, and began to make overtures to the Medici. The Nove della Milizia were, however, dissolved; and on November 7, 1512, Machiavelli was deprived of his appointments. He was exiled from Florence and confined to tle dominion for one year, and on November 17 was further prohibited from setting foot in the Palazzo Pubblico. Ruin stared him in the face; and, to make matters worse, he was implicated in the conspiracy of Pier Paolo Boscoli in February 1513. Machiavelli had taken no share in that feeble attempt against the Medici, but his name was found upon a memorandum dropped by Boscoli. This was enough to ensure his imprisonment. He was racked, and only released upon Giovanni de' Medici's election to the papacy in March 1513. When he left his dungeon, le retired to a farm near San Casciano, and faced the fact that his political career was at an end.

Machiavelli now entered upon a period of life to which we owe the great works that have rendered his name immortal. But it was one of prolonged disappointment and annoyance. He had not accustomed himself to economical living ; and, when the emoluments of his office were withdrawn, he had but barely enough to support his family. The previous years of his manhood had been spent in continual activity. Muchas he enjoyed the study of the Latin and Italian classics, literature was not his business; nor had he looked on writing as more than an occasional amusenient. He was now driven in upon his books for the employment of a restless temperament ; and to this irksomeness of enforced leisure may be ascribed the production of the Principe, the Discorsi, the Arte della Guerra, the comedies, and the Storia Fiorentina. The uneasiness of Machiavelli's mind in the first years of this retirement is brought before us by his private correspond- ence. The letters with Vettori paint a man of vigorous intellect and feverish activity, dividing his time between studies and vulgar dissipations, seeking at one time distrac- tion in low intrigues and wanton company, at another turning to the great minds of antiquity for solace. It is not easy for a modern gentleman to understand the spirit in which the

author of the Principe sat down to exchange obscenities with the author of the Sommario della Storiad'Italia. Nor can it be urged that Machiavelli plunged into dissipation at this crisis to escape from care, or that he penned filth because he had no other occupation for his thoughts. From the camp of Borgia in 1502, when his mind was on the stretch, and he was watching history in the making, he had written

similar trash to his acquaintances at home. At the same time this coarseness of taste did not blunt his intellectual sagacity. His letters on public affairs in Italy and Europe, especially those which he meant Vettori to communicate to the Medici at Rome, are marked by extraordinary fineness of perception, combined, as usual in his case, with philo- sophical breadth. In retirement at his villa near Percussina, a hamlet of San Casciano, Machiavelli com- pleted the Principe before the end of 1513. This famous book is an analysis of the methods whereby an ambitious man may rise to sovereign power. It appears to have grown out of another scarcely less celebrated work, upon which Machiavelli had been engaged before he took the Principe in hand, and which he did not finish until some time afterwards. This second treatise is the Déscorsi sul primo libro delle Deche di Tito Livio, which will henceforth be mentioned in this article as the Discorsi.

Cast in the form of comments on the history of Livy, the Discorsi are really an inquiry into the genesis and maintenance of states, — how states come into being, prosper, and decline—in what forms they can be modelled and maintained. The Principe is an offshoot from the main theme of the Discorsi, setting forth Machiavelli's views at large and in detail upon the nature of prineipalities, the method of cementing them, and the qualities of a successful autocrat. Being more limited in subject and more independent as a work of literary art, this essay detaches itself from the main body of' the Discors?, and has attracted far more attention. We feel that the Principe is inspired with greater fervency, as though its author had miore than a speculative aim in view, and brought it forth to serve a special crisis. The moment of its composition was indeed decisive. Machiavelli judged the case of Italy so desperate that salvation could only be expected from the intervention of a power- ful despot. The unification of Italy in a state

proventaa’ by a national army was the cherished dream of his life; and the peroration of the Principe shows that he meant this treatise to have a direct bearing on the problem. We must be careful, however, not to fall into the error of supposing that he wrote it with the sole object of meeting an occasional emergency. Together with the Discorsi, the Principe contains the speculative fruits of his experience and observation combined with his deductions from Roman history. _The two works form one coherent body of opinion, not systematically expressed, it is true, but based on the same principles, involving the same conclusions, and directed to the same philosophical end. That end is the analysis of the conception of the state, studied under two main types, republican and monarchical. Up to the date of Machiavelli, modern political philosophy had always presupposed an ideal. Medieval speculation took the church and the empire for granted, as divinely appointed institutions, under which the nations of the earth must flourish for the space of man’s probation on this planet. Thinkers differed only as Gnelfs and Ghibellines, as leaning on the one side to papal on the other to imperial supremacy. In the revival of learning, scholarship supplanted scholasticism, and the old ways of medieval thinking were forgotten. But no substantial philosophy of any kind emerged from humanism; the political lucubrations of the scholars were, like their ethical treatises, for the most part rhetorical. Still the humanists effected a delivery of the intellect from what had become the bondage of obsolete ideas, and created a new medium for the specu- lative faculty. Society in Europe had outgrown the conditions of the Middle Ages, and this new humanistic atmosphere corresponded to the new phase upon which the modern nations were entering. Simultaneously with the revival, Italy had passed into that stage of her existence which has been called the age of despots. The yoke of the empire had been shaken off. The church had taken rank among Italian tyrannies. The peninsula was, roughly speak- ing, divided into principalities and sovereign cities, cach of which claimed autocratic jurisdiction. These separate despotisms owned no common social tie, were founded on uo common jus or right, but were connected in a network of conflicting interests and change- ful diplomatic combinations. A keen and positive political intelli- gence emerged in the Italian race. The reports of Venetian and Florentine ambassadors at this epoch contain the first germs of an attempt to study politics from the point of view of science. At this moment Machiavelli intervenes. He was conscious of the chauge which had come

over Italy and Enrope. He was aware that the old strongholds of medizval thought must be abandoned, and that the decaying ruins of medieval institutions furnished no basis for the erection of solid political edifices. He felt the corrmption of his country, and sought to bring the world back to a lively sense of the necessity for reformation. His originality con- sists in having extended the positive intelligence of his century from the sphere of contemporary politics and special interests to

man at large regarded as a political being. He founded the science of politics for the modern world, by concentrating thought upon its fundamental principles. Much that is unnatural in the forced severance of politics from ethics, much that we know now to be untrue in the conception of national development, much that offends our moral sense in the justification of iniquity for public ends, much that the experience of the last three centuries has shown to be mistaken in the theory of the state considered as a work of plastic art, much that belongs to the Renaissance, and has perished with that period of transition, much that is wrongly applied from the experience of Italian diplomacy to politics in general, can be noted by the students of Machiavelli. We feel the want in him of a thorough philosophical education, the continual oscillation between speculative and practical points of view, the lack of system and the negligence of stringent definition. We surmise that, had he studied Plato's Republic or the first chapters of Aristotle's Politics and Ethics, he might perhaps have avoided what has been the stumbling-block to generous readers—his indiffer- ence to moral righteousness as indispensable to states no less than individuals. We regret his unqualified inculeation of the doctrine that means are justified by ends,—a doctrine rendered odious by Jesuitry to the modern mind, and incompatible with any sound science of humanity. We know that ethics cannot be severed, as he severed them, from politics; that, though national differs from private duty, both are based upon the same immutable principles ; that the former tends, with the growth of the race, to approach ever more nearly to the former; and that it is the function of the political philosopher to keep this stcadily in view. We have learned to regard nations, not merely as materials to be moulded bya law- giver, but as total organisms, which, however modified by men of genius, obey their own

laws of evolution. We have outgrown his admiration of antiquity, and do not believe that modern states should seek to model themselves upon the type of Rome. We perceive that his ideal of a prince, working by force, fraud, cruelty, dissimulation to a certain end, was the creature of circumstances, which caused him to advocate the opposition of violence to anarchy as the only possible resort. These are deductions to be made from Machiavelli's teaching, regarded as final, or as instructive for the times in which we live. But, when we have made these deductions, there remains the fact of his achievement. He began to study men, not according to some preconception, but as he found them,— men, not in the isolation of one century, but as a whole in history. He drew his conclusions from the nature of mankind itself, 'ascribing all things to natural causes or to fortune." In this way he restored the right method of study, a method which had been neglected since the days of Aristotle. He formed a conception of the modern state, which marked the close of the Middle Ages, and anticipated the next phase of European development. His prince, abating those points which are purely Italian or strongly tinctured with the author's personal peculiarities, prefigured the monarchs of the 16th and 17th centuries, the monarchs whose motto was L'état c'est moi/ His doctrine of a national militia fore-shadowed the system which has given strength in arms to France and Germany. His insight into the causes of Italian decadence was complete; and the remedies which he suggested, in the perorations of the Principe and the Arte della Guerra, have since been applied in the unification of Italy. Lastly, when we once have freed ourselves from the antipathy engendcred by his severance of ethics from the field of politics, when we have once made proper allowance for his peculiar use of phrases like ''frodi onorevoli" or "'scelleratezze gloriose,"' nothing is left but admiration for his mental attitude. That is the attitude of a patriot, who saw with open eyes the ruin of his country, who burned above all things to save Italy and set her in her place among the powerful nations, who held the duty of self-sacrifice in the most absolute sense, whose very limita- tions and mistakes were due to an absorbing passion for the state he dreamed might be reconstituted. It was Machiavelli's intense preoccupation with this problem—what a state is and how to found one in existing cireumstances—which caused the many riddles of his speculative writings. Dazzled, as it were, with the brilliancy of his own discovery, concentrated in attention on the one necessity for organizing a powerful coherent nation, he forgot that men are more than

political beings. He neglected religion, or regarded it as part of the state machinery. He was by no means indifferent to private virtue, which indeed he judged the basis of all healthy national existence ; but in the realm of politics he postponed morals to politival expediency. He held that the people, as distinguished from the nobles and the clergy, were the pith and fibre of nations ; yet this same people had to become wax in the hands of the politi- cian,—their commerce and their comforts, the arts which give a dignity to life and the pleasures which make life liveable, neglected,—their very liberty subordinated to the one tyrannical conception. To this point the segregation of politics from every other factor which goes to constitute humanity had brought him ; and this it is which makes us feel his world a wilderness, devoid of atmosphere and vegetation. Yet some such isolation of the subject-matter of this science was demanded at the moment of

its birth, just as political economy, when first started, had to make a rigid severance of wealth from other units. It is only by a gradual process that social science in its whole complexity can be evolved. We have hardly yet discovered that political economy has unavoidable points of contact with ethics.

From the foregoing criticism it will be perceived that all the questions whether Machiavelli meant to corrupt or to instruct the world, to fortify the hands of tyrants or to lead them to their ruin, are now obsolete. He was a man of science—one who by the vigorous study of his subject-matter sought from that subject- inatter itself to deduce laws. The difficulty which remains in judging him is a difficulty of statement, valuation, allowance. How much shall we allow for his position in Renaissance Italy, for the corruption in the midst of which he lived, for his own personal temperament? How shall we state his point of departure from the Middle Ages, his sympathy with prevalent classical enthu- siasms, his divination of a new period? How shall we estimate the permanent worth of his method, the residuum of value in his maxims ?

After finishing the Principe, Machiavelli thought of dedicating it to one of the Medicean princes, with the avowed hope that he might thereby regain their favour and find public employment. He wrote to Vettori on the subject,

and Giuliano de’ Medici, duke of Nemours, seemed to him the proper person. The choice was reasonable. No sooner had Leo been made pope than he formed schemes for the aggrandizement of his family. Giuliano was offered and refused the duchy of Urbino. Later on, Leo designed for him a duchy in Emilia, to be cemented out of Parma, Piacenza, Reggio, and Modena. Supported by the power of the papacy, with the goodwill of Florence to back him, Giuliano would have found himself in a position somewhat better than that of Cesare Borgia ; and the Borgia’s creation of the duchy of Romagna might have served as his model. Machiavelli therefore was justified in feeling that here was an opportunity for putting his cherished schemes in practice, and that a prince with such alliances might even advance to the grand end of the uni- fication of Italy. Giuliano, however, died in 1506. Then Machiavelli turned his thoughts towards Lorenzo, duke of Urbino. The choice of this man as a possible Italian liberator reminds us of the choice of Don Micheletto as general of the Florentine militia. To Lorenzo the Principe was dedicated, but without result. The Medici, as yet at all events, could not employ Machiavelli, and had not in themselves the stuff to found Italian kingdoms.

Machiavelli, meanwhile, was reading his Dzscorsi to a select audience in the Rucellai gardens, fanning that republican enthusiasm which never lay long dormant among the Florentines. Towards the year 1519 both Leo X. and his cousin the cardinal Giulio de’ Medici were much perplexed about the management of the republic. It seemed necessary, if possible, in the gradual extinc- tion of their family, to give the city at least a semblance of self-government. They applied to several celebrated politicians, among others to Machiavelli, for advice in the emergency. The result was his Discorso sopra wu Riformar lo Stato di Firenze, a treatise in which he deduces practical conclusions from the past history and present temper of the city, blending these with his favourite principles of govern- ment in general, He earnestly admonishes Leo, for his own sake and for Florence, to found a permanent and free state system for the republic, reminding him in terms of noble eloquence how splendid is the glory of the rman who shall confer such benefits upon a people. The year 1520 saw the composition of I sette Libri dell’ Arte di Guerra, and of the Vita di Castruccio.

The first of these is a methodical treatise, setting forth Machiavelli's views on military matters, digesting his theories respecting the superiority of national troops, the inefficiency of fortresses, the necessity of relying upon infantry in war, and the comparative insignificance of artillery. It is strongly coloured with his enthusiasm for ancient Rome; and specially upon the topic of artillery it displays a want of insight into the actualities of modern warfare. We may regard it as a supplement or appendix to the

Principe and the Discorsi, since Machiavelli held it for a funda- mental axiom that states are powerless unless completely armed in permanence. The peroration contains a noble appeal to the Italian liberator of his dreams, and a parallel from Macedonian history, which, read by the light of this century, sounds like a prophecy of Piedmont.

The Vita di Castruccio was composed at Lucca, whither Machiavelli had been sent on a mission. This so-called biography of the medieval adventurer who raised himself by personal ability and military skill to the tyranny of several Tuscan cities must be regarded in the light of an historical romance. Dealing freely with the outline of Castruccio's career, as he had previously dealt with Cesare Borgia, he sketched his own ideal of the successful prince. Cesare Borgia had entered into the Principe as a representative figure rather than an actual personage ; so now conversely the theories of the Principe assumed the outward form and semblance of Castruccio. In each case history is blent with speculation in nearly the same proportions. But Castruccio, being farther from the writer's own experience, bears weaker traits of personality.

In the same ycar, 1520, Machiavelli, at the instance of the cardinal Giulio de' Medici, received commission from the officers of the Studio Pubblico to write a history of Florence. They agreed to pay him an annual allowance of 100 florins while engaged upon the work. The next six years were partly employed in its composition, and he left a portion of it finished, with a dedication to Clement VII., when he died in 1527, In the Istorie Fiorentine Machiavelli quitted the field of political speculation for that of history. But, having already written the Discorsi and the Principe, he carried with him to this new task of historiography the habit of mind proper to political

philosophy. In his hands the history of Florence became a text on which at fitting seasons to deliver lessons in the science he ini- tiated. This gives the work its special character. It is not so much achronicle of Florentine aflairs, from the commencement of modern history to the death of Lorenzo de' Medici in 1492, as a critique of that chronicle from the point of view adopted by Machiavelli in his former writings. Having condensed his doctrines in the Principe and the Discorsi, he applies their abstract principles to the example of the Florentine republic. His favourite topics reappear—the dismemberment of Italy by the papacy (bk i. 9, 28); the ruin of her national militia (bk. i. 34, 88; bk. v. 1; bk. vi. 1); the enervation of her commonwealths by commerce (bk. i. 39; bk. ii. 42); her corrupt morality (bk. ili, 1); the reference of Italian circumstances to Roman precedents (bk. iii. 1); the theory of the intervenient ''nomothetes" in states (bk. iv. 1); and the theory of human vicissitudes (bk. v. 1). This gives to his history a deductive and illustrative quality which men of less imaginative mind, like Guicciardini, or the exact students of our own days may criticize. But the History of Florence is not a mere political i a It is the first exainple in Italian literature of a national biography, the first attempt in any literature to trace the vicissitudes of a people's life in their logical sequence, deducing each successive phase from passions or necessities inherent in pre- ceding circumstances, reasoning upon them from gencral principles, and inferring corollaries for the conduct of the future. In his proeminm Machiavelli taxes Poggio and Lionardo Bruni with having neglected civic affairs for the record of wars and alliances. It is to the analysis of the republic's inner life that he directs attention, showing how her acts were the phenomena of this organic force. At the sanie time hc does not omit the narrative of external events, but places the portrait of Florence in the centre of an animated group of pictures drawn from Italian history. _Approach- ing his own times, he enlarges on the part played by the Medici; for it was one of the conditions of the task imposed on him that he should celebrate the ancestors of Giulio. This portion of the work 1s executed in no servile spirit, and the subsequent destiny of Florence fully justified the prominence here given to the elder Cosimo and Lorenzo. In point of form the Florentine History is modelled upon Livy. In contains speeches in the antique manner, which may be taken as partly embodying the author's commentary upon situations of importance, partly as expressing what he thought dramatically appropriate to prominent personages. The style of the whole book is

nervous, vivid, free from artifice and rhetoric, obeying the writer's thought with absolute plasticity. Machiavelli had formed for himself a prose style, equalled by no oue but by Guicciardini in his minor works, which was far removed from the emptiness of the Latinizing humanists and the trivialities of the Italian purists. Words in his hands have the substance, the self-evidence of things. It is an athlete's style, all bone and sinew, nude, without superfluous flesh or ornament.

It would seem that from the date of Machiavelli's dis- course to Leo on the government of Florence the Medici had taken him into consideration. Writing to Vettori in 1513, he had expressed his eager wish to "roll stones" in their service; and this desire was now gratified. In 1521 he was sent to Carpi to transact a petty matter with the

chapter of the Franciscans, the chief known result of the embassy being a burlesque correspondence with Francesco Guicciardini. Four years later, in 1525, he received a rather more important mission to Venice. But Machiavelli's public career was virtually closed; and the interest of his biography still centres in his literary work. We have seen that already, in 1504, he had been engaged upon a comedy in the manner of Aristophanes, which is now unfortunately lost. A translation of the Andria, and three original comedies from his pen are extant, the precise dates of which are uncertain, though the greatest of them was first printed at Rome in 1524. This is the Mandragola, which may be justly called the ripest and most powerful single play in the Italian language.

The plot is both improbable and unpleasing. But, having granted this, literary criticism is merged in admiration of the wit, the humour, the vivacity, the satire of a piece which brings before us the old life of Florence in a succession of brilliant scenes. If Machiavelli had any moral object when he composed the Mandragola, it was to paint in glaring colours the corruption of Italian society. It shows howa bold and plausible adventurer, aided by the profligacy of a parasite, the avarice and hypocrisy of a confessor, and a mother's complaisant familiarity with vice, achieves the triumph of making a gulled husband bring his own unwilling but too yielding wife to shame. The whole comedy is a study of stupidity and

baseness acted on by roguery. About the power with which this picture of domestic immorality is presented there can be no question. But the perusal of the piece obliges us to ask ourselves whether the author's radical eonception of human nature was not false. The same suspicion is forced upon us by the Principe. Did not Machiavelli leave good habit, as an essential ingredient of character, out of account? Men are not such absolute fools as Nicia, nor such compliant catspaws as Ligurio and Timoteo ; women are not such weak instruments as Sostrata and Lucrezia. Somewhere, in actual life, the stress of craft and courage acting on the springs of human vice and weakness fails, unless the hero of the comedy or tragedy, Callimaco or Cesare, allows for the revolt of healthier instincts. Machiavelli does not seem to have calculated the force of this recoil. He speculates a world in which Virtu, unscrupulous strength of character, shall deal successfully with frailty. This, we submit, was a deep-seated error in his theory of life, an error to which may be ascribed the numerous stumbling- blocks and rocks of offence in his more serious writings.

Some time after the Jfandragola, he composed a second comedy, entitled Clizia, a portion of the plot of which is borrowed from the Casina, Though modelled on the art of Plautus, the Clizia is even homelier and closer to the life of Florence than its predecessor. It contains ineomparable studies of the Florentine housewife and her husband, a grave business-like citizen, who falls into the senile folly of abase intrigue. The device by which Nicomaco is brought back to a sense of duty is presented in scenes of solid humour which recall the manner of Ben Jonson. On the whole, the Clizia is a pleasanter and wholesomer play than the Mandragola. It served as model to a school of later playwrights. There remains a short piece without title, the Commedia in Prosa, which, if it be Machiavelli's, as inter- nal evidence of style sufficiently argues, might be accepted as a study for both the Clizia and the Mandragola. It seems written to ex- pose the corruption of domestic life in Florence, and especially to satirize the friars in their familiar part of go-betwecns, tamc cats, confessors, and adulterers. The Fra Alberigo of this comedy is a vigorous piece of realistic portraiture, anticipating, if not surpass- ing, the Fra Timoteo of the Afandragola.

Of Machiavelli's minor poems, sonnets, capitoli, and carnival songs, there is not much to say. Powerful as a comic playwright, he was nota poet in the

proper sense of the term. The little novel of Belfagor claims a passing word, if only because of its celebrity. It is a good-humoured satire upon marriage, the devil being forced to admit that hell itself is preferable to his wife's company. That Machiavelli invented it to express the irritation of his own domestic life is a myth without foundation. The story has a medieval origin, and it was almost simultaneously treated in Italian by Machiavelli, Straparola, and Giovanni Brevio.

In the spring of 1526 Machiavelli was employed by Clement VII. to inspect the fortifications of Florence. He presented a report upon the subject, and in the summer of the same year received orders to attend Francesco Guicciardini, the pope's commissary of war in Lombardy. Guicciardini sent him in August to Cremona, to transact business with the Venetian provveditori. Later on in the autumn we find him once more with Guicciardini at Bologna. 'Thus the two great Italian historians of the

16th century, who had been friends for several years, were brought into relations of close intimacy. It would be interesting to know the topics of their conversation, and to possess some fragments of the debates they undoubtedly held upon the grave affairs of Italy at this decisive juncture. In the next year Rome was destined to be sacked by an imperial army. Florence was to rise in 'rebellion against the Medici. Four years later Charles V. was to lay the iron hand of Spain upon the remuants of Italian liberty. But nothing survives of Machiavelli's and Guicciardini's discourse. We can only form an opinion of what it must have been from the commentaries written by the latter on the political philosophy of Machiavelli—com- mentaries which sufficiently explain the different methods of the two great thinkers. Guicciardini, more positive even than Machiavelli in his criticism, averse to theory, satisfied with a policy of public temporizing and expedieucy, ac- cepting Italian decadence with the tranquillity of egotism, looked on Machiavelli as a dreamer. '' Nothing," he says, "can cure the discases of our century but the knife of Lycurgus, and the knife of Lycurgus may not be expected." Machiavelli was always hoping against hope that this knife in the hands of some superior Cesare might still be used. Guicciardini, as events proved,.had taken a sounder

view of the situation ; or rather it was men like Guicciardini who made the situation. Machiavelli to the last remained a patriot, with darkly bright impracticable visions in his brain.

After another visit to Guicciardini in the spring of 1527, Machiavelli was sent by him to Civita Vecchia. It seemed that he was destined to be associated in the papal service with Clement's viceroy, and that a new period of diplomatic employment was opening for him, But soon after his return to Florence he fell ill, His son Piero said that he took medicine on the 20th of June which disagreed with him; and on the 22d he died, having received the last offices of the church. There is no foundation for the legend that he expired with profane sarcasms upon his lips. Yet we need not run into the opposite extreme, and try to fancy that Machiavelli, who had professed paganism in his life, proved himself a believing Christian on his death-bed. That he left an unfavourable opinion among his fellow- citizens is very decidedly recorded by the historian Varchi. The Principe, it seems, had already begun to prejudice the world against him; and we can readily believe what Varchi sententiously observes, that "it would have been better for him if nature had given him either a less power- ful intellect or a mind of a more genial temper." There is in truth a something crude, unsympathetic, cynical in his mental attitude toward human nature, for which, even after the lapse of more than three centuries, we find it difficult to make allowance. The force of his intellect renders this want of geniality repulsive. We cannot help objecting that one who was so powerful could have been kindlier and sounder if he willed. We therefore do him the injustice of mistaking his infirmity for perversity. He was colour-blind to commonplace morality ; and we are angry with him because he merged the hues of ethics in one grey monotone of politics. In person Machiavelli was of middle height, black-haired, with rather a small head, very bright eyes, and slightly aquiline nose. His thin close lips often broke into a smile of sarcasm. His activity was almost feverish, When unemployed in work or study, he was not averse to the society of boon companions, gave himself readily to transient amours, and corresponded in a tone of cynical bad taste. At the same time he lived on terms of intimacy with worthy men. Varchi says of him that "in his conversation he was pleasant, obliging to his intimates, the friend of virtuous persons." Those who care to understand the contradictions of which such a

character was capable should study his correspondence with Vettori. It would be unfair to charge what is re- pulsive in their letters wholly on the habits of the times; for wide familiarity with the published correspondence of similar men at the same epoch brings one acquainted with little that is so disagreeable.

For complete editions of Machiavelli's works, that of Italia, 8 vols., 1818, and the more comprehensive by Usigli, Florence, 1858, may be cited. The best biography is by Professor Pasquale Villari, 3 vols., Florence, 1877-82. This work contains a copious critique of all the most important studies which have been made of Machiavelli's works. An English translation of this life, finished by Madame Villari under the guidance of Professor Villari, is being published. (J. A. 8.)

MACHINE TOOLS. The very small degree of anti- quity to which machine tools can lay claim appears forcibly in the sparse records of the state of the mechanical crafts a century ago. A few tools of a rude kind, such as tilt-hammers, and a few special ones which aimed at accuracy, but were of very limited application, such as " mills" for boring cannon, or ''engincs" for cutting the teeth of clock wheels, were almost their only representatives. Machine tools of the modern type indeed would not then have been likely to have found much favour even if they had been invented, owing to the difficulty of providing sufficient power for driving them, except in the comparatively few positions where water-power was available. The transmis- sion of power was unthought of, except for the very limited distances which were possible with the ill-fitted "oudgeons" and "lanterns and trundles" of the old mill- wriglits.

The steam-engine, however, changed all this. On the one hand the hitherto unheard-of accuracy of fit required by its working parts created a demand for tools of increased power and precision, and on the other it rendered the use of such tools possible in almost any situation. Thus, acting and reacting on each other, machine tools and steam-engines have grown side by side, till our workshops have become peopled with a race of giants, capable of uncomplainingly performing tasks altogether beyond the powers of the easily wearied hands which have brought them into existence. But the first

steps in the process were costly and difficult to a degree which it is not now easy to realize. James Watt, for instance, in 1769, was fain to be content with a cylinder for his “ fire-engine ” of which, though it was but 18 inches in the bore, the diameter in one place exceeded that at another by about 3 (°375) of an inch; its piston was not unnaturally leaky, though he packed it with “ paper, cork, putty, pasteboard, and old hat.” In the bore of a cylinder of 120 inches there would not now be admitted an error of +2, of an inch, and the leakage past the piston is practically nil. Even this must by no means be taken to represent the extreme limit attainable in respect of size and accuracy.

Machine tools present so many points of difference that no classification of them will be attempted beyond a broad division into general and special tools,—those included under the latter head being such as are intended to perform repeatedly one single operation (or one of a small number of varieties of that operation), or are mainly employed in particular processes or manufactures.

As an instance of special tools working successively in a series,—which is a frequent arrangement with special tools,—the block machinery, for making ships’ blocks at Portsmouth dockyard, may be mentioned. Erected in 1807 by Mr H. Maudslay from designs by Mr (afterwards Sir Marc) Brunel, on the recommendation of Sir 8 Bentham, it enabled ten men to do in a superior manner work which previously required one hundred and ten, and effected in the annual expenditure of the nation a saving of about £24,000. Into the particulars of the beautifully

arranged sawing, mortising, shaping, and other machines by which this was accomplished we cannot enter, but they are of great interest, not only from their intrinsic merits, but also as being, if not the very first, certainly superior to any which had previously been used. Our limited space, however, will be more profitably devoted to giving a few examples of the general tools used in engineers’ work- shops.

The Steam-Hammer, which in some respects may be re- garded as the most important of machine tools, has already been noticed (see Hammer, vol. xi.

p. 425). Second only to it in importance, and long anterior to it in date, stands the lathe. At what exact point of its development from the simple foot lathe it first became entitled to rank as a machine tool we will not stop to inquire, for the origin of this, as of most of the mechanical legacies which have been handed down to us by successive inventors and improvers, is involved in much obscurity. But as far as tools laying any claim to precision are concerned it appears certainly to have been the first to come into existence. On the Con- tinent, mechanism to be used in conjunction with it for oval turning, and for producing mouldings oblique to the axis of the work, had been devised as early as 1569, in which year one Jacques Besson published drawings of two lathes so arranged. Whether much additional beauty was obtained by thus departing from the circular sections pro- ducible with the simple lathe, aud converting them | into distorted ones, such as that sketched in fig. 1 (reduced from Besson), may perhaps be questioned, but the taste for this Fia, 1.—Swash Work. “swash” work, as it is called, ere long extended also to England. Moxon, the first English writer on the subject, gives a drawing of a very similar lathe, and he men- tions the name of an established London maker whose oval engines and swash engines, and all other engines, were “excellently well: made,” so they were apparently in some demand at the time of his writing (1680).

Screw cutting in the lathe was another problem—and a more worthy one—which occupied the attention of inventors at the same early period. A curious but mechanically very imperfect arrangement for accomplish- ing it (with which, however, threads either right or left handed could be cut on tapered and oval as well as on cylindrical work) is given in another of Besson’s engrav- ings. In this the tool is entirely supported and its movements are controlled by the machine instead of being held in the hand, —an arrangement of which the great advantage appears to have been but tardily appreciated, though it contains the germ of the principle which, applied first in the slide-rest of the lathe, and subsequently in machine tools of almost every type, has enabled tasks of seersikly increasing severity to be successfully dealt with.

Nearly two centuries seem to have elapsed before what we now know as the s/ide-rest became a recognized adjunct to the turning lathe, though in the meantime arrangements had been devised for controlling the motion of the

tool by attaching it to some portion of the mechanism in some special cases, —as in that of two curious lathes for turning hyperbolic, spherical, or plane mirrors for optical purposes, of which engravings were published at Rome in 1648. Its first definite appearance in print occurs in the great French Encyclopédie, published in 1772. Detail drawings of an admirable slide-rest are given in one, and evidence of its being then in regular use occurs in several of the very interesting engravings of that ponderous work, which gives so clear an insight into the methods then employed

in France in the various crafts. The description, however, by no means settles the question of its origin.

It is pretty certain that the slide-rest was reinvented in England by the ingenious Henry Maudslay, when he was employed in Mr Bramah's workshop in London, where "Maudslay's go-cart" (as if was at one time derisively called) was first set to work in 1794. That he had not previously seen the drawings just mentioned cannot of course be proved, but the high price at which the Encyclopédie was published makes it very probable that no copy of it had at that time come under the notice of a hard- working English mechanic. The intrinsic differences of the two slide-rests tend towards a similar conclusion. Who- ever may have been its first inventor, the slide-rest has cer- tainly proved itself to be the most invaluable of all the additions made to the turning lathe. Its indispensability to the modern power-lathe will be readily appreciated from the following examples.

An engraving of a simple slide-rest for use with a foot lathe has already been given (see LaTHE), and its effect in reducing the labour of the turner was then pointed out. The self-acting slide-rest (fig. 2) carries this reduction still farther ; and, by deriving from the lathe itself the small "feed" movement ne- aa cessary for bringing the tool to bear on succes- sive portions of the work, it dispenses wholly with the need \ for physical exertion on the part of the work- } man, and does not ' even demand his con- tinuous _— supervision. ' 2 One result of this is Fic. 2.—Self-Acting Slide-Rest. that the slide lathe (for so complete is the union between the slide-rest and the lathe that they must now be re- garded as one machine) affords a complete solution of the screw-cutting problem, since, by varying

the extent to which the rest traverses the lathe bed during each revolu- tion of the mandrel, a screw thread of any desired pitch can be cut with a single tool.

In fig. 3, which shows a self-acting screw-cutting lathe with double-geared headstock, of a type now well estab- lished, the arrangements for obtaining and varying this traversing motion may be observed. A steel leading screw

Fic. 3.—Self-Acting Screw-Cutting Lathe. runs along the front of the lathe bed, and with it the slide-

rest can be connected at pleasure. Two or more change wheels, properly proportioned as to the number of their teeth, connect the head of the screw with the hinder end of the mandrel.

Although a leading screw is not the only nor in all cases the best mode of rendering a lathe self-acting, ordinary screw-cutting lathes are very largely used for other pur- poses than that implied by their name. The advantage of perfect regularity in the feed is very great even for plain turning, and this can only be secured when it is inde- pendent of human vigilance. The feed in a direction

transverse to the bed is also very commonly rendered automatic by means into which we cannot here enter, lathes so provided being distinguished as self-acting sur- facing lathes. In this case, however, the varying diameter of the successive cuts introduces serious objections to a uniform rate of feed. These were remedied as long ago as 1827 by that excellent mechanician Joseph Clement, —who was one of the greatest improvers of the power lathe; but his arrangement has never come into general use.

To enable a comparatively small lathe to be used for surfacing work of larger diameter than it would naturally admit, a portion of the bed is frequently made removable soasto leave a ‘‘gap” close to the fixed

headstock. An 8-inch gap lathe, for instance, such as fig. 3, can thus admit an article of 26 inches diameter instead of 16 inches only.

Break lathes, such as fig. 4, carry the same principle still farther, so that they can take in work of considerable length as well as of large diameter,— the treble-geared headstock and all other parts being in their case made of sufficient strength to bear the heavy strains which result from the increased size and weight of the work, a quality

Fic. 4.—Self-Acting Break Lathe. in which gap lathes are not unfrequently deficient. Lathes of this kind were made by Mr (now Sir Joseph) Whitworth as long ago as 1840, and the type is still the accepted one for general heavy turning. The face plates on which large work is chucked in these lathes are sometimes as much as 15 feet in diameter.

Face lathes, of which the main duty is surfacing articles whereof the diameter is great but the length small, are very similar to the foregoing minus the entire right-hand portion of the bed and all that it carries. They have occasionally been made for work of very large diameter,— such as turning the roller paths of 40 feet railway turn- tables,—though it is now found preferable to turn such things in a horizontal position, in lathes of which the mandrels are vertical.

But the point to which the growth of power-lathes has now attained will be best illustrated by the following interesting particulars of two which have been quite recently designed and made in the Royal Gun Factories at Woolwich. Each of these cau take in a piece of work having a maximum diameter of 12 feet and a total length of 36 feet,—which represents a truly appalling weight of metal to have to deal with,—their main dimensions, &c., being

Height of centre of mandrel above the bed….. 6 ft. Total lepgth, Ofibed), duct. kcascce temecee reece eee 60 ,, Length of fixed headstock ….....ecccceeeeeees # Diameter of front bearing of mandrel in do. ... 18 in Length of 0. fc) 36 ,, Length of leading screw over all….....000.66 .- 52 ft. 3 in. Diameter of do. (1G 7 get Ae: oe 7 in Weight of fixed headstock, abotite…..... 55 tons Do. movable do., abotiti..s..4.005… 14 Do. slide-rest and saddle, about…..... 154),, Total weight, 1 | i A iam 300 ,,

In lathes of this enormous size—as in all machine tools of the heaviest class —great weight and a proper disposal |

of it on a thoroughly secure foundation are necessary for obtaining the rigidity which is a first essential to success, When, however, this and all other conditions have been fulfilled, and the tool and the speed have been suitably adjusted, the operation of paring off great shavings from the revolving mass becomes one of such apparent facility that it is almost difficult for a stranger to believe that it is not lead or even some yet softer substance, rather than wrought iron or steel, which is under treatment.

It has been found that in heavy turning the best results are obtained by taking deep cuts at a low rate of speed, fast driving bringing no corresponding increase in the amount of work got through. Various other means have therefore been devised for accelerating operations. Each of the Woolwich lathes just mentioned is furnished with two slide-rests, so that two independent cuts can be taken at once at different parts of the work. The duplex system effects the same thing in a different way, two slide-rests (one in front and the other at the back of the lathe) being mounted on one saddle and adjusted simultaneously by a . single right and left handed screw,—a plan which has the advantage of subjecting the work to two opposite strains which either wholly or partially balance each other. In some instances both the above advantages are combined by using two duplex rests at different parts of the bed. A quick hand traverse is another time-saving arrangement, now common to almost all screw cutting lathes. It enables the slide-rest to be run quickly back from the end of oue cut to the starting point of the next. In turning up a number of similar articles upon each of which several different tools have to be used in succession, the time which would be lost in changing the tools is sometimes saved by employing a capstan rest, in which the whole series of tools is so fixed once for all that each in turn can be brought to bear upon the work without further adjust-ment.

Three examples of turning tools are given in fig. 5, the middle one being an ordinary hook tool, suited for outside work on wrought iron or steel, and the one above it a Jeft- hand tool which can be used also for inside. Their cut-

ting edges are of course forged and ground straighter or more pointed or otherwise varied ac- cording to circumstances, and for cast iron or brass the angle of the edge is made much less acute, as in the lowest of the three in the engraving. The size of the steel from which they are made also | varies, 2 inches square being by no means exceptionally large, so that the weight of it uselessly employed in the shanks is very considerable, and altogether disproportionate to that required for the cutting edges. The plan of fixing a short steel cutter in an iron tool-holder, suggested many years ago by Mr Babbage (which has already been men- tioned in connexion with foot lathes), has, however, not found the favour which at first sight might have been expected for it, in spite of the saving which it effects in this respect.

For chasing long or coarse-threaded screws the above- mentioned screw-cutting lathes leave little or nothing to be desired. But for producing the large number of screwed bolts, studs, &c., now required in mechanical workshops more rapid methods must be had recourse to,‘ and special machines for forging, turning, screwing, and finishing them have accordingly come into common use. Of these one example only can be given—the screwing machine, fig. 6—with which the threads of bolts or nuts are cut to the “standard pitch” which now (happily) is almost

Fic. 5.—Slide- Rest Tools.

universally accepted. Immense loss and inconvenience were formerly caused by the absence of uniformity in this respect, but, thanks to the persevering manner in which the efforts of Maudslay and Clement to put an end to this evil have been followed up by Whitworth, it has now almost ceased to exist, and any bolt or nut can be sub- stituted for any other of a like size, however different the processes by which the two have been manufactured. The machine (fig. 6) is in fact a lathe with a few special features, such as the hollow man- drel, whichenables g it to operate upon a barof any length. Dies mounted on a modified form of slide-rest cut the thread to the full depth at a single traverse, and a simple arrangement enables nuts to be tapped with equal facility. In some other varieties of screwing machines, more particularly those in- tended for hand power only, the outward resemblance to the turning lathe is less apparent, but if their

action is looked into it will be found that in them as in almost all machine tools it is the principle of the slide which is mainly conducive to their success.

Second only to the lathe in its importance stands the planing machine. Just as the slide lathe renders it easy to turn a cylindrical surface true from end to end, a task which before its introduction had been one of extreme difficulty, even for the most highly skilled workman, so the planing machine supersedes, by a method giving vastly superior results, the difficult and costly process of hand chipping and filing, by which flat surfaces of metal were formerly produced. Although it is a comparatively modern invention, its real origin is obscure. No drawings or description of any planing machine at all resembling those now in use were published in England previously to those of one made by Clement in 1825, which appeared in the Z'ransactions of the Society of Arts. With this beauti- ful machine, which was of considerable size, being capable of admitting articles measuring as much as 6 feet in height or width, he obtained results which would satisfy all ordinary requirements at the present day.

The ordinary self-acting planing machine is shown in fig. 7. Its action bears no resemblance to the familiar

Fia. 6.—Screwing Machine.

Fria. 7.—Planing Machine.

process of wood planing, but is analogous to that by which the successive cuts of a narrow tool produce a cylindrical surface in a slide lathe. A traversing table carries the

work and forces it against the tool, which is stationary while making its cut, but between the cuts has a slight "feed" motion along its horizontal slide. Perfectly parallel cuts are thus taken from every portion of the work in succession, the result being a surface, not indeed per- fectly smooth and free from scores, but (what is generally fay more important) possessing a general flatness and free- dom from twist which can be obtained only with a

great expenditure of time and trouble by hand labour. The extent to which machinery has cheapened work of this kind will be appreciated from the fact that in 1826 the cost of rendering a square foot of surface true by hand chip- ping and filing was 12s., whereas in 1856 it could be done in the planing machine at a cost of less than one penny. Planing machines, equally with lathes, are required not only to give good results but to give them quickly. Pro- vision is therefore made for regulating the traverse of the table to suit the length of the cut, and for utilizing or accelerating its return journeys. The former is sometimes done by fixing the tool in a revolving tool-holder or “jim crow,” so that its face can be always turned towards its cut, and for accomplishing the latter there are various arrangements which give a “ quick return” to the table. It is also a common practice to use two tools at once, as in turning. It will be observed that the size of the work which can be treated in a planing machine, such as fig. 7, is strictly limited by the clear width between the standards, and the height of the horizontal slide above the table when at its highest point. Although these dimensions are very considerable in the larger sizes, which can occasionally take in articles over 9 feet in width and height and 50 feet in length, yet it is sometimes desirable to be able to exceed them, and in these large machines the weight of the table and the power consumed in driving and reversing it become a serious consideration. It is therefore mechani- cally preferable to keep the work at rest when it is large or heavy, and to give all the requisite movements to the tool ‘This view is now gradually gaining favour, and the makers of some recent machines have adopted a form of construction entirely different from the above, which has the advantage of enabling cuts either horizontal or vertical to be taken from any piece of work which can be secured to the base-plate, so that its full size is almost immaterial. An ordinary vertical drilling machine is represented in fig. 8, one of comparatively small size and single- geared having been chosen rather than a larger example with greater complication. When once properly started, this machine is self-acting, but for each hole the work has to be adjusted by hand so as to bring the required portion exactly under the drill spindle, and the small size of the table prevents its being at any great distance from the edge. These objections are remedied in larger machines, either by making the table cap- able of horizontal adjustment,—a good way of doing this being to pivot a circular table at the end of an arm which can revolve round

the main standard of the machine,—or by mounting the © drill spindle on a radial arm, and enabling its distance from the

Machine. standard to be varied. In the first case the tool is then distinguished as a “pillar” and in the second as a “radial”

drilling machine. Lither of these methods enables the drill to be brought to bear exactly upon the desired spot

(within certain limits as to distance from the edge, &c.), the first by adjusting the work below the drill, the second by adjusting the drill over the work. ; A wall drill dis- penses with a table altogether, and gives great facilities for operating on large pieces of work, especially if the means of adjustment is secured by the radial arm just men- tioned. Multiple drilling machines, with which a series of holes can be drilled at once, are serviceable tools for some purposes, mainly on account of the sav- ing of time which they effect. Three drills are shown in fig. 9, the first the old, bad, but not yet quite superseded pattern, which is incapable of making a straight or clean hole of any consider- able depth, and which loses its ori- ginal diameter both in wear and in sharpening; the second the twist drill, which compares favourably with it in every one of these respects ; and the third a pin drill, for enlarging a hole already existing. Boring machines deal chiefly with apertures of large diameter, for which great straightness and accuracy are required, such as the cylinders of pumps, steam-engines, &c., or the bores of guns. The latter object brought them very early into existence, as already mentioned, and the general principle upon which the rude machinery of more than a century ago bored out the old cast iron mortars is still used for the powerful weapons of our own day. It consists in the employment of a boring bar formed by mounting a series of cutters (or a combination of guides and cutters) round the periphery of a cylindrical ‘“ head ” somewhat less in diameter than the required bore. Fig. 10 will render evident the great similarity which exists between the oldest : and the most re- f cent gun-boring ‘ heads, the one be- ing taken from the Encyclopédie already referred to, and the other from a draw- ing of a boring-bar used for a similar purpose at Woolwich, The head may be either a fixture at the end of its bar, in which case it forms a kind of drill with several cutting edges,

or it may be so arranged as to traverse the bar to a small extent at each revolution,—a plan which is generally preferred for all open-ended cylinders, &c., and which admits of the work being kept stationary throughout the operation. The bar when in use is mounted either vertically or hori- zontally, according to circumstances, in a lathe or boring machine. The excellent results obtainable in this manner will be appreciated from the fact that with the gun-boring machinery at Woolwich a hole 10 inches in diameter and 10 feet deep can be bored in solid steel at a single operation, and holes h been carried to a depth of 24 feet with a variation of less than ;45 of an inch in the diameter. The accuracy of modern machine work indeed not unfrequently brings into prominence sources of error which were previously unsuspected. The boring of large cast iron cylinders affords an instance of

Fie. 9,—Drills.

Fie. 10.—Gun-Boring Heads.

this, for it has been found that, however true the boring |

tool may be, the distortion of the cylinder itself, through being laid on its side, is sufficient to mar the results obtained with it ; consequently it has been found necessary always to bore a large cylinder in the vertical position which it will occupy when in use.

In the construction of modern machinery, &c., it is often neces- sary to depart from the simple geometric forms to the production of which the tools which have thus far occupied our attention are

mainly adapted. _ We will now glance at some of the labour-saving coutrivances applicable to other cases.

The slot-drilling machine effects (by a method said to have been

1

| and is rapidly extending, is that of emery grinders.

first used about the year 1848) the conversion of the circular cavity producible with an ordinary drilling machine into an elongated ‘slot ” or slit. The extent of the elongation can be varied by in- creasing or diminishing the re- ee movement of the slide which carries the rotating drill. An example of it is given in fig. 11, and the cutting end of a = roughing drill is shown to an = enlarged scale. Where smooth- =

ness of the sunken surface is re- Fie. 11.—Slot Drilling. quired this is followed by a rose or some other finishing tool.

The slotting machine (fig. 12) also cuts grooves and slots, but in an entirely different manner. Those who are acquainted with the wood mortising ma- chine, from which the idea of this tool was derived by Roberts of Manchester, will at once understand its prin- ciple, and will appre- ciate the good service which can be rendered by this powerful paring tool. A large propor- tion of the shaping,

. . — at &c., required in heavy SS work is now done in A ral s . LP) Seta these machines, which —Seer are sometimes of great 5— At

size and power. The table on which the = work is placedispivoted ~ = and mounted on a com- —— pound slide, and a self- Fig. 12.—Slotting Machine. acting horizontal transverse or circular movement can thus be given to it.

For work of moderate size shaping machines, which are more of recent introduction than either slotting or planing machines, both of which they resemble in their action, are in some respects more convenient. The slide which carries the tool is in their case hori- zontal, and its short but variable strokes are in a direction trans- verse to the bed, along which it can travel, just as a_ slide-rest travels along a lathe bed. Curved surfaces, either convex or concave, as well as flat ones, can generally be worked up antomatically in these machines, one of which is . shown in fig. 18, but their details and arrangements vary consider- ~ ably. For operating upon small surfaces, especially those of com- plicated outline, the plan of employing a revolving cutter, re- sembling a circular file, is now gaining favour. It is interesting to

note that this is but a return to a system which is stated to have been devised by Dr Hooke in 1664, and which was certainly used in some of the carly ‘engines ” for cutting the teeth of wheels. One such cutter or milling tool is shown in fig. 14. Others are of a plain cylindrical form, or are varied in outline to any extent to suit the particular purpose for which they are intended, amongst which purposes may be mentioned that of cutting the teeth of other milling tools. When mounted ona compound slide and used in a milling machine, a tool of this kind is a labour-saving contrivance of a very efficient kind, and it should be observed that it may in some cases be employed for finishing metal surfaces possessing a double curvature, to which none of the foregoing planing or shaping machines could be applied.

Profiling or edge-milling machines are a still more recent appli- cation of the milling-tool system. They enable the curved or com- plicated outline of a previously prepared templet to be reproduced with certainty any number of times in succession. They are in fact copying machines, acting in a similar manner to Jordan’s carving machine or Blanchard’s copying lathe, in both of which the form of the copy is derived from the original pattern by causing this pattern to control the movements of the revolving tool.

Another class of machine tools, which has sprung up of late years One thing

Fie. 14.— Milling Tool.

which has given much impetus to these is the now not unfrequent necessity for turning or shaping steel in a more or less hard con- dition, for doing which these and natural grinding-stones are the only substances practically available on a large scale, while the rapid wear of the latter unfits them for many of the purposes to which the artificial preparations of emery can be applied with great advantage. Accordingly emery wheels are now mounted for use in a great many different ways,—either on slide-rests as turning tools, in emery planers and __ = emery shaping maehines CO Th ‘ (such as fig. 15), and = > 4, I various others in which they take the place of steel cutters, or as tool grinders either general or special, in which the rival material, so far from supplanting steel, does much to- wards increasing its efficiency, by enabling the process of grinding to be applied to many cutting

tools which could previously be sharpened only with much greater labourand : = other methods. ; F ghee: pee Fia. 15.—Emery Shaping Machine. and screw taps, and twist drills are familiar instances of this appli- eation. A high rate of speed isessential for obtaining the full effect of an emery wheel, half a mile a minute being by no means an unusual or excessive rate of travel for its cutting surface. A con- siderable amount of heat is consequently developed at the point of contact with the work, and the composition of the wheel must be such that it can endure this without injury. Some which could not fulfil this requirement have long been used by native workmen in India, but others which could fulfil it were patented in England in 1842, though for years after this they were but little known or used.

Punehing and shearing machinery holds the same isolated position amongst machine tools that punches and shears occupy amongst cutting tools used by hand—if indeed either the one or the other can be regarded as cutting tools at all. Yet, for performing rapidly and in many cases without any waste of material, shears can often claim superiority to any other means available for ac- complishing the same ends. The diagram (fig. 16) shows the old arrangement known as eropping shears, still in use at many iron-works, where early appliances seem to enjoy a remarkable vitality. An ex- ample of a self-contained shearing and punching machine is given in fig. 17. The apparent ease with which machines of this kind, acting with a slow quiet stroke, shear or perforate plates of iron, even when of considerable thickness, gives an altogether false impression of the amount of power which the operation requires. Arrangements for obviating the difficulty of placing the work exactly in the correct position for each one of a series of holes to be punched in it were devised by Maudslay ; his plau, which is the one now usually adopted, being to place a traversing table in front of the machine, from some part of which it is moved to a distance depending on the ‘‘ pitch” of the holes after each stroke of the punch. Another system, by which the holes could be arranged in any required pattern, was subsequently invented by Roberts.

The above examples of workshop tools have been confined to those to which the requisite power is transmitted from an inde- pendent steam-engine or some other prime mover—the usual mode of transmission being

by lines of shafting carrying pulleys or drums. Belts pass from these to similar pulleys, which may be observed on many of the machines in the engravings. But this is not the invariable method. The prime mover may itself form part of the machine, as it does in the case of a steam-hammer. Or steam may be dispensed with and water confined under a high pressure substi- tuted, —which constitutes the hydraulic system of distribution, now largely applied to the working of cranes and many other purposes, and to some extent also to machine tools, Punches and shears lend themselves readily to this system on account of their slow move- ments ; so, too, do riveting machines. The distribution of power by hydraulic means, and also by compressed air, was patented by Mr Bramah in 1796. Another formidable rival to steam also has

Fie. 16.—Cropping Shears.

now sprung up in the shape of electricity, and the results from it which are promised to us—and which indeed seem likely to be ob- tained—will go far towards revolutionizing all our present ideas as to the difficulty of transmitting power to a distance, and will work : complete transformation in the aspect of the machine tools of the uture.

Fia,. 17,—-Punching and Shearing Machine.

One other class of machines must be mentioned before conclud- ing, viz., measuring machines. The greatly increased accuracy of modern work has rendered necessary the recording of very minute dimensions, such as are quite beyond the measuring powers of ordi- nary rules and callipers. Difference engines, 7.e., machines which can measure minute differences between two articles—such as a standard gauge and an intended copy of it —have thus found a place in engineers’ works. To their arrangement and manufacture, as well as to that of standard measuring bars and gauges, Sir J. Whitworth has paid great attention, and he has achieved such success that in his workshop measuring machines a difference of zoos part of an inch is readily appreciable. At the standards de- partment of the Board of Trade there is one of these machines, used for the verification of standard gauges, which reads to the rodeos Of an inch ; and with his most sensitive machines

—which, however, require great care and special precautions in their use—the roobon0 part of an inch can be detected.

The social influence of machine tools we cannot discuss, though it is a subject upon which the diffusion of correct ideas is greatly needed. The days of mill-burning and implement-breaking mobs indeed are past, but the effect of the introduction of the machinery of which these tools are the parents is one which is still much mis- understood. More particularly is this the case amongst the hand- working classes in England, who see clearly the local and temporary hardships which its introduction occasionally causes, but are blind to the greatly preponderating advantages which they reap from it in an especial ane (©. P. B. 8.)

MACKENZIE, Srr Atexanper (1755-1820), a Canadian explorer, was a native of Inverness. Having emigrated at an early age to Canada, he was for a number of years engaged in the fur trade at Fort Chipewyan, on the north side of thd@Lake of the Hills, and it was there that his schemes of travel were formed. His first journey (3d July to 27th September 1789)—for which he had prepared himself by a year's study in England of astronomy and navigation—was from Fort Chipewyan along the Great Slave Lake and down the river which now bears his name to the Frozen Ocean ; and his second (October 1792 to July 1793) from Fort Chipewyan up the Peace river across to the Columbia river, and thence westward to the coast of the Pacific at Cape Menzies, opposite Queen Charlotte Islands. The narrative of these expeditions (Voyages through North America to the Frozen and Pacific Oceans, London, 1801) is of considerable interest from the information it contains about the native tribes; and it is prefaced by an historical dissertation on the Canadian fur trade. Mackenzie was rewarded for his discoveries by the honour of knighthood in 1801.

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MACKENZIE, Sir Grorce (1636-1691), of Rosehaugh,

knight, a prominent Scottish lawyer, was the grandson of Kenneth, first Lord Mackenzie of Kintail, and the nephew of Colin and George, first and second earls of Seaforth; his mother was a daughter of Dr Andrew Bruce, principal of St Leonard's College, St Andrews. He was born at Dundee in

1636, and, having passed through the grammar school there, was sent at an early age to college at Aberdeen, and afterwards at St Andrews, graduating at sixteen. He then engaged for three years in the study of the civil law at Bourges; on his return to Scotland he was called to the bar in 1656, and before the Restoration had risen into considerable practice. Immediately after the Restoration he was appointed a " justice-depute," and it is

recorded that he and his colleagues in that office were | ordained. by the parliament in 1661 "to repair, once in the |

week at least, to Musselburgh and Dalkeith, and to try and judge such persons as are there or thereabouts delate of witchcraft." In the same year he acted as counsel for the marquis of Argyll; soon afterwards he was knighted, and he represented the county of Ross during the four sessions of the parliament which was called in 1669. He succeeded Sir John Nisbet as king's advocate in August 1677, and in the discharge of this office became implicated in all the worst acts of the Scottish administration of Charles IL, earning for himself an unenviable distinction as 'the bloody Mackenzie." His refusal to concur in the measures for dispensing with the penal laws against Catholics led to his removal from office in 1686, but he was reinstated in February 1688. At the Revolution, being a member of convention, he was one of the minority of five in the division on the forfeiture of the crown. King William was urged to declare him incapacitated for holding any public office, but refused to accede to the proposal. When the death of Dundee (September 1689) had finally destroyed the hopes of his party in Scotland, Mackenzie betook himself to Oxford, where, admitted a student by a grace passed on June 2, 1690, he was allowed to spend the rest of his days in the enjoyment of the ample fortune he had acquired, and in the prosecution of his literary labours. One of his last acts before leaving Edinburgh had been to pronounce (March 15, 1689), as dean of the faculty of advocates, the inaugural oration at the foundation of the Advocates' Library. He died at. Westminster on May 8, 1691, and was buried in Greyfriars churchyard, Edinburgh.

While still a young man Sir George Mackenzie appears to have aspired to eminence in the domain of pure literature, his earliest publication having been Arectina, or a Serious Romance (anon., 1660) ; it was followed, also

anonymously, by Religio Stoici, a Short Discourse upon several Divine and Moral Subjects (1663), A Moral Essay, preferring Solitude to Public Employment (1665), and one or two other disquisitions of a similar nature. None of these earlier efforts are now read, if they ever were; and perhaps Mackenzie's strongest claim to be remembered at allin eonnexion with belles lettres is that which rests upon Dryden's grateful reminiscence of some stimulating conversation held with '' that noble wit of Seot- land, Sir George Mackenzie," about1673. (See Dryden's " Discourse on the Origin and Progress of Satire," prefixed to his Juvenal in 1693.) His most important legal works are entitled A Discourse upon the Laws and Customs of Scotland in Matters Criminal (1678), Observations upon the Laws and Customs of Nations as to Precedency, with the Science of Heraldry (1680), Institutions of the Law of Scot- land (1684), and Observations upon the Acts of Parliament (1686); of these the last-named is the most important, the Institutions being completely overshadowed by the similar work of his great contem- porary Stair. In his Jus Regiwm: or the Just and Solid Founda- tions of Monarchy in general, and more especially of the Monarchy of Scotland, maintained (1684), Maekenzie appears as an uneompro- mising advocate of the highest doctrines of prerogative. ae Vindication of the Government of Scotland during the reign of Charles IT. is valuable as a piece of contemporary history. The collected Works were published at Edinburgh (2 vols. fol.) in 1716-22 ; and Memoirs of the Affairs of Scotland from the Restora- tion of King Charles II., from previously unpublished MSS., in

MACKENZIBE

1821, It may be well to add that the subject of this notice must

not be confounded with Dr George Mackenzie, the author of Lives

re i seal of the Most Eminent Writers of the Seots Nation

08-22).

MACKENZIE, Henry (1745-1831), was born at Edinburgh in August 1745. His father was Dr Joshua or Josiah Mackenzie, a successful physician, who also culti- vated letters in a small way. Mackenzie got the ordinary

education of a youth in his position at the high school and university of Edinburgh, and was afterwards articled to Mr Inglis, who was then attorney for the crown in the management of exchequer affairs. To this comfortable post the author in due time succeeded, and perhaps knew as little as any of that tribe ever did about the struggles and sorrows of a literary career. For his work's sake it would have been better if he had travelled some of life's rougher paths, or else been content to write about what he had actually seen in the Scottish world of that day. There was plenty of material there if he had had the open eye to see it, as Walter Scott showed by and by; and it is a pity that Mackenzie did not try his hand at it, having been more in the heart of it than Scott could ever have been. As it is, his stories are clearly not the fruit of his experience, but rather the echo of his reading. He could write graceful enough sentences, somewhat artificial, yet smooth and pointed ; but the men he describes are mere shadows, and the life altogether unreal. His first and best-known work, The Man of Feeling, was published anonymously when he was only twenty-six years of age, and soon became highly popular. It was a droughty season in Scottish literature, and therefore any little blossom, however sickly, was welcome for its rarity. Hume and Robertson and Smith had left the scene; Burns was just learning to think of the daisy he turned up with his ploughshare, and Fergusson had lately closed his brief.and troubled career. Mackenzie had the field all to himself, and got the attention which is given to a solitary figure. He had read the Senti- mental Journey, as one can see from expressions here and there, as well as from the affectation of writing his story in a fragmentary form; but he had nota gleam of Sterne's humour to relieve the seutimentality. He had read Richardson too, but he had none of that writer's subtle insight into character. Perhaps Goldsmith was his real model, but the likeness was as that between a fire- fly and a star. The "man of feeling" is a weak foolish creature, possessed with a futile benevolence, who goes up to London, where his friends should never have let him go, and meets a variety of sharpers, and comes out of their hands pretty much as Goldsmith makes the vicar's son do, only without the fun that clings to poor Moses. For this book is all in one key, sentimental and lachrymose, and the hero dies at last, from no particular cause, in a highly tragic fashion beside his fainting mistress. His next work, The Man of the World, is the picture of a born villain, a rogue in grain, who begins his rascality at school, perhaps earlier, and carries it through with entire consistency to the end. The man is unnaturally

bad, and the incidents are badly unnatural; and such a book at present would only find a place in some third-rate penny paper, if even there. Julia de Roubigné, his only other novelette, was meant to depict the misfortunes of a number of quite blameless people—to be, in short, a tragedy without a villain, an Othello without an Iago. But, as it has no insight, and does not even try to have any insight, into the mystery of such calamities, the result is insipid and tedious, All these works had great popularity in their day ; but that day is long past, and what life they now have is only a tradition.

Mackenzie also wrote several dramas, mostly of the tragic sort, for in that tone he had won his successes, such

as they were. But one who had no conception of distinct character, of human individuality, was not likely to succeed in the drama, which depends more on that than on anything ; and hence it was not our author's good fortune to deliver his country from the stigma of never having produced a genuine tragedy. Of Zhe Spanish Lather, The Prince of Tunis, and The Shipwreck, the second was brought on the stage, and managed to live for six nights; the other two were stillborn, and probably no man living has ever read theni, unless for purely critical purposes.

But Mackenzie, if nowise a great writer, but quite other- wise essentially a small writer, with a knack of making sentences indeed, but having nothing particular of his own to say, was not therefore altogether a useless man in his day. That he did well for himself, and perhaps for the exchequer too, is quite likely, even though he toiled in the high-Tory service of Dundas, and wrote tracts meant to "broom" out of the country the tide of French Revolu- tionary notions. At any rate he became in his old age a kind of literary centre and social power in Edinburgh, when that was really needed and useful. He had known John Home and blind Dr Blacklock, and wrote lives of them ; but, what is of more consequence, he was among the first to recognize the genius of Robert Burns, as editor of The Lounger, which he and a group of young men with some literary tastes wrote and printed for some years. Yet, though he once breakfasted with Johnson, and certainly met Burns more than once, he has told us nothing about either of them, though a page of Burns's talk would have been worth all Zhe Afan of

Feeling twice told. It was so far good, however, that he hailed the peasant poet cordially, which we could hardly have hoped so artificial a writer would do, and even better that he noticed the dawn of German literature when Lessing and Schiller rose above the horizon, and not only wrote some account of them, taken from French sources, but boldly set to the study of German that he might really know them at first hand. How far he went in that study we do not know, only he set young Walter Scott on the scent, with results such as he himself could never have imagined. So he lived on, a kind of small king in the Edinburgh literary world, till 1831, dying in his eighty-sixth year, with a wonderful new world around him, which had not yet begun to criticize, but only to admire and honour him. ,

MACKEREL. Mackerels are pelagic fishes, belonging toa small family, Scombridx, of which the tunny, bonito, albacore, sucking-fish (Zchenevs), and a few other tropical genera are members (see IcurHyoLoey, vol. xii. p. 690). Although the species are fewer in number than in the majority of other families of fishes, they are widely spread and extreniely abundant, peopling by countless schools the oceans of the tropical and temperate zones, and approaching the coasts only accidentally, occasionally, or periodically. The mackerels proper (genus Scomber) are readily recognized by their elegantly shaped, well-proportioned body, shining in iridescent colours. Small, thin, deciduous scales equally cover nearly the entire body. The dorsal fin extends over a great part of the back, and consists of several portions: the anterior, composed of feeble spines which can be laid backwards in a groove ; the posterior, of rays only, of which the five or six hindmost are detached, forming isolated “‘finlets.” The shape of the anal fin is similar to that of the rayed dorsal. The caudal fin is crescent-shaped, strengthened at the base by two short ridges on each side. The mouth is wide, armed above and below with a row of very small, fixed teeth.

No other fish shows finer proportions in the shape of its body. Every “line” of its build is designed and eminently adapted for rapid progression through the water; the muscles massed along the vertebral column are enormously

developed, especially on the back and the sides of the tail, and impart to the body a certain rigidity which interferes with abruptly sideward motions of the fish. Therefore mackerel generally swim in a straightforward dircction, deviating sidewards only when compelled, and rarely turn- ing about in thesame spot. They are in almost continuous motion, their power of endurance being equal to the rapidity of their motions. Mackerel, like all fishes of this family (with the exception, perhaps, of Hcheneis, which has not yet been examined in this respect), have a firm flesh; that is, the muscles of the several segments are interlaced, and receive a greater supply of blood-vessels and nerves than in other fishes. Therefore the flesh, especially of the larger kinds, is of a red colour; and the energy of their muscular action causes the temperature of their blood to be several degrees higher than in other fishes.

All fishes of the mackerel family are strictly carnivorous ; they unceasingly pursue their prey, which consists princi- pally of other fish and pelagic crustaceans. The fry of clupeoids, which likewise swim in schools, are followed by the mackerel until they reach some shallow part of the coast, which their enemies dare not enter.

Mackerels are found in almost all tropical and temperate seas, with the exception of the Atlantic shores of temperate South America, where they have not hitherto been met with. The distinctive characters of the various species have not yet been fully investigated; and there is much confusion in the discrimination of the species. So much is certain that the European mackerel are of two kinds, of which one, the common mackerel, Scomber scomber, lacks, while the other possesses, an air-bladder. The best-known species of the latter kind is Scomber colias, the ‘‘ Spanish ” mackerel; ! a third, Scomber pneumatophorus, is believed by some ichthyo- logists to be identical with S. colias. Be this asit may, we have strong evidence that the Mediterranean is inhabited by other species different from S. scomber and S. colias, and well characterized by their dentition and coloration. Also the species from St Helena is distinct. Of extra-Atlantic species the mackerel of the Japanese seas are the most nearly allied to the European, those of New Zealand and Australia, and still more those of the Indian Ocean, differing in many conspicuous points. Two of these species occur in the British seas: Scomber scomber, which is the most common there as well as in other parts

of the North Atlantic, crossing the ocean to America, where it abounds; and the Spanish mackerel, Scomber colias, which is distinguished by a somewhat different pattern of coloration, the transverse black bands of the common mackerel being in this species narrower, more irregular or partly broken up into spots, while the scales of the pectoral region are larger, and the snout is longer and more pointed. The Spanish mackerel is, as the name implies, a native of the seas of southern Europe, but single individuals or small schools reach fre- quently the shores of Great Britain and of the United States.

The home of the eommon maekerel (to whieh the following re- marks refer) is the North Atlantic, from the Canary Islands to the Orkneys, and from the Mediterranean and the Black Sea and the eoasts of Norway to the United States.

Towards the spring large sehools approach the coasts. Two eauses have been assigned of this migration: first, the instinet of finding a suitable locality for propagating their species; and, secondly, the seareh and pursuit of food, which in the warmer season is more abundant in the neighbourhood of land than in the open sea. It is probable that the latter is the true and only eause, for the following reasons :—mackerel are known to inerease much more rapidly in size while in the neighbourhood of land than in the months during which they lead a roving pelagic life in the open sea; and, further, one-year and two-year-old fishes, which have not yet attained maturity, and therefore do not travel land-

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1 The term ‘‘ Spanish mackerel” is applied to a very different fish in America, viz., Cybiwm maculatum.

wards for the purpose of spawning, actually take the lead in the migration, and are followed later on by the older and mature fishes. Finally, according to the observations made by Sars, vicinity of land or shallow water are not neccessary conditions for the ovipo- sition of mackercl ; they spawn at the spot which they happen to have reached during their wanderings at the time

when the ova have attained thcir full development, independently of the distance of the land or of the depth of water below them, as the ova float and the embryo is developed on the surface of the watcr.

In the month of February, or in some years as early as the end of January, the first large schools appear at the entrance of the English Channel, and are met by the more adventurous of the drift- net fishers many miles west of the Scilly Islands. These early schools, which, as we mentioned above, consist chiefly of one-year and two-year-old fishes, yield somctimes enormous catches, whilst in other years they escape the drift-nets altogether, passing them, for some hitherto unexplained reason, at a greater depth than that to which the nets reach, viz., 20 feet. As the season advances, tlie schools penetrate farther northwards into St George's Channel or eastwards into the English Channel. The fishery then assumes proportions which render it next in importance to the herring and cod fisheries. In Plymouth alone a fleet of some two hundred boats assembles ; and ou the French side of the Channel no less capital and labour are invested in it, the vesscls employed being, though less in number, larger in size than on the English side. Simultaneously with the drift-net the deep-sea-seine and shore-seine are used, which towards June almost entirely supersede the drift-net. Towards the end of May the old fish become heavy with spawn, and are in the highest condition for the table ; and the latter half of June or be- ginning of July may be regarded as the time at which the greater part of mackerel spawn.

Mackerel are scarcely less abundant in the German Ocean ; prob- ably some of the schools never leave it, and this resident stock (if we are allowed to apply this term to a fish which is ever shifting its quarters) is increased by the schools coming from the Atlantic through the English Channel or round the north coast of Scotland. The schools approach the coasts of the German Ocean somewhat later in the season, partly owing to the greater severity of the weather, which detains the resident fishes in the open sea, and partly owing to the greater distance which the Atlantic shoals have to travel. On the Norwegian coast mackerel fishing does not begin before May, whilst on the English coasts large catches are frequently made in March. Large cargoes are now annually im- ported in ice from Norway to the English market.

After the spawning the schools break up into smaller companies which are much scattered, and offer for two or thrce months employment to the hand-line fishermen. They now begin to dis- appear from the coasts and return to the open sea. Single indi- viduals or small companies are found, however, on the coast all the year round ; they may have become detached from the main bodics, and be seeking for the larger schools which have long left on their return migration.

Although, on the whole, the course and time of the annual migration of mackerel are marked with great regularity, their appearance and abundance at certain localities are subject to great variations. ‘Thcy may pass a spot at such a depth as to evade the nets, and reappear at the surface some days after farther eastwards ; they may deviate from their direct line of migration, and even temporarily return westwards. In some years between 1852 and 1867 the old mackerel disappeared off Guernsey from the surface, aud were accidentally discovered feeding at the bottom. Many were taken at 10 fathoms and decper with the line, and all were of exceptionally large size, several measuring 18 inches, and weigh- ing nearly 3 tb ; these are the largest mackercl on record.

The mackerel most esteemed as food is the common species, and individuals from 10 to 12 inches in length are considered the best flavoured. In more southern latitudes, however, this species scems to deteriorate, specimens from the coast of Portugal, and from the Mediterranean and Black Sea, being stated to be dry and resembling in flavour the Spanish mackerel (S. colias), which is not esteemcd for the table. See also FisHerigrs. (A. C. G.)

_MACKINTOSH, Sir James (1765-1832), publicist, historian, statesman, and philosopher, was born at Aldourie, fl miles from Inverness, in 1765. He came of old Highland families both through his father and his mother. Of the former, who was an officer in the army, and was mostly on duty abroad, he saw but little, and he spent his early years under the care of his mother and her relatives. At avery early age young James bore the reputation of a prodigy for multifarious reading and learning. His schooling he received at Fortrose, whence he went in 1780 to college at Aberdeen. As a student in the arts faculty there his reading extended far beyond the bounds of the

curriculum ; but the influence that most powerfully formed his mind was the companionship of Robert Hall, afterwards so famous as a pulpit orator, with whom he ardently beat the usual round of vexed questions. In 1784 he proceeded for the study of medicine to Edinburgh, where he found a still more congenial field for his opening mind, at a time when Hume had been dead just eight years, while Adam Smith, Dr Black the father of chemistry, Dr Cullen, Robertson, Ferguson, and other eminent men, were resident there. Mackintosh participated to the full in the intel- lectual ferment, but did not quite neglect his medical studies, and took his degree, though with characteristic unpunctuality he kept the professors waiting for a considerable time on the examination morning.

In 1788 Mackintosh removed to London, then agitated by the trial of Hastings and the king's first lapse into insanity. He was much more interested in these and other political events than in his professional prospects ; and his attention was specially directed to the events and tendencies which caused or preceded the Revolution in France. In the year of his removal to London his father died, and he succeeded to the family estate, which; being small and burdened, brought very little income; and, as he made no headway in his profession, his financial outlook was not very bright. It was under these circumstances that he wedded his first wife Catherine Stuart. Yet his marriage was a happy event for him. His wife's prudence was a corrective to his own unpractical temperament, and his efforts in journalism soon became fairly profitable. Mackintosh was soon absorbed in the question of the time ; and in April 1791, after long meditation, he published his Vindicte Gallice, a reply to Burke's Jeeflections on the French Revolution. Jt was the only worthy answer to Burke that appeared. It placed the author in the front rank of European publicists at the age of twenty-five, and won him the friendship of some of the most distinguished men of the time, including Burke himself. About the same time he became honorary secretary of the association of the Friends of the People. The success of the Vindicix finally decided him to give up the medical for the legal profession. He was called to the bar in 1795, and gained a considerable reputation there as well as a tolerable practice. During this period his greatest public efforts were his lectures (1799) at

Lincoln's Inn on the law of nature and nations, of which the introductory discourse was published, and his eloquent defence (1803) of Jean Peltier, a French refugee, tried at the instance of the French Government for a libel against the first consul. In 1804 he was created knight, and received the post of recorder at Bombay, where he spent the next seven years of his life. The spoilt child of London society was not at home in Bombay. He did seek to interest himself in India, and in imitation of Sir William Jones founded the Literary Society of Bombay ; but the current literature of Europe was far more engross- ing than the old Indian life, and the packet with the latest tidings from Europe and the newest development of the Napoleonic drama was infinitely more interesting than either. In spite of his scholarly and historic sympathies, his heart always was with the new era, and he was glad to return to England, where he arrived in 1812. True to his old faith, he courteously declined the offer of Perceval to resume political life under the auspices of the dominant Tory party, though tempting prospects of office in connexion with India were opened up. He entered parliament in the Whig interest as member for Nairn. He sat for that county, and afterwards for Knaresborough, till his death. In London society, and in Paris during his occasional visits, he was a recognized favourite for his genial wisdom and his great conversational power. On Madame de Stael's visit to London he was the only Englishman capable of

representing his country in talk with that phenomenal woman. His parliamentary career was marked by the same wide and candid liberalism as his private life. He opposed the repressive and reactionary measures of the Tory Government, supported and afterwards succeeded Romilly in his efforts for reforming the criminal code, and took a leading part both in Catholic emancipation and in the Reform Bill. But he was too little of a partisan, too widely sympathetic and candid, as well as too elaborate, to be a telling speaker in parliament, and was consequently surpassed by more practical men whose powers were incom- parably inferior. From 1818 to 1824 he was professor of law and general politics in the East India Company's College at Haileybury.

In the midst of the attractions of London society and of his parliamentary avocations Mackintosh felt that the real work of his life was being neglected. His great ambition was to write a history of England. His studies both in English and foreign speculation led him to cherish the design also of making some worthy contribution to philo- sophy. _ There is real pathos in the fact that it was not till 1828, when he was sixty-three years of age, and even then only at the instance of Macvey Napier, editor of the Encyclopedia Britannica, that he set about the first task of his literary ambition. This was the Dussertation on the Progress of Ethical Philosophy, prefixed to the seventh edition of the Zncyclopedia. The dissertation, written mostly in ill-health and in snatches of time taken from his parliamentary engagements, was published in 1831. About the same time he wrote for the Cabinet Cyclopedia a “History of England from the Earliest Times to the Final Establishment of the Reformation.” His more elaborate History of the Revolution, for which he had made great researches and collections, was not published till after his death. Already a privy councillor, Mackintosh was appointed commissioner for the affairs of India under the Whig administration of 1830. He died in 1832.

Mackintosh was undoubtedly one of the most cultured and catholic-minded men of his time. His studies and sympathies embraced almost every human interest, except pure science. But it was the width of his intellectual sympathies joined to a con- stitutional indecision and vis inertiz# that prevented him from doing more enduring work. Thus it was that his actual achievements came so far short both of his real power and of the promise given in his early efforts. ‘The works of Mackintosh which have the best claim to permanent valuc are the Vindicix Gallice, the Dissertation, and the History of the English Revolution. Of the three the first is the greatest both in ability and historical significance. It is the verdict of a philosophic Liberal on the development of the French Revolution up to the spring of 1791, and is at the same time a sympathetic estimate of its causes, principles, and tendencies. While respectful to liis great opponent, he is firm and manly in his assertion of the rights and interests of man so deeply concerned in the Revolution. Its excesses compclled him a few years after to express his entire agreement with the opinions of Burke ; but few will now deny that his early judgment was the more correct. The Dissertation is a sketchy and fragmentary work, redeemed by catholic criticism and

ingenious suggestion. It was a great under- taking, for which half a lifetime would hardly have been sufficient, attempted at a time when the study of the history of philosophy had hardly been begun. Yet his suggestions as to the formation of conscience are valuable. The History of the Revolution in England in 1688, which is only a posthumous fragment of a long meditated history of England beginning with the Revolution, is written in a style of calm and lofty impartiality. It is wanting in colouring, in movement, in the concrete and picturesque, and could never have been a popular history. It gives the history only of three years (1685-88), breaking off at the point where William of Orange is preparing to intervene in the affairs of England. The account of the early career of the prince is a noble and striking piece of work, showing that, ifthe author could have resisted the charms of society and applied himself resolutely to historical composition, he might have achieved something really great in that department.

See the Memoirs of Sir James Mackintosh's Life, edited by his son; also Macaulay's Essay on Sir J, Mackintosh.

MACLAURIN, Contin (1698-1746), one of the most eminent among the mathematicians and philosophers that

Great Britain has produced, was the son of a clergyman, and born at Kilmodan, Argyllshire, in 1698. At the early age of eleven years he entered the university of Glasgow, where he graduated as master of arts in his sixteenth year. While at the university he exhibited a decided genius for mathematics, more especially for geometry ; and it is said that before the end of his six- teenth year he had discovered many of the theorems after- wards published in his Geometria Organica.

In 1717 he was elected professor of mathematics in Marischal College, Aberdeen, as the result of a competitive examination. 'Two years later he was admitted a fellow of the Royal Society, and in a visit to London made the acquaintance of Newton, whose friendship and esteem he afterwards enjoyed. In 1719 he published his Geometria Organica, sive descriptio linearum curvarum universalis. This work was inspired by the beautiful discoveries of Newton on the organic description of conic sections. In it

Maclaurin introduced the well-known method of generat- ing conics which bears his name, and showed that many species of curves of the third and fourth degrees can be described by the intersection of two movable angles. In 1721 he wrote a supplement to the Geometria Organica, which he afterwards published, with extensions, in the Philosophical Transactions for 1735. This paper is principally based on the following general theorem, which is a remarkable extension of Pascal's hexagram :—" If a polygon move so that each of its sides passes through a fixed point, and if all its summits except one describe curves of the degrees m, , p, &c., respectively, then the free summit moves on a curve of the degree 2mnp… . which reduces to map .. . when the fixed points all lie ou a right line."

In 1722 Maclaurin travelled as tutor and companion to the eldest son of Lord Polwarth, and after a short stay in Paris resided for some time in Lorraine, where he wrote an essay on the percussion of bodies, which obtained the prize of the Freuch Academy of Science for the year 1724. The following year he was elected professor of mathematics in the university of Edinburgh on the urgent recommenda- tion of Newton. After the death of Newtou in 1728, his nephew, Mr Conduitt, applied to Maclaurin for his assist- auce in publishing an account of Newton's life and discoveries, This Maclaurin gladly undertook, but before the account was written the death of Mr Conduitt put a stop to the project. It was not until many years afterwards, and subsequently to Maclaurin's death, that this account of Newton's philosophical discoveries was published (1748).

In 1740 Maclaurin obtained the high distinction of dividing with Euler and Daniel Bernoulli the prize offered by the French Academy of Science for an essay on the flux and reflux of the sea. This important memoir was subsequently revised by him, and inserted in his 7'reatise on Fluxions, which was published at Edinburgh in 1742, in two volumes. In the preface he states that the work was undertaken in consequence of the attack on the method of fluxions made by Berkeley in 1734, under the title of The Analyst. Maclaurin's object was to found the doc- trine of fluxions on geometrical demonstration, after the manner of Archimedes and the ancient mathematicians, and thus to answer all objections to its method as being founded on false reasoning and full of mystery. He thus laid down the grounds of the fluxional method, regarding fluxions as velocities, after

Newton. He proceeded to give an extensive application of the method to curves, surfaces, and the other subjects usually discussed in works on the differential and integral calculus, his treatment being almost exclusively geometrical ; but the most valuable part of the work is that devoted to physical applications, in which he embodied his essay on the tides, as stated above.

In this he investigated the attraction of an ellipsoid of revolution, and showed that a homogeneous fluid mass revolving uniformly round an axis under the action of gravity ought to assume the form of an ellipsoid of revolu- tion. The importance of this investigation 1n connexion with the theory of the tides, the figure of the earth, and other kindred questions has always caused it to be regarded as one of the great problems of mathematical physics. Thus Clairant, D'Alembert, Lagrange, Legendre, Laplace, Gauss, Ivory, Poisson, Jacobi, Chasles, and other eminent mathematicians have successively attacked the problem, and in doing so have declared their obligations to Maclaurin as the creator of the theory of the attraction of ellipsoids. Lagrange's statement as to Maclaurin's dis- coveries deserves to be especially cited: after observing that the attraction of a spheroid of revolution is one of the problems in which the method of the ancients has advantages over that of modern analysis, he adds that Maclaurin's investigation is "un chef d'ceuvre de géométrie qwon peut comparer a tout ce qu' Archimeéde nous a laissé de plus beau et de plus ingénieux" (J/ém. de l'Acad. de Berlin, 1773). It may be added that Maclaurin was the first to introduce into mechanics, in this discussion, the important conception of surfaces of level, namely, surfaces at each of whose points the total force acts in the normal direction. He also gave in his /lusions, for the first time, the correct theory for distinguishing between maxima and minima in general, aud pointed out the importance of the distinction in the theory of the multiple points of curves.

In 1745, when the rebels, having got between Edinburgh and the king's troops, were marching on that city, Maclaurin took a most prominent part in preparing trenches and barricades for its defence. This occupied him night

and day, and the anxiety, fatigue, and cold to which he was thus exposed, affecting a constitution naturally weak, laid the foundation of the disease to which he afterwards succumbed. As soon as the rebel army got possession of Edinburgh, Maclaurin fled to England, to avoid making the submission to the Pretender which was demanded of all who had defended the town. He accepted the invita- tion of Dr Herring, then archbishop of York, with whom he remained until it was safe to return to Edinburgh. From that time his health was broken, and he died of dropsy on June 14, 1746, at Edinburgh, in his forty-eighth year. Maclaurin was married in 1733 to Anne, daughter of Walter Stewart, solicitor-general for Scotland. His eldest son, John, born in 1734, was distinguished as an advocate, and appointed one of the judges of the Scottish Court of Session, with the title of Lord Dreghorn. He inherited an attachment to scientific discovery, and was one of the founders of the Royal Society of Edinburgh, in

1782.

After Maclaurin's death his account of Newton's philosophical dis- coveries was published, and also his algebra in 1748. As anappen- dix to the latter appeared his work, De linearwn. geometricarum pro- prietatibus generalibus tractatus, a treatise of remarkable elegance. Of the more immediate successors of Newton in Great Britain Maclaurin is probably the only one who can be placed in competi- tion with the great mathematicians of the Continent at the time, and his name will ever be held in remembrance in connexion with his important discoveries. Among his publications in the Philo- sophical Transactions the following should be noticed :—

(1) ''Tractatus de curvarum constructione et mensura, ubi plurime serles curvarum infinite vel rectis mensurantur, vel ad simpliores curvas reducantur," May 1718. The series of curves here treated are what are now styled '' pedal" curves, which hold an important place in the modern discussion of curves. Maclaurin established many geometrical properties connecting a curve with its pedal. Heinves- tigated the properties of the successive pedals of a circle with respect to a point on its circumference, also those of the pedals of curves for which the. perpendicular on the tangent varies as some power of the radius vector drawn to the point of contact. (2) '* Nova methodus

universalis curvas omnes cujuscunque ordinis mechanice describendi sola datorum angulorum ct rectarum ope," January 1719. This and the preceding memoir were subsequently enlarged and incorporated by Maclaurin in his Geometria Organica. (8) '*On Equations with Impossible Roots," May 1726. (4) On''Continuation of the Same," March 1729. In these papers he gave a proof of Newton's rule for the discovery of the number of imaginary roots of an equation. He added some general results on the limits to the roots, and gave the well-known method of finding equal roots by aid of the first derived equation. (5) ''Observation of the Eclipse of the Sun of February 18, 1737," January 1738. (6) '' On the Bases of the Cells where Bees Deposit their Honey," November 1743.

French translations of his Treatise on Fluxions and that on Newton's philosophical discoveries were published at Paris in 1749. His algebra was also translated into French, in 1753. (B. W.)

M'LENNAN, Joun Fercuson, LL.D. (1827-1881), one of the most original of modern inquirers into the con- stitution of early society, was born at Inverness 14th October 1827. He studied at King's College, Aberdeen, where he graduated with great distinction in 1849, and then proceeded to Cambridge, where he remained till 1855, but did not take his degree. After some years spent in literary work and legal studies in London and Edinburgh, he joined the Scottish bar (January 1857). In 1865 he published an epoch-making study on Primitwe Marriage, in which, starting from the prevalence of the symbolical form of capture in marriage ceremonies, and combining with great argumentative power a variety of phenomena of primitive society previously quite obscure, he developed an intelligible picture of the growth of the marriage relation and of systems of kinship (see Faminy) according to natural laws. Continuing his studies on allied topics, M'Lennan published in 1866 (Portnightly Review, April and May 1866) an essay on "Kinship in Ancient Greece," in which he proposed to test by early Greek facts the theory of the history of kinship set forth in Primitive Marriage, and, three years later, a series of essays on "Totemism" (Mortnightly Review, 1869-70) (the germ of which had been contained in

the paper just named), which mark the second great step in the systematic study of early society, to which the energies of his life were now devoted. Areprint of Primitive Marriage, with “ Kinship in Ancient Greece ” and some other essays not previously published, appeared in 1876 under the title of Studies in Ancient History. The new essays contained in this volume were mostly critical, but one of them, in which perhaps his guessing talent is seen atits best, on ‘‘ The Divisions of the Irish Family,” is an elaborate discussion of a problem whick has long puzzled both Celtic scholars and jurists; and in another, “‘ On the Classificatory System of Relation- ship,” he propounded a new explanation of a series of facts which, he thought, might be made to throw a flood of light upon the early Tiseose of society, at the same time putting to the test of those facts the theories he had set forth in Primitive Marriage. Papers on ‘‘ The Levirate and Poly- andry,” following up the line of his previous investigations, appeared in the following year (Mortnightly Review, 1877), and were the last work he was able to publish. From 1872 to 1875 his literary plans were much interrupted by his duties as parliamentary draftsman for Scotland, and when he retired from this office his health was broken; hig last years were chiefly spent abroad, and in spite of the self-denying assistance of his second wife (his first wife, a daughter of. M‘Culloch the political economist, died in 1870, and he married again in 1875) the vast materials which he had accumulated for a comprehensive work on his favourite subjects were left only partially worked up, though the publication of his remains may still be looked for. He died 14th June 1881. In private life M‘Lennan was distinguished by his remarkable powers of conversation, by an uncompromising sense of duty, especially of duty to truth, by a warm and affectionate disposition, and by his

readiness to help all workers in science, especially young men of promise. Besides the works already cited, M‘Lennan wrote Life of Thomas Drummond (Edinburgh, 1867). His later labours had for immediate object the solution of the origin of exogamy—that is, of laws prohibit- ing the marriage of relations (laws of incest); and in con- nexion with this he had prepared materials for a description of the social state of the less advanced races of men (keeping totemism in view as it bore on the history of society

rather than the history of religion), which, he believed, would throw much light on the history of marriage and the family, of kinship, and laws of inheritance.

MACLEOD, Norman (1812-1872). There were three Norman Macleods, all ministers of the Church of Scotland, and all men of some note in their day. The first was settled in Morven, the "' Highland parish," looking out on the Sound of Mull, of which his grandson has given us so many pleasant and sunny reminiscences. The second was minister of Campbeltown, afterwards of Campsie, and finally of St Columba's Gaelic Church in Glasgow, an able Celtic scholar and popular preacher, with a dash of dry humour in him, and general Highland '"' pawkiness." The third Norman was born in Campbeltown on June 3, 1812, and, like his father, he too could tell a good story, only his humour was not of the pawky kind, but verged on caricature, when it had not, as it mostly had, a vein of pathos in it; for he had received, probably from his mother, Agnes Maxwell, a richer blood and a larger life than we can trace in his more purely Celtic ancestry.

A sunny, light-hearted youth, full of jest and song, given to miscellaneous literature rather than to accurate scholar- ship or professional learning, would hardly seem to have been the kind of training to prepare for the life of an eloquent preacher and earnest pastor. Yet the broad human sympathies which were thus fostered were, after all, more serviceable for the work that lay before him than a knowledge of the Greek drama or of Dutch divinity ; and, though he was never much of a scholar or a theologian, he was out and out a man, which is of more consequence in the long run. He had also moved about, and seen a good deal of the world in Highland Morven, in Glasgow, in Edinburgh, in England, and in Germany, when in 1838, on the recommendation of Dr Chalmers, he was presented by the dowager marchioness of Hastings to the parish of Loudoun, and began his ministry among a curious com- bination of Davie Deanses and Silas Marners—covenant- ing sinall farmers and Chartist hand-loom weavers. There, in the small rural parish, his work had the same character- istic features as in the larger sphere which afterwards opened up to him in the Barony church and in general literature. He carefully prepared for his pulpit, yet he was most eloquent when most spontaneous, for he was naturally more of a speaker than a writer. Courteous and chivalrous, yet also homely and ready-witted,

he was as much liked by the radical weavers as he was honoured and trusted by the marchioness and her family. And if his natural gaiety of heart, which now and then amounted to rollicking animal spirits, gave him an occasional twinge of conscience which is duly recorded in his secret diary, that only shows that his genuine piety had not yet harmonized his whole nature, as it afterwards did, blending the grave and gay in one beautiful human service.

When he began his ministry, the troubles in the Scottish Church were already gathering to a head, and he found himself compelled to look around, and choose his ground. He wanted to get for the church all that Chalmers and his friends wanted. He felt that the best men, both lay and cleric, were with them, and against himself. He had no love for lay patronage, and he wished the church to be free to do its proper work. But more than

all else he clung in those days to the idea of a national Established Church; and it was not without a sinking of heart that he saw the long array file out of the Assembly of 1843 after Drs Welsh and Chalmers. Yet he girded himself up for the task that had now to be done with courage and wisdom. It was a beavy job to fill four hundred and thirty pulpits with such materials as came to hand, mostly men who had already failed, and practically given up the profession. For years Macleod, and those who worked with him, toiled almost despairingly to inspire them with any living interest in the real business of the Christian Church. But in the long run his labours were crowned with a large measure of success, though his own brethren to the last hardly gave him the credit for it which was due almost to him alone—to him, at any rate, above all others. With his broad sympathies he flung himself upon the masses, and taught the working men to feel that the Church of Scotland was still as interested in their wellbeing as any denomination. Discerning also that the harder forms of Calvinism had no longer the hold on their minds that they once had, he made room for the thoughtful teachings of his cousin, Dr John Macleod Campbell, whom the Evangelical party had formerly cast out as a heretic, gaining by this means not a little influence with the young and inquiring intellects of the country.

And finally, by his efforts to diffuse a wholesome religious literature through the land, he so identified his church with the growing spirit of the age that at length he lived to see it, not indeed the strong and united community which in his youth practically controlled the nation, but yet once more a great power, dear to the hearts of many of the people, and doing good Christian service to the land.

It may be doubted if the work which Norman Macleod did for Scotland could have been done in his day without the disruption of the church. For the Evangelical party, using that word in its technical sense, had not only gained the confidence of the people by much faithful service, but also had confirmed their power by somewhat sharp treat- ment of all who differed from them. It needed a different kind of church to tolerate the views of Macleod Campbell; but as these were now, more or less, identified with the living element in the kirk, with those who were most diligent in parochial work, and most zealous in mission enterprise, they gradually established their right to be preached in Calvinistic pulpits. Norman Macleod, of course, was not long left to expend his energies on the weavers of Loudoun. Removing first to Dalkeith, he was finally, in 1851, called to the Barony church, Glasgow, where the rest of his days were passed, in honour and influence, as the foremost of its citizens. There the more liberal theology rapidly made way among a people who judged it more by its fruits than its arguments. And, as they heard his eloquent voice pleading on behalf of churches and schools for the poor, penny savings banks, foreign missions, and every likely scheme for doing good to men, they learned to look without suspicion at opinions which yielded such Christian results.

Two other events also helped not a little to increase his influence. These were his position as editor of Good Words, and his relation to the queen and the royal. family.

In 1860 a magazine was projected which was to deal with subjects common to all, only with a decidedly religious tone. It was not for Sunday only, nor was it for Christians only; but it was to be broadly human, and at the same time clearly pious. For the conduct- ing of such a magazine Macleod was singularly well qualified. Not that he had yet attained any great lite- rary position, or indeed was ever likely to do so. He

_had written some ecclesiastical pamphlets, amusing but

not weighty. He had edited the Ldinburgh Christian Magazine, without achieving any marked success. His best work as yet was the life of his friend and brother- in-law, John Mackintosh. But nothing human was foreign to him, and “ good words,” on things in general, were just the words that he could make quick and powerful. Very soon Good Words came to be by far the most popular magazine of the day. Nearly all his own literary work, by which he will be judged in other times, appeared in its pages,—sermons, stories, travels, novels, poems,—all of them honest “good words” which it was wholesome to read. But they hardly give him a name in literature,—at least, not such a name in the future as he had while he was still alive. They were too much the hurried productions of a life busy with many affairs. The short stories, like “Wee Davie” and “ Billy Buttons,” are those which are most likely to retain a place in letters, on account of their mingled humour and pathos. Of his more studied works “The Starling” is perhaps the best ; but, while he could tell a brief tale admirably, he could not sustain a long narrative, with its play of varied character and incident ; and, instead of leaving his art to read its own lesson, he preached a sermon by means of a story. Always, indeed, it is evident that he was more of an orator than a writer. The best of his poems is the hymn “Trust in God and do the right,” though the “Curling” song has the right ring of the stones rattling over the ice. Altogether, his work was honest and good, not the highest in point of literary finish, but wholesomer than much that is more perfect in its form.

While Good Words made his name widely known, and helped the cause he had so deeply at heart, his relations with the queen and the royal family strengthened yet further his position in the country. Never since Principal Carstairs had any Scotch clergyman been on such terms with his sovereign; and their friendship was felt to be alike honourable to both, resting, on her part, on esteem for his work and character, and on his, on a loyal desire to serve his queen as a Christian minister may. All this helped not a little to increase his influence in the councils of the church, and to restore its prestige, which had for a time been nearly overthrown; and yet, while his

popu- larity was in full swing, one unlucky piece of honesty made him for a time the man in all Scotland most profoundly distrusted.

Scotch Sabbatarian ideas had been a good deal disturbed by the running of Sunday trains and by other novelties, and in 1865 the presbytery of Glasgow issued a pastoral letter on the subject to be read from all the pulpits there. Macleod, of course, loved the day of rest as much as any of them, but he did not like the grounds ou which they rested it, nor yet the spirit in which they would have it observed, Therefore he resolved to deliver his mind on the subject to his brethren. Like St Paul, he refused to let any man judge him concerning “new moons and Sab- baths.” His speech was not at first well reported, those parts only being printed which were most likely to startle the religious public; and in consequence it was, for a while, greatly misunderstood. Old friends shrunk from him. His house seemed to be shunned as if plague- stricken. His brethren in the presbytery threatened a “libel” for heresy. And he needed all his courage to bear Up against the outcry which assailed him on all hands. A more correct version of the speech was issued, however, and the good sense and Christian intelligence of the people soon learned to form a juster estimate of its real bearing. The threatened prosecution broke down. Truer ideas of Sabbath observance got a lodgment in men’s minds. And, four years after, the church, which at one time seemed ready to cast him from her bosom, accorded him the highest honour

in her power to give, by choosing him as moderator of her General Assembly.

Before that, however, he had already gained her con- fidence so far as to be sent, along with Dr Archibald Watson, to India to inquire into the state of her mission there. He had always taken a deep interest in the India mission, and had been for some time convener of the com- mittee which took charge of its interests. When asked to undertake this duty, he was already labouring under the disease which afterwards shortened his days; his medical advisers were not without grave anxieties as to the effect of the climate on his constitution, and it was with clear consciousness of the risk he ran that, in 1867, he sailed for the East. He returned fully resolved to devote the rest of

his days largely to the work of rousing the church to her duty in carrying out “the marching orders” of her Commander. But he was not destined to do much more for the cause that lay so near his heart than to make oue or two stirring appeals to the conscience of the church. His health was now broken, and his old energy flagged. Always his habits of work had been somewhat irregular; properly, indeed, he had no fixed habits, but only tremendous fits of labour and periods of exhaustion. Now neither body nor brain could stand this strain, and with reluctance and pain he had to give. up the charge of the India mission. His speech in doing so was the last and greatest he ever made. It was as if he had gathered up his failing powers for one final effort, and spent his life on it. Shortly after his return from the Assembly of May 1872, his disease showed some fresh symptoms that alarmed the doctors. And on Sunday the 16th of June, shortly after completing his sixtieth year, Norman Macleod peacefully fell asleep, the country hardly knowing how it had loved him till he was borne to his quiet resting-place in Campsie churchyard.

Memoir of Norman Macleod, D.D., by his brother, the Rev. Donald Macleod, 2 vols., appeared in 1876. (W. C. 8.*)

MACLISE, Danret (1806 or 1811-1870), subject and history painter, was born at Cork, the son of a Highland soldier.1 His education was of the plainest kind, but he was eager for culture, fond of reading, and anxious to be- come au artist. His father, however, placed him, in 1820, in Newenhani’s Bank, where he remained for two years, and then left to study in the Cork school of art. In 1825 it happened that Sir Walter Scott was travelling in Ireland, and young Maclise, having seen him in a bookseller’s shop, made a surreptitious sketch of the great man, which he after- wards lithographed. It was exceedingly popular, and the artist became celebrated enough to receive many commis- sions for portraits, which he executed, in pencil, with very careful treatment of detail and accessory. Various influ- ential friends perceived the genius and promise of the lad, and were anxious to furnish him with the means of studying in the metropolis; but with rare independence he refused all aid, and by careful economy saved a sufficient sum to enable him to leave for London. There he made a lucky hit by a sketch of the younger Kean, which, like his portrait of Scott, was lithographed and published. He entered the Academy schools in 1828, and

carried off the highest prizes open to the students, including, in 1829, the gold medal for the best historical composition. In the same year he exhibited for the first time in the Royal Academy. Gradually he began to confine him- self more exclusively to subject and historical pictures, varied occasionally by portraits of Campbell, Miss Landon, Dickens, and other of his celebrated literary

1 The year of his birth is uncertain; he himself used to assert that the 25th of January 1811 was the correct date, but research in the register of the old Presbyterian church in Cork seems to prove that he was born on 2d February 1806.

friends. In 1833 he exhibited Snap Apple Night, or All Hallow Eve in Ireland, aud Mokanna Unveiling his Features to.Zelica, which greatly increased his reputation, and were followed in the succeeding year by the powerfully dramatic subject of the Installation of Captain Rock, and in 1835 by the Chivalric Vow of the Ladies and the Peacock, a work which procured his election as associate of the Academy, of which he became full member iu 1840. The years that followed were occupied with a long series of figure pictures, deriving their subjects from history and tradition, and from the works of Shakespeare, Goldsmith, and Le Sage. He also designed illustrations for Moore's Irish Melodies, Lytton's Pilgrims of the Rhine, and several of Dickens's Christmas books, and for Zhe Story of the Norman Con- quest and Shakespeare's Seven Ages, published by the Art Union. Between the years 1830 and 1836 he contributed to Fraser's Magazine, under the nom-de-crayon of Alfred Croquis, a very remarkable series of portraits of the literary and other celebrities of the time,—character studies, etched or lithographed in outline, and touched more or less with the emphasis of the caricaturist, which have been since reproduced and published in a volume. In 1858 Maclise commenced one of the two great monumental works of his life, the Meeting of Wellington and Bliicher, on the walls of Westminster Palace, where he had pre- viously painted his Spirit of Religion and his Spirit of Chivalry. It was begun in fresco, a process which proved unmanageable. The artist wished to resign the task ; but, encouraged by Prince Albert, he studied in Berlin the new method of

“water-glass” painting, and carried out the subject and its companion, the Death of Nelson, in that medium, completing the latter painting in 1864. The intense application which he gave to these great historic works, and the various depressing and discouraging circumstances connected with the commission, had a serious effect on the artist’s health. He began to shun the company in which he formerly delighted; his old buoyancy of spirits was gone; and when, in 1865, the presidentship of the Academy was offered to him, he declined the honour. In 1868 he exhibited the Sleep of Duncan, and in 1869 his King Cophetua and the Beggar Maid. Having finished the Earls of Desmond and Ormond, he was attacked by acute pneumonia, which carried him off, after a brief illness, on the 25th April 1870.

The works of Maclise are distinguished by powerful intellectual and imaginative qualities, but most of them are marred by harsh and dull colouring, by metallic hardness of surface and texture, and by frequent touches of the theatrical in the action and attitudes of the figures. His fame rests most securely on his two greatest works at Westminster. A memoir of the artist by his friend W. J. O’Driscoll was published in 1871.

MACLURE, Wirttam (1763-1840), the pioneer of American geology, was born at Ayr in Scotland in 1763. After a brief visit to New York he began active life as a partner in the firm of Miller, Hart, & Co., London. Four years later (1796) business affairs brought him again to America, which he thereafter made his home. In 1803 he visited France as one of the commissioners appointed to settle the claims of American citizens on the French Government for spoliations committed during the Revolu- tion ; and during the few years then spent in Europe he applied himself with enthusiasm to the study of geology. On his return home he commenced the self-imposed task of making a geological survey of the United States. Almost every State in the Union from the St Lawrence to the Gulf of Mexico was traversed and mapped by him, the Alleghany mountains being crossed and recrossed some fifty times. The results of his unaided labours were submitted in a memoir to the American Philosophical Society (1809), and published in the Society’s Zransactions (vol. vi.), together with a geological map, which thus

_ was born in 1806 at Fintry in Stirlingshire.

antedates William Smith's great geological map of England by six years. Subsequent survey has corroborated the general accuracy of Maclure's observations, so far at least as the Primary and Secondary formations are concerned. From 1817 to his death Maclure was president of the Academy of Natural Sciences of Philadelphia, and much of the prosperity of the institution was due to his devoted services. In 1819 he visited Spain, and attempted to establish an agricultural college near the city of Alicante ; but with the overthrow of the short-lived Liberal constitu- tion his plans became hopelessly deranged. Returning to America in 1824, he settled for some years at New Harmony, Indiana, endeavouring, but with small success, to develop his scheme of the agricultural college. Failing health ultimately constrained him to relinquish the attempt, and to seek (in 1827) a more congenial climate in Mexico, There, at San Angel, he died March 23, 1840.

His great geological memoir was issued separately, with some additional matter, in 1817 ; and in 1837 he published a collection of essays, in 2 vols., mainly on political economy, entitled Opinions on Various Subjects. His other original papers, including obser- vations on the geology of the West Indies and of Mexico, and re- marks on the origin and arrangement of rocks, were published in the Journal of the Academy of Natural Sciences (Philadelphia), in

Silliman's American Journal of Science and Arts, and in the French Journal de Physique.

MACNEE, Sir Dantex (1806-1882), portrait painter, He was edu- cated in Glasgow, and at the age of thirteen apprenticed, along with Horatio Macculloch and Leitch the water-colour painter, to John Knox, a landscapist of some repute at the time. He afterwards worked for a year as a lithographer, was employed by the Messrs Smith of Camnock to paint the ornamental lids of the planewood snuff-boxes for which their manufactory was celebrated, and, having studied in Edinburgh at the 'Trustees' Academy," sup- porting himself meanwhile by designing aud colouring book illustrations for Lizars the engraver, he established himself as an artist in Glasgow. At first he was occupied a good deal with figure pictures, but the increasing demands on his time as a fashionable portrait painter

eventually left him little leisure for this branch of art. He was one of the twenty-four associates of the Royal Institution who, in 1829, were admitted members of the Royal Scottish Academy ; and on the death of Sir George Harvey in 1876 he was elected president, and received the honour of knighthood, and the degree of LL.D. from the Glasgow University. From this period till his death, on the 18th of January 1882, he resided in Edinburgh, where his genial social qualities and his inimitable powers as a teller of humorous Scottish anecdote rendered him popular. Among his portraits may be mentioned those of Lord Brougham, Viscount Melville, Lord Inglis, and Mrs Bough. His Dr Wardlaw obtained a gold medal at the Paris Inter- national Exhibition of 1855.

MACNEILL, Hecror (1746-1818), a minor Scottish poet, born near Roslin, October 22, 1746, died at Edinburgh, March 15,1818. The son of an impoverished army captain, he spent several years of his boyhood on a farm which his father had taken on the banks of Loch Lomond, and was sent to Bristol at the age of fourteen to enter on a mercantile career. Soon afterwards he was despatched to the West Indies, where he remained many years without ever enjoying even a moderate prosperity. When about forty he returned to Scotland with the inten- tion of devoting himself to a literary life, but his ill fortune still pursued him, and he was obliged to go back to Jamaica. The kindness of two friends enabled him soon to come home again to Scotland, and on the journey he finished The Harp, a Legendary Tale, published at Edinburgh in 1789. After six years spent at Edinburgh,

rendered miserable by shattered health and depressed spirits, he retired to the house of a friend at Stirling, where he wrote most of his songs and his Scotland’s Skaath, or the History of Will and Jean, a narrative poem intended to show the deteriorating influences of whisky and pot- house politics, which appeared in 1795, and at once made its author popular, having passed through fourteen editions within the year. A sequel, Zhe Ways of War, appeared next year, and in 1799 The Links of Forth, or a Parting Peep at the Carse of Stirling, a somewhat feeble descriptive poem, intended as a parting tribute to his kind host before his own departure for Jamaica. Not longafter his arrival an early friend settled on him an annuity

of £100, which enabled the poet to returu soon afterwards to Scotland, and so close his long struggle against adversity with fifteen years of comparative comfort at Edinburgh. In 1800 he published The Memoirs of Charles Macpherson, Esq., a novel understood to be a close narrative of his own hardships and adventures. His later works, which added little to his fame, were —The Pastoral or Lyric Muse of Scotland, 1809 ; two anonymous works in verse entitled Town Fashions, or Modern Manners Deline- ated, and Byegone Times and Latecome Changes, and The Scottish Adventurers, a novel. He left behind an autobiography still un- published, but of which an abstract appeared in Blackwood's Maga- zine for December 1818. A complete edition of the poems he wished to own appeared in 1812, and it is on these that his fame will rest. His songs, ‘‘ Mary of Castlecary," ‘‘ Come under my plaidy," ‘‘ My boy, Taminy," ‘‘O tell me how for to woo," ‘‘I lo'ed ne'er a lassie but ane," ‘‘ The plaid amang the hether," and ‘‘Jeanie's black e'e," will live, spite of Allan Cunningham, for their swectness and sim- plicity, while his /Vil? and Jean, quite apart from its excellent intention and tendency, will maintain a place among the most characteristic productions of the Doric Muse in Scotland. MACON, the capital of Sadne-et-Loire, France, occupies a gently sloping site on the right bank of the Sadne, 41 miles north of Lyons. It is connected by a bridge of twelve arches with the suburb of St Laurent on the opposite bank of the river. The site is sheltered aud the climate mild, but the locality is subject to sudden changes of tempera- ture. Of the public buildings of Macon the most pro- minent is the old church of St Pierre, reconstructed in 1866,—a three-naved basilica, 328 feet in length, with two fine spires. Of the old cathedral, destroyed at the Revolu- tion, nothing remains but the facade, portions of the two towers, and a narthex of the 12th century, now used as a chapel. The old episcopal palace, which has been rebuilt, is now used as the prefecture. The hospital is from designs by Soufflot; the lyceum bears the name of Lamartine (a native of Macon, to whom there is a statue). The town house contains a library of 7000 volumes, and a museum. Macon is a railway centre of considerable importance, being the point at which the line from Paris to Marseilles is joined by that from Mont Cenis and Geneva, as well as by a branch from Digoin. The industries of the place include brass-founding, the manu- facture of agricultural inplements, weighing-machines, and the like, printing, dyeing, and the production of faience. The principal articles of commerce are wine, barrels and hoops, and grain. The population

in 1876 was 17,570. Macon (AMatisco) was an important town of the Adui, but under the Romans it was supplanted by Autun and Lyons. It suffered a succession of disasters at the hands of Germans, Burgundians, Vandals, Huns, Hungarians, and even of the Carlovingian kings. In 1228 it was sold to the king of France, but more than once afterwards passed into the possession of the dukes of Burgundy, until the ownership of the French crown was fixed in the time of Louis XT. In the 16th century Macon became a stronghold of the Huguenots, sided with the League, and did not yield to Henry IV. until 1594. The bishopric, created by King Childebert, was suppressed in 1790. MACON, a city of the United States, the chief town of Bibb county, Georgia, is situated on rising ground in the midst of a beautifully wooded country on both sides of the Ocmulgee river, a navigable headwater of the Altamaha, about 80 miles south-east of Atlanta. It is well laid out

with tree-bordered streets, often 180 feet wide, and pos- sesses since 1870 a fine central park, on the formation of which $125,000 were expended. The principal institu- tions in the town are the State academy for the blind (1852), the Mercer university (a Baptist foundation, 1838), the Wesleyan Female College (1839), the Pio Nono (Roman Catholic) College, and the Southern Botanico-Medical Institute. As an important junction for the Georgia, the Georgia Central, and the South-Western Railways, and com- municating with the coast by the direct line to Brunswick, Macon enjoys great facilities for trade; and, besides its extensive railway machine-shiops, it has cotton factories, iron foundries, flour-mills, and sash and blind factories. The annual fair held in the Central Park is the great meeting-place of the Georgian planters. From 5720 in 1850 the population has steadily advanced to 8247 in 1860, 10,810 in 1870, and 12,748 in 1880. The foundation of the town dates only from 1823.

MACPHERSON, James (1738-1796), the “ translator ” of the Ossianic poems, was born at Ruthven, Inverness, Scotland, in 1738, was educated in his native village and at King’s College, Aberdeen, and from 1756 taught the school of Ruthven for some time. In 1758 he published a poem entitled the /7/ighlander, and about the same period contributed several minor pieces

to the Scots Magazine. In 1759, while residing with a pupil at Moffat, he became accidentally known to Dr Carlyle of Inveresk and Mr Home, the author of Douglas, both of them already interested in the subject of ancient Highland poetry; some fragmentary “translations” from the Gaelic, which in the course of a few days he supplied to Home, were much appreciated in the literary circles of Edinburgh, and in 1760 a volume was published by Macpherson, entitled Fragments of Ancient Poetry collected in the Highlands of Scotland, and translated from the Gaelic or Ese Language, with a preface by Dr Blair. A sum of money was now subscribed by the faculty of advocates for the purpose of enabling Macpherson to go to the Scottish Highlands in search of other fragments, and the result of his labours was the publication at London in 1762 of Fingal, an Epic Poem, in six books, with other lesser Poems, dedicated to Lord Bute; this was followed in 1763 by Zemora, in eight books, with several other poems. For the real character of these publications see CeLttic LITERATURE, vol. v. p. 313-4. At the time of their appearance they greatly advanced the translator both in fame and fortune ; in 1764 he was appointed surveyor-general of the Floridas, and on his return to England two years afterwards he was permitted to retain for life the salary of the office. In 1771 he published An Introduction to the History of Great Britain and Ireland, and in 1775 A History of Great Britain from the Restoration to the Accession of the House of Hanover (2 vols. 4to) and Original Papers containing the Secret History of Great Britain for the same period (also in 2 vols. 4to) His translation of the Iliad, published in 1773, was greatly praised by Robertson and others in Scotland, but met with a severe reception in England, and has not stood the test of time. About 1779 he was appointed to the lucrative post of agent for the nabob of Arcot, and from 1780 onwards he sat in parlia- ment for the borough of Camelford. He died at Belleville, an estate which he had recently purchased in Inverness, on February 17, 1796, and was buried in the Poets’ Corner at Westminster Abbey. His will had provided for the publication of the Ossianic poems in the original Gaelic, which he is understood to have been preparing for the press at the time of his death; and the work accordingly appeared in 3 vols. 8vo, in 1807, with a literal translation into Latin, by Robert Macfarlane, and a dissertation on the authenticity of the poems, by Sir John Sinclair.

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MACREADY, Wituam Cuaries (1793-1873), was born in London 3d March 1793, and educated at Rugby. His intention was to proceed to Oxford, but the embarrassed affairs of his father, the lessee of several provincial theatres, called him to share the respousibilities of theatrical man- agement, in which he showed great prudence and address. In 1810 he made a successful debut as Romeo at Birming- ham ; and the fame which he had acquired in the provinces gave exceptional interest to his appearance in 1816 at Covent Garden, in the character of Orestes in the Distressed Mother. In London his choice of characters was at first confined chiefly to the romantic drama, but he showed his capacity for the highest tragic parts when he played Richard III. at Covent Garden in 1819, and in the follow- ing year his performance of Virginius, in the new play of Sheridan Knowles, assisted to give solidity to his reputa- tion. Transferring his services to Drury Lane, he gradu- ally rose in public favour, till, on the retirement of Kean and Young, he was regarded as the legitimate successor of these tragedians. In 1826 he completed a successful engagement in America, and in 1828 his performances met with a very flattering reception in Paris. Already he had done something to encourage the creation of a modern English drama through the interest awakened by his performances in Virginius, Gaius Gracchus, and Wiliam Tell, and after entering on the management of Covent Garden in 1837 he introduced, besides other new plays, Bulwer’s Lady of Lyons and Richelieu, the principal characters of which were among his most effective parts. Both, however, in his management of Covent Garden, which he resigned in 1839, and of Drury Lane, which he held from 1841 to 1843, he found his designs for the elevation of the stage hampered and finally frustrated by the sordid aims of the proprietors and the absence of adequate public support. In 1843-44 he made a prosperous tour in the United States, but his last visit to that country, in 1849, was marred by a riot at the Astor Opera House, New York, arising from the jealousy of the actor Forrest, and resulting in the death of twenty- two persons, who were shot by the military called out to quell the disturbance. Macready retired from the stage in 1851; and the remainder of his life was occupied chiefly in superintending the education of his family, and in schemes for the welfare of the poorer classes. He died at Cheltenham 27th April 1873.

Macready’s performances always displayed fine artistic perceptions developed to a high degree of perfection by very comprehensive cul- ture, and even his least successful personations had the interest resulting from thorough intellectual study. He belonged to the school of Kean rather than of Kenible; but, if his tastes were better disciplined and in some respects more refined than those of Kean, his natural temperament did not permit him to give pro- per effect to the most characteristic features of the great tragic parts of Shakespeare, King Lear perhaps excepted, which in some degree afforded scope for his pathos and tenderness, the qualities in which he specially excclled. With the exception of a voice of good compass and capable of very varied expression, Macready was not in a special degree gifted physically for acting, but the defects of his face and figure cannot be said to have mate- rially influenced his success. He created a considcrable number of parts, which still retain their hold on the stage, and, although not by virtue of natural genius worthy of a place among tragediaus of the first rank, he is almost entitled to this on account of the high degree of perfection to which he had cultivated his powers, and from the fact that there is no tragedian of the second rank who can be named his equal. See Afacready’s Reminiscences, edited by Sir Frederick Pollock, 2 vols., 1875.

MACROBIUS, Amsrostus Turopostus, a Roman grammarian and philosopher, who wrote towards the beginning of the 5th century after Christ. He is described in the superscription of the best MSS. as vir clarissimus et illustris; hence it has been supposed that he is the Macrobius who was prefectus pratorius Hispaniarum in 399 A.D., proconsul of Africa in 410, and chamberlain

(prepositus sacri cubicul’/) in 422. But the tenure of high office at that date was limited to Christians, and there is no evidence in the writings of Macrobius that he was a Christian. On the contrary, he shows great interest in the deities of paganism ; his friends seem to have belonged wholly to the pagan party; and his philosophical views are those of the Neo-Platonists. Hence the identification is more than doubtful. It is possible, but by no means certain, that he was the Theodosius to whom Avianus dedicates his

fables. From the date of the persons who are mentioned by him as contemporaries, he appears to have flourished in the time of Honorius.

The most important of his works is the Conviviorum Saturnaliorum Libri Septem, containing an account of the discussions held at the house of Vettius Pretextatus during the holiday of the Saturnalia. The latter part of the second book and the beginning of the third, the second half of the fourth book, and the end of the seventh have been lost ; otherwise the work is in fairly good preserva- tion. It was written by the author for the benefit of his son Eustachius, and contains a great variety of curious historical, mythological, critical, and grammatical disquisi- tions, the value of which is much increased by the frequent quotations from earlier writers. The machinery is some- what cumbrous ; for, as in some of Plato's dialogues, the discussions are not directly reported, but a certain Postumianus reproduces, for his friend Decius, the account which he had received from a rhetorician Eusebius, who had been present at them. There is but little attempt to give any dramatic character to the dialogue; in each book sonie one of the personages takes the leading part, and the remarks of the others serve only as occasions for calling forth fresh displays of erudition. The first book is devoted to an inquiry as to the origin of the Saturnalia and the festivals of Janus, which leads to a history and discussion of the Roman calendar, and to an attempt to derive all forms of worship from that of the sun. The second book begins with a collection of bons mots, to which all present make their contributions, many of them being ascribed to Cicero and Augustus ; it then appears to have passed into a discussion of various pleasures, especially of the senses ; but almost the whole of this is lost. The third, fourth, fifth, and sixth books are devoted to Virgil, dwelling respec- tively on his learning in religious matters, his rhetorical skill, his debt to Homer (with a comparison of the art of the two) and to other Greek writers, and the nature and extent of his borrowings from the earlier Latin poets. The latter part of the third book is taken up with a disserta- tion upon luxury and the sumptuary laws intended to check it, which is probably a dislocated portion of the second book, being entirely out of place where it stands. The seventh book is of a more miscellaneous character, consisting largely of the discussion of various physiological questions. The value of the work consists solely in the facts and Opinions quoted from earlier writers, for it is purely a com- pilation, and has little in its literary form to recommend it.

We have also two books of a commentary on the Somnium Scipronis narrated by Cicero in his De Republica. The nature of the dream, in which the elder Scipio appears to his (adopted) grandson, and describes the life of the good after death and the constitution of the universe from the Stoic point of view, gives occasion for Macrobius to discourse upon many points of physics in a series of essays interesting as showing the astronomical notions then current. The moral elevation of the fragment of Cicero thus preserved to us gave the work a popularity in the Middle Ages to which its own merits have little claim.

There is a good critical edition of Macrobius, with a commentary

by L. van Jan (2 vols., Leipsic, 1848-52), and a convenient and excellent edition of the text by F, Eyssenhardt (Leipsic, 1868).

Plate IV.

Size and position.

Explora- tion,

Bays.

Islands.

Moun- tains.

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MADAGASCAR, an important island in the Indian Ocean, and the third largest island in the world, is about 300 miles from the south-east coast of the African con- tinent, from which it is separated by the Mozambique Channel. It is 980 miles in length from north to south, the northern point, Cape Ambro, in 12° S. lat., inclining 16° to the east from the longitude of Cape St Mary, the southernmost point, in 25° 35’ S. lat., so that the main axis of the island runs from north-north-east to south-south- west. The broadest portion of Madagascar is near the centre, where it is nearly 350 miles across, and there it is only 230 miles distant from the African coast.

From this part of the island its northern half forms a long irregular triangle, while south of it the average breadth is about 250 miles. Its total area is nearly 230,000 square miles, or not quite four times the extent of England and Wales.

Although known to Arab merchants for more than a thousand years past, and frequently visited by Europeans since the beginning of the 16th century, Madagascar is still but imperfectly explored. A careful survey of the coast was made in 1823-25 by Captain W. F. W. Owen, R.N., but all maps of the interior up to about ten years ago were constructed on the most insufficient data. But during the last decade many portions of the island pre- viously unknown have been traversed by missionaries and naturalists, and maps, more or less detailed, have been prepared of a considerable portion of the interior. Con- spicuous in this work have been the missionaries of the London Missionary Society and the Friends' Foreign Mission, especially the late Rev. Dr Mullens, whose large map, published in 1879, embodied all that was known up to that date, and also M. Alfred Grandidier, a French traveller and scientist, whose great work on the island is now in process of publication.

Madagascar has a very regular and compact form, with but few indentations considering its great extent of shore- line. Along two-thirds of its eastern side the coast is almost a straight line, without any inlet, for Tamatave and Foule Pointe, which are the most frequented ports on this side of the island, are only open roadsteads protected by coral reefs. North of this, however, is Antongil Bay, a deep and wide inlet running northwards for about 50 miles ; farther north is Port Louquez, and at the extreme point of the island is Diego Suarez Bay, one of the finest harbours in the world. The north-western side of Madagascar is broken up by a number of spacious inlets, some of them landlocked and of considerable size. Going southward, these are the bays of Chimpaiky, Pasandava, Port Radama, Narinda, Majambo, Bémbatoka, and Ibdina, as well as the estuaries of some of the rivers. South of Cape St Andrew, the north-west angle of the island, there is nothing else in the shape of a gulf until we reach the estuary of the river Onilahy, or St Augustine's Bay. Rounding the southern end of the island, we find no other inlet until we come to the small bay of Itapéra near Fort Dauphin, at the southern extremity of the straight line of coast already mentioned.

The islands around Madagascar are few and unimportant. The largest are St Marie's, near the eastern coast, a narrow island about 30 miles long, and Nodsibé, larger and more compact in form, opposite Pasandava Bay on the north- west coast. Except the Minnow group, north of Nosibé, the rest are merely rocky islets, chiefly of coral.

Much light has been thrown upon the physical geography of Madagascar by recent explorations. In most accounts, np toa very short time ago, a "central mountain chain " is described as running throughout the island as a sort of backbone from north to south ; and most maps show this, with numerous branches extending in various directions. It is, however, now quite clear that instead

of this supposed mountain chain there is an elevated mountainous region, from 3000 to 5000 feet in altitude, occupying from a third to two-fifths of the whole interior, but lying more towards the north and east. Around this upper region are extensive plains, at a much less elevation above the sea, and most developed on the western side of the island, and in its southern portion beyond 23° §. lat. But this lower region is not entirely level, as it is broken up towards the west by three prominent lines of hills runuing north and south. See Plate IV.

The shores of the greater portion of the southern half of the island are low and flat, but in the northern half much of the coast is bold and precipitous, the high land often approaching the sea. On the eastern side the plains vary from 10 to 50 miles in breadth, but on the western side they often exceed 100 miles across. From these coast plains the ground rises by successive ranges of hills to the high interior land. This elevated region is broken up in all directions by mountains, the highest in the island being centrally situated as regards its length, but more to the eastern side. These are the summits of the basaltic mass of Ankaratra, four of the peaks ranging in elevation from 8100 to 8950 feet above the sea, and from 3900 to 4700 feet above the general level of the surrounding country. The loftiest of these is named Tsi-afa-javona, 2.¢., "that which the mists cannot climb." Besides these highest points there are a considerable number of mountains in the central provinces, varying in height from 5000 to 7000 feet, the highest as yet

measured being Iavohadika (“the Lofty defying one”), 7100 feet high, about 30 miles west- south-west of Ankaratra, and the highest point of a remarkably rocky and rugged district named Vavavato (“Stonemouth”). There are also very many lofty and grand peaks in the Bétsiléo province, some, it is said, nearly 8000 feet high; and in the Bara country the [salo mountains are compared by a recent traveller to the “Church Buttes” and other striking features of the scenery of Utah, on the line of the Pacific Railway. One of the grandest of all the Madagascar peaks is an isolated mountain near the northern point of the island, called Amber or Ambdhitra. This is said to be more than 6000 feet high, and, rising, not as do those before-mentioned, from an elevated plateau, but from plains little above the sea-level, is a remarkably majestic hill as cbserved from every direction, and is well seen far out to sea.

In the elevated region of Madagascar are many fertile Valleys plains and valleys. Among these are Bétsimitatatra in and

Imérina, and Tsiénimparihy in Bétsiléo, supplying a large proportion of the rice for the capitals of these two pro- vinces. Still more extensive valleys are the plain of the Antsihanaka country, the valley east of Angavo, and the Ankay district between the two eastern lines of forest (all of which are one step downwards towards the lower coast plains), and the valley east of the Bémaraha range in the Sakalava country. Sections across the central portions of Madagascar show that there is a somewhat saucer-like depression in the centre, the eastern and western edges rising higher than the enclosed space. The eastern ridge is the higher of the two, so that the watershed for a con- siderable distance is much nearer the eastern than the western side, averaging from 50 to 80 miles from the sea, The country is well watered, even in the highest ranges of the interior, the abundant rainfall giving a perennial supply to the innumerable springs and streams. There are, therefore, no extensive districts that can be called desert, except parts of the west and south-west provinces, where the rainfall is scanty. The extreme southern portion is also reported to be arid, but as yet little is accurately known of this part of the country.

As is necessarily the case from the physical conformation Rivers.

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of the interior, the chief rivers flow to the west and north- west sides of the island. The eastern streams are all less in size, except the Mangoro, which flows for some distance parallel with the coast. ew of them, therefore, are of much service for navigation, except for the light-draught native canoes, and almost all of them are more or less closed at their outlets by sand-bars. Commencing at the

southern point and going northward, on the eastern side,

the principal rivers are the Mananara, Manambava, Matitanana, Mananjara, Onivé and Mangoro, Maningory, and the Anjahanambo at the head of Antongil Bay, besides numerous smaller streams. On the north-west coast, going southward, are the Sofia and Mahajamba, falling into Majambo Bay, the Bétsibdka with the Ikidpa, —the great drains of the northern central provinces, and forming unitedly the second largest river of the island and falling into Bémbatoka Bay,—the Manjaray, Manambodlo, Tsiribihina or Onimainty, the largest river of Madagascar, draining by its tributaries the Kitsimby, Mahajilo, and Mania the central parts of the island, the Morondava, Maharivo, Mangoky, the third largest river, the Mahandmby, Fiherénana, and Onilahy.

Of these western rivers the Bétsiboka could be ascended by steamers of light draught for about 90 miles, and the Tsiribihina is also navigable for a considerable distance. The former is about 300 miles long ; the latter is somewhat less, but by its affluents spreads over a greater extent of country. It brings down so large a body of water that the sea is said to be fresh 3 miles from the land. But owing to the height of the interior of Madagascar there is no uninterrupted water-communication with it from the sea by any of the rivers, which are all crossed by rocky bars, and in some cases by grand waterfalls, as on the Mania. The eastern rivers cut their way through the ramparts of the high land by magnificent gorges, amidst dense forest, The

are found farther north, in the Antsihanaka province and the Mandritsira valley, and on the north-west coast and its islands, the great mountain Ambodhitra being an old volcano. Others have been observed towards the

southern extremity of the higher region of the island, as well as columnar basalt, and beds of lava rock, pumice, and ash. Slight shocks of earthquake are felt every year in Madagascar, and other signs of subterranean action are evident in the hot springs which occur at several places in the central and eastern provinces. Several of these are

sulphurous and medicinal, and have been found efficacious in skin diseases.

The geology of Madagascar has as yet been very imper- Geology.

fectly investigated, for few travellers have possessed the special scientific knowledge requisite to give much value to their observations ; and hardly anything has yet been done towards making collections of fossils, or in procuring specimens of rocks and minerals. There are, however, a few facts of a general character which are easily recogniz- able. In the first place, the upper region of the island already mentioned appears to consist chiefly of Primary and unstratified rocks—granite, gneiss, and basalt—which form the highest points of the hills, and present most varied and picturesque outlines, resembling titanic castles, cathedrals, domes, pyramids, and spires. The general face of the country consists of bare rolling moors, with a great amount of bright red and light brown clays, while the valleys have a rich vegetable soil of bluish-black alluvium. No stratified or fossiliferous rocks have yet been discovered in this upper part of the island, which appears to be very ancient land, and during portions of the Secondary and Tertiary periods probably formed the entire island, then about from a third to two-fifths of its present size, while the extensive southern and western plains were again and again submerged.

and descend by a succession of rapids and cataracts.

The lower portions of Madagascar do not, as far as is Fossils Matitanana, whose falls were first seen by the present writer

yet known, much exceed from 300 to 600 feet in height and

in 1876, descends at one plunge some 400 or 500 feet. above the sea-level (except, of course, the three chains of Minerals. Lagoons On the eastern side of Madagascar the contest between | hills in the south-west). They

appear in several localities pS the fresh water of the rivers and the sea has caused the | to consist of strata of the Secondary period, with fossils of axes. formation of a long chain of lagoons for nearly three hundred | the Neocomian age belonging to the genera Nerinea, miles. In many parts these look like a river following | Zwrritella, Ammonites, Terebratula, Rhynconella, Neritina, the coast-line, but frequently they spread out into extensive | and Echinoderms, and also Foraminifera of the genera sheets of water. So short is the distance between these | Alveolina, Orbitoides, Triloculina, &c. There are also beds that, by cutting about 30 miles of canal to connect them, | of a much later age, containing fossils of recently extinct a continuous water-way could be formed for 260 milesalong | gigantic tortoises, hippopotami, and struthious birds. In the coast. This will doubtless be accomplished at some | addition to the rocks already mentioned as found in the future time, with great benefit to the commerce of the | higher portions of the island, there are also slate, mica schist, country. Besides these lagoons, there are few lakes of | greywacke, chert, pink and white quartz, and an unstratified any size in Madagascar, although there were probably | limestone deposited by hot springs. Iron exists in great some very extensive ones in a recent geological epoch. | abundance in the central parts of the country, and copper Of one of the largest of these the Aldotra Lake in the | and silver are said to have been found in small quantities, Antsihanaka plain is the relic; it is about 25 miles long. | but are not worked. Antimony seems to be plentiful in Next comes Itasy, in western Imérina, about 8 miles long; | the north, and rock-salt, iron pyrites, plumbago, and various and a large lake is reported by the natives to be formed by | ochres and coloured earths are among the mineral products. an expansion of the river Mangoky. Two salt lakes are | On the north-west coast thin beds of lignite, suitable for said to exist near the south-west coast. steam coal, occur, but no true coal has yet been discovered. a Among the many new facts brought to light by recent The climate varies very much in different parts of the Climate.

research in Madagascar is the evidence of very widespread and powerful subterranean action throughout a great part of the island, apparently extending almost unbroken from the south-east to the north-west and extreme north. This Volcanic belt is part of a line which has its northern extremity in the Comoro Islands, all of which are volcanic in origin, and

where, in Great Comoro, there is a still active vent. There is now no active volcano in Madagascar, but a large number of extinct cones have been observed in various parts of the country. In the central province of Imérina, within an arc of about 90 miles round the mass of Ankaratra, Dr Mullens counted a hundred craters. Others

country. In the high interior districts it resembles that of the temperate zones, with no intense heat, and is quite cold during the nights in winter. These parts of the island are therefore tolerably healthy for Europeans. But the coasts are much hotter, especially on the western side ; and, from the large amount of marsh and Jagoon, malarial fever is prevalent, and frequently fatal both to Europeans and to natives from the interior. The seasons are two— the hot and rainy season from November to April, and the cool and dry season during the rest of the year. Rain indeed falls almost all the year round on the eastern coast, which is exposed to the vapour-laden south-east trade XV. -— 22

Fiora.

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winds, but it is much less frequent on the western sidc, being intercepted by the high interior land. No snow is known even on the loftiest mountains, but thin ice is very occasionally found; and hail showers, often very destructive, are frequent in the rainy season. ‘Terrific thunder storms are also common at that period; waterspouts are sometimes seen, and hurricanes occur every few years, at very rare intervals ascending into the interior high land. Very few extended or complete observations have been made in different parts of the island as to temperature. On the eastern coast the heat is probably not very different from that of Bourbon and Mauritius, where the average annual mean is 77° and 78° in the shade, and the average daily range from 70° at sunrise to 86° in the afternoon. The temperature of the capital resembles that of Naples or Palermo.

The flora of Madagascar is one of great fulness and interest, and recent collections have thrown much light upon its relationships. One of the most prominent features is the existence of an almost unbroken belt of dense forest all round the island, at no great distance from the sea, and generally

following the coast-line. It appears to be continuous everywhere except on the north-west coast, where, however, the two lines overlap for about 100 miles, leaving an opening of 70 miles wide between them. This forest belt has an average breadth of from 15 to 20 miles, but reaches 40 miles in the north-east, and contains a large variety of hard-wooded and valuable timber trees, as well as numerous species of palm, bamboo, tree- fern, euphorbia, pandanus, baobab, tamarind, &c. Ferns are numerous, about two hundred and fifty species having been already collected, and there are many interesting orchids. The vegetation of the forests, the abundant epiphytes, the tree-mosses, the filmy ferns, and the viviparous character of many of the ferns, show clearly how abundant the rainfall is in the forest region. Several trees and plants are characteristic of Madagascar vegetation ; some of them are endemic, and others are very prominent features in the landscape. Among these are the traveller's- tree (Urania speciosa), with its graceful crown of plantain- like leaves growing in a fan shape at the top of a lofty trunk, and supplying a quantity of pure cool water, and every portion of it being of some service in building ; the rofia palm (Sagus Rufia), from whose pinnate leaves a valuable fibre used for cloth is obtained ; the curious and beautiful lace-leaf or lattice-leaf (Owwirandra fenestralis), a water plant whose root is edible; the Madagascar spice (Ravintsara madagascariensis), a large forest tree with fragrant fruit and leaves; and the tangéna (Zanghinia veneniflua), formerly so destructive to life from its employ- ment as a poison ordeal. Although flowers growing on the ground are not remarkable for number or beauty, there are many magnificent flowering trees ; conspicuous among these are the Poinciana regia, presenting, when in bloom, a mass of scarlet flowers; Colvillia racemosa, with yellow flowers ; Cryptostegia madagascariensis, a purple-flowered creeper, and several species of Hibiscus, Mascarenhasia, Kitchingia, Tachiadenus, &c. There are large numbers of spiny and prickly plants, and numerous grasses, reeds, and rushes, many of them of great service in the native manufac- tures. Mr J. G. Baker of Kew says :—" We now know no less than two thousand flowering plants, and among the tropical types there are a considerable number of endemic genera. One natural order, Chlenacez, is strictly confined to Madagascar, and there are not less than fifty peculiar genera of plants, some of them very curious types. Besides these the tropical flora contains a large proportion—(1) of endemic species of generanot known elsewhere; (2)of

species common to Madagascar, Mavvitius, and Bourbon, but not known elsewhere ; (3) of species that spread across tropical

Africa ; (4) of species spread universally through the tropics of the Old World; and (5) of species spread through the tropics of both hemispheres. A small proportion of the Madagascar species are Asian but not African ; and the flora of the mountains corresponds closely with that of the great ranges of the tropical zone of Africa." "In the island altogether, the number of genera now known is about seven hundred ; of these about eighty are supposed to be endemic, as far as present knowledge extends." '" The general plan of the flora follows thoroughly the same lines as that of the tropical regions of the Old World," and thus leads to somewhat different conclusions to what are suggested (as will be presently seen) by a study of the fauna. It 1s, however, probable that the flora is as yet not half known, so that fuller research may modify some of the inferences drawn from the collections now available.

Among the food-giving plants are rice—the staff of life Food- to the Malagasy—in several varieties, maize, millet, siving manioc, yams, sweet potatoes, and numerous vegetables pa of European introduction, The fruits, indigenous and introduccd, are the banana, peach, loquat, mango, melon, pine-apple, mulberry, orange, citron, lemon, guava, Chinese guava, fig, raspberry, tonato, and several others. Several spices are grown; ginger, sugar-cane, coffee, indigo, to- bacco, cotton, hemp, gourds, dye-woods, and gums are also among the vegetable productions ; and gum-copal and india-rubber have been exported in considerable quantities. Besides the dense forest belt already mentioned, a great extent of the coast plains is also well wooded, as well as the river valleys in the upper parts of the island; and, as many portions of the country, especially of the forests, have not yet been traversed by Europeans, its vegetable wealth is probably still far from being fully known.

The fauna of Madagascar, while deficient in most of the Fauna

characteristic tropical forms of life, is one of great interest to the naturalist. As a continental island, probably separated at a very remote period from the

mainland, it possesses no large quadrupeds—none of the larger carnivorous, ungulate, proboscoid, or quadrumanous animals; but it is the headquarters of the Lemuridx, no less than thirty-six of which animals are found in its forests and wooded plains. Some of these creatures are highly specialized, while the curious aye-aye (Chiromys madagasca- riensis), an allied form, is one of the most remarkable animals known, forming a genus and family by itself. Its whole structure is strangely modified to enable it to procure the wood-boring larvee which form its food. Other peculiar animals are several species of the Centetidx, a family of the Znsectivora which is almost confined to Madagascar; while of the Carnivora there are several small creatures belonging to the civets (Viverridx). The largest of the ferocious animals, also forming a genus and family by itself, is the Cryptoprocta ferox; it is a plantigrade animal, 3 feet long, but very like an enormous weasel, and attacks the largest animals with great ferocity. African humped cattle were introduced several hundred years ago into Madagascar, and now exist in large herds all over the island. The fat-tailed sheep, goats, and swine have also been naturalized, as well as all kinds of domestic poultry, which are reared in great abundance for export as well as for home consumption.

The avi-fauna is much richer than the mammalian, and, although wanting the largest birds, as well as the most brilliantly coloured, comprises more than two hundred and twenty species, nearly half of which are peculiar to the island. Many of the birds are remarkable, not so much for their shape or colouring as for their distant relationships; many belong to peculiar genera, and some are so isolated that it is very difficult to classify them, and they yet remain a puzzle to ornithologists. There is a large variety of perching birds,

Inhabi- tants,

MADAGASCAR

including several species of brilliant plumage—sun-birds, kingfishers, &c.; kites, hawks, and owls are numerous; and the lakes and streams abound with water-fowl. Although there is now no living member of the Struthide, until four or five centuries ago Madagascar was the home of a very large bird of this family, the extinct Zpyornis, whose eggs, found in a sub-fossil state, are the largest known (124 inches by 94 inches), The island is almost, if not quite, free from deadly serpents, but contains two or three small species of boa; crocodiles abound in the rivers and lakes, and numerous species of lizard, chameleon, and tree-frog inhabit the woods. There are several peculiar tortoises, but the gigantic species are extinct on the mainland, and are now only found alive on the little island of Aldebra to the north. The insect life com- prises many brilliantly coloured beetles, butterflies, moths, spiders, locusts, and flies, and also noxious spiders, and scorpions and centipedes. As a whole, the Madagascar fauna is marked by a strong individuality, which would appear to be the result of long isolation from the other zoological ‘‘ regions.”

Numerous interesting questions suggested by the peculiar fauna are closely connected with the physical geography of the island, and that of the numerous groups of small islands to the north and north-east. The Asiatic and Malayan affinities of many of its animals, as well as the physical conditions of the bed of the western part of the Indian Ocean, make it highly probable that Madagascar is the chief relic of a considerable archipelago formerly occupying that area, and now only shown by groups of small islands, and by coral atolls and shoals, which are gradually disappearing beneath the waves. These questions have been most fully treated by Mr A. R. Wallace in his Geographical Distribution of Animals (vol. i. chap. ix.) and Island Life (chap. xix.).

The people of Madagascar, who are collectively known by the name of Malagasy, are divided into a considerable number of tribes, each having its own distinct name and customs. Although by its geographical position the country isan African island, a large portion, if not the majority, of its

inhabitants appear not to be derived from Africa, but. to belong to the Malayo-Polynesian stock. This is inferred from their similarity to the peoples of the Indian and Pacific archipelagoes in their physical appearance, mental habits, customs, and, above all, in their language. ‘Their traditions also point in the same direction. There is, however, an undoubted African mixture in the western and some other tribes.; and there is also an Arab element both on the north-west and south-east coasts. It is believed that there are traces of an aboriginal people who occupied portions of the interior before the advent of the present inhabitants, and these appear to have been a somewhat dwarfish race, and lighter-coloured than the Malagasy generally. Looked at as regards their present geographical position, the people of Madagascar may be classed in three divisions: the eastern, including the Bétsimisaraka, Bezinozino, Tanadla, Taishka, and Taimoro ; the central, including the Sihanaka, Hova, Bétsiléo, and Bara ; and the western, comprehending a number of peoples commonly known under the name of Sakalava, because this tribe conquered all the others, but each of which retains also its own proper name. Of all these the Hova, who occupy the central province of Imérina, are now the dominant tribe; they appear to be the latest immigrants, and are the lightest in colour ; and they are also the most advanced, intelligent, and civilized of all the peoples inhabiting the island.

As regards both language and customs, there appears to be a wider difference between the Hova and all the surrounding tribes than exists between any of these

latter, although living on opposite sides of the island, far separate from one another. The most striking proof of the virtual unity of the inhabitants of Madagascar is that there is substantially but one language spoken over the whole country. There are considerable dialectic differences both in vocabulary and in pronunciation, but there is no evidence that any other distinctly different language was ever spoken in any part of the island. The Malay affinities of Malagasy were noted more than two hundred and seventy years ago ; indeed, the second and fifth’ books published upon the country (in 1603 and 1613) were comparative vocabularies of these two

languages. Fuller and later investigations have quite confirmed the conclusions thus early arrived at ; and very recently Van der Tuuk, Marre de Marin, and W. E. Cousins have shown conclusively the close relationships which exist between the language of the Malagasy and those of the Malayan and Polynesian regions. The Malagasy had never invented for themselves a written character, and had consequently no manuscripts, inscrip- tions, or books, until their language was reduced to writing by English missionaries about sixty years ago.! Their speech nevertheless is very full in many of its verbal and other forms, while it also exhibits some curious deficiencies. It is very soft and musical in sound, full of vowels and liquids, and free from all harsh gutturals. Native oratory abounds in figures, metaphors, and parables; and within the last five or six years a large number of folk-tales, songs, and legends have been brought to light which, together with the very numerous proverbs, give ample evidence of the mental ability and imaginative powers of the Malagasy. :

While the people are not civilized in a European sense, Civiliza- they are not a savage race, and some of the tribes can tion.

hardly be classed among barbarous peoples. They have never, for instance, fallen into the cannibal practices of many allied races in Polynesia ; and the tribal instincts are strong among all sections of the population. They are law-obeying and loyal, living in settled communities, in villages which are often fortified with considerable skill, with a government of chiefs and elders, a development of a primitive patriarchal system.

Native society in Imérina among the Hova is divided Ranks of into three great classes : the Andriana, or nobles; the Hova, *°ciety-

freemen or cominoners ; and the Andévo, or slaves. The Andriana, however, although generally termed “nobles,” are, strictly speaking, royal clans, being descendants of the families of several of the petty kings or chiefs who once ruled small divisions of the central province, and who were conquered, or otherwise lost their authority, through the increasing power of the ancestors of the present reigning family. Their descendants have retained certain honours in virtue of their royal origin, such as special terms of salutation, the use of the smaller scarlet umbrella (the larger one is the mark of royal rank), the right to build a particular kind of tomb, &c.; they

also enjoy exemption from certain Government service, and from some punish- ments for crime. There are six ranks of Andriana be- sides the royal clan, and many members of the higher ranks hold their lands on a kind of feudal tenure from the sovereign. They form a large proportion of the people, whole villages being often occupied almost entirely by them and their slaves, and they monopolize some handicrafts. Many are very poor, and there are no out- ward distinctions in dress, &c., between them and the people generally.

1 There is, however, an account in one of the very earliest English books upon Madagascar (Hamond, 1648) of a kind of picture-writing which is said to have been in use among the native "' priests" near St Augustine's Bay (south-west coast).

The Hova! or commoners form the mass of the free | together with several other roots and many vegetables;

population of Imérina. They are composed of a large number of tribes, who usually intermarry strictly among themselves, as indeed do families, so that property and land may be kept together. Hitherto they have also been divided into two great sections—the bdrozdno or civilians, and the mzaramila or military class; but this distinction does not follow tribal lines, members of the same family belonging to both classes; and the Andriana are also almost all members either of the civilian or the military orders.

The third great division of native society comprises the slave population. Until the year 1877 it was also again subdivided into three classes :—(a) the Zaza-hova, that is, "offspring of the Hova," or free people who have been reduced to slavery for debt or for political or criminal offences; (b) the Andévo, or slaves proper, mostly the descendants of people of other Malagasy tribes who have been conquered by the Hoéva, and thus have become their slaves; and © the Mozambiques or African slaves, whose ancestors or they themselves have been brought across from the African

coast by the Arab slaving dhows. These last, however, were in 1877 formally set free, and will be henceforth mostly reckoned among the Hova.

Royalty and chieftainship in Madagascar has many peculiar customs connected with it. It still retains a semi- sacred character, the chief being in heathen tribes, while living, the high priest for his people, and after death worshipped as a god; and in its modern development among the Hova sovereigns it has gathered round it much state and ceremony. There are many curious examples of the tabu with regard to actions connected with royalty, and also in the words used which relate to Malagasy sovereigns and their surroundings. These are particularly seen in every thing having to do with the burial of a deceased king or queen.?

While the foregoing description of native society applies

but little animal food (save fish and freshwater Crustacea) is taken by the mass of the people except at festival times. Rice is used less by the western tribes than by those of the central and eastern provinces, and the former people are more nomadic in their habits than are the others. Large herds of fine humped cattle are kept almost all over the island.

The central and eastern peoples have a considerable Handi- amount of manual dexterity. The women spin and weave, crafts.

and with the rudest appliances manufacture a variety of strong and durable cloths of silk, cotton, and hemp, and of rdfia palm, aloe, and banana fibre, of elegant patterns, and often with much taste in colour. ‘They also make from straw aud papyrus peel strong and beautiful mats and baskets in great variety, some of much fineness and delicacy, and also hats resembling those of Panama. The people of the south and south-east make large use of soft rush matting for covering, and they also prepare a rough cloth of bark. Their non-employment of skins for cloth- ing is a marked distinction between the Malagasy and the South African races, and their use of vegetable fibres an equally strong link between them and the Polynesian peoples. The ordinary native dress is a loin-cloth or salaka for the men, and a kitamby or apron folded round the body from waist to heel for the women; both sexes use over this the /amba, a large square of cloth folded round the body something like the Roman toga. The Malagasy are skilful in metal working; with a few

rude- looking tools they manufacture silver chains of great fineness, and filagree ornaments both of gold and silver. Their iron-work is of excellent quality, and in copper and brass they can produce copies of anything made by Europeans. They display considerable inventive power, and they are exceedingly quick to adopt new ideas from Europeans.

There is a considerable variety in the houses of the Houses different Malagasy tribes. The majority of Hoéva houses and

chiefly to the people of the central province of Imérina, it are built of layers of the hard red clay of the country, with “/*ses

is more or less applicable, with local modifications, to most

Agricul- ture.

of the Malagasy tribes, amongst almost all of whom similar distinctions of rank are found. In modern times a kind of non-hereditary nobility has arisen, derived from military “honours”; and the tendency of recent changes in the native government is to depress the old fendal authority and influence, and to make it subservient to the army and its officers. .

The chief employment of the Malagasy is agriculture, a large portion of their time being spent in the cultivation of rice, their staple food. In this they show very great ingenuity, the kétsa grounds, where the rice is sown before transplanting, being formed either on the margins of the streams or in the hollows of the hills in a series of terraces, to which water is often conducted from a considerable distance. In this agricultural engineering no people surpass the Bétsiléo tribes. No plough is used, but all work is done by a long-handled spade; and oxen are only employed to tread out the soft mud preparatory to transplanting. The other processes are very primitive:

the rice is threshed by being beaten in bundles on stones’

set upright on the threshing-floor; and when beaten out the grain is stored by the Hova in rice-pits dug in the hard red clay, but by the coast tribes in small timber houses raised on posts to protect them from vermin. In prepar- ing the rice for use it is pounded in a wooden mortar to remove the husk,

this work being always done by the women. The manioe root is also largely consumed, — ee gs

; This is, of course, a special and restricted use of the word, Hova in its widest sense being a tribal name, and including all ranks of people in Imérina—royalty, nobles, commoners, and slaves alike.

- See Sibree, The Great African Island, pp. 185-90, 226, 227, &c.

high-pitched roofs thatched with grass orrush. The chiefs and wealthy people have houses of framed timber, with massive upright planking, and lofty roofs covered with shingles or tiles. The forest and coast tribes make their dwellings chiefly of wood framing, filfed in with the leaf- stalks of the traveller's-tree, with the leaves themselves forming the roof covering. The houses of the Bétsiléo and Sakalava are very small and dirty, but those of the coast peoples are more cleanly and roomy. A.mong the Hova and Bétsiléo the old villages were always built for security on the summits of lofty hills, around which were dug several deep fosses, one within the other. In other districts the villages and homesteads are enclosed within formidable defences of prickly pear or thorny mimosas.

The country is very deficient in means of communica- Com- There are no roads or wheeled vehicles, so that all merce.

tion. goods are carried either by canoes, where practicable, or on the shoulders of bearers along the rough paths which traverse the country, and which have only been formed by the feet of the travellers. Intercourse between distant portions of the island is therefore very limited, but a large © quantity of European goods is brought up to the capital city and its neighbourhood, and a good deal of native pro- duce is taken down to the coast. Commerce is gradually increasing, as shown by the consular returns, the chief articles of export being bullocks, rice, hides, rofia palm cloths (rabénnas) and fibre, and also gum-copal and india- rubber, although the yield of these products has latterly much diminished. Coffee is being planted to some extent by creole traders, and is likely to become a staple article of export, and from the natural fertility of the soil almost

Morals.

unlimited quantities of most tropical produce could be obtained—sugar, coffee, rive, cotton, tobacco, indigo, spices, &c. The chief imports are European and American calicoes and prints, hardware, and spirits.! On the west coast a sea-going canoe with outrigger is employed, but in the south-east an ingeniously constructed boat, with all the timbers tied together, is used for going through the heavy surf. A considerable number of European traders are scattered along the coasts, especially at Tamatave and other eastern seaports, and there is a large Arab and Indian conimunity in the north-western. ports. There is no native coinage, but the French five-franc piece or dollar is the standard, and all sums under that amount are obtained by cutting up these coins into all shapes and sizes, which are weighed with small weights and scales into halves, quarters, eighths, twelfths, and twenty-fourths of a dollar, and are even reckoned down to the seven-hundred-and-twentieth fraction of the same amount.

Apart from the modern influence of religious teaching, the people are very immoral and untruthful, disregardful of human life and suffering, and cruel in war. Until lately polygamy has been common among all the Malagasy tribes, and divorce effected in an absurdly easy fashion. At the same time the position of woman is much higher in Madagascar than in most heathen countries; and, since for more than fifty years past there have been (with a few months' exception) only female sovereigns, this has helped to give women considerable influence in native society. Among some of the tribes, as, for instance, the Bara, there is often a shameless indecency of speech and gesture. The southern and western peoples still practice infanticide as regards children born on several unlucky days in each month. This was formerly the general practice all over the island. The old laws among the Hova were very barbarous in their punishments, and death in various cruel forms was inflicted for very trifling offences. Drunkenness is very prevalent in many parts of the island (except in Imérina, where it is much restrained by the laws) ; and it can hardly be said of many of the Malagasy that they are very industrious. But, on the other hand, they are courageous and loyal to their chiefs and tribe, and for short periods are capable of much strenuous exertion. They are affectionate and firm in their friendships, kind to their children and their aged and infirm relatives, very

- respectful to old age, most courteous and polite, and very

1 The following tables will give some idea of the imports and ex- ports in English vessels from Tamatave, the chief eastern port of Madagascar, to Mauritius during the last few years, since the country has been reopened to European trade :—

hospitable to strangers. Although slavery has existed among them from time immemorial, it bears quite a patriarchal and family character, and is seldom exercised in a cruel or oppressive way. In 1877 all the African slaves who had been brought into the island were formally set free; the other slaves are still retained in servitude, but probably with the advance of Christianity slavery will eventually pass away.

In their religious notions and practices the Malagasy Religion.

seem to occupy a middle position among heathen peoples. On the one hand, they have never had any organized religious system or forms of worship ; there are no temples, images, or stated seasons of devotion, nor is there a priest- hood, properly so called. On the other hand, they have never been without some distinct recognition of a Supreme Being, whom they call Andriamamtra, “The Fragrant One,” and Zanahary, “The Creator,”’—words which are recognized all over the island. They have also retained in their public and oratorical forms of speech many ancient sayings, proverbial in their style, which enforce many of the truths of natural religion as to the attributes of God. With all this, however, there has long existed a kind of idolatry, which in its origin is simply fetichism, the belief in charms—worthless objects of almost any kind—as having power to procure various benefits and protect from certain evils. Among the Hdvain modern times some four or five of these charms had acquired special sanctity and renown, and were each honoured as a kind of national deity, being called god, and brought out on all public occasions to sanctify the proceedings. Together with this idolatry there is also a firm belief in the power of witch- craft and sorcery, in divination, in lucky and unlucky days and times, in ancestor worship, especially that of the sovereign’s predecessors, and in several curious ordeals for the detection of crime. The chief of these was the cele-

brated tangéna poison ordeal, in which there was implicit belief as a test of guilt or innocence, and by which, until its prohibition by an article in the Anglo-Malagasy treaty of 1865, thousands of persons, mostly innocent, perished every year. Sacrifices of fowls and sheep are made at many places at sacred stones and altars, both in thanks- giving at times of harvest, &c., and as propitiatory offerings. Blood and fat are used to anoint many of these stones, as well as the tombs of ancestors, and especially those of the Vazimba, the supposed aboriginal inhabitants of the central provinces. In some of the southern districts it is said that human sacrifices were occasionally offered. The chief festival among the Hova, and almost confined to them, is that of the New Year, at which time a kind of sacrificial killing of oxen takes place, and a ceremonial bathing, from

L862… seereseee cece teeeee £101 07 £57 714 which the festival takes its name of Fandroana (the Bath). AMM ovecss oisigsne vance snrcna’s 66,873 40,082 Another and more general feast is at circumcision times. 1870 Reese ee ee asters sseneces ceecee 57,922 68,047 This rite is observed by royal command at intervals of a 185.00 cw auuuull M898 ——Tiatso —_| few years; these are oecasions of great rejoicing, but also EPI oe oisecckicescsicvecsseos 54,882 59,680 of much drunkenness and licentiousness. Funerals are

The great diminution in the eastern trade during the last four or five years was due to a fearful epidemic of small-pox, which desolated the coast provinces and is said to have carried off 40 per cent. of the population. Of these figures, in the exports, cattle form the largest item, amounting from three-fourths in early years to one-third more recently of the total value; and next to this comes india-rubber, which, in 1872, was exported to the value of £65,000. These figures, however, by no means represent the whole tradc of the country, as they do not include French, American, and German commerce, nor

also times of much feasting, and at the death of people of rank and wealth numbers of bullocks are killed. Although,

_as already observed, there was no proper priesthood, the

idol keepers, the diviners, the day-declarers, and some others formed a class of people closely connected with heathen customs and interested in their continued observ- ance.

History,—From the earliest accounts given of the people of Mada- Early gascar by European travellers, as well as from what may be inferred political from their present condition over a large portion of the island, they divi- seem for many centuries to have been divided into a number of tribes, sions.

do they show what is the trade on the western side of the island. Mr Samuel Procter, the consul for Madagascar in England, says that the west coast has developed very much during the last five or six years,

and his opinion is ‘‘that the entire foreign trade with Madagascar, import and export, does not fall far short, if at all, of a million pounds sterling.” When it is remembered that it is less than thirty years since almost all foreign commerce was excluded, it will be seen that Madagascar trade has developed somewhat rapidly since the re- opening of the country.

cach occupying its own territory, and often divided from the others by a wide extent of uninhabited country. Each of these was under its own chief, and was often at war with its neighbours. No one tribe seems to have gained any great ascendency over’the rest until about two hundred and thirty years ago, when a small but warlike people

Arab in-

called Sakalava, in the south-west of Madagascar, advanced north- ward, conquered all the inhabitants of the western half of the island, as well as some northern and central tribes, and eventually founded two kingdoms which retained their supremacy until the close of last century. About that time, however, the Hova in the central province of Imérina began to assert their own position under two warlike and energetic chieftains, Andrianimpdina and his son Radama ; they threw off the Sakalava authority, and after several wars obtained a nominal allegiance from them ;

they also conquered the surrounding tribes, and so made themselves virtual kings of Madagascar. Since that time the Hova authority has been retained over the central and eastern provinces, but is only nominal over much of the western side of the island, while in the south-west the people are quite independent, and arc still under their own petty kings or chiefs.

While European intercourse with Madagascar is comparatively

tercourse recent, the connexion of the Arabs with the island dates from a

and in- fluence.

Euro- pean in-

tercourse size and position.

and at- tempted eoloniza- tion.

Radama I,

very remote epoch ; and in very early times settlements were formed both on the north-west and south-east coasts. In the latter locality there are still traces of their influence in the knowledge of Arabic possessed by a few of the people; and it is asserted that the ruling clans of the Tanala and other tribes in that district are all of Arab descent. But in these provinces they have almost lost all separate existence, and have become merged in the general mass of the people. It is different, however, in the north-west of the island. Here are several large Arab colonies, occupying the ports of Amérontsanga, Mdjanga, Mirovoay, and Morondava, and retaining their distinct nationality, together with their own dress, habits, houses, worship, and language. There is also in these districts a Hindu element in the population, for intercourse has also been maintained for some centuries between India and northern Madagascar, and in some towns the Banyan Indian element is as prominent as the Arab one, and Hindu dress, ornament, music, food, and speech are inarked features in the social life of these places. In the early times of their intercourse with Madagascar, the Arabs had a very powerful and marked influence upon the Malagasy. Thisis seen in the num- ber of words derived from the Arabic which are found in the

native language. Among these are the names of the months and the days of the week, those used in astrology and divination, some forms of salutation, words for dress and bedding, money, musical instru- ments, books and writing, together with a number of miscellaneous terms. These form enduring memorials of the influence the Arabs have exerted upon Malagasy civilization, and also on their superstition.

The island is mentioned by several of the early Arabic writers and geographers, but mediseval maps show curious ignorance of its Marco Polo has a chapter upon it, and terms it Madeigascar, but his accounts are evidently confused with those of the mainland of Africa. The first European voyager who saw Madagascar appears to have been a Portuguese captain named Fernando Soares, in command of a squadron of eight ships from the fleet of Don Francisco de Almeida. On his way home from India he sighted the island on the 1st of February 1506. The Portuguese gave names to most of the capes, but made no persistent attempts at colonization. After them the Dutch endeavoured, but with little success, to form colonies ; and in the time of Charles I. proposals were made to form an English ‘‘ plantation,” but these were never carried into effect, although for a short time there was a settlement formed on the south-west coast. In the latter part of the 17th and during most of the 18th century the French attempted to establish military positions at various places on the east coast, but with little permanent result. For some time they held the extreme south-east point of the island at Fort Dauphin ; but several of their command- ants were so incapable and tyrannical that they were frequently involved in war with the people, and more than once their stations were destroyed and the French were massacred. Early in the present century all their positions on the mainland were relinquished, and they now retain nothing but the islands of St Marie on the east coast and Nosibé on the north-west. No foreign power now holds any portion of Madagascar, for the native Government has jealously reserved all territorial rights to itself, and will suffer no purchase of land by foreigners, allowing it only to be held on short leases.

The political history of Madagascar as a whole may be said to date from the reign of Radama I. (1810-28). The ancestors of that king had been merely chiefs of the central provinces, but he was the first to claim by right of conquest to be supreme ruler of the whole island, although actually

exercising authority over less than two-thirds of its surface. Radiama was a man much in advance of his age,—shrewd, enterprising, and undeterred by difficulty,—a kind of Peter the Great of his time. He saw that it was necessary for his people to be educated and civilized if the country was to pro- gress ; and making a treaty with the governor of Manritius to abolish the export of slaves, he received every year in compensation a subsidy of arms, ammunition, and uniforms, as well as English training for his troops. He was thus enabled to establish his authority over a large portion of the island,- and, although this was often cffected with much eruclty, the ultimate results were bene-

ficial to the country as a whole, A number of native youths were sent to Mauritius, and others to England, for education and instruc- tion in some of the arts of civilization, as well as in seamanship. For some years a British agent, Mr Hastie, resided at Radama's court, and exercised a powerful influence over the king, doing very

much for the material advance of the country. At the same period Intro- (1820) Christian teaching was commenced in the capital by the duction London Missionary Society, and by the efforts of its missionaries of Chris- the language was for the first time reduced to a systematic written tianity.

form, and the art of printing introduced ; books were prepared, the Scriptures were translated, numerous schools were formed, and several Christian congregations were gathered together. The know- ledge of many of the useful arts was also imparted, and many valuable natural productions were discovered, and their pre- paration and manufacture taught to the people. At the same time the power of superstition was greatly broken, a result partly due to the keen good sense of the king, but chiefly to the spread of know- ledge and religious teaching.

The bright prospects thus opening up for the country were Ranaya- clouded by the death of Radama at the early age of thirty-six, and lona I.

the seizure of the royal authority by one of his wives, the Princess Ranavalona. Superstitions and despotic in temper, the new sovereign looked

with much suspicion upon the ideas then gaining power among many of her people, and after a few years of tem- porizing she at length determined to strike a decisive blow at the new teaching. In 1835 the profession of the Christian religion was declared illegal ; all worship was to cease, and all religious books were ordered to be given up. By the middle of the following year all the English missionaries were obliged to leave the island, and for twenty-five years the most strenuous efforts were made by the queen and her Government to suppress all opposition to her com- mands. This, however, only served to show in a very remarkable manner the courage and faith of the Christian Malagasy, of whom about two hundred suffered death in various cruel forms, while many hundreds were punished more or less severely by fine, degrada- tion, imprisonment, and slavery. During the queen's reign the political condition of the country was deplorable ; there were fre- quent rebellions owing to the oppressive nature of the government ; many of the distant provinces were desolated by barbarous wars ; and for some years all Europeans were excluded, and foreign com- merce almost ceased. This last circumstance was partly owing to an ill-managed attack upon Tamatave in 1846 by a combined English and French force, made to redress the wrongs inflicted upon the foreign traders of that port. But for the leaven of Christianity and education which had been introduced into the country it would have quite reverted to a state of barbarism.

This rcign of terror was brought to a close in 1861 by the death Radima The island IT.

of the queen and the accession of her son Radama II. was reopened to European trade, and missionary efforts were recom- menced.

During the five years' reign of Queen Rasohérina, quiet and steady Rasohé- advances were made in civilization and education, and treaties were rina.

concluded with the English, French, and American Governments.

At the death of Rasohérina in 1868, she was succeeded by her Ranava- One of the Jona II.

cousin, the present (1882) sovereign, Ranavalona II. first acts of the new queen was the public recognition of Christianity ; and very soon afterwards

she and her husband, the prime minister, were baptized, and the erection of achapel royal was commenced in the palace yard. These acts were followed in the succeeding year by the burning of the royal idols, and immediately afterwards by tho destruction of the idols throughout the central provinces, the people generally putting themsclves under Christian instruction. Since that time education and enlightenment have made great progress, chiefly through the labours of the London Missionary Society's missionaries, with whom are also associated several agents of the Friends' Foreign Mission Association. About 1200 congrega- tions have been formed, and about 900 schools, in which nearly 50,000 children receive instruction; and there are also normal schools and colleges where teachers, pastors, evangelists, and the sons of the upper classes are well educated. A considerable amount of literature has been prepared, and several printing presses are con- stantly at work. Very marked advance has been made as regards the morality of the people by the suppression of the grosser and more open forms of vice, the abolition of polygamy, and the restric- tions plaeed upon arbitrary divorcee. All the barbarous punish- ments of the old laws have been done away with ; and the only war earricd on during the present reign was conducted with sueh humanity as well as sagacity that peace was speedily restored.

MADAGASCAR

Although these changes have as yet only affected about a fourth part of the whole population, there is reason to believe that the influences at work in the centre of the island will eventually affect all the different tribes. Missionary work is also carried on by English Episcopalians (S. P. G.), Norwegian Lutherans, and French Roman Catholics.

The government of Madagascar during the present century has been and still is monarchical theoretically despotic, but practi- cally limited in various ways. Radama I. and Ranavalona I. were much more absolute sovereigns than those before or after them, but even they were largely restrained by public opinion. New laws are announced at large assemblies of the people, whose consent is asked, and always given through the headmen of the different divisions of native society ; and this custom is no doubt a " sur- vival" from a time when the popular assent was not a merely for- mal act, as it has now almost entirely become. The large disci- plined

army formed by Radama I. aided much in changing what was formerly a somewhat limited monarchy into an absolute one. The Hova queen's authority is maintained over the central and eastern portions of Madagascar, and at almost all the ports, by governors appointed by the queen, and supported by small garrisons of Hdéva troops. At the same time the chiefs of the various tribes are left in possession of a good deal of their former honours and influence, so long as they acknowledge the suzerainty of the Hova sovereign, and perform a certain amount of Government service. The present queen and her predecessor have both been married to the prime minister, a man of great ability and sagacity, who, by his position as husband and chief adviser of the sovereign, is the virtual ruler of the country. Chiefly owing to his influence, the last five or six years have been markcd by the introduction of several measures tending to modify the government of the country and improve the administration. The purpose of these new laws is to weaken the old oppressive feudal system ; to remodel the army; to appoint a kind of local magistracy and registrars ; to encourage education ; and to form a responsible ministry, with departments of justice, war, education, agriculture, commerce, revenue, &c.

Owing to the conservative habits of the people, considerable time will probably clapse before all these measures are carried into effect, but their mere enactment is a proof of the progress of enlightened ideas. Until lately the military service has been very oppressive upon certain classes, being for life, and without any pay; but it is now to be made compulsory upon all, and for short periods only. The Hova army has been variously estimated at from 30,000 to 40,000 men, although it is popularly termed ny Folo-dlin-dahy, t.c., "the Ten ten-thousand men." Military rank is reckoned by num- bers, from one ‘‘ honour," that of a private, to sixtecn ‘‘ honours," the rank of the highest officer ; but several of the English words for different ranks are employed, as a sergeant, captain, general, Justice, marshal, &c. Justice has hitherto been administered by a number

of unpaid judges appointed by the sovereign, and they generally sit in the open air. There appears to be a somewhat ah amount of crimes of violence; but cattle-stealing raids made by one tribe upon another arc a frequent cause of petty wars away from the Hova Revenue. authority. The revenue of the Government is derived from customs duties, first fruits, fines and

confiscation of offenders’ property, and a money offering called hasina, presented on a great variety of occasions both to the sovereign in person and to her representa- tives; and these are supplemented by ‘‘benevolences” (in the medieval sense of the word) levied upon the people for occasional state necessities. Besides these, the Government claims the unpaid service of all classes of the community for all kinds of public work. Foreign Consuls appointed by the English, French, and American Govern- Tela- ments are accredited to the Malagasy sovercign, and the queen has tions. a consul in England, and a consular agent at Mauritius. During the late Lord Clarendon’s tenure of officc as foreign secretary an understanding was come to between the English and French Governments by which it was agreed that each power should respect the independence of Madagascar ; and, although the intrigues of Jesuit priests have more than once fomented difficulties between the native Government and the French, it may be hoped that the home authorities in France will still refuse to interfere, and will allow the Malagasy—undisturbed by fear of foreign invasion— quietly to advance in that path of progress which they have for some years been following with such happy results. The best prospects for the future of the country would appear to be bound up in the gradual consolidation of the central Héva authority over the whole island, bringing to every part of it those civilizing and enlightening influences which have already worked such changes in the central provinces, The Antananarivo, the capital of Madagascar, is by far the largest capital. city in the island. It has about 100,000 inhabitants, and has been almost rebuilt during the last twelve years, the old timber and rush houses being nearly all replaced by much larger and more substan- tial ones of sun-dried brick and stone, constructed in European fashion. A group of royal palaces, with lofty roofs and stone-arched verandahs, crowns the summit of the ridge on and around which the city is built, and hardly less conspicuous is the grand

Govern- ment,

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new residence of the prime minister. Four handsome stone memorial churches, with spircs or towers, mark the spots where the Christian martyrs

suffered ; and other prominent buildings are the Chapel Royal, the Norwegian and the Roman Catholic churches, the London Missionary College, the London Missionary Socicty and the Friends' normal schools, mission hospitals, the court of justice, and numerous large Congregational churches of sun-dried brick.

Next to the capital in size are the port of Mojanga, on the north- Other west coast, with about 14,000 inhabitants; Tamatave, the chief towns. eastern port, and Fianarantsda, the chief town of the Bétsiléo, each with about 6000 people; and Ambdhimanga, the old capital of Imérina, with about 5000. There are very few places besides these with as many as 5000 people, and the majority of native towns are small, The population is dense in two or three districts only, and Popula- the entire island is variously estimated to contain from four to tion. five millions of inhabitants.

Literature.—A eonsiderable number of books have been written upon Madagas- ear, both in the English and French languages, but many of the latter are of little value. And during the last twenty yearsa great many papers upon the exploration, natural resourees, animal and vegetable life, and political and religious condition of the country have appearcd in various pcriodicals and in the Proceedings of the different lcarned societics, both English and French. In the following lists no attempt is made at completcness, but only to select the most important of each class. As regards the scicntifie aspects of the country, almost cvcrything worth preserving in previous books and papers will be included in the magnifieent work now in course of publication in twenty-eight 4to vols. by M. Alfred Grandidier, en- titled, Histoire Naturelle, Physique, et Politique de Madagascar. Of this magnunz opus four volumes are already issued.

Of books treating of the country generally, the following are the most note- worthy :—Hamond, Madagascar, the Richest and most Frvitfull {sland in the World, London, 1643; Boothby, A Breife Discovery or Description of the most famous Island of Madagascar or St Laurence, London, 1664; Flacourt, (Zistoire de la grande Isle de Madagascar, Paris, 1658; Madagascar, or Robert Drury's Journal during Fifteen Years' Captivity on that Island, London, 1729; Voyages et Mémotres de Maurice Auguste comte de Benyowski, Paris, 1791; Rochon, Voyages & Mada- gascar, &c., Paris,

an x.; Froberville, {fistoire de Madagascar, Isle de France, 1809; Copland, A Mfistory of the Island of Madagascar, London, 1822 ; Ellis, flistory of Madagascar, London, 1838; Leguevel de Lacombe, Voyage 4 Madagascar et aux tiles Comores, Paris, 1840; Guillain, Documents sur… la partie occidentale de Madagascar, Paris, 1845; Macé Descartes, {Histoire et Géographie de Madagascar, Paris, 1846; Ellis, Three Visits to Madagascar, London, 1859; Oliver, Aadagas- car and the Malagasy, London, 1863 ; Sibree, Mfadagascar and its People, London, 1870; articles in Revue des Deux Mondes, 1872; Tantara ny Andriana eto Mada- gascar: {listotre des Rois d'Imérina d'aprés les manuscrits Malgaches, Antan2- narivo, 1875 ; Mullens, 7welve Months in Madagascar, London, 1875; Blanchard, fie de Madagascar, Paris, 1875; Dahle, Madagaskar og dets Beboere, Chris- tiania, 1876-78 ; The Antandnarwo Annual, Nos. i-v., 1875-81; and Sibree, The Great African Island, London, 1880, and "The Arts and Commerce of Madagascar," Jour. Soc. Arts, June 4, 1880.

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Racines Oceaniennes, Paris, 1876 ; Dahle, Specimens of Malagasy Foilk-lore, Antan., 1877 ; and W. E, Cousins, “ The Malagasy Language,” in Trans Phil. Soc., 1878. Besides these there are several valuable papcrs by Dahle in the ycarly numbers of The Antananarivo Annual (ante), and a number of short yocabularics of coast and other dialccts of Malagasy in the notes of various exploratory journcys published at Antananarivo, noticed below.

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Tanghinia Veneniflua),” Jour. of Anat. and Phys., vol. viii; articles on ferns a ahaering Monte iin Linn. Soc. Jour.—Bot., for 1864, 1876, 1877, 1880; “ Reliquiz Rutenbergiane,” in the Bremen Naturwissenschaftliche Verein, No- yember 1880; Baker on “ The Plants of Madagascar,” Nature, December 9, 1880, and on “ Botany of Madagascar,” Proc. of Brit. Assoc., 1881, fens : Anthropology.—Oliver, ‘The Hovas and other Characteristic Tribes of Madagascar,” Jour. Anthrop. Inst., 1868; Wake, “The Race Elements of the Madecasses,” Jbid., 1869 ; Mullens, “On the Origin and Progress of the People of Madagascar,” /bid., 1875; Wake, “ Notes on the Origin of the Malagasy,” /67d., 1881; Sibree, “‘ Malagasy Folk-Lore and Popular Superstitions,” Folk-Lore Soc. Record, 1880; Id., Zhe Oratory, Songs, Legends, and Folk-Tales of the Malagasy, 1882. Religious History. —Frecman and Johns, Narrative of the Persecutions of the Christians in Madagascar, London, 1840; Prout, Madagascar, its Missions and tts Martyrs, London, 1863; Ellis, Madagascar Revisited, London, 1867 ; Id., The Martyr Church, London, 1869; ‘‘ Religion in Madagascar,” Ch. Quart. Rev., July 1878; and Ten Years’ Review of Mission Work in Connexion with the London Missionary Society, 1870-80, Antan., 1880, ; (J. S., jr.)

MADDALONI, a city of Italy, in the province of Caserta (Terra di Lavoro), about 34 miles south-east of Caserta, with a station both on the railway from Caserta to Benevento and on that from Caserta to Avellino. It is prettily situated at the base of one of the Tiffata hills, the towers of its medieval castle and the church of San Michele crowning the heights above. The fine old palace of the Carafias, once dukes of Maddaloni, the old college now named after Giordano Bruno, and the institute for the sons of soldiers (dating from 1859, and accommodating 500 pupils) are the chief

points of interest. In 1871 the population was 18,767. About 24 miles to the east, at Valle di Maddaloni, the Caroline aqueduct (so called after Charles IV. of Naples), conveying the water of the Tiburno to Caserta (a distance of 19 miles), is carried across the valley between Monte Longano and Monte Gargano by a threefold series of noble arches rising to a height of 178 feet. The work was designed by Lodovico Vanvitelli, and constructed between 1753 and 1759.

Maddaloni (in medieval documents JMatalonwm, Madalonwm, and Magdalonwm) lies on the Appian Way, and is doubtfully identi- fied with Sessuela. Its castle aud walls are probably of Lombard origin. The first count of Maddaloni was invested with the fief in 1465, the first duke in 1558. In 1860 General Bixio's volunteers beat the royal Neapolitan forces at Maddaloni. Sec A. de Reumont, The Carafas of Maddaloni, Bohn's series, 1854.

MADDEN, Sir Freperic (1801-1873), one of the first palzeographers and antiquaries of his time, and for nearly forty years assistant keeper and keeper of manu- scripts at the British Museum, was born at Portsmouth on February 16, 1801, the son of an officer of Irish extraction. From his earliest years he displayed a strong bent to linguistic and antiquarian studies. In 1825 he was engaged in collating the text of Cedmon for the university of Oxford, and assisting Dr Bliss in editing Blore's Monumental Remains; in the following year he joined Mr Roscoe in preparing a catalogue of the earl of Leicester'ss MSS. at Holkham, which was completed in eight volumes folio, but remains unpublished. In the same year he was engaged by the British Museum to assist in the preparation of the classed catalogue of printed books at that time contemplated, and in 1828 he became assistant keeper of manuscripts. In 1833 he was knighted, and in 1837 succeeded the Rev. Josiah Forshall as keeper of manuscripts, which office he continued to hold until his retirement in 1866. Notwithstanding his indefatigable attention to his official duties, he found time fora great amount of exceedingly valuable literary work. Between 1828 and 1838 he edited for the Roxburghe Club the old English romances of Havelok the Dane (discovered by him- self among the Laudian MSS. in the Bodleian) and Welliam and the Werwolf, and the old English versions of the Gesta Romanorum. In 1839 he edited the ancient metrical romances of Syr

Gawayne for the Bannatyne Club, and in 1847 Layamon's Brut, with a prose translation, for the Society of Antiquaries. In 1850 the magnificent edition of Wickliffe's translations of the Scriptures from the original MSS., upon which he and his coadjutor, Mr Forshall, had been engaged for twenty years, was published by the university of Oxford. In 1866-69 he edited the Historia

Minor of Matthew Paris for the Rolls series In 1833 he prepared the literary part of Mr Shaw's work on Ldluminated Ornaments ; and in 1850 he edited the English translation of Silvestre's Universal Palxography. He had projected a history of chess in the Middle Ages ; ill-health, however, and other causes, prevented the completion of the work. He died on March 8, 1873, bequeathing his journals and other private papers to the Bodleian Library, where they are to remain unopened until 1920.

Sir Frederic Madden's attainments were great, and his services to literature highly distinguished. He was perhaps the first paleographer of his day, and as kecper of manuscripts was most zealous and industrious, imposing a large amount of manual as well as intellectual labour upon himself, and continually, although too often unsuccessfully, exerting hunself to enrich the collections committed to his care. He was an acute as well as a laborious antiquary, but rather qualified for critical than for original research, and his unacquaintance with German prevented his ranking high as a philologer, although he paid much attention to the early dialectical forms of French and English. His judgment was shown in the substantial value of the works edited by him. Wickliffe's Bible is the first English version ; Layamon's Brut, a semi-Saxon paraphrase of the Norman Brut of Robert Wace, unites two ages of English poetry, is an inestimable monument of the language at the period of its composition, and possesses no small poetical merit ; while Havelok is hardly less important in a philological and a metrical point of view. The first volume of his edition of Matthew Paris contains a valuable critical introduction, and the third a biography of the historian, with an estimate of his place in literature. Sir Frederic's minor contributions to antiquarian research were exceedingly numerous: the best known, perhaps, is his dissertation on the orthography of Shakespeare's naine, which, mainly

on the strength of the Florio autograph, he contends should be ‘‘Shakspere.” This mode of spelling has been adopted by the New Shakspere Society. It is not generally known that Sir Frederic was the first to discover the ‘‘ Perkins” forgeries in the duke of Devonshire folio Shakespeare, although private consider- ations induced him to leave the further clucidation of the matter to others. He also promptly detected the fabrications of the Greek Simouides, which had imposed upon some of the first scholars in Germany.

MADDER, or Dyzr’s Mappsr, is the root of Aubia tinctorum, L., and perhaps of &. peregrina, L., as well, both being European; but 2’. cordifolia, L., and perhaps Mungista, Roxb., a native of the mountains of Nepal, Bengal, Japan, &c., supply the Indian madder or manjit (see Pickering, Chron. Hist. of Pl., 421; Drury, Useful Plants of India, 541). Rubia is a genus of about thirty species of the tribe Galiex of the order Rubiacee, and much resembles the familiar Galiwms, eg., the lady’s bedstraw and cleaver of English hedges having similarly whorled leaves, but the parts of the flowers are in fives and uot fours, while the fruit is somewhat fleshy. The sole British species is eubia peregrina, L. The use of madder appears to have been known from the earliest times, as cloth dyed with it has been found on the Egyptian mummies. It was the epevfddavov used for dyeing the cloaks of the Libyan women in the days of Herodotus (Herod., iv. 189). It is the épvOpddavov of Dioscorides, who speaks of its cultivation in Caria (iii. 160), and of Hippocrates (De Morb. Mul., i.), and the Rubia of Pliny (xix. 17), (see Pickering, p. 275). Rubia tinctorum, L., a native of western Europe, &c., has been extensively culti- vated in South Europe, France, where it is called garance, and Holland, and to a small extent in the United States.

‘Large quantities have been imported into England from

Smyrna, Trieste, Leghorn, &c. The cultivation, however, is decreasing since alizarin, the red colouring principle of madder, has been made artificially (see ALIZARIN). Madder was employed medicinally by the ancients and in the Middle Ages. Gerard, in 1597, speaks of it as having beeu culti- vated in many gardens in his day, and describes its sup- posed many virtues (Zerball, p. 960) ; but the influence of madder over the system is now believed to be

exceedingly slight. Its most remarkable physiological effect is that. of colouring red the bones of aninials fed upon it, as also the

claws and beaks of birds. This appears to be due to the chemical affinity of phosphate of lime for the colouring matter (Pereira, Mat. Med., vol. ii. pt. ii p. 52). Rubia chilensis, Mol., has been used for dyeing red from time immemorial (Pickering, p. 661). The chay-root, which furnishes a red dye in Coromandel and other parts of India, is obtained from Hedyotis wmbellata, Lam., of the same family as madder (Drury, p. 366).

MADEIRA. The Madeiras, a group of islands in the North Atlantic Ocean belonging to Portugal, consist of two inhabited islands named Madeira and Porto Santo, and three uninhabited rocks named collectively the Desertas. Funchal, the capital of Madeira, is on the south coast of the principal island, in 32° 37’ 45” N. lat., 16° 55’ 20” W. long. It is about 360 miles from the coast of Africa, 535 miles from Lisbon, 1215 from Plymouth, 240 from Teneriffe, and 480 from Santa Maria, the nearest of the Azores. Funchal is connected by the Brazilian submarine telegraph, which belongs to a British company, with Lisbon on the one hand, and on the other with Brazil.

Madeira, the largest island of the group, has a length of 30 geographical miles, an extreme breadth of 13 miles, and a coast-line of 80 or 90 miles. Its longer axis lies east and west, in which direction it is traversed by a mountain chain, the backbone of the island, having a mean altitude of 4000 fect, up to which many deep ravines penetrate from both coasts, rendcring travelling by land from place to place a very tedious and fatiguing labour. Pico Ruivo, the highest summit, stands in the centre of the island, and has a height of 6100 feet, but some of the adjacent sum- mits are very little lower. The depth and narrowness of the ravines, the loftiness of the rugged peaks that tower above them, the bold precipices of the coast, and the proximity of the sea afford many scenes of picturesque beauty or striking grandeur which are continually changing in character as the traveller advances on his way. The greater part of the interior is uninhabited, for the towns, villages, and scattered huts lie either at the mouths of ravines or upon the lower slopes

that extend from the mountains to the coast. The ridges between the ravines usually terminate in lofty headlands, one of which has the height of 1920 feet, and much of the coast is bound by precipices of dark basalt. The north coast, having been more exposed to the erosion of the sea, is on the whole more precipitous than the south coast, and presents every- where a wilder aspect. On the south there is left very little of the indigenous forest which once clothed the whole island and gave it the name it bears (Madeira, from materia, wood), but on the north some of the valleys still contain native trees of fine growth. A long, narrow, and compara- tively low rocky promontory forms the eastern extremity of the island, and here is to be seen a tract of calcareous sand, known as the Fossil Bed, containing land shells and numerous bodies resembling the roots of trees, probably produced by infiltration. Upon an islet off this promontory stands the only lighthouse of the group. It has a flashing light visible at the distance of 25 miles in clear weather.

Mstory.—It has becn conjectured, but on insufficient evidence, that the Phcenicians discovered Madeira at a very early period. Pliny mentions certain Purple or Mauretanian Islands, the position of which with reference to the Fortunate Islands or Canaries might seem to indi- cate the Madeiras. There is a romantic story, of doubtful truth, to the effect that two lovers, Robert Machim and Anna d'Arfet, fleeing from England to France in 1346, were driven out of their course by a violent storm, and east on the coast of Madeira at the place subsequently named Machico, in memory of one of them. On the evidence of a portulano dated 1351, preserved at Florence, it would appear that Madeira had been discovered long

previous to that date by Portuguese vessels under Genoese captains. In 1419 two of the captains of Prince Henry of Portugal were driven by a storm to the island called by them Porto Santo, or Holy Port, in gratitude for their rescue from shipwreck. The next year an expedition was sent out to colonize the island, and, Madeira being descried, they made for it, and took possession on behalf of the Portuguese crown. The islands were then uninhabited. For the sixty years intervening between 1580 and 1640, Madeira, with Portugal itself, was under Spanish rule. In 1801 British

troops occupied the island for a few months, commanded by General Beresford, and it was again under the British flag from 1807 to 1814. Madeira is now a province and an integral part of the Portuguese kingdom, entitled to send deputies to the Cortes assembling at Lisbon.

Inhabitants,—The inhabitants are of Portuguese descent, with probably some intermixture of Moorish and Negro blood amongst the lower classes. The dress of the peasantry, without being picturesque, is peculiar. Both men and women in the outlying country districts wear the carapuca, a small cap made of blue cloth, in shape something like a funnel, with the pipe standing upwards. The men have trousers of linen, drawn tight, and terminating at the knees; a coarse shirt enveloping the upper part of their person, covered by a short jacket, completes their attire, with the exception of a pair of rough yellow boots. The women's outer garments consist of a gaudily coloured gown, made from island material, with a small cape of coarse scarlet or blue woollen cloth. At the end of 1881 the inhabitants of Madeira numbered 131,906 persons, the females exceed- ing the males by 7060. The population increases, notwith- standing the emigration to Demerara and the Hawaiian Islands that occasionally takes place. There is strong reason for thinking that the islands are too densely peopled, considering the small proportion which cultivable ground bears to the whole, and the general want of capital.

Government.—The administration of affairs is in the hands of a civil governor appointed by the crown, under whom is a military officer in command of the troops, which consist of a battalion of infantry, a detachment of artillery, and some militia. The law of Portugal is administered by four chief judges, each of whom has a separate division (comarca) of the island in his jurisdiction, within which he tries both civil and criminal cases with the assistance of a jury. Magistrates elected by the people decide minor cases. For municipal purposes the island is divided into nine districts, called concelhos (Porto Santo forming a tenth), each of which has its popularly elected municipal chamber, whose duty it is to repair the roads, light aud cleanse the towns and villages, &c. The chief police magistrate of each district is the administrador, who is appointed by the central Government. A bishop is at the head of the clergy, his cathedral being at Funchal. There are forty-eight parishes, each with its church and

resident priest. Roman Catholicism is the established form of reli- gion, but others are now tolerated.

Lducation.—By law all children of a certain age should be sent to school, but this regulation is not strictly enforced, and only a small fraction of the total number actually receive instruction. The chief educational establishment is the Lyceo at Funchal, where there are seven professors paid by Government. In 1881 the pupils at this establish- ment were two hundred and fifty in number. There is a seminary for young priests, and a number of public primary schools are scattered over the island.

Agriculture.—Until recently a considerable portion of the land was strictly entailed in the families of the land- lords (morgados), but entails have been abolished by the legislature, and the land is now absolutely free. Owing to the irremediable difficulties of the surface, the roads XV. — 23

are bad, except in the neighbourhood of the capital. A deficient supply of water is another great obstacle to the proper cultivation of the land, and the rocky nature or steep inclination of the upper parts of the islands is an effectual bar to all tillage. An incredible amount of labour has been expended upon the soil, partly in the erection of

walls intended to prevent its being washed away by the |

rains, and to build up the plots of ground in the form of terraces, so as to lessen their slope. Water-courses, too, have been constructed for purposes of irrigation, without which at regular intervals the island would not produce a hundredth part of its present yield. These water-courses originate high up in the ravines, are built of masonry or driven through the rock, and wind about for miles until they reach the cultivated land. Some of them are brought by tunnels from the north side of the island through the central crest of hill. The water thus conveyed is carefully dealt out according to the rights of each occupier, who takes his turn at the running stream for so many hours in the day or night at a time notified to him beforehand. In this climate flowing water has a saleable value as well as land, for the latter is useless without a supply of the former. The agricultural implements employed are of the

rudest kind, and the system of cultivation is extremely primitive. Very few of the occupiers are the owners of the land they cultivate; but they are almost invariably the owners of the walls, cottages, and trees standing thereon, the bare land alone belonging to the landlord. The tenant can sell his share of the property without the con- sent of the landlord, and if he does not so dispose of it that share passes to his heirs. In this way the tenant practically enjoys fixity of tenure, for the landlord is seldom in a position to pay the price at which the tenant's share is valued. Money rents are rare, tlie métayer system regulating almost universally the relations between landlord and tenant; that is, the tenant pays to the owner a cer- tain portion of the produce, usually one half or one third. The holdings are usually very small, rarely larger than one man can cultivate with a little occasional assistance. Meadows and pastures are seldom to be met with, the cattle being stall-fed when not feeding on the mountains. Horses are never employed for draught, all labour of that kind being done by oxen, of which there is an ample supply.

The two staple productions of the soil are wine and sugar. 'The vine was introduced from Cyprus or Crete soon after the discovery of the island by the Portuguese, but it was not actively cultivated until the early part of the 16th century. The vines, after having been totally destroyed by the oidium disease, which made its first appearance in the island in 1852, were replanted, and in a few years wine was again made. 'The disease is now kept in check by the application of sulphur, which has the effect of increasing the quantity of fruit, whilst it shortens the life of the plant. The phylloxera has also made its way to the island, and every vineyard in Madeira is more or less affected by it. The wine usually termed Madeira, and known in the trade as '" London particular," is made from a mixture of black and white grapes, which are also made separately into wines called Tinta and Verdelho, after the names of the grapes. Other high-class wines, known as Bual, Sercial, and Malmsey, are made from varieties of grapes bearing the same names. The exported Madeira is a strong-bodied wine of fine bouquet and excellent quality, but of late years it has gone out of fashion in England, the lighter wines of France and Germany having to a certain extent supplanted it. Taking the four years 1878-1881, the average quantity annually exported was 3045 pipes, each of 92 imperial gallons. It is not usual for the merchant to possess vineyards of his own. The vines are

cultivated by the peasants in their small patches of land, and the general rule is for the merchant or wine manufac- turer to buy the must from them, and to have it conveyed as it comes from the press direct to his store, where the process of fermentation and the subsequent treatment are carried on from first to last under his own eye.

The sugar cane is said to have been brought from Sicily about 1452, and in course of time its produce became the sole staple of the island. The cultivation languished, however, as the more abundant produce of tropical countries came into the European market, and sugar had long ceased to be made when the destruction of the vines com- pelled the peasants to turn their attention to other things. Its cultivation was resumed, and sugar machinery im- ported, In 1881 about 6515 cwts, of sugar, valued at £14,452, were exported. A considerable quantity of spirit is made by the distillation of the juice, or of the molasses left after extracting the sugar, and this is consumed on the island,—not an unmixed benefit to the people, for intem- perate habits have greatly increased since they have been subjected to the temptation of cheap spirits) The cane does not flourish here as luxuriantly as within the tropics; still in localities below 1000 feet, where there is a good supply of water, it pays the cultivator well. ;

The grain produced on the island (principally wheat, barley, and Indian corn) is not sufficient for the consump- tion of the people. The common potato, sweet potato, and gourds of various kinds are extensively grown, as well as the Colocasia esculenta, the kalo of the Pacific islanders, the root of which yields an insipid food. Most of the common table vegetables of Europe—cabbages, carrots, onions, beans, pease, &c.—are plentiful. Besides apples, pears, and peaches, all of poor quality, oranges, lemons, guavas, mangos, loquats, custard-apples, figs, bananas, and pine-apples are produced, the last two forming articles of export to the London market. The date palm is occasion- ally seen, but its fruit is scarcely edible. On the hills large quantities of the Spanish chestnut afford an item in the food of the common people. A little tobacco is grown, and is made up into cigars of inferior quality.

Trade and Commerce.—Excepting sugar and tobacco, the nianufactures are insignificant. Coarse linen and woollen articles and boots and shoes are made for island use. A. good deal of needlework embroidery is made by the women in and about Funchal for exportation. Baskets, chairs, &e., of wicker work are also exported. According to official returns the total value of exports in 1881 was £134,000, whilst the imports from foreign countries amounted to £175,000 (including £128,500 from the United Kingdom), and the imports from Portugal and the Azores to £112,800. The principal imports were textile fabrics, hardware, grain, salt fish, salt, tea and coffee, tobacco, cask staves, timber, and petroleum (the last three articles coming from America). The duties levied at the custom-house amounted in the same year to about £41,000. In the course of the year 710 merchant vessels entered the port, but more than half of these were English steamers calling on their passage to and from the west coast of Africa, the Cape of Good Hope, or Brazil. The number of Portuguese vessels was only 113.

There is a local bank at Funchal, and also a branch of the Bank of Portugal. The English merchants act as bankers for visitors, and bills or cheques can be negotiated through them. Accounts are made out in reis, an imaginary coin, 4500 of which are equal to the pound sterling, and 1000 form the mil-ret or dollar, equal to 4s. 54d. The coins in circulation are of British gold and Portuguese silver, the latter in pieces of 50, 100, 200, and 500 reis, the coinage being decimal. The French decimal system has been established here as in Portugal. Madeira, as a province

of Portugal, has the benefit of the regulations of the International Postal Union. Consuls from Great Britain and other European states, as well as from the United States and Brazil, reside at Funchal. Lines of steamers from Liverpool to the British colonies on the west coast of Africa, and from London and Plymouth to the Cape of Good Hope, touch at Madeira, both on their outward and homeward voyages. There is steam communication with Lisbon, and also with Brazil, the Cape Verds, the Canaries, and the Azores (St Michael’s), as well as with Antwerp. A large coal depdt for supplying the steamers has been established at Funchal by a firm of British merchants. Funchal, the capital of the archipelago, lies on the south coast of Madeira,

and has a population of about 18,000 persons, the immediate neighbourhood being inhabited by nearly as many more. It is seen to great advantage from the bay, lying on its curving shore, and backed by an amphitheatre of lofty mountains, some of them 4000 feet in height. Numerous country houses (quintas) with terraced gardens, and surrounded by vineyards and patches of sugar cane, adorn the slopes and give an air of cheerfulness to the landscape. A small fort on an insulated rock close to the shore commands the bay with its cannon, and there is a much larger fortress on an eminence behind the city.

There are no facilities for landing either passengers or

goods, nor is there any dock for vessels, which are obliged to remain in the open roadstead, where, however, the anchorage is good. Vessels are protected from all winds except that from the south, which, when blowing with violence, occasionally drives those on shore that do not slip their cables in good time, and take to the open sea. The principal edifices in the city are the cathedral and the churches, none of which deserve much notice, the governor's residence, a semi-castellated building, and the substantial custom-house. The streets are for the most part narrow, but fairly clean, paved with small stones, without side walks, and lighted at night by petroleum lamps. There are two public walks planted with trees, and a garden of small extent, but rendered gay with flower- ing plants which would need protection in England. There are also fountains of good water, a large hospital, a poor- house, and an unsightly ill-managed jail. The late empress of Brazil built a spacious and handsome hospital close to the town for the reception of twenty-four consumptive patients of Portuguese or Brazilian birth. The entrances of some of the larger houses are through great gates into a paved vestibule, from which a double flight of stairs ascends to the principal rooms. The shops are poor and without dis- play. The windows on the ground floor of the dwelling houses are filled with stout iron bars, which give a prison- like air to the streets. Three streams come down from the hills and run across the town at the bottom of deep channels, which in summer are dry, because the water is diverted higher up for irrigation purposes. Convenient market places have been constructed for the sale of meat, vegetables, and fish. Vegetables and fruit are abundant, but not of the first quality. Fish is plentiful and cheap when fishing is possible, and fresh

fish forms with salted cod and herrings an important item in the food of the islanders. Butcher meat is fairly good, with the exception of the mutton, which is very inferior.

The affairs of the city are managed by a municipal chamber of seven persons with a president. Their revenue is derived from imposts on grain and salt imported, and from duties on fresh meat and fish sold in the open market, on wine exported, on houses, and on persons carrying on trade or business. It is expended principally on the lighting and repairing of the streets, and the maintenance of markets and public gardens.

Wheel carriages are not in use; and all heavy articles

are transported either on the backs of mules or upon rude wooden sledges drawn by bullocks. When horses are not employed, locomotion is effected either by means of ham- mocks, or by bullock cars, The hammock isa piece of stout canvas gathered up and secured at each end to a long pole carried by acouple of bearers. In place of cabs, curtained cars on sledges, made to hold four persons, and drawn by a pair of bullocks,are employed. heyare convenient enough, but the rate of progress is very slow. The common people carry heavy burdens on the head and shoulders. Such aids as wheelbarrows and trucks are entirely rejected.

A few daily and weekly newspapers are published at Funchal, but they are small sheets, and their circulation is very limited. In a room of the building occupied by the municipal chamber there is a collection of books, numbering about 2800 volumes, accessible to the public. The Portuguese have a club, which has a large house con- taining a ball room, card rooins, and a billiard room, but no library.

The wine trade attracted several British merchants in the last century to take up their residence at Funchal, where, notwithstanding the decrease of that trade, there was in 1881 a resident British population of 208 persons. A church has been built where a resident chaplain con- ducts the services of the English Established Church, and the Presbyterians of the Free Church of Scotland have also erected a place of worship. The British community have

formed a cemetery, which is kept in admirable order. The English Club, to which strangers can subscribe, has a library of 5000 volumes and a billiard table.

Climate and Meteorology.—The following results have been derived from observations made for a series of eight years at the Government observatory, Funchal, which has a height of 80 feet above the sea. The mean annual barometrical pressure was 30°14 inches. The mean annual temperature was 65°°84 Fahr., the high- est point during the cight years having been 90°83 Fahr. and the lowest 46°°22 Fahr. The two hottest months are August and Sep- tember, when the mean temperature was 72° °58 Fahr. The three coldest months are January, February, and March, their mean temperature being 60°°6 Fahr. The mean temperature of the six months November to April was 61°°8 Fahr. The mean temperature of winter (December to February) was 61°; of spring (March to May) 62°°64 ; of summer (June to August) 70°‘8 ; of autumn (Sep- tember to November) 68°‘9. The mean number of days in the year on which rain fell was 803. The distribution of rain through the months from October to May varies a good deal, but the wettest months are usually November, December, January, and March. Taking a scries of twelve years’ observations, the mean annual rain- fall was 304 inches, the cxtremes being 16 and 49°15 inches. The mean daily range of the thermometer from 8 A.M. to 6 P.M. during the six months November to April is about 6°°1 Fahr., but taking the twenty-four hours the mean daily range is about 10°.

The remarkable mildness both in summer and winter of the climate of Madeira, though it lies only 10° north of the Tropic of Cancer, is owing to its being surrounded by a great ocean, from which the atmosphere obtains a large supply of watery vapour. The mean humidity of the air is about 75 (saturation=100). he prevalent winds are those that blow from the north or from a few points cast or west of north, but these winds are much mitigated on the south coast by the central range of mountains. The west wind usually brings rain. That from the east isa dry wind. A hot and dry wind, the deste of the natives, occasionally blows from the east- south-east, the direction of the Great Sahara, and causes the hill region to be hotter than below, but even on the coast the thermo- meter under its influence sometimes indicates 98°. As the ther- mometer has never becn known to fall as low as 46° at

Funchal, frost and snow are there wholly unknown, but snow falls on the mountains once or twice during the winter, very scldom, however, below the altitude of 2000 feet. Thunderstorms are rare, and scarcely ever violent.

Madeira has long had a high reputation as a sanatory resort for persons suffering from diseases of the chest. '* When we take into consideration," said Sir James Clark in his work on Climate, 'the mildness of the winter and the coolness of the suminer, together with the remarkable equality of the temperature during the day and night, as well as throughout the year, we may safely conclude that the climate of Madeira is the finest in the northern hemi- sphere." Notwithstanding the ever-increasing competition of other winter resorts, a considerable number of invalids, both English and.

German, continue to spend the winter at Funchal, where there are numerous well-conducted hotels and boarding-honses, as well as furnished houses, with gardens, for hire in the neighbourhood, and where English and German physieiaus practise their profession. The island possesses one great advantage over most other places frequented by invalids in affording eool and comfortable summer quarters on the hills, so that they have no need to make a long journey for the purpose of escaping froin the heat.

Zoology.—No species of land mammal is indigenous to the Madeiras. Some of the early voyagers indeed speak of wild goats and swine, but these animals must have eseaped from confinement. The rabbit, and those pests the black rat, brown rat, and mouse, have been introduced. The first comers encountered seals, and this amphibious mammal (Afonachus albiventer) still lingers at the Desertas, but its early extinction is threatened, from the same cause that has brought about its extinction at the Canaries, the pcr- sistent attacks of man. Amongst the thirty spceies of birds which breed in these islands are the kestrel, buzzard, and barn owl, the blackbird, redbreast, wagtail, goldfinch, ring sparrow, linnet, two swifts, three pigeons, the quail, red-legged partridge, woodcock, tern, herring gull, two petrels, and three puflins. Only one species is endemic, and that is a wren (Regulus madetrensis), but five other species are known elsewhere only at the Canaries. These are the green canary (Fringilla butyracea, the parent of the domesti- cated yellow variety), a chaflinch (Fringilla tintillon), a swift

(Cypselus unicolor), a wood pigeon (Columba trocaz), and a petrel (Thalassidroma bulwerit). There is also a local variety of the black cap, distinguishable from the common kind by the extension in the male of the cap to theshoulder. About seventy other species have been seen from time to time in Madeira, chiefly stragelers from the African coast, many of them coming with the leste wind.

The only land reptile is a small lizard (Lacerta dugesit), which is abundant and is very destructive to the grape crop. The logger- head turtle (Caowana caretia, Gray) is frequently captured, and is eooked for the table, but the soup is much inferior to that made from the green turtle of the West Indies. The only batrachian is a frog (Rana esculenta) whieh has been introduced and has made its way from ravine to ravine.

About 250 species of marine fishes taken at Madeira have been seientifically determined, the largest families being Seombridx with 35 species, the sharks with 24, the Sparidg# with 15, the rays with 14, the Labride with 138, the Gadidxz with 12, the cels with 12, the Pereide with 11, and the Carangide with 10. Many kinds, such as the mackerel, horse mackerel, groper, mullet, braise, &c., are caught in abundance, and afford a cheap article of diet to the people. Several species of tunny are taken plentifully in spring and summer, one of them sometimes attaining the weight of 300 Ib. The only freshwater fish is the common eel, which is found in one or two of the streams. (See lists and memoirs by R. T. Lowe and J. Y. Johnson, published by the Zoological Society of London.)

According to the latest writer on the land mollusca of the Madeiras (T. V. Wollaston, Yestacea Atlantica, 1878), there have been found 158 species on the land, 6 inhabiting fresh water, and 7 littoral species, making a total of 171. A large majority of the land shells are considered to be peeuliar, but naturalists do not agree as to the distinctness of the so-called species. Many of the species are variable in form or colour, and some have an extraordinary number of varieties. Of the land mollusca 91 species are assigned to the genus Helix, 31 to the genus Pupa, and 15 to the genus Achatina (or Lovea). About 43 species are found both living and fossil in superficial deposits of caleareous sand in Madeira or Porto Santo. These deposits were assigned by Lyell to the Newer Pliocene period. Some 12 or

13 species have not been hitherto discovered alive. As to the marine testaceous mollusca it may be stated that between 300 and 400 species have been collected, but they have been only partially examined, and a large number of forms await identification. Few of them are remarkable for size or colour, and a consider- able number are very small. More than 100 species of Polyzoa (Bryozoa) have been collected, and amongst them are some highly interesting forms.

The only order of inseets which has been thoroughly examined is that of the Coleoptera. By the persevering researches of the late T. V. Wollaston the astonishing number of 695 species of beetles has been brought to light at the Madeiras (Insceta Maderensia, Cat. of Madeiran Col., &c.). The proportion of endemic kinds is very large, and it is remarkable that 200 of them are either wingless or their wings are so poorly developed that they canuot fly, whilst 23 of the endemic genera have all their species in this condition. This faet, Mr Darwin thinks, may be mainly due to the action of natural seleetion combined with disuse, since those beetles which were mueh on the wing would incur the risk of being blown out into the sea, whilst those with less-developed wings had the best chance of surviving. With regard to the Lepidoptera, 11 or 12 species of butterflies have been seen, all of which belong to European genera. Some of the species are intcresting as being geographical varieties of well-known types. Upwards of 100 moths have been collected, the majority of them being of a European

stamp, but probably a fourth of the total number are peculiar to the Madeiran group. Thirty-seven species of Newroptera have been observed in Madeira, 12 of them being so far as is known peculiar.

The bristle-footed worms of the coast have been studied by Pro- fessor P. Langerhans, who has met with about 200 species, of which a large nninber were new to seienee. There are no modern coral reefs at these islands, but several species of stony and flexible corals have been eolleeted, though none are of commercial value. There is, however, a white stony coral allied to the red coral of the Mediterranean which would be valuable as an article of trade if it eould be obtained in sufficicnt quantity. Specimens of a rare

and handsome red Pavagorgia are to be seen in the British Museum and Liverpool Museuin.

Botany.—The vegetation of these islands is strongly impressed with a South-European character. Many of the plants in the lower region have undoubtedly been introdueed and naturalized since the Portuguese colonization, A large number of the remainder are found at the Canaries and the Azores, or in one of these groups, but nowhere else. Lastly, there are about a hundred plants which are peculiarly Madeiran, either as distinet species or as strongly marked varieties. The late Mr Lowe undertook a description of the vegeta- tion in his Manual Flora of Madeira, but unfortunately this valu- able work has been left unfinished. The flowering plants found truly wild belong to about 363 genera and 717 species, —the mono- cotyledons numbering 70 genera and 128 species, the dicotyledons 293 genera and 589 species. The three largest orders are the Composit, Leguminose, and Graminacex. Forty-one species of ferns grow in Madeira, three of which are endemic species and six others belong to the peculiar flora of the North Atlantic islands. About 100 species of moss have been eolleeted, and 47 species of Hepatice, A connexion between the flora of Madeira and that of the West Indies and tropical America has been inferred by the presence in the former of six ferns found nowhere in Europe or North Africa, but existing on the islands of the east coast of America or on the Istlimus of Panama. A further relationship to that continent is to be traeed by the presence in Madeira of the beautiful erieaceous tree Clethra arborea, belonging to a genus which is otherwise wholly American, and of a Persea, a tree laurel, alsoan Ameriean genus. The dragon tree (Dracena Draco) is almost extinet. Amongst the trees most worthy of note are four of the laurel order belonging to separate genera, an A7rdisia, Pittosporum, Sideroxylon, Notelxwa, Rhamnus, and Myrica,—a strange mixture of genera to be found on a small Atlantic island. Two heaths of arborescent growth and a whortleberry cover large tracts on the mountains. In some parts there is a belt of the Spanish chestnut about the height of 1500 feet. There is no indigenous pine tree as at the Canaries; but large tracts on the hills have been planted with Pinus pinaster, from which the fuel of the inhabitants is mainly derived. A European juniper (J. Oxyeedrus), growing to the height of 40 or 50 fect, was formerly abundant, but has been almost exterminated, as its seented wood is ee by the cabinet- maker. Indeed the

flora has been recklessly defaced by the un- sparing hand of man. Several of the native trees and shrubs now grow only in situations which are nearly inaccessible, and some of the indigenous plants are of the greatest rarity. There are few remains of the noble forests that onee clothed the island, and these are daily becoming less. On the other hand, some plants of foreign origin have spread in a remarkable manner. Amongst these is the common cactus or prickly pear (Opuntia Tuna), whieh in many spots on the coast is sufficiently abundant to give a character to the landseape. As to Algex, the coast is too rocky and the sea too unquiet for a luxuriant marine vegetation, consequently the species are few and poor.

Geology.—The hypothesis that the Madeiras during or since the middle part of the Tertiary epoch formed part of a large tract of land connecting the Canaries in the south and the Azores in the west with south-western Europe and northern Africa has been com- pletely discredited by the diseovery of the great depth of the sur- rounding ocean. The origin of its existing fauna and flora, both of which must have been very different if such a connexion had ever been a fact, is now attributed to the chance arrival from Europe or Africa at distant intervals of the ancestors of the present species, the winds and waves, birds and insects, having been the means of transport. This immigration must have commenced at an early date if the aboriginal flora is partly traceable, as is asserted, to the Miocene flora of Europe, which has been found to contain genera now represented by species only living in the Atlantic islands and in America.

In one of the northern ravines of Madeira some masses of hyper- sthenite are exposed to view, aud these are believed to belong toa diabase formation (better displayed in some of the Canary Islands than in Madeira) of much older date than the beds of basalt, tuff, &c., constituting the rest of the island. It is therefore supposed that there existed at an ancient but unknown epoch an island or the foundation of an island composed of diabase rocks, which, after being subjected to denudation, were overlaid by the materials thrown out by volcanoes of Miocene or later times.

MA D—M AD

All the islands of the group are of volcanic origin, and recent soundings show that they are the summits of very lofty mountains which have their

bases in an abyssal ocean. The greater part of what is now visible in Madeira is of subaerial formation, consisting of an accumulation of basaltie and tracliytic lavas, beds of tuff and other ejectamenta, the result of a long and complicated series of eruptions from innumerable vents. Besides this operation of building up by the emission of matter from craters and clefts there is evidence that a certain amount of upheaval in mass has taken place, for at a spot about 1200 feet above the sea in the northeru valley of St Vicente, and again at about the same height on Pico Juliana in Porto Santo, there have been found fragments of lime- stone accompanied by tuffs containing marine shells and echinoderms of the Miocene Tertiary epoch. We have here proof that during or since that epoch portious at least of these islands have been bodily uplifted more than 1000 feet. The fossils are sufficiently well pre- served to admit of their genera and in many instances even their species being made out.

That there were pauses of considerable duration whilst the island of Madeira was being increased in height is proved by several facts. The leaf bed and the accompanying carbonaceous matter, frequently termed lignite, although it displays no trace of structure, which lie under 1200 feet of lavas in the valley of St Jorge, afford proof that there had been sufficient time for the growth of a vegetation of high order, many of the leaf impressions having been identified as belouging to species of trees and shrubs which still cxist on the island. It is evident, moreover, that great alterations and disloca- tions had taken place in the rocks of various localities before other lavas and tuffs had been thrown upon them.

There are no data for determining when volcanic action commenced in this locality, but looking at the enormous depth of the surround- ing sea it is clear that a vast period of tine must have elapsed to allow of a great mountain reaching the surface and then rising several thousand fect into the air. Again, considering the com- paratively feeble agents for effecting the work of denudation (neither glaciers nor thick accumulations of alpine snow being found here), and then the enormous erosion that has actually taken place, the inference is inevitable that a very great lapse of time was required to excavate the deep and wide ravines that everywhere intersect the island. Nor is anything known as to the period of the cessation of volcanic action. At the present day there are uo live craters, or smoking crevices, as

at the Canaries and Cape Verds, nor any hot springs, as at the Azores. On the slopes mich descend from the central ridge to the sea, especially in the neigbourhood of Funchal, there are many hills with conical shapes of more or less regularity, which seem to have been formed at a comparatively modern epoch. Volcanic cinders and slag are lying upon several of them, which look as if they had been thrown out of a furnace yesterday. Yet round the base of others there may be traced streams of lava flowing from a higher source, and showing that, subsequent to the con- struction of these lateral cones, modern as they look, molten imatter issued from higher vents, which assumed, on cooling, the character of ordinary compact basalt.

If we examine the general configuration of Madeira, we shall see a mountain chain, about 30 miles in length, running east and west, and throwing off lateral ridges, that give it an extreme breadth of about 12 miles. Peaks rise about the middle to a height of more than 6030 feet ; and deep ravines, lying between the lateral ridges, strike for the most part north and south from the central ridge to the sea. In the sections afforded by the ravines, the nucleus of the island is seen to consist of a confused mass of more or less stratified rock, upon which rest beds of tuff, scorie, and lava, in the shape of basalt, trap, and trachyte, the whole traversed by dykes. These beds are thinnest near the eentral axis ; as they approach the coast they become thicker and less intersected by dykes. At the centre of the island there are several summits of nearly the same altitude,

ani these are in some places connected by narrow walls and ridges, which are frequently quite impassable, whilst at others they are separated by ravines of great depth. On all sides are seen vertical dykes, projecting like turrets above the weathered surface of the softer beds. In various parts of the island may be seen elevated tracts of com- ae level ground. These are supposed to have been formed y the meeting of numerous streains of lava flowing from cones and points of eruption in close proximity, various ejectamenta assisting at the same time to fill up inequalities. Deep down in some of the lateral ravines may be seen ancient cones of eruption which have been overwhelmed by streams of melted matter issuing from the eentral region, and afterwards exposed to view by the same eauses that excavated the ravines. These ravines may be regarded as having been formed at first by subterranean niovements, both gradual and violent, which

dislocated the rocks, and cut clefts through which streams flowed to the sea. In course of time the waters, periodically swollen by melted snows and the copious rains of winter, would cut deeper and deeper into the heart of the mountains, and would undermine the lateral cliffs, until the valleys became as large as we now find them. Even the Curral, which,

fron its rounded shape and its position in the centre of the island, has been usually deemed the ruins of a crater, 1s thought to be nothing more than a valley scooped out in the way described. The rarity of crateriform cavities in Madeira is very remarkable. There exists, however, to the east of Funchal, on a tract 2000 feet high, the Lagoa, a sinall but perfect crater, 500 feet in diameter, and with a depth of 150 feet; and there is another, which is a double one, in the district known as Fanal, in the north-west of Madeira, nearly 5000 feet above the sea. ‘The basalt of which much of the outer part of the island is composed is of a dark colour and a tough texture, with small disseminated crystals of olivine and augite. It is sometimes full of vesicular cavities, formed by the expansion of imprisoned gases. A rndely columnar structure is very often seen in the basalt, but there is nothing so perfect as the columns of Staffa or the Giant’s Causeway. The trachytic rocks are small in quantity eompared with those of the basaltic class. The tufa is soft and friable, and generally of a yellow colour ; but where it has been overflowed by a hot stream of lava it has assumed a red colour. Black ashes and fragments of pumice are sometimes found in the tufaceous strata.

The mineral contents of the rocks of Madeira are unimportant. There are no metallic ores, nor has any sulphur been found ; but a little iron pyrites and specular iton are occasionally met with. The basalt yiclds an excellent building-stone, various qualitics of which are quarried near Cama dos Lobos, 5 or 6 miles west of Fun- chal.

At Porto Santo the trachytic rocks bear a much greater proportion to the basaltic than in Madeira. An adjacent islet is formed of tuffs and calcareons rock, indicating a submarine origin, upon which supramarine lavas have been poured. The older serics contains corals and shells (also of the Miocene Tertiary epoch), with water-worn pebbles, cemented together by carbonate of lime, the whole appearing to have been a coral reef near an

ancient beach. The calcareous rock is taken in large quantities to Funchal, to be burnt into lime for bnilding purposes.

Porto Santo.—This forms a single concelho and parish, about 25 geographical miles north-east of Madeira. It has a length of 64 geographical miles and a width of 8. A stationary population of about 1750 persons inhabits 435 houses, chiefly collected at one spot known as the Villa, where a lieutenant-governor resides. The island is very unproductive, water being scarce and wood wholly absent. Around the little town there is a considerable tract of pretty level ground covered by calcareous sand containing fossil land shells. At cach end of the island there are hills, of which Pico do Facho, the highest, reaches the altitude of 1600 feet. Barley, but little else, is grown here, the limited requirements of the in- habitants being supplied from Funchal by means of small sailing vessels.

Tuer DrsEerTAs.—These are three uninhabited rocks lying about 11 miles south-east of Madeira. They are not easily accessible, as they present lofty preeipices to the sea on all sides. Rabbits and goats abound on them. The archil weed grows on the rocks, and is gathered for exportation. The largest islet is 6} miles long, and attains the height of 2000 feet. These rocks are conspicuous objects in the sea-views from Funchal.

MADISON, a city of the United States, the county seat of Jefferson county, Indiana, is situated on the north bank of the Ohio, 90 miles below Cincinnati, and 44 above Louisville, with which it has daily steamboat communica- tion. As the terminus of one of the divisions of the Jeffersonville, Madison, and Indianapolis Railroad, Madison commands extensive means of traffic; and its provision trade especially has attained important dimensions. Pork- packing is also carried on, and brass and iron foundries, tanneries, and flour-mills appear among the industrial establishments. The population was 8012 in 1850, 8130 in 1860, 10,709 in 1870, and 8945 in 1880.

MADISON, a city of the United States, the capital of Wisconsin, and seat of justice of Dane county, lies towards the south of the State, in 43° 4’ N. lat. and 89° 21’ W. long., 75 miles west of Milwaukee. In the beauty of its situation it las few rivals, occupying as it does the undulating isthmus between Mendota and Menona, two of the lakes which give name to the

Four Lake Region, con- nected with the Mississippi by Yahara or Catfish river and Rock river; and the cool summer climate, which it owes to the fact that it stands 788 feet above the level of the sea, and 210 feet above Lake Michigan, renders it a health resort of some value, especially for consumptive patients. The State capitol, situated in the midst of a finely wooded

park of 13 acres, is a rather imposing but hybrid edifice of white limestcne crowned by a central dome rising 200 feet above the level of the basement; it was originally built in room of an earlier capitol in 1860, at a cost of -$400,000, and has since been greatly enlarged. About a mile to the west of the capitol stand, on the high grounds known as College hill, the buildings of the Wisconsin university, an institution dating from 1850, and attended by about eight hundred students. Other buildings of note are tle United States post-office and court-house, thie soldiers' orphans' home, and at some distance from the city the State lunatic asylum. The Wisconsin Historical Society has a library of 58,000 volumes. Various lines belonging to the Chicago and North-Western Railway and to the Chicago, Milwaukee, and St Paul Railway meet at Madison ; and the city has not only a good general trade, but manufactures ploughs and other agricultural implements, waggons, woollen goods, and flour. The population, which was only 1525 in 1850, appears in the three later censuses as 6611, 9176, and 10,325. When tlie site was selected (1836) for the capital of the territory of Wisconsin it was altogether unoccupied.

MADISON, Jamzs (1751-1836), fourth president of the United States, was born in King George county, Virginia, on the 16th of March 1751, during a temporary visit of his mother to her relatives. His father was the owner of large landed estates in Orange county, Virginia, and was a man of distinction in the county. In 1769 Madison entered Princeton College in New Jersey, and graduated as B.A. in 1771; but he remained another year at Princeton study- ing under the direction of President Witherspoon. His close application to study had seriously impaired his health, which continued delicate for many years. Returning to Virginia in 1772, he pursued his reading and studies, how- ever, with the same zeal as before,

the subjects chosen being particularly those of philosophy, theology, and law.

Madison had as yet taken no active part in the exciting politics of the time. In 1775, however, he was chairman of the committee of public safety for Orange county, aud in the spring of 1776 he was cliosen a delegate to the new Virginia convention, which formed a constitution for the State. Failing to be re-elected in 1777, he was chosen in that year a member of the council of State, in which he took a prominent part until the end of 1779, at which time he was elected a delegate to the Continental Congress, later the Congress of the Confederation. It was in this assembly that Madison first displayed those powers which ultimately made him the founder of tle constitution of the United States. He was in Congress during the final stages of the revolutionary war, and one year after the establishment of peace, at a time when the confederation was in a chronic state of collapse, occasioned by the neglect or the refusal of the States to respond to the requisitions of Congress for supplies for the federal treasury, Madison was among the first to advocate the granting of additional powers to Congress. In 1781 he favoured the amendment of the articles of confederation, giving to Congress the power to enforce its requisitions ; and in 1783 he zealously advocated the proposed plan by which the States should grant to Congress for a period of twenty-five years the authority to levy an impost duty. Accompanying this plan was an address to the States drawn up by Madison. This address is one of the ablest of his state papers, and with others of this period placed him in the front rank of American statesmen.

In November 1783, the constitutional limit of his term as deputy having expired, Madison returned to Virginia, and the next year he again took a seat in the legisla- ture of that State. As chairman of the judiciary committee, he was particularly instrumental in revising the statute

laws of the State. He opposed the further issue of paper money by the State, and tried to induce the legislature to repeal the law confiscating British debts.

As a member of the legislature of Virginia, Madison did not lose sight of the interests of the confederacy. He looked beyond mere local interests, believing that the highest good of the State would best be advanced through a respected central Government. Virginia and Maryland possessing 2 common jurisdiction over the waters of the Potomac river and the Chesapeak Bay, it became necessary to come.to some agreement between them as to the com- merce and navigation upon those waters. On Madison's proposal, commissioners of the two States met at Mount Vernon in March 1785. Maryland having proposed to invite the States of Pennsylvania and Delaware to join in the arrangement, Madison saw an opportunity for a more: extended and general concert in regard to commerce and trade, and proposed that all the States should be invited to send conimissioners to take into consideration the trade of the United States. This resolution was adopted by the legislature of Virginia; and thus was inaugurated the move- ment which led to the meeting at Annapolis in 1786, and later to tle convention at Philadelphia in 1787. The palpable defects in the government of the confederation had led Madison to make an extended study of con- federacies, ancient and modern. Among his papers was found one bearing the title Votes on Confederacies, but he gave the results of these researches more at length in Nos. 17, 18, and 19 of The Federalist. His conclusion was that no confederacy could be long successful which acted upon States only, and not directly upon individuals.

As the time for the meeting of the convention approached, he drew up an outline of a new system of government to take the place of the articles of confederation.

As expressed in a letter to Gencral Washington of the 16th of April 1787, it was in substance that the individual sovereignty of the States is totally irreconcilable with the aggregate sovereignty, and that a consolidation of the whole into one simple republic would be as inexpedient as it was unattainable. Hc sought therefore some middle ground, which might at once support a due supremacy of the national authority and not exclude ths local authorities when- ever they might be subordinately useful. He proposed, to this end, to change the basis of representation in Congress from States to the population.

The national government should have authority in all cases requiring uniformity. In addition to this positive power, the national government should have a negative on all State laws "'as heretofore exercised by the kingly prerogative." This negative,

he thought, would best be vested in the senate, which should be a comparatively permanent body.

The national supremacy should extend to the judiciary depart- ment and to the inilitia. The legislature should be composed of two branches—one, the more numerous, clected fora short term, the other, few in number, for a longer term. A national executive should be provided for, and the States should be guaranteed against both internal and external dangers. The right of coercion should be expressly declared. ''But the difficulty and awkwardness of operating by force on the collective will of a State rendered it desirable that the necessity of it should be precluded." He thought the negative on State laws might answer the purpose. This was a weak point in Madison's theory of government. He thought, with Jefferson, that there could be found some means of governing without resorting to force. Lastly, ''to give the new system its proper validity and energy, a ratification must be obtained from the people, and not merely from the legislatures."

These ideas, somewhat modified and extended in details, formed the Virginia plan of government, presented in the convention by Edmund Randolph; and this plan, again, became the basis of the extended deliberations in the con- vention which resulted in the constitution adopted in that body on the 17th of September 1787. In the convention, as a delegate from Virginia, Madison took a leading part in the debates, of which he kept notes which were afterwards published by order of Congress. It was his influence which largely shaped the form of the final draft of the constitution. But the labour was not finished with this draft; the con-

stitution was yet to be accepted by the people; that it was accepted was due in an eminent degree to the efforts of Madison. In order to place the new constitution before the people in its true light, and to meet objections brought against it, he joined Hamilton and Jay in the publication of a series

of essays, which were published in a collected form in 1788 under the name of Zhe Federalist, and which are still worthy of careful study.

In the Virginia convention for ratifying the constitution he was again called upon to defend that instrument, and against such staunch patriots as Patrick Henry and George Mason. Madison here appeared at his best. He answered every objection in detail, calmly, yet with an eloquence and zeal that carried conviction to his audience. The result was a victory against an adverse public opinion, as well as against the eloquence of his opponents,

Although he remained in the public service for nearly twenty-five years longer, his greatest work was finished with the adoption of the constitution. He had gained the well-earned title of “ father of the constitution.” The part he had taken, however, alicnated from him the support of a majority of the people of his State. He was defeated as a candidate for United States senate, though le was chosen in his own district as representative to Congress. Taking his seat in the Lower House in April 1789, he assumed a leading part in the legislation necessary to the organization of the new government. To Hamilton’s measures, how- ever, for the funding of the debt, the assumption of the State debts, and the establishment of a national bank, he was opposcd. On other questions, too, he sided with the Anti-Federalists, and gradually assumed the leadership of the opposition in the House of Representatives.

One would have expected to find him advocating with Washington, Hamilton, Marshall, Jay, and others those measures which would strengthen still more the federal government. On the contrary, we find him labouring to confine the powers of the national government within the narrowest possible limits.

Much has been said in regard to Madison’s change of principles at this time. Ithas been intimated that he was influenced, perhaps unconsciously, by the decided attitude of his State, but especially by the dominating mind of his most intimate friend, Jefferson. Probably there is something of truth in this charge, yet it must be said that Madison had shown on many previous occasions an aversion to a liberal construction of granted powers. Timid by nature, he was frightened at the bold and com- prehensive measures of the secretary of the treasury. He thought he saw in them a constructive latitude

of inter- pretation and a centralization of interests dangerous to republican principles.

Madison opposed also the foreign policy of the adminis- tration in 1793-96, in its attempts to maintain a neutral position between Great Britain and France, then at war with each other. And under the signature of “ Helvidius ” he published in the public journals five papers of great power and acuteness, criticizing the ‘ monarchical preroga- tive of the executive” as exercised in the proclamation of neutrality of 1793, and the right of the recognition by the president of foreign states. So far as the question of inter- national law was concerned, Madison was essentially right, but in regard to the authority of the executive, and the question of the expediency of Washington’s neutral policy, the subsequent practice of the Government and the general verdict of history condemn his view. In 1794 Madison introduced in the House of Representatives resolutions based upon Jefferson’s report on commerce, advising retaliatory measures against Great Britain and a discrimi- nation in commercial and navigation laws in favour of France. Again, in 1796 he strenuously opposed the

appropriation of money for tlie purpose of carrying into effect the treaty of 1794 with Great Britain. He scouted the idea as visionary that Great Britain would go to war on a refusal to carry the treaty into effect. It was not conceivable, he thought, that she would “make war upon a country which was the best market she had for her manu- factures.” It had been a favourite theory with Madison, as with Jefferson, that foreign nations could be coerced through their commercial interests. The fallacy of this doctrine was well exemplified by its utter inefficiency when put in practice by them in 1807-12.

In 1797 Madison withdrew to private life, though not to a life of inactivity. In 1798 he was induced by Jefferson to join in a movement in opposition to the Alien and Sedition Laws passed by the Federalists in that year, and was himself the author of the Virginia resolutions, which declared—

“That the constitution of the United States was a compact, to which the States were parties, granting limited powers of govern- ment; that in case of

a deliberate, palpable, and dangerous exer- cise of other powers, not granted by the compact, the States had the right, and were in duty bound, to interpose for arresting the pro- gress of the evils and for maintaining within their respective limits, the authorities, rights, and liberties pertaining to them ; that the Alien and Sedition Laws were such infractions of the compact ;... . and finally that the State of Virginia declared those laws unconstitutional and not law, but utterly null, void, and of no effect, and invited the other States to join her in this action."

These resolutions, with those of Kentucky drawn by Jefferson, met with decided objections from the other States. Upon these objections Madison made a report to the legislature of Virginia, consisting of an elaborate and carefully considered argument sustaining in every point the resolutions of 1798. Thirty years later these argu- ments were freely made use of by Calhoun and his school of nullifiers as the basis of their doctrine. But Madison, in 1830, repudiated the idea that the resolutions of 1798 involved the principles of nullification. He wrote at that time many letters to public men, and especially one to Edward Everett, in August 1830, to prove this position. The nullifiers were not convinced, however, by this reason- ing, and continued to use his arguments in favour of their doctrine, till it became a source of great annoyance to him.

With the rise of the republican party to power in 1801, Madison became secretary of state in Jefferson's cabinet,— a position for which he was well fitted both by his tempera- ment and his training, well versed as he was in constitu- tional and international law, and practising a calmness and fairness in discussion which are essential qualities of the diplomatist. In defending the neutral rights of the United States against the encroachments of European belligerents (1801-9), there was almost constant need of the use of all those qualities. The most important of his papers during this period was An Zxamination of the British Doctrine which subjects to capture a neutral trade not open in time of peace, that is, the so-called "rule of the war of 1756," as extended by Great Britain in 1793 and 1803. This treatise, published in 1806, was an argument against the British doctrine, drawn from a careful inves- tigation of authorities on international law, and was a valuable contribution to the discussion of a question which, for various reasons, has now lost its importance.

In 1809 Madison was elected president to succeed Jefferson, whose peace policy—a policy of commercial re- strictions to coerce Great Britain and France—he con- tinued to follow until, in 1812, he was forced by his party to change it for a policy of war. He had been, under the lead of Jefferson, a great lieutenant; he had for the most part furnished the arguments in support of the republican policy since 1790; but he did not possess the qualities of a leader. His cabinet was in part forced upon him in 1809 by a senatorial clique, and his administration lacked vigour,

particularly during the war of 1812-15. He had never been a partisan in politics, and was averse to forcing his views upon others, except in so far as he could do so by impartial arguments. In argument, he was not satisfied witli generalities ; his reasoning went to the foundation of principles—to the minutest details, sometimes almost pain- fully so. is analysis of the arguments was powerful and searching. In this he resembled Hamilton; but his con- clusions were reached through a laborious process of induc- tion, whilst those of Hamilton seemed more the result of intuition. Madison, moreover, lacked Hamilton's boldness of conception and courage in assuming the responsibility of his theories. The difference between them was the difference between great talent and genius.

Madison served two terms as president, and in 1817 retired to Montpellier, his country seat in Virginia. For nearly twenty years thereafter le was engaged inagricultural pursuits, but was ever interested in literature and politics. To the time of his death he continued to be consulted by statesmen as an oracle on all constitutional questions.

In character he was mild and conciliatory ; and, whether in power or in opposition, he never lost the friendship or confidence of his political opponents. His death occurred on the 28th of June 1836.

His Letters and Writings, in 4 vols., were published by order of Congress in 1865. Zhe Madison Paper's, a report of debates during the Congress of the Confederation, and reports of debates in the Federal Convention, were also published by order of Congress. The History of the Life and Times of Madison, by William C. Rives, in 8 vols., comes down only to 1794.

MADRAS, a presidency of British India, occupying, with its dependencies, the entire south of the Indian peninsula, and washed on the east by the Bay of Bengal and on the west by the Indian Ocean. The north boundary is extremely irregular. On the extreme north-east is the Bengal province of Orissa; then the wild highlands of the Central Provinces ; next the dominions of the niz4m of Hyderabad ; and lastly, on the north-west, the Bombay districts of Dharw4r and North Kanara. The extreme length from north-east to south-west is about 950 miles, and the breadth 450 miles; the area of the British districts (1879) is 138,856 square miles, and the population in 1871 was 31,672,613. The five native states attached to Madras—Travancore, Cochin, Puducottah, Banganapalli, and Sandur—have an additional area of 9818 square miles, anda population of 3,289,392, making a grand total area of 148,674 square miles, with a population of 34,962,005.

General Aspect.—From a physical point of view, the Madras presidency may be roughly divided into three tracts —(1) the long and broad east const, (2) the shorter and narrower west coast, and (3) the high interior table-land. These divisions are determined by the great mountain ranges of the Eastern and Western Ghats. The Eastern Ghats form a continuation of the confused hill system of Chutid Nagpur. They run in a south-west direction through almost the entire length of Madras until they lose theniselves in the Nilgiris, and there join the Western Ghats. Their average height is only 1500 feet, and for the most part they leave a broad expanse of low land between their base and the sea; their line is pierced by three great rivers—the Godavari, Kistna, and Kaveri (Cauvery). The Western Ghats stretch continuously along the shore of the Indian Ocean. Rising steeply at a distance of from 30 to 50 miles from the coast, they catch almost the whole rain- fall of the monsoon; and within Madras territory not a single stream breaks through their barrier. Some of the peaks attain an elevation of more than 5000 feet. Between these two ranges lies the central table-land, with an eleva- tion of from 1000 to 3000 feet, which includes the whole of Mysore, and extends over about half a dozen districts of Madras. The three principal rivers above-mentioned, each

having a large tributary system, all rise in the Western Ghats, and run across the peninsula in a south-east direction into the Bay of Bengal. In the upper parts of their course they drain rather than water the country through which they flow, and are comparatively valueless either for navigation or for irrigation; but before reaching the sea they spread over alluvial deltas. Other but smaller rivers of the same character are the North and South Penuar or Ponniyar, Palar, Vaigai, Vellar, and Tambraparni. The two main hill systems have been already described (see GuAts, vol. x. p. 559). The Nilgiris, which join these, culminate in Dodabetta (8640 feet), the loftiest peak in southern India. There are, besides, many outlying spurs and tangled masses of hills, of which the Shevaroys, Ana- malais, and the Palnis are the most important. The principal lake in the presidency is that of Pulicat on the east coast, which is 33 miles from north to south, and forms an important means of communication between Madras city and the north districts. On the west coast are a remarkable series of backwaters or lagoons, fringing the seaboard of Kanara, Malabar, and Travancore. The largest is the backwater of Cochin, which extends for a distance of 120 miles from north to south.

The mineral wealth of the province is as yet undeveloped. Tron of excellent quality has been smelted by native smiths in many localities from time immemorial; but attempts to work the beds after European methods have hitherto proved unsuccessful. Carboniferous sandstone extends across the Godavari valley as far as Ellore, but the coal has been found to be of inferior quality. Scientific researches have proved the existence of gold in the Nilgiris, in suf- ficient quantity to render outlay on it profitable; and several companies, representing a large amount of capital, have been formed for working the mines. Among other minerals may be mentioned manganese in the Nilgiris and Bellary ; copper and lead ores in many parts of the Eastern Ghats ; antimony and silver; and corundum in the valley of the Kaveri. Garnets are abundant in the sandstone of the Northern Circars, and diamonds of moderate value are found in the same region. Stone and gravel quarries are very numerous. 3

The Forest Department of Madras was first organized in 1856, and it is estimated that forests cover a total area of more than 5000 square miles, the whole of which is under conservancy rules. For supplying fuel to the railways an area of about 160,000 acres is strictly conserved. In the

remaining forests, after supplying local wants, timber is either sold direct by the department, or licences are granted to wood-cutters. The more valuable timber-trees comprise teak, ebony, rosewood, sandal-wood, and redwood. The Government plantations cover an area of 9000 acres. The trees thus artificially reared are teak, sandal-wood, Casuarina, and Eucalyptus. The finest teak plantation (over 3000 acres) is near Beypur in Malabar. At Mudumalli there are plantations of both teak and sandal- wood; and the Hucalyptus or Australian gum-tree now grows on the Nilgiris in magnificent clumps. The total value of timber and wood exported was £95,801 in 1875-76, and £122,413 in 1880-81.

The wild animals are those for the most part common to the rest of India. Those deserving mention are the elephant, bison, sambur, and ibex of the Western Ghats and the Nilgiris. Bison are also found in the hill tracts of the Northern Circars. In Travancore state the black variety of leopard is not uncommon. In 1880-81 182 persons and 11,628 cattle were returned as killed by wild beasts. ‘The number of persons killed by snake-bites in 1880 was 928. The elephant is now protected by law from indiscriminate destruction. The agricultural re- turns for 1880-81 report the number of buffaloes as

1,324,435, bullocks 3,228,907, cows 2,873,979, goats 2,803,407, sheep 4,082,411, horses 8986, and elephants 532. The cattle are small, but in Nellore and along the Mysore frontier a superior breed is carefully kept up by the wealthier farmers. The best buffaloes are imported from the Bombay district of Dharwdr. Experiments in sheep breeding have been made at the Saiddpet model farm, with fair success,

Population.—The first census, in 1822, returned the population as 18,476,923, and an enumeration in 1866-67 gave 26,539,052. The census of November 1871, however, was the first conducted in regular form. The following table gives the results for the British districts of the presidency. According to the preliminary return the total population at the census in 1871 was 30,839,181 (15,242,122 males and 15,597,059 females). This would seem to

show that the loss caused by the famine of 1876-78 has been nearly made up.

Area, Population, &e., of Madras Presidency in 1871.

Inhab. pe Sq. Mile.

Popula-

Name of District. lone

Sq. Miles.| Villages. | Houses,

341,404 489,419 389,712 982,358

COMING is vesencacvosce cess

1,520,088

Vizagapatam …

2,159,199 1,592,939 1,452,374 1,376,811 1,351,194 1,668,006 959,640 938,184 2,015,278 1,755,817 1,973,731 1,200,408 2,266,615

403,803 | 1,693,959 361,109 | 1,763,274

13,922 49,501

391,519 | 1,966,995 184,569 | 918,362 435,462 | 2,261,250

51,741 397,552

6,229,954 |31,281,177

263,820 339,063 351,943 205,884 141,434 329,844 228,761 369,984 210,690 443,513

Chengalpat ….. North Areot . South Arcot . Tanjore …..... Trichinopoli . Madura …....0

138,318

Hindus numbered 28, 863,978 ; Mohammedans, 1,857,857; Chris- tians, 538,760 ; Jains, 21,254; and ‘‘ others,” 4828. The Hindus (92°3 per cent. of the whole) are subdivided into 16,159,610 Sivaites, 11,657,311 Vishnuvites, 154,989 Lingdyats, and 892,068 ‘‘ others,” including hill tribes. The Sivaites are most numerous in the extreme south and on the west coast, while the Vishnuvites are chiefly found in the northern districts. The Lingdyats may be described as a sect of Sivaite puritans, who derive their name from their practice of carrying about on their persons the lingd or emblem of Siva. Of Hindu castes, Brahmans number 1,094,455. They follow various pursuits, and many of them are said to be recent immigrants, who came south in the train of the Mahratta armies, A peculiar caste of Brdhmans, called Namburi, is found in Malabar, who are said to be descended from fishermen. The Kshattriyas, or warrior caste of the ancient Hindu organization, number only 190,415. The three trading castes of Chettis, Beri Chettis, and Komatis number 714,712, and except in Kanara district still retain in their hands nearly all the commerce of the country, Agricul- tural castes number 7,826,127 ; the highest classes among them do not cultivate with their own hands, and many of them formerly held their lands on a military tenure. The pastoral castes number 1,730,681, buta large proportion of them have now abandoned their hereditary occupation. Artisans number 785,085, of whom nearly one-half are workers in metal. Weavers number 1,017,781, but their industry is now decayed owing to Manchester competition. The labouring castes are returned at 3,944,463. Fishing and hunting castes number 971,837, but many have now betaken them- selves to agriculture. The palm cultivators and toddy makers amount to 1,664,862. Out-castes (Pariahs) number 4,761,503 ; in the country round Madras they form about one-quarter of the total ‘population. Up to the close of the last century they lived in a state of slavery to the superior castes ; and they are still compelled by custom to live in separate hovels outside the boundary of the village, and to perform all menial services. laborious, frugal, pleasure-loving people, omnivorous in diet, and capable of performing much hard work. Unclassified Hindus (2,666,890) consist of aboriginal hill races and wandering tribes. Numerically the most important are the Kandhs and Sauras, two cognate races who inhabit the mountainous tracts of the Eastern Ghats attached to several of the large zaminddris of

Ganjam and Vizagapatam. On the Nilgiris, the aboriginal tribe best known to Europeans is the Todas, a stalwart, haughty race, who domineer over the more timid jungle folk, and confine themselves to the pasturing

They are described as a.

of buffaloes. It is believed that the Todas are now dying out, for in 1871 they numbered only 698. The principal wandering tribes are the Brinjaris and Lambadis, who are to be found in all parts of the country as carriers of grain and salt.

The Mohammedans are thus subdivided:—Sunnis, 1,654,529 ; Shias, 69,302; Wahhabis, 3954; unspecified, 130,072. A more familiar division is a race one :—Labbay, Mopla, Arab, Shaikh, Sayyid, Pathan, and Mughal. The Labbays (312,088) are the de- scendants of Hindu converts, and are traders by hereditary occu- pation, although many now cmploy themselves as sailors and fishermen. The Moplas (612,789) are the descendants of Malayalam converts to Islam,—the head of the tribe, the raja of Kananur, being descended from a fisher family in Malabar. They are a hard- working, frugal people, but quite uneducated and very fanatical, and under the influence of religious excitement have often disturbed. the public peace. The Shaikhs number 511,112, the Sayyids 89,219, the Pathans 70,943, and the Mughals 12,407.

Christians are more numerous in Madras than in any other part of India. They number in the British districts 533,760, of whom 40,879 are Europeans or Eurasians, and the remainder native con- verts ; Roman Catholics number 397,071, and Protestants 93,228. In Travancore and Cochin states the native Christians are still moro numerous, constituting as much as one-fourth of the population. The Roman Catholics, whose number throughout southern India is estimated at upwards of 650,000, owe their origin to St Fran- cis Xavier, and the famous Jesuit mission of Madura; they are partly under the authority of the archbishop of Goa, and partly under twelve Jesuit vicariates. Protestant missions date from the beginning of the last century. The Danes were the pionccrs ; but their work was taken up by the Society for Promoting Christian Knowledge, under whom laboured the

great Lutherans of the last century—Schultz, Sartorius, Fabricius, and Schwartz. The Church Missionary Society entered the field in 1814 ; and subsequently an American mission joined in the work. The total number of Protestant native Christians in southern India (British and native) in 1878 was 296,408.

Urban life may be said to be more highly developed in Madras than in Bengal or Bombay. Populous cities, indeed, are not numerous, but there is an unusual proportion of towns with from 2000 to 20,000 inhabitants. The six cities with a population of more than 50,000 are—Madras city (1871), 397,552; Trichinopoli, 76,530; Tanjore, 52,175; Madura, 51,987; Bellary, 51,766; Salem, 50,012.

Agriculture.—Over the greater part of the area of Madras arti- ficial irrigation is impossible, and cultivation is dependent upon the local rainfall, which rarely exceeds 40 inches a year, and is liable to fall irregularly. The Malabar coast is the only part where the rainfall brought by the south-west monsoon may be trusted both for its amount and regularity. Other districts, such as Bellary, are also dependent upon this monsoon, but in their case the rain clouds have spent themselves in passing over the Western Ghats, and cultivation becomes a matter of hazard. Over the greater part of the presidency the rainy season is caused by the south-east monsoon, which breaks about the end of September. The deltas of the Godavari, Kistna, and Kaveri rivers are the only spots on the east coast which artificial irrigation is able to save from risk of occasional scarcity, Of the total cultivated area about 80 per cent. is returned as ‘‘dry” land, or that which is solely dependent upon local rainfall ; 15 per cent. as ‘‘ wet” land, irrigated from river channels ; 2 per cent. as garden land irrigated from wells ; and about 3 per cent. fallow and pasture. The principal food staples are ricc, cholam, kambu, ragi, and varagu. The most common oil- seedisgingelly. Garden crops comprise tobacco, sugar-cane, chillics, betel-leaf, and plantains. ‘he fruit trees are cocoa-nut, areca-nut, date and palmyra palm, jack, tamarind, and mango, Special crops include cotton, indigo, coffee, tea, cinchona. The principal coffee tract stretches along the slopes of the Western Ghats from the north” of Mysore almost down to Cape Comorin. The larger portion of this area lies within Mysore, Coorg, and Travancore states, but Wainad and the Nilgiri hills are within Madras. The first coffee plantation was opened in

the Wainad in 1840, Many of the early clearings proved unprofitable, and the enterprise made little pro- gress till about 1855, in which year the total exports were 32,000 ewts. Coffee, which is much cultivated on the Nilgiris, now covers in the whole presidency 131,348 acres. The tea plant was also in- troduced into the Nilgiri hills about 1840, but was not taken up as a commercial speculation till 1865. The area under tea is over 4000 acres, and the exports in 1880-81 were 263,940 ib. The cinchona plant was successfully introduced into the Nilgiri hills by Government in 1860. Jn 1880-81 847 acres were under cultiva- tion ; 1,087,637 plants were raiscd; and the receipts of sales were £39,618, the amount in 1875-76 being only £4989. Tobacco is extensively grown in Godavari and Kistna districts. ~~The greater part of the soil in Madras is held by the cultivators direct from Government under the tenure known as rdyatwari. The average rate of Government assessment is about 2s. 3d. per acre on unirri~~ gated and 9s. 6d. on irrigated land. In 4880-81 thc total revenue

from this source amounted to £4,170,052. Besides these lands in the hands of the Government, there are also proprietary or zaméin- dart estates in all parts of the eountry. These estates are either the remains of ancient principalities, which the holder cannot sell or eneumber beyond his own life interest, or they are creations of British rule and subjeet to the usual Hindu custom of partition. The total area of the zamétnddri estates is about 21 million acres, or one-fourth of the whole presidency. The peshkash or tribute pay- able to Goverument in perpetuity amounts to about £500,000 a year. Jndms, revenue-free or quit-rent grants of lands made for religious endowments or for services rendered to the state, occupy an aggregate area of a little over 1,500,000 aeres,

Manufactures,—Madras possesses few staple manufactures. The preparation of the coffee berry for export constitutes the one great business earried on by means of European capital and under Euro- pean supervision. Indigo is manufactured in eonsiderable quan- tities, but of inferior quality. The more important of the large manufactories are three eotton mills in Madras, a weaving estab- lishment maintained by the Basel mission in

South Kanara, sugar works in Ganjim and South Arcot, and a jute factory at Vizaga- patam. Up to the elose of the last century cotton goods consti- tuted the main article of export. Masulipatam, where the first English factory on the Coromandel coast was established in 1620, enjoyed a special.reputation for its chintzes, which were valued for the freshness and permaneney of their dyes. There is still a small demand for these artieles in Burmah, the Straits, and the Persian Gulf ; but Manchester goods have nearly beaten the Indian exporter out of the field. Native looms, however, still hold their own in the local market, in face of strenuous opposition. After weaving, working in metals appears to be the most widespread native in- dustry. Among local specialities which have attracted European curiosity may be mentioned the jewellery of Triechinopoli, orna- ments of ivory and horn worked at Vizagapatam, and sandal-wood earving at Kanara. The manufacture and sale of salt is a Govern- ment monopoly, earried on under elose supervision. The process employed is solar evaporation, and the entire eastern ecoast-line from Orissa to Cape Comorin affords natural facilities for the in- dustry. The preparation of arrack and toddy spirit is also a Government monopoly. On tho Nilgiri hills and at Bellary country beer is manufactured by European firms subject to an excise duty of 6d. per gallon.

Lailways.—Two guaranteed railway companies, the Madras and the South Indian, have their lines almost entirely within the presidency. The Madras Railway, whieh eonneets at Raiehur with the Great Indian Peninsular system, runs south-east to Madras, and then west across the peninsula to Beypur, with branches to Bellary and Bangalore. The total length open in 1881 was 858 miles; the eapital expended, £10,441,699 ; the net profits £177, 488, giving a dividend of 1°7 per eent. on the capital expended. The South Indian Railway (narrow guage) runs north from Tuticorin to Madras. In 1881 the total length was 658 miles; the capital expended, £4,291,311; and the net profits yielded a dividend of 2°9 per cent.

Commerce and Trade.—The continuous seaboard of the Madras presideney, without any natural harbours of the first rank, has tended to ereate a widely diffused trade. Madras city conducts nearly one-half of the total sea-borne commerce; next comes Malabar, containing the western railway terminus near Calieut ; then Goda- vari, with its eluster of ports along the fringe of the delta; ‘Tinnevelli, with the new harbour at Tuticorin, which has opened

large dealings with Ceylon; Tanjore, South Kanara, Ganjam, and Vizagapatam in the order given. The total foreign trade in 1880-81 was as follows. The imports amounted to £6,518,783, of which eotton picce goods and twist made up £2,908,379, grain £158,144, and apparel £147,691. The exports amounted to £9,271,345, tlie ehief items being—coffee, £1,393, 090; raw cotton, £939,127; hides and skins, £1,261,182 ; rice, £996,314 ; seeds, £708,390 ; indigo, £693,103; spices, £379,282; oils, £372,119; sugar, £301,670. The total number of vessels engaged in foreign trade that cleared and entered Madras ports in 1880-81 was 6247, with a tonnage of 1,177,337 ; the eoasting trade was conducted by 11,816 vessels, with 3,748,474 tons, for ports outside Madras presidency, and 24,057 vessels, with 8,092,286 tons, for ports within the pre- sidency. The importance of this active eoasting trade may be gathered from the fact that in 1876-77 (the first year of the late famine) the imports of grain suddenly rose to 652,850 tons, by far the greater part consisting of rice from Bengal.

Administration.—The supreme executive authority is vested in the governor, with a council of three members, of whom one is the commander-in-ehief ; the others belong to the covenanted civil serviee. For legislative purposes this eouneil is inereased by the presence of the advoeate-general and from four to eight other mem- bers nominated by the governor, of whom not less than one-half must be non-officials. The local administration is organized with the district or ztké as its unit. Of these distriets there are twenty- one in all, ineluding the Nilgiris and Madras eity, both of which occupy an exceptional position. Each of the remaining districts is

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under the jurisdiction of a collector-magistrate and a sessions judge. Beneath the collector-magistrate come deputy collectors, sub-col- leetors, and assistants. Lach district is subdivided into téluks, numbering one hundred and fifty-six in all, under the charge of a tahsildér. Hach téluk eomprises from fifty to one hundred villages, which eonstitute the ultimate units for fiscal and administrative purposes. The hereditary village officials, to be found in almost every Hindu village, are employed to perform minor public offices, revenue and judicial, and. are inadequately remunerated cither by fees in grain and other cesses levied from the villagers, or by a

reduction in their land assessment. The heads of villages and village accountants (karnam) collect and aeceount for all revenue, rates, and taxes within their respective villages or townships.

Loeal and municipal administration, including roads and com- munications, schools and primary education, public health and local endowments, together with special taxation levied for any of these purposes, is provided for by special legislation passed in 1871, Entire districts or, where these are of unmanageable size, parts of districts have been constituted local fund circles, each under the management of a board of eommissioners, of which the collector is ex officio president, and the district engineer, medical officer, and one or more civil officers are official members. With them are associ- ated at least an equal number of native non-official gentlemen, appointed by Government. To these boards is entrusted the entire management of the local interests above named, subject to the sub- mission of an annual budget for the sanetion of Government, and of a report of the board's transactions at the elose of each year. The twenty-one distriets of the presidency eomprise thirty-five sueh local fund circles. The sources of income at the disposal of these boards are a grant from provincial funds, a special land rate not exceeding one anna in the rupee of the Government assessment, tolls, school fees, loeal endowments, and other minor special funds. Munieipal administration of the larger towns is provided for by boards of town commissioners, constituted similarly to the local boards as regards official and non-official members, except that, with the consent of. Government, the latter may be eleeted by the rate- payers. Besides the above-named local interests, the commissioners manage the local sanitation and hospitals of the towns, registration of births and deaths, lighting, and police. About fifty towns, in- cluding Madras eity, with an aggregate population of 1,500,000, are provided with municipal administration, and the number is steadily inereasing. The funds at the disposal of the commissioners eonsist of rates on housesand lands, a tax on professions and trades, a wheel and animal tax, tolls and ferrics, sehool and market fees, &e. Under the administration of these loeal and municipal boards great impulse has been given to the developmeut of roads, educa- tion, and hospitals and dispensavies.

Revenue and Expenditure.—Down to 1871 every branch of revenue and expenditure throughout India was managed in all details by the Government of India. Under the decentralization scheme of that year the financial administration of the jail, police, and ainentiotal services, together with eertain branches of the medical, sanitary, and other minor services, were transferred to the Government of Madras, and a grant of a single fixed sum from the imperial funds was assigned for their maintenance, The local fund boards, deseribed above, were constituted in the same year, and the municipal administration improved. The provincial expenditure is almost entirely met by a grant from imperial funds ; and the local receipts benefit in a similar way by a subsidy from the imperial budget. The following figures show the revenue and expenditure under each head of finanee for the year 1880-81, exclusive of tlie charges under the heads of army, interest, and imperial publie works. (1) Imperial : total revenue, £8,526,451, of which about one- half, £4,284,335, is derived from the laud revenue, and £1,483,974 from salt; expenditure, £3,478,655, (2) Provincial: total revenue, £955,162, of whieh £781,990 forms the allotment from the imperial funds; expenditure, £971,011,—the main items being police, £376,356; law and justice, £105,962; public works, £142,187; edueation, £90,875. (3) Unfettered local funds: reeeipts, £24,768 ; eharges, £19,628. (4) Fettercd local funds: ineome, £748,315 ; expenditure, £729,746. (5) Municipal: total revenue, £137,364 ; expenditure, £129,525. The gross revenue of the presidency was £9,030,152, and the expenditure £6,893,960.

Army.—The Madras army garrisons, besides the whole of Madras proper, the adjoining state of Mysore, the Nizam’s Dominions, the Central Provinees, and British Burmah; a regiment is also usually stationed at Dorunda in the Chutia Nagpur division of Bengal, and another at Cuttack in Orissa. The entire foree consists of 1 regiment of European eavalry, 19 batteries of European artillery, and 8 regiments of European infantry, with 1 eompany of native sappers aud miners, 4 regiments of native eavalry, and 40 regiments of native infantry. In 1880-81 the European force numbered 10,229, and the native army 30,958 of all ranks. The military expenditure eharged against Madras in 1880-81 was £2,/22,105. The principal eantonments are Kampti, Secunderabad, Bangalore, Bellary, and Rangoon. St Thomas’s Mount near Madras eity is an important station for artillery. The two military sanatariums

are Ramandrug near Bellary, and Jakatala or Wellington in the Nilgiri hills.

Administrative Statistics.—An early task of the English ad- ministration was the repression of the system of black mail levied by bands of Kavilgars, which was not fully extinguished for many years. By a Government regulation in 1866 the village police was placed under the head of the village, and became practically the most useful (although a somewhat dishonest) agency of the magis- trate in the police administration. The Madras police force was organized in its present form in 1860. In March 1881 it consisted of a total strength of 26,415 officers and men, maintained at a cost of £364,233. In 1880 the total number of prisoners passing through the jails in the presidency was 27,708,—considcrably lIcss than during and after the famine ; the daily average number of prisoners was 12,202. Education was afforded in 1880-81 by 12,878 schools, attended by 327,808 pupils; the expenditure was £284,873, of which £86,641 was contributed by the state. The chief educa- tional institutions are the Madras university, the provincial college of Combaconum, the Madras Christian college, the Doveton Pro- testant college, 8. P. G. high school at Tanjore, medical college, civil engineering collegc, Lawrence asylum, school of agriculture, school of ordnance artificers and school of arts, and the military orphanage at Utakamand in memory of the late Sir Henry Lawrence.

Climate and Health.—The climate varices in different parts of the presidency, being determincd by the very diverse geographical conditions, The Nilgiri hills enjoy the climate of the temperate zouc, with a moderate rainfall, and a thermometer rarely exceed- ing 80° F., and sometimes falling to the freezing-point. On the Malabar coast the south-west monsoon brings an excessive rainfall, reaching 150 inches in the year at certain spots. Thc rain clouds hanging on the slope of the Westcrn Ghats somctimes obscure the sun for month after month. Along the eastern coast and on the cecntral table-lands the rainfall is comparatively low, but the heat of the summer months is excessive. At Masulipatam the thermo- incter frequently rises to above 110° F. in the shade. The whole coast of the Bay of Bengal is liable to disastrous cyclones, which not only wreck the shipping in the roads, but have rcpeatedly over- whelmed the low-lying ports. The most prevalent

diseases arc fevers, diarrhea, dysentery, and other bowel complaints, cholera, and simall-pox.

History.—Until the English conquest the whole of southern India had never acknowledged a single ruler. The difficult nature of the hill passes and the warlike character of the highland tribes forbade the growth of great empires, such as succéeded one another on the plains of Hindustan. ‘The Tamil country in the extreme south is traditionally divided between the three kingdoms of Pandya, Chola, and Chera, The west coast supplied the nucleus of a monarchy which afterwards cxtended over the highlands of Mysore, and took its name from the Carnatic. On the north-east the kings of Kalinga at onc time ruled over the entire line of sea- board from the Krishna to the Ganges. Hindu legend has preserved marvellous stories of these early dynasties, but our only authentic evidence consists in their inscriptions on stone and brass, and their noble architecture. The Mohammedan invader first established himsclf in the south in the beginning of the 14th century. Ala-ud- din, the sccond inonarch of the Khilji dynasty at Delhi, and his general Malik Kafur conquered the Deccan, and overthrew the kingdoms of Karnataka and Telingdna, which were then the most powerful in southern India. Butafter the withdrawal of the Musal- man armies the native monarchy of Vijayanagar arose out of the ruins. This dynasty gradually extended its dominions from sea to sea, and reached a pitch of prosperity before unknown. At last, in 1565, it was overwhelmed by a combination of the four Moham- medan principalities of the Deccan. At the close of the reign of Aurangzeb, although that emperor nominally cxtended his sove- reignty as far as Cape Comorin, in reality South India had again fallen under a number of rulers who owned no regular allegiance. The nizim of the Deccan, himself an independent sovercign, repre- sented the distant court of Delhi. The most powerful of his feudatories was the nawab of the Carnatic, with his capital at Arcot. In Tanjore, a descendant of Sivaji ruled ; and on the cen- tral table-land a Hindu chieftain was gradually establishing his authority and founding the state of Mysore, destincd soon to pass to a Mohammedan usurper.

Vasco da Gama cast anchor off Calicut on the 20th May 1498, and for a century the Portuguese retained in their control the commerce of India. The Dutch began to establish themselves on the ruin of the Portuguese at the

beginning of the 17th century, and were quickly followed by the English, who established them- selves at Calicut and Cranganore in 1616. Tellicherri became the

rincipal British emporium on the west coast of Madras. The ortuguese cventually retired to Goa, and the Dutch to the Spice Islands. The first English settlement on the east coast was in 1620, at Masulipatam, even then celebrated for its fabrics. Farther south a factory, the nucleus of Madras city, was erected in 1639. Pondicherri was purchased by the French in 1762. For many

years the English and French traders lived peacefully side by side, and with no ambition for territorial aggrandisement. The war of the Austrian succession in Europe lit the first flame of hostility on the Coromandel coast. In 1746 Madras was forced to surrender to Labourdonnais, and Fort St David remaincd the only British possession in southern India. By the peace of Aix-la-Chapelle Madras was restored to the English; but from this time the rivalry of the two nations was keen, and found its opportunities in the disputed successions which always fill a large place in Oriental politics. English influence was generally able to sccure the favour of the rulers of the Carnatic and Tanjore, while the French suc- ceeded in placing their own nominec on the throne at Hyderabad. At last Dupleix rose to be the temporary arbiter of the fate of southern India, but he was overthrown by Clive, whose defence of Arcot in 1751 forms the turning point in Indian history. In 1760 the crowning victory of Wandewash was won by Colonel (afterwards Sir Eyre) Coote, over Lally, and in the following ycar, despite help from Mysore, Pondicherri was captured.

Though the English had no longer any European rival, they had yet to deal with Mohammedan fanaticism and the warlike popula- tion of the highlands of Mysore. The dynasty founded by Hyder Ali, and terminating in his son Tipt Sultan, proved itself in four several wars, which terminated only in 1799, the most formidable antagonist which the English had ever encountered (see HyDER Att and Inpra). Since the beginning of the present century Madras has known no regular war, but occasional disturbances have ealled for measures of repression. The pdlegdrs or local chieftains long

clung to their independence after their country was ceded to the British. On the west coast, the feudal aristocracy of the Nairs, and the religious fanaticism of the Moplas, have morc than once led to rebellion and bloodshed. In the extreme north, the wild tribes occupying the hills of Ganjam and Vizagapatam have only latcly learned the habit of subordination. In 1836 the zaméinddri of Gumstr in this remote tract was attached by Government for the rebellious conduct of its chief. An inquiry then instituted revealed the wide prevalence among tlic tribe of Kandhs of human sacrifice, under the name of meriah. The practice has since been suppressed by a special agency.

The different territories comprising the Madras presidency have been acquired by the British at various dates. In 1763 the tract encircling Madras city, now Chengalpat district, was ceded by the nawab of Arcot. In 1765 the Northern Circars, out of which the French had recently been driven, were granted to the Company by the Mughal cmperor, but at the price of an annual tribute of £90,000. Full rights of dominion were not acquired till 1823, when the tribute was commuted for a lump payment. In 1792 Tipt was compelled to cede the Baramahal (now part of Salem district), Malabar, and Dindigal subdivision of Madura. In 1799, on the reconstruction of Mysore state after Tipt's death, Coimbatore and Kanara were appropriated as the British share ; and in the same year the Mahratta raja of Tanjore resigned the administration of his territory, though his descendant retained titular rank till 1855. In 1800 Bellary and Cuddapah were made over by the nizim of Hyderabad to defray the expense of an increased subsidiary force. In the following year the dominions of the nawab of the Carnatic, extending along the east coast almost continuously from Nellore to Tinnevelli, were resigned into the hands of the British by a puppet who had been put upon the throne forthe purpose. The last titular nawab of the Carnatic died in 1855 ; but his representative still bears the title of prince of Arcot, and is recognized as the first native nobleman in Madras. In 1838 the nawdb of Karnil was deposed for misgovernment and suspicion of treason, and his terri- tories annexed.

Manpras, capital of Madras presidency, is situated on the sea-coast in 13° 4' 8" N. lat., 80° 14' 51" E. long. Although at first sight the city presents a disappointing appearance, and possesses not a single handsome street, it has

several edifices of high architectural pretensions, and many spots of historical interest. Seen from the roadstead, the fort, a row of merchants' offices, a few spires and public buildings, are all that strike the eye. Roughly speaking, it consists of the following divisions. (1) Black Town, an ill-built, densely populated block, about a mile square, is the – business part of the town, and contains the banks, custom house, high court, and all the mercantile offices, The last, for the most part handsome structures, lie along the beach. On the sea-face of Black Town are the pier and the new harbour. Immediately south of Black Town there is (2) an open space which contains the fort, esplanade, brigade parade ground, Government house, and several handsome public buildings on the sea-face. (3) West and south of this lung of the city come a series of crowded quarters known by

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Plan of Madras.

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of Egmore, Nangambaikam, and Perambur, adorned with

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the west of Black Town are the quarters of Veperi and

Pudupet

Tiruvaleswarampet, which bend (4) Te

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handsome European mansions and their spacious “com- pounds” or parks. (5) South-west and south lie the European quarters of Tanampet and aristocratic Adyar. Amongst the buildings most deserving of notice for their architectural features are the cathedral, Scotch church, Government house, Patcheappah’s hall, senate house, Chepauk palace (now the Revenue Board), and the Central Railway station.

Nearly all the most important offices of the presidency, and the headquarters of every department, are located in Madras. Apart from the headquarters staff of the Madras army, that of the central division is also stationed here, with a garrison of 1 European and 3 native infantry regiments, 1 battery of artillery, and the bodyguard of the governor (100 sabres). At St Thomas's Mount are 3 bat- terles of artillery and a detachment of native infantry. Including these, the garrison of Madras is. about 3500 strong, of whom 1200 are Europeans.

The population of Madras city, as ascertained by the census of 1871, was 397,552, including 330,062 Hindus, 50,964 Mohammedans, 12,013 Eurasians, and 3613 Kuropeans. The annual municipal income is about £53,000. Madras, notwithstanding its exposed situation, ranks third among the ports of India in respect of the number and tonnage of vessels calling and the value of its imports and exports. The port trades with every part of the world, exporting coffee, cotton, grain, hides, indigo, oilseeds, dyes, sugar, and horns, and importing piece goods, iron and other metals, and all kinds of European manufactures. The lighthouse, 125 feet high, is visible from a ship's deck 15 miles at sea. The Madras roadstead, like the whole line of the western coast of India, is liable to be swept by hurricanes of irresistible fury, which occur at irregular intervals of years, generally at the beginning of the monsoons in May and October. The first recorded cyclone was in October 1746, a few weeks after the fort had surrendered to Labourdonnais. A French fleet then lay at anchor in the roads. Five large ships foundered, with 1200 men on board; and scarcely a single vessel escaped with its masts standing. Perhaps the most destructive of these storms occurred in May 1872. On this occasion the registered wind pressure reached a maximum of 53 tb to the square foot. In the space of a few hours nine English vessels and twenty native craft were driven ashore. In May 1874 another cyclone broke on the Madras coast, but the ships were warned in time to put to sea and gain an offing. The most recent of these periodical hurricanes occurred in November 1881, when the new harbour works sustained serious damage.

The trade of the town does not depend on any special local manufactures or produce. Such industries as once flourished—weaving, for instance—have decayed, and no others have grown up to replace them. As elsewhere in

India, spinning companies have recently been formed, but what effect they are likely to exercise on local trade remains to be seen. With the exception of banks, and enterprises connected with the preparation of produce for export, ¢.g., cotton-pressing and coffee-cleaning, joint-stock undertakings have not prospered. As the capital of southern India, Madras is the centre on which all the great military roads converge. It is also the terminal station of two lines of railway, the Madras line and the Madras and Tanjore section of the South Indian Railway.

The Buckingham Canal, which passes through an outlying part of the city, connects South Arcot district with Nellore and the Krishna and Godavari system of canal navigation. This long delayed project was undertaken as a famine work.

The town of Madras dates from 1639, when Francis Day, chief

of the East India Company's settlement at Armagon, obtained a grant of the present site of the city from the raja of Chandragiri.

A factory, with some slight fortifications, was at once constructed, and a gradually increasing population settled around its walls, In 1653 Madras, which had previously been subordinate to the scttle- ment of Bantam in Java, was raised to the rank of an independent presidency. In 1702 Daad Khan, Aurangzcb's general, blockaded the town for a few weeks, and in 1741 the Mahrattas unsuccess- fully attacked the plaee. In 1746 Labourdonnais bombarded and captured the fort. The settlement was restored to the English two years later by the treaty of Aix-la-Chapelle, but the government of the presidency did not return to Madras till 1762. In 1758 the French under Lally occupied the Black Town, and invested the fort. The siege was conducted on both sides with great skill and vigour. After two months, the arrival of a British flect relieved the garrison, and the besiegers retired with some precipitancy. With the exception of the threatening approach of Hyder Ali's horsemen in 1769, and again in 1780, Madras has since the French siege been free from external attack. The town of Saint Thomé, now part of Madras city, was founded and fortified by the Portu- guese in 1504, and was held by the French from 1672 to 1674.

MADRID, a province of Spain, one of the five into which New Castile is divided, is bounded on the W., N.W., and N. by Avila and Segovia, on the E. by Guadalajara, on the S.E. by Cuenca, and on the S. by Toledo. The area is 2997 square miles, with a population in 1877 of 593,775, an increase of 104,443 since 1860. Madrid belongs to the basin of the Tagus, being separated from that of the Douro by tlie Sierra Guadarrama, which skirts the province on the north-west and north. The Tagus itself is the southern boundary for some distance, its chief tributary being the Jarama, which rises in the Somosierra in the north, and terminates at Aranjuez. The Jarama, in turn, is joined by the Henares and Tajuiia on the left, and by the Lozoya and Manzanares on the right. The Guadarrama, another tributary of the Tagus, has its upper course within the province. Like the rest of Castile, Madrid is chiefly of Tertiary formation ; the soil is mostly clayey, and there are sandy tracts, Agriculture is in a somewhat backward condition; the rainfall is deficient, and the rivers, poor though they are, are not utilized as they might be for irrigation. The chief preducts are wheat, barley, rye, oats, algarrobas (Zrvum tetraspermum), pease, chick pease, and various other legumes, wine, oil, flax, hemp, wax, honey, and various fruits. Gardening is carried on to some extent near the capital, though the markets of Madrid receive their most liberal supply of fruits and vegetables from Valencia. Sheep, goats, and horned cattle are reared, and fish are found in the Jarama and other rivers. The province is on the whole treeless; but some wood is grown on the mountain slopes in the north, The Sierra Guadarrama has quarries of granite, lime, and gypsum, and is known to contain iron, copper, and argentiferous lead, but these resources are as yet unde- veloped. The manufactures are trifling (coarse cloth, leather, paper, earthenware, porcelain, bricks and _ tiles, saltpetre, glass and crystal, chocolate, lace); and there is very little commerce beyond that for the supply of the capital with necessaries. The only towns with a population above 10,000 are Alcalé (Complutum) on the Henares, and Madrid ; the famous university of the former was trans- ferred to the latter in 1836. Aranjuez (8154), on the Tagus, is also of historical importance.

MADRID, capital of the above province and of Spain, is situated in 40° 24’ 35” N. lat. and 3° 41’ 51” W. long., on the left bank of the Manzanares, a subtributary of the Tagus, at a maximum elevation of 2372 feet above the sea-level. The population (397,816 in 1877) was over 400,000 in 1881. The

town is nearly in the centre of the kingdom, almost equidistant from the Mediterranean, the Atlantic, and the Bay of Biscay. The site consists of some sandy hills of little elevation, in the midst of an extensive plain, bounded to the view on the north only by the Sierra Guadarrama. The basin in which it stands is of Tertiary formation, consisting of gypsum, marl, and limestone.

Owing to its elevated and exposed situation, the climate of Madrid has some marked peculiarities. In winter the mean temperature is 43° Fahr., and as many as sixteen degrees of frost have been observed ; the mean in summer is 76° Fahr., but a temperature of 107° has been registered ; and the daily oscillation sometimes amounts to as much as 57°. The readings in sun and shade at the same moment are also widely different. The tendency to inflammatory disorders in the population is, as might be expected from these circumstances, very pronounced ; but against it must be set the advantages of a dry atmosphere and a cloudless sky, and in point of fact the city is not exceptionally unhealthy; its salubrity has been much euhanced by the recent introduction of a plentiful supply of pure water from the Lozoya (32 miles distant).

The form of Madrid proper is almost that of a square

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whence the name) is now the central plaza, and the favourite lounge and place of most traffic in the city; the animated scene it presents has been described with more or less fulness in almost every book of Spanish travel. On its south side stands the Palacio de la Gobernacion, or Home Office, a heavy square building, by a French architect, J. Marquet, and dating from 1768. From the Puerta del Sol diverge, immediately or mediately, almost all the principal streets of Madrid—eastward by north, the Calle de Alcala, terminating in the Prado; eastward, the Carrera de San Geronimo, terminating by the Plaza de las Cortes also in the Prado ; southward, the Calle de Carretas ; westward, the Calle Mayor, which leads to the council chamber and to the palace, and the Calle del Arenal, ter- Ininating in the

Plaza de Isabel II. and the opera-house ; north-westward, the Calles de Preciados and Del Carmen ;

Plan of Madrid.

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with the corners rounded off; from east to west it measures rather less than from north to south. It was formerly surrounded by a poor wall, partly of brick, partly of earth, some 20 feet in height, and pierced by five principal gates (pwertas) and eleven "' portillos." Of these gateways only three, the Puerta de Alcala on the east, the Puerta de Toledo on the south, and the Portillo de San Vicente on the west, now actually exist; the first aud the third were erected in the time of Charles IIL, and the second in honour of the restoration of Ferdinand VIL; all have some architectural pretensions, The Manzanares (or

rather its bed, for the stream is at most seasons of the year quite insignificant) is spanned by six bridges, the Puente de Toledo and that of Segovia being the chief. The Puerta del Sol (formerly the east gate and tower of the city, having on its front a representation of the suu—

and northward, the Calle de la Montera, which afterwards divides into the Calle de Fuencarral to the left and the Calle de Hortaleza to the right. Of these the Calle de Alcal& is the finest; it is bordered on both sides with acacias, and contains some elegant buildings, including the museum of natural history, formerly the general custom- house, dating from 1769, and the offices of the Board of Trade (Ministerio de Hacienda) on the north side, and on the south the palace of the duke of Sesto (the site of which is about to be occupied by the new buildings of the Banco de Espafia or Bank of Spain) ; its irregularity in point of width and level, however, detracts much from its appearance. The Plaza de las Cortes is so called from the Congreso de los Diputados, or House of Commons, on its north side, a building in the Corinthian style, but of little merit; the square contains a bronze

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statue of Cervantes, by Sola, erected in 1835. The Calle de Carretas ranks with the Carrera de San Geronimo and Calle de la Montera for the excellence of its shops. From

the Calle Mayor is entered the Plaza Mayor, a rectangle of –

about 430 feet by 330, formerly the scene of tournaments, bull fights, autos-de-fe, and similar exhibitions, which used to be viewed by the royal family from the balcony of one of the houses called the Panaderia (belonging to the guild of bakers). The square, which was built under Philip IIL. in 1619, is surrounded by an arcade; the houses are uniform in height and decoration. In the centre stands a bronze equestrian statue of Philip III, designed by Pantoja, cast by Juan de Bologna, and finished by Pedro Tacca. From the south-east angle of the Plaza Mayor the Calle de Atocha, one of the principal thoroughfares of Madrid, leads to the outskirts of the city; at the south- west angle of the same square the Calle de Toledo begins, the chief mart for the various woollen and silken fabrics from which the picturesque costumes peculiar to the peninsula are made. In the Plaza de Isabel IL, at the western extremity of the Calle del Arenal, stands the royal opera-house, the principal front of which faces the Plaza del Oriente and the royal palace. In the centre of the plaza is a fine bronze equestrian statue of Philip IV. ; it was designed by Velazquez and cast by Tacca, while Galileo is said to have suggested the means by which the balance is preserved. The gift of the grand-duke of Tuscany in 1640, it stood in the Buen Retiro gardens until 1844.

As compared with other capitals, Madrid has very few buildings of much interest architecturally or otherwise. There is no cathedral. The Basilica de Nuestra Sefiora de Atocha, on the Paseo de Atocha, a continuation of the Calle de Atocha, originally founded in 1523, after being destroyed by the French was rebuilt by Ferdinand VIL. ; it contains one of those miraculous images attributed to St Luke with which Spain abounds, and is specially associated in history with the name of Queen Isabella II. The collegiate church of San Isidro el Real, in the Calle de Toledo, dates from 1651; it has no architectural merit, but contains one or two valuable pictures and other works of art. The modern Gothic church of San Geronimo el Teal occupies a conspicuous site eastward of the town; it is not at present used asa place

of worship. Of secular buildings unquestionably the most important is the royal palace (Palacio Real) on the west side of the town, ona rising ground overhanging the Manzanares. It occupies the site of the ancient Moorish alcazar, where a hunting seat was built by Henry IV.; this was enlarged and improved by Charles V. when he first made Madrid his residence in 1532, was further developed by Philip IL, but ultimately was destroyed by fire in 1734. The present edifice was begun under Philip V. in 1737 by Sacchetti of Turin, and was finished in 1764. It is in the Tuscan style, and is 470 feet square and 100 feet in height, the material being white Colmenar granite, resembling marble. To the north of the palace are the royal stables and coach- houses, remarkable for their extent ; to the south is the armoury (Museo de la Real Armeria), containing what is probably the best collection of the kind anywhere to be met with. After the Palacio Real may be mentioned the royal picture gallery (Real Museo de Pinturas), adjoining the Salon del Prado; it was built about 1785 for Charles III. by Juan de Villanueva, as a museum of natural history and academy of sciences. It contains the collections of Charles V., Philip IL, and Philip IV., and the pictures number upwards of twothousand. The specimens of Titian, Raphael, Veronese, Tintoretto, Velazquez, Vandyck, Rubens, and Teniers are numerous and remarkable, giving it a claim.to be regarded as the finest picture gallery in the

only for their size. There are some seventeen theatres of all classes. The bull-ring (Plaza de Toros), to the east of the town, accommodates 12,000 spectators; the present building dates from 1874. Of the promenades and open places of public resort the most fashionable and most fre- quented is the Prado (Paseo del Prado, Salon del Prado) on the east side of the town, with its northward continuation the Paseo de Recoletos. ‘T’o the south of the town is the Paseo de las Delicias, and on the west, below the royal palace, and skirting the Manzanares, is the Paseo de la Virgen del Puerto, used chiefly by the poorer classes, East- ward from the Prado are the Buen Retiro gardens, with the usual ponds and pavilions, and a poor menagerie, The gar- dens were formerly the grounds surrounding a royal hunting seat, on the site of which a palace was built for Philip IV. in 1633; it was destroyed during the French occupation.

Modern educational movements have not left Madrid unaffected, and considerable improvements in this respect have taken place within recent years. There are upwards of 100 official primary schools (attended by 4810 boys and 3958 girls), and a large number of private ones ; among the other educational instrumentalities the numerous schools connected with various Protestant missions claim special mention. There are two normal schools. The university of Alcalé, founded by Cardinal Ximenes in 1508, was transferred in 1836 to Madrid, and has since that time undergone much reform and extension. In 1882 the teach- ing staff numbered 88, and the students 7000. Of these 2400 belonged to the faculty of law, 2500 to that of medicine, 400 tothat of science, 1400 to that of pharmacy, and 250 to that of philosophy and literature. The faculty of theology was suppressed in 1868, and has not been re-established. Madrid also has schools of agriculture, architecture, civil and mining engineering, the fine arts, veterinary science, and music. The school of military en- gineering is at Guadalajara. Among the educational insti- tutions may be reckoned the botanical garden, originated in 1781, the national library, with those of the palace, the university, and San Isidro, and the museum of natural science, exceedingly rich in the mineralogical department. The principal learned society is the Royal Spanish Acadeiny, founded in 1713 for the cultivation and improvement of the Spanish tongue. The Academy of History possesses a good library, rich in MSS. and incunabula, as well as a fine collection of coins and medals. There are likewise academies of the fine arts, the exact sciences, moral and political science, medicine and surgery, and jurisprudence and legislation, all possessing libraries. There are also anthropological, economical, and geographical societies, and a scientific and literary atheneum. ‘The charitable institutions include upwards of cighteen hospitals, the largest of which contains 1200 beds; there are three foundling hospitals and six for orphans. The military hospital is large and well conducted. There are very good schools for the blind and for deaf mutes, and a number of asylums of various kinds.

The manufactures of Madrid are inconsiderable ; every article of food and clothing, almost without exception, is imported. The most important industries are the manu- factures of tobacco and cigars, gold and silver wares, tapestry and carpets, porcelain, hats, mirrors, and beer. Little wine is grown near the capital, and not much fruit ; but the markets are well

supplied, and regularly, from all quarters of the kingdom. Madrid is still the principal, one might almost say the only, focus of the now largely developed railway system of the peninsula. The suburbs of the town are rapidly extending, especially towards the north and south. The immediate environs are uninterest- ing. About 6 miles to the north-west lies the fine hunting

world. The palaces of the grandees are generally noteworthy | seat El Pardo, restored by Charles IIT.

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Spanish archeologists have frequently claimed for Madrid a very high antiquity, but the earliest authentie historical mention of the town (Majrit, Majoritum) oeeurs In an Arab chronicle, and does not take us farther back than to the first half of the 10th century. The place was finally taken from the Moors by Alphonso VI. (1083), and was made a hunting-seat by Henry IV., but first rose into importanee when Charles Y., benefiting by its keen air, made it his oceasional residenee. Philip IJ. created it his eapital and "‘ only court" (nica corte) in 1560. To this day it only ranks, however, as "villa," not as ‘‘ciudad." Fruitless attempts were made by Philip III, and Charles Ill. respectively to transfer the seat of government to Valladolid and to Seville.

MADRIGAL. The notice of this branch of musical art which will be included in the general article Music may here be anticipated by an approximately chronological list, according to nationalities, of the masters who lave been chiefly distinguished for their compositions of the class :— Flanders: Egide Binchois, Brusnois, Jean Okeghem or Ockenheim, Jean Tinctor, Adrian Willaert, Cyprian di Rore, Jacques Hobrecht, Firmin Caron, Josquin des Prés, Alexander Agricola, Antoine Brumel, Pierre de la Rue, Jacques Arcadelt, Claude Goudimel, Philippe Verdelot, Jacques de Wert, Hubert Waelrent, and Orlando di Lasso ; Rome : Costanzo Festa, Giovanni Pierluigi da Palestrina, Felice and Francesco Anerio, Giovanni Maria, Bernardino Nanini, and Luca Marenzio (styled in his own time " I] pit dolce Cigno d'Italia"); Venice: Giovanni Croce, Andrea and Giovanni Gabrielli, Costanzo Porta, Orazio Vecchi, and Giovanni Giacomo Gastoldi; "ngland: William Cornyshe (father and son), Richard Taverner, Robert Fayrefax,

Thomas Phelyppes, Richard Edwards, William Byrd, Thomas Morley, Giles Farnaby, Edward Johnson, Thomas Weelkes, George Kirbye, John Dowland, Michael Este, Thomas Tomkins, John Benet, John Hilton, John Wilbye, Thomas Ford, Thomas Bateson, Richard Allison, John Ward, and Orlando Gibbons, also John Cooper and Peter Philips, who dwelt long in Rome, and published their works under the names respectively of Giovanni Coperario and Pietro Filippii Many of all these wrote strictly madrigals, that is, continuous compositions abounding in ingenious artifices of imitation of one part by another ; others wrote rhythmical songs of four or more parts, or ballets, or fal-las, all of which, being for unaccompanied voices, or for viols instead of voices, are often erroneously ranked as madrigals, though ditfering entirely in structure from them. The English composers, to Byrd inclusive, produced pieces distinctly of the madrigal class, but described them by other definitions; it was in the year 1588, when Byrd published Psalms, Sonets, and Songs of Sadness and Pietie, that the word madrigal was first introduced into England by Nicholas Yonge, a merchant, a lover of music who, having received copies of some foreign compositions in his chests of merchandise, adapted English words to these, and printed a collection under the title Musica Transalpina, the success of which stimulated the powers of English writers that had already been proved, and excited others to emulate their example. The art of madrigal composition was never practised in Germany, and it died out in other countries early in the 17th century. The knowledge of the works that endear the madrigal writers to lovers of a high and most pure form of music was revived, and has since been kept alive, by the Madrigal Society. This was founded in 1741 by John Immyns, an attorney, and its original members were mechanics or small tradesmen ; it held its first meeting at the Twelve Bells Tavern in Bride Lane, made many migrations to other houses of entertainment, and has its present home at the Freemasons' Tavern, where its members are of a far higher social caste than the men who associated themselves for the practice of contrapuntal vocal music when the rank and fashion of the land went to worship Varinelli at tke Italian opera, and to take part with the

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followers of the king or the prince of Wales in supporting one or other of the opposition establishments for its perform- ance. In 1811 the society offered a prize for the composi- tion of a madrigal, which was won by William Beale. ‘The same incentive has occasionally been repeated. This encouragement, and still more the love for the class of music engendered by the public performance of madrigals by large choral societies during the last fifty years, have incited later composers to more or less successful imitations of the style, especially distinguished among whom was Robert Lucas Pearsall (1795-1856).

MADURA, a district in the south of the Madras presidency, India, lying between 9° 4’ and 10° 44’ N. lat., and 77° 14’ and 79° 20’ E, long., is bounded on the N. by Coimbatore, Trichinopoli, and Tanjore districts, E. and S.E. by the sea, S.W. by Tinnevelli district, and W. by Travancore state. Broadly speaking, it consists of a sec: tion of the plain stretching from the mountains east to the sea, coinciding with the basin of the Vaigdi river, and gradually sloping to the south-east. The plain is broken in the west by the outlying spurs of the Ghats, and by a few isolated hills and masses of rock scattered over the country. The most important spur of ‘the Ghats is that known as the Palni hills, which project east-north-cast across the district for a distance of about 54 miles. Their highest peaks are more than 8000 feet above sea-level, and they enclose a plateau of about 100 square miles in area, with an average height of 7000 feet. A sanatarium has been recently established on this plateau, at Kodaikanal, and coffee planting is here snecessfully carried on. Farther east a confused group of hills, known as the Sirumalais, the highest of which has an elevation of nearly 4000 feet, clusters round the village of Nattam. Among isolated rocks may be mentioned the precipitous fortress of Dindigal, and the ‘Elephant Rock,” the “Cow Hill,” and the sacred Skandamalia—all in the immediate vicinity of Madura town. The chief river is the Vaigai, which divides the district into two almost equal portions. Very little forest is found in any part of the district. The cultivated plain is absolutely barren of trees, except where a newly-planted avenue marks a line of road. Groves of palmyra and cocoa-nut palms flourish along the sea-coast and river banks, Among the wild products of the Palni hills are nutmeg, cinnamon, and pepper. The predominant geological formation is granite. Syenite oc- curs in large boulders. A gravelly bed of laterite, which runs across the district, is

quarried for building purposes ; and sandstone is said to extend along the whole length of the sea-coast. Mineral products include saltpetre, salt, lime, chalk, and graphite. Iron in various forms is found, but it is nowhere worked profitably, even by the rude native processes. Gold is washed in some of the streams. Several kinds of opal, chalcedony, jasper, garnet, and rock- crystal are found.

The census of 1871 showed a total population of 2,266,615 persons (1,112,066 males and 1,154,549 females), spread over au area of 9502 square miles, and inhabiting 5459 villages and 443,513 houses. Hindus numbered 2,062,768, and Mohammedans 132,833 ; and the Catholies at the present day number about 60,000, under the charge of the missions of the Jesuits and of the Chureh of Goa. The Protestant population are under the charge of an American mission, first established in1834. The principal towns are Madura eity (51,987), Dindigal (12,818), Palni (12,801), Ramnad (15,442), Tirumangalam (5772), Parambakudi (6284), Sivaganga (7392), Killakarai, Aruppukotai, and Periyakulam. The only munici- palities are Madura and Dindigal.

Of a total area of 9502 square miles, 6507 belong to zaménddri or permanently assessed estates. The total area of Government lands in occupation in 1875-76 was 1,013,000 aeres, of which 806,630 were under eultivation. The chief food crops are rice, cholam (Holcus saccharatus), kambu (Holcus spicatus), ragt (Eleusine cora- cana), varagu (Paspalum frumentaccum), saimdi (Panicum mili- accum), and several kinds of pulses. Other crops include oil-sced,

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tobacco of excellent quality, and a little indigo and cotton. The rainfall is small and variable in its seasons. Every possible means of storing up surplus water has been resorted to from time imme- morial, An important engineering project, known as the Pcriyar scheme, has long been under consideration, by which the abundant rainfall on the farther slope of the Travancore hills might be diverted into the drainage basin of the Vaigai. Salt is manufactured at certain stations on the coast asa Government

monopoly. Hand- some turbans fringed with gold cloth, and a peculiar kind of red eloth, are specialities of Madura town. Considerable sea-borne trade is carried on by native craft, chiefly with Ceylon. Rice and other food grains, gingelly oil, spices, cloth, salt fish, tobacco, red ochre, and earthenware are the principal exports. The district is traversed by the South Indian railway from Tinnevelli to Trichino- poli. The total imperial revenue in 1875-76 amounted to £393, 448, of which £280,067 was derived from the land. Education in 1876-77 was afforded by 424 schools, attended by 12,509 pupils. Besides ordinary diseases, Madura possesses three special scourges:— endemic fever, which sometimes rages with exccptional severity ; cholera, disseminated by pilgrims to the sacred temple at Rames- waram ; and the well-known ‘‘ Madura foot.” This last complaint, known to science as imorbus pedis entophyticus, is a species of fungus which spreads over the whole foot in a mass of tubcrcles. lts primary cause seems to be unknown.

History.—Madura was the seat of the Pandian monarchy, which ruled over this part of India from the 5th century B.c. to the end of the 11th century of our era. The last of the Pandid kings is said to have externiinated the Jains, and conquered the neighbour- ing kingdom of Chola; but he was in his turn overthrown by an invader from the north, conjeetured to have been a Mohammedan. In 1324 a Moslem army under Malik Kafur occupied Madura, and the Hindus were held in subjection for a period of fifty years. Subsequently Madura became a province of the Hindu empire of Vijayanagar. In the middle of the 16th century the governor Viswanath established an hereditary rule which lasted for a century. The greatest of the line was Tirumala Nayak (1623-1659), whose magnificence and military exploits are recorded in the contemporary letters of the Jesuit missionarics. He adorned Madura with many public buildings, and extended his empire over the adjoining dis- tricts of Tinnevelli, Travancore, Coimbatore, Salem, and Trichino- poli. His repudiation of the nominal allegiance paid to the raja of Vijayanagar brought him into collision with the sultan of Bijapur, and Mohammedans, after the lapse of three centuries, again invaded Madura, and compelled him to pay them tribute. After the death of Tirumala the kingdom of Madura gradually fell to pieces. In 1740 the distriet fell into the hands of the nawab of the Carnatic, and the line of the Nayaks was extinguished. In 1762 British officers took charge of Madura,

in trust for Wallah Jah, the last independent nawab of the Carnatic, who finally ceded his rights of sovereignty to the East India Company in 1801.

Mapura, the chief town and headquarters of Madura district, is situated on the south bank of the Vaigai river in 9° 55’ 16” N. lat., and 78° 9’ 44” E. long., with a population (1871) of 51,987, being the fourth largest town in the Madras presidency. Its principal architectural feature is the great temple, forming a parallelogram 847 feet by 744 feet, surrounded by nine gopuras, one of which is 152 feet high. The principal structure is the “ Hall of a Thousand Pillars ” (the actual number being 997). The other buildings comprise the celebrated palace of Tirumala Nayak, the most perfect relic of secular architecture in Madras. Its ruins cover a large area of ground, and a considerable sum of money has been recently assigned by Government for the restoration of the building. Only second in importance to the palace is the Vasanta or Puthu mantapam, which still exists in complete preservation, and is said to have been built as a summer retreat for the god Sundareshwara, a form of Siva. On the opposite bank of the river is the Tamakam, a two-storied building of quaint architecture, said to have been erected as a stand from which to view sports and combats. Last is the Teppu- kulam or great tank, situated 14 miles to the east of the town, and nieasuring 1200 yards each way. Once a year its banks are illuminated by (it is said) 100,000 lamps, while the idols from the pagoda are drawn round it on a teppam or raft.

MADURA, in High Javanese Madunten, an island of the Hast Indian Archipelago, separated by the shallow Strait of Madura from the east end of Java. It extends

from about 112° 32’ to 114° 7’ E. long., and is divided into two nearly equal portions by the parallel of 7° S. lat. ; the area is estimated at 2100 square miles. As the few travellers wlio have visited Madura have been for the most part content to follow the highways which, though running the whole length of the island, never strike very far inland either from the north or the south coast, a con- siderable part of the country is but vaguely known to Europeans. It may be safely asserted, however, that the general configuration is fairly simple,—the island being a plateau-like prolongation

of the limestone range of northern Java, with frequent interchange of hill and dale, culminat- ing towards the east in Gunong Pedjudan or Tambuko at a height of 1542 feet. Hot springs are uot unfrequent; and in the valley between Gunong Geger and Bandjar lies the mud volcano of Banju Ening. ‘“ Round the coast runs a girdle of tropical vegetation, broken only here and there by small white peaks with steep perpendicular cliffs ;” but, except in a few alluvial tracts in the lower courses of the streams, the soil is thin and poor, and better fitted for pastoral than agricultural purposes. Maize is by far the most important of the crops ; it is planted after rice in the non-irrigable sawahs, and often before it in the irrigable ; in the tagal fields it is sometimes sown thrice in a single year, frequently along with katjang (various kinds of native beans). European enterprise has not yet invaded the island ; there is only one sugar plantation, Tedjeh, near Pamakasan, established in 1835. Much attention is paid to the rearing of cattle,—the small Madura oxen being greatly prized in Java, and consequently forming a regular article of export. Petroleum is found in small quantities in all the departments, but the most valuable product of the island is its salt (hence perhaps the name Madura; Sansk. Jfandura, salt). The manufacture, a Dutch Gov- erninent monopoly, was formerly carried on in several places, as at Brantah and Bunder (where the salt pans now serve as fish ponds), but in 1870 Sumenep was made the sole establishment for Java and Madura, and it still remains by far the most important, though its annual production of 875,000 cwts. has since 1875 to be supple- mented by Ragung and Pangaringan. The population of Madura was in 1879 returned as 768,992,—472 kuropeans (mostly at Maringan near Sumenep), 3702 Chinese, 1445 Arabs and other Orientals, and 763,373 natives. These last constitute one of the three great races of Java and Madura, and speak a distinct language, for which compare JAvA, vol. xiii.

The following are the places of chief note in the island. Kamal at the south-west corner is the point where people usually cross from Java. Bangkalang is the large and flourishing chief town of Madura proper, with the old palace of the sultan and the residences of the priuces of the blood ; the mosque is adorned with the first three suras of the Koran, thus differing from nearly all the mosques in Java and Madura, though resembling those of western Islam. In the vicinity once stood the Erfprins fort. Arisbaya (less correctly Arosbaya) is the place where the first mosque was built in

Madura, and where the Dutch sailors first made acquaintance with the natives. The once exeellent harbour is now silted up. Ajermata, so called from its salt-springs, is the burial-place of the princes of Bangkalang. Pamakasan, though a town of considerable extent, presents nothing worthy of notice apart from the regent's residence. Sanipaug, the seat of an important market, seems hardly so flourish- ing as in Valentyn's days. The town or kota of Sumenep had 15,000 inhabitants in 1846 ; and there are populous Malay, Arab, and Chinese villages between the town and the European settle- nent of Maringan. On a hill in the neighbourhood, with a fine outlook over the Bay of Sumenep, lies Asta, the burial-place of the Sumenep princes; and Nati Kusuma's mausoleum excels every- thing of the kind in Java.

Madura formerly consisted of three native states—Madura or Bang- kalang, Pamakasan, and Sumenep. Dutch authority was represented by an assistant resident, and the whole island considered part of the Java residency of Surabaya. The separate residency of Madura was constituted in 1857. On the death of the second sultan of Bang- kalang (1847) the title had been reduced to that of panembahan ;

and in 1872 the new ruler was deprived of the right of collecting taxes, and made a Government pensioner, while his territory was split into the two Dutch ''departments " of Madura and Sampang. The sultan of Sumenep was in like manner succeeded by a panem- bahan in 1853; and the death of the panembahan in 1879 afforded an opportunity of enlarging the Government control. There are thus four ''departments" in Madura,—Pamakasan, Madura, Sumenep, and Sampang. The first three are also regencies, and the fourth a subregency of Bangkalang ; but Pamakasan alone has the full regency organization. 'The number of village communities is

1271.

The best systematic account of Madura will be found in Professor Veth's Java, vol. iii., the proof sheets of which have, by the author's courtesy, been

consulted for this artiele. See also Bleeker, in Jndisch. Archief.,i., and Tijds. van Ned. ind. ix.; C. de Groot in Nat. 7ijds. van Ned. Ind., iv.; Hoevell, Reis over Java, ii; Zollinger, “Jets over de Nat. gesehied. van Madura,” in ¥. Tijds. van Ned. Ind., xvii.; Jukes, Voyage of the“ Fly”; and Hageman in 7%jds. van Ned. Ind., 1858.

MASCENAS, C. Crnnius, is, from two different points of view, a prominent representative man of the ancient world. He was the first, and one of the most capable and successful, of those who filled the office of a great minister under the Romau empire. He was also, if not the first, certainly the most fortunate and influential among the patrons of Roman literature. It is in the latter capacity that heis best known. Among all the names, royal, noble, or otherwise eminent, associated with the patronage of letters, none either in ancient or modern times is so familiarly known as that of Mzecenas. Yet, if we had any contemporary history of the establishment of the empire, possessing the same permanent interest which the poetry of Virgil and Horace possesses, it is probable that his influence in shaping the political destinies of the world would have been as amply recognized as his influence on its literature.

The date and place of his birth are unknown. He first appears in history in the year 40 B.c., when he is employed by Octavianus in arranging his marriage with Scribonia, and afterwards in negotiating, along with Pollio and Cocceius Nerva (‘‘aversos soliti componere amicos,” Hor., Sat., i.. 5, 28), the peace of Brundisium, and the reconciliation with Antony, which was confirmed by the marriage of the latter with Octavia. From the fact that he was then the most trusted friend and agent of the future emperor it is likely that he had been associated with his fortunes from the time when he came forward to claim his inheritance after the death of Julius Cesar; and expressions in Propertius (ii. 1, 25-30) seem to imply that he had borne some share in the campaigns of Mutina, Philippi, and Perusia. He may have been a few years older than Octavianus, who began to play the foreniost part in Roman politics before he was twenty years of age. The men of the Augustan age great in action and literature were all born within a few years of one another. Agrippa, the right hand of Augustus in war as Mecenas was in peace, was born in the same year as his master; and there is no indication in the relations of Meecenas to Augustus or to his friend Horace that he

stood towards either of them in the relation of an older to a younger man. Although the place of his birth is unknown, we learn from Horace and Propertius that he prided himself on his ancient Etruscau lineage, and claimed descent from the princely house of the Cilnii, who, as is recorded by Livy (x. 3), excited the Jealousy of their townsmen by their preponderating wealth and influence at Arretium in the 4th century before our era. He probably prized the glories of his paternal and maternal ancestry (Hor., Sat., i. 6, 3) as compensating him for his original social inferiority to the members of the great Roman houses ; and the fact dwelt on so prominently by his panegyrists, that, through all his life, he preferred the position of a great commoner to the new honours of the senate and of the Roman magistracies, may have been the result as much of pride in his provincial ancestry as of a politic desire to disarm the jealousy of his master or of the Roman aristocracy. Cicero, in his defence of Cluentius,

speaks of a C, Maecenas as one of the most substantial members of the equestrian order during the tribunate of Drusus (91 B.c.), and as one of those who preferred the position their fathers had enjoyed before them to the higher rank obtainable through office (Cic., Clwent.,56, 153). From the identity of the prenomen and the rarity of the cognomen it is not unlikely that he may have been the grandfather, or perhaps the father, of the future minister. It was in accordance with the policy of Julius Cesar to choose his confidential friends from men of this order, as he chose his tools from a less reputable class ; and the two most trusted friends and ministers of his successor would both have been regarded as “novi homines” by the representatives of the great senatorian families. The testimony of Horace (Odes, iii. 8, 5) and his own literary tastes imply that he had profited by the highest education of his time. His great wealth may have been in part hereditary, as there was no district of Italy in which the inequalities of wealth and station were greater than in Etruria ;! but he owed his position and influence in the state to his early adherence to and close connexion with Augustus) Among the charges brought against him by Seneca, one of the most prominent is that he had been spoiled by his excessive good fortune. From the year 40 B.c. his influence as the confidential adviser of Octavianus seems to have been thoroughly established, It was in the

following year that Horace was introduced to him, and he had before this received Varius and Virgil into his intimacy. In the “Journey to Brundisium,” which took place in the year 37 B.c., Meecenas and Cocceius Nerva are described as ‘“ missi magnis de rebus uterque Legati,” and were again success- ful in patching up, by the treaty of Tarentum, a reconciliation between the two claimants for supreme power. During the Sicilian war against Sextus Pompeius in 36 B.c., he was sent back to Rome, and was entrusted with supreme administrative control in the city and in Italy. He is again found acting as vicegerent of Octavianus during the campaign of Actium, when with great promptness and secrecy he crushed the conspiracy of the younger Lepidus ; and during the subsequent absences of his chief in the provinces he held the same position. During the latter years of his life he fell somewhat out of favour with his master, or his services were less needed. Perhaps the freedom with which, in the earlier stages of his career, he had offered advice and told unpleasant truths had become distasteful. One cause for a comparative coolness between the old friends was said to be the emperor’s relations with Terentia, the wife of Mzecenas, to whom he was uxoriously attached. Perhaps the ennui resulting from the cessation of a life of constant vigilance and activity may account for the state of sleepless restlessness and fever in which he passed the last three years of his life. He died in the year 8 B.c., leaving the emperor heir to his wealth, and affectionately commending his friend Horace, who only survived him a few days, to his protection. Opinions were much divided in ancient times as to the personal character of Meecenas; but the testimony as to his administrative and diplomatic ability was unanimous. He enjoyed the credit —or discredit, as the adherents of the republic must have regarded it—of sharing largely in the establishment of the new order of things,? of reconciling parties, and of carrying the new empire safely through many dangers. ‘To his influence especially was attributed

1 The lines of Propertius (iv. 8, 27-8)— Et tibi ad effectum vires det Cesar et omni Tempore tam factles insinuentur opes—

show that his position under the empire also brought very substantial additions to his original fortune.

? This is implied by the long speech which Dion Cassius puts into his mouth, recommending the establishment and prompting the policy of the new empire (Dion Cass., lii. 14-40),

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the humaner policy of Octavianus after his first alliance |

with Antouy and Lepidus. Even Seneca, who shows a very bitter animus against him, admits that he deserved the credit of clemency,—although he attributes it to elfeminacy rather than to true humanity. The highest tribute paid to him in his capacity of minister is to be found in the least eminent of the poets whose genius he fostered. ‘‘ The true trophies of Mzecenas,” says Propertius, ‘will be his loyalty.”! And in another elegy he addresses him as “fidele caput.” One great testimony both to his

loyalty and to his tact is the saying of Augustus, when he»

had made public the scandal concerning his daughter Julia, “that all this would never have happened if Agrippa or Mecenas had lived” (Sen., De Ben., vi. 32). The only instance in which he is said to have acted with indiscretion as a minister was in his betrayal to his wife Terentia of his knowledge of the conspiracy in which her brother Licinius Mursena was involved.

The best summary of his character as a man and a,

statesman is that of Velleius (ii. 88), who describes him as ‘in critical emergencies of sleepless vigilance far-seeing and knowing how to act, but in his relaxation from business more luxurious and effeminatethan a woman.” The latter is the aspect of his character on which Seneca chiefly dwells. He draws attention to the enervating effect which his good fortune had even on his literary style. We need not ask how far ‘“‘the stately mansion on the Esquiline” outdid in luxury the “gardens of Seneca the millionaire” (“Senecze pradivitis hortos”).? Msecenas was certainly a nan who combined an epicurean love of pleasure with a thorough devotion to business; and verses of his own are quoted against him indicative of an unmanly clinging to life after the loss of all that makes life valuable. ‘These

may have been written in the feverish unrest of his last years, when he was no longer himself ; but expressions in the Odes of Horace (ii. 17, 1), written at a much earlier period, seem to imply that he was deficient in the robustness of fibre characteristic of the average Roman. His style of dress and his indolent lounging walk exposed him to animadver- sion; and the Maltinus of Horace's Satires (i. 2, 25) was supposed by some ancient commentators to be a sketch of the great man, drawn before the poet was admitted to his intimacy. Probably there niay have been some affectation or politic dissimulation in this assumption of a character so alien to the standard of the aspirants to public honours at Rome. It was an exaggerated form of that indifference to appearances and conventionalities which made him satisfied with the position of an eques, and induced him to choose his intimate associates from poets of obscure and provincial origin. His ambition was to be the second man in the empire, and to enjoy the reality without the show of power. A similar character is attributed by Tacitus to Sallustius Crispus, who, after the death of Macenas, most enjoyed the favour of Augustus.

His character as a munificent patron of literature is not only acknowledged gratefully by the recipients of it in his own tine, but is attested by the regrets of the men of letters of a later age, expressed through the mouths of Martial and Juvenal. His patronage was exercised, not from vanity or a mere dilettaute love of letters, but with a view to the higher interest of the state. He recognized in the genius of the poets of that time, not only the truest orna-

ment of the court, but a power of reconciling meu's minds | to the new order of things, and of investing the actual state | of affairs with an ideal glory and majesty. The change in |

seriousness of purpose between the Helogues and the Greor- gies of Virgil was, in a great measure, the result, of the direction given by the statesman to the poet's genius. A

1 Propert , Al. iv. 9, 34; ii. 1, 36. ave x6:

similar change between the earlier odes of Horace, in which he declares his epicurean indifference to affairs of state, and the great national odes of the third book is to be ascribed to the same guidance. He endeavoured also to divert the less masculine genius of Propertius from harping coutinually on his love to themes of public interest.

But, if the motive of his patronage had been merely politic, it never could have inspired the affection which it did in its recipients. ‘The great charm of Macenas in his relation to the men of genius who formed his circle was his simplicity, cordiality, and sincerity. Although uot particular in the choice of some of the associates of his pleasures, he admitted none but men of worth to his

| intimacy, and when once admitted they were treated like

equals. That loyalty which was his own distinction in his

_ public life was, if we may trust the evidence of Horace,

the characteristic of his own relations to his intimates, and of their relations to one another. But, while loyal to all, to Horace he was bound by acloser tie. Among the great friendships of history, none is more certainly attested, or more honourable to both parties, than that between the poet and the statesman. Much of the wisdom of Macenas probably lives in the Saéeres and Epistles of Horace. It has fallen to the lot of no other patron of literature to have his name associated with works of such lasting interest as the Georgics of Virgil, the first three books of Horace’s Odes, and the first book of his Zpistles. Such a fortune can scarcely have been altogether undeserved. Accepting as literally true the disparaging statements of Seneca, admitting the weakness, and perhaps the vanity, which were the blots in his character, and considering at the same time the difficulties of an unprecedented position, we must allow that few ministers of an irresponsible inonarch have accomplished so much with such immunity from the baser and more violent passions, for the gratifica- tion of which that position holds out unlimited oppor- tunities. As a minister and friend of the emperor he compared favourably, both as regards capacity and character, not with men of the stamp of Sejanus and Tigellinus, but with Seneca. Few men have used the influence of a grand seigueur with such

enlightened beneficence, with such lasting results on human culture and civilization, with such genuine simplicity and cordial loyalty. : (WwW. ¥. 8.) MAESTRICHT, or Maastricut, the chief town of the province of Limburg, in the Netherlands, lies, as the name expresses, at the trecht or crossing of the Maas (Meuse), where the Romans erected a military post on the road between Bagacum (Bavay) and Colonia Agrippina (Cologue). Aix-la-Chapelle is 18 miles east-south-east, and Liége 18 miles south by west. The baths discovered in 1840 in the Groote Stokstraat show that the settlement at Trajectum ad Mosam became a place of some considerable importance. The town is divided by the river into two parts—the larger portion, or Maestricht proper, on the left bank, aud the smaller portion, distinguished as Wijk, on the right. A stone bridge of eight arches connecting the two took the place of a wooden structure as early as 1280, and was greatly improved in 1828 and 1836. J ormerly a fortress, Maestricht is still a considerable garrison town, but its ramparts were dismantled 1871-78 ; formerly the seat of a bishop, it still bears a strongly Roman Catholic impress ; and, in modern times more especially, it has developed into a great centre of commerce and industry. The churches and religious foundations are almost the only buildings of note, the chief exceptions being the town-house, completed in 1683, and the solitary Protestant church, Janskerk (13th century). The church of St Servatius was, according to

one account, rebuilt and enlarged as early as the time of Charles the Great. It is now 260 feet in length, and

in the varied character of its Gothic architecture bears evidence of the frequency with which it has been restored and altered. The high altar has a Descent from the Cross by Anthony Vandyck. The saint whose name it preserves obtained great reputation in Maestricht by transferring his bishopric thither from Tongres, and his miracle-working relics became the occasion of a great septennial fair which was formerly of great service to the city. The Church of Our Lady (Lieve-Vrouwe-kerk), possibly founded in the 6th century, has two very ancient crypts and an 11th century choir of exceptional beauty, but in the nave has suffered severely from a restoration

in 1764. St Matthyskerk was founded by the cloth-weavers' guild in the 13th century ; and, though the present Gothic building of St Martin's (in Wijk) was erected so late as 1859, the original church was one of the oldest in the city, and is said by tradition to have occupied the site of one of the old heathen temples. The twelve hospitals, the poor- house, the orphanage, and most of the other charitable foundations are Roman Catholic institutions, and neither the administrative bodies nor the educational establish- ments are free from ecclesiastical influence. Though Maestricht is no doubt mainly indebted for its commercial prosperity to its position on the river, it did not begin to reap the full advantages of the situation till the removal of the fortifications and the opening of the railways (Aix- la-Chapelle, 1853; Hasselt, 1856; Lidge, 1861; Vanlo, 1865, &c.). At first a trade was carried on in wine, colonial wares, alcoholic liquors, and salt ; but now, besides Regout's well-known earthenware, glass, and crystal fac- tory, there are establishments for the making of arms, tools, lead, copper, and zine work, &c., as well as tobacco and cigar factories. The Maestricht beer also is highly esteemed. The population, which was 18,000 in the beginning of the century, was 28,917 on January 1, 1882.

Maestricht was taken and plundered by the Normans (881 and 884), by Bishop Henry of Guelders (1267), by Adolph de la Marck (1334), and by the people of Liége (1407 and 1408). In the war with Spain it was successively besieged by the Spaniards, the prince of Orange, Prince Maurice, and Frederiek Henry (1579, 1580, 1594, 1632); and in the struggle between Louis XIV. of France and William HI., and again during the French Revolution and the Napoleonic period, it paid the penalty of its frontier position—wit- ness the sieges of 1673, 1676, 1701, and 1793. During the revolu- tion of 1830 it was invested by the Belgians. Among the more peaceful memories of the place is the marriage of Otto IV. with Mary of Brabant. The people of Maestricht have aspcecial dialect of their own;1 but French and Duteh are in use among the upper classes, In the neighbourhood of the town are the great sandstone quarries of Petersberg, one of the most extraordinary labyrinths of subterranean excavation in the world.

MAFFEI, Francesco Scrpronn, MARcHESE DI (1675 – 1755), Italian archeologist and man of letters, was born at Verona on June 1, 1675. He

studied for five years in Parma at the Jesuit college, and afterwards from 1698 at Rome ; and in 1703-4 he took part as a volunteer in the war of succession, fighting on the Bavarian side at Donauwerth. In 1709 he began at Padua along with Apostolo Zeno and Valisnieri the Giornale det letterati

1 While the North Limburg dialeets, says Professor Gallée of Utrecht, are largely eorrupted with Duteh forms and words, the Maestrieht or South Limburg dialect (to which those of Hasselt, St Fruiden, and Sittand are nearly akin) has remained eomparatively free from sueh admixture. Its phonology is peeuliarly interesting both in itself and because its history ean be traeed to an early date by authentic doeuments. The Old Frankish psalms and the Limburg sermons are written in it ; and it was also the original dialeet of the St Servatius Legend (ed. by Bormanns) now transeribed in the Belgian Limburg dialeet, and of Veldeke's neid (ed. by Behoghel), now in Middle High German. About these works eonsult Cosyn, Taal en letterbode iii., v., vi.; and in regard to the modern dialect Mone's Anz. Sir Kunde der teutschen Vorzeit, 1836 ; Belgisch. Museum, iii. ; Franquinet in Jager's Archief, iii. ; and Winkler's Nederduitsch en Friesch dialecticon i. Specimens will be found in Firmenieh's Volkerstimmen and Leopold's Van de Schelde tot de Weichsel.

d'Italia, a literary periodical which had but a short career , and subsequently an acquaintance with the actor Riccoboni led him to exert himself for the improvement of dramatic art in Italy. His Merope, a tragedy, appeared in 1713 ; Leatro Italiano, a small collection of works for presenta- tion on the stage, in 1723-25; and Le Ceremonie, an original comedy, in 1728. From 1718 he became specially interested in the archeology of his native town, and his investigations resulted in the valuable Verona Illustrata (1731-32). | Maffei afterwards devoted four years to travel in France, England, Holland, and Germany. He died at Verona on February 11, 1755. A list of his very numerous works will be found in the Biographie Générale. A complete edition of them appeared at Venice (28 vols. 8vo) in 1790.

MAFRA, a town of Portugal, in the province of Kstremadura and district of Lisbon, lies near the Atlantic coast, about 20 miles to the north-west of Lisbon, and had a population in 1878 of 3231. It is remarkable for its

cloister-palace, built by John V. in 1717-32, in conse- quence of a vow made during a dangerous illness to build a convent for the poorest friary of the kingdom,—which proved to be a small T'ranciscan settlement here. The architect, Ludoviei, took the Escorial for his model; but the imitation is still less successful than the original. The building, which isin the form of a parallclogram measuring upwards of 800 feet from north to south and 700 feet from east to west, is said to contain 866 rooms, and to be lighted by no fewer than 5200 windows. The centre is occupied by the domed church, sumptuously built of marble, and richly adorned with statues and other objects of art. The conventual buildings (which are no longer used as such) contain 300 cells; and the library numbers 30,000 volumes. Adjoining the palace are fine gardens and pleasure grounds.

MAGDALA (more correctly Makdala), a natural strong- hold in the country to the south of Abyssinia, situated about 200 iniles inland from the Gulf of Aden, in 11° 22' N. lat. and 39° 25'E. long. 'he basaltic plateau of which it consists rises 9110 feet above the level of the sca, and forms along with the neighbouring height of Salassye (9160 feet), with which it is connected by the ridge of Salamgye (8650 feet), a comparatively small and narrow outrunner of the Amara Seint plateau. It is about three quarters of a mile in Jength by less than half a mile in breadth, and lies more than a thousand feet higher than the neighbouring plain of Arogye. To the south runs the Kukullo Ravine and to the north and the west the Bashilo and the Wark Waha Ravines, all of which ultimately drain into the Abai, and thus belong to the basin of the Nile. Chosen by King Theodore of Abyssinia as his principal stronghold in the south, Magdala owes its celebrity to the fact that, as the place of imprisonment of the English captives, it became the goal of the great English expedition of 1868. At the time of its capture it contained huts for a permanent population of about three thousand, a royal residence of the most meagre pretensions, a still more insignificant church, and a large treasure-house stored with arms, ecclesiastical furniture, and vast quantities of Abyssinian manuscripts. The whole rock was burned bare by order of Sir Robert Napier, and on the departure of the English it was scized by Mastwat, queen of the Wollo Gallas, in whose country it is situated.

See Markham, History of the Abyssinian Expedition, 1869; and Rassam, British Mission to Theodore, 1869. Both contain plans and views of

Magdala,

MAGDEBURG, the capital of the Prussian province of Saxony, and one of the strongest fortresses in Germany, is situated in 52° 8’ N. lat. and 11° 40’ E. long., mainly on the left bank of the Elbe, which here divides into three branches. It consists of the town proper and of the four suburbs of Friedrichstadt, Neustadt, Sudenburg, and

Buckau ; the last three of these are separated from the town by the ramparts and glacis, but are all included within the new linc of advanced bastions. In the Elbe, between the old town and the Friedrichstadt, lies an island called the Werder, occupied by the citadel, and united with both banks by bridges. With the exception of the Breiter Weg, a handsome thoroughfare running from north to south, the streets of the town proper are narrow and crooked. Along the Elbe, however, extends a fine pro- menade named the Fiirstenwall, at one end of which stands a monument in commemoration of the Franco-German war. To the south of the inner town is the Friedrich-Wilhelm’s Garten, a beautiful park laid out on the site of the cele- brated convent of Bergen, which was founded in 937 and suppressed in 1810. By far the most important building in Magdeburg is the cathedral, a handsome and massive structure of the 13th and 14th centuries, exhibiting an

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Plan of Magdeburg.

1, St James’s Church.

2. Walloon Church.

3. St Catherine’s,

4, St Peter’s. 10. St Ulrich’s Church.

5, Statue of A. W. Franke. | 11, Town Theatre.

6, Statue of Otho the | 12. St Mary’s (Liebfrauen- Great. Kirche).

13. Dutch Reformed Chureh.

14. Higher Courts.

15. Post-Office.

16, Government Build- ings.

17. Cathedral,

Rathhaus. St John’s Church.

co

8.

9. School of Art.

interesting blending of Romanesque and Gothic architecture. The two fine towers were completed about 1520. The interior contains the tombs of the emperor Otho the Great and his wife Editha, an English princess, and the fine monument of Archbishop Ernest, executed in 1497 hy Peter Vischer of Nuremberg. The Liebfrauenkirche, the oldest church in Magdeburg, is an interesting Romanesque edifice of the 12th and 13th centuries. buildings are tle town hall, built in 1691 and enlarged in 1866, the theatre, the governor’s house, the central railway station, and the exchange. The Breiter Weg and the old market contain numerous fine private houses in the style of the Renaissance. In front of the town-hall stands an

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The chief secular |

equestrian statue of the emperor Otho the Great, erected | towards the close of the 13th century. The favourable |

situation of Magdeburg, in the very heart of Germany, and on the Elbe below all its principal affluents, has made it one of the most important commercial towns in the empire,

and it is also the focus of several important railways. The chief articles of commerce are agricultural and colonial products, manufactured goods, and wine. The town and its suburbs contain numerous manufactories of woollen, cotton, and silk goods, sugar, spirits, tobacco, organs and pianos, chocolate, and chicory. Magdeburg is the head- quarters of the 4th corps of the German army, and the seat of the provincial court of appeal and administrative offices, of a Lutheran consistory, and of a superintendent general of the Evangelical (Reformed) Church. It also contains two gymnasia, two “ Realschulen,” schools of art, medicine, surgery, and mining, and numerous scientific and charitable institutions. The population of Magdeburg in 1880 was 97,539, or, including Neustadt and Buckau,

137,109.

Magdeburg, which was in existence as a small trading settlement at the beginuing of the 9th century, owes its early prosperity chiefly to the emperor Otho I., who established a Benedictine convent here in 937 (see above). In 968 it became the seat of an archbishop, who was also primate of Germany, and exercised sway over an ex- tensive territory. By the 18th century Magdeburg had become a flourishing commercial town and an important member of the Hanseatic League. Its bench of sheriffs (Schippenstuhl) became celebrated, and ‘‘ Magdeburg law,” securing the administrative independence of municipalities, was adopted in many parts of Ger- many, Poland, and Bohemia. During the Middle Ages the citizens were almost constantly at variance with the archbishops, and by the end of the 15th century had become nearly independent of them. lt should, however, be noted that Magdeburg never became a free city of the empire.

The town embraced the Reformation in 1524, and was thenceforth governed by Protestant administrators or arch- bishops. On the refusal of the citizens to accept the ‘‘ Interim,” Magdeburg was besieged by Maurice of Saxony in 1550, and capi- tulated in 1551 on favourable terms. During the Thirty Years’ War the city was twice besieged, and suffered terribly. It success- fully resisted Wallenstein for seven months in 1629, but was stormed and sacked by Tilly in 1631. The whole town, with the exception of the cathedral, the Frauenkirche, and about 140 houses, was burned to the ground, and 30,000 of its 36,000 inhabitants were butchered without regard to age or sex. The town recovered from this deadly blow with wonderful rapidity. In 1648 the arch- bishopric was converted into a secular duchy, to fall to Branden-

| burg on the death of the last administrator, which happened in

1680. In 1806 Magdeburg was taken by the French and annexed to the kingdom of Westphalia, but it was restored to Prussia in 1814, on the downfall of Napoleon. Otto von Guericke, the inventor of the air-pump, was burgomaster of Magdeburg at the time of Tilly’s siege, Carnot died here in exile, and is buried in the cemetery, and Luther was at school here and sang in the streets for bread with other poor choristers.

See Rathmann, Geschichte der Stadt Magdebwrg, 1800-17; Hoff- mann, Chromik der Stadt Magdeburg, 1843-50; Barthold, Geschichte der deutschen Stddte, 1850.

MAGELLAN, Ferpinanp, in Portuguese Ferndo DE

| MacanAzs (c. 1470-1521), who, though he did not survive , to return home with his ship, well deserves the title of the

“first cireumnavigator,” was born about 1470, and (accord- ing to the somewhat questionable authority of his will, dating from 1504) at Villa de Sabroza in the district of Villa Real, Traz os Montes. His family was “ hidalgo,” and he seems to have spent his boyhood in the household of Queen Leonora, consort of John II. of Portugal. For several years he was in active service in the East Indies. It was he who, in 1510, gave Siqueira timely warning of the plot of the people of Malacca, thus probably saving

his countrymen from annihilation ; and, along with Serrano, he commanded the ships sent out under Abreu for the dis- covery of the Spice Islands. On his return from the East, Magellan was sent to Azamor in Morocco; and this brief episode in his career is memorable for the wound which left him lame for the rest of his life, and for the beginning of the troubles which determined his future course. Contrary to what he had a right to expect, the king (Manuel) refused Magellan's application for an increase of the pay assigned to him as a member of the royal household; and the manner of the refusal added insult to what he considered injury. In company with another malcontent of note,

Ruy Faleiro the astronomer, he formally renounced his nationality, and went to offer his services to the court of Spain. Word was no sooner brought to Manuel of the schemes proposed to the Spaniards than he felt the mistake he had committed ; but all the efforts put forth by special agents to allure his alienated subjects back to their allegiance, or to thwart their negotiations, proved of no avail. The bishop of Burgos, Juan Rodriguez de Fonseca, had taken the matter up, and things had gone too far for Magellan to retrace his steps. On August 10, 1519, the expedition set sail; to find his way by a western route to the Spice Islands of the East was the task which its com- mander had undertaken. When more than three years afterwards, on September 6, 1522, the " Victoria" cast anchor in a Spanish port, the captain, Sebastian del Cano, had a strange tale to tell of mingled triumph and tragedy. While the squadron lay in Port St Julian, on the Pata- gonian coast, three of Magellan's Spanish captains had defied him and conspired against him, and it was only by a rapid execution of summary vengeance that he had main- tained his authority. At a later date the " Antonio," at the instigation of Gomez, the Portuguese pilot, his personal enemy, sailed home to Spain with evil reports, at the very moment of success, when the Strait of the Eleven Thousand Virgins, or of the Patigonians, now known as the Strait of Magellan, had been explored almost to the Pacific. The strait was passed on November 28, 1520; and, though Magellan had not quite reached the Spice Islands when he fell in conflict with the people of Zebu, 27th April 1521, his task was virtually accomplished. The name Magellan's Land—long given to Patagonia and that hypothetical continent of which

Tierra del Fuego was considered only. a portion—had disappeared from our maps, but has again been bestowed by Chili on the terri- tory she claims in the extreme south.

No record of his exploits has been left by Magellan himself; and coutemporary accounts are less detailed and consistent than could be wished. The best is that of Antonio Pigafetta, a volunteer in the fleet. It is printed in Ramusio, and exists in four early MS. copies, three in Freneh and one in Italian. The Italian was printed in 1801 by Amoretti. Along with five minor narratives an English version appears in Lord. Stanley of Alderley's First Voyage round the World by Magellan, 1874 (Hakluyt Society's Publications, vol. lii.). See also J. G. Kohl, Gesch. der Entdeckungsreise . . . zur Magellan's Strasse (Berlin, 1877), and Ramon Guerrero Vergara, = "ati i del Estrecho de Magellanes, Santiago de Chile,

MAGGIORE, Laco (French, Zac Majeur; in Italian also frequently Lago Verbano; Latin, Verbanus), is the westmost of the great lakes of northern Italy. In accord- ance with its popular name it has long been reputed the largest of them all; but though in length it somewhat surpasses Lago di Garda, it does not cover so extensive an area. Of the total surface of 82 square miles, 65 belong to Italy, and the remaining 17 to the Swiss canton of Tessin or Ticino. The length from north to south, between 45° 43' and 46° 10' N. lat., is 38 miles; the breadth, generally between 2 and 4 miles, is increased to 6 or 7 at the junction of the Toce valley on the west. The Ticino, the leading tributary of the Po, enters at the one end of the lake and escapes at the other. The very interesting geo- logical problems which Lago Maggiore suggests are not yet fully cleared up. (See Taramelli, Z/ cantone Ticino meridi- onale ed t paesi finitimi, Bern, 1880, forming vol. xvii. of the materials for the geological map of Switzerland.) The whole of the west side and the east side as far south as Val Travaglia are shut in by a region of gneiss and schists, while the remaining portion presents dolomites, calcareous rocks, and conglomerates, mingled with strongly developed moraines. On Dufour's great map of Switzerland the greatest depth is given as 2801 feet, opposite Pino; but this is probably much in excess, as in GQ, B. Maggi's

topographical map of the lake (Turin, 1857) the highest figure registered along the medial line is only 1233 feet between Barbe and Lavello, and at the laying of a telegraph line in 1860 Salis found no more than 337 between Vira and Locarno. The ordinary height of the surface above the sea is about 640 feet.

Between the lowest | and highest water-mark, |: however, there is a difference in ordinary years | of nearly 12 feet, and in very exceptional cases of twice as much. For } not only is the Ticino subject to floods, but the |: lake receives a number of considerable streams JOR (the Toce, the Maggia, jaa the Verzasca, the Tresa, | 2% &ec.), and some of these bring down the surplus waters of other lakes— Lugano, Varese, and {¥ Orta. The flood of [1868, which exceeded [a by about 6 feet the greatest that had been known for centuries, so deepened and enlarged

the outlet of the river that the level of the lake was permanently reduced by about a foot and a half, and alterations had to be made at the

various ports to suit the new condition of things. (See Paolo Gallizia in Atte del Coll. degli Ingegn. ed Archit. in Milano, 1879.) At least twenty-three species of fish are caught in Lago Maggiore; and the fisheries are of value enough to be closely preserved by the proprietors.

The principal towns and villages round the lake are the following,—the first being in Switzerland, and the others in Italy :—Locarno (population in 1880, 2645), at the mouth of the Maggia, one of the alternate capitals of the canton of Ticino; Cannobio (2000), famous from the 15th century for its tanneries, and with paper-mills and silk- works; Luino (2000), the original home of the Luini family, and the scene of one of Garibaldi’s exploits in 1867, commemorated on the spot by a statue of the victor; Laveno (1500), formerly an Austrian naval harbour ; Intra (4500), a busy manufacturing town—cotton, glass, silk, &c.; and Pallanza (4200), a flourishing little city with a large cathedral, a penitentiary, &c., and altogether the most important place on the lake. The celebrated Bor- ROMEAN IsLANDs, lying off Pallanza, have been already described, vol. iv. p. 64; compare Medone, Le isole Borro- mee, with views by Falkenstein (Novara, 1840), As the St

Gotthard and St Bernardino routes meet at Bellinzona, much of the trade between Italy and the north used to pass by way of the lake and the high roads that skirt its banks; and the opening of the St Gotthard railway, which joins the Italian system at Pino on the east side, and goes as far as Locarno on the west side, will bring back some of the traffic which the earlier railways diverted into other channels. The first steamboat was launched on the lake in 1826.

See P. Morriggia, Ist. della Nobilta del Lago Maggiore ; Amoretti, Viaggio at tre laghi; Vagliano, Rive del Verbano.

MAGHIANA, the chief town and headquarters of Jhang district, Punjab, India, is situated in 31° 17’ N. lat. and 72° 21’ EK. long., and had a population in 1868 of 10,525 (Hindus, 5192; Mohammedans, 4698; Sikhs, 306; and “others,” 329). It has a considerable trade with Kandahar, large exports of country cloth, and a fluctuating

Origin of

term.

Magical beliefs and prac- tices.

business in grain from the fertile lowlands of the Ravi. The civil station lies to the east of the town, and consists only of a court-house and treasury, sessions bungalow, jail, church, and three or four residences of officials. Maghiina forms a single municipality with Jhang town, which lies 3 miles to the north. The united population is

19,649.

MAGIC 1 has its name from the mag?, Greek payor, the hereditary caste of priests among the ancient Persians, thought to be of Median origin (Spiegel, Avesta, vol. ii. p. vi). Among the magi the interpretation of dreams was practised, as appears from the story of the birth of Cyrus (Herodotus, i. 107); later writers describe them in both a sacerdotal and magical capacity,

Lucian (Wakrob., 4) calling them a prophetic class and devoted to the gods, while Cicero (De Divinatione, i. 23, 41) writes of them as wise men, augurs, and diviners. In such super- natural crafts the magi seem to have much influenced the Western nations, to judge by their name having passed into a set of classical terms (uayeia, payedw, magia, magice, de.) applied to sorcery, enchantment, and occult science in general. In the New Testament soothsaying and sorcery are so designated (Acts viii. 9, xiii. 6) ; while the astrologers who divine the birth of the King of the Jews by the appearance of a star in the east are called magi (Matt. ii.).

The word magic is still used, as in the ancient world, to include a confused mass of beliefs and practices, hardly agreeing except in being beyond those ordinary actions of cause and effect which men accustomed to their regularity have come to regard as merely natural. Thus magical rites are difficult even to arrange in systematic order. A large proportion of them belong properly to the general theory of religion, inasmuch as their efficacy is ascribed to the intervention of spiritual beings. Thus the ghosts of the dead are called up by the necromancer to give oracles or discover hidden treasures, or sent to enter men's bodies aud afflict them with diseases or to cure them, or in a score of ways to do the behests of the magician, whose spells or incantations are thought powerful enough to control the will even of such divine beings as can drive the winds and give or withhold the rain. It must be noticed, on the other hand, that many magical arts show no connexion with spirits at all, or, even if ghosts or demons or gods have to do with them, the nature of these beings does not of itself account for the processes employed or the effects believed to result. This non-spiritual element in magic depends on imagined powers and correspondences in nature, of which the adepts avail themselves in order to discover hidden knowledge, and to act on the world around them by means beyond the ordinary capabilities of men. Thus by mere effort of will, by traditional formulas and rites, or by working on symbolic fancies, the sorcerer believes he can bewitch others to sickness or death, the astrologer reads the future in the aspects of the stars, the augur attends to omens from the cries of birds and beasts, the haruspex prophesies by the heart or liver of a slaughtered animal, and other classes of diviners judge of the hidden past and the yet more hidden future by the falling of lots or dice, the twitching of their own fingers or the tingling of their ears, and a host of other facts of nature

which, as the educated world has now found out, have no practical connexion with the magical meanings or effects assigned to them. The great characteristic of magic is its unreality. Its methods have often an ideal coherence which may be plainly traced, but practical effect they have none, and so they may be altered or transposed without being made worse or better, a re

‘ The etymology of the word is seen in the terms ‘art magic,” or the ‘* magic art”; French, art magique; Latin, magica ars.

One remarkable consequence of this is the fixity with which some magical formulas framed thousands of years ago hold on almost unchanged to this day. To understand this, it must be borne in mind that, if there were any practical use in such rules as those for divining by the cries of animals, the old rules would have been improved by experience into new shapes. But, they being worthless and incapable of improvement, this motive of change is absent, and the old precepts have held their ground, handed on by faithful but stupid tradition, from age to age. When the test of practical efficacy comes in upon the magic art, it is apt either to destroy it utterly or to transform it into something more rational, which passes from supernatural into natural science.

Magic is to be reckoned among the earliest growths of Magic of The evidence for its remote antiquity lower

human thought. lies partly in its presence among all races of mankind, the ruder tribes especially showing it in such intelligible shapes that the beginnings of magical crafts may be fairly supposed to have arisen in the oldest and lowest periods of culture. An example may be taken from the wild natives of Australia, whose whole life is pervaded by the belief, and embittered by the terror, of sorcery. They imagiue the sorcerers, armed with their mysterious power called boyl-ya, to come moving along in the sky, invisible except to other sorcerers ; they enter the bodies of men, and feed stealthily on them, not eating the bones, but consuming the flesh ; the native feels the pain as the boyl-ya enters him like a bit of pointed quartz, and in this shape of quartz crystal the evil can be extracted by another sorcerer.

‘The sorcerer has other means of attacking his victim: he can creep uear to him when asleep, and bewitch him to death by merely pointing at hin a leg boue of a kangaroo ; or he can steal away his kidney fat, where, as the natives believe, a man’s power dwells; or he can call in the aid of a malignant demon to strike the poor wretch with ltis club behind the neck ; or he can get a lock of hair, and roast it with fat over the fire till its former owner pines away too, aud dies. The Australians, like other low tribes in the world whose minds are thus set on imaginary causes of death, hardly believe a man can die unless by being slain or bewitched. When a native dies what we call a natural death, they ascribe it to magic. Then other magic must reveal the hostile sorcerer who has done him to death: either the corpse itself will seem to push its bearers in the direction of the murderer, or the flames of the grave-fire are seen to flicker towards where he is, or some insect will be seen creeping towards his home; and, when the next of kin thus discover the magic enemy, they set off to take vengeance with earthly weapons. The sorcerer has kindlier duties when he sits by a sick man and charms and charms till he recovers, or sucks out the disease from his body in the shape of a stone spear-head or a fish bone, or brings out the ailment along a string, the other end of which he draws between his own lips till it is covered with blood, telling the bystanders (who believe it) that this blood came along the string out of the sick man. Not disease and cure only, but other events of life, come within the scope of native magic. Storm and thunder are the work of the sorcerers ; they can bring rain and make the rivers swell, or burn up the land with drought. Shooting stars and comets are to the natives omens of disaster; the great hawk’s cry in the night portends the death of a child, whose soul the bird is carrying off; but when a man’s finger-joints crack he stretches out his arm, for in that direction some one is doing him a kindness,2

- For these and other details see Grey, Journals of Expeditions ; Waitz, Anthropologie der Naturvolker, vol. vi. ; Brough Smyth, Aborigines of Victoria ; Fison and Howitt, Kamilaroi and Kurnai, &e.

Taken together, such a repertory of the demonology and witchcraft of a special group of savage tribes shows remarkable correspondence in

principle with the magic which once flourished in the civilized world, and which still lingers in peasant folklore. The very details often agree so much as to raise the question whether the magic of savages may sometimes have been borrowed from the lower class of colonists. The superstitions of the peasant are in fact what the savage would readily assimilate, as belonging to a state of mind like his own, and there is even evidence of European charms and omens having been sometimes borrowed by native tribes of Australia or America. It was necessary to mention this, if merely to point out that such borrowing has been only slight and superficial. It in no way upsets the general principle that the magic of the lower races was developed among them, fitting as it does with their low level of knowledge. Every book of travels in savage and barbaric countries shows the influence of the native magician, who, often at once sorcerer and established priest, and sometimes even chief of his tribe, by the aid of spirits and other supernatural means interferes in every act of life. Thus in the Pacific islands the Europeans found a whole class of sorcerers living by making diseases, their method being the familiar one of burning or otherwise practising on some morsel of hair or remnant of food, so as to send disease into its owner, by a malignant spirit tying knots in his inside till he writhed with agony. Every sick man was a source of profit to the sorcerer who was believed to have brought on the disease by burning his rubbish, and of course had to be bought off by liberal presents. In these Pacific islands

a fact most important in the theory of magic everywhere |

comes into view with particular distinctness—that such inagical arts prove effective through the patient’s own imagination; when he knows or fancies that he has been bewitched he will fall ill, and he will actually die unless he can be persuaded that he has been cured. Thus, wherever sorcery is practised with the belief of its victims, some system of exorcism or some protective magical art becomes, not only necessary, but actually effective, a mental disease being met by a mental remedy to match it! At the discovery of America, the Spaniards found the native sorcerers throwing themselves into delirious ecstasy by snuffing a narcotic powder, their ravings in this state being held to be conversation with departed souls, through whose help they were able to cure the sick by expelling the disease. The class to which these sorcerers belong extends over South America, and is generally known

under the name of payé (or allied terms). The sorcerer is described as being initiated by living in some wild spot till by fast- ing and self-torture he attains his supernatural craft, becoming able to see spirits, to consecrate bits of bone or stone into powerful amulets, to make good or bad weather, to gain mystic powers over familiar birds and beasts, to take omens from their cries or from the itching of his own skin, which latter symptom an Abipone diviner declared to portend an attack from a tribe of enemies, in spite of the missionary, who irreverently set it down to fleas. The old arts of the payés, their malicious witchcraft with herbs and hair, the use of narcotics to produce ecstasy, and their mental excitement by drumming, rattling, and dancing are still to be met with in the wild districts of Guiana and Brazil. In North America practitioners of the same kind are generally known as " medicine-men," from the French colonists calling them médecins, as being the native doctors; the term is really appropriate to barbaric magicians in all parts of the world, whose

1 ne = See Ellis, Polynesian Researches ; Turner, Nineteen Years in

ee eda E Polack, Manners and Customs of New Zealanders ; Waitz, vols. v., Vi.

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arts of causing and curing disease generally include con- siderable knowledge of herbs powerful as poisons and remedies, of simple stopping of wounds and bandaging hurt limbs, in fact of medicine in its elementary state, as yet not separated from the magic with which it was at first inextricably mixed up. The medicine-man's apparatus includes the sorcerer's usual music, the rattle and the drum, simple and primitive instruments whose constant association with the lower magic bears witness to the beginnings of music and magic having been associated together when civilization was yet in its low stages of development. The American sorcerer carries a " medicine- bag" made with the skin of his guardian animal, which protects him in fight, cures the bites of serpents, and strikes at a distance as a spiritual weapon. He knows magic chants of power over tlie elements; he can by sucking and blowing extract disease-animals from the sick; he can make pictures and images and pierce them with thorns so as to kill the men or animals they represent ; and he can compel love by

practising on the heart of the picture of the beloved one.? In Africa the native sorcerer bears the name of mganga among the west and central negro tribes, nyanya among the Zulus of the south. He is the rain-maker, an office of the utmost importance among tribes who may perish of famine and disease after a long drought. In his craft a principal part is played by what the English in Africa (using the Portuguese word fevtzco, charm or amulet) call “ fetiches,” which are claws, fangs, roots, stones, and any other odds and ends fancied to be inhabited by spirits or invested with superhuman power. These fetiches the negroes trust in for good and against evil fortune, with a coufidence which no failure can shake further than to cause the unlucky bearer to discard a par- ticular fetich which has failed, and to replace it by a more successful one. The African mganga has intercourse with demons; and, being called on every day to predict the fortune of a fight or a bargain, or to discover lost or stolen cattle, he professes to gain information from the spirits, or uses his various modes of divination, such as taking omens from the cries of the eagle or the owl, the swimming of berries, or the moving of sticks in his own hands as they twitch spasmodically in nervousexcitement. As with magicians everywhere, his trade is profitable but dangerous, for if his arts of killing have been successful beyond bearing, or still worse if public opinion decides that he has wilfully withheld the rain, he may be drowned or burned as miser- ably as one of the many victims he has done to death.? These instances are selected to give an idea of the sorcerers of the lower races and their modes of working, which are remarkable for their uniformity in the most distant regions, among tribes who can have had no communication or con- nexion since remote ages. Where, however, such races as the African negroes come in contact with such foreigners as the Arabs, who though more civilized than themselves have not outgrown the magical stage, they borrow their more cultured magical arts, such as divination by lots. In this way the natives of Madagascar appear to have borrowed from the Arabs a system of lucky and unlucky days of birth, which, carried out with stupid ferocity, has cost the lives of thousands of children, born truly in an evil honr, for when the magician declares their birth ill-omened their fate is settled at once by putting them to death.* Turning now to the cultured nations of antiquity, among

2 See Waitz, vol. iii. ; Martius, Ethnographie Amerikas ; Letters of Columbus ; Dobrizhoffer, Abipones ; Schoolcraft, Indian Tribes of North America.

3 See Burton, Lake Regions of Central Africa ; Wood, Natural History of Man, vol. i. ; Callaway, Religious System of Amazulu, &c.

4 See Ellis, J/adagascar vol. ii. chaps. vi., xv.; Dahle in Antanana- vivo Annual, 1876.

Egyptian whom the art of writing consolidated and developed false

spirits and demons ; only these more cultured nations dealt

magic. gs well as true science, we find magic in full vogue, hardly differing in principle from that of the illiterate barbarians, but worked into more elaborate system and ritual. Of ancient Egyptian magic various original documents have been preserved, containing formulas, mostly of religious magic,—that is, acting through the aid of deities invoked. For instance, there are hymns against dangerous animals in the water, and spells for remaining in the country; and the power ascribed to such formulas appears from passages like the following :—“ I confide in the efficacy of that excellent written book given to-day into my hand, which repels lions through fascination, disables men,..... which muzzles the mouths of lions, hyzenas, wolves, the mouth of all men who have bad faces, so as to paralyse their limbs,” &c. Ancient as Egyptian magic is, it has evidently grown up

from still earlier forms, as is shown by that plainest symp- °

tom of old traditional lore, the relying on ancient or foreign epithets as words of power over the gods. This practice appears in the ancient papyri, and goes on to later ages, when the god Set is invoked by other mystically powerful names which he must obey, such as “Joerbeth.” The medical art in

ancient Egypt shows an interesting com- bination of practical and magical remedies. The practical recipe might contain nitre or cedar chips, or deer horn, or various other ingredients administered in ointment or drunk in beer, but with this the magical formula was also required to deal with the demon-cause of the ailment. Thus an emetic was given with the following formula, “O demon who art lodged in the stomach of M., son of N., thou whose father is called Head-smiter, whose name is Death, whose name is cursed for ever!” &c. It must be remembered that such formulas, foolish as they seem to modern educa- tion, had and still have great efficacy in relieving the mind of the superstitious patient, and giving a fair chance to diet and medicaments, Their appearance in medicine so ancient as that of Egypt is good historical evidence how the old magical treatment was encroached upon by natural remedies, though then aud for many ages afterwards the physicians, wise in their generation, thought it best not to discard the supernatural charm. The Egyptians divided out the limbs and organs of the human body, putting each under the special care of a god, a system which, like many other details of their magic, has lasted on into the modern world. From the ‘astrological point of view they made a calendar of lucky and unlucky days, according to which for instance on the 19th of tle month Athor one must not embark on the Nile, while a child born on the 5th of the mouth Paopi will be killed by a bull; traces of this set of precepts may be discerned still in the modern Egyptian almanac. { Another point deserving attention is the appear- ance in early Egypt of the distinction between good and bad magic. Magical curative arts were practised by learned scribes or priests, and were doubtless in high esteem, but when it came to attracting love by charms or philtres, or paralysing men by secret arts, this was held to be a crime. As long ago as the time of Rameses III. it is recorded that one Hai was accused of making images and paralysing a man’s hand, for which he was condemned to death; this was doubtless the ordinary bewitching by an image or pic-

systematically with them by set formulas of propitiation and expulsion.’ The cuneiform writings preserve numerous documents of this kind, such as “From the burning spirit of the entrails which devours the man, from the spirit of the entrails which works evil, may the king of heaven preserve, may the king of earth preserve !”—“‘The god… . shall stand by his bedside. Those seven evil spirits he shall root out, and shall expel them from his

body; and those seven shall never return to the sick man again.” The magic power believed to reside in the secret names of the gods was recognized by the Babylonians, one of whose famous myths relates how by the utterance of these mystic names the goddess Ishtar was delivered front Hades. In the rites of the magician priests, this kind of supernatural power resided in sacred texts, whether chanted or tied on as pliylacteries. In divinatory magic the Babylonians had elaborate codes of rules, of which many have been preserved. Thus omens were drawn from prodigies, such as “when a woman bears a child and at the time of birth its teeth are cut, the days of the prince will be long.” So with omens from animals: ‘‘if a dog goes to the palace and lies down on a throne, that palace will be burned.” A remarkable passage, Ezekiel xxi. 21, mentions three modes of divination practised by the king of Babylon as he stood at the head of the two ways: ‘he shuffled arrows, he con- sulted teraphim, he looked in the liver.” The arrow- divination or belomancy here mentioned was done with pointless arrows marked and drawn as lots. They are often represented on Babylonian aud Assyrian cylinders, and their use was kept up among the Arabs till the time of Mohammed. The Babylonian rules of haruspication, or examining the entrails of animals, were most minute, to judge from the omens of prosperity or misfortune to be drawn from the twisting and colour of the intestines of an ass. Diodorus Siculus (ii. 29, &c.), in his account of the Chaldean priests, mentions with evidently good information their hereditary skill in various branches of magic, their use of purifications, sacrifices, and chants, to avert evil and obtain good, their foretelling by omens, dreams, prodigies, &c. But it is on their astrology that he deservedly lays the greatest stress. The five planets, which they called “interpreters,” they held to portend events by their rising and setting and their colour, foretelling the. wind or rain or heat, comets also, and eclipses of the sun and moon, and earthquakes, and atmospheric changes, beneficial or harm- ful, both to nations and kings and common men. The Babylonian calendars still remain to show how eclipses were brought into connexiou with floods, invasions, good and bad harvests,—such ideas being worked out, not by mere arbitrary fancy, but from such fancied regularities as that the same weather and the same famines and pestilences tended to recur in a cycle of twelve years. To the Babylonian astrological system belong the stars of men’s nativities, the planetary houses, the twelve signs of the zodiac (probably invented in observatories in Babylon), while the fixed stars are associated with the

planets and gods in a system which is seen at a glance to be the astrology which later nations of Asia and Europe have followed since with servile faithfulness.?

ture, here already mentioned among the lower races,and to | ;Egypt and Babylon, as these brief notices show, were

. be mentioned again as not forgotten among ourselves.’ the chief sources whence the world learnt what may be Baby- ‘ Still more prominent among the ancient nations who | called the higher branches of occult science, and from the a brought magic into its pseudo-scientific stage were the | historical point of view the magical rites and beliefs of atic Babylonians, whose supernatural arts were adopted and | other ancient Eastern nations, such as Asia Minor and

continued among the Assyrians. No savage tribe ever

India, are of little importance. It was mainly through filled their world with more swarming hosts of nature-

Greece and Rome that magic was consolidated and

2 See Sayce in Records of the Past, vols. i., iii., v.; Trans. Soc. Biblical Archzxology, Vols. iii., iv.; Lenormant, Magie chez les Chaldéens, and

1 Records of the Past, vols. vi., x. ; Maspero, Hist. Anc. des Peuples Divination chez les Chaldéens. XV. — 26

del Orient, p. 84; F. Chabas, Le Papyrus Magique Harris.

Greek and Roman magic.

developed in Western civilization. In these classic nations there may be traced the rude old magic inherited from barbaric ancestors, to which in later times were added ceremonies and calculations imported as Oriental wisdom. Ancient literature shows the Greeks as a people whose religion ran much into the consultation of oracle-gods at many temples, of which the

shrine of Apollo at Delpi.i was the chief. No rite could keep up more perfectly the habit of savage religion than their necromancy (vexpomevreia, vexvonavreia) or consulting ghosts for prophecy; there was a famous oracle of the dead near the river Acheron in Thesprotia, where the departing souls crossed on their way to Hades (Herod., v. 92).) The myth of Circe turning the companions of Odysseus into swine shows the barbaric belief in magical transformation of men into beasts, and the classic sorcerer was believed to turn himself into a wolf by spells like the medicine-man of some modern savage tribe. Not less clearly does the story of Medea and her caldron typify the witch-doctress with her pharmacy (pappaxeta) powerful both to kill and bring to life. The worship of Hecate, the moon, sender of midnight phan- toms, lent itself especially to the magician's rites, as may be seen from this formula to evoke her: 'O friend and com- panion of night, thou who rejoicest in the baying of dogs and spilt blood, who wanderest in the midst of shades among the tombs, who longest for blood and bringest terror to mortals, Gorgo, Mormo, thousand-faced moon, look favourably on our sacrifices!" This magical record, pre- served by an early Christian writer, may be compared with the poetic picture in Theocritus's idyll of the sorceress (Idylt., ii.), where the passionate witch cries in similar words to Heeate, the moon, to shine clear while she compels by sacrifice her faithless lover, and goes through her magic ritual of love and hate, striving to force her beloved home to her by whirling the brazen rhomb, scattering his bones with the scattered barley, melting him to love by the melting wax, casting into the fierce flames a torn shred of his cloak and laurels to crackle and blaze and be con- sumed that his flesh shall be consumed likewise. This ancient witchcraft ascribed magic power to such filth as pounded lizards and the blood of creatures untimely dead, revolting messes made familiar to moderns by Shake- speare, who introduces real magic recipes in the witches' caldronin Macbeth, 'The early Greeks lived in the same fear as southern nations still do of the arts of "fascination " (Bacxavia, Lat. fascinatio) worked by envious praise, or ill-wishing, or the evil eye ; and they sought to avert these bad influences by the means still in use, spitting and symbolic gestures, and the use of charms and amulets. As to ancient Rome, much of the magic in the Latin poets, such as Virgil and Horace, is only Greek sorcery in a Latin dress. But severe Roman laws against those who practised such malefic arts as making hail and spoiling the crops show that here also the soreerer was at his usual work. What is more remarkable

is the high official place given to divination in old Rome, where every public act was done under magical sanction. The auspex, or bird-viewer, and the augur, whose similar name seems to refer also to omens from the flight and cries of birds, in fact carried on super- natural divination not by omens from birds only, but by a variety of magical processes forming a complex traditional system, partly adopted from the Etruscans, as to which some curious remarks have come down to us in the treatise On Divination by Cicero, himself an augur, though living in the days when the ancient lore was falling into contempt, The Roman divination was, as its name implies, a religious system of consulting the gods, who sent the signs to guide mankind. Jupiter, the Heaven- father himself, was heard and seen in thunder and lightning ; wherefore these heavenly manifestations were

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of the highest import, observed by the augur in the templum or division of the sky marked out with his lituus or curved wand; there was no better omen than when Jove lightened on the left. Among birds, the fierce eagle, Jove's messenger, gave the highest presage of victory, while the owl with its dismal cry was unluckiest. The good or ill signs given by many birds depended on whether they were on the right or left hand, and the sacred chickens gave their omens according as they were eager or not to feed, and dropped crumbs on the ground. All prodigies were recorded as portents in Roman affairs; and those which Livy mentions year by year, whether they were real or fictitious, in either case had their effect on the minds of men who saw national signs in a heavy hailstorm, a calf born with two heads, or a bullock found when sacrificed to have no heart. It was in quest of such portents that the haruspex made his professional examination of the entrails of the victims, and reported the aspects of the head of the liver or cleft of the lungs, as a sacred guide to warriors and statesmen in the conduct of national affairs. Public divination being on this footing, it is not to be wondered at that, in the time of the empire, foreign soothsayers thronged to Rome to practise their craft among rich and credulous dupes. It appears that the magie of Egypt and Babylon still held a prominent place, for Juvenal refers to both in his sixth satire, where he rails at the superstitious women of his time for putting their trust in Chaldzan astrologers, all the more if under the laws against magicians they had been put in prison or banished, while

ladies would not go out for a drive or take a meal without consulting their book of lucky and unlucky hours, which bore the Egyptian name of Petosiris.

In the classic world, however, the growth of knowledge and accurate reasoning began to have their effect in bring- ing magic to the test of facts, and proving its failure. Greek philosophy, with its physical theories of the universe, had shaken the old religion, and with it the old magic. Though the Romans kept it up as a matter of statecraft, the judgment of statesmen and philosophers revolted from it, holding rather with Ennius, who pointed out the absurdity of the hungry fortune-teller promising others wealth and begging a drachma for himself, or with Cato, who wondered that one diviner could meet another and not burst out laughing. These are both quoted by Cicero, with other passages argued quite in the modern spirit, as where he asks on what principle a raven's croak should be propitious on the right but a crow's on the left, or how a chicken eating a cake could help dropping crumbs. Historically attacks of this kind have a particular value, as recording many magical details which we do not know from the believers themselves. Of such details Pliny's Natural History is full, though he hates magic as the most fraudulent of arts; and among the most instructive accounts of classie astrology must be reckoned the treatise written against it by Sextus Empiricus. Had sceptical philosophy had its way, magic would have perished ages earlier out of the civilized world. But there were other in- fluences already at work, not only to preserve it, but even to give it another great expansion before its final decay.

The Pythagorean philosophy, while on the one hand bringing in the science of Egypt and Babylon, and develop- ing it into Greek mathematics and physics, on the other hand favoured the growth of magic by mystical speculations, such as those on numbers. Not that the Pythagoreans began this delusive science, which had long been at home in Babylon, where the occult powers of the planetary 7 and the zodiacal 12 were recognized, and spiritual arithmetic was carried so far as to indicate good deities by whole numbers and evil denions by fractions. But the Pythagoreans developed it further in their mystic

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thenrgic magic.

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symbolism of the active 1 and the passive 2, the sacred 4 of space proceeding from the 1, the 7 of intelligence, the 8 of love, and the 10 of the universe. Whatever rational thought may at first have been veiled under all this, its literal nonsense suited the magical mind, and its effects may be traced in magical literature ever since. With such speculations was combined an animistic system of spirits pervading the world, ranging from gods and demons down to the souls of beasts and plants. Both in mystic symbolism and in the doctrine of demons the mind of Plato followed the Pythagorean track, and at a later period the tendency towards magical speculation came out strongly among the Neo-Platonists, when enthusiasts, not content with speculating about the demonic powers of the universe, sought to establish personal relations with them, and use them for their own ends. The treatise on the Egyptian mysteries ascribed to Iamblichus is an interesting record of this phase of thought. Alexandria became the especial home of systems of theurgic magic, in which invocations, sacrifices, diagrams, talismans, were employed with rule and method, as though they were really effective. Much of this delusive craft has perished or become unintelligible, but its once considerable hold on men’s minds may be traced in such relics as the gem-talismans of the Gnostics, still objects of curiosity to archeologists ; among their formulas is the celebrated Abraras, the Greek letters of which (ABpagas, ABpaca€) stand with astrono- mical significance for the number 365. The theurgy which came down into medieval and modern Europe is strongly marked with Jewish magical speculation. After the captivity, the Jews worked out a classification and nomenclature of angels and demons. On the one side are ranged such celestial powers as Gabriel and Raphael, while against them stand such beings as BEELZEBUB (g.v.) and Ashmodai or Asmodzeus (Tobit, chap. iii., &c.), who is clearly the great evil demon Aeshma-daeva of the Persian religion. Many centuries afterwards, in European magic books of the Middle Ages we find the remains of these theurgic systems still handed on. Their elaborate folly may be best realized by looking into such books as Francis

Barrett's Magus, or Horst's Zauber-Bibliothek, where the actual rites and formulas for raising demons are given. The evocations, with their uncouth jumbles of sacred names, have some historical interest from their strangely mixed traces of ancient religions, preserved by charlatans whose blunders show how little they understood the words they copied. We can fancy the magician in his black robe embroidered with mystic characters, waving his wand as he invokes at one breath the great demons '" Acheront," " Ashtaroth," '" Asmodi," names which the modern student recognizes as borrowed from the ancient religions of three different countries—Greece, Phoenicia, Persia, Of all the sources of this branch of magic, the Jewish tradition is the chief. The magician relies on the power of divine Hebrew names, such as the shem hammephorash or the name Jehovah in its true pronunciation, with which Solomon and other wonder-workers of old did marvellous things. He draws powerful spells from the KappaLan (g.v.) of the later Jews, with its transposed letters and artificial words,— using for instance the name Agia, formed from the initials of the Hebrew sentence—' Thou art a mighty God for ever." But in compelling the spirits he can use Hebrew and Greek in admired confusion, as in the following formula (copied with its mistakes as an illustration of magical scholarship in its lowest stage)—" Hel Heloym Sother Emmanuel Sabaoth Agla Tetragrammaton Agyros Otheos Ischyros Athanatos Jehova Va Adonai Saday Homousion Messias Eschereheye!" One of the most curious features of the demon-evocation is the use of the pentagram, an essential adjunct of the magic circle, whose

effect in barring the passage of Mephistopheles is described in a well-known scene in Goethe's Faust. This symbol is an interesting proof of tradition from the Pythagoreans. It is a@ geometrical figure for the construc- tion of the regular pentagon (Euclid, iv. prop. 11), now familiar to school-boys, but which to the school of Pythagoras was so wondrous a novelty that they used it as a sign of fellowship (see Bretschneider, Geometrie vor Kuklides, p. 85), and it after- wards became a magical symbol, still to be seen in use in every country from Ireland to China.

The magic of the Moslem world is in part adopted from Jewish angelology and demonology, and in part carries on Babylonian-Greek astrology, as systematized by such writers as Paul of Alexandria and Claudius Ptolemy. Thus the proceedings of the Moslem magician, as met with in the Thousand and One Nights, mostly run parallel with those familiar in Europe, in their fumigations and incanta- tions, talismans (rereAcopeva), horoscopes, and almanacs or calendars of lucky and unlucky days. In fact a modern Zadkiel in England would find himself on common ground with his brother practitioner in Baghdad or Delhi! In other districts of Asia, more peculiar developments of magic have been preserved. To mention a few of the most noteworthy, the Sanskrit literature in India is rich in ancient magical precepts and hymn-charms.? (The ancient Hindu magic is religious, turning on the actions of demons (bhdia) in causing disease' by possession, and their exorcism and compulsion, as well as power obtained over higher spirits by sacrifices, austerities, and formulas or charms (mantra). From their connexion with early Aryan customs, these rites sometimes throw light on European practices derived from the same stock. Thus the magical practice of going round "with the sun," well known as deisi/ in High- land superstition, and kept up in England in the rule of passing the decanter "through the button-hole," appears to be @ rite of Aryan sun-worship belonging to remote antiquity, for (under the name of pradaxina) it forms part of the Hindu marriage ceremony handed down from Vedic times.? Buddhism as well as Brahmanism had its magical side, and its literature of magic formulas (tantra). The "'red-cap" lamas of Tibet, with their pretended miracles of breathing fire, swallowing knives, and ripping themselves up, are curious as reminding us of the time when these tricks, now come down among us to jugglers' feats, were regarded as supernatural, In the low Buddhism of the Mongols, mixed with native barbarism, the shamans or sorcerer- priests, with their rude sacrifices and demon-dances, are among the most remarkable types of their ancient class. In this part-of Asia, and farther east, a somewhat remark- able system of divinatory magic has grown out of the reckoning of days, months, and years by a zodiac-calendar, whose signs ape, horse, dog, &c., are combined in series with the elements, male and female, so that a year may be called that of the "female firedog." It was inevitable that such a system should lead the magicians to draw omens from its signs. They do so in a most elaborate way, interfering with their presages on every occasion of life, beginning when the child

undergoes its ceremonial washing, and has its fate defined by the signs it is born under, as “in the element fire, under the red sign in the year of the tiger, in the month of the sheep and day of the hog, in the fortieth division of the day under the influence of the ninth star,” &c. This quaint science seems, however, not altogether native, for the influence of

Pentagram.

1 See, for instance, Herklot’s translation of the Qanoon-e-Islam.

2 See Weber, Omina et Portenta, and volumes of Indische Studien.

° Haas, in Indische Studien, vol. v. p. 257; Pictet, Origines Indo-Européennes, part ii., p. 498.

Babylonian and Greek scientific and magical ideas has extended across Asia, eveninto China. ‘The magic of this latter country is remarkable for its various and elaborate modes of divination. These may be obtained from mediums possessed by spirits, and giving oracles by speech or writing with the “descending pencil,” as has lately been done by “spiritualists” in Europe. But higher authority is given to divination by throwing sacred lots, as the two wooden ka pwe, which fall with the flat or rounded side up. The results of such processes of divination, in then-

selves meagre, may be brought to any required elaborate—

ness by the use of the “eight diagrams” obtained by combinations of the whole line (—) and the broken line (—). These, primarily interpreted as representing the male and the female principle (yang, yn), perfect and imperfect, heavenly and earthly, are referred by syste- matic fancy to elements, qualities, tempers, &c., and inter- preted in the celebrated Chinese classic book called the Y-king into a collection of oracular responses… Tho feng-shut, or ‘“ wind-and-water” magic, is a system the practitioners of which regulate the building of houses and tombs by their local aspects; it has of late come under the notice of Europeans from the unexpected

impediments it has placed in their way when desirous of building or constructing railways on Chinese soil.?

In the lower stages of civilization the distinction between

os religion and magic hardly appears, the functions of priest om.

and sorcerer being still blended, as was long since pointed out by Meiners (Geschichte der Religionen, book xii.). As established religions were formed among nations of a higher grade, the separation became more distinct between the official rites of the priesthood and those practised by castes of magicians, rivalry often becoming serious between them. Thus in ancient Egypt there appear, on the one hand, the miracles worked by divinities under official sanc- tion of the priesthood, and, on the other hand, the unlicensed proceedings of sorcerers, who indeed doubtless deserved ill of society by practices done by detestable means or for detestable ends, such as bewitching by hurtful demons, or administering love-potions. Here we come into view of the distinction still expressed by the terms ‘‘ white magic” and “black magic.” Laws were made against magic in these ancient times, but it must be remembered that then and for thousands of years later, the opposition to magic had seldom anything to do with the sceptical doubts of its reality which arose among the classic philosophers. Magic was none the less believed in for being hated and proscribed ; and when a soothsayer was looked upon as a false prophet

the inference was, not that magic was unreal, but that this |

particular magician was pretending to supernatural power he did not possess. The Levitical law prohibits sorcery under penalty of death (Levit. xx. 27). Among the early Christians sorcery was recognized as illegal miracle; and ~~magic acts, such as turning men into beasts, calling up familiar demons, raising storms, éc., are mentioned, not in a sceptical spirit, but with reprobation. In the changed relations of the state to the church under Constantine, the laws against magic served the new purpose of proscribing the rites of the Greek and Roman religion, whose oracles, sacrifices, and auguries, once carried on under the highest public sanction, were put under the same ban with the low arts of the necromancer and the witch.2 As Christianity extended its sway over Europe, the same antagonism con~~

tinued, the church striving with considerable success to put down at once the old local religions, and the even older

ee eee eee : See Mohl, Y-king ; Pauthier, Livres Sacrés de U Orient. ‘See Eitel, Handbook of Chinese Buddhism ; Edkins, Folklore of China, p. 65.

3 For an excellent account of the classical and medieval history of magic see Maury, La Magie et 1’ Astrologie,

practices of witchcraft ; condemning Thor and Woden as demons, they punished their rites in common with those of the sorcerers who bewitched their neighbours, and turned themselves into wolves or cats. Thus gradually arose the legal persecution of witches, which went on through the Middle Ages under ecclesiastical sanction both Catholic and Protestant. The literature of the Middle Ages does not contribute many new elements to the study of magic, which was carried on under the old traditional systems. Bnt it shows on the one hand how unbroken the faith of even the educated classes remained in the reality of magic, and on the other hand that its more respectable branches, such as astrology and alchemy, were largely followed, and indeed included in their scope much of the real science of the period (see the works of Thomas Aquinas, Gerbert, Roger Bacon, Cornelius Agrippa, &c.). The final fall of magic began with the revival of science in the 16th and 17th centuries, when the question whether the supposed effects of magic really take place or not was raised, and decided against it. In our day the occult sciences are rapidly dying out in the educated classes of the civilized world, though astro- logy still has its votaries, and the communications in ‘spirit circles” by possessed mediums and spirit-writing are what would in old times have been classed as necro- mancy. The magic which holds its place most firmly in Europe has come down by tradition in popular folk-lore, which is full of precepts for bewitching and averting witchcraft, and divining by omens. Among the practices which occur to everyone’s mind are foretelling changes of the weather by the moon’s quarters, taking omens from seeing magpies and hearing a dog howl at night, the fear of spilling salt, observation of the shroud in the candle and the stranger in the tea-cup, the girls’ listening to the cuckoo to tell how soon they will be married, pulling off the row of leaves to settle what the lover’s

calling will be, and perhaps even compelling him to come by a pin stuck through the rushlight. Nor has the wizard forgotten how to cure inflammation with a “thunderbolt,” generally an ancient stone or bronze hatchet dug up in the fields, nor how to punish an enemy by means of a heart stuck full of pins and hung in the chimney. These are but a few out of hundreds to be found in Brand’s Popular Anti- quittes and the volumes published by the Folklore Society, or in the similar collections from every country of Europe. If any one wonders that popular magic still enjoys much credit in the peasant class, it should be remembered that even the educated world still shows a remarkable unreason- ableness in connecting causes and effects. Thus the old magical belief survives that a loadstone, because it draws steel, will also draw out pain. Peasants may well carry a magnet in their trousers’ pocket against rheumatism when better-informed people will wear with as great con- fidence a ‘galvanic belt,” though any electrician will tell them it has not the power to hurt or curea fly. One of the most favourable proofs of the changed public opinion in England is seen in the laws, where the penalties of the old statute against those who keep familiar demons are abolished, and the time-honoured charge has disap- peared from the commission of the peace to inquire of all “inchantments, sorceries, art magic, trespasses, forestall- ings, regratings, &c.” But persons pretending to exercise witchcraft, sorcery, enchantment, or conjuration, or under- taking to tell fortunes or pretending by occult or crafty science to discover lost or stolen goods, may be imprisoned under 9 Geo. II. c. 5, or fortune-tellers dealt with as rogues and vagabonds under 5 Geo. IV. c. 83, or they may be prosecuted for obtaining money under false pretences.

‘Looked at as a series of delusions, magic is distasteful to Origin of the modern mind, which, oncesatisfied of its practical futility, masie.

is apt to discard it as folly unworthy of further notice.

MAGIC

This, however, is hardly doing it justice,’for in the early developments of the human mind both religion and science were intimately connected with magic, whose various branches, uufruitful as tlley may be, are nevertheless growths from the tree of knowledge. The universal diffusion of magical ideas among mankind, excepting only the limited class who have

abandoned them through higher education, shows that we are here in presence of adeep-seated intellectual process, while the strong likeness in the principles of magic among the rudest tribes points tolits having sprung up under most ancient and primitive conditions. ‘The connexion between magic and religion in its lower stages is obvious from the impossibility of separating them, inasmuch as in every country sorcerers and diviners, savage or civilized, are found invoking the aid of ghosts, demons, or gods, to give them information or execute their will. ‘So far as magic is ascribed to the influence of spirits, its theory belongs to the animistic philosophy developed in the lower levels of civilization, where all the powers of life and nature are set down to spiritual beings (see ANimism). A chief part of tle magician’s business being to converse with spirits and gain their help, he sets about this in various ways. More often than not the spirit is considered to be a human ghost, which behaves much as it did while it was. still a living man’s soul; or if it is called a demon or deity, still these are beings modelled on the human soul. Thus their manner of hearing prayers and receiving offerings is like human intercourse, especially in the frequent cases where the sorcerer is a “medium” possessed by the spirit, who is considered to inhabit his body like his ordinary soul, and to give oracles speaking by his human voice. In such supposed interviews with spirits there is plenty of delusion and fraud, but nothing specially magical; and, in fact, were the whole craft of the sorcerer of this spiritualistic kind, there would be no practical distinction between the sorcerer and the priest, and magic would fall into its place as an inferior branch of religion. It is because magical practices are by no means accounted for altogether by the doctrine of spirits, but involve other special explanations of their own, that it is found convenient to make magic a department by itself. Such explanation is needed in ordinary magical practices, like that of the American medicine-man, who draws a deer on a piece of bark aud shoots at it, expecting thereby to kill a real deer next day, or of the Tongan sootlisayer, who spins a cocoa-nut as a teetotum, in order to discover a thief by noticing towards whom the monkey-face of the nut is looking when it stops. The magical train of thought which leads men to resort to such devices is childishly simple. It is merely imperfect reasoning, the mistaking of an ideal connexion for a real one, the confusion of ineffective analogy with effective cause. Our minds go with those of the barbaric magicians so far as to recognize the analogy between shooting an animal and its picture ; we see

as plainly as they that the cocoa-nut as it were looks in a particular direction. The difference is that, in the magical stage of thought, these are taken to be real connexions, while more advanced knowledge discards them as ideal. As Wilhelm von Humboldt well remarks, "‘ Man begins by seeking the connexion even of external phenomena in the region of thought; .... pure observation, still more experiment, follow at a wide distance after ideal or phantastic systems. Man’s first attempt is to govern nature through its idea."

_So much of the intellect of mankind has been spent since remote antiquity on magic that it may seem hard to believe the chief secret of the occult sciences to be after all nothing but bad reasoning. This at any rate is very unlike the theories propounded by those who have con- demned magic as a real craft made known to mau by dia- bolical influence, or by those who have thought to find in

its mystic precepts relics of antique wisdom. The question is not, however, an abstruse one, for every reader has the means of satisfying himself by inspection of a few magical processes, as to what amount of reason really goes to making them. Ina large proportion of cases there may be perceived, not absolute nonsense, but a kind of half- formed sense stopping short of practical value. There being an evident relation between an object and the thought of it, it becomes one of the chief practices of the sorcerer to try to make things happen by thinking about them. Thus he so "takes the will for the deed" that when he "‘ill-wishes " his enemies, and looks upon them with the "evil eye," he believes that he does them direct harm. On the other hand, those who know or suspect that such influence has been used against them suffer in reality from fear, often even dying of it. The belief in this mysterious power furnishes an explanation which is resorted to when any one falls ill or has any misfortune, and thus the belief in witchcraft among savages leads to constant enmity and revenge. Nor is this state of things to be traced only in what is called the uncivilized world, for those who lave much intercourse with English country folks may still meet with instances of some cow or child firmly believed to have been "overlooked," the death of which may possibly be revenged on a neighbouring cottager, supposed to

be the witch. Whenever a good or evil wish is uttered in words, it becomes a blessing or curse. When these are addressed to some deity or demon, they are in fact prayers, but when they are merely expressed wishes, without reference to any spiritual being, then their supposed effects are purely magical. Thus, in an ancient Hindu love-charm, the girl expects to bring back an offended lover by repeating the formula, "' May thy heart devour itself for me, may thy dry mouth water for me!" &c. Still more does this kind of magic explain itself in the various rites where some object is used as a symbol, and the association of ideas transfers whatever is done to it to the person it represents. Thus Ovid's sorceress (JZeroid., vi. 91)—
**simulacraque cerea fingit, Et miserum tenuis in jecur urget acus."

King James in his Demonology says that "the devil teacheth how to make pictures of wax or clay, that by roasting thereof the persons that they bear the name of may be continually melted or dried away by continual sickness." By a similar association of ideas, any object which has belonged to a person may be thus practised on, as has been already here mentioned among the South Sea islanders, or, to take a case nearer home, when in 1618 two women were executed at Lincoln for burying the glove of Heury Lord Rosse, so that, "as that glove did rot and waste, so did the liver of the said lord rot and waste." By like reasoning, when internal disease is ascribed to knots within the patient's body, it becomes a branch of witchcraft to tie magic knots, which produce their corresponding effect within the victim, Kindlier though not less delusive operations of misunderstood analogy are found in attempted cures by sympathetic magic, on the same principle which malignant sorcerers would have used in giving the disease itself. Thus knots are untied in order to untie internal complications in the sick beast, and weapons treated to cure by sympathy the wounds they made :—

'* But she has ta'en the broken lance, And washed it from the clotted gore, And salved the splinter o'er and o'er. William of Deloraine in trance,

Whene'er she turned it round and round,

Twisted, as if she galled his wound. Then to her maidens she did say

That he should be whole man and sound Within the course of a night and day.”

—Lay of the Last Minstrel, iii. 23. The herbs used as medicaments in the infancy of

medicine appear to have been chosen for magical rather than medical motives, by a kind of reasoning which comes out very plainly among Chinese physicians, who administer the heads, middles, and roots of plants to cure their patients’ heads, bodies, and legs respectively. In like manner European doctors long followed the “doctrine of signatures,” which was in fact mere magic,—prescribing euphrasy or ‘“‘eye-bright” for complaints of the eyes, because of the likeness of an eye in the flower, and treat- ing small-pox with mulberries because their colour made them proper to diseases of the blood (see Pettigrew, Superstitions of Medicine and Surgery). The same easily- understood though practically absurd principle may be seen to have guided the processes of divination, many of which show plainly the association of ideas that suggested them. Thus, in the Roman augury already mentioned, there is no difficulty in following the fancy which made the war-eagle give an omen of victory, but attached a doleful foreboding to the melancholy owl. The same half- rational meaning explains the reversal of omens accord- ingly as they come on the right or left, that is, the good or bad hand. Any one who glances through one of the cheap dream-books still bouglit by servant-maids, which fairly represent the ancient books on onevromancy, such as that of Artemidorus, will find many of the analogies still intelligible on which they are fonnded, as that to dream of washing one’s hands presages relief from anxiety, while he who dreams of losing a tooth will lose a friend. The ancient art of chiromancy, or telling fortunes by the hand, goes on the evident analogy between the lines of the palm and the diverging courses of human life; closely allied to this is scapulimancy or divining by the cracks of a shoulder-blade put into the fire. Of divination by lots, so common that the term for throwing lots (sortes) has passed into sorcery, there are many varieties. Some are quite pictorial, such as the Maori diviner’s sticks set up in the ground to show by their standing or falling the fate of the warriors they represent. But this strong

analogy is not necessary, for it only requires a particular lot to be mentally associated with a particular idea to make the diviner believe that the fall of that lot makes that idea true. It would be tedious to go at length through other details of magic where the same key of imperfect analogy applies. But it may be pointed out that this explanation is nowhere more conclusive than in astrology. The very foundation of the science of the horoscope lies in the mere analogy between the rising of a star above the horizon and the birth of aman. Such circumstances as whether a planet is in conjunction or opposition alter their effect on the “native ” in corresponding ways. The names of gods, happening to be given also to certain planets, are taken as omens, so that because a planet bears the name of Mercury it is brought into fanciful connexion with wisdom, and in like manner the planet Venus with love. Each planet having a colour assigned to it, the aspect of Mars or Saturn is believed to tell one, when in quest of a thief, whether he will have on red or black clothes. So the arbitrary names of the signs of the zodiac are made into presages, a just person being found under the sign of Libra, aud charms against bugs being effective in the sign of Cancer. For convenience some of these examples are taken from modern handbooks of astrology, but in principle the old starcraft has changed little in the course of ages. In the study of magic it is necessary further to notice that precepts which seem quite arbitrary, not showing even fanciful half-reason, are often explained on further examination, which gives the key to the symbolic process by which they are formed. For Instance, it would hardly be guessed why Cancer should be a sign involving movableness, but Scorpio firmness, were it not known that this result is obtained by arranging the

twelve signs in order as they stand, as successively movable, fixed, and double (see Proclus, Paraphrasis, i. 15). Con- sidering the antiquity of magic, the wonder is not that so much of its sense should be lost, but that so much is still intelligible! Various other causes may be traced in the occult sciences, among which can only be mentioned here rhabdomancy or the use of the divining rod, by which the cunning man professes to discover water springs, murderers, or hidden treasure. Here it is evident that the decision is really arrived at by the diviner himself, not by the twig, and the same is true of various similar arts. From the earliest times also tricks of sleight-of-hand,

&c., have been passed off by magicians as miracles to deceive their dupes; our lan- guage still testifies to this in the use of the word conjuror, the wonder-worker carrying on the old juggling, although uo longer evoking demons to give him his mysterious power. Hitherto magic has been dealt with on its delusive and harmful side, this being what most practically manifests itself in history. Yet it must be borne in mind that in its early stages it has been a source of real knowledge. True as it is that misunderstood facts and misleading analogies have produced its delusions, its imperfect arguments have been steps towards more perfect reasoning. Analogy has always been the forerunner of scientific thought, and, as experience corrected and restricted it into real effectiveness, from age to age whole branches of what was magic passed into the realm of science. The vague and misleading parts which could not be thus transformed were left behind as occult science, and thus the very reason why magic is almost all bad is because when any of it becomes good it ceases to be magic. (From this point of view the intellectual position of magic is well expressed by Adolf Bastian (Rechtsalterthiimer, p. 242) :—‘‘Sorcery, or, in its higher expression, magic, marks the first dawning consciousness of mutual connexion throughout nature, in which man, feeling himself part of the whole, thinks himself able to interfere for his own wishes or needs. So long as religion fills the whole horizon of culture, the vagne groping of magic contains the first experiments which lead to the results of exact science. Magic is the physics of mankind in the state of nature. It rests on the beginning of induc- tion, which remains without result only because in its imperfect judgments by analogy it raises the post hoc to the propter hoc, &c.” The nature-spirits and demons with which the magician has so much to do represent indeed the notion of physical cause in the rudimentary science of the lower races, while the association of ideas on which his sorcery and divination is based has much the same relation to the scientific induction which succeeds it. That this view is sound is best shown by noticing the great depart- ments of science whose early development is known to have taken place through magic. Astronomy grew up in Babylon, not through quest of mechanical laws of the universe, but through observation of the heavens to obtain presages of wars and harvest ; while even in modern times Kepler’s discoveries in physical astronomy were led up to through mystic magical speculations. In alchemy appears the early history of chemistry, which only emancipated itself in modern ages from its

magical surroundings. The astrological connexion of the metals each with its planet was one of its fundamental ideas, of which the traces are still to be found in the name of the metal “mercury,” and that of “‘lunar caustic” for silver nitrate. Lastly, the history of medicine goes back to the times when primi- tive science accepted demoniacal possession as the rational means of accounting for disease, and magical operations with herbs originated their more practical use in materia medica. (g. B. T.)

1 For details of the association of ideas in magic see Tylor, arly Hist. of Mankind, chap. vi., and Primitive Culture, chap. iv.

WHITE MAGIC.]

MAGIC, Waitt. Under this head is included the art of performing tricks and exhibiting illusions by aid of apparatus, excluding feats of dexterity in which there is no deccption, together with the performances of such auto- maton figures as are actuated in a secret and mysterious manner. Conjuring by prestidigitation, or sleight of hand, independently of mechanical apparatus, is referred to under LEGERDEMAIN.

Whether or not the book of Exodus makes the earliest historical reference to this natural magic when it records how the magicians of Egypt imitated certain miracles of Moses “by their enchantments,” it is known that the Egyptian hierophants, as well as the magicians of ancient Greece and Rome, were accustomed to astonish their dupes with optical illusions, visible representations of the divinities and subdiviuities passing before the spectators in dark subterranean chambers. From the descriptions of ancient authors we may conjecture that the principal optical illusion employed in these effects was the throwing of spectral images of living persons and other objects upon the smoke of burning incense by means of concave metal mirrors. But, according to the detailed exposure of the tricks of the magicians given by Hippolytus (Ref Om. Her., iv. 35), it appears that the desired effect was often produced in a simpler way, by causing the dupe to look into a cellar through a basin of water with a glass bottom standing under a sky-blue ceiling, or by figures on a dark wall drawn in inflammable material and suddenly ignited. ‘The flashes of lightning and the rolling thunders which sometimes accompanied these manifestations were easy tricks, now familiar to everybody as the ignition of lycopodium and the

shaking of a sheet of metal. The ancient methods described by Hippolytus (iv. 32) were very similar.

Spectral pictures or reflexions of moving objects, similar to those of the camera or magic lantern, were described in the 14thand 16th centuries. Thus, in the Mouse of Fame, bk. iii, Chaucer speaks of “appearances such as the subtil tregetours perform at feasts ”—-pictorial representations of hunting, falconry, and knights jousting, with the persons and objects instantaneously disappearing ; exhibitions of the same kind are mentioned by Sir John Mandeville, as seen by him at the court of “the Great Chan” in Asia; and in the middle of the 16th century Benvenuto Cellini saw phantasmagoric spectres projected upon smoke at a nocturnal exhibition in the Colosseum at Rome. ‘The existence of a camera at tliis latter date is a fact; for the instrument is described by Baptista Porta, the Neapolitan philosopher, in his Magia Naturalis (1558). And the doubt how magic lantern effects could have been produced in the 14th century, when the lantern itself is alleged to have been invented by Athanasius Kircher in the middle of the 17th century, is set at rest by the fact that glass lenses were constructed at the earlier of these dates,—Roger Bacon, in his Discovery of the Miracles of Art, Nature, and Magic (about 1260), writing of glass lenses and perspectives so well made as to give good telescopic and microscopic effects, and to be useful to old men and those who have weak eyes. Towards the end of last century Comus, a French conjuror (the second of the name), included in his entertainment a figure which suddenly appeared and disappeared about 3 feet above a table,—a trick explained by the circum-stance that a concave mirror was among his properties ; and a contemporary performer, Robert, exhibited the raising of the dead by the same agency. Early in the present century Philipstal gave a sensation to his magic lantern entertainment bylowering unperceived between the audience and the stage a sheet of gauze upon which fell the vivid moving shadows of phantasmagoria.

Nevil Maskelyne, a Cheltenham artist in jewellery, invented a wood cabinet in which persons vanished and were made to reappear, although it was

placed upon high feet, with no passage through which a person could pass from the cabinet to the stage floor, the scenes, or the ceiling; and this cabinet was examined and measured for concealed space, aud watched round by persons from the audience during the whole of the transformations. The general principle undoubtedly was this :—if a looking-glass be set upright in the corner of a room, bisecting the right angle formed by the walls, the side wall reflected will appear as if it were the back, and hence an object may be hidden behind the glass, yet the space seem to remain unoccupied. This principle, however, was so carried out that no sign of the existence of any mirror was discernible under the closest inspection. Two years later the same simple principle appeared in “The Cabinet of Proteus,” patented by Tobin and Pepper of the Polytechnic Institution, in which two mirrors were employed, meeting in the middle, where an upright pillar concealed their edges. In the same year Stodare exhibited the illusion in an extended form, by placing the pair of mirrors in the centre of the stage, supported between the legs of a three-legged table having the apex towards the audience; and as the side walls of his stage were draped exactly like the back, reflexion showed an apparently clear space below the. table top, where in reality a man in a sitting position was hidden beliind the glasses and exhibited his head (“The Sphinx”) above the table. The plane mirror illusion is so effective that it has been reproduced with modifications by various performers. In one case a living bust was shown through an aperture in a looking-glass sloping upward from the front toward the back of a curtained cabinet; in another a person stood half-hidden by a vertical mirror, and imitation limbs placed in front of it were sundered and removed ; and in another case a large vertical mirror was pushed forward from a back corner of tlie stage at an angle of 45 degrees, to cover the entrance of a living “ phantom,” and then withdrawn. Maskelyne improved upon hisoriginal cabinet by taking out a shelf which, in conjunction with a mirror, could enclose a space, and thus left no apparent place in which a person could possibly be hidden. He introduced a further mystification by secretly conveying a person behind a curtain screen, notwithstanding that, during the whole time, the existence of a clear space under the stool upon which the screen is placed is proved by performers con- tinually walking round. And the illusion reached its height when he revealed or ““‘ vanished” a succession of persons out of a light shell obelisk or ‘‘ Cleopatra’s Needle,” with a sheet of paper interposed between this

cover and the stool it stood upon, thus intercepting the apparently only avail- able avenue of approach. ‘The principle of reflecting by means of transparent plate-glass the images of highly-illu- minated objects placed in front, so that they appear as if among less brilliantly lighted objects behind the glass, was employed in the “ ghost” illusions of Sylvester, of Dircks and Pepper, of Robin, and of some other inventors,—tlie transparent plate-glass being, in some cases, inclined for- wards so as to reflect a lime-lighted object placed below the front of the stage, and in other arrangements set vertically at an angle so as to reflect the object from a lateral position.

Among the acoustic wonders of antiquity, fabled or real, were the speaking head of Orpheus, the golden virgins, whose voices resounded through the temple of Delphi, and the like. Hippolytus (iv. 4) explains the trick of the speaking head as practised in his day: the voice was really that of a concealed assistant who spoke through the flexible gullet of a crane. Towards the close of the 10th

A new era in optical tricks began in 1863 when John | century Gerbert (Pope Sylvester II.) constructed (says

William of Malmesbury) a brazen head which answered questions ; and similar inventions are ascribed to Roger Bacon, Albertus Magnus, and others. the 17th century the philosopher Descartes made a speak- ing figure which he called his daughter Franchina; and

the superstitious captain of a vessel had it thrown over- | board. In the latter part of the same century Thomas |

Irson, an Englishman, exhibited at the court of Charles II. a wooden figure with a speaking-trumpet in its mouth ; and questions whispered in its ear were answered through a pipe secretly communicating with an apartment wherein was a learned priest able to converse in various languages. Beckmann, in his History of Inventions (about 1770), relates his inspection of a speaking figure, in which the words really came through a tube from a confederate who held a card of signs by which he received intelligence from the exhibitor. Somewhat later was shown in England the figure of an

infant suspended by a ribbon, having a speaking-trumpet in its mouth,—an illusion in which two concave mirrors were employed, one of them concentrating the rays of sound into a focus within the head of the figure ; and the mirror nearest the figure was hidden by a portion of the wall-paper which was perforated with pin- holes, In 1783 Giuseppe Pinetti de Wildalle, an Italian conjuror of great originality, exhibited amoug his many wonders a toy bird perched upon a bottle, which fluttered, blew out a candle, and warbled any melody proposed or improvised by the audience,—doing this also when removed from the bottle to a table, or when held in the performer's hand upon any part of the stage. The sounds were pro- duced by a confederate who imitated song-birds after Rossignol's method by aid of the iuner skin of an onion in the mouth; and speaking-trumpets directed the sounds to whatever position was occupied by the bird. About the year 1825 Charles, a Frenchman, exhibited a copper globe, carrying four speaking-trumpets, which was sus- pended in a light frame in the centre of a room. Whispers uttered near to this apparatus were heard by a confederate in an adjoining room by means of a tube passing through the frame and the floor, and answers issued from the trumpets in aloud toue. And of late years have appeared more than one illusion of a similar order, in which the talking and singing of a distant person issue from an isolated head or figure by aid of ear-trumpets secretly contained within parts in which, from their outside form, the presence of such instruments would not be suspected. It is probable that the automaton trumpeters of Kaufmann and of Maelzel were clever deceptions of tle same kind. As described in the Journal de Mode, 1809, Maelzel's life-size figure had the musical instrument fixed in its mouth ; the mechanism was wound up, and a set series of inarches, army calls, and other compositions was performed, accompaniments being played by a real band. Mechanical counterparts of the human lips, tongue, and breath, both in speech and in playing certain musical instruments, have, lhowever, been constructed,—as in Vaucanson's celebrated automaton flute-player, which was completed in 1736; the same mechanician's tambourine and flageolet player, which was still more ingenious, as, the flageolet having only three holes, some of the notes were produced by half-stop- ping ; Abbé Mical's heads which articulated syllables, and his automata playing upon instruments; Kempelen's and Kratzenstein's speaking-machines, in the latter part of last century; the speaking-machine made by Fabermann of Vienna, closely imitating the human voice, with a fairly good pronunciation

of various words; the automaton clarionet-player constructed by Van Oeckelen, a Dutchman, and exhibited in New York in 1860, which played airs from a barrel like that of a crank-organ, and could take

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In the first half of |

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Maskelyne's two automata, " Fanfare" (1878) playing a cornet, aud " Labial" (1879) playing a euphonium, both operated by mechanism inside the figures and supplied with wind from a bellows placed separately upon the stage.

Lucian tells of the magician Alexander in the 2d cen- tury that he received written questions enclosed in sealed envelopes, and a few days afterwards delivered written responses in the same envelopes, with the seals apparently unbroken; and both he and Hippolytus explain several methods by which this could be effected. In this deception we have the germ of "'spirit-reading" and " spirit-writing," which, introduced in 1840 by Anderson, "The Wizard of the North," became common in the répertotre of modern coujurors,—embracing a variety of effects from an instan- taneous substitution which allows the performer or lis confederate to see what has been secretly written by the audience. The so-called '" second-sight" trick depends upon a system of signalling between the exhibitor, who moves among the audience collecting questions to be answered and articles to be described, and the performer, who is blindfolded on the stage. As already stated, the speaking figure which Stock showed to Professor Beckmann, at Gottingen, about 1770, was instructed by a code of signals. In 1783 Pinetti had an automaton figure about 18 inches in height, named the Grand Sultan or Wise Little Turk, which answered questions as to chosen cards and many other things by striking upon a bell, intelligence being communicated to a confederate by an ingenious ordering of the words, syllables, or vowels in the questions put. The teaching of Mesmer and feats of alleged clair-voyance suggested to Pinetti a more remarkable performance in 1785, when Signora Pinetti, sitting blindfold in a front box of a theatre, replied to questions and displayed her knowledge of articles in the possession of the

audience. Half a century later this was developed with greater elaboration, and the system of telegraphing cloaked by intermixing signals on other methods, first by Robert- Houdin in 1846, then by Hermann in 1848, and by Anderson at a later period. Details of the system of indicating a very large number of answers by slight and unperceived variations in the form of question are given by F. A. Gandon, La Seconde Vue Dévoilée, Paris, 1849.

Fire tricks, such as walking on burning coals, breathing flame and smoke from a gall-nut filled with an inflammable composition and wrapped in tow, or dipping the hands in boiling pitch, were known in early times, and are explained by Hippolytus (iv. 33). At the close of the 17th century Richardson astonished the English public by chewing ignited coals, pouring melted lead (really quicksilver) upon his tongue, and swallowing melted glass. Strutt, in Sports and Pastimes of the People of England, relates how he saw Powel the fire-eater, in 1762, broil a piece of beefsteak laid upon his tongue,—a piece of lighted charcoal being placed under his tongue which a spectator blew upon with a bellows till the meat was sufficiently done. This man also drank a melted mixture of pitch, brimstone, and lead out of an iron spoon, the stuff blazing furiously. These per- formers anointed their mouths and tongues with a pro- tective composition.

Galen speaks of a person in the 2d century who relighted a blown-out candle by holding it against a wall or a stone which had been rubbed with sulphur and naphtha; and the instantaneous lighting of candles became a famous feat of later times. Baptista Porta gave directions for perform- ing a trick entitled “many candles shall be lighted pre- sently.” Thread is boiled in oil with brimstone and orpiment, and when dry bound to the wicks of candles ; and, one being lighted, the flame runs to them all. He says that on festival days they are wont to do this among

the clarionet from its mouth and replace it; and, lastly, | the Turks. ‘Some call it Hermes his ointment.” In 1783

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Pinetti showed two figures sketclied upon a wall, one of |

which put out a candle, and the other relighted the hot wick, when the candle was held to their mouths. By wafers he had applied a few grains of gunpowder to the mouth of the first, and a bit of phosphorus to that of the other. A striking trick of this conjuror was to extinguish two wax candles and simultaneously light two others at a distance of 3 feet, by firing a pistol. The candles were placed in a row, and the pistol fired from the end where the lighted candles were placed; the sudden blast of hot gas from the pistol blew out the flames and lighted the nore distant candles, because in the wick of each was placed a millet-grain of phosphorus. A more recent conjuror showed a pretty illusion by appearing to carry a flame invisibly between his hands from a lighted to an unlighted candle. What he did was to hold a piece of wire for a second or two in the flame of the first candle, and then touch with the heated wire a bit of phosphorus which had been inserted in the turpentine-wetted wick of the other. But in 1842 Louis Dobler, a German con- juror of much originality, surprised his audience: by light- ing two hundred candles instantaneously upon the firing of a pistol. This was the earliest application of electricity to stage illusions. The candles were so arranged that each wick, black from previous burning, stood a few inches in front of a fine nozzle gas-burner projecting horizontally from a pipe of hydrogen gas, and the two hundred jets of gas passed through the same number of gaps in a con- ducting-wire. An electric current leaping in a spark through each jet of gas ignited all simultaneously, aud the gas flames fired the candle wicks,

Robert-Houdin, who opened his “Temple of Magic” at Paris in 1845, originated the application of electro- magnetism for secretly working or controlling mechanical apparatus in stage illusions, He first exhibited in 1845 his light and heavy chest, which, when placed upon the broad plank or “rake” among the spectators, and exactly over a powerful electromagnet hidden under the cloth covering of the plank, was held fast at pleasure. In order to divert suspicion Houdin showed a second experi- ment with the same box, suspending it by a rope which passed over a single small pulley attached to the ceiling ; but any person in the audience who took hold of the rope to feel the sudden increase in the weight of the box was unaware that the rope, while appearing to pass simply over the pulley, really passed upward over a winding-barrel worked as required by an assistant. Remarkable ingenuity was displayed in concealing a small electromagnet in

the handle of his glass bell, as well as in his drum, the electric current passing through wires hidden within the cord by which these articles were suspended. In one of Houdin's illusions—-throwing eight half-crowns into a crystal cash- box previously set swinging—electricity was employed in a difiereut manner. Top, bottom, sides, and ends of an oblong casket were of transparent glass, held together at all the edges by a light metal frame. The coins were con- cealed under an opaque design on the lid, and supported by a false lid of glass, which was tied by cotton thread to a piece of platinum wire. Upon connecting the electric circuit, the platinum, becoming red-hot, severed the thread, mae fall the glass flap, and dropping the coins into the

ox.

Down to the latter part of last century no means of secretly communicating ad libitum motions to apparently isolated pieces of mechanism had superseded the clumsy device of packing a confederate into a box on legs draped to look like an unsophisticated table. Pinetti placed three horizontal levers close beside each other in the top of a thin table, covered by a cloth, these levers being actuated by wires passing through the legs

and feet of the table and to the confederate behind a scene or partition. In the pedestal of each piece of apparatus which was to be operated upon when set loosely upon the table were three corresponding levers hidden by cloth ; and, after being examined by the audience, the piece of mechanism was placed upon a table in such 4 position that the two sets of levers exactly coincided, one being superimposed upon the other. In one "effect" the confederate worked a small bellows in the base of a lamp, to blow out the flame; in another he let go a trigger, causing an arrow to fly by a spring from the bow of a doll sportsman ; he actuated a double-bellows inside a bottle, which caused flowers and fruit to protrude from among the foliage of an artificial shrub, by distending with air a number of small bladders shaped and painted to represent them; he opened or shut valves which allowed balls to issue out of various doors in a model house as directed by the audience; and he moved the tiny bellows in the body of a toy bird by which it blew

out a candle. Other conjurors added more complicated pieces of appa- ratus, —one being a clock with small hand moving upon a glass disk as required by the audience. ‘The glass disk earryiug the numbers or letters was in reality two, the back one being isolated by ratchet teeth on its periphery hidden by the ring frame which supported it, and, though the pillar-pedestal was separated into three pieces and shown to tlie spectators, movable rods, worked by the table levers, were in each section duly covered by cloth faces. Another mechanical trick, popular with Torrini, Ifoudin, Philippe, and Robin, and worked in a similar way, was a little harlequin figure which rose out of a box set upon the table, put his legs over the front of the box and sat on the edge, nodded his head, smoked a pipe, blew out a candle, and whistled a one-note obbligato to an orchestra. Robert-Houdin employed, iustead of the table levers, vertical rods each arranged to rise and fall in a tube, according as it was drawn down by a spiral spring or pulled up by whip-cord which passed over a pulley at the top of the tube and so down the table leg to the hiding- place of the confederate. In his centre table he had ten of these “pistons,” and the ten cords passing under the floor of the stage terminated at a keyboard. Various ingenious automata were actuated by this means of trans- mitting motion ; but the most elaborate piece of mechanical apparatus constructed by Houdin was his orange tree. The oranges, with one exception, were real, stuck upon small spikes, and concealed by hemispherical screens which were covered with foliage; and the screens, when released by the upward pressure of a piston, made half a turn, and disclosed the fruit. The flowers were hidden behind foliage until raised. above the leaves by tlie action of another piston. Near the top of the tree an artificial orange opened into four portions; while two butterflies attached to two light arms of brass rose up behind the tree, appeared on each side by the spreading of the arms, and drew out of the opened orange a handkerchief which had been borrowed and vanished away.

It is remarkable how many of the illusions regarded as the original inventions of eminent conjurors have been really improvements of older tricks. Hocus Pocus Junior, The Anatomy of Legerdemain (4th edition, 1654), gives an explanatory cut of a method of drawing different liquors out of a single tap in a barrel, the barrel being divided into compartments, each having an air-hole at the top, by means of which the liquid in any of the compartments was withheld or permitted to flow. Robert-Houdin applied

the principle to a wine-bottle held in his hand from which he could pour four different liquids regulated by the un- stopping of any of the four tiny air-holes which were covered by his fingers. A large number of very small

liqueur glasses being provided on trays, and containing drops of certain flavouring essences, enabled him to supply imitations of various wines and liquors, according to the glasses into which he poured syrup from the bottle ; while by a skilful substitution of a full bottle for an emptied one, or by secretly refilling in the act of wiping the bottle with a cloth, he produced the impression that the bottle was “inexhaustible.” In 1835 was first exhibited in England a trick which a Brahman had been seen to perform at Madras several years before. Ching Lau Lauro sat cross- legged upon nothing,—one of his hands only just touching some beads hung upon a genuine hollow bamboo which was set upright in a hole on the top of a wooden stool. The placing of the performer in position was done behind a screen ; and the explanation of the mysterious suspension is that he passed through the bamboo a strong iron bar, to which he connected a support which, concealed by the beads, his hand, and his dress, upheld his body. In 1849 Robert-Houdin reproduced the idea under the title of ethereal suspension,—professedly rendering his son’s body devoid of weight by administering vapour of etlier to his nose, and then, in sight of the audience, laying him in a horizontal position in the air with one elbow resting upon a staff resembling a loug walking-stick. The support was a jointed iron frame under the boy’s dress, with cushions and belts passing round and under the body. Subsequently the trick was improved upon by Sylvester—the suspended person being shown in several changes of position, while the sole supporting upright was finally removed. For the latter deception the steel upright was made with polished angular faces, apex toward the spectators, and acted in a dim light on the same principle as the mirrors of a Sphinx table. Before lowering the light, the reflector bar is covered by the wood staff set up before it.

The mysterious vanishing or appearing of a person under a large extinguisher upon the top of a table, and without the use of mirrors, was first performed by Comus, a French conjuror very expert in the cups-and-balls sleight-of-hand, who, appearing in London in 1789, an- nounced that he would convey his wife under a cup in the same manner as he would balls. The feat was accom- plished by means of a trap in a box table. Early in the present century Chalons, a Swiss conjuror, transformed a bird into a young lady, on the same principle. In 1836 Sutton varied the feat by causing the vanished body to re- appear under the crust of a great pie. Houdin "vanished" a person standing upon a table top which was shown to be only a few inches thick; but there was a false top which was let down like the side of a bellows, this distension being hidden by a table-cloth hanging sufficiently low for the purpose, and the person, when covered by the extinguisher, entered the table though a trap-door opening upwards. Robin, in 1851, added to the wonder of the trick by vanishing two persons in succession, without any pos- sibility of either escaping from the table,—the two persons really packing themselves into a space which, without clever arrangementand practice, couldnot hold more thanone. The sword-and-basket trick was common in India many years ago. In one form it consisted in inverting an empty basket over a child upon the ground ; after the child had secreted himself between the basket-bottom and a belt concealed by a curtain painted to look like the actual 'wicker bottom, a sword was thrust through both sides of the basket, the clild screaming, and squeezing upon the sword and upon the ground a blood-coloured liquid from a Sponge. When the performer upset the basket, the child could not be seen 3 but another child similarly costumed suddenly appeared among the spectators, having been up to that time supported by a pair of stirrups under the cloak of a confederate among the bystanders. In another

form an oblong basket is used large at the bottom and tapering to the top, with the lid occupying only the central portion of the top, and the child is so disposed round the basket that the sword plunged downward avoids him, and the performer can step inside and stamp upon the bottom to prove that

the basket is empty. In 1865 Stodare introduced the trick into England, but in anew manner. Upon light tressels he placed a large oblong basket; and after a lady attired in a profuse muslin dress had composed herself and her abundance of skirt within, after the lid had been shut and the sword plunged through the sides, the basket was tilted towards the audience to show that it was empty, and the lady reappeared in a gallery of the hall. The basket was formed with an outer shell to turn down, leaving the lady with her dress packed together lying upon the basket bottom and behind what had formed a false front side, —the principle being the same as in the clown's box, which, when containing a man, is rolled over to display the inside empty. The reappearing lady was a double, or twin sister.

Among the most meritorious and celebrated mecliauical illusions have been automaton figures secretly influenced in their movements by concealed operators. In the 17th century M. Raisin, organist of Troyes, took to the French court a harpsichord which played airs as directed by the audience ; but, upon opening the instrument, Louis XIV, discovered a youthful performer inside. In 1769 Baron Kempelen, of Pressburg, in Hungary, completed his chess- player, which for a long time remained the puzzle of Europe. It was an illusion,—the merit consisting in the devices by which the confederate player was hidden in the cabinet and body of the figure, while the interior was opened in successive instalments to the scrutiny of the spectators. The first player was a Polish patriot, Worousky, who had lost both legs in a campaign; ashe was furnished with artificial limbs when in public, his appearance, together with the fact that no dwarf or child travelled in Kempelen's company, dispelled the suspicion that any person could be employed inside the machine This automaton, which made more than one tour to the capitals and courts of Europe, and was owned for a short time by Napoleon I., was exhibited by Maelzel after the death of Kempelen in 1819, and ultimately perished ina fire at Philadelphia in 1854. A revival of the trick appeared in Hooper's "Ajeeb," shown a few years ago at the Sydenham Crystal Palace and elsewhere. Still more recently a chess-playing figure, ‘‘ Mephisto," designed by Gumpel, has been on view. No space exists for the accommodation of a living player within ; but, as there is no attempt at isolating the apparatus from mechanical communication through the carpet or the floor, there is nothing to preclude the moving arm and gripping finger and thumb of the figure from being worked by any

convenient connexion of threads, wires, rods, and levers. In 1875 Maskelyne and Cooke produced at the Egyptian Hall, in London, an automaton whist-player, “ Psycho,” which, from the manner in which it is placed upon the stage, appears to be perfectly isolated from any mechanical communication from without; there is no room within for the concealment of a living player by aid of any optical or other illusion, and yet the free motions of both arms, especially of the right arm and hand in finding any card, taking hold of it, and raising it or lowering it to any position and at any speed as demanded by the audience, prove that the actions are directed from without. The arm has all the complicated movements necessary for chess or draught playing; and Psycho calcu- lates any sum up to a total of 99,000,000. What the mysterious means of connexion are has not been dis- covered; or, at any rate, down to the time of writing

this article there has appeared no correct imitation of this joint invention of John Nevil Maskelyne and John Algernon Clarke. Perhaps a still more original automaton is Maskelyne’s figure “ Zoe,” constructed in 1877, which writes and draws at dictation of the audience, yet cannot have a living person within, and could not be more completely severed from all conceivable means of control without. ‘‘ Zoe,” a nearly life-size but very light doll, sits loose upon a cushioned skeleton-stand, of which the solid feet of the plinth rest upon a thick plate of clear glass laid upon the floor-cloth or carpet of the stage. “Psycho,” asmaller Oriental figure, sitting cross-legged on a box, is supported by a single large cylinder of clear glass, which, as originally exhibited, stood upon the carpet of the stage, but was afterwards set loose upon a small stool, having solid wood feet ; moreover, this automaton may be placed in almost any number of different ways. Thus, from the precautions observed in the isolation of Maskelyne’s automata, no current of electricity, no magnetic attraction, no hydraulic or pneumatic force can reach them, or, if it could, would not account for the many and delicate movements which they execute; and there can be no wires, threads, or hairs, passing in any direction away from the figures, seeing that persons from the audience admitted close around the figures while they are in operation could not fail to observe them. It may be mentioned that, in the same year in which “Psycho” appeared, the joint

inventors patented a method of con- trolling the speed of clock-work mechanism by compressed air or gas stored in the pedestal of an automaton, this compressed fluid acting upon a piston in a cylinder and also upon a rotating fan when a valve is opened by an electrical or other connexion worked by the foot of the performer or an assistant." But it is not known whether the principle obscurely described in the speci- fication was applicable in any way to the invisible agency employed in " Psycho" or in " Zoe," or whether it had reference to some other invention which has never been realized. 'The whist-playing automaton is affirmed to be the only one of Maskelyne's many subtle inventions in which he received suggestions from another person. That a mysterious and apparently elaborate mechanical movement may, after all, possess the utmost simplicity is illustrated by the familiar conjuring trick known as "rising cards." Four cards having been chosen by the audience and returned to the pack, this is placed end upwards in a glass goblet, or in a thin case not deep enough to hide the pack, upon the top of a decanter or upon a stick. At command, the cards rise, one at a time, out of the pack ; one rises part of the way and sinks back again ; one rises quickly or slowly as directed ; one comes out feet first, and, on being put back, rises head upwards like the others ; and one dances in time to music, and finally jumps out of the pack. At the conclusion there remain only the goblet or the case and tho cards, subject to the minutest examination of any one from the audience, without a trace of moving mechanism visible. This was one of the chief jeux of Comte, the French conjuror and ventriloquist, at the end of last century, and in varied forms has been popular to the present day. Probably it was suggested by the earlier device of the golden head dancing in a glass tumbler, which is described in The Conjuror Unmasked, 1790. Several crown pieces were put in the glass, a small gilded head above them, and a plate or other flat cover laid upon the mouth of the glass; yet the head thus isolated jumped inside the glass so as to count numbers and answer questions, The secret communicator of motion was a fine silk thread attached to the head and passing through a tiny notch cut in the lip of the glass, and so to a con- federate who pulls it. In the case of the rising cards the

whole of the movements are effected by arranging a single silk thread in the previously prepared pack, passing over some cards and under others, and led behind the decanter or other support to the stage and thence to the confederate. As this infinitely simple mechanical agent is drawn alto- gether out of the pack after the last card hag risen, liter- ally no trace remains of any means of communicating motion to the cards.

Oriental ingenuity, which furnished the original idea of the ethereal suspension trick, contributed the Chinese rings introduced into England in 1834 ; also the Chinese feat of producing a bowl of water with gold-fish out of a shawl, first seen in England in 1845, and the Indian rope-tying and sack feats upon which the American brothers Davenport founded a distinct order of performances in 1859, Their quick escape from rope bonds in which they were tied by representatives of the audience, the instantaneous removal of their coats in a dark séance, leaving themselves still bound, and their various other so-called "'phenomena" were exposed and imitated by Maskelyne, who, in 1860, greatly surpassed any feats which they had accomplished. He proceeded to exhibit himself floating in the air, to show " material- ized spirit forms," and to present a succession of wonders of the spirit mediums in novel performances down to the present time. One of Maskelyne's cleverest inventions was the box which he constructed in 1860; it closely fitted when he packed himself in a cramped position within ; it was enclosed in a canvass wrapper, corded with any length and complicated meshing of rope, and the knot sealed, yet his escape was effected in the brief space of seven seconds. Taking more time, he performed the converse of these opera- tions except the sealing. Provided with the wrapper and the open box, himself standing outside, he drew a curtain before him to conceal the modus operandi, and in a few minutes was found in the box, which, though so small as to permit no limb to be moved more than a few inches, he nevertheless wrapped and corded as exactly as if he had operated from the outside. Partially imitated with trick boxes of larger size, this feat has never been executed under the same conditions by any other conjuror ; and the process of escape and repacking has never been fully eluci- dated. Gi: er)

MAGIC LANTERN is the name given to an optical instrument for projecting on a white wall or screen largely magnified representations of

transparent pictures painted or photographed on glass,

The invention of the magic lantern is usually attributed to Athanasius Kircher, who died in 1680, although, ac- cording to some, it was known four centuries earlier to Roger Bacon (see p. 207). For long after its discovery the magic lantern was used chiefly to exhibit comic pictures, or in the hands of so-called wizards to summon up ghosts and perform other tricks astonishing to those who were ignorant of the simple optical principles employed. Within the last twenty or thirty years, however, and mainly on account of the invention of photography, the magic lantern has been greatly improved in construction, and its use widely extended. By its means finely executed photographs on glass can be shown greatly magnified to large audiences, The scientific lecturer is thus saved the trouble and expense of preparing large diagrams, besides having his subject better illustrated. When suitably constructed, the magic lantern can be used in the form of a microscope to exhibit on a screen the forms and movements of minute living organisms, or to show to an audience delicate physical and chemical experiments which could otherwise be seen only by a few at a time.

The magic lantern in its simplest form is represented in fig. 1. A is a dark box surmounted by asuitable chimney for carrying off the products of combustion from the source

of light L, which is placed in the focus of a spherical reflector. On the side opposite the reflector the box is pierced by a round hole, into which is fitted the metal tube D, which may either be cylindrical or slightly tapered, To the inner end of the tube D is fitted a Jens or combina- tion of lenses C called the “ condenser.” Immediately in front of the condenser, and at right angles to the axis of the tube, is a vertical slit S for receiving the transparent pictures usnally called ‘‘slides.”. To the outer end of D is fitted a lens or combination of lenses O called the ‘ objective” or “ project- ing lens.” At a suitable distance from O is placed the screen for receiving the magnified picture —the screen and slit being in the conjugate foci of the lens O. Since the objective reverses, the picture must be inserted in the slit upside down. The objective can be moved backwards and forwards in the tube D by

means of a rack and pinion, Since the screen and slide are in the conjugate foci of O the diameter of the picture on the screen has the same ratio to the screen's distance from O that the diameter of the picture on the slide has to the slide's distance from O. The ratio adopted is generally 1 to 3 or 4.

Source of Light.—Almost any good source of light can be used in the magic lantern. In the earlier forms a simple oil light was used; and in the toy forms either an oil light or simple gas- flame is still employed. Better effects are obtained from the Argand fountain lamp (fig. 2) or from the common Argand gas burner with a glass chimney. In the sciopticon (fig. 3) —a handy and ex- cellent form recently introduced—a speci- ally constructed paraffin lamp is employed with three parallel flat wicks set edgeways to the condenser. With this lamp aclear, well-defined picture varying from 6 to 10 feet in diameter can be readily thrown on the screen. For the best effects, however, recourse must be had to the oxy-calcium light (fig. 4), in which a small cylinder of lime is heated to intense luminosity in the flame of a spirit lamp through which a jet of oxygen plays; the Oxy-HypDRoGEN LIGHT

Fig. 1.

Fie. 2.—Argand Fountain Lamp.

Yih (SOD)

Fia. 3.—Sciopticon.

(q.v.); the maguesinm light, in which two narrow ribands of magnesium are put through slits bya clock-work arrange- ment and burn as they advance; or, best of all,—unless when sunlight can be used with the aid of a heliostat (see HEtio- GRAPHY),—the electric light.

MAGIC LANTERN

Condenser and Obdjective.—The object of the condenser (fig. 5, C) is to collect as much light as possible from the source, and pass it through the trans- parent picture in the slit. For this purpose the con- denser should sub- tend as large an angle as possible at the source of light. To secure this, the

condenser should be tolerably large, and its distance from the light, that is, its focal length, small. Since effective single lenses of large diameter are neces- sarily of long focus, a really good con- denser of consider- able diameter and yet of short focus must be a com- bination of two or more lenses.

Let 7, and f, be the focal lengths of two lenses, and f the focal length of their com- bination. Then, ne-

Fia. 4,—Oxy-calcium Lanip.

Fia. 5.—Condenser and Objective.

glecting the thickness of the lenses, we have when the two are close toegther

My.) ae ie Site

, a fraction which is always less than

From which we get f= Ff either /, or f, provided these are not zero. Suppose, for example, two lenses of 6 and 10 inches focal -— respectively ; the focal x

6+10

In the earlier lanterns, as still in the cheaper forms, only a single plano-convex lens or bull’s-eye was employed as a condenser. Better effects are produced by two such lenses. Perhaps the best con- denser for ordinary work is that proposed by Herschel and repre- sented in fig. 5, C, consisting of a biconvex lens and a meniscus mounted together with the concave side of the meniscus next the light. The diameter of such a condenser is about 6 inches, and its focal length a little over 8 inches. The focus must not be so short as to bring the lens too near the light, and render it liable to crack from the intense heat. In some lanterns this is guarded a oe by placing a plate of thin glass between the condenser and the light. ‘In the sciopticon (fig. 3) the condenser consists of two plane-convex lenses, each about 4 inches in

diameter. Condensers of large diameter are not so essential now as formerly, seeing that small pictures can easily be produced by photography.

The function of the objective (fig. 5, O) is to produce a magnified inverted image of the picture on thescreen. In toy lanterns it is a simple double-convex lens of short focus. This, however, can only produce a small picture, and that not very distinct at the edges. The best objective is the portrait combination lens used in ordinary photo- graphic cameras. ‘These are carefully corrected both for spherical and chromatic aberration, which is absolutely essential in the objective, although not so necessary in the condenser. It is essential, however, that the condenser be free from cracks or flaws, as these would appear and mar the picture.

Slides.—These are pictures, painted with transparent water or oil colours, or photographed on pieces of glass. The pieces of glass are usually fixed in small wooden frames for insertion in the slit. If parts of the picture are to be movable, two disks of glass are employed, the one movable in front of the other, the fixed part of the picture being painted on the fixed disk and the movable part on the other. By means of a lever the latter disk is moved in its

length of their combination will be = 8% inches,

own plane; and in this way a cow for instance can be represented drinking, or a donkey cutting amusing capers. A lever slide is represented in fig. 6. In the chromatrope

Fic. 6.—Lever Slide. slide (fig. 7) two circular disks of glass are placed face to face, each containing a design radiating from the centre, and painted with brilliant transparent colours. By a small pinion gearing in toothed wheels or endless bands the disks are made to move in opposite directions in their own plane.

Fia. 7.—Chromatrope. The effect produced is a singularly beautiful change of

design and colour. In astronomical slides the motions of the heavenly bodies, eclipses, the phases of the moon, or the like are similarly represented by mechanical means Slides can also be made from narrow glass tanks with parallel sides. When these are filled with water contain- ing delicate living organisms the forms and movements of the latter are beautifully seen. Such tanks can also be employed to show such phenomena as the gradual growth of crystals, the electrolysis of water between platinum electrodes, &c. A great variety of physical and chemical experiments can be shown in this way.

Dissolving Views.—For this purpose two magic lanterns are necessary, arranged either side by side or the one on the top of the other. The fronts of the lanterns are slightly inclined to each other so as to make the illuminated disks on the screen due to each lantern coincide. By means of a pair of thin metallic shutters terminating in comb-like teeth, and movable bya rack or lever, the light from either lantern can be gradually cut off at the same time that the light from the other is allowed gradually to fall on the screen. In this way one view appears to melt or dissolve into another. This arrangement was first adopted by Childe in 1811.

Phantasmagoria.—In this arran gement the pictures on the scrcen appear gradually to increase or diminish in size and brightness. To effect this a semi-transparent screen of cotton or other material is used, the lantern being behind and the andience in front. The lantern is mounted on wheels so that it can be rapidly moved up to or withdrawn from the screcn ; and an automatic arrangement 1s provided whereby simultaneously with this the objective is made to approach or recede from the slide so as to focus the picture on the screen in any position of the lantern. In this way a very small picture appears gradually to grow to enormous dimensions.

_ Lantern Polariscope.—This, perhaps the most beautiful modifica- tion of the magic lantern for scientific purposes, consists of an elbow-

shaped tube, containing mirrors, lenses, &c., and attached to the front of the lantern in place of the tube containing the objective. It is represented in section in fig. 8. C’ is the usual condenser belonging to the lantern. G is a

set of thin glass plates inclined at the polarizing angle 56° 45’ to the axis of the tube. The beam of polarized light from L reflected from G passes through the lenses

Fig. 8.—Lantern Polariscope. F and the analysing Nicol’s prism P, and falls on the screen.

The objects to be examined by the polarized light are placed in the

transverse slit O. When thin plates of selenite or other doubly refracting crystals are placed in O, a most beautiful display of com- plementary colours is produced on the screen by rotating the Nicol’s prism. Almost all the experiments on polarized light can be well shown by this arrangement.

The sctopticon (fig. 8) is an excellent and convenient lantern, very suitable for all the requirements of the lecturer, as well as for school use in teaching geography, &c.

See Brewster’s Optics; Ganot’s Physics ; and Chadwick’s Manual of the Magic Lantern. (J. BL.)

MAGIC SQUARE. A magic square is one divided into any number of equal squares, like a chess-board, in each of which is placed one of a series of consecutive numbers from 1 up to the square of the number of cells in a side, in such a manner that the sum of those in the same row or column and in each of the two diagonals is constant.

From a very early period these squares engaged the attention of mathematicians, especially such as possessed a love of the marvellous, or sought to win for themselves a superstitious regard. They were then supposed to possess magical properties, and were worn, as in India at the present day, engraven in metal or stone, as amulets or talismans. According to the mystic imaginings of the old astrologers relations subsisted between these squares and the planets: a square with only one cell, containing 1, symbolized the unity of the deity; a square of two, containing the four elements, way the symbol of matter; while those of 3, 4, 5, 6, 7, 8 were consecrated respect- ively to Saturn, Jupiter, Mars, the Sun, Venus, and Mercury. In later times such squares ranked only as mathematical

curiosities ; till at last their mode of con- struction was systematically investigated. These squares were at first mere triumphs of the same dogged persever- ance as was in later times exhibited by the Dutchman, Ludolph van Ceulen, who, after calculating z to 35 places of decimals, directed, like Archimedes, that it should be engraven on his tomb, though his industry was surpassed by M. de Lagry, who continued the decimal to 127 places. The earliest known writer on the subject was Emanuel Moscopulus, a Greek, who lived in the 4th or 5th century, and whose manuscript is preserved in the National Library at Paris. After him Frenicle constructed magic squares, such that if one or more of the encircling bands of numbers be taken away the remaining central squares are still magical, Subsequently M. Poignard constructed squares with numbers in arithmetical progression, having the magical summations. The later researches of M. de la Hire, recorded in the Mémoires de Académie Royale in 1705, are interesting as giving general methods of con-

struction. He has there collected the results of the labours of earlier pioneers; but the subject has now been fully systematized, and extended to cubes.

Tn order to understand the rest of this article diagram A should be carefully examined. A square of 5 has adjoining it one of the eight equal squares by which any square may be conceived to be surrounded, each of which has two sides resting on adjoining ones, while four have sides resting on the surrounded square, and four meet it only at itsfour angles. 1, 2, 3 are placed along the path of a knight in chess; 4, along the same path, would fall in a cell of the outer square, and is placed instead in the corresponding cell of the original square; 5 then falls within the square. a, b, ¢, d are placed diagonally | | _ in the square; but e enters the outer square, and is removed thence to the same cell of the square it had left. o, 8, y, 8, « pursue another, but regular, course; and the diagram shows how that course is recorded in the square they have twice left. Whichever of the eight surrounding squares may be entered, the corresponding cell of the central square is taken instead. The 1, 2, 3,04 .« »pG by Ge ss « ty Ei kw Cee said to lie in paths.

Squares whose Roots are Odd.—Diagrams B, OC, D exhibit one of the earliest methods of constructing magic squares. Here the 3’s in B and 2’s in C are placed in

opposite diagonals to secure the two diagonal summations; then each number in C is multiplied by 5 and added to

G.

that in the corresponding number in B, which gives the square D, Diagrams E, F, G give M. de la Hire’s method ;

sei

1

6 2 I ul 7 8 rv (am Oe a (ie FS” a = fav} tas) | 9 5 22| |is| |i] | 10 3} lao| [a5

24 20 25

the squares E, F, being combined as above, give the magic square G. M. Bachet arranged the numbers as in H, where there are three numbers in each of four surrounding

MAGIC SQUARE

squares ; these being placed in the corresponding cells of the central square, the square I is formed. He also con- structed squares such that if one or more outer bands of numbers are removed the remaining central squares are magical. His method of forming them may be understood from a square of 5. Here each summation is 5×13; if therefore 13 is subtracted from each number, the summa-

tions will be zero, and the twenty-five cells will contain the series +1, +2,+3,.... #12, the odd cell having 0. The central square of 3 is formed with four of the twelve numbers with+and-—signs and zero in the middle; the band is filled up with the rest, as in diagram J; then, 13

being added in each cell, the magic square K is obtained. Squares whose Roots are Lven.—These were constructed in various ways, similar to that of 4 in diagrams L, M, N. The numbers in M being multiplied by 4, and the squares L, M being superimposed, give N. The application of M. C

this method to squares the half of whose roots are odd requires a complicated adjustment. Squares whose half root is a multiple of 4, and in which there are summations along all the diagonal paths, may be formed, by observ- ing, as when the root is 4, that the series 1 to 16 may be

Q. 9| 7/14] 4 ~e|a2| 1] a5 ~3|13| 8|10

ya ee ee

changed into the series 15, 13,... . 3,1,~~1,~~ Digs. oan —13, —15, by multiplying each number by 2 and subtract- ing 17; and, vice versa, by adding 17 to each of the latter, and dividing by 2. The diagonal summations of a square,

filled as in diagram O, make zero ; and, to obtain the same

in the rows and columns, we must assign such values to the y's and q's as satisfy the equations p,+~,4,%= 0,

P3 + Py ag o4=0, Py +P3—0,-a,=0, and py + Py

MAGIG SQUARE 215

—a,~—0,=0,—a solution of which is readily obtained by inspection, as in diagram P; this leads to the square, dia- gram Q. When the root is 8, the upper four subsidiary rows may at once be written, as in diagram R; then, if the square be completed, 65 added to each, and the sums halved, the square is completed. In such squares as these, the two opposite squares about the same diagonal (except that of 4) may be turned through any number of right angles, in the same direction, without altering the summations.

Nasik Squares.—Squares that have many more summa- tions than in rows, columns, and diagonals have been investigated by the Rev. A. H. Frost

(Cambridge Math. Jour., 1857), and called Nasik squares, from the town in India where he resided ; and he has extended the method to cubes, various sections of which have the same singular properties. Jn order to understand their construction it will be necessary to consider carefully diagram 8, which shows that, when the root is a prime, and uot composite, number, as 7, eight letters a, b,. . . A may proceed from any, the same, cell, suppose that marked 0, each letter being repeated in the cells along different paths. These eight paths are called normal paths, their number being one more than the root. Observe here that, excepting the cells from

which any two letters start, they do not occupy again the

same cell, and that two letters, starting from any two different cells along different paths, will appear together in one and only one cell. Hence, if p, be placed in the cells of one of the 2 + 1 normal paths, each of the remaining 2 normal paths will contain one, and only one, of these p,'s. If now we fill each row with p,, ps, ... pn in the same order, commencing from the p, in that row, the Py'8) P3'8, aNd pn's will lie each in a path similar to that of p,, and each of the m normal paths will contain one, and only one, of the letters p,, Po… – Pn, Whose g. sum will be Sp. Similarly, if q, be placed along any of the |% normal paths, different from | a that of the p's, and each row an filled as above with the letters Yo Ig, + » » Yn» the sum of the | @ a a

0

q's along any normal path dif- ferent from that of the g, will be Sq. The x? cells of the square will now be found to contain all the combinations of the p's and g's; and, if the q's be multiplied by 2, the p's made equal to 1, 2,. . . 2, and the q's to Ol 2.5. wel in any order, the Nasik square of » will be obtained, and the summations along all the normal paths, except those traversed by the p's and q's, will be the constant 2ng+ 3p. When the root is an odd composite number, as 9, 15, é&c., it will be found that in some paths, different from the two along which the p, and q, were placed, instead of having each of the p's and q'8, some will be wanting, while some are repeated. Thus, in the case of 9, the triplets p.p,p,) PoPsPar PsPePo» 804 494979 %095%s9 %3%6%9 occur, each triplet thrice, along paths whose summation should be—3p, 45, and Sr, 36. But if we make p,,... py=1, 3,

6,5, 4, 7, 9, 8, 2, and the ry – +. %=0, 2, 5, 4, 3, 6, 8, 7, 1, thrice each of the above sets of triplets will equal Sp and XS respectively. If now the q’s are multiplied by 9, and added to the y’s in their several cells, we shall have a Nasik square, with a constant summation along eight of itsten normal paths. In diagram T, the numbers are in the nonary scale; that in the centre is the middle one of 1 to 92, and the sum of pairs of humbers equidistant from and opposite to the central 45 is twice 45; and the sum of any number and the 8 numbers 3 from it, diagonally, and in its row and column,

is the constant Nasical summation, é.9., 72 and 32, 29, 76, 77, 26, 37, 36, 27. The numbers in T being kept in the nonary scale, it is not necessary to add any nine of them together in order to test the Nasical summation } for, taking the first column, the figures in the place of units are seen at | % | 88| 74 | 18 once to form the series, |11| 9 | 295 | 51 1, 2,3,.... 9, and those in the other place three ae a |Sam triplets of 6, 1, 5. For | 68 | 84 | 73 | 18 the squares of 15 the p’s |

52 | 47 | 86 | 62

and g’s may be respect- | ed ively 1, 2, 10, 8, 6, 14, wa Be 15, 11, 4, 13, 9, 7, 8, 12, 3 | 78 | 14

5, and 0, 1, 9, 7, 8, 13, 14, 10, 3, 12, 8, 6, 2, IT, 4, where five times the sum 37 of every third number and three times the sum of every fifth number makes =p and 3q; then, if the q’s are multiplied by 15, and added to the p’s, the Nasik square of 15 is obtained. When the root is a multiple of 4, the same process gives us, for the square of 4, the diagram U. Here the columns give 3p, but alter- Vv nately 29,, 2g,, and : 29 29,3; and the rows give 3g, but alternately 2p,, 29, and 2p,, 2p,; the diagonals giving Sp and 3g. If p,, », Py Py aNd Ys Yo 95994 be 1, 2, 4, 3, and 0, 1, 3, 2, we have the Nasik square of diagram V. A square like this is engraven in the Sanskrit character on the gate of the fort of Gwalior, in India. The squares of higher multiples of 4 are readily obtained by a similar adjustment.

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A Nasik cube is composed of 3 small equal cubes, here called cubelets, in the centres of which the natural numbers from 1 to n3 are so placed that

every section of the cube by plancs perpendicular to an edge has the properties of a Nasik square ; also sections by planes perpendicular to a face, and passing through the cubelet centres of any path of Nasical summation in that face. Diagram W shows by dots the way in which these cubes are constructed. A dot is here placed on three faces of a cubelet at the corner, showing that this cubelct belongs to each of the faces AOB, BOC, COA, of the cube. Dots are placed on the cubelets of some path of AOB (here the knight's path), beginning from O, also on the cubelets of a knight's path in BOC. Dots are now placed in the cubelets of similar a to that on BOC in the other six sections parallel to BOC, starting from their dots in AOB. Forty-nine of the three hundred and forty-three cubclets will now contain a dot ; and it will be ob- served that the dots in sections perpendicular to BO have arranged themselves in similar paths. In this manner, p,, 9, 7, being placed in the corner cubelet O, these letters are severally placed in the cubelets of three different paths of AOB, and again along any similar

aths in the seven sections perpendicular to AO, starting from the teil? position in AOB. Next, p.Qoo, PsQ31"g. + « + P7%77"7 are placed in the other cubelcts of the edge AO, and dispersedin thesame manner as 49,7, Everycubelet will then be found to contain a different com- bination of the p's, g's, and 7's. If therefore the p's are made equal to 1, 2,... 7, and the q's and 7's to 0, 1, 2,. . . 6, in any order, and the q's multiplied by 7, and the 7's by 72, then, as in the case of the squares, the 7* cnbelets will contain the numbers from 1 to 73, and the Nasical summations will be 37?7+237q+p. If 2, 4, 5 be values of 7,p,q the number for that cubclet is written 245 in the septenary scale, and if all the cubelet numbers are kept thus, the paths along which summations are found can be seen without adding, as the seven numbers would contain 1, 2, 3,... 7 in the unit place, and 0, 1, 2, . . . 6 in each of the other places. In all Nasik cubes, if such values are given to the letters on the central cubelet that the number is the middle one of the series 1 to m3, the sum of all the pairs of numbers opposite to and equidistant from the middle number is the double of it. Also, if around a Nasik cube the twenty-six surrounding equal cubes be placed with their cells filled with the same numbers, and their corresponding faces looking the

same way, —and if the surrounding space be conecived thus filled with similar cubes, and a straight line of unlimited length be drawn through any two eubelet centres, one In each of any two cubes,—the numbers along that line will be found to recur in groups of seven, which (except in the three cases where the same p, g, or 7 recur in the group) together make the Nasical summation of the cube. Further, if we take similarly filled Nasik cubes of n, m new letters, Otlasa can be so placed, onc in each of the n4 cubelets of this

Pets

Nasik Cube.

group of 7 cubes, that each shall contain a different combination of the p’s, q’s, 7’s, and s’s, This is done by placing s, on each of the n? cubelets of the first cube that contain p,, and on the n? cubelets of the 2d, 3d,.. . and th cube that contain p,, p53, . . – Pn respect- ively. This process is repeated with s,, beginning with the cube at which we ended, and so on with the other s’s ; the 24 cubelets, after multiplying the q’s, 7’s, and s’s by 2, n, and n respectively,

14 | 23 | 18

10 | 15 | 22 | 19

24 | 17 | 12

will now be filled with the numbers from 1 to 4, and the constant summation will be 3n°s+2%n°r+23nqg+3p. This process may be carried on without limit ; for, if the m eubes are placed in a row with their faces resting on each other, and the corresponding faces looking the same way, 7 such parallelepipeds might be put side by side, and the n® cubelets of this solid square be Nasically filled by the introduction of a new letter ¢; while, by introducing another letter, the n® cubelets of the compound cube of 2? Nasik cubes

22 | 31] 8 | 35

9 | 36 | 17 | 26

82 | 23 | 2) 11

10 | 33 | 24

might be filled by the numbers from 1 to 78, and so ad infinitum. When the root is an odd composite number the values of the three groups of letters have to be adjusted as in squares, also in cubes of aneven root. A similar process enables us to place successive numbers in the cells of several equal squares in which the Nasical summations are the same in each, as in diagrams X.

Among the many ingcnious squares given by various writers, this

article may justly close with two by Euler, in the Histoire de V Aca- dénie Royale des Sciences, Berlin, 1759. In diagram Y the natural numbers show the path of a knight that moves within an odd square in such a manner that the sum of pairs of numbers opposite to and equidistant from the middle figure is its double. 1n diagrain Z the knight returns to its starting cell in a square of 6, and the difference between the pairs of numbers opposite to and equidistant from the middle point is 18.

A model consisting of seven Nasik cubes, constructed by Mr Frost, can be seen in the South Kensington Museum. The centres of the cubes are placed at equal distances in a straight line, the similar faces looking the same way in a planc parallel to that linc. Each of the cubes has seven parallel glass plates, to which, on one side, the seven numbers in the septenary scale are fixed, and behind each, on the other side, its value in the common scale. 1201, the middle number from 1 to 74, oecupies the central cubelet of the middle cube. Besides each cube having separately the same Nasical summation, this is also obtained by adding the numbers in any seven similarly situated cubelets, one in each cube. Also, the sum of all pairs of

numbers, in a straight line through the central cube of the system, equidistant from it, in whatever cubes they are, is twice 1201.

A very complete bibliographical index of writers on this subject is given in Professor Lucas's Récréations Mathématiques, Paris, 1882. (A. HL. F.)
MAGISTRATE. The term magistrate, derived from the Latin magistratus, is one of more general and compre- hensive meaning than JustTIcE oF THE PEacg, which has already been treated of (vol. xiii, p. 789), and is of far higher antiquity. In its full significance it indicates one side of the universal public relation by which men are connected together as governors and governed—in other words, as magistrates and people. Of magistrates some are supreme, in whom the sovereign power and executive government of the state reside, as the king or queen regnant, or the president of a republic, as of the United States; and such a functionary would formally be designated the first magistrate of the realm or state. Speaking gene- rally, a magistrate may be described asa public civil officer invested with legal or other authority; but the term is more particularly applied to subordinate officers, as justices of the peace and the like, deriving their authority solely from the chief of the state or in virtue of legislative enact- ment. During the Roman republic the offices of magistrate and judge were distinct and separate. A magistrate was appointed cum jurisdictione et imperio ; toa judge belonged only nuda notio sine jurisdictione et imperio. The office of the magistrate was to inquire into matters of law ; and whatever business was transacted before him was said to be done in jure. The office of the judge was to inquire into matters of fact; and whatever was transacted before him was said to be done in judicio. This distinction is thus clearly defined by Cicero in his well-known oration for Cluentius :—" Legum ministri, magistratus ; legum inter- pretes, judices." When the magistrate took cognizance both of the law and the fact he was said to administer justice extra ordinem; and the judgment so administered was called extraordinary. The magistrate, when he decided on matters of law, was assisted by a council of ten, called decemvirt litibus judicandis. To these was added in important cases another council of one hundred and five persons, selected from each tribe, whose judgment was final; this was called judicium centumvirale. After the decline of the Roman republic the offices of magistrate and judge were united, by which means all judgments became extra- ordinary, and the distinction of what was done in jure and in judicio

was abolished. The magistrates were chosen only from the patricians in the early republic, but in the course of time the plebeians shared in these honours. The chief magistrates of Athens were designated archons. They were nine in number, and none were chosen but such as were descended from ancestors who had been free citizens of the republic for three generations. They took an oath that they would observe the laws, administer justice with impartiality, and never suffer themselves to

be corrupted. They all had the power of punishing male- factors with death. The chief among them was called archon, and the year took its designation from him,—the archon eponymus, who was also constituted a sort of state protector of those who were unable to defend themselves. The Franks, Lombards, and Saxons appear to have been jealous of judicial authority, and averse to removing what concerned a' man's private right out of the hands of his neighbours and equals ; every ten families are supposed to have had a magistrate of their own election, the tything

man-of England, the decanus of France and Lombardy. .

The decanus was the lowest species of judge.

See Blackstone's Commentaries, 1825 ; Cowel, Law Diet., 1717 ; Geldart's Hallifax on the Civil Law, 1836 ; Hallam, Afiddle Ages.

MAGLIABECHI, Antonio (1633-1714), one of the most remarkable bibliophiles of his time, was born at Florence, October 28, 1633, and followed the trade of a goldsmith until 1673, when he received the appointment of librarian to the grand-duke of Tuscany, a post for which he had qualified himself by his vast stores of self-acquired learning. He died on July 4, 1714, bequeathing his large private library to the grand-duke, who in turn handed it over to the city, See Liprarius, vol. xiv. pp. 530, 548.

MAGNA CHARTA. See Cuarrer, and EncLanp, vol, viii. pp. 306, 308.

MAGNA GRAKCIA. See Gruacta.

MAGNESIA, in ancient geography, was the name of two cities in Asia Minor, both of considerable interest and importance.

(1) A city of Tonia, situated on a small stream flowing into the valley of the Meander, whence it was commonly called Magnesia ad Meandrum. It was distant 120 stadia or 15 Roman miles from Miletus, and rather less from Ephesus. According to tradition, as well as the similarity of names, it was founded by a body of colonists from the Thessalian tribe of the Magnetes, with whom were associated, accord- ing to Strabo, some Cretan settlers. It was thus not properly an Ionic city, and for this reason apparently was not included among the cities of the Ionic league, though superior in wealth and prosperity to most of them, except Ephesus and Miletus. It was indeed taken and destroyed by the Cimmerians in their irruption into Asia Minor (about 660 B.c.), but was soon after rebuilt, and gradually recovered its former prosperity. It was one of the towns assigned by Artaxerxes to Themistocles for his support in his exile, and there the latter ended his days (449 B.c.), In later times it was chiefly noted for its temple of Artemis Leucophryne, which, according to Strabo, surpassed that at Ephesus in the beauty of its architecture, though inferior to it in size and wealth. The remains of this temple, as well as of the ancient city adjoining it, are still extant, and have been laid open by recent excavations. They are described by M. Texier (Aste Af ineure, Vol. iii.). Magnesia continued under the kings of Pergamum to be one of the most flourishing cities in this part of Asia, but appears to have gradually declined under the Roman empire, and its name disappears from history, though its continued exist- ence is attested by coins as late as the time of Gallienus.

(2) A city of Lydia, about 40 miles north-east of

myrna, which stood on the southern bank of the river Hermus, at the foot of Mount Sipylus, from which circumstance it was often called for distinction’s sake Magnesia ad Sipylum. It is probable from its name that it was founded, like the city of the same name in the valley of the Meander, by Magnesian colonists from Thessaly ; but we have no authority for the fact. Nor is any mention of the town found in history till 190 3.c.,, when the Syrian king, Antiochus the Great, was defeated under its walls by the

Roman consul L. Scipio, who derived from his success in this campaign the surname of

Pid ell

Asiaticus. Magnesia became a city of importance under the Roman dominion, and, though nearly destroyed by an earthquake in the reign of Tiberius, was restored by that emperor, and continued to flourish throughout the period of the Roman empire. It was one of the few towns in this part of Asia Minor that retained its prosperity under the Turkish rule; and Manusa (q.v.) is at the present day a large and flourishing town with considerable trade,

MAGNESIUM, a metallic element (symbol Mg) forming a basic oxide “magnesia,” MgO, which in some form or other is universally disseminated throughout the whole of the earth’s crust, apart from the large masses of mineral con- sisting essentially of magnesia compounds. This accounts for the presence of at least traces of magnesia in the ashes of all plants and animals, and for its presence in almost all natural waters. In these, however, it in general is present only as a quasi-contamination of the lime ; in certain mineral waters, on the other hand, known as bitter waters (as those of Epsom, Sedlitz, Piillna), sulphate of magnesia forms the principal solid component. All native chloride of sodium is accompanied by magnesia salts, including the cases of salt-springs and of ocean-water, the latter contain- ing about 0°21 per cent. of magnesia as sulphate and chloride.

Of magnesium minerals we may name the following :—

A. Silicates.—(1) Olivine, Si0,.2MgO, occasionally met with in transparent crystals (“chrysolite”), but more fre- quently embedded as an admixture in lava, basalt, and other rocks ; also in meteorites. (2) Augite and (3) horn- blende, both MgO.SiO,. ‘The latter more frequently than the former forms independent rocks ; both occur abundantly as components of more ordinary mixed rocks, all basalts containing augite as a principal component. (4) Ser- pentine, Si0,2H,0.3(SiO,.2MgO) +2Aq (meaning 2H,O loosely combined), —a very common mineral; there are inountain masses consisting almost of it alone. In all these silicates, and more especially in (2) and (3), the MgO is partly replaced by FeO, CaO, MnO, and other isomorphous oxides, these

latter not unfrequently even predominating over the MgO itself. Their names, in fact, represent genera of minerals comprising each numerous species. Asbestos (so remarkable on account of its exceptional structure, which lends itself for the production of fire-proof textile fabrics, paper, pasteboard, &c.) must be mentioned here, as some varieties fall under hornblende, others under chrysotil (included in serpentine). More purely magnesian are—(5) talc, 48i0,.3MgO.H,O (Rammelsberg), and (6) meerschaum, 38i0,.2MgO + 4(!)H,O (same authority).

B. Carbonates.—Of these the most abundant are the dolomites, all compounds of the carbonates of lime and magnesia, aCa(1—«x)Mg.0.CO,, where x may assunie almost any value down to zero, which it actually has in “magnesite,” MgOCO,. Bitter spar, MgOCO,, is very similar to and isomorphous with Iceland spar, CaOCO,,

C. Soluble Salts, known chiefly as occurring in the famous salt-deposits of Stassfurth in Germany :—kieserite, MgOSO;.H,O (Epsom salt minus 6H,O); carnallite, MgCl, KCl+6H,O ; kainite, a hydrated compound of chlorides and sulphates of magnesium and potassium.

Any of these minerals may be used, and A (4), B, and C are actually used for the preparation of magnesium compounds. Starting from magnesite, we need only sub- ject it to gentle ignition to obtain the oxide MgO; ‘treat- ment with dilute sulphuric or muriatic acid produces the sulphate (Epsom Str, ¢.v.) or the chloride, as a solution, contaminated in general,—chiefly with iron, also with alumina, and perhapslime. The two former, after peroxida- tion of the iron by chlorine, may be eliminated by digestion with powdered magnesite, and filtered off. The acidified muriate solution, on evaporation and cooling, deposits trans-

parent crystals, MgCl,.6H,O, very hygroscopic, very readily soluble in water, and (like the anhydrous salt) soluble also in alcohol. When dehydrated by heat it loses acid (HCl), so that the residue is largely contaminated with oxychlorides, MgCl,.«MgO. Certain of these are

industrially important as cements, used by dentists and otherwise. A concentrated solution of the chloride, made into a paste with the ignited (CO,-free) oxide, in a few hours hardens into a stone susceptible of polishing (Sorel). To prepare the anhydrous chloride, the crystallized or dissolved hydrated salt is evaporated with sal-ammonia to dryness, and the residue (a stable double salt) is ignited in platinum. Pure chloride, MgCl,, remains as a clear liquid, solidifying on cooling into a compact aggregate of flexible crystal-leaves of a mother- of-pearl lustre. From the chloride the metal can be pro- duced, either by electrolysing the fused substance, or (more conveniently) by Caron and Deville's method: 600 grammes of the chloride, 480 grammes of powdered fluor-spar, and 230 grammes of finely cut-up sodium are mixed, and thrown, small portions at a time, into a red-hot crucible, which is then well covered, When the reaction, which is violent, is over, the contents are well stirred with an iron rod to cause the small metal-beads to unite into bigger lumps, which, after cooling, are picked from the broken-up mass. Sonstadt (who, along with Mellor, was the first to prepare magnesium industrially) substitutes for plain MgCl, the double chloride of potassium and magnesium, obtainable synthetically from the hydrated components without the use of sal-ammoniac, or simply by ignition of pure carnal- lite. To purify the crude metal Sonstadt and Mellor distil it "per descensum" out of an iron crucible provided with a pipe piercing the bottom and reaching up to almost the lid; an atmosphere of coal-gas is established to prevent oxidation of the metal in this operation, as also in the subsequent casting of the ingot.

The metal magnesium has the colour of silver, and re- mains unchanged in dry air; in ordinary air it tarnishes a little more readily than zinc does. It is malleable and ductile, but has little tenacity. The specific gravity is 1°75 ; thus it is considerably lighter than even aluminium, whose specific gravity is 2°6. It fuses and distils at about the same temperatures as zinc. It is generally sold in the form of thin ribbon, being used for the easy production of highly intense light. The ribbon kindles readily in a candle flame, and then continues burning most intensely by itself, the solid oxide produced radiating out abundant light. A wire 0:3 millimetre (=-012 inch) thick gives out the light of 74 stearine candles weighing 100 grammes (2 bb avoirdupois) a piece (Bunsen and Roscoe). It used to be employed for photographing at night, but is now super- seded by the electric light.

Magnesium has the excep- tional property of combining (at a bright red heat) directly with nitrogen gas into Mg,N, (Briegleb and Geuther), a greenish-yellow powder, which, when heated in steam, yields magnesia and ammonia, NH,.

Of magnesium salts the most important is the sulphate, Epsom Sat (qv.). This salt serves as a raw material for the preparation of two or three medicinally important substances, especially magnesia alba. When epsom salt solution is precipitated by carbonate of soda, the salt MgOCO,, first formed, loses carbonic acid and takes up water, forming a precipitate of the approximate composi- tion 3MgCO,.Mg(OH), +2 to 3 times H,O. When pre- pared by cold precipitation it forms a very light, when in the heat a somewhat denser, white powder (magnesia alba levis and ponderosa). This substance holds an important position in the history of chemistry, having served, in the hands of Black, to prove finally the individual existence of magnesia as something distinct from lime, and helped him in establishing the true relation between “caustic” and

“mild” alkalies. Before his time the “ causticity” was supposed to go into the “‘mild” substance from the fire; Black showed that it is owing to the loss of a ponderable substance, which he called “ fixed air,” that is, carbonic acid. It was in this memorable research that for the first time in chemistry the balance was used for the precise determination of quantitative relations.

Magnesia, the oxide MgO, is produced by the gentle ignition of magnesia alba. It isa white powder, absolutely infusible and non-volatile, and not reducible by charcoal, and is used medicinally. The gently ignited oxide ‘com- bines very slowly with water into the practically insoluble hydrate MgO.H,O. Magnesia when boiled with sugar- water dissolves into a solution of saccharate, and in this form is sometimes administered medicinally in lieu of plain magnesia. Magnesia alba (also the normal carbonate) dissolves rather largely in carbonic acid water. Accord- ing to R. Wagner, one part of MgOCO, dissolves in 760 parts of water saturated by carbonic acid under 1 atmo- sphere pressure. Under 6 atmospheres pressure it requires only 76 parts of carbonic acid water for its solution. Dinneford’s “fluid magnesia” is a solution of such bicar- bonate of magnesia. The

bicarbonate solution, when allowed to stand in air, deposits crystals of hydrated nor- mal carbonate, MgCO, +3 or 5H,O.

Magnesia preparations play a great part in therapeutics. The oxide and basic carbonate (also the dissolved forms of saccharate and bicarbonate) are used in small doses as anti-acids, in larger ones as very mild purgatives, for children more especially. For the latter purpose, however, the sulphate is generally preferred as acting far more ener- getically. The nauseous bitter taste of the salt can be concealed, to some extent, by acidification of its solution

with dilute sulphuric acid. Citrate of magnesia, being

exceptionally free of the “Bittererde” taste, was introduced some thirty years ago by the French as a pleasant substi- tute for Epsom salt, and it has since come much into fashion everywhere, although, weight for weight, it is far less efficient than the sulphate. The preparation of dry soluble citrate offering difficulties, the French originally dispensed it exclusively in the dissolved form of “ Limon- ade au citrate de magnésie,” a flavoured, decidedly acid solution of the salt, rendered effervescent by addition of some bicarbonate of soda immediately before corkimg up. In England it is generally preferred to offer the dry in- gredients of the “limonade” in the form of “granular effervescent citrate of magnesia.” Magnesia alba is pounded up with an excess of citric acid crystals and a few drops of water to produce a paste of amorphous acid citrate, which is dried at a temperature below 30° C. At higher temperatures the salt would pass into a crystalline, insoluble, and consequently therapeutically valueless modi- fication. The citrate is mixed with bicarbonate of soda, citric acid, and sugar, made into a “dough” with alcohol, granulated, and dried. The granules, when thrown into water, dissolve with effervescence. We must not omit to state here that much of what is sold under the name is a mere concoction in which Epsom salt figures as “ citrate.” To test a solution for magnesia, remove whatever can be precipitated by means of sulphuretted hydrogen or sul- phide of ammonium; then eliminate lime, baryta, and strontia by precipitation with carbonate of ammonia in the presence of sal ammoniac. The magnesia remains dis- solved, and can be precipitated (and detected) by addition of phosphate of ammonia (or soda) and free ammonia;

the salt PO,MgNH,.6H,O gradually separates out as a crystal- | line precipitate. This method of course fails when the magnesia is present from the first as phosphate ; but we cannot here enter into a consideration of this or any other exceptionally difficult case. (Ww. D.)

Deriva- tion of

MAGNETISM

HE word magnetism is derived from the Greek word payvys, which was applied to an ore of iron possessing

the word . remarkable attractive power for iron, and supposed to

magnet.

have been originally found near the town of Magnesia, in Lydia.! Thus Lucretius writes :—

Quem Magneta vocaut patrio de nomine Graii,

Magnetum quia fit patriis in finibus ortus. This name is said by Plato? to have been given to it by Euripides, and he adds that most call it the Heraclean stone. It is needless here to criticize the above or other

We are told, for instance, that the maguet attracts wood and flesh, which was certainly beyond their powers of observation ; that it is effective in the cure of disease ; that it affects the brain, causing melancholy ; that it acts as a love philtre; that it may be used in testing the chastity of a woman; that it loses its power when rubbed with garlic, but recovers it when treated with goat’s blood ; that it will not attract iron in the presence of a diamond, and much else that was eagerly copied by the wonder-loving writers of the Middle Ages.

derivations that have been given for the word ; we merely remark that it isnow applicd to all the phenomena kindred to that which first drew attention to the magnetic iron ore, viz., a selective attraction for iron.

The science of magnetism made no real progress till the Begin- invention of the mariner’s compass. The early history of ning of. this instrument is very obscure. According to some autho- ™2snetic

Ono ue : d 2 0 : science. rities it was invented in China, and found its way into yfariner’s

Plan of the

In the following article we shall give, in the first place, a sketch of the leading phenomena of strongly magnetic

Europe probably through Arabian sources. thrown by recent researches on the literature of the Chinese

article. }odies. We shall then describe a provisional theory suf- | has apparently thrown doubt upon their claim to this

ficient to render a general account of these phenomena, | invention,’ although the knowledge of the loadstone and

and shall afterwards proceed to render this theory more pre- | its attractive property may have been older among them

cise, to develop it to its necessary conclusions, and to com- | than even among the Greeks. ‘The first accounts of the

pare these with experiment, indicating where the theory is | compass in Europe go back to the 12th century, and,

either incorrect or incomplete. Then we shall discuss the | although the instrument described is very rough, it is

paramagnetic and diamagnetic properties of all bodies, as | not spoken of as a uew invention. In its earliest form

expounded by Faraday; an account will be given of the con- | it seems to have consisted simply of an iron needle which

nexion between the magnetic and the other physical proper- | was touched with the loadstone and placed upon a pivot,

ties of bodies ; and, lastly, we shall endeavour to give some | or floated on water, so that it could turn more or less

idea of the different physical theories that have been pro- | freely. It was found that such a needle came to rest in a

posed in order to give something more than a mere short- | position pointing approximately north and south (some

hand record of the facts of observation. accounts say east and west, in which case there must have

been a cross piece on the needle to indicate what was pro-

LeaDING PHENOMENA. bably the important direction for the mariner). As these

: : , compasses were made of iron (steel was not used till much

Magnetic It appears, from what Lucretius says in the passage later), and were probably ill-pivoted, they must have been leer above quoted,’ that the Greeks and Romans were aware, | very’ inaccurate; and the difficulty of using them must |

roe ceptaiiie iediphone, or magnetic iron ore, attracted | pave heen much increased by the want of a card, which

cients, 100, but also that it endued iron in contact gatlinnts wath | 62 6 lager addition made apparently by the Dutch.

its own peculiar property. Thus an iron ring will hang suspended by the attraction of a loadstone, and from that ring another, and so on, up to a certain number, depending on thé power of the stone and the weight, d&c., of the rings. They were also aware that the attraction was confined to iron, or at all events was not indiscriminate, and that it was not destroyed by the

intervention of other bodies, such as brass, between the magnet and the iron. It appears, too, from the passage—

Fit quoque ut a lapide hoc ferri natura recedat

Interdum, fugere atque sequi consueta vicissim, &c.— that they had an idea that, under certain circumstances, the attraction might be replaced by a repulsion. If, how- ever, we understand aright the latter part of Lucretius's

- somewhat obscure description of what seems to have been

It is unnecessary to enter into more detail here respect- ing the early history of the compass, as the matter has been very fully treated in the article Compass.6 We pro- ceed therefore to show the bearing of the invention upon the science of magnetism. It will at once be seen that it involves two scientific discoveries of capital importance :— first, that the loadstone can transmit to iron with which it comes in contact a permanent property like its own; and, secondly, that a loadstone or magnet if suspended freely will turn so that a certain direction in it assumes a fixed position relative to the geographical meridian, a certain part of the magnet turning always towards the north, and the part opposite towards the south. These opposite parts of the magnet are called its " poles."

The light compass.

To fix our ideas we shall describe a process by which Axis of a we might definitely determine this direction in the magnet. Masnet Following the example of Gilbert, let us consider a memeailt spherical magnet.

an actual experiment of his own, this notion was in reality a hasty generalization, not justified by the observed facts.*

In any case there seems no warrant for assuming, as some Our reason for dealing with this form defmed

have done, that the ancients had any definite conception of magnetic polarity.

What they wanted in definite experimental knowledge they supplied by an abundant use of the imagination.

1 Gilbert, De Magnete, lib. i. chap. ii., says, ‘‘ Magnesia ad Me- andrum”; but it is uncertain whether this or Magnesia ad Sipylum is meant.

2”Ev TH AlOw hy Ebpimldns pev Mayvitiv wvdpuacey, of 5& moAAo) “HpdkAeiayv (Ion, 583D). See Munro’s Lucretius, vol. i. p. 662. The other name is from Heraclea in Lydia. —

3 Bk. vi. line 906 sq., and 1042 sg.; comp. Plato, Jon, ut supra, whom there is reason to think he is quoting.

- See below, p. 225.

in the first instance is to make it perfectly clear that the phenomena depend essentially on something apart from the form of the body. We shall suppose that the magnet is homogeneous as to its mass, so that its centre of gravity

5 See Mollendorff, 7. D. Af. G., xxxv. 76.

8 It may be mentioned that the statement that Peter Adsiger, in a letter written in 1296, mentions the magnetic declination, appears to be a mistake, arising from the mistranscription of a title. See Wenckebach, quoted by Lamont, Handbuch des Magnetismus, p. 449. The passage from Are Frode, quoted by Hansteen, and alluded to in last edition of this encyclopedia, appears also to be of doubtful antiquity. See Poggendorff, Geschichte der Physik, p. 99.

Poles, north and south.

Magnetic meridian.

Magnetic needle.

coincides with its centre of figure. Suspend this spherical magnet by a fine thread of untwisted silk, attached to any point of its surface, say P. After the

magnet has come to rest, mark the vertical plane through the centre which falls in the geographical meridian; this may be done by trac- ing a great circle on the surface of the magnet. Next find the point P’ in which the vertical through P cuts the surface again, and suspend the magnet by P’, again marking the plane which falls in the meridian. Now, find the plane which bisects the acute angle between the two former planes, mark it by a great circle, and call it the axial plane of P. If we thus find the axial planes of any number of points, we shall find that they all intersect in one common line passing through the centre of the sphere. We may call this line the “axis” of the magnet. Let us mark the points where it cuts the surface ; we may call these the “‘poles” of the magnet. We shall then observe that, however we suspend it, the magnet will always come to rest so that the vertical plane through the axis makes a definite angle with the meridian. This angle (8)is called the “declination” (also, by sailors, the “ variation”); it varies from place to place, and from time to time, but very slowly, so that throughout a limited area of the earth’s surface, and for a limited time, it may be regarded as constant.}

One end of the axis always turns northwards, and the other always southwards; we shall call the former the “north” and the latter the “south pole,” although, for reasons to be afterwards explained, it would be more appro- priate to invert the order of these names. Henceforth the vertical plane in which the axis of the magnet comes to rest will be called the magnetic meridian, and the two horizontal directions in this plane magnetic north and magnetic south respectively.

It must be carefully noticed that there is a certain amount of arbitrariness in our definition of the axis and poles of a magnet. In reality it is only the direction of the axis that is fixed in the body, and not its absolute position. This will be made plain if we repeat all our experiments with the spherical magnet after fastening to it a piece of wax or other non-magnetic body, so as to leave its magnetic properties unchanged, but to throw its centre of gravity out of the centre of figure. Everything will fall out as before, only the axial planes of the different points of suspension will now meet in a line, parallel, it is true, to the axis determined before, but passing through the new centre of gravity. In point of fact, therefore, we might choose any point in the body, draw a line through it in the proper direction, and call this

the axis. Hereafter we shall, unless the contrary is stated, draw the axis through the centre of gravity of the body, or through its centre of figure if it has one; and we define the poles, for the present, as the points in which the axis cuts the sur- face of the magnet, supposing, as will be generally the case, that the line cuts the surface in two points and no more.

Having now obtained a definite idea of the axis of a magnet, and seen that it has, in the first instance at least, nothing to do with the external form of the body, let us proceed to make an artificial magnet of the particular kind usually called a “magnetic needle,” and briefly examine its properties. Take a tolerably thin flat piece of pretty hard-tempered steel, of the elongated symmetrical form NS shown in fig. 1. We suppose it, in the first place, in an unmagnetic condition. Let it be pierced by a well- turned axis ab, passing accurately through its centre of gravity, and perpendicular to its plane, so that, when the Frm ee ee

1 For the early observations on the declination the reader is re- ferred to the treatment of the subject of terrestrial magnetism in the article METEOROLOGY. At the present time the declination at Green- wich is a little over 18°; at Edinburgh it would be about 4° more,

axis is placed on two horizontal knife edges, the ueedle will rest in any position indifferently. Further, let four very small hooks, ¢, d, e, f, be attached, two (c¢, d) to the ends of the axis, and other two (e, /) to the edges of the needle in aline perpendicular to NS. Now rub the half of the veedle

€

——__ Os

towards N with the south pole of the spherical magnet whose properties we have just discussed, beginning the stroke at the middle and ending it at the point of the needle, and for symmetry’s sake let us do the same to the other side of the needle, and then repeat this process with the north pole of the sphere on the other half towards S. Let us examine the properties of the needle thus “magnetized,” If we suspend it first by the hook c and then by

the hook d, we shall find that in both cases the line joining NS? makes very nearly the same angle with the geographical meridian. Hence the mag-

netic axis must lie in a plane through NS perpendi-

cular to the plane of the needle. A similar experiment with the two hooks e, f will show that the magnetic axis lies approximately in the plane of the strip, which we may suppose for the present to be infinitely thin. Hence the magnetic axis may be taken to be coincident with the line NS joining the points of the needle. This coincidence is, however, in general only approximate, and in delicate measurements corrections have’to be made on that account, of which more hereafter. If we now mount our magnetized needle on a piece of cork or two straws, and float it in a basin of water, or replace its axle by a small cap and set it on a pivot, we have the mariner’s compass in its early form. We shall call it a magnetic needle, to distinguish it from the more elaborate compass of the present day. A favourite way of showing the directive property of a magnet, described by Gilbert, is to magnetize a sewing- needle, and lay it very gently, by means of a fork of wire, on the surface of water ; it will float and turn until it takes up its position in the magnetic meridian,

A needle mounted in this way, so as to have great freedom to move in a horizontal plane, is of great use in magnetic experiments. Gilbert calls it a *‘ versorium.” When very delicate applications are in view, the point of the pivot on which it is mounted must be very hard (say of hard tempered steel or iridium), and the cap should be fitted with an agate or other hard stone having a polished cavity of the form of a blunted cone to receive the pivot. A still better arrangement, also used by Gilbert, is to suspend a short and very light piece of steel wire—a fine sewing needle may be used— by means of a single fibre of silk. The most delicate arrangement of all is to use one of Sir W. Thomson’s light galvanometer mizrors

with the magnets attached, and follow its movements by means of the lamp and scale as usual. See GALVANOMETER.

Such, with as much of modern accuracy imported into them as was necessary for clearness of exposition, were the facts of magnetism as known up to the beginning of the 16th century.

Another experiment with our magnetized needle will enable us to describe the next important magnetic dis covery. In its unmagnetized condition the needle rested indifferently in any position when its axis was placed on

2 Or the vertical plane through it, should it happen to be not quite horizontal,

Discov- ery of the dip.

two horizontal knife edges. In the magnetized state this is no longer the case. The axis of the needle now takes up a fixed position, with its north r end pointing downwards (fig. 2), and if disturbed will oscillate about that position, and finally settle into it again. The angle which the axis NS makes with the horizon is least when the plane of rotation of the needle is in the mag- netic meridian: the angle (e) in this case is called the “dip,” or (by Con- tinental writers) the “inclination.” It is greatest, viz. 90°, when the plane of rotation of the needle is vertical and perpendicular to the magnetic meridian. At Greenwich the dip is about 67° 30’ at the pre- sent time. If we place the needle with its plane of rotation perpendi- cular to the line of dip, the equili- N brium will be indifferent, as it was

[Fig. 2. in all positions before magnetization; but there is no other position of the magnetized needle for which this is true.

The remarks which we made as to variation in space and time of the declination apply also to the dip. The variation from place to place differs, however, in nature

from that of the declination. Along a line running in the neighbourhood of the geographical equator, partly north and partly south of it, the dip is zero, North of this line, which is called the magnetic equator, the north end of the needle dips below the horizon; and the angle of dip increases aS we go northwards, until, at a point in the Hudson’s Bay Territory, the needle dips with its north

measurement, and it is not surprising that he got a result of 9° instead of somewhcre about 70°.

In 1576 the dip was independently discovered by Robert Norman.

Norman, a skilful seaman and an ingenious artificer, according to Gilbert. He was in the habit of making compass needles, and carefully balancing them so as to play horizontally on their pivots before magnetization. He found that, after they were magnetized, they constantly dipped with the north end downwards, so that a counter- poise had to be added to bring them back to the horizon. This led him to construct a special instrument, the proto- type of the modern dipping needle, to show this new phenomenon. With this instrument hc made the first accurate measurement of the dip, and found it to be 71° 50’ at London.?

The early English magnetic observers, of whom Norman and Burroughs (who wrote an able supplement to Norman’s work) were admirable examples, must have done much for the introduction of precise ideas into magnetism. But their

fame was speedily eclipsed by William Gilbert of Colchester? Gilbert.

(1540-1603), whom Poggendorff has justly called the Galileo of magnetism, and whom Galileo himself thouglit enviably great. In his great work entitled De Magnete Magneticisque Corporibus et de Magno Magnee Tellure Physiologia Nova, first published in 1600, we find a com- plete account of what was known of magnetic phenomena up to his time, with a large number of new ideas and new experimental facts added by himself. We find in Gilbert’s work, in a more or less accurate form, nearly all that we shall lay before the reader in the first section of this article, described very much in the language that we shall use. ‘How far he was ahead of his time is best proved by the works of those who wrote on magnetism during the first few decades after his death. They contributed in reality nothing to the extension of this branch of physical science.” 4

pole vertically downwards. South of the magnetic equator the south end dips below the horizon; and there is again a point in the southern hemisphere where the south

Mutual Action of Like and Unlike Poles.—If we take a Like _ magnet whose poles N’, S’ have been determined and ™agnetic

he ; pol marked as above explained, and bring its north pole N leds

Hart- mann,

end dips vertically downwards. These points are called the “magnetic poles” of the earth. For further details on this subject we refer the reader to the discussion of terrestrial magnetism in the article METEOROLOGY.

It was in the accurate observation of the declination and dip of the magnetic needle that the science of magnetism arose. The dip appears to have been first observed by Georg Hartmann, vicar of the church of St Sebaldus at Nuremberg (1489-1564), who seems to have been in advance of his age in magnetical matters. In a letter! to

Duke Albrecht of Prussia, dated 4th March 1544, he writes :—

‘‘ Besides, 1 find this also in the magnet, that it not only turns from the north and deflects to the east about 9° more or less, as I have reported, but it points downwards. This may be proved as follows. I make a needle, a finger long, which stands horizontally on a pointed pivot, so that it nowhere inclines towards the earth, but stands horizontal on both sides. But as soon as I stroke one of the ends (with the loadstone), it matters not which end it be, then the needle no longer stands horizontal, but points downwards (fallt wnter sich) some 9° more or less. The reason why this happens was I not able to indicate to his Royal Majesty.”

From this it will be seen that Hartmann had unques- tionably observed the tendency of the magnetized needle to dip. His method of observing is of course unsuited for

__ Brought to light by Moser. See Dove’s Repertorium der Physik, li., 1838. It does not appear that Hartmann’s letter was ever before published. Moser is therefore scarcely justified in attacking Norman’s priority in this matter, still less in attempting to deny him the credit of first observing the dip by a sound method. Had he read the Newe Attractive he could scarcely have

fallen into such an error; for in respect of clearness and scientific precision Hartmann’s letter,

interesting as it is, cannot for a moment be compared with Norman’s little work.

near the north pole N of a magnetic needle, N will move untike in a direction indicating repulsion between N and N’. attract.

The same result will follow if the south pole S’ of the magnet be brought near the south pole S of the needle. But if 8’ be brought near N, or N’ near §, attraction will be indicated. Hence the following fundamental law of the action between two magnets :—Like poles repel each other; unlike poles attract each other. It would appear, therefore, that the whole action of one magnet upon another is of a some- what complicated character, .

even if we take the simplest __, 5! view of it that the experi- Fic. 3

mental facts will allow, viz., = jae that the action may be represented by forces acting between the two pairs of points in each magnet which we have defined as north and south poles. On this assumption, the action of N’S’ upon NS would consist of the four forces represented in fig. 3, for all these must exist in accordance with the law just established. Whether this is a sufficient

2

- He published a work, of which the following description is given in the Ronalds’ Catalogue :—‘‘ The Newe Attractive, containing a short discourse of the Magnes or Lodestone, and amongst other his vertues, of a new discovered secret and subtill propertie concernyng the Declyning of the Needle, touched therewith, under the plaine of the Horizon. Now first found out by Robert Norman, Hydrographer. 4to (black letter, scarce), London, 1581.”

3 For details as to his life, see art. GILBERT.

4 Poggendorff, Geschichte der Physik, p. 286.

representation of the most general case, and what the exact law of the forces ought to be, we are not yet in a position to decide. One thing, however, is clear, that the action between two poles must diminish when the distance between them increases ; otherwise we should not have been able to make the action of N or 8 upon N' prevail, by bringing the one or the other nearer.

It was perhaps the complexity of this analysis (along with the fact that the action of the magnet upon soft iron, which was the earliest discovered magnetic pheno- menon, is not a pure case of this action, but involves also another phenomenon, viz., magnetic induction) that prevented for so long the discovery of the elementary law we are now discussing. At all events, it seems to have been a new discovery in the 16th century, if we may judge from a passage in the letter of Hartmann above alluded to. He was certainly aware of the existence of magnetic repul- sion in some form or other. It is somewhat difficult to gather from his description what it was exactly that he observed, and he nowhere states the law fully and explicitly. In Norman's Newe Attractive! we find it clearly stated, and demonstrated by means of a needle floating on water or suspended by a thread ;? yet he does not appear to claim the fact as his discovery. If, therefore, Hartmann was not the actual discoverer, we may at least conclude that the law became familiar to magnetic philosophers during the thirty years that separated him from Norman.

The Magnetic Field.—We next introduce a method of conceiving and describing magnetic actions which was fiel{, 12Vented and much used by Faraday. Since a magnet acts

_. , upon a magnetic needle placed anywhere in the surround- Lines of . 3 : macnetic 8Z Space,® we call that space the magnetic field of the force. magnet. Neglecting the earth's magnetism, we may map out this field as follows. Conceive any plane drawn through the axis of the magnet, and place it so that this plane shall be horizontal. Then at any point in this plane place a very small magnetic needle, and note the direction which its axis assumes under the action of the magnet; then proceed to move the centre of the needle in the direction in which its north pole points, and con- tinue the motion so that at each point the centre is following the direction indicated

by the north pole. The line thus traced will at last cut the surface of the magnet at some point lying towards its south pole; and if we continue the line backwards, by following the direction continually indicated by the south pole of the needle, it will cut the surface of the magnet at some point lying towards the north pole. Such a line is called a line of magnetic force; and, since one such line can be drawn through every point of the plane, and any number of planes can be taken through the axis of the magnet, we can conceive the whole magnetic field filled with such lines. Fig. 4, taken from Faraday, gives an idea of the distribu- tion of the lines of force in the field of a bar magnet ; fig. 5 represents the lines in the field due to two neighbouring like poles.

These diagrams were not obtained by the method we have just described, but by a much simpler process which we shall describe by and by. Their use, so far as we have gone, is to tell us how a small needle, free to move about its centre in any direction, will place itself at any part of the field, viz., it will place its axis along the tangent to the line of force which passes through its centre, its north pole pointing in that direction which ultimately leads to the south pole of the magnet producing the field.

Terella Suppose we apply these ideas to a spherical magnet (a or ideal terella, or earthkin i ue eee pen) , aS Gilbert calls it), The lines of force

1 Chap. i.

® See also Gilbert, De Magnete, lib. i. cap. v.

3 Gilbert uses the phrase orbis virtutis im a somewhat similar sense.

Mapping out the magnetic

MAGNETISM

in any plane through its axis would be found to run some- thing like the curves in fig. 6. If, therefore, we carried a small needle (suspended from a silk fibre so as to be perfectly free to move in all directions) round the magnet

—— unt —

Fig. 4. in a meridian plane, its axis would constantly remain in the meridian plane, its north pole always point towards the

below the tangent plane to the sphere as the centre recedes from the equator, and end by pointing straight towards the south pole when the centre reaches the magnetic axis (see fig. 6).

Fig. 6.

When we reflect that in all our experiments the pro- perties of magnets, whether native, such as the loadstone, or artificial, such as the needles magnetized by rubbing with the loadstone, have proved alike, and» that every

Earth’s

force of transla- tion nil.

WAG N ih

purely magnetic action on a magnet has its source in some other magnetic body, we are naturally led to the con- clusion that the reason why at every point of the earth’s surface the axis of a freely suspended magnet assumes a definite position is simply that the earth itself is a great magnet, and that in observing the declination and dip we are simply exploring the magnetic field of the earth. It is true that, according to the experiment above described, the declination would every where be zero, and the magnetic equator would coincide with the geographical, but that arises merely because we assumed our earthkin, for simplicity of explanation, to be symmetrically magnetized, so that its lines of force ran in planes passing through its axis. It remains to be discussed whether the most general assumption, viz., that the earth is a magnetic body, will not account for the facts of terrestrial magnetism. The answer to this question has been given, as we shall see, by Gauss.

This idea, whose simplicity is the truest measure of its greatness, is due to Gilbert, and was by him made the foundation of his work on magnetism. The boldness of his theory will be appreciated when we remind the reader that in his day the dip was but newly discovered, and had been measured only at London, so that Gilbert's very full and clear exposition of this phenomenon, which we have given above, was in fact a scientific prediction, which was not fully verified till long afterwards! Before Gilbert a variety of wild conjectures had been made as to the cause of the directive property of the magnet.2 Many, like Columbus, Cardan, and Paracelsus, believed that the magnet was attracted by a point in the heavens, possibly some magnetic star. Others supposed that the attracting point was situated in the earth; Fracastorius imagined hyperborean mountains of loadstone situated near but not quite at the north pole; and to this theory others contributed the detail that the magnetism of these mountains was so powerful that ships in these regions have to be built with wooden nails instead of iron ones, which would be instantly drawn out by the magnetic attraction.

It is clear that, if we call that magnetic pole of the earth which lies in the northern hemisphere its north pole, we ought, in accord- ance with our fundamental law of magnetic action, to call the north- seeking pole of an ordinary magnet a south pole. When it is necessary to speak of magnets from this point of view, the diffi- culty is got over by calliug the north-seeking pole the austral pole, and the south-seeking pole the boreal pole. In reality the danger of confusion is more imaginary than real. The reader should be warned, however, that in some French works the ordinary nomenclature is reversed, and that Faraday uses ‘‘ marked” and “ unmarked,” and Airy ‘‘red” and ‘‘ blue,” in the sense in which north and south are commonly used.

Lhe Earth's Action on a Magnet is a Couple.—Norman in his Newe Attractive (chapters v. and vi.) discusses very acutely the question whether there is any force of transla- tion exerted upon a magnet. He advances three conclusive experiments to prove the negative. First, he weighed several small pieces of steel in a delicate gold balance, and then magnetized them, but could not detect the slightest alteration in their weight, “though every one of them had received vertue sufficient to lift up his fellow.” Secondly, he pushed a steel wire through a spherical piece of cork, and carefully pared

the latter so that the whole sank to a certain depth in a vessel of water and remained there, taking up any position about the centre indifferently. After the wire was magnetized very carefully, without disturbing its position in the cork, it sank to the same

1 The first verification was by FHudson, who, in 1608, found the dip in 75° 22’ N. lat. to be 89°30’. Gilbert fonnd 72° at London in 1600. The place of vertical dip in the northern hemisphere was first reached by Sir James Ross in 1831. It was found about 70° 5’ 17” N, lat. and 96° 45’ 48” W. long.

- See Gilbert, De Magnete, lib. i. cap. i.

depth as before, neither more nor less, the only difference being that now the wire set itself persistently in a definite fixed direction parallel to the magnetic meridian, the north end dipping about 71° or 72° below thehorizon. Thirdly, he arranged a magnetized needle on a cork so as to float on the surface of water, and found that, although it set in the magnetic meridian, there was not the slightest tendency to translation in any direction.? He concludes that there is no force of translation on the magnet, either vertical or horizontal. He was evidently somewhat puzzled how to put this result into a positive form, and his “point respective,” as he calls it, is nota very clear explanation of the earth’s action. What he wanted was the modern idea of a “couple,” ze, a pair of equal but oppositely directed parallel forces acting on the two ends of the needle; but such an idea was not conceived in Norman’s day. Gilbert adopts Norman’s result in this matter, adding nothing essential, reproducing even Norman’s diagram of the spherical cork with the wire through it. It is clear therefore that Gilbert had a forerunner in the practice, as Bacon had in the theory, of inductive science ; for Norman says, speaking of the mass of fables that had passed for truth in geography, hydrography, and navigation before his time, “I wish experience to bee the leader of Writers in those Artes, and reason their rule in setting it downe, that the followers bee not led by them into errors, as often- times have beene seene.”

The Magnetic Property is Molecular.—Apart altogether from the question as to how we are to represent the action of a magnet upon other magnets,

there arises another quite distinct question, as to where the cause of this action resides. That these two questions are really distinct, although there has always been a tendency in the more superficial treatises on the subject to confuse them, will be obvious from the fact that we shall afterwards obtain more than one perfectly general way of representing the action of a magnet at external points, whereas there must be one and only one cause of this action. A very old experiment 4

at once throws considerable light on this point. If we break a bar mag-

; S net into two (eee pieces, it will be s’ N’ 5 lomnd hat Caen LS of these Is itself s’N” s! N! s ee Se SS being in much Fic. 7 the same direc- Ke

tion as that of the original magnet, and its poles in cor- responding positions, see fig. 7. The same holds if we break the bar into any number of pieces; and, quite generally, if we remove any piece, however small, from a magnet, this piece will be found to be magnetic, the direc- tion of its axis usually bearing a distinct and easily recognizable relation to the direction of the axis of the whole magnet. We are therefore driven to the conclusion that the magnetic quality of a body is related to its ultimate structure, and not simply to its mass as a whole, or to its surface alone; and this conclusion is not to be invalidated by the fact that we can in general, as will afterwards appear, represent the action of the magnet at external points by means of a proper distribution of centres of attractive and repulsive forces upon its surface merely. Temporary Magnetism of Soft Tron and Steel in the Magnetic Field.—Bodies which possess permanent magnetic

3 Hartmann (sce his letter above cited) was in error on this subject. He describes a somewhat similar experiment, and distinctly states that the needle has a motion of translation. ‘‘Schwimmt mit dem Ort welcher ist mitternichtlich am Stein, bis er kam an den Port der Schiissel, da das Wasser in war.”

4 Cf. Gilbert, De Magnete, lib. i. cap. v.

Magnet- ism a molecnlar property.

Magnetic properties, not depending on the circumstances in which

they are placed, we shall henceforth call ‘“ permanent magnets.” ‘I’he law of the action of one permanent magnet upon another, as we have seen, is that like poles repel and unlike poles attract each other. The action of a permanent magnet on pieces of soft iron is, at first sight, different, for either pole attracts them alike.

To fix our ideas let us take a small thin bar of soft iron or of steel, and test it with adelicate magnetic needle. It will usually be found, more particularly if a steel bar is taken, that one end of the bar will repel one or other of the poles of the needle. This is a sure sign of permanent magnetism. If, however, we heat the bar to whiteness and allow it to cool in a position perpendicular to the earth’s magnetic force, all permanent magnet- ism will be found to have disappeared. If a we now place the bar in a horizontal plane (fig. 8) with its axis perpendicular .to the axis of the needle, and one of its ends A, B near either pole of the needle, that pole will be attracted, no matter whether it be the north pole or the south pole s’ of the needle, or which end of the bar be used. = Care must be taken in this experiment to avoid using a too strongly magnetized needle, and to keep the needle from touching the bar, otherwise the bar may receive traces of permanent magnetism which will disturb the result. It is very easy, by repeating the above experiment with an un- magnetized needle, to show that the power that the bar acquires of attracting the poles of the needle is temporary and depends on the presence of a magnetized body.

Keeping to our principle that a magnetic cause is to be sought for every magnetic action, we are led to explain the above experiment by saying that in the magnetic field a bar of soft iron or of unmagnetized steel becomes magnetic in such a way that its north pole points as nearly as may be in the positive direction of the lines of force passing in its neighbourhood (or, in other words, in the direction, as nearly as may be, in which a magnetic needle would point if placed in its neighbourhood). A body which becomes magnetic in this way by the magnetic action of another

body is said to be “ magnetized ” by “induction.” We shall.

suppose, in the meantime, that it loses all the magnetism thus acquired when the inducing action is withdrawn ; although this is not necessarily, and in fact not generally, the case, as we shall see by and by. The reason why soft iron is attracted by a permanent magnet is therefore now said to be that the iron becomes magnetic by induction, and is then acted upon by the magnet like any other magnet similarly placed. The accuracy of this analysis of the phenomenon may be confirmed by many simple but striking experiments, such as the following.

In the experiment above described, instead of placing the non-magnetic bar in a horizontal plane, place it in the plane of the magnetic meridian with its axis in the direc- tion of the earth's force (7.e., parallel to the line of dip). The lower end of the bar will then be found to repel and the upper end to attract the north pole of the needle (figs. 9, 10). This is at once explained on the above hypothesis ; for the bar will be magnetized inductively by the earth's force, so that its lower end becomes a north pole, and its upper end a south pole.

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Let NS (fig. 11) be a bar magnet placed. horizontally so that its axis produced passes through O, the centre of suspension of the needle sn, then the needle will be deflected

A

Fig. 9.

in the direction of the arrow. If now we place between S and O a small sphere of soft iron, this deflexion will be

B

Fig. 10.

increased, the reason being that the sphere is magnetized by induction, having a south pole towards O and a north pole

v17

Wrrw renee -------- =

Fig. 11.

towards S, and the action of these is added to that of NS. Let NS (fig. 12) be a magnet placed in the magnetic meridian, 7’s’ a small

: n s magnetic needle in the eee aiid a same horizontal plane, ee ; with its centre inthe .“ S

.

of

line bisecting NS at right angles. When acted on by NS alone, n’s’ will place itself parallel to NS, with |W}

its north pole pointing S N in the direction NS Let the dotted line represent a line of force. If we move a small piece of soft iron ms along this line in the direc- tion from N towards §, it will first deflect the needle-as

a, a role

rig. 12.

Gilbert’s experi- ment.

Experi- mnents withiron filings,

MAGNETISM

in fig. 13, and finally as in fig. 14, and in each position reversing it end for end will not alter the effect. is at once explained by the above hypothesis.

A variation of the last experiment may be made thus, Place a magnet verti- eally, in the neighi- bourhood of a mag- netic needle ; by mov- ing it up and down a position will be found in which the action of

a S

7

if ‘\ \ \ \ f }

1 1 ‘

{ i t

4

A

the magnet on the / needle is wholly verti- \ /

cal, so that the needle A ne N is not deflected from Fig. 13.

the magnetic meridian. Now take a small piece

of soft iron and move a ae it along a line of force por “, passingnear theneedle, “ ‘.

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ss,

-

proceeding from the north to the south pole of the vertical magnet. It will then be found, in accord- ance with our hypo- Fig. 14. thesis, that the north pole of the needle is first repelled, and finally attracted by the soft iron.

If we hang two short pieces of iron wire alongside of each other by parallel threads, they will be found to repel

one auother, and to | n a

poet, Pe sel 8

considerable interval when a magnet is brought under them

(see fig. 15 and 16). This experi- ment is due to

Gilbert, who rightly explains it by saying that the two ends nearer the magnetic pole S become like poles of opposite kind to §, while the two farther ends are like poles of the same kindas§. The experiment may be varied by placing some little distance below the pole of a magnet S a piece of mica or thin card- Fig. 15. Pig 16, board M, and placing below that a short piece of soft iron wire; it will remain adhering to the mica, and so long as it is alone will hang more or less nearly vertical, but when another is placed alongside of it the two will diverge as in fig. 17.

One of the most interesting. examples of magnetic induc- tion is furnished by the action of a magnet on iron filings. If we plunge a magnet into & quantity of iron filings Me 4% and then remove it, we find it thickly fringed around the poles, where the filings adhere to the magnet and to one another so as to form short bushy filaments; the thick-

rw)

=

hang separated by a s! nl!

%

ey

225

ness of the fringe diminishes very rapidly towards the

All this | middle of the magnet, where very few adhere at all. These

filaments are composed of magnetized particles of iron adhering by their unlike poles,

If we place a small bar magnet under a piece of mode- rately rough drawing paper, strewn as uniformly as possible with fine iron filings, and then tap the paper very gently so as to relieve the friction, and allow cach filing to follow the magnetic action, then the filings will be seen to arrange themselves in a series of lines, passing, roughly speaking, from pole to pole, as in fig. 4(p. 222). The explanation of this phenomenon is simply that each filing becomes magnetized by induction, and, if it were quite free to move about its centre, it would not be in equilibrium until it set its longest dimension along the line of force through its centre. The roughness of the paper effectually prevents translation, but does not hinder rotation, especially when the friction is relieved by tapping ; hence every filing does actually set as if it were a little magnetic needle, subject of course to some slight disturbance from the neighbouring filings. The whole therefore assumes a grained structure, and the graining runs in the direction of the lines of force. We have thus an extremely convenient way of representing these lines to the eye, which lends itself in a variety of ways to the illustration of magnetic phenomena. In fig. 5 are shown the lines formed in the field near two like magnetic poles, These magnetic figures may be fixed in a great variety of ways, and projected on a screen so as to be visible to a large audience, but it is scarcely necessary to dwell here upon details of this kind.

These magnetic curves seem to have fixed the attention of natural philosophers at a very early period. They were originally called the magnetic currents, from an idea that they represented the stream lines of magnetic matter, which explained the magnetic action according to the theory then in vogue. La Hire mentions them, Mém. del’ Acad., 1717. Bazin gives an elaborate account of them in his Description des Courans Magnétiques dessinés @aprées Nature, Stras- burg, 1753. Musschenbroek seems to have been the first to give the correct explanation depending on magnetic induction, Diss. de Magnete, 1729.

If the filings be laid very thickly on the paper, and one Lncre- pole of the magnet be brought under them at a short tius’s ex- distance off, they wiil arrange themselves in a pattern, Peiment.

and at the same time bristle up so as to stand more or less erect, according as they are nearer or farther from the magnet. They have thus the appearance of being repelled from the magnet. It was, in all proba- bility, this phenomenon that was observed by Lucretius when he says (vi.. 1042) : —

‘* Exultare ctiam Samothracia ferrea vidi, Ac ramenta simul ferri furcre intus ahenis In scaphiis, lapis hic Magnes cum subditus esset.”

His conclusion, therefore, that iron sometimes flies and sometimes follows the magnet, was scarcely justified by his experimental facts, and it is a mistake to suppose, as some have done, that he was aware of the polarity of permanent magnets.

If we tap the card in the last experiment a curious Magnetic The lines of paradox.

result may sometimes be observed.! filings will be seen to recede from the point of the card immediately over the pole of the magnet. If, however, the magnet be held over, instead of under, the card, tapping will cause the filings to approach the point under the pole of the magnet. The most probable explanation 2 of this is to be found in the fact that the erected filings stand in thie et ee eee eee

1 Mpinus, Tentamen Theorie Electrieitatis et Magnetismi, 1759 ; Cavallo, Treatise on Magnetism, 1787.

2 Roget, Library of Useful Knowledge, 1882. XV. — 29

former case as shown in fig. 18, and in the latter as shown in fig. 19; that is, in both cases, owing to the action of gravity, they are more acutely inclined to the card than

wy Fig. 18. the lines of force (represented by dotted lines in the figure).

Consequently, when the filing springs up into the air, and is thus free to follow the magnetic couple, it turns more

5

yy

“~~ te

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into the direction of the line of force ; the effect of this is to carry its lower end each time a little farther from the axis of the magnet in the one case, and a little nearer to it in the other.

Electro- By far the most important case of magnetic induction

magnets. js the electromagnet. Whenever an electric current flows in a closed circuit, the surrounding space becomes a field of magnetic force, and any piece of iron in it will be in- ductively magnetized. Such an arrangement of an electric circuit and iron is called an electromagnet. The variety of form and of application of such instruments in modern science is endless. A few of the more important modifica- tions will be considered below.

Induced Co-existence of Induced and Permanent Magnetism.—The

and per- fact that a body is already a permanent magnet does not

“ight prevent its being susceptible to magnetic induction. If ism in We take any piece of iron at random, the chances are that

the same one end or other of it will repel the north pole of a magnetic body. needle,—in other words, it will be to some extent per- manently magnetic ; but if we bring it slowly nearer and nearer to the pole of the needle, provided its magnetism be not too strong, it will by and by attract the pole which it at first repelled. Again, if we take two steel magnets, which may be as powerful as we please, provided at all events that they are unequally powerful, and bring two dike poles together, these poles will at first repel

each other in accordance with the fundamental law of permanent magnets; but, when the distance is less than a certain amount, the repulsion passes into an attraetion, and when the poles are in contact this attraction may be very considerable. These phenomena are at once explained by the law of induction. The induced or temporary magnetism is superposed on the permanent magnetism, and, when the poles are near enough, the opposite inagnetism induced by the pole attracts it more than the permanent like magnetism repels it; and this happens even with steel, whose susceptibility for magnetic induction is considerably less than that of iron. This phenomenon was observed pretty early in the history

of magnetism, but was not fully explained until the idea of magnetic induction was fully developed. Michell, in his Treatise of Artificial Magnets, gives a tolerably clear account of it. Musschenbroek meutions it,? along with the fact that a magnet attracts iron more than it does another magnet, but offers no explanation of either fact. The latter result, so far as it is true, can of course be explained by the smaller susceptibility of steel, particularly of hard steel, to magnetic induction, which is the main factor in attraction at small distances. Poggendorff* and others have experimented on the subject in later times. The reader should notice the close analogy between these phenomena and the repulsion and attraction at different distances between two similarly electrified conductors. See article ELEcTRICITY, vol. viii. p. 33.

Induction of Permanent Magnetism.—The case above supposed, in which the induced magnetism is wholly temporary, although it can be easily realized with small magnetizing forces, is not the general one, but in fact the exception. Usually a certain proportion of the magnetism remains after the inducing force is removed. This happens Coercive even with the softest iron, when the inducing force is very force. great. Just as bodies differ very much in their suscepti- bility for induced magnetism, so they differ greatly in their power of retaining this magnetism when the inducing force ceases, or, as the phrase is, in “‘coercive force.” Thus, while the inductive susceptibility of steel is less than that of iron, it retains much more of the magnetism imparted to it, and is therefore said to have much greater

coercive force ; and the coercive force is greater the harder the steel is tempered.

It is obvious, therefore, that the principle of “induction,” along with the idea of ‘‘retaining power” or “coercive force,” furnishes us with the key to the explanation of the com- munication of permanent magnetism, whether by means of natural magnets or of artificial magnets, or of the electric current. In particular, we see at once the reason why the end of a needle which has been touched by the north pole of another magnet becomes a south pole, and vice versa,—a fact which greatly puzzled the earlier magnetic experi- menters, and indeed all who were inclined to think that, in the process of magnetization, something was communicated from the one magnet to the other.

MATHEMATICAL THEORY OF THE ACTION OF PERMA- NENTLY MAGNETIZED Boptgs.

In this section we shall suppose the bodies considered to be rigidly magnetized ; 7.¢., we shall suppose that magnetic action exerted on any body produces no change in its magnetization. It is further to be observed that we are merely establishing a compendious representation of ob- served facts, and foreclosing nothing as to their physical theory or ultimate cause. Our method is therefore to some extent tentative, and its success is to be judged by the agreement of the results with experiment.

There are two main facts to be borne in mind :—(1) that a magnet is polarized, and (2) that the properties of its smallest parts are similar to those of the whole. Adopting the mathematical fiction of action at a distance, we may represent the action of such a body by a proper distribution of imaginary positive and negative attracting matter through- Positive _ out its mass. This imaginary matter, following Sir W. and . Thomson, we shall call “magnetism,” as we thus avoid °C” ® suggesting other properties of matter than attraction, of ism. which in the present case experience has given no evidence.

We assume that magnetism of any sign repels magnetism 1 Cambridge, 1750.

2 Philosophia Naturalis, §§ 953, 954, 1762. 3 Pogg. Ann., xlv. p. 375, 1838.

of the same sign and attracts magnetism of the opposite sign. Magnetism is supposed to be so associated with the matter of the body that magnetic force exerted on the magnetism is ponderomotive force exerted on the matter. On the other hand, magnetic force is‘always supposed to be exerted by magnetism upon magnetism, and never directly by or upon matter. Into the nature of this association of magnetism with matter there is no pretence, indeed no need, to enter.

‘ Elemen- The elementary law of action assumed is that the attrac- tary law tion or repulsion (as the case may be) between two quantities

‘ ~n mand m’ of magnetism supposed concentrated in two points at a

distance. g distance r apart is a? and as in the line joining the two

Unit of points. This supposes that the unit quantity of magnetism magnet- jg so chosen that two units of positive magnetism at unit

sm distance apart repel each other with unit force. This definition, which is fundamental in the electromagnetic system of units, gives for the dimensions of a quantity of magnetism [L?M?T~”]. If the electrostatic system be adopted the result would of course be different.

Strength An accurate meaning can now be given to the phrase

of mag- “strength of a magnetic field,” or its equivalent “resultant

re Re. Magnetic force at a point in the field;” it is defined to

sultant be the force exerted upon a unit of positive magnetism magnetic supposed concentrated at the point. The force exerted on

force. a unit of negative magnetism would of course be equal in magnitude, but oppositely directed ; and in general, if R denote the resultant magnetic

force at the point, the magnetic force exerted on a quantity « of magnetism concentrated there is «R.

Volume We may, as in the corresponding theory of electricity,

and introduce the ideas of volume density (p) and surface

pe density (o),—so that pdv and odS denote the quantities

of mag. Of magnetism in an element of volume and on an element netism, Of surface respectively ; p and o may of course be positive or negative according to circumstances.

It will now be seen that, mathematically speaking, the theories of action at a distance for electricity and magnetism are identical, and every conclusion drawn will have, so far as the physical diversity of the two cases may allow, a double application! In particular it will be found that the theory of magnetism, when properly interpreted, gives the theory of dielectrics polarized in the way imagined by Faraday.

Total The fact of magnetic polarity requires the conception of pe a negative as well as positive magnetism ; the fact that the

properties of the smallest parts of a magnet are similar to those of the whole requires that in every element of the body there shall be both negative and positive magnetism. From the fact that in a uniform field, i.e., one in which the resultant magnetic force has at every point the same magnitude and direction, the force of translation upon a magnet is nil, it follows that the algebraic sum of all the Magnetism in any magnet must be zero; for, if R denote the strength of the field, by the theory of parallel forces the whole force on the magnet will be 3%(«R),=R3k; hence 3«=0. In other words, in every magnet there must be as much negative as positive magnetism; and this con- clusion also must be extended to the smallest parts of every magnet, so long as we do not go behind the mere facts of observation. The positive and negative magnetism cannot be coincident throughout, otherwise there would be no external magnetic action, but the separation is in the elements of the body. Thus, although there is no force of translation

in a uniform field, there will in general be acouple. Consider the positive and negative magnetism

1 To prevent needless repetition, we shall adopt henceforth, without farther explanation, the definitions, terminology, and results given in the article ELECTRICITY, vol. viii. p. 24 sq.

od

separately, and let x denote any element of the former and « any element of the latter. Let N be the centre of mass of the positive, S the centre of mass of the negative magnetism ; so that, if the magnet be referred to a set of rectangular axes, the coordinates of N and S are

SKa SKy SKz Se Set . Be and (1). at zee? | SK’ eden Pd

Let the distance NS=J, and let K =J3x, = —U3x’; this Magnetic quantity K is called the “magnetic moment.” By the theory moment. of parallel forces, if we suspend the magnet in a uniform field of strength R, the action upon it reduces to two forces R3« and — Rx, each parallel to the direction of the field, acting respectively at N and §, in other words to a couple Magnetic

whose moment is R&«lsiny or KRsiny, where y is the couple in > uniform angle between SN and the direction of the field. Hence, field.

if the magnet be perfectly free to follow the magnetic action

we coma of the field, it will set so that the line SN or the line NS is parallel to the direction of the field, the equilibrium being stable in the former case, but unstable in the latter. The line NS is therefore parallel to what we have already defined on experimental grounds as the axial direction in the magnet. N, 8, and NS are sometimes called par excellence the poles and the axis of the magnet ; we have adopted the looser definition given above because it is more convenient and nearer the popular usage.

The above results may be applied to some cases very important in Theory practice. Let the magnet whose centres of positive and negative of magnetism are N and S be suspended by the middle point of NS, dipping

which, for simplicity, may be assumed to be also its centre of necdle. gravity. Let OX (fig. 20) be a horizontal line drawn northwards, OZ

Ss

Z

Fig. 20.

a vertical drawn downwards, both in the magnetic meridian. Let the vertical plane through NS make an angle @ with the magnetic meridian, and let ON make an angle » with the horizon. If R be the strength of the earth's magnetic field, and: the angle of dip, then the horizontal and vertical components of the earth's force are H=R cos: and Z=R sinz.

First, suppose the angle ¢ fixed, and the magnet free to rotate about OZ only ; then the couple tending to diminish the angle 6 is

2.34.8 cost cos sing, or KR cos: cos¢ sin @.

In other words the directive couple varies as the sine of the angle of deviation from the magnetic meridian. This conclusion was verified experimentally by Lambert, and also by Coulomb? by means of his torsion balance. It will be seen that, cateris paribus, the directive couple is greatest when the magnetic axis is horizontal. soe eet Oe ee A A ee

2 Mém. de V Acad., 1785.

Magnetie moment resolved as & vector.

Finite magnet replaced by an infinite number of in- finitely small magnets.

Intensity of

magnet- ization.

Next suppose the angle fixed, and the magnet free to rotate about a horizontal axis inclined at an angle 90°- to OX. The couple tending to diminish the angle ¢ is KI (cos: cos@ sing — sin: cos). The position of equilibrium is given by the equation tan @ =sec tant.

The angle at which the axis is depressed below the horizon is therefore least when 6=0, and greatest when 6=90°, its value being « in the former case, and 90° in the latter, as stated above, p. 221.

In general, if a’, yw’, ’ and A, p, v be the direction cosines of the direction of the field and of the axis of the magnet respectively, then, resolving the forces acting at N and 8, we see at once that the three components of the magnetic couple are

KR(y’p—p’‘v), KRAy—v’a), KR(w/a -A’y) (2):

These are clearly the same as the components of the couple on a system of three magnets whose axes are parallel to OX, OY, OZ, and whose niagnetic moments are Ka, Ku, Ky. Hence, so far as the action of a uniform field is concerned, we may resolve the magnetic moment like a vector, and replace a given magnet by others the resultant of whose moments is the moment of the given magnet.

It appears therefore that in a uniform field every magnet behaves as if it were made up of a certain quantity of positive magnetism and an equal quantity of negative magnetism placed at such a distance apart on a line parallel to the magnetic axis that the product of the quantity of magnetism into that distance has a value equal to the magnetic moment of the magnet. It is very im- portant to observe that the magnetic moment alone appears in the above formule forthe magnetic action. We can- not therefore separately determine from observations in a uniform field either the quantity of positive or negative magnetism in a magnet or the distance between the magnetic centres of mass.

Let M be any magnet, and P a point whose distance from any point of M is infinitely great compared with the linear dimensions of M. Then, since all the lines drawn from P to different points of M are sensibly parallel and equal in length, we may suppose the positive and negative magnetism of M

to be collected at their mass centres, 7.¢., M to be replaced by an ideal magnet. It is also obvious that, throughout a region around P whose linear dimensions are of the same order as those of M, the field due to M may be regarded as uniform. Hence we conclude that in cal- culating the mutual action of two magnets M and M’ we may replace each of them by an ideal magnet, provided the distance between them be infinitely great compared with the linear dimensions of either. This condition may be satis- fied either by making the distance between the magnets very great if their dimensions be finite, or by making their dimensions infinitely small if the distance between them be finite. The second alternative suggests at once a method for representing the magnetic action of magnetized bodies at finite distances. We may divide up the body into portions whose linear dimensions are infinitely small compared with their distance from any point at which their action is to be considered; each of these portions is itself a magnet, and may be replaced by an ideal magnet having the same axis and moment. The whole magnetic action is obtained by integrating the action of all the ideal magnets of which the body is thus supposed to be com- posed,

Let A, », v be the direction cosines of the magnetic axis of any element dv of a magnet, and I such that Idv is the magnetic moment of the element, and let IA=A, In=B, Iv=C; then I is called the “intensity of magnetization” at the point where the element is taken. I may be regarded as a vector which specifies the magnetization of the body ; in general it varies continuously from point to point ; if it has the same value and direction at every point, the body is said to be uniformly magnetized. A line drawn so that the direction of I at every point of it is tangential to it is

MAGNETISM

called a “line of magnetization.” It is clear from what has Line of already been shown that we may if we choose replace the ™gnet- element dv by three ideal magnets whose axes are parallel “°™ to the coordinate axes, and whose moments are Adv, Buz,

Cdv respectively.

If then K be the magnetic moment of the whole magnet, 5K the Resultant moment of any clement 5v, and p, g, 7 the direction cosines of the magnetic

axis of the whole magnet, we have K=/3«,= —/2x’; and, remem- moment bering that «’= —« for every clement, and axis. fie SE) 1 =(Mi *3(8Ka)* xTadv_ SAby

r=(a A Ls : a Sn K KK ik We inay therefore write, replacing summation by integration,

Kp=///hdv, Kqg=///Bdv Kg=///Cdv (3).

Let SN be an ideal magnet of infinitely small length 7, let m be its Potential magnetic moment, and m—=«l. Let Q be its middle point, and the of in- angle PQN=8, N being the positive or north-seeking pole ; and let finitely QP=D. Then the potential at P due to this magnet is small

—} = magnet. e{ D?~~Dlcos + 42} F—1e{ D2 + Drcose~~+42 } 4,

| above the first, we get for

Expanding and neglecting powers of D

the potential

ee (4).

Hence the potential at P (¢, 7, ¢) of an infinitely small magnct Potential Adv at (x, y, 2), having its axis parallel to the axis of a, is of finite A (é-2)/D%, and similarly for the other two. We therefore obtain magnet. for the potential of the whole magnet

Va ff { Me-2) + Bln) + 06-2) pe

1 1 1

M0) AD {ff {ad tug +7, | yee |

Taking the second of these expressions and integrating by parts in the usual way, we get

v=f/ 5083+ /f/fav ; |

o=lA+mB+nC=Icos6 | . d\ dB dC

= (Gel am)

1, m, being the direction cosines of the outward normal to any cle-

ment dS of the surface of the magnet, and @ the angle between thc

normal and the direction of magnetization at dS.

Hence the action of any magnet may be represented by Poisson's means of a certain volume distribution (p) and a certain "istibe surface distribution (co) of free magnetism. This important ~~ proposition is due to Poisson.}

The fact, in itself obvious, that the sum of all the magnetism of Poisson's distribution must be zero, gives the theorem

dA dB, dC Wik (oe =)av -/fiis +mB+n0)dS -/fi cosédS

which admits of course of direct analytical proof.

The magnet may also be replaced, so far as its external action is concerned, by a distribution wholly on its surface, as was shown by Gauss.? This will be seen at once if we replace the positive and negative magnetism throughout the body by positive and negative electricity, and suppose the surface of the magnet covered with a conducting layer in connexion with the earth. The surface will thus become charged with a distribution of positive and negative electricity whose total sum is zero, such that the potential of the surface is zero, and hence the potential at every external point zero. The potential of this surface layer

1 Mém. de U Institut, tom, v., 1821. 2 Intensitas Vis, § 2 (1832), and Allgemeine Lehrsiitze, § 36 (1889).

(5).

(6),

where

(7);

Gaussian distribu- tion.

RS

Case of solenoid-

al mag- dA dB aC_ (8); there is complete continuity of the magnetic induction. ea dx dy | dz * | When the magnetization at the surface is tangential, there “when this condition is satisfied at every point of the body, is, on the other hand, complete continuity of the magnetic A is said to be ‘“‘solenoidally” magnetized ; a particular force. case is that of uniform magnetization. It follows from the above that the surface integral of Surface Result: So long as the point considered is external to the magnet the ‘magnetic induction taken over any closed surface S pile Ae ant force there is no difficulty in attaching a definite meaning to the vanishes. eens inside a pesyltant magnetic force (%) at a point; its components |. First, let the surface be wholly within or wholly without con- guction | magnet- : b tinuously magnetized matter. We have, integrating all over S and ;, pero, ized meek. OF all over the space cnclosed by S, the analytical theorem ee av dV dV P y y body. a= 3 a ay’ eee (9); Vi b-+ne)dS AE ab = \d (14) is a+- mbd+nej\ds = —+—+—]dv. . and the values obtained will be the same whether V be oe tee Ne calculated by means of Poisson’s or of Gauss’s distribution. iy the site od Say Sra Lae Suan : . . F vanishes. Next, suppose S to be partly within and partly withou fe ald a sal a ee ae a ante ont Divide it into two parts by a > peor not altiicult to understand, when one of whose walls runs outside the surface of the body and our fundamental assumptions. It is therefore necessary | infinitely near it, the other inside and infinitely near it; then, on to be careful to define what we mean by resultant magnetic account of the normal continuity of %, the surface integral will force in the interior of a magnet. It is dofined by the | pre Me. t.e whole of S diflors infinitely Hitte from tho sum of above equation (9) on the understanding that V is caleu- the integrals over the two surfaces into which it is broken up by lated from Poissou’s distribution. We can show that 4) | the double partition, each of which vanishes by the former case. : : : MA thus defined is the resultant force in an infinitely small | Hence the theorem holds in this case also. cylindrical cavity within the magnet, whose axis is

parallel | © We may therefore apply to lines and tubes of magnetic to the line of magnetization, and whose radius @ is infinitely | induction without restriction all the theorems proved for small compared with its axis 20. lines and tubes of electric force in space free from electrified The removal of the matter filling such a cavity will affect | bodies. We may speak of the number of lines of magnetic Poisson’s volume distribution to an infinitely small extent ; the | induction instead of the surface integral if we choose. And alteration of the force if any, will therefore arise simply from the 1 phe i caitel : surface distribution which we niust place on the walls of the cavity | W “Wave vis Important theorem :~~— in order to make up the complete representation of the action of the The number of lines of magnetic induction that pass through magnet inthe cavity. This distribution reduces to two circular disks | an unclosed surface depends merely on its boundary. oe eZ 2 oe bel alee aes ¢ Le mgt ole on There must therefore be a vector A, whose line integral Vector ee ee eee ee eee eee nee S| round the boundary is equal to the surface integral of BP force 41(1—b/a? +22) in the direction of magnetization. If abe t] f ” tial. infinitely small compared with 6, this foree becomes zero, which over the surlace. : proves onr proposition. we components F, G, H of & are connected with those of 8 by Mag~~ If, on the other hand, the cavity in the magnet be disk- | *° tions piste. ae aa a — netic in- shaped—say a narrow crevasse perpendicular to the line of FF eee en? Ka (15), duction. maonetization—then the force due to the distribution on its soar gual of walls becomes 4zI, and the resultant force in the cavity | has been shown in the article ELECTRICITY, vol. viii. p. 69. : longer %. b f % | t Mutual potential energy and mutual action of two magnetic Mutual Eee ees 4», ut a Lorce 8, whose components are systems. —The potential energy of a small magnet is x(V.-V,), potential a=at4rA, b=B+40cB, c=yt+4nC (10). | where V, and V,are the values of V at its negative and Lge poles. ieyeed Qj és aes sis 99 ‘ If the magnet be infinitely small, of length ds say, the direction of two sue ya ae ie a Ate cae — eat ee a 2). cosines of ds being A,u,”, this may be written xdsdV/ds, t.e., mdV/ds, magnets. d de “ itis 2 or, if we are considering a magnetized element of volume dv, & it a ee O_o (11). iV, aV, av ” l dz pa ao = : 16). agente mad (a Te thay + Ge ao (16) an i ae – =4np pig ka Lear rea g the whole magnetic system in a field ° whose potential is given by V is

(12).

dA aB dC adv dV dV =~ (Ft ae W= A—+B-—+C—]dv dx dy = THA (dx dy dz Con- At the surface of a magnetized body the tangential com- (7), pa ponent of % is continuous, but the normal component = frat BB+Oy)dv discon D°TPASES abruptly by 4Icos6 in passing from the inside the integration being extended all over the magnetized masses sup- tinuity to the outside of the surface. : posed to be acted upon. Integrating by parts, we get at once of $and Outside magnetized matter the magnetic force and the

WAGH a TIS ™m

at every point external to the body is therefore equal and opposite to that of the internal electricity. If, therefore, we change the sign of the surface density at every point, we obtain a surface distribution whose potential at every external point is the same as that of the body. There is of course only one such distribution: we may call it Gauss's distribution.

Poisson's distribution will coincide with that of Gauss provided the magnetization be such that

magnetic induction are coincident. Inside we have da db de da dp ad dA dB dadC_ tpt eget ett (Se +BrG)\=0. (18). Hence the magnetic induction satisfies the solenoidal con- dition both inside and outside magnetized matter. It has normal continuity, and, in general, tangential discontinuity, at the surface of a magnetized body.

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For if », 7 and n, t be the normal and tangential components of H and ¥ just inside, and »', 7' and 7', ¢' the corresponding components just outside the surface near any point, we have n=v+ 4a1cos@, and w=y'; but Y=r+4nIcosé, therefore n='. On the other hand 7'=t', whereas 7 is the resultant of ¢ and 4rIsin 6, which is parallel to the surface, but otherwise may have any direction according to circumstances ; hence, since ¢t/=¢, in general 7' is not cqual to 7.

In fact there will be tangential discontinuity of the

magnetic induction unless the line of magnetization be perpendicular to the surface of the magnet; in this case

W=//VodS +f//fVoedv . (18),

o and p being the surface aud volume densities of Poisson’s distri- bution, a result that might have been expected. W may also be expressed as a sextuple integral ; for, if I’, a’, w’, x’, 2’, y’, 2 refer to the acting system, then

d v=/H/ r(vo + a 2 Vay yada!

Foree and couple ona magnet in given tield.

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Whence marian (2 ¢J@ gz z=) WLffffrmmeariti rast ay *re)) a = ye. a 1 «(n’a May” a) D

A remarkable expression for W may be obtained by supposing the integration in (17) extended throughout the whole of space, on the understanding that A, B, C are zero where there is no magnetized matter, and then integrating by parts. We get, since the surface integral at infinity may be shown to vanish,

i a ar:

‘a 7d dB aC Meee)

=<

where it must be understood that A, B, C vary continuously, how-

ever rapidly. In point of fact, where, as at the surface of a

magnetized body, there is discontinuity, a finite portion of the

integral will arise from an infinitely thin stratum near the surface.

The proper representation of this part will be a surface integral, as

may be seen by referring to (18), from which we might have started. If now V’ be the potential of the magnet acted upon, then

(20),

CY’ BV’ Py’ dA dB dC. a apt tas —**(Seta + ae) >

whence

foo} 1 av’ av’ av’ W= – in Yat ay aE) q —o ic.2) 1 dV dv’ dV av’ av av’ “ Ms de ‘ dy dy da di ao

ive) = +e RR’ cosé dv }

4 ~&

where R and R’ are the resultant forces at any point of space due to the acting and acted-upon systems respectively, and @ the angle between their directions.

In practice W is expressed as a function of the variables (equal in number to the degrees of freedom) that determine the relative position of the two systems; differentiation with respect to any one of these then gives the generalized force component tending to decrease that variable.

We may also calculate the forces directly. For, the components of force on the element dv, being the differences of the forces acting on the two poles of the clement, are

da da da (agt+ af oA of? \a, &e, 3 and the components of couple, in calculating which the field may be supposed uniform, are (sec above, p. 228) (vB – BC)dv, &e.

Hence, integrating, we get, with the chosen origin, for the com- ponents of the whole force and couple,

da da da

and similarly for 3J and 2.

(21),

(22)

sr dy ay dy s-//f’) »B- pC + y(ag?+ BEY +097) a dB 378 | (dB

and similarly for 3 and 3.

In the important case of a uniform field whose components are a, B, y, we have

W=- K(la+mB+ny) (28),

K being the moment of the magnet, and J, um, n the direction cosines

ofits axis. From this formula the results given above (p. 227) can be deduced with great case. . (P) ean

Examples.—Some examples of the application of the foregoing theory are here given, partly on account of their intrinsic value as types enabling us to conceive the differ-

ent varieties of magnetic action, partly for the sake of the light they throw on the theory itself. The reader who

1 See Thomson, Reprint of Papers on Electricity and Magnetism, p. 433,

desires more such should consult Maxwell’s Hlectricity and Magnetism, or Mascart and Joubert, Lecons sur V Electricité et le Magnétisme.

Solenotdal Magnets have already been defined as-such that the Sole-

vector I satisfies the solenoidal condition noidal dA dB dC _ 0 magneti- ae + dy oi a. zation.

The lines of magnetization, therefore, have all the properties of lines of magnetic mduction or electric force. In particular, if we consider a portion of the magnet enclosed by a tube of the lines of magnetization, the product of the intensity of magnetization by the section at each point is the same. Such a portion of magnetized matter taken by itself is called a ‘‘ magnetic solenoid,” and the pro- duct mentioned is called its ‘‘strength.” It is clear (from the general definition, or it may be proved directly from the secondary property just mentioned) that the action of the solenoid may be represented by the distribution of a certain quantity wl of positive magnetism on the one end and an equal quantity of negative magnetism on the other, I being the intensity of magnetization, w the normal sec- tion at the end. The action therefore depends merely on the strength of the solenoid and on the position of its ends. The shape

Ss

Fig. 21.

of the intervening portion is immaterial. If we suppose it straight, Equipo- and if the section be infinitely small so that the magnetisin at the tential ends may be regarded as condensed at two pants, we have an ideal Jines and magnet of finite length. The equipotential lines of such a magnet lines of in any plane throngh its axis are of course given by the equation

1

1

—— 7 = CONst, eR

foree.

(24),

where 7 and.7” are the distances of any point P on the line from the poles.

The equation to the lines of force is easily obtained ;2 for, if NP Ideal and SP (fig. 21) make angles 6 and 6’ with the axis of the magnet, bar and and

¢’ with the line of force, we must have magnet.

sin ¢/7? — sing’/r?=0; hence, since sin¢=rd6/ds, sing’=r’dé’/ds, we get do/r —dé’/r’=0; i.¢., sindd@—sin de’ =0; which gives for the equation to a line of force cos –cosé’=const. . (25).

We may imagine a magnet of this kind so long that the action Two of one of its poles may be altogether neglected at points which are like at a finite distance from the other. We thus effectively realize what poles. never occurs in nature, viz., a magnet with one pole only. If we place the like poles of two such magnets near each other, we get a field the equipotential lines and lines of force in any axial plane of which are given by the equations

1

1

—+—= const. 26). PT ad (26) cos@+ cosé’=const. (27).

The lines of force given by equations (25) and (27) may be traced in a diagram by means of the following simple and elegant construc- tion.? Draw two circles A and B, having equal radii and N and § respectively for centres; produce the line NS both ways, and, starting from the centre, divide it into any number of equal parts ; through these draw perpendiculars to meet the circles A and B;

? The first mathematical investigations of the equation to the lines of foree of an ideal magnet appear to have been made by Playfair at the request of Robison, and by Leslie, Geom. Analysis, 1821, They had previously been very earefully eonsidered from an experimental point of view by Lambert, Afém. de (Acad, de Berlin, 1766,

3 Roget, Jour. Roy. Inst., 1831,

MAGNE TLUSM

from N draw a series of lines to the points of division on B, and from § a similar series to the points of division on A. These lines will form a network

of lozenges the loci of the vertices of which will be lines of force, corresponding to (25) or (27) according as we

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mind of the reader acquainted with the analysis employed in hydro-kinetieal problems the close analogy that subsists between the two methods. In fact, by proper arrangement, every problem in the one subject can be converted into a problem in the other. For details we refer the reader to Thomson, who was, so far as we know, the first to work out this matter fully ; in the present connexion he should consult more particularly §§ 573 sq. of the Reprint.

22.

Fig.

pass from point to point along one set of lozenge diagonals or he the other. Fig, 22 will give the reader an idea of the genera appearance of the two sets of lines. the actual cases by referring to figs. 4 and 5,

Fig. 28. Uniformly Magnetized Bodies constitute in practice the most im-Potential

He may compare the ideal with p. 222.

Infin- In the case of an infinitely small magnet, the equipotential lines are | portant case of solenoidal magnets. In the first place it is obvious of uni-itely of course given by the polar equation 7°=c? cos6, c being a variable | that the whole magnetic moment of sucha body is simply its volume formly small parameter. It is easily shown that the lines of force, which are | multiplied by the intensity of magnetization, and that the axis of magnet-magnet. necessarily orthogonal to these, have for their eae r=c sin*@.1 | the whole is parallel to the axis of each of its infinitely small parts. ized

If @ be the angle between 7 and the tangent of the line of force, we have tanp=rd6/dr=} tané; hence the following construction for the direction of the line of force at P due to asmall magnet at O:— let K be the point of

trisection of OP nearest O, and let KT, per- pendicular to OP, cut the axis of the magnet in T; then TP is the tangent to the line of force at P. This construction in a slightly different form was given by Hansteen? and by Gauss*; the latter adds that the resultant force at P is given by M.PT/OT.OP* where M is the magnetic moment of the magnet, a proposition which the reader will easily verify. These propositions are of considerable use in rough magnetic calculations. As this is an important case we give a diagram of the equipotential lines and lines of force in fig. 23.

We may, if we choose, consider a filament of matter magnetized longitudinally at every point, but so that the strength wl (=J, say) is variable. Such a filament is called a complex solenoid. It may clearly be supposed made up of a bundle of simple solenoids whosc

The method usually applied to calculate the potential in this case bodies.

may be presented in two ways. ing to Poisson’s method in this case merely from a surface distribution of vary- ing density Icos@. We may replace this by a layer of uniform density p and vary- ing normal thickness. Let the thickness at any point measured parallel to the magnetic axis be ¢; then the normal thickuess is tcos@; hence ptcos@= Icos@, and pt=I; i.¢., ¢ is constant. We may there- fore suppose the magnet

The potential is ealculated accord-

ends are not all coincident with the ends of the filament. If ds be | replaced by itself (fig. 24) an element of such a filament, the potential is given by with a uniform volume 1 distribution p of positive a(3;) % Jj 1 ga magnetism, and itself dis-

v=/ass = ey (28). | placed through a distance ¢ in a direction opposite to that of

ds D, Dz D ds magnetization with a uniform volume distribution -—p; or, which

That is, its action may be represented by two particles of magnetism J, and J, at its two ends, and by a coutinuous distribu- tion of free magnetism along its length whose density is —dJ/ds. This is of course merely a particular case of Poisson's distribution. When a body is solenoidally magnetized, the magnetic force

H both external and internal depends solely on the surface distri- |

bution, 4.¢., merely on the ends of the solenoids of which the body 1s composed. We may therefore suppose the two ends of any solenoid joined by a solenoid of equal strength lying in the surface of the body. Proceeding thus, we may in an infinite number of ways construct a surface layer of tangentially magnetized matter which will represent the magnetic action of a solenoidally magnetized body. Thomson has shown by means of a highly interesting piece of analysis how to find the components of this tangential magnetization. See Reprint of Papers on Electricity and Magnetism, p. 401.

The magnetic theorems just stated will suggest at once to the

1 Hansteen, Magnetismus der Erde, p. 208 (1819). 2 Magnetismus der Erde, p. 209. 3 Resultate d. Mag. Vereins, 1837 and 1840.

comes to the same thing, the potential of the magnet at P is (U —U'), where U is the potential at P of a uniform volume distri- bation of density +1 throughout the magnet, and U' the potential of the same at a point P' displaced through a distance ¢ in the direction of magnetization. If 7, m, 2 be the direction cosines of the magnetic axis, this gives at once dU dU

dU = -o(Get 4 Fidel az")

= dU au aU = (Ge tm oo +n) f

=AX+BY+CZ }

where X,Y,Z are the components of the resultant force due to volume distribution p= +1 throughout the body, and A,B,C the components of the magnetization.

The same result may also be arrived at thus. The part of the potential due to the element dv is Idv cos 6/r®, but this is the com- ponent parallel to the direction of I of the resultant force at P of a velume distribution whose density in dv is 1; hence, since the

(29);

direction of I is everywhere the same, the whole potential is the

from a function (x, y, 2), which is sometimes called the ‘potential Lamellar

component parallel to the magnetic axis of the body of the resultant of magnetization,” * so that magneti- foree at P of a volume distribution p=I throughout its whole d d d zation, extent. his gives at ouce the expression of (29) for V. j a=

il ; (81); which is the analytical expression of the property in question. We Magnetic whenee it appears that the magnetic force inside the sphere is con- | may therefore suppose a lamellar magnet divided up by these sur- shells. stant in magnitude and in direction, being opposite to the uniform | faces of magnetization into an infinite number of infinitely thin magnetization, and equal to — al. _ , | normally magnetized shells or lamelle. It can be shown that the

Ellipsoid. The potential of a uniformly magnetized ellipsoid may be simi- | product of the intensity of magnetization by the thickness at each

larly treated. Let the origin be at the centre, and the axes along the principal diameters of the ellipsoid, whose lengths are 2a, 2, 2c, and let 72, m, 2 be the direction cosines of its magnetic axis. Consider first an external point. Then,} if

dp

point of any such shell is the same ; for, if ¢(a, y, z)=c and $(, y, 2) =e-+6e be the equations to the two surfaces bounding the shell, dy the normal distance between them at any point, we have

dbs, 154 ans, – ee ay a ic,

Oo L=2nabof a a Se dl a V (a? + 9) (0? + (e+ $) henee QU aa F oe 2 @ where a is the positive _ of (3 tat ate = y= a0 , x U & -+5°—+ =1 ¢.e., 15v=8e=constant for the same shell, which was to be proved. m eee ese ere * This product is called the strength of the shell, ‘ we have Xele, YeMy, Z —-Ne A shell, which is everywhere normally magnetized, but whose 4 ee ye RE 9 OT See strength is not constant, is called a ‘‘ complex shell ” ; a magnet made a V=ALx+BMy-+ONz (33), | UP of such shells is called a ‘‘complex lamellar magnet.” The con- x }

where it must be remembered that L, M, N are functions of x, y, 2, inasmuch as « is so.

If (x, y, 2) be an internal point, X, Y, Z are the components of the force due to a similar and similarly situated ellipsoid through

dition to be satisfied by A, B, C in this ease is simply that the lines of magnetization must be orthogonal to a family of surfaces, i.¢., Adz + Bdy+Cdz must be convertible into a perfect differential by multiplication by a factor ; otherwise that

C dB dC dC dA dA dB (x, y, 2). Let its axes be pa, pb, pe; we now have A(2-S) +3(Z-S re o(F-a)-° i , X=Lx, Y=My, Z=Nz, The potential at P of a simple magnetic shell of strength 7 is Nasties pas de given by the formula L=27pa, tpef rate es ; ; DTD, N Pa + oP @U + OPO 9) of “ff a icaaieaae (88),

or, writing ¢=p*y,

where w is the solid angle subtended at the point P.? There is a

=! dy – Ta & 9 convention here as to sign, viz., that side of the shell is positive

- anal (+p (P+y)(+y)’ alas age Slab wal 6c towards which the lines of magnetization pass, and the aolf anglo

: subtended at points infinitely near that side is positive, while that

We thus obtain for V, subtended at points infinitely near the other side is negative. If V=ALa+BMy+CNz, (85), | we cause P to move from the positive side away to infinity, then

where L, M, N are now constants, which remain the same so long as the ratios of the axes remain unaltered. The components of the force inside the ellipsoid are a=-AL, B=-BM, y=-CN (36), The force is therefore uniform ; but its direction does not coincide with that of the magnetization, unless the latter be parallel to one of the principal diameters, and then the force is opposite in direc- tion to the magnetization. It will be observed that the force inside similar ellipsoids similarly magnetized to the same intensity is always the same. For an oblate ellipsoid of revolution, in which b=c=a/V 1-¢,

— g2 ae ay pate(5 -ME; “sin-¥e), M=N=2r (4 £ sin <1y) = :) e € c

ce? For a very flat oblate ellipsoid of revolution L=4r, M=N=7’a/c. For a prolate or ovary ellipsoid of revolution, in which

a=b=eV 1-2,

. 1 1-2 ieee b= M=2e(—3 = “oa log oh

1 i l+e Nada(y-1) (= log i471) .

From the formule for an ellipsoid we could easily deduee those for an infinitely long elliptic or circular cylinder ; we have merely to make one of the axes infinite. We find in this way, for instance, that the force inside a circular cylinder of infinite length magnetized transversely is — 27rl.

The reader will find it interesting to exaniine the values of the magnetic induction in the foregoing cases, and to verify its normal continuity at the surface of the magnet.

Lamellar Magnets form another very important class. In them the components of magnetization are derivable by differentiation

1 See Thomson and Tait, Natural Philosophy, vol. i. $522,

back from infinity to the negative side, or to move anyhow from infinitely near the positive side to a point infinitely near the nega- tive side without cutting through the shell, it will decrease con- tinuously by 4×7; if we pass through the shell from a point infinitely near on the negative side to a point infinitely near on the positive side, there will be a sudden increase of 4m7; tangentially to the shell there is continuity. The potential of a closed shell is evidently zero for any external point, +47 for an internal point according as the positive or negative side is innermost. It appears also that the potential of a simple magnetic shell depends merely on its strength and on its boundary, just as that of a magnetic

solenoid depends merely on its strength and the position of its ends,

A lamellar magnet will in general be made up partly of closed Potential shells, and partly of shells whose boundaries lie on the surface ; of lamel- only the latter of course cau influence the potential at external lar mag- The general expression for the potential at any point net.

points.

P(E, Ub) 9) is

1 1 I vl ts 2g Dae)

1 1 1

x cos é@ , -// bD aS + 4a

where @ is the angle between D and the outward normal to dS, and o’ the value of ¢ at the point é, 7, ¢ (zero of course if &, n, ¢ be outside the magnet). The value of V thus found is not discontinuous at the surface as might be supposed, for both the surface integral and

‘2 To be distinguished of course from the magnetic potential. 3 Gauss, Allgemeine Theorie des Erdmagnetismus, § 38,

MAGNETISM

4rg’ have discontinuities there, and they are equal in amount and

of opposite sign. For an external point the potential is

cos 6

The immediate interpretation of this is that the potential is the

same as that due to a normally magnetized layer on the surface of

the body whose strength at dS is @; in other words, gua external action, every lamellar magnet may be replaced by a complex shell on its surface,

There is, however, another way of looking at the result. Sinee A, B, C are derivable from a potential @, the difference between the values of pat any two points is simply the value of the line integral | (Adx+Bdy-+Cdz) along any path between those points. Hence if the tangential component of magnetization be given in direction and magnitude all over any surface, the value of , a constant pres, is given all over that surface. We conclude therefore that, if a body be lamellarly magnetized, and we know the tangential component of its magnetization all over its surface, its external action is deter- mined ;1 for a constant ¢ added to » will simply add to the surface

integral coséds eff py?

wlrich, being ¢ times the whole solid angle subtended by the surface at any external point, vanishes. For another very interesting proof of this result, see Thomson, Reprint, p. 398 sq.

Vector The vector potential of a lamellar magnet may be expressed by

poten- means of the formule

tial of (1

Z lamellar dp d zs) dp a(ss)) magaet. ie = -z ay)

1 1

-/f io) (D) is! ff dv ae oa)

= Sffs(wt ~ not Nas ;G=&e; H=&c,

These formule furnish an immediate proof of the theorems of Thomson above stated.

Poten- By means of the last of them, it has been shown in tho article tial Exxcrriciry * that the vector potential of a simple magnetic shell energy of can, as might be expected, be expressed by means of a line integral magnetic taken round its boundary ; in the same place it has also been shown shell, &c. that the potential energy of such a shell in a magnetic field reduces toa similar line integral ; and that the mutual potential energy of two such shells reduces to a double line integral taken round their boundaries.

An important approximate expression for the potential of a magnet at a point P, whose distance r from some chosen point in expres- the magnet is great compared with the greatest lincar dimension of sion for the magnet, may be obtained as follows. Let the coordinates of P magnetic with respect to the chosen point and any axes through it be &, n, ¢; poten- and let the coordinates of any point in the body referred to the same

tial, ” axes be x, y, z Also let D= { (E-x)P??(¢- 2)? ye and

let r= (242+ 0)8, s= (x2 + 42 + 22)3, t=tu+ny+@. Then the potential U at (x, y, z) of a unit pole placed at (¢, 7, ¢) is given by

(40).

Approxi- mate

1 1 ¢ | 8¢2—752 548 — 8t9%52 ———————— a — $$ ee : D fr 2 7 + or ort 7a.

by a well-known theorem, where U,, Uy, Us, &c., are spherical harmonics of degrees 1, 2, 8, &c., in x, y, z, and —2, -3, -4, &e, in 7, ¢ Now, by the theorem of mutual potential energy, the potential V of the magnet at (é, 7, ¢) is the potential energy of the magnet in the field due to a unit pole at (é, n, ¢); hence by (17)

a 260 .4U Deg ze)” | . =V,V. V3t+ &e.

where V, arises from U,, V, from U,, and soon. Vj, Va; V3, &c., will be spherical harmonics in tn, ¢ of the most general kind, involving essentially 3, 5, 7,... 2¢+1 constants respectively, their degrees being —2, —38,... —d respectively. These con- stants will, however, depend in each case on a larger number of integrals taken throughout the magnetized body, thus the constants In V; will depend upon 3(¢+1)(¢+ 2) integrals. There is no diffi-

(41),

1 Sir W. Thomson, Reprint of Papers on Electricity and Magnetism, p. 592.

2 Vol. viii. p. 69,

® This fact is a further proof, if that were wanted, that the magnetization of a body eannot be determined from its external aetion.

culty in writing down these terms except the length of the formule. Putting

ff Adv=Ki, Sf Bdv=Km, fffCdv=Kn L=/ffAadv, M=/ffBydv, een . (42),

P=///(Bz+Cy)dv, Q=&., R=&e. J we get Vm KS trig tng | GL M NDE te + 8Pat te. | ig (43).

It may be shown ‘ that, in the most general case, if we take the axis of x parallel to the magnetic axis, and the origin at the point

{(2L-M-N)/2K, R/K, Q/K },8 and turn the axes about an angle tan-!P/(M-—N), the above

reduces to a 2 72 Fae pO) de,

7 7

(44),

An interesting particular case is that in which the magnet is symmetrical with respect to the three coordinate planes. If we take its axis to be in the axis of x, then, since all the integrals

L, M, N, P, Q, R vanish, V, disappears, of the next set only

AHf[fAwdv, Ay=fffAy*dv, As=fff Adv . (45)

remain, and we get ye Re , 8EA(289— Bn? – 36%) + Ag(4n?— – 2) + Ag(4C2-2- a)}E

7

2r7

(46).

The potential to the same degree of approximation of a positive and negative pole of strength wu, placed on the magnetic axis at distances +L and —L from the origin (centre of symmetry), is

1 2MLE | QL FEE — 8? – 3¢?) i at Q7

If we attempt now to find » and L, so that the two magnetic Ideal systems may be equivalent, we find different values for L for represen- different positions of the external point. If, however, the magnet tative be symmetrical about its axis, so that A,=A3, then the expression magnet. for V reduces to

KE, 8(Ay—As)E (28? 31? — 3¢2) vane ea Ae (47),

we then get 2uL=K, and 2uL3 = 8(A,— A,), whence L? =8(A, — A,)/K. In other words, in the case of a magnet which is symmetrical about its axis and also about an equatorial plane, we can represent the external action by means of a fixed ideal magnet, provided higher powers of the ratio of the greatest linear dimension of the magnet to the distance of the point considered than the fourth can be neglected. It is to be observed, however, that if A,C a) = Zn)

we have

where ty = 2} (a —2)8, + (y’—y)Bq+ (e-2)8 t “2,

or W=W,+ W,+ Wt ° (48), where W,, W., Ws, are spherical harmonics in , , ¢ of degrees ~2, -3, -—4, &. lf we neglect all the terms except those of the first order, which amounts to supposing M and M’ infinitely small, we get

W= -KK’ jWsP+... If 0), 6, be the angles between the axes of M and M’ and the line

b,53 ... cs r

4 See Sir W. Thomson, Reprint, p. 368.

5 This point is sometimes ealled the centre of the magnet, and the new axes of Y and Z its seeondary axes. It should be observed, however, that this ‘“ centre” is not neeessarily the middle point of the line joining the mass centres of the positive and negative magnetism. On this subjeet see a paper by Beltrami, “Sul Potenziale Magnetico,” Ann. d. Afatem., 1882.

6 Cf. Rieeke in Pogg. Ann., p. 149, 1873; an Wied, Ann., p. 8, 1879,

from the centre of M to the centre of M’, and 64, the angle between the axes, this reduces to KK’ W=

Action between

From this formula we can derive at once by differentiation the force of translation and the couple about the centre of M’, which two in- represent the action of M upon it. An elegant synthesis of this finitely action has been given for the most general case by Tait.? It will small _ be sufficient to confine ourselves here to the case where the magnetic magnets. axes are in one plane. In this case 0,,.=0,~ 6, and W becomes KK’ (sin 6,sin 0, — 2cos @,cos6,)/2%. Denoting by X, Y, L the forces

>» of translation parallel to MM’ and perpendicular to MM’ (so as to decrease 6,) and the couple tending to decrease @,, we have dW 3KX’

Km om me = (sin 4, sin 6, — 2.cos 6, cos 62)

*dw dW 3KX’.. do, * rd, A sin(6, + 6.) (50). dW KK’*

L

“a (sin 6, cos 6, + 2.c0s6, sin 9)

One most important conclusion follows at once from these for- mule, viz., that the translatory forces vary inversely as the fourth

ower of the distance, whereas the directive couple varies only inversely as the third power. Hence the couple may be quite sen- sible at distances for which the force of translation is inappreciably small. These conclusions apply of course equally to any pair of magnetized bodies, provided the distance between them be suffi- ciently great as compared with their linear dimensions. This, 5 ao to the case of the carth, at once explains the phenomena that puzzled Norman and the earlier magnetic philosophers so greatly.

Force of transla- tion « (dist) ~ Couple (dist) -%.*

The following particular cases are important (fig. 25) :— (A) 9,=0,-0, X=-S8E, vo, Loo, 3 KK’

(B) = h=7-, X=—~, Y=0, L=o.

==, X=0, yak

(C) 6,=0,

2KK’

’ rs

» Le

“ag

(D). sat ya0, Kod, Wes

2 rt

*Deflect- | The last two cases are especially important : the position of the ing deflecting magnet in © is deseribed as *‘ eud on” (erster Hauptlage), magnet in (D) as “ broadside on” (zweiter Hauptlage) ; it will be noticed ‘fend that the couple in the former case is double that in the latter.*

*on” and t ** broad- fy side on.” H , n } n n { n! f s’ S | ‘ i 8 5 | | i] H H Al | | H nl | | | \ 4 a See | ie Sl ‘ea re \ ‘ H H sf $ n H s V H H H H at Fig, 25. Closer*

; If the terms of the second and third order be taken into account, approxl- and the magnet 2’s’ be deflected. through an angle @ from its mation original position by a deflecting magnet (I.) originally end on and

for de- (IL) originally broadside on, we get for the couples flecting OKK T. T couple I. cos@ ete ces 3 5 te A end on ? ceed (51) and ’ , , ’ troad- Il. cos A +o ge eo | J side on, ia*

Quart. Jour. Math., 1860 ; and Quaternions, § 414.

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where T, and T’, are odd functions of the relative position of M and M’, but T, and T’, are even. In the case where M and M’ are symmetrical about three orthogonal planes, O and O’ being tho centres of symmetry, T, and T’, vanish, and the writer has obtained for the values of T, and T’,

T, =-6{K(3A’,— 4A’, +A’;) — K’(2A, – Ay Ag)}

52),

T.=- ${ K(12.A, ~~114’,~~ A’3) – K’(8.A,—4Ag+ As) } = where A,, A,, &c., have the meanings above assigned in (45).?

Sphere Magnetized in any Manner.—This is the most Gauss's interesting of all the cases that fall under the present theory of section, both from its being amenable to mathematical hm 4 treatment and on account of its historical interest. It was petism, " first discussed in the beautiful memoir, entitled Allgemeine Theorie des Erdmagnetismus,? in which Gauss laid the foundation of the rational theory of terrestrial magnetism.

The following is a brief account of the theory, which has not been greatly added to since he left it.

Let X, Y, Z be the components of the earth's resultant magnetic force at any point on its surface, in the directions of geographical north, geographical west, and vertically upwards respectively. The force is completely known when these are given, since it depends on three elements only. If H, 8, « have the meanings formerly assigned (p. 220, 221, 227), we have of course

H=VX2?Y¥?2, tand3=Y/X, tani=Z/VX? Y?.

Again, if V be the magnetic potential of the earth, ithe latitude, and \ the longitude of any point on its surface, then, supposing the earth to be a sphere of radius a, we have " oa ld d Secon Gx? ae" (58), r denoting the distance of any point from the centre of the earth. When V is known, therefore, the force is com- pletely determined.

If now we suppose all the magnetized matter (or its equivalent—say, electric currents) to be within the earth, it follows, from the theory of spherical harmonics, that we can write down a convergent series for its potential at all external points, when the potential at every point of its surface is given. In fact, if the expansion of this surface potential in terms of surface harmonics be*

S,+8,% ... PBF 2g

we have for all external points

g.(4 i] + (=) ED bed

2 3

v-s(+) +8,(4) reek

The number of terms of this series that must be retained

in order to obtain a sufficiently accurate representation of

the phenomena will of course depend on circumstances,

and can only be ascertained by trial. §,,S,,... S¢ are functions of known form, containing respectively 3, 5,...

2i+1 constants; hence, if terms beyond the 2” order may

be neglected, the expression for V will contain 27+ 20 arbitrary constants. These must be determined by obser- vation, and then the magnetic action at all points on the surface or outside the earth is known irrespective of the internal distribution of the magnetic causes.

If we look at the matter from the general point of view Data that V is determined when its surface value is known, we ee have the following propositions. ihe Avy

I. V is determined when the vertical force is known at earth’s

every point of the earth’s surface. magnetic

For, let the sarface value of Z be expanded in a series of action. surface harmonics of which the 7» is Z;; then, equating this to the ¢ harmonic in the surface value of Z= —dV/dr derived from (54), we have (i+1)S;=aZ;, which determines 8;. Thus the proposition is proved.*

2 Of. Riecke, dc. 3 Res. d. Mag. Vereins, 1838. 4 See Thomson and Tait, vol. i. chap. 1, App. A and B. 5 The term S, of course vanishes, since the sum of the positive and

(54).°

negative magnetism within the earth is zero.

II. The surface value of V, and hence its general value for external points, is determined if the northward com- ponent of the magnetic force be known at every point of the earth's surface.

This follows at once from the fact that the difference of the values of V at any two places is the line integral of the magnetic force

along any line joining them ; thus, if Vy be the value of V at the geographical north pole, we have

wa af K+ V,-

wT

2

But the constant V, does not affect the gencral value of V; hence the proposition is established.

III. The same conclusion follows if the westward horizontal component be known all over the earth's surface and the northward component along any one meridian.

In fact, if V be the potential at any place whose latitude is 7 and longitude A, then

*V= -af'xat~ af *¥ cosldA+ Vy, i 0*

5

the first integration being performed along the given meridian, the second along the parallel of latitude corresponding to the place. From I., IJ., and IIT. we have the remarkable con- clusion that, if the vertical component be given all over the earth, or the northward component, or the westward component and the northward along one parallel, then in . each case the other two elements are determined. Approxi- Gauss gives another interesting application of the line integral of mation magneticforce. If this

integral be taken all round any closed curve by means or polygon, the result is zero. Let us express this for any geodesic ofthe triangle ABC, at whose vertices the horizontal force has the values line in- a fare. of Hy, H,, H;. Ifthe inclinations of H to BO at B and C be a and a',

(55).

magnetic, - ‘ > s fore, 19 CA at Cand A B and #', to AB at Aand B yand , then, if "the ares BC, CA, AB be not too long, we may replace the com. ponent along BC at every point by the average of its values at B and ©, and soon. We thus get $BC (H,cosa Hgcosa')+4CA (H,cosB +H, cos 8') +4AB (H, cosy + H, cosy') =0 (56). If we suppose the values of H at B and C to be known, and the values of the declination to be known at all three places, the above, equation determines the value of H at A. Calculating in this way: from observed values at Gottingen, Milan, and Paris, Gauss found for H at Paris 0°51696, the observed value being 0°51804, External It has been supposed hitherto that the magnetic causes | and are entirely internal to the earth. The foregoing theory age enables us to test how far this assumption is correct. earth's ‘ If we suppose that there are external causes, then the potential

*magnetic 4t internal points due to these will be action. ot ry \2 " * TAT T+T(2) +. T(S)e 0,*

Ty, T;, T, .. . Ti being the different harmonics in the surface value of the part of the potential due to external causes. Suppose now the whole vertical force deduced from observation for all parts of the earth's surface, and expanded in a series of surface harmonics, the i‘ of which is Z;; then, since this is the sum of the 7t har- nionics in the parts due to internal and to, external causes, we have

—(¢+1)8;+7T;=aZ,; . (57). Further, suppose the surface value of V determined from observa-

tions of horizontal force, and let the i» harmonic in it be V;, then we have

Sra dia Ve et a (58).

From equations (57) and (58) we can determine §; and

T;, and thus settle how much is due to external and how

much to internal causes. It does not appear from observa-

tion that any sensible part of the mean value of V arises from causes external to the earth.

Gaussian We have seen already that the action of any body can be repre-

distribu- sented at external points by an ideal layer of positive and negative

tion for magnetism. Gauss finds for the surface density of the layer in

asphere. the case of a spherical body like the earth, the expression (V/a – 2Z)/4e, which may be deduced immediately from the for- inule already given.

If we draw a series of equipotential surfaces correspond-

called the "magnetic parallels."

-lines there.

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ing to small equidifferent values ot V, these will cut the Magnetic earth's surface in a series of equipotential lines, which are parallels These lines obviously ti osaians. have the following properties. The horizontal force is every-

where perpendicular to them, and is at any point inversely proportional to the distance between two consecutive So that, if these lines were drawn upon a terrestrial globe, their crowding would indicate increase of horizontal force. The lines of horizontal force, or "magnetic mneridians," the tangent at every point of which is parallel to the horizontal component, are everywhere orthogonal to the magnetic parallels, and their positive direction is from parallels of greater potential to parallels of less potential.

If, as has been tacitly assumed hitherto in accordance with the results of observation, the potential on the earth's surface have but one maximum and one minimum, then the parallels will be closed curves expanding successively from the maximum point and then closing again round the mini- inum point, and the magnetic meridians will all run between these two points. [t is clear that at each of these points the equipotential surface and the earth's surface touch ; at the minimum point the line of total resultant force will pass ¢o the earth, at the maximum point from it; at the former, therefore, the north end of a freely suspended needle will dip vertically downwards, at the latter the south end will do the same. This is the simplest possible case for a magnetized sphere. It is easy to see that, if we define a north pole} as a point on the earth's surface at which the horizontal intensity vanishes, and the dip is 90°, there might be more than one such point. Consider the series of equipotential surfaces 1, 2, 3, 4, 5, 6 in fig. 26,? each of which has two eminences with a depression

Fig. 26, between them. 'The lines a, 6, c, d, e, f are the sections

of these by the earth's surface. 1 just touches the surface

in a; and, if the potential increase in the order in which

the surfaces are numbered, a will be a north pole. The section by 2 is the single oval 6. 3 touches the surface in

c', which is clearly another north pole, and also meets the surface in a single oval c equipotential with c'. The section by 4 is the double oval d, d'. The depression on 5 False touches the surface at F, and meets it in a figure of 8, e, ¢', poles. on which F is the double point. F is therefore yet another . north pole according to our definition ; it differs, however, from an ordinary north pole in one important respect ; for

the law that the north end of the compass points from parallel of greater to parallel of less potential shows at once that near F and inside the 8-shaped parallel the south end will point to F, whereas at a neighbouring point outside the north end will point to F. Such a point is called a false north pole, and we see that the existence of

two true north poles necessitates the existence of a false north pole; and in general it may be established® that,

1 Of course pole as thus defined has nothing to do with pole in any of the former senses, ¢.g., the line joining its N and § poles is not parallel to the earth's magnetic axis,

- *Gauss, J.c., §12. Cf Mascart and Joubert, Lecons sur I' Elec- tricité et sur le Magnétisme, tom. i. § 436, 1882.*

>See Gauss, All. Theorie des Erdmagnetismus, § 12; Maxwell, vol. i, § 113, vol. ii. § 468.

however many poles of the same kind there may be, trae and false, the whole number must be odd. This of course disposes of the notion formerly held by some physicists that the earth actually had ¢wo north poles. As already indicated, Gauss concluded from his reduction of the magnetic observations at his disposal that, apart from purely local disturbances, the earth has, as a matter of fact, only one north and one south pole.

Local The effect of a deposit of magnetic ore, or other cause disturb- of the kind, might of course produce a disturbance, within ances of 4 limited area, of the equipotential lines. It may assist ee the practical magnetist to indicate the nature of this lels. disturbance in a particular case. Let us suppose that a magnet is placed some distance underground, vertical, with its north pole uppermost. Then, if its moment be sufficiently great, the equipotential lines will be as in fig. 27.1 The upper side of the figure is supposed to be magnetic north, and it is supposed that the undisturbed Fig. 27, parallels would be straight lincs running magnetic east and west, which is sufficiently near the truth in most cases, It should be observed that fig. 27 is in reality a transformation of figure 26, one of the poles being projected to infinity. The reader should notice that the double point f, due south of the point a vertically over the disturbing magnet, is a point of equilibrium at which the horizontal components of the forces of the earth and the magnet destroy each other ; it will be a false pole, south or north according as the magnet or the earth prevails, EXPERIMENTAL FouUNDATION FOR THE

LAW OF THE : INVERSE SQUARE. Difficule From what has already been laid down, it will be ties of seen that the determination of the elementary law of the | magnetic action is a very complex problem. 'The action question é 4 as to the between two magnets depends, not only on their distance elemen- apart, but also on their relative angular position. Then tary law. we have to distinguish force of translation, which varies

inversely as the fourth power of the distance, and directive couple, which varies inversely as the third power. It must also be remembered that the elementary law results in part from an hypothesis as to the nature and distribution of the cause of the magnetic action, for, until some such hypothesis is made, no clear conception is possible of what is to be understood by elementary action. Lastly, we have the disturbance which arises from magnetic induction, the consequence of which is that magnetically speaking two magnets are not the same at different distances apart. When all these circumstances are considered, it is not surprising to find considerable uncertainty and difference of opinion among the earlier magnetic philosophers, The truth is that the law as now established owes quite as 1 Gauss, lc, § 13.

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much to the development of magnetic theory as to the work of magnetic experimenters.

The question attracted the notice of Huygens and Huygens, Hooke, but Newton seems to have been one of the first Hooke,

who propounded any law on the subject. (Principia, lib. iii. prop. 6, cor. 5) that some rough experiments had led him to the conclusion that the magnetic force (vis magnetica) decreases according to the law of the inverse cube of the distance. No account of the experiments is extant, and it does not appear what he means exactly by vis magnetica. If the directive couple is meant, and the action of the entire magnet is intended, then, as we have seen, this is in agreement with modern theory. In a remarkable note in the annotated edition

He says Newton.

of the Principia by Le Sueur and Jacquier (assisted by Le Sueur Calandrini?) (1742) on the passage in question, a series and

of deflexion experiments are described, and an accurate discussion is given, from which results the law of the inverse cube for the deflecting couple.

Jacquier,

Hawksbee ? made Hawks-

experiments with a view to determine the law of magnetic bee and

action, in which a deflecting magnet was moved at various distances round a compass, and the corresponding deflex- ions noted, A few years later Brook Taylor? and the same experimenter made a series of observations in which the "'end on" method of deflexion still in use was adopted. But in neither case was any definite result arrived at. A

Taylor.

similar uncertainty appeared in the experiments of Whiston, Whiston.

who indicates the inverse 3th power of the distance as the law of decrease. extensive, also led to no final result. Hooke, in which the attraction of a vertical bar magnet upon another suspended from one arm of a delicate balance is balanced by weights attached to the otherarm. From some of his experiments he deduces as low a power as the inverse Ist, from others the 3th, and so on; but no attempt is made to analyse the phenomena. Michell, in his treatise on artificial magnets (1750), however, deduces the law of the inverse square from Musschenbroek's results. Although fHpinus does not arrive at any definite result as to the elementary law, there can be no doubt that his Z'entamen Theorie Llectricitatis et Magnetismt (1759) contributed powerfully towards the solution of the question.

Musschenbroek's experiments, which were Musschen- He used the method of reek.

Tobias Tobias

Mayer seems to have been the first to publish the law of Mayer.

the inverse square as the actual result of an experimental investigation. His paper was read before the Royal Society of Géttingen, and was referred to in the Géttinger Gelehrter Anzetger for 1760, but never fully published ; it is best known from the criticism of AZpinus, " Examen Theorie Magnetic a Tob. Mayero proposite" (Nov. Comm. Acad. Petrop., 1768).4 The most important of the

earlier contributions was undoubtedly that of Lambert.> Lambert.

He seems to have been the first to analyse the physical circumstances of the problem in a thorough manner, and to point out the various elements of disturbance to be provided for. We regret that we are unable to devote space to an exhaustive account of his memoirs,® which are most instructive reading even now. He showed that the effect of an oblique magnetic force on the needle varies as the sine of the inclination ; and, making allowances for this, he deduced the law of the inverse square from de- flexion experiments made at different distances. He also described the method of oscillations, but found difficulties in its practical application. It is upon his theoretical work, however, rather than upon his experiments, that his claim to be remembered rests. About the same time as Lambert,

® Phil. Trans., 1712. ® Phil. Drans., 1715 and. 1721.

- *Comp. Hansteen, Mag. d. Erde, p. 283, 1819.*

> Hist. d. V Acad. Roy. d. Sc. Berlin, 1766.

8 An excellent one will be found in Hansteen, Magnetismus der Erde, pp. 295 sq.

Dalla | In his classical memoir on the absolute measurement of Bella professor of natural philosophy in the university of | the earth's magnetic force, Gauss took up the question in Gauss. a Edinburgh, working at the same subject. The former used | the most general manner yet attempted. Assuming that sonIsom the method of Hooke and Musschenbroek, but discussed | the force due to an element of positive magnetism varies nore

carefully the exact nature of the resultant action. | as the inverse mth power of the distance, he showed that, His results indicated the law of the inverse square. | when the distance between the magnets is sufficiently great Robison used both the niethod of deflexion and the method | compared with the greatest linear dimensions of either of oscillation, the peculiarity in his apparatus being the (more than four times as great in his own experiments), novable magnet, which was composed of two magnetized | the deflexions ¢ and ¢' for the "end on" and "broadside spheres connected by a slender rod, and suspended either | on" positions of the deflecting magnet are given by in the field of the earth alone, or at different distances eae Sy ee pee 6, from, a large magnet. He made several imdependent tand!eLy'r-H)4 Lee) 4 eo. investigations, and seems to have arrived in each case at : ee a ; the law of the inverse square as his final result. where L,/ Li =n. He made a series of deflexion experi- Conlomb, The researches of Coulomb,? from which many date the ments, and found that his results og be represented commencement of the modern theory, present many features with sufficient accuracy by the formulz of great interest. He used the improved form of Michell's tan p =9°086870r-3— 0°0021857-5 , torsion balance, which had served him so well in his tan ' =0°0438435r-3+0°0024497-5 . electrical experiments. In order to realize as nearly as | 'The following table shows the closeness of the agreement possible the ideal case of a linear solenoid, whose action | between theory and experiment (r is measured in metres ; can be represented by positive and negative magnetism | » and 6' denote observed and #and ¢' calculated values):— concentrated at its ends, he worked with magnets made of ree eae thin steel wire magnetized longitudinally. The circum- . s 7 Pe a'-¢! stances of the experiment are thus considerably simplified, for the acting magnet may be so arranged that the action ae ai 2 of one of the poles may be neglected, or, failing that, the 45 : of ae Be action of both can be easily calculated. 1°3 $13 61-2 | +08 | 110 19°3 6:0 In one of his experiments he took a magnetized steel wire 25 1-4 1 47 28°6 + 4°5 0 55 58°9 +0°2 inehes long, and 1} lines thick, and placed it vertically in the 15 1 27 19:1 - 96 0 45 14:3 -6'6 magnetic meridian before a horizontal magnetie needle some 38 16 1m 75 - 3°38 De ie -3°2 inches long, delicately suspended by a silk fibre. The rod was

Ley 10 99 - 50 0 80 57'9 -1°2 raised and lowered at a given distanee from the needle until the 1°8 0 50 52°5 + 4:2 0 25 59°5 -38°4 attraction on the near pole of the needle, as tested by the rapidity 1:9 0 43 21°8 + 7'8 0 22 9:2 +2°6 of the vibrations, was, a maximum; it was then found that the 2°0 0 37 16:2 +10°6 019 1° +59 lower end of the bar was about 1 ineh below the needle. Again, ual 0 82 46 + 0°9 0 16 24:7 +4°9 the rod being placed horizontal and perpendicular to the magnetic 2°5 0 18 51°9 -10°2 0 9 36°1 —2°5 meridian on a level with the needle, it was displaced until the 3°0 OF leer - 11 Osorees FP =O needle returned to the magnetie meridian ; it was then found that 3°5 0 6 56°9 - 02 0 3 289 -1°0 the needle was direeted to a point about 1 inch from the end of the 4:0 0 4 35°9 - 37 0 2 22-2 +17 bar. Both these experiments thus indieate that the magnetism at ——_—_— ope og a, ve ences Ce a at a tt about an inch | We have here a double proof of the law of the inverse rom the end of the bar. It is elear that, in these experiments, ; ’ provided the rod is sufficiently long or the distance between it and square,—first, in the fact that tang and tan can be the needle not too great, the action of the distant pole may be expressed 50 accurately by two terms of a series, the first neglected, for the double reason that the pole is more distant and | of which contains r~; second, in the fact that the coefficient Bete fonoe cae a is pet ——— = the ean of the first term in tang is exactly double that in tang’. tl en it ean be elleetive, aking this assumption ouion) A ‘ fA observed the number of vibrations, when the vertical rod was absent, These research es of Gauss are remarkable, not only for the and when it was placed at various distances. great generality of the theory, but also for the novelty of The forces thence deduced were found to vary very the experimental method, and the exceeding accuracy and nearly as the inverse square of the distance. Statical ee of on b ‘Gately ae S nl experiments with the torsion balance led to a like result. ry = * Th a. OS osit – a me ae sie oe Later re- Later than Coulomb we have the experiments of Bidone,! | ‘°° = Pi at alg ee searches. Hansteen,° Steinhauser,® and Scoresby.’ By far the most view, to which we shall return presently. a important among these is Hansteen, whose methods*

MVAGYET Lee

we lave Dalla Bella! and Robison,? the well-known

were a great step towards the more complete treatment finally adopted by Gauss. He uses Taylor's "end on"

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Macnetic MEASUREMENTS, RELATIVE AND ABSOLUTE.

he mos. important magnetic determinations that have Chief _ to be made are the direction of the axis of a magnet re- magnetic

° . : measure- fon er latively to its mass, the magnetic moment of a magnet, iaiias

method of deflexion, and also the method of Hooke and Musschenbroek. The acting magnet was a bar magnet, the action of which he represents by a distribution of

positive and negative magnetism on its two halves whose density at a distance x from the centre is Az", The force at distance D due to an element dp of positive magnetism he assumes to be du/D". He finds that in all his experi- ments the value x = 2 best represents the results obtained ; but that various values of r may be adopted with almost equal advantage ; he inclines, however, to the value = 2.

1 Mem. d. Acad. Real d. Sc. d. Lisboa. 2 See Ency. Brit., supplement to 3d ed., 1801. 3 Mém. de U Inst., 1785, 1788. 4 Gren's Journal, 1811; Gilb. Ann., 1820. > Magnetismus der rde, 1819. 8 De Magnetismo Telluris, 1806-10. _ 7 Jamieson's New Edinburgh Journal, 1881.

the direction of a magnetic field, and the strength of a magnetic field, or its component in any given direction. In most of these cases the measurement may be either relative or absolute. For example, we may determine the moment of a magnet either relatively, in terms of the moment of some other magnet arbitrarily chosen, or abso- lutely, in terms of the fundamental units of space, mass, and time. The complete tlieory of measurements of the latter kind is due to Gauss, and the carrying of them into practice to him in

conjunction with Weber and the Magnetischer Verein, of which these two German philoso- phers were the leading spirits. We shall discuss the

8 Intensitas Vis Magneticw, Kc., § 21, 1883.

Deter- mination of mag- netic axis, and of the magnetic declina- tion.

Mirror method.

Colli- mator magnet.

Unifilar magneto- meter.

X18, -is observed by means of a fixed telescope, and the angular

‘on the axial point of the scale.

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matter here only in so far as it concerns the work of a physical laboratory, the rest belonging more properly to the subject of Terrestrial Magnetism (see MxrEoro- LOGY).

Axial Directionand Magnetic Declination.—The magnet is suspended, usually by means of one or more fibres of unspun silk, so as to be free to move about a vertical axis. We shall suppose, for simplicity, that the magnetic axis is in a horizontal plane. If this is not so, instead of deter- mining the axial direction, we determine a vertical plane through it. In order to obtain a fixed line of reference in the magnet, two marks may be made on it as nearly in the direction of the axis as can be guessed to begin with ; this arrangement is used with dipping needles and also for horizontal needles when no great accuracy is required. For declination needles two contrivances of greater refine- ment are used. .

1. A mirror is rigidly attached to the magnet, so that the normal to its surface is nearly parallel to the magnetic The image of a fixed horizontal scale in this mirror

motion of the magnet deduced from the motion of the scale divisions over the wires of the telescope. This is called the mirror method.!

2. A more compact arrangement is to attach to the magnet a small photographic scale and a lens, the former being placed at the principal focus of the latter, so that the line joining the middle division of the scale to the optical centre of the lens is nearly parallel to the axis of the: magnet. The scale is viewed through the lens by means of a fixed telescope, and it is clear that the line just inentioned gives us a fixed direction in the magnet, and that the motion of the magnet can be followed by observing the apparent motion of the scale across the wires of the telescope. This may be called the collimator method.?

The apparatus usually employed in the United Kingdom for observing the magnetic declination,? and also for other absolute magnctic measurements, is the portable unifilar magnetometer, the upper part of which is shown in figs. 28, 29. The lower part con- sists simply of a tripod stand supporting three V-shaped groves, into which the points of the levelling screws attached to the fixed limb of the instrument are set. In making an observation of the declination the instrument is arranged as in fig. 28. The declina- tion collimator magnet is suspended in the box A (the sides of which are removed to allow the interior to be seen) by means of the suspension fibre D, attached to the torsion head PH. The scale of the magnet is observed through the small telescope QBG. The first step is to remove the torsion as far as possible from the suspension fibre by hanging to it a brass plummet E of the same weight as the declination magnet. After this weight has come to rest, itis replaced by the declination magnet, so that the latter shall rest as nearly as possible in the magnetie meridian without intro- ducing torsion of the fibre. The movable limb is now turned till some division of the magnet scale is on the cross wires of the tele- scope, Itis thenclamped. The magnet is now inverted, and the number of the scale division on the wires again read. The mean of these readings gives the point of the scale the line from which to the centre of the collimating lens is parallel to the axis of the magnet. This point of the scale (axial point) will remain the same so long as the magnetism of the magnet does not alter, or the adjust- ment of the scale and collimating lens is not interfered with. The

tangent screw is now worked until the cross wires of the telescope are The verniers of the limb are then

a i The mirror method was first suggested by Poggendortf (Pogg. Ann., vii., 1826). It was carried out in practice by Gauss. =, There seems to be some doubt to whom the collimator method ts due. Airy, Lloyd, Lamont, and Weber all did something for it. See Lamont, Handb. d. Magnetismus, p. 154. Want of space compels us to omit all but the leading points. Readers in search of m4 practical details must be referred to The : ab of Scientific Enquir . 84 sg.; Maxwell Electricity and Magnetism, §§ 449 an mal Bintuas der Magnetismus, and Hrd-Magnetismus, where references to all the authorities up to his time will be found. They should also study the

classical memoirs of Gauss to be found in the fifth volume of his col- lected works.

J

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read, The next step is to observe the azimuth of the sun or of some other heavenly body, by means of which we can refer the azimuth of the magnetic meridian to the true north. For this purpose the instrument is provided with a small transit mirror NO, which has a motion in altitude so as to bring any object into the field of the telescope. To use it, the limb is unclamped, and it and the

Q

. B ag" Py. ee oh eee ") »

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Fia, 28.—Unifilar Magnetometer, arranged to indicate declination.

mirror moved until the sun or star comes into the field of the telescope ; the limb is then clamped and the time noted at which the heavenly body passes the intersection of the cross wires. The verniers are again read. The

differences of the readings, added to the azimuth of the heavenly body found by means of the time from the Nautical Almanac, gives the declination at the time and place of observation.

‘There are several causes of error to be guarded against. (1) Tor- sion is reduced within as small limits as possible to begin with, and if there is reason to suspect any residual error we may test the apparatus by turning the torsion head of the suspension tube first 90° one way and then 90° the other. If the deflexion of the magnet is cxactly the same and oppositely directed in the two cases, then we may conclude that the torsion is zero in the azimuth of equilibrium. If not, then we may turn the torsion head so as to reduce the error still further; or we may calculate its amount (assuming torsion to be proportional to twist) from the two observa- tions, and allow forit. (2) Ifthe axis of the magnet is not very nearly parallel to the line of collimation of the telescope to begin with, and consequently the two scale readings far apart, an error may arise? from the vertical axis of suspension not being exactly reversed by the inversion. This error is reduced by repeating the observation, after adjusting the axis of the magnet and telescope so as to be more nearly parallel. (8) If mean declination for a given day be desired, correction must be made for the diurnal variation, and under certain circumstances this variation may even produce disturbances in the course of a single observation.

Magnetic Moment, Horizontal Intensity of the Earth’s Magnetic Force.—If merely relative measurements of the magnetic pe” horizontal 224 hor-

intensity H of the earth’s force, are desired, there are two tensity,

moment K of a given magnet, or of the

methods of obtaining them. ‘The first is the method of vibrations. Having found the moment of inertia A of the magnet M about its vertical axis of suspension, and the

4 See Swan, Trans. Roy. Soc. Edin., vol. xxi., 1855.

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time T of its vibration under the earth's force, we obtain the product KH,=, say.. Secondly, by the method of deflexion, of which two varieties, tangent deflexion and sine deflexion, are in use, 'the value of the quotient K/H, =, say, is found. In this method K is used as the

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There are several corrections which, although in gencral negligible, may sometimes require to be considered, (1) H may vary so much during the experiment as to cause a sensible error; (2) if the arc of vibration be too large, it may be necessary to apply the reduction: to infinitely small arcs; (3) if the amplitude of the vibrations decrease too rapidly, account must be taken of the resistance to the

motion arising from the viscosity of the air, &c. ;? (4) a correction has to be nade for the alteration of the moment of the magnet by the earth's induction, and (5) a temperature correction for the magnetic moment and the moment of inertia.

Deflexion Experiments.—In Gauss's arrangement the deflecting Deflexion magnet was placed in an east-west direction, ¢.¢., end on to the experi- original position of the deflected magnet. The cquation of ments

deflecting magnet, and the moment K' of the deflected magnet does not appear in the result! It is obvious that, if we know the value of H, or may assume it constant, either of these methods will enable us to express the moment of any magnet in terms of that of another arbitrarily chosen as unit ; and, reciprocally, if we operate

Gtshibe a thi : ; '

with a magnet of known or of constant moment, we can ee ae ee ee (01)] Lon

determine the values of H at different times "and places in K'H(1+7)sin @=cos (a og T) magneto-

terms of its value at an arbitrarily chosen time and place. a os nl meter. By combining two observations, in one of which a H(1+7) P,P,

magnet K is the vibrating and in the other the deflecting er Pic tae peri are ta ae (61).

magnet, we can obtain both K and H in absolute measure,

for we have two equations KH=p, and K/H=gq, which where. P,~T,/2KK, Py~T 2K, ke.

In the method of sines the deflecting magnet is turned until it is

give – ee perpendicular to the axis of the deflected magnet in its final position K=Vpq, and H=Vp/q. of equilibrium ; the equation of equilibrium in this case is Onifilar Vibration Experiments.—lf 6 be the angle between the axis of eH a Py Ps 4 he. (62). magneto- the magnet and H at time ¢, y the angle between the axis and 2K ee

meter: H in the position of no torsion, tKH the coefficient of torsion,

vibration then the equation of motion of the magnet, when the arc of oscilla- The advantage of the method of tangents is that the moment of

the deflector is not affected inductively by the earth's force. In

ei ey aint = ncndags the method of sines a correction has on this account to be made ;

es Ad+KH6+7KH(6—y)=0. – (59). | but, on the other hand, there is no torsion, and, from the symmetry

This gives for the period of a complete vibration of the position of the two magnets, the approximate formulx Tiad4g2A/KH(1+7). (60). have a more exact application.

The observations are made with the magnetometer arranged as for the declination experiment. The swinging magnet is brought to rest, and the circle so clamped that the axial point of the magnet scale is on the cross

wire of the telescope ; the magnet is then slightly disturbed so as to oscillate through a small are (16’ or so). The time of vibration is found first roughly, by taking the time of a single vibration, then more accurately by counting a large number of vibrations and timing the end of the last as accurately as possible. 7 is found by observing the de- flexion 6’ and 6” caused by turning the torsion head

The new pattern of the unifilar magnetometer is adapted for the method of sines. The instrument arranged as in fig. 29 is first carefully levelled, and fitted with the graduated cross bar D, which

through an angle f in one

direction and then through an angle B in the opposite direction; we thus get from equation (59)

KH@ +7KH(6’-y-gs)=0,

KH6" + rKH(0”—-y+8)=0 ; and 1=(6’—6”)/(26 – 6’+6”). From the same equation we may also determine y when necessary.

The most troublesome part of the whole process still re- mains, viz., the determination of A.

from its dimensions. For this purpose Gauss fixed a cross bar of wood to the magnet, and attached to it at known equal distances from the axis of suspension two cylindrical weights of known mass and dimension. Sometimes a cylinder of gun metal is slung below the magnet by means of two loops. Perhaps the best method is to use a ring of gun metal attached to the magnet so that its plane is horizontal and its centre as nearly as possible in the line of suspen- sion. The new time of vibration being T,, and the new coefficient of torsion (if different) +’, we have the new equation

T?=472(A + B)/KH(1+7’). From this and (60) we get

2

ise (3 JU =i

1 This important fact was first noticed by Lambert.

Fig. 29.—Unifilar Magnetometer, arranged to show deflexion.

This is effected by attaching to the magnet a body whose moment of inertia B can be caleulated

is so set in its sockets as to be perpendicular to the line of collima- tion of the telescope A. The box is opened, and the torsion removed from the suspending fibre by means of a plummet as already explained. The deflected magnet is then suspended so as to be at the same height as the deflecting magnet when the latter is placed in its carriage on the cross bar. The sides of the box are now closed, and the circle of the instrument turned until the middle division of the scale B, seen by reflexion from a mirror attached to the deflected magnet, is on the cross wires of the telescope A; the circle is then clamped, and the verniers read. The deflecting magnet K (the same as that used in the vibration experiments) is next placed in its carriage L on the cross bar at a distance 7, (30 cm. or so) east ; the circle is then turned until the middle division of the scale is again on the cross wires ; the verniers are read once more. The difference between the two readings being @,, we have

2In this connexion see more especially Lamont, Handb. d. Mag- netismus, pp. 282 sq. ‘ 3 See Lamont, Handd., p. 371; Maxwell, vol. iii. § 457,

Statical instru- ments.

Measure- ments by electro- magnetic induc- tion.

rH sin _ 4 _ Py 2K 1

The deflecting magnet is reversed in its carriage, and the whole operation repeated. If the deflexion now be 6, irrespective of sign,

3 4

a

1"

(63).

then a wl pinGes iL a—s + 64), OK Sine 1+ ee (64) The mean of these gives #,°H, 3 ; ek 65 rie (sin@, + sin@,)=1 von" ‘ (65).

The magnet is finally removed to a distance 7, west, and the previous observations repeated ; we thus get

nas ing,)—1+423 66 4K (sin 3 + sin,)=1 5a : (66). The mean of (65) and (66) is then taken, and we get Ml gs Lae aK =1+ ps (67),

where S,=} (sin 6,+sin 6,+8in 6,+sin 64), or, what is practically the same, the sine of the mean of 6, 0, 63, and @,. The object in taking the mean of (65) and (66) is to eliminate any error arising from the non-coincidence of the middle point of the cross bar with the axis of suspension.

In order to eliminate P,, another set of obscrvations are made with a new distance 7, (26 cm. or so), giving the equation

wo 2k From (67) and (68) we have finally K _ 7°81) — 79°Se , H 272-72) ’ P.= 1 yT9"(79°8q = 74’S) . 2 7S} ea Ty Se ‘ When great accuracy is required, several corrections have to be applied :—(1) the moment of the deflector must be corrected for induction ; (2) the moment of the deflector must be corrected for

temperature ; (3) the lengths 7; and 7, on the cross bar must be corrected for temperature.

Statical Method.—There is another method by which we may determine the product KH, viz, we may oppose a statical couple to the couple exerted by the earth on the magnet in a given position, so that there may be equilibrium; the statical couple, which may arise from the torsion of a fibre, from a bifilar suspension, or other gravitational force, thus becomes the measure of the magnetic couple; and hence KH can be determined in absolute measure. Coulomb’s torsion balance experiments are an example of this method. It finds numerous ap- plications in the variation instruments of

fixed magnetical observatories, and also in instruments for magnetic observations at sea, but it is very little used in the ordinary work of a physical laboratory.

Magnetic Measurement by Electromagnetic Induction.— It has been explained in the article ELecrricrry that, if, either owing to the variation of the magnetic field, or owing to the motion of a closed linear conductor in it, the number of lines of magnetic force N passing in the positive direction through the conductor vary, this variation will cause an electromotive force —dN/dt in the positive direction round the circuit. Let us suppose, to take a simple case, that we have a coil of wire made up of a number of parallel plane circular windings, and that the sum of all the areas of the separate windings is A. If we place this in a field of uniform intensity R, so that the normal to the windings makes an angle 6 with R, the uumber of lines of force passing through the coil will be N,=ARcos@. If we now suddenly reverse the coil, by turning it through 180° about an axis perpendicular to its normal, the value of N in the new position is N,= —ARcos6. Hence the integral electromotive force during the motion is — /dtdN/dt=N,—N,= –2ARcos6, and the whole quantity Q of electricity which passes will be Q= ~ 2ARcos6/S, where S is the resistance of the

(68).

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coil. IfQ be found in absolute measure,! and A and S$

be known, we thus obtain the value of Rcos@. This is

the principle of Weber's "earth inductor,"? by means of Weber's which the horizontal and vertical components of the earth's earth in- force can be measured, and in consequence the declination @™ and inclination determined.*

If the test coil be made very small, so that the portion Verdet's of the field which it occupies may be supposed uniform, ¢xploring this method may be applied to measure the intensity at °°" different parts of a non-uniform field? The small coil is placed with its windings perpendicular to the lines

of force, and then suddenly reversed, or, if that be impossible, suddenly removed to a part of the field where the number of lines of force passing through it is zero. The integral electromotive force is of course in the latter case only half what it is in the former. This method is often of use where, owing to the great strength of the field and the consequent disturbances arising from induction, any other method would be utterly useless.

The method of electromagnetic induction may also be Magnetic applied to measure the component of the magnetic moment pein of any body parallel to a given line. mined by

Let aa'bb' (fig. 30) be the section of a uniform cylindrical coil of electro-length 22, made up of a single Jayer of flat circular windings of magnetic radius 6, n to the centimetre. Let the axis of the coil be taken induction, —

for x-axis, and let K be any magnet within the coil, placed with Z

¥

xX

Fig. 30.

the given line parallel to the axis of the coil. winding of the coil, then the surface intcgral of the magnetic induction for pq is given by ffadydz; hence the whole number of lines of force through the coil is given by

Let pq be any single

N= /nduffadyde, =n Sf fadudyde j

the integration being extended all over the cylindrical space abd'a'. Now, since a=a+4rA= -—dV/du+4mrA, we get

N= =f ff ON dedyde + tna ff/ Adadydz , ; = —n(f[Vdyde—f/V'dydz) + 4nnK , 'as = +4anK—n(S -8') where K is the component parallel to the axis of the coil of the moment of the imagnet, and S and 8' the values of the surface integral of the potential of the magnet (derived from Poisson's distribution) over the two ends of the coil, When there are more layers than

one, we must of course sum the different parts of N arising from the different layers. The formule are quite general, and some applications will be given later. Meantime we see that, if the coil be

1 See arts, ELECTRICITY and GALVANOMETER. 2 Pogg. Ann., xc., 1853. 3 Cf Verdet, Ann. d. Chim. et d. Phys., xli., 1854.

wach EP? ls i'

so long that the magnetic potential of the body at its two ends may be neglected, then the integral electromotive force caused by the sudden removal of the body, or by the sudden destruction of its magnetism, is 4am times the component of the magnetic moment parallel to the axis of the coil, being the number of windings per unit of length of the coil.

Early Ilistorical Remarks on the Progress of Magnetic Measure-

vibration ments,—The method of vibrations came very early into use

v\ jn magnetic measurements. Whiston and Graham made wns vibration observations with a dipping needle. Musschen- broek and Mallet also used a horizontal needle. Lambert

appears, however, to have been the first to thoroughly understand and appreciate the method. For long it was the only accurate process in use for obtaining relative measures of the earth's force. It was so used by Rossel, D'Entrecasteaux, and Humboldt. Coulomb, Hansteen, and Poisson, all contributed more or less to its improve- ment; and it finally reached perfection in the hands of Gauss, who gave the experimental process for obtaining the moment of inertia, investigated the correction for resist- ance, aud, by the introduction of the mirror and scale method, imparted astronomical accuracy to the determina- tiou of the period of vibration.

The method of deflexion, in one form or another, is very old. Its existence as a thoroughly scientific method, however, dates from Hansteen. The essential improve- ment of eliminating the constants depending on the magnetic distribution by observations at different distances is due to Gauss. The advantages of the sine method were first pointed out by Lamont in 1841.2

Poisson Poisson seems to have been the first to conceive the first idea of absolute magnetic measurement. Ina short but (ane luminous article at the end of the Connarssance des Temps maonetic Or 1828, he describes a method for obtaining the value of measure- H in absolute measure. Horizontal vibration experiments ments. are to be made with two magnets A and A', whose moments of inertia A and A' are known. The times of vibration ¢ and ¢' of A and A', each suspended alone, are to be observed, Then both are to befplaced in the magnetic meridian at a distance 7 apart in the same hori- zontal line, and the periods 6 and 6' observed, of A when A' is fixed, and of A' when A is fixed. If7 be very great compared with the linear dimensions of A and A', then Bar0e'/AA' ret! s/(? — 6°)(t? — 6) He recommends, however, that comparatively small values of r be taken, and the constants of distribution eliminated by experimenting at different distances. His fundamental units are the gramme, metre, and second.

*Nothing came of Poisson's proposal until Gauss took up the subject, both theoretically and experimentally, as above described. The first absolute measure of the earth's hori- zontal force was made by him at Gottingen on the 18th September 1832; the value found was 1°7823 in milli- metre milligramme second units. The magnet he used (about a foot long and weighing about 1 ib) had for its moment 100877000 * in the same units.*

Determi. The determination of the distribution of magnetism within ay body, in other words, the determination of the magnetic dist, Moments of its individual elements, by observations of bution, Magnetic force at external points, is, as we have seen, an indeterminate problem. Nevertheless, a considerable part of the literature of magnetic science relates to it; and we must give some account of what has been done, although

H?=

1See his memoir, "Anleitung zur Bestimmung der Schwingungs- dauer einer Magnetnadel," in Res. d. Mag. Ver., 1837. 2 Handbd, d. Magnetismus, p. 309.

wm peal, CG. S. 1008777, C. GS.

the results obtained are of comparatively slight physical interest, and of small practical value.

Experimenters have been somewhat slow in recognizing "Free the essential indeterminateness of the problem. This no magnet- doubt has arisen from their imperfect analysis of the 3.4? 4 phenomena. Thus, although we cannot determine the jses of the actual internal distribution, yet the problem to determine phrase. the Gaussian surface distribution which will represent the magnetic action at all external points, however difficult, is quite determinate. This surface distribution has been called by some the "free magnetism" of the body; and some, all the powerful contrary evidence notwithstanding, have imagined that this distribution has a physical existence, and have even spoken of the depth to which the free magnetism penetrates into the magnet. Others have con- founded the free magnetism of Gauss's distribution with that of Poisson's; and in many cases it is impossible to gather what the experimenter meant to indicate exactly by the phrase.

The case in which, from the circumstances, the variation of the internal distribution is confined within the narrowest limits is that of bar magnets, whose length considerably exceeds their lateral dimensions; and this is practically the only case that has been much studied. The most natural way of attempting to represent the action of such a magnet would be to suppose it replaceable by a fixed ideal magnet, and then to determine by experiment the strength and position of the poles of this magnet. The earliest notion was that the poles were situated exactly at the ends of the bar. It was soon found, however, that, if the poles did exist, they were not in general exactly at the ends, Lambert and Kupfer > concluded from their experi- ments that in many cases the poles lay outside the bar, while in weak magnets they lay inside. Coulomb, as we have seen, and also Dalla Bella, inferred from their results that the poles fell within. Recent experiments have been made by Pouillet,® by Benoit,' by Petruscheffsky,® and by others on the same subject; but it is needless to describe tliem here.

The word "pole," like the phrase "free magnetism," has " Poles," been used by different writers in very different senses, 'different Some have

applied that name to the mass centres of the (pS positive and negative magnetism of the actual molecules.

But, although as a matter of convenience we have used these points in our theoretical development, they have, as far as physical observations are concerned, no existence. Others have defined the poles to be the mass centres of the positive and negative parts of Gauss's surface distribution. These might of course be determined, although the process would be extremely troublesome, and the result of no practical value whatever. In point of fact, if the magnet be ina uniform field, ze, at a very great distance from the system that acts on it, the action depends solely on the magnetic moment, and the magnetic distribution has nothing to do with it; the poles in this case are physically indeterminate. If, on the other hand, two magnets are within a moderate distance of each other, we may set to ourselves the problem to find two points in each of them such that the mutual action will be represented by quantities of positive and negative magnetism concentrated there. Then, in general, such points may or may not exist. Riecke has shown (see above, p. 233) that, if the distance between the magnets exceed a certain limit, then, as a matter of approximation, these equivalent poles, as he calls them, do exist. Except, however, in the case of magnets symmetrical about an axis, and also about an equatorial plane, they are not fixed in the magnets, but 5 See Lamont, Handb. d. Magnetismus, p. 294 sq.

8 Comptes Rend., 1868. 7 Comptes Rend., 1875. 8 Pogg. Ann., clit., 1874, and elx., 1877.

Distribu-

depend upon their relative position. Although his results are extremely interesting from a mathematical and theo- retical point of view, we do not see that much practical advantage would attend the use of these equivalent poles ; and we are inclined to think that, except in the popular usage for

distinguishing one end of a magnet from the other, and in the case of ideal magnets, the word pole had better be abandoned altogether.

The idea of representing the action of a linear magnet

tion in 4 by a continuous distribution of free magnetism, positive in

linear

magnet.

Different

one half and negative in the other, is very old. It appears in Bazin's work on the magnetic curves published in 1753; and Tobias Mayer, in his memoir above quoted, assumes that the density of the distribution is proportional to the distance from the middle of the bar. Four distinct methods have been used in attempting to determine the law of distribution.

1. The deflexions of a small needle in different positions near the magnet have been observed, and by means of these the constants in some formula assumed for the dis- tribution have been calculated. This was the process adopted by Lambert and Hansteen, and, in some of his experiments, by Lamont.!

2. Instead of measuring deflexion, we may count the oscillations of the needle, and proceed as before. This method was used by Coulomb, Becquerel, and Kupfer, but it led to no satisfactory results, partly owing to the disturb- ances arising from induction and the force of translation upon the needle, partly owing to the difficulty of putting a satisfactory theoretical interpretation upon the results.

3. Some observers have measured the force required to

niethods detach a small armature of soft iron or steel from different

em- ployed.

parts of the bar, thinking thereby to obtain a direct measure of the free magnetism. It is not very easy to say what is measured by this process, but it is obvious, on a little consideration, that the effect is complex, depending greatly on the nature and extent of the surfaces in contact, and also upon the mutual induction between the magnet and the armature. made by Dub, Lamont, and others.

4. Another method frequently employed is to slide along the bar a small ring-shaped coil embracing it as closely as possible, and to measure the induction currents for a given displacement. The assumption usually made is that the integral electromotive force is proportional to the free magnetism on the portion of the bar passed over, or, what amounts to the same thing, to the difference between the magnetic moments per unit of length of the sections of the bar on which the coil rests at the beginning and end of the motion. This is, however, only an approximation to the truth, and the accuracy of this approximation is very difficult to estimate in the practical case where the lateral dimensions of the bar are finite. The following investiga- tion will show the nature of the difficulty.

The integral electromotive force is – (N, — N.), where N, and N,are the surface integrals of magnetic induction taken over the coil in its initial and final positions. Let us take first a linear solenoid SN (fig. 31) of length 7, and magnetic moment m, and a coil of a single

winding PQ, which moves so thatits ceutre R is always in the line SN, and its plane always perpendicular to SN ; then

N=/fadydz=ffadydz+ 4nffAdydz, the former integral- extending all over PQ, the latter over the infinitely small section of the solenoid at R, a being the force due to the end distribution at N and S. We thus get

N= 72" (coso — cos6')

(70),

where and ' are the angles PSX and PNX. This shows, in the first place (see equation (25) above), that if the coil PQ were to expand and contract as it

moves, so as always to remain a section of the same tube of force, there would be no variation of N, and no eee

? See also Airy and Stuart, Phil, Mag., 1878.

Experiments of this kind have been.

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electromotive force, which is asit should be. If we were at liberty to suppose PQ infinitely small, then, when R is between S and N, cos 6 — cosé' would be the sum of two unities, and, when R is outside, the difference. In such a case, so long as PQ moved on the magnet, there would be no electromotive force, but if we suddenly move it over the end, there would be an electromotive force

' Fig. 31. Q -—4mm/l, which is proportional to the moment of the bar. PQ is not infinitely small, there is a variable part of N, depending on the dimensions of PQ, which will give rise to an electromotive force, even when the coil is moved along a uniformly magnetized bar, where there is no free magnetism except at the ends. It is now easy to form a conception of what happens in the case

When

of an ordinary complex solenoidal bar. We may suppose such a bar made up of a number of simple lincar solenoids. A certain number of these, corresponding to the end parts of Poisson's distribution, will have the same length as the bar; the others, corresponding to the lateral surface and volume parts of the distribution, will be of continuously diminishing lengths. If we were at liberty to suppose the latcral dimensions of the bar and the radius of the coil to be infinitely small, then, as the coil moves along the bar, we should have an electromotive force due to passage over the ends of the short solenoids, and, as it moves over the end, an electromotive force due to passage over the ends of the long solenoids. We might in this way by a sufficient number of observations determine the distribution of the free magnetism throughout the bar and at its ends; and in

this case no distinction would be necessary between the volume and the surface distribution in any section.

If, however, the dimensions of the section of the bar, and con- sequently of the coil, be finite, a correction would have to be applied, depending, not only on the dimensions of the bar and coil, but also on the magnetic distribution. All that we can then do is to assume a formula for Gauss's surface distribution and determine its con- stants. We thus get Gauss's distribution, and a formula that will account for the electrical observations ; but we obtain no information as to the actual internal distribution of the magnetism in the bar.

Lenz and Jacobi? appear to have been the first to apply the method of induction currents to the measurement of the magnetic distribution in bar magnets. They attempted no theoretical analysis of their results, although they assigned a law of distribution. Van Rees,? who questioned

their conclusions, gave an imperfect theory, and made some

careful researches of his own. Rothlauf made further experiments, and entered more fully into the theory, though still with insufficient generality. The most recent experi- ments of the kind we are aware of are those of Schaper,® who discusses the theory with complete generality, taking account of the ends of the bar.*

After what has been said, the reader will scarcely be Different surprised to find that the different experimenters assigned Jaws as- very different formule for the distribution in bar magnets. 'i8¢¢-

Lambert deduces from his experiments a distribution whose density is Axz, —A being a constant, and x the distance from the ends of the bar. Brugmans, V. Swinden, and Lenz and Jacobi adopt the law Az'; Hansteen, as we have seen, the law Aw', where r= 2 or 3. Biot deduced from Coulomb's experiments the law A(u ~ .7*) for the density of the free magnetism, which would give for the moment per unit of length of the bar the law a —b(u*+ 7"), see above, p. 231. Becquerel,*

2 Pogg. Ann., Ixi., 1844. 3 Over de Verdeeling van het Magnetismus in Magneten, Amst.,

1847.

4 Pogg. Ann., cxvi., 1862. 5 Wied. Ann., ix., 1880.

Theory of carrying power ; experi- ments on it.

Axioms of mag- netic in- duction.

Van Rees, Lamont, and Rothlauf favour this last formula ; but none of these experimenters give any proper account of the ends, which must be specially represented in all but those cases where the magnetic moment is zero there. Schaper finds that the results of experiment can be adequately represented by means of end distributions, and a lateral surface distribution following the law Az + Bz. See his paper above quoted, p. 242.1

*Carrying Power of a Magnet.—It is obvious that the magnetization of a piece of iron must affect its force of cohesion. The most familiar case is that of a magnet to which an armature is fitted. If the surfaces of the pole and armature be carefully ground flat, so as to fit, we may regard the magnet and the armature as continuations of each other. The force of cohesion here is mainly due to the magnetism; and the force required to separate the two is called the " carrying power" of the magnet. To simplify the question, let us consider a cylindrical bar of section a, uniformly magnetized in the direction of its length with intensity I. Suppose the bar cut so that the normal to the plane of section makes an angle # with I, and let the surfaces of section be separated infinitely little, then the surface density of Poisson's distribution will be Icos0 on each surface. Assuming that the cohesion is caused solely by the attraction of these surface layers, we get for the carrying power P= 2zIcosé x IcosOwsecO, 2.¢., P=27I*wcos@. The carrying power is therefore greatest, viz., 27wI?, when the surface of the pole is perpendicular to the lines of magnetization.*

A great variety of experiments have been made on this subject by Joule, Dub, Tyndall, Lamont, and others, mostly, however, under circumstances that do not admit of the application of the above theory. For an account of what has been done, the reader should consult Wiede- mann's Galvanismus, ii. § 425 sg. The most recent inves- tigations on the subject will be found in the papers of Rowland, quoted below, p. 255, and.in papers by Stefan and Wassmuth in the Monatsberichte der Weiner Akademie for 1880 and 1882.2. The facts are not so simple as the above theory would indicate; but Wassmuth finds a modi- fied form of it to agree sufficiently well with observation.

MATHEMATICAL THEORY OF MaGNETIC INDUCTION.

The two fundamental axioms of this theory are the following :—

1. The induced magnetism in any element of a body depends merely on the magnitude and direction of the re- sultant magnetic force (#) at the element.

2. The magnetic moment induced by any force # is the resultant of the magnetic moments induced separately by any forces of which % is the resultant.

With reference to axiom 1 it is to be remarked that account must be taken of the physical condition of the body as to temperature, and so forth ; but it is implied that no account is to be taken of its magnetic state, except in so far as that affects the resultant magnetic force. In other words, it is asserted that the moment induced by any force does not depend upon any pre-existing magnetic moment in the element, and is the same whatever forces may have acted on the element previously. The full significance of these statements will be better appreciated when we come to consider the exceptions to them in case of strongly mag- netic bodies. It should also be noticed that it is supposed

1 Various experimenters have attempted to determine the "indif- ference zone" of magnets under different circumstances, 7.¢., the line separating the positive and negative parts of the surface distribution. For information as to this and other matters under the present head omitted for want of

space, see Wiedemann, Galvanismus, ii. §§ 277, 356, 396, 401 ; and Lamont, Handbuch, §§ 6, 27, 68, 64, 65.

2 Abstractedin Wied. Beibl. 1880 and 1882; see also Von Walten- hofen, Wien. Ber., 1870, and Siemens, Berl. Monatsber., 1881.

that the body has reached a state of magnetic equilibrium, and that by whole resultant magnetic force is understood, not only that arising from the given inducing system, includ- ing pre-existing magnetism in the body itself, but also that arising from induced magnetism.

In the mathematical theory no distinction is drawn between the part of the induced magnetism which dis- appears when the inducing force is removed, and that which remains. If anywhere we contemplate what happens after the removal of the force, it is assumed that all the induced magnetism disappears. This important restriction must be borne in mind in applying the results in practice.

Axiom 2 enables us to assign at once the law connecting the components of induced magnetization A,, B,, C, with the components a, £, y of the resultant force. If 7,,¢5, p, be the components parallel to the three coordinate axes of the induced magnetization caused by a unit resultant force parallel to the axis of x, then, by the axiom, the components of magnetization induced bya force a in the same direction will be r,a, ga, p,a; similarly, if p,, 7, q, be the com- ponents due to unit force parallel to the y axis, then the components due to @ will be 8, 7.8, ¢,8; and finally, if go, P,, 73 be components due to unit force parallel to z axis, the components due to y will be guy, pry, Tsy- Compounding all these, according to the axiom, we get —_ General

Ay=74+p3B + G27 Jaw of in- By, =93a +78 217 ie ah. Ge —— Cy =p.4 B+ Tsy

Hence the most general expressions for the components of magnetization compatible with our axioms are three linear functions of the components of the resultant force.

Here it is necessary to introduce a classification of bodies according to their magnetic properties.

If equal, similar, and similarly situated elements cut Homo- from different parts of a body have identical magnetic pro- geneity perties, it is said to be " magnetically homogeneous," if not, 2 " heterogeneous." fore.

If equal and similar elements cut around the same point Isotropy in different directions be identical in their magnetic proper- and xolo- ties, the body is said to be magnetically "isotropic"; if PY: not, ' zolotropic."

These are not cross classifications; for a body (eg., Iceland spar) may be zolotropicand yet homogeneous, and it might be heterogeneous and yet isotropic. We must regard the coefficients p, g, r of (71) as belonging to a point of the body; and we see that in a homogeneous body they will be the same for all points, whereas in a heterogeneous body they will vary from point to point, 7.¢., they will be functions continuous or discontinuous of the position of the point.

In the case of an isotropic body it is obvious a priori Law of that the induced magnetization must be coincident in induc- direction with the resultant force; the conditions for this ta es are that the coefficients p and q should all vanish, and that "0"? 1, =T,=7,=k. The equations (71) thus reduce to

A,;=xa, By=xB, Cy=uy . . . . (72).

In an xolotropic body, on the other hand, the coeflicients may be all different from zero and from one another ; but, as we shall see, at all events in the ideal case contemplated by the mathematical theory, the conservation of energy reduces the number of independent constants by three; while a proper choice of axes reduces it by three more; so that the magnetic properties of any element of an zolotropic body depend virtually on three independent constants.

The theory here given is the generalization of Poisson's theory due to Sir William Thomson. It aims at giving the simplest possible exposition of the results of experiment with the fewest assumptions as to the molecular structure of bodies. We first discuss specially a few of the cases

more important in practice, and then give a brief account of the general theory with a view to establish some general principles to guide us in the subsequent account of the (often very complex) phenomena observed hy experimenters.

synthetic JZomogeneous Azolotropic Sphere in a Uniform Field of solution Inductive Force.—We suppose that the sphere, to begin with, ~ 4 is not magnetized. If the sphere were uniformly magnet- se foem ized,! with components A,, B,, C,, then (see above, p. 232) field, the force inside the sphere due to this magnetization would have for its components a= ~$7A,, B= -37B,, n= -§nC. This uniform force combined with the given uniform force (a, Bo Yo) of the inductive field would result in a uniform force a=dy~ZeA,, B=By-§xB,, y= yo-§0C, » « (78). It is obvious therefore that the assumption of uniform magnetization will enable us to satisfy the law of induction. In point of fact, substituting in (71) and transposing, we get three linear equations to determine A,, B,, C, in terms of ag, Bo; Yo» V1Z. : (14 dary) Ay + Sarpy, + $1qo0y = + PsBotGarvo» &e.. (74). It is easy, by means of these and formule given above, to calculate the couple exerted on the inductively magnet- Reduc- ized sphere. If we put a,=0, B)=Fcosé, y)=FsinO, we tion in can calculate the work done on the sphere in turning num through 180° about an axis perpendicular to the direction er of : : snduc. Of the field. This, by the conservation of energy, ought

tion co- to vanish, and we thus get the conditions », = P2= 9% efficients. »,=¢,. The equations (74) therefore reduce to Ay = 70 + p38 + Poy By=pyat+ B+ Ay ¢ + Cy=p a+ p B+ 73 Hence, if a, B, y be parallel to a radius of the central quadric 142? + roy? + 1°92" + Qpyyet QWpze + Qpyry=1, A,, B,, C, will be normal to the diametral plane of that radius. We have, therefore, by the theory of surfaces of the second degree, the following conclusions. Three 1. The induced magnetization is not in general in the principal direction of the inducing force; but there are in general magnetic a every point three directions, called the three principal axes. ° ° magnetic axes, mutually at right angles to each other, for which the directions of the induced magnetization and of the inducing force coincide. If the axes of coordinates be parallel to these principal axes, the equations (75) reduce to

(75).

A,=“2, B,=7.8; Oi =1s7 (76).

Principal The values of 7,,72, 7’ in this case are called the “ principal magnetic magnetic inductive susceptibilities.” Bodies for which these inductive c ake ‘ suet coefficients are all positive are called paramagnetic or bilities, ferromagnetic. Bodies for which they are all negative are called diamagnetic. No substance is known for which some are positive and others negative, although this is a mathematically possible case. Since intensity of magnet-

ization and resultant magnetic force are of the same

dimension iL it”), 1”) Tg) “3 are pure numbers; for all substances exccpt iron, nickel, and cobalt, they are extremely small. The value of the coefficients 7 and p for any other axes can be expressed in terms of the three principal susceptibilities by means of simple formule which we need not stop to deduce.

A physical meaning can be given to 7,, as follows. Let the body be homogeneous, and let us cut from ita cylindrical piece whose axis is parallel to the principal axis of susceptibility 7. Place this cylinder in the direction of

1 Here and in future the suffix 0 denotes components of magnetizing force, &c., due to given or pre-existent magnetization; while the swfix 1 denotes those due to induced magnetization. Letters without suflixes denote totals; ¢.g., a=a +a, A=Ay)+A,, and so on

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the lines of force in a uniform field of unit strength, then, provided the cylinder be infinitely thin, and of longitudinal dimensions infinitely great compared with its lateral, the internal force due to the induced magnetization will be zero (see above, p. 229), and it will be magnetized induc- tively with a uniform intensity 7,. Similarly for 7, 75. The three coefficients a=l+4ar,, w=1+4rrm,, w,=1+4075,

used later on, are called by Thomson the three principal permeabilities of the body at any point. These are of course pure numbers, and they are positive for all known substances.

2. If the susceptibilities for any two principal axes be equal, then evcry axis in the plane of these two is a principal axis.

3. If all three principal susceptibilities be equal at any point, then every axis through that point is a principal axis, and the susceptibility for every such axis is the same. The body is therefore isotropic at that point, and the direction of the induced magnetization coincides with the direction of the inductive force for every direction of the latter.

Returning to the problem of tle eolotropic sphere, let us Maguet- simplify our cquations by taking the coordinate axes parallel to the ization common dircctions of the principal axes throughout the homogene- and ous sphere. We then get for the components of magnetization —_ couple

for aoe eee ee =, 6% A= 1+ tary? . 1+ tare? er 1+ tarry! » AG: paren

Using these formule, we get, by means of (22), for the compon- field.

ents of the couple acting on the sphere (of volume 2),

Principal permea- bilities.

oy T= 73 ~“Ty gar.Xl + oar) ry DSSS Brasil ten) ; GEO) TT Far Sl + a7)

There is of course no force of translation. As a special case let us suppose 7, 7, and 7, to be in descending order of algebraical magnitude, and suspend the sphere with the axis of 7, perpendicular to the lines of force. We may put By =F cos0, yy =F sind, where @ is the angle between the axis of y i and the direction of the field, then we have

¥ = oF Xr, — 74) sin 26/(1-+ 4mr,)(1 + 4×75).

Hence the sphere tends to turn so as to place the axis of algebraically greatest susceptibility parallel to the lines of force. It will be in equilibrium when either principal axis is parallel to the lines of force; but in stable

equili- brium only when the axis of greatest permeability is in that position. It is to be' noticed that the couple is pro- portional to the square of the strength of the field.

There is another way of expressing these results more in accordance with the ideas of Faraday.

If N be the surface integral of magnetic induction taken over the meridian section (w) of the sphere perpendicular to the direction of

the vector % inside, or, as we may call it, the number of lines of force that pass through the sphere, then we have

2 2

N=38Fw (5) cos?@ + (25) sin? @ oe

2 3

1 (a+ 2)(ag+2) a{N)*

9

dé

(78).

Bo J

*oP 24r*R a, + 3+ war's R being the radius of the sphere.*

From these formule we can draw the following conclu- sions :—

1. Lhe number of lines of force that pass through the Deduc: sphere is greatest, viz, 3Fwero/(a,+2), when the axis of tion of | greatest permeability ts parallel to the direction of the un- —_ ' disturbed field, and least, viz, 3Fwa,/(w,+2), when the ees axis of least permeability is in the same position.

2. In any position the number of lines passing through the spherical space ts greater for a paramagnetic body, and

|

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less for a diamagnetic body, than it would be if the sphere were absent.

3. The sphere is in equilibrium when the number of lines of force passing through it 1s a maximum or a minimum, the equilibrium being stable in the former case, and unstable in the latter.

Induced Homogeneous Isotropic Sphere in Uniform Field.—This magnet-case is obtained by putting r;=r,=r,=«x in the above ization of formule, The magnetization is parallel to the undisturbed , ited field; and the couple vanishes, so that the sphere is in a equilibrium in all positions. If the strength of the field be F, we get for the intensity of magnetization

as _ 3(@—1)

14+ 47K

also

In order to familiarize the reader with this important case, we give two figures of the lines of force from Sir W. Thomson's Reprint, pp. 490, 491,—one for a paramagnetic

j \

|

|

\ *f Y* \ \

|

— Cs =

—— =e aie

Fic. 32,—Lines of Force for a Paramaguetic Sphere.

(fig. 32) having #=2°8, and another for a diamagnetic (fig. 33) having #=‘48. The former represents a para- ‘magnetic whose susceptibility is something like zjoth of the maximum observed for the best Norwayirou. The latter corresponds to a diamagnetic having a susceptibility some 16,000 times that of bismuth, which is the most powerfully diamagnetic substance known. The reader should observe that, although the field inside the isotropic sphere is uniform, this is not the case outside,

i

Fic. 338,—Lines of Force for a Diamagnetic Sphere.

a fact sometimes forgotten by experimenters. Of course the disturbance in the case of a bismuth sphere would be infinitesimal.

Homogeneous Aiolotropic Ellipsoid in a Uniform Field. —In the case of a sphere the tendency to set in a uni- form field is wholly dependent on the eolotropy of the sphere, and is independent of its form. It is important, in order to get a complete picture of the behaviour of inductively magnetized bodies, to obtain a solution for some case where the form hasan effect upon the result. A solid bounded by a surface of the second degree affords such a case.

If ani ellipsoid be uniformly magnetized so that the components of Magnetization parallel to its three principal axes a,b,c be A,,B,,C,, this magnetization gives risc to a force

a= ~A,L, By = -B,M, 2 -C,N; when L. M, N have the values given above, p. 232. If we now

Eolotro« pic ellip. soid in uniform field.

place this ellipsoid in a uniform field (a9, By, Yo), the force inside will be given by a=a,-A,L, B=B,—BL, y=y—C,L (79).

It is obvious, therefore, that the equations (75) of induction can, as in the case of a sphere, be satisfied by the assumption of uniform magnetization.

There is no difficulty in dealing with the general case in which the principal magnetic axes are not parallel to the principal axes of figure ; we shall content ourselves, however, with the case in which the principal magnetic axes 7, 7, 73 are parallel respectively to a, b,c, Hquations (76) then give at once

A,=7(a,-A,L), B,=7,(8)-B,M), C,=75(y-C,N) (80); whence _ "1% wet. Gin HT V'ltrnL? ") 14+r.M'? 7 l4+7,N The components of the magnetic moment are of course obtained at once from these by multiplying by the volume.

For the components of couple, ¥, Mt, H, tending to turn the cllipsoid about the axes a, b, c, we get

12 —13+1o%3(N – M) ¥ = Saab M1 +7,N) HW =&e., R= ke.

From these equations we can draw the following im- portant conclusions,—first as to the magnetization of the ellipsoid.

1. When 7, 72, 7"; are so small that their squares may be With neglected, as in fact is the case with all bodies except iron, weakly. nickel, and cobalt, the components of magnetization reduce a ose to ra, %oBy Tsyo A glance at equations (79) will ces the show that what happens is simply that the part of the form does internal inducing force which depends on the squares of not affect the susceptibilities is not sensible. In other words, the : arg

6 ; c : uced form of the body is without influence on the induced magnet magnetization. Or, what is again equivalent to the same ization. thing, the induced magnetism may be supposed to produce no disturbance in the inducing field.

These conclusions are of course not limited to the ellipsoidal form in particular; but we have the general result that, if the squares of the susceptibilities are negligible, then the form of the body has no effect on the induced magnetism.

2. On the other hand, when the susceptibilities (and With consequently the permeabilities) are very great, since Strongly A, =a,/(1/r, +), &e., it is clear that the influence of the magnene form of the body predominates. Tlie extreme case is that the influ: of a body of infinite permeability, in which the induced ence of

(81).

Bove (82).

magnetism is wholly determined by the form. ier al 3. If, however, the ellipsoid be very elongated in the (iy…

direction of a, then L will be very small, and 7,L may be nt very small, notwithstanding the largeness of 7,. In that °°?" case A, =r,a,.

4. From 1, 2, and 3 we have the following most Best form important results. In experimenting with weakly magnetic for deter- bodies in a uniform field —in order, say, to determine their ——— susceptibility—the form of the body is indifferent. On the tibility.. other hand, with strongly magnetic bodies an elongated form must be used, because in that case only does the induced magnetism depend mainly on the susceptibility of the material. With bodies approaching the spherical form differences in form produce far more effect on the experimental results than differences in the susceptibility of the material, so that in such cases the experimenter really measures the accuracy of his instrument maker! more than the magnetic susceptibility of his material.

5. For a flat disk (infinitely oblate ellipsoid), having Flat disk. its 7, axis parallel to the lines of force, L=4z, and A,=7,a)/(1+427r,)=a)(a7,-1)/4ae, If such a body were diamagnetic, and had r,= —1/47,7.¢, had zero

As a matter of history, Riecke did unwittingly obtain in this way a tolerable approximation to the ratio of the circumference of a circle to the diameter. See Stoletow, Phil. Mag., 1874, p. 202.

permeability, the normal magnetization would be infinite for any finite force. Mag- Next, we have the following conclusions as to the mag- netic netic couple. Let us suppose the ellipsoid free to move couple, about its a axis, and let the direction of the field be per- oe pendicular to a, so that By) = Fcos6, y)=Fsin@; the couple

3 tending to turn the & axis parallel to the undisturbed direc- tion of the field is the sum of two parts :— wg Tbe Pg = 73) gs 88 ew cart bee Ao eam (88), and io maberers(N-M) . 84), ¢ = 3i+r,Myd+r,N) +rM\ 7,6) sin 26 (84) For 1. Jf the susceptibilities are so small that their squares small and products are negligible, then ¥ reduces to pee 2 #, = 3rabcF(r, — 73) sin 20.

the effect lu other words, the form of the body has no effect, and it of eolo- behaves exactly like an xolotropic sphere of the same

em . volume; z.e., it will tend to turn its axis of greatest per- Pte Meability parallel to the lines of force.

For 2. If the susceptibilities be very large, then the most large important part of ¥ will be ¥, Now a glance at the

suscepti: values of M and N (34) shows that N—M_ has the same

bilities sion as 62—c®; hence the ellipsoid will tend to place its

the effect Jongest dimension parallel to the lines of force. This is the

of form 0 :

predomi- general effect of the influence of form in the case of strongly

nates. magnetic bodies, or, if we choose to put it so, the effect of the disturbance of the field by the induced magnetism.

3. It is of course possible in the case of strongly magnetic bodies that both parts of ¥ may be sensible, so that the resultant action would be affected both by form and by the magnetic structure, either predominating according to cir- cumstances ; for by properly shaping the ellipsoid we can give N — M any value positive or negative from Oto 27. In this way, given an xolotropic body for which 1/r,—1/rgis not greater than 27, we might so shape it that it would turn its longest dimensions parallel to the lines of force, or so that it would turn its shortest dimensions parallel to the lines of force, the shortest axis in the second case being the axis of greatest permeability ; or we might so shape it that the equilibrium would be neutral.

And, in general, given a body eolotropic within certain limits, we might shape it in such a manner that the effect of its form would exactly neutralize the effect due to its structure, so that, as far as setting in a uniform field is concerned," it would behave like an isotropic sphere.

Homogeneous Isotropic Ellipsoid in a Uniform Field.— The formule for this case are of course at once obtained by putting r,=r,=r,=« in the above formulez. We thus get

Isotropic ellip- soid,

(85);

Kee eye ee Pete') 1+eM? 2 Ten

ant ian ee ee oe

The following conclusions are worthy of notice :—

1. The resultant magnetization will not, as in the case of an wsotropic sphere, be parallel to the resultant magnetic force.

2. The ellipsotd will tend to set tts longest dimension

parallel to the lines of force; and, since x is involved in the the same numerator in the form x2, this conclusion is the same for a foradia- ,. : u magnetic "amagnetic as for a paramagnetic body. Of course we as fora exclude the mathematically possible case of one of the para- factors 1+«M or 1+«N vanishing or becoming negative.

eal For all weakly magnetic bodies, however, « is so small

amaben(N — M)Borvo (86).*

Influence of form

1 : : :

Assuming, as is always the case in nature, that r, and 7 have the same sign,

: 2 Tn other respects it would not in general behave as if it were isotropic.

MAGNE TIS@®

that the tendency of an elongated isotropic body to set in a uniform field is insensible.

Ring Electromagnet.—A simple case, which has recently Tore. acquired practical importance, is that of an electromagnet having a soft iron core shaped like an anchor ring, whose mean diameter is R, and radius of section a, wound uni- formly with » turns of a primary coil in which flows a current 7 The lines of force and the lines of magnetiza- tion will evidently be circles, and, since the Poisson's surface and volume distributions vanish, the whole mag- netic force 4 will be simply that due to the current. At a distance p from the axis of the ring %=2ni/p; for the whole work done on a unit pole in passing round any coaxial circle of radius p is % x 2rp=4rni.4 The inten- sity of magnetization is, therefore, I= 2nxi/p, and ®= 2ni(4irk+1)/p=2newi/p. Hence it appears that the total induction through a secondary coil of ' windings is 2nn't(4rKfdS/p+fdS'/p), where /dS/p is taken over the section of the core, and /dS'/p over the section of the coil. In the case of an anchor ring of circular section, if we neglect the difference between the radius of the primary coil and the radius of the core, the

expression for the total induction through the secondary is 4ann'ai(R – ,/R? —a).*

In a non-uniform field the problem of magnetic Small

induction becomes very difficult for bodies of finite size, Sphere in

If, however, we deal with infinitely small bodies we may (Vs.

suppose the field uniform throughout the body, and apply the ged. results already obtained to find the induced magnetism.

Small Afolotropie Sphere in a WNon-uniform Field.—Let A,, B,, C; be the components of the induced magnetization parallel to the principal magnetic axes of the sphere, ao,Bo,yo the components of the strength of the undisturbed field at the centre of the sphere in the same direction; then, denotiug 7,/(1+427,) by 5, and so on, we have Ay=5S,a), B,=s,B), Cj=Sgy. If the mag- netization of the small sphcre (of volume v) were rigid, its potential energy W' would be W'= ~—v(Aja)+B,8)+Cyy). The actual potential energy, W, of the inductively magnetized sphere is different, because its magnetism varies as it passes from one part of the field to another. In any infinitely small displacement, how- ever, we may calculate the work on the supposition that the magnetism is temporarily rigid. In other words, we may put aW =dW', where the latter is taken on the supposition that A,,B,,C, do not vary, while on the other hand ao, 8),79 do vary, because the resultant foree both alters its magnitude and its direction relative to the principal axes of the sphere. We thus get

aW = —2(Ajday + BydBy + Cydyo) . In integrating we must take account of the fact that A,,B,,C, are variable. Substituting their values, we get

aw = (Sy ayhay + SoBy4Bo + 8370270) ' whence

W=- (100? + 8589? +8976") oe (87).

This important formula contains the whole of the theory of the movement of small spherical masses of inductively magnetizable matter in any field of force. We can deduce Faraday's from it at once the position of equilibrium

of an zolotropic magne- sphere suspended ina uniform magnetic field, with freedom Pia

; de- to rotate about a given diameter. rial

Let A, u,v and J, m, 2 be the direction cosines of the given diameter from the and of the direction of the field relative to the principal magnetic principle axes of the sphcre, and R the strength of the field; then W= of least — 4uR%(s, +sym?+s,n”). For stable equilibrium W must be a potential minimum, and for unstable equilibrium a maximum, 7.¢., there is energy. stable or unstable equilibrium according as s,/?+sym?+5s,n? is a maximum or a minimum under the given kinematical conditions, which will be expressed by a relation between A, w, v and J, m, n.

It is needless to work out the analytical solution; for it leads to results easily obtainable from formule already given. It is im- portant, however, to show the identity of this method of treatment

3 See art. ELECTRICITY, vol. viii. p. 68.

4 Kirchhoff, Pogg. Ann., Ergbd. v. 1870. In the same paper he discusses the effect of a rectilinear current in a cylindrical iron wire, and finds that the circular magnetization in a wire of length L gives rise to an apparent increase of the coefficient of self-induction equal to QerkL.

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with Faraday’s view of the matter. If a, 0, c be the cornponents of the magnetic induction parallel to the principal axes of the sphere, then we get a=(1+8s,)RJ, b=&c., c=&c.. Whence if N denote the total induction through the sphere! in the direction of the undisturbed field, we have, w being the arca of its meridian section, N= (al +bm + cen) =R+ $rR(s,/? + sym? + 84n?),

N is thus a maximum or a minimum when 3,/?+s,m?+3s,n? is a maximum or @ Minimum.

We have therefore established quite generally Faraday's law that an exolotropic sphere suspended in a uniform field uth freedom to rotate about any diameter will be in stable or unstable equilibrium according as the number of lines of force that pass through tt is a maximum or a minimum. A particular case of this theorem has already been proved above (p. 245) for strongly magnetic bodies.

We next apply the formula (87) to deduce the force of translation in a heterogeneous field.

I, We see that in a uniform field W is constant so long as there is translation merely without rotation, 7.¢., there is no tendency in an olotropic or isotropic sphere to move bodily in a uniform field.

Fara- 2. If we suppose the sphere isotropic (7.c., s, = $= 8, =7),

day's then W = — $ro(a3 + B23 -+72)= —47vR%. Hence the force

. tending to move the sphere in the direction of ds is

; aw a(R? aR

ae = ae = ee = = TOR (88).

deduced. In other words, the small sphere is subject to a force of

Isotropic which the scalar potential is JrvR%. If then we draw

sphere. the isodynamic surfaces R2— const., the force on an inductively magnetized isotropic sphere will be everywhere at right angles to these ; that is, the direction of this force at every point will be tangential to the lines of slope of the resultant force, viz., in the direction in which that force varies most rapidly. In the case of paramagnetic bodies, for which r is positive, the spheres will tend to move Srom places of weaker to places of stronger resultant force ; in the case of diamagnetic bodies, for which + is negative, from places of stronger-to places of weaker force. This is the famous law found experimentally by Faraday, and atfter- wards theoretically established by Sir William Thomson.

Tsodyna- It must be carefully borne in mind that the lines of

i 'i slope of the field are not necessarily coincident with the lines

lines of 2 force, but may cross them at any degree of obliquity.

slope. As strange mistakes have been made in this matter,? it may be

well to illustrate this statement by a few examples,

In the case of an isolated north pole the lines of slope coincide with the lines of force, which are straight lines radiating from the pole. In this case a paramagnetic sphere would approach and a diamagnetic sphere recede from the pole along the lincs of force.

The lines of force for a rectilinear electric current are circles of which it is the axis ; the lines of slope are straight lines radiating from the current. A paramagnetic sphere would therefore move towards, a diamagnetic sphere away froin the current in a direction perpendicular to the lines of force.

*_in the case of an infinitely small magnet, whose lines of force are given by = sin9, the lines of slope are given by r=c' sin'*6/ cos 0 – and the angle between the line of force and the line of slope at the point (7,6) is tan -1{ tano(1 + cos*@)/(3 +5 cos?6/}*

he theory of isodynamics and lines of slope in the case-of plane fields of force, ¢.e., those for which the potential is given by the equation @?V/dx? + d?V /dy?—=0, is remarkably simple. If {=x +ty, =~ ty, we know that V=¢ (t)+¥(n), and » being functions depending on the particular case. When these are known the isodynamics are given by

#(é)¥'(n) = const. XE) ¥(n)

8. Next suppose an xolotropic sphere allowed to move

and the lines of slope by

1 That is, the number of lines of force passing through the sphere (see above, p, 244),

?See Wiedemann, Galvanismus (ed. 1874), ii. 665; Todhunter, Natural Philosophy for Beginners, His Tk WS BIE

without rotation in any direction ds. Let the direction Holo- cosines of the field relative to its principal magnetic axes tropic be J, m,n, then these are constant during the displacement; 'P» and, if R be the intensity of the field, ay= Ri, 8) = Rm, Yo = Rn; whence a(R?) , ds*

Hence, as before, the résultant force of translation on the sphere is along the line of slope, in the direction in which the force increases uf the body be wholly paramagnetic, in the opposite direction if it be wholly diamagnetic.

Besides depending on the nature of the field, the force of translation, on account of the factor 5,[7 + som? + s.n?, depends on the position of the body relative to the lines of force. Bearing in mind the theory of the radii of an ellipsoid, we have the following proposition :—

Lhe force of translation on an xolotropic sphere is greatest when rts aais of (numerically) greatest magnetic susceptibility ts parallel to the lines of force, and least when the axis of (numerically) least susceptibility is in the same position.

Or, using permeability instead of susceptibility,—

The force of translation is greatest for a paramagnetic sphere when its axis of greatest permeability ts parallel to the lines of force, for a diamagnetic sphere when the axis of least permeability is parallel to the lines of force, and vice versa.

Or, yet again, in the words of Faraday :—

The force of translation exerted upon a paramagnetic sphere vs greatest when tt is so placed that the greatest number of lines of force pass through it, whereas in the case of a diamagnetic sphere the force is greatest when it is so placed that the least number of lines of force pass through tt, and vice versa.

Approximate Theory of the Action on Bodies of Finite Size Approxi- ina Non-Uniform Field.—We have seen that, if the square ™ate of the susceptibility be negligible, the effect of the form of pe. Z the body and the

disturbance of the field arising from the of finite induced magnetism may be neglected.

~ a = $0(8,27 + sym? + 33?) (89).

In that case we size. may replace the spheres of the foregoing discussion by cubes, and determine the action on a body of finite size

by integrating the action on the elementary cubes of which

it is composed. Thus the potential energy will be

— £S/ (5108 + 5582 + syy2)dv, and the body need not neces- sarily be homogeneous. From this expression we can deduce the force under given circumstances.

It is quite easy to see, without any mathematical calcula- tion, what will happen in a field of force which diminishes in intensity outwards from an axial line. If we suspend an elongated paramagnetic body with its centre in the axis of the field, it will evidently be in stable equilibrium with its longest dimension placed axially ; for if it were slightly displaced every little cube of it would move into a place of weaker force, and would therefore tend to return. If, on the other hand, the body were diamagnetic, it would be in stable equilibrium in an equatorial position; for any displacement from that position would bring every little cube nearer the axis of the field, ze, into a place of stronger force, and therefore each such cube would tend to return.

General Problem of Magnetic Induction.—It will be instructive to consider for a little the theory of induced magnetism in its most general form.

We shall suppose the induction to arise from given magnetic force (a, 8o, ¥0), arising from pre-existing magnetism (A,,B,,C,) or other- wise. Letters with suffix 1 denote components of induced magnet- ism, of force arising therefrom, and soon. Letters without suffix denote components of total force, total magnetization, &c. Thus Vo, Vy, V denote the potentials due to pre-existent, induced, and total magnetism respectively ; and we have V=V,o+Vj,, and the like relation in other cascs,

We suppose all the media within the field to have definite permeability ; but there may be xolotropy and heterogencity to any extent, and discontinuity along given surfaces,

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General Resolving along the principal magnetic axes at (x, y, 2), we get, by problem the law of induced magnetism, (2,5 Myy %y)y (Loy Mqy M%q)y (Lay 272g, Mg) of mag- being the direction cosines of the axcs a, w2, Ws

netic in- al, + bm, + en = wy (al, + BM, + ym) + 4ar(Agly + Bott + Com) , duction. and two similar equations. Multiplying these by 4, Ja) 43, adding and so on, we get Q= sya + toB + toy + 4rA, b=teatsB+hyy+ 4nBo ° ’ ’ ‘ ‘ where Sy oly? + aryly? + wale” s &c. ;—that is to say, given functions of x,y,2. Besides these, we have the conditions of normal continuity for B, viz.,

ty = AYN Ny, + AHyMgNyF WyMdyMg y

da ab te 5 dx’ dy dz’ and at a surface of discontinuity, A, u, v being the direction cosines of the normal at any point from the first medium to the second, (a-a’)at+(b-b)u+(c-c’y=0, dashed letters referring to values on the first side of the surface, undashed letters to values on the second. 2 From these we get finally, for the determination of V, d (adv dV av

aah ©) da ts + tsi) + ke. +&e +4rpy=0 . (91).

(pak 9 SOR nO GNM age tat (he at 8 dy 3 Gy 18 da re a Re, b a+ &o, b y+ 4moy=0 (92). Here

pami- (Geant ae

oy =(Ag—Ag A+ (Bo — Bo) + (Cy -Co’)v 5

i.e, they are Poisson’s volume and surface densities for the pre- existing magnetization. It may be shown by a method? essentially the same as that used in the article ELecrricity, vol. viii. p. 27, that equations (91) and (92), with the condition that V be continuous everywhere and vanish at infinity, lead to a unique determination of V. When Vv is known, A,B,C, can be found

at once from (90). Case of In what follows we shall confine ourselves to homogeneous iso- homo- tropic media, and we shall suppose that in parts of the medinm geneous inductively magnetizable there is uo pre-existing magnetism. The isotropic equations (91) and (92) then reduce to

medium av V&V ;

with no aa ale ay ata a= . (98); Rae and

existing ’

panied wi tw =O (94), ization. v HA

dy,dy’ being elements of normals drawn inwards in the two media. Equations (90) reduce to a=aa, b=aB, c=ay; ae 1 dV 1 dV 1 dV a a i Ae ae? I “ae aye ae pe Induced From these last, combined with(93), we have the im- magnet- portant consequence that the induced magnetization is ee both solenoidal and lamellar. This is true only for homo- both geneous isotropic media in which the pre-existing magnet- solenoi- ism, if any there be, is solenoidal. daland In all cases such as we are now considering, the part of lamellar. the magnetic potential due to induced magnetism may be calculated wholly from surface distributions at the surfaces

of discontinuity. If o, be this surface density, we have

dv av’ no ae . (96).

From equations (94) and (96) av oa’

one fins, ag

’ B=

where ky =(–a)/4aw’, nf =(@’- w)/4ae.

Let us suppose that a body A of permeability @ is sus-

1 See Thomson, Reprint of Papers on Electrostatics and Magnetism, pp. 548 sq.

pended in a medium of permeability a'. If the suscepti- Differen- bilities be small, the forces arising from the induced tal magnetism will be so small that the direction of the eu normal force at the surface of A will be the same as if the

field were undisturbed by its presence.

First, let the medium be vacuum, for which we suppose aw =1, then, if A be paramagnetic (7.¢, #>1), «, will be positive, and the surface magnetism will be positive where the lines of force leave the body, and negative where they enter it. If A be diamagnetic (7¢, w<1), «, will be negative, and the magnetic polarity of the body as a whole will be opposite to what it was in the former case.

Secondly, let the surrounding medium have permeability a', then x, is positive or negative according as # > or

It appears then that, ly virtue of differential action, a body may behave paramagnetically or diamagnetically according as it is placed in a less or in a@ more permeable medium than itself.

In practice it is most convenient in general to determine Poisson's V, instead of V. The above equations can be easily modified equation, to admit of this. In fact we get at once, remembering that dV)! /dv' = —dV,/dv, since Vy has no discontinuity at the surface of the media,

@V, &V,

*Vy (Q7)- ae * dye * a = ae) dy ay ( ) dy Oe ae)*

These equations, together with the condition that V, be finite and continuous and vanish at infinity, determine V, completely. Since the induced magnetization is lamellar, we may write A, =do,/dz &c., we then get by (95)

aii s (Vet Vil = e(Vo+ Vy)

Q\= = 4 (99),

which give the components of moment in terms of the known function V.

The number of cases in which the solution of the induc- tion problem can be worked out is very small. Besides those already treated synthetically, one or two more, affording examples of the general method, will be men- tioned in the historical summary below. Meantime, we J. Neu- must not omit to mention an extremely elegant transfor- niann's mation theorem, due to J. Neumann,? which enables us to ee deduce the magnetic moment of any body asa whole under theorem. the action of any forces whatever, when its magnetization in a uniform field is known.

Let A,',B,,C,' be the components of induced magnetization pro- duced in the body A by the uniform field whose components are to's Bo's'Vol 3 Ar» By, C, the magnetization produced in A by any field whatever (a,Bo;7o)» Let /dv denote volume integration throughont A; and consider the function

U=/fdr(agAy' + BoB, + 701') «

U is known, since we suppose a Bo»Vo» Ay, By, Cy to be known. Bat, since Ay=x(a)-+ a), &e., Ay'=K(ag +a), &c., we have

v=/ae (- ay ay + 0y/)+ GC, cane = fdv(ay Ay +e.) + fdr(ay'A, + &c.) — fdo(a,Ay +&c.).

Now the last two terms destroy each other ; for they are simply different expressions for the mutnal potential energies of the in- duced magnetism Ane to (a, Bo, Yo) and to (ag', Bo yo), regarded as separate rigid systems, although coincident in position. Hence we

get U= ag flv Ay + B'ofavBy + 0, /aO, ; whence

dU au dU Jonnie fem ag fPr= Ges :

2 Crelle's Jour., xxxvii. 44 (1848). The proof given is a modifica- tion of Kirchhoff's, Orelle, xviii. 366 (1854).

Cases of ellipsoid, &e.

Kirch-, hoff's extension of Poisson's theory.

Cases in which the mag- netiza- tion is uniform.

Coulomb,

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For an ellipsoid this gives at once for the components of moment

a i‘ ae eT : Pate O= aig fits, R= rx fir.

An interesting particular case is that of an infinite cylinder. If P be the component of the moment parallel to its axis, P= —x//dydz (Ve_—-V-o). If the inducing system be magnetic bodies at a finite distance, then Ve=V-»=0, and P=0. If the cylinder be magnet- ized by a spiral current 7, of x windings, of whatever form, then, » being the radius of the cylinder, P = 4a?x«r?nz.!

Generalization of the Z’heory for Isotropic Media in which x is not constant.—In the above theory we have supposed the magnetic susceptibility to be constant. This is by no means the case in nature, however. It is of im-

ortance therefore to consider how the theory must be modified when we assume « to be a function of the magnetization already induced. Subject to the restriction (obviously necessary for isotropic media) that the resultant magnetization shall coincide in direction with the total resultant magnetic force (%), the most general assumption that can be made is

A=f(I)a, B=f(I)B, C=f(I)y. + « + (100), where f is a function depending on the nature of the sub- stance. From these equations, by squaring, adding, and extracting the square root, we get f(I)/I=1/%, in other words, I, and therefore /(I), are functions of 4}. Hence we may write the equations (95). A,=F(H)a, B= FB), C= F(H)y_ « « – (L01). It is easy by means of these to introduce the requisite modifications into the general equations of magnetic equili- brium. For the details we refer our readers to Kirchhoff’s memoir in Ovelle’s Journal,? where the matter was first fully worked out. It will be seen at once that the induced magnetization is in general neither solenoidal nor lamellar.

There is one important class of cases in which the con- clusions arrived at on the assumption that « is constant still hold, viz., those in which the induced magnetization is uniform. Insuch cases I has the same value throughout the body, and « is therefore constant throughout the body in any one case, although it differs from one case to another. Tor example, in the case of an ellipsoid the equations (85) above given for the components of magnetization still hold good, provided we understand x to be defined by the equation

*«=F G ao) + (; fe) + € 2) *] =*

{t is clear, therefore, that by experiments on an ellipsoid placed in a uniform field we could determine the function F(%}), and also test the truth of the mathematical theory. For, A,,B,,C, being obtained by observation, one of the equations (85) will enable us to determine x, and the argument % can be calculated from'a,, Bo, yy and A,,B,,O, ; the test of the truth of the theory would be the agreement of the three values of « obtained from the three equations (85).*

Historical Remarks on the History of the Mathematical Theory.—Although the ZYentamen of Apinus, published in 1759, and the discoveries of Mayer and Lambert did much to make clear the exact nature of the problems in- volved in the modern mathematical theory of magnetism, yet the origin of that theory is usually, and with justice, dated from Coulomb. Not only did the results of his careful and judicious experiments afford the means of bring- ing a mathematical theory to the test, but the marvellous sagacity he displayed in analysing the phenomena enabled him actually to lay the foundations upon which such a

1 Kirchhoff, 2. ¢. ? xIviii, 370, 1854. 3 Mém. del Acad. de Paris, 1780, 1785, &c.

*theory could be constructed. After him, Biot * and Han- Biot. steen,° of whose services we have already spoken, are to be Hansteen. reckoned as pioneers. The theory as it now stands was virtually created by Poisson in four of the most admirable Poisson. memoirs ® to be found in the whole literature of mathemati-*

cal physics. In the first two he investigates expressions for

the force due to bodies magnetized in any manner; he then applies his formulz to the case of bodies inductively mag- netized but having no coercive force. Although he con- fines his investigations to the case of isotropic bodies, he is quite aware of the general nature of the consequences of eolotropy, and in fact distinctly predicts as possible the mag- necrystallic phenomena afterwards discovered by Pliicker and Faraday. The formule he gives are practically identi-

cal with those given above (p. 248). He works out in detail the solution for the case of a hollow or solid sphere exposed to any system of inducing forces having a poten- tial,' and in particular compares the results, when the inducing field is uniform, with the experiments of Barlow.

In the second memoir he works out the solution of his equations for an ellipsoid in a uniform field, examining specially the case of an ellipsoid of revolution and its extreme cases (see above, p. 245). At the end of this memoir he discusses the disturbing forces on a compass, arising from the earth's induction on any distribution of soft iron, and shows that the given components of the disturbing force are expressed by linear functions of the components of the earth's force, involving nine constants which depend on the quantity and distribution of the iron. The third memoir, on magnetism in motion, is an attempt to explain the phenomena of the deviation of

the magnetic needle caused by rotating metal spheres or disks. Although the physical interest of this memoir was

in a great measure destroyed by the discoveries of Faraday

as to the true nature of this action, yet, as a piece of profound mathematical investigation, this work of Poisson's

is still worthy of study; nor is it perfectly certain that

his theory will not after all be required to explain certain residual phenomena. The fourth memoir develops the mathematical theory of the deviation of the compass caused by the iron of ships. After Poisson the most

im- portant investigators are Green and Gauss. Green's ser- Green. vices have already been alluded to in the article ELEc- Gauss. TRICITY ; we need only mention here his approximate solution of the problem of the magnetic distribution on cylindrical bars, which gives a formula agreeing with that

of Biot. The all-important work of Gauss has already been detailed.

In Crelle's Journal for 1848 J. Neumann worked out Neumann. the solution of the induction problem for an ellipsoid of revolution under the action of any conservative system ; and six years later, in the same journal, Kirchhoff worked Kirchhoff. out the case of a circular cylinder of infinite length. We are not aware that the solution of Pvisson's equations in particular cases has been carried any farther, unless we include as new the case of a hollow ellipsoid treated by A. Greenhill. G. Greenhill in the Journal de Physique for 1881.

The most important contributions to the general theory of magnetism since Poisson are to be found in a series of memoirs § by Sir William Thomson, the first of which Thomson. appeared in the Philosophical Transactions for 1851. He divests the theory of Poisson of all particular assumptions connected with the two-fluid theory, and bases it on a

4 Traité de Physique, 1816.

5 Magnetismus der Erde, 1819.

8 Mém. de Ulnst., v., 1821 (two memoirs); vi, 1828; and xvi., 1838.

7 He did not use the word " potential," although he uses the corre- sponding function.

8 Reprinted in 1872 under the title of Papers on Electrostatics and

Beer. Beer? the friend and coadjutor of Pliicker. The experi- | force, and the plane of a and ¢ began to do so; , the menters who followed these-masters were less intelligent, | number of degrees between this point and the end of the and the theory of Thomson was for a number of years mis- | axis a, was observed. The times of vibration, T, and T,, understood or neglected, the result being much fruitless | of the ellipsoid, when suspended so that a and c were vertical, discussion in which the true issues were often confused. | were then observed. By the theory we ought to have Of late the theory has obtained wide currency and the tan w = T2(b2 + 0)/Ti(a? 0). pati os pc et sigh if en ig The value of w calculated by means of T, and T, from Helm- ol ee bel re 1 B2)/T?2 + (02 + 02)/TR – (2 +.0)/T2=0; the more important papers on the mathematical theory of magnet- een , ism that have appeared recently, and are not quoted above:— and the observed values of T,, T,, T, did, in fact, satisfy Jeg eee la reo du ee at hae this equation very nearly. Dronke's experiments on ellip- XXXI1X., ; . eumann, orlesungen woer are veorve acs ' ae 3 ier ee Magnetismus, delivered 1857, edited by C. Neumann, 1881; soids of — and nickel were of a similar character. , Riemann, Schwere, Electricität, wnd Magnetismus, lectures de- Deviation of the _Compass.—One of the earliest and First ob- livered in 1861, edited by Hattendorf, 1876; Lamont, 'Beitrag | certainly the most important of the applications of tlie serva- zu einer mathematischen Theorie des Magnetismus," Sitzber. d. | mathematical theory of magnetic induction was the discus- oe of Bayer. tad, Woes Le Weber Zur Thane diy Mele | sion of the deviation of the eompass eased by the magnet lon man's Jour., 1879 (ealeulation of couple on a body suspended in { ism of the iron in ships. This disturbance seems to have a heterogeneous magnetic field); Boltzmann, " Magnetisirung | been first noticed by Wales the astronomer, who accom- uns vise 5 em een 1 9; sii od eee panied Cook on his voyages of discovery (1772 to 1779). lamagnete Wirkendae Ta, tend. er. 95 1eCKEe, ucad. s 4 : z m Ann., 1881 (approximative solutions of the problem of magnetic The oe thing was noticed during the voyage of D'Entre induction). casteaux in search of La Pérouse; and Beautemps-Beaupré, who accompanied him, calls attention to the errors thence TABwerrs Gx SrRONcey Nc Bone arising the surveying of coasts by means of the compass. Flinders,® using the numerous observations made by Wales Experi: Zhe earliest experiments bearing on the mathematical | and by himself, endeavoured without success to construct ments of theory of

magnetic induction are those of Barlow‘ and | empirical formule for correcting the errors of the compass. oes Christie, who determined the deflexion of a compass needle | He also attempted to correct the errors partially by means Christie. Placed in various positions relatively to spheres of cast | of a vertical bar of soft iron placed near the binnacle. iron inductively magnetized by the earth’s force. They | Barlow ® and Scoresby 1° also occupied themselves with the found that the deflexion a of the compass could be repre- | problem. sented by tana=Asin@cosOsing/7r, where is the angle The unusually great deviations observed during the between the line of dip and the line joining the centres of | Arctic voyage of the “Isabella” and “ Alexander” in 1818 the sphere and compass, and ¢ the angle between the plane | attracted the attention of Poisson, and gave rise to his of these two lines and the plane of the magnetic meridian. | memoir on the subject already alluded to. Important as It was also found that the deflexion produced by a hollow | the matter then appeared, it became still more so after the sphere was as great as that produced by a solid sphere so | introduction of iron ships. Investigations both theoretical long as the thickness of the former was not less than the | and experimental were made ii England by Johnson, zirth of its radius. Airy,!? Evans,3 Smith,!? &. It is to Smith that the Magnetic All these results of Barlow and Christie are in agreement | mathematical theory as it now stands is mainly due. sercens,

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small number of principles drawn from observation. He enters more fully than Poisson had done into the specifica- tion of magnetic distribution. He gives simple synthetic solutions of the induction problem for spheres and ellipsoids ina uniform field. He gives for the first time with full generality the theory of induction in xolotropic media, and shows that Poisson’s theory thus fully developed leads to all the laws of paramagnetic and diamagnetic action discovered by Faraday, and also to the laws of magnecrystallic action discovered by Plticker and Faraday. The value of his theory was fully recognized by Plicker,! and apparently also by Faraday ; indeed one of its ablest expositors was

with the theory of Poisson.> Another consequence of great practical importance follows from the mathematical theory, viz., that inside a hollow iron sphere of any considerable thickness the magnetic force is very small in comparison with the external inducing force. Sir William Thomson takes advantage of this principle to render his marine galvanometers independent of external magnetic force by surrounding them with a tube of soft iron.

Along with the experiments of Barlow we may rank

: See Phil. Trans., 1858, p. 587. Sce his Hinlettung in die Electrostatik, die Lehre vom Magnetismus, und die Electrodynamik, published after the death of its accomplished

author, under the editorship of Pliicker, This is one of the best works on the subject.

{ Monatsber. d. Ber. Akad., 1881. . Barlow, An Essay on Magnetic Attractions, London, 1820. ee Poisson's first memoir, or Maxwell, El.and Afag., vol. ii. $435.

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those of Pliicker ® and Dronke' as affording us the means Plicker of testing the general applicability of the mathematica] and

theory to the magnetization of soft iron. experiments an ellipsoid of soft iron was fixed in a gradu- ated brass ring with its longest and shortest axes (a and c) in the plane of the ring. When the ring was suspended with the longest axis a vertical in the nearly uniform field between the two flat vertical faces of the poles of an electro- magnet, the mean axis 6 set itself parallel to the horizontal line of force ; as the point of suspension was moved along the circumference of the ring a point was reached at which the plane of J and a ceased to set parallel to the lines of

The cause of the deviation of the compass is twofold ; Causes «f

In Pliicker's Dronke,

it arises partly from the permanent magnetism of the ship, devia-

*partly from the temporary or induced magnetism. The * permanent magnetism of the ship is acquired for the most part during the process of building. The earth's force acts on the iron, and the constant jarring in the process of con- struction enables it to induce a considerable permanent magnetization, which the ship carries with her to sea. The quantity and distribution of this magnetism will depend greatly on the build of the ship (whether of wood or of*

5 Phil. Trans., 1858, p. 555.

8 Phil. Trans., 1805.

107 Oya SUS anil ee 2) sce

12 76., 11839; &c.

13 See- Admiralty Manual for the Deviation of the Compass, 4th ed , 1874; also a very interesting obituary notice of Smith by Sir W. Thomson, Proc. Fou. Soc. Lond., 1874.

7 Pogg. Amn., 1862. 9 7b,, 1831. ll 7b,, 1836.

100.

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Perma- iron), and on her position with respect to the magnetic nent and meridian during building. A considerable portion of it ig subper- what Airy calls subpermanent ; 7.c., it diminishes gradually manent me : ; i 5 ; maenet- 28 the ship is worked. This magnetic settling down will eon. take place more rapidly in a steamer which is constantly agitated by the jarring of machinery than in a sailing ship, unless the latter be subjected to shocks from the impact of waves in rough weather. After a time the ship reaches a more or less stationary condition as to per- manent magnetism. Along with the phenomenon of sub- permanent magnetism has to be classed what is sometimes Sluggish- called the sluggishness of ships' magnetism ; this

arises ness. from the fact that all the temporary magnetism of a ship which has sailed for some time on any one magnetic course in any one latitude does not at once disappear when the course or the latitude is changed, so that to the permanent magnetism of the ship has to be added a subpermanent magnetism depending on her course and position several days before. It is evident that the cause of disturbance at pre- sent under discussion is somewhat capricious, and can only be controlled by constant attention on the part of the mariner. Tempo: The temporary induced magnetism depends on the ship's rary mag- position on the earth, and on her angular position relative netism. t the magnetic meridian; but, so long as the iron in the ship or the position of the compass is not altered, the con- stants which determine it remain the same; the disturbance can be foreseen, and either allowed for or mechanically corrected with much greater certainty than in the case of the permanent magnetism.

Mathematical Formule for the Deviation.—Let the origin be at the centre of suspension of the compass card ; and let the axes of x, y, and zbe drawn in the direction from stern to head, in the per- pendieular direction from port to starboard, and vertically down- wards respectively, the ship for the present being supposed to be on even keel. Let P, Q, R be the components of the magnetic force parallel to these axes arising front the permanent magnetism of the ship ; ~, y, z the components of the earth's force ; and 2', y/, 7 the components of the whole force at the centre of the compass eard. Then

a =we+actbytez+P ya=ytdeteytfetQer. . . 6

amet gethyt+het+R

are, according to Poisson's general theory, the fundamental equations of the subject. P, Q, R are constants depending on the permanent, and a, b,c, d,e,f,9,h,% constants depending on the temporary induced magnetism.

Nine By a synthetic process of great interest and importance we may rods to show that the nine constants a, b, c,d, c, f, g, h, & are all independ- repre- ent. For example, if we place a rod of practically infinite length sent the with itsend before the binnacle, and stretching forward, or with its

Poisson's equa- tions,

(108)

induc- end abaft the binnacle and stretching aft, it will give rise to the tion con- term ax ina', If a be negative the rod must be finite and it must stants. run under the binnacle, ending a little fore and aft; again, to represent dv, we must have a pair of infinite rods with their ends to starboard and port of the binnacle, and running fore and aft or aft and fore respectively, according as d is positive or negative ; finally, to represent gu, a pair of infinite rods with ends above and below the binnacle, running fore and aft or aft and fore respectively. The reader will have no difficulty in completing the scheme, the rule being that the ends lie in the direction of 2', y', or 2, and the lengths in the direction of x, y, or 2. From equations (103) the deviation of the compass is expressed in terms of the magnetic or of the compass course as follows. Let H be the horizontal force of the earth; H' the horizontal foree of the earth and ship; the dip; ¢ the ''magnetie course," 7.¢., tle azimuth of the ship's head eastward from magnetic north; ¢" the "compass course," 7.¢., the azimuth of the ship's head eastward ; from the direction of the disturbed necdle; 5=¢-—¢ the easterly Devia- deviation of the compass. Then tion in H', 7. : term of rH st d= 3.4 Bsin (+ Ccos¢+ Hsin 2¢+ € eos2¢ magnetic : (104), oe JF, 0088=1+ Boos ¢- Csin¢+ Deos2¢— Esin2¢ courses. " d—b a—e d+b Where ARTES Ba By Ea

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*From (104) we get tanp= ot Bain (+ Ccos'(+ Dsin2¢+ E cos2¢ : 1+ Bcos(— @sin (+ Deos2¢- Esin2¢e **

whieh gives the deviation on any given magnetic course. From (105) we get by substitution

sind=Aeosd + Hsin ¢' + Coos ¢' + Dain (2¢' + 8) + Ecos(2 ¢' +8)(106), an_ equation connecting the deviation with the eompass course.

When the deviation is not greater than 20° or so, then (106) may be replaced with sufficient accuracy by

5=A+Bsin¢'+Ccos¢'+Dsin2¢'4+Eeos2¢' . . (107),

where 3, B, €, D, €, are nearly the natural sines of A, B, OC, D, E.

In the above it is supposed that the ship is on even keel. Strictly Effect of we ought to take into account both the pitch and the heel of the heeling. ship ; in practice the pitch is always so small as to be of no conse- quence, but the heel, especially in a ship under sail, may be very considerable. When the ship heels through an angle z, the deviation is obtained from the above formule by writing a, bi, &e., in place of a, b, &c., where

(105),

ai=d, b=beost—esini, ¢=ccost+bsint, d;=dceost-gsint, e=c-(f+h)costsinté — (e—k)sin2i, Si=ft+(e-k)ecosisini—(f+h)sin2z7, gi=gceosi+dsinz, hi=h+ (e~-k)eosisiné —-(f+h)sin??, ky=k+(f+h)cosisini + (e-k)sin®4, P;=P, Q;=Qeosi—Rsinz, R;=Reosi+Qsini.

If the soft iron be symmetrical with respect to the fore and aft

central line, and if7 be so small that its square may be neglected, then

M=A, =|, aa, €;= Es, B= B, 1 R he ee C-O44tandi€ 4343

and if 8; represent the deviation for the given compass course ¢' when the ship heels ¢ to starboard, 8 the deviation on the same course on even keel, then

c— g. ° / e+ J. / 5;=5+ or t+ Jicos¢ a teos2('. .

The part of the deviation which depends mainly on & is called Constant the 'constant deviation"; it ean only arise from horizontal in- devia- duction on soft iron unsymmetrically placed. tion.

The part depending mainly on % and , viz., Beos¢'+Csin¢', Semicir- is called the ''semicireular deviation" because it vanishes and cular de changes sign on two diametrically opposite compass courses, or viatiou. neutral points. The principal coefficient of the semicireular devia- tion is B=(ctan0+P/H)/aA; ctané/a

arises from vertical indue- tion in soft iron before or abaft the compass; P/AH arises from the permanent magnetism of the ship. The second coefficient €= (ftan 6+ Q/H)/a consists of ftan 6/A, arising from soft iron unsym- metrically placed, and therefore in general very small, and Q/AH arising from permanent magnetism. % can be reduced to zero by a magnet placed fore and aft with its centre in a transverse vertical plane passing through the compass, by meaus of a transverse magnet in a fore and aft plane through the compass. ool

In wooden ships the courses for which the semicircular deviation vanishes are nearly north and south; but in iron ships they approximate to those points of the compass towards which the stem a stern lay in building.

The terms Dsin 2%' + Keos2¢', depending mainly on the constants Quad- D and &, are called the "quadrantal deviation." This part 1s rantal alternately easterly and westerly in the four quadrants, vanishing devia- on four compass courses. B=(a- ¢)/2a is the principal coefficient tion. of the quadrantal deviation ; it depends on horizontal induction in symmetrically placed fore and aft or transverse soft iron. It is in general positive, and in that case ean be redueed to zero by two transverse rods with their ends symmetrically placed to starboard and port of the compass. In practice two hollow spheres an inch or so thick are used instead of the rods. _ The other coefficient € =(d+)/2a is in general small, as it depends on horizontal induc- tion in soft iron unsyminetrically placed. It is only when the ship heels that this coefficient is in general of any importance.

Whereas the semicircular deviation depends both on the geo-

graphical position of the ship and on the state of its subpermanent magnetism, the quadrantal deviation is independent of both, and ean be corrected mechanically once for all, or allowed for by means of tables constructed from observations made in any one place. The amount of the semicireular deviation in England does not exceed 10° for wooden ships of war, but in iron-built ships it fre- quently exceeds 30° even at the standard compass. The quadrantal deviation in wooden ships does not often exceed 1° or 2°; in ordi- nary iron ships it ranges from 3° to 7°, but in some

armour-plated iron ships of war it has reached as much as 84° at the standard compass, and 15° for compasses less favourably placed.

(108).

Deter- mination of devia- tions by

‘ swing-*

Thom- son’s compass.

Experi- mental diffieul- ties.

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The chief part of the heeling deviation is the term Jicos¢’, depending on the coefficient J =(¢-k-R/Z)tan6/a, This coefti- cient may be reduced to zero by increasing or diminishing the earth’s vertical foree by means of a vertical magnet under the compass.

The usual way of ascertaining the deviations of a ship’s compass is to “swing” the ship gently round so that her head comes into various positions, and to observe with the compass the magnetic bearing of some well-defined distant point (compass mark) on shore. ‘The true magnetic bearing of this point is then ascertained, which may be doue by taking the compass ashore, carefully placing it in a line join- ing the compass mark with the point on board at which the compass was formerly placed, and then taking the mag- netic bearing of the mark once more. Care must of course be taken that there is no local magnetic disturbance at the shore station. The differences between the bearings on board and the bearing on shore give of course the devia- tions for the various positions of the ship’s lead.

When the deviations have thus been ascertained they may be either corrected by means of tables, by graphical methods, such as the steering diagram of Napier or the dygograms of Smith, or mechanically as we have partially explained. For full details on the subject the reader should consult the Admiralty Manual on the Deviation of the Compass.

Of late years Sir W. Thomson has devoted his great scientific knowledge and well-known practical sagacity and inventive skill to the improvement of the compass. By reducing the size of the magnets and increasiug their number he has succeeded in reducing Airy's apparatus for the mechanical correction of the quadrantal deviation within convenient bulk, and by lightening-the card and suspension of the magnets in a very ingenious manner (at the same time throwing all the remaining weight as much as possible to the circumference) he has reduced the friction on the pivot to a minimum while retaining a sufficiently long period of vibration to secure perfect steadiness. He has also contrived apparatus for facilitat- ing the determinations of the deviation on different courses and of the heeling error.!

*The experimental investigation of induced magnetisn reduces itself mainly to the investigation of the dependence of the magnetic susceptibility x * (or the magnetic per- meability #) upon the magnetizing force #. Confining ourselves to the strongly magnetic metals, iron, nickel, and cobalt, it will be seen presently that « depends, not only upon 4, but also upon the magnetic condition of the body at the actual moment when 4 is in action, and upon its previous magnetic history. « also depends greatly on the temperature, on the state of the body as to purity (notably in the case of iron and steel on the percentage of carbon present), and on the temper. Thus, if we make one experiment on a body by magnetizing it in any way, we permanently alter its magnetic properties, and can restore it to the magnetically virgin condition only by heating it toa high temperature; but in this process we are very apt to permanently alter its molecular condition, so that, although magnetically indifferent, it is physically changed. Owing to the fact, already insisted upon, that we cannot infer the magnetic distribution inside a heterogeneously magnetized body from its external magnetic action, and to the fact, presently to be established, that « varies with %,*

u For a description of his compass see art. Compass, vol. vi. p. 228. Detailed descriptions of the compass with instructions for its adjust-

t ; ' 1873) issued in the form of a small pamphlet (Maclehose, Glasgow,

, & is sometimes called by Contineutal writers the magnetization

unction, ‘They have also a habit of speaking of the ratio of whole

magnetic moment of a body of any form divided by its volume to the

ae ” ae ae be is placed as the magnetization function : articular form. This is a most i reni racti

has led to considerable confusion, ‘ EE ee

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it is of the last importance to clioose the experimental Import-

circumstances so that both the magnetic field and the in- duced magnetization shall be uniform, or very approximately so, A further necessity for the fulfilment of these con- ditions arises from the fact that we must in all cases be able to render an account of the effect of the form of the magnetized body, because the true argument of « is not the strength of the original field but the whole force % due to the original field and the induced magnetism together.

The simplest method for securing a uniform field whose strength can be controlled is to place the body inside a hollow cylindrical coil (usually called the magnetizing spiral), whose length so far exceeds that of the body that the disturbance arising from the ends of the coil may be neglected in the neighbourhood of the body. The results in all cases where the length of the body or core is nearly equal to or exceeds that of the coil are impure, and can only be used with the greatest caution in drawing general conclusions as to the value of x. The core should always be either exactly or approximately one of the calculable forms, but preferably such that the dimension parallel to the axis of the spiral very much exceeds the others, because in this case the effect of the form is of secondary importance compared with the effect of the susceptibility (see above, p. 245). Thus a very thin cylindrical core is convenient, because the force inside it differs very little from that of the undisturbed field, and any small difference can be easily calculated by supposing the cylinder replaced by a very elongated ellipsoid. On the other hand, a thick cylindrical bar is a bad form of core for the determination of x, both because the magnetizing force inside it is

less than the intensity of the undisturbed field by a large quantity, which it is impossible to calculate, and because the magnetization at the end is not uniform, and the disturbance thereby arising is so great that it may mask the general character of the function « altogether. A further question arises as to how far the time during which a magnetizing force acts affects the resulting magnetization, whether temporary or permanent. It is also important to consider the disturbances arising during the

make and break of the current in the magnetizing spiral. . 4

As the resistance in the circuit is usually small, and the self-induction and capacity scnsible, oscillatory currents may arise ; to these will correspond oscillatory magnetizing forces, which may even vary in sign, When we consider that the permanent magnetization produced by any force may be very much weakened or eveu altogether destroyed by a smaller force in the opposite direction, it is evident that we have no right to conclude that these disturbances, especially at break, will be without effect upon the per-manent magnetization. In order to elude these difficulties, some experimenters have followed the practice of first establishing the current, then gently? introduciug the core into its place, and finally removing it before breaking the circuit. In this way the disturbances just alluded to are avoided ; but another difficulty is raised, for it is clear that in this operation the core passes through a heterogeneous field before it reaches the final position where the magnetiz- ing force is uniform; diffcrent parts of it have therefore been subjected successively to different influences, and we are not at liberty a priore to conclude that this fact will not influence the results. Perhaps the best plan would be to place the core in its position, and allow the current to rise very slowly to the maximum value required, and then to fall slowly to zero. This, however, is not the place to dogmatize concerning the best method of experimenting ; all that is necessary is to furnish the reader with points of

3 Carefully avoiding all shocks or tremors which exercise a very important influence on the induced magnetism, see below, p. 268.

ance of uniform magnet-

ization,

Uniform field.

Best forin of eore.

Disturb- ances at make

break,

a moment of the core was measured by the induction current In these experiments the method of deflexion was used. Experi- Jacobi. in a secondary coil placed upon the magnetizing spiral. A | The magnetizing spiral was placed magnetic east and west, baie ae considerable portion of their work was directed to proving | and in the continuation of its axis was hung a magnetic ; 'principles which we here take for granted, e.g., that the | steel mirror in a thick copper box to damp its oscillations. magnetizing force is independent of the thickness of the | The deflexions of this mirror, read as usual with a scale wire of the magnetizing spiral, of the radius of its wind- | and telescope wheu the core was not in, gave a measure of ings, and soon. They concluded from these experiments | the current; and the inercase of the deflexion on introduc- that the magnetization is proportional to the magnetizing | ing the core gave a measure of the magnetic moment of force ; z.¢., x is constant for a given quality, &c., of metal. | the core, The cores were cylinders 22 cm. long., 1:35 cm. Joule. The experiments of Joule," which were made independently | thick, and the length of the spiral was only 24 cm,,—so about the same time, led in general to a similar result. | that perfectly pure results could not be obtained. To His method consisted in measuring by means of a balance | compensate to some extent for the shortness of the spiral, the attraction P between two electromagnets actuated by | the bars were gently drawn to and fro several times the same current C. Ifthe magnetization of the core were | before being placed in the final position for which the strictly proportional to the magnetizing force, z. ¢., to the | reading was taken. In order to measure the permanent current, tllen P would be proportional to C, and P/C?| magnetism the core was removed, the current broken, the would be constant. In most cases this was so; but in | core returned to its former position, and a reading again two cases, where the cores of the electromagnets were very | taken. The conclusions arrived at were as follows. thin and the windings more than usually numerous, the I, When a steel or iron bar is magnetized for the first*

Maxi- xde- ratio P/C? was found to decrease as the current increased. | time by a current C, the temporary moment K produced ™™™ of creases This shows that the magnetization tends to a maximum | during the action of the current at first increases faster j 0°" for large value as the current increases, in other words, that, for | than the current, then more slowly, and finally tends to a ana a very large values of 4, « decreases. maximum, as shown by Joule and Miiller. The period of turning Miiller, Miiller,? using the method of deflexions, arrived at a | quicker increase is more marked in long than in short point. similar conclusion, His cores were 56 cm. long and from | bars; it shows itself even on remagnetizing bars that have 9 mm. to 44 mm. thick, his magnetizing spirals from 48-2 | been several times magnetized and demagnetized. As C em. to 53'2 cm. long ; his results are therefore impure, and | increases, the maximum of K is reached sooner in thin and the empirical formula by means of which he represents | long bars than in short and thick bars. Between the them of comparatively little importance ; but the approach | period of increase of K/C and its period of decrease there Maxi- t9 a maximum of magnetization (saturation) is quite | is no period of any considerable length for which it is con- mum of clearly demonstrated. He found, in accordance with | stant. This last fact may be shown by means of the ea theory, that if we increase the external magnetizing forces | experiment of Koosen described above; viz., if the com- ' (>) saturation is more quickly reached in thin than in | pensation be made for very small currents, when tlie thick bars. Somewhat similar experiments were made by | current is increased, at first the electromagnet prevails, Von Waltenhofen, who deduces® from some of his own | and the needle goes to one side of zero, then the current in experiments with very thin cores, and from the experiments | the coil prevails, and the needle returns towards zero, and of Miiller, Weber, and Dub, 1678 to 2125 mm. mg. sec. | finally deviates on the other side. units of magnetic moment per mg. of iron as the maximum The point at which the ratio K/C has its maximum for of magnetization. This would give from 1317 to 1668 | any particular electromagnet is called by Wiedemann the C.G.8. units for the maximum magnetic intensity in iron. | "turning point" (Wendepunkt). The turning point relates These numbers, derived from more or less impure results, | to the body as a whole, and the value of the external are merely rough approximations, but they agree very well | magnetizing force 4%, for which it occurs depends both on the with those derived at a later date by methods*

less open to | form of the body and on the nature of the metal. It has theoretical objections. therefore no very definite physical meaning. It must be Koosen's The approach to saturation may be very neatly demon- | carefully distinguished from the "saturation point." Any ment, Serated as follows.© The same current is sent through a | element of a body is said to be magnetized to saturation ' galvanometer and through the coil of an electromagnet | when no increase of the magnetic force can increase its with a thin core. The electromagnet is so placed that its | magnetization any farther. It may happen, however, that action on the needle of the galvanometer just compensates | some parts of a body are magnetized to saturation while the action of the galvanometer coil for a particular strength | others are not. With regard to the turning point, Dub ? of current ; the needle then points to zero. If now the | has shown that with similar and similarly wound cores the current be increased, since the increase of magnetization does | turning point occurs for the same value of the current. not keep up with the increase of the current, the action of | This is of course in agreement with an obvious corollary the coil prevails, and the needle deviates accordingly. of the general theory of magnetic induction. Wiede- The most extensive and important of the earlier II. In a freshly! magnetized bar the permanent moment > «researches into the general nature of magnetic induc- | which remains after the action of the current has ceased searches, #0 are those of Wiedemann.? An epitome ® of his | at first increases quicker than the producing current ; but

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view from which to criticize the experimental results now to be cited. In the researches of Lenz and Jacobi! the magnetic

results, with references to contemporary or preceding researches in the same direction, will put the reader in possession of almost all the more important general facts

1 Pogg. Ann., xlvii., 1839.

2 Sturgeon's Annals of Electricity, vol. iv., 1889; Phil. Afag., ser. 4, vol. ii. 3 Pogg. Ann., \xxix., 1850.

4 Sitzber. d. Wien. Akad., 1865. 5 Pogg. Ann., cxxxvii., 1869,

® Koosen, Pogg. Ann., 1852; also Dub, 76, 1853.

7 Pogg. Ann., c., 1857 ; Ib., cvi., 1859; 1d., cxvii., 1862.

8 Abridged from the author's own work, Galvanismus, Bd. ii. §$ 309 sg.

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known until the quantitative experiments of Stoletow,

Rowland, and their followers gave a complete account of the general characteristics of the function x.

for stronger currents a turning point is reached ; and then the moment increases more slowly than the current, and approaches a Maximum,

IIL. In attempting to destroy the permanent magnetism of a bar by means of a demagnetizing current, it may happen that a current, which, during its action, already

9 Pogg. Ann., 1868.

20 See Thomson, quoted by Joule, Phil. Trans., vol. cxlvi., 1856.

1) That is, after being heated white hot to destroy all pre-existing magnetism,

Demag- netiza- tion easicr than magnet- ization.

Uni- lateral property of de- magnet- ized bar.

Repeated magnet- ization and de- magnet- ization,

Tem- porary and per- manent magnet- ism in hard and soft steel, and in soft iron.

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produces a temporary magnetic moment of opposite sign, still leaves on ceasing to act a permanent magnetic moment of the same sign as before, although less in amount.! On increasing the demagnetizing current still farther the per- manent moment is at last destroyed. In this process the permanent magnetism decreascs faster than the demagnet- izing current increases,—so that the current required to destroy a given permanent magnetisne is less than the current that originally produced u.?

IV. When a fresh bar has been magnetized with any permanent moment, and then demagnetized by a current —(©', opposite to the magnetizing current C, a second application of ~~C', or of any weaker current in the same direction, will not produce a reverse permanent moment, although a current C' in the same direction as C will mnagnetize the bar permanently in the original direction more or less strongly. It follows therefore that demagnetiz~~ing by an opposite magnetic force, although it may destroy the permanent magnetism of a body, does not render it magnetically indifferent, as heating to a white heat would do. The body remains in fact more easily magnetizable in one direction than in another.'

V. In certain cases a fresh bar was magnetized by a current ©, and then partly demagnetized; it was then found that a current C was required to bring it back to its original permanent moment.

VI. In another case a fresh bar was magnetized by a current C to permanent moment K, then reduced by a demagnetizing current C' to permancnt moment K', then by a direct current C" less than C brought to permanent moment K", It was then found that a current C' was necessary to bring it back to permanent moment K'; and this held whether K' was positive, zero, or negative.

VII. When a bar is repeatedly magnetized and demag- netized by currents of the same intensity, the permanent magnetic moments corresponding to a given force become, to begin with, a little greater than at first; to begin with, they increase faster than the magnetizing force, though not so fast as at the first. The turning point, however, occurs for a weaker current than _ bcfore. The magnetization obtained with the strongest current gradually decreases a little. The moments left by the demagnetizing current decrease less rapidly than before, so that a current at first capable of demagnetizing

the bar altogether leaves after repeated magnetization and demag- netization a slowly increasing residual moment. After a large number of repetitions of the operation of magnetiza- tion by a current C and demagnetization by a current —C', the bar finally reaches a constant state, so that each magnetization and demagnetization leaves a corresponding invariable permanent moment. When we pass beyond the limits C and—C', these phcnomena arc repeated in the same order as before.#

VIIL All the above phenomena are most clearly seen in hard steel, less clearly in soft stcel and iron. For small magnetizing forces the temporary moment in hard steel is less than in soft steel, and greatest of all in soft iron. The general rule is, the harder the material the less the tem- porary and the greatcr the permancut moment for a given magnetizing force.

IX. If, however, we consider the ratios of the tempvurary moments in soft steel and iron to the temporary moment in hard steel, all for the same force, then these ratios decrease gradually as the force increascs; so that the tcm-

1 See Poggendorff, Pogg. Ann. plsoos

? This result had also been arrived at by Abria, Ann. d. Chim. et a. Phys., 1844; and by Joule, Phil. Mag., 1847, Phil. Trans., 1856.

Similar conclusions were arrived at by Ritchie, Phil. Mag., 1833 ; Jacobi, Pogg. Ann., 1834; Marianini, Ann. Chim. ef d. Phys., 1846.

- *On the same subject see Jonle, Phil, Trans., 1856; also Von Waltenhofen, Pogg. Ann., 1864.*

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porary moment in soft iron reaches its maximum sooner than in soft steel, and still sooner than in hard stcel.5

The earliest experiments from which definite values of Earlier A cylindrical values bar, 10-02 cm. long and '36 cm. thick, was placed inside a © ™

« have been calculated are those of Weber.®

spiral so long that the magnetizing force throughout the length of the bar could be assumed to be uniform. The moment of tle bar was measured by the method of deflex- ion, the action of the spiral on the deflected magnet being compensated by means of a part of its own circuit suitably arranged. The intensity of the current in the spiral was found in absolute measure by means of a tangent galvano- meter. Assuming that the bar could be replaced by a very elongated ellipsoid, Kirchhoff calculated by means of the © theory explained above (p. 249) the values of « for values of 4) ranging from 29°6 to 248-4 (C.G.S. units), and found that it decreased steadily from 25:0 to 56. In the experiments

of Von Quintus Icilius' bars were used which had bcen Quintus reduced by filing as nearly as possible to the form of Icilius.

ellipsoids of revolution. The magnetic moments were measured partly by the deflexion method, partly by the method of electromagnetic induction. In this last method a secondary spiral is placed upon the magnetizing spiral, and the induced current in it, caused by reversing the magnetizing current, is observed first when the ellipsoid is in the magnetizing spiral, secondly when it is not. When these currents are known in absolute measure, the moment of the ellipsoid can be calculated. The experimenter did not himself reduce his results so as to obtain x, but con- tented himself with remarking that the ratio of the whole moment of the ellipsoid K to the strength of the undisturbed field #), reached a maximum as %» was increased, this maximum occurring for smaller values of %, the more elongated the ellipsoid. The true meaning

of his results was brought out by Stoletow,® who Stoletow's

reduced them, and established the interesting fact that, ae] 10ns,

as the magnetizing force? 4) increases from very smal values, « at first increases rapidly, then reaches a maximum, and afterwards decreases more slowly. For one ellipsoid x increased from 30°, for 4) =:24, to a maximum 120-4, for 4} = 4:56, and then decreased to the value 39-4, for 4) = 30-07. In another, the initial value was 20:1 for 4) = 518, the maximum value 107°5 for 4) = 4:92, and the final value 2°86 for 4) = 454:1.

Thalén, adopting a method indicated by Weber,!? Thalén.

determined the value of « for small magnetizing forces. Long bars were placed in the axis of a cylindrical coil con- sidcrably exceeding them in length. This coil was caused to rotate 180° about a horizontal axis, so that tlic magnetization induced by the earth's vertical force was reversed relatively to the coil. The current thus caused was meaured by means of tlie swing of a galvanometer in circuit with the coil; from this (see above, p. 240) the moment of the induced magnetism was calculated; and thencc, assuming the bar to be replaceable by an ellipsoid, «x was calculated. From three bars of the same metal each 400°4 mm. long, having diameters of 36°4, 29°94, and 23°87 mm. respectively, the values of x deduccd were 32°32, 31°80, and 32°64. Jor other specimens of iron he found values of «x ranging from 27:24 to 44°23.

5 Similar results by Pliicker, Pogg. Ann., 1852 and 1855.

6 Klectrodynamische Maasbestimmungen, Ba. iii. § 26.

" Pogg. Ann., cxxi., 1864. Similar results were obtained by Oberbeck, Pogg. Ann., exxxv., 1868.

8 Pogg. Ann., exlvi. p. 448, 1872.

9 3% here means the whole magnetizing force, arising partly from the inducing field and partly from the induced magnetism. Experi- inenters have needlessly complicated the already complex problem cf ferro-magnetic indnction by neglecting the all-important distinction between 4 and Hip.

0 Abh. d. Gitt. Gesellschaft, Bd. 6.

Riecke.

Stole- tow's experi- ments.

Row- land's experi- ments,

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A set of observations on ellipsoids of revolution were made by Riecke,! by the method just described. The ellipsoids, seven in number, were all cut from the same piece of soft iron, but varied in volume and in eccen- tricity. The resulting values of x were found to be independent of the volume of the ellipsoids and of the part of the iron from which they were cut; but, on the other hand, with one slight exception, they increased with the eccentricity of the ellipsoids. Kohlrausch, in com- municating these results to Poggendorff's Annalen, remarked that they stand in contradiction with the theory of Poisson and Neumann; in so saying he probably considered the constant vertical force of the earth (4) to be the argument of the function x; but this is not so, as Stoletow points out in the paper already quoted. 'The actual magnetizing forces are greater in the more elongated ellipsoids; and Riecke's results simply prove that for values of 4 varying from '031 to '072 « increases from 13°5 to 25-4.

In order to establish the initial increase of the magnetization function x beyond all doubt, Stoletow (/. c.) made a new set of experiments on a carefully annealed iron ring? of rectangular section (exterior diameter 20 em., in-

a4

160

140 120 990 #0

Ps)

40

20

Stoletow's experinients; the abscisse represent the values of % in C.G.S, units, and the ordinates the correspond- ing values of x.

About the same time as Stoletow, and independently, Rowland? made a much more extensive series of experi- ments, the results of which form one of the most important contributions yet made to our knowledge of magnetic

induction. The experiments were made partly on very long bars; but the published results were mostly obtained from rings, it having been found that the effect of the ends of the bar was sensible even when the length was as much as 144 times the diameter. About a dozen rings of iron, nickel, and cobalt were used; the section was circular in all cases; and a primary and a secondary coil were used as in Stoletow's experiments. The primary current was measured by means of a tangent galvanometer in which 1, 3, 9, 27, or 48 coils could be brought into operation according to the sensibility required. The induction current in the secondary was measured by the swing of a Thomson's galvanometer fitted with a heavier needle than usual, The indications of this last were reduced to absolute measure by taking the swing caused by turning over a

1 Pogg. Ann., cxli., 1870. 2 A method suggested by Kirchhoff, Pogy. Aniv., Ergbd. v., 1870. 3 Phil. Mag., 1878, 1874.

terior diameter 18 cm., height 1:47 cm.). The ring was care- fully wound throughout with a primary coil of 2 (= 800) windings; over this, in one or more shorter or longer stretches, was wound a secondary coil of n'(=50 to 750) windings. The induction current in the secondary, due to the reversal of a known current z in the primary, was sent through a galvanometer, and thus measured. If E be the electromotive force of this current, then (see above, p. 246) E=4nn't(4rxM +P), where M and P can be cal- culated from the dimensions of the ring and its primary

coil, All then that is necessary is to know E/2 in absolute

i0 Fig. 34.

*measure. We refer the reader to the original paper for the details of the measurements. The results are very interesting, and fully confirm the conclusions drawn from the results of Von Quintus Icilius and Riecke. The smallest value of % was *43, and the corresponding value of x 21:5; the maximum value of « was 174, for H=3:2; the last value observed was x= 42:1, for #}=30°7. The temperature varied from 15° C. to 20° C., but it appeared from the experiments that « did not alter much for moderate*

changes of temperature. In figure (34) is given a transcription of the curve that represents the results of

20,000 — %B

Maximum

S 15 “ 16 7 18 BP 20

horizontal coil of known area, inserted in its circuit, so as to produce the full induction current due to the earth’s vertical force. In order to obtain the total induced magnetization the primary current was reversed. To obtain the permanent magnetism it was simply broken ; this gives the part of the induced magnetism that disappears with the inducing force (temporary magnetism Rowland calls it); subtracting this from the total mag- netization, we get the permanent magnetization. Care was taken in these experiments always to work with magnetizing forces of ascending magnitude, as it was found that the effect of any force is considerably modified if a greater force has previously acted on the body,—in other words, that the magnetic permeability of iron or steel is much affected by pre-existing permanent magnetism. This fact raises an objection to the ring method; for per- manent magnetization in a ring is not easily discoverable, and would give it a one-sidedness, so that a magnetizing force would produce much more alteration when exerted in one direction than it would when exerted in the other.‘ Rowland publishes about thirteen different tables, relating to rings of iron and steel in different states, and also to nickel and cobalt, under different conditions as to temper,

4 See Rowland, Phil. Alag. (4), 48, p. 886; also above, p. 254.

General conclu- sions.

magnetization, and so on; the results for cobalt are, how- ever, held to be less satisfactory than those for iron and nickel, for a variety of reasons which he assigns.

In treating his results graphically, two methods are followed. In the first the magnetic induction ¥ is plotted against the magnetizing force % as abscissa. Figure 34 shows the curve obtained in this way from one of his tables. In the second method (1) the permeability a is plotted against the magnetic induction %, or (2) the susceptibility x is plotted against the intensity of magnet- ization ¥. Either variety of the second method leads

to a curve having the general form shown in figures 35 and 36.

mw

250

200

Fe.

1508

1000

500.

o 5,000 10.000 15,000

Fic. 85.—Curve w¥ fcr Iron,

300

200

100

0 2000 4000 6000

Fig, 36.—Curves w¥ for Nickel at different temperatures,

The curves obtained, whether for # and &, or for x and 4, fall very rapidly, and ultimately to all appearance almost straight, towards the axis of § or ¥.

This suggests that % or ¥ or both reach a maximum when 4) is increased indefinitely. Supposing such an increase of #) possible, the question arises a3 to which it is that actually reaches a inmaximum. Most experimenters seem to assume that g does so, but it must be remarked that this is simply an assumption.! Several delicate points of great physical interest might be discussed here, butit will be sufficient to refer the reader to the introduction to Rowland's second paper.

The general conclusions to be drawn from these experi- ments are as follows :—

1. The magnetic properties of iron, nickel, and cobalt at ordinary temperatures differ in degree but not in quality.

2. As the magnetizing force # increases from 0 upwards, the permeability of iron, nickel, and cobalt increases until

1 All the more so that it has been found by some experimenters that the curve (4) actually has a point of inflexion and becomes convex to the axis of 4 for very large values of %.

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'it reaches a maximum, and after that diminishes down to

avery small value. 'The maximum value? is reached when the metal has attained a magnetization of from '24 to °38 of the maximum. The following table will give some idea of the order of the magnitudes involved ; «) denotes the permeability for %=0, « the maximum permeability, and %' the force for which it occurs. In some cases the actual maximum is given, in other cases simply the greatest recorded in the tables of experimental results, and the values of % are stated roughly; strict accuracy is of no consequence, owing to the great variability of all the magnitudes.

Material, 'Temper. ; 4)'

*Very fibrous iron wire. | Annealed. mnt. Soft wire. 5 od Burden's best iron. a 2°5 ie – - Magnetic. 24 5 * Carefully annculed.| Burnt. 16 Norway iron, '*

*59 Normal. ars *y a Magnetic. 12 Bessemer stecl. Natural, Normal. 5‘6 Stubbs’ steel. 35 Xi 25°0 Cast nickel. Annealed, 16 a at 15°C. | Natural. a ae 971 a at 12°C, Magnetic.| ... 88 i at 220° C, 3 53 Cast cobalt at 5° C. Normal. | ... 89 %s at -—5°C. Magnetic.| ... 68 y at 230° C. 5 01*

The smallest permeabilities (for large forces) observed were—for iron 258, for 4 = 64; for steel 246, for H = 48 ; for nickel 41, for = 131; for cobalt 55, for #) = 147.

3. The curve showing the relation between « and @, or between w and %, is of such a form that a diameter can be drawn bisecting chords parallel to the axis of g or 8, and its equation is approximately

y=Bsin (tee) , where y=« or w, = or ¥, and 0,d, B,D are constants.

4, If a metal is permanently magnetized, its permeability is less for low magnetizing forces, but is unaltered for high magnetizing forces. This applies to the permanent state finally attained after several reversals of the magnetizing force ; but if we strongly magnetize a bar in one direction, and apply a weak magnetizing force in the opposite direc- tion, the change of magnetization will be very great.

5, Iron, nickel, and cobalt all probably havea maximum of magnetization, although its existence can never be entirely established by experiment, and must always be a matter of inference. If such a maximum exists, then at ordinary temperatures it will be roughly as follows :—

For iron when %=17,500, or when §=1390 ; For nickel when B= 6,340, or when ¥=494 ; For cobalt when %=10,000, or when §=800.3

2 Baur, Wied. Ann., ii. p. 395, 1880, has remarked that the in- tensity of magnetization corresponding to the maximum permeability seems to be about the same for different sorts of soft iron; e.g., for two of the ellipsoids of Von Quintus Icilius it is 550 and 540; for Stoletow’s ring, 550; for Baur’s ring, 540. It would seem that it is much higher for séeel, judging by Rowland’s tables,

3 ‘The maximum of magnetization for soft iron was calculated from the observations of various experimenters by Von Waltenhofen (Wien. Ber., 1869; or Pogg. Ann., cxxxvi.). He finds 1670, or thereby, for the maximum intensity of maguetization. Stefan, using Rowland’s graphical method (Wien. Ber., 1874), had found 1400. Fromme (Wied. Ann., xiii., 1881), who had himself actually observed an intensity of as much as 1531, examined the curve for « and 9, and found, in agreement with Haubner (Wied. Beibl., v., 1881), that there is a point of inflexion about g=1200; taking this into account, he finds for the maximum value of ¥ 1730, as a mean of results varying between 1720 and 1750. From a result of Weber’s (Elec. Maasbest., p. 578) he calculates the value 1737.

For the maximum permanent magnetization of steel, Weber (Res. d. Mag. Ver., 1840) gives 814 (common steel magnet); Won Waltenhofen (Pogg. Ann., 1871) 369 (glass hard wolfram steel) ; Schneebeli (IWied. Galv., Bd. ii, § 308) 557 to 671 (sewing needles 25 to 66 mm. long and ‘6 mm. thick), and 765 to 832 (knitting necdles 198 to 210 mm. long and ‘83 to 1°75 mm. thick), It must

Maxi- mum inten-

)

field and of mag- netiza-

tion.

Effect of tenipera-

ture.

Experi- ments with ellip- soids and spheres. Riecke, Fromme,

and Holz,

Bouty.

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6. The permeability of any metal depends on the quality.

of the metal, on the amount of permanent magnetization, on the total magnetization, and on the temperature.

7. The permeability of nickel and cobalt varies very much with temperature. In nickel for a moderate amount of magnetization the permeability increases with rise of temperaturc, but for high magnetization it decreases. This is very well shown in fig, 36, where the permeability curves for 15° C. and 220° C, intersect each other. In cobalt, on the other hand, the permeability appears to be always increased. The permeability of iron is not much affected by moderate changes of temperature.

8. The maximum of magnetization of iron and nickel decreases with rise of temperature, at least between 10° C. and 220° C., the first very slowly, the second very rapidly. At 220° C. the maximum for iron is 8 = 17200 or 4=1360, and for nickel 8 = 4900 or ¥= 380.

Theresearches of Stoletow and Rowland have undoubtedly made clear the main phenomena of magnetic induction ; but in so doing they have raised a host of other questions which have not as yet been settled. There is no lack of recent work bearing on them, but it would be a difficult matter to give succinctly a complete account of the con- clusions arrived at. The results of the different experi- menters are not seldom contradictory, and the circumstances of experiment are often so complicated that criticism with the view of reconciling them seems hopeless in the meantime. While, therefore, we shall give a fairly complete list of the literature, the reader must not expect in this article an exhaustive aualysis of the different memoirs that have recently appeared. Any remarks we shall make have chiefly for their object to call attention to the prominent questions that have been raised by the different workers.

Riecke 1 made a series of experimeuts on ellipsoids of soft iron; he cxpresses his results in terms of p the magnetization function for a sphere, and finds, as he ouglit to do, that, for a considerable range of values of the maguetizing force, p is approximately constant.? In point of fact this method of representation is bad, for the quality of the metal only begins to affect » about the fourth or fifth decimal place. Similar experiments on spheres and

ellipsoids of soft iron were made by Fromme ;° and a very extensive series by A. L. Holz‘ on ellipsoids of iron and steel, in which he gives tables and curves showing the values both of » (to a large number of decimals) and of «; and the values of the temporary, permanent, and vanisli- ing magnetisms for a considerable range of magnetizing forces, The results, although wanting in regularity and smoothness for the harder kinds of steel, agree in the main with those of Stoletowand Rowland. Holz enters largely in this and in a former paper ° into speculations concerning the effect of the molecular structure of the metal upon its magnetic properties.

Relating more particularly to the phenomena of the per- manent and temporary magnetization of steel we have important memoirs of recent date by Bouty, Fromme, and Auerbach. Bouty’s papers,® besides copious references to the general literature of the subject and interesting critical discussions of magnetic theory, contain the results of careful investigations as to the permanent magnetization attained by repeated applications of magnetic force under various circumstances, and verifications of the formule of

be remembered that the maximum of permanent magnetization which a body can attain is essentially conditioned by its form; since the more elongated the form the less the demagnetizing force arising from the existing magnetization, 1 Pogg. Ann., éxlix., 1873. 2 = 3/4 = 2387. 3 Pong. Ann., clii., 1878. This paper contains also some results as to the permanent magnetism of soft iron. + Pogg. Ann., Ergbd. viii., 1877. 5 Pogg. Anin., cli., 1873, 6 Comptes Rend., 1875; Jour. d. UEc. Norm, Sup., 1875, 1876.

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Green for the magnetic distribution in thin needles and cylindrical bars of steel. Two points as to his methods are worthy of notice. He employs a very simple method of measuring the magnetic mqment of small pieces of steel :

Measure-

a small needle of moment m attached to a stiff stem, which ment of

carries a mirror, is freely suspended and allowed to come

to rest in the magnetic meridian; the needle whose

moment # is to be measured is then inserted into a tube fixed to the stem with its axis at right angles to the former needle, The deviation a of the compound system being measured by means of the mirror, we have =m tana. He studies the magnetic distribution in very thin hard needles by the method of rupture, finding that, if the needle be carefully broken, so that the distortion or shock caused by the bending does not extend far from the point of rupture, the magnetic moment of the different parts is little, if at all, affected. For thicker magnets ho uses the ordinary method of deflexion.

Bouty found, in agreement with Hermann Scholz and Frankenheim,' that, although the continwed application of a magnetizing force does not increase the resulting per- manent magnetization, the repetition® of its application will. He finds for the magnetic moment y of a thin needle passed # times through a magnetizing spiral the formula y=A-B'x, where A and B are constants: e¢g., in one case, A=57'78, and B=6'32. The ratio A/(A~B), that is, the ratio of the moment attained by an infinite number of applications of the magnetizing force to that attained by one, decreases as the force increases ; on the other land, if Iv' be the force required to produce by a single application the same effect as Ri produces by an infinite number, he finds the ratio R'/R fairly constant ® (viz, from 1-060 to 1-065 in his best experiments) for values of R ranging from 10 to 42. In certain cases where the magnetization was effected by in- duced currents, he finds the formula y=A+B (1 $_c$) to represent the results better.!0*

He found that Green's formula,

; (2 ee | y=Aa| a – '*

B elBe 4 ¢~186

giving the moment of a cylinder of length w and diameter a, was sufficiently accurate both for temporary and for permanent magnetism, and for hard or soft tempered steel, whether saturated or not, provided the bars were iu a virgin condition before magnetization. or example, in a saturated bar of soft steel (4=7 mm.), for the temporary magnetism A=4'081, B=1/7'142; for the permanent magnetism A = 2°34, B= 1/17°857. Ina non-saturated bar of

soft steel (c=10 mm.), for temporary magnetism A= ‘9966, B=1/7:142; for permanent magnetism A= ‘723, B=1/17-‘857 ; so that B is independent of the magnetic force. With hard tempered bars, A was less, both for temporary and permanent magnetism, than with soft bars ; B was independent of the magnetizing force for temporary magnetism, but increased for permanent magnetism with large magnetizing forces. He calls the magnetic distribu- tion long or short according as B is small or great, and

where ime

a

7 Pogg. Ann., exxiii., 1864.

8 Ina very interesting paper (Phil, Mag., 1869 and 1870) dealing with certain phenomena of induced currents, Lord Rayleigh incident- ally arrives at the conclusion that the magnetizing force of a current depends on its maximum intensity more than on its duration, or on the whole quantity of electricity that passes. This observation has an important bearing on certain experiments of Bouty as to the effect of the “extra current,” which it does not scem necessary to mention here.

® This conclusion is not in agreement with the results of Fromme.

10The formula y=B(1-e7%) was used by Quetelet for the nioment induced in a stecl bar by rubbing it z times with a magnet.

small

ments.

Rupture of needles.

Effect. of repeated applica: tion of magnet: izing force.

Mag- netic after- effect.

explains the phenomena of demagnetized or remagnetized bars by the superposition of long and short distributions. His final conclusion is that there is a greater independence between permanent and temporary magnetism than is usually admitted; and he starts a theory that magnetic bodies are composed of a mixture of two kinds of magnetic molecules, one kind retaining all the induced magnetism, the other wholly devoid of coercive force.

It is obvious, from the results of Wiedemann, Franken- heim, and Bouty just alluded to, that the assumption made in the mathematical theory, that the effect of a magnetizing force is independent of the previous magnetic history of the body, is not even a first approximation to the actual truth. It becomes a matter of importance therefore to study the modification in the induced magnetism cor-

responding to any force produced by the forces that have |

preceded it. This effect has been called by German experimenters the magnetic after-effect (Magnetische Nachwirkung), Fromme and Auerbach have recently occupied themselves with this subject, and it may be of some interest to the reader to indicate a few of their con- clusions. :

In his first paper? Fromme experiments with rotational ellipsoids of soft steel, using partly the method of Weber, Thalén, and Riecke, partly the ordinary method of deflexion. He found, in the first place, that the geueralized theory of magnetic induction was applicable for values of % vary- ing from ‘0061 to ‘132, x decreasing between these limits from 23°5 to 8°68. He attempted to find the maximum force for which permanent magnetism first appears, and fixes it with some reserve at from ‘2 to ‘3.2 The curve which he indicates for the temporary magnetization of soft steel has two points of inflexion, being first concave to the axis of %, then convex, and finally concave again.

He confirms the observation of Frankenheim that repeated applications of the magnetizing force increase the permanent magnetization up to a certain limit, and finds that when that limit is reached the body behaves towards all smaller forces having the same direction as if it were devoid of coercive force. Experimenting on ellipsoids permanently magnetized in this way, he found the mathematical theory of Kirchhoff to be inapplicable, it being impossible to fit the results obtained with the different ellipsoids together; and the discrepancy was greater with the softer than with the harder steel. For forces that are not suflicient to alter the permanent magnetization, x decreases with decreasing force, as is the case with soft iron, so long at all events as the forces are not very great; and, again, for such forces the variation of « is more regular the greater the permanent magnetization.

The number of impulses required to saturate with per- manent magnetism was greater the greater the ratio of the moment of saturation to the initial moment, ¢g., greater for hard than for soft steel. It was found, in extension of a result of Frankenheim's, that, if U be the original moment, R, that produced by one and R that produced by an infinite number of impulses of the magnetizing force, then (U+R,)/(U +R) is tolerably constant ; but R,/R decreases with increasing magnetizing force.

With reference to the non-permanent magnetism of a bar repeatedly magnetized by the same constant current, he concludes from his researches that it diminishes, but in such a way that the total induced magnetism remains con- stant,—so that what is lost in non-permanent is gained in permanent magnetism.

In his second paper? Fromme experimented both with

5 E99: Ann., Erghd. vii., 1875. So far confirming Maxwell's conclusions from his modification of

Weber's theory of molecular magnets, Zl. and M ii, 8 3 Wied Ann., iv., 1878. gnets, 41. an ag., vol. ii, § 446.

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iron and withsteel cylinders, pointed at the end, of lengths varying from 140 to 220 mm., and of thicknesses from 15 to 8mm. The method of deflexion was used, the effect of the magnetizing spiral itself being compensated by an auxiliary spiral suitably placed. The cores were carefully introduced into the spiral after the current was established, removed before it was broken, and then replaced when the permanent magnetism was determined. In the following extract from his conclusions T,, denotes the total induced magnetization, R,, the whole residual or permanent magnetization, V,, the non-permanent or vanish- ing magnetization, after 2 impulses of a given magnetizing force, the suffix being dropped when the number of impulses is not in question, and replaced by «© when the number is so great that by further increasing it no altera-

_ tion in the effect is produced.

A constant force greater than all preceding induces a T Varying which varies with successive impulses, sometimes increas- "ect of ing, sometimes decreasing. If a bar previously heated ive i white hot be subjected to a large force, successive impulses pulses usually give a decrease of T. If, however, the force is on tem- preceded by one somewhat smaller, successive impulses Poy usually give an increase. It depends merely on the als magnitude and the number of impulses of the preceding ~ force P whether the repeated impulses of a force p will give an increasing or a decreasing T.

R always increases with successive impulses until the limit Hffect is reached, and always faster than T'; hence increase of Rand 0? Pct decrease of V go hand in hand; the magnitude of this me pore depends on P and », and approaches zero WI som,

—p.

In order that the action of a force y» may not be influenced by the after-effect of smaller forces preceding it, it must be applied so often that its further application ceases to increase R. When saturation for R is thus reached, then T, R, and V have the values corresponding to frequent impulses of p for a fresh bar.

R,/Rao, Rp/R,, &e., all starting from unity, decrease as the force » increases from zero, diverging more and more until they all reach minima for the same value of p ; they then converge again towards unity, which they all reach at the maximum of permanent magnetization. The values of » corresponding to the maxima of Ry /p,... –

R,/p, R,/p are in ascending order of magnitude, and the first of them is the value corresponding to tle minima of R,/Reos RefRe, &e.

What was stated for R,/Ry, R,/Rao, &e., holds word for word for Ty /T,, Teo /T,, &c. Hence the decrease of T is conditioned solely by the increase of R; so that it would appear that the after-effect of a preceding force P depends on the R which it produces. It would therefore be more correct to say that the after-effect depends on 7— R than to say that it depends on p — P.

When a bar has been magnetized by any force P, all smaller succeeding forces leave R unaltered, yet by repeated impulses of p (

N=cp(P—p), where ¢ is a constant and a and 0 are constant positive

Effect on van- ishing magnet- ism.

Auer- bach.

His general law of after- effect.

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numbers, 6 being a proper fraction, and @ possibly very

near unity. This of course gives N=0 for p=0 and for p =P, and gives a maximum value of N for some value of

» between 0 and P. The interposition ofa force P' between P and p increases

the after-effect if P'>P, diminishes it if P'

holds irrespective of the sign of P' — p.

If we denote by & the susceptibility of a body for

vanishing magnetism (V) induced by any force p, the question arises how far this is influenced by the permanent magnetism R induced by preceding greater forces. Jamin holds that & is approximately, and Chwolson that it is absolutely, independent of such permanent magnetism. Fromme finds that, when a force p, capable of itself producing a permanent magnetism 7, acts on a bar already possessing a permanent magnetism R>r, then & is increased (by the presence of R) if R-r is small, but diminished when R-r is great.) The after-effect for small forces p may therefore be either increase or decrease of &; but for large forces p it is always increase.

At the conclusion of his paper Fromme points out the contrast between magnetic and elastic after-effect, and dwells upon the analogy between his results and those of Thalén2 concerning the limits of elasticity in solid bodies.

The experimental method followed by Auerbach® was much the same as that of Fromme, except that the core was left in the magnetizing spiral during the make and break of the current. The core was generally a hollow cylinder of soft iron 148-1 mm. long, 17°38 mm, in diameter, 1°6 mm. thick, with end plates 1°5 mm. thick. He distinguishes two kinds of magnetic after-effect. The first kind consists in alteration of the magnetization of the body during the action of a constant force, or after it has ceased to act. The second kind is that already mentioned, in which the action of any force is influenced by preceding forces, It is this second kind of after-effect that is dealt with in the paper from which we are quoting.

The leading peculiarity of his view of the phenomenon is the introduction of the force zero, both as a preceding and as a final force. The fundamental principle laid down is the following :—

When the force p, which, following immediately after the force 0, would produce a magnetization Ty, is preceded by a series of forces P,, Pg… – .P,, the magnetization which results is T, differing from T, by an amount N called the after-effect. N is wholly determined by the first of the preceding forces P., which is such that all the forces that act between P, and p lie in magnitude between P, and p.

This general law is, however, subject to exceptions. For example, let the whole series of forces acting be P,); p, Po; o (evidently an extreme case), then experience shows that neither T,, nor Ty is the resulting magnetization, but something intermediate, much nearer to T,), however, than to T, In order to obtain T, a force P)

-

In this way, for a given p, T can be determined as a function of P. It is necessary, however, to attend to the following principle,—that, of two preceding forces lying in magnitude on different sides of p, the second determines a iVi ———

1 These conclusions are in agreement with the results of Herwig

obtained from experiments on the longitudinal and circular magnetiza- tion of iron tubes, Pogg. Ann., clvi., 1875. 2 Pogg. Ann., cxxiv., 1865. 3 Wied. Ann., xiv., 1881.

the after-effect of the first.

The process used for obtaining T as a function of P, for a given p, say 10, is therefore to cause the influencing forces

to alternate with the influenced, the succession of the

former being such that the one preceding p always differs less from p than the one following. The stationary con-

dition is supposed to be established for each pair as above explained; eg., starting with P=11, the series might be 11, 10, 8, 10, 13, 10, 6, 10, 15, 10, 4, 10, && In this way T,,, Ts, Ts, &c., can be determined.

When the values of T are plotted against the values of Curves P, the curves corresponding to different values of p have of tem- all a similar character (see figure 37). They consist of POY

two congruent parts lying on the two sides of a point of

inflexion, which is the only point that has any marked after- To the right of the inflexion the concavity effect.

character. is towards the axis of P, to the left in the opposite direction. The infinite branches appear to approach

asyinptotes parallel to the axis of P. The abscissa of the point of inflexion for any particular curve p is P=p; the ordinate is T,, which may be called the normal magnetization corresponding to p when p alone has acted before, This of course is an ideal case; but a process is indicated for determining T, directly. The dotted curve in the figure is the curve of normal magnetization, whose abscissa and ordinate are p and T,,

From the symmetry of the curves representing the after- effect Auerbach concludes that the after-effect of forces on. opposite sides of p as to magnitude, and equidifferent from it, is equal and opposite, and ascribes the failure to observe the after-effect of forces smaller than p to the interposition of the force zero. He further concludes that the after-effect depends in the same way on P-pas T, depends on p.

There is one of the curves of after-effect, that, viz., for p= 0, which has a special meaning. Itis clearly the curve Be

4A particular case of this process is interesting and practically important ; viz., in order to demagnetize a core (i.¢., to find To) possessing a moment T. Apply in succession the forces — P, + (P-e), —(P—2e), +(P—8e), &c., down to 0, P being chosen of sufficient magnitude, rather too great than too small (the smaller ¢ the better).

the after-effect exclusively only when it differs more from p than the first; in other cases both contribute to the after- effect ; in no case does the first exclusively determine the after-effect. In the case where both preceding forces lie on the same side of p, the exceptions to the general law are far less marked; only where the secorid force is very nearly equal to p does it exercise a disturbing influence ou

of permanent or residual magnetism, which is thus in Auerbach's view a particular case of after-effect. To it we can apply the general rule given above, subject of course to like exceptions. "

Tt would be premature to pronounce any opinion as to the ultimate value of Auerbach's results; but the elegance of his representation of the phenomena will scarcely be disputed. In the latter part of his paper le applies his views to explain the peculiarities in the curve of maguetiza- tion with forces of ascending magnitude obtained when the after-effect is neglected, and to the cyclical process dis- cussed by Warburg.! He also discusses the influence of

Effect of the duration of the impulse of the magnetizing force and

duration of the sudden closing and opening of the current,

and re-

His conclusions agree in the main with those of Fromme: in

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Christiansen, "Rescarches ou the Magnetic Distribution in an lron Bar, on one part of which is placed a Short Magnetizing Spiral," Ved, Bevdl., i., 1877.

Ruths, "Ueber den Magnetismus weicher Hisencylinder und verschieden harter Stahlsorten" (Dortmund, 1876), Wied. Betbl., i, L874,

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petition : DY aes : ; netization of Iron in any Direction upon its Permeability in the

ofim- particular he inclines to Fromme’s view? that there is a | Perpendicular Direction,” Wied. Ann., xiv., 1881.

*pulse. specific magnetic effect produced in certain cases by the Righi, ‘*Contributions to the Theory of the Magnetization of breaking of the current while the core is in the spiral. | Steel,” Mem, d. Ace. d. Bologna, 1880; HWved. Beibl., vi 1882,*

° ° . . . . For asuccinct account of several of the foregoing memoirs, see the

This effect in certain cases (with short thick cores) 18 80 | « Nachtriige ” to Wiedemann’s Galvantsmus, and a paper by the great that a permanent magnetization of opposite sign to | same author in Poggendorf’s Annaten, elvii. p. 257, 1876. the total induced magnetism remains.2 This ‘anomalous Influence of the Hardness and Structure of Iron and Influence magnetization ” was first observed by Von Waltenhofen, | Steel on Permanent Magnetism.—Some information has of hard- who also establishes the more general result, of which this | already been given incidentally on this subject, and mre is an extreme case, viz., that the residual magnetism of the | a lengthy discussion would be out of place here. The ture, core depends upon the rapidity with which the magnetizing | statements of the various authorities are very contra- force is reduced to zero. Auerbach lays down as a general | dictory. This is not to be wondered at; for those best principle that when the variation of the magnetizing force*

| qualified to prepare the materials for experiment are is slow and continuous the velocity of the transition does | generally deficient in the scientific knowledge requisite to not influence the final magnetization ; but sudden transition | enable them to form a sound judgment as to the result, causes the final magnetization to be less or greater than | while thoroughly trained scientific men have not as a rule that obtained by gradual transition, according as the | acquired a command over the delicate manipulation of the passage is from a greater to a less or from a less toa | forging and tempering of steel, an art which those who greater force. possess it usually find difficult to describe in words or

Addi- The reader who wishes to pursne the present subject farther | Teduce to rules. There is the further circumstance that

tional — should consult the works of the following experimenters :— many who have been successful in making good steel for

litera- Jamin,® who holds what he pea regards as a new theory of | magnetic or other purposes have found it for their interest

ture, magnetization. It isin point of fact merely a modification of the

theory of solenoids, somewhat restricted in its application to the

not to publish the process by which success was attained.

Fineness of grain and uniformity of temper are the Fineness

phenomena of magnetic induction. His special point is that the sia : ¢ greatest requisites in steel for permanent magnets. The of grain

lincs of magnetization in a bar magnetized (say) by a magnetizing

spiral only penetrate to a limited depth, which is greater the greater | latter in bars of any size is never attained in perfection, — uni- the current. The following experiments® are adduced in confir- | for the surface is always harder than the interior. The formity mation of his views. Thesteel tube of a Chassepot rifle was plugged : of

at both ends by screwing into it bolts of the same metal. Inside was placed a eylindrical rod, It was found that, so Jong as the current in the spiral was not very great, the rod was not sensibly magnetized ; but, as the current increased, it became more and more affected, and by and by was as much permanently magnetized as if the enveloping tube had been absent. Again, the rod having been magnetized to saturation and inserted in the tube, a demagnetizing force was applied to the whole, and it was found possible to render the tube and core together seemingly neutral, or even oppositely magnetic, while the rod when taken out proved to be still power- fully magnetized in the original direction. Again, a bar was magnetized by a powerful current, and then magnetized in the opposite direction by another current. The surface of the bar was then eaten away toa certain depth; and it was found that the original magnetization reappeared. These experiments, although most interesting in themselves, do not appear to warrant the inter- pretation which their author puts upon them, Jamin has made extensive researches on the magnetie distribution in bars and ribbons of steel, partly with a view to obtain empirical rules for the cons:ruction of powerful permanent magncts, in which he has been very successful.

oa Comptes Rendus, passim ; Ann, d. Chim. et d. Phys., 5) Xi,

. Wied. Ann., xiii., 1881; cf. Fromme, J0., xiii, 1881; also Himstedt, 70., xiv., 1881. A similar phenomenon was observed by Meyer and Auerbach during their experiments on the gramme machine, Wied. Ann., v., 1878.

- *See an elaborate paper which we can onl ention here, Ii ag, ome pap y mention here, Wied.*

- *Experiments on the same subject have been made by Richi*

M y Righi, Comptes

Rendus, 1880, or Wied. Beibl., iv., 1880; and by Bartoli and Ales-

sandro, NN, Cin. , 1880, or Wied. Beibi., iv., 1880. Cf. Fromme, Wied Ann, xiii., 1881. 4 Wien. Ber., 1863.

Comptes Rendus, passim. 5 Comptes Rendus, \xxx., 1875.

mischief which thereby arises may be understood by taking temper,

the extreme case of a thin steel tube magnetized to satura- tion, and then fitted with a perfectly soft iron core. It is clear that the core will act very much like the armature of a horse-shoe magnet; the lines of force will run back through it, and the external action will be in a great measure destroyed.

The different tempers of steel may be roughily classified as glass hard, straw colour, blue, and soft. The current statement is that the harder the steel the more difficult it is to magnetize, but the better it retains its magnetism. If this were so, provided sufficient magnetizing force to pro- duce saturation were at command, the best temper for magnets would be glass hard. Lamont, however, whose experience was great, states that he found the loss after magnetization to be as great, and to continue as long, with glass lard as with blue tempered magnets. The same experimenter gives it as his opinion that great differences in the quality of magnets arise more from defects as to homogeneity, continuity, and uniformity of temper than from the quality of the steel in other respects ; he inclines, however, to a preference for English cast steel.

Purity and homogeneity of structure are equally necessary in iron of high magnetic inductive susceptibility and smail coercive force. Hammering, rolling, and drawing diminish the susceptibility and increase the coercive force. Tolling does so more in the direction of rolling than transversely, so that the iron becomes eolotropic. It is advisable in all cases where high susceptibility is wished to anneal the

body carefully after manufacture, by heating it in a wood fire and allowing it to cool very gradually ; this process is still more effective when the iron is covered all over before- hand with half an inch or so of clay.

The reader who wishes for further details on this subject should consult Lamont's Handbuch des Magnetismus, chap. v. The follow- ing references to the literature may be useful.

Michell, Treatise of Artificial Magnets, 1750; Coulomb, Alem. deV Acad., 1784; Barlow, Phil. Trans., 1822; Kater, Phil. Trans., 1821; Sabine, Phil. Trans, 1848; Hansteen, Pogg. Ann., 1825; Hicker, Pogg. Ann., 1848 ; Poggendorff, Jd., 1850; Miiller, Jb., 1852; Matthiessen, Pal. Mag., 1858 ; Airy, 7b., 1863; Von Walten- hofen, Pogg. Ann., 1864; Tréve, Comptes Rendus, 1869 ; lh: Holz, Wied. Ann., v., 1878; Ruths, Wied. Beibl. i, 1877 ; Chees- man, Wied. Ann. 1882.

Special Magnetic Character of Nickel and Cobalt. —Besides the results of Rowland above quoted, we have on record experiments by the following physicists:—Biot, Traité de Phys., 1806 ; Gay Lussac, Ann. d. Chim. et d. Phys., 1824; Lampadius, Scehivegger's Jour., 1814; E. Becquerel, Comptes Rendus, 1845 ; Pliicker, Poyg. Ann, 1854; Arndtsen, Jb, 1858; Hankel, Wied.

Experiments with Finely Divided Magnetic Metals and with Electrolytic Iron.—These have been made by various physicists, mostly to test the theory of molecular magnets, The earliest of the experiments with finely divided iron was made by Coulomb, who mixed iron filings with wax, and found that the magnetic moment was proportional to the mass of magnetic metal. Similar experi- ments were made by the clder Becquercl,! his result being that the magnetic moment was proportional to the weight of magnetic sub- stance, so long as the filings were not too denscly distributed; with increasing density the mixture acquires magnetic properties more like those of a eontinuous metallic mass, Several modern experi- menters have gone into the matter with considerable care; but their results are not sufficiently concordant, or of suffeient general interest, to justify us in dwelling at length upon them here. A few references to recent memoirs will suffice.

Boernstein, Pogg. Ann., 1875; Toepler and Von Ettingshausen, Jb., 1877; Von Waltenhofen, Wied, Anz,, 1879; Auerbach, Jd., 1880; Baur, J., 1880.

Experiments on electrolytically deposited iron have been made by Beez, Pogg, Ann., 1860; Jacobi, Jb., 1873 ; Beez, Zb., 1874 ; Holz, 7b., 1875; Baur, Wicd. Ann,, 1880.

Using a fine scratch on a varnished silver wire as electrode, Beez deposited a thread of iron between the poles of an electromagnet, and thus obtained a

permanent magnet of extreme tenuity. It was found that the inductive susceptibility of this linear magnet was very small, and that considerable magnetizing force produced no increase of its permanent magnetism. Thus in one ease the original magnetism was 360, the total magnetism under the induc- ing foree 370, the magnetism remaining after the force ccased to act 360, Broader, but equally thin, magnets deposited in a strong field in the same way gave more temporary magnetism than the linear magnets, but never more permanent magnetism than they possessed originally. Thicker plates exhibited greater temporary magnetism, and also an increase of the permanent magnetism acquired during deposition, With continued reversals of the magnetizing force electrolytic iron gave a continual decrease of the temporary magnet- ism down to a certain limit (as does steel) ; but the negative per- manent magnctism never approaches so near the positive after many reversals as in the case of steel. On the other hand, Jacobi fonnd that iron reduced electrolytically from ferrous sulphate and sul- phate of magnesia, even after tempering, took a considerable temporary moment, but retained very little permanent magnetism. Holz found that the iron reduced from the solution of J acobi and Klein was not sensibly hardened by heating and suddenly cooling, although its density was increased, and that its coercive force was diminished. On the other hand, it was found that hard tempering decreased the density of steel. He draws the conclusion that the eoercive force is greater the farther apart the molecules, Baur's main result is that the maximum of magnetization with electrolytic iron occurs for much larger forces than with ordinary iron. These results are not wholly concordant ; but the discrepancies may be reasonably assigned to differences in the preparation of the metal.

Macnetic Properries or MatTrEer IN GENERAL.

Among the earliest statements of the properties of the loadstone we find accounts of its action on other bodies ; but it is clear from their surroundings that these statements are purely fabulous. Many experimenters at a later date

1 Traité Complet du Magnétisme, chap. ti. p. 73.

found indications of magnetic action in other metals besides

iron; but with praiseworthy caution' they ascribed them

for the most part to the admixture of small quantities of

iron.2 There can be no doubt that the results of Cavallo? Early obtained with brass (especially hammered brass) were due observa- to impurity, for Bennet' failed to obtain any indications slate of magnetism with pieces of brass made from pure zinc

and copper, whereas he was immediately successful on adding small traces of iron to the metal,

It very soon appeared, however, that an independent magnetic property must be ascribed to nickel and cobalt, and to these were by and by added with more or less certainty manganese and chromium.®

Brugmans® seems to have been the first to observe the repulsion by a magnet of a body not permanently magnet- ized. He found that a piece of bismuth floating upon mercury in a small paper boat was repelled by both poles of a magnet. Lebaillif' confirmed the observation of Brngmans, and found that antimony possessed a like property. Saigey,' who experimented on the same subject, concluded that all bodies when suspended in air behave like bismuth, unless they contain traces of iron.

Notwithstanding these results and others which we pass

over,? the whole matter remained in obscurity till the repulsion of neutral bodies was rediscovered by Faraday in 1845, He speedily unravelled the laws of the phenomenon, Faraday's showing how much depends on the nature of the body, Teds and how much upon the nature of the magnetic field. His °°)", observations enabled him in fact to comprehend under a jnyesti- few general principles the action of all magnetic bodies gation. whether of the nature of iron or of the nature of bismuth. The earlier observers had fallen into difficulties by neglect- ing the effects due to heterogeneity of field; these were pointed out for the first time by Faraday, and since then order reigns where there was formerly confusion.

The best arrangement for testing the behaviour of Experi- weakly magnetic bodies is to suspend either a small sphere mental of the substance or else a small cylinder in a heterogencous (ents magnetic field. This field is usually produced by placing for test- two pointed soft iron poles (fig. 38) on the arms of a power- ing ful electromagnet, The line joining these poles is called weakly | the axial direction of the field ; directions perpendicular to oes this line are called equatorial. 'I'he magnetic force varies 'i

d b oe ek Fig. 88, Fig. 89.

along the axial line, being less in the middle than at the poles; and it decreases everywhere from the axial line outwards. For some purposes poles of the shape shown in figure 39 are used ; here the line along the upper edges of the poles are lines of greatest force, whereas the line in the plane of the upper faces equidistant from the upper edges is a line of weakest force; the force also decreases to the right of ab and to the left of cd.

In suspending small spheres the best plan is to hang them from one end of an arm of wood db (fig. 40). At the other end of this arm is placed a counterpoise), and the whole is suspended by a fibre of unspun silk w from a torsion head ¢, by means of which the arm dé can be brought into

a

2Of, Lehmann, Nov. Comm. Petrop., 1766; Brugmans, Mag- netismus seu de Afinitatibus Magneticis Observationes Academice, Leyden, 1778; Coulomb, Mém. de ?Inst., 1812; Biot, Traité de Physique, 1816, &c.

3 Phil, Trans., 1786 ; or Treatise on Magnetism, 1787.

4 Phil. Trans., 1792. 5 Ritter, Gilb. Ann., 1800.

© Toe, eit, 7 Pogg. Ann., 1827.

8 Bull. Univ. d. St., 1828.

9 See Von Feilitsch, Karsten's Ency., Bd, xvi. ; Wicdemann's Gal- vanismus, Ba. ii, p. 516.

Be- haviour of heavy glass,

any required position, and if necessary kept there by the exertion of a known torsional couple. The arm and suspension must be carefully guarded from draughts by enclosing it in a glass case, which fits over the poles of the electromagnet, and is provided with a door and with means for bringing the torsion head ¢ over any given part of the magnetic field. When a cylindrical piece is to be tested itis suspended from the fibre wsoas to hang horizontally. For this pur- pose Faraday was in the habit of using a stirrup of carefully se- lected writing paperattached to the lower end of the fibre. It is of the utmost importance to guard against magnetic ac- tion on the suspension; the least trace of iron in the arm db for in- stance, or in the paper stirrup, would in many cases be more than sufficient to mask the ac- tion proper to a weakly mag- netic —_ body. Fig. 40. In every experiment the magnetic behaviour of the support should be tested by itself beforehand, so that if any residual effect be present it may be allowed for. The greatest caution is also requisite in choosing the material to be experimented upon. There must be no chemical impurity, especially no trace of iron ; the spheres and cylinders must not be worked with iron tools or even with dirty hands, A source of error! to be specially guarded against in experiments with metals, or other good conductors, is the action arising from induced currents in the mass of the tested body caused by the increase and decrease of the strength of the magnetic field when the circuit of the electromagnet is made and broken. This error is wholly avoided by waiting till the suspended body has come to rest, and attending only to deflexions which are permanent after the intensity of the field has become steady. The first substance with which Faraday experimented was a bar of the heavy glass with which he had discovered the rotation of the plane of polarization of light. It took up the equatorial position between the poles of the electro- magnet as soon as the current was established. There was no distinction between its ends, or according to the direction of the lines of force; the bar always took the shortest course to the equatorial position, and remained

there in stable equilibrium. When placed in the axial position it was in unstable equilibrium, and on the slightest displacement either way it moved off in that direction to ee

1 See Faraday, Hxp. Res., 2309 sg.

the equatorial position. A further action was observed Setting of when the bar was placed with its centre of mass out of the elongated

centre of the field; it was then repelled as a whole away Net at

from the nearest pole (no matter which). On testing a transla- small cube or sphere of the substance, no pointing tendency tion of

was observed, but the mass as a whole when it was placed spheres unsymmetrically with respect to the poles tended to pass = oe away from the poles towards the centre of the field, and , from the axial line outwards.

Faraday sums up the matter by saying that every element Experi- of the heavy glass tends to move from places of stronger to mental places of weaker resultant magnetic force. Thisis exactly °¥ the opposite of the law for bodies like iron (see mathematical oes theory above, p. 247). All bodies that follow the same law netics as heavy glass he calls diamagnetics, all that follow the and dia- opposite law, like iron, paramagnetics, For the purposes of en experimental demonstration it is better to take some weaker ~~ paramagnetic than iron, ¢.g., a tube filled with a solution of ferric chloride; for the order of magnitude of the effect obtained is then the same as with diamagnetics, and there is no danger of complications arising from the mutual action of the particles of the substance (see above, p, 245).

Faraday found the following substances to be dia- magnetic; 2.¢., pieces of them tended to set their longest dimension equatorial between pointed poles, and spheres and cubes of them tended to pass from places of stronger to places of weaker force :—rock crystal, sulphate of lime, List sulphate of baryta, sulphate of soda, sulphate of potash, of dia- sulphate of magnesia, alum, muriate of ammonia, chloride > of lead, chloride of sodium, nitrate of potash, nitrate of 77 lead, carbonate of soda, Iceland spar, acetate of lead, tar- trate of potash and antimony, tartrate of potash and soda, tartaric

acid, citric acid, water, alcohol, ether, nitric acid, sulphuric acid, muriatic acid, solutions of various alkaline and earthy salts, glass, litharge, white arsenic, iodine, phos- phorus, sulphur, resin, spermaceti, caffeine, cinchonia, mar- garic acid, wax from shellac, sealing wax, olive oil, oil of turpentine, jet, caoutchouc, sugar, starch, gum arabic, wood, ivory, mutton (dried), beef (dried), blood (dried or fresh), leather, apple, bread.

In testing liquids Faraday used a very thin glass tube Liquids. of the form shown in figure 41; the opening being very fine, there was no need for a cork or other stopper which might have caused disturbance; the slight diamagnetic effect arising from the glass was

allowed for. Another way of testing a liquid? is to place it in the bottom of a watch glass

which rests on the edges of the sha

pole of the electromagnet. When >

the fluid is paramagnetic, it ees collects in the places of greater force, forming a depression in the Fig. 42,

centre of the field as in figure 42; when it is diamagnetic, it collects in the places of weaker , force in the centre of the field, eee: as in fig. 43. Yet another method? is to put a small quantity of the fluid in a narrow tube, and place the tube horizontally in the equatorial line so that the end of the liquid column is just on the axial line. When the electro- magnet is excited the liquid will be driven away from the axial line or drawn in according as it is diamagnetic or paramagnetic.

Faraday found that breaking a weakly magnetic body Powders.

into pieces, or even reducing it to powder, produced no

effect upon its magnetic behaviour provided its general form was unaltered. In order to avoid disturbance from

2 Pliicker, Poyg. Ann., 1848. 3 Quet, Comptes Rendus, 1854. —

Faraday' s list of magnetic and dia- ~ magnetic metals.

Addi- tional list of nietals,

Early results.

Faraday's Becquerel 1° to the subject.

experi- ments,

MAGNETISM

the magnecrystallic effect to be described presently, it is often advisable to reduce certain substances to powder before testing them ; the powder is filled into a thin glass tubs and then tested like a liquid. By means of powdered bismuth the tendency of a diamagnetic to pass from places of stronger to places of weaker force can be very prettily shown. If the powder be strewn upon the circular end of the core of an electromagnet, it will leave the edges and collect in the centre, whereas iron filings will leave the centre and arrange themselves round the edges, the fact being that at the edges the force is much more intense than in the centre.!

Faraday arranges the metals in the following order of descending magnetic susceptibility :—

Paramagnetic. Tron. Chromiuin. Palladiuin. Nickel. Cerium. Platinum. Cobalt. Titanium. Osmium. Manganese. Diamagnetic. Bismuth. Mercury. Arsenic. Antimony. Lead. Uraninm. Zine. Silver. Rhodium. Tin, Copper. Iridium. Cadmium. Gold. Tungsten. Sodium.

*Silicium is given as strongly paramagnetic, and beryllium,? aluminium, potassium, and sodium * as weakly magnetic ; the last three were given as diamagnetic by Faraday ; the magnetic character appears to depend on the method by which the material is prepared, being doubtless deter- mined by the presence or absence of slight impurities, The copper of commerce is magnetic, owing to traces of iron; but when it is reduced by means of zinc from the chloride or sulphate it is diamagnetic. that the paramagnetism of titanium, palladium, platinum, and osmium is due to iron impurity.*

Platinum ® rednced from very pure chloroplatinate of ammonium by heating in a current of air is diamagnetic. According to Graham the magnetism of palladium when charged with hydrogen is due to the presence of hydrogenium ; Blondlot,° however, has recently found that palladium is less magnetic when charged with hydrogen than when uncharged, from which he concludes that condensed hydrogen is pretty powerfully diamagnetic, Tellurium, sulphur, selenium, and thallium arestrongly, and niobium and tantalum weakly diamagnetic.

Magnetic Properties of Gases.—The earliest results of Faraday were of a negative description, but the discovery by Bancalari" of the powerful diamagnetic action of flame again drew the attention of Faraday,' Pliicker,? and Faraday caused the gas under examination to stream vertically upwards or downwards (according as it was lighter or heavier than the surround- ing gas) between the poles of an electromagnet, and observed how the stream was deflected. In the case of colourless: gases the deflexion was observed by allowing small traces of hydrochloric acid to mix with the gas, and then placing in different parts of the field small tubes con- taining pieces of filter paper moistened with ammonia ey noticing in which of these the white fumes of ammonium chloride were formed the course of the gaseous current could be determined. Another method employed was to fix two thin glass tubes containing gases to be tested to the ends of a cross piece on one end of the arm of a torsion

1 This fact explains the astonishing behaviour of a flat disk of thin iron when placed on the centre of the pole,

? See Wiedemann, Gulvanismus, Bd. ii, § 552.

3 Laing, Ann. d. Chim. et d. Phys., 1857.

" Wiedemann, luc. 5 Wiedemann.

8 Comptes Rendus, 1877. 7 Zantedeschi, Pogg. Ann., 1848.

® Phil. Mag., 1847 ; or Exp. Res., vol. iii. p. 467.

» Pogg. Ann., 1848, &c. 10 Ann. d. Chim, et d. Phys., 1850.

It would appear:

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balance ; the tube containing the most magnetic then moved towards the axial line. Another method, employed both by Pliicker and by Faraday, is to blow soap bubbles with the gas to be tested, and observe their behaviour in the

magnetic field, allowing of course for the feeble diamagnet- ism of the ~ater film. Faraday's results are as follows :—

In Carbonic Acid,

In Wydrogen.

In Air,

Air Nitrogen ORE. ose es Hydrogen …..... Carbonic acid… Carbonic oxide . Nitrous oxide… Nitric oxide …. Nitrous acid …. Olefiant gas Coal gas Sulphuric acid.. Hydrochloric AU eet Hydriodic acid. Fluosilicic acid. Ammonia …..... = = Chlorine Todine

+ weak — strong + strong

0

+ strong

— strong

— weak — weak

— ?weak 4- 2wealk

—strong | —

a

weak

11o01l t+

— ?weak

— weak

+ means magnetic relatively to the surrounding gas, — diamagnetic; the epithets strong and weak relate of course to the apparent behaviour under the circumstances of the experiment.

It appears therefore that oxygen is the most paramag- netic of all the gases ; on this account Faraday conceived that it probably played an important part as a cause of terrestrial magnetism.!!_ Becquerel }2 has concluded from recent experiments of his own that the specific magnetism of ozone is still greater than thatof oxygen. Faraday was able by filling thin glass bulbs with oxygen at different densities to show that the magnetic susceptibility decreased with the density, apparently in simple proportion. Some numbers giving an idea of the magnetic susceptibility of the various weakly magnetic bodies are given below.

In all experiments with gases or fluid media, and indeed in every possible magnetic experiment more or less, it is important to notice that the resulting magnetic action is the difference between the action of the movable body and the action on the surrounding medium. This was first pointed out by Faraday.!° He prepared three solutions of ferrous sulphate. No. 1 contained 74 grains of the hydrated salt for every ounce of water; No. 2 was formed by diluting one volume of No. 1 with two volumes of water, No. 3 by diluting one volume of No. 1 with fifteen volumes of water. Three glasses g,, 7., 9, and three tubes ti, t, ts were filled with the respective solutions. The glasses were placed in succession between the pointed poles of the electromagnet, and the tubes tested in them with the following result :—

— means pointed axially; -++ + the same with greater decision; — pointed

equatorially ; 0 was indifferent.

We have here the experimental confirmation of the important theoretical conclusion (see above, p. 248) that any body will behave paramagnetically or diamagnetically according as it is surrounded by a medium less or more magnetic than itself. In cases where the square of the

11 See Hap. Res., 2847 sq.; also art. Mernorotocy. 12 Comptes Rendus, 1881. 13 Exp. Res., 2362, 1845.

Oxygen.

Faraday's

experi-

ments on

differ- ential magnetic action.

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susceptibility may be neglected, it is clear that the resultant

action on any body is the difference between the action

upon it and the poition of the medium which it displaces.

This principle, which is the analogue of the Archimedean

law for floating bodies, is of great use in quantitative

Pliicker magnetic experiments. It was exemplified by Pliicker,! and and extensively applied in magnetic observations by ie ; Becquerel.2 Becquerel found, for instance, that the querel. Gigerences between the couples tending to set a small rod of sulphur in water and in air, in magnesium chloride and

in air, and in nickel sulphate and in air were very nearly

the same as the corresponding differences for a rod of wax.

Very curious qualitative illustrations of differential

magnetic action are obtained by scattering drops of alcoholic solution of chloride of iron in olive oil; the

drops of chloride collect and displace the olive oil in the

places of stronger force. Another form? of the samo experiment consists in placing a layer of oil of violets over

Different a layer of solution of chloride of iron. When a narrow cell liquids. filled in this way is placed equatorially with the interface of the two liquids in the axial line, on exciting the clectro-

magnet the iron solution rises in the equatorial plane forming a disk-shaped mass around the axial line. Not- withstanding these results the general opinion of experi- menters seems to be that no separation of the parts of a solution can be effected magnetically once the constituents Constitu- have been thoroughly mixed. Thus Faraday® could obtain ents of a2 no evidence of the concentration of an iron solution near thoaoyen the pole of a magnet, although it was exposed for days

re ° ° . not sepa- together in the magnetic field, aud found no separation of

rated. the oxygen and nitrogen of atmospheric air, although they differ greatly in their magnetic character. Rarefac- Pliicker © endeavoured to show that the air enclosed in a

tion of vessel placed between the poles of an electromagnet was aoubital rarefied by the magnetic action. Faraday, however, with 'almost identical experimental arrangements arrived at a negative result. Magnetic Elaborate investigations of the magnetism of chemical a. compounds have been made by G. Wiedemann with a view ofchemi- tO Connect their magnetic properties with their composition. calcom: A full account of these researches will be found in pounds, Wiedemann's CGralvanismus, Bd. ii. § 590 sq.7 The follow- Wiede- ing aresome of the more important of his conclusions as to mann the effect of composition.

1. The magnetic susceptibility of the dissolved salt by itself is nearly independent of the solvent, being propor- tional to the concentration.

9. If the magnetic moment m induced by a field of unit intensity in a unit of weight of the salt dissolved in water be called the "specific susceptibility," and the product y= Am, where A is the molecular weight of the salt, the "molecular susceptibility," then the molecular susceptibility of the

dissolved salt of the same metal with different acids is approximately the saine. The mean molecular suscepti- bilities for nickelous, cobaltous, ferrous, and manganous salts are as 142 : 313 : 387 : 468.

3. The molecular susceptibility of cobaltous salts stands about midway between the molecular susceptibilites of nickelous and manganous salts; and the ferrous salts stand midway between cobaltous and manganous.

4, The molecular susceptibility of dry salts (combined with water of crystallization) is for the most part nearly the same as their molecular susceptibility in solution.

A similar law holds to a certain extent for insoluble

E98: Ann., 1849. 2 Ann. d. Chim. et d. Phys., 1850. Matteucci, Comptes Rendus, 1858. 4 Marangoni, Wed. Beibl., 1881. Lap. Stes., 2757 ; see also Righi, Wied. Beibl., 1878. nL O99: Ann., 1848; see also Beer's treatise referred to above, p. 250. 7 See also Phil. Mag., 1877.

MAGNE T a

salts freshly precipitated ; and generally, with like chemical properties of the metallic molecule, the molecular suscepti- bility remains the same.®

5. Two diamagnetic elements may give 2 magnetic com- pound ; e.g., copper and bromine, both diainagnetic, give bromide of copper, which is paramagnetic.

6. When two solutions are mixed and the salts exchange their constituents by double decomposition, the specific magnetism of the solutions taken together is unchanged. Whence the conclusion is drawn that the susceptibility of a binary compound is made up by addition of the suscepti- bilities of its constituents, and that these constituents pre- serve their susceptibilities unaltered when their constitution or atomic arrangement in composition is unaltered.

Magnecrystallic Action.—In what precedes we supposed Magne- the inductively magnetized body, whether paramagnetic or crystallic

*diamagnetic, to be isotropic, and all experiments on its magnetic properties to be conducted in a heterogeneous magnetic field. In a uniform field such a body would be acted upon neither by force of translation nor by rotational couple. The case is otherwise if the body be magnetically eolotropic. In this case, according to the mathematical theory, (1) the body ought to set in a uniform field so as Two to place its axis of greatest magnetic permeability (we., of kinds of greatest paramagnetic and of least diamagnetic suscepti- *" bility) parallel to the lines of force, aud (2) in a hetero- geneous field Faraday's translational force from places of less to places of greater resultant force in thie case of para- magnetic, and from places of greater to places of less in the case of diamagnetic bodies, onglit to be greatest when the axis of greatest susceptibility is parallel to the lines of force, least when the axis of least susceptibility is in the same position, and intermediate for other positions of the body.*

In observing the first class of phenomena above men- Approxi- tioned, poles with flat faces are placed on the electro- mately magnet. Faraday recommends that the faces should be Mii placed at a distance of about one-third of their breadth. petween He warns the experimenter, however, that the uniformity flat poles with this arrangement is by no means perfect, although in used for general sufficient. The best arrangement would be to use inte the magnetic field in the interior of a cylindrical coil of magne- sufficient length were it not for the difficulty of attaining crystallic the requisite intensity in this way. In cases where there is action. any doubt it is well to give the body under examination a spherical or cubical shape, and so eliminate the tendency to set arising from heterogeneity of field.

The first observations of the magnecrystallic couple were Magne- made by Pliicker,® and elaborate investigations of the erystallic phenomenon were made by him in conjunction with Beer," eee in the course of which the magnetic properties of a large covered number of crystalline bodies were examined. licker also by detected the magnecrystallic property in a rapidly cooled Pliicker, cylinder of glass. Shortly after Plticker's first results were published, Faraday discovered the magnecrystallic Faraday. action of crystallized bismuth. At first, misled no doubt by the language in which Pliicker stated the newly dis- covered facts, he did not recognize the identity of the two phenomena; but on further investigation he was able to class all

the observations under a few simple laws," which in the mathematical form given to them by Thomson con- stitute the theory already given. To the observations of Pliicker and Faraday Knoblauch and Tyndall added the Knob- important discovery that bodies in which the linear density lauch in one direction is greater than in another, whether as a Tyndall. consequence of compression or of stratification artificial or natural, exhibit magnetic zolotropy.

8 For qualifications see Wied., Galv., se.

9 Pliicker, Pogg. Ann., 1847, 1848, 1849, 1852. 10 Pliicker and Beer, ogg. Ani., 1850, 1851.

ll Hop. Res., 2797 sq., 1850.

MAGNETISM

Magnetic It is convenient, following the analogy of physical optics, classifi- to divide magnetically eolotropic bodies into (a) "uniaxal" cation of bodics, ze, those that are symmetrical about one principal me Tis of magnetic susceptibility, or, in other words, have two of the principal coefficients of magnetic susceptibility equal (kg=K); and (b) "biaxal" bodies, 2.¢, those that have the three principal susceptibilities unequal. Class (a) naturally divides itself into those in which.the susceptibility parallel to the axis of symmetry is greater ., and those in which it is less than that in the plane perpen- . dicular to it. The former (where x,>x,) are said to be magnetic positive, the latter (x,<.«,) negative uniaxals. We have and dia- also to attend to the distinction which arises according as mas- the mass of the crystal is paramagnetic or diamagnetic ol (x, and x, both +, or both —). We have then the follow- ing experiinental behaviour in uniaxal bodics :—

Uniaxals positive and

Sets the Axis of Symmetry

Pesitive }

Parallel to lines of force. Perpendicular to lines of foree. Perpendicular to lines of foree. Parallel to lines of force.

Paramagnetie papagiatic ‘ aramagnetie ee Datnersatic Faraday found for example that a crystal of bismuth suspended with its plane of smoothest cleavage vertical set with this plane perpendicular to the lines of force, but was indifferent when suspended with this plane horizontal. The axis of magnetic symmetry is therefore perpendicular to the plane of smoothest cleavage, and, since’ the substance is diamagnetic, it is a negative uniaxal. When suspended in any other way the crystal set so that the magnetic axis rested in a vertical plane through the direction of the lines of force. The difference between the behaviour of magnetic and diamagnetic uniaxals is beautifully illustrated hy the behaviour of pure Iceland spar, which is a positive diamagnetic uniaxal, and sets the optic axis, which is the Inagnetic axis, equatorially ; when, however, as sometimes happens, the calcium is partly replaced by iron, its physical properties (optical included) being thereby unchanged, except that the mass of the crystal becomes magnetic, it sets the optic axis axial. Magne. All these cases are of course included in the single rule crystallic that the body sets the axis of greatest permeability parallel couple to tlie lines of force. Since the setting of weakly magnetic indepen- : ; i dent of ®olotropic bodies depends merely on the differences between sur- the principal magnetic susceptibilities, it follows that it is rounding independent of the medium in which the body is placed. medium. ‘This was established experimentally by Faraday,” who found the magnecrystallic couple exerted on a crystal of bismuth to be the same whether it was surrounded by air, by water, or by a saturated solution of protosulphate of iron. Pliicker gives the following list of uniaxal eolotropic

bodies :— MAGNETIC. Positive. Negative. Spathic iron ore. Tourmaline. Seapolite, Beryl. Green uranite. Dioptase.

Vesuvian. Sulphate of nickel. Ammoniochloride of copper.

Ferruginous sulphate of mag- nesia.

DIAMAGNETIC. Positive. Negative. Cale-spar. Bismuth. Antimony. Arsenic, Molybdate of lead. Tee. Arsenide of lead. Zircon. Sulphate of potash. Mellite.

Nitrate of potash. Cyanide of mercury.

Arseniate of ammonium.

1 Tyndall and Knoblauch, Phil. Mag., 1850. ’ ? Kap. Res., 2498 sq., 1848. A later but much more extensive series of experiments led to the same result (Hap. Res., ser. xxx., 1855).

The phenomena in the case of biaxal solotropics are naturally nore complicated ; but they are all comprehended in the simple rule given above (page 244) that the axis of greatest paramagnetic or of least diamagnetic resultant susceptibility in the horizontal plane tends to set itself parallel to the lines of force, or, in the words of F araday, Faraday’s the body tends to set so as to allow the greatest number experi- of lines of magnetic induction to pass through it. In the ™etal azimuth just mentioned the body is in stable equilibrium, in the perpendicular azimuth in unstable equilibrium. There are two axes of suspension in the plane of the axes Pliicker’s of least and greatest susceptibility, viz., the normals to the two mag- circular sections of the ellipsoid «x? + «oy? + x42? = constant, 2¢t¢ such that the body behaves indifferently; these axes were called by Pliicker the “ magnetic axes” of the body. If we observe the times of vibration T,, T,, T, of a sphere of the substance, when the axes k,, Kk, Kg respectively are vertical, then we have at once by the theory already given

die Gorge ae 1)/V eq — tg! 1 ee WV ig — ko 3

whence 1/T?+1/T}=1/T}, and tanw=T,/T,, w being the angle between either magnetic axis and the axis of greatest magnetic susceptibility. These results were veri- fied experimentally by Pliicker.®

Magnecrystallic phenomena of the second kind were Pheno- looked for by Faraday very early in the history of the mene of subject, but at first he was unsuccessful in detecting them.4 a He seems, however, to have understood and clearly repre- , sented to himself in his own way their close connexion with the phenomena of the first kind, for he alluded to the subject more than once, and finally in the twenty-sixth series of his experimental rescarches,

where he explained at length his magnetic theory, hc showcd that such an effect ought to exist, and actually succeeded in observing it in the case of a crystal of bismuth, which he found to be less repelled from places of stronger to places of weaker force when its First dis- axis was parallel to tlie lines of force than when it was covered perpendicular to them. He concluded that with Iceland nes spar the translational force ought to be greatest when the pismuth. axis is parallel to the lines of force, and least when it is perpendicular to them; but his apparatus was not sufficiently delicate to show the effect.

Unlike the magnecrystallic phenomena of the first kind, Pheno- those of the second kind depend on the difference between mena the susceptibilities of the body and of the surrounding ed medium. Faraday> demonstrated this conclusion experi- j:54 mentally by covering crystals of the red prussiate of depend potash with a thin layer of wax to prevent dissolution, and on the immersing them in solution of sulphate of iron of various ae strengths between the pointed poles of an electromagnet. actin In water the crystal was attracted to places of stronger force in all positions, in concentrated solution of sulphate of iron repelled in all positions, while in a solution of 14 or 15 volumes of the concentrated solution to 6 volumes of water it was attracted when the axis of symmetry was parallel to the lines of force and repelled about as strongly when the axis was perpendicular to them. Here then the crystal actually behaved paramagnetically in one direction and diamagnetically in the other. Similar results can be ob- tained with Iceland spar in a mixture of alcohol and water.

The prediction of the second class of magnecrystallic Faraday phenomena is one of the most extraordinary instances of and the theoretic insight which formed so large a part of the Thomson. genius of Faraday. The laws of the phenomena of the first class might be regarded as merely a skilful classifica- tion of observed facts, but the passage therefrom to the second class was a step of the first magnitude ; it constitutes in fact the root of the whole matter. To Sir William

3 Phil. Trans., 1858. 4 Kap, Res., 2552, October 1848, 5 Exp. Res., ser. xxx., 1855. XV. — 34

Tyndall verifies the pre- diction of Fara- day and Thom- sou for Iceland spar.

Hankel.

Relation of mag- , netic eolo- tropy to crystal – line form,

Effect of compres- sion, Tyndall and Knob- “auch.

Effect of laminar structure.

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Thomson belongs the credit of throwing the laws of magne- crystallic action into the appropriate mathematical form, and of showing that they range themselves quite naturally under the theory of Poisson!

Tyndall succeeded, where Faraday had failed, in showing the magnecrystallic phenomenon of the second kind in Iceland spar. It is particularly instructive to compare his results for carbonate of iron and carbonate of lime, both positive uniaxals, but the one magnetic and the other diamagnetic. His results are as follows :—

Axis Equatorial.

ral ap

90 –

85 ar

100 –

Magnetic

Axis Axial. Character.

Substance,

Carbonate of iron

100 100 100

in

Carbonate of lime Sulphate of iron Bisinuth

Hankel 2 measured the repulsion on a cylinder of bismuth placed with its magnetic axis inclined at angles of 15°, 45°, and 75° with the lines of force, and compared his results with the theoretical formula 90:7 + 45:3 sin 24; the result was as follows :—

oe 75%,

1382°4 133°0

Observed repulsion Calculated repulsion

Influence of Crystalline Form, Compression, &c., in pro- ducing Magnetic dolotropy.—In general the magnetic eeolotropy stands in close relation to the crystalline form, and consequently to a considerable extent also to the optical properties, Thus crystals of the regular system exhibit as a rule no magnecrystallic properties, but there appear to be exceptions in the case of certain pyroelectric crystals such as boracite. Again, crystals that have one crystallographic axis of symmetry are usually magnetically uniaxal, but the optical distinction of positive and negative does not involve the corresponding magnetic distinction, as is shown by the results of Tyndall and Knoblauch with pure Iceland spar and Iceland spar in which part of the calcium is replaced by iron. Crystals that are optically biaxal are asa rule magnetically biaxal, but the magnetic properties cannot be deduced immediately from thee optical.

If a small cylinder be made of a paste formed with finely ground bismuth and gum water it will point equatorially in a heterogeneous field, but if the roll be squeezed flat the plate thus formed will point axially, although its length be ten times its breadth. A roll of paste of powdered carbonate of iron, again, will point axially, the plate formed by squeezing it flat

equatorially.2 From these results Tyndall and Knoblauch concluded that, if the arrangement of the particles of any body be such as to present different degrees of proximity in different directions, then the line of closest proximity, other circumstances being equal, will stand axial if the mass be magnetic, equatorial if the mass be diamagnetic. They constructed parallelepipeds (Lin. x din. x }in.), first, by gumming together rectangular slips of sandpaper (1 in. x } in.), secondly, by gumming together squares of the same (} in.x}in.). The paper was comparatively indifferent, while the sand by itself was magnetic ; and it was found that the first model set its

longest dimension axially, while the second set its longest

Stratified and fibrous bodies,

*dimension equatorially ; 7.¢., the layers of sand set in both cases axially. Tyndall*has observed similar magnecrystallic actions with naturally stratified bodies such as shale, and in fibrous bodies such as wood. He was even able by*

ee eee

‘ Phil. Mag., March 1851 ; or Reprint, chap. x. ie he 3 see Wied., Galv., ii. § 689.

yndall and Knoblauch, Phil. Afag., 1850. 4 Phil. Mag, 1851. as

MAGNETISM

squeezing plates of bismuth to apparently reverse the magnetic character of the substance ; for the compression rendered the plates ecolotropic with an axis perpendicular to their longest dimension, and in consequence they set axially like plates of a paramagnetic substance.

crystals proper by means of these results. They assume that the planes of cleavage are directions of closer aggrega- tion, and therefore tend to point axially in magnetic and equatorially in diamagnetic crystals. first of the above-mentioned sandpaper models would °% represent magnetic crystals that cleave parallel to their axis,

the second magnetic crystals which cleave perpendicular Knob. If we regard this theory merely as a way lauch.

to their axis. of representing the facts of observation, even if we allow it to be sufficient, it is far inferior in simplicity to the theory of Faraday and Thomson, the sufficiency of which is not disputed. Regarded as an attempt to penetrate a little farther into the relation between molecular structure and magnetic properties, it is of great interest and importance, even if we admit that like most other speculations of the kind it leads us but a little way; for the question arises immediately, How does proximity of the molecules increase specific inductive capacity? This last question is all the more difficult to answer that no experiment has ever yet been adduced wherein the effect of the mutual induction of the parts of a diamagnetic or weak para- magnetic body plays an undoubted part.®

Discussion as to the Existence of Diamagnetic Polarity.— Contro- Soon after Faraday's first discovery of diamagnetism, an Versy

animated discussion arose as to the proper way of stating the facts involved in the new phenomenon. Faraday him-

self inclined in the first instance to put the matter by polarity. saying that under the action of an inducing force a Faraday.

diamagnetic body is magnetized in a direction opposite to that of soft iron; at a later period he abandoned this form of statement in favour of what he called the theory of magnetic conduction, which fitted better with his ideas as to the part played by the surrounding medium by means of which magnetic action is transmitted from one body to another. Faraday's first theory under the name of the theory of diamagnetic polarity was immediately adopted

by the Continental physicists, such as Weber, Reich, Weber

and Poggendorff, who naturally found it consonant with and Tt others.

their favourite views as to action at a distance.

was also supported in England by Tyndall and others, Tyndall.

Many experiments were advanced on both sides of the question, and the result was much instructive illus- tration of the laws of magnetic action. But the con- troversy settled nothing, because in point of fact there was nothing to settle.

5 Faraday, Exp. Res., 2825, &c. There is a further difficulty in the case of diamagnetic bodies. See Thomson's letter to Tyndall, Reprint of Papers on Elec. and Mag., p. 586.

It was also found Imita-

Tyndall and Knoblauch piaxa) attempt to explain the magnetic phenomena exhibited by crystal.

For example, the Theory

Either theory was perfectly sufficient, The dis- when properly applied, to represent the phenomena, cussion a and each left the question of the ultimate nature of cittenema paramagnetic and diamagnetic action where it found it. words This ought to have been evident after Thomson had shown merely. that the phenomena were included in a perfectly natural Thom- generalizatian of Poisson's theory, indicated in fact by son.

MAGNETISM 267 Poisson himself, and demonstrated that Faraday's con- | Olive oil… -—86 { Chloride of arsenic…..... — 122 ception of the phenomena was only another method of | W8%:ir-r.e eee = 80 | Tee aa er lead'... Sl yeoine : : : ; NSO ROM asassuensanees = 88 | PHGSQNOMS" cwcgstcseasnets = Og viewing the facts leading to identical conclusions, Faraday | Wate 66¢| Selenitnn'.o. 168 himself! seems in the end to have considered that the | Ammonia solution…..... -98 | Pure copper™ voces aim Maxwell. difference was a matter of phrases. Since Clerk Maxwell's | Bisulphide of carbon….. —100 Pure silver®, Stent peace — 235 elaborate mathematical reconstruction of the theories of | 54. Solution of nitre…. -100 | Pure gold..... cee 200 2 " : l eee sev) Hil Sulphuric acid …..... SOE | SISISMNIEL Ay. s-ceacvacucorens ~ 1967*

Faraday this seems to be universally recognized, an @ | Sulphur… 118

Earlier Numerical Data respecting the Susceptibility of Weakly | oxygen, and air are as — 100 :~~1°8 : '352, according to Becquerel results, AMfagnetic Bodies, — The earlier experimenters arrived forthe | #8 — 100:1'82: 382. _ Pliicker's results do not agree so well eo Fost part at the conclusion that the susceptibility ee ef with those of Faraday and Becquerel ; but his method was faulty. = weakly magnetic bodies is constant. Among these may be | _ Within the last five years a large number of absolute Recent mentioned Weber, who experimented with bismuth, E. | determinations of « have been made, chiefly for bismuth and absolute Becquerel,2 Tyndall 8 Joule, Reich,® and Matteucci,® who | ferric chloride. Toepler and Von Ettingshausen !? in their oer experimented on various substances by means of the | expsriments on bismuth used with some alietos the tions. torsion balance; Christie,' who worked with bismuth, | Method of induced currents employed by Weber !5 in the Toepler and Arndtsen,® who worked with ferric sulphate and | earliest attempts that were made to determine the et ven ferric chloride, both using Weber's diamagnetometer; and | Susceptibility of bismuth. Like Weber they compare = Wiedemann,® who experimented with solutions of a variety | bismuth with iron, an unsatisfactory procedure on account of salts, E. Becquerel, however, in some of his experi~~ | Of the great variability of the susceptibility of iron for ments, ¢.g., with sulphate of nickel, found that « showed | different magnetizing forces, and for different samples with a tendency to decrease for very large values of the | the same magnetizing force. ; magnetizing force ; Pliicker,!° who tested a great variety of Silow worked with ferric chloride. In his first set of Silow. to) ° es * oe Ad substances (powdered or in solution) by measuring with a | ¢Xperiments** he observed the time of vibration of an delicate balance the attraction or repulsion exerted upon | Static needle suspended over a ee) vow filled them by an electromagnet, arrived at a similar conclusion ; | With the solution ; in his second investigation ™ the solution but the methods of both these experimenters are open to | Was placed in a glass globe, on the outside of which suspicion. insulated wire was wound so that a given current in it Relative A large number of relative results were obtained by the | Produced a uniform magnetic field whose strength could be employed were not satisfactory, and in others the results so | Suspended inside the globe, was*

observed when the globe evidently depend on the state of aggregation of the material | ¥28 empty and when it was fnll, and thence « was calcu- that they are of little importance. he following tables | lated ; in his third determination ‘” he used the method of will give the reader some idea of the relative magnitudes | Toepler and Von Ettingshausen so improved as to allowan of the susceptibilities of different substances :— absolute determination of « to be obtained directly. q ‘@ Borgmann !° enclosed one coil within another, and filled Borg- peoreer, Plicker’s Lable for Magnetics. the hollow cylindrical space between them with the solution mann. Magucticivou ovessu.- 40,297 | Fersic sulphate “‘‘y, ” ge | OF ferric chloride to be tested; he also used the ring Werric oxide…cccs.ecceeee 286 | Ferrous chloride ,, g4 | method of Stoletow and Rowland. HVGTNABTEG sce cscesevesnens 134 | Ferrous sulphate ,, 126 Jacques,!9 following a method elaborated by Rowland, Jacques Specular iron ore …..... 5338 | Nickelous oxide…..... 35 | measured the repulsion of crystals of bismuth and Iceland and a ate i oxide …. ee ae ee cee ee “ae spar placed with their magnetic axes axially and equatori- Rowland. Green vittiol…....., 78 | Mangano-manganic oxide. 167 | ally between the poles of 2 Ruhmkorf’s electromagnet, the Nitrate ofiron, conc. soln, 34 field of which was carefully explored after the manner of The numbers here denote specific magnetic susceptibility ; 7.2, | Verdet by means of a small coil moved through a known equal weights of the substances are compared. distance in different parts of it ; from these observations Faraday Results of Faraday and Becquerel. the two principal magnetic susceptibilities were calcu- and Ferrous chloride, conc, 4.655 Hydrogen …....00.s000 —0‘1 | lated. Rol , oa: rt 7 eam BAS veeeeeeeses ‘ E Schuhmeister ° **experimented with ferric chloride, using gchuh- Ei reieonide.. sain 4134 coe eee” _4g:9 | the same method as Rowland and Jacques. Do. of cupric oxide…... +120 | Pure zine vwscscseee —75 In the experiments of Eaton** the method formerly OT oa ctncscsaneoveneee TY Weis. seosesesvasexees ~~75 | employed by Wiedemann was adopted; the data in his BM as cccoas ss stss ess 3‘4 | Alcohol absolute’..... —79 | paper are, however, insufficient for an absolute determina~~ oe foe nest ome. a ae tion either of the magnetizing force or of «3; in fact he Vactim ec FOO | Gambhir Teg | determines merely the force with which the magnetic body Carbonic acid…..... 00 | Linseed oil…..... -—85 | isattracted and the magnetic moment of the electromagnet,*

discussion has subsided. For a full account of the various interesting experiments that were made during the contro- versy the reader may be referred to Wiedemann's Gal- vanismus, § 558 sqz., and to the reprint of Tyndall's Papers on Diamagnetism and Magnecrystallic Action, pp. 76 sq.

1 See a lettcr to Matteucci dated November 2, 1855, published. in Bence Jones's Life and Letters of Faraday, reprinted in Tyndall's Diamagnetism and Magnecrystallic Action, p. 180.

2 Ann. d. Chim. et d. Phys.

3 Phil, Mag., 1851.

5 Pogg. Ann., 1856.

4 Phil, Mag., 1852.

6 Ann. d. Chim. et d. Phys., 1859.

7 Pogg. Ann., 1858. 8 Pogg. Ann., 1858.

9 Pogg. Ann., 1865. 10 Pogg. Ann., 1854.

1 #.g., Pliicker, Pogg. Ann., 1848, 1851, &c. ; E. Becquerel, Ann. d. Chim. et d. Phys., 1850, 1851, 1855, &c. ; Matteucci, Comptes Rendus, 1853, and Cours d' Induction, 1854; Wiedemann, Pogg. Ann., 1865, 1868, &c.

The results marked with an asterisk are taken from Becquercl ; the rest are from Faraday. The numbers relate to equal volumes of the substances, and the mcdium is supposed to be vacuum; so that water in air would be represcnted by 100.

The numbers of Faraday, Becquerel, and Matteucci agrec very fairly ; ¢g., according to Faraday the susceptibilities of water,

assuming that the strength of the magnetic field at a given point is proportional to the latter,—which is not necessarily true, for the magnetic distribution in the core of the electromagnet may alter with increasing current.

12 Pogg. Ann., 1877. 13 Tl, Maasbest,, Thi. iii

M4 Wied. Ann., 1877. 15 Wied. Beibl., 1879.

16 See Maxwell, Hl. and Mag., vol. ii. § 672.

WV Wied. Ann., 1880, 18 Wied. Beibl., 1879.

‘9 Silliman’s Jour., 1879. The published results are vitiated by some error of calculation ; but the experiments are to be repeated.

20 Wien. Ber., 1882. 41 Wied. Ann., 1882.

Von Von Ettingshausen! in the most recent research on the Ettings- subject with which we are acquainted has made determina- hausen. tion of the susceptibility of bismuth by four different methods. The first of these was that formerly used by Toepler and himself, with the addition that the action of the bismuth bar was compared with that of a solenoid of as nearly the same dimensions as possible through which flowed a current of given strength (an artifice previously used by Christie). The second method consisted in measuring the force with which a portion of the diamag- netic substance hung in the axis of a coil and near one of its ends was repelled out of the coil when a known current passed through it. The third method was that of Rowland and Jacques. The fourth consisted in measuring the deflexion of a magnetometer needle produced by placing a piece of the diamagnetic substance between the poles of a powerful magnet under whose action the magnetometer needle had come to rest in the first

The unit of % is the earth’s horizontal force, presumably at Moscow.

From the observations of Arndtsen ou a solution of density 1:495 Silow® calculates 10% = 575 (magnetic force 20°3). For a solution of density 1:395, with magnetiz- ing forces from 38 to 252, Schuhmeister gets 10° = 30 to 39. Von Ettingshausen, fora solution of density 1°48, with magnetizing force 14 to 20, gets 10° =59 to 56.

The following are the values of 10° obtained by Schuhmeister for various substances.

Schuh- meister,

instance.2 The ee 1418 272°2 agreement between the results obtained by all the different | | ——~ 7 ; 7 ae methods was very fair considering the smallness of the a ec alienate ae — effects to be measured in some of them. The second Cie eet from electroly: is) 181 i‘ inethod is pronounced to be the best, and by means of it el 2) a ee ‘177 Ae: he gives also a determination of x for ferric chloride. as eat oe 0377 “0496 Results Some of the results of the different experimenters for a cs — i s bismuth are given in the following table :— pice Roncinden Poe. kathories, te, RELATION OF MAGNETISM TO OTHER PHYSICAL PROPERTIES. 63 Calculated by Stoletow from cer- : F : _— 301 tain results of Weber’s, see Shocks, Jarring, or Vibration.—The effect of these in aid- Silow, Wied, Ann., 1882. ing the action of an inductive magnetic force was known to pyre i Sees Gilbert; and it was also known to the earlier experimenters Calenioed yt on Ettingshausen, | | that the permanent magnetism of a body not subject to a l.c., from Christie. external magnetizing force was destroyed by like causes. 25°8 to 128 Three different samples by Von | | The action is precisely similar to that found in the case of 71°4 to 110°2 Ettin shauscn’s s : d je bodi il tly def d b hanical 39°2 to 822 ittin gs econd method. odies temporarl y or permanently deformea by mechanica stress, and, again, to the first effects of temperature on Most of the specimens contained slight traces of iron. bodies temporarily or pounaneeny strained, or temporarily Although the range of the magnetizing force in Von | ° permanently magnetized. The effect may be conceived Ettingshausen’s experiments was considerable, « was very | ®% consisting of a loosening of the molecules for the moment, nearly constant ; if there was any tendency to variation, | °° that they follow more easily any force acting on them it was decrease with the large magnetizing forces. whether mechanical or magnetic. The following parallel Results Tho results for ferric chloride are not so concordant, | Statements, taken from the results of Wiedemann, who for Silow, after comparing his own earliest result (10% =81 has devoted much careful study to these phenomena, will yo je, for a solution of density 1:475, magnetized by the earth’s sufficiently illustrate the matter :—*

horizontal force) with those of Borgmann (10% = 48°8, density 1:87, magnetic force 40 to 59), concluded that the susceptibility of ferric chloride probably follows the same law as that of iron; 2.¢., it first increases, then reaches a maximum, and afterwards decreases more or less slowly. His later experiments confirm this conjecture, and he finds that « has a maximum value for a magnetizing force of about ‘4 0.G.S. The smallest force used was about ‘08 C.G.S. and the corresponding value of 10% was 34; the largest value of 10° occurring in his tables is 179. The values obtained in his last investigation are smaller than those given in his first table, but there is the same in- crease and decrease. The following are his latest results :—

1. Jarring a body under twist- ing stress canses increase of twist.

2, Permanent twist in a wire is diminished by jarring.

3. A wire permanently twisted and then partly untwisted loses or gains twist when jarred according as the untwisting is small or great.®

Minuter details regarding the effects of jarring will be found in memoirs by Wiedemann, Fromme, Auerbach, and others already quoted. The reader may also consult Warburg, Pogg. Ann.,

1870, and Villari, Pogg. Ann., 1869.

Mechanical Strain produced by Magnetization.—The Joule’s starting point of accurate research on this subject was the dis- discovery made by Joule® in 1842 that a bar of soft iron (Fino, lengthened when it was temporarily magnetized in the magnetic longitudinal direction. When the magnetizing force was strains. removed the bar shortened, but in general not quite to its ge eC

I. Jarring a bar under magne- Wiede- tizing force causes increase of mann’s magnetization. parallel

II. Permanent magnetization state- in a bar is diminished by jarring. ments.

III. A bar permanently mag- netized and then partly demag- netized loses or gains magnetiza- tion according as the demagnet- ization is small or great.®

Silow.

3 Wed. Ann., 1882.

4 Compare also the effect of the same causes on the temporary and residual charge of Leyden jars, art. ELECTRICITY, vol. viii. p. 40.

5 It is possible in this way even to cause a wire to reverse its twist and a bar to reverse its magnetization by jarring.

6 His attention had been drawn to the subject in 1841 by a Mr Arstall, who had suspected the existence of some such effect. Joule's papers on the subject are in Sturgeon, Ann. of El., 1842, and Phil.

| Mag., 1847.

1 Wien. Ber., 1882. 2 This was one of the experiments adduced by Weber in the contro- versy Oe diamagnetic polarity ; see Pogg. Ann., 1848.

Effect of

teusion,

No alter- ation of volume,

Effect of

traction on mag- netiza- tion. Mat- teucci.

Villari.

MAGNETISM

original length. This residual extension was due in part to permanent maguetism, but he found that the permanent magnetization due to a current

1088 was reversed from ~ 1°3 to+°25 bya current 175, while two-thirds of the permanent extension was still left. The actual clongation of an iron bar magnetized to saturation was found to be from qzvoooth to zypopoth of its whole length. The exten- sion varied approximately as the square of the intensity of magnetization (temporary or permanent). The general character of the phenomena is the same in soft or hard iron, and in soft or hard steel ;1 but the effects are smaller with hard than with soft bars.

It was found that longitudinal compression of the bar influenced the magnetic extension little if at all; on the other hand, longitudinal traction was found to diminish it, and in the case of thin wires under considerable tension the magnetization caused a contraction. Thus in the case of a bar 1 foot long, } inch in diameter, with a weight of 600 tb, there was neither extension nor contraction, even with a current of 1600; with weights of 1040 tb and 1680 tb, and a current of 1804, there was a contraction of 00002 inch and ‘000032 inch respectively, The contrac- tion under tension was found to vary approximately as the product of the magnetizing current and the intensity of magnetization. After the magnetizing force was withdrawn the wire regained its original length, permanent magnetiza- tion notwithstanding.

Joule made careful experiments to determine whether the magnetization of an iron bar produced any alteration of its volume, but could find none. He therefore concluded that the longitudinal extension of a magnetized bar is accom- panied by an equal lateral contraction ; and, in accordance with this conclusion, he found that when an iron tube is cir- cularly magnetized, perpendicular to its length, by passing a current along its axis, it contracts longitudinally.

The results of Joule have been verified and to some extent added to by Wertheim,? Buff,’ Beez, Tyndall,> Mayer,® Righi,” and Ader.® The three first experimented with magnetizing coils shorter than the bar, and found that the extension was much greater when thie coil was near the free end than when it was near the fixed end of the bar. This of course raises the question how far the extension is due to electromagnetic action between the coil and the bar, and how far to internal molecular disturbance.® Mayer’s results are in agreement with Joule’s except in the case of bars of soft steel,*

which (not under traction) when the magnetizing current was first estab- lished, elongated in some cases aud retracted in others,—at the first break elongated, and subsequently retracted at make and elongated at break. Righi's results for longitudinal magnetization are in agreement with those of Joule ; he also gives a variety of interest- ing results regarding the effects of circular and longitudinal mag- netization on the length of iron wires. Barrett!® has recently arrived at the interesting result that nickel behaves oppositely to iron,—retracting about ysayyath when magnetized to saturation ; he gives for the elongation of iron and cobalt under like circum- stances ygyoyath and aeeonoth respectively.

Liffect upon Magnetization of Traction along the Lines of Magnetization.—Matteucci! seems to have been the first to discover that when a bar subject to a magnetizing force in the direction of its length is stretched in the same direction its temporary magnetization increases. When the stretching force is removed the magnetization again diminishes, Wertheim!? confirmed Matteucci's observation. Villari,' however, found that, after the first effect, which

1 In the case of a bar of hard stcel he found a considerable increase in length every time the magnetizing current was interrupted. This he attributes to a state of " tension" in the hardened steel.

2 Ann. d. Chim. et d. Phys., 1848.

3 Cited by Wiedemann, Galv., ii. § 504. 4 Pogg. Ann., 1866.

5 Diamagnetism and Magnecrystallic Action, 1870.

6 Phil. Mag., 1873. 7 Nuov. Cim., 1880.

8 Comptes Rendus, 1880.

® See Wiedemann's remarks, Galv., ii. § 503.

10 Nature, vol. xxvi., 1882.

1 Comptes Rendus, 1847; Ann. d. Chim. et d. Phys., 1858. 2 Ann. d. Chim. et d. Phys., 1857, 1858.

13 Pogg. Ann., 1868, also 1865, 1869.

is always increase, the application of the traction will cause increase if the intensity of magnetization is not beyond a certain critical value, but decrease if that value is surpassed ; the removal of the traction causes in each case the opposite effect to the application.

The effect of the first traction on the permanent mag- netization, whether of iron or steel, is a diminution ; the effect of subsequent tractions in steel is a diminution on application, with increase on removal; in soft iron an increase on application, a diminution on removal. Partial demagnetization of a steel bar by an opposite magnetic force causes it to behave like soft iron ; when the demagnet- izing force is sufficient to reverse its polarity, the effect of even the first traction may be to increase the magnetization.

Sir W. Thomson ! has carefully studied the phenomena Thom- in question, as exhibited in a very soft iron wire '075 cm. son.*

in diameter permanently stretched by a weight of 1 Ib, and alternately stretched by weights of 7 tb, 14 Ib, or 21 Ib, and unstretched (so that there was no permanent elongation). As the magnetizing force was increased, the increase of magnetization caused by the application of traction increased to a maximum, then diminished, and became zero for a ecrtain critical value of the magnetizing force; after the critical value was passed, the traction caused a diminution of the magnetization, which increased asymptotically towards a fixed limit as the magnetizing force was increased more and more. The following table will give an idea of the results.

I denotes the maximum increase, and D the limit of the decrease, roughly estimated in the same arbitrary unit ; %' is the force corre- sponding to I, and #, the critical force, each expressed in terms of the carth's vertical force at Glasgow as unit ; T is the traction, ¢ the temperature.

Ho

59 84 64 35 48 25 4:5 25

4°5 26

50 29

Bars of nickel and cobalt were also examined; and it was found that after the first effect the result of applying traction in the direction of magnetization was in both cases to diminish the magnetization. The effect appeared to increase up to a maximum, and then to diminish as the magnetizing force increased ; but the critical value was not reached with the largest forces employed.

Traction perpendicular to the lines of magnetization was found by Thomson to diminish the magnetic susceptibility. The experiment was made by means of a gun barrel magnetized longitudinally, and subjected to internal hydro-static pressure.

The effect of pressure along or perpendicular to the magnetization would in all probability be opposite (and equal?) to that of an equal amount of traction ; but no experiments have as yet been made on the subject. The effect of traction is therefore to produce magnetic xolotropy, the susceptibility being increased in the direction of the stress and diminished in the perpendicular direction so long as the intensity of magnetization is not above a certain critical value; above that value the effects are reversed. The effect of pressure would be opposite in every particular. Hence the effect of a shearing stress would be increase of magnetic susceptibility along the principal axis of elonga- tion, and decrease (to an equal extent?) along the principal axis of compression.

14 Phil. Trans., 1876 and 1879, p, 55. 1 Pressure applied outside Thomson's gun barrel would enable us to observe the effect of transverse pressure; and by magnetizing the

barrel circularly the effect of pressure along the lines of force could be determined.

Wiede- mann. Torsion and magnet- ization.

Parallel state- ments for strain and magnet- izution.

270

*Relations between Torsion and Magnetization. —These were investigated by Matteucci,! and after him by Becquerel and Wertheim.2 The whole subject was carefully studied by G. W. Wiedemann,' who has done more than any living physicist both in discovering new facts in this interesting field and in coordinating those formerly known. We extract from his Galvanismus * the following series of parallel statements, which will serve the double purpose of inaking the reader acquainted with the principal facts, and of drawing his attention to the close analogy between the mechanical and magnetic properties of bodies, and to the*

almost perfect reciprocity of their experimental laws.

1. The permanent torsion of iron wires is diminished by magnetization in a proportion decreasing with increasing mag- netization.

2. Repetition of magnetization in the same direction diminishes permanent torsion very little farther; but magnetization in the opposite direction causes a fresh and considerable diminu- tion.

3. Whenthce permanent torsion of a wire has been removed as far as it can be by magnetizations within certain limits repeated alternately in oppositedirections, it takes a maximum of torsion when magnetized inone direction, a minimum when magnetized in the other direction.

4, A permanently twisted wire partially untwisted loses less of its twist when magnetized than an ordinary permanently twisted wire. If the untwisting has been considerable, feeblo magnetization causes an increase of torsion, which rises to a maximum and then decreases as the magnetization is increased. The greater the untwisting the stronger the magnetization corre- sponding to this maximum, and, when the untwisting is very great, the maximum may not be reached at all.

5. Ifa wire under the influence of a twisting stress is magnctized, the twist increases with weak but decreases again with strong inagnetization. The first effect of magnetization is usually to increase the twist; but, if the wire be jarred beforehand, the magnetization at once causes untwisting, which disappears when the magnetization ceases.

6. If we magnetize an iron wire so that its free end has north polarity, and then pass a current from the fixed to the free end, or first pass the current and then magnetize, the free end of the wire as seen from the fixed end twists in the direction of the hands of a watch. The reversion of current or of magnetization reverses the twist; reversion of both leaves it unaltered.

{It would appear that when the magnetizing force and thecurrent are both in action thé twist tends to a maximum when either is increased, the other remaining constant.]

I, The permanent magnetiza- tion of steel bars is diminished by torsion in a proportion de- creasing with inercasing tor- sion.

II. Repetition of torsion in the same direction diminishes ee ial magnetization very ittle farther; but torsion in the opposite direction causes a fresh and considerable diminu- tion.

Ill. When the permanent magnctization of a bar has been removed as far as it can be by twisting within certain limits repeated alternately in oppo- site directions, it takes a maxi- mum of magnetization when twisted in one direction, a mini- mum when twisted in the other direction.

IV. Apermanently magnetized bar partially demagnetized loses less of its magnetization when twisted than an ordinary per- manently magnetized bar. If the demagnetization has been considerable, feeble twist causes an increase of magnetization, which rises to a maximum and then decreases as the twist is increased. The greater the de- magnetization the greater the twist corresponding to this maxi- mum, and, when the demagnet- ization is very great, the maxi- mum may not be reached at all.

Y. Ifa bar under the influence of a longitudinal magnetizing force is twisted, tho magnetiza- tion increases with small twists but decreases again with

large twists. The first effect of twisting is usually to increase the magnet- ization ; but, if the bar be jarred beforehand, the twist at once causes a decrease, which disap- pears when the twist ceases.

VI. If we twist the free end of a wire in the direction of the hands of a watch as seen from the fixed end, while a current from fixed end to free end either is passing through it or has passed through it, the wire be- comes longitudinally magnetized so that its free end has north polarity. The reversion of cur- rent or of twist reverses the mag- netization; reversion of both leaves it unaltcred.

The alterations of the longitudinal and circular magnetization of

1 Comptes Rendus, 1847.

3 Pogg. Ann., 1858, 1859, 1860.

2 Comptes Rendus, 1852. 4 Bd, ii. § 492,

iron wires may be shown by the induced currents thereby caused in a coil surrounding the wire or in the wire itself. For example, ifan iron wire be circularly magnetized by passing a current through it, and then twisted in either direction, an induction current flows through the wire in the same direction as the original current ; and an opposite current is observed when the wire is untwisted again. This shows that twisting the wire diminishes the permanent circular magnetization, while untwisting partially restores it.®

The relation between bending stress and magnetization has been studied by Guillemin,® Wertheim,' Ader,® and Kimball ;® but the results are not of sufficient interest to be cited here. The question has also been raised whether magnetization affects the elasticity of bodies, and has been answered by Wertheim and Wartmann in the negative. Both Kimball ® and Piazzoli!? find that the breaking ten- sion of iron wires is increased by longitudinal magnetization ; the former puts the increase at 0°9 per cent. when the wire is saturated.

This is the place to mention the so-called " magnetic Magnetic sounds" which accompany the magnetization and demag- sounds.

netization of the strongly magnetic metals. It is now established beyond all doubt that these sounds have their origin partly at least in the mechanical strains accompany- ing magnetization. In many cases direct magnetic or electromagnetic action, and even electrostatic and thermal actions, concur in producing them, and it is often diffi- cult to say how much is due to each of these several causes. This is especially to be observed where the sounds are produced by the passage of interrupted or undulatory currents through wires of the strongly magnetic metals. A full discussion of the matter belongs more properly to the subject of electric telephony; but a few notes on the history and literature of the subject may be given here.

Page" seems to have been onc of the first to notice phenomena of the kind ; but Joule" appears to have first stated clearly that mag- netic-mechanical strain was a specific cause. He says that the magnetic extension in the core of an electromagnet takes place so suddenly that the shock is sensible to the touch, and is accom- panied by a musical note arising from vibration in the metal. Marrian,™ Matteucci,4 Beatson, and Wertheim" all took up the matter; and Dela Rive? published many investigations concerning it. In 1861 Reiss published the invention of an electric telephone for the transmission of music and specch, which depended essen- tially on the magnetic sounds produced by a varying current in an iron core. This instrument was the prototype of the telephone of Gray, and of the still more famous instrument of Bell, whose action, although often described as purely clectromagnetic, is no doubt in part due to the magnetic strains. Among the more recent investi- gations on this subject may be mentioned Ferguson, Proc. Roy. Soc. Edin., 1878 and 1880; Ader, Comptes Rendus, 1879; Du Moncel, Jb.; Chrystal, Nature, vol. xxii., 1880; Hughes, Proc. Roy. Soc. Lond., xxxi. and xxxii., 1881.

General Remarks.—Wiedemann has remarked with justice that most of the effects of strain upon magnetization and vice versa are complex. Apart from the possible admixture of direct magnetic action, we must distinguish

(1) the mere disturbing effect of jarring: thus the first Effects application of a mechanical stress has the same effect as a complex.

shock, z.¢., it loosens the molecules of the body, as it were, and renders them more ready to follow any inductive magnetic force, while the first effect of magnetization upon a body under stress is precisely similar, and may in fact be imitated by mechanical jarring pure and simple; (2) after-effect, whether mechanical or magnetic, the conse- quence of which is that the effect due to any mechanical stress or magnetizing force is affected by pre-existing stress and magnetization ; (3) the proper effect of mechanical stress or magnetic force, which appears at once where one or the other is applied, and disappears when it is removed.

Se

5 See Wiedemann and Villari, J.c. ; also Gore, Phil. Trans., 1874 ; H. and F. Strenitz, Wien. Ber., 1877; Hughes, Proc. Roy. Soc. Lond., 1881.

8 Comptes Rendus, 1846. 7 Ib., 1846, &c.

8 7b, 1879. 9 Sill. Jour., 1879.

10 Wied. Beibl., 1880; see also Hoffmann, Jd.

1! Pogg. Ann., 1838.

12 Sturgeon, Ann. El., 1842; Phil. Mag., 1847.

3 Phil. Mag., 1844. 14 Wied., Gaiv., ii. § 515.

16 Comptes Rendus, 1845; Phil. Trans., 1847, &c.

aD

MAGNETISM

Theory § In his excellent analysis of the phenomena, Wiedemann of mole- coordinates them throughout by means of an extension of

cular _ Weber's theory of "molecular magnets" (Drehbare Mole- magnets. 188 A cularmagnete). 'This of course involves an attempt to pass beyond the mere results of experience ; and there can be no question that, on the

whole, this theory explains the facts in a highly instructive and suggestive manner. The main defect in itis the multitude of assumptions and the want of clearness and definiteness in its conclusions. Thus it is sometimes not easy to see why exactly the opposite conclu- sion should not be drawn ; and it appears hopeless to bring it to the test of a quantitative comparison with experiment. Possible. Without entering into the ultimate causes of magnetism, con- we might endeavour to reduce the phenomena to the ney, Smallest number of experimental facts. Thus, assuming between eee . the merely the effects of longitudinal and transverse traction different upon magnetization and the magnetic extension and com- pho- ‘ pression along and perpendicular to the lines of magnetiza- nomena,

tion, we might explain many of the results concerning the relation between torsion and magnetization.

Let us take for example No. VI. of Wiedemann’s parallel state- ments. In fig. 44 let the upper end of the wire be the fixed end, and let P be a point in any of the thin coaxal cylindrical shells into which the wire may be supposed divided. First suppose the wire to be eircularly magnetized by the action of a downward current, the resultant magnetic foree at P being in the horizontal direction PB. If now the wire be twisted in the direction of the arrow T, it acquires two axes of greatest and least magnetic susceptibility Pe and Pr. The resultant magnetie force PB being resolved along these axes will induce moro magnetism along Pe than along Pr; hence the xolotropy will cause the resultant magnetization to take the direction PB’ ; it will therefore have a posi- tive vertical component downwards, which agrees with statement VI. In fact the twisting converts the cireular lincs of magnetization into right- handed helices.

Next let us suppose the wire untwisted to begin with, but magnetized both eircularly and longitudinally, the eomponents being PB and PA. The resultant magnetization will then have some direction such as Pe, but, by Joule’s prin- ciple, this will causo extension along Pe and compression along the perpendicular direction Pr ; consequently the wire will twist in the direction of the arrow T, which agrees with statement 6. Moreover, since magnetization along PB alone would simply cause the tube to expand along a horizontal section, and magnetization along PA alone would simply cause

longitudinal extension, it is clear that when either A or B is given the twisting reaches a maximum and then diminishes when the other is in- creased. !

Fig. 44.

Tt does not seem unreasonable to expect that a general mechanical theory of this kind will yet be found to co- ordinate all the facts; although there are difficulties in its way at present.? The phenomena will then be reduced to two or three experimental facts at the utmost, which it will be the business of some ultimate dynamical theory of magnetism to explain.

L fect of Temperature.—Some information on this subject has been given incidentally above, p. 256. We collect here a few additional facts; but a complete account of all that has been done could not be compressed within our available Space, owing to the great diversity of opinion upon the subject. That the question is a very difficult one will appear at once, if we reflect that variations of temperature influence the density and molecular structure of magnetic bodies to a remarkable degree, and that thus secondary

1 According to the results of Villari and Thomson, if the magnetiza- tion were beyond a certain critical value, Pe would become an axis of compression and Pr an axis of extension, in which case the wire would twist in the opposite direction.

2 See Thomson, Phil. Trans., 1879, p. 73. Not the least of these arise from gaps in our experimental knowledge ; ¢.g., regarding the effects of permanent set caused by traetion and compression.

influences arise in addition to the proper effect of tempera- ture.

That very high temperatures destroy both the magnetic Destrue- susceptibility and the power of retaining magnetism tion of altogether has been known since the infancy of magnetic ons ied science. Thus Gilbert found that a loadstone and a piece very of iron equally lost their power of

*affecting the magnetic high needle when heated very hot, and remarks that the tempera- magnetic property returns to the iron after it has cooled a little, but that the magnetic virtue of the loadstone is altogether destroyed.? Similar results were obtained by Brugmans, Boyle, Cavallo, Barlow and Bonnycastle, Christie, Ritchie, Erman, Scoresby, Seebeck, and others. Faraday * found that a steel magnet Jost its permanent magnetism rather suddenly at a ternperature a little under the boiling point of almond oil; it behaved liko soft iron till it was raised to an orange-red heat, and then it lost its magnetic susceptibility and becamo indifferent. The temperature at which retentive power for permanent magnetism was lost appeared to vary in steel with the hardness and structure ; in fragments of loadstone it was very high: they retained their permanent magnetism until just below visible ignition in the dark, but, on the other hand, they lost their susceptibility at dull ignition, ie, at a much lower temperature than iron. Nickel was found to lose its magnetic susceptibility at a much lower tem- perature than iron, viz., about 330° to 340°C.5 Cobalt is much more refractory, for it retains its susceptibility, according to Faraday, nearly up to the melting point of copper, 2.¢., to a white heat. The writer had occasion to verify these results in the course of some experiments on tho magnetic sounds in wires of iron, nickel, and cobalt traversed by an interrupted current of electricity.®*

The effect of extreme cold, produced in the ordinary Eftect of way by means of solid carbonic acid and ether, was, accord- extreme ing to Trowbridge,' to diminish the moment of a steel °4. magnet (magnetized at 20° C.) by about 60 per cent.

The effect of moderate alteration of temperaturo varies Mode- greatly according to circumstances, We shall consider rate separately the effect upon the magnetic susceptibility and leon el upon the permanent magnetism; but it must be noticed 'it hl that no such separation is possible in actual experiment. ture. ,

The temporary magnetism of bars of cast iron, smithy Effect on iron, soft iron, soft steel, and hard steel magnetized by the mag- earth's vertical force was found by Scoresby® to be insensible 2°#¢ " at a white heat, but to be much greater at a dark red vility. 2 heat than at the temperature of the air. The difference was most marked in the case of hard steel, no doubt partly

because of the softening of the bar. Similar experiments were made by Barlow, Seebeck, and others. Kupfer? experimented on the subject using variations of temperature between 0° and 100° C., and found the susceptibility of soft iron to increase with the temperature. Wiedemann's con- Wicde- clusion is that the first alteration of temperature, whether mann's increase or decrease, increases the temporary magnetism of Tuts. iron or steel, whatever the temperature at starting. If the temperature be repeatedly altered and brought back to its initial value, the magnetization continues to increase, but after a time becomes more and more nearly constant at the initial temperature. After this state has been reached, an increase of temperature causes increase of magnetiza- tion in very hard steel bars, a decreaso of temperature a decrease of magnetization ; the behaviour of soft steel bars is exactly opposite.

3 De Magnete, lib. ii. cap. 3.

4 Kap, Res., vol. ii. p. 220, 1836.

5 According to Becquerel about 400° C., according to Pouillet about 350° C. 8 Nature, vol. xxii,, 1880.

7 Sill. Jour., 1881. 8 Phil. Trans, Roy. Soc. Edin., vol. ix.

9 Wied, Galv., ii, § 521,

Baur's results,

Diamag- netism. of flame.

Banca- lari.

Fara- day's experi- ments on heated gases,

Effect of indifferent.

heat on suseepti- bility

in weak mag- netics,

Baur! and Wassmuth? have recently taken up the matter with all the advantages of modern experience. The former concludes from his experiments on iron by the ring method, at temperatures between 0° and 150° C., that the magnetic susceptibility for a given magnetizing force increases with the temperature if the force be below a certain critical value (3°6 or so), but decreases as the temperature in- creases if the force be above that value? The smaller the inagnetizing force the greater the influence of temperature on the magnetic susceptibility. The result of his experi- inents at very high temperatures is that, for small magnetizing forces, the susceptibility at first increases rapidly as the temperature increases, reaches a maximum at red heat, and then falls suddenly to zero. For large forces, the susceptibility decreases gradually until red heat, and then falls suddenly to a very small value. According to him, if a bar be cooled from white heat the first traces of susceptibility are observed at a very bright red, the brighter the greater the magnetizing force. He gives a variety of interesting results concerning the phenomenon of Gore, all in accordance with what we have just stated.*

In his earlier researches Faraday was unsuccessful in obtaining any evidence of the influence of temperature on the susceptibility of weakly magnetic bodies, such as the chlorides of the magnetic metals or of diamagnetic bodies.® His earliest results were obtained with gases, and that too, strange to say, before the magnetic character of gases was fully investigated. It was Bancalari's discovery of the extraordinary behaviour of flame between the poles of an electromagnet that led Faraday to resume his magnetic experiments on gases, Flames of all descriptions are strongly repelled from the axial line of a heterogeneous magnetic field, so much so that it is impossible to induce the flame of a candle to go between the pointed poles of a powerful electromagnet when they are placed at a short distance apart. The flame is blown aside, or even down- wards, as if by a strong current of air issuing from between the poles. If a flat pointed flame is placed with its centre a little below the axial line, when the magnet is excited it drops down and spreads out below and around the axial line, assuming a fish-tail shape. It appears that the effect is not due to the solid matter in the flame but simply to the hot gases in it; for the upper and

cooler part of the stream of smoke from a freshly extinguished taper is scarcely affected, while the lower and hotter part is most powerfully acted upon, being blown aside and often split into two independent streams. A careful investigation led Faraday to the conclusion that oxygen, carbonic acid, and coal gas are rendered more diamagnetic, or, what is the same thing so far as the resultant differential action is concerned, less magnetic by heat,® and that this effect was much greater than could be accounted for by the mere rarefaction of the gas. He likewise obtained an increase of the susceptibility of oxygen by cooling it with ether and solid carbonic acid. Nitrogen appeared to be altogether He found in a later series' of experiments that the magnecrystallic property of bismuth was destroyed at a temperature a little below its mclting point, and that the same thing happened to crystalline antimony a little below red heat. In the thirtieth series of his experimental researches he states that between 35° and 142° C. the susceptibility of a specimen of spathic iron ore perpendi- cular to its magnetic axis decreased by '333 per cent. per degree centigrade of rise of temperature; this agrees very closely with the formula which was found by Wiedemann to

' Wied. Ann., xi., 1880. 2 Wien. Ber., 1880, 1881, 1882. See the results of Faraday, Hxp. Res., ser. xxx. 3424, &e.

4 Phil, Mag., 1869, 1870,

5 Hap. Res., 2859, 2397, 1845.

8 Exp. Res., vol. iii. p. 486. 7 Bap. Res., 2570 sq., 1848. _— :

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represent very approximately the temperature effect for salt solutions, viz., k,=k) (1 — 00325 7). For the decrease in the magnecrystallic couple, or, which is the same thing, in the difference between the susceptibilities along and perpendicular to the magnetic axis, he found for the spathic iron ore '482 per cent. between 0° and 138° C., and the percentage of fdecrease was four times as great between ~~14° and 0° as between 129° and 143°. The cor~~ responding decrease in the case of crystalline bismuth between 36° and 137° C. was '53 per cent. The experi- ments of Pliicker and Matteucci led

them to conclude that the susceptibility of diamagnetics diminishes with increase of temperature; in the case of bismuth the decrease between ordinary temperatures and its melting point is said to be about one-sixth or more.

Canton seems to have been one of the first to study the effect of moderate variations of temperature on the per- manent magnetism of iron and steel. The results of his and Hallstrom's experiments went to show that permanent magnetization decreases when the temperature rises, and increases again when the temperature falls. In reality, however, as was shown by Kupffer, Riess and Moser, G. Wiedemann, and others, the phenomenon is complicated ; for, if we repeatedly heat a magnet and allow it to cool to its initial temperature, the magnetization lost at each heat- ing is only partially recovered on cooling, and thus a progressive loss goes on, until at last a constant state is reached, in which the magnetization lost on heating is completely recovered on cooling. In this respect, as well as in the effect on the magnetic susceptibility already discussed, there is an analogy between the effect of temperature and the effect of strain; 7.¢., there is a first or permanent effect and a proper or temporary temperature effect. The permanent effect is that any alteration of temperature, be it increase or decrease, diminishes the permanent magnetization just as a shock or a jar would do, and probably for a similar reason. The proper or temporary effect consists in a decrease of magnetization with increase of temperature, which is completely recovered on decrease of temperature and vice versa.8 If this be borne in mind, together with what las already been said above, it will not be difficult for the reader to see that the order and amount of the temperature variations, the hardness and form of the bar, and its magnetic history will all influence the temperature coefficient.

To take one example, Wiedemann found that a bar magnetized at 0° C. and then partially demagnetized by an opposite force, lost magnetism when heated; if the demagnetization was not carried too far, it did not when cooled again to 0° wholly recover what it had lost. If the demagnetization was carried a certain length, it recovered all that it had lost ; if farther still, more than it had lost. It was in fact found possible to demagnetize a bar, so as to render it apparently unmagnetic, and then to restore part of its original magnetism by merely heating and cooling it again. Similar

phenomena were observed with a bar magnetized and de- magnetized at 100°, and then alternately cooled and heated. Unverdorben,? who arrived somewhat later at similar results, represents the matter by saying that the bar in this case has two magnetizations superposed, each having its own temperature coefficient.

The following are a few additional references to sources of information concerning the present subject: Mauritius, Pogg. Ann., 1863, and Phil. Mag., 1864; Jamin and Gaugain, Comptes Rendus, passim; Favé, I0., 1876; Poloni, Wied. Betbl., 1878. °

8 To give the reader an idea of the magnitude of this effeet, we may mention that Whipple in determining the temperature corrections for magnetometer magnets at Kew, according to the formula

ik 1 -9(t-t))-g(t- to)?}» found for the coeffieient g values varying from ‘000762 to ‘000044, with a mean of ‘000161; and for g from -00000898 to ‘00000001, with a mean of 00000048 (Proc. Roy. Soc. Lond., 1877).

9 Quoted in Lamont, Handd, d. Mag., §82. An account of Lamont’s own researches will be found in the same place.

Effeet of

heat on per-

manent

mag- netism.

First

and per-

manent effect.

Proper tem- porary effeet.

WP ANG WE’D PSM

Thom- Development of Heat during Magnetization.—Reasoning | hot junction. In the case of nickel, the current flowed son's on purely thermodynamic principles from the results of | from longitudinally magnetized to unmagnetized through conelu- Faraday, as to the influence of temperature on the mag- | the hot junction, ze. nickel behaved oppositely to iron. sions. ; . eG i ; ¢ ' netic properties of bodies, Thomson! has concluded —(1) | Thomson's results have been in part confirmed by a recent that a piece of soft iron at a moderate or low red heat, | investigation of Strouhal and Barus,!9 when drawn gently away from a magnet, experiences a A relation between magnetism and light was first Magnet- cooling effect, and, when allowed to approach, a heating | established by Varaday's discovery of the magnetic rotation ism and effect, and that nickel at ordinary temperatures and cobalt | of the plane of polarization of a ray passing along the "+ at high temperatures (between the melting point of copper | lines of force. This subject belongs more properly to and some lower temperature) experience the same kind of | physical optics, but there is one magnetic phenomenon effect ; (2) that cobalt at ordinary temperatures and up to | apparently closely connected with it which falls to be the temperature of maximum permeability experiences a | mentioned here. This is Hall's discovery! that, if an Hall's cooling effect when allowed to approach a magnet, and | electric current flow in a thin metallic strip in a direction Pheno- heating when drawn away; (3) that a crystal in a | AB, the effect of placing the strip in a magnetic field with ™°2°™ magnetic fiell experiences cooling when the axis of | its planc perpendicular to the lines of force is to cause a greatest paramagnetic or of least diamagnetic suscepti- | transverse electromotive force perpendicular to AB, which bility is turned from along to across the lines of force, aud | changes in sign when the direction either of the current or vice versa. of the magnetic field is changed. This transverse electro- Besides these considerations, the fact that those who | motive force is proportional to the product of the current adopt the molecular magnet theory are obliged to assume | intensity and the strength of the magnetic field ; ceteris something of the nature of a frictional resistance to the | parzbus, its direction in the case of iron is opposite to that turning of the magnetic molecules, and gencrally, without | in other metals, and its magnitude is also greatest with iron. reference to

any particular theory, many of the plienomena | This discovery establishes the existence of the rotatory of coercive force," lead us to suppose that some specific | coefficient of resistance mentioned by Maxwell? in his development of heat may accompany magnetization and | discussion of xolotropic conductivity ; and Rowland has Experi- demagnetization. The experimental verification of this | shown that the phenomenon is probably due to the same mental suspicion is, however, a matter of great difficulty, owing to | cause as the magnetic rotation of the plane of polarization.18 cx the enormous gencration of heat arising secondarily from If, as modern physicists suppose, magnetism be a dyna- Effect of " induced currents in the mass of the metal. The develop- | mical phenomenon, time must enter as a conditioning time. ment caused by magnetization and demagnetization was | elemeut. The question has been raised how long any taken advantage of by Joule in one of his determinations | magnetizing force takes to develop the maximum magnetiza- of the mechanical equivalent of heat, but he makes no | tion that itis capable of producing. There are many facts attempt: to separate the effect of the two causes, indeed it | that go to prove that this time is very small, or, at all events, did not concern his purpose to do so. Notwithstanding | that any force develops a very large fraction of the total that several experimenters have attacked the problem, it | magnetization due to it in a very short period of time. cannot be said that it is yet completely solved. It will | Perhaps the most wonderful evidence on this head is the fact therefore be best simply to call the reader's attention to | that the telephone, which depends essentially on varying some of the papers that have been published on the subject, | magnetic action, can reproduce the sounds of human speech and leave him to form his own judgment. even to the consonants.! Experiments bearing directly on See Von Breda, Pogg. Ann., 1846; Grove, Phil, Mag., 1849; | the subject have been made by Villari.!® A flat circular disk Edlund, Pogg. Ann., 1864; Villari, V, Oim., 1870; Cazin, Comptes | of flint glass was placed between the poles of a Ruhmkorff's eet ee Wied. Ann, iv., 1878; Trowbridge, apparatus for measuring the magnetic rotation of the plane Thermal Mascellancous Relations of Magnetism to other Physical os polenta ae ee oe ee tee According to Masel? the tk Tee ae the axial line, so that rotation brought the different radii on perties.— According to Maggi * the thermal conductivity le ditt | fee Wb tho. disk. was tivity. of magnetized iron is less along the lines of force than | * "°StYOY Ito the line of sight. When the disk*

was ° —s : at rest the magnetic action in one experiment caused a rota- across them. Naccari and Bellati® were unable to verify tion of 19 divisions: spinning the diskeat! the rate-of 110 this result; Tomlinson,® however, found that the con- 191, 146. and eo ¢ a Fi d a ah : ae ductivity of iron and steel bars was diminished by | .,.'. ze. ee ee ae er eer longitudinal and increased by transversal magnetization een guile P ee claringt pn ee >) }oand, 17 Electric Abraham, Edlund, Mousson, and oe all made GIVISKONS TegpechtNely ; Clipag Coe randegloss:the cheetah condlue- experiments in search of a magnetic alteration of the electric | ™°Sn°he ae pean AUT ee ened tivity. conductivit of iron Thomson ans however, to have bagi see oo se guid to. produce been the first to arrive at any definite result,' He found ST a ane Dey ue Satine eeaiied by the th MMe to be di y, et le 41 ij f rotation of the plane of polarization, and that 000241 ee Pe CLNIMISHE? along mee mes °. | second at least is required to develop the greatest iaghetization and increased across them. | Beez, verified diamagnetization of which this substance is capable; le the former result, but doubts the latter, which he is uichined'" | sles. Ktates thee the diamagnetism lasts for less than to explain as a secondary effect caused by the con bressi°D | 0:00018 second after the inducing force is withdrawn. A of the iron arising from the external magnetic action on the | series of interesting experiments on the oscillation of the plates used in ee? experiments. ; : plane of polarization caused by the oscillatory discharge —— __ Thomson a ed that the eo a ee of | from a Leyden jar recently made by Bichat and Blondlot 1% motive OT Was allected by magnetization; the thermoelectric | joq them to a different conelusion, viz., that if any lagging fore, Current flowed from unmagnetized to longitudinally | o¢ the induced magnetization behind the magnetizing force

magnetized, and from transversely magnetized to wn-

magnetized or longitudinally magnetized iron through the |

! Phil. Mag., 1878 ; or Nichol's Cyclopedia, 2d ed., 1860.

2 See the paper of Warburg quoted above, p. 260.

3 Joule, Phil. Mag., 1848.

4 Archives de Geneve, 1850; or Wied., Galv., ii. § 510.

® Wied. Beibl., 1877. 6 Proc. Roy. Soc. Lond., 1878. ? Phil. Trans., 1856. 8 Pogg. Ann., 1866. 9 Loc. cit.

10 Wied. Ann., xiv., 1881. ™ Phil. Mag. [5], ix. and x., 1880.

El. and Mag., vol. i. § 808. See also Stokes, Camb. and Dub. Math. Jour, vi., 1851; and Thomson, Trans. RSE, vol. xxi. p,

165, 1854.

3 Am. Jour. of Math.,

1881.

14 See also an article by the writer,

15 Pogg. Ann., 1879.

1880 ; Phil. Mag. [5], x., 1880, and xi.,

Phil. Mag. [5], ii. 1876. 16 Comptes Rendus, 1882. XV. — 35

Direct influence of light upon magnet- ization.

Load- stones.

Steel magnets.

274

exists it is less than 0°000033 second. No explanation has been given of the discrepancy of these results.

In the early part of this century there was an animated controversy as to whether light exerted a direct influence upon magnetization, in which Morichini, Mrs Somer- ville, Christie, Riess and Moser, and many others took part. Nothing definite, however, was established. A similar fate befell

the attempts to trace the influence of magnetic force upon crystallization, and to detect a relation between magnetism and gravity,! although both quests at one time or another engaged the skill of Faraday.

Forms, ConstRUCTION, AND PRESERVATION OF MAGNETS.

This subject occupied a large portion of most of the earlier treatises on magnetism. Much of the information given, however, either has now been recognized to be of questionable value or has been superseded by recent pro- gress, and retains a merely antiquarian interest ; a few brief remarks, mainly historical, will therefore be sufficient.

The oldest form of magnet was a piece of magnetic iron ore or loadstone. The power of these natural magnets varicd exceedingly from one specimen to another. An elaborate discussion of the various kinds of loadstone will be found in Gilbert's De Magnete.2 In order to increase the carrying power, the loadstone was usually fitted with armatures of soft iron upon its polar regions; figure 45, taken from Gilbert, represents one of the oldest arrangemcuts.

Fig. 45.

Figure 46 is taken from a loadstone in the collection of physical apparatus belonging to the university of Edinburgh, the carrying power of which is 205 tb. A loadstone in the Teylerian Musewin at Haarlem has a carrying power of 230 tb ; and one at Lisbon, pre-

»)

mn

*sented by the emperor of China to King John V. of Portugal, is said to support as much as 300 tb. Small loadstones are often very powerful in proportion to their weight ; eg., Newton is said to have worn in a ring one that weighed only 3 grains, and yet was able to carry about 746 grains; and one in the physical collection at Edin- burgh, formerly belonging to Sir John Leslie, weighing itself 34 grains, had at one time a carrying power of 1560 grains. The*introduction of steel magnets, and the perfection to which*

they were gradually brought, caused the loadstone to fall into disuse. It is said that Galileo possessed the art of making steel magnets about the beginning of the 17th century. It was early discovered that the earth's force could be utilized in magnetizing steel.

1 For the literature, see Wied., Galv., §§ 688, 689. 2 See also Gehler's Physikalisches Worterbuch, art. "Magnetismus."

MAGNETISM

Gilbert was aware that a fecble magnetization could be produced in this way; and Michell, in his treatise on artificial magnets, minutely describes how weak magnets may be made by means of the earth's force, then combined into bundles or " magazines" and used in turn to produce stronger magnets, these used to produce still stronger, and so on.

The earliest process of all was no doubt the method of rub- bing or touching by another magnet. This method of making magnets was studied with much attention by the natural philosophers of the 18th century, among whom we may men- tion Savery, Knight, Duhamel, Le Maire, Canton, Michell, Hpinus, Coulomb, and Euler. The method of single touch consists simply in stroking the bar to be magnetized alternately on its two halves with the south and north poles of a loadstone or bar magnet, the stroke beginning always at the middle and ending at the end. According to Lamont, the best plan is to lay the magnet flat, overlapping one half of the bar to be magnetized, and then draw it off ; whcn the magnet is held perpendicular to the bar during the process, the result is apt to give an irregular magnetiza- tion: ¢.g., we may even get a magnet with its two ends north poles and with a south pole in the middle, or one with four poles, a north and south pole at the two ends and a south and can pole in the middle. ,

The first improvement on single touch was double touch with scparate magnets. This consists in using two magnets simul- taneously on the two halves of the bar undergoing magnetization. The north pole of one and the south pole of the other are placed either close together, or at a small distance apart near the middle of the bar, and then each is drawn towards the end of the half on which it lies; according to Lamont, here, as in single touch, the magnets should be laid flat on the bar. Michell introduced the*

further improvement of using two bar magnets (or bundles of such) fastened together and kept parallel at a small distance apart by means of small pieces of wood, the north pole of one being conter- minous with the south pole of the other. This pair is placed verti- cal with one end on the middle of the bar, drawn towards one end and slipped off, then replaced on the middle and drawn to the other end, and so on alternately until the moment of the bar ceases to increase any farther. Instead of the pair of bar magnets a horse- shoe magnet might of course be used.

Le Maire® introduced the essential improvement of placing the bar to be magnetized upon a larger bar, and then magnetizing the two together. The advantage of this is best seen in the form of the same device adopted by Canton® and Duhamel,' who mag- netized steel bars in pairs, connecting them up parallel to each other by means of two pieces of soft iron, and then magnetizing them in opposite directions. It is easy to see that the magnetiza- tion of the one reacts on the magnetization of the other and strengthens it. Michell? obtained a similar advantage by magnetizing a number of bars placed end to end in a line; he found, as was to be expected, that the end bars were weaker, but this defect he remedied by repeating the process with the bars arranged in a different order. Coulomb's method was to

lace the ends of the bar on the north and south poles of two ar magnets arranged in line at the proper distance apart. This process of connecting up the bars to be magnetized in a closed magnetic circuit is sometimes called circular touch; it can be applied to horse-shoe magnets by placing a pair of them with their ends together, and then passing round and round upon them a horse-shoe magnet or a pair of bar magnets arranged as already described.®

Immediately after CErsted's discovery of the magnetic action of the galvanic current, Arago,® Boisgiraud," and Davy almost simul- taneously applied this property to the magnetization of iron and steel. Powerful electromagnets, with cores of soft iron, were first constructed a few years later by Sturgeon and Brewster. Pohl, Moll, and Pfaffin Germany, and Henry and Ten Eyck in America, may be mentioned as the most successful

of the early constructors. One of the electromagnets of Henry and Ten Eyck reached a carrying

3 Poles situated abnormally in this way are called " consecutive points."*

4'This method appears to have been invented by Knight (about 1740), and used in producing the powerful magnets for which he was famous. 'The secret of his process was never divulged by himself, but was published by Wilson after his death. See art. MAGNETISM, 8th edition of Encyclopedia Britannica,

5 Mém. d. UV Acad. d. Paris, 1745 and 1750.

6 Phil. Trans., 1751.

7 Treatise of Artificial Magnets, 1750.

8 For fuller information on the present subject, see kalisches Woérterbuch, art. " Magnetismus," xv.

9 Ann, d. Chim. et d. Phys., 1820.

10 Phil. Trans., 1820-21.

11 'The anomalous magnetization of needles by the discharge from Leyden jars had been observed earlier, but not properly understood. See art. ELEcTRICITY, yol. viii. p. 82.

Gehler's Physi-

Single touch.

Double touch,

Electro- magnets,

Magnet- ization by electric current.

Magnet- ization

of an electro- magnet.

Lami- nated

magnets.

power of 2061 Ib; but magnets specially constructed for carrying

ower have surpassed this limit. As a specimen of scientific toys of this description may be mentioned the electromagnet of Roberts (fig. 47), which consists of a square block of iron deeply slotted with four parallel grooves into which three layers of copper wire cable are wound in zigzag fashion so that the current converts the flanges alternately into north and south poles; the armature is a square block planed to fit the face of the magnet. The carrying power of a machine of this kind was 2949 Ib, 7.¢., more than 1} tons!

The fornis of electroniagnet used in the arts, ¢g., in electric bells, fire alarms, telegraphs, telephones, electric light regu- lators, dynamo machines, &c., are simply innumerable. It will be sufficient to allude to those constructed for the purpose of pro- ducing an intense inagnetic field, uniform

or non-uniform, over a larger or smaller area; these find their practical application in the construction of dynaimo-electric machines, but they are mainly interesting to purely scientific men on account of their use in the investigation of the properties of weakly magnetic bodies. Figure 40 shows the usual arrangement adopted for large laboratory magnets. In considering the

greatest available strength of such magnets, j

it is necessary to bear in mind the fact Fig. 47.

that magnetic saturation of iron is practically reached with mag- netic forces much under the greatcst that we can command. The strength of field

in a narrow crevasse perpendicular to the lines of magnetization in saturated iron is less than 18,000 C.G.S. units;} and this is practically the utmost at present attainable, for any addition to the strength of the field, arising from direct action of the magnetizing helix, would not under ordinary circumstances affect the hundreds in this numver. Further increase of magnetizing current after we have reached within a small percentage of the limit of saturation is a waste of power.

Elias? of Haarlem seems to have been the first who applied the electric current directly with success in the manufacture of powerful permanent magnets. He used a short flat magnetizing coil which was pushed backwards and forwards along the bar, the ends of which were caused to abut against two pieces of iron, which becoming in- ductively magnetized reacted on the bar, and also served to keep the magnetization at the ends more uniform. The famous Logeman magnets were constructed by this process.

By far the most convenient way of magnetizing steel is to use an electromagnet.® The bar to be magnetized may be laid flat on the pole of the magnet before it is excited, and after excitation drawn slowly off. By repeating this process several times, with the north pole of the electromagnet for one half and the south pole for the other half, saturation can be very quickly obtained. Perhaps a better plan is to lay the bar with its ends on the two poles, and then excite the electromagnet. For reasons already sufficiently explained, it is advisable to hammer the bar with a mallet while the magnetizing force is in action, and to turn the current off and on several times in succession.4

On account of the difficulty of tempering steel to any great depth from the surface, and for specific magnetic reasons as well, it thas been customary in constructing powerful permanent magnets to build them up of thin laminz of steel, each of which is separately magnetized. Figure 48 represents an arrangement of this nature

N S c c Fig. 48.

adopted by Coulomb, and figure 49 a horse-shoe magnet constructed in the same way. It will be observed that the ends of the lamine are not exactly

conterminous, the middle ones projecting more than the others ; this arrangement was adopted with the view of getting rid to sone extent of the weakening effect which the induction of one lamina has upon theother. That such an effect exists and is very great was conclusively shown by Coulomb ; how far the modification

~ 1 See above, p. 256. 2 Pogg. Ann., 1844 and 1846.

3 Frick, Pogg. Ann., 1849, was one of the earliest who practised this method.

4 It has been several times proposed to magnetize steel bars by heat- ing them red hot, allowing them to cool to the proper temperature under the magnetizing force, and then tempering while the force is still acting. Gilbert, Knight, Robison, Haman, Gaugain, Aimé, and Holz (Wied. Ann., vii., 1879) have all experimented with this method, but it does not appear to possess any advantage over the ordinary modern process, and need not be discussed here.

hw

in question cures it is another matter; much no doubt depends on the purpose for which the magnet is required; but it is scarcely worth while to discuss the subject here. We may call attention to a farther point-in the construction of Coulomb's magnet, viz., that the ends of the lamine are embedded in two soft iron terminals N and S; there can be no doubt that, for some purposes at least, this is an advantageous arrangement. Among the famous modern makers of permanent magnets Hicker of Nuremberg, Logeman and Wetteren of Haar- lem,> Willward, and Jamin deserve to be specially mentioned.®

In the preservation of permanent magnets it Preser- is essential to avoid extreme changes of tem- vation of perature and shocks. When the magnet is magnets.

laid aside it should be made part of a closcd magnetic circuit; in the case of a horsc-shoe magnet this is attained by simply laying a picce of soft iron, called the keeper, across the poles ; bar magnets should be kept in parallel

pairs, north pole to south pole and south pole , to north pole, with two pieces of soft iron Fig. 49. between the poles. When this is done the induced magnetism reacts on the magnets and diminishes the demagnetizing force; the action of shocks then ceases to destroy the permanent magnet- ism, and may even increase it.

ULTIMATE THEORIES OF MAGNETIC PHENOMENA.

If we pass over the stream theory, which, although Stream partially developed by Euler, has never taken root in theory. modern physical science, the first great theory that we find proposed with a view to the explanation of magnetism is the two-fluid theory of Coulomb and Poisson. This is not an ultimate theory in the modern sense, inasmuch as it is not dynamical ; but it was, doubtless, looked upon as ultimate in the days when the imponderable fluids had a recognized role in the physical sciences. In the two-fluid Two- theory the imaginary positive and negative attractive agents (called magnetism in the empirical theory developed | alg above) are regarded as imponderable fluids; but the essential point in the definite form of the theory due to Poisson is that he regards a body susceptible to magnetic induction as made up of an infinite number of particles of infinite permeability immersed in an impermeable médium. After pointing out that, if the particles were of elongated form, and arranged so that the axes of elongation had one pre- ponderating direction, or if they were arranged so that the linear density in different directions varied, the result would be zolotropy, he assumes that they are spheres uniformily distributed in the impermeable medium so that the volume of the magnetic particles in unit volume of the substance is the fraction 4. The problem of magnetic induction under the influence of a uniform force is then the same as the problem of electric induction for an infinite number of perfectly conducting spheres uniformly distributed in a non-conducting medium. He finds for the permeability aw =(1+2k)/(1 —%).

Maxwell has pointed out one fundamental objection to this theory, viz., that the valne of & calculated from the formula just given by means of observed values of @ in the case of iron is greater than it would be even if the magnetic spheres were packed in the closest possible manner. Another objection is that the theory affords no explanation of the variability of &

with different forces. We might of course modify the hypothesis, as was done by Pliicker, by supposing that a resistance depending on the magnitude of the force opposes the separation of the fluids in the magnetic molecules, and that in certain cases a frictional resistance tends to prevent their reunion. We might in this way explain magnetic saturation and permanent magnetism; but the theory thus bur-

dened has no more scientific value than the purely empiric theory, and, moreover, affords no clue to the phenomena of diamagnetism.

5 Advised by Elias and Van der Willigen; see Nature, vol. xix. p- 552, 1879.

6 Further details as to the advantages and disadvantages of various forms of magnets will be found in Wiedemann's Galvanismus, and Lamont's Handbuch des Magnetismus. See also a recent paper by W. Holz, Wied. Ann., 1880, on hollow cylindrical magnets, and another by Gray on the moments attainable with hard steel bars, Phil, Mag., 1878.

Mole- In a very important class of modern theories, the funda-

cular mental assumption is that the molecules, or at all events

magnet 9 certain proportion of the molecules, of magnetic sub-

theory. stances are small permanent magnets. In a body which is to outward appearance unmagnetized, the axes of these molecular magnets are turned indifferently in all directions ; in a body which is magnetized in a certain direction a larger proportion than usual of the molecular magnets have their axes more or less in that direction. Magnetic induction is supposed to consist, not in any alteration of the molecular magnets themselves, but in the orientation of their axes under the action of the inducing force. The reader may figure to himself the nature of the action by imagining a line of small magnetic needles with their axes all horizontal, but all pointing in different directions ; the whole system thus arranged will have no determinate magnetic moment, and will represent an unmagnetized body. Next, suppose a magnetizing force to act parallel to the line joining the

centres of the needles, they will then arrange themselves in that line, and the magnetic moment of the system will be the sum of the moment of the different parts; we have thus an image of a body magnet- ized by induction.

Weber's The notion of molecular magnets seems to have been suggested form. by Kirwan; but it was not until a definite form was given to it by Weber that it acquired any importance. The mathematical problem presented is one of great complexity. In the position of equilibrium: any molecule is acted on by the magnetizing force, by a magnetic force due to the combined action of the other molecules, and possibly by a force arising from the displacement as well. Weber assumes that the couple tending to restore the mole- cule to its original position is that due to a constant magnetic force D, parallel to the origiual direction of itsaxis. If m be the magnetic moment of a molecule, and there be 2 molecules in a unit of volume, then the magnetic intensity ¥ due to the magnetizing force % is iven by ¥=2mn¥H/3D, if HD. In other words, the curve (4, 9) is straight till it reaches the point (3mn, D), it then becomes concave towards the axis of H, and rises towards an asymptote parallel to the axis of 3; the maximum value of Yis mn. The theory does, therefore, give a general explana- tion of the phenomena of magnetic induction. The reader will be able by comparison with the experimental data given above to sec how far it falls short of a complete explanation.

If the magnetic substance be devoid of coercive force, we must suppose that the molecules return to their original positions when the magnetizing force is removed, In substances capable of being permanently magnetized, we must imagine something of the nature of a frictional resistance to the motion of the magnetic molecules ; so that, when they are deflected through more than a certain angle, they retain a permanent set after removal of the magnetizing force.

Max- Maxwell has worked out the particular hypothesis that eacli mole- well's cule which is deficcted through an angle less than By returns when form. the magnetizing force ceases to act, but that a molecule deflected through an angle B>, retains the deflexion B-B) Denoting Dsin By by L, he finds as the result of the above supposition that the curve of temporary magnetization is a straight line from 4 —=0 to ¥=L; after that it is concave

to the axis of %, and rises to an asymptote, the maximunt value of J being mn as before. The curve of residual magnetization begins when 3=L ; it is concave to the axis of , and riscs to an asymptote corresponding to the maximuin d= }mn{1+/1-L?/D?}, It results from the hypothesis that, when a bar is permanently magnetized by a positive force j, its magnetism cannot be increased by a positive force ¥%,; but a positive force < H, is sufficient to begin to remagnetize*

*the bar in the original direction. Ampére's Behind the molecular magnet theory there arises the ae question, What is the nature of the magnetic molecule? * 'One answer to this question is given by the hypothesis of Aupére, that around each such molecule a current circulates in planes perpendicular to the axis of the molecule. That such an arrangement will be equivalent to an infinitely small magnet in the axis of the molecule, so far as external action is concerned, we know from the laws of electrodynamics. It remains only to inquire what the nature and properties of these molecular currents must be, to trace the full logical*

consequences of the assumption, and to compare them with experience. This was first done by Weber, and afterwards more completely by Clerk Maxwell.

It is obvious in the first place that the cireuits in which the molecular currents flow must be perfectly conducting ; for other- wise the electrokinetic energy of the molecular currents would be continually transformed into heat, and a constant supply of energy fron. without would be necessary to support the magnetism of a permanent magnet, which is contrary to experience. Let A be the effective area of a molecular circuit, L its coetficient of self- induction, @ the inclination of its axis to the inducing force ®, yo the primitive current, and y the current after the inducing force is in action, Then y=y)—%Acosé/L; and the component of the moment parallel to H will be A(y)— HAcose/L)cosé. There are three different cases to consider.

1. Let either y) be so great, or HA/L be so small, that the effect due to the electiomagnetic induction may be neglected in compari- son with the effect due to the deflexion of the molecule ; putting m=—Ayp, we have thus merely the theory of molecular magnets already explained.

2. Let the force resisting the turning of the molecules be in- finitely great, we then find for the magnetic susceptibility the value x= —}nA2/L. This is the theory originally proposed by Weber to explain diamagnetism.

3. If the effects due to deflexion of the molecules and to electro- magnetic induction in the nolecular circuits be both considered, we have a theory intermediate to (1) and (2), inclining to the one or the other according to the assumptions made as to the relative values of yp, A, and L.

The reader will find a full discussion of the different cascs in Maxwell's Electricity and Magnetism, vol. ii. chap, xxii.

The most important attempt that has yet been made to realize a mechanism affording a dynamical explanation of magnetic phenomena is the theory of molecular vortices, published by Clerk Maxwell in the Philosophical Magazine for 1861 and 1862 (4th ser., vols. 21 and 23). The general results, stripped of all particular assumptions, will be found embodied in his great treatise on Llectricity and Magnetism; but the following summary, taken from the original paper, may be of some interest.

1. Magnetoelectric phenomena are duc to the existence of matter under certain conditions of motion or of pressure in every part of the magnetic field. The substance producing these effects may be a certain part of ordinary matter, or it may be an ether associated with matter.

2. The condition of any part of the field through which lines of magnetic force pass is one of unequal pressure in different directions, the pressure being least along the lines of force, so that they may be considered as lines of tension.

8. This inequality of pressure is due to vortices coaxial with the lines of force. The density of the revolving matter is propor- tional to the magnetic permeability of the medium, The direction of rotation is related to the direction of the line of force; and the velocity at the circumference of the vortex is proportional to the resultant magnetic force.

4. The vortices are separated from each other by a single layer of round particles ; so that a system of cells is formed, the partitions being layers of

these particles, and the substance of each cell being capable of rotating as a vortex.

5. The particles forming the layer are in rolling contact with both the vortices which they separate, but do not rub against each other. They are perfectly free to roll between the vortices and so to change their place, provided they keep within one complete molecule of the substance; but in passing frum one molecule to another they experience resistance and generate irregular motions which constitute heat. These particles play the part of electricity. Their motion of translation constitutes an electric current ; their rotation serves to transmit the motion of the vortices from one part of the field to another; the tangential pressures thus called into play constitute electromotive force; and the elastic yielding of the connecting particles coustitutes electric displacement.

Maxwell deduces without difficulty all the principal electrical and magnetic phenomena from tls theory ; and he points out that its general conclnsions have a value which does not depend upon the somewhat intricate kinematical arrangements supposed to exist in the magnetic medium. The theory certainly affords us a most instruc- tive dynamical picture of the phenomena of electricity and magnetism; and it remains, so far as we know, the only successful attempt of its kind. (G.CH)

Weber's theory of diamag- netism.

Max- well's mole-_ ular vortex theory.

ANIMAL MAGNETISM. |

MAGNETISM, Animav. The terms animal magnetism, electro-biology, mesmerism, clairvoyance, odylic or odie force, and hypnotism have been used to designate peculiar nervous conditions in which the body and mind of an individual were supposed to be influenced by a mysterious force emanating from another person. With the exception of mesmerism, a name given to the phenomena in honour of one ot their earliest investigators, F. A. Mesmer, each of thesc terms implies a theory. Thus the phcnomena of animal magnetism were supposed to be due to some kind of magnetic force or influence peculiar to living beings and analogous to the action of a

magnet upon steel or certain metals ; electro-b:ology, a more modern term, introduced in 1850 by two American lecturers, referred the phenomena to the action of electrical currents generated in the living body, and capable of influencing electrically the bodies of others; clairvoyance implied a power of mental vision or of mental hearing, or of a mental production of other sensations, by which the individual became aware of events happening in another part of the world from where he was, or could tell of the existence of objects which could not affect at the time any of his bodily senses ; odylve force was a term given to a force of a mysterious character by which all the phenomena of animal magnetism might be accounted for; and hypnotism, from vmvos, sleep, was a name applied to a condition artificially produced in which the person was apparently asleep and yet acted in obedicnce to the will of the operator as regards both motion and sensation.

Mistory.—It was natural that the apparent power of influencing the bodies and minds of others should attract much attention and be eagerly sought after for purposes of gain, or from a love of the marvellous, or for the cure of diseases. Hence we find that, whilst not a few have investigated these phenomena in a scientific spirit, morc have done so as quacks and charlatans who have thrown discredit on a department of the physiology of man of the deepest interest. Recently, however, as will be shown in this article, physiologists and physicians have set about investigating the subject in such a manner as to bring it into the domain of exact science, and to dispel the idea that the phenomena arc due either to any occult force or to super- natural agency. It would appear that in all ages discases were alleged to be affected by the touch of the hand of certain persons, who were supposed to communicate a healing virtue to the sufferer. It is also known that among the Chaldzans, the Babylonians, the Persians, tlic Hindus, the Egyptians, the Greeks, and the Romans many of the priests effected cures, or threw people into deep sleeps in the shades of the temples, during which the sleeper sometimes had prophetic drcams, and that they otherwise produced effects like those now referred to animal magnetism. Such influences were held to be supernatural, and no doubt they gave power to the priest- hood. In the middle of the 17th century there appeared in England several persons who said they had the power of curing diseases by stroking with the hand. Notable amongst these was Valentine Greatrakes, of Affane, in the county of Waterford, Ireland, who was born in February

1628, and who attracted great attention in England by his supposed power of curing the king's evil, or scrofula. Many of the most distinguished scientific and theological men of the day, such as Robert Boyle and R. Cudworth, witnessed and attested the cures supposed to be effected by Greatrakes, and thousands of sufferers crowded to him from all parts of the kingdom (see Colquhoun's History of Magic, &c., vol. it. p. 146).

Phenomena of a marvellous kind, more especially such as imply a mysterious or supernatural power exercised by one person over another, not only attract attention, bnt take so firm a hold on the imagination that belief in

them breaks out now and again with all the intensity of an epidemic. Thus since the time of Greatrakes, at short intervals, men have arisen who have led the public captive at their will. About the middle of the 18th century John Joseph Gassner, a Roman Catholic priest in Swabia, took up the notion that the majority of diseases arose from demoniacal possession, and could only be cured by exorcism. His method was undoubtedly similar to that followed by Mesmer and others, and he had an extraordinary influence over the nervous systems of his patients. Gassner, how- ever, believed his power to be altogether supernatural and connected with religion.

Friedrich (or Franz) Anton Mesmer was born at Weil, near the point at which the Rhine leaves the Lake of Con- stance, on May 23, 1733. He studied medicine at Vienna under the eminent masters of that day, Van Swieten and De Haen, took a degree, and commenced practice. Interested in astrology, he imagined that the stars exerted an influ- ence on beings living on the earth. He identified the sup- posed force first with electricity, and then with magnetism ; and it was but a short step to suppose that stroking diseased bodies with magnets might effect a cure. He published his first work (De Planetarum Influxu) in 1766. Ten years later, on meeting with Gassner in Switzerland, he observed that the priest effected cures without the use of magnets, by manipulation alone. This led Mesmer to discard the magnets, and to suppose that some kind of occult force resided in himself by

which he could influence others. He held that this force permeated the universe, and more especially affected the nervous systems of men. He removed to Paris in 1778, and in a short time the French capital was thrown into a state of great excitement by the marvellous effects of mesmerism. Mesmer soon made many converts; controversies arose; he excited the indignation of the medical faculty of Paris, who stigmatized him as a charlatan ; still the people crowded to him. He refused an offer of 20,000 francs from the Government for the disclosure of his secret, but it is asserted that he really told all he knew privately to any one for 100 louis. He received private rewards of large sums of money. Appreciat- ing the effect of mysterious surroundings on the imagina- tions of his patients, he had his consulting apartments dimly lighted and hung with mirrors; strains of soft music occasionally broke the profound silence; odours were wafted through the room; and the patients sat round a kind of vat in which various chemical ingredients were concocted or simmered over a fire. Holding each others' hands, or joined by cords, the patients sat in expectancy, and then Mesmer, clothed in the dress of a magician, glided amongst them, affecting this one by a touch, another by a look, and making "passes" with his hand towards a third. The effects were various, but all were held to be salutary. Nervous ladies became hysterical or fainted ; some men became convulsed, or were seized with palpitations of the heart or other bodily disturbances. The Government appointed a commission of physicians and members of the Academy of Sciences to investigate these phenomena; Franklin and Baillie were members of this commission, and drew up an elaborate report admitting many of the facts, but contesting Mesmer's theory that there was au agent called animal magnetism, and attributing the effects to physiological causes. Mesmer himself was undoubtedly a mystic; and, although the excitement of the time led him to indulge in mummery and sensational effects, he was honest in the belief that the phcnomena produced were real, and called for further investigation. For a time, however, animal magnetism fell into disrepute ; it became a system of downright jugglery, and Mesmer himself was denounced as a shallow empiric and impostor. He with- drew from Paris, and died at Meersbnrg in Switzerland

on 5th March 1815. He left many disciples, the most distinguished of whom was the Marquis de Puysegur. This nobleman revolutionized the art of mesmerism by showing that many of the phenomena might be produced by gentlé manipulation causing sleep, and without the mysterious surroundings and violent means resorted tu by Mesmer. 'The gentler method was followed successfully by Deleuze, Bertrand, Georget, Rostan, and Foissac in France, and by Dr John Elliotson in England up to about

1830.

In 1845 considerable attention was drawn to the an- nouncement by Baron von Reichenbach of a so-called new "jmponderable" or "influence" developed by certain crystals, magnets, the human body, associated with heat, chemical action, or electricity, and existing throughout the universe, to which he gave the name of ody/. Persons sensitive to odyl saw luminous phenomena near the poles of magnets, or even around the hands or heads of certain persons in whose bodies the force was supposed to be concentrated. In Britain an impetus was given to this view of the subject by the translation in 1850 of Reichenbach's Researches on Magnetism, dc. in relation to Vital Force, by Dr Gregory, professor of chemistry in the university of Edinburgh. 'These Researches show many of the phenomena to be of the same nature as those described previously by Mesmer, and even long before Mesmer's time by Swedenborg. 'The idea that some such force exists has been a favourite speculation of scientific men having a mental bias to mysticism, and it makes its appearance not unfrequently.

The next great step in the investigation of these phenomena was made by James Braid, a surgeon in Manchester, who in 1841 began the study of the preten- sions of animal magnetism or mesmerism, in his own words, as a "complete sceptic" regarding all the phenomena. 'This led him to the discovery that he could artificially produce "a peculiar condition of the nervous system, induced by a fixed and abstracted attention of the imental and visual eye on one object, uot of an exciting nature." To this condition he gave the name of meuro- hypnotism (from vedpov, nerve, v7vos, sleep); for the sake of brevity, newo' was suppressed, and the term hypnotism came into general use. Braid read a paper ata meeting of the British Association in Manchester on 29th June 1842, entitled Practical Essay on the Curative

Agency of Nenro- Hypnotism; and his work Veurypnology, or the Rationale of Nervous Sleep considered in relation with Animal Magnetism, illustrated by numerous cases of its successful application in the relief and cure of disease, was published in 1848. It is necessary to point this out, as certain recent Continental writers have obtained many of Braid's results by following his methods, and have not adequately recognized the value of the work done by him forty years ago. Braid was undoubtedly the first to investigate the subject in a scientific way, and to attempt to give a physiological explanation. In this he was much aided by the physiologist Herbert Mayo, and also by Dr William B. Carpenter,—the latter being the first to recognize the value of Braid's re- searches as bearing on the theory of the reflex action of the ganglia at the base of the brain and of the cerebrum itself, with which Carpenter's own name is associated.

Recently the subject has been reinvestigated by Professor Weinhold of Chemnitz, and more particularly by Dr. Rudolf Heidenhain, professor of physiology in the university of Breslau, who has published a small but interesting work on animal magnetism. In this work Heidenhain attempts to explain most of the phenomena by the physiological doctrine of inhibitory nervous action, as will be shown hereafter.

Phenomena and Physiological Explanation. —The usual

inethod of inducing the mesmeric or hypnotic state is to cause the person operated on to stare fixedly at a faceted or glittering piece of glass held at from 8 to 15 inches from the eyes, in such a position above the forehead as will strain the eyes and eyelids. The operator may stand behind the patient, and he will observe that the pupils are at first contracted from the effort of accommodation of each eye for near vision ou the object; in a short time the pupils begin to relax, and then the operator makes a few "asses" over the face without touching it. The eyelids then close; or the operator may gently close them with the tips of the fingers, at the same time very gently stroking the cheeks. Often a vibratory motion of the eyelids may be observed when they are closed, or there may be slight spasm of the eyelids.

The eyes may afterwards become widely opened. 'The patient is now in a sleep-like condi- tion, and the limbs often remain in almost any position in which the operator may place them, as in a cataleptic con- dition. At the same time the patient may now be caused to make movements in obedience to the commands of the operator, and to act according to ideas suggested to him. Thus, he may eat a raw onion with gusto, apparently under the impression that it is an apple; he may make wry faces on drinking a glass of water when told that what he is taking is castor oil; he may ride on a chair or stool as in a horse race; he may fight with imaginary enemies, or show tokens of affection to imaginary friends ; in short, all kinds of actions, even of a ridiculous and a degrading nature, may be done by the patient at the command of the operator. Another class of phenomena consists in the production of stiffness or rigidity of certain muscles or groups of muscles, or even of the whole body. For example, on stroking the fore arm it may become rigid in the prone or supine condition ; the knee may be strongly bent, with the muscles in a state of spasm; the muscles of the trunk may become so rigid as to allow the body to rest like a log, head and heels on two chairs, so stiff and rigid as to bear the weight of the operator sitting upon it; or various cataleptic conditions may be induced and as readily removed by a few passes of the hand. Many disorders of sensation have been observed, such as defective colour perception, the hearing of special sounds which have no objective existence, or deafness to certain tones, or perverted sensations, such as tingling, prickling, rubbing, &c., referred to the skin. The patient may remain in this condition for an hour or more, and may then be roused by holding him for a few minutes and blowing gently into the eyes. Usually the patient has a vague recollection, like that of a disturbed dream, but sometimes there is an acute reniembrance of all that has happened, and even a feeling of pain at having been compelled to do ridiculous actions. Certain persons are more readily hypnotized than others, and it has been observed that, once the condition has been successfully induced, it cau be more easily induced a second time, a third time more easily than a second, and so on until the patient may be so pliant to the will of the operator that a fixed look, or a wave of the hand, may throw him at once into the condition. Such are the general facts in artificially induced hypnotism, and they belong to the same class as those referred to animal inagnetism, electro-biological effects, odylic influences, &e., according to the whim or theory of the operator.

It is not surprising that such phenomena have been the cause of much wonder and the basis of many superstitions. Some have supposed that they were supernatural, others that they indicated the existence of a specific force exerted by the experimenter upon the passive subject. Many operators have no doubt believed they possessed such a force; such a belief would not affect the success of their experiments except to make them more likely to be

successful, as the operator would readily comply with all the conditions; but most of these phenomena can be explained physiologically, and those which caunot be so accounted for will remain hidden uutil we get further light on the physiology of the nervous system.

The symptoms of the hypnotic state, as shown by Heidenhain, may be grouped under four heads :—(1) those referable to conditions of the sensorium or portion of the brain which receives nervous impulses, resulting in move- inents of a reflex and imitative character ; (2) insensibility to pain, and various forms of perverted sensation ; (3) increased irritability of the portion of the nervous system devoted to reflex actions; and (4) states of the nervous centres controlling the movements of the eye, the accom- inodation of the eye to objects at various distances, and the inovements of respiration, &c.

1. The State of the Sensorium.—By the sensorium is meant that portion of the nervous system which receives impulses from the nerves coming from the organs of sense, such as those from the eye, ear, nose, tongue, and skin. Each of these nerves brings its message to a portion of the central nervous system in intimate connexion with the rest of the nervous system. 'This message may possibly arouse nervous actions associated with consciousness, or it may not; or the nervous actions of consciousness may be so transient as to leave a faint impress on the meinory, so that it can be revived only if no great interval has elapsed since the impression was made on the sense organ. If, however, the impression be vivid, then it may be revived long afterwards, This impression may be consciously perceived, and then any apparent effect may end; but it inay set up a set of actions, resulting in motion, which are apparently of a reflex character. Thus, suppose a person in the dark; light is suddenly brought before the eye ; this

affects the retina, and through the changes in it the optic nerve and central organ ; there may be consciousness or there may not; if the person be wide awake he will see the light; if he be asleep he will not see it, at all events he will give no indication of seeing it; on awaking, he may have a recollection of a dreain in which light has a place, or his memory may be blank; but nevertheless the light will cause the pupil of the eye to contract by reflex action without lis consciousness ; and perhaps, also, without consciousness, the sleeping person may make an effort to avoid the light, as has been noticed in the case of somnambulists.

Now, when a patient has been thrown into a weak hypnotic state, there may be a vivid recollection on awaking of all that happened during the apparent sleep. This implies, of course, that conscious sensory perceptions took place during the condition. Memory depends on the direction of the attention to sensations. If the effort of attention be strong, the recollection will probably be vivid, and the converse is true. But this does not preclude the supposition that sensory perceptions may come and go, like the shadows of clouds on a landscape, without any attempts at fixing them, and consequently with no recollection following their occurrence. The sensory perceptions may have existed for so short a time as to leave no impress behind. This may explain how it is that in the deeper forms of hypnotism there is either no recollection of what occurred or the recollection can only be aroused by hints and leading questions. Attention is necessary, therefore, to form a conscious idea arising out of a sensation.

It is generally admitted by physiologists that the cerebral hemispheres are the seat of the higher mental operations, such as attention, &c., although the interdepend- ence of these hemispheres with the lower sensory ganglia, which receive all sensory impressions in the first instance, and with motor ganglia, which are, in like manner, the

starting-points of motor impulses, is not understood. The one portion of the nervous system may work without the other. Thus, during free cerebral activity we pay little attention to what we see or hear, and consequently we remember nothing. A man ina reverie may have many iinpressions of sight or of hearing of which he has been really unconscious. On the other hand, the cerebral apparatus may be so attuned with the recipient portion that if the latter receives a message the former sympa- thetically responds. For example, a mother sound asleep is disturbed by the slightest cry of her child, although loud sounds of other kinds may not awake her.

It would appear then that impressions on the senses and the consciousness of impressions are two separate states which may occur in a manner independently ; that is to say, there may be purely sensory operations, in which conscious- ness is not involved, or there may be the conscious repetition of old impressions, or what is called memory. Now it is a law of nervous action that processes which at first are always of a conscious kind may by repetition become so liabitual as to be performed without consciousness. Thus a child learns to perform a piece of music on the pianoforte by conscious efforts, often of a painful kind ; each note has to be recognized, and the appropriate muscular movements required for its production on the instrument executed with precision and delicacy ; but by and by the music may be performed accurately even while the attention is directed to something else. In like manner, all movements which are the results of sensory impressions may become unconscious movements; the sensory impressions are at first paid attention to; but as they become habitual the mind becomes less and less engaged in the process, until the movements resulting from thein are practically unconscious. A familiar illustration is that of a man in deep reverie walking along a street. Immersed in thought, he pays little or no attention to passers by; as his eyes are open, their images, or those of adjacent objects, must affect his visual apparatus, but they arouse no conscious impression, and still those impressions, evanescent as they are, are sufficient to excite the appropriate movements of locomotion. These movements are in all respects like voluntary movements, but they are not really voluntary, showing that, by the machinery of the nervous system, movements like voluntary movements may be executed without volition. It is important to observe, however, that these movements are the result of sensory impressions. A man in the deepest

reverie, with his eyes blindfolded, could not execute the requisite inovements ; and when we see the blind walking in the streets, they afford no contradiction to this view, as their minds are busily engaged in noticing another set of sensory impressions derived from the sense of touch, muscular movement, and hearing, a set of impressions of the greatest importance to them, although of little importance comparatively to ordinary people, who are guided chiefly by visual impressions.

A person in a state of hypnotism may be regarded as in a condition in which the part of the nervous apparatus associated with conscious perception is thrown out of gear, without preventing the kind of movements which would result were it really im action. Impres- sions are made on the sensory organs; the sensory nerves convey the impression to a part of the brain; in the deepest condition of hypnotism these impressions may not arouse any consciousness, but the result may be the kind of movement which would naturally follow supposing the person had been conscious. 'The movements made by the hypnotic are chiefly those of an imitative kind. It has often been noticed that the mere suggestion of the move- ment may not be enough to excite it; to secure success,

the movement must be made before the eyes of the person. For example, it is a common part of the exhibition of such persons for the operator to clench his fist; the patient at once clenches his; the operator blows his nose ; the patient does likewise ; but if the operator performs these actions behind the back of his patient the chances are that the patient will not repeat the movements.

The condition scems to be one in which the sensory impression leads to no conscious perception and to no voluutary movement, but is quite sufficient to arouse those nervous and muscular mechanisms which lead to uncon- scious imitation. The patient is in a sense an automaton played upon by the operator through the medium of the patient's sensory organs. It is important to observe that in deep hypnotism the patient has no idea corresponding to the movements he makes in obedience tv the example of the operator. Jor example, suppose he is swallowing a glass of water and the operator tells him it is castor oil, at the same time making the requisite grimaces, the

patient will imitate these grimaces without having any idea either of water or of castor oil. The grimaces are purely imitative, without any connexiou with the idea which would naturally excite them. This is the case only with those deeply hypnotized. In some cases, however, tlie hypnotism isso deep as to resemble coma, and in these there is no trace of any sensory impressions or of move- ments. In cases where tle hypnotism is slight, there may be a curious mixture of effects. Here the patient may be partially conscious of the requests made to him, and of the imitative movements executed before his eyes; to some extent he may resist the commands of the operator, he may feel he is being fooled, and yet he may perform many ridiculous actions; and when he awakes he may have a vivid recollection of the events in which he participated. A hypnotized person, in fact, is in a state similar to that of the somnainbulist, who acts the movements of a dis- turbed dream. There are many degrees of the sleeping state, from the profound condition resembling coma to that of the light sleeper who starts with every sound. Insome sleeps there are dreams in which the sleeper is so occupied with the phantoms of thought as to pay no attention to external impressions, unless these be sufficiently powerful to awake him, whilst there are other sleeps in which thie boundary between the conscious reception of new impres- sions and the reproduction of old ones is so thin as to permit of a blending of the two. In this kind of sleep, a spoken word, a familiar touch, the suggestion of something in keeping with the thoughts of the dreamer, are sufficient to change the current of the dream, and even to excite inovements. When the ideas of the dreamer cause movements corresponding to these ideas, then the dreamer becomesa somnambulist. He acts tle dream ; according to the depth of the semi-conscious state will be his capacity for responding to external impressions. Some somnambu- lists respond to external suggestions readily, others do not ; and in all there is almost invariably no recollection of the state. Artificial hypnotism is a condition of the same kind, though usually not so profound.

The question now arises as to how this artificial state may be induced. In one awake and active, all sensory impressions as a rule are quick, evanescent, and constantly renewed. New successions of images and thoughts pass rapidly before the mind during walking, working, eating, or in the leisure hours of social life; but none last so long as to cause fatigue of any particular part of the body. By

and by there is a general feeling of fatigue, and then sleep |

is needed to restore exhausted nature. But if the attention be fixed on one set of sensory impressions, fatigue is much sooner experienced than if the impressions are various in kind and degree. Thus one or two hours Spent at a

picture gallery or at a concert, if the attention be devoted to the impressions on the eye or ear, usually cause fatigue. It would appear that the method of exciting hypnotism by causing the patient to gaze ata bit of glass or a bright button depends in the first place on the feeling of fatigue induced, At first there is a dazzling feeling; then the eyes become moist ; images become blurred and indistinct, and seem to swim in the field of vision ; the field of vision becomes unsteady, and just about this period ideas do not pass in the mind in erderly sequence, but irregularly, as in the few minutes immediately before passing into sleep. At this stage also the pupils become widely dilated, and the eyeballs become more prominent than usual. The innervation of the iris must be understood, so as to appreciate the physiological meaning of these changes. The muscular structure of the iris is supplied by two nerves, the third cranial nerve and the sympathetic nerve. If the third nerve be cut the pupil dilates; if the distal end of the nerve be irritated the pupil contracts. On the other hand, if the sympathetic nerve be cut the pupil contracts, whilst if the distal end be irritated the pupil dilates. These experimental facts show that the radiating fibres of the iris which dilate the pupil are under the control of the sympathetic nerve, whilst the circular fibres which contract the pupil are supplied by the third. Further it can be shown that the corpora quadrigemina, two ganglionic masses in the brain, are the reflex centres for the regulation of these movements. The optic nerve from the retina supplies the sensory stimulus which causes the pupil to contract. Thus, suppose light to be brouglit before the eye while the pupil is dilated; the retina is affected, a stimulus is sent to the corpora quadrigemina along the fibres of the optic nerve, and from the corpora quadrigemina a nervous influence passes along the fibres of the third nerve to the circular fibres of the iris, causing the pupil to contract. It is also very

probable that the corpora quadrigemina act as reflex centres for nervous impulses regulating the calibre of the blood-vessels of the eye, the vaso-motor nerves. If we apply these facts to the case of a hypnotized person, we find that (1) the pupil of a hypnotized person contracts energetically when light falls upon the eye, showing that the reflex mechanism is still intact ; (2) just before the hypnotic state is induced the pupil dilates, indicating feeble nervous impulses passing along the third from the corpora quadrigemina; (3) at first, the eyeballs seem to sink in, but when hypnotism is complete they project in a manner similar to what has been observed in an animal when the arteries supplying tlle head have been compressed so as to make the brain anemic or bloodless; and (4) the ophthalmoscope has not shown any change in the calibre of the blood-vessels of the retina in the hypnotic state. From a consideration of these facts and inferences Heidenhain was at first inclined to believe that hypnotism might be due toa reflex influence on the vessels of the brain, causing them to contract so as to permit the passage of only a small quantity of blood, and make the brain anemic. This view, however, had to be abandoned, as the faces of hypnotized persons are usually red, and not pale, as they would be were the arterioles contracted. Further, Heiden- hain performed a crucial experiment by giving to his brother nitrite of amyl, which causes dilatation of the vessels by vaso-motor paralysis, when he still found hypnotism could be readily induced, showing that the state was not caused by deficient blood supply.

Heidenhain has advanced another and more probable hypothesis. During the past twenty years a new mode of nervous action, known as inhibitory action, has been discovered by physiologists. A good example is supplied by the innervation of the heart. This organ has nervous

ganglia in its substance by which its rhythmic contractions are maintained. Further it is supplied by the vagus or pneumogastric nerve and by the sympathetic. Section of the vagus is followed by quickening of the heart's action, and stimulation of the lower end causes slowing and, if the stimulation be strong enough, stoppage of the heart, not, however, in a tetanic state (which would be the case if the fibres of the vagus acted

directly on the muscular structure of the heart, as a motor nerve), but in a state of complete relaxation or diastole. Opposite results follow section and stimulation of the sympathetic fibres. It has been clearly made out that the terminal fibres of both nerves do not act on muscular fibres but on ganglion cells, those of the vagus "inhibiting" or restraining, whilst those of the sympathetic '" accelerate " the action of the cells, Inhibition is now known to play an important part in all nervous actions, and it would seem that any power- ful impression in a sensory nerve may inhibit or restrain motion. This is strikingly seen in some of the lower animals. A ligature applied loosely round the thigh of a frog whilst it lies on its back apparently deprives it of all power of motion. The weak sensory stimulation in this case seems to stop voluntary motion. Pressure on the internal organs of such animals as the rabbit, although gentle, sometimes causes paralysis of the lower or hinder limbs. Again, it has been ascertained that, whilst the spinal cord is the chief reflex centre, the reflex activity can be inhibited by impulses transmitted to it from portions of the cerebral hemispheres which are in a state of high activity. It would appear then that, if we suppose one set of sensory or recipient cellsin the brain to be brought into a state of exalted irritability by the preliminary operations of hypnotism, the result might be inhibition of the parts devoted to voluntary movement. In like manner, the activity of sensory nerve cells may become inhibited. Thus stimulation of a certain cutaneous area, say the arm, by a mustard plaster, has been found to lower the sensi- bility of the corresponding portion of skin on the opposite arm. The theory then offered is that "the cause of the phenomena of hypnotism lies in the inhibition of the activity of the ganglion-cells of the cerebral cortex, .. . the inhibition being brought about by gentle prolonged stimulation of the sensory nerves of the face, or of the auditory or optic nerve."

According to this view, the portion of the brain devoted to voluntary movements is as it were thrown out of gear, and the movements that follow, in the hypnotic state, are involuntary, and depend on impressions made on the senses of the patient. To understand how this is possible, we must now consider shortly some.of the views presently held as to the action of the brain. The researches of Hitzig, Fritsch, Ferrier, Hughlings Jackson, and many others indicate that certain movements initiated as a consequence of perception, and of the ideas thereby called forth, are due to nervous actions

in the grey matter in certain areas on the surface of the cerebral hemispheres, and that there is another class of movements which do not require the agency of the cortex of the brain, but depend on the activity of deeper centres. 'These deeper centres are the optic thalami, which receive sensory impressions from all parts of the skin; the corpora quadrigemina, which receive luminous impressions from the retina; and the corpora striata, which are the motor centres whence emanate influences passing to the various groups of muscles. No doubt other sensory centres exist for hearing, taste, and smell, but these have not been clearly ascertained. In the case of conscious and voluntary movements carried out as the result of external impres- sions, the excitation would pass first to the thalami optici (tactile) or corpora quadrigemina (visual), thence to the

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cerebral hemispheres, where ideas would be called forth and volitional impulses generated; these would then be transmitted downwards through the corpora striata (motor) to the crura cerebri and spinal cord, and from thence to special groups of muscles, thus causing specific movements. Suppose now that the portions of cerebral hemispheres connected with ideation and volition were thrown out of gear, and that a similar sensory impression was made on the person ; again the path of nervous impulses would be to the thalami optici (tactile) or corpora quadrigemina (visual), and from thence directly through corpora striata (motor) to crura cerebri and spinal cord, then passing out to muscles, and causing movements as precise as those in the first in- stance, and apparently of the samecharacter. The difference between the two operations, however, would be this :—in the first there would be movements following perception, idea- tion, and volition; in the second the same class of move- ments would be effected by anautomatic mechanism without any of tle psychical operations above alluded to. Thistheory has the merit of simplicity, and is in accordance with most of the facts. The chief difficulty in the way of accepting it is to understand why, if hypnotism be so induced, it is not induced much oftener. One would suppose that, if gazing at a coin and having a few passes made with the hand were sufficient to bring about physiological changes of such

importance, men would be oftener hypnotized in daily life than they are. But it is to be remembered that attention is seldom fixed on one object so long as in the experiment of producing hypnotism. The first occasion the experiment is made, even with so-called susceptible persons, the time occupied may be from 10 to 20 minutes, and during all that time the attention is on the strain, and feelings of fatigue are excited in the way above described. Again it is well known that sudden and strong sensory impressions often paralyse voluntary action for a time, even in ordinary life, and what is called "presence of mind" really means that power of self-control which prevents the bodily energies being paralysed by strong sensory impressions. A carriage bearing down on a nervous lady in a crowded street may deprive her of all power of movement, or she may automatically run here or there in obedience to the shouts of the bystanders ; but one with coolness can thread her way among the vehicles without fear or trouble.

A hypnotized person is therefore to be regarded as an automaton. 'To cause him to move his arm, the image of a moving arm must pass over his retina, or an unconscious sensation of motion must be induced through passive movement of his arm."

2. Insensibility to Pain.—It has often been noticed that in the mesmerized or hypnotized person there may be complete insensibility to pain, so that deep pricks with a needle are not felt. During deep hypnotism a pin may be run into the hand without pain, but pain will be felt on awaking, and pulling out the pin in the waking state will cause acute pain. It would appear that certain nerves may convey tactile sensibility whilst others convey only painful impressions, and in certain forms of paralysis the patient may have tactile sensibility without pain, or the reverse. In hysterical women, as has been shown by Charcot and others, disorders of sensibility of this kind

'are not uncommon, indicating changes in the nervous

centres,

3. Increased Reflex Spasm of Muscles,—One of the most striking phenomena of the hypnotic state is the ease with which certain voluntary muscles may be rendered stiff. For example, if the operator stroke the skin

over the biceps muscle in the upper arm, the limb will be at once power- fully flexed, and the biceps can be felt stiffand rigid. To understand the physiological explanation offered of this

phenomenon it will be necessary shortly to describe the mechanism of reflex acts. If a sensory nerve be irritated at its periphery, say in the skin, a nervous impulse is trans- mitted to a central nervous organ, such as the spinal cord, and through the agency of nerve cells in this organ impulses are then transmitted by motor nerves to muscles, causing movements, without any operation of the will. Thus a particle of food getting into the larynx irritates sensory nerves of the vagus, and there is a reflex spasm of various muscles of expiration, causing a violent cough. That such reflex acts not only can occur without the will, but in spite of it, is shown by the want of control over a sneeze when the nostril is irritated by snuff. Now these reflex centres in the cord are partially under the control of higher centres in the brain. If the agency of the latter be removed, the activity of the cord-centres is increased, and reflex actions are more easily induced. This we have assumed to be the state of the hypnotic. If a portion of his skin be stroked, first one muscle, say the one imme- diately under the skin stroked, will become stiff, then in obedience to a law regulating reflex actions,—namely, that they tend to becoine diffused according to the strength and duration of the stimulus,—other muscles become rigid, and so on until the whole trunk becomes cataleptic. This phenomenon is so well described by Heidenhain that we quote as follows (pp. 28, 24) :—

**‘ With slight increase of reflex irritability, those muscles alone contract which lie immediately under the area of skin which has been stroked. In this condition it is casy to bring single muscles and groups of muscles into isolated action, and thus demonstrate their special motor function. Stroking the ball of the thumb causcs adduction of the thumb (towards the palm). Stimulating the skin over the sterno-mastoid causes the head to assume the well-known oblique position which it has when one has got a ‘“‘stiff neck”; stroking the skin at one corner of the mouth leads to distortion of the mouth on that side, owing to the contraction of the muscles inserted there. When*

the irritability is somewhat more increased, we are able, by continuous irritation of a defined group of skin, to set in activity neighbouring and distant groups of muscle, according to the degrce of irritation. Thus, when I gently stroke the ball of the thumb, only the flexors and the adductors of this-member are set in aetivity. If I stroke somewhat harder, the forearm muselcs, especially the flexors of the fingers, contract. Our paticnt can, however, still bend and stretch his arm at the elbow, the upper arm muscles being still unaffected. Through further increase of the irritation, the latter too and the shoulder muscles are thrown into spasm, so that the whole limb appears immovably fixed. But the highest degree of reflex irritability is not yet attained. Mr

This condition of the muscles is exactly like that in catalepsy, a peculiar nervous disease ; and hypnotism may be regarded as an artificial catalepsy.

4. Other Peculiar Nervous Phenomena of the Hypnotic State.—The changes in the eyes have been already alluded to. The pupils dilate, the eyelids open widely, and the eyeballs protrude. Occasionally the upper eyelid droops, so that the eyelids seem closed. It has often been asserted that clairvoyants see with the eyelids closed, but they are really partially open. The movements of respiration are often quickened from 16 to 30 or 35 per minute, indicat- ing stimulation of the respiratory centres in the medulla oblongata. Sometimes the flow of saliva is increased.

MAGNETISM

[ANIMAL MAGNETISM.

Hallucinations of sense may occur, theugh they are rare. One man in the hypnotic state experienced a strong odour of violets.

There is a class of phenomena referred to the hypnotic state of a very doubtful character, inasmuch as we have to depend entirely on the statements of the person operated on, and no objective tests can be employed. Such, for example, are various disturbances of sensation, hearing with the pit of the stomach more acutely than when the sound is made in the usual ways towards the ear, and the application of the hand of the operator to the body giving rise to profound sleep or dreams, induced

dreaming, é&e. Again it is asserted by Heidenhain and Griitzner (Breslauer Aerztl. Zeitsch., No, 4, 28th February 1880) that unilateral hypnosis is possible. Thus stroking the left forehead and temple caused immobility of the right arm and leg.

*‘*Stroking on both sides causes catalepsy of all four limbs; no facial paralysis or aphasia. Unilateral stroking causes crossed catalepsy and facial paralysis, accompanied when on the left by aphasia. Ifin addition to unilateral stroking, and this being still maintained, the other side be stroked, then the same result is brought about as if both sides had been stroked from the begin- ning… . Measurement of the volume of the arm by means of Mosso’s volumeter [an instrument for estimating the bulk of the limb by displacement of water and movements of a recording lever] proves that in the cataleptic arm the quantity of blood (in con- sequence of the vascular contraction) sinks enormously, whilst it simultaneously risesin the other arm. When the catalepsy is gone by, the quantity of blood in the cataleptic arm increases, whilst in the other arm it sinks” (Heidenhain, p. 91).*

Charcot has pointed out that in certain kinds of hysteria in women there are remarkable unilateral disturbances or perversions of sensory impressions of colour. Pheno- inena of the same kind have been observed by Cohn, Ieidenhain, and others in hypnotized persons. Thus A. Heidenhain became completely colour blind in the eye of the cataleptic side. All colours appeared grey in different degrees of brightness, from a dirty dark grey to a clear silver grey.

‘“Tf one eye be treated with atropin, whilst the effect of the latter is making its appearance, the phenomena of colour blindness are changed as follows :—red and green still appear as different shades of grey ; blue and yellow, on the other hand, do not appear grey. They appear differently in the different stages of atropin action :—jirst stage, yellow appears. grey, with a glimmer of blue; second stage, yellow appears pure blue; third stage, yellow appears blue with a slight ge of yellow, somewhat as in the so-called struggle of the fields of vision,—yellow is seen, as it were, through a blue mist ; fourth stage, yellow appears mostly yellow, with a tinge of blue. When blue is tried, the corresponding result is obtained ; that is, at last blue with

a slight yellow tinge is seen. During the action of atropin the sensation of yellow or blue passes from grey through the contrast colour to the right colour, whilst red and green only appear as different shades of grey" (Heiden- hain, p. 95).

These facts are interesting as showing perverted sensa- tion in the particular individual affected, but they throw no light on the condition of hypnotism.

It is.evident then that animal magnetism or hypnotism is a peculiar physiological condition excited by perverted action of certain parts of the cerebral nervous organs, and that it is not caused by any occult force emanating from the operator. Whilst all the phenomena cannot be ac- counted for, owing to the imperfect knowledge we possess of the functions of the brain and cord, enough has been stated to show that just in proportion as our knowledge has increased has it been possible to give a rational explanation of some of the phenomena. It is also clear that the perverted condition of the nervous apparatus in hypnotism is ofa serious character, and therefore that these experiments should not be performed by ignorant empirics for the sake of gain, or with the view of causing amuse- ment. Nervous persons may be seriously injured by being subjected to such experiments, more especially if they undergo them repeatedly; and it should be illegal to

have public exhibitions of the kind alluded to. The medical profession has always been rightly jealous of the employment of hypnotism in the treatment of disease, both from fear of the effects of such operations on the nervous systems of excitable people, and because such practice is in the border land of quackery and of imposture. Still in the hands of skilful men there is no reason why the proper employment of a method influencing the nervous system so powerfully as hypnotism should not be the means of relieving pain or of remedying disease.

Literature.—A very complete bibliography will be found ap- pended to the article " Mcesmérisme," Dictionnaire Eneyelopédiqne des Sevenees Médicales (deuxiéme série, 1878). In addition, sce Braid, Newrypnology,

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MAGNOLIA, L., the typical genus of the order Magnoliacex, named from Pierre Magnol, professor of medicine and botany at Montpellier. It contains about fourteen species, distributed in Japan, China, and the Himalayas, as well as in North America and Mexico (De Candolle, Prod., i. 79; Bentham and Hooker, Gen. P1., i. 18; A. Gray, Gen. Jil., xxiii., xxiv.).

Magnolias are trees or shrubs with evergreen or deciduous foliage. They bear conspicuous, and often large, fragrant, white, rose, or purple flowers. The sepals are three in number, the petals six to twelve, in two to four series of three in each, the stamens and carpels being numerous. The fruit consists of a number of follicles which dehisce (contrary to the rule) along the outer edge to allow the scarlet or brown seeds to escape, but which are suspended by a long slender thread. Of the Old-World species, the earliest in cultivation appears to have been AZ. Yulan, Desf. (conspicua, Salisb.), of

China, of which the buds were preserved, as well as used medicinally and to season tice (Pickering, Chron. Hist. of Ll., p. 600). It, together with Jf, fuscata, Audr,, was transported to Europe in 1789 (Paxton's Bot. Dic.) aud thence to North America, and is now cultivated in the middle States. Of the Japanese magnolias, M. Kobus, DC., and the purple-flowered J. obovata, Thim., were met with by Kacmpfer in 1690. They were introduced into England in 1709 and 1804 respect- ively. The species M. pumila, Andr., the dwarf magnolia, from the mountains of Amboyna, is nearly evergreen, and bears deliciously scented flowers. It was introduced in 1786. The Indian species are three in number, /. globosa, H. f. et T., allied to AL. conspicua of Japan; I. sphenocarpa, Roxb., and the most magnificent of all magnolias, JZ. Campbellii, H. f. et T., which forms a conspicuous feature in the scenery and vegetation of Darjiling. It was discovered by Dr Griffith in Bhutan. It isa large forest tree, abounding on the outer ranges of Sikkim, 80 feet high, and from 6 to 12 feet ingirth. The flowers are 6 to

10 inches across, appearing before the leaves. 'hey vary from white to a deep rose colour (Hook. fil., J22. Zim. P1., pls. iv. and v.).

The first of the American species brought to Europe (in 1688, by Banister) was JL glauca, L. It is found in low situations near the sea from Massachusetts to Louisiana, —more especially in New Jersey and Carolina. In 1712 Catesby visited Virginia and found J/. acuminata, L., the so-called cucumber tree, from the resemblance of the young fruits to small cucumbers, It ranges from Pennsylvania to Carolina. The wood is yellow, and used for bowls; the flowers are rather small. It was introduced into England in 1736. He also found Jf. wmbrella, Lam. (tripetala, L.), called the umbrella tree. The flowers are very large, white, and highly scented. It was brought to England in 1752. JL, pyramidata, Bart., discovered by Bartram in 1773, is a native of the western parts of Carolina and Georgia. The most beautiful species of North America is Jf, grandiflora, L., discovered by Catesby in 1719 in South Carolina and Florida, and introduced into England in 1734. It grows a straight trunk 2 feet in diameter, and upwards of 70 feet high, bearing a profusion of large

powerfully lemon-scented creamy-white flowers. In England it is customary to train it against a wall; and the original species is surpassed by the Exmouth varieties, which originated as seedlings at Exeter from the tree first raised in England by Sir John Colliton, and which flower much more freely than the parent plant. The remaining North-American species are Jf. auriculata, Lam., J. macrophylla, Michx., and M. cordata, Michx. The Mexican species is Af, meaicana, DO. The tulip tree, Leriodendron tulipifera, L., frequently cultivated in England, is also a member of the saine family. It is the sole species, and is a native of North America.

For a description of the principal species of magnolia under cultivation see Hemsley's Handbook of Hardy Trees, de., p. 24; Loudon's Arboretum, vol. i. p. 260.

MAGNUS, Hzrnricon Gustav (1802-1870), an eminent Gerinan chemist and physicist, was born at Berlin May 2, 1802. He early showed a strong scientific bias, which was well fostered and strengthened by his education. Six years of thorough study at Berlin university were supplemented by a year's course at Stockholm in Berzelius's laboratory (1828). After some time spent in Paris under Gay-Lussac and Thénard, Magnus settled at Berlin in 1831 as lecturer on technology and physics in the university. In 1834 he was elected extraordinary and in 1845 ordinary professor of these subjects. He died April 4,1870. His numerous papers, which appeared chiefly in Poggendorff's Annalen and in the publications of the Berlin Academy of Sciences, cover a wide range of chemical and physical subjects. His first memoir, published in 1825, while he was yet a student, was a discussion of the spontaneous inflammability of finely divided iron, nickel, and cobalt. From 1827 to 1833 he was occupied mainly with chemical researches, which resulted in the discovery of sulphovinic, ethionic, and isethionic acids and their salts, and, in conjunction with Ammermiiller, of periodic acid. The absorption of gases in blood (1837-45), the expansion of gases by heat. (1841-44), the vapour pressures of water and various solutions (1844-54), thermo-electricity (1851), electrolysis (1856), induction of currents (1858-61), conduction of heat in gases (1860), and polarization of heat (1866-68) are some of the many subjects of which he treated. From 1861 onwards he devoted much attention to the still vexed question of diathermancy in gases and vapours, especially to the behaviour

in this respect of dry and moist air, and to the thermal effects produced by the condensation of moisture on solid surfaces. Many of his papers were translated and published in the Philosophical Magazine.

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MAGNUSSON, Arnt (1663-1730), a scholar to whom we are largely indebted for the preservation of the old Icelandic literature, was born in the west of Iceland in 1663. In his youth he resided for a time at Hvamm, then the residence of his mother's father, Ketil the priest, who was a well-known copyist of manuscripts. In 1683 he came to Copenhagen, and was employed by Bartholinus at first as a copyist, and afterwards to investigate the monuments and ancient customs of Norway. In 1697 he was appointed secretary of the archives of the kingdom. Before this he had begun to collect Icelandic manuscripts, his earliest acquisition (Zulda) being in 1687. From that time he steadily persevered, but his great acquisitions were chiefly made in Iceland, whither he went in connexion with the royal survey in 1702-12. The old and important manuscripts were by that time falling into neglect, and it is more than probable that without Arni's intervention the greater part would have been lost to us. On his return from Iceland he was appointed professor of history and Danish antiquities in the university of Copenhagen. He is said never to have recovered the shock caused by the mischief done to hislibrary by the great fire of Copenhagen in 1728. He himself had never the courage to ascertain exactly what he had lost; but it appeared afterwards that scarcely any MS. of real importance had perished. On his death on 6th January 1730, he bequeathed his property to the university of Copenhagen for the purpose chiefly of publishing Icelandic manuscripts (Arna-Magnzan Bequest). The first volume published under the bequest was Wala, which appeared in 1772, and was succeeded by a number of valuable publications of the same class. Arni left behind him no literary work of any consequence, and his notes and historical material were mostly destroyed in the conflagra- tion. The signal service which he rendered to Icelandic literature lay in his judicious and extensive collection of the old manuscripts, and investigation of their history so far as attainable, at atime when they were rapidly being superseded and disappearing through neglect.

MAGO was one of the most common Carthaginian names, borne among others by the reputed founder of the military power of Carthage, and the Punic admiral in the war with the elder Dionysius (see CarruaGe). The most famous of the name was the youngest of the three sons of Ilamilcar Barca. He accompanied his brother Hannibal on his expedition into Italy, and held important commands in the great victories of the first three years. After the battle of Cannze he marched through southern Italy and sailed to Carthage to report the successes gained. He was about to return to Italy with strong reinforcements for Hannibal, when the Government ordered him to goto help his other brother, Hasdrubal, wlio was hard pressed in Spain. He maintained war there with varying success in concert with the two generals Hasdrubal, until, in 209 B.c., his brother marched into Italy to help Hannibal. Mago remained in Spain with the other Hasdrubal. In 207 he was defeated by M. Silanus, and in 206 the combined forces of Mago and Hasdrubal were scattered by Scipio in the decisive battle of Silpia. Mago maintained himself for a long time in Gades, but afterwards received orders to carry the war into Liguria. He wintered in the Balearic Isles, where the fine harbour Portus Magonis, Port Mahon, still bears his name. Early in 204 he landed in Liguria, where he maintained adesultory warfare till in 203 he was defeated in Cisalpine Gaul by the Roman forces. He received orders soon after to return to Carthage, but on the voyage home he died of wounds received in the battle.

The name of Mago—but which Mago is uncertain—is attached to a great work on agriculture which was brought to Rome and translated by order. of the senate after the

destruction of Carthage. The book was regarded as a standard authority, and is often referred to by later writers.

MAGPIE, or simply Pre (French, Pie), the prefix being the abbreviated form of a human name (Margaret?) applied as in so many other instances to familiar animals, as this bird once was throughout Great Britain, though of late years almost exterminated in many parts, and now nearly everywhere scarce. Its pilfering habits have led to this result, yet the injuries it causes are unquestionably ex- aggerated by common report; and

in many countries of Europe it is still the tolerated or even the cherished neigh- bour of every farmer, as it formerly was in England if not in Scotland also. 'There is ample evidence? to prove that it did not exist in Ireland in 1617, when Fynes Morison wrote his Itinerary, and that it had appeared there within a hundred years later, when Swift mentions its occurrences in his Journal to Stella, under date of 9th July 1711. It is now common enough in that country, and there is a widespread but of course unfounded belief that it was in- troduced by the English out of spite. It is a species that when not molested is extending its range, as Wolley ascer- tained in Lapland, where within the last century it has been gradually pushing its way along the coast and into the interior from one fishing-station or settler's house to the next, as the country has been peopled.*

Since the persecution to which the Pie has been subjected in Great Britain, its habits have undoubtedly altered greatly in character. It is no longer the merry, saucy hanger-on of the homestead, as it was to writers of former days, who were constantly alluding to its disposition, but is become the suspicious thief, shunning the gaze of man, and knowing that danger may lurk in every bush. Hence opportunities of observing it fall to the lot of few, and most persons know it only as a curtailed captive in a wicker cage, where its vivacity and natural beauty are lessened or wholly lost. At large few European birds possess greater beauty, the pure white of its scapulars and inner web of the flight- feathers contrasting vividly with the deep glossy black on the rest of its body and wings, while its long tail is lustrous with green, bronze, and purple reflexions, The Pie's nest is a wonderfully ingenious structure, placed either in high trees or low bushes, and so massively built that it will stand for years. Its foundation consists of stout sticks, turf, and clay, wrought into a deep, hollow cup, plastered with earth, and lined with fibres; but around this is erected a firmly-interwoven, basket-like outwork of thorny sticks, forming a dome over the nest, and leaving but a single hole in the side for entrance and exit, so that the whole structure is rendered almost impregnable. Herein are laid from six to nine eggs, of a pale bluish-green freckled with brown and blotched with ash-colour. Superstition as to the appearance of the Pie still survives even among many educated persons, and there are several versions of a rhyming adage as to the various turns of luck which its presenting itself, either alone or in company with others, is supposed to betoken, for some of these versions

contradict one another in details, though all agree in this that the sight of a single Pie unquestionably presages sorrow.

The Pie belongs to the same Family of birds as the Crow (vol. vi. p. 617), and is the Corvus pica of Linneus, the Pica caudata, P. melanoleuca, or P. rustica of modern

1 “Magot” and “ Madge,” with the same ofigin, are names fre- quently given in England to the Pie ; while in France it is commonly known as Margot, if not termed, as it is in some districts, Jaquedte.

2 A compendious summary of this will be found in Yarrell’s British Birds, ed. 4, ti. pp. 318-320.

8 His predecessor Derricke, in 1578, said :—

“No Pies to plucke the Thatch from house, sre breed in Irishe grounde: But worse then Pies, the same to burne, a thousande maie be founde.”

---The Image of Irelande, London, 1581.

ornithologists, who have recognized it as forming a dis- tinct genus, but the number of species thereto belonging has been a fruitful source of discussion. Examples from the south of Spain differ slightly from those inhabiting the rest of Europe, and in some points more resemble the P. mauritanica of north-western Africa ; but that species has a patch of bare skin of a fine blue colour behind the eye, and much shorter wings. No fewer than five species have been discriminated from various parts of Asia, extend- ing to Japan; but only one of them, the P. lewcoptera of Turkestan and Tibet, has of late been admitted as valid. In the west of North America, and in some of its islands, a Pie is found which extends to the upper valleys of the Missouri and the Yellowstone, and has long been thought entitled to specific distinction as P. hudsonea ; but its claim thereto is now disallowed by some of the best ornithologists of the United States, and it can hardly be deemed even a geographical variety of the Old-World form. In California, however, there is a permanent race if not a good species, P. nuttalli, easily

distinguishable by its yellow bill and the bare yellow skin round its eyes; and it is a curious fact that on two occasions in the year 1867 a bird apparently similar was observed in Great Britain (Zoologist, ser. 2, pp. 706, 1016). (4. N.)

MAHABALESHWAR, a hill station in Satdra district, and the principal sanatarium in the Bombay presidency, India (17° 58' N. lat., 73° 42' E. long.), occupies the sun- mit of a range of the Western Ghats, with a general eleva- tion of 4500 feet above sea-level. It was established by Sir John Malcolm, the governor in Bombay in 1828, who obtained the site from the raja of Satara in exchange for another patch of territory. The superior elevation of Mahabaleshwar renders it much cooler than Matherdn (2460 feet), but its heavy rainfall (about 240 inches) makes it almost uninhabitable during the rainy season. It forms the retreat usually during spring, and occasionally in autumn, of the governor of Bombay, the commander-in-chief of the Bombay army, and the chief officers of their establish- ments, and has the usual public buildings of a first-class sanatarium. The population was returned in 18/2 at

2759.

MAHABHARATA. See Sanskrit LITERATURE,

MAHANADI, or Mananuppvy ("The Great River"), a river of India, rising in 20° 10' N, lat., 82° E. long., 25 miles south of Raipur town, in a wild mountainous region of the Central Provinces. At first an insignificant stream, it flows in a tortuous easterly course through the hills in a rocky bed until it reaches Dholpur in Orissa. From this point it rolls its unrestrained waters straight for the outermost line of the Eastern Ghats. This mountain line it pierces by a gorge about 40 miles in length, over- looked by hills, shaded by forests, deep and tranquil, and navigable at all seasons, It pours down upon the Orissa delta at Nardj, about 7 miles west of Cuttack town; and after traversing Cuttack district from west to east, and throwing off numerous branches (the Katjuri, Paika, Birapa, Chitartald, é&c.), it falls into the Bay of Bengal at False Point by several channels.

The Mahdnadi has an estimated basin of 43,800 miles, and its rapid flow renders its maximum discharge in time of flood seeond to that of no other

river in India. During unusually high floods 1,800,000 cubic feet of water pour every seeond through fits Naraj gorge, one-half of which, uncontrolled by the elaborate embank- ments, pours over the delta, filling the swamps, inundating the rice-fields, and converting the plains into a boundless sea. In the dry weather the discharge of the Mahanadi dwindles to 1125 feet per second. Efforts have been made to husband and utilize the vast water supply thrown upon the Orissa delta during seasons of flood. Each of the three branches into which the parent stream splits at the delta head is regulated by a weir. Of the four eanals which form the Orissa irrigation system, two take off from the Birupa weir, and

one, withits branch, fromthe Mahdnadi weir. On the 31st Decem- ber 1868 the Government took over the whole canal works from

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the East Indian Irrigation Company, at a cost of £941,368, since whieh time the gradual prosecution of the Orissa scheme to com- pletion has been sanctioned. sinee completed, or carried to an advanced stage of eonstruction, are the High-Level Canal, the Kendrépar4 Canal, the Taldanda Canal, and the Machhgaon Canal, with their distributarics, designed to irrigate a total of 1,600,000 aeres.

The canals thus taken over and

MAHANOY CITY, a post borough of the United

States, in Mahanoy towuship, Schuylkill county, Pennsyl- vania, lies at a height of 1211 feet above the sea, 56 miles forth-east of Harrisburg, with astation both on the Lehigh Valley and on the Philadelphia and Reading Railway. It was founded in 1859, and owes its existence to the great anthracite mines in the neighbourhood. Two public halls, a public library, two weekly newspapers, and the increase of its population from 5533 in 1870 to 7181 in 1880, betoken its prosperity.

MAHASEER, or Mausrer (Barbus mosal), a kind of

barbel, abundant in the rivers of India, especially in pools of the upper and more rapid streams where they issue from the mountainous part of the country. largest species of the family of carps, attaining to a length of from 3 to 5 feet, and exceeding sometimes a weight of

It is one of the

70 ib. Its body is well-proportioned, rather elongate, and somewhat like that of the European barbel, but covered with very large scales, of which there are only twenty-five or twenty-seven placed along the lateral line; the dorsal fin is armed with a long and strong spine, and the mouth provided with four slender and short barbels. The lips are sometimes produced into fleshy lobes. To the fisher- man in India the mahaseer affords the same kind of sport as the salmon in the British Isles, and it rivals that fish as regards size, strength, and activity. Its flesh is likewise much esteemed.

MAHDI. ze., "he who is guided aright," the third caliph of the house of 'Abbas (see MouHamMEDAN Emrirr). The name of Mahdi is also that which the Shiite Mohammedans give to their Messiah, the last of the Im4ms of the house of 'Ali. It was under the name of al-Mahdi that Mokhtar proclaimed 'Ali's son Mohammed as the opponent of thie caliph''Abd al-Malik, and, according to Shahrastani, p. 111, the doctrine of the Mahdi, the hidden deliverer who is one day to appear and fill the oppressed world with righteous- ness, first arose in connexion with a wild notion that this Mohammed had not died but lived concealed at Mount Radwa, near Mecca, guarded by a lion and a panther. The hidden Imdém of the common Shi'ites is, however, the twelfth Imém, Mohammed Abu'l-K4sim, who disappeared mysteri- ously 879 a.p. The belief in the appearance of the Mahdf readily lent itself to imposture. Of the many pretendants to this dignity known in all periods of Moslem history down to the present day! the most famous was the first caliph of the Fatimite dynasty in N orth Africa, 'Obaid-allah al-Mahdi, who reigned 909-934 a.p. From him was named the capital of the dynasty, the once mighty city of Mahdlya, the port and entrepét of Kairawan (see MOHAMMEDAN Empire under the reign of Moktadir). Another great historical movement, headed by a leader who proclaimed himself the Mahdi (Mohammed ibn Abdallah ibn Tumrut), was that of the ALMoHADES (q..).

MAHKE, a French settlement and town, in the Malabar district, Madras, India, is situated in 11° 41‘50" N, lat. and 75° 34’ 25" E. long., to the south of the river Mahé, with an area of 1445 acres. It is the only French possession on the west coast of India, and is in charge of a chef-de-service, subordinate to the governor-general at Pondicherri. It is now a decaying place, with most of its chief buildings

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1 Thus there are at the present date (1882) three actual pretendants to the dignity of Mahdi, Sheikh Mohammed of Dongola in the Egyptian Stidin, the Sheikh El-Sents{ in Tripoli, and a third in the vilayet of Afdin.

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picturesquely situated close to the river mouth. The population in 1871 was 8492. It contains a Roman Catholic chapel, a school, and a British post-office; and a long wooden bridge maintained by the British Government gives access to the British territory beyond thie river. MAHI KANTHA, Taz, a group of native states forming a political agency under the Government of Bombay, India, lying between 23° 14’ and 24° 28’ N. lat. and 72° 40’ and 74° 5’ E. long., with an area of about 4000 square miles, and an estimated population of 447,056. It is bounded on the N.E. by the Rajput states of Udaipur and Dunyarpur, on the 8.E. by Rewa Kantha, on the S. by Kaira district, and on the W. by the native states of Baroda and the Palanpur agency. The Mahi Kantha territory is divided among a number of chiefs, of whom the rdj4 of Edar is by far the most important. In May 1877 these chiefs were classified in seven divisions, according to their importance and the extent of their jurisdiction. There are two states of the second class, three of the third, nine of the fourth, nine of the fifth, fourteen of the sixth, and fourteen of the seventh class. The entire revenues amount to about £110,000. MAHMUD or Guazyt (971-1030), known also as Mahmud, son of Subuktigin, was born October 2, 971. His fame rests chiefly on his successful wars, in particular his numerous invasions of India. His military capacity, inherited from his father, Nastr-ud-din Subuktigin, was strengthened by youthful experience in the field. Subuk- tigin, a Turki slave of Alptigin, governor of Khordsdn under Abd@ ul Malik Nuh, king of the SAmani dynasty of Bokhara, early brought himself to notice. He was raised

to high office in the state by Alptigin's successor, Abt Ishak, and in 366 a.n. (977 A.D.), by the choice of the nobles of Ghazni, he became their ruler. He soon began to make conquests in the neighbouring countries, and in these wars he was accompanied by his young son Mahinud. On one occasion, when Mahmud was fourteen years of age, his advice with respect to a military operation in the hills was approved and adopted by the generals. Before he had reached even this age he encountered in two expedi- tions under his father the Indian forces of Jaipal, raja of Lahore, whom Subuktigin defeated on the Punjab frontier, In 994 Mahmud was made governor of Khorasan, with the title of Saif-ed-daulah (" Sword of the State"), by the Sdmani emir, Abd' ul Malik Nuh. Two years later, his father Subuktigin died in the neighbourhood of Balkh, having declared his second son, Ismail, who was then with him, to be his successor. As soon as Ismail had assumed the sovereignty at Balkh, Mahmtd, who was at Nishapur, addressed him in friendly terms, proposing a division of the territories held by their father at his death. Ismail rejected the proposal, and was immediately attacked by Mahmud and defeated. Retreating to Ghazni, he there yielded, and was imprisoned, and Mahmud obtained undis- puted power as sovereign of Khordsdn and Ghazni (997). The Ghaznavi dynasty is sometimes reckoned by native historians to commence with Subuktigin's conquest of Bust and Kusdar (978). But Subuktigin, throughout his reign at Ghazni, continued to acknowledge the Sdmani suzerainty, as did Mahmud also, until the time, soon after succeeding to his father's dominions, when he received from the caliph of Baghdad, Al Kddir Billah, a hilat or robe of honour, with a letter recognizing his sovereignty, and conferring on him the titles Yamin-ed-daulah (" Right Hand of the State"), and

u Even before suceceding his father he struck coins in his own name at Nisabur (Nishdpur), when he was governor of Khorasan.

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Sdémani sovereign, Mansur bin Nuh (successor of Abd' ul Malik) is given along with his own former title, Saif-ed- daulah Mahmud. The earliest of those of the new form gives his name Mahmud bin Subuktigin. Thereafter his father's name does not appear on his coins, but it is inscribed again on his tomb.

The new honours received from the caliph gave fresh impulse to Mahmid's zeal on behalf of Islam, and he resolved on an annual expedition against the idolaters of India. He could not quite carry out this intention, but a great part of his reign was occupied with his Indian campaigns. In 1000 a.p. he started on the first of these expeditions, but it does not appear that on this occasion he went farther than the hill country near Peshawar. The hostile attitude of Khalaf ibn Ahmad, governor of Sistdn, called Mahmud to that province for a short time. He was appeased by Khalaf's speedy submission, together with the gift of a large sum of money, and further, it is said, by his subdued opponent addressing him as swltdn, a title new at that time, and by which Mahmud continued to be called, though he did not formally adopt it, or stamp it on his coins, Four years later Khalaf, incurring Mahmud's dis-pleasure again, was imprisoned, and his property con- fiscated.

Mahmud's army first crossed the Indus in 1001, opposed by Jaipal, raja of Lahore. Jaipal was defeated, and Mahmud, after his return from this expedition, is said to have taken the distinctive appellation of Ghdzi ("Valiant for the Faith"), but he is rarely so called.2 On the next occasion (1005) Mahmud advanced as far as Bhera on the Jhelum, when his adversary Anang-pdl, son and successor of Jaipal, fled to Kashmir. The following year saw Mahmud at Multan. When he was in the Punjab at this time, he heard of the invasion of Khorasdn by Ilak Khan, ruler of Transoxiana (whose daughter Mahmud had married). After a rapid march back from India, Mahmud repelled theinvaders. Ilak Khan, having retreated across the Oxus, returned with reinforcements, and took up a position a few miles from Balkh, where he was signally defeated by Mahmud.

Two years had elapsed since his last visit to Iudia when Mahmud again entered the Punjab (1008), this timo for the express purpose of chastising Séwah Pal, who, having become a Mussulman, and been left by Mahmud in charge of Multan, had relapsed to Hinduism. The Indian campaign of the following year (1009) was a notable one. Near the Indus Mahmud was opposed again by Anang-pal, supported by powerful rajas from other parts of India. After a severe fight, Anang-p4l's elephants were so terror-struck by the fire-missiles flung amongst them by the invaders that they turned and fled, the whole army retreating in confusion and leaving Mahmud master of the field. Mahmud, after this victory, pushed on through the Punjab to

Nagar-két (Kangra), and carried off much spoil from the Hindu temples‘ to enrich his treasury at Ghazni. In 1011 Mahmud, after a short campaign against the Afghans under Mohammed ibn Str in the hill country of Ghor, marched again into the Punjab. The next time (1014) he advanced to Thanésar, another noted stronghold

- *The emperor Babar gives him this title (1526). He himself was the second Mohammedan king who had conquered India, the first being Sultan Mahmud Ghazi.*

3 The terms in which native historians have described the effects of these missiles—not unlike the account given by De Joinville of the Greek fire which caused such consternation to the army of St Louis something more than two centuries later—gave rise at one time to the idea that something like modern artillery was meant. The fact that naphtha is distinctly mentioned as having been used by Mahmud on a later occasion, and the knowledge that petroleum is found at several places on both sides of the Indus near the scene of the fight with Anang-pal, furnish the most probable explanation.

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of Hindnism, between the Sutlej and the Jumna. Having now found his way across all the Punjab rivers, he was induced on two subsequent occasions to go still farther. But first he designed an invasion of Kashmir (1015), which was not carried out, as his progress was checked at Lob-két, a strong hill-fort in the north-west of the Punjab. And then beforeundertaking his longer inroad into Hindustan he had to march north into Khwarizm (Khiva) against his brother-in-law Mamun, who had refused to acknowledge Mahmud’s supremacy. The result was as usual, and Mahmud, having committed Khwarizm to a new ruler, one of Mamun’s chief officers, returned to his capital. Then in 1018, with a very large force, he proceeded to India again, extending his inroad this time to the great Hindu cities of Mathra on the Junina and Kanavj on the Ganges. To the glory of reducing the one and receiving the submission of the other he added, as was his custom, the further satisfaction of carrying back great stores of plunder from both to his own country. Three years later he went into India again, marching over nearly the same ground, to the support, this time, of the raja of Kanauj,

who, having made friendship with the Mohammedan invader on his last visit, had been attacked by the raja of Kalinjar. But Mahmud found he had not yet snfficiently subdued the idolaters nearer his own border, between Cabul and the Indus, and the campaign of the year 413 (1022 a.p.) was directed against them, and reached no farther than Peshawar. Another march into India the following year was made direct to Gwalior.

The next expedition (1025) is the most famous of all. The point to which it was directed was the temple of Somnath on the coast of the Gujerdt peninsula. After an arduous journey by Multan, and through part of Rajputana, he reached Somnath, and met with a very vigorous but fruitless resistance on the part of the Hindus of Gujerdt. Moslem feet soon trod the courts of the great temple. The chief object of worship it contained was broken up, and the fragments kept to be carried off to Ghazni. The story is often told of the hollow figure, cleft by Mahmud's battle- axe, pouring out great store of costly jewels and gold. But the idol in this Sivite temple was only a tall block or pillar of hewn stone, of a familiar kind. The popular legend isa very natural one. Mahniid, it was well known, made Hindu temples yield up their most precious things. He was a determined idol-breaker. And the stone block in this temple was enriched with a crown of jewels, the gifts of wealthy worshippers. These data readily give the Somnath exploit its more dramatic form. For the more recent story of the Somnath gates see GHAZNI, vol. x. p. 560.

After the successes at Somnath, Mahmud remained some months in India before returning to Ghazni. Then in 1026 he crossed the Indus once more into the Punjab. His brilliant military career closed with an expedition to Persia, in the third year after this, his last visit to India. The Indian campaigns of Mahmud and his father were almost, but not altogether, unvarying successes. The Moslem historians touch lightly on reverses. And, although the annals of Rajputana tell how Subuktigin was defeated by one raja of Ajmir and Mahmud by his successor, the course of events which followed shows how little these and other reverses affected the invader's progress. Mahmud's failure at Ajmir, when the brave raja Bisal-deo obliged him to raise the siege but was himself slain, was when the Moslem army was on its way to Somnath. Yet Mahmiud's Indian conquests, striking and important in themselves, were, after all, in great measure barren, except to

the Ghazni treasury. Mahmud retained no possessions in India under his own direct rule. But after the repeated defeats, by his father and himself, of two successive rajas of Lahore, the conqueror assumed the right of nominating

the governors of the Punjab as a dependency of Ghazani, a right which continued to be exercised by seven of his successors. And for a time, in the reign of Masdud II. (1098-1114), Lahore was the plave of residence of the Ghaznavi sovereign. Certain silver coins of Mahmiud's reign bear inscriptions in Sanskrit characters as well as Arabic, betokening sovereignty in India. They are dated 418 and 419 a.u., the two years immediately following his last visit to the Punjab, and are struck at a place called by his naine, Mahmudpur, supposed to be Lahore. There are also copper coins struck at Lahore (now retaining legible dates) bearing Mahmud's name and the caliph's, in Arabic characters only. Mahmud's coins are numerous and histori- cally important. They were issued from mints at NisAbur, Hirat, Ghaznah (a common alternative form of the name), Farwan, and Balkh, besides Mahmudpur and Lahore, just mentioned. Mahmud died at Ghazni in 10380, the year following his expedition to Persia, in the sixty-first year of his age and thirty-third of his reign.

Mahmitd stands conspicuous for his military ardour, his ambi- tion, strong will, perseverance, watchfulness, and energy, combined with great eourage and unbounded self-reliance. But his tastes were not exclusively military. His love of literature brought men of learning to Ghazni. His acquaintance with Moslem theology was recognized by the learned doctors. Mahmud is aecused of avariee. It has been said that the prospect of booty was as strong a motive power in these repeatcd invasions of India as his love of military glory and desire to shine as a champion of the faith. An illustration commonly given of his want of liberality is his treat- ment of the poet Firdousi. Delighted with a portion which was read to him of the poet's metrical romance narrating the deeds of the early kings of Persia, Mahmud presented him with a thousand dindrs, one for each couplet, with an implied promise, or at least expectation on the part of the author, of payment on the same scale for the rest. The completed Shéh Namah, presented in due

course, contained no less than sixty thousand couplets, and the reward this time was given in dirhems instead of dindrs. Firdousi retired in disgust to his native place, Tus, and satirized the sultan. At a later time, it is said, Mahmud sent him the larger sum; but the poet died just before it arrived. Mahmud had the general repu- tation of giving liberal and discerning encouragement to learned and literary men. Among those who took up their abode at Ghazni in his tine, the most noted, after Firdonsi, were the poet Unsuri of Balkh, whose compositions were largely devoted to the praise of the sultan Malimud ; another poet, Asjudi of Merv, who wrote a grand ode on the Somnath expedition ; KE] Utbi of Khorasan, author of the Kitdb-i-Yamint, a history of Subuktigin and of Mahmud (to about the middle of his reign); and the aecomplished historian, Abu Rihan, called Al Birtni, author of the Tartkh ul Hind, as well as of a number of scientific works. The sultan established large educational institutions at Ghazni.

Mahinid also found time to bestow attention on other arts of peace, and did not neglect his capital and the country around. Large sums were devoted to important public works. The building of the great Jama Masjid of Ghazni is described by El Utbi in admiring terms. A splendid palace which Mahmud built induced wealthy nobles at Ghazni to erect great mansions for themselves. Two fine towers or minarets at Ghazni, 140 feet in hcight, bearing Mahmiud's name (though one is said to have been built by his suceessor) have attracted the attention of travellers. They are of a remarkable eonstruction, the lower part with a zigzag or star- shaped outline, the upper part round, like the third and fourth stories of the Kutb Minar at Delhi, built two centuries later. Like the Kutb pillar too, they are isolated, and may, like it, lave served as the minarets for a separate mosque or mosques. The dam called the Band-i-Sulidn, which Mahmud constructed to forin an artificial lake for irrigation, appears to have been a really great and substantial work.

Mahmitd, besides being marked by small-pox, had an iil- favoured countenance, and knew it. Courtiers met his allusions to his personal appearance by the familiar complimentary remarks about inward graces more than counterbalancing outward defeets. He himself is said to have observed, after looking in the glass, that he saw so many faults in himself he was ready to excuse those of others.

Mahmud's tomb stands in a garden a short distance from Ghazni, called Rauzat-i-Sultdn ("the sultan's tomb," or 'garden "'—the word means both). On one of the minarets is an inscription which gives all his titles. On the massive tombstone within the building he is named more briefly Nizam-ed-din Abu'l Kasim Mahmud, son of Subuktigin. He was succeeded by his son Muhammad, who was soon displaced by his more vigorous brother Musaid.

The principal histories of Mahmud's reign are—Kitdb-i- Yamint (Utbi); Tartkh-us-Subuktigin (Baihaki); Zabakdt 4 Nasiri (Minhaj el-Sirdj); Rawzat-ws-Safa (Mir Khond) ; Habib-us-Siyar (Khon- damir). See Elliot, History of India; Elphinstone, History of India; Jour. Roy. As. Soc., vols, ix., xvii.; Jour. As, Soc. Bengal, vol. xii. ; As. Res., vols, Xvi, XVil. (R. M'L.)*

MAHOGANY, a familiar dark-coloured wood largely used for household furniture, and supplied by a large tree indigenous to Central America and the Antilles. It was originally received from Jamaica; 521,300 feet were exported from thatislandin 1753. Swietenta Mahogani, I.., is the sole species of the genus of the order Melacex (Benth. and Hook., Gen. Pl., i, 338). It bears imparipin- nate leaves, like those of the ash, and panicles of small pentamerous flowers with 10 monadelphous stamens, The fruit is a pear-shaped woody capsule, with many winged seeds. The dark-coloured bark has been considered a febrifuge, and the seeds were used by the ancient Aztecs with oil for a cosmetic, but the most valuable product is the timber, first noticed by the carpenter on board Sir Walter Raleigh's ship in 1595, for its great beauty, hard- ness, and durability. Dr Gibbons brought it into notice as well adapted for furniture in the early part of the 18th century, and its use as a cabinet wood was first practically established by a cabinetmaker named Wollaston, who was employed by Gibbons to work up some mahogany brought to England by his brother. Since its introduction no wood has been more generally used for cabinet-making purposes, and none possesses like advantages of combined soundness, large size, uniform grain, durability, beauty of colour, and richness of figure.

In the trade the wood is generally classificd under the two heads of Spanish Mahogany and Honduras Mahogany or Baywood. The former comprises the rich, solid, and heavy varicties, susceptible of a high degrce of polish,

and frequently showing rich wavy figuring, in which case the wood is enormously enhanced in value, and used only in the form of veneers. Under the name of Honduras maho- gany or baywood is embraced the light open-grained and plain classes of mahogany, uniform in colour, and valuable for the ease with which they can be worked for an endless variety of uses where sound straight timber, free from all tendency to warp, is required. By importers, however, several classes of mahogany are recognized. The original Spanish mahogany is the produce of the island of San Domingo, whence only small supplies now come, and these mostly in logs of not more than 8 to 10 fect in length by 12 or 18 inches in thickness. Cuba mahogany is in richness of figure and other propertics little inferior for ornamental purposes to San Domingo wood, while it possesses the advantage of being obtained in logs up to 35 feet long and 2 feet square in cross scc- tion. Squared Honduras logs are sometimes obtained 40 feet long and 2 feet thick, and, although the wood is generally plain in character, richly figured logs are occasionally got. It appears that the Honduras wood obtaincd in the north, near the Mexican bound- ary, is much more ricli, dense, and solid than the soft swamp-grown timber, which commonly gocs by the name of Honduras or bay- wood. In Mexico the mahogany tree attains its greatest dimensions, and thence logs squared to 40 and even 48 inches are somctimcs obtained, whilst the common size of logs varices between 15 inches and 3 feet. The Mexican wood is cut into lengths of from 18 to 30 feet, for convenience of shipment, and, while in general the wood is plain and somewhat soft in the core, the produce of some provinces, Tabasco especially, is firm, solid, and not unfrequently richly figured. Occasionally the wood which has been floated in tropical seas is found to be badly ‘“‘wormed” or attacked by marine borers. The cutting, squaring, and shipment of the wood in the tropical regions which are its home are conducted under circumstances of great difficulty. The tree has recently been introduced into the north-west provinces of India under very favourable conditions, and its successful cultivation there is likely to prove a matter of considerable economic importance. Mahogany is included among the second-class woods in Lloyd’s list for ship-building purposes ; it is a good deal employed in internal joiner work both in ships and houses ; it is a favourite turnery wood, and is equally preferred by wood-carvers, The imports of mahogany into the United Kingdom during 1881 were 42,412

tons, of an estimated value of £390,418, fully one-half of which came from Mexico.

MAHOMET. See Monammep. MAHONY, Francis (1804-1866), "Father Prout," Roman Catholic priest, scholar, journalist, song-writer,

and humorist, was born at Cork of a respectable middle- class family in 1804, His classical education was chiefly obtained at a Jesuit college at Amiens, and after studying theology at Paris he received clerical ordination, and served in Switzerland and Ireland. He then came to London, and officiated for some time in the chapel of the Bavarian Legation. While there he fell in with the coterie of wits and men of letters who were then engaged on Fraser's Magazine, and, soon finding their society and pursuits more congenial to him than those of the Romish priesthood, he, about 1834, began to contribute his cele- brated Prout papers to raser. These consist principally of translations of well-known English songs into Latin, Greek, French, and Italian verse, which he humorously represents as being the true originals from which the English authors had merely plagiarized them. The songs of France, and those of modern and ancient Italy (includ- ing among the latter many most felicitous renderings of Horace's odes), were then given in English versions, accompanied by a running commentary full of queer humour and often acute criticism. Prout's translations have been universally admired for the extraordinary command which they display of the various languages into which his renderings are made, and for their spirit and freedom both of thought and expression. Perhaps, how- ever, the wonder at his polyglott learning has led to less attention than is deserved being paid to the remarkable excellence of many of his English versions of French and Latin odes. In happy abandon they are often almost unequalled, and most of them have all the unfettered character of original compositions. It might have been expected that with his great gift of poetical expression he would have left behind him more of what was exclusively his own. What he has given us in this line tends chiefly to show that with all his sarcastic and cynical wit his

enius had also its tender, serious, and sentimental side. His " Bells of Shandon" have always been greatly admired ; and " The Mistletoe," "The

Redbreast of Aquitaine," ' The Lady of Lee," and the 'Legend of Arcthusa" are not without a certain sweetness and beauty. In 1846 Mahony became "own correspondent" at Rome to the Daily News, and his letters from that capital gave very vivid pictures, and contain much valuable and interesting information, of the first years, so full of liberal promise, of the reign of Pius IX. 'The last twelve or fifteen years of his life were spent at Paris, from which he supplied the Globe with a series of piquant letters on the incidents of the day. His death took place in May 1866. Mahony was not less distinguished as a conversationalist than as a writer. He had great stores of very various knowledge, had seen much of the world, and had a quick power of repartee and no end of sharp cynical wit. It is difficult to suppose that he could ever have been in his true place as a priest of the Roman Catholic Church. Bohemian as he was, however, he never separated himself from it, or seems to have lost his attach- ment to it; and it is creditable to his character that, though living much among scorners and indifferentists, he would never suffer injurious reflexions either upon his church or upon Christianity to pass without sharp rebuke.

The Reliques of Father Prout were collected from Fraser's Magazine and published in two handsome volumes in 1836, a con- siderably enlarged edition appearing in 1860. A biographical notice of him by his friend Mr Sheehan was prefixed to the Bentley Ballads ; aud many additional details were given, with a consider- able amount of his fugitive work contributed to the Daily News and the Globe, edited by Mr Blanchard Jerrold, in the Final Reliques of Father Prout, published in 1876.

MAHRATTAS. The Mahrattas inhabit that portion of India which is known by the ancient name of Maharashtra (Sanskrit for the great kingdom or region). This large tract, extending from the Arabian Sea on the west to the

Satpura mountains in the north, comprises a good part of western and central India, including the modern provinces of the Concan, Khandesh, Berar, the British Deccan, part of Nagpur, and about half the Nizam's Deccan. Its area amounts to about 120,000 square miles, and its population to about 12 millions of souls, or 100 to the square mile. The population has increased greatly in the 19th century under British rule; but there had been

much decrease during the 17th and 18th centuries owing to war and devastation. Frightful depopulation occurred from the famine which was at its height in 1400 a.p., and was called the Dirga Dévi or the goddess of destruction. Much mortality was also caused by famine between 1801 and 1803. There was probably a period of high prosperity during the first centuries of the Christian era, under a number of petty indigenous sovereigns, among whom these wide territories had become parcelled out before the first invasion of the Deccan by the Moslems about 1100.

The etymology of the word Mahratta (or Marhatta, as it is written in the vernacular) is uncertain. The name does not indicate a social caste, or a religious sect; it is not even tribal. It embraces the people of all races who dwell in the region of Maharashtra, both high-caste and low-caste Hindus ; it is applied, of course, to Hindus only. Thus there are Mahratta Brahmans, next Mahratta Kumbis or cultivators, and Mahratta Rajputs or warriors, thongh the latter have but a small infusion of real Rajput blood. The Mahrattas, then, are essentially Hindus in religion and in caste ordinances, not differing in these respects from the Hindus in other parts of India. They have a language of their own, called the Mahratti, a dialect of the Sanskrit, —a, copious, flexible, and sonorous tongue.

But the Mahrattas have always been a separate nation or people, and still regard themselves as such, though now- adays they are almost all under British or Mohammedan jurisdiction ; that is, they belong either to British India or to the Nizam's Dominions. A few states or principalities purely Mahratta,—such as Kolhapur.and some lesser states clustering round it in the southern Deccan,—still survive, but they are uuder close supervision on the part of the British Government. There are indeed still three large native states nominally Mahratta, namely, that of Sindhia near the borders of Hindustan in the north, that of Holkar in Malwa in the heart of the Indian continent, and that of the gaekwar in Gujerat on the western coast. But in these states the prince, his relatives, and some of his ministers or employés only are Mahrattas; the nobility and the mass of the people are not Mahrattas at all, but belong to other sections of the Hindu race. These states then are not to be included in the Mahratta nation, though they have a share in the Mahratta history, and are con- cerned in the extraneous achievements of that people.

In general terms the Mahrattas, as above defined, may be described under two mein heads, first the Brahmans, and secondly the humble or low-caste men. The Mahratta Brahmans possess, in an intense degree, the qualities of that famous caste, physical, intellectual, and moral. They have generally the lofty brow, the regular features, the spare upright figure, the calm aspect, the commanding gait, which might be expected in a race maintained in great purity yet upon a broad basis. In modern times they have proved themselves the most able and ambitious of all the Brahmans in the Indian empire. They are notably divided into two sections—the Concanast, coming from the Concan or littoral tract on the west coast below the Western Ghat mountains, and the Déshast, coming from the uplands or Deccan, on the east of the mountains. Though there have been many distinguished Déshasts, yet the most remarkable of all have been Concanasts. For

instance, the péshwas, or heads of the Mahratta confedera- | thus the farm-labourers become a considerable class.

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tion which at one time dominated nearly all India, were Concanast Brahmans, The birthplaces of these persons are still known, and to this day there are sequestered villages, uestling near the western base of the Ghats, which are pointed to as being the ancestral homes of men who two centuries ago had political control over the Indian empire.

Apart from the Brahmans, the Mahrattas may be gene- rally designated as Sudras, or men of the humblest of thie four great castes into which the Hindu race is divided. But, as indicated above, the upper classes among the Mahrattas claim to be Kshattriyas or Rajputs. They prob- ably are aborigines fundamentally, with a mixture of what are now called the Scythian tribes, which at a very early time overran India. They have but a slight admixture of the Aryans, who victoriously immigrated from Central Asia and established the Hindu system.

These ordinary Mahrattas, who form the backbone of the nation, have plain features, an uncouth manner, a clownish aspect, short stature, a small but wiry frame. Their eyes, liowever, are bright and piercing, and under excite- ment will gleam with passion. Though not powerful physically as compared

with the northern races of the Punjab and Oudh, they have much activity and an unsur- passed endurance. Born and bred in or near the Western Ghat mountains and the numerous tributary ranges, they have all the qualities of mountaineers. Among their native hills they have at all times evinced desperate courage. Away from the hills they do not display remarkable valour, except under the discipline which may be supplied by other races. Jor such organization they have never, of them- selves, shown any aptitude. Under civilized authority, however, they are to be reckoned among the good soldiers of the empire. In recent times they enter military service less and less, betaking themselves mainly to cultivation and to the carrying business connected with agriculture. As husbandmen they are not remarkable; but as graziers, as cartmen, as labourers, they are excellent. As artisans they have seldom signalized themselves, save as armourers and clothweavers.

Those Mahrattas who dwell in the extreme west of Maharashtra, within the main range of the Western Ghats, and in the extreme north of Maharashtra near the Satpura mountains, are blessed with unfailing rainfall and regular seasons. But those who dwell at a distance from these main ranges, or among the lower or subsidiary ranges, are troubled with variable moisture and uncertain seasons, frequently, too, with alternations of drought and of flood. Periodically they are afflicted by scarcity, and sometimes by severe famine. They have within the last half century largely extended their area of cultivation. Their industry, which is chiefly agricultural, has grown apace. Their tendency is undoubtedly to increase in numbers; and, despite occasional depopulation froin disasters of season, they have increased considerably on the whole. But in some districts, owing to the famine of 1877, and the sick- ness which ensued when excessive rainfall followed the drought, the population has been stationary, while in others it has actually retrograded because epidemics and plagues of vermin were added to the misfortunes of season.

Among all the Mahrattas the land is usually held on the tenure technically known as "ryotwari." This tenure is now established under the British Government by surveying and assessing operations comprehended under the official term "settlement." It practically means peasant pro- prietorship. 'The proprietor, or ryot, is a cultivator also. His holding may

be on the average 20 or 80 aeres, divided into small fields. Of these fields he cultivates some, himself working at the plough, and his family weed- ing and cleaning the soil. He will also hire labour, and He Ve 37

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pays to the Government direct the land tax, which is assessed on his holding for the long term of thirty years, so that he may have the benefit of his improvements. His property in the land is absolute; it descends according to the Hindu law of inheritance; it can be sold or otherwise transferred by private arrangement; it is pledged or mortgaged for debt, and money is largely borrowed on its security. It is liable to sale for default in regard to land revenue; and Government as a creditor has the first claim. Thus, as a peasant proprietary, the Mahrattas are in the best possible position, and have been so for many years since the completion of the British settlement. Their only fault is a disposition to live beyond their humble means. 'They have thus been of late years led into debt, which has produced disputes between them and the money-lenders, ending sometimes in agrarian disturbance.

In the Concan there are some superior proprietors termed Khotes. With this and perhaps some other exceptions, notably that of Nagpur, there are not in the Mahratta country many large landlords, nor many of the superior tenure-holders whose position relatively to that of the peasantry has caused much discussion in other parts of India. There are indeed many Mahratta chiefs still resi- dent in the country, members of the aristocracy which formerly enjoyed much more wealth and power than at present. They are sometimes in the position of landlords, but often they are the assignees of the land revenue, which they are entitled under special grants to collect for themselves instead of for Government, paying merely a small sum to Government by way of quit-rent. Under them the cultivators are by British arrangements placed in the position of peasant proprietors. The village community has always existed as the social unit in the Mahratta territories, though with less cohesion among its members than in the village communities of Hindustan and the Punjab. The ancient offices pertaining to the village, as those of the headman (pateé/), the village accountant, &c., are in working order throughout the Mahratta country.

The Mahratta peasantry possess manly fortitude under suffering and misfortune. Though patient and good- tempered in the main, they have a latent warmth of temper, and if oppressed beyond a certain endurable limit they would fiercely turn and rend their tormentors, Cruelty also is an element in their character. Asa rule they are orderly and law-abiding, but traditions of plunder have been handed down to them from early times, and many of them retain the predatory instincts of their forefathers. The neighbourhood of dense forests, steep hill-sides, and fastnesses hard of access offers extraordinary facilities to plunderers for screening themselves and their booty. Thus gang robbery is apt to break out, gains head with rapidity, and is suppressed with difficulty. In time of peace it is kept under, but during war, or whenever the bands of civil order are loosened, it becomes a cause of anxiety and a source of danger. 'The women have frankness and strength of character ; they work hard in the fields, and as a rule evince domestic virtue. Conjugal infidelity, however, is not unknown among them, and here, as elsewhere in India, leads to bloodshed.

The peasantry preserve a grave and quiet demeanour, but they have their humble ideas of gaiety, and hold their gatherings on occasions of births or marriages. They fre- quently beguile their toil with carols. They like the gossiping and bartering at the rural markets and in the larger fairs, which are sometimes held in strikingly pictur- esque localities. They are utterly superstitious, and will Worship with hearty veneration any being or thing whose destructive agency they fear. They will even speak of the tiger with honorific titles. They are Hindus, but their Hinduism is held to be of a non-Aryan type. They are

MAH RHR AT Tas

sincerely devout in religion, and feel an awe regarding " the holy Brahmans," holding the life and the person of a Brahman sacred, even though he be a criminal of the deepest dye. They of course regard the cow as equally sacred. There are two principal sects among the modern Hindus — those who follow Vishnu, and those who follow Siva. The Mahrattas generally follow Siva and his wife, a dread goddess known under many names. The Mahratta war- cry, "Hur Hur Mahadeo," which used to be heard above the din of battle urging the soldiers to onset with victorious

élan, referred to Siva. All classes high and low are fond of the religious festivals, the principal of which, "the Dasserah," occurs in October, when the first harvest of the year has been secured and the second crops sown. This has always been held with the utmost pomp and magnificence at every centre of Mahratta wealth and power. The people frequently assemble in bowers and arbours con- structed of leafy boughs to hear "kathas" recited. These recitations are partly religious, partly also romantic and quasi-historical, After them national resolves of just re- sistance or of aggressive ambition have often been formed.

Apart from the Mahratta Brahmans, as already men- tioned, the Mahratta nobles and princes are not generally fine-looking men. Their appearance, notwithstanding jewel- lery and rich apparel, is still that of peasants. 'There cer- tainly are some exceptions, but there is general truth in what was once said by a high authority to the effect that, while there will be something dignified in the humblest Rajpit, there will be something mean in the highest Mahratta. Bluff good-nature, a certain jocoseness, a humour pungent and ready, though somewhat coarse, a hot or even violent disposition, are characteristics of Mahratta chieftains. They usually show little aptitude for business or for sedentary pursuits ; but, on the other hand, they are born equestrians and sportsmen. As a rule they are not moderate in living, and are not unfrequently addicted to intemperance. Instances of licentiousness and debauchery have always been found among them. They have generally sprung from a lowly origin, and they have been proud of this fact even after attaining greatness. For instance, three Mahratta chiefs, each of whom established a large kingdom—Sindhia, Holkar, and the gaekwar— declared the lowliness of their birth. Holkar was the descendant of a shepherd; Sindhia boasted of having begun life by keeping' his master's slippers; and by his very title the gaekwar perpetuates the memory of his pro- genitor having tended the cow (gae). Mahratta ladies and princesses have often taken a prominent part in public affairs and in dynastic intrigues ; in some instances their conduct has been of the highest type, in others their in- fluence has been exerted for evil.

Though they have produced some poetry, the Mahrattas lave never done much for Oriental literature. Nor have they been distinguished in industrial art. Their archi- tecture in wood, however, was excellent; and the teak

forests of their country afforded the finest timber for build- ing and for carving. ‘They had also much skill in the construction of works for the supply of drinking water on a large scale, and for irrigation.

On the whole the Mahrattas will hardly be ce by Europeans as being among the most interesting of the Indian races. The admirable History of the Mahrattas, by Captain Grant Duff (1826), may possibly awaken enthusiasm, as written under personal ad- vantages and with a living knowledge which will never again be possessed by a historian of the later Mahratta times. At all events, a strange interest gathers itself around the Mahratta history.

In the first plaee the Mahratta country is for the most part strategically important as well as highly pieturesque. Some parts of the Deccan are indeed almost irretrievably ugly. The stretehes of low hill have long been disforested, and even laid bare of lesser

vegetation, and the champaign tracts are treeless as far as the eye can reach. Still much of the Mahratta country lies in the bosom

or near the skirts of mountains. The geological formations may be popularly described as consisting of trap, basalt, and indurated Java in magnificent layers. The black precipices, scarped for thousands of feet, and striped with marks of the laycrs, are superb. The summits, though generally flat with horizontal outlines, are often broken into towers and cones. The vapours from the Arabian Sea are propelled by the south-west monsoon against these nioun- tain tops, and produce an excessive rainfall. Hence arise a luxuri- ant vegetation and the surprising spectacle (at certain seasons) of cascades tumbling down the perpendicular flanks of the mountains. The forests have suffered during ages from wasteful entting ; but of late years a system of conservancy has been established, and many great forests remain.

The mountains stand in the midst of a fertile and populous country ; on both sides of them are rich valleys, cultivated plains, numerous villages, and large towns. Thus insurgents or warriors had here a complete military base,

with sources whence supplies could be drawn, and strongholds for organizing power or for secur- ing refuge. This hill country has been regarded by strategists as one of the strongest, in a military sense, to be found in India, It extends over nearly 500 miles from north to south, and has at least twenty fortresses which in uncivilized warfare were virtually im- pregnable if resolutely defended, and. which, though of course un- able to resist a scientific attack in these times, would yet prove diffieult of approach. Several of these are surrounded with historic traditions. in former times there was no road worthy of the name across these mountains. No means of passage existed save stecp rugged pathways for footmen and pack animals, 'Within the last generation the British Government has, in Oriental ie lifted up the veil of these mountains, piercing them with well- made roads and with railways. There are now seven of such roads, and two lines of railway open, a third being projected. Guns and troops as well as goods and produce can now be moved up and down these once impassable mountains.

It is the range of the Western Ghats which enabled the Mahrattas to rise against their Mohammedan conquerors, to reassert their Hindu nationality against the whole power of the Mogul empire, and to establish in its place an empire of their own. It is often held that in India British conquest or annexation succeeded Mohammedan rule; and to a eonsiderable extent this was the case. But, on the other hand, the principal power, the widest sovereignty, whieh the British overthrew in India was that of the Mahrattas.

During the carlier Moslem invasions in 1100 and in subsequent

ears, the Mahrattas do not seem to have made much resistance. They submitted to several Mohammedan kings under the ehanging eircumstances of those times. They were despised by their con- querors, and were called "mountain rats" in derision. It was against the Mohammedan king of Bijapur in the Deccan that Sivaji, the hero of Mahratta history, first rebelled in 1657. Sivaji and his fighting officers were Mahrattas of humble caste, but his ministers were Mahratta Brahmans. When the Mogul empire absorbed that kingdom he defied the emperor. He imparted a self-reliant enthusiasm to his countrymen, formed them into an army, and organized them as a political community; his mountaineer infantry, ueaee limited in numbers, proved desperately courageous ; his cavalry was daring and ubiquitous. Having once overcome the Hindus in almost all parts of India, often after heroie resistance, the Moslems had not for centuries met with any noteworthy up- rising. Sivaji, however, planned their expulsion, and before the end of his restless life made much progress in the execution of that design. The new Mahratta state which he founded was maintained under various vieissitudes after his death. Still Mahratta rcsist- ance, once aroused by him, was never extinguished, and the im- perial resources were worn out by ceaseless though vain efforts to quell it. The great Mogul emperor's impoverished and en- feebled successor was fain to recognize the Mahratta state by a formal instrument. The Mahratta king, a descendant of Sivaji, was a roi fainéant, and the arrangement was negotiated by his Brahman minister, whose official designation was the péshwa. The office of péshwa then became hereditary in the minister's family, and grew in importanee as the Mahratta kingdom rose, while the king sunk into the condition of a puppet. Thus the Mahratta power was eonsolidated

throughout nearly the whole of Maharashtra under the Brahman péshwa as virtual sovereign, with his capital at Poona, while the titular Mahratta raja or king had his court at the neighbouring city of Sattara. Despite his political importance, however, the raja was still venerated as the deseendant of Sivaji.

Then several chiefs carved out principalities of their own from among the ruins of the Mogul empire. Thus Raghoji Bhousla

established himself in the traets lying underneath the southern'

base of the Satpura range (namely, Nagpur and Berar), overran Orissa, and entered Bengal. Dammaji Gaekwar descended from the Western Ghats upon the alluvial plains of Gujerat around Baroda; Takaji Holkar subdued the uplands of Malwa beyond the Vindhya range on the north bank of the Nerbudda; and Madhaji Sindhia obtained possession of large tracts immediately south of Agra and Delhi, marched into Hindustan, and became virtually the

tinent of India. the Mogul empire.

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master of the Mogul emperor himself. Princes of Sivaji's own family founded a dominion at Tanjore, in the rich delta of the Kaveri south of Madras.

But these principalities, though really independent respecting internal adininistration, and making war or peace with their neigh- bours according to opportunity, yet owned allegiance to the péshwa at Poona as the head of the Mahratta body. On state occasions

heads of principalities would visit Poona by way of acknowledging

the superior position of the péshwa. On the other hand the péshwa was eareful to obtain the sanction of his nominal sovercign at Sattara to every important act of state. Thus a confederation was

formed of which the Brahman péshwa or head was at Poona, governing the adjacent territories, while the members, belonging to

the lower castes of Mahrattas, were scattered througheut the con- Sueh was the Mahratta empire which supplanted The Mahratta power grew and prospered till it embraced all India with certain exceptions. Its cnlminating point

was reaehed about 1750, or about a century after Sivaji first rebelled against his Mohammedan sovereign.

Its armies drew soldiers from all parts of India. The infantry was not of good quality; but its cavalry was really an enormous force, numbering fully a hundred thousand in all. The horsemen were splendidly audacious in riding for long distances into the heart of a hostile country, without support, striking some terrific blows, and then returning rapidly beyond reach of pursuit. They could truly boast of having watered their horses in every Indian river from the Kaveri to the Indus, If attacked, however, in a competent manner they would not stand ; and afterwards, in con- flict with the British, whole masses of them behaved in a dastardly manner. As their ambition grew, the ehiefs began to organize their troops after the system learnt from the English and Freneh, In this way several Frenchmen—De Boigne, Perron, and others— rose in the Mahratta serviee to a position dangerous to the British. But the new system was unsuited to the Mahratta genius; it hampered the meteoric movements of the cavalry, which was obliged to maneuvre in combination with the new artillery and the disciplined battalions. Mahratta elders hence uttered predictions of military disaster which were in the end more than fulfilled.

While the Mahrattas collected vast quantities of treasure and valuables, the ordinary revenue of the confederation hardly exceeded ten millions sterling annually. Large amounts, however, were drawn by feudal tenure-holders, which never appeared in the public aecounts. The area and population under the dominion or the control of the eonfederation eould hardly have been less than 700,000 square miles and 90 millions of souls.

The rapid and amazing success of the Mahratta confederation rendered it the largest Hindu sovereignty that ever existed in India. But it lacked the

elements of rue greatness, It was founded by plundering expeditions, and its subscquent existence was tainted by the baseness of this predatory origin. With the exception of the péshwas, its chiefs were little more than freebooting warriors, for the most part rude, violent, and unlettered. Their custoin was to offer their neighbours or victims the alternative of paying "chouth," that is, one-fourth of the revenue, or being plundered and ravaged. Thus the Mahratta chouth came to have an ominous significance in Indian history. Desultory efforts were made to establish a civil government, but in the main there was no administration formed on statesmanlike prineiples. The ptshwas, on the other hand, as Brahmans, were men of the highest education then possible in India. But they were absorbed by the direction of military and political combinations, and by intrigucs for the preservation of their own power ; and, even allowing for all this, they failed to evinee the civil eapacity whieh might have been anticipated. While several displayed commanding abilities, and some possessed many virtues, one only attempted to conduct an administration in an enlightened manner, and he died prematurely.

There were at the same time powers existing in India to keep the Mahrattas in eheck, and it has just been mentioned that some parts of India were exeepted from their depredations. The English power was rising at Yaleutta, Madras, and Bombay. The nascent Sikh power prevented Mahratta neursions from being permanently suecessful in the Punjab. As the Mogul empire broke up, some separate Mohammedan powers rose upon its ruins. The nizam of the Deccan established himself at Hyderabad, comparatively near the headquarters of the ptshwa. Hyder Ali was proelaimed sultan of Mysore in the south. Ahmed Shah Abdal burst upon India from Afghanistan. The Mahrattas bravely encountered him at Panipat near Delhi in 1761, and were decisively defeated. The defeat, however, did not essentially shake the Mahratta empire. It was collision with the English that broke that wonderful fabric to pieces.

The first collision with the English occurred in 1780 ; it arose from a disputed succession to the péshwaship. The English Government at Bombay supported one of the claimants, and the affair became critical for the English as well as for the Mahrattas. It was at this conjuncture that Warren

Hastings displayed his political genius and rendered signal service to his country.

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The next collision happened in 1803. The péshwa had fallen into grave difficulties with some of the principal members of the Mahratta confederation, namely Sindhia, Holkar, and the Bhonsla raja of Nagpur. He therefore placed himself under British protee- tion, and this led to the great Mahratta war, in which the Marquis Wellesley displayed those talents for military and political combina- tion which have rendered him illustrious. It was during the cam- paigns which ensued that General Arthur Wellesley defeated Holkar and the Bhonsla raja at Assaye, and General Lake won the victories of Farrukhabad, Dig, and Laswari over Sindhia and Holkar. The three confederates, Sindhia, Holkar, and the Bhonsla, concluded peace with the British Government, after making large sacrifices of territory in favour of the victor, and submitting to British control politically. Thus the Mahratta empire was broken up. It was during these events that the British won the province of Orissa, the old Hindustan now known as the North-Western Provinces, and a part of the western coast comprising Gujerat.

The third collision came to pass between 1816 and 1818, through the conduct, not only of the confederates, but also of the péshwa himself. During the previous war the péshwa had been the protégé and ally of the British ; and since the war he had fallen more completely than before under British protection and guidance, British political officers and British troops being stationed at his capital. He apparently felt encouraged by cireumstauces to rebel. Holkar and the Bhonslas committed hostile acts. The predatory Pindaris offered a formidable resistance to the British troops. So the péshwa ventured to take part in the combination against the British power, which even yet the Mahrattas did not despair of overthrowing. After long-protracted menaces, he attacked the British at Kirki, but failed utterly, and fled a ruined man. Ulti- mately he surrendered to Sir John Maleolm, and was sent as a state pensioner to Bithir, near Cawnpur. Thus the last vestige of the Mahratta empire disappeared. The British, however, released the raja of Sattara from the eaptivity in which he had been kept during the peshwa's time, and reinstated him on the throne.

Owing to these events the British Government became possessed of the Con- can and of the greater part of the Deccan.

It remains to mention briefly the fortunes of each remaining member of the once imperial confederation, The principality of Sattara was held to have lapsed in 1849 by the death of the raja without lineal heirs, and was annexed by the British Government. The Bhonsla raja of Nagpur and Berar was obliged to surrender Berar to the nizam, as the ally of the British, in 1803. Berar then remained under the nizam till 1854, when it came under British administration, though it is still included in the nizam's dominions. The raja of Nagpur died without lineal heirs in 1853, and his terri- tory, being held to have lapsed, was annexed to the British territorics. The house of Holkar has, during the last sixty years, remained faithful to its engagements with the British Government, and its pesition as a feudatory of the empire is well maintained. In Sindhia's territory, by reason of internal feuds, the British had to undertake measures which were successfully terminated after the battles of Maharajpur and Panniar in 1848, But on the whole the house of Sindhia has remained faithful. Sindhia himself was actively loyal during the war of the mutinies, The gaekwar gradually fcll under British control towards the close of last cen- tury, and his house has never engaged in hostilities with the British Government. The gaekwar Khande Rao signalized himself by loyalty during the war of the mutinies. His successor, Malhar Rao, has recently been deposed by the British Government on account of gross maladiinistration. The ex-péshwa lived to old age at Bithir, and died in 1851. His adopted son grew up to be the Nana Sahib, of infamous memory, who took a leading part in the war of the mutinies. (Ui, Mts)

MAHZOR (7h), or Manazor,! as some write the word (from the root 'th, to go round, to return),

signifies a cycle. The term is used by the Jews in a threefold sense :—(1) astronomically, as Mahzor Katan for the cycle of nineteen years, Mahzor Gadol for that of twenty-eight years, Mahzor Gadol lallebanah? for the Metonic cycle; (2) liturgically, for the "Larger Prayer- Book," whether in its narrower or its wider meaning (see below); and (3) ritually, for a book containing religious laws and directions, as, for example, Afahzor Vitrt by

BR. Simhah b. Shemuel of Vitri-le-Frangais, Mahzor Rabbenu Tam by R. Yaakob b. Meir of Rameru, &c. In the first sense the plural is either Mahazoroth,3

1 Targum Yonathan on Genesis i. 14 qa), which is the plural of {ahazoro, and mediately of Mahazor. ; This must not be mistaken for Mahzor Gadol shel Lebanah, which

comets of twenty-one years. See Pireke R. Lilvezer, eap. vii. Sec Pireke R, Llv'ezer, cap. Vi.

or Mahzorim, or Mahazorin;> in the second and third it is exclusively Jfahzorim. As most ancient prayer- books contain more or less fully elaborate "tables," ex- hibiting calendar matter, in counexion with tle fixing of feasts and fasts and of the lessons from the Pentateuch and the Prophets, we cannot be in doubt as to the true cause of the application of the word Mahzor to the "Larger Prayer-Book." It is not applied because it is the equivalent of the Syriac hudrd, as some think, but simply because Afahzor is the equivalent of the Greek eyclos (kvKXos).®*

The Mahzor, meaning prayer-book, is capable of division from different points of view. According to its contents we may divide it into two parts,—the Smaller and the Larger. The Smaller Mahzor contains the ordinary prayers, together with. the poetical insertions and the lessons from the Pentateuch and the Prophets used ou the Yamim Noraim, or " Awe-inspiring Days" (i.e, New Year and the Day of Atonement), and those used on the Yamim Jobim, the three principal festivals (Passover, Pentecost, and Tabernacles). The Larger Mahzor is, indeed, the only one which really deserves this name, since it embodies the ordinary prayers, together with the poetical insertions for the whole year, and the lessons from the Pentateuch and the Prophets for all feasts and fasts and the other extra-ordinary occasions, According to its various "uses" the Mahzor may be divided into the Rabbanite and the Anti- Rabbanite. The Anti-Rabbanite Mahzor comprises the Karaite," used by the so-called Karaites, or Scripturalists, inhabiting Russia (especially the Crimea), Galizia(Austrian Poland), Egypt, Palestine, &c., and the Semi-Karaite, adopted by the so-

called "Reformed Jews" of England, in reality the 'Congregations of British Jews" of London, Manchester, and Bradford.® The Rabbanite Mahzor may be divided into that of the Ashkenazim, the Sepharadim, and the Italiani. The Italian Mahzor, though embodying Jarge Ashkenazic and Sepharadic elements, is yet a distinct "use." It branches out at home into three subdivisions— (1) the Roman,® (2) the Neapolitan}? (now extinct), and (3) the Italian proper ;14 and abroad into (4) the Greek Rites of Kaffa,!? Crete, dc. (Crete having very early received a large influx of immigrants from France and Germany, but chiefly from Italy), and (5) the Romanian,}5 ¢.¢., the " use" obtaining, among others, at Constantinople and other Byzantine cities, The Italians who, long before the year 1000, had given Jewish learning and poetry, not merely to

4 See Pireke R. Elitezer, cap. vi. 5 See note ? above.

6 For the sake of completeness we may mention the term " Mahazor- to," which ocenrs in the Massoreth. It is not so called, as some have: thought, because the Mahzor Vitri (or, indeed, any other Mahzor), ever gave the text of the whole Bible. The Mahazorto was a pattern codex of the Bible, and got its name simply from its containing the cycle of the sacred Scriptures,— the Law, the Prophets, and the Hagio- grapha. It (or a similar codex) is also sometimes called Mahazoro Rubbo, in eontradistinction to smaller codices, which contained only some part of the Bible. It should be also borne in mind that the Babylonian Jews '(as we are distinctly told of those of Nehardea) used in olden times to read on Sabbaths in the synagogue not merely, as nowadays, the Pentateuch and portions of the Prophets, but, in the afternoon service, portions of the Hagiographa also (T. B., Shabbath,

1168).

" See Daily and Festival Prayers, in 4 vols., Venice, 1528-29, 4to; in 8 vols., Kale, 1806, 4to; in 4 vols., Eupatoria, 1836, 4to; do., Vienna, 1854, 8vo.,

8 Forms of Prayer, &e., in 5 vols., London, 1841-43, 8vo.

9 Soncinatt, Soneino, Casal Maggiore, 1485-86, Bologna, 1540, both in folio.

10 Cambridge MS. Add. 491.

1 Prayers, &., Venice, 1545, 16mo, &e.

12 Cambridge MS. Add. 542. ‘4

2 Prayers for the Whole Year, &e., in 2 vols., Venice, 1517-49, folio ; Constantinople, 1573-76, folio. The eopies of both editions in the Cambridge University Library are, so far as we know, the finest to be found in England.

Germany, but to the whole Roman empire, received in the 14th century numerous immigrants from northern France,} in the 15th century from Spain and Portugal, and at all times from Germany. The “‘uses” of these immigrants are practically preserved side by side with the native Italian to this day. The pure Sepharadic Ritual? repre- gents, in the first instance, of course, the “use” of the Jews formerly inhabiting Spain and Portugal, who now form the minority in Hamburg, Amsterdam, Manchester, London, Paris, Vienna, Budapest, Temesvar, Semlin, Bucharest, Venice, Rome, and some other Italian and Greek cities, as also in Canada and the United States, and the majority in India, Persia, Morocco, Leghorn, Corfu, Belgrade, all Bulgaria, Constantinople, Palestine, Egypt, South Arabia, and other parts of the Turkish empire, in the French possessions in Africa, and in the south of France. Some of these, although characteristically Sepharadic, are distinct enough to claim a ritual of their own, as those of “Catalonia,” ? Algiers, Tunis,® Tripoli,® Tlemcen,’ Ceylon and Cochin in India,® the Comtat in France,? and Provence, as a whole, in bygone days.!° The “use” of the Ashkenazim,! 7.¢., of the majority of the Jews inhabiting Germany, the Austrian states, Hungary, Russia, Denmark, Sweden, France, Belgium, Holland, the British empire (India cxcepted), the United States, &c., branches out into two rituals, the German proper’? and the Polish. This latter has some differences of use between Great Poland and Little Poland.1* The German proper had in times past the separate rituals of Worms and other cities in the empire, which are all now extinct. Those of Frank- fort-on-the-Main and of othcr towns are not sufficiently marked to deserve separate notice. It should, however, be mentioned that*

*there are scattered everywhere, both at home and abroad, “Reformed congregations,” whose separate uses and practices are more or less an imitation of the “ Temple ” (Reformed congregation) of Hamburg.’**

1 There are to this day three congregations in Italy (Asti, Fossano, Moncalvo), which use the ancient ritual of northern France (see MS. Add. 667, in the Cambridge University Library).

2 Seder Tephilloth, &c., Amsterdam, 1642, 16mo; in 4 vols., 1644 ; in 6 vols,, London, 1789-93 ; Afahzor, &c,, Vienna, 1820, 8vo.

8 Mahzor, &c., Salonika, 1863, 8vo.

4 Hokhmath Hammisken, &c., 1793; Katan, &c., 1861, all at Leghorn, in 8vo.

5 Mahzor, &c., Pisa, 1794; Selihoth, 1845; Pene Haragel, 1856, all at Leghorn, and in 8vo.

8 Siphethe Renanoth, &c., 2 vols., Venice, 1648, 1711, 4to, Leg- horn, 1837 ; Kisshurin Leya‘akob, Leghorn, 1858 ; Readings, Venice, 1736, all three in 8vo.

7 Mahzor, &c., 1842 and 1861, both at Leghorn, and in 8vo,

8 Order of Prayers, &c., Amsterdam, 1757 and 1769, Leghorn, 1849, all in 8vo.,

9 Or Venaissin, 7.¢., the four congregations of Carpentras, Avignon, Lisle, and Cavaillon. See Seder Hattamid, &c., Avignon, 1767, Aix, 1855, 8vo ; Seder leyamim Noratm, &c., 1739; Seder leshalosh Regalim, 1759-1762, both at Amsterdam, and in 8vo ; Seder Jfakun- teris, &c., Avignon, 1765; Seder shel yom Kippur, 1766, and Seder Haashmuroth, 1763, both at Amsterdam, and all three in 4to.

10 Tt ought not to be omitted that in the old Provengal ritual and the South Arabian there are several points of contact existing, A teacher or teachers

must have come from the one country and Settled in the other. We will give but one example. ‘The phrase,

nda moydnwa) NWTF 13D, which occurs in the Path- shegen (on Genesis ii. 1), by an anonymons author, and published by Dr Nathan Adler, and which the editor modestly says he has not succeeded in finding, is in reality to be found in the service of the Hosha‘noth, both in the old Provencal Mahzor (Camb. MS. Add. 752, leaf 2050; only that, instead of NWOT, it reads NWIPID NI) and in that of Yemen (Camb. MS. Add. 1200, leaf 625), though in no other so far as we know.

N Mahzor, Pesaro, 1520, Augsburg, 1536, Venice, 1567, all in folio ; 6 vols., London, 1807, 1824, 1826, &c., 8vo.

2 Mahzor, 2 vols., Sulzbach, 1794, folio.

13 These differences show themselves first in the prayer “ El erekh appayim” in the service for Monday and Thursday.

M4 Ordnung der éffentlichen Andacht, &c., 1819 5 Seder Ha‘abodah, &c., both at Iamburg, and in Svo.

YAMP, 1823; Mahzor

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Some of these have only introduced choirs, others have introduced instrumental music, and others again have con- siderably curtailed not merely the poetical insertions, but the ordinary prayers themselves, and have introduced hymns and prayers in the vernacular. (S. M. 8.-8.)

MAT, Anerto (1782-1854), cardinal, well known as the discoverer and editor of numerous ancient texts, was born of humble peasant parentage at Schilpario, a mountain village in the province of Bergamo, Lombardy, on March 7, 1782. For the excellence of his early education, received at Bergamo, he was indebted to a Jesuit priest named Mozzi, whom the suppression of the order had caused to settle in the neighbourliood. He afterwards accompanied Mozzi to a college at Colorno, in the duchy of

Parma, where the Jesuits had been permitted to re-establish themselves ; and there he entered the noviciate of the society in 1799. In 1804, after the brief which restored the Jesuits to the Two Sicilies had been granted, he was removed to Naples as teacher of classics in the college there. Next, after com- pleting his theological studies at the Collegium Romanum, he lived for some time at Orvieto, where he was admitted to priestly orders, and was engaged partly in teaching and partly in the paleographical studies for which he had already manifested a strong partiality. The political events of 1808 necessitated his withdrawal from Rome (to which he had meanwhile returned) to Milan, where he assumed the functions of a secular priest, and in 1813, through the influence of Mozzi, was made custodian of the Ambrosian library. He now threw himself with characteristic energy and zeal into the business of carefully exploring the numcrous and valuable MSS. committed to his charge, and in the course of the next six years was able to restore to the world a considerable number of long-lost works. With the full approval of all concerned he now withdrew from his connexion with the Society of Jesus, and in 1819 he was invited to Rome as chief keeper of the library of thie Vatican, Soon after his installation there he found the palimpsest from which he edited the De Republica of Cicero ; this, probably the most important work of his life, was followed by the publication of a vast number of fragments of Greek and Latin fathers and historians. In 1833 Mai was transferred from the office of Vatican librarian to that of secretary of the congregation of the Propaganda; on February 12, 1838, he was raised to the dignity of cardinal. In this rank he successively discharged the functions of prefect of the congregation for the super- vision of the Oriental press, prefect of the congregation of the council of Trent, and cardinal librarian of the Roman Church. He dicd at Castelgandolfo, near Albano, on September 9, 1854, bequeathing his valuable private library at half its estimated value to the Vatican, the proceeds to be applied to the relief of the poor of his uative village.

To the period of his Milanese activity belong MZ. 7. Ciccronis trium orationum, pro Scauro, pro Tullio, pro Flacco, partes ineditz, (1814, from a palimpsest containing the poems of Sedulius); AZ 7. Ciceronts trium orationum, in Clodiwm ct Curionem, de xre alieno Milonis, de rege Alcxandrino, fragmenta tcdita (1814, from a MS. containing a Latin translation of the Acta of the couneil of Chalcedon); Af. Corn. Frontonis

opera inedita, cum cpistolis, item incditis, Antonini Pit, Marci Aurcltt, Lucti Veri et Appiant, nec- non aliorum veterum fragmentis (1815) ; portions of eight speeches of Quintus Aurelius Symmachus, fragments of Plautus, the oration of Iseus De hereditate Clconymi, the last nine books of the Antiquitics of Dionysius of Haliearnassus, and a number of other editorial labours. Jf, Tullit Ciccronis de Republica que swpersunt appeared at Rome in 1822; Seriptorwm Veterwm nova collectio, e Vaticanis codictbus cdita (10 vols. 4to), in 1825-38; Classicorwm Auctorum Collectio e Vaticanis codicibus cdita (10 vols. 8vo) in 1828-38 ; Spictlegiwm Romanum (10 vols. 8vo) in 1839-44; and Patrwm nova Bibliotheca (6 vols. 4to) in 1845-53. His edition of the eelebrated Codex Vaticanus, eompleted in 1838, but not published (ostensibly on the ground of inaccuracies) till four years after his death (1858, 5 vols, 4to), is unsatisfactory and has been superseded

by the subsequent magnificent cdition of Vereellone and Cozza (Rome, 1868), which in turn leaves much tobe desired. Generally speaking, it may be said that the services rendered to scholarship by Mai (great though they were) were merely those of a laborious and persevering pionecr; as a textual critic he does not rank high, either for sagacity or for accuracy.

MAIA was the eldest and fairest of the Pleiades, the seven daughters of Atlas and the Oceanid Pleione. Ter name marks her as the "'fruitful mother"; and the seven sisters have no individuality except as the mothers of famous families. 'They were all born on Mount Cyllene in Arcadia, and are sometimes called mountain goddesses. In a cave of Cyllene, in the darkness of night, Maia became by Zeus the mother of the god Hermes. Maia bears one of the most characteristic names of the Phrygian mother, Cybele or Ma, the goddess whose hore is on mountains and in caves; and in a common class of votive reliefs Hermes-Cadmilus is represented as a youth bearing a vase standing beside the throne on which Cybele sits. Maia was also an epithet of the Bona Dea, who is a form of Cybele, in Rome. See Conze, ' Hermes-Cadmilos," in Arch, Ztg., 1880.

MAIDENHEAD, a municipal borough and market- town in Berkshire, England, in the diocese of Oxford, 224 miles from London, 134 from Reading, and 6 from Windsor. It was formerly called Maidenhythe, a wharf

for timber and a wooden bridge across the Thames having existed there fron very early times, In 1352 Edward III. incor- porated a guild to keep the bridge in repair. In 1400 the duke of Surrey and the followers of Richard II. held the bridge against the new king, Henry IV., and at nightfall made good their retreat. In July 1647 a meeting took place at the Greyhound Inn between Charles I. and his three children, The church, dedicated to St Andrew and St Mary Magdalene, was originally founded by Margaret of France in 1270, and it was rebuilt on the same site in 1724; but in 1826 it was entirely taken down, and a new church was erected at the east end of the High Street. A church dedicated to St Luke was erected in 1867, and enlarged in 1869. The town contains a small town-hall, a large hall recently erected for concerts and lectures, schools, almhouses, and Roman Catholic, Wesleyan, and Baptist places of worship. There are numerous charities for the education and maintenance of poor persons. The principal trades are in malt, meal, and timber. A fine stone bridge across the Thames was erected at a cost of £20,000 in 1772, connecting Berkshire with Buckingham, The scenery around Maidenhead is extremely picturesque, and several noblemen's seats are in the neighbourhood. Population in 1871, 6173; in 1881, 8219.

MAIDSTONE, a municipal and parliamentary borough, and the county town of Kent, England, situated almost midway between London and Dover. It lies princi- pally on the eastern bank of the river Medway, thie modern part spreading over the western slopes of a picturesque valley, which is intersected and environed by orchards and hop gardens, Although antiquaries have conjectured that Maidstone was a military station of the Romans, few Roman remains have been found in the neighbourhood. 'The Saxon spelling of the name was Medwegestun, " Medway's town." The manor, valued in Domesday Book at £35, 10s., had from a very early period belonged to the see of Canterbury. Archbishop Boniface in 1260 established a hospital here for poor pilgrims, the chapel of which, with modern additions, is again used for public worship. The parish church of St Mary, which had existed from Norman times, was demolished in 1395 by Archbishop Courtenay, who erected on the site thereof the present church of All Saints; he also, at a short distance, founded a college of secular canons, the ruins of which are an interesting specimen of 14th century architecture.

From the reign of John until the Reformation the arch- bishops had here a residence, at which Stafford and Courtenay died; but the existing building known as the palace dates chiefly from Elizabethan times. The rectory, with the manor, passed into lay hands at the Reformation; and, having been a perpetual curacy for three hundred and twenty years, the living became a vicarage in 1866. All Saints is one of the largest parish churchesin the kingdom, and contains, besides many excellent monuments, the richly carved sedilia and the twenty-eight oak seats used by the collegiate priests. The parish has, since 1837, been divided into nine ecclesiastical districts, each with a church. The grammar school was founded in 1549, and endowed with the estates of the local Corpus Christi fraternity, then dis- solved; the hall in which the guild assembled still remains. Broadcloth and linen thread, introduced by Dutch settlers, were at one time manufactured here; but brewing and papermaking have long superseded these industries. Of the barges trading on the Medway, about sixty belong to Maidstone wharfingers. The river is crossed by a stone bridge of three arches, completed in 1879. A museum, with public library attached, was opened in 1858. The endowed charities yield an annual income of £3000. Since the beginning of the 17th century the Kent assizes have generally been held at Maidstone. From Saxon times down to 1830 condemned malefactors were executed, and all the great county meetings were held, on Penenden Heath, a common situated about a mile north-east of the town, and recently enclosed by the corporation, The area of the municipal borough is 4008 acres, of the parliamentary borough 4576 acres. The population has steadily increased during the present century; in 1801 it was 8027, in 1881

29,632,

With general history Maidstone has been intimately associated. Wat Tyler broke into the prison, liberated John Ball, the rebel preacher, and committed other deprcdations. Several of the lead- ing inhabitants joined Jack Cade's rising. Sir Thomas Wyatt, who resided at Allington Castle, now an ivy-elad ruin a mile and a half north of the town, raised the standard of rebellion at Maid- stone on 25th January 1554. Asa punishment for their eomplicity with Wyatt, the burgesses were for the next five years deprived of

their charter of incorporation. The rising of the Kentish royalists in 1648 collapsed at Maidstone, where, on the Ist June, Fairfax, after five hours' obstinate fighting, captured the town at midnight. Anciently governed by a portreve, Maidstone was first incorporated by Edward VI., and since the beginning of Elizabeth's reign it has sent two representatives to parliainent. Andrew Broughton, one of its mayors, as elerk of the court which tried Charles I., read the fatal sentence to the king.

See Russell's History of Maidstone, and Poste's History of the College of All Saints.

MAIMANSINH, or Mymensine, a district in the Jieu- tenant-governorship of Bengal, India, lying between 23° 56' and 25° 25' N. lat., and 89° 43' and 91° 18' E. long., with an area of 6287 square miles, is bounded on the N. by the Garo Hills, on the E. by Sylhet, on the S.E. by Tipperah, on the S. by Dacca, and on the W. by the river Jamuna, which separates it from Pabna, Bogra, and Rangpur dis- tricts. It is, for the most part, level and open, covered with well-cultivated fields, and intersected by numerous rivers. The Madhupur jungle is a slightly elevated tract, extending from the north of Dacca district into the heart of Maimansinh, almost as far as the Bralmaputra; its average height is about 60 feet above the level of the surrounding country, and it nowhere exceeds 100 feet. The jungle contains abundance of sd/, valuable both as timber and for charcoal. During the cold season the open parts of the jungle afford grazing grounds for cattle. The only other elevated tract in the district is on the southern border, where the Susang hills rise. They are for the most part covered with thick thorny jungle, but in parts are barren and rocky. The Jamund4 forms the western boundary of Maimansinh for a course of 94 miles, It is

navigable for large boats throughout the year ; and during the rainy season it expands in many places to 5 or 6 miles in breadth, overflowing a considerable portion of low- lying land. The Brahmaputra enters Maimansinh at its north-western corner near Kardibari, and flows south-east and south till it joins the Meghna a little below Bhairab Bazar. The gradual formation of chars and bars of sand in the upper part of its course has diverted the main volume of water into the present channel of the

Jamuna, which has in consequence become of much more importance than the Brahmaputra proper. The Meghna only flows through the south-east portion of the district for a short distance. The castern and south-eastern parts of the district abound in marshes. The wild animals include tigers, leopards, deer, bears, elephants, and an occasional rhinoceros. Small game is abundant.

The census of 1872 returned the population of Maimansinh at 2,349,917 (males, 1,187,962; and females, 1,161,955), ~~Mohamme~~ dans numbering 1,519,635; Hindus, 817,963 ; Christians, 124. Of aboriginal tribes the most numerous are the Hajongs (24,936) and Garos (10,997). The semi-Hinduized aborigines number in all 205,592, of whom more than one-half are Chandals (123,262), the most numerous caste in the district, employed as cultivators, fishermen, labourers, and menial servants. Among _high-caste Hindus, Brahmans number 33,414. Five towns contain upwards of 5000 inhabitants: —Maimansinh or Nasirabad, 10,068 ; Jamalpur, 14,302; Kisoriganj, 18,687; Sherpt, 8015; and Dhanikhola, 6730. Uldkandi or Bhairab Bazar, although with only a population of 1500, is the most important commercial mart, with a large trade in jute and a well-supplied cattle-market. Rice, of which three crops are raised annually, forms the staple food crop of the district. Other agricultural products are wheat, oats, maize, pulses, linseed, mustard, ¢i7, indigo, tobacco, sugar- cane, pin, and jute. The last constitutes the chief commercial staple. Maimansinh suffers occasionally from blights and floods, but never to any serious extent. The chief imports are piece goods, raw cotton, wheat, betel nuts, chillies, sugar, and cattle; the exports consist of rice, jute, indigo, reed-mats, hides, brass and copper utensils, cheese, ghi, &c. 'Tobacvo and muslins are also exported to asmall extent. Besides a little muslin, the only manufactures are coarse silk cloth, sitalpati mats, cheese, and ghi. Apart from the rivers, means of communication are afforded by about 146 miles of good and 124 miles of inferior roads. Although the general revenue (£166,938 in 1880-81) has more than doubled in seventy-five years, the land revenue has remained almost stationary ; in 1880-81 it was only £75,226, excise amounting to £28,652, and stamps to £48,680. Hducation in 1872-73 was afforded by 173 state-sup- ported schools attended by 6372 pees besides 71 unaided schools, with 2425 pupils. Except towards the close of the rainy season, the climate is fairly healthy. The average annual rainfall is 105 inches.

MAIMBOURG, Louts (1610-1686), a French historical writer, was born at Nancy in 1610. At theage of sixteen he entered the Society of Jesus, and after completing his theological studies at Rome he became a classical master in the Jesuit college at Rouen. He afterwards devoted himself to preaching, but with only moderate success. After having taken some part in minor controversies he threw himself with energy into the dispute which had arisen as to the Gallican liberties ; for his Zracté historique sur les prérogatives de V Hglise de Rome (1682) he was by command of Innocent XI. expelled from his order, but rewarded by Louis XIV. with a residence at the abbey of St Victor, Paris, and a pension. He died on August 13, 1686. His numerous works (exhaustively enumerated in the Biographie Générale) include histories of Arianism, the iconoclastic controversy, the Greek schism, Lutheranism, Calvinism, and of the pontificates of Leo I. and Gregory I; they are mere compilations, written indeed in a very lively and attractive style, but inaccurate throughout, and wherever matters of controversy are totiched on, specially untrustworthy.

MAIMONIDES (1135-1204). Among the great men to whom Mohammedan Cordova! has given birth—and

*1 Hence he is called '*Al-Kortubi" (and not al-Kordovi, or Hakordovi) by Arabic writers, and " Hassephardi" by himself (preface to Mishneh Torah).*

*these are not a few—the greatest is unquestionably Rab- benu Mosheh b. Maimun? Haddayyan.? Like the lives of so many. great men, that of this "last of the Geonim as regards time and the first of them as regards worth" * is surrounded by a halo of fables, some of which, though fictitious, are instructive in many respects, whilst others are telling in dramatic effect and touching in the extreme. Some of these fables, however, are merely amusing, whilst others are simply ridiculous. The present article confines itself to facts and a few criticisms founded on them. "Rambam," or Maimonides, was born March 30, 1135, and died at Cairo, December 13, 1204; consequently he did not quite attain the age of seventy,°—a short space of life, when we take into consideration all the work he did for his contemporaries and all the works he left to posterity. Like many other great and conscientious rabbis of all times, who considered it a sin to make of*

religious learning a means of gaining bread, Maimonides adopted the medical profession. That he must have greatly excelled in it is not merely known by the medical works he composed, but is best testified to by the fact that, although a Jew (and the times and the country he lived in were certainly not

more tolerant than ours), he held the lucrative and im-

portant office of court-physician to Saladin of Egypt.

Maimonides was master of Greek-Arabic philosophy, as may be seen from his Zechnical Terms of Logic," his Guide, and his other works. That he was a mathematician and astronomer of no mean standing appears from the Afaamar Ha ibbur' (calculations of the calendar, which he wrote at the age of twenty-two), the Milekhoth Kiddush Hahodesh (in the book Zemannim of the Mishneh Torah), and the commentary on T. B., Josh LZasshanah. That he was a great Talmudist we know from his commentary on the Mishnah and his chef-d'ewvre the Mishneh Torah. That he was, as philosopher and theologian, a profound thinker we know from his Guide of the Perplexed and his other works. To sum up in a few words the merits of Maimonides, we may say that, with all the disadvan- tages of the times in which he lived, he was the greatest theologian and philosopher the Jews ever produced, and one of the greatest the world has seen to this day. As a religious and moral character he is equalled only by a few and surpassed by none.

The works of Maimonides were composed by him partly in Hebrew and partly in the vernacular Arabic,—a portion of the latter eing translated into Hebrew by himself.

I. Works composed by Maimonides in Hebrew.

1. wfishnch Torah, i.¢., the systematic codification of the whole of the Jewish law, as it is to be found in the Bible, the ALishnah, Toscphta, Mekhilta, Siphra, Siphre, both Talmudim, the Shecltoth,

Halakhoth Gedoloth, the Responsa of the Geonim, the Hilckhoth, Rab Al-phest, &c. This work is drawn up in fourteen (V"= Yad)

2 From the initials of his name, with "R" (for ' Rabbenu"') pre- fixed, and his father's name with '* B" (for son of) prefixed, the Jews*

call him RaMBaM ; among Christians he is, more Greco, called Maimonides, from his father's name Afaimun or Maimon.

3 See end of the commentary on the Afishnah ('' Ani Mosheh bar Maimun Haddayyan"').

4Sq Maimonides is designated by the famous Enbonet Abram (or Yedatyah Happenini Bederesi, 7.¢., of Beziers) at the end of his Behinath 'Olam.

5 Whoever wishes to know more of these fables may gratify his desire, if he knows Rabbinic, by reading Ibn Yahya's Shalsheleth Hakkabdbalah ; if he understands German, by reading Jost's Geschichte ; and if he understands only English, by reading Benisch, Two Lectures, &c., London, 1847, 8vo.

6 Note at the end of the author's commentary on T. B., Rosh Hasshanah, by his grandson R. David (Hallebanon, ii. p. 60).

7 This work was translated from the Arabic into Hebrew by R. Mosheh Ibn Tibbon, and printed for the first time at Venice, 1550, 4to. The third edition (Frankfort-on-the-Oder, 1761, 4to) has a com- mentary by Mendelssohn.

8 See the collection Dibere Hakhamim (Metz, 1849, 8vo), p. 23. The translation is by h. Mosheh Ibn Tibbon.

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books, with a view to which fact and to the author's name (Afosheh) admiring and grateful posterity called it, from Deut. xxxiv. 125 Hayyad Hahazakah,—a title which has eclipsed, if it has not actually superseded, that given to it by the author himself. Great has been the success of this work. If Maimonides has not suc- ceeded in superseding by it the Babylonian Talmud (as some think was his purpose!), he has certainly succeeded (probably against his will) in making of it a second Talmud of Babylon in the Talmudic acceptation of this term.? The Afishneh Torah has become an arena of endless, though happily bloodless, strife. lt is to this

day a place of tournament for all Talmudists. The hundreds of folios on Rabbinic literature, written since the author's time, constantly draw the Rambam,® naturally or artificially, into the discussions they contain. To clear up a difficult Ram- bam, or to 'answer a Rambam," i.e, to remove an apparent difficulty in the Mishneh Torah, is the great test of the fitness or learning of a rabbi to this day. Moreover, all Sepharadim have received its dicta, though only ewm grano, whilst the congregations of Arabia (as those of Yemen and others) not only live absolutely according to its teachings, but have actually neglected the study of the J'almudim through it. The work itself is to be found in MS. in numerous libraries (probably one of the oldest MSS. lying in the University Library of Cam- bridge, Add. 1564). Printed editions are also numerous, some without "strictures" (Hassagoth) and without a commentary, others with the "strictures" of the great rabbi' of the little town of Pesquiers (in Provence), others with eommentarics varying from four to cight, and even more. The earliest edition, which has neither place nor date, appeared somewhere in Italy, about 1480 ; the second at Soneino, 1490 ; the third at Constantinople, 1509; the fourth, fifth, sixth (with the Sepher Hammisvoth, &c.), and seventh editions at Venice, 1524, 1550, 1550-51, and 1574-75 respectively ; the eighth (with the Antichristiana) at Amsterdam, 1702-8, all in folio; the most recent and incomplete edition being that of Leipsic, 1862, 8vo. The Afishneh Torah stands, and has stood for centuries, even among non-Jews, in such respect that " parts of books" (Halakhoth) have becn rendered into other languages, notably into Latin. Extracts from this work have been translated into English by the late H. H. Bernard of Cambridge (Cambridge, 1832, 8vo) and E. Soloweyczik of Poland (London, 1863, 8vo).

2. Commentary on the treatise of Rosh Hasshanah according to the Babylonian Talmud. We know from Maimonides himself that he commented on almost the whole of the second, third, and fourth Sedarim and on one treatise (Hullin) of the fifth Seder of the Babylonian Talmud. But of all this none but his Rosh Hasshanah has been preserved. This commentary is extant in four MSS., one of which, however, is a mere transcript, whilst two of the others are imperfect. The only edition existing (Hallebanon, ii. p. 61, &c.) is from these imperfect MSS. The one perfect MS. copy known to us is preserved in the University Library of Cambridge (Add. 494).

3. Some of the numerous letters ascribed to Maimonides. These are inextricably mixed up both with letters written by him in Arabic and translated by others into Hebrew, and with letters addressed to him by others.

4, Religious poetry. There is a short liturgical piece (it is recited on the first day of New Year by the Arabic-speaking Jews of Algiers, Tunis, &c.) which begins 2th Sha'are Ratzon, and which bears the acrostie Anz Mosheh biribbi Maimon Hazak. It isan "'Akedah." But because there is a composition of the same nature and beginning, but of greater length and by another author (Abbas Yehudah Shemuel), this is, in contradistinction, called "Akedah Ketannah. Since the name of Moshch, however, is com- mon among all Jews and that of Maimon among those of the Maghrib (see Schiller-Szinessy's Cambridge Catalogue of the Hebrew Manuseripts, ii. p. 28, note 2), this little poem may, perhaps, be- long to another (and inferior) rabbi of this name. [If it really does belong to our Maimonides, we have a key to his contempt for the liturgical pocts.® Being a poor poet himself, he judged them by his own merits, or rather demerits.

Il. Works composed by Maimonides in Arabte.

1. The commentary on the whole Ifishnah. The author began this work whilst yct in Spain, continued it on his flight through Morocco, and finished it at his ease at Fostat (Cairo). The merit of this work is that the author explains therein the Afishnah in a very lucid and brief way ; and, having privately digested the Tal- mudical controversies regarding cach paragraph, he gives the result

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*: Luzzatto, Kerem [Hemed, iti. 67. *T. B., Syxhedrin, 24a, cone this work is commonly and especially called from the author's 4 a * ba * Kh. Abraham Ben David and the only literar owu confession,*

® See introduction to the Sepher Hammisvoth.

(Labad) was the author's contemporary y man who ever conquered him, according to his

of it in the decision of the Halakhah. But this work has also its demerits. (1) It is occasionally incorrect in itself. (2) Being to most Talmudists accessible only in a translation, which they cannot gauge, the smallest clerical error produces confusion. (3) Nor were all the translators equally qualified for their task. Some were good Talmudists, but indifferent Arabic scholars ; some were vood Talmudists and good Arabic scholars, but not fine Hebraists. For the translators see Schiller-Szinessy, wt supra, ii. pp. 16, 17.)

2. The Sepher Hammvisvoth is a preliminary to the author's masterpiece, the Mishneh Torah. This small but important work has been twice translated,—first by R. Mosheh b. Shemuel b. Yehudah Ibn Tibbon (Tabbon 2), and secondly by R. Shelomoh b. Yoseph Ibn Aiytb. The former translation is known by printed editions ® and the latter by MSS. Ibn Aiyub's, though less known, is the more correct translation. There is a eopy of it in the University Library of Cambridge (Add. 676, 2).

3. But the most important and most learned and to us the most interesting of Maimonides's Arabic works is the Gwide of the Per- plexed (Daldlatu '1-Hairin in Arabic, and Moreh Hannebokhim in Hebrew). Itis the result of deep research in Bible and Midrash on the one hand and in Greek philosophy, as interpreted by Aristotle and his followers, together with various religious systems, on the othcr. The purpose of its composition and publication was to reconcile Jewish theology with refined heathen philosophy. Maimonides deservedly held Aristotle in very high estimation ; his traducers, however, said that he placed him in the Guide next to, if not above, Moses. No wonder, then, that religious Jews of a eertain type in the author's lifetime took offence both at the book and the author. But serious warfare broke out only after Maimon- ides's death, which raged for more than a full century, and is not entirely extinguished even at this day. His followers, chiefly in Provence at the end of the 18th and the beginning of the 14th century, some of whom had only eyes for the master's nega- tions and none for his affirmations, declared the whole history of the Bible to be mere symbolism, Abraham was, according to them, the Morphe, Sarah the Hyle, and so forth." These absurdities were considered by the religious as

highly irreligious, and provoked active opposition and even excommunication. ‘hese, in their turn, provoked again the strong rcmonstrance of the moderate middle party and the ultimate excommunication of the excom- municators by the excommunicated. But long before that time the Guide had been publicly burned,—an act quite un-Jewish, but in unison with an age which had more faith than knowledge, and which, dwelling in darkness, hated the light. People in our days cannot understand this ; they cannot understand the fierce oppo- sition to the Gudde, and much less the attachment to it. They ask, Is this the great work of the great Maimonides? These ex- planations of the Scriptures we have long ago outgrown, and the philosophy it contains is not worth mention by the side of that of Schelling, Fichte, and Hegel! But the fact is that, if one wishes to form a proper estimate of this work, he must not merely read it, but earnestly study it. Then again, its contents must be viewed historically, ¢.e., both in connexion with the theological and philo- sophical systems of past ages and with the influence it has exercised uninterruptedly from the time of its appearance down to almost our own days.’ Isolated portions of it may have become antiquated. The symbolism of the Pentateuch and the meaning of the words of the prophetic books and Hagiographa may be clearer to us than they were in the author’s time, by reason of our discoveries in science, our progress in philology, and our knowledge of history. Our know- ledge of Greek philosophy may be much greater than Maimonides’s was, owing partly to our acquaintance with the original writings of Aristotle and others, accessible to Maimonides only through a trans- lation of a translation, and partly owing to our collation of numer-ous MSS., by which the errors are rectitied of the copies from which the first translators made their version,—a rectification by which parts of the foundation and of the superstructure of the Aforeh go down at one and the same time. But, when all this is considered, the Guide still remains a great work,—a product, indeed, of the Middle Ages, but truly immortal.®

6 The first edition appcared without place and date, but Constanti- nople about 1516, 4to.

- *See Schiller-Szinessy, Catalogue, &c., i. p. 188, notes 1 and 2.*

8 Moses Mendelssohn, for example, became one of the greatest philosophers of his day throngh studying the Aforeh.

® This book was till within the last few years known only through the translation of R. Shemuel b. Yehndah Ibn Tibbon, which has been printed numcrous times, the editio prineeps being without place or date, but somewhere in Italy (Bologna?) before 1480, There is, how- ever, also another translation from olden times in existence. It is by the famous R. Yehudah Al-Harizi, and has been edited by Schlossberg (i., London, 1851; ii. and iii., Vienna, 1874 and 1879 respectively, all in 8vo). The late 8. Munk has, however, surpassed in correctness both his predecessors in his Guide des Egarés, which contains the Arabic original with a French translation. It appeared at Paris, 1856-66, in 3 vols. 8vo.

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MAI—MAT

4, Responsa and other letters (Teshuboth Shecloth ve-Iggeroth). These do not belong exclusively to Maimonides. The first edition came out without place or date, but at Constantinople about 1520, folio.

5. Responsa (printed under the title Pecr Haddor) translated by R. Mordekhai Tammah, Amsterdam, 1765, 4to.

Ill. Works composed by Maimonides in Arabie and translated

into Hebrew by himself.

1. The commentary on the Mishnah of the whole Seder Tohoroth. Asis well known, the translation of this Seder has been hitherto regarded as anonymous. But the writer of this article has shown in the Cambridge Catalogue, ut supra, ii. p. 17, note 2, the high probability, amounting to a moral certainty, that nobody clse could have been, and that Maimonides himself must have been, the translator of this Seder, which more than any other demanded the three necessary qualifications of a good translator.

9. The letter on the sanctification of the name of God (Iggereth Hasshemad, or Maamar Kiddush Hasshen). Although the proofs

which one can adduce for the translation by the author himself of this treatise are not so telling as those in the ease just mentioned

before, the moral certainty is not less. The treatise details (1)

how much a Jew may yield, and how much he must resist, if

foreed to embrace another religion, and (2) that Mohammcdanism is not aheathenish religion. It is generally held, though not quite conclusively proved, that Maimonides wrote this treatise p70 domo sua, he and his family having been themselves forced to embracc

Mohaminedanism during the persecution by Ibn Tamurt. It

ought to be borne in mind that the Jews generally look upon Christianity and Mohammedanism as having each taken a large share in their mother's (Judaism's) inheritance, and that, whilst the former looked more for her moral, the latter coveted her doc- trinal possessions. Since morality, however, consists more in negatives than positives, and since doctrines are more openly challenged and openly avowed than morals, the Jews have always manifested less repugnance to profess, under pressure, Mohammed- anism than Christianity.

There are other works both in Hebrew and in Arabic extant by our author. These relate mostly either to ritual affairs, and consist of letters to various rabbis, and colleges of rabbis, notably in the south of France, to congregations in Ycmen and elsewhere, or to medical matters, and consist of short treatises, such as aphorisms, &c., but do not come up in interest to the great works already named. (S. M. 8.-8.)

MAINE, a province of France, was bounded on the N. by Normandy, on the W. by Brittany, on the S. by Anjou and Touraine, and on the E. by Orléanais; along with the northern part of Anjou it is now represented by the depart- ments of Sarthe and Mayenne. Together with a portion of Perche which was conterminous with it on the north- east, and the

countship of Laval on the west, it constituted a great military governinent, of which Le Mans was the capital. Before the Roman conquest Maine was held by the Aulerci Cenomani, whence probably its name. Le Mans, a great city, was connected by the conquerors by good roads with Chartres, Orleans, Vendéme, Tours, Angers, Jublains (capital of the Aulerci Diablintes, inhabiting the western portion of Maine), and Sées. Under the later Ceesars the Cenomani became almost independent, and joined the Armorican republic. Christianity was first introduced in the 3d century by St Julian, first bishop of Le Mans. Down to the time of Hugh Capet the bishops were the real rulers of the country; but in consequence of the incursions of the Northmen, who came up the Sarthe and Mayenne, the erection of strongholds became necessary, and Hugh Capet made the countship of Maine hereditary in the person of Hugh J. One of the descendants of thie latter, Count Herbert, having acknowledged the suzerainty of William, duke of Normandy, the people of Le Mans availed themselves of the absence of the Conqueror in England to rise against him, and were ultimately success- ful in gaining their freedom, Maine became united with Anjou by the marriage of its heiress with Fulk of Anjou, father of Geoffrey Plantagenet. son of Geoffrey, was born at Le Mans. On the confiscation of the estates of King John, Maine passed to Philip

Augustus of France; by Louis IX., the grandson of oe eee "=.

1 See Geiger, Moses b. Maimon, Breslau, 1850, 8vo.

Henry II. of England, the

Philip, it was handed over in 1245 to Charles, count of Provence, afterwards king of Naples; and in 1328 it was reunited to the domains of the crown by Philip of Valois, who was count of Maine. It was again separated by his grandson Louis of Anjou, the brother of King Charles V. During the Hundred Years' War, Maine was a continual battlefield ; the English were at last driven out by Dunois, who took possession of Le Mans in 1447. In 1481, on the death of Charles of Maine, the last scion of tlie house of Anjou, Maine was again united to the French crown by Louis XI. The province suffered much during the wars of religion; its strong places were

dismantled by Henry IV. and Richelieu. At the Revolution the troops of La Vendée entered Maine, and took possession of Laval, Mayenne, and Le Mans at the end of 1793; after they had been defeated by the republican forces under Marceau and Westermann, their place was taken by the Chouans ; and the pacification of the province, begun by General Hoche, was not completed until 1800. Towards the close of 1870 the second army of the Loire, retreating before the Prussians, was reformed in Maine, and in the neighbour- hood of Le Mans one of the last great struggles in the Franco-German war took place in January 1871.

MAINE

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AINE, the most north-easterly of the United States, Plate V-

lies between 43° 4’ and 47° 27’ 33” N, lat., and be- tween 66° 56’ 48” and 71° 6’ 41” W. long. It is 302 miles in extreme length and 285 in width, with a total area of 33,040 square miles (of which 29,895 square miles are land), being nearly as large as all the other New England States combined. Its figure resembles that of a moun- tain peak, broken at the top. Its S.E. base rests on the Atlantic Ocean. On the E. and N. it has the province of New Brunswick, and on the N.W. the province of Quebec, while its southern half is bounded on the W. by the State of New Hampshire.

The coast-line measured direct is about 225 miles in Coast- extent; but the numerous river mouths and indentations line. of the sea make an actual tide-water line of not less than 2500 miles. The headlands and far-stretching narrow points, together with innumerable outlying islands, give to the whole ocean front the appearance of a fringed and tasselled border. This striking feature, which gives peculiar interest in many ways to the coast of Maine, is chiefly the result of a southward glacial movement, which, coinciding with the trend of the rocks produced by a remote geologic upheaval, cut these fiord valleys far out into the sea, the prolongation of their edges being marked by islands, reefs, and scattered knobs of rock. In these deep bays and river mouths, and behind these outlying islands, are numerous harbours, convenient, safe, and capacious, and the poet is well within the truth who sings of ‘“lundred-harboured Maine.” There are no

better harbours on the Atlantic coast than those of Portland and Wis- casset. The beaches and marshes and low grassy islands common in the west are scarcely found east of the Ken- nebec river, beyond which the shore becomes more and more bold, rising in the precipitous cliffs and rounded summits of Mount Desert and Quoddy Head to a height of from 1000 to 1500 feet. The general slope of the land Drainage surface falls from an extreme elevation of 2000 feet on Slopes. the west, in the neighbourhood of the White Mountains, to 600 feet on the east. Two principal drainage slopes stretch respectively southward and northward from a watershed which crosses the State in a general easterly and westerly direction, at a distance of about 140 miles from the coast, while the northward slope has an extreme

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Moune tains.

Lakes.

Rivers.

Geology and minerals.

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breadth of about 80 miles. The general direction of the rivers, as determined by these slopes, is about south-south- east for the southern slope and nortl-north-east for the uorthern. It is a noteworthy fact that the course of the principal rivers is at right angles to the general trend of the stratified rocks, throughout the large section where these are exhibited. The surface is hilly and rolling rather than mountainous. The Appalachian range, which be- comes so promivent in the White Mountain group just westward of the State, seems to have broken its force there and to have strewn only a few scattered mountain masses across mniddle Maine and into New Brunswick. These all have a peculiar aspect, rising in conical peaks, heavily wooded at the base and bare at the summit. The most noteworthy is Mount Katahdin, with a height of 5385 feet (a little less than

Mount Washington), and in its isolation and crater-like formation the most remarkable mountain in New England.

The lakes of Maine, situated for the most part among thesemountain regions, are among its characteristic and most attractive features. They number more than 1570, with an aggregate area of 2300 square miles, about one-fiftecnth part of the entire area of the State. The largest is Moosehead Lake, 35 miles long by 10 miles wide; but many others of less size are more picturesque. 'Their height above the sea-level is noticeable. Rangely Lake, at the head of the Androscoggin river, is 1511 feet high, this altitude being very nearly that of Lake Itasca at the head of the Mississippi; Moosehead, on the Kennebce waters, is 1023 feet in height, or nearly two-thirds as high again as Lake Superior at the source of the St Lawrence ; Chamberlain Lake, on the headwaters of the St John, 926 feet, and Chesuncook, on the Penobscot, 900 feet high, are 400 or 500 feet above the level of Lake Winnepesaukee in New Hampshire. Most of the lakes of Maine lie within regions as yet unsettled, where nature's wild luxuriance and grandeur are still undisturbed by man. Few similarly habitable regions possess lakes in such numbers and of sucli size, variety of situation, and beauty of aspect and surroundings. They are, moreover, nearly all connected with the river systems of the State, and con- stitute vast reservoirs for evaporation, irrigation, and mechanical power.

All the principal rivers rise at great elevations—the Saco at an altitude of 1890 feet, the Androscoggin 3000, the Kennebec 2000, the Penobscot 2500, the St Johu 1980. The general drainage areas, however, fall off in height and increase in breadth in preportion as their location is easterly. The principal features of the water systems of Maine are the great amount of fall, the control of steady volume by the storage capacity of the lakes, and the situation of the best falls in the lower sections of the rivers where the volume is largest, and in many instances at the head of tide-waters where vessels may come to thcir very feet. The water- power of the State available for industrial purposes has been estimated by Walter Wells, in his valuable report on that subject, to amount to 1,229,200,000,000 cubic feet, with gross power of 4427 horse for each foot of fall, making a total of 2,656,200 horse-power.

The important geological features are connected with the highly crystalline metamorphic condition of the strata, which rarely lie in horizontal position, but are upturned, bent, folded, and fractured. Fossiliferous rocks occur only in limited localities in the interior. In various places veins of silver-bearing galena and of copper are exposed. Granite of every variety and quality abounds in veins and in eruptive masses. The western portion of the State is largely granitic in its features, and a belt of the same rocks extends along the entire sea-coast. There are also beautiful varieties of syenite. In many places the granite

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is very coarse, so that the constituents can be separated, and each utilized for industrial purposes. The felspar, quartz, and mica often lie in large contiguous veins. Valuable beds of crystalline limestone are found in many places along the coast, and in the Aroostook region. Argillaccous slates as well as limestone occur in the interior and in the north. On the Piscataquis, a tributary of the Penobscot, the slate is suitable for writing-slates and pencils, blackboards, and tables, while large quantities of roofing slate are found throughout the whole region between the Kennebec and Penobscot. There are also some beds of marble well suited for building purposes. Some surface iron is found, especially in one locality in the interior known as the Katahdin iron-works, where the iron is remarkably pure owing to its freedom from sulphur and phosphorus. A bed of hematite is found in Aroostook county.

The soil is mostly of glacial origin, derived largely from boulders and a mixture of rocks transported from various aud often distant localities. This drift is spread every- where over the surface. Along the lake-beds and rivers are some alluvial soils and old flood-planes. Deposits of Quaternary marie clays occur along the south border, rising to the height of 200 feet above the sea. These clays were deposited during the Champlain epoch, at a time when the temperature of the water was much lower than at present, as is indicated by the fossil remains which abound in them. In the lower strata these remains of life are of the same specics as are now found living in the Arctic seas. Skeletons of the walrus have been found in Portland and elsewhere. In the upper strata the remains of life indicate the same specics

as now exist on the coast. Isolated forms of life not elsewhere found north of Massa- chusetts occur in the north part of Quohatig Bay (north- east of Casco Bay), composed of various species which seem to be a remnant of former life on this coast.

In general it may be said that animal life in this State Zoology.

shows a mixture of northern and southern forms, and but little that is peculiaras compared with surrounding regions. The moose, caribou, and deer still roam in the vast forests in the north. The bear, wolf, catamount, wolverene, wild cat, fox, beaver, raccoon, marten, sable, woodchuck, rabbit, and squirrel keep at a due distance from man, and so still exist. Scals are found in many of the bays. Wild geese and ducks and other sea fowl frequent the lakes and bays in the migratory season, and eagles, ospreys, gulls, hawks, kingfishers, owls, plover, woodcock, partridges, pigeons, quails, blackbirds, robins, orioles, bobolinks, blue birds, swallows and sparrows in all variety, yellow birds, and humming birds arecommon. The inland waters teem with fish of various kinds—pickerel, togue, and bream, and, chief of all, the trout, whose beauty and size attract num- bers of sportsmen ; while in the rivers the sturgeon, bass, and salmon are still plentiful. Game laws protect several species of the fish, birds, and other animals. Along the coast the clam, mussel, and lobster are abundant, and in some places the horse-shoe crab is found. Of shore-fish the cunner, flounder, rock-cod, and seulpin are most com- nion, while off shore cod, haddock, hake, herring, pollack, menhaden, porgy, and mackerel abound. The black fish and porpoise are not uncommon. Gigantic cuttle-fishes, measuring 40 feet and upwards in the long tentacles, and thus not inaptly termed sea-serpents, have sometimes been seen in these waters.

The forests of Maine consist chiefly of pine, spruce, Forests.

MALWN E

hemlock, and fir, although some oak is found along the coast, and other hard wood growth in the highlands of the Aroostook, The white cedar is common, especially in the low lands in the east and north-east. The hackmatack or black larch appears in the same localities. White and red oak, rock (or sugar) maple, white maple, white and yellow birch, white and

brown ash, beech, cherry, basswood (linden), and poplar are the common deciduous trees. Chestnut and walnut are rare, and are found only near the south-west border. The majestic mast pine—the heraldic emblem of Maine, which has given it the sobriquet the "Pine Tree State"'—is fast receding before the demands

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marriage, with other prescribed duties; and municipal and police judges. Each county elects judges of probate and insolvency, and registers of the same, a county attorney, clerk of court, sheriff, and county commissioners.

The enrolled militia numbers 97,320. The present system keeps Militia. up an élite corps consisting of two regiments of volunteer infantry an one battery of light artillery, with two regiments of reserve infantry. Much pains is taken in the discipline and character of this small corps, and membership in it is regarded as honourable. The entire State militia is by existing orders constituted into one division under the command of a major-general, who is elected by concurrent ballot of the two houses of the legislature.

Various reformatory, sanitary, and benevolent institutions are Reforma- supported wholly or in part by the Statc. The State prison, with tory and an average of one hundred and forty-six convicts, is managed on benevo-

Fruits. of commerce. Of fruit trees the chief is the apple. The | the ' hard labour" and the "silent" system, at an annual expense Jent plum, cherry, and pear are also natural. The peach thrives | of $30,000, which in some years is cancelled by the proceeds of the institu- only in the south-west border. Species of grape, gooseberry, eon ie nee in carriage and harness making. tions, : : qd aeeeeatt ult cated with e hospital for the insane is an extensive establishment, with and currant are native, and othe upwards of four hundred inmates and an increasing demand advantage. The blackberry, raspberry, and strawberry | for more accommodation. The annual appropriation for State grow wild in profusion throughout the State. beneficiaries here is $40,000. An annual appropriation ($14,000)

Gite. 'The climate of Maine, while on the whole cooler than | # made for the elution of the dest end dumb and the blind might be expected from its mean

latitude of 45° N., | institutions out of the State. P cannot be considered severe or unfavourable to health. The remnants of two tribes of Indians still exist in Maine, with Indians. The summer heats are tempered by the sea and the cool | which the State is in public relations, the Penobscots, numbering north winds. The winter cold has a constancy which about six hundred, and the Passamaquoddies, numbering five hun-

es it 1 aie feleathan the chanci ; dred. The former have their chief gathering place on the islands maxes 1t tess Severely felt than the changmg temperature | in the Penobscot river, and the lattcr on the shores of Passama- of more southern places. The air is also more dry and quoddy Bay and the St Croix river, Though classed usually as pure owing to the snow surface. The average winter | civilized, they are still virtually in tribal relations. Their status is temperature is about 20°, and remains pretty steadily below | dtenmied by a eras of tentce from oxy tines, which re A : : — eh aden. the freezing-point throughout the State for at least three The public policy which has culminated in the well-known pro- Maine months. By reason of the tides and the prevailing off-shore | nipitory «« Maine Law" began with the 'Act to restrict the sale of liquor winds, which break up and drive off the ice, many of the intoxicating liquors," passed in Angust 1846. This was followed law. harbours are unobstructed the winter through. The a ie by eo bia te ee Ps ee Par a i ait . ippling shops," and by thirty-nine other statutcs directed agains summers are short, giving something less than five months liquor selling, "drunkenness, and the habit of drinking in the com- between frosts, even in the southern portion, but the heat munity. The manufacture for sale of any intoxicating liquors, sometimes rises for a few days to 100° Fahr. The average | except cider, is forbidden. The sale of such liquor by the manu- summer heat is 62°°5 Fahr. The lakes and forests of | facturer_is punished by imprisonment for two months and a fine of j A i as antiti ~ : Maine attract great numbers of summer tourists ac the | 10%, {yaatutrtsl cdr in quate of 6 gallo an upward sea-coast 18 fast becoming lined with the cottages of sum- liquors, including wine, ale, porter, strong beer, lager beer, and all mer residents from all parts of the country. other malt liquors, also cider for tippling purposes, on a penalty for

Health. 'The soil is well-drained, and the surface swept by sea | & first offence of $30 and costs, or imprisonment for thirty days;

*Mfeercs and winds from ihe Tense) andl Ait *, al for a second offence $20 and costs and imprisonment for thirty*

: ‘ eee ae a WABMnS OL Une days ; third offence $20 and costs and imprisonment for ninety

north-west, which tend to banish malarious disease. The | days.’ A common seller on conviction is punished for a first offence

co ; a J ane !

principal form of disease is phthisis or disease of the | by fine of $100 and costs, or imprisonment for three months ; for a respiratory organs, the ratio of deaths therefrom being a | second and rage aes offences le see costs, = fas Geil . . . + iniprisonment. person convicted of keeping a drinking house or little over 27 et sent. of the enue mortality. This has tippling shop is punished by fine of $100 and costs, or imprisonment been called the “scourge of New England 3 but in Old | for three months, for a first offence, and the same with six months’ England the death-rate from this class of diseases is only | additional imprisonment for every subsequent conviction. Any one a fraction less—26°6 per cent. injured in person, property, neans of support, or otherwise by an a. ‘ ; intoxicated person may bring an action for damages against the

Adminis» Theold United States district court for Maine, constituted in | person who sold the liquor ; and the owncr or lessee of the building

tration. 1779, remains ; and Maine, New Hampshire, Massachusetts, aud | where it was sold is jointly liable if cognizant of snch use. Any

Rhode Island constitute the first district of the United States circuit court. The officers of these courts are a judge, district attorney, narshal, clerk, and reporter. Mainc is also a district for the col- lection of United States internal revenue. There are seven United States forts in Maine, only one of which, Fort Preble, Portland, is fully garrisoned ; and the United States navy yard, often called Portsmonth navy yard, is in Kittery, Maine.

_ Maine has two senators and four representatives in Congress, and 81x votes in the electoral college for choosing the president. The government of Mainc rests on a constitution adopted in 1820, which closely resembles that of the other New England States. It is most liberal in respect to suffrage, every male citizen twenty-one years of age and upwards resident in the State for three months, except paupers, persons under guardianship, and Indians not taxed, being allowed to vote. The governor and legislature are chosen every two years, and the legislative sessions are also bicnnial. A council chosen by the legislature on joint ballot advises and assists the governor in the appointment of State officers, management of State Institutions and lands, granting pardons, and other duties with which they may be charged by the legislature. The jndiciary consists of a supreme court of eight members at a salary of $3000, with a reporter of decisions, appointed by the governor and council for seven years ; the superior courts for Cumberland and Kennebec counties, whose judges are appointed in the same way ; as also trial justices for the several counties with jurisdiction in minor cases ; Justices of the peace for the county, who are authorized to solemnize

*person convicted of being intoxicated in the streets or in any house, or of disturbing the public peacc or that of his own or any family, is punished by a fine of $10, or thirty days' imprisonment, and for the second offence $20 or ninety days. Al] intoxicating liquors kept for sale and the vessels containing them are contraband, and forfeited to the towns where seized, and are there to be destroyed. 'To pro- vide for the necessary sale of such liquors a State commissioner is appointed by the governor and council to furnish to the municipal officers of towns pure, unadulterated intoxicating liquors to be sold for medicinal, mechanical, and manufacturing purposes. He is put under $10,000 bond, and is allowed*7 per cent. commission on his sales. Municipal officers may purchase what they deem necessary of such liquors, and appoint an agent to sell them for such purposes as have been named, and no other. This agent is forbidden to sell toany minor, soldier, Indian, or intoxicated person, or to any person of whose intemperate habits he has been notified by such person's relations or by the municipal officers. It is made the special duty of sheriffs and county attorneys to enforce the provisions of the laws relating to the sale of intoxicating liquors.*

The history of this legislation is that of laws generally which are enacted rather from the high moral ends which they propose than froni the sincere and settled judgment of the legislators, and which do not represent the average moral scutiment actually prevailing among the people in whose name they are enacted and are to be enforced. Jt was inevitable that towards an issue like this political parties should take an attitude not always sincere. The Maine law

Popula- tion.

Divorces.

Dimin- ished birth- rate.

Church statis- tics.

Educa- tion. +

has not eutirely suppressed drunkenness, or even liquor selling, but it has had a decided influence in that direction. It has also tended to make drinking disgraceful, and has removed much temptation from young men. 'The people would be reluctant to abolish it until they could see something better to put in its place. :

The population of Maine has not increased at an equal ratio with the other States of the Union, as will be observed from the subjoined table. 'There is a constant emigration from the State of native-born people to other parts of the country, which is only about half made up for by immigration from the adjoining pro- vinees and the Old World.

Census Total. Males. Females. Years.

Density per sq. mile.

96,540 49,432 47,108 3:2 151,719 77,250 74,469 5 228,705 116,118 112,587 77

298,335 149,664 148,671 9°9

399,462 201,232 198,230 1344

501,793 253,709 248,084 16°8 583,169 297,471 285,698 19°5 628,279 317,189 311,090 21°0 626,915 313,103 313,812 20°9 648,986 324,058 324,878 21°6

In 1880 the number of native-born was 590,053, and of foreign- born 58,883.

The following cities had in 1880 a population of 5000 and up- wards :—Portland, Lewiston, Bangor, Biddeford, Auburn, Augusta, Bath, Rockland, Saco, Calais, Brunswick, Belfast, Ellsworth.

Divorces in Maine reach the highest ratio to the marriages, or to the population, of any State of which statistics are reported. The privilege of a jury trial favours the plaintiffs, and it 1s not easy to find a jury who will withhold a verdict for divorce.

The birth-rate of the native or oldest and typical families of Maine has greatly fallen off, and the number of children of school age is diminishing, not only proportionately to the population but in positive numbers, the diminution for the last cleven years being

14,200.

The latest reports as to the religious societies of Maine show that there are 242 Congregationalist churches, with a membership of 21,340 ; 261 Baptist churches, membership 20,954 ; Methodist 228, membership 20,774 ; Freewill Baptist 286, and membership 15, 822; Christian 60, membership 6000; Universalist 41, membership 4500; Unitarian 21, membership (estimated) 2500; Episcopal 32, membership 2115; New Jerusalem 5, membership 341; others 9500 ;—total Protestant membership 103,846. There are 42 Roman Catholic churches, with a membership of 40,000. The tendency seems to be toa decrease of the Congregationalists, and a corresponding increase of the Free Baptists and Methodists.

Common school education in the State is widespread. In the number of citizens able to read and write it stands in the very front rauk of States. Instruction in the public schools is not under ecclesiastical control, and is free to all between the ages of four and twenty-one, and compulsory upon all between the ages of nine and fifteen years for twelve weeks each year. Every city and town is required to raise and expend annually for schools not less than 80 cents for each inhabitant. The State meets this on its part by distributing, in proportion to the number of children of school age in each town, the income of a permanent school fund ($44,275,791), and by a State tax of 1 mill per dollar‘of valuation on the property in the State, and a tax of one per cent. on the average annual deposits in savings banks. The average cost of supporting the public schools is $1,240,000 a year. In the larger towns the schools arc graded into primary, intermediate, and grammar schools. A system of free high schools was cstablished in 1878, for which the State contributes a sum equal to that paid by the town, not exceeding $250. “he whole sum appropriated in 1881 was $26,000. There are three normal schools, intended for the training of teachers in the common schools. For these tuition is free, and the annual appropriation required is $19,000. The State college of agriculture and mechanic arts may in some respects be considered the culmination of the public school system. A large farm and various workshops are here provided, and every facility afforded at the least possible expense for a good education, chiefly directed to the industrial arts, but still liberal in scope. There are three colleges, with the usual course of study leading to the degrees of bachelor and master of arts :—Bowdoin, founded by the old State of Massachusetts in 1794, and since liberally endowed by private benefactions, from which Hawthorne and Longfellow graduated ; Colby University, founded as Waterville College in 1820, and under the control of the Baptist denomination ; and Bates College, founded in 1863, in the interest of the Free Baptist denomination, with a fitting school and a theological seminary attached. The theological seminary at Bangor, under the care of the Congregationalists, is open to all denominations, and attracts many students from the adjacent provinces of Canada. The medical department of Bowdoin College is known as the medical school of Maine. It has an annual attendance of more than 100. and has graduated 1300. There are

oats, 2,265,575 bushels ; maize, 960,633 bushels; wheat, 665,714

various societies which are of a nature to afford instruction. The Maine Historical Society is making interesting investigations, and preserving nemorials and records of historical matters, and its pub- lications are of much value.

The bonded debt of the State is $5,801,900, which matures on Public or before 1889. Deducting the sinking fund of $1,436,367, the debt, actual balance of indebtedness is now (1882) $4,365,533. The local and municipal debt for all purposes, including aid to railroads, is $17,722,109.

The total settled area of Maine is 17,900 square miles, of which 6000 have a population of 2 to 6 to the square mile, 3500 have 6 to 18, 5600 have 18 to 45, and 2800 have 43 to 90. Agriculture Agricul- is still the most extensive occupation, engaging 83,000 of the people. ture, There are 64,310 farms, with 1,864,136 acres of tillage. Of these 61,530 farms are occupied by their owners ; 24,640 contain over 100 acres each, and nearly as many have between 50and 100 acres. The chief farm products are annually :— potatoes, 8,000,000 bushels; hay, 1,200,000 tons; butter, 14,103,960 tb; cheese, 1,167,770 Ib ;

bushels ; buckwheat, 382,701 bushels; barley, 242,185 bushels ; rye, 26,398 bushels; wool, 2,776,404 tb; milk sold, 3,720,783 gallons.

The remaining unsettled area is mostly unbroken forest. At Forest present this region only furnishes material for lumbering. The pine tracts, has been cut back to the headwaters of the rivers, and the chief material is spruce and hemlock, with some cedar. The principal shipping port is Bangor on the Penobscot, where the amount sur- veyed has been 200,000,000 feet a year.

In fisheries the State stands second in the Union. There are Fisheries, 12,662 persons directly employed in fisheries, but it is estimated that 48,000 people are dependent chiefly on this business. The sea fish taken are cod, hake, haddock, pollack, herring, mackerel, and holibut. The amount taken is 206,778,693 Ib annually. There are establishments for preparing oil from the menhaden, &c., where 168,732 gallons a year are produced. The canning of fish is a considerable industry ; and in the lobster canning business this State has a monopoly. The catch in 1879 was for Maine 14,234,182 tb, and that bought of British fishermen 10,588,578 Ib.

In the home establishments 1,830,200 cans were put up, and in | those worked in the British Provinces on account of Maine | owners 2,198,024 cans. A recent but rapidly growing interest is | that of sardine canning, chiefly carried on at Eastport. In 1880

there were 1328 persons employed in this industry, with an annual | product of 7,550,868 cans and 8365 barrels. The river fish chiefly | taken are salmon, shad, alewives, and smelts. Much interest is

taken in restocking the lower rivers, especially with salmon, shad,

and bass. The Penobscot is the only river on the Atlantic coast of | the United States from which a supply of sea salmon eggs can be obtained for propagation. An association of the United States with the States of Maine, New Hampshire, Massachusetts, and Con- necticut appoints agents for procuring these eggs, which are distributed in proportion to the respective contribution of funds. The great hatchery is at Orland, where also there is one for the eggs of the land-locked salmon ; there is another at Grand Lake Stream, owned by the same association. The black bass and ale- wives have also been distributed in the lower ponds and streams.

The other native products are lime, quarried stone,—both for Other in-

building and for monumental purposes—slate, iron, and copper. dustries. Ice is cut and shipped to various parts of the world, to the amount annually of 350,000 tons, and the value, when ready for transporta- tion, of $600,000. Maine was long distinguished for her ship- building ; and, though of late years this industry has greatly fallen off, yet in the building of wooden ships the State probably holds her old rank. The shipping owned in Mainc is mostly engaged in foreign commerce, or in coasting to and from distant States. There are 12,000 sailors in this service. There are 1022 miles of railroad in Maine. Of manufactories there are 24 cotton-mills, running 696,564 spindles, and employing 11,844 persons, of whom 7010 are women; and 97 woollen-mills of all kinds, employing 3265 persons, of whom 1160 are women. The other chief indus- tries are flouring mills, leather tanneries, boot and shoe making, paper making, and iron working of various kinds.

The shores of what is now sometimes called the Gulf of Maine, History. whose waters stretch between Cape Sable and Cape Cod, attracted much attention from the early voyagers and explorers, as many glowing accounts remain to testify. The Cabots, under English auspices, visited this region in 1497; Verrazano, representing the French, in 1524; Gomez in the name of Spain in 1525, giving his name to Penobscot river and bay. In 1526 the Frenchman Thevet followed ; he states that before that time the Frencl had a fort 30 miles up the river, named Norumbega. The enterprise of Sir Walter Raleigh and Sir Humphrey Gilbert first reveals a purpose on the part of Englishmen to colonize these shores. Gosnold (1602),

Pring (1603) , and Weymouth (1605) had made some explorations, but a ceutury had passed and no European power had gained a foot- hold on the Atlantic coast north of Florida. But in 1603 Henry IV. of France granted a charter to De Monts, a Protestant gentle-

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inan of his household, of all North America between 40° and 46° N. lat. In 1604 De Monts established a settlement on what is now Neutral Island, in the St Croix river. In 1605 James I. of Eng- land granted to some English gentlemen all the territory between 34° and 45° N. lat. The portion between 40° and 45° was thus the subject of a double grant, to parties naturally antagonistic. The latter parallel, striking nearly at the mouth of the St Croix, includes almost all the southern half of Maine, and brought what was practically at that time the whole of Maine to be the theatre of the disputed jurisdiction. The French did not indeed claim further west than the Kennebec river, the limit of their actual occupation ; but the English endeavoured by sporadic and violent sallies to hold, if not by oecupation at least by desolation, to the St Croix river, the extreme north-east boundary of their claim. The Indians, already exasperated by the wrongs received from roving English shipmasters and traders, were easily persuaded to make alliance with the French, and this double frontier was a scene of strife for the space of one hundred years. The English with much earnestness of purpose proceeded to plant acolony in 1607, undcr the guidance of George Popham, brother of the chief-justice of England, and Captain Gilbert Raleigh, whose name indicates his lineage and spirit. This colony they

planted with solemn ceremonies on a point at the mouth of the Kennebec. The little town rose rapidly, with its fort and its church in due order, They also built a vessel, the " Virginia of Sagadahock," the first vessel built by Europeans in America. The colony grew discouraged by their winter experi- ences, and the next year broke up, most of the colonists returning to England. It appears, however, that they did not utterly forsake their object, for scattered settlements still remained and increased about the Point and Bay of Pemaquid and the island of Monhegan, inidway between the Kennebec and Penobscot. This region became a centre of trade and a base of operations, being the headquarters of the famous Captain John Smith, where he built a fleet of boats in 1614, and explored the adjacent coast, which he named New England. In 1620 a new impulse found expression in the great charter of New England, given to Sir Ferdinando Gorges and others, who proceeded to lay out their plans on a large scale. Two years afterwards a patent under this charter conveyed to Gorges and Captain John Mason the country between the Merrimac and Kennebec and 60 miles inland, which they proposed to call the province of Maine. In 1629 they divided their possession, Gorges taking the portion between the Piscataqua and the Kennebec.

The great council of New England surrendered their charter in 1635, and in the division of its territory Gorges retained his portion previously granted, while the region between the Kennebec and the St Croix and the St Lawrence rivers, though still claimed by the French as part of Acadia, was given to Sir William Alexander, carl of Stirling, and this was to be called the county of Canada. Gorges named his tract the county of New Somersetshire, and im- mediately commenced the administration of government, setting up a court at Saco (1636) under direction of his kinsman, William Gorges. In 1639 he obtained from Charles I. a new and extra- ordinary charter, confirming to him his province of Maine under that name, and under the feudal tenure of a county palatine, Gorges, as lord palatine, being invested with vice-regal powers. In 1641 he established a capital and court at Georgiana (now York), the first chartered city in America. But it was no easy task to administer government or hold a jurisdiction in his palatinate. The great council of New England, before breaking up, had granted not less than nine patents, conveying territory already ineluded in Gorges's thrice-granted jurisdiction, to various parties,

who had imade vigorous beginnings to improve their holdings and confirin their claims. In like manner the council had made two important grants within the jurisdiction of Sir William Alexander, so that difficulties arose in that quarter also. In this confusion of juris- diction Massachusetts, under a new construction of the extent of her chartered rights, laid claiin to a line which included nearly all the settled portion of Gorges's territory, and by a farther exten- sion she claimed the coast as far east as Penobscot Bay. This latter she named the county of Devonshire, and set up a court at Pemaquid (1674). This latter territory had been conveyed by the earl of Stirling to the duke of York, afterwards James II. of England, This was organized by James as the county of Cornwall, and was afterwards represented in the general assembly in New York (1683). In 1677, however, the claim of Massachusetts in Maine being contested and decided adversely to her, she took the occasion to buy of the heirs of Sir Ferdinand Gorges all his right, title, and interest in Maine for £1250. Matters were still more complicated by the persistent efforts of the Dutch to gain possession of the east coast, who had now (1676) effected a lodgment on the shores of Penobscot Bay ; but they were finally driven off. The troubled state of things in England prevented Massachusetts from profiting very much by her purchase in Maine, and at last the new charter of William and Mary (1691) merged all the provinces of Plymouth, Massachusetts, Maine, Sagadahock, and Acadia under one title and jurisdiction, "the province of Massachusetts Bay."

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That part of Acadia cast of the St Croix was five years afterwards ceded back to the Crown. 'Thus Maine, with the St Croix for its castern boundary, became an integral part of the Province, afterwards the State, of Massachusetts Bay. From that time for over one hundred years the history of Maine is merged in that of Massachusetts. Although its people were not of the religious or political faith of the Puritan colony, and for that reason had been shut out of the famous New England confederacy of 1648, yet they were true Englishmen, and stood manfully for the common cause. Not only was Maine an exposed frontier and battleground, during the long struggle of the English against the Indians and the French, but its citizens bore a conspicuous part in the expeditions beyond its borders. Two of these werc commanded and largely manned by men of Maine. Port Royal was taken by

Sir William Phipps and Louisburg by Sir William Pepperell. In fact these expeditions were sucli a drain on Maine population that Massachusetts was called upon to send men to garrison the little forts that protected the homes left defenceless by tlhe men who had gone to the front. The great losses and destruction of these wars kept this portion of the province back frum its natural increase.

Iu the stand made for the rights of Englishmen, which led to revolution and independence, Maine was behind none. Two years before the battles of Lexington and Concord its towns had offered themselves "as a sacrifice if need be to the glorious cause of liberty."' Some, it is true, were deep-rooted in sympathy with the mother country, and these retired eastward, first beyond the Penobscot and afterwards beyond the St Croix. This war made Maine again an outpost and frontier. That same picturesque and commanding promontory of Castine in Penobscot Bay, which had been once the most eastern post held by the Pilgrims of Plymouth and afterwards the western advaneed post of the French in Acadia, was now the stronghold of the English in this region, as against the Americans, larly in the war (1775) the chief town, Falmouth (now Portland), was bombarded and nearly destroyed. Soime patriots the same year attacked a king's ship off Machias, and after a desperate struggle the British flag was struck to Americans for the first time on sca or land. Maine was fully and honourably represented in the war by a division of the Massachusetts line. It had also representatives in Congress, aud some eminent officers and patriots of the Revolution resided within its borders. In fact, to all intents and purposes execpt in naine, Maine was one of the original States of the Union.

At the elose of the war, the old spirit of independent personality and self-government made a forcible expression. The people songht to be separated from Massachusetts, and to make their laws and their history in theirown name. There were two parties, however, and the troubles which agitated the whole country at that time, postponed action on this issue, and Maine continued almost forty years longer an integral part of Massachusetts, but was at no time a dependent province of that State. At the conclusion of peace there was a large immigration into Maine, chiefly of soldiers of the Revolution, who strengthened the already vigorous character of the people. Everything prospered until the Embargo Act of 1808, cutting off commerce

and the coast trade, struck Maine in a vital point. Its shipping at this time amounted to 150,000 tons, its exports to a million dollars a year. The war with England, which soon followed, almost destroyed these interests. Other industries, however, were stimulated. Manufactories of woollen, cotton, glass, of iron and other metals were set on foot, only to be ruined by the influx of British goods, which followed the new peace. It was a discouraging time, and one or two unusually severe winters threat- ened the only industries which the war and peace had spared, while in 1815-16 not less than 15,000 people emigrated to Ohio, In 1820 Maine was recognized as a separate State of the Union. Its population was then about 300,000, and its chief industries, agri- culture, lumbering, and shipbuilding, were in prosperous course. Its encouragement of manufactures was slow. A prejudice against great corporations long kept Maine from entering largely at the auspicious time into those industrial enterprises which have built up neighbouring States. It is only within recent years that the State has begun to take proper advantage of its unsurpassed facilities for manufacturing. The difficulties about the north- eastern boundary had increased with each year since the treaty in 1783. Great Britain had gradually obtained possession of consider- able territory within the line claimed by the States under the treaty, and after the war of 1812 laid claim to territory which had long been under the actual jurisdiction of Massachusetts. The question assumed national and international importance. The Government of the United States, apparently desirous of gratifying Great Britain, offered Maine 1,200,000 acres of land in Michigan. to yield its claim, but the proposition only roused indignant pro- test in the State, which culminated in the sending of a military force to defend its territory. Finally, however, considerations of national policy urged at Washington induced Maine to acquiesce in a treaty, which took away a large area additional to that already silently yiclded, amounting in all to 5500 square miles,—an area greater by 600 square miles than the State of Connecticut, and by

1680 square miles than the States of Rhode Island and Dclaware combined.

In the war against secession the service of the State was prompt and efficient. Maine sent to the front 72,000 men, of whom not less than 20,000

gave their lives for the cause. These volunteers were distributed in thirty-two regiments of infantry, two regiments of cavalry, one regiment of artillery, one battalion of sharpshooters, and 6764 enlistments in the navy. The whole amount of State and municipal debt incurred in raising and equipping these troops was about $12,000,000. The United States afterwards reimbursed the State to the amount of $668,284, most of which was applied to form a sinking fund for extinguishing the war debt at maturity. The State also provided pensions for its disabled soldiers and their families. (diy ey, Ca),

MAINE DE BIRAN, FRrancots-PIERRE-GoNTHIER (1766-1824), a distinguished philosopher of France, the son of a physician, was born at Bergerac November 29, 1766. After studying with distinction under the doctrin- atres of Perigueux, he entered the life-guards of Louis XVI, and was present at Versailles on the notable 5th and 6th of October 1789. On the breaking up of the garde du corps, Maine de Biran retired to his patrimonial inheritance of Grateloup, near Bergerac, where his sequestered residence and limited income preserved him from the horrors of the Revolution. It was at this period that, as he says himself, he " passed per saltwm from frivolity to philosophy." The forced leisure of this fearful time decided the vocation of his life. He combined, ina more than ordinary degree, subtle sensitiveness to external influences with singular acuteness in surveying and analysing internal phenomena. The modes of the mind and their organic causes or condi- tions were alike submitted to his scrutiny. He began his philosophical studies with psychology, and he made psycho- logy the study of his life. When the Reign of Terror was succeeded by calmer days, Maine de Biran was called to take part in the administrative and political affairs of his country. After his exclusion from the council of the Five Hundred on being suspected of royalism, he took part with his friend Lainé in the commission of 18138, which gave expression for the first time to direct opposition to the will of the emperor. After the Restoration he held the office of treasurer to the chamber of deputies, and habitually retired during the autumn recess to his native district to pursue his favourite study. He died 16th July 1824.

Maine de Biran's philosophical reputation has suffered from two causes—the obsoure, laboured quality of his style, and the un- fortunate mode of

publication of his writings. In all his work there is evidence of thorough originality of thinking, but in the expression of his thoughts this very originality is so far a disad- vantage in that it imposes on him a mode of exposition little calculated to attract and retain the attention of a reader. During his life, moreover, but few, and these the least characteristic of his works, were formally published. An essay on habit (Sur ?'Influence de l Habitude, 1803), a critical review of Laromiguiére's lectures (1817), and the philosophical portion of the article Leibnitz in the Biographie Universelle (1819) appcared during his lifetime. A long memoir on the analysis of thought (Sur la Déeomposition de la Pensée), crowned by the Institute in 1805, was sent to press, but, for some reason, was not finally printed. His manuscripts, very large in quantity, were not made accessible in their entirety to Cousin when that writer desired to prepare a collective edition of De Biran's works. In 1834 the writings above enumer- ated, together with the important essay entitled Mowvelles con- siderations sur les rapports du physique ct du moral de Vhomme, were published by Cousin, and in 1841 there were added three voluines by the same editor, under the title Quvres philosophiques de Maine de Btran. The manuscripts from which Cousin had prepared this edition were, however, in a most imperfect condition, and it was known that some memoirs to which De Biran attached the greatest importance were still in obscurity. In 1845 a large mass of manuscript was placed by De Biran's son in the hands of F, M. E. Naville. The labour of preparing these for publication, interrupted by the death of Naville in 1846, was continued by his son, E. Navillc, and completed, with the aid of M. Debrit, in 1859. The CEuercs inédites de M. de Biran, 3 vols., rendered it possible for the first time to obtain a conneeted view of a very remarkable monument of philosophieal development. In these volumes the most important work is that entitled Zssai sur les fondements de la psychologie ct sur ses rapports avee étude de

la nature, whieh represents the completest stage of De Biran's thinking. A later stage is represented by the fragments of a projected work entitled Nouveaux Essais d' Anthropologie, in which the psychology of the earlier treatise is developed in the direction of a somewhat mystical metaphysic.

De Biran's first essays in philosophy were written avowedly from the point of view of Locke and Condillac, but even in them he was brought to signalize the essential fact on which his later speculation turns. Dealing with the formation of habits, he is compelled to note that passive impressions, however transformed, do not furnish a complete or adequate explanation. With Laromiguiére he dis- tinguishes attention as an active effort, of no less importance than the passive receptivity of sense, and with Butler distinguishes passively formed customs from active habits. Prolonged medita- tion, evidenced in the occasional writings, prize essays, and the like of the subsequent years, brought him to the far-reaching conclusion that Condillac's notion of passive receptivity as the one source of conscious experience was not only an error in fact but an error of metlod,—in short, that the mechanical mode of viewing conscious- ness as formed by external influence was fallacious and deceptive. For it he proposed to substitute the genetic method, whereby human conscious experience might be exhibited as growing or developing from its essential basis in connexion with external conditions. The essential basis he finds in the real consciousness of self as an active striving power, and the stages of its development, correspond- ing to what one may call the relative importance of the external conditions and the reflective clearness of self-consciousness, he designates as the affective, the perceptive, and the refleetive. These stages are characterized with much skill and psyehological acuteness, and in connexion therewith De Biran treats most of the obscure problems which arise in dealing with conseious experience, such as the mode by which the organism is cognized, the mode by which the organism is distinguished from extra-organie things, aud the nature of those general ideas by which the relations of things are known to us—cause, power, force, &c. His views are always suggestive, and the best recent psychology in France is but a reproduction of some of them.

In the latest stage of his speculation De Biran distinguishes the animal existence from the human, under which the three forms above noted are classed, and both from the life of the spirit, in which human thought is brought into relation with the supersensible, divine system of things. This stage, as above said, is left imperfect. Altogether De Biran's work presents a very remarkable specimen of deep metaphysical thinking directed by preference to the psychological aspeet of experience. It is almost a solitary

instance of an eflort to treat psychology in a wide and philosophical manner.

The Guvres inédites of De Biran by Naville contain an intro- ductory study. Special monographs on him are—Merten, Htude critique sur Maine de Biran, 1865; KH. Naville, Alaine de Biran, sa vie et ses pensées, 21 ed., 1874; Gerard, Afaine de Biran, essai sur sa philosophic, 1876.

MAINE-ET-LOIRE, a western department of France, lying between 47° and 47° 50’ N. lat., and between 15’ HK. and 1° 20′ W. long., consists of the southern portion of the former province of Anjou, and is bounded on the N. by the departments of Mayenne and Sarthe, on the E. by Indre-et-Loire, on the 8. by Deux-Sévres and Vendée, on the W. by Loire-inférienre, and on the N.W. by Ille-et- Vilaine. The extreme length from north-east to south- west is about 78 miles; the breadth from north to south ranges from 25 to 50 miles, and the area is 2750 square miles. The capital, Angers, lies 162 miles south-west from Paris. The department is made up of two distinct regions, the line of demarcation running from south-east to north-west, and passing through Angers; that to the south consists of granites, felspars, and a continuation of the geological formations of Brittany and Vendée; to the north, on the contrary, schists, limestone, and chalk pre- vail. The general elevation of the latter region is but small, and none of its eminences exceed 330 feet in height ; the former, on the contrary, has a surface richly varied with deep winding valleys clothed with woods and thickets, though the highest points are under 700 feet. The department belongs entirely to the basin of the Loire, which traverses it from east to west by a valley varying in breadth from about 1 to 5 miles; the bed is wide but shallow, and full of islands, the depth of the water in summer being at some places little more than 2 feet. The floods which occur are sudden and destructive.

The chief affluent of the Loire within the department is the Maine, formed a little above Angers by the junction of the Mayenne and the Sarthe (the latter in turn having previously received the waters of the Loir). All three rivers are navigable. Otlier tributaries of the Loire are the Thouet (with its tributary the Dive), the Layon, the Evre, the Divatte on the left, and the Authion on the right. The latter, which has a course parallel to that of the

Loire, has been supposed, but erroneously, to occupy an ancient bed of that river. The Mayenne is joined on the right by the Oudon, whicli can be navigated below Segré. The Erdre, which joins the Loire at Nantes, and the Moine, a tributary of the Séevre-Nantaise, both take their rise within this department. The climate, which is very mild, shares the characteristics botli of the Sequanian and of the Armorican districts. The mean annual temperature of Angers is 3° Fahr. above that of Paris; the rainfall at the same place is only 18°64 inches, but rises to 23°6 inches farther down the river, and 27°75 as the sea is approached. Notwithstanding this deficiency of rain, the frequent fogs, combined with the peculiar nature of the soil in the south- east of the department, produce a degree of moisture which is highly favourable to meadow growths. The winter colds are never severe, and readily permit the culti- vation of certain trees which cannot be reared in the adjoining departments.

Of the entire area more than one-half is arable ; onc-tenth is occupied by meadows ; and considerably smaller areas are occupied by woods, vineyards, aud heath respectively. Oxen number 225,000, pigs 100,000, and sheep 68,500 ; these figures represent a considerable commercial activity, as most of the animals are pur- chased out of neighbouring departments for the purpose of being fattened. Cholet alone exports annually 100,000 cattle, 150,000 or 200,000 sheep, and 25,000 or 30,000 pigs. The nuniber of horses in the department is 55,000, chicfly of a race much used for light cavalry service. The cavalry school is at Saumur within this department. The production of cereals is in excess of the con- sumption ; there are extensive arcas in the valleys of the Loire and Sarthe under hemp, and linseed and colza oil are produced in quantity. The legumes of Saumur and Angers are specially prized. The wine of the department (14,000,000 gallons in 1880) is fairly good, and the white wine of Saumur is exported and sold as spark- ling champagne (about 6,000,000 bottles yearly). Cider is pro- duced, and large quantities of apples, pears, and plums are exported to the markets of Paris, England, and Russia. Floriculture is an important industry, and the forests of oak and beech abound in game (stag, rocbuck, wildboar). Near Angers are slate quarries in which 3250 workmen are employed ; and the " Layon-et-Loire " coal-bed produced in 1881 15,288 tons of coal and anthracite, which, however, did not supply the demand of the department. There are sandstone quarries in the arrondissements of

Saumur and Baugé. Cholet, the chief manufacturing town, is famous for its pocket- handkerchiefs ; it has also manufactures of linen cloths, flannels, and cotton stuffs, worsted and cotton thread factories, and bleach- ing works. Similar manufactures are carried on at Angers ; the speciality of Saumur is the making of enamels and beads, in which it employs 600 workmen, producing goods to the annual valne of 1,500,000 francs. The population of the department was 517,258 in 1876, being an increase of 141,714 since 1801. There are five arrondissements,—Angers, Baugé, Cholet, Saumur, and Segré. The capital is Angers.

MAINPURI, or Mynpoores, a district in the lieutenant- governorship of the North-Western Provinces, India, be- tween 26° 52’ 30” and 27° 30’N, Jat., and 78° 27’ 45” and 79° 28’ 30”-E. long., is bounded on the N. by Etah, on the E. by Farrukhdbdéd, on the S. by Etawah, and on the W. by Muttra and Agra, and has an area of 1697 square miles, of which 949 are cultivated, and 190 cultivable. It consists of an almost unbroken level plain, intersected by small rivers, but unvaried by any greater elevations than a few undulating sand ridges. It is wooded throughout with mango groves, and isolated clumps of bdbul trees occasionally relieve the bareness of its saline usar plains. On the south-western boundary the Jumna flows in a deep alluvial bed, sometimes sweeping close to the high banks which overhang its valley, and at others leaving room for

a narrow strip of fertile soil between the river and the upland plain. From the low-lying lands thus formed a belt of ravines stretches inland for some 2 miles, often covered with jungle, but affording good pasturage for cattle. Moving north-eastward from this point, one reaches in succession the small rivers Aganga, Sengar, Rind, Isan, and Kali Nadi, most of which supply water to a small tract on either side, besides giving origin to rich deposits of cultivable silt. The Etawah and Cawnpur branches of the Ganges canal intersect the district for irrigation purposes, and the Lower Ganges canal, when completed, will furnish additional facilities in the same direction.

The census of 1872 returned the population of the district at 765,783 (males, 426,955; females, 338,828), The Hindus num- bered 724,663, Mohammedans 40,965, Christians 85. Among high-caste Hindus, the

Brahmans number 67,072, and form a wealthy landholding class. Rajputs are returned at 60,155, amongst whom the Chauhans form the largest clan. They have long formed the aristocratic class of the district, and in 1872 owued 44 per cent. of the total area. Much of their hereditary property is, however, passing out of their hands into those of merchants and traders. Of the lower castes, the most important are the Ahirs, numbering 123,358, who own over 12 per cent. of the soil. For many centuries this tribe consisted of lawless robber hordes, who held the fastnesses of the Jumna ravines; and, though they have now bcen reduced to a comparatively in- dustrial life, they still continue to afford the local authoritics much trouble and anxicty. The Chamérs, 103,193 in number, are mere hewers of wood and drawers of water for the landholding classes, who held them in a condition of absolute serfdom under native rule. Other important Hindu tribes are Kachhis (72,898), Lodhas (53,658), Gadariyas (28,047), and Kahars (25,273). The Moslems are for the most part poor and without social influence. Only four towns in the district contain a population exceeding 5000: Maiupurf, 21,117; Shikohabad, 10,069; Bhongaon, 6271; and Karhal, 5574.

Mainpuri is one of the districts where the question of female infanticide has long engaged the attention of Government, and even as late as 1872 this practice was so common as in a great measure to account for the large preponderance of males in the general population. In 1842 measures were first introduced for the supervision of the Chauhan Rajputs and Phatak Ahirs, among whoni the practice was most common. Every female birth had to be duly reported and authenticated, together with a subsequent report on the child's health. Illness had to be immediately announced to the police, who held aninvestigation. These rules remained in force nntil snpplementcd by those of the Infanticide Act of 1870. In 1848 there was not a single female child among these tribes ; in 1847 there were but two hundred and ninety-nine. In 1851 a convention of the heads of clans was held, when a body of rules was drawn up and subscribed to, but they were never observed. In 1865 acensusof the Chauhan and Phatak villages was held, when six of the former were found without a single female infant. In some cases a daughter had never been known in the village. In 1870 it was found necessary to impose more stringent rules, and a special Infanticide Act was passed by the viceregal council. Inquiries instituted in counexion with the census of 1872 revealed the fact that many other tribes than the Chauhdns

and Phataks were implicated in the practice. In 1875, although a large proportion of the community had so far reformed in this respect as to be exempted from the special supervision provided by the Infanticide Act, there were still two hundred and seventy-six villages on the. “ proclaimed list” nnder the surveillance of a specially organized police, maintained by a tax levied on the guilty communities. – ;

In Mainpuri almost every acre of available soil is under tillage. The total area under cultivation at the date of the last settlement was 607,991 acres. Kharif or rain crops included cotton, 48,901 acres; joar, 120,497 ; bdjra, 74,028 ; indigo, 53869; with a little maize, rice, hemp, &c., making up a total of 299,850 acres. abt, or spring crops were the following :—wheat, 105,488 acres; barley, 60,443 ; wheat and barley mixed together, 66,488; with gram, poppy, &c., making a total of 282,376 acres. There were also 17,528 acres under sugar-canc. Of the 607,360 acres cultivated in 1881, 337,726 were unitrigated, 180,415 were irrigated by private individuals, and 89,219 by Government. Two-thirds of the land is held by tenants with rights of occupancy, and one-third by tenants-at-will. Mainpuri suffers little from floods or blights, but in former years it used to be severely afflicted by drought. The means of communication, added to the large and increasing iirigation system, are now probably sufficient to protect the district from extreme distress in years of famine.

The district trade is almost entirely of a rural character. The chief exports are cotton, grain, indigo, ghi, and miscellaneous agricultural. produce ; while metals, English piece goods, sugar,

vedlar’s wares, tobacco, and rice are imported. Cotton thread is Tateeely manufactured, and there is some trade in bangles, hukds or pipes, inlaid wood-work, and other fancy articles. Saltpctre is refined at several factories. The district is thoroughly supplied with land and water communications. Good metalled roads connect all the principal towns and villages ; the Kast Indian Railway runs for 23 miles throngh the south-western angle ; the navigable branch of the Ganges canal intersects the central plateau ; and the natural highway of the Jumna skirts the district to the sonth.

The gross amount of assessment in 1880-81 was £115,132. Education was afforded in 1880-81 by 151 schools with 4146 pupils. The climate is hot but not excessively sultry during the summer months, and damp or foggy during the cold weather rains. The avcrage annual rainfall for the five years ending 1870-71 was 32°20 inches. The chicf endemic disease is inalarial fever.

Mainpuri anciently formed part of the great kingdom of Kanauj, and after the fall of that famous state it was divided into a number of petty principalities, of which Rapriand Bhongaon were the chief. In 1194 Rapri was made the seat of a Moslem governor. Mainpuri fell to the Mughals on Babar's invasion in 1526, and, although temporarily wrested from them by the short-lived Afghan dynasty of Sher Shah, was again occupied by them on the reinstatement of Humayun after the victory of Panipat. Like the rest of the lower Doab, Mainpuri passed, towards the end of the last century, into the power of the Mahrattas, and finally became a portion of the province of Oudh. When this part of the country was ceded to the British in 1801, Mainpuri town became the headquarters of the ex- extensive district of Etawah, which was in 1856 reduced by the for- mation of Etah and Mainpuri into separate collectorates. On the outbreak of the mutiny in 1857, the regiment stationed at Mainpurt revolted, and attacked the town, which was successfully defended by the few Europeans of the station for a week, until the arrival of the Jhansi mutineers male it necessary to abandon the district.

MArnpurti, the chief town and headquarters of the above district, is situuted in 27° 14' 15" N. lat., 79° 3' 5" E. long., and had a population in 1872 of 21,117, viz., Hindus, 17,596; Mohammedans, 3485; Christians and "others," 146. The town consists of two separate portions, Mdinpurf proper and Mukhamganj; the former traditionally dates from the prehistoric period of the Mahdbharata, while the latter was founded by Raja Jaswant Sinhin 1803. Holkar plundered and burned part of the town in 1804, but was repulsed by the local militia. Since the British occupation the population has rapidly increased, and many improvements have been carried out. The Agra branch of the Grand Trunk Road runs through the ceutre, and forms a wide street lined on both sides by shops, which constitute the principal bazaar. Besides the usual Government offices, &c., in the civil station, the

chief buildings are the police station, opium warehouses, jail, post-office, dispensary, two large schools, American Presby- terian mission, church, reading-rooms; there are two public gardens. The town carries on a considerable trade in cotton, indigo seed, country produce, and iron; and there is a manufacture of wooden articles inlaid with wire.

MAINTENON, Francoise D'AUBIGNE, MARQUISE DE (1635-1719), the second wife of Louis XIV., and unac- knowledged queen of France for the last thirty years of his reign, was born in a prison at Niort on November 27, 1635. Her father Constant d'Aubigné, was the son of Agrippa d'Aubigné, the famous friend and general of Henry IV., and had been imprisoned as a Huguenot malcontent, but her mother, a fervent Catholic, had the child baptized in her religion, her sponsors being the Duc de la Rochefoucauld, father of the author of the dJfaxims, and the Comtesse de Neuillant. In 1639 Constant d'Aubigné was released from prison and took all his family with him to Martinique, where he died in 1645, after having lost what fortune remained to him at cards. Madame @Aubigné returned to France, and from sheer poverty unwillingly yielded her daughter to her sister-in-law, Madame de Villette, who made the child very happy, but, unfortunately for her, converted or pretended to convert her to Protestantism. When this was known, an order of state was issued that she should be entrusted to Madame

de Neuillant, her godmother. Every means, every indignity even, was now used to convert her back to Catholicism, but at the last she only yielded on the con- dition that she need not believe that the soul of Madame de Villette was lost. Once reconverted, she was neglected, and sent home to live with her mother, who had only a small pension of 200 livres a year, which ceased on her death in 1650. The Chevalier de Meré, a man of some literary distinction, who had made her acquaintance at Madame de Neuillant's, discovered her penniless condition, and introduced his 'young Indian," as he called her, to Scarron, the famous wit and comic writer, at whose house all the literary society of the day assembled. The wit, who was of good legal family, and had a kind heart, took a fancy to the friendless girl, and offered either to pay for her admission to a convent, or, though he was deformed and an invalid, to marry her himself. She accepted his offer of marriage,

and became Madame Scarron in 1651. For nine years she was not only his most faithful nurse, but an attraction to his house, where she tried to bridle the licence of the conversation of the time. On the death of Scarron in 1660, Anne of Austria continued his pension to his widow, and even increased it to 2000 livres a year, which enabled her to entertain and frequent the literary society her husband had made her acquainted with; but on the queen-mother's death in 1666 the king, in spite of all the efforts of her friends, refused to continue her pension, aud she prepared to leave Paris fur Liston as lady attendant to the queen of Portugal. But before she started, she met Madame de Montespan, who was already, though not avowedly, the king's mistress, at the Hotel d'Albret, and the lady in question took such a fancy to her that she obtained the continuance of her pension, which put off for ever the question of going to Portugal. Madame de Montespan did yet more for her, for when, in 1669, her first child by the king was born Madame Scarron was established with a large income and a large staff of servants at Vaugirard to bring up the king's children in secrecy as they were born. In 1674 the king determined to have his children at court, and their governess, who had now made sufficient fortune to buy the estate of Maintenon, accoinpanied them. The king had now many opportunities of seeing Madame Scarron, and, though at first he was prejudiced against her, her even temper showed so advantageously against the storms of passion and jealousy exhibited by Madame de Montespan that she grew steadily in his favour, and had in 1678 the gratification of having her estate at Maintenon raised to a marquisate, and herself entitled Madame de Maintenon by the king himself. Such favours brought down the fury of Madame de Montespan's jealousy, and Madame de Maintenon's position was almost unendurable, until, in 1680, the king severed their connexion by making the latter second lady in waiting to the dauphiness, and soon after Madame de Montespan left the court. The new "amie" used her influence on the side of decency, and the queen openly declared she had never been so well treated as at this time, and eventually died in Madame de Maintenon's arms in 1683. The queen's death opened the way to yet greater advancement ; in 1684 she was made first lady in waiting to the dauphiness, and in the winter of 1685, or, Voltaire says, in January 1686, she was privately married to the king by Harlay, archbishop of Paris, in the presence, it is believed, of Pére la Chaise, the king's confessor, the Marquis de Montchevreuil, the Chevalier de Forbin, and Bontemps. No written proof of the marriage is

extant, but that it took place is nevertheless certain. Her life during the thirty years of ler second married life must be studied from more than one side, and can be so fully from her letters, which are masterpieces even of an age

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when Madame de Sevigné wrote, and of which many authentic examples are extant. As a wife she is wholly admirable; she had to entertain a man who would not be amused, and had to submit to that terribly strict court etiquette of absolute obedience to the king's inclina- tions which Saint-Simon so vividly describes, and yet be always cheerful, and never complain of weariness or ill- health. Her political influence has probably been over-stated, but it was supreme in matters of detail. The ministers of the day used to discuss and arrange all the business to be done with the king beforehand with her, and it was all done in her cabinet and in her presence, bnt the king in more important matters often chose not to consult her. Such mistakes as, for instance, the replacing of Catinat by Villeroi may be attributed to her, but not whole policies,—notably, according to Saint-Simon, uot the policy with regard to the Spanish succession. Even the revocation of the edict of Nantes and the Dragonnades have been laid to her charge, but there can be no doubt that, in spite of ardent Catholicism, she retained a liking for her father's religion, and opposed, if not very vigorously, the cruelties of the Dragonnades. She was probably afraid to say much, or peril her great reputation for devotion, which had in 1692 obtained for her from Innocent XII. the right of visitation over all the convents in France. Where she deserves blame. is in her use of her power for personal patronage, as in compassing the promotions of Chamillart and Villeroi, and the frequent assistance given to her brother Comte Charles d'Aubigné. Her influence was on the whole a moderating and prudent force, and the king, when he wanted her advice, used to say, 'Qu'en pensez votre Solidité?" or "Consultons la Raison." Her social influence was not as great as it might have been owing to her holding no recognized position at court, but it was always exercised on the side of decency and morality, and it must not be forgotten that from her former life she was intimate with the literary people of the day, and never deserted her old friends. Side by side with this public life, which wearied her with its shadowy power, occasionally crossed by a

desire to be recognized as queen, she passed a nobler and sweeter private existence as the foundress of St Cyr. Madame de Maintenon was a born teacher ; she had so won the hearts of her first pupils that they preferred her to their own mother, and was similarly successful later with the young and impetuous Duchesse de Bourgogne, and she had always wished to establish a home for poor girls of good family placed in such straits as she herself had experienced. As soon as her fortunes began to mend she started a small liome for poor girls at Ruel, which she afterwards moved to Noisy, and which was the nucleus of the splendid institution of St Cyr, which the king had endowed in 1686 at her request out of the funds of the Abbey of St Denis. She was in her element there. She herself drew up the rules of the institution; she examined every minute detail; she befriended her pupils in every way; and her heart often turned from the weariness of Versailles or of Marly to her "little girls" at St Cyr. It was for the girls at St Cyr that Racine wrote his Esther and his Athalie, and it was because he managed the affairs of St Cyr well that Chamillart became controller-general of the finances. The later years of her power were marked by the promotion of her old pupils, the children of the king and Madame de Montespan, to high dignity between the blood royal and the peers of the realm, and it was doubtless under the influence of her dislike for the Duc d'Orleans that the king drew up his will, leaving the personal care of his successor to the Duc de Maine, and hampering the Duc d'Orleans by a council of regency. On or even before her husband's death she retired to St Cyr, and had the chagrin of seeing all her plans for the advancement of the Duc de Maine

overthrown by means of the parlement of Paris. However, the regent Orleans in no way molested her, but on the contrary visited her at St Cyr, and continued her pension of 48,000 livres. She spent her last years at St Cyr in perfect seclusion, but an object of great interest to all visitors to France, who, however, with the exception of Peter the Great, found it impossible to get an audience with her. On April 15, 1719, she died, and was buried in the choir at St Cyr, bequeathing her estate at Maintenon to her niece, the only daughter of her brother Charles, and wife of the Maréchal de Noailles, to whose family it still belongs. Such was the life of the extraordinary woman who kept till the last the heart of Louis XIV.,

marked by a virtue almost amounting to prudery, in strong contrast to the generations which preceded and followed her, by a love of power, and a use of it which can indeed be excused by her early life, but which was not exercised for the good of France, and by a religious devotion which was narrow, if not violently fanatical, but sweetened throughout by her ardent love for her "little girls," whom she had saved from the difficulties of life, and whom she loved with all a mother's love. 7

La Beaumelle published the Lettres de Madame de Maintenon, but much garbled, in 2 vols. in 1752, and on a larger scale in 9 vols. in 1756. He also in 1755 published Mémoires de Madame de Maintenon, in 6 vols., which caused him to be imprisoned in the Bastille. Next must be noted Madame de Maintenon peinte par elle méme, by Madame Suard, 1810; Histoire de Madame de Main- tenon, by Lafont d'Aussonne, 1814; Lettres inédites de Madame de Maintenon et la prineesse des Ursins, 1826, reviewed by Sainte- Beuve, Causeries du Lundi, vol. v.; and Histoire de Madame de Maintenon, by the Duc de Noailles, 1848-58. All materials for her life have, however, been superseded by Théophile Lavallée's His- toire de St Cyr, reviewed in Causeries du Lundi, vol. viii., and by his edition of her Lettres historiques et édifiantes, &c., in 7 vols., and of her Correspondanee Générale, in 4 vols., which latter must, however, be read with the knowledge of many forged letters, noticed in P. Grimblot's Faux Autographes de Madame de Main- tenon. Saint-Simon's fine account of the court in her day and of her carecr is contained in the twelfth volume of Chéruel and Regnier's edition of his Mémoires. (H. M. 8.)

MAINZ, or Mentz (in French, Mayence), the largest town in the grand-duchy of Hesse-Darmstadt, one of the strongest fortresses in Germany, and formerly the seat of an archbishop and elector, is situated on a rising ground on the left bank of the Rhine, nearly opposite the influx of the Main. 'The fortifications, which consist of three enceintes with a series of outlying forts, embrace the small town of Castel on the opposite bank, and have recently been widened so as to admit of a large extension of the town. Mainz is connected with Castel by a bridge of boats, and the Rhine is also spanned there by a railway bridge. The interior of the town consists chiefly of narrow and irregular streets, but the oldest part of all, to the west, was almost entirely destroyed by the explosion of a powder- magazine in 1857,

and has been rebuilt in a much improved style. There are also several handsome modern streets on the side next the Rhine, which is bordered by a fine quay, upwards of 300 feet in breadth. To the south lies the Neue Anlage, a park laid out on the site of the chateau of Favorite, where the duke of Brunswick signed his famous manifesto to the French people in 1792. The principal object of historical and architectural interest in Mainz is the grand old cathedral, an imposing Romanesque edifice with numerous Gothic additions and details. It was originally erected between 975 and 1009, but has since been repeatedly burned down and rebuilt, and in its present form dates chiefly from the 12th, 13th, and 14th centuries. The largest of its six towers is 300 feet in height. The whole building was restored by order of Napoleon in 1814, and another thorough renovation has been recently in pro- gress. The interior contains the tombs of Boniface, the first archbishop of Mainz, of Frauenlob the minnesinger,

and of most of the archiepiscopal electors. Mainz possesses other eight Roman Catholic churches, the most noteworthy of which are those of St Ignatius, with a finely painted ceiling, and St Stephen, built in 1318, and restored after the explosion of 1857. 'The old electoral palace, erected in 1627-78, now contains valuable collections of Roman and Germanic antiquities, a picture gallery, and a library of 130,000 volumes, including several productions of Gutenberg, Fust, and Schéffer. Among the other principal buildings are the palace of the grand-duke, built in 1731-39 as a lodge of the Teutonic Order, the theatre, the arsenal, the Government house, the commandant's residence, and several fine private houses. A handsome statue of Gutenberg, by Thorwaldsen, was erected at Mainz in 1837,

/Plan of Mainz.

1. Cathedral. 5. Theatre.' 6. Guten berg'sMonument, 7. Sehiller's Monument,

8. Neubrunnen.

9. Government House. 2, Palace. 10. St Stephen's Chureh. 3. Courts of Justice, 11. Action Beerhouse. 4. Town-House. 12. Eichelstein.

and the town is also embellished with a statue of Schiller and two architectural fountains. Mainz still retains many relics of the Roman period, the most important of which is the Eigelstein, a monument believed to have been erected by the Roman legions in honour of Drusus. It stands within the citadel, which occupies the site of the Roman castrum. A little to the south-west of the town are the remains of a large Roman aqueduct, of which upwards of sixty pillars are still standing. The educational and scientific institutions of Mainz include an _ episcopal seminary, a gymnasium, a society for literature and art, a musical society, and an antiquarian society, the fine collec- tion of which has been mentioned above. The university, founded in 1477, was suppressed in 1791.

The site of Mainz would seem to mark it out naturally as a great centre of trade, but the illiberal rule of the arch- bishops and its military importance seriously hampered its commercial and industrial development, and prevented it from rivalling its neighbour Frankfort. It is now, however, the chief emporium of the Rhenish wine traffic, and also carries on an extensive transit trade in grain, timber, flour, and oil. The natural facilities for carriage by water are supplemented by seven railways. The principal manu- factures of Mainz are leather goods, furniture, carriages, chemicals, musical instruments, and carpets, for the first

two of which it has attained a wide reputation. Mainz is the seat of the administrative and judicial authorities of the province of Rheinhessen, and also of a Roman Catholic bishop. The population in 1880 amounted to 61,322, including a garrison of about 8000 men. Fully two-thirds are Roman Catholics. Castel has about 5000 inhabitants,

Mainz, one of the oldest cities in Germany, was originally a Celtic settlement. Its strategic importance was early recognized by the Romans, and in 13 B.c. Drusus, the son-in-law of Augustus, erected a fortified camp (castrum) there, to which a smaller castellum (the modern Castel) on the opposite bank was afterwards added. The Celtic name became Latinized as

Maguntiacwm or Moguntiacum, and a town, Maguntia, gradually arose, which became the capital of Germania Superior. In the " Volkerwanderungen," or migra- tions of peoples during the gradual dissolution of the Roman empire, Mainz was destroyed on different occasions by the Alemanni, the Vandals, and the Huns (451 a.p.). Christianity seems to have been introduced at an early period, and soon after its recovery from the last of these calamities we find it the seat of a bishop. In the middle of the 8th century, under Boniface, the see became an archbishopric, to which the primacy of Germany was annexed. Charlemagne built a bridge here and granted the town important privileges, and in the following centuries it was the seat of several diets and ecclesiastical councils. In 1254 Mainz was the head and mainspring of the league of Rhenish towns, and had attained ta such a pitch of commercial prosperity that it was known asthe " Goldene Mainz."' Soon after this time it is believed that the population was as numerous as at the present day. In 1462, during the strife between the rival archbishops Diether von Isenburg and Adolph von Nassau, Mainz espoused the cause of the former, but was taken by the latter, who had the support of the emperor, lost its imperial privileges, and was henceforth subject to the archbishops. Many of its citizens were driven into exile, and carried into other lands a knowledge of the art of printing, which had been invented at Mainz by Gutenberg in 1440. In the Thirty Years' War Mainz was occupied by the Swedes and the French. In 1792 it enthusiastically weleomed the principles of the French Revolution, and opened its gates to the Republican troops under Gencral Custine. It was recaptured in the following year, but was ceded to France by the peace of Campo Formio in 1797. In 1814 it was restored to Germany and handed over to the grand-duchy of Hesse, remaining, however, a fortress of the German Confedera- tion, garrisoned in common by Prussian, Austrian, and Hessian troops. Since 1871 it has been a fortress of the German empire.

For further information consult Schaab, Geschichte der Stadt Mainz, 1841-44 ; K. Klein, Mainz und scine Umgcbungen, 1868 » Bockenheimer, Beitrége zur Geschichte der Stadt Mainz, 1874, and Mainz und Umgebungen, 1880; Werner, Der Dom von Mainz und seine Denkmdler, 1827-86. (J. F. M.)

MAISTRE, JosErpH ps, diplomatist and polemical, writer was born at Chambéry on the lst April 1754, and died at Turin on the 26th February 1821. The family was an ancient and noble one, enjoying the title of count, and is said to have been of Languedocian extraction. The father of Joseph was president of the senate of Savoy, and held other important offices. Joseph himself, after studying at Turin, received various appointments in the civil service of Savoy, finally becoming a member of the senate. In 1786 he married Francoise de Morand. The invasion and annexation of Savoy by the French Re- publicans made him an exile. He did not take refuge in that part of the king of Sardinia's domains which was for the time spared, but betook himself to the as yet neutral territory of Lausanne. There, in 1796, he published his first important work (he had previously written certain discourses, pamphlets, letters, dc.), Constdérations sur la France. In this he developed his views, which were those of a Legitimist, but a Legitimist entirely from the religious and Roman Catholic point of view. The philosophism of the 18th century, as shown in its political views, or rather the second as a consequence of the first, was Joseph de Maistre's life-long object of assault.

After the still further losses which, in the year of the publication of this book, the French Revolution inflicted on Sardinia, Charles Emmanuel summoned Joseph de Maistre to Turin, and he remained there for the brief space during which the king retained a remnant of territory on the mainland. Then he went to the island of Sardinia itself,

and held office at Cagliari In 1802 he was appointed envoy extraordinary and minister plenipotentiary at St Petersburg, and journeyed thither the next year. Although his post was no sinecure, its duties were naturally less engrossing than the official life, with intervals of uneasy exile and travelling, which he had hitherto known, and his literary activity was great. He only published a single treatise, on the Principe générateur des Constitutions ; but he wrote his best and most famous works, Du Pape, De PEglise Gallicane, and the Soirées de St Pétersbourg, the last of which was never finished. Dw Pape, which the second-named book completes, is a treatise in regular form, dealing with the relations of the sovereign pontiff

to the church, to temporal sovereigns, to civilization generally, and to schismatics, especially Anglicans and the Greek Church. Itis written from the highest possible standpoint of papal absolutism. The Sotrées de St Pétersbourg, so far as it is anything (for the arrangement is somewhat desultory), is a kind of théodicée, dealing with the fortunes of virtue and vice in this world. It contains two of De Maistre's most famous pieces, his panegyric on the execu- tioner as the foundation of social order, and his acrimonious, and in part unfair, but also in part very damaging, attack on Locke. The Du Pape is dated May 1817 ; on the Sowrées the author was still engaged at his death. Besides these works he wrote an examination of the philosophy of Bacon, some letters on the Inquisition (an institution which, as may be guessed from the remarks just noticed about the executioner, was no stumbling-block to him), and, earlier than any of these, a translation of Plutarch's " Essay on the Delay of Divine Justice, " with somewhat copious notes. After 1815 he returned to Savoy, and was appointed to high office, while his Du Pape made a great sensation. But the world to which he had returned was not altogether in accordance with his desires. He had domestic troubles ; and chagrin of one sort and another is said to have had not a little to do with his death by paralysis at no very advanced age. Most of the works mentioned were not published till after his death, and it was not till 1851 that a collection of Lettres et Opuscules appeared, while even since that time fresh matter has been published.

Joseph de Maistre was one of the most powerful, and by far the ablest, of the leaders of the Neo-Catholic and anti-revolutionary movement. The most remarkable thing about his standpoint is that, layman as he was, it was entirely ecclesiastical. Unlike his contemporary Bonald, Joseph de Maistre regarded the temporal monarchy as an institution of altogether inferior importance to the spiritual primacy of the pope. He was by no means a, political absolutist, except in so far as he regarded obedience as the first of political virtues, and he seldom loses an opportunity of stipulating fora tempered monarchy. But the pope's power is not to be tempered at all, either by councils or by the temporal power or by national churches, least of all by private judgment. The peculiarity of Joseph de Maistre is that he supports his conclusions, or if it be preferred his paradoxes, by the hardest and heaviest argument. Although a great master of rhetoric, he never makes rhetoric do duty for logic. Every now and then it is possible to detect

fallacies in him, but for the most part he has succeeded in carrying matters back to those fundamental differences of opinion which hardly admit of argument, and on which men take sides in consequence chiefly of natural bent, and of predilection for one state of things rather than for another. The absolute necessity of order may be said to have been the first principle of this thinker. He could not conceive such order without a single visible authority, teference to which should settle all dispute. He saw that 'here could be no such temporal head, and in the pope he thought that he saw a spiritual substitute. The anarchic

tendencies of the revolution in politics and religion were what offended him. It ought to be added that he was profoundly and accurately learned in history and philosophy, and that the superficial blunders of the 18th century philosophes irritated him as much as their doctrines. To Voltaire in particular he shows no mercy.

A good and complete edition of De Maistre has yet to appear. Of the two works named as his masterpieces, Du Pape is to be found in the Bibliotheque Charpenticr, and the Sotrées de St Péters-

bourg is printed in two volumes, the fifteenth edition, so-called, bearing date Lyons, 1878. (G. SA.)

MAISTRE, Xaviur bz, the younger brother of Joseph, was born at Chambéry in October 1763, and died at St Petersburg on the 12th June 1852. He served when young in the Piedmontese army, and wrote his Voyage autour de ma Chambre when he was in garrison at Turin. This, a delightful fantasy piece which may have owed something to the example of Sterne in its conception, but which is quite original in execution, he showed to his brother Joseph, and on his approval it was published at Turin in 1794, Xavicr, however, shared the politics and the loyalty of his brother, and the annexation of Savoy, followed as it was at no long date by the extinction of Piedmontese independence, made him quit his country. He served in the victorious Austro-Russian campaign in which Suwaroff performed such wonders, and accompanied the marshal to Russia. For a time he was in very reduced circumstances, and is said to have supported himself by

painting. But on his brother's arrival in St Petersburg he was introduced to the minister of marine. He was appointed to several posts in the capital, but also saw active service, was wounded in the Caucasus, and attained the rank of major-general. He married a Russian lady and established himself in his adopted country, even after the overthrow of Napoleon, and the consequent restoration of the Piedmontese dynasty. Fora time, however, he lived at Naples, but he returned to St Petersburg and died there. He was only once at Paris (in 1839), when Sainte-Beuve, who has left some pleasant reminiscences of him, met him. Besides the Voyage already mentioned, Xavier de Maistre's works (all of which are of very modest dimensions) are Le Lépreux de la Cité d'Aoste, a touching little story of human misfortune, Les Prisonniers du Caucase, a powerful sketch of Russian character, Za Jeune Sibérienne, and the Lixpédition Nocturne, a sequel to the Voyage autour de ma Chambre. But his Voyage is, with the Lépreuz, his title to fame. Both have a certain resemblance to Sterne, the first in its quaintness and desultory arrangement, the second in its sentiment. Xavier de Maistre is, however, much less artificial than his forerunner, especially in his pathos, and he is also much better bred. His style is of remarkable ease and purity. The works of Xavier de Maistre, with the exception of some brief chemical tractates, are usually printed in a single volume, which figures in the collections of Charpentier, Garnier, &c.

MAITLAND, a town of Australia, in New South Wales, 93 miles north of Sydney, in the valley of Hunter river, and communicating with Newcastle and Port Hunter both by steamboat and railway. It consists of two distinct municipalities—East Maitland, incorporated in 1862, and West Maitland, in 1863. The former, which is the seat of a Roman Catholic bishop, contains a court-house, a large prison, and a mechanics' institute ; the latter a court- house, an excellent hospital (Campbell's Hill), a school of arts with a considerable library, a benevolent asylum, a theatre, and a Dominicau nunnery. The district is a rich agricultural country, growing maize, barley, oats, wheat, tobacco, grapes, and oranges ; coal and shale are regularly worked near the town ; and a good trade is carried on with the interior townships. The inhabitants number 7881, East Maitland having 2500 and West Maitland 5381.

MAITLAND, Joun (1614-1682), earl and afterwards duke of Lauderdale in the peerage of Scotland, was a great- grandson of Sir Ricuarp MaITLAND (g.v.). In early life a Presbyterian, he attended the Westminster Assembly in 1643 as an elder of the Church of Scotland; and he was a party to the surrender of Charles I. to the English army in 1645. Soon afterwards, changing his politics, he became a zealous supporter of the royal cause, and promoter of the Engagement for raising forces for the king's rescue. He was taken prisoner at the battle of Worcester; and, on being set at liberty in 1660, he repaired to the Hague and accompanied Charles [T. to Scotland. From 1663 he was virtually ruler of Scotland,—at first moderate in his counsels, but afterwards severe in his measures against the Covenanters. In 1672 he was made duke of Lauderdale and a Knight of the Garter; and he had also an English peerage conferred on him (with the title of earl of Guildford) in 1674. One of the administrative council known as the "Cabal," he eventually fell into disgrace, and died in 1682. His dukedom and English honours expired with him; the earldom of Lauderdale passed to his brother Charles, and is still in possession of his descendants. The voluminous correspondence of Lauderdale, which is still extant, shows that, in addition to a remarkable power over men of all classes, great watchfulness and resolution, and very clear ideas of what was needed to keep Scotland peaceful and in a state of usefulness for further ends, he was possessed of no slight learning.

MAITLAND, Sir Ricuarp (1496-1586), an early Scottish lawyer and poet, was born in 1496. His father, William Maitland of Lethington and Thirlstane, fell at Flodden; his mother was a daughter of George, Lord Seton, He studied law at the university of St Andrews, and afterwards in France. He was in 1552 one of the commissioners to settle matters with the English about the debatable lands on the borders, and about that time had the honour of knighthood conferred upon him. In 1554 he was made an extraordinary lord of session. About 1561 he seems to have lost his sight, but this did not render him incapable of attending to public business, as lie was the same year admitted an ordinary lord of session by the title of Lethington, and in 1562 was nominated lord privy seal. He resigned this latter office in 1567, in favour of John, prior of Coldingham, his second son, but he sat on the bench till he attained his eighty-eighth year. He was an amiable and accomplished man, and died in 1586, aged ninety, after

having been employed in public offices for upwards of seventy years. His eldest son, William, forms the subject of next article. His second son, John, was a lord of session, and was made a lord of parliament in 1590, by the title of Lord Maitland of Thirlstane, in which he was succeeded by his son John, also for some time a lord of session, who was created earl of Lauderdale in 1624. The latter was the father of John Maitland, duke of Lauderdale, noticed above. One of Sir Richard's daughters, Mary, assisted her father in his studies, and also wrote verses.

The poems of Sir Richard Maitland, none of them lengthy, are somewhat satirical, and are principally directed against the abuses of his time. He must, however, be regarded asthe industrious collector and preserver of many pieces of ancient Scottish poetry. These were copied into two large volumes, one in folio and another in quarto, the former written by himself,,and the latter by his daughter. After being in the possession of his descendant the duke of Lau- derdale, these volumes were purchased at the sale of the duke's library by the celebrated Samuel Pepys, who was one of the first collectors of rare books in England. They have since been pre- served in the Pepysian Library, Magdalene College, Cambridge. They lay there unnoticed for many years till Bishop Percy pub- lished one of the poems in his Reliques of English Poetry. Several of the pieces were then transcribed by John Pinkerton, who after- wards published them under the title of Ancient Scottish Poems, comprising Pieces written from about 1420 till 1586, with Notes and

a Glossary, 2 vols. 8vo, London, 1786. Sir Richard left in manu- script a history of the family of Seton, and a volume of legal decisions collected by him between the years 1550 and 1565. Both are preserved in-the Advocates' Library, Edinburgh, and the latter work is still unpublished. The Poems of Sir Richard Maitland were printed in 1830 by the Maitland Club, a literary society, founded, in Glasgow in 1828, which took its name from him. The MS. used for the purpose was one preserved in the Drummond col- lection in' the library of the university of Edinburgh. It seems to have been written shortly before the year 1627, when it was presented by Drummond to the library. In 1829 there was also printed for the club The History of the House of Seytoun to the year 1559, with a continuation to 1687 by Alexander, Viscount Kingston.

MAITLAND, Wrt11am (c. 1525-1573), best known in Scottish history by the name of his father's estate of Lethington, near Haddington, where he resided, was the eldest son of Sir Richard Maitland, noticed above. Born about 1525, and partly educated in France, he was at an early age initiated into public life. He was made secretary of state by Mary of Guise in 1558 ; but the favour with which he regarded the views of the reforming party soon

exposed him to the queen mother's resentment. He became one of the "lords of the congregation," and was also one of the Scottish commissioners who negotiated with Queen Elizabeth regarding the terms on which she would agree to aid the Reformers. Soon after Mary's arrival in Scotland, he was employed in two embassies to Eng- land, and was made first an extraordinary and then an ordinary lord of session. He had a controversy with Knox, whom he accused in the General Assembly of 1564 of teaching seditious doctrine. He went again to Eng- land as ambassador to notify the queen's marriage to Darnley, and was implicated both in the conspiracy against Rizzio and in the Kirk of Field tragedy, though he was also a member of the secret council at which the deposi- tions of Darnley's murderers were taken, and signed the act of council accusing Mary of being the author of the crime. He fought against the queen at Langside, but at the conference at York identified himself in a measure with her interests. At the instance of the regent Murray he was in 1569 arrested as a participant in the king's murder, and would have been brought to trial but for a ruse of Kirkcaldy of Grange, who, as commander of Edin- burgh Castle, conveyed him thither as a prisoner. The two principal representatives of Mary's cause, Lethington and Grange, who may be described as the forlorn hope of the captive queen, held the castle of Edinburgh for some time against the regent Morton and an English force; and, when surrender became a matter of necessity, they made their submission, not to the regent, but to the English queen. Kirkcaldy was executed ; but Maitland died in prison, it was generally believed of poison administered by his own hand, on 9th June 1573. "Secretary Mait- land" was a man of great learning and power of repartee, wanting in integrity, but skilled in intrigue, and reputed the most accomplished and most versatile statesmen that his country has produced ; in the opinion of his con- temporaries his capacities were too great for the narrow sphere of Scottish politics.

MAITTAIRE, Micuen (1668-1747), bibliographer and editor, was a native of France, and was born in 1668. On the revocation of the edict of Nantes his parents, who were Protestants, removed to England, where he was educated at Westminster and at Christ Church, Oxford, graduating in 1696. From 1695 to 1699 he taught in Westminster School, but afterwards devoted himself exclu- sively to private teaching and editorial work. He died on August 4, 1747.

Maittaire was a great lover of books, but no critic; and his numerous editions take rank only as compilations. His works in- clude De Grace Linguz Dialectis, 1706 ; Stephanorum Historia, vitas ipsorwm et libros complectens, 1713 ; Historia Typographorum

aliquot Parisiensium, vitas et libros complectens, 1717; Annales Typographict, 9 vols. 4to, The Hague, Amsterdam, and London, 1719-41 ; Marmora Oxoniensia, 1732; editions of a large number of Latin authors (Lucretius, Phedrus, Sallust, Terence, &c.), as well as an edition of Anacreon (1725), and Miscellanea Grecorum aliquot scriptorum Carmina, 1722.

MAIZE, or Inp1aAn Corn, Zea Mays, L., from fed or fed, which appears to have been "spelt" (Z'riticum spelta, L.), according to the description of Theophrastus, is of the tribe Phalaridexe of the order Graminez or grasses. It is unknown in the native state, but is most probably indi- genous to tropical America (Endlicher, Gen. Pl., No. 742). Small grains of an unknown variety have been found in the ancient tombs of Peru. Bonafous, however (/istoire naturelle du Mais), quotes authorities (Bock, 1532, Ruel and Fuchs) as believing that it came from Asia, and maize was said by Santa Rosa de Viterbo to have been brought by the Arabs into Spain in the 13th century. A drawing of maize is also given by Bonafous from a Chinese work on natural history, Zv-chi-tchin, dated 1562, a little over sixty years after the discovery of the New World. It is not figured on Egyptian monuments, nor was any mention made of it by Eastern travellers in Africa or Asia prior to the 16th century. On the authority, however, of Mr J. Crawford, who resided for nine years in Java, Bonafous says it had been cultivated from a very ancient period in the Asiatic islands under the equator, and that it was received thence into China, and so passed westwards into India and Turkey, hence its name of " Turkey corn," under which title Gerard in 1597 figured and described seven kinds, as well as one called "Corne of Asia." Both Gerard and Bonafons think that it first came from the East, but that on the dis- covery of America it was reintroduced into Europe from that country. The former observes :—" These kinds of graine were first brought into Spaine, and then into other

provinces of Europe out of Asia, which is in the Turkes Dominions ; as also out of America and the [lands adioyn- ing from the East and West Indies and Virginia, &c." Humboldt and others, however, do not hesitate to say that it originated solely in America, It had been long and extensively cultivated there at the period of the diftovery of the New World. The plant is monecious, producing

*the staminate (male) flowers in a large feathery panicle at_*

Fia. 2,—Male.

Fic, 1.—Male. the summit, and the (female) dense spikes of flowers, or '"'cobs," in the axils of the leaves below, the long pink styles hanging out like a silken tassel. They are invested by the sheaths of leaves, much used in packing oranges in South Europe, and the more delicate ones for cigarettes

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in South America. The accompanying figures are after Nees von Esenbeck, Gen. Pl. £1. Germ. Fig. 1 shows a branch of the terminal male inflorescence. Fig. 2 is a single spikelet of the same, containing two florets, with the three stamens of one only protruded. Fig. 3 is a

Fic. 8. —Female.

spike of the female inflorescence, protected by the sheaths of leaves,—the blades being also present. Usually the sheaths terminate in a point, the blades being arrested. Fig. 4 is a spikelet of the female inflorescence, consisting of two outer glumes, the lower one ciliated, which enclose two florets,—one barren (sometimes fertile), consisting of a flowering glume and pale only, and the \ other fertile, containing the pistil \ with elongated style. The mass of styles from the whole spike is pendulous from the summit of the sheaths, as in fig. 3. Fig. 5 shows the fruit or grain. More than three hundred varieties are known, which differ more among themselves than those of any other cereal. Some come to maturity in two months, others require seven months; some are as many feet high as others are inches; some have kernels eleven times larger than others. They vary similarly in shape and size of ears, colour of = the grain, which may be white, Fia, 5.—

Grain. yellow, purple, striped, &c., and also in physical characters and chemical composition,—in short, in all those char- acters in which the different species of a genus differ among themselves. The varieties grown most abund- antly in the United States may be roughly grouped into four great classes. The "Flint" varieties are most common east of Lake Erie and north of Maryland, and the " Dent" varieties are the common ones west and south of these points. The "Horsetooth" varieties are grown extensively only in the south, and there they are grown along with the dent. These three classes pass into each other by every gradation, and the grain from all is similar in chemical composition. The "Sweet" varieties are not grown for the ripe grain, but for boiling corn, and that the stalks may serve as "corn fodder." 'Green corn" was an im- portant food with the native Indians. Many of the tribes celebrated its season with religious ceremonies and festivals. In the large cities of America "green corn" is a table luxury, but in the smaller towns and country districts it is an important article of food. Chemical analysis, as well as common experience, shows that this is a very nutritious article of food, being richer in albuminoids

Fic, 4.—Female.

tte

*f 'i a iN aft. Na iv aM *

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than any other cereals when ripe (calculated in the dry weight). It is capable of being grown in the tropics from the level of the sea to a height equal that of the Pyrenees, and in the south and middle of Europe, but it cannot be grown in England with any chance of profit, except perhaps as fodder. Frost kills the plant in all its stages and all its varieties ; and the crop does not flourish well if the nights are cool, no matter how favourable the other conditions. Consequently it is the first crop to dis- appear as one ascends into the mountain regions, and com- paratively little is grown west of the great plains of North America. In Brittany, where it scarcely ripens the grain, it furnishes a strong crop in the autumn upon sandy soil where clover and lucern will yield but a poor produce. It prefers a deep, rich, warm, dry, and mellow soil, and hence the rich bottoms and fertile prairies

of the Mississippi basin constitute the region of its greatest production. Illinois leads in total amount, producing in 1879 nearly 326 millions of bushels, or 105 bushels per head of population. The region of chief production in the United States may be described as a rude ellipse 900 miles long from east to west by 600 miles wide, with Springfield (the capital of Illinois) as its centre. This region pro- duces annually from 1000 to 1400 millions of bushels, or uearly three-fourths of the total crop of the country.

As an article of food, maize is one of the most extensively used grains in the world. Although rich in nitrogenous matter and fat, it does not make good bread. A mixture of rye and corn meal, however, makes an excellent coarse bread, formerly much used in the Atlantic States, and a similar bread is now the chief coarse bread of Portugal and some parts of Spain. When the harder "flint" varieties are roasted, the grains "pop," the skin bursts, and the white interior swells up, emitting a pleasant odour. It is either baked into cakes called tortilla by the Indians of Yucatan, or made into a kind of porridge, as in Ireland. When deprived of the gluten it constitutes oswego, maizena, or corn flour (see Letheby's Lectures on Food, p. 19; and Moods, by E. Smith, 156). Maize con- tains more oil than any other cereal, ranging from 3°5 to 9°5 per cent. in the commercial grain. This is one of the factors in its value for fattening purposes. In distilling and some other processes this oil is separated and forms an article of commerce. When maize is sown broadcast or closely planted in drills, the ears may not develop at all, but the stalk is richer in sugar and sweeter, and this is the basis of growing "corn-fodder." The amount of forage that may be produced in this way is enormous ; 50,000 to 80,000 tb of green fodder are grown per acre, which makes 8000 to 12,000 ib as field-cured. Sugar and molasses have from time to time been manufactured from the corn stalks, but at present this manufacture is not commercially successful.

In the treeless western prairies maize is often grown for fuel, as in many places fuel can be procured so cheaply in no other way. A hundred bushels of ears is equal in heating power to a cord of the best hard wood, and may be grown for a price less.than a cord of hard wood brings in the large cities. The use of corn in the industries, as the raw material for the manufacture of alcohol, whisky, starch, glucose, oil, and various food

products, increases year by year, with the increase of facilities for production and the increasing applications of chemistry to the arts.

For fuller details see a paper by Professor W. H. Brewer, Yale Col., Conn., from which some of the above details are taken, as well as the Special Report on Cereal Products, Washington, 1882, and the 88th Annual Report of the New York State Agricultural Society, 1878. (Gye)

MAJLATH, Jdnos or Joun, Count (1786-1855), Hungarian historian and poet, was born at Pest on the 5th of October 1786. First educated at home, he subse-

quently studied philosophy at Eger (Erlau) and law at Gyor (Raab), his father, Count Joseph Majlath, an Austrian minister of state, eventually obtaining for him an appointment in the public service. The weakness of his eyesight having rendered it necessary for him a few years later to resign the Government secretaryship to which he had been promoted, Majlath turned his attention to litera- ture, especially devoting himself to historical research, and the translation into German of Magyar folk-tales, and of selections from the works of the best of his country's native poets. Moreover, as an original lyrical writer, and as an editor and adapter of old German poems, Majlath showed considerable talent; and, in general, his activity as an author was remarkable, his various literary produc- tions in German and Hungarian amounting together to more than sixty volumes. During the greater part of his life he resided either at Pest or Vienna, but a few years before his death he removed to Munich, where he fell into a state of destitution and extreme despondency. Seized at last by a terrible infatuation, he and his daughter Henriette, who had long been his constant companion and amanuensis, determined to put an end to their depend- ent position by drowning themselves in the Lake of Starn- berg, a few miles south-west of Munich. This fatal resolu- tion was carried into effect on the 3d of January 1855.

It is gencrally admitted that in his great historical treatises Count Majlath has failed in a critical discrimination between the merely mythical or poetical and the true historical element,—the former not unfrequently being

allowed to unduly influence and obscure the latter. The political tendency of his writings, more- over, has been objected to, especially by his own countrymen, as being too conservative and over-favourable to Austria, Of his his- torical works the most important are the Geschichte der Magyaren (Vienna, 1828-31, 5 vols. ; 2d ed., Ratisbon, 1852-53), and his Gesehiehte des dsterreiehisehen Kaiserstaats (Hamburg, 1834-50, 5 vols.). Specially noteworthy among his metrical translations from the Hungarian are the Magyarisehe Gedichte (Stuttgart and Tiibingen, 1825) ; and Himfy's auserlesene Liebeslieder (Pest, 1829 ; 2d. ed., 1831; see KisraLupy, SANDOR). A valuable contribution to folk-lore appeared in the Magyarisehe Sagen, Aldrehen, und Erzihlungen (Brinn, 1825 ; 2d ed., Stuttgart and Tubingen, 1837, 2 vols. ue

MAJOLICA. See Porrery.

MAJOR, or Marr, Joun (c. 1470-1550), a theological and historical writer, was born at the village of Cleghorn, near North Berwick, Scotland, about the year 1470. After a short period spent at Cambridge, he entered the university of Paris in 1493, studying successively at the colleges of St Barbe and Montaigu, and graduating as master of arts in 1496. Promoted to the doctorate in 1505, he lectured in philosophy at Montaigu College for some time, and had several distinguished auditors. From 1518 to 1522 he held the office of principal in the university of Glasgow, John Knox being among the number of those who attended his lectures there; he was afterwards removed to St Andrews, where George Buchanan was one of his pupils in 1525. He appears again to have returned to France for some time, but we find him once more at St Andrews in 1530, where he was head of St Salvator's College from 1533 until his death, which took place about 1550.

He wrote In Libros Sententiarum eommentarius, Paris, 1509- 19; De Historia Gentis Seotorwm libri sex, Paris, 1521; Commen- tarius in Physica Aristotelis, Paris, 1526 ; and In Quatuor Evan- gelia Expositiones Lueulente, Paris, 1529. By Knox he is spoken of as having been in his day an oracle in religious matters ; and it has been conjectured that both the great Reformer and Buchanan were largely indebted to him for their advanced opinions on politi- cal and ecclesiastical questions. His writings do not now, however, possess any intercst or importance apart from this

circumstance; and even Buchanan has allowed himself to speak of his old pre- ceptor as “ Joannes solo cognomine major.”

MAJORCA. See Batearic ISLANDs.

MAJORIANUS, Jutrus Vaterius, emperor of the West from 457 to 461, was the successor of Avitus. He

had been a distinguished soldier under Aetius, and also after the death of that general; for his election to the purple he was indebted to the powerful Count Ricimer, patrician of Rome. To put a stop to the harassing incur- sions of the Vandals he, in 458, resolved to lead an expedi- tion against Genseric himself; for this purpose he got together a large army, composed chiefly of barbarians, and, passing the Alps in November 458, made Lyons, and afterwards Arles, his headquarters until the preparations for the invasion of Africa had been completed. Having during his stay in Gaul succeeded in pacifying Theodoric, he, in the beginning of 460, crossed the Pyrenees for the purpose of joining his armament at Carthagena. Glenseric, however, after all overtures for peace had been rejected, succeeded through the treachery of certain officers in surpris- ing the Roman fleet, most of the ships being either taken or destroyed. Majorianus returned at once to Gaul, where he made peace with Genseric in the following year. Soon afterwards, while at Tortona in Lombardy, he was sur- rounded by partisans of Ricimer, and compelled to abdicate (August 2, 461). He died, most probably by violence, five days afterwards, and was succeeded on the throne by Severus. He was the author of several laws, which, “remarkable for an original cast of thought and expression, faithfully represent the character of a sovereign who loved his people, who sympathized in their distress, who had studied the causes of the decline of the empire, and who was capable of applying (as far as such reforma- tion was practicable) judicious and effectual remedies to the public disorders” (Gibbon, Decline and Fall, chap.

39).

MAKALLA, or MACULLA, a port on the south coast of Arabia, in 14° 31’ N. lat. and 49° 13’ E. long. The town, which appears to be of no great

antiquity, is described by Wellsted as built on a low projecting point, with many lofty and substantial houses, and a suburb of huts, chiefly inhabited by slaves, Somalis, and Arab sailors, on the slopes leading up to a lofty chalk-hill (Jebel el-Kdra) which overhangs the town. The Arab inhabitants are of the Beni 'Isd tribe. The Somali traders do not settle perman- ently in Makalla, but they form an important element in the population. There are also Indian residents (Banians). The harbour is good, and the town, which may be regarded as the port of Hadramaut, rose during the decline of. Aden to the rank of the chief emporium between India and the Somali coast. It still exports, among other productions of Hadramaut, tobacco, mother-of-pearl, and incense to Jeddah and shark fins to India, but has lately declined in the general transformation of the character of the Eastern trade. According to the latest Arabic accounts (see Badger in the Academy, March 4, 1882), the town contains about a thousand houses. Makalla is governed by a prince or nakib who is esteemed one of the chief minor potentates of that coast. The present prince Salah el-Kesidi has made himself quite independent of the sur- rounding Bedouins, and is even reported to have made conquests in the interior.

MAKKARI. Abu'l-Abbas Ahmed ibn Mohammed el- Makkart, Arabic historian, was born at Tilimsdn (Tlemcen) in Algeria, towards the close of the 16th century, and studied at Fez, where he remained occupied with literary pursuits till, for some unknown cause, he was driven into exile and, after visiting Mecca, settled in Cairo. In 1628 he came to Damascus after a pilgrimage to Jerusalem. Warmly received by the scholars there, he delivered lec- tures on the traditions of the Prophet, and in the evenings entertained his friends with stories of the glories of Moslem Spain, a subject of interest to all Arabs, and especially to those of Syria. His friends made him promise to reduce his narrative to writing, and on returning to Cairo he

devoted three years to this task. He had divorced his wife and made other preparations to settle definitively in Damascus when death overtook him in 1631.

Makkary's great work, The Breath of Perfume from the Braneh of Green Andalusia, and Memorials of its Vizier Lisdn el-Din ibn el Khatib, consists,

as the name indicates, of two parts. The first is a general history and description of Mohammedan Spain, mainly in the form of analecta from a number of authors, with many verses interspersed. This part, which is of great historical value, was published in an (incomplete) English version by P. de Gayangos (London, 1840-43) and in Arabie by Wright, Krehl, Dozy, and Dugat (Analeetes sur Vhistoire et la littérature des Arabes @ Espagne, Leyden, 1855, 1856, 1858, 1861). An edition in four volumes, published at Cairo (1868), contains also (in vols. iii. and iv.) the life of the famous statesman and author Lisan el-Din, vizier of Granada (ob. 1874). Further references to literature are given by Pertsch, Arab. Hdsehr, xu Gotha, No. 1697. Among other works of Makkari a commentary on the prolegomena of Ibn Khaldun is mentioned (H. Kh., 8043). ;

MAKO, a corporate town of Hungary, and capital of the trans-Tisian county of Csandd, is situated near the right bank of the Maros, about 15 miles east-south-east of Szeged, in 46° 13' N. lat, 20° 28' E. long. The town consists of the three wards of Bujak, Szeut-Lorinez (Saint- Lawrence), and Ujvaros (New Town), aud has, besides the usual official buildings connected with the administration of a county, Roman and Greek Catholic, Lutheran, and Calvinist churches, and a synagogue; also an elegant (Calvinist) gymnasium, the bishop of Csanad's palace and gardens, royal and circuit courts of law, barracks, tax and salt offices, a timber trading agency, a manufactory of agricultural implements, and numerous mills. The sur-rounding country is fertile. The communal lands are extensive, and afford excellent pasturage for horses and sheep, as also for large herds of horned cattle, for the size and quality of which Maké has obtained a high repute. An abundance of fish and aquatic fowl is supplied by the Maros, the water of which river is used also for drinking purposes, that from the wells being unpalatable. The town is protected from inundations of the Maros by a powerful dike, but the commune nevertheless sometimes suffers during the spring floods (see Huncary, vol. xii. p. 363). The population, which is chiefly agricultural, amounted in 1880 to 30,077," mostly Magyars by nationality. A great part of the business of the town is in the hands of Jews.

MAKRIZI. Taki el-Din Ahmed ibn 'AI el Makrizf (13642-1441), one of the most meritorious of Arabic historians and archwologists, was descended on both sides from families of scholarly distinction. His hereditary surname of

Makrizf, by which he is usually known, was derived from Makriz, a suburb of Ba‘lbek, with which town his paternal ancestors had been connected. Taki el-Din himself was born in Cairo, and spent his life mainly in Egypt, where he was brouglit up as clerk in a Govern- ment office, and at a later date he became Mohtesib (a sort of police officer in charge of the markets) for Cairo and northern Egypt, and afterwards inspector of the Kaldnest foundation at Damascus. He declined the post of cadi in the latter town. He was, however, mainly engrossed in scholarly pursuits as a traditionist and a jurisconsult, but especially as an indefatigable student of history. He is reproached by his contemporaries for a somewhat inordinate zeal in theological controversy, but otherwise passed a quiet and uneventful life. Makrizi’s literary activity was very great; he was not a man of original power, and his books are largely compilations, in which he is not always scrupulous in naming the sources to which he is indebted, but his learning was vast, his observation accurate, and his

1 Roman Catholics, 11,178 ; Greek Catholics, 1456 ; Greek Eastern Church, 50; Calvinists, 15,492; Lutherans, 445 ; Jews, 1452; Unitarians, 4,

? The year of his birth is variously given as 760, 7 66, 769 a.H.; but 766 a.H. (1364 a.D.) is the date best authenticated,

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judgment sagacious. His most important work is the historical and topographical description of Egypt (#/- Mawé iz woll-I’tibar fi dhokr el-Hitat wa’l-Athdr), of which an edition in 2 vols. folio has appeared at Bulak (1270 A.u., 1854 a.p.). This is in many respects a monumental work; the elaborate description of medizval Cairo is of unique interest.! It has enjoyed a great reputation, having even been translated into Turkish.

Besides this work Makriz{ wrote a variety of other books bearing on Egypt. The unfinished Mukaffd is a vast alphabetical cyclopedia of Egyptian biography ; three volumes of the author’s autograph are at Leyden (pcccxx of the printed catalogue), and one is at Paris. He also wrote three works on the history of Egypt under the Moslems. Animperfect copy of the second in the author’s autograph, containing the history of the Fatimites, is at Gotha (Pertsch, No. 1652; Kose- garten, Chrest., p. xvii.), while the third (history

of the Ayyubite and Mameluke sovereigns) has been in great part translated by Quatremére (Histoire des Sultans Mamlouks de l Egypte, 2 vols., 1837-45). Ofa biographical dictionary of Makrizi's contemporaries one autograph volume is preserved at Gotha (No. 1771). A number of minor works of our author are known in Europe in MS., and several have been published, viz., on the Moslems in Abyssinia, by Rink, 1797; on Mohammedan Coinage, by Tychsen, 1797, and French translation by De Sacy, 1797; on Arab Weights and Measures, by Tychsen, 1800; on the Arabic Tribes that Migrated to Egypt, by Wuestenfeld, 1847 ; History of Hadramaut, by Noskowy, 1866. Ofa great work on the earliest history of the Arabs part at least is still known in Egypt.

For further details as to Makrizi and his writings sce the con- temporary biographies published by De Sacy (Chrest. Arabe) and Hamaker (Spee. Oat. Cod. Lugd. Bat.), and the introduction to Quatremére's work alrcady named.

MALABAR, a district in the Madras presidency, Iudia, between 10° 15' and 12° 18' N. lat., and 75° 14' and 76° 52' E. long., is bounded on the N. by South Kanara, on the E. by Coorg, the Nilgiri hills, and Coimbatore district, on the 8. by Cochin and Travancore states, and on the W. by the Arabian Sea. The extreme length is 145 miles, while the breadth varies from 25 miles in the north to 70 miles in the south ; the area is 5763 square miles. Mala- bar is singularly diversified in its configuration ; from the eastward, the great range of the Western Ghats, only interrupted by the Palghat gap, looks down ona country broken by long spurs, extensive ravines, dense forests, and tangled jungle. To the westward, gentler slopes and downs, and gradually widening valleys closely cultivated, succeed the forest uplands, till, nearer the seaboard, the low laterite table-lands shelve into rice plains and backwaters fringed with cocoa-nut palms. The coast ruus in a south-easterly direction, and forms a few head- lands aud small bays, with a natural harbour in the south at Cochin. In the south there is considerable extent of table-land. The mountains of the Western Ghats run almost parallel to the coast, and vary from 3000 to 7000 feet in height. One of the most striking features in the country is the Palghat gap, a complete opening in the Western Ghats some 25 miles across. The chief rivers are the Beliapatam, Kota, Mahe, Beypur, Kadelundi, and Pondni. One of the most

characteristic features of Malabar is an all but continuous chain of lagoons or backwaters lying parallel to the coast, which have been formed by the action of the waves and shore currents in obstructing the waters of the rivers. Of these backwaters the most important are the Kavai and Beliapatam in the north, the Payangadi, Quilandi, and Elatur in the middle, and the Chetwai and Kodungalir in the south. Connected as they are by artificial canals, they form a cheap and abundant means of transit ; and a large local trade is carried on by inland navigation. Fishing and fishcuring is an important

1 Various extracts have been published in Europe, e.g., the History of the Copts, in Arabic and German, by Wuestenfeld (Gétt., 1845). For other extracts, list of MSS., &c., see Pertsch, Arab. Hand-

ee xu Gotha, No. 1675 ; and Cat. Codd. MSS. Or. Mus. Brit.,

industry, the value of the exports of salt fish to Ceylon being about £20,000 per annum. The forests are extensive and of great value, but they are almost entirely private property. The few tracts which are conserved have come into Government hands by éscheat or by contract. Wild animals include the elephant, tiger, panther, bison, sambhar, spotted deer, hog, Nilgiri ibex, hyeena, and bear. Small

game is very abundant.

The census of 1872 returned the population of the district at 2,261,250, namely, Hindus, 1,637,914 ; Mohammcdans, 581,609 ; Europeans, 2579; Eurasians, 5409; native Christians, 32,280; Jains, 31; and "others," 1428. The Moplas or Mapilas, who form a leading section of the Mohammcdans, are the descendants of Malayalam converts to Islam, mainly confined to the coast tract. They are fanatical and bigoted, and thcir outrages, partly fanatical and partly agrarian, have for long been a distinct feature in Mala-bar history. Many of these outbreaks have necessitated the use of Enropean troops for their suppression. A few Syrian Chris- tians are found in the south of the district, where they have one church. The Roman Catholics have several churches and villages, the chief occupation of the people being

fishing and cultivating vegetables. The existing Roman Catholic mission dates from 1656, having been founded by the Carmelites. The Protestant Basel mission, established in 1889, has founded churches and schools at Calicut, Cannanore, Tellicherri, and Palghat, with branch establish- ments at Chombla and Todakel. The native Christian population is steadily increasing, mainly through the conversion of low-caste Hindus, who gain in social position by the change. The five largest towns, which are all municipalities, are Calicut, the capital, popula- tion 48,338; Palghat, 31,115; Tellicherri, 20,479; Cochin, 13,588; and Cannanore (Kanantr) town and cantonment, 10,265.

In 1880-81 926,359 acres were under cultivation, and 2,869,965 were returned as cultivable. Rice, which oceupied 580,281 acres in 1881, forms the principal food crop, but it is also largely imported from neighbouring districts. Other crops are cholam, ragi, chama, gingelly sced, castor-oil seed, gram, coffee, pepper, ginger, arrowroot, cardamoms, chillies, onions, cocoa-nut, areca nut, cinnamon, &c. Cocoa-nut gardens form one of the greatest sources of commercial wealth ; the value of the exported produce from Madras in 1880-81 was £141,800, chiefly from Malabar, this being a decrease of 18 per cent. on the year preceding. Pepper and spices yield over a quarter of a million. As a rule, the peasantry are well off and free from debt. The district is not liable to blight, flood, or drought. When, however, the neighbouring districts to the east suffer from scarcity, Malabar, which ordinarily imports grain, is affected by the prevalence of high prices.

The district is fairly supplied with means of communication, and possesses 400 miles of good metalled roads, besides minor cart tracks. The water communication provided by the backwaters and their canals has already been referred to. The Madras rail- way traverses the southern part of the district for a total dis- tance of 89 miles from Walliar to Beypur. Except cloth weaving, and the making of tiles, bricks, &c., at the mission stations at Calicut and Cannanore, and the weaving of coarse cotton cloths and mats at Palghat, there are no local manufactures worthy of mention. The weaving of calico, which derived its name from Calicut, seems to have altogether died out; while unsuccessful attempts have been made to manufacture canvas at Beypur and silk at Palghat. The principal seats of

commerce are Calicut, Cannanore, Tellicherri, Cochin, Palghat, and Badagara. In 1876- 77 the value of the imports (which were abnormally increased by the famine demand for rice) amounted to £1,765,200, of which £1,118,000 was for rice ; exports £2,466,000, of which £960,000 represented coffee. European banks are represented at Calicut, Cochin, and Tellicherri.

The revenue has largely increased of late years. In 1880-81 the land revenue amounted to £176,062, and the gross revenue to £332,628. The nuinber of pupils connected with the various schools at the same date was 20,971. The principal educational institutions are the provincial school at Calicut, the mission school at Tellicherri, the Palghat high school, and the " Kerala Vidya Sala," recently established by the zamorin, for the instruction of the young noblemen of his family and of other influential persons in the district. Nearly one hundred schools are exclusively confined to Moplas. There are several printing presses at Calicut and Cochin, and at the latter port are published two English and two Malay- alam newspapers. The climate of the district is, on the whole, healthy; the rainfall is heavy, averaging 120 inches a year, of which about 80 inches fall in June, July, and Angust. The tem- perature varies from 60° in December to about 92° in the hot weather in May. The principal diseases are small-pox, dysentery, and fever.

MALACCA. The town of Malacca lies on the south- west coast of the Malay Peninsula, in 2° 14' N. lat. and

102° 12' E. long, It is situated on a small river bearing its name, which separates it into two parts. That on the right bank is occupied by the old Dutch town, and that on the left by the business quarter, which is connected with the former by a small bridge, and is chiefly inhabited by Chinese and native traders. 'The view of Malacca from the harbour is picturesque and pleasing to the eye. From Flagstaff Hill on the left—whose slopes are always of a bright emerald green—to St J vhn's Hill on the right, on which stand the ruins of the old " Dutch redoubt,"—hidden ina mass of wild vegetation,—stretches for a distance of about half a mile a row of spacious dwelling houses belong- ing to European and wealthy Chinese aud Arab

resideuts. These houses are roofed with neat red tiles, and have windows opening to a stone verandah facing the sea. Each house is surrounded by a large "compound," laid out with a flower garden in front and a "plantation " or orchard at the back. Adjoining this European quarter lies a large suburb of native and other dwellings almost concealed in a dense forest of beautiful fruit trees. Behind this we see a prominent green hill, formerly used as a fort, and now as a Chinese burial-gronnd, and beyond this the horizon is hemmed in by a long chain of the Brnong and Rumbow Hills, while far in the extreme east rises the jagged cone of Mount Ophir, blue as sapphire in the distance. Since the destruction (in 1807) of the old Portuguese fort erected by Albuquerque, the "antiquitics" of Malacca are reduced toa mere name. At the foot of Tlagstaff Hill, however, are the remains of the massive wall which surrounded the hill, with an arched and carved gateway. On the summit of the hill, where a fine view is had of the harbour and the Water Islands, are the ruins of the first Christian church planted in Malayan territory, and also a portion of the old convent. At the back of this hill to the right may be noted the barracks, hospital, and convict lines, and vassing under some fine "ansana" trees—the shady elms of the East—we reach the garden of the old Dutch stadthouse, and then a green square, facing which are the court-house and other Government build- ings, and the old Dutch church. All these buildings have sloping roofs covered with small square tiles after the Dutch style of architecture of the 16th century. This is quite a unique example of Dutch domestic architecture in the East, and several of thc adjoining streets still bear their Dutch designation, as "Heren Straat," "Jonker Straat," dc. The stadthouse is approached by a fine flight of stone steps, forming a covered way to the upper rooms. 'These are occupied by the governor of the Straits Settlements and the judge during their annual or biennial visits, and those in the lower story are used as Government offices. From the interesting ruins of the Dutch redoubt on St John's Hill an extensive view may be had of the country running around and to the north and south of Malacca. Its general aspect in the immediate vicinity is that of a flat country covered with luxuriant " dusoons" or plantations of fruit trees, and extensive forests of tall timber ; beyond this is an open country, interspersed with extensive plantations of tapioca, which at a distance resemble fields of clover; then follow rice-fields, and marshes or fens, and at the foot of the hills patches of virgin forest, the whole being walled in by a range of blue hills. The climate

of Malacca is very healthy, and the thermometer in the shade ranges from 72° to 84° or even 90° Fahr. The population, which is not very large, consists of Malays of the surrounding countries, of Malacca Portuguese (the mixed descendants of early Portuguese settlers), of Chinese proper and a large number born of Malay mothers. There is also a sprinkling of natives of India and of Arabs. The Malacca Portuguese employ themselves as fishermen, servants, and clerks; the rest

are chiefly engaged in agricultural and commercial pur- suits,

In consequence of its shallow harbour, Malacca has becn com- pletely outstripped, as a seaport by Singapore and Penang, though it still carries on a brisk trade with the surrounding countries in Malacca canes, stuffed birds of beautiful plumage, poultry, and large quantities of the most luscious fruits. The import and export returns show a large apparent increase in the trade,—the imports in 1880 amounting to $3,817,848 (£812,308), and the exports to $8,634,640, as against an average of $2,505,175 and $2,577,020 re- spectively for 1869-72 ; and, though Malacca has been a drag on the revenue of the colouy generally, a marked inercase is shown in the principal items of revenue, viz., in land rents, tenths in paddy, tapioca, and fruits, royalty on timber, and survey fecs, In 1880 the revenue was $182,323, and the expenditure $174,333, while the income and expenditure of the municipality in the same year were $29,428 and $18,899 respectively. The Government is improving the drainage of the country by clearing its natural water course. The municipality has no debts, and the general progress of the settlement during the year ending 1880 must be regarded as satis- factory, with an increase under almost every heading of revenue that bids fair to continue.

See ©. A. Cameron, Owr Tropical Possessions in Malayan India, and Papers Relating to H. M. Colonial Possessions, 1879-1881.

MALACHI. According to the title (Mal. i. 1) the last

book of the minor prophets contains the word of Jehovah

to Israel by the hand of Malachi. The word spon may either be an adjective, "angelic," or may signify " the angel (messenger) of Jehovah." In either case it seems a strange (though hardly an impossible) name for a man to bear, and from "he time of the Septuagint, which translates "by the hand of His messenger." it has often been doubted whether Malachi is the real name of the author, or only an epithet assumed by himself, or attached by the collector to a work which he found anonymous (so Ewald), with reference to iii. 1.1 A Hebrew tradition given in the Targum of Jonathan, and approved by Jerome, identifies Malachi with Ezra the priest and scribe ; but, though this opinion is ingeniously supported by reference to ii, 7, where the priest and custodian of the law is called the messenger of Jehovah of hosts, it is unlikely that Ezra's name would have been lost had he been the real author.?

The tradition, however, may at least be taken as imply- ing the perception of a real affinity between the prophet and the great restorer of the law. The religious spirit of Malachi's prophecy is that of the prayers of Ezra and Nehemiah. A strong sense of the unique privileges of the children of Jacob, the objects of electing love (i 2), the children of the Divine Father (ii. 10), is combined with an equally strong assurance of Jehovah's righteousness amidst the many miseries that pressed on the unhappy inhabitants of Judea. At an earlier date the prophet Haggai had taught that the people could not expect Jehovah's blessing while the temple lay in ruins. In Malachi's time the temple was built (i. 10) and the priests waited in their office, but still a curse seemed to rest on the nation's labours (iii 9). To Malachi the reason of this is plain. The "law of Moses" was forgotten (iv. 4 [iii 22]); let the people return to Jehovah, and He will return to them. It was vain to complain, saying, "Every one that doeth evil is good in the eyes of Jehovah," or " Where is the God of judgment ?"—vain to ask " Wherein shall we return ?" Obedience to the law is the sure path to bless- ing (ii. 17-iii, 12).

oO ST eee

1 Stade (Z. f. ATliche Wiss., 1882, p. 808; comp. 188], p. 14) thinks that the title in Mal. i. 1 is by the same hand as that in Zech, xii. 1, and that both are

copied from Zech. ix. 1, under the misconception that NW! was to be construed with the following words.

2The LXX. rendering of i. 1 gave rise to strange fancies. Jerome and Cyril mention that some supposed the prophet to have been an angel in bodily form; and the Vite Prophetarum of Pseudo-Epiphanius have a "word-myth" to the effect that his prophecies were regularly contirmed by an angelic apparition, The same book will have it that

Malachi was of the tribe of Zebulon, born in a town Sopha or Sophera, had his name from his great beauty, and died young.

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It is not easy to say whether the law to which Malachi recalls the people is that which was established by the covenant taken under Ezra, or whether the prophet wrote before that event. It is at least the Deuteronomic law that is most familiar to him, as appears from his use of the name Horeb for the mountain of the law, and the Deutero- nomic phrase " statutes and judgments "! (iv. 4), from his language as to tithes and offerings (ill, 8, 10, comp. Deut. xii. 11, xxvi. 12),? and especially from his conception of the priesthood as resting on a covenant with Levi (ii. 4 sq.). The abuses of which he particularly complains are such-as were found rampant by Ezra and Nehemiah, —inarriage with foreign women (ii. 11, comp. Ezra ix., Neh. xiii, 23 sg., Deut. vii. 3) and failure in payment of sacred dues (iii. 8 sqg., comp. Neh. x. 34 sq., xiii. 10 sg., Deut. xxvi. 12 s¢.). Add to this that the position of the priests had fallen into contempt (ii. 9), and that the oral law is still one of their chief trusts (ii. 6 sqg.),and we shall be disposed to conclude that, if Malachi's work did not precede the reformation of Ezra, it must have fallen very little later, and before the new order was thoroughly established. The prophecy of Joel shows the new theocracy in much fuller development.

The object of Ezra and Nehemiah was to establish the law by means of the organs of government under warrant from the Great King. Malachi looks for reformation in another direction. He calls the people to repentance, and

he enforces the call by proclaiming the approach of Jehovah in judgment against the sorcerers, the adulterers, the false swearers, the oppressors of the poor, the orphan, and the stranger. Then it shall be seen that He is indeed a God of righteous judgment, distinguishing between those that serve Him and those that serve Him not. The Sun of Righteousness shall shine forth on those that fear Jehovah's name; they shall go forth with joy, and tread the wicked under foot. The conception of the day of final decision, when Jehovah shall come suddenly to His temple (iii. 1) and confound those who think the presumptuous godless happy (iii. 15), is taken from earlier prophets, but it receives a special character from an application of a thought based on Isa. xl. 3. The day of Jehovah would be a curse not a blessing if it found the nation in its present state, the priests listlessly performing a fraudulent service (i. 7-ii. 9), the people bound by marriage to heathen women, while the tears of the daughters of Israel, thrust aside to make way for strangers, cover the altar (ii. 11-16), all faith in divine justice gone (ii. 17, iii, 14 sg.), sorcery, uncleanness, falsehood, and oppression rampant (ill. 5), the house of God deprived of its dues (iii. 8), and the true fearers of God a little flock gathered together in private exercises of religion (perhaps the germ of the later synagogue) in the midst of a godless nation (iii, 16). That the day of Jehovah is delayed in such a state of things is but a new proof of His unchanging love (iii. 6), which refuses to consume the sons of Jacob. Meantime He is about to send His messenger to prepare His way before Him. The

1 Malachi had the law of Deuteronomy in its present historical frame-work (the opening chapters), according to which all " the laws and statutes" apart from the Decalogue were given to Moses for Israel upon Horeb. This description would not hold good of the ae fo: which accordingly is hardly contemplated in

al. iv. 4,

- *Malachi indeed assumes that the "whole tithe" "—the Deutero- nomic phrase for the tithe in which the Levites shared—is not stored in each township, but brought into the treasury at the temple. But this was a modification of the Deuteronomic law naturally called for under the circumstances of the return from Babylon, and Neh, x. and xill.*

produce the impression that it was not introduced for the first time by Ezra and Nehemiah, though the collection of the tithe was enforced by them.

3 As the "governor" in i. 8 is hardly Nehemiah, Kéhler and other recent writers think of the period between Nehemiah's first and second

visit to Jerusalem, when the evils lai f by e ee Seon : vils complained of by the prophet broke

prophet Elijah must reappear to bring back the hearts of fathers and children before the great and terrible day of Jehovah come. Elijah was the advocate of national decision in tlie great concerns of Israel's religion; and it is such decision, a clear recognition of what the service of Jehovah means, a purging of His professed worshippers from hypocritical and half-hearted service (iii. 3) that Malachi with his intense religious earnestness sees to be the only salvation of the nation. In thus looking to the return of an ancient prophet to do the work for which later prophecy is too weak, Malachi unconsciously signalizes the decay of the order of which he was one of the last representatives; and the somewhat mechanical measure which he applies to the people's sins, as for example when he teaches that if the sacred dues were rightly paid pro- sperous seasons would at once return (iii. 10), heralds the advent of that system of formal legalism which thought that all religious duty could be reduced to a system of set rules. It was left to a greater Teacher to show that hypocrisy and vain religion might coexist with Pharisaic exactness in the observance of the whole letter of the law. Yet Malachi himself is no mere formalist. To him, as to the Deuteronomic legislation, the forms of legal observ- ance are of value only as the fitting expression of Israel's peculiar sonship and service, and he shows himself a true prophet when he contrasts the worthless ministry of unwilling priests with the pure offering of prayer and praise that rises from all corners of the Hebrew dispersion (i. 11), or when he asserts the brotherhood of all Israelites under their one Father (ii. 10), not merely as a ground of separa- tion from the heathen, but as inconsistent with the selfish and cruel freedom of divorce current in his time. It is characteristic of later Judaism that an arbitrary exegesis transformed this anticipation of the doctrine of marriage

laid down in the gospel into an express sanction of the right of the husband to put away his wife at will.4

The style of Malachi, like his argument, corresponds in its generally prosaic character to that transformation or decay of prophecy which began with Ezekiel ; and Ewald has rightly called attention to the fact that the conduct of the argument already shows traces of the dialectic manner of the schools. Yet there is a simple dignity in the manner not unworthy of a prophet, and rising from time to time to poetical rhythm.

The exegetical helps to the study of Malachi are mainly thesameas have been already cited in the article Haccar. Reference mayalso be made to the lengthy commentary of Reinke (Roman Catholic), 1856 ;

to M. Singer, MJaleachi, eine exegetische Studie, 1867 ; and among older commentaries to that of Pococke (2d ed., 1692). (W.R.S.)

MALACHITE, an ore of copper, presenting in its finer varieties a beautiful green colour which has led to its use as an ornamental stone. It is chemically a hydrated basic carbonate of copper, and appears to have been formed in most cases by the action of meteoric agencies on native copper, red oxide of copper, copper pyrites, and other ores. Upon these minerals the malachite frequently forms an incrustation. Although occasionally found in. crystals belonging to the monoclinic system, its usual mode of occurrence isin stalactiticand stalagmitic forms,—frequently with a globular, botryoidal, or mammillated surface ; while in other cases it forms compact and even earthy masses. The stalagmitic varieties display, when fractured, a beauti- ful internal structure, being made up of concentric zones of light and dark tints ; and it is upon this structure that much of the beauty of polished malachite depends. The colours include various shades of apple-green, emerald-

4JTn ii. 16 the Targum renders "If thou hatest her put her away," and this translation seems to be intended by the Massoretic punctuation. We should probably point NJY in the sense of Arabic

makrih, used of actions not illegal but offensive to right feeling.

ereen, and verdigris-green. Certain varieties of the mineral exhibit, when fractured, a finely fibrous texture and soft silky lustre. The name malachite is derived from paraxy (the mallow), in allusion to the resemblance of the colour of the mineral to thatof mallow leaves. Malachite was prob- ably one of the green minerals described by Theophrastus under the general name of opdpaydos, or emerald. It is believed to have been the smaragdus medicus of Pliny, while the molochitis of that author does not appear to have represented our modern malachite. Malachite is a mineral of very wide geographical distribution, being found more or less abundantly in the upper part of most deposits of copper ore. 'The finer varieties, such as lend themselves ' to purposes of ornament, are, however, found only in Siberia, in Australia, and at Bembe on the west coast of Africa. Probably the finest deposits in the world were those discovered some years ago in Prince Demidoff's mines at Nijni Tagilsk, in the government of Ekaterinburg, on the Siberian side of the Ural mountains. The mineral is highly prized in Russia for use in mosaic work, and for the manufacture of vases, snuff-boxes, and other sinall ornaments. Magnificent examples of malachite work, in the shape of mantelpieces, folding doors, tables, chairs, and other articles of furniture, have occasionally been executed. Such objects are veneered with thin slabs of malachite ingeniously fitted together so as to preserve tlie pattern, and having the interspaces between the com- ponent pieces filled up with a cement formed of small fragments of the malachite itself, The mineral is sawn into slabs, ground smooth with emery, and finally polished with tripoli. Although its degree of hardness is only from 3°5 to 4, it takes an excclent polish. It is rather denser than marble, its specific gravity being 3°7 to 4; but it is much more difficult to work, in consequence of its tendency to break along the planes of deposition. Malachite is occasionally used for cameo-work, but not with great success; some fine antique cameos in malachite are, however, known. The mineral has also been ground to powder, and used as a pigment under the name of mountain- green. The coarser masses are extensively used as ores of copper, malachite containing about 57 per cent. of metal. The mineral called azurite or chessylite, a hydrated basic carbonate of copper closely resembling malachite, save in colour, is occasionally knowu as blue malachite. MALACHY, Sr (c. 1094-1148), otherwise known as Maelmaedog

Ua Morgair, for some time archbishop of Armagh, and afterwards papal legate in Ireland, was born of noble parentage at Armagh about the year 1094, early gained a high reputation for sanctity, and was ordained to the priesthood at the age of twenty-five (thirty being at that time, according to his biographer St Bernard, the canonical age). For some time he was employed as vicar by Archbishop Celsus or Ceallach of Armagh, and in this capacity was successful in effecting throughout the diocese many important reforms in the direction of increased con- formity with the usage of the Church of Rome ; afterwards he undertook the government of the decayed monastery of Bangor or Benchor, in what is now known as county Down, and made it a flourishing seminary of learning and piety. When thirty years of age he was chosen and consecrated bishop of Connor ; after the sack of that place by the king of Ulster he withdrew into Munster and built the monastery of Ibrac. Meanwhile he had been designated by Celsus (in whose family the see of Armagh had been hereditary for many years) to succeed him in the archbishopric ; reluctantly but dutifully in the interests of reform he accepted the dignity, and thus became involved for some years in astruggle with the so-called heirs. Having finally settled the diocese he, as had been previously stipulated by himself, was permitted to return to his former diocese,

old or rather, it having in the meanwhile been divided, to the smaller and poorer portion of it, the bishopric of Down, where he reorganized a house of regular clergy. In 1139 he set out from Ireland with the purpose of soliciting from the pope the pallium for the archbishop of Armagh; on his way to Rome he visited Clairvaux, and thus began a life-long friendship with St Bernard, who survived to write his biography. Malachy was received by Innocent II. with great honour, and made legate in Ireland, though he did not at once obtain the pallium ; on his way homeward he revisited Clairvaux, and took with him from thence four members of the Cistercian order, by whom the abbey of Mellifont was afterwards foundedin 1141. For the next eight years after his return from Rome Malachy was active in the discharge of his legatine duties, and in 1148 he received from the bishops of Ireland a commission to return to Rome and make fresh application for the pallium ; he did not, however, get beyond Clairvaux, where he died on November 2, 1148. The object of his life was realized four

years afterwards, in 1152, during the legateship of his successor (see [RELAND, vol. xiii. p. 255). Malachy was canonized by Clement IV.

MALAGA, a maritime province of Spain, one of the eight modern subdivisions of Andalucia, is bounded on the W. by Cadiz, on the N. by Seville and Cordova, on the E. by Granada, and on the S. by the Mediterranean, having an area of 2823 square miles, and a population (1877) of 500,231. The rise from the sea is rapid, and the average elevation of the province is considerable. Of the numerous sierras may be mentioned that of Alhama, separating the province from Granada, and at one point rising above 7000 feet; its westward continuation in the Sierra de Abdalajis and the Axarquia between Antequera and Malaga; and not far from the Cadiz boundary the Sierras de Ronda, de Mijas, de Tolox, and Bermeja, converging and culminating in a suinmit of nearly 6500 feet. The principal river is the Guadalhorce, which rises in the Sierra de Alhama, and after a westerly course past the vicinity of Antequera, bends southward through the wild defile of Pefiarrubia and the beautiful vega or vale of Malaya, falling into the sea near that city. The only other considerable stream is the Guadiaro, which has the greater part of its course within the province, and flows past Ronda. The mountains are rich in minerals,—lead, nickel, and (in the neighbourhood of Marbella) iron being obtained or obtainable in large quantities. There are much frequented warm springs of sulphuretted hydrogen at the baths of Carratraca. Though the methods of agriculture are for the most part rude, the yield of wheat in good seasons is considerably in excess of the local demand; and large quantities of grapes and raisins, oranges and lemons, figs and almonds, are annually exported. The oil and wines of Malaga are also highly esteemed ; and in recent years, especially since the phylloxera invasion, the growth of the sugar- cane has developed into a considerable industry. In 1880 the total production of wine within the province was estimated at about 5,250,000 gallons; of this amount about 1,575,000 gallons were exported (1,000,000 gallons to Great Britain and the continent of Europe, and the remainder chiefly to South America and the Spanish colonies). In 1879 about 1,400,000 gallons of olive oil were exported, chiefly to the Baltic. The sugar produced in 1880 was calculated to amount to about 5650 tons. The internal communications of the province are in many parts, owing to the broken nature of the surface, very defective ; it is traversed, however, from north to south by the Cordova-Malaga

Railway, which sends off a branch, recently made continuous, from Bobadilla to Granada. The only towns with a population exceeding 10,000 are Malaga (the capital), Antequera, Ronda, and Velez Malaga,

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Maxaca, the capital of the above province, and, next to Barcelona, the most important seaport of Spain, is finely situated on the Mediterranean coast, at the southern base of the group of hills known to history as the Axarquia, and at the eastern extremity of the fertile vega of Malaga (36° 43' N. lat., 4° 25' W. long.). The popula- tion in 1877 was 115,882. In the clearness of its sky, which a cloud rarely obscures, and the beautiful sweep of its bay, Malaga has sometimes been compared to Naples. The climate is one of the mildest and most equable in Europe, the mean annual temperature being 66°°7 Fahr. (55°°6 in winter, 80°'4 in summer) ; the yearly average of rainy days is thirty-nine, and the rainfall is slightly under 16 inches. The town lies principally on the left bank of a mountain torrent, the Guadalmedina ("river of the city"); the streets near the sea are spacious and compara- tively modern, but those in the older part of the town, where the buildings are huddled around the ancient citadel, are narrow, winding, and often dilapidated. There are various squares or plazas and public promenades: of the former the most important are the Plaza de Riego

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(containing the monument to General Torrijos, who, along with forty-eight others, was executed in Malaga in 1831) and the Plaza de la Constitucion; adjoining the quay is the fine Paseo de la Alameda. The town has no public buildings of commanding importance architecturally or historically. The cathedral, on the site of the ancient mosque, was begun about 1528, in the

Graeco-Roman style ; after the works had been once and again interrupted and resumed, it was completed to its present state in the 18th century, and is in consequence an obtrusive record of the degeneration of Spanish architecture. The woodwork of the choir, however, is worthy of attention. The church of El Cristo de la Victoria contains some relics of the siege by the "Catholic kings." Of the old Moorish " Atarazanas" or arsenal only a single horse-shoe gateway now remains, the rest of the site being chiefly occupied by an iron structure used as a meat and provision market; the "Alcazaba" or citadel has entirely disappeared. The castle of Gibralfaro, on a bold eminence to the north-east, dating from the 13th century, is still in fairly good preservation. The harbour, which in the beginning of the present century was deep enough to float a line-of- battle ship, has in recent years been permitted to silt up, so that it is not now safe for vessels drawing more than 18 feet to enter. These are consequently obliged to lie in the roads outside, and receive and discharge cargo by

2. Custom House. | 4, Hospital.

means of lighters. New harbour works were begun in 1880, but from time, to time have been suspended, and only some 280 yards of the new eastern mole (about one- fourth of the intended length) have been constructed in October 1882. The trade of the port is chiefly in the products of the province,—lead, wine, raisins, oranges, lemons, figs, and esparto being the staples. The most active period is from the middle of August to the end of October. In 1880 the total quantity of muscatel raisins exported was estimated at 1,864,000 boxes (of 25 ib each), 35,500 frails (of 25 Ib), and 15,000 barrels (of 50 tb); of this amount more than half was sent to the United States of America, and the remainder to other countries (chicfly Great Britain, France, and Germany). In the same year 50,000 boxes of lemons and 21,500 boxes of oranges were shipped, besides 20,000 barrels of muscatel grapes. The wine ex- ported in 1879 was only 1,400,000 gallons as against 3,108,000 in 1878; the lead 310,251 cwts. as against 481,021 cwts. in 1878. The olive oil is sent chiefly to the Baltic. The principal imports are coal (41,822 tons in 1878), codfish, timber, pig-iron, hardware, machinery, and rails.

Malaga is the MéAaka of Strabo (iii. 156) and Ptolemy (ii. 4, 7), and the Malaca federatorum of Pliny (iii. 3). The place seems to have been of some pspetians even during the Carthaginian period ; under the Romans it became a municipium, and under the Visigoths an episcopal see. After the battle of Guadalete it passed into the possession of the Arabs, and soon came to be regarded as one of the most important cities of Andalucia. It was attached to the caliphate of Cordoba, but on the fall of the Omayyad dynasty it became fora short timc the capital of an independent kingdom ; afterwards it was dependent on Granada. In 1487 it was taken and treated with great harshness by Ferdinand and Isabella after a protracted siege. In 1810 it suffered much from the French general Sebastiani.

MALARIA, an Italian colloquial word (from mala, bad, and aria, air), introduced into English medical literature by Macculloch (1827) as a substitute for the more restricted terms marsh miasm or paludal poison. By very general consent the word is understood to mean an actual poisonous

- substance existing as a separate entity, and giving rise to the

definite unhealthy condition of body known by a variety of names, such as ague, intermittent (and remittent) fever, marsh fever, jungle fever, hill fever, ‘fever of the country,” and “fever and ague.” By a figure of speech, the name of malaria is often applied to the disease itself; strictly speaking, the effects on the human body are ‘malarial fever,” or manifestations of the “malarial process.” The existence of a specific malaria-poison is a pure hypo- thesis ; and it has becn attempted by a respectable minority to dispense with the hypothesis of an actual poisonous agent, and to find the cause of intermittents and remittents in the excessive and sudden abstraction of heat through damp and cold after sunset from the bodies of individuals who had previously endured great solar heat. In either view, the unknown cause of ague is denoted with sufficient etymological accuracy by the word malaria.

A single paroxysm of simple ague is much the same in all countries, temperate, subtropical, or tropical. It may come upon the patient in the midst of good health, or it may be preceded by some malaise. The ague-fit begins with chills proceeding as if from the lower part of the back, and gradually extending until the coldness overtakes the whole body. Tremors of

the muscles, more or less violent, accompany the cold sensations, beginning with the muscles of the lower jaw (chattering of the teeth), and extending to the extremities and trunk. The expression has meanwhile changed: the face is pale or livid; there are dark rings under the eyes; the features are pinched and sharp, and the whole skin shrunken; the fingers are dead white, and the nails blue. All those symptoms are referable to spasmodic constriction of the small surface arteries, the pulse at the wrist being

itself small, hard, and quick. In the interior organs tlre are indications of a compensating accumulation of blood, such as swelling of the spleen, engorgement (very rarely rupture) of the heart, with a feeling of oppression in the chest, and a copious flow of clear and watery urine from the congested kidneys. The body temperature will

have risen suddenly from the normal to 103° or. higher.

This first or cold stage of the paroxysm varies much in length; in temperate climates it lasts from one to two hours, while in tropical and subtropical countries it may be shortened. It is followed by the stage of dry heat, which will be prolonged in proportion as the previous stage is curtailed. The feeling of heat is at first an internal one, but it spreads outwards to the surface and to the extremities; the skin becomes warm and red, but remains dry; the pulse becomes softer and more full, but still quick ; and throbbings occur in exposed arteries, such as the tem- poral. The spleen continues to enlarge; the urine is now scanty and high-coloured ; the body temperature still rises (up to 104° or 105° or even higher); there is considerable thirst ; and there is the usual intellectual unfitness, and it may be confusion, of the feverish state. This period of dry heat, having lasted three or four hours or longer, comes to an end in perspiration, at first a mere moistness of the skin, passing into sweating that may be profuse and even drenching. Sleep may overtake the patient in the midst of the sweating stage, and he awakes, not without some feeling of what he has passed through, but on the whole well, with the temperature fallen almost or altogether to the normal, or it may be even below the normal, the pulse moderate and full, the spleen again of its ordinary size ; the urine that is passed after the paroxysm deposits a thick brick-red sediment of urates. The three stages together will

probably have lasted six to twelve hours. The paroxysm is followed by a definite interval in whicl there is not only no fever, but even a fair degree of bodily comfort and fitness; this is the intermission of the fever. Another

paroxysm begins at or near the same hour next day

(quotidian ague), or the interval may be forty-eight hours (tertian ague), or seventy-two hours (quartan ague). It is the general rule, with frequent exceptions, that the quotidian paroxysm comes on in the morning, the tertian about noon, and the quartan in the afternoon. Another rule is that the quartan has the longest cold stage, while its paroxysm is shortest as a whole; .the quotidian has the shortest cold stage and a long hot stage, while its paroxysm i3 longest as a whole. The point common to the various forms of ague is that the paroxysm ceases about midnight or early morning. Quotidian intermittent is on the whole more common than tertian in hot countries; elsewhere the tertian is the usual type, and quartan is only occasional.

If the first paroxysm should not cease within the twenty-four hours, the fever is not reckoned as an inter- mittent, but as a remittent.

Remittent is a not unusual form of the malarial process in tropical and subtropical countries, and in some localities or in some seasons it is more common than intermittent. It may be said to arise out of that type of intermittent in which the cold stage is shortened while the hot stage tends to be prolonged. A certain abatement or remission of the fever takes place, with or without sweating, but there is no true intermission or interval of absolute apyrexia. The periodicity shows itself in the form of an exacerbation of the still continuing fever, and that exacerbation may take place twenty-four hours after the first onset, or the interval may be only half that period, or it may be double. A fever that isto be remittent will usually declare itself from the outset: it begins with chills, but without the shivering and shaking fit of the intermittent; the hot stage soon

follows, presenting the same characters as the prolonged hot stage of a quotidian, with the frequent addition of bilious symptoms, and it may be even of jaundice and of tenderness over the stomach and liver. Towards morning the fever abates ; the pulse falls in frequency, but does not come

down to the normal; headache and aching in the loins and limbs become less, but do not cease altogether ; the body temperature falls, but does not touch the level of apyrexia. The remission or abatement lasts generally throughout the morning ; and about noon there is an exacer- bation, seldom ushered in by chills, which continues till the early morning following, when it remits or abates as before. A patient with remittent may get well in a week, under treatment, but the fever may go on for several weeks ; the return to health is often announced by the fever assuming the intermittent type, or in other words, by the remissions touching the level of absolute apyrexia. Remittent fevers (as well as intermittents) vary considerably in intensity; some cases are intense from the outset, or pernicious, with aggra- vation of all the symptoms—leading to stupor, delirium, collapse, intense jaundice, blood in the stools, blood and albumen in the urine, and, it may be, suppression of urine followed by convulsions. The severe forms of intermittent are most apt to occur in the very young, or in the aged, or in debilitated persons generally. Milder cases of malarial fever are apt to become dangerous from the com- plications of dysentery, bronchitis, or pneumonia. Severe remittents (pernicious or bilious remittents) approximate to the type of yellow fever, which is conventionally limited to epidemic outbreaks in western longitudes and on the west coast of Africa. Blood in the urine has been described by several recent writers as distinctive of a form of bilious remittent occurring at a number of malarious localities in the tropical zone of both hemispheres. The remittent type occurs wherever and whenever the malarial conditions are severe; when it has appeared in colder climates, it has usually been at the height of an epidemic of intermittent. With all the foregoing statements, it should be borne in mind that anomalies are frequent.

Of the mortality due to malarial disease a small part only is referable to the direct attack of intermittent, and chiefly to the fever in its pernicious form. Remittent fever is much more fatal in its direct attack ; it often kills in the first few days, according to its initial intensity or the severity of the complications. But probably the greater part of the enormous total of deaths set down to malaria is due to the malarial cachexia. The malarial cachexia may be either the sequel of one or more actual attacks of fever, or it may arise insidiously in those who inhabit a malarious district and have never experienced the sharp paroxysms of fever. In the latter case, malaria is

almost as much an ethnological as a pathological factor. The dwellers in a malarious region like the Terai (at the foot of the Himalayas) are miserable, listless, and ugly, with large heads and particularly promineut ears, flat noses, tumid bellies, slender limbs, and sallow complexions; the children are impregnated with malaria from their birth, and their growth is attended with aberrations from the normal which practically amount to the disease of rickets. The malarial cachexia that follows definite attacks of ague consists in a state of ill-defined suffering, associated with a sallow skin, enlarged spleen and liver, and sometimes witli dropsy.

Nearly allied to the malarial cachexia is the so-called state of masked ague. Many common ailments have been set down to malaria, without sufficient reason; but there is hardly any doubt that intermittent paroxysms of neuralgia, especially of the supra-orbital nerve (brow-ague) and of the infra-orbital (tic dowlowreux), are often malarial in origin. These non-febrile effects are apt to follow

exposure to malaria; they occur (not exclusively) in those who have had fever and ague; they are sometimes accom- panied by suggestions of the cold, and hot, and sweating stages of the true paroxysm ; and they often yield to the great anti-malarial remedy, quinine. Such patients have the general ill-health and suffering, as well as the pallor, of the malarial cachexia.

The morbid anatomy of malarial fevers is chiefly confined to congestions and enlargements (with textural changes) of the spleen and liver. One of the most salient patho- logical facts is the occurrence of black pigment in the blood, and deposits of it in the spleen, liver, and other parts. The malarial process sometimes leads to ulcera- tions and sloughing of the mucous membrane of tlie great intestine, not distinguishable from those of dysentery. The malarial fever of Rome is often associated with more or less of swelling and, it may be, even ulceration of the lymphatic follicles of the small intestine, as in typhoid fever ; the same anatomical condition was associated with much of the malarial fever of the American Civil War (typho-malaria).

Geographical Distribution and Prevalence.—Malaria has been estimated to produce one-half of the entire mortality of the human race; and, inasmuch as it is the most frequent cause of sickness and death in those parts of the globe that are most densely populated, the estimate may be taken as at least rhetorically correct.

In the British Islands, sporadic cases of ague may occur anywhere ; but malaria is not now endemic except in a few localities, among which may be mentioned certain parishes on the Essex side of the Thames estuary. In France there are several districts that are still notoriously malarious. In the interior these are chiefly found in the valley of the Loire (Sologne) and of its tributary the Indre (Brenne), and also in the valley of the Rhone, more particularly near the confluence of the Sadne (Dombes, Bresse). [France has two great coast regions of malaria,—the one on the Atlantic seaboard, from the estuary of the Loire to the Pyrenees, with especial intensity in the Charente, and the other on the Mediterranean coast, from the Pyrenees to the Rhone delta. The most con- siderable malarious district of Switzerland is in the Rhone valley from Sion to the Lake of Geneva. In Germany, the upper valley of the Rhine and the sources of the Danube have a certain character for malaria; but it is chiefly on the western seaboard of Schleswig-Holstein and in the moors and marshes of Oldenburg, Hanover, and Westphalia that the disease is endemic. Scarcely any province of Holland can be said to be quite free from it, while Gréningen, Friesland, and Zealand (with brackish marshes) are the most unhealthy. The parts of Belgium that are almost or altogether exempt are the high-lying districts of Brabant, Namur, and Liége. In Sweden, malaria is endemic in the central depression of the country (especially on the shores of Lake Wener), and it has of late years spread northwards in epidemic outbreaks. For the countries of southern and eastern Europe (Spain and Portugal, Italy, Hungary and other Danubian states, Turkey, Greece, southern Russia), the language used to describe the prevalence of malaria has to be pitched ina somewhat higher key. There are certain pestilential districts of those countries where almost the half of the population suffers from ague, and there are even limited areas which are too malarious to be inhabited. The lower basin of the Danube (from above Vienna to the Black Sea), and the basin of its tributary the Theiss, are in the first rank. Both sides of the Adriatic have malarious localities, the chief being the delta of the Po and

the Gulf of Com- acclo; among other unhealthy parts of Italy are the strip of coast from Pisa to Civita Vecchia (Maremma), the

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Roman Campagna, the Pontine Marshes, the neighbourhood of Capua, and the Neapolitan and Calabrian coasts. Sicily is highly malarious, both in the plains and in the higher districts; and that is equally the character of Sardinia, Corsica, and the Balearic Isles. Greece, the Yonian Islands, and Crete take a high place among European malarious countries; there are also numerous unhealthy localities on the shores of the Caspian and Black Seas and in Asia Minor. For countries in both hemispheres sitnated between 35° N. and 20° §., to describe the prevalence of malaria in detail would be practically to give the whole geography within those lati- tudes. The regions of special intensity are the west coast of Africa, the American seaboard (with the West Indies) from the Gulf of Mexico to Pernambuco, parts of India (the Terai, the Doab, the Sunderbunds), parts of Sumatra, of Java, and of Borneo. Gibraltar, Malta, Aden, Singa- pore, and Manila enjoy a comparative immunity from fever; the healthiest islands of the West Indies are Barbados, St Vincent, and Antigua,

In England, the fen district of the eastern counties, Romney Marsh in Kent, aud the marsh district of Somer- set have in great part ceased to be malarious within recent memory; and there has been a proportionate improvement, through drainage, in most parts of Holland, in some of the malarious districts of France and Italy, and in Algiers. Portsmouth in England and Rochefort in France are examples of towns that have entirely lost their evil repute for malaria; and there are many towns in the United States, as well as in the East, which are much less malarious than they used to be. Wherever malarial fevers have become less frequent, they have also become milder in type. On the other hand, malaria has become intense where it was formerly unimportant or altogether unknown. It is incredible that the Roman Campagna could have been so malarious at the time of the empire as it is now; places on the coast, such as Ostia and Palo (Alsium), which are now almost uninhabitable in summer, were then the favourite summer resorts of the rich; while the Campagna, which is now almost entirely given up to pasturage, was not only densely populated, but was

even specially com- mended as salubrious. In North Africa, Asia Minor, and the East, malaria las taken possession of the ruined sites of ancient cities, and of large tracts of land that must have been at one time highly cultivated, but are now treeless, barren, and sometimes marshy. Of recent years malaria has appeared in Réunion and Mauritius, and it has reappeared in Connecticut; in the two islands the associated circumstances are somewhat complicated, but they relate to changes in the cultivated area. The re- appearance of ague in New England and the recent appearance of a form of masked ague in New York and elsewhere are at present unaccounted for. Earthquakes were said by older writers to have brought malaria to a locality ; a recent and well-authenticated instance is that of Amboyna in the Moluccas, which has become strikingly un- healthy since the earthquakes that occurred in it in 1835.

Among the numerous military enterprises into whose records malaria enters largely, may be mentioned the expedition against Carthagena (1741), the Walcheren expedition (1810), and the capture of Rangoon (1824). Recent enterprises in which malarial fever has been a great factor are the expedition against Achin by the Dutch (1873), the occupation of Cyprus by the English (1878), and the subjugation of Tunis by the French (1881). Schemes of colonization, such as the Darien scheme (1701), have sometimes been frustrated by malaria. Of historical personages, James J. and Cromwell died in London of malarial fever, the latter of a pernicious tertian.

There have been numerous historical epidemies of inter-

mittent and remittent fever, from that of 1557-53 (which spread over all Europe) down to that of 1872, which prevailed simultaneously in Europe, North America, and southern India. The epidemic or pandemic prevalence of intermittent and remittent fever in certain years probably finds its explanation in the meteorology of those years, but no uniform law has been discovered. Whenever malaria has settled endemically in a new locality, there had been epidemics coming and going for some time previously.

Malarious Localzties.—The most malarious localities are the deltas and estuaries of rivers (Ganges, Euphrates, Po, Mississippi, Orinoco),. low-lying country that is apt to be inundated (Danubian states), tropical or subtropical forests in which there is a moist atmosphere, with stagna- tion of the air and rank vegetation (jungles), tracts of land that have been cleared of trees and have gone out of cultivation, being in more cases dry than wet (Roman Campagna, Tuscan Maremma, many parts of Persia, Asia Minor, and North Africa, including the sites of ruined cities), inland swamps and marshes (Pontine Marshes), and situations on the coast where the tidal and fresh water join to form brackish marshes (mangrove swamps of the West Indian, Central American, Brazilian, and West African coasts). The mangrove is associated with the most pestilential localities; it springs 'like a miniature forest out of the greasy mud-banks, the bright green colour of the bushes reminding one of the rank grass in a churchyard" (C. Darwin). In all those localities there is a soil, usually wet but sometimes dry, rich in the products of vegetable decay; the soil has been either deposited by rivers and tides, or it has formed on the spot out of the undisturbed accumulation of decaying vegetation season after season over a long period. There is, however, a second great class of malarious localities, distinguished by characters that are to some extent the opposite of the foregoing. These are barren rocks (Ionian Islands, Hong Kong, parts of Baluchistan, De Los Islands near Sierra Leone) ; high table-lands more or less barren (Deccan, Mysore, Persia, New Castile); mountainous regions (Andes, Rocky Mountains); prairies of North America and savannas of Venezuela and Brazil; sandy plains (North Africa, Rajputana, Sindh). A somewhat excep- tional locality for malaria is on board ship at sea; there are several well-authenticated instances of epidemic outbreaks at sea, in most cases referred to the putrid bilge-water, and in one case to a cargo of wet deals from the Baltic.

There are several localities whose exemption from malaria has been thought remarkable. Among these, Singapore has long been noted; other instances are the Amazon (as compared with its tributaries and with the Orinoco), the pampas of the La Plata and the Parana, marshy parts of Australia) New Zealand, and New Caledonia, and the marshy Bermudas. The explanation given of the exemption of Singapore, where many of the supposed malarial conditions are present, is that the range of temperature

(diurnal and annual) is small ; the explana- tion for the Amazon is that a wind constantly blows up the river from the sea (not reaching the side streams), which serves to equalize the day and night temperature and to obviate the nocturnal radiation of heat.

Malarious Seasons.—In temperate climates autumn is the season when malaria prevails most. 'In the autumn, and after the harvest has been gathered, when the ground is covered with its debris, when the rain falls in torrents and when the solar heat has acquired its greatest intensity, all the conditions of greatest quantity of vegetable matter, of moisture, and of highest temperature are united, so that the season which realizes the hopes of the husbandman is the period of pestilence and of his greatest danger "

(R. Williams). In the equatorial regions of the East Indies, Africa, and America, the rainy season (May to July or August) is most unhealthy, and especially the time of commencement of the rains and the time of cessation ; on the west coast of Africa the months of February, March, and April, which are the hottest months of the year, are at the same time the most healthy. But while autumn and the time of the rains are the malarious season for those localities that are distinguished by wet soil, rank vegetation, d&c., it is summer, or the time of extreme heat aud drought, that is the unhealthy season for the localities distinguished by dryness of the soil and often by barren- ness. The hill fever of the Deccan and Mysore is often most prevalent and most severe in the hottest and driest seasons ; in Algeria there is most fever when the country is parched to a desert. The malarial season in the Tuscan Maremma is from June to the middle of September. In military experience it has frequently happened that malaria has attacked the troops in the hottest weather after camp- ing in the dried-up water-courses of uplands, or in parched meadows and sandy levels that are apt to be flooded only in winter.

Conditions of Origin. —In all localities and at all seasons, it is at or after sunset that the malarial influence prevails, and it tells most when a cold night follows a hot day. Perhaps the most constant fact relating to malaria is that it goes with watery exhalations and with the fall of dew. On wet soils, and over marshes, swamps, and jungles, the aqueous vapour condenses as the air cools; while on dry surfaces the rapid radiation of heat causes a

heavy dew-fall. The occurrence of malaria on bare rocks, parched uplands, and treeless tracts of dry fallow land may have several associated circumstances; but that which has been most uniformly observed in such localities is great diurnal range of temperature, with rapid radiation of heat after sunset, and copious fall of dew. The " hill fever" of Mysore occurs among bare rocks and stones and brown earth; at the hottest season (March to June) the diurnal range of the shade temperature may be 20° to 30°, while the rocks in the sun may show a surface temperature up to 220°, and undergo a rapid cooling after sunset. The most malarious locality at all times of the year on the Orinoco is around the great cataract, where the banks of the river for some distance are covered with bare black rocks piled to a con- siderable height ; the rocky substance and the black surface combine to produce the greatest absorption of heat and the most rapid radiation, and the rocks there, as well as in other parts of South America and in India, are credited by the natives with giving off poisonous exhalations which cause the fever. Among the conditions of origin the pre-disposition of the human subject takes a prominent place. Those who have been habituated to extreme heat, and are on occasion exposed to cold and damp, are likely to acquire intermittent or remittent fever; and those who are poorly clad, housed, and fed are most likely. Fires at night in a malarious locality are a well-known protection from fever; the cover of trees (preventing the radiation of heat) is also a protection. Those who have had ague before are liable to have it again on exposure in a malarious locality, or to chill anywhere.

Diffusion of Malarva.—On the hypothesis that malaria is a poisonous substance, it is permissible to speak of its diffusion. It acts for the most part only within a few feet of the ground; in the East Indies the raising of dwellings on piles serves to keep off, or at least lessen, the liability to fever, and the Indians in South America escape it by sleeping in the branches of trees. Although it is not known to act beyond a few feet from the earth's surface, it may produce fever in localities situated at a height of 7000 to 9000 feet above the sea-level. It sometimes acts

at a distance from its supposed place of origin. Thus, it it is said to have caused fever on board ships lying 2 or 3 miles off a malarious shore, although it is more usual for ships at even a short distance from the shore to escape. In West Indian experience it has been known to render the high limestone ridge more unhealthy than the swamp at its foot, and a similar experience has occurred on the Kentish shore of the Thames estuary, and at other parts of the English (Channel) coast. There are instances where it has, so to speak, travelled along a narrow valley from an unhealthy marsh to a salubrious situation. Although a still night is most favourable to its production, there is a popular opinion that it is carried by the wind. In many malarious localities there is a definite "ague line," beyond which the noxious influence is not felt. A belt of trees, or even a wall, will "keep it off." It clings to those surfaces that are most easily bedewed. Situations to windward of a malarious swamp are usually reckoned safe.

Hypothesis of Malaria.—Malaria is known only by its |

effects on the animal body ; the effects, although they vary much in intensity, are uniform, definite, or specific, and are characterized by a truly remarkable periodicity. The oldest and most prevalent hypothesis of malaria is that it is a specific poison generated in the soil. Perhaps not every soil is capable under circumstances of causing malaria, but it is difficult to assign limits to its potential presence. There are seemingly well-authenticated cases of malarial disease appearing during the making of railway cuttings, canals, and other excavations in places where malaria had not previously been known; and there is sufficient evidence that malaria has appeared in the track of cultivation in the western States of America, and that it follows on the upturning of virgin soil, and even of soil that has been long fallow. Attempts have been nade, without success, to separate a malarious poison from the gases generated by swamps, or from the air of malarious localities. Still more frequent and elaborate attempts have been made to dis- eover the hypothetical poison among the numerous minute vegetable organisms that occur in the soil of malarious (and non-malarious) places; and these also have hitherto yielded no solid result, Another hypothesis is that malaria is a "telluric intoxication," generated by the vegetative power of the soil when that power is not duly exhausted by plant growth. Lastly, there is an hypothesis that malarial fevers are caused by the excessive and sudden

abstraction of heat from tle body under the influence of cold and damp, and that the specific effects of the nocturnal chill, amounting to intermittent and remittent fever, are most usual and most marked in hot climates because of the antecedent ex- posure of the body to great solar heat.

Remedies. —Cinchona or Peruvian bark (with its alkaloid quinine) is a remedy universally applied with good effect in the treatment of malarial fevers. The treatment is usually commenced during the first intermission or remis- sion. There is no good evidence that the taking of quinine wards off the attack of malaria, The extent of cinchona planting in southern India, Ceylon, Jamaica, and elsewhere is the best measure of the value of quinine as a remedy, and more particularly as a remedy for ague. Arsenic has proved one of the most efficient substitutes for quinine. The dwellers in malarious localities have found in opium a palliative of the misery induced by the malarial cachexia.

Literature.—Hirsch, Geographisch-historisehe Pathologie, 20 cd., Stuttgart, 1881, pt. i, sec. 7 (the bibliographical references ap- pended to Hirsch's chapter on malaria include upwards of eight hundred names) ; W. Ferguson, 'On the Nature and History of the Marsh Poison," Trans. Roy. Soc. Edin., ix., 1823 (omitted by Hirsch; was the first to dwell upon the fact that malaria is often associated with heat and drought, and elevated rocky localities) ; Macculloch, Malaria, an Essay, &c., London, 1827; Robert Williams, Afordid Poisons, London, 1836-41, vol. ii, chaptcr on " Paludal Diseases"';

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Colin, Traité des fiewres tntermittentes, Paris, 1870 (expounds the theory of 'intoxication tellurique"); C, F. Oldham, What is Malaria? and Why is it most Intense in Hot Climates? London, 1871 (a comprehensive review and acute criticism of established facts and current theories, with the motive of showing that there is no specifie malarial poison) ; Morehead, Clinical Researches on Disease in India, London, 1856, vol. i. (for symptoms, diagnosis, and treatment of intermittent and remittent fevers); Vayrer, Climate and Fevers of India, London, 1882 (both gencral and clinical). (

MALATIA, less correctly Mazatiyan, the ancient Melitene of Cappadocia, a town of Kurdish Armenia in the vilayet of Diarbekir, about 8 miles to the south-west of the Euphrates below the confluence of the Tokhma-su, and about half way between Baghdad and Constantinople, on a route which for ages has been one of the most important in that part of Asia, Asbuzi or Aspuzi, a place about 5 miles distant, which was formerly inhabited by the people of Malatia during the summer only, has become the per- manent residence of a large part of the population (about 20,000, including both), but Malatia proper remains the administrative centre of the sanjak, The remains of the ancient town are much dilapidated,

In the time of Strabo (xii. 537) there was no town in the district of Melitene. Under Titus the place became the permanent station of the 12th legion; Trajan raised it to a city. Lying in a very fertile country at the crossing-point of important routes, it grew in size and importance, and was the capital of Armenia Minor or Secunda. Justinian, who completed the walls commenced by Anastasius, made it the capital of Armenia Tertia; it was then a very great place (Procop., De /id,, iii. 4), The town was burnt by Chosroes on his retreat after his great defeat there in 577, Taken by the Saracens, retaken and destroyed by Constantine Copronymus, it was presently recovered to Islam, and rebuilt under Mansur (757-58 A.D.). It again changed hatids more than once, being reckoned among the fronticr towns of Syria (Istakhry, p. 55, 62). At length the Greeks recovered it in 934, and Nicephorus II., finding the district much wasted, encouraged the Jacobites to settle in it, which they did in great numbers. A convent of the Virgin, and the great church which bears his name, were erected by the bishop Ignatius (Isaac the Runner). From this time Malatia con- tinued to be a great seat of the Jacobites, and it was the birth- place of thcir famous maphrian Barhcbreus (or Abulfaragius). At the commencement of the 11th century the town was said to number 60,000 fighting men (Asscm., Bib. Or., ii. 149 ; comp. Barheb., Chr. Eccl., i. 411, 423). At the time of the first crusade, the city, being hard pressed by the Turks under Ibn Danishmend, was relieved by Baldwin, after Bohemund had failed and lost his liberty in the attempt. But the Jacobites had no cause to love Byzantium, and the Greek governor Gabriel was so cruel and faith- less that the townsmen were soon glad to open their gates to Ibn Danishmend (1102), and the city subsequently became part of the realm of Kilij Arslan, sultan of Iconium,

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MALAY PENINSULA, Matacca, or TANanH Ma.Ayu Plate VI.

(“ Malay Land”), the southernmost region in Asia, attached to Further India by the isthmus of Kra, in 10° N. lat., whence it projects for about 600 miles, first south, then south-east parallel with Sumatra, to Cape Ramiunia (Romania) in 1° 23’ N., within 95 miles of the equator ; it varies in width from 45 miles at the isthmus of Kra, and again at Talung in 7° 30’ N., to 210 at Perak in 5° N., and 150 at Selangor, 3° 20’N. The area is about 70,000 square miles, with a population of at least 650,000. The peninsula, which is washed on the west by the Bay of Bengal and Malacca Strait, on the east by the Gulf of Siam and China Sea, belongs geogra- phically and ethnically rather to the eastern archipelago than to the Asiatic continent. Hence, whenever the proposed canalization? of the isthmus of Kré is carried

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1 A careful caleulation made by T. J. Newbold in 1838 gave a total population of 375,000, since which date the British possessions have increased about fourfold, from 90,000 to 330,000. Hence, allowing for a slight increase elsewhere, the present population must be at least 650,000 (Political and Statistical Account of the British Settlements in the Straits of Malacca, London, 1839, vol. i. p, 418).

2 The several projects of canalization are fully discussed by M. Léon Dru in L’ Exploration for March 9 and 16, 1882. The most feasible, but not the shortest, follows the line of railway already projected in

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out, this region will fall into its natural position as one of the ~~great islands of Malaysia. In a wider sense the peninsular formation begins properly at the head of the Gulf of Siam, about the parallel of Bangkok. But this northern section between 10° and 13° 30’ N. being com~~ prised within the limits of Siam proper and British Burmah, js not usually included in Malacca, whose political frontier towards the north-west is thus traced by

the lower course of the river Pakshan, which there separates it from Tenasserim, the southernmost division of British Burmah. But east of that river there is no natural or political frontier towards Lower Siam, which embraces all the land as far south as the river Muda on the west coast in 5° 33' N., and on the east side as far as the state of Pahang in 4° N. The seaboard, which is generally flat and overgrown with mangroves for 5 or 6 miles inland, is fringed with numerous islands and insular groups, of which the chief are Salanga (Junk Ceylon), Langkawi, and Pulo Penang

on the west side; Singapore, Batang, and Bintang at the.

southern extremity; Tantalem and Bardia on the east coast. All these islands, which may have a total area of some 5000 square miles, seem to have originally formed part of the mainland, of which they may be regarded as scattered geological fragments.

Although known to Europeans since the beginning of the 16th century, and nowhere more than 100 miles from the sea, the interior still remains one of the least known lands in Asia. D'Souza's large map, prepared in 1879 for the British Government, is still in many places almost a complete blank ; the mountain ranges are traced only for short distances, chiefly on the west side below Kedah; the river courses and political boundaries are often mierely conjectured, while the elevation of some of the highest peaks is absolutely unknown. Accurate surveys, however, have since then been made, especially by H. 8. Deane in the Perak and Selangor states, by D. D. Daly in most of the British native states,! by Dru in the extreme north, and by others in the extreme south about the Endau river basin and at several other points, from which a rough idea may be formed of the general orographic and geological features and hydrographic systems. The surface seems to be everywhere essentially mountainous, and considerably more elevated than had till recently been supposed. The land is traversed in its entire length by a somewhat irregular and ill-defined backbone, forming a southern continuation of the Arakan and Tenasserim ranges, but here falling to a mean elevation of perhaps 3000 feet, and constituting a distinct water-parting betwéen the streams flowing east and west to the surrounding seas. The surface is further varied by numerous spurs and detached ridges running mainly north and south, besides isolated masses often vying in

elevation with the central ranges. Little space is thus left for upland plateaus, broad valleys, or lowland alluvial plains of any extent, except about Tringganu and Pahang on the east, and Selangor on the west side. The highest ascertained altitudes are the Titi Bangsa range (7000 feet), between Kedah and Perak; the Gunong Inas (5000) ascended in 1881 by Deane ; the Gunong Bubu (5650), and Gunong Ulu Tumulang (6435), near the right and left banks of the Perak river; the

1861 by Fraser and Forlong across the neck of the isthmus in 10° 30' between the estuaries of the rivers Pekshan and Champon. This scheme, which might be carried out for about £5,000,000, would shorten the sea route from India to China by fonr days, besides avoid- ing the dangerous navigation of the Straits.

1 A detailed account of Mr Daly's surveys, which extended over the years 1875-82, appeared in the Proceedings of the Royal Geographical Society for July 1882. It is accompanied by a large map which fills up several gaps left in that of D'Sonza. Yet the surveyor remarks that "there is a vast extent —more than half—of the Malayan Peninsula still unexplored," p. 409,

'Slim range (6000 to 7000) in south-east Perak; the

Gunong Rajah (6500), in the main range; a peak (7000) in the Endau river basin, nearly double the height of Gunong Ledang, or Mount Ophir (3849), hitherto sup- posed to be the' highest point in the extreme south. But an unexplored ridge towards the west frontier of Kelantan, with'a probable elevation of 8500 or 9000 feet, is taken by Miklucho Maclay as the culminating land of the whole peninsula. These mountains are scarcely any- where traversed by recognized beaten tracks, the natural

_ passes between tlie eastern and western watersheds being

still mostly overgrown by dense jungle. Deane, however, came upon a forest path across the main water-parting from Kedali to Patani, and a route is said to lead from the Bernam river basin across the main axis to Pahang on the east side. " .

Owing to the formation of the land, the rivers, although numerous, are necessarily of short length, and, as their mouths are generally obstructed by bars and coral reefs, they are on the whole more useful for irrigation than as water highways. Nevertheless some are navigable by light craft for considerable distances, and in 1881 Deane steamed up the Bernam between Perak and Selangor to Kampong Chankat Bertiham, 76 miles from the coast. He proceeded by boat thence for 9 miles to Simpang, where the stream divides and shallows. For about 80 miles it is 10 to 17 feet deep, while the Perak, with its chief tributaries, the Plus, Kinta, and Batang Padang, presents a total navigable waterway of perhaps 200 miles. The Perak on the west and the Pahang on the east slope are by far the largest river basins in the peninsula, each draining an area of 5000 to 6000 square miles. The other chief streams are the Sel4ngor and Klang on the southi-west coast, the Johér facing Singapore, and on the east side the Endau, Kelantan, and Patani.

As far as has been ascertained, the main geological formiations would appear to be Lower Devonian sandstones and unfossilized clay slates, with a basis of grey stanni- ferous granite everywhere cropping out. Although no trace has been found of recent volcanic action, there are several isolated and unstratified limestone masses from

500 to 2000 feet high, of a highly crystallized character,

with no fossils of any kind. Earthquakes also are frequent, while numerous hot springs attest the presence of still active igneous forces beneath the surface. In the south porphyry occurs, associated with granite and clay ironstone ; and laterite, resembling that of the Malabar coast, abounds, especially along the west slope. The rich stanniferous granites forming the backbone of the peninsula render this region the most extensive storehouse of tin in the world. Vast deposits of tin ores, sometimes associated with gold and silver,2 occur almost everywhere, and are continued in the neighbouring islands as far south as Banca on the Sumatra coast.2 Gold, whence the land was known to the ancients as the Aurea Chersonesus, is also found in considerable quantities, either disseminated in quartz or in alluvial deposits, especially about Mount Ophir, in Pahang, Gomichi, Tringganu, and Kemaman. The total yield has amounted in some years to

25,000 and 30,000 ounces. Iron ores abound especially in the south, and coal has recently been found in the isthmus of Kr4 conveniently situated for the future ship canal across the peninsula.

The climate, everywhere moist and hot, becomes

2 Although the Perak river is named from the Malay word perak, 'silver,' the presence of this metal has been doubted. M. Alfred Marche, however, who recently visited the west coast, found it in Laroot, associated with :the rich tin ores of that district (Comptes Rendus of the French Geol..Soc. for April 14, 1882, p. 165).

3 "The alluvial tin deposits permeate the whole length of the Malayan Peninsula on the wéstern side of the dividing range"

(Daly). XV. — 41

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oppressive and even malarious along the low muddy banks of the coast streams. Higher up, although cooler, it is not always more healthy, and the uplands, especially about Mount Ophir, have the reputation of being extremely dangerous to Europeans (Wallace). Yet the mean temper- ature, thanks to the general elevation of the land and the prevailing sea-breezes, is much lower than that of many Asiatic lands lying much farther from the equator. While the glass rises normally on the Makrdn coast and in the Persian Gulf to 110°, 120°, and even 125° Fahr., the mean summer range in the peninsula scarcely exceeds 90°, while at an altitude of 2500 feet it is under 70° for the whole year. There is strictly speaking no winter, nor a distinctly marked rainy season, the alternate north-east and south-west monsoons distributing the moisture over the east and west slopes throughout most of the year. The average number of rainy days is about one hundred and ninety, and the mean rainfall from 100 to 130 inches. The west coast is exposed to sudden squalls of short duration, known as "'Sumatras" from the direction whence they blow, while the opposite side is often visited by tornadoes during the monsoons.

Except in some limestone tracts, especially in Perak and Kedah, the soil is generally poor, and the country, which may be described as of comparatively recent formation slowly undergoing decomposition, is incapable of growing sufficient rice even for the local demand (D. D. Daly). The land, however, is almost everywhere clothed with a magnificent tropical vegetation, in which the most con- spicuous and useful plants are the gutta-percha (here first discovered), the camphor tree, ebony, sapan, ratan, eagle wood, bamboo, nibung, and nipa palm. Unfortunately the work of reckless destruction has already commenced, and the Chinese miners have in many places cleared extensive tracts, cutting down the finest trees to serve as fuel for smelting the tinores. Of fruits the most characteristic are the durian and mangosteen ; and of cultivated plants the most common are rice, the sugar-cane, cotton, tobacco, yams, batata, cocoa and areca palms. Tea and coffee might be successfully cultivated along the slopes of the Perak and Selangor rivers (Deane). A species of climbing indigo and the wild nutmeg are indigenous, and the true nutmeg, cinnamon, and cloves have long been introduced, and thrive well (Newbold).

The fauna of the peninsula, which is unusually rich, is allied, like the flora and the inhabitants, rather to that of the Eastern Archipelago than the mainland. Here are the one-horned rhinoceros, Malay tapir (tanan), elephant, and hog, all of the same species as those of Sumatra. Here is also a small bear (bruangh), found elsewhere only in Borneo, as well as the Sunda ox of Java, besides two kinds of bison said to be peculiar to the peninsula (Crawfurd). On the other hand, the Asiatic tiger has extended his range throughout the whole region, even crossing over to Singapore and other adjacent islands. Of quadrumanes there are no less than nine species, including the chimpanzee (Sima troglodytes), the kukang (Lemur tardigradus), the black and white unka, but apparently not the orang-outan, although the word is in common use among the Malays, who often apply it in its natural sense to the Sakai and other wild tribes of the interior. Of birds perhaps the most characteristic are the rhinoceros hornbill (Buceros), the bangu or Javanese stork, the argus and pencilled pheasants, birds of paradise (Paradisea regia and P. gularis), myna or grackle (Gracula religiosa), murei or dial bird (Gracula saularis), the humming bird, besides king- fishers, flycatchers, doves, and pigeons in endless variety. The islands are frequented by the Hirundo esculenta, or swallow that builds edible

nests. The forests swarm with coleoptera, lepidoptrea, and other insects, including the

MALAY PERIARGY Le

magnificent butterfly Ornithoptera Brookeana, till recently supposed to be peculiar to Borneo (Deane). "The sur- rounding waters are inhabited by the halicore, or "mer- maid," a sirenian whose Malay name duyong has been corrupted to dugong in our natural history books. Politically the peninsula is partly held directly by Siam and Great Britain, and partly divided among a number of petty Malay states, either tributary to or in treaty with those paramount powers. The Siamese territory and states embrace the whole of the northern section southwards to 5° 35' N., and thence on the east side as far as the southern frontier of Tringganu in 4°35' N. A line drawn from this parallel on the east coast across the peninsula north-west- wards to Kedah on the west coast will thus mark the southern limits of all the land directly or indirectly subject to Siam. The rest of the peninsula is occupied by the British possessions grouped under the collective name of the Straits SETTLEMENTS (q.v.), and by the more or less independent Malay states proper, which may be regarded as forming part of the British system. Subjoined is a table of all the political divisions of the peninsula :—

Siamese Political System.

Ligor, Sengora. These two provinces of Lower Siam proper comprise the isthmus of Kra between 7° and 10° N., witha coast-line of 240 miles on the cast and 260 on the west side; arca perhaps 17,000 square miles; population, 50,000 (?). ;

Kedah, between Ligor and Perak, 7° to 5°35' N., with 120 miles on west coast; area, 3600 square miles; population, 30,000.

Patani or Raman, between Sengora and Kelantan, 7° to 5° 30' N., with coast-line on east side 50 miles; area, 5000 square miles; population, 30,000.

Kelantan, between Patani and Tringgdnu, 6° to 4° N., 60 miles eoast on east side; area, 7000 square miles; population, 20,000.

Tringganu with Kemaman, between Kelantan and Pahang, 5° 30’ to 4° N., with 80 miles coast-line on the east side; area, 6000 square miles; population 50,000 (?).

British Political System.

Perak, between Kedah and Selangor, 5° 30’ to 4° N., with 80 miles coast-line on west side; area, 6500 square miles; population,

30,000.

Selangor with Kalang, between Perak and Malacca territory, 4° to 8° N., with 120 miles coast-line on west side; population, 15,000.

Johor, southern extremity of the peninsula from 2° 40’ N. to Cape Romania; area, 10,000 square miles ; population, 20,000.

Pahang, between Johér and Tringganu, 8° to 5° N., 90 miles coast on east side ;- areca, 8500 square miles; population, 20,000.

Jelébu, Sungei Ujong, Sri Menanti, Jumpdl, Johdl, Rambau, Jelai, Segamat or Moar. These inland states, lying between 2° and 4° N., formerly constituted with Naning (Malacea territory) the so-called Negri Sambilan, or “ Nine Lands,” governed by pan- ghulus or chiefs, feudatory first to the sultans of Malacca and then to those of Johdér. It is now proposed again to consolidate them in one state under the suzerainty of or in alliance with Great Britain. They lie surrounding Malacea territory, between Johor on the east, Pahang on the north, and Selangor on the west and north- west. Total area probably not more than 5000 square miles; popu- lation, 50,000 (?). The more important are Rambau (Linggi river basin), Segamat (Moar river basin), Johél (north from Mount Ophir), and Sungei Ujong (Langat river basin).

Straits Settlements: parts of Perak, Malacca, Pulo Penang, and Singapore; total area, 1445 square miles; population (1881),

314,000.

Excluding the Chinese, Klings, Bugis, and other more recent arrivals, the inhabitants of all these states belong to three distinct stocks—the Tai (Siamese), Malay, and Negrito. The Siamese of pure blood occupy the extreme north with scattered communities as far south as the town of Sengora (7° 10' N.). A mixed Malayo-Siamese people, commonly known as Samsams, form the bulk of the population in the lower parts of Ligor and Sengora, and in the north of Kedah. Although entirely assimilated to the Siamese in speech, customs, and religion, these Samsams appear to be allied physically much more to the Malay than to the Tai stock. Yet their national sympathics seem to be altogether with the dominant race, and the people, especially of Ligor, have during the present century

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zealously co-operated with the Siamese in their persistent efforts to subdue the Malays of the neighbouring states.!

All the rest of the peninsula, from about 7° N. to Cape Romania, may be regarded as essentially " Malay land," as it is in fact called by the people themselves. But whether the Malays are here indigenous, or intruders front Sumatra, is a question still warmly discussed by ethnologists. Those, however, who support the latter view by appealing to the undoubted historic migrations of civilized Malays from Menangkabo or Palembang in the 12th century, or even to still earlier arrivals from Java, do not understand tlie point at issue. For the peninsula is occupied, not only by these civilized Orang Maldyu of cultured speech, Mohammedans and mostly no doubt originally from Sumatra, but also by the Orang Benua, that is, "men of the soil," or aborigines, of Malay stock and of rude Malay speech, nature worshippers, and settled here from prehistoric times. Similar uncultured Malay tribes, such as the Orang Kubu of Palembang, are no doubt also found in Sumatra. But it is unlikely that any of these people ever crossed the shallow intervening Straits of Malacca, which were probably dry land when the race, was gradually diffused over the common area, Whiether the migration proceeded eastwards or westwards is therefore a point which cannot be determined pending the settlement of the further and broader question of the origin and dispersion of the Malay race itself. If the Malays

are a branch of the Mongol stock, as many hold, then the Orang Benua must have passed through the peninsula southwards to the archipelago at a time when most of it still formed part of the Asiatic mainland. But if they originated in the archipelago itself, as others maintain, then the stream of migration must have been reversed.

In any case the Orang Benua are not the only aborigines in the peninsula, For the most recent research has fully confirmed the somewhat vague statements of earlier writers regarding the presence in this region of a Negroid element differing fundamentally from the Malay type, and apparently to be affiliated to the Negrito of the Audaman Islands and Philippines. "Purely anthropological observations and considerations lead me to accept the supposition of a 'Melanesian' element (a remnant of the original race), which through intermixture with the Malays is being more and more supplanted. . .. . In the mountains of Pahang and Kelantan as far as Sengora and Ligor, I have discovered a Melanesian? population. This people undoubt- edly belongs to the Melanesian stock" (Miklucho Maclay in Lthnologische Excursion in Johor).°

*The Malay and Negrito aborigines are collectively known to the civilized Malays as Semang and Sakei * respectively, although much confusion seems to have arisen in the use of these terms, nor is this surprising, seeing that the two races themselves, who have been in contact for ages, have become largely intermingled and assimilated in customs, and even in speech. The original Negrito dialects, which Maclay has compared with those of the Philippines, are everywhere yielding to the Malay, which is spoken throughout the peninsula with little dialectic variety as far*

1 The horrors attending the reduction of Kedah in 1821 were caused chiefly by the ferocity of the Samsams of Ligor in the Siamese service.

2 This writer applies the term " Melanesian" to all the dark races of the Oceanic area, and not merely to the natives of the Melanesian Archipelago.

3 See also the Field, April 23, 1878 ; Journal of the Straits Branch of the Roy. As. Soc. for 1878-81, passim; and the paper of Mr Daly, who says, "'The true Orang Sakei is a Negrito, and reminds one of the Papuans of New Guinea, whom I have seen in Torres Straits," p. 409.

4The aborigines of the neighbouring island of Billiton are also collectively known as Sakah (Annales de Hxtréme Orient, 1879, p. 130).

as 6° and 7° N., where it is replaced by Siamese. The aborigines, who are said not to number altogether more than some 10,000, are divided into a great many tribes, of which the best known are the Jakuns, widespread in the south, the Udai, Basisi, Sabimba, Mintira (Mantra), and Hala. All are in a very low state of culture, holding aloof from the settled populations, living entirely on the chase, and pursuing the game with poisoned arrows. It is note- worthy that even the more or less civilized Malays, especially of Rambau and other inland states, still hold to the tribal organization, the very names of many of their tribes, such as the Anak Achi ("children of Achin") and Sri Lummah Menangkabau, betraying their comparatively recent migration from Sumatra.

Other ethnical elements in the peninsula are the Bugis from Celébes, formerly powerful on the west coast; the "Moors" (Arabs), now mostly absorbed by the civilized Malays ; the Klings® from India, chiefly traders in the seaports; the Topas (Topazio), half-caste Portuguese Christians, still numerous especially in Malacca territory, a few Europeans, Battas, and African slaves; and, lastly, the Chinese, by far the most numerous of all, who are gradually converting the Malay peninsula into a second China. They have already monopolized the mining and agricultural industries, as well as the retail trade and local shipping.

Although vaguely known to the ancients as the Aurea Chersonesus, and even by them already described as a " Regio Latronum," or piratical land, the Malay peninsula possesses no historic traditions earlier than the 18th century. According to the native writers the first settlement was madc at Singa-pura, or the " Lion City," about 1250 by emigrants from the banks of a river Malayu in Sumatra, Expelled from Singapore by the Javanese king Majapahit, the colonists founded the city of Malacca on the south-west coast of the mainland in 1253. From this point the cultured and Mohammedan Malays of Sumatra are supposed to have rapidly spread over the whole peninsula, where they had already established a number of petty aa states, when the Portuguese under Albuquerque reached Malaysia and reduced Malacca in 1511. Being thus, so to say, taken on the flank by the

Europeans, while their progress northwards was barred by the Siamese continually pressing forward from Indo-China, the Malays of the peninsula, ever prone to piracy and lawlessness, have remained in a morc or less unsettled state almost down tothe present time. The Portugucse held Malacca for one hundred and thirty years, when they were supplanted in 1641 by the Dutch, who yielded in 1795 to the English, and finally in 1824 surrendered all their possessions on the mainland to Great Britain in exchange for Bencoolen in Java. Penang and Singapore had already been occupied by the British, who, by the suppression of piracy and the old monopolies, the proclamation of free trade principles, the example of a wise administration and treaties with the surrounding states, have gradually laid a solid foundation for the future prosperity of this distracted land. (A. H. K.)

MALAYS (Orang Malayu, " Malay Men"), the domin- ant people in Malacca and the Eastern Archipelago (hence often called Malaysia), where they are diversely inter- mingled with other races, and where they have represented the local cultured element for over two thousand years. The Malays proper, that is, those who call themselves by this name,° who speak the standard Malay language, and who possess 2 common sentiment of racial unity, are found in compact masses chiefly in the Malay peninsula as far north as 8° or 9° N. lat., in the adjacent islands of Penang, Bintang, Lingen, &c., and in Sumatra, of which they occupy fully one half, mainly in the south, along the east coast, and on parts of the west coast. In these lands

5'The term Kling, a corrupt form of Telinga (Telugu), is applied throughout Malaysia to all the natives of India settled in that region.

6 The origin of this word has given rise to much controversy. Its derivation from the Javanese ma-layu, to run or flee, must be rejected as grammatically impossible, for this is a true verbal form, whereas the national name is strictly adjectival, hence always accom- panied by anoun. Valentyn points out (Beschryvinge van Sumatra, p. 18) that the name is specially applied in Sumatra to the great Sungei-pdgt-Maldyu tribe of the Sungei-pagi auriferous district, and it seems on the whole most probable that it was originally the name of some local tribe, which rose to pre-eminence,

alone they are really indigenous, and regard themselves as the aboriginal population. Elsewhere they are met in scattered communities chiefly round the coast of Borneo, in the Sulu Archipelago, in Tidor, Ternate, and some other members of the Molucca group, where they are held to be intruders or immigrants from Sumatra.

Long considered as an independent division of mankind, the Malays are now more generally affiliated to the Mongol stock, of which A. R. Wallace, De Quatrefages, and other eminent naturalists regard them as a simple variety more or less modified by mixture with other elements. "The Malayan race, as a whole, undoubtedly very closely resembles the -East-Asian populations from Siam to Manchuria. I was much struck with this when in the island of Bali I saw Chinese traders who had adopted the costume of that country, and who could then hardly be

distinguished from Malays ; and, on the other hand, I have |

seen natives of Java who, as far as physiognomy was con- cerned, would pass very well for Chinese."1 In fact, the typical Malay can scarcely be distinguished anthropologi- cally from the typical Mongolian. He is described as of low stature, averaging little over 5 feet,? of olive-yellow complexion inclining to light brown or cinnamon, bracliy- cephalous, with somewhat flat features, high cheek bones, black and slightly oblique eyes, small but not flat nose, dilated nostrils, mouth wide but not projecting, hands and feet small and delicate, legs very thin and weak, coarse black hair, always lank and round in section, scant or no beard.®

The departure from this description so frequently noticed in the archipelago must be attributed to intermixture with the black Papuan stock in the east, and with a distinct pre-Malay Caucasic element in the west. The presence of this "Indonesian" element, as it is called by Dr Hamy, may now be regarded as an ascertained fact, the recogni- tion of which will help to remove many of the difficulties hitherto associated with the natural history of the Malay race. It at once explains, for instance, the apparent dis- crepancy between the foregoing description of the ordinary Malay and that of the Battas, Orang Kabu, and many other Sumatran and Bornean peoples

*described as tall and robust, with regular features, symmetrical figure, light complexion, brown and wavy hair, and general European appearance.**

These considerations also enable us to fix the true centre of dispersion of the Malay race rather in Malacca than in Sumatra, contrary to the generally reccived opinion. If they are to be physically allied to the Mongol stock, it is obvious that the earliest migration must have been from High Asia southwards to the peninsula, and thence to Sumatra, possibly at a time when the island still formed part of the mainland.' The national traditions of a disper- sion from Menangkabo or Palembang in South Sumatra must accordingly be understood to refer to later movements, and more especially to the diffusion of the civilized Malay peoples, who first acquired a really. national development in Sumatra in comparatively recent, times. From this point they spread to the peninsula, to Borneo, Sulu, and other parts of Malaysia, apparently since their conversion to Islam, although there is reason to believe that other waves of migration must have reached Further India and especially Camboja, if not from the same region at all events from Java, at much earlier dates. The impulse to these earlier movements must be attributed to the intro-

*1 Wallace's Malay Archipelago, 5th ed., p. 591. * Miiller says 4 ft. 6 in. to 5 ft. ; Wallace 5 ft. 2 in. to 5 ft. 4 in. ; Flower 5 ft. 3 in. ; others 5 ft. * See Dr A. B. Meyer, Minahassa auf Celebes, Berlin, 1876, p. 7. See Sehouw-Santvoort, in Annales de I' Extréme Orient, 1878-79, . p. 148; and Montano, Proc. Roy. Geol. Soc., 1881, p. 598.*

duction of Indian culture through the Hindu and Buddhist missionaries, perhaps two or three centuries before the ~ Christian era. During still more remote prehistoric times various sections of the Malay and Indonesian stocks were diffused westwards to Madagascar, where the Hovas, of undoubted Malay descent, still hold the political supre- macy, and eastwards to the Philippines, Formosa, Micro- nesia, and Polynesia. This astonishing expansion of the Malaysian peoples throughout the Oceanic area is suffi- ciently attested by the diffusion of a common Malayo-Polynesian speech from Madagascar to Easter Island, and from Hawaii to New Zealand. See PotyNesta.

*The Malays proper have long been divided socially into three dis- tinct groups,—the Orang Benia, or " Men of the Soil," that is, the uncivilized wild tribes ; the Orang-lawt, or " Men of the Sea," that is, the semi-civilized floating population ; and the Orang Maldyu, or "Malay Men," that is, the civilized Malays with a culture, a literature, and a religion. The Orang Benua, called also Orang Gunung, or ' Highlanders," and sometimes even Orang-utan, or ** Wild Men," constitute the aboriginal Malay element, the " raw material,' so to say, of the race, which has hitherto reiained wholly unaffected by foreign influences, and which is still grouped in sinall tribes at a very low stage of culture, living nearly exclusively by the ehase, and almost destitute of all social organization. They are found ehiefly in the more inaccessible wooded uplands of Malacca and Sumatra, in the former region more or less intimately associated for ages with the Negrito tribes, and in the latter island apparently the sole occupiers of the land from the first. Interme- diate between the Orang Benta and Orang Malayu are the Orang- laut, the '*Sea Gipsies" of English writers, who still occupy the same low social position that they held when the Portuguese first reached Malaysia. They were then described by De Barros under the name of Cellates, or "people of the Straits," as "a vile people dwelling more on the sea than on the land," and "living by fish- ing and robbing"; and this description is still largely applicable, although piracy is now all but suppressed in the Eastern waters. The Bajau and Millanau of the Sulu Archipelago and neighbouring coast lands also belong to this class of sea nomads. Lastly, the Orang Malayu are that section of the race which, under the influence first of the Hindus and then of the Arabs, has developed a national life and culture, and which has founded more or less powerful political states in various parts of the archipelago. But here again it is necessary to distinguish between the civilized Malays proper, and the other civilized branches of the race, to whom the term Malay is never applied, and who speak languages which, while belonging to the common Malay linguistic family, differ greatly from the standard Malay speech. 'The chief divisions of all these civilized cominunities are as under :—*

Orang Malayu: Menangkabo, Palembang, and Lampong in Sumatra; petty states of the Malay Peninsula; Borneo ; Tidor ; Ternate.

Sumatran group: Achinese, Rejangs, Passumahs.

Javanese group : Javanese proper, Sundanese, Madurese, Balinese.

Celebes group: Bugis, Mangkassara, and others.

Philippine group : Tagalas, Bisayans, Bicol, Sulu, and others.

Outlying groups: Hovas of Madagascar, Formosan Islanders.

In all these the distinctly Malay physical type decidedly pre- dominates, whereas elsewhere in the archipelago the so-called Malays are often rather " Indonesians,"' in whom the distinctly Caucasic physical type predominates. Such especially are the Battas and Orang Kubu of Sumatra, the Nias and Mentawey islanders, the Kayans, and many of the Dyak tribes of Borneo.®

In their temperament no less than in their features the Malays still betray their Asiatic origin. They are described as of a taciturn, undemonstrative disposition, little given to outward manifestations of joy or sorrow, yet extremely courteous towards each other, and as a rule kind to their women, children, and domestic. animals.. Slow and deliberate in speech, neither elated by good nor depressed by bad fortune, normally impassive and indolent, they are never- theless capable of the greatest excesses when their passions are roused. Under the influence of religious excitement, losses at gamb- ling, jealousy or other domestic troubles, they are often seized by the so-called "amok" fever, when they will rush wildly through the crowded streets armed with their sharp krisses, cutting down all who cross their path with incredible fury and without the least discrimination. Amongst the practices and propensities which connect them with the Mongoloid inhabitants of Indo-China the most striking are pile-building, especially in Java and Borneo; cock-fighting, universal throughout the archipelago; a pronounced taste for putrescent fish, with a corresponding dislike of milk ; head- hunting (Borneo and Celebes); large ear-ornaments, greatly dis- tending the lobe; husband entering the wife's family, and father ieee = Mica le Mie aac laine ee Se,

5 See Carl Bock's Wead-Hunters of Borneo, p. 59.

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exchanging his own for his child's name; counting by numcral auxiliaries, such as pebble, chief, log, mountain, feather, &c., according to the nature of the object.'

The race is on the: whole of a sluggish intellect, inferior in natural intelligence even to the surrounding Paptan populations. Dr Montano tells us that in the girls' school at Malacca, conducted by the Roman Catholic sisters, the Chinese children take the first, the Mantras (aborigines) the second, and the Malays the last place in order of capacity.2 Unaided by foreign influences they never attained a higher culture than that of the "Sea Gipsies"; and for their letters, most of their arts, and their religions they are in- debted either to the Hindus or the Arabs. (A. H. K.)

Malay Language and Literature.

The Malay language is a member of the Malayan section of the Malayo-Polynesian class of languages, but it is by no means a rc- presentative type of the section which has taken its name from it. The area over which it is spoken comprises the peninsula of Malaeca with the adjacent islands (the Rhio-Lingga Archipelago), the greater part of the coast districts of Sumatra and Borneo, the seaports of Java, the Sunda and Banda Islands. It is the general medium of communication throughout the archipelago from Sumatra to the Philippine Islands, and it was so upwards of three hundred and fifty years ago when the Portuguese first appeared in those parts.

There are no Malay manuscripts extant, no monnmental records with inscriptions in Malay, dating from before the spreading of Islam in the archipelago, about the end of the 18th eentury. By some it has been argued from this fact that the Malays possessed no kind of writing prior to the introduction of the Arabic alphabet (W. Robinson, J. J. do Hollander) ; whereas others have maintained, with greater show of probability, that the Malays were in possession of au ancient alphabet, and that it was the same as the Rechang (Marsden, Friederich), as the Kawi (Van der Tnuk), or most like the Lampong (Kern),—all of which alphabets, with the Battak, Bugi, and Macassar, are ultimately traceable to the ancient Cambojan characters. With the Mohammedan conquest the Perso- Arabic alphabet was introduced among the Malays ; it has continued ever since to be in use for literary, religious, and business purposes. Where Javanese is the

principal language, Malay is sometimes found written with Javanese characters; and in Palembang, in the M&nangkabo country of Middle Sumatra, the Rechang or Renchong characters are in general use, so called from the sharp and pointed knife with which they are cut on the smooth side of bamboo staves. It is only since the Dutch have established their supremacy in the archipelago that the Roinan character has come to be largely used in writing and printing Malay. This is also the case in the Straits Settlements.

By the simplicity of its phonetic clements, the regularity of its ranimatical strueture, and the copiousness of its nautical vocabu- ary, the Malay language is singularly well-fitted to be the lingua

franea throughout the Indian archipelago. It possesses the five vowels a, 2, wu, €, 0, both short and long, and one pure diphthong au. Its consonants are k, g, ng, ch, j, %, t, d, n, p, b, m, y, 7, I, w, 8, h. Long vowels can only occur in open syllables. The only possible consonantal nexus in purely Malay words is that of a nasal and mute, a liquid and mute and vice versa, and a liquid and nasal. Final & and ’ are all but suppressed in the utterance. Purely Arabic letters are only used in Arabic words, a great number of which have been received into the Malay vocabulary. But the Arabic charae- ter is even less suited to Malay than to the other Kastern languages on which it has been foisted. As the short vowels are not inarked, one would, in seeing, ¢.g., the word bring, think first of bintang, a star; but the word might also mean a large scar, to throw down, to spread, rigid, mutilated, enceinte, a kind of cucumber, a redoubt, according as it is pronounced bantang, banting, bentang, buntang, buntung, bunting, bonteng, benteng.

Malay is essentially, with few exceptions, a dissyllabic language, and the syllabic accent rests on the penultimate unless that syllable is open and short; ¢.g., ditang, namina, bésdr, diumpatkanfalah. Nothing in the form of a root word indicates the grammatical cate- pory to which it belongs; thus, kdsih, kindness, affectionate, to ove ; ganti, a proxy, to exchange, instead of. It is only in deriva- tive words that this vagueness is avoided. Derivation is effected by infixes, prefixes, affixes, and rcduplication. Infixes occur more rarely in Malay than in the cognate tongnes. Examples are— guruh, a

rumbling noise, gumiruh, to make sueh a noise ; #unjwk, to point, delunjuk, the forefinger; chiiehuk, to pierce, cherichuk, a stockade. The import of the prefixes—mé (inéng, méh, mén, mém), pé (peng, péh, pen, pém), bér (bél), pér, pél, ka, di, tér,—and affixes—an, kan, i, lah—will best appear from the following examples : root word dar, to teach, to learn ; méngajar, to instruct (expresses an action); bédjar, to study (state or condition) ; méngajari, to instruct (some one, trans.) ; méngajarkan, to instruct (in something, causative) ; péngajar, the instructor ; pélajar, the Je eS ee

1 Gol. Yule, in Jour. Anthrop. Soc. for February 1880. 2 Jour. d' Anthropologie for March 1882,

learner ; péngajaran, the lesson taught, also the school ; pélajdran, the lesson learnt ; didjar, to be learnt ; terdjar, learnt ; térdjarkan, taught ; térajart, instructed ; [peraja (from raja, prince), to recog- nize as prince ; p&rajakan, to crown as prince ; karajaan, royalty] ; djarkantah, teach } Examples of reduplication are—djar-qar, a sainted person ; Gjar-bérdyar (or bel@jar), to be learning and tcach- ing by turns ; similarly there are forms like djar-méngdjar, bérdjar- ajaran, ajar-ajari, mémpérajar, meémptrajarkan, mémperajari, lérbélajarkan, pérbélajarkan, &c. Altogether there are upwards of a hundred possible derivative forms, in the idiomatic use of which the Malays exhibit much skill. See especially H. von Dewall, De vormeeranderingen der Maleische taal, Batavia, 1864; and J. Pijnappel, Maleisch-Hollandsch Woordenboek, Amsterdam, 1875, 'Inleiding." In every other respect the language is charaeterized by great simplicity and indefiniteness, There is no inflexion to dis- tinguish number, gender, or ease. Number is never indieated when the sense is obvious or can be gathered from the context; otherwise plurality is expressed by adjectives such as sagda/a, all, and bafak, iany, more rarely by the repetition of the noun, and the indefinite singular by sa@ or satu, one, with a class-word. Gender may, if necessary, be distinguished by the words laki-lakt, male, and perampuan, female, in the case of persons, and of jantan and bétina in the case of animals. The genitive case is generally indieated by the position of the word after its governing noun. Also adjectives and demonstrative pronouns have their places after the noun. Coinparison is effected by the

use of particles. Instead df the per- sonal pronouns, both in their full and abbreviated forms, conven- tional nouns are in frequent use to indicate the social position or relation of the respective interlocutors, as, ¢.g., hamba twan, the master's slave, t.e., I. These nouns vary according to the different localities. Another peculiarity of Malay (and likewise of Chinese, Shan, Talaing, Burmese, and Siamese) is the use of certain class- words or coefficients with numerals, such as orang (man), when speaking of persons, ekor (tail) of animals, képing (piece) of flat things, bit (sced) of roundish things ; ¢.g., lima byt télor, five eggs. The number of these class-words is considerable. Malay verbs have neither person or number nor mood or tense. The last two are sometimes indicated by particles or auxiliary verbs ; but these are generally dispensed with if the meaning is sufficiently plain without them. The Malays avoid the building up of long sentences. The two main rules by which the order of the words in a sentence is regulated are—subject, verb, object ; and qualifying words follow those which they qualify. This is quite the reverse of what is the rule in Burmese.

The history of the Malays amply accounts for the number and variety of foreign ingredients in their language. Hindus appear to have settled in Sumatra and Java as early as the 4th century of our era, and to have continned to exereise sway over the native popula- tions for many centuries. These received from them into their language a very large number of Sanskrit terms from which we can infer the nature of the civilizing influence imparted by the Hindu rulers. Not only in words concerning commerce and agriculture, but also in terms connected with social, religions, and administra-

tive matters, that influence is traceable in Malay. See W. E.

Maxwell, Manual of the Malay Language, 1882, pp. 5-34, where this subject is treated more fully than by previous writers, This Sanskrit element forms such an integral part of the Malay vocabu- lary that in spite of the subsequent infusion of Arabic and Persian words adopted in the usual course of Mohammedan conquest it has retained its ancient citizenship in the language. The number of Portuguese, English, Dutch, and Chinese words in Malay is not considerable ; their presence is easily accounted for by political or commercial contact.

The Malay language abounds in idiomatic expressions, whieh con- stitute the chief difficulty in its acquisition. It is sparing in the use of personal pronouns, and prefers impersonal and elliptical diction. As it is rich in specific expressions for the various aspects of certain ideas, it is requisite to employ always the most appro- priate term suited to the particular aspect. In Maxwell's Manual, pp. 120 sq., no less than sixteen terms are given to express the different kinds of striking, as many for the different kinds of speak- ing, eighteen for the various inodes of carrying, &c. An unneces- sary distinction has been made between High Malay and Low Malay. The latter is no separate dialect at all, but a mere brogue or jargon, the medium of intercourse between illiterate natives and Europeans too indolent to apply themselves to the acquisition of the language of the people ; its vocabulary is made up of Malay words, with a conventional admixture of words from other languages; and it varies, not only in different localities, but also in proportion to the individual speaker's acquaintance with Malay proper. The use is different as regards the term Jduwit as applied to the Malay language. This has its origin in the names Great Java and Lesser Java, by which the medieval Java and Sumatra were called, and it aceordingly means the language spoken along the coasts of the two great islands.

Malay is probably spoken with greatest purity in the Rhio- Lingga Archipelago and in the independent states of Perak and

Kedah, on the western coast of the peninsula of Malacca. – In other states of the peninsula (Johor, Tringganu, Kelantan) dialectical divergencies both as to pronunciation and the usc of words have been noted. The most important and the most interesting of all the Malay dialects is that of Menangkabo (Menangkarbau) in the residency of Padang and in Upper Jambi, in Central Sumatra. It abounds in diphthongs, and prefers vocalic to consonantal termina- tions, thus changing final a/ and ar into a', i and ir into tye, ul and ar into uwe, as and at into e', us into ut; final a mostly passes into 6, so that for suddra and suddgar they say sudéd, sudéqa ; the emphatic -daA is turned into -malah or malah hd; the prefixes bér, per, tér are changed into bd, pd, td, or bard, pird, tard. Ainong other changes in

pronunciation may be noted arang for orang, mungko for maka, lai for lagi; they use nan for yang, na' for hendak, deh for oleh, ba' for bagai, pai for pergi, ko' for jikalan, &c. In some districts of Menangkabo (Palembang, Lebong) the Renchong character is in general use in writing this dialect, for which purpose it is far bettcr suited than the Arabic. As early as 1822 a small tract on the customs and traditions of Moko-Moko, in this dialect, was printed with a translation at Bencoolen. But it is only in recent years that the Dutch have commenced to pay the dialect the attention it deserves, by publishing texts, with transliteration and translations, and supplying other materials for its investigation. See the Z'ransactions and Journal of the Asiatic Societies of Batavia and the Hague, the Indische Gids, and more especially the philological portion, by A. L. van Hasselt, of Afiddcn-Sumatra, iii. 1 (Leyden, 1880), where also the best and fullest account of the Renchong character is to be found. Of other Malay dialects in Suinatra, only the one spoken at Achih (Achin) descrves mention; in Java the Batavian dialect shows the most marked peculiarities, The numerous and greatly divergent dialects spoken in the Molucca Islands (valuable information on which has been supplied by F. 8. A. de Clereq, G. W. W. C. van Hoevell, and A. van Ekris) and in Timor differ so materially from the Malay of the peninsula and of Menangkabo that they cannot be called Malay dialects at all; whereas the Malay spoken in some parts of the Minahassa (Celcbes) scarcely differs from Malay proper.

There is no grammar of Malay by a native writer with the sole exception of a small tract of 70 pages, entitled Bustanw lkatibin, by Raja Ali Hajji of Rhio, which was lithographed in the island of Pehengal in 1857. A. Pigafetta, who accompanied Magellan in his first voyage round the globe, was the first European whose vocabulary of Malay words (450) has come down to us. Nextinthe field were the Dutch, who provided a medium of intercourse between their tradcrs and the Malays. F. Houtman's J'ocabulary and Conversations, in Dutch, Malay, and Malagasy, appeared at Amsterdam in 1603; and it may be noted that the Malay spoken in those days does not appear to have materially altered since. The same dialogues appeared in English and Malay in 1614. Since then numerous grammars, dictionaries, and conversation books have been brought out by English and Dutch writers. As the best helps at present available for the study of Malay may be recom- mended W. I. Maxwell's Manual of the Malay Language,

London, 1882 (especially valuable for its full treatment of the idioms); P. Favre, Grammaire de la langue Malaise, Vienna and Paris, 1876 ; and Dietionnaire Malats- Francais, ib., 1875, 2 vols. ; Dictionnaire Francais-Malais, tb., 1880, 2 vols.; J. J. de Hollander, Handleiding bij de beoefening der Maleische taal en letterkunde, Breda, 1882; J. Pijnappel, Maleische Spraakkunst, Hague, 1866 ; and Maleiseh-Hollandsch Woordenboek, Amsterdam, 1875. The printing of Von Dewall's Dictionary, edited by H. N. van der Tuuk, is still in progress at Batavia.

Literature.—There are two kinds of Malay popular literature— the one in prose, the other in poetry. The former comprises the proverbs, the latter the "pantuns." " Agriculture, hunting, fishing, boating, and wood-craft are the occupations or accomplishments which furnish most of the illustrations, and the number of beasts, birds, fishes, and plants named in a collection of Malay proverbs will be found to be considerable" (W. E. Maxwell, Malay Proverbs). H. C. Klinkert published a collection in the Bidragen tot de taalkunde van N. I. (Journal of the Asiatic Society of the Hague) for 1866, pp. 39-87. See also J. Habbema on the Menangkabo pro- verbs, in vols. xxv. and xxvi. of the Batavian Tijdschrift, and Favre's Dictionnaire Malais-Francais, passim. The pantuns are improvised poems, generally (though not necessarily) of four lines, in which the first and third and the second and fourth rhyme. They are mostly love poems ; and their chief peculiarity is that the meaning intended to be conveyed is expressed in the second couplet, whereas the first contains a simile or distant allusion to the second, or often has, beyond the rhyme, no connexion with the sccond at all. The Malays are fond of reciting such rhymes 'in alternate contest for several hours, the preceding pantun furnishing the catchword to that which follows, until onc of the parties be silenced or van- quished." See T. J. Newbold, Account of the British Settlements in the Straits of Malacca, vol. ii. 346; Klinkert in the Bijdragen for 1868, pp. 309-70 ; L. K. Harmsen in the Tijdschrift, vol. xxi. pp. 480-533 (Menangkabo). If the Malays have kept entircly aloof

from the influences of Islam in this the most characteristic part of their literature, they have almost equally preserved their independ- euce in the

other departments. Not that this may be considered entirely to their credit ; for, if they had endeavoured to infuse into their writings some of the spirit of Arabic and Persian historio- graphy, poetry, and fiction, it could not but have benefited the char- acter of their own literary productions. Asit is, their histories and chronicles are a strange motley of truth and fiction; their poems and novels lack coherence and imagination, and are singularly monotonous and devoid of that spirit of chivalry which pervades the corresponding branches of literature among the leading nations of Islam. As Malay copyists are much given to making arbitrary changes, it happens that no two MSS. agree, and that of many a popular work different recensions exist, which, moreover, often go by different names. This circumstance greatly tends to increase the difficulties of editing Malay texts. Works on specially Mohammedan subjects (theology, law, ethics, mysticism) are of course only imitations of Arabic or Persian originals ; there are also numerous novels and poenis treating of purely Mohammedan legends. But not only is there traceable in many of these a slight undercurrent of Hinduism and even pre-Hinduism ; the Malays possess also, and indiscriminately read along with their Mohammedan books, quite as many works of fiction of purely Hindu origin. The waut, however, of political cohesion, and of a national spirit among tribes so scattered as the Malays are, which could have favoured the growth of a national epic or national songs, sufficiently accounts for the absence from their literature of any productions of this class, such as exist in Bugi and Macassar literature. The most popular of their poetical productions are the Shair Ken Jambihan, Sha'ir Lidasari, Shatir Jauhar Manikam and Shatir 'Abdwlmulik, all of which have been printed. Among the prose works there are various collections of local laws and customs (wndang-wndang), chronicles (such as the Sajarat malayuw), books on ethics (the best are the Makota sagala raja-réja, and the Bustdnwssalatin, and a very large number of works of fiction and legendary lore, some of which possess much descriptive power. They all bear the title Hikayat, and the following are the best-known : H. Hang Tiah, H. Hamzah, H. Ismaé Yatim, H. Jumjumah, H. Bakhtiyar (Sddah Bakhtin, Gholam), H. Simiskin, H. Sultan Ibrahim, H. Sri Rama, H. Pandadwa lima, Several of these and many other works not men- tioned here have appeared in print (with or without translation) chiefly in Holland, Batavia, sid Singapore, and extracts have been given in the various Malay chrestomathies by Dulaurier, De Hollander, Niemann, Van der Tnuk,

Grashuis, and in Marsden's Malay Grammar. The best recent Malay writer was 'Abdullah ibn 'Abdelkadir Munshi of Singapore, who died, it is said of poison, at Mecca, some eight and twenty years ago. His autobiography, 'journey to Kelantan," and " pilgrimage to Mecca" are patterns of Malay style, though the author's contact with educated Euro- peans is traceable in them, while his translation (from the Tamil version) of the Panchatantra is frec from such influence.

Malay literature is fairly represented in England in the British Museum, the India Office, and the Royal Asiatic Society, and descriptive catalogues of the Malay MSS. in each of these libraries are available. See Niemann in the Bijdragen, iii. 6, p. 96-101; Van der Tuuk in Vijdschrift voor Ned. Indié for 1849, i. p. 385-400, and in the Jowrnal of the Royal Asiatic Society, new series, ii, p. 85-185. An account of the Leyden collection, by J. Pijnappel, is given in the Bidragen, ili. 5, p. 142-178. The finest collection of Malay MSS., upwards of 400 volumes, is in the library of the Asiatic Society of Batavia. See L. W. C. van den Berg, Verslag van eene verzameling Maleische, &c., handschriften, Batavia, 1877. Ifit had not been for the loss, by fire, on their passage from India, of three hundred Malay MSS., the property of the late Sir T. S. Raffles, England would now boast of the largest assemblage of Malay MSS. in the world. Ou Malay literature in general com- pare G. H. Werndly, Afaletsche Spraakkunst, Amsterdain, 1736, pp. 227-357 ; E. Jacquet in the Nouveau Journal Asiatique, vol. ix. (1832), pp. 97-182, and 222-253; T. J. Newbold, British Settlements in the Straits of Malacca, 1889, vol. ii. pp. 215-368 ; E. Dulaurier, A/émoire, lettres, ct rapports, Paris, 1848; J. J. de Hollander, Handleiding bij de beoefening der Maleische taal en letterkunde, Breda, 1882, pp. 277-888; and G. K. Niemann, in Bijdragen, iii. 1 (1866), pp. 113-46, 333 sq. (R. RB.)

MALCOLM, Sir Joun, G.C.B. (1769-1833), soldier, diplomatist, administrator, and author, was born at Burn- foot of Esk, near Langholm, Dumfriesshire, Scotland, on May 2, 1769. At the age of twelve he received a cadetship in the Indian army, and in April 1783 he landed at Madras, shortly afterwards joining his regiment at Vellore. In 1792, having for some time devoted himself to the study of Persian, he was appointed to the staff of Lord Cornwallis as Persian interpreter, but two years afterwards was compelled by ill-health to leave for

England, On his return to India in 1796 he became military secretary to Sir Alured Clarke, commander-in- chief at Madras, and afterwards to his successor General Harris ; and in 1798 he was appointed by Lord Wellesley assistant to the resident at Hyderabad. In the last- mentioned capacity le highly distinguished himself by the manner in whicli lie gave effect to the difficult measure of disbanding the French corps in the pay of the nizam. In 1799, under the walls of Seringapatam, began his intimacy with Colonel Arthur Wellesley, which in a short time ripened into a life-long friendship; in the course of tlle same year he acted as first secretary to the commission appointed to settle the Mysore government, and before its close he was appointed by Lord Wellesley to proceed as envoy to the court of Persia for the purpose of counteract- ing the policy of the French by inducing that country to form a British alliance. Arriving at Teheran in December 1800, he was successful in negotiating favourable treaties, both political and commercial, and returned to Bombay by way of Baghdad in May 180]. He now for some time held the interim post of private secretary to Lord Wellesley, and in 1803 was appointed to the Mysore residency. At the close of the Mahratta war, in 1804, and again in 1805, he negotiated important treaties with Sindhia and Holkar, and in 1806, besides seeing the arrangements arising out of these alliances carried out, he directed the difficult work of reducing the immense body of irregular native troops. In 1808 he was again sent on a mission to Persia, but circumstances prevented him from getting beyond Bushire; on his reappointment in 1810, he was successful indeed in procuring a favourable reception at court, but otherwise his embassy, if the information which he afterwards incorporated in his works on Persia be left out of account, was (through no fault of his) without any substantial result. He sailed for England in 1811, and shortly after his arrival in the following year was knighted. His intervals of leisure he devoted to literary work, and especially to the composition of a History of Persia, which was published in two quarto volumes in 1815. On his return to India in 1817 he was appointed by Lord Moira his political agent in the Deccan, with eligibility for military command ; as brigadier-general under Sir T. Hislop he served against the Mahrattas and Pindharis, and took a distinguished part in the victory of Mehidpur (December 21, 1817), as also in the subsequent work of following up the fugitives, determining the

conditions of peace, and settling the country. In 1821 ho returned once more to England, where he remained until 1827, when he was appointed to the Bombay government. His influence in this office was directed to the promotion of various economical reforms and useful administrative measures, shortly after his arrival in England entered parliament as member for Launceston, and was an active opponent of the Reform Bill. He died of paralysis on May 30,

1833.

Besides the work mentioned above, Sir John Malcolm published Sketch of the Political History of India since. . . 1784, in 1811 and 1826 ; Sketeh of the Sikhs, 1812 ; Observations on the Disturbanees im the Madras Army in 1809, 1812; Persia, a Poem, anonymous, 1814; 4 Memoir of Central India, 2 vols., 1828 ; and Sketches of Persia, anonynious, 1827. A posthumous work, Life of Robert, Lord Clive, appeared in 1836. See Life and Correspondence of

ee Sir John Malcolm, G.C.B., by J. W. Kaye, 2 vols.,

6.

MALDAG, a district in the lieutenant-governorship of Bengal, India, between 24° 29’ 50” and 25° 32’ 30” N, lat., and 87° 48’ and 88° 33’ 30” E. long., the Ganges river forming the continuous west and south-west boundary. The administrative headquarters are at English Bazar. The district, of which the area is 1813 square miles, is

Leaving India for the last time in 1830, he

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divided into two almost equal parts by the Mahdnanda river, flowing from north to south. The western tract between the Mabdnandé and the main stream of the Ganges is a low-lying allnvial plain of sandy soil and great fertility. The eastern half is an elevated region broken by the deep valleys of the Tangan and Purndbhaba rivers and their small tributary streams. The soil of this district is a hard red clay; and the whole is overgrown with

thorny tree jungle known as the /éta/. Agricultural prosperity centres on the Mahdénanda, where mango orchards and high raised plots of mulberry land extend continuously along both banks of the river. The Ganges nowhere intersects the district, but skirts it from its north-western corner to the extreme south. The Mahdnandé flows in a deep well- defined channel through the centre of the district, and joins the Ganges at the southern corner. Its tributaries are the Kalindri on the right, and the Tangan and Purndbhd4ba on the left bank.

The population in 1881 was 710,310 (347,055 males and 363,255 females), In 1872 the number of inhabitants was 671,974,— 355,276 Hindus, 307,460 Mohammedans, 9195 aborigines, and 43 Christians. The male adult agriculturists numbered 134,358. Only two towns then contained upwards of 5000 inhabitants, viz., English Bazar or Angrazabad, 12,859, and Maldah, 5262, The most important centres of commerce are Haiatpur on the Ganges, and Rohanpur on the Purndbhaba, just above the con- fluence of that river with the Mahananda. Rice constitutes the staple crop, and occupies about 53 per cent. of the total cultivated food crop area. The miscellaneous crops include indigo, mulberry, and mangoes. The average rate of rent may be put at over 4s. an acre. There is little that is peculiar in the land tenures of the district, except the existence of several large rent-free estates, granted as endowments to Mohammedan fakirs. Among cultivating tenures, the hal hdsild deserves notice, under which the annual rent varies according to the nature of the crop raised. This tenure is most common in the backward parts of the district, and one of its incidents is that it allows a certain proportion of the village lands to lie fallow. Maldah is liable to some extent to the calamities of flood and drought; but the means of com- munication by river are sufficiently ample to prevent scarcity from intensifying into acute distress. The two staple manufactures are silk and cotton. Brass ware of excellent quality is manufactured at Nawabganj, and paper in certain villages. The principal exports are rice, silk, indigo, brass ware, and mango fruit. The imports comprise cotton cloth, salt, sugar, spices, and betel-nuts. The net revenue of the district in 1880-81 amounted to £60,674, of which £37,998 was derived from the land tax, and £11,538 from excise. Education was afforded in 1872 by 170 schools, attended by 4207 pupils, The average annual rainfall of the district is returned at 54°56

inches. The chief epidemic diseases are malarious fever, cholera, and small-pox.

Maldah supplied two great capitals to the early Mohammedan kings of Bengal ; and the sites of Gaur and Panduah exhibit the niost interesting remains to be found in the lower Gangetic valley. See Gaur, vol. x. p. 112 sg. The connexion of the East India Company with Maldah dates from a very early period. As far back as 1686 there was a silk factory there. In 1770 English Bazar was fixed upon for a commercial residency, the buildings of which at the present day form both the public offices and private residence of the collector.

MALDEN, a city of the United States, in Middlesex county, Massachusetts, situated on the Malden river, 5 miles north of Boston. Malden was settled in 1634, being then known as thie village of Mystic Side. It was incor- porated as a town under the name of " Mauldon" in 1649, and became a city in 1882. It is a place of considerable industry, producing india-rubber boots and shoes, leather, lasts, sandpaper, &c. There are Turkey red dye-works; and the U. 8. Government has a depét where large quan- tities of saltpetre are stored. Judson, the apostle of Burmah, was born in the town in 1788. The population has increased from 7367 in 1870 to 12,017 in 1880.

MALDIVE ISLANDS, a remarkable archipelago in the Indian Ocean, the northern extremity of which is 7° west of Ceylon, and which extends in length from north to south, from 7° 7' N. lat. to 0° 42'S., a space of 540 British, miles (or about as far as from Kirkwall in Orkney to Dover), and is limited in width by the meridians 72°

27' and 73° 50.1. The strange appearance which this group assumes in the old maps of the 16th and 17th centuries (see fig. 2, from Mappemonde, cited on p. 329) is entirely inaccurate in detail, but hardly so singular as the reality exhibited by modern surveys.

The archipelago is in some respects one of the most dis- tinctly typical examples of a great aggregation of coral islands; indeed the technical name adopted by modern science for the annular coral formation which they

exhibit (viz., atoll) has been taken from the language of these islands.? For Mr Darwin's theory of such formations see vol. vi. p. 378. Objections to this have recently been raised by Mr John Murray, but these do not affect the description.'

The Maldive archipelago in plan may. be compared to a chain suspended from a peg, each link of which chain is an irregularly elliptical chaplet of islets, the greater axes of these quasi-ellipses varying from about 90 miles down- wards. Taking separately any one of these chaplets (or atolls), we now know it to be the nearly level summit of a submarine table-mountain, rising abruptly from the un- fathomable ocean, and approaching the surface within a distance which varies in different atolls from 20 to 45 fathoms. The quasi-elliptical margin of the atoll is fringed, and the central expanse of its area is more or less sparsely studded, 'with oval basins of coral-rock just lipping the surface of the sea, and each containing a lake of clear water" (Darwin). These small oval basins, or ring-shaped reefs and islets, are in fact essentially miniatures of the atoll itself.

The general impression made by the Maldive atoll is vividly drawn by the French adventurer Pyrard de la Val

(1602-7):

' Each atollon is detached, and contains within it a great multi- tude of small islands. It is a marvel to see one of these afollons, compassed all round by a great bank of stove, insomneh that no art of man could so well euclose with walls an equal space of ground, ,... Looking from the middle of an atollon you see all round you that great bank of stone encircling the isles and defend- ing them against the violence of the sea. And it is a fearful thing even for the boldest to draw near this bank and see the waves come on and break furiously all round …. so that you sce all round you as it were a whitened wall."*

Though the barrier reef, or banc de pierre, of which Pyrard speaks, exists in most of the atolls, there is none in the most northerly of the great atolls (Tiladummati and Milladummadu, two divisions of one atoll). In this there are broad and safe navigable channels, from 1 to 2 niles wide, between all the islands forming the chaplet. A vessel can enter the atoll by any one of

these channels, and steer within it in any direction, anchoring anywhere ona sandy bottom in 20 to 25 fathoms. In the more southerly atolls entrance channels are only found at occa- sional intervals, though in all they are pretty numerous. Thus in Suadiva, the most southerly of the large atolls (50 miles from north to south, 36 miles from east to west), which has a barrier reef on great part of its contour, there are forty-two channels by which a ship can enter the lagoon.

It is observed that in the double part of the chain of atolls the openings are most numerous on those sides which are in juxtaposition. Thus on the three atolls of

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} The solitary island of Minucoy (Afinakai), lying 70 miles north of the Maldives (med. lat. 8° 16’ 30” N.; population 3000), pertains to these islands by the race and language of its people, but, as it has long belonged to the raja of Cannanore, it is usnally elassed with the Laccadives,

7 Mald. afolu. The word atollon is already defined as a generic ex- pression in Zeidler's Universal Lewicon, 1782 ('a name applied to such a placein the Sea as exhibits a heap of little islands lying close together, and almost hanging on to each other "). Atolu is probably connected with the Singhalese prep. etula, 'inside " (Bell).

3 See Proc. Roy. Soc. Edin., 1879-80, No. 107.'

ISLANDS Minikoi 47)

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Fig. 1, Admy. Chart ; Fig. 2, Map of cir. 1555.

Maldive Islands.

ALD ITLYE

Ari and North and South Nilandu there are on the inner or eastern side seventy-three deep-water channels through the barrier, on the outer or western side only twenty-five; wliilst on the atolls of South Malé, Felida, and Mulaku, which lie facing the three former, there are on the inner or western side fifty-six deep-water openings, and on the outer or eastern side only thirty-seven. These differences are doubt- less due to differences in the action of the sea caused by the juxtaposition of the two rows of atolls, and analogous facts are observed elsewhere in atolls exposed to trade-winds.

Immediately outside of the great chaplets or atolls thie figures of the soundings rise suddenly. Thus at Ihavan- diffulu (Heawandoo of charts), the most northerly atoll, close to the margin of the reef the line gave 50 and 60 fathoms, and at 300 yards distance there was no bottom with a 300-fathom line. And this sudden increase of depth applies to the deep channels between the atolls as much as to the ocean east and west of them.

We have spoken of the small reefs, which fringe tlic atolls and dot their area, as also ring-shaped. This is the type, but it is not universal. The charts show that where the channels or breaches through the marginal reef of the atoll are few or narrow there are no minor annular reefs (e.g., in Suadiva); where the channels are somewhat broader, the intercepted portions of reef are annular, but – not the recf in the central area; where the channels are broadest, almost every reef throughout the atoll is more or less perfectly annular. The depth of the lagoon within these rings is generally 5 to 7 fathoms, but sometimes, as in Ari atoll, it reaches 12 fathoms. The outer margin of the rings is bordered with living coral, within which is a flat surface of coral-rock. On this flat, sand partially indurated, and fragments of coral, &c., have accumulated, and been converted into islets clothed with vegetation. Such islets sometimes fill the whole ring of reef, and some- times are mere strips occupying a segment of it. Obviously the whole aggregate of

actual dry land in such an archi- pelago is infinitesimal compared with the area of the atolls, The highest part of the islands is generally about 6 feet above water. Moresby found the surface-sand usually about 3 feet thick, the upper part partially mixed with vegetable matter so as to forma light soil; below this a white compact sand, and then a soft sandstone 2 feet thick, below which it softened to sand again, and fresh-water appeared.

All the islands of any extent are well clothed with wood, including many fine large trees and the ordinary shrubs of the Ceylon coast-jungle ; where the jungle has been cleared, grass grows luxuriantly. But the cocoa-palm is the char- acteristic tree ; and, low as the islands are, being covered with these, they can be seen from a masthead at 15 miles, The appearance they present is that of a tuft or line of trees rising out of the water.

A good deal of vicissitude seems to go on in the forma- tion of new islets and decay of old ones, of which our survey-officers met with various instances.

All the inhabited islands, and some besides, afford fresh water. But the quality of water varies; and it is not uncommon to see two wells within a few feet of each other, one brackish and the other excellent. None of the wells are more than 6 feet deep.

The whole archipelago has from the earliest reports of it formed a little kingdom. Physically the number of atolls may be reckoned as nineteen, besides some solitary islands ; but administratively these are grouped into thirteen, and the term atoll has been transferred to this division. We give in the following table the list of these (political) atolls, in a second column the spelling of the marine charts, and in a third the list of atolls as given by Pyrard de la Val, in the beginning of the 17th century.

L&e&baAN DS 329

es As in Moresby's Charts,| As in Pyrard de la Names of Atolls. 1837, Val,

1. ee ae gee Tilla Dou Matte. ae dou matis. 2. Miladummadulu,} ; Milla doue ma- or Miladummadu. Milla Dou Madou. doue. 3. Fadiffolu. | Paddipholo. Padypolo. 4, Malosmadulu. Mahlos Mahdou. Malos madou. 5.

Male. Malé. Malé Atollon. 6. Ari. Ari. Ariatollon. 7. Felidu. Phah-Lee-doo. Poulisdous. 8 Mulaku. Moloque. Molucque. 9. Nilandu. Nillandoo. Nillandous, ne cic oe a | Collomandoo. Collomadous. 11. Haddummatt. | Adou Matte. Adou matis, 12, Suvadiva, or ‘ Suadiva, or Hooah- aia Huvadu. | doo. ae 13. Addu, which in- } | Addou and cludes the island | | “4900 (and Phooa |) °° bona “Mol- of Fua Mulaku. atetawlelond). lucque.

The list from Pyrard shows that the division in the beginning of the 17th century was identical with what it now is. But we may gather that it is substantially of much greater antiquity, from the statement of Ibn Batuta (c. 1343), who says the islands were divided into aklém (kAiwara), each under a governor. He mentions eleven of these :—Bilibfir, Kannaltis, Mahal, Tiladtb, Kar4ida, Tim, Tiladummati, Hiladummati, Baridi, Kandakal, Muldk,—of which indeed the names of only seven, viz., (1) Tiladummati, (2) Heladummati, (3) Balibfr, (5) Mahal, (7) Bartda, (8) Mulik, (12) Suweid, can be identified with those of the existing divisions. But another, Karaid, no doubt repre- sents Karadiva, a well-known solitary island north of MAlé atoll; Kandakal is an island of the Miladummadu atoll, called in the charts Condaicoll ; Tim appears near the north of Tilladummati as Oteim; and the three—Kannalts, Kandakal, and Tim—are presented prominently as the islands Camdalus, Camdicall, and Otimo in the Mappe- monde made for Henry IT. of France (c, 1555, see Jomard’s Facsimiles, livr®. vi, copied in fig. 2 supra; and compare Portolano of 1570, copied in Mr Birch’s translation of Albuquerque’s Commentaries) Possibly, therefore, the Moorish traveller had substituted true names of islands which he remembered for the names of atolls which he had forgotten.

The Maldives are inhabited by a people of old civiliza- tion, professing Islam, and ruled by a sultan of ancient lineage. What the number of islands may be we cannot say. They are popularly estimated at 12,000, as appears by the ancient style of the sultan as “king of 12,000 islands and 13 atolls.” (See also Marco Polo, 2d ed., 1875, ii, 417-19.) Those marked with names in the British survey amount to 602, and the inhabited islands to 178. The men are of a darkish copper colour, short stature (5 feet 2 inches), and poor physique, but oval contour of face, pleasing expression, and large bright eyes, suggesting resemblance to both the Singhalese and Malabar people.

The women arc fairer than the men, with regular features and clean healthy aspect.

1 The frequent termination dw represents the Singh. déva, diva, and Sansk. dvipa, "island." Bell takes madwiu for Sansk. mandala, '"'yegion." Qu. mahd-atolu, 'great atoll"?

and domestic habits. some books at 200,000; almost certainly one-tenth of that number would be an ample estimate. Moresby states the population of 98 islands, and the aggregate is 11,310. In the same proportion 178 islands would give 20,543; but the aggregate quoted includes the King's Island, which is inuch above the average in population.

The language is undoubtedly a dialect of Singhalese approaching the old Z/u, but indicating a separation of ancient date, and it is more or less Mohammedanized. Nothing at present can be said of grammar. But Mr Albert Grayhas drawn out in parallel columns the Maldivian words given by Pyrard with the modern Singhalese equi- valents (see Jour. Loy. As, Soc., quoted atend). A cursory analysis of the list (which contains 275 words) gives the following result :—

1. Words evidently to be explained by Singhalese 58°0 per cent. ie

2. », less evidently " i ne B, JPteareie wal fhatcl JW) ONE o aneontog :ova cso onaasae nena aboDon NOG. Hp A, AW al av icentes.s ssnpieas sition 0 ieee vestments soem 1 Omer, fa, UNeron0 Rae ae canes cococunonmeerunpadasencunoronconsonorod et, Gi MOU OMS, ta scaceanceter car usica wiry ooiee-na rie emses Ne ee 7. Sanekrit or Pali, not Singhalese….....0..:. OuSias Re WanelereisimbncKtl pasnonncnbdso soocaoe onponscaoertoccrgaana. 24°3

Combining 1, 2, and 7, we have 61 per cent. of words of Singhalese or Sanskrit origin. And an analysis by Mr Bell of one of the sultan's letters to the Ceylon Govern- ment gives 65 per cent. of such words.

Tho origin of the name Jfal-diva or Mdldiva is obscure. Diva is a familiar word in the Indian prakrits (Sansk., dvipa ; Pali, dépo) for an island. By a form of this word the people formerly designated themselves and their country, and this survives in letters of last century from the sultan to the Ceylon Government, in which he designates his kingdom as Divehi Rdjjé, and his subjects as Divehi mthun, 'island people." There is a very old example of this use in Ammianus Marcellinus, who, in reference to the alleged excitement in the East at the accession of Julian, says that missions were prepared "ab wsque Divis et Serendivis," from the people of the Divas and of Serendiva or Ceylon. And this is the name Diva or Dibaydt (Pers. plural form) by which these islands are described by the early Arabian geographers. The first literary use of the whole name is Ibn Batuta's Dhibat-al-Mahal (14th century), an Arabized form, sometimes used (Jahal-dib) by the people now, though the proper form seems to be JAfalé. Malé-diva may possibly, as Bishop Caldwell (comp. Grammar, 2ded., Introd. p. 28) and others have suggested, have meant the "islands of Malé" or Malabar. On the other hand Jfdld (Sansk.), "a chaplet" or "row," is not an impossible etymology considering how naturally the word '"chaplet" occurs in the endeavour to describe an atoll. But these are conjectures. Under the sultan (who styles himself on coinage " Lord of Land and Sea") there used to be six recognized viziers or councillors (but this system is now obsolete), besides a chief of law and religion called fandiart. Over each of the thirteen atolls is a king's agent, called atolu-veri, who collects the revenue. This official is often one of the royal family, or a vizier's son, and often resides at M&lé, employing a deputy. On each island is a headman called rarhu-veri. There is also on each island containing forty inhabitants a kddibu (Ar., kétib, scribe"), who acts as judge and minister, celebrat- ing marriages, &c. Pyrard calls him the cwré.

Some of the oldest accounts of these islands represent them as always governed by a woman,—a notion which probably arose among the Mohammedan visitors from finding that female heirs were not precluded from succes- sion, Just the same notion was held about Achin in the lith century, because there chanced to reign there several female sovereigns in succession (see vol. i. p. 97). We

The population has been guessed in |

do find females nominally reigning on the Maldives on two of the rare occasions when we have glimpses of their state, viz., in the time of Ibn Batuta, and again in the last century.

*Islam is universally professed by the people, nor is there tradition of any other religion, though there are a variety of Pagan superstitions and some doubtful traces of Buddhism. Thus the Bo-tree (or pippal), so sacred among the Buddhists of Ceylon, is still cherished near mosques. Pyrard de la Val was informed that the conversion to Islam took place two centuries at most before his time, z.e., about 1400. But, unless there was a decay and revival, we know this to be wrong, as the islanders were Mohammedan in the time of Ibn Batuta (1343). And this traveller tells that the father of one of his wives in the islands had for his grandfather (though the word used may mean " ancestor i only) the Sultan Datid, who was grandson of Ahmed Shanti-raza, the first king who adopted Islam. Accepting the meaning of *' grandfather," this would carry the con- version back to about 1200, a probable epoch, for about that time there was a considerable outburst of missionary zeal in Islam, which led to the conversion of the coast states of Sumatra, &c. Ibn Batuta records an inscription on the Jami Mosque of the King's Island which ran :— '"'Sultan Almed Shanti-razah embraced Islam at the hands of Abu'l Barak&t the Berber from the West"; but no date is given.*

We have mentioned the occurrence of the name Divi in Ammianus. At an earlier date Ptolemy notices the numerous islands lying in front of Taprobane, alleged to number 1378. It is possible also that the Afaniole of the same geographer may constitute a duplicate indication of the Maldives. For in the gossip of Palladius about India (see C. Miiller's Pscudo-Callisthenes, p. 102) this name Maniolx is applicd to a group of islands, 1000 in number, that lay near Taprobane, and respecting which the old fable of the magnetic rock was current, whicli Ptolemy also connects with the IJaniolz.

Cosmas (c. 545) shows distinct knowledge of the Maldives (with- out naming them) as numerous close-set small islands round Sielediba or Taprobane, in all of which were found cocoa-nuts and fresh water. Passing

next to the Arabian notices translated by Renaudot and Reinaud, which date from 851, and to the work of Mas'{idi in the next century, we find tolerably correct accounts of the Dibas, said to be 1900 in number, Al Birfini's account (¢. 1080) of the islands is marked by his usual perspicacity and accuracy. The Dtvas are islets which form themselves in the sea, appearing like a ridge of sand, extending and uniting till they present a solid aspect. But also with time some decompose and melt away in the sea, whilst the inhabitants transfer their cocoa-trees and possessions to an island which is waxing instcad of waning,—circumstances corroborated by modern observation.

All the old authors speak of coir (the fibre of the cocoa-nut husk) as one of the staple products of these islands, and the importance of this article for marine equipment led the Portuguese about 1518 to establish a factory on the Maldives. Joao Gomez, the head of the settlement, was at first well received, but his arrogant and violent conduct gave great offence to the Mohammedan traders from. Cambay, who brought an armed Hotilla against the Portuguese and put them all to death. The Portuguese several times renewed the attempt to establish themselves on the islands, and maintained a garrison for some time, but these endeavours had no permanent result. The islanders were also frequently subject to raids at the hands of the Mopla pirates of Malabar, and sometimes also, it would secm, to maltreatment from the crews of European vessels. The MS. diary of Mr (afterwards Sir William) Hedges, who passed through the Maldives in 1685, says: " We putt out a piece of a Red Ancient to appear like a Moor's Vessell: not judging it safe to be known to be English ; Our Nation having lately gott an ill Name by abusing yc Inhabitants." Such circumstances probably led the islanders to place themselves in relation with the rulers of Ceylon ; and in 1645 occurs the first record of the embassy from the sultan of the Maldives to the Dutch governor at Colombo, which has continued to the present day, under Dutch and English, to arrive annually, bringing some poor offering, as a vague token of homage and claim of protection. The last political trouble of which we have notice occurred in the middle of last century. In 1753 the chief minister conspired to hand over the islands to the Ali raja of Cannanore. A Mopla force occupied Malé, and carried off the sultan. The traitor himself was rewarded by being thrown into the sea. The

oppression of these foreigners made the islanders risc and expel them. ‘he sultan never returned, and a minister who

MALDIVE

had ruled on his behalf assumed the kingdom in 1760. In 1754 Dupleix occupied Malé with a small Freneh detachment, which remained several years. In 1811 the sultan wrote to the govcrnor- general (Lord Minto) to eomplain of the violent conduet of the officers of a ship under British eolours which had becn wrecked on the islands. Lord Minto sent baek a courtcous answer with presents. There have been no other events during the British rule in Ceylon, and the last sultan, Mohammed Moidin, reigned without dispute from 1835 to 1882.

We have only three substantial accounts of the Maldives from aetual residence :—(1) that of the Moor Ibn Batuta, who lived upon them more than a year (1343-44), and filled the office of cadi; ‘t contains much eurious detail; (2) the narrative of Frangois Pyrard de la Val, a French adventurer on board a ship of St Malo, which was wreeked on a reef of the Malosmaduln atoll in 1602, and who was detained five years on the islands, —a book of the greatest interest and aceuraey, and by far the best aceount of these

islands in existence ; (3) a memoir by two officers of the Indian navy, Lieut. Young and Mr Christopher, who had been employed in the survey of the islands under Captain R. Moresby in 1834-35, and who volunteered to remain behind at MAlé, in order to acquire a knowledge of the language, customs, &c., of the inhabitants, — a laudable effort, but the result of it was marred somewhat by the illness which prostrated both officers.

The sultan’s residence and the capital of the kingdom is

the island of Malé, which lies near the middle of the archipelago on the east side. It is about 1 mile long by $ mile wide, and contains a population approaching 2000. It has been at one time encompassed with walls and bastions, but these continue in repair only on the north and west. On the north too is an old fort, apparently of Portuguese construction, with a few old guns, On the north and west sides also advantage has been taken of the

encircling reef as the base of a wall which has been built up so as to form the lagoon into a harbour for small craft, having a depth of 6 to 12 feet, and a width of 150 yards. The town is laid out in long regular streets at right angles, shaded with trees; the houses are in "compounds," with high fences excluding the street, and are surrounded with fruit trees and flowers. The sultan's palace, a large upper- roomed house, occupies with its appurtenances an area of 4 square mile, enclosed by a shallow ditch now choked with vegetation. The houses generally are large cottages of about 28 feet by 12, formed of substantial wooden frame, with peaked roofs thatched with cocoa-leaves; the walls are matted with cocoa-leaves, but sometimes planked. There are several mosques, and at least one minaret, about 40 fect high, for the call to prayer. Stone-built houses, common in Pyrard's time, are so no longer; there is now but one. There are marked distinctions of rank among the people. At least six classes (we hardly know whether to call them castes) are recognized, of whom the two highest form a pure aristocracy. The sixth class, called Kallo ("black" ?), consists of the common people generally, of whom the toddy-drawers are regarded as the lowest. _ The employments of the common people are fishing, gathering cocoa-nuts and cowries, weaving, and toddy-draw- ing. Women beat the cocoa-fibre and twist it into yarn, make mats, prepare breadfruit by slicing and drying in the sun, spin and dye cotton thread, make sweetmeats of cocoa- nut and palm-sugar. Women are not secluded or veiled as in typical Moslem countries.

Rice, the staple of food, is imported. Other chief food is fish (chiefly dried bonito), breadfruit prepared in various ways, cocoa-nut, and a few fruits and vegetables. There are a few sheep and cattle on MAlé island, which are oc- casionally slaughtered.

From the earliest notices the production of coir, the collection of cowries, and the weaving of excellent textures on these islands have been noted. This last, and that of fine mats are the only manufactures in which skill is shown. The mats seem to be now produced only in Suadiva atoll ; the cloth chiefly, but not solely, in Malosmadulu atoll.

The chief exports of the islands, besides coir and cowries

(a decreasing trade), are cocoa-nuts, copra (i.e, cocoa-nut husk), tortoise-shell, and dried bonito-fish, An enormous amount of this last was formerly carried to Ceylon and Sumatra, the latter being supplied by traders who came from Chittagong. It has been known over the East from time immemorial as kobolt-mdis, a corruption apparently of the Maldivian £ald-beli-mds, " black bonito fish," sometimes further corrupted to gomulmutch.

Native vessels of 80 to 200 tons burthen make annual trips to Calcutta towards the end of the south-west monsoon, returning with the north-east monsoon in December. After leaving the Maldives they sight no land till Jagannath. They carry thither the articles named above, and bring back rice, cotton stuffs, and sundries. These long voyages are not confined to the craft of the capital. Moresby, in 1834-35, found that a small island in the North Nilandu atoll sent annually to Bengal five or six boats of 80 to 100 tons each. On the same island there was a kind of navigation school, and the natives made and repaired some kind of nauticalinstruments. The old cash of the Maldives was the curious /érin or " fish- hook money" made of a bent rod of silver. This has been long replaced by coins of base metal bearing the same name. The Anglo-Indian rupee is current for larger payments, and cowries are still used to some extent.

Two alphabets are known on the islands (besides thie Arabic, which appears on tombstones and in other inscrip- tions). The first is an ancient alphabet, known as Divehi Hakura, "island letters." This in 1835 still survived in the southern atolls, and orders for these were written in it. It is written, like all the Indian alphabets, from left to right, and is evidently (by comparison with plate xvii. in Dr Burnell's Zlements of South Indian Paleography) a form (with additional letters) of the old Tamil character (790 to 1300 a.p.) called in Malabar Vatteluttu, or " round haud."! The modern Maldive writing, called Gabali Tana, is usually? written from right to left, like Arabic. It is said to have been introduced in the 16th century, and has gone through several variations. Some of the letters are modified from the Arabic character, and nine of them are the Arabic numeral digits. On the other hand numerals are represented by letters of the alphabet. The former system of reckoning was duodecimal, but this is dying out,

Nothing is accurately known of the flora of the islands, and Kew possesses no illustration of it. Among larger trees are mentioned the banyan, pippal, breadfruit, tamarind, and a large tree called kandu, affording a very light wood used for rafts, floats, é&c.; also species of pandanus. 'The castor-oil tree is abundant, though not used. The cocoa-nut of the islands, though of fine quality, is very small, not much larger than an orange. The tree itself furnishes the only indigenous wood used for boat- building. The dumbart (Calophyllum inophyllum) and kuradi (Pemphis acidula) are used in minor wood-work. A tuber, grated and steeped in water to remove its acridity, is made into flour,—perhaps a Colocasia, which Ibn Batuta mentions (al-kalakas) as used to make a kind of vermicelli. They have also sweet potatoes, pine-apples, pomegranates (bearing fruit throughout the year), plantains, and most of the other tropical or subtropical Indian fruits, chillies, a few areca trees, &c. The double cocoa-nut of the Seychelles Islands (fruit of Lodoicea Sechellarum) used to be cast up on the islands, and was believed to be a submarine pro- LP , _ eee SS es ete

1 The resemblance to this is much eloser than to the old Singhalese with which it is compared in Mr Albert Gray's valuable paper already referred to.

2 Usually'; but a Maldivian skipper who gave James Prinsep ie wrote it from left to right (see Jour, As. Soc, Bengal, v.

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duction, —lience called the sea cocoa-nut. It was valued for imaginary qualities, and exported to India, The Portuguese long believed it to be a product of these islands, and called it the Maldive cocoa-nut.

Animals are few. Those named are rats, numerous and destructive, which climb the cocoa-trees and devour the kernels; the large bat called in India " flying-fox," also said to destroy many small cocoa-nuts ; tortoises ; a small snake said to be harmless, &c. Domestic animals are rare ; a few goats and cattle are reared on MAlé.

The climate is not oppressive or disagreeable, but is very unhealthy for strangers, whether Asiatic or European. Ibn Batuta says every visitor was

attacked by violent fever ; Pyrard says the same; and this was substantially the experience of the survey officers and crews in 1834-35. The native crews also suffered much from the disease called beri-bert (which has dropsical symptoms, and is often fatal) and from violent bowel-complaints.

A complete report on the Maldives has recently been prepared by Mr H. C. P. Bell of the Ceylon civil serviec, who has visited the islands, and this is now being printed at Colombo. Mr Bell kindly enabled the present writer to sce a copy before this article went to press, and many valuable facts have been added from it. Other materials used have been—Darwin, The Strueture and Distribution of Coral Reefs, 1842; Voyage de Francois Pyrard de la Val, Paris, 1679 (previous editions 1611, 1615-16, 1619); Voyages Vlbn Batoutah, trans. of Defréméry and Sanguinetti, tom. iv., Paris, 1858; Hamilton, Dese. of Hindostan, ii. 299; Moresby, Naut. Directions for the Maldiva Islands, &e., 1840; Young and Chris- topher, in Trans. Bomb. Geog. Soe., vol. i. pp. 54-86 ; also sec ibid. p- 102 and p. 318; Trans. Roy. Geog. Soe., vol. ii. pp. 72-93; also vol. v. p. 398; Jour. As. Soc. Bengal, vol. v. p. 794; Jour. Roy. As. Soc., vol. vi. pp. 42-76; ibid., new series, vol. x. pp. 173-209 (paper by Mr Albert Gray), &c. (H. Y.)

MALDON, a municipal and parliamentary borough and seaport town of Essex, England, is situated on an acclivity rising from the south side of the Blackwater, 44 miles east-north-east of London and 16 south-west from Col- chester. It consists principally of one main street with several cross streets at right angles. The church of All Saints, dating from 1056, is a spacious edifice consisting of chancel, nave, and aisles, with a triangular tower at the west end surmounted by an hexagonal spire. The church was restored in 1867, and new windows were added in 1877. St Mary's Church is also of very early origin, and was restored in the 17th century. The other public buildings are the grammar school, founded in 1547; the town-hall, formerly D'Arcy's tower, built in the reign of Henry VI. ; and the public-hall, 1859. There are manu- factures of crystallized salt, as well as breweries, iron foundries, and some shipping. The population of the municipal borough (3508 acres) in 1871 was 5586, and in 1881 it was 5476. That of the parliamentary borough (5177 acres) in the same years was 7151 and 7128.

Maldon, which is a very ancient town, is supposed to have received its name, meaning "cross hill," from a eross at onc time erected on the eminence. From remains found in the neighbour- hood there is no doubt that the plaec was of some importance in the time of the Romans, but the supposition that it was Camulodunwm is not sufficiently established. On the western side of the town there are also traces of a large camp, but whether the work is of Roman, Saxon, or Danish origin it is impossible to say. The oldest historical mention of the town is in 913, when Edward the Elder encamped near it to impede the progress of the Danes. 'The town received its first charter from Henry IJ., and in 1558 it was incor- porated by Queen Mary. From the time of Edward III. it returned two members to parliament, but since 1867 only one member,

MALEBRANCHE, Niconas (1638-1 715), a well-known disciple of Descartes, was the youngest child of Nicolas Malebranche, secretary to Louis XIII., and Catherine de Lauzon, sister of a viceroy of Canada, and was born at Paris on August 6, 1638. Of an extremely feeble constitution and somewhat deformed habit of body, he received his elementary education in Latin and Greek from a domestic tutor, and only left home when sufficiently advanced to

enter upoh a course of philosophy at the Collége de la Marche, and subsequently to study theology at the Sorbonne. He had resolved to enter the church, but his retiring and studious disposition led him to decline a stall in Notre Dame, and in 1660 he joined the Congrega- tion of the Oratory. Both his ecclesiastical superiors and himself appear to have experienced considerable difficulty for some time in ascertaining what his special talents were, if they existed at all. He was first advised by Pére Lecomte to devote himself to ecclesiastical history, and he accordingly set about a laborious perusal of the works of Eusebius, Socrates, Sozomen, and Theodoret, but it was found that "the facts refused to arrange themselves in his mind, and mutually effaced one another." Afterwards Richard Simon undertook to teach him Hebrew and Biblical criticism, but with no better success. At last having accidentally, in 1664, fallen upon one of the works of Descartes (the Z'raité de l'Homme), Malebranche was forthwith alive to

his true vocation. So overpowered was he by the novelty and luminousness of the ideas, and by the solidity and coherence of the principles of his author, that (it is said) he was repeatedly compelled by violent palpitations of the heart to lay aside his reading, Malebranche was from that hour consecrated to philosophy, and especially to that of Descartes; and after ten years' study of the works of his master he produced, in 1674, the famous J? echerche de la Vérité, which was followed at intervals by other works, both speculative and controversial, the titles of which are given below. Like most of the great metaphysicians of the 17th century, Malebranche interested himself also in questions of mathematics and natural philo- sophy, and in 1699 he was admitted an honorary member of the Academy of Sciences. During his later years his society was much conrted, and he received many visits from foreigners of distinction, His death took place on October 13, 1715; according to Stock, the biographer of Berkeley, it was hastened by an excited metaphysical argument into which he had been drawn in the course of an interview sought by that philosopher. For a critical account of Malebranche's place in the history of philo- sophy, see CARTESIANISM (vol. v. p. 148 sz.).

The following is a list of his principal works :—De la Recherche de la Vérité, ou Von tratte de la nature de Vesprit de Vhomme, et de usage qu'tl en dott faire pour éviter Verreur dans les sciences (1674, 6th ed. 1712; Latin translation by J. Lenfant at Geneva in 1685 ; two English translations, the second by Taylor in 1712; transla- tions also into German, Dutch, and modern Greek) ; Conversations Chrétiennes, dais lesquelles on justifie ln Vérité de la Religion et de la Morale de Jesus Christ (1676, and frequently); Zraité de la Nature et de lw Grace, 1680; Méditations Chrétiennes et Métaphy- siques, 1683; Traité de la Morcale, 1684 ; several polemical works against Arnauld from 1684 to 1688 ; Hntretiens sur la Métaphysique et la Religion, 1688; Traité de V Amour de Dieu, 1697 ; Entretien dun Philosophe Chrétien et d'un Philosophe Chinois sur Vexistence et la nature de Diew, 1708; Réflexions sur la Prémotion Physique, 1715. Aconvenient edition of the Huwvres choisies de Malebranche, in ae 'ee with an introduction, was published by Jules Simon in 1846.

MALER KOTLA, a native state in the Punjab, India, situated between 30° 24’ and 30° 41’ N. lat., and between 75° 42’ and 75° 59’ 15” E. long., with an estimated area of 165 square miles, and an estimated population of 91,560. The chief products are cotton, sugar, opium, aniseed, tobacco, garlic, and grain. The gross revenue is £25,893, Tho nawdb exercises complete jurisdiction, and receives a compensation of £250 per annum in perpetuity from the British Government, on account of loss of revenue caused by the abolition of customs duties. Maler Kotla town is situated 30 miles south of Ludhiana.

The nawab or chief is of Afghan descent; his family originally eame from Cabul, and oceupied positions of trust in Sirhind under

the Mughal emperors. They gradually beeame independent as the Mughal cmpire sank into decay in the course of the 18th century.

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In General Lake’s campaign against Holkar in 1805 the nawab of Maler Kotla sided with the British. After the subjugation and flight of Holkar, the English Government succeeded to the power of the Mahrattas in the districts between the Sutlej and the Jumna ; and in 1809 its protection was formally extended to Maler Kotla, as to the other cis-Sutlej states against the formidable encroachments of Ranjit Sinh. In the campaigns of 1806, 1807, and 1808 Ranjit Sinh had made considerable conquests across the Sutlej ; in 1808 he marehed on Maler Kotla, and demanded a ransom of £10,000 from the nawab. This led to the interference of the British, who addressed an ultimatum to Ranjit Sinh, declaring the cis-Sutlej states to be under British protection. Finally the raja of Lahore submitted, and the nawab was reinstated in February 1809.

MALESHERBBES, Curitien GUILLAUME DELAMOIGNON pE (1721-17 94), minister aud afterwards counsel for the defence of Louis XVI, came of a famous legal family, and was born at Paris on December 6, 1721. He too was destined for the legal profession, much to the surprise of Marcel, the famous dancing master, who declared that his pupil would never be able to dance well enough to be a soldier or a lawyer, and must therefore be a priest. The young lawyer soon proved his intellectual capacity, when he was

appointed president of thie cour des aides in the parlement of Paris in 1750 on the promotion of his father to be chancellor. One of the chancellor's duties was to control the press, and this duty was entrusted to Malesherbes by his father during his eighteen years of office, and brought him into connexion with the public far more than his judicial functions. To carry it out efficiently he kept in communication with the literary leaders of Paris, and especially with Diderot, and Grimm even goes so far as to say that "without the assistance of Malesherbes the Fincyclopédie would probably never have been published." Though he met with abuse from all sides, there can be no doubt that it was the eminently judicious manner in which he carried out his objectionable duties which laid the foundation of his subsequent popularity. In 1771 he was called upon to mix in politics; the parlements of France had been dissolved, and a new method of administering justice devised by Maupcou, which was in itself commend- able as tending to the better and quicker administration of justice, but pernicious as exhibiting a tendency to over- centralization, and as abolishing the hercditary " nobility of the robe," which, with all its faults, had from its nature preserved some independence, and been a check on the royal power. Malesherbes presented a strong remonstrance against the new system, and was at once banished to his country seat at St Lucie, to be recalled, however, with the old parlement on the accession of Louis XVI., and to be made minister of the mason du roi in1775, He only held office nine months, during which, however, he directed his attention to the police of the kingdom, which came under his department, and did much to check the odious practice of issuing Jettres de cachet. On retiring from the ministry with Turgot in 1776, he betook himself entirely to a happy country and doniestic life. He had always been an enthusiastic botanist ; his avenue at St Lucie was world famous; he had written against Buffon on behalf of the botanists whom Buffon had attacked, and had been elected a member of the Académie des Sciences as far back as 1750. He was now elected a member of the Académie Frangaise, and everything seemed to promise a quiet and peaceful old age spent in the bosom of his family and occupied with scientific and literary pursuits, when the king in his difficultics wished for the support of his name, and sunimoned him back to the ministry in 1787. Again he held office but a short time, but returned to his country life this time with a feeling of insecurity and disquiet, and, as the troubles increased, retired to Switzerland, Never- theless, in December 1792, in spitc

of the fair excuse his old age and long retirement would have given him, he voluntarily left his asylum and undertook with Troncliet and

Deséze the defence of the king before the convention, and it was luis painful task to break the news of his condemnation to the king. After this effort he returned once more to the country, but in December 1793 he was arrested with his daughter, his son-in-law M. de Rosambé, and his grand- children, and on April 23, 1794, he was guillotined, after having seen all whom he loved in the world executed before his eyes for their relationship to him. Malesherbes is one of the sweetest characters of the 18th century ; though no man of action, hardly a man of the world, by his charity and unfeigned goodness he became one of the most popular men in France, and it was an act of truest self-devotion in him to sacrifice himself for a king who had done little or nothing for him. With reason does his statue stand in the hall of justice at Paris, for he is the greatest representative of that noble independence which should prevent any thought of self when a counsel is pleading his client's cause, however perilous such advocacy might be.

There are in print several scientific works of Malesherbes of vary- ing value, of which the most interesting is his Observations sur Buffon et Daubenton, written when he was very young, and pub- lished with a notice by Abeille in 1798. There exist also his Mémoire pour Lowis XVI., his Mémoire swr la liberté de la presse, published 1809, and extracts from his remonstranees, published as Ghwires choistes de Malesherbes in. 1809. For his life should be read the Notice historique of Dubois, the Eloge historique of Gaillard, and the interesting Zssaz, in 2 vols., 1818, of Boissy d'Anglas. There are also many éloges on him in print, of which the best- known is that of M. Dupin, which is interestingly reviewed with much light on Malesherbes's control of the press by Sainte-Beuve in the second volume of the Causeries dw Lundi.

MALHERBE, Francois pe (1555-1628), poet, critic, and translator, was born at Caen in 1555. His family was of some position, though it seems not to have been able to establish to the satisfaction of heralds the claims which it made to nobility older than the 16th century. The poet was the eldest son of another Francois de Malherbe, conseiller du rot in the magistracy of

Caen. He himself was elaborately educated at Caen, at Paris, at Heidelberg, and at Basel. At the age of twenty-one he entered the household of Henri d'Angouléme, grand prior of France, the natural son of Henry IL He served this prince as secretary in Provence, and married there in 1581. It seems that he wrote verses at this period, but, to judge from a quotation of Tallemant des Réaux, they must have been very bad ones. His patron died when Malherbe was on a visit in his native province, and for a time he had no particular employment, though by some servile verses he obtained a considerable gift cf money from Henry III, whom he afterwards libelled. He lived partly in Provence and partly in Normandy for many years after this event ; but very little is known of his life during this period. It was in the year parting the two centuries (1600) that he presented to Marie de' Medici the first of his remarkable poems. But four or five years more passed before his fortune, which had hitherto becn indifferent, turned. He was presented by his countryman, the cardinal Du Perron, to Henry IV.; and, though that economical prince did not at first show any great eagerness to entertain the poet, he was at last summoned to court and endowed after one fashion or another. is father died in 1606, and he came into his inheritance. From this time forward he lived at court, corresponding affectionately with his wife, but seeing her only twice in some twenty years. His old age was saddened by a great misfortune. His son, Marc Autoine, a young man of promise, perished in one of the frivolous but desperate duels which, common at all periods of French history, were never more frivolous or more desperate than in the 16th and the early 17th centuries. Mare Antoine de Malherbe fell in 1626. His father used his utmost influence to have the guilty parties (for more than one were

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concerned, and there are grounds for thinking that it was not a fair duel) brought to justice. But he died before the suit was decided (it is said in consequence of disease caught at the camp of La Rochelle, whither he had gone to petition the king), at Paris, on the 16th of October 1628, at the age of seventy-three.

The personal character of Malherbe was far from amiable. He was an obstinate solicitor of favours from the great, a morose and bearish

companion to his equals, a loose liver at a time of life when loose living is especially unbecoming if not especially blameable, a jealous and unfair critic ; but he exercised a great and enduring effect upon French literature, though by no means a wholly beneficial one. The lines of Boileau beginning Lnjin Malherbe vint are rendered only partially applicable by the extraordinary ignorance of older French poetry which distinguished that peremptory critic. But the good as well as bad side of Malherbe's theory and practice is excellently described by his contemporary and superior Regnier, who was animated against him, not merely by reason of his own devotion to Ronsard, but because of a brutal act of discourtesy of which Malherbe had been guilty towards Regnier's uncle Desportes. These are the lines :—

"Cependant leur savoir ne s'étend nullement Qu'a régratter un mot douteuse au jugement, Prendre garde qu'un qué ne heurte une diphthongue, Hpier si des vers la rime est bréve ou longue, Ou bien si la voyelle 4 autre s'unissant Ne rend point 4 Voreille un vers trop languissant.

C'est proser de la rime et rimer de la prose." This is perfectly true, and from the time of Malherbe dates that great and deplorable falling off of French poetry in its more poetic qualities, which was not made good till 1830. Nevertheless the critical and restraining tendency of Malherbe was not ill in place after the luxuriant importation and innovation of the Pléiade ; and if he had confined himself to preaching greater technical perfection, instead of superciliously striking his pen through the great works of his predecessors, he would have deserved wholly well. As it was his reforms helped to elaborate the kind of verse necessary for the classical tragedy, and that is the most that can be said for him. His own poetical work is scanty in amount, and for the most part frigid and devoid of inspiration. The beautiful Consola- tion &@ Du Perrier, in which occurs the famous line—

Et, rose, elle a véeu ce que vivent les roses— the odes to Marie de' Medici and to Louis XIII, and a few other pieces comprise all that is really worth remembering of him. His prose work is much more abundant, not less remarkable for care as to style and expression, and of greater positive value. It consists of some translations of Livy and Seneca, and of a very

large number of interesting and admirably written letters, many of which are addressed to Peiresc, the man of science of whom Gassendi has left a delightful Latin life. It contains also a most curious commentary on Desportes, in which Malherbe's minute and carping style of verbal criticism is displayed on the great scale.

The chief authorities for the biography of Malherbe are the Vie de Matherbe of his friend and pupil Racan, and the long Historiette which Tallemant des Réaux has devoted to him. The standard edition is the admirable one of M. Ludovic Lalanne, 5 vols., Paris, 1862-69. Of the poems only, there is an exeellent and

handsome little issue in the Nouvelle Collection Jannet, Paris, 1874. (G. 6%)

MALINES. See Mrcurin.

_MALLANWAN, a town in Hardoi district, Oudh, India, situated on the Hardoi and Unas road, in 27° 2' 10" N. lat. and 80° 11' 30" E. long., with a population in 1869 of 11,670. Under native rule the town possessed considerable political importance, and upon the British

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annexation of Oudh it was selected as the civil head- quarters of the district, but was abandoned in favour of Hardoi town on the reoccupation of the province after the mutiny. The town has now but little trade, and a deserted indigo factory occupies the site of the old fort. Saltpetre and brass utensils are manufactured.

MALLEMUCK, from the German rendering of the Dutch Mallemugge (which originally meant small flies or midges that madly whirl round a light), a name given by the early Dutch Arctic voyagers to the Futmar (vol. ix. p- 8171), of which the English form is nowadays most commonly applied by our sailors to the smaller Albatroses, of about the size of a Goose, met with in the Southern Ocean—corrupted into "Molly Mawk," or otherwise modified. There is some difference of opinion as to the number of species of small Albatroses, and it is unfortunate that the results of the voyage of the

“Challenger” do not clear up the doubts that have been expressed. Three species have been described and figured, the Dvomedea melanophrys and D. chlororhynchus for a long while, while the third, D. culminata, was discriminated by Gould (Proc. Zool. Society, 1843, p. 107), who has stated that the dif- ference between it and the second is so apparent that he had no difficulty in distinguishing them on the wing. Captain Hutton, on the other hand (bis, 1865, p. 283), considers all three to be specifically identical. Others, as appears by the Report on the Birds of the “Challenger ” voyage (pp, 148, 149), while regarding D. melanophrys as distinct, would seem to unite D. culminata with D. chlororhynchus. The first of these birds, says Gould, is the commonest species of Albatros inhabiting the Southern Ocean, and its gregarious habits and familiar disposition make it well known to every voyager to or from Australia, for it is equally common in the Atlantic as well as the Pacific. The back, wings, and tail are of a blackish-grey, but all the rest of the plumage is white, except a dusky superciliary streak, whence its name of Black-browed Albatros, as also its scientific epithet, are taken. The bill of the adult is of an ochreous-yellow, while that of the young is dark. This species (supposing it to be one) is said to breed on the Falkland Islands and on Tristan da Cunha, but the latter locality seems questionable, for, according to Carmichael (Zrans. Linn. Soc., xit. p. 490), D. chlororhynchus is the bird of this group there found ; while Professor Moseley (Notes of a Naturalist, p. 130) calls it D. culminata.2 Whatever it may be, the excellent observer just named describes it as making a cylindrical nest of grass, sedge, and clay, with a shallow basin atop and an overhanging rim—the whole being about 14 inches in diameter and 10in height. The bird laysa single white egg, which is held in a sort of pouch formed by the skin of the abdomen, while she is incubating. A few other details are given by him, but his visit was too hurried to enable him to ascertain the more important and interesting points in the economy of this Albatros which were neglected by his predecessor, Carmichael, during his four months’ sojourn in 1816-17. D. culminata is said by Gould to be more plentiful in the Australian seas than elsewhere, numbers coming under his notice between Launceston and

1 It was there erroneously stated that Afallemuck was a Dutch word, which it is not ; and the correct German form, as givell by Friderich Martens (Spitzbergische oder Groenlandische Reise Beschreibung, Hamburg, 1675,

4to, p. 68), is Afallemucke. The anonymous transla- tion of this voyage, under the title of An Account of several late Voyages and Discoveries to the South and North, published in London in 1694 (p. 98), was probably the means of the name beconiing known to Ray, in whose Synopsis methodica Avium, published in 1718, it appears (p. 130) as Afallemuck, and thereafter kept its place in English ornithological works.

2 Mr Sclater with commendable caution assigns no specific name to

the eggs of the Diomedea found breeding on this island and its neighbour (Report, de., wt supra, p, 151).

Adelaide, and being also frequently observed by him between Sydney and the northern extremity of New Zealand, as well as in the same latitude of the Indian Ocean. He describes its bill as having the greyish-yellow ridge broad and flat, while that of D. chlororhynchus is laterally compressed and the ridge round. All these birds seem to have much the same habits. Ae 3.) MALLET, Pavt Henri (1730-1807), born in Geneva in 1730, and educated there, became tutor in the family of the count of Calenberg in Saxony. In 1752 he was appointed professor of belles lettres to the academy at Copenhagen, but as the French language was then little known in Denmark he had but few students. He was naturally attracted to the study of the ancient literature and history of his adopted country, and in 1755 he published the first fruits of his researches, under the title —Introduction & Vhistovre. de Danemarck ot Ton traite dela religion, des maurs, des lois, et des usages des anciens Danois, A second part was issued in 1756, more parti- cularly relating to the ancient literature of the country, and bearing the title—Jfonuments de la neythologie et de la poeste des Celtes, et particuliérenent des anciens Scandi- naves. In the same year a translation of the work appeared in Danish. Tis is the work by which the author is best known in Britain. Though intended only as a preliminary dissertation to the formal history of Denmark, by which it was followed, it has all the merits of an independent work, complete in itself, and presenting a general view of the civilization and culture, religion and customs, of the Scandinavian nations. A translation into English, with notes and preface, by Bishop Percy, was issued in 1770 under the title of Worthen Antiquities

(republished with additions in 1847). It had a wide circulation, and attracted much attention on account of its being the first (though a very defective) translation into French of the Hdda. Mallet's dissertations and notes are vitiated by untenable theories as to the racial affinities of the early inhabitants of Scandinavia; but, judged by the Standards of its time, his work was of great merit and usefulness. Its publication attracted the notice of the king to its author, and he was chosen as preceptor of the prince of Denmark. In 1760 he returned to Geneva, and became professor of history in his native city. While there he was requested by the czarina to undertake the education of the heir-apparent of Russia (afterwards the Czar Paul I.), but declined the honour. An invitation more congenial to his tastes led to his accompanying Lord Mountstuart in his travels through Italy and thence to England, where he

was presented at court and commissioned to write the |

history of the house of Brunswick. He had previously received a similar commission from the landgrave of Hesse- Cassel for the preparation of a history of the house of Hesse, and both works were completed in 1785. 'The quietude of a literary life was rudely broken by the shock of the Revolution, to which he was openly hostile. His leanings to the unpopular side were so obnoxious to his

fellow-citizens that he was obliged to quit his native

country in 1792, and remained in exile till 1801. died at Geneva, 8th February 1807.

A memoir of his life and writings by Simonde Sismondi was published at Geneva in 1807. Besides the Fntroduetion to the His- tory of Denmark, his prineipal works are—Histoire de Danemarck, 3 vols., Copenhagen, 1758-77; Histoire de la maison de Hesse, 4 vols., 1767-85 ; Histoire de la maison de Brunswick, 4 vols., 1767-85 ; Histoire de la maison et des états de Mecklenbourg, 1796 ; Histoire des Suisses ow Helvétiens, 4 vols., Geneva, 1803; Histoire de la Ligue Hanséatique, 1805.

MALLOW, botanically Jfalva, the typical genus of Malvacex, embracing about sixteen species of annual aud perennial herbaceous plants, widely

distributed throughout the northern hemisphere. The mallows possess the reniform

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one-celled anthers which distinguish the Jfalvacex from all other dichlamydeous exogens. The petals also are united by their base to the tube formed by the coalesced filaments of the stamens. The special characters which separate the genus Jfalva from others most nearly allied to it are the involucre, consisting of a row of three separate bracts attached to the lower part of the true calyx, and the numerous single-seeded carpels disposed in a circle around a central axis, from which they become detached when ripe. The flowers are mostly white or pinkish, never yellow, the leaves radiate-veined, and more or less lobed or cut. Three species are natives of Britain. The musk mallow (Afalva moschata) is a perennial herb with five-partite, deeply-cut leaves, and large rose-coloured flowers clustered together at the ends of the branched stems, and is found growing along hedges and borders of fields, blossoming in July and August. It owes its name to a slight musky odour diffused by the plant in warm dry weather when it is kept in a confined situation, The round-leaved mallow (Malva rotundifolia) is a creeping annual, growing in waste sandy places, with roundish serrate leaves and small pinkish-white flowers produced in the axils of the leaves from June to September. It is common throughout Europe and the north of Africa, extending to western Asia. The common mallow (Malva sylvestris), the manve of the French, is an erect biennial plant with long-stalked roundish-angular serrate leaves, and conspicuous axillary reddish-purple flowers, blossoming from May to September. Like most plants of the order it abounds in mucilage, and hence forms a favourite domestic remedy for colds and various other complaints affecting the mucous membrane. The aniline dye called mauve derives its name from its resemblance to the colour of this plant.

The marsh mallow (Althxa officinalis), the guimauve of the Freneh, belongs to another genus having an involuere of numerous braets. It is a native of marshy ground near the sea or in the neighbourhood of saline springs. It is an ereet perennial herb, with somewhat woody stems, velvety, ovate, acute,

unequally serrate leaves, and delicate pink showy flowers blooming from July to September. The flowers are said to yield a good deal of honey to bees. The root is used in medieine as a demuleent, on aceount of its containing more mucilage than the eommon mallow. It is supposed to form a chief ingredient in the well-known pdte de guimauve lozenges. The marsh mallow is remarkable for eon- taining asparagin, CyH,N.03,H,0, whieh, if the root be long kept in a damp place, disappears, butyric acid being developed. The root also eontains about 25 per cent. of starch and the same quantity of mueilage, whieh differs from that of gum arabie in eontaining one molecule less of water and in being preeipitated by neutral acetate of lead. The marsh mallow is far more largely used on the Continent than in England.

The mallow of Seripture, Job xxx. 4, has been sometimes identi- fied with Jew's mallow (Corchorus olitorius), but more plausibly (the word mid implying a saline plant) with Atriplex Halinvus, or sea orache. In Syria the Halimus was still known by the name Malith in the time of Ibn Beitar. See Boehart, Hieroz., iii. 16.

MALLOW, a municipal and parliamentary borough, market-town, and watering-place in the county of Cork, Treland, is situated on the Blackwater, 150 miles south- west from Dublin, and 20 north from Cork. The town owes its prosperity to its beautiful situation in a fine valley surrounded by mountains, and to its tepid mineral spring, which is very efficacious for general debility and for scorbutic and consumptive complaints. A spa-house with pump-room and baths was erected in 1828. Besides the parish church in the Later English style, erected in 1818, the principal buildings of the town are the court-house, the work-house and infirmary, and the bridewell. There are a manufactory of mineral water, a condensed-milk manufactory, corn-mills, and tanneries. Mallow received a charter of incorporation from James I. The population of the borough in 1871 was 4165, and in 1881 it was 4437.

MALMESBURY, a parliamentary borough and market- town of Wilts, England, is finely situated on an eminence

almost surrounded by the Lower Avon, and on a branch of the Great Western Railway, 92 miles west of London. Of the Benedictine house which was founded in the 7th century, and in the reign of Edward III. rose to the dignity of a mitred abbey, little more than the nave and side aisles of the conventual church now remain; this at the dissolution was changed into a parish church, instead of the old church of St Paul's. There are a town- hall, national and endowed schools, and several almshouses. In the market-place there is a richly ornamented octagonal cross supposed to date from the reignof Henry VIII. The industries include the manufacture of ribbons and pillow lace, brewing, and tanning. The population of the town in 1871 was 3142, and of the parliamentary borough (which comprises an area of 21,772 acres, mostly rural) 6879. In 1881 the numbers were 3133 and 6866.

Malmesbury is supposed to have becn a British town, and also a Roman settlement.

MALMESBURY, James Harris, Fart or (1746-1820), the best-known English diplomatist of the latter half of the 18th century, was born at Salisbury on April 21, 1746. He was the son of James Harris (¢.v.), the author of Hermes, and, what was important for his son's future success, M.P. for Christchurch, a lord of the treasury under George Grenville (1763-65), and comptroller to the queen (1774-80). Educated at Winchester, Oxford, and Leyden, the younger Harris was intended for diplomacy. In 1768 he became secretary to the British embassy at Madrid, and in 1770 he was left as chargé daffaires at that court on the departure of Sir James Gray until the arrival of George Pitt, afterwards Lord Rivers. This interval gave him his opportunity ; he discovered the intention of Spain to attack the Falkland Islands, and was instrumental in thwarting it by putting on a bold countenance. As a reward he was appointed minister ad interim at Madrid, and in January 1772 minister plenipotentiary to the court of Prussia. His success was marked, and in 1776 he was transferred to the court of Russia. At St Petersburg he made his reputation, for he managed to get on with Catherine in spite of her predilections for France, and steered adroitly through the accumulated difficulties of the first Armed Neutrality. In 1782 Sir James Harris (le was now a Knight of the Bath) returned home from ill-health, and was appointed by his friend Fox minister at the Hague, an appointment confirmed after some delay by Pitt, which he took up in July

1784. He did very great service in furthering Pitt's policy of maintaining England's influence on the Continent by the arms of her allies, and held the threads of the diplomacy which ended in the king of Prussia's overthrowing the republican party in Holland, which was inclined to France, and re-establishing the prince of Orange. He was in recogui- tion of his services created Lord Malmesbury of Malmes- bury in the county of Wilts, and permitted by the king of Prussia to bear the Prussian eagle on his arms, and by the prince of Orange to use his motto "je maintiendrai." In 1789 he returned to England, and took an anxious interest in politics, which ended in his seceding from the Whig party with the duke of Portland in 1793, in which year he was sent, but in vain, to try to keep Prussia true

to the first coalition against France. In 1794 he was sent to Brunswick to solicit the hand of the unfortunate Princess Caroline for the prince of Wales, to marry her as proxy, and couduct her to her husband in England. In 1796 and 1797 he was at Paris and Lille vainly negotiating with the French Directory. After 1797 he became partially deaf, and quitted diplomacy altogether ; but for his long and eminent services he was in 1800 created earl of Malmesbury, and Viscount Fitzharris, of Heron Court in the county of Hants. He now became a sort of political Nestor, consulted on foreign policy by successive foreign ministers, trusted by men of the most different ideas in political crises, and above all was the confidant, and for a short time after Pitt's death almost the political director, of Canning. Younger men were also wont to go to him for advice, and Lord Palmerston particularly, who was his ward, was tenderly attached to him, and owed many of his ideas on foreign policy directly to his teaching. His later years were free from politics, and till his death in 1820 he lived very quietly and almost forgotten. As a statesman, Malmesbury had an influence among his contemporaries which is scarcely to be understood from his writings, but which must have owed much to personal charm of manner and persuasiveness of tongue ; as a diplomatist, he seems to have deserved his reputation, and shares with Macartney, Auckland, and Whitworth the credit of raising diplomacy from a profession in which only great nobles won thie prizes to a career opening the path of honour to ability.

Malmesbury did not publish anything himself, except an account of the Dutzh revolution, and anedition of his father's works, but his grandson the third carl published four volumes of his diaries and correspondence from 1768-1807, and aftcrwards two volumes of letters to and from his family and friends.

MALMESBURY, W111 or, an historical writer of tne 12th century, the date of whose birth is usually assigned to the year 1095, but may with more probability be placed some twenty years earlier. It may reasonably be con-jectured from his own statement (‘“‘utriusque gentis sanguinem traho”) that he was the son of a Norman father and an English mother; he undoubtedly represents the fusion of the two races, although his sympathies as a writer are unmistakably on the side of the conquerors. He received his early education at the ancient Benedictine abbey at Malmesbury, and he speaks of Aldhelm, bishop of Sherborne, the great benefactor and second founder of that house, who died in 709, as his “lord and patron,” to whom he was indebted both for his life and his learning (Gesta Pont., sec. 273), The earliest known incident in his personal history is the fact, which he himself records, that he assisted the abbot Godefrey in collecting books to form the first library of the abbey. William himself subse- quently became the librarian, and was also precentor of the abbey; in 1140 he received the offer of the abbacy, an honour which he declined, probably from a desire to secure as much leisure as possible for study. In his later life he was honoured by the particular friendship of Robert, earl of Gloucester, a natural son of Henry I., and a distinguished patron of learned men and letters. In politics he was a warm partisan of the empress Matilda against Stephen, and he was present at the council of Winchester convened by her supporters in 1141. His death is supposed to have occurred in or after 1142.

Printed Works.—William's earliest important work was the Gesta Regum Anglorwm, which he dedicated to his patron, the earl of Gloucester. It was originally completed in 1120, but subsequently brought down to 1128. It extcnds from 449 a.p. to the twenty- eighth year of the reign of Henry I., and is a record of the highest value, preserving from unknown sonrces numerous facts which would otherwise be lost to ns. In 1125 William completed his Gesta Pontificum Anglorum. He himself tells us that the pro-

duction of this work cost him especial pains, but that the material for its composition was ncither so abundant nor so easily reducible

to consistency as that for the Gesta Regum. The work may be regarded as the main source for our early ecclesiastical history, and constitutes the basis of later productions relating to the same subject at the same period. It is divided into five books, the bishops being grouped under their respective sees, and the chief monasterics under their jurisdiction being also noticed, somctimes at con- siderable length. The fifth book is mainly occupied by the life of St Aldhelm, and includes numerous details of interest not given in the earlier life by Faricius. The Gesta Pontificum is likewise brought by further additions down to the year 1140. William's last work was a continuation of the Gesta Regum under the title of Historia Novella. It concludes abruptly with the escape of Matilda from Oxford when besieged there by Stephen in 1142, aud the manner of its termination suggests that the narrative was broken off by the death of the writer. Like the Gesta Regum, the Historia is dedicated to the duke of Gloucester, whose doings in behalf of his sister Matilda are described in such a way as to make him in a great measure the central figure of the narrative. Other printed writings of William are an account of the churcli of Glastonbury (included along with the life of St Aldhelm in Gale's Seriptores XV.), and a life of St Wulstan, of which a considerable portion is given in the second volume of Wharton's Anglia Sacra, The best text of the Gesta Regu and the Historia Novella is that given by Sir T. D. Hardy in the edition published by the English Historical Society in 1840; the text in Savile's Seriptores is faulty in the extreme. The Cesta Pontificum was edited for the Rolls Series, in 1870, by Mr N. E. S. A. Hamilton, from a manuscript which he was the first to identify as the autograph of William himself.

Extant Works Unprinted.—Among these are Miracles of the Virgin Mary ; Miracles of St Andrew ; Life of St Dunstan ; a com-

end of the commentary on the book of Jeremiah attributed to

Tee asin Radbertus ; an abridgment of the treatise by Amalarins on Sacred Offices ; Lives of the English Saints; and an epitome of the History of

Haymo of Fleury, together with other abridgments or transcripts of historical and legal writers,—this last being an autograph preserved in the Bodleian, where, or at the British Museum, the other manuscripts are also to be found.

Lost Works.—Amonug these are a Life of St Patrick; a metrical Life of St Atifgiva; the Miracles of St Benignus; aud the Little Chroniele, in three books (of which a supposed fragment is preserved at the British Museum, Lansdowne MS. No. 486). The work which we have probably most cause to regret is the Itincrarium Johannis Abbatis, or account of the journey of John, abbot of Malmesbury, to Rome in 1140. This was written by William from the oral account which he received from Peter Baldwin, John's companion. A few extracts are given by Leland in his Collectanea, iii. 272.

Malmesbury's merits as an historian are of a very high order. He labours, it is true, under the defect of being but imperfectly acquainted with English institutions, and having but little sympathy with the English race, while he occasionally evinces a Norman contempt for the English language. His habitual carclessness in chronology is also at times extremely perplexing, and his narrative of facts is alloyed with romantic details which serve to excite dis- trust with respect to his general credibility. But, notwithstanding these faults, he is entitled to rank as an authority (in relation to the period of which he treats) with Bede and Matthew Paris. He is again the first of our historical writers in whom the critical faculty is to any extent discernible, and the comparisons which he occasionally institutes between two different and discrepant accounts of the same events form a noteworthy feature in his mode of treat- ment. The pains and judgment which he employs in the arrange- ment of his inatcrials arc also often no less conspicuous than his industry in collecting them.

MALMO, a seaport town of Sweden, inferior only to Stockholm and Gothenburg in importance, is the capital of the lan or province of Malméhus, and stands on the eastern shore of the Sound, opposite Copenhagen, from which it is 16 miles distant. The town, which is built on a level plain, formerly had strong fortifications, of which all that now remains is the citadel, where the earl of Bothwell was imprisoned for some time after 1573; it is at present used as a house of correction. In the large

central square (Stortorg), which is planted with trees, stands the town- hall, a brick and sandstone structure in the Renaissance style; it contains the handsome Knutssal, or former council chamber of the guild of Canute. The principal ecclesiastical buildings are the church of St Peter (Petrikyrka), begun in 1319, and the German church (Tyskakyrka), The harbour in the north-west has recently been deepened, and admits vessels drawing 18 feet of water; there is daily communication by steamer with

| Copenhagen, and also at regular intervals with Stockholm,

Gothenburg, Litbeck, &c. he trade of the port is con- siderable, the exports including timber, iron, tar, oil-cake, and bones, while the imports consist chiefly of wine, salt- fish, salt, and coal. There are a number of manufactures, that of gloves being the specialty. Malmé is connected with Stockholm by rail. Population in 1878, 35,626.

Malmé (Malmhauge, Malmey, Malmoéye, Malmoughc), sometimes called " Ancona Scanorum" or " Ellenbogen," first appears in his- tory about the middle of the 13th century. During the Hanscatic period it was the most important commercial town on the Sound, bunt in the 16th and 17th centuries greatly lost ground owing to the decay of its herring fisheries and the rise of its rival Copenhagen. Its modern prosperity is largely due to the enterprise of Frans Suell, one of its merchants, who first constructed the harbour, which has more than once been enlarged subsequently.

MALORY, Sim Tuomas, the author or compiler of the Morte Darthur, was born most probably about the year 1430. From his own words he is known to have been a knight, and his description of himself as "a servant of Jesu both day and night" has led to the inference that he was also a priest. On the authority of Leland the antiquary he is believed to have been a Welshman. The name appears in a variety of forms, including those of Maillorie and Maleore. In the preface to the first edition of the Morte Darthur Caxton speaks of the work as printed by himself "after a copy unto me delivered, which copy Sir Thomas Malorye did take out of certain books of French, and reduced it into English." Malory himself tells us that he finished the book in the ninth year of Edward IV. (c. 1470). For the place of

the JMorte Darthur in the literary history of the Arthurian legend, see ARTHUR, Grorrrey or Monmoutn, Grain (Hoty), é&e.

MALPIGHI, Marcetto (1628-1694), of Bologna, was one of the first to apply the microscope to the study of animal and vegetable structure; his discoveries are so numerous and important that he may be considered to be the founder of microscopic anatomy. Shortly before his death, he drew up a long account of his academical and scientific labours, correspondence, and controversies, and committed it to the charge of the Royal Society of London, a body with which he had been in intimate relations for more than twenty years. The autobiography, along with some other posthumous writings, was published in London in 1696, at the cost of the Society. The personal details left by Malpighi are few and dry. His narrative is mainly occupied with a summary of his scientific contributions and an account of his relations to contemporary anatomists, and is entirely without graces of style or elements of ordinary human interest, He was born in the country, about 20 miles to the north of Bologna, on the 16th of March 1628. At the age of seventeen he began the study of the Aris- totelian philosophy, and continued it for four years; it appears from another statement that he was in the habit of amusing himself with the microscope during this period. Owing to domestic circumstances, it became necessary for him, in 1649, to choose a profession, and he elected to study medicine; after four years study at Bologna he graduated there as doctor, He at once applied to be admitted to lecture in the university, but it was not till after three years (1656) that his request was granted. A few months later he was appointed to the chair of theore- tical medicine at Pisa, where he enjoyed the friendship and countenance of Borelli. At the end of four years he left Pisa, on the ground of ill-health, and returned to Bologna. A call to be professor primarius at Messina (procured for him through Borelli, who had in the mean- time become professor there) induced him to leave Bologna in 1662. His engagement at Messina was for a term of four years, at an annual stipend of 1000 scudi. An attempt was made to retain him at Messina beyond that

period, but his services were secured for his native uni- versity, and he spent the next twenty-five years there. In 1691, being then in his sixty-fourth year, and in failing health, he removed to Rome to become private physician to Pope Innocent XII., and he died there of apoplexy three years later. In the portrait prefixed to his autobiography, the features are those of the phlegmatic type. His addiction to the microscope: brought him into conflict with the re- spectabilities of the medical profession, including two of his colleagues at Bologna, whose names have been pre- served from oblivion; it was felt by those who affected to watch over the future welfare of medicine that the study of microscopic anatomy was adverse to the true interests of medical practice, and that feeling is said to have found expression in a duel that was fought between the brother of Malpighi and a near relative of one of his con- servative colleagues, in which the latter combatant was killed. Amid such incidents was the fruitful microscopic era of medical and biological science ushered in.

The compound microscope (invented in the Netherlands) had been used in ltaly (Rome) to study the parts and organs of the bee as early as 1625, and it was employed by Malpighi and by his con- temporaries Hooke (botanist) and Leeuwenhoek; the illumination of the objects was always direct, the mirror being a much later addition, and the tube was of unwieldy length. Owing to the inability to overcome spherical and chromatic aberration in com- pound lenses, the siniple microscope came again into common use, and continued to be the chief instrument in the study of minute anatomy until the introduction of flint-and-crown glass lenses by English opticians about a century later. It was Malpighi's prac- tice to open animals alive, and some of his most striking discoveries were made under those circumstances. Although Harvey had correctly inferred the existence of the capillary cir- culation, he had never seen it; it was reserved for Malpighi in 1661 (four years after Harvey's death) to see for the first time the marvellous spectacle of the blood coursing through a network of small tubes on the surface of the lung and of the distended urinary bladder of the frog. We are enabled to mcasure the diffi- culties of microscopic observation at the time by the fact that it took Malpighi four years longer to reach a clear understanding of the corpuscles in the frog's blood, although they are the parts of the blood by which its movement in the capillaries is made visible. His discovery of the capillary circulation was given to the world in

the form of two letters De Pulmonibus, addressed to Borelli, published at Bologna in 1661 and reprinted at Leyden and other places in the years following; the letters to Borelli contained also the first account of the vesicular structure of the human lung, and they made a theory of respiration for the first time possible. The achievement that comes next both in import- ance and in order of time was a demonstration of the plan of struc- ture of secreting glands; against the current opinion (revived by Ruysch forty years later) that the glandular structure was essentially that of a closed vascular coil from which the secretion exuded, he maintained that the secretion was formed in terminal acini standing in open communication with the ducts. The name of Malpighi is still associated with his discovery of the soft or mucous character of the lower stratum of the epidermis, of the vascular coils in the cortex of the kidney, and of the follicular bodies in the spleen. He was the first to attempt the finer anatomy of the brain, and his descriptions of the distribution of grey matter and of the fibre-tracts in the cord, with their extensions to the cerebrum and cerebellum, are distinguished by accuracy ; but his microscopic study of the grey matter conducted him to the opinion that it was of glandular structure and that it secreted the "vital spirits." At an early period he applied himself to vegetable histology as an introduction to the more difficult study of the animal tissues, and he was acquainted with the spiral vessels of plants in 1662. It was not till 1671 that he wrote his Anatome Plantarum and sent it to the Royal Society, who published it in the following year. An English work under a similar title (Anatomy of Vegetables) had been pub- lished in London a few months earlier, by Nehemiah Grew ; so that Malpighi's priority as a vegetable histologist is not so incon- testable as it is in animal histology. The Anatome Plantarum contained an appendix, Observationes de ovo incubato, which gave an account (with good plates) of the development of the chick (especially of the later stages) in many points more complete than that of Harvey, although the observations were needlessly lessened in value by being joined to the metaphysical notion of ' preedelinea- tion" in the undeveloped ovum, His works are—De pulmonibus : Epistole AUZ% ad Borelliwm, Bologna, 1661 (went through several editions) ; Lpistole anatomicz Marc. Malpighii et Car. Fracassati, Amsterdam, 1662 (on the tongue, brain, skin, omentum, &c.); De

Viscerum Structura: cxercitatio anatomica, London, 1669; Anatome Plantarum, cum appendiee obscrvationes de ovo incubato continente, London, 1672 (other editions in 1675 and 1679); De Structura Glandularum conglobatarum, London, 1689; Opera posthuma, et vita a scipso scripta, London, 1697 (another edition, with preface and additions, was published at Amsterdam in 1700). An edition con- taining all his works cxcept the last two was published in London in 1687, in 2 vols. folio, with portrait and plates.

MALSTATT-BURBACH, a town in the district of Treves, Prussia, is situated on the right bank of the Saar (Sarre), almost contiguous with the town of St Johann, and separated from Saarbriicken by the river. It lies in the midst of an important coal-mining and industrial district, and is itself little more than a long and narrow row of manufactories and workmen's houses. The largest factories are engaged in the production of iron, steel, and cement, one iron-work employing nearly 2000 men, and producing 285,000 tons of raw and manufactured metal annually. There is a large wharf on the river for the export of coal. At the census of 1880 Malstatt-Burbach contained 13,158 inhabitants.

Malstatt is of very ancient origin, and received municipal rights in 1321. These, however, were afterwards resigned to the newer towu of Saarbriicken, and in 1818 Malstatt and Burbach were two small villages with a joint population of only 822. About the middle of the century the population began to increase rapidly, in consequence of the development of the mining industry of the

| district and the extension of the railway system, and in 1875 the

two villages were united to form a town. In 1870 Malstatt- Burbach was cannonaded by French troops under the command of Napoleon III.

MALT is the grain of any cereal artificially germinated so as to induce certain changes in the constitution of the seed, specially a conversion of a portion of the starch into sugar. 'The varicties of grain usually employed for malting are barley and bere or bigg, and the processes of preparing the substance are fully explained under Brewince (vol. iv. p. 266).

ibe spécite effect of the malting of grain is to transform by the process of germination a proportion of the starch into soluble sugar and dextrin. These changes are effected by the agency of a peculiar nitrogenous ferment, diastase, which exists in the grain, but which is increased in amount during the germination. The precise sequence of changes, and the exact nature of the new chemical compounds evolved, are still matters of some doubt. It is clearly established that the ferment of barley is in- capable of transforming the starch on which it operates entirely into sugar, the ultimate products of the action being partly dextrin and partly sugar. The relative proportions of these bodies evolved by fermentation from starch have been matter of dispute, some holding that from three molecules of starch there are evolved two molecules of dextrin and one of sugar, while others affirm that the yield is two of sugar and one of dextrin, and a third party hold that for each molecule of sugar there is one of dextrin produced, thus :—

Starch, Sugar. Dextrin. 2C,H,,05 + H,O = C,H,.0, + CyH,)0;. These statements, however, are based on the assumption that the sugar which results from the fermentation of germinating barley is ordinary grape sugar or dextrose, C,H,,0,; but it has been demonstrated, first by O'Sullivan, that it is a form of sugar possessed of peculiar properties to which the name maltose has been given. Maltose, according to O'Sullivan, is isomeric with cane sugar, C,,H,.0,,, but Marcker considers that its constitution should be represented by C,,H,,0,,, and that the equa- tion is as follows :— Starch. Maltose. Dextrin. 40¢H 05 + 2H,0 = CygH3,0,7 + CeH,)0;. Maltose possesses the power of reducing Fehling's solution

(cupric oxide) only to the extent of 63 per cent. as com- pared with dextrose, but its power of right-handed _polar- ization is three times as great= +154°. According to Dubrunfaut the efficient ferment in barley is maltin, a much more richly nitrogenous and active body than diastase, which he considers to be only a product of the decomposition of maltin.

By the processes of malting 100 parts by weight of barley yield about 80 of kiln-dried malt and 2 to 3 of dried radicle and plumule called " malt dust." The pro- gressive modification in composition is shown in the accompanying table of analyses extracted from the report presented by Mr

(now Sir) J. B. Lawes to the Board of Trade "On the Relative Value of Unmalted and Malted Barley as Food for Stock, 1866,"—an inquiry which re- sulted in showing that the advantages claimed for malt as a feeding material were largely illusory :—

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Since the article BRew1Ne was written the malt tax then in force in the United Kingdom has been repealed, and in its place, under the provisions of the Inland Revenue Act 1880 (43 & 44 Vict. cap. 20), an equivalent duty on beer has been substituted. By that enactment numerous modifications have been made practicable in the use of malt for feeding and other industrial purposes, and much greater latitude has been given to brewers in the selection and use of raw materials for the manufacture of the beverages hitherto known as malt liquors.) Taking as the unit of measurement the bushel of malt, which is defincd by statute as equivalent to 42 tb of malt or corn of any description, or to 28 Ib of sugar, the malt duty, which under the provisions of the repealed statutes amounted to 2s. 7d., with 5 per cent. additional, has been transformed into a beer duty of 6s. 3d. charged upon every 36 gallons of wort of a specific gravity of 1057; and every brewer is

deemed to have brewed 36 gallons of worts of that gravity who has used 2 bushels of malt in brewing. In the case of brewers for sale, should the quantity of worts produced and the specific gravity of such worts exceed by more than 4 per cent. the quantity and gravity above specified, the duty is charged for the excess over and above such 4 per cent. Brewers for domestic use and for the use of their own farm labourers are exempt from duty when the annual value of the house occupied by the brewer is not more than £10, and all brewers for domestic use who occupy houses exceeding in value that amount, and who consequently are subject to the beer tax, Inust brew their beer on their own premises only.

The malt tax, which in reality was a duty on raw grain, had long been regarded as a grievous impost, and its repeal was systematically agitated for by the agricultural interest. The tax, it was alleged, operated injuriously on the cultivators of barley, and prevented stockholders from freely using malt for the feeding of cattle and of ewes at the lambing season, &c. On the part of brewers it was maintained that the operation of the tax restricted them to the use of the heaviest and most expensive classes of barley alone; and that they were consequently precluded from using many varieties of grain and saccharine materials which under other conditions they might employ with

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advantage both to themselves and to the consumers of beer. No sooner, however, was it proposed by the Government to effect the change so long clamoured for—not indeed the entire abolition of taxation on malt liquors, but the freeing of a raw material from fiscal impost—than the agricultural community discovered they had made a mistake, and that, while it was really the beer drinker who paid the malt tax, its operation had rather tended to give the British barley- grower a monopoly of the trade in that raw material, aud to artificially enhance the value of the heavier qualities of the grain, Further it was found that the idea of using malt for feeding purposes to any considerable extent, a right which stockholders already possessed under the pro- visions of the "Gladstone Act" (27 & 28 Vict. cap. 9) was entirely illusory ; and as a matter of fact no demand has arisen for malt for such purposes. On the other hand, the freedom of choice as to raw

materials which the Inland Revenue Act 1880 has given to brewers has not becn Without influence on the industry, although the modifica- tions have up to this time been by no means so numerous and important as had been anticipated. Barley continues to be the principal, and, supplemented by sugar, almost the only, raw material of wort; but brewers no longer have any interest in confining themselves to the heaviest and plumpest growths, and consequently much light foreign- grown barley is now used. It was also expected that raw grain, and particularly maize, would be largely used with malt in the mashings, especially as a method had been devised and. patented by Mr R. Blair Robertson of Glasgow for removing the germ of that grain, which contains a peculiar acrid oil, and which communicates a bitter un- pleasant flavour to the wort in which it may be infused. To a limited extent a "maize beer,-" in which one-third part of Robertson's patent prepared maize is mashed with two-thirds of malt, is being brewed with quite satisfactory results, but the mixture does not appear to have com mended itself generally to the trade either on the score of quality or of cheapness.

Malt is also the raw material from which the whisky of Scotland. and Ireland is principally distilled, and it is the source of the greater part of the best qualities of table and pickling vinegar. Chiefly on account of the great solvent power over starch possessed by the diastase or maltin it con- tains, malt is extensively used as a combination in prepared farinaceous food for infants, and in the form of a malt extract it possesses considerable reputation in pharmacy.

MALTA is the chief island of the Maltese group, con- Plate III.

sisting of Malta, 35° 50' N. lat. and 14° 30' E. long., Gozo, 36° 5' N. lat. and 14° 10' E. long., Comino, which lies between them, and the two islets Cominotto and Filfla, a crown colony, and one of the Mediterranean possessions of Great Britain. Malta is 17} miles long by 9} broad, con- taining an area of about 95 square miles (about two-thirds the size of the Isle of Wight), aud Gozo is 9 miles long by 5 wide, with an area of 20 square miles. The islands lie directly south of Sicily, distant from 55 to 60 miles, near the centre of the Mediterranean basin, where they appear as the remains of an ancient chain of islands, mucli worn and still wearing away

*by the sea. Gozo, which has the same general character as Malta, possesses more moisture and richer soil, and therefore more verdure. A cluster of single hills, remarkable for their steeply conical shape, on one of which stands*Rabato, the principal village, is near the middle of the island. Along the northern and eastern shores of Malta the coast-line is frequently broken by deep indentations and bays (St Paul's, St George's, and St Julian's Bays) ; on the peninsulas in and round the most remarkable of these Valetta and its fortifications are built. The geological formation is late Eocene, the prevailing rocks being white, grey, reddish, or yellow sandstone, with*

some beds of marl and coral limestone, in many parts abounding in fossils. The surface of the country is diversified by valleys and steep hills; there is little water, and no river, brook, or lake exists on any of the islands. The highest point of Malta is near Casal Dingli, abont 750 feet above the sea to the south; a little farther north lies the ancient capital, Citta Vecchia, upon another steep height; west of these lies the range of Bingemma Ilills running north-east to south-west; from this higher ground the island slopes somewhat towards the north-west. On the west and south the cliffs rise sheer from the sea to a height of 300 or 400 feet ; on the north the rock in many places shelves to the water's edge, though the lar- bours of Valetta and the rocks where the apostle Paul was wrecked are an exception to this. At the east end is the large harbour Marsa Scirocco, into which the south-east sirocco blows with full force. The general appearance of the land is bare, owing to the want of woodland, and also to the use of stone walls as enclosures for the fields, which in the east of the island are smaller than in the west. The dark foliage of the carob and thie singular masses of the prickly pear are, however, very marked in the landscape, which with its contrasts of blue sea running into the brown and yellow land, heightened by whatever of green may be, is of fascinating beauty under the effects of morning light and setting sun. The land is closely cul- tivated; often the soil is terraced on the sides of the hills as a safeguard against the winter rains. The soil is in many places extremely thin; it is, however, so fertile that it produces two and sometimes three crops in a year. Large quantities of early potatoes grown for the English market, corn sufficient to supply the island for four months of the year, cotton, principally for home use, and a fine red-

flowering clover, called szlla, are the chief crops; excellent honey is obtained from Gozo ; oranges and figs come to great perfection. Goats abound, but few cows are kept; the mules and asses are fine ; cattle and sheep for butcher meat are imported from Barbary. Fish is good and abundant. The flowers of Malta are famous; Cicero mentions the cushions stuffed with roses used by Verres, and many a lovely garden is hidden behind the high stone walls. The interesting flora of the islands approaches that of Africa (to which contineut the old geographers considered them to belong, as the French do still), including the palm, cactus, and other sub-tropical plants. The scanty fauna is for the most part European; the Maltese dog is mentioned by Strabo and other old writers; a few still remain, though not wild. Of birds there are about ten or twelve indigenous species, but a large number of migratory birds pass or rest here. The marine plants and animals also offer a rich fund of material to the student.

The winter climate is temperate and healthy, the ther- mometer ranging from 51° to 71° Fahr. between October and May. In the summer months the heat is almost tropical; from July to the end of October it ranges be- tween 80° and 90°. Snow is unknown, but hail occurs in winter, and much rain usually falls between December and February. The northerly winds are bracing, but the south- east wind, called the sirocco, which brings the warm air from the African deserts, and then takes up the salt sea mists, is very deleterious ; it occurs suddenly, chiefly in August and Septeniber, occasionally in the spring, and fortunately lasts usually but a few hours. The "gregale" ("eurokylon" of Acts xxvii. 14) is a strong north-east wind which occasionally blows in the winter months with great fury and force for two or three days together, espe- cially in November and February, rendering it dangerous to cross the harbour, sometimes tearing up stone walls and landing-steps, and otherwise doing much damage.

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The Maltese are a stroug well-formed race, the men dark, handsonie, and lithe, the women with black eyes and fine hair and an easy carriage; as in other Eastern nations, the working classes grow old at a comparatively early age. They are a cheerful, good-humoured, and industrious people, sober and abstemious, though quick-tempered and addicted to the use of the

knife. Bread or pasta, with a few olives, a little oil, or milk cheese, forms the chief support of the poor, who seldom or ever eat meat, and drink but little of the light wine of the country. The gentry have a large admixture of Spanish, Italian, and French, but among the people in general the Arab race and character predominate, influenced by contact with Sicily. Of the native language 70 per cent. consists of Arabic words, the rest being chiefly a corrupt Italian ; that spoken in Gozo is the purest Maltese. 'The festivals and ceremonials of the Roman Church are kept up to an extra- ordinary degree, together with a few that seem to be derived from the Greek Church. The perpetual ringing of mono- tonous church bells, and the peculiar method of striking time, are relics of South Italian customs.

Malta is divided into twenty-six casals or village districts, Gozo into nine; some of the villages are large and populous, each having its church, often large and handsome. Near the middle of the island, on sharply rising ground, stands the ancient capital, called Civitas Melita by the Romans and oldest writers, Medina (z.e., the city) by the Saracens, Notabile ("'jocale notabile, et insigne coronz regie," as it is called in a charter by Alphonso, 1428) under the Sicilian rule, and Citta Vecchia (old city) by the knights. The cathedral, overthrown by an earthquake in 1693, but rebuilt, stands on the reputed site of the house of Publius, Paul's friend ; many Maltese gentry live in this town, and the English utilize some of the buildings. The Roman remains and catacombs of Citta Vecchia must not be forgotten. Since 1570 the chief town has been Valetta, —a city built on a ridge of rock (Mount Sceberras) which runs like a tongue into the middle of a bay, which it thus divides into two great harbours, subdivided again by three other peninsulas into creeks. On two of these peninsulas, and at their base, are built the aggre- gate of towns called the Three Cities, part of which (grown up under the old Fort St Angelo) is much older than the coming of the knights, and is called Vittoriosa in commemoration of the siege of 1565. Valetta, includ- ing the suburb Florian, is about 2 miles long and # mile wide; Fort St Elmo, with a lighthouse, stands on the point; the summer suburb Sliema lies on the point which encloses the west or Marsamusceit harbour ; Fort Ricasoli on the opposite point enclosing the east or grand harbour. The streets of Valetta, paved with stone, run along and across the ridge, and end on each side towards the water in steep flights of steps. Many of the houses, which are of stone throughout, with flat roofs, are large and luxuriously built;

wooden covered balconies project from the windows and give a peculiar aspect to the streets. There are several fine public buildings, as the governor's palace, the new opera-house, the public library, the awberges or lodges of the knights, especially the Auberge de Castile, the English church built by Queen Adelaide and others. Roman Catholic churches in Valetta are very numerous : the cathedral of St John is famous for its rich inlaid marbles, its Brussels tapestries, its roof painted by Matteo Preti (1661-99), and the picture by Caravaggio, the Decollation of John the Baptist. The hospital of the knights contains one of the longest rooms in Europe, 503 feet in length, without a central support. The extensive bagnios under the rock, formerly occupied by the slaves of the knights, are now used for naval stores. The knights strengthened Valetta and its harbours by bastions, curtain-walls, lines,

and forts, towards the sea, towards the.land, and on every available point, taking advantage in every particular of the natural rock and of the marvellous advantages of situation,

rendering it then almost impregnable. The work of fortify-.

ing the place with modern armament is carried on by the British Government, which possesses there the finest naval hospital in Europe, a military prison, and other necessary institutions, including immense subterranean stores of grain. New sanitary and water works and dwellings for the over-crowded poor have lately been undertaken by the local authorities. The city is clean and well-regulated, gay with the motley throng of all nations that continually come and go, and presenting many features common to thie East ; the influx of winter visitors attracted by the mild climate and social gaieties lias of late years proved a source of wealth to the inhabitants. A railroad from Valetta to Citta Vecchia, the first in the island, is now nearly completed.

The importance of Malta lies, as of old, in its harbours, which render it a splendid port of call, repair, or refuge, as well as a fine naval station, in its capabilities as a depot for coals and stores, in its hospitals, and in its strength as a military station. Its position in the Mediterranean is of the

utmost value towards keeping a clear highway to the East and toIndia. During the eighty-two years of British. occupation the population, trade, and produce have largely increased. The government, created by royal letters patent of llth May 1849, consists of a council of eighteen members, eight elected by the Maltese (about two thousand three hundred electors), nine chosen by the crown, and the governor, with a salary of £5000, who is usually a military officer. 'To these were added by letters patent of May 1881 an executive council of three members to advise and assist the governor. The council have powers to make laws and to vote money; this last was restricted by the British Government in 1875, leading to a protest in the following year by the elected eight. The government of the islands presents peculiarities owing to the combina- tion of military and civil duties. Several recent inquiries on taxation, education, &c., have led to important changes during the last two years. The consolidated revenue is at the disposal of the crown through the governor and council ; Malta is self-supporting, costing the imperial exchequer little beyond the military and naval establishments, and even contributing £5000 annually towards the former. The revenue arises chiefly from import duties (of which a large proportion accrues from a tax of 10s. a quarter upon grain) and tonnage dues.

Revenue. Expenditure. WES BOB cievuicien carton £183,794 £185,946 ILE Osaepanenbordeceene 190,661 169,318

The tonnage of vessels entering and clearing equals that at Gibraltar ; in1878 it amounted to 6,503,859 (5,669,046 of which was for British vessels), and in 1880 it was 6,147,234. In 1879 the value of imports actually landed was £794,565, and of exports £216,050,—a value of about £18,700,000 merely touching at the port. The figures fluctuate ; in the following year they fell considerably. In 1837 the revenue was but £95,600, while but one steam- ship, of 137 tons, entered the harbour; in 1879 2894 steamers, with a tonnage of 2,781,806 entered. In the naval yard numerous vessels are repaired yearly; in 1876— 77 these amounted to 39 ironclad and other ships and 43 smaller vessels. One arm of the harbour is devoted toa coaling station, where enormous quantities of coal are annually imported and sold (384,272 tons in 1880). The British Mediterranean fleet is stationed there for six months of the year, the strength of the naval forces

being usually about 5000 men. 'The strength of the military in the island is usually about 6500, the largest garrison in any British colony.

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The population, which in 1837 was 115,570, was 154,892 in 1880, exclusive of British troops and their families, about 24,000 being English and foreigners ; it is rapidly increasing, and is unequally distributed, the greater part being settled in the large casals or villages on the eastern half of Malta, including the densely populated Valetta ; large tracts to the west are bare and but sparsely inhabited ; about one-third of the island is rocky and uncultivated. Malta has now 1510 inhabitants to the square mile, Gozo 962. In 1879 there were 9868 children (about two-fifths of these at school age) attending elementary schools, in- cluding 768 students at the university and two lyceums ; in 1880 the total was 9595. All the casals of Malta and Gozo (with but one or two exceptions), besides Valetta and the Cities, have schools, which are now placed on the same system as the board schools in England; great efforts are being made to extend the acquisition of the English language, which till recently was neglected in favour of Italian. The director of public education, besides the elementary, has under his care several secondary schools, two lyceums in Vittoriosa and in Valetta, and the university (founded by the knights in 1768), with faculties of philosophy and arts, law, medicine, and theology. In Valetta is a large public library founded by the knights in 1760, containing 48,000 volumes, open free daily ; in Gozo is a smaller one.

History and Antiquities. —Malta (Melita), with its sister Gozo (Gaulus or Gaudus), has from time immemorial been a place of importance to whatever race wished to hold the highway of the Mediterranean, whether Pheenician, Punic, Roman, or Arab, Thus even the stories of Homer have a semblance of truth, for the Ogygian isle where Ulysses took refuge has been supposed to be Malta or Gozo, in both of which tradition (born of the poem) yet points out the grottoes of Calypso. The earliest inhabitants of whose presence we have any actual trace are the Pheenicians, from whom we have several important inscriptions which tell of them and their temples, several curious images believed to belong to their worship, and many specimens of their pottery and glass, chiefly found in tombs, some bearing Pheenician

characters and potters' marks. Sepulchral caves and clusters of rock-hewn tombs, especially those in the hills of Bingemma, in several of which terra cotta sarcophagi have been found, are referred with reason to a Pheenician or a Punic origin ; Caruana's Report gives a list of these in eight places, dis- tinguishing them from numerous Greek and Christian catacombs which also exist in the islands. The most remarkable remains are three rough stone erections, one in Gozo (Torre dei Giganti), and two in Malta, about a mile apart (Hagiar Kim and Mnaidra), which mainly consist of several apsidal chambers side by side, the walls of which are built of enormous horizontal and upright stones. In Malta the ruins show evidence of much skill in stone-cutting ; the entrances to the chambers consist of three large slabs of stone in place of doorpost, each smaller than and at a little distance from the one outside it ; several have well-shaped holes for ropes or other fastening ; other slabs have sharply-squared holes and shelves cut in the solid stone; others again are ornamented with " pit-markings " or little depressions cut evenly all over the surface of the stone. A table or altar is also found in some of the rooms, a massive slab of stone supported on an upright formed like the trunk of a tree ; in one case the two ends of the slab are carefully mortised into the walls at each side, the chamber being very small, and apparently intended specially for its reception. Hagiar Kim was excavated by the Government in 1840, when considerable traces of the action of fire were found on some of the walls, as well as buried ashes. In other rooms were found quantities of bones, many fragments of pottery, lamps, bowls, &c., nine images, and a small ornamented altar (Archeol., vol. xxix. p. 227). The ruins in Gozo were excay- ated about 1827 (Archxol., vol. xxii. p. 294). All these buildings stand on commanding positions, high on the side or the shoulder of steep hills. They have been usually considered Pheenician temples ; and, on comparison of them with what is known of the great temple of Melkart at the south-east corner of Malta, the presumption is strong that these too were built by the same race, at some very early period. The bilingual inscription found there belongs to a later age, the Greco-Punic time, to which Greek coins found in both islands and a few other remains bear evidence. It is probable that the islands shared in some degree the varying fortunes that followed on the wars in Sicily, which took place as Greek drove out Pheeni- cian, as Carthaginian drove out Greek and tried to regain the ancient possession of the mother-land, as finally

Rome conquered all. During the First Punic War (264-241 B.c,) Malta scems to have

been conquered and reconquered more than once (Orosius, iv. ¢. 8). In the Second Punic War the Carthaginians, under Hamilcar, son of Gisco, gave it up to Titus Sempronius, 218 B.c. (Livy, xxi. 51).

In the pursuit of manufactures and commerce Malta had attained ahigh degree of prosperity under the Pheenicians, which still existed under the Romans of the Augustan age. It was especially famous for its textile fabrics (probably of cotton, which is grown aud spun there to this day); the Sicilian pretor Verres sent there for women's woven garments. The inhabitants were rich, and there were many artificers of all kinds. Ovid speaks of it as a fertile island (Fast., iii, 567). The remains formerly cxisted (unfortunately now for the most part dispersed or destroyed) of several fine Greco-Roman temples, such as the temple of Juno spoken of by Cicero and Valerius Maximus, whose ornaments and fine ivories and carved figures of Victory tempted more than one sacrilegious robber ; the temple of Proserpine, which we learn from an inscription was re- paired by Chrestion, a freedman of Augustus, procurator of Malta ; and the temple of Apollo at the chief town Melita, which with a theatre shared the munificence of a wealthy Maltese under the Antonine rule ; these and the ruins of a princely Roman dwelling with mosaics, system of water supply, &c., at the same place, are buta few signs of the luxury enjoyed in the islands. Diodorus noticed the beauty aud adornment of the houses in Malta in his time, a few years after the shipwreck of St Paul. One of the islanders was a friend of Cicero, who had thoughts of retiring there himself. A mole and important harbour works, discovered a few years ago, show that the Romans were not behind in strengthening the natural advantages of the islands for shelter. Inscriptions re- cording municipal institutions there datc from the time of Hadrian ; how much earlier they possessed them is unknown. Before then we hear of Chrestion the procurator mentioned above, and a Roman governor under Augustus, Lucius Castricius, styled mpéros MeAr- tatwy , 'chief man of the Maltese' (Caruana, 1882, p. 1384; 1881, pp. 20, 21), just as, half a century later, Publius was TpOTOS THs vioov, "chief man of the

island" (Acts xxviii. 7); all these were probably concerned in the local government. 'The Romans retained the Maltese group for many centuries. At the division of the empire in 337 A.D. it passed with Italy, [llyria, and Africa to Con- stans ; after the reunion, and the final division after the death of Theodosius in 395, Malta, as one of the isles of the Mediterranean, remained with the empire of the East. History has but little to mention regarding it during those early times, except that event of ever-living interest, the shipwreck of St Paul, 58 a.p., which it is now well-ascertained took tee in a bay on the north side of Malta, The alleged conversion of the Maltese to Christianity following the three months' stay of the apostle and his companions may be a fact ; Chrysostom refers to it (Hom. 54 on Acts). Many Christian monograms and inscriptions have been found, ranging from the 2d to the 9th century; and the tombs and subterrancan cemeteries near Citta Vecchia are said to be arranged like the Christian ceme- teries of subterranean Rome (Caruana, 1881, p. 18). Tradition says these were used as hiding-places in times of persecution ; itis certain that Ptolemy at the end of the 2d century notes the famous temples of Hercules and Juno as still in existence ; the old religion and the new must have gone on side by side for a longtime. After a time Malta was made a bishopric ; according to R. Pirrus (Sicilia Sacra, Melitensis Eccl. Not. vii., s.v. "Lucillo") it was, though considered part of Africa, subject to the bishop of Palermo (in 6th century primate of Africa) ; we find Gregory the Great dealing with a contu- macious bishop of Malta and directing the bishop of Syracuse and others to depose him, and to aid the successor appointed in his place (Greg., Hpist., ii. 44; ix. 63; x. 1).

The Saracens did not gain possession of Malta without a struggle of many ycars; thcy invaded it three times, in 828, 886 (when it appears to have been chiefly Gozo that suffered), and finally in 870, when the inhabitants of Melita, having massacred the Greek (Byzantine) garrison of 3000, opened their gates to the invaders, The Arabs are said to have destroyed part of the city so as to bring the fortifications within smaller compass, rendering it more easy to defend, and to have changed its name to Medina (great or chief city). Ina suburb just outside the present walls there was discovered in 1881 a burial-placc containing numerous Arab coffins, overlying the remains of the Roman palace mentioned above, which was thus finally ruined and concealed by the conquerors. It is known that they built a

fortress in 973; at the point of Mount Sceberras where Fort St Elmo now stands. A few coins are pre- served, but otherwise very little record remains of the Arab dominion, which lasted about two hundred and twenty years; no more Christian bishops are known until after that time, but tradi- tion asserts, not without probability, that some of the original natives remained in certain villages and some Greeks in the capital, among whom were Christians.

The Norman knights, who brought their conquering arms into Apulia, Calabria, and Sicily, and even sent ships to Byzantium, were probably the first to bring a Teutonic race and influence into Malta. Through somewhat uncertain dates it appears that Roger I. (youngest son of Tancred, and brother of Guiscard) about 1090

landed in the island and levied tribute, and that about 1127 Roger I1., this not being paid, set sail with a fleet, took M edina, then governed by a gaito, Maimono, and after setting free all the Christians and exacting a large sum in money, mules, and horses, completed the conquest of Malta and Gozo. Walter, bishop of Malta, whose name is found as witness to a document of 1090, is believed to have been now appointed by Roger J., and consecrated by the pope. A succession of Christian bishops, endowments and buildmgs made, tithes granted, &c., testify to the restoration of the church in the islands, while they shared with Sicily the feudal laws aud adininistration newly established under the Norinan rule. In 1193 Malta as a county gave a title to Margarito Brundusio, grand-admiral of Sicily, and three successive counts of Malta followed. After the Norman princes had possessed the islands about a century, the kingdom of the Two Sicilies, and the Maltese islands with it, passed in 1194 to the emperor Henry VL., in pro- fessed right of his wife Constance, daughter and heiress of Roger II. In 1223 a Maltese named Henry or Arrigo is stated to have been grand-admiral of Sicily (Pirrus, p. 906; Miége, ii. 38). He is probably the same as the distinguished Henry, count of Malta, who with three hundred Maltese youths in 1205 earned the favours of the Genoese by brilliantly taking two forts in Tripoli (Caflarus, Ann. Genuenses, in Muratori, t. vi.), and who took part also in the fourth crusade. No traces of the crusades, however, have

been found in these islands, although it is probable that their leaders would not neglect the advantages ‘of Maltese ports and sailors.

Henceforward Malta, as a fief of Sicily, followed the fortunes of that country. The Maltese seem to have taken no part in the Sicilian Vespcrs (1282), but to have held out for Charles of Anjou until Peter of Aragon, crowned king of Sicily, August 1282, won a battle at sea against the French, attacked Notabile and the forts, and thus obtained possession of the islands. For nearly two hundred and fifty years the Spanish house, through fourteen kings of Aragon, bore rule over Sicily and Malta. In 1391 the countship was erected into a marquisate, which lasted two years only. In 1427 a swarm of Moors (18,000) ravaged Malta and Gozo, but were not able to take the city Notabile ; yet the poke, though afflicted by the plague in 1431—as not unfrequently at other times—were able to sa ly forth to conquer Gerbi on the coast of Africa in the following year. The king at this time (1432) authorized the demolition of the old castle at Notabile, built three hundred and fifty years before, and gave the ground on which it stood to the town ; but the fortifica- tions of the island were strengthened (1466), the chief stronghold in the 15th century being the fortress of St Angelo. The inhabitants, addicted to fighting at sea, were forbidden from 1448 to 1494 to send out armed corsair ships, in order it is said to retain those capable of defence in the islands, the population of which was at the beginning of that period very scant. The Jews were expelled from Malta by the same edict of Ferdinand, in 1492, which turned them out of Spain. By 1514 the population of Malta had doubled ; the two islands together contained 22,000 inhabitants (Miége, ii. 81). They frequently attacked the Moors on the mainland, and suffered reprisals themselves as late as 1526. Their last king of the Spanish house, the emperor Charles V., in 1530 granted Malta and Gozo (with the city of Tripoli) as a noble and free fief to the knights of St John of Jerusalem, still retaining, however, the suzerainty, by the homage of a falcon annually to be given by the knights.

Malta thus during many centuries occupied the position of a feudal fief of Sicily ; her laws and her church date from the times of the Normans, and both developed as in other feudal governments. The progress of her political independence iu the 15th century, especially under Alphonso J. and John I.,.has been shown by the historian Miége ; the history of the

relations between Malta and the monarchs of Sicily affords an interesting example of feudal obligations with their attendant difficulties. That these fostered a spirit of liberty and independence in the people, and must have tended largely to the prosperity of the islands, is shown by numerous diplomas of the Aragonese suzerains preserved in the archives at Malta (Eton's Authentic Materials, 1808, p. 108 sq.), where it is seen that the inhabitants acquired many privileges and were also able to pay on emergency considerable sums of money to increase and preserve their privileges. Thus in 1428, only a century before the knights came, they paid 30,000 florins of gold to King Alphonso in order to secure their tenure by the crown of Sicily without any middle-lords, being the second time they thus bought back their island rights (Eton, p. 84). These things are to be noticed, because, as has been complained, the knights unjustly depreciated the value and advantages of the islands, in order the more readily to obtain the grant from Charles V. Under the kings of Sicily, Notabile was a universita or commune, with its popular council and jurats, a captain-justiciar representing the rights of the crown ; in other words, Malta was a republic governed by its own laws ; the principal magistrate was named by the king out of three persons proposed by the consilio popolare, and was liable to dismissal on complaint by the people. The king protected the island, and in

return the Maltese took a share in his wars. When the knights took possession the Maltese stipulated that each grand master on

entering office should take oath to maintain their ancient rights |

and liberties (Eton, pp. 38, 85, 101). The knights began by deceiv- ing the Maltese candidates for admission into their ranks. 'heir rule, at first conciliatory, soon became despotic ; in time the over- shadowing power of a rich military organization encroached upon the constitutional government, corruption brought the officials under the control of the knights, and the people lost their liberties, though the material prosperity of the islands was in many ways heightened.

For the history of the order of St John see St JOHN (KNIGHTS OF). Twenty-eight successive grand inasters, from Lisle d'Adam to Hom- pesch (1530 to 1798), held the islands. Lisle d'Adam established his convent and hospital in the Borgo, a city that had grown up on the coast near the castle St Angelo, opposite the ancient fort St Elmo. In 1541 was made the first survey for the fortification of Valetta. Ten years later the Turks, led by their famous naval commander Dragut, ravaged Gozo, and madc an attempt upon Malta which failed. The knights, already famous for their power at sea, were soon engaged in much skirmishing warfare against the pirates and Turks, winning success and riches, and the gratitude of Christian nations. In 1565, after eight yearsof threatening prepara- tions, during which the knights had been strengthening and forti- fying their island, the Turks besieged them with an immense force ; they defended themselves with such valour that it took a month to reduce Fort St Elmo, and in rather over two months more thie Turks, whose further advance was successfully resisted, were forced to retire, leaving the knights free to build their new city Valetta and its fortifications. The admiration and gratitude of Catholic countries for this service to Christendom showed itself in liberal donations towards these works ; large sums werc also raised from the possessions of the order ; and Valetta, the first stone of which was laid on 26th March 1566, in four years rose upon the ridge of rock, "a eity built by gentlemen for gentlemen," as it has been well described, —the original design of which, the cutting down the rock to a level platform, had only suffered from the continual fear of molestation by the Turks while building.

The order, now firmly established in their island, continucd to carry out their mission, that of keeping the Mediterranean clear from Turkish and Moorish pirates, and of protecting Christendom against the infidels. Numerous sea-fights took place during the 16th and 17th centuries, many of them undertaken more to make up for the neglect of some of the grand masters to supply the islands with corn, by scizing upon Turkish stores, than he any better reason. Valetta became in consequence "a vast slave mart." In 1614, under G. M. Vignacourt, an aqneduct was constructed at a cost of £13,000 to bring water to Valctta from springs near Citta Vecchia, a work of immense value, and still in use. But the work of fortifying Malta occupied a large share of money and attention, and was carried on without relaxation by many of the grand masters, down as late as the building of Fort Tigné in

1793. Besides the great lines and forts in and round Valetta, the knights have left their mark all over the islands: they made good roads, improved Citta Vecchia, built watch-towers round the coasts, and erected towers, country palaces, and gardens. They also established and continually carried on, at Notabile and Valetta, their hospitals for the sick and wounded. In 1768 the Jesuits, having given much trouble, were expelled and their property confiscated. Danger from rebellion twice threatened the knights—in 1722, when the slaves were believed to be in com- munication with the Turks, and from 1773 to 1775, when both people and priests were wrought upon by oppression and mis- government, which, only mitigated for a time by the better mea- sures of G. M. Rohan, led to the weak and disorganized condition of the ordcr that ended in its overthrow. In June 1798, the pos- sessions of the order in France having already been seized by the

republicans, Bonaparte on his way to Egypt landed with a large .

force in a bay behind Valetta; no resistance was made, and in a few hours the French were in possession of the whole of Gozo and Malta except the town of Valetta and one little fort. In four days more, without bombardment, the order had surrendered Valetta and practically ccased to exist. Bonaparte stayed six days, laying down laws and regulations with a high hand, and collecting plunder from churches, &c. He left Vaubois in charge, but in less than three months the Maltese had revolted from the tyranny of their new masters, and Vaubois inside Valetta with 6000 men sustained a siege and blockade lasting two years, during which time Portuguese, Neapolitans, and a small force of English assisted the Maltese. Sir Alexander Ball commanded in the name of the Sicilian king, and was put at the head of their National Council by the Maltese. On 4th September 1800 Vaubois surrendered, and the Maltese (who lost 20,000 men) put themselves and their islands under the pro- tection of the English,—reunion to the crown of Sicily, which they had sought, being no longer thought of. The treaty of Amiens (1802) provided that the islands should be restored to the order of St John, obviously to the advantage of France, but repugnant to

the Maltese. War breaking out again, the islands remained in the hands of England till in 1814 they were secured to her by the treaty of Paris (Art. 7), under which she still holds them.

See Kenriek's Phenicia, 1855; A. A. Caruana's Reports on Phoenician and Roman Antiquities in Malta, 1881 and 1882; James Smith, Voyage and Shipwreck of St Paul, 1866; R. Pirrus, Sicilia Sacra; T. Fazello, Storia di Sicilia, 1833; C. de Bazaneourt,.Histotre de la Sicile, 1846; G. F. Abela, Malta fllustrata, 1772; J. Quintin, fnsule Melite descriptio, 1536; G. W. von Streitburg, Reyse nach der fnsel Malta, 1632; R. Gregorio, Consideraztont sopra la Storia di Sicilia, 1839; F, A. C. Davalos, Tableau historique de Malte, 1816; W. Etou, Authentic Mate- rials for History of Malta, 1802; Houel, Voyage Pitioresque, vol. iv., 1787; G. P. Badger, Description of Malia and Gozo, 1858; G. N. Godwin, Guide to and Natural History of Maltese {slands, 1880; Whitworth Porter, History of Knights of Malta, 1858; A. Bigelow, Travels in Malta and Sicily, 1831; M. Miége, Histoire de Malte, 1840; Parliamentary Papers—reports by Mr Rowsell on "Taxation and Expenditure of Malta," 1878, by Sir P. Julyan on "Civil Establishments," 1880, and Mr Keenan on the ' Edueational System," 1880 (the Just two deal with the question of language); F. Vella, Afaltese Grammar Jor the use of the Engiish, 1831; Malta Penny Magazine, 1839-41; J. T. Mifsud, Biblioteca Maltcse, 1764. Brydone, Teonge, John Dryden, jun., W. Tallaek, Rev. H. Seddall, Boisgelin, Rev. W. K. R. Bedford, W. H. Bartlett, St Priest, Msgr. Bres, and F. Lacroix have also written on Malta. For natural seience, see the works of Dr A. L. Adams, Professor E. Forbes, Captain Spratt, Dr G. Gulia, C. A. Wright, and Wood's Tourist's Flora. (O05 din ey

MALTE-BRUN, Conran, a distinguished geographer, was born August 12, 1755, at Thysted in Denmark, and died at Paris, December 14, 1826. His real name was Malte Conrad Bruun, and it was not till he settled in France that he became known by the more familiar form. While a student at Copenhagen, he made himself famous partly by his verses, but muclt more by tlie violence of his political pamphleteering ; and at length, in 1800, the legal actions which the Government authorities had from time to time instituted against him culminated in a sentence of perpetual banishment. The principles which he had advocated were those of the French

Revolution, and, though he at first sought asylum in Sweden, before long he found his way to Paris. There he looked forward to a political career; but, when Napoleon's personal ambition began to unfold itself, Malte Brun was bold enough to protest, and to turn elsewhere for employ- ment and advancement. He was associated with Mentelle and Herbin in the compilation of their Géographie mathémateque . . de toutes les purties du Monde (Paris, 1803-7, 16 vols.), and before many years he was recognized as one of the best geographers of France. He is remembered, not only as the author of six volumes of the learned Précis de yéographie universelle, continued after his death by other hands, but also as the originator of the Annales des Voyages (1808), and the principal founder of the Geographical Society of Paris.

MALTHUS, Tuomas Roperr (1766-1834), the scientific expounder of the principle of population, was born in 1766 at the Rookery, a small estate owned by his father in the county of Surrey. His father was a gentleman of good family and independent fortune,—a man of consider- able culture both in literature and philosophy, the friend and correspondent of Rousseau, and one of his executors, one, too, who showed no little interest in those social problems in which his son was to be an original inquirer. Young Malthus was never sent to a public school, but received his education from private tutors, wlio were themselves men of some distinction. In 1784 he was sent to Cambridge,

' where he was ninth wrangler, and became fellow of his

own college (Jésus) in 1797. The same year he received orders, and undertook the charge of a small parish in Surrey, still, however, retaining his fellowship. In the following year he published the first edition of his great work, An Lssay on the Principle of Population as tt affects the Future Improvement of Society, with remarks on the speculations of Mr Godwin, M. Condorcet, and other writers. The work excited a good deal of surprise as well as attention ; and with characteristic thoroughness and love of truth the author went abroad to collect materials for the verification and more exhaustive treatment of his views. As Britain was then at war with France, only the northern countries of Europe were quite open to his research at that time; but during the brief peace of Amiens Malthus

continued his investigations in France and Switzerland. The result of these praiseworthy labours appeared in the greatly enlarged and more mature edition of his work, which was published in 1803. In 1805 Malthus married happily, and not long after was appointed professor of modern history and political economy in the East India Company's College at Haileybury. This situation he retained till his death in 1834. Malthus was one of the most amiable, candid, and cultured of men. In all his private relations he was not only without reproach, but distinguished for the beauty of his character. He bore the popular abuse and misrepresentation without the slightest murmur or sourness of temper. The aim of his inquiries was to promote the happiness of mankind, which could be better accomplished by pointing out the real possibilities of progress than by indulging in vague dreams of perfectibility apart from the actual facts which condition human life.

Malthus's Hssay on Population grew out of some discus- sions which he had with his father respecting the perfecti- bility of society. His father shared the theories on that subject of Condorcet and Godwin; and lis son combated them on the ground that the realization of a happy society will always be hindered by the miseries consequent on the tendency of population to increase faster than the means of subsistence. His father was struck by the weight and originality of his views, asked him to put them in writing, and then recommended the publication of the manuscript. It was in this way the Zssay saw the light. Thus it will be seen that both historically and philosophically the doctrine of Malthus was a corrective reaction against the superficial optimism diffused by the school of Rousseau. It was the same optimism, with its easy methods of regenerating society and its fatal blindness to the real conditions that circumscribe human life, that was re- sponsible for the wild theories of the French Revolution and many of its consequent excesses.

The Essay on the Principle of Population will best be considered under two heads :—(1) the principle itself, with the arguments and illustrations by which it is supported; and (2) remarks on its origin and its applications.

I. The principle itself. The idea with which Malthus starts is the improvement of society. In an inquiry concerning the im- provement of

society there are two things to be done,—(1) to investigate the causes that have hitherto impeded the progress of mankind to happiness, and (2) to examine the probability of the total or partial removal of these causes in future. Waiving the considera- tion of such an immense field of thought, Malthus restricts him- self to the examination of one great cause intimately connected with human nature and its effects on society, which, though operat- ing since the commencement of society, has been little noticed by writers. This cause is the constant tendency in all animated life to increase beyond the nourishment prepared for it. Throughout both the animal and vegetable kingdoms, nature has scattered the seeds of life abroad with the most profuse and liberal hand. Life on this planet is so prolific that, if allowed free room to develop itself, it would fill millions of worlds in the course of a few thousand years. There is only one limit to the indefinite increase, and that is necessity. In plants and irrational animals, which are impelled by blind instinct untroubled by doubts about providing for their off- spring, the problem is simple; in their case increase is checked ouly by want of room and nourishment. As regards man, whose equally powerful instinct is controlled by reason, the question is more complicated. In his case, increase must either be checked by preventive restraint, which too frequently produces vice ; or a con- stant check, from the difficulty of acquiring food, must be in opera- tion.

That population tends to increase beyond the means of subsist- ence is obvious in two ways,—(1) from a comparison of the natural increase of population, if left to exert itself with perfect freedom, with the available increase of subsistence under the most favourable eonditions, and (2) from a review of the different states of society in which man has existed. Under the first head, Malthus considers it a safe calculation that population, when unchecked, goes on doubling itself every twenty-five years. It has even been calcu- lated that it may double itself in about thirteen years ; that pro- portion has actually occurred for short periods in more countries than one. Malthus, however, contents himself with the more

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moderate rate, namely, that population, when unchecked, doubles itself every twenty-five years, or increases in a geometrical ratio.

If so, how is the rate of increase of the means of subsistence to be

estimated ? If we take a limited area, no improvement in develop-

ing the resources of the soil will keep pace with the unchecked

increase of population. We may allow that, through the great improvements of agriculture in Great Britain, the average produce

of the island could be doubled in the first twenty-five years ; but in the next twenty-five it is impossible to suppose that the produce' could be quadrupled. The utmost we can allow is that the pro-

duce might be increased every twenty-five years by a quantity equal to what it at present yields. If we apply this supposition to the whole earth, we shall assume an increase much greater than any possible exertions of mankind could effect. On the whole,

then, in the present average state of the earth, the means of sub- sistence could not be made to increase faster than in an arithmeti-

cal ratio. With such a disproportion between the ratio of increase of population and of the means of subsistence, population can be

kept down to the level of the means of subsistence ouly by the strong law of necessity operating as a check on the greater power.

In fact, the ultimate check to population is the want of food ; but this ultimate check is never the immediate check, except in cases of actual famine. The immediate check consists of all those cus- toms aud all those diseases which are generated by a scarcity of food, aud all the causes independent of the scarcity which tend to

weaken and destroy the human frame. These checks are either preventive or positive ; aud the former consist either of moral restraiut or of vice, always so pernicious to society. The positive ehecks are extremely various, including everything that contributes to shorten the natural duration of human life. " Under this head may be enumerated all unwholesome

occupations, severe labour and exposure to the seasons, extreme poverty, bad nursing of children,

large towns, excesses of all kinds, the whole train of common diseases and epidemics, wars, plague, and famine." The checks of all kinds may be reduced to three heads—moral restraint, vice, and misery. This theoretical exposition of the checks to population 'Malthus supports and illustrates by an' exhaustive examination of the checks which have operated or still operate in the various countries and states of society from the brutal and Evel practices prevalent among the savages of Tierra del Fuego anc

Australia to the moral self-control of the highest nations." Itis not a pleasant picture, but it is merely a presentation of historical and statistical facts for which Malthus is in no way responsible.

Throughout his entire exposition he does not theorize, but seeks only to systematize and elucidate facts which cannot be contro- verted, belonging as they do to the history of the world. The only notable exception is his attempt to express in mathematical lan- guage the possible increase of the means of subsistence. The con- ditions determining such increase arc too vague and various to be calculated in such a way. On this point Malthus is not followed by subsequent economists, and it is not essential to his principle.

At the same time, in spite of its unsoundness, it does help us to realize the disproportion between thie possible increase of population and the means of subsistence.

II. What remains to be said of the Essay on the Principle of Popu- lation may be embraced in the following notes. (1) Origin of the principle. The population question has always had a great influ- ence on the development of mankind. In the most barbarous nations the problem of preserving the balance between food and population must always have been a pressing one, and has led to some of their cruellest and most immoral customs. The more theoretic consideration of the question has a large place in the political treatises of Plato and Aristotle. Just before Malthus's time it had been touched by such writers as Benjamin Franklin (Otser- vations concerning the Inercase of Mankind), Hume (Populousness of the Ancient

Nations), Wallace (On the Numbers of Mankind in Ancient and Modern Times), Townshend (Travels in Spain), not to mention many other modern writers of less recent date. (2) The remedy for over-population usually proposed is emigration. No doubt there are immense fertile areas yet unpeopled. But the diffi- culty of transferring the surplus population, and especially of con- veying surplus capital to these regions, and of co-ordinating the two, isa point that must not be overlooked. In spite of the great de- velopment of steam as a means of emigration, it remains a fact that population tends to excess in many of the most important centres of the world. Besides, emigration is only a postponing of the diffi- culty. In another century even the Mississippi valley will be well stocked. (8) Relation of Malthus to Darwin. In his book Animals and Plants under Domestication, vol. i. p. 10, Darwin expressly acknowledges his indebtedness to Malthus in thinking out his cardinal principle of uatural selection. After the study of domestie productions had given him a just idea of the power of selection, he saw, " on reading Malthus On Population, that natural selection was the inevitable result of the rapid increase of all organic beings." (4) Poor-law reform. The reformed poor law of 1834 wasa real triumph of Malthus's teaching. The effect of the old poor law was to encourage population by relieving the labouring classes of

*the due responsibility of supporting themselves and their fainilies. By discouraging foresight, self-control, and the spirit of self-reliaut independenee, it demoralized the working man. The great aim of the new poor law was to emphasize the duty of self-support and the responsibilities of parentage. (5) Relation to modern politics. Some of the greatest difficulties in contemporary politics can be correetly understood onlyin the light of the principle of population. The niost striking example of this is India, where, under the good government of England, the old and unhappy checks to population, such as war, * famiue, pestilence, and religious self-immolation, have beenremoved. As there lias been no proportionate improvement in agriculture, and in the ethical development of the people, population has increased beyond the means of subsistence, and there prevails a tendency to chronic poverty, a very low standard of living, a general misery, and an unsatisfactory social morale, which correspond*

badly with the high European civilization under which such a state of things is main- tained. (6) It is only due to the memory of a good man, who wasa siucere lover of truth and of the progress of humauity, that weshould emphasize the fact that Malthus is in no way responsible for the immoral theories popularly connected with his name. Apart froin such increase in the means of subsistence as may be attained by emigration and improved agriculture, Malthus approved of only one method of solving the population question, namely, moral self- restraint. prospect of supporting a family." The greatest and highest moral result of his principle is that it clearly and emphatically teaches the responsibility of parentage, and declares the sin of those who bring human beings into the world for whose physical, intellec- tual, and moral wellbeing no satisfactory provision is made.

Besides his great work, Malthus wrote Observations on the Effect of the Corn Laws; An Inguiry into the Nature and Progress of Rent; Principles of Political Economy ; and Definitions in Political Economy. Wis views on rent were of real importanee. For his life see Memoir by his friend Dr Otter, bishop of Chiehester (prefixed to 2d edition, 1836, of the Principles of Political Economy), (T. K.)

MALTON, a parliamentary borough of Yorkshire, Eng- land, which includes Old Malton and New Malton in the North Riding, and the parish of Norton in the East Riding. New Malton is situated on an eminence on the right bank of the Derwent, 22 miles north-east of York and 213 north of London. Old Malton lies about a mile to the north-east, and a bridge across the river connects New Malton with Norton. New Malton, which is a market-town, consists of several well-built streets radiating from the market-place. The church of St Michael is a fine building in the Late Norman style; the church of St Leonard, of mixed archi- tecture, with square tower and spire, has three Norman arches anda Norman font; the west doorway of the church of St Mary at Old Malton is one of the finest specimens of Norman in England. In Old Malton there is a grammar school founded in 1547, and also the remains of a priory of Gilbertine canons, founded in 1150. New Malton possesses a town-hall and a corn exchange. The town has some shipping trade, and also iron and brass foundries, agricultural implement works, corn mills, tanneries, and breweries. In the neighbourhood there are lime

and whin- stone quarries. The population of the parhamentary borough (area 6855 acres) in 1871 was 8168, and in 1881 it was 8750.

Malton was a Roman station, and various Roman remains have been found in the neighbourhood. The old castle, built by the De Vescis in the time of the Normans, was demolished by Henry II. In the reign of Stephen the town, while occupied by the Scots, was burned down by Thurston, arehbishop of York, and on being rebuilt it was named New Malton. The borough sent members to parliament as early as the reign of Edward I., but for some years

previous to 1640 the privilege was in abeyance. Since 1868 only one member has been returned.

MALTZAN, Hetwrrcy K. E. H. Freerr [Baron] von (1826-1874), African and Oriental traveller, was born in the Vicinity of Dresden, and studied law at Jena, but on account of ill-health spent much of his time from 1850 in travel. Succeeding to his father's property in 1852, he extended the range of his journeys to Morocco and other parts of the Maghrib, and before his return home in 1854 had also visited Egypt, Palestine, and other countries of the Levant. In 1856-57 he was again in Algeria ; in 1858 he reached the city of Morocco; and in 1860 he succeeded in per- forming the pilgrimage to Mecca, which he afterwards

His single precept is " Do not marry till you have a fair |

described in his book Afeine Wallfahrt nach Mecca, but had to flee for his life to Jeddah without visiting Medina. He then visited Aden and Bombay, and after some two years of study in Europe again began to wander through the coasts and islands of the Mediterranean, repeatedly visiting Algeria. His first book of travel, Zhree Years in the North-West of Africa, appeared in 1863, and was followed by a variety of works and essays, popular and scientific, till a httle before his death at Pisa in 1874, when he put an end with his own hand to neuralgic pains which had tortured him for years.

Maltzan's last book, Reise ix Arabien (18738), is one of his most useful contributions. It contains, like his other works, some lively description, but is chiefly valuable as a digest of much information about little-known parts of South Arabia collected from natives . during a residence at Aden in 1870-71. Among his other services to science must be notieed his collection of Punic inscriptions (2cise in Tunis und Tripolis, 3 vols., Leipsic, 1870), various eollections on Arabic dialects (7 D. Af. G., various dates), and the editing of Von Wrede's remarkable journey in Hadramaut (18738).

MALUS, Errenne Lovis (1775-1812), the discoverer of the laws of the polarization of light by reflexion, born at Paris on the 23d of June 1775, was the son of Anne Louis Malus du Mitry, and of Louisa Charlotte Desboves, his wife. His father, who had a place in the treasury of France, gave him at home an excellent education in mathematics and in the fine arts, as well as in classical literature, and he then studied with distinction in the school of military engineers; but, beiug regarded as a suspected person, probably on account of the situation held by his father, he was dismissed from the school without receiving a commission, and obliged to enter the army as a private soldier. Being employed upon the fortifications of Dunkirk, he was soon distinguished by M. Lepére, the director of the works, as superior to his accidental situation, and was selected as a member of the Ecole Polytechnique then to be established under Monge, who immediately chose him as one of the twenty who were to be instructors of the rest. In this institution, which at that moment was the only refuge of the sciences in France, he passed three years, giving special attention to the mathematical theory of optics. From the Ecole he was admitted into the corps of engineers, and served in the army of the Sambre and Meuse; he was present at the passage of the Rhine in 1797, and at the affairs of Ukratz and Altenkirch. In Germany he fell in love with the daughter of Koch, the chancellor of the university of Giessen; and he was on the point of marrying her when he was obliged to join the Egyptian expedition. Ne remained in the East, and saw much service till the capitulation with the English, when he returned to France (October 1801), and hastened to Germany to fulfil his engagement. His fidehty was rewarded, during the eleven years that he survived, by the most constant and affectionate attention on the part of his wife.

Though his health was much broken by the eastern campaign, Malus was still able to combine the pursuit of his favourite sciences with his official duties in superin- tending the construction of works at Antwerp and at Strasburg ; and upon occasion of a prize question proposed by the Institute he undertook the investigation of the extraordinary refraction of Iceland crystal, which tlic experiments of Dr Wollaston had previously shown to agree very accurately with the laws laid down by Huygens; and, besides completely confirming all Wollas- ton's results, he had the good fortune greatly to extend the Huygenian discovery of the peculiar modification of light produced by the action of such crystals, which Newton had distinguished by the name "polarity," and which Malus now found to be produced in a variety of circumstances, independently of the action of crystallized

bodies. It seems uatural to suppose that the investigation of the laws of the internal reflexion of light at the second

of the effects of oblique reflexion in other circumstances ; but, according to Biot, Malus's first observation of polariza-

to look through a quartz crystal at the image of the sun reflected from the windows of the Luxembourg. The value of his discovery was acknowledged by his election as a member of the Institute, by the award of the Rum- ford medal of the Royal Society of London, and by military promotion. Malus died on the 24th of February 1812, universally regretted by the lovers of science in all countries, and deeply lamented by his colleagues, who

dicular, with square embattled tower. tion by reflexion was due to the accident that he chanced |

dictine priory. Of the buildings, which date from 1083,

there still remain the abbey gate, and also the church surface of the crystals must have led him to the discovery |

(partly rebuilt in the reign of Henry VII., and restored since 1861), a very fine structure, Norman and Perpen- There is a proprie- tary college, founded in 1863. At Little Malvern, about 3 miles south of Great Malvern, there was a Benedictine

| priory, founded in 1171, upon the site of which the dwell-

said of him, as Newton did of Cotes, that if his life had | been prolonged we should at last "have known some-—

thing " of the laws of nature.

Malus's first publication appears to have becn a paper "On an unknown Branch of the Nile," in the first volume of the Décade Egyptienne. A mathematical " Traité d'Optique," presented to the Institute before the completion of his experiments on double refrac- tion, was published in the Mémoires pr. a U Institut, vol. 1i., Paris, 1810. His more important discoveries were first made known in the second volume of the Jfémoires @ Arcueil, Paris, 1809, 8vo; and again, in the "Theory of Double Refraction," Mém. pr. & 0Inst., vol. il., a paper which obtained a prize on the 2d of January 1810. See Delambre, Jf Jnst., 1816, p. xxvii.; Biot, in Bilographie Universelle, xxvi., Paris 1820.

MALVASIA (from the Greek Jfonembasia, «e., the city of the single approach or entrance; the Italian Napoli di Malvasia, the Turkish Mengeshe or Beneshe), one of the principal fortresses and commercial centres of the Levant during the Middle Ages, still represented by a considerable mass of ruins and a town of about 1000 inhabitants, stood on the east coast of the Morea, contigu- ous to the site of the ancient Epidaurus Limera, of which it took the place. So extensive was its trade in wine that the name of the place became familiar throughout Europe as the distinctive appellation of a special kind—the Italian Malvasia, Spanish Jfalvagia, French IMalvoisie, English Malvesie or Malmsey. The wine was not of local growth, but came for the most part from Tenos and others of the Cyclades.

As a fortress Malvasia played an important part in the struggles between Byzantium, Venice, and Turkey. The Byzantine emperors considered it one of their most valuable posts in the Morea, and rewarded its inhabitants for their fidelity by unusual privileges. Phrantzes (lib. iv. cap. xvi.) tells how Mauricius Tiberius made the city (previously dependent in ecclesiastical matters on Corinth) a metropolis or archbishop's see, and how Alexius Comnenus, and more especially Andronicus Paleologus, gave the Monembasiotes freedom from all sorts of exactions throughout the empire. In

Villchardouin, after a four years' siege, to swear to preserve its liberties and privileges (Fallmerayer, i. pp. 408-409). It was defended against the Turks by Manuel Paleologus in 1460. In 1689 it was the only town of the Morea which held out against Morosini, and Cornaro his successor only succeeded in reducing it by famine. of the insurrection of 1770 the leading familics were scattered abroad. As the first fortress which fell into the hands of the Greeks in 1821, it became in the following year the seat of the first national assembly.

See Curtius, Peloponnesos, ii. pp. 293 and 328; Castellan, Lettres sur la Morée (1808) for a plan; and Valiero, Hist. della guerra di Candia (Veniee, 1679) for details as to the fortress.

MALVERN, Great, a watering-place of Worcestershire, England, beautifully situated on the eastern slope of the Malvern hills, 8 miles south-west by south of Worcester, and 120 north-west by west of London. The town is irregularly built, but there are many villas, and on account of its fine situation in the centre of the Chase of Malvern, its pure air, and its chalybeate and bituminous springs, it is much frequented by summer visitors. At Malvern a hermitage was endowed by Edward the Confessor, which after the Conquest was changed into a Bene-

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ing-house of Malvern Court has been erected, preserving the tower and chancel of the old priory church. At Mal- vern Wells, 2 miles south of Malvern, is the celebrated "'Holy Well," the water of which is of perfect

purity. The population of Malvern in 1871 was 5693, and in 1881 it was 5847.

MALWA, an historical province of Central India, roughly coextensive with the western portion of the Central India agency, is bounded on the N. by Hindustan Proper, on the E. by Bundelkhand, on the S. by the Deccan, and on the W. by Rajputina. It consists of an upland region, with many fertile valleys, included within the main rivers of the Ganges, the Sdn, the Chambal, and Nerbudda, In prehistoric times the capital was the ancient city of Ujain (Oojein), associated in Hindu legend with the great king Vikramaditya, the date of whose accession (57 B.c.) has given the "' Samvat"' era to all India. The Mohammedan chronicler Ferishta describes Malwa as the kingdom of an independent raj4, when Mahmud of Ghazni invaded India in the beginning of the 11th century. It appears to have first fallen into the hands of the Moslems about 1309, during the reign of the Delhi emperor Ala-ud-din. When the Tughlak dynasty was weakened by the repeated attacks of the Mughals, their viceroy in Malwa succeeded in establishing his independ- ence. 'The first Moslem king of Malw4 was Dilawar Khan Ghori, of Afghan origin, who ruled from 1387 to 1405, and placed his capital at Mandu. He was succeeded by his son Hoshang Ghori, to whom are attributed most of the magnificent ruins still to be seen at Mandu., In

_ 1526 the Ghori dynasty came toan end, being overthrown

by Bahadur Shah of Guzerdt ; and in 1570 Malwa was, on the conquest of Guzerdt by the emperor Akbar, incor- porated in the Mughal dominions. On the decay of the Delhi empire in the 18th century, M4lwé was one of the first provinces to be overrun by the Malirattas. In 1737 the peshwa exacted chauth or one-fourth of the revenue, and at a later date the two great military chiefs Sindhia and Holkar carved out for themselves kingdoms, which their descendants still retain. But the Mahrattas set up

I _in no organized government, so that Malwa, besides its native 1147 Malvasia bade defiance to the Normans, and in 1205 obliged |

In 1715 it capitulated to the Turks, and on the failure |

population of predatory Blils, became the refuge of all the mercenary bandits of the peninsula. In the beginning of the present century, the depredations of these bandits or Pindaris led to what is sometimes known as the fourth Mahratta war of 1817, under the governor-generalship of Lord Hastings. As the result, the Pinddris were extirpated ; and under the rule of Sir John Malcolm the Bhils were tamed, and the jungles were cleared of wild beasts. Many of the Bhils have been enlisted as British soldiers; and the headquarters of the Malwa Bhil corps is at Sarddérpur. At the present day Malwé is best known as giving its name to the opium which is annually exported from Bombay to the amount of about 37,000 chests.

MAMELUKE, a corruption of the Arabic Mamluk (Afemlook), a slave. The name of Mamelukes has passed into history from the body-guard of Turkish slaves first formed in Egypt under the successors of Saladin, who ultimately usurped the supreme power. For the history of the Mameluke sultans and Mameluke beys, see EcyPr, vol. vii. p. 753 sg.

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MAMMALIA

AMMALIA (French, Mammiferes; German, Sduge- thiere) is the name invented by Linnzus (from the Latin, mamma), and now commonly used by zoologists, for one of the classes of vertebrated animals, which, though the best known aud undoubtedly the most im- portant group of the animal kingdom, has never received any generally accepted vernacular designation in our language. The unity of structure of the animals compos- ing this class, and their definite demarcation from other vertebrates, were not recognized until comparatively modern times, and hence no word was thought of to desig- nate what zoologists now term a mammal. The nearest equivalents in common use are "beast" and "quadruped," both of which, however, cover a different ground, as they are often used to include the larger four-footed reptiles, and to exclude certain undoubted mammals, as Man, Bats, and Whales.

The limits of the class as now understood by zoologists are perfectly well defined, and, although certain forms still existing on the earth (though not those mentioned above as excluded by the popular idea) are of exceedingly aberrant structure, exhibiting several well-marked characters which connect them with the lower vertebrated groups, common consent retains them in the class with which the great proportion of their characters ally them, and hitherto no traces of any species showing still more divergent or tran- sitional characters have been discovered. There is thus a great interval, not bridged over by any known forms, recent or extinct, between mammals and other vertebrates.

In the gradual order of evolution of living beings, mammals taken altogether are certainly the highest in organization, as they were probably the last to appear on the earth's surface, though this must be said with some reservation, pending further knowledge of the early history of the class of birds. But, as in speaking of all other large aud greatly differentiated groups, this expression must not be understood in too limited a sense. The tendency to gradual perfection for their particular station in life, which all groups manifest, leads to various lines of specialization, or divergence from the common or general type, which may or may not take the direction of elevation. A too complex and sensitive condition of organization may in some circumstances of life be disadvantageous, and modification may then take place in a retrograde direction. In mammals, as in other classes, there are low forms as well as high forms, but by any tests that can be applied, especially those based on the state of development of the central nervous system, it will be seen that the average exceeds the average of any other class, that many species of this class far excel those of any other in perfection of structure, and that it contains one form which is unques- tionably the culminating point yet arrived at amongst organized beings.

With regard to the time of the first appearance of mammals upon the earth, the geological record is provok- ingly imperfect. At the commencement of the Tertiary period they were abundant, and already modified into most of the leading types at present existing. It was at one time thought that they first came into being at this date, but the discovery of fragments of numerous small species has revealed the existence of some forms of tlie

class at various periods throughout almost the whole of the age of the deposition of the Secondary rocks. This subject will be reverted to later on.

It hardly need be said that mammals are vertebrated animals, and possess all the characteristics common to the

members of that division of the animal kingdom. They are separated from the Jchthyopsida (fishes and amphibia) aud agree with the Sauropsida (reptiles and birds) in the possession during their development of an amnion and allantois, and in never having external branchiz or gills. They differ from reptiles and resemble birds in being warm-blooded, and having a heart with four cavities and a complete double circulation. 'They differ from both birds and reptiles in the red corpuscles of the blood being nucleated and, with very few exceptions, circular in out- line ; in the lungs being freely suspended in a thoracic cavity, separated from the abdomen bya complete muscular partition, the diaphragm, which is the principal agent in inflating the lungs in respiration ; in having but one aortic arch, which curves over the left bronchus; in the skin being more or less clothed with hair, and never with feathers ; in the greater perfection of the commissural system of the cerebral hemispheres, which has either a complete corpus callosum, or an incomplete one associated with a very large anterior commissure; in having no syrinx or inferior vocal organ, but a complete larynx at the upper end of the trachea; in having a mandible of which each ramus (except in very early developmental conditions) consists of a single bone on each side, articulat- ing to the squamosal, without the intervention of a quadrate bone; in having a pair of laterally placed occipital con- dyles instead of one median one; and in tle very obvious character of the female being provided with mammary glands, by the secretion of which the young (produced alive and not by means of externally hatched eggs) are nourished for some time after birth.

In common with all vertebrated animals, mammals have never more than two pairs of limbs. In the great majority of the class both are well-developed and functional, and adapted for terrestrial progression, as the larger number of mammals live ordinarily on the surface of the earth. They are, however, by no means limited to this situation. Some species spend the greater part of their lives beneath the surface, their fore limbs being

specially modified for burrowing; others are habitually arboreal, their limbs being fitted for climbing or hanging to boughs of trees ; some are as aerial as birds, the fore limbs being developed into wings of a special character ; others are as aquatic as fishes, the limbs assuming the form of fins or paddles. In many of the latter the hinder extremities are either completely suppressed, or present only in a rudimentary state. In no known manmal are the fore limbs absent.

The hinder extremity of the axis of the body is usually prolonged into a tail, which may be a mere pendent appendage, or modified to perform various functions, as grasping boughs in climbing, or even gathering food, in the case of the prehensile-tailed Monkeys and Opossums, swimming in the Cetacea, and acting as a flap to drive away troublesome insects from the skin in the Ungulata.

GENERAL ANATOMICAL CHARACTERS OF THE MAMMALIA.

TEGUMENTARY STRUCTURES.

The external surface of the greater number of members Hair.

of the class is thickly clothed with a peculiarly modified form of epidermis, commonly called hair. 'This consists of hard, elongated, slender, cylindrical or tapering, filiform, unbranched masses of epidermic material, growing from a short papilla sunk at the bottom of a follicle in the derm or true skin. Such hairs upon different parts of the same

animal, or upon different animals, assume various forms, and are of various sizes and degrees of rigidity,—as seen in the delicate soft velvety fur of the Mole, the stiff bristles of the Pig, and the spines of the Hedgeliog and Porcupine, all modifications of the same structures. These differences arise mainly from the different arrange- ment of the constituent elements into which the epithelial cells are modified. Each hair is composed usually of a cellular pithy internal portion, containing much air, and a denser or more horny cortical part. In some animals, as Deer, the substance of the hair is almost entirely composed of the medullary or cellular substance, and it is

conse- quently very easily broken ; in others the horny part pre- vails alinost exclusively, as in the bristles of the Wild Boar. In the Three-toed Sloth (Bradypus) the hairs have a central horny axis and a pithy exterior. Though gene- rally nearly smooth, or but slightly scaly, the surface of some hairs is strongly imbricated, notably so in some Bats, while in the Two-toed Sloth (Cholepus) they are longi- tudinally grooved or fluted. Though usually more or less cylindrical or circular in section, they are often elliptical or flattened, as in the curly-haired races of men, the terminal portion of the hair of Moles and Shrews, and conspicuously in the spines of the Rodents Xerus and Platacanthomys. Hair having a property of mutual cohesion or "felting," which depends upon a roughened scaly surface and a tendency to curl, as in domestic Sheep (in which animals this property has been especially culti- vated by selective breeding), is called " wool."

In a large number of mammals hairs of one kind only are scattered pretty evenly over the surface, bnt in many there are two kinds, one longer, stiffer, and alone appear- ing on the surface, and the other shorter, finer, and softer, constituting the under fur, analogous to the down of birds. In most cases hairs of a different character from those of the general surface grow in special regions, forming ridges or tufts on the median dorsal or ventral surface or elsewhere. The tail is very often completed in this way by variously disposed elougated hairs, The margins of the eyelids are almost always furnished witli a special row of stiffish hairs, called c7lix or eyelashes, and in most mammals specially modified hairs, constituting the wbrisse or whiskers, endowed, through the abundant nerve supply of their basal papilla, with special tactile powers, grow from the lips and cheeks. In some mammals the hairy covering is partial and limited to particular regions; in others, as the Hippopotamus and the Sirenia, though scattered over the whole surface, it is extremely short and scanty; but in mone is it reduced to so great an extent as in the Cetacea, in which it is limited toa few small bristles confined to the neighbourhood of the lips and nostrils, and often only present in the young or even foetal condition.

Some kinds of hairs, as those of the mane and tail of the Horse, appear to persist throughout the life-time of the animal; but more generally, as in the case of the body hair of the same animal, they are shed and renewed periodically, generally annually. Many mammals have a longer hairy coat

in winter, which is shed as summer comes on; and some few, which inhabit countries covered in winter with snow, as the Arctic Fox, Variable Hare, and Ermine, undergo a complete change of colour in the two seasons, being white in winter, and grey or browninsummer. The several species of Cape Mole (Chrysochloris), the Desmans or Water Moles (Afyogale), and Potamogale velox are remarkable as being the only mammals whose hair reflects a iridescent tints so common in the feathers of tropical

irds.

The principal and most obvious purpose of the hairy covering 1s to protect the skin against external influences, especially cold and damp. Its function in the hairless

MAM MALTA

[TEG UMENTARY STRUCTURES.

Cetacea is supplied by the specially modified and thickened layer of adipose tissue beneath the skin called “ blubber.”

True scales, or flat imbricated plates of horny material, Scales,

covering the greater part of the body, so frequently occur- ring in reptiles, are found in one family only of mammals, the Jfanidx or Pangolins; but these are also. associated with hairs growing from the intervals between thie scales or on the parts of the skin not covered by them. Similarly imbricated epidermic productions form the covering of the under surface of the tail of the flying Rodents of the genus Anomalurus ; and flat scutes, with the edges in apposition, and not overlaid, clothe both surfaces of the tail of the Beaver, Rats, and others of the same order, and also of some Insectivores and Marsupials. The Armadillos alone have an ossified exoskeleton, composed of plates of true bony tissue, developed in the derm or corium, and covered withscutes of hornyepidermis. Other epidermic appendages are tlie horns of Ruminants and Rhinoceroses,—the former being elongated, tapering, hollow caps of hardened epidermis of fibrillated structure, fitting on and growing from coni- cal projections of the frontal bone, and always arranged in pairs, while the latter are of similar

structure, but without any internal bony support, and situated in the median line. Callosities, or bare patches covered with hardened and thickened epidermis, are found over the ischial tuberosities of many apes, the sternum of camels, on the inner side of the limbs of the Lquida, the grasping under surface of the tail of prehensile-tailed monkeys, &c. The greater part of the skin of both species of one-horned Asiatic Rhinoceros is immensely thickened and stiffened by increase of the tissue both of the derm and epiderm, con- stituting the well known jointed "armour-plated " hide of those animals,

&e.

With very few exceptions, the terminal extremities of Nails, the digits of both limbs are more or less protected or armed claws,

by epidermic plates or sheaths, constituting the various forms of nails, claws, or hoofs. These are wanting in the Cetacea alone. A perforated spur, with a special secreting glaud in connexion with it, is found attached to the hind leg of the males of the two species of Monotremata, the Ornithorhynchus and Echidna.

ools.

Besides the universally distributed sebaceous glands Odour- connected with the pilose system, most mammals have secreting

special glands situated in modified portions of the integu- ment, often involuted to form a shallow recess or a deep sac with a narrow opening, situated in various parts of the surface of the body, and which secrete odorous substances, by the aid of which individuals appear to recognize one another, and which probably afford the principal means by which wild animals are able to become aware of the pre- sence of other members of the species, even at great dis- tances, Although the commencement of the modifications of portions of the external covering for the formation of special secretions may be at present difficult to understand, the principle of natural selection will readily explain how such organs can become fixed and gradually increase in development in any species, especially as there would probably be a corresponding modification and increased sensibility

of the olfactory organs. Such individuals as by the intensity and peculiarity of their scent had greater power of attracting the opposite sex would certainly be those most likely to leave descendants to inherit and in their turn propagate the modification.

To this group of structures belong the suborbital gland or "crumen" of Antelopes and Deer, the frontal gland of the Muntjak and of Bats of the genus Phyllorhina, the submental gland of the Chevrotains and of Zaphozous and some other Bats, the post-auditory follicle of the Chamois, the temporal gland of the Elephant, the lateral glands of the Musk-Shrew, the lumbar gland of the Peccary, the inguinal

glands.

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elands of Antelopes, the preputial glands of the Musk Deer and Beaver (both so well known for the use made of their powerfully odorons secretion in medicine and perfumery) and also of the Swine and Hare, the anal glands of Car- nivora, the perineal gland of the Civet (also of comnuercial value), the caudal glands of the Fox and Goat, the gland on the humeral membrane of Bats of tle genus Saccopteryz, the post-digital gland of the Rhinoceros, the inter-digital glands of the Sheep and many Ruminants, and numerous others. In some of these cases the glands are peculiar to, or more largely developed in, the male; in others they are found equally developed in both sexes.

DENTAL SYSTEM. |

DENTAL SYSTEM.

The dental system of mammals may be considered rather more in detail than space permits for some other portions of their structure, both on account of the important part it plays in the economy of the animals of this class, and of its interest to zoologists as an aid in classification and identi- fication of species. Owing to the imperishable nature of their tissues, teeth are preserved for an indefinite time, aud in the case of extinct species often offer the only indications available from which to derive an idea of the

characters, affinities, and habits of the animal to which they have belonged. Hence even their smallest modifications have received great attention from comparative anatomists, and they have formed the subject of many special mono- graphs.!

Teeth are present in nearly all mammals, and are applied to various purposes. They are, however, mainly subserv- ient to the function of alimentation, being used either in procuring food by seizing and killing living prey or gather- ing and biting off portions of vegetable material, and more indirectly in tearing or cutting through the hard protective coverings of food substances, as the husks aud shells of nuts, or in pounding, crushing, or otherwise mechanically dividing the solid materials before swallowing, so as to prepare them for digestion in the stomach. Certain teeth are also in many animals most efficient weapons of offence and defence, and for this purpose alone, quite irrespective of subserviency to the digestive process, are they developed in the male sex of many herbivorous animals, in the females of which they are absent or rudimentary.

Teeth belong essentially to the tegumentary or dermal system of organs, and, as is well seen in the lower vertebrates, pass by almost insensible gradations into the hardened spines and scutes formed upon the integument covering the outer surface of the body, but in mammals they are more specialized in structure and limited in locality. In this class they are developed only in the gums or fibro-mucous membrane covering the alveolar borders of the upper and lower jaw or the premaxillary and maxillary bones and the mandible. In the process of development, for the purpose of giving them that support which is needful for the per- formance of their functions, they almost always become implanted in the bone,—the osseous tissue growing up and moulding itself around the lengthening root of the tooth, so that ultimately they become apparently parts of the skeleton. Inno mammal, however, does ankylosis or bony union between the tooth and jaw normally take place, as in many fishes and reptiles,—a vascular layer of connective tissue, the alveolo-dental membrane, always intervening."

1L. F. E. Rousseau, Anatomie comparée du Systéme Dentatre chez ViTomme et chez les principaux Animaux, 2d ed. 1839; F. Cuvier, Des Dents des Mammiferes considérées comme caracteres zoologiques, 1822- 25; R.

Owen, Odontography, 1840-45; C. G. Giebel, Odonto- graphie, 1855; C. S. Tomes, Manual of Dental Anatomy, Human and Comparative, 2d ed., 1882.

2 The lower incisors of some species of Shrews are, howeyer, said to become ankylosed to the jaw in adult age.

The presence of two or more roots, frequently met with in mammals, implanted into corresponding distinct sockets of the jaw, is peculiar to animals of this class.

The greater number of mammalian teeth when fully Struc- formed are not simple and homogeneous in structure, ture of but are composed of several distinct tissues. as

1. The pulp, a soft substance, consisting of a very delicate Pulp. gelatinous connective tissue, in which numerous cells are imbedded, and abundantly supplied with blood-vessels and nerves, constitutes the central axis of all the basal part of the tooth, and affords the means by which the vitality of the whole is preserved. The nerves which pass into the pulp and endow the tooth with sensibility are branches of the fifth pairof cranial nerves. The pulp occupies a larger relative space, and performs a more important purpose in the young growing tooth than afterwards, as by the calci- fication and conversion of its outer layers the principal hard constituent of the tooth, the dentine, is formed. In teeth which have ceased to grow the pulp occupies a com- paratively sinall space, which in the dried tooth is called the pulp cavity. This communicates with the external surface of the tooth by a small aperture at the apex of the root, through which the branches of blood-vessels and nerves, by which the tooth receives its nutrition and sensi- tiveness, pass in to be distributed in the pulp. In grow- ing teeth the pulp cavity is widely open below, while in advanced age it often becomes obliterated, and the pulp itself entirely converted into bone- like material.

2. The dentine or iwory forms the principal constituent of Dentine. the greatcr number of teeth. When developed in its most characteristic form, it is a very hard but elastic substance, white, with a yellowish tinge, and

slightly translucent. It consists of an organic matrix, something like but not identical with that of bone, richly impregnated with calcareous salts (chiefly phosphate of lime), these constitut- ing in a fresh hnman tooth 72 per cent. of its weight. When subjected to microscopical examination it is seen to he everywhere permeated by nearly parallel branching tubes which run, in a slightly curving or wavy manner, in a general direction from the centre towards the free surface of the tooth. These tubes communicate by open mouths with the pulp cavity, and terminate usually near the periphery of the dentine, by closed ends or loops, though in Marsupials and certain other mammals they penetrate into the enamel. They are occupied in the living tooth by soft gelatinous fibrils connected with the cells of the pulp. A variety of dentine, permeated by canals con- taining blood-vessels, met with commonly in fishes and in some few mammals, as the Megatherium, is called vaso- dentine. Other modifications of this tissue occasionally met with are called osteo-dentine and secondary dentine,— the latter being a dentine of irregular structure which often fills up the pulp cavity of old animals.

3. The enamel constitutes a thin investing layer, com- Enamel. plete or partial, of the outer or exposed and working surface of the dentine of the crown of the teeth of most mammals. This is the hardest tissue met with in the animal body, containing from 95 to 97 per cent. of mineral substances (chiefly phosphate and some carbonate of lime, with traces of fluoride of calcium). Its ultimate structure consists of prismatic fibres, placed generally with their long axes at right angles to the free surface of the tooth. Enamel is easily distinguished from dentine with the naked eye, by its clear, bluish-white, translucent appearance.

4, The cementum or erusta petrosa is always the most Ce- externally placed of the hard tissues of which teeth are mentum. composed, as will be understood when the mode of develop- ment of these organs is considered. It is often only found as a thin layer upon the surface of the root, but sometinics, as in the complex-crowned molar teeth of the Horse and

Develop- ment.

Elephant, it is a structure which plays a very important part, covering and filling in the interstices between the folds of the enamel. In appearance, histological structure, and chemical composition it is closely allied to osseous tissue, containing lacune® and canaliculi, thongh only when it is of considerable thickness are Haversian canals present in it,

Development of the T'eeth.—The two principal constituents of the teeth, the dentine and the enamel, are developed from the two layers of the buccal mucous membrane, the dentine from the submucous, the enamel from the epithelial layer. 'The latter dips down into the substance of the gum, and forms the enamel organ or germ, the first rudiment of the future tooth, which is constantly present even in those animals in which the enamel is not found as a constituent of the perfectly-formed tooth. Below the mass of epithelial cells thus embedded in the substance of the gum, and re- inaining connected by a narrow neck of similar structure with the epithelium of the surface, a portion of the vascular submucous areolar tissue becomes gradually separated and defined from that which surrounds it, and assumes a distinct form, which is that of the crown of the future tooth,—a single cone in the case of simple teeth, or with two or more eminences in the complex forms. This is called the dental papilla or dentine germ, and by the gradual conversion of its tissue into dentine the bulk of the future tooth is formed, the uncalcified central portion remaining as the pulp. The conversion of the papilla into hard tissue com- inences at the outer surface of the apex, and gradually proceeds downwards and inwards, so that the form of the papilla exactly determines the form of the future dentine, and no alteration either in shape or size of this portion of the tooth, when once calcified, can take place by addition to its outer surface. In the meanwhile calcification of portion of the cells of the enamel organ, which adapts itself like a cap round the top of the dentinal papilla, and has assumed a somewhat complex structure, results in the formation of the enamel coating of the crown of the tooth. While these changes are taking place the tissues immediately surrounding the tooth germ become condensed and differen- tiated into a capsule, which appears to grow up from the base of the dental papilla, and encloses both this and the enamel germ, constituting the follicle or tooth sac By the ossification of the inner layer of this follicle, the ceinentuin is formed. This substance therefore, unlike the dentine, increases from within outwards, and its growth may therefore be the cause of considerable modi-

fication of form and enlargement, especially of the roots, of certain teeth, as those of Seals and some Cetacea. The delicate homogeneous layer which coats the enamel surface of newly-formed teeth, in which cementum is not found in the adult state, and known as Nasmyth's membrane, is considered by Tomes as probably a film of this substance, too thin to exhibit its characteristic structure, though by others it is believed to be derived from the external layer of the enamel organ. The homology of the teeth with the dermal appendages, hairs, scales, and claws has already been alluded to, and it will now be seen that in both cases two of the primary embryonic layers are concerned in their development, the mesoblast and epiblast, although in very different proportions. In the hair or nail the part derived from the epiblast forms the principal bulk of the organ, the mesoblast only constituting the papilla or matrix. In the tooth the epiblastic portion is limited to the enamel, always of relatively small bulk and often absent, while the dentine (the principal constituent of the tooth) and the cementum are formed from the mesoblast.

When more than one set of teeth occur in mammals, those of the second set are developed in a precisely similar nauner to the first, but the enamel germ, instead of being

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derived directly from an independent part of the oral epithelium, is formed from a budding out of the neck of the germ of the tooth succeeded. In the case of the true molars which have no predecessors, the germ of the first has an independent origin, but that of the others is derived from the neck of the germ of the tooth preceding it in the series. The foundations of the permanent teeth are thus laid as it were almost simultaneously with those of their predecessors, although they remain in many cases for years before they are developed into functional activity.

Although the commencement of the formation of teeth takes place at an early period of embryonic life, they are in nearly all mammals still concealed beneath the gum at the time of birth. The period of eruption, or "cutting" of the teeth as it is called, that is, their piercing through and rising above the surface of the mucous meinbrane, varies much in different species. In some, as Seals, the whole series of teeth appear almost

simultaneously ; but more often there are considerable intervals between their appearance, the front teeth usually coming into place first, and those at the back of tlhe mouth at a later period.

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General Characters.—The simplest form of tooth may be Forms of exemplified on a large scale by the tusk of the Elephant teeth.

(fig. 1, I.) It isa hard mass almost entirely composed of dentine, of a conical shape at first, but during growth becoming more and more cylindrical or uniform in width. The enamel covering, present on the apex in its earliest condition, soon disappears, but a thin layer of cementum covers the circumference of the tooth throughout life. On – section it will be seen that the basal portion is hollow, and contains a large conical pulp, as broad at the base as the tooth itself, and deeply imbedded in the bottom of a recess or sucket in the upper maxillary bone. This pulp continues to grow during the lifetime of the animal, and to be converted at its surface into dentine. The tooth therefore continually elongates, but the use to which the animal subjects it in its natural state causes the apex to wear away, at a rate generally proportionate to the growth at the base, otherwise it would becomte of inconvenient length and weight. Such teeth of indefinite growth are said to be "rootless," or to have " persistent pulps."

One of the corresponding front teeth of man (fig. 1, II. and Ill.) may be taken as an example of a very different condition. After its crown is fully formed by calcification of the germ, the pulp, though continuing to elongate, begins to contract in diameter; a neck or slight constriction is formed; and the remainder of the pulp is converted into the root (or fang), a tapering conical process which is imbedded in the alveolar cavity of the bone, and has at its extremity a minute perfora- tion, through which the vessels and nerves required to maintain the vitality of the tooth enter the pulp cavity, very different from the widely open cavity at the base of the growing tooth. When the crown of the tooth is broad and complex in character, instead of having a single root, it may be supported by two or more roots, each of which is implanted in a distinct alveolar recess or socket, and to the apex of which a branch of the common pulp cavity is continued (fig.1,IV.). Such teeth are called "rooted teeth." When they have

once attained their position in the jaw, with the neck a little way above the level of the upper margin of the alveolus, and embraced by the gum or tough fibro-vascular membrane which covers the alveolar border, and having the root fully formed, they can never increase in length or alter their position. If they appear to do so in old age it is only in consequence of absorption and retrocession of the surrounding alveolar margins, If, as

1 See the conclusion of the article DIGESTIVE ORGANS, Vol. vii. p. 233 sg., for a more detailed and illustrated account of the structure and development, especially of the human teeth.

often happens, their surface wears away in mastication, it is never renewed. The open cavity at the base of the imperfectly developed rooted tooth (fig. 1, II.) causes it to resemble the persistent condition of the rootless tooth. The latter istherefore a more primitive condi- tion, the forma- tion of the root being a comple- tion of the process of tooth develop- ment. Function- ally itis, however, difficult to say that the one isa higher form than the other, as they both serve | important and | different purposes in the animal economy.

As is almost always the case in nature, inter- mediate condi- tions between these two forms of teeth are met with. Some, as the molars of the Horse, and of many Rodents, are for a_ time

rootless, and have Fie. ae igi bem of Maine ne forms of s Teeth. I. Incisor of Elephant, with pulp cavity per- growing pulps sistently open at base. II. Human incisor during producing a very development, with root imperfectly formed, and pulp 2 . cavity widely open at base. I11. Completely formed long crown with human incisor, with _ cavity contracted to a small ‘ aperture at the end of the root. [V. Human molar, parallel sides, the with broad crown and two roots. V. Molar of Ox, summit of which with enamel covering the crown deeply folded and may be in use with the depressions filled up with cementum, The and beginning to wear away while the base is still

surface is worn by use; otherwise the enamel coating would be continuous at the top of the ridges. In all the figures the enamel is black, the pulp white,

the dentine represented by horizontal lines, and the ce- mentum by dots. growing, but ultimately the pulp contracts, forms a neck and distinct roots, and ceases to grow. The canine tusks of the Musk Deer and of the Walrus have persistent pulps, and are open at their base until the animal is of advanced age, when they close, and the pulp ceases to be renewed. The simplest form of the crown of a tooth is that of a cone; but this may be variously modified. It may be flattened, with its edges sharp and cutting, and pointed at the apex, as in the laterally compressed premolars of most Carnivora, or it may be chisel- or awl-shaped, with a straight truncated edge, as in the human incisors; or it may be broad, with a flat or rounded upper surface. Very often there isa more or less prominent ridge encircling the whole or part of the base of the crown just above the neck, called the cingulum, which serves as a protection to the edge of the gum in masticating, and is best developed in flesh- eating and insectivorous animals, in which the gums are liable to be injured by splinters of bone or other hard frag- ments of their food. The form of the crown is frequently rendered complex by the development upon its surface of elevations or tubercles called cusps, or by ridges usually transverse, but sometimes variously curved or folded. When the crown is broad and the ridges greatly developed,

as in the molars of the Elephant, Horse, and Ox (fig. J, V.), the interspaces between them are filled with cementum,

which supports them and makes a solid compact mass of the whole tooth. When such a tooth wears away at the surface by friction against the opposed tooth of the other jaw, the different density of the layers of the substances of which it is composed—enamel, dentine, and cementum—arranged in characteristic patterns, causes them to wear unequally, the hard enamel ridges projecting beyond the others, thus giving rise to a grinding surface of great mechanical advantage.

Succession of Teeth.—The dentition of all mammals con- sists of a definite set of teeth almost always of constant and determinate number, form, and

situation, and, with few exceptions, persisting in a functional condition throughout the natural term of the animal's life. In many species these are the only teeth which the animal ever possesses, —the set which is first formed being permanent, or, if accidentally lost, or decaying in extreme old age, not being replaced by others. These animals are called Monophyodont. But, in the larger number of mammals, certain of the teeth are preceded by others, which may be only of a very transient, rudimentary, and functionless character (being in the Seals, for example, shed either before or within a few days after birth), or may be considerably developed, and functionally occupy the place of the permanent teeth for a somewhat lengthened period, during the growth and development of the latter and of the jaws. In all cases these teeth disappear (by the absorption of their roots and shedding of the crowns) before the frame of the animal has acquired complete maturity as evidenced by the coalescence of the epiphyses of the osseous system. As these teeth are, as a general rule, present during the period in which the animal is nourished by the milk of the mother, the name of "milk teeth" (French dents de latt, German Mfilchzihne) has been commonly accorded to them, although it must be understood that the epoch of their presence is by no means necessarily synchronous with that of lactation. Animals which possess such tceth are called Diphyodont. No mammal is known to have more than two sets of teeth; and the definite and orderly replacc- ment of certain. members of the series is a process of quite a different nature from the indefinite succession which takes place in all the tecth continuously throughout the lifetime of the lower vertebrates.

When the milk teeth are well developed, and coutinue in place during the greater part of the animal's growth, as is especially the case with the Ungulata, and, though to a less degree, with the Primates and Carnivora, their use is obvious, as taken all together they form structurally a complete epitome on a small scale of the more numerous and larger permanent set (see fig. 3), and, consequently, are able to perform the same functions, while time is allowed for the gradual maturation of the latter, and espe- cially while the jaws of the growing animal are acquiring the size and strength sufficient to support the permanent teeth. Those animals, therefore, that have a well-developed and tolerably persistent set of milk teeth may be considered to be in a higher state of development, guoad dentition, than those that have the milk teeth absent or rudimentary.

It is a very general rule that individual teeth of the milk and permanent set have a close relationship to one another, being originally formed, as mentioned above, in exceedingly near proximity, and with, at all events as far as the enamel germ is concerned, a direct connexion. More- over, as the latter ultimately come to occupy the position in the alveolar border temporarily held by the former, they are spoken of respectively as the predecessors or successors of each other. But it must be understood that milk teeth may be present which have no successors in the permanent series, and, what is far more general, permanent teeth may have no predecessors in the milk series.

Succes- sion of teeth.

Arrange- mentand classi- fication of teeth,

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The complete series of permanent teeth of most mammals forms a complex machine, with its several parts adapted for different functions,—the most obvious structural modification for this purpose being an increased complexity of the individual components of the series from the anterior towards the posterior extremity of such series. Since, as has just been said, the complete series of the milk teeth often presents structurally and functionally a similar machine, but composed of fewer individual members, and the anterior of which are as simple, and the posterior as complex, as those occupying corresponding positions in the permanent series,—and since the milk teeth are only developed in relation to the anterior or lateral, never to the most posterior of the permanent series,—it follows that the hinder milk teeth are usually more complex than the teeth of which they are the predecessors in the permanent series, and represent functionally, not their immediate suc- cessors, but those more posterior permanent teeth which have no direct predecessors. This character is clearly seen in those animals in which the various members of the molar series are well differentiated from each other in form, as the Carnivora, and also in Man.

Tn animals which have two sets of teeth the number of the teeth of the permanent series which are preceded by milk teeth varies greatly, being

sometimes, as in Marsupials and some Rodents, as few as one on each side of each jaw, and sometimes including the larger portion of the series.

Although there are difficulties in some cases in arriving at a satisfactory solution of the question, it is, on the whole, safest to assume that when only one set of teeth is present, these correspond to the permanent teeth of the Diphyodonts. When this one set is completely developed, and remains in use throughout the animal's life, there can be no question on this subject. When, on the other hand, the teeth are rudimentary and transient, as in the Whale-bone Whales, it is possible to consider them as representing the milk series; but there are weighty reasons in favour of the opposite conclusion.

General Arrangement, Homologies, and Notation of Teeth of Mammals.—The teeth of the two sides of the jaws are always alike in number and character, except in cases of accidental or abnormal variation, and in the one remark- able instance of constant deviation from bilateral symmetry among mammals, the tusks of the Narwhal (see fig. 49, p. 398), in which the left is of immense size, and the right rudimentary. In those animals also, as the Dolphins aud some Armadillos, which have a very large series of similar teeth, not always constant in number in different indi- viduals, there may be differences in the two sides; but, apart from these, in describing the dentition of any mammal, it is quite sufficient to give the number and characters of the teeth of one side only. As the teeth of the upper and the lower jaws work against each other in masticating, there is a general correspondence or harmony between them, the projections of one series, when thie mouth is closed, fitting into corresponding depressions of the other. There is also a general resemblance in the nutnber, characters, and mode of succession of both series, so that, although individual teeth of the upper and lower jaws may not be in any strict sense of the term homologous parts, there is a great convenience in applying the same descriptive terms to the one which are used for the other.

The simplest dentition as a whole is that of many species

1 This and other questions concerning the homologies, notation, and succession of the teeth of mammals are more fully developed in two memoirs by the present writer :—-" Remarks on the Homologies and

Notation of the Teeth of the Mammalia," in the Journal of Anatomy and Physiology, vol. iii. p. 262, 1869; and " Notes on the First or

Milk Dentition of the Mammalia," in the Z'rans. Odontological Society of Great Britain, 1871.

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of Dolphin (fig. 2), in which the crowns are single-pointed, slightly curved cones, and the roots also single and taper- ing, and all alike in form from the anterior to the posterior end of the series, though it may be with some slight difference in size, those at the two extremities of the

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bby Fig. 2.—Upper and Lower Tecth of one side of the Mouth of a Dolphin (Lageno- rhynchus), a8 an example of the homodont type of dentition. The bone cover- ing the outer side of the rvots of the teeth has been removed to show their simple character.

series being rather smaller than the others. Such a den- tition is called Homodont, and in the case cited, as the teeth are never changed, it is also Monophyodont. Sucli teeth are adapted only for catching slippery living prey, as fish.

In a very large number of mammals the teeth of different parts of the series are more or less differentiated in character, and have different functions to perform. The front teeth are simple and one-rooted, and are adapted for cutting and seizing. They are called "'incisors." The back teeth have broader and more complex crowns, tuberculated or ridged, and they are supported on two or more roots. They crush or grind the food, and are hence called "molars." Many animals have, between these two sets, a tooth at each corner of the mouth, longer and more pointed than the others, adapted for tearing or stabbing, or for fixing struggling prey. From the conspicuous development of such teeth in the Carnivora, especially the Dogs, they have received the name of "canines." A dentition with its

component parts so differently formed that these distinctive terms are applicable to them is called Heterodont. In most cases, though by no means invariably, animals with Heterodont dentition are also Diphyodont.

This general arrangement is extremely obvious in a considerable number of mammals ; and closer examinaticu shows that, under very great modifications in detail, there is a remarkable uniformity of essential characters in the dentition of a large number of members of the class belonging to different orders and not otherwise closely allied, so much that it has been possible (chiefly through the researches of Professor Owen) to formulate a common plan of dentition from which the others have been derived by the alteration of some and suppression of other members of the series, and occasionally, but very rarely, by addition. The records of paleontology fully confirm this view, as by tracing back many groups now widely separated in dental characters we find a gradual approxi- mation to a common type. In this generalized form of mammalian dentition (which is best exemplified in the genera Anoplothertum and Homalodontotherium) the entire number of teeth present is 44, or 11 above and 11 below on each side. Those of each jaw are placed in continuous series without intervals between them; and, although the anterior teeth are simple and single-rooted, and the pos- terior teeth complex and with several roots, the transition between the two kinds is gradual.

In dividing and grouping such teeth for the purpose of description and comparison, more definite characters are required than those derived merely from form or function. The first step towards a classification has been made by the observation that the upper jaw is composed of two bones, the premaxilla and the maxilla, and that the suture between these bones separates the

three anterior teeth from the others. These three teeth then, which are implanted by their roots in the pre- maxilla, form a distinct group, to which the name of "incisor" is applied. This distinction is, however, not so important as it appears at first sight, for, as mentioned when speaking of the development of the teeth, their counexion with the bone is only of a secondary nature, and, although it happens conveniently for our purpose

that in the great majority of cases the segmentation of the bone coincides with the interspace between the third and fourth tooth of the series, still, when it does not happen to do so, as in the case of the Mole, we must not give too much weight to this fact, if it contravenes other reasons for determining the homologies of the teeth. The eight remaining teeth of the upper jaw offer a natural division, inasmuch as the posterior three never have milk predecessors, and, although some of the anterior teeth may be in the same case, the particular one pre- ceding these three always has such a predecessor. These three then are grouped apart as the "molars," or "true molars," as some of the teeth in front of them often have a molariform character. Of the five teeth between the incisors and molars the most anterior, or that which is usually situated close behind the premaxillary suture, almost always, as soon as any departure takes place from the simplest and most homogeneous type, assumes a lengthened and pointed form, and is the tooth so developed as to constitute the 'canine " or "laniary" tooth of the Car- nivora, the tusk of the Boar, &c. It is customary therefore to call this tooth, whatever its size or forni, the " canine." The remaining four are the "premolars" or "false molars." This system of nomenclature has been objected to as being artificial, and in many cases not descriptive, the distinction between premolars and cauine especially being sometimes not obvious, but the terms are now in such general use, and are so practically convenient—especially if, as it is best to do in all such cases, we forget their original signification, and treat them as arbitrary signs—that it is not likely they will be superseded by any that have been proposed as substitutes for them.

With regard to the lower teeth the difficulties are greater, owing to the absence of any suture corresponding to that which defines the incisors above; but, as the number of the teeth is the same, as the corresponding teeth are preceded by milk teeth, and as in the large majority of cases it is the fourth tooth of the series which is modified in the same way as the canine (or fourth tooth) of the upper jaw, it is quite reasonable to adopt the same divisions as with the upper series, and to call the first three, which are implanted in the part of the mandible opposite to the pre- maxilla, the incisors, the next the canine, the next four the premolars, and the last three the molars, It may be observed that when the mouth is closed, especially when the opposed surfaces of the teeth present an irregular out- line, the

corresponding upper and lower teeth are not exactly opposite, otherwise the two series could not fit into one another, but as a rule the points of the lower teeth shut into the interspaces in front of the corresponding teeth of the upper jaw. This is seen very distinctly in the canine teeth of the Carnivora, and is a useful guide in determining the homologies of the teeth of the two jaws. Objections have certainly been made to this view, because, in certain rare cases, the tooth which, according to it, would be called the lower canine has the form and function of an incisor (as in Ruminants and Lemurs), and on the other hand (as in Oreodon, an extinct Ungulate from North America) the tooth that would thus be determined as the first premolar has the form of a canine; but it should not be forgotten that, as in all such cases, definitions derived from form and function alone are quite as open to

objection as those derived from position ana relation to sur- rounding parts, or still more so.

Fig. 3.—Milk and Permanent Dentition of Upper (I.) and Lower (II.) Jaw of the

Dog (Canis familiaris), with the symbols by which the different teeth are

commonly designated. The third upper molar (m 8) is the only tooth wanting in this animal to complete the typical heterodont mammalian dentition.

For the sake of brevity the complete dentition, arranged Dental according to these principles, is often described by the fol- formule.

lowing formula, the numbers above the line representing the teeth of the upper, those below the line those of the lower jaw : — incisors oa canines = premolars $—, molars*

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a oe total 44. As, however, initial letters may be

substituted for the names of each group, and it is quite unnecessary to give more than the numbers of the teeth on one side of the mouth, the formula may be conveniently abbreviated into—

iS, ch p4,m3=H; total 44,

The individual teeth of each group are always enumerated from before backwards, and by such a formula as the following—

41,272,738, ¢,p1, p2, 93, p 4,m1, m2, m8 41,72,73,¢,p1,p2, p38, p4,m1,m2,m3 a special numerical designation is given by which each one can be indicated. In mentioning any single tooth, such a sign as "+ will mean the first upper molar, ,,; the first lower molar, and soon. The use of such signs saves much time and space in description.

It was part of the view of the founder of this system of dental notation that, at least throughout the group of mammals whose dentition is derived from this general type, each tooth has its strict homologue in all species, and that in those cases in which fewer than the typical fumber are present (as in all existing mammals except the genera Sus, Gymnura, Talpa, and Myogale) the teeth that are missing can be accurately defined. According to this view, when the number of incisors falls short of three it is assumed that the absent ones are missing from the outer and posterior end of the series. Thus when there is but one incisor present, it is 7 1; when two, they arez] and a 2. Furthermore, when the premolars and the molars are below their typical number, the absent teeth are missing from the fore part of the premolar series, and from the back part of the molar series, If this were invariably so, the labours of- those who describe teeth would be greatly simplified; but there are unfortun- ately so many exceptions that a close scrutiny into tha

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Excep- tions from general- ized type.

Pisci- yorous dentition.

situation, relations, and development of a tooth may be required before its nature can be determined, and in some cases the evidence at our disposal is scarcely sufficient for the purpose.

The milk dentition is expressed by a similar formula, d for deciduous being commonly added before the letter expressive of the nature of the tooth. As the three molars and (almost invariably) the first premolar of the permanent series have no predecessors, the typical milk dentition would be expressed as follows—di 3, dc 4, dm 3=4=28. The teeth which precede the premolars of the permanent series are all called molars in the milk dentition, although, as a general rule, in form and function they represent in a condensed form the whole premolar and molar series of the adult. When there is a marked difference between the premolars and molars of the permanent dentition, the first milk molar resembles a premolar, and the last has the characters of the posterior true molar.

The dentition of all the animals of the orders Primates, Carnivora, Insectivora, Chiroptera, and Ungulata can clearly be derived from the above-described generalized type. The same may be said of the Rodents, and even the Proboscidea, though with greater modification, at least in the existing members of the order. It is also apparent in certain extinct Cetaceans, as Zeuglodon and Squalodon, but it is difficult to find any traces of it in existing Cetacea, Sirenia, or any of the so-called Edentata. All the Marsupials, different as they are in their general structure and mode of life, and variously modified as is their dentition, present in this system of organs some deep-lying common characters which show their unity of origin. The generalized type to which their dentition can be reduced presents considerable resemblance to that of the placeutal mainmals, yet differing in details. It is markedly heterodont, and susceptible of division into incisors, canines, premolars, and molars upon the same principles. The whole number is, however, not limited to forty-four. The incisors may be as numerous as five on each side, and are almost always different in number in the upper and the lower jaw. The premolars and molars

are commonly seven, as in the placental mammals, but their |

arrangement is reversed, as there are four true molars and three premolars ; and finally the milk dentition of all known Marsupials, existing or extinct,

is (if not entirely absent) limited to a single tooth on each side of each jaw, this being the predecessor of the last permanent premolar.

In very few mammals are teeth entirely absent. Even in the Whalebone Whales their germs are formed in the same manner and at the same period of life as in other mammals, and even become partially calcified, but they never rise above the gums, and completely disappear before the birth of the animal. In some species of the order Edentata, the true Anteaters and the Pangolins, no traces of teeth have been found at any age. The Monotremata are in like case, although the Ornithorhynchus has flattened, ridged, horny plates at the back of both jaws, which answer the purpose of molar teeth.

Modifications of the Teeth in Relation to their Functions. —The principal functional modifications noticed in the dentition of Mammalia may be roughly grouped as (1) piscivorous, (2) carnivorous, (3) insectivorous, (4) omni- vorous, and (5) herbivorous, each having, of course, numerous variations and transitional conditions.

1. The essential characters of a piscivorous dentition are best exemplified in the Dolphins, and also (as modifications of the carnivorous type) in the Seals. It consists of an

1 : . .

Hyrax alone among existing mammals which have four premolars has also four milk molars.

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elongated, rather narrow mouth, wide gape, with numerous subequal, conical, sharp-pointed, recurved teeth adapted simply to rapidly seize, but not to divide or masticate, active, slippery, but not powerful prey. All animals which feed on fish asa rule swallow and digest them entire, a process which the structure of prey of this nature, especi- ally the intimate interblending of delicate, sharp-pointed bones with the muscles, renders

very advantageous, and for which the above-described type of dentition is best adapted.

9. The carnivorous type of dentition is shown in its Carmi- most perfect development among existing mammals in vorous. the Felide. The function being here to seize and kill struggling animals, often of large size and great muscular power, the canines are immensely developed, trenchant, and piercing, 1

and are situated wide apart so as to give the firmest hold when fixed in the victim's body. The jaws are as short as is consistent with the free action of the canines, so that no power may be lost. The incisors are very small, so as not to interfere with the penetrating action of the canines, and the crowns of the molar series are reduced to scissor-like blades, with which to pare off the soft tissues from the large bones, or to divide into small pieces the less dense portions of the bone for the sake of nutriment afforded by the blood and marrow it contains. The gradual modification between this and the two following types will be noticed in their appropriate places.

3. In the most typical insectivorous animals, as the Insecti- Hedgehogs and Shrews, the central incisors are elongated, vorous. pointed, and project forwards, those of the upper and lower

jaw meeting like the blades of a pair of forceps, so as

readily to secure small active prey, quick to elude capture, but powerless to resist when once seized. The crowns of the molars are covered with numerous sharp edges and points, which working against each other, rapidly cut up the hard cased insects into little pieces, fit for swallowing and digestion.

4, The omnivorous type, especially that adapted for the Omni- consumption of soft vegetable substances, such as fruits of vorous various kinds, may be exemplified in the dentition of Man, of most Monkeys, and of the less modified Pigs. The incisors are moderate, subequal, and cutting. If the canines are enlarged, it is usually for other purposes than those connected with food, and only in the male sex. The molars have their crowns broad, flattened, and elevated into rounded tubercles.

5. In the most typically herbivorous forms of dentition, Herbi- as seen in the Horse and Kangaroo, the incisors are well vorous, developed and trenchant, adapted for cutting off the herbage on which the animals feed ; the canines are rudi-. mentary or suppressed ; the molars are large, with broad crowns, which in the simplest forms have strong transverse ridges, but may become variously complicated in the higher degrees of modification which this type of tooth assumes.

The natural groups of mammals, or those which in our present state of knowledge we have reason to believe are truly related to each other, may each contain examples of more than one of these modifications. Thus the Primates have both omnivorous and insectivorous forms. The Carnivora show piscivorous, carnivorous, insectivorous, and omnivorous modifications of their common type of denti- tion. The Ungulata and the Rodentia have among them the omnivorous and various modifications, both simple and complex, of the herbivorous type. The Marsupialia exhibit examples of all forms, except the purely piscivorous. Other orders, more restricted in number or in habits, as the Proboscidea and Cetacea, naturally do not show so great a variety in the dental structure of their members.

In considering the taxonomic value to be assigned to

Taxo- nomy.

SKELETON. |

the modifications of teeth of mammals, two principles, often opposed to each other, which have been at work in produc- ing these modifications, must be held in view :—(1) the type, or ancestral form, as we generally now call it, characteristic of each group, which in most mammals is itself derived from the still more generalized type described above ; and (2) variations which have taken place from this type, generally in accordance with special functions which the teeth are called upon to fulfil in particular cases. These variations are sometimes so great as completely to mask the primitive type, and in this way the dentition of many animals of widely different origin has come to present a remarkable superficial resemblance, as in the case of the

‘Wombat (a Marsupial), the Aye-Aye (a Lemur), and the

Rodents, or as in the case of the Thylacine and the Dog, In all these examples indications may generally be found of the true nature of the case by examining the earlier conditions of dentition; for the characters of the milk teeth or the presence of rudimentary or deciduous mem- bers of the permanent set will generally indicate the route by which the specialized dentition of the adult has been derived. It is perhaps owing to the importance of the dental armature to the well-being of the animal in procuring its susten- ance, and preserving its life from the attacks of enemies, that great changes appear to have taken place so readily, and with such comparative rapidity, in the form of these organs, changes often accompanied with but little modification in the general structure of the animal. Of this pro- position the Aye Aye (Chiromys) among Lemurs, the Walrus among Seals, and the Narwhal among Dolphins form striking examples; as, in all, the superficial characters of their dentition would entirely separate them from the animals with which all other evidence (even including the mode of development of their teeth) proves their close affinity.

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axial portion belonging to the head and trunk, and an appendicular portion belonging to the limbs. ‘There are also certain bones called splanchnic, being developed within the substance of some of the viscera. Such are the os cordis and os penis found in some mammals.

It is characteristic of all the larger bones of the Mam- mala that their ossification takes its origin from several distinct centres. One near the middle of the bone, and spreading throughout its greater portion, constitutes the diaphysis, or “shaft,” in the case of the long bones. Others near the extremities, or in projecting parts, form the epiphyses, which remain distinct during growth, but ultimately coalesce with the rest of the bone.

The axial skeleton consists of the skull, the vertebral Axial column (prolonged at the posterior extremity into the tail), skeleton.

the sternum, and the ribs.

In the skull of adult mammals, all the bones, except the gkull,

lower jaw, the auditory ossicles, and the bones of the hyoid arch, are immovably articulated together, their edges being

FE Pa

The skeleton is a system of hard parts, forming Fic. 4.—Longitudinal and Vcrtical Section of the Skull of a Dog (Canis familiaris), with

a framework which supports and protects the softer organs and tissues of the body. It consists of dense fibrous and cartilaginous tissues, of which portions remain through life in this state, but the greater part is transformed during the growth of the animal into bone or osseous tissue. This is characterized by a peculiar histological structure and chemical composition, being formed mainly of a gelatinous basis, strongly impregnated with salts of lime, chiefly phosphate, and disposed in a definite manner, con- taining numerous minute nucleated spaces or cavities called lacune, connected together by delicate channels or canaliculi, which radiate in all directions from the sides of the lacunz. Parts composed of bone are, next to the teeth, the most imperishable of all the organs of the body, often retaining their exact form and internal structure for ages after every trace of all other portions of the organiza- tion has completely disappeared, and thus, in the case of extinct animals, affording the only means of attaining a knowledge of their characters and affinities.

In the Armadillos and their extinct allies alone is an ossified exoskeleton, or bony covering developed in the skin, present. In all other mammals the skeleton is com- pletely internal, It may be described as consisting of an

? See for the principal modifications of the skeleton of this class, the large and beautifully illustrated Ostéographie of De Blainville, 1835- 54; the section devoted to this subject in Bronn's Klassen und Ord- nungen des

Thier-Reichs, by Giebel, 1874-79; and An Introduction to the Osteology of the Mammalia, by W. H. Flower, 2d ed. 1876.

*mandible and hyoid arch. ethmo-turbinal; Wa, nasal ; JZ, ossified portion of the mesethmoid ; CZ, cribriform plate of the ethmo-turbinal; Fr, frontal; Pa, parietal; JP, interparietal; SO, supra-occipital; Ex0, ex-occipital ; BO, basi-occipital; Per, periotic; BS, basi-sphenoid ; Pt, pterygoid; AS, ali-sphenoid; OS, orbito-sphenoid; PS, presphenoid ; Pi, palatine; Vo, vomer; Mz, maxilla; PHz, premaxilla; sh, stylo-hyal; ¢h, epi-hyal; ch, cerato-hyal ; bA, basihyal; th, thyro-hyal; 8, symphysis of mandible; cp, coronoid process; cd, condyle; a, angle; 7d, infcrior dental canal, The mandible is displaced downwards, to show its entire form; the * indicates the part of the cranium to which the condyle is articulated.?*

an, anterior narial aperture; 4/7, maxillo-turbinal bone; £7,

in close contact, often interlocking by means of fine denti- culations projecting from one bone and fitting into corre- sponding depressions of the other, and held together by the periosteum, or fibrous membrane investing the bones, pass- ing directly from one to the other, permitting no motion, beyond perhaps a slight yielding to external pressure. In old animals there is a great tendency for the different bones to become actually united by the extension of ossification from one to the other, with consequent obliteration of the sutures. The cranium, thus formed of numerous originally independent ossifications, retaining through life more or less of their individuality, or all fused together, according to the species, the age, or even individual peculiarity, con- sists of a brain case, or bony capsule for enclosing and protecting the brain, and a face for the support of the organs of sight, smell, and taste and of those concerned in seizing and masticating the food. The brain case articulates directly with the anterior cervical vertebra, by means of a pair of oval eminences, called condyles, placed on each side of the large median foramen which transmits ae ee eee |) tS Ee

- *This and many of the following figures are taken from Flower's Osteology of the Mammalia, Macmillan, 1876.*

the spinal cord. It consists of a basal axis, continuous serially with the axes or centra of the vertebrae, and of an arch above, roofing over and enclosing the cavity which contains the cephalic portion of the central nervous sys- tem (see fig. 4). The base with its arch is composed of three segments placed one before the other, each of which is comparable to a vertebra with a greatly expanded neural arch.. The hinder or occipital segment cousists of the basi-occipital, ex-occipital, and supra-occipital bones ; the middle segment of the basi-sphenoid, ali-sphenoid, and parietal bones; and the anterior segment of the pre- sphenoid, orbito-sphenoid, and frontal bones. The axis is continued forwards into the mesethmoid, or septum of the nose, around which the bones of the face are arranged in a manner so extremely modified for their special purposes that anatomists who have attempted to trace their serial homologies with the more simple portions of the axial skeleton have arrived at very diverse interpretations. The characteristic form and structure of the face of mammals is mainly dependent upon. the size and shape of (1) the orbits, a pair of cup-shaped cavities for containing the eye- ball and its muscles, which may be directed forwards or laterally, placed near together or wide apart, and may be completely or only partially encircled by bone ; (2) the nasal fosse, cavities on each side of the median nasal septum, and forming the passage for the air to pass between the external and the internal nares, and contain- ing in their upper part the organ of smell; (3) the zygomatic arch, a bridge of bone for the purpose of muscular attachment, which extends from the side of the face to the skull, overarching the temporal fossa ; (4) the roof of the mouth, with its alveolar margin for the implantation of the upper teeth. The face is completed by the mandible, or lower jaw, consisting of two lateral rami, articulated by a hinge joint with the squamosal (a cranial bone interposed between the posterior and penul- timate segment of the brain case, where also the bony capsule of the organ of hearing is placed), each being com- posed of a single solid piece of bone, and united together in the middle line in front, at the symphysis, ——which union may be permanently ligamentous or become completely ossified. Into the upper border of the mandibular rami the lower teeth are implanted.

In only those species in which the brain holds a large relative proportion to the rest of the body, as in Man and the smaller species of the Primages and some other orders, does the external form of the skull receive much impress

from the real shape of the cavity containing the brain. The size and form of the mouth, and the modifications of the jaws for the support of teeth of various shape and num- ber, the ridges and crests on the cranium for the attach- ment of the muscles necessary to put this apparatus in motion, outgrowths of bone for the enlargement of the external surface required for the support of sense organs or of weapons, such as horns or antlers (which outgrowths, to prevent undue increase of weight, are filled with cells containing air), cause the principal variations in the general configuration of the skull. These variations are, however, only characteristically developed in perfectly adult animals, and are in many cases more strongly marked in the male than the female sex. Throughout all the later stages of growth up to maturity the size and form of the brain case remain comparatively stationary, while the accessory parts of the skull rapidly increase and take on their distinctive development characteristic of the species.

The hyoidean apparatus in mammals supports the tongue and larynx, and consists of a median portion below, the basi-hyal, from which two pairs of half arches, or cornua, extend upwards and outwards. The anterior is the most important, being connected with the periotic bone of the

cranium. It may be almost entirely ligamentous, but more often has several ossifications, the largest of which is usually the stylo-hyal. The posterior cornu (thyro-lyal) is united at its extremity with the thyroid cartilage of the larynx, which it suspends in position. The median portion, or basi-hyal, is sometimes, as in the Howling Monkeys, enormously enlarged and hollowed, admitting into its cavity an air-sac connected with the organ of voice.

The vertebral column cousists of a series of distinct Vertebral bones called vertebre, arranged in close connexion with uma.

each other along the dorsal side of the neck and trunk, and in the median line! It is generally prolonged posteriorly beyond the trunk, to form the axial support of the appendage called the tail. Anteriorly it is articulated

with the occipital region of the skull. The number of distinct bones of which the vertebral column is composed varies greatly among the Mammalia, the main variation being due to the elongation or otherwise of the tail. Apart from this, in most mammals the number is not far from thirty, though it may fall as low as twenty-six (as in some Bats), or rise as high as forty (Hyrax and Cholwpus). The different vertebre, with some exceptions, remain through life quite distinct from each other, though closely connected by means of fibrous structures which allow of a certain, but limited, amount of motion between them. The exceptions are the following :—near the posterior part of the trunk, in nearly all mammals which possess completely developed hinder limbs, two or more vertebrae become ankylosed together to form the "sacrum," the portion of the vertebral column to which the pelvic girdle is attached ; also, in certain species of Whales and of Armadillos, there are constant ossific unions of certain vertebrze of the cervical region.

Although the vertebre of different regions of the column of the same animal or of different animals present great diversities of form, there is a certain general resemblance among them, or a common plan on which they are con- structed, which is more or less modified by alteration of form or proportions, or by the addition or suppression of parts to fit them to fulfil their special purpose in the economy. An ordinary or typical vertebra consists in the first place of a solid piece of bone, the body or centrum (fig. 5, c), of the form of a disk or short cylinder. The bodies of contiguous vertebrae are con- nected together by a very dense, tough, and elastic material called the "intervertebral substance," of peculiar and com- plex arrangement. This sub- stance forms the main, and in sone cases the only, union between the vertebra. Its elasticity provides for the verte- bre always returning to their normal relation to each other and to the column generally, when they have been dis- turbed therefrom by muscular action. A process (p) arises on each side from the dorsal surface of the body. These, meeting in the middle line above, form together an arch, surmounting a space or short canal (7). As in this space lies the posterior prolongation of the great cerebro- spinal nervous axis, or spinal cord, it is called the neural canal, and the arch is called the neural arch, in con- tradistinction to auother arch on the ventral surface of the ie ee

1 For the sake of uniformity, in all the following descriptions of the

vertebral column, the lung axis of the body is supposed to be in the horizontal position.

Fig 5.—Anterior Surface of Human Thoracic Vertebra (Fourth). ¢ body or centrum; ne, neural canal; p, pedicle, and 7, lamina of the arch; ¢, transverse process ; az, anterior zygapophysis.

SKELETON. |

body of the vertebra, called the hamal arch. The last is, however, never formed in mammals by any part of the vertebra itself, but only by certain distinct bones placed more or less in apposition to it—the ribs in the thoracic, and the "chevron bones" in the caudal region. In most cases the arch of one vertebra is articulated with that of the next by distinct surfaces with synovial joints, placed one on each side, called '"zygapophyses" (z), but these are often entirely wanting when flexibility is more needed than strength, as in the greater part of the caudal region of long-tailed animals. In ad- dition to the body and the arch, there are certain project- ing parts called processes, chiefly serving for the attach- ment of the numerous muscles which move the vertebral column. Of these two are single and median,—the spi- nous process or neural spine, or vas' phe delle

neurapophysis (2), arising from M,6Sie View ofthe Fist Lumber the middle of the upper part of s spinous process; | az, anterior the arch, and the hypapophysis apuphysis; 1, metapophysis; a, from the under surface of the

anapophysis 5 ¢, transverse process.

. body. This, however, is as frequently absent as the former

Cervical vertebree,

is constant. The other processes are paired and lateral. They are transverse processes (¢), of which there may be two, an upper and a-lower, in which case the former is called, in the language of Owen (to whom we are indebted for the terminology of the parts of vertebrae in common use), "

diapophysis," and the latter " parapophysis." Other pro- cesses less constantly present are called respectively '" meta- pophyses" (m) and "'anapophyses " (a).

The vertebral column is divided for convenience of description into five regions, the cervical, thoracic or dorsal, lumbar, sacral, and caudal. This division is useful, especially as it is not entirely arbitrary, and in most cases is capable of ready definition; but at the contiguous extremities of the regions the characters of the vertebra of one are apt to blend into those of the next region, either normally or as peculiarities of individual skeletons.

The cervical region constitutes the most anterior portion of the column, or that which joins the cranium. The vertebrae which belong to it are either entirely destitute of movable ribs, or if they have any these are small, and do not jointhe sternum, As a geue- ral rule they have a cousiderable perforation through the base of the transverse process (the vertebrar- terial canal (fig. 7, ¢), or, as it is sometimes described, they have two transverse processes, superior and inferior, which, meeting at their extremities, enclose a canal. This, however, rarely applies to the last vertebra of the region, in which only the upper trans- verse process is usually de- tee oo bee veloped. The transverse Process, spinous process; az, anterior moreover, very often sends down rea eee eee eceee, near its extremity a more or less __ its inferior lamella. compressed plate (inferior lamella), which, being considered to be serially homologous with the ribs of the thoracic ver- tebre (though not developed autogenously), is often called the "costal" or " pleurapophysial" plate. This is usually largest on the sixth, and altogether wanting on the seventh vertebra. The first and second cervical vertebre, called respectively "atlas" and " axis," are specially modified for the function of supporting and permitting the free move-

ments of the head. They are not united together by the intervertebral substance, but connected only by ordinary ligaments and synovial joints.

The cervical region in mammals presents the remarkable peculiarity that, whatever the length or flexibility of the neck, the number of vertebra is the same, viz., seven, with only three known exceptions, the Manatee and Hoffman's Two-toed Sloth (Cholepus hofimanni), which both have but six, and the Three-toed Sloth (Bradypus tridactylus), which bas nine, though in this case the last two usually support movable ribs, though not sufficiently developed to reach the sternum.

The dorsal (or thoracic, as it would be more correctly Dorsal termed) region consists of the vertebree which succeed those vertebra.

of the neck, having ribs movably articulated to them. These ribs arch round the thorax,—the anterior one, aud most usually the greater number of those that follow, being attached below to the sternum.

The dumbar region consists of those vertebra of the Lumbar trunk in front of the sacrum which bear no movable ribs. vertebre.

It may happen that, as the ribs decrease in size posteriorly, the last being sometimes more or less rudimentary, the step from the thoracic to the lumbar region may be gradual aud rather undetermined in a given species. But most commonly this is not the case, and the distinction is as well defined here as in any other region, As a general rule there is a certain relation between the number of the thoracic and lumbar vertebra, the whole number being tolerably constant in a given group of animals, and any increase of the one being at the expense of the other. Thus in all known Artiodactyle Ungulata there are 19 dorso-lumbar vertebrae; but these may consist of 12 dorsal and 7 lumbar vertebra, or 13 dorsal and 6 lumbar, or 14 dorsal and 5 lumbar. The smallest number of dorso-lumbar vertebrae in mammals occurs in some Armadillos, which have but 14. The number found in Man, the higher Apes, and most Bats, viz., 17, is excep- tionally low 19 prevails in the Artiodactyles, nearly all Marsupials, and very many Rodents; 20 or 21 in Carnivora and most Jnsectvora; and 23 in Perissodactyla. The highest and quite exceptional numbers are in the Two-toed Sloth (Cholapus) 27, and the Hyrax 30, The prevailing number of rib-bearing vertebra is 12 or 13, any variation being generally in excess of these numbers.

The sacral region offers more difficulties of definition. Sacral Taking the human ‘os sacrum” for a guide for comparison, vertebre.

it is generally defined as consisting of those vertebra ° between the lumbar and caudal regions which are ankylosed together to form a single bone. It happens, however, that the number of such vertebree varies in different individuals of the same or nearly allied species, especially as age advances, when a certain number of the tail vertebra generally become incorporated with the true sacrum. Other suggested tests, as those vertebrae which have a distinct additional (pleurapophysial) centre of ossification between the body and the ilium, those to which the ilium is directly articulated, or those in front of the insertion of the ischio- sacral ligaments, being equally unsatisfactory or unpractical, the old one of ankylosis, as it is found to prevail in the average condition of adults in each species, is used in the enumeration of the vertebre in tlie following pages. The Cetacea, having no iliac bones, have no part of the vertebral column modified into a sacrum.

The caudal vertebre are those placed behind the sacrum, Caudal They vary in vertebra.

and terminating the vertebral column. number greatly,—being reduced to 5, 4, or even 3, in a most rudimentary condition, in Man and in some Apes and Bats, and being numerous and powerfully developed, with strong and complex processes, in many mammals, especi- ally among the Hdentata, Cetacea, and Marsupialia. The

Sternum.

highest known number, 46, is possessed by the African Long-tailed Manis. Connected with the under surface of the caudal vertebrae of

former attacliment corresponds to the interspace between the vertebra, the head of the rib commonly articulating partly with the hinder edge of the body of the vertebra

many mammals which antecedent to that which bears its tubercle. Hence the have the tail well de- body of the last veloped are certain cervical vertebra bones formed more or usually supports less like an inverted part of the head arch, called chevron of the first rib.

bones, or by the French os en V. ‘These are always situated nearly opposite to an inter- vertebral space, and are

In the posterior part of the series the capitular and tubercular _at- tachments com-

generally articulated inonly coalesce, |

both to the vertebra in and the rib is at- re, = front and the vertebra tached solely to ee behind, but sometimes its correspond-

chiefly or entirely either Fie. 8.—Anterior Surface of Fourth Caudal Vertebra of Porpoise (Phocena communis). to one or the other. $, spinous process; m, metapophysis; ¢, The sternum of mam- transverse process; A, ehevron bone. mals is a bone, or generally a series of bones, placed longitudinally in the mesial line, on the inferior or ventral 5 D aspect of the thorax, and con- nected on each side with the

ing vertebra. The number of pairs of ribs is of course the

same as that of Fic. 10.—Sternum and strongly ossified Sternal Ribs of

. Great Armadillo (Priodon gigas). ps, presternum ; xs tlie thoracic ver- xiphisternum., ¢ oe) BE : ; tebre.

vertebral column by a series of more or less ossified bars called “ribs.” It is present in all mammals, but varies much in character in the dif-

The appendicular portion of the framework consists, Appen- when completely developed, of two pairs of limbs, anterior dicular and posterior.

shale

The anterior limb is present and fully developed in all Anterior mammals, being composed of a shoulder girdle and three limb.

Ribs.

ferent groups. It usually consists of a series of distinct segments placed one before the other, the anterior being called the presternum or "'manubrium sterni" of hu- man anatomy, and the pos- terior the xiplusternum, or xiphioid or ensiform process, while the intermediate seg- ments, whatever their number, constitute the mesosternum or "body." In the Whale- bone Whales the presternum alone is developed, and but rq. 9.—Human Sternum and Sternal

single pair of ribs is attached Ribs. ps, presternum; ms, meso- to it sternum; xs, xiphisternum,; ¢, point O 1. of attachment of clavicle; 1 to 10, The rzbs form a series of the cartilaginous sternal ribs.

long, narrow, and more or less flattened bones, extending laterally from the sides of the vertebral column, curving downwards towards the median line of the body below, and mostly joining the sides of the sternum. The posterior ribs, however, do not directly articulate with that bone, but are either attached by their extremities to the edges of each rib in front of them, and thus only indirectly join the sternum, or else they are quite free below, meeting no part of the skeleton. These differences have given rise to the division into "true" and ' false" ribs (by no means good expressions), signifying those that join the sternum directly and those that do not; and of the latter, those that are free below are called " floating" ribs. The portion of each rib nearest the vertebral column and that nearest the sternum differ in their characters, the latter being usually but imperfectly ossified, or remaining permanently cartilaginous. These are called "costal cartilages," or when ossified "sternal ribs."

In the anterior part of the thorax the vertebral extremity

of each rib is divided into two parts, "bead" and

“tubercle”; the former is attached to the side of the body of the vertebra, the latter to its transverse process ; the

segments belonging to the limb proper, viz., the upper arm or brachium, the fore-arm or antibrachium, and the hand or manus.

The shoulder girdle in the large majority of mammals is Shoulder in a rudimentary or rather modified condition, compared sirdle.

to that in which it exists in otler vertebrates. In the Monotremata (Ornithorhynchus and Echidna) alone is the ventral portion, or coracoid, complete and articulates with the sternum below, as in the Sawropsida. In all other mammals this portion, though ossified from a distinct centre, forms only a process, sometimes a scarcely distinct tubercle, projecting from the anterior border of the glenoid cavity of the scapula, The last-named bone is always well developed, generally broad and flat (whence its vernacular name “blade bone”), with a ridge called the “spine” on its outer surface, generally ending ina free curved process, the ‘“‘acromion.” As the scapula affords attachment to many of the muscles which act upon the anterior limb, its form and the development of its processes are greatly modified according to the uses to which the member is put. It is most reduced and simple in character in those animals whose limbs are mere organs of support, as the Ungulates, and most complex when they are also used for grasping, climbing, or digging. The development or absence of the clavicle or “collar-bone,” an accessory bar which connects the sternum with the scapula and steadies the shoulder- joint, has a somewhat similar relation, though its complete absence in the Bears shows that this is not an invariable rule. A complete clavicle is found in Man and all the Primates, in Chiroptera, all Insectivora (except Potamogale), in many Rodents, in most Edentates, and in all Marsu- pials, except Perameles. More or less rudimentary clavicles (generally suspended freely in the muscles) are found in the Cat, Dog, and most Carnivora, Myrmecophaga, and some Rodents. Clavicles are altogether absent in most of the Urside, all the Pinnipedia, Manis among Edentates, the Cetacea, Sirenia, Proboscidea, all Ungulates, and some Rodents.

-The proximal segment of the limb proper contains a single bone, the humerus, and the second segment two

Brachi- um and antibra- chium.

Manus.

Carpus.

SKELETON. |

bones, the radius and the ulna, placed side by side, articu- lating with the humerus at their proximal, and with the carpus at their distal extremity. In their primitive and unmodified condition these bones may be considered as placed one on each border of the limb, the radius being preaxial or anterior, and the ulna postaxial or posterior, when the distal or free end of the limb is directed outwards or away from the trunk. This is their position in the earliest embryonic condition, and is best illustrated in adult mammals in the Cetacea, where the two bones are fixed side by side and parallel to each other. In the greater number of mammals the bones assume a very modified and adaptive position, usually crossing each other in the fore- arm, the radius in front of the ulna, so that the preaxial bone (radius), though external (in the ordinary position of the limb) at the upper end, is internal at the lower end ; and the hand, being mainly fixed to the radius, also has its preaxial border internal. In the large majority of mammals the bones are fixed in this position, but in some few, as in Man, a free movement of crossing and uncrossing—or pro- nation and supination, as it is termed—is allowed between them, so that they can be placed in their primitive parallel condition, when the hand (which moves with the radius) is said to be supine, or they may be crossed, when the hand is said to be prone.

In most mammals which walk on four limbs, and in which the hand is permanently prone, the ulna is much reduced in size, and the radius increased, especially at the upper end ; and the articular surface of the latter, instead of being confined to the external side of the trochlea of the humerus, extends all across its anterior surface, and the two bones, instead of being external and internal, are anterior and posterior. In many hoofed or ungulated mammals, and in Bats, the ulna is reduced to little more than its upper articular extremity, and firmly ankylosed to the radius,—stability of these parts being more essential than mobility.

The terminal segment of the anterior limb is the hand or manus. Its skeleton consists of three divisions :—(1) the "carpus," a group of small, more or less rounded or angular bones with flattened surfaces applied to one another, and, though articulating by synovial joints, having scarcely any motion between them; (2) the ' metacarpus," a series of elongated bones placed side by side, with their proximal ends articulating by almost immovable joints with the carpus ; (3) the " phalanges" or bones of the digits, usually three in nuni- ber to each, articulating to one % another by freely movable hinge- joints, the first being connected in like manner to the distal end of the corresponding metacarpal bone.

To understand thoroughly the arrangement of the bones of the carpus in mammals, it is neces- sary to study their condition Fic. 11—Dorsal Surface of the in some of the lower vertebrates. Right Manus of a Water Tortoise

: : (Chelydra serpentina). After Fig. 11 represents the manus in Gegenbaur. U, ulna; R, radius; ° u, winare; 7@, intermedium ; one of its most complete and at +, radiale; ¢, centrale; 1-5, the i ' five bones of the distal row of the same time most generalized is carpus; mi-mS, the fire forms, as seen in one of the metacarpals. Water Tortoises (Chelydra serpentina). The carpus consists of two principal rows of bones. The upper or proximal row contains three bones, to which Gegenbaur has applied the terms radiale ®, intermedium (i), and wnare (w), the first being on the radial or preaxial side of the limb. The

lower or distal row contains five bones, called carpale 1, 2, 3, 4, and 5 respectively, commencing on the radial side. Between these two rows, in the middle of the carpus, is a single bone, the centrale ©. In this very symmetrical carpus it will be observed that the radiale supports on its distal side two bones, carpale 1 and 2; the imtermedium is in a line with the centrale and carpale 3, which together form a median axis of the hand, while the wlnare has also two bones articulated with its distal end, viz, carpale 4 and 5. Each of the carpals of the distal row supports a metacarpal.

In the carpus of the Mammalia there are usually two additional bones developed in the tendons of the flexor muscles, one on each side of the carpus, which may be

called the radial and ulnar sesamoid bones; the latter is

most constant and generally largest, and is commonly known as the pisiform bone. The fourth and fifth carpals of the distal rows are always united into a single bone, and the centrale is very often absent. As a general rule all the other bones are present and distinct, though it not unfre- quently happens that one or more may have coalesced to form a single bone, or may be altogether suppressed.

The following table shows the principal names in use for the various carpal bones,—those in the second column being the terms most generally employed by English anato- mists :-—

Radiale =Scaphoid = Naviculare.

Intermedium = Lunar =Semilunare, Lunatum. Ulnare =Cuneiform = Triquetrum, Pyramidale. Centrale = Central = Intermediwm (Cuvier).

Carpale 1 Carpale 2 Carpale 3 Carpale 4 Carpale 5

=Trapezium = Multangulwm majus. =Trapezoid =Multangulum minus. =Magnum =Capitatum.

yi

=Uneiform =Hamatum, Uneinatum.

The metacarpal bones, with the digits which they Meta-

support, are never more than five in number, and are carpus described numerically—first, second, &c., counting from — the radial towards the ulnar side. 'The digits are also bees sometimes named (1) the pollex, (2) index, (3) medius, (4) annularis, (5) minimus. One or more may be in a rudi- mentary condition, or altogether suppressed. If one is absent, it is most commonly the first. Excepting the Cetacea, no mainmals have more

than three phalanges to each digit, but they may occasionally have fewer by suppression or ankylosis. The first or radial digit is an exception to the usnal rule, one of its parts being con- stantly absent, for, while each of the other digits has commonly a metacarpal and three phalanges, it has only three bones altogether; whether the missing one is a metacarpal or one of the phalanges is a subject which has occasioned much discussion, and has not yet been satis- factorily decided. The terminal phalanges of the digits are usually specially modified to support the nail, claw, or hoof, and are called "ungual phalanges." In walking, some mammals (as the Bears) apply the whole of the lower surface of the carpus, metacarpus, and phalanges to the ground; to these the term " plantigrade" is applied. Many others (as nearly all the Ungulata) only rest on the last one or two phalanges of the toes, the first phalanx and the metacarpals being vertical and in a line with the fore-arm. These are called "digitigrade." Intermediate conditions exist between these two forms, to which the terms " phalangigrade" (as the Camel) and "subplantigrade," (as in most Carnivora) are applied. When the weight is borne entirely on the distal surface of the ungual phalanx, and the horny structures growing around it, as in the Horse, the mode of progression is called " unguligrade."

In the Chiroptera the digits are enormously elongated, and support a cutaneous expansion constituting the organ of flight. In the Cetacea the manus is formed into a

paddle, being covered by continuous integument, which conceals all trace of division into separate digits, and without sign of nails or claws. In the Sloths the manus is long and very narrow, habitually curved, and terminat- ing in two or three pointed curved claws in close apposition with each other, incapable, in fact, of being divaricated, so that it is reduced to the condition of a hook, by which the animal suspends itself to the boughs of the trees among which it lives. These are only examples of the endless modifications to which the distal extremity of the limb is subjected in adaptation to the various purposes to which it is applied.

Posterior The posterior limb is constructed upon a plan very

limb. _ similar to that of the anterior extremity. It consists of a pelvic girdle and three segments belonging to the limb proper, viz., the thigh, the leg, and the foot or pes.

Pelvic The pelvic girdle is present in some form in all mammals,

girdle. though in the Cetacea and the Sirenia it is in an exceed- ingly rudimentary condition. In all mammals except those belonging to the two orders just named, each lateral half of the pelvic girdle consists essentially, like the corre- sponding part of the anterior limb, of a flattened rod of bone crossing the long axis of the trunk, having an upper or dorsal and a lower or ventral end. The upper end diverges from that of the opposite side, but the lower end approaches, and, in most cases, meets it, forming a symphysis, without the intervention of any bone corre- sponding to the sternum. The pelvic girdle differs from the shoulder girdle in being firmly articulated to the

vertebral column, thus giving greater power to the hinder

limb in its function of supporting and propelling the body. Like the shoulder girdle, it bears on its outer side, near the middle, a cup-shaped articular cavity ("acetabulum"), into which the proximal end of the first bone of the limb proper is received. Hach lateral half of the girdle is called the "os innominatum," and consists originally of three bones which unite at the acetabulum. The "ilium" or upper bone is that which articulates with the sacral vertebre. Of the two lower bones the anterior or "pubis" unites with its fellow of the other side at the symphysis ; the posterior is the "ischium." These two form two bars of bone, united above and below, but leaving a space between them in the middle, filled only by membrane, and called the " thyroid" or "obturator" foramen. The whole circle of bone formed by the two innominate bones and the sacrum is called the pelvis. In the Monotremata and Marsupialia, a pair of thin, flat, elongated bones called epipubic or marsupial bones are attached to the fore part of the pubis, and project forward into the muscular wall of the abdomen.

Thigh The first segment of the limb proper has one bone, the

and leg. femur, corresponding with the humerus of the upper limb. The second segment has two bones, the tibia and fibula, corresponding with the radius and ulna. These bones always lie in their primitive unmodified position, parallel to each other, the tibia on the preaxial and the fibula on the postaxial side, and are never either permanently crossed or capable of any considerable amount of rotation, as in the corresponding bones of the fore limb. In the ordinary walking position the tibia is internal, and the fibula external. In many mammals the fibula is in a more or less rudimentary condition, and it often ankyloses with the tibia at one or both extremities. The patella or '"knee- cap" is found in an ossified condition in all mammals, with the exception of some of the Marsupialia. It isa large sesamoid bone developed in the tendon of the extensor muscles of the thigh, where the tendon passes over the front of the knee-joint, to which it serves as a protection. There are frequently smaller ossicles, one or two in

number, situated behind the femoral condyles, called " fabellee."*

The terminal segment of the hind limb is the foot or pes. Foot.

Its skeleton presents in many particulars a close resemblance to that of the manus, being divisible into three parts :—(1) a group of short, more or less rounded or square-shaped bones, constituting the tarsus; (2) a series of long bones placed side by side, forming the metatarsus; and (3) the phalanges of the digits or toes.

The bones of the tarsus of many of the lower Vertebrata closely resemble both in number and arrangement those of the carpus, as shown in fig. 11. They have been described in their most generalized condition by Gegenbaur under the names expressed in the first column of the following table. The names in the second column are those by which they are most generally known to English anatomists, while in the third column some synonyms occasionally employed are added

Tibtale

user aiene = Astragalus = Talus. Fibulare = Calcaneum = Os ealets. Centrale = Navicular = Scaphoidewm. Tarsale 1 = Internal cuneiform =

Entocuneiforme. Tarsale 2 = Middle cuneiform = Mesocuneiforme. Tarsale 3 = External cuneiform = Kelocuneiforme. Tarsale 4 ;

Tarsale 5 = Cabent.

The bones of the tarsus of mammals present fewer diversities of number and arrangement than those of the carpus. The proximal row (see fig. 12) always consists of two bones, the astragalus (a, which probably represents the coalesced scaphoid and lunar of the hand) and the calcaneum ©. The former is placed more to the dorsal side of the foot than the latter, and almost exclusively furnishes the tarsal part of the tibio-tarsal or ankle-joint. The calcaneum, placed more to the ventral or "plantar" side of the foot, is elongated backwards to form a more or less prominent tuberosity, the "tuber calcis," to which the tendon of the great extensor muscles of the foot is attached. The navicular bone (n) is inter- posed between the proximal and distal row on the inner or tibial side of the foot, but on the outer side the bones of the two rows come into contact. 'The distal row, when complete, consists of four bones, which, beginning on the inner side, are the three cuneiform bones, internal (c!), middle (c?), and external (c'%), articulated to the distal surface MiG 12.—Bones of the Right

: 3 uman Foot. JZ, tarsus; J/, of the navicular, and the cuboid metatarsus; Ph, phalanges; c, (cd), articulated with the calca- Caran nm; " astragals; 60,

cuboid; m, navicular; cl, in- neum. Of these the middle ternal cuneiform; c%, middle cuneiform is usually the smallest fon. The dig pre tlio in animals in which all five digits by Ragen ee are developed; but when the side. hallux is wanting the internal cuneiform may be rudiment- ary or altogether absent. The three cuneiform bones sup- port respectively the first, second, and third metatarsals, and the cuboid supports the fourth and fifth ; they thus exactly correspond with the four bones of the distal row of the carpus.

In addition to these constant tarsal bones, there may be supplemental or sesamoid bones :-—one situated near the middle of the tibial side of the tarsus, largely developed in many Carnivora and Rodentia; another, less frequent, on the fibular side ; anda third, often developed in the tendons

a }

/

”) {

; /of the plantar surface of the tarsus, is especially large in

/\ Armadillos. There is also usually a pair of sesamoid bones

/ © on the plantar aspect of each metatarso-phalangeal articula- , tion.

{The metatarsal bones never exceed five in number, and

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the phalanges follow the same numerical rule as in the manus, never exceeding three in each digit. Moreover, the first digit, counting from the tibial side, or hallux, resembles the pollex of the haud in always having one segment less than the other digits. As the function of the hind foot is more restricted than that of the hand, the modifications of its structure are less striking. In the Cetacea and the Sirenta it is entirely wanting, though in some members of the first-named order rudiments of the bones of the first and second segment of the limb have been detected.

Digestive System.

The search after the purpose which every modification of structure subserves in the economy is always full of interest, and, if conducted with due caution and sufficient knowledge of all the attendant circumstances, may lead to important generalizations. It must always be borne in mind, however, that adaptation to its special function is not the only cause of the particular form or structure of an organ, but that this form, having in all probability been arrived at by the successive and gradual modification of some other different form from which it is now to a greater or less degree removed, has other factors besides use to be taken into account. In no case is this principle so well seen as in that of the organs of digestion. These may

be con- sidered as machines which have to operate upon alimentary substances in very different conditions of mechanical and chemical combination, and to reduce them in every case to the same or precisely similar materials; and we might well imagine that the apparatus required to produce flesh and blood out of coarse fibrous vegetable substances would be different from that which had to produce exactly the same results out of ready-made flesh or blood ; and in a very broad sense we find that this is so. If we take a large number of carnivorous animals, belonging to different funda- mental types, and a large number of herbivorous animals, and strike a kind of average of each, we shall find that there is, pervading the first group, a general style, if we may use the expression, of the alimentary organs, different from that of the others. 'here is a specially carnivorous and a specially herbivorous modification of these parts. But, if function were the only element which has guided such modification, it might be inferred that, as one form must be supposed to be best adapted and most perfect in its relation to a particular kind of diet, that form would be found in all the animals consuming that diet. But this is far from being the case. The Horse and the Ox, for instance,—two animals whose food in the natural state is precisely similar,—are yet most different as regards the structure of their alimentary canal, and the processes involved in the preparation of that food. Again, the Seal and the Porpoise, both purely fish-eaters, which seize and swallow and digest precisely the same kind of prey in pre- cisely the same manner, have a totally different arrange- ment of the alimentary canal. If the Seal's stomach is adapted in the best conceivable manner for the purpose it has to fulfil, why is not the Porpoise's stomach an exact facsimile of it, and vice versa? We can only answer, the Seal and Porpoise belong to different natural groups of animals, formed on different primitive types, or descended from differently constructed ancestors. On this principle only can we account for the fact that, whereas, owing to the comparatively small variety of the different alimentary substances met with in nature, few modifications would

appear necessary in the organs of digestion, there is really endless variety in the parts devoted to this purpose.

The digestive apparatus of mammals, .as in other vertebrates, consists mainly of a tube with an aperture placed at or near either extremity of the

body,—the oral and the anal orifice,—witli muscular walls, the fibres of which are so arranged as by their regular alternate con-

es MAMMALIA 361 a

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traction and relaxation to drive onwards the contents of The the tube from the first to the last of these apertures, The mouth.

anterior or commencing portion of this tube and the parts around it are greatly and variously modified in relation to the functions assigned to them of selecting and seizing the food, and preparing it by various mechanical and chemical processes for the true digestion which it has afterwards to undergo before it can be assimilated into the system. For this end it is dilated into a chamber or cavity called the mouth, bordered externally by the lips, usually muscular and prehensile, and supported by a movable framework which carries the teeth,—organs the structure and modi-fications of which have been already described. The roof of the mouth is formed by the palate, terminating behind by a muscular, contractile arch, having in Man and some few other species a median projection called uvula, beneath which the mouth communicates with the pharynx. The anterior part of the palate is composed of mucous membrane tightly stretched over the flat or slightly concave bony lamina which separates the mouth from the nasal passages, and is generally raised into a series of transverse ridges, which sometimes, as in Ruminants, attain a con-siderable development. In the floor of the mouth, between the rami of the mandible, and supported behind by the hyoidean apparatus, lies the tongue, an organ the free surface of which, especially in its posterior part, is devoted to the sense of taste, but which also by its great mobility, being composed almost entirely of muscular fibres, performs important mechanical functions connected with masticating and procuring food. Its modifications of form in different mammals are very numerous. Between the long, extensile, vermiform tongue of the Anteaters, which is essential to the peculiar mode of feeding of those animals, and the short, sessile, and almost functionless tongue of the Porpoise, every intermediate coudition is found. Whatever the form, the upper surface is always covered with

numerous fine papillz, in which the terminal filaments of the gustatory nerve are distributed.

In connexion with the buccal cavity is an extensive and Salivary" complex glandular apparatus which pours its secretions into glands.

it—secretions which constitute the fluid commonly known as saliva. This apparatus consists of small glands em- bedded in the mucous membrane or submucous tissue lining the cavity of the mouth, and which are of two kinds (the follicular and the racemose), and of others in which the secreting structure is aggregated in distinct masses removed some distance from the cavity, other tissues besides the lining membrane being usually interposed, and pouring their secretion into the cavity by a distinct tube or duct, which traverses the mucousmembrane. To the latter alone the name of "salivary glands " is ordinarily appropriated, although the distinction between them and the smaller racemose glands is only one of convenience for descriptive purposes, their structure being more or less identical; and, as the fluids secreted by all become mixed in the mouth, their functions are, at all events in great part, common. Under the name of salivary glands are commonly included —(1) the " parotid," situated very superficially on the side of the head, below or around the cartilaginous external auditory meatus, and the secretion of which enters the mouth by a duct (often called Steno's or Stenson's) which crosses the masseter muscle and opens into the upper and back part of the cheek ; and (2) the "submaxillary," situ- XV. — 46

Stomach.

ated in the neck, near or below the angle of the mandible, and sending a long duct (Wharton's) forwards to open in the fore-part of the floor of the cavity of the mouth, below the apex of the tongue. These are the most largely developed and constant of the salivary glands, being met with in various degrees of development in almost all animals of the class. Next in constancy are (3) the "sublingual," closely associated with the last-named, at all events in the locality in which the secretion is poured out; and (4) the ' zygo- matic," found only in some animals in the cheek, just under cover of the anterior part of the zygomatic arch, its duct entering the buccal cavity near that of the parotid.

The most obvious function common to the secretion of these various glands, and to that of the smaller ones placed in the mucous membrane of the lips, the cheeks, the tongue, the palate and fauces, is the mechanical one of moistening and softening the food, to enable it the more readily to be tasted, masticated, and swallowed, though each kind of gland may contribute in different manner and different degree to perform this function. The saliva is, moreover, of the greatest importance in the first stage or introduction to the digestive process, as it dissolves or makes a watery extract of all soluble substances in the food, and so prepares them to be further acted on by the more potent digestive fluids met with subsequently in their progress through the alimentary canal. In addition to these functions it seems now well established by experiment that saliva serves in Man and many animals to aid directly in the digestive process, particularly by its power of inducing the saccharine transformation of amylaceous substances, As a general rule, in mammals the parotid saliva is more watery in its composition, while that of the submaxillaries, and still more the sublingual, contains more solid elements and is more viscid, so much so that some anatomists consider the latter, together with the small racemose glands of the cheeks, lips, and tongue, as mucous glands, retaining the name of salivary only for the parotid, These peculiar properties

are sometimes illustrated in a remarkable degree, as, |

for example, the great secretion of excessively viscid saliva which lubricates the tongue of the Anteaters and Armadillos, associated with enormously developed sub- maxillary glands; while, on the other hand, the parotids are of great size in those animals which habitually masticate dry and fibrous food,

After the preparation which the aliment has undergone in the mouth,—the extent of which varies immensely in different forms, being reduced almost to nothing in such animals as the Seals and Cetaceans, which, to use the familiar expression, "bolt" their food entire,—it is swallowed, and is carried along the cesophagus by the action of its muscular coats into the stomach. In the greater proportion of mammals this organ is a simple saccular dilatation of the alimentary canal, but in others it undergoes remarkable modifications and complexities, The lining of the stomach is thickly beset with tubular glands, which are generally considered to belong to two different forms, recognizable by their strueture, and different in their function—the most numerous and important secreting the

gastric juice (the active agent in stomachic digestion), and |

hence called "peptic" glands, the others concerned only in the elaboration of mucus. The relative distribution of these glands in different regions of the walls of the stomach varies greatly in different animals, and in many species there are large tracts of the mucous membrane which do not secrete a fluid having the properties of gastric juice, and often constitute more or less distinct cavities devoted to storing and perhaps softening or otherwise preparing the food for digestion. Sometimes there is a great aggregation of glands forming distinct thickened patches of the stomach wall, as in the Beaver and Koala, or even collected in

MAMM

jejunum, and ileum, and the latter

ALIA

pyriform pouches with a common narrow opening into the | cavity, as in the Manatee and the curious African Rodent Lophyomys. The action of the

gastric fluid is mainly exerted upon the nitrogenous elements of the food, which — it dissolves and modifies so as to render thei capable of undergoing absorption, which is partly etfected by the blood-vessels of the stomach, though the greater part passes through the pylorus, an aperture surrounded by a circular muscular valve, into the intestinal canal. Here it comes in contact with the secretion of a vast number of small glands called the crypts of Lieberkuhn, somewhat similar to those of the stomach, and also of several special glands of a different character, namely, the small racemose, duodenal, or Brunner's glands, the pancreas, and the liver.

| DIGESTIV:

The intestinal canal varies greatly in relative length and Intestin capacity in different animals, and it also offers manifold canal. j

peculiarities of form, being sometimes a simple cylindrical tube of nearly uniform calibre throughout, but more often subject to alterations of form and capacity in different portions of its course,—the most characteristic and constant being the division into an upper and narrower and a lower and wider portion, called respectively the small and the large intestine, the former being divided quite arbitrarily and artificially into duodenum,

into colon and rectum. One of the most striking peculiarities of this part of the alimentary canal is the frequent presence of a diverticu- lum or blind pouch, the caput cecum colt, as it was first called, a name geuerally abbreviated into "ezcum," situated at the junction of the large and the small intestine, a structure presenting an immense variety of development, from the smallest bulging of a portion of the side wall of the tube to a huge and coniplex sac, greatly exceeding in capacity the remainder of the ali- mentary canal, It is only in herbi- vorous animals that the czcum is developed to this great extent, and among these there is a curious com- plementary relationship between the size and complexity of the organ and that of the stomach. Where the latter is simple the cecum is geuerally the largest, and vice versa. Both cecum and colon are often saccu- lated, a disposition caused by the arrangement of the longitudinal bands of muscular tissue in their walls; but the small intestine is always smooth and simple-walled externally, though its lining membrane often exhibits various contrivances for increasing the absorbing surface without adding to the

general bulk of the organ, such as the numerous small villi by which it is everywhere beset, and the more obvious transverse, longitudinal, or reticulating folds projecting into the interior, met with in many. animals, of which the " valvulz conniventes" of Man form well-known examples. Besides the crypts of Lieberkuhn found throughout the intestinal canal, and the glands of Brunner confined to the duodenum, there are other structures in the mucous membrane, about the nature of which there is still much uncertainty, called "solitary " and "aominated" glands, the latter more commonly known by the name of " Peyer's patches." These were formerly supposed to be secretory organs, which discharged some kind of fluid into the intestine, but are now more generally considered to belong to the group of structures of somewhat mysterious function of which the lymphatic and lacteal

Fig. 13.—Diagrammatic Plan of the general arrangement of the Alimentary Canal in a typical Mammal, o0, ceso- phagus; sf, stomach; 97, pylorus; ss, small intestine (abbreviated) ; ¢c, caecum ; Ul, large intestine or colon, end- ing in r, the rectum.

Liver.

_ and even in different individuals of the same species, and

SYSTEM. |

glands are members. The solitary glands are found scat- tered irregularly throughout the whole intestinal tract ; the agminated, on the other hand, are always confined to the small intestine, and are most abundant in its lower part. They are subject to great variation in number and in size,

also differ in character at different periods of life, becoming atrophied in old age.

The distinct glands situated outside of the walls of the intestinal canal, but which pour their secretion into it, are the pancreas and the liver. The latter is the most important on account of its size, if not on account of the direct action of its secretion in the digestive process. This large gland, so complex in structure and function, is well developed in all mammals, and its

secreting duct, the bile duct, always opens into the duodenum or that portion of the canal which immediately succeeds the stomach. It is situated in the right side of the abdomen in contact with the diaphragm and the stomach, but varies greatly in relative size, and also in form, in different groupsof mammals, In most mammals a gall-bladder, consisting of a pyriform diverticulum from the gall duct, is present, but in many it is wanting, and it is difficult to find the rationale of its presence or absence in relation to use or any other cir- cumstance in the animal economy.

The descriptions of the livers of various animals to be met with in treatises or memoirs on comparative anatomy are very difficult to understand for want of a uniform system of nomenclature. The difficulty usually met with arises from the circumstance that this organ is divided sometimes, as in Man, Ruminants, and the Cetacea, into two main lobes, which have been always called respectively right and left, and in other cases, as in the lower Monkeys, Carnivora, Insectivora, and many other orders, into a larger number of lobes. Among the latter the primary division usually appears at first sight tripartite, the whole organ consisting of a middle, called "cystic " or "suspensory " lobe, and two lateral lobes, called respectively right. and left lobes. This introduces confusion in describing livers by the same terms throughout the whole series of mammals, as the right and left lobes of the Monkey or Dog, for instance, do not correspond with parts designated by the Same name in Man and the Sheep. There are, moreover, conditions in which neither the bipartite nor the tripartite system of nomenclature will answer, which we should have considerable difficulty in describing without some moro general system. In order to arrive at such a system it appears desirable to consider the liver in all cases as primarily divided by the umbilical vein (see fig.14, «) into two segments, right and left. This corresponds with its development and with the condition characteristic of the organ in the inferior classes of vertebrates. The situation of this division can almost always be recognized in adult animals by the persistence of some traces of the umbilical vein in the form of the round ligament, and by the position of the suspensory ligament.

When the two main parts into which the liver is thus divided are entire, as in Man, the Ruminants, and Cetacea, they may be spoken of as the right and left lobes; when fissured, as the right and left segments of the liver, reserv-

ing the term lobe for the subdivisions. This will involve no ambiguity, for the terms right and left lobe will no longer be used for divisions of the more complex form of liver. In the large majority of mammals each segment is further divided by a fissure, more or less deep, extending from the free towards the attached border, which are called right and left lateral fissures (fig. 14, rif and ZZ). When these are more deeply cut than the umbilical fissure (u), the organ has that tripartite or trefoil-like form just Spoken of, but it is easily seen that it is really divided into

four regions or lobes, those included between the lateral fissures being the right and left central (re and lc) separated by the umbilical fissure, and those beyond the lateral fissures on each side being the right and left lateral lobes (77 and 72). The essentially bipartite character of the- organ and its uniformity of construction throughout the class are thus not lost sight of, even in the most complex forms. The left segment of the liver is rarely complicated to any further extent, except in some cases by minor or secondary fissures marking off small lobules, generally inconstant and irregular, and never worthy of any special designation. On the other hand, the right segment is usually more complex. The gall bladder, when present, is always attached to the under surface of the right central lobe, sometimes merely applied to it, in other cases deeply embedded in its substance. In many cases the fossa in which it is sunk is continued to the free margin of the liver as an indent, or even a tolerably deep fissure (cf). The portal fissure (p), through which the portal vein and

Fic. 14.—Diagrammatie Plan of the Inferior Surface of a Multilobed Liver of a Mammal. The posterior or attached border is uppermost. 4, umbilical vein of the foetus, represented by the round ligament in the adult, lying in the um- bilical fissure ; dv, the ductus venosus; wc, the inferior vena cava; p, the vena porte entering the transverse fissure ; 7/7, the left Jatcral fissure ; 717, the right lateral fissure; ¢/, the cystic fissure ; Ul, the left lateral lobe; Zc, the left central lobe; re, the right central lobe ; r?, the light lateral lobe; s, the Spigelian lobe; c, the caudate lobe; g, the gall bladder.

hepatic artery enter and the gall duct emerges from the liver, crosses this lobe transversely, near the attached

border of the liver. The right lateral lobe always has the great vena cava (vc) either grooving its surface or tunnel-

ling through its substance near the inner or left end of its

attached border ; and a prolongation of the lobe to the left, between the vein and the portal fissure, sometimes a mere flat track of hepatic substance, but more often a prominent tongue-shaped process, is the so-called " Spigelian lobe "(s). From the under surface of the right lateral lobe a portion is generally partially detached by a fissure, and called the "caudate lobe" (c). In Man this is almost obsolete, but in most mammals it is of considerable magnitude, and has very constant and characteristic relations. Itis connected by an isthmus at the left (narrowest or attached) end to the Spigelian lobe, behind which isthmus the vena cava is always in relation to it, channelling through or grooving its surface. It generally has a pointed apex, and is deeply hollowed to receive the right kidney, to the upper and inner side of which it is applied.

Considerations derived from the comparatively small and simple condition of the liver of the Ungulates, compared with its large size and complex form in the Carnivora, have led to the perhaps too hasty generalization that the first type is related to a herbivorous and the latter to a carnivorous diet. The exceptions to such a proposition are very numerous. The fact of the great difference between the liver of the Cetacea and that of the Seals cannot be accounted for by difference of habits of life, though it

Blood.

Heart.

Blood- vessels.

perliaps may be by difference of origin, upon the supposi- tion that the former are modifications of the primary branch of mammals from which the Ungulates, and the latter of that from which the Carnivora, are derived.}

CircuLaTory, ABSORBENT, RESPIRATORY, AND URINARY SYSTEMS.

The blood of mammals is always red, and during the life of the animal hot, having a nearly uniform temperature, varying within a few degrees on each side of 100° Fahr. The corpuscles are, as usual in vertebrates, of two kinds: —(1) colourless, spheroidal, nucleated, and exhibiting amce- boid movements ; while (2) the more numerous, on which depends the characteristic hue of the fluid in which they are suspended, are coloured, non-nucleated, flattened, slightly biconcave disks, with circular outline in all known species except the Camels and Llamas, where they have the elliptical form characteristic of the red corpuscles of

nearly all the other vertebrates, though adhering to the

inammalian type in absence of nucleus and relatively small size. Asa rule they are smaller as well a3 more numerous than in other classes, but vary considerably in size in different species, and not always in relation to the magnitude of the animal, a Mouse, for instance, having as large corpuscles as a Horse. Within the limits of any natural group there is, however, very often some such relation, the largest corpuscles being found among the large species and the smallest corpuscles among the small species of the group, but even to this generalization there are many exceptions. The transverse diameter of the red corpuscles in Man averages z545g of an inch, which is exceptionally large, and only exceeded by the Elephant (srs), and by some Cetacea and Hdentata, They are also generally large in Apes, Rodents, and the Monotremata, and small in the Artiodactyles, least of all in the Chevrotains (Tragulus), being in 7. javanicus and meminna not more than yy5zrs-

The heart of mammals consists of four distinct cavities, two auricles and two ventricles. Usually the ventricular portion is externally of conical form, with a simple apex,

but in the Sirenia it is broad and flattened, and a deep.

A

notch separates the apical portion of each ventricle.

tendency to this form is seen in the Cetacea and the Seals. °

Tt is characteristie of mammals alone among vertebrates that the right auriculo-ventricular valve is tendinous like the left, consisting of flaps held in their place by fibrous ends (chordx tendinix) which arise from projections from the muscular walls of the ventricular cavity (musculi papillares). In the Monotremata a transition between this condition and the simple muscular flap of the Sauropsida is observed. In most of the larger Ungulates a distinct but rather irregular ossification is developed in the central tendinous portion of the base of the heart.

The orifices of the aorta and pulmonary artery are each guarded by three semilunar valves. The aorta is single, and arches over the left bronchial tube. After supplying the tissues of the heart itself with blood by means of the coronary arteries, it gives off large vessels (“‘ carotid”) to the head and (“brachial”) to the anterior extremities. The mode in which these vessels arise from the aorta varies much in different mammals, and the study of their disposition affords some guide to classification. In nearly all cases the right brachial and carotid have a common origin (called “innominate artery” in anthropotomy). The other two vessels may come off fron: this, as is the rule in Ungulates,

1 See “ Lectures on the Comparative Anatomy of the Organs of

eee of the Mammalia,” Medical Times and Gazette, Fcb.—Dec.

2G. Gulliver, Proc. Zool. Soc., 1862, p. 91.

the common trunk constituting the “anterior aorta” of veterinary anatomy; or they may be detached in various degrees, both arising separately from

the aorta, as in Man, or the left carotid from the innominate and the left brachial from the aorta, a very common arrangement, or the last two from a common second or left innominate as in some Bats and Insectivores, The aorta, after giving off the in- tercostal arteries, passes through the diaphragm into the abdomen, and, after supplying the viscera of that cavity by means of the gastric, hepatic, splenic, mesenteric, renal, and spermatic vessels, gives off in the lumbar region a large branch (iliac) to each of the hinder extremities, which also supplies the pelvic viscera, and is continued onwards in the middle Jine, greatly diminished in size, along the under surface of the tail. In certain mammals, arterial plexuses, called retia mirabilia, formed by the breaking up of the vessel into an immense number of small trunks, which may run in a straight course parallel to one another (as in the limbs of Sloths and Slow Lemurs), or form a closely packed network, as in the intracranial plexuses of Ruminants, or a sponge-like mass of convoluted vessels, as in the intercostals of Cetaceans, are peculiarities of the vascular system the meaning of which is not in all cases clearly understood. In the Cetacea they are obviously receptacles for contain- ing a large quantity of oxygenated blood available during the prolonged immersion, with consequent absence of respiration, to which these animals are subject.

The vessels which return the blood to the heart from the head and upper extremities usually unite, as in Man, to form the single vena cava superior or precaval vein, but in some Insectivores, Chiroptera, and Rodents, and in the Elephant, and all Marsupials and Monotremes, the two superior caval veins enter the right auricle without uniting, as in birds. In Seals and some other diving mammals there is a large venous sinus or dilatation of the inferior cava immediately below the diaphragm. In the Cetacea the purpose of this is supplied by the immense abdominal venous plexuses. As a rule the veins of mammals are furnished with valves, but these are said to be altogether wanting in the Cetacea, and in the superior and inferior cava, subclavian and iliac veins, the veins of the liver (both portal and hepatic), heart, lungs, kidneys, brain, and spinal chord of other mammals, Many of the veins within the cranium are included in spaces formed by the separation of the laminz of the dura mater, and do not admit of being dilated beyond a certain size; these are termed sinuses. The portal circulation in mammals is limited to the liver, the portal vein being formed

by the superior and inferior mesentelic, the splenic, the gastro- epiploic, and the pancreatic veins. The kidney is supplied solely by arterial blood, and its veins empty their contents only into the inferior cava.

The absorbent or lymphatic system of vessels is very completely developed in the Mammalia. Its ramifications extend through all the soft tissues of the body, and con- vey a colourless fluid called lymph, containing nucleated corpuscles, aud also, during the process of digestion, the chyle, a milky fluid taken up by the lymphatics (here called lacteals) of the small intestine, and pour them into the general vascular system, where they mix with the venous blood. The lymphatic vessels of the hinder extremities, as well as those from the intestinal canal, unite in the abdomen to form the "thoracic duct," the hinder end or commencement of which has a dilatation called the receptaculum chyli. The duct, which is of irregular size and sometimes double, often dividing and uniting again in its course, or even becoming plexiform, passes forwards close to the bodies of the thoracic vertebrae, and empties itself, by an orifice guarded by a valve, into the great left brachio- cephalic vein, having previonsly received the lymphatics

Lym- phatic vessels,

Ductless glands.

Nostrils.

CIRCULATION, ETC.]

from the thorax and the left side of the head and left anterior extremity. Those from the right side of the head and right anterior limb usually enter by a small distinct trunk into the corresponding part of the right brachio-cephalic vein. The duct, and also the principal lymphatic vessels, are provided with valves.

Lymphatic glands, rarely met with in the Sauropsida, are usually present in mammals, both in the general and in the lacteal system, the latter being called "' mesenteric glands." They are round or oval masses, situated upon the course of the vessels, which break up in them and assume a plexiform arrangement, and then reunite as they emerge. No structures corresponding

to the pulsating "lymphatic hearts" of the lower vertebrates have been met with in mamuinals.

Associated with the vascular and lymphatic systems are certain bodies, the functions of which are not properly understood, and which are usually, on account of their general appearanee, grouped together under the name of "ductless glands." Of these the "spleen" is the largest, and single, always placed in mammals in relation to the fundus or left end of the stomach, to which it is attached by a fold of peritoneum. It is dark-coloured and spongy in substance, and has a depression on one side or " hilus," into which the splenic artery, a branch of the cceliac axis of the abdominal aorta, enters, and from which the vein, which joins the portal system, emerges. It varies much in size and form in different mammals, being relatively very small in the Cetacea. Itis sometimes almost spherical, but more often flattened, oval, triangular, or elongated, and occasionally, as in Monotremes and most Marsupials, tri- radiate. 'The ' suprarenal bodies" or " adrenals" are two in number, each situated either in contact with or at a short distance in front of the anterior extremity of the kidney. 'They are abundantly supplied with nerves, and are much larger relatively in early than in adult life. The "thyroid body," or rather bodies, for there are gene- rally two, though in Man and some other species connected by an isthmus passing across the middle line, are constant in mammals, though only met with in a rudimentary con. dition, if at all, in other vertebrates. They are situated in the neck, in contact with the sides of the anterior ex- tremity of the trachea. The "thymus" lies in the ante-

rior part of the thorax, between the sternum and the great _

vessels at the base of the heart, and differs from the thyroid in being median and single, and having a central cavity. It attains its greatest development during the period of lactation, and then diminishes and generally disappears before full growth is attained.

Respiratory Organs.—Mammals breathe occasionally through the mouth, but usually, and in many cases exclusively, through the nostrils or nares. These are apertures, always paired (except in the toothed Cetacea, where they unite to form a single external opening), and situated at the fore part of the face, generally at or beneath the end of the muzzle, a median

prominence above the mouth. This is sometimes clongated to form a proboscis, to the extremity of which the nostrils are carried, and which attains its maximum of development in the Elephant. In the Cetacea the nostrils are situated at a considerable distance behind the anterior end of the face, upon the highest part of the head, and are called " blow-holes," from the peculiar mode of respiration of these animals. The nostrils are kept open by means of cartilages which surround their aperture, and which many animals have the power of moving so as to cause partial dilatation or contraction. In diving animals, as Seals and Cetacea, they can be completely closed at will so as to prevent the entrance of water when beneath the surface. The passage to which the nostrils lead is in most mammals filled by a more or less

complex sieve-like apparatus, formed of the convoluted turbinal bones and cartilages, over which a moist, vascular, ciliated mucous membrane is spread, and which intercepts particles of dust, aud also aids in warming the inspired air before it reaches the lungs, In the Proboscidea, in which these functions are performed by the walls of the long tubular proboscis, this apparatus is entirely wanting. The narial passages have the organ of smell situated in their upper part, aud communicate posteriorly with the pharynx, and through the glottis with the '" trachea" or windpipe, a Trachea. tube by which the air is conveyed to and from the lungs. The permanent patency of the trachea during the varied movements of the neck is provided for by its walls being stiffened by a series of cartilaginous rings or hoops, which in most mammals are incomplete behind. Having entered the thorax, the tracliea bifurcates into the two bronchi, one of which enters, and, dividing dichotomously, ramifies through, each lung. In some of the Cetacea and Artio- dactyla a third bronchus is given off from the lower part of the trachea, above its bifurcation, and enters the right lung.

The upper end of the trachea is modified into the organ Larynx, of voice or "larynx," the air passing through which to and from the lungs is made use of to set the edges of the " vocal cords," fibrous bands stretched one on each side of the tube, ~ into vibration, The larynx is composed of several

cartil- ages, of which the "thyroid," the '"'cricoid," and the "arytenoid" are the principal, moved upon one another by muscles, and suspended from the hyoidean arch. By alteration of the relative position of these cartilages the cords can be tightened or relaxed, approximated or divari- cated, as required to modulate the tone and volume of the voice. A median tongue-shaped fibro-cartilage at the top of the larynx, the "epiglottis," protects the " glottis," or aperture by which the larynx communicates with the pharynx, from the entry of particles of food during deglu- tition. The form of the larynx and development of the vocal cords present many variations in different members of the class, the greatest modification from the ordinary type being met with in the Cetacea, where the arytenoid cartilages and epiglottis are united in a tubular manner, project into the nasal passage, and, being grasped by the muscular posterior margin of the palate, provide a direct channel of communication from the lungs to the external surface. An approach to this condition is met with in the Hippopotamus and some other Ungulates. Nearly all mammals have a voice, although sometimes it is only exer- cised at seasons of sexual excitement. Some Marsupials and Edentates appear to Be quite mute. In no mammal is there an inferior larynx, or "'syrinx, as in birds.

The thoracic cavity of mammals differs from that of the Dia- Sauropsida in being completely separated from the abdomen Phragm. by a muscular partition, the " diaphragm," attached to the vertebral column, the ribs, and the sternum. This is much arched, with the convexity towards the thorax, so that when its fibres contract it is flattened and the cavity of the thorax increased, and when theyare relaxed the cavityis diminished.

The lungs are suspended freely in the thorax, one on each Lungs. side of the heart, being attached only by the root, which consists of the bronchus or air-tube, and pulmonary arteries and veins by which the blood is passed backwards and forwards between the heart and the lungs. The remaining part of the surface of each lung is covered by serous mem- brane, the " pleura," and, whatever the state of distension or contraction of the chest-wall, is accurately in contact with it. Inspiration is effected by the contraction of the diaphragm, and by the intercostal and other muscles ele- vating or bringiug forward the ribs, and thus throwing the sternum farther

away from the vertebral column. As the surface ofthe lung must follow the chest-wall, the organ

Air sacs.

Kidneys.

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is itself expanded, and air rushes in through the trachea to fill all the minute cells in which the ultimate ramifica- tions of the bronchi terminate. In ordinary expiration very little muscular power is expended, the elasticity of the lungs and surrounding parts being sufficient to cause a state of contraction and to drive out at least a portion of the air contained in the cells, when the muscular stimulus is withdrawn, The lungs are sometimes simple externally, as in the Strenta (where they are greatly elongated) and the Cetacea, but they are more often divided by deep fissures into one or more lobes. The right lung is usually larger and more subdivided than the left. It often has a small distinct lobe behind, wanting on the left side, and hence called lobulus azygos.

Most mammals have in connexion with the air passages certain diverticuli or pouches containing air, the use of which is not always easy to divine. The numerous air sinuses situated between the outer and inner tables of the bones of the head, which in Man are represented by the antrum of Highmore and the frontal and sphenoidal sinuses, and which attain their maximum of development in the Indian Elephant, are obviously for the mechanical pur- pose of allowing expansion of the bone surface without increase of weight. They are connected with the nasal passages. The Eustachian tubes pass from the back of the pharynx into the cavity of the tympanum, into which and the mastoid cells they allow air to pass. In the Zguide there are large post-pharyngeal air sacs in connexion with them. The Dolphins have an exceedingly complicated system of air sacs in connexion with the nasal passages just within the nostrils, and the Tapir and Horses have blind sacs in the same situation. In the males of some Seals (Cystophora and Jfacrorhinus) large pouches, which the animal can inflate with air, but which at other times are flaccid, and which are not developed in the young animal or the female, arise from the upper part of

the nasal passages, and lie immediately under the skin of the face. These are very analogous, although not in the same situation, to the gular pouch of the male Bustard. The larynx has frequently membranous pouches in connexion with it, into which air passes. These may be lateral and opening just above the vocal cords, constituting the sacculi laryngis, found in a rudimentary state in Man, and attaining an enormous development, reaching to the shoulders and axille, in some of the Anthropoid Apes; or they may be median, opening in front either above or below the thyroid and cricoid car- tilages, as in the Howling and other Monkeys, and also in the Whalebone Whales and Great Anteater.

Urinary Organs.—The kidneys of mammals are more compact and definite in form than in other vertebrates, being usually more or less oval, with an indent on the side turned towards the middle line from and into which the vessels and ducts pass. They are distinctly divided into a

cortical secretory portion, composed mainly of convoluted .

tubes, and containing Malpighian bodies, and a medullary excreting portion, formed of straight tubes converging towards a papilla, embraced by the commencement of the ureter or duct of the organ. The kidneys of some mammals, as most Monkeys, Carnivores, Rodents, é&c., are simple, with a single papilla into which all the renal tubuli enter. In others, as Man, there are many. pyramids of the medullary portion, each with its papilla, opening into a division (calyx) of the upper end of the ureter. Such kidneys are, either in the embryonic condition only or throughout life, lobulated on the surface. In some cases, as in Bears, Seals, and especially the Cetacea, the lobulation 1s carried further, the whole organ being composed of a mass of renules, loosely united by connective tissue, and with separate ducts, which soon join to form the common ureter. In all mammals except the Monotremes the ureters termi-

nate by slit-like valvular openings in the urinary bladder. Bladder,

This receptacle when filled discharges its contents through the single median urethra, which in the male is almost invariably included in the penis, and in the females of some species of Rodents, Insectivores, and Lemurs has a similar relation to the clitoris, In the Monotremes, though the bladder is present, the ureters do not enter into it, but into the urogenital canal some distance below it, the orifice of the genital duct intervening.

NERVOUS SYSTEM AND ORGANS oF SENSE,

The brain of mammals shows a higher condition of Brain,

organization than that of other vertebrates. The cerebral hemispheres have a greater preponderance compared to other parts, especially to the -so-called optic lobes, or corpora quadrigemina, which are completely concealed by them. The commissural system of the hemisphcres is much more complete, both fornix and corpus callosum being present in some form; and, when the latter is rudimentary, as in Marsupials and Monotremes, its defi- ciency is made up for by the great size of the anterior com- missure. The lateral lobes of the cerebellum, wanting in lower vertebrates, are well developed and connected by a transverse commissure, the pons Varolii. The whole brain, owing especially to the size of the cerebral hemispheres, is considerably larger relatively to the bulk of the animal than in other classes, but it must be recollected that the size of its brain depends upon many circumstances besides the degree of intelligence which an animal pos- sesses, although this is certainly one. Man's brain is many times larger than that of all other known mammals of equal bulk, and even three times as large as that of the most nearly allied Ape. Equal bulk of body is here mentioned, because, in drawing any conclusions from the size of the brain compared with that of the entire animal, it is always necessary to take into consideration the fact that in every natural group of closely allied animals the larger species have much smaller brains relatively to their general size than the smaller species, so that, in making any effective comparison among animals belonging to different groups, species of the same size must be selected. It may be true that the brain of a Mouse is, as compared with the size of its body, larger than that of a Man, but, if it were possible to reduce an animal having the general organization of a Man to the size of a Mouse, its brain would doubtless be very many times larger;

and conversely, as shown by the rapid diminution of the relative size of the brain in all the large members of the Rodent order, a Mouse magnified to the size of a Man would, if the general rule were observed, have a brain exceedingly inferior in volume. Although the brain of the large species of Whales is, as commonly stated, the smallest in proportion to the bulk of the animal of any mammal, this does not invalidate the general proposition that the Cetacea have very large brains compared with terrestrial mammals, as the Ungulata, or even the aquatic Szrenia, as may be proved by placing the brain of a Dolphin by the side of that of a Sheep or Pig, or a Manatee of equal general weight. It is only because the universally observed difference between the slower ratio of increase of the brain compared with that of the body becomes so enormous in these immense creatures that they are accredited with small brains,

The presence or absence of "sulci" or fissures on the sur- face of the hemisphere, dividing it into "convolutions" or "gyri," and increasing the superficies of the cortical grey matter, as well as allowing the pia mater with its nutrient blood-vessels to penetrate into the cerebral substance, follow somewhat similar rules. They are related partly to the high or low condition of organization of the species, but also

Nerves.

Sense of

touch.

Taste. Smell.

Sight.

MAMM

in a great degree to the size of the cerebral hemispheres. In very small species of all groups, even the Primates, they are absent, and in the largest species of groups so low in the scale as the Marsupials and Edentates they are found. They reach their maximum of development in the Cetacea.

The researches of paleontologists, founded upon studies of casts of the interior of the cranial cavity of extinct forms, have shown that, in many natural groups of mammals, if not in all, the brain has increased in size, and also in complexity of surface foldings, with the advance of tiine,—indicating in this, as in so many other respects, a gradual progress from a lower to a higher type of develop- ment.

The twelve pairs of cranial nerves generally recognized in vertebrates are all usually found in mammals, though the olfactory nerves are excessively rudimentary, if not altogether absent, in the Toothed Whales. The spinal cord, or continuation of the central nervous axis, lies in the canal formed by the neural arches of the vertebrae, and gives off the compound double-rooted nerves of the trunk and the extremities corresponding in number to the vertebre, through the interspaces between which they pass out to their destination. The cord is somewhat enlarged at the two points where it gives off the great nerves to the anterior and the posterior extremities, which from their intcrlacements soon after their origin are called respectively the brachial and lumbar plexuses. The ganglionic or sympathetic portion of the nervous system is well developed, and presents few modifications.

The sense of touch is situated in the skin generally, but is most acute in certain regions more or less specialized for the purpose by the presence of tactile papilla, such as por- tions of the face, especially the lips and end of the snout, and the extremities of the limbs when these are used for other purposes than mere progression, and the under surface of the end of the tail in some Monkeys. The " vibrissa" or long stiff bristles situated on the face of many mammals are rendered extremely sensitive to touch by the abundant supply of branches from the fifth nerve to their basal papillae. In Bats, the extended wing membranes, and prob- ably also the large ears and the folds and prominences of skin about the face of some species, are so sensitive as to receive impressions even from the different degrees of resist-ance of the air, and so enable the animals to avoid coming in contact with obstacles to their nocturnal flight.

The organs of the other special senses are confined to the head. Taste is situated in the papille scattered on the clorsal surface of the tongue. The organ of smell is present in all mammals except the Toothed Whales. It

consists of a ramification of the olfactory nerves over a plicated, moist, mucous membrane, supported by folded plates of bone, placed on each side of the septum nasi in the roof, or often in a partially distinct upper chamber of the nasal passage, so arranged that, of the air passing into the lungs in inspira- tion, some comes in contact with it, causing the perception of any odorous particles with which it may be charged.

SENSE ORGANS. |

Many mammals possess intense powers of smelling cer-.

tain odours which others are quite unable to appreciate, and the influence which this sense exercises over the well- being of many species is very great, especially in indicating the proximity of others of the same kind, aud giving warning of the approach of enemies. The develop- ment and modification of the sense of smell is probably associated with that of the odorous secretion of the cutaneous glands.

The organ of sight is quite rudimentary, and even con- cealed beneath the integument, insome burrowing Rodents and Insectivores, and is most imperfectly developed in the Platanista, or Freshwater Dolphin of the rivers of India. In all other mammals the eyeball has the structure

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characteristic of the organ in the higher Vertebrata, con- sisting of parts through which the rays of light are admitted, regulated, and concentrated upon the sensitive expansion of the optic nerve lining the posterior part of the ball. A portion of the fibro-vascular and highly pigmented layer, the choroid, which is interposed between the retina and the outer sclerotic coat, is in many mammals modified into a brilliantly coloured light-reflecting surface, the tapetum lucidum. 'There is never a pecten or marsupium, as in the Sauropsida, nor is the sclerotic ever supported by a ring of flattened ossicles, as is so frequently the case in the lower vertebrated classes. The eyeball is moved in various directions by a series of muscles—the four recti, two obliqui, and, except in the higher Primates, a posterior retractor muscle called choanoid. It is protected by the lids, generally distinctly separated into an upper and a lower movable flap, which, when closed,

meet over the front of the eye in a more or less horizontal line; but sometimes, as in the Sirenca, the lids are not distinct, and the aperture is circular, closing to a point. In almost all mammals below the Primates, except the Cetacea, a " nictitating membrane" or third eyelid is placed at the inner corner of the eyeball, and works horizontally across the front of the ball within the true lids. Its action is instantaneous, being apparently for the purpose of cleaning the front of the transparent cornea, a function which is unnecessary in animals whose eyes are habitually bathed in water, and which in Man and his nearest allies is performed by winking the true eyelids. Except in Cetacea the surface is kept moist by the secretion of the lacrymal gland, placed under the upper lid at its outer side, and the lids are lubricated by the Harderian and Meibomian glands, the former being situated at the inner side of the orbit, and especially related to the nictitating membrane, the latter in the lining membrane of the lids.

The organ of hearing is enclosed in a bony capsule Hearing.

(periotic) situated in the side of the head, intercalated between the posterior (occipital) and the penultimate (parietal) segment of the skull, It las, in common with other vertebrates, three semicircular canals and a vestibule, but the cochlea is more fully developed than in Sauropsida, and, except in the Monotremes, spirally convoluted. The tympanic cavity is often dilated below, forming a smooth rounded prominence on the base of the skull, the tympanic bulla, The three principal ossicles, the " malleus," " incus," and "stapes," are always present, but variable in characters. In the Sirenia, Cetacea, and Seals they are massive in form, being in the first-named order of larger size than in any other mammals. In the Cetacea the malleus is ankyloscd to the tympanic; in other mammals it is connected only with the membrana tympani. The stapes in the lower orders —KEdentates, Marsupials, and Monotremes—has a great

tendency to assume the columnar form of tle correspond-

ing bone in Sauropsida, its two rami entirely or partially coalescing.! The tympanic membrane (drum of the ear) forms the outer wall of the cavity. In the foetal state it is level with the external surface of the skull, and remains so permanently in a few mammals, as the American Monkeys ; but commonly, by the growth of the squamosal bone, it becomes deeply buried

at the bottom of a bony tube (meatus auditorius externus), which is continued to the surface of the skin in a fibrous or fibro-cartilaginous form, In Whales, owing to the thickness of the subcutaneous adipose tissue, this is of great length, and is also extremely narrow. In most aquatic and burrowing animals the meatus opens upon the surface by a simple aperture, but

1 The modifications of these bones are fully described by A. Doran, ' Morphology of the Mammalian Ossicula auditus," Trans. Linn. Soc., ser. 2, vol. i. pp. 871-497, pl. lviii.Ixiv., 1878.*

Testes.

Penis,

Ovaries. and oviduct.

in the large majority of the class there is a projecting fold of skin, strengthened by fibro-cartilages, called the pinna or auricle, or "external ear," of very variable size and shape, generally movably articulated on the skull, and provided with muscles to vary its position, as it helps to collect and direct the vibrations of sound into the meatus.

REPRODUCTIVE ORGANS,

In the male the testes retain nearly their primitive or internal position throughout life in the Jonotremata, Sirenia, Cetacea, most Edentata, Hyracoidea, Proboscidea, and Seals, but in other orders they either periodically (as in Jodentia, Insectivora, and Chiroptera) or perman- ently pass out of the abdominal cavity through the inguinal canal, forming a projection beneath the skin of the perineum, or becoming suspended in a distinct pouch of the integument called scrotum. All the Marsupials have a pedunculated scrotum, the position of which differs from that of other mammals, being in front of, instead of behind, the preputial orifice. The presence, absence, or comparative size and number of the accessory generative glands—prostate, vesicular, and Cowper's glands, as they are

called—vary much in different groups of mammals, The penis is almost always completely developed, consist- ing of two corpora cavernosa attached to the ischial bones, and of a median corpus spongiosum enclosing the urethra, and forming the glans at the distal portion of the organ. In Marsupials, Monotremes, and the Sloths and Anteaters, the corpora cavernosa are not attached directly to the ischia, aud in the last-named the penis is otherwise of a very rudimentary character, the corpus spongiosum not being present. In many Marsupials the glans penis is bifurcated. In most Primates, Carnivora, Rodentia, Insectivora, and Chiroptera, but in no other orders, an os penis 1s present.

In the female, the ovaries retain permanently their original abdominal position, or only descend a short distance into the pelvis, They are of comparatively smaller size than in other vertebrates, and have a definite flattened oval form, and are enclosed in a more or less firm "tunica albugenia." The oviduct has a trumpet-like, and usually fimbriated abdominal aperture, and is more or less differentiated into three portions : —(1) a contracted upper part, called in Man and the higher mammals " Fallopian tube"; (2) an expanded part with muscular walls, in which the ovum undergoes the changes by which it is developed into the foetus, called the "uterus"; (3) a canal, the "vagina," separated from the last by a valvular aperture, and terminating in the urino-genital canal, or common urinal and geuital passage, which in higher mammals is so short as scarcely to be distinct from the last. The complete dis- tinction of the oviducts of the two sides throughout their whiole length, found in all lower vertebrates, only occurs in this class in Monotremes, a prevailing mammalian characteristic being their more or less perfect coalescence in the middle line to form a single median canal, In the Marsupials this union only includes the lower part of the vagina; in most Placentalia it extends to the whole vagina and a certain portion of the uterus, which cavity is then described as "bicornuate." In the higher mammals, as in Man, and also in some of the Edentates, the whole of the uterus is single, the contracted upper portion of the oviducts or Fallopian tubes, as they are then called, enter- ing its upper lateral angles by small apertures. In certain lower forms of mammals the urino-genital canal opens with the termination of the rectum into a comnion cloaca, as in other vertebrates; but it is characteristic of the majority

of the class that the two orifices are more or less distinct externally.

ML Ted

[REPRODUCTIVE

Mammary glands, which secrete the milk by which Mam- the young are nourished during the first portion of their mary existence after birth, are present in both sexes in all Slands.

mammals, though usually only functional in the female. In the Monotremes alone, their orifices are mere scattered pores in the skin, but in all others they are situated upon the end of conical elevations, called mammille or 'teats, which, taken into the mouth of the young animal, facilitate the process of sucking. These are always placed in pairs upon some part of the ventral surface of the body, but varying greatly in number and position in different groups. In the Cetacea, where the prolonged action of sucking would be incompatible with their subaqueous life, the ducts of the glands are dilated into large reservoirs from which the contents are injected into the mouth of the young animal by the action of a compressor muscle.

Secondary sexual characters, or modifications of structure peculiar to one sex, but not directly related to the repro- ductive function, are very general in mammals. They almost always consist of the acquisition or perfection of some character by the male as it attains maturity, which is not found in the female or the young in either sex. Ina large number of cases these clearly relate to the combats in which the males of many species engage for the posses- sion of the females during the breeding season ; others are apparently ornamental, and of many if is still difficult to apprehend the meaning. Many suggestions on this subject will, however, be found in the chapters devoted to it in Darwin's work on Zhe Descent of Man and Selection in Lelation to Sex, where most of the best-known instances are collected. Superiority of size and strength in the male of many species is a well-marked secondary sexual character related to the purpose indicated above, being probably perpetuated by the survivors or victors in combats transmitting to their descendants those qualities which gave them advantages over others of their kind. To the same category belong the great development of the canine teeth of the males of many species which do not

use these organs in procuring their food, as the Apes, Swine, Musk and some other Deer, the tusk of the male Narwhal, the antlers of Deer, which are present in most cases only in the males, and the usual superiority in size and strength of the horns of the Bovide. Other secondary sexual characters, the use of which is not so obvious, or which may only relate to ornament, are the presence of masses or tufts of long hair on different parts of the body, as the mane of the male Lion and Bison, the beards of some Ruminants and Bats (as Zaphozous melanopogon), Monkeys, and of Man, and all the variations of coloration in the sexes, in which, as a general rule, the adult male is darker and more vividly coloured than the female. Here may also be men- tioned the presence or the greater development of odoriferous glands in the male, as in the Musk Deer, and the remarkable perforated spur with its gland and duct, so hke the poison-tooth of the venomous serpents, found in the imales of both Ornithorhynchus and Echidna, the use of which is at present unknown.

Second- ary sexual char- acters,

Placenta.—The development of the mammalian ovum, Placenta

and the changes which the various tissues and organs of the body undergo in the process of growth, are too intricate subjects to be explained without entering into details incompatible with the limits of this article, especially as they scarcely differ, excepting in their later stages, from those of other vertebrates, upon which, owing to the greater facilities these present for examination and study, the subject has been more fully worked out. There are, however, some points which require notice, as peculiar to the mammalian class, and as affording at least some hints upon the difficult subject of the affinitics and classification of the members of the group.

ORGANS. |

The nourishment of the foetus during intra-uterine life takes place through the medium of certain structures, partly belonging to the foetus itself and partly belonging to the inner parietes of the uterus of the parent. These in their complete form constitute the complex organ called the "placenta," which serves as the medium of communication between the mother and foetus, and in which the pliysio- logical processes that are concerned in the

nutrition of the latter take place; but, as we shall see, though a placenta, in the usual acceptation of the term, is peculiar to the mammalian class, it is not in all of its members that one is developed. The structures to which we shall have especially to refer are the outer tunic of the ovum, to which, however formed, the term "chorion" is commonly applied, and two sac-like organs connected with the body cavity of the em- bryo, both formed from the splanchnic mesoblast, lined by a layer of the hypoblast. These are the 'umbilical vesicle" or " yolk sac" and the "allantois."

The umbilical vesicle is a thin membrane enclosing the yolk, which by the doubling in of the ventral walls of the embryo becomes gradually formed into a distinct sac external to the body, with a pedicle (the omphalo-enteric duct) by which for a time a communication is maintained between its cavity and the intestinal canal. In the walls of this sac blood-vessels (omphalo-meseraic or vitelline) are developed in connexion with the vascular system of the embryo, through which, either by their contact with the outer surface of the walls of the ovum, or by the absorption through them of the contents of the yolk sac, the nutrition of the embryo in the lower vertebrates chiefly takes place. In mammals the umbilical vesicle plays a comparatively subordinate part in the nourishment of the foetus, its function being generally superseded by the allantois,

The last-named sac commences at a very early period as a diverticulum from the hinder end of the alimentary tract of the embryo. Its proximal portion afterwards becomes the urinary bladder, the contracted part between this and the cavity of the allantois proper constituting the urachus, which passes out of the body of the foetus at the umbilicus together with the vitelline duct. The mesoblastic tissue of the walls of the allantois soon becomes vascular; its . arteries are supplied with foetal blood by the two

hypogastric branches of the iliacs, or main divisions of the

abdominal aorta, and the blood is returned by venous trunks which unite to form the single umbilical vein which runs to the under surface of the liver, where, part of it joining the portal vein and part entering the vena cava directly, it is brought to the heart. These are the vessels which, with their surrounding membranes, constitute the umbilical cord, the medium of

communication between the foetus and the placenta, when that organ is fully de- veloped.

The nature of the foctal membranes of the Monotremata isnot known. In the Marsupialia the observations made many years ago by Professor Owen, upon the development of the Kangaroo, have recently been confirmed by Dr H. C. Chapman,! but fuller investigations in different species and at different stages are still much to be desired. As far as is known, up to the period of the very premature birth of these animals the outer covering of the ovum or chorion is free from villi and not adherent to the uterine walls, for, though fitting into the folds of the latter, it is perfectly and readily separable in its entire extent from them. The umbilical vesicle is large, vascular, and adherent to a con- siderable portion of the chorion, while the allantois is relatively small, and, though the usual blood-vessels can

1 Proc. Acad. Nat. Sc. Philadelphia, December 27, 1881; Ann. Mag. Nat, Hist., April 1882.

be traced in it, it does not appear to contract any con- nexion with the chorion, and therefore much less with the walls of the uterus, of such a nature as to constitute a placenta. While in the uterus the nourishment of the foetus seems therefore to be derived from the umbilical vesicle, as in reptiles and birds, rather than from the uterine walls by means of the allantoic vessels, as in the higher mammals. The latter vessels, in fact, play even a much less important part in the development of these animals, not only than in the placental manmals, but even than in the Sawropsida, for they can scarcely have the respiratory function assigned to them in that group. Pulmonary re- spiration and the lacteal secretion of the mother very early supersede all other methods of providing the due supply both of oxygen and of food required for the development and growth of the young animal. In this sense the Marsupials may be looked upon as the most typically "mammalian" of the whole class) In no other group do the milk-secreting glands play such an important part in providing for the continuity of the race.

In the third primary division of the Mammalia, the so- called Placentalia, the umbilical vesicle generally does not quite unite with the chorion, and disappears as develop- ment proceeds, so that no trace of it can be seen in the membranes of an advanced embryo; but it may persist until the end of intra-uterine life as a distinct sac in the umbilical cord, or lying between the allantois and amnion. The disappearance or persistence of the umbilical vesicle does not, according to our present knowledge, appear to be correlated with a higher or lower general grade of development, as might be presupposed. It is stated to have been found in Man even up to the end of intra-uterine life, and also in the Carnivora, while in the Ungulata and Cetacea it disappears at an earlier age. In many, if not all, of the Rodentia, Insectivora, and Chiroptera, it plays a more important part, becoming adherent to a considerable part of the inner surface of the chorion, to which it conveys blood-vessels, although villi do not appear to be developed from the surface of this part, as they are on the portion of the chorion supplied by the allantoic vessels. These orders thus present to a certain extent a transitional condition from the Marsupials, although essentially different, in possessing the structures next to be described,

The special characteristic of the whole of the placental mammals constituting the majority of the class, is that the allantois and its vessels become intimately blended with a smaller or greater part of the parieties of the ovum, form- ing a structure on the outer surface of which villi are de- veloped, and which, penetrating into corresponding cavities of the "decidua," or soft, vascular, hypertrophied lining membrane of the uterus, constitutes the placenta. This organ may be regarded, as Professor Turner says, both in its function and in the relative arrangement of its consti- tuent textures, as a specially modified secreting gland, the ducts of which are represented by the extremities of the blood-vessels of the foetal system. The passage of material from tle maternal to the foetal system of vessels is not a simple percolation or diffusion through their walls, but is occasioned by the action of a layer of cells derived from the maternal or uterine structures, and interposed between the blood-vessels of the maternal part of the placenta and those of the villi covering the chorion, in which the embryonic vessels ramify.

The numerous modifications in the details of the structure of this organ relate to increasing the absorbing capacity of the vessels of the chorion, and are brought about either by increasing the complexity of the foetal villi and maternal crypts over a limited area, or by increasing the area of the part of the chorion covered by the placental villi, or by various combinations of the two methods.

The first class of variations has given rise to a distine- tion into two principal kinds of placenta—(1) simple or non-deciduate, and (2) deciduate. In the former the foetal villi are received into corresponding depressions of the maternal surface, from which at the period of parturition they are simply withdrawn. In the second or more complex form the relation is more intimate, a layer of greater or less thickness of the lining membrane of the uterus, called " decidua," becoming so intimately blended with the chorion as to form part of the placenta proper, or that structure which is cast off asa solid body at parturi- tion. In other words, in the one case the line of separation between the placenta and uterus at birth takes place at the

junction of the foetal and maternal structures, in the other : through the latter, so that a pertion of them, often of'

considerable thickness, and containing highly organized structures, is cast off with the former. It has heen thought that the distinction between these two forms of placentation is so important as to constitute a sufficiently

valid basis for a primary division of the placental mammals :

into two groups. It has, however, been shown that the distinction is one rather of degree than of kind, as inter- mediate conditions may exist, and it is not improbable that in different primary groups the simpler, non-deciduate form may have become developed independently into one or other of the more complex kinds,

Apart from its intimate structure, the placenta may be met with of very varied general form. It may consist of villi scattered more or less regularly over the greater part of the surface of the chorion, the two extremities or poles being usually more or less bare. This form is called the "diffused placenta." It is probably a primitive condition, from which most of the others are derived, although its existence must presuppose the absence of the umbilical vesicle as a constituent of the chorionic wall. It is found at present in the Manis among Edentates, the Cetacea, Sirenia, the Perissodactyle Ungulates, and the Camels, Pigs, and Chevrotains among the Artiodactyles. Such placentze are always non-deciduate. In the true Ruminants

or Pecora, among the Artiodactyle Ungulates, the villi are ,

aggregated in masses called cotyledons, with bare spaces between. Sucha placentation is called "polycotyledonary." In another modification the villi are collected in a more or less broad band encircling the chorion, leaving a very large

portion of the two poles bare, constituting the "zonary .

placenta," characteristic of the Carnivora, and also occur- ring in the Elephant, Hyrax, and Orycteropus. The fact of the form of the placenta of these three last-named animals agreeing together, and with that of the Carni- vora, does not, however, necessitate the ascription of zoological affinities, as the placenta of the Carnivora has been shown to be at first discoidal, and to become zonary by spreading round the chorion in the course of develop- ment. In the other cases, although it must be admitted

that the early stages have not been well observed, it is.

quite probable that it may be derived from a diffused placenta, in which the foetal villi have disappeared from a larger space than usual of the two poles of the ovum.

In another form one pole only of the chorion is non- vascular, the placenta assuming a dome or bell shape, as in the Lemurs and the Sloths) The transition from this, by the gradual restriction of the vascular area, is easy

to the oval or discoidal form of placenta of the Anteaters, Armadillos, and Primates. The discoidal placenta of the Rodents, Insectivores, and Chiroptera, though showing so much superficial resemblance to that of the last-named order as to have caused them formerly to be associated In one primary group, is now known to be developed in another manner, not by the concentration of villi from a diffused to a limited area, but by retaining the area to

opsida.

[CLASSIFICATION.

which it was originally restricted in consequence of the large surface of chorion occupied, as before mentioned, by the umbilical vesicle. To compensate for the smallness of area, the complex or deciduate structure has been developed. We may conclude that, although tle characters and arrange- ment of the fcetal structures may not have that extreme importance which has been attributed to them by some zoologists, they will form, especially when more completely understoed, valuable aids in the study of the natural affinities and evolution of the Mammalia.}

CLASSIFICATION OF THE MAMMALIA. As stated at the commencement of this article, the

mammalian class, as at present known either by existing or

extinct forms, is completely isolated from all other groups of the animal kingdom, but it is impossible to refrain from speculating as to its origin and nearest affinities. In arranging the classes of vertebrates in a linear series it is customary to place them in the following order—Pusces, Amphibia, Reptilia, Aves, Mammalia,—an order which may possibly indicate the relative degree of elevation to which the most completely developed members of each class attain, though it would be a great mistake to suppose that such an arrangement expresses the true relationship

of one to the other, and still less must it be imagined that

in the process of evolution any of the higher classes are necessarily derived directly from those nearest below them in this serial arrangement. On the contrary, some argu- ments recently set forth by Professor Huxley? point very strongly to the conclusion that, in looking among verte- brates for the progenitors of the J/ammalia, we must pass over all known forms of birds and reptiles, and go straight down to the Amphzbia. In addition to the characters derived from the conformation of the pelvis upon which the argument is primarily based, the following reasons are given for this conclusion: —" The Amphibia are the only air-breathing Vertebrata which, like mammals, have a dicondylian skull. It is only in them that the articular

element of the mandibular arch remains cartilaginous,

while the quadrate ossification is small, and the squamosal extends down over it to the osseous elements of the

mandible, thus affording an easy transition to the mam-

malian condition of those parts, The pectoral arch of the Monotremes is as much amphibian as it is sauropsidian; the carpus and the tarsus of all Sawropsida, except the Chelonia, are modified away from the Urodele type, while those of the mammal are directly reducible to it. Finally, the fact that in all Sauwropsida it is a right aortic arch which is the main conduit of arterial blood leaving the heart, while in mammals it is a left aortic arch which per- forms this office, is a great stumbling-block in the way of the derivation of the Mammalia from any of the Saur- But, if we suppose the earliest forms of both the Mammalia and the Sauropsida to have had a common Amphibian origin, there is no difficulty in the supposition that, from the first, it was a left aortic arch in the one series, and the corresponding right aortic arch in the other, which became the predominant feeder of the arterial system." There is so much in common between the very aberrant Monotremes, upon the structure of which the above con- clusions are mainly based, and all other known mammals that we cannot but suppose they are derived, perhaps at some remote period, from one stock, some of the pre- dominating characters of which survive in the existing eee — 1 For a full exposition of the present state of knowledge on this subject, see the various memoirs of Professor Turner, and especially ¥, M. Balfour's Treatise on Comparative Embryology, 1881, vol. ii.

2 Proceedings of the Royal Society of London, vol. xxviii., Iki S, p. 395.

Three great natural divisions,

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Monotremes, though lost in most other members of the class. ‘These “ Prototheria,” as Professor Huxley terms them, have in their turn probably been derived from the game source as that in which the existing Amphibia on the one hand and the Sauropsida on the other have had their origin. ‘The great divisions of the Vertebrata may be looked upon therefore as parallel, or rather diverging groups, each tending towards its own specialization, not in any way in the light of ancestor and descendant. No further advance of the Sauropsidian type, which has reached its highest perfection in the modern volant birds, would bring it nearer to the mammalian organization.

Restricting ourselves now to the class of mammals, as differentiated from other vertebrates, it will be unnecessary to repeat the oft-told history of the various attempts to express the prevailing knowledge of their structure and affinities in a systematic manner called a classification. The systems of Ray, Linnzus, Cuvier, Owen, Milne- Edwards, Huxley, and others mark successive epochs of that knowledge. A perfect arrangement of any group of animals can only be obtained simultaneously with a perfect knowledge of their structure and life history, and from this, it need scarcely be said, we are still very far removed. If, as was formerly the case, classifications could be con- fined to existing species, the work would be far less difficult. By the extinction of intermediate forms the surviving groups have mostly come to be much isolated, and their limits can be readily determined and defined. The discovery of extinct species, which appears to be taking place at a constantly increasing rate, is by degrees breaking down these boundaries, and making definitions impossible, though at the same time it is throwing much light upon the affinities and probable origin of many groups now widely separated. A source of difficulty, and perhaps error, which this advancing knowledge has introduced, arises from the necessity of determining the position and relation of so many forms by the bones and teeth alone, without any hope of deriving aid from all those other structures of which we avail ourselves in the case of recent animals. These

considerations will show that any classi- fication advanced at present must be regarded as_pro- visional, There are, however, some positions which seem to be so firmly established that it is very unlikely that we shall be dislodged from them by any further increase of knowledge, and which we should carefully distinguish from others which are acknowledged to be doubtful, and adopted rather for convenience, owing to the necessity of having some arrangement, than asrepresenting unimpeachable truth.

One of the most certain and fundamental points in the classification of the Mammalia is, that all the animals now composing the class can be grouped primarily in three natural divisions, which, presenting very marked differen- tiating characters, and having no existing, or yet certainly demonstrated extinct, intermediate or transitional forms, may be considered as subclasses of equal value, tax- onomically speaking, though very different in the numbers and importance of the animals at present composing them. These three groups are often called by the names originally proposed for them by De Blainville—(1) Ornithodelphia, (2) Didelphia, (3) Monodelphia,—the first being equivalent to the order Monotremata, the second to the Marsupialia, and the third including all the remaining members of the class. Although actual paleontological proof is wanting, there is much reason to believe that each of these, as now existing, are survivors of distinct branches to which the earliest forms of mammals have successively given rise, and for which hypothetical branches Huxley has proposed the names of Prototheria, Metatheria, and Eutheria,! names

1 Proceedings of the Zoological Society, 1880, p. 649,

which, being far less open to objection than thdse of Blainville, we shall here use as equivalents for the latter.

The characters of the Prototheria can only be deduced Proto- from the two existing families, as hitherto no extinct animals theria.

which can be referred to other divisions of this remarkable and well-characterized group have been discovered. These two isolated forms, in many respects widely dissimilar, yet having numerous common characters which unite them together and distinguish them from the rest of the Mammalia, are the Ornithorhynchide and the Lichidnide, both restricted in their geographical range to the Australian Taken altogether they represent the lowest type of evolution of the mammalian class, and most of the characters in which they differ from the otlier two subclasses tend to connect them with the inferior verte- brates, the Sawropsida and Amphibia ; for, though the

/name Ornithodelphia owes its erigin to the resemblance of

the structure of the female reproductive organs to those of

birds, there is nothing especially bird-like about them. Their principal distinctive characters are these. The

brain has a very large anterior commissure, and a very

| small corpus callosum, agreeing exactly in this respect with

the next group. The cerebral hemispheres, in Lchidna at least, are well developed and convoluted on the surface. The auditory ossicles present a low grade of development, the malleus being very large, the incus small, and the stapes columelliform, They have no true teeth, though the jaws of Ornithorhynchus are. provided with horny productions, which functionally supply their place. The coracoid bone is complete, and articulates with the sternum, and there is a large "interclavicle" or episternum infront of the sternum, and connecting it with the clavicles, There are also "epipubic " bones. The oviducts (not differentiated into uterine and Fallopian portions) are completely dis- tinct, and open as in oviparous vertebrates separately into a cloacal chamber, and there is no distinct vagina. The testes of the male are abdominal in position throughout life, and the vasa deferentia open into the cloaca, not into a distinct urethral passage. The penis, attached to the ventral wall of the cloaca, is perforated by a canal in the greater part of its length, but not at the base, which is open as in reptiles and those birds which have such an organ, and brought only temporarily in

contact with the termination of the vasa deferentia, so as to form a seminal urethra when required, but never transmits the urinary secretion. This condition is a distinct advance on that of the Sauropsida in the direction of the more complete development of these parts in most of the other Mammalia. The ureters do not open into the bladder, but behind it into the dorsal wall of the genito-urinary passage. The mammary glands have no distinct nipple, but pour out their secretion through numerous apertures in the skin. The early stages of the development of the young are not yet fully known, but they are produced in a very rudimentary condition, and appear never to be nourished by means of an allantoic placenta.

The Metatheria or Didelphia are represented at present Meta- by numerous species, presenting great diversities of genera] theria.

appearance, structure, and habits, although all united by many essential anatomical and physiological characters, which, taken altogether, give them an intermediate posi- tion between the Prototheria and the Futheria. In the structure of the brain and the presence of epipubic bones they agree with the former, while in the structure of the ear bones and the shoulder girdle and the presence of teats on the mammary glands they resemble the latter, the repro- ductive organs belonging to neither one nor the other type, but presenting a special character representing an inter- mediate grade of development. The ureters open into the base of the bladder. The oviducts are differentiated into

Eutheria,

O12

uterine and Fallopian portions, and open into a long and distinct vagina, quite separate from the cystic urethra, The penis is large, but its crura are not directly attached to the ischia. The spongy body has a large bifurcated bulb. The young are born in an exceedingly rudimentary condition, and are never nourished by means of an allantoic placenta, but are transferred to the nipple of the mother, to which they remain firmly attached for a considerable time, nourished by the milk injected into the mouth by compression of the muscle covering the mammary gland. They are therefore, as previously remarked (see p. 369), the most typically

mammalian of the whole class. The nipples are nearly always concealed in a fold of the abdominal integument or "pouch" (marsupium) which serves to support and protect the young in their early helpless condition. The existing species of this group are entirely confined to the Australian region and the American continent, though in former times they had a more ex- tended geographical range. The earliest mammals hitherto discovered appear (as far as the scanty evidence at present obtainable permits any such conclusion to be hazarded) to have belonged to this type, although it is reasonable to conclude that Prototheria (unless upon the improbable supposition that the existing forms have resulted from a process of degradation), and perhaps Hutheria, were their contemporaries far back in the Mesozoic age

The Lutheria, Monodelphia, or "placental mammals " (so called because the foetus is always nourished while within the uterus of the mother by means of an allantoic placenta) include at present by far the greater proportion of the class. While the survivors of the other groups have probably been for a long time in a stationary condition, these have, as there is already good evidence to show throughout all the Tertiary geological age, and by inference for some time before, been multiplying in numbers and variations of form, and attaining higher stages of development and specialization in various directions. They consequently exhibit far greater diversity of external or adaptive modi- fication than is met with in either of the other subclasses, — some being fitted to live as exclusively in the water as fishes, and others to emulate the aerial flight of birds.

To facilitate the study of the different component mem- bers of this large group, it is usual to separate them into certain divisions which are called "orders." In the main zoologists are now of accord as to the general number and limits of these divisions among the existing forms, but the affinities and relationships of the orders to one another are far from being understood, and there are very many extinct forms already discovered which do not fit at all satis- factorily into any of the orders as commonly defined.

Commencing with the most easily distinguished, we may first separate a group called Hdentata, composed of several very distinct forms, the Sloths,

Anteaters, and Armadillos, which under great modifications of characters of limbs and digestive organs, as well as habits of life, have just enough in common to make it probable that they are the very specialized survivors of an ancient group, most of the members of which are extinct, but which the researches of paleontology have not yet revealed to us. The characters of their cerebral, dental, and in many cases of their repro- ductive organs show an inferior grade of organization to that of the generality of the subclass. The next order, about the limits of which there is no difficulty, is the Sirenia, aquatic vegetable-eating animals, with complete absence of hind limbs, and low cerebral organization,— represented in our present state of knowledge by but two existing genera, the Dugongs and Manatees, and by a few extinct forms, which, though approaching a more generalized mammalian type, show no special characters allying them to any of the other orders. Another equally

well-marked and equally isolated, though far more numer- ously represented and diversified order, is that of the Cetacea, composed of the various forms of Whales, Dolphins, and Porpoises. In aquatic habits, external fish-like form, and absence of hind limbs they resemble the last, though in all other characters they are as widely removed as are any two orders among the Lutheria. The association by systematists of the Cetacea and Sirenca in one group can only be made either in ignorance of their true structure, or in an avowedly artificial system.

All the remaining orders are more nearly allied together, the steps by which they have become modified from one general type being in most cases not difficult to realize. Their dentition especially, however diversified in detail, always responds to the formula already described (see p. 353); and, although the existing forms are broken up into groups in most cases easy of definition, the discoveries already made in paleontology have in great measure filled up the gaps between them.

Very isolated among existing Mutheria are the two species of Elephant constituting the order called Probos- codea, These, however, are now

known to be the survivors of a large series of similar animals, Mammoths, Mastodons, and Dinotheria, which as we pass backwards in time gradually assume a more ordinary or generalized type; and the interval which was lately supposed to exist between even these and the rest of the class is partially bridged over by the discovery in American Eocene and early Miocene formations of the gigantic Dinocerata, evidently offshoots of the great group of hoofed animals, or Ungulata, repre- sented in the actual fauna by the Horses, Rhinoceroses, Tapirs, Swine, and Ruminants. Almost as isolated as the Proboscidea among existing mammals are the few small species constituting the genus Hyrax, and in their case palzontology affords no help at present, and therefore, pending further discoveries, it has been thought advisable in most recent systems to give them the honour of an order to themselves, under the name of Hyracoidea. But the number of extinct forms already known allied to the Ungulata, but not coming under the definition of either of the two groups (Artiodactyla and Perissodactyla) under which all existing species range themselves, is so great that either many new orders must be made for their reception or the definition of the old order Ungulata so far extended as to receive them all, in which case both Proboscidea and Hyracoidea might be included within it. Again the Rodentia, or gnawing animals—Rabbits, Rats, Squirrels, Porcupines, Beavers, &c.—are, if we look only at the present state of the class, most isolated. No one can doubt what is meant by a Rodent animal, or have any difficulty about defining it clearly, at least by its dental characters ; yet our definitions break down before the extinct South American Mesotherium, half Rodent and half Ungulate, which leads by an easy transition to the still more truly Ungnlate Toxodon, for the reception of which a distinct order (Toxodontia) has been proposed. The Jnsectivora and the Carnivora again are at present quite distinct orders, but they merge into one another through fossil forms, and are especially conuected by the large group of primitive Carnivora, so abundantly repre- sented in the Eocene deposits both of America and Enrope, to which Cope has given the name of Creodonta. The transition from the Insectivores to the Lemurs is not great, and, strange to say, however different they now appear, the early forms of Lemurs are not easily distinguished from the primitive Ungulates. The Bats or Chiroptera are allied to the Znsectivora in all characters but the extraordinary modification of their anterior extremities into wings, but this, like the want

of the hind limbs in the Cetacea and Sirenia, makes such a clear distinction between

Aerial mam- mals,

Aquatic mam- mals,

DISTRIBUTION. |

them and alt other mammals that, in the absence of any knowledge of intermediate or transitional forms, they can be perfectly separated, and form as well defined an order as any in the class. Lastly, we have the important and well-characterized group, called Primates, including all the Monkeys and Man, and the question is not yet solved as to how and through what forms it is linked on to the other groups. It is commonly assumed that the Lemurs are nothing more than inferior Primates, but the interval between them in the actual fauna of the world is very great, and our knowledge of numerous extinct species recently discovered in America, said to be intermediate in characters, is not yet sufficiently perfect to enable us to form a definite opinion upon the subject.

The distinctive characters of the generally recognized orders of mammals, with an account of their subdivisions and the principal forms contained in each, will be given further on.

GEOGRAPHICAL DISTRIBUTION OF MAMMALIA.

The existing species of few classes of the animal kingdom are better known than those of the Jfammalia, and, owing to the comparatively limited methods of locomotion or transport which most of them possess, the area of distribu- tion of each species is more definite and restricted than in some other classes. In the articles Brrps and DistRiBu- tion the various regions into which naturalists have divided the earth's surface, according to the prevailing characters of its animal inhabitants, have been described, and in the latter the main facts connected with the distribution of mammals have been treated of, In the account of each group contained in the preseut article the particular circumstances relating to its geographical range will

be mentioned. There is little therefore needed here, except a brief summary of the most important facts relat- ing to this interesting subject.

As regards their distribution over the surface of the earth, mammals may be divided into three groups accord- ing to their principal methods of locomotion—(1) aerial, (2) aquatic, and (3) terrestrial.

1. Aerial Mammals.—This group only comprises the animals composing the single order Chiroptera, which differ from all other mammals in the fact that their prin- cipal means of transport from place to place is by aerial flight, as in the majority of birds and insects. Broad expanses of water, which form natural barriers to the spread of terrestrial mammals, are therefore no obstacles to their distribution ; accordingly we find the general rule that mammals are not inhabitants of oceanic islands modi- fied in their case. But even in this group, notwithstanding their exceptional powers of locomotion, different species, genera, and families inhabit very definite areas, Each zoological region of the earth has its characteristic Bats ; and those of the New World and of the Old World are, with very few exceptions, quite distinct. This subject will be more fully treated of under the order Chzroptera.

2. Aquatic Mammals.—Many mammals grouped for the present purpose as terrestrial pass a great portion of their lives in brooks, lakes, or rivers, and, being dependent upon such waters for obtaining their subsistence, are necessarily confined to their vicinity ; but the truly aquatic mammals, or those living constantly in the water, and unable to move their quarters from place to place by land, are the orders Cetacea and Sirenia, with which may also be grouped the Seals, forming the Pinniped division of the order Carnwora.

For the marine Cetacea, animals mostly of large size and endowed with powers of rapid locomotion, there are obviously no barriers to universal distribution over the surface of the earth covered by sea, except such as are

interposed by uncongenial temperature or absence of suit- able food. Nevertheless it was thought some years ago that the fact of a Whale or a Dolphin occurring in a sea distant from that in which it had usually been found was sufficient justification for considering it as a distinct species and im- posing a new name upon it. There are now, however, so many cases known in which Cetaceans from the northern and southern seas, from the Atlantic and the Pacific Oceans, present absolutely no distinguishing external or anatomical characters upon which specific determination can be based that the opposite view is gaining ground; and, as some species are undoubtedly very widely distributed, almost cosmopolitan in fact, there seems little reason why many others should not be included in the same category. The evidence is satisfactory enough in those cases in which the intermediate regions are inhabited by the same forms, the cases of "continuous areas" of distribution, In those in which the areas of distribution are apparently discontinuous, there may be more room for doubt; but it must not be forgotten that the negative evidence is here of much less value than in the case of land animals, as the existence of Cetaceans in any particular part of the ocean is most easily overlooked. The great Sperm Whale (Physeter macro- cephalus) is known to be almost cosmopolitan, inhabiting or passing through all the tropical and temperate seas, although not found near either pole. At least three of the well-known species of Rorqual (Balenoptera) of the British coasts are represented in the North Pacific, on the South American shores, and near New Zealand by species so closely allied that it is difficult to point out any valid dis- tinctive characters, though it may perhaps be desirable to wait fora more complete examination of a large series of individuals before absolutely pronouncing them to be specifically identical. There is nothing yet known by which we can separate the "Humpback Whales" (Mega.

ptera) of Greenland, the Cape of Good Hope, and Japan.

The same may be said of the common Dolphin of the European seas (Delphinus delphis) and the so-called D. bairdit of the North Pacific and D. forstert of the Australian seas. The Pilot Whale (Globicephalus melas) and the Pseudorca of the North Atlantic and of New Zealand are also precisely alike, as far as present know- ledge enables us to judge. Many other similar cases might be given. Captain Maury collected much valuable evidence |

about the distribution of the larger Cetacea, and, finding Right Whales (Balena) common in both northern and southern temperate seas, and absent in the intermediate region, laid down the axiom that "the torrid zone is to the Right Whale as a sea of fire, through which he cannot pass." Hence all cetologists have assumed that the Right Whale of the North Atlantic (B. biscayensis), that of the South Seas (B. australis), and that of the North Pacific (B. japonica) are necessarily distinct species. The anato- mical structure and external appearance of all are, how- ever, as far as yet known, marvellously alike, and, unless some distinguishing characters can be pointed out, it seems scarcely justifiable to separate them upon geographical position alone; as, although the tropical seas may be usually avoided by them, it scarcely seems impossible, or even improbable, that some individuals of animals of such size and rapid powers of swimming may not have at some time traversed so small a space of ocean as that which divides the present habitual localities of these supposed distinct species. If identity or diversity of struc- tural characters is not to be allowed as a test of species in these cases, as it is usually admitted to be in others, the study of their geographical distribution becomes an impossibility.

Although many species are thus apparently of such wide distribution, others are certainly restricted ; thus the

Arctic Right Whale (Balena mysticetus) has been conclu- sively shown to be limited in its range to the region of the northern circumpolar ice, and no corresponding species has been met with in the southern hemisphere. In this case, not only temperature, but also the peculiarity of its mode of feeding, may be the cause. The Narwhal and the Beluga have a very similar distribution, though the latter occasionally ranges farther south. The Hyperoodons are restricted to the North Atlantic, never entering, as far as is yet known, the tropical seas. Other species are exclu- sively tropical or austral in their range. One of the true Whalebone Whales (Veobalena marginata) has only been met with hitherto in the seas round Australia and New Zealand, a large Ziphioid (Berardius arnouxi) only near the last-named islands.

The Cetacea are not limited to the ocean, or even to salt water, some entering large rivers for considerable distances, and some being exclusively fluviatile. One species of Platanista is extensively distributed throughout nearly the whole of the river systems of the Ganges, Brahmaputra, and Indus, ascending as high as there is water enough to swim in, but apparently never passing out to sea. The individuals inhabiting the Indus and the Ganges must therefore have been for long ages isolated without de- veloping any definite distinguishing anatomical characters, for those by which the supposed P. edi was formerly separated from P. gangetica have been shown by Anderson to be of no constant value. Orcella fluminalis appears to be limited to the Irawaddy river, and at least two distinct specics of Dolphin, belonging to different genera, are found in the waters of the upper Amazon. It is remarkable, how- ever, that none of the great lakes or inland seas of the world are, according to our present knowledge, inhabited by Cetaceans. A regular seasonal migration has been ob- served in many of the oceanic Cetacea, especially those in- habiting the North Atlantic, but further observations upon this subject are still much needed.

The great difference in the manner of life of the Strenza, as compared with that-of the Cetacea, causes a correspond- ing difference in their geographical distribution. Slow in their movements, and feeding exclusively upon vegetable substances, water-grasses, or fuci, they are confined to rivers, estuaries, or coasts where these grow, and are not denizens of the open sea, although of course there is a possibility of accidental transport by the assistance of oceanic currents across considerable distances. Of the three genera existing within historic times, one (A/anatus) is exclusively confined to the shores of the tropical Atlantic and the rivers entering into it, individuals scarcely specifi- cally distinguishable being found both on the American and the African side of the ocean. The Dugong (LZalicore) is distributed in different colonies, at present isolated, throughout the Indian Ocean from Arabia to North Aus- tralia. The Lhytina or Northern Sea-Cow was, for some time before its extinction, limited to a single island in the extreme north of the Pacific Ocean.

The Pinnipeds, although capable of traversing long reaches of ocean, are less truly aquatic than the last two groups, always resorting to the land or to extensive ice- floes for the purposes of breeding. The geographical range

of each species is generally more or less restricted, usually according to climate, as they are mostly inhabitants either of the Arctic or Antarctic seas and adjacent temperate regions, very few being found within the tropics. For this reason the northern and the southern species are for the most part quite distinct. In fact, the only known exception is the case of a colony of the Sea-Elephant (Macrorhinus leoninus), the general range of which is in the southern hemisphere, inhabiting the coast of California. Even in this case a different specific name has been given

to the northern form, but the characters by which it is distinguished are not of great importance, and probably, except for the abnormal geographical distribution, would never have been discovcred. The most remarkable circumstance connected with the distribution of the Pinnipeds is the presence of members of the order in the three isolated great lakes or inland seas of Central Asia— the Caspian, Aral, and Baikal—which, notwithstanding their long isolation, have varied but slightly from species now inhabiting the Polar Seas.

3. Terrestrial Mammals.—One of the most important Terres-

facts connected with the present distribution of terrestrial #4! mammals, but one of which the cause is sufficiently 7 obvious, is their entire absencc, except where introduced by the direct agency of man, from all oceanic islands, including even the great New Zealand group. Another, equally striking, but less easily explained, is the very marked isolation as regards its mammalian fauna of the Australian region of zoologists. When once the narrow neutral ground on the border line between this and the Oriental region is passed, there is not found, notwithstand- ing the vast extent of land it comprises, a single indigenous placental or monodelphous mammal, except a few species of a single family (A/uridex) of the very wide-spread order Rodentia,—the Wild Dog or Dingo having been in all probability introduced. On the other hand, the members of the other two subclasses, the Prototheria or Ornitho- delphia and the Metatheria or Didelphia, are

almost entirely restricted to this region. It might have been said entirely, but for the presence of one family (Didelphidx) of the latter group in America.

The Hutheria or Monodelphia are distributed through- out the remaining geographical regions, as described in the article Distrrpution, and in many cases form valuable indications by which thc natural boundaries of these divisions have been traced. Many anomialies, otherwise inexplicable in the present range of families and species, have been cleared up by the study of their distribution in former geological epochs, a subject in relation to which the present facts of distribution should always be studied. There are few lines of evidence so conclusive as this in favour of the existing species being modified lineal descendants of those which have lived in previous times upon the earth.}

HISTORY OF THE MAMMALIA IN PAST TIMES,

As already intimated, such knowledge as we yet possess of the history of mammals in past times is of very recent growth, and is still extremely incomplete. The very rapid advances which have been made in the last few years, especially in consequence of the explorations of rich fossiliferous beds in North America, have not only com- pletely changed the present aspect of the science, but give such promise for the future that any sketch which we might now attempt of this branch of the subject could only be regarded as representing a transient phase of knowledge. It will be well, however, to gather together in this place the leading facts now ascertained with regard to the most ancient forms, as, owing to the uncertainty of their rela- tionship with any of the existing orders, they will be most conveniently treated of separately, while the ascertained. facts relating to the geological history of the forms more nearly allied to those now living will be more appropriately described under the account of the different groups into which the class may now be divided. ew eee

1 On this subject, see A. Murray, Geographical Distribution of Mammals, 1866 ; and especially A. R. Wallace, The Geographical Distribution of Animals, 2 vols., 1876, and Island Life, 1881.

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MESOZOIC MAMMALS. |

The hitherto discovered remains of mammals which ex- isted anterior to the Tertiary period all belong to creatures of very small size, the largest scarcely exceeding the common Polecat or Squirrel. Some are known only by a few isvlated teeth, others by nearly complete sets of these organs, and the majority by more or less perfect specimens of the rami of the lower jaw. It is a very curious circumstance that this part of the skeleton alone has been preserved in such a large number of instances. No complete cranium has ever been found, nor is there satis- factory evidence of the structure of the vertebral column or of the limbs of any single individual. The species already described from European strata amount to nearly thirty, which have been arranged in fifteen genera, Of these by far the greater number have been found at a single spot near Swanage in Dorsetshire, in a bed of calcareous mud only 40 feet long, 10 feet wide, and averaging 5 inches in depth. The marvellous results obtained by the exploration by Mr S. H. Beckles of this small fragment of the earth's surface show by what accidents, as it were, our knowledge of the past history of life has been gained, and what may still remain in store where little thought of at present. A bed, apparently equally rich, has recently been discovered in the Territory of Wyoming,. North America, the contents of which are being made known by Professor Marsh.

1. Mammals of the Triassic Period.—The Rhetic formations, so named from the Rhetian Alps of Bavaria, are the highest beds of the Trias, and are situated above the New Red Sandstone, and just below the Lias. In 1847 Professor Pleininger of Stuttgart, while assiduously sifting some sand from this formation, belonging to the Keuper of Diegerloch and Steinenbronn, discovered, among an immense mass of teeth, scales, and unrecognizable fragments of skeletons of fish and saurians, two minute teeth, each with well-defined, enamelled, tuberculated crowns and distinct roots, plainly showing their mammalian character. These, the oldest known evidence of

the class, were considered by their discoverer to indicate a predaceous and carnivorous animal of very small size, to which he gave the name of Microlestes antiquus. Subsequently Mr C. Moore discovered in a bone bed of Rheetic age filling a fissure in the mountain limestone at Holwell, near Frome in Somersetshire, various isolated teeth with their crowns much worn, but apparently including both upper and lower molars and a canine, which are assigned by Professor Owen to Pleininger's genus JMicrolestes, and described specifically as Mf. moorei. Under the name of Hypsv-prymnopsis rheticus Prof. Boyd Dawkins? has described a single tooth with two roots which he discovered in a Rheetic marlstone at Watchet in Somersetshire, and which may be even somewhat older than the last. Professor Dawkins finds the nearest analogue of this tooth among recent mammals in the large trenchant premolar of the Rat-Kangaroo or Hypsiprymnus (see vol. xiii. p. 840, fig. 4), a resemblance not concurred in by Professor Owen, who refers it to the genus Jficrolestes. The minute size and worn condition of the tooth render it extremely difficult to form a decided opinion upon its characters, and therefore upon the affinities of the animal to which it belonged.

Still more satisfactory evidence of the presence of mammals at a period at least as ancient as the Kuropean Trias is afforded by the discovery of three nearly perfect

1 The subjects referred to under this heading are mostly described and figured in detail in Owen's " Monograph of the Fossil Mammalia of the Mesozoic Formations," Palwontographical Society's Publications, 1871; and in various papers by Marsh, in the American Journal of Science and Arts, 1878-80.

- *Quart. Jour. Geol. Soc., vol. xx. p. 411, 1864.*

mandibular rami in the Chatham coal-field of North Carolina by Dr Emmons, who, however, placed them as far back in age as the Permian, or altogether beyond the Mesozoic stage, a conclusion not now received, Of this animal, called Dromatherium sylvestre, the complete dentition of the lower jaw is known, and consists of three pointed incisors, separated by

intervals, one canine, and ten molars, of which the first three have simple sub- compressed crowns, and the remainder are multicuspid. The jaw figured by Dr Emmons? is % of an inch in length. He considered it to belong to a placental Insectivore, but the number of molar teeth exceeds that of any existing member of that order, and is only found in some Marsupials. It was associated in the same bed with thecodont reptiles.

2. Mammals of the Jurassic Period.—In the ascending order of geological age the next remains of mammals have been met with in the Lower Oolite at Stonesfield in Oxfordshire, where they are associated with wing cases of insects, Plesiosaurs, Crocodiles, and Pterodactyles. From this bed several specimens have been met with at various times, which have been placed in three genera.

A, Amphitherium, Blainville, 1838. The specimen (A. prevostit, see fig. 15) upon which this genus was founded, was discovered in 1812, and examined in 1818 at Oxford by Cuvier, who pronounced it to be mammalian, and to resemble the jaw of an Opossum. This conclusion was afterwards disputed by De Blainville and others, who

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Fie, 15,—Lower Jaw and Teeth of Amphitherium prevostit (twice nat. size). From Owen.

believed it to be reptilian, but the original determination is

now generally accepted. Three rami of mandibles, all more or less perfect, are now known, 'The length of the jaw is rather less thanan inch, It contains sixteen teeth, which, as defined by shape only, are—i 3, ¢ 1, p 6, m 6, so that if the upper jaw had a corresponding number

Fic. 16—Lower Jaw and Teeth of Phascolotherium bucklandit , (nat. size in outline), From Owen.

there would be sixty-four teeth in all,—a greater number than in any existing heterodont mammal, though equalled by some of the species from the Purbeck. The nearest approach to this number is in Myrmecobwis

among recent Marsupials. The incisors are rather long and slender, the canines apparently not much larger than the incisors, all the premolars and molars two-rooted—the former with a single large pointed cusp and small basal cusp on one or both sides, the latter quinquecuspidate. The lower margin

3 American Geology, part vi., p. 98, 1857.

4A full description of this interesting fossil, with a history of the discussion regarding its nature, is given in Owen's British Fossil Mammals and Birds.

of the angular process is slightly inflected, and the mylo- hyoid groove persistent, as in some of the existing Mar- supials and in Whalebone Whales. This groove, a remnant of that which originally lodges Meckel's cartilage, mistaken for a suture, was once considered evidence of the reptilian nature of these jaws. A second species is described as A. broderipit (Owen).

B. Phascolotherium, Owen, 1839. This is founded on a right ramus of the lower jaw, presenting the inner side to view. Its length is 1:4 inch. The number of teeth resemble those of existing ¢ insectivorous mammals, be- ing ¢ 3 or 4, ¢ 1, p and m 7, but not clearly defined from each other. One spe- cies, P. bucklandit (fig. 16).

C. Stereognathus, Charles- worth, 1854. S. oaltticus webean te Saw, (fig. 17)isfounded on a frag- embedded in Oolitic matrix (nat, size), ment of a jaw of minute size 7m Owen. . with three molar teeth ¢m sttu. The grinding surface is of quadrate form, of very little height, and supports six sub- equal cusps. Its affinities are quite problematical.

The freshwater bed previously alluded to, situated at Durdlestone Bay near Swanage, belongs to the Middle Purbeck series, intervening between the Middle Oolite and the Wealden. The first discovery of mammalian bones was made in this spot by Mr W. R. Brodie in 1854, but the subsequent explorations of Mr 8. H. Beckles have yielded a surprising number of species. They are associated with numerous saurians, insects, and

freshwater shells, as Paludina, Planorbis, and Cyclas. No less than eleven genera from this locality alone are fully described in Professor Owen's memoir, These may be grouped as follows :—

A. With teeth arranged on the insectivorous type. Mandibular incisors more than two; canines well de- veloped ; premolars and molars cuspidate, seven or more :—(a) molars and premolars more than eight, Fie. 18.—Spalacotherium tricuspidens (twice nat. mostly twelve (Spa- size), Purbeck beds. From Owen. lacotherium, Amblotherium, Peralestes, Achyrodon, Pera- spalax, Peramus, Stylodon aud Bolodon—the last known only by the maxillary teeth); (5) molars and premolars seven or eight (Zriconodon and T'ria- canthodon). As any synopsis of the characters of these genera would be scarcely intelligible Fis. 19.—Jaw of | Triconodon

° : oe, rdax (nat. size). From Owen. without minute descriptions and reference to figures, the reader who desires further infor- mation is referred to the memoir cited above.

B, With a single, strong, pointed, slightly curved incisor, placed close to the median line asin Rodents. No canine. Three or four compressed, trenchant, obliquely grooved premolars, increasing in size from first to last, and two small molars with low multitubereulated crowns. Genus Plagiaulaxz, Faleoner. This remarkable and_ highly specialized type has been the occasion of one of the most interesting discussions on the inferences which may be drawn as to the affinities and habits of an otherwise unknown animal from the structure of a small portion of its organization which occurs in the annals of natural history, a discussion carried on with great ability, ingenuity, and wealth of illustration on both sides. Dr Falconer maintained that it was more nearly allied to the Rat-Kangaroo (Hypsiprymnus) than to any other existing

Fia. 17.—Stereognathus.

form, and that, as it is known that these animals feed upon grass and roots, "it may be inferred of Plagiaulax that the species were herbivorous or frugivorous. I can see nothing in the character of their teeth," he adds, "to

Fig, 20.—Plagiaulax becclesié (twice nat. size). From Owen.

indicate that they were either insectivorous or omnivorous." Professor Owen, on the other hand, from the same materials came to the conclusion that "the physiological deductions from the above-described characteristics of the lower jaw and teeth of Plagiaulax are that it was a carnivorous Marsupial. P It probably found its ™ wr ek prey in the contemporary 2 small insectivorous mam mals and Lizards, sup- | posing no herbivorous form like Stereognathus to have co-existed durin <

the Upper Oolite period." a rity be ad = It isimpossible here to give at any length the arguments by which these opposing views are respectively supported, but it may be indicated that the first-mentioned is strongly countenanced by the consideration of the following facts :— (1) all existing Marsupials may be divided, as far as their dentition is concerned, into two groups—(a) those which have a pair of large more cr less procumbent incisors close to the symphysis of the lower jaw, and rudimentary or no canines (diprotodont dentition; families Phascolomyide, Macropodide, and Phalangistidx), and (b) those which have numerous small incisors, and large pointed canines (polyprotodont dentition; families Peramelidx, Dasyuridz, and Didelphide); (2) the vast majority of the former group are purely vegetable feeders, and almost all of the latter are carnivorous or insectivorous; and (3) Plagiaulax, so far as its structure is known, belongs obviously to the former group, and, as we have no sure basis for inferences as to the habits of an unknown animal but the knowledge of the habits of such as are known, we have no grounds for supposing that its habits differed from those of its structural congeners.!

That the two types of dentition still found among Marsupials should have existed side by side in so remote a period of time as that in which the Purbeck bone bed was deposited, and that one of these types should have already attained so singular a degree of specialization, is one of the most remarkable facts yet revealed by mammalian palzon- tology. Whether the teeth of the upper jaw correspond also to the modern diprotodout type is a

question of great interest, for the solution of which we must await future discoveries, of which we have more hope since the announce- ment by Professor Marsh of the existence, in considerable numbers, of small mammals in the American Jurassic formations of the Rocky Mountains, which conform in all

1 The whole discussion is contained in the following memoirs :— (1) H. Falconer, " Description of Two Species of the Fossil Mammalian genus Plagiaulax, from Purbeck," Quart. Jour. Geol. Soc., August 1857 ; (2) R. Owen, art. " Paleontology," Hncyclopedia Britannica, 8th ed., 1859; (8) H. Falconer, "On the Disputed Affinity of the Mammalian genus Plagiaulax," Quart. Jour. Geol. Soc., November 1860; (4) R. Owen, " Monograph of the Fossil Mammalia of the Mesozoic Formation," Paleontographical Socicty, 1871.

their general characters to those of the English Purbecks, some being even considered to be generically identical. Both polyprotodont and diprotodont types are represented, the latter by a species called by its discoverer Ctenacodon serratus, very closely allied to Plagiaulazx. s

It will be of very great interest to know the mode of succession of the teeth of those early mammals, as it may throw some light upon the question of the relation of the succession of teeth in mammals generally with the same process in the inferior classes of the Vertebrata. There is, however, as yet very little, if any, reliable evidence upon the subject, but such as there is rather points to the fact of an absence or very feeble development of the diphyodont condition, resembling that of modern Marsupials. If this is so, it may lead to the somewhat startling conclusion that in the transition from the lower vertebrate to the inammal, by whatever process it took place, the indefinite reproduction of the teeth of the former was lost, and that a monophyodont condition supervened, which was again superseded by the peculiar definite diphyodont mode of succession characteristic of the most highly organized mammals.

There is nothing yet known in the structure of these sinall nammals of the Mesozoic ages of the world to connect them with the surviving

representatives (the Monotremes) of the hypothetical Prototherva ; but whether their position was among the MMetatheria or Hutheria, or whether they represented generalized forms from which both these branches have been derived, it is impossible at present to say. Toavoid the difficulty of endeavouring to find places for them in any of the existing groups, Marsh proposes? to found two new orders for their reception—Pantotheria for those of the polyprotodont or insectivorous type of dentition, aud Allotherta for Plagiaulaxz and its allies. The former may be convenient, but it is scarcely advisable to separate the latter ordinally, as long as we continue to place Phascolomys and Thylacinus, Chiromys and Lemur, Trichecus and Phoca in the same orders, for Plagiaulax and Amphitherium do not differ in the characters of their jaws aud teeth more than any of these examples, which show how much the dentition may be modified with com- paratively little general diversity of structure.

This scanty evidence of mammalian life must bear a very small proportion to that which doubtless existed during the greater part of the vast Mesozoic period. The Cretaceous formations have as yet yielded no trace of the presence of animals of this class; but the number and variety of species met with in the earliest Tertiary forma- tions, when already differentiation into most of the existing

leading divisions had taken place, strikingly proves the |

imperfect state of our geological record during the immedi- ately antecedent ages of the world.

CHARACTERS OF THE DIFFERENT ORDERS AND FAMILIES AND OF THE PRINCIPAL FORMS OF THE MAMMALIA.

SUBCLASS PROTOTHERIA or ORNITHODELPHIA.

The principal distinguishing characteristics of this group have been already given (p. 371). They apply not only to the subclass, but of course equally to the one order Monorremata, in which the few known members of the group

are commonly associated. In addition to the more important characters enumerated above, the following,

2 "Notice of Jurassic Mammals representing two New Orders," American Journal of Science, xx., September 1880. Accounts of further discoveries of forms allied to Plagiaulaz, some surviving even to the earliest Tertiary period, are given by Cope in the American Naturalist for November 1881 and May 1882.

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which are common to all existing species, may be men- tioned.

The dorso-thoracic vertebree are nineteen in number, and have no terminal epiphyses to their bodies, The transverse processes of the cervical vertebrae are of auto- genous formation, and remain suturally connected with the remainder of the vertebra until the animal is full-grown. Though in this respect they present an approximation to the Sawropsida (Reptiles and Birds), they differ from that group, inasmuch as there is not a gradual transition from these autogenous transverse processes of the neck (or cervical ribs, as they may be considered) into the thoracic ribs, for in the seventh vertebra the costal element is much smaller than in the other, indicative of a very marked

| separation of neck from thorax, not seen in the Sauropsida,

The upper ends of the ribs are attached to the sides of the hodies of the dorsal vertebrae only, and not to the transverse processes, The sternal ribs are well ossified, and there are distinct partly ossified intermediate ribs. The cerebral cavity, unlike that of the lower Marsupials or the Reptiles, with which they have so many structural affinities, is large and hemispherical, flattened below and arched above, and about as broad as long. The ecribriform plate of the ethmoid is nearly horizontal. The cranial walls are very thin, and smoothly rounded externally, and the sutures become completely obliterated in adult skulls, as in Birds, The broad occipital region slopes upwards and forwards, and the face is produced into a long and depressed rostrum. The bony palate is prolonged backwards, so that the posterior nares are nearly on a level with the glenoid fossa. The

mandibleis without distinct ascending ramus ; the coronoid process and angle are rudimentary, and the two halves are loosely connected at the symphysis. The fibula has a broad, flattened process, projecting upwards from its upper extremity above the articulation, like an olecranon. In the male there is an additional, flat, curved ossicle on the hinder and tibial side of the plantar aspect. of the tarsus, articulating chiefly to the tibia, which supports in the adult a sharp-pointed perferated horny spur, with which is con- nected the duct of a gland situated beneath the skin of the back of the thigh, the function of which is not yet clearly understood. (A rudimentary spur is found in the young female Ornithorhynchus, but this disappears when the animal becomes adult.) The stomach is subglobular, simple ; the alimentary canal has no ileo-cecal valve, or marked distinction between large and small intestine, but has a small, slender vermiform cecum with glandular walls. The liver is divided into the usual number of lobes characteristic of the J/ammalia, and is provided with a gall- bladder.

Although agreeing in so many important characters, the existing members of the group evidently represent two very diverging branches, perhaps as far removed as are the inembers of some of the accepted orders of the Lutherta. It would, however, be encumbering zoological science with new names to give them any other than the ordinarily known family designations of Ornithorhynchide and Lchidnide,

Family ORNITHORHYNCHIDA,

One genus, Ornithorhynchus, Blumenbach, 1800.2 Cerebral hemi- spheres smooth. Premaxille and mandible expanded anteriorly and supporting a horny beak something like that of a duck, bordered ly a naked and very sensittve membranous expansion. The place of tecth supplied functionally by horny structures, elongated, narrow, and sharp-edged along the anterior part of the sides of the mouth, and broad, flat-topped or molariform behind. Legs short, fitted for swimming; feet webbed, each with five well-developed toes

armed with large claws, and beyond which in the fore feet the interdigital membrane is extended. Vertebre : C iy ene SNS,

- *The name Platypus, bestowed by Shaw in 1799, was preoccupied by a genus of Coleoptera.*

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C21. Acctabulum not perforated. Tongue not extensile. Mucous membrane of small intestine covered with delicate, close-set trans- verse folds or ridges. . Tail rather short, broad, and depressed. Eyes very small. Fur close and soft. One species, 0. anatinus (Shaw), O. paradoxus (Blum.), the duck-billed Platypus, or Watcr- Mole of the colonists, entirely aquatic in habits, diving with great facility, and burrowing in the banks of rivers. It feeds on water insects, small mollusca, and worms, and inhabits Australia and Tasmania. Sce ORNITHORUYNCUUS.

Family ECuIpNIDs.

Cerebral hemispheres larger and well convoluted. Facial portion of skall produced into a long, tapering, tubular rostrum, at the end of which the anterior nares are situated. Rami of mandible slender, styliform. Opening of mouth small, and placed below the extremity of the rostrum. No laterally placed horny teeth, though the palate and tongue are furnished with spines. Tongue very long, vermiform, slender, and protractile. Lining membrane of small intestine villous, but without transverse folds. Feet not webbed, but with long strong claws fitted for scratching and bur- rowing. The hinder feet with the ends of the toes turned outwards and backwards in the ordinary position of the animal when on the ground. Tail very short. Acetabulum witha large perforation, as in Birds. Calcaneal spur and gland of the male much smaller than in Ornithorhynchus. Fur intermixed with strong, sharp-pointed spines. Terrestrial and fossorial in habits, feeding exclusively on ants, and recalling in the structure of the mouth and various other parts relating to the peculiar mode of life the true Anteaters of the order Hdentata.

Receut discoveries have shown that there are two distinct forms i

of this family, which may even be considered of generic value. Echidna (Cuvier, 1797) or Tachyglossus (Iiger, 1811).1—Claws five on each foot. Rostrum moderately developed and straight. Vertebra : C 7,D16,L3,83,C12. Tongue tapering at the tip, the spines restricted to the basal portion. The best-known species is E. aculeata (Shaw), found in Australia and Tasmania. The specimens from the latter locality, with longer fur almost conceal- ing the spines, have been separated specifically under the name of E. setosa (Cuv.). Another species, HZ. lawesit (Ramsay), has lately been discovered in southern New Guinea. See EcHIDNA. Acanthoglossus (Gervais).—Ungual phalanges and claws present only on the three middle digits of both fore and hind feet. Ros- trum much elongated and curved downwards at the end. Vertebre : C7, D17, L4, 83, C12. Tongue somewhat spoon-shaped near the tip, and armed on its dorsal surface with three rows of recurved spines. Ouc species : 4. brudjnii (Peters and Doria) (fig.22), from

Fie. 22.—Acanthoglossus brutjnit.

From Gervais.

the mountainous regions of the northern part of New Guinea ; con- siderably larger than £. aewleata. The external characters and osteology of this animal, one of the most interesting of recent zoological discoveries, have been fully described and figured by Gervais (Ostéographie des Monotrémcs, Paris, 1878).

Among bones of extinct Marsupials of Pleistocene age from the Darling Downs, Mr Kreffit found a portion of a humerus of an Echidna, considerably larger than the existing Australian specics, which he has named F. owent.2 Notwithstanding the strong pre- sumption of antiquity of the Monotrematous type, derived from its inferiority of structure, no fossil remains of earlier date, re- ferable to it, or connecting it with the lower vertebrates on the one hand and the higher mammals on the other, have yet been discovered.

a The latter name is often used now, under the impression that Hichidna is preoccupied by Forster (177 8) for a genus of Pisces; but, a3 that was not characterized ina recognizable manner, the author even omitting to name the species for which it was intended, it is now generally considered a

synonym for Murana (see Giinther's Catalogue of Fishes), and is scarcely sufficient to bar a name so nniversally acknowledged and so deeply rooted in mammalian literature. Merrem's a ad Echidna, (Reptilia) is of later date, viz., 1820.

Annals and Mag. Nat. Hist., 1868, vol. i. (scr. iv.) p. 113.

ALIA [MONOTREMATA. Susctass METATHERIA or DIDELPHIA.

Although the great diversity in external form, in many anatomical characters, and in mode of life of varions animals of this section might lead to their division into groups equivalent to the orders of the Hutheria, it is more convenient on the whole to adhere to the usual custom of treating them all as forming one order called MARSUPIALIA, the limits of which are therefore equivalent to that of the subclass. The more essentially distinctive characters have been already pointed out (p. 371). These may be more fully stated as follows.

The brain is generally small in proportion to the size of tle animal, and the surface folding of the cerebral hemi- spheres, though well marked in the larger species, is never very complex in character, and is absent in the smaller and medium-sized species. The arrangement of the folding of the inner wall of the cerebrum differs essentially from that of all known Zutheria, the hippocampal fissure being con- tinued forward above the corpus callosum, whicli is of very small size. The anterior commissure is, on the other hand, greatly developed.?

There are always true teeth, implanted in the usual manner in both jaws, and divisible, according to their posi- tion and form, into incisors, canines, premolars, and molars ;

| but they vary much in number and character in the different

families. Except in the genus Phascolomys, the number of incisors in the upper and lower jaws is never equal. The true molars are very generally four in number on each side of each jaw. The chief peculiarity in the dentition lies, lrowever, in the mode of succession. There is no vertical displacement and succession of the teeth, except in the case of a single

tooth on each side of each jaw, which is always the hindermost of the premolar series, and is preceded by a tooth having more or less of the characters of a true molar (see fig. 23), and is the only tooth comparable to those

Fig. 23.—Teeth of Upper Jaw of Opossum (Didelzhys virginiana), all of which are unchanged, except the third premolar, the pluce of which is occupied in the young animal by a molariform tooth, represented in the figure below the line of the other te. th.

called "milk teeth" in the diphyodont Zutheria. In some cases (as in Hypsiprymnus) this tooth retains its place and function until the anintal has nearly, if not quite, attained its full stature, and is not shed and replaced by its successor until after all the other teeth of the permanent series, including the posterior molars, are fully in place and use. In others, as tlie Thylacine, it is most rudimentary in form and size, being slied or absorbed before any of the other teeth have cut the gum, and therefore quite function- less. It must further be noted that there are some Marsupials, as the Wombat, Koala, Myrmecobius, and the Dasyures, in which no such milk tooth, even in a rudi- mentary state, has yet been discovered, possibly in some cases from want of materials for observation at the right stage of development.

Epipubic or marsupial bones are present in both sexes of nearly all species. In one genus alone, Thylacinus, they are not ossified. The number of dorso-lumbar vertebre is always nineteen, although there are some apparent exceptions caused by the last lumbar being

3 W. H. Flower, " On the Commissures of the Cerebral. Hemispheres of the Aarsugialia," &e., Phil. Trans., 1865, p. 633.

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modified into a sacral vertebra. The number of pairs of ribs is nearly always thirteen. The tympanic bone remains permanently distinct. The carotid canal perforates the basi-sphenoid. The lacrymal foramen is situated upon or external to the anterior margin of the orbit, and there are generally large vacuities in the bony palate. the mandible is (except in Zarsipes) more or less inflected. 'The hyoid bones have always a peculiar

form, consisting of a small, more or less lozenge-shaped basi-hyal, broad cerato-hyals, with the remainder of the anterior arch usually unossified, and stout, somewhat compressed thyro-hyals. There are two anterior ven cave,! into each of which a "vena azygos" enters. In the male the testes are always contained in a scrotum which is suspended by a narrow pedicle to the abdomen in front of the penis. The vasa deferentia open into a complete and continuous urethra, which is also the passage by which the urine escapes from the bladder, and is perfectly distinct from the passage for the faeces, although the anus and the termination of the urethro-sexual canal are embraced by the same sphincter muscle. The glans is often bifurcated anteriorly. In the female the oviducts never unite to form a common cavity or uterus, but open separately into the vagina, which at least for part of its course is double. During the very short period in which the embryo is contained in the uterus, its nourishment seems to be derived from the umbilical vesicle, the allantoic vessels not reaching the surface of the chorion to form a true placenta. The mamme vary inuch in number, but are always abdominal in position, have long teats, and in most of the species are more or less enclosed in a fold of the integument forming a pouch or marsupium, though in some this is entirely wanting, and the newly-born, blind, naked, and helpless young, attached by their mouths to the teat, are merely concealed and protected by the hairy covering of the mother's abdomen. In this stage of their existence they are fed by milk injected into their stomach by the contraction of the muscles covering the mammary gland, the respiratory organs heing modified temporarily, much as they are permanently in the Cetacea,—the elongated upper part of the larynx projecting into the posterior nares, and so maintaining a free communication between the lungs and the external surface independently of the mouth and gullet, thus averting the danger of suffocation while the milk is passing down the latter passage.

The existing species of Marsupials are, with the excep- tion of one family (the Didelphidz), limited in geographical distribution to the Australian region, forming the chief mammalian fauna of Australia, New Guinea, and some of the adjacent islands. The Didelphide are almost purely neotropical, one or two species ranging northwards into the Nearctic region, Fossil remains of members of this family have also been found in Europe in strata of the Eocene and early Miocene period. –

In dividing the Marsupials into minor groups, it may be observed that one of the most obvious distinctive characters among them is derived from the form and arrangement of the teeth. In certain species, as the Opossums, Dasyures, and Thylacines, the incisors are numerous, small, and subequal in size and the canines large, as in the typical placental Carnivores (fig. 24; compare with that of Lion, vol. xiv. p. 680). To these the term "polyprotodont " is applied, and they are all more or less carnivorous in their habits. In others the central incisors are very prominent, and the lateral incisors and canines absent or subordinate in function (fig. 25). These are called " diprotodont," and they are all wholly or in great part vegetable feeders.

MARSUPIALIA. |

1 Except in Belideus breviceps (Forbes, Proc, Zool. Soc., 1881, p. 188),

The angte of |

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In one group of these, the Wombats, there are but two incisors above and the same number below; but all the others, including the Kangaroos, Koalas, and Phalangers,

Fic. 24.—Front View of Skull of Dasyurus ursinus, showing polyprotodont and carnivorous dentition (Proc. Geol, Soc., 1868, p. 313).

have two incisors below and as many as six above, three

on each side, but of these the first or central pair is the

most fully developed.

Thougli this division is extremely convenient, a difficulty in accepting it as marking a_ radical separation of the order into two pri- mary stocks is caused by the Peramelide, which combine a poly- protodont form of \ dentition with a pecu- liar structure of the hind feet, so exactly resembling that of some of the _best- marked diprotodonts, as the Kangaroos, that it is

difficult to believe that it can have been developed independently. Tak- ing various combina- tions of into consideration, the existing Marsupials readily group themselves into six very natural families, the characters of which can be thus defined :—

A. Teeth rooted.

a. Polyprotodont. — Incisors numerous, Canines larger than the ineisors. tubereles.

a. Ineisors § Hind feet with the four outer toes sub-

equal, distinet, and a well-developed opposable hallux. 1. Didelphide.

B. Ineisors 4. Hind feet with four outer toes distinet, subequal. Hallux small or rudimentary; rarely opposable. 2. Dasyuride.

y. Incisors $. Hind feet long, narrow. Fourth toe larger than all the others. Hallux rudimentary or absent. Second and third toes very slender and united in a common integument (syndactylous). 3. Peramclidz,

b. Diprotodont.—Incisors #. Central upper and lower incisors large and cutting. Canines absent or small. Molars with bluntly tubereculated or transversely ridged erowns. Hind feet syndactylous.

a, Hind limbs disproportionately large, with feet as in Peramelidxe. 4. Macropodide.

8. Hind limbs not disproportionately large. Feet broad, with four subequal outer toes, and a large opposable hallux: 5. Phalangistide,

Fie. 25,—Front View of Skull of Koala (Phascol- arctos cinereus), showing diprotodont and her- characters bivorous dentition (Proc. Geol, Soc., 1868, p. 313).

small, subequal. Molars with sharp

B. Ali the teeth with persistent pulps. Incisors 3, large, scalpri- form, with cnamel on the outer surface only. No canines. Hind feet with four subequal outer toes; partially syndactylous and with rudimentary hallux. 6. Phascolomyide.

Family DIDELPHIDA.

Dentition: 73, c4, » 3, m 4; total 50. Incisors very small and pointed. Canines large. Premolars with compressed pointed erowus. Molars with numerous sharpcusps. The third premolar preceded by a deciduous multicuspidate molar, whieh remains in place until the animal is nearly adult. Limbs of moderate develop- inent, each with five complete and distinct toes, all of which are provided with short, compressed, curved, sharp claws of nearly equal size, except the first toe of the hind foot or hallux, which is large, widely separable from the others, to which it is opposed in climbing, and terminates in a dilated rounded extremity, without a nail. Tail generally long, partially naked and _ prehensile. Stomach simple. Cxcum of small or moderate size, Pouch in some complete, in others represented by two lateral folds of the abdominal integument, partially covering the teats, while in some all trace of it is absent. Vertebre : C7, D138, L6, 8 2, C 19-35.

The Didelphidx, or true Opossums, differ from all other Marsu- pials in their habitat, being peeuliar to the American continent. 'They are mostly earnivorons or insectivorous in their diet, and arbo- realin habits. One slightly aberrant form, with webbed hind feet, and aquatic mode of life, constitutes the genus Chironcctcs. The other numerous species are commonly included in the genus Di- delphys. See Opossum.

Punily DASYURID.

Dentition: 7 4, c+, p and m numerous, variable. Incisors small; canines well developed ; molars with pointed cusps. Limbs equal. Fore feet with five subequal toes with claws. Hind feet with the four outer toes well-developed, and distinct from each other and bearing claws ; the first (or hallux) elawless, generally rudimentary, sometimes entirely wanting. Stomach simple. No ecxcum. Predatory, carnivorous or inseetivorous animals, inhabitants of Australia, Tasmania, and the southern parts of New Guinea

and some of the adjacent islands. The aberrant genus Myrmecobius, though elearly a member of this family, is so sharply distinguished from all the others as to render a division into two subfamilies necessary.

Subfamily Dasyuringz.—This eomprises the more typical Dasyuridz, in which the premolars and molars never exceed the normal number of seven on each side of each jaw, and in which the tongue is not.specially extensile,

Thylacinus.—Dentition: 14, ¢+, p 4, m 4=46. Incisors small, vertical, the outer one in the upper jaw larger than the others. Summit of the lower incisors, before they are worn, with a deep transverse groove, dividing it into an anterior and a posterior cusp. Canines long, strong, and conical. Premolars with compressed crowns, increasing in size from before backwards. True molars in general characters resembling those of Dasyurus, but of more simple form, the cusps being not so distinet nor sharply pointed. Milk

Fig. 26.—Thylacine (7hylucinus cynocephalus). molar very small, and shed before the animal leaves the mother's

pouch. General form very Dog-like. Head elongated. Muzzle pointed. Kars moderate, erect, triangular. Fur short and closely applied to the skin. Tail of moderate length, thiek at the base and tapering towards the apex, clothed with short hair. Hallux (ineluding the metacarpal bone) wanting. Vertebrea: C7, D 18, L6,

§ 2, C 23. Marsupial bones represented only by small unossified fibro-cartilages.

MAMMALIA

[MARSUPIALIA.

The only known species of this genus, 7. cynocephalus, though smaller than a common Wolf, is the largest predaceous Marsupial at present existing. It is now entirely eonfined to the island of Tasmania, although fragments of bones and teeth found in caves afford evidence that a closely allied species once inhabited the Australian mainland. The general colour of the

Thylacine is grey- brown, but it has a series of transverse black bands on the hinder part of the back and loins, whence the name of "' Tiger" frequently applied to it by the colonists. It is also called " Wolf," and sometimes, though less appropriately, " Hyena." Owing to the havoe it commits among the sheepfolds, it has been nearly exterminated in all the more settled parts of Tasmania, but still finds shelter in the almost impenetrable rocky glens of the more mountainous regions of the island. The female produces four young at a time.

Dasyurus.—Dentition: 74, ¢4, p%, m4; total 42. Upper incisors nearly equal, and placed vertically. In the smaller species the first is slightly longer, narrower, and separated from the rest. Lower incisors nearly vertical in the larger, but sloping forwards and upwards in the smaller species. Canines large and sharply pointed. Premolars, in the typical forms, with eompressed and sharp-pointed erowns, and slightly developed anterior and posterior accessory basal cusps. True molars with numerous sharp-pointed eusps. In the upper jaw the first three with crowns having a triangular free surface, the fourth small, simple, narrow, and placed transversely, In the lower jaw the molars more compressed, with longer cusps; the fourth not notably smaller than the others. Ears of moderate size, prominent, and obtusely pointed. Hallux rudimentary, clawless, or absent; its metatarsal bone always pre- sent, Tail generally long and well clothed with hair. Vertebre: C7, D 13, L6, 82, C18-20. The true Dasyures are mostly inhabitants of the Australian continent and Tasmania, where in the economy of nature they take the place of the smaller predaceous Carni- vora, the Cats, Civets, aud Weasels of other parts of the world. They hide themselves in the daytime in holes among rocks or in hollow trees, but prowl about at night in search of the small living mammals and birds which constitute their prey. The species are not numerous, and divide themselves into two sections. (1) Dasyurus proper includes D. maculatus, about the size of a com- mon Cat, inhabiting Tasmania and the southern part of Australia ; D. viverrinus or mauget, Tasmania and Victoria ; D. geaffroyt, South Australia ; D. hallucatus, North Australia ; D. albopunctatus, New Guinea. (2) Sarcophilus contains one species, D. wrsinus, differ- ing from the others in being a larger and heavier animal, with a disproportionally large and broad head. Its teeth are relatively larger and more massive, and hence more erowded in the jaws; the premolars especially are scarcely

compressed but rather conical ; the lower molars want a cusp placed near the middle of the inner border, found developed in different degrees in all the species of the first section. This animal is peculiar to Tasmania, where it is eommonly known by the name of " Devil." Its prevailing colour is black, its size about that of an English Badger, and its disposition – remarkably savage and voracious.

Phascogale.—This genus (more properly Phascologale) eomprises a considerable number of small Marsupials, none of them exceeding a common Rat in size, differing from the true Dasyures in pos- sessing an additional premolar,—the dentition being @ $, ct, p% m +4; total 46,—and having the teeth generally developed upon an insectivorous rather than a carnivorous pattern, the upper middle incisors being larger and inclined forwards, the canines relatively smaller, and the molars with broad crowns, armed with prickly tubercles. The muzzle is pointed. Ears moderately rounded and nearly naked. Fore feet with five subequal toes, with compressed, slightly curved pointed claws. Hind feet with the four outer toes subequal, with claws similar to those in the fore feet; the hallnx almost always distinet and partially opposable, though small and nailless, sometimes absent. The food of these animals is almost entirely insects, which some pursue among the branches of trees, while others are purely terrestrial. They are found throughout Australia, and also in New Guinea and the Aru and some of the adjacent islands. Variations in the details of the dentition and of the structure of the hind limbs, and in the length and arrange- ment of the hairy covering of the tail, have given rise to several subdivisions which will probably be accepted as generic by most zoologists, although further investigations are required before their limits can be very satisfactorily defined.

P. cristicawda, a species with a thick compressed tail orna- mented upon its apical half with a erest of black hair, differs from the others by the very redueed size of the third premolar in the upper and its complete absence in the lower jaw, thus forming an interesting transition in dentition towards Dasyurus. It consti- tutes the genus Chetocercus of Krefft. Another very aberrant form, P. lanigera, distinguished by the great elongation of the fore arm and hind foot, and the complete absence of hallux, is Antechinomys of

the same author. It is an elegant little terrestrial mouse-like animal, with large oval ears and long tail with the terminal part bushy.

MARSUPIALIA. |

Subfamily Myrmecobiinee.—Molars and premolarsexeeeding the normal number of seven on each side. Tongue long and extensile. Myrmecobius.—Dentition: ¢ $,¢ 7, p 3, m § or $3 total 52 or 54, being the largest number of teeth in any existing Marsupial. The distinction between the molars and premolars is not certain, as it is

not founded on a knowledge of the succession of the teeth, but on

their form. 'The teeth are all small and (except the four posterior inferior molars) separated from each other by an interval. Head elongated, but broad behind. Muzzle long and pointed. Ears of moderate size, ovate, and rather pointed. Fore feet with five toes, all having strong, eee compressed claws, the second, third, and fourth nearly equal, the fifth somewhat and the first considerably shorter. Hind feet with no trace of hallux externally, but the metatarsal bone is present. 'Tail long, clothed with long hairs. Fur rather harsh and bristly. Female without any trace of a pouch, the young when attached to the nipples being concealed only by the long hair of the abdomen. Vertebre: C7, D138, L6, $3, C23.

Fg. 27.—Myrmecobius fasciatus, From Gould.

Of this singular genus but one species is known, Jf. fasciatus, found in western and southern Australia. It is about the size of an English squirrel, to which animal its long bushy tail gives it some resemblance; but it lives entirely on the ground, especially in sterile, sandy districts, feeding on ants. Its prevailing colour is chestnut-red, but the hinder part of the back is elegantly marked with broad, white, transverse bands on a dark ground.

Family PERAMELIDA,

Dentition : 7 §,¢4, p 3, m3 total 48, Upper incisors small, with short, broad crowns. Lower incisors modcrate, narrow, pro- clivous. Canines well developed. Premolars compressed, pointed. Molars with quadrate

tuberculated crowns. Third premolar pre- ceded by a very minute molariform tooth, which remains in place until the animal is nearly full grown. Fore fect with two or three of the middle toes of nearly equal size, and provided with strong, sharp, slightly curved claws; the other toes rudi- mentary. Hind feet long and narrow; the hallux rudimentary or absent ; the second and third toes very slender, and united in a common integument ; the fourth very large, with a stout elongated conical claw; the fifth smaller than the fourth (see fig. 29). The ungual phalanges of the large tocs of both feet cleft at their ex- tremities (as in Manis among the Edentata, but in no other Marsupials). Head elongated. Muzzle long, narrow, and pointed. Stomach simple. Cacum of moderate size. Pouch complete, generally opening backwards. Alone among Marsupials they have no clavicles,

The Peramelidx form a very distinct family, in some respects intermediate between the sarcophagous Dasyuride and the phytophagous Macropodidx. In dentition they resemble the former, but they agree with the latter in the peculiar structure of the hind feet. In the construction of the fore feet they differ from all other Marsupials. They may be divided into three genera.

Perameles.—Anterior and posterior extremities not differing greatly in development. Fore feet with three middle toes well developed, the third slightly larger than the second, the fourth

somewhat shorter, provided with long, strong, slightly curved, pointed claws. First and fifth toes very short and without claws. Hind feet with hallux of one or two phalanges, forming a distinct tubercle visible externally ; the second and third toes very slender,

Fie, 28.—Perameles yunnit, From Gould, of equal length, joined as far as the ungual phalanx, but with distinet claws ; the fifth intermediate in length between these aud the largely developed fourth toe. Ears of moderate or small size, ovate, pointed. ‘Tail rather short, clothed with short adpressed hairs. Furshort and harsh. Pouch opening backwards. Verte- bre: C7, D138, L6, Si, C17.

The animals of this genus, commonly called “ Bandicoots” in Australia, are all small, and live entirely on the ground, mak- ing nests composed of dried leaves, grass, and sticks in hollow places. They are rather mixed feeders; but insects, worms, roots, and bulbs constitute their ordinary diet. The various species are widely distributed over Australia, Tasmania, New Guinea, -and several of the adjacent islands, as Aru, Kei, and New Ireland. The best known are—P. fasciata, gunnii (fig. 28), myosurus, nasuta, obesula, and macrura from Australia, and P. doreyana, saffrayana and longicauda from New Guinea.

Macrotis.—Molar teeth curved, and with longer crowns and shorter roots than in the last. Hinder extremities proportionally longer, and hallux represented only by a small metatarsal bone. Muzzle much elon- gated and narrow. Fur soft and silky, Ears very large, long, and pointed. Tail long, its apical halt clothed on the dorsal surface with long hairs. Pouch opening forwards. Vertebre: C7, D 13, L6, 8 2, C 28. .

But one species is known, Jf. lagotis, from western Australia, 1t is the largest member of the family, being about the size of the common Rabbit, to which animal it bears sufficient super- ficial resemblance to have acquired the name of “Native Rabbit” from the colonists. It burrows in the ground, but in other respects resembles the Bandicoots in its habits.

Cheropus.—Dentition generally resembling that of Perameles, but the canines are less developed, and in the upper jaw two-rooted. Limbs very slender ; posterior nearly twice the length of the anterior. Fore feet with the funetional toes reduced to two, the seeond and third, of equal length, with closely united metaearpals and short, sharp, slightly curved, compressed claws. First toe represented by a minute rudiment of a metacarpal bone ; the fourth by a metacarpal and two small phalanges without a Fy¢, 29.—Skeleton

claw, and not reaching the middle of the metacarpal of Hind Foot of

of the third ; fifth entirely absent. Hind foot long and narrow, inainly composed of the strongly devel- oped fourth toe, terminating in a conical pointed nail, with a strong pad behind it ; the hallux repre- sented by a rudimentary metatarsal; the remaining toes completely developed, and with

claws, but ex- ceedingly slender; theunited second and third reaeh- ing a little way beyond the metatarso-phalangeal articulation of the fourth; the fifth somewhat shorter. Tail not quite so long as the body, and covered with short hairs. Ears large and pointed, and folded down when the animal is at rest. Fur soft and loose. Pouch opening backwards. Ver- tebre: C7, D138, L6, S1, C20.

Cheropus casta- notis. c, 0s calcis; a, astragalus; cb, cuboid; 2, navicular; ¢3, ec- tocuneiform; II, and III, the conjoined second and third digits; IV, the large and only fune- tional digit; V, the rudimen- tary fifth digit. Compare _ this foot with that of the Kangaroo, vol. xiii. p. 839.

The only known species of this genus, chiefly remarkable for the singular construction of its limbs, is an animal about the size of a

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small Rat, found in the interior of the Australian continent. Its general habits and food appear to resemble those of the other

From Gould.

Fig. 380,.—Cheeropus castanotts,

Peramclide. It was first described as C. ccawdatus by Ogilby from a mutilated specimen, but the specific name was afterwards changed by Gray to castanotis.

Family MAcRoPpoDIDA.

The general characters of this family, and an account of the animals composing it, will be found in the article KANGAROO, vol. xiii, p. 838 sq.

Family PHALANGISTIDE.

Dentition (except in the aberrant genus Tarsipes): ¢ 3, the first above strong, curved, and cutting, the other two gene- rally somewhat smaller; the single lower incisor large, more

‘ocli oe . ; : a. or less proclivous; ¢;4, 9, upper small or moderate, conical and

harp-pointed; lower absent or quite rudimentary ; Pes) variable ;

m £ or 8, with four obtuse tubercles. Limbs subequal. Fore feet with five distinet, subequal toes with claws. Hind feet, short and broad, with five well-developed toes ; the hallux large, nailless and opposable ; the second and third slender and united by a common integument as far as the claws. Stomach simple. Caecum present (except in Tarsipes), and usually large. Pouch complete. Animals of small or moderate size and arboreal habits, feeding on vegetable or mixed diet, inhabiting Australia and the Papuan Islands. Excluding Phascolarctos and especially Tarsipes, they form a very natural family. The latter is, however, evidently a modified form of the same general type, chiefly aberrant in the characters of its alimentary organs, which are adapted for a peculiar mode of subsistence. It may constitute a distinct subfamily.

Subfamily Tarsipedinee. —Teeth almost rudimentary and vari- ablein number. Tongue long, slender, pointed, and very extensile. Ceecum absent.

Tarsipcs.—This is named from some supposed resemblance of its foot to that of the Lemurine genus Zarsius; but it must be remarke that it has none of the peculiar clongation of the ealeaneum and seaphoid so characteristie of that genus. Head with elongated and slender muzzle. Mouth opening small. The two lower incisors are long, very slender, sharp-pointed, and horizontally placed. All the other teeth are simple, conical, minute, and placed at considerable and irregular intervals apart in the jaws, the number appearing to vary in different individuals and even on different sides of the two individuals. The formula ina specimen in the Museum of the Royal

College of Surgeons is oi, cit, p and mn; total 20, Rami of the mandible extremely slender, nearly straight, and without coronoid process or inflected angle. Fore feet with five well- developed toes, with small, flat, scale-like nails, not reaching to the extremity of the digits. Hind feet rather long and slender com- pared with that of the Phalangistinx, with well-developed opposable and nailless hallux; second and third digits syndactylous, with sharp compressed curved claws; the fourth and fifth free, and with small

flat nails. Ears of moderate size and rounded. Tail longer than the body and head, scantily clothed with short hairs, pre- hensile. Vertebre: C7, D13, L5, 88, C24.

Of this singular genus but one species, 7. rostratus (fig. 81), is known, about the size of a common Mouse. Itinhabits western Aus- tralia, lives in trees and bushes, uses its tail in climbing, and feeds on honey, which it proeures by inserting its long tongue into the

blossoms of Afelaleuce, &c.

One kept in confinement by Mr Gould was also observed to eat flias.

Fic. 31.—TZursipes rostratus. From Gould.

Subfamily Phalangistinee.

Teeth normal. Rudimentary lower canines present. Tongue of ordinary structure. No cheek pouches. Stomach and ascending colon simple. Czecum long, simple. Tail well-developed.

*A numerous group, varying in size from that of a Mouse toa large Cat, arboreal in their habits, and abundantly distributed through- out the Australian region. One seetion is distinguished hy the possession of a flying membrane, or fold of skin, extending on each side of the body between the fore and hind legs, forming when the limbs are extended a kind of parachute, as in the Flying Squirrels, and also by a non-prehensile tail. This includes the genera Ietaurus, Belideus, and Acrobata. The remainder have no such membrane, and have the tail more or less prehensile, the under sur- face at least of the apical portion being bare. These are the typical Phalangers, or *‘Opossuins” as they are commonly called in Australia (genus Phalangista), and their various modifications, as Cuscus, Pscudochirus, and Dactylopsila. These will be more fully described in the article PHALANGER.*

Subfamily Phascolarctinee.—Teeth normal; no rudimentary lower canines. Tongue of ordinary structure. Distinct cheek pouches. Stomach with a special gland near the cardiac orifice. Cecum very long, and (with the upper portion of the colon) dilated and provided with numer- ous longitudinal folds of ; mucous membrane. In many anatomical eha- racters, especially the possession of a special gastric gland, this group resembles the Phasco- lomyide, to which it obviously forms a transi- tion.

Phascolarctos. — Denti- tion: ¢$, cy, pt mé; total 30. Upper ineisors erowded together, cylin- droidal, the first much larger than the others, with a bevelled cutting edge(fig.25). Canine very small; a considerable in- terval between it and the premolar, which is as long rq, 2,skeleton of Hind Foot of Koala (Phascol- from before backwards arctos cinereus), showing the stout opposable but not so broad as the hallux, followed by two slender toes, whieh in true molars, and has a the living animal are enclosed as far as the nails

*5 * in a eommon integument. cutting edge, with a eo smaller parallel inner ridge. The molars slightly diminishing in size from the first to the fourth, with square crowns, each bearing four pyramidal cusps. The lower incisors are semiproclivous, com-*

1 Cf. W. A. Forbes, " Anatomy of the Koala," Prec. Zool. Soc., 1881, p. 190.

pressed and tapering, bevelled at the ends. Premolars and molars in continuous series, as in the upper jaw. Fore feet with the two inner toes slightly separated from and opposable to the re- maining three, all with strong, curved, and much compressed claws. Hind foot with the hallux placed very far back, large and broad, the second and third (united) toes considerably smaller than the other two; the fourth the largest. No external tail. Fur dense and woolly. Ears of moderate size, thickly clothed with long hairs. Vertebra: C7, D11, L 8,82, C8. Ribs eleven pairs, a rare ex- ception to the usual number (13) in the Marsupialia.

There is but one species, the Koala or Native Bear of the Australian colonists (P. cinereus), found in the south-eastern parts of the Australian continent. It is about 2 feet in length, and of an ash-grey colour, an excellent climber, and residing generally in lofty Lucalyptus trees, on the buds and tender shoots of which it feeds, though occasionally descending to the ground in the night.

Kindred Fossil Forms.

Here may be noticed several genera of extinct Marsupials, the remains of which have been found in the post-Tertiary deposits of Australia, which agree with the Macropodidx and the Phalangistide in having # incisors, those of the lower jaw very large and proclivous. As the whole of their structure, especially that of the hind feet, is not yet known, their precise affinities cannot be determined.

Diprotodon.—Dentition: 7 #, ¢ 2, 94, m4; total 28. The first upper incisor very large and scalpriform. True molars with pro- minent transverse ridges, as in Aacropus, but wanting the longi- tudinal connecting ridge. Anterior and posterior limbs less dis- proportionate than in the Kangaroos. D. australis is a gigantic animal compared with all existing Marsupials, surpassing a Rhino- ceros in bulk.

Nototherium.—Dental formula as in the last, from which it differs chiefly in the incisor teeth, especially those of the lower jaw, being much smaller. The skull is short, with the zygomatie arches extremely broad. NV. mitchclli and incrme, both animals of great size, though inferior to Diprotodon.

Thylacotco.—Dentition of adult: 7 2, ¢ 4, p 3, m4; total 24. First upper incisor much larger than the others; canine and first two premolars rudimentary. In the lower jaw there are also one or two small and early deciduous premolars ; posterior premolars of both jaws formed on the same type as that of Hypsiprymnus, but relatively much larger ; true molars rudimentary, tubercular. One species, 7. carnifex, This animal presents a most anomalous con- dition of deutition, the functional teeth being reduced to one pair

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Fig, 33.—Front View of Skull of 7hylacoleo earnifer, restored, 4. From Proc. Geol. Soc., 1868, p, 312,

of large cutting incisors situated close to the median line, and one great, trenchant, compressed premolar, on each side above and below. It was first described as a carnivorous Marsupial, and named, in accordance with its presumed habits, "as one of the fellest and most destructive of predatory beasts ;" but, as its affinities ave certainly with the Phalangistid# and Mucropodidz, and its den- tition completely unlike that of any known predaceous animal, this view has been called in question.?

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1 The lowest Eocene formation of New Mexico has recently yielded an animal (Péilodus medizvus) having a mandibular dentition allied to that of Thylacoleo, and which goes some way to bridge over the gap, both in strueture and time, between this and the Mesozoic Plagiau- lactdx (see Cope in American Naturalist, June 1882).

Family PHASCOLOMYID&.

Dentition: ¢ 3, ¢ 8, p 4, m 4=24, All the teeth with per- sistent pulps. The incisors large, scalpriform, with enamel only on the front surface, as in the Rodentia. The molars strongly curved, forming from the base to the summit about a quarter of a circle, the concavity heing directed outwards in the upper and in- wards in the lower teeth. The first of the series (generally called ' premolar," though it appears to have no milk predecessor) single-lobed; the other four composed of two lobes, cach subtriangular in section. Limbs equal, stout, and short. Fore feet with five distinct toes, each furnished with a long, strong, and slightly curved nail, the first and fifth considerably shorter than the other three, Hind feet with a very short nailless hallux, the second, third, and fourth toes_ partially united by integuments, of nearly equal length, the fifth distinct and rather shorter; all four provided with long and curved nails. In the skeleton of the foot, the*

second and third toes are distinctly more slender than the fourth, showing a slight tendency towards the peculiar character so marked in the last three families. Tail rudimentary. Stomach simple, provided with a special gland situated near the cardiac orifice. Caecum very short, wide, and with a peculiar vermiform appendage.

The species of this family are few, and all contained in one genus, Phascolomys, with two well-marked sections, one containing the Common and Broad-nosed Wombats, P. wombat and platyrhinus, the other the Hairy-nosed Wombat, P. latifrons. They are all terres- trial and burrowing animals, generally slow in their movements, and harmless in disposition ; they feed on roots and other vegetable substances, and inhabit the southern parts of the Australian eon- tinent, Tasmania, and the islands of Bass's Straits. Sce WomBAT.

Bibliography of Marsupialia.—G. R. Waterhouse, Nat, Hist. of the Mammatia, vol. 4. "Marsupiata," 1846; J. Gould, Mammais of Australia, 1863; R. Owen, article " Marsupialia," in Cyclop. of Anatomy and Physiology, and various memoirs "On Extinct Mammals of Australia" in Philosophical Transactions; W. WU. Flower, "On the Development and Succession of the fecth in the Marsupialia," Phil, Trans,, 1867,

SuscLass EUTHERIA or MONODELPHIA.

The remaining mammals are included in the EuTHERtas, PLACENTALIA, or MonopELputa, the leading characters of which have been given at p. 372. Their affinities with one another are so complex that it is impossible to arrange them satisfactorily in any serial order. The Hdentata may be taken first as standing in some respects apart from all the others. The Stvenia and Cetacea are also somewhat isolated, having undergone most remarkable modifications from the normal mammalian type. The Primates must be placed at the head of the series, The position of the others is quite arbitrary, as none of the hitherto proposed associations of the orders into larger groups stand the test of critical investigation, and paleontological researches have already gone far to show that they are all modifications of a common heterodont, diphyodont, pentadactyle form.

OrpER EDENTATA.

The name assigned to this group (which some zoologists thiuk ought rather to be ranked as a subclass than an order) by Cuvier is often objected to as inappropriate, for though some of the members are edentulous, others have very numerous teeth; and the Linnzan name Bruta is occasionally substituted. But that term is quite as objec- tionable, especially as the group to which Linneeus applied it is by no means equivalent to the order as now under- stood, as the names of the genera contained in it, viz., Llephas, Trichechus, Bradypus, Myrmecophaga, Manis, and Dasypus, will indicate. It contained, in fact, all the animals then known which are comprised in the modern orders of Proboscidea, Sirenia, and Kdentata, together with the Walrus, one of the Carnivora. If retained at all, it should rather belong to the Proboscidea, as Hlephas stands first in the list of genera, and was probably in the mind of Linneus when he assigned the name to the group. Cuvier's order included the Ornithorhynchus and Hichidua, the structure of which was then imperfectly known, and which are now by common consent removed to an altogether different section of the class, but otherwise its limits are those now adopted. 'The name Hdentata is so generally used, and its meaning so well understood, that it would be very undesirable to change it now ; in fact similar

reasons might be assigned for ceasing to use nearly all the other current ordinal designations, for it might be equally well objected that all the Carnzvora are not flesheaters, many of the Marsupialia have not pouches, and so forth.

If the teeth are not always absent, they invariably exhibit certain imperfections, which are indeed almost the only common characters which bind together the various extinct and existing members of the order. These are—that they are homodont aud, with the remarkable exception of the genus 7atusia, monophyodont; they are never rooted but have persistent pulps; they are always deficient in one of the constituents which enter into the formation of the complete mammalian tooth, the enamel, and are never present either in the upper or lower jaw in the fore part of the mouth, the situation occupied by the incisors of other mammals.!

There is so great a difference in structure and habits between some of the existing animals assigned to this order that, beyond the negative characters just, mentioned, there seems little to connect them. The Sloths and Anteaters, for instance, in mode of life, general conforma- tion of limbs, structure of digestive organs, &c., appear at first sight almost as widely separated as any mammals. Paleontology has, however, thrown great light upon their relations, and proved their real affinities. Perfectly inter- mediate forms have been discovered in the great Ground Sloths of America, which have the dentition and general form of the head of the Sloths, combined with the limbs and trunk of the Anteaters. It is highly probable that the existing members of the order are very much differen- tiated representatives of a large group, the greater number of which are now extinct, and which have become so with- out ever attaining a high grade of organization. The great diversity of structure of the cxisting families, the high degree of specialization to which many have attained, the paucity of species and even of individuals, their limited area of distribution, and their small size compared with known ancestral forms, all show that this is an ancient and a waning group, the members of which seem still to hold their own either by the remoteness and seclusion of their dwelling-places, by their remarkable adaptation of structure to special conditions of life, or by aid of the peculiar defensive armature with which they are invested. Their former history can, however, only be thus surmised, rather than read, at present ; for, though we have ample evidence of the abundance and superior magnitude of certain forms in the most recent or post-Tertiary geological age, and in one part of the world, beyond this time, z.¢., in the true Ter- tiary period, and in other parts of the world than America, the remains of animals of this order hitherto discovered are only fragmentary, giving a most imperfect idea of their actual structure, and affording no indications which serve to connect them with any other branch of the class.

The existing members of the order readily group them- selves into five distinct families, the limits of which are perfectly clear. These are (1) Bradypodidex, or Sloths ; (2) Myrmecophagide, or Anteaters; (3) Dasypodide, or Armadillos ; (4) Mantdz, Pangolins or Scaly Anteaters ; and (5) Orycteropodidx, Aard-varks or Africau Anteaters. The geographical distribution of these families coincides with their structural distinction, the first three being inhabitants of the New and the last two of the Old World. It

has been usual to arrange these families into two large groups or suborders :—(1) the Phyllophaga, leaf-eaters, also called Z'ardigrada, containing the Bradypodide alone ; and (2) the Hntomophaga, insect-eaters, or Vermilingua, contain- ing all the other families, from which sometimes the Orycteropodide are separated as a third suborder under the

- *In some few Armadillos the suture between the premaxilla*

and maxilla passes behind the first upper tooth, but in all the other known members ef the order all the teeth are implanted in the maxilla.

name of Hfodientia. Such an arrangement is, however, an artificial one, founded on superficial resemblance. The bonds which unite the Manide to the Myrmecophagide are mainly to be found in the structure of the mouth, especially the extensile character of the tongue, the great develop- ment of the submaxillary glands, and the absence of teeth. These characters are exactly analogous to those found in the Hchidna among Monotremes, the Woodpeckers among Birds, and the Chameleon among Reptiles,—the fact prob- ably being that in countries where Termites and similar insects flourish various .distinct forms of vertebrates have become modified in special relation to this abundance of nutritious food, which could only be made available by a peculiar structure of the alimentary organs. A close study of the more essential portions of the anatomy of these animals leads to the belief that all the American Edentates at present known, however diversified in form and habits, belong to a common stock. The Bradypodide, Megathe- riude, and Myrmecophagide are closely allied, the modifica- tions seen in the existing families relating only to food and manner of life. The ancestral forms may have been omni- vorous, and gradually separated into the purely vegetable and purely animal feeders ; from the former are developed the modern Sloths, from the latter the Anteaters. The Ar- inadillos (Dasypodide) are another modification of the same type, retaining some generalized characters, as those of the alimentary organs, but in other respccts, as their defen- sive armature, remarkably specialized. The two Old-World families Manidx and Orycteropodide are so essentially dis- tinct,*

both from the American families and from each other, that it may even be considered doubtful whether they are derived from the same primary branch of mammals, or whether they may not be offsets of some other branch, the remaining members of which have been lost to knowledgo.

Family BRADYPODIDA.

Externally clothed with long, coarse, crisp hair. Head shortand rounded. External ears ineonspicuous. 'Teeth § in each jaw, subcylindrical, of persistent growth, consisting of a central axis of vaso-dentine, with a thin investment of hard dentine, with a thick outer coating of cement ; without (as far as is yet known) any suc- cession. Fore limbs greatly longer than the hind limbs. Al the extremities terminating in narrow, curved feet; the digits never

Fie. 34.—Skull of Two-toed Sloth (Cholepus didactylus), From Proc. Zool. Soc., 1871, p. 432.

exceeding three in number, encased for nearly their whole length in a common integument, and armed with long strong claws. Tail rudimentary. Stomach complex. No caxcum. Placenta decid- uate, dome-like, composed of an aggregation of numerous discoidal lobes. Strictly arboreal in habits, vegetable feeders, and limited geographically to the forest regions of South and Central America. Two genera, Bradypus and Cholepus. See SLOTH.

Family MEcATHERUDS.

The members of this family are all extinct. Their charac- ters, so far as is known from the well-preserved remains o many species found abundantly in deposits of Pleistocene age in

2 See Proccedings of the Zoological Society of London, 1882, p. 358.

both North and South America, were intermediate between those of the existing Bradypodidx# and the Myrmccophagidx, combining the head and dentition of the former with the structure of the vertebral eolumn, limbs,

and tail of the latter. Almost all the known species are of comparatively gigantic size, the smallest, Celodon escrivan- ensis, exceeding the largest existing Anteater, and the Megatherium being larger than a Rhinoceros. The dentition is usually ¢ on each

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Fa. 35.—Section of Upper Molar Teeth of Megatherium, x4. From Owen.

side, as in the Sloths, but in Cewlodon 4. This genus, and in a still more marked degree Mcgatheriwm, differ from all the others in the details of the structure of the teeth. They are very deeply implanted, of prismatic form (quadrate in transverse section); and the component tissues—hard dentine (fig, 35, d), softer vaso-dentine (v), and cementum ©—are so arranged that, as the tooth wears, the surface always presents a pair of transverse ridges, thus producing a triturating apparatus comparable to the “ bilopho- dont” molar of Dinotherium, Tapirus, Manatus, Macropus, and others, though produced in a different manner. In all the other genera the teeth are more or less cylindrical, though sometimes later- ally compressed or even longitudinally grooved on the sides, and ou the grind- ing surface the prominent ridge of hard dentine follows the external contour, and is surrounded only by a thin layer of cementum, as in the existing Sloths. The genera of which the remains are best known are Mylodon (fig. 37), Lesto- don, Scclidotherium, Gryphotherium, and Megalonyx. In the last-named the anterior tooth of both upper and lower jaws is large and removed by a consider- able interval from the others. The osteological eharacters of these genera have been fully described in the works of Cuvier, Owen, Burmeister, Leidy, Gervais, Reinhardt, and others.

No Eocene Edentates have yet been found in America. In the Miocene of the Pacific coast of North Ainerica sonic remains have been discovered, assigned F1¢. 36.—Lower oct ny i by Marsh to the genus Moropus, the ae type of a distinct family, the Moropidw. There are two specics, one about as large as a Tapir, and one nearly twice that size. In the Lower Pliocene, well-

preserved remains of Edentates of very large size have becn found at several widely separated localities in Idaho and California, These belong to the genus Morotheriwm, of which two species are known. East of the Rocky Mountains, in the Lower Pliocene of Nebraska, a large species apparently of the genus Moropus has been discovered. None of these have as yet been fully described or figured. Marsh belicves that North America was the or1- ginal home of the Edentates, and that they spread to the southern portion of the continent towards the close of the Tertiary period.

Family MYRMECOPHAGIDE.

Externally clothed with hair. No teeth. Head elongated. Mouth tubular, with a small terminal aperture, through which

the long, vermiform tongue, covered with the viscid secretion of the enormous submaxillary glands, is rapidly protruded in feed- ing, and withdrawn again with the adhering particles of aliment, whieh are then sucked into the pharynx. In the manus, the third toe is greatly developed, and has a long falcate claw; the others are reduced or suppressed. The pes has four or five subequal digits with claws. Posterior dorsal and lumbar vertebre with ad- ditional interlocking zygapophyses. Tail long, sometimes prehen- sile. Placenta dome-like or discoidal. The animals of this family are the " Anteaters" par excellence. They feed exelusively on animal substances, mostly insects. One species is terrestrial, the others arboreal; none burrow in the ground. They are all inhabitants of the Neotropical region.

Myrmecophaga.—Skull greatly elongated and narrow, its upper surface smooth and cylindriform. Anteriorly the faee is produced into a long, tubular rostrum, rounded above and flattened below, and with terminal nares, and composed of the mesethmoid ossified for more than half its length, the vomer, the maxille, and the long and narrow nasal bones, the premaxille being extremely short and eon- fined to the margin of the anterior nares. The zygomatie areh is in- complete, the styliform malar only articulating with the niaxilla in front, and not reaching to the very short zygomatic process of the squamosal, The lacrymal foramen is in front of the

margin of the orbit. There are no post-orbital processes to the frontals or any other demarcation between the orbits and the temporal fosse. Palate ex-

rq. 87.—Skeleton of Mylodon robustus (Pleistocene, South America). From Owen,

tremely elongated, and produced backwards as far as the level of the external auditory meatus by the mecting in the middle line of the largely developed pterygoids. The glenoid fossa a shallow oval facet, with its long diameter from before backwards. Mandible very long and slender, with an exceedingly short symphysis, no distinct eoronoid process, and a slightly elevated, elongated, flattened, con- dylar articular surface. Vertebre: C7, D 15-16, L 3-2, 86, C3i. Clavieles rudimentary. In the manus, the first digit is very slender, the second also slender, with compressed phalanges of nearly equal length. The third digit is immensely developed ; though its proximal phalanx is extremely short, its ungual phalanx is so long that the entire length of the digit exeeeds that of thesecond. The fourth has a long and rather slender metaearpal, and three phalanges diminishing in size, the ungual phalanx being very small. The fifth has the metacarpal nearly as long, but not so stout as the fourth, and followed by two small phalanges, the last rudimentary and conical. Claws are developed upon all but the fifth. In walking the toes are kept strongly flexed, and have their points turned upwards and inwards, the weight being supported upon a callous pad over the end of the fifth digit, and by the dorsal sur- faces of the third and fourth digits. The hind feet are short and rather broad, with five subequal claws, the fourth rather longest, the first shortest; the whole sole is placed on the ground in walking. Body rather eompressed, clothed with long, coarse hair. Tail about as long as the body, and covered with very long hair ; not prehensile. ars small, oval, erect. Eyes very small. Stomach consisting of a subglobular, thin-walled, cardiac portion, and a muscular pyloric gizzard with dense epithelial lining. No ileo- colic valve, and a short wide ill-defined cecum. Mamme two, peetoral.

There is one species, Af. jubata, the Great Anteater, or Ant Bear, measuring 4 feet in length withont the tail, and upwards of 2 feet in height at the shoulder. Its prevailing colour is grey, with a broad black band, bordered

with white, commencing on the chest, aud passing obliquely over the shoulder, diminishing gradu- ally in breadth as it approaches the loins, where it ends in a point.

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It is extensively distributed in the tropical parts of South and Central America, frequenting low swampy savannas, along the banks of rivers, and the depths of the humid forests, but is nowhere abundant. Its food consists mainly of termites, to obtain which it opens their nests with its powerful sharp anterior claws, and as the insects swarm to the damaged part of their dwelling, it draws them into its mouth by means of its long, flexible, rapidly-moving tongue eovered with glutinous saliva. The Great Anteater is quite terres- trial in its habits, being never known to climb trees, nor does it burrow underground like the Armadillos. Though generally an inoffensive animal, when attaeked it can defend itself vigorously and effeetively with its sabre-like anterior claws. The female bears but a single young at a birth.

Tamandua.—This genus closely resembles the last in anatomical strueture, but the head is much less elongated, the fur is short and bristly, the tail, tapering, prehensile, with the under side through-

out and the whole of the terminal portion naked and scaly. The | stomach is similar to that of Myrmecophaga, but with the muscular |

pyloric gizzard not quite so strongly developed. There is a distinct

Fie. 38.—Tamandua Anteater (Tamandua tetradactyla). From Proc. Zool. Sce., 1871, pl. xlili.

ileo-colic valve and short globular eacum. The fore foot has a very large elaw on the third toe, moderate-sized claws on the second and fourth, a very minute one on the first, and none on the fifth, which is entirely concealed within the skin. The hind foot has five subequal claws. Vertebre: C7, D17,L2,85, C37. There are very rudimentary clavicles.

The Tamandua (7. ¢ctradactyla) is much smaller than the Great Anteater, and differs essentially from it in its habits, being mainly arboreal. It is an inhabitant of the dense primeval forests of South and Central America. As different individuals vary much in their coloration, it is possible that there may be more than one species. The usual colour is yellowish-white, with a broad black lateral band, eovering nearly the whole of the side of the body.

Cycloturuws.—The skull is mueh shorter even than in Zamandua, and is arched considerably in the longitudinal direction. It differs from that of the other members of the family mainly in the long canal for the posterior nares not being closed by bone below, as the greater part of the palatines and the pterygoids do not meet in the middle line. The mandible has a prominent, narrow, recurved coronoid and a well-developed angular process ; it is strongly de- curved in front. Vertebre: C 7,D16,L2,8 4,C 40. Ribs remarkably broad and flat. Clavicles well developed. Manus remarkably modified. The third digit is greatly developed at the expense of all the others; it has a stout short metacarpal and but two phalanges, of which the most distal is large, compressed, pointed, and much curved, and bears a very strong hook-like claw. The second digit has the same number of phalanges, and bears aclaw, but is very much more slender than the third. The fourth is represented only by the metacarpal, and qne nailless phalanx, the first and fifth only by very rudimentary metacarpals. The pes is also completely modified into a climbing organ. The hallux is rudimentary, consisting of a metatarsal and one phalanx, concealed beneath the skin, but the other four toes are subequal and much curved, with long pointed compressed claws. The tuber caleanei is direeted towards the plantar surface, and parallel with it and extending to about double its length is a greatly elongated sesamoid ossicle. These together support a prominent calcarine cushion to which the nails are opposed in climbing. Stomach pyriform, with muscular walls, but no distinet gizzard-like portion, as in the foregoing genera. The cemmencement of the colon provided with two small ceca, resembling those of many Birds, narrow at the base, and rather dilated at their terminal blind ends, and communicating with the general eavity by very minute apertures. Tail longer than the body, tapering, bare on the under surface, and very prehensile. Fur soft and silky.

This genus has also but one species certainly known, the Little cr Two-toed Anteater (C. didactylus), an animal not larger than a

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Rat, of a general yellowish colour, and exclusively arboreal in its habits. It isa native of the hottest parts of South and Central America,

[EDENTATA.

Family DASYPODIDE.

The greater part of the skin strongly ossified. On the back and sides the union of numerous quadrate or polygonal seutes forms a hard shield, usually consisting of an anterior (scapular) and posterier (pelvic) solid portion (which overhang on each side the parts of the body they respectively cover, forming chambers into which the limbs are withdrawn), and a variable number of rings between, connected by soft flexible skin so as to allow of eurvature of the body. The top of the head has also a similar shield (cephalic), and the tail is usually encased in bony rings or plates. The outer or exposed surfaces of the limbs are protected by irregular bony seutes, not united at their margins; but the skin of the inner surface of the limbs and under side of the body is soft and more or less clothed with hair. Hairs also in many species project through apertures between the bony seutes of the back. The ossified dermal plates are everywhere covered bya layer of horny epidermis.

'Teeth numerous, simple, of persistent growth, and usually mono-

phyodont, but in one genus (Zatusia) a succession of teeth has been observed. Zygomatie arch of skull complete. Cervical vertebrae with extremely short, broad, and depressed bodies. The atlas free, but the second and third, and often several of the others, ankylosed together both by their bodies and arches. Lumbar vertebree with accessory zygomatic processes, and very large metapophyses, supporting the bony carapace. Clavicles well developed. A third trochanter on the femur. Tibia and fibula ankylosed at their distal extremities. Fore feet with strongly developed, curved claws, adapted for digging and seratehing, three, four, or five in number. Hind feet

plantigrade, with five toes, all provided with nails. Tongue long, pointed, and extensile, though to a less degree than inthe Anteaters. Submaxillary glands largely developed. Stomach simple. Placenta discoidal, deciduate.

The animals of this family are commonly called Armadillos, a word of Spanish origin, having reference to their armour-like eovering. The existing species are all of small or moderate size, They are mostly, though not universally, nocturnal in their habits. They are omnivorous, feeding on roots, insects, worms, reptiles, and carrion. They are harmless and inoffensive creatures, offering no resistance when caught, their principal means of escape from their enemies being the extraordinary rapidity with which they can burrow in the ground, and the tenacity with which they retain their hold in their subterranean retreats. Notwithstanding the shortness of their limbs they can run with great rapidity. Most of the species are esteemed good eating by the natives of the countries in which they live. They are all inhabitants of the open plains or the forests of the tropical and temperate parts of South America, with the exception of one species (Z'atwsia peba), which ranges as far north as Texas. Of the existing genera, Chlamydophorus stands apart from the rest in the formation of its external covering; but in all other respects Tatwsta is the most aberrant form, exhibiting a different type of strueture of the fore feet, which in all the others shows modifications, though in very varying degrees, of the same type.

Subfamily Chlamydophorinee.— In most anatomical characters, especially the structure of the fore foot, this little group resembles the Dasypodinw, but it differs remarkably from all other known Armadillos, living or extinct, in the peculiar modification of the dermal armour.»

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Chlamydophorus. —Teeth =,, subcylindrical, somewhat eom-

pressed, moderate in size, smaller at each end (especially in front) than at the middle of the series. Skull broad and rounded behind, pointed in front. Muzzle subcylindrical and depressed. A con- spicuous rounded, rough prominence on the frontal bone, just before each orbit. Tympanie prolonged into a tubular auditory meatus, curving upwards round the base of the

zygoma. Vertebre: C 7, Dil, 3,810, C15. Upper part of head and trunk covered with four-sided horny plates (with very small thin ossifications beneath), forming a shield, free, and overhanging the sides of the trunk, and attached only along the middle line of the back. The plates are arranged in a series of distinet transverse bands, about twenty in number between the occiput and the posterior truncated end, and not divided into solid thoracic and pelvic shields with movable bands between. The hinder end of the body is abruptly truncated and covered by a vertically-placed, strong, solid, bony shield, of an oval (transversely extended) form, covered by thin epidermic oe This shield is firmly ankylosed by five bony processes to the hinder

art of the pelvis. Through a noteh in the middle of its lower Kartice the tail passes out. The latter is rather short, eylindrical in its proximal half, and expanded and depressed or spatulate in its terminal portion, and covered with horny ~— The dorsal surfaces of the fore and hind feet are also covered with horny plates. The remainder of the limbs and under surface and sides of the body beneath the overlapping lateral parts of the dorsal shield are elothed with rather long, very soft silky hair. Eyes and ears very sinall, and concealed by the hair. Extremities short. Feet large, each

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with five well-developed claws, those on the fore feet very long, stout, and subconipressed, the structure of the digits being essentially the same as those of Xenurws and Priodon. Nipples two, pectoral. Visceral anatomy closely resembling that of Dasypus, the cecum being broad, short, and bifid.

C. truncatus. —The Pichiciago, a small burrowing animal, about 5 inches long, inhabits the sandy plains of the western part of the Argentine Republic, especially the vicinity of Mendoza. Its horny covering is of a pinkish colour, and its silky hair snow white. It is rare, and its habits but little known. A second species, C. retusa, from Bolivia, has been described by Burmeister. It is of rather larger size, and has the dorsal shield attached to the skin of the back, as far as its edge, instead of only along the median line.

Subfamily Dasypodinge.—Fore feet usually with all five digits

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developed and with nails, though the first and fifth may be’

suppressed. The first and second long and slender, with the normal number and relative length of phalanges. The others stout, with short broad metacarpals, and with phalanges greatly reduced in length and generally in number by coalescence. The ungual

halanx of the third very large, that of the others gradually Menatshing to the fifth. Dasypus, as now restricted, has the most normal form of manus, but the modifications so markedly developed in all the others (and culminating in Tolypeutes) are foreshadowed, as it were, init. Ears wide apart. Manne one pair, pectoral.

Dasypus.—Teeth 3 or 3, of which tho anterior in the upper jaw is usually implanted in the premaxillary bone. The series of teeth extends posteriorly some distance behind the anterior root of the zygoma, almost level with the hinder edge of the palate. They are large, subcylindrical, slightly compressed, diminishing in size towards each end of the series; the anterior two in the mandible inuch smaller, and nore compressed than the others. Cranial por- tion of the skull broad and depressed. Facial portion triangular, broad in front and much depressed. Auditory bulla completely ossified, perforated on the inner side by the carotid canal, and con- tinued externally into an elongated bony meatus auditorius, with its aperture directed upwards and backwards. (In all the remain- ing genera of Dasypodinew the tympanic bone is a mere half ring, loosely attached to the cranium.) Mandible with a high ascending ramus, broad transversely-placed condyle, and high slender coronoid process. Vertebre: C7, D11-12, L3,88,C 17-18. Head broad and flat above. Muzzle obtusely pointed. Ears of moderate size or rather small, placed laterally, far apart. Body broad and depressed. Carapace with six or seven movable bands between the scapular and pelvic shiclds, Tail shorter than the body, tapering, covered with plates forming distinct rings near the base. Fore feet with five toes; the first much more slender than the others, and with a smaller ungual phalanx and nail; the second, though the longest, also slender. The third, fourth, and

fifth gradually diminishing in length, all armed with very strong, slightly curved, compressed claws, sloping away from an elevated rounded inner border to a sharp, outer, and inferior edge. The hind foot is rather short, with all five toes armed with stout, compressed, slightly curved, obtusely pointed claws,—the third the longest, the second nearly equal to it, the fourth the next, the first and fifth shorter and nearly equal.

To this gems belongs one of the best-known species of the group, the Six-banded Armadillo or Encoubert (D. sexcinetus) of Brazil and Paraguay.

Xenurus.—Teeth 3 or &, of moderate size and subeylindrical, The most posterior placed a little way behind the anterior root of the zygoma, but far from the hinder margin of the palate. Cranium somewhat elongated, much constricted behind the orbits, and immediately in front of the constriction considerably dilated. Mandible slender ; coronoid process very small and sharp-pointed, sometimes obsolete. Vertebre: C7, D 12-13, L5, $10, C18. Head broad behind. Ears rather large and rounded, wide apart. Movable bands of carapace 12-18. Tail considerably shorter than the body, and slender, covered with nearly naked skin, with but a few small, scattered, dermal bony plates, chiefly on the under surface and near the apex. On the fore fect the first and second toes are long and slender, with small claws and the normal number of phalanges ; the other toes have but two phalanges; the third has an immense faleate claw ; the fourth and fifth similar but smaller claws. The hind feet are comparatively small, with five toes, with small, triangular, blunt nails ; the third longest, the first shortest. The best known species of this genus, the Tatouay or Cabassou, ax unicinetus, is, after Priodon gigas, the largest of the group. It is found, though not abundantly, in Surinam, Brazil, and Paraguay. Others, X. hispidus and lugubris, have been described, but little is as yet. known of them. Fat

Priodon.—Teeth variable in number, and generally differing on the two sides of each jaw, usnally from 20 to 25 on each side above and below, so that as many as 100 may be present altogether, but

as life advances the anterior teeth fall out, and all traces of their alveoli disappear. The series extends as far back as the hinder edge of the anterior root of the zygoma. 'They are all very small ; in the anterior half of each series they are strongly compressed, having flat sides and a straight free edge ; the posterior teeth are more cylindrical, with flat, truncated, free surfaces. Vertebre: C7, D12, L3, 810, C23. Head small, elongated, conical. ars moderate, ovate. Carapace with 12-13 movable bands. Tail nearly equal to the body in length, gradually tapering, closely covered with quadrangular scales, arranged in a quincunx pattern. Fore feet with five toes, formed on the same plan as those of Xenwrus, but with the claw of the third of still greater size, and that of the others, especially the fifth, proportionately reduced. Hind foot short and rounded, with five very short toes, with short, broad, flat obtuse nails. The only known species, the Great Armadillo (P. gigas), is by far the largest of existing members of the family, measuring rather more than 3 feet from the tip of the nose to the root of the tail, the tail being about 20 inches long. It inhabits the forests of Surinam and Brazil. The powerful falcate claws of its fore feet enable it to dig with great facility. Its food consists chiefly of termites and other insects, but it is said to attack and uproot newly- made graves for the purpose of devouring the flesh of the bodies contained in them.

Tolypeutes.—Teeth 3 or 3, rather large in proportion to the size of the skull, the hinder end of the series reaching nearly to the posterior margin of the palate. Vertebre: C7, D11, 13,812, C18. Ears placed low on the sides of the head, rather large, broadly ovate. Carapace with its scapular and pelvic shields very free at the sides of the body, forming large chambers into which the limbs can be readily withdrawn. Only three movable bands. Tail short, conical, covered with large bony tubercles. Tlie fore feet formed on the same type as the last, but the peculiarities carried out toa still greaterextent. The claw of the third toe is very long and falcate, the first and fifth greatly reduced and sometimes want- ing. On the hind foot the three middle toes have broad, flat, subequal nails, forming together a kind of tripartite hoof ; the first and fifth much shorter and with more compressed nails.

The Armadillos of this genus have the power of rolling them- selves up into a perfect ball, the shield ou the top of the head and the tuberculated dorsal surface of the tail exactly fitting into and filling up the apertures left by the

notches at cither end of the carapace. This appears to be their nsual means of defence when frightened or surprised, as they do not burrow like the other species. They run very quickly, with a very peculiar gait, only the tips of the claws of the fore fect touching the ground. Three species are described ;—TZ. tricinetus, tho Apar; 7. conwrus, the Matico; and T. murict,

Subfamily Tatusiinse.—This contains but one genus, Tatusia. —Teeth § or 7, very small, subcylindrical, The first and second sub- compressed, the last considerably smaller thanthe others. They pre- sent the remarkable peculiarity (unique among Edentates, so far as

Fia. 39.—Glyptodon clavipes (Pleistocene, South America). From Owen.

is yet known) of all being, with the exception of the last, preceded by two-rooted milk teeth, which are not changed until the animal has nearly attained its full size. Vertebre: C7, D 9-11, L 5, 88, C 20-27. Head narrow, with a long, narrow, subcylindrical, obliquely-truncated snout. Ears rather large, ovate, and erect, placed close together onthe occiput. Carapace with seven to nine distinct movable bands. Body generally elongated and narrow. Tail mode- rate or long, gradually tapering; its dermal plates forming very dis- tinet rings for the greater part of its length. Fore feet with four visible toes, and a concealed clawless rudiment of the fifth. Claws all long, slightly curved, and very slender, the third and fourth

subequal and alike, the first and fourth much shorter. Hind feet with five toes, all armed with strong, slightly-curved, conical, obtusely-pointed nails. The third longest, then the second and fourth ; the first and fifth much shorter than the others.

This genus differs from all the other Armadillos in having a pair of inguinal namie, in addition to the usual pectoral pair, and in producing a large number (four to ten) of young at a birth, all the others having usually but one or two.

The Peba Armadillo, 7. septemcincta, is a well-known species, having an extensive range from Texas to Paraguay. It is replaced in the more southern regions of South America by a smaller specics, with shorter tail, the Mulita (7. hybrida), so called from the resemblance of its head and ears to those of a mule, 7', kappleri is a large species or variety from Surinam.?

Fossil remains of Dasypodidw have been found by Lund and others in the caves of Brazil in deposits of Pleistocene age. Some are attributable to existing genera, but others are assigned to distinct modifications of the type called Euryodon, Chlamydo- thorium, Eutatus, &c. In the same region, but still more abundantly in the fluviatile deposits which cover the country in the neighbourhood of Buenos Ayres, are found the remains of one of the most remarkable forms of mammals yet discovered, the Glypto- dons, or Lfoplophoride (fig. 39). They differ from the existing Dasypodidx in their large size, and in having the carapace composed of a solid piece (formed by the union of a multi- tude of bony dermal scutes) without any movable rings, and in having also a ventral piece or plastron. The facial portion of the skull is very short. A long proeess of the maxillary bone descends from the anterior part of the zygomatic arch. The ascending ramus of the mandible is remarkably high. The tceth are ~ in all known species, all much alike, having two deep grooves or flutings on each side, so as to divide them into shes nearly distinct lobes (fig. 40). The vertebral column isalmost entirely ankylosed into a solid tube, but there is a complex joint Fie. 40.—Teeth of Glypto- at the base of the neck, to allowthe head on. From Owen. being retracted within the carapace. The limbs are very strong, aud the feet short and broad, resembling externally those of an elephant or tortoise. Many species of the family have been described and figured, especially by Burmeister (in the Annales del Musco publico de Buenos Aircs), by whom five genera are recognized, which are thus characterized :—~

I. Four toes only on the posterior feet.

A. Fonr toes on the anterior feet, the pollex being absent. a, Cuirass thin but inflexible. 1, Hoplophorus :—H. cuphractus, H. ornatus, H. elegans, H. pumilio. b, The cuirass stronger, with clefts between the scutes at the lower antero-lateral border, allowing of a certain amount of flexibility, 2.

Panochthus :—P. tuberculatus, P. bullifer. B. Both pollex and fifth digit of the manus absent. 3. Dedicurus:—D. giganteus.

Il. Five perfect toes on the posterior feet, and four on the

anterior, the fifth digit of which is absent. A. Tail elongated, with the rings of the base smooth, and the cuirassed apex cylindrical or tubular. 4. Glyptodon :—G. clavipes, G. rcticulatus, B. Tail short, the rings tuberculated, the point round and short. 5. Schistopleurum :—S. clongatum, S. asperunr, S. lave.

Family MANID&,

Covered externally (except the under surface of the body and inside of the limbs) with large imbricated horny scales, with scattered hairs growing in the intervals, No teeth. Tongue long, vermiform, and protractile. No accessory articular processes to the lumbar vertebre, but the anterior zygapophyses largely de- veloped and very concave, completely embracing the semieylindri- cal surfaces of the posterior zygapophyses. Limbs short, with five

1 A single imperfect skin, brought from the provinee of Ceara in Brazil, indi- cates a very remarkable form of Armadillo, named by A. Milne-Edwards Sclero- pleura brunetti(Ann. Se. Nat., xvi. p. 8, 1872). The dermal plates are said to be much less developed than in other members of the family, and confined to the sides, all the median portion of the back being clothed with a flexible hairy skin. The head is broad and short, the ears smali and far apart. ‘The tail is long, and almost entirely devoid of scutes. The feet are unknown.

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complete digits on each foot. Scaphoid and lunar bone of carpus united. Uterus bicornuate. Placenta diffused and non-deciduate. The species are mainly terrestrial and fossorial, though one is par- tially arboreal. All belong to the Ethiopian and Oriental regions of the Old World.

Manis.—Skull somewhat of the form of an elongated cone, with the small end turned forwards; very smooth and free from crests and ridges. No distinetion between the orbits aud temporal fossa. The zygomatic arch usually incomplete, owing to the absence of the malar bone. No distinet lacrymal bone. Palate long and narrow. The pterygoids extend backwards as far as the tympanics, but do not meet in the middle line below. Tympanic ankylosed to the surrounding bones, and more or less bullate, but not produced into a tubular auditory meatus. Rami of mandible very slender aud straight, without any angle or coronoid process. From near the anterior extremity of the upper edge a sharp, conical, tooth-like process projects upwards and outwards. No clavieles. No third trochanter to the femur. Ungual phalanges bifid at their ter- minations. Caudal vertebre with very long strong transverse processes and numerous chevron bones. Tongue long, vermiform, flattened towards the tip. The retractor or sterno-glossal muscles arise from the hinder extremity of the immensely prolonged ensi-form cartilage of the sternum. Stomach with thick, muscular walls and lining membrane, and with a special gland near the middle of the great curvature, consisting of a mass of complex secreting follicles, the ducts of which terminate in a common orifiee. No eecum. A gall-bladder. Head sinall, depressed, uarrow, pointed in front, with a very small mouth-opening. Eyes and pinna of ear very small. Body elongated, narrow. Tail more or less elongated, convex above, flat underneath. The whole of the upper surface of the head, the upper surface and sides of the body, the whole of the tail, and the outer sides of the extremities covered with large, overlapping, horny scales, with usually a few stiff hairs growing between and projecting beyond them. The sides and under surface of the head, the under surface of the body, and the inner sides of the limbs without scales but with arather scanty covering of hair. Limbs short. In walking the dorsal surface and outer sides of the phalanges of the two outer digits of the front feet alone rest on the ground, the points of the nails turning upwards and inwards, The third toe the longest, with a powerful compressed curved claw, the second and fourth with similar but smaller claws, that of the pollex often almost rudi- mentary. Hind feet plantigrade, with hallux very short, and four other toes subequal, with moderate, eurved, subcompresscd nails.

The animals of this genus, called Pangolins or Scaly Anteaters, are all of small or moderate size, terrestrial and burrowing, and feed mainly on

termites. One small African species climbs trees. They can roll themselves up in a ball when in danger. Their peculiar elongated form, short limbs, long, gradually-tapering tail, and scaly eovering give them on a superficial inspection more the appearance of reptiles than of mammals. The species are not numerous, but may be grouped into three sections. (1) Manis proper. Tail con- siderably exceeding in length both head and body. Scales not covering the dorsal surface of the manus. On fore feet the first toe exceedingly small, but with a distinct short nail; second, fourth, and fifth subequal, with modcrate compressed claws ; third greatly exceeding the others, with a much larger falcate claw. Two species, both from West Africa: I. longicaudata (vertebre : C7, D138, L5, 838, C46), and M. tricuspus (vertebre : C7, D 13, L6, $3, C44). (2) All the others have the scaly covering of the fore limbs extending to the claws, and the tail not exceeding the length of the head and body. On the fore feet the first and fifth toes are equal and very small, the second and fourth equal and longer, the third longest, but not so disproportionately so as in the other section. The tails of inost of these are broad at the base and taper towards the extremity. They constitute the genus Pholidotus of Gray, and inelude M. gigantea, West Africa, the largest species of the group, of which the head and body measure 2 feet 6 inches, aud the tail the same. Vertebre: C7, D13, L6, S4, C28. M. pentadactyla, M. aurita, and M. javanica, all of the Oriental region. (3) One very distinct species, JL temminckit, from South and East Africa, with the tail nearly as broad as the body for the whole of its length, and rounded at the end, constitutes the genus Smuztsia of Gray.

Family ORYCTEROPODIDE.

External surface scantily covered with bristle-like hairs. Teeth numerous, and of peculiar and complex structure, being traversed by a number of parallel vertical pulp-canals. Lumbar vertebra with no accessory zygapophyses. Femur with a third trochanter. Fore feet without pollex, but all the other digits well developed, with strong moderate-sized nails, suited to digging, the plantar surfaces of which rest on the ground in walking. Hind feet with five subequal toes. Mouth elongated and tubular. Tongue subyerim- form. Placenta broadly zonular. Feed on animal substances. Ter- restrial and fossorial in habits. Limited to the Ethiopian region.

Orycteropus.—The total number of tecth appears to be from

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eight to ten in cach side of the upper, and cight in the lower jaw ; put they are never all in place at one time, as the small anterior teeth are shed before the series is eompleted behind. In the adult they number usually five on each side above and below, of whieh the first two are simple and compressed, the next two larger and longitudinally grooved at the sides, the most posterior simple and eylindrieal. The structure of all these teeth is quite peculiar among mammals, though resembling that of some fishes. Their suminits are rounded before they are worn; their bases do not taper to a root, but are evenly truneated and continually growing. Each tooth is made up of an aggregation of parallel dental systems, having a slender pulp eavity in the centre, from which the dentinal tubes radiate outwards, and being closely packed together each system assumes a polygonal outline as secn in transverse section. No evidence of any vertical suecession of teeth has been dis- eovered. Skull moderately elongated. The facial portion sub-eylindrical and slightly tapering. The zygoma complete and slender. 'The palate ends posteriorly in the thickened transverse border of the palatines, and is not continued back by the pterygoids. The tympanic is annular, and not ankylosed to the surrounding bones. The mandible is slender anteriorly, but rises high posteriorly, with a slender reeurved coronoid, and an ascending pointed process on the hinder edge below the eondyle, which is small, oval, and looks forwards as much as upwards. Vertebre: C7, D18, L8, 86, C25. The large number of lumbar vertebrae is peculiar among Edentates. Tongue less vermiform than in Myrmecophaga, being thick and fleshy at the base, and gradually tapering to the apex. The salivary apparatus is developed much in the same manner as in that genus, but the duct of the submax- illary gland has no reservoir. The stomach consists of a large sub- globular cardiac portion, with a very thick, soft, and corrugated lining membrane, and a smaller museular, pylorie part, with a compara-tively thin and smooth lining. There is a very distinct ileo-escal valve, and a considerable-sized ceeum ; also a gall-bladder. No pollex to the fore foot. All the other usual toes well developed, with strong, subeompressed nails, flatter on the hind foot. Head elongated, with a tubular snout, terminal nostrils, and small mouth- opening. Ears large, pointed, erect. Tail nearly

as long as the body, cylindrical, very thick at the base, tapering to the extremity. The best known species is the Cape Anteater (0. capensis), or " Aard-Vark" (Earth Pig) of the Dutch colonists, from South Africa, an animal not altogether unlike a Pig in size and general appearance. It lives in burrows in the ground, and feeds ehiefly on auts and other insects. A seeond species, or well-marked loeal variety, 0. xthiopicus, inhabits the north-eastern parts of Africa.

SIRENLA. |

Extrincr EDENTATA OF THE OLD Wonr.p.

Certain remains, chiefly of bones of the limbs, found in France and Greece, and assigned to genera called Macotheriun aud Ancy- lotherium., united provisionally in the family Alacrothertide, indi- cate the existence of animals of large size inhabiting Europe during the Middle Tertiary epoch, the characters of which appear to in- dieate a generalized Edentate form or something intermediate between the Hdcntata and Ungulata. In the structure of the eee they most resembled the A/anidex, but there is some evi- denee that they possessed teeth. Some fragments from the Eocene of Paris are still more doubtfully assigned by Gervais to the order.

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Orper SIRENIA.

The purely aquatic habits and Fish-like form of the animals of this order caused them to be formerly con- founded with the Cetacea, but a more intimate knowledge of their structure has shown that they really belong to a widely different type of the class.

The head is rounded and not disproportionate in size as compared with the trunk, from which it is scarcely separated by any externally visible constriction or neck.

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Nostrils valvular, separate, and placed above the fore part of the obtuse, truncated muzzle. Eyes very small, with imperfectly formed eyelids, capable, however, of contraction, and with a well-developed nictitating meni- brane. Ear without any pinna. Mouth of small or moderate size, with tumid lips beset with stiff bristles. General form of the body depressed fusiform. No dorsal fin. Tail flattened and horizontally expanded. Fore linbs paddle-shaped, the digits being enveloped in a common cutaneous covering, though sometimes rudiments of nails are present. No trace of hind limbs. External surface covered with a tough, finely wrinkled, or very rugous skin, naked, or with fine hairs sparsely scattered over it.

The skeleton is remarkable for the massiveness and density of most of the bones of which it is composed, especially the skull and ribs, which must add to the specific gravity of these slow-moving animals, and aid in keeping them to the bottom of the slallow waters in which they dwell, while feeding on aquatic vegetables. The skull presents many peculiarities, among which may be indicated the large size and backward position of the anterior narial aperture, a further modification of that met with in the Tapirs among

Ungulates, and presenting some approach to that so characteristic of the Cetacea. The nasal bones are generally absent in the recent forms, or are only found in a most rudimentary condition, attached to the edge of the frontals, far away from the middle line; but in some at least of the extinct species these bones, though small in size, are normal in situation and relations. In very few other respects does the skull present any resemblance to that of the Cetacea. In the spinal column none of the vertebree are united together to form a sacrum, and the flat ends of the bodies do not ossify separately, so as to form disk-like epiphyses in the young state, as in nearly all other mammals. The anterior caudal vertebra have well-developed chevron bones. In one genus (Manatus) there are only six cervical vertebra. There are no clavicles. The humerus has a small but distinct trochlear articulation at the elbow-joint. The two bones of the forearm are about equally developed, and generally ankylosed together at both extremities. The carpus is short and broad, and the digits five in number, with moderately elongated and flattened phalanges, which are never increased in number beyond the limit usual in the Mammalia. The pelvis is extremely rudimentary, consist- ing of a pair of bones suspendcd at some distance from the vertebral columu. In no existing species is there any trace of a hind limb, but in the extinct Halithervum an acetabular depression and rudimentary femur have been discovered.

Two kinds of teeth, incisors and molars, separated by a wide interval, are generally present. The former may be developed into tusks in the upper jaw, or may be quite rudimentary. The molars vary much in character. In one genus (2ytina) no teeth of any kind are present, at least in the adult. In all, the anterior part of the palate, and a corresponding surface on the prolonged symphysis of the lower jaw, are covered with rough horny plates of peculiar structure, which doubtless assist iu mastication. The tongue is small and fixed in position, with a surface resembling that of the plates just spoken of. The salivary glands are largely developed. The stomach is compound, being divided by a valvular constriction into two principal cavities, the first of which is provided with a singular glandular pouch near the cardiac end, and the second usually with a pair of elongated, conical, cecal sacs or diverticula. The intestinal canal is long, and with very muscular walls, There is a caecum, either simple, conical, aud with extremely thick walls, as in Halicore, or bifid, as

in Manatus. The apex of the heart is deeply cleft between the ventricles. The principal arteries form very extensive aud complex retia mirabilia. The lungs are remarkably long and narrow, as, owing to the very oblique position of | L and C 25-29. Rostrum of the skull, formed by the union of the the diaphragm, the thoracic cavity extends far back over premaxille in front of the anterior narial aperture, shorter than the the abdomen. The epiglottis and arytenoid cartilages of length of the aperture and scarcely deflected from the basi-cranial

upper teeth with two ridges and three roots, the lower teeth with an additional (posterior) ridge or talon and two roots. The ecer- vieal vertebre present the remarkable anomaly of being reduced to six in number, the usual vertebral formula being C6, D15-18,

do not for ; ; axis. Tail entire, rounded or shovel-shaped. Rudimentary nails oa nde Seti . ba wn Pi ae . pe on the fore limbs. Caecum bifid. Habitat the shores of, and the eaced, = ihe brain 18 of comparatively small size, and the great rivers which empty themselves into, the Atlantic within the convolutions on the surface of the cerebrum few and tropics, The American and African forms are generally considered shallow. The kidneys are simple. Testes abdominal. | to be distinct species (Mf. australis and Af, senegalensis), though The uterus is bicornuate. The placenta (in the Dugong) they differ but little from each other in anatomical characters and : : , ae in habits. They are rather fluviatile than marine, ascending large is non-deciduate and ditfuse, the villi being scattered BONS | overs aloe to their sources, See MAndaer, rally over the surface of the chorion except at the poles. Halicore.—In the upper jaw a pair of large, nearly straight, tnsk- The umbilical vesicle disappears early. The mamme are like incisors, directed downwards and forwards, partially coated two, and pectoral or rather post-axillary in position. with enamel. In the male they have persistent pulps, and bevelled The ere, s.their whole life in ch thy. del cutting edges, which project a short distance from the mouth, but oe. eee ole tite in the water, peng | in the female, though they remain through life in the alveolar denizens of shallow bays, estuaries, lagoons, and large rivers, cavity, they are not exserted, and, the pulp cavity being filled with but unlike

the Cetacea are not met with in the high seas, | osteodentine, they soon cease to grow (as in the female Narwhal). far away from the shore. Their food consists entirely of In the young there is also a second small deciduous incisor on tie planks itl : Aes fresh ial each side above. At this age there are also beneath the horny plate aquatic plants, elther marine alge or freshwater grasses, which covers the anterior portion of the mandible four pairs of upon which they browse beneath the surface, as the | slender conical teeth loge in wide alveolar depressions. These § i terrestrial herbivorous mammals do upon the green pastures | become absorbed before the animal reaches maturity. The molars on shore. They are generally gregarious, slow and inactive in their movements, mild, inoffensive, and apparently unintelligent in disposition. Though occasionally found stranded by the tide or waves, there is no satisfactory

are usually §, sometimes §, altogether, but not all in place at once, as the first falls before the last rises above the gum ; they are more evidence that they voluntarily leave the water to bask or feed on the shore. The habit of the Dugong

or less cylindrical in section, except the last, which is compressed of raising its round head out of water, and

and grooved laterally, without distinction into crown an root, increasing in size from before backwards, with persistent pulps and noenamel, The suminits of the crowns are tuberculated before wear-

carrying its young under the fore fin, seems to

have given rise, among the imaginative early

voyagers in the Indian Ocean, to the legendary

beings, half human and half fish, in allusion to which the name Strenia was bestowed by Illiger on the order, though certainly the face of a Dugong, when closely inspected, does not bear the slightest resemblance to that of the mermaid of romance. The species now existing are very few, and there is reason to believe that the time is not far distant

when they will all become extinct. One species, Rhytina | ing, afterwards flattened or slightly concave. Skull with rostrum

stellert, of the North Pacific, was totally exterminated | formed by the union of the premaxille in front of the narial

through the agency of man during the last century; and aperture, longer than the aperture itself, bending downwards at a o {=} © d

‘ f . | right angle with the basi-cranial axis, and enclosing the sockets the others, being valuable for their flesh as food, for their of the large incisor tusks, Anterior ‘part of the lower jaw bent

hides, and especially for the oil obtained from the thick | down in a corres ponding manner. Vertebre: C7, D18-19, L and layer of fat which lies immediately beneath their skin, | ©80. Tail broad y notched in the middle line, and with two pointed rapidly diminish in numbers as civilized populations occupy lateral lobes. No nails on the fore limbs. Caecum single.

. 5 ei ; ney The Dugongs are more distinctly marine in their habits than the the regions forming their natural habitat. The surviving Manatees, feeding chiefly on sea-water alge. They inhabit the

species are confined to the tropical regions of the shores of | shallow bays and creeks of the Red Sea, east coast of Africa, both sides of the Atlantic and the great rivers which | Ceylon, islands of the Bay of Bengal and the Indo-Malayan empty themselves into that ocean, and to the coasts of the Archipelago (including the Philippines), and the north coast of

; bs ‘ Australia, ranging from Barrow Reefs on the west to Moreton Bay Indian Ocean from the Red Sea to North Australia. In on the east. Thongh the distinctive characters are not very

the Miocene and early Pliocene epoch Sirenians abounded | obvious, they have been divided into three species, according to in the seas of Europe, and their remains have been found | the localities which they respectively

inhabit :—H, tabernacult in deposits of corresponding periods of North America. from the Red Sea, H. dugong from the Indian seas, and #.

Evid 1 lea & Ai A ok : e australis from Australia. The last-named has lately been the vidence has aiso been discovered of the existence of an object of a regular “ fishery,” chiefly on account of its oil, which is

animal of the group in the seas at the bottom of which the peculiarly clear, limpid, and free from disagreeable smell, and js Eocene nummulitic limestone mountain ranges of Egypt | said to have the same medical properties as cod-liver oil. Although were deposited. often stated in books to attain the length of 20 feet when adult,

r Pare . Oe there does not appear to be any evidence from actual specimens The existing genera present such well-marked distin- in museums that Dugongs ever reach half that size, 8 feet being

guishing characters that, if they alone were known, they | the common length of adult animals. might be placed in separate families; but, as in so many Lthytina.—No teeth, their place being supplied functionally similar cases, our knowledge of the extinct forms, imperfect | by the dense, strongly-ridged, horny oral plates. Premaxillary as it is, goes far to bridge over the distinction betwee rostrum about as long as the anterior narial aperture, and moderately »& 5 deflected. Vertebra: C7, D19, L and C 34-37. Head very small them. in proportion to the body. Tail with two lateral pointed lobes. Manatus.—Incisors 2, rudimentary, concealed beneath the horny | Pectoral limbs small and truncated. Skin naked and covered with oral plates, and disappearing before maturity. Molars j=}, but | a very thick, hard, rugged bark-like epidermis. Stomach without rarely more than § present at one time; the anterior teeth falling | cacal appendages to the pyloric cavity. Caecum simple. before the posterior come into use ; similar in characters from Only one species of this genus is known, R. stelleri, the Northern beginning to end of the series ; with square, enamelled crowns, the | Sea-cow, by far the largest animal of the order, attaining the length grinding surface raised into tuberculated transverse ridges, The | of 20 to 25 feet. It was formerly an inhabitant of the shores

Fic. 41.—American Manatee (Aanatus australis), from life. Proc, Zool, Soc., 1881, p. 457.

of two small islands in the North Pacific, Behring's and the adjacent Copper Island, on the former of which it was diseovered by the ill-fated navigator whose name the island bears, when, with his accomplished companion, the German naturalist Steller, he was wrecked upon it in 1741. Twenty-seven years afterwards (1768), as is commonly supposed, the last of the race was killed,} and its very existence would have been unknown to science but for the interesting account of its anatomy and habits left by Steller, and the few more or less perfect skeletons which have recently rewarded the researches carried on in the frozen soil of the islands around which it dwelt. 'There is no evidence at present of its having inhab- ited any other coasts than those of the islands just named, though it can hardly be supposed that its range was always so restricted.

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When first discovered it was extremely numerous in the shallow |

bays round Behring's Island, finding abundant nutriment in the large laminaric growing in the sea. Its extirpation is entirely due to the Russian hunters and traders who followed upon the track of the explorers, and who, upon Steller's suggestion, lived upon the flesh of the great Sea-cows. Its restricted distribution, large size, inactive habits, fearlessness of man, and even its affec- tionate disposition towards its own kind when wounded or iu distress, all contributed to accelerate its final extinction.

EXTINCT SIRENIA.

The Miocene and early Plioeene seas of Europe abounded in Sirenians, to which the generic name of Halitheritwm was given by Kaup. They had large tusk-like incisors in the upper jaw, as in the existing Dugongs, though not so greatly developed. Their molar teeth were £ or §, anteriorly simple and single-rooted, posteriorly those above with three and those below with two roots, and with enamelled and tuberculated or ridged crowns, in all which respects they more resemble those of the Manatee than of the Dugong. The anterior molars were deciduous. Some species at least had nasal bones,

short, broad, but normal in position, whereas in all the existing genera these bones are quite rudimentary, An- other and still more important evidence of conformity to the general mamunalian type is the better development of the pelvic bone, and the presence of a small styliform femur articulated to the acetabulum, although no traces of any other part of the limb have been dis- covered, 'hese ancicut Sirenians were thus, in dental, cranial, and other osteological characters, less specialized than are either of the existing species, and, if the intermediate links could be discovered, might well be looked upon as ancestral forms from which the latter have been derived, but at present the transitional conditions have not been deteeted. So far as is yet known, when changes in the physical conditions of the European seas rendered them unfitted to be the habitation of Sirenians, the Halitherium type still prevailed. If the existing Dugongs and Manatees are descended from it, their evolution must have taken place during the Pliocene and Pleistocene epochs, the one in seas to the east, the other to the west of the African continent, which has long formed a barrier to their intercommunication. Halitherium remains have been found in many parts of Germany, especially near Darmstadt, also in France, Italy, Belgium, Malta, the isthmus of Suez, &c. Until lately none were known from England, probably owing to the absence of beds of an age corresponding to those in which they are found on the European continent ; but recently a skull and several tceth have been detected among the rolled debris of Miocene formations, out of which the Red Crag of Suffolk is partially composed. The species are not yet satisfactorily charactcrized. Some of them appear to have attained a larger size than the existing Manatee or Dugong. One of these fron: the Pliocene of Italy and France, having but $ molar teeth, has been separated generically under the name of Felsinotheriwm by Capellini, by whom it has been fully described. A portion of a skull found in Belgium has been named Crassitherium by Van Beneden; and some eompressed tecth, some- what similar to but larger than those of the Dugong, discovered in the department of Lot-et-Garonne, France, gave origin to the genus Rytiodus of E. Lartet. Of this more complete remains have recently been described by Delfortrie. The rostrum is morc elong- ated than in Halitheriwm, but the skull is otherwise very similar, as are the molar teeth. The incisors are very large, exserted, strongly compressed, almost sabre-like, rounded on the upper or anterior surface, sharp below, concave on the external and convex on the inner side, and transversely striated.

Pachyacanthus of Brandt, from the Vienna basin, is also, accord- ing to Van Beneden, another form of Sirenia, of which, however, the skull is not known. In various Miocene and perhaps Eocene marine formations of the United States of America remains of Sirenians have been found, but mostly in such a fragmentary con- dition that they afford at present little evidence of the early history of the group in that country. A more satisfactory discovery is that

1 Nordenskidld, during his recent voyage in the " Vega," obtained some information from natives of Behring's Island which led him to believe that a few individuals may have survived to a much later date, even to 1854,

of a nearly complete skull and some bones from a limestone Tertiary formation in Jamaica, It is of smaller size than the Manatee, and as far as the teeth are coneerned, of a still more generalized character than Halitheriwm, the dentition being apparently 73, ¢4, p 3, m %=48. The incisors are small, not developed into tusks; the eanines (wanting iu all existing Sirenians) are rather larger than the incisors, judging by the sockets; and the molars are bilophodont, and covered with enamel. It has been described by Professor Owen under the name of Prorastomus strenoides. Unfortunately we have no knowledge of the geological antiquity of the formation in which it was embedded. Lastly must be mentioned the Zothcrium egyptiacum, Owen, founded on the east of a brain, with a small quantity of surrounding bone, discovered in the nuinmulitic lime- stone of Koeene age of the Mokattam Hills, near Cairo. The brain is narrower than in Afanatus, and resembles that of Halitherium. This is of interest as the most ancient known evidence of any Sirenian whose age has been geologically determined.

The few facts as yet eollected relating to the former history of the Sivenia leave us as much in the dark as to the origin and affinities of this peculiar group of animals as we were when we only knew the living members. They lend no countenance to their association with the Cetacca, and on the other hand their supposed affinity with the Uiguluta, so much favoured by modern zoologists, receives no very material support from them.

Bibliography of Sirenia—J. F. Brandt, Symbolex Sirenologicx, St Petersburg, 8 fascieuli, 1846-G1-68,— an exhaustive account of the

anatomy, affinities, and literature of the group, with copious illustrations of the osteology of Rhytina, Anatomy of Dugong :—Everard Home, Phil. Trans., 1820, p. 315; Owen, Proc. Zool. Soc., 1838, p.29. Manatee :—-Violik, Bijdr. tot de Dierkunde, 1851; Muric, Trans. Zool. Soc. Lond., vol, viii. p. 127, 1870, and vol. xi, p. 19, 1880; Garrod, ibid., vol. x. p. 187, 1875, Eatinct Sirenta;:—Gervais, Journal de Zoologie, tom. i. p. 882, 1872,

Orver CETACEA,

This is perhaps the most distinctly circumscribed aud natural of all the larger groups into which the class is divided.

The external form is Fish-like, the body being fusiform, passing anteriorly into the head without any distinct con- striction or neck, aud posteriorly tapering off gradually towards the extremity of the tail, which is provided with a pair of lateral, pointed expansions of skin supported by dense fibrous tissue, called "flukes," forming together a horizontally placed triangular propelling organ, notched in the middle line behind.

The head is generally large, in some species attuining to even more than one-third of the entire length of the animal, and the aperture of the mouth is always wide, and bounded by stiff immobile lips. The fore limbs are reduced to the condition of flattened ovoid paddles, encased in a continuous integument, showing no external sign of division into fore arm and manus, or of separate digits, and without any trace of nails. There are no signs of hind limbs visible externally. The general surface of the skin is smooth and glistening, and devoid of hair, although in many species there are a few fine bristles in the neighbourhood of the mouth, which may persist through life or be present only in the young state. Immediately beneath the skin, and intimately connected with it, is a thick layer of fat, held together by a dense mesh of areolar tissue, constituting the "blubber," which serves the purpose of the hairy covering of other mammals in retaining the heat of the body. In nearly all species a compressed median dorsal tegumentary fin is present. The eye is small, and is not provided with a nictitating membrane or true lacrymal apparatus. The external auditory meatus is a very minute aperture in the skin situated at a short distance behind the eye, and there is no vestige of a pinna. The nostrils open separately or by a single crescentic valvular aperture, not at the extremity of the snout, but near the vertex.

The bones generally are spongy in texture, the cavities being filled with oil. In the vertebral column, the cervical region is remarkably short and immobile, and the vertebra, originally always seven in number, are in many species more or less fused together into a solid mass. The odontoid process of the axis, when that bone is free, is usually very obtuse, or even obsolete. None of the vertebra are united

together to form a sacrum. The Inmbar and caudal vertebrae are numerous and large, and, as their arches are not connected by any articular processes (zygapophyses), they are capable of a very free motion in all directions. The epiphyses at the ends of the vertebral bodies are very distinct flattened disks, not uniting until after the animal has attained its full dimensions.1_ There are largely developed chevron bones, the presence of which indicates the distinction between the caudal and lumbar vertebra. The skull is modified in a very peculiar manner. The brain-case is short, broad, and high, almost spherical in fact. The supra-occipital bone rises upwards and for- wards from the foramen magnum, to meet the frontals at the vertex, completely excluding the parietals from the upper region of the cranium. The frontals are expanded laterally to form the roof of the orbits. The anterior narial aperture opens upwards, and has in front of ita

Fic. 42.—-A Seetion of the Skull of a Young Dolphin (@lobicephalus melas). x}. PMx, pre- maxilla; Mz, maxilla; Jf#, ossified portion of the mesethmoid; an, anterior nares ; Na,

corpora cavernosa are attached to them. In some species, to the outer surface of these are fixed other small bones or cartilages, the rudiments of the hind limb.

Teeth are generally present, but exceedingly variable in number. In the existing species, they are of simple, uni- form character, all having conical or compressed crowns and single roots, and are never preceded by milk teeth. They are therefore homodont and monophyodont. In one group, the Mystacocetes, the teeth are absent (except in the foetal condition), and the

palate is provided with numerous transversely placed horny lamine or "baleen." The salivary glands are rudimentary or absent. The stomach is multilocular. The intestinal canal simple, and only in some species provided with a small cecum. The liver is very little fissured, and there is no gall-bladder. The vascular system is greatly complicated by arterial and venous plexuses, or retia mirabilia. The larynx is of peculiar shape, the arytenoid cartilages and the epiglottis being much elongated, and together form- ing a tubular prolongation, which projects into the posterior nares, and when embraced by the soft palate forms a continuous passage between the nostrils and the trachea, as in the Ungulates, but ina more perfect manner. The brain is large re- latively to the size of the animal, very round in form, and with its surface divided by sulci into very numerous and complex convolutions. The kidneys are deeply lobulated. The testes are ab- dominal. There are no vesicule seminales, nor os penis. Theuterus is bicornuate, the placenta non- deciduate and diffuse. The mamme are two in number, and the nipples placed in depressions on each side of the vulva. The principal ducts of the gland are dilated during lactation into large reservoirs, into which the milk collects, and from which it is injected by the action of a compressor muscle into the mouth of the young animal, by which means the process of sucking under water is greatly facilitated and expedited.

The animals of the order Cetacea abound in all known seas, and some species are inhabitants of the larger rivers of South America and Asia.

[CETACEA.

nasal; /P, inter-parietal ; /'r, frontal; Pa, parietal; SO, supra-oceipital ; HaO, ex-occipital ; Their organization necessitates their passing their BO, basi-oeeipital; Sg, squamosal; Per, periotie; AS, alisphenoid ; PS, presphenoid ; 12, re 'ool in th 4 b pterygoid ; pn, posterior nares; Pl, palatine; Vo, Vomer; s, symphysis of mandible; zd, LUe entirely in the water, as on lan they are apso-

inferior dental canal; ep, eoronoid process of mandible; cd, condyle; a, angle; sh, stylo-hyal ; lutely helpless. They have, however, to rise very

bh, basi-hyal; ¢h, thyro-hyal, From Osteology of Mammalia.

more or less horizontally prolonged rostrum, formed of the maxille, premaxille, vomer, and mesethmoid cartilage, ex- tending forwards to form the upper jaw orroof of the mouth,

There are no clavicles. The humerus is freely movable on the scapula at the shoulder-joint, but beyond this the articulations of the limb are imperfect, flattened ends of the bones coming in contact with each other, with fibrous tissue interposed, allowing of scarcely any motion. The radius and ulna are distinct, and about equally developed, and much flattened, as are all the bones of the manus. There are four, or more commonly five, digits, and the number of the phalanges of the second and third digits always exceeds the normal number in mammals, sometimes very considerably ; they present the exceptional character of having epiphyses at both ends.2_ The pelvis is repre- sented by a pair of small styliform bones placed longitu dinally, suspended below and at some distance from the vertebral column at the commencement of the caudal region. These appear to represent the ischia, as the crura of the

1 This is an important distinction from the Sirenia, but a character common to nearly all other mammals. It is doubtful whether there is any foundation for the statement that these epiphyses remain ununited for an exceptionally long period in the Cetacea.

® A character repeated in some of the Seals,

frequently to the surface for the purpose of respira- tion; and, in relation to the constant upward and downward movement in the water thus necessitated, their principal instrument of motion, the tail, is expanded horizontally, quite unlike that of a Fish, whose movements are mainly in straightforward or lateral directions. The position of the respiratory orifice or nostril on the highest part of the head is very important for this mode of life, as it is the only part of the body the exposure of which above the sur- face is absolutely necessary. Of the numerous erroneons ideas connected with natural history, few are so widespread and still so firmly believed, notwithstanding repeated expositions of its falsity, as that the Cetacea spout out through their blowholes water taken in at the mouth. The fact is, the "spouting," or more properly " blowing," of the Whale is nothing more than the ordinary act of expiration, which, taking place at longer intervals

than inland animals, is performed with a greater amount of emphasis. The moment the animal rises to the surface it forcibly expels from its lungs the air taken in at the last inspiration, which of course is highly charged with watery vapour in consequence of the natural respiratory changes. This, rapidly condensing in the cold atmosphere in which the phenomenon is generally observed, forms a column of steam or spray, which has been erroneously taken for

water. It also often happens, especially when the surface of the ocean is agitated intu waves, that the animal com- mences its expiratory puff before the orifice has quite cleared the top of the water, some of which may thus be driven upwards with the blast, tending to com- plete the illusion. In hunting Whales the harpoon often pierces the lungs or air passages of the unfortunate victim, and then fountains of blood may be forced high in the air through the blowholes, as commonly depicted in scenes of Arctic adventure; but this is nothing more (nllowance being made for the Whale's peculiar mode of breathing) than what always follows severe wounds of the respiratory organs of other mammals.

All the Cetacea are predaceous, subsisting on living animal food of some kind. One genus alone (Orca) eats other warm-blooded animals, as seals, and even members of its own order, both large and small. Many feed on fish, others on small floating crustaceans, pteropods, and medus, while the principal staple of the food of many is constituted by the various species of cephalopods, Loligo and other Teuthidx, which must abound in some seas in vast numbers, as they form alinost the entire support of some of the largest members of the order. In size the Cetacea vary much, some of the smaller Dolphins scarcely exceeding 4 feet in length, while others are the most colossal of all animals. It is true that most statements of their bulk found in general and even zoological literature are greatly exaggerated, but even when reduced to their actual dimensions (which will be mentioned under the respective genera) some of thie existing Whales exceed in size that of any animal living either at present or in former times of which we have any certain evidence. With some excep- tions, the Cetacea generally are timid inoffensive animals, active in their movements, and very

affectionate in their disposition towards one another, especially the mother towards the young, of which there is usually but one, or at most two, at a time. They are generally gregarious, swimming in herds or " schools" (so termed by the whalers) sometimes amounting to many thousands in number; though some species have hitherto only been met with either singly or in pairs.

Relations of the different Cetacea to each other and to other Mammals.—As before said, the Cetacca form a per- fectly well-defined group, sharply separated from all other mammals, and with no outlying or doubtful forms at present known. Among the existing members of the order, there are two very distinct types, the Toothed Whales or Odontoceti and the Baleen Whales or Afystacoceti, which present as many marked distinguishing structural characters as are found between many other divisions of the Mammalia which are reckoned as orders. The extinct Zeuglodon, so far as its characters are known, does not fall into either of these groups, but is in some respects an annectant form, and therefore must be placed, provi- sionally at least, in a third group by itself.

The Mystacocetes appear at first sight to be the most specialized and aberrant of the existing Cetacea, as indicated by the absence of teeth, the presence of baleen, and the form and size of the mouth; but, as we see in other groups, dental characters, and all such as relate to the prehension of food generally, are essentially adaptive and consequently plastic or prone to variation, and hence cannot well be relied upon as tests of affinity. In another character, also adaptive, the laxity of the connexion of the ribs with the vertebral column and with the sternum, and the reduction of that bone in size, allowing great freedom of expansion of the thoracic cavity for prolonged immersion beneath the water, the Mystacocetes have passed beyond the Odonto- eetes in specialization. On the other hand, the greater symmetry of the skull, the more anterior position of the

external nostrils and their double external orifice, the form of the nasal bones, the presence of a distinctly developed olfactory organ, the mode of

attachment of the periotic bone to the cranium, the presence of a caecum and the regular arrangement of the alimentary canal, the more normal characters of the manus and the better development of the muscles attached to it, and the presence, in many species at least, of parts representing not only the bones but the muscles and ligaments of a hind limb,! all show less deviation from the ordinary mammalian type than is presented by tle Odontocetes. Taking all these characters into consideration, it does not appear reasonable to suppose that either type has been derived from the. other, at all events in the form in which we see it now, but rather that they are parallel groups, both modified in different fashions from common ancestors, .

Among the ~~Mystacocetes, in the especially distinguish~~ ing characters of the division, the Balenoptere are less specialized than the Balanex, which in the greater size of the head, the length and compression of the rostrum, the development of the baleen, and shortness of the cervical region are exaggerated forms of the type, and yet they retain more fully some primitive characters, as the better development of the hind limb, the pentadactylous manus, and the absence of a dorsal fin. Both forms are found distinct in a fossil state as far back as the early Pliocene age, but generally represented by smaller species than those now existing. 'The Mystacocetes of the Miocene seas were, so far as we know at present, only Balenoptere, some of which (Cetotherium) were, in the elongated flattened

form of the nasal bones, the greater distance between the

occipital and frontal bone at the top of the head, and the greater length of the cervical vertebra, more generalized than those now existing. In the shape of the mandible also, Van Beneden, to whose researches we are chiefly indebted for a knowledge of these forms, discerns some approximation to the Odontocetes,

Among the last-named group there are several distinct types, of which that represented by Platanista, althongh in some respects singularly modified, has been considered to present on the whole approximations towards the more normal and general type of mammalian structure. It is therefore interesting to find asimilar form well represented among the earliest fossil remains of Cetaceans in Europe. Almost all the other members of the

suborder range them- selves under the two principal heads of Ziphioids (or Physeteroids) and Delphinoids. The former is an ancient and once abounding type, of which the Sperm Whale (Physeter) is a highly specialized form. Among the latter, Globicephalus is a modified form as regards the structure of its anterior extremity, and Jfonodon as regards its dentition, while Delphinus with its various minor subdivi- sions may be regarded as the dominating type of Cetaceans at the present day, abundant in slightly differentiated species and abundant in individuals. They are in this respect to the rest of the order much as the hollow-horned Ruminants are to the Ungulates.

The earliest Cetaceans of whose organization we lave anything like complete evidence are tle AZeuglodons of the Eocene period,? which approach in the structure of skull and teeth to a more generalized mammalian type than either of the existing suborders. The smallness of the cerebral cavity compared with the jaws and the rest of theskull they share with the primitive forms of many other types. The forward

I These have recently becn described in detail by Professor Struthers in the Journal of Anatomy and Physiology, 1881.

2 The cervical vertebra of Paleocetus, supposed to be from the Cam- bridge Greensand, and a single caudal vertebra lately found in the Upper Eocene at Roydon in Hampshire, may for the present he omitted

from consideration, as too inconclusive in the nature of the evidence they afford as to the history of the group.

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position of the narial aperture and the length and flatness of the nasal bones, which distinguish them from all existing forms, we must also suppose to be a character at one time common to all Cetaceans, though now retained (but to a less degree) only by the Mystacocetes. Even Squalodon, which in its heterodont dentition so much resembles Zeuglodon as to have been placed by soine zoologists in the same genus, entirely differs from it,

and conforms with the ordinary Dolphins in its essential cranial characters. The origin of the Cetacea is at present involved in much obscurity. They present no signs of closer affinity to any of the lower classes of vertebrates than do many other members of their own class. Indeed in all that essentially distinguishes a mammal from the oviparous vertebrates, whether in the osseous, nervous, reproductive, or any other system, they are as truly mammalian as any other group. Any supposed marks of inferiority, as absence of limb structure, of hairy covering, of lacrymal apparatus, &c., are obviously modifications (or degradations, as they may be termed) in adaptation to their special mode of life. The characters of the teeth of Zeuglodon and other extinct forms, and also of the foetal Mystacocetes, clearly indicate that they have been derived from mammals in which the heterodont type of dentition was fully established. The steps by which a land mammal may have been modified into a purely aquatic one are clearly indicated by the stages which still survive among the Carnivora, in the Otarie, and in the true Seals. A further change in the same direction would produce an animal somewhat resembling a Dolphin, and it has been thought that this may have been the route by which the Cetacean form has been developed. There are, however, great difficulties in the way of this view. If the hind limbs had ever been developed into the very efficient aquatic propelling organs they present in the Seals, it is not easy to imagine how they could have become completely atrophied and their function transferred to the tail. It is more likely that the Whales were derived from animals with long tails, which were used in swimming, eventually with such effect that the hind limbs became no longer necessary. The powerful tail, with its lateral cutaneous flanges, of an American species of Otter (Pteronura sandbachti) may give an idea of this member in the primitive Cetaceans. But the structure of the Cetacea is, in so many essential characters, so unlike that of the Carnivora that the probabilities are against these orders being nearly related. Even in the skull of the Zeuglodon, which has been cited as presenting a great resemblance to that of a Seal, quite as many likenesses may be traced to one of the primitive Pig-like Ungulates (except in the purely adaptive character of the form of the teeth), while the elongated larynx, complex stomach, simple liver, reproductive organs both male and female, and foetal membranes of the existing Cetacea are far more like those of that group than of the Carnivora. Indeed it appears probable that the old popular idea which affixed the name of " Sea-Hog"2

to the Porpoise contains a larger element of truth than the speculations of many accomplished zoologists of modern times. The fact that Platanista, which, as mentioned above, appears to retain more of the primitive characteristics of the group than any other existing form, and also the somewhat related Jzza from South America, ure both to the present day exclusively fluviatile, may point to the freshwater origin of the whole group, in which case their otherwise rather inexplicable absence

from the seas of the Cretaceous period would be accounted for.

1 There is much resemblance in the larynx of the Hippopotamus, but none in that of the Seal, to the same organ in the Cetacea.

2 German, Meerschwein, whence the French Marsouin, "Porpoise" is said to be derived from " Porc-poisson."

MAMMALIA

[CETACEA.

Suporper MYSTACOCETI, the BALENOIDEA, or Whalclione Whales.

Teeth never functionally developed, but always disappearing before the close of intra-uterine life. Palate provided with plates of baleen or " whalebone." Skull symmetrical. Nasal bones forin- ing aroof tothe anterior nasal passages, which are directed upwards and forwards. Maxilla produced in front of, but not over, the orbital process of the frontal. Lacrymal bones small and distinct from thejugal. Tympanic bone ankylosed with the periotic, which is attached to the base of the cranium by two stroug diverging processes, Olfactory organ distinctly developed. Rami of mnandible arched outwards, their anterior ends meeting at an angle, and connected by fibrous tissue without any true symphysis. All the ribs at their upper extremity articulating only with the transverse processes of the vertebre ; their capitular processes when present not articulating directly with the bodies of the vertebrae. Sterunm composed of a single piece, and articulating only with a single pair of ribs. No ossified sternal ribs. External openings of nostrils distinct from each other, longitudinal. A short conical eecum.

These animals have, when in the foetal state, numerous, minute, ealcified teeth lying in the dental groove of both upper and lower jaws. They aré best developed about the middle of fectal life, after which period they are absorbed, and no trace of them remains at the time of birth.? The baleen or whalebone does not make its appear- ance until after birth. It consists of a series of flattened horny plates, between three and four hundred in number, on each side of the palate, with a bare interval along the middle line. They are placed transversely to the long axis of the palate, with very short intervals between them. Each plate or blade is somewhat triangular in form, with the base attached to the palate and the apex hanging downwards. The outer edge of the blade is hard and smooth, but the inner edge and apex fray out into long bristly fibres, so that the roof of the whale's mouth looks as if covered with hair, as deseribed by Aristotle. At the inner edge of each principal blade are two or three much smaller or subsidiary blades. The principal blades are longest near the middle of the series, and gradually diminish towards the front and back of the mouth. The horny plates grow from a dense fibrous and highly vascular matrix, which covers the palatal surface of the maxill, and which sends out lamellar processes, one of which penetrates the base of each blade. More- over, the free edge of these processes is covered with very long vascular thread-like papilla, one of which forms the eentral axis of each of the hair-like epidermic fibres of which the blade is mainly composed.

Our knowledge of the different structural modifications at-

3 These were discovered in the Greenland Whale by Geoffroy St Hilaire, whose observations were confirmed and extended to other genera by Eschricht. They have lately been very fully described in Balenoptera rostrata by Julin (Archives de Biologie, i., 1880).

4 For the structure of whalebone, see Hunter, " Observations on the Structure and Economy of Whales," Phil. Trans., 1787 ; Eschricht and Reinhardt, On the Greenland Right Whale, English translation by the Ray Society, 1866, pp. 67-78 ; and W. Turner, in Zrans. Roy. Soc. Hdin., 1870.

CETACEA. |

tained by members of this important group of mammals, though largely increased of late years, is still imperfect. Formerly they were all divided into Right Whales (Balxna) and Rorquals or Fin- whales(Balenoptera), the latter distinguished by their smaller heads, elongated and slender form, free cervical vertebrae, tetradactylous manns, and the presence of very conspicuous longitudinal furrows or folds in the skin of the throat and chest, and of a small adipose dorsal fin. Recent discoveries have, however, brought to light several forms holding a somewhat intermediate position, and pre- senting combinations of characters not found in cither of the larger known sections. According to our present knowledge the group is naturally divided into five very distinct genera. As these will be more fully described in the article WHALE, it will be suflicient at present to indicate their principal characteristics,

Balena.—Skin of throat smooth, not furrowed. No dorsal fin. Cervical vertebree united into a single mass. Pectoral limb short, broad, and pentadactylous. Head very large. Baleen very long and narrow, highly clastic and black. Scapula high, with a distinct coracoid and coronoid process. This genus contains the well-known Greenland Right Whale (B. mystieetus) of the Arctic seas, the whale- bone and oil of which are so much valued in commerce, and also other whales, distinguished from this by having heads somewhat smaller in proportion to the body, with shorter baleen, and a larger number of vertebre. These inhabit the temperate seas of both northern and southern hemispheres, and have been divided by zoologists into several species in accordance with their geographical distribution,—B. biscayensis of the North Atlantic, B. japonica of the North Pacific, B. australis of the South Atlantic, and B. antipodarum and nove-zelandiw of the South Pacific; but the differential characters by which they have been separated—external as well as anatomical—are so slight and so liable to individual varia- tion that it is not improbable that when they are better known they will all come to be regarded as forming but a single species.

Neobalena.—Known chiefly at present by the characters of the skeleton and baleen, which are very different from those of all other whales, but said to combine absence of plications of the throat with the presence of a dorsal fin. The cervical vertebra are united. The manus small, narrow, and

tetradactylous, wanting the pollex. The ribs remarkably expanded and flattened. The scapula very low and broad, with completely developed acromion and coracoid processes. Baleen very long, slender, elastic, and white. A single at present very rare species, V. marginata, from the Australian and New Zealand seas, is the smallest of the Whalebone Whales, being not more than 20 feet in length.

Raehiancetes.—This combines the small head, elongated form, and narrow pectoral fin of Balwnoptera with the smooth skin of the throat and absence of the dorsal fin of Balezna. The baleen is the shortest and coarsest of any of the group. Its osteology is im- perfectly known. One species, 2. glawews, the Grey Whale of the North Pacifie.

Megaptera.—Wead of moderate size. Baleen plates short and broad. Cervical vertebra free. Scapula with acromion and coracoid process absent orrudimentary. Skinof throat plicated. Dorsal fin low. Pectoral limb tetradactylous, very long and narrow, attaining about one-fourth of the length of the entire animal, the metacarpus and phalanges being greatly developed, and the latter very numerous. Animals of this genus, called " Humpbacks" by the whalers, are found in almost all seas. They have been divided into many species, but no satisfactory characters have yet been pointed out by which these can be distinguished from one another.

Balenoptera.—Head small and flat, and pointed in front. Body long and slender. Skin of throat plicated. A small falcate dorsal fin. Baleen short and coarse. Cervical vertebre free. Scapula low and broad, with a large acromion and coracoid process. Pectoral limb tetradactylous, small, narrow, and pointed. This genus con- tains the various species of Rorquals, Fin-whales, Fin-backs, Finners, or Razor-backs, as they are variously called, some of which are found in almost every sea. Among them are the most gigantic of all animals, B. sibbaldii, which attains the length of 80 feet, and the small B. rostrata, which does not exceed 30. There are certainly four quite distinct modifications of this genus, represented by the two just mentioned, and by B. museulus and B. borealis, all inhabitants of British seas, but the question whether almost identical forms found in the Southern and Pacific Oceans are to be regarded as specifically identical or as distinct awaits the result of future rescarches.

SuporpEeR, ARCH AOCETT.

This group is formed to include certain extinct Cetaceans, which are at present only known by more or less fragmentary portions of their skeleton and teeth, and whose position and affinities are therefore still subject to doubt.

In the anterior part of both jaws the teeth are simple, conical, or slightly compressed, and sharp-pointed. The first three in the upper jaw are distinctly implanted in the premaxillary bone, and so may be reckoned as incisors. The tooth which succeeds, or the canine, is also simple and conical, but it does not excced the others

in size. This is followed by five teeth with two distinct roots, and compressed, pointed crowns, with denticulated cutting edges. The dentition is therefore 7 3, ¢ +, p and m $=86, resembling that of some Seals.! General form of the skull elongated and much depressed. Brain cavity very small, and the skull between it and the orbits elongated and narrow. 'I'emporal fosse very large. A strong sagittal crest. Rostrum long and narrow, differing from that of other Cetaceans in the large extent to which the premaxille form the sides of the anterior extremity. Nasal bones elongated, flat, and narrow, the opening of the anterior nares being over the middle of the elongated compressed rostrum. All the cervical vertebrae free. The characters of the dorsal vertebre, and mode of articulation of the ribs, appear to have resembled those of Platanista rather than Balena, Physeter, or Delphinus. WLumbar vertebre with elongated bodies. Characters of the limbs not known with certainty.?

All the known fossil reinains belonging to the animals of this group may be referred, provisionally at least, to the genus Zeuglodon, so named because the first section of a molar tooth examined was taken from the base of the crown, where it was beginning to divide into the two roots, and looked like two single teeth "linked or yoked together." This name was substituted by Owen for the earlier one Basilosaurus of Harlan, with the consent of that

author, on the mammalian nature of the animal being demonstrated. The latter naine is, however, still generally retained by American zoologists. The remains have hitherto been found chiefly in the Eocene for- mations of the States of Alabama, Louisiana, Mississippi, and Arkansas, and have been assigned to several species. A portion of a skull is recorded from the Barton Clay (Eocene) of Hampshire, England.

SuborpDEer ODONTOCETT, the DELPHINOIDEA, 07 Toothed Whales.

Calcified tecth always present after birth ; generally numerous, but sometinies a very limited number (in a few cascs none) are functionally developed. No baleen. Upper surface of the skull more or less asymmetrical. Nasal bones in the form of nodules or flattened plates, applied closely to the frontals, and not forming any part of the roof to the narial passage, which is directed upwards and backwards. Olfactory organ rudimentary or absent. Hinder end of the maxilla expanded and covering the greater part of the orbital plate of the frontal bone. Lacrymal bone either inseparable from the jugal, or, when distinct, very large, and forming part of the roof of the orbit. Tympanfe bone not ankylosed with the periotic, which is usually only attached to the rest of the skull by ligament. Rami of mandible nearly straight, much expanded in height posteriorly, with a wide funnel-shaped aperture to the dental canal, and coming in contact in front by a flat surface of variable length, but always constituting a true symphysis. Several of the anterior ribs with well-developed capitular processes, which articn- late with the bodies of the vertebrae. Sternum almost always com- posed of several picces, placed one behind the other, with which several pairs of ribs are always connected by the intervention of well-developed cartilaginous or ossified sternal ribs, External respiratory aperture single, the two nostrils uniting before they reach the surface, usually in the form of a transverse subcrescentie valvular aperture, situated on the top of the hcad. Manus always pentadactylous, though the first and fifth digits are usually very little developed. No cecum, except in Platanista.

Family PHYSETERID.

No functional teeth in the upper jaw. Mandibular teeth varions, often much reduced in number. Bones of the cranium raised so as to form an elevated prominence or crest behind the nares. Pterygoid bones thick, produced

backwards, meeting in the middle line, and not involuted to form the outer wall of the post-palatine air-sinuses, but simply hollowed on their outer side. Transverse processes of the arches of the dorsal vertebra, to which the tubercles of the ribs are attached, ceasing abruptly near the end of the series, and replaced by processes on the body at a much lower level, and not on a line, or serially homologous with them, but serially homologous anteriorly with the heads of the ribs, and posteriorly with the transverse processes of the lumbar vertebra. (In soine genera, as Physeter, the two processes, upper and lower on each side, are both present and well developed in the same vertebra in the region of transition. In others, as Ziphius and Berardius, they are not both developed on any single vertebra.) Costal cartilages not ossified.

Subfamily Physeterinee.—Numerous teeth in the mandible, which are not set in distinct bony alveoli, but in a long groove

1 An appearanee In one specimen has been described by C. G. Carus as indi- cating a vertical succession of the teeth, but the evidence upon which this rests is by no means satisfactory, and appears to admit of another explanation.

2 A mutilated humerus of Zeuglodon cetoides has given rise to many eonjeetures, appearing to some anatomists to indicate Seal-like freedom of motion at the elbow- joint, while to others its eharaeters appear to be truly Cetacean.

3 See Trans. Geol. Soc. Lond., ser. ii., vol. vi. p. 67.

imperfectly divided by partial septa, and heid in place by the strong, fibrous gum. which surrounds them. No distinct lacrymal bone. Cranium strikingly asymmetrical in the region of the narial apertures, in consequence of the left opening greatly excceding the right in size.

Physeter.—Upper teeth apparently of uncertain number, rudi- inentary and functionless, being embedded in the gum. Lower jaw with from 20 to 25 teeth on cach side, stout, conical, recurved, and pointed at the apex until

they are worn, without enamel. Upper surface of the cranium concave; its posterior and lateral edges raised into a very high and greatly compressed semicircular crest or wall. Zygomatic processes of malar bones thick and massive. Rostrum greatly elongated, broad at the base and gradually tapering to the apex. Upper edge of the mesethmoid forming a roughened irregular projection between the narial apertures, inclining to the left side. Mandible exccedingly long and narrow, the symphysis being more than half the length of the ramus. Vertebre: 07, D11,

Fig. 43.—Skull of Sperm Whale (Physeter macrocephalus).

L8, 24; total 50. Atlas free; all the other cervical vertebre united by their bodies and spines into a single mass. Eleventh pair of ribs rudimentary. Head about one-third the length of the body; very massive, high and truncated, and rather compressed in front ; owing its huge size and remarkable form mainly to the great accumulation of a peculiarly modified form of adipose tissue filling the large hollow on the upper surface of the cranium and overlying the rostrum. The single blowhole is longitudinal, slightly sigmoid, and placed at the upper and anterior extremity of the head to the left side of the middle line. The opening of the mouth is on the under side of the head, considerably behind the end of the snout. Pectoral fin short, broad, and truncated. Dorsal fin a mere low protuberance.

There is no certain evidence that more than one species of this genus exists. This is the Cachalot or Sperm Whale, P. macro- cephalus, one of the most colossal of animals, quite equalling, if not exceeding, the Greenland Whale in bulk. The length of the full-grown male is from 55 to 60 feet, but the female is stated not to reach more than half that size. It feeds chiefly on cephalopods and fish, and is one of the most extensively distributed of Cetaceans, being met with, usually in herds or "schools," in almost all tropical or subtropical seas, but not occurring, except accidentally, in : the polar regions. Those that appear occasionally on the British coasts are solitary stragglers, usually, if not always, old males. The oil contained in the great cavity above the skull, when refined, yields "spermaceti," andthe thick covering of blubber which everywhere envelops the body produces the valuable 'sperm oil" of commerce ; hence this animal has long been the subject of a regular chase, by which its numbers have been greatly

diminished. The substance called "ambergris," largely used in perfumery, is a concretion formed in the intestine of the Sperm Whale, and is found floating on the surface of the seas which they inhabit. Its genuineness is attested by the presence of the debris 'of the horny beaks of the cephalopods on whieh the Whales feed.

Kogia.—Teeth of the upper jaw absent or reduced to a rudi- mentary pair in front; in lower jaw 9 to 12 on each side, rather long, slender, pointed, and curved, with a coating of enamel. Upper surface of the cranium concave, with thick, raised, posterior and latcral margins, massive and rounded at their anterior terminations above the orbits. Upper edge of the mesethmoid forming a pro- minent sinuous ridge, constituting a kind of longitudinal septum to the base of the great supra-cranial cavity. Rostrum not longer than the cranial portion of the skull, broad at the base, and rapidly tapering to the apex. Zygomatic process of the malar styliform. Mandible with symphysis less than half the length of the entire ramus. Vertebre: C7, D13 orl4, L and C 80; total 50o0r51. All the cervical vertebrae united by their bodies and arches. External characters not well known, but, judging by the somewhat conflicting accounts of those that have had an opportunity of observing them, the head is about one-sixth of the length of the body, and obtusely pointed in front ; the mouth small and placed far below the apex of the snout; the spiracle crescentic, and placed obliquely on the

top of the head anteriorly to the eyes, and to the left of the middle line ; the pectoral fins are obtusely falcate ; and there is a trian- gular dorsal fin.

The history of this genus is a good illustration of the difficulties in which the study of the Cetacea hag been involved by the super- ficial manner in which it has been investigated. The first known example, a skull from the Cape of Good Hope in the Paris Museum, was described by Blainville under the name of Physeter brevieeps. This was afterwards with good reason generically separated by Gray. Until within a very few years ago only five other individuals had been met with, each of which had been described under a different specific name (viz., grayt, macleayi, simus,

flowert, and potsii), and which are arranged by Gray in two distinct genera. The most careful examination of the description given of these specimens, or of the now numerous osteological remains available, fails to detect any differences beyond those which may be attributed to age or sex ; and hence, according to our present knowledge, these six supposed species must all be included, under one name, K. breviceps, au animal which appears to attain the length of 10 feet when adult, aud has been met with at various distant localities in the Southern Ocean, and also off the coast of Madras and in the North Pacific.

Subfamily Ziphiines.—Teeth of the mandible quite rudimentary and concealed in the gum, except one, or very rarely two, pairs which may be largely developed, especially in the male sex. A distinct lacrymal bone. Jxternally the mouth is produced into a slender rostrum or beak, from above which the rounded eminence formed by a cushion of fat resting on the cranium in front of the blowhole rises somewhat abruptly. Spiraele or blowhole single, crescentic, median, asin the Delphinide. Pectoral fin small, ovate, the five digits all moderately well developed. A small obtusely faleate dorsal fin situated considerably behind the middle of the back. Longitudinal grooves on each side of the skin of the throat, diverging posteriorly, and nearly meeting in front. In external characters and habits the animals of this group closely resemble each other. They appear to be almost exclusively feeders on various species of cephalopods, and occur either singly, in pairs, or in small herds. By their dental and osteological characters they are easily separated into four distinct genera.

Hyperoodon.—A small conieal pointed tooth at the apex of cach ramus of the mandible, concealed by the gum during life. Skull with the upper ends of the premaxille rising suddenly behind the nares to the vertex and expanded laterally, their outer edges curving backwards and their anterior surfaces arching forwards and overhang- ing the nares ; the right larger than the left. Nasal bones lying in the hollow between the upper extremities of the premaxille, strongly concave in the middle line and in front; their outer edges, espe- cially that of the right, expanded over the front of the inner

Fia. 44.—Hyperoodon rostvatus. From a specimen taken off the coast of Scotland, 1882.

border of the maxilla. Very high longitudinal crests on the maxill at the base of the rostrum, extending backwards almost to the nares, approaching each other in the middle line above; sometimes compressed and sometimes so massive that their inner edges come almost in contact. Anteorbital notch distinct. Mesethmoid but slightly ossified. Vertebra: C7, D9, L.10, C19; total 45. All the cervical vertebre united. Upper surface of the head in front of the blowhole very prominent and rounded, rising abruptly from above the small, distinct snout.

Two species are known, Z. rostratus, the common Hyperoodon or Bottle-nose, and H. latifrons, both inhabitants of the North Atlantic, and attaining when adult respectively the length of 24 and 30 feet.

Ziphius.—A single conical tooth of moderate size on each side of the mandible close to the anterior extremity, and directed forwards and upwards. Skull with the premaxille immediately in front and at the sides of the nares expanded, hollowed, and with elevated. lateral margins, the posterior ends rising to the vertex and curving forwards, the right being considerably more developed than the left; the conjoint nasals forming a strongly pronounced sym- metrical eminence at the top of the cranium, projecting forwards over the nares, flat above, most prominent and rounded in the middle line in front, and separated by a notch on each side from the premaxille. Anteorbital notch not distinct. Rostrum (seen from above) triangular, gradually tapering from the base to the apex ; upper and outer edges of maxille at base of rostrum raised into low roughened tuberosities. Mesethmoid cartilage densely ossified in adult age, and coalescing with the surrounding bones of the rostrum. Vertebre: C7, D10, L10, C 22; total 49. The three anterior cervical vertebree united, the rest free.

ORTACEA. |

The type of this genus is 7. cavirostris of Cuvier, founded upou an imperfect skull picked up in 1804 on the Mediterranean coast of France, and described and figured in the Ossemens Fossiles under the impression that it was that of an extinct species. Many other individuals have, however, been subsequently met with in various parts of the world, from the Shetland Islands to New Zcaland, all referable to the same genus if not to the same species ; although, as is usual in such cases, they have mostly been

described under different names. Teeth, apparently of allied forms, are abundantly found in the Suffolk and Antwerp Crags.

Mesoplodon.\—A much compressed and pointed tooth in each vamus of the mandible, variously situated, but generally at some distance behind the apex ; its point directed upwards, and often somewhat backwards, occasionally developed toa great size. Skull with the region around the nares as in Hyperoodon, except that the nasals are narrow and more sunk between the upper ends of the

From Reinhardt.

Fig. 45.—Jesoplodon bidens,

remaxille ; like those of yperoodon, they are concave in the middle

ine in front and above. No maxillary tuberosities. Anteorbital notch not very distinct. Rostrum long and narrow. Mesethmoid in adult age ossified in its entire length, and coalescing with the surrounding bones. Vertebre: C7, D 10, L.10 or 11, C19 or 20; total 46 to 48. Two or three anterior cervicals united, the rest usually free.

Though varying in form, the mandibular teeth of the different members of this genus agree in their essential structure, having a small and pointed enamel-covered crown, composed of true dentine, which, instead of surmounting a root of the ordinary character, is raised upon a solid mass of osteodentine, the continuous growth of which greatly alters the form and general appearance of the organ as age advances, as seen most strikingly in the case of M. layardi, where the long, narrow, flat, strap-like teeth, curving inwards at their extremities, actually meet over the rostrum, and must greatly interfere with the movements of the jaw. In one species (M. grayi) a row of minute, conical, pointed teeth, like those" of ordinary Dolphins, 17 to 19 in number, are present even in the adults, on each side of the middle part of the upper jaw, but embedded by their roots only in the gum, and not in bony alveoli. This fact, with the frequent presence of rudimentary teeth in other species of this and the last genus in both upper and lower jaws, suggests the idea that the Ziphioids are derived from

ancestral forms having teeth of normal character in both jaws, but whose dentition

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Fig. 46.—Skull of Mesoplodon densirostris,

has become greatly specialized. The existing specics of this genus are widely distributed in both northern and southern hemispheres, but most frequent in the latter. The best established are MM. bidens, M. europewus, M. densirostris, M. layardi, M. gray, and M. hectort; but there is still much to be learned with regard to their distinctive characters and geographical distribution. 'They were abundant in the Later Miocene and Pliocene age, as attested by the frequency with which the most imperishable and easily recognized portion of their structure, the long, cylindrical rostrum of the skull, of more than ivory denseness, is found among the rolled and waterworn fragments of animal remains which compose the well-known "bone-bed" at the base of the Red Crags of Snffolk. Numerous generic distinctions have been founded upon slight modifications of the form of these rostra, such as Choneziphius, Placoziphtus, Belemnoziphius, &c., but these can only be considered as provisional until further knowledge is obtained of the structure of the animals to which they belonged.

Ya For the very eomplicated synonymy of this genus, see Trans. Zool. Soc,, vol. viii, p. 208.

Berardius. —Two moderate-sized, compressed, pointed tecth on each side of the symphysis of the mandible, with their apices directed forwards, the anterior being the larger of the two and close to the apex. Upper ends of the premaxille nearly symmetrical, moderately elevated, very slightly expanded, and not curved forward over the nares. Nasals broad, massive, and rounded, of nearly equal size, forming the vertex of the skull, flattened in front, most prominent in the middie linc. Anteorbital notch distinct. Rostrum long and narrow. Mesethmoid only partially ossilied. Small rugous

eminences on the outer edge of the upper surface of the maxille at base of rostrum. Vertebre: C 7, D10, L 12, C19; total 48, whe three anterior cervicals ankylosed, the rest free and well developed.

The only known species, B. arnouxt, attains the length of 30 “ 7 has hitherto only been met with in the seas around New

ealand.

Family SQUALODONTIDA.

Numerous extinct forms, chiefly known by teeth and fragments of crania, may be provisionally placed here, until more of their osteological characters shall be brought to light. They differ from all existing Cetaceans in having the teeth distinctly differentiated into groups, as in the Archxoceti, the posterior molars being two-rooted. The cranium, has, however, none of the distinguishing characteristics of the Zcuglo- dons, but essentially resembles that of the Odontoceti, especially in the position of the anterior nares and form of the nasal bones.

The best-known are associated in the genus Sgualodon. Denti- tion: 7 $, c4, simple teeth of the molar serics (premolars ?) 4, two- rooted molars 7=+8; total 60. The double-rooted molars differ from those of Zeuglodon in having the denticulations of the crown | confined to the posterior border, or at all events much less developed on the front edge. Very little is known of the structure of these animals, beyond the skull and teeth, fragments of which have been found widely distributed throughout the marine Miocene and Early Pliocene formations of Europe, especially in the Vienna basin, many parts of France, and the Antwerp and Suffolk Crags. They have also been found in formations of corresponding age in North America and South Australia.

Family PLATANISTIDA.

Under this heading may be placed three very singular genera, which, though differing considerably from each other, have several points in common, and do not altogether come under the definition either of the Physeteridx or the Delphinide, especially in the important character of the

mode of articulation of the ribs with the dorsal vertebra, as the tubercular and capitular articulations, distinct at the commencement of the series, gradually blend together, as they do in most ordinary mammals. The cervical vertebre are all free. The lacrymal bone is not distinct from the malar. The jaws are long and narréw, with numerous teeth in both. The symphysis of the mandible exceeds half the length of the whole ramus. Externally the head is divided from the body by aslightly constricted neck, Pectoral limbs broad and truncated. Dorsal fin small or obsolete. Fluviatile or estuarine. There are three distinct genera, which might almost be made the types of families, but it is probably more convenient to keep them together.

Platanista.—Teeth about 3% on each side, set near together, vather large, cylindrical, and sharp-pointed in the young ; in old animals acquiring a large laterally compressed base, which in the posterior part of the series becomes irregularly divided into roots. 'As the conical enamel-covered crown wears away, the teeth of the young and old animals have a totally different appearance. The rostrum and dentigerous portion of the mandible are so narrow that

From Anderson.

Fig. 47.—Platanista gangetica.

the tceth of the two sides are almost in contact. Maxille support- ing very large, incurved, compressed bony crests, which overarch the nares and base of the rostrum, and almost meet in the middle line above. Orbits very small and eyes rudimentary, without crystalline lens. External respiratory aperture longitudinal, linear. Vertebre: C7, D 11, L 8, C 25; total 51. Asmall cecum. No pelvic bones. Dorsal fin represented by a low ridge.

One species, P. gangetica, entirely fluviatile, being extensively distributed throughout nearly the whole of the river systems, not only of the Ganges, but of the Brahmaputra and Indus, ascending as high as there is water enough to swim in, but never passing out to sea. It is quite blind, and feeds on small fish and Crustacea,

groping for them with its long snout in the muddy water at the bottom of the rivers. It attains the length of 8 feet.

Inia.—Teeth variable, from 26 to 33 on each side of each jaw; those at the posterior part with a distinct tubercle at the inner side of the base of the crown. Vertebree: C7, D13, L8, C18; total 41. Transverse processes of lumbar vertebre very broad. Sternum short and broad, and consisting of a single segment only. Dorsal fina mere ridge. The long cylindrical rostrum externally furnished with scattered, stout, and crisp hairs. One species only is known, I. geofrensis, about 8 feet in length, inhabiting the upper Amazon and its tributary streams.

Pontoporia,—-Teeth 50 to 60 on each side of each jaw, with a eingulum at the base of the crown. Jaws very long and slender. Vertebre: C7, D10, L 5, C19; total 41. Transverse processes of the lumbar vertebra extremely broad. Sternum elongated, composed of two segments, with four sternal ribsattached. Dorsal fin rather small, triangular, pointed. External respiratory aperture transverse,

Fic. 48.—Pontoporia blainvillit, From Burmeister, This genus connects the last two forms with the true

crescentic, Delphinide. The only species, P. dblainvillii, is one of the smallest of the whole order, not exceeding 5 feet in length. It has only been met with at the mouth of the Rio de la Plata, near Buenos Ayres, and there is at present no evidence that it ascends into the fresh waters of the river.

Family DELPHINIDA.

Teeth usually numerous in both jaws. Pterygoid bones short, thin, each involuted to form with a process of the palate bone the outer wall of the post-palatine air-sinus. Symphysis of mandible short, or moderate, never exceeding one-third of the length of the ramus. Lacrymal bone not distinct from the jugal. Transverse processes of the dorsal vertebre gradually transferred from the arches to the bodies of the vertebre without any sudden break, and becoming posteriorly continuous serially with the transverse pro- cesses of the lumbar vertebra. Anterior ribs attached to the transverse process by the tubercle, and to the body of the vertebra by the head; the

latter attachment lost in the posterior ribs. Sternal ribs firmly ossified. External respiratory aperture trans- verse, crescentic, with the horns of the crescent pointing forwards.

A very large group, closely united in essential characters but presenting great modifications in details. 'The different types are mostly so connected by intermediate or osculant forms that there are great difficulties in grouping them into natural subfamilies, Even the formation of well-defined genera is by no means satis- factory in all cases.

Monodon.—Besides some irregular rudimentary teeth, the entire dentition is reduced to a single pair of teeth which lie horizontally in the maxilla, and which in the female remain permanently concealed within the alveolus, so that this sex is practically toothless, while in the male (see fig. 49) the right tooth usually remains similarly concealed and abortive and the left.isimmensely developed, attaining a length equal to more than half that of the entire animal, projecting horizontally from the head in the form of a cylindrical, or slightly tapering, pointed tusk, without enamel, and with the surface marked by spiral grooves and ridges, running ina sinistral direction. (When, as occasionally happens, both tusks are developed, the spiral grooves have the same direction in each.) Vertebre: C 7, D11, L6, C 26; total 50. Cervical region comparatively long, and

.all the vertebra distinct, or with irregular unions towards the middle of the series, the atlas and axis being usually free. Manus small, short, and broad; second and third digits nearly equal, fourth slightly shorter. No dorsal fin.

One species, Af, monoceros, the Narwhal or Sea-unicorn, so called on account of the remarkable single, horn-like tusk of the male, 'which often grows to a length of 7 or 8 feet. Itinhabits the Arctic Ocean, where it is tolerably abundant and gregarious, feeding on various species of cephalopods, small fish, and crustaceans. It is rarely seen south of 65° N, lat.

Delphinapterus.—This genus is closely allied to the last in external form, as well as anatomical structure, differing only in the very different character of the dentition. Teeth from § to 12, occupying the anterior three-fourths of the rostrum and correspond- ing portion of the mandible, rather small, conical,

and pointed when unworn, but usually become obliquely truncated, separated by intervals considerably wider than the diameter of the tooth, and implanted obliquely, the crowns inclining forwards especially in the upper jaw. Skull rather narrow and elongated, depressed, Premaxille convex in front of the nares. Rostrum about equal in

length to the cranial portion of the skull, triangular, broad at the base, and gradually contracting towards the apex, when it is some- what curved downwards. Vertebre: C7, D11, L9, C 28; total 50. Cervical vertebre free. Manus broad, short, and rounded, all the digits being tolerably well developed, ex- cept the first. Anterior part of head rounded ; no distinct snout. No dorsal fin, but a low ridge in its place.

One species, D. leweas (fig. 50), the Beluga, or White Whale, so called from its pure white colour, about 12 feet long, abundant in the Arctic seas, and extending as far south on the American coast as the river St Lawrence, which it ascends for a con- siderable distance. On rare occasions it has been seen on the coast of Scotland.

In all the remaining genera of Delphi- nidz the cervical region of the vertebral column is very short, and the first two, and usually more, of the vertebrae are firmly united.

Phocena.—Teeth 48 to $3, small, oc- cupying nearly the whole length of the rostrum, with compressed, spade-shaped crowns, separated from the root by a constricted neck. Rostrum rather shorter than the cranium proper, broad at the base and tapering towards the apex. Premaxille raised into tuberosities in front of the nares. The frontal bones forming a somewhat square, elevated pro- tuberance in the middle line of the skull behind the nares, rising altogether above the flattened nasals. Symphysis of man- dible very short. Vertebre: C7, D 18, L 14, C 30; total 64 (subject to slight individual modifications). First to sixth cervical vertebre, and sometimes the seventh also, coalesced. Manus of mode- rate size, oval, slightly falcate ; second and third digits nearly equal in length; fourth and fifth well

developed, but shorter. Head short, moderately rounded in front of the blowhole. Dorsal fin (in the typical species) near the middle of the back, triangular ; its height considerably less than the length of the base; its anterior edge frequently furnished with

one or more rows of conical horny tubercles. The common Porpoise or Porpus,

P. communis, is the best known of British Cetaceans (sec PorpotsE).

Oreclla.—Tecth 12 to +4, small, conical, pointed, rather closely set, and occupying nearly the whole length of the rostrum. Skull sub-globular, high. Rostrum nearly equal in length to the cranial portion of the skull, tapering. Manus of moderate size, not elongated, but somewhat pointed. All the bones of the digits broader than Fie, 49—Upper Surface of the long, except the proximal phalanges of Skull of Male Narwhal the index and third fingers. Head (AMonodon monoceros), with

- *the whole of both teeth ex- globular in front. Dorsal fin rather posea by removal of the small, plaved behind the middle of the upper wall of their alveolar body. Two species, both of small size—*

eavities.

O. brevirostris, from the Bay of Bengal, and 0. fluminalis, from the Irrawaddy river, from 300 to 900 miles from the sea. Our present knowledge of the anatomy, geographical distribution, ard habits of these interesting Cetaceans is almost entirely due to the researches of Dr J. Anderson.}

Orca. —Teeth about 44, occupying nearly the whole length of the rostrum, very large and stout, with conical recurved crowns, and large roots, expanded laterally and flattened, or rather hollowed, on the anterior and posterior surfaces, Rostrum about equal in length to the cranial part of the skull, broad and flattened above, rounded in front; premaxille broad and rather concave in front of the

1 Anatomical and Zoological Researches, comprising an Account of the Zoological Results of the two Expeditions to Western Yunnan, in 1868 and

1875 (1878).

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nares, contracted at the middle of the rostrum, and expanding again towards the apex. Vertebre: C7, D 11-12, L10, C28; total 51 or 52. Bodies of the first and second and sometimes the third cervical vertebre united ; the rest frze. Pectoral fin very large, ovate, nearly as broad as long. All the phalanges and metacarpals broader than long. General form of body robust. Face short and rounded. Dorsal fin near the middle of the back, very high and ointed. P The animals composing this genus are met with in almost all seas from Greenland to Tasmania, but the nuniber of species is still very uncertain. They are readily known, when swimining in the water,

CETACEA. |

by the high, erect, falcate dorsal fin, whence theircommon German By English sailors they are They are

pame of Schwert-fisch (Sword-tish). generally known as ' Grampuses"*

or ' Killers."*

Fic. 50.—Beluga or White Whale (Delphinapterus leucas).

distinguished from all their allies by their great strength and ferocity, being the only Cetaceans which habitually prey on warin- blooded animals, for, though fish form part of their food, they also attack and devour Seals, and various species of their own order, not only the smaller Porpoises and Dolphins, but even full-sized Whales, which last they combine in packs to hunt down and destroy, as Wolves do the larger Ruminants.

Pseudorea.—Teeth about 32. Cranial and dental characters generally like those of Orea, except that the roots of the teeth are cylindrical. Vertebre: C7, D10, L9, C 24; total 50. First to sixth or seventh cervical vertebrae united. Bodies of the lumbar ver- tebre distinguished from those of the preceding gencra by being

From Hunter.

Fic. 51.— Grampus (Orca gladiator).

more elongated, the length being to the width as 3 to 2. Pectoral | fin of moderate size, narrow, and pointed. Dorsal fin situated near the middle of the back, of moderate size, falcate. Head in front of the blowhole high, and compressed anteriorly, the snout truncated. This genus was first known by the discovery of a skull in a sub- fossil state in a fen in Lincolnshire, named by Professor Owen Phocena crassidens. Animals of apparently the same species were afterwards met with in small herds on the Danish coast, and fully described by Reinhardt. Others subsequently received from Tasmania were supposed at first to indicate a different specics, but comparison of a larger series of specimens from these extremely distant loealities fails to establish any characteristic difference, and indicates an immense range of distribution for a species apparently so rare. Its length is about 14 feet, and its colour entirely black.

Globicephaluws.—Teeth ay confined to the anterior half of the

rostrum and corresponding part of the mandible, small, conical, curved, sharp-pointed when unworn, sometimes deciduous in old age. Skull broad and depressed. Rostrum and cranial portion about equal in length. Upper surface of rostrum broad and flat. Premaxille strongly concave in front of the nares, as wide at the middle of the rostrum as at the base or wider, and very nearly or completely concealing the maxille in the anterior half of this region, Vertebre: C7, D 11, I. 12-14, C 28-29 ; total 58 or 59. Bodies of the auterior five or six cervical vertebre united. Length of the bodies of the lumbar and anterior caudal vertebree about equal to their width. Pectoral limb very long and narrow, the second digit the longest, and having as many as 12 or 13 phalanges, the third shorter (with 9 phalanges), the first, fourth, and fifth very short. Fore part of the head very round, in consequence of the great development of a cushion of fat, placed on the rostrum of the skull in front of the blowhole. Dorsal fin low and triangular, the length of its base considerably exceeding its vertical height. __ The type of this well-marked genus is G. melas, the Pilot Whale, Ca'ing Whale, or Grindhval of the Faroe islanders, which

From a specimen taken in the river St Lawrence, and exhibited in London, 1577.

attains the length of 20 feet, and is of nearly uniform black colour, except the middle of the under surface, which is lighter. They are extremely gregarious, and, unlike the Killers, are mild and inoffensive

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in disposition, feeding principally on cephalopods. Their eminently sociable character constantly leads to their destruction, as when attacked they instinctively rush together and blindly follow the leaders of the herd. In this way many hundreds at a time are frequently driven ashore and killed, when a herd enters one of the bays or fiords of the Faroe Islands or north of Scotland. Animals of this well-marked genus are found in nearly all seas, and their specific distinctions are not yet made out. Specimens from the Australian coasts, where they are generally called " Blackfish," are quite indistinguishable, either by external or osteological characters, from those of the North Atlantic.

Grampus.—Teeth none in the upper jaw; in the mandible few (3 to 7 on each side), and confined to the region of the symphysis. Vertebrea: C7, D 12, L.19, C 30; total 68. General external char- acters much as in Globicephalus, but the fore part of the head less rounded, and the pectoral fin less elongated.

But one species, G. griseus, is certainly known, about 13 feet long, and remarkable for its great variability of colour. It has been found, though rarely, in the North => Atlantic and Mediterranean. A skull from the Cape of

Good Hope, which differs slightly from that of the above, has been described under the name of @. richardsont.

Delphinus.—Teeth very numerous in both jaws, more than 39, occupying nearly the whole length of the rostrum, small, close-set, conical, pointed, slightly curved. Rostrum more or less elongated,' and pointed in front, usually considerably longer than the cranial portion of theskull, Vertebre:

C7, D 12-14, Land C variable; total 51 to 90. Pectoral fin of moderate size, narrow, pointed, somewhat faleate. First digit rudimentary, the second longest, third nearly equal, fourth and fifth extremely short. Externally the head shows a distinct beak or pointed snout, marked off from the antenarial adipose elevation by a V-shaped groove, Dorsal fin rather large, triangular or falcate, rarely wanting.

This is a large and heterogeneous genus, which probably ought to be divided, but, until more is known of the structure of many of the species than is at present attainable from the scanty materials in our collections, it is impossible to frame a system of subdivision upon a scientific basis. It seems preferable therefore, in- stead of introducing new names into zoology for groups founded upon trifling differences in the length or width of the rostruin. of the skull or the nunber of the teeth, which may or may not be correlated with other more important structural modifications, to keep provisionally at least the Linnzan term Delphinus for what remains of the family, after eliminating the well-characterized

enera previously described.

The true Dolphins, Bottle-noses, or, as they are more commonly called by seafaring people, " Porpoises,'"' are found in considerable abundance in all seas, and some species are habitually inhabitants of large rivers, as the Amazon. They are all among the smaller members of the order, none exceeding 10 feet in length. Their food is chiefly fish, for the capture of which their long narrow beaks, armed with numerous sharp-pointed teeth, are well adapted, but some appear also to devour crustaceans and molluscs, They are mostly gregarious, and the agility aud grace of their move- ments in the water are constant themes of admiration to the spectators of the scene when a "school of Porpoises" is observed playing round the bows of a vessel at sea, The type of the genus

Fig. 52.—Cuommon Dolphin (Delphinus delphis). From Reinhardt.

| is the Common Dolphinof the Mediterranean (D.delphis, fig. 52), also

found in the Atlantic, and of which a closely allied if not identical form is met with in the Australian seas (D. forstert) and in the North Pacific (D.

batrdit). The Tursio (D. éwrsio) is another British species of larger size and heavier build, with larger and less numerous teeth ; this and several allied forms probably constitute a natural subgroup. The White-beaked and White-sided Dolphins (D. albirostris and lewcoplewrus) of the North Atlantic, and several others from the South and Pacific Seas, with comparatively broad and short rostrum to the skull and very numerous (80 to 90) vertebre, constitute the genns Lagenorhynchus of Gray. Others, with long narrow rostrum, are associated under the name of Steno, one of which from the Chinese seas (D. sinensis) has but 51 vertebrae. This last is of a pure milk-white colour, but most of the species are variegated with glossy black, various shades of grey, and white, the latter chiefly on the under parts of the body. One species (D. peronit) from the South Seas is remarkable for the absence of

dorsal fin. It constitutes the genus Leucorhamphus of Lilljeborg, and Delphinapterus of other authors ; this last name, however, was orizinally bestowed on the Beluga, and should be retained for it.

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Wallthiere, 1849, contains a eopious bibliography of the group up to the date of publication. Sinee that time numerous monographs on special families and genera have been published, and a large illustrated general work, Ostéographie des Cétacés, py P. J. Van Beneden and P, Gervais, 1868-79. See also J. F. Brandt, "' Unter- suchungen tiber dic Fossilen und Subfossilen Cetaceen Europa's," in Afém. de VAcad. Imp. de St. Pétersbourg, 7th ser. t. xx., 1873; and C. M, Seainmon, Marine Mammals of the N. W. Coast of North America, 1874.

Orpver INSECTIVORA.

Terrestrial, rarely arboreal or natatorial, diphyodont, heterodont, placental mammals of small size, with planti- grade or semiplantigrade, generally pentadactyle, unguicu- late feet; with clavicles (except in Potamogale); with more than two incisors in the mandible, and witl. enamel- coated

molars having tuberculated crowns and well-de- veloped roots. The body is clothed with fur, or protected by an armature of spines; the testes are inguinal or placed near the kidneys, and are not received into a scrotum, the 'penis is pendent or suspended from the wall of the abdomen ; the uterus is two-horned and with or without a distinct corpus uteri, the placenta discoidal and deciduate; and the smooth cerebral hemispheres do not extend backwards over the cerebellum.

Representatives of this order 'are found throughout the temperate and tropical parts of both hemispheres (except South America and Australia), and exhibit much variety both in organization and in habit. The greater number are cursorial, but some (Z'alpa, Chrysochloris, Oryzorictes) are fossorial, some (Potamogale, Nectogale, Myogale) natatorial, and some (Z'wpavidx) arboreal, while the species of one genus (Galeopithecus) glide through the air like Flying Squirrels; to the great majority, however, the term insectivorous is applicable, the aberrant G'aleoprthecus being alone phyto- phagous also, while Potamogale is said to feed on fish, and the different species of Moles live chiefly on worms. Notwithstanding tlle homogeneous nature of their food, much variety prevails in the form and number of their teeth, as will be seen when we come to consider the classification of the species. In many the division into incisors, canines, premolars, and molars may be readily traced, but in others, forming the great majority of the species, such as the Shrews, this is accomplished with difficulty. The dentition of the Jnsectivora may, however, be considered typical, since from it may be derived, by modification, that of any known species of diphyodont placental Mammalia. This typical dentition is especially noticeable in the genus Gymnura, where the dental formula is—? 3, ¢ 1, pm 4+, m 3; total 44 teeth. So also, in their general organization, tllese animals appear to have departed so little from what must have been the original mammalian type that, were it not for the apparently advanced character of their placentation, they might easily be considered the scarcely modified descendants of the ancestors of all other orders of diphyodont placental mammals. Their study, therefore, affords the best intro- duction to that of this division especially.

In most Jzsectivora the cranial cavity is of small relative size, and in none is the brain case elevated to any con- siderable extent above the face-line. The

facial part of ‘the skull is generally much produced, and the premaxillary and nasal bones well developed. The zygomatic arch is usually slender or deficient, the latter being the case in most of the species, and post-orbital processes of the frontals are found only in Guleopithecide, Tupatidx, and Macroscelide. The number of dorsal vertebra varies from 13 in Tupaia to 19 in Centetes, of lumbar from 3 in Chrysochloris to 6 in Talpa and Sorex, and of caudal from the rudimentary vertebree of Centetes to the 40 or morc

digestive organs.

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well-developed ones of dftcrogale. Not less variable are the characters of the vertebrae: the spinous processes may be very long in one species and short in another, though belonging to the same genus; in the Sortcide and in Myogale the neural arches of the cervical vertebrae are very slender ; in Sorictdex also and in Gymnura the four anterior vertebrae develop large single hypapophyses, and in Galeopithecus the body of each supports posteriorly a pair of hypapophysial tubercles. In Lrinaceus, Afyogale, and Talpa small oval ossicles are found on the inferior surfaces of the lumbar interspaces. In Zrinaceus, owing to the thickness of the cord in the cervical region and its abrupt termination, the diameter of the neural canal in the cervical and first two dorsal vertebree greatly exceeds that of any of the succeeding vertebra. The sternum is variable, but generally narrow, bilobate in front, and divided into segments. The shoulder-girdle presents remarkable adaptive modifications, most expressed in Z’al/pa (see Motz), having relation to the use of the fore limbs in burrowing ; in the Golden Moles (Chrysochloris), however (vide infra), the forearm and manus alone become specially modified. In Galeopithecus and Aacroscelides the forearm boncs are distally united; in ail other known Jzsectivora the radius and ulna are distinct. The manus has generally five digits, but in hynchocyon and in one species of Oryzorictes the pollex is wanting. In the true Moles (see Mots) it is extremely modified. The femur has, in most species, a prominent ridge below the greater trocliantеr presenting the characters of a third trochanter. In Galeopithecus, Tupaia, Centetes, Hemicentetes, Hriculus, and Solenodon the tibia and fibula are distinct, in all other genera more or less united together. The pes consists usually of five digits (rarely four by

reduction of the hallux), and in some, as in the lcaping species (Macroscelides, Rhynchocyon), the tarsal bones are greatly elongated. The form of the pelvis, and especially that of the symphysis pubis, varies within certain limits, which have been proposed by Leche as a basis for the classification of the families. Thus in Galeopithecide, Tupatide, and Macroscelide there is a long symphysis, as in Rodents; in Hrinaceidx, Centetide, and Potamogalide it is short; and in Soricide, Talmde, and Chrysochloride there is none.

Space does not admit of even attempting a sketch of the interesting modifications of the muscular system, which will be found fully described in the present writer's Mono- graph, referred to in the bibliography. As to the nervous system, it may be noticed that the brain throughout the species presents a low type of organization: in none do the cerebral hemispheres present any trace of convolutions, nor do they extend backwards so as to cover the cerebellum; the olfactory lobes are large and project in front; and the corpus callosum is short and thin. In the Hedgehogs (E£rinaceus) the spinal column ends abruptly opposite the third or fourth dorsal vertebra in a slender filament ; the dorsal and lumbar nerves, given off in front of this pomt, are carried backwards in two compressed bundles occupying the suddenly narrowed spinal canal as far as the sacrum.

Owing to the similarity in the character of the food, the truly insectivorous species, forming more than nine-tenths of the order, present littie variety in the structure of the Except in Galeopithecus (vide infra) the stomach is a simple, thin-walled sac ; in some, as in Centetes and allied genera, the pyloric and cesophageal openings are very close together ; the intestinal canal has much the same calibre throughout, and varies from three (in the Shrews) to twelve times (in the Hedgehogs) the length of the head and body. In the arboreal genera, Galeogrthecus and Z'upaia, and in the allied Afacroscelide, all of which probably feed on vegetable substances as well, most of the species possess a cecum. The liver is deeply divided into

lobes, the right and left lateral being cut off by deep fissures ; both the caudate and Spigelian lobes are generally well developed, and the gall-bladder, usually large and globular, is placed on the middle of the posterior surface of the right central lobe.

In most of the species (Soricidx, Centetidx, Chryso- chloride) the penis is capable of being more or less com- pletely retracted within the fold of integument surrounding the anus ; in some (Galeopithecidx, Talpidz) it is pendent in front of the anus, while in others (Macroscelida, Erinaceide, Solenodontide) it is carried forwards and suspended from the abdominal wall. In Centetine and Chrysochloris the testes lie immediately behind the kidneys, in others more or less within the pelvis. During the rut they become greatly enlarged, forming protrusions in the inguinal region. Except in Rhynchocyon the uterine cornua are long and open into a short corpus uteri, which in many species (Soricidx, Talpidx, Centetide, Chrysochloride) is not separated from the vagina by a distinct os uteri. With the exception of Galeopithecus all Insectivora appear to be multiparous, the number of foetuses varying from two to eight in Zrinaceus, and from twelve to twenty-one in Centetes. The position of the mammary glands and the number of the teats vary greatly. In Galeopithecus there are two pairs of axillary teats, in Solenodon a single pair post-inguinal, but in most species they range from the thorax to the abdomen, varying from two pairs in Gymnura to twelve in Centetes. In Chrysochloris the thoracic and inguinal teats are lodged in deep cup-shaped depressions.

Odoriferous glands exist in many species. In most Shrews they occur on the sides of the body at a short distance behind the axilla, and their exudation is probably protective, as few carnivorous animals will eat their dead bodies. In both species of Gymnura and in Potamogale large pouches are situated on either side of the rectum, and discharge their secretions by ducts, opening in the first- named genus in front of and in the latter within the margin of the anus. In Centetes racemose glands similarly situated discharge by pores opening at the bottom of deep pits placed at either side of the anus.

The integument is thin, but in many species lined with well-developed muscles, which are probably more developed in the Hedgehogs

(Hrinaceidx) than in any other mammal ; in this family and in Centetide most of the species are protected by spines implanted in the panniculus carnosus, and more or less replacing the fur of the upper surface of the body.

The Inseetivora are divisible into two very distinct suborders, of which the first includes a single genus only.

INSECTIVORA. |

SuporDER I. Dermoptera.

Upper and lower incisors compressed, multicuspidate, the lower deeply pectinate ; anterior and posterior limbs connected by a broad integumentary expansion forming a parachute. Family I. Galeo- pithecide.

SuBorDER II. Inscetivora Vera.

Upper and lower incisors conical, unicuspidate or with basal cusps only, the lower not pectinate; limbs free, formed for terrestrial progression.

I. Upper true molars broad, multicuspidate, with more or less well-defined W-shaped crowns. A. Symphysis pubis long ; intestinal canal generally with a cecum ; cercbral cavity comparatively large. a. Orbital ring encircled by bone ; metatarsus moderate ; arboreal. Family 11. Tupaiide. b. Orbital ring not encircled by bone ; metatarsus greatly elongated ; terrestrial. Family Ill. Macroseclide. B. Symphysis pubis short or noue ; intestinal canal without cecum ; cerebral cavity small ; skull without post- orbital processes. a. First and second upper molars with a central fifth cusp. @. praanlas annular, not forming bulla. Family IV. Lrinaceide.

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b. No central fifth cusp; crowns of the upper molars _ W-shaped. a'. Tympanics annular, not forming bull; no zygo- matic arches. Family V. Soricide. b'. Tympanics forming bulle; zygomatic arches de- veloped. Family VI. Talpide. II. Upper true molars narrow, with V-shaped crowns. a'. Tympanics annular, not forming bulle ; zygomatic arches imperfect. a".

No clavicles. Family VII. Potamogalide. b'. Clavicles well developed. a", Skull constricted between the orbits ; penis suspended. Family VIII. Solenodontide. b"". Skull not constricted; penis pendent, retractible. Family 1X. Centetidex. b.' Tympanics forming bullae; zygomatic arches well- developed. Family X. Chrysochloride.

Family GALEOPITHECIDE.

The characters of the family are those of the suborder Dermoptera, to which may be added that the orbit is nearly sur- rounded by bone, the zygomatic arches are well developed, the tympanics form bulle ossex, the ulna is distally united with the radius, the tibia and fibula are distinct, the pubic symphysis is long, the penis is pendent, the testes are received into inguinal pouches, the mamme are axillary, the uterus is two-horned, and there is a large cecum.

Galeopithecus (3, ¢ +, pm %, m 3 second upper incisors and canines with two roots), with two species—G@. volans and @. philip- pinensis. The former, the Flying Lemur of Linnzus, distinguished from the latter by the form of the upper incisors, has a total length of nearly 2 feet. The long and slender limbs are connected by a broad integumentary expansion extending outwards from the sides

! ~ TA, Usit Fra, 63.—Feet of Galeopithecus philippinensis.

of the neck and body, and forming also a web between the fingers and toes as far as the base of the claws (fig. 53); the hind limbs are further connected by a similar expansion passing outwards along the back of the feet to the base of the claws, and, inwardly, involving the long tail to the tip, forming a true interfemoral membrane, as in the Bats.

The species of this family live in the forests of the Malay Peninsula, Sumatra, Borneo, and the Philippine Islands, where they feed chiefly on the leaves of trees, and probably also on insects. Their habits are nocturnal, and during the daytime they cling to the trunks or limbs of trees head downwards in a state of repose. With the approach of night their season of activity commences, when they may be occasionally seen gliding from tree to tree supported on their cutaneous parachute, and they have been noticed

as capable of traversing in this way a space of 70 yards with a descent of only about one in five, as

Galeopithecus was referred by some of the older zoologists and anatomists to the Bats, and by others (and even in lately published works) to the Lemurs, but Professor Peters's view (in which most subsequent writers agree) that it belongs to neither of these orders, and must be considered an aberrant Insectivore, appears to be undoubtedly the correct one. Besides differing from the Bats altogether in the form of the anterior limbs and of the double-rooted outer incisors and canines, it also contrasts strongly with them in the presence of a large sacculated cecum, and in the great length of the colon, which is so remarkably short in all the Chiroptera. From the Lemurs, on the other hand, the form, of the brain, the character of the teeth, the structure of the skull, and the deciduate discoidal placenta at once separate it.

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Family TUPAIIDA.

Arboreal Insectivora, with comparatively large brain case, orbits encircled with bone, and well-developed zygomatic arches. The malar bone is perforated ; the tympanics form bulle ; the pubic symphysis is long; the tibia and fibula are distinct, the meta- tarsus but little longer than the tarsus ; the molars are broad, with

W-shaped cusps; and the intestinal canal has generally a short cecum.

The animals included in this family are all arboreal, resembling Squirrels closcly both in habits and in external form; they are divided into two genera having the same dental formula (7 2, ¢ 4, pm %, m %), but distinguished by the form of the skull. Tupaia, with nine species, is found in India, Burmah, the Malay Peninsula, Nieobars, Sumatra, Java, and Borneo, The species

closely resemble one another, differing chiefly in size and in the colour and length of the fur. Nearly all have long bushy tails, which still further

Fic. 54,—Pentail (Ptilocereus lowid). %}. From Gray, Proc. Zool. Soc., 1848,

increase their resemblance to Squirrels. Thcir food consists of insects and fruit, which they usually seek for in the trees, but also occasionally on the ground. When feeding they often sit on their haunches, holding the food, after the manner of Squirrels, between their fore paws. Ptilocerews includes a single very intcresting species, Pt. lowii, inhabiting Borneo, remarkable for its long tail, two-thirds naked, having the terminal third furnished with a double fringe ef long hairs. Its habits are probably similar to those of the Tupaias, of which it may be further noticed that they alone among Inscetivora are day-feeders,

Family MAcRoscELips.

Terrestrial Inscetivora, with comparatively large brain case, well-developed zygomatic arches, and tympanic bulle ; but the orbits are not sheirdlod by bone, the malar is imperforate, and thcre are generally no post-orbital processes. The pubic symphysis is long, the tibia and fibula united high up, the metatarsus much longer than the tarsus, the molars broad and quadricuspidate, and the intestinal canal has a large cecum.

These leaping Insectivores are casily distinguished by the great length of their metatarsal bones. All the species are African, and are divisible into two genera :—

a. % 3, e€ , pm 3, m & or 8; forearm bones united below. Maeroscelides,

b. 4 4 (or $), ¢ 4, pm 8, m %; forearm bones separate. Rhynehoeyon.

Macroseclides includes ten species widely distributed throughout the African continent. All are closely related, resembling one another in general forms, and even in the colour of the fur. They fall into two groups distinguished by the presence or absence of a stall lower fourth molar. Jf. tetradactylus (fig. 55), type of the subgenus Petrodromus, differs from all in

the absence of the hallux. Of Rhynchocyon four closely allied species have been described, all from East Africa.

Family ERINACEIDA.

Terrestrial Inseetivora, with a small brain case, without post- orbital processes, with slender (rarely imperfect) zygomatic arches, with a short pubic symphysis, and with the tibia and fibula united above, The tympanics are annular, not forming bulle; the intestine has no cecum; the penis is carried forwards, and suspended from the wall of the abdomen ; and the upper true

molars have each four principal cusps and a small central fifth cusp very characteristic of the family.

MAMMALIA

[INSECTIVORA. |

Subfamily I. @Gymnurinese.—Caudal vertebre numerous ; palate bones coinpletely ossified ; pelvis very narrow ; fur without spines.

Gymnura, 7 3, ¢€ +, pm 4, m %, with two species, G. rafflesit and (. swidla, from the Malay Peninsula and Indian Archipelago. The former has the appearance of a large Rat with a long head and projecting mobile snout ; the latter, much smaller, with a short tail and small third upper premolar, has long been known under the name of Hylomys swillus, and classed with the Tupatide. Both species present a very generalized type of dentition, in this respect occupying an almost central position in the order,

Fic. 55.—Macroscelides (Petrodromus) tetradacty'us. Reise nach Mossambique.

Subfamily II]. Erinaceinss.—Caudal vertebre rudimentary ; palate bones with defects of ossification ; pelvis wide; fur with spines.

Erinaceus, 4 3, ¢ 4, pm , m 4, includes nineteen species (fa- miliarly known as Hedgehogs) distributed throughout Europe, Africa, and the greater part

of Asia, but they have not been found in Madagascar, Ceylon, Burmah, Siam, the Malay Peninsula and Archipelago, or Australia, All the species resemble one another

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x4. From Peters,

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Fic, 56.—Facial parts of Skulls of (A) Hrinaceus europeus and (B) E. grayt, much enlarged. Dobson, Proc. Zool. Soc., 1881. closely in the armature of spines which invests the upper surface and side of the body; and all possess the power of rolling them- selves up into the form of a ball protected on all sides by strong spines, the dorsal integument being brought downwards and inwards over the head and tail, so as to include the limbs also, by the action of special muscles (for description see Monograph of the

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Inscetivora referred to in the bibliography). The common Hedgehog (A. curopeus) is the most aberrant species, differing from all the rest in the peculiarly shaped and single-rooted third incisors and first upper premolars (fig. 56, A), and in its very coarse harsh fur. The dentition of the long-eared North Indian form, #. grayt (fig. 56, B), may be considered characteristic of all the other species, the only important differences being found in the variable size and position of the second upper premolar, which is very small, external, and deciduous in the Indian species £. micropus and pictus. The former species, limited to South India, is further distinguished by the absence of the malar bone. Of African species, HL. diadematus, with long frontal spincs, is probably the commonest, and J. albiventris has been made the type of a separate genus on account of the total absence of the hallux.

INSECTIVORA. |

Family Soricips.

Terrestrial, rarcly natatorial, Znsectivora, with narrow elongated skulls, without post-orbital processes or zygomatic arches. The tympanics are annular, not forming bulle ; there is no symphysis pubis; the intestine has no cecum ; the tibia and fibula are united ; and the molars have well-developed W-shaped cusps.

The dentition is very characteristic of the family; in all the upper front incisors are large, with a more or less prominent posterior basal cusp, and be- : tween these and the last pre- « molar intervene a variable number of small incisorsand =} premolars, among which the small canine can be distin- guished only by its position immediately behind the pre- maxillary suture. The number of teeth in the mandible is always twelve, and the single pair of incisors are much ex- tended horizontally forwards, the canine is the smallest tooth, and the single pre-

a peor Homens larger (see Fig. 57.—Skull and Dentition of Sorex vere-

pacis,

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The Shrews thus form a very compact family, which includes considerably more than half the known species of Jnsectivora, and of which the geographical distribution is coextensive with that of the order. They have been divided into several genera (so-called) and subgenera, depending chiefly on the number of the upper incisors and premolars, and on the colour of the teeth. The best arrangement appears to be that proposed by M. Alph. Milne-Edwards, as follows :—

A. Terrestrial ; feet without a border composed of stiff hairs.

(a”, Tail very short, concealed. ; 1. Anourosorex. a. Teeth white. 4% 76 teeth. 9 a7 Tail moderately long. 2. Diplomesodon. b’. 28-80 teeth. 38. Crocidura. b. Teeth more or (a’. Tail short; cars small. 4. Blavina.

less brown; 0'. Tail and ears moderately long. or red. 5. Sorex. B. Amphibious ; feet with a border of stiff hairs. wid nok a', 32 teeth ; hairs of tailequal. 6. Neosorex. "b eeihed b'. 30 teeth ; tail fringed along middle edge. . 7. Crossopus. b. Feet webbed. 8. Mectogale.

Anourosorex includes A. sqwamipes, a Mole-like species, with very short ears and tail, from Tibet. Dtplomesodon, with one species, D. pulchellus, from the Kirghiz steppes, though agreeing in the number of teeth, is Shrew-like in external form. Crocidura, 28-30 teeth, with about seventy species divided into four subgenera, comprises the greater number of white-toothed Old-World Shrews, having a round tail thinly clothed with a few hairs of unequal length. C. aranea and C. suaveolens of the continent of Europe, and C. indicus, the Musk-Rat of India, are well-known examples. Sorex, the typical genus (see SHREW), also divided into four sub- genera, with Blarina, includes all the species with brown teeth and angular uniformly hairy tail. Neosorcx ineludes the New-World and Crossopus (see SHREW) the Old-World amphibious speeies, hav- ing a fringe of stiff hairs along the sides of the feet, and Nectogale a very remarkable species from Tibet, NW. clegans (fig. 58), distin- guished from all other Shrews by the webbed condition of the toes, and the presence of adhesive cushions on the under surface of the feet, which enable the animal to hold on to smooth stones at the bottom of rushing torrents.

Family Taupipz.

Fossorial, rarely natatorial, Inscctivora, distinguished from the Soricidz by the presence of zygomatic arches and tympanic bulle ossex, aud by the form of the teeth. The eyes are very small, in

some species covered with skin ; the ears are short and concealed by the fur; the fore limbs are generally more or less modified for digging ; there is no symphysis pubis ; the intestine has no cecum ; the tibia and fibula are united; and the nnicuspidate upper and lower front incisors are not extended horizontally forwards.

Fig. 58.—Wectogale elegans. A. Milne-Edwards, Mammif. Tibet.

This family, though thus easily distinguished, is, nevertheless, evidently closely related to the Shrews, with which such inter- mediate forms as those included in the genera Urotrichus and Uropsilus connect it. In striking contrast with the Shrews, however, the distribution of the Moles is limited to the temperate regions of Europe, Asia, and North America.

Subfamily I. Myogalinge.—Clavicles and humeri moderately elongated ; manus without os falciforme.

a. +4, ¢4, pm 4, m3; feet webbed; natatorial. Afyogale. b. 72,04, pm $, m3; feet narrow ; terrestrial. Uropsilus. c. 732, ¢4, pm 4 or 3, m$; feet wide ; fossorial. Urotrichus.

Myogalc includes two very remarkable species, Jf. meschata and M. pyrenaica. The former is by far the largest species of the

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xX} family, its total length being about 16 inches. Its long proboscis- like snout projects far beyond the margin of the upper lip; the toes are webbed as far as the bases of the claws ; and the long scaly tail is laterally flattened, forming a powerful instrument of pro- pulsion when swimming. This species inhabits the banks of streams and lakes in south-east Russia, where its food consists of various aquatic insects. Jf. pyrenaica, living in a similar manner in the region of the Pyrences, is very inuch smaller, has a round

Fig. 59.—Myogale moschata.

tail, and a proportionally longer snout. Urotrichus, with pm 4, and Neiirotrichus (subg.), with pm 3, are represented by two small Mole- like species, externally resembling one another closely, from Japan and North America respectively. Of Uropsilus, U. sorictpes, from the borders of Tibet, is a very interesting species, having the external form of a Shrew but the skull of a Mole.

Subfamily II. Talpinze (True Moles),—Clavicles and humeri very short and broad ; manus with a large os falciforme.

A. Front upper incisors much larger than the second pair (New- World Moles). a. + $,c%4, pm 3, m%; extremity of nose simple. Scalops. b. ¢ $,c4, pm 4, m3; extremity of nose simple. Scapanus. c. 4 ,c4, pm 4, m3; extremity of nose with appendages. Condylura. / B. Front upper incisors scarcely larger than the second pair (Old-World Moles). d. 7, ¢4, pm 4,m%; manus as in Urotrichus. Scaptonyzx. é. 1% or 3, ¢ 4, pm 4, m #3; manus very broad. Talpa.

Scaptonyx, with a single species S. fusicaudatus, from west China, connects Urotrichus with the true Moles. Z'alpa includes seven species, of which the Common Mole is a familiar example. See MOoue.

Family POTAMOGALIDE.

Insectivora with a small brain case, without post-orbital processes or zygomatic arches, and with annular tympanics not forming bulle. There are no clavicles; the pubie bones are connected by a liga- ment, and there is no true symphysis ; the intestine has no cecum ; the tibia and fibula are united low down; and the upper true molars have broadly V-shaped cusps presenting characters inter- mediate between those of the preceding and succeeding families,

Fic. 60.— Potamogale velox.

x}. Allman, Zrans. Zool. Soc., vi., pl. i.

Potamogale, 7 3, ¢ 4, pm 8, m 8, with P. velox. This most in- teresting species inhabits the banks of streams in west equatorial Africa, and its whole structure indicates an aquatic life. It is nearly 2 feet in length, the tail measuring about half. The long cylindrical body is continued uninterruptedly into the thick laterally compressed tail, the legs are very short, and the toes are not webbed, progression through the water evidently depending wholly on the action of the powerful tail, while the limbs are folded inwards and backwards, The niuzzle is broad and flat, and the nostrils are protected by valves. The furis dark brown above, the extremities

of the hairs on the back being of a metallic violet hue by reflected light, beneath whitish.

Geogale, t $, ct, pm $, m4, with G. aurita, a small Mouse-like species from Madagascar, agrees closely with Potamogale in the general form of the skull and tecth; the tibia and fibula are distinct, but it is not known whethier a clavicle exists or not, and the material at present available is insufficient to definitely fix the natural position of the species.

Family SOLENODONTIDA.

Insectivora with a small brain case constricted between the orbits, and without post-orbital processes or zygomatic arches, The penis is carried forwards and suspended from the abdomen ; the testes are received into perineal pouches ; the mammary glands are post-inguinal ; the uterine cornua end in cecal sacs; the Intestine has no cecum ; the tympanics are annular ; the upper true molars have V-shaped crowns; the symphysis pubis is short ; and the tibia and fibula are distinct.

Solenodon, i 3, ¢4, pm 4%, m 3, with S. paradoxus and S. cubanus, from Hayti and Cuba respectively, alone represents the family. These species, which differ chiefly in the colour and quality of the fur, have each a remarkably long cylindrical snout,

a long naked tail, feet formed for running, and the body clothed with long, coarse fur.

The position of the mamme quite behind on the buttocks is unique among Jnsectivora, The upper front incisors are much enlarged, and with the other incisors, canines, and premolars closely resemble those of Afyogale ; the second lower incisors are, as in

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Fia. 61.—Solenodon cubanus, x}. Peters, Abh. Akad. Berl.

Potamogale, much larger than the anterior pair, and are deeply hollowed out internally. While thus apparently showing relation- ship with the Zalpidx, the form of the crowns of the molar teeth connects them with the next family.

Fanvily CENTETIDA.

Insectivora with a small cylindrical brain case not constricted between the orbits, and without post-orbital processes or zygomatie arches. The penis is pendent and retractible within the fold of the integument surrounding the anus; the testes are abdominal ; the mammary glands are thoracic and ventral; the uterine cornua are terminated by the Fallopian tubes; the intestine has no cecum ; the tympanics are annular ; the molars have V-shaped crowns ; the pubic symphysis is short, and the tibia and fibula separate or united. All the known species are limited to Madagascar.

Subfamily I. Centetinee.—Tibia and fibula distinct; testes near kidneys ; fur with spines.

Fria. 62.—Skull of Centetes ecaudatus (reduced).

Centetes, i & or 2, ¢4, pm %, m % or 4. The single species, C. ecaudatus, the well-known tailless Ground-Hog of Madagascar, attains a total length of from 12 to 16 inches, and is the largest known Insectivore. 'The adult males have exceedingly long canines, the extremities of the lower pair being received into pits in front of the upper carines. It is probably the most prolific of all mammals ; as many as twenty-one young are said to have been brought forth at a birth. The young have strong white spines arranged in longi- tudinal lines along the back, but these are lost in the adult animal, which is provided only with a nuchal crest of long rigid hairs. Hemicentetes, 1 3, with H. semispinosus and H. nigriceps, 18 distinguished by the persistence of the third upper incisor, and by the form of the skull.'The two species are very much smaller than C. ecaudatus, and the dorsal spines are retained in the adult state. Ericulus, 7 2, has EF. setosus, a remarkable Hedgehog-like species having the whole upper surface and even the short tail densely covered with close-set spines. The facial bones

are much shorter than in any of the preceding genera, and the upper front incisors are elongated asin Erinaceus. Judging from the slight development of the cutancous muscles compared with those of the true

CHIROPTERA. |

Hedgehogs, it is probable that complete involution, as in the latter animals, does not take place.

1G, 63.—Skull of Hemicentetes semispinosus. x 2. Mivart,

Proc. Zool. Soc., 1871,

Subfamily II. Oryzorictinee.—Tibia and fibula united ; testes near urethra ; fur without spines.

Microgale, i %, ¢+, pm %, m 3, includes AL. lougieaudata and M. cowant, small Mouse-like species, the former with a tail double the length of the head and body ; teeth like those of C. ecaudatus, but, owing to the comparatively much shorter muzzle, not separated by wide spaces, and the last premolar and molars with internal basal

rocesses, Oryzorictes contains O. hova and O. tetradactylus, the atter distinguished by the presence of four digits only in the manus, the three inner having long laterally compressed fossorial claws. The general form of the head and body of the two species known is that of a Mole. They burrow in the rice-fields, and do much damage to the crops.

Family CHRYSOCHLORIDA.

Fossorial Znseetivora, with conical skulls not constricted between the orbits, with well-developed zygomatic arches and tympanic bulle, but without post-orbital processes. The eyes are covered by the hairy integument, the ears short and concealed by the fur; the internal generative organs and the crowns of the upper molar teeth are as in Centetine ; the mammary teats are thoracic and inguinal, and placed in cup-shaped depressions ; there is no pubic symphysis ; and the tibia and fibula are united.

This family is evidently closely allied to Centetidx, occupying the same relative position with respect to that family that Talpidx does to Sorieidx. All the species are fossorial, and restricted to south Africa. In all the forearm and manus are similarly modified for digging, but in a manner very different from that observable in Talpide (see Mouse).

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Fig. 64.—Chrysochivris obtusirostris (reduced).

Chrysochloris, 1 3,4, pm %, m $ or 3, embraces seven or eight species. Those with m 3, with a basal talon to the lower grinders, and without a prominence in the temporal fossa, have been placed in a separate genus Caleoehloris by Professor Mivart. Nearly all the species have the fur of the upper surface of a brilliant metallic alte varying from golden bronze to green and violet of different shades.

Fossin INSECTIVORA.

Of fossil Insectivora no undoubted traces have been found in deposits earlier than the Eocene. Amphidozotherium, allied to Urotrichus, and Neogymnurus and Protalpa, with relationships to Gymnura and Talpa respectively, have been described from the lacustrine Eocene beds of Quercy. Several genera with insectivorous affinities have been characterized by Cope and Marsh from remains found in the Eocene of Wyoming, but these have been relegated to distinct suborders of a new order Bunodonta, of which Inscctivora is

considered a suborder only. ‘he Miocene deposits of the south of France and Germany have yielded fossil forms of Hrinaccidx (Ampheehinus, Galerix, Tetraeus), of Sorieidx (Sorex, Mysarachue, Plestosorex), and of Talpidw (Dimylus, Galeospalax, Geotrypus, Hyporissus, Myogale). Of the latter family Galeospalax has been characterized from the Pliocene of

Norfolk ; and remains of the common Hedgehog, and of. some of the existing species of Sorex, have been found in various post-Tertiary deposits.

Bibliography of Insectivora.—Peters, Reise nach Mossambique—Sdugeth., 1852; Id., " Ueber die Classification der Inscctivora," Monatsh. Akad. Wissensch. Berlin, 1865, and other papers; Mivart, "On the Osteology of the Insectivora," Jour, Anat. and Phys., 1867, 1868, and Proc. Zool. Soc., 1871; Gill, '«Synopsis of Insectivorous Mammals," Bull. Geol. and Geog. Survey, U.S.A, Washington, 1875 (includes a general bibliography of the order /nsectivora) ; Dobson, Iono- graph of the Insectivora, Systematic and Anatomical, London, 1882.

OrpER CHIROPTERA.

Volant mammals, having their fore limbs specially modified for flight. The forearm consists of a rudimentary ulna, a long curved radius, and a carpus of six bones supporting a thumb and four greatly elongated fingers, between which, the sides of the body, and the hinder extremities a thin expansion of the integument (the wing- menibrane) is spread out. The knee is directed backwards, owing to the rotation of the hind limb outwards by the wing-membrane ; a peculiar elongated cartilaginous process (the caleaneum or calcar), rarely rudimentary or absent, arising from the inner side of the ankle-joint, is directed inwards, and supports part of the posterior margin of an accessory membrane of flight, extending from the tail or posterior extremity of the body to the hinder limbs (the inter-femoral membrane). The penis is pendent; the testes abdominal or inguinal; the mammary glands thoracic and generally post-axillary ; the uterus simple cr with more or less long cornua; the placenta discoidal and deciduate ; and the smooth cerebral hemispheres do not extend backwards over the cerebellum. The dental series

consists of four kinds of teeth—incisors, canines, premolars,

and molars; and the dental formula never exceeds 1 3,¢4, pm 3, m3; total 38 teeth.

The animals comprised in this order are at once distinguished by the presence of true wings, and this peculiarity is accompanied by other

modifications of bodily structure having special relation to aerial locomotion. Thus, in direct contrast to all other mammals, in which locomotion is chiefly effected by action from behind, and the hind limbs consequently greatly preponderate in size over the fore, in the Chiroptera the fore limbs, being the only agents in propelling the body forward during flight, immensely exceed the short and weak hinder extremities ; the thorax, giving origin to the great muscles which sustain flight, and containing the proportionately (com- pared with other mammals) very large lungs and heart, is remarkably capacious, and the ribs are flattened and close together ; the shoulder-girdle is also greatly developed in comparison with the weak pelvic bones.

Linneeus included the Bats among the Primates, mainly on account of the number of their upper incisors, supposed to be always four, the thoracic position of the mamma, and the pendent condition of the penis. Many other zoologists, taking into consideration also the placental characters and the form of the uterus, have followed him; but it is evident that the situation of the mamma is related to the necessarily central position of the young during flight, the shortness of the uterine cornua, observable in so many species, to the generally uniparous gestation requiring less room, while the discoid deciduate placenta is equally present in and characteristic of the Jnsectivora, many species of which have also the penis pendent. Then, all these reasons for maintaining the Bats in such an exalted position being disposed of, we find in the low organization of their brain another proof of their inferior position in the zoological scale, while furthermore, although they differ

widely from all other mammals in external form, it is evident that this is but the result of special adaptation to aerial locomotion ; and, taking into account their whole bodily structure, we are forced to admit with Professor Huxley that they may be regarded as exceedingly modified Jnsectivora.

So thoroughly, however, has this adaptation been carried out that of all animals the Bats are the least terrestrial, not one of them being equally well fitted, as most Birds and Insects are, for progression on the earth. This is

due to the hind as well as the fore limbs being pressed into the service of aerial locomotion. The hind limb is so

rotated outwards by the wing-membrane that, contrary to what obtains in all other vertebrates, the knee is directed backwards, and corresponds in position to its serial When placed on the ground,

homologue the elbow.

Fre, 65.—Skeleton and Volar Membranes of the Noctule Bat (Vesperugo noctula). x}. ¢, clavicle; h, humerus; 4, a5, other digits of the manus sup-

r, radius; wu, ulna (rudimentary) ; d}, first digit or pollex ; d?, d3, d

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[CHIROPTERA.

From the first thoracic to the last lumbar vertebra the spinal column forms a single curve backwards, which is most pronounced in the lumbar region. The bodies of the vertebrae are very slightly movable upon each other, and in old individuals appear to become partially ankylosed together. The caudal vertebra are simple cylindrical bones without processes ; their number and length is extremely variable even in closely allied species; and the anterior vertebree are generally united to the ischial tuberosities. The development of these vertebra, in fact, is intimately correlated to the habits of the animals, the long tail in the insectivorous species supporting and controlling the position of the large interfemoral membrane which appears not only to aid their rapid doubling motions when in pursuit of their insect prey by acting as a rudder on the air, but also to assist them in the capture and retention of the larger insects ; in the frugivorous species, on the other hand, this is not required, and the tail is accordingly rudimentary or absent. In all Bats the presternum has a promi- nent keel for the attachment of the great pectoral muscles. In most species the ribs are much flattened, and in some partially ankylosed by their contiguous margins. Great as is the variability of the shape of the skull in Jnsectivora, it is still greater in Chiroptera, aud evidently depends upon the much wider differences in the nature of the food of different species requiring corresponding

modifications of the man- ducatory apparatus, so that extreme modi- fications may be found in species of the same family, as in the case of the Phyl- lostomide. In some genera, however, as in Miniopterus, Furia, Mormops (vide infra), the peculiar shape of the skull cannot thus be accountedfor. As in the Insectivora, post-orbital processes are de- veloped in some species only, as in the Pteropodide and in a few Wycteride and

porting wm, the wing-membrane ; m,m, metacarpal bones; ph!, first phalanx; ph?, second phalanx ; ph', Emballonuride ; in P teropus leucopterus

third phalanx; am, antebrachial membrane; /, femur; ¢, tibia; 76, fibula (rudimentary) ; c, caleaneum

or calear supporting im, the interfemoral membranc ; pel, post-calcaneal lobe.

therefore, the animal rests on all fours, having the knees directed upwards like a grasshopper's, while, in order to bring the foot into a position for forward progression, it is rotated forwards and inwards on the ankle. Walking under these circumstances is at best only a species of shuffle, and that this is fully recognized by the auimal is evidenced by its great anxiety to take to the wing, or, if this be impracticable, to ascend to some point where it can hitch itself up by the claws of the hind-legs in its usual position when at rest.

The bones entering into the formation of the skeleton in Charoptera are characterized by their slenderness, and by the great size of the medullary canals in those of the extremities. The vertebral column is short, and the vertebre differ very slightly in number and form through- out the species. The general number of the dorso-lumbar vertebr is 17, whereof 12 are dorsal; the cervical vertebrae are very broad, but short from before backwards (their breadth is due to the great transverse diameter of the spinal canal rendered necessary by the comparatively very large size of the spinal cord in this position, which, after giving off the nervous supply to the fore limbs and thorax, rapidly diminishes in size, and in the lumbo-sacral region is reduced to a fine thread). Except in the great frugivorous Bats (Pteropodide), the vertebra, from the third cervical backwards, are devoid

of spinous processes, a characteristic feature in the general osteology of the order.

alone does a process from the zygomatic arch meet the post-orbital so as to com- plete the orbital ring. Zygomatic arches, though slender, are present in all except in some of the species of Phy/- lostomidx.

The milk teeth differ from those of all other mammals

‘in that they in no respect resemble in form those of the

permanent series. They are very slender, with acutely pointed recurved cusps, and are soon shed, but often coexist for a short time with the permanent teeth when the latter are considerably elevated above the gum. In the family Rhcnolophide the milk teeth are absorbed before birth. The permanent teeth exhibit great variety in form, sometimes even in the same family, as in Phyllostomidex, whilst in other families, as in Rhinolophide, the resemblance between the dentition of species otherwise differing in many important respects is most remarkable. In all, however, they are provided with well-developed roots, and their crowns are acutely tuberculate, with more or less well-defined W-shaped cusps, in the insecti- vorous species, as in Jnsectivora, or variously hollowed out or longitudinally grooved in the frugivorous, as in some species of Phyllostomide and in the Pteropodide.

As might be expected, the shoulder-girdle varies very slightly, having the same office to fulfil in all species. The clavicle is very long, strong, and curved ; the scapule large, oval, triangular, with a long curved coracoid process. The humerus, though long, is scarcely two-thirds the lengtli of the radius ; the ulna is rudimentary; its proximal extremity,

which articulates with but a small part of the humerus, is ankylosed with the radius; immediately beyond the joint it is reduced to a very slender splint-like bone, which extends about as far as the middle of the radius. In all species a detached sesamoid bone exists in the tendon of the triceps muscle, and is generally found in skeletons. The radius is very long, in some

species as Jong as the head and body. The proximal row of the carpus consists of a single bone (the united scaphoid, lunar, and cuneiform bones), which, with the extremity of the radius, forms the radio-carpal joint; in the distal row the trapezium, trapezoid, and os magnum vary much in size in the different families; the unciform appears to be the most constant, and the pisiform is generally very small. It will be necessary to again refer to this subject when dealing with the diagnostic characters of the suborders. The manus is, in all the species, composed of five digits. The first, fourth, and fifth consist each of a metacarpal bone and two osseous phalanges; in the second and third the number of phalanges is different. in certain families. The first digit—the pollex—always terminates in a claw, which, with the proximal phalanx, is most developed in the frugivorous species. In most of the species of the frugivorous Pteropodidx the second digit is also provided with a claw, but in all other Bats this and the remaining digits are unarmed. In the genus Z'riznops alone a very peculiar short bony process projects from the outer side of the proximal extremity of the terminal phalanx of the fourth digit. The relative development of the digits and

their phalanges will be specially treated of under each |

family.

As might be expected from the small size of the posterior limbs, the pelvic girdle is very weak. The iliac bones are long and narrow. In most species the pubic bones of opposite sides are very loosely united in front in males; in females they are widely separated; in the family

Lhinolophide alone do these bones forma symphysis. The | eminentia ileo-pectinea develops in all species a long |

pectineal process, which in the subfamily Phyllorhinine alone is continued forwards to the anterior extremity of the ilium (wide infra, p. 412), forming a preacetabulor foramen which is unique among mammals, The acetabulum is small and directed outwards, and slightly upwards, and with this is related the peculiar position of the hind limb described above as one of the chief characteristics of the order. The femur is slender and cylindrical, with a small head and very short neck, and scarcely differs in form throughout the species, The bones of the leg and foot are

more variable ; in the subfamily Afolossine alone is there –

a well-developed fibula; in all other species this bone is either very slender or cartilaginous and ligamentous in its upper third, or reduced to a small bony process above the heel, as in Megaderma, or altogether absent, as in Nycteris.

The foot consists of a very short tarsus, and of slender, laterally compressed toes, with much curved claws. The first digit is composed of a metacarpal bone, a proximal and an ungual phalanx, and is slightly shorter than the other four toes, which have each an additional phalanx, except in the subfamily Phyllorhinine and in the anomalous genera ZThyroptera and Myxopodd, where all the toes have the same number of phalanges as the first digit, and are equal to it in length. In the very remark- able genus Cheiromeles the first digit is thumb-like and separated from the others ; and in the A/olossi the first and fifth digits are much thicker than the intermediate toes.

The muscular system, as might be expected, exhibits few striking differences throughout the species, The most noticeable peculiarities in the myology of the order consist in the separated bands or slips into which the platysma is

divided, and in the remarkable muscle termed occipito- pollicalis, which extends from the occipital bone to the base of the terminal phalanx of the pollex (see Macalister, i ious of the Chiroptera," Phil. Trans. Roy. Soc.,

1372).

Although, as above mentioned, the brain presents a low type of organization, yet probably no animals possess so delicate sense of touch as the Chiroptera. It is undoubt- edly this perceptive power which enabled the individuals deprived of sight, hearing, and smell, in Spallanzani's well-known experiments, to avoid the numerous threads hung across the rooms in which they were permitted to fly about. In the common Bats the tactile

organs evidently exist, not only in the delicate vibrisse which spring from the sides of the muzzle, but also in the highly sensitive and widely extended integumentary structures entcring into the forma- tion of the wing-membranes and ear-conchs, while in many other species, notably in the tropical Rhinolophine and Phyllostomine Bats, peculiar foliaceous cutancous expan- sions surrounding the nasal apertures or extending' back-wards behind them are superadded (vide infra). These structures, collectively known as the "nose-leaf" (whence the term "leaf-nosed Bats"), have been shown by the present writer (who has traced their gradual development in different species) to be made up partly of the extended and thickened marginal integument of the nostrils, and partly of the highly differentiated glandular eminences occupying the sides of the muzzle, in which, in all the common Bats, the vibrissz are implanted.

In all species of leaf-nosed Bats, and especially in the Lhinolophidx, in which the nasal appendages reach their highest development, the superior maxillary division of the fifth nerve is of remarkably large calibre. The nasal branch of this nerve, which is given off immediately beyond the infra-orbital foramen, is by far the largest por- tion, the palpebral and labial branches consisting of a few slender nerve fibres only. This branch passes forwards and upwards on the sides of the superior maxillary bone, but soon spreads out into numerous filaments which pass into the muscles and integument above, and into the base of the nose-leaf. The nerve supply of the nose-leaf is further considerably augmented by the large nasal branch of the ophthalmic division of the fifth nerve.

While the many foliations, elevations, and depressions which vary the form of the nose-leaf also greatly increase the sensory surface so abundantly supplied by tho fifth nerve, and in rapid flight intensify the vibrations conveycd to it, the great number of sweat and oil glands which enter into its structure perform an important function, analogous to that of the glands of the auditory canal in relation to the membrana tympani, in maintaining its surface in a highly sensitive condition.

The nasal appendages of Chiroptera, then, may be regarded as performing the office of an organ of a very exalted sense of touch stauding in the same relation to the nasal branches of the sensory divisious of the fifth nerve as

the aural apparatus to the auditory nerve; for, as the latter organ collects and transmits the waves of sound, so the former receives impressions arising from vibrations communicated to the air by approaching objects.

In no order of mammals is the ear-conch so greatly developed or so variable in form; in most of the insecti- vorous species the ears are longer than the head, while in some, as in the common Long-eared Bat (Plecotus auritus), their length nearly equals that of the head and body. The form of the conch is very characteristic in each of the families ; in most the tragus is remarkably large, in some extending nearly to the outer margin of the conch; its office appears to be to cause undulations in the waves of sound, and so intensify and prolong them. It is worthy of

notice that in the only family of insectivorous Bats wanting the tragus, the Rhinolophidx, the auditory bulle osseze reach their greatest size, aud the highly sensitive nasal appendages their highest development ; also in the group Molossi the ear-conch is di- vided by a prominent keel ; and the antitragus is remark- ably large in those species in which the tragus is minute (see fig. 66, a). In the frugi- vorous Bats, as might be expected, the form of the ear-conch is very simple, and but slightly variable through- out the species.

In all Bats the ears are extremcly mobile, each mov- ing independently at the Fic. 66—Head of Molossus glaucinus. will, of the -eimal. . This~ Dining? Sree a tee nto has been observed by the © notch behind antitragus. writer even in the frugivorous Pteropodide, in which the peculiar vibratory movements noticed by Mr Osburn in Artibeus perspicillatus may also be seen when the animals are alarmed.

The opening of the mouth is anterior in most species, but in many it is inferior, the extremity of the nose being more or less produced beyond the lower lip, so much so indeed in the small South-American species ’ynchonycteris naso as to resemble that of the Shrews. The lips exhibit the greatest variety in form, which will be specially referred to under each family. The absence of a fringe of hairs is very characteristic of all fruit-eating Bats, and probably always distinguishes them from the insectivorous

species, which they may resemble in the form of their teeth and in other respects.

The cesophagus is narrow in all species, and especially so in the sanguivorous Desmodontes. The stomach presents two principal types of structure, which correspond respec- tively to the two great divisions of the order, the Megachiroptera and the Microchiroptera; in the former (with the exception of Harpyia) the pyloric extremity is more or less elongated and folded upon itself, in the latter it is simple, asin Znsectivora vera ; a third exceptional type is met with in the sanguivorous Desmodontes, where the left or cardiac extremity is greatly elongated, forming a long narrow cecum-like appendage. The intestine is com- paratively short, varying from one and a half to four times the length of the head and body, being longest in the frugivorous, shortest in the insectivorous species. In Rhinopoma microphyllum and MMegaderma spasma only las a very small ceecum been found.

The liver is characterized by the great size of the left lateral lobe, which occasionally equals half the size of the whole organ ; the right and left lateral fissures are usually very deep; in Megachiroptera (Harpyia excepted) the Spigelian lobe is ill-defined or absent, and the caudate is generally very large, but in Mvcrochiroptera, on the other hand, the Spigelian lobe is very large, while the caudate is small, in most species forming a ridge only. The gall- bladder is generally well developed and attached to the right central lobe, exccpt in Rhenolophidx, where it is connected with the left central.

In most species the hyoid bones are simple, consisting of a chain of slender, elongated, cylindrical bones connect- ing the small basi-hyoid with the cranium, while the pharynx is short, the larynx shallow with feebly developed vocal cords, and guarded by a short acutely-pointed epiglottis, which in some genera (Harpyta, Vampyrus, e.g.) is almost obsolete. In the Epomophori, however, we find a remarkable departure from the general type; the

pharynx is long and very capacious, the aperture of the larynx far removed from the fauces, and, opposite to it, a canal, leading from the narial chambers, and extending along the back of the pharynx, opens; the laryngeal cavity is spacious and its walls are ossified ; the hyoid bone is

foamy

Fic. 67.—Head and Neck of Epomophorus jfranqueti (adult male, natural size). Dobson, Proc. Zool. Soc., 1881. The anterior (a.ph.s) and posterior (p.ph.s) pharyngeal sacs are opened from without, the dotted lines indicating the points where they communicate with the pharynx; s, thin membranous septum in middle line between the antcrior pharyngeal sacs of opposite sides; 8.m, sterno- mastoid muscle separating the anterior from the posterior sac.

quite unconnected, except by muscle, with the cranium ;

the cerato-hyals and epi-hyals are cartilaginous and greatly

expanded, entering into the formation of the walls of the pharynx, and, in the males of three species at least, sup- porting the orifices of a large pair of air-sacs communicat-

ing with the pharynx (see fig. 67).

In extent, peculiar modifications, and sensitiveness, the cutaneous system reaches its highest development in this order. As a sensory organ its chief modifications in con- nexion with the external ear, and with the nasal and labial appendages, have been described when referring to the nervous system. It remains therefore to consider its relative development as part cf the organs of flight.

The extent and shape of the volar membranes depend mainly on the form of the bones of the anterior extremities, and on the presence or absence of the tail. Certain modifications of these membranes, however, are met with,

which evidently do not depend on the skeleton, but are related to the habits of the animals, and to the manner in which the wing is folded in repose.

The volar membranes consist of—(1) the "antebrachial membrane," which extends from the point of the shoulder along the humerus and more or less of the forearm to the base of the thumb, the metacarpal bone of which is partially or wholly included in it ; (2) the " wing-membrane," which is spread out between the greatly elongated fingers, aud extends along the sides of the body to the posterior extremities, generally reaching to the feet ; and (3) the '"'interfemoral membrane," the most variable of all, which is supported between the extremity of the body, the legs, and the calcanea (see fig. 65).

The antebrachial and wing membranes are most developed in those species which are fitted only for aerial locomotion, and which when at rest hang with the body enveloped in the wings ; but in the family Emballonuride, especially in the subfamily Molossinex (the species of which are, of all Bats, the best fitted for terrestrial progression), the antebrachial membrane is reduced to the smallest size, and is not developed along the forearm, leaving also the

thumb quite free, and the wing-membrane is very narrow and folded in repose completely under the forearm. The relative development of the interfernoral membrane has been referred to above in describing the caudal vertebra. Its small size in the frugivorous and sanguivorous species, which do not require it, to which, indeed, its presence would be actually in- 4

jurious as impeding \ F

their motions when searching for food as they hang suspended : by their feet, is easily understood. Odorifer-

ous glands and pouches Fic. 68.—Frontal Sac and Nose-Leaf in Male and

opening on the surface Female of Phyllorhina larvata. Dobson, of the outer skin are Proc. Zool. Soc., 1873,

developed in many species, but in most cases more so in males than in females, and so constitute very remark- able secondary sexual characters. They will be referred to wlien treating of the peculiarities of certain species. (See also the writer's paper "On Secondary Sexual Characters in Chiroptera," Proc. Zool. Soc. Lond., 18738, pp. 241-252.)

Space does not admit of entering liere upon a special description of the respiratory, circulatory, digestive, urinary, and generative organs, which will be found fully treated of in the works noted in the bibliography of the order below, and therefore with the above short account of the general structure of the species we proceed to consider their classification and geographical distribution.

The Chiroptera fall naturally into two subdivisions, which may be called suborders,

SuporvErR I]. MEGACHIROPTERA.,

Frugivorous Bats, generally of large size, having the crowns of the molar teeth smooth, marked with a longitudinal groove; with the bony palate continued behind the last molar narrowing slowly backwards ; with three phalanges in the index finger, the third phalanx terminated generally by a claw; with the sides of the ear- conch forming a complete ring at the base; with the tail, when present, inferior to (not contained in) the interfemoral membrane ; with the pyloric extremity of the stomach generally much elongated ; and with the Spigelian lobe of the liver ill-defined or absent, while the caudate is well developed.

Frugivorous ; limited to the tropical and subtropical parts of the

Kastern Hemisphere.

Family PrEROPODIDA.

The characters of the single family are those of the suborder.

Epomophorus, « % (or 4), ¢4, pm 3, m4; tail very short or none, when present quite free from the interfemoral membrane ; second finger with a

claw ; premaxillary bones united in front. The six species include some of the most remarkable forms of fruit- eating Bats. They are strictly limited to the African continent south of the Sahara, and are readily distinguished by their remark- ably large and long head and very expansible, often peculiarly folded, lips, and by the invariable white tuft of hair which adorns the margins of the ears ; most of the species also are provided with peculiar glandular pouches, situated in the integument of the side of the neck near the point of the shoulder. These pouches are rudimentary or quite absent in females, thus presenting .an interest- ing secondary sexual character. In the males they are lined with a glandular membrane, from which long coarse ycllowish hairs arise, and, projecting from the mouth of the pouches, form conspicuous epaulet-like tufts on the shoulders, hence the generic name. Another and even still more remarkable secondary sexual character has been recently discovered by the writer in the males of Z. frangueti, comptus, pusillus, and monstrosus. This consists in the presence of a pair of large air-sacs extending outwards on each side from the pharynx beneath the integument of the neck, in the position shown in fig. 67. These sacs are evidently capable of being greatly clistended at the will of the animal, and their inflation probably occurs under the same circumstances that the wattles of male gallinaceous birds swell up, namely, when engaged in courting the females. Other remarkable conditions in which these Bats appear to differ from all other species, as in the peculiar structure of the hyoid bones and larynx, may be found described in detail in the writer's paper in the Proceedings of the Zoological Society for June 1881. These Bats appear to live principally on figs, the juicy

contents of which their voluminous lips and capacious mouths enable them to swallow without loss.

Pieropus, 7 3,¢ 4, pm %, m 2, with forty-one species, includes more than half the Pécropodidw. All are of large size, and the absence of a tail, the long pointed muzzle, and the woolly fur cover- ing the neck render their recognition easy. They are the " Flying Foxes" of Europeans in India, and one of the species, Pt. edulis, in- habiting Java, measures , 5 feet across the

fully extended wings, and is the largest known species of the order, The species resemble As one a in oe at ‘ – dentition, and are main- ° e—110a ao CEropus persona us. ly distinguished by the Proc. Zool. Soc., 1866. form of the ears and quality of the fur. Lt. scapulatus, from north-east Australia, approaches the species of the second section of the family, the Jfacroglossi, in the remarkable narrowness of its molars and premolars.

The geographical range of the genus is very peculiar, extending from Madagascar and its islands through the Seychelles to India, Ceylon, Burmah, the Malay Archipelago, southern Japan, New Guinea, Australia, and Polynesia (except the Sandwich Islands, Ellice’s Group, Gilbert’s Group, Tokelau, and the Low Archipelago). Of the islands inhabited some are very small and remote from any continent, such as Savage Island in the South Pacific, and Rodriguez in the Indian Ocean. Although two species inhabit the Comoro Islands, which are scarcely 200 miles from the African coast, not a single species is found in Africa; yet in India, separated by: thousands of miles of almost unbroken ocean, a species exceedingly closely allied to the common Madagascar “ Flying Fox” isabundant. The Malay Archipelago and Aystralia are their headquarters, and in some places they occur in countless multitudes, Me Maagiiieny remarks of Pt. conspicillatus :—“On the wooded slope of a hill on Fitzroy Island I one day fell in with this Bat in prodigious numbers, looking while flying in the bright sunshine (so unusual for a nocturnal animal) like a large flock of rooks, On close approach a strong musky odour became apparent, and a loud incessant chattering was heard. Many of the branches were bending under their load of Bats, some in a state of inactivity, suspended by their hind claws, others scrambling along among the boughs, and taking to wing when disturbed.” Cynonycteris, Sovittgon as in Pleropus, but with a short tail, and the fur of the back of the neck not differing from that of the back, with nine species, extends into Africa, but has not been recorded from Australia or Polynesia ; otherwise its distribution accords with that of Péteropus, C. egyptiaca inhabits the chambers of the Great Pyramid and other deserted buildings in Egypt, and is probably the species so generally figured in Egyptian frescos. Boneta, with one species, B. bidens, from Borneo, differs from Cynonycteris in having two upper incisors only:

Cynopterus, 1 % or ?, ¢ 4+, pm $, m $, muzzle shorter and grooved like Pécropus in front, tail and fur as in Cynonycteris, with seven species, is almost limited to the Oriental region. marginatus is very common in India, and extremely destructive to ripe fruit of every description. Toa specimen of this Bat obtained by the writer at Calcutta uninjured was given a ripe banana, which, with the skin removed, weighed exactly 2 ounces, The animal immediately, as if famished with hunger, fell upon the fruit, seizing it between the thumbs and the index fingers, and took large mouthfuls out of it, opening the mouth to the fullest extent with extreme voracity. In the space of three hours the whole fruit was consumed. Next morning the Bat was killed, and found to weigh one ounce, half the — weight of the food eaten in three hours. Indeed the animal when eating seemed to be a kind of living mill, the food passing from it almost as fast as devoured, and ap- parently unaltered, eat- ing being, as it were, performed only for the f pleasure of eating. Fig. 70,—Head of Harpyia major. Dobson, Proc.

Harpyia, i 4, ¢ 4, Zool, Soc., 1877. pm 3, m 3, premaxillary bones well-developed and united in front, facial bones much elevated above the margin of the jaw, nostrils tubular, body and limbs as in Cynopterus, includes two species

of very remarkable physiognomy (as may be seen from fig. 70), limited to the Austro-Malayan subregion.

Cephalotes, 4 4, ¢ 4, pnr3, m %, premaxillary bones not united in front, nostrils simple, muzzle short, index finger without a claw, tail short, includes two species, having the same distribution as those of Harpyia; in both the wing-membrane arises from the centre line of the back, to whieh it is attached by a longitudinal very thin process of the integument ; the wings are quite naked, but the back covered by them is well clothed with hair.

Notopteris, i 2, ¢ 4, pm 3, m $, index finger without a claw, wings from the spine, tail long. With this genus we enter the second division of the family, the Afaeroglossi, which have the facial part of the skull much produced, the molar teeth narrow, and scarcely raiscd above the gum, and the tongue exceedingly long, attenuated in the anterior third, and armed with long recurved papille near the tip. The single representative of the genus, N. maedonaldii, inhabits the Fiji Islands, Aneiteum Island, and New Guinea. It is at once distinguished from all other Bats of this family by the remarkable length of its tail, which is nearly as long as the forearm.

Eouyeteris, 12, c+, pm %, m 2, is also represented by a single species, E. spelwa, from the Farm Caves, Moulinein, Burmah, which has somewhat the appearance of a Cynonyeteris, but the absence of a claw in the index finger and the presence of the characteristic tongue and tceth at once distinguish 1t.

Macroglossus and Melowyeteris, each with a single specics, are closely allied; the index finger in both has a claw, but the number of the teeth is the same as in Louyeteris. Macroglossus minimus is the smallest known species of the suborder ; it is much smaller than the common Serotine Bat of Europe, and its forearm is scarcely longer than that of the Long-eared Bat. It is nearly as common in eertain parts of India as Cynopterus marginatus (compared with which it is proportionally equally destructive to fruit), and extends eastward through the Malay Arehipelago as far as New Ireland, where it is associated with Melouyeteris melanops, distinguished from it by its larger size and by the total absence of the tail.

SuporpEer Il. MICROCHIROPTERA.

Insectivorous (rarely frugivorous or sanguivorous) Bats, of com- paratively small size, having the crowns of the molar teeth acutely tuberculated, marked by transverse grooves, with the bony palate narrowing abruptly, not continued backwards laterally behind the last molar; with one rudimentary phalanx (rarely two phalanges or none) in the index finger, which is never terminated by a claw ; with the outer aud inner sides of the ear-conch commencing inferiorly from separate points of origin ; with the tail, when present, contained in the interfemoral membrane, or appearing upon its upper surface ; with a simple stomach (except in Desmodontes) ; and with

the Spigelian lobe of the liver very large, the caudate lobe generally small. Inhabiting the tropical and temperate regions of both hemispheres.

The Bats included in this suborder are mainly insectivorous, though some are frugivorous, and two species are known to be sanguivorous. 'They fall into five natural families, which may be arranged in two groups or alliances as follows :—

I. Tail contained within the interfemoral membrane ; the middle pair of upper incisors never large, always separated from each other by a more or less wide space. I. Vespertilionine Allianee.

a, Middle finger with two osseous phalanges only (except in Myxopoda aurita, Thyroptera tricolor, and Mystacina tubereulata).

a', First phalanx of the middle finger extended (in repose) in a line with the metacarpal bone.

a". Nostrils opening in a depression on the upper surface of the muzzle, surrounded by foliaceous cutaneous appendages.

a". Tragus none ; premiaxillary bones rudimcn- tary, represented by thin osseous lamin suspended from the nasal cartilages in the centre of the space between the canines. Rhinolophidz.

b'. Tragus distinct ; premaxillary bones cartila- ginous or small, separated by a space in front. Nyeteride.

b". Nostrils opening by simple crescentic or circular apertures at the extremity of the muzzle, not surrounded by distinct foliaceous cutaneous appendages ; preniaxillary bones small, lateral, separated by a wide space in front; tragus

; distinct. Vespertilionidx.

Il. Tail perforating the intcrfemoral membrane, and appearing on its upper surface, or produced considerably beyond the truneated membrane ; the middle pair of upper incisors

generally large and close together. II. Emballonurine Alliance.

ae TL 1 ee

b'. First phalanx of the middle finger folded (in repose) on the dorsal surface of tlle metacarpal bone (except in Noetilio and Afystacina).

e". Nostrils opening by simple cireular or valvular apertures at the extremity of the muzzic, not surrounded or margined by foliaceous eutancous appendages; tragus distinct. Hmballonuridx.

b. Middle finger with three well devcloped osseous phalanges ; first phalanx of the middle finger short ; nostrils in the front part of the cutaneous nasal appendages, or opening by simple apertures at the extremity of the muzzle ; chin with warts or erect cutaneous ridges; premaxillary bones well-developed, united in front. Phyllostomide.

[CHIROPTERA.

J], VESPERTILIONINE ALLIANCE, Family VESPERTILIONIDS.

In the above synopsis of the families of Mfieroehiroptera the Vespertilionide take the central position; and this is, indeed, the place really occupied by them in the subordcr. This family includes the common simple-faced Bats of all countries, of which the well-known Pipistrelle and the Whiskered Bat (Vespertilio mystacinus) may be taken as familiar types, and its species number about 150, considerably more than one-third the total number of the known species of Chiroptera, estimated at slightly over 400 (see Introd. to Dobsoun's Catal. Chiropt. Brit. Afus., 1878). Besides the characters of the family given in the synopsis, it may be added that the skull is of moderate size, the nasal and frontal boues not much extended laterally or vertically, nor furrowed by deep depressions ; the number of incisors varies from 4 to 3, rarely (in Auntrozous only) 4, premolars % or 3 or 4, rarely (in Vesperugo noctivagans of North America) 3; the upper incisors are small, separated by a wide space in the centre, and placed in pairs or singly near the canines ; the molars are well-developed, with acute W-shaped cusps. The family is distributed over the temperate and tropical regions of both

hemispheres. The genera may be con- veniently divided into four groups :— Plecoti, Vespertiliones, Mini- optert, and Thyropter?.

In the Pleeott, of which the common Long-eared Bat (Plecotus auritus) is the type, the crown of the head is but slightly raised above the face-line, the upper incisors are elosc to the canines, and the nostrils are margined behind by grooves on the upper surface of the muzzle, or by rudimentary nose-leaves ; the ears also are generally very large and united. Of the five genera, Plecotus, 7 %, pm 2, has two species :—one the eommon Long-eared European Bat referred to above; the other, 7. maerotis, restricted to North America, is distinguished by the great size of the glandular prominences of the sides of the muzzle, which meet in the centre above and behind the nostrils. Synotus, 1 3, pm 2, distinguished by dentition and by the outer margin of the ear being carried forwards above the mouth and in front of the eye, includes the European Barbastelle Bat, S. barbastellus, and 8. darjelingensis from the Himalaya. Otonyeteris, 14, pm 4, connecting this group with the Vespertiliones through the tropical Seotophilt, is represented by a single species, O. hemprichit, from North Africa and the Himalaya. The next two genera are distinguished by the presence of a rudimentary nose-leaf:—Myetophilus, 1 3, pm 4, with one species, WV. timoriensis, from the Australian region; and Auntrozous, ¢ 4, pm %, distinguished from all the family besides by having but two lower incisors, and from other Pleeoti by the separate ears ; the single spccics, A. pallidus, inhabits California.

The group Vespertiliones, with eight genera, includes nine-tenths of the specics. Of thcse one-third are contained in the genus Vesperugo, which is divisible into six subgenera according to the nuniber of premolars and incisors; the latter vary from § to } in the subgenera Scotozous and Rhogeéssa, and the premolars from 3 to $ (in the subgenus Lasionyeteris 2). The Bats of this genus are generally casily distinguished by their comparatively thickly formed bodies, by their flat broad heads and obtuse muzzles, by their short, broad, and triangular, obtusely-pointed ears, by their obtuse and usually slightly incurved tragus, by their short legs, and by the presence in most species of a well-developed post-calcaneal lobule. ‘This lobule (which is supported by a cartilaginous process derived from the caleaneum) may act as a kind of adhesive disk in securing the animal’s

grasp when climbing over smooth surfaces. Vesperugo probably contains the greatest number of individuals among the genera of Chiroptera, and, with the exception of Vespertilio, its species have also the widest geographical range, being in fact cosmopolitan ; and one of the species, the well-known Serotine, V. (Vesperus) serotinus, is remarkable as the only species of Bat known to inhabit both the Old and the New World; one, V. borealis, has been found close to the limits of the Arctic Circle, and another, V. magellanicus, inhabits the cold and desolate shores of the Straits of Magellan, doubtless the Bat referred to by Mr Darwin in the Naturalist's Voyage. Chalinolobus agrees with Vesperugo in the dental formula, but is readily distinguished by the presence of a

well-defined lobe projecting near the angle of the mouth from the lower lip, and by the unicuspidate upper inner incisors, The species fall into two subgenera:—Chalinolobus, pm 2, with C. tuber- ewlatus from New Zealand, Tasmania, and Australia, and three other species from Australia; and Glauconycteris, pm 4, limited to southern and equatorial Africa, with G. argentatus and two other species, the Bats of this subgenus being especially remarkable for their peculiarly thin membranes traversed by very distinct reticulatious and parallel lines, Seotophilus, 4 4, pm %, includes eight species, restricted to the tropical aud subtropical regions of the eastern hemisphere, though widely distributed within these limits. The Bats of this genus, though difficult to define, and approaching certain of those of Vesperugo in many points, are distinguished espe- : eially by the single pair of unicuspidate NAAQS WS

upper incisors separated by a wide spacc SQ'

and placed close to the canines, by the Fig. 71.—Head of Scotophitus small transverse first lower premolar emarginatus. Dobson, Mo- croshed in between the canine and ogr. Asiat. Chiropt. second premolar, and, generally, by their conical nearly naked muzzles and remarkably thick leathery membranes. Sc. tem- minckit is probably the commouest specics of Bat in India, and appears often on the wing even before the sun has touched the horizon, especially when the white ants are swarming, feeding eagerly upon them as they rise in the air. Sc. gigas, from equa- torial Africa, with

the forearm 3°4 inches, is by far the largest species. Nyeticejus, with the same dental formula as Scotophilus, is distin- guished by the first lower premolar not being crushed in between the adjoining teeth, and by the a much greater size of the last upper molar. It includes only the common North Ameriean species NV. crepusewlaris, a small Bat scarcely larger than the Pipistrelle. Atalapha, 2 4, pm % or 4, with five species, is also limited to the New World. 'The Bats of this genus are generally characterized by the interfemoral membrane being more or less covered with hair (in the two commonest species, .4. noveboracensis and A. cinerea, wholly thickly covered), and by the peculiar form of the tragus, which is expanded above and abruptly curved inwards. In these species, which have two upper premolars, the first is extremely small and quite internal to the tooth-row. The genus Harpyiocephalus, i 3, pm %, includes eight very remarkable small species, distinguished at once by their prominent tube-like nostrils and hairy interfemoral membrane. A. swillus from Java and neighbouring islands is the best-known species, and another closely allied, Zf. hilgendorfi, has been described by Professor Peters from Japan. The remaining six specics are known only from the Himalaya and Tibet. All appear to be restricted to the hill tracts of the countries in which they are found. Next to Vesperugo, the genus Vespertilio, + 3, pm 4, includes by far the largest number of species, amounting to forty-three ; it has, however, rather a wider geographical distribution in both hemispheres, one species at least being recorded from the Navigators' Islands. The species are easily recognized by the peculiar character of the pairs of upper incisors on each side, the cusps of which diverge from each other, by the large number of premolars, of which the second upper is always very small, and by the oval elongated ear and uarrow attenuated tragus. Kerivoula, with the same dental formula as Vespertilio, is easily distinguished by the parallel upper incisors, and by the compara- tively large size of the second upper premolar. Cs

Ten species have been Fre. 72.—Side and Front View of the Head of Keri- described from the %0¥/@ hardwickit. Dobson, Monogr. Asiat. Chiropt. Ethiopian and Criental regions, of which K. picta, from India and the Indo-Malayan snbregion, is the best-known, being well char- acterized by its brilliantly coloured orange fur and conspicuously marked membrane, which are variegated with orange and black. The genus includes the most

delicately formed and most truly insectivorous, tropical, forest-haunting Bats, which appear to stand as regards the species of Vespertilio in a position similar to that occupied by Chalinolobus with respect to Vesperugo.

The next group, Miniopteri, includes two genera, Natalus and Miniopterus, characterized by the great elevation of the crown of the head above the face-line, and by the upper incisors being separated from the canines and also in front. Natalus, with the same dental formula and general external form as Kerivowla, is distinguished by the short triangular tragus, and by the characters of the group enumerated above. It includes three species, all restricted to South and Central America and the West Indies; the head of one, N. mieropus, lately described by the present writer, is shown in fig. 73. Miniopterus, + 3, pm 2, at once distinguished by the shortness of the first phalanx of the middle finger, and by the great length of the tail, which is wholly contained within the interfemoral

membrane, includes four species, restricted to the eastern hemi- sphere. Of these the best-known, JI sehreibersti, is very widely distributed, being found 4 a almost everywhere through- out the tropical and warmer temperate regions of the eastern hemisphere, speci- mens from Germany, Mada- |} gascar, Japan, and Australia differing in no appreciable respect.

The last group, Thy- roptert, includes also two genera, distinguished not only by the presence of an additional osseous phalanx

Fic. 73.—Head of Natalus micropus. Dobson, Proc. Zool. Soc., 1880.

in the middle finger and an equal number of phalanges in the toes, but also by peculiar accessory clinging organs attached to the

extremities. In Thyroptera tricolor, 12, pm %, from Brazil, these organs have the appearance of small, circular, pedunculated, hollow disks (fig. 74), resembling in miniature the sucking cups of cuttle-fishes, and attached to the inferior surfaces of the thumbs and soles of the feet, with which the animal is enabled to main- tain its hold when creeping over smooth vertical surfaces (for an

Fic. 74.—Suctorial Disks in Thyroptera tricolor, a, side, and b, concave surface, of thumb disk; c, foot with disk, and calcar with projections (all much en- larged). Dobson, Proc. Zool. Soc., 1876.

account of the minute anatomy of these clinging organs see the writer's paper in the Proc. Zool. Soc., 1876, pp. 531-34). In Myxopoda aurita from Madagascar (type of the second genus), with the same dental formula, but differing much in the characters of the tecth and in the form of the ears, the whole inferior surface of the thumb supports a large sessile horse-shoe-shaped adhesive pad, with the circular margin directed forwards and notched along its edge, and a smaller pad occupies part of the sole of the foot.

Family NycrEripa. This small family, defined in the synopsis above, includes only

i Fig. 75.—Megaderma gigas. x 3, Dobson, Proc. Zool, Soc., 1880.

two genera of Bats of very peculiar aspect, limited to the tropical and subtropical parts of the eastern hemisphere.

Megaderma, 7 $, pm ¢ or 4, with five species, is distingnished by the absence of upper incisors, by the cylindrical narrow muzzle snr- mounted by an erect naked cutaneous process (the nose-leaf), the base of which conceals the nasal orifices, by the immense connate ears with large bifid tragi, and by the great extent of the interfemoral membrane, in the base of which the very short tail is concealed. M. gigas, from central Queensland (forearm 4°2 inches), is not only the largest species of the genus but also of the suborder. M. lyra, common in India (forearm 2°7 inches), has been

caught in the act of sucking the blood, while flying, from a small species of Ves- perugo, which it afterwards devoured (see Dobson's Monograph of the Asiatic Chiroptera, p. 77), so that it is probable that the Bats of this genus do not confine themselves to insect prey alone, but also feed, when they can, upon the smaller species of Bats and other small mammals.

Nycteris, t 2, pm 4, with seven species, differs so much from Megaderma that it may be considered the type of a separate sub- family. As in that genus, the frontal bones are deeply hollowed out and expanded latcrally, the muzzle presents a similar cylindrical form, and the lower jaw also projects, but the single elevated nose- leaf is absent, and instead of it the face is eaiket by a deep longi- tudinal sharp-edged groove extending from the nostrils (which are on the upper surface of the muzzle near its extremity) to the low band connecting the bases of the large ears; the sides of this depression are margined as far back as the eyes by small horizontal cutaneous appendages. All the species resemble one another closely, and are mainly distinguished by the form of the tragus, and the size and relative position of the second lower premolar. With the exception of N. javanica, all the species are limited to the Ethiopian region.

Family RHINOLOPHIDS.

In all the species of this family the nasal appendages are highly developed, and surround on all sides the nasal apertures, which are situated iu a depression on the upper surface of the muzzle; the ears are large and generally separate, without trace of a tragns ; the premaxillary bones are rudimentary, are suspended from the nasal cartilages, and support a pair of very small incisors; the molars have acute W-shaped cusps; the skull is large, and the

nasal bones which support the large nasal cutaneous appendages are |

much expanded vertically and laterally ; in females a pair of teat- like appendages are found in front of the pubis; and the tail is long and produced to the posterior margin of the interfemoral membrane. The family is found in the temperate and tropical parts of the eastern hemisphere.

From whatever point of view the Rhinolophidx may be considcred, they are evidently the most highly organized of insectivorous Bats. In them the osseous and cutaneous systems reach the most perfect development. Compared with theirs the bones of the extremities and the volar membranes of other Bats appcar coarsely formed, and even their teeth seem less perfectly fitted to crush the hard bodies of insects. The very complicated nasal appendages, which evidently act as delicate organs of special perception (vide supra), here reach their highest development, and the differences in their form afford valuable characters in the discrimination of the specics, which resemble one another very closely in dentition and in the colour of the fur.

Subfamily I. Rhinolophines.—First toe with two, other toes with three phalanges each ; ilio-pectineal spine not connected by bone with the antero-inferior surface of the ilium.

Rhinolophus, ¢ 4, ¢ 4, pm %, m 3, nose-leaf with a central process behind and between the nasal orifices, posterior extremity lanceolate, antitragus large, includes twenty-four species. £. dwetus, forearm 8 inches, is the largest species, in- habiting elevated hill tracts in India and Malayana; R&R. hipposideros of Europe, extending into south England and Ireland, forearm 1°5 inches, is one of the smallest; and R&R. ferrum-equinum, forearm 2°38 inches, represents the average size of the species, which are mainly distinguished from one another by the form of the nose-leaf. The last-named species extends from Eng- land to Japan, and southward to the Cape of Good Hope.

Weise cc ae Fie. 76.—Head of Rhinolophus Subfamily II. Phyllorhinines.—mitrazus. Dobson, Monogr.

Tocs equal, of two phalanges each;

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having been taken at Amoy in China, and in the Himalaya at an elevation of 5500 fcet. Many are provided with a peculiar frontal sac behind the nose-leaf, rudimentary in females (sce fig. 67), which the animal can evert at plea- sure; the sides of this sac secrete a waxy substance, and its extremity

sup- ports a pencil of straight hairs. Rhinonycteris, re- presented by &. awrantia from Australia, and Triwnops, by T. persicus, from Persia and eastrrn Africa, are closely allied genera; the latter species is characterized by the very remarkable form of its nasal appendages and ears, and by the presence of a peculiar osseous projection from the proxi-

Fic. 77.—Head of Phullorhina calcarata. Dobson, Proc. Zeol, Soc., 1877.

mal extremity of the second phalanx of the fourth finger. Colops

(C. frithii), from the Ben- gal Sunderbunds, Java, and Siam (in the roof of the great pagoda at Laos), is distinguished, not only by the very peculiar form of its nose-leaf, but also by the great length of the metacarpal bone of the index finger, as well as by the shortness of the calcanea and inter-femora] membrane.

Fig. 78,—Head of Triwnops persicus. x 2. Dobson, Monogr. Astat. Chiropt.

II. EMBALLONURINE ALLIANCE, Family EMBALLONURIDA.

‘The second group of families (as defined above) into which the Microchiroptera may be divided includes the Emballonuride and Phyllostomide. The former is represented by thirteen genera, including sixty-five species. The Hmballonuridw are generally easily distinguished by the peculiar form of the muzzle, which is obliquely truncated, the nostrils projecting more or less in front beyond the lower lip, by the first phalanx of the middle fingcr being folded in repose forwards on the upper surface of the metacarpal bone, by the tail, which either perforates the. inter- femoral membrane or is produced far beyond it, and by the upper incisors, which are generally a single pair separated from the canines and also in front. They are cosmopolitan like the Vesper- tilionidz, but rarely extend north or south of the thirtieth parallel of latitude.

Subfamily I. Emballonuringe.—Tail slender, perforating the interfemoral membrane, and appearing upon its upper surface, or rs in it; legs long, fibule very slender; upper incisors weak,

Group I. Furi#.—Tail terminating in the interfemoral mem- brane ; crown of the head greatly elevated above the face-line ; thumb and first phalanx of the middle finger very short ; 7 2, ¢ 4, pm %, mF.

Two genera, Furia and Amorphoechilus, each including one species of very peculiar aspect, the latter distinguished from the © former by the widely separated nostrils and great extension back- wards of the bony palate. . Habitat South America.

Group II. Emballonure.—Part of the tail included in the basal half of the interfemoral membrane, the remaining part passing through and appearing upon its upper surface; crown of the head slightly elevated; thumb and first phalanx of the middle finger moderately long; pm 3. With five genera.

Emballonura, ¢ %, extremity of the |' muzzle more or less produced beyond the 4 lower lip, forehead flat, contains five species, inhabiting islands from Mada- gascar through the Malay Archipelago to the Navigators' Islands. Coletira, 4 4, Fie. 79.—Ear of Emballonura extremity of the muzzle broad, forehead T"@frayana. x2 Dobson,

*7 * ms Proc. Zocl. Soc., 1878. concave, has two species from east Africa and the Seychelles Islands. Rhynehonycteris is distinguished from Coletira by the much produced extremity of the muzzle ; the single species, R. naso, from Central and South America, is very common in the vicinity of streams throughout the tropical parts of these countries. It is usually found during the day resting on the vertical*

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CHIROPTERA. |

faces of rocks, or on the trunks of trees growing out over the water, aud, owing to the peculiar greyish colour of the fur covering the body and growing in small tufts from the antebrachial membrane, counterfeiting the weathered surfaces of the rocks and the bark of the trees, easily escapes notice. As the shades of evening approach it appears early on the wing, flying close to the surface of the water, and seizing the minute insects that hover over it. Saccoptery.x, é 4, antebrachial membrane with a pouch

opening on its upper snrface, contains six species from Central and South America ; the wing-sac varies in position in different species. It is developed only in the male; in the female it is quite rudimentary. In the adult males of the different species a valvular longitudinal opening is found on the upper surface of the membrane. This opening leads into a small poucli (in some pore large enough to hold. a pea), the interior of which is lined with a glandular membrane secreting an unctuous substance of a reddish colour with a strong ammoniacal odour. The presence of this sac in males only indicates that it is a secondary sexual character analogous to the shoulder pouches of Epomophorus, the frontal sacs of Phyllorhina, &e.

The next genus Taphozous, including ten species, inhabiting the tropical and subtropical parts of all the eastern hemisphere except Polynesia, forms the second section of this group, distinguished by its cartilaginous premaxillaries, deciduous pair of upper incisors, and by the presence of four lower incisors only. Most of the specics have a peculiar glandular sae (see fig. 80) placed between the

Fig. 80.—Heads of Taphozous longimanus, showing relative development of gular sacs in male and female. Dobson, Proc. Zool, Soc., 1873.

angles of the lower jaw, a sexual character ; for, while always more developed in males than in females, in some species, although distinct in the male, it is quite absent in the female. An open gular sac is wanting in both sexes in 7. melanopogon, but about its usual position the openings of small pores may be scen, the secretion exuding from which probably causes the hairs to grow very long, forming the black beard found in many male specimens of this species.

Group III. Dicliduri.—This is represented by a single genus, Diclidurus, including two species, LD. albus, from Central and South America, ¢ 4, ¢ 4, pm %, m %, resembles the species of Taphozous in the form of the head and ears, but, besides other characters, differs from all other Bats in possessing a peculiar

ouch, opening on the centre of the inferior surface of the inter- emoral membrane; the extremity of the tail enters this, and per- forates its fundus.

Group IV. Noctiliones, —This also is represented by asingle genus

*and two species, Noctilio leporinus and N. dorsatus, + 2, pm 34, from Central and South America. The group connects the family Emballonuride with the Phylilostomidx, possessing characters eommon to both, but also so many remarkable special peculiarities as almost to warrant the formation of a separate family for its reception. The type, V. leporinus of Linneus, is a Bat of very curious aspect, with strangely folded lips, erect eutaneous processes on the chin, and enormous feet and claws. The two middle incisors are close to- gether, and so large as to con- ceal the small outer ones, while in the lower jaw there are but two small incisors. This ap- parent resemblance to a Ro- dent actually led the great bs sis naturalist to remove this Fre, §1.—Skull of Rhinopoma micro- species from the Bats and phyllum, x2. Dobson, Monogr, Asiat. place it in his order Glires or ©**70P¢. Rodents. Similarly the next group Rhinopomata, represented by a single species, R. microphyllum, might also be elevated into the rank of a family, for it is very difficult to determine its exact affinities, a kind of eross relationship attaching it to the Nycteridx on the one hand and to this family, in which it is here placed provisionally, on the other. This curious species, distin guished from all other Mierochiroptera as well by the presence of two phalanges in the index finger as by its remarkably long and slender tail projecting far beyond the narrow interfemoral membrane, in- liabits the subterrancan tombs in Egypt and deserted buildings generally from north-east Africa to Burmah.*

Subfamily II. Molossinge. —Tail thick, prodneed far beyond the posterior margin of the interfemoral membrane (except in Aysta- cina) ; legs short and strong, with well-developed fibule ; upper incisors strong. This subfamily includes all the species of Embal- lonuridx with short and strong legs and broad feet—whereof the first toe (and in most species the fifth also) is much thicker than the others, and furnished with long curved hairs, — with well-developed eallosities at the base of the thumbs, and with a single pair of large upper incisors occupying the centre of the space between the canines. In all the species the fect are free from the wing- membrane, which

folds up very perfectly under the forearm and legs ; the interfemoral membrane is retractile, being movable back- wards and forwards along the tail, and this power of varying its superficial extent must eonfer upon these Bats great dexterity in quickly changing the direction of their flight, as when obliged to double in pursuing their swiftly-flying insect prey, which their extremely expansible lips evidently enable them to secure with ease.

Group I. Molossi.—Tail produced beyond the posterior margin of the interfemoral membrane.

Chetromeles, 4 1, ¢ 4, pm 4, m %, hallux much larger than the other toes and separable from them, ears separate, is represented by a single species, U. torquatus, of large size (forearm 3°1 inches) and very peculiar aspect, inhabiting the Indo-Malayan subregion. This species is nearly naked, a collar only of thinly spread hairs half sur- rounding the neck, and is further remarkable for its enormous throat sac and curious nursing pouches. The former consists of a great semicircular fold ofskin forminga deep pouch round the neck beneath, concealing the orifices of large subcutaneous pectoral glands which discharge an oily fluid of insufferably offensive smell. The nursing pouch is formed on each side by an extension of a fold of skin from the side of the body to the inferior surfaces of the humerus and femur. In the anterior part of this pouch the mamma is placed, For figures of these throat sacs and notes on the use of the nursing pouchics see Catal. Chiroptera, p. 406, pl. xxi.

Molossus, 4 + or 4, pm 4 or $, upper incisors 'close together in front, with ten species, is restricted ¢ to the tropical and subtropical re- }§ gions of the New World. The | woodcut of M. glaucinus (fig. 82) § exhibits the general physiognomy of the Bats of this genus. Af. obscurus, a small species, is very eommon in tropical America. It , inhabits the hollow trunks of palms @ and other trees, and also the roofs of houses. The males and females live apart (as, indeed, appears to be the case in most if not in all species of Bats). In the hollow WNhiVe | trunk of a palm two colonies were Fre. 82.—Head of Molossus glaucinus. discovered, one consisting of from Dobson, Proe, Zool, Soc., 1876. 150 to 200 individuals, exclusively males, while the other was com- posed of females with a male here and there among them.*

Nyctinomus, ¢ 4 or 4, pm % or 4, upper incisors separate in front, includes twenty-one species, inhabiting the tropical and_ sub- tropical parts of both hemispheres. The lips of the Bats of this genus are even more expansible than in Molossus, in many of the species (as in the woodcut of the head of N. macrotis, fig. 83) showing vertical wrinkles. NV. cestonii, one of the largest species, alone extends into Fim Europe, and has been taken as far north as Switzerland. N. johorensts, . from the Malay Peninsula, is remark- Fra, 83,.—Head of Nyctinomus ma- able from the extraordinary form crotis. Dobson, Proc. Zool. Soc., of its ears. NV. brasiliensis is nearly as common as Jf. obscurus in tropical America, and extends farther north (California) and south than that species.

Group Il. Mystacinw.—Tail perforating the interfemoral mem- brane, and 7 agg upon its upper surface.

This includes a single genus and species, Mystacina tuberculata, a very peculiar form restrieted to New Zealand, where, with Ohalinolobus tuberculatus, it represents the whole indigenous mammalian fauna of theislands. There are three distinct phalanges in the middle finger ; the greater part of the wing-membrane is exceedingly thin, but a narrow portion along the forearm, the sides of the body, and the legs is remarkably thick and leathery , beneath this thickened portion the wings are folded, and it is evidently analogous to the thickened part of the anterior wings in hemipterous insects and to the elytra of the Coleoptera. With the wings thus encased, this species is the most quadrupedal of Bats. Other peculiarities of structure are found in the remarkable form of

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the claws of the thumbs and toes, which have each a small talon

projecting from its concave surface near the base, also in the sole of the foot and inferior surface of the leg, as shown in fig. 84. The plantar surface, including the toes, is covered with soft and very lax integument deeply wrinkled, and each toe is marked by a central longitudinal groove with short grooves at right angles to it,

of Bats, like Megaderma lyra of the eastern hemisphere, which it resembles in many respects.

The species may be divided into two sections, according as the tail is produced to the hinder margin of the interfemoral membrane or perforates it and appears upon its upper surface. Those included in the first section fall. into three genera, Lonchorhina, Macrotus, and Macrophyllum, the first-named including a very remarkable species, J. aurita, with an extraordinary long nose-leaf aud peculiarly large ears and tragi, In the second section are included the genera Vampyrus, Lopho- stoma, Schizostoma, Trachyops, Phylloderma, Phyllostoma, Tylostoma, Mimon, Carollia, De and Rhinophylia, all, with Fra, 86.—Head of Phyllostoma elonga- the exception of the last, dis- tum. Proc, Zool. Soc., 1866.

Fie, 84.—Thumb and Leg and Foot of Mystacina tuberculata (enlarged). Dobson, tinguished from one another chiefly by the form: of the skull

Proc, Zool, Soc., 1876,

as in the genus Hemidaetylus (Geckotidx), The lax wrinkled inteeu- ment is continued along the inferior flattencd surface of the ankle and leg. These peculiarities appear to be related to climbing habits in the species. See the writer's remarks in Proc. Zool. Soe., 1876, p. 488,

Family PHYLLOSTOMID A.

The Bats included in this family are readily distinguished by the presence of a well-developed third phalanx in the middle finger, associated either with distinct cutaneous nasal appendages, or with well-developed central upper incisors, or with both. Unlike the chinolophide, their eyes are generally large, and the tragus well developed, maintaining almost the same form throughout the species, however much the outer parts of the body may vary. Their fur is of a dull colour, and the face and back (in the Stenodermata especially)are often marked with white streaks, as inthe Ptcropodide, of which they take the place in the western hemisphere.

Subfamily 1. Lobostominge.—Nostrils opening by simple apertures at the extremity of the muzzle in front, not margined by a distinct nose-leaf ; chin with expanded leaf-like appendages.

It includes two genera." In Chilonycteris (six species) the crown of the head is moderately elevated above the face-line, and the basi- cranial axis is almost in the same plane as the facial, while in Mormops the crown of the head is greatly ele- vated above the face- line, and the basi- cranial axis is almost at right angles to the facial; 7 2, pm 2 in both genera. The latter genus contains ek two species, which, Fa 8i—Tead of Mormaps bina, Dobson, in their very peculiar physiognomy, are probably the most remarkable among the inany strange forms exhibited by the different species of this order.

Subfamily 2. PhylHostominse.—Nostrils opening on the upper surface of the muzzle, the nasal apertures more or less surrounded or margined by well-developed cutaneous appendages, forming a distinct nose-leaf; chin with warts.

Group I. Vampyri.—Muzzle long and narrow in front, the distance between the eyes generally less than, rarely equal to, the distance from the eye to the extremity of the muzzle ; nose-leaf well-developed, horse-shoe-shaped in front, lanceolate behind ; interfemoral membrane well-developed ; tail generally distinct, rarely absent ; inner margin of the lips not fringed; 7 2 or 3, pm 2 or $; molars with W-shaped cusps, usually well-developed.

Nearly all the species of Vampyri appear to be insectivorous, so that the term applied to this group cannot be considered indicative of their habits. A few, if not all, probably supplement their insect diet with fruit. Vampyrus spectrum (the largest Bat in the New World, forearm 4-2 inches) is said to be wholly frugivorous, and Macrotus waterhousii appears to prey occasionally on small species

and the presence or absence of the second lower premolar; Trachyops, Phylloderma, and the three last-named genera are each represented bya single species. Phyllostoma hastatum, fore- arm 3°2 inches, next in point of size to Vampyrus spectrum, is a well-known specics in South America; Ph. clongatum (see fig. 86) differs in its smaller size and much larger nose-leaf.

Carollia breviewuda, a small species, is generally found represented in collections, and externally so closely resembles Glossophaga soricina (of the next group) that it has often been confounded with that species. It forms a connecting link between this group and the next Lhinophylla pumilio, forearm 1°25 inches, tail none, is the smallest known species of the family; it is further distinguished by the narrowness of its molars, which do not form W-shaped cusps, and by the very small size of the last upper molar, characters connecting it, and consequently the group, with the Stenodermata.

Fre, 87.—Head of Cheeronycteris mexicana, showing fibrillated tongue. Dobson, Cat, Chiropt. Brit. Mus.

Group II. Glossophagew.— Muzzle long and narrow; tongue remarkably long and extensible, much attenuated towards the tip, and beset with very long filiform recurved papille; lower lip with a wide groove above, and in front margined by small warts ; nose- leaf small ; tail short or none; ¢ 3, pm 2 or or 3, m % or 3 or 3; tceth very narrow ; molars with narrow W-shaped cusps, sometimes indistinct or absent ; lower incisors very small or deciduous.

The ten species included in this group represent seven genera, which are distinguished principally by differences in the form and number of the teeth, and by the presence or absence of the zygomatic arches. The form and position of the upper incisors are extremely variable. In Glossophaga and Phyllonycteris the upper incisors form, as in the Vampyrt, a continuous row between the canines; in Monophylla and Ischnoglossa they are separated into pairs by a narrow interval in front; while in Lonchoglossa, Glossonycteris, and Cheronycteris they are widely separated and placed in pairs near the canines ; in the first four genera the lower incisors are present (at least up to a certain age), in the last three they are deciduous even in youth. 'The zygomatic arch is wanting in Phyllonycteris, Glossonycteris, and Charonyeteris.

The typical species is Glossophaga soricina, which so closely resembles Caroliia brevicauda, both in external form and dentition, that it has frequently been confounded with it. Its long fibrillated tongue (which it possesses in common with other species of the group) led Spix to describe it

as a very cruel blood-sucker (sanguisuga crudclissima), believing that it;was used to increase the flow of blood. This view is, however, altogether without founda- tion, and from the observations of Osburn and others it is evident that the peculiarly shaped tongue is used by the aniinal, as in the case of the Macroglossi among the frugivorous Pteropodid, to lick out the pulpy contents of fruits having hard rinds. The food of the species of this group appears to consist of both fruit and insects, and the long tongue may also be used for extracting the latter from the deep corolle of certain flowers.

Group III. Stenodermata.—Muzzle very short and generally broad in front, the distance between the eyes nearly always exceed-

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ing (rarely equal to) the distance from the eye to the extremity of the muzzle ; nose-leaf short, horse-shoe-shaped in front, lanceolate behind (except in Brachyphylla and Centurio); interfemoral mem- brane always concave behind ; tail none ; inner margin of the lips fringed with conical papille; 7 % or ?, pm 3, m % or 2 or 2; premolars and molars very broad (except in Sturndra), the latter with concave or flat erowns margined externally by raised cutting edges.

Although the Stenodermata are generally easily distinguished from the Vampyri by the peculiar shortness and breadth of the muzzle, and by the form of the molar teeth, certain species of the latter group closely resemble those of the former in external appearance, agreeing almost absolutely in the form of the nose-leaf, of the ears and tragus, and of the warts on the chin. These resemblances show that, while the form of the teeth and jaws has become modified to suit the food of the animals, the external eharacters, being but slightly affected by this cause, have remained much the same, and now indicate their common origin. The food of these Bats appears to be wholly or in great part tree fruit. twenty species have been divided into nine genera, distinguished by the form of the skull and teeth.

Artibeus, with five, includes among them the well-known frugivorous Bat, A. perspicillatus of Linneus, so common in collections. Stenoderma achradophilum, found in Jamaica and Cuba, associated with the above, and scarcely distinguishable externally except by its very much smaller size, differs altogether in the absence of the horizontal plate of the palate bones. Sturnira lilium, while 4% agreeing with the above in the form / of the nose-leaf and ears, differs from all the species of the family in its longitudinally-grooved mo- lars, which resemble those of the , frugivorous Pteropodidx more closely ys than those of any other Bats; and Fra. 88.—Hend of Centurio senex. the presence of tufts of long differ- Dobson, Cat. Chéropt. Brit. Mus. ently-eoloured hairs over glands in the sides of the neck shows yet another character in common still more remarkable, which can scarcely be considered, like the teeth, the result of adaptive change. Centwrio senex is the type of a genus distinguished from Stenoderma and other genera of this group by the absence of a dis- tinct nose-leaf. This most remarkable form stands alone among the species of Chiroptera, and, indeed, in its peculiar and grotesque physiognomy is unrivalled among known mammals.

Group 1V. Desmodontes.—Muzzle short and conical; nose-leaf distinct ; interfemoral membrane very short ; tail none ; 7 4, pm 3, m+}or }; upper incisors very large, trenchant, occupying the whole space between the canines; premolars very narrow, with sharp- edged longitudinal crowns ; molars rudimentary or none; stomach greatly elongated, intestiniform.

There are two genera, Desmodus, without ealcaneum or true molars, and Diphylia, with a short ealeaneum and with a single rudimen- tary molar on each side,—restricted to Central and South America. Desmodus rufus, the commoner species, is a little larger than the Noctule Bat of Europe, and abundant in certain parts of South America, where it is very troublesome owing to its attacks upon domestic animals, sucking their blood and often leaving them much weakened from repeated bleedings. See VAMPIRE.

RODENTIA. |

Fossil CHIROPTERA,

Fossil remains of Chiroptera extend as‘far back as the Upper Eocene of Europe and America, if, indeed, the beds in which they have been found are

rightly considered as belonging to that age, Of these Vesperugo (Nyctitherium) paristensis, described by Cuvier from the gypsum of Montmartre, is very like a small specimen of the widely distributed V. serotinus; V. velow and priscus of the same subsection, and Nyetilestes serotinus, have been eharacterized by Marsh from the Eoccne of the United States, and Vespertilio morloti, Pictet, from that of Switzerland. From the Quercy lacustrine deposits comes Rhinolophus antiquus, Fithol, but these are very donbtfully of Eocene age. Palxonyeteris (allied to Ehinolophus), with P. robustus, Vesperugo, with V. noetulotdes and murinoides, and Vespertilio, with V. aquensis, pracow, and insignis, have been found in Miocene beds of France and Germany. Pliocene bone eaves have also yielded remains, in all cases closely allied to species now inhabiting the same countries. All these forms, however, exhibit as much specialization in their general structure as any existing species of the same families, indicating (if the age assigned to the deposits can be trusted) that the first appearance of Chiroptera must be referred toa very remote period.

Bibliography of Chiroptera.—G. E. Dobson, Catalogue of the Chiroptera tn the Collection of the British Museum, 1878, including descriptions of all the speeies of Bats then known; subsequent papers by the same author in Rep. Brit. Assoc. Adv. Science, Proc. Zool. Soc., Ann. Mag. Nat. Hist, and Bullet. Soc. Zool. de France, by Peters in Monatsb. Akad. Wissensch. Berlin, and by Oldfield Thomas

and J. Seully in Ann. Mag. Nat, Hist.; H. A. Robin, Recherches Anatomiques sur les Mammiféres del Ordre des Chiroptéres, Paris, 1881,

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OrpER RODENTIA.

Terrestrial, rarely arboreal or natatorial, diphyodont placental mammals of small size; with plantigrade or semiplantigrade, generally pentadactyle, unguiculate, rarely subungulate, feet ; with clavicles (sometimes imperfect or rudimentary) ; with never more than two incisors in the mandible, and without canines.

The upper incisors resemble the lower in growing uninterruptedly from persistent pulps, and (except in Lagomorpha) agree with them in number ; the premolars and molars are rooted or rootless, with tuberculated or laminated crowns, and arranged in an unbroken series; the orbits are not circumscribed by bone; the mandibular con- dyle is antero-posteriorly elongated ; the intestine (except in Myoxidx) has a large cecum; the testes are inguinal orabdominal; the uterus is two-horned, the cornua opening separately into the vagina or uniting to form a corpus uteri; the placenta is discoidal and deciduate; and the smooth cerebral hemispheres do not extend backwards so as to cover any part of the cerebellum.

The Rodents form a very compact order, readily distinguished by their large chisel-shaped incisors, and by the absence of canines. They include by far the greatest number of species (over 900), and have the widest distribu- tion, of any of the orders of terrestrial mammals, being in fact cosmopolitan, although more abundant in some parts, as in South America, which may be considered their head- quarters, than in others, as in Australasia and Madagascar, where representatives of a few genera of one family (Muride) only are found, thus contrasting remarkably with the Jnsectivora, which constitute at least half the mamma- lian fauna of Madagascar, but are without living represen- tatives in South America.

If, as we have seen, the term entomophagous is applicable to most Znsectivora, much more so, on the other hand, may the species of this great order be defined as phytophagous, and this uniformity in their food and in the mode of obtaining it, namely, by gnawing, has evidently led to such corresponding general uniformity in structure, which is observable throughout the species, that with difficulty we obtain characters sufficiently salient for divid- ing them into genera and families. Although, like the Insectivora, they present much diversity of habit,—some being arboreal, as the Squirrels, many species of which are provided with cutaneous parachutes on which they glide from tree to tree; some cursorial, as the Hares ; some agile jumpers, as the Jerboas ; some fossorial, as the great Mole- Rats; and some natatorial, as the Beavers and Water-Rats, —yet we do not find corresponding structural modifications comparable with those noticed in that order.

Fie. 89.—Side View of Skull of Cape Jumping Hare (Pedetes caffer). x%. PMzx, premaxilla; Mz, maxilla; Ma, malar; /'r, frontal; Z, lachrymal ; Pa, parietal; Na, nasal; Sg, squamosal; 7y, tympanie; Fx0, exoecipital ; AS, alisphenoid; OS, orbito-sphenoid; Per, mastoid bulla. Flower, Osteol. Mammal.

The Rodent skull is characterized by the great size of the premaxillary bones, which completely separate the nasals

from the maxillaries, by the invariable presence of zygomatic arches, and by the wide unoccupied space exist- ing between the alveoli of the incisors and tlie molar teeth, and (except in Lagomorpha) by the antero-posteriorly elongated glenoid cavity. Post-orbital processes of the frontals exist only in the Squirrels, Marmots, and Hares ; in all other genera they are rudimentary or altogether absent; the zygoma never sends upwards a corresponding process, and the orbit in all is freely continuous with the temporal fossa; the lachrymal foramen is always within the orbital margin; in many species the infra-orbital foramen is very large (in some as large as the orbit), and

Fig. 90.—Skull of Mystrtix ertstata (juv.), ¢, temporat muscle ; m, masseter, m', portion of masseter transmitted through the infra-orbital foramen, the superior maxillary nerve passing outwards between it and the maxillary bone.

transmits part of tle masseter muscle ; the zygomatic arch is variously developed, and the position of the malar in it is used as a distinguishing character for grouping the families; the nasals are, with few exceptions, large, and extend far forwards; the parietals are moderate, and there is generally a distinct interparietal; the palate is narrow from before backwards,—-this is especially pronounced in the Hares, where it is reduced to a mere bridge between the premolars,—in others, as in the great Rodent Moles (Bathyergine), it is extremely narrow transversely, its width being less than that of one of the molar teeth; tympanic bull ossee are always present and generally large ; in some genera, as in the Gerbilles(Gerbilinzx) and Jerboas (Dipodine), there are supplemental

mastoid bulla which form great hemispherical bony swellings at the back of the skull (see fig. 89, Per); in these genera, and in the true Hares, the meatus auditorius is tubular and directed upwards and backwards. The mandible is characterized by its abruptly narrowed and rounded symphysial part supporting the pair of large incisors, as well as by the small size of the coronoid process and great development of the angular portion.

The dental formula varies from 7 2, ¢ 9, pm 3, m 3 (total 28) in the Hares and Rabbits to 7 4, ¢ 8, pm 2, m 2 (total 12) in the Australian Water-Rats; but in the vast majority of the species it presents striking uniformity, and may be set down typically as 7 4, ¢ 2, pm + or g, m %. In Lagomorpha only are there more than a single pair of incisors, and in them the additional pair are small and placed quite behind the middle pair,} and in this group alone does the enamel extend even partially to the back of the tooth; in all others it is restricted to its front surface, and so, by the faster wearing away of the softer structures behind, a chisel-shaped edge is always maintained. Both the upper and lower incisors are regularly curved, the upper slightly more so than the lower, and, their growth being continuous, should anything

Professor Huxley remarks (Proc. Zool. Soc., 1880, p. 655) :— “ “ The deciduous molars and the posterior deciduous upper ineisors of the Rabbit have long been snown, But I have recently found that unborn Rabbits possess, in addition, two anterior upper and two lower deciduous incisors. Both are simple conieal teeth, the sacs of whieh are merely embedded in the gum. The upper is not more than one- hundredth of an inch long, the lower rather larger.”

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prevent the normal attrition by which their length is regulated, as by the loss of one of them, or by displace- ment owing to a broken jaw or other cause, the unopposed unused incisor may gradually curve upon itself until a complete circle or more has been formed, the tooth, perhaps, passing during its growth through some part of the animal’s head. The molar teeth may be rooted or

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Fria. 91.—Vertical and Longitudinal Section through Skull of Castor fiber, showing the cerebral cavity, the greatly-developed turbinal lamella, the mode of implantation of the large ever-growing chisel-edged ineisor, and the curved rootless molars.

rootless, tuberculated or laminated ; and this diversity of

structure may be noticed even in the same family. When

there are more than three back teeth those whicl: precede the last three have succeeded milk teeth, and must there- fore be considered premolars. In some species, as in the

Agoutis (Dasyproctedz), the milk tceth are long retained,

while in the allied Cavies (Cavizdx) they are shed before

birth.

There are generally nineteen dorso-lumbar vertebree (13 thoracic and 6 lumbar), and their forms vary in the different genera ; in the cursorial and leaping species the lumbar transverse processes are generally very long, and in the Hares there are large compressed hypapophyses. The caudal vertebree exhibit as much variety as in Lnsectivora, from their rudimentary condition in the Guinea-Pig to their great size in the Jumping Hares and prehensile – tailed Porcupines. The scapula is usually . narrow, with a long acromion; the clavicles may be altogether absent or imperfect, as in the Porcupines, Cavies, and Hares, but in most species they are well-developed; tle humerus has no supra-condylar foramen, and the fore- arm bones are distinct; in most species the manus has five digits with phalanges normally developed, the pollex rarely rudimentary or absent. In contrast to the normal condition of the pelvis in Zusectivora, we find here largely developed ischiatic and pubic bones, with a long usually osseous symphysis ; the femur varies considerably in form, and there is generally a well-defined third trochanter; in the Sciurine and Hystricine Rodents the tibia and fibula are distinct, but in the Rats and other Murines, and in the Hares, these bones are united, often high up; the pes is much more variable than the manus, the digits varying in number from five, as in the Squirrels and

Rats, to four, as in the Hares, or even three, as in the Capybara, Viscacha, and Agouti; in the Dipodide the metatarsals are greatly elongated, and in some of the species, as in the Jerboas, they are ankylosed together.

The mouth is divided into two cavities communicating by a constricted orifice, an anterior containing the large incisors and a posterior in which the molars are placed, the hairy integument of the face being continued inwards behind the incisors. This evidently prevents substances not intended for food getting into the mouth, as when the animal is engaged in gnawing through an obstacle. In the Hares and Pacas the inside of the cheeks is hairy, and in some species, as in the Pouched Rats and Hamsters, there are large internal cheek pouches lined with the hairy integu- ment, which open near the angles of the mouth and extend backwards behind the ears; in the New-World Pouched Rats (Gecmyidz) the pouches open externally on the cheeks.

The tongue presents little of that variability in length observable in the preceding orders ; it is characteristically short and compressed, with an obtuse apex never protruded beyond the incisors; in most species there are, as in Insectivora, three papille circumvallatz at the base; and the apical portion is generally covered with small filiform papillee, some of which in the Porcupines (Hystrix) become greatly enlarged, forming toothed spines. The stomach varies in form from the simple oval sac of the Squirrel to the complex ruminant-like organ of the Lemming. In the Water-Vole (Arvicola amphibius) and in the Agouti (Dasy- procta agouti) it is strongly constricted between the cesophagus and pylorus; in the common Dormouse the cesophagus immediately before entering the stomach is much dilated, forming a large egg-shaped sac with thickened glandular walls, and in some other species, as in Lophiomys imhausi and in the Beaver, glandular masses are attached to and open into the cardiac or pyloric pouches. All Rodents, with the exception only of the species of Dormice (Myoridex), have a cecum, often of great length and saccul- ated, as in the Hares, Water-Voles, and Porcupines, and the long colon is in some, as in the Hamster and Water- Vole, spirally twisted upon itself near its commencement. The liver is typically divided in all, but the lobes are variously subdivided in the different species (in Capromys they are divided into minute lobules); and the gall-bladder, though present in most, is absent in a few. In most species, as in many Jnsectivora, the penis (which is generally provided with a bone) may be more or less completely retracted within tlie fold of integument surrounding the anus, and lie curved backwards upon itself under cover of the integument, or it may be carried forward some distance in front of the anal orifice, from which in the breeding season, as in the Voles and Marmots, the prominent testi- cular mass separates it. The testes in the rut form projections in the groins, but (except in Lagomorpha) do not completely leave the cavity of the abdomen. Prostatic glands and, except in Lagomorpha, vesicule seminales are present in all. The uterus may be double, each division opening by a separate os uteri into a common vagina, as in Leporide, Sciuride, and Hydrocherus, or two-horned, as in most species. The mammary teats vary in number from the single abdominal pair

of the Guinea-Pig to the six thoracico-abdominal pairs in the Rats. In the Octodontide the teats are placed high up on the sides of the body.

The peculiar odour evolved by many Rodents is due, as in the /nsectivora, to the secretions of special glands, which may open into the prepuce, as in Mus, Arvicola, Cricetus, &c., or into the rectum, as in Arvctomys and Awlacodus, or into the passage common to both, as in the Beaver, or into pouches opening near the anus, as in the Hare, Agouti, and Jerboa.

The integument is generally thin, and the panniculus carnosus rarely much developed. The fur varies exceed- ingly in character,—in some very fine and soft, as in the Chinchillas and Hares, in others more or less replaced by spines on the upper surface, as in the Spiny Rats and Porcupines; in several genera, as in Xerus, Acomys, Platacanthomys, Echiothrixz, Loncheres, and Echinomys, the spines are flattened. In the muscular structures the chief peculiarities are noticeable in the comparatively small size of the temporal muscles, generally so largely developed in Insectivora, and in the great double masseters, which are the principal agents in gnawing; the digastrics also are remarkable for their well-defined central tendon, and in many species their anterior bellies are united between the mandibular rami; the cleidomastoid generally arises from the basi-occipital, and the pectoralis major is connected with the latissimus dorsi; in the Porcupines and Hares the tendons of the flexor digitorum longus and flexor

hallucis longus are connected in the foot, while in the Rats and Squirrels they are separate, and the flexor digitorum longus is generally inserted into the halluceal nietatarsal. (See Dobson, Journ. Anat. Phys., vol. xvii.)

Susorprer Il. RODENTIA SIMPLICIDENTATA.

Rodents with two incisors only in the upper jaw, having their enamel confined to their front surfaces. The incisive foramina are moderate and distinct ; the fibula does not articulate with the os calcis; and the testcs are abdominal, and descend periodically only into the inguinal canal.

Section I. ScIUROMORPHA.

Zygomatic arch slender, chiefly formed by the malar, which is not supported by a long maxillary process extending backwards beneath it; post-orbital processes present or absent; infra-orbital

Fig. 92.—Skull of Arctomys monax.

opening small (except in Anomalurus) ; mandible with the angular part arising from the inferior surface of the bony socket of the lower incisor ; clavicles well-developed ; fibula distinct.

Family 1. ANOMALURIDA.

Arboreal Rodents, having their limbs connected by a cutaneous expansion supported by a cartilaginous process arising from the olecranon; with a long hairy tail having large scales on its inferior surface near its root ; with sixteen pairs of ribs, and without post- orbital processes of the frontals; pm }; molars not tuberculate, Ethiopian.

with transverse enamel folds.

Fie, 93.—Anomalurus fulgens (reduced), Alstun, Proc. Zool. Soc., 1875,

Anomalurus, with (2) five species from West Africa, alone re- presents the family. The peculiar caudal scales, which evidently assist the animal in climbing, and the position of the cartilaginous fe op) of the parachute, are well shown in the above woodcut (fig. 93).

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Arboreal or terrestrial Rodents, with cylindrical hairy tails, without scales, and with twelve or thirteen pairs of ribs. Skull with distinct post-orbital processes ; infra-orbital opening small ; palate broad ; pm ?; first upper premolar very small or deciduous ; molars rooted, tubercular.

Subfamily 1. Sciuringe.—Incisors compressed, form slender, tail long and hairy (True Squirrels), Cosmopolitan (excluding Australian region).

There are four genera. Ptcromys,—limbs united by a cutaneous expansion forming a parachute, the supporting cartilage of which springs from the carpus,—includes the Flying Squirrels of both hemispheres, Sciwrus, with more than cighty species, comprises the true Tree Squirrels. To this group also belong the Short-eared Squirrels of the genera Xerws and Tamias; the first-named, distinguished from Sccvwrws by possessing only two pairs of mam- mary teats, by the comparatively short tail, and by the fur bein mixed with flattened spines, includes a few African species ne live in burrows ; Tamias, separated by the presence of large internal cheek-pouches, includes the well-known Ground Squirrels of North America, of which one species (7. asiaticus) extends into North Europe and Asia. See SQUIRREL.

Subfamily 2. Arctomyinee.—Incisors not compressed ; form stout ; tail short (Marmots). Palearctic and Nearctic.

Spermophilus, distinguished by its large cheek-pouches and by the absence or rudimentary condition of the pollex claw, resembles Tamias in the slender form of the body, and connects the Marmots with the true Squirrels. The distribution and habits of the species are similar to those of Tamias. Cynomys, with shallow cheek- pouches, long pollex claw and stout form, includes the well-known Prairie Dogs peculiar to North America, which live together in large communities, inhabiting burrows which they excavate at short distances apart ; they feed on the buffalo-grass which covers the plains. The small burrowing owl (Athene cwnicularia) and the rattlesnake are often found inhabiting their burrows, the former probably availing itself of the convenience of a ready-made habi- tation, the latter coming there to feed on the young Marmots. Arctomys, distinguished by its rudimentary pollex, includes the true Marmots. See Marmot.

Family 3. HarLoponTIDsz.

Terrestrial Rodents, distinguished from Sciwridw# by the absence of post-orbital processes, the depressed form of the skull, and the rootless molars. Premolars ?, the first upper one small.

Haplodon, with H. rufus, from North America west of the Rocky Mountains, alone represents the family. The habits of the single species are similar to those of the Prairie Dog.

Family 4, CAsToRIDa.

Natatorial Rodents, with massive skulls, without post-orbital processes, with mandibular angle rounded, and with semi-rooted or rootless molars with re-entering enamel folds ; pm 4.

Castor, with one species only, C. fiber, the Beaver of the northern parts of Asia, Europe, and America. The upper molars are subequal, cach with one internal and two external enamel folds ; the stomach has a large glandular mass situated to the right of the cesophageal orifice ; the anal and urethro-genital orifices open within a common cloaca; the tail is broad, horizontally flattened, and naked ; and the hind feet are webbed. See BEAVER.

Section II. MYomMonpHa.

Zygomiatic arch slender, the malar rarely extending far forwards, and usually supported below by the long zygomatic process of the

Fig. 94.—Skull of Fiber zibethicus. Natural size.

maxillary ; no post-orbital processes ; infra-orbital opening vari- able ; mandible with the angular part arising from the inferior surface of the bony socket of the lower incisor (except in

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Bathyerging); clavicles well-developed (except in Lophiomys); tibia and fibula united.

[RODENTIA.

Family 1. Myoxipa.

Arboreal Rodents, with long hairy tails, large eyes and ears, and short fore limbs. ‘he intestine is without a cecum ; the skull has contracted frontals;

the infra-orbital foramen is moderate, high, and narrow ; and the mandible has a long and slender coronoid process. Pm+; molars rooted, with transverse enamel plates. Palearctic and Ethiopian.

There are four genera :—Jfyoxus, with Jf. glis of Europe, with bushy, distichous tail, simple stomach, and large molars with well- marked enamel folds; wuscardinius, with M. avellanarius, the common Dormouse, distinguished by the cylindrical bushy tail.and thickened glandular walls of the cardiac extremity of the cesophagus ; Eliomys, with about six species, with tufted and distichous tail, simple stomach and smaller molar teeth with concave crowns and faintly marked enamel folds ; and Graphiurus, with two species, with short cylindrical tail ending in a pencil of hairs, and very small molars almost without trace of enamel folds. The Dormice form a very natural family, distinguished from all other Rodents by the absence of acecum. In their habits and form they evidently closely approach the Squirrels.

Family 2, LoPHIOMYIDA.

Arboreal Rodents, with rudimentary clavicles and rooted tuberculate molars. Premolars none. Skull murine in form, but the temporal fosse are completely arched over by thin plates arising from the temporal ridge and malar bone. Intestine with a small cecum,

Fic. 95.—Lophiomys imhausi (reduced). A. Milne-Edwards.

Lophiomys, with L. imhausi (fig. 95), alone represents the family. This very extraordinary species from north-east Africa differs from all other Rodents in the peculiar granulated plates which cover the temporal fossx, and from all the species of the section in the rudimentary condition of the clavicles as well as in the possession of an opposable hallux. The hair is very peculiar in structure, and forms a crest along the back and tail. For full description see A. Milne-Edwards, L'Jnstitut, xxxv. p. 46.

Family 3. Muripa.

Rodents of various habit, but generally terrestrial ; with con- tracted frontals, with the lower root of the maxillary zygomatic process more or less

flattened into a perpendicular plate ; with a short and slender malar, generally reduced to a splint between the maxillary and squamosal processes ; with (in typical forms) a high, perpendicular infra-orbital foramen, wide above and narrow below; with compressed lower incisors and rooted or rootless molars, tuberculate or with angular enamel folds. Premolars none (except in Snvinthine) ; pollex rudimentary ; tail generally sub-naked and scaly.

This large family includes more than one-third of all the species of Rodents, and is represented by thirty-five genera of cosniopolitan distribution. These fall into two sections corresponding to the rooted or rootless condition of the molars.

J. Afolars rooted.

Subfamily 1. Sminthinee.—Pm 4, m $; infra-orbital opening subtriangular, widest below; incisive foramina long. / :

Sminthus, with one species, S. vagus, a Rat-like Rodent inhabit- ing northern Asia and Europe.

Subfamily 2. Hydromyine. Jf 3, divided into transverse lobes ; infra-orbital opening crescentic, scarcely narrowed aboye ; incisive foramina very small.

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Hydromys, with two species from Australia, Tasmania, and New Guinea, includes the Water-Rats of the Australian region, with partially webbed toes. They are distinguished from all other Rodents by the small number of their molars.

Subfamily 3. Platacanthomyinee.—i/ %, with transverse lamine ; fur mixed with flattened spines ; tail densely hairy.

Platacanthomys, with P. lasiwrus, a small Dormouse-like species from western India, inhabiting the roeky mountains of Travancore.

Subfamily 4. Gerbillinge.—Incisors narrow, molars with trans: verse lamine; auditory bullz ossex usually large; hind limbs elongated ; tail generally long and hairy. Palearctic, Indian, and Ethiopian.

Gerbillus, with nearly fifty species, has a range coextensive with that of the subfamily. Pachywromys is distinguished by the enormous size of the auditory bull, as well as by the short fleshy club-shaped tail. JMystromys, Otomys, and Dasymys differ in the form of the molars, and are represented by a few species, all from South Africa.

Subfamily 5. Phlesomyinge.—Incisors broad, molars with transverse lamine ; claws large. Indian.

Phizomys, with P. cwmingii from the Philippines, and Nesokia, with cight species widely distributed throughout the Indian Region. The latter (distinguished from the former genus by the short, subnaked, scaly tail) includes the Great Bandicoot Rat of India (NM. bandicota).

Subfamily 6. Dendromyinee.—Incisors convex in front, molars tuberculate ; ears hairy; claws long. Ethiopian.

Three genera, Dendromys, Steatomys, and Lophuromys, include several species of small Mouse-like Rodents with the habits of Dormice generally, though some burrow in corn- fields.

Subfamily 7. Cricetinge.—Molars tuberculate. Large internal cheek-pouches. Palearctic and Ethiopian.

Of the three gencra, Cricctus, Saccostomus, and Cricctomys, the last is distinguished from the others by the grooved upper incisors,

while Saccostomus is separated from Cricctus by the tubercles of

the molar teeth being arranged in threes. The cheek pouches in Cricetus are very large, and their walls are connected with muscles arising from the lumbar vertebre. The best-known species is C. frumentarius. See HAMSTER.

Subfamily 8. Murinee.—Molars tuberculate, at least in youth. Cheek-pouches absent. ‘Tail scaly, more or less naked. Cosmo-

olitan. 8 This includes the typical murine forms, divided into fiftcen genera with over three hundred species, of which nearly half, however, are contained in the genus Afus. JM. decwmanis, the common Grey Rat, and M. musculus (see Movs) are familiar examples which have been introduced in ships into almost every part of the habitable world, In Acomys the skull and teeth are as in Jfws, but the fur is mixed with sharp flattened spines. 4. dimidiatus presents the appearance of a little Hedgehog when its spincs are erected ; it inhabits the stony deserts of Avabia Petreea and Palestine, and feeds on bulbs. Echiothrix, Uromys, and Hapaiotis, the latter with about a dozen species, are limited to the Australian region. Brachytarsomys, Nesomys, Hallomys, and Lypogcomys, each with one or two specics, are peculiar to Madagascar, where they alone represent the order. Drymomys, Holocheilus, Ochetodon, and Hesperonvys are New-World genera, the last-named including many species representing the Old-World Mice, but distinguished by the indenting enamel folds of the molars. Of the remaining genera, Reithrodon, with grooved incisors, includes two very remarkable Rabbit-like species, one inhabiting Patagonia, the other Tierra del Fuego,

Ii. Molavs Scmi-Rooted or Rootless.

Subfamily 9. Arvicolinse.—Molars composed of triangular prisms placed alternately ; limbs moderate ; tail moderate or short, hairy. Palearctic and Nearetic.

Arvicola, with over thirty species, includes the Voles, of which the Field-Vole (4. agrestis) and the Water-Vole (4. amphibius) are well-known examples (see VoLE), JMyodes, distingnished by the hairy foot-sole, includes two species, of which If, lemmus, of the Seandinavian Peninsula, is remarkable for its extraordinary migvations (see LEMMING). Fiber is represented by a single large species, F. zibethicus (see fig. 94), the Musk-Rat, or Musquash, a Beaver-like Water-Rat with webbed toes, but a laterally flattened tail, inhabiting the banks of rivers and lakes in North America, and constructing dome-roofed dwellings like those of the Beaver ; it is much hunted for its fur.

Subfamily 10. Siphneinge.—Molars as in Arvicoline ; form cylindrical ; ear-conch rudimentary ; limbs and tail very short, Palearctic.

Ellobius, with short claws, connects the species of this subfamily of fossorial Mole-like Rodents with the Arvicoline. Siphneus, on the other hand, leads to the next family, which includes the true Mole-Rats; the species, whieh chiefly inhabit northern Asia, closely resemble the Golden Moles (Chrysochloris) in general form and in the great development of the claws of the fore feet (compare fig. 96 with fig. 64, p. 405).

_conchs, large claws, and short or rudimentary tail.

Family 4, SPALACIDA.

Rodent Moles, with very small or rudimentary eyes cot

orm eylindvical. Incisors large; molars rooted, with re-entering enamel folds ; palate narrow.

Subfamily 1. Spalacinee.— Angular part of the mandible arising from the lower edge of the socket of the lower incisor. Palearctic, Indian, and Ethiopian.

Spalax, with S. typhlus of south-east Europe, agrecs with the insectivorous Golden Moles in the complete external absence of the eye, which is covered by the hairy skin, showing similar adaptive

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es “ivi Fia. 96,—Siphneus armandii (reduced), A. Milne-Edwards, Mammi/. Tibet.

modification in widely removed species, In Rhizomys, including several species from China, Tibet, Malay Peninsula, and eastern Africa, the eye is very small.

Subfamily 2, Bathyerginee.—Angular part of the mandible arising from the side of the socket of thelowerincisor. Ethiopian.

Bathyergus, with B. maritimus, the Great Rodent-Mole, inhabit- ing the sand-dunes along the coast in the vicinity of the Cape of Good Hope, is distinguished chiefly by its grooved incisors from the other specics included in the genera Georychus and Heliophobius, the former with several, the latter with one species, and differing from both in the presence of two or three premolars,

Family 5. GEOMYIDA.

Terrestrial or fossorial Rodents, with large cheek-pouches opening on the cheeks outside the mouth. The squamosal bones are much expanded, and the malars extend forwards to the lachrymals, Pm }; molars rooted or rootless. Nearctic and Neotropical,

Subfamily 1. Geomyinee,—Incisors broad ; mastoid not appear- ing on the top of the skull; eyes small; ear-conch rudimentary ; limbs short, subequa]. Fossorial.

Geomys bursarius, the common Pouched Rat of North America, with deeply-grooved incisors, inhabits the plains of the Mississippi, living in burrows like the Mole. Four other species from the Southein States, Mexico, and Central America are recognized. Thomomys talpoides, with plain incisors, extends all over Canada and North America west of the Rocky Mountains,

Subfamily 2. Heteromyineze.—TIncisors narrow; mastoid appear- ing largely on the top of the skull; eyes and ears moderate or large ; hind limbs and tail elongated. Terrestrial.

Dipodomys has the molars rootless ; D, phillipst is the Kangaroo- Rat of the desert regions east of the Rocky Mountains. Perognathus and

Hetcromys have rooted molars; the latter genus is distinguished by the presence of flattened spines among the fur, with species extending into South America,

Family 6, DireoDIpz.

Terrestrial leaping Rodents, of slender form, with elongated hind limbs. The incisors are compressed, the molars have transverse enamel folds, the infra-orbital opening is rounded and very large, the malar ascends in front to the lachrymal in a flattened per- pendicular plate (see fig. 89, p. 415), and the mastoid part of the auditory bulla is usually greatly developed.

Subfamily 1. Zapodinee.—Molars rooted; cervical vertebre free ; metatarsals separate ; hind feet with five digits. Nearctic.

Zapus hudsonius, the American Jumping-Mouse, extends over almost the whole North-American continent from Labrador to Mexico.

Subfamily 2. Dipodinge.—Molars rooted; cervical vertebra more or less ankylosed ; metatarsals united ; hind feet with three functional digits only. Palearctic and Ethiopian.

This includes the true Jerboas. It contains three genera: Dipus

with three toes, and Alactaga and Platycercomys with five, the last- named distinguished by the total absence of premolars, comprising many species extending from Siberia to Nubia.

Subfamily 3. Pedetinge.—Molars rootless; cervical vertebra free; metatarsals separate ; hind feet with four digits. Ethiopian.

Pedctes caffer, the Cape Jumping Hare, by far the largest species of the family, extends from Mozambique and Angola to the Cape of Good Hope. See JERBOA.

Section JJJ. HystTricoMoRPHA,

Zygomatic arch stout; malar not supported below by a continua- tion of the maxillary zygomatic process ; infra-orbital opening large ;

Fic. 97.—Skull of Hydrocherus capybara (reduced).

mandible with the angular part arising from the onter side of the bony socket of the lower incisor; clavicles perfect or imperfect ; fibula distinct.

Family 1. OcToDoNTIDa.

Terrestrial, rarely fossorial or natatorial Rodents, with perfect clavicles and long incisive foramina extending into the maxillaries. Malar with an inferior angle ; molars with external and internal enamel folds ; mammary teats placed high on the sides of the body.

Subfamily 1. Ctenodactylinse.—Molars seini-rooted ; malar as in Dipodidz; the two inner toes of the hind feet with a horny comb and rigid bristles. Ethiopian.

Ctenodactylus gundi and Pectinator speket, both from North Africa, alone represent the subfamily ; the peculiar comb-like inner toes are used in dressing the soft fur.

Subfamily 2. Octodontinze.—Molars semi-rooted or rootless, with simple enamel folds ; fur soft. Ethiopian and Neotropical.

There are six genera, including several species of Rat-like Rodents. Octodon cumingii, common in Chili and Peru, about the size of a Rat, lives like Rabbits in large communities, Petromys typicus is the only African representative.

Subfamily 3. Echiomyinz. Molars semi-rooted or rooted, with deep, curved enamel folds ; fur more or less harsh, often mixed with spines. Neotropical and Ethiopian.

Aulacodus, with A. swinderianus, the Ground-Rat of western Africa; the remaining nine genera are all Neotropical. Of these Myopotamus includes AM. coypu, about 2 feet in length, the largest species of the family, common

in South America, living in burrows near water, and feeding on aquatic plants. Capromys piloridcs, nearly as large, is arboreal in habits, and inhabits Cuba and Hayti, where it is the largest indigenous mammal; the species of this genus are remarkable for the manner in which the liver is divided into minute lobules. Plagiodontia xdiwm is peculiar to Hayti and Jamaica, and in the latter island (besides Bats and Mice, the latter

robably introduced) appears to be the only indigenous mammal. n Loncheres and Echinomys most of the species have the fur mixed with flattened lanceolate spines.

Family 2. Hysrricipa.

Terrestrial or arboreal Rodents, of stout form, with subequal limbs and more or less spiny integument. Malar without an inferior angle ; the facial part of the skull short and broad; molars with external and internal enamel folds.

Subfamily 1. Spinguringe.—Molars rooted; clavicles perfect ; soles of feet tuberculatel; teats four; tail generally prehensile. Arboreal. Nearctic and Neotropical.

There are three genera, including several species. Of these Ercthizon dorsatus, the Urson, is distributed all over the forest regions of North America; Synetheres (=Cercolabes) prehensilis, the well-known prehensile-tailed Porcupine of South America (fig. 98), has the whole upper surface of the body protected by long white-tipped spines ; Chetomys subspinosus is elothed with strong wavy bristles; in the last two genera the feet have four digits only.

Subfamily 2. Hystricinge.—Molars semi-rooted; clavicles imperfect ; soles of feet smooth; teats six; tail not prehensile. Terrestrial. Palearctic, Indian, and Ethiopian.

Hystrix cristata, the Common Porcupine of southern Europe and northern Africa, is typical of this genus, which includes several other

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Fia. 98 —Synetheres prehensilis.

cpr a from the Indian region. The eye are cylindrical, the tail short and covered with spines and slender stalked open quills. In Atherura fasciculata of the Malay Peninsula the spines are flattened, and the tail is long and scaly, with a tuft of compressed bristles. A closely allied species, 4. africana, inhabits western Africa. See PORCUPINE,

Family 3, CHINCHILLIDA.

Terrestrial Rodents, with elongated hind limbs, bushy tails, very soft fur, and perfect clavicles. The malar is without an inferior angle, and extends forwards to the lacrymal; the palate is con- tracted in front and deeply emarginate behind ; the ineisors are short, and the molars divided by continuous folds into transverse lamine. Neotropical,

This small family includes only three species, divided into as many genera. Chinchilla lanigera and Lagidiwm peruanum are restricted to the alpine zones of the Andes from the northern boundary of Pern to the southern parts of Chili, and Lagostomus trichodactylus, the Viscacha, to the pampas from the Uruguay river to the Rio Negro. In Chinchilla the fore feet have five and the hind four digits, the tail is long and bushy, and the auditory bulle are enormous, appearing on the top of the skull; Lagidiwm has four digits in both fore and hind feet, and Lagostomus three only in the hind feet, while the auditory bulle are much smaller. See CHINCHILLA.

Family 4, DAsYPROCTIDS.

Terrestrial Rodents, with subequal limbs, hoof-like claws, short or obsolete tail, and rudimentary piavicles. Mandibular masseteric ridge obsolete ; palate broad ; incisors long ; molars semi-rooted, with external and internal enamel folds. Neotropical.

With two genera:—Dasyprocta, including several species of slender-limbed, subungulate Rodents with three hind toes, inhabiting Central and South America, one (D. cristata) extending into the West-Indian Islands ; and Celogenys, with five hind toes, remark- able for the extraordinary development of its zygomatic arches, which are enormously expanded vertically, forming great eonvex bony capsules on the sides of the face, enclosing on each side a large cavity lined with mucous membrane internally, and com- municating by a small opening with the mouth ; C. paca is about 2 feet long, and, like the species of Dasyprocta, lives generally in the forests or along the banks of rivers.

Family 5. DiInoMYIDz.

Terrestrial Rodents, distinguished from Dasyproctidez by the cieft upper lip and rather long and bushy tail, and by the presence of four digits in the fore and hind feet. 'The manubrium is broad ; the optic foramina are confluent, the incisors broad and the molars rootless, with folds dividing them into transverse lobes.

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This family includes but a single species, Dinomys branickti, known only from a single specimen obtained in Peru, which resembles Celogenys paca in the general form of its body and in size. It is regarded by its describer, Professor Peters, as a connect- ing link between the families Octodontidw, Chinchillide, Dasy- proctid#, and Caviidex.

UNGULATA. |

Family 6. CAVIIDS.

Terrestrial or natatorial Rodents, with short incisors, strong mandibular masseteric ridges, long and curved paroccipitals, and palate contracted in front. Fore fect with four digits, hind feet with three ; clavicles imperfect ; molars divided by enamel folds into transverse lobes; milk teeth shed before birth. Other characters as in Dasyproctide. Neotropical.

Cavia, limbs and ears short, subequal, tail none, includes several species widely distributed throughout South America, extending even to the Straits of Magellan, from one of which (C. aperea, prob- ably) the common Guinea-Pig is derived. Dolichotis has the limbs and ears long, tail very short, with D. patagonica, a large species, nearly 8 feet long, inhabiting the gravelly plains of Patagonia. The palate is so much contracted in front that the premolars of opposite sides touch by their antero-internal edges. Hydrocherus, with all the feet fully webbed, also includes a single species, which _ isthe largest of living Rodents. The skull (fig. 97) is distinguished, not only by its great size, but also by the enormous development of the paroccipital processes. See CAvy and CAPYBARA,

SusorDer II. RODENTIA DUPLICIDENTATA.

Rodents with four incisors in the upper jaw (two of them very small, and placed directly behind the large middle pair), the enamel of which extends round to their posterior surfaces. At birth there are six of these incisors, but the outer one on each side is soon lost. The incisive foramina are large and usually confluent ; the bony palate is very narrow from before backwards ; there is no true alisphenoid canal ; the fibula is ankylosed to the tibia, and articu- lates with the os calcis ; and the testes are permanently external.

Section IV. LAGOMORPHA. Characters those of the suborder.

Family 1. LacoMyipaz.

Terrestrial Rodents, with complete clavicles, subequal limbs, no external tail, and short ears. Skull depressed, frontals contracted and without post-orbital processes ; pm+or#; molars rootless, with transverse enamel folds, Palearctic and Nearctic.

Lagomys, with about a dozen species of small Guinea-Pig-like animals, inhabiting chiefly the mountainous parts of northern Asia (from 11,000 to 14,000 feet), one species only being known from south-east Europe and one from the Rocky Mountains.

Family 2, LEPORIDa.

Terrestrial Rodents, with imperfect clavicles, elongated hind limbs, short recurved tail, and long ears. Skull compressed,

Fig. 99,—-Skull of Lepus timidus.

frontals with large wing-shaped post-orbital processes (fig. 99); pm 4%; molars asin Lagomyide, Cosmopolitan (execpt Australasia).

Lepus ineludes about twenty species, which all resemble one another in general external characters. In all the fore limbs have five and the hind only four digits, and the soles of the feet are densely clothed with hairs similar to those covering the legs; the inner surface of the cheeks also is hairy. Although the family has such a wide distribution, the greater number of the species are restricted to the Palearctic and Nearctic regions, and a single species only (L. brasiliensis) extends into South America. See HARE and Rassir.

ALIA 421

Fossit RopENTIA.

Fossil representatives of all the above-defined familics, with the exception only of the small groups included under Anomaluride, Haplodontide, Lophionyide, Spalacidz, and Dinomyide, have been described from varions deposits. Of these the earliest have been found in the Upper Eocene of Europe and America, and belong to the family Seturide, of which the genera Colonomys, Taxymys, Tillomys, Paramys, Heliscomys, and Mysyops have been character- ized from the Eocene of North America, and Plesiaretomys from that of both America and France, while examples of even the receut genus Sctwrus have been found in beds of the same age in the latter country. Other recent families have representatives in later deposits, as Castoridz with Steneofiber and Paleomys from the Miocene of Europe and North America, Trogonotherium from that of India, Chalicomys from that of Germany, and Fucastor from North America, Myoxide with Myorus and Muride with Elomys, Deetieus, Oreomys, and Cricetodon from the European Miocene, Aystricide with Erethizon extending back to the Miocene of India, Geomyide with Entoptychus and Plewrolicus and Dasyproctidx, with Paciewlus from the Miocene of North America,

Lagomyidx: with Titanomys and MMyolagus from the European Miocene, and Leporid# with Palwolagus from corresponding North American beds. Later Tertiary strata have yielded Rodent remains more abundantly ; many of them referable to recent genera, or even closely allied to or undistinguishable from existing species, have been described from Brazilian bone-caves.

Besides those referable to existing families, several fossil remains: have been discovered which cannot be soclassed. These have been included in three families :—Jschromyidx with Pseudotomus from the Eocene, and Jschromys and Gymnoptychus from the Miocene of North America ; Theridomyidw with Theridomys extending from the Eocene to the Pliocene of France, and Archwomys, Issidioromys, and Dipoides from the Miocene; and Castoroidide with Castoroides from post-Pliocene deposits of North America, and Amblyrhiza and Loxomylus from the bone-breccias of the island of Anguilla. The first-named family appears to be intermediate between the Sciwridz and Castoridz# ; the second is allied to Geomyidx and Dipodide ; and the last, connected with Chinchillidw, includes Castorotdes ohioensis, a species vastly exceeding in size the largest of existing Rodents.

. Thus, like the Inseetivora and Chiroptera, fossil remains of Rodentia are found as far back as the Eocene period, and of these some are even referable to one or more recent genera, and differ but slightly from existing species, while all others are either capable of being classed in recent familics or are more or less closely related to them. It follows therefore (if the age of the beds in which these remains were found has been correctly determined) that, as in the case of these orders also, the first appearance of true Rodents must be sought for much farther back in time, and the question of their descent must be deferred till the discovery of sufficient material admits of reliable generalizations.

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[For the above sections on the Insectivora, Chiroptera, and Rodentia we are indebted to Dr G. E. Dobson, }

OrpEr UNGULATA.

Under this term may be included provisionally a large and rather heterogeneous group of mammals, the existing members of which form the Pecora and Bellux of Linnaeus, the Ruminantia and Pachydermata of Cuvier. A few years ago it was found convenient to restrict the order to a well-marked and distinctly circumscribed group, com- prising the two sections known as Pervssodactyla and Artiodactyla, and to leave out such isolated forms as the Elephant and Hyrax ; but the discovery of a vast number of extinct species, which could not be brought under the defini- tion of either Perissodactyle or Artiodactyle Ungulates,

and yet are evidently allied to both, and which to a certain extent bridge over the interval between these and the isolated groups just mentioned, makes it necessary either to introduce a number of new and ill-defined ordinal divisions, or to widen the scope of the original order so as to embrace them all.

They are all animals eminently adapted for a terrestrial life, and in the main for a vegetable diet. Though a few are more or less omnivorous, and may under some cir- cumstances kill living creatures smaller and weaker than themselves for food, none are distinctly and habitually predaceous. Tlieir teeth are markedly heterodont and diphyodont,—the milk set being well developed and not completely changed until the animal attains its full

stature. The molars have broad crowns with tuberculated or ridged surfaces. They have no clavicles. Their toes are provided with blunt, broad nails, or in the majority of cases with hoofs, more or less enclosing the ungual phalanges. The scaphoid and lunar bones of the carpus are always distinct.

The whole group may be divided into the Ungulata Vera, containing the suborders Perissodactyla and Artiodactyla, and a less well-known assemblage of animals which may be called Subungulata or

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Ungulata Polydactyla. } i

Cope has pointed out a URS Ys ,. character in the struc- us

ture of the carpus by which the latter are dif- ferentiated from the for- mer. In all the Subungu- lata the bones of the proximal and distal row retain the primitive or more typical relation to each other (see fig. 100). The os magnum of the second row articulates mainly with the lunar of the first, or with the cuneiform, but not with the scaphoid, while in the group to which the

vast majority of modern yy. 100,—Right Fore Foot of Indian Ele-

Ungulates belong the pant. x§. U, ulna; R, radius ; c, cuneiform ; . 1, lunar ; sc, scaphoid; uw, unciform; m, mag- second or distal row has num; za, trapezoid; ¢m, trapezium' I'to V, been shifted altogether "tte ffth digit. towards the inner side of the limb (see figs. 107 and 109), so that the magnum is brought considerably in relation with the scaphoid, and is entirely removed from the cunei- form, as in the great majority of existing mammals.

SUBUNGULATA.

By far the greater number of the Subungulata are eztinct, and of many of those whose former existence has been revealed, chiefly by the labours of the American paleonto- logists, our knowledge is at present necessarily

imperfect, though daily extending. It will only be possible here to give any details of some of the more interesting or best- known forms.

Susorper HYRACOIDEA,

This division is constituted to receive a single family of mammals, the affinities of which have long constituted a puzzle to zoologists. They were first placed among the Rodents, to which animals their small size and general appearance and habits give them much superficial resem- blance. Cuvier's investigations into their anatomical structure, and especially their dental characters, led him to place them among the Ungulates, near the genus Lthinoceros, a position still accepted by many zoologists.

MAMMALIA

[UNGULATA.

Further knowledge of their organization and mode of development has caused Milne-Edwards, Huxley, and others to disassociate them from this connexion, and, failing to find any agreement with any other known forms, to place them in a group entirely apart. Paleontology has thrown no light upon the affinities of this anomalous and isolated group, as no extinct animals possessing their distinctive characters have as yet been discovered.

The dentition consists only of incisors and molars, the formula in all known species being 2 4, ¢ $, p 4, m 3. The upper incisors have persistent pulps, and are curved longitudinally, forming a semicircle as in Rodents. They

are, however, not flattened from before backwards as in that order, but prismatic, with an antero-external, an antero-internal, and a posterior surface, the first two only being covered with enamel; their apices are consequently not chisel-shaped, but sharp pointed. They are preceded by functional, rooted milk teeth. The lower incisors have

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Fig. 101.—Skull and Dentition of Dendrohyraxz dorsalis. x 3. long tapering roots, but not of persistent growth. They are straight, procumbent, with awl-

shaped, trilobed crowns. Behind the incisors is a considerable diastema or interval. The molars and premolars are all contiguous, and formed almost exactly on the pattern of some of the Perissodactyle Ungulates, The hyoid arch is unlike that of any known mammal. 'The dorsal and lumbar vertebree are very numerous, 28 to 30, of which 21 or 22 bear ribs. The tail is extremely short. There are no clavicles, In the fore foot, the three middle toes are subequally developed, the fifth is present, but smaller, and the hallux is rudimen- tary, although, in one species at least, all its normal bones are present. The ungual phalanges of the four outer digits are small, somewhat conical, and flattened in form. The carpus has a distinct os centrale. There is a slight ridge on the femur in the place of a third trochanter. The fibula is complete, thickest at its upper end, where it generally ankyloses with the tibia, The articulation between the tibia and astragalus is more complex than in other mammals, the end of the malleolus entering into it. The hind foot is very like that of Rhinoceros, having three well-developed toes. There is no trace of a hallux, and the fifth metatarsal is represented by a small nodule only. The ungual phalanx of the inner (or second) digit is deeply cleft, and has a peculiar long curved claw, the others having short broad nails. The stomach is formed upon much the same principle as that of the Horse or Rhinoceros, but is more elongated transversely and divided by a constriction into two cavities—a large left cul de sac, lined by a very dense white epithelium, and a right pylorio cavity, with a very thick, soft, vascular lining. The intestinal canal is long, and has an arrangement perfectly unique among mammals, indeed among vertebrated animals, for, in addition to the ordinary short, but capacious and sacculated cecum at the commencement of the colon, there is, lower down, an additional pair of large, conical, pointed czeca, The liver is much subdivided, and there is

no gall-bladder. The brain resembles that of the typical Ungulates far more than the Rodents. The testes are permanently abdominal. The ureters open into the fundus of the bladder as in some Rodents, The female has six teats, of which four are inguinal and two axillary, and the placenta is zonary, as in the Elephant and Carnivora.

There are two distinct forms of Hyrax, differing both in structure and habits, and which may well be accorded generic rank.

1. Hyrax.—Molar tceth having the same pattern as those of Rhinoceros. Interval between upper incisors less than the width of the teeth. Lower incisors slightly notched at the cutting edge. Vertebre: C7, D 22, L8,86,C6. Of this form the earliest known species, H. capensis, is the type. There are several other species, as H. syriaeus and habessinieus, from eastern Africa and Syria. They inhabit mountainous and rocky regions, and live on the ground.

2, Dendrohyrax.—Molar teeth having the same pattern as Paleo- therium (except that the third lower molar has but two lobes). Interval between upper incisors excecding the width of the teeth. Lower incisors with very distinctly trilobed crowns. Vertebre : C7, D21,L7,85,C10. The members of this section frequent the trunks and large branches of trees, sleeping in holes. There are several species, not distinctly defined, from western and south Africa, as D. arboreus and D. dorsalis. The members of both groups appear to have a power like that possessed by the Lizards called Geckos of clinging to vertical surfaces of rocks and trees by the soles of their feet. See Hyrax.

The anatomy of Hyrax was first described by Pallas (Spicilegia Zoologica), Besides minor memoirs, two very detailed accounts of its structure have recently appeared—one by Brandt, in Mém. Acad. Nat. Scien. St Pétersbourg, series vii. vol. xiv., No. 2, 1869; and another by George, in Annales des Sciences Naturelles, series vi. tom. i., 1874, in which references to all the previous literature will be found. The mechanism by which the sole of the foot is enabled to adhere to smooth surfaces is fully described by G. E. Dobson, Proc. Zool. Soc., 1876, p.

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Susorprr PROBOSCIDEA.,

This name has been appropriated to a well-marked group of animals, presenting some very anomalous characters, allied in many respects to tho Ungulata, but belonging neither to the Artiodactyle nor Perissodactyle type

of that order. It lias been thought that they possess some, though certainly not very close, affinities with the Modentva, and also with the Strenia. It is certain, however, that the two species of Elephant which are the sole living representatives of the group, stand quite alone among existing mammals, differing widely from all others in many points of their structure. In some respects, as the skull, proboscis, and dentition, they are highly specialized, but in others, as in the presence of two anterior venz cave, and in the structure of the limbs, they retain a low or generalized con- dition. A considerable series of extinct forms, extending back through the Pliocene and Miocene epochs, show the same type under different modifications, and in still more generalized outlines; and certain recently discovered forms from the Eocene of North America, if their affinities are rightly interpreted, appear to link the true Proboscidea to some unknown primitive type of Perissodactyle Un- gulata.

The following are the principal characters common to existing, and, by inference, to the extinct, Proboscidea. The nose extended into a long, muscular, very flexible and prehensile proboscis, at the end of which the nostrils aro situated, and from which the name given to the group is derived. The teeth consisting of ever-growing incisors of very great size, but never exceeding one pair in each jaw, and often present in one jaw only; no canines ; large and transversely ridged molars. No clavicles. Limbs strong, the upper segment, especially in the hind limb, the longest. Radius and ulna distinct, the latter articulating extensively with the carpus. Fibula and tibia distinct. Astragalus very flat on both surfaces. Manus and pes short, broad, and massive, each with five toes, though the outer pair may be more or less rudimentary, all encased in a common integument, though with distinct, broad, short, hoofs. Third digit the largest. Two anterior vene cave entering the right auricle. Stomach simple. A capacious cecum. Testes permanently abdominal. Uterus bicor-

nuate. Placenta non-deciduate and zonary. Mamme two, pectoral.

With regard to the teeth, the incisors,' which project largely out of the mouth, and are commonly called " tusks," are of an elongated conical

form, and generally curved. They are composed mainly of solid dentine, the fine elastic

.quality and large mass of which renders it invaluable as

“ivory ” for commerce and the arts.

The molar teeth present a remarkable series of modifica- tions from the comparatively simple form in Dznotherium, with two or three strongly pronounced transverse ridges and a normal mode of succession, to the extremely complex structure and anomalous mode of replacement found in the true Elephants. The intermediate conditions occur in the various species of Mastodon. In this genus the enamel- covered transverse ridges of each tooth are generally more numerous than in Dinotherium, and often complicated by notches dividing their edge or by accessory columns attached

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Fic, 102.—Longitudinal Sections of the Crown of a Molar Tooth of various Pro- boscideans, showing stages in the gradual modification from the simple to the complex form. I, Afastodon ohioticus ; 1I, Stegodon insignis ; III, Loxodon africanus; 1V, Elephas primigenius. The dentine is indicated

by transverse lines, the cementum by a dotted surface, and the enamel is black.

to them, but in the unworn tooth they stand out freely on the surface of the crown, with deep valleys between (fig. 102, I). In the Elephants the ridges are still further in- creased in number, and consequently narrower from before backwards, and are greatly extended in vertical height, so that, in order to give solidity to what would otherwise be a laminated or pectinated tooth, it becomes necessary to envelop and unite the whole in a large mass of cementum,

1 These teeth are by some writers classed as eanines, as their roots are implanted in the maxille ; but, as in Rodents, they are originally developed in the gum covering the premaxillw, in whieh bones their primitive alveoli are sunk. As growth proceeds, however, firm sup- port for sueh massive and weighty bodies ean only be obtained by their roots gradually sinking through the premaxille into the great and specially modified alveolar processes of the maxilla, but this does not vitiate their homology with the incisors of other mammals.

which completely fills up the valleys, and gives a general smooth appearance to the organ when unworn; but as the wear consequent upon the masticating process proceeds, the alternate layers of tissue of different hardness —cementum, dentine, and enamel—whiich are disclosed upon the surface form a fine and very efficient triturating instrument. The modification of the tooth of a Mastodon into that of an Elephant is therefore precisely the same in principle as that of the molar of a Palzotherium into that of a Horse (see vol. xiii. p. 174), or of the corresponding tooth of one of the primitive Artiodactyles into that of an Ox. The intermediate stages, moreover, even in the present state of our knowledge, are so numerous that it is not possible to draw a definite line between the two types of tooth structure (see fig. 102, II, III, IV).

As regards the mode of succession, that of modern Elephants is, as before mentioned, very peculiar. During the complete lifetime of the animal there are but six molar teeth on each side of each jaw, with occasionally a

rudimentary one in front, completing the typical number of seven. The last three represent the true molars of ordinary mammals ; those in front appear to be milk molars, which are never replaced by permanent successors, but the whole series gradually moves forwards in the jaw, and the teeth become worn away and their remnants cast out in front, while development of others proceeds behind. The individual teeth are so large, and the processes of growth and destruction by wear take place so slowly, that not more than one, or portions of two, teeth are ever in place and in use on each side of each jaw at one time, and the whole series of changes coincides with the usual duration of the animal's life. On the other hand, the Dinotherium, the opposite extreme of the Proboscidean series, has the whole of the molar teeth in place and use at one time, and the milk molars are vertically displaced by premolars in the ordinary fashion. Among Mastodons transitional forms occur in the mode of succession as well as in structure, many species showing a vertical displacement of one or more of the milk molars, and the same has been observed in one extinct species of Elephant (#. planifrons) as regards the posterior of these teeth.

All known Proboscideans are animals of large dimensions, and some are the most colossal of land mammals. The head is of great proportionate size ; and, as the brain case increases but little in bulk during growth, while the

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Fie. 103.—A Section of the Skull of the African Elephant (Elephas africanus) taken to the left of the middle line, and including the vomer (Vo) and the mesethmoid (JZ). an, anterior, and pn, posterior narial aperture, yy nat. size. Flower's Osteology of Mammalia.

exterior wall of the skull is required to be of great super- ficial extent to support the trunk and the huge and ponderous tusks, and to afford space for the attachment of muscles of sufficient size and strength to wield the skull

thus heavily weighted, an extraordinary development of air-cells takes place in the cancellous tissue of nearly all the bones of the cranium. These cells are not only formed in the walls of the cranium proper, but are also largely developed in the nasal bones and upper part of the pre-: maxille and maxille, the bones forming the palate and the basi-cranial axis, and even extend into the interior of the ossified mesethmoid and vomer. Where two originally distinct bones come into contact, the cells pass freely from one to the other, and almost all the sutures become obliterated in old animals. The intercellular lamelle in the great mass which surrounds the brain cavity superiorly and laterally mostly radiate from the inner to the outer table, but in the other bones their direction is more irregular. Like the similar but less developed air-cells in the skulls of many other mammals, they all communicate with the nasal passages, and they are entirely secondary to the original growth of the bones, their development having scarcely commenced in the new-born animal, and they gradu- ally enlarge as the growth of the creature proceeds towards maturity. The nasal bones are very short, and the anterior narial aperture situated high in the face. The zygomatic arch is slender and straight, the malar bones being small, and forming only the middle part of the arch, the anterior part of which (unlike that of all true Ungulates) is formed only by the maxilla, The maxillo-turbinals are but rudimentary, the elongated proboscis supplying their place functionally in warming and clearing from dust the inspired air.

The neck is very short. The limbs are long and stout, and remarkable for the great length of the upper segment (especially the femur) as compared with the distal segment, the manus and pes. It is owing to this and the vertical position of the femur that the knee-joint in the hind leg is placed much lower, and is more conspicuous externally than in most quadrupedal mammals, and, this having been erro- neously compared with the hock-joint or ankle of Ungulates, the popular fallacy that the joints of the Elephant's leg bend in a contrary direction to that of other mammals has arisen. There is no round ligament in the hip-joint, or third trochanter to the femur. The radius and ulna are distinct, though fixed in a crossed or prone position. The fibula also is quite distinct from the tibia. The feet are short and broad, the carpal and tarsal bones being very square, with flattened surfaces for articulation; the astragalus especially differs from that of true Ungulates in its flatness, in the absence of a distinct pulley-like articular surface at either

extremity, and in having no articular facet for the cuboid. 'The fibula articulates with the caleaneum, as in Artiodactyles. Of the five toes present on each extremity (see fig. 100), the middle one is somewhat the largest, and the lateral ones smallest, and generally wanting (especially in the hind foot) the complete number of phalanges. The ungual phalanges are all small, irregular in form, and late in ossification. The whole are encased in a common in- tegument, with a flat, subcircular, truncated sole, the only external indication of the toes being the broad oval nails or hoofs arranged in a semicircle around the front edge of the sole. The hind foot is smaller and narrower than the front. The liver is small and simple, and there is no gall- bladder. In form the brain resembles that of the Rodents and other lower orders of mammals, the cerebellum being entirely behind and uncovered by the cerebrum, but the hemispheres of the latter are richly convoluted.

The Proboscidea are exclusively vegetable feeders, living chiefly on leaves and young branches of forest trees and various kinds of herbage, which they gather and convey to their mouth by the very mobile proboscis, an organ which combines in a marvellous manner strength with dexterity of application, and is a necessary compensation for the shortness and inflexibility of the neck, as by it many of the

functions of the lips of other animals are performed. By its means the Elephant is enabled to drink without bend- ing the head or limbs; the end of the trunk being dipped into the stream or pool, a forcible inspiration fills the two capacious air-passages in its interior with water, which, on the tip of the trunk being turned upwards and inserted into the mouth, is ejected by a blowing action, and swallowed ; or if the animal wishes to refresh and cool its skin, it can throw the water in a copious stream over any part of its surface. Elephants can also throw dust and sand over their bodies by the same means and for the same purpose, and wild animals have been frequently observed fanning themselves with leafy boughs held in the trunk. The species are at present limited in their geographical distri- bution to the Ethiopian and Oriental regions, but they formerly had a far more extensive range.

Elephas.—Dentition: 44, ¢%, m $=26. The incisors variable, but usually of very large size, especially in the male sex, directed some- what outwards, and curved upwards, without enamel except on the apex before itis worn; preceded by small milk incisors. The molars succeed each other by horizontal replacement from before back- wards, never more than one or part of two being in use on each side of each jaw at the same time; each composed of numerous flattened enamel-covered plates or ridges of dentine, projecting from acommon many-rooted base, surrounded and united together by cementum. 'The number of plates inereases from the anterior to the posterior molar in regular succession, varying in the different speeies, but the third and fourth (or the last milk molar and the first true molar), and these only, have the same number of ridges, which always exceeds five. Skull of adult very high and globular. Mandible ending in front in a prolonged deflected and spout-like symphysis. Vertebre: C7, D 19-21, L 3-4, S 4, C 26-83.

The existing species of the genus differ so much that they must be placed in two distinct sections, considered by some zoologists as distinct genera.

1. Elephas proper. lasmodon, F. Cuv.; Huelephas, Fale.— Average number of plates of the six successive molar teeth expressed by the '"'ridge formula" 4, 8, 12, 12, 16, 24. The plates com- pressed from before backwards, the anterior and posterior surfaces (as seen in the worn grinding face of the tooth) being nearly parallel. Ears of moderate size. Upper margin of the end of the proboscis developed into a distinct finger-like process, much longer than the lower margin. Five nails on the fore feet, and four (oceasionally five) on the hind feet.

The well-known Asiatic Elephant, £. indicus, inhabits in a wild state the forest lands of India, Burmah, the Malay Peninsula, Cochin China, Ceylon, and Sumatra. Those from the last-named islands, presenting some variations from those of the mainland, have been separated under the name of /. swmatranus, but the distinction has not been satisfaetorily established. The appearance of the Asiatic Elephant is familiar to all. Though rarely breeding in captivity, it has been domesticated from the most remote antiquity, and is still extensively used in the East as a beast of burden. In the wild state it is gregarious, associating in herds of ten, twenty, or more

individuals, and, though it may under certain circumstances become dangerous, it is generally inoffensive and even timid, fond of shade and solitude and the neighbourhood of water. The height of the male at the shoulder when full grown is usually from 8 to 10 fect, occasionally as much as 11. The female is somewhat smaller. See ELEPHANT.

2. Loxodon.—Molar teeth of coarse construction, with fewer and larger plates and thicker cnamel. Ridge formula: 3, 6, 7, 7, 8, 10. The plates not flattened, but thicker in the middle than at the edges, so that their worn grinding surfaces are lozenge-shaped. Ears very large. The upper and lower margins of the end of the trunk forming two nearly equal prehensile lips, But three hoofs on the hind foot. The one species, Z. africanus, now inhabits the wooded districts of the whole of Africa south of the Sahara, except where it has been driven away by human settlements. Fossil remains of Pleistocene age, undistinguishable specifically, have been found in Algeria, Spain, and Sicily. It was trained for war and show by the ancient Carthaginians and Romans, and recent experi- ence of the species in captivity in England shows that it is as intelligent as its Asiatic relative, if not more so, while surpass- ing it in eourage, activity, and obstinacy. Nevertheless, in modern times, no people in Africa have been sufficiently eivilized or enter- prising to eare to train it for domestie purposes. It is hunted ehiefly for the sake of the ivory of its immense tusks, of which it yields the principal source of supply to the European market, and the desire to obtain which is rapidly leading to the extermination of the species. In size the male African elephant often surpasses that of Asia, but the female is usually smaller. The circumference of the forefoot is half the height at the shoulder, a circumstance

whieh enables the hunters to judge from the footprints the exact size of the animals of which they are in pursuit.

Extinet Species of Elephant.—Abundant remains of Elephants are found embedded in alluvial gravels, or secreted in the recesses of caves, into which they have been washed by streams and floods, or dragged as food by

Hynas aud other earnivorous inhabitants of these subterranean dens. Sueh remains belonging to the Pleistocene and Pliocene periods have been found in many parts of Europe, in- cluding the Lritish Isles, in North Africa, throughout the North American eontinent from Alaska to Mexico, and extensively dis- tributed in Asia, where the deposits of the sub-Himalayan or Sivalik hills, belonging to the earliest Pliocene, are rich in the remains of Elephants of varied form. These species are ehiefly known and eharacterized at present by the teeth, some of which resemble the existing Indian and some the African type, but the majority are between the two, and make the distinction between Elephas and Loxodon as different genera quite impracticable. Others again approach so closely in the breadth and eoarseness of the ridges and paucity of cementum to Afastodon as to have been placed by some zoologists in that genus. These form the group or subgenus called Stegodon by Falconer.

Among the best known extinct Elephants are Z. primigenius, the Mammoth, very elosely resembling the existing Indian species, and one of the most recently extinct and extensively distributed (sce Mammortn); £. antiquus and £. meridionalis, also found in Britain, as well as in Europe generally, of rather earlier date, and inclining more to the Loxodon type, as also do two species found in the island of Malta, #. mnatdiensts and FE. melitensis, the latter the smallest known species of the suborder, sometimes not exceeding 8 feet in height when adult. The Stegodon forms, £. elifti, bombifrons, insig- ais, and ganesa, are all from India, which locality would appear, from the abundance of remains and variety of forms, as well as the generalized character of some and the geological horizon (Plio- Miocene) in which the remains are found, to be the earliest hahi- tation of the true Elephants yct discovered. Remains of Elephants of the last-named group have also lately been found in China and Japan. A tusk the dentine of which presents the characters hither- to considered peculiar to the Proboseidea, from Australia, has been lately described by Professor Owen under the name of Nolelephas.

Mastodon.—Dentition: 4 re? ¢ 3, p and m&. Upper incisors

very large, as in Elephas; sometimes with longitudinal bands of enamel, more or less spirally disposed. Lower incisors vari- able: when present

comparatively small and straight, sometimes persistent, sometimes early deciduous, and in some species never present. Grinding surface of molars with transverse ridges, the summits of which are divided more or less into eonical or mam- millary cusps, and often with secondary or additional cusps between and clustering against the principal ridges ; enamel thick ; cemen- tum very scanty, never filling up the interspaces between the ridges, The third, fourth, and fifth molars having the same num- ber of ridges,! which never exceeds five. In some species (Jf. ohiotieus) no vertical succession has been observed, but in others, as M. angustidens, the two posterior premolars, and in the American M. produetus apparently all three, are preceded by milk molars. There is also a horizontal succession as 1n Elephants, the anterior teeth being lost before the posterior ones are fully developed, but not so complete as in the former genus, for as many as three teeth niay be in place in one jaw at onetime. The skull generally is less elevated and less eellular than in Elephas ; otherwise the remainder of the skeleton is similar.

All known Mastodons are gigantie animals, equalling or exeeed- ing the recent Elephants in size. Their remains have been found in Europe and southern Asia and America, from the Miocene to the Pleistocene epochs.

Dinotherium.—Dentition of adult : it »¢ pd, m 3=22; all present at the same time, there being no horizontal succession, but the premolars replace milk teeth in the ordinary manner. The presence or absence of upper incisors has not yet been clearly ascer- tained. Lower incisors, large, eonical, descending and slightly eurved backwards, implanted in a greatly thickened and deflected beak or prolongation of the symphysis. In section they do not show the decussating strie characteristie of Mastodons and Elephants. Crowns of molars with strong, transverse, erenulated ridges, with deep valleys between, much resembling those of the Tapirs. Ridge formula of the permanent molar series: 2, 2, 3, 2,2. The three ridges of the first true molar appear to be constant in both upper and lower jaws, although it is quite an anomalous character among

1 This, and the larger number of ridges in the latter, are the only absolute distinctions which Falconer could find between Afastodon and Elephas (Paleont. Memoirs, ii. p. 9), and it is clear that they are somewhat

arbitrary. Theline between the two genera is drawn at this point more as a matter of convenience for descriptive purposes than as indicating any great natural break in the sequence of modifications

of the same type. XV. — 54

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come behind it. The last milk molar has also three ridges, the pen- ultimate but two. The cranium is much depressed, with compara-

Fia, 104.—Skull of Dinotherium giganteum (Mioeene, Eppe!sheim). tively little development of air-cells. The remainder of the skeleton is imperfectly known, but apparently agrecs in its general charac- ters with that of the other Proboscideans.

Remains of Dinotheriwm giganteum, an animal of elephantine pro- portions, strikingly characterized by the pair of huge tusks descend-

ing nearly vertically from the front of the 'lower jaw, were first discovered at Eppels- heim, near Darmstadt, and described by Kaup. They have since been met with in various Middle and Upper Miocene forma- tions in the south of Germany, France, Greece, and Asia Minor. Three species, D. pentapotamie, D. indicum, and sindiense, have been described by Falconer and Lydekker from north-western India. The genus has hitherto not been found in England or in America.

The genus Phenocodus, from the Lower Focene of Wyoming, lately described by Cope (Am. Naturalist, December 1881 and June 1882), is placed by that zoologist in a Je group called Condylarthra, allied to the Proboscidea, but distinguished by "a post-glenoid process, and a third trochanter of the femur, and no calcaneal facet for the fibula." This and the Proboscidea are united by Cope to form the order Z'aacopoda, one of his primary divisions of the Ungulata.

In all the preceding forms the astragalus articulates only with 'the navicular bone, in those that follow with both navicular and cuboid.

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SuporpEerR 4AMBLYPODA,

Among the most remarkable of the recent discoveries in the Eocene formations of the western States of North America has been that of a group of animals of huge size, approaching if not equalling that of the largest existing Elephants, presenting a combination of characters quite unlike those known among either recent or extinct creatures, and of which there were evidently many species living contemporaneously, but all of which became extinct before the close of the Eocene period. To form some idea of their appearance, we must imagine animals very elephan- tine in general proportions and in the structure of their limbs. The fore foot had five, and the hind foot four toes, The tail, as in the Elephants, was long and slender, but the neck, though still short, was not so much abbre-

MAMMALIA

-Proboscideans for this molar to have more ridges than those which :

[UNGULATA.

viated as in modern Proboscideans, and there is no evi- dence that they possessed a trunk. The head differed greatly from that of the Elephants, being long and narrow, nore like that of a Rhinoceros, and, as in that animal, was elevated behind into a great occipital crest, and it had developed upon its upper surface three pairs of con- spicuous, laterally diverging protuberances, one pair in the parietal region, one on the maxillaries in front of the orbits, and one (mucli smaller) near the fore part of the elongated nasal bones. Whether these were merely covered by bosses of callous skin, as the rounded form and ruggedness of their extremities would indicate, or whether they formed the bases of attachment for horns of still greater extent, like those of the Rhinoceros or of the Cavicorn Ruminants, can only be a matter of con- jecture. There were no upper incisors, but three on each side below, of comparatively small size, as was also the lower canine.

| the Musk-Deer, descended from each side of the upper | jaw. These were present in both sexes, but very much

smaller in the female, as was also the flange-like process

| of the lower jaw by which they were guarded. Behind

these, and at some distance from them, were on each

{ side above and below six molar teeth, of comparatively

small size, placed in continuous series, each with a pair of oblique ridges conjoined internally and diverging exter-. nally in a V-like manner, and provided with a stout basal cingulum. 'The dental formula was therefore z 3, c }, p 3, m 3=34; and the dentition had thus already attained a remarkable degree of specialization, although the brain was smaller and more rudimentary in characters than in almost any other known mammal.

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Fia, 105.—Restoration of Dinoceras mirabile. py nat. size. From Marsh (Am. Jour, Sci., vol. xii. pl. 2).

The first-discovered evidences of the existence of animals of this group were described by Leidy in 1872, under the name of Uinta- therium (from the Uintah mountains, near which they were found). Other nearly allied forms have been named Dinoceras (restoration of which is shown in fig. 105), Tinoceras, and Loxolophodon. They constitute the order Dinocerata of Marsh, but are included by Cope in the Amblypoda.

Another interesting form referred to this suborder is Coryphodon, which appears to connect the Probosctdea with the most primitive Perissodactyla, especially Lophiodon. It was first described by Owen in 1846 from a fragment of a jaw from the London Clay. More perfect remains were afterwards discovered in France, and lately in great abundance, indicating many species from the size of a Tapir to that of a Rhinoceros, in the lowest

Eocenes of New Mexico and Wyoming, in the United States. It had forty-four teeth ; the canines of both jaws were large and sharp-pointed, and the molars had strongly pronounced oblique ridges. The general proportions were those of a Bear, but the tail was of —— length, and the feet short and wide, with five toes on each.

The Tertiaries of South America have yielded some very remark- able forms of mammalian life, the nature and affinities of which

have greatly puzzled all zoologists who have attempted to unravel them. J/acrauchenia, an animal with a Camel-like neck, is now known to be a Perissodactyle, though in some charaeters somewhat aberraut. The articulation of the fibula with the calcaneuim is an Artiodactyle or perhaps generalized character. The teeth ally it to Palwotherium and Rhinoceros. Homalodontotheriwm, from the banks of the river Gallegos, south-east Patagonia, is known by the teeth alone, which, though very generalized, are on the whole rhinocerotic. Nesodon, from the same locality, also only known by the dentition and some parts of the skull, conneets the last and Macrauchenia with Toxodon. These three gencra have the typical dental formula of 7 3, ¢4, p 4, m 3=44. Toxodon isan animal about the size of a Hippopotamus ; it was first discovered by Darwin,

and many specimens have sinee been found in Pleistocene deposits

near Buenos Ayres, and described by Owen, Gervais, and Burmeister. The teeth consist of large incisors, very small lower eanines, and strongly curved molars, all with persistent roots, the formula being apparently 7 3, ¢ ¢, p $, m $=88. The eranial characters ex- hibit a combination of those found in both Perissodactyles and Artiodactyles, but the form of the hinder part of the palate and the absenee of an alisphenoid eanal belong to the latter ; and the tym- panic, firmly fixed in between the squamosal and the exoccipital, ankylosed to both, and forming the floor of a long upward-directed

meatus auditorius, is so exactly like that of the Swina that it } is difficult to belicve it does not indicate some real affinity to | that group. ‘These

characters seem to outweigh in importance | those by which some zoologists have linked Toxodon to the Peris- |

u f i ; H th ti- | 4 sodactyla, and the absence of the third trochanter and the arti- | mammals, represented in the actual fauna of the world by

‘only three distinct types or families—the Tapirs, the y a _BRhinoceroses, and the Horses—poor in genera and species, Artiodaetyles or Perissodactyles, and more nearly resemble those of | ang (except in the case of the two domesticated species of _ Lquus, which have been largely multiplied and diffused by man’s agency) not generally numerous in individuals, , though widely scattered over the earth’s surface. Palaon- | tological records show very clearly that these are but the surviving fragments of a very extensive and much varied ‘assemblage of animals which flourished upon the earth throughout the whole of the Tertiary geological period, ‘and which, if it could be reconstructed in its entirety, ‘would not only show members filling up structurally the i intervals between the existing apparently isolated forms, but would show several marked lines of specialization which have become extinct without leaving any direct

culation of the fibula with the caleaneum tell in the same direction. The structure of the feet is not completely known, but Cope has shown that the tarsal bones differ altogether from those of either

the Proboscidea than any other known Ungulates.

Mesotheriwm, also called Dypotheriwm, from the same locality, was au animal rather larger than a Capybara, and of much the same general appearance. Its skeleton is completely known, and shows a singular combination of charaeters, resembling Towodon or a

Fie 106.—Cranium and Lower Jaw of Mfesotherium cristatum. 4% nat. size. From Gervais.

generalized Ungulate on the one hand, and the Rodents, especially the Leporidx, on the other. In the presence of clavicles it differs from all known Ungulates, and in having four lower incisors from all Rodents. The teeth are 7 4, ¢ $, p 3, m §=24.

It will thus be seen that, although our knowledge of many of these forms is still very limited, we may trace among them a curious chain of affinities, which would seem to unite the Ungulates on the one hand with the Rodents on the other ; but further materials are required before we can establish with certainty so important a rela- tionship, one which, if true, would alter materially some of the prevailing views upon the classification of mammals.

UNGULATA VERA.

In the typical Ungulata the feet are never plantigrade, and the functional toes do not exceed four,—the inner digit being suppressed, at all events in all forms which have

existed since the Early Eocene period. The os magnum of the carpus articulates freely with the scaphoid. The allantois is largely developed, and the placenta, so far as is known, is non-deciduate, the chorionic villi being either evenly diffused er collected in groups or cotyledons (in Pecora). The testes descend into a scrutum. There is never an os penis, The nterus is bicornuate. The mamme are usually few and in- guinal, or may be numerous and abdominal (as in Suina), but are never solely pectoral. The cerebral hemispheres in exist-

ing Ungulates are well convoluted.

The group is now, and has been throughout the whole of the Tertiary period, composed of two perfectly distinct

sections, differing from each other, not only in the obvious

characters of the structure of the limbs, but in so many other parts of their organization that they must be con-

sidered as of the rank at least of suborders. The characters of these divisions, first indicated by Cuvier, were thoroughly

established by Owen, by whom the names whereby they are now generally known were proposed.

Suporprr PERISSODACTYLA. This is a perfectly well-defined group of Ungulate

successors. The following are the principal characters distinguishing them from the Artiodactyla. Premolarand molar teeth in

Fig. 107.—Bones of Fore Foot of existing Perissodactyles. A, Tapir (Tapirus indicus), X4; B, Rhinoeeros (Rhinoceros sumairensis), X43 C, Horse (Equus caballus), x4. U, ulna; R, radius; c, euneiform; /, lunar; s, scaphoid; w, unci- form; m, magnum; ¢d, trapezoid; tm, trapezium. Osteology of Mammalia.

continuous scries, with massive, quadrate, transversely

ridged or complex crowns,—the posterior premolars reseim-

bling the true molars in size and structure. Crown of the

lastlower molar commonly bilobed.! Dorso-lumbar vertebrae never fewer than twenty-two, usually twenty-three in the existing species. Nasal bones expanded posteriorly. An alisphenoid canal, Femur with a third trochanter. The iniddle or third digit on both fore and hind feet larger than any of the others, and symmetrical in itself, the free border of the ungual phalanx being evenly rounded (see fig. 107). This may be the only functional toe, or the second and fourth may be subequally developed on each side of it. In the Tapirs and many extinct forms, the fifth toe also remains on the fore limb, but its presence does not interfere with the symmetrical arrangement of the remainder of the foot around the median line of the third or middle digit. Traces of a hallux have only been found iu some extrentely ancient and primitive forms. The astragalus has a pulley- like surface above for articulation into the tibia, but its distal surface is flattened and unites to a much greater extent with the navicular than with the cuboid, which bone is of comparatively less importance than in the Artiodac- tyles. The

calcaneum does not articulate with the lower end of the fibula. The stomach is simple, the caecum large and capacious, the placenta diffused, and the mamme inguinal.

The very distinct minor groups into which the Perissodactyles are divided in the later periods of the earth's history are, even by the knowledge already gained of the ancient members of the sub- order, so closely united by connected forms that it is difficult to make any satisfactory classification of the whole. This is of course what might be expected, and would probably be the case with all other groups if we knew as much of thcir past history as we do of that of the Perissodactyles. It is necessary, however, for descriptive purposes to have some arrangement; and perhaps, if not the most natural, the most convenient division (especially as it is chicfly or only by these organs that many are known) is one founded upon the structure of the lower molar teeth. By this character we may make three primary divisions, each of which has a representative at the present time:—(4) those in which the crowns of the lower molars are disposed in transverse ridges, as in the Tapirs; (2) those in which the crowns of the lower molars are formed by a pair of crescents, as in Rhinoceros; (C') those in which the crowns of the lower molars are formed of a pair of crescents, with the addition of inner lobes or columns, as in the Horscs. As these forms are all modifications of the same essential pattern, transitions in certain or all of the teetl must be expected in many cases, and, as before implied, the grouping of the Perisso-dactyles into Tapiroid, Rhinocerotic, and Equine sections according to the pattern of their molar teeth may not be a truc exposition of the real affinities of the genera, but must be looked upon rather as a convenient provisional arrangeinent.

A. TAPIROID SECTION. Lower molars bilophodont.

Family LoPHIODONTIDS.

Both upper and lower true molars bilophodont. smaller and simpler than the true molars. Four toes on the anterior and three on the posterior feet. This family includes a large number of more or less imperfectly known forms, all extinct, ranging from the size of a Rabbit to that of an Ox. They are the earliest in time and most generalized in structure of the known Perissodactyles, It is possible that from some either of the known or tlie still

undiscovered membcrs of this group most of the other types of the order have been derived, Their remnains have been found in Europe only in the Lower and Middle Eocene, though in North America they appear to have lingered to a somewhat later date. The genus Hyracotheriwm was established in 1839 by Owen for a smal] animal, no larger than a Hare, the skull of which was found in the London Clay at Herne Bay. A more perfect specimen apparently of the same species was afterwards (in 1857) described under the name of Philophus vulpiceps. Closely allied forms from the European eontinent have been named Paehynolophus and Lophiotherium, These have all the complete dentition, viz., 7 3, ct,p {,m 3=44. The posterior lower molar has three lobes. The genus Lophiodon (Cuvier, 1822) contains animals of much larger size and later geological period (Middle or Upper Eocene), in which the dentition was so far specialized as to have lest the anterior pre- molar of both jaws, the formula being 7 3, c+, » 3, m $=40. The transverse ridges of the upper molars are placed obliquely, the

Premolars

} These dental characters are not strictly applicable to the most ancient forms,

-is completely known.

of 1X

posterior is smaller than the anterior, and they are united by their external borders; those of the mandible are distinct and only con- nected by a feeble diagonal crest, the last bearing a talon or rudiment ofathird lobe. On the premolars the anterior ridge only isdeveloped.. Nearly allied was the American genus Hyrachyus, the structure of which is now very completely known from well-preserved remains. Theskcleton closely resembles that of the Tapir, thougli the dentition is more like that of Lophiodon, except that the last lower molar has but two lobes. As many as nine specics have been already de- scribed, all from the Upper Eocene. Another form from the same deposits, Colonoccras of Marsh, is said to have had an attachment for a dermal horn on each nasal bone. Triplopus, otherwise closely similar to

Hyrachyus, wants the fifth digit of the manus, and hence is placed by Cope in a distinct family, Triplopide.

[UNGULATA.

Family TAPIRIDA.

Both upper and lowcr true molars bilophodont. Posterior pre- molars above and below resembling the true molars. This family is connected with the last by the Middle Miocene genus Listriodon. The genus Tapirus, in which as many as three pre- molars resemble the true molars, and in which the last lower inolar has no talon, appears first in the Upper Miocene of Europe, and has continued with scarcely any appreciable change until the present time, being represented by scvcral species in Central and South America, and one in the Malay Peninsula and adjacent islands. It is therefore probably the oldest existing genus of mammals. One of the Amcrican species differs from all the others in the great an- terior prolongation of the ossification of the mesethmoid cartilage, and has been separated generically by Gill under the name of Elasmognathus, See TAPIR.

B. RUINOCEROTIC SECTION,

Lower molar teeth with the ridges, instead of being transverse, curved in a crescentic manner. The outer extremity of each ridge is curved forwards so that the hinder ridge abuts against the ex- ternal surface of the ridge in front of it. An unworn lower molar of a Rhinocéros has thus externally two convex areas separated by a vertical groove, and internally two principal sinuses, correspond- ing to the projections externally. The entrances to these sinuses are bordered by three conical pillars—the first of comparatively little importance, representing the anterior talon of the Tapir's tooth, the second, the largest, representing the antcro-internal principal cusp, and the third the postero-internal principal cusp. The upper molars of all the animals of this section resemble those of Lophiodon in principle, the transverse ridges being joined by an outer wall and placed obliqucly, their inner ends inclining back- wards and their posterior surfaces being more or less concave. There are two further chief modifications of this type:—(1) that in which the free edge of the outer wall

acquires a strongly zigzag or bi- crescentic character, being deviated inwards opposite each of the principal outer cusps, and outwards at the anterior and posterior angles of the tooth and in the middle between the cusps, as in Paleotherium; and (2) that in which the outer wall is geet developed, and in the main flat or smoothly convex, though with slight elevations and depressions corresponding with those so regular and well-marked in the last section; this is the character of the teeth of Rhinoceros and its allics.

Family HyRAcoDONTIDE.

Separated by Cope from the next, and containing the genus Hyracodon of Leidy,a primitive or simple Rhinoceros-like type, from the Lower Miocene of North America, with the full number of teeth, but only three digits on each foot.

Family RUINOCERONTIDA.

A very extensive group, of which many modifications, form- ing a gradual series, showing increasing specialization from primitive ZLophiodon-like animals, have been discovered both in North America and in the Old World. One of the most remarkable of these specializations has been the devclopment of dermal horns over the nasal bones, either in laterally placed pairs as in some of the early forms, or in the median line, either single or double. In America they all became extinct before the close of the Pliocene period; but in the Old World, although their geographical distribution has become greatly restricted, at least five well-marked species survive. See RIINOCEROS.

Family MACRAUCHENID,

This contains one extinct genus, Macrauchenia, with two species Mf. patachonica and M. bolivicnsis, both from South America, and apparently from Pliocene. formations. They are very singular and specialized forms, quite out of the line of descent of any of the existing Perissodactyles, and the steps by which they are connected with the rest of the group have not yet been discovered. Of the larger species, Jf. patachonica, the skeleton It had the full number of . forty-four

teeth, forming an uninterrupted series. The cervical vertebrae resemble those of the Camels in the position of the vertebrarterial canal, but the ends of the centra are flat, and not opisthoccelous as in the allied forms. In some of the limb characters it resembles the Equidw, but in the articulation of the fibula with the calcan- cum it agrees with the Artiodactyles. The structure of the feet is, however, distinctly Perissodactyle, there being three toes on each.

UNGULATA. |

Families CHALICOTHERIIDE and MENODONTIDS!.

These families, with not very distinctly defined boundaries, con- tain a large number of extinct forms from Kocene and Miocene formations of both the Old and the New World. Among the latter the most remarkable is a group of animals of gigantic size, to tlie first-known fragment of which the name of Menodus was given in 1849 by Pomel, but of which more perfect remains have since been described by Leidy as Titanotheriwm and Megacerops, by Marsh as Brontotherium, and by Cope as Symborodon, some of which appear to represent distinct generic modifications, but the synonymy of the group is at present much confused. The head was large and much clongated, as in the Rhinoceros; but they had a pair of stout diverging osseous protuberances like horn-cores on the maxillaries in front of the orbits. Their molar teeth were of a simple paleotheroid type, and the incisors and canines were very much reduced. Their fore feet had four and their hind feet three short, stout toes. Their remains abound in the Lower Miocene strata of North America.

Family PALBHOTHERIDS.

The structure of the type of this family, Palwothertwm, was made known by Cuvier, from specimens found in the Paris gypsum beds (Upper Eocene). Fig. 108 gives an idea of its general appear- ance, not unlike that of a Tapir, which also it resembled in size. It had, however, but three toes on the fore feet. The dentition was i $, c+, p 4, m$%=44. Many species and allied genera (as

Fic. 108.—Restoration of Palaotherium (Upper Eocene). Cuvier.

Palaplotheriwm, an earlier form from the Middle Eocene, and Anchitherium, a later one from the Miocene) have been discovered both in Europe and North America. To some of these the ancestral form of the modern Horses may be traced, the transition from this to the next family being formed by almost imperceptible gradations.

OC. Equine SECTION,

‘Lower molars formed of a pair of crescents complicated by the addition of columns or lobes at the inner extremities. Upper molars a modification of the paleotheroid type, but gradually passing as time advanced from the brachyodont to the hypsodont form. Outer digits becoming gradually reduced, until, as in the modern Horses, there is but one (the third) functional digit on each foot. ‘To these alone the family Eqwidx is restricted by some authors, but in few groups is the artificial nature of the boundaries placed between such divisions so apparent as in the Perissodactyles, for the simplé reason that their paleontological history is better known than that of most others, and so many of the intermediate forms have been preserved. For the history, characters, and pre- <" distribution of the Equidw, see the article Honss, vol. xii. p» 1/2 sg.

SusorpeR ARTIODACTYLA.

This is an equally well-defined group, traceable from the Early Eocene period, tliough then apparently by no means so nunierous as the Perissodactyles. Some of its types, as that represented in the existing Swine, have retained to the present time much of the primitive character of the group ; but others have been gradually becoming more specialized and more perfected in structure, and its latest modification, the Cavicorn Ruminants or Bovide (Antelopes, Sheep, and

Oxen), are now the dominating members of the great Ungulate order, widespread in geographical range, rich in generic and specific variation, and numerous in individuals, —forming in all these respects a great

contrast to such decadent types as those represented by the Tapirs and Rhinoceroses.

The principal anatomical characters by which they are distinguished from the Perissodactyles are as follows. The premolar and molar teeth not alike, the former being single and the latter two-lobed. The last lower molar of both first and second dentition almost invariably three- lobed. Nasal bones not expanded posteriorly. No alisphenoid canal. Dorsal and lumbar vertebra together always nineteen, though the former may vary from twelve to fifteen, Femur without third trochanter. Third and fourth digits of both fect almost equally developed, and their ungual phalanges flattened on their inner or con- tiguous surfaces, so that each is not symmetrical in itself,

Frc. 109.—Bones of Fore Foot of existing Artiodactyles. A, Pig (Sus scrofa), x4; B, Red Deer (Cervus elaphus); X4; C, Camel (Camelus bactrianus), X4. U, ulna; R, radius; c, cuneiform; /, lunar; s,scaphoid ; «, unciform ; m, mag- num; id, trapezoid; tm, trapezium. From Osteology of Mammalia,

Pat when the two are placed together they form a figure symmetrically disposed to a line drawn between them. Or, in other words, the axis or median line of the whole foot is a line drawn between the third and fourth digits, while in the Perissodactyles it is a line drawn down the centre of the third digit. Distal articular surface of the astragalus divided into two nearly equal faccts, onc for the navicular and one for the cuboid bone. The calcaneum with an articular facet for the lower end of the fibula. Stomach almost always more or less complex. Colon convoluted, Cecum small. Placenta diffused or cotyledonary. Mammee few and inguinal, or numerous and abdominal.

In treating of many sections of mammals, it is only from the exist- ing species that our characters and classification can be derived, and to these chiefly our observations upon the group must be directed, the extinct forms being so little known that they can only be referred to incidentally. With the Ungulata, however, it is quite otherwise. As with the last section, the history of the

TOUps. F The principal modifications which have taken place in the type from its earliest known and most generalized manifestation have been the following :—

1. As regards the teeth. Assumption of the grinding surfaces of the molar teeth either of a distinctly tubercular (bunodoné) or of a erescentic ridged (selenodont) form. Modification of the latter from

a brachyodont to a hypsodont type. Development of canines into projecting tusks. premolars. 7 :

2. As regards the limbs. Reduction of the ulna from a complete and distinet bone to a comparatively rudimentary state in which it coalesces more or less firmly with the radius. Reduction of the fibula till nothing but its lower extremity remains. Reduction and final loss of outer pair of digits (second and fifth), with coalescence of the metapodial bones of the two middle digits. Union of the navi- cularand cuboid, andsometimes the ectocuneiform bone, of thetarsus.

3. Change of form of the odontoid process of the axis from a cone to a hollow half-cylinder.

4, Development of horns or antlers on the frontal bones, and gradual complication of form of antlers.

5. By inference only, increasing complication of stomach with ruminating function superadded. Modification of placenta from simple diffused to cotyledonary form.

The primitive Artiodactyles, with the typical number (44) of incisor, canine, and molar teeth, brachyodont molars, conical odon- toid process, four distinct toes on each foot, with metapodium and all carpal bones discrete, no frontal appendages, and (in all proba- bility) simple stomach and diffused placenta, were separated even in the earliest known forms into Bunodonta and Selenodonta.

A. Bunodonta.

This, the most primitive group, with various offsets which became partially specialized and then extinct, unable apparently to adapt themselves to new conditions, has been continued to the present day with comparatively little change in the section of the suborder called Swina, containing the families Hippopotamide and Suidzx. Sce HrppopoTAMus, PEccaRyY, and SwINE.

Loss of upper incisors. Loss of anterior

B. Selenodonta.

Members of this group having the complete typical dentition as regards number, but with various modifications in the details of the form of the teeth, and also in the structure of the feet, abounded in the Middle and Upper Eocene and Lower Miocene of Europe and America. One of the earliest known, Anoplotheriwm, was fully described by Cuvier from remains found in the Paris gyp- sum beds (Upper Eocene). Its teeth formed a series unbroken by a gap or diastema, and were of uniform height (as in Man alone of existing mammals), Its tail was long, with large chevron bones

Fig, 110.—Restoration of Anoplotherium commune (Upper Eocene). Cuvi

underneath, not usually found in Ungulates, and there were but two toes on cach foot. It was in many respects a much specialized form, apparently not on the line of descent of any of the existing groups. Cheropotamus, Anthracotherium, Hyopotamus, Xiphodon, Dichodon, Dichobune, Cainotherium, the American Oreodon, and numerous others were forms more or less intermediate in character between the three distinct sections into which, by their extinction, the Selenodont Artiodactyles can now be divided,—the J'ylopoda, also called Phalangigrada, the T'ragulina, and the Pecora or Cotylophora. I. TYLopopDA,

Represented at the prescnt time by the two species of Camels of the Old World and the Llamas of America, For their special dis- tinguishing characters see articles LLAMA and CAMEL.

II. TRAGULINA.

No teeth in premaxille. Upper canines well-developed, especi- ally in the males ; narrow and pointed. Lower canines incisiform. No caniniform premolars in either jaw. Molariform teeth in a continuous series consisting of p $, m %. Odontoid process of axis conical. Fibula complete. Four complete toeson each foot. The middle metapodials generally confluent, the outer ones (second and fifth) very slender but complete, 4.¢., extending from the carpus or tarsus to the digit. Navicular, cuboid, and ectocuneiform bones of tarsus united. Tympanic bulle of skull filled with cancellar tissue. No frontal appendages. Ruminating, but the stomach with only three distinet compartinents, the maniplies or third cavity of the stomach of the Pecora being rudimentary. Placenta diffused.

This section contains the single family Tragulide, containing a

few animals of small sizc, commonly known as Chevrotains, inter- mediate in their structure between the Deer and the Pigs, The large size of the canines of the male and the absence of horns caused them to be associated formerly with Moschus, one of the true Deer ; hence they are often spoken of as " Pigmy Musk-Decr," although they have no musk-secrcting gland, or, except in the above-named trivial external characters, no special affinities with the true Musk. There has scarcely been a more troublesome and ob- durate error in zoology than in this association of animals so really distinct. It has been troublesome, not only as preventing a just conception of the relations of existing Artiodactyles, but also in causing great confusion and hindrance in paleontological researches among allicd forms ; and most obdurate, inasmuch as all that has been recently done in advancing our knowledge of both groups has not succeeded in eradicating it, not only from nearly every one of our zoological text-books, whether British or Continental, but even from works of the highest scientific pretensions.

The family is now generally divided into two genera,

Tragulus, containing the smallest of the existing Ungulates, animals having more of the general aspects and habits of some Rodents, as the Agoutis,

than of the rest of their own order. The best-known species are 7'. javanicus, T. napu, J. kanchil, T. stanleyanus, and J'. memmina. The first four are from the Malay Peninsula, or the islands of the Indo-Malayan Archipelago, the last from Ceylon and Hindustan.

Hyomosehus is distinguished chiefly by the feet being stouter and shorter, the outer toes better developed, and the two middle meta- carpals not ankylosed together. Its dental formula (as that of Tragulus) is ¢ 3, ct, p}, m$=84. Vertebre: C7, D138, L6, $5, C12-13. The only existing species, H. aguaticus (fig. 111), from the west coast of Africa, is rather larger than any of the

Fig, 111.—African Water Chevrotain (Hyomoschus aguaticus),

Asiatic Chevrotains, which it otherwise much resembles, but it is said to frequent the banks of streams, and have much the habits of Pigs. It is of a rich brown colour, with back and sides spotted and striped with white. It is evidently the survivor of a very ancient form, as remains of a species only differing in size (H. crassus) have been found in Miocene deposits at Sansan, depart- ment of Gers, France.

IIJ. Prcora or CoTyYLoPHoRA.

No premaxillary teeth or caniniform premolars. Upper canines generally absent, though sometimes largely developed. Inferior incisors, three on each side with an incisiform canine in contact

with them. Moiariform .teeth consisting of p 3, m %, in con- tinuous series. Auditory bulle simple and hollow within. Odon- toid process in the form of a crescent, hollow above. Distal

extremity of the fibula represented by a distinct malleolar bone of peculiar shape, articulating with the outer surface of the lower end of the tibia. Third and fourth metacarpals and metatarsals con- fluent. Outer toes small and rudimentary, or in some cases entirely suppressed; their metapodial bones never complete. Navicular and cuboid bones of tarsus united. Horns or antlers usually present, at least in the male sex. Left brachial artery arising from a common innominate trunk, instead of coming off separately

from the aortic arch as in the preceding sections. Stomach with four complete cavities. Placenta cotyledonous.

UNGULATA. |

The Pecora or true Ruminants form at the present time an ex- tremely homogeneous group, one of the best-dcfined and most closely united of any of the Mammalia. But, though the original or com- mon type has never been departed from in essentials, variation has been very active among them within certain limits ; and the great difficulty which all zoologists have felt in subdividing them into natural minor groups arises from the fact that the changes in dif- ferent organs (feet, skull, frontal appendages, teeth, cutaneous glands, &c.) have proceeded with such apparent irregularity and absence of correlation that the different modifications of these parts are most variously combined in different members of the group. It appears, however, extremely probable that they soon branched into two main types, represented in the present day by the Cervide and the Bovide,—otherwise the Antlered and Horned Ruminants. In- termediate smaller branches produced the existing Musk-Deer and Giraffe, as well as the extinct Helladotheriwm inclining to the first- named group and the extinct Sivatherium, Brahmatherium, Hy- daspitheriwm and others more allied to the latter, although upon the true relationship of these forins there is a difference of opinion between the two paleontologists who have paid inost attention to the group, Riitimeyer and Lydekker, but the materials forthcoming at present are scarcely sufficient for forming a decided opinion.

he earliest forms of true Pecora, as Gelocus and Dremotherium (Miocene), had no frontal appendages, and some few forms (Aosehus and Hydropotes) continue to the present day in a similar casc. In the very large majority, however, either in both sexes or in the male only, a pair or occasionally two pairs (Zetraceros and the extinct Sivatherium) of processes are developed as weapons of offence and defence from the frontal bones, these being almost always formed on one or other of two types.

1. Antlers" are an outgrowth of true bone, covered during their growth with vascular, sensitive integument coated with short hair. In this state they remain permanently in the Giraffe, but in the true Cervidx, when the growth

of the antler is complete, the supply of blood to it ceases, the skin dies and peels off, leaving the bone bare and insensible, and after a time, by a proeess of absorption near the base it becomes detached from the skull and is "shed." A more or less elongated portion or '< pedicle" always remains on the skull, from the summit of which

Fig. 112,—Head of Deer (Cervus schomburgkii), showing Antlers. From Sclater, Proc. Zool. Soc., 1877, p. 682. a new antler is developed. In the greater number of existing Species of Deer this process is repeated with great regularity at the same period of each year. The antler may be simple, straight, subcylindrical, tapering and pointed, but more often it sends off one or more branches called " tynes" or " snags." In this case the main stem is termed the "beam."» Commonly all the branches of the antler are cylindrical and gradually tapering. Sometimes they are more or less expanded and flattened, the antler being then said to be " palmated." In young animals the antlers are always small and simple, and in those species in which they are variously

branched or palmated, this condition is only gradually acquired in several successive annual growths. An interesting parallel has been observed here, as in so many other cases, between the development of the race and that of the individual. The earliest known forms of Deer, those of the Lower Miocene, have no antlers, as in the young of the existing species. The Deer of the Middle Miocene have simple antlers, with not more than two branches, as in existing Decr of the second year. Species occur in the Upper Miocene with three branches to the antlers, but it is not until the Upper Pliocene and Pleistocene times that Deer occur with antlers developed with that luxuriance of growth and beauty of form characteristic of some of the existing species in a perfectly adult state. Among recent Cervidx, antlers are wanting in the genera Moschus and Hydropotes ; they are present in both sexes in Z'arandus (the Reindeer), and in the male scx only in all others.

2. The "horns"' of the Bovidex consist of permanent, conical, usu- ally curved, bony processes, into which air-cells continued from the frontal

sinuses often extend, called "horn-cores," ensheathed in a case of true horn, an epidermic development of fibrous structure, which grows continuously, though slowly, from the base, and wears away at the apex, but is very rarely shed entire. The only existing species in which such a process occurs regularly and periodically is

Fic. 113.—Head of Antelope (Gazelia granti), showing Horns, Brooke, Proc. Zool. Soc., 1878, p. 724.

From Sir V. ' the American Prong-Buck (.4ntilocapra), in which the horns also differ from those of all others in being bifurcated. Horns are not present at birth, but begin to grow very soon afterwards. The males of all existing Bovide possess them, and thcy are also present (though usually not so fully developed) in the females of all except the genera Portax, Tragelaphus, Procapra, Antilope, Aipyceros, Saiga, Kobus, Cervicapra, Pelea, Nanotragus, Neotragus, and Tetraceros.+

Another character by which the different members of the Peeora can be distinguished is derived from the characters of the molar teeth. Although there is nothing in the general mode and arrangement of the enamel folds, or in the accessory columns, absolutely distinctive between the two principal families, existing specics may generally be distinguished inasmuch as the true molars of the Cervide are "brachyodont," and those of the Bovidez '"'hypsodont," z.¢., the teeth of the former have comparatively short crowns, which, as in most mammals, take their place at once with the neck (or point where the crown and root join) on a level with or a little above the alveolar border, and remain in this

1 Sir Victor Brooke, Proc. Zool. Soc., 1878, p. 884.

position throughout the animal's life ; wheréas in the other forms, the crown being lengthened and the root small, the neck docs not come up to the alveolar level until a considerable part of the sur- face has worn away, and the crown of the tooth thus appears for the ~~greater part of the animal's life partially buried in the socket. In this form of tooth (which is almost always most developed in the pos~~ terior molars of the permaneut scries), the

constituent columns of the crown are necessarily nearly parallel, whereas in the first-described they diverge from the neck towards the free or grinding surface of the tooth. In the more coniplete hypsodont form the intersticcs of the lengthened columnar folds of enamel and dentine are filled up with cementum, which gives stability to the whole organ, and which is entirely or nearly wanting in the short-crowned teeth. The same niodification from low to high crowns without essential alteration of patterm is seen in an even still more marked manner in some of the Perissodactyle Ungulates, the tooth of the Horse bearing to that of Anehitheriwm (see Horse, vol. xii. p. 174) the same relation as that of an Ox does to the early Selenodont Artiodactyles.

As the hypsodont tooth is essentially a modification of and, as it were, an improvenient upon the brachyodont, it is but natural to expect that all intermediate forms may be met with. Even among the Deer themselves, as pointed out by Lartet, the most ancient have very short molars, and the depressions on the grinding surface are so shallow that the bottom is always visible, while in the Cervida of the more recent Tertiary periods, and especially the Pleistocene and living species, these same cavities are so deep that whatever be the state of the dentition the bottom cannot be seen. Some existing Deer, as the Axis, are far more hypsodont than the majority of the family ; and, on the other hand, many of the Antelopes (as Trag-elaphus) retain much of the brachyodont character, which is, however, completely lost in the more modern and highly specialized Sheep and Oxen.

Family Carvipz.

Frontal appendages, when present, in the form of antlers. First molar at least in both jaws brachyodont. Two orifices to the lac- rymal duct, situated on or inside the rim of the orbit. An ante- orbital vacuity of such dimensions as to exclude the lacrymal bone from articulation with the nasal. Upper canines usually present in both sexes, and sometimes attaining a very great size in the male (see fig. 114). Lateral digits of both fore and hind feet almost

Fig. 114.—Skull of ZZydropotes inermis (adult male), a Deer without Antlers, but

with largely-developed upper canine teeth. x 4. From Sir V. Brooke, Proc. Zool, Soc., 1872, p. 524,

always present, and frequently the distal ends of the metapodals. Placenta with few cotyledons. Gall-bladder absent (except in Moschus). This family contains numerous species, having a wide geographical distribution, ranging in the New World from the Arctic Circle as far south as Chili, and in the Old World throughout the whole of Europe and Asia, but absent in the Ethiopian and Austra- lian regions. For the characters of the generic subdivisions and

ee distribution, see Srac, also Dezr, Munrzac, and Musx- EER.

Family CAMELOPARDALIDA.

Frontal appendages consisting of a pair of short, erect, permanent bony processes, ossified from distinct centres, and for a time suturally connected with the frontals, though. after- wards ankylosed to them, covered externally with a hairy skin, 'present in both sexes, and even in the new-born animal. Anterior to these is a median protuberance on the frontal and eontiguous parts of the nasal bones, which increases with age, and 1s sometimes spoken of as a third horn. No upper canines. Molars brachyodont. Lateral digits entirely absent on both fore and hind feet, even the hoofs not developed.

This family contains but a single species, the well-known and

very remarkable animal the Giraff ? desis girasia\ad Seniinaen : iraile, or Camclopard (Camelopar

MAMMALIA

[TILLODONTTA:

Family Bovip2.

Frontal appendages when present in the form of horns. Molars usually hypsodont. Usually only one orifice to the lacrymal canal, situated inside

the rim of the orbit. Lacrymal bone almost always articulating with the nasal. Canines absent in both sexes. The lateral toes may be completely absent, but more often they are represented by the hoofs alone, supported sometimes by a very rudimentary skeleton, consisting of mere irregular nodules of bone. Distal ends of the lateral metapodals never present. Gall-bladder almost always present. Placenta with many cotyledons.

The Bovide, or hollow-horned Ruminants (Cavicornia), form amost extensive family, with members widely distributed throughout the Old World, with the exception of the Australian region; but in America they are less numerous, and confined to the Arctic and northern temperate regions, no species being indigenous either to South or Central America. There is scarcely any natural and well- defined group in the whole class which presents greater difficulties of subdivision than this; consequently zoologists are as yet very little agreed as to the extent and boundaries of the genera into which it should be divided. The principal species will be found more particularly described under the headings ANTELOPE, BIson, BurFALo, CATTLE, CHAMOIS, ELAND, GNu, Goat, HARTEBEEST, Ipex, Musk-Ox, NYLGHAv, Ox, Saica, and SHEEP.

Grover TILLODONTIA.

Here may be noticed a remarkable group of animals, called by Marsh Z'llodontia, the remains of which are found abundantly in the Lower and Middle Eocene beds of North America. They seem to combine the characters of the Ungulata, Rodentia, and Carnivora. In the genus Tillotherium of Marsh (probably identical with the pre- viously described Anchippodus of Leidy) the skull resembled

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Fie. 115.—Skull of Zillotherium fodiens, i nat. size,

From Marsh.

that of the Bears, but the molar teeth were of the Ungulate type, while the large incisors were very similar to those of the Rodents. The skeleton resembled that of the Carnivores, but the scaphoid and lunar bones were distinct, and there was a third trochanter on the femur. The' feet were plantigrade, and each had five digits, all with long pointed claws. In the allied genus Stydinodon all the teeth were rootless. Some were as large as a Tapir.

These, with other similar animals, constituting a group called Z'nzodonta, are included by Cope in his large order Bunotheria, to which also the existing Jnsectivora are referred. The constantly increasing knowledge of these annectant forms adds to the difficulty so often referred to in this article of establishing anything like a definite classi- fication of the heterodont mammals.

Orper CARNIVORA.

Though the Carnivora as at present restricted! form a very natural and well-defined order among the Mammalia, it is difficult to find any important common diagnostic characters by which they can be absolutely separated ; but, asin the case of so many other natural groups, it is by the possession of a combination of various characters that

1The Fere# of Linneus included all the then known species of the inodern orders Carnivora, Insectivora, and Marsupialia.

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they must be distinguished. They are unguiculate, and have never less than four well-developed toes on each foot, with nails more or less pointed, rarely rudimentary or absent. The pollex and hallux are never opposable to the other digits. They are regularly diphyodont and hetero. dont, and their teeth are always rooted. Their dentition consists of small pointed incisors, usually three in number, on each side of each jaw, of which the first is always the smallest and the third the largest, the difference being most marked in the upper jaw ; strong conical, pointed, recurved canines; molars variable, but generally, especially in the anterior part of the series, more or less compressed, pointed, aud trenchant ; if the crowns are flat and

tuberculated they are never complex or divided into lobes by deep inflexions of enamel. The condyle of the lower jaw is a transversely placed half-cylinder working in a deep glenoid fossa of corresponding form. The brain varies much in relative size and form, but the hemispheres are never destitute of well-marked convolutions. The stomach is always simple and pyriform. The cecum is either absent or short and simple, and the colon is not sacculated or greatly wider than the small intestine. Vesicule seminales are never present. Cowper's glands are present in some, absent in other groups. 'The uterus is bicornuate, The mamme are abdominal, and very variable in number. The placenta is deciduate, and almost always zonary. The clavicle is often entirely absent, and when present is never complete. The radius and ulna are distinct. The scaphoid and lunar bones are always united into one, and there is never a distinct os centrale in the adult. The fibula is always a distinct slender bone.

The large majority of the species composing this order subsist chiefly upon some variety of animal food, though many are omnivorous, and some few chiefly, though not entirely, vegetable eaters. The more typical forms live altogether on recently-killed warm-blooded animals, and their whole organization is thoroughly adapted to a pre- daceous mode of life. In conformity with this manner of obtaining their subsistence they are generally bold and savage in disposition, though some species are capable of being domesticated, and when placed under favourable circumstances for the development of such qualities exhibit a very high degree of intelligence and fidelity. The order is naturally divided into two suborders, the members of one being the more typical, and mainly terrestrial in their mode of life, while those of the other are aberrant, having the whole of their organization specially modified for living habitually in water. These are called respectively the True or Fissiped and the Pinniped Carnivora.

CARNIVORA. |

SusorpER CARNIVORA VERA on FISSIPEDIA.

Generally adapted for terrestrial progression and mode of life, though some may be partially aquatic in their habits. The fore limbs never have the first digit, or the hind limbs the first and fifth digits, longer than the others. Incisors 3 on each side, with very rare exceptions. Cerebral hemispheres

more or less elongated ; always with three or four gyri on the outer surface forming. arches above each other, the lowest surrounding the Sylvian fissure. The inolar series of teeth have not the uniform characters of those of the Pinnipedia. There is always one tooth in each jaw which is specially modified, and to which the name of " sectorial " or " carnassial " tooth has been applied. The teeth in front of this are more or less sharp-pointed and compressed ; the teeth behind it are broad and tuber- culated. The characters of the sectorial teeth deserve special attention, as, though fundamentally the same

1 The tusks of the Walrus, altogether so aberrant in its dentition, are partial exceptions to this statement, but in old individuals the pulp cavity fills up, and they cease to grow.

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throughout the subordef, they are greatly modified in different genera. The upper sectorial is the most posterior of the teeth which have predecessors, and is therefore reckoned as the last premolar (p 4 of the typical denti-

tion). It consists essentially of a more or less compressed

Fig. 116.—Upper Sectorial Teeth of Carnivora. I, Felis; Il, Canis; 111, Ursus, 1, anterior, 2, middle, and 3, posterior cusp of blade; 4, inner lobe supported on distinct root; 5, inner lobe, posterior in position, and without distinct root, characteristic of the Ursidz.

blade supported on two roots and an inner lobe supported

by a distinct root (see fig. 116). The blade when fully

developed has three cusps (1, 2, and 3), but the anterior is always small, and often absent. The middle lobe is conical, high, and pointed; the postertor lobe has a compressed straight knife-like edge. The inner lobe (4) varies very much in extent, but it is generally placed near the anterior end of the blade, though sometimes it is median in position,

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Fig. 117.—Modifications of the Lower Sectorial Tooth in Carnivora. 1, Felts; ll, Canis; 111, Herpestes; 1V, Lutra; V, Meles; V1, Ursus, 1, anterior lobe of blade; 2, posterior lobe of blade; 3, inner tubercic; 4, hecl. 1t will be scen that the relative size of the two roots varies according to the develop- ment of the portion of the crown they have respectively to support.

In the Urside alone both inner lobe and root are wanting,

and there is often a small internal and posterior cusp (5)

without root. In this aberrant family also the sectorial is

relatively to the other teeth much smaller than in the rest of the Carnivora. The lower sectorial (see fig. 117) is the most anterior of the teeth without predecessors in the milk

series ; it is therefore reckoned the first true molar (m 1).

It has two roots supporting a crown, consisting when fully

developed of a compressed bilobed blade (1 and 2), a heel

(4), and an inner tubercle (3). The lobes of the blade, of

which the hinder (2) is the larger, are separated by a notch,

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generally prolonged into a linear fissure. In the most } specialized Carnivora, as the Felide (I.), the blade alone is developed, both heel and inner tubercle being absent or rudimentary. In others, as Meles (V.) and Ursus (VI), the heel is greatly developed, broad, and tuberculated. The blade in these cases is generally placed obliquely, its flat or convex (outer) side looking forwards, so that the two lobes are almost side by side, instead of anterior and posterior. The inner tubercle (3) is generally a conical pointed cusp, placed to the inner side of the hinder lobe of the blade. ‘The

special characters of these teeth are more disguised in the Sea Otter (Znhydra) than in any other form, but even in it they can be traced.

The toes are nearly always armed with large, strong, curved, and tolerably sharp claws, ensheathing the ungual phalanges, and held more firmly in their places by broad lamin of bone reflected over their attached ends from the bases of the phalanges. In some forms, most notably the Felidx, these claws are "retractile." The ungual phalanx, with the claw attached, folds back in the fore foot into a sheath by the outer or ulnar side of the middle phalanx of

the digit, being retained in this position when the animal is at rest by a strong elastic ligament. In the hind foot the ungual phalanx is retracted on to the top, and not the side of the middle phalanx. By the action of the deep flexor muscles, the ungual phalanges are straightened out, the claws protruded from their sheath, and the soft 'velvety " paw becomes suddenly converted into a most formidable weapon of offence. The habitual retraction of the claws pre- serves their points from wear in ordinary progression.

The Fissipedal Carnivora were divided by Cuvier into two groups, according to the position of the feet in walking,— the Plantigrada, or those that place the whole of the soles to the ground, and the Digitigrada, or those that walk only on the toes; and the difference between these groups was considered of equal importance to that which separated from them both the Pinnigrada or Seals. The distinction is, however, quite an artificial one, and every intermediate condition exists between the extreme typical plantigrade gait of the Bears and the truly digitigrade walk of the Cats and Dogs; in fact, the greater number of the Carnivora belong to neither one form nor the other, but may be called "subplantigrade," often when at rest applying the whole of the sole to the ground, but keeping the heel raised to a greater or less extent when walking.

A more natural classification is into three distinct sections, of which the Cats, the Dogs, and the Bears may be respectively taken as representatives, and which are hence called Mluroidea, Cynoidea, and Arctoidea. This division is founded mainly on characters exhibited by the base of the skull, but is corroborated by the structure of other parts.! The presence or

absence of a bridge of bone, covering the external carotid artery in a part of its course by the side of the alisphenoid bone, and enclosing the "alisphenoid canal," a character to which the late Mr H. N. Turner first drew attention, might seem unimportant at first sight, but it is curiously constant in certain groups, which we have other reasons, derived often from a com- bination of less easily definable characters, to regard as

natural. It is therefore generally mentioned in the follow- ing family definitions.

Section ALUROIDEA.

The 42 luroidea or Cat-like forms include the Felide, Viverridx, Protelidw, and Hyxenidex.

1 See W. H. Flower, "On the Value of the Characters of the Base of the Cranium in the Classification of the order Carnivora," Proc. Zool. Soc., 1869, p. 4; St George Mivart, "On the Classification and Distribution of the dluroidea," ibid., 1882, p. 185; and Id., The

Cat, an Introduction to the Study of Backboned Ani \ a y of Backboned Animals, especially

ALIA

[CARNIVORA.

Family FEvDA. True molars reduced to one above and below, that of the upper jaw very small and transversely extended. Only two inferior pre-

molars. Auditory bulla not externally constricted, but internally divided by aseptum. No alisphenoid canal. Carotid canal very minute. Digits 5-4. Dorsal vertebre 13.

Felis. —The whole structure of the animals of this genus ex- hibits the carnivorous type in its fullest perfection. Dentition: i$, ¢ 4, p%, m 4=$; total 30. The upper anterior premolar, always small, may sometimes be absent without any other modifi- cation in the dental or other structures.

Such @ variation should not therefore be considered as of generic importance. Incisors very small. Canines large, strong, slightly recurved, with trenchant edges and sharp points, and placed wide apart. Premolars com- pressed and sharp-pointed. he most posterior in the upper jaw (the sectorial) a very large tooth, consisting of a subcompressed blade, divided into three unequal cusps supported by two roots, with a very small inner lobe placed near the front end of the tooth and supported by a distinct root. The upper true molar a very small tubercular tooth placed more or less transversely at the inner side of the hinder end of the last. In the lower jaw the true molar (sectorial) reduced to the blade alone, which is very large, trenchant, and much compressed, divided into two subequal lobes. Occasion- ally it hasa rudimentary heel, but never an inner tubercle. The skull generally is short and rounded, though proportionally more elon- gated in the larger forms. The facial portion is especially short aud broad, and the zygomatic arches very wide and strong. The auditory bulla are large, rounded, and smooth. Vertebre: C7, D 18, L 7, S 8, C 18-29, Clavicles better developed than in other Carnivora, but not articulating with either the shoulder bones or sternum. Limbs digitigrade. Anterior feet with five toes, the third and fourth nearly equal and longest, the second slightly and the fifth considerably shorter ; the pollex still shorter, not reaching as far as the metacarpo-phalangeal articulation of the second. Hind feet with only four toes. The third and fourth the longest, the second and fifth somewhat shorter and nearly equal; the hallux represented only by the rudimentary metatarsal bone. The claws all very large, strongly curved, compressed, very sharp, and exhibiting the retractile condition in the highest degree. The tail varies greatly in length, being in sone a mere stump, in others nearly as long as

the body. ars of moderate size, more or less triangular and pointed. Eyes rather large. Iris very mobile, and with a

pupillary aperture which contracts under the influence of light in some species to a narrow vertical slit, in others to an oval, and in some to a circular aperture. Tongue thickly covered with sharp- pointed, recurved horny papilla. Caecum small and simple.

Ag in structure so in habits, the Cats may be considered the most specialized of all the Carnivora, All the known members of the genus feed, in the natural state, almost exclusively on warm-blooded animals which they have themselves killed. One Indian specics (F. viverrina) is said to prey on fish and even freshwater molluscs. Unlike the Dogs, they never associate in packs, and rarely hunt their prey in open ground, but from some place of concealment wait until the unsuspecting victim comes within reach, or with noiseless and stealthy tread, crouching close to the ground for concealment, approach near enough to make the fatal spring. In this manner they frequently attack and kill animals considerably exceeding their own size. They are mostly nocturnal, and the greater number, especially the smaller species, more or less arboreal. None are aquatic, and all take to the water with reluctance, though some may habitually haunt the banks of rivers or pools, because they more easily obtain their prey in such situations. The numerous species of the genus are very widely diffused over tlie greater part of the habitable world, though most abundant in the warm latitudes of both hemispheres. No species are, however, found in the Australian region, or in Madagascar. Although the Old-World and New- World Cats (except perhaps the Northern Lynx) are all specifically distinct, no common structural character has been pointed out by which the former can be separated from the latter. On the con- trary, most of the minor groups into which the genus has been divided have representatives in both hemispheres.

Notwithstanding the considerable diversity in external appearance and size between different members of this extensive genus, the structural differences are but slight, and so variously combined in different species that the numerous attempts hitherto made to subdivide it are all unsatisfactory and artificial. The principal differences are to be found in the form of the cranium, especially of the nasal and adjoining bones, the completeness of the bony orbit posteriorly, the development of the first upper premolar and of the inner lobe of the upper sectorial, the length of the tail, the form of the pupil, and the condition and coloration of the fur, especially the presence or absence of tufts or pencils of hair on the external ears. There is one decidedly aberrant form, which enables us to divide the genus into two sections, to which the rank of genera 1s sometimes accorded.

1, Felis proper.—A distinctly cusped inner lobe to the upper sectorial tooth. Claws completely retractile. There are about

fifty species, of which the following are the most important and best known.

A. Old-lVorld Speetes.

For F', leo, see Lion; and for F. tigris, see Tiger. With regard to F. pardus, the Leopard or Panther, it is still a matter of un- eertainty whether the large spotted Cats to which these names are given, found ehiefly in wooded districts through nearly the whole of Afriea and the warmer parts of Asia as far as Japan, belong to one or several species. See Leoparp. F. wneia, the Ounce, inhabits the highlands of Central Asia, from the snowy mountains of Tibet to the southern parts of Siberia, at altitudes of from 9000 to 18,000 feet above the sea. It is about the size of the common Leopard, but lighter in colour, with longer fur and less distinet spots. Its skull differs in shape from that of all the other Felide, the facial portion being very broad, the nasal bones especially being wide and depressed, and the zygomatie arches very strong and deep. Ff. macrocelis, the Clouded Tiger, is a beautifully marked species, with elongated head and body, long tail, and rather short limbs. The canine teeth are proportionally longer than in any exist- ing member of the genus. It is thoroughly arboreal, and is found in the forests of south-east Asia and the islands of Sumatra, Java, Borneo, and Formosa. F. serval, the Serval, from South Africa, is yellow with black spots, and has a short tail and large ears. Numerous smaller species ealled Tiger Cats and Wild Cats, many of them by no means clearly defined zoologically, are found through- out the warmer parts of Asia and Africa. The Wild Cat of Europe, F. catus, still inhabits the mountainous and wooded parts of Great Britain. 'The Domestic Cat is an introdueed species, and generally supposed to be derived from FP. manienlata of Egypt and Syria. Moderate-sized Cats, with short tails, rather long limbs, especially the hinder ones, and tufts or pencils of hair on their ears, are ealled Lynxes. See Lynx.

B. New-World Species.

F. concolor, the Puma or Couguar, commonly ealled ' Panther" in the United States, is about the size of a Leopard, but of an uni- form brown colour, spotted only when young, and is extensively distributed in both North and South Ameriea, ranging between the parallels of 60° N. and 50°S. F. onea, the Jaguar, is a larger and more powerful animal than the last, and more resembles the Leopard in its colours. It also is found in both North and South America, but with less extensive range, reaching northwards only as far as Texas, and southwards nearly to Patagonia. See JAGUAR. F. pardalis, and several allied smaller elegantly-spotted species in- habiting the intratropieal regions of America, are eommonly eon- founded under the name of Ocelot or Tiger Cat. 2. yaguarundi, rather larger than the Domestic Cat, with an elongated head and body, and of a uniform brownish-grey colour, ranges from Mata- moras to Paraguay. 7. cyra is a small Cat, very Musteline in form, having an elongated head, body, and tail, and short limbs, and is also of a uniform light reddish-brown colour, It is a native of South America and Mexico. . pajerosisthe Pampas Cat. Four species of Lynx are described from North America, but it is doubtful whether these are specifically distinct from each other and from the Lynx of northern Europe.*

2. Cynxlurus.—Sometimes considered as a distinct genus. The Cheetah or Hunting Leopard, F.jubata, is distinguished from the other Felidex by the inner lobe of the upper seetorial, though supported by a distinct root, having no salient cusp upon it, by the tubereular molar being more in a line with the other teeth, and by the claws being smaller, less curved, and less completely retractile, owing to the feebler development of the elastie ligaments. The skull is short and high, with the frontal region broad and elevated in consequence of the large development of tlie frontal air-sinuses. The head is small and round, the body light, the limbs and tail long. Its eolour is pale yellowish-brown with small blaek spots. The Cheetah is less savage and more easily tamed than most of the Cats. In Asia it has been trained for the ehase of the Antelope, It has rather an extensive geographieal range from the Cape of Good Hope, through- out Africa and the south-western parts of Asia, as far as southern India.

Fossil Felide.—Numerous extinet species of the genus are found in Pleistocene, Plioeenc,and even later Miocene deposits in Europe, Asia, and

Ameriva. Among them is the Cave Lion, F. spelea, which ean searcely be separated specifieally from F. leo, and of whieh abundant remains are found in eaves in England and other parts of Europe. F. cristata, from the Siwalik Hills, intermediate in size between a Tiger and Jaguar, is distinguished from the other Felidz by the shortness of the face as eompared with the eranial part of the skull. These and many others, mostly of smaller size, present no greater modifications of form than the various existing members of the genus Felis, and ean therefore be ie aaa ineluded within its limits; but numerous other forms are gradually beeoming known, especially through the researches of American paleontologists, which, though evidently animals of the same general type and therefore to be included in the family [elidx, depart so much in various details of structure that they must be placed in different genera. As one of the points in which Felis manifests its speeial-

ization is the reduction of the number of the molar scries of teeth, with concomitant shortening of the jaws, it might be supposed that in the earlier and perhaps anecstral forms these teeth would be more numerous and approach more nearly to the primitive or typical number of the heterodont mammals, viz., seven on each side. This is aetually the case. One Iuropean form (also recently found in America) to which Gervais has given the name of Pseudxlurus, of Miocene age, has the dentition of Felis with an addition of one premolar in the lower jaw; but others have a still larger number, as Archexlurus debilis of Cope from the Ameriean Miocene, about the size of a Panther, whieh has four premolars and a tubercular molar in the upper jaw, and three premolars and two molars in tlie lower jaw.

Cope divides all the known Feline animals into two families, Felide and Nimravidzx,! distinguished by the characters of the foramina at the base of the eranium, the former being of more modern origin than the latter, the members of which are all extinct, and which seem to connect the Cats with still more primitive types of Carnivora.

Family VIVERRIDA.

Premolars 8or4. Molars}or%. Auditory bulla externally con- stricted, and divided bya septum. An alisplienoid canal (with very rare exceptions). Carotid eanal distinct as a groove on the side of the bulla, Digits usually 5-5, but sometiines the pollex or hallux or both may be wanting. Dorsal vertcbre 13 or 14. Limited in distribution to the Old World.

The subfainily Cryptoproctinee contains the single genus Cryp- toprocta. Dentition: 7 3,¢c4,p 4, m4+= $; total 36. The teeth generally elosely resemble those of the Felidz. The first premolar of both jaws is very minute and early deciduous, The upper sectorial has a very small inner lobe, quite at the anterior part of the tooth. The true molar is very small and placed _ transversely. The lower sectorial has a large trenchant bilobed blade, and a very minute heel, but no inner tubercle. Skull generally like that of Felis, but proportionately longer and narrower, Orbit widely open behind. Vertebre: C7, D13, L7, 88, C29. Body elongated. Limbs moderate in size. Feet subplantigrade ; five well-developed toes on each, with sharp, compressed, retractile claws. Ears mode- rate. Tail long and eylindrieal.

The only known species, C. ferow, the “ Foussa” of the Malagasy, is peculiar to Madagascar, being the largest carnivorous animal in theisland. Itis about twice the size of the eommon Cat (5 feet from nose to end of tail), with short elose fur of nearly uniform pale brown. Little is as yet known of its habits, except that it is noeturnal, fre- quently attaeks and carries off goats, and especially kids, and shows great ferocity when wounded, on which account it is much dreaded by the natives.

The remaining numerous specific and generic modifications found in the existing animals belonging to this family seem to group themselves mainly into two tolerably distinet groups, distinguishable by the eharacters of the auditory bulla and neighbouring parts of the base of the skull, and by the strueture of the feet. ‘lhe one form has the genus Viverra or Civet Cats for its most typieal repre- sentative, and the other Herpestes or the Ichneumons.

Subfamily Viverrinee.—Auditory bulla oval or rather conical, broad and truncated and not everted behind, narrow in front and

1“ On the Extinct Cats of America,” American Nateralist, December 1880,

more or less compressed at the sides. The outer or anterior chamber very sinall and flat. ‘The meatus with scareely any inferior lip, its orifice being close to the tympanic ring. Paroccipital pro- cess triangular, its apex projecting slightly beyond the bulla. Claws strongly eurved and more or less retractile.

Viverra.—Dentition: 7 3, ¢ +, p 4, m3=42; total 40. Skull elongated; facial portion small and compressed. Orbits well- defined but ineomplete behind. Vertebre: C7, D138, L7 (or D 14, L 6), S 8, C 22-30. Body elongated and compressed. Head pointed in front; ears rather small. Extremities short. Feet synall and rounded. ‘Toes short, five on each foot. First toe both on fore and hind feet much shorter than the others. Palms and soles eovered with hair, except the pads of the feet and toes, and in some species a narrow central line on the under side of the sole, extending backwards nearly to the heel. Tail moderate or long. A pair of large glandular follicles situated on the perineum (in both sexes), and secrcting in most species an oily substance of a peculiarly penetrating odour.

The numerous species of this genus form a large series, the two extremes of which differ considerably, but the several sections into whieh thcy may be divided blend so into one another that it is difficult to differentiate them sharply. (1) Viverra proper. This includes the largest species. The teeth are stouter and less com- pressed than in the other seetions. The second upper molar especially larger. The auditory bulla smaller and more pointed in front. Body shorter and stouter; limbs longer; tail shorter, tapering. Under side of tarsus completely eovered with hair. Claws longer and less retractile. Fur rather long and loose, and in the middle line of the neck and back especially elongated so as to form a sort of erest or mane. Pupil circular when contracted. Perineal glands greatly developed. These characters apply especially to V. civetta, the Afriean Civet, or “ Civet Cat” as it is eommonly ealled, an animal rather larger than a common Fox, and an inhabi- tant of intratropical Africa. V. zibetta, the Indian Civet, of about equal size, approaches in many respects, especially in the charaeters of the teeth and feet and absence of the crest of elongated hair on the back, to the next section. It inhabits Bengal, China, the Malay Peninsula, and adjoining

islands. V. tangalunga is a smaller but nearly allied animal from the same part of the world. From these three species and the next the eivet of eommeree, onee so much admired as a perfume in England, and still largely used in the East, is obtained. The animals are kept in eages, and the odoriferous secretion colleeted by scraping the interior of the perineal follicles with a spoon or spatula. (2) Viverricula. This section resembles enteral the next, but with the whole of the under side of the tarsus hairy. Alisphenoid eanal generally absent. V. malaccensis, the Rasse, inhabiting India, China, Java, and Sumatra, is an elegant little animal, which affords a favourite perfume to the Javanese. (3) Genetta. The Genettes are smaller animals, with more elongated and slender bodies, and shorter limbs than the Civets. Skull elongated and narrow. Auditory bulla large, elongated, rounded at both ends. Teeth compressed and sharp-pointed ; a lobe on the inner side of the third upper premolar not present in the previous section. Pupil contracting to a linear aperture. Tail long, slender, ringed. Fur short and soft, spotted or cloudy. Under side of the tarso-metatarsus with a narrow longi- tudinal bald streak. V. genetta, the eommon Genette, is found in Franee south of the river Loire, Spain, south-western Asia, and Africa from Barbary to the Cape. V. felina, senegalensis, tigrina, and pardalis are other named species, all Afriean in habitat. (4) Fossa. V. fossa, from Madagascar, may belong to a distinct section or genus, but its structure is very imperfectly known. (5) In some of the smallest species the second upper molar (already reduced to very small dimensions in the Genettes) is absent ; in other respects their dentition agrees with seetion 8. V. gracilis and V. pardicolor, both from southern Asia, constitute the genus Prionodon of Hors- field; V. richardsonzi, from West Africa, the genus Poiana of Gray. The former has the back of the tarsus hairy, the latter has a narrow naked streak as in the Genettes.

All tlie animats of this genus are, for their size, extremely active, fieree, and rapacious. They feed chiefly on small mammals and birds.

Arctictis.—Dentition: ¢ 3, ¢ +, p 4, m =34; total 40. The posterior upper molar and the first lower premolar very often absent. Molar teeth generally small and rounded, with a distinct interval between every two, but formed generally on the same pattern as Parodoxurus. Vertebre: C7, D 14, L5, 8 8, C34. Body elon- gated. Head broad behind, with a small pointed faee.

Whiskers long and numerous. Ears small, rounded, but clothed with a pencil of long hairs. Eyes small. Limbs short. Soles and palms broad, entirely naked. Tail very long and prehensile. Fur long and harsh, Cecum extremely small. But one species is known, A. binturong, the Binturong, an inhabitant of southern Asia from Nepal through the Malay Peninsula to the islands of Sumatra and Java. Although strueturally agreeing elosely with the Paradoxures, its tufted ears, long, coarse, and dark hair, and prehensile tail give it a very different external appearance. It is

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slow and eautious in its movements, chiefly if not entirely arboreal, and appears to feed on vegetable as well as animal substances.

Paradoxurus.—Dentition: ¢ 3, ¢ 4, p 4, m =48; total 40. The blunt and rounded form of the cusps of the hinder premolar and the molar teeth distinguishes this genus from most of the members of the faniily. Vertebre: C 7, D 13, L7, 8S 8, C 29-36. Head pointed in front. Ears small, rounded. Body long. Limbs moderate. Palms and soles almost entirely naked. Claws com- pletely retraetile. Tail long, non-prehensile. The Paradoxures or Palm-Civets are less strietly carnivorous than the other members of the family. They are mostly about the size of the eommon Cat, or rather larger, and are partly arboreal in their habits. The species are rather numerous, and present eonsiderable variations in the details of the form and size of their molar teeth. They are restricted geographically to southern Asia and the Indo-Malayan archipelago. The best known species are P. bondar, P. zcylanicus, P. typus, P. musanga, P. larvata, and P. grayi. P. virgata has been separated from the others, and raised into a distinct genus, Arctogale, on aeeount of the smallness of the teeth and the elonga- tion of the bony palate. Otherwise it seems not to differ from the others.

Nandinia contains one species, N. binotata, a somewhat aberrant Paradoxure, from West Africa. It is rather smaller than the true Paradoxures, has smaller and more pointed molar teeth, and no cecum. The wall of the inner ehamber of the auditory bulla remains through life unossified.

Hemigalea, another modification of the Paradoxure type, con- tains one species, 1. hardwickii, from Borneo, an elegant-looking animal, smaller and more slender than the Paradoxures, of light grey eolour, with transverse broad dark bands across the back and loins.

Cynogale also contains one species, C. bennettti, Gray (described by S. Miiller under the name of Potamophilus barbatus), from Borneo. This is a eurious Otter-like modification of the Viverrine type, having semi-aquatie habits, both swimming in the water and cliinb- ing trees, living upon fish, erustaeea, small maminals, birds, and fruit. The number and general arrangement of its teeth are as in Para- doxurus, but the premolars are peculiarly elongated, compressed, pointed, and reeurved, somewhat as in the Seals, though the molars are tuberculated. The head is elongated, the muzzle broad and depressed. Whiskers very long and abundant. ars small and rounded. Toes short and slightly webbed at the base. Tail short, cylindrical, covered with short hair. Fur very dense and soft, of a dark brown eolour, mixed with black and grey.

Subfamily Herpestinz.—Auditory bulla very prominent, and somewhat pear-shaped, the posterior ehamber being large, rounded, and generally with its greatest prominence to the outer side. The anterior ehamber considerably dilated, and produced into a short inferior wall to the auditory meatus, in which is a depression or vacuity just below the eentre of the opening of the meatus. Sometimes this vacuity is continued into the meatus, forming a narrow fissure. The paroeceipital process does not projeet beyond the bulla, but is spread out and lost (in adult animals) on its posterior surface. Toes straight ; claws lengthened, exserted, non- retractile.

Herpestes.—Dentition: 7 3, ¢}, p 4, sometimes $, m2 ; 40 or 36. Teeth of molar series generally with strongly-developed, sharply- poiuted cusps. Skull elongated, constricted behind the orbits. Face short and compressed. Frontal region broad andarehed. Post- orbital processes of frontal and malar bones well-developed, gene- rally meeting so as to complete the circle of the orbit behind. Vertebre: C7, D138, L7, 88, C 21-26. Head pointed in front. Ears short and rounded. Body very long and slender. Extrem- ities short. Five toes on each foot, the first, especially that on the hind foot, very short. Toes free, or but slightly palmated. Palms naked.

Distal portion of soles naked, under surface of tarsus and metatarsus clothed with hair. Tail long or moderate, generally thick at the base, and sometimes covered with more or less elongated hair. The longer hairs covering the bedy and tail almost always annulated. This genus contains a very large number of animals eommonly ealled Ichneumons, or in India Mongooses, varying in size from that of a large Cat down to a Weasel. They are widely distributed over the African continent and the southern parts of Asia, especially India and the Indo-Malayan archipelago, one species occurring also in Spain. They are mostly terrestrial in their habits, feeding on small mammals and birds, reptiles, especially snakes, eggs of birds and reptiles, and also insects. Some speeies are partially domesti- eated, being used to keep houses elear of rats, mice, and snakes. H. ichnewmon was a sacred animal to the ancient Egyptians. They vary considerably in appearance, some, as H. galera (also called paludinosus and robustus), are larger and heavier, with steuter body, longer limbs, and stronger teeth. Others are small, with very elongated bodies and short legs. The tail also varies somewhat in length, and in the amount of hair with which it is covered. These trivial differences have given rise to the formation by some zoologists of very numerous genera, the characters of which are by no means elearly defined, but the following are the most dis- tinct and generally reeognized.

[CARNIVORA.

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Helogale, premolars $, contains two small South-African species, Hi. parvula and H. undulata.

Bdeogale contains also two small Ichneumon-like animals, B. crassicauda and puisa, differing from Herpestes proper in having only four toes ou each foot, both pollex and hallux being absent. The orbit is nearly complete, the tail of moderate length and rather bushy.

Cynictis. —Pollex present, but hallux absent. Skull shorter and broader than in Herpestes, rather contracted behind the orbits, which are large and complete behind. Face short. Anterior chamber of the auditory bulla very large. Front claws elongated. C, penteillata, from South Africa. tn

All the foregoing Herpestines have the nose short, with its under surface flat, bald, and with a median longitudinal groove. The remaining forms have the nose more or less produced, with its under side convex, and a space between the nostrils and the upper lip covered with close adpressed hairs, and without any median

roove. : Rhinogale.—Toes 5-5. Claws of fore feet short, compressed, acute. Under surface of tarsus hairy. Founded on a single specimen from Hast Africa, R. melleri.

Crossarchus.—Dentition: 7 8, c 4, p $, m 3; total 36. Snout elongated. Toes 5-5. Claws on fore feet long and curved. Hallux very short. Under surface of tarsus naked. Tail shorter than the body, tapering. Fur harsh. Species: C. obscurus, the Kusimanse, a small burrowing animal from West Africa, of uniform dark-brown colour; C. fasciatus; C. zebra; C. gambianus.

Suricata.—A more distinct genus than any of the above. The dental formula as in the last, but the teeth of the molar series remarkably short in the antero-posterior direction, corresponding with the shortness of the skull generally. Orbits complete behind. Vertebree: C7, D15, L 6, 8 38, C20. Though the head is short and broad, the nose is pointed and rather produced and movable. Ears very short. Body shorter and limbs longer than in Herpestes. Toes 4-4, the pollex andhallux being absent. Claws on fore feet very long and narrow, arched, pointed, and subequal. Hind feet with much shorter claws, soles hairy. Tail rather shorter than the body. One species only is known, the Suricate, S. tetradactyla, a small grey- brown animal, with dark transverse stripes on the hinder part of the back, from South Africa.

Galidictis, Galidea, and Hemigalidia are names of three slight generic modifications of the Viverrine type, allied to the Herpes- tine, but placed by Mivart in a distinct subfamily, Galidictine. They are all inhabitants of Madagascar. The best-known, Galidia elegans, is a lively Squirrel-like little animal with soft fur and a long bushy tail, which climbs and jumps with agility. Itis of a chestnut-brown colour, the tail being annulated with darker brown. Galidictis vittata and striata chiefly differ from the Ichneumons in their coloration, being grey with parallel longitudinal stripes of dark brown.

Eupleres is another form, also from Madagascar, which has been placed in a subfamily apart. It differs remarkably from all the other Viverridz in the weak development of the jaws and the small

CARNIVORA. |

Fic. 118.—Skull of Zupleres goudoti, 4 nat. size. Mus. Roy. Coll. Surgeons.

size of the teeth, in consequence of which it was, when first dis- covered, placed inthe order Insectivora. Deutition: 7 3, ¢ 4, p 4, m%=40. Vertebre: C7, D 13,L7,83,C 20. But one species is known, Z. goudoti.

Fanily HY#nipa.

No alisphenoid canal. Dorsal vertebre 15, Molars 4.

to the Old World. _ Subfamily Protelides.—Auditory bulla divided into two dis- tinct chambers. Premolar and molar teeth very small and simple in character. This group contains but a single species, belonging to the genus Proteles, P. cristatus, the Aard-Wolf or Earth-Wolf of the Dutch colonists of the Cape, an animal nearly allied to the Hyznas, but remarkably modified in its dentition, the molar teeth being very small, placed far apart, and almost rudimentary in character (see fig. 119). The canines are long and rather slender. The dental formula is ¢ 3, c 4, p and m total 30 or 32. Vertebrea: C7, D15, L5, 82, C24. though short, with a distinct claw.

Limited

2 eee 3or4 7or8?

The hind fect with four

The fore feet with five toes; the pollex, –

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subequal toes. Claws all strong, blunt, subcompressed, and non- retractile. The general external appearance is very like that of a small striped Hyena,

but the muzzle is more pointed and the ears larger. It has a copious mane of long hair, capable of being

Fic. 119.—Skull and Dentition of Proteles cristatus. x 4. Mus. Roy. Coll. Surgeons,

erected, when the animal is excited, along the middle line of the neck and back. It is a native of South Africa, and is a burrowing nocturnal animal, feeding on decomposing animal substances, larve, aud termites. Observations upon specimens in captivity indicate that it has neither inclination nor power to attack or feed upon living vertebrated animals.

Subfamily Hysenidee.—Auditory bulla not divided by a septum into two chambers.

Hyxna,—Dentition : 7 3,¢ 4, p 4, m 4+=2; total 34. Teeth, especially canines and premolars, very large, strong, and conical. Upper sectorial with a very large, distinctly trilobed blade and a moderately developed inner lobe placed at the anterior extremity of the blade. Molar very small, and placed transversely close to the hinder edge of the last, as in the Melidw. Lower sectorial consisting of little more than the bilobed blade. Zygomatic arches of cranium very wide and strong. Sagittal crest high, giving attachment to very powerful biting muscles. Orbits incomplete behind. Vertebre: C7, D15,L5,84,C19. Limbs rather long, especially the anterior pair, digitigrade, four subequal toes on each, with stout non-retractile claws. Pollex and hallux only repre- sented by rudimentary metacarpal and metatarsal bones, ‘ail rather short. A large post-anal median glandular pouch, into which the largely developed anal scent glands pour their secretion.

The three existing species of Hyena (see Hymna) are divisible into two sections to which some zoologists assign generic rank.

1. Upper molar moderately developed and three-rooted. An inner tubercle and heel more or less developed on the lower molar. Ears large, pointed. Hair long, forming a mane on the back and shoulders. H. striata, the

Striped Hyena, of northern Africa and southern Asia. H. brunnea, of south Africa, in some respects intermediate between this and the next section. 2. Genus Crocuta. Upper molar extremely small, two- or one-rooted, often deciduous. Lower molar without trace of inner tubercle, and with an extremely small heel. Ears moderate, rounded. Hair uot elongated to forma mane, ZH. crocuta or Crocuta maeulata, the Spotted Hyena, from Africa south of the Sahara. In dental characters the first section inclines more to the Viverridx, the second to the Felidx; or the second may be considered as the more specialized form, as it certainly is in its visceral anatomy, especially in that of the reproductive organs of the female.!

Extinct Hyenide.—Hyenas abounded in Europe from the Upper Miocene to the Pleistocene epoch, and a series of transitional forms from ancient generalized types merging into Viverridx, as Icti- therium and Hyznictis (with additional tubercular molars), leading by gradual modifications during successive geological ages to the species now existing, have been traced by Gaudry. The Cave Hyena (H. spelewa), once so abundant in Britain and other parts of Europe, is scarcely distinguishable specifically from the existing H. crocuta of Africa; and extinct forms found in France, described under the names of H. prisea and H. arvernensis, are probably the ancestors of H. striata. The existing H. brunnea seems to have preserved the characters of H. eximia of the Upper Miocene of Pikermi in Greece with little modification. There is at present no evidence of the existence of this group in America.

Section CyNOIDEA.

This section contains a single family, Canidw, or Dog-like animals, which appear to hold an intermediate position between the other two sections, retaining also many of the more generalized characters of the ancient members of the order. The structure of the auditory bulla and adjacent parts of the bones of the skull is

1 The anatomical peculiarities of Hyana crocuta have been fully elucidated in a series of papers by Morrison Watson, in the Proceedings of the Zoological Society for 1877, 1878, 1879, and 1881, in which references to previous authors on the subject will be found.

quite intermediate between that of the Aluroid and Arctoid forms. In the number and arrangement of the teeth they morc nearly approach the primitive hetcrodont type than any other existing Carnivora. A cecum isalways present, somctimes short and simple, but when long it is folded upon itself in a characteristic manncr.

The Dogs form a very compact group, composed of numerous species which closely resemble each other in essential characters, though differing considerably externally. The most marked differences are a slight variation in the number of the truc molar teeth, which exceed the nsual number in the Cape Long-cared Fox (Otocyon), and fall short of it in some other less aberrant forms to which the names of Jeéicyon and Cyow have been given, and a diminution in the number of toes in the Cape Hunting Dog (Lycaon), which has 4—4, instead of 5-4 as in the remainder of the family. After taking these away, there remain a great number of animals called Dogs, Wolves, Jackals, and Foxes, varying from one another only in the characters of the tail, ears, fur, form of the pupil, and some trifling peculiarities of skull and tecth, upon which some authors have divided them into many genera. These divisions are, however, extremely difficult, if not impossible, to define, on account of the numerous gradual transitions from one form to the other.

Canis.—Pending further investigation, it will perhaps be safest to retain all the species, with the exceptions of Otocyon and Lycaon mentioned above, in the old genus Canis, the most prominent characters of which are the following. Teeth, usually 7 #, ¢ 4, p 4, m %=41°2; total 42, The absence of the last upper molar (m 3), alone distinguishes this from the generalized dentition of heterodonts (see p. 353), and this tooth is occasionally present in one species (C. cancrivorus). In certain Asiatic species (C. primevus and its allies), which on this account have been separated to form the genus

Cyon of Hodgson, the last lower molar (7 3) appears to be con- stantly absent, and in C. venaticws (genus Jeticyon, Lund) not only this but also m 2 is usually not developed. The milk dentition is di 3, de 4, dm %=4; total 28,—the first permanent premolar having no predecessor. The teeth of both permanent and milk or temporary series are figured at p. 3538 (fig. 3). The

upper scc- torial p 4 consists of a stout blade, of which the anterior cusp is almost obsolete, the middle cusp large, conical, and pointed back- wards, and the posterior cusp in the form of a compressed ridge ; the inner lobe is very small, and placed quite at the fore part of the tooth. The first molar is more than half the antero-posterior length of the sectorial, and considerably wider than it is long; its crown consists of two prominent conical cusps, of which the anterior is the larger, and a low broad inward prolongation, supporting two more or less distinct cuspsand a raised inncr border, The second molar resembles the first in general form, but is considerably smaller. The lower sectorial m 1 isa very large tooth, with a strong compressed bilobed blade, the hinder lobe being considerably the larger and more pointed, a small but distinct inner tubercle placed at the hinder margin of the posterior lobe of the blade, and a broad, low, tuberculated heel, occupying about one-third of the whole length of the tooth. The second molar is less than half the length of the first, with a pair of cusps placed side by side anteriorly, and a less distinct posterior pair, The third is an extremely small and simple tooth with a subcircular tuberculated crown and single root.

The cranium is more or less elongated, the facial portion taper- ing forwards and compressed. The jawselongated. The zygomata moderately strong. The post-orbital processcs of the frontal short, leaving the orbit widely open posteriorly. Vertebre; C7, D138, L7, S38, C 17-22. Clavicles present, but very rudimentary, Limbs of moderate proportions, digitigrade. Feet short; five toes ou the fore foot, the pollex much shorter than the others, and not reaching to the ground. Four toes on the hind foot, the hallux being repre- sented by a rudiment of the metatarsal.! All the toes are provided with exserted non-retractile slightly curved and blunt claws, which, being exposed, become worn at the tips, Tail imoderate, or rather long, generally somewhat bushy. The pupil of the eye, when con- tracted, isin some species round, in others elliptical and vertical.

This extensive genus may be considered as truly cosmopolitan. One or more species are found throughout the American continent from Greenland to Patagonia and the Falkland Isles ; and similarly, in the Old World, Enrope, Africa, and Asia, with most of the large islands adjacent, and even Australia, have their wild Dogs, though in the last case they probably

belong to a feral race, introduced originally by man. They are generally sociable animals, hunting their prey in packs. Many species burrow in the ground; none habitually climb trees. Though mostly carnivorous, feeding chiefly on animals they have chased and killed themselves, many, especially among the smaller species, eat garbage, carrion, insects, and also fruit, berries, and other vegetable substances, The species

1In Domestic Dogs a hallux is frequently developed, though often in a rudimentary condition, the phalanges and claw being suspended loosely in the skin,

without direet connexion with the other b ; iti . hte ice ones of the foot; it is ealled by dog

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are very numcrous, and, as in most other large genera, very ill- defined, few zoologists agreeing as to which of the many slightly different modifications may be considered as local varieties and which true species. Perhaps the best cranial character by which the different members of the genus can be distinguished is that pointed out by Burmeister, viz., that in the animals gencrally called Dogs, Wolves, and Jackals the post-orbital process of the frontal bone is regularly smooth and convex above, with its extremity bent downwards, whereas in Foxes the process is hollowed above, with its outer margin (particularly of the anterior border) somewhat raised. This modification coincides in the main with that upon which Professor Huxley has recently ? bascd his division of the group into two parallel series, the Thooids or Lupine forms and Alopecoids or Vulpine forms, which he characterizes by the presence of frontal air-sinuses in the former, which not ouly affects the exter- nal form but to a still greatcr degree the shape of the anterior part of the cranial cavity, and the absence of such sinuses in the latter. The pnpil of the eye when contracted is round in most members of the first group, and vertically elliptical in the others, but more observations are required before this character can be absolutely relied upon. The form and length of the tail is often used for the purposes of classification, but its characters do not coincide with those of the cranium, as many of the South American Canidx have the long bushy tails of Foxes and the skulls of Wolves. Taking into account various combinations of these and other minor

characters, the species may be arranged in the following groups, which some authors have considered as of generic importance.

A. Thooid or Lupine Series.

(1) Canis proper contains the largest members of the genus, the true Wolves of the northern parts of both Old and New Worlds (C. lupus, &c,), the Jackals of southern Asia and Africa (C. aureus, mesomelas, &c.), and the various breeds of the domestic Dog (C. familiaris), the origin of which is still involved in obscurity. Some naturalists believe it to be a distinct species, descended froin one that no longer exists in a wild state; others have sought to find its progenitors in some one of the wild or feral races, either of true Dogs, Wolves, or Jackals; while others again believe that it is derived from the mingling of two or more wild species or races. It is probably the earliest animal domesticated by man, and few if any other species have undergone such an extraordinary amount of variation in sizc, form, and proportion of limbs, ears, and tail, variations which have been perpetuated and increased by careful selective breeding. See Doc. The Dingo or Australian Dog is met with wild, and also as the domestic companion of the aboriginal people, Dogs were also in the possession of the natives of New Zealand and other islands of the Pacific, where no placental mammals exist naturally, on their discovery by Europeans in the last century. (2) Cyon, wild Dogs of the south-east of Asia, distinguished by slight modifications as C. primevus, C. dukh- encnsis, aud C. swmatrensis, differ from the above in wanting the small last»]ower tubercular molar. (8) Lycalopex is a group formed of certain South-American Canide, distinguished from Canis proper by their longer tails and Fox-like aspect :—C. cancrivorus, OC. brasili- ensis, OC. melampus, C. vetulus, C. fulvicaudus, C. azare, CU. megellant- cus, C. griseus, The last three have been further separated (under the name of Pscudalopex) on account of slight differences in the relative size of the molar teeth, and of their pupil being elliptical when con- tracted. (4) Nyctercutcs (one species, C. procyonides, from Japan and north-east Asia) has no claims to generic distinction but such as are founded upon its long loose fur, short ears, and short bushy tail, which give it some superficial resemblance to a Raccoon. (5) Icticyon, with one small species, C. venaticus, the Bush Dog, from Guiana and Brazil, with close hair, and short legs and tail, has more reason

to be regarded asa distinct form, as it is distinguished from all othcr Dogs by the reduction of its molar teeth to 4, and their comparatively small size. In consequence of this, and its general external characters, it was formerly placed among the Mustclide, but its Canine affinities have now been thoroughly established,

B. Alopecoid or Vulpine Series,

(6) Vulpes, true Foxes. The species or varieties are numerous and widely spread over North America, Eurasia, and Africa:—C. vulpes, the common Fox of Europe; C. niloticus, adustus, and varicgatus, Africa; C. flavescens, montanus, bengalensis, japonicus, corse, Asia ; C. fulvus, macrourus, velox, North America. The tail of the above is clothed with soft fur and long hair, uniformly mixed; from them Baird distinguishes, under the name of Urocyon, other species which have a concealed erect mane of stiff hairs along the upper line of the tail. Thesc havc also a shorter muzzle and a wide space between the temporal crests; they are C. virginianus and C. hittor- alis, both from North America. The Arctic Fox (C. lagopus, genus Leucocyon, Gray) has the tail very full and bushy and the soles of the fect densely furred below. Its colour changes according to season from bluish-grey to pure white. (7) Fenncews. Certain small elegant African Foxes (C. cerdo, famelicus, and chan), with very

2 Proc. Zool. Soc. Lond., 1880, p. 288.

large ears and corresponding large auditory bulls, have been separ- ated under the above name.

Lyeaon.—This resembles in most of its characters the Dogs of the Lupine series, but the teeth arc rather more massive and rounded, the skull shorter and broader, and it has but four toes on each limb, as in Hyena. The one species, L. pictus, the Cape Hunting Dog (fig. 120) from south and east Africa, is very distinct exter-

Fic. 120,—Cape Hunting Dog (Lycaon pictus).

nally from all the other Canide. It is nearly as large as a mastiff, with large, broadly ovate erect ears, and singularly coloured, being not only variable in different individuals, but unsymmetrically marked with large spots of white, yellow, and black. It presents some curious superficial resemblances to Hyana crocuta, perhaps a case of mimetic analogy. It hunts its prey in large packs.

*Otocyon.—Dentition: 4}, ¢}, p 4, m *er fue; total 46 or 48, The molar teeth are thus in excess of any other known heter- odont mammal. They have the same general characters as in Canis, with very pointed cusps. The lower sectorial shows little of its typical characters, having five cusps on the surface; these can, however, be identified as the inner tubercle, the two greatly reduced and obliquely placed lobes of the blade, and two cusps on the heel. The skull generally resembles that of the smaller Foxes, particularly the Fennecs. The auditory bullz are very large. The hinder edge of the mandible has a very peculiar form, owing to the great development of an expanded, compressed, and somewhat inverted subangular process. Vertebre: C7, D138, L7, 83, C22, Ears very large. Limbs rather long. Toes 5-4. One species, 0. megalotis, from South Africa, rather smaller than a common Fox.*

Professor Huxley looks upon this as the least differentiated or most primitive existing form of Canis, regarding the presence of the four molar teeth as a survival of a condition of the dentition exhibited by the common ancestors of the existing Canidx and the existing carnivorous Marsupials, There is, however, at present no paleontological proof of this, as none of the numerous fossil forms of Oanide yet discovered have more than the normal number of molars. One of the best known of these is Amphicyon, from the Miocene strata of Europe and America, formerly supposed to have affinities with the Bears, having five toes on each foot, and being possibly plantigrade, but, as the structure of the skull and teeth clearly show, only a generalized Dog, in which the true molars are fully developed. Another genus, Cynodictis, of which many modi- fications have been described by Filhol from the south of France, approaches the Viverride, and may be a common ancestor of the Cynoid and Mluroid Carnivora.

Section ARCTOIDEA.

The section Arctoidea includes a considerable number of forms which agree in the essential characteristics of the structures of the base of the cranium and reproductive organs, and in the absence of a cecum to the intestinal canal. They have no Cowper's glands, and have a rudimentary prostate aud a large cylindrical penial bone. All the members of this group have five completely developed toes on each foot.

Family MUsTELIDe.

True molars 3 (or + in Mellivora). No alisphenoid canal. A large group widely diffused, especially in the northern temperate regions of the earth. The different genera are very difficult to arrange in'any natural order. They are rather artificially divided,

chiefly according to the characters of their feet and claws, into the Otter-like (Lutrine), Badger-like (Meline), and Weasel-like (Muste- line) forms.

Subfainily Lutrinse.—Feet short, rounded (except the hind feet of Enhydra). Toes webbed. Claws small, curved, blunt. Head broad and much depressed. Upper posterior molars large and quadrate. Kidneys conglomerate. Habits aquatic.

Lutra.—Dentition: ¢ %, ¢ 4, p $, m 4; total 36. Upper sectorial with a trenchant tricusped blade, and a very large inner lobe, hollowed on the free surface, with a raised sharp edge, and extending along two-thirds or more of the length of the blade. True molar large, with a quadricuspidate crown, broader than long. Skull broad and depressed, contracted immediately behind the orbits. Facial portion very short; brain case large. Vertebre: C7, D 14-15, L6-5, S8, C 20-26. Body verylong. Ears short and rounded. Limbs short. Feet completely webbed, with well developed claws on all the toes. Tail long, thick at the base and tapering, rather depressed. Fur short and close.

The Otters are all more or less aquatic, living on the margins of rivers, lakes, and in some cases the sea, are expert divers and swimmers, and feed chiefly on fish. They have a very extensive geographical range, and so much resemble each other in outward appearance, especially in the nearly uniform brown colouring, that the species are by uo means well-defined. See OTTER.

L. sandbachii, a very large species from Demerara and Surinam, with a prominent ridge along each lateral margin of the tail, con- stitutes the genus Pteronura of Gray.

Aonyzx.—Feet only slightly webbed ; claws exceedingly small or altogether wanting on some of the toes. First upper premolar very small, sometimes wanting. True molars very broad and massive, presenting an approach to the form of the next genus. 4. inunguis, South Africa ; A. leptonyx, Java, Sumatra.

Enhydriodon.—E. sivalensis is a large extinct Otter-like animal described by Dr Falconer from the Pliocene strata of the Sub- himalayan mountains.

Enhydra.—Dentition: ¢ 3, ¢ 4, p $, m4; total 32. Differs from all other kuown Carnivora in having but two incisors on each side of the lower jaw, the one corresponding to the first (very small in the true Otters) being constantly absent. Though the molar teeth generally resemble those of Latra in their proportions, they differ very much in the exceeding roundness and massiveness of their crowns and bluntness of their cusps. Feet webbed. Fore feet short, with five subequal toes, with short compressed claws. Hind feet very large, depressed, and fin-like. The phalanges flattened as in the Seals. The fifth toe the longest and stoutest, the rest gradually diminishing in size to the first, all with mode- rate claws, Tail moderate, cylindrical.

One species, E. Jutris, the Sea-Otter. It is larger than any of the true Otters, and is found only on the coasts and islands of the North Pacific, where it was formerly very abundant, but is gradu- ally becoming more and more rare, on account of the numbers killed annually for their valuable fur. It is said to live on molluses and crabs as well as fish, and the massive mill-like struc- ture of the grinding teeth, so unlike that of all the known purely piscivorous mammals, would seem to indicate some such diet.

Subfamily Melinge.—Feet elongated. Toes straight. Claws non-retractile, slightly curved, subcompressed, blunt ; those of the fore foot especially large. Upper posterior molar variable. Kidneys simple. Habits mostly terrestrial and fossorial.

Mephitis. —Dentition: + 3, ¢ t, P , m 4; total 82-34. Upper molar larger than the sectorial, subquadrate, rather broader than long. Lower sectorial with heel less than half the length of the whole tooth. Bony palate terminating posteriorly opposite the hinder border of the last molar tooth. Facial portion of skull short and somewhat truncated in front. Vertebre: C7, D16, L6,S2, C21. Headsmall. Body elongated. Limbs moderate, subplantigrade. ars short and rounded. 'Tail long, abundantly clothed with very long fine hair. Anal glands largely developed ; their secretion, which can be discharged at the will of the animal, has an intolerably offensive odour, which circumstance has ren- dered the Skunks, as they are commonly called, proverbial. They are strictly nocturnal animals, terrestrial and burrowing, feeding chiefly on small mammals, birds, reptiles, insects, worms, roots, and berries. All the known species have a prevalent black eolour, varied by white stripes or spots on the upper part. They generally carry the body much arched, and the tail erect, the long loose hair of which waves like a plume over the back. There are many species, all inhabitauts of the American continent, over which they have an extensive range. See Sxkunx. The South-American species, which have only two upper premolars, and differ in some other characters, have been generically separated under the name of Conepatus.

Aretonyx.—Dentition : 7 3,¢ 4, p 4, ™ 43 total 38. Incisor line curved, the outer teeth being placed posteriorly to the others. Lower incisors proclivous. First premolars often rudimentary or absent. Upper molar much larger than the scctorial, longer in the

antero-posterior direction than broad. Lower sectorial with a very large, low, tuberculated heel. Cranium elongated and depressed ; face long, narrow, and concave above. Bony palate extending as far backwards as the level of the glenoid fossa. Palatal bones dilated. Suborbital foramina very

large. Vertebre : C7, D16, L4,84, C20. Snout long, naked, mobile, and truncated, with large terminal nostrils, much like those of a Pig. Eyes small. Ears very small and rounded. Body compressed, rather than depressed. Limbs of moderate length and digitigrade in walking. Tail moderate, tapering. A full soft under fur, with longer, bristly hairs interspersed. 'The best-known species is 4. collaris, the Sand-Bear or Bhali-soor (i.c., Bear-Pig) of the natives, found in the mountains of the north-east of Hindustan and Assam. It is rather larger than the English Badger, higher in its legs, and very Pig-like in general aspect, of a light grey colour, with flesh-coloured snout and feet; nocturnal and omnivorous, Other species or local varieties have been described by A. Milne-Edwards from North China and Tibet.

Mydaus.—Dentition as the last, but the cusps of the teeth more acutely pointed. Cranium elongated, face narrow and produced. Suborbital foramen small, and the palate, as in all the succeeding genera of this group, produced backwards about midway between the last molar tooth and the glenoid fosse. Vertebree: C7, D 14-15, L6-5, 83, C12. Head pointed in front ; snout produced, mobile, obliquely truncated, the nostrils being inferior, Limbs rather short and stout. 'Tail extremely short, but clothed with rather long bushy hair. Anal glands largely developed, and emitting an odour like 'that of the American Skunks (Mephitis). One species, M. meliceps, the Teledu, a small burrowing animal, found in the mountains of Java, at an elevation of 7000 or more feet above the sea-level.

Melcs.—Dentition: 7 3,¢4, p 4, m4; total 38. The first pre- molar in both jaws extremely minute and often deciduous. Upper molar very much larger than the sectorial, subquadrate, as broad as long. Lower sectorial with a broad, low, tuberculated heel, more than half the length of the whole tooth. The postglenoid processes of the skull are so strongly developed, and the glenoid fossa is so deep, that the condyle of the lower jaw is firmly held in its place even after all the surrouuding soft parts are removed. Vertebre: C7, D15, L5,88,C18. Muzzle pointed. Ears very short. Body stout, broad. Limbs short, strong, subplantigrade. Tail short. The best-known species is the common Badger (AZ. taxus) of Furope and northern Asia, still found in many parts of England, where it lives in woods, is nocturnal, burrowing, and very omnivorous, feeding on mice, reptiles, insects, fruit, acorns, and

roots. Other nearly allied species, If. leucwrus and MM. chinensis, are found in continental Asia, and Af. anakwma in Japan.

Taxidea.—Dental formula as in Melcs, except that the rudimen- tary anterior premolars appear to be always wanting in the upper jaw. The upper sectorial much larger in proportion to the other teeth. Upper molar about the same size as the sectorial, triangular, with the apex turned backwards. Heel of lower sectorial less than half the length of the tooth. Skull very wide in the occipital region ; the lambdoidal crest very greatly developed, and _the sagit- tal but slightly, contrary to what obtains in Melcs. Vertebre : C7, D 15, L5, 8 8, C (%). Body very stoutly built and depressed. Tail short. 'I'he animals of this genus are peculiar to North America, where they represent the Badgers of the Old World, resembling them much in appearance and habits. TJ. americana is the common American Badger of the United States. 7. berlan- diert, the Mexican Badger, is perhaps only a local variety.

Mellivora.—Dentition: 7 3, ¢ 4, p & m +4; total 82. Upper sectorial large, with its inner cusp quite at the antcrior end of the blade, as in the following genera ; molar much smaller and trans- versely extended, having a very small outer and a larger rounded inner lobe. Heel of lower sectorial very small, scarcely one-fourth of the whole length of the tooth, and with but one cusp. Tuber- cular molar absent. Vertebre: C7, D14,L4,84,C15. Body stout, depressed. Limbs short, strong. Head depressed, nose rather pointed. External ears rudimentary. Tail short. The animals of this genus are commonly called Ratels. Jf. indica, from India, and A. ratcl and JL. Icuconota from South and West Africa, have nearly the same general appearance and size, being rather larger than a common Badger. Their coloration is peculiar, all the upper surface of the body, head, and tail being ash-grey, while the lower parts, separated by a distinct longitudinal boundary line, are black. They live chiefly on the ground, into which they burrow, but can also climb trees. They feed on small mammals, birds, reptiles, and insects, and arc said to be very partial to honey.

Helictis.—Dentition: 7 §, ¢ 4, p 4, m 4; total 38. Upper sec- torial with a large bicusped inner lobe. Molar smaller, wider transversely than in the antero-posterior direction. Lower sectorial with heel about one-third the

length of the tooth. Skull elon- gated, rather narrow and depressed. Facial portion especially narrow. Infraorbital foramen very large. Head rather small and produced in front, with an elongated, obliquely truncated, naked

snout. Ears small. Body elongated. Limbs short. Tail short or moderate, bushy. Several species are described (H. orientalis, moschata, nipalensis, subuurantiaea), all from eastern Asia, small animals compared with the other members of the subfamily, climb- ing trees with agility and living much on fruit and berries as well as on small mammals and birds.

Ictonyx.—Dentition: 7 3, ¢ 4, p %, m 4; total 34. In general characters the teeth much resemble those of the Polecats (Mustela), being more delicately cut and sharply cusped than in most of the foregoing. Upper molar smaller than the sectorial, narrow from before backwards. Lower sectorial with a small narrow heel and distinct inner tubercle. General form of body musteline. Limbs short. Fore feet large and broad, with five stout, nearly straight, blunt, and non-retractile claws, of which the first and fifth are considerably shorter than the others. Tail moderate, with longer hairs towards the end, giving it a bushy appearance. Hair gene- rally long and loose. The best-known species of this genus, I. zorilla, the Cape Polecat, was placed by Cuvier in the genus Mustela, by Lichtenstein in Mephitis, and in many characters it forms a transition between these genera. It is about the size of an English Polecat, but conspicuous by its coloration, having broad, longitudinal bands of dark brown, alternating with white. Its odour is said to be as offensive as that of the American Skunks. From the Cape of Good Hope it ranges as far northas Senegal. Another species, J. frenata, from Sennaar, has been described.

Subfamily Mustelinze.—Toes short, partially webbed; claws short, compressed, acute, curved, often semiretractile. Upper pos- terior molar of moderate size, wide transversely. Kidneys simple. Terrestrial and arboreal in habits.

Galictis.—Dentition: 7 3, c +, p 3, m4; total 34. Molars small but stout; upper sectorial with the inner lobe near the middle of the inner border of the tooth. Lower scctorial with heel small, and inner tubercle small or absent. Body long. Limbs short ; claws non-retractile. Palms and soles naked. Head broad and depressed. Tail of moderate length. The best-known species, G. vittata, the Grison (genus Grisonia, Gray), and G. barbara, the Tayra (genus Galcra, Gray), are both South-American ; G. alla- mand? is an intermediate form.

Mustcla.—Dentition: 7 3, ¢ 4, p 4, m 4; total 38. Upper sectorial with inner lobe close to the anterior edge of the tooth. Molar nearly as large as sectorial. Lower sectorial with small inner tubercle. Vertebre: C7, D14,L 6,88, C 18-23. Body long and slender. Limbs short, digitigrade. Feet rounded; toesshort, with compressed, acute, semiretractile claws. Tail moderate or long, more or less bushy. One species is British, Jf martcs, the Pine Marten ; the remainder inhabit the northern regions of Europe, Asia, and America. Many of the species, as the Sable (JZ. ztbel- lina), yield fur of great value. See MARTEN.

Putorius.—The dentition differs from that of Mustela chiefly in the absence of the anterior premolars of both jaws. The teeth are more sharply cusped, and the lower sectorial wants the inner tubercle. External characters generally similar to those of the Martens, but the body is longer and more slender, and the limbs even shorter. They are all small animals, of very active, blood- thirsty and courageous disposition, living chiefly on birds and small mammals, and are rather terrestrial than arboreal, dwelling among rocks, stones, and outbuildings. Some of the species, as the Stoat or Ermine (P. ermineus), inhabiting cold climates, undergo a seasonal change of colour, being brown in summer and white in winter, though the change does not affect the whole of the fur, the end of the tail remaining black in all seasons. This is a large genus, having a very extensive geographical range throughout the Old and New Worlds, and includes the animals commonly known as Weasels, Polecats, Ferrets, and Minks.,

Gulo.—Dentition : 1 2, ¢4, p 4, mz; total 38. Crowns of the tecth very stout. Upper molar very much smaller than the sec- torial. Lower sectorial large, with very small heel and no inner tubercle. The dentition, though really but

a modification of that of the Weasels, presents a great general resemblance to that of Hyena, Vertebre: C 7, D 15, L 5, 838, C15. Body and limbs stoutly made. Feet large and powerful, subplantigrade, with large, compressed, much curved, and sharp-pointed claws. Soles of the feet (except the pads of the toes) covered with thick bristly hairs, Ears very small, nearly concealed by the fur. Eyes small. Tail short, thick, and bushy. Fur full, long, and rather coarse. The one species, the Wolverene or Glutton, G. Juseus, an inhabit- ant of the forest regions of northern Europe, Asia, and America, much resembles a small Bear in appearance. It is a very powerful animal for its size, climbs trees, and lives on squirrels, hares, beavers, reindeer, and is said to attack even horses and cows.

[CARNIVORA.

Family PROCYONIDE. True molars 2, obtusely tuberculated. No alisphenoid canal. Habitat exclusively American. Procyon.—Nentition: 7 3, ¢ 4, p 4, m $; total 40. The molar teeth broad and tuberculated. The upper sectorial with three cusps along the outer margin, and a very broad bicusped inner lobe,

CARNIVORA. |

giving an almost quadrate form to the crown. First molar with a large tuberculated crown, tather broader than long. Second con- siderably smaller, with transversely oblong crown. Lower sec- torial with an extremely small and 1ll-defined blade, placed trans- versely in front, and a large inner tuberele and heel. Second molar as long as the first, but narrower behind, with five obtuse cusps. Vertebre: C7, D14, L6,8 3, C 16-20. Body stout. Head broad behind, but with a pointed muzzle. Limbs plantigrade, but in walking the entire sole is not applied to the ground as it is when the animal isstanding. Toes, especially of the fore foot, very free, and capable of being spread wide apart. Claws compressed, curved, pial, and non-retractile. Tail moderately long, cylindrical, thickly covered with hair, annulated, non-prehensile. Fur long, thick, and soft. The well-known Raccoon (Procyon lotor) of North America is the type of this genus. It is replaced in South America by P. cancrivorus.

Bassaris.—A form closely allied to Procyon, but of more slender and elegant proportions, with sharper nose, longer tail, and more digitigrade feet, and with teeth otherwise like, but smaller, and more sharply denticulated. It was formerly, but erroneously, placed among the Viverride. Two species:—B. astuta, from the southern parts of the United States and Mexico, and B. sumi- chrasti, from Central America.

Bassuricyon.—This name has recently (1876) been given to a distinct modification of the Procyonine type of which at present only two examples are known, one from Costa Rica and the other from Ecuador, which, appearing to be different species, have been named B. gabbi and B. allent. They much resemble the Kinkajou (Cercoleptes) in external appearance, but the skull and teeth are more like those of Procyon and Nasua.

Nasuwa.—Dentition as in Procyon, but the upper canines are larger and more strongly compressed, and the molars smaller. The facial portion of the skull is more elongated and narrow. Vertebra: C 7, D 14, L 6, 8 8, C 22-23. Body elongated and rather compressed. Nose prolonged into a somewhat upturned, obliquely truncated, mobile snout. Tail long, non-prehensile, tapering, annulated. These animals, commonly called Coatis or Coati-Mundis, live in small troops of eight to twenty, are chiefly arboreal, and feed on fruits, young birds, eggs, insects, &c. Recent researches have re-duced the number of supposed species to two, WV. narica of Mexico and Central America, and WV. rufa of South America from Surinam to Paraguay.

Cercolcptes.—Dentition: ¢ %, ¢ 4, p 3, m $3=36. Molars with low flat crowns, very obscurely tubereulated. Skull short and rounded, with flat upper surface. Vertebre: C7, D 14, L 6, 8 3, C 26-28. Clavicles present, but in a very rudimentary condition. Ifead broad and round. Ears short. Body long and musteline. Limbs short. Tail long, tapering, and prehensile. Fur short and soft. Tongue long and very extensile. But one species of this somewhat aberrant genus is known, C. caudivolvulus, the Kink- ajou, found in the forests of the warmer parts of South and Central America. It is about the size of a Cat, of a uniform pale, yellow- ish-brown colour, nocturnal and arboreal in its habits, feeding on fruit, honey, eggs, and small birds and mammals, and is of a tolerably gentle disposition and easily tamed.

Family AILURIDA.

Formed for the reception of one genus, resembling the Procyonidz in the number of true molar teeth, but differing in some cranial characters, especially the presence of an alisphenoid canal, and in its Asiatic habitat.

Ailurus.—Dentition: 1-3, c+, p 3, m 2; total 38. First lower premolar very minute and deciduous. Molars remarkable for their great transverse breadth, and the numerous cusps of their crowns. Vertebre: C7, D14,L6,8 3, C18. Skull high and compressed. Facial portion short. Ascending ramus of mandible po teeing, high. Head round. Face short and broad. Ears large, erect, pointed. Limbs stout, plantigrade, with large blunt non-retractile claws. Tail nearly as long as body, cylindrical, clothed with long hairs. Fur long and thick. One species, 4. fulgens, the Panda, rather larger than a Cat, found in the south-east Himalayas, at heights of from 7000 to 12,000 feet above the sea, among rocks and trees, and chiefly feeding on fruits and other vegetable substances. Its fur is of a remarkably rich reddish-brown colour, darker below.

Family URSIDE. _

True molars 3, with broad, flat, tuberculated crowns. The three anterior premolars of both jaws rudimentary and often deciduous. Fourth upper premolar (sectorial) with no third or inner root. No alisphenoid canal (except in Ailwropus). Kidneys conglomerate. Geographical distribution extensive.

Ailuropus.—An interesting annectant form connecting the true Bears with Azlurus and with several extinct genera. Dentition: i $c 4, p 4, m 2; total 40. Premolars increasing in size from first to last, and two-rooted except the first. First upper molar with quadrate crown, broader than long. Second larger than the first. Cranium with zygomatic arches and sagittal crest immensely

developed, and ascending ramus of mandible very high, giving | greater spaces for attachments of temporal muscle than in any other existing member of the order. Facial portion short. Bony palate not extending behind the last molar tooth. An alisphenoid canal. Feet bear-like, but soles more hairy, and perhaps less completely

Fig. 121. Ailuropus melanoleucus. From A, Milne-Edwards.

plantigrade. Fur longand thick. Tail very short. One extremely rare species, A. melanoleucus (fig. 121), diseovered by Pére David in 1869, in the most inaccessible mountains of eastern Tibet. Said to feed principally on roots, bamboos, and other vegetables. Itis of the size of a small Brown Bear, of a white colour, with ears, spots round the eyes, shoulders, and limbs black.

Ursus.—Dentition: 7 $, c+, p ¢, m 3=42. The three anterior premolars above and below one-rooted, rudimentary, and frequently wanting. Usually the first (placed close to the canine) is present, and after a considerable interval the third, which is situated close to the other teeth of the molar series. The second is very rarely present in the adult state. The fourth (upper sectorial) differs essentially from the corresponding tooth of other Carnivores in wanting the inner lobe supported by a distinct root. Its sectorial characters are very slightly marked. The crowns of both the true molars are longer than broad, with flattened, tuberculated, grinding surfaces, The second has a large backward prolongation or heel. The lower sectorial has a small and indistinct blade and greatly developed tubercular heel. 'The second molar is of about the same length, but with a broader and more flattened tubercular crown. The third is smaller. The milk teeth are comparatively small, and shed at an early age. Skull more or less elongated. Orbits small and incomplete behind. . Palate prolonged considerably behind the last molar tooth. Vertebre: C7, D14, L6,85,C 8-10. Body heavy. Feet broad, completely plantigrade. The five toes on each foot all well-developed, and armed with long compressed and moderately curved, non-retractile claws. Palms and soles naked. Tail very short. Ears moderate, erect, rounded, hairy. Fur gene- rally long, soft, and shaggy.

The Bears are all animals of considerable bulk, and include among them the largest members of the order. Though the species are not numerous, they are widely spread over the earth's surface (but absent from the Ethiopian

and Australian regions, and only represented by one species in the Neotropical region), and differ much among themselves in their food and manner of life. They are mostly omnivorous or vegetable feeders, and even the Polar Bear, usually purely carnivorous or piscivorous, devours grass with avidity in summer. The various species may be grouped in the following sections. (1) Thalassarctos. Head comparatively small, molar teeth small and narrow. Soles more covered with hair than in the other sections. U. maritimus, the Polar or White Bear of the Arctic regions. (2) Ursus proper. U. arctos, the common Brown Bear of Europe and Asia, a very variable species, to which U. syriacus and isabellinus, if distinct, are nearly related ; U. horribilis, the Grizzly Bear, an American represen- tative form; U. tibetanus, japonicus, and americanus, the Black Bears of the Himalayas, Japan, and North America ; U. ornatus, the Spectacled Bear of the Peruvian Andes, (3) Helarctos. Head short and broad. Molar teeth comparatively broad (but the length still exceeding the breadth). Tongue very longand extensile. Fur short and smooth. U.malayanus, the Malay Bear or Sun Bear. See Brar.

Melursus. This differs from the true Bears in the first upper incisor being absent or shed at a very early age, in the very small

gize of the other teeth, in the very large extensile lips, and in other minor characters. The one species, M. labiatus, the well- known Sloth Bear of India, feeds chiefly on black ants, termites, beetles, fruit, honey, &e.

The great Cave Bear, the remains of which are found so abund- antly in eaves of Pleistocene age in Europe, was a true Ursus, and as much or more specialized as any existing species, as it had lost its three anterior premolars in the adult state, but in Ursus arvernensis and older species from the Pliocene they were all re- tained. Still more generalized forms of Bears, presenting various degrees of transition towards a common Carnivorous type, are repre- sented by the genera

Extinct CARNIVORA OF DouBTFuUL POSITION.

The discovery of fossil remains in Eocene and early Miocene formations both in Europe and North America, shows that numerous species of terrestrial carnivorous animals existed upon the earth during those periods, which eannot be referred to either of the sections into which the order has now become broken up. By some zoologists these have been supposed to be Marsupials, or at least to show transitional characters between the Didelphous and Monodelphous subclasses. By others they are looked upon as belonging altogether to the latter gronp, and as the eommon ancestors of existing Carnivores and Insectivores, or perhaps rather as descendants or relatives of sueh common ancestors, retaining more of the generalized characters than any of the exist- ing species. They shade off almost insensibly into numerous other forms less distinctly carnivorous, to the whole of which, including the modern Juscctivora, Cope (to whom we are indebted for onr principal knowledge of the American extinct species) gives the name of BuNoTUERIA, those more specially related to the existing Carnivora forming the snborder Creodonta, which is divided into the five families, Arctocyonidx, Miacide, Oxyenidx, Amblyctonide, and Meronychide. These are cases, however, in which the appli- cation of the principles of classification adopted in the case of existing species, of which the entire structure is known, and which have become divided into isolated groups by the extinction of intermediate forms, is really impossible. If the generally accepted view of evolution is true, and the extreme modifications pass insensibly into each other by minute gradations (a view the paleontological proof of which becomes strengthened by every fresh discovery), there must be many of these extinct forms which eannot be assigned to definitely characterized groups. There are, however, some which stand out prominently from the others as formed on distinct types, having no exact representatives at present living on the earth. Of these the best-known is that named Hyenodon, of which, with the nearly allied Pterodon, many species

Fig, 122.—Dentition of Hyxnodon leptorhynchus (Lower Miocene, France). The posterior molar is concealed behind the penultimate tooth.

have been found both in Europe and America. They had the full number of forty-four teeth, grouped in the usual manner, and the incisors, canines, and premolars were formed upon the ordinary Carnivorous type as now seen in

*the Canidex, the fourth premolar above and the first true molar below being formed upon the *sectorial" plan, but the teeth behind these, instead of being tuberculated as in all existing Carnivora, repeated the characters of the sectorial, and also increased iu size, especially in the lower jaw, from before backwards. They thus present some resemblance to the teeth of such carnivorous Marsupials as the Dasyuride ; but, as the researehes of Filho] have demonstrated, their milk deutition follows precisely the rnle of existing placental heterodont mammals, and not that characteristic of the Marsupials, They show, morcover,*

none of the essential cranial modifications which distingnish true Marsupials. The curious American genus UOxwna seems to have been a specialized form of this type, and the European Proviverra or Cynohyenodon of Filhol) forms a complete transition between it and the Viverride. In Arctocyon primexvus, the oldest known Tertiary mammal, from the lowest Eocene beds of La Fére, department of Aisne, France, on the other hand, all the molars were tuberculated, and have been compared with those of the Procyonidx and also Gymnura, among the Jnscctivora. The small size of the brain of these early forms is not, as has been supposed, a special Marsupial character, but is common to the primitive forms of all groups of vertebrates. Jfcsonyx, from the Kocene of North Ameriea, seems to have been a very generalized form, with flat blunt claws, and long and slender tail. Cope makes the interesting suggestion that this may have been in the ancestral line of the Pinnipeds, but his state- ment that the scaphoid and lunar bones of the carpus were distinct offers a decided difficulty to the acceptance of this view.

SuzsorperR PINNIPEDIA.

These differ from the rest of the Carnivora mainly in the structure of their limbs, which are modified for aquatic progression,—the two proximal segments being very short and partially enveloped in the general integument of the body, while the third segment, especially in the hinder ex- tremities, is elongated, expanded, and webbed. There are always five well-

developed digits on each limb. In the hind limb the two marginal digits (first and fifth) are stouter and generally larger than the others. The teeth also differ from those of the more typical Carnwora. The incisors are always fewer than 3. The molar series consists generally of four premolars and one molar of very uniform characters, with never more than two roots, and with conical, more or less compressed, pointed crowns, which may have accessory cusps, placed before or behind the principal one, but are never broad and tuberculated. The milk teeth are very small and simple, and are shed or absorbed at a very early age, usually either before or within a few days after birth. The brain is relatively large, the cerebral hemispheres broad in proportion to their length, and with numerous and complex convolutions. There is a very short cecum. The kidneys are divided into numerous distinct lobules. There are no Cowper's glands. Mammee two or four, abdominal. No clavicles. Tail always very short. Eyes very large and exposed, with flat cornea. The nostrils close by the elasticity of their walls, and are opened at will by muscular action.

The animals of this group are all aquatic in their mode of life, spending the greater part of their time in the water, swimming and diving with great facility, feeding mainly on fish, crustaceans, and other marine animals, and progress- ing on land with difficulty. They always come on shore, however, for the purpose of bringing forth their young. They are generally marine, but they occasionally ascend large rivers, and some inhabit inland seas and Jakes, as the Caspian and Baikal. Though not numerous in species, they are widely distributed over the world, but occur most abundantly on the coasts of lands situated in cold and temperate zones, The suborder is divisible into three well- marked families :—the Otaride or Sea Bears, which form a transition from the Fissiped Carnivora to the Seals; the Trichechide, containing the Walrus ; and the Phocide or typical Seals.

Family OTARIIDE.

When on Jand the hind feet are turned forwards under the body, and aid in supporting and moving the trunk as in ordinary quadrupeds. .A small externalear. Testes suspended in a distinct

external scrotum. Skull with post-orbital processes and alisphenoid canal. Palms and soles of feet naked.

Otaria.—Dentition: ¢ 3, ¢ 4, p 4, m +; total 34 or 36. First and second upper incisors small, with the summits of the crowns divided by a deep transverse groove into an anterior and a posterior cusp of nearly equal height; the third large and eanine-like.- Canines large, conical, pointed, recnrved. Molars and premolars, usually §, of which the second, third, and fourth are

preceded by milk teeth shed a few days after birth ; sometimes (as in fig. 128) a sixth upper molar (occasionally developed on one side and not the other) ; all with similar characters, generally uniradi- cular ; crown moderate, compressed, pointed, with a single principal eusp, and sometimesa cingulum, and more or less developed anterior and posterior accessory cusps. Vertebre : C7,D15, L 5,84, C

——

Fig. 123.—Skull and Dentition of Otaria forstert. From Gray,

Proc. Zool, Soc., 1872, p. 660.

9-10. Head rounded. Eyes large. Pinna of ear small, narrow, and pointed. Neck long. Skin of all the feet extended far beyond the nails and ends of the digits, with a deeply-lobed margin. 'The nails small and often quite rudimentary, especially those of .the first and fifth toes of both feet; the best-developed and most constant are the three middle claws of the hind foot, which are elongated, com- pressed, and eurved.

The Otariz, or Eared Seals, commonly called Sea Bears or Sea Lions, are widely distributed, especially in the temperate regions of both hemispheres, though absent from the coasts of the North Atlantic. As might be inferred from their power of walking on all fours, they spend more of their time on shore, and range inland to greater dis- tanccs, than the true Seals, especially at the breeding time, though they are obliged always to return to the water to seek their food. They are gregarious and polygamous, and the males are usually much larger than the females, a circumstance which has given rise to some of the confusion existing in the specific determination of

*the various members of the genus. Some of the species possess, in addition to the stiff, close, hairy covering common to all the group, an exceed- ingly fine, dense, woolly under fur. The skins of these, when dressed and deprived of the longer harsh outer hairs, constitute the '*sealskin" of commerce, so much valued for wearing apparel, which is not.the product of any of the true Seals, The best-known species are O. stelleri, the Northern Sea Lion, the largest of the genus, from the North Pacific, about 10 feet in length; 0. jubata, the Southern Sea Lion, from the Falkland Islands and Patagonia ; 0. californiana, from California, frequently exhibited alive in menageries in Europe; 0. wrsina, the common Sea Bear or Fur Seal of the North Pacific, the skins of which are imported in immense numbers from the Prybiloff Islands ; 0. pusilla, from the Cape of Good Hope; 0. forsteri and others, from the coasts of Aus- tralia and various islands scattercd over the southern hemisphere. These have been grouped by some zoologists into many genera, founded upon very trivial modifications of teeth and skull.*

Family TRICHECHIDA.

In many characters the single genus comprising this family is intermediate between the Otartide and Phocidx, but it has a completely aberrant dentition. Phocide ; but when on land the hind feet are turned forwards and used in progression, though less completely than in the Otariidz.

The upper canines are developed into immense tusks, which |

descend a long distance below the lower jaw. All the other teeth, including the lower canines, are much alike, small, simple and one-rooted, the molars with flat crowns. The skull is without post- orbital process, but has an alisphenoid canal.

Trichechus, Linn. ; Odobenus, Brisson (which some modern zoologists have revived).—Dentition of young : 7 $, c}, p and w §. Many of these teeth are, however, lost carly or remain through life in a rudimentary state, concealed by the gums, The teeth which are usually developed functionally are i 4, ¢ 4, P 3, ™ %3 total18. Vertebra: C7,D14,L6,94,C 9. Head round. Eyes rather small. Muzzle short and broad, with on each side a group of long, very stiff, bristly whiskers. The remainder of the hair cover- ing very short and adpressed. 'Tail very rudimentary. Fore feet with subequal toes, with five

minute flattened nails. Hind feet with subequal toes, the fifth slightly the largest, with eutaneous lobes pro- jecting beyond the ends as in Ofaria ; first and fifth with minute flattencd nails ; second, third, and fourth with large, elongated, sub- eompressed pointed nails.

The Walrus or Morse (7. rosmarus) is found throughout the circum- polar regions, those of the North Atlantie and North Pacifie being considered by some zoologists as distinct species, by others as local varieties, It is gregarious, but, owing to the destruction by the

It has no external ears, as in the |

sealers for the sake of its tusks, oil, and hide, it is far less abundant than formerly. The use of the great tusks (which are developed in both sexes, though in the female they are more slender than in the male) appears to be for scraping and digging among the sand and shingle for the molluscs and crustaceans which form its principal sustenance ; they are also formidable weapons of defence.

Family Poocipa.

The true Seals are the most completely adapted for aquatic life of all the Pinnipeds. When on land the hind limbs are extended behind them and take no part in progression, which is effected by a series of jumping movements produced by the muscles of the trunk, in some species aided by the fore limbs only. The palms and soles of the feet are hairy. There is no pinna to the ear, and no scrotum, the testes being abdominal. The upper incisors have simple, pointed crowns, and vary in number in the different groups. All have well developed canines and $ teeth of the molarseries. In those species of which the milk dentition is known, there are three milk molars, which precede the seeond, third, and fourth permanent molars ; the dentition is therefore p 4, m 4, the first premolar having as usual no milk predecessor. The skull has no post-orbital process and no alisphenoid canal. The fur is stiff and adpressed, without woolly under fur.

Subfamily Phocinss.—Incisors $. All feet with five well- developed claws. The toes on the hind feet subequal, the first and fifth not greatly excceding the others in length, and with the interdigital membrane not extending beyond the toes.

Halichcerus.—Dentition : 7 $, c+, p4, m4; total 34. Molars with large, simple, conical, recurved, slightly compressed crowns, with sharp anterior and posterior edges, but without accessory cusps, except sometimes the two hinder ones of the lower jaw. With the exception of the last one or two in the upper jaw and the last in the lower jaw they are all uniradicular. Vertebre : 07, D15, L5, $4, C14.

One species, H. grypus, the Grey Seal of the coasts of Scandinavia and the British Isles.

Phoca.—Dental formula as the last. Teeth smaller and more pointed. Molars with tworoots (except the first in each jaw). Crowns with accessory cusps. Vertebre: by, D 14-15, L5, $4, C11-14. Head round and short. Fore feet short, with five very strong, sub- compressed, slightly curved, rather sharp claws, subequal in length. On the hind feet the claws much narrower and less eurved. Tho species of this genus are widely distributed throughout the northern hemisphere, and include P. barbata, the Bearded Seal; P. grenland- tea, the Greenland Seal; P. vitulina, the Common Scal ; and P. hispida, the Ringed Seal of the North Atlantic ; P. caspica, from the Caspian and Aral Scas; and P. siberica, from Lake Baikal. See SEAL.

Subfamily Stenorhynchinee.-—Incisors 3. Molars two-rooted, except the first. On the hind feet the first and fifth tocs greatly exceeding the others in length, with nails rudimentary or absent.

Monachus.—Dentition : 7 %, ¢1, p#, m4; total 32. Crowns of molars strong, conical, eompresscd, ollowed on the inner side, with /a strongly-marked lobed cingulum, especially on the inner side, and slightly developed accessory eusps before and behind. The first and last upper and the first lower molar considerably smaller than the others. Vertebre :, C7, D15, L5,82,C11. All the nails of both fore and hind feet very small and rudimentary. One species, MM. albiventer (Pelagius monachus of some

authors), the Monk Seal of the Mediterranean and adjacent parts of the Atlantic.

The other genera of this section have the same dental formula, "put are distinguished by the eharaeters of the molar teeth and the feet. 'hey are all inhabitants of the shores of the southern hemisphere.

Stenorhynchus (Ogmorhinus, Peters). —All the teeth of the molar serics with, three distinct pointed cusps, deeply separated from each other ; of these the middle or principal cusp is largest and slightly recurved ; the other two (anterior and posterior) are nearly equal in size, and have their apices directed towards the middle one. Skull much elongated. One species, S. leptonyx, the Sea Leopard, widely distributed in the Antarctic and southern temperate seas,

Lobodon.—Molars with much-compressed elongated crowns, with a principal recurved cusp, rounded and somewhat bulbous at the apex, and with one anterior, and one, two, or three posterior, very distinct aceessory cusps. One species, L. carcinophaga.

Leptonyz,—Molars small, with simple, subcompressed, conical crowns, with a broad cingulum, but no distinet accessory cusps. L. weddellti.

Ommatophoce.—All tho teeth very small; those of the molar series with pointed recurved crowns, and small posterior and still less developed anterior accessory cusps. Orbits very large. Nails quite rudimentary on front and absent on hind feet. The skull bears a considerable resemblance to that of the members of the next subfamily, towards which it may form a transition. There is one species, Q. rossit, of whieh very httle is known.

Subfamily Cystophorines.—Incisors ?. Tceth of molar series

generally one-rooted. Nese of males with an appendage capable of

being inflated. k y the others in length, with prolonged cutaneous lobes, and rudi-

mentary or no nails.

Cystophora.—Dentition : 72, ¢4, p¢, m4; total 30. The last molar has gencrally two distinct roots. Beneath the skin ovcr the face of the male, and connected with the nostrils, is a sac capable of inflation, when it forms a kind of hood covering the upper part of the head. Nails present, thongh small on the hind feet. C. cristata, the Hooded or Bladder-Nose Seal of the Polar Seas.

Macrorhinus.—Dentition as the last, but molars of simpler char- acter, and all one-rooted. All the teeth, except the canines, very small relatively to the size of the animal. Hind feet without nails. Vertebre: C7,D15,L5,84, C11. Nose of adult male pro- duced into a short tubular proboscis, ordinarily flaccid, but capable of dilatation and elongation under excitement. One species, AZ. leonina, the Elephant Seal, or "Sea Elephant" of the whalers, the largest of the whole family, attaining the length of nearly 20 feet. Formerly abundant in the Antarctic Seas, and also found on the coast of California.

EXtTIncT PINNIPEDS.

Remains of animals of this group have been found in late Miocene and Pliocene strata in Europe and America, the most abundant and best preserved being those of the Antwerp Crags, the subject of a recent illustrated monograph by Van Beneden. Nothing has, however, yet been diseovered which throws any light upon the origin of the group, as all the extinct forms at present known come within the definition of the existing families; and, though annectant forms betwecn these occur, there are as yet no transitions to a more generalized type of mammal, Indeed, all those of which the characters are best known belong to the com- pletely developed Phocine or Triehechine, not to the Otarine, type. The structure of the Pinnipeds is so clearly a modification of that of the terrestrial Carnivores, especially of the Arctoid type, that it is difficult to imagine that they can have had any other origin but one in common with that group; but the separation must have taken place early in the Tertiary epoch, if not before.

Bibliography of Pinnipedia.—J. A. Allen, History of North American Pinni- peds, 1880; P. J. Van Beneden, Ossements fossiles d'Anvers, pt. i., 1877.

OrpErR PRIMATES.

This order in the system of Linnzeus includes Man, all the Monkeys, the Lemurs, and the Bats. By common con- sent of all zoologists the last-named animals have been removed into a distinct order. With regard to the associa- tion of the others, there has been, and still is, much difference of opinion.

That all the Monkeys, from the highest Anthropoid Apes to the lowest Marmosets, form a natural and tolerably homogeneous group seems never to have been questioned ; but whether the Lemurs on the one hand and Man on the other should be united with them in the same order are points of controversy. With regard to the first, the question has already been referred to in the article Lemur, in which an account has been given of the characters and the princi- pal modifications of the type. If, in accordance with the traditional views of zoologists, they are still considered to be members of the order Primates, they must form a sub- order apart from all the others, with which they have really very little in common except the opposable hallux of the hind foot, a character also met with in the Opossums, and which is therefore of very secondary importance,

The history of all the various forms of true Monkeys is very fully given in the article Arg. The position of Man alone remains to be considered. In the Systema Nature of Linnzus he was separated only generically from thie Apes, but in the next great work which exercised a wide- spread influence over the progress of zoological science, the fiégne Animal of Cuvier, he forms a distinct order under the name of Bimana, the Monkeys and Lemurs being associated together as Quadrumana. This has been the prevailing arrangement in the zoological systems of the present century, though in the classification of Owen his position is still farther removed from that of the Monkeys, is in it the genus Zomo' forms one of the four primary divisions or subclasses of the Mammalia, called Archence- phala, the Quadrumana being united with the Carnivora,

MAMM

First and fifth toes of hind feet greatly excceding |

A Telok

Ungulata, and others in another division called Gyrence- phala. On the other hand the tendency of most modern systematists, for reasons which have been fully stated by Professor Huxley,! is to revert towards the Linnean position, Considering solely the facts of Man's bodily structure, it can be clearly demonstrated that the points in which he differs from the most nearly resembling Ape are not of greater importance than those by which that Ape differs from other universally acknowledged members of the group; and therefore, in any natural system, if Mau is to be made a subject of zoological classification upon the same principles as those applied elsewhere, he must be in- cluded in the order which comprises the Monkeys. We say upon the same principles as are applied elsewhere, us zoological classification has never taken into consideration the psychological characteristics which distinguish the sub- jects of its investigations, but only their tangible and physical structure, otherwise eudless confusion would result, at all events with our very imperfect knowledge of animal psychology. The essential attributes which distin- guish Man, and give him a perfectly isolated position among living creatures, are not to be found in his bodily structure, and therefore should either be left entirely out of consideration or have such weiglit given to them as would remove him completely out of the region of zoologi- cal classification. To profess to classify Man as if he were one of the animals, as in all points of the structure aud functions of his organs he undoubtedly is, to place him in the class Mammalia, and then to allow other con- siderations to influence the judgment as to the particular position he should occupy in the class, is most illogical.

Man, therefore, considered from a zoological point of view, must be included in the order Primates, even if the Lemurs are removed from it, as' his structural affinities with the Monkeys are far closer than are those of the so- called " Half-Apes." We may, without treading upon debateable ground, go farther, and say that the differences between Man and the Anthropoid Apes are really not so marked as those which separate the latter from the American Monkeys. Perhaps the best exposition of the facts relating to the present condition of the order will be a division into five sections, which may be considered as families, of course without intending to imply that they are exactly equivalent, or that the intervals which separate them are of precisely the same importance, but that they are five distinct groups, all

branches from a common stem, and unconnected in the present condition of nature by any intermediate forms. These are—(1) Hominida, con- taining Man alone; (2) Smid, containing the four genera of Man-like Apes: Z'roglodytes, Gorilla, Sima, and Hylobates ; (3) Cercopithecidx, containing all the remaining Old-World Monkeys ; (4) Cebidx, containing the American Monkeys having three trne molar teeth on each side of each jaw ; and (5) Hapalide, the American Monkeys with two molar teeth, or Marmosets.

The distinctions between Hominidxe and Simide, of which alone we have to treat at present, as the characters of the other families are given in the article APE, are cluiefly relative, being greater size of brain and of brain case as compared with the facial portion of the skull, smaller development of the canine teeth of the males, more com- plete adaptation of the structure of the vertebral column to the vertical position, greater length of the lower as com- pared with the upper extremities, and greater length of hallux or great toe, with almost complete absence of the power of bringing it in opposition to the other four toes. The last

1 Man's Place in Nature, 1868, and Anatomy of Vertebrated Ani- mals, 1871. See also the more recent investigations of Broca into the comparative strueture of Man and the higher Apes, published mostly in the Revue d Anthropologie.

and the small size of the canine teeth are perhaps the most imarked and easily defined distinctions that can be drawn between the two groups. ,

Man is universally admitted to form a single genus, Homo of Linnzus, but a question of considerable import- ance in treating of him from a zoological point of view, and one which has been a subject of much controversy, is whether all men should be considered as belonging to one or to several species. 'This question is perhaps of less importance now than formerly, when those who maintained a plurality of species associated with the hypothesis plurality of origin. One of the strongest arguments against the

view that the various races of Man represent more than one species is that none of those who have maintained it have been able to agree as to how many dis- tinct specific modifications can be defined, almost every number from three to twenty or more having been advo- cated by different authors. Ifthe distinguishing characters of the so-called species had been so marked, there could not be such a remarkable diversity of opinion upon them. Again, the two facts—(1) that, however different the ex- tremes of any two races may be in appearance (and it must be admitted that, as advocated by many polygenists, the differences are greater than many which are considered specific among other animals), every intermediate grad- ation can be found through which the one passes into the other, and (2) that all races are fertile ¢nter se—are quite conclusive in favour of considering Man as repre- senting a single species in the ordinary sense in which the word is now used, and of treating of all his various modifications as varieties or races.

The great problem at the root of all zoology, the discovery of a natural classification which shall be an expression of our knowledge of the real relationship or consanguinity of different forms, is also applicable to the study of the races of Man. When we can satisfactorily prove that any two of the known groups of mankind are descended from the same common stock, a point is gained. The more such points we have acquired the more nearly shall we be able to picture to ourselves, not only the present, but the past distribution of the races of Man upon the earth, and the mode and order in which thcy have been derived from one another. But the difficulties in the way of applying zoological principles to the classification of Man are vastly greater than in the case of most animals. When groups of animals become so far differentiated from each other as

to represent separate species, they remain isolated ; they –

may break up into further subdivisions—-in fact, it is only by further subdivision that new species can be formed ; but it is of the very essence of species, as now universally understood by naturalists, that they cannot recombine, and so give rise to new forms. With the varieties of Man it is otherwise. They have never so far separated as to answer to the physiological definition of species. All races, as said above, are fertile with one another, though perhaps in different degrees. Hence new varieties have

constantly been formed, not only by the segmentation of portions of one of the old stocks, but also by various combinations of those already established.

Without entering into the difficult question of the method of Man's first appearance upon the world, we must assume for it vast antiquity,—at all events as measured by any historical standard. Of this there is now ample proof. During the long time he existed in a savage state—a time compared to which the dawn of our historical period is as yesterday—he was influenced by the operation of those natural laws which have produced the variations scen in other regions of organic nature. The first Men may very probably have been all alike ; but, when spread over the face of the earth, and become subject

to all kinds of diverse external conditions,—climate, food,

competition with embers of his own species or with wild animals,—racial differences began slowly to be developed through the potency of various kinds of selection acting upon the slight variations which appeared in individuals in obedience to the tendency planted in all living things. These differences manifested themselves externally in the colour of the skin, the colour, quality, and distribution of the hair, the form of the head and features, and the pro- portions of the limbs, as well as in the general stature.

Geographical position must have been one of the main elements in determining the formation and permanence of races. Groups of Men isolated from their fellows for long periods, such as those living on small islands, to which their ancestors may have been accidentally drifted, would naturally, in course of time, develop a new type of features, of skull, of complexion, or hair. A slight set in one direc- tion, in any of these characters, would constantly tend to intensify itself, and so new races would be formed. In the same way, different intellectual or moral qualities would be gradually developed or transmitted in different groups of Men. The

longer a race thus formed remained isolated, the more strongly impressed and the more perma- nent would its characteristics become, and less liable to be changed or lost when the surrounding circumstances were altered, or under a moderate amount of intermixture from other races—the more " true" in fact, would it be. On the otlier hand, on large continental tracts, where no mountain ranges or other natural barriers form obstacles to free intercourse between tribe and tribe, there would always be a tendency towards uniformity, from the amalgamation of races brought into close relation by war or by com- merce. Smaller or feebler races would be destroyed or absorbed by others impelled by superabundant population or other causes to spread beyond their original limits ; or sometimes the conquering race would itself disappear by absorption into the conquered.

Thus, for untold ages, the history of Man has presented a shifting, kaleidoscopic scene: new races gradually be- coming differentiated out of the old elements, and, after dwelling a while upon the earth, eithcr becoming suddenly annihilated or gradually merged into new combinations ; a constant destruction and reconstruction; a constant tendency to separation and differentiation, and a tendency to combine again into a common uniformity—the two tendencies acting against and modifying each other. The history of these processes in former times, except in so far as they may be inferred from the present state of things, is a difficult study, owing to the scarcity of evidence. If we had any approach to a complete palzeontological record, the history of Man could be reconstructed ; but nothing of the kind is forthcoming. Evidence of the anatomical characters of Man, as he lived on the earth during the time when the most striking racial characteristics were being developed, during the long ante-historic period in which the Negro, the Mongolian, and the Caucasian were being gradually fashioned into their respective types, is entirely wanting, or if any exists it is at present safely buried in the earth, perhaps to be revealed at some unexpected time and in some unforeseen manner. Even the materials from which a history of the modifications of the human species as known to our generation must be constructed are rapidly passing away, as the age in which we live is an age in which, in a far greater degree than any previous one, the destruction of races, both by annihilation and absorption, is going on. Owing to the rapid extension of maritime discovery and commerce, changes such as have never been witnessed before are now taking place in

the ethnology of the world, changes especially affecting the island popula-
tions among which, more than elsewhere, the solution of

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many of these problems may be looked for.

MAM MALGI&

The subject

is, however, attracting the attention of observers of all countries to a
greater degree than it ever has before, with the usual result of bringing
distrust upon, and dissatis- faction with, the old systems, without as yet
establishing anything in their place which meets with universal accept-

ance,

The difficulty of finding distinctive characters

capable of strict definition by which races or groups may be differentiated
may be inferred from what has been said

above.

It is rather by the preponderance of certain

characters in a large number of members of a group than by the exclusive
or even constant possession of these characters in each of its members that
the group must be

distinguished.

Hence, in all cases in which the characters

can be expressed by the numerical method, as in the

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dimensions and proportions of different parts of the body, averages are now largely used by anthropologists. Provided the data upon which these averages are based have been obtained from a sufficient number of individuals, they can be absolutely relied upon to express the prevailing or most characteristic development of each particular feature in any group, and permit satisfactory comparisons between the

conditions of that feature in different groups.

Great pro-

gress is now being made in perfecting the methods of investigation of racial characteristics, and as we are begin- ning to learn what lines of research are profitable and what are barren, we may hope that the time is not far distant when we may get some clear insight into the knowledge of the natural classification and relationships of

the races of Man.

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MAMMOTH

MAMMOTH, a name commonly given to one of the numerous extinct forms of Elephant, Llephas primigenius of Blumenbach and most subsequent authors.! Prob- ably no animal which has not survived to the historic period has left such abundant and well-preserved evidence of its former existence. The discovery of immense

numbers, not only, a8 in the case of most extinct creatures, in the form of fragmentary bones and teeth, but often as more or less entire carcases, or "'mummies" as they may be

Fic. 1.—Restored Skeleton of Mammoth Imp. Se. St Pétersbourg, t. v. (1815).

called, with the flesh, skin, and hair 2 stu, in the frozen soil of the tundras of northern Siberia, has for a long time given great interest to the species, and been the cause of many legendary stories among the natives of the lands in which they occur. Among these one of the most prevailing is that the Mammoth was, or still is, an animal which passes its life habitually in burrows below the surface of the ground, and which immediately dies if by any chance it comes into the upper air.

The general characteristics of the animals of the order Proboscidea, to which the Mammoth belongs, are given in the article MamMALtia (p. 423). Its position is also there indicated as a member of the most highly specialized section of the group of Elephants, that called by Falconer Luelephas, which also contains the modern Asiatic species. Of the whole group it is in many respects, as in the size and form of the tusks, and especially the characters of the molar teeth, the farthest removed from the primitive Mastodon-like . type, while its nearest surviving relative, /. indicus, has retained the slightly more generalized characters of the Mammoth's contemporaries of more southern climes, JZ. columbi of America, and #. armeniacus of the Old World, if, indeed, it can be specifically distinguished from them.

The tusks or upper incisor teeth were doubtless present in both sexes, but probably of smaller size in the female. In the adult males they often attained

the length of from 9 to 10 feet measured along the outer curve. Upon leav- ing the head they were directed at first downwards and outwards, then upwards and finally inwards at the tips,

1 The word Mammoth was introduced into the languages of western Europe about two centuries ago from the Russian, and is thought by Pallas and Nordenskidld to be of Tartar origin, but others, as Witzen, Strahlenburg, and Howorth have endeavoured to prove that it is a corruption of the Arabic word Behemoth, or great beast.

(Elephas primigenius). From Tilesius in Afém. Acad.

and generally with a tendency to a spiral form not seen in other species of Elephant. Different specimens, however, present great variations in curve, from nearly straight to an almost complete circle.

It is chiefly by the characters of the molar teeth that the various extinct modifications of the Elephant type are distinguished. Those of the Mammoth (see fig. 2) differ from the corresponding organs of allied species in (1) great breadth of the crown as compared with the length, (2) the narrowness and crowding or close approximation of the ridges, (3) the thinness of the enamel and its straightness, parallelism, and absence of "crimping" as seen on the worn surface, or in a horizontal section of the tooth. The molars, as in other Elephants, are six in number on each side above and below, suc- ceeding each other from before backwards. Of these Dr Falconer gave the prevailing "ridge-formula" (or number of complete enamelled ridges in each tooth) as 4, 8, 12, 12, 16, 24, as in ZF. indicus. Dr Leith Adams, working from more abundant materials, has shown tliat the number of ridges of each tooth, especially those at the posterior end of the series, is subject to very great individual variation, ranging in each tooth of the series within the following limits: 3 to 4,6 to 9, 9 to 12, 9to 15, 14 to 16, 18 to 27,—excluding the smal] plates called "talons" at each end of the tooth. Besides these variations in the number of ridges or plates of which each tooth is composed, the thickness of the enamel varies so much as_ to have given rise to a distinc- / tion between a \ " thick-plated " and a " thin-plated " variety, —the latter be- ing most pre- Fyq, 2.—Grinding Surface of

Upper Molar Tooth valent among of the Mammoth (Hephas primigenius). From the specimens Owen. c, cementum; d, dentine; e, enamel. from the Arctic regions,and most distinctively characteristic of the species. From the specimens with thick enamel plates the transition to the other species or varieties men- tioned above, including LZ. indicus, is almost imperceptible.

The bones of the skeleton generally more resemble those of the Indian Elephant than of any other known species, but the skull differs, in the narrower summit, narrower temporal fosse, and more prolonged incisive sheaths, required to support the roots of the enormous tusks. Among the external characters by which the Mammoth was distinguished from either of the existing species of Elephant was the dense clothing, not only of long coarse outer hair, but also of close under woolly hair, of a reddish- brown colour, evidently in adaptation to the colder climate which it inhabited. his character, for a knowledge of which we are indebted to the well-preserved remains found in northern Siberia, is also represented in the rude but

graphic drawings of prehistoric age, found in caverns in the south of Francc.! In size different individuals varied considerably, but the average height does not appear to have exceeded that of either of the existing species of Elephant. .

The geographical range of the Mammoth was very extensive. There is scarcely a county in England in which some of its remains have not been found either in alluvial deposits of gravel or in caverns, and numbers of its teeth are from time to time dredged up from the bottom of the sea by the fishermen who ply their trade in the German Ocean, having been washed out of the water-worn cliffs of the eastern counties of England. In Scotland and Ireland its remains are less abundant, but they have been found in vast numbers at various localities throughout the greater part of central Europe (as far south as Santander in Spain and Rome), northern Asia, and the northern part of the American continent, though the exact distribution of the Mammoth in the New World is still a question of debate. It has not hitherto been met with in any part of Scan- dinavia or Finland.

In point of time, the Mammoth belongs exclusively to the post-Tertiary or Pleistocene epoch of geologists, and it was undoubtedly contemporaneous with man in France, and probably elsewhere. There is evidence to show that it existed in Britain before, during, and after the glacial period.

As before indicated, it is in the northern part of Siberia that its remains have been found in the greatest abund- ance, and in quite exceptional conditions of preservation. For a very long period there has been from that region a regular export of Mammoth ivory in a state fit for com- mercial purposes, both eastward to China and westward to Europe. In the middle of the 10th century an active trade was carried on at Khiva in fossil ivory, which was fashioned into combs, vases, and other objects, as related by Abu 71 Kasim, an Arab writer of that period. Mid- dendorff reckoned that the number of tusks which have yearly come into the market during the last two centuries has been at least a hundred pairs, and Nordenskiold from personal observation considers this calculation as prob- ably rather too low than too high. They are found at all snitable places along the whole line of the shore between the mouth of the Obi and Behring's Straits, and the farther north the more numerous do they become, the islands of New Siberia being now one of the most favourite collecting localities. The soil of Bear Islands and of Liachoff Islands is said to consist only of sand aud ice with such quantities of Mammoth bones as almost to compose its chief substance. The remains are not only found around the mouths of the great rivers, as would be the case if the carcases had been washed down from more southern localities in the interior of the continent, but are imbedded in the frozen soil in such circumstances as to indicate that the animals had lived not far from the localities in which they are now found, and they are exposed either by the melting of the ice in unusually warm summers or by the washing away of the sea cliffs or river banks by storms or floods. In this way the bodies of more or less perfect animals, often standing in the erect position, with the soft parts and hairy covering entire, have frequently been brought to light.

References to the principal recorded discoveries of this kind, and to the numcrous speculations to which they have given rise, both among the ignorant peasants and learned academicians, will be found in Nordenskiéld's Voyage of the Vega (English translation,

vol. i, 1881, p. 398 sq.) and a series of papers in the Geological Magazine for 1880 and 1881, by H. H. Howorth. For the geo- i nS ca

u The best-known of these is the etching upon a portion of tusk found in the cave of La Madelaine in the Dordogne, figured in Christy and Lartet's Reliquiw Aquitanice, and in many other works bearing on the subject of the antiquity of man.

graphical distribution and anatomical characters, see Falconer's Palzxontologieal Memoirs, vol. ii., 1868; Boyd Dawkins, " Hlephas – primigenius, its range in space and time," Quart. Jour. Geol. Soe., XXxXV. p. 188 (1879); and Leith Adams, " Monograph of British Fossil Elephants," part ii., Palwontographical Soetety, 1879. (W. H. F.)

MAMMOTH CAVE, in Edmondson county, Kentucky, United States, 37° 14' N. lat. and 86° 12' W. long., by rail 85 miles south-south-west of Louisville, was discovered, in 1809, by a hunter named Hutchins, while in pursuit of a wounded bear. Its mouth is in a forest ravine, 194 feet above Green river, and 600 feet above the sea. This aperture is not the original mouth, the latter being a chasm a quarter of a nile north of it, and leading into what is known as Dixon's Cave. The two portions are not now connected, though persons in one can make themselves heard by those inthe other. Saltpetre was formerly made from the nitrous earth in which the cave abounded; but it is now mainly turned to account as a place of exhibition.

The cavernous limestone of Kentucky covers an area of 8000 square miles, is massive and homogeneons, and belongs to the Subcarboniferous period. It shows few traces of dynamic disturbance, but has been carved, since the Miocene epoch, into many caverns, of which the Mammoth Cave is the noblest specimen known. The region is undulating, but its valleys are mostly funnel-shaped depressions emptying through fissures into subterranean streams, which feed rivers, often of navigable size, and whose waters are never frozen over, even in severe winters. Such valleys are called sink-holes.

The natural arch that admits one to Mammoth Cave has a span of 70 feet, and from a ledge above it a cascade leaps 50 feet to the rocks below, where

it disappears. A winding flight of stone steps leads the way down to a narrow passage, through whicli the air rushes with violence, outward in summer, and inward in winter. The tempera- ture of the cave is uniformly 54° Fahr. throughout the year, and the atmosphere is both chemically and optically of singular purity. While the lower levels are moist from the large pools that have secret connexion with Green river, the upper galleries are extremely dry. These con- ditions led, at one time, to the erection of thirteen cottages, at a point about I mile under ground, for the use of invalids, especially consumptives. The experiment ended in failure, and only two cottages now remain.

The Main Cave, from 40 to 300 feet wide, and from 35 to 125 feet high, has several vast rooms, e.g., the Rotunda, where are the ruins of the old saltpetre works; the Star Chamber, where the protrusion of white crystals through a coating of the black oxide of manganese creates an optical Ulusion of great beauty ; the Chicf City, where an area of 2 acres is covered by a vault 125 feet high, and the floor is strewn with rocky fragments, among which are found numerous half-burnt torches made of canes, and other signs of prehistoric occupancy. Two skeletons were exhumed near the Rotunda; but no other bones of any description have been found. The so-called Mammoth Cave "mummies " (2.e., bodies kept by being inhumed in nitrous earth), with accompanying utensils, ornaments, braided sandals, and other relics, were found in Short and Salt caves near by, and removed to Mammoth Cave for exhibition. The Main Cave, which abruptly ends 4 miles from the entrance, is joined by winding passages, with spacious galleries on different levels; and, although the diameter of the area of the whole cavern is less than 10 miles, the combined length of all accessible avenues is supposed to be about 150 miles."

2 The present manager, Mr F. Klett, has undertaken the difficult task of a thorough survey, the results of which, so far as completed, are presented in the accompanying map. The portion beyond River Hall is supplemented from an older survey by Stephen, the guide.

MAMMOTH CAVE

The chief points of interest are arranged along two lines of exploration, besides which there are certain side excursions. The 'short route" requires

about four hours, and the "long route" nine. Audubon's Avenue, the one nearest the entrance, is seldom visited, except by the bats that hang from the walls in clusters like swarms of bees. The Gothic Avenue contains numerous large stalactites and stalagmites, and an interesting place called the Chapel, and ends in a small double dome and cascade. Among the most surprising features of cave scenery are the vertical shafts that pierce through all levels, from the uppermost galleries, or even from the sink-holes, down to the lowest floor. These are styled pits or domes, according to the position occupied by the observer. A crevice behind a block of stone 40 feet long by 20 wide, called the Giant's Coffin, admits the explorer toa place where six pits, varying in depth from 65 feet to 220 fect, exist in an area of 600 yards. This includes Gorin's Dome, which is viewed from a point midway in its side, and is by many regarded as the finest room in the

cavern. Others admire more the Mammoth Dome, at the termina-

tion of Spark's Avenue, where a cataract falls from a height of 250 feet amid walls wonderfully draped with stalactitic tapestry. The Egyptian Temple, which is a continuation of the Mammoth Dome,

MAP OF THE

MAMMOTH CAVE.

INDIAN AVENUE.

STAR CHAMBER.

LABYRINTH

the crystal fibres curl outward from the centre of the group. Thus spotless arches of 50 feet span are embellished by floral clusters and garlands, hiding nearly every foot of the grey limestone. The botryoidal formations hanging by thousands in Mary's Vineyard resemble mimic clusters of grapes, as the oulopholites resemble roses. Again there are chambers with drifts of snowy crystals of the sulphate of magnesia, the ceilings so thickly covered with their efflorescence that a loud concussion of the air will cause them to fall like the flakes of a snow storm.

Many small rooms and tortuous paths, where nothing of special interest can be found, are avoided as much as possible on the regular routes ; but certain disagreeable experiences are inevitable. There is peril also in the vicinity of the deep pits. The one known as the Bottomless Pit was for many years a barrier to all further exploration, but is now crossed by a wooden bridge. Long before the shaft had been cut as deep as now, the water flowed away by a channel gradually contracting to a serpentine way, so extremely narrow as to be called the Fat Man's Misery. The walls, only 18 inches apart, change direction eight times in 105 yards, while the distance from the sandy path to the ledge overhead is but 5 feet. The rocky sides are finely marked with waves and ripples,

contains six massive columns, two of them quite perfect, and 80 feet-high and 25 feet in diameter. The combined length of these contiguous chambers is 400 feet. By a crevice above they are con- nected with an arm of Audubon's Avenue. Lucy's Dome, about 300 feet high, is supposed to be the loftiest of all these vertical shafts. A pit called "the Maelstrom," in Croghan's Hall, is the spot most remote from the mouth of the cave; a son of Prentice, the poet, permitted himself to be lowered 190 feet by a rope to the bottom, in 1859. There are some fine stalactites near this pit, and others in the Fairy Grotto and in Pensico Avenue ; but, consider- ing the magnitude of Mammoth Cave, its poverty of stalactitic ornamentation is remarkable, The wealth of crystals is, however, eo peng: These are of endless variety and fantastic beauty. Besides the sparkling vault of the Star Chamber (300 feet long and 80 high), there are halls canopied by fieecy clouds, or studded with mimic snowballs, and others displaying various grotesque resem- blances on the walls and cciling.

Cleveland's Cabinet and Marion's Avenue, each a mile long, are adorned by myriads of gypsum rosettes and curiously twisted crystals, called "oulopholites." These cave flowers are unfolded by pressure, as if a sheaf were forced through a tight binding, and

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CROGHAN’S HALL.

Typograple ic Etching Co.,del.et Sc

as if running water had suddenly been petrified. This winding way conducts onc to River Hall, beyond which lie the crystalline gardens that have been described. It used to be said that, if this narrow passage were blocked up, escape would be impossible; but lately an intricate web of fissures, called the Corkscrew, has been discovered, by means of which a good climber, ascending only a few hundred feet, lands 1000 yards from the mouth of the cave, and cuts off one or two miles.

The waters, entcring through numerous domes and pits, and falling, during the rainy season, in cascades of great volume, are finally collected in River Hall, where they form several extensive lakes, or rivers, wliose connexion with Green river is known to be in two deep springs appearing under arches on its margin Wheuever there is a freshet in Green river the streams in the cave are joined in a continuous body of water, the rise some- times being 60 feet above the low-water mark. The subsidence within is less rapid than the rise ; and the streams are impassable for about seven months in each year. They are navigable from May to October, and furnish interesting features of cave scenery. The first approached is called the Dead Sea, embraced by cliffs 60 feet high and 100 feet long, above which a path has been made,

whence a stairway conducts us down to the banks of the River Styx, a body of water 40 fect wide and 400 feet long, crossed by a natural bridge. Lake Lethe comes next—a broad basin enclosed by walls 90 feet high, below which a narrow path leads to a pontoon at the neck of the lake. A beach of the finest yellow sand extends for 500 yards to Echo river, the largest of all, being from 20 to 200 feet wide, 10 to 40 feet deep, and about three-quarters of a mile long. It is crossed by boats. The arched passage-way is very symmetrical, varying in height from 10 to 35 feet, and famous for its musical reverberations,—not a distinct echo, but an harmonious prolongation of sound for from 10 to 30 seconds after the original tone is produced. The long vault has a certain keynote of its own, which, when firmly struck, excites harmonics, including tones of incredible depth and sweetness,

The fauna of Mammoth Cave has been classified by Putman, Packard, and Cope, who have catalogued twenty-eight species truly subterraneous, besides those that may be regarded as stragglers from the surface. They are distributed thus :—Vertebrata, 4 species ; Insecta, 11; Arachnida, 6; Myriapoda, 2; Crustacea, 2; Vermes, 3. Ehrenberg adds a list of 8 Polygastric Infusoria, 1 fossil infusorian, 5 Phytolitharia, and several microscopic fungi. A bed of Agarieus was found by the writer near the River Styx ; and upon this hint an attempt has been made to propagate edible fungi in this locality. The most interesting inhabitants of Mam- moth Cave are the blind, wingless grasshoppers, with extremely long antenne; blind, colourless crayfish (Cambarus pellucidus, Telk.); and the blind fish, Amblyopsis speleus, colourless and viviparous, from 1 inch to 6 inches long. The Cambarus and Amblyopsis have wide distribution, being found in many other caves, and also in deep wells, in Kentucky and Indiana. Fish not blind are occasionally caught, which are apparently identical with species existing in streams outside. The true subterranean fauna may be regarded as chiefly of Pleistocene origin ; yet certain forms are possibly remnants of Tertiary life. The strongly marked divergence of these animals from those found outside convinced the elder Agassiz that they were specially created for the limits within which they dwell. But the opinion now held is that they are modified from allied species existing in the sunlight, and that their peculiarities may all be accounted for on principles of evolu- tion,—the process being accelerated (or retarded) by their migra- tion from the outer world to a realm of absolute silence and perpetual darkness.

The literature of Mammoth Cave is extensive, though scattered through many periodicals, volumes of travels, and scientific reports. See especially Bullitt, Rambles by a Visitor, 1844; Collins, History of Kentucky, 1847; Forwood, The Mammoth Cave, 1870; Packard and Putnam, Inhabitants of Mammoth Cave, 1872; Shaler, Memoirs of Geological Survey of Kentucky, 1876; Hovey, 'In Mammoth Cave," Scribner's Magazine, 1880; Celebrated Caverns, 1882. (H. C. H.)

MAN. See AnTHRoPoLOGY (vol. ii. p. 107 sg.) and the

articles on the various contributory sciences there referred.

to. Compare also Mamma ia, above, p. 444. MAN, Istz or, a dominion of the crown of England, situated in the Irish Sea, almost equidistant from England on the east, Scotland on the north, and Ireland on the west. It lies between 54° 2’ and 54° 25’ N. lat., and between 4° 18’ and 4° 50’ W. long., Douglas on the east coast of the island being distant 58 miles west-north-west from Fleetwood, while Peel on the west coast is 65 miles south-east of Belfast. The greatest length of the island is about 33 miles, and its greatest breadth about 12 miles. The total area is 145,325 acres, or about 227 square miles. A mountain range occupies the larger portion of the island, extending from Maughold Head to the Calf Islet; the highest summits—Snaefell (2024 feet), North Barrule (1842), and Slieu Chairw (1808)—are in the north-west. These mountains rise abruptly from the narrow tract of almost level ground which forms the extreme northern boundary of the island; and between their lofty chasms are the lovely and picturesque recesses of Ravensdale, Sulby Glen, Glen Aldyn, and Ballure. The fine scenery of the mountains has been made more accessible by the construction of a series of roads, commanding at many points views unsurpassed in the United Kingdom for picturesqueness and variety. Inthe south-western portion of the mountain range only one summit, that of South Barrule (1585 feet), rises above 1500 feet. From Peel southwards along the western shore the mountains stretch to the very edge of the coast-line, and at the south-western extremity the shore is wildly precipitous, especially at Cronk-ny-Irree-Lhaa, which rises abruptly from the sea to the height of 1449

feet; at Brada Head, near which Brada Hill forms an almost precipitous wall over 700 feet in height; at Calf Islet, surrounded by rugged broken rocks ; and at Spanish Head (said to take its name from the destruction which there overtook a portion of the Spanish Armada). Towards the south-eastern shore the mountains slope more gradually towards the sea, the coast of which is generally low and sandy, being indented by several finely rounded bays, in- cluding Castletown Bay and Derby Haven. From Derby Haven to Maughold Point the coast is frequently bold and rocky, and the numerous creeks and bays, the largest of which are Douglas Bay and Laxey Bay, greatly add to the charm and variety of the scenery. From Maughold Head round to Peel the coast presents little of special interest, being formed

in great part of sand and gravel cliffs, although along the western side the bold clay-slate forma- mation again appears.

Isle of Man.

The largest river in the island is the Sulby, which rises near Snaefell, and, after flowing northwards through a rugged glen to Sulby village, winds eastwards through a level and well-cultivated country to the sea at Ramsey. The Neb or Great River, which is formed by the junction near Slieuwhallin of a stream rising near South Barrule and flowing north by the Foxdale Glen, and of another flowing south from Sartfell by Rhenass, passes west to the Irish Sea at Peel. The Silverburn flows southwards from South Barrule to the Castletown Bay. The Dhu and Glass flowing eastwards unite before entering the sea at Douglas, which takes its name from their union. The streams abound with trout, and fishing is generally per- mitted without restriction. There are no lakes.

Geology.—The greater part of the island is formed of slaty Silurian rocks of identical formation with the mountainous regions of Cumberland and Westmore- land. No characteristic fossils, however, exist to deter- mine their exact age except one, Palxochorda major, found in the Skiddaw slates. The line of strike is from south-west to north-east, and the strata are highly in- clined. The mountains for the most part present a smooth rounded appearance, superinduced by prolonged subaerial waste. The clay-slate formation is sometimes broken through by intrusions of granite and other eruptive rocks. The "greenstones" are especially visible at Brada Head,

Castletown, Langness, and other points along the coast. A large mass of granite, containing silvery mica, red and white felspar, and gray quartz, rests on the eastern slope of South Barrule mountain, and valuable masses of the

' game rock appear at the Dhoon river to the north-east of

the Laxey lead-mines. Upper Old Red Sandstone and conglomerate occur at Peel on the west coast, and on the south coast, in the neighbourhood of

Castletown Bay, chiefly at the peninsula of Langness. It rests on the upturned edges of the slates, and passes imperceptibly into the beds of limestone. The Carboniferous or Moun- tain Limestone is the only representative of the Carboni- ferous strata in the island. The limestone contains numerous fossils. At Poolvash it assumes the character of black marble, which is much used for chimneypieces. At Scarlet Point, and thence to Poolvash, interesting evi- dence exists of voleanic eruptions during the accumulation of the Carboniferous rocks. A great blank in the geolo- gical record occurs at the top of the limestone series, for the next strata that appear are the clays and gravels of the Glacial period. These strata occupy the greater portion of the low ground of the island, and consist of boulder clay, drift gravel, and sands. They occasionally reach as far up the mountains as 500 feet, and in the southern dis- tricts erratic boulders are sometimes to be observed on the very highest summits. Boulders of granite, for example, have been carried across South Barrule Hill (1585 feet) and dropped on the top of Crook-ny-Irree-Lhaa (1449 feet), The whole of the plain in the north of the island is occupied by Drift deposits, which occasionally form hills above 300 feet in height. Numerous depressions in the plain at one time occupied by lakes are now filled by beds of peat.

Minerals.—The most important mincrals are lead, copper, and zinc. The principal mines are those of Laxey, near the. Laxey river, which produce lead, copper, and especially sulphide of zinc, which forms more than two-thirds of the total quantity of ore raised from those mincs. The galena obtained is very rich insilver. The Foxdale mines, between Castletown and St John's, are also very largely wrought. The amount of copper ore is comparatively small. 'The mines are rented from the queen as lady of the manor, the lessees paying one-tenth of the produce. In 1852 the total quantity of Maid ore obtained was 2415 tons, of lead 1834} tons, and of silver 36,700 oz., the value of which was £7646. In 1871 the total quantity of lead ore obtained was 4645 tons, producing 3835 tons of lead and 176,631 oz. of silver ; 5768 tons of zinc were also obtained, valued at £19,015, and 267 tons of copper ore, producing 18 tons of copper, valued at £1074. In 1881 Brada Head copper- mine yielded 78 tons of ore, producing 6 tons 5 cwts. of fine copper, valued at £562, 13s.; and at Great | i 7567 tons of zine were raised, giving 3480 tons of the metal, valued at £28,701. The fol- lowing table gives the produce of the lead-mines in 1881.

Lead Ore. Lead. Value of Ore,

Tons, Cwts. te Be

2,500 0 39,145 10

y bts 1,275 0 80,487 0 Foxdale, East …..... 292

5,362 0

SUHBEIEND NarecasAiseansveoss > 75 1,050 15 Kirk Michael 30 338 0 Great Laxey. ey : 129 15

RODAN oa sanva sues vs 4,183 76,513 0 0

Rotten-stone and ochre are obtained in the south at Malew and Arbory, the total amount raised in 1881 being 207 tons, valued at £636. Iron is found in small quantities at Foxdale, but the total quantity obtained in 1881 was only 120 tons, valued at £60. Lime- stone is extensively quarried in the southern districts, both for building purposes and for agriculture. Dolomite occurs in large quantities in the mines at Laxey. There is a valuable granite quarry at Foxdale. Gold in minute particles lies in the bed of a small stream near Barrule. A considerable number of other minerals are found, but the quantity of each is unimportant. The total number of persons employed in the mines in 1881 was 1258.

Climate.—The mean annual temperature is higher than that of any other district occupying the same parallel of

- latitude, and the variation according to the seasons is

remarkably small. The mean annual temperature is a

little less than 49° Fahr., the mean temperature of summer less than 59°, and that of winter nearly 42°, giving a difference of only 17°. Rain is frequent but seldom heavy, the annual fall being 41°71 inches, about the same as in the adjacent parts of England and Scotland, but less than in those of Ireland. 'Thunderstorms are very rare. Many plants, even palms, which in England require artificial heat, grow in some parts of the island

throughout winter in the open air, while fuchsias under the same conditions attain to great size and perfection. The air is unusually clear and pure,

Agriculture.——Owing originally to the enterprise of Scotch and English farmers, the land where arable has been brought into a state of high cultivation, Through the use of seaweed in large quantities in the northern districts of the island the sandy and gravelly soil has been greatly enriched, and it now possesses remarkable fertility, its productiveness being increased by the fine climate, The lime obtained in the neighbourhood of Castletown in the south has also been found highly beneficial for the soil in that vicinity. 'The best land is in these two districts, but even in the mountainous regions in the centre of the island great improvements have taken place. The farms are principally held on lease, and of late years many small holdings have been combined into large farms cultivated on modern principles.

*According to the agricultural returns of 1882, the cultivated area comprehended 97, 494 acres, 67 percent. ofthe whole. The commons and uncultivated lands on the mountains are, moreover, utilized for the pasturage of horses, cattle, and sheep, the evergreen furze forming the principal food of these animals during the winter season. The area under corn crops-was 25,211 acres, under green crops 12,046, rotation grasses 37,094, permanent pasture (exclusive of heath or mountain land), 22,836, and fallow 307. Oats occupy about one-half of the total area under corn crops, barley about one- third, and wheat about one-sixth. The wheat, which is of a very fine quality, is cultivated chiefly in the north of the island. The white and red clover and the common grasses grow in great luxuriance, and on account of the good * emp in winter the supply much exceeds the needs of the island, large quantities being shipped to the neighbouring districts of England. Turnips, which in 1882 occupied 8432 acres, are also largely exported. The dry sandy soil of the island is very favourable for the growth of potatoes, the area planted in 1882 being 3378 acres. The most common rotation of crops is corn, green crop, corn, clover and hay, and pasture.*

The total number of horses in 1882 was 5249, of which 3551 were used solely for purposes of agriculture. The native breed of horses is similar to

that of N orth Wales. They are small, but hardy, active, and patient of labour. In 1882 cattle numbered as many as 19,780, an 'average of nearly 21 to every 100 acres under culti- vation, considerably above that of Great Britain, which was 18:4. Of the cattle, 6862, or more than one-third, were cows and heifers in milk or in calf. On account of the large number of summer visitors, dairy farming is specially profitable. The native breed of cattle has very much degenerated, but an improved stock is now general through the importation chiefly of Ayrshires and_shorthorns. Sheep in 1882 numbered 55,690, not a very large number consider- ing the mountainous nature of the country, but cattle feeding is generally more profitable than sheep rearing, partly owing to the fine climate. The principal sheep runs are those which have been enclosed by the crown from the common lands. The native breed of sheep, small hardy animals, is gradually being superseded by crosses, and by the introduction of English sheep in the low grounds. The fleece of the native sheep is not valuable, but the mutton is of very fine quality. Pigs are largely kept, the number in 1882 being 4685. The old breed called " purrs" is now nearly extinct.

In 1882 there were 237 acres under orchards, 142 under market gardens, and 6 under nursery grounds. The acreage under woods is not given, but it is very small. Apples, for which the island was at one time famed, are still grown in considerable quantities, and gooseberries, currants, strawberries, and other smaller fruits are largely cultivated. The botany of the island is not specially in- teresting. The variety of species is not great, although there are a few rare plants,

Fauna.—Like Ireland, the Isle of Man is exempt from venomous reptiles and toads, a circumstance traditionally attributed to the agency of St Patrick, the patron saint of both islands. Frogs are, however, found, and both the sand lizard and the common lizard are met with. Moles are absent, badgers are unknown, and foxes are now extinct. Fossil bones are frequently found of the

Trish elk ; and the red deer, as is proved by the references to it in

old laws, and the representations of it on Runic monuments, was'

at one time common, although the species had almost disappeared about the beginning of the 18th century. Hares are less plentiful than formerly, and rabbits are not numerous except on the Calf Islet. Snipe are abundant. There are a few partridges, grouse, and quail, but neither pheasants nor black game. Various specics of water- fowl visit the island, including wild geese, wild ducks, plover, widgeon, and teal, The Manx puffin (Procellarta anglorum) is becoming scarce, but still frequents the Calf Islet. The peregrine falcon brecds in the precipitous rocks in the neighbourhood of the Calf Islet, and at Maughold Head. The red-legged crow is common, the kingfisher scarce. The cuckoo is a yearly visitant, as is also the lapwing. Wild pigeons and seabirds of great variety frequent the rocks.

A variety of the domestic cat, remarkable for the absence or stunted condition of the tail, is common in the island.

Manufactures and Tradc.—Partly perhaps on account of the absence of coal, the manufactures of the island have not attained any importance, the principal being Manx cloth, canvas, nets, ropes, and twine. There is, however, a large export of all kinds of agricultural produce, horses, cattle, and sheep, as well as of lead, lime, and black marble. Much of the trade is still carried on by means of small coasting vessels, but these are being gradually super- seded by steainers which ply between Douglas and Liverpool, Barrow, Fleetwood, Silloth, Dublin, Belfast, Whitehaven, and Glasgow. The imports consist principally of provisions from England, timber from Norway, and lean cattle from Ireland. In 1881 the number of vessels engaged in the foreign and colonial trade that entered the ports of the island was 26 of 4885 tons, while 14 of 2916 tonseleared. The number engaged in the coasting trade was—entered, 2288 of 440,158 tons ; cleared, 2328 of 436,107 tons. There is daily communication between Douglas and Liverpool.

There are very valuable fishing grounds, especially for herring and cod, round the southern half of the island from Peel to Douglas, and mackerel fishing is also largely prosecuted by the islanders off the coast of Ireland. The Manx fishing boats, decked and undecked, number upwards of seven hundred, employing more than four thousand men. Peel and Port St Mary alone have about three hundred and fifty-seven boats, manned by two

thousand five hundred men, the capital invested in boats and nets being for these ports alone about £100,000.

The prosperity of the island, apart from its fishing and agriculture, is mainly dependent on its yearly influx of summer visitors, the annual number being now about 120,000. The season lasts from the middle of May to the middle of September.

Inicrnal Communication.—The roads, which of late years have been greatly improved and extended, are excellent. They are main- tained by a system of licences on innkeepers, grocers, and hawkers, and by an impost on carriages, carts, and dogs, and a rate on real property. 'The highways are under the management of a board appointed by the Tynwald court, a surveyor-general, and parochial surveyors.

The first railway in the Isle of Man was that between Douglas and Peel, opened in 1873. There is now communication by rail between the various towns of the island, and a proposal has also been made for a direct line between Douglas and Ramsey via Laxey. The insular goverumient has assisted one of the railway eompanies by a guarantee. The railways are single narrow-gauge lines, and are worked on the baton system,

Governnent and Administration.—The government of the island is vested in a governor appointed by the crown, a council which acts as an upper chamber of the legislature, and the House of Keys. The governor and council and the House of Keys together constitute the court of Tynwald; but the approval of the queen of Great Britain in council is essential to every legislative enactment. Acts of the British legislature do not affect the island except it be specially named in them. For the purposes of civil jurisdiction the island is divided into a northern and a southern district, and each of these is again subdivided into three "sheadings," which are analogous to counties.

The governor, who is the representative of the sovereign, is captain-general of the military forecs. He presides in the council and in all courts of Tynwald, and is ex officio sole judge of the chancery and exchequer courts. The council consists of the lord bishop of the diocese, the attorney-general, the two decmsters, the clerk of the rolls, the water-bailiff, the receiver-

general, the arch- deacon, and the vicar-general, all of whom are appointed by the crown, except the vicar-general, who is appointed by the bishop. No aet of the governor and council is valid unless it is the act of the governor and at least two members of the council. The House of Keys, the representative branch of the legislature of the island, is onc of the most ancient legislative assemblies in the world. It consists of twenty-four members elected by male owners or occupiers, and female owners of property. Each of the six sheadings elects three members, the towns of Castletown, Peel, and Ramsey one each, and Douglas, the chief town, three. There is a property quali-

fication required of the members, and the house sits for seven years unless previously dissolved. 'The Keys were at one time self-elected, but in 1866 they consented to popular election in exchange for the privilege of controlling the expenditure of the surplus revenue of the island, agreeing, however, to pay into the imperial exchequer a fixed sum of £10,000 annually as the island's contribution to- wards the expenses of the army and navy of the United Kingdom.

_ In matters of property the court of chancery has the most exten- sive Jurisdiction of any in the island, and is a court both of law and of equity. The governor presides, and is assisted by the clerk of the rolls and the deemsters. The exchequer court takes cogniz- ance of all matters connected with the revenue, and also determines the right of tithe. The common law courts for the southern division are held at Douglas and Castletown alternately, aud those for the northern division at Ramsey, once in three months. They are presided over by the deemsters, and take cognizance of all actions, real, personal, and mixed, and of civil matters that require to be determined by a jury. Courts of general jail delivery are held at Castletown, for the trial of prisoners indicted for criminal offences ; the governor presides, attended by the deemsters, the clerk of the rolls, and the water-bailiff,

The deemsters or judges of the island (supposed by some to be the successors of the Druidical priests) until the 15th century acted according to unwritten laws, called 'breast laws," of which they were the depositaries.

They have concurrent jurisdiction over the wholeisland. Their advice is taken by the governor on all difficult Nie of law. Each has now a salary of £1000 per annum.

eemster courts are held weekly, alternately at Douglas and Castletown by the deemster for the southern division, and at Ramsey and Peel or Kirk Michael by the deemster of the northern division, They take cognizance in a summary manner of matters of debt, and have jurisdiction in criminal cases. The herring fishery, and the boats employed in it, are placed under the charge of the water-bailiff, who holds courts to redress grievances and enforce the regulations of the fishery. He appoints with a small salary two fishermen, called admirals, to preserve order. The water-bailiff has also civil jurisdiction in questions of salvage, and takes cognizance of suits in maritime matters, The high bailiff's courts are held weekly in Douglas, Castletown, Ramsey, and Peel for the recovery of debts under 40s., and daily for the punishment of drunkenness and offences against public order. The magistrates hold regular courts in each of the towns for the summary trial of breaches of the peace and minor offences. 'They are appointed by commission under the great seal of England, but their powers are regulated by insular acts of Tynwald, The members of the council and the four high bailiffs are also ex officio magistrates. The coroner of the sheading, who is appointed annually by the governor, is a kind of sheriff. Inquests of death are held by the high bailiff and jury. There are about thirty legal practitioners, called advocates, who combine the functions of barrister and solicitor.

The laws of the island still retain much of their ancient peculi- arity of character, though modified by acts of Tynwald, and rendered in some respects more in unison with those of England. The criminal law was consolidated and amended by the criminal code of 1872.

The gencral tenure is a customary freehold devolving from each possessor to his next heir-at-law. The descent of land follows the same rules as the descent of the crown of England. The right of oe extends to females in default of males in the direct

ine. The interest of a widow or widower, being the first wife or husband of a person deceased, in a life estate is one-half of the lands which have

descended hereditarily, and is forfeited by a second marriage ; a second husband or second wife is only entitled to a lite interest in one-fourth, if therc be issue of the first marriage. Of the land purchased by the husband the wife surviving him is entitled to a life interest in one moiety. By a statute of the year 1777 proprietors of land are empowered to grant leases for any term not exceeding twenty-onc years in possession without the consent of the wife.

Previous to the Act of Revestment in 1765, the commerce of the island consisted principally in the importing and exporting of contraband goods, the average return of which exceeded half a million sterling per annum, the loss to the British revenue being estimated at £300,000. After this period the customs of the island were regulated by the imperial parliament. The various loans to the insular government were consolidated in 1882, and the funded debt now amounts to £230,000.

For the year ending March 31, 1882, the net revenue of the customs of the island was £70,906, and the expenditure £50,558, leaving a balance of £20,348, which is disposed of thus :—

One-ninth part of the quarter's revenue to 31st March 1882….. £1,091 DDWEHER CMG GWED aeas corn ecttnite: sntieess ceive tel ivccmmccetemaerseorsin 10,000 Less abatement on account of loss on importation of

FU TOICUS GpmecooconuaanoaauDObasaTsonDsononobonnouBoSosobpoSenNEEHE N nS

Expended by War Department, 1881-82 … Do. Board of Works, 1881-82….. Unappropriated surplus due Isle of Man

£20,348

MAN 453

Religion and Education.—Christianity is said to have been introduecd into the island by St Patrick about the middle of the 5th century. The bishopric

of Sodor (i.e., Sudrcys, the southern Hebrides) was formerly united with that of Man; and the union continued till the 14th century, the Manx bishops even now retain- ing the joint title Sodor and Man. Some indeed affirm, but with small evidence to support the statement, that the title of Sodor was derived from the little island off Peel, said to have been at one time called Sodor, now known as St Patrick's Isle, and the seat of the cathedral of St German. The diocese is in the province of York ; its bishop has a seat but not a vote in the House of Lords. The bishop is assisted in ecclesiastical matters by an archdeacon, a vicar-gencral, a registrar, and a sumner-general.

The ecclesiastical courts are the consistory, chapter, and the viear-general's summary court. The livings of, the clergy arise chiefly from tithes ; the patronage, from the bishopric downwards, with the exception of four in the gift of the diocesan, is vested in the crown.

Besides King William's College, opened in 1838, providing an education equal to that obtainable at the highest class schools of England, and possessing a considerable number of exhibitions to the universities, there are in the island several other good secondary schools. 'The parochial schools are also well taught, and there are now board schools, under the insular Education Act, established throughout the island.

Population.—The following table shows the population of cach parish and town from 1726 to 1881.

Population.

1726. | 1757. | 1821. | 1851. | 1871. } 1881.

Mulew, (P.)...cccccsee

Castletown, (T.).....0. AYLbory, (P.).conesseeeseres Rishon, (P.), ...0.c0-+00

90 | 1,466 | 2,649 | 3,232 | 2,466 | 2,595

DAMGOMN CEs) ccs ssceccseeeres raddan) (P.):...sesccss 780 | 1,121 | 1,754 | 2,407 | 2,215 2,071 | Douglas, (T.).. te Onchan, (P.)... (Marown, (P.).. Germain, (P.). eel, (.) ss… Patrick, (P.)... ae TEGMETINN (Ly,)isieeseseraocse=20 IMAMGHOIA, (P.) ...sccceccee FROMAREV, (Ds)re.s.cc.00se00 Lezayre, (P.)...scccsscaes JsvHIRI), (025 Honenoenngsecneenn MATICNCHS, CP.)..0c..<000 0000

RULITOW U(lE)escsescreseseee VATION, (IP). .0+rcrese Michael! ((P.)....000s0ess0s

Michael, Ayre.Garff.Glenfaba. Middle. Rushen.

~

14,070 ‘20,134 140,087 | 52,116 | 53,763 | 53,738

batt 1880 the death-rate was 21°9 per 1000, and the birth-rate

The principal towns of the island are Douglas, Castletown, Rainsey, and Peel. Douglas, the chief town and seat of government, is noticed in vol. vii. p. 876. Castletown, the ancient capital of the island, was until a recent period the residence of the governor. It possesses a good harbour, barracks, and a custom-honse. Ramsey, on account of its fine sandy beach and beautiful situation, is a favourite watering-place, and it has also a large shipping trade. pie adjoining St Patrick’s Islet, is the principal seat of the herring

shery.

Language. —The Manx language isa subdialect of the ancient Celtic, and a dialect of the Irish branch, to which the Scottish Gaelic also belongs. The differences in pronunciation of these languages are not so great as to prevent a native of either country conversing with one of the other, although the differences in ortho- graphy perplex even the most learned linguists. The Manx is now spoken only in the north-western parishes and at a few localities along the western coast. The natives generally converse in the English language. Manx is not taught in any of the schools, and itis very

probable that it will shortly become utterly extinct. See Critic LITERATURE, vol. y. p. 298.

History and Antiquities.—It admits of nearly absolute demon- stration that Anglesey and not Man was the Mona of Cesar. By ancient writers the island is called Eubonia. The English name Man is derived from the Manx Mannin. Many explanations have been given of the origin of the word, but none of them are better than conjectures.! It is inherently probable that the island was oceupied by the Romans, and this is eonfirmed by the discovery of a Roman altar, which is still preserved in Castle Rushen, and of Roman coins in the same vicinity. A cist and urn found in 1852 near.Tynwald Hill are supposed to belong to the aboriginal pagan

1See "Man, its Names and their Origin," by J. M. Jeffcott, in Mana Society Publications, 1878.

period ; another memorial of this period is probably St Patrick's chair, consisting of five upright stones on a stone platform forming a seat, 'woof the stones are marked by a cross, but this in all likelihood was done at a period long subsequent to their erection. According to tradition the island was for a considerable period one of the chief seats-of the Druids. By the peasantry nearly all the old monuments are attributed to the Druids, but the Runic crosses belong of course to a later period. One of the principal Druidical arne circles is that on the eminence called Mull, near the Calf slet.

The earliest personage mentioned by tradition and history is Mannanan-Beg-Mac-y-Lheirr, who is described in the statute-book of the island as a paynim, who '"'kept the land wander mist by his necromancy." In 517 Maelgwyn, king of North Wales, and nephew of King Arthur, expelled the Scots, and annexed the island to his Welsh dominions. He was succceded by his son Rhun-ap- Maelgwyn in 560, from whom in 581 the island was reconquered by Aydun M'Gabhran, king of Scotland, who appointed his sister's son Brennus "'thane of Man." The Welsh king appears to have recovered it from the Scots about 611, and to have retained posses- sion of it until 630, when it was conquered by Edwin, king of North- uinbria. Shortly afterwards it again fell under the dominion of the Welsh, till towards the close of the 9th century it was subdued by Harold Haarfager of Norway.

The jarls of Harold for some time threw off his rule, and held independent sway. Of these Jarl Orry succeeded in establishing his rule over Man. His descendants continued to rule till 1077, when Godred Crovan, son of Harold the Black of Iceland, routed the islanders and slew their king, Fingal II. On the death of Godred in 1098, Magnus Barefoot succeeded in obtaining possession of Man, over which he placed the Norwe- gian jarl Octtar as governor. The inhabitants of the southern district, becoming displeased with Octtar, elected Macmanus in his place ; a battle in consequence ensued at Santwart (or Sainthill), in the parish of Jurby, and victory was inclining to the party of Macmanus, when the women of the north, rushing to the scene of action, totally changed the issue of the fight, although not till both leaders were slain. On the death of Magnus, the right of Godred Crovan's line to the kingdom of the Isles was recognized, and Lagman, the son of that conqueror, succeeded to the government. He at length abdicated, and undertook a pilgrimage to Palestine, whence he never returned. Olave II., surnamed the Dwarf, the only surviving son of Godred Crovan, being then a minor, a regent was appointed, who was expelled from the kingdom in the third year of his government. Olave ascended the throne in 1114. He entered into alliance with the kings of England, Ireland, and Scotland, but his reign was disturbed by the pretensions of three natural sons of his brother Harold, by one of whom he was treacherously slain in 1154. On this Godred the Black, Olave's only legitimate son, was recalled from Norway, and the sons of Harold were delivered to condign punishment. During his reign Somerled, thanc of Argyll, obtained possession of the island, and Godred had to take refuge in Norway, where he remained till the death of the usurper, on which he regained possession of his throne. His death took place in 1187. Olave III., his only legitimate son, being then a minor, Reginald, another son, was appointed to the government during his minority. The latter endcavoured to secure to himself the throne by doing homage to John of England, and afterwards by acknowledging the supremacy of the pope; a series of struggles was the consequence, till at length Reginald was slain in 1226. In 1287 Olave died in Peel Castle, leaving three sons,—Harold, Reginald, and Magnus; he was suc- ceeded by his son Harold II., who was drowned, with his queen and a numerous retinue of nobility, in 1248, on their return from Norway, where they had been eelebrating his marriage with Cecilia, daughter of Haco. His brother Reginald II. assumed the govern- ment, but

was afterwards slain by Ivar, brother of Reginald the usurper, in 1249. On the death of Reginald II. his brother Magnus was chosen king. John of the Isles landed with an army at Ronaldsway to dispute his claims, but was driven from the island.

From this time the power of the Norwegian kings began to de- cline, and that of the Scottish sovereigns to revive. Magnus did homage to Alcxander III. of Scotland, and held the island from the crown of Scotland. He died in 1265, without issue. In the meantime Magnus VI. of Norway, as the legitimate sovereign of Man, ceded in 1266 to Alexander III. all his claims and interest in the sovereignty and episcopacy of Man for the sum of 4000 marks, and an annual pension of 100 marks. The widow of Magnus (the late king of Man) succeeded, however, in getting Ivar, the assassin of her brother-in-law Reginald, placed on the vacant throne; and Alexander in 1270 sent an arniy to reduce the island to obedience. After a decisive battle at Ronaldsway, in which Ivar was slain, the kingdom was annexed to the dominions of Alexander. This monarch, in token of his conquest, substituted the quaint device of "the three legs," which still constitutes the national emblem, for the ancient armorial ensign of the is and— a ship in full sail, with the motto, " Rea Mannix et Insularum."

He placed the island under the government of his nobles or thanes, whose repeated acts of tyrannical oppression at length inspired the inhabitants to throw off the Scottish yoke. Bishop Mark (Marcus Galvadiensis), a Scotchman, however, being in- formed of their determination, obtained their mutual consent to decide the contest by thirty champions selected from each party. The Manx champions were all killed, and twenty-five of the Scot- tish warriors shared the same fate. This victory confirmed the

conquest of the Scots; the ancient regal government was abolished, and a military despotism established.

The most important relics of the Northmen are the Runic crosses, of which there are about forty, either whole or fragmentary. Nearly one half of these contain Scandinavian inscriptions in the ancient Norse language and in Runic character. There are a very large number at Kirk Michael, but some

of the most perfect are those in the churchyards of Ballaugh, Maughold, and Braddan.

During the contentions of Bruce and Baliol, Edward I. of Eng- land took possession of the island for a period, while two rival claimants for the throne appeared. One of these was Mary, the daughter of Reginald II.; the other her aunt Affrica or Alfrida, a daughter of Olave II., and sister of Magnus. The latter in 1305 conveyed her right in the island to her husband, Sir Simon de Montacutc, whose son Sir William afterwards mortgaged its revenues to Anthony Beck, bishop of Durham and patriarch of Jerusalem, In 13813 Bruce made a descent on the island, and granted it to his nephew Randolph, earl of Murray.

In the reign of Edward III. Mary Waldebeof, daughter of the previous claimant, solicited the assistance of that monarch. The king allowed her title, and by giving her in marriage to William Montacute, carl of Salisbury (the grandson of Sir Simon Montacute and Alfrida), thus united in their persons the rights of the two lines of descendants of Olave the Black to the kingdom of Man. With the aid of the English king, the earl was enabled to expel the Randolphs from the island ; and in the year 1344 he was crowned king of Man. In the year 1393 the earl of Salisbury sold to Sir William le Scroop, afterwards earl of Wiltshire, "the Isle of Man, with the title of king, and the right of being crowned with a golden crown." On his attainder for high treason, the island in 1399 was bestowed on Henry Percy, earl of Northumberland, but, he having been attainted and banished, Henry IV. made a grant of it to Sir John Stanley for life. This grant was cancelled, and a new patent passed the Great Seal in 1406, bestowing the island on him and his heirs, to be held of the crown of Great Britain, by presenting to the king a cast of falcons at his coronation. Sir John died in 1414.

The lords of the house of Stanley governed the island chiefly by lieutenants, who occupicd the castles of Peel and Rushen. Various tumults arose ; and in 1422 fourteen persons were drawn by wild horses, quartered, and beheaded. Eventually authority was dele- gated by Sir John Stanley the second to Henry Byron, who remodelled the House of Keys, and rendered his regency one of the most popular in the insular history. Sir John dicd in 1432, and was succeeded by his son Thomas, who was created Baron

Stanley by Henry VI., and died in 1460. Thomas his son was created earl of Derby by Henry VII. He died in 1505. This nobleman's son Thomas, the second earl of Derby, relinquished the title of king of Man, as he preferred " being a great lord to being a petty king." Edward, the third earl, son of the last-named Thomas, was a great favourite with Henry VIII. On his death in 1572 he was succeeded by his son Henry, the fourth earl of Derby. He died in 1594, leaving two sons, Ferdinand and William, who in time became lords of Man. The title of William was disputed by the three daughters of Ferdinand ; with these, however, he effected a compromise ; and in 1610 he obtained an "act for assuring and establishing the Isle of Man in the name and blood of William, earl of Derby," but in 1627 resigned his dignities to his son James, celebrated in history as "the great earl of Derby."

After the execution of this earl in 1651, for bringing aid to Charles II. before the battle of Worcester, the defence of the island was undertaken by the heroic Lady Derby, who was then in Castle Rushen ; but William Christian, the receiver-general, on the appear- ance of a hostile fleet, surrendered the castle without resistance. The island was then granted to General Lord Fairfax, who held it until the Restoration, when it was restored to Charles, the eighth earl (the son of Earl James), in 1660. On the death of Earl Charles in 1672 he was succeeded by his son William, the ninth earl, who took but little interest in his Manx property, and, dying without issue in 1702, was succeeded by his brother James (a younger son of Charles, the eighth earl). At this time the lordship of Man was approaching dissolution. The leases, which had been granted for three hives, having nearly expired, and no provision having been made relative to their renewal, the neglect of agriculture became general, and the people were wholly given up to the fisheries and the pursuit of the contraband trade. In 1708, however, the earl conferred on his Manx subjects the Act of Settlement (very justly calicd the Manx Magna Charta), by which the lessees of estates were finally established in their possession, and their descent

-(40 miles by rail, by way of Inca).

MAN—MAN

secured in perpetuity, on the payment of certain fines, rents, and dues to the lords. James died in 1736 without issue.

The lgrdship of Man then devolved on James, second duke of Athole, a descendant of the Lady Amelia Anna Sophia Stanley (youngest daughter of the seventh earl of Derby). In 1725, in

order to put an end to the contraband trade of the island, an Act

of Parliament was passed authorizing the purchase of all the royalties and revenues of the island; but no result followed till 1765, when proposals for the purchase were revived and the sovereignty and its revenues were surrendered to the crown for £70,000. 'The duke and duchess reserved the manorial rights, the patronage of the see, and other emoluments and perquisites. By the Act of Revestment the island was more closely united to the crown of England, although its independent form of government has never experienced any material change. An annuity of £2000 had also

_been granted to the duke and duchess, but, on the ground of

inadequate compensation, the fourth duke presented petitions to parliament and the privy council in 1781 and 1790. He did not succeed, however, until the year 1805, when an Act was passed assigning to him and his heirs, as an additional grant, a sum equal to one-fourth of the revenues of the island, which was afterwards commuted for £3000 per annum for ever.

In 1825 an Act passed both houses of parliament, at the instance of the lords of the treasury, authorizing the lords of the treasury to treat with the duke for the purchase of his remaining interest in the island, and in 1829 he was awarded a further sum of £417,144 for his rights in and over the soil as lord of the manor, as follows :— e

For the annuity £150,000 Rents and alienation fines.. 34,000 Tithes, mines, and quarries,, j 5 a Patronage of the bishopric, with fourteen advowsons, the 233,144 aggregate value,of which was £6000….....c.csesscsevees eonee 20) cpeaeepacanéooonnd cocuaononbrocnodocnecBOondasnoHecKOCHeS £417,144

The ecclesiastical buildings of Man have never been remarkable for architectural beauty. The most important ecclesiastical ruin is St German's cathedral on St Patrick's Isle. The present building, which is roofless and in a very dilapidated condition, dates from 1245, but is supposed to occupy the site of an older building. It is a rude cruciform structure 110 feet long by 70 feet broad. The tower, 68 feet in height, is still entire. The crypt of the cathedral was made use of for an ecclesiastical prison, among its more import- ant captives being Eleanor, wife of Humphrey, duke of Gloucester, uncle of Henry VI. She is alluded to by Shakespeare as living in banishment " with Sir John Stanley in the Isle of Man." St Patrick's church on the same islet is supposed to have been erected in the time of St Patrick. Adjoining it is a round tower similar to those so common in Ireland. Most of the other old churches in Man have been replaced by modern structures, but another very ancient one is Lonan old church, now partly roofless, a very unpretending structure, but said to date from the 6th century. St Trinian's church, also in ruins, is said never to have been roofed, a cireum-

.stance accounted for by an interesting legend. Of Rushen Abbey, a

house of the Cistercians, founded by Olave, king of Man, in 1134, there now only remain the tower, refectory, and dormitory. The Franciscan friary of Bimakin, founded in 1373, has been partly re- built in a rude manner, and is used asa barn. Of the nunnery of Douglas, said to have been founded by Matilda, daughter of Ethel- bert, king of the West Saxons, there are now very slight remains, chiefly of the chapel.

The principal castles are Castle Rushen, in Castletown, the ancient residence of the kings of Man, dating probably from the 13th century, and still quite entire ; Peel Castle, the ancient strong- hold of the island ; and Castle Mona, Douglas, erected in 1801 as a residence by the duke of Athole, and now used as a hotel.

The ehief sources of the early history of Man are the Norse and Erse Sagas, and the reeord kept by the monks of Rushen Abbey entitled Chronicon Mannix, which has been edited with learned notes by P. A. Munch, Christiania, 1860. The best general history is that of Train, 2 vols., 1845. Among other works may be mentioned J. G, Cumming, Jsle of Man, its history, physical, ecclesiastical, civil, and legendary, 1848 ; Id., Runic and

other Remains of the Isle of Man, 1857 ; J. QO. Halliwell, Roundabout Notes on the Isle of Man, 1863, The publications of the Manx Society are of great value and interest.

MANACOR, a town in the island of Majorca, stands on a slight eminence in a fertile plain, 30 miles east of Palma It is substantially built, with wide streets and several squares; it has the usual buildings (a parish church, a hospital, schools, and the like), and the former palace of the independent kings of Majorca is pointed out. The neighbourhood produces cereals, fruits, an inferior quality of wine, and some oil ; and there is some trade in these, as well as in sheep and cattle. The population in 1877 was 14,894.

MANAGUA, the capital of Nicaragua, Central America, lies on the south shore of Lake Managua in 12° 7' N. lat.

and 86° 12' W. long. Steamboat communication with Old Leon was opened in 1881, and a railway (32 miles) is in course of construction to Granada. It was mainly owing to the rivalry between Leon and Granada that Managua was chosen as the seat of the national assembly, and apart from the administrative buildings there is little of interest in the place. The population is about 12,000.

MANAKIN, from the Dutch word Manneken, applied to certain small birds, a name apparently introduced into English by Edwards (Wat. fist. Birds, i. p. 21) in or about 1743, since which time it has been accepted generally, and is now used for those which form the Family Pipride of modern ornithologists, The Manakins are peculiar to the Neotropical Region, and are said to have many of the habits of the Titmouse Family (Paridz), living, says Swainson, in deep forests, associating in small bands, aud keeping continually in motion, but feeding almost wholly on the large soft berries of the different kinds of J/elastoma. However, as with most other South American Passerine birds, little is really known of their mode of life; and it is certain that the Pipride have no close affinity with the Paride,' but belong to the other great division of the Order Passeres, to which Garrod assigned the name Mesomyodi, and in that division, according to the same authority, constitute, with the Cotingide,? the group Heteromert (Proc.

Zool. Society, 1876, p. 518). The Manakins are nearly all birds of gay appearance, generally exhibiting rich tints of blue, crimson, scarlet, orange, or yellow in combination with chestnut, deep black, black and white, or olive green ; aud among their most obvious characteristics are their short bill and feeble feet, of which the outer toe is united to the middle toe for a good part of its length. The tail, in most species very short, has in others the middle feathers much elongated, and in one the outer rectrices are attenuated and produced into threads. They have been divided by various authors into upwards of twenty so-called genera; but Messrs Sclater and Salvin (Nomenclator, pp. 53-55) recognize only fifteen, though admitting sixty species, of which fifteen belong to the genus Pipra as now restricted, the P. leucocilla of Linneus being its type. This species has a wide distribution from the isthmus of Panama to Guiana and the valley of the Amazon ; but it is one of the most plainly coloured of the Family, being black with a white head. The genus Macheropterus, consisting of four species, is very remark- able for the extraordinary form of some of the secondary wing-feathers in the males, in which the shaft is thickened and the webs changed in shape, as described and illustrated by Mr Sclater (Proc. Zool. Society, 1860, p. 90; Ibis, 1862, p. 175%) in the case of the beautiful JL deliciosus, and it has been observed that the wing-bones of these birds are also much thickened, no doubt in correlation with this abnormal structure. A like deviation from the ordinary character is found in the allied genus JManacus or Chiromacheris, comprehending six species, and that gentle- man believes it enables them to make the singular noise for which they have long been noted (see Birps, vol. iii. p. 770), described by Mr Salvin (Jéis, 1860, p. 37) in the case cf one of them, Jf, candxi, as beginning " with a sharp note not unlike the crack of a whip," which is "followed by a rattling sound not unlike the call of a landrail" ; and it is a similar habit that has obtained for another species, MM. edwardsi, the name in Cayenne, accord-

1 Though Edwards called the species he figured (wt supra) a Titniouse, he properly remarked that there was no genus of European birds to which he could liken it.

- *Excluding, however, the genus Rupieola—the beautiful orange-coloured birds well known as the " Cocks of the Rock "—which has*

usually been placed among the Cotingidz. oa ce are repeated by Mr Darwin (Descent of Man, &c., ii. p. 66),

ing to Buffon (dist. Nat. Oiseaux, iv. p. 413), of Casse- novsette. This view is supported by Mr Layard, who, writing of the last species, says (/dis, 1873, p. 384)— "They make a curious rattling noise (I suspect, by some movement of the oddly shaped wing-feathers), which con- stantly betrays their presence in the forests," while of the congeneric Jf. gutturosus, Mr J. F. Hamilton remarks (Zits, 1871, p. 305)—" The first intimation given of the presence of one of these birds isa sharp whirring sound very like that of a child's small wooden rattle, followed by two or three sharp snaps." The same observer adds (Coe. cet.) ofa inember of the kindred genus Chirowiphia, contain- ing five species, that C. caudata is known to the Brazilians as the Fandango-bird from its "habit of performing a dance." They say that '"'one perches upon a branch and the others arrange themselves in a circle round it, dancing up and down on their perches to the music sung [1] by the centre one." Exception must be taken to this story so far as regards the mode in which the "music" is pro- duced, for these birds have no true song-muscles; but the effect is doubtless as described by Mr Hamilton's informant. (A. N.) MANANTADI, or Manantoppy, a town in Malabar district, Madras, the trading centre of the Waindd coffee district (11° 48' N. lat., 76° 2'55" E.long.). The popula- tion in 1871, including numerous European coffee planters, with their families, in the neighbourhood, was 10,959. Besides several Government offices, it contains a good club. Early in the century it was a military outpost, and in 1802 the garrison was massacred by the Kotiote rebels. MANASSEH. The tribe of Josmpu (g.v.), the northern and stronger half of the "sons of Rachel," was divided into two branches, so considerable as themselves to bear the name of tribes, which referred their origin to Manasseh and Ephraim, the two sons of Joseph by his Egyptian wife Asenath. Of the two Manasseh was held to be the elder, but the patriarchal story relates how Jacob predicted the superiority of the younger branch (Gen. xlvili.), which in fact played far the greater part in history, occupying in the early days of the settlement in Canaan the part of the central mountain land (Mount Ephraim) where the head- quarters of armed Israel and the sanctuary of the

ark stood (at Shiloh), and in later times holding the kingship, and greatly excelling Manasseh in numerical strength (Deut. xxxiil. 17). During the conquest, perhaps, the separation of the two branches of Joseph was not so well marked as it afterwards became, for the ancient narrative of Josh. xvil. 14 sy. represents the whole house of Joseph as acting together, establishing itself in the uncleared forests of the central mountains till it had strength to contend with the iron chariots of the Canaanites about Bethshean, and in the cities of the rich plain of Jezreel. These cities probably were not all subdued till the days of David or Solomon (Jud. i. 27; 1 Sam. xxxi. 10; 1 Kings ix. 15); they ulti- mately fell to Manasseh, which held the northern part of the hill country of Joseph, overlooking the plain, and finally encroached on lands once reckoned to the Jess warlike tribes of Asher and Issachar (Josh. xvii. 11). But the line of division between Ephraim and Manasseh was not always the same, and in the time of Gideon, the great hero of Manasseh, and the man under whom the seniority of the tribe had a real meaning, Shechem itself was a Manassite dependency (Jud. viii. 31, ix.; comp. Num. xxvi. 31; Josh. xvii. 2). Besides their western settlements in the fertile glades of northern Samaria, running ou' into the great plain, the Manassites had broad territories east of the Jordan in the pasture land of Bashan and Gilead, mainly occupied by a clan named Machir, and reckoned as the first-born of Manasseh. On the probability that these territories were colonies from the west see vol. xiii. p. 401,

The outlying Manassites had many struggles with their foreign neighbours ; 1 Chron. ii, 23 speaks of the loss of sixty cities to Geshur and the Aramzeans (A. V. mistrans- lates). After suffering much at the hands of Damascus, they were carried into captivity by Tiglath Pileser (734 B.c.). The captivity of their brethren in the west followed some thirteen years later.

The name Manasseh (AWwIND, he who causes to forget) is referred in Gen. xli. 51 to Joseph's joy at the birth of the son who caused him to forget his sorrows and cease to long for his home. Unlike the other tribal names, it occurs as a personal name before the captivity, being that borne'by the son

and successor of Hezekiah, the godless king whose sins are designated as the decisive cause of the rejection of the kingdom of Judah.

MANATEE, an animal belonging to the order Strenca, for the general characters and position of which see MAMMALIA (p. 389). The name Manati was appar- ently first applied to it by the early Spanish colonists of the West Indies, in allusion to the hand-like use which it frequently makes of its fore limbs; by English writers from the time of Dampier (who gives a good account of its habits) downwards it has been generally spelt "Manatee." It was placed by Linneus in his hetero- geneous genus Z'richechus, but Storr's name Manatus is now generally accepted for it by zoologists, The question of the specific distinction of the African and American Manatees will be tréated of further on, but it will be chiefly to the latter and better known form that the following description applies.

The size of the Manatee has been much exaggerated, as there is no trustworthy evidence of its attaining a greater length than 8 or perhaps 9 feet. Its general external form may be seen in the figure at p. 390 of the present volume, taken from a living example in the Brighton Aquarium. The body is somewhat fish-like, but depressed and ending posteriorly iu a broad flat shovel-like horizontal tail, with rounded edges. The head is of moderate size, obloug, with a blunt, truncated muzzle, and divided from the body by a very slight constriction or neck, The fore limbs are flattened oval paddles, placed rather low on the sides of the body, and showing externally no signs of division into fingers, but with a tolerably free motion at

B

Fic. 1.—Front View of Head of American Manatee, showing the eyes, nostrils, and mouth. A, with the lobes of the upper lip divaricated ; B, with the lip contracted. From Murie, Trans. Zool. Soc., vol. xi.

the shoulder, elbow, and wrist joints, and with three diminutive flat nails near their extremities. No traces of hind limbs are discernible either externally or internally ; and there is no dorsal fin. The mouth is very peculiar, the tumid upper lip being cleft in the middle line into two lobes, each of which is separately movable, as will be described in speaking of its manner of feeding, The nostrils are two semilunar valve-like slits, at the

apex of the muzzle. The eyes are very minute, placed at the sides of the head, and with a nearly circular aperture with wrinkled margins, The external ear is a minute orifice situated behind the eye, without any trace of pinna. The skin generally is of a dark greyish colour, not smooth or

glistening, like that of the Cetacea, but finely wrinkled. At a little distance it appears naked, but a close inspection, at all events in young animals, shows a scanty covering of very delicate hairs, and both upper and under lips are well supplied with short, stiff bristles.

The skeleton is remarkable fur the massiveness and extreme density of most of the bones of which it is com- posed, especially the skull and ribs, The cervical region of the vertebral column is short, and presents the great peculiarity of containing only six bones instead of seven, the number usual in the Mammalia,—the only other case being that of one species of Sloth (Cholepus hafimanni). Another great peculiarity (which, however, seems to be characteristic of all the Szrenza) is that the flat ends of the bodies of the vertebrze do not ossify separately, so as to form disk-like epiphyses in the young state. None of the vertebra are united together to form a sacrum, the rudimentary pelvic bones having no direct connexion with the vertebral column. The number of rib-bearing vertebrae appears to vary in differeut individuals from fifteen to eighteen, and those of the lumbar and caudal region from twenty-five to twenty-nine. The skull (fig. 2) is exceed-

x4.

Fic. 2.—Skull of African Manatee (Manatus senegalensis). From Mus. Roy. Coll, Surgeons.

ingly different from that of any of the Whales or Dolphins (order Cetacea), with which the Manatee was formerly supposed to be allied. The cerebral cavity is rather small as compared with the size of the animal, and of oblong form; its roof is formed of the parietal bones as in ordinary mammals, The squamosal has an extremely large and massive zygonlatic process, which joins the largely de- veloped malar bone in front. The orbit is small, but. prominent and nearly surrounded by bone, The anterior nares

taken together form a lozenge-shaped aperture, which looks upwards and extends backwards considerably behind the orbits. Their sides are formed by the ascending pro- cesses of the premaxille below, and by the supraorbital processes of the frontals above, no traces of nasals being found in most skulls, though these bones are occasionally present in a most rudimentary condition, attached to the edges of the frontals, far away from the middle line, a position quite unique among the mammalia. In front of the narial aperture the face is prolonged into a narrow rostrum, formed by the premaxille, supported below and at the sides by the maxille. The under surface of this is very rugous, and in life covered by a horny plate. The rami of the mandible are firmly united together at the symphysis, which is compressed laterally, deflected, and has a rugous upper surface; to this another horny plate is attached, which with that of the upper jaw function- ally supplies the place of teeth in the anterior part of the mouth. In the young state there are rudimentary teeth concealed beneath these horny plates, which never penetrate through them, and must therefore be quite

functionless, and altogether disappear before the animal is full-grown. There is besides, on each side of the hinder part of both upper and lower jaws, a parallel row of molar teeth, similar in characters from the beginning to the end of the series, with square enamelled crowns raised into tuberculated transverse ridges, something like those of the Tapir and Kangaroo. The upper teeth have two ridges and three roots; the lower teeth have an additional posterior small ridge or talon, and but two roots. These teeth succeed each other from before backwards, as in the Proboscidea, those at the front of the mouth being worn out and shed before those at the back are fully developed. There are altogether about eleven on each side of each jaw, but rarely more than six are present at one time. The brain is remarkably simple in structure, its hemispheres exhibiting none of the richness of convolution so character- istic of the Cetacea. The stomach is compound, being divided by a valvular constriction into two principal cavities, the first of which is provided with a singular glandular pouch near the cardiac end, and the second with a pair of elongated, conical ceecal sacs or diverticula, the use of which is by no means obvious. The cecum is bifid. The kidneys are simple. The heart is broad and flat, with the apex

deeply cleft between the ventricles, The prin- cipal blood-vessels form very extensive and complex retia mirabilia. The lungs are remarkably long and narrow, as owing to the very oblique position of the diaphragm the thoracic cavity extends very far back over the abdomen. The mammary glands of the female are two in number, situated just behind and to the inner side of the origin of the pectoral limb. The red corpuscles of the blood are among the largest of those of any members of the class, averaging in diameter, according to Gulliver, 3,55 of an inch. Manatees pass the whole of their life in the water, inhabiting bays, lagoons, estuaries, and large rivers, but the open sea, so congenial to the Cetacea, is quite unsuited to their peculiar mode of life. As a general rule they prefer shallow water, in which, when not feeding, they lie near the bottom, supporting themselves on the extremity of the tail, or slowly moving about by the assistance of the fore limbs, the tips of which are just allowed to touch the ground, and only raising the top of the head above the surface for the purpose of breathing at intervals of two or three minutes. In deeper water they often float, with the body niuch arched, the rounded back close to the surface, and the head, limbs, and tail hanging downwards. The air in the lungs obviously assists them to maintain this position, acting in the same manner as that in the air-sac of fishes. Their food consists exclusively of aquatic plants, on which they browse beneath the water much as terrestrial Ungulates do on the green pastures on shore. They are extremely slow and inactive in their movements, aud perfectly harmless and inoffensive, but are subject to a coustant persecution from the inhabitants of the countries in which they dwell for the sake of their oil, skin, and flesh. Frequent attempts have of late been made to keep specimens alivo in captivity, and sometimes with con-siderable success, one having lived in the Brighton Aquarium for upwards of sixteen months, It was fed chiefly on lettuce and endives, but would also eat leaves of the dandelion, sow-thistle, cabbage, turnip, and carrot. From this and other captive specimens some interesting observations upon the mode of life of the animal have been made. One of these is the free use it makes of its fore- limbs. From the shoulder-joint they can be moved in all directions, and the elbow and wrist permit of free extension and flexion. In feeding they push the food towards their mouths by means of one of the hands, or both used

simultaneously, and any one who has seen these members.

thus employed can readily believe the stories of their

carrying their young about under their arms. Still more interesting and quite unique among Mammals is the action of the peculiar lateral pads formed by the divided upper

‘lip, thus described by Professor Garrod :—‘“’ These pads

have the power of transversely approaching towards and receding from one another simultaneously (see fig. 1, A and B). When the animal is on the point of seizing (say) a leaf of lettuce, the pads are diverged transversely in such a way as to make a median gap of considerable breadth. Directly the leaf is within grasp the lip-pads are approximated, the leaf is firmly seized between their con- tiguous bristly surfaces, and then drawn inwards by a backward movement of the lower margin of the lip asa whole.” The animal is thus enabled by the unaided means of the upper lip to introduce food placed before it without the assistance of the comparatively insignificant lower lip, the action greatly recalling to the observer that of the mouth of the silkworm and other caterpillars in which the mandibles diverge and converge laterally during mastication. When out of water the Manatee is an ex- tremely helpless animal; and, although statements are frequently met with in books of its voluntarily leaving the water for the purpose of basking or feeding on shore, all trustworthy observations of those acquainted with it, either in a state of nature or in captivity, indicate that it has not the power of doing so. None of the specimens in con- finement have been observed to emit any sound.)

Manatees, though much less numerous than formerly are still occasionally found in creeks, lagoons, and estuaries in some of the West India Islands, and at various spots on the Atlantic coast of America from Florida as far south as about 20° S. lat., and in the great rivers of Brazil, almost as high as their sources. They are also met with in similar situations on the opposite African coast, from about 16° N. to 10° §. lat., and as far into the interior as Lake Tchad. Its range may even extend, if native reports obtained by Schweinfurth are correctly interpreted, to the river Keebaly, 27° E. long.

The American Manatee (Jf australis, Tilesius) was thought by Dr Harlan to be divisible into two species, one inhabiting Brazil and the other the West Indies and Florida. To the northern form he gave the name of JZ. latirostris, but the distinction is not now generally recognized, On better grounds the African Manatee was separated by Desmarest, under the name of JL, senegalensis, and there are certainly constant although not very important cranial characters by which it can be dis- tinguished from its American congener, among which the following may be cited :—the anterior part of the rostrum is shorter, shallower, and altogether smaller; the orbit is smaller ; the zygomatic process is more deep and massive ; the malar bone is deeper from above downwards; the upper margin of the anterior nares is narrower and with a smooth and rounded instead of a thin and serrated edge; the upper surface of the frontal is flat, instead of concave; the foramen magnum and occipital condyles are narrower from side to side, and the symphysis of the mandible smaller and shallower.

For an account of the animals most nearly allied to the Manatee, the Rhytina, or 'Northern Manatee" as it is sometimes called, and the Dugong, as well as the various extinct kindred forms, see MamMattia, pp. 390, 391.

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the Manatces in Captivity in the Brighton Aquarium," Proc, Zool. Soc. Lond., 1881, p. 456. (W. H. F.)

MANBHUM, a district in the lieutenant-governorship of Bengal, India, lying between 22° 37' and 24° 3' N. lat., and 85° 51' and 87° 16' E. long., is bounded on the N. by Hazaribagh and Birbhim, on the E. by Bardwén

and Bankura, on the 8. by Singbhum and Midnapur, and on the W. by Lohardag4 and Hazaribagh. It has an area of 4147 square miles. The headquarters station is at Purulia. Manbhuim district forms the first step of a gradual descent from the table-land of Chutiaé Nagpur to the delta of lower Bengal. In the northern and eastern portions the country is open, and consists of a series of rolling downs, dotted here and there with isolated conical hills, 'The soil is for the most part composed of hard, dry, ferruginous gravel, but many of the lower levels are filled with good alluvial soil, which yields a fine rice crop. In the western and southern tracts the country is more broken, and the scenery much more picturesque. The principal hills are Dalma (3407 feet), the crowning peak of a range of the same name; Gangabari or Gajboro (2220 feet), the highest peak of the Baghmundi range, about 20 miles south-west of Purulia; and PAnchkot or Panchet (1600 feet), on the summit of which stands the old palace of the rajas of Panchet. 'The hills are all covered with dense jungle. The chief river is the Kasdi, which flows through the district from north-west to south-east into Midnapur, and on which a considerable floating trade in sdél timber is carried on, The useful timber found in Man- bhum is very limited in quantity, and with the present rate of decrease the supply cannot last many years. 'Tigers, leopards, bears, wolves, and jackals are not uncommon ; various kinds of deer abound ; and bison are occasionally met in the south of the district. Elephants come every year from the south-east into the hilly country between Manbhum and Singbhim.

The census of 1872 returned the population at 820,521. The aboriginal tribes numbered about 100,000, Hindus nearly 700,000, and Mohammedans about 30,000. In 1881 the population was 1,042,117. A large proportion of the aborigines are now semi- Hinduized. The most numerous aboriginal tribe are the Santals; but the Bhumij Kols are the characteristic aboriginal race. In Manbhum they inhabit the country lying on both sides of the Subarnarekha, They are pure Mundas, but their compatriots to the east have dropped the title of Munda and the use of their distinctive language, have adopted Hindu customs, and are fast becoming Hindus in religion. The Bhumij Kols of the Jungle Mahals were once the terror of the surrounding districts; they are now a morc peaceful tribe, but have lost to a great extent the simplicity and truthfulness of character for which their cognates are gencrally distinguished. Among high-caste Hindus

about 50,000 are Brahmans and 16,000 Rajputs. The Kevmts, who are agriculturists, form the most numerous caste in the district. The Christian population numbers about 600, most of whom are engaged in agriculture. Manbhum isa thoroughly rural district, and contains only two towns with upwards of 5000 in- habitants, namely Purulia and Raghunathpur, and three others with over 2000, namely Jhalida, Kas{pur, and Manbdazar.

Three principal crops of rice are grown, one sown broadcast early in May on table-lands and the tops of ridges, an autumn crop, and a winter crop, the last forming the chicf harvest of the district. Other crops are wheat, barley, Indian corn, pulses, oilseeds, lin- seeds, jute, hcmp, sugar-canc, indigo, pan, and tobacco. Owing to the completeness of the natural drainage floods are unknown, but the country is liable to droughts caused by deficient rainfall. The principal articles of export are oilseeds, pulses, ghi, lac, indigo, tasar silk (manufactured near Raghunathpur), timber, resin, coal, and (in good seasons) rice. The chief imports are salt, picce goods, brass utensils, and unwrought iron. Cotton hand-loom weaving is carried on all over the district. Coal is found at Iharia, a few miles from Parasnath. The total revenue of Manbhum district in 1881 amounted to £25,760, of which £7562 was obtained from land, and £6424 from excise. The schools in 1877 numbered 392, with 9616 pupils. The climate of the district is fairly healthy. The average rainfall for the ten years ending 1880-81 was 55:95 inches.

MANCHA, La. This name, when employed in its widest sense, denotes that bare and monotonous elevated plateau of central Spain which stretches between the mountains of Toledo and the western spurs of the hills of

Cuenca, being bounded on the S. by the Sierra Morena and on the N. by the Alcarria, which skirts the upper course of the Tagus. It thus comprises portions of the modern provinces of Toledo, Albacete, and Cuenca, and almost the whole of Ciudad Real. Down tothe 16th century the eastern portion was known as La Mancha de Montearagon or de Aragon, and the western simply as La Mancha; afterwarde the north-eastern and south-western sections respectively were distinguished by the epithets “ Alta” and “Baja” (upper and lower). Ja Mancha was created a province in 1691 ; its

officially recognized boundaries have since that time varicd considerably, and in common parlance it is often now identified with the modern province of Ciudad Real. Ciudad Real, which is bounded on the N. by Toledo and Cuenca, on the E. by Albacete, on the 8. by Jaen and Cordova, and on the W. by Badajoz, ranks next to Badajoz and Caceres in point of extent, containing an area of 7840 square miles. The population in 1877 was 260,641. From the scarcity of water and the absence of trees and fences, as also from the circumstance of the rural population being concentrated only at certain points, it as a whole presents to the traveller the arid and cheerless aspect of a desert. The principal river is the Guadiana, which rises in the so-called Ojos (" Eyes") del Guadiana in the north-east, and is joined by the Azuer and the Jabalon on the left, and by the united waters of the Zancara and Giguela on the right. No advantage, unfortunately, is taken of these or any of the other streams in the province for irrigation, the inhabitants depending entirely on the meagre and precarious rainfall. A peculiarity of the province is the facility with which water can be reached by digging ; but neither has this resource been turned to much account. The mineral wealth of the province (lead, copper, iron, antimony, coal). is great, the cinnabar mines of Almaden, in particular, which were known to the ancients, being the chief European source for the supply of quick- silver. Saltpetre is obtained in several places, especially in the north (Herencia and Alcazar de San Juan), and there are quarries of fine stone at Santa Cruz and elsewhere. The crops, when not interfered with by drought and locusts, the two scourges of La Mancha, are very large; they include wheat, barley, rye, chick pease, wine (that of Valdepeiias being especially famous), vinegar, and brandy, some oil, saffron, esparto, flax, and silk. The mules reared in the province are considered the best in or out of Spain. There are manufactures of woollen fabrics, lace, earthenware, cutlery, saltpetre, gunpowder, and soap. 'The lace of Almagro is much appreciated throughout the peninsula. The province is traversed by the Madrid and Cordova Railway, which enters near Alcazar de San Juan and passes through Manzanares and Valdepeiias, entering Jaen at the Venta de Cardenas in the Sierra Morena. The Madrid and Badajoz line passes through Ciudad Real, the capital of the province, which is connected by rail with Manzanares. There are ten judicial partidos,—those of Alcd4zar de San Juan, Almaden, Almagro, Almodévar del Campo, Ciudad Real, Daimiel, Infantes, Manzanares, Piedrabuena, and Valdepefias. The only towns having a

population above 10,000 in 1877 were Almodévar del Campo, Ciudad Real, and Valdepeifias,

MANCHE, a department in the north-west of France, washed by the English Channel (Fr., Za Janche), from which it derives its name, and made up of the Cotentin, the Avranchin, and part of the Bocage, three districts of the former province of Normandy, lies between 48° 28' 40" and 49° 47' 30" N. lat., and between 0° 43' and 1° 54'°30" W. long., bounded W., N., and N.E. by the Channel, E. by the department of Calvados, S.E. by Orne, 8S. by Mayenne and Ille-et-Vilaine. The capital, St L6, is 159 miles west of Paris. The extreme length from north-west to south-east

is 81 miles, the mean breadth from east to west about 28 miles, and the area 2289 square miles.

The department is traversed from south to north by a range of hills, in many parts picturesque, and connected in the south with those of Maine and Brittany. In the country round Mortain, which has been called the Switzer-land of Normandy, they rise to a height of 1200 feet, and at Cherbourg their altitude is still from 500 to 600 feet. As a whole the department has an English aspect, with its broken and tide-beaten shores often enveloped in mist, and its ever-verdant meadows. The coast-line, running north- ward along the bay of the Seine from the rocks of Grand Camp to Cape Bartleur, thence westward to Cape la Hague, and finally southward to the Bay of Mont St Michel, has a length of 200 miles. The Vire and the Taute (which re- ceives the Ouve as a tributary on the left) fall into the sea at the Calvados border, and are united by a canal some miles above their mouths. From the mouth of the Taute a low beach runs to St Vaast la Hougue, where the coast becomes rocky, with sandbanks. Between Cape Barfleur and Cape la Hague lie the roads of Cherbourg, protected by the famous breakwater. The whole western coast is in- hospitable ; its petty havens, lying behind formidable barriers and reefs, are almost dry at low tide. Great cliffs like the points of Jobourg (420 feet high) and Flamanville alternate with long strands such as that which extends for 30 miles from Cape Carteret to Granville. Between this coast and the Channel Islands the tide, pent up between humerous sandbanks, flows with a terrific force that has given

these passages such ill-omened names as Passage de la Déroute and the like. The only important harbours are Granville and the haven of refuge of Diélette between Granville and Cherbourg. The chief stream is the Sienne with its tributary the Soulle flowing by Coutances. South of Granville the sands of St Pair are the commencement of the great Bay of Mount St Michel, whose area of 60,000 acres was covered with forest till the terrible tide of the year 709. The equinoctial tides reach a vertical height of nearly 50 feet. Amidst the foam rise the picturesque walls of the abbey, from the summit of a rock 400 feet high. The Sée, which waters Avranches, and the Couesnon (separating Manche from Ille-et-Vilaine) disembogue in the bay.

The climate of Manche is mild and humid from its propinquity to the sea, northerly exposure, the mean temperature is 3° Fahr. above the mean for that latitude over France. Frosts are never severe ; myrtles and fuchsias flourish in the open air. Ex- cessive heat is also unusual; the predominant winds are south-west. Rains are frequent, as the verdure of the country testifies, but they are not violent, the annual rain- fall varying from 30 to 34 inches.

Of the entire area more than the half is arable, 198,000 acres are meadow land, 52,000 are under wood, and 82,000 are heath. The soil is not naturally fertile, but vegetation is promoted by the humidity of the climate and by artificial improvements. The characteristic industry of the department is the rearing of horses

and other live stock; the horses number 92,839, besides several thousands of asses and mules, and there are 270,000 horned cattle,

277,000 sheep, upwards of 100,000 pigs, and 40,000 beehives. In –

1876 the department yielded 1,458,476 hectolitres of wheat, 83,393 of meslin, 1,014,662 of barley, 427,360 of sarrasin, 484,365 of oats, 52,236 of rye, 683,834 of potatoes, 72,401 of dried legumes, 363, 372 of beetroot, and 8758 quintals of hemp; and in the same year there were manufactured 86,088 kilogrammes of linseed oil and 39,380 kilogrammes of colza oil. The arable and meadow lands occupy the eastern portion of the department ; legumes are grown in the west, where lands adapted for market gardening purposes are worth as much as 15,000 francs per hectare. Manche has a

larger production of cider than any other department of Franee (upwards of 28,000,000 gallons). Besides apples, pears, plums, cherries, and figs are grown. The fields are lined with rows of oak, elm, and becch, which furnish good timber for building purposes. The aspen, poplar, walnut, and chestnut are also common. Some attempts at reclamation have been made along the sea-shore. The department

At Cherbourg, in spite of the.

contains valuable granite quarries in the Cherbourg arrondissement and the Chausay Islands; there are also deposits of carboniferous – marble, kaolin, tale, and of calcareous sand ("tangue") used as manure. There are smiths' forges and iron foundries, important brass foundries, and establishments for the manufacture of tools, needles, and other kinds of hardware. The port and arsenal of Cherbourg is very complete in all its appointments. The depart- ment has 45 wool-spinning factories with 13,123 spindles, and 6 cotton-spinning mills with 50,000 spindles; and cloth-making, paper-making, tanning, and othcr industries are carried on. On the coast there are important beds for oyster culture, and the maritime population, when not engaged in the pursuit of the herring, mackerel, or lobster, collect ware and sea-grass. The shipping of Manche amounts to some 4600 vessels, with an aggregate tonnage of 29,000 tons; the exports consist of butter, eggs, poultry, live stock, legumes, meat, fish, horses, grain, stone, brasiery, and hardware. The popu- lation in 1876 was 539,910. There are six arrondissements (St Lé, Avranches, Cherbourg, Coutances, Mortain, Valognes), 48 cantons, and 643 communes ; the capital is St Lé.

MANCHESTER, a city whose industries are famous throughout the civilized world, is situated in the south- eastern corner of Lancashire, and forms the centre of the towns and villages which constitute the great English cotton district.

The tity of Manchester and the borough of Salford are about 180 miles north-west of London, and lie in 53° 29' N. lat., 2° 14' 23" W. long. The sister towns stand for the most part on a level plain, the rising ground being chiefly on the north side. The rivers are the Irwell, the

| Medlock, the Irk, and the Tib, the last entirely overarched

and covered by streets and warehouses. The Irwell, which separates Manchester from Salford, is crossed by a series of bridges ; it has here an average width of 91 feet and an average depth of about 7 feet; and it discharges itself into the Mersey, which is about ten miles distant. The chief part of the district, before it was covered with the superficial drift of sand, gravel, and clay, consisted of upper New Red Sandstone with slight portions of lower New Red Sandstone, magnesian marls and upper red marls, hard sandstone and limestone rock, and cold clays and shales of contiguous coal-fields. The town, as its thousands of brick- built houses show, has been for the most part dug out of its own fields of clay. The parliamentary borough of Manchester has an area of 6349 acres; the municipal area is 4294 acres. The parliamentary and municipal bound- aries of Salford are identical, and have an area of 5208 acres.

Parks and Statues.—Of the parks and open spaces the principal is the Peel Park in Salford, containing an area of about 40 acres. In its centre is the building containing the Salfurd library, and also a valuable museum of natural history and a collection of paintings known as the Lang- worthy gallery (built and endowed by the late Mr E. R. Langworthy, a wealthy Manchester merchant). Among the notable pictures may be named the Last Sleep of Argyll and the Execution of Montrose, by Mr E. M. Ward. Seedley Park, Ordsall Park, and Albert Park have been recently constructed, and are situated in Salford,—where also is the Kersal Moor, a bit of wild moorland, some 21 acres in extent, now under the care of the corporation of Salford. The moor has long been noted for the richness of its flora, about one-eighth of the English flowering plants having been gathered on its very limited area. It has also been the scene of an entomological incident of some interest—the capture of the Wceophara Woodiella, of which there is no other recorded habitat. The Queen's Park at Harpurhey is pleasantly situated, notwithstanding that it is now completely surrounded by cottages and manufactories. In the centre is a small museum, the chief interest of which depends upon a series of phrenological casts made by Gall and Spurzheim and completed by Bally. Philips Park is also attractive, not withstanding its close proximity to some of the densest

portions of the town. The principal parks so far named were constructed from money obtained by a public subscription in 1846, but the Alexandra Park at Moss Side has been entirely paid for out of the public rates. It has very good ornamental grounds, but owing to the difficulties of the situation the construction has been some- what costly. In this connexion may be mentioned the Botanical Gardens, which are situated at Old Trafford, and, although intended chiefly for the subscribers, are open at certain times to the public on liberal terms.

Manchester is not remarkable for the number of its public memorials of the dead; but it possesses some

Scale of % a Mile.

MANCHESTER

which should not be passed unnoticed. In front of the infirmary are bronze statues of Wellington, Watt, Dalton, and Peel. A bronze statue of Cobden occupies a prominent position in St Ann's Square. The marble statue of the Prince Consort, covered by a Gothic canopy of stone, is placed in Albert Square, in proximity to the town-hall, the enormous proportions of which have the effect of dwarfing what would otherwise be a striking monument. The most picturesque is the bronze statue of Cromwell, on a huge block of rough granite as pedestal. In the Peel Park are statues of Queen Victoria, the Prince Consort, Sir Robert Peel, and Joseph Brotherton.

Plan of Manchester.

Public Buildings.—There are many fine public buildings in Manchester. Among them may briefly be noticed the royal infirmary, consisting of three sides of a quadrangle, one of which owes its existence to the benevolence of Jenny Lind, who gave two concerts in order to raise the necessary funds. The institution will accommodate about two hundred and sixty patients. The royal exchange is a fine specimen of Italian architecture, and was erected in 1869; the great meeting-hall is one of the largest rooms in England, the ceiling having a clear area, without supports, of 120 feet in width. The

exchange is seen at its best on market days (Tuesday and Friday), when representatives from all parts of Lancashire, and indeed of the neighbour-

ing counties, are earnestly engaged in buying and selling. The assize courts were built in 1864 from designs by Waterhouse. The style is a mixture of Early English and Decorative, and a large amount of decorative art has been expended on the building. The cost was about £100,000. The New Bailey prison, intended for the criminals of Salford hundred, was built (1787) in accord- ance with the suggestions of Howard, the prison philan-thropist, but in 1868 the present structure, at the rear of the assize courts, was erected. The style of archi- tecture is Norman, and the building, which covers 9 acres, cost £170,000. The city jail is situated in Hyde Road. The old town-hall was built in 1832, in imitation

of the Erectheum of Athens, at a cost of £40,000; it is now occupied by the town library. The business of the city is conducted in the new town-hall, probably beyond dispute the most important municipal building in the kingdom, if not in Europe It was completed in 1877, from designs by Waterhouse, who selected as the style of architecture a form of Gothic, but treated it very freely as purposes of utility required. The edifice covers 8000 square yards, and includes more than two hundred and fifty rooms. The triangular or flat-iron form of the site was a great difficulty, but the architect has skilfully sur- mounted it. The building consists of continuous lines of corridors surrounding a central courtyard and connected by bridges, The principal tower is 260 fcet high, and affords a view which extends over a large part of South Lancashire and Cheshire, and is bounded only by the hills of Derbyshire. It contains a remarkable peal of bells by Taylor of Longhborough, forming an almost perfect chromatic scale of twenty-one bells ; each bell has on it a line from section 105 of Tennyson's Jn Memoriam. The great hall is 100 feet long and 50 feet wide, and contains a magnificent organ built by Cavaillé-Coll of Paris. The panels of this room are being filled with mural paintings illustrating the various incidents connected with the history and progress of the city, The total cost of the building has been £1,053,264, inclusive of £201,925 for interest. The branch Bank of England is a Doric building designed by Cockerell, The

Salford town-hall is also Doric; and there are besides separate town-halls for the townships of Ardwick, Chorlton, Hulme, Cheetham, Broughton, and Pendleton. The Free Trade hall is a fine structure in the Lombardo-Venetian style, and its great hall will accommo- date five thousand people. It is used for public meetings, concerts, &c., and was built by Walters. The young men's Christian association hall was originally used as a natural history museum. The Royal Institution, built by Sir Charles Barry, is a proprietary institution intended for the encourage- ment chiefly of the fine arts. In the entrance hall are casts of the Elgin Marbles, given by George IV., and a statue of Dalton by Chantrey. There is a small permanent gallery, and periodical exhibitions of pictures are held and courses of lectures delivered. Arrangements have now (1882) been concluded by which the institution will become the pro- perty of the town and be managed by a joint committee of members of the town council and others interested in art and literature. The Atheneum, also designed by Barry, was founded by Richard Cobden and others associated with him, for "the advancement and diffusion of know- ledge." The institution has, perhaps, not developed exactly on the lines contemplated by its promoters, but it has become one of the most useful in the town. All thic advantages enjoyed by members of high-class social clubs, with the addition of facilities for educational classes and the use of an excellent news-room and a well-selected library of 18,000 volumes, are offered in return for a payment which does not amount toa penny a day. The mechanics' institution contains a library of 17,000 volumes, and has connected with it excellent day and evening schools, and classes for technical instruction. The Portico is a good specimen of the older proprietary libraries and news- rooms. It dates from 1806, and has a library of 20,000 volumes, The Memorial Hall was built to commemorate the memory of the Nonconformist ejected ministers of 1662. The Unitarian home missionary board has here its library and rooms for the education of students ; and the building is used for a variety of meetings, scientific, educational, musical, and religious. The inconvenience arising' from inadequate provision for postal service is, after many years of hesitation, to be remedied by the erection, now (1882) in progress, of a commodious post-office.

Means of Communication.—The opening of the Man- chester and Liverpool Railway in 1830 marked an im- portant epoch in the history of modern industry, and since that time Manchester has gradually been connected by rail with every part of the kingdom. The enormous traffic by this meaus has not, however, entirely superseded the use of the canals, which formerly played so important a part in the cotton industry. The construction of the Bridgewater Canal in 1761 was an event second in importance only to that of the introduction of the railway system. There arc three large railway stations, Victoria, London Road, and the Central, and several minor ones. The excellence of the omnibus system of the city was perhaps one principal cause for the somewhat tardy adoption of tramways; but these have now rapidly developed, and ensure facilities for transit between the different parts of the city and also for com- munication with the neighbouring towns and villages. The establishment of a ship canal to connect Manchester with the sea has been frequently suggested at intervals for the last sixty years, and ascheme of tidal navigation elaborated by Mr Hamilton Fulton is now (1882) being actively dis- cussed.

Water Supply.—This is under the control of the cor- poration, which supplies not only the citizens but the sur- rounding populations. The gathering-ground is a series of reservoirs in the valley of Longdendale, chiefly along the course of the river Etherow. Woodhead, the chief reservoir, 20 miles from Manchester, is 777 feet above sea-level, is 72 feet deep, covers an area of 155 acres, and has a capacity of 1,235,000,000 gallons. The present system of water- works, including the portions now being constructed at Audenshaw and Denton, have an area of reservoirs of 8544 acres, and a capacity of holding 5,914,000,000 gallons. The average daily supply of water was in 1855 8,078,152 gallons ; in 1881 it was 18,929,704 gallons. In 1877 the water committee announced that in view of the increased demand it would be necessary to obtain additional or fresh sources of supply. The proposal to utilize Thirlmere in Cumberland for this purpose was vehemently opposed, but the scheme was eventually sanctioned by parliament, and the works have been begun, but have not as yet made rapid progress. Thirlmere is 533 feet above the sea, and it is proposed to raise it by an embankment to 584 feet above the sea. From this height it is estimated that a maximum quantity of 50,000,000 gallons might be with- drawn daily.

Lighting.—The corporation not only manufactures gas for the lighting of the city, but sells it to out-districts. The area of distribution amounts to 42 square miles, and the street mains for the gas supply are 597 miles long. The entire assets of the gas-works were valued in September 1881 at £1,386,942. The average quantity of gas transmitted daily was 2,425,630,000 cubic feet. The revenue from the sale of bye-products is about £90,000. Salford, which is supplied with water by Manchester, has its own gas-works, the property of the ratepayers, and managed by a committee of the town council.

Administration of Justice.—The city has a stipendiary magistrate who, in conjunction with lay magistrates, tries cases of summary jurisdiction in the police courts; these are held in a building erected for the purpose, and having some architectural pretensions. There are also quarter sessions, presided over by a recorder. Separate sessions are held for the Salford hundred. Salford has also a police court with a stipendiary magistrate. Certain sittings of the Court of Chancery for the duchy of Lancaster are held in Manchester. In addition to the county court, there is an ancient civil court known as the Salford Hundred Court of Record, Assizes have been beld since 1866.

Churches,—The chief ecclesiastical building in Man- chester is the cathedral, which, however, hardly corre- sponds to the ideas usually associated with that word. It was indeed built simply as a parish church, and, although a fine specimen of Perpendicular Gothic, is by no means what might be expected as the cathedral of an important and wealthy diocese. Though there are remains of older work, the bulk of the building belongs to the early part of the 15th century. The first warden was John Huntington, rector of Ashton, who built the choir. The building, which was noticed for its hard stone by Leland when he visited the town, did not stand time and weather well, and by 1845 some portions of it were rapidly decaying. This led to its restoration by Holden, which was not finished until 1868, when the tower was almost completely renovated in a more durable stone than that formerly used. The total length is 220 feet and the breadth

112 feet; the only parish church exceeding it in this last dimension is said to be that of Coventry. There are several stained-glass windows. In the Ely chapel is the altar tomb of Bishop Stanley, the father of the gallant Sir John Stanley, who fought at Flodden Field. In the stalls there are some curious miserere carvings. The tower is 139 feet high, and con- tains a peal of ten bells, chiefly from the foundry of the Rudhalls. There are two organs, one by Father Smith, and a new one erected at a cost of more than £7000, and enclosed in an oak case designed by the late Sir G. Scott. The church endowments are considerable, and have been the subject of a special act of parliament, known as the Manchester Rectory Division Act of 1845, which provides £1500 per annum for the dean, and £600 to each of the four canons, and divides the residue among the incumbents of the new churches formed out of the old parish. There are about one hundred places of worship in Manchester belonging to the Church of England, but they are not especially remarkable. Of the Roman Catholic churches, the most important are the cathedral church of St John in Salford, of the earliest Decorative character, with a spire 240 feet in height, and the church of the Holy Name, which belongs to the Jesuits, and is remarkable for its costly decoration. Salford is the seat of a Roman Catholic bishopric, as Manchester is the seat of an Anglican one. Most of the Nonconformist bodies have churches in the city and its environs. The meeting-house of the Society of Friends is said to be the largest of the kind in the kingdom, and will seat twelve hundred persons.

Interature and Scvence.—Manchester possesses numerous associations for the cultivation of literature and science. The oldest of these, the Literary and Philosophical Society, founded in 1781, has a high reputation, and has numbered among its working members John Dalton, Eaton Hodg- kinson, William Fairbairn, J. P. Joule, H. E. Roscoe, and many other famous men of science. It has published a lengthy series of memoirs and proceedings. The Man- chester Literary Club was founded in 1862, and publishes an annual volume of papers. The Manchester Statistical Society was the first society of the kind established in the kingdom, and has issued Zransactions containing many important papers. The Scientific Students' Association, the Field Naturalists' and Archzologists' Society, the Microscopical Society, the Botanists' Association, the Geo- logical Society, and the Science Association may also be named. Several printing clubs, the Chetham,

Record, Holbein, and English Dialect societies, have their head- quarters here. Nine daily papers are published, and the journalism of Manchester takes high rank. The periodicals issued are between fifty and sixty in number.

University and Schools,—There are many educational facilities in Manchester and Salford. The oldest school is the Manchester grammar school, which was founded in

1519 by Hugh Oldham, bishop of Exeter, who was a native of Crumpsall, one of the outskirts of the town. The foundation was done "out of the good mind he bore to the county of Lancashire, perceiving that the children thereof, having pregnant wits, were for the most part brought up rudely and idly; that knowledge might be advanced, and that the children might be better taught to love, honour, and dread God and His laws." The master and usher appointed by the good bishop were to teach freely every child and scholar coming to the school, " without any money or reward taken." Some mills were devised for the maintenance of the school, which was further endowed at both the universities by Sarah, duchess of Somerset, in 1692. The school has been reconstituted on a new basis within recent years, and has now two hundred and fifty free scholars, whilst other pupils are received on payment of low fees. Mr E. R. Langworthy bequeathed to it £10,000 as an endowment for scholarships. Among those educated at the grammar school may be mentioned Thomas De Quincey and the late Mr Harrison Ainsworth.

The Owens College was founded in 1846 by John Owens, who left nearly £100,000 to trustees for an institution in which should be taught "such branches of learning and science as were then and might be hereafter usually taught in English universities." The college was opened in 1851, in a house which had formerly been the residence of Cobden, but in 1872 it was removed to its present home, a hand- some Gothic building designed by Waterhouse. An appeal made to the public in 1867 in behalf of the college was heartily responded to, and its capital funds now amount to over £400,000. The building is carefully adapted to its purposes; and the chemical laboratory, a separate struc- ture at the rear, is of the completest

description. The first bishop of Manchester, Dr J. Prince Lee, who had an interesting library of some 6000 volumes, bequeathed it to the college, which has also received gifts of books and money from various other quarters, and thus has now the nucleus of an important collection. The Royal School of Medicine, which was founded in 1824, and had acquired the reputation of being one of the most successful of the provincial schools, has been amalgamated with the college. The Medical Society has, by an arrangement with the college authorities, deposited its valuable library of 22,000 volumes in the college rooms. The Manchester museum is now the property of the college, and contains the bulk of the specimens gathered by the Geological Society and by the now extinct Natural History Society. A suitable build- ing for the accommodation of the museum has long been a decided want, and is now (1882) about to be undertaken. The growing importance of the Owens College led to the – project for a university charter. The proposal was not received without some opposition, but as the result of lengthy discussions and adjustments a scheme was evolved for a university to consist of affiliated colleges, situated in different towns, but having its centre in Manchester; and the charter of the Victoria University was granted in 1880, with full powers to grant degrees except in medicine—an exception which is to be removed. Among the other educational institutions of the district are the Lancashire Independent college, the Primitive Methodist college, the Baptist institute, the St Bede's college (Roman Catholic), the college for women, the Salford college for working men, the school of art, and many minor institutions. The elementary education is controlled by an elected school board. Salford has also a school board. Very nearly the oldest educational institution in the town is the Chetham hospital, a bluecoat school educating one hundred boys ; and almost the latest addition to these institutions is a similar institution founded by the late Alderman Nicholls. The schools for the deaf and dumb are situated at Old

Mm A NPC i 'Trafford, in a contiguous building of the same Gothic design as the blind asylum, to which Mr Thomas Henshaw left a bequest of £20,000. There is also an adult deaf and dumb institution, containing a news-room, lecture-hall, chapel, &c., for the use of deaf mutes.

Labraries and Museums.—Manchester is well provided with libraries. The Chetham library is sometimes spoken of as the oldest free library in Europe, and certainly its doors have been open without let or hindrance for more than two centuries, and the building which it occupies is almost the only relic now left of ancient Manchester. What had once been the barons' hall, and afterwards the residence of the clergy, was purchased by the trustees of Humphrey Chetham, and by them applied to the purposes of a blue- coat school and library, provision for the foundation and maintenance of which he had made by will. The library, with its quiet and almost monastic corridors, forms a striking contrast to the busy streets without. The contents now amount to about 40,000 volumes, and include many rare manuscripts and curious books, the gem of the collec- tion undoubtedly being a copy of the historical compilation of Matthew Paris, with corrections in the author's hand- writing. There is a large collection of matter relating to the history and archzeology of Lancashire and Cheshire. A recent addition to its riches in this department is the ex- tensive series of Lancashire manuscripts bequeathed by the late Canon Raines, The collection of broadsides formed by Mr J. O, Halliwell-Phillips, and the library of John Byrom, rich in mystics and shorthand writers, should also be named. In addition to the library, Chetham left provision for the education of a number of poor boys, and the increase in the value of the endowments has raised the number to one hundred, who receive a good English education and are afterwards put to some useful trade or calling. An ad- ditional school has recently been erected from designs by Waterhouse, who has been successful in making the new building harmonize with the quaint and sober architecture of the hospital and library. The Manchester Free Libraries were founded by Sir John Potter, who was instrumental in promoting a public subscription from which a building was bought and stocked with books, and then handed over to the town, by whose municipal authorities the libraries have since been not only maintained but materially increased. There is now a reference library containing about 70,000 volumes, including an extensive series of English historical works and a remarkable collection of books of political economy and trade. The chief object has been to make a good working collection for the student and man of letters. But, although the collection of objects dear to the bibliomaniac has not been considered of first importance, the library now includes some literary curiosities of the first rank, among them specimens of the press of Caxton

and Wynkyn de Worde. Affiliated to the central consulting library there are six lending libraries, the Hulme library having 17,000 volumes, Ancoats 15,000, Rochdale Road 15,000, Chorlton and Ardwick 17,000, Cheetham 12,000, and Deansgate 18,000. Each lending library has attached to it a commodious reading-room. There are also libraries in connexion with-the Athenzum, the mechanics' institu- tion, the Portico, the Owens College, and other institu- tions. The sister borough of Salford has also adopted the free library system, and possesses at Peel Park a large reference and lending library, whilst additional lending libraries and news-rooms have been opened at Pendleton, Greengate, and Regent Road.

Recreation.—The city has always been noted for its love of theatrical amusements, and the German element in its population has in the last fifty years largely influeneed the taste for music by which it is now distinguished. The theatre royal is a patent theatre, and was opened in 1845, its predeccssor having been burned in the previous year. It ranks in size with the large metro-

politan theatres, and has connected with it memories of nearly all the great actors of the present and past generation. The Prince's theatre was opened in 1864, and is an elegant and beautifully finished structure. The Queen's theatre is a substantial building with but small architectural pretensions. A theatre has recently been opened in Salford. The concert-hall will hold twelve hundred people. There are many musical societies; and amongst other places of amusement may be mentioned the Belle Vue Zoological Gardens, the Pomona Palace, and numerous music-halls, &c.

Population.—According to the census of 1881, the municipal borough of Manchester contains a population of 341,414 (163,475 males, 177,989 females), while the parliamentary borough has 393,585 (189,005 males, 204,580 females). Salford, on the same authority, has 176,236 (84,610 males, 91,625 females). These figures, however, hardly convey the actual facts of the case. Manchester and Salford are as closely joined as London and Southwark, and are surrounded by populous districts quite as much united as the component parts of what the registrar-general styles "Greater London." 'There has been a seeming decrease in the population of the city,

which in 1871 was stated to contain 355,655 persons ; but this appearance is fallacious, for, while the eae of city improvements has reduced the number of inhabited

ouses in the centre, there has been a large influx into Salford, which has increased by 51,432 persons during the last ten years. The two boroughs, with the urban sanitary districts immediately contiguous, have a population of about 800,000 persons. In the Middle Ages there were in Manchester and Salford probably not more than two or three hundred burgesses and their dependants. In 1588 the population was estimated at 10,000, but the parish is here meant. In 1757 the two towns contained 19,839 persons, who by 1778 had increased to 27,246, and by 1783 toover 39,000. At the first census in 1801 Manchester had 75,275, and Salford 14,477. The last four census statements are :—

Manchester, Salford. W851! vez 303,382 63,850

1861. 338,722 102,449 1871. — 801,189 124,801 1881 …. 341,414 176,235

The increase in rateable valne has becn equally remarkable. In 1815 Manchester was rated at £357,778; in 1882 the estimate was £2,761,469. The corresponding values for Salford were £54,180 and £801,192.

Sanitary Condition.—Manchester, like other towns, grew more rapidly than the provision for its wise government ; but determined efforts have been made in the direction of sanitary improvement. The death-rate in 1840 was 34°3; in 1850, 29°6; in 1860, 28-0; in 1861, 30°4; in 1862, 30°83; in 1869, 28°9; in 1870, 26°52; in 1871, 29°8 ; in 1877, 25°4; in 1880, 24°7; and for nine months of 1881 it was 23°3. Whatever may be the causes of these fluctua- tions, it is clear that there is still ample room for further improve- ment. The air laden with the products of the combustion of coal, and the unspeakably filthy rivers, are urgently in need of energetic reniedial action.

Manufactures and Commerce.—As las already been stated, Man- chester is the centre of the English cotton industry; but in the town itself of late years the tendency has been more and more in the direction of commerce. Owing to the enhanced value of land, many mills and workshops have been removed to the outskirts and to neighbouring villages and towns, so that the

centre of Manchester and an ever-widening circle around is now chiefly devoted not so much to production as to the various offices of distribution. Large and handsome warehouses and shops abound, and there is every evidence of quick and opulent life. It would be a mistake, however, to regard Manchester as solely dependent upon the industries con- nected with cotton. There are other important manufactures whicli in another community would be described as gigantic. Wool and silk are manufactured on a considerable scale, though the latter industry has forsome years been on the decline. The miscellaneous and multifarious articles grouped under the designation of small- wares occupy many hands. Machinery and tools, using the term with its most comprehensive meaning so as to include alike philo- sophical instruments and steam-engines, are made in vast quanti- ties. The chemical industries of the city are also on a large scale. In short, there are but few important manufactures that are wholly unrepresented. The proximity of Manchester to the rich coal-fields of Lancashire has had a marked influence upon its prosperity ; but for this, indeed, the rapid expansion of its industries would have been impossible.

It would probably be difficult to find a community in any part of the world with which Manchester has no commercial relations. The enterprise of its merchants has kept pace with the energy of its manufacturers, and the products of its looms are to be found in every land, though doubtless the supremacy which its cotton goods have held in the markets of the world tends to become more and more abated by the gradually increasing foreign competition.

From figures laid before the Manchester Statistical Society, the money extent of trading operations at this centre has bcen calcu-

lated at about £207,000,000 in 1872 and £818,000,000 in 1881. 'These figures, thongh to be taken with certain reservations, indicate approximately the extent of the activity of the city.

The commercial institutions of Manchester are too numerous for detailed description. Its chamber of commerce has for more than sixty years held a position of much influence in regard to the trade of the district andof the

nation. There are eleven joint-stock banks, seven of whieh have their head offices in the town ; these banks, besides numerous brauches in the surrounding district, have sixteen branches in the town; and there are several private bankers.

Municipality.—The affairs of the town are regulated by a couneil consisting of sixty-four representatives of the fiftecn wards into whieh the city is divided. The body corporate of sixteen aldermen and forty-eight councillors, who are presided over by the mayor, has shown much enterprise and public spirit in the energy with which it has prosecuted public improvements, and in the business ability with which it has managed the vast undertakings conneeted with the lighting and water supply of the town. The town council of Salford consists also of sixteen aldermen and forty-eight coun- cillors, aud there are fourteen wards,

History.—Very little is known with certainty of the early history of Manehester. It has, indeed, been conjectured, and with some probability, that at Castlefield there was a British fortress, whieh was afterwards taken possession of by the soldiers of Agricola. It is at all events certain that a Roman station of some importance existed in this locality, and a fragment of the wall still exists. In the last century considerable evidences of Roman oecupation were still visible ; and from time to time, in the course of excavation (especially during the making of the Bridgewater Canal), Roman remains have been found. The coins were ehiefly those of Vespasian, Antoninus Pius, Trajan, Hadrian, Nero, Domitian, Vitellius, and Constantine. The period succeeding the Roman occupation is for some time legendary. As latc as the 17th century there was a floating tradition that Tarquin, an enemy of King Arthur, kept the eastle of Manchester, and was killed by Launcelot of the Lake. The mention of the town in authentic annals is very scanty. It was probably one of the scenes of the missionary preaching of Panlinus; and it is said (though by a chronicler of comparatively late date) to have been the residence of Ina, king of Wessex, and his queen Ethelberga, after he had defeated Ivor, somewhere about the year 689. Nearly the only point of certainty in its history before the Conquest is that it suffered greatly from the devastations of the Danes, and that in 923 Edward, who was then at Thelwall, near Warrington, sent a number of his Mereian troops to repair and garrison it. In Domesday Book

Manchester, Salford, Rochdale, and Radcliffe are the only places named in South-East Lancashire, a distriet now covered by populous towns. Large por- tions of it were then forest, wood, and waste lands. Twenty-one thanes held the manor of Salford among them. The church of St Mary and the church of St Michael in Manchester are both named in Domesday, and some difficulty has arisen as to their proper identification. Most antiquaries have considered that the passage refers to the town only, whilst others think it relates to the parisli, and that, while St Mary's is the present cathedral, St Michael's would be the present parish chureh of Ashton-under-Lyne. Man- chester and Salford are so closely allied that it is impossible to dis- associate their history. Salford received a charter from Ranulph de Blundeville, in the reign of Henry IJJ., constituting it a free borough, and Manchester in 1301 received a similar warrant of munieipal liberties and privileges, from its baron, Thomas Gresley, a descendant of one to whom the manor had been given by Roger of Poictou, who was created by William the Conqueror lord of all the land between the rivers Mersey and Ribble. The Gresleys were succeeded by the De la Warres, the last of wliom was educated for the priesthood, and became rector of the town. To avoid the cvil of a non-resident clergy, he made considerable additions to the lands of the church, in order that it might be endowed as a collegiate institution. A sacred guild was thus formed, whose members were bound to perform the necessary services at the parish chureh, and to whom the old baronial hall was granted as a place of residence. The manorial rights passed to Sir Reginald West, the son of Joan Greslet, and he was summoned to parliament as Baron de la Warre. The West family, in 1579, sold the manorial rights for £3000 to John Lacy, who, in 1596, resold them to Sir Nieholas Mosley, whose descend- ants enjoyed the emoluments and profits to be derived from them until the middle of the present century (1845), when they were purchased by the present town council of Manchester for a sum of £200,000. The lord of the manor had the right to tax and toll all articles brought for sale into the market of the town. But, though the inhabitants were thus to a large extent taxed for the benefit of one individual, they had a far greater amount of local self-govern- ment than might have been supposed, and the court leet, which was then the governing body of the town, had, though doubtless in a somewhat rudimentary form, nearly all the powers and functions now possessed by munieipal corporations. This court

had not only eontrol over the watching and watering of the town, the regulation

| ingly marked.

of the water supply, and the cleaning of the strects, but also had power, which at times was used freely, of interfering with what would now be considered the private liberty of their fellow-citizens. Some of the regulations adopted, and presumably enforced, sound grotesquely at the present day. Thus, no single woman was allowed to be a householder ; no person might employ other than the town musieians ; and the amount to be spent at wedding feasts and other festivities was carefully settled. Under the protection of the barons the town appears to have steadily increased in prosperity, and it early became an important seat of the textile manufactures. Full- ing mills were at work in the distriet in the 138th century ; and documentary evidence exists to show that woollen manufactures were carried on in Ancoats at that period. In 1641 we hear of the Manehester people purehasing linen yarn from the Irish, weaving it, and returning it for sale in a finished state. They also brought cotton wool from Smyrna to work into fustians and dimities. An Act passed in the reign of Edward VI. regulates the length of eottons ealled Manchester, Laneashire, and Cheshire cottons. These, notwithstanding their name, were probably all woollen tex- tures. It is thought that some of the Flemish weavers who were introduced into England by Queen Philippa of Hainault were settled at Manchester ; aud Fuller has given an exceedingly quaint and picturesque deseription of the manner in which these artisans were welcomed by the inhabitants of the country they were about to enrich with a new industry, one whieh in after centuries has beeome perhaps the most important industry of the country. The Flemish weavers were in all probability reinforeed by religious refugees from the Low Countries. Leland, writing in 1688, describes Manchester as the " fairest, best builded, quickest, and most popu- lous town of Lancashire." The right of sanctuary had been granted to the town, but this was found so detrimental to its industrial pur- suits that after very brief experience the privilege was taken away. The college of Manchester was dissolved in 1547, but was refounded in Mary's

reign. Under her sneeessor the town became the head- quarters of the commission for establishing the Reformed religion.

In the eivil wars, the town was besieged by the Royalists under Lord Strange, but was successfully defended by the inhabitants under the eommand of a German soldier of fortune, Colonel Ros- worm, who complained with some bitterness of their ingratitude to him. An earlier affray between the Puritans and some of Lord Strange's followers is said to have occasioned the shedding of the first biood in the disastrous struggle between the king and parlia- meut. The year 1689 witnessed that strange episode, the trial of those concerned in the so-called Lancashire plot, whieh ended in the triumphant acquittal of the supposed Jacobites. That the dis- trict really contained many ardent sympathizers with the Stuarts was, however, shown in the rising of 1715, when the elergy ranged themselves to a large extent on the side of the Pretender, and was still more elearly shown in the rebellion of 1745, when the town was taken possession of by Prince Charles Edward Stuart, and a regiment, known afterwards as the Manchester regiment, was formed and placed under the command of Colonel Franeis Townley. In the fatal retreat of the Stuart troops the Manchester contingent was left to garrison Carlisle, and surrendered to the duke of Cum- berland. 'The officers were taken to London, where they were tried for high treason and beheaded on Kennington Common.

The variations of political action in Manchester had been exceed- In the 16th century, although it produced both Catholic and Protestant martyrs, it was earnestly in favour of the Reformed faith, and in the succeeding century it became indeed a stronghold of Puritanism. Yet the deseendants of the Roundheads who defeated the army of Charles J. were Jacobite in their sym- pathies, and bythe latter half of the 18th eentury had become imbued with the aggressive form of patriotic sentiment known as anti-Jacobinism, which showed itself chiefly in dislike of reform and reformers of every description. A change was, however, immi- nent. The distress caused by war and taxation, towards the end of the last and the beginning of the present century, led to bitter dis- content, and the anomalies existing in the parliamentary system of representation afforded only too fair an objeet of attack. While single individuals in some portions of the country had the power to return members of parliament for their pocket boroughs, great

towns like Manchester were entirely without representation. The injudicious conduct of the authorities, also, led to an increase in the bitterness with which the working classes regarded the condition of society in which they found themselves compelled to toil with very little profit tothemselves. Their expressions of discontent, instead of being wisely regarded as symptoms of diseasc in the body politie, were looked upon as crimes, and the severest efforts were made to repress all expression of dissatisfaction. This foolish policy of the authorities reached its culmination in the affair of Peterloo, which may be regarded as the starting point of the modern reform agitation. This was in 1819, when an immense crowd assembled on St Peter's Fields (now covered by the Free Trade hall and warehouses) to petition parliament for a redress of their grievances. The authorities had the Riot Act read, but in sueh a manner as to be quite unheard by the mass of the people ; and drunken ycomanry cavalry were

then turned loose upon the unresisting mass of spectators. The yeomanry appear to have used their sabres somewhat frecly ; several people were killed and many more injured ; and, although the magistrates received the thanks of the prinee regent and_ the ministry, their conduct exeited the decpest indignation throughout the entire country. Naturally enough, the Manchester politicians took an important part in the reform agitation, and when the Act of 1832 was passed, the town sent as its representatives the Right Ilon. C. P. Thomson, vice-president of the Board of Trade, and Mr Mark Philips. With one notable exception, this was the first time that Manchester had bcen represented in parliament sinec its parons had seats in the House of Pcers in the earlier centuries. In 1654 Mr Charles Worsley and Mr R. Radcliffe were nominated to represent it in Cromwell's parliament. Worsley was a man of great ability, and must ever have a conspieuous place in history as the man who earried out the injunction of the Proteetor to 'remove that bauble," the mace of the House of Commons. The agitation for the repeal of the corn laws hadits headquarters at Manchester, and the suceess which attended it, not less than the active interest taken by its inhabitants in public questions, has made the eity the home of various projects of reform. The "United Kingdom Alliance for the suppression of the liquor traffic" was founded there in 1853, and during the

continuance of the American War the adherents both of the North and of the South deemed it desir- able to have organizations to influence publie opinion in favour of their respective causes. A charter of incorporation was granted in 1838 ; a bishop was appointed in 1847 ; and the town became a city in 1853. The Lancashire cotton famine, eaused by the civil war in Ameriea, produeed much distress in the Manchester distriet, and led to a national movement to help the starving operatives. The relief operations then organized are amongst the most remark- able efforts of modern philanthropy.

Although several excellent books have been written on subjects conneeted with the town, there is no adequate modern history. The Iistory of Manchester, by the Rev. John Whitaker, appeared in 1771; it is a mere fragment, and, though containing much important matter, requires to be very discreetly used. 'lhe following may be recommended :—Reilly, ITistory of Manchester, 1861 ; Procter, 'Manchester in Ioliday Dress (1866), Memorials of Manchester Streets (1874), Afemo- rials of Byegone Manchester, 1880; Buxton, Botanical Guide to Manchester, &c., 2d ed., 1859; Axon, Handbook of the Public Libraries of Manchester and Salford, 1877; Grindon, Manchester Flora, 1859; Baines, Iistory of Lancashire, 2d ed., 1868-70, (W. E, A. A.)

MANCHESTER, a town of the United States, in Hart- ford county, Connecticut, with a station on the New York and New England Railroad, 8 miles east of Hartford. Its spinning aud weaving mills turn out annually 2,000,000 yards of gingham and 90,000 pairs of stockings ; and its paper mills (upwards of a dozen in number) produce net only vast quantities of book paper but Government and bank-note paper for several nations. At South Manchester, 21 miles distant, and reached by a branch line, are the silk factories of Messrs Cheney, which cover about 8 acres, and give employment to one thousand operatives. The factory village has been laid out by a landscape gardener ; and connected with it are a public hall, a library and reading- room, and a free school. The population of the town has increased from 4223 in 1870 to 6462 in 1880.

MANCHESTER, a city of the United States, one of the shire towns of Hillsborough county, New Hampshire, is situated mainly on the left bank of

the Merrimac, in a broad plain about 90 feet above the level of the river, in 42° 35’ N. lat. and 71° 31’ W. long, 16 miles from Concord and 46 north-west of Boston. It is a terminus of several railroads, as well as a principal station on the Boston, Lowell, and Concord line. The general plan is regular and spacious; there are several large and ornamental squares, and the main thoroughfare, Elm Street, is 100 feet wide, more than a mile long, and bordered by the trees from which it takes its name. Towards the river the froutage consists of great brick-built factories and substantial tene-ments for the accommodation of the operatives. A city- hall (rebuilt after the fire in 1842), the county court-house, the State reform school (for one hundred and fifty pupils), two opera-houses, and a Roman Catholic convent (St Ann’s) and orphan asylum are among the buildings of note. The city library (24,000 volumes), founded by private enterprise in 1844 as the Manchester Atheneum, became public pro- perty in 1854. Water from Lake Massabesic (4 miles distant and 2300 acres in extent) was introduced into the

town in 1874, at a cost of nearly $1,000,000, and is stored in a reservoir capable of containing 16,000,000 gallons. It is almost exclusively to the water-power furnished by the Blodgett Canal (built in 1816 round the Amoskeag Falls, which have a descent of 47 feet) that Manchester owes its prosperity asa manufacturing centre. The Amoskeag Com- pany (dating from 1831), the Stark mills (1838), the Man- chester mills (1839), the Langdon mills (1857), and the Amory mills (1880) are the leading establishments ; they possess an aggregate capital of $7,650,000, work 12,000 looms and 409,000 spindles, and make 143 miles of web daily. Locomotive engines (produced at the rate of fourteen per month), steam fire-engines, edge tools, circular saws, files, sewing machines, carriages, leather, boots and shoes, paper, and ale all likewise form important items in the local industry. Manchester is governed by a mayor, a board of aldermen (one member for each of the eight wards), and a common council (three members for each ward). The assessed value of property in 1881 was $19,175,408 ; and the city debt $965,550. The popula- tion, which was 13,932 in 1850, stands in the succeeding decades at 20,107, 23,536, and 32,630, and is stated in 1882 at 36,500.

Originally settled in the elose of the 17th century by Seotch Presbyterians and Massachusetts Puritans, Derryfield, as it was then called, though incorporated in1751,eontinued for upwards of seventy years to be a place of less than one hundred inhabitants, with neither minister nor lawyer, and so dependent on the river fishcries that the eels were known as the 'Derryfield beef." The name Manchester was legally reeognized in 1810, and a city eharter was granted in 1846. 'The city has recently been described as paying nearly one-ninth of the State tax and producing one-eighth of the manufaetured goods made in the State, as embracing one-tenth of the population of the Statc, as the fourth city of the Union in the value of its cotton and woollen manufactures, and the third eity in New England in increase during the last decade.

MANCHURIA is the name by which the territory in the east of Asia occupied by the Manchus is known in Europe. By the Chinese it is called the country of the Manchows, or, a8 it is pronounced by the natives, of the Manchus, an epithet meaning "Pure," chosen by the founder of the dynasty which now rules over Manchuria and China as an appropriate designation for his family. Manchuria as it has existed for upwards of two centuries, that is to say since it has had an historical existence, is a tract of country lying in a north-easterly and southi- westerly direction between 38° 40° and 49° N, lat. and 120° and 133° E, long., and is wedged in between China and Mongolia on the west and north-west, and Corea and the Russian territory on the Amur on the east and north. Speaking more definitely, it is bounded on the N. by the Amur, on the E. by the Usuri, on the S. by the Gulf of Leaou-tung, the Yellow Sea, and Corea, and on the W. by the river Nonni and a line of palisades which stretch from Kwan-chung-tsze to the Great Wall of China. The territory thus defined is about 800 miles in length and 500 miles in width, and contains about 390,000 square miles. It is divided into three provinces, viz., Tsitsihar or North- ern Manchuria, Kirin or Central Manchuria, and Leaou- tung or Southern Manchuria. Physically the country is divided into two regions, the one a series of mountain ranges occupying the northern and eastern portions of the kingdom, and the other a plain which stretches southwards from Moukden, the capital, to the Gulf of Leaou-tung. Speaking generally, the mountains run in a direction parallel with the lie of the country, and are interspersed with numerous and fertile valleys, more especially on the southern and eastern slopes, where

the summer sun brings to rich perfection the fruits of the soil fertilized by the showers of the south monsoon.

The principal range of mountains is the Shan-a lin, the Chinese Chang pith Shan, "the long white mountains," AV. — 59

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which runs in a north-easterly direction from the shores of the Gulf of Leaou-tung to the mouth of the Amur river. In its course through Northern Manchuria it forms the watershed of the Sungari, Hurka, and Usuri rivers, and in the south that of the Ya-lu, Ta-yang, and many smaller streams. It also forms the eastern boundary of the great plain of Leaou-tung. The mountains of this range reach their greatest height on the south-east of Kirin, where their snow-capped peaks rise to the elevation of from 10,000 to 12,000 feet. The scenery among them is justly celebrated for the grandeur of its beauty, more especially in the neigh- bourhood of Haiching, Siu-yen, and the Corean Gate. Another range forms a parallel line to the Shan-a-lin mountains on their west, and runs from the neighbour- hood of the junction of the Hurka and Sungari rivers, passing Kirin, to the plain on the north side of Moukden.

The three principal rivers of Manchuria are the Sungari, Hurka, and Usuri already mentioned. Of these the Sun- gari, which is the largest, rises on the northern slopes of the Shan-a-lin range, and runs in a north-westerly direction to its junction with the Nonni, from which point it turns north-east until it empties itself into the Amur. It is navigable by native junks above Kirin, to which city also the Russians have succeeded in travelling on it by steamer. In its long course it varies greatly both in depth and width, in some parts being only a few feet deep aud spreading out to a width of more than a mile, while in other and mountainous portions of its course its channel is narrowed to 300 or 400 feet, and its depth is increased in inverse ratio, 'The Usuri rises in about 44° N. lat. and 131° E. long., and, after running a north- easterly course for nearly 500 miles, it also loses itself in the Amur. The Hurka takes its rise, like the Sungari, on the northern slopes of the Shan-a-lin range, and not far form the sources of that river. It takes a north-easterly course as far as the city of Ninguta, at which point it turns northward, and so continues until it joins the Sun- gari at San-sing. It is

navigable by junks between that city and Ninguta, though the torrents in its course make the voyage backwards and forwards one of considerable difficulty. Next in importance to these rivers are the Leaou and Ta-yang, the former of which rises in Mongolia, and after running in an easterly direction for about 400 niles enters Manchuria in about 43° N. lat., and turning southward empties itself into the Gulf of Leaou-tung. In bygone days large junks were able to sail up it as far as New-chwang, but owing to the silting up of the bed it is not now navigable for any but small boats beyond Ying-tsze, where the foreign settlement is situated. The Ta-yang rises on the southern slopes of the Shan-a-lin mountains, and flows southward into the Yellow Sea.

Moukden, or as it is called by the Chinese Shing-yang, the capital city of Manchuria, is situated in the province of Leaou-tung, in 41° 40' N. lat. and 130° 30' E. long. It occupies a fine position on the river Shin, an affluent of the Leaou, and is a city with considerable pretensions to grandeur. The city wall presents a handsome appearance, and is pierced by eight gates. Like Peking, the town possesses a drum tower and a huge bell. The streets are broad and well laid out, and the shops are well supplied with both native and foreign goods. The population is estimated at about 200,000, including that of the suburbs, the richest and most extensive of which are on the western and southern faces of the city. Leaou-yang, which was once the capital of the country, also stands in the province of Leaou-tung, but it is not now a place of much import- ance. Such trade as there is is carried on in the centre of the city, the remaining portions being open, having been turned into vegetable gardens. The other cities in the province are King-chow-foo on the west of the Gulf of

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Leaou-tung ; Kin-chow, on the western extremity of the Leaou-tung peninsula; Kai-chow, on the north-western shore of the same peninsula; Hai-ching, on the road from Ying-tsze to Moukden ; Ki-yuen, a populous and prosperous city in the north of the province; and Hing-king, on the northern slope of the Shan-a-lin mountains, which is famous rather from the fact that it was the original seat of the founders of the present dynasty than for any pretensions to present importance. The most important commercial

place, however, is the treaty port of Ying-tsze, which is situated at the head of the Gulf of Leaou-tung. The niain street, which is lined with shops and warehouses, is 2 miles in length, and the trade there carried on is very considerable. According to the custom-house returns the value of the foreign imports and exports in the year 1880 was £691,954 and £1,117,790 respectively, besides a large native trade carried on in junks. The population of the whole province of Leaou-tung is estimated to be about

12,000,000.

The province of Kirin, or Central Manchuria, is bounded on the N. and N.W. by the Sungari, on the S. by Leaou- tung and Corea, on the W. by the line of palisades already spoken of, and on the E. by the Usuri and the maritime Russian provinces. It contains an area of about 135,000 square miles, and is entirely mountainous with the excep- tion of a stretch of plain country in its north-western corner. This plain produces large quantities of indigo and opium, and is physically remarkable for the number of isolated conical hills which dot its surface. These sometimes occur in a direct line at intervals of 15 or 20 miles, and elsewhere are scattered about " like dish-covers on a table." Kirin, the capital of the province, is situated in about 43° 40' N. lat. and 126° 50' E. long., and occupies a magnificent position, being surrounded on the north, west, and south by a semicircular range of mountains with the broad stream of the Sungari flowing across the front. The local trade is considerable, and is benefited by the presence of large junk-building yards, which, owing to the abundance and cheapness of wood, have been established there, and from which the place has derived its Chinese name of Chuen- chang or "shipyard." The town has a well-to-do appear- ance, and in summer time the houses and shops are gaily decorated with flowers brought from the sunny south. Ashehoh, on the Ashe, with its population of 40,000 ; Petuna, Sinice Sing-chung, on the Sungari, population 30,000 ; San-sing, near the junction of the Sungari and Hurka ; La-lin, 120 miles to the north of Kirin, popula- tion 20,000 ; and Ninguta, are the other principal cities in the province.

Tsi-tsi-har, or Northern Manchuria, which contains about 195,000 square miles, is bounded on the N. and N.E. by the Amur, on the 8. by the Sungari, and on the W, by the Nonni and Mongolia. This province is thinly

populated, and is cultivated only along the lines of its rivers. The only towns of any importance are Tsitsihar and Mergen, both situated on the Nonni.

Four principal highways traverse Manchuria. The first runs from Peking to Kirin va Moukden, where it sends off a branch to Corea. At Kirin it bifurcates, one branch going to San-sing, the extreme north-eastern town of the province of Kirin, and the other to Poissiet on the coast wa Ninguta. The second road runs from the treaty port of Ying-tsze through Moukden to Petuna in the north- western corner of the Kirin province and thence to Tsitsihar, Mergen, and the Amur. The third also starts from Ying-tsze, and strikes southward to Kin-chow at the extremity of the Leaou-tung peninsula. And the fourth connects Ying-tsze with the Gate of Corea.

The great plain in Leaou-tung is in many parts swampy, and in the neighbourhood of the sea, where the soil emits a saline exuda-

tion such as is also common in the north of China, it is perfectly sterile. In other parts fine crops of millet and various kinds of grain are grown, and on it trees flourish abundantly.

The climate over the greater part of the country varies between the two extremes of heat and cold, the thermometer ranging be- tween 90° in the summer and 10° below zero in the winter. As in the north of China, the rivers are frozen up during the four winter months. After ashort spring the heat of summer succeeds, which in its turn is separated by an autumn of six weeks' duration from snow and ice. The trees and plants are mucli the same as those comnion in England, and severe as the weather is in winter the less elevated mountains are covered to their summits with trees. The wild animals also are those known in Europe, with the addition of tigers and panthers. Bears, wild boars, hares, wolves, foxes, and wild cats are very common, and, in the north, sables are found in great numbers. Onc of the most noticeable of the birds is the Mongolian lark (Melanocoryphya mongolica), which is found in a wild state both in Manchuria and in the desert of Mongolia. This bird is exported in large numbers to northern China, where it is much prized on account of the extraordinary power it

possesses of imitating the songs of other birds, the different tones of the barks of dogs, and the mews and hisses of cats, as well as all the noises peculiar to the neighbourhood in which it lives. The Manchurian crane is common, as also are eagles, cuckoos, laughing doves, &c. Insects, of which there are, accord- ing to the Russians, onc thousand different species, abound, owing to the swampy nature of much ofthe country. The rivers are well stocked with fish, especially with salmon, which forms a common article of food among the people. In such immense shoals do these fish appear in some of the smallcr streams that numbers are squeezed out on to the banks and there perish. This fact possibly gave rise to the ee of a certain Prince whose royal mother became preg- nant by the influence of the rays of the sun, and who brought forth an egg from which the prince was sprung. His supernatural origin excited the alarm of the king's ministers, who advised that he should be put to dcath, but his mother, having warning of their intention, sent him away privately. This Manchurian Phaeton thereupon wandered forth, and in his travels came to a river having neither bridge nor ferry. In his difficulty he cried for help to his father the Sun, and instantly fishes rose to the surface of the water and formed themselves into such close array that the prince was able to walk to the opposite bank on their backs.

In minerals Manchuria is very rich: coal, gold, iron (as well as magnetic iron ore), and precious stones are found in quantities which suggest that if better appliances wcre employed than are now in use the returns might be very large.

Of the crops grown by the people indigo and opium are the most lucrative. The indigo plant is grown in large quantities in the plain country to the north of Moukden, and is transported thence to the coast. in carts, each of which carries rather more than a ton weight of the dye. The poppy is cultivated wherever it will grow, the crop being far more profitable than that of any other product. Cotton, tobacco, pulse, millet, wheat, and barley are other crops grown by the Manchurian farmers.

History.—Manchow, or more correctly Manchu, is, as has been said, not the name of the country but of the people who inhabit it. The name is a modern one, having been adopted by a ruler who rose to power in the beginning of

the 13th century. Before that time the Manchus were more or less a shifting population, with no fixed location, and, being broken up into a number of tribes, they went mainly under the distinctive name of those clans which at different periods exercised lordship over them. Thus under the Chow dynasty (1122-225 B.c.) we find them spoken of as Sewshin, and at subsequent periods they were known as Yih-low, Wuh- keih, Moh-hoh, Pohai, Niichin, and according to the Chinese his- torians also as K'etan. Throughout their history they appcar as a ride people, the tribute they brought to the Chinese court consisting of stone arrow-heads, hawks, gold, and latterly ginseng. Assum- ing that, as the Chinese say, the K'etans were Manchus, the first appearance of the Manchus, as a people, in China dates from the beginning of the 10th century, when K'etans having first conquered the kingdom of Pohai crossed the fronticr into China and estab- lished the Leaou or Iron dynasty in the northern portion of the empire. These invaders were in their turn overthrown two cen- turies later by another invasion from Manchuria. These new conquerors were Niichins, and, therefore, direct ancestors of the Manchus. On assuming the imperial yellow in China, their chief adopted the title of Kin or "Golden" for his dynasty. " Iron" (Leaou), he said, "rusts, but gold always keeps its purity and colour, therefore my dynasty shall be called Kin." Ina little more than a century, however, the Kins were driven out of China by the Mongols under Jenghiz Khan. But before the close of their rule a miraculous event occurred on the Shan-a-lin mountains which is popularly believed to have laid the seeds of the greatness of the present rulers of the empire. Three heaven-born maidens, so runs the legend, were bathing one day ina lake under the Shan-a-lin mountains when a passing magpic dropped a ripe red fruit into the

lap of one of them. The maiden ate the fruit, and in due course a child was born to her, whom she named Aisin Gioro, or the Golden. When quite a lad Aisin Gioro was elected chief over three contending clans, and established his capital at Otole near the Shan-a-lin mountains. His reign, however, was not of long dura- tion, for his subjects rose against him and murdered him, together with all his sons except the youngest, Fancha, who, like the infant Haitu in Mongolian history, was miraculously saved from his pursuers. Nothing is recorded of the facts of Aisin Gioro's reign except that he named

the people over whom he reigned Manchu, or "Pure." His descendants, through the rescued Fancha, fell into complete obscurity until about the middle of the 16th century, when one of them, Norhachi by name, a chieftain of a small tribe, rose to power. 'Taking advantage of the shifting scenes of Man- churian politics, Norhachi played with skill and daring the réle which had been played by Jenghiz Khan more than three centuries before in Mongolia. With even greater success than his Mongolian counterpart, Norhachi drew tribe after tribe under his sway, and after numerous wars with Corea and Mongolia, he established his rulc over the whole of Manchuria. Being thus the sovereign of an empire, he, again like Jenghiz Khan, adopted for himself the title of Ying-ming, " Brave and Illustrious," and took for his reign the title of T'een-ming. Thirtecen years later, in 1617, after numerous border fights with the Chinese, Norhachi drew up a list of " seven hates," or indictments, against his southern neighbours, and, not getting the satisfaction he demanded, declared war against them. The progress of this war, thc hastily patched up peace, the equally hasty alliance and its consequences, being matters of Chinese history, have been treated of under the article CHINA.

At the present day the Manchus are rapidly dying out before the quietly advancing Chinese settlers. By far the greater number of the present inhabitants of Manchuria are Chinamen. The Chinese system of education is adopted everywhere throughout the country ; the Chinese language is taught in all the schools ; and Manchuria promiscs to become before long as much a Chinese province as Chih-le or Shantung.

See Journeys in North China, Manchuria, and Eastern Mongolia, by the Rev. Alexander Williamson; The Manchus, by Rev. John Ross; Ian-chow yuen lew kaou. (R. K. D.)

~ MANDAZANS, also known as Sabians, Nasoreans, or St John's Christians,! an Oriental sect of great antiquity, interesting to the theologian as almost the only surviving example of a religion compounded of Christian, heathen, and Jewish elements on a type which is essentially that of ancient Gnosticism.

The Mandzeans, who can never have been numerous, and are now much decayed, are found in the marshy lands of South Babylonia (al-batdih), the

ancient refuge of so many strange sects, particularly in the neighbourhood of Basrah (or Bussorah), and in Khuzistan (Disful, Shuster).? They speak the languages of the localities in which they are settled (Arabic or Persian), but the language of their sacred books is an Aramaic dialect, which has its closest affinities with that of the Babylonian Talmud, written in a peculiar character suggestive of the old Palmyrene.? The existence of the Mandeeans has been known since the middle of the 17th cen- tury, when the first Christian missionaries, Ignatius a Jesu 4

1 The first of these names (not Mendeans or Mandaites) is that given by themselves, and means yvwortirol, followers of Gnosis (SYR TN, from NINO, Hebr. yD). The Gnosis of which they profess themselves adherents is a personification, the eon and mediator "knowledge of life" (see below). The title Nasorans (Nasdérayé), according to Petermann, they give only to those among themselves who are most distinguished for knowledge and character. Like the Arabic Nasdra, it is originally identical with the uame of the half heathen half Jewish-Christian Na (wpato:, and indicates an early connexion with that sect. 'The inappropriate designation of St John's Christians arises from the early and imperfect acquaintance of Christian missionaries, who had regard merely to the reverence'in which the name of the Baptist is held among them, and their frequent baptisms. In their dealings with members of other communions the designation they take is Sabians, in Arabic Subba' (sing. Sabi'), from NAY=YAY, to baptize, thus claiming the toleration extended by the Koran (Sur- 5, 73; 22, 17; 2, 59) to those of that name.

2 Recent accounts (1882) represent them as shrunk to 200 families, and seeking a new settlement on the Tigris, to escape the perseeutions to which they are exposed.

3 See Néldeke's admirable Afanddische Grammatik, Halle, 1875.

4 Narratio originis, rituum, et errorwm Christiancrum S. Joannis, Rome, 1652.

and Angelus a Sancto, began to labour among them at Basrah; further information was gathered at a some- what later date by Pietro della Valle! and Thevenot,? and in the following century by Kaempfer, Chardin, and Niebuhr. In recent times they have been visited by Petermann® and Albert Socin, and last of all Liouffi pub- lished in 1880 a full and accurate account of the manners and customs of the sect, taken from the lips of a converted Mandean himself. For our knowledge of their doctrinal system, however, we must of course still depend chiefly upon the sacred books already mentioned, consisting of fragments of very various antiquity derived from an older literature.> Of these the largest and most important 1s the Stdré rabbé or "Great Book," known also as Ginzd (treasure), consisting of two unequal parts, of which the larger is called "yamina" (to the right hand) and the smaller "'s'mald" (to the left hand), because of the manner in which they are bound together, In Petermanu's edition the former occupies three hundred and ninety-five large quarto pages and the other only one hundred and thirty-eight. The former is intended for the living; the latter consists chiefly of prayers to be read at the burial of priests. As re- gards doctrine, the work is exhaustive; but it is characterized throughout by diffuseness, and often by extreme obscurity, besides being occasionally self-contradictory, as might be expected in a work which consists of a number of uncon- nected paragraphs of various authorship and date. The last section of the "right-hand" part (the "Book of Kings") is one of the older portions, and from its allusion to "the Persian and Arabian kings". may be concluded to date from somewhere between 700 and 900 a.p. Many of the doctrinal portions may in substance well be still older, and date from the time of the Sassanids. None of the MSS., however, are older than the 16th century.®*

The following sketch represents, as far as can be gathered from these heterogeneous sources, the principal features of the Mandewan system. The ground and origin of all things is Pira, or more correctly Péra rabba, "the great abyss" (either Persian Pir, "old," or from "yp, 'to split," comp. the Gnostic BvOds), associated with whom, and forming a triad with him, are the primal ons Ayar ziva rabba, 'the great shining ether," and Mand rabbd d'ékara, "the great

1 Reisebeschreibung, part iv., Gencva, 1674.

2 Voyage au Levant, Paris, 1689.

3 Reisen im Orient, ii. 447 sq.

4 Liouffi, Ktudes sur la Religion . . . des Soubbas, Paris, 1880.

5 Mandewan MSS. occur in the British Museum, the Bodleian Library, the Bibliotheque Nationale of France, and also in Rome, Weimar, and Berlin.

*6 The first printed edition and translation of the Sidré rabbd, by Matth. Norberg (Codex Nazarwus, liber Adami appellatus, 3 vols., Copenhagen, 1815-16, followed by a lexicon in 1816, and an onomas- ticon in 1817), is so defective as to be quite useless; even the name Book of Adam is unknown to the Mandeans. Petermann's Zhe- saurus s. Liber magnus, vulgo * Liber Adami" appellatus, opus Mandexorum summit ponderis (2 vols., Leipsic, 1867), is an excellent metallographic reproduction of the Paris MS. A critical edition still remains a desideratum. Next in importance to the Sidra rabba is the Sidré d'¥ahyd, or " Book of John," otherwise known as the Drasché d' Malké, or " Discourses of the Kings," which has not as yet been printed as a whole, although portions have been published by Lorsbach and Tychsen (see Afuseum f. bibl. wu. orient, Lit., 1807, and Staudlin's Beitr. 2 Phil. u. Gesch.'d. Relig. u. Sittenlehre, 1796 sg.). The MKoldsté (Ar., Kholdsa, '* Quintessence "'), or, accord- ing to its fuller title "Anydné uderdshé d'masbitha umassektha ('*Sougs and Discourses of Baptism and the Ascent," viz., of the soul after dcath) has been admirably lithographed by Euting (Stuttgart, 1867). At is also known as Sidra d'neshmdtha, " Book of Souls," and besides hymns and doctrinal discourses contains prayers to be offered by the priests at sacrifice and at meals, as well as other litur- gical matter. The Mandean marriage service occurs both in Paris and in Oxford as an independent MS. The Diwén, hitherto unpub- lished, contains the ritual for atonement. The Asfur malwdshé, or*

uf Book of the Zodiac," is astrological. Of smaller pieces many are magical and used as amulcts.

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spirit of glory," usually called simply Méné rabbi. The last-named, the most prominent of the three, is the king of light properly so called, from whom the development of all things begins. From him emanates Yardtna rabba, "the great Jordan," which, as the higher world soul, permeates the whole ether, the domain of Ayar. Along- side of Mand rabbd frequent mention is made of D'mutha, his "image," as a female power; the hame "image of the father" arises out of the same conception as that which gives rise to the names of ovy) and évo.a among the Greek Gnostics. M4n4 rabba called into being the highest of the eons properly so-called, Hayyé Kadmayé, " Primal Life," and then withdrew into deepest secrecy, visible indeed to the highest but not to the lowest ons (comp. So¢ia and IIpordérwp), yet manifesting himself also to the souls of the more pious of the Mandzans after their separation fromthe body. Primal Life, who is properly speaking the Mandzan god, has the same predicates as the primal spirit, and every prayer, as well as every section of the sacred books, begins by invoking him.' The extremely fantastic delineation of the world of light by which Hayyé Kadmayé is surrounded (see for example the beginning of Szdré rabbd) corresponds very closely with the Manichzan description of the abode of the "king of the paradise of light." 'The king of light "sits in the far north in might and glory." The Primal Light unfolds himself by five great branches, viz., "the highest purest light, the gentle wind, the harmony of sounds, the voice of all the sons, and the beauty of their forms," all these being treated as abstractions and personified. Out of the further development and combination of these primary manifestations arise numerous cons ("Uthré, "splendours," from any, "is rich"), of which the number is often stated to be three hundred and sixty. They are divided into a number of classes (kings, hypostases, forms, &c.); the proper names by which they are invoked are many, and for the most part obscure, borrowed doubtless, to some extent, from the Parsee angelology. From the First Life proceeds as a principal emanation the "Second Life," Hayyé Tinydné, generally called Yaishamin. This last name is evidently meant to ~ be Hebrew, "Jehovah of the heavens," the God of the Jews being of a secondary rank in the usual Gnostic style. The next emanation after Yushamin is "the messenger of life" (Mandé Vhayyé, literally yyaors rs Cwis), the most important figure in the entire system, the mediator and redeemer, the Adyos and the Christ of the Mandeans, from whom, as already stated, they take their name. He is occasionally also called the primal man, Gabra Kadmayé, as in the Kabbala and by Mani.

Yushamin desired to raise himself above the Primal Light, but failed in the attempt, and was punished by removal out of the pure cetherial world into that of inferior light. The one world is separated from the other by water channels (H'fiké Mayyé). Mand on the other hand continues with the First Life and Mand rabba, and is called his " beloved son," the " first born, 'high priest," and " word of life." Manda makes his appearance in the visible world in a series of incarnations beginning with the three brothers Haibil, Shithil, and Antsh (late Judeeo-Babylonian transformations of the well-known names of the book of Genesis), and ending with John the Baptist. Of the first three the most highly honoured is Hibil, almost invariably referred to as "the brilliant Hibil"s he is the alter ego of Manda, his image in this present world, having the same predicates and the same activities, and is the Jesus Christ of the Mandeans. The Second Life, Yuishamin, has as the last of three sons Hayyé t'litayé, the " Third Life," the most distinguished of

7 The use of the word "'life" in a personal sense is usual in Gnos- ticism; comparc the Zw of Valentin, and el-hayat cl-nmallama, " the dark life," of Mani in the Fihrist.

the 'Uthré, hence usually called their father (Aba d' "Uthré, Abathur). His usual epithet is "the Ancient" ('Atika) ;

and he is also called "the deeply hidden and guarded." He stands on the borderland between the here and the hereafter, like the mysterious wpeoBurys tpiros or senex

tertius of Mani, whose becoming visible will betoken the end of the world. Abdathur sits on the furthest verge of the world of light that lies towards the lower regions, and weighs in his balance the deeds of the departed spirits who ascend to him. Beneath him was originally nothing but a huge void with muddy black water at the bottom, in which his image was reflected, becoming ultimately solidified into P'tahil, his son, who now partakes of the nature of matter. The demiurge of the Mandeans, and correspond- ing to the Ialdabaoth of the Ophites, he at the instance of his father frames the earth and men,—according to some passages in conjunction with the seven bad

planetary spirits. THe created Adam and Eve, but was unable to make them stand upright, whereupon Hibil, Shithil, and Antsh were sent by the First Life to infuse into their forms spirit from Mana rabba himself. Hibil, at the instance of the supreme God, also taught men about the world of light and the eons, and especially gave them to know that not P'tahil but another was their creator and supreme God, who as "the great king of light, without number, without limit," stands far above him. At the same time he enjoined the protoplasts to marry and people the world. P'tahil had now lost his power over men, and was driven by his father out of the world of light into a place beneath it, whence he shall at the day of judgment be raised, and after receiving baptism be made king of the' Uthré with divine honours. The underworld is made up of four vestibules and three hells properly so-called. The vestibules have each two rulers, Zartay and Zartanay, Hag and Mag, Gaf and Gafan, Anatan and Kin. In the highest hell rules alone the grisly king Sh'dim, "the warrior"; in the story immediately beneath is Giv, "the great"; and in the lowest is Krin or Karkum, the oldest and most powerful of all, commonly called "the great mountain of flesh" (Turd rabbé d'besré), but also "the first-born of darkness." In the vestibules dirty water is still to be met with, but the hells are full of scorching consuming fire, except Kruin's domain, where is nought but dust, ashes, and vacancy. Into these regions descended Hibil the brilliant, in the power of Mand rabba, just asin the Manichzean mythology the "primal man," armed with the elements of the king of light, descends to a contest with the primal devil. Hibil lingers, gradually unfolding his power, in each of the vestibules, and finally passing from hell to hell reaches Karkim. Hibil allows himself to be half swallowed by the monster, but is unhurt, and compels his antagonist to recognize the superiority of Mand rabba, the God of light, and to divulge his profoundest secret, the hidden name of darkness. Armed with this he returns through the suc- cessive hells, compelling the disclosure of every secret, depriving the rulers of their power, and barring the doors of the several regions. From the fourth vestibule he brought the female devil Ruh4, daughter of Kin, and set her over the whole four. This Rttha, the mother of false- hood and lies, of poisoning and fornication, is an anti- Christian parody of the Ruhd d'Kudsh (Holy Spirit) of the Syriac Church. She is the mother of Ur, the personified fire of hell, who in anger and pride made a violent onset on the world of light (compare the similar occurrence in the Manichman mythology), but was mastered by Hibil and thrown in chains down to the "black water," and

imprisoned within seven iron and seven golden walls. By Ur, Ruhd, while P'tahil was engaged in his work of creation, became mother of three sets of seven, twelve, and five sons respectively ; all were translated by

P'téhil to the heavenly firmament (like the Archons of Mani), the first group forming the planets and the next the signs of the zodiac, while the third is as yet undeter- mined, Of the names of the planets Estera (Istar, Venus, also called Ruhdé d'Kudsha, "holy spirit"), Enba (Nebo, Mercury), Sin (moon), Kéwén (Saturn), Bil (Jupiter), and Nirig (Nirgal, Mars) reveal their Babylonian origin ; Tl or Il Il, the sun, is also known as Kadush and Adunay (the Adonai of the Old Testament) ; as lord of the planetary spirits his place is in the midst of them; they are the source of all temptation and evil amongst men. 'The houses of the planets, as well as the earth and a second world immediately to the north of it, rest upon anvils laid by Hibil on the belly of Ur.

In the Mandan representation tle sky is-an ocean of water, pure and clear, but of more than adamantine solidity, upon which the stars and planets sail. Its transparency allows us to see even to the pole star, who is the central sun around whom all the heavenly bodies move. Wearing a jewelled crown, he stands before Abdthur's door at the gate of the world of light; the Mandeans accordingly invariably pray with their faces turned northward. The earth is conceived of as a round disk, slightly sloping towards the south, surrounded on three sides by the sea but on the north by a high mountain of turquoises ; behind this is the abode of the blest, a sort of inferior paradise, inhabited by the Egyptians drowned along with Pharaoh in the Red Sea, whom the Mandians look upon as their ancestors, Pharaoh himself having been their first high priest and king. 'The total duration of the earth they fix at four hundred and eighty thousand years, divided into seven epochs, in each of which one of the planets rules. The Sidraé Rabbd knows of three total destructions of the human race by fire and water, pestilence and sword, a single pair alone surviving in each case. In the Mandzan view the Old Testament saints are false prophets ; such are Abraham, who arose six thousand years after Nu (Noah) during the reign of the Sun, Mish (Moses), in whose time the true religion was professed by the Egyptians, and Shlimun (Solomon) bar Davith, the lord of the demons. Another false prophet and magician was Yishu M'shiha, who was in fact a

manifestation of the planet Mercury. Forty-two years before his day, under King Pontius Pilate, there had appeared the true prophet Yahyé or John son of Zechariah, an incarnation of Hibil, of whose birth and child- hood fantastic stories are told. Yahy4 by a mistake gave baptism to the false Messiah, who had feigned humility ; on the completion of his mission, after undergoing a seeming execution, he returned clothed with light into the kingdom of light. Asa contemporary of Yahya and the false Messiah Hibils younger brother Anush "Uthra came down from heaven, caused himself to be baptized by Yahya, wrought miracles of healing and of raising the dead, and brought about the crucifixion'of the false Messiah. He preached the true religion, destroyed Jerusalem (" Urashlam," 7.¢., "the devil finished it"), which had been built by Adunay, dispersed over the world the Jews who had put Yahya to death, and previous to his return into the worlds of light sent forth three hundred and sixty prophets for the diffusion of the true religion. All this speaks of intense hatred alike of Jews and Christians ; the fasts, celibacy, and monastic and anchoret life of the latter are peculiarly objectionable to the Mandeans. 'Two hundred and forty years after the appearing of the false Messiah there came to the world sixty thousand saints out of Pharaoh's world to take the place of the Mandzans, who had been completely extirpated ; their high priest had his residence in Damascus. 'The last false prophet was M'hammad or Ahmat bar Bisbat (Mohammed), but Antsh, who remained close beside him and his immediate successors, prevented hostilities against

the true believers, who claim to have had in Babylonia, under the Abbasides, four hundred places of worship. Subsequent persecutions compelled their withdrawal to 'Ammarah in the neighbourhood of Wasit, and ultimately to Khuzistan. At the end of the world the devil Ur will swallow up the earth and the other intermediate higher worlds, and thereupon will burst and fall into the abyss of darkness, where, along with all the worlds and powers of darkness, he will ultimately cease to be, so that thence- forward the universe will consist of but one everlasting world of light.

The chief depositaries of these Mandan mysteries are the priests, who enjoy a high degree of power and social regard. The priest- hood has three grades. (1) the Sh'kanda or deacon is generally chosen from episcopal or priestly families, and must be without bodily blemish. The candidate for orders must be at least ninetcen years old and have undergone twelve years' preparation ; he is then qualified to assist the priesthood in the ceremonies of religion. (2) The Tarmida (7.¢., "Talmida," initiated "') or priest is ordained by a bishop and two priests or by four priests after a long and extremely painful period of preparation. (3) The Ganzivra (" treasurer") or bishop, the highest dignitary, is chosen from the whole body of the Tarmidas after a variety of tests, and possesses unlimited authority over the clergy. A supreme priestly rank, that of Rish 'amma, or " head of the people," is recognized, but only in theory ; since the time of Pharaoh this sovereign pontificate has only once been filled. The priestly dress, which is all white, consists of drawers, an upper garment, and a girdle with the so-called taga or "crown"; in all ceremonies the eelebrants must be barefoot. By far the most frequent and important of the religious ceremonies is that of baptism (masbutha), which is called for in a great variety of cases, not only for children but for adults, where consecration or

urification is required, as for example on all Sundays and feast

ays, after contact with a dead body, after return from abroad, after neglect of any formality on the part of a priest in the discharge of his functions. In all these cases baptism is performed by total immersion in running water, but during the five days' baptismal festival the rite is observed wholesale by mere sprinkling of large masses of the faithful at once. The Mandezans observe also with the elements of bread (pehta) and wine (mambiga, lit. " fountain") a sort of eucharist, which has a special sanctifying efficacy, and is usually dispensed at festivals, but only to baptized ages of good repute who have never willingly denied the Mandan faith. In recciving it the communicant must not touch the host with his finger ; otherwise it loses its virtue. The hosts are made by the

ricsts from unleavened fine flour. A peculiar act of piety is for a favre under the guidance of the bishop to receive the massektha ('elevation'), and thereby become a sort of ascetic, a shalmana taba (" really perfect"). The

Mandzean places of worship, being designed only for the priests and their assistants, are excessively small, and very simply furnished; two windows, a door that opens towards the south so that those who enter have their faces turned towards the pole star, a few boards in the corner, and a gabled roof eomplete the whole structure ; there is neither altar nor decoration of any kind. The neighbourhood of running water (for baptisms) is essential. At the consecration of a church the sacrificc of a dove (the bird of Venus) has place among the ceremonies. Besides Sundays there are six great feasts: (1) that of the New Year (Naurtz rabba), on the first day of the first month of winter; (2) Dehwa h'nina, the anniversary of tho happy return of Hibil Ziva from the kingdom of darkness into that of light, lasting five days, beginning with the 18th of the first month of spring; (8) the Marwana, in com-memoration of the drowned Egyptians, on the first day of the second month of spring; (4) the great five days' baptismal festival (pantsha), the chief feast, kept on the five intercalary days at the end of the second month of summer, —during its continuance every Mandsan, male and female, must dress in white and bathe thrice daily; (5) Dehwa d'daimana, in honour of one of the three hundred and sixty 'Uthras, on the first day of the second month of autumn; (6) Kanshe Zahla, the preparation feast, held on the last day of the year. There are also fast days called m'battal (Arab.), on which it is forbidden to kill any living thing or eat flesh. The ycar is solar, and has twelve months of thirty days each, with five intercalary days between the eighth and the ninth month. Of the seven days of the week, next to Sunday (habshaba) Thursday has a special sacredness as the day of Hibil Ziva. As regards secular occupation, the present Mandeans are goldsmiths, ironworkers, and house and ship carpenters. They practise polygamy, the Sidrd Rabbd laying great stress upon the duty of procreation, but few of them are rich enough to maintain more than two wives. In the 17th eentury, according to the old travellers, they numbered about 20,000 families, but at the present day they hardly number more than 1200 souls. In external Bppearanee the Mandzan is distinguished from the Moslem only by a brown eoat and a parti-coloured headcloth with a cord twisted

round it. They have some peculiar death-bed rites : a deacon with some attendants waits upon the dying, and as death approaehes administers a

bath first of warm and afterwards of cold water; a holy dress, consisting of seven pieces (rasta), is then put on; the feet are directed towards the north and the head turned to the south, so that the body faces the pole star. After the burial a funeral feast is held in the house of mourning.

The Mandzans are strictly reticent about their theological dog- mas in the presence of strangers ; and the knowledge they actually possess of these is extremely small. The foundation of the system is obviously to be sought in Gnosticism, and more particularly in the older type of that doctrine (known from the serpent symbol as Ophite or Naassene) which obtained in Mesopotamia and Further Asia generally. But it is equally plain that the Ophite nucleus has from time to time received very numerous and often curi- ously perverted accretions from Babylonian Judaism, Oriental Christianity, and Parsism, exhibiting a striking example of religious syncretism. In the Gnostic basis itself it is not difficult to recognize the gencral features of the religion of ancient Baby- lonia, and thus we are brought nearer a solution of the problem as to the origin of Gnosticism in general. It is certain that Babylonia, the seat of the present Mandeans, must be regarded also as the cradle in which their system was reared ; it is impossible to think of them as coming from Palestine, or to attribute to their doctrines a Jewish or Christian origin. They do not spring historically from the disciples of John the Baptist (Acts xviii. 25; xix. 359.; Recog. Clem., i. 54) ; the tradition in which he and the Jordan figure so largely is not original, and is therefore worthless ; at the same time it is true | that their baptismal praxis and its interpretation place them in the same religious group with the Hemerobaptists of Kusebius (#7. Z., iv. 22) and Epiphanius (Hwr., xvii.), or with the sect of disciples of John who remained apart from Christianity. Their reverence for John is of a piece with their whole syncretizing attitude towards the New Testament. Indeed, as has been seen, they appropriate the entire personale of the Bible from Adam, Seth, Abel, Enos, and Pharaoh to Jesus and John, a phenomenon which bears witness to the close relations of the Mandan doctrine, at the time of its formation, both with Judaism and Christianity,—not the less close because they were relations of hostility. The history of religion presents other examples of the degradation of holy to demonic figures on occasion of religious schism. The use of the word " Jordan," even in. the plural, for "sacred water," is precisely similar to that by the Naassenes described in the Philosophumena

(v. 7) ;~ there 5 péyas "lopddvns denotes the spiritualizing, sanctifying fluid which pervades the world of light. The notions of the Egyptians and the Red Sea, according to the same work (v. 16), are used by – the Peratee much as by the Mandeans. And the position assigned by the Sethians (Sy6@:avol) to Seth is precisely similar to that given by the Mandezans to Abcl. Both alike are merely old Babylonian divinities in a new Biblical garb. The genesis of Mandeism and the older gnosis from the old and elaborate Babylonio-Chaldxan religion is clearly seen also in the fact that the names of the old pantheon (as for example those of the planetary divinities) are re- tained, but their holders degraded to the position of demons, —a eon- elusion confirmed by the fact that the Mandeeans, like the allied Ophites, Perate, and Manicheans, certainly have their original seat in Mesopotamia and Babylonia. Great caution is necessary, in the present state of our knowledge, in the use made of the results of cuneiform decipherment in relation to Babylonian mythology ; but so much seenis clear, that the trinity of Anu, Bil, and Ea in the old Babylonian religion has its counterpart in the Mandean Pira, Ayar, and Mana rabba. The D'mutha of Mana is the Damkina, the wife of Ea, mentioned by Damascius as Aadin, wife of 'Ads. Manda @hayyé and his image Hibil Ziva with his incarnations clearly correspond with the old Babylonian Marduk, Mcro- dach, the "first-born" son of Ea, with his incarnations, the chief divinity of the city of Babylon, the mediator and re- deemer in the old religion. Hibil's contest with darkness has its prototype in Marduk's battle with chaos, the dragon Tiamat, which (another striking parallel) partially swallows Marduk, just as is related of Hibiland the Manichean primal man. Other features are borrowed by the Mandan mythology under this head from the well-known epos of Istar's descensus ad inferos. The sanctity with which water is invested by the Mandeans is to be explained by this fact that Ea has his scat "in the depths of the world sea."

Compare K. Kessler's article " Mandiier " in Herzog-Plitt's Real-encyklopddie, and the same author's paper, ' Ueber Gnosis u. altbabylonische Religion," in the ee d. finfien internationalen Orientalisten-congresses ZU si ca*

MANDALAY, the capital of Independent Burmah, is situated about 2 miles from the left bank of the Irawadi river, in 21° 59' N. lat. and 96° 8' E. long. It was founded by the king of Burmah, who transferred to it the seat of government from Amarapura in 1860. The city proper is laid out in a square, each side of which is a

little over a mile in length. It is enclosed by a crenel-

lated brick wall 26 feet high and 3 feet thick; the twelve gates (three on each side) are surmounted with wooden watch-towers. A deep wet moat, 100 feet broad, with its escarp 60 feet from the walls, extends along all four sides ; it is crossed by five bridges. The palace of the king occupies the central space of the city; the walls of its en- closure are laid symmetrically with those of the city, and each face is about 370 yards in length. The outer fence consists of a stockade of teak-wood posts 20 feet high, and within it are three successive enclosures, bounded by brick walls. The palace is built within the inner enclosure ; and its front, which faces the east, contains the great hall of audience, 260 feet long, composed of teak timber, elabo- rately carved and gilded, erected on a terrace of brickwork 10 feet high. It is in the form of a colonnade, tlie central part running back, forming a nave with two side aisles. At the extremity of this nave is a space like a chancel (said to be the exact centre of the city) where stands the throne, over which rises a graceful gilded spire, visible from all parts of the city and surrounding country. Another feature of the complex palace buildings. is the lofty campanile. Around the palace walls a wide space has been laid out as an esplanade, on the further margin of which are situated most of the houses of the princes, ministers of state, and court officials. The city may be said to consist of two parts, intramural and extramural ; the streets in the former run parallel with the walls, dividing the building sites into rect- angular blocks. The majority of the houses are constructed of bamboos and bamboo

matting, slightly raised from the ground on posts, with here and there a few brick and wooden buildings. The streets inside the city are very wide, the principal ones being lined with tamarind trees. In the suburbs the roads are laid out with something of the same regularity as in the city, but are of less width, with. the exception of the principal road, the Kuladan or foreign quarter, inhabited chiefly by Armenians, Mughals, and the few European residents. The number of houses in the city and suburbs is said to be, in round numbers, 12,000; and the population is roughly estimated at 65,000. Monasteries and pagodas are dotted about in open spaces, both within and without the walls. Silk- weaving is the principal manufacture.

See Fytche, Burma Past and Present, 1878.

MANDAMUS, Wrir or, in English law, is usually described as a high prerogative writ, containing a command in the name of the king, and issuing from the King's Bench, directed to persons, corporations, and inferior courts, ordering them to do a specific act within the duty of their office. Direct orders from the sovereign to subjects com- manding the performance of particular acts were common in early times, and to this class of orders mandamus originally belonged. It became customary for the Court of King's Bench, in cases where a legal duty was established but no sufficient means existed for enforcing it, to order performance by this writ. At all times, accordingly, mandamus has been regarded as of the nature of an equitable interference supplementing the deficiencies of the common law. When the object sought could be equally well obtained by other means, as by an action, or by any other form of proceedings, then mandamus would not lie. A further condition of mandamus at common law was that it lay only for the performance of acts of a public or official character. The enforcement of merely private obligations, such as those arising from contracts, was not within its scope. Further, the interference of the court could only be obtained when there was no doubt of the existence of the duty, or when performance had been demanded and refused. Nor would the writ be issued when performance had become impossible. By the Conimon Law Procedure Act, 1854, the plaintiff in any

action other than replevin and ejectment was entitled to claim a writ of mandamus to compel the defendant to discharge any duty in which the plaintiff might show that he was personally interested, or from the non-performance of which he might sustain damage. The duties so enforceable must, however, be of a public character. By the Judicature Act, 1873, a mandamus may be granted by an interlocutory order of the court in all cases in which it shall appear to the court to be just and convenient, and subject to such terms and conditions, if any, as the court shall think just. Under this section it has been held that the court (wlich now includes what was formerly the Court of Chancery) has power to issue a writ of mandamus in any cause or matter pending before it, but when the cause is at an end the power is gone, And it has also been held that, when the circumstances are such as would form ground for an application for the old prerogative writ of mandamus, the application must be made to the Queen's Bench division, which has taken the place of the Court of Queen's Bench on the old system. The jurisdiction of the Court of Chancery to compel specific performance of con- tracts has some resemblance to mandamus in the domain of semi-public law. For a collection of the cases in which the prerogative writ of mandamus will or will not lie, reference may be made to Tapping On Mandamus, and to Selwyn's Wisi Prius, art. " Mandamus."

The writ has passed into the law of the United States. "There is in the federal judiciary an employment of the writ substantially as the old prerogative writ in the King's Bench practice, also as a mode of exercising appellate jurisdiction, also as a proceeding ancillary to a judgment previously rendered, in cxercise of original jurisdiction, as when a circuit court having rendered a judgment against a county issues a nandamus requiring its officers to levy a tax to provide for the payment of the judgment." And in the various States mandamus is used under varying regulations, man- date being in some cases substituted as the name of the procceding, See Abbott's Law Dictionary.

MANDATE (Manparum). The contract of mandatum in Roman law was constituted by one person (the mandatarius) promising to do something gratuitously at the request of another (the mandator), who undertakes to indemnify him against loss. The jurist distinguished the different cases of mandatum according as the object of the contract was the benefit of the

mandator or a third person singly, or the mandator and a third person, the mandator and the mandatarius, or the mandatarius and a third person together. When the benefit was that of the mandatarius alone, the obligations of the contract were held not to arise, although the form of the contract might exist, the commission being held to be merely advice tendered to the mandatarius, and acted on by him at his own risk. Mandatum was classified as one of the contracts established by consent of the parties alone; but, as there was really no obligation of any kind until the mandatarius had acted on the mandate, it has with more propriety been referred to the contracts created by the supply of some fact (ve). The obligations of the mandatarius under the contract were, briefly, to do what he had promised according to his instructions, observing ordinary diligence in taking care of any property entrusted to him, and handing over to his principal the results of his action, including the right to sue in his name. On the other hand, the principal was bound to recoup him his expenses and indemnify him against loss through obligations he might have incurred.

The essentials and the terminology of the contract are preserved in most modern systems of law. But in English law mandate, under that name, can hardly be said to exist as a separate form of contract. To some extent the law of mandatum corresponds partly to our law of principal and agent, partly to that of principal and surety. Story, disputing the assertion that "in the laws of England the contract of mandatum is of no use," points out that

"the common law does not indced comprchend under that appella- tion all the contracts of mandate according to the civil law, —such,

for example, as mere naked acts of agency, where there is no bailment of anything to the agent. But for the most part the principles applicable to all the various classes of mandate have a place in our law, although they may be differently named." The difference, however, is more than one of name. English law in this as in other cases Teaches its end by a different method through different prin- ciples from those of the civil law, though the end may be the same. Mandate is retained by Story and others to signify the contract more generally known as gratuitous bailment. It is restricted, as he points out, to personal property, and it implies the delivery of something to the

bailee, both of which conditions are unknown iu the mandatum of the civil law. Mandate in this later sense is further distinguished from deposit in that the custody of the thing is the principal object of the latter contract, while in the former it is something to be done with respect to the thing, though Story holds that custody and performance concur in both contracts, —this by way of correction of Sir W. Jones's distinction that mandate consists in fcasance and deposit in custody. MANDEVILLE, Bernanrp bz (1670-1733), is generally known as an ethical writer of debasing and degrading tendency, but le was at least as much of a humorist as a philosopher, and set up as an analyst of " whaty a5," repeatedly disavowing all pretensions as a lawgiver of "what ought to be." Ho was a foreigner by birth, a native of Rotterdam, where his father practised as a physician for thirty years. A remarkably eloquent school- boy exercise, De Medicina Oratio Scholastica, was printed for him at Rotterdam in 1685. He studied for six years at Leyden, and took his degree in medicine in 1691, his inaugural thesis being De Chylost Vitiata. Immediately afterwards he camo over to England "to learn the language," which he did to some purpose, writing it with such mastery as to throw doubts upon his foreign extrac- tion. He settled in London asa physician, The Fable of the Bees is the general title of the miscellaneous work by which he is known to fame. This work includes the fable proper, The Grumbling Hive, or Knaves Turned Honest (some two hundred doggerel couplets, published as a sixpenny pamphlet and pirated as a halfpenny sheet in 1705); Remarks on the fable and An Inquiry into the Origin of Moral Virtue, added to the edition of 1714; An Essay on Charity Schools, and A Search into the Origin of Society, added to the edition of 1723. Owing to a curious misprint in an edition published after Mandeville's death, a wrong date is commonly assigned to the Grumbling Hive, and the contemporary point of it consequently missed. It appeared during the heat of the bitterly contested elections of 1705, when the question before the country was whether Marlborough's war with France should be continued. The cry of the high Tory advocates of peace was that the war was carried on purely in the interests of the general and the men in office ; charges of bribery, peculation, hypocrisy, every form of fraud and dislionesty, were freely cast about among the electors. It was amidst this excitement that Mandeville sought and found an audience for his grimly humorous paradox that "private vices are public benefits,"-—- that individual self-seeking, ambition, greed, vanity, luxury, are indispensable to

the prosperity and greatness of a nation. "Fools only strive to make a great an honest hive." The bees of his fable grumbled as many Englishmen were dis- posed to do,—" cursed politicians, armies, fleets," whenever there came a reverse, and cried, "Had we but honesty !" Jove at last in a passion swore that he would "rid the bawling hive of fraud," and filled the hearts of the bees with honesty and all the virtues, strict justice, frugal living, contentment with little, acquiescence in the insults of enemies. Straightway the flourishing hive declined, till in time only a small remnant was left ; this took refuge in a hollow tree, "blest with content and honesty," but destitute of arts and manufactures. The Grumbling Hive was in fact a political jew d'esprit, full of the impartial mockery that might be expected from a humorous foreigner, and with as much ethical theory underlying it as might be

his defining neither

MAN—MAWN

expected from a highly educated man in an age of aetive ethical speculation. 'The underlying theory was made explicit in the Remarks and the Inquiry into the Origin of Moral Virtue, published in 1714. But his purpose in dwelling on the text that private vices are public benefits was still rather the invention of humorous paradoxes than the elaboration of serious theory. Dr Johnson, who owned that Mandeville "opened his views into real life very much," considered that the fallacy of his argument lay in vices nor benefits. But such a criticism as this overlooks the hinge on which all Mandeville's paradoxes turn. He does define virtue and

vice very precisely, in accordance with the current orthodoxy of the time.

He "gives the name of virtue to every performance by which mau, contrary to the impulse of nature, should endeavour the benefit of others, or the conquest of his own passions, out of a rational ambition of being good"; while "everything which, without regard to the public, man should commit to gratify any of his appetites" is vice. His paradoxical humour has ample scope in tracing how much vice and how little virtue there is in the world, when the terms are thus strictly defined. He finds self-love (a vice by the definition) masquerading in many virtuous disguises, lying at the root of

asceticism, heroism, public spirit, decorous conduct,—at the root, in short, of all the actions that pass current as virtuous. 'These actious are not virtuous by the definition, because not performed solely "out of a rational ambition of being good." 'This is the way," Dr Johnson says, "' to try what is vicious, by ascertaining whether more evil than good is produced by it on the whole." Mandeville would at once have admitted this, but his definition com- pelled him, in determining virtue and vice, to consider also the motive. And having regard to the motive, 'the nearer we search into human nature, the more we shall be convinced that the moral virtues are the political offspring which flattery begot upon pride." Man, "'an extraordinary selfish and headstrong as well as a cunning animal," has been induced to subordinate his own appetites to the good of others, by the dexterous management of politicians and moralists, who have worked upon his pride to persuade him that self-indulgence is worthy only of the brutes, and altogether "unbecoming the dignity of such a sublime creature as himself." When Mandeville, in the 1723 edition of the fable, applied his analysis of self-regarding motives to the institution of charity schools, at that time a highly fashionable form of munificence, a great outcry was made against his doctrines ; his book was presented to the justices by the grand jury of Middlesex as being of an immoral and pernicious tendency, and a copy was condemned to be burnt by the common hangman. Mandeville's defence of himself was that his remarks were "designed for the entertainment of people of knowledge and education," and that his inquiry could hardly be intelligible except to those accustomed to matters of speculation ; and he claimed that he had "diverted persons of great probity and virtue and unquestionable good sense." The truth is that, to be rightly understood, the prose part of Mandeville's fable inust be read in connexion with Lord Shaftesbury's ethical writings; the intention to ridicule the amiable but some- what feebly reasoned theories of that moralist is most apparent in the Search into the Origin of Society, but many lurking references may be detectcd elsewhere. If Mandeville were taken seriously, he would certainly be open to the charge of conveying the impression that those who restrain their appetites and sacrifice personal interests for the public good make fools of themselves, and are the dupes of a designing society. But his main purpose seems to have been to entertain himself and others at the expense of more serious but less quick-witted theorizers.

MWArMDE VILLE

Besides his political and philosophical parerga, Mandeville wrote, in 1711, a medical treatise, Of the Wypochondriack and Hysterick Passtons—their symptoms, causes, and cures, The treatise is in the form of a dialogue, and is " inter- spersed with instructive discourses on the real art of physic itself, and entertaining remarks on the modern practice of physicians and apothecaries." In this, with the same entertaining style and clear and subtle judgment, he pro- tests against and ridicules speculative therapeutics, and pleads for patient diagnosis and careful observation and record of facts. His own theories about the animal spirits and their conuexion with "the stomachic ferment" are fanci- ful enough, but he shows an intimate acquaintance with the scientific methods of Locke, and a warm admiration for Sydenham. Zhe Virgin Unmasked; I'ree Thoughts on Religion, the Church, and National Happiness; An Inquiry into the Causes of the frequent LExecutions at Tyburn; An Inquiry into the Origin of Honour, and Usefulness of Christianity in War—are titles of other works of Mandeville; but all that is characteristic of him as a thinker and humorist may be found in the J'able of the Bees. (W. M.)

MANDEVILLE, Jewan pz, the name claimed by the compiler of a singular book of travels, written in French, and published between 1357 and 1371. By aid of trans- lations into many other languages it acquired extraordinary popularity, while a few interpolated words in a particular cdition of the English version have gained for Mandeville in modern times the spurious credit of being "the father of English prose."

In his preface the compiler calls himself a knight, and states that he was born and bred in England, of the town of St Albans; had crossed the sea on Michaelmas Day 1322; had travelled by way of Turkey (Asia Minor), Armenia the little (Cilicia) and the great, Tartary, Persia, Syria, Arabia, Egypt upper and lower, Libya, great part of Ethiopia, Chaldeea, Amazonia, India the less, the greater, and the middle, and many countries about India; had often been to Jerusalem; and had written in Romance as more generally understood than Latin, In tlie body of the work we hear that he had been at Paris and Con- stantinople ; had served the sultan of Egypt a long time in his wars against the Bedouins, had been freely addressed by

him on the corruption of contemporary Christendom, had been vainly offered by him a princely marriage and a great estate on condition of renouncing Christianity, and had left Egypt under Sultan Melech Madabron, «.e,, Muzaffar or Mudhaffar! (who reigned in 1346-47) ; had been at Mount Sinai, and had visited the Holy Land with letters under the great seal of the sultan, which gave him extraordinary facilities; had been in Russia, Livonia, Cracow, Lithuania, 'en roialme daresten" (?de Daresten or Silistria), and many other parts near Tartary, but not in Tartary itself; had drunk of the well of youth at Polombe (Quilon on the Malabar coast), and still seemed to feel the better; had taken astronomical observations on the way to Lamary (Sumatra), as well as in Brabant, Germany, Bohemia, and still farther north; had been at an isle called Pathen in the Indian Ocean; had been at Cansay (Hangchow-fu) in China,and had served the emperor of China fifteen months against the king of Manzi; had becn among rocks of adamant in the Indian Ocean ; had been through an haunted valley, which he places near Mille- storach (= Millescorath, i.c., Malasgird in Armenia); had been at many great feats of arms, but had been incapable of performing any himsclf; had been driven home against his will in 1357 by arthritic gout (despite the well of

1 The on in Madabron apparently represents the Arabie nunation, though its use in such a ease is very odd.

youth !); and had written his book as a consolation for his "wretched rest." The paragraph which states that he had had his book confirmed at Rome by the pope is, how- ever, an interpolation of tle English version.

This recital is of itself enough to provoke some little questioning, and on investigating the sources of the book it will-presently be obvious that part at least of the per- sonal history of Mandeville is mere invention. Under these circumstances the truth of any part of that history, and even the genuineness of the compiler's name, become matter for serious doubt. No contemporary corroboration of the existence of such a Jelian de Mandeville seems to be known. Some French MSS., not contemporary, give a Latin letter of presentation from him to Edward IIL, but this is so hopelessly vague that it might have been penned by any writer on any subject. At Liége, in the

abbey of the Guilelmites, now pulled down, there certainly was in the 16th century a tomb of a man in armour said to be Mandeville; but the old French inscription showed no name, and the arms were quite unlike those of the Mandevilles, earls of Essex; while the Latin inscription, stating that the tomb was Mandeville's, and that he died at Lidge on November 17, 1371, is not only apparently much later in style, but confounds him with a physician called "ad Barbam," who is said in a printed Latin edition of Mandeville to have met him first at Cairo and again at Lidge, and to have persuaded and helped him to write his travels."

Leaving this question, there remains the more complex one whether the book contains, in any measure, facts and knowledge acquired by actual travels and residence in the

iast. We believe that it may, but only as a small por- tion of the whole, and that confined entirely to the section of the work which treats of the Holy Land, and of the different ways of getting thither, as well as of Egypt, and in general of what we understand by the Levant.

The prologue indeed points almost exclusively to the Holy Land as the subject of the work. The mention of more distant regions comes in ouly towards the end of this prologue, and (in a manner) as an afterthought. As regards the writer's claim to have travelled in those more distant regions, it is somewhat astonishing to find that any modern editor could have regarded this as possibly founded in truth, And the apology sometimes made for the book, as only a compilation of what was regarded as truth in the writer's age, is not tenable in the face of the frequent essertion (explicit or implicit) that he had himself been in the remotest regions spoken of, and had witnessed some of the most marvellous circumstances that he details. To this we shall recur later, for the bearing of these state- ments can only be appreciated when the true derivation of the matter about the further East shall have been exhibited.

By far the greater part of these more distant travels, extending in fact from Trebizond to Ormus, India, the Indian Archipelago, and China, and back again to western Asia, has been appropriated from the narrative of Friar Odoric (written in 1330). These passages, as served up by Mandeville, are almost always, indeed, swollen with he eee particulars, usually of an

extravagant kind, whilst in no few eases the writer has failed to understand the passages which

he adopts from Odoric and professes to give as his own experiences. Thus (p. 193)% in appropriating a passage of Odorie about tortoises ee EE

2 This physician is called in a French MS. "'Jehan de Bourgoigne dit a la Barbe." 'M. Michelant onee saw the title of a medieal or botanical treatise bearing the name of Jehan de Bourgoigne. Can he also have written these travels under a feigned name?

3 Page indications like this refer to passages in the 1866 reissue of Halliwell's edition, as being the most ready of access. But all these passages have also been verified as substantially oceurring in the Freneh MS. from Lord Ashburnham's library mentioned below (of 1371 a.p.), eited A, and in that numbered xxxix. of the Grenville eolleetion (B. M.), which dates probably from the early part of the 15th eentury, cited G.

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of great size, seen in Champa, these are described as " snails" (lymecons, A., limassons, G.) whose shells were as big as cottages,

In another place (p. 209), where Odoric has given a most curious and veracious account of the Chinese custom of employing tante cormorants to catch fish, the cormorants are converted by Mande- ville into " little beasts called loyres (layre, A.), which are taught to go into the water" (the word loyre being apparently used here for " otter, " Zwtra, for which the Provengal is luria or lotria). Where Odoric, describing the court of the Great Khan, mentions the genuine Tartar custom which forbade any man in entering to set down his foot on the threshold of the door (an etiquette which P. della Valle found still in force at Ispahan in the 17th century), Mandeville quite fails to understand the point (see p. 220).

Ata very early date the coincidence of Mandeville's stories with those of Odoric was recognized, insomuch that a MS. of Odorie, which is or was in

the chapter library at Mainz, begins with the words : Ineipit Itinerartus fidelis fratris Odorict socit Militis Men- davil per Indiam ; licet hic [read tlle] prius et alter posterius peregrinationem suam descripstt. At a later day Sir T. Herbert calls Odoric " travelling companion of our Sir John" ; and Purchas, with most perverse injustice, whilst calling Mandeville, next to Polo, "if next, ... the greatest Asian traveller that ever the world had," insinuates that Odoric's story was stolen from Mandeville's. Mandeville himself is crafty enough, at least in one

assage, to anticipate criticism by suggesting the probability of his

aving travelled with Odoric (see p. 282, and below).

Much again of Mandeville's matter, particularly in Asiatic geo- graphy and history, is taken bodily from the book of Hayton, an Armenian of princely family, who became a monk of the Premon- strant order, and in 1807 dictated this work on the East in the French tongue at Poictiers, outof his own extraordinary acquaint- ance with Asia and its history in his own time.

It is curions that no passage in Mandeville can be plausibly traced to Marco Polo, with one exception. This is (p. 163) where he states that at Ormus the people, during the great heat, lie in water,—a circumstance mentioned by Polo, though not by Odoric. We should suppose. it most likely that this fact had been interpolated in the copy of Odoric used by Mandeville ; for, if he had borrowed it direct from Polo, he would have borrowed more.

A good deal about the manners and customs of the Tartars is demonstrably derived from the famous work of the Franciscan John of Plano Carpini (see Carprnt, vol. v. p. 182), though possibly the immediate source for Mandeville may have been some popular compilation, For though the passages in question are all to be found in Carpini, more or less exactly, the expression is condensed and the order changed. For examples compare Mandeville, p. 250, on the tasks done by Tartar women, with Plano Carpini, p. 648 ;! Mandeville, p. 250, on Tartar habits of eating, with Plano Carpini pp. 689-40 ; Mandeville, p. 231, on the titles borne on the seals of the Great Khan, with Plano Carpini, p. 715, &c.

The account of Prester John, and all the wonders of his court and realm, is taken from the famous Epistle of that imaginary potentate, which was so widely diffused in the 18th century, and created that renown which made it incumbent on every traveller in Asia to assume his existence, and to find some new tale to tell of him. Many fabulous stories again of monsters, such as cyclopes, sciapodes, hippopodes, monoscelides, anthropophagi, and men whose heads did grow beneath their shoulders, of the phoenix and the weeping crocodile, such as Pliny has collected, are introduced here and there, derived no doubt from the popular versions of Solinus. And interspersed, especially in the chapters about the Levant, are the stories and legends that were retailed to every pilgrim, such as the legend of Seth and the grains of paradise from which grew the wood of the cross, that of the shooting of old Cain by Lamech, that of the castle of the sparrow-hawk (which appears in the tale of Melusina), those of the origin of the balsam or at Matartya, of the dragon of Cos, of the river Sabbation,

C.

Even in that part of the book which may be admitted with prob- ability to represent some genuine experience, there are distinct traces that another work has been made use of, more or less, as an aid in the compilation, we might almost say as a framework to fill up. This is the itinerary of the German knight William of Bolden- sele, written in 1336 at the desire of Cardinal Talleyrand de Peri- gord.? A cursory comparison of this with Mandeville leaves no doubt of the fact that the latter has followed its thread, using its suggestions, and on many subjects its expressions, though digress- ing and expanding on every side, and too often climinating the singular good sense of the German traveller. After such a compari- son we may indicate as examples Boldensele's account of Cyprus (Mandeville, p. 28, and p. 10), of Tyre and the eoast of Palestine (Mandeville, 29, 30, 33, 84), of the journey from Gaza to Egypt (34), in hb v4 ioe in tom. iv. of Rec. de Voyages et de Mémoires, pub. by

2 It isfound inthe Thesaurus of isi ii i ; same by Basnage, 175, tv. 337, Canisius, 1604, v. pt. ii. p. 95, and in ed. of

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passages about Babylon of Egypt (40), about Mecca (42), the general account of Egypt (45), the pyramids (52), some of the particular wonders of Cairo, such as the slave-market, the chicken-hatching stoves, and the apples of paradise, 7.¢., plantains (49), the Red Sea (57), the convent on Sinai (58, 60), the account of the church of the Holy Sepulchre (74-76), &. 'The following nay be quoted as a specimen, showing how Mandeville has at once followed Boldensele and deviated from his good sense :—

Boldensele (ed. Basnage, p. 342). "Sunt plura antiquorum monumenta, figure pyramidalis, inter que sunt duo mire magnitudinis et altitudinis, de maximis lapidibus et politis, in quibus inveni seripturas diversorum idiomatum. . Dicunt simplices hee maxima monumenta fuisse granaria Pharaonis, et sie ea appellant, quod verum nullo

Mandeville (p. 52).

**' Now also I shall speak of another thing. , . that is to say of the Garners of Joseph that he caused to be made. . .. And they be made of stone, full well made of mason's craft; of which two be marvellously great and high, and the other is not so great…. And above the Garners, without, be many*

modo est; quia nee ad imponendam scriptures of divers languages. And nee ad servandam annonam … locus some say that they are sepulchres of in ipsis pyramidibus aptus deprehenditur great Lords . .. but that is not true;

. . verum quod monumenta sunt,"&e, for all the common rumour and speech

is … that they be the Garners of Joseph."

It will be seen from these inaications, and more particularly from the specific analysis given below, that there is only a small residuum of the book to which genuine character, as containing the experi- ences of the author, can possibly be attributed. Yet, as has been intimated, the borrowed stories are frequently claimed as such experiences. We have already alluded to Mandeville's claim (p. 4) to have visited distant parts of Asia; to have drunk of the Foun- tain of Youth, a favourite medieval fable which he interpolates in Odoric's account of Malabar (169); to his assertion that he

*had visited Lamary (Sumatra), and indeed that he had gone beyond it to 33° 16' of S. lat. (181-82) ; and that he had been at a certain other island in the Indian Archipelago (190). He alleges also that he had witnessed the curious exhibition of the garden of transmigrated souls (described by Odoric) at Cansay, 7.¢c., Hangchow-fu (211). He and his fellows with their valets had remained fifteen months in service with the emperor of Cathay in his wars against the king of Manzi,—Manzi, or Southern China, having ceased to have any existence as a separate kingdom some seventy years before the time referred to. Similar false statements are found at pp. 219, 235, 248, 271. But the most notable of these passages occurs in his adoption from Odoric of the story of the Valley Perilous (282). This is, in its original form, apparently founded on real experiences of Odoric viewed through a haze of excitement and superstition. Mandeville, whilst swelling the wonders of the tale with a variety of extravagant touches, appears to safeguard himself from the reader's possible discovery that the tale was stolen by the interpola- tion: '*And some of our fellows accorded to enter, and some not. So there were with us two worthy men, Friars Minor, that were of Lom- bardy, who said that if any man would enter they would go in with us. And when they had said so, upon the gracious trust of God and of them, we caused mass to be sung, and made every man to be shriven and housclled ; and then we entered, fourteen persons ; but at our going out we were but nine," &c.*

In referring to this passage it is only fair to recognize that the description (though the suggestion of the greatest part exists in Odoric) displays a good deal of imaginative power; and there is much in the account of Christian's passage through the Valley of the Shadow of Death, in Bunyan's famous allegory, which indicates a possibility that John Bunyan may have read and remembered this episode either in Mandeville or in Hakluyt's Odoric.

Such a passage, however, as that which we recently quoted, and which appears to exist in all the MSS. and versions that have been examined, leaves no room for the rehabilitation of Mandeville's character as regards conscious mendacity. But it does not neces- sarily follow that the whole work is borrowed or fictitious. There are other examples in medieval works of travel in which fiction has been linked to true experiences. Even the great Moorish traveller Ibn Batuta, accurate and veracious in the main, seems, in

one part at least of his narrative, to invent experiences ; and in such works as those of John of Hese and Arnold von Harff, we have examples of pilgrims to the Holy Land whose narratives begin apparently in sober truth, and gradually pass into flourishes of fiction and extravagance. So in Mandeville also we find various particulars which we are unable to trace to other writers, and which may therefore be, provisionally at least, assigned to the writer's own experience, or to knowledge acquired by colloquial intereourse in the East.

It is difficult to decide on the character of his statements as to recent Egyptian history. In his account of that country (pp. 37, 38) though the series of the Comanian (7.¢., of the Bahri Mame- luke) sultans is borrowed from Hayton down to the accession of Melechnasser, i.c., El-Malik el-Na&sir Mohammed ibn Kalaun, who eame first to the throne in 1299, Mandeville appears to speak from his own knowledge when he adds that this " Melechnasser reigned long and governed wisely." In fact, though twice displaced in the early part of his life, Malik Nasir reigned till 1341, a duration un-

paralleled in Mohammedan Egypt, whilst we are told that during the last thirty years of his reign Egypt rose to a high pitch of

wealth and prosperity. Mandeville, however, then goes on to say

that his eldest son Afelechemader was chosen to succeed, but this prince was caused privily to be slain by his brother, who took the kingdom under the name of Mclechmadabron. " And he was Soldan

Now Malik Nasir Mohammed was followed in succession by no less than eight of

when I departed from those countries,"

his sons in thirteen years, the first three of whom reigned in aggregate only a few months. The names mentioned by Mande- ville appear to represent those of the fourth and sixth of the cight, viz., El-Malik el-Salih 'Jmddu-d-din, and El-Malik cl-M/ugajfar Zainu-d-din Hajj ; and these the statements of Mandeville do not fit.

Among particulars which seem to suggest personal knowledge may be instanced the very good description of the Bedouins (p. 64), starting from that of Boldensele, but largely and accurately expanded ; the use of carrier pigeons in Syria (p. 118) ; the inti- mation that the Red Sea was frequented by Venetian immerchants trading with India (p. 140). There are some other particulars which the author can hardly have witnessed, but which may: pos-

sibly have been heard in communication with other travellers (if not Such are the practice of

borrowed from some untraced source). polyandry in a certain island (p. 287), and the rite of fraternal adoption between two persons by drinking each other's blood (195). The mention of Ani in Armenia with its thousand churches (148)

is probably derived from some book ; the city and its thousand

churches are mentioned by William of Rubrouck.

On several occasions the writer indicates some acquaintance with Arabic, though the words are not always recognizable, owing per- haps to the carelessness of copyistsin such matters. Thus (p. 142) he gives the Mohammedan confession of faith as La ellct clla Machometh rores alla (Rosel-alia, A.) (La ilaha illa "Wah Muhamma- dun rastilu 'llah) ; (p. 50) the Arabic names of the wood, fruit, and sap of the balsam plant; (p. 99) the name of bitumen, "alkatran" (al-Katrén) ; (p. 181) three titles of the Koran, viz., "Alkoran,"

- *Meshaf" (i.¢., mishaf, " written sheets or pages," "a eopy of*

the Koran"), and Harme (t.c., haram, in the sense of " sacred ' rey tr '

inviolable") ; (p. 168) the names of the three different kinds of

pepper (long pepper, black pepper, and white pepper) as sorbotin, fulful, and bano or bauo (fulful is the common Arabic word for pepper, the others

we cannot explain with any confidence); (p. 192) the name of the elephant (but in A. this runs: Zt apelle on ld les oliphans vaches).

Mandeville again, in some passages (and especially in one which is familiar from its being cited by Dr Johnson in the preface to his dictionary) shows a correct idea of the form of the earth, and of position in latitude ascertained by observation of the pole star ; he knows that there are antipodes, and that if ships were sent on voyages of discovery they might sail round the world. And he tells a curious story, which he had heard in his youth, how a worthy man did travel ever eastward until he came to his own country again (p. 183). But on the other hand he repeatedly asserts the old belief that Jerusalem was in the centre of the world (79, 183), whilst he maintains in proof of this that at the equinox a spear planted erect in Jerusalem casts no shadow at noon,— which if true would only show that the city was on the equator.

Brief Analysis.—Prologue. Chaps. i-iii. The way to Constantinople; the wonders and holy places there; the Greek islands, Greek Church, &c. Chaps. iv.-v. Constantinople and Palestine; Rhodes, Cyprus, coast of Palestine ; Egypt and Babylon of Egypt; the Sinai desert and convent (these two chapters on the lines of Boldensele ; succession of Ayubite and Mameluke sultans from Hayton), Chaps. v.~~x. Palestine and the holy places (the most original part of the work, but based occasionally on Boldenscle). Chap. xi. Syria, various routes from Western Europe; description of Tartary (the steppe country about the Volga,— very good, though expressly not from personal experience). Chap. xii. On the Saracens and their religion, Mohammed, &c. (partly based on Boldenscle), Chap. xiii. Countries of Asia and Africa; journey to the East from Trebizond (this and on to chap. xx. inclusive is all based on Odoric, with interpolations ad libitum). Chap. xxi. The Great Khan; the history of Jenghiz and his suc~~ cessors (from Hayton, with something from Plano Carpini). Chap. xxii. The court and splendour of the khan, his paper-money, &c. (from Odoric). Chap. xxiii. Customs of the Tartars, &c. (chicfly from Plano Carpini). Chap, xxiv. Countries of Asia shortly described (from Hayton). Chap. xxvi. The lamb-plant (from Odoric), with much added about Alexander and the shut-up nations, griffins, and other monsters. Chap. xxvii. The royal estate of Prester John (chiefly from the " Letter" of Prester John, with something from Hayton); the Old Man of

the Mountain (from Odoric). Chap. xxviii. The Valley Perilous (from Odoric, with inventions), followed by a quantity of fabulous geography of mixed and uncertain origin. Chaps. xxix., xxx. Similar hotchpotch continued (from the romance of Alexander, the letter of Prester John, Plinian fables, &c.). Chap. xxxi. The retwn journey from Cathay, &c. (from Odoric). The epilogue.

The oldest known MS. of the original is the earl of Ashburnham's MS. Libri xxiv., dated 1371, but nevertheless very inaccurate in proper names, The English version was made, at least as early as the beginning of the 15th century, froma French MS. defective be- tween p. 36 1. 7 (' And there"') of Halliwell's edition and p. 62 1. 25 ("And that Valey"'), and is represented in this state by nearly every known English MS. It was completed and revised by two*

independent editors, neither of them later than the first quarter of

the 15th century. One of these revisions is represented by the British Museum MS. Egerton 1982, and the very badly abbreviated

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Bodleian MS. e Mus. 116. The other is represented by the British Museum MS. Cotton Titus C. xvi. The first printed edition of the English version is apparently the undated edition of Pynson, which gives the version in its original defective shape. So do Wynkyn de Worde's edition of 1499 and eleven editions before 1725, except that they insert a paragraph seemingly abbre- viated from the revision represented by Cotton Titus C. xvi. This latter revision was, however, followed in full by the cditions of 1725 and 1727, and is, in Halliwell's editions, the text now current. The otlier revision seems never to have been printed.

That none of the forms of the English version can conceivably be from the same hand which wrote the original work is made pateut to any eritical reader by their glaring errors of translation, but the form now current asserts in the preface that it was made by Mandeville himself, and this assertion has been taken on trust by almost all modern historians of English literature. The words of the original " je eusse cest livret mis en latin. ...

mais… je lay mis en romant" were mistranslated as if " je eusse " meant "JT had" instead of "I should have," and then (whether of fraudu- lent intent or by the crror of a copyist thinking to supply an accidental omission) the words were added " and translated it azen out of Frensche into Englyssche." Schonborn and Matzner respectively seem to have been the first to show that the current Latin and English texts cannot possibly have been made by Mandeville himself. Dr J. Vogels states the same of unprinted Latin versions which he has discovered in the British Museum, and he has proved it as regards the Italian version.

The terseness, the simplicity, and the quaintness of the English version, together with the curiosity of the subject-matter, will always make it delightful reading ; but the title " father of English prose," which in its stricter sense already belonged to King Alfred, must in its looser sense be now transferred to Wickliffe.

Sec Schénborn's Bibliographische Untersuchungen tiber die Reise-Beschreibung des Sir John Mandeville, Breslau, 1840; Miatzner's Altenglische Sprachproben, I, ii, pp. 154-55; letters by E. B. Nicholson in Zhe Academy of November 11, 1876, and February 12, 1881; Vogels, " Das Verhiiltniss der italienischen Version der Reise- beschrcibung Mandeville's zur franzdsischen" in a Festschrift, dem Gymnasium zu Moers zur Feter seines 800jdhrigen Bestehens gewidmet vom Lehrer- Collegium des Crefelder Gyninasiums, Bonn, 1882, and his forthcoming " Hand-schriftliche Untersuchungen tiber Mandeville's Reisebeschreibung,"in Vollm@ller's Romanische Forschungen; also for the bibliography of editions and translations, up to 1867, Tobler's Bibliographia geographica Palestine. See also Yule's Cathay and the Way Thither (Hakluyt Society), i, 27, 28, on the sources of the book, At least two critical editions are undcrstood to be in preparation—by Vogels(French and English), and by Michelant (French, for the Société de l'Orient Latin). On

a French ZLapidaire and other works attributed to Mandeville see Pannier's Lapidaires frangais du moyen dge, Paris, 1882, pp. 189-204, (E. B. N.—H. Y.)

MANDI, a native state in the Punjab, India, lying between 31° 23' 45" and 32° 4' N. lat., and between 76° 40' and 77° 22' 30" E. long., and bounded

on the N. and E. by Kullu, on the 8. by Suket, and on the W. by Kangra. The country is very mountainous, being intersected by two great parallel ranges, reaching to an average height of from 5000 to 7000 feet above sea. The valleys between the hill ranges are very fertile, and produce all the ordinary grains, besides more valuable crops of rice, maize, sugar- cane, poppy, and tobacco. Salt-mines contribute about one-third of the state revenue. Iron is found in places, and also gold in small quantities. The area of the state is estimated at about 1200 square miles, and a census in 1881 gives the population as 147,017. The chief, a Rajput by caste, enjoys an approximate income of £36,500, and the state pays a tribute to the British Government of £10,000 a year. Mandi town, the capital, is situated on the Bids, in 31° 43' N. lat. and 76° 58' E. long.

MANDINGOES, otherwise krown as WANGARAWA, Mainkes, or WakoreE (the last probably their primitive designation), are one of the most widely distributed and important peoples of Western Africa to the north of the equator, and perhaps form the best representatives of the Negro stock. The country of Manding, from which their ordinary name is derived, is a comparatively small district on both banks of the Niger, about the intersection of 12° N. lat. with 9° E. long. A Mandingo empire, usually called after Mali, the chief town, which stood on the bank of the Niger to the north of Buré, was founded by a certain prince Baramindana or Baramangole in the 12th century ; and its power was gradually extended till, in the reign of Mansa Musa (1311-31), Songhai, Timbuctoo, and, in fact, the whole of the Sudan with the exception of Genné

on the Niger, were more or less thoroughly subjugated. Timbuctoo finally fell into the hands of the Berbers about 1433; but Mali remained a leading state and its capital a great commercial centre till the beginning of the 16th century, when Omar Askia, prince of Songhai, captured the city. The Mali dynasty was a Mohammedan one; and, though some sections of the Mandingo race are still pagans, the greater number are ardent supporters of Islam. Of the present grouping and relations of the states in which they are the dominant element detailed information does not exist; but such accounts as those of Benjamin Anderson (Journey to Musardu, the capital

of the Western Mandingoes, New York, 1870) show that some of them aro possessed of a considerable share of barbaric civilization. According to Dr Quintin, the leading areas of Mandingo occupation are the country watered by the great head- streams of the Senegal (the Faleme, the Bafing, &c.), tlic district to the south of the lower course of the Gambia, and the coast region of Susu to the north of Sierra Leone. The Mandingoes are generally tall and strongly built ; black in complexion, aud harsh and ugly in features, but with a spirited and intellectual expression. They are great traders, work in iron and gold, weave cotton cloth, tan excellent leather, and regularly cultivate a considerable variety of crops—rice, cotton, tobacco, kola, potatoes. Their clay-built walled towns often contain 8000 to 10,000 inhabitants, and villages and hamlets are thickly scattered over the country.

Besides Park's Zravels (in which the Mandingoes play a promin- ent part) see Barth, Travels in Central Africa, and Dr L. Quintin, "' Etude ethnogr. sur les pays entre le Sénégal et le Niger," in Budd. de la Soe. de Géogr., Paris, 1881.

MANDLA, a district in the chief commissionership of the Central Provinces, India, lying between 22° 14' and 23° 22' N. lat., and between 80° and 81° 48' E. long.,, is bounded on the N.E. by Rewah state, on the S.E. by Bilaspur, on the S.W. by Balaghat, and on the W. by Seoni and Jabalpur. It has an area of 4719 square miles, and the headquarters are at Mandla town. The district consists of a wild highland region, broken up by tlie valleys of numerous rivers and streams, In the lower valleys there is abundance of rich black cotton soil, while in the less favoured valleys a light friable soil is found. The Nerbudda river flows through the centre of the district, receiving several tributaries which take their rise in the Maikal Hills, a range densely clothed with sd/ forest, and forming part of the great watershed between eastern and western India. The loftiest mountain is Chaurddadar, about 3400 feet high. Tigers and wild beasts abound, and the proportion of deaths caused by wild animals is greater in Mandla than in any other district of the Central Provinces.

The census of 1872 disclosed a population of 218,018 (males, 110,478 ; females, 102,545). The aboriginal or hill tribes num- ber more strongly in Mandla than in any other district of the Central Provinces, the Gonas being

alone returned at 118,806. Mandla town, with a population of 4936, is the only place in the district with upwards of 2000 inhabitants. Of the total area of 4719 square miles, 556 were returned in 1881 as culti- vated, and 2580 as cultivable. In the same year 54,481 acres were devoted to the production of rice, and 75,196 to wheat, while other food grains occupied 199,062 acres. Fibres and sugar-cane are pro- duced in considerable quantities, The magnificent sdl forests which formerly clothed the highlands of the district have suffered greatly from the nomadic system of cultivation practised by the hill tribes, who cut down and burn the wood on the hill-sides, and sow their crops in the ashes. Of late ycars, however, measures have becn taken to prevent further damage to the forests, The only local manufacture consists in the weaving of coarse cotton cloth. The ie gross revenue of the district in 1881 was returned at £21,398, i i ecm: es tie ey from the land. There are 46 Govern-

and 2 schools, e cost of officia ice W : The district has a bad reputation for . sea ea

MANDOLINE. See Lutz.

MAN—MAN

MANDRAKE, Mandragora officinarum, L., of the potato family, order Solanacee, is a native of Spain, Sicily, Crete, Cilicia, Syria, &c., and North Africa (Benth. et Hook., Gen. P1., ii. p. 900; and DC., Prod., xiii. p. 466), It has a short stem bearing a tuft of ovate leaves, with a thick fleshy and often forked root. The flowers are soli- tary, with a purple bell-shaped corolla. The fruit is a fleshy orange-coloured berry. The mandrake has been long known for its poisonous properties and supposed virtues. It acts as an emetic, purgative, and narcotic, and was much esteemed in old times ; but, except in Africa and the East, where it is used as a narcotic and antispasmodic, it has fallen into disrepute (Pickering's Chron. List. of Plants, p. 247). In ancient times, according to Isidorus and Serapion, it was used as a narcotic to diminish sensibility under surgical operations, and the sarme use is mentioned by Kazwint, i. 297, s.v. "Luffah." Shakespeare more than once alludes to this plant, as when Banquo in Macbeth says—" Or have we eaten of the insane root that takes the reason prisoner ?" and again in Antony and Cleopatra— Give me to drink mandragora." The

notion that the plant shrieked when touched, so that those who desired to pluck it up had to stop their cars with pitch, is alluded to in Romeo and Juliet-—" And shrieks like mandrakes torn out of the earth, that living mortals, hearing them, run mad." The mandrake, often growing like the lower limbs of a man, was supposed to have other virtues, and was much used for love philtres (Diosc., iv. 76), while the fruit was supposed, and in the East is still supposed, to facilitate pregnancy (Aug., C. Maust., xxii. 56; compare Gen. xxx. 14, where the Hebrew O°87)7 is undoubtedly the mandrake). Like the mallow, the mandrake was potent in all kinds of enchantment (see Maimonides in Cliwolson, Ssabier, i. 459, and the notes). Dioscorides identifies it with the xipxaia, the root named after the enchantress Circe. To it appears to apply the fable of the magical herb Baaras, which cured demoniacs, and was procured at great risk or by the death. of a dog employed to drag it up, in Josephus (B. J,, vii. 6, § 3), The German name of the plant (Alraune; O. H. G. Alrfina) indicates the prophetic power supposed to be in little images (homunculi, Goldminnchen, Galgenminnchen) made of this root which were cherished as oracles. The possession of such roots was thought to ensure prosperity. (See Ducange, s.v. " Mandragora," and Littré.)

Gerard in 1597 (Herball, p. 280) described the male and female mandrakes. Dioscorides also recognizes two such plants apparently corresponding to the spring and autumn species (MZ, vernalis, Bert., and M. oficinarum, L., respectively), differing as he says in the colour of the foliage and shape of fruit. Healludes to the "ridicu- lous tales" and "doltish dreames" about it merely to scout them. He notes that the root is often single, or with two to many branches. Even in his day, as now, the root of the wild bryony was trimmed to represent the human form, miscalled mandrake, and then sold as such to the ignorant.

MANDRILL, the naime of one of the most remark- able, at all events in outward appearanee, of the Baboons, Cynocephalus maimon or mormon, The general characters of the genus to which it belongs are given in the article Arg, vol. ii. p. 152. The word appears to have been first introduced into our literature in a work published in 1744 called A New Voyage to Guinea, by William Smith, who in an account of the animals of Sierra Leone describes one "called by the white men in this country Mandrill," but adds,

“why it is so called I know not.”! Smith gives sufficiently accurate details to show that his animal is not

*1 “© *Mandrill’ seems to signify a ‘man-like ape,’ the word ‘ Drill’ or ‘ Dril’ having been anciently employed in England to denote an Ape or Baboon, Thus in the fifth edition of Blount’s ‘ Glossographia, or a dictionary interpreting the hard words of whatsoever language now used in our refined English tongue . . . very useful for all such as desire to understand what they read,’ published in 1681, I find ‘Dril, a stonecutter’s tool wherewith he bores little holes in marble,*

that now called Mandrill, but the Chimpanzee. Buffon, however, while quoting Smith’s description, transferred the name to the very different species now under consideration, and to that it has been attached ever since.

The Baboons generally are distinguished from other Monkeys by the comparative equality of the length of their limbs, which with the structure of the vertebral column adapts them rather for quadrupedal progression on the ground than for climbing among the branches of trees. ‘They are also remarkable for the great size of their face and jaws as compared with the part of the skull which encloses the brain. The Mandrill, in addition to these characters, is distinguished by the heaviness of its body, stoutness aud strength of its limbs, and exceeding shortuess of its tail, which is a mere stump, not 2 inches long, and usually carried erect. It is, moreover, remarkable for the prominence of its brow ridges, beneath which the small and closely approximated eyes are deeply sunk; the immense size of the canine teeth; tle great development of a pair of oval bony prominences on the maxillary bones in front of the orbits, rising on each side of the median line of the face, and covered by a longitudinally-ribbed naked skin ; and more especially for the extraordinarily vivid colouring of some parts of the skin.

The body generally is covered with a full soft coating of hair of a light olive-brown above and silvery-grey beneath, and the chin is furnished underneath with a small pointed yellow beard. The hair of the forehead and

temples is directed upwards so as to meet in a point on the crown, which gives the head a triangular appearance. 'The ears are naked and of a bluisli-black colour. The hands and feet are naked and black. A large space around the greatly developed ischial callosities, as well as the upper part of the insides of the thighs, is naked and of a crimson colour, shading off on the sides to lilac or blue, which, depending not upon pigment but upon injection of the superficial blood-vessels, varies in intensity according to the condition of the animal—increasing under excitement, fading during sickness, and disappearing after death. But it isin the face that the most remarkable disposition of vivid hues occur, more resembling those of a brilliantly coloured flower than what might be expected in the cutaneous covering of a mammal. The cheek prominences are of an intense blue, the effect of which is heightened by deeply sunk longitudinal furrows of a darker tint, while the central line and termination of the nose are a bright scarlet. Notwithstanding the beauty of these colours in themselves, the whole combination, with the form and expression of features, quite justifies Cuvier's assertion that 'il serait difficile de se figurer un étre plus hideux que le Mandrill."'

It is only to fully adult males that this description applies. The female is of much smaller size, and of more slender make ; and, though the general tone of the hairy parts of the body is the same, the prominences, furrows, and colouring of the face are very much less marked. The young males have black faces. At the age of three the blue of the cheeks begins to appear, and it is not until they are about five, when they cut their great canine teeth, that they acquire the characteristic red of the end of the nose.

The Mandrills, especially the old males, are remarkable for the ferocity of their disposition, as well as for other disagree- able qualities, which are fully described in Cuvier's account of the animal in La Ménagerie du Muséum @ Histoire Naturelle (1801), but when young they can easily be tamed. Like the rest of the Baboons, they appear to be rather eee eee

&e. Also a large overgrown Ape and Baboon, so called.' 'Drill' is used in the same sense in Charlton's Onomasticon Zoicon, 1668. The singular etymology of the word given by Buffon seems hardly a probable one."—Huxley's Man's Place in Nature, p, 10, 1868. |"

indiscriminate eaters, feeding upon fruit, roots, reptiles, insects, scorpions, &c., and inhabit open rocky ground rather than forests. Not much is known of the Mandrill's habits in the wild state, nor of the exact limits of its geographical distribution. The specimens brought to Europe all come from the west coast of tropical Africa, from Guinea to the Gaboon.

An allied species, the Drill (Cynocephalus leucopheus), which resembles the Mandrill in size, general proportions, and shortness of tail, but wants the bright colouring of the face which makes that animal so remarkable, inhabits the same district. (wW. H. F.)

MANDURIA, a city of Italy in the province of Lecce, 22 miles east of Taranto on the road to Lecce, in the midst of a wide open country. It had 7948 inhabitants at the census of 1871, is the seat of two pretty important fairs, and contains a spacious palace of the Francavilla family, and a fine old church with campanile and rose window; but the main interest of the place attaches to the ruins of the ancient city in the neighbour- hood. The whole circuit of the double line of ancient walls, built of large rectangular stones without mortar, can still be traced, the outer wall and ditch measuring 23 feet in breadth, and the inner passage with the inner wall about 50 feet. At Scegno, just outside the walls, the visitor may still see the fountain of Manduria, the level of which, according to Pliny, it was impossible to alter by any drawing out or pouring in of water.

Manduria is first mentioned in connexion with the death of Archidamus, king of Sparta, who perished in a battle fought under its walls in 338 B.c.; and the only other fact of importance in its ancient annals is the capture by Fabius Maximus in 209. Though omitted from Pliny's list of towns in this region, it appears in the Tabula Peutingeriana. After the destruction of the old town by the Saracens the inhabitants removed to the present site, and the

name Casalnuovo, which they at first applied to the new settlement, was exchanged by Ferdinand I. for the original Manduria.

MANES. This term, which is clearly euphemistic, meaning " goodies" or " good fellows," was applied by the Romans to the spirits of the departed. As in all nations of antiquity, and in many existing savage tribes, these spirits were held by them in great awe and veneration, as being powerful for good or for harm. The doctrine, whether imported from the Egyptiau theology or of Turanian origin through the Etruscan tomb-builders, is closely allied to that of the Greek belief in the existence of the souls of heroes, ancestors, and generally of the "mighty dead," whom they called éainoves, but, of course, in a sense widely different from our notion of demons. Thus in A¢schylus the spirits of Agamemnon and of Darius are invoked as dafpoves, and in the Suppliant Women (24) they are appealed to as Bapvrynot xOdvi01, where the notion of "heavily-punishing" seems conveyed by the compound epithet. Generally, the dzmones were regarded as hostile, or at least dangerous, and blood-offerings (é€vayropot) were made to them to propitiate their wrath, and to induce them to send aid or material blessings from the realms below. 'The idea appears to have been that the spirits ranged the earth, hungry and forlorn, and seeking whom they might devour. Hence pestilences and sudden deaths were attributed to them, and in this sense they came to be regarded as the enemies of theliving. Victims were given to them, that they might not themselves make victims of whomsoever they pleased. Offerings of all kinds were placed in the tomb or burnt on the pyre, and the rites of burial were, with the lamentations of surviving friends, thought necessary for the repose of the ghost. Hesiod, however, in a remarkable passage (Op. et D., 122), speaks of the da/moves in terms more allied to our ideas of " guardian angels." He says they were the souls or spirits of the men who lived in the golden age, and that their office now is to

walk the earth unseen, and to watch the actions and conduct of man. The meaning of the word demon is very obscure. Some connect it with df, the root of Dis, Dyaus, Zevs, Juppiter, &c., others with dace, "to allot," "to distribute," (Curtius, Gr. Htym., i. 230), while others, with Plato (Cratylus, p. 398, B), have supposed that dajuwy, ' knowing," is the original sense. Ina general way, daiuwv meant a man's luck or fortune in life, and hence dvcdaipov and etdaipwv are common phrases for " unfortunate" and " prosperous."

The word manes seems referable to an old adjective, of which there were two forms, mantis and manus, " good." From the former comes immanis, applied to things or persons of formidable size, power, dimensions, &c., and so "huge," "savage," or in any sense "uncanny." The morning is mane, "the good or lucky time," because there was an old proverb (Hesiod, Op. e¢ D., 578) that morning was the best time for work. It is generally used as an ablative, mane novo, &e., yet Virgil has dum mane novum, (Georg. iii. 325). Manus is found in the old Italian divinity Genita Mana; the "good mother," also called Mania and Larunda, the reputed mother of the Lares or household gods. To this goddess Pliny tells us (WV. Z/. xxix. 58) the Romans offered in sacrifice a puppy-dog, catulus. In xxi. 11 he says that chaplets used to be offered to the manes, and in xxxiii. 2 he speaks of men digging mines to get wealth en sede manium, in the depths where the spirits reside.

There can be no doubt that food offerings were, accord- ing to a widely spread superstition, offered to the manes, as to the Lar, to Hecate, to Trivia, and to other infernal powers. Thus Virgil (who is fond of the use of the word) says in An, ili, 63, "aggeritur tumulo tellus; stant Manibus are." On these altars, he adds, goblets of milk and the blood of victims were offered, though he evidently has in view the Greek rite of appeasing the demons. Perhaps there were not such solemn propitiatory sacrifices made to the manes as to the Greek daiuoves. But all nations have reverenced the spirits of their ancestors, and especially those nations which retain strongly patriarchal traditions and the distinctions of caste.

The genius was a kind of attendant on the living, the sharer of his fortunes, and perhaps to some extent regulat- ing them, from birth to death. 'To indulge one's genius originally meant to please him with good cheer, an idea that lay at the root of all primitive notions of sacrifice. Of this notion there is no Greek equivalent. It seems more nearly allied to the superstition of a "double" or "wraith," a kind of alter ego who at once was, and was not, identical with the individual person, (See Hor., Fipist. ii. 2, 187.)

Between the manes and the received idea of souls there was a pretty close analogy. When Virgil says (dn. vi. 743), " quisque suos patimur manes," he appears to mean that the souls of all receive the reward of deeds done in

life. There was, of course, a corresponding idea that the manes could be conjured up, and could appear as ghosts. Thus Propertius (Z/., v. 7), commencing with the verse " Sunt aliquid manes, letum non omnia finit," describes how the ghost of his Cynthia appeared to him and upbraided him for his faithlessness. See also Virg., dn. iv. 490 and v. 99. Like the Safuoves, they were also re to have the power of sending dreams (bid. vi.

In sepulchral inscriptions, even on early Christian tombs, the dedication dis manibus is common, showing the strong tendency to deify which prevailed with the Romans under the empire.

MANETHO. Manetho Sebennyta (MaréOwv, Mave, MaveBibs, Mavea6, &e., t.¢., Mai en Thoth, "beloved by Thoth "), Egyptian priest and annalist, was a native of

Sebennytus (Semmentd) in the Delta. His name is con- nected by Plutarch with the reign of Ptolemy I., and he is usually stated to have written under Ptolemy II. Philadel- phus, though the only authority for this is an epistle to that king of the Pseudo-Manetho, authorsof the forged Book of Sothis preserved bySyncellus. He was instructed in Greek— so Josephus tells us— and the three books of his Aiyurriaxe composed in that language opened to foreigners the history of Egypt from the mythical period downwards, as it was preserved in the records of the priests. Unhappily tlic book is now known only by some lists and fragments pre- served by Josephus in his treatise Against Apion, by Eusebius in his Chronica, and by Syncellus. Syncellus used the work of Eusebius (also known to us through Jerome and the Armenian version!) and the lost Pentabiblon of Africanus. Thus the little that we know of Manetho's history has reached us through a process of transcription and retranscription very unfavourable to the correct trans- mission of the lists of kings and dynasties, to which Josephus alone adds any considerable narrative excerpts. It seems indeed that our authorities themselves used vary- ing and partly corrupt recensions of the original text, and that deliberate corruptions of the Manethonic tradition were not wanting appears from the existence of the Book of Sothis cited by Syncellus, which was undoubtedly a spurious work. That Manetho himself made honest use of his Egyptian sources is generally recognized, since the

Egyptian monuments have afforded confirmation of many, though by no means all, of his statements; but how the corrupt and varying data we now have should be used, or whether the Egyptian tradition can be made the basis of a rational chronology of the oldest historical period, is doubtful (see vol. vil. p. 729 sq.).

The titles of several other books ascribed to Manetho, with a mass of useful material and discussion, will be found along with the best edition of the fragments in Miiller's Fragmenta Historicorum Gre- corum, ii, 511-616. An extant astrological poem called 'AmworeAea- paricd bears thc name of Manetho, but is of much later date (last: edition by Koechly, Leipsic, 1858). See Boeckh, Manetho w. die Hundsstcrnperiode, 1845; Gutschmid, in Philologus (1856), and Rhein. Mus., 1859; Lauth, Manetho und der Turiner Konigs- Papyrus, 1865 ; Lieblein, dcg. Chron. (1863) and Recherches sur la Chron. Eg., 1873 ; and in gencral the books on Egyptian history and chronology.

MANFRED (c. 1231-1266), regent and king of the Two Sicilies, a natural son of the emperor Frederick II. by Bianca Lanzia, the daughter of a Lombard earl, was born in Sicily about 1231, and received from his father the title of prince of Tarentum in 1248. Frederick II. at his death appointed him regent of the Two Sicilies during the absence of his brother Conrad IV., and notwithstanding the hostility of Innocent IV., and the revolt of many nobles and towns in Apulia at the instigation of that pontiff, he was able in 1252 to hand over to Conrad an undivided sovereignty. On the death of the latter in 1254, Manfred was once more called to the regency in the interests of his infant nephew Conradin, and by his victory over the forces of Innocent IV. at Foggia on December 2d of that year was able to establish his authority over the entire kingdom. When in 1258 rumours had reached Sicily of the death of Conradin, Manfred, yielding to the solicitations of his prelates, barons, and people, allowed himself to be crowned at Palermo on August 11. Shortly afterwards envoys arrived from the mother of Conradin to say that he was still alive, and to demand the crown for him ; but this the king, strong in the popularity which he had acquired by his brave defence of his country, by his pleasing person, and by his many accomplishments, declined to give, promising only to preserve the crown for his nephew,

1 Husebi Chronicorwm libri duo, ed. A. Schoene, Berlin, 1866-75.

and faithfully to bequeath it to him on his own death. Excommunicated in 1259 by Alexander IV., Manfred again resorted to arms, and overrunning the papal states, was made master of Tuscany by the battle of Monte Aperto (September 4, 1260). Now at the height of his power, he was anew excommunicated by Urban IV. in 1261, and iu 1263 his forfeited crown was offered to Charles, count of Anjou, and brother of Louis IX. of France. Towards the end of summer in 1265, giving effect to a crusade proclaimed by Urban, Charles with his army entered Piedmont, but the encounter with the Sicilians did not take place until February 1266 at Benevento, where Manfred, filled with despair by the cowardly flight of his Apulians, spurred into the thickest of the battle and fell covered with wounds. His mangled body was hastily buried under a heap of stones near the bridge, but afterwards, at the instance of Pope Clement IV., was dragged out and laid in unconsecrated ground on the frontier of the kingdom.

MANFREDONIA, a seaport and city of Italy, in the province of Foggia, the see of au archbishop, and the centre of a maritime district, lies 22 miles north-east of Foggia, with which it is connected by railway. The situation, on the shores of the Gulf of Manfredonia and at the foot of Monte Gargano, is finely sheltered, and the vegetation of the district is similar to that of Sicily. Acastle dating from the 13th century protects the port, and the city is sur- rounded by walls and towers. The principal building is the cathedral. Though the anchorage is available only for small vessels, a fair trade is carried on in the export of grain. While in 1863 there entered in all 418 vessels with a total burden of 20,346 tons, in 1880 the burden of the 463 vessels was only 10,832 tons. The population of the commune in 1881 was 9401.

Manfredonia is the historical representative of Sipontum, a Roman municipium and colony of some mark, which lay about 14 miles to thesouth. The ancient city having greatly declined, partly owing to the unhealthiness of its situation and partly to the disasters of war, Manfred transferred its inhabitants to the prescnt site in 1261. For a time Manfredonia flourished

greatly, but the ravages of the Turks in 1620 proved fatal to its development. 'Thc site of

Sipontum is marked by the ancicnt church of Santa Maria di Siponto.

MANGALIA, a town on the coast of the Black Sea, in the south of the Dobrudja, at the head of a district in the new Roumanian province of Kustendji. In the time of Genoese supremacy in the Black Sea it was a place of 30,000 inhabitants ; and its population has again risen from a few hundreds to upwards of two thousand. According to the Corpus Inscriptionum Latinarum, it is to be identified with the ancient Thracian city of Callatis (or Acervetis, as it was formerly called)—a colony of Miletus which continued to be a flourishing place to the close of the Roman period.

MANGALORE, the administrative headquarters of south Kanara district, Madras, is situated on the Malabar coast, in 12° 51' 40" N. lat., 74° 52' 36" E. long., with a population in 1871 of 29,667. The town is picturesque, clean, and prosperous. The native houses are laid out in good streets, and the European quarter is particularly pleasant. Mangalore clears and exports all the coffee of Coorg, and trades directly with Arabia and the Persian Gulf. In 1875 3600 ships of 264,000 tons entered. The exports in that year were valued at £505,800, and the imports at £272,704. There isa large native Roman Catholic population, with two European bishops, several churches, and a convent. The Basel Lutheran mission has its headquarters here, and has done much good in teaching trades, &c. Good cloth is woven at their establishment; the making of roof tiles, printing, and bookbinding are also taught.

MANGANESE, a metallic chemical element (symbol Mn; atomic weight 55) widely diffused throughout the mineral kingdom, being an almost constant companion of ferrous oxide, lime, and magnesia in their native carbonates and silicates. Of manganese minerals proper—which are comparatively scarce—the most important is pyrolustte, the native binoxide, MnO,. This is a black crystalline or crystallized solid with semi-metallic lustre, sufficiently soft to give a (black) streak on paper; hardness, 2 to 2°5 :

specific gravity, 4°8 to 4:9. It is known in commerce as "black oxide of manganese" or "manganese," and is extensively used for the industrial extraction of chlorine from muriatic acid. Its most extensive beds are found at Ilmenau and Elgersburg, Thuringia; near Giessen, North Hesse; near Mahrisch-Triibau, Moravia; and in Spain. Almost all pyrolusite is contaminated with more or less of the following "'manganites"—general formula MnO,.R"O—which besides occur (in the same localities) as independent minerals:—brawnite, Mn,O, or MnO,MnO; manganite, or grey manganese ore, Mn,O,.H,O; hausman- nite, MnO, or MnO,.2MnO ; and psilomelan, a complex mineral, the composition of which generally approximates to 4MnO,.RO+aH,O,—the R being chiefly Ba or K,, but including in general more or less of Ca, Mg, and Mn. These ores are not unlike pyrolusite in their general appearance, but can usually be easily distinguished from it by their greater hardness and other physical pro- perties. Closely allied to psilomelan are those earthy, massive, or reniform mineral mixtures known as " bog- manganese," "cupreous manganese," "earthy cobalt." In the two last-named the RO is chiefly CuO and CoO respec- tively. We must here mention those curious formations known as " manganese nodules " which were so frequently dredged up by the "Challenger" expedition, and with which, it seems, large areas of the ocean's bed are thickly covered. The writer found in one of these, which seemed exceptionally rich in manganese, 20-12 per cent. of bin- oxide of manganese (fully oxidized), 0-4 of oxide of nickel, 0°25 of cobalt, and 0:27 of copper,—a total of 21:04 per cent. of the psilomelanic part, not reckoning the CaO, MgO, &e., belonging to it. All the manganese ores named are available for the manufacture of chlorine, and indeed are so used, as components of what goes in the arts as '" man- ganese."

The industrial value of a "mangancsce" depends, of course, on its actual or virtual percentage of binoxide. A convenient method for its determination was worked out by Fresenius and Will, on the basis of a reaction long before discovercd by Turner. When MnO, is brought in contact with aqueous sulphuric and oxalic acids, it is reduced to MnO (-salt) with formation of carbonic acid; thus: MnO, +C,0,H, + H,SO,=2H,0+MnOSO,+2C0,. It is easy so toarrange matters that all the CO, leaves the apparatus and nothing elsc, so that the weight of CO, formed identifies itself with the loss of

weight suffered by the co-reagents ; and obviously evcry one gramme

MnO of CO, formed indicates Scone 3 = 0°9986 gramme of real MnO,,

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A determination of the free water (loss of weight suffered by the powdered ore at 120° C.) must accompany the assay to enable onc to compare two analyses made at different times.

For the making of manganese preparations, high class pyrolusite is the most convenient raw material.

Metallic manganese may be prepared by intimately mixing it with lamp-black and heating the mixture to whiteness in a blast furnace. But the regulus thus obtained contains a large percentage of combined carbon. A purer metal was obtained by Deville, who started with perfectly pure "red oxide," Mn,O,, and heated it along with a proportion of sugar-charcoal insufficient for complete reduction in a double crucible made of quicklime. The unreduced oxide (MnO) and part of the lime fuse together into a violet slag, from which the regulus is easily. separated. Brunner's manganese (obtained by the reduc-

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tion of the fluoride with sodium in a clay crucible) is not manganese at all, but a silicide of the metal.

Hugo Tamm, who endeavoured to work out a process for the manu- facture of the inetal, gives the following process :—11 parts of good pyrolusite is mixed with 1 part of lamp-black and 6 parts of a flux consisting of 20 parts of lead-free bottle-glass, 7 parts of quick- lime, and 7 of fluor-spar; and the mixture is strongly heated, in a graphite crucible coated over with a mixture of 3 parts of graphite and 1 part of clay, by means of a blast-furnace. There is formed a regulus covered by a green silicious slag containing much protoxide of manganese. The "raw" manganese thus pro- duced is contaminated with about 1 per cent. each of iron, silicon, and carbon, aud traces of sulphur, phosphorus, calcium, and aluminium. The green slag in

subsequent operations is substituted for part of the white flux. The raw metal, when re-fused with about one-third of its weight of manganous carbonate, yielded a regulus which contained 99°9 per cent. of the metal,—the remaining 75 per cent. consisting of carbon, silicon, and iron. ;

Manganese metal is grey, like cast iron (Deville's had a reddish hue like bismuth); its specific gravity is about 8; it is hard and brittle, and about as difficult to fuse as wrought iron. It readily tarnishes in ordinary air; even pure water, and much more dilute acid, attack it with evolution of hydrogen and formation of manganous (MnO) hydrate or salt. It is worth stating that neither MnO nor MnCl, is reducible at a red heat by hydrogen gas ; yet Bunsen succeeded in obtaining metallic manganese by the electrolysis of a concentrated solution of the chloride, using a strong current and a negative electrode of very small area.

Oxides.—Pure peroxide can be obtained artificially by keeping the pure nitrate at 200°C. But really pure nitrate is hard to procure. Perhaps the only method for obtain- ing a really' pure preparation is Volhard's: 10 grammes of " pure " (iron- and cobalt-free) manganous sulphate is dissolved in half a litre of water and 100 cm. of nitric acid of 1-2 specific gravity; the solution is heated to boiling, and strong solution of permanganate of potash added until the MnO is nearly but not quite down, and the mixture kept for a while on a water-bath. The precipitate of binoxide formed (according to equation Mn,O,+3MnO=5Mn0O,) is washed, first with dilute nitric acid, then with water, and dried (when it retains some combined water).

When binoxide of manganese is heated to redness—in vacuum, air, oxygen, nitrogen—it loses oxygen with formation of lower oxides. 'his phenomenon was investigated by W. Dittmar, who found that, when the binoxide is heated in a constantly renewed atmosphere, the result, for a given temperaturc, depends only on the partial tension of the oxygen in that atmosphere. Pure (brown-red) Mn,0, remains when this tension is less, while (black) Mn,O, remains when the tension is greater than a certain limit value p. In Dittmar's experiments (which were all made at a temperature somewhat above the melting point of sterling silver), the value p was found to lie close to 26 cm. of mercury. An exact detcrmina- tion of this critical point was not

possible, because the temperature was not perfectly constant, and an increase in temperature is equi- valent to a diminution in the partial tension of the oxygen. Hence, supposing the oxide Mn,0, to be heated, sayin vacuum and within a close apparatus, it will give off oxygen at any temperature greater than a certain minimum ¢), and at any temperature ¢)-+ Az the gas-evolution will come to a stop as soon as the tension of the gas has come up to the critical value » corresponding to this ¢)+At,—p increasing with Ad.

The protoxide, MnO, is most readily obtained by heating

any higher oxide to redness in a current of hydrogen gas, as a dull green powder which gets readily discoloured by oxidation in ordinary air. It is not acted on by water, but readily dissolves in aqueous acids, with formation of manganous Salts. _ The sulphate, MnSO,, is prepared by making pyrolusite into a paste with concentrated sulphuric acid and then heating in a crucible to dull redness until vapours of thie acid cease to come off. The ferric and aluminic sulphates (originally present) are now, at least mostly, decomposed and reduced to insoluble basic salts, so that the residue when treated with water and filtered may yield a solution free of these impurities, aud, of course, of baryta.

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Should any iron or alumina be left it is easily eliminated by digestion with a little carbonate of manganese (prepared from a small portion of the solution by precipitation with carbonate of soda) and filtration. Cobalt and nickel, if present, can be removed by fractional precipitation with sulphide of sodium (or H,S in the presence of MnCO, ?); the black sulphide of Co or Ni comes down first, the (flesh-coloured) MnS afterwards. But lime, magnesia, and alkalies (which are frequently present) are very difficult to get rid of. Compare the section on binoxide. The salt, according to the temperature at which it crystallizes, takes up 7 or 5 or 4 or even 3 or 1 H,O. Crystallized sulphate of manganese generally exhibits a rose-red tint ; but this is owing to the presence of a trace of manganic salt (if not to cobalt salt). The pure salt is colourless.

The chloride, MnCl,.—The crude chloride contained in the preparation of chlorine from the binoxide and muri- atic acid is purified by methods

analogous to those explained for the sulphate. This (very soluble) salt crystallizes at 15°-20° C., with 4H,O. To obtain real MnCl,, the salt must be dehydrated in a current of dry hydrochloric acid gas.

The carbonate, MnCO., is obtained by precipitating the solution of the sulphate or chloride by excess of carbonate of soda on boiling. It is a white precipitate, soluble in 8000 parts of water, which, when dried in the air, gets slightly oxidized with discoloration.

Far more oxidizable is the hydrate, Mn(OH),, as ob- tained by precipitation of manganous solution by caustic alkalies. In the presence of an excess of alkali or other strong soluble base (such as lime, for instance) the oxidation progresses very rapidly, with formation, ultimately, of a black manganite MnO,.RO (e.g., MnO,CaO). This is the rationale of the famous " Weldon Process" for the recovery of the "mangancse" from chlorine liquors (see BLEAcH- inc Powprr). A mixed solution of chloride of manganese and sal-ammoniac, when mixed with ammonia, gives no pre- cipitate ; but the alkaline liquor readily absorbs oxygen from the atmosphere with formation of a brown precipitate of a higher oxide. If, immediately after addition of the ammonia, the excess of volatile alkali is chased away by boiling, the resulting (neutral or slightly acid) liquor remains clear, even in air. Ilereupon is founded a method

for the separation of ferric iron and alumina from man- | ganese.

Manganie salts, t.c., salts of Mn,O3, are produced only under very apecle. conditions, Solutions containing the sulphate and a phosphate respectively are obtained by heating finely divided pyro- lusite with strong sulphuric or phosphoric acid. Both products dissolve in water with formation of intenscly purple solutions, which, however, are very unstable, showing a great tendency to pass into the manganous condition. Any manganic salt when boiled with hydrochloric acid gives manganous salt with evolution of chlorine. 'This tendeney separates them sharply from the corre- sponding compounds of iron.

Manganates and permanganates (compounds with bases of the hypothetical oxides MnO, and Mn,O,).—The most important of these is the manganate of potash, K,MnQ,. Four parts of very finely divided binoxide of manganese

and 34 parts of chlorate of potash are evaporated to dry- ness with the solution of 5 parts of caustic potash, and the residue ignited (not fused) in platinum crucibles until all the chlorate is decomposed. The intensely green mass, containing large excess of caustic alkali, dissolves in water into an intensely green solution from which crystals of the salt K,MunO, can beobtained; but when the alkali is neutral- ized by an acid, the liquor turns intensely purple with for- mation of permanganate and a precipitate of alkaliferous binoxide : 2K,MnO,+ 2H,O = 2KMnO,+ 2KHO + 2H and 2H +K,Mn0O,=H,O+K,MnO,. The purple solution when alkalinized with potash contaminated with organic matter reassumes its original green colour (whence its old name of "chameleon minerale"). For the preparation of permanganate of potash it is best to pass chlorine into the green solution, when the whole of the manganese assumes the permanganate form: K,MnO,+Cl=KCl+KMnO,.

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From the purple liquid crystals of permanganate are easily obtained by evaporation. The crystals (long prisms) are isomorphous with perchlorate of potash, KC]O, They are soluble in 16 parts of cold and far less of hot water. 'They are almost black, and endowed with a peeuliar greenish or bluish metallic lustre. Their powder is red. Their aqueous solution is most intensely purple, one milligramme of tlic salt giving a perceptible eolour to a whole litre and more of water. On addition of acid the solution, through libera- tion of Mn,O., becomes pink.

Of all wet-way reagents, manganates and permanganates are the most powerful oxidizing agents, especially when they are employed in conjunction with free alkali, or (the permanganates) along with free mineral acid. By one or the other of the two combinations most oxidizable inorganic and almost all organie substances are promptly oxidized. Hence both manganates and permanganates are extensively employed as disinfectants, and, in chemical laboratories, as oxidizing agents. For the former purpose impure forms of the soda salts are generally used, while pure per- manganate of potash, nowadays, is exclusively employed for scientific or analytical laboratory work.

The ultimate fate of the reagent depends on whether alkali or acid was used as an auxiliary agent. In the former case the salt passes successively into (green) manganate and (insoluble brown) hydrated binoxide of manganese, —threc-sevenths of the oxygen in the Mn,O, being utilized. In the presence of free acid (sulphuric works best) the Mn,O, loses five-sevenths of its oxygen with formation of a colourless solution of manganous (MnO) salt. Hence, supposing such a change to take place promptly, and the reagent to be added gradually, the exact point of completed oxidation is reached when the liquid, by the addition of another drop of the permanganate, assumes a permanent pink colour. This is the principle of a num- ber of processes for the determination of certain reducmg agents by means of a standard solution of permanganate.

Analysis. —A mianganifcrous substauce when fused up with car- bonate of soda on platinum in the presence of air yields a grecn mass (manganate), the colour being more distinct after cooling. Manganese oxides, when fused up with a borax bead in the oxidizing flame, impart to it an intense amethyst colour, which disappears in the reducing flame. To detect manganese in a solution of mineral salts, we first eliminate what can be precipitated by sulphuretted hydrogen in the presence of mineral acid. In the filtrate the iron (if present) is oxidized by boiling with a granule of chlorate of potash, and the ferric oxide precipitated along with the alumina by addition of sal-ammoniac and excess of ammonia, and boiling off the free volatile alkali. From the filtrate the manganese is pre- cipitated by sulphide of ammonium, as a sulphide which, when es exhibits a delicate flesh-red colour but is readily discoloured, by oxidation, when in contact with air. Cobalt, nickel, and zine, if present, go down with the manganese, but can ke eliminated by treatment of the washcd sulphides with acetic acid, which dissolves the mangancse only. (W. D.)

MANGEL WURZEL. See Acricutturt, vol. i, p. 368.

MANGO. The mango-tree (Mangifera indica, L.,natural |

order Anacardiacex or Terebinthacex) is a native of tropical Asia, but during the last hundred years has been exten- sively cultivated in the tropical and subtropical regious of the New as well as the Old World. It grows rapidly to a height of 30 to 40 feet, and its dense, spreading, and

glossy foliage would secure its cultivation for the sake of its shade and beauty alone. Its fruit, a drupe, though in the wild variety (not to be confused with that of Spondias mangifera, Pers., belonging to the same order, also called wild mango in India) stringy and sour from its containing much gallic acid, and with a disagreeable flavour of turpentine, has become sweet and luscious through culture and selection, to which we owe many varieties, differing not ouly in flavour but also in size, from that of a plum to that of an apple. When unripe, they are used to make pickles, tarts, and preserves ; ripe, they form a wholesome and very agreeable dessert. In times of scarcity, the kernels also are eaten. Not only the flesh and kernel of the fruit, but also the bark and resin are of some medicinal value; and the timber, although soft and liable to decay, serves for common purposes, and, mixed with sandal wood, is employed in

cremation by the Hindus. It is usually propagated by grafts, or by layering or inarching, rather than by sced. See Drury's Useful Plants of India.

MANGOSTEEN, Garcinia Afangostana, L., is a tree belonging to the gamboge ordcr (Clustacex or Guttifere). It is a native of the Molncca Islands, but has been iutro- duced into the other islands of the eastern archipelago, Ceylon, and southern Asia, and even the Antilles, though not without difficulty. It grows about 20 feet high, and is somewhat fir-like in general form, but the leaves are large, oval, entire, coriaceous, and glistening. Its fruit, the much-valued mangosteen, is about the size and shape of an orange, and is somewhat similarly partitioned, but is of a reddish-brown to chestnut eolour. Its thick rind yields a very astringent juice, rich in tannin, and containing a gamboge-like resin. The soft and juicy pulp is snow-white or rose-coloured, and of exceedingly delicious and subtle flavour and perfume. Being perfectly wholesome, it may be eaten freely, and administered in fever. G. purpurea is known in India as mate mangosteen, and Hmbryopteris glutinifera, an ebenaceous tree, as wild mangosteen. See Drury's Useful Plants of India.

MANGROVE. The remarkable 'mangrove forests" which fringe tidal estuaries, overrun salt marshes, and line muddy coasts in the tropics of both Old and New Worlds, are composed of trees and shrubs belonging to the

L¢hizo- phoracee, a small order of calycifloral' exogens, mixed, however, with the "white mangrove," Avicennia, a ver- benaceous plant. Their trunks and branches constantly emit adventitious roots, which, descending in arched fashion, strike at some distance from the parent stem, and send up new trunks, the forest thus spreading like a banyan grove. The roots and stems afford lodgment and shelter to innumer- able bivalves, erabs, and other marine animals, while the branches are inhabited by aquatic birds. A further advantage in dispersal, very characteristic of the order, is afforded by the seeds, which have a striking peculiarity of germination. While the fruit is still attached to the parent branch, the long radicle emerges from the seed and descends rapidly towards the mud, where it may even establish itself before falling off. Owing to its elubbed shape, this is always in the right position, the plumule then making its appearance. The wood of some spccies is hard and durable, and the astringent bark is employed intanning. The fruit of the eommon mangrove, Lhizophora Mangle, L., is sweet and wholesome, and yields a light wine. See Zreasury of Botany, and Lindley's Vegetable Kingdom.

MANICHAISM. At the elose of the 3d century three great religious systems stood opposed to one another in western Asia and the south of Europe; these were Neo- Platonism, Catholicism, and Manicheism. All three may be described as the final results reaclied, after a history of more than a thousand years, by the religious development of the civilized nations stretching from Persia to Italy. Each had put off the national and particular character of the ancient religions, and had become a world-religion, with universalizing tendencies, and with demands which in their effect transformed the whole of human life, both public and private. The place of national worship was taken by a system which not only aimed at being a philosophy of God, the world, and history, but at the same time embraced a definite eode of ethics and a religious ritual. In point of form, then, the three religions were like each other, as they also were in this, that each had appropriated elements of older and widely different religions. Their mutual resem- blance becomes still further apparent when we observe that in all three the ideas of revelation, redemption, ascetic virtue, and immortality eome into the foreground. Neo- Platonism, however, was the spiritualized religion of nature,

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Mani's life,

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Greek polytheism transfigured and developed into Pan- theism through Oriental influences and philosophical specu- lations; Catholicism was the monotheistic universal re- ligion, based upon the Old Testament and the Gospel, but built up with the resources of Hellenic speculation and ethics; Manichzism was the dualistic and universal religion, founded on Chaldaism, but charged with Christian, Parsic, and perhaps Buddhistic ideas. In Manichzism the Hel- lenic element was wanting, in Catholicism the Chaldeo- Persian. These three universal religions were developed in the course of two centuries (c. 50-250 a.p.), Catholicism being the earliest and Manichsism the latest creation. To both of these, however, Neo-Platonism was from the outset inferior, because it did not possess a founder, and conse- quently did not develop elemental force, but retained the character of an artificial creation. Attempts were made to invent a founder for it, but these, of course, entirely failed. Catholicism, again, appears as superior to Mani- cheeism, even if we do not look at the contents of the two religions, because it honoured its founder, not only as a bearer of revelation, but as Redeemer in His own person, and as the Son of God. The struggle of Catholicism with Neo-Platonism had been already decided by about the middle of the 4th century, though the latter maintained itself in the Greek empire for nearly two centuries longer. In its contest with Manichxism, the Catholic Church was from the outset certain of victory, being at the time the privileged church of the empire. But this rival could not be annihilated ; it maintained itself both in the East and in the West, though in various forms and modifications, until far on in the Middle Ages.

Mani (Mévys, Manes, Maviyatos, Manicheus 1) is said, in the Acta Archelai, to have originally been called " Cubricus " (according to Kessler, a corruption of "Shura- ik"). Nothing reliable about his life was ever known in the Graeco-Roman empire; for the account in the Acta Archelat is quite incredible, and shaped by the objects

of its author. If criticism may succeed in showing the.

sources from which this account has flowed, in ascertaining the tendencies which have been at work in it, and thus in extracting some solid matter, it can only do so by starting from the Oriental, the Mohammedan, tradition, which is comparatively worthy of credence. It is therefore to the latter alone that we must apply for information. Accord- Ing to it, Mani was a high-born Persian of Ecbatana. The year of his birth is uncertain, but Kessler accepts as reliable the statement made by Biruni, that Mani was born in the year 527 of the astronomers of Babylon (215-216 a.p.). He received a careful education at Ctesiphon from his father Futak (Iaré«os). As the father connected himself at a later period with the confession of the Moghtasilah, or " Baptists," in southern Babylonia, the son also was brought up in the religious doctrines and exercises of this sect. These Baptists (see the Fthrist) were apparently connected with the Elkesaites and the Hemerobaptists, and certainly with the Mandzans. It is not improbable that this Babylonian sect had absorbed Christian elements. Thus the boy early became acquainted with very different forms of religion. If even a small part of the stories about his father is founded on fact, —and there is no doubt that most of them are mere Manichwan legends,—it was he who first introduced Mani to that medley of religions out of which his system arose. Mani- chan tradition relates that Mani received revelations while yet a boy, and assumed a critical attitude towards the religious instruction that was being imparted to him. This is the more incredible since the same tradition informs Se ae ae

a s s ° The name has not as yet been explained, nor is it even known whether it be of Persian or Semitic origin,

us that the boy was as yet prohibited from making public use of his new religious views. It was only when Mani had reached the age of twenty-five or thirty years that he began to proclaim his new religion. This he did at the court of the Persian king, Sapor I., and according to the story, on the coronation-day of that monarch (241-42). A Persian tradition says that he had previously been a Christian presbyter ; but this is certainly incorrect. Mani did not remain long in Persia, but undertook long journeys for the purpose of spreading his religion, and also sent forth disciples. According

to the Acta Archelai, his missionary activity extended westwards into the territory of the Christian church ; but from Oriental sources it is certain that Mani rather went into Transoxania, western China, and southwards as far as India. His labours there as well as in Persia were not without result. Like Mohammed after him aud the founder of the Elkesaites before him, he gave himself out for the last and highest prophet, who was to surpass all previous divine revelation, which only possessed a relative value, and to set up the perfect religion. In the closing years of the reign of Sapor I. (c. 270) Mani returned to the Persian capital, aud gained adherents even at court. But the dominant priestly caste of the Magians, on whose support the king was dependent, were naturally hostile to him, and after some successes Mani was made a prisoner, and had then to flee. The successor of Sapor, Hormuz (272-273), appears to have been favourably disposed towards him, but Bahram I. abandoued him to the fanaticism of the Magians, and caused him to be crucified in the capital in the year 276-7. The corpse was flayed, and Mauni's adherents were cruelly persecuted by the king.

Mani himself composed a large number of works and Mani's epistles, which were in great part still known to the Writings.

Mohammedan historians, but are now lost. The later heads of the Manichzan churches also wrote religious treatises, so that the ancient Manichean literature must have been very extensive. According to the Fthrist, Mani made use of the Persian and Syriac languages ; but, like the Oriental Marcionites before him, he invented an alphabet of his own, which the FvArist has handed down to us. In this alphabet the sacred books of the Manicheans were written even at a later period. The Frhrist reckons seven principal works of Mani, six being in the Syriac and one in the Persian language ; regarding some of these we also have information in Epiphanius, Augustine, Titus of Bostra, and Photius, as well as in the formula of abjuration (Cotelerius, PP. Apost. Opp., i. 543) and in the Acta Archelat. They are (1) The Book of Secrets (see Acta Archel.), containing discussions bearing on the Chris- tian sects spread throughout the East, especially the Mar- cionites and Bardesanites, and dealing also with their conception of the Old and New Testaments; (2) The . Book: of the Giants (Demons?) ; (3) The Book of Precepts for Hearers (probably identical with the Zpistola Funda- ment: of Augustine, and with the Book of Chapters of

Epiphanius and the Acta Archelat; this was the most widely spread and most popular Manichean work, having been translated into Greek and Latin; it contained a short summary of all the doctrines of fundamental authority) ; (4) Lhe Book Shéhpirakdn (Fliigel was unable to ex- plain this name ; according to Kessler it signifies " epistle to King Sapor"; the treatise was of an eschatological character) ; (5) Zhe Book of Quickening (Kessler identifies this work with the "Thesaurus [vitee]" of the Acta Archelai, Epiphanius, Photius, and Augustine, and if this be correct, it also must have been in use among the Latin Manichzeans) ; (6) The Book rpayparefa (of unknown con- tents) ; (7) a book in the Persian language, the title of which is not given in our present text of the Fihrist, but

Mani- chean system,

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which is in all probability identical with the " holy gospel " of the Manichzans (mentioned in the Acta Archel. and many other authorities). It was this work which the Manichzeans set up in opposition to the Gospels. Besides these principal works, Mani also wrote a large number of smaller treatises and epistles. The practice of writing epistles was continued by his successors. These Manichzan dissertations also became known in the Greeco-Roman empire, and existed in collections! There also existed a Manichzan book of memorabilia, and of prayers, in Greek, as well as many others,? all of which were destroyed by the Christian bishops acting in conjunction with the authorities. A Manichean epistle, addressed to one Marcellus, las, however, been preserved for us in the Acta Agchelar.?

Though the leading features of Manichzan doctrine can be exhibited clearly even at the present day, and though it is undoubted that Mani himself drew up a com- plete system, many details are nevertheless uncertain, since they are differently described in different sources, and it often remains doubtful which of the accounts that have been transmitted to us represents the original teaching of the founder.

The Manichzan system is one of consistent, uncompro- mising dualism, in the form of a fantastic philosophy of nature. The physical and the ethical are not distinguished, and in this respect the character of the system is

thoroughly materialistic ; for when Mani coordinates good with light, and evil with darkness, this is no mere figure of speech, but light is actually the only good, and darkness the only evil. From this it follows that religious knowledge can be nothing else than the knowledge of nature and her elements, and that redemption can only consist in a physical process of freeing the element of light from the darkness. Under such circumstances ethics becomes a doctrine of abstinence in regard to all elements which have their source within the sphere of darkness.

The self-contradictory character of the present world forms the point of departure for Mani's speculations. This contradiction presents itself to his mind primarily as elemental, and only in the second instance as ethical, inasmuch as he considers the sensual nature of man to be the outflow of the evil elements in nature. From the contradictory character of the world he concludes the existence of two beings, originally quite separate from each other—light and darkness. Each is to be thought of according to the analogy of a kingdom. Light presents itself to us as the good primal spirit (God, radiant with the ten [twelve] virtues of love, faith, fidelity, high-minded- ness, wisdom, meekness, knowledge, understanding, mystery, and insight), and then further as the heavens of light and the earth of light, with their guardians the glorious zons. Darkness is likewise a spiritual kingdom (more correctly, it also is couceived of as a spiritual and feminine person-ification), but it has no "God" at its head. It embraces an "earth of darkness." As the earth of light has five tokens (the mild zephyr, cooling wind, bright light, quickening fire, and clear water), so has the earth of darkness also five (mist, heat, the sirocco, darkness, and

1A BiBAtoy érioroAGy is spoken of in the formula of abjuration, and an Epistola ad virginem Menoch by Augustine. Fabricius has collected the " Greek fragments of Manichean Epistles" in his Biblio- theca Greca (vii. p. 811 sq.).

2 The Canticum amatorium is cited by Augustine.

3 Zittwitz assumes that this epistle was in its original form of much larger extent, and that the author of the Acés took out of it the matter for the speeches which he makes Mani deliver during his disputation with Bishop Archelaus. The same scholar traces back the account by Turbo in the Acts,

and the historical data given in the fourth section, to the writings of Turbo, a Mesopotamian, who is assumed to have been a Manichewan renegade and a Christian. But as to this difference of opinion is at least allowable.

4

vapour). Satan with his demons was born from the kingdom of darkness. These two kingdoms stood opposed to each other from all eternity, touching each other on one side, but remaining unmingled. Then Satan began to rage, and made an incursion into the kingdom of light, into the earth of light. The God of light, with his syzygy, "the spirit of his right hand," now begot the primal man, and sent him, equipped with the five pure elements, to fight against Satan. But the latter proved himself the stronger, and the primal man was for a nioment vanquished. And, although the God of light himself now took to the field, and with the help of new wons (the spirit of life, &c.), inflicted total defeat upon Satan, and set the primal man free, the latter had already been robbed of part of his light by the darkness, and the five dark elements had already mingled themselves with the generations of light. It only remained now for the primal man to descend into the abyss, and prevent the further increase of the generations of darkness by cutting off their roots; but he could not immediately separate again the elements that had once mingled. These mixed elements are the elements of the present visible world, which was formed from them at the command of the God of light. The forming of the world is in itself the beginning of the deliverance of the imprisoned elements of light. The world is represented as an orderly structure of various heavens and various earths, which is borne and supported by the seons, the angels of light. It possesses in the sun and moon, which are in their nature almost quite pure, large reservoirs, in which the portions of light that have been rescued are stored up. In the sun dwells the primal man himself, as well as the glorious spirits which carry on the work of redemption ; in the moon the mother of life is enthroned. The twelve constellations of the zodiac form an ingénious machine, a great wheel with buckets, which pour into the sun and moon, those shining ships that sail continually through space, the portions of light set free from the world. Here they are purified anew, and attain finally to the kingdom of

pure light and to God Himself. The later Western Manichzans termed those portions of light which are scattered throughout the world—in its ele- ments and organisms—awaiting their deliverance, the Jesus patebilis.

It is a significant mark of the materialistic and inhuman character of the system" that, while the formation of the world is considered as a work of the good spirits, the creation of man is referred to the princes of darkness. The first man Adam was engendered by Satan in conjunc- tion with " sin," "cupidity," "desire." But the spirit of darkness drove into him all the portions of light he had stolen, in order to be able to dominate them the more securely. Hence Adam is a discordant being, created in the image of Satan, but carrying within him the stronger spark of light. Eve is given him by Satan as his com- panion. She is seductive sensuousness, though also having in her a small spark of light. But if the first human beings thus stood entirely under the dominion of the devil, the glorious spirits took them under their care from the very outset, sending zeons down to them (including Jesus), who instructed them regarding their nature, and in particu- lar warned Adam against sensuality. But this first man fell under the temptation of sexual desire. Cain and Abel indeed are not sons of Adam, but of Satan and Eve ; Seth, however, who is full of light, is the offspring of Adam by Eve. Thus did mankind come into existence, its various members possessing very different shares of light, but the men having uniformly a larger measure of it than the women. Inthe course of history the demons sought to bind men to themselves by means of sensuality, error, and false religions (among which is to be reckoned above all

Ethics, social polity, and worship of the Mani- cheeans.

'thoroughly ascetic.

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the religion of Moses and the prophets), while the spirits of light carried on their process of distillation with the view of gaining the pure light which exists in the world. But these good spirits can only save men by imparting to them the true gnosis concerning nature and her forces, and by calling them away from the service of darkness and

sensuality. To this end prophets, preachers of true knowledge, have been sent into the world. Mani, follow- ing the example of the gnostic Jewish Christians, appears to have held Adam, Noah, Abraham (perhaps Zoroaster Probably Jesus was

and Buddha) to be such prophets. also accounted a prophet who had descended from the world of light,—not, however, the historical Jesus, the devilish Messiah of the Jews, but a contemporaneous

phantom Jesus, who neither suffered nor died (Jesus impatibiles). According to the teaching of some Mani- cheeans, it was the primal man who disseminated the true But at all events Mani himself, on his own claim, is to be reckoned the last and greatest prophet, who took up the work of Jesus impatibilis and of Paul (for he too finds recognition), and He is the "leader," the It is ouly through his agency and that of his imitators "the elect," that the separation of the light from the darkness can be completed. The system contains very fantastic descrip- tions of the processes by which the portions of hight when once set free finally ascend even to the God of light. He who during his lifetime did not become one of the elect, who did not completely redeem himself, has to go through a

gnosis in the character of Christ.

first brought full knowledge. '"'ambassador of the light," the " Paraclcte."

severe process of purification on the other side of the grave,

till he too is gathered to the blessedness of the light. It is erroneous, however, to ascribe, as has been done, a Of course men's bodies as well as the souls of the unsaved, who according to the oldest conception have in them no light

doctrine of transmigration to the Manicheans.

whatever, fall under the sway of the powers of darkness, A later view, adapted to the Christian one, represents the portions of light in the unsaved as actually becoming lost. When the elements of light have at last been completely, or as far as possible, delivered from the world, the end of all

things comes. All glorious spirits assemble, the God of light himself appears, accompanied by the sons and the perfected just ones. The angels supporting the world withdraw themselves from their burden, and everything falls in ruins. A tremendous conflagration consumes the world; the perfect separation of the two powers takes place once more ; high above is the kingdom of light, again brought into a condition of completeness, and deep below is the (?now powerless) darkness.

On the basis of such a cosmical philosophy, ethics can only have a dualistic ascetic character. Manichean ethics is not merely negative, however, since it is necessary to cherish, strengthen, and purify the elements of light, as well as free oneself from the elements of darkness. The aim is not self-destruction, but self-preservation ; and yet the ethics of Manichzism appears in point of fact as The Manichean had above all to refrain from sensual enjoyment, shutting himself up against it by three seals, the signaculum ores, manus, and sinus. The signaculum oris forbids all eating of unclean food (which included all bodies of animals, wine, &c.,—vegetable diet being allowed because plants contained more light, though the killing of plants, or even plucking their fruit and breaking their twigs, was not permitted), as well as all impure speech. The signaculum manus prohibits al] traffic with things generally, in so far as they carry in them clements of darkness. Finally by the stgnaculum sinus every gratification of sexual desire, and hence also marriage, 1s forbidden. Besides all this, life was further regulated

by an exceedingly rigorous system of fasts. Certain astronomical conjunctions determined the selection of the fast-days, which in their total number amounted to nearly a quarter of the year. Sunday was regularly solemnized as one, and the practice was also generally observed on Monday. Hours of prayer were determined with equal cxactness. T'he Manichsan had to pray four times a day, each prayer being preceded by ablutions. The worshipper turned towards the sun, or the moon, or the north, as the seat of light ; but it is erroneous to conclude from this, as has been done, that in Manicheism the sun and moon were themselves objects of worship. Forms of prayer used by the Manicheans have been preserved to

us in the Lhrist. The prayers are addressed to the God of light, to the whole kingdom of light, to the glorious angels, and to Mani himself, who is apostroplized in them as "the great tree, which is all salvation." According to Kessler, these prayers are closely related to the Mandan and the ancient Babylonian hymns, An asceticism so strict and painful as that demanded by Manicheism could only be practised by few; hence the religion must have abandoned all attempts at an extensive propaganda, had it not con- ceded the principle of a twofold morality. A distinction was made in the community between the Lect (Perfect), the perfect Manicheans, and the Catechument (Auditores), the secular Manichaans. Ouly the former submitted themselves to all the demands made by their religion ; for the latter the stringency of the precepts was relaxed. They had to avoid idolatry, sorcery, avarice, false- hood, fornication, ce.; above all, they were not allowed to kill any living being (the ten commandments of Mani). They had also to free themselves as much as possible from the world; but in truth they lived very much as their non-Manichan fellow-citizens. We have here essentially the same condition of things as in the Catholic Church, where a twofold morality was also in force, that of the religious orders and that of secular Christians,—only that the position of the electi in Manichzism was a more distinguished one than that of the monks in Catholicism. For, after all, the Christian monks uever quite forgot that salvation is given by God through Christ, whereas the Manichean electi were actually themselves redeemers. Hence it was the duty of the auditores to pay the greatest respect and most assiduous attention to tlie elccti. These "perfect ones," wasting away under their asceticism, were objects of admiration, and of the most elaborate solicitude. Food was presented to them in abundance, and by their eating it the electi set free the portions of light from the vegctables. They prayed for the auditores, they blessed them and interceded for them, thereby shortening tlie process of purification the lattcr had to pass through after death. It was only the electi, too, who possessed full knowledge of religious truths, a point of distinction from Catholicism.

The distinction between electi and auditores, however, does not exhaust the conception of the Manichean Church ; on the contrary, the latter possessed a hierarchy of three ranks, so that there were altogether five grada- tions in the community. These were regarded as a copy of the ranks of the kingdom of light. At the head stood the teachers ('the sons of meekness," Mani

himself and his successors) ; then follow the administrators (“‘the sons of knowledge,” the bishops) ; then the e/ders (“the sons of understanding,” the presbyters); the edecti (“the sons of mystery”); and finally the auditores (“the sons of

1 Analogous to this is the veneration in which the Catholic monks and the Neo-Platonic ‘philosophers ” were held, but the prestige of the Manichean electi was greater than that of the monks and the philosophers,

Historical

MANICHAISM

The number of the electi must always have

According to Augustine the teachers were twelve, and the bishops seventy-two in number. One of the teachers appears to have occupied the position of

insight ”). been small.

superior at the head of the whole Manichzan Church.

At least Augustine speaks of such a personage, aud the

Filvist also has knowledge of a chief of all Manichveans. The constitution, therefore, had a monarchic head.

The worship of the Manichxans must have been very simple, and must have essentially consisted of prayers, hymns, and ceremonies of adoration. This simple service promoted the secret dissemination of their doctrines. The Manichzeans too, at least in the West, appear to have adapted themselves to the church’s system of festivals. The electi celebrated special feasts; but the principal festival with all classes was the “Bema” (8a) the feast of the “teacher’s chair,” held in commemoration of the death of Mani in the month of March. The faithful prostrated themselves before an adorned but empty chair, which was raised upon a podium of five steps. Long fasts accompanied the feasts. ‘The Christian and Mohammedan historians could

learn little of the Manichazan mysteries and "sacraments," and hence the former charged them with obsceue rites and abominable usages.

mysteries analogous to Christian baptism and the Lord's Supper, which may have rested upon ancient consecration rites and other ceremonies, instituted by Mani himself and having their origin in nature worship.

From the foregoing account it will be evident, as

position jndeed from modern investigation it is certain, that

of Mani-

cheism.

Manichexism did not originate ou Christian ground. It would be more proper to speak of Mohammedanism than of Manichxism as a Christian sect; for Mohammed stands in a far closer relation to the Jewish and Christian religions than did Mani. It is Kessler's merit to have shown that the ancient Babylonian religion, the original source of all the gnosis of western Asia, was the basis of the Manichsean system. Hence the erroncousness of the assumption, which formerly prevailed, that Manicheeism was a reform movement of Parsism, a modification of Zoroastrianism under the influence of Christianity. Manicheism is a system which rather belongs to the Semitic group of religions. It is the Semitic religion of nature, withdrawn from national limits, modified by Christian and Persian elements, elevated into a gnosis, and transforming human life by the influence of stringent regulations. But the recognition of this fact only supplies us with a very general explanation of the origin of Manicheism. The question still remains, through what channels and to what extent Mani adopted those Persian and Christian elements, and further, in what form the ancient nature religion of Babylonia was utilized by him. As far as the latter point is concerned it is known that, two centuries before Mani, the Semitic nature-religions liad already been taken up by various enthusiastic or speculative spirits, who had given them philosophic depth and moulded than into "systems," which were propagated with the aid of mysterious rites. Maui's undertaking, then, was by no means a novel one, but was rather the last in a long series of similar efforts. Again, even in the

earlier of these attempts, from that of Simon Magus onward, Christian elements had been adopted to a greater or less extent; and the sects of the Christian gnostic schools of Syria and western Asia may all be traced back to the nature-religions of ancient Semitism, transformed into a philosophy of the world and of life. It is the Babylonian sect of the Moghtasilah that seems to have fur- nished Mani with the matter of his religious philosophical speculations, and the religion of this sect was purely

Tt may be held as undoubted that the later Manichseans celebrated

Semitic (see Manpmans ; the Mandseans were related to the Moghtasilah). This was the source of the thorough- going dualism which forms the basis of Mani's system ; for the ancient Persian religion was not essentially dualistic, but was at bottom monistic, since Ahriman is created by Ormuzd. At the same time Mani turned the theologu- mena of ancient Persia also to account. The fact that the two opposed elements are called "light" and "darkness " can hardly be independent of Parsism, and Manicheism uses other termini technice of the Persian religion. Whether Mani's idea of redemption is to be traced to the ancient Babylonian or 'to the Zoroastrian religion we do not venture to decide. The idea of "the prophet" and "the primal man" is at all events Semitic.

It is very difficult to determine what was the extent of Mani's knowledge of Christianity, how much he himself borrowed from it, and through what channels it reached him. In any case it is certain that Manicheism, in those districts where it was brought much into contact with Christianity, became additionally influenced by the latter at a very early period. The Western Manichaans 'of the 4th and 5th centuries are much more like Christians than their Eastern brethren. In this respect Manichaism ex- perienced the same kind of development as Neo-Platonism. As regards Mani himself, it is safest to assume that he held both Judaism and Catholic Christianity to be entirely false religions. It is indeed true that he not only described himself as the promised Paraclete—for this designation probably originated with himself—but also conceded a high place in his system to " Jesus ;" we can only conclude from this, however, that he distinguished between Christi- anity and Christianity. The religion which had proceeded from the historical

Jesus he repudiated together with its founder, and Catholicism as well as Judaism he looked upon as a religion of the devil. But he distinguished between the Jesus of darkness and the Jesus of light who had lived and acted contemporaneously with the former. This distinction agrees with that made by the gnostic Basilides no less strikingly than the Manichzan criticism of the Old Testament does with that propounded by the Marcionites (see the Acta Archelat, in which Mani is made to utter the antitheses of Marcion). Finally the Mani- chaan doctrines exhibit points of similarity to those of the Christian Elkesaites; but, as it is possible, and even probable, that such resemblances are to be ascribed to a common ancient Semitic source, they do not here call for further consideration. The historical relation of Mani to Christianity is then as follows. From Catholicism, which he very probably had no detailed knowledge of, he borrowed nothing, rejecting it as devilish error. On the other hand, he looked upon what he considered to be Christianity proper, that is, Christianity as it had been developed among the sects of Basilidians, Marcionites, and perhaps Bardesanites, as a comparatively valuable and sound religion. He took from it, however, as from the Persian religion, hardly anything but names, and, perhaps we may add, a criticism of the Old Testament and of Judaism so far as he required it. Indications of the influence of Marcionitism are found in the high estimation in which Mani held the apostle Paul, and in the fact that he explicitly rejects the Book of Acts. Mani appears to have given recognition to a portion of the historical matter of the Gospels, and to have interpreted it in accordance with his own doctrine. In conclusion, it remains to be asked whether Buddhistic elements can also be detected in Manichzism. Most modern scholars since F. C. Baur have answered this question in the affirmative. According to Kessler, Mani made use of the teaching of Buddha, at least as far as ethics was concerned. It cannot be doubted that Mani, who undertook long journeys as far as India,

knew of Buddhism. The name Buddha (Buddas) which occurs in the legendary account of Mani, and perhaps in the latter's own writings, indicates further that he had occupied his attention with Buddhism when engaged in the work of founding his new religion. But his borrowings frori

this source must have been quite insignificant. A detailed comparison shows the difference between Buddhism and Manicheeism in all their principal doctrines to be very great, while it becomes evident that the points of resem- blance are almost everywhere accidental. This is also true of the ethics and the asceticism of the two systems, There is not a single point in Manicheism which demands for its explanation an appeal to Buddhism. Such being the case, the relationship between the two religions remains a mere possibility, a possibility which the inquiry of Geyler (Das System des Manicheismus und sein Verhdltniss zum Buddhismus, Jena, 1875) has not been able to elevate into a probability.

How are we to explain the rapid spread of Manichzism, and the fact that it really became one of the great religions ? One answer is that Manicheism was the most complete guosis, the richest, most consequent, and most artistic system formed on the basis of the ancient Babylonian re- ligion (so Kessler). This explanation is insufficient, for no religion operates mainly through the perfection of its system of doctrine ; and it is not strictly correct, for the older gnostic systems were not less richly equipped than the Manichewan. What gave strength to Manichwism was rather that it united an ancient mythology and a thorough- going materialistic dualism with an exceedingly simple spiritual worship and a strict morality, On comparing it with the Semitic religions of nature, we perceive that it retained their mythologies, after transforming them into "doctrines," but abolished all their sensuous cultus, substituting instead a spiritual worship as well as a strict morality. Manicheism was thus able to satisfy the new wants of an old world. It offered revelation, redemption, moral virtue, and immortality, spiritual benefits on the basis of the religion of nature. A further source of strength lay in the simple yet firm social organization which was given by Mani himself to his new institution, The wise man and the ignorant, the enthusiast and the man of the world, could all find acceptance here, and there was laid on no one more than he was able and willing to bear. Each one, however, was attached and led onward by the prospect of a higher rank to be attained, while the intellectually gifted had an additional inducement in the assurance that they did not require to submit themselves to any authority, but would be led to God by pure reason, Thus adapted from the first to individual requirements, this religion also showed itself able to appropriate from time to time foreign elements. Originally furnished from

fragments of various religions, it could increase or diminish this possession without rupturing its own elastic framework, And, after all, great adaptability is just as necessary for a universal religion as a divine founder in whom the highest revelation of God Himself may be seen and reverenced, Manicheism indeed, though it applies the title " redeemer " to Mani, has really no knowledge of a redeemer, but only of a physical and gnostic process of redemption ; on the other hand, it possesses in Mani the Supreme prophet of God. If we consider in conclusion that Manicheism gave a simple, apparently profound and yet convenient solution of the problem of good and evil, a problem that had become peculiarly oppressive to the human race in the 2d and 3d centuries, we shall have named the most important factors which account for the rapid spread of the system.

_ Manichzism first gained a firm footing in the East, %€, In Persia, Mesopotamia, and Transoxania. The persecutions it had to endure did not hinder its extension,

The seat of the Manichexan pope was for centuries in Sketch Babylon, at a later period in Samarkand. Even after the of the conquests of Islam the Manichezan Church continued to ree : maintain itself, indeed it seems to have become still more coherent widely diffused by the victorious campaigns of the Mohammedans, and it frequently gained secret adherents amoug the latter themselves. Its doctrine and discipline underwent little change in the East; in particular, it drew no nearer to the Christian religion. More than once, however, Manicheism experienced attempts at reformation; for of course the auditores very easily became worldly in character, and movements of reformation led temporarily to divisions and the formation of sects. Towards the close of the 10th century, at the time the Fihrist was written, the Manicheans in Mesopotamia and Persia had already been in large measure ousted from the towns, and had withdrawn to the villages. But in Turkestan, and as far as the Chinese frontier, there existed numerous Manichzan communities, and even whole tribes that had adopted the name of Mani. Probably it was the great migrations of the Mongolian race that first put an end to Manicheism in Central Asia. But even in the 15th century there were Manichans living beside the Thomas-Christians on the coast of Malabar in India (see Germann, Die Thomas-Christen, 1875). Manicheism first penetrated the Greek-Roman empire

about the year 280, in the time of the emperor Probus (see the Chronicon of Eusebius). If we may take the edict of Diocletian against the Manicheans as genuine, the system must have gained a firm footing in the West by the beginning of the 4th century, but we know that as late as about the year 325 Eusebius had not any accurate knowledge of the sect. It was only subsequent to about 330 that Manicheism spread rapidly in the Roman empire. Its adherents were recruited on the one hand from the old gnostic sects. (especially from the Marcionites,—Manicheism exerted besides this a strong influence on the development of the Marcionite churches of the 4th century), on the other hand from the large number of the "cultured," who were striving after a "rational" and yet in some manner Christian religion. Its polemics and its criticism of the Catholic Church now became the strong side of Mani- cheeism, especially in the West. It admitted the stumb- ling-blocks which the Old Testament offers to every intelligent reader, and gave itself out as a Christianity without the Old Testament. Instead of the subtle Catholic theories concerning divine predestination and human freedom, and instead of a difficult theodicewa, it offered an exceedingly simple conception of sin and goodness. The doctrine of the incarnation of God, which was especially objectionable to those who were going over to the new universal religion from the old cults, was not proclaimed by Manicheism. In its rejection of this doctrine Manicheism agreed with Neo-Platonism ; but, while the latter, notwithstanding all its attempts to conform itself to Christianity, could find no formula by which to inaugurate within its own limits the special veneration of Christ, the Western Manicheeans succeeded in giving their teaching a Christian tinge. The only part of the Manichean mythology that became popular was the crude, physical dualism. The barbaric elements were judiciously screened from view as a " mystery ;" they were, indeed, here and there explicitly disavowed even by the initiated. The further Manichxism advanced into the West, the more Christian and philosophic did it become. In Syria it maintained itself in comparative purity. In North Africa it found its most numerous adherents, gaining secret support even among the clergy. The explanation of this perhaps lies in the fact that one part of the population of North Africa was of Semitic origin. Augustine was an

auditor for nine years, while Faustus was at that time the inost esteemed Manichean teacher in the West. Augustine in his later writings against the Manicheans deals chiefly with the following problems :—(1) the relation between knowledge and faith, and between reason and authority ; (2) the nature of good and evil, and the origin of the latter ; (3) the existence of free will, and its relation to the divine omnipotence ; (4) the relation of the evil in the world to the divine government. .

The Christian Byzantine and Roman emperors, from Valens onwards, enacted strict laws against the Mani- cheeans. But at first these bore little fruit. The auditores were difficult to trace out, and besides they really gave little occasion for persecution. In Rome itself between 370 and 440 Manichxism gained a large amount of support, especially among the scholars and public teachers. It also made its way into the life of the people by means of a popular literature in which the apostles were made to play a prominent part (Apocryphal Acts of the Apostles). Manichzism in the West had also some experience of attempts at reformation from the ascetic side, but of these we know little. In Rome Leo the Great was the first who took energetic measures, along with the state authorities, against the system. Valentinian III. decreed banishment against its adherents, Justinian the punish- ment of death. In North Africa Manichxism appears to have been extinguished by the persecution of the Vandals. But it still continued to exist elsewhere, both in the Byzantine empire and in the West, and in the earlier part of the Middle Ages it gave an impulse to the formation of new sects, which remained related to it. And, if it has not been quite proved that so early as the 4th century the Priscillianists of Spain were influenced by Manicheism, it is at least undoubted that the Paulicians and Bogomiles as well as the Catharists and the Albigenses are to be traced back to Manichzism (and Marcionitism). Thus the system, not indeed of Mani the Persian, but of Manichsism as modified by Christian influences, accompanied the Catholic Church until the 13th century.

Sowrces.—(a) Oriental. Among the sources for a history of Mani- chxism, the most important are the Oriental. Of these the Mo- haminedan, though of comparatively late date, are distinguished by the excellent manner in which they have been transmitted to us, as well as by their impartiality. They must be named first, because ancient Manichexan writings have been used in

their construction, while, with the exception of some small and rather unimportant pieces, we possess no other original Manicheean works dating from the 3d century. At the head of all stands En-Nedim, Fihrist (cirea 980), edited by Fliigel (1871-72); comp. the latter's work Mani, scine Lehre u. seine Schriften, 1862. See also Shahrastani, Kitab al-milal wan-nuhal (12th cent.), edited by Cureton (1846) and translated into German by Haarbriicker, 1851, and individual notes

and excerpts by Tabarf (10th cent.), Al-Birtini (11th cent.), and other Arabian and Persian historians,

Of the Christian Orientals those that afford most information are Ephraem Syrus (ob, 373), in various writings; the Armenian Esnik (see Zeitsch. f. hist. Lheol., 1840, ii.; Langlois, Collection, ll, 375 sg.), who wrote in the 5th century against Marcion and Mani; and the Alexandrian patriarch Eutychius (0). 916), Annales, ed. Pococke, 1628. 'There are besides scattered pieces of information in Aphraates (4th cent.), Barhebraus (13th cent.), and others.

_ (0) Greek and Latin. The earliest mention of the Manicheans in the Greco-Roman empire is to be found in an edict of Diocletian (see Hinel, Cod. Gregor., tit. xv.), which is held by some to bo Spurious, while others assign it to one or other of the years 287, 290, 296, 308 (so Mason, The Persce. of Diocl., p. 275 sq.). Eusebius gives a short account of the sect (H. £., vii. 31). It was the Acta Archelat, however, that became the principal source on the subject of Manicheism for Greek and Roman writers. These Acta are not indeed what they give themselves out for, viz., an account of a disputation held between Mani and the bishop Archelaus of Cascar in Mesopotamia ; but they nevertheless contain much that is trust- worthy, especially regarding the doctrine of Mani, and they also Include Manichean documents. They consist of various distinct Pieces, and originated in the beginning of the 4th century, probabl

at Edessa, They were translated as carly as the first half of the

same century from the Syriac (as is maintained by Jerome, De Vir. Illust., 72; though this is doubted by modern scholars) into Greek, and soon afterwards into Latin. It is only this secondary Latin version that we possess (edited by Zacagni, 1698; Routh, Relig. Sac., vol. v., 1848; translated in Clark's Ante-Nicene Library, vol. xx.); small fragments of the Greek version have been pre- served. Regarding the Acta Archclai, see Zittwitz in Zeitschr. f. ad. histor, Theol., 1878, and Oblasinski, Acta disp. Arch. et Manctis, 1874. In the form in which we now possess them, they are a compilation after the pattern of the Clementine Homilies, and have been subjected to manifold redactions. These Acta were used by Cyril of Jerusalem (Catcch., 6), Epiphanius (Har., 66), and a great number of other writers. All the Greck and Latin heresi- ologists have included the Manichzans in their catalogues; but they seldom adduce any independent information regarding them (see Theodoret, Hwr. yab., i. 26). Important matter is to be found in the resolutions of the councils from the 4th century onwards (see Mansi, Acta Concil., and Hefele, Conciliengeschichte; vol. i.-iii.), and also in the controversial writings of Titus of Bostra (6th cent.), Tpbs Mavexatous (ed. Lagarde, 1859), and of Alexander of Lycopolis, Adyos mpdos ras Mavixatov ddtas (ed. Combefis; transl. in Ante-Nic. Inb., vol. xiv. Of the Byzantines, the most worthy of mention are John of Damascus (De Heres. and Dialog.) and Photius (cod. 179 Biblioth.). The struggle with the Paulicians and the Bogomiles, who were often simply identified with the Manichans, again directed attention to the latter. In the West the works of Augus- tine are the great repertory for information on the subject of Manicheism (Contra epistolam Manichei, quam vocant funda- menti; Contra Faustum Manicheum ; Contra Fortuaatum ; Contra Adimanium ; Contra Sccundimum ; De actis cum Felice Manichexo De Genesi c. Manichxos ; De natura boni; De duabus animabus ; De utilitate ercdendi; De moribus cccl. cathol. et de moribus Manichxoruwm; De hercs.). The more complete the picture, however, which may here be obtained of Manicheism, the more cautious must we be in making generalizations from it, for it is beyond doubt that Western Manicheism adopted Christian elements which are wanting in the original and in the Oriental Manichaism.

Litcratuwre.—The most important works on Manicheism are Beansobre, Hist. critique de Manichée ct du Manichéisme, 2 vols., 1734 sg. (the Christian elements in Manichwism are here strongly, indeed too strongly,

emphasized); Baur, Das manich. Neligionssystem, 1881 (in this work Manichean speculation is exhibited from a speculative standpoint) ; Fliigel, Mani, 1862 (a very careful investigation on the basis of the Fihrist) ; Kessler, Untersuchung zur Genesis des manich. Religionssystems, 1876 ; and the article " Mani, Manichier," by the same writer in Herzog- Plitt's A. H., ix, 228-59. This article is very thorough, and leads to most favourable expectations regarding the author's forthcoming work. The accounts of Mosheim, Lardner, Walch, and Schréckh, as well as the monograph by Trechsel, Veber Kanon, Kvitik, und Lxegese der Maniehier, 1832, may also be mentioned as still useful. The various researches which have been made regarding Parsism, the ancient Semitic religions, Gnosticism, &c., are of the greatest importance for the investigation of Manicheism. (A. HA.)

MANILA (less correctly Mantua), the capital of Luzon and the Philippine Islands, and the centre of Spanish commerce in the East, was founded by Legaspi in 1571, and is situated on the eastern shore of a circular bay 120 nautical miles in circumference, 14° 36' N. lat, and 120° 52' E. long. The country around the bay is more or less flat in character, and in the dry season almost bare uf vegetation, so that, excepting the Mafonso and Matéo mountains behind Manila, and the chains of mountains running north and south of the entrance to the bay, there is really nothing attractive about the harbour. It is unsafe in the north-east and south-west monsoons, and vessels over 300 tons have to run for shelter to the naval port of Cavité, the smaller craft finding a safe anchorage behind a break- water facing the mouth of the Pasig. A new breakwater, however, was commenced in 1880 for large vessels. This river Pasig, which is about 14 miles long, is fed by an inland lake called the Laguna de Bayo, and on its way into the harbour it divides Manila into two parts. On its northern bank are large commercial warehouses, a bazaar occupied chiefly by Chinese, known as the Escolta, and trending eastwards an extensive suburb of native dwellings extending some miles up the Pasig. Beyond the Escolta lie Binondo, the business part of Manila, and San Miguel, the fashion- able quarter where Spaniards and foreigners have their resi- dence, and where since the earthquake of 1880 two palaces

have been crected for the governor or captain-general and for the admiral of the fleet. There are numerous churches and barracks in this part of the town, and several public buildings, of which the following may be mentioned,——the hospital of St Lazarus, the garnero or large military storehouse, and the famous cigar factory, covering a space of about 6 acres, and employing daily 10,000 women. Beyond and blending as it were with Binondo are villages in which the governor has his country house, and where Europeaus have built pretty villa residences. A stone bridge and a new suspension bridge connect Binondo or modern Manila with the suburb opposite and the old fort of St Iago, situated on the south bank and about a mile from the mouth of the Pasig. Within the fort wall lies the old city, or, as it is commonly called, the Plaza de Manila. It is approached by several gates—the principal being the Entrada, near which stands the custom-house. It has several squares, and the streets running at right angles with each other are fairly broad and clean, but, as no trade is carried on in this part of the town, they are dull by day, and, as only oil lamps are used, gloomy by night. The public edifices, such as the governor's palace, the town-hall, and the cathedral, are in a large square, in the centre of which is a statue of Charles IV. surrounded by a garden of flowers, To these may be added the civil and military hospitals, the mint and museum, the university and the academy of arts, the arsenal, the prison, and numerous barracks, convents, and monasteries. Beyond the walls is the calzada or esplanade, with a small paseo or promenade faeing the bay, where three or four military bands play twice a week to a large concourse of people. This forms the chief out-door attraction for the élite of Manila, There are two theatres —occasionally visited by European companies; but there is a want of the cafés and bull fights so associated with Spanish life. Evening recep- tions are given by the Spaniards, where cards and music serve to while away the time, and the well-to-do Zagalo, besides imitating his masters in all their amusements, has another to which he is passionately addicted, viz., cock-fighting. This is under Government control, and in town ein only be held in licensed cockpits, which in 1878 yielded above £33,000 to the revenue. The native officials may sometimes be a little officious and overbearing ; but the natives generally, especially those out of Manila, are as hospitable to the stranger as the Spaniard.

The population in the walled town, inclusive of the garrison, is given in the consular reports for 1880 as 12,000, and that of Binondo and the suburbs as 250,000 to 300,000. In 1842 the total was rather more than

150,000.

The climate is healthy, and though hot is not unbearably so, the mean temperature being about 82°°6 Fahr. The hot season prevails from March to the end of June; the rest of the year may be said to be showery and stormy. The chief climatic drawbacks to a residence in Manila are hurricanes, earthquakes, and fearful thunderstorms. Great damage was done to property by a tornado of exceptional severity in October 1882.

The cemetery of Manila is weil suited for a hot climate and the backward eondition of its sanitary arrangements. It is a large circular area, surrounded by an outer and an inner wall, with horizontal recesses between them placed one above anothcr in tiers. On the arrival of a body for scpulture it is taken out of its coffin and put into one of these recesses ; quicklime is then spread upon it and the mouth of the reeess bricked up. If the recess is the property of the relatives of the dead, the body remains undis- turbed for ever. If otherwise, it remains until the recess is abso- lutely required for another inmate, when the bones, the only remains left of the deceased, are collected and carefully deposited in a large hollow or fosse kept for that purpose.

For tivo eenturies after the Spanish settlement the trade of Manila with the Western world was carried on via Acapulco and Mexico ;

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and it was not till 1764 that even the Spanish vessels began to come round by the Cape. The port, however, was opened with some restrictions to foreign vessels in 1789 ; permission for the establish- ment of an English commercial house was granted in 1809; the samc liberty was before long extended to other nationalities ; and in 1834 the privileges of the Royal Company of the Philippines expired and left the commercial movement to

its natural tendencies, Since that time the trade of Manila has greatly increased. While in 1840 the port was entered by 187 vessels with a burden of about 57,000 tons, the corresponding figures for 1881 are, including 182 steamers, 317 vessels (British, 118; Spanish, 95; German, 38), with a burden of 244,000tons. Manila hemp (abaca), sugar, cigars, and coffce are the chicf articles of export; and sapan wood, mother of pearl, and gum arc regular though secondary items. The quantity of hemp shipped at Manila has increased from 528,206 piculs (1 picul=189 Tb) in 1877 to 662,886 in 1881, and in the same period the quantity of sugar has risen from 1,215,066 piculs to 2,001,310. Britain and the United States are the great markets for both. Theaverage number of cigars exported is 92,620,000, the greater proportion going to Singapore and China, The total value of the exports was £5,460,000 in 1881, against £2,679,000 in 1864 ; and a corresponding incréase has taken place in the imports.

Telegraphic communication between Manila and Hong-Kong was established in 1880,

MANILA HEMP, the most valuable of all fibres for cordage, is the produce of the leaf-stalks of Musa textilis, a native of the Philippine Islands. The plant, ealied abaca by the islanders, throws up a spurious stem from its rhizome, consisting of a cluster of sheathing leaf-stalks which rise to a height of from 20 to 30 feet, and spread out into a crown of huge undivided leaves characteristic of the various species of J/usa (plantain, banana, &c.). In its native regions the plant is rudely cultivated solely as a source of fibre; it requires little attention, and when about three years old develops flowers on a central stem, at which stage it is in the most favourable condition for yielding fibre. The stock is then cut down, and the sheath- ing stalks torn asunder and reduced to small strips. These strips in their fresh succulent condition are drawn between a sharp knife-edged instrument and a hard wooden block to which it is fixed, and by repeated scraping in this way the soft cellular matter which surrounds the fibre is removed, and the fibre so cleaned has only to be hung up to dry in the open air, when, without further treatment, it is ready for use. Each stock yields, on an average, a little under 1 ib of fibre; and two natives cutting down plants and separating fibre will prepare not more than 25 ib per day. The fibre yielded by the outer layer of leaf-stalks is hard, fully developed, and strong, but the

produce of the inner stalks is increasingly thin, fine, and weak. 'The finer fibre is used by the natives, without spinning or twisting (the ends of the single fibres being knotted together), for making exceedingly fine, light, and transparent yet com- paratively strong textures, which they use as articles of dress and ornameut. The hemp exported for cordage purposes is a somewhat woody fibre, of a bright brownish- white colour, and possessing great durability and strain- resisting power. It contains a very considerable amount of adherent pectinous matter, and an unusually large pro- portion, as much as 12 per cent., of water in a dry condition. In a damp atmosphere the fibre absorbs moisture so freely that it has been found to contain not lessthan 40 per cent. of water, a circumstance which dealers in the raw fibre should bear in mind. The plant has been introduced into many tropical lands; but the cheapness of labour in its native regions, and its abundance there, prevent its being a profitable substance for general cultivation. The entire supply comes from Manila and Cebu in the Philippine Islands, where its cultivation and preparation must give employment to a very Jarge population. 'The exports, which are increasing with great rapidity, amounted in 1881 to about 400,000 bales of 24 cwts. each, almost the whole of which goes to the United Kingdom, the United States, and the Australian colonies. The quantity imported into

the United Kingdom in 1881 was 346,908 ewts., valued at £678,514. The fibre is now so valuable that manila hemp cordage is freely adulterated by manufacturers, chiefly by admixtnre of phormium (New Zealand flax) and Russian hemp.

MANILIUS, a Roman poet, was the author of a poem in five books called Astronomeca. Nothing is recorded of the author; he is neither quoted nor mentioned by any ancient writer. His very name is uncertain, but was probably Marcus Manilius. From the work itself it may be gathered with much probability that the writer lived under Augustus or Tiberius, and that he was a citizen of and resident in Rome. He bears the name of a distin- guished plebeian family. His work is one of great learn- ing; he had studied his subject in the best writers, and generally represents the most advanced views of the ancients on astronomy. It is, however, destitute of poetical or

literary merit. It is difficult to explain how a work of such learning on a subject which was studied with such interest by the ancients should have remained so neglected. Firmicus, who wrote in the time of Constantine, has so many points of resemblance with the work of Manilius that he must either have used him or have followed some work that Manilius alsofollowed. As Firmicus says that hardly any Roman except Cesar, Cicero, and Fronto had treated the subject, it is probable that he did not know the work of Manilius. The latest event referred to in the poem is the great defeat of 9 A.p.

MANIN, Daniete (1804-1857), president of the Venetian republic in 1848-49, and one of the principal founders of Italian independence, was born in Venice on the 13th May 1804. He studied at Padua, graduating as doctor of laws when only seventeen years of age, aud soon after translated Pothier's large treatise Sur le Droit Romain. To his father, an eminent barrister, he was indebted not only for much of his skill in jurisprudence but for his strong republican bias, having as a boy con- stantly heard him denounce indignantly the injustice of Bonaparte in handing Venice over to Austria by the scandalous treaty of Campio Formio. In 1830 Manin commenced practice as an advocate, but only to become conscious of the harsh restrictions laid by Austria upon the administration of law. That and the following year showed some stirrings of political life in Italy; and Manin, already the leading spirit in Venetia of the new national party, strove to train his countrymen to united purpose aud action, The question of a railway to Milan, for in- stance, or whether the Indian mail should go by Venice, was utilized to quicken the patriotic instinct by thwarting the Government, and that without neglecting the great principle "legality and publicity "—-which till 1848 was his unswerving rule of conduct.

In 1847 he spoke ably on political economy at the scientific congress held in Venice, and soon after presented two petitions to the " congregation,"—a shadowy delibera- tive assembly which was tolerated by Austria. His principal demands were—separate government of Venice and Lombardy, revision of the code, an annual budget, freedom of the press, and religious equality. On the 18th January 1848, soon after Radetsky's cruel treatment of Milan, he was arrested, but only to intensify the patriotic enthusiasm of the people. The population of Venice marched past his prison silently and

mournfully, every head uncovered. The carnival (that year spent in gloom) was scarcely over, however, when the glad news from Sicily, Naples, and Paris so worked upon their minds that the Austrian authorities were forced to feel that the revolutionary wave had reached Venice. March Manin was carried in triumph to the Place St Mark, and virtually declared dictator. Now that the moment for

On the 17th.

action was come he immediately formed a civic guard, and by his energy and earnestness inspired all classes of the citizens to act as one man. On the 22d the dictator became president of the new republic of St Mark, to cope alone with all the difficulties of administration, organiza- tion, and finance. In March 1849, on the defeat of King Charles Albert, Venice had to prepare herself resolutely for defence ; and on the 2d April there was passed in the palace of the Doges a decree in two clauses :— ‘ (1) Venice will resist the Austrians at whatever cost ; (2) the president Manin is invested with unlimited powers.” On the 26th May one outlying fort was taken, but on the 3d July, when Rome and Mazzini had succumbed to the French, Venice and Manin were still strenuous in their heroic defence. Only when cholera had also attacked them, when food and ammunition were spent and people were dying of hunger, when every house not burned down was riddled by the shot and shell of the bombardment, and no gleam of hope from without was visible, was the capitu- lation signed, 24th August, on terms of amnesty to all except tle president and thirty-nine other citizens.

Leaving Venice on the 27th, with his wife and two children, Manin spent the rest of his life in Paris, where he maintained a modest independence by teaching his native language. His energies were still devoted to the unification of Italy, so that, whether as a republic or as a kingdom, she might be freed from Austrian domination. He died of heart disease on the 22d September 1857, and was buried in the family tomb of Ary Scheffer. In 1868 the remains were removed to Venice, and honoured with a public funeral.

See Henri Martin, D. Manin, 1859, and L'Unité Italienne, 1861 (Martin also wrote the article in the Biogr. Universelle) ; C. L. Chassin, Manin et UItalie; Ervera's Vita di D. Manin, Venice, 1872; P. de La Faye's Documents, &c., de D. Manin, 1860. Other writers are Ernest Legouvé, A. de La Forge, and Edmund Flagg (New York).

MANIOC or Mawnpioc. ROOT.

MANIPUR, a native state in north-eastern India, lying between 24° 35' and 24° 48' 30" N. lat., and between 93° and 94° 40' E. long., is bounded on the N. by the Naga country and the hills overlooking the Assam valley, on the W. by Cachar district, and on the E. by Independent Burmah. On the south the boundary is undefined, and abuts on the country inhabited by various independent wild hill tribes of Lushais, Kukis, &c. The state consists of an extensive valley, estimated at about 650 square miles in extent, and a large surrounding unsurveyed tract of difficult mountainous country stretching between Assam, Cachar, Burmah, and Chittagong. The total area is estimated at about 7600 square miles. The population of the Manipur valley and the surrounding hills is supposed to be about 74,000 hill-men and 65,000 Manipuris. The hill ranges generally run north and south, with occasional connecting spurs and ridges of lower elevation between. Their greatest altitude is in the north, where they reach to upwards of 8000 feet above sea-level. The principal geographical feature in the valley is the Logtak Lake, an irregular sheet of water of considerable size, but said to be yearly growing smaller. The valley is watered by numerous rivers, the Bérak being the most important. The hills are densely clothed with tree jungle and large forest timber. There are large herds of wild elephants, as well as tigers, leopards, bears, buffaloes, &c. The country seems to be singularly free from poisonous snakes ; the cobra does not appear to exist in the valley, but the boa constrictor is found in the dense forests to the south.

The first relations of the British with Manipur date from 1762, when the raja solicited British aid to repel a Burmese invasion, and a treaty was entered into, The force was recalled, and

See Cassava and ARROW-

but little communication between the two countries took place until 1824, on the outbreak of the first British Burmese war. British assistance was again invoked by the raja, and the Burmese were finally expelled both trom the Assam and Manipur valleys. A political agent acts as a means of commuuication between the state and the British Government. Manipur valley appears to have been originally oceupied by several tribes which eame from different directions. Although their general facial characteristics are Mongolian, there is a great diversity of feature among the Manipuris, some of them showing a regularity approach- ing the Aryan type. In the valley the people are chiefly Hindus, that religion being apparently of recent introduction. They have a easte system of their own, different from that of India, and chiefly founded on what is known as the system of lal/ap or foreed labour. Every male between the ages of seventcen and sixty is obliged to place his serviees at the disposal of the state for a certain number of days each year, and to different classes of the people different employments are assigned. About four hundred Mohammedan families, descendants of settlers from Bengal, reside to the east of the capital. The aboriginal hill-men belong to one of the two great divisions of Nagas and Kukis, and are sub- divided into innumerable clans and sections with slight differences in language, customs, ordress. The state is noted for the excellence of its breed of ponies. The now popular English game of polo was introduced from Manipur, where it forms a great national pastime. The trade is but small, owing chiefly to the want of means of transport, none of the roads being available for wheeled carts,

MANIS. See Pancorin.

MANISA, or Mantssa, a town of Asia Minor or Anatolia, situated on the north side of Mount Sipylus, 28 miles north- east of Smyrna. This town was anciently called Magnesia ad Sipylum (see MacNnrsiA). It is situated on the banks of the Hermus, and is noted as being one of the neatest and cleanest cities in Asia Minor. It contains above twenty mosques, two of which are adorned on the exterior with double minarets, and in the inside with paintings and other articles) The Armenians, Greeks, and Jews have also

their respective places of worship. ‘There is also a fine khan, and a citadel, which stands on a lofty rock, and commauds an extensive view. The surrounding country is rich and productive, especially of saffron, which is ex- ported. The town is the seat of some considerable trade, and many of the inhabitants are employed in the manufac- ture of cotton and silk goods and goats’ hair shawls. Population about 40,000. The town is now connected with Smyrna by a railway, which is continued on to Ala- Shehr (Philadelphia). A few miles from Manisa is a colossal statue cut in the rock, which is generally supposed to be the figure of Niobe, alluded to by ancient authors.

MANISTEE, a city of the United States, the county seat of Manistee county, Michigan, is situated 135 miles north-west of Lansing, on the east side of Lake Michigan, at the mouth of the Manistee river, which is navigable for vessels drawing 10 to 12 feet of water for the distance of 14 miles to Manistee Lake. It is a great seat of the lumber trade, shipping annually 200,000,000 feet of timber, and having a score of saw-mills and about as many shingle mills, the latter of which produce in the year 400,000,000 shingles,—the largest quantity made at any one place in the world. Planing-mills aud foundries are also maintained ; and, in consequence of the discovery in 1881 of a bed of solid salt 30 feet thick, extensive salt factories are being built. The surrounding district is especially adapted for fruit-growing ; and sportsmen are attracted to the Manistee river and its tributaries by the abundance of the rarely found grayling. The population, 3373 in 1870, was 7080 in 1880.

MANITOBA, one of the western provinces of the Dominion of Canada, is situated midway between the Atlantic and the Pacific coasts of the Dominion, about 1090 miles due west of Quebec (see vol. iv. plate xxxv.). It is bounded on the S. by the parallel 49° N. lat., which divides it from the United States; on the W. by 101° 20' W. long; on the N. by 52° 50' N. lat.; and on the E. by the western boundary of Ontario. Manitoba formerly

belonged to the Hupson's Bay Company (q.v.), and was, after the transfer of their territory to Canada, admitted in 1870 as the fifth province of the Dominion. At that time the infant province had an area of 13,500 square miles, and some 12,000 people, chiefly Indian half-breeds. In 1881 the limits were increased to the extent indicated above, and now contain, taking the Lake of the Woods as the eastern boundary, upwards.of 80,000 square miles, an area only 8782 square miles less than that of England and Scotland together, extending 264 miles from north to south and upwards of 300 from east to west. The old district of Assiniboia, the result of the efforts in colonization by the earl of Selkirk in 1811 and succeeding years, was the nucleus of the province. Manitoba was so called by the Dominion parliament after the lake of that name; the designation is usually

considered to be a com- pound of the Ojibway words, Manito, great spirit, and Waba, straits between lakes, or a word meaning echo.

The drainage of Manitoba is entirely north-eastward to Hudson's Bay. The three lakes—whose greatest lengths are 250, 150, and 130 miles respectively—are Winnipeg, Winnipegoosis, and Manitoba. They are all of a very varying and irregular shape, but average respectively 30, 18, and 10 iniles in width. They are fresh, shallow, and tideless. Winnipegoosis and Manitoba at high water, in spring time, discharge their overflow through small streams into Winnipeg. The chief rivers emptying into Lake Winnipeg are the Winnipeg, the Red, and the Saskatchewan. The Assiniboine river, with its source in the province, and navigable from 250 to 350 miles for steamers of light draught, enters the Red river 45 miles from Lake Winnipeg, and at the confluence of the rivers ("The Forks") is situated the city of Winnipeg. The Winnipeg, which flows from the territory lying south-east of Lake Winnipeg, is a noble river some 200 miles long, that after leaving Lake of the Woods, dashes with its clear water over many cascades, and traverses very beautiful scenery. At its falls from Lake of the Woods is one of the greatest and most easily utilized water-powers in the world. Like most rivers in the New World, the Red river is at intervals of years subject to freshets. In the seventy years' experience of the Selkirkcolonists there have been four "floods." The highest level of the site of the city of Winni-peg is said to have been under 5 feet of water for several weeks in May and June in 1826, under 24 feet in 1852, not covered in 1861, and only under water on the lowest levels in 1882. The extent of overflow has thus on each occasion been less. The loose soil on the banks of the river is every year carried away in great masses, and the channel has so widened as to render tlie recurrence of an overflow unlikely. The Saskatchewan, though not in the province, empties into Lake Winnepeg less than half a degree from the northern boundary. It is a mighty river, rising in the Rocky Mountains, and crossing eighteen degrees of longi- tude. Near its mouth are the Grand Rapids. Above these, steamers ply to Fort Edmonton, a point upwards of 800 miles north-west of the city of Winnipeg. Steamers run from Grand Rapids, through Lake Winnipeg, up Red river to the city of Winnipeg.

Geologically Manitoba may be said to be the resumption of the Secondary rocks left behind in the fertile portions of Ontario. The whole north-east of

North America, running from Labrador, crossing the Ottawa, and skirting the Georgian Bay and Lake Superior, is a region of Laurentian or Primary rocks—containing copper, silver, and probably gold-bearing rocks. From Lake Superior north-westward to within 40 miles of Red river and up to the eastern shore of Lake Winnipeg the same region con- tinues for about 500 miles, including near its western limits the Lake of the Woods. This barren region left behind, the

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fertile plains of Manitoba begin—a district resting on Silurian limestones. For 100 or 150 miles these rocks continue. 'This is the first prairie steppe. At very few points does an outcrop of limestone occur. A range of hills running from south-east to north-west bounds this region on the west. These are Pembina Mountains, Riding Mountains, and Duck Mountain, varying from 200 to 700 feet in height. Before the Riding Mountains are reached, on the shores and islands of Lakes Manitoba and Winni- pegoosis are found a few buff-coloured Devonian limestones. From this line of hills westward spreads out the second prairie steppe, extending some 400 or 500 miles. Beyond this for an equal distance, at a still higher elevation, is the third prairie steppe, till the Rocky Mountains are reached. From the Pembina and Riding Mountains to the Rocky Mountains, say 1000 miles, Cretaceous beds underlie the plains and crop out at long intervals. The most striking feature of this formation, of which only the eastern 100 or 150 miles are within Manitoba, is the presence of coal. Tt is, like most of the Tertiary varieties, a lignite; a specimen analysed gives water 7°82 per cent., volatile combustible matter 31°35 per cent., fixed carbon 54:97 per cent., and ash 5'86 per cent. The supply of this coal is, according to Professor Selwyn, practically inexhaustible. Mr G. M. Dawson, Government explorer, has figured exposures of lignite 1 foot, 7 feet, and even 18 feet in thickness in the Souris valley, 250 miles south-west of Winnipeg. Asa fuel for domestic purposes, this coal in general answers very well, The drift deposit on the first and second prairie levels varies from 2U to 100 feet, and consists of clay and boulders. A clay lying near the surface is used for making the white brick of which Winnipeg is built. The most recent geologic deposit is a

rich vegetable mould, sometimes 4 feet in thickness. It is . this that gives the reputation for fertility which the soil of the province enjoys.

The surface of Manitoba is somewhat level and mono- tonous. It is chiefly a prairie region, with treeless plains of from 5 to 40 miles extent, covered in summer with an éxuberant vegetable growth, which dies every year. The river banks are, however, fringed with trees, and in the more undulating lands the timber belts vary from a few hundreds of yards to 5 or 10 miles in width, forming at times forests of no inconsiderable size. The chief trees of the country are the aspen (Populus tremuloides), the ash-leaved maple (Vegundo aceroides), oak (Quercus alba), elm (Ulmus americana), and many varieties of willow. The strawberry, raspberry, currant, plum, cherry, and grape are indigenous.

The climate of Manituba, being that of a region of wide extent and of similar conditions, is not subject to frequent variations. Winter, with cold but clear and bracing weather, usually sets in about the middle of November, and ends with March. In April and May the rivers have opened, the snow has disappeared, and the opportunity has been afforded the farmer of sowing his grain. The month of June is often wet, but most favourable for the springing crops ; July and August are warm, but, excepting two or three days at a time, not uncomfortably so; while the autumn months of August and September are very pleasant. Harvest generally extends from the middle of August to near the end of September. 'The chief crops of the farmer are wheat (which from its flinty hardness and full kernel is the specialty of the Canadian north-west), oats, barley, and pease. Hay is mare of the native prairie grasses, which grow luxuriantly. From the richness and mellowness of the soil potatoes and all tap-roots reach a great size. Heavy dews in summer give the needed moisture after the rains of June have ceased. The traveller and farmer are at times annoyed by the mosquito. This trdublesome insect is

chiefly found near swampy ground or on the uncultivated prairie, It usually continues through June and July.

The population of the province is very mixed. In 1870 there were 2000 whites and 10,000 Indian half-breeds. Of the latter, one half are of English-speaking parentage, and chiefly of Orkney origin ; the remainder are known as Metis or Bois-briéilés, and are descended from French-Canadian voyageurs. In 1875 a number of Russian Mennonites (descendants of the Anabaptists of the Reformation) came to the country. Some fifty years ago they originally emigrated from Germany to the plains of southern Russia, but came over to Manitoba to escape the conscription. Thcy num- ber nearly 8000. About 4000 French Canadians, who had einigrated from Quebec to the United States, have also made the province their home, as well as a number of Icelanders. The remainder of the population is chiefly made up of English-speaking people from the other provinces of the Dominion, from the United States, from England and Scotland and the north of Ireland. Though some- what difficult to estimate, the population of Manitoba is estimated by competent authorities at upwards of 120,000 in 1882.

In 1881 the religious opinions of the people were as follows :— Episcopalians, 22 per cent; Presbyterians, 22 ; Roman Catholics, 19 ; Methodists, 14; Baptists, 24; Lutherans, 14 per cent.

There is a system of primary and secondary free school education for Protestants, and another for Roman Catholics. For the higher education there are the three colleges of St Boniface (Roman Catho- lic), St John's (Episcopalian), and Manitoba College (Presbyterian). These are affiliated to the university of Manitoba, which is an ex- amining and degree-conferring body.

Like other provinces of the Dominion, Manitoba is under a licutenant-governor, with a council of five ministers responsible to the local legislature, which again is composed of thirty-one members. The province is represented by three senators in the Dominion senate, and by five members in the Dominion house of commons. There are three judges of the superior court, and a number of county court judges. 'he whole province is divided into municipalities, cach of which chooses a warden and six councillors annually.

The city of Winnipeg, the provincial centre of government, law, education, and religion, had in 1882 upwards of 20,000 inhabitants. The trade of the country has chiefly grown up since Winnipeg was connected in 1878 with the United States railroad system, and it has received a further impulse from the construction of the Canadian Pacific Railway, which traverses the territory. (G. BR.)

MANITOWOC, a city of the United States, the county seat of Manitowoc county, Wisconsin, is situated on the west side of Lake Michigan, at the mouth of Manitowoc river, 77 miles north of Milwaukee by the Milwaukee, Lake Shore, and Western Railway. It has a good harbour, and is the seat of an active trade in lumber, leather, and wheat. Shipbuilding is also extensively carried on. Population in 1870, 3059 ; in 1880, 6367.

MANKATO, a city of the United States, the county seat of Blue Earth county, Minnesota, is situated in the midst of a good agricultural district on the right bank of the Minnesota river, and is a station on the Chicago, Milwaukee, and St Paul, the Chicago and North Western, and the Chicago, St Paul, Minneapolis, and Omaha railways. From St Paul it is distant 86 miles. Besides carrying on an extensive trade Mankato manufactures woollen goods, linseed oil, flour, beer, carriages and waggons, iron wares, aud furniture. It has a fine park and fair ground, three public halls, a public library, and a State normal school. The population increased from 3482 in 1870 to 5550 in 1880.

MANLEY, Mary peza Rivirr (1672-1724), dramatist, political writer, and novelist, the most eminent female "wit" of the reign of Queen Anne, was the daughter of a , studious and literary royalist, Sir Roger Manley, governor of the Channel Islands, part author of The Turkish Spy, and author of several military histories. Mrs Manley is herself the chief authority for such particulars of her private life as are known. Towards the close of Anne's reign, finding that Curll hac announced The Adventures of Rivella, or the History of the Author of Atalantis, and suspecting this to be the work of an enemy, she contrived with dexterous tact to supplant Curll's author, and wrote her own biography under the announced title. Her mother died when she was a child, her father when she was a girl

of sixteen. A kinsman, already married, took advantage of her position, weut through a mock ceremony of marriage, and deserted her basely three years afterwards. She was patronized for a short time by the duchess of Cleveland, and in 1696 made good a position among writers of established reputation by two plays, a comedy and a tragedy. The dialogue of the comedy, Zhe Lost Lover, is extremely brilliant and witty, overflowing with high auimal spirits; in freedom of speech it goes almost beyond the most licentious male writers of comedy in that generation. The play was at once published. In the preface she thanks the town for not keeping her long in suspense: her comedy was damned with promptitude. A similar fate befel her tragedy, 7'he Royal Mischief, though great literary power wassliown init. The splendid energy of the characters, and the hyperbolical vigour of their language, way be compared with the undisciplined youth of the Elizabethan drama ; but it was not without reason that even contemporary critics complained of the "' warmth " of certain passages. She pleaded in defence the example of Dryden ; but Dryden in his most indecent moments falls short of it. From 1696 Mrs Manley was a favourite member of witty and fashionable society ; she admits that she never had any pretensions to beauty, but the charms of her eyes and her conversation made her very fascinating. She achieved her principal triumph as a writer by her Secret Memoirs of Several Persons of Quality, a scandalous chronicle "'from the New Atalantis, an island in the Mediterranean," published in 1709. Henceforth she was known as "the author of Atalantis." The Atalantis had a political purpose. Mrs Manley was a warm 'Tory partisan, and she sought in this scandalous narrative to expose the private vices of the ministers whom Swift, Bolingbroke, and Harley combined to drive from office. There are many references to her in Swift's Journal to Stella. "She has very good principles for one of her sort, and a great deal of good sense and invention." Mrs Manley was in fact one of the most romantically public-spirited and disinterested politicians of that corrupt time, and next to Swift the most effective writer on the side of Harley and Bolingbroke. During the keen political campaign in 1711 she wrote several pamphlets, and many numbers of the Haaminer, criticizing persons and policy with equal vivacity. After the accession of George, she wrote a tragedy Lucius (1717)—a failure, and two so- called novels, Lath Intrigues, and A Stage-Coach Journey to Exeter. The story in these novels is told in letters between the principal characters.

MANLIUS is the name of a Roman gens, chiefly patrician, but, in later times at least, also containing plebeian families. The Roman historians represent them as intrepid, but stern even to cruelty.

I. Marcus Manutus Capironinus, a brave and distin- guished soldier, was one of the garrison of the Capitol while besieged by the Gauls; when they attempted to scale the rock by night, Manlius, aroused by the cackling of the sacred geese, rushed to the spot and threw down the fore- most. Several years after, seeing a centurion led to prison for debt, he freed him with his own money, and even sold his estate to relieve other poor debtors, while he accused the senate of embezzling public money. He was charged with aspiring to kingship, and condemned by the comitia, but not until the assembly had adjourned to a Place without the walls, where they could no longer see the Capitol which he had saved. His house on the Capitol was razed, and the Manlii resolved that no patrician Manlius should henceforth bear the name of Marcus.

AL Tirus Manurus Impertosus Torquatus went to the tribune Pomponius, who had brought his father to trial for overstepping the limits of his office, and threatened to kill

him unless he desisted from the accusation (365 3.c.). Shortly after he slew a gigantic Gaul in single combat, and took from him a torques or neck-ornament, whence his surname is said to have been derived. When the Latins demanded an equal share in the government of the con- federacy, Manlius vowed to kill with his own hand the first Latin he saw in the senate-house. The Latins and Campanians revolted, and Manlius, consul for the third time, marched into Campania and gained two great victories, near Vesuvius (where Decius his colleague devoted himself to gain the day), and at Trifanum. In this campaign Manlius executed his own son, who had killed an enemy in single combat, and thus disobeyed the express command of the consuls,

Both these Manlii belong to a great extent to legend, much of which is probably due to attempts to explain their surnames.

ITf. Trrus Manurus Torquatus in his first consulship (235 B.c.) subjugated Sardinia, recently acquired from the Carthaginians ; he was consul again (224) during the Gallic war. In 216 he opposed the ransoming of the Romans taken prisoners at Canna; and in 215 he was sent to Sardinia and defeated a Carthaginian attempt to regain possession of the island.

IV. Cyaus Manuzius Vuuso, consul in 189 B.o., re- ceived Asia as his province. Starting from Ephesus in the spring, he marched into Pamphylia, levying enormous contributions. He then attacked the Celts of Galatia on the pretext that they had aided Antiochus. They took refuge in Mounts Olympus and Magaba, but the missiles of the Roman light troops won each position with great slaughter. In the winter, assisted by ten delegates sent from Rome, he settled the terms of peace with Antiochus. He returned to Rome in 187, and triumphed after much opposition. The discipline of his army was loose, and his soldiers brought into Rome many foreign luxuries.

MANN, Horace, one of the best-known of American educationists, was born at Franklin, Massachusetts, May 4, 1796, and died at Yellow Springs, Ohio, August 2, 1859. His childhood and youth were passed in great poverty. "Tt was the misfortune of his family that it belonged to the smallest district, had the poorest schoolhouse, and employed the cheapest teachers, in a town which was itself small and poor." His health was early injured by hard manual labour, which left him no time for recreation either in summer or winter. He lost his father at the age of thirteen. He was from his childhood an eager reader ; but his only means of gratifying this desire was a very small library in his native town. Up to thie age of fifteen he had never been able to attend school for more than eight or ten weeks in any one year. He remained at home, working for his mother and the rest of the family, till the age of twenty. At that age he was taught the rudiments of Latin and Greek and a little English grammar by an itinerant schoolmaster, and entered the junior classes in Brown University in the year 1816. Symptoms of con- sumption, poverty, the necessity of supporting liimself while at college,and other circumstances interfered with his studies. He, however, graduated in 1819. In 1821 he entered the school of law at Litchfield, Connecticut, and was called to the bar in 1823. In 1827 he was elected to the State legislature of Massachusetts, and in 1833 he was returned to the upper house. He suggested and organized the State lunatic asylum of Worcester. In

1837 the legislature appointed a board of education to revise and re-organize the common school system of the State; and Mann was appointed secretary. To give his whole time to the work, he gave up his profession and also his seat in the senate. He was secretary for twelve years. For these twelve years lie worked fifteen hours a day, held teachers'

conventions, gave lectures, and carried on an enormous correspondence. He started a periodical, Zhe Common School Journal, in which he explained his views on educa- tion. He also published a series of Annual Reports ; these American critics call 'a classic on the subject." His seventh annual report gave the substance of his obser- vations in Europe, and compared the systems of instruction followed in Prussia with those in use in Massachusetts, much to the disadvantage of the latter.!

In 1848 Mann was elected to Congress to fill the vacancy caused by the death of John Quincy Adams. He tried to induce the Government to establish a bureau of education at Washington, but this was not done till much later. He resigned his seat in Congress in 1853, and became the first president of Antioch College, at Yellow Springs,—a college for the combined education of men and women. Mann's clef work in American education is the reform which he brought about in the common ald normal school system of Massachusetts ; and this reform is largely due to his twelve annual reports.

Mann's other works are—Lectures on Education, 1848; A Few Thoughts for a Young Man, 1850; Slavery, Letters and Speeches, 1851; Powers and Duties of Women, 1858, &c. A complete cdition of his writings, with a biography, was published in Cambridge, Massachusetts, in 1867; and a selection, under the title of Thoughts Selected from the Writings of Horace Mann, in 1869.

MANNA, a concrete saccharine exudation obtained by making incisions in the trunk of the flowering or manna ash tree, Fraxinus Ornus, L. At the present day the manna of commerce is collected exclusively in Sicily from cultivated trees, chiefly in the districts around Capaci, Carini, Cinisi, and Favarota, small towns 20 to 25 miles west of Palermo, and in the townships

of Geraci, Castelbuono, and other places in the district of Cefal, 50 to 70 miles east of Palermo. In the frassivett: or plantations the trees are placed about 7 feet apart, and after they are eight years old, and the trunk at least 3 inches in dia- meter, the collection of manna is begun. This operation is performed in July or August during the dry weatlier, by making transverse incisions 14 to 2 inches long, and about 1 inch apart, through the bark, one cut being made each day, the first at the bottom of the tree, another directly above the first, and so on. In succeeding years the pro- cess is repeated on the untouched sides of the trunk, until the tree has been cut all round and exhausted. It is then cut down, and a young plant arising from the same root takes its place. The finest or flaky manna appears to have been allowed to harden on the stem. A very superior kind, obtained by allowing the juice to encrust pieces of wood or straws inserted in the cuts, and called manna a cannolo, is not found in commerce in England. The fragments adhering to the stem after the finest flakes have been re- moved are scraped off, and form the small or Tolfa manna of commerce. That which flows from the lower incisions is often collected on tiles or on a concave piece of the prickly pear (Opuntia), but is less crystalline and more glutinous, and is less esteemed.

Manna of good quality dissolves at ordinary temperatures in about 6 parts of water, forming a clear liquid. Its chief constituent is mannite or manna sugar, a hexatomic alcohol, C;H,(OH)®, which likewise occurs, in much smaller quantity, in certain species of Fucus and in plants of several widely separated natural orders. Of this substance the best manna contains 70 to 80 per cent. It crystallizes in shining rhombic prisms from its solution in boiling alcohol. Manna possesses mildly laxative properties,

1 This report has been published and edited, with preface and notes, by Dr W. B. Hodgson, under the title of Report ofan Hdu- cational Tour in Germany, France, Holland, and parts of Great Britain and Ireland, London, 1846.

and on account of its sweet taste is employed as a mild aperient for children. It is less used in England now than formerly, but is still largely consumed in South America. In Italy mannite is prepared for sale in the

shape of small cones resembling loaf sugar in shape, and is frequently prescribed in medicine instead of manna.

The manna of the present day appears to have been unknown before the 15th century, although a mountain in Sicily with the Arabic name Gibelman, 7.e., "manna moun- tain," appears to point to its collection there during the period that the island was held by the €aracens, 827-1070. In the 16th century it was collected in Calabria in Italy, and until recently was produced in the Tuscan Maremma, but neither from that locality nor from the States of the Church is any now brought into commerce, although the name of Tolfa, a town near Civita Vecchia, is still applied

to an inferior variety of the drug.

Various other kinds of manna are known, but none of these have been found to contain mannite. Alhagi manna (Persian and Arabic tar-angubin) is the produce of Alhagi camelorum, Fisch., a small, spiny, leguminous plant, growing in Persia, Afghanistan, and Baluchistan. This manna occurs in the form of small, roundish, hard, dry tears, varying from the size of a mustard seed to that of a coriander, of a light-brown colour, sweet taste, and senna-like odour. The spines and pods of the plant are often mixed with it. It is collected near Kandahar and Herat, and imported into India from Cabul and Kandahar to the extent of about 2000 fb. annually, and is valued at about thirty shillings per fb. Tamarisk manna (Persian gaz-angubin, tamarisk honey) exudes in June and July from the slender branches of Z'amarix gallica, var. mannifera, Ehrenb., in the form of honey-like drops, which, in the cool tem- perature of the early morning, are found in the solid state. This secretion is caused by the puncture of an insect, Coccus manniparus, Ehrenb. In the valleys of the peninsula of Sinai, especially in the Wady el-Sheikh, this manna (Arabic man) is collected by the Arabs and sold to the monks of St Catherine, who supply it to the pilgrims visiting the convent. It is found also in Persia and the Punjab, but does not appear to be collected in any quantity. This kind of manna seems to be alluded to by Herodotus (vii. 31), Under the same name of gaz-angubin there are sold commonly in the Persian bazaars round cakes, of which a chief ingrcdient is a manna obtaincd to the south-west of Ispahan, in the month of August, by shaking the branches or seraping the stems of Astragalus florulentus and

A. adscendens, Boiss. and Hausskn.2 Shirkhist, a kind of manna known to writers on materia medica in the 16th century, is still found in the bazaars of north-west India, being imported from Afghanistan and Turkestan to a limited extent. Haussknecht states that it is the produce of Cotoneaster nummularia, Fisch. and Mey. (Rosacex), and Atraphaais spinosa, L. (Polygonacce), and that it is brought chiefly from Herat.

Oak manna, according to Haussknecht, is collected from the twigs of Quercus Vallonea, Kotschy, and Q. persica, Jaub. and Spach, on which itis produced by the puncture of an inseet during the month of August. This manna occurs in the state of agglutinated tears, and forms an object of some industry among the wandering tribes of Kurdistan at the present day. It is collected before sunrise, by shaking the grains of manna on to linen cloths spread out beneath the trees, or by dipping the smal] branchcs in hot water and evaporating the solution thus obtained. A substance collected by the inhabitants of Laristan from Pyrus glabra, Boiss., strongly resenibles oak manna in appearance.

Australian manna isfound on the leaves of Lucalyptus viminalis, Lab.; the Lerp manna of Australia is of animal origin.

Briangon manua is met with on the leaves of the common LARcH (q.v.), and a kind of manna was at one time obtained from the cedar, but none of these are now collected for commercial purposes.

The manna of Scripture, notwithstanding the miraculous circum- stances which distinguish it in the Biblical narrative from anything now known, answers in its description very closely to the tamarisk manna.

See Pharmacographia, p. 409 ; Hanbury, Science Papers, p. 355— 868 ; Stewart, Punjab Plants, Lahore, 1869, pp. 57-92; Geoffroy, Mat, Med., ti. (1741) p. 584; Dobson, Proc. Roy. Soc. Van Dicmen's Land, i. (1851) p. 234.

MANNHEIM, the most populous town and the second capital of the grand-duchy of Baden, lies on the right bank of the Rhine, in the triangular piece of low-lying ground enclosed between that river and the Neckar. It

2! See Bombay Lat. Tr., vol. i. art. 16, for details as to the gaz- angubin. A common Persian sweetmeat consists of wheat-flour kneaded with manna into a thick paste.

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is the most regularly built town in Germany, consisting of twelve parallel streets intersected at right angles by ten others, which cut it up into about 130 square sections of equal size. These blocks are distinguished, after the American fashion, by letters and numerals. Except on the south side all the streets debouch on the promenade, which forms a circle round the town on the site of the old ramparts. Outside this ring are the suburbs of Schwetz- inger Garten to the south and Neckargiirten to the north. Mannheim is connected by a handsome bridge with Ludwigshafen, a rapidly growing commercial and manu- facturing town on the left bank of the Rhine, in Bavarian territory. The Neckar is spanned by a suspension bridge. In 1880 Mannheim contained 53,545 inhabitants, of whom about 4500 were Jews, and the rest Roman Catholics and Protestants in nearly equal proportions. Ludwigshafen contained 15,012 inhabitants.

Nearly the whole of the south-west side of the town is occupied by the palace, built in 1720-29, and formerly the residence of the elector of the Palatinate. It is one of the largest buildings of the kind in Germany, covering an area of 15 acres, and having a frontage of 650 yards. The left wing was totally destroyed by the bombardment of 1795, but has since been restored. The palace coutains a picture gallery andcollections of natural history and antiquities. The large and beantiful

the park of the } S38 town. Among the Gx other prominent Ee buildings are the Néqé theatre, the arsen- N al, the synagogue, LZ the ' kaufhaus,"*

the town-hall, the

railway station, and the observatory. The only note- worthy church is that of the old Jesuit college, the interior of which is lavishly decorated with marble and painting. The square in front of the theatre is embellished with statues of Schiller, Iffland the actor, and Dalberg, intendant of the theatre in the time of Schiller. Mannheim is the chief commercial town on the upper

Rhine, and yields in importance to Cob- lentz and Cologne alone among the lower Rhenish towns, The staple commodities of its trade are tobacco, grain, petroleum, hops, timber, and coffee. Its new harbour, constructed at a cost of £650,000, and measuring 2300 yards in length, is the most extensive inland harbour in Germany. It is entered annually by 3000 river craft, carrying nearly 700,000 tons of goods. The railway goods station and warehouses in connexion with the harbour cover 400 acres of ground. The principal industrial products of Maunheim are machinery, iron, brass, india-rubber, sugar, uurrors, chemicals, wall-paper, and cigars. The manufac-

Plan of Mannheim.

tories of Ludwigshafen produce aniline dyes, soda, tartaric acid, alum, artificial manures, and lime. Manuheim is the seat of the central board for the navigation of the Rhine, of a chamber of commerce, and of the supreme court of Baden. Ten or twelve different countries are represented here by their consuls. The schools and public institutions of Mannheim include a gymnasium, a " real- schule," an industrial school, a high school for girls, a public library, a large poorhouse, three hospitals, and an orphanage.

History.—The name of Mannhcim was connected with its present site as early as the 8th century, when a small village belonging to the abbey of Lorsch lay in the marshy district between the Neckar and the Rhine. To the south of this village, on the Rhine, was the castle of Kicholzheim, which acquired some celebrity as the place of confinement assigned to Pope Jolin XXIII. by the council of Constance. The history of the modern Mannheim begins, however, with the opening of the 17th century, when Elector John Frederick IV. founded a town here, which he peopled chiefly with Protestant refugees from Holland. The strongly fortified castle which he erected at the same time had the unfortunate result of making the infant town an object of contention in the Thirty Years' War, during which it was five times taken and retaken. In 1689 Mannhcim, which had in the meantime recovered from its former disasters, was captured by the French under Melac, and ruthlessly destroyed. Ten years later it was rebuilt on an extended scale and provided with fortifications. For its subsequent importance it was indebted

to Elector Charles Philip, who, owing to ecclesiastical disputes, trans- ferred his residence from Heidelberg to Mannheim in 1720. It reniained the capital of the Palatinate for nearly sixty years. In 1794 Mannheim fell into the hands of the French, and in the following year it was retaken by the Austrians after a severe bombardment, which left scarcely a single building uninjured. In 1802 it was assigned to the grand-duke of Baden, who caused the fortifications to be razed. Ludwigshafen, originally only the ¢éte- du- pont of Mannheim, received its present name in 1843, and became a town in 1859. Towards the end of last century Mann- heim attained great celebrity in the literary world as the place where Schiller's early plays were performed for the first time. It was at Mannheim that Kotzebue was assassinated in 1819.

See Feder, Geschichte der Stadt Mannheim, 1875; and Unglenk, Praktischer Fiithrer durch Mannheim, 1880.

MANNING, Rosert, commonly known as Robert of Brunne, a monk of the priory of Brunne or Bourne in Lincolnshire, wrote in the beginning of the reign of Edward IIT. a metrical history of England from the landing of the imaginary Brute to the end of the reign of Edward I. The work has no independent historical value ; it professedly follows Peter of Langtoft's Chronicle from the Anglo-Saxon or " Inglis " invasion downwards, and Wace for the previous "British" story. It is a lively narrative, written 'not for the lered bot for the lewed," and it has a certain interest as a landmark, not only in the history of the English language, but also in the history of national sentiment. Manning is warm in praise of the deeds and the character of Edward I., "Edward of Inglond," although he deplores the Norman Conquest as a " bondage," and says concerning the death of Harold that " our freedom that day for ever took the leave." The old monk is our first avowedly "popular" historian. He wrote for the entertainment of men who knew neither Latin nor French, and in his prologue comments humorously on the " quaint English " and subtle rhymes of his predecessors, claiming for himself purity of language and simplicity of metre. A passage in this prologue has often been quoted as bear- ing on the authorship of the romance of Svr Tristram. Manning also translated William of Waddington's Manuel des Pechiez under the title of Handlying Synne, in 1303, and is plausibly conjectured to be the author of Jedy-

tacyuns of the Soper of oure Lorde Ihesu, translated from Bonaventura's Vita Christi. He is not a bald rhymester, but uses language with skill and effect, and in some places where he departs from his originals shows genuine poetical rapture. ,

MANOMETER, or Pressure GauGzE, is an instrument for measuring the hydrostatic pressure exerted by gases,

"cylinder by the cross pipe D, and at its

MANOMETER

vapours, or liquids against the sides of the closed vessels in which they are confined,—as, for instance, the pressure of steam in a steam-boiler.

The simplest and at the same time most accurate form of manometer is that known as the "mercury manometer," sometimes also called the "free-air mano- meter," and represented in fig. 1. It consists essentially of two vertical communicating tubes. One of these, AB, open at both ends, and made of thick glass, with a narrow uni- form bore, is fixed hermetically in the neck of a large wrought-iron cylinder C, its lower end dipping below the surface of mercury contained in the cylinder. The other tube, EF, is attached at its lower end to the

upper end can be put in communication with the vessel the pressure in which is to be ascertained. Usually the tube EF, the cross pipe D, and the space above the mercury in C are filled with water. At first the tube EF is left open to the atmosphere, and the height of the mercury in AB noted. When EF is then put in communication with the vessel in which the pressure (above atmo- spheric) is to be determined, the mercury in AB rises, and from the height to which it rises the pressure is deduced. For accurate work corrections must be made for the fall of the mercury in C as it rises in AB, and for the temperature and the height of the barometer at the time of the experiment. The great drawback to the employment of the simple mereury manometer for measuring very great pressures is the mechanical difficulty of obtain- ing a sufficiently long column of mercury. E. H. M. Amagat, however, has lately (1880) worked with a column one-fifth of a mile high. His experiments were undertaken to find out how the various gases,

nitrogen, oxygen, air, hydrogen, &e., departed from Mariotte's law when subjected to enormous pres- sures, At the bottom of a coal-mine at Verpilleux, near St Etienne, which had a depth of 327 metres, was placed the glass manometer tube containing the compressed gas, while the mercury tube (made of steel) extended up the shaft, being gradually built up in sections. See Nature, vol. xxii. pp.

62, 63. By means of Amagat's tables of the volume FIG. 1.— d responding pr f the] ' Mereury

and correspon & P essure 0 several gases,

and with special forms of manometer to suit par- Tanometer.

ticular cireumstanees, aceurate and delicate measures of enormous pressures can now be obtained. Professor Tait, for instance, has recently applied these tables along with a manometer of his own devising for testing the behaviour of the thermometers supplied to the 'Challenger " os under a pressure of as much as 10 tons to the square inch.

"Regnault's manometer" is shown in fig. 2. ABisa strong metal tube, closed at the lower end, and carrying at the upper a bent pipe for admitting the compressed gas and a stop-cock R pierced with holes in a T form. DE and FG are two graduated glass tubes communicating at their lower ends by a narrow passage in the metal block to which they are hermetically fixed. DE and AB also com- municate at the upper ends by a passage ina metal piece attached hermetically to them. By the stop-cock R', having radial holes at right angles to each other, DE can communicate either with AB or with the atmosphere at O ; and by the stop-cock R" it can communicate either with FG or with the open air. The three tubes are surrounded by a cylinder MM' containing water to keep the tempera- ture constant. The tube AB is filled with the compressed gas whose pressure is to be ascertained. The stop-cock R' being then placed as in fig. 2, mercury is poured into FG till it fills DE and runs out at O, The stop-

cocks R and R' are then turned as in fig. 2a, so that AB and DE communicate with each other. Part of the com- pressed gas flows over into DE, and the mercury in FG rises. By manipu- lating the stop-cock R" as shown in fig. 26, part of the mercury is allowed to run out of DE till a conveniently measurable differ- ence of level be- tween the mercury surfaces in DE and FG is attained.

Let f be this differ- ence. Also let x be the pressure of the gas originally filling the volume V of AB, V' the additional volume occupied by the ex- panded gas, and H be the height of the baro- meter at the time; | then we have by Mari- a otte's law

aV=(V+V'(H+h),

from whieh

Fie. 2.—Regnault's Manometer.

V+vV' es 1).

7 (1)

V' is determined by weighing the mereury required to fill the space it oceupies, and V ean be ealeulated from (1) when AB is filled with dry air at pressure H.

In Regnault's apparatus the length of AB and DE was 1 metre, the diameter of AB 5 mm. and of DE 20 mm. The section of DE was thus sixteen times that of AB, and in this way a very great pressure could be measured by a comparatively small differenee of level between the mercury surfaces in FG and DE. The instru- ment, however, is subject to errors, arising chiefly from the diffi- eulty of measuring accurately the volumes V and V'.

The "compressed air manometer" (fig. 3) consists of a strong graduated glass tube of uniform narrow bore, closed at the top and fixed hermetically into the neck of a wide iron cylinder. The tube contains dry air, and its lower end dips below the surface of mercury contained in the cylinder. Attached to the side of the cylinder is a tube A, with a stop-cock, to afford

communication with the vessel the pressure in which is to be measured. When the manometer is attached to the vessel containing compressed gas the mer- cury rises in the glass tube till the pres- sure of the air confined in the tube (reck- oned in millimetres of mercury) plus the height of the mercury column above the level of the mercury in the cylinder is equal to the pressure on the surface of mercury in the cylinder.

*‘*Desgoffe’s manometer” depends upon the same principle as the hydraulic press, and ean be employed to measure the enormous pressure*

reached in the eylinder of that instrument. It is represented in perspective in fig. 4 and in

(H+h)

8

I

section in fig. 5. V is astrong cireular iron 0 Fia. ge vessel, in which moves np and down for a short ‘0@Pressed Air Manometer.

distance a flat piston D attached to a cylindrical plug T. The lower part of V contains mereury whieh has free communication with a graduated vertical glass tube AB fixed her- metically into the side of V. Above the mercury in V is placed a thin layer of water, and above that is stretched a thin membrane of india-rubber bolted down water-tight by an iron ring. The ehamber C contains a cavity in which the plug T moves water-tight. By means of the tube ¢ the instrument can be put in communication

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with the vessel containing the fluid whose pressure is to be mea- sured. The compressed fiuid acting upon T depresses the piston D and causes the mercury to rise in AB.

Let p be the pressure of the fluid per unit of area, s the area of T, and S the area of : D; also let P be the pressure per unit of area as recorded by the

height of the mercury mAB. Thus evidently we have

gs=PS, or p=—?.

Hence by making S very great and s very small a very great pressure can be measured by a comparatively short column of mercury in AB. As part of the pressure p is em- ployed to stretch the india-rubber mem- brane, the ratio S:s should be made very great, so that D will only sink a_ very short distance. Caille- tet, who employed this manometer in his experiments on the compressibility of fluids, had it so arranged that (ne- glecting the stretch- ad BY

fea – eed – ae Fic. 5. Section of Desgoffe's Manometer. in AB rose 4°3 metres while the piston in D sunk only one-eighth of a millimetre.

Metallic manometers depend on the principle exemplified in the aneroid barometer. Suppose a long tube, preferably of elliptic section, and having thin walls of elastic material, to be closed at one end and cither bent or coiled up in the form of a spiral. Let the open end be attached to an apparatus whereby the pressure in- sile the tube can be cither increased or diminished. If the pressure inside the tube be made greater than that outside, the tube has a tendency to straighten or uncoil itself, but if the pressure outside be greater than that inside the tube has a tendency to bend or coil itself up farther. Fig. 6 represents an early form of metallic mano- meter rade on this principle by Bourdon, the first to construct such instruments, A metallictubead,closed at b, is coiled in a spiral and rigidly at- tached at the open end a toa tube with stop-cock m, whereby it can communicate with the compression apparatus. A_ light index ¢ is attached to b and moves over a graduated scale. The scale is graduated by applying known pres- sures inside the tube. This form of mano- meter is very conveni- ent forrough practical work, but lias no pre- tensions to scientific accuracy, as changes of temperature affect the elasticity of the tube in a way which is difficult to discover and allow for. Various forms of metallic manometers have been recently invented, the best-known of which are perhaps those of Bourdon and Schafer, in which the index is moved by a train of wheels actuated by the free end of the elastic tube. ;

Air-pump Manometer.—For measuring pressures less than that of the atmosphere, as in the receiver of an air-pump, a special form of mercury manometer is employed, consisting of a glass U tube with each leg over 30 inches long and half filled with mercury. One leg communicates by an air-tight communication with the re- ceiver of the air-pump, and the other is left open. As the exhaustion proceeds, the mercury falls in the open leg and rises in the other.

Fic. 4.—Desgoffe's Manometer.

EEE anAZ EEO SSS S29.

Fia. 6.—Bourdon's Metallic Manometer.

MAN—MAN

When only considerable degrees of exhaustion are to be measured, the instruinent takes the form of a short U tube closed at one end and open at the other, and has its closed leg completely filled with mercury, the mercury being held up by the atmospheric pressure. The whole is enclosed in a wide glass tube closed at the top and hermetically fixed at the lower end to a brass piece, provided with a stop-cock, whereby it can be serewed on to the sole plate of the air-pump. The difference of level in the two legs gives the degree of exhaustion obtained.

See Ganot's Physics; Wiillner's Lehrbuch der Experimentalphysik; Amagat in Annales de Chemie et de Physique, March 1880; Report of H.M.S. Challenger, in regard to pressure corrections supplied by thermometers, by Professor Tait. @. Bi) 4

MANOR, in English law, is an estate in land, to which is incident the right to hold certain courts called courts baron. It might be described as the unit of tenure under the feudal system, and it is historically connected with the territorial divisions of the mark and the parish or township. The legal theory of the origin of manors refers them to a grant from the crown, as stated in the following extract from Perkins's Z'reatise on the laws of England :—" The beginning of a manor was when the king gave a thousand acres of land, or a greater or lesser parcel of land, unto one of his subjects*

and his heirs, which tenure is knight's service at the least. And the donor did perhaps build a mansion house upon parcel of the same land, and of 20 acres, parcel of that which remained, or of a greater or lesser parcel before the statute of Quia Hmptores did enfeoff a stranger to hold of him and his heirs to plow 10 acres of land, parcel of that which remained in his possession, and did enfeoff another of another parcel thereof to go to war with him against the Scots, &c., and so by continu- ance of time made a manor." It is still, as Mr Joshua Williams terms it, a "fundamental rule" that all lands were originally derived from the crown, and that the queen is lady paramount mediate or immediate of all the land in the realm. A manor then arises where the owner of a parcel so granted or supposed to have been granted by the crown (aud who is called in relation thereto the lord) has in turn granted portions thereof to others who stand to lim in the relation of tenants. Of the portion reserved by the lord for his own use (his demesne) part was occupied by villeins, with the duty of cultivating the rest for the lord's use. These were originally tenants at will, and ina state of semi-serfdom, but they became in course of time the copyhold tenants of the later law. (See CoPYHOLD.) It is of the essence of copyhold that it should be regulated by the custom of the manor ; and that, according to some authorities, is one reason why a manor cannot be created at the present day. "Length of time being of the very essence of a manor, such things as receive their perfection by the continuance of time come not within the compass of a king's prerogative" (Scriven, Copyholds, chap. i.). But the effect of the statute of Quia Emptores was to make the creation of manors henceforward impossible, inasmuch as it enacted 'that upon all sales or feoffments of land, the feoffee shall hold the same, not of his immediate feoffor, but of the chief lord of the fee of whom such feoffor him- self held it." The statute did not apply to the king's tenants in capite, who might have aliened their land under a licence, Accordingly it is assumed that all existing manors are "ofa date prior to the statute of Quia Lmptores, except perhaps some which may have been created by the king's tenants iz capite with licence from the crown" (Williams, Real Property, chap. iv. ; see also Scriven, Copy- holds, chap. i.). When a great baron had granted out smaller

1 Laveleye (Primitive Property, chap. xviii.) observes that in the 10th century, even before the Norman Conquest, the mark had already been transformed into the manor, although the term was not yet in use. The

country was covered with a great number of domains (maneria), of very different extent, from the maneriolum of one plough to the latt- fundium of fifty ploughs.

manors to others, the seignory of the superior baron was frequently termed an honour.

MANRESA, a town of Catalonia, Spain, 39 miles north-west of Barcelona, with a population of 15,264. It was formerly Bacasis, one of the cities of the Jaccetani, the most important of the small tribes at the foot of the Pyrenees. It lies on the left bank of the Cardonero, 2 miles above its junction with the Llobregat, in the midst of a fertile and well-irrigated district, and its chief manufactures are cloth, cotton, silk, gunpowder, and brandy. Building stone is quarried near the town. The Cardonero is crossed by two bridges,—one ancient, the other erected in 1804. The two principal sights of Man- resa are the collegiate church, El] Seo, commenced in 1328, aud finished in the 15th century, and the Cueva de San Ygnacio. The late Mr G. E. Street has minutely described the church in his Gothic Architecture of Spain. Among its greatest treasures he specializes a magnificent altar frontal as "the most beautiful work of its age." It is 10 feet long by 2 feet 10 inches in height, and is divided into nine compartments, at the bottom of which is the inscription in Lombardic characters :—GERI: LAPI : RECHAMATORE : MEFECIT : INFLORENTIA. In the Cueva de San Ygnacio, Ignatius Loyola lived for a year, fasting and submitting himself to the severest penances, constantly gazing at the shrine of the Virgin of Montscrrat, who, he asserted, encouraged him in his austerities. A great monastery surrounds the cave, which is visited by thousands of pilgrims, and from the esplanade there is a magnificent view of the "pinnacles, spires, turrets, sugar- loaves, and pyramids of faint grey rocks," constituting the famous mountain of Montserrat. At Cardona, a little more than 20 miles to the north-west of Manresa, there is a remarkable hill of rock-salt 3 miles in circumference, and 350 feet in height, which is estimated to contain 400 million cubic yards of salt.

MANS, Lg, a town of France, formerly capital of Maine and now of the department of Sarthe, lies 118 miles (131 by rail) W.S.W. from Paris, near

the confluence of the Sarthe and the Huisne, on an elevation rising from the left bank of the former river. Three bridges besides that of the rail- way connect the town with the quartcr on the right bank. Of the wide and commodious thoroughfares which are gradually superseding the old winding and narrow streets, the most worthy of notice is the tunnel by which the Place des Jacobins is connected with the river side. The principal building is the cathedral, originally founded by St Julian, to whom it is dedicated. Rebuilt in the 6th century by St Innocent, in the 9th by St Aldric, and a third or fourth time in the 11th by Vulgrin, who was at once architect and bishop, it was completed by the addition of two towers in the 12th. Destroyed by two fires, the roof was recon- structed in the Gothic style, and the transept and south portal wereadded. In the 13th century the choir was en- larged in the grandest and boldest style of that magnificent period. Finally a new transept and a bell tower were added in the 15th century, In the large window of the west front the ten divisions which have for their subject the legend of St Julian are the oldest extant specimens of stained glass in France (end of 11th century). The side portal (12th century) is richly decorated, and its statuettes exhibit many interesting costumes of the period. The aisles have ten bays, but the nave only five; the transept is much higher ; from it rises the only tower of the building. The austere simplicity of the nave is in striking contrast with the lavish richness of the ornamentation in the choir and apse. former is 115 feet in height, and has twelve chapels besides the sacristy ; its windows almost entirely date from the middle of the 13th century. The glass of the north transept is of the 15th century, and represents the Last Judgment ;

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it contains many historical figures. The cathedral has also curious tapestries and some remarkable tombs, including that of Berengaria, queen of Richard Coeur de Lion. The eutire length of the building is 427 feet. Close to the western wall is a megalithic monument nearly 15 feet in height. The church of La Couture, which belonged to an old abbey founded in the 7th century by St Bertrand or Bertram, has a remarkable porch of the 13th century; the rest of the building is older. Of the other churches of Le Mans,

none require special mention except that of Notre Danie du Pré, on the right bank of the Sarthe. Of the secular buildings may be mentioned the hétel de ville, built about a century ago on the site of the former castle of the counts of Maine, and the prefecture, occupying the site of the monastery of La Couture (1760). The latter contains the library (50,000 volumes, 700 MSS.), the com- munal archives, and the museum of paintings, archeology, and natural history. Other prominent buildings are the general hospital, the lyceum, the seminary, the palais de justice, and the cavalry barracks; the house occupied by Scarron is still pointed out, and there are considerable remains of the old Gallo-Roman enceinte. The principal promenades are those of the Jacobins, of the horticultural garden, Du Greftier (on the right bank of the river), aud Des Sapins (on the road to Tours), The industries of Le Mans, which are carried on chiefly in the faubourg of Pontlieue, include metal-working, the manufacture of agri- cultural implements, and weaving. For some years there has been a Government tobacco factory. A local specialty is the fattening of poultry. The population in 1876 was 50,175 (including 5282 representing the garrison, &c.), Le Mans is an important railway junction.

As the eapital of the Aulerci Cenomani, Le Mans was called Suindinum or Vindinum. The Romans surrounded it with walls in the 3d century ; it was evangelized by St Julian in the 4th. The eountship of Maine was made hereditary by Hugh Capet in the 10th eentury. Le Mans was seized by William the Con- queror, but his son Robert was unable to retain it. Having ehosen the side of Richard Cceur-de-Lion, it was taken by Philip Augustus, recaptured by John, subsequently confiscated, and afterwards ceded to the widow of Richard. Maine was next held by Margaret, the wife of St Louis, who gave it to his brother Charles of Anjou. Le Mans was five times besieged during the Hundred Years' War, and was subsequently devastated by the Huguenots in 1562, In 1793 it was seized by the Vendeans, who were expelled by Marceau after a sanguinary battle in the streets of the town. In 1799 it was again occupied by the Chouans; and in January 1871 the second army of the Loire sustained in the neighbourhood of Le Mans a defeat which made the relief of Paris impossible. The town is the birthplace of Henry Il. of England, of John the Good, king of France, and of Chappe, the inventor of the aerial telegraph.

MANSEL, Henry Lonevrvitte (1820-1871), meta- physician and theologian, was born at Cosgrove, North- amptonshire (where his father was rector) in 1820, and educated at Merchant Taylors' School and St John's College, Oxford. He succeeded to a fellowship in 1842, graduated in 1843, and became tutor of his college. He was ap- pointed reader in moral and metaphysical philosophy at Magdalen College in 1855, becoming Waynflete professor in 1859. In 1867 he succeeded Dean Stanley as professor of ecclesiastical history, and in the following year was appointed dean of St Paul's. He died July 31, 1871,

The philosophy of Mansel, like that of his older contemporary Sir W, Hamilton of Edinburgh, was mainly due to three sources, — the works of Aristotle, the speculations of Kant, and the philosophy of Reid. Like Hamilton, Mansel maintained the purely formal eharacter of logieal science, the duality of consciousness as testify- ing to both self and the external world, and the limitation of knowledge to the finite and " conditioned." His logieal doctrines were developed in his edition of Aldrich's Artis Logicw Rudimenta (1849)—his chief contribution to the reviving study of Aristotle— and in his Prolegomena Legica,—an Inquiry into the Psychological Character of Logicel Processes (1851), in whieh the limits of logic as the " science of formal thinking" are rigorously determined. In his Bampton Lectures on The Limits of Religious Thought (1858)

he applicd to Christian theology the metaphysical agnosticism which seemed to result from Kant's criticism, and which had been developed in Hamilton's Philosophy of the Uneonditioned, Showing the contradictions which arise when we attempt to conceive God under the categories of substance or cause, Mansel contends that we can have no positive conception either of the metaphysical or moral attributes of the Absolute and Infinite Being, though we are compelled to believe in His existeuce, the religious conscious- ness being built up by reflexion from the feeling of dependence and the conviction of moral obligation. Hence he infers the invalidity of all objections to revelation from its alleged inconsistency with

the Divine character, maintaining the dependence of its claim to acceptance upon the evidences accompanying it. While denying all knowledge of the supersensuous, Manscl deviated from Kant in eoutending that cognition of the ego as it really is is itself a fact of experience. Consciousness, he held,—agrceing thus with the doctrine of "natural realism"? which Hamilton developed from Reid, —implies knowledge both of self and of the external world. The latter Mansel's psychology reduces to consciousness of our organism as extended ; with the former is given consciousness of free-will and moral obligation. These views and a summary of his whole philosophy are contained in his article " Metaphysics " eontributed to the 8th edition of the Hneyelopxdia Britannica (separately published, 1860), Mansel was also the author of an essay on The Philosophy of the Conditioned (1866) in reply to Mill's criticism of Hamilton, of other controversial and occasional writings republished in Letters, Lectures, and Reviews (1873), and ae on The Gnostie Heresies (edited by J. B. Lightfoot,

1875),

MANSFELD, Count Ernest or (1585-1626), a natural son of Peter Ernest, governor of Luxemburg and Brussels, was born in 1585. 'Trained by his godfather, the archduke Iirnest of Austria, in the Roman Catholic religion, he devotcd himself to the service of the king of Spain in the Netherlands, and to that of the emperor in Hungary. The emperor Rudolf H. conferred on him the rights of legitimate birth, and promised to put him in possession of his father's lands in the Netherlands. As this promise was not fulfilled, he joined the Reformed Church, and in 1610 formally associated himself with the Protestant princes. From the ontbreak of the Thirty Years' War in 1618 he fought steadily on behalf of the elector of the Palatinate both in Bohemia and in the Rhine country. In 1625 he was able to collect a powerful force with which he intended to attack the hereditary territorics of Austria, but, on the 25th of April 1626, he was defeated by Wallenstein at Dessau. He pressed forward to effect a junction with Bethlen Gabor, prince of Transylvania, but as the latter changed his policy Mansfeld had no alternative but to disband his army. When preparing to go to England by Venice, he became ill at a village near Zara, and died on the 20th of November 1628. He was a man of great courage and resource, and ranks among the most brilliant generals of his age.

See Reuss, Graf Ernst von Mansfeld im bihmischen Kriege 1618-21 (1865); Villermont, Ernest de Mansfeld (1866); and Graf Uetterodt zu Scharffenberg, Ernest Graf zu Mansfeld, his- torisehe Darstellung (1867).

MANSFIELD, a market-town in tho county of Nottingham, England, is situated in Sherwood Forest, near the north bank of the river Mann or Maun, 17 miles north-west from Nottingham, and 140 north-north-west of London by rail. The town is built of stone, with regular streets radiating from the market place, and several good houses. The church of St Peter is partly Early Norman and partly Perpendicular. There is a grammar school founded by Queen Elizabeth in 1561, for which new buildings have latcly been erected at a cost of £10,000. Twelve almshouses were founded by Elizabeth Heath in 1693, and to these six were afterwards added. In addition there are a number of other charities, The other principal buildings are the town-hall, the mechanics' institute, and the public baths. In the market place there is a monu- ment to Lord George Bentinck. The industries of the town are the manufacture of lace thread, cotton hose, machines, engines, and bricks and tiles, iron-founding, and brewing.

In the neighbourhood there are quarries of limestone, sandstone, and freestone. Population in 1871, 11,824; in 1881, Veo!

From coins found at Mansfield and the remains of a Roman villa in the neighbourhood, it is believed to have been a Roman station. During the heptarchy it was occasionally the residence of the Mercian kings, and it was afterwards a favourite resort of Norman sovereigns. By Henry VIII. the manor was granted to the earl of Surrey. Afterwards it went by exchange to the duke of Newcastle, and from the Newcastles to the Portland family. The town obtained a fair from Richard II. in 1377.

MANSFIELD, the county seat of Richland county, Ohio, U.S., pleasantly situated on high ground, 54 miles south of Sandusky, in the midst of a prosperous farming district. It is the terminus of the North-Western Ohio Rail- road, and is at the junction of the Baltimore and Ohio, the Pittsburgh, Fort Wayne, and Chicago, and the New York, Pennsylvania, and Ohio lines. Tt possesses a flourishing trade, and extensive manufactories of

agricultural imple- ments, machinery, flour, boilers, carriages, and houseliold furniture, with many minor industries. Mansfield has public water-works on the “ Holly ” system, a public library, and an opera-house. The population was 8029 in 1870 and 9859 in 1880.

MANSFIELD, Wittiam Murray, Eart or (1705— 1793), was born at Scone, in Perthshire, on 2d March 1705, He was the eleventh child and fourth son of David, fifth Viscount Stormont, a nobleman whose family possessions had shrunk within so narrow limits that he had to bring up his numerous family with exceedingly strict economy. The family was Jacobite in its politics, and the second son, being apparently mixed up in some of the plots of the time, joined the court of the Pretender at the accession of George L, and was created by him earl of Dunbar. William Murray was sent first to the grammar school at Perth, where he remained until he was thirteen, and at that age was sent to Westminster at the suggestion of his exiled brother, who had been in close relation with Atterbury (then dean of Westminster), and probably desired to bring the boy under his influence. He was elected a king’s scholar a year after his entrance, and in 1723 was first on the list of scholars sent on the foundation to Christ Church, where he remained for nearly four years. It had been originally intended that he should enter the English church, as, although his own inclination while at school pointed strongly towards the bar, the circumstances of his family seemed to forbid the expense of a legal education. But this obstacle was removed by the kindness of the father of one of his school- fellows, and he was entered at Lincoln’s Inn. Soon after he went to Oxford, In 1727 he took chambers in Lincoln’s Inn, and in 1730 was called to the bar. His studies from the time he left Westminster seem to have been steadily directed towards his future profession, but in a manner far more liberal than was then usual among lawyers. He had made himself at Westminster and Oxford an admirable classical scholar; he paid particular attention to English composition and to the art of debate; his historical studies were extensive, and in the more strictly professional sphere his wide view of the education necessary for a lawyer was shown by the knowledge he acquired of Roman law and of the juridical writers of Scotland and France. At the same time he enjoyed the advantage of mixing extensively with the best literary society. He had early become an intimate friend of Pope, and his own ability and accomplishments soon made him everywhere a man of mark.

For two or three ycars he made little or no progress at the bar, but at length his appearance in some important Scotch appeal cases brought him into notice, and in Scotland at least he acquired an immense reputation by his appearance for the city of Edinburgh when it was

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threatened with disfranchisement for the affair of the Porteous mob. His English business had as yet been scanty, but in 1737 a single speech in a jury trial of note may be said to lave placed him at the head of the bar, and from this time he enjoyed a great business. In 1738 he married Lady Elizabeth Finch, daughter of the earl of Winchelsea. His political career commenced in 1742 with his appointment as solicitor-general. Probably his politi- cal opinions were not of a marked party character; he had been bred a Jacobite, and many of his earlier associates belonged to the high Tory camp, but his calm sense and temper disinclined him to extreme factions, and indeed his interest in politics seems at all times to have been sub- ordinate to the love of his profession. He had kept entirely aloof during the struggles which preceded the fall of Sir Robert Walpole ; he refused any purely political appoint- ment, and only took office as solicitor when he felt assured of the permanence of the new administration. During the next fourteen years Murray was one of the most con- spicuous figures in the parliamentary history of the time. Although holding an office of subordinate rank, and not sharing, nominally at least, in the councils of the adminis- tration, he was the chief defender of their measures in the House of Commons, and during the time that Pitt was in opposition had to bear the brunt of his attacks. He was especially conspicuous in the great debates on the employ- ment of the Hanoverian troops, the treaty of Aix-la- Chapelle, and the Regency Bill. In 1754 he became attorney-general, and for the next two years acted as leader of the House of Commons under the administration of the duke of Newcastle. During these years he had to defend a weak Government against the incessant, vehe- ment assaults of Pitt, and, according to the testimony of contemporaries, acquitted himself brilliantly in the contest. But in 1756, when the Government was evidently ap- proaching its fall, an unexpected vacancy occurred in the chief justiceship of the king's bench, and he claimed the office. Newcastle made every effort to retain him in the House of Commons, feeling as he did that

his departure would hasten the fall of the Government, but Murray was inexorable.. He seems to have been thoroughly tired of his parliamentary life, and to have long looked forward to the bench as the proper sphere of his work. He was at the same time raised to the peerage as Baron Mansfield.

From this time the chief interest of his career lies in his judicial work, but he did not wholly dissever himself from politics. He became by a singular arrangement, only once repeated subsequently in the case of Lord Ellenborough, a member of the cabinet, and remained in that position through various changes of administration for nearly fifteen years, and, although he persistently refused the chancellorship, he acted as speaker of the House of Lords while the great seal was in commission. During the time of Pitt's ascendency he took but little part in politics, but while Lord Bute was in power his influence was very considerable, and seems mostly to have been exerted in favour of a more moderate line of policy. He was on the whole a supporter of the prerogative, but within definite limits, Macaulay terms him, justly enough, "the father of modern Toryism, of Toryism modified to suit an order of things in which the House of Commons is the most power- ful body in the state." In this spirit he continued to act a conspicuous though not a foremost part in political life during the rest of his career. During the stormy session of 1770 he came into violent collision with Lord Chatham and Lord Camden in the questions that arose out of the Middlesex election and the trials for political libel, and in the subsequent years he was made the subject of the bitter attacks of Junius, in which his early Jacobite connexions, and his apparent leanings to arbitrary power, were used

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against him with extraordinary ability and virulence. In 1776 he was created earl of Mansfield. In 1783, although he declined to re-enter the cabinet, he acted as speaker of the House of Lords during the coalition ministry, and with this his political career may be said to have closed. He continued to act as chief justice until his resignation in June 1788, and after five years spent in quiet retirement died peacefully on 20th March 1793. He

left no family, but his title had been re-granted (in 1792) with a direct remainder to his nephew, Lord Stormont.

Lord Mansfield's great reputation rests chiefly on his judicial career. The political trials in which he presided, although they gave rise to numerous accusations against him, were conducted with singular fairness and propriety. He was accused with especial bitterness of favouring arbi- trary power by the law which he laid down in the trials for libel which arose out of the publications of Junius and Horne Tooke, and which at a later time he reaffirmed in the case of the dean of St Asaph (see Lien). But, although his political opinions led him to look with disfavour on the popular view, and although it was unquestionably unfor- tunate that in some of these instances he was a member of the cabinet which directed the proceedings, we must remember that his view of the law was concurred in by the great majority of the judges and lawyers of that time, and was supported by undoubted precedents. In other instances, when the Government were equally concerned, he was wholly free from suspicion. He supported Lord Camden's decision against general warrants, and reversed the outlawry of Wilkes. While on the whole he leaned in opinion to a view of the law which we should now call oppressive, there is no instance in which he can justly be accused of wresting it, and in every instance he treated the accused with a fairness and decency which had not always been shown by his predecessors. In another way he came into conflict with popular prejudices. He was always ready to protect the rights of conscience, whether they were claimed by Dissenters or Catholics, and the popular fury which led to the destruction of his house during the Gordon riots was directed against him very much because a Catholic priest, who was accused of saying mass, had escaped the penal laws by his charge to the jury. His chief celebrity, however, is founded upon the con- summate ability with which he discharged the civil duties of his office. He has always been recognized as the founder of English mercantile law. The common law as it existed before his time was wholly inadequate to cope with the new cases and customs which arose with the increasing development of commerce. The facts were left to the jury to decide as best they might, and no principle was ever extracted from them which might serve as a guide in subsequent cases. Lord Mansfield found the law in this chaotic state, and left it in a form that was almost equivalent to a code. Working patiently with the guild- hall juries,

whom he trained to act in thorough understand- ing with him, he defined almost every principle that governed commercial transactions in such a manner that his successors had only to apply the rules he had laid down. His knowledge of Roman and foreign law, and the general width of his education, freed him from the danger of rely- ing too exclusively upon narrow precedents, and afforded him a storehouse of principles and illustrations, while the grasp and acuteness of his intellect enabled him to put his judgments in a form which almost always commanded assent. A similar influence was exerted by him in other branches of the common law; and although, after his retirement, a reaction took place, and he was regarded for a while as one who had corrupted the ancient principles of English law, these prejudices passed rapidly away, and the value of his work in bringing the older law in harmony

with the needs of modern society has long been fully recognized.

The chief defect of Lord Mansfield's character was a certain coldness and want of moral courage. He had no very warm attachment either to persons or opinions, although invariably kindly and considerate in his de- meanour. Even his greatest speeches owe their impres- siveness to a certain intellectual nobleness and breadth of view. His attachment to justice was not impassioned, but of the type which is bred from highest professional custom, and from the kind of intellectual taste which led him so frequently to the ethical writings of Cicero. He could not always face the enthusiasm of Chatham, and we cannot feel certain that his courage would have sustained him through any very perilous stand for righteousness. But in the sphere in which he was chiefly famous these defects were scarcely disadvantages. His sense of duty and of personal dignity was amply sufficient to bear him perfectly unstained through life. No suitor had ever to complain of delay or neglect. His want of strong feeling only per- mitted him to use his magnificent intellect with greater impartiality ; and, if at any time he was affected by personal prejudice, no trace of it was ever allowed to appear. Nothing ever disturbed the perfect dignity and propriety of his judicial conduct, which is apparent in every trial at which he presided. He impressed himself on the mind of his contemporaries as one of the best

examples of what a great judge ought to be, and from that estimate a closer examination of his claims will scarcely lead us to differ. (A. GI.)

M.ANSLAUGHTER. See Murper.

MANSON, Gerorcx (1850-1876), a Scottish water- colour painter, was born in Edinburgh on the 3d of December 1850. When about fifteen he was apprenticed as a woodcutter with Messrs W. & R. Chambers, with whom he remained for over five years, designing and engraving vignettes distinguished by singular rightness and directness of technical method, diligently employing all his spare time in the study and practice of art, and pro- ducing in his morning and evening hours water-colours of much delicacy and beauty, like the Milking Time and the Cottage Door. In 1871 he left the Messrs Chambers, and devoted himself exclusively to painting. His subjects were derived from humble Scottish life—especially child life, varied occasionally by portraiture, by landscape, and by views of picturesque architecture. In 1873 he visited Normandy, Belgium, and Holland ; in the following year he spent several months in Sark; and in 1875 he resided at St Ld, and in Paris, where he mastered the processes of etching. He afterwards produced a series of plates which promised excellence in the art. Meanwhile in his water-colour work he had been adding more of breadth and power to the tenderness and richness of colour which distinguished his early pictures, and he was planning more complex and important subjects. But his health had been gradually failing, and he was ordered to Lympstone in Devonshire, where he died on the 27th of February 1876. Among his chief productions are the High School Wynd; the Companions—a gipsy girl and her donkey; Waiting for the Boats ; What is It ?—~a child examining an antique clock ; and his own portrait as a Sark fisherman. Since his death several exhibitions of his works have been held in London and Edinburgh, and a volume of photographs from his water-colours and sketches, with a memoir by J. M. Gray, was published in 1880. For an account of Manson's technical method as a wood engraver see P. G, Hamerton's Graphic Arts, p. 311.

MANSUR, Mansoor, or more properly, with the article, Au-Mangtr, "the victorious," a surname (lakab) assumed by not a few Mohammedan princes. Among the person-

ages commonly referred to by this title the following may be noticed.

1, Abu Ja‘far ibn Mohammed, second caliph of the house of ‘Abbas, who reigned 754-775 ap. See MoHAMMEDAN EMPIRE.

2. Abu Tahir Isma‘il ibn Al-Kdim, third Fatimite caliph

of Africa (946-953). Under Al-Kaim, his father, the Fatim-

ites, already weakened by their conflict with the Omayyads of Spain, were threatened with utter ruin by a Berber rising under Abt Yezid, a poor nonconformist (‘Ib4df) school- inaster, who appeared asa religious reformer, and gathered round him the Sunnites, who detested the Fatimites. In 944 Abu Yezid conquered the capital Kairaw4n, and recognized the spiritual headship of the Spanish caliph, While the Spanish caliph and his vassals stripped the Fatimite of his remoter possessions, Abu Yezid pressed him at home, and during thesiege of Sta Al-K4im died, and wassucceeded by Al-Manstr. Then the fortunes of war rapidly turned. Abt Yezid alienated many of his followers by lapsing into habits of arrogant luxury and by treachery towards the Sunnites. At length he lost all he had won, fell into the hands of Al-Mansur, and was put to death (947). The caliph built the city of Man- suriyah on the field of the decisive battle and made it his residence ; the empire was rapidly restored, and the Spanish vassals driven from Africa. Al-Manstir died at Manstri- yah, and was succeeded by Al-Mo‘izz, the conqueror of Egypt (see vol. vii. p. 750 sq.).

3. Ibn Abi ‘Amir Mohammed, commonly called Almanzor by Enropean writers, of an ancient but not illustrious Arab family, which had its seat at Torrox near Algeciras, was bern 939 a.p., and began life as a lawyer at Cordova. In 967 he obtained a place at the court of Hakam IL, the Andalusian caliph, and by an unusnal combination of the talents of a courtier with administrative ability and address in dealing with men, rapidly rose to distinction, enjoying in particular the powerful support of Subh, the favourite of the caliph and mother of his heir Hishém. On the death of Hakam (976) the accession of a minor gave fresh scope to the genius of Ibn Abi ‘Amir, who threaded his way with consummate but

unscrupulous talent through the intrigues of the court, and in 978 became prime minister. He now aimed at absolute do- minion. The weak yonng caliph, absorbed in exercises of piety, was easily reduced to a cipher, but at first Ibu Abi 'Amir had to share the power with his father-in-law Ghalib, the best general of Andalusia, and his chief aid, along with the mother of Hishém, in the steps that had raised him to power. At last a rupture took place be- tween the two ministers, and ended in a war, in which Ghalib professed himself the champion of the caliph and called in the aid of the Christians of Leon. But his rival had anticipated the struggle; he had long before found means to add military to administrative reputation, and since lie rose to the direction of affairs had remodelled the army so as to make it more formidable and more devoted to his cause. Ghalib fell in battle (981); a vic- torious campaign chastised the Leonese; and on his return to Cordova the victor assumed the regal surname of Al- Mansitr billah, and became practically sovereign of Anda- lusia. The caliph was a mere prisoner of state, holding a nominal dignity, and Al-Manstr ultimately assnmed the title as well as the prerogatives of king (996). Unscrupu- lous in the means by which he rose to power, he wielded the sovereignty nobly. His strict justice and the en- lightened excellence of his internal administration were not less notable than his military prowess. But it is by. the latter that he is best known. His arms were the terror of the Christians, and raised the Moslem power in Spain to a pitch it had never before attained. He fought more than

fifty campaigns, all glorious, and destroyed many cities, including the three capitals of Leon, Pampeluna, and Bar- celona, and the sacred shrine of Santiago de Compostella, In Africa his armies were for a time hard pressed by the revolt of Zirl, viceroy of Mauretania, but before his death this enemy had also fallen. Al-Manstr died at Medinaceli 10th August 1002, and was succeeded by his son Modaffar.!

4, Abi Yusuf Ya'kub ibn Yusuf (Jacob Almanzor), of the Moorish dynasty of the Almohades, the conqueror of Alphonso ITI. in the great battle of Alarcos (1195), reigned

1184-99.

MANTEGNA, Anprea (1431-1506), one of tlie chief heroes in the advance of painting in Italy, was born in or near Padua, of very humble parentage. It is said that in his earliest boyhood Andrea was, like Giotto, put to shepherding or cattle-herding; but this can have lasted only a very short while, as his natural genius for art developed with singular precocity, and excited the attention of Francesco Squarcione, who entered him in the guild of painters before he had completed his eleventh year.

Squarcione, whiose original vocation was tailoring, appears to have had a remarkable enthusiasm for ancient art, and a proportionate faculty for acting, with profit to himself and others, as a sort of artistic middleman; his own per- formances as a painter were merely mediocre. He travelled in Italy, and perhaps in Greece also, collecting antique statues, reliefs, vases, &c., forming the largest collection then extant of such works, making drawings from them himself, and throwing open his stores for others to study from, and then undertaking works on commission for which his pupils no less than himsclf were made available. As many as one hundred and thirty-seven painters and pictorial students passed through his school, established towards 1440, which became famous all over Italy. Mantegna was, as he deserved to be, Squarcione's favourite pupil. Squarcione adopted him as his son, and purposed making him the heir of his fortune. Andrea was only seven- teen when he painted, in the church of St Sophia in Padua, a Madonna picture of exceptional and recognized excellence, He was no doubt fully aware of having achieved no com- mon feat, as he marked the work with his name and the date, and the years of liisage. This painting was destroyed in the 17th century.

The affectionate relation between Squarcione and Mantegna was not destined to continue long. As tlie youth progressed in his studies, he came under the influence of Jacopo Bellini, a painter considerably superior to Squarcione, father of the celebrated painters Giovanni and Gentile, and of a daughter Niccolosia ; and at some date, which may have been towards 1450, Jacopo gave Niccolosia to Andrea in marriage. This connexion of Andrea with the pictorial rival of Squarcione is generally assigned as the reason why the latter became alienated from the son of lis adoption, and always afterwards hostile to lim. Another suggestion, which rests, however, merely on its own internal probability, is that Squarcione had at the outset

used his pupil Andrea as the unavowed executant of certain commissions, but that after a while Andrea began

ainting on his own account, thus injuring the professional interests of his chief, and incurring his animosity. The remarkably definite and original style formed by Mantegna may be traced out as founded on the study of the antique in Squarcione's atelier, followed by a diligent application of principles of work exemplified by Paolo Uccello and Donatello, with the practical guidance and example of Jacopo Bellini in the sequel.

Among the other early works of Mantegna are the fresco of two saints over the entrance-porch of the cliurch of S.

1 His life is brilliantly described in vol. iii. of Dozy, Histoire des Musulmans @ Espagne.

Antonio in Padua, 1452, and an altarpiece of St Luke and other saints for the church of St Justina, now in thie Brera Gallery in Milan, 1453. It is probable, however, that before this time some of the pupils of Squarcione, including Mantegna, had already begun that series of frescos in the chapel of St Christopher, in the church of S. Agostino degli Eremitani, by which the great painter's reputation was fully confirmed, and which remain to this day conspicuous among his finest achievements.2. The now censorious Squarcione found much to carp at in the earlier works of this series, illustrating the life of St James; he said the figures were like men of stone, and had better have been 'coloured stone-colour at once. Andrea, con- scious as he was of his great faculty and mastery, and of the transcendent display he had here made of these, seems nevertheless to have felt that there was something in lis old preceptor's strictures ; and the later subjects, from the legend of St Christopher, combine with his other excel- lences more of natural character and vivacity. 'Trained as he had been in the study of marbles and the severity of the antique, and openly avowing that he considered thie antique superior to nature as being more eclectic in form, he now and always affected precision of outline, dignity of idea and of figure, and he thus tended towards rigidity, and to an austere wholeness rather than gracious sensi- tiveness of expression, His draperies are tight

and closely folded, being studied (as it is said) from models draped in paper and woven fabrics gummed. Figures slint, mus- cular, and bony, action impetuous but of arrested energy, tawny landscape, gritty with littering pebbles, mark the athletic hauteur of his style. He never changed, though he developed and perfected, the manner which he had adopted in Padua; his colouring, at first rather neutral and undecided, strengthened and matured. There is throughout his works more balancing of colour than fine- ness of tune. One of his great aims was optical illusion, which he carried out by a mastery of perspective that, though not always impeccably correct, nor absolutely superior in principle to the highest contemporary point of attainment, was worked out by himself with strenuous labour, and an effect of actuality astonishing in those times.

Successful and admired though he was in Padua, Mantegna left his native city at an early age, and never afterwards resettled there; the hostility of Sqnarcione has been assigned as the cause. The rest of his life was passed in Verona, Mantua, and Rome—chiefly Mantua ; Venice and Florence liave also been named, but without confirmation.

It may have been in 1459 that he went to Verona; and he painted, tlough not on the spot, a grand altarpiece for the church of S. Zenon, a Madonna and angels, with four saints on each side. The Marquis Lodovico Gonzaga of Mantua had for some time been pressing Mantegna to enter lis service ; and the following year, 1460, was perhaps the one in which he actually established himself at the Mantuan court, residing at first from time to time at Goito, but, from December 1466 onwards, with his family in Mantua itself. His engagement was for a salary of 75 lire (about £30) a month, a sum so large for that period as to mark conspicuously the high regard in which his art was held. He was in fact the first painter of any eminence

2 His fellow-workers-were Bono of Ferrara, Ansuino of Forli, and Niccold Pizzolo, to whom considerable sections of the fresco-paintings are to be assigned. The acts of St James and St Christopher are the leading subjects of the series. St James Exorcising may have been commenced by Pizzolo, and completed by Mantegna. The Calling of St James to the Apostleship appears to be Mantegna's design, partially carried out by Pizzolo ; the subjects of St James baptizing, his appear- ing before the judge, and going

to execution, and most of the legend of St Christopher, are entirely by Mantegna,

ever domiciled in Mantna. He built a stately house in the city, and adorned it with a multitude of paintings. The house remains, but the pictures have perished. Some of his early Mantuan works are in that apartment of the Castello which is termed the Camera degli Sposi,—full compositions in fresco, including various portraits of tlie Gonzaga family, and some figures of genii, &c. In 1488 he went to Rome at the request of Pope Innocent VIIL, to paint the frescos in the chapel of the Belvedere in the Vatican; the duke of Mantua created him a cavaliere before his departure. This series of frescos, including a noted Baptism of Christ, was ruthlessly destroyed by Pius VI. in laying out the Museo Pio-Clementino. The pope treated Mantegna with less liberality than he had been used to at the Mantuan court; but on tlie whole their connexion, which ceased in 1490, was not unsatisfactory to either party. Mautegna then returned to Mantua, and went on with a series of works—the nine tempera-pictures, each of them 9 feet square, of the Triumph of Csesar—which he had probably begun before his leaving for Rome, and which are now in Hampton Court. These superbly invented and designed compositions, gorgeous with all splendour of subject-matter and accessory, and with the classical learning and enthusiasm of one of the master- spirits of the age, have always been accounted of the first rank among Mantegna's works. They were sold in 1628 along with the bulk of the Mantuan art treasures, and were not, as is commonly said, plundered in the sack of Mantua in 1630. They are now greatly damaged by patchy repaintings. Another work of Mantegna's later years was the so-called Madonna della Vittoria, now in the Louvre. It was painted in tempera about 1495, in com- memoration of the battle of Fornovo, which Gonzaga found it convenient to represent to his lieges as an Italian victory, though in fact it had been a French victory; the church which originally housed the picture was built from Mantegna's own design. The Madonna is here depicted with various saints, the archangel Michael and St Maurice holding her mantle, which is extended over the kneeling Francesco Gonzaga, amid a profusion of rich festooning and other accessory. Though not in all respects of his highest order of execution, this counts among the most obviously beautiful

and attractive of Mantegna's works,— from which it must be said that the qualities of beauty and attraction are often excluded, in the stringent pursuit of those other excellences more germane to his severe genius, tense energy passing into haggard passion.

Vasari eulogizes Mantegna for his courteous, distin- guished, and praiseworthy deportment, although there are indications of his having been not a little litigious in dis- position. With his fellow-pupils at Padua he had been affectionate ; and for two of them, Dario da Trevigi and Marco Zoppo, he retained a steady friendship. That he had a high opinion of himself was natural, for no artist of his epoch could produce more manifest vouchers of high and progressive attainment. He became very expensive in his habits, fell at times into difficulties, and had to urge his valid claims upon the duke's attention. After his return to Mantua from Rome his prosperity was at its height, until the death of his wife. He then formed some other connexion, and became at an advanced age the father of a natural son, Giovanni Andrea; and at the last, although he continued launching out into various expenses and schemes, he had serious tribulations, such as the banishment from Mantua of his son Francesco, who had incurred the duke's displeasure. Perhaps the aged master and connoisseur regarded as barely less trying the hard necessity of parting with a beloved antique bust of Faustina. Very soon after this transaction he died in Mantua, on 12th September 1506. In 1517 a handsome

monument was set up to him by his sons in the church of S. Andrea, where he had painted the altarpiece of the mortuary chapel.

We have spoken as yet of Mantegna as a painter and architect ; he was no less eminent as an engraver, and is reported to have been a sculptor and poet as well, though we are not aware that any verses of his are extant, or that his sculptural practice extended beyond making a drawing for a statue of Virgil. As an engraver his his- tory is somewhat obscure, partly because he never signed or dated any of his plates, unless in one single disputed instance, 1472. The account which has come down to us is that Mantegna began en- graving in Rome, prompted by the engravings produced 'by Baccio Baldini of Florence after Sandro Botticelli ; nor is there anything

positive to invalidate this account, except the eonsideration that it would consign all the numerous and elaborate engravings made by Mantegna to the last sixteen or seventeen years of his life, which seems a scanty space for them. To get over this difficulty, it has been suggested, but without any evidence, that he began engraving while still in Padua, under the tuition of a distinguished goldsmith, Niccold. He engraved about fifty plates, according to the usual reckoning ; some thirty of them are indisputable—often large, full of figures, and highly studied. Among the principal examples are Roman Triumphs (not the same compositions as the Hampton Court pictures), A Bacchanal Festival, Hercules and Auteus, Marine Gods, Judith with the Head of Holophernes, the Deposition from the Cross, the Entombment, the Resurrection, the Man of Sorrows, the Virgin in a Grotto. Mantegna has sometimes been credited with the important invention of engraving with the burin on copper. This claim eannot be sustained on a comparison of dates, but at any rate he introduced the art into upper Italy. Several of his engravings are supposed to be executed on some metal less hard than copper. The technique of himself and his followers is characterized by the strongly marked forms of the design, and by the oblique formal hatchings of the shadows. The prints are frequently to be found in two states, or editions. In the first state, the prints have been taken off with the roller, or even by hand-pressing, and they are weak in tint ; in the second state, the printing press has been used, and the ink is stronger.

The influence of Mantegna on the style and tendency of his age was very marked, and extended not only to his own flourishing Mantuan school, but over Italian art generally. His vigorous per- spectives and trenchant foreshorteuings pioneered the way to other artists ; in solid antique taste, and the power of reviving the aspect of a remote age with some approach to system and consistency, he distanced all eontemporary competition. He did not, however, leave behind him many scholars of superior faculty. His two legitimate sons were painters of only ordinary ability. His favourite pupil was known as Carlo del Mantegna; Caroto of Verona was another pupil, Bonsignori an imitator. Giovanni Bellini, in his earlier works, obviously followed the lead of his brother-in-law Andrea.

The works painted by Mantegna, apart from his frescos, are not numerous ; thirty-three or thereabouts are regarded as fully authen- ticated. We may

name, besides those already specified—in the Naples museum, St Euphemia, a fine early work ; in Casa Melzi, Milan, the Madonna and Child with Chanting Angels, 1461; in the Tribune of the Uffizi, Florence, three pictures remarkable for scrupulous finish; in the Berlin Museum, the Dead Christ with two Angels ; in the Louvre, the two celebrated pictures of mythic allegory—Parnassus, and Minerva Triumphing over the Vices ; in the London National Gallery, the Virgin and Child enthroned, with the Baptist and the Magdalen, a late example ; the mono- chrome of Vestals, lately bought from Hamilton Palace; the Triumph of Scipio (or Phrygian Mother of the Gods received by the Roman Commonwealth), a tempera in chiaroscuro, painted only a few months before the master's death; in the Brera, Milan, the Dead Christ, with the two Maries weeping, a remarkable tour de Jorce in the way of foreshortening, which, though it has a stunted appearance, is in correct technical perspective as seen from all points of view. With all its exceptional merit, this is an emi- nently ugly picture. It remained in Mantegna's studio unsold at his death, and was disposed of to liquidate debts. | (W. M. R.)

MANTELL, Gipron AtcERNon (1790-1852), born in 1790 at Lewes, Sussex, rose to eminence as a popular exponent of geology, and contributed many original papers to the literature of the science. Educated for the medical profession, he first practised in his native town, afterwards in Brighton, and finally at Clapham, near London. While devoting himself with industry and success to the duties of a medical man, he yet found time to prosecute researches in the paleontology of the Secondary rocks, particularly in Sussex—a region which he has made for ever classical in the history of discovery. While he was still a country

doctor at Lewes his eminence as a geological investigator was fully recognized on the publication of his work on Zhe Fossils of the South Downs, 1822. His most remarkable discoveries were made in the Wealden formations, whence he brought to light and described the remarkable Dinosaurian reptiles known as Jguanodon, Hylxosaurus, Pelorosaurus, and Regnosaurus. The memoirs in which he sketched the structure of these strange creatures, and pointed out the probable conditions in which they

lived, were recognized by the Geological Society as deserving of its highest honour—the Wollaston medal. The Royal Society also awarded him a Royal medal. Besides these and other contributions to the literature of paleontology and geology, he published from time to time various popular works which had a large sale and did much to spread a knowledge of and interest in the science.! Towards the end of his life Dr Mantell retired to London. Though for many years suffering from a severe spinal disease, the result of an accident, he continued with unabated enthusiasm the prosecution of his favourite scientific pursuits, sparing neither pains nor expense towards the attainment of his objects, and kindling in others a spirit of eager desire to further the cause of science. He wrote with great clearness and attractiveness, so that his general works were deservedly popular. As a lecturer also he was almost unrivalled for fluency and eloquence. His name appeared on the list of membership of niany learned societies both at home and abroad. He died in 1852.

MANTINEIA was one of the most famous cities of Arcadia, It was situated in the long narrow valley, running north and south, which is now called after the chief town Tripolitza. Tegea was in the same valley, about 10 miles south of Mantineia, and the two cities continually disputed the supremacy of the valley. In every great war we find them ranged on opposite sides, except when superior force constrained both. In the Peloponnesus the disputes between Argos and Sparta lasted for centuries ; and Mantineia was always an ally of the former. In the war between Sparta and Athens, Mantineia was at first forced to be an ally of Sparta, but in 421 it joined Argos in making an alliance with Athens. The city is said by Strabo to have been founded under Argive instigation, by the union of several villages of the valley ; there can be no doubt that this was done in order to maintain a party in the valley hostile to Tegea and Sparta. It is impossible here to trace the varying history of the town. It was one of the chief members of the Arcadian league that helped Epaminondas to break the power of Sparta. It was one of the original members of the Achzan league, but deserted it for the Atolian. The Acheans and Antigonus Doson captured the city in 222 B.c., and changed its name to Antigoneia, but the emperor Hadrian restored the ancient name 'The worship and mysteries of Cora at Mantineia were famous. The valley in which the city lies has no opening to the coast, and the water finds its way, often only with much care and artificial aid, through underground

passages (catabothra) to the sea. It is bounded on the west by Mount Meenalus, on the east by Mount Artemision, The river Ophis flowed through the city. The position of the town in the centre of this valley route made it of great military importance, and five important battles were fought beside it: in 418 Bo. Sparta defeated the alliance above mentioned ; in 362 Epaminondas defeated the Spartans and lost his own life ; as

1 Of these the following may be enumerated—The Wonders of Geology, 2 vols.; The Medals of Creation, 2 vols.; Thoughts on a Pebble, or First Lessons in Geology; A Geological Hacursion round the Isle af Wight; Pictorial Atlas of Fossil Remains; Thoughts on Animalcules, or a Glimpse at the Invisible World as revealed by the Mticroscope; Petrifactions and their Teachings.

in 295 Demetrius Poliorcetes defeated the Spartans; in 242 Aratus defeated the Spartans; in 207 Philopcemen defeated the Spartans. In the beginning of the 4th century B.c, Mantineia had 3000 citizens capable of bear- ing arms.

MANTIS. Probably no other insect has been the sub- ject of so many and widespread legends and superstitions as the common "praying mantis," Mantis religiosa, L. (see Insects, Orthoptera, fam. Mantidz, vol. xiii, p. 152). The ancient Greeks endowed it with supernatural powers (udvris, "a diviner"); the Turks and Arabs hold that it prays constantly with its face turned towards Mecca; the Provengals call it Prega-Diow (Prie-Dieu) ; and numerous more or less similar names—preacher, saint, nun, mendi- cant, soothsayer, &c.,—are widely diffused throughout southern Europe. Children ask it to show them the way, and Mouffet assures us that it rarely or never deceives them ; and it is even recorded that one specimen, which alighted on the hand of St Francis Xavier, and which he commanded to sing the praise of God, loudly intoned a very beautiful canticle. In Nubia it is held in great esteem, and the Hottentots, if not indeed worshipping the local species (MM. fausta), as one traveller has alleged, at least appear to regard its alighting upon any person both as a token of saintliness and an omen of good fortune.

; Praying Mantis (Iantis religiosa). Yet these are ‘not the saints, but the tigers, of the

insect world.” The front pair of limbs are very peculiarly modified,—the coxa being greatly elongated, while the strong third joint or femur bears on its curved underside a channel armed on each edge by strong movable spines. Into this groove the stout tibia is capable of closing like the blade of a penknife, its sharp, serrated edge being adapted to cut and hold. The arrangement is essentially similar to the sub-chela of Squi//a and Amphipods among CRUSTACEA (¢.v.), as well as to the cheliceree of spiders (see ARACHNIDA). Thus armed, with head raised upon the much-elongated and semi-erect prothorax, and with the half-opened fore limbs held outwards in the characteristic devotional attitude, it rests motionless upon the four posterior limbs waiting for prey, or occasionally stalks it with slow and silent movements, finally seizing it with its knife-blades and devouring it. Although apparently not daring to attack ants, these insects destroy great numbers of flies, grasshoppers, and caterpillars, and the larger South-American species even attack small frogs, lizards, and birds. They are very pugnacious, fencing with their sword-like limbs “like hussars with sabres,” the larger fre- quently devouring the smaller, and the females the males. The Chinese keep them in bamboo cages, and match them like fighting cocks.

The elytra of the comnion mantis have been compared to a withering willow leaf, a circumstance which not improb- ably aids in concealing them from their prey. Some of the tropical forms exhibit as perfect mimicry of the leaves as the leaf insects proper (Phasmidx), Bates found a mantis on the Amazon which exactly resembled the

white ants it preyed upon, while Wallace mentions a Javanese species which mimics a pink orchid flower, and ‘Cig said to feed largely on butterflies,—so that it is really a living trap, and forms its own bait !”

The common species fixes its somewhat nut-like egg capsules on the stems of plants in September. The young are hatched in early summer, and resemble tlie adults, but are without wings.

See Westwood's Introd. AMfod. Class. of Insects, 1840, and forth- coming monograph of the family.

MANTUA (Italian, Afantova), a fortified city of Italy, the chicf town of a province, the see of a bishop, and the centre of a military district, lies 95 miles east-south-east of Milan, and 25 miles by rail south of Verona on the way to Modena, occupying, at the height of 88 feet above the level of the Adriatic, an almost insular site in the midst of the swampy lagoons of the Mincio, with their vast reaches of reeds and bulrushes. As the belt of marshy ground along the south side can be laid under water at pleasure, the site of the city proper, exclusive of the considerable suburbs of Borgo di Fortezza to the north and Borgo di San Giorgio to the east, may still be said to consist,'as it formerly did more distinctly, of two islands separated by a narrow channel and united by a number of bridges. On the west side lies Lago Superiore, on the east side Lago Inferiore —the boundary between the two being marked by the Argine del Mulino, a long covered wooden bridge stretch- ing northward from the north-west angle of the city. As approached from the north by the old road, Mantua pre- sents a beautiful prospect with its "'towers and walls and waters." On the highest ground in the city rises the cathedral, built after his death according to the plans of Giulio Romano on the site of the ancient church of Sts Peter and Paul; it has double aisles, a dome-covered transept, and a large tower, popularly assigned to the Roman governor Arius. Architecturally much more ini- portant is the church of St Andrew, built towards the close of the 15th century, after plans by Leon Battista Alberti, and consisting of a single barrel-vaulted nave 350 feet long by 62 feet wide. It has a noble facade, with a deeply recessed portico, and a brick campanile of earlier date than the main building. The interior is richly decorated with 18th century frescos. S. Maria delle Grazie, consecrated in 1399 as an act of thanksgiving for the cessation of the plague, has a curious collection of ex voto pictures and the tombs of the Gonzaga family, The old ducal palace—one of the largest buildings of its kind in Europe—was commenced in 1302 for Guido Bonaccolsi, and probably completed in 1328 for Ludovico Gonzaga; but many of the accessory apartments are of much later date, and the interior decorations are for the most part the work of Giulio Romano and his pupils. Outside of the city, to the south of Porta Pusterla, stands the Palazzo del Te, Guiulio's architectural masterpiece, erected for Frederick Gonzaga; of the numerous

fresco- covered chambers which it contains, perhaps the most cele- brated is the Sala dei Giganti, where, by a combination of mechanical with artistic devices, the rout of the Titans still contending with artillery of uptorn rocks against the pur- suit and thunderbolts of Jove appears to rush downwards on the spectator. Among the educational institutions in Mantua are an academy of arts and sciences (Accademia Vergiliana) occupying a fine building erected by Piermarini, a public library founded in 1780 by Maria Theresa, a museum of antiquities dating from 1779, a good botanical garden, and an observatory. The Monte di Pieta was established in 1484, the civil hospital in 1449, Oil, beer, leather, and playing cards are the chief products of the limited local industry. The population increased from 26,687 in 1871 to 28,048 in 1881. Asa fortress Mantua

was long one of the most formidable in Europe, a force of thirty to forty thousand men finding accommodation within its walls; but it had two serious defects—the marshy climate told heavily on the health of the garrison, and effective sorties were almost impossible.

Mantua was originally an Etruscan town, and had still a strong Etruscan element in its population during the Roman period. It was a Roman municipium ; but Martial calls it little Mantua, and, had it not been for Virgil's interest in his native place and in the expulsion of a number of the Mantuans from their lands in favour of Octavian's soldiers, we should probably have heard almost nothing of its existence. In 568 the Lombards found Mantua a walled town cf some strength ; recovered from their grasp in 590 by the exareh of Ravenna, it was again captured by Agilulf in 601. The 9th century was the period of episcopal supremacy, and in the 11ththe cityformed part of thevast possessions of Bonifacio, marquis of Canossa. From him it passed to Geoffrey, duke of Lorraine, and afterwards to the Countess Matilda, whose support of the pope led to the conquest of Mantua by the emperor Henry IV. in 1090. Reduced to obedience by Matilda in 1118, the city obtained its liberty on her death, and instituted a communal government of its own, salva imperiali justitia. It afterwards joined the Lombard League ; and the unsuecessful attack made by Frederick IJ. in 1236 brought it a confirmation of its privileges. But after a period of

internal discord Ludovico Gonzaga attained to power (1328), and was recognized as imperial vicar (1329); and from that time till the death of Ferdinando Carbo in 1708 the Gonzagas were masters of Mantua (see GONZAGA, Vol. x. p. 772). Under Gian Francesco IL, Ludovico, and Federico II., the first duke of Mantua, the city rose rapidly into importance as a seat of industry and culture. Claimed in 1708 as a fief of the empire by Joseph I., it was governed for the greater part of the century by the Austrians. In June 1796 it was besieged by Napoleon; but in spite of terrific bombardments it held out till February 1797.

Besides Virgil, Mantua counts among its celebrities Sordello the Provengal poet, Castiglioni, Folengo the writer of macaronies, and Pomponazzi the philosopher; and it has a long roll of local historians—Donesmondi (ecclesiastical affairs), Possevino, Daino, Amedei, Visi, Tonelli, and Count Carlo d'Arco.

Gaet. Susani, Nuovo prospetto delle pitture, &c., di Mantova, Mantua, 1880; Carlo d'Arco, Delle arti e degli artefict di Mantova, Mantua, 1857, and Storia di Mantova, Mantua, 1874.

MANUCODE, from the French, an abbreviation of Manucodiata, and the Latinized form of the Malay Manuk- dewata, meaning, says Crawfurd (Malay and Engl. Dictionary, p. 97), the "bird of the gods," and a name applied for more than two hundred years apparently to Birds-of-paradise in general. In the original sense of its inventor, Montbeillard (//vst. Mat. Ovseaus, iii. p. 163), Manucode was restricted to the King Bird-of-paradise and three allied species; but in English it has curiously been transferred! to a small group of species whose relationship to the Paradiseidx has been frequently doubted, and must be considered uncertain. These Manucodes have a glossy steel-blue plumage of much beauty, but are easily distinguished from other birds of similar coloration by the outer and middle toes being united for some distance, and they are very remarkable for the extraordinary convolution of the trachea, in the males at least, with which singular structure is correlated the loud and clear voice of the birds. The convoluted portion of the trachea lies on the breast, between the skin and the muscles, much as is found in the females of the genus AAynchea, in the males of the Curassows (Cracidz), and in a few other birds, but wholly

unknown elsewhere among the Passeres. The Manucodes are peculiar to the Papuan Sub-region (including therein

1 MManucodiata was used by Brisson (Ornithologie, ii. p. 180) as a generic term equivalent to the Linnean Paradisea. In 1783 Boddaert, when assigning scientifie names to the birds figured by Daubenton, called the subject of one of them (Pl. enlwm. 634) Manucodia chalybea, the first word being apparently an accidental curtailment of the name of Brisson's genus to which he referred it. Nevertheless some writers have taken it as evidence of an intention to found a new genus by that name, and hence the importation of Afanucodia into seientifie nomenclature, and the English form to correspond.

the peninsula of Cape York), and comprehend, according to Mr Sharpe (Cat. B. Brit. Museum, iii. p. 164), two genera, for the first of which, distinguished by the elongated tufts on the head, he adopts Lesson's name Phonygama, and for the second, having no tufts, but the feathers of the head erisped, that of J/anucodia ; and Mr W. A. Forbes (Proc. Zool, Society, 1882, p. 349) observes that the validity of the separation (which has not yet been generally acknow- ledged) is confirmed by what is now known of their tracheal formation. Of Phonygama Mr Sharpe recognizes 'three species, P, keraudreni (the type) and P. jamesz, both from New Guinea, and P. gould, the Australian representative species ; but the first two are considered by Mr Elliot (dis, 1878, p. 56) and Count Salvadori (Ornetol. della Papuasia, ii. p. 510) to be inseparable. There is a greater unanimity in regard to the species of the so-called geuus Manucodia proper, of which four are admitted —M. chalybeata or chalybea from north-western New Guinea, Jf. comriei from the south-eastern part of the same country, Jf. atra of wide distribution within the Papuan area, and Jf. jobiensis peculiar to the island which gives it a name. Little is known of the habits of these birds, except that they are as already mentioned remarkable for their vocal powers, which, in P. keraudrent, Lesson describes (Voy. de la Coquille, Zoologie, i. p. 638) as enabling them to pass through every note of the gamut. Mr Wallace (Ann. Nat. Ilistory, ser. 2, xx. p. 476) remarked that JM. atra was very power- ful and active, clinging suspended to the smaller

branches of trees, on the fruits of which alone it appears to feed. MM. gouldi, according to an informant quoted by Mr Forbes (ut supra), frequents in pairs the dense palm-forests, perch- ing high up, uttering a very deep and joud guttural note ; it is graceful in its movements, evincing more curiosity than timidity on being approached. As with members of the Paradiseidx generally, the nidification of the Manucodes is still shrouded in mystery. (A. N. MANUEL I, Comnenvus, emperor of Constantinople from 1143 to 1184, was the fourth son of John IL. (Calo- Joannes), aud was born about the year 1120. He suc- ceeded to the imperial crown on April 8, 1143, having for his martial qualities been nominated by John to the inheritance in preference to his elder surviving brother. During his reign of thirty-seven years he was involved in almost perpetual war, in which he displayed much more of the courage of a soldier than of the prudence and skill ofa commander. In 1144 the imperial general Demetrius Branas brought back Raymond, the Latin prince of Antioch, to his allegiance, and in 1145 Manuel in person drove out the Turks who had invaded Isauria, and compelled them to accept peace on his own terms, In 1147 he granted a passage through his dominions to the crusaders under Louis VIL. of France and Conrad III. of Germany, but secretly harassed them by every means in his power, and sent word to the Turks of their approach. In the following year he became involved, along with the Venetians, in a war with Roger of Sicily, who had taken Corfu and invaded Greece ; an episode of the campaign towards its beginning was his repulse beyond the Danube of the Patzenegues, of whom he took hostages for their future good behaviour. Disembarking his host at Corfu before the end of the year, he invested the fortress in co-operation with the Venetian army ; the inhabitants, after a long siege, in which he displayed prodigies of personal strength and _ valour, surrendered in 1149. Manuel was now prevented from invading Sicily by a diversion made by the Servians and Hungarians on the Danube, who were not completely vanquished until 1152. In that year Manuel was repulsed by the Turks in Cilicia, but in the west his troops obtained possession of Bari, Brundisium, and other places of importance in Apulia and Calabria. The course of Italian

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politics, however, deprived him of the meaus on which he had reckoned for enabling him to reunite southern Italy with the Byzantine empire, and after the defeat of his fleet at Negropont he concluded a peace with William, Roger's successor, in 1155, The next important war of Manuel's reign was waged against the Hungarians from 1163 to 1168 ; it came to an end in the latter year with the hard- won victory of the Byzantine arms at Zeugminum (Semlin). Less successful was the expedition under Andronicus Contostephanus against Egypt in 1169, when the combined forces of Manuel and King Amalric were compelled to withdraw from before Damietta. From 1171 to 1174 Manuel had a war with the Venetians; and in 1176 he led in person an expedition against Kilidj Arslan, the sultan of Iconium when he sustained a disastrous defeat at Myriocephalus, and was compelled to sign a dishonourable peace. This disgrace, although partially retrieved by a somewhat more successful expedition in 1177, so preyed upon the spirit of Manuel that he ultimately succumbed to a slow fever on September 24,1180. He was first married to Bertha (Irene), a relative of Conrad III. of Germany, and afterwards to Maria (Xene), daughter of Raymond of Antioch ; Alexis II., his son by the latter, succeeded him.

MANUEL IL., Patmoxoaus, emperor of Constantinople, was born in 1348, and succeeded his father, John VI. (with whom he had been associated since 1375), in 1391. At the time he was a hostage at the court of Bajazet at Nica, but succeeded in making his escape; he was forthwith besieged in Constantinople by the sultan, whose victory over the Christians at Nicopolis, however (September 28, 1395), did not secure for him the capital. Manuel subsequently set out in person to seek help from the West, and for this purpose visited Italy, France, and Germany, but without material success; the victory of Timur in 1402, and tne death of Bajazet in the following year, were the first events to give him a genuine respite from Ottoman oppression. He stood on friendly terms with Mahomet I., but was again besieged in his capital by Amurath ITI. in 1422. He died in 1425, and was succeeded by his son, John VII,

MANUEL IL, emperor of Trebizond, surnamed the Great Captain (6 orparyyixdéraros), was the second son of Alexius I., first emperor of Trebizond, and ruled from 1238 to 1263. Whatever may have been his military skill, or his personal character for bravery, he was unable to

deliver his empire from vassalage first to the Seljuks and after- wards to the Mongols. He was the fouuder of the church and monastery of St Sophia at Trebizond. His predecessor was John I., Axuchus, and his eldest son, Andronicus IL., succeeded him.

Manuel II., the descendant of Manuel I., reigned only a few months in 1322-338. Manuel III. reigned from 1390 to 1417, but the only interest attaching to his name arises' from his connexion with Timur, whose vassal he was.

See Finlay, Medixval Greeee and Trebizond, 1851.

MANURE. The term " manure," though formerly ap- plied only to the excrements of animals, either alone or mixed with straw, is now more widely used, and is given to all substances, or mixtures of substances, which are added to the soil in order to increase its productiveness or to restore the natural fertility lost by repeated cropping.

The subject of manures and their application involves a prior consideration of plant life and its requirements. The plant, growing as it does in the soil, aud surrounded by the atmosphere, derives from these two sources its nourishment and means of growth through the various stages of its development. From these sources, each equally indispensable, the plant obtains the materials which it has the power of elaborating and building up to form its own structure.

Chemical analysis has shown that plants are composed

of water, organic or combustible matters, and inorganic, incombustible, or mineral matters. These last are left as the ash when the plant is burnt. The elements forming the organic portion of plants are carbon, hydrogen, oxygen, and nitrogen; the mineral portion, or ash, consists prin- cipally of lime, magnesia, potash, soda, oxide of iron, phosphoric acid, sulphuric acid, chlorine, and silica.

Tho atmosphere is the great storehouse of organic plant- food, The carbonic acid always present in the air is, as is well known, eagerly taken up by the leaves of plants, all of which have the power of decomposing carbonic acid, giving off its oxygen, and assimilating its carbon. Roughly speaking, three-fourths of the dry substance of all plants is derived from the atmosphere,

Under conditions of natural growth and decay, when no crops are gathered in, or consumed on the land by live stock, the herbage on dying down and decaying returns to the atmosphere and the soil the elements taken from them during life; but under cultivation a succession of crops deprives the land of the constituents which are essential to healthy and luxuriant growth. Without an adequate return to the land of the matters removed in the produce, its fertility cannot be maintained for many years, In newly-opened countries, where old forests have been cleared and the land brought into cultivation, the virgin soil often possesses at first a high degree of fertility, but gradually its productive power decreases from year to year. Genc- rally speaking, it is more convenient to clear fresh forest land than to improve more or less exhausted virgin land by the application of manure, labour, and skill. In all densely peopled countries where such a mode of cultiva-tion cannot be followed it is necessary to resort to arti- ficial means to restore the natural fertility of the land and maintain and increase its productiveness,

The researches of Liebig, Wiegmann, Polstorff, and others have proved beyond doubt the important functions of the mineral constituents of the soil in relation to plant life, The gradual removal of phosphate of lime in the tillage of dairy districts, or the removal of other mineral matters essential to the healthy growth of farm crops, certainly impoverishes the land. The exhaustion of the soil is caused in a much more marked way, however, by the rapid loss in available nitrogenous plant food which soils sustain when under cultivation without manure.

Agricultural improvements manifest themselves in two different dircctions—the mechanical and the chemical. Under mechanical improvement the physical condition of the soil is bettered and its latent stores of plant food brought into action by mechanical means, such as ploughing, sub- soiling, steam cultivation, &c. The introduction of new and superior agricultural

implements, good systems of drainage, and intelligent division of labour characterize the first stage of progress in agriculture. The second stage is marked by the application of chemical principles to practical agriculture, an application shown by the intro- duction of a rational system of feeding, a proper rotation of crops, and chiefly the use of chemical, or artificial, manures for the purpose of restoring the natural fertility of the soil and increasing its productive powers,

The aid which chemistry has rendered during the last twenty-five or thirty years to practical agriculture has greatly promoted agricultural improvements ; and farming, which is in a large measure dependent for success upon an economical use of manures, is now being carried on much more rationally than in former times. The proper appli- cation of various kinds of manures is one of the most prominent features of successful modern farming.

In considering the economical use of manures on the land, regard must be had to the following points :—(1) the requirements of the crops intended to be cultivated 2 2)

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the physical condition of the soil; (3) the composition of the soil; and (4) the composition of the manure. Briefly stated, the guiding principle of manuring economically and profitably is to meet the requirements of the crops intended to be cultivated, by incorporating with the soil, in the most efficacious states of combination, the materials in which it is deficient, or which the various crops usually grown on the farm do not find in the land in a sufficiently avail- able condition to ensure an abundant harvest.

Soils vary greatly in composition, and hence it will be readily understood that in one locality or on one particular field a certain manure may be used with great benefit, while in another field the same manure has little or no effect upon the produce. Although increased attention has of recent years been paid to the chemical composition and properties of soils, there is still much room left for improve- ment, for many farmers disregard almost altogether the composition of their fields in buying artificial manures,

It has been pointed out by Sir John Lawes that in actual English farm-practice there is, speaking practically, a standard of natural produce which varies within certain limits, as influenced by seasons and management, and which cannot be permanently increased or reduced by cultivation ; and further, when land is spoken of as being in " good condition," reference is made only to the tem- porary rise of fertility by means of the manures employed, while by land "out of condition" is signified the exhaus- tion of the manures by the removal of crops, loss by drain- age, &c., and that the soil has merely gone back to its standard of natural productiveness. Some soils, indeed, contain in their natural condition hardly a sufficient pro-portion of available elements of plant food to yield remunerative crops; such soils are naturally barren, and, although by the constant use of manures they may be improved and may attain some degree of fertility, they will, if left unmanured, speedily revert to their former natural unproductive state,

The principal constituents of manures are—nitrogen, in the form of ammonia, nitrates, and nitrogenous organic matters ; organic matters not containing nitrogen (humus); phosphoric acid, potash, soda, lime, magnesia, silica, sulphuric acid, and chlorine. Of these constituents by far the most important are the nitrogen, phosphoric acid, and potash, and these will be considered more in detail.

1, Nitrogen.—Nothing so much affects the productive- ness of soils as nitrogen, when it is supplied to plants in a form in which it can be assimilated by them, and nothing is more readily removed from the land, either in the crop grown or, in the form of nitrates, by drainage. The " good condition " of land, to which allusion has been made already, is, in a great measure, the fertility which has been imparted to the soil by the nitrogen supplied to it, while the " natural productiveness" may be taken as that due to the phos- phoric acid, potash, and other mineral constituents of the soil.

Supply of Nitrogenous Plant Foad.—In the case of a crop growing under natural conditions, and not removed from the land, the mineral constituents taken from the soil, and carbonaceous as well as some nitrogenous organic matter, principally derived from the atmosphere, are returned to the land, and a rich carbonaceous soil or humus is produced in the conrse of years.

Such a soil is capable of supplying for a considerable number of years, when under cultivation, the nitrogen needed by the crops grown on the land. This supply of nitrogen, however, gradually becomes exhausted by repeated cropping. The atmosphere, in addition to free nitrogen gas, which constitutes about four-fifths of its volume, contains but very little combined nitrogen in the forms of ammonia or nitric acid.

M. Boussingault's experiments clearly show that plants

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do not possess the power of taking up by their leaves and of assimilating the free nitrogen of the air. This conclusion has been verified by the extensive researches of Messrs Lawes, Gilbert, and Pugh. The nitrogen contained as nitric acid and ammonia in the air, and descending upon the land in the shape of rain, dew, or snow, though, without doubt, adding to the supply of nitrogen in the soil, is altogether insufficient to meet the requirements of remunerative crops. The experiments of Messrs Lawes and Gilbert and Professor Way show that the average proportion of nitrogen deposited annually upon one acre of land at Rothamsted, St Albans, amounts to 7°21 tb, of which quan- tity 6°46 ib occur as ammonia and '75 Ib as nitric acid.

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The further investigations of Dr Voelcker, Professor Frankland, and Messrs Lawes and Gilbert upon the drainage water from cultivated soils show that a consider- able quantity of nitrogen in the shape of nitric acid passes into land drainage, and that this loss of nitrogen is much greater than the total amount supplied to the land by the rain and dew. 'The results which Messrs Lawes and Gilbert obtained in their experiments on the continuous growth of barley at Rothamsted from 1852 to 1875 afford, as is shown in the following table (I.), direct evidence of the insufficiency of the atmospheric supply of nitrogen, and of that present in the soil in the form of nitrogenous organic matter.

Tape I.—Jessrs Lawes and Gilbert's Experiments on the Growth of Wheat and Barley, year after year on the same Land, without Manure, and with diferent kinds of Manure.

Manures per Acre per Annum.

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Wheat.t 1, Unmanured continuously…..... Peer icaiecieau eespitog shtAcinessusnsi sisneaasasiiesnneneci cannes

100 ib sulphate of magnesia, and 3} ewts. of superphosphate made from 200 tb bone ash, 150 th sulphurie acid of 1:7 specifie gravity, and water) ... . Ammonia salts alone for 1845, and cach year since; mineral manure in 1844

2, Mineral manures alone (200 ib sulphate of potash, 100 tb sulphate of soda,| }

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(equal parts of sulphate and muriate of ammonia of commerce).....+. 4, Ammonia salts and minerals, (The same minerals as in No. 2, and 600 ib Met MANAGES) Weteetcearctieccaarcceracencsevotertceceuetcctrecesersecsstssesvensstane peanocce . Farmyard manure (14 toms Cvery yal')... ...scccsseecsesesssteecs beseees soopEnHO poaOMHOH

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Barley.? MAU IAM UIE CNC OMMMMUMONIS | Varnressersvescsescessevercesreccesscscortsussiccsssresesesrseessonssss

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. Nitrate of soda and minerals. (The same minerals as in No. 2, and 275 Ib PPIMENALOUOMMBMOC As) s.ceresucerersescoaascccocesesssescceseuccessetonsseantssasessssserssoreeas cesses . Farmyard manure (1f tomS every year)....cscccecsserccesccsccreessssseseestiesceseassees

100 tb sulphate of magnesia, and 3} ewts, of superphosphates).....0sseeeee.!

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. Mineral manure alone (200 ib sulphate of potash, 100 Ib sulphate of oni

Produee per Acre (Average per Annum),

Dressed Corn. Total Straw.

Quantity. Weight per Bushel.

12 Years|l12 Years] 24 Years 12 Years‘12 Years 24 Years/12 Years‘12 Years 24 Years 1852-68.) 1864-75.) 1852-75. 1852-68.) 1864-75.‘1852-75. | 1852-68. 1864-75.| 1852-75, bush bush, bush, Ib Ib ib ewts, ewts ewts 15} 123 lt 56} 59 57} ‘ 18} 13% 16} big 593 587 228 21} 21; | 55% 58 563 338 87 oy. Ode 60} 59 358 85 354 59} 603 60 215 15] 15} 513 53} 52} 303 213 257 523 543 53} ye 203 244 | 52 543 583 344 29 81g | 51} 554 524

39% 32 36 51 532 524

47} 44 45} 528 558 54} 508 463 48} 51} 55s 538% 468 50} 483 53} 553 543

The Rothamsted soil is a moderately stiff one, of con- siderable depth, and contains naturally the mineral elements of plant food in abundance ; thus it has been possible to grow corn crops for over twenty-five years without any

manure (Plots 1), The crops in the second period of twelve years were, however, less than those of the first period, and in neither case were full crops obtained, While the application of mineral manures alone (Plots 2) produced only a slight increase in the case of the wheat, and rather better, though poor, results with barley, nitrogenous manures, applied to the land either in the shape of ammonia salts or nitrate of soda, produced a strikingly large increase. The experiments further show that while good crops, both of wheat and barley, can be grown by the annual application of 14 tons of farmyard manure per acre, the best results are obtained by the use of a mix- ture of mineral and nitrogenous manures.

In Messrs Lawes and Gilbert's experiments the amount of nitrogen removed in different crops was determined with the following results :—over a period of thirty-two years (to 1875), wheat yieldedan averageof 20°7 tbof nitrogen per acre

1 Previous cropping :—1839, turnips with farmyard manure ; 1840, barley; 1841, pease; 1842, wheat ; 1843, oats; the last four crops unmanured. First experimental wheat crop in 1844. Wheat every year since ; and, with some exceptions, nearly the same description of manure on the same plots each year—especially during the last twenty-six years (1852 and since). Unless otherwise stated, the manures are sown in the autumin before the seed. Area under ex- periment about 18 acres.

2 Previous cropping :—1847, swedish turnips with dung and super-plosphate of lime, the roots carted off; 1848, barley ; 1849, clover ; 1850, wheat ; 1851, barley manured with ammonia salts, First ex- perimental crop in 1852. Barley every year since.

per annum without any manure, but the annual yield has decreased from an average of over 25 tb in the first eight to less than 16 Ib in the last twelve years, and since 1875 it has been still less; over a period of twenty-four years, barley, when unmanured, yielded an average of 18:3 ib nitrogen per acre per annum, but witha decline from 22 ib in the first twelve to 14°6 in the last twelve years. Experiments similar to those on wheat and barley have been made on oats, root crops, leguminous and grass crops, all showing the gradual decline in produce when grown continuously without nitrogenous manures, and prov- ing that the soil and not the atmosphere is

the chief source of nitrogen in plants. In face of these results the "mineral theory" of Liebig, which attached but small value to nitrogen applied to the soil in the form of nitro- genous manures, and maintained the sufficiency of the ammonia of the atmosphere for supplying the needs of the plant, cannot be accepted without reserve.

Notwithstanding the great effect produced by the nitrogenous manures, two-thirds of the nitrogen supplied was unrecovered in the increase of crops when the ammonia salts were supplied to wheat in autumn. When, however, nitrate of soda was used, which is always applied in the spring, the quantity left unrecovered was not much more than half that supplied.

The following table (II.), by Messrs Lawes and Gilbert, shows the amount of nitrogen recovered, and the amount not recovered, in the increase of the crop for 100 supplied in manure, to wheat and to barley respectively, the result being in each case the average over a period of twenty

| years :—

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TABLE II. Wheat. 20 Years 20 Years ie 2-71. 52-71, Manuring quantities per Acre mone! a per Annum, es | Sees covered | covered; Re- | Not re- in In- | in In- | covered.| covered, crease. | crease. Complex mineral manure and 41 tb of}) 32:4] 676 48-1 NitTOYEN AS AMMONIA.....,.csccee rerereerverree |S Complex mineral manure and 53°3 Ib of |) 49-8 50-2 NitTOSEN AF AMMONIA,...,.cosesecsscrosceveres f Complex mineral manure and 82 ib of} ao. ; NUtTOMEMIAG AMIIMONIA.....0….cceccsereeeees | § ey om Complex mineral manure and 123 tb of 315 68°5 MIGLOMETIMASEAIMINON aeeceeceessedoreeccesscones Complex mineral manure and 164 tb of t 28-5 715 NiTOMCN AS AMMONIA.....ceceeesseeaees Complex mineral manure and 82 ib of xe A MLE HOMEM IAS MILT HEC... .scescvescecctnecerecanes ; aoe oa Complex mineral and rape eake (61°75 tb \ 36°3 63:7 Of MICTOREN) eee vecencscevecctereseceseserstes ees i Farmyard manure (about 200 tb of rv 2 : , F TLONOBOM)G << ssvettedsecssuetetesccatereertrer eee j 1496 8-4 ee exe

The question will naturally be raised, What becomes of the one-half or two-thirds of the nitrogen which is not recovered in the increase of the crops? The examination of some seventy samples by Dr Voelcker, and a number of independent determinations by Dr Frankland, of the drainage-water from the experimental wheat plots which yielded the above results throw much light on this loss. The following table (III.) contains a summary of some of the more important results obtained.

TABLE II].—Nitrogen as Nitrates and Nitrites, per 100,000 parts of Drainage Water from Plots differently Manured, in the Experi- mental Wheat-field at Rothamsted, Wheat every year, commencing

1844.

Mean of Dr Voelecker's and Dr Frankland's Experi- wie Results. ments, Nitrogen. WagTIy TAM UNGY « antetacereesss crea ss cescesesarecetmetete cette 6 1:264 WDD O ME MATING ss .cccsreocventecescsremestrireee eee nee 11 0°353 Complex mineral manure …..:,....cc:cccssssserseeeses soe ll 0°428 Do. and 41 tb nitrogen as ammonia 11 0°823 Do. and 82 tb nitrogen as ammonia 11 1:439 Do, and 123 tb nitrogen asammonia tl 1815 Do. and 82 Ib nitrogen as nitrate… 10 1:437

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These experiments show how great may be the loss of nitrogen by drainage when ammonia salts or nitrates are liberally applied to the land in autumn, should there be much wet weather in winter, or even when applied in spring if there be much heavy rain ; also, that the quantity of nitrogen in drainage water as nitrates is increased in proportion to the amounts of ammonia or nitrate employed on the land. Assuming that from one-quarter to nearly one-half the annual rainfall descends more than 40 inches below the surface, every inch of rain passing through the drains and carrying with it one part of nitrogen in 100,000 of water, there will be a loss of 24 ib of nitrogen per acre from the manure. Dr Voelcker's analysis of the drainage water of a wheat field manured in autumn – by ammonia salts supplying 82 Ib of nitrogen per acre shows that for every inch of rain passing through the drains in J anuary a loss took place of about 84 tb of nitrogen, costing

about ls. per Ib as manure. The loss of nitrogen thus is very large, and shows that by far the largest proportion of the nitrogen of manure which is not recovered in the crop is lost in drainage. In addition to the nitrogen removed in the crop and to that lost in drainage, some small proportion is found by analysis to be retained in the soil itself, The nitrogen may be of advantage to crops grown subsequently, according to the source from which it was derived; for while ammonia salts and nitrates yield but very small residues, and exert little or no effect beyond the first year, from bones, cake, and other such materials we get large residues of nitrogen in the soil, which tell markedly on future crops. The experiments on drainage water have further shown the

absorbent power of soils, and that manuring matters when in contact with soils undergo remarkable changes, being taken up by plants, not in the simple state in which they are applied, but in quite different kinds of combination. Professor Way has the merit of having first proved that all soils possess, in different degrees, the power of absorbing ammonia from its solution in water, and that in passing solutions of salts of ammonia through soils the ammonia alone is absorbed, and the acids of the ammonia salts pass through in combination, generally with lime, or, if lime be deficient, with magnesia or other mineral bases of the soil.

In the drainage investigations at Rothamsted, it was found that, although large quantities of ammonia salts were applied to some of the plots, the drainage water from them contained mere traces of ammonia, but at all times of the year nitrates were present in quautity; from this it would appear that it is chiefly, if not solely, from nitrates that crops build up their nitrogenous organic constituents. Before leaving the subject of drainage water it is worthy of note here that phosphoric acid and potash, the most valuable mineral fertilizing constituents of the manures, passed but little into the drainage water, but were retained almost entirely in the land, while the more abundant and less important mineral matters, such as lime, magnesia, soda, chlorine, sulphuric acid, and soluble silica, passed in large quantities into the drainage water. It follows from these investigations, first, that much more nitrogenous material must be applied to the land than

would be needed to produce a given increase in the crop, supposing all the nitrogen to be recoverable ; and secondly, that nitrogenous organic matters when applied to the land undergo decom- position, and are gradually resolved into ammonia com- pounds, which, after being retained a short time by the soil, are finally oxidized into nitrates, in which form they are most available and beneficial to plants, but are not absorbed by the soil, and are readily washed out by rain. Nitrogen has great forcing properties, and is most beneficial when applied to crops in their early stages. Grass land on which nitrate of soda has been put as a top dressing shows very rapidly and markedly the effects of the manure.

Nitrate of soda, unless applied just at the time the crop is ready to take it up, will be largely wasted in drainage ; hence it is usual to apply nitrate of soda as a top dressing in spring. Ammoniacal manures, such as Peruvian guano, soot, sulphate of ammonia, &c, when used for winter wheat, are best applied in autumn, either before the wheat is sown or when it is fairly above ground. On light land they are often used as top dressings for wheat early in spring. The gradual decomposition of farmyard manures gives a more constant supply of nitrogen than the manures already noticed, and as the fermentation of dung proceeds but slowly it is best to apply it, when quite fresh, in autumn or winter, allowing it to decompose in the land and to yield nitrogen as nitrates when required in spring by the fresh growth of vegetation. In the case of nitrogenous organic materials, such as wool or hair refuse, which take even longer than farmyard manure to decompose, it is necessary to apply them some three or four months before the seed is sown.

2. Phosphoric Acid.—Next in value to nitrogen as a constituent of manures comes phosphoric acid. Of all the mineral or ash constituents of plants, this is the most im- portant, for the simple reason that it occurs in most soils in comparatively small proportions, and is required alike by corn and forage crops in larger quantities than lime, magnesia, aud other mineral matters, which occur in most soils in almost inexhaustible quantities, or which, if defi- cient, can be easily and cheaply incorporated with the land.

Phosphoric acid occurs in soils principally in combination with lime as phosphate of lime, a constituent which enters

largely into the composition of recent and fossil bones, coprolites, and guano, and of a variety of phosphatic minerals, such as Norwegian and Canadian apatite, Sombrero and Curagoa rock phosphate, South Carolina phosphate, Spanish and Portuguese phosphorite, &c. These and other phosphatic materials are now used largely in the manufacture of superphosphate and otlier artificial manures.

Phosphate of lime is so sparingly soluble in pure water that, for all practical purposes, it may be considered to be insoluble in water ; it is, however, attacked by the natural agencies at work in the soil, and rendered available as plant food. According to the more or less porons condition of the phosphatic manuring materials, phosphate of lime is rendered more or less readily assimilable. Thus, while bone dust and guano, on account of their porous condi- tion, may be used with good effect as suppliers of phosphoric acid to the soil, others, such as hard and crystalline Canadian or Norwegian apatite, produce but little or no result when used as manures merely in a powdered state. It was in 1840 that Liebig suggested the treatment of bones with sulphuric acid in order to make their action more rapid. 'This treatment of bones by acid converts the phosphate of lime into a soluble lime salt called superphosphate, or, speaking chemically, trans- forms the original tribasic phosphate of lime into the mono- calcic phosphate, sulphate of lime being at the same time produced. Following on this, Mr (now Sir) John Lawes treated mineral phosphates similarly with sulphuric acid, and with results which led to the establishment of a new industry, the nianufacture of superphosphate and other artificial manures. The yearly importation of phosphatic minerals, &c., into England for this manufacture alone exceeds 500,000 tons.

The acid or soluble phosphate of lime in superphosphate, when applied to the soil, is first dissolved by the rain, and equally distributed in a portion of the soil, in which it must be precipitated and rendered insoluble before it can be assimilated by the plant. It is this intimate distribu- tion and subsequent precipitation in a most finely divided state that would seem to constitute the beneficial effects of superphosphate, and its superiority over undissolved phosphates. It supplies at once phosphoric acid, lime, and

sulphuric acid to the soil, and is much used in con- Junction with nitrogenous materials. Superphosphates are manufactured of various strengths, the percentage of tribasic phosphate of lime, rendered soluble by acid, being taken as the basis of valuation.

3, Potash.—The next to rank after phosphoric acid as a valuable constituent of manures is potash, It enters largely into the composition of all crops, especially root crops. Sandy soils, as a rule, are poor in potash, for which reason they are benefited to a greater extent by the application of potash salts than most clay soils, which con- tain sufficient potash to meet the requirements of farm crops. In clay soils potash mainly occurs in the form of insoluble silicate of potash together with other silicates. By autumn cultivation, subsoiling, and similar means of facilitating the free access of the air to clay-land potash is gradually liberated from the insoluble silicates and is rendered available as plant food. Lime also seems to be an important agent in the liberation of potash. Potash also occurs in farmyard manure, urine, all excrements, in oil cakes, and largely in wood ashes.

Most potash salts are very soluble in water ; this explains their greater abundance in the liquid than the solid exere- ments of animals. On this account it is a matter of importance, in making farmyard manure, to preserve the urine, and not lose the benefit of the potash salts it con- tains. On most soils in a good agricultural condition

the addition of potash manures produces little or no effect, but on poor sandy soils or worn-out pasture land the use of potash salts, in conjunction with superphosphate, dis- solved bones, and guano, is followed by most beneficial results, Potash salts as an addition to manures for potatoes have been found advantageous, while their effect on pasture seems to be to improve the quality of the herbage rather than to increase the yield of grass per acre.

4. Soda.—Most soils contain in abundance all the soda that farm crops require. With the exception of chloride of sodium (common salt), which occasionally is applied with more or less benefit to light sandy soils, and of nitrate of soda, which is employed as a nitro- gellous inanure, soda salts are not used for manuriug purposes.

5. Lime.—Lime is essential for the production of healthy crops. Experience has shown that, when a soil is deficient in lime, farm- yard manure, Peruvian guano, and other manures, though used in abundance, produce coniparatively but little effect. Again, on poor sandy soils, lime, marl, or chalk not unfrequently produces better crops than farmyard or expensive artificial manures. Lime not only supplies an essential constituent of plants, but also prevents the loss by drainage of fertilizing matters such as potash, ammonia, and phosphoric acid. One of the functions of lime in the soil is to combine with the acids of the potash and ammoniacal salts of guano and of farmyard and other manures, and to liberate potash and ammonia, which arc retained in the land, while the inexpensive lime salts pass into the land drainage.

Lime is used in agriculture in the form of quicklime, chalk (carbonate of lime), gypsum (sulphate of lime), marl, and shcll- sand, For liming purposes gas-lime also is frequently employed, and, if well exposed to the air before being put on the land, may be used. with safety and advantage.

6. Magnesia. —Magnesia is of but slight importance in manures ; it occurs with potash in kainite and other potash salts, and the sulphate is sometimes used in making up artificial manures, but apparently without benetit.

7. Siliea.—Silica is a constituent of the ashes of all plants, and occurs specially in large proportion in the straw of cereal crops. All soils contain such an abundance of silica that no necessity exists of supplying it artificially.

8. Chlorine, Sulphuric Acid, and Oxide of Iron.—These ash coustituents are of little practical importance, inasmuch as most soils contain a sufficiency of them to meet the requirements of the crops usually cultivated on the farm. It may be observed, how- ever, that chlorine has been feund to be essential

to plant life, and that iron is necessary for imparting to plants their green colour.

9. Organie Matter or Humus.—The importance of organic matter in manures was formerly much exaggerated. It has been con- clusively proved that the carbon of which the bulk of the dry sub- stance of all agricultural produce consists is derived from the carbonic acid of the atmosphere, and not from humus of the soil or the non-nitrogenous organic matters supplied in the manure, The organic matters present in dung in the shape of more or less decomposed or rotten straw exert a beneficial effect by improving the physical condition of both light and heavy land.

Farmyard Manure.—¥armyard manure is composed of the urine and solid excrements of animals collected in the stalls or yards, together with the straw used as litter. Its

TaBLe 1V.— The Composition of Farmyard Rotted Dung from Horses, Cows, and Pigs, in 100 parts.

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Phosphate of lime 382

chime)... lie

Magnesia. ‘O47

Potash …. °446

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Oxides of iron and alumina with phosphates…... 947

(Containing phosphoric acid +274, equal to bone earth °573.)

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100-00

1 Containing -297 of nitrogen, equal to -36 of ammonia. 2 Containing °309 of nitrogen, equal to 375 of ammonia.

om 0: : The whole manure containing ammonia in free state, 046; in form of salts, -057.

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composition varies greatly, according to the quantity of straw used as an absorbent, the nature of the animals, the food they have consumed to produce it, the length of time and way in which it has been kept, &c. The analysis by Dr Voelcker of well-made farmyard manure from horses, cows, and pigs, given in Table IV., p. 509, will show its approximate composition.

This analysis shows that farmyard manure contains all the constituents, without exception, which are required by cultivated crops to bring them to perfection, and hence it may be called a perfect manure. Dung, it will be observed, contains a great variety of organic and inorganic compounds of various degrees of solubility, and this complexity of composition—difficult, if not impossible, to imitate by art —is one of the reasons which render farmyard manure a perfect as well as a universal manure.

The excrements of different kinds of animals vary in composition, and those of the same animal will vary according to the nature and quantity of the food given, the age of the animal, and the way it is generally treated. Thus a young animal which is growing needs food to produce bone and muscle, and voids poorer dung than one which is fully grown and only has to keep up its condition. The solid and liquid excrements differ much in composition, for, while the former contains a good deal of phosphoric acid, lime, magnesia, and silica, and comparatively little nitrogen, the urine is almost destitute of phosphoric acid, and abounds in alkaline salts and nitrogenous organic matters, which on decomposition yield ammonia, Unless, therefore, the two kinds of excrements are mixed, a perfect manure supplying all the needs of the plant is not obtained ; care must accordingly be taken to absorb all the urine by the litter. Farmyard manure, it is well known, is much affected by the length of time and the way in which it has beenkept. Fresh dung is soluble in water only toa limited extent, and in consequence it acts more slowly on vegeta- tion, and the action lasts longer than when dung is used which has been kept some time; fresh dung is therefore genc- rally used in autumn or winter, and thoroughly rotten dung in spring, when an immediate forcing effect is required.

The changes which farmyard manure undergoes on keep- ing are illustrated by the following table of analyses, by Professor Wolff of Hohenheim in

Wiirtemberg, of farm- yard manure in its different stages of decomposition : —

TABLE V.— Average Percentage Composition of Farmyard Manure.

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5 Moderately | Thoroughly

Fresh Rotten. Rotten, WLC Wen siuninetinrnecaetincasesascrnseststete 71°0 75:0. 79°0 Organie matters…..... 24°6 19°2 14°5 Ash 4°4 5‘8 65

100:0 1¢0:0 100°0 TPOTASHY sicascesescesctensasceseshooctssstenecsarsle 52 63 50 GGA iiescscnencesciaanterssnrecticnaon sdeaenicessein 15 “19 13 UME). inapsesscavavecstieeeroeeresnarescadeceres 57 “70 88 Magnesia.. ee 00 14 18 18 (HOS PHO CAC etnenenstarrerieceinenses| ll 26 30 HP) TULL BIEL EKOLG| caaconcenmonepooaaenboaa000000 | ‘12 16 13 Chlorine…..... voahhadonnbaeegtagonqudenodcaonon ‘1d 19 ‘16 DIGG Haase vencatunetecmencsnsssueeremtetaecn 1:25 1°68 179 NUELOQ EMS (sissies ccssssenacstessecestcgseessscaat 45 50 58

These figures represent the composition of farmyard manure of rather poor quality. Well-made good dung, produced by fattening cattle fed upon a fair allowance of

cake, roots, hay, and straw, on an average may be said to contain—

BOREL rrcz cede ian: «een eee ae ‘50 per cent. Phosphoric DCUL, comianiaceumareecee 533 – INEM sacra scene eee ‘Oe Gs

Forty tons of dung, according to this estimate, contain in

round numbers 448 tb of potash, 475 of phosphoric acid, and 573 of nitrogen, |

Mw ANP Re

During the fermentation of dung a large proportion of tlle non-nitrogenous organic matters disappears in the form of carbonic acid and water, while another portion is con- verted into humic acids which effectually fix the ammonia gradually produced from the nitrogenous constituents of the solid and liquid excrements. The mineral matters remain behind entirely in the rotten dung, if care be taken to prevent loss by drainage.

Well-fermented dung, it will be noticed from the preced- ing table, is more concentrated and consequently more efficacious than fresh farmyard manure. Neither fresh nor rotten dung contains any appreciable quantity of volatile ammonia, and hence there is no necessity for applying gypsum, dilute acid, green vitriol, or other sub- stances recommended as fixers of ammonia. If dung is carted out into the field and spread out at once it may be left for weeks together before it is ploughed in without the slightest risk of sustaining loss in fertilizing matter by evaporation, for dung does not lose ammonia by evapora- tion on exposure to the air, and any mineral soluble salts will be washed into the soil where they are wanted. If, however, dung is kept for a length of time in shallow heaps, or in open straw-yards and exposed to rain, it loses by drainage a considerable proportion of its most valuable soluble fertilizing constituents. .

With a view to ascertaining the loss in fertilizing sub- stances which farmyard manure sustains when it is kept for a long time exposed in open yards to the deteriorating influences of rain, Dr Voelcker spread a weighed quantity of fresh dung of known composition in an open yard, and after a period of twelve months again weighed the dung and submitted it to analysis, when the results shown in Table VI. were obtained :—

TABLE VI.—Showing the Loss which Dung sustains by Drainage in Open Yards.

Fresh es ne Manure. Ors Exposure. Weight of the manure…...csccscsecsesestersccrcstversteeres LOO2 793°65 Amount of water in the MaANuUre …..cscccetecssrcenrssceee 1093 622°80 nA APY SUDSEAMCEB cesscesessse-scossseereondeesesvesss 559 170°85 The dry substances consist of — A. Soluble Orpainie MAttersi…..ccsc.ssneeeesesesors eens 40:97 3°95 B. Soluble mineral matters. ...11…::sssecersseecscasces 25°43 5°52 C. Insoluble organic

MaAtters,.....cccccccecestseresesers 425°67 9445 IDE Wnsoluble mineral MAsterss…c.csscscnscssesceossse 66°93 66°98 Whereof 55900 170°85 A contains nitrogen ..csccscccrccrsoees 3:28 32 Equal to ammonia ….....0… seseeee 3°98 39 B contains nitrogen. .....sscccsccecoee 6°21 3°56 Equal to AMMONIA.....c cece, TO 4:25 Total amount of nitrogen in manure 9-49 3°88 Equal t0 AMMONIA ...seoceresesseeee 11°52 4°64

The whole manure contained— Ammonia in free State ….ccccccccrecoersseree

98-40

Total amount of organic matters ….....csseeee

72:45

h ° mineral Matters …...cccccseeees

These tabulated results showed that the manure lost 69°8 per cent. of its fertilizing matters; or, in round numbers, two-thirds of the dung was wasted and only one- third left behind. Thus, after twelve months' exposure to the weather, nearly all the soluble nitrogen and 78-2 per cent. of the soluble mineral matters were lost by drainage. To prevent this loss, farmyard manure, as had been already pointed out, should, when possible, be carted into the field, spread out at once, and ploughed in at the convenience of the farmer. It is, however, not always practicable to apply farmyard manure just at the time it is made, and, as the manure heap cannot be altogether dispensed with, it 1s necessary to see how the manure may best be kept. _For proper decomposition both air and moisture are requisite, while extreme dryness or too much water will arrest 1t. Farmyard manure is either prepared in dung-pits, which

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are put in a separate place, or is accumulated under the animal in the feeding-boxes ; of the two plans the latter is the better, the urine being more thoroughly absorbed, and, owing to the box manure being more compact through constant treading on it, air enters less freely and the decomposition

goes on less rapidly, the volatile matters in consequence not being so readily lost. External agents, such as rain, wind, sun, &c., do not affect it as they would in the case of dung-pits. If farmyard manure must ke stored in heaps, care should be taken to have the bottom and sides of the pit impermeable to water, aud the bottom slightly inclined to allow any liquid manure which collects to run off into a tank below, from which, by means of a pump, it may be again poured over the heap. A concrete bottom for the pit is best, or, failing that, one of thick clay or well-beaten earth. The manure heap should be kept as compact as possible, aud always moist. The advantage of farmyard manure lies, not only in its supplying all the constituents of plant food, but also in the improved physical condition of the soil through its application, as the land is kept porous, and air is allowed free access, While, how- ever, farmyard manure has these advantages, experieuce has shown that artificial manures, properly selected to meet the requirements of the crops intended to be grown, due regard being had to the cheniical composition of the soil, may be employed to greater advantage. In farmyard manure about two-thirds of the weight is water and one- third dry matter; a large bulk thus contains only a small proportion of fertilizing substances, and expense is incurred for carriage of much useless matter when dung has to be earted to distant fields.) When a plentiful supply of good farmyard manure can be produced on the farm or bought at a moderate price in the immediate neighbourhood, it is economy to use it either alone or in conjunction with artificial manures; but when food is dear and fattening does not pay, or farmyard manure is expensive to buy, it will be found more economical to use artificial manures. Manures from Feeding Stuffs.—The investigations of Messrs Lawes, Gilbert, and Mure have shown that, in estimating the value of animal manure, 90 per cent. of the nitrogen of the food may be reckoned to be recovered in the case of feeding cakes, pulse, and other highly nitrogenous feeding stuffs ; 85 per cent. in the cage of foods compara- tively poor in nitrogen, such as cereals and roots; and less than 65 per cent. in the case of bulky feeding stuffs, such as hay and straw. As a source of manure, the value of fattening foods is greater the more nitrogen they contain. Practically speaking, the whole of the mineral constituents and about nine-tenths of the nitrogen of the food are recovered in the dung and urine, For the same weight of dry substance consumed, oxen void more manure than sheep, and sheep more than pigs, The composition of the different foods given to fattening animals being well

known, it is easy to calculate the amounts of nitrogen, phosphoric acid, and potash of the food which will be recovered in the manure, Each constituent having its market value as a manuring constituent, the money value of the manure obtained from the consumption of a ton of any ordinary food of which the composition is known can be determined. Assuming ammonia to be worth 8d. per Ib, potash 2d, per tb, and phosphate of lime 1d. per ib, the money value of the manure produced by the consumption of a ton of various foods is given by Mr Lawes in the following table (VII.), which also shows the general composition of the different foods as far as their manurial value is concerned. In these estimates it is presumed that the manure can be put on the land without loss, but in practice some loss is unavoidable ; it may be but sliglit, as, for instance, when sheep are fed on the land, or when the manure is made in feeding-boxes, but it will be considerable when the food

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has been consumed in open yards in a very rainy season, Allowances must thus be made for the circumstances under which the manure was produced,

TABLE VII,—Composition of Ordinary Feeding Stuffs in 1000 parts, and their Manuring Value per Ton.

Dry Matter,

Nitro- gen,

Potash. | phorie

NEG from One

Ton of each Food.

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Nain Akon Veh avsyaGaNexavecda ‘ 14°8 861 218 0

f 45 62 115 0

j 54 80 113 0

B°5 4-9 73 110 0

Hebe 3 MH 3°6 61 LL 40

16. Locust beans .. 850 12°5 3°5 58 42) a6 Gawusian Ady wues|ncyoagnasagign oe 66 16:3 3813 6

} 18, Coarse pollard…...scccceee: 860 258 14:9 34:2 218 0 VO, Bimeppollatdiccs:.c.cccscesaces 860 26°0 14:6 30°83 2517, 10 OM MUALUMcettesvereressccrceriss cen: 950 170 65 3} 111 6 DIP ClOvCTAlldVakecsccsesestastesure 840 23°0 19°5 5°6 Bt (8 22, Meadow hay a.cccccccccseres-| 840 146 16°8 38 110 6 23, Bean straw ….. Pe 2 10°0 Ll 41 10 6 24. Wheat straw 4°0 5:8 2°6 012 6 25. Barley straw 5:0 Oa 2:0 @alQ &) 26, Oat straw …. 50 10-4 2°5 018 6 27. Pea straw…. cone 03 8°9 3°8 O18 9 DS OUMKOGS)..+¢:caseascassseeseuss : 35 5°6 18 O a DO) MUITEOIOS scaccscessscscactseoe 115 2:0 3°9 ot 05 3 DOM OW COGS Me. ccacescoversisecssscor 107 2:3 2:0 6 0 4 3 GL, CORRECTS)

Gogoaponcooccanoccogoden 142 2-0 3:2 10 04 0 ae ALUNTUNIOS) sc cantareeriieressossenisee 82 1) 2:9 “6 0 4 0 GOL TRAUSIIPS!. .02..0cesecscssceesees 150 2:2 36 1:7 05 6

Artificial Manures.—By some a distinction has been drawn between those manures which, like superphosphate, dissolved bones, &c., are manufactured in chemical works and those which arc produced naturally, such as guano, nitrate of soda, &c. However, the term artificial manure is generally applied to all manures, natural or manufactured, which are not produced on the farm, as distinguished from farmyard manure and manure from purchased foods, which are essentially farm products. The value of all manurcs mainly depends on their chenuical composition.

As compared with farmyard manure, artificial manures have the disadvantage that they, unlike it, do not improve the physical condition of the soil. Artificial manures have, on the other hand, the advantage over farmyard manure that they can supply in a small compass, and even if used in small quantity, the necded nitrogen, phosphoric acid, and potash, &c., which crops require, and which farmyard manure las but in small proportion; they present tlic expensive fertilizing mattcrs in a concentrated form, and by their application save expense in labour and carriage.

The following are the principal artificial manures in use :—

1. Nitrogenous Manures.—Peruvian Guano.—This is a natural manure, valuable on account of the ammonia, phosphoric acid, and potash it contains. It is the excrement, &e., of sca birds accumu- lated in parts where no rain falls, The earliest deposits found contained as much as 14 to 17 per cent. of ammonia, e.g., Chinchas Island guano; those now (1882) imported seldom exceed 8 per cent., and generally vary from 4 to 8 per cent., ofammonia. In using guano it should be mixed with earth, &c., to prevent injury to the seeds orplants. Peruvian guano is also treated with sulphuric acid, which renders the phosphates soluble and fixes the ammonia, thereby preventing any loss of it; this constitutes dissolved guano, and is frequently sold upon a guarantee of 20 per cent. of soluble phosphates, 4 per cent. of insoluble phosphates, and 9 per cent. of ammonia. Peruvian guano is used as a top dressing for wheat and barley ; in addition to insoluble phosphates, it contains soluble phosphates of the alkalies,

Ammonia Salts.—The principal one is sulphate of ammonia, largely produccd in gas works by neutralizing gas liquor with sulphuric acid ; it is usually sold on a basis of 24 to 25 per cent. of ammonia.

Soot is valuable on account of the sulphate of ammonia it con- tains; the percentage of ammonia varies from 14 to 4.

Nitrate of soda is a natural deposit ; it is greatly used as a top dressing for wheat and barley. It usually contains common salt, and when purified is sold on a basis of 95 per cent. of pure nitrate.

Organic Nitrogenous Substanecs.—Wool, hair, fish, flesh, horn, blood, rape cake, damaged cotton cake and other oil cakes. Wool refuse (shoddy), according to its quality, contains from 4 to 8 per cent. of nitrogen, flesh 14 to 15 per cent., blood (dried) 13 to 15 per cent., rape cake 4 to 5 per cent., linseed cake about 4 percent., cotton cake (undecorticatcd) nearly 4 per cent., and cotton cake (dccorticated) over 6 per cent. of nitrogen.

2. Phosphatie Manures.—(a) The following phosphatic minerals are used for the manufacture of superphosphate of various strengths, and of compound manures :—coprolites (Cambridge, Suffolk, and Bedfordshire), containing 50 to 55 per cent. of phosphate of limc ; phosphorite (Spanish and Portuguese); apatite (Norwegian and Canadian), containing often as much as 80 per cent. phosphate of lime ; South Carolina (land and river) phosphate, 52 to 56 percent. phosphate of lime ; French phosphate ; Sombrero phosphate, 70 per cent. phosphate of limc ; Curacoa phosphate, 80 per cent. phosphate of lime ; Navassa phosphate ; Aruba phosphate, &c.

(b) Bones.—Raw boues, as $inch and 4 inchbones; bonemeal; bone dust, having about 48 per cent. phosphate of lime and 4% per cent. of ammonia; boiled bones, with 60 per cent. phosphate of lime and about 1°8 per cent. of ammonia; dissolved bones ; bone ash, with 70 per cent. phosphate of lime; animal charcoal, with 70 to 80 per cent. phosphate of lime.

(c) Phosphatie Guanos.—Laccpede Island guano; Mexillones guano; Malden Island guano; Fanning Island guano; and many others varying in

composition froin 60 to 90 per cent. phosphate of lime. ;

3. Saline Materials. —Potash salts (chloride andsulphate); kainite, with 20 to 25 per cent. sulphate of potash, and also sulphate of magnesia and common salt ; wood ashes, with about 10 per cent. of potash; common salt.

4, Calcarcous Manures.—Lime, chalk, marl, gypsum, shell sand, gas lime, coal ashes, road scrapings, &c.

5. Carbonaccous Manures.—Sawdust, peat, sea-wecd, vegetable refuse, &c.

6. Special and Compound Manures.—The basis of these is super-phosphate, which is mixed with other manuring materials to mcet the special requirements of particular crops and soils.

The foregoing remarks made on the application of manures to different kinds of crops may now in conclusion be summed up. Farmyard manure, in order to be most beneficial, should be applied as quickly as possible after it is made, the best time being in autumn or early winter. Nitrate of soda should be applied as a top dressing early in spring ; its effect will be seen in the first season only. Ammonia salts, guano, dung, &c., are best applied to heavy land in autumn or winter, either before the seed is sown, or after the plant is fairly above ground, but in the case of light land early in spring. The effect of bones in the various form of dissolved bones, bone dust, raw bones, &c., will last two or more seasons according to the quantities used and their respective solubility. Lastly, it may be observed that the presence of lime is essential to the economical use of manures.

As regards cereal crops, it has been found that mineral manures alone, whether simple or complex, do not pro- duce appreciable increase of crop, but that nitrogenous manures, whether as ammonia salts, nitrate of soda, or farmyard manure, greatly benefit the crop; that nitrate of soda does rather better than ammonia salts; and that, while on fairly heavy land farmyard manure will yield good crops, the best results are obtained by using mineral and nitrogenous manures together. On clay soils a top dressing of nitrate of soda often answers all practical purposes, but on light soils nitrate of soda or ammonia salts should not be used without mineral manures, while it is advisable even on heavy land to use superphosphate as well.

For root crops, on cold clays nothing answers so well as mineral superphosphate alone, but on light land dissolved bones, bone dust, precipitated phosphate, or a compound

artificial manure wil] be found to be much preferable to superphosphate. Bone meal mixed with mineral super- phosphate makes, for instance, a good manure for roots; for mangolds Peruvian guano and common salt in addition are useful, and for potatoes potash salts with phosphatic and nitrogenous mauures.

For pasture land the use of artificial manures is, as a rule, not economical; nitrogenous manures raise the quautity and phosphatic and potash manures improve the quality of the herbage, while, for worn-out pastures, potash with dissolved bones or superphosphate or super- phosphate and guano will do much good. The most economical way of manuring pasture land is to apply farni- yard manure liberally, or feed it off with cattle, giving cotton cake in addition.

The employment of artificial manures in a judicious manner has shown the occupier of land that it is not necessary for him to be bound down to any system of rotation of crops which may be practised in his particular district, but that he has the means of pursuing the course of cropping, system of manuring, and general management of his farm which will yield him the best returns. No more striking instance of this could be put forward than the experience of Mr Prout, who at Sawbridgeworth, Herts, has grown with much success cereal crops, year after year, on heavy clay land, selling the whole of the growing crops, and restoring the fertility of the soil by artificial manures. The land was purchased in 1861, and up to the present time (1882) the crops have been as good as ever, and the land has not been deteriorated, but on the other hand improved, by continuous corn growing. The experiments of Messrs Lawes and Gilbert at Rothamsted and of Dr Voelcker at Woburn have been thus verified on a large scale in thie experience of Mr Prout, and have shown beyond all pos- sibility of doubt the efficacy and economy of a liberal use of artificial manures. (A. Vv.)

MANUSCRIPTS, Awncrent. See Diptomarics and PALHOGRAPEY.

MANUTIUS. I. Atpus Manurtius (1450-1515). Teo- baldo Mannucci, better known as Aldo Manuzio, the founder of the Aldine press, was born in 1450 at Sermoneta in the Papal States. He received a scholar's training, studying Latin at Rome under Gasparino da Verona, and Greek at Ferrara under Guarino da Verona. Having qualified himself for the career of a humanist, according to the custom of the century, he went in 1482 to reside at Mirandola with his old friend and fellow-student, the illustrious Giovanni Pico. 'There he stayed two years, prosecuting his studies in Greek literature. Before Pico removed to Florence, he procured for Aldo the post of tutor to his nephews Alberto and Lionello Pio, princes of Carpi. To Alberto Pio the world owes a debt of gratitude, inasmuch as he supplied Aldo with funds for starting his printing press, and gave him lands at Carpi. It was Aldo's anibition to secure the literature of Greece from further accident by committing its chief masterpieces to type; and the history of his life is the record of the execution of this gigantic task. Before his time four Italian towns had won the honours of Greek publications:—Milan, with the grammar of Lascaris, Alsop, Theocritus, a Greek Psalter, and Isocrates, between 1476 and 1493; Venice, with the Hrotemata of Chrysoloras in 1484; Vicenza, with reprints of Lascaris's grammar and the Hrotemata, in 1488 and 1490; Florence, with Alopa's Homer, in 1488. Of these works, only three, the Milanese Theocritus and Isocrates and the Florentine Homer, were classics. Aldo selected Venice as the most appropriate station for his labours. He settled there in 1490, and soon afterwards gave to the world editions of the Hero and Leander of Muszeus, the Galeomyomachia, and the Greek Psalter. These have no date; but they are the earliest

tracts issued from his press, and are called by him " Precursors of the Greek Library."

At Venice Aldo gathered an army of Greek scholars and compositors around him. His trade was carried on by Greeks, and Greek was the language of his household. Instructions to type-setters and binders were given in Greek. The prefaces to his editions were written in

treek. Greeks from Crete collated MSS., read proofs, and gave models of calligraphy for casts of Greek type. Not counting the craftsmen employed in

merely manual labour, Aldo entertained as many as thirty of these Greek assistants in his family. His own industry and energy were unremitting. In 1495 he issued the first volume of his Aristotle. Four more volumes completed the work in 1497-98. Nine comedies of Aristophanes appeared in 1498. Thucydides, Sophocles, and Herodotus followed in 1502; Xenophon's Hellenics and Euripides in 1503; Demosthenes in 1504. The troubles of Italy, which pressed heavily on Venice at this epoch, suspended Aldo's labours fur a while. But in 1508 he resumed his series with an edition of the minor Greek orators ; and in 1509 appeared the lesser works of Plutarch. Then came another stoppage. The league of Cambray had driven Venice back to her lagoons, and all the forces of the republic were concentrated on a struggle to the death with the allied powers of Europe. In 1513 Aldo reappeared with Plato, which he dedicated to Leo X. in a preface eloquently and earnestly comparing the miseries of warfare aud the woes of Italy with the sublime and tranquil objects of the student's life. Pindar, Hesychius, and Athenzeus followed in 1514.

These complete the list of Aldo's prime services to Greek literature. But it may be well in this place to observe that his successors continued his work by giving Pausanias, Strabo, /Eschylus, Galen, Hippocrates, and Longinus to the world in first editions. Omission has been made of Aldo's reprints, in order that the attention of the reader might be concentrated ou his labours in editing Greek classics from MSS. Other presses were at work in Italy ; and, as the classics issued from Florence, Rome, or Milan, Aldo took them up, bistowing in each case fresh industry upon the collation of codices and the correction of texts. Nor was the Aldine press idle in regard to Latin and Italian classics. The Asolani of Bembo, the collected writings of Poliziano, the Hypnerotomachia Poliphilt, Dante's Divine Comedy, Petrarch's poems, a collection of early Latin poets of the Christian era, the letters of the younger Pliny, the poems of Pontanus, Sannazzaro's Arcadia, Quintilian, Valerius Maximus, and the Adagia of Erasmus were printed, either in first editions, or with a beauty of type and paper never reached before, between the years 1495 and 1514. For these Italian and Latin editions Aldo had the elegant type struck which bears his name. It is said to have been copied from Petrarch's handwriting, and was cast uuder the direction of Francesco da Bologna, who has been identified by Panizzi with Francia the painter.

Aldo's enthusiasm for Greek literature was not confined to the printing-roo. He burned with a humanist's enthusiasm for the books he printed; and we may well pause astonished at his industry, when we remember what a task it was in that age to prepare texts of authors so numerous and so voluminous from MSS. Whatever the students of this century may think of Aldo's scholarship, they must allow that only vast erudition and thorough familiarity with the Greek language could have enabled him to accomplish what he did. In his own days Aldo's learning won the hearty acknowledgment of ripe scholars. To his fellow workers he was uniformly generous, free from jealousy, and prodigal of praise. His stores of MSS. were as open to the learned as his printed books were liberally given to the public. While aiming at that

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excellence of typography which renders his editions the treasures of the book-collector, he strove at the same time to make them cheap. We may perhaps roughly estimate the current price of his pocket series of Greek, Latin, and Italian classics, begun in 1501, at 2s. per volume of our present money. 'he five volumes of the Aristotle cost about £8. His great undertaking was carried on under continual difficulties, arising from strikes among his workmen, the piracies of rivals, aud the interruptions of war. When he died, bequeathing Greek literature as an inalienable possession to the world, he was a poor man. In order to promote Greek studies, Aldo founded an academy of Hellenists in 1500 under the title of the New Academy. Its rules were written in Greek. Its mem- bers were obliged to speak Greek. Their names were Hellenized, and their official titles were Greek. The biographies of all the famous men who were enrolled in this academy must be sought in the pages of Didot's Alde Manuce. It is enough here to mention that they included Erasmus and the English Linacre.

In 1499 Aldo married Maria, daughter of Andrea Torresano of Asola, Andrea had already bought the press established by Nicholas Jenson at Venice. Therefore Aldo's marriage combined two important publishing firms. Henceforth the names Aldus and Asolanus were as- sociated on the title pages of the Aldine publications ; and after Aldo's death in 1515, Andrea and his two sons carried on the business during the minority of

Aldo's children. The device of the dolphin and the anchor, and the motto festina lente, which indicated quickness combined with firmness in the execution of a great scheme, were never wholly abandoned by the Aldines until the expiration of their firm in the third generation.

II. Pavtus Manutius (1512-1574), By his marriage with Maria Torresano, Aldo had three sons, the youngest of whom, Paolo, was born in 1512. He had the misfortune to lose his father at the age of two. After this event his grandfather and two uncles, the three Asolani, carried on the Aldine press, while Paolo prosecuted his early studies with unreniitting industry at Venice. Excessive applica- tion hurt his health, which remained weak during the rest of his life. At the age of twenty-one he had acquired a solid reputation for scholarship and learning. In 1533 Pavlo undertook the conduct of his father's business, which had latterly been much ueglected by his uncles. In the interregnum between Aldo's death and Paolo's succession (1514-33) the Asolani continued to issue books, the best of which were Latin classics. But, though their publications count a large number of first editions, and some are works of considerable magnitude, they were not brought out with the scholarly perfection at which Aldo aimed. The Asolani attempted to perform the whole duties of editing, and to reserve all its honours for them- selves, dispensing with the service of competent colla- borators. The result was that some of their editions, especially their Auschylus of 1518, are singularly bad. Paolo determined to restore the glories of the house, and in 1540 he separated from his uncles. The field of Greek literature having been well-nigh exhausted, he devoted himself principally to the Latin classics. He was a passionate Ciceronian, and perhaps his chief contributions to scholarship are the corrected editions of Cicero's letters and orations, his own epistles in a Ciceronian style, and his Latin version of Demosthenes. Throughout his life he combined the occupations of a student and a printer, winning an even higher celebrity in the former field than his father had done. Four treatises from his pen on Roman antiquities deserve to be commemorated for their erudition no less than for the elegance of their Latinity, Several Italian cities contended for the possession of so

rare a man; and he received tempting offers from the Spanish court. Yet his life was a long struggle with pecuniary difficulties. To prepare correct editions of the classics, and to print them in a splendid style, has always been a costly undertaking. Aud, though Paolo's publica- tions were highly esteemed, their sale was slow. In 1556 he received for a time external support from the Venetian Academy, founded by Federigo Badoaro, But Badoaro failed disgracefully in 1559, and the academy was extinct in 1562. Meanwhile Paolo lad established his brother, Antonio, a man of good parts but indifferent conduct, in a printing office and book shop at Bologna. Antonio died in 1559, having been a source of trouble and expense to Paolo during the last four years of his life. Other pecuniary embarrassments arose from a contract for supplying fish to Venice, into which Paolo had somewhat strangely entered with the Government. In 1561 Pope Pius IV. invited him to Rome, offering him a yearly stipend of 500 ducats, and undertaking to establish and maintain his press there. The profits on publications were to be divided between Paolo Manuzio and the apostolic cainera. Paolo accepted the invitation, and spent the larger portion of his life, under three papacies, with varying fortunes, in the city of Rome. Ill health, the commercial interests he had left behind at Venice, and the coldness shown him by Pope Pius V., induced him at various times and for several reasons to leave Rome. But of these excursions it is not necessary to take particular notice. As was natural, his editions after his removal to Rome were mostly Latin works of theology and Biblical or patristic literature.

Paolo married his wife, Caterina Odoni, in 1546. She brought him three sons and one daughter. His eldest son, the younger Aldus, succeeded him in the management of the Venetian printing house when his father settled at Rome in 1561. Paolo had never been a strong man, and his health was overtaxed with studies and conmercial worries. Yet he lived into his sixty-second year, and died at Rome in 1574.

III. Atpus Manutius, Junior (1547-1597). The younger Aldo, born in the year after his father Paolo's marriage, cradled in scholarship, and suckled as it were with printer's ink, proved what is called an infant prodigy. When

he was nine years old, his naine was placed upon the title page of the famous Lleganze della lingua Toscana e Latina. What his share was in that really excellent selection cannot be ascertained ; but it is hardly possible that a boy of nine could have compiled it without assistance. The Hleganze was probably a book made for his instruction and in his company by his father. In 1561, at the age of fourteen, he produced a work upon Latin spelling, called Ortho- graphie Katio. During a visit to his father at Rome in the next. year, he was able to improve this treatise by the study of inscriptions, and in 1575 he completed his labours in the same field by the publication of an Epitome Orthographix. Whether Aldo was the sole composer of the work on spelling, in its first edition, may be doubted ; but he appropriated the subject and made it his own. Probably his greatest service to scholarship is this analysis of the principles of orthography in Latin.

Aldo remained at Venice, prosecuting studies in literature and superintending the Aldine press. But in these days of early manhood he was not satisfied with the career of scholarship and business, At one time he hankered after the more worldly honours of the law, at another he built a country house at Asola, perplexing his father, who had given him too easy independence, with the humours of his age. A marriage came to make these matters straight. The Giunta family had been steadily rising in the world as printers, in proportion as the Aldi declined through want of concentration upon commerce. In 1572 Aldo took for

his wife Francesca Lucrezia, daughter of Bartolommeo Giunta, and great-grandchild of the first Giunta, who founded the famous printing house in Venice. This was an alliance which augured well for the future of the Aldines, especially as the young husband, in the midst of distractions, had recently found time to publish a new revised edition of Velleius Paterculus. Two years later the death of his father at Rome placed Aldo at the head of the firm. In concert with his new relatives, the Giunta, he now edited an extensive collection of Italian letters, and in 1576 he appeared again before the public as a critic with his commentary upon the Ars Poetica of Horace. Printing, in this case, as in the case of his father, went hand in hand with

original authorship. About the same time, that is to say, about tle year 1576, he was appointed professor of literature to the Cancelleria at Venice. The Aldine press continued through this period to issue books, but none of signal merit ; and in 1585 Aldo determined to quit his native city for Bologna, where he occupied the chair of eloquence for a few months. In 1587 he left Bologna for Pisa, and there, in his quality of professor, he made the curious mistake of printing Alberti's comedy Philodoxius as a work of the classic Lepidus, Sixtus V. drew him in 1588 from Tuscany to Rome; and at Rome he hoped to make a permanent settlement as lecturer. But his public lessons were ill attended, and he svon fell back upon his old vocation of publisher under the patronage of a new pope, Clement VIII. In the tenth year of his residence at Rome, that is, in 1597, he died, leaving children, but none who cared or had capacity to carry on the Aldine press. Aldo himself, though a precocious student, a scholar of no mean ability, and a publisher of some distinction, was the least remarkable of the three men who gave books to the public under the old Aldine ensign. Times had changed in Italy since Aldo the elder conceived the great idea of reaping for the press the harvest of Greek literature. And his posterity had changed with the times for the worse. This does not of necessity mean that we should adopt Scaliger's critique of the younger Aldo without reservation. Scaliger called him "a _ poverty- stricken talent, slow in operation; his work is very commonplace ; he aped his father." What is true in this remark lies partly in the fact that scholarship in Aldo's days had flown beyond the Alps, where a new growth of erudition, on a basis different from that of the Italian Renaissance, had begun.

~ Renonard's Annales de l' Imprimerie des Aldes, Paris, 1834, and Didot's Alde Manuce, Paris, 1873, contain all necessary informa-

tion regarding the lives of the Manntii and their publica- tions. (J. A. 8.)

MANZONI, ALEssAnpRo [RANncesco TomMMaso Antonio (1785-1875), founder of the romantic school in Italian literature, was born at Milan, March 7, 1785. Don Pietro, his father, then about fifty, represented an old family settled near Lecco, but originally feudal lords of Barzio, in the Valsassina, where the memory of their violence is still perpetuated in a local proverb, comparing it to that of the mountain torrent. The poet's

maternal grandfather, Cesare Beccaria, was a well-known author, and his mother Giulia a woman of some literary ability. Manzoni's intellect was slow in maturing, and at the various colleges where his school days were passed he ranked among the dunces, At fifteen, however, he developed a passion for poetry, and wrote two sonnets of considerable merit. On the death of his father in 1808, he joined his mother at Auteuil, and spent two years there, mixing in the literary set of the so-called "idealogues," philosophers of the 18th century school, among whom he made many friends, notably Claude Fauriel. There too he imbibed the negative creed of Voltairianism, and only after

his marriage, and under the influence of his wife, did he exchange it for that fervent Catholicism which coloured his later life. In 1806-7, while at Auteuil, he first ap- peared before the public as a poet with two pieces, one entitled Urania, in the classical style, of which he became later the most conspicuous adversary, the other an elegy in blank verse, on the death of Count Carlo Imbonati, from whom, through his mother, he inherited considerable property, including the villa of Brusuglio, thenceforward his principal residence.

Manzoni's marriage in 1808 to Henriette Blondel, daughter of a Genevese banker, proved a most happy one, and he led for many years a retired domestic life, divided between literature and the picturesque husbandry of Lombardy. His intellectual energy at this period was devoted to the composition of the Zznet Sacri, a series of sacred lyrics, aud a treatise on Catholic morality, forming a task undertaken under religious guidance, in reparation for his early lapse from faith. In 1818 he had to sell his paternal inheritance, as his affairs had gone to ruin in the hands of a dishonest agent. The beautiful villa Il Galeotto, where he had spent his childish years amid the scenery he afterwards immortalized, then passed from his hands, to his great regret. His characteristic generosity was shown on this occasion in his dealings with his peasants, who on settling their accounts were found heavily indebted to him. He not only cancelled on the spot the record of all sums owing to him, but bade them keep for themselves the whole of the coming maize harvest.

In 1819 Manzoni published his first tragedy, J/ Conte di Carmagnola, which, boldly violating all classical con- ventionalisms, excited a lively controversy. It was severely criticized in the Quarterly Review, in an article to which Goethe replied in its defence, "one genius," as Count de Gubernatis remarks, "having divined the other." The death of Napoleon in 1821 inspired Manzoni's powerful stanzas 11 Cinque Maggio, the most popular lyric in the Italian language.

The political events of that year, and the imprisonment of many of his friends, weighed much on Manzoni's mind, and the historical studies in which he sought distraction during his subsequent retirement at Brusuglio, suggested his great work. Round the episode of the Znnominato, historically identified with Bernardino Visconti, J Promessi Spost began to grow into shape, and was completed in September 1822. The work when published, after revision by friends in 1825-27, at the rate of a volume a year, at once raised its author to the first rank of literary fame. In the interim of its composition in 1822, Manzoni published his second tragedy Adelchi, turning on the over- throw by Charlemagne of the Lombard domination in Italy, and containing many veiled allusions to the existing Austrian rule.

With these works Manzoni's literary career was practi- cally closed. The end of the poet's long life was saddened by domestic sorrows. The loss of his wife in 1833 was followed by that of several of his children, and of his mother, to whom he was fondly attached. In 1837 he married his second wife, Teresa Borri, widow of Count Stampa, whom he also survived, while of nine children born to him in his two marriages, all but two preceded him to the grave. The death of his eldest son, Pier Luigi, on April 28, 1873, was the final blow which hastened his end, he fell ill immediately, and died of cerebral meningitis, May 22, aged eighty-eight. His country mourned him with almost royal pomp, and his remains, after lying in state for some days, were followed to the cemetery of Milan by a vast cortége, including the royal princes and all the great officers of state. But his noblest monument was Verdi's Requiem, specially written to honour his memory.

old

Manzoni's position in literature is unique; for, while the romantic Renaissance produced in other countries a galaxy of genius, in Italy it

remained embodied in him alone, sincc none of his disciples came near enough to be classed with him. Scott declared L Promessi Sposi the finest novel ever written; and, if we take as our standard loftiness of aim combined with ingenuous simplicity of style, and Titiancsque power of character painting relieved by an under- curreut of subtle irony giving point to every trivial incident, we uced scarcely disputc his verdict. It occupies the same place in Italian as Don Quwixote in Spanish literature, overshadowing in similar fashion the whole field of subscquent fiction. Manzoni's poctry cannot be classed so high, and, despite its nervous diction and epigrammatic intensity of thought, it is as a grcat master of Italian prose that he will go down to posterity.

Of exalted private character, Manzoni furnishes an almost solitary instance of a poet whose life contains no note of discord with the loftiest standard presented by his works. The highest genius, dis- ciplined by still higher moral self-control, produced in him the rare spectacle of a perfect cquilibrium of forces in a powerful mind. His presence was impressive, and his speech, though retarded by a slight impediment, so full of wisdom that Tommaseo dcclared he had learned more from his conversation than from all the books he liad ever read. At the same time he had that exquisite courtesy in listening which gave to those who addresscd him the sense of having spoken well. No man cver attained to greater honour from his contemporarics, or sought it less, and few have joined such rare intellectual gifts to so much gracious humility of mind and manners. His warmth of affection, tenderness of sympathy, aud universal benevolence endeared him to his friends and tellow- citizens, while by his countrymen at large he was revered as the sage and patriarch of Italian Jetters.

In addition to the works already named, he wrote La Storia della Colonna Infame, and a small treatise on the Italian language. I Promessi Sposi, laboriously revised by the author in accordance with the Tuscan idiom, has gone through 118 Italian, 19 French, 17 German, and 10 English editions.

Biographical sketches of Manzoni have been recently published by Cesare Canttt (1882), Benedetto Prina, Giulio Carcano, Angelo de Gubernatis, Antonio Stoppani (his carly years), and others. Some of his letters have been published by Giovanni Sforza, and a work entitled, Commento Storico

su I Promesst Spost, by Cesare Cantit. See also the essay on ‘ Fauriel” in Sainte-Beuve’s Portraits Contemporains, vol. iv.

MAORIES. See New Zearann.

MAP. 1. First Lssays in Map-making.—As each man stands in the centre of his horizon and the portion of the earth’s surface which lies within his range of vision has the appearance of a disk, the whole world was in ancient times conceived as a disk surrounded by the sea, It was consequently not uncommon for a people to imagine—as was the case we know with the Chinese, the Hindus, the Chaldeans, the Jews, the Arabs, and even the ancient Peruvians—that it occupied the middle part of the world. The wider a people’s range of vision, the wider was the disk of the world represented. A circular surface is thus the simplest form fora mappa mundi or map of the world ; and it is met with both in antiquity and in the Middle Ages. The extent of the circle of vision depends among uncivilized peoples on their way of life. Wandering tribes have seen more of the world than settled tribes; and lunters, fishers, and seamen make the widest excursions. Among them consequeutly we find the beginnings of map- making; and Eskimo, Indians, and Polynesians, for example, show in this matter astonishing quickness of apprehension, while among the settled Negro tribes, on the other hand, there are no maps. A map drawn by an Eskimo woman enabled Sir Edward Parry to discover Fury and Hecla Strait ; M‘Clintock during his endeavours to clear up the fate of the Franklin expedition repeatedly got the Eskimo to draw coast-maps of the Arctic lands; and many similar instances are given by Andree, “ Begin- nings of Cartography,” Globus, xxxi. pp. 24-27, 37-43.

Turning to civilized peoples, it is among the Egyptians that we find the earliest recorded examples of carto- graphic representation. Apollonius of Rhodes (born 230 8.c.) reports in his Argonautica (iv. 279) that the Egyptians of Colchis, a colony dating from the time of Ramses II. (?), had preserved as heirlooms certain wooden tablets (xvpGes) on which land and sea, roads and highways, were accurately indicated ; Eustathius, in his commentary

on Dionysius Periegetes, mentions that Sesostris the Egyptian king caused route-maps to be prepared ; and Strabo also refers to certain old maps in the library of Eratosthenes in which Meroe and the south end of the peninsula of India were placed on the same parallel of latitude. These statements have been confirmed by the actual discovery of such maps and plans on old Egyptian papyrus-rolls. Birch has, for instance, identified a drawing on a papyrus in the Turin Museum as the topographical map of a gold-mining district in Nubia. The perspective in this case is very childish : in order to show that the road leads between two mountain-chains, the mountains on one side of the road are inverted (comp. Lepsius, Urkun-denbuch, pl. xxii.). This map is one thousand years older than that of Anaximander, who was considered by the Greeks as the inventor of cartography. On another sheet appears a representation of the victorious return of Sethos I. (1443-1392 B.c.) from Asia, showing the road from Pelusium by Leontopolis to Heroopolis, Lake Timsah with fish in it, the canal from the Nile with crocodiles, and at Heroopolis a bridge over the canal. Similar picture- maps were discovered by Layard in Assyria (Vineveh and Babylon, p. 231 sq., 1867). The ancient Babylonians have also the high distinction of having divided space and time in a way that allowed scientific measurements to be made after the still customary method. It was they who origin- ated the division of the ecliptic into twelve signs and later into 360 degrees ; and the division of the circle into 360 degrees with 60 minutes to the degree and 60 seconds to the minute, as well as the corresponding division of the hour, was the outcome of their sexagesimal system of numeration. This method of division was introduced among the Greeks by Hipparchus (150 3.c.), and obtained general currency through the geographer Ptolemy (150 a.p.). By this means were provided the elements necessary for the astro- nomical determination of geographical position. Among the Egyptians and Babylonians map-making remained in its first infantile stage; its scientific development was received at the hands of the Greeks.

2. Development of Map-making among the Greeks.— In Homer the " circumfluent ocean" represents the horizon which bounds the disk of the world; the scientific treat- ment of geography and map-making has its origin among the Ionic Greeks of Asia Minor. Anaximander, a pupil of Thales (about 560 B.c.), sketched the first map (yewypa- duos iva), and was

the first who sought to deter- mine the compass of the earth (the world-disk) and the sea. As the Greeks gradually extended their journeys as far as India in the East and the Atlantic in the West, the con- viction gained ground that the world-disk could not be bounded by a regular circular outline. About one hundred years after Anaximander, Democritus of Abdera ventured to draw a new map on the basis of his own observations (for in his extensive wanderings he had been as far as Persia and perhaps even India); and in opposition to the circular form of the Ionians he gave the world an oblong shape, aud taught that from east to west it was half as long again as from north to south. Although after the time of Aristotle the tabular or flat-surface theory of the figure of the earth was expelled by the spherical or globe theory, the portion of the earth's surface which was really known retained the same oblong shape which it had with Democritus ; and hence we still speak of longitude and latitude, that is, length and breadth. It was on this basis also that the far-travelled Hecatzeus of Miletus, who wrote his Tijs wepiodos between 520 and 500 3,c, drew up his map ; for the representation of the world on a brazen tablet, which was shown by Aristagoras, tyrant of Miletus, to King Cleomenes of Sparta, was robably nothing else than the world-map of Hecatzeus. The first application of astronomy

MAP

to geography was made by the famous Arctic navigator Pytheas of Marseilles, about 326 B.o.; it is from him that we obtain the first observation of latitude, and, what is of some importance, this is for Marseilles. His voyage to the extreme North (Thule) was undertaken partly for the purpose of satisfying himself in regard to the figure and size of the earth. Dicawarchus of Messana in Sicily, a pupil of Aristotle's (310 3.c.), made the first approach to a projection. He divided the inhabited (i.c., the known) world, which he reckoned to be one and a half times as long as it was broad, into a northern and a southern half by means of what he considered a straight line drawn from the pillars of Hercules, through Sicily, the Peloponnesus, Caria, Lycia, Pamphylia, Cilicia, and across the Taurus to the Imaus (Himalaya). He thus drew the first parallel of latitude, and upon this basis he prepared maps which were to be publicly exhibited in a hall (Agathem., § 5; Strabo, p. 105). The name duagpaypa ris

oixoupévys, 2.e., partition of the inhabited world, was given to the base-line. For the next material improvement we are indebted to the famous astronomer and geographer Eratosthenes of Cyrene, the keeper of the Alexandrian library (276-196 3.c.). He was the first to make a rational geodetic measurement for the purpose of determining the size of the earth, and he col- lected in his Tewypaducd the whole geographical learning of his time. This work has unfortunately been lost, but from the numerous fragments that have been preserved, especially by Strabo, it is possible to form an idea of this the first systematic geography. Starting with the spherical form and the size of the world, it gave a descrip- tion of the oikovyévy, discussed the space relations of the world-island, and estimated its extent in longitude and latitude. On the basis of the diaphragm of Dice-archus, the course of which was more precisely indicated, a series of seven parallels and as many meridians cutting the diaphragm at right angles were drawn, and by this means the inhabited world was divided to the north and the south of the diaphragm into a certain number of regular divisions to which the name of sphragidia or seals was given. Then follows a description of the countries in the several 'seals,' beginning with India. In this arrangement we may recognize the first attempt to con- struct a network or system of degrees. As numerous data in regard to distances were already at his command, Eratosthenes greatly improved on the old maps in the matter of correctness ; but, as the number of astronomical determinations of latitude was still small, and the intervals between the parallels and the meridians were unequal and conditioned by the available data in regard to distance, his network of lines was far from being an exact mathematical system. Hipparchus of Nicsa in Bithynia, the greatest astronomer of the ancient world (about 150 B.C.), consequently rejected the geography of Eratosthenes because it only partially utilized the abundant resources provided by the high development of contemporary mathe- matics and astronomy. Instead of the uncertain estimates of distance and direction furnished by travellers, only astronomical determinations of latitude and longitude should, he maintained, have beenemployed. He does not appear, however, to have himself written a geo- graphy or constructed a map. About the same €B time Crates of Mallus made the first globe. On Vie. 1 this he extended the Atlantic Ocean southward to "'® ~ the south pole, placed a corresponding ocean on the other hemisphere, and, in the belief that the torrid zone could be occupied by nothing but water, ran an Oceanic belt

along the line of the equator (fig. 1). In the four segments thus produced he set four semicircular land-areas, only one of which was known to the ancient world. This systematic figure maintained its place down into the Middle Ages, as

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appears from the ornamentation of the globe that forms part of the insignia of royalty.

Marinus of Tyre (about 150 a.p.) was the first who sought to give effect to the demand made by Hipparchus for a trustworthy representation of the countries of the world. His work unfortunately has been lost; and we know of its existence only from his successor Claudius Ptolemy. Without Marinus, however, Ptolemy's work would have been impossible; and neither of them was able really to carry out Hipparchus's idea of determiniug the latitude and longitude for every place; for observa- tions of latitude were known only for Marseilles, Syene, Alexandria, Rhodes, and perhaps a few other places, and all other positions were obtained by reducing distances to degrees. The determination of longitudes was even more difficult. Ptolemy possessed only the contemporary observation of the lunar eclipse in Arbela and Carthage of the year 331 B.c., from which he calculated a dif- ference of meridian of 45° 10' instead of 34° 2'. The longer axis of the Mediterranean was consequently a third too great, 62 degrees of the meridian being assumed instead of 412, and from this there resulted an exaggera- tion of all the Mediterranean countries, which was corrected only by the compass-maps of the later Middle Ages. Ptolemy, however (availing himself of the stereographic projection devised by Hipparchus), corrected an important blunder which Marinus had committed through neglecting to take account of the sphericity of the earth and con- structing a rectangular system of degrees. Like Marinus, he counted his meridians from the Canaries (the Fortunate Islands). No maps appear to have been drawn by Ptolemy himself; those to be found in the oldest editions of his work are by Agathodeemon (a mathematician of the 5th (?) century after Christ), though accurately based, it is true, on Ptolemy's data. The oldest MS. of Ptolemy is that found in the Vatopedi monastery of Mount Athos, and published by Victor Langlois in 1867 along with careful reproductions of

the maps. It dates from the 12th or 13th century. Besides the exaggeration of the Mediterranean, the greatest blunders of Ptolemy are the following :— the European continent between the Black Sea and the Baltic is too narrow ; India is not represented as a peninsula ; Ceylon (Taprobane) is made much too large; and the Indian Ocean is bounded by lands towards the south (Plate VIT.). But in spite of all this the scientific method pursued in the representation was perfectly correct. It was not till the Renaissance that a return was made to the rational treat- ment of cartography inaugurated by Ptolemy; and he then became the teacher of the modern world.

3. Map-making among the Romans.—The Romans con- tributed nothing to the development of the scientific method of the Greeks, and did not apply astronomy to the purposes of cartography. 'They valued maps according to their practical utility as implements of political administration ; and they accordingly attached most importance to the route- map, from which they could learn the roads, the stations, and the distances. If we may judge by the few examples which have been preserved, these sketches may, distortions apart, be compared with our railway maps. Cicero and Seneca mention general and topographical maps. In their time the military routes were already divided into stages, furnished with milestones, and consequently measured. During the reign of Augustus a survey of the whole Roman empire was carried out. The routes were marked on parchment rolls for the purposes of military and civil administration. A map of the world was painted in a portico at Rome; a map of Italy was to be seen in the temple of Tellus. Particularly celebrated was Agrippa's map. Pliny must plainly have been in possession of maps to keep himself right in regard to the great number of

names which he records. A map of the Roman empire was drawn up under Domitian. The emperors of the 2d, 3d, and 4th centuries caused maps to be constructed and painted on the walls of public buildings in the cities of Gaul, as for example in Augustodunum (Autun); but of this class unfortunately none has been preserved. The only Roman map, indeed, of the imperial epoch which has come down to us is the Yabula Peutingertana, which takes its modern name from Conrad Peutinger of Augsburg, who

possessed it in the 16th century. Itis now preserved in the Imperial Library of Vienna. Its origin as a map goes back at least to the 3d century of the Christian era,— to the time, that is, of Alexander Severus; but the actual copy is not older than the 13th century. It consists of twelve folio sheets of parchment, which originally formed one long strip. It has been published by Scheyb (1753) and Mannert (1834), and in excellent facsimile by Desjardins (1869, &c.). That the original of this remark- able map was of a circular shape has been satisfactorily proved, the pattern followed being that of the map of the world in the portico of the Campus Agrippe, which for centuries retained the rank of a model. Probably, however, such an orbis pictus was not exactly round, but rather oval. In its construction effect was also given to the opinion current from the time of Herodotus that the extent of the inhabited world was greater from east to west than from north to south. From this it is clear that the Romans had not advanced beyond the earlier Greek con- ception, and were ignorant of the astronomico-mathematical method inaugurated by Hipparchus.

4, Map-making in the Middle Ages.—The scholastic Middle Ages confined themselves to imitation of the Roman orbes. Fulness of detail, moreover, was gradually lost, meagreness and crudity appearing in its place. Carto-graphy in fact fell back to a second childhood. Fanatical exponents of the orthodox faith, like Lactantius, looked with disdain on all scientific culture. Geographical ques- tions were of no interest to him because he regarded them as mere matters of opinion. Astronomy was a piece of fantastic folly, the knowledge of distant lands mere learned lumber. "Que beatitudo," he exclaims, "erit mihi proposita si sciero unde Nilus oriatur vel quicquid de ccelo physici delirant?" As this narrow conception of things became on the whole the dominant one, geography and map-making practically ceased to exist. The doctrine of the sphericity of the earth was placed under the ban of the church, and people went back to the Homeric idea of a disk sur-rounded by the ocean. Isidore of Seville (0b. 636) taught: "Orbis a rotunditate circuli dictus quia sicut rota est. Undique enim Oceanus circumfluens ejus in circulo ambit fines. Divisus est autem trifarie; e quibus una pars Asia, altera Europa, tertia Africa, que et Libya nuncupatur." Isidore is a master of false etymological inferences. Deriving rotunditas from rota, a wheel, he declares that consequently the earth has the appearance of a wheel. Hence the name wheel-maps has been given to all

those maps of the earlier Middle Ages. The three-fold division which he gives of the world-disk kept its ground for cen- turies, and the figure of the earth put on the miserable guise shown in fig. 2. It was only by the Greek fathers that the doctrine of the earth's sphericity continued to be taught; and, as the knowledge of Greek rapidly died out in western Europe, the fountain was dried up from which a better science might have been derived. Many minor modifica- tions were introduced into the map of the world, but the fundamental type remained as given in fig, 2. Jerusalem lay in the centre, Paradise in the extreme east. Clever artists gave life to the disk of the world by turreted pictures of towns—Jerusalem, Troy, Babylon, Rome, &c., and drew Adam and Eve in the midst of a Paradise which

was defended by a fence of thorns or of flames, and, being considered the highest place in the world, was always introduced at the top of the map! The positions of Jerusalem and Paradise served to fix the other points. How long this conception remained in vogue appears from

Oriens.

Paradisus,

Sem. Asia.

Hierusalem.

Septen- trio.

Meri- dies.

Mare magnum

Europa. Africa.

Taphet. Ham.

Occidens. Fig. 2.

the fact that in 1422 Leonardo Dati, in a poem on the sphere (Della Spera), wrote, "A T within an O shows the design" (Un 7' dentre a uno O mostra il disegno), thus @. In this way the whole science of cartography sank back below the level attained by the Ionian Greeks,

5. Map-making among the Arabians.—The first develop- ment of geographical science among the Arabs took place at Baghdad about 772 a.p., in the reign of the caliph Mansur, and under the influence of an Indian astronomer and mathematician; and, not long after the works of Euclid, Archimedes, Aristotle, and Ptolemy were translated into Arabic, by orders of the caliph Mamun (813-833), a degree was measured in Mesopotamia in the plain of Sinjar, and a system of the world (Rasm el-ard) was constructed by his librarian Mohammed ben Musa of Khiva (Alcharesmius), in which every place was to be determined by longitude and latitude in the style of Ptolemy. But the science split up only too soon into a practical and a theoretical (astronomical) section—the one treating geography .(jaraffy4) as the doctrine of routes and provinces, the other as the doctrine of latitudes and longitudes. Astronomy contented itself with the astronomical determination of the position of places without drawing maps or exerting any influence on their projection; travellers and topographers on the other hand did not trouble themselves about astronomy, but like Istakhri (c. 750) or [bn Haukal (c. 750) added maps to their descriptions which were destitute of any system of degrees, and betrayed by the roughness of their outlines the clumsi- ness of the draughtsman. Ultimately, like Dimishk{(1327), they left mathematical geography completely out of their works, Ibn Haukal having already declared that mathemati- cal division only brought confusion into geography. Only Edrisi's map, engraved for King Roger IL. of Sicily upon a silver plate (1164), forms an exception; but, as it was not drawn according to the Ptolemaic projection, but simply indicated the seven climates, it was after all but an unsuc- cessful copy of Ptolemy.

6. Nautical Maps.—The nautical (loxodromic or compass) maps, which make their first appearance in Italy in the 13th century, indicate a gratifying improvement in cartography after a long period of stagnation. These maps were constructed with the aid of the compass, and took the name of compass-maps because they are covered with the figure of a

compass from which numerous straight lines radiate out in all directions over the sheet. The fact that the magnet turns towards the north is first mentioned in

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1187. Flavio Gioja of Amalfi was perhaps the first to make a mariner's compass and to teach seamen the use of that important instrument. The Italians divided the compass into eight parts (venti), assigning 45° to each — Tramontane (N.), Greco (N.E.), Levante (E.), Sirocco (S.E.), Ostro (S.), Libeccio or Garbino (S. W.), Ponente (W.), Maestro (N.W.). Every division had four quarters (quarte di vento), each of 11} degrees. The maps were produced as follows. The courses of individual ships were first of all inserted as straight lines, calculated according to the distances traversed, from particular ports, as Genoa or Venice, to other ports, and when a good supply of such material had been collected and a series of diagonals drawn in accordance therewith, the most important points on the coast and in the islands were fixed. The lines by which the meridians were cut at the same angle were called loxodromes; they gave a correct indication when they cut the true astronomical meridian, a false one when they cut the magnetic meridian. On the Italian charts the loxodromes were drawn as straight lines. The numerous radii of the compass shown on the maps enabled the seaman to find the direction which he had to take to reach his goal. Hence the title loxodromic maps.

Charts on which the degrees were marked became neces- sary only when navigation extended to the ocean; they were introduced by the Portuguese, probably at the sugges- tion of Prince Henry the Navigator. They are "plane charts" with lines of longitude and latitude.

The oldest loxodromic charts which have been preserved come from Pisa, Genoa,. and Veniee. The earliest, the so-called Pisan chart, belongs probably to the middle of the 13th eentury, and already comprises the whole Mediterranean. As this representation of the whole must of necessity have been preceded by surveys of the several portions, the beginning of the chart may be placed at least as far back as the first part of the 18th eentury. Next in point of age comes (2) the Luxoro Atlas in Genoa about the year 1300, in the possession of the Cavaliere Tomas Luxoro. Then follow (3) Petrus

Veseonte, 1311, in the national archives at Florence, including the eastern Mediterranean (Petrus Vesconte de Janua fecit ista carta ann dit M°COCXI°), see fig. 3; (4) Marino Sanudo, a map of the world representing the Mediterranean and the Atlantic coasts as far as Flanders, probably drawn between 1312 and 1321—several copies in Rome (the Vatiean), Venice, and Brussels; (5) an atlas of Petrus Vesconte's about 1318 (in Venice, in eight sheets; in Milan, ten sheets) ; (6) Perrinus Veseonte, 1327, in the Laurentian Library at Florence; (7) Joannes da Carignano, between 1806 and 1338, in the archives of Florenee (Presbiter Joannes rector sancti Marci de portu Janus me fecit) ; (8) a map of 1346 in the Castilian tongue, in the National Library at Paris; (9) the Medicean atlas of 1351 in the Laurentian Library at Florenee, eight sheets, which represents also the Caspian Sea, and, remarkable enough, the whole of Africa ; (10) Pizigani, 1367, in the National Library at Parma, a map of the world whieh extends as far as Persia, with numerous entries not only on the eoasts but also in the interior; (11) an atlas of Pizigani, of date 1368, nine sheets in folio, in the Ambrosian Library in Milan, comprising the Mediterranean and the Ocean as far as Jutland (ALCCCLEXXIII a dic VIII di zugno franzescho pizigani) veniziano in venicaia me fecit); (12) the famous Catalonian map of the world of 1375, in four sheets, in the National Library at Paris; (13) a map by Guill. Solerio of Majorea, 1885, in the publie archives in Florenee; and (14) atlas by some un- known hand, four sheets folio, in the Biblioteca Marciana at Venice.

Several of these Italian maps give indubitable evidence that as early as the 14th century the Azores and Canaries had been dis- eovered, as well as the eoast of Africa as far as beyond Cape Bojador. With the middle of the eentury the coast maps developed into maps of countries with trade routes, pictorial figures, aud numerous inscriptions. Maps preserved from the 15th century are still more numerous :—(15) a map by the Venetian Nicolao, of date 1408, in Vienna ; (16) Mecia de Villa destes, 1413, in the National Gallery at Paris; (17) a map of the world of 1417, in the National Library at Florence ; (18) Francesco de Cesanis, 1421, in the Museo Correr at: Venice ; (19) a map of 1424 at Weimar; (20) atlases by Gia- eomo de Giraldi, 1426-43, in Venice and Milan ; (21) Gabriel de Valseequa, 1434, from;Majorea; (22) Franeesco Beccario, three maps, in the British Museum ; (23) two maps by Battista Beeeario in Munieh (1426) and Parma (1435);

(24) Andrea Bianco, 1486, an atlas of ten sheets, where for the first time the medieval cireular maps are aceompanied by the Ptolemaic maps, in the Biblioteca

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Marciana at Venice ; also a map of 1448, drawn at London, now in the Ambrosian Library at Milan (Andrea Bianco venecian comito di galia me fexe a londra, 1448); (25) an elliptical map of the world in the Pitti Palace at Florence, of Genoese origin, and of date 1447 ; (26) Hannibal de Madiis, 1449, in the Ambrosian Library ; (27) a Catalonian map of the world, of 1450 (?), in the National Library at Florence ; (28) Giovanni Leardo, two maps of the world, of date 1448 (in the museum at Vicenza) and 1452 (the property of Consul- general von Pilat at Venicc) ; (29) Fra Mauro, a famous map of the world from 1457-59 in the Biblioteca Marciana at Venice; (30) Gratioso Benincasa of Ancona, a diligent cartographer, twenty-

- five very carefully executed works dating from between 1460 and

1482; most of them are in Italy, chiefly at Venice, two in Paris, one at Munich, and one without date in the British Museum ; (31) Andrea Benincasa, son of the preceding, three maps of 1476 (Geneva) and 1490 (Ancona and Rome) ; (82) Bartolomeo Parcto, a map of the world, of 1455, at Rome; (33) Giorgio Giovanni, 1484 (Parma) ; (34) Count Hortomanus Fredutius of Ancona, 1497 (Wolfenbiittel).

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In the beginning of the 16th century, (85) Alberto Cantino, about 1501-3, was the first in Italy to draw a map representing portions of America, Carta da navigare per le Isole nwovamente trovate in la parte delle Indie, in the library at Modena. (36) The Maggiolo family, famous for its cartography, flourished in Genoa between 1511 and 1648. .Visconte Maggiolo, the founder of the family, is known to have produced nineteen atlases between 1511 and 1587. A map by Giacomo Maggiolo, of date 1562, is in the British

Museum. (87) Battista Agnese laboured between 1527 and 1554 in Venice, and the thirteen atlases he has left behind him are pieces of fine artistic work adorned with charming miniatures. Two of these atlases, of date 1527 and 1586, are in the British Museum.

In the 15th century and the beginning of the 16th Spanish, Portuguese, Greek, and Frenchi cartographers appear as competitors with the Italian, Catalonian, and Balearic artists. We name only the most important. Juan de la Casa, a Basque, and a companion of Columbus, drew in 1500 a map of the world in which for the first time the hitherto discovered coasts and islands of

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Fic. 3.—Chart of the Mediterranean (P. Vesconte, 1311).

America were introduced. A map of the world by Garcia de Torero, 1522, is preserved at Turin ; and two gencral maps, the one dating 1527 (probably by Fernando Colon, son of Bitoni and the other 1529 (a Diego Ribero), exist at Weimar. Between 1558 and 1569 Diego Homem produced several beautiful atlases; of these four are in Italy, and one, of date 1568, at Dresden. Among the Frencli world-maps a special place is due to that drawn up by order of King Henry II. It is published by Jomard in his Monwmens de la, géographic.

As far as Italian navigation extended, and especially within the limits of the Mediterranean, a very correct representation of the eoasts and of the contours of the several countries was secured at an early date. The interior of the countries, on the other hand, remained confused and inexact. These defects were first supplied in the 15th century, when recourse was again had to the contri- butions of the Greeks, and especially of Ptolemy.

Before proceeding to discuss this new development, it may be as well to mention the various names by which the representations of

the earth's surface have been designated. The Greeks employed the expression mfvat (picture), the Romans in like manner said tabula. The word map came into use in the Middle Ages, the name mappa- mundi, mappemonde ("world-napkin"), proving that maps were originally painted on cloth. In English map is applied only to a land-map, the sea-map being known as a chart. The Romance languages had the expressions disegno, figura, pintura, padron. When the loxodromic maps eame into existence, hand-books with sailing directions were written to accompany them, hence the titles ' sailing directions," "sea-books," portulani (by which word actual maps were afterwards meant), or cartasda marear. The Latin word charta signifies originally a letter, a written document ; and in like manner the Portuguese and Spanish form carta. But as early as the 14th eentury this expression was (as appears from the inscrip- tion quoted under No. 3 above) used to distinguish a sea-map. In the same sense Paolo Toscanelli speaks of his carta, which he sent to the king of Portugal. But the expression did not become general till the 16th century ; in 1513 we find it in Germany in a Strasburg*

edition of Ptolemy (Carta Marina Portugalensium), in 1524 in Spain (in the Junta of Badajoz), in 1582 in England (Michael Lock).

7. The Revival of Ptolemy.—This produced in the 15th century a revolution in the construction of maps, and laid the foundations of modern cartography. Ptolemy's great work again became generally well known in western Europe only after it was translated into Latin by Jacobus Angelus de Scarparia in 1409; and this version was first printed in 1475 at Vicenza without maps. The first edition with maps (to wit, a map of the world, ten maps of Europe, four of Africa, and twelve of Asia) appeared at Rome in 1478. Afterwards there were editions at Bologna (1482), Ulm (1482, by Nicolaus Donis with five modern maps), Ulm (1486), Rome (1490, 1507, and 1508, the last with seven modern maps, among which the famous map of the world by Joh. Ruysch), Strasburg (1513, with forty-seven maps); and in the course of the same century twenty-five other editions might be mentioned at Strasburg, Basel, Lyons, Cologne, Venice, and Paris. From this long series, which

if prolonged to the beginning of the Thirty Years' War.

would be further increased by five, it is evident that Ptolemy was the great master of the modern time. At first maps were drawn according to Ptolemy's determinations of geographical position; but, in proportion as the study of mathematics, astronomy, and cosmography excited the interest of men of culture, opportunities were afforded of correcting Ptolemy's astronomical positions, especially in the case of central and northern Europe, where the range of the great cosmographer's knowledge had hardly enabled him to collect original material. The new arts of wood and copper engraving supplied the means for a rapid diffusion of printed maps. The oldest map printed from a wooden block (in the National Library at Paris), dating from 1460, and thus belonging to the earliest period of wood engrav- ing, was produced in Germany, and represents Germany and western Europe. It is considered to be a copy from an old Roman map.

After the foundations of trigonometry had been laid by Purbach, Regiomontanus, and others, attempts of a rather rude kind were made in the beginning of the 16th century to execute geographical triangulations and delineations. The towns formed the central points of the system, their

direction and position from the post of observation being fixed as precisely as possible, and their distance estimated in miles according to the best available data without being accurately measured. It was considered sufficient to assign in this way the relative positions of inhabited places, and che representation of the physical relations was very super- ficial ; the course of rivers, for instance,-was not measured, but carried past the towns on their banks in conventional lines.

In the Ptolemy of 1513 we already find three topographical maps, viz., one of Switzerland, one of the district of the upper Rhine from Basel to Mainz and Lorraine, and a large one of Crete, which it has been conjectured was taken from a Venetian original. The number of maps of smaller districts rapidly increased. In 1528 Aventinus drew the duchy of Bavaria, in1533Sebastian of Rotenhamm produced a map of East Franconia. Map drawing became a favourite occupation with the Germans. The best geographical survey of this period was the Chorographia Bavariz, by the famous Philip Apianus (twenty-four sheets, at Ingolstadt, 1568). The number of cartographers increased so rapidly that Abraham Ortelius, in the first edition of his collection of maps (Zheatrum Mundt, 1570), was able to give the names of ninety-three. The first attempts to improve and to increase the inethods of projection known to the Greeks were made by Germans,—namely, Johann Stoffler (1452-1536), Johann Werner of Nuremberg (1468-1528), Peter Apianus (1495-1552). The last-mentioned introduced the favourite method of representing both hemispheres together in an elliptical form with lines of latitude. Maps of the world were compiled by Peter Apianus, Oronce Finé (1494-1555), Sebastian Cabot (1544), Giacomo Gastaldo (1546-48), Giov. Batt. Guicciardini (1549), Giov. Domin. Methoni at Venice, Heinrich Pontanus of Arnhem (1556, a map of the world in the shape of an imperial eagle), Guill. Postel at Paris (1581), &c.

MAP

8. Mercator and his Successors.—Gerhard Kramer, usually called Mercator (born of German parents at Rupelmonde in Flanders in 1512), has the honourable place of a re- former of cartography. We possess his map of Palestine (1537), a map of Flanders (Louvain, 1540) in nine sheets, phototyped in 1882, a globe (1541), and, the first critical map of Europe

(1554), by which he laid the foundation of his fame as the first cartographer of his age. The exclusive use of Latin' letters for maps in Germany was due to his example. Especially famous is his map of the world (fig. 4) dating from 1569: 'Nova et aucta orbis terre descriptio ad usum navi- gantium emendate accommodata" (one copy in the National Library at Paris). This map is drawn in the projection of increasing latitudes with lines of latitude and parallel meridians, the basis of which was furnished by Edward Wright in 1599 in Certain Errors in Naviga- tion. It is the first chart on which true rhumb lines could be drawn as straight lines. By 1601 Mercator's projection was in use for all sea charts. In 1578 Mercator drew up maps for Ptolemy exactly in accordance with his determinations ; and these were followed by maps of Germany, the Low Countries, and France (1585), and of Italy (1590). It was his purpose to produce a complete collection of new maps, to which he gave the name Adlas ; but he died in 1594, and the publication of this first atlas (1595) was left to his son. The title took the place of the designations previously in fashion—-Theatrum Orbis, Speculum Mundi, &c. The second edition of the Adlas appeared in 1602. The later editions were issued by Jodocus Hondius in Amsterdam.

Before Mercator collections of maps, including various countries, and independent of Ptolemy, had begun to be published. Thus Christoffel Froschover in Zurich issued various " Landtaflen" in 1562 —a map of the world (Universalis Cosmographia, in the shape of a heart, dated MD.XL.VI.), Europe, Germania, Gallia, "die gantze Eydgnoschafft," and eight topographical maps of Swiss districts. Of much greater importance and influence was the collection pub- lished by Abraham Ortelius of Antwerp (1527-98), Theatruwm Orbis Lerrarum (1570), in which the best maps from all countries were re- engraved, The first edition with a Latin text contained fifty-three sheets; the seventh (1573) had sixty-nine maps, the twelfth (1579) ninety-two, Editions appeared with the text in German, French, Dutch, and after 1600 in English and Italian, and obtained the widest diffusion. Through this work the centre of cartographic activity was transferred to Holland. There too laboured the suc- cessors of Mercator, Jodocus Hondius (1563-1611) and his son Henricus Hondius (1580-1644). Their maps, in several folio volumes, were numbered by hundreds. To the scliool of Mercator belonged also Petrus Plancius and Lucas Janszoon Waghenaer of Enkhuyzen (Aurigarius), who by his Spieghel der Zeevaerdt

(Leyden, 1583) became the founder of nautical map-collections. In 1588 a re- production of this atlas appeared in London as the first " Waggoner." In the beginning of the 17th century the town of Dieppe also pro- duced excellent charts, —Guill. Levasseur(1601), Jean Dupont(1625), and Jean Guerard (1631) being at work there. About the saime time another famous cartographic family arose in Holland. William Jansz. Blaeu (1571-1638) and his sons Jan and Cornelis turned out about four hundred maps previous to 1655. William Blaeu was in 1633 appointed by public decree cartographer to the States-General ; and it was his duty to examine the ships' logs and so amend the maps. He had a rival in the person of Jan Janszoon (Jansonius), who, working with the material inherited by him from his father- in-law Jodocus Hondius, produced a Dutch atlas in six volumes, a French in six folios, a German in nine folios, and a Latin in two. Cartography became a lucrative business, but the scientific value of the work grew less and less in the hands of Nicolaus Vischer (Piscator) from 1621 to 1670 and lis son of the same name (00. 1709), of Friedrich de Witt and his sons, and of PeterSchenck. The in- fluence of the Dutch school, which had previously been so great, disappeared with the close of the 17th century.

In the 16th century the Italians were still active competitors with the Germans and Dutch. In engraved maps Venice held a specially high rank up to 1570, the Piedmontese Giacomo Gastaldo and Paolo Forlani of Verona being settled there. Their publications com- prised well-nigh all parts of the earth. The progress of discovery can be followed on their general (wntversale) and topographical maps. Gastaldo's period of activity lay between 1546 and 1569, Forlani's between 1560 and 1570. They had a successor in Antonio

MAP

Magini (1555-1617) of Padua, who in his Nove geogr. tabulx, pub- lished in 1596, gave greater precision to the determinations of Giovanni Battista Nicolosi (1610-70) of Sicily issued

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was produced in 1539 by Olaus Magnus, archbishop of Upsala. Much more accurate was the map drawn by Adrian Veno in 1618, and engraved by Jodocus Hondius, but the real reformer of northern cartography was Anders Buré (Bureus, 1571-1646), who surveyed the several parts of the country. His maps were afterwards pub- lished in the atlas of the brothers Blaeu between 1650 and 1660.

The first new map of Spain and the first of Portugal both appeared in the same year, 1560, the former being due to Pedro de Medina, the latter to Fernando Alvarez Secco.

During all this period there prevailed a remarkable variety in the determination of the first meridian. Whilst the Spaniards and Portuguese reckoned from the line of demarcation (370 leagues west of the Cape Verds) sanctioned by the pope, the Protestant Dutch, Germans, and English at first went back to Ptolemy, who began at the Canaries. Mercator, on his globe of the year 1541, chose the island Forteventura in the Canaries as his starting-point, but he afterwards adopted Corvo in the Azores, because he there approached the true indication of the magnetic needle. For the same reason Ortelius, the younger Mercator, Jansonius, and at first also William Blaeu fixed on the Isla de] Fuego in the Cape Verd group. Blaeu afterwards proposed the Peak of Teneriffe, and in this he was followed by all Dutchmen. In the year 1634 Richelieu consulted

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Fic. 4.—Outline of Mercator's Nova et Aucta Orbis Descriptio, 1569.

the astronomers Gassendi (1592-1655) and Morin (1583-1656), and |

in accordance with their decision Louis XIIJ. commanded, under penalty, that all French ships should calculate their longitudes from the meridian of Ferro, though it was not till the close of the 17th century that a French expedition determined with accuracy the relation of the. position of Ferro to that of the observatory of Paris. It was in this way that the Ferro meridian obtained almost uni- versal currency down to the 19th century. As in this period it was still practically impossible to secure precise determinations of Iongi- tude, all cartographic representations were naturally subject to con- siderable distortions, especially in countries outside of Europe.

9. Period of Transition.—A series of important dis- coveries and inventions in mathematics, physics, and astro- nomy having provided the means of making much more accurate observations and calculations, there followed as a matter of course a substantial improvement in cartography. Of chief moment were the invention of the telescope (1606), Galileo's discovery of Jupiter's moons (1610) and Cassini's calculation of their periods of rotation, so important for determinations of longitude (1666), the first application of trigonometry to geodesy by Snellius (1615), Picard's

measurement of a degree between Paris and Amiens (1669 and 1670), the French measurement of a degree between Dunkirk and Perpignan by Cassini and Lahire(1683-1718), Hadley's mirror-sextant (1731; according to Newton's idea, 1699), the improvements made on the lunar tables by Tobias Mayer (1753), and John Harrison's chronometer (1761). In this way there set in a period of transition in cartography which lasted till somewhere about 1750; the results of new investigations and measurements were gradually turned to account, but, while here and there traditional blunders were corrected and expunged, nothing essentially new was as, yet created.

To this epoch in Germany belong Johann Baptist Homann, (1664-1724), whose elegantly engraved maps, published in Nurem- berg, continued to have a wide sale after his death, Johann Matthias Hase in Nuremberg (0b. 1748), and the famous Tobias Mayer (1723-86), who published in Nuremberg a critical map of Germany. In France eminence was obtained by Nicolas Sanson (1600-67) of Abbeville, who from 1627 worked at Paris as royal geographer, and issued more than three hundred maps; and tle reputa- tion of the house was maintained by his sons Nicolas, Adrien, and

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Guill. Sanson, who worked along with Hubert Jaillot (1681-1717), Pierre du Val (1619-83), and Jean Baptiste Nolin (1692) at the French book of charts, Neptune francois, 1693, in which for the first time the new astronomical determinations were turned to account. Greater critical acumen was shown by the royal geo- grapher Guill. de I'Isle (1675-1726), and especially by the talented Jean Baptiste Bourgignon d'Anville (1697-1782) and his younger contemporary Philippe Buache (1700-1773). In this period France was facile princeps in cartographic achievements, and led the way to the next and latest epoch. In England Dowet's Atlas was published at the cost of the duke of Argyll, and in the same year Aaron Arrowsmith was born (ob. 1828). A beginning of geodetic labour was at this time made in Sweden under Charles XI.,— the proceedings being carried on first under the Baron Karl Griep- enhielm (0b. 1684) and afterwards under Count Dahlberg. For political reasons, however, the king did not allow the publication of the map of Sweden; but, the French ambassador D'Avaux having in 1704 got possession of copies, it. was engraved at Paris by De I'Isle. In Italy P. Vincent Coronelli (0b. 1718) deserves to be mentioned. 10. The Period of Triangulations and Geodetic Surveys. —Up to this point the whole art of map-making had been treated as a matter of private speculation. It was France that gave the first example of carrying out the cartographic survey of the country at the cost of the state. Such surveys had a double object, one military, to provide the army with satisfactory maps, and the other administrative, to furnish a cadastre for the land tax. The military interest predominated ; consequently the surveys

have in almost all countries been carried out by officers of the general staff, and the maps are briefly designated as general staff or ordnance maps. For such a survey the whole country is covered with a network of triangles, and, in order to secure the most trustworthy basis for the representation, numerous points are astronomically fixed. In comparison with those of earlier date the maps thus produced are distinguished by correctness of detail. In the century between 1750 and 1850 attention was mainly directed to the accurate rendering of the horizontal development of the face of the country ; but during the last thirty years the vertical con- figuration has also been faithfully represented on topo- graphical maps of large scale by the introduction of contour lines. The first example of this also was given by France, when at Laplace's suggestion (1816) it was determined to publish a new map of France with curves of altitude. But owing to the great extent of the country, and the con- sequent difficulty and slowness of the undertaking, only four sheets of this kind were published by 1833. Hanover, however, followed suit in 1829, Baden in 1833, Hesse in 1840, and so on. Since the middle of last century nearly all the states of Europe have been active in map-making ; and prolonged effort has produced rich results. Surveying and mapping have been followed by the publication of topographic maps. The states of the Balkan peninsula alone lag behind ; there no comprehensive survey has been undertaken at public expense. As a summary of these great achievements in the larger part of Europe, we append a chronological! table of the most important surveys, with the date of the publication of the first sheet, the name of the country, the title of the map, the scale, and the number of sheets. Outside of Europe there are but few countries in which a survey based on exact triangulation has been carried out. The largest areas thus measured are the United States of North America and British India, where great activity has been shown; and to these may be added Asiatic Russia, portions of Australia, portions of the Dutch possessions in the Hast Indies, and Algeria. Inthe whole of South America there is only one country, Chili, of which we possess a map based upon a careful survey. In the second portion of the table consequently some maps are included which are merely the work of private carto- graphers, and the list must be regarded as tentative.

' For convenience of comparison the different series for the British Isles are grouped together in the table in the place of the earliest date.

List of Topographic Maps.

: : , No, of Year, Country. Title of Map. Seale. Sheets. 1750 | France. Carte géomctrique de la Franec. 1: 86,400 | 134 1766 | Denmark. Maps of Denmark, published by the] Various. 19

*Academy of Sciences, 1780 | Mecklenburg- | Chorograph. und Militair-Karte. 1; 33,900 9 Strelitz. 1788 | Mecklenburg- Fs 3 By *y ae 16 Schwerin. 1855 | England. 25-inch maps (400,400 shts.published).) 1: 2500 | 3625 1846 5 6-inch maps.) 7 1:10,560} 110 1801 ne 1-inch map (old series), . 1874 "6 1-inch map (new series). 5 GRAD) "Ome 1856 | Scotland. 25-inch maps. : 1: 2500 114315 1847 6-inch maps. 1:10,560 | 2025 1856 AO 1-inch maps. 1; 63,360 | 131 1871 | Ireland. 25-inch maps (Dublin county only). 1; 2500 | 665 1833 . 6-inch maps : 1: 10,560 | 1908 1853 as 1-Inch maps m0 1: 63,360} 205 1803 | Prussia. Karte von Altprenssen, enthaltend | 1: 150,000 25 Ost preussen nebst Preuss. Lithauen und Westpreusscn nebst dem Netze-district, 1805 | Salzburg, Karte des Herzogthums Salzburg, 1: 144,000 15 1812 | Bavaria. Topograph. Atlas vom Kénigr. Bayern.| 1: 50,000 | 112 1813 | Austria. Karte d. Erzherzogth, Oesterreich. | 1: 144,000 31 1815 rs Karte der geftirsteten Grafsch. Tyrol | 1: 144,000 24 nebst Vorarlberg. ° 1826 | Norway. Official maps published since 1845 | 1:200,000| ... by the Government. e 1828 | Parma. Caita topografica dei ducati Parma,} 1: 86,400 9 Piacenza, e Guastalla. 1829 | Wtirtemberg. | Karte vom Konigr. Wiittemberg. 1:50,000 57 1832 | llanover and | Topogr. Atlas des Kénigr. Mannover | 1; 100,000 69 Brunswick, und Herzogth. Braunschweig. 1832 | Hesse. Karte von dem Grossherz. Hessen. 1: 50,000 31 1833 | France. Carte topographique de la France, 1; 80,000 | 274 1833 | Lombardy Carte topogr. del Regno Lombardo- | 1:86,400 42 and Venice.; Vencto. 1837 | Saxony. Topogr. Atlas des Kénigr. Sachsen. 1: 57,600 20 1838 | Baden. Topogr. Karte iiber das Grossherz.!} 1:50,000 56 Baden. 1840 | Hesse, Topogr. Karte von dem Kurfiirst-| 1:50,000 40 enth. Hessen. 1842 | Modena. Carta topogr. del ducato di Modena. | 1: 86,400 8 1842 | Switzerland. | Topogr. Karte der Schweiz. 1: 100,000 25 1844 | Moravia and | Specialkarte d. Markgr. Mahren mit | 1: 144,000 20 Silesla. d, Antheilen des Hrzgth. Sclilesien. 1849 | Bohemia. Specialkarte des Kénigr. Bolimen., a 38 1849 | Belgium. Grande Carte topogr. de Belgique par | 1:20,000| 250 P. v. d. Maelen. 1850 | Sardinia. Carta degli stati di sua*

maesta Sarda, | 1:50,000 91 in terra firma. 1850 | Netherlands. | Topogr. en Milit. Kaart van het | 1:50,000 62

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Koningrijk der Nederlande. Tuscany and | Carta topogr. dello stato Pontificioe | 1:86,400 52 Papal States.) del gran ducato di Toscana. Denmark, Topographisk Kart over Kongeriget | 1:80,000 81 Danmark met hertogt. Slesvig. Prussia, E. Topogr. Karte vom Gstliche Theile | 1:100,000 | 249 der Monarchic.

Prussia, W. | Topogr. Karte der Provinz West-| 1:80,000 70 phalen und der Rheinprovinz. Greece. Map of Greece (Paris, 1852), 1; 200,000 20 Hungary. (Komitits-Karten des Kénigr. Ungarn., 1:288,000| ... Galicia. Generalkarte von Galizieu und Lodo- | 1; 288,000 33 merien. Oldenburg.

Topogr. Karte des Grossherz. Olden- | 1: 50,000 16 burg. Portugal. Carta corografica dos reinos de | 1:100,000 37 Portugal e Algurve. i Russia, Military Topogr. Map of Russia. 1:126,000 | 751 | Sweden. Yopogr. Corpsens Karta 6fver Svcrige.| 1: 100,000 | 2338 | Saxony. Topogr, Karte vom Konigr, Sachsen. | 1:100,000 28 Belgium. Carte topographique. 1; 40,000 76 Sinai Penins. 1: 63,360 1

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Norway, Topogr. Kart. over Kongeriget Norge.| 1:100,000 | 216 Hungary. Specialkarte von Ungarn, Croatien, | 1:144,000 | 198 und Slavonien. Switzerland. | Topographischer Atlas — higher | 1; 50,000 mountain regions. 546 Do. —h)iill regions. | 1:25,000 Portugal. Carta geogr. de Portngal poblicada | 1: 500,000 1 por ordera de Sua Magestade. Spain. Mapa topogr. de Espafia. 1: 50,000 nes Austria, Specialkarte der Oesterr.-ungar. | 1:75,000} 718 Monarchie. Saxony. Topogr. Karte von Sachsen. 1: 25,000 | 156 Germany Karte des deutschen Reiches. 1: 100,000 | 674 ltaly. Carta delle provincie meridionali. 1:50,000 | 230 53 Gran Carta topografica d'Italia. 1:500,000} ... | Palestine. l-inch map. 1: 63,360 26 United States. Virginia (Hermann Boije). 5 ml.—=lin. i) South Carolina (Rob. Mills). 2mji.=1 in. Fast Indies. | The Indian Atlas (J. Horsburgh). 1: 266,000; 177 Australia. Map of the Colony of New South | 1: 540,000 3 Wales (T. L. Mitchell). United States.) Map of Alabama and West Florida |6ml.=1 in.

(John la Tourrette). rei Map of Mississippi with a large 6 ml—=1 in. portion of Louisiana and Alabama (La Tourrette). Caucasia. Map of the Caucasian Countries | 1: 420,000 25 (General Staff).

MAP—MAP

No. of

Title of Map. Sheets.

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Map of the Eastern Provinces of'|1:1,700,000 6 Australia (J. Arrowsmith).

United States.

Australia. Reference Map of Louisiana (La |6ml.=1 in. Tourrette). United States. | Map of Arkansas (Langtree). 8 m1.=1 in. India. North-West Himalaya (surveyed 4ml—lin.) 15 1848-54 by A. S. Waugh). | United States. | Map of Kentucky (Edmund Fr. Lee). |6 ml.=1 in. India. Kashmir (surveyed 1850-57 by T. |1 ml.=lin. 4 G. Montgomcrie). United States.| Map of Texas (C. W. Pressler). 16m.=1 in. 8 Palestine. Map of the Holy Land (Van der | 1: 315,000 Velde). Australia. County Maps of New South Wales, | 1: 126,720 United States.) Map of Georgia (J. R. Butts). 6ml.=1 in. Map of Missouri (Fiela). 6 ml.=1 in.

South Africa, | Natal (Capt. Grantham), 1: 250,000 ' United States.| Territory of the U.S. from the Mis- |1:3,000,000 4 sissippi River to the Pacitic Ocean (Edward Freyhold),

U.S, North-West Boundary Survey. /1:1,060,000 Z Map of parts of California, Nevada, | 1: 760,320 1 and Idaho Territory, Post Route Maps of the States (W.| Various. 36 L. Nicholson), General Map of Transbaikal country. | 1: 840,000 10 Java. Residency Maps. 1; 100,000 Cuucasia, Map of the Caucasian countries, 1: 420,000 22 Siberia. Special Map of West Siberia. 1: 420,000 | 125

Plan of the southern portion of the province of South Australia, Turkestan. Military Map of Turkestan. Chili. Plano topogvafico y geologico de la Republ. de Chile (A. Pissis). United States.) Atlas of the United States to the W. | 1: 506,880| 95 of 100° W. long. (Wheeler), Map of Central California, 1: 380,160 ae Carte d'Algérie (Dépét de la guerre).| 1: 800,000 4

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Algeria. Turkestan, Australia.

South Africa.

Map of Turkestan, Military District. | J: 168,000 1 Western Australia, Northern District | 1: 770,000 (J. Forrest). Eastern portion of South Africa 8°6m.=lin. (Capt. C. E. Grover).

Algeria. Carte de la province d'Alger. iy pia 3 Australia. Map of Queensland (Bailey and 1:1,000,000 6

Lawson).

(Ss. R.)

MAP, Marrs, or Mapus, WALTER, an ecclesiastical statesman and renowned wit of the 12th century, must be ranked among the greatest of English writers, though French was the language that he used, and his personal fame has long been lost in the splendour of his creations. He was the cosmogonist and one of the principal creators of the Round Table legends, which supplied the ideal of chivalrous life to so many succeeding centuries. Most of the facts that are known about his position in the world have been gathered froin a gossipy anecdotical work of his in Latin, De Nugis Curialium. He was probably a native of Herefordshire or Gloucestershire. He tells us that his parents rendered services to Henry If. both before and after his accession. He was acquainted with the household of Thomas Becket before this famous ecclesiastic became archbishop of Canterbury, which wasin 1162. He studied in the university of Paris, attending the lectures of Girard la Pucelle, who began lecturing in 1160. Map seems to have risen rapidly in favour at the court of Henry IL, combining ecclesiastical with civil and political functions. In 1173 he was an itinerant justice at the assize of Gloucester, and in the same year was with the court at Limoges, where the duty fell to him of entertaining the archbishop of Tarentaise, about whom he tells some mar- vellous stories. He was sent on a diplomatic mission to Louis le Jeune, king of France, and sat as a delegate in a council called by Pope Alexander III. (probably 1179), enjoying such repute that he was deputed to argue with the Waldenses. He accompanied Henry II. on all his pro- gresses, and in return

for his services received several ecclesiastical preferments. Apparently he maintained his position at court under Richard and John. In 1196 he was appointed archdeacon of Oxford, and in 1207-8 the custodes of the abbey of Eynsham were ordered to pay him his accustomed rent of five marks per annum. In the 12th century the abuses of the church were assailed with great

and Hook., Gen. Pl., i. 409).

freedom and abundanee of humorous wit in rhymed Latin verse, and a century or two later rubrics appear in the MSS, of these satirical poems ascribing them to Walter Map. "'Golias Episcopus" is the nominal author and hero of a great many of these effusions ; that is to say, they repre- sent the sayings and doings of Golias, the revelation made to him, the confession made by him, his creed, his reasons for not marrying, and so forth. The fact that Map's friend Giraldus Cambrensis denounces Golias as a foul-mouthed scoffer is rather against Map's alleged authorship, and they have probably been attributed to him in consequence of his great reputation as a wit, and a tradition that he had such a hatred of the White Monks that he exempted them from his oath as king's deputy to render even justice to all men. If these coarse and witty poems were really Map's, they are a proof of astonishing versatility, for they offer as great a contrast as possible to the high imaginative qualities, gracious tenderness, pure and lofty idealism, of his contri- butions to the Round Table legends. This is not the place for an exposition of the origin of these legends, but the Quest du Saint Graal was undoubtedly written by Map, being assigned to him in the earliest MSS. M. Paulin Paris ascribes to him also, upon grounds which commend themselves as being at least highly probable, the Saint Graal, and the noble prologue and the concluding parts of Lancelot du Lac. The effect of these contributions to the cycle was to completely transform its character, making out of it a lofty spiritual allegory, and forcing the paganism of the earlier legends into the service of the morality of the church. With such consummate skill did Map insinuate his story of the Graal into the cycle that the separate legends of Lancelot, Gawain, Percival, and Tristan seem to grow out of it; the whole luxuriant and irregular growth acquires a unity

from its connexion with this root and stem. This reorganizing achievement alone, apart from the high roniantic value of Map's independent additions, entitles him to a high place in literature.

The De Nugis Curtaliwm and the Latin poems commonly attri- buted to Walter Mapes were edited by Mr Thomas Wright for the

Camden Society ; and the Quest du Saint Graal, by Mr Furnivall, for the Roxburghe Club.

MAPLE. Maples and the sycamore are species of Acer, suborder Acerinezx, order Sapindacex, The genus includes about fifty species, natives of Europe, North America, North Asia, especially the Himalayas and Japan (Benth. Maples are for the most part trees with palmately-lobed leaves. 'The flowers are in corymbs or racemes,—the lowermost mostly male, the terminal bisexual. The fruit is a two-winged " samara."

The earliest known maples occur in the Miocene strata of Oeningen, where nineteen species have been discovered, —a greater number than occurs in any one district at the present day (Lyell's £7. of Geol., 6th ed. p. 250). A typical species appears to have been Acer trilobatum, Heer (Flora Yert. Helv, pl. 114). This had many marked varieties, of which leaves, flowers, and fruit have all been discovered. The foliage was even attacked by a fungus, Rhytisma induratum, Heer, just as the syca- more is now by &. acerinum, which forms black spots on the leaves.

The common maple, A. campestre, L., is the only species indigenous to Great Britain. This and the sycamore were described by Gerard in 1597 (Herball, p. 1299), the latter being "a stranger to England." Many species have been introduced, especially from Japan, for ornamental purposes. The following are more especially worthy of notice.

European Species.—Accr 'ampestre, I.., the common maple, is common in hedgerows, but not often seen ag a tree (see, however, Loudon, Arboretum, vol. i. p: 430). Loudon gives four varieties, — the downy-fruited, the variegated, the hill-inhabiting, and the

Austrian. It occurs in northern Europe, the Caucasus, and northern Asia. The wood is excellent fuel, and makes the best charcoal. It is compact, of a fine grain, sometimes beautifully

veined, and takes a high polish. Hence it has been celebrated from antiquity for tables, &. The wood of the roots is frequently knotted, and valuable for small objects of cabinet work. The young shoots, being flexible and tough, are employed in France as whips. A. psewdo-Platanus, L., the sycamore, or great maple, is a handsome tree of quick growth, with a smooth bark. The leaves are large, with finely acute and serrated lobes, affording abundant shade. Its longevity is from one hundred and forty to two hundred years. Itis found in various parts of Europe in wooded mountainous situations. The wood when young is white, but old heart-wood is yellow or brownish. Like the common maple it is hard and takes a high polish. It is much prized by wheelwrights, cabinetmakers, sculptors, &c., on the Continent, while knotted roots are used for in- laying. Sugar has been obtained from the sap of this as from other species, the most being one ounce froin a quart ofsap. The latter has also been made into wine in the Highlands of Seotland. There are inany Varieties, the variegated and cut-leaved being the most notice~ able (see Gard. Chron., 1881, p. 229). For remarkable variations in the number of cotyledons arising from fusion, see a paper by the late Prof. J. S. Henslow in Mag. Nat. Hist., vol. v. p. 346. A. Platanoides, L., the Norway maple (Loudon, lc, p. 408; Gard. Chron., 1881, p. 564), is met with from Norway to Italy, Greeee, ecntral and south Russia. It was introduced into Britain in 1683. It is a lofty tree (from 40 to 70 feet), resembling the sycamore, but with yellow flowers, and more spreading wings to the fruit. There are several varieties. The wood is used for the same purposes as that of the sycamore. Sugar has been made from the sap in Norway and Sweden. those of the syeamore especially, and perhaps all others, are liable to produce honeydew, which appears to be extravasated_cell-sap. The present writer suggests that the starch formed in the leaves may be rapidly converted into sugar, which is then condensed on the surface of the leaf under excessive transpiration.

Asiatic Species. —Thirteen species are described by Hiern, chiefly in the temperate Himalayas (flor. of Brit. India, p. 692; sce also Brandis, For. Fl.,110). The wood of some species is used, as that of A. levigatum, Wall.,

for building; that of A. cwsiwm, Wall., being soft, inferior drinking cups are made of it ; while that of A. pictum, Thunb., is white, light, and fine-grained.

Japanese Species.—Species, and many varieties, especially of 4. palmatum, Thunb., generally known as polynorphum, with variously laciniated and more or less coloured foliage, have lately been intro- duced as ornamental shrubs. The original species was introdueed in 1832. The branches and corolla are purple, the fruit woolly. The foliage of the typical form is bright green with very pointed lobes. It oceurs in the central mountains of Nippon and near Nagasaki, Beautiful varieties have been introduced under the names A. P. ampelopsifolium, atropurpureum, dissectum, &e. They are remarkable for the coppery purple tint that pervades the leaves and young growths of some of the varieties (for figs., see Catalogue of Hardy Trees, &e., by Messrs Veitch). Of other Japanese species, A. rufinerve, Sieb. and Zuce., with the habit of the syeamore, from Nippon ; A. distylum, Sieb. and Zuce., bearing leaves without lobes; 4. diabolicum, Bl., with large plane-like leaves, from Nippon ; and 4. carpinifoliwm, Sieb. and Zuce., with tee resembling that of the hornbeams, are especially worthy of note.

North American Specics,— A. saccharinum, L., the sugar, rock, or bird's-eye maple, was introduced in 1735. It sometimes attains to 70 or even over 100 feet, more commonly 50 to 60 feet. It is remarkable for the whiteness of the bark. 'The wood is white, but acquires a rosy tinge after exposure to light. The grain is fine and elose, and when polished has a silky lustre. The timber is used instead of oak where the latter is searee, and is employed for axle- trees and spokes, as well as for Windsor chairs, &c. It exhibits two aecidental forms in the arrangement of the fibres, an undulated one like those of the curled maple (4. rubrwm), and one of spots which gives the name bird's-eye to the wood of this species. Like the curled maple, it is used for inlaying mahogany. It is much prized for bedsteads, writing desks, shoe lasts, &c. The wood forms excellent fuel and charceal, while the ashes are rich in alkaline prineiples, furnishing a large proportion of the potash exported from Boston and New York. Sugar is principally ex- tracted from this species, the sap being boiled and the syrup when reduced to a proper consistence run into moulds to form cakes. Trees growing in low and moist situations afford the most sap but least sugar. A cold north-west wind, with

frosty nights and sunny days in alternation, tends to incite the flow, which is more abundant during the day than the night. A thawing night is said to promote the flow, and it ceases during a south-west wind and at the approach of a storm; and so sensitive are the trees to aspect and climatic variations that the flow of sap on the south and east side has been noticed to be earlier than on the north and west side of the same tree. The average quantity of sap per tree is from

The leaves of this species, in common with –

id Vo.

MAR—MAR

12 to 24 gallons in a season. For full details of the preparation, &c., see Loudon, J.¢., p. 418; and Gard. Chron. 1878, p. 187.

A. rubrum, L., the red-flowering or searlet maple, is a middle- sized tree, and was introduced in 1656. It is the first tree to blossom in spring in North America. The wood, like that of other species, is applicable to many purposes, as for the seats of Windsor chairs, turnery, &c. The grain in very old trees is sometimes undulated, which suggested the name of eurled maple, and gives beautiful effects of light and shade on polished surfaces. The most constant use of curled maple is for the stocks of fowling picces and rifles, as it affords toughness and strength combined with lightness and elegance. The inner bark is dusky red. On boiling, it yields a purple colour which with sulphate of iron affords a black dye. The wood is inferior to that of the preceeding species in strength and as fuel. Sugar was made from the sap by the French Canadians, but the production is only half as great as that from the sugar maple (Michaux). In Britain it is eultivated as an ornamental tree, as being conspicuous for its flowers in spring, and for its red fruit and foliage in autumn. 4. macrophyllum, Pursch., furnishes material for hats, baskets, mats, &e., from its inner bark, and the sap gives sugar. A. circinatum, Pursech., of California, has a fine, white, tough wood, which takes a good polish.

For description of other species of North America, see Gard. Chron., 1881, index, s.v. ‘ Acer”; Sargent’s Cat. of For. Trees of N. Amer.; Loudon, l.c., p.

405 sq.3 Gray's Manual of Bot., p. 84. (G. H.)

*MAR, Earitpom or. Mar, one of the ancient divisions or provinces of Scotland, comprised the larger portion of Aberdeenshire, extending from north of the Don southwards to the Mounth. It is remarkable for its association with the oldest historical dignity of Scotland, or perhaps of any country, which has been perpetuated to our own time. Donald MacEnun MacCainech, mormaer (hereditary ruler or steward) of Mar, fought, according to nearly contem- porary testimony, at the battle of Clontarf in Ireland in 1014. Under Anglo-Saxon influences mormaers or great stewards became earls; and Ruadri, mormaer of Mar, whose name appears in the Book of Deer, is designed ** Rothri comes " in a charter of Alexander I. of 1114 or His representative in the latter part of the 12th century was Gratney, earl of Mar, who married Christian Bruce, sister of King Nobert, a lady famed for her defence of the chief stronghold of the earldom, Kildrummy Castle, against David of Strathbogie, earl of Athole, then (1335) in alliance with the English. Their son, Earl Donald, in his youth a captive in England, was restored to his country after Bannockburn. On the landing of Edward Balliol in 1332, and death of Thomas Randolph, earl of Moray, he was in- vested with the regency, and the troops hastily assembled by him to meet the invader suffered a disastrous defeat at Dupplin, the earl of Mar being himself among the slain. Earl Thomas, the regent's son, dying without issue in 1377, his successor was his sister Margaret, countess of Douglas by marriage. J'rom her the earldom of Mar passed to her daughter, Isabel Douglas, countess of Mar, whose second marriage forms a notable episode in Scottish history. Alex- ander Stewart, natural son of Alexander, earl of Buchan, and, according to common belief, the instigator of a murderous attack on that lady's first husband, stormed the widowed countess of Mar in Kildrummy Castle in 1404, compelled her to marry him, and extorted from her a charter which, had the king been prevailed on to confirm it, would have made over the earldom to him and his heirs, in exclusion of the heirs of his wife. But, weak as was the law north of the Mounth in the reign of Robert III, this outrage was too flagrant to be condoned. The indis- pensable confirmation was refused by the king; but a compromise was effected, by which Isabel voluntarily accepted Stewart as her husband, and, by a charter which Robert duly confirmed, gave him a right to the earldom for life, with remainder, however, to her own heirs. Qua earl of Mar, the*

quondam leader of freebooters became a sup- porter of law and order ; and in 1411, when Donald, lord of the Isles, was leading his marauding host southwards, it was under Alexander, earl of Mar, that the lowland gentry and the burghers of Aberdeen mustered to oppose

his advances. The sanguinary battle of Harlaw arrested the progress of the highlanders, and left Mar master of the field.

Earl Alexander died in 1435, when the right to the earldom passed to Isabel's nearest heir, Robert Lord Erskine (descended from a daughter of Earl Gratney), who established his right by retour in 1438, and became earl of Mar. The crown, however, had seized on the valuable territories of the earldom, of which he could only obtain partial possession ; and James II. and his advisers, after temporizing for a length of time, in 1457 reduced Earl Robert's retour by a collusive "service negutive," based ou the plea that, either by the bastardy of Alexander or in virtue of a resignation by him to James I., the earldom had lapsed to the crown, two ex facie worthless pretexts, inasmuch as Alexander had only been a liferenter. The wrongful possession of the crown lasted more than a century, in the course of which time the earldom was twice temporarily in possession of younger members of the royal house, and portions of it were given away to favourites ; while its lawful owners, the Erskines, continued loyally to serve the sovereigns who had usurped their inheritance.

At length, on 23d May 1565, Queen Mary, made aware of the wrongs inflicted by her predecessors, and '" moved by conscience" to make the fullest reparation, granted to John Lord Erskine a charter restoring the earldom of which he and his ancestors had been unjustly deprived. The earl of Mar, thus replaced in his rights, was regent of Scotland during the last two years of his life; and his son, who succeeded him in 1572, and was treasurer to James VI, recovered by process of law those portions of his inheritance which had been alienated by the crown during the period of illegal possession. In the next two genera- tions the attachment of the family to the Stewarts brought with it fines and impaired fortunes. Jolin, earl of Mar, fourth in descent from the treasurer, headed the rebellion of 1715, and suffered attainder, but escaped abroad and survived till 1732. His daughter

Lady Frances (who married an Erskine, the younger son of her uncle, Lord Grange) would, but for the attainder, have inherited his title ; and what remained of the lands was preserved to her by arrangement with the commissioners of forfeited estates. In 1824 her son, John Francis Erskine of Mar, was, as "grandson and lineal heir" of the attainted earl, restored by Act of Parliament from the effects of the forfei- ture,

At the death in 1866 of John Francis Miller Erskine, earl of Mar, grandson of the restored earl, there seemcd no room for doubt that the earldom devolved, in accordance with the rule of succession which it had always followed, on his sister's son John Francis Erskine Goodeve, in preference to his cousin and heir male, the earl of Kellie, The latter, however, claimed, not indeed the ancient dignity, but a separate titular earldom, supposed to have been

bestowed by Queen Mary, not by her charter above alluded to, but by a lost and till then unheard-of patent a few weeks later in datc,

and with a different remainder, namely, to heirs male of the body. |

The resolution of the committee of privileges of the House of Lords in 1875, finding Lord Kellie entitled to the earldom thus claimed by him, has caused great surprise ; and Scotch lawyers generally, while disbelieving as a question of fact in this creation of 1565, seem also to hold in point of law that the resolution alluded to leaves untouched the right of the heir general to the ancient historical honour. large number of the Scottish peers, and enforced by the late earl of Crawford in his ably written posthumous work The Earldom of Mar in Sunshine and Shade,

MARABOUT is a corruption of the Arabic Mordbit, a Moslem name for a hermit or a devotee. Primarily the word is derived from stbdf, a fortified frontier station. To such stations pious men betook them to win religious merit in war against the infidel; their leisure was spent in devotion, and the habits of the convent superseded those

of the camp (see De Slane in Jour, As., 1842, i. 168; |

The same view has been expressed by way of protest by a |

Dozy, Suppl., i. 502). Thus r2bd¢ came to mean a religious house or hospice (zéwiya), The great sphere of the marabouts is North Africa. There it was that the com- munity formed by King Yahya and the doctor Abdalla developed into the conquering empire of the Mordbits, or, as Christian writers call them, the ALMORAVIDES (g.e.), and there still, among the Berbers, the marabouts enjoy extra- ordinary influence, being esteemed as living saints and mediators. They are liberally supported by alms, direct all popular assemblies, and have a decisive voice in intertribal quarrels and all matters of consequence. On their death their sanctity is transferred to their tombs, where chapels are erected and gifts and prayers offered. The prominent part which the marabouts took in the resistance offered to the French by the Algerian Moslems is well known ; and they have been similarly active in recent politico-religious movemeuts in Tunis and Tripoli.

MARACAIBO, a city and seaport of Venezuela, the capital of the state of Zulia (formerly Maracaibo), lies about 25 miles from the sea on the west bank of Lake Maracaibo, the suburbs presenting, with their cocoa-nut groves, a fine contrast to the background of barren-looking hills sloping up from the shore to a height of about 200 feet. The streets are laid out at right angles; the houses are poor structures of a crude concrete or rubble, strength- ened by wooden beams; and even the public buildings— such as the churches, the government house, the court- house, and the theatre—owe their pretentious appearance to plaster and paint. The water of the lake being brackish, and the sinking of Artesian wellsas yet in the experimental stage, Maracaibo is dependent on the rains for its drinking water. The markets are well supplied with provisions (especially game), and the lower classes, with whom the plantain forms the staff of life, are able to subsist in a state of comparative idleness. The prosperity of the place is due to the fact that it forms the outlet for the produce of a wide region; aud if the bar at the mouth of the lake, preventing the entrance of vessels drawing more than 10 or 11 feet, were removed Maracaibo would bid fair to become the chief mercantile centre of the north coast of South America. Coffee, not of prime quality, cocoa, and hides are the principal exports at present, $4,029,852 out of the $4,188,617 at which the whole exports were valued in 1880 being drawn from those items. Steamers ascend the Catatumbo as far as San

Buenaventura and Villarnizar and the Escalente to Santa Cruz, thus tapping the border provinces of both Venezuela and Colombia. Bricks and tiles, leather and admirable saddlery, cocoa-nut oil, sugar, rum, and chocolate are manufactured in the town. Though the Jesuit College, which formerly made Maracaibo one of the few real seats of learning in this part of the world, no longer exists, means of education are fairly abundant (a national college, a nautical school, &c.); and, although they devote them- selves mainly to political agitation, the upper classes are not without culture. Maracaibo was founded by Alonso Pacheco in 1571. The population, returned in 1873 as 21,954, is estimated at 30,000 in 1881.

Sec Engel, " Maracaibo," in Zeit. d. Ges. Erdk., Berlin, 1870; and U. S. Consular Reports, 1882.

MARAGHA, a town of Persia, province Azerbijan, 37° 20' N., 46° 25' E., 68 miles from Tabriz, 232 north-west of Tehran, pleasantly situated in a long narrow valley opening towards Lake Urmiah, which lies 10 miles to the north-west. The town consists mostly of mud_ houses enclosed by a high dilapidated wall, and containing no conspicuous buildings except a large bazaar and fine public bath. Niasir-ed-din's observatory formerly stood on a hill to the west, where there are some old tombs covered with Cufic inscriptions. The surrounding gardens and planta-

tions are watered by canals from a small river crossed here by two good bridges built in 1809. At the village of Dash-Kesen, 6 miles from Deh Kurgan in this district, are the famous Maragha marble pits, occupying a space half a mile in circumference, and sunk to a depth of about 12 feet. Here a multitude of springs charged with carbonic acid gas bubble up in all directions, precipitating large quantities of carbonate of lime. The marble in the semi- crystallized formation of this deposit forms horizontal layers, which when cut in thin slabs are nearly transparent, and serve as windows in the Tabriz baths and elsewhere. Larger blocks are also used as pavements in bazaars and palaces, and the famous throne in the Diwdn Khana at Tehrau is made of the same material. Mardgha was formerly the capital of Hulaku, grandson of Jenghis Khan, and its fifteen thousand inhabitants still belong mostly to the Mukadam Turki tribe.

MARANHAO, or Maranuam (Latinized as Marag- nanum), in full form Sao Luiz p—E Maranuio, the chief town of the province of Maranhao in Brazil, is situated in 2° 30'S. lat. and 44°17' W. long., on the west side of an island of the same name 28 miles long and 15 broad. Though built on so hilly a surface that carriages cannot be used, it is laid out with regularity, and has straight, wide, and clean-looking streets. The public institutions comprise a naval arsenal, a high court of appeal, a tribunal of commerce, a military hospital, several general hospitals, a theatre, a museum, a public library, and a botanic garden, as well as a cathedral and an episcopal palace, both built by the Jesuits. Maranhio has some commercial import- ance, exporting cotton, sugar, hides, &c., from a wide region of the interior, and receiving manufactured goods from Europe, and especially from England. Though some- what difficult of access to large sailing vessels, the port atfords good anchorage to all drawing less than 20 feet. Steamers ply to Rio de Janeiro and Para, as well as up the rivers Itapicuru, Guajahu, and Pindare; and direct steam communication is maintained with Lisbon and Liverpool. The population of the island Maranhio was 34,023 in 1872, about 30,000 belonging to the city,

French colonists settled at St Luiz in 1612, but they were expelled by Jeronimo d'Albuquerque in 1614, The Dutch were in possession from 1641 to 1653, The bishopric was created in 1676. The city was captured in 1823 by Lord Cochrane, who was afterwards created marquis of Maranham,

MARAT, Jean Paut (1743-1793), a famous revolution- ary leader, was the eldest child of Jean Paul Mara of Cagliari and Louise Cabrol of Geneva, and was born at Boudry, in the principality of Nenchatel, on May 24, 1743. His father was a doctor of some learning, who had aban- doned his country and his religion, and had married a Swiss Protestant. It was he that laid the basis of the young Jean Paul's scientific learning, and the son at the same time imbibed the doctrines of Rousseau. On _ his mother's death in 1759 he set out on his travels, and Spent two years at Bordeaux in the study of medicine, whence he moved to Paris, where he made use of his knowledge of his two favourite sciences, optics and electricity, to subdue an obstinate disease of the eyes. After some years in Paris he went to Holland, the retreat of philosophers, where all the works of the Encyclopédists were printed for the French market, and then on to London, where he settled in

Church Street, Soho, a fashionable district, and practised his profession. In 1773, at the age of thirty, he made his first appearance as an author with a Philosophical Lissay on Man, being an Attempt to Investigate the Principles and Laws of the Recip- rocal Influence of the Soul on the Body, of which only two volumes are extant, though at the end of the second volume he speaks of a third. The book shows a wonder-

ful knowledge of English, French, German, Italian, and Spanish philosophers, and directly attacks Helvetius, who had in his L'Hsprit declared a knowledge of science un- necessary for a philosopher. Marat, as he now began to call himself, declares that physiology alone can solve the problems of the connexion between soul and body, and proposes the existence of a nervous fluid as the true solution, In 1774 he published a political work, Zhe Chains of Slavery, which appeared without his name, and was intended to influence constituencies to return popular members, and reject the king's friends, with innumerable examples from classical and modern history of the ways in which kings enslaved their peoples. The book was too late to have any influence on the general election, and was got up in a style too costly for a wide circulation, but its author declared later that it procured him an honorary membership of the patriotic societies of Carlisle, Berwick, and Newcastle. He remained devoted to his profession, and in 1775 published in London a little Lssay on Gleets, price 1s. 6d., of which no copy is to be found, and in Amsterdam a French translation of the first two volumes of his Lssay on Man. In this year, 1775, he visited Edin- burgh, and on the recommendation of certain Edinburgh physicians, was, on June 30, made an M.D. of St Andrews University. On his return to London he published an Enquiry into the Nature, Cause, and Cure of a Singular Disease of the Eyes, with a dedication to the Royal Society. In the same year there appeared the third volume of the French edition of the Assay on Man, which reached Ferney, and exasperated Voltaire, by its onslaught on Helvetius, into a sharp attack, that only made the young author more conspicuous. His fame as a clever doctor was now great, and on June 24, 1777, the Comte d'Artois, afterwards Charles X. of France, " owing to the report he had heard of the good and moral life, and of the

knowledge and experience in the art of medicine, of J. P. Marat," made him by brevet physician to his guards, with 2000 livres a year and allowances.

Marat was soon in great request as a court doctor among the aristocracy ; and even Brissot, in his A/émozres, admits his influence in the scientific world of Paris. The next years were much occupied with scientific work, especially the study of heat, light, and electricity, on which he pre- sented memoirs to the Académie des Sciences, but the Academicians were horrified at his temerity in differing from Newton, and, though acknowledging his industry, would not receive him among them. His experiments greatly interested Benjamin Franklin, who used to visit

.him; and Goethe always regarded his rejection by the

Academy as a glaring instance of scientific despotism. In 1780 he had published at Neuchatel without his name a Plan de Législation Criminelle, founded on the humane principles established by Beccaria, In April 1786 he resigned his court appointment. The results of his leisure were in 1787 a new translation of Newton's Optics, and in 1788 his Mémoires Académiques, ou Nowvelles Découvertes sur la Lumiere,

His scientific life was now over, his political life was to begin; in the notoriety of that political life his great scientific and philosophical knowledge was to be forgotten, the high position he had.given up denied, and he himself to be scoffed at as an ignorant charlatan, who had sold quack medicines about the streets of Paris, and been glad to earn a few sous in the stables of the Comte d'Artois. In 1788 the notables had met, and advised the assembling of the states-general. The elections were the cause of a flood of pamphlets, of which one, Ofrande & la Patrie, was by Marat, and, though now forgotten, dwelt on much the same points as the famous brochure of the Abbé Siéyes. When the states-general met, Marat's interest was as great

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as ever, and in June 1789 he published a supplement to his Ofrande, followed in July by La Constitution, in which he embodies his idea of a constitution for France, and in September by his Tableau des Vices de la

Constitution d' Angleterre, which he presented to the assembly. The latter alone deserves remark. The assembly was at this time full of Anglomaniacs, who desired to establish in France a constitution exactly similar to that of England. Marat, who liad lived in England, had seen that England was at this time being ruled by an oligarchy using the forms of liberty, which, while pretending to represent the country, was really being gradually mastered by the royal power. His heart was now all in politics; and, feeling that his energies needed. a larger scope than occasional tracts afforded, he decided to start a paper. At first appeared a single number of the JMonteur patriote, followed on September 12 by the first number of the Publiciste parisien, Which ou September 16 took the title of L' Amz du Peuple, and was to absorb his future life.

The life of Marat now becomes part of the history of the French Revolution. From the beginning to the end he stood alone. He was never attached to any party; the tone of his mind was to suspect whoever was in power; and therefore no historian has tried to defend him, and all state the facts about him with a strong colouring. About his paper, the incarnation of himself, the first thing to be said is that the man always meant what he said; no poverty, no misery or persecution, could keep him quiet ; he was perpetually crying —' nous sommes trahis."

Further, tiie suspicious tone of his mind extended to his paper, and he made it play the part of the lion's mouth at Venice : whoever suspected any one had only to denounce him to the Amz du Peuple, and the denounced was never let alone till he was proved innocent or guilty. He began by attacking the most powerful bodies in Paris,—the corps Inunicipal, with Bailly at their head, and the court of the Chatelet,—and after a struggle found them too strong for him, and fled to London (January 1790), There he wrote his Denonciation contre Necker, and in May dared to return to Paris and continue the Amz du Peuple. He was embittered by persecution, and continued his vehement attacks against all in power—against Bailly, against La Fayette, and at last, after the day of the Champs du Mars, against the king himself. All this time he was hiding in cellars and sewers, where he was attacked by a horrible skin disease, tended only by the woman Simonne Evrard, who remained true to him. The end of the constituent assembly he heard of with joy, and with bright hopes (soon dashed by the

behaviour of the legislative) for the future, when almost despairing in December 1791 he fled once more to London, where he wrote his Ecole du Citoyen. In April 1792, suinmoned again by the Cordeliers, he returned to Paris, and published No. 627 of the Ami. The war was now the question, and Marat saw clearly enough that it was not sought for the sake of France, that it was to serve the purposes of the royalists and the Girondins, who thought of themselves alone. The early days of the war being unsuccessful, the proclaination of the duke of Brunswick excited all hearts ; who could go to save France on the frontiers and leave Paris in the hands of his enemies? Marat, like Danton, foresaw the massacres of September. After the events of August 10th he took his seat at the commune, and demanded a tribunal to try the royalists in prison. No tribunal was formed, and the inassacres in the prisons were the inevitable result. In the elections to the convention, Marat was elected seveuth out of the twenty-four deputies for Paris, and for the first time took his seat in an assembly of the nation, At the declaration of the republic, he closed his Ami Zu Penple, and commenced a new paper, the Journal de la République Francaise, which

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was to contain his sentiments aos its predecessor had done, and to be always on the watch. Inthe assembly Marat had no party; he would always suspect and oppose the power- ful, refuse power for himself. After the battle of Valmy, Dumouriez was the greatest man in France; he could almost have restored the monarchy, yet Marat did not fear to go uninvited to the tragedian Talma's, and there accuse Dumouriez in the presence of his friends of want of patriotism. His unpopularity in the assembly was extreme, yet he insisted on speaking on the question of the king's trial, declared it unfair to accuse Louis for anything anterior to his acceptance of the constitution, and, though implacable towards the king, as the one man who must die for the people's good, he would not allow Malesherbes, the king's counsel, to be attacked in his paper, and speaks of hin as a "'sage et respectable vieillard." The king dead, the months from January to May were spent in an unre- lenting struggle between Marat and the Girondins. Marat despised the ruling party because they had suffered nothing for the republic, because they talked too much of their feelings and their antique virtue, because they had for their owh purposes plunged the country into

war; while the Girondins hated Marat as representative of that rough red republicanism which would not yield itself to a Roman republic, with themselves for tribuues, orators, and generals. The Girondins conquered at first in the convention, and ordered that Marat should be tried before the Tribunal Revolutionnaire. But their victory ruined them, for Marat was acquitted on April 24, and returned to the con- vention with the people at his back. Their fall was a veritable victory for Marat. But it was his last. The skin disease he had contracted in the subterranean haunts was rapidly closing his life ; he could only ease his pain by sitting in a warm bath, where he wrote his journal, and accused the Girondins, who were trying to raise France against Paris. Sitting thus on the 13th July he heard in the evening a young woinan begging to be admitted to see him, saying that she brought news from Caen, where the escaped Girondins were trying to rouse Normandy. He ordered her to be admitted, asked her the names of the deputies then at Caen, and, after writing their names, said, "They shall be soon guillotined," when the young girl, whose name was Charlotte Corday, stabbed him to the heart. Grand was the funeral given to the man who had suffered so much for the republic. Whatever his political ideas, two things shine clearly out of the mass of pre- judice which has shrouded the name of Marat—that he was a man of great attainments and acknowledged posi- tion, who sacrificed fortune, health, life itself, to his con- victions, and that he was no léte feroce, no factious dema- gogue, but a man, and a humane man too, who could not keep his head cool in stirring times, who was rendered sus- picious by constant persecution, and who has been regarded as a personification of murder, because he published every thought in his mind, while others only vented their anger and displayed their suspicions in spoken words.

The only works of Marat not mentioned in the text are Les aventures du Comte Potowski, a poor novel, which must have been written in his early days, and which was discovered in MS. and published by Bibliophile Jacob ; two brochures on a balloon acci- dent, 1785; Les Charlatans Modernes, ou Lettres sur le Charla- tanisme académigque, 1791; Le Junius Frangais, journal politique, June 2 to June 24,1790 ; translation of Chains of Slavery, with fifty pages on French history prefixed, year 1.

On Marat's life should be read L'ami du peuple, Skizzen aus Marat's journalistichen Leben, Hamburg, 1846; A. Bougeart, ilarat, Pamidu peuple, 2 vols., 1864 ; G. Piazzoli, Marat, lamico del Popolo ela Rivoluzione, Milan, 1874; A. Vermorel, uvres de J. P. Marat, lami du peuple, reeueitlies et annotées, 1869 ; F. Chevremont, Marat, Index du Bibliophile, &c., 1876; Ik@leg Placards de Murat, 1877; and particularly his Jean Paul Marat, esprit politique, accompagné de sa vie scientifique, politique, et privée, 2 vols,, 1881. (H. M. &.)

MARATHON was a plain on the north-east coast of Attica, containing four villages—Marathon, Probalinthos, Tricorythos, and Oinoe, which formed a tetrapolis, It was divided from the plain of Athens by Mount Pentelicus and the hilly district of Diacria, and was in the early period an autonomous state. After it became incorporated in the Attic state, it retained something of its original distinctive character. The worship of Apollo had its first home in Attica here, and it was carried hence to Athens when the tetrapolis was made part of the Athenian commonwealth. The district was one of the chief seats of the worship of Hercules, and boasted that it was the first place where he had been worshipped as a god. Hence legend localized here several events in the story of the Heraclide, and especially the self-sacrifice of Macaria, daughter of Hercules. The legend of Theseus was also known in the district ; here the hero slew the Marathonian bull. The plain derived its fame chiefly from the battle in which tle Athenians and Plateans under Miltiades defeated the Persians, 490 pc. The one hundred and ninety-two Athenians that were slain were buried on the field of battle, contrary to the usual Attic custom, aud a mound, which is still called Soro, was erected overthem. Another tnmulus covered the bodies of the slain Platsans and slaves, and a special monument was raised to Miltiades.

MARBLE is a term applied to any limestone which is sufficiently close im texture to admit of being polished. Many other ornamental stones—snch as_ serpentine, alabaster, and even granite—are sometimes loosely designated as marbles, but by accurate writers the term is invariably restricted to those erystalline and compact varieties of carbonate of lime which, when polished, are applicable to purposes of decoration. The crystalline structure

is typically shown in statuary marble. A fractured surface of this stone displays a multitude of sparkling facets, which are the rhombohedral cleavage- planes of the component grains. On placing a tliin section of Carrara marble under the microscope, it is seen that éich grain is an imperfect crystal, or crystalloid, of culc- spar, having an irregular boundary, and being itself made up of a number of crystalline plates twinned together (see fig. 5, article Gzonoay, vol. x. p. 231). It is said that a somewhat similar polysynthetic structure may be artificially induced in cale-spar by means of pressure. As marble appears to be, in many cases, a metamorphic rock, it is probable that pressure and heat have been the principal natural agents concerned in the alteration of compact into crystalline limestones. It was shown many years ago by Sir James Hall that even an earthy limestone, like chalk, when strongly heated in a closed vessel, might assume a saccharoidal texture ; and it is a fact familiar to the field-geologist that a erystalline structure is often locally developed in limestone where it happens to have been invaded by an eruptive rock. Prof. Geikie proposes to distinguish this kind of metamorphism by the term mar-marosis (Text-Book of Geology, 1882).

Among statuary marbles the first place may be assigned to the famous Pentelic marble, the material in which Phidias, Praxiteles, and other Greek sculptors executed their principal works. The characteristics of this stone are well seen in the Elgin marbles, which were removed from the Parthenon at Athens, and are now in the British Museum. The marble was derived from the quarries of Mount Pentelicus in Attica. The neighbouring mountain of Hymettus likewise yielded marbles, but these. were neither so pure in colour nor so fine in texttire as those of Pentelicus. Parian marble, another stone much used by

Greek sculptors and architects, was quarried in the. isle of

Paros, chiefly at Mount Marpessa, It is called by ancient writers /ychnites, in allusion to the fact that the quarries

were worked by the light of lamps. The Venus de' Medici is a notable example of work in this material. Carrara marble is better known than any of the Greek marbles, inasmuch as it constitutes the stone invariably employed by the best sculptors of the present day. This marble occurs

abundantly in the Apuan Alps, an offshoot of the Apennines, and is largely worked in the neighbourhood of Carrara, Massa, and Serravezza. Stone from this district was employed in Rome for architectural purposes in the time of Augustus, but the finer varieties, adapted to the needs of the sculptor, were not discovered until some time

later. It is in Carrara marble that the finest works of . Michelangelo and of Canova are executed. The purest

varieties of this stone are of snow-white colour and of fine saccharoidal texture. Silica is disseminated through some of the marble, becoming a source of annoyance to the workman; while occasionally it separates as beautifully pellucid crystals of quartz known as Carrara diamonds. The geological age of the marbles of the Apuan Alps has been a subject of much dispute, some geologists regarding

‘them as metamorphosed Triassic or even Liassic rocks,

while others are disposed to refer them to the Carbomi- ferous system. Much of the common marble is of a bluish colour, and therefore unfit for statuary purposes; when streaked with blue and grey veins, the stone is known as bardiglio. Curiously enough, the common white marble of Tuscany comes to England as Sicilian marble—a name

| probably due to its having been formerly re-shipped from

some port in Sicily.

Although crystalline marbles fit for statuary work are not found to any extent in Great Britain, the limestones of the Paleozoic formations yet yield a great variety of

‘marbles well suited for architectural purposes. The / Devonian rocks of South Devon are rich in handsome

marbles, presenting great diversity of tint and pattern.

. Plymouth, Torquay, Ipplepen, Babbacombe, and Chudleigh

may be named as the principal localities. Many of these limestones owe their beauty to the fossil corals which they contain, and are hence known as madrepore marbles.

Of far greater importance than the marbles of the Devonian system are those of Carboniferous age. It is from the Carboniferous or Mountain Limestone that British marbles are mainly derived. Marbles of this age are

- worked in Derbyshire and Yorkshire, in the neighbour-

hood of Bristol, in North Wales, in the Isle of Man, and in various parts of Ireland. One of the most beautiful of these stones is the eucrinital marble, a material which owes its peculiarities to the presence of numerous encrinites, or stone-lilies. These fossils, when cut in various directions, give a characteristic pattern to the stone. The joints of the stems and arms are known from their shape as

|“ wheel-stones,” and the rock itself is sometimes called ‘entrochal marble. The most beautiful varieties are those

in which the calcareous fossils appear as white markings on a ground of grey limestone. On the Continent a black marble with small sections of crinoid stems is known as petit granit, while in Derbyshire a similar rock, crowded with fragments of minute encrinites, is termed. bird’s-eye marble.

Perhaps the most generally useful marbles yielded by the Carboniferous system are the black varieties, which are largely employed for chimney-pieces, vases, and other ornamental objects. The eolour of most black limestone is due to the presence of bituminous matter, whence the mineralogical name anthraconite. Such limestone com- monly emits a fetid odour when struck ; and the colour, being of organic origin, is discharged on calcination. Black marbles, more or less dense in colour, are quarried in various parts of Ireland, especially at Kilkenny and near

Galway ; but the finest kind is obtained from near Ashford |

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in Derbyshire. From Ashford is also derived a very beautiful stone known as rosewood marble. This is a dense brown laminated limestone, displaying when polished a handsome pattern somewhat resembling the grain of rosewood ; it occurs in very limited quantity, and

is used chiefly for inlaid work.

With the rosewood marble may be compared the well- |

known landscape marble or Cotham stone, an argillaceous limestone with peculiar dendritic markings, due probably to the infiltration of water containing oxide of manganese. This limestone occurs in irregular masses near the base of the White Lias, or uppermost division of the Rheetic series. It is found principally in the neighbourhood of Bristol. The arborescent forms depicted in bluish-grey upon this landscape marble form a marked contrast to the angular markings of warm brown colour which are seeu on slabs of ruin marble from Florence—a stone occasionally known also as landscape stone, or pietra paesia.

British limestones of Secondary and Tertiary age are not generally compact enough to be used as marbles, but some of the shelly beds are employed to a limited extent for decorative purposes. Ammonite marble is a dark brown limestone from the Lower Lias of Somersetshire, crowded with ammonites, principally A. planicostatu. Under the name of Forest marble, geologists recognize a local division of the Lower Oolitic series, so named by W. Smith from Wychwood Forest in Oxfordshire, where shelly limestones occur; and these, though of little economic value, are capable of being used as rough marbles. But the most important marbles of the Secondary series are the shelly limestones of the Purbeck formation. Purbeck marble was a favourite material with medieval architects, who used it freely for slender clustered columns and for sepulchral monuments. It consists of a mass of the shells of a fresh-water snail, Paludina carinifera, embedded in a blue or grey limestone, and is found in the Upper Purbeck beds of Swanage in Dorsetshire. Excellent examples of its use may be seen in Westminster Abbey and in the Temple Church, as well as in the cathedrals of Salisbury, Winchester, Worcester, and. Lincoln. Sussex marble is a very similar stone, occurring in thin beds in the Weald clay, and consisting largely of the shells

of Paludina, principally P. sussexiensis and P. jluviorum. The altar stones and the episcopal chair in Canterbury cathedral are of this material,

Mixtures of limestone and serpentine frequently form rocks which are sufficiently beautiful to be used as orna- mental stones, and are generally classed as marbles, serpentinous limestones are included by petrologists under the term ophicalcite. The famous verde antico is a rock of this character. Mona marble is an ophicalcite from the metamorphic series of the Isle of Anglesey, while the " Irish green" of architects is a similar rock from Connemara in western Galway. It is notable that some of the " white marble" of Counemara has been found by Messrs King and Rowney to consist almost wholly of malacolite, a silicate of calcium and magnesium,

A beautiful marble has been worked to a limited extent in the island of Tiree, one of the Hebrides, but the quarry appears to be now exhausted. This Tiree marble is a limestone having a delicate carnelian colour diffused through it in irregular patches, and containing rounded crystalloids of sahlite, a green augitic mineral resembling malacolite in composition. When dissolved in acid the marble leaves a brick-red powder, which has been studied by Dr Heddle, who has also analysed the sahlite.

Many marbles which are prized for the variegated pat- terns they display owe these patterns to their formation in concentric zones,—such marbles being in fact stalagmitic deposits of carbonate of lime, and probably consisting in

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| many cases of aragonite. One of the most beautiful stalagmitic rocks is the so-called onyx marble of Algeria. This stone was largely used in the buildings of Carthage and Rome, but the quarries which yielded it were not _ known to modern sculptors until 1849, when M. Delamonte rediscovered the marble near Oued-Abdallah. The stone is a beautifully translucent material, delicately clouded with yellow and brown, and is greatly prized by French workmen. Large deposits of a very fine onyx-like marble, similar to the Algerian stone, have been worked of late years at Técali, about 35 miles

from the city of Mexico. Among other stalagmitic marbles, mention may be made of the well-known Gibraltar stone, which is often worked into models of cannon and other ornamental objects. This stalagmite is much deeper in colour and less translucent than the onyx marbles of Algeria and Mexico. A richly tinted stalagmitic stone worked in California is known as Californian marble. It is worth noting that the "ala- baster " of the ancients was stalagmitic carbonate of lime, and that this stone is therefore called by mineralogists " Oriental alabaster" in order to distinguish it from our modern "alabaster," which is a sulphate, and not a car- | bonate, of lime.

The brown and yellow colours which stalagmitic marbles usually present are due to the presence of oxide of iron. This colouring matter gives special characters to certain stones, such as the giallo antico, or antique yellow marble of the Italian antiquaries. Siena marble is a reddish mottled stone obtained from the neighbourhood of Siena in Tuscany; and a somewhat similar stone is found in King's Connty, Ireland. True red marble is by no means common, but it does occur, of bright and uniform colour, though in very small quantity, in the Carboniferous lime- stone of Derbyshire and north-east Staffordshire. It may be noted that the red marble called rosso antico is often confounded with the porjido rosso antico, which is really a red porphyritic felstone.

Fire marble is the name given to a brown shelly lime- stone containing ammonites and other fossil shells, which present a brilliant display of iridescent colours, like those of precious opal. It occurs in rocks of Liassic age at the lead-mines of Bleiberg in Carinthia, and is worked into snuff-boxes and other small objects. By mineralogists it is often termed /machella, an Italian name which may, however, be appropriately applied to any marble which contains small shells.

It would unnecessarily extend this article to enumerate the local names by which marble-workers in different countries distinguish the various stones which pass under their hands. The quarries of France, Belgium, and Italy,

| not to mention less important localities, yield a great

diversity of marbles, and almost each stone bears a distinc- tive name, often of trivial meaning.

America possesses some valuable deposits of marble, which in the eastern States have been extensively worked. The crystalline limestones of western New England furnish an abundance of white aud grey marble, while a |

beautiful material fit for statuary work has been quarried near Rutland in Vermont. A grey bird's-eye marble is obtained from central New York, and the greyish clouded limestones of Thomaston in Maine have been extensively quarried. Of the variegated and coloured marbles, perhaps the most beautiful are those from the northern part of Vermont, in the neighbourhood of Lake Champlain. A fine brecciated marble is found on the Maryland side of the Potomac, below Point of Rocks. Among the principal localities for black marble may be mentioned Shoreham _in Vermont and Glen Falls in New York. In Canada the erystalline limestones of the Laurentian series yield | beautiful marbles.

Turning to India, we find important quarries at Makrana in Rajputana—a, locality which is said to have yielded the marble for the famous Taj Mahal at Agra. In the valley of the Nerbudda, near Jabalpur, there is a large develop- ment of marble. The white marble which is used for the delicately-pierced screens called jalee work is obtained from near Raialo, in Ulwar. See Ball's Heonomie Geology of India, 1882.

For descriptions of ancient marbles sce F. Corsi's treatise Delle Pietre antiche ; and for marbles in general consult Professor Hull's Building and Ornamental Stones, 1872. (F. W. R.)*

MARBLEHEAD, a town and port of entry of the United States, in Essex county, Massachusetts, situated on the coast, 17 miles by rail north-east of Boston, and 4 miles south-east of Salem, and communicates by two branch lines with the main line of the Eastern Railway. It is built on a rocky peninsula of about 3700 acres in extent, which juts out into Massachusetts Bay, and has a deep, roomy, and nearly land-locked harbour. The fisheries in which Marblehead was once largely engaged have declined ; but shoemaking has become an important industry, and the town is rising into

favour as a summer resort. Many of the houses date from the "colonial" period, and one of the churches was built in 1714, but in the summer of 1877 nearly the whole business part of the town was burnt to the ground. The population was 7703 in 1870, and 7467 in 1880.

Marblehead was incorporated in 1649. Of the original settlers, a considerable number were from the Channel Islands, and their peculiarities of speech continued for a long time to affect the local dialect. As at that period the second town of Massachusetts in wealth and size, Marblehead sent one thousand men to the War of Independence, and its privateers rendered excellent service ; but its trading prosperity never recovered from the effects of the contest. Elbridge Gerry, vice-president of the United States in 1812, was born at Marblehead ; and the town is the scene of the grim revenge celebrated, with considerable poetical licence, in Whittier's Skipper Ireson's Ride.

MARBURG, an ancient university town of Prussia, in the province of Hesse-Nassau and district of Cassel, is very picturesquely situated on the slope of a hill on the right bank of the Lahn, 50 miles to the north of Frankfort-on- the-Main, and about the same distance to the south-west of Cassel. On the opposite bank of the river, which is here spanned by two bridges, lie the suburb of Weiden- hausen and the station of the Main-Weser Railway. The streets of the town proper are steep and narrow, and the general character of the architecture is quaint and medieval. The hill on which the town lies is crowned by the extensive old schloss, a fine Gothic building, the most noteworthy parts of which are the rittersaal (see below), dating from 1277-1320, and the beautiful little chapel. This chateau was formerly the residence of the landgraves of Hesse, afterwards served as a prison, and is now the repository of the historically interesting and valuable archives of Hesse. The chief architectural ornament of Marburg is, however, the Elisabethenkirche, a veritable gem of the purest Early Gothic style, erected by the grand master of the Teutonic Order in 1235-83, to contain the tomb of St Elizabeth of Hungary. The remains of the saint were deposited in a rich silver-gilt sarcophagus, which is still extant, and were afterwards visited by myriads of pilgrims, until the Protestant zeal of Landgrave Philip the Generous caused him to remove the body to some unknown spot in the church. The church also contains the tombs of

numerous Hessian landgraves and knights of the Teutonic Order. The Lutheran church is another good Gothic edifice, dating mainly from the 15th century. The town- house, built in 1512, and several fine houses in the Renaissance style, also deserve mention. The university of Marburg, founded by Philip the Generous in 1527, was the first university established without papal privileges,

and speedily acquired a great reputation throughout Protestant Europe. It has a library of 140,000 volumes, and is admirably equipped with medical and other insti- tutes, which form some of the finest modern buildings in the town. The number of students is now about seven hundred. Marburg also possesses a gymnasium, a " real- schule," an agricultural school, a society of naturalists, a hospital, a poorhouse, and an extensive lunatic asylum. It is the seat of a district court, and of superintendents of the Lutheran and Reformed churches. Marburg pottery is renowned ; and leather, iron wares, and surgical instru- ments are also manufactured there. The population in 1880 amounted to 11,225. The environs are very pictur- esque.

Marburg is first historically mentioned in a document of the beginning of the 13th century, and reccived its municipal charter from Landgrave Louis of Thuringia in 1227. On his death it became the residence of his wife, Elizabeth of Hungary, who built a hospital there and died in 1231, at the age of twenty-four, worn out with works of religion and charity. She was canonized soon after her death. By 1247 Marburg had already become the second town of Hesse, and in the 15th and 16th centuries it alternated with Cassel as the seat of the landgraves. In 1529 the famous conference between Luther and Zwingli on the subject of transub- stantiation took place there in the rittersaal of the schloss. During the Thirty Years' and Seven Years' Wars Marburg suffered consider- ably from sieges and famine. In 1806, and again in 1810, it was the centre of an abortive rising against the French, in consequence of which the fortifications of the castle were destroyed.

Several monographs have been published on the conference and university of Marburg. A general account of the town, with referenees to the most important of these, is given in Btieking's Wegweiser durch Marburg, 1875.

MARBURG, the second town of the Austrian duchy of Styria, is very picturesquely situated on both banks of the river Drave, in a plain called the Pettauer-Feld, at the base of the well-wooded Bachergebirge. It is the seat of the bishop of Lavant, and of the judicial and administra- tive authorities of the district, and contains a gymnasium, a ‘“realschule,” an episcopal seminary, a normal school, a pomological school, a theatre, and three hospitals. The principal buildings are the cathedral, the tower of which commands a beautiful view, and the old castle. Its situa- tion in the midst of a fertile vine-growing district, con- nected by the navigable Drave with Hungary, and by railway with Vienna, Trieste, the Tyrol, and Carinthia, makes it the centre of a considerable traffic in wine and grain. Its industria] products are leather, iron and tin wares, liqueurs, and sparkling wine, and it also contains several large cooperages. The extensive workshops of the South Austrian Railway are situated in the suburb of Magdalena, on the right bank of the Drave, and give employment to nearly three thousand hands. With the exception of a successful resistance to Matthias Corvinus in 1480-81, the history of the town presents no notable event. In 1880 Marburg contained 17,628 inhabitants, including a garrison of 1600 men. The environs abound in interesting and picturesque points. :

See Puff’s Handbook to Marburg, Gratz, 1847.

MARCANTONIO, or, to give him his full name, Marcantonio Rarmonpi, is celebrated as the chief Italian master of the art of engraving in the age of the Renaissance. The date of his birth is uncertain, nor is there any good authority for assigning it, as is commonly done, approxi- mately to the year 1488. He was probably born some years at least earlier than this, inasmuch as he is mentioned by a contemporary writer, Achillini, as being an artist of repute in 1504. His earliest dated plate, illustrating the story of Pyramus and Thisbe, belongs to the following year, 1505. Marcantonio received his training in the workshop of the famous goldsmith and painter of Bologna, Francesco Raibolini, usually called Francia. ‘Having more aptitude in design,” says Vasari, “than his master, and managing the graver with facility and grace, he made waist-buckles and

many other things in niello, such being then greatly in fashion, and made them most beautifully, as being in truth most excellent in that craft." The real fame, however, of Marcantonio was destined to be founded on his attain- ments, not in the goldsmith's art generally, but in that particular development of it which consists of engraving desigus on metal plates for the purpose of reproduction by the printing press. This art was not new in Italy in the days of Marcantonio's apprenticeship. It had been practised, in a more or less elementary form, for not less than forty or fifty years in the workshops of both Tuscany and Lombardy. A school of engravers had formed itself at Floreuce under the inspiration, as it appears, chiefly of Sandro Botticelli; in Lombardy the prevailing influence upon the nascent art had been that of Andrea Mantegna. But hitherto neither the engravers of Florence nor those of the Lombard cities had produced anything comparable for richness of effect and technical accomplishment to the work done during the same period on the other side of the Alps. The aim of the Italian engravers had not hitherto been directed, like that of Schongauer or Diirer, towards securing such freedom and precision in the nse of the burin as should impart to the impressions taken from their engraved plates both a striking decorative effect and a power of suggesting to the eye a complex variety of natural objects aud surfaces in light and shade. The Italian masters had been satisfied with a much more primitive order of effects. They had been content to omit all acces- sories and details except the simplest. They had merely drawn with the needle, or dry-point, upon the copper, in just the same way as they were accustonied to draw on paper with the pen or silver point,—taking great pains to get the outlines true and pure, and indicating shadows only by means of straight lines rapidly drawn in, or very simple hatchings.

By the beginning of the 16th century, however, when Marcantonio began to work at engraving along with the other pupils of Francia, a desire for a more complicated kind of effects was already arising among the followers of the art in Italy. Both backgrounds and passages of foreground detail were often imitated, inartificially enough, from the works of the northern masters. Marcantonio himself was among the foremost in carrying out this movement. There exist about eighty engravings which can be referred to the first five or six years of his career (1505-11). Their subjects are very various, in- cluding many of pagan mythology, and some of obscure

allegory, along with those of Christian devotion. The types of figures and drapery, and the general character of the compositions, bespeak for the most part the inspiration, and sometimes the direct authorship, of that artist as graceful as he was grave, Francia. But the influence of German example is very perceptible also in the work of the young Marcantonio, particularly in the landscape backgrounds, and in the endeavour shown by him to express form by means of light and shadow with greater freedom than had been hitherto the practice of the southern schools. In a few subjects also the figures themselves correspond to a coarse Teutonic, instead of to the refined Italian, ideal. But so far we find Marcantonio only indirectly leaning on the north for the sake of self-improvement. It must have been for the sake of commercial profit that he by and by pro- duced a series of direct counterfeits of northern work. We allude to the celebrated facsimiles engraved by Marcantonio on copper from Albert Diirer's woodcuts. These facsimiles are sixty-nine in number, including seventeen of Diirer's Life of the Virgin, thirty-seven of his Intile Passion on wood, and a number of single pieces. According to Vasari, Diirer's indignation over thosé counterfeits was the cause of his journey to Venice, where

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he is said to have lodged a complaint against Marcantonio, and induced the signoria to prohibit the counterfeiting of his monogram, at any rate, upon any future imitations of the kind. Vasari's account must certainly be mistaken, inasmuch as Diirer's journey to Venice took place in 1506, and neither of the two series of woodcuts imitated by Marcantonio was published until 1511. The greater part of the designs for the Life of the Virgin had, it is true, been made and engraved seven years earlier than the date of their publication; and it is to be remarked that, whereas Marcantonio's copies of the Zvttle Passion leave out the monogram of Diirer, it is inserted in his copies of the Life of the Virgin; whence it would after all seem possible that he had seen and counterfeited a set of impressions of this series at the time when they were originally executed, and before their publication. But the real nature of the transaction, if transaction there was, which took place between Diirer and Marcantonio, we cannot now hope to recover. Enough that the Bolognese engraver evidently profited, both in money and in education of the hand, by his work

in imitating in a finer material the energetic characters of these uorthern woodcuts. He was soon to cone under a totally different influence, and to turn the experience he had gained to account in interpreting the work of a master of a quite other stamp. Up till the year 1510 Marcantonio had lived entirely at Bologna, with the exception, it would appear, of a visit or visits to Venice. Very soon afterwards he was attracted for good and all into the circle which surrounded Rapliael at Rome. Where or when he had first made Raphael's acquaintance is uncertain. His passage to Rome by way of Florence has been supposed to be marked by an engraving, dated 1510, and known as the Climbers, Les Grimpeurs (Bartsch 487), in which he has reproduced a portion of the design of Michelangelo's cartoon of the Battle of Anghiari, and has added behind the figures a landscape imitated from the then young Dutch engraver Lucas of Leyden. The piece in which he is recorded to have first tried his hand after Raphael himself is the Lucretia (Bartsch 192). From that time until he disappears in the catastrophe of 1527, Marcantonio was almost exclusively engaged in reproducing, by means of engraving, the designs of Raphael or of his immediate pupils. Raphael, the story goes, was so delighted with the print of the Lucretia that he per- sonally trained aud helped Marcantonio afterwards, adding, as some think, a touch of his own here and there to the engravers work. A printing establishment was set up uuder the charge of Raphael's colour grinder, I] Baviera, and the profits, in the early stage of the business, were shared between the engraver and the printer. The sale soon became very great; pupils gathered round about Marcantonio, of whom the two most distinguished were Marco Dente, known as Marco da Ravenna, and Agostino de' Musi, known as Agostino Veneziano ; and he and they, during the last ten years of Raphael's life, and for several years following his death, gave forth a great profusion of engravings after the master's work,—not copying, in most instances, his finished paintings, but working up, with the addition of simple backgrounds and accessories, his first sketches and trials, which often give the composition in a different form from the finished work, and are all the more interesting on that account.

The best of these engravings produced in the workshop of Marcantonio—those, namely, done by his own hand, and especially those done during the first few years after he had attached himself to Raphael—justly count among the most prized and coveted examples of the art. In them he enters

into the genius of his master, the genius of choice, of balance, of rhythmical purity and charm ; ‘he loses little of the chastened science and subtle grace of

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Raphael’s contours, or of the inspired and winning sentiment of his faces; while in the parts where he is left to himself—the rounding and shading, the background and landscape—he manages his burin with all the skill and freedom which he had gained by the imitation of northern niodels, but puts away the northern emphasis and redund- ance of detail. His work, however, does not long remain at the height marked by pieces like the Lucretia, the Dido, the Judgment of Paris, the Poetry, the Philosophy, or the first Massacre of the Innocents. Marcantonio’s engravings after the works of Raphael’s later years are cold, osten- tatious, and soulless by comparison. Still more so, as is natural, were those which he and his pupils produced after the designs of the degenerate scholars of Raphael and Michelangelo, of a Giulio Romano, a Polidoro, or a Bandi- nelli. Marcantonio’s association with Giulio Romano was the cause of his first great disaster in life. He engraved a series of obscene designs by that painter in illustration of the Sonnetti lusswriosi of Pietro Aretino, and thereby incurred the anger of Pope Clement VIL, at whose order he was thrown into prison. Marcantonio’s ruin was completed by the calamities attendant on the sack of Rome in 1527. He had to pay a heavy ransom in order to escape from the hands of the Spaniards, and fled from Rome, in the words of Vasari, “all but a beggar.” It is said that he took refuge in his native city, Bologna; but he never again emerges from obscurity, and all we know with certainty is that in 1534 he was dead. (s. C.) MARCASITE. Modern mineralogists, following Haid- inger, have restricted this name to those forms of native bisulphide of iron which erystallize in the orthorhombic system, and are sometimes known as “prismatic iron- pyrites.” By the older mineralogists the word was used with less definite meaning, being applied to all crystallized and radiated pyrites, whether rhombic or cubic. In the last century both minerals were extensively used as ornamental stones. The marcasites were generally of small size, faceted like rose diamonds, and brilliantly polished, in which form they were mounted in pins, brooches, shoe- buckles, watch-cases, and other ornamental objects. The lustre of the polished surface was

so brilliant that the stone, although opaque, formed a rough substitute for diamond ; and this lustre was not readily impaired by atmospheric influences. Much of the old marcasite jewellery is of so pale a colour as almost to resemble burnished steel; such kinds generally belong to the true modern marcasite, sometimes called "white pyrites"; while the specimens which possess a brassy yellow colour are mostly referable to the cubic species, which is distinctively termed pyrite. Some of the finest pyrites suitable for the jeweller is found in Elba and in Brazil; but the mineral enjoys a very wide geographical distribution, and is common in England, especially in Cornwall, where it is known to the miners as '""mundic." By the ancient Peruvians the mineral was extensively used for amulets, while the larger pieces were polished as mirrors ; hence marcasite is sometimes called pierre des Incas. The word marcasite, variously written marchasite, marchesite, marquesite, &c., appears to have been introduced from Spain, and is supposed to be of Arabic origin. It is notable that the word was applied by early writers on chemistry to the metal now called bismuth. MARCELLINUS, 8x, according to the Liberian catalogue, became bishop of Rome on June 30, 296 ; his predecessor was Caius or Gaius. Of his pontificate virtually nothing isknown. In the Concilia of Mansi and Hardouin there 18 an account of a synod alleged to have been held in 303 at Sinuessa (between Rome and Capua), at which Marcellinus was accused by three of his priests and two of his deacons of having accompanied Diocletian into the temple of Vesta and Isis, and there burnt incense. The

narrative goes on to say that ultimately he confessed his guilt in the presence of the three hundred assembled bishops, but that his condemnation was left to himself, for " prima sedes non judicatur a quoquam." It is further stated in the same account that he and many of the other bishops were put to death by Diocletian on August 23, 303. The story of the synod of Sinuessa was current at an early date, but was condemned by Augustine and Theodoret as a mere invention of the Donatists. Its fabulous character is maintained by Déllinger (Papstfabeln) and by Hefele (Conciliengeschichte), even against the weighty authority of the Bremary,

where it constitutes a lesson in one of the nocturns for April 26, the commemoration day of Marcellinus. Marcellinus died, according to the Liberian catalogue, in 304, after a pontificate of eight years three months and twenty-five days ; after a considerable interval he was succeeded by Marcellus, who has sometimes been identified with him.

MARCELLUS, Marcus Cravnpivs, Roman warrior, was born about 268 3.c., and served first in Sicily against Hamilcar. In his first consulship (222) he was engaged in the war against the Insubres, and won the spolia opima by slaying their chief Viridomarus. In 216 he was to have gone as pretor to Sicily with a fleet, but was detained on the news of the defeat at Canne. He went to Canusium and took command of the fragments of the army. He tried without success to prevent Capua going over to Hannibal, but saved Nola, In 214 he was in Sicily as consul at the time of the revolt of Syracuse ; he stormed Leontini and besieged Syracuse, but the engineering skill of Archimedes repelled his attacks and compelled him to content himself with a blockade. Himilco landed with a Carthaginian army, and Marcellus failed to prevent their occupying Agrigentum. Taking the opportunity of a feast of Artemis, Marcellus stormed Epipole; but the old town and the island remained untaken, as also the fort of Euryalus, which was, however, cut off and soon fell. Meanwhile pestilence raged among the Carthaginian army encamped outside. After several months, during which disorder reigned in the town, he gained a lodgment by the aid of a Spanish officer, and Syracuse was sur- rendered (212). Marcellus spared the lives of the Syracusans, but carried off their art treasures to Rome. Cousul again in 210, he took Salapia by help of the Roman party there, and put to death the Numidian garrison, Proconsul in 209, he attacked Haunibal near Venusia, and after a desperate battle retired to that town; he was accused of bad generalship, and had to leave the army to defend himself in Rome, In his last consulship (208), while both consuls were reconnoitring near Venusia, they were unexpectedly attacked, and Marcellus was killed. His successes have probably been exaggerated, but he was a brave soldier, and the name often given to him, the "sword of Rome," was well deserved. Though plebeians, the Marcelli henceforth took a high position; they were hereditary patrons of Sicily.

MARCELLUS, M, Crauptivs, was curule eedile in 56 B.c. with P. Clodius. In 52 he spoke on behalf of Milo at his trial. In 51 he was consul with Ser. Sulpicius. During his consulship he proposed to remove Czesar from his army from March 49. The decision was, however, delayed by Pompeius's irresolution till February 50, and then the tribune C. Curio insisted that Pompeius also should vacate his command; and the senate voted this by a large majority. But at last C. Marcellus, cousin of Marcus, and then consul, went to Pompeius with the two consuls elect, and offered him the command of the army against Cesar. In January 49 M. Marcellus tried to put off declaring war till an army could be got ready ; but when Pompeius left Italy Marcus and his brother Caius followed, while his cousin withdrew

to Literuum. After Pharsalus M. Marcellus retired to Mytilene. He long made no attempt to return, till in 46 the senate appealed to Cxsar. Marcellus accepted this favour reluctantly. Pressed by Cicero, he left Mytilene for Italy, but was murdered in May by Magius Cilo in the Pireus. Marcellus was a thorough aristocrat, but free from the violence which disgraced many of his party.

MARCELLUS, M. Crauptus, son of C. Marcellus and Octavia, sister to Octavianus, was born about 43 zac. Octavianus adopted him and made him pontifex and senator with pratorian rank. In 25 he married Julia, daughter of Octaviauus, and was looked on as his future successor. Yet in a dangerous illness Augustus gave his signet to Agrippa. Differences arising, Agrippa was made proconsul of Syria to separate the rivals. In 23 Marcellus, while curule dile, fell ill and died at Bais. Livia was suspected of having poisoned him to get the empire for her son Tiberius. Great hopes had been built on the youth, and he was celebrated by many writers, especially by Virgil, in a famous passage in Zn. vi.

MAKRCELLUS LI, pope, succeeded Marcellinus, after a considerable interval, most probably in May 307; under Maxentius he was banished from Rome in 309 on account of the tumult caused by the severity of the penances he had imposed on Christians who had lapsed under the recent persecution. He died the same year, being succeeded by Eusebius.

MARCELLUS IL, Marcellus Cervini, cardinal of Santa Croce, a native of the Mark of Ancona, was elected pope in the room of Julius ITT. on April 9, 1555, but his feeble constitution succumbed to the fatigues of the conclave, the exhausting ceremonies conuected with his accession, and the anxieties arising from his high office, on the twenty-first day after his election. He had a high reputation for integrity, tact, and ability. His successor was Paul IV.

MARCH, the third month of our modern year, contains thirty-one days. As in the Roman year so in the English ecclesiastical calendar used till 1752 this was the first month, and the legal year commenced on the 25th of March. The Romans called this month Martius, from the god Mars; and it received the name Hlyd Monath, i.e., loud or stormy month, from the Anglo-Saxons. In Frauce March was also generally reckoned the first month of the year until 1564, when, by an edict of Charles IX., January was decreed to be thenceforth tle first month. Scotland followed the example of France in 1599; but in England the change did not take place before 1752. There is an old saying, common to both England and Scotland, which represents March as borrowing three days from April; thus the last three days of March are called the "borrowing" or the "'borrowed days." In the Complaynt of Scotland we find '"'the borial blastis of the thre borouing dais of Marche hed chaisset the fragrant flureise of evyrie fruit- tree far athourt the feildis." An ancient popular rhyme says :—

*: ** March borrowit from Averill*

*Three days, and they were ill ;" aud then there is another rhyme which graphically characterizes those three "ill" days in detail :— ** The first, it sall be wind and weet, The next, it sall be snaw and sleet ;*

The third, it sall be sic a freeze, Sall gar the birds stick to the trees."

There is an old proverb, "A bushel of March dust is worth a king's ransom." Dry weather in March is gene- rally favourable to the production of grain on clay lands ; and hence a "dusty March" portended a plenteous season ; while, on the contrary, a " wet March " frequently proved destructive of both wheat and rye.

The principal fixed days now observed and noted in the

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course of this month are the following :—March Ist, St David ; March 12th, St Gregory ; March 17th, St Patrick; and March 25th, Lady Day, one of the established quarter- days in England.

MARCHE, a former province of central France, was bounded on the N. by Berri, on the N. E. by Bourbonnais, on the E. by Auvergne, on the 8. by Limousin, and on the W. by Angoumois and Poitou, embracing the greater part of the modern department of Creusc, a considerable portion of Haute-Vienne, and fragments of Charente and Indre. It derived its name from the circumstance of its being the "mark" or boundary between Poitou and Berri; it is sometimes referred to as Marche Limousine. It is first mentioned in history as a separate fief about the middle of the 10th century, when the countship of Marche was committed by Duke William IIL. of Aquitania to Boso I., count of Limoges and Charroux,

MARCHENA, a town of Spain, in the province of Seville, lies in a sandy valley, not far from the Corbones, a tributary of the Guadalquivir, about 30 miles east- south-east from Seville. It is a station on the line by which Seville and Utrera are connected with Osuna and the Cordova-Malaga line. Formerly it was surrounded with walls and towers, of which some traces still remain. Among the principal buildings is the palace of the dukes of Arcos (descendants of Ponce de Leon), within the en- closure of which is an ancient Moorish building, now the church of Santa Maria de la Mota, with a tower of con- siderable architectural merit. The ancient parish church of Sau Juan, rebuilt in 1490, has five naves. At the eastern end of the town is a sulphur spring which is a place of considerable resort for the cure of cutaneous diseases, The manufactures of tlie place are unimportant ; there is some trade in the wheat, barley, olives, oil, and wine pro- duced inthe neighbourhood. The population in 1877 was 13,768, Marchena (the Castra Gemina of Pliny?) was taken from the Moors by St Ferdinand in 1240, and was presented to Ponce de Leon by Ferdinand IV. in

1309.

MARCIAN (Marcranus), emperor of the East from 450 to 457, was born in a private station of life in Illyria or Thrace, about the year 391, and at an early age entered the army, where after a considerable term of obscurity he attracted the attention of Ardaburius and subsequently of Aspar, being made military secretary and a captain in the guards. He accompanied Aspar in the ill-fated expedition against Genseric, by whom he was taken prisoner, but soon released. In 450, having in the meantime become tribune and senator, he went through the form of marriage with Pulcheria, tle sister and successor of Theodosius II, and was crowned on August 25. In 451 he assembled the cecumenical council of Chalcedon, at which the proceed- ings of the "robber-synod " of Ephesus were annulled, and the Eutychian heresy condemned, a service to ortho- doxy which has greatly endeared his memory to the minds of Catholic historians. In 452 his generals Ardaburius and Maximin respectively gained victories of some import- ance over the Arabs near Damascus and over the Blemmyes who had invaded the Thebaid; and after the death of Attila (453) he set about the task of repopulating the extensive tracts which had been devastated by the Huns. He main- tained the peace of his dominions during the troubles which convulsed the Western empire in 455; and in 456 his arms were free to repress disturbances in Lazica which had been fomented by the Armenians and Persians. He died in 457, and was succeeded by Leo I.

MARCION anp THE Marcionite Cuurcnes. In the period between 130 and 180 4.p. the varied and compli- cated Christian fellowships in the Roman empire crystallized into close and mutually exclusive societies :—churches with

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fixed constitutions and creeds, schools with distinctive esoteric doctrines, associations for worship with peculiar mysteries, and ascetic sects with special rules of conduct. Of churchly organizations the most important, next to catholicism, was the Marcionite community. Like the catholic church, this body professed to comprehend every- thing belonging to Christianity. It admitted all believers without distinction of age, sex, rank, or culture. It was no mere school for the learned, disclosed no mysteries for the privileged, but sought to lay the foundation of the Christian community on

the pure gospel, the authentic institutes of Christ. The pure gospel, however, Marcion found to be everywhere more or less corrupted and mutilated in the Christian circles of his time. His undertaking thus resolved itself into a reformation of Christendom. This reformation was to deliver Christendom from false Jewish doctrinesby restoring the Pauliue conception of the gospel,— Paul being, according to Marcion, the only apostle who had rightly understood the new message of salvation as delivered by Christ. In Marcion's own view, therefore, the founding of his church—to which he was first driven by opposition—amounts to a reformation of Christendom through a return to the gospel of Christ and to Paul; nothing was to be accepted beyond that. This of itself shows that it is a mistake to reckon Marcion among the Gnostics. A dualist, we shall see, he certainly was, but le was not a Gnostic. For he ascribed salvation, not to "knowledge" but to "faith"; he appealed openly to the whole Christian world ; and he nowhere consciously added foreign elements to the revelation given through Christ. It is true that in many features his Christian system—if we may use the expression—resembles the so-called Gnostic systems ; but the first duty of the historian is to point out what Marcion plainly aimed at; only in the second place have we to inquire how far the result corresponded with those purposes. ; The doctrines of Marcion and the history of his churches from the 2d to the 7th century are known to us from the controversial works of the catholic fathers, From Justin downwards, almost every eminent church teacher takes some notice of Marcion, while very many write extensive treatises against him. The most important of those which have come down to us are the controversial pieces of Ireneus (in his great work against heretics), Tertullian (Adv. Marc., ii—v.), Hippolytus, Pseudo-Origen Adamantius, Epiphanius, and the Armenian Esnik. From these works the contents of the Marcionite Gospel, and also the text of Paul's epistles in Marcion's recension, can be settled with tolerable accuracy. His opponents, more- over, have preserved some expressions of his, with ex- tracts from his principal work ; so that our knowledge of Marcion's views is in part derived from the best sources. Marcion was a wealthy shipowner, belonging to Sinope in Pontus. He appears to have been a convert from paganism to Christianity, although it was asserted in later times that his father had been a bishop. That report is probably as untrustworthy as another, that he was excommunicated from the church for seducing a virgin. What we know for certain is that after the death of Hyginus (or c. 139 a.p.) he arrived, in the

course of his travels, at Rome, and made a handsome donation of money to the local church. Even then, however, the leading features of his peculiar system must have been already thought out. At Rome he tried to gain acceptance for them in the college of presbyters and in the church ; indeed he had previously made similar attempts in Asia Minor. But he now encountered such determined opposition from the Inajority of the congregation that he found it necessary to withdraw from the great church and establish in Rome a community of hisown. This was about the year 144. The

new society increased in the two following decades ; and very soon numerous sister-churches were flourishing in the east and west of the empire. Marcion took up his residence permanently in Rome, but still undertook journeys for the propagation of his opinions. In Rome he became acquainted with the Syrian Gnostic Cerdo, whose specu- lations influenced the development of the Marcionite theology. Still Marcion seems never to have abandoned his design of gaining over the whole church to his gospel. The proof of this is found, partly in the fact that he tried to establish relations with Polycarp of Smyrna,—from whom, to be sure, he got a sharp rebuff,—partly in a legend to the effect that towards the end of his life he sought re- admission to the church. Such, presumably, was the construction put in after times on his earnest endeavour to unite Christians on the footing of the 'pure gospel." When he died is not known ; but his death can scarcely have been much later than the year 165.

The distinctive teaching of Marcion originated in a com- parison of the Old Testament with the gospel of Christ and the theology of the apostle Paul. Its motive was not cosmological or metaphysical, but religious and historical. In the gospel he found a God revealed who is goodness and love, and who desires faith and love from men. This God he could not discover in the Old Testament ; on the contrary, he saw there the revelations of a just, stern, jealous, wrathful, and variable god, who requires from his servants blind obedience, fear and outward righteousness. Overpowered by the majesty and novelty of the Christian message of salvation, too conscientious to rest satisfied with the ordinary attempts at the solution of difficulties, while yet

he was in no position to reach an historical insight into the relation of Christianity to the Old Testament and to Judaism——who indeed was so in those days !—he believed that he expressed Paul's view by the hypothesis of two Gods: the just God of the law (the God of the Jews, who is also the Creator of the world), and the good God, the Father of Jesus Christ. Paradoxes in the history of religion and revelation which Paul draws out, and which Marcion's contemporaries passed by as utterly incompreheu-sible, are here made the foundation of an ethico-dualistic conception of history and of religion. It may be said that in the 2d century only one Christian—Marcion—took the trouble to understand Paul; but it must be added that he misunderstood him. The profound reflexions of the apostle on the radical antithesis of law and gospel, works aud faith, were not appreciated in the 2d century. Marcion alone perceived their decisive religious importance, and with them confronted the legalizing, and in this sense Judaizing, tendencies of his Christian contemporaries. But the Pauline ideas lost their truth under his treatment ; for, when it is denied that the God of redemption is at the same time the almighty Lord of heaven and earth, the gospel is turned upside down.

The assumption of two gods necessarily led to cosmo- logical speculations. Under the influence of Cerdo, Marcion carried out his ethical dualism in the sphere of cosmology ; but the fact that his system is not free from contradictions is the best proof that all along religious knowledge, and not philosophical, had the chief value in his eyes. The main outlines of his teaching are as follows. Man is, in spirit, soul, and body, a creature of the just and wrathful god. This god created man from Hyle (matter),” and imposed on him a strict law. Since no one could keep this law, the whole human race fell under the curse, temporal and eternal, of the Demiurge. Then a higher God, hitherto unknown, and concealed even from the

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1On the relation of matter to the Creator Marcion himself seems not to have speculated, though his followers may have done so.

“SAR=MAE

Demiurge, took pity on the wretched, condemned race of men. He sent His Son (whom Marcion probably regarded as a manifestation of the supreme God Himself) down to this earth in order to redeem men. Clothed in a visiouary body, in the likeness of a man of thirty years old, the Son made His appearance in the fifteenth year of Tiberius, and preached in the synagogue at Capernaum. But none of the Jewish people understood Him. Even the disciples whom He chose did not recognize His true nature, but mis: took Him for the Messiah promised by the Demiurge through the prophets, who as warrior and king was to come and set up the Jewish empire. The Demiurge him- self did uot suspect who the stranger was; nevertheless he became angry with Him, and, although Jesus had punctually fulfilled his law, caused Him to be nailed to the cross. By that act, however, he pronounced his own doon. For the risen Christ appeared before him in His glory, and charged him with having acted contrary to his own law. 'To make amends for this crime, the Demiurge had now to deliver up to the good God the souls of those who were to be redeemed ; they are, as it were, purchased from him by the death of Christ. Christ then proceeded to the underworld to deliver the spirits of the departed. It was not the Old Testament saints, however, but only sinners and malefactors who obeyed His summons. Then, to gain the living, Christ raised up Paul as His apostle. He alone understood the gospel, and recognized the difference between the just God and the good. Accord- ingly, he opposed the original apostles with their Judaistic doctrines, and founded small congregationsof true Christians. But the preaching of the false Jewish Christians gained the upper hand; nay, they even falsified the evangelical oracles and the letters of Paul. Marcion himself was the next raised up by the good God, to proclaim once more the true gospel. This he did by setting aside the spurious gospels, purging the real Gospel (the Gospel of Luke) from supposed Judaizing interpolations, and restoring the true text of the Pauline epistles. He likewise composed a book, called the Antitheses, in which he proved the disparity of the two gods, from a comparison of the Old Testament with the evangelical writings.

On the basis of: these writings Marcion proclaimed the true Christianity, aud founded churches. He taught that all who put their trust in the good God, and His crucified Son, renounce their allegiance to the Demiurge, and approve themselves by good works of love, shall be saved. But he taught

further—and here we trace the influence of the current Gnosticism on Marcion—that only the spirit of man is saved by the good God ; the body, because material, perishes. Accordingly his ethics also were thoroughly dualistic. By the "works of the Demiurge," which the Christian is to flee, he meant the whole "service of the perishable." The Christian must shun everything sensual, and especially marriage, and free himself from the body by strict asceticism. The original ethical contrast of "good" and "just" is thus transformed into the cosmo- logical contrast of "spirit" and "matter." The good God appears as the god of spirit, the Old Testament god as the god of matter. That is Gnosticism ; but it is at the same time illogical. For, since, according to Marcion, the spirit of man is derived, not from the good, but from the just God, it is impossible to see why the spiritual should yet be more closely related to the good God, than the material. There is yet another direction in which the system ends with a contradiction. According to Marcion, the good God never judges, but everywhere manifests His goodness, — is, therefore, not to be feared, but simply to be loved, as a father. But here the question occurs, What becomes of the men who do not believe the gospel? Marcion answers, The good God does not judge them, but merely removes

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them from His presence. Then they fall under the power of the Demiurge, who—rewards them for their fidelity ¢ No, says Marcion, but on the contrary—punishes them in his hell! The contradiction here is palpable ; and at the same time the antithesis of "just" and "good" ultimately vanishes. For the Demiurge now appears as an inferior being, who in reality executes the purposes of the good God. It is plain that dualism here terminates in the idea of the sole supremacy of the good God.

It is not surprising, therefore, that even in the 2d century the disciples of Marcion diverged in several directions. Rigorous asceticism, the rejection of the Old Testament, and the recognition of the "new God" remained common to all Marcionites, who, moreover, like the catholics, lived together in close communities ruled by bishops and presbyters (although their constitution was originally very loose, and sought to avoid every appearance of "legality"). Some, however, accepted three first principles

(the evil, the just, the good); others held by two, but regarded the Demiurge as the god of evil, “.e., the devil; while a third party, like Apelles, the most dis- tinguished of Marcion’s pupils, saw in the Demiurge only an apostate angel of the good God,—thus returning to monotheism. The golden age of the Marcionite churches falls between the years 150 and 250. During that time they were really dangerous to the great church; for in fact they maintained certain genuine Christian ideas, which the catholic church had forgotten. From the beginning of the 4th century they began to die out in the West; or rather they fell a prey to’ Manichwism. In the East also many Marcionites went over to the Manichwans ; but there they survived much longer. They can be traced down to the 7th century, and then they seem to vanish. But it was unquestionably from Marcionite impulses that the new sects of the Paulicians and Bogomiles arose ; and in so far as the western Katharoi, and the antinomian and anti- clerical sects of the 13th century are connected with these, they also may be included in the history of Marcionitism.

Literature.—PBaur, Die Gnosis, 1835; Moller, Geschichte der Kosmologie in der gricchisehen Kirehe, 1860 ; Lipsius, Gnostieismus, 1860 ; Harnack, Zur Quellenkritik der Geschichte des Gnosticismus, 1873, and in the Zeitschrift f. hist. Theol., 1874; Harnack, De Apellis gnosi monarehiea, 1874; Lipsius, Quellen der diltesten Ketzergeschichte, 1875 ; Mansel, The Gnostie Heresies, 1875; Harnack, Zur Geschichte der Mareionitischen Kirchen (Hilgenfeld’s Zeitschrift, 1876). Of the numerous works on Marcion’s Gospel and Apostolos lists will be found in any introduction to the New Testament or history of the canon. The following are the ascertained results of criticism :—(1) Marcion was the first to make a canonical collection of New Testament writings ; (2) his Gospel is to be regarded as a reconstruction, and not as the basis, of our canonical Gospel of Luke. (A. HA.)

MARCO POLO. See Poto.

MARCUS, the successor of Pope Sylvester I., according to the Liberian catalogue, had a pontiticate of eight months and twenty days, from January 18 to October 7, 336. Of his character or history nothing is recorded. He was suc- ceeded by Julius I.

MARDIN, a town of Turkish Kurdistan, the seat of a governor dependent on the pasha of Diarbekir, is situated in 37° 20' N, lat. and 41° E. long., about 60 miles south- east of Diarbekir, at a height of 3900 feet above the sea. Climbing the southern side of a steep conical hill (of soft limestone) in such a way that the roofs of the lower tier of houses serve as a street for those immediately above, Mardin presents a very picturesque appearance; and on the summit of the hill, which affords an unusually wide view over the Mesopotamian plain, stand the ruins of the famous castle Kal'ah Shuhbé (Maride and Marde in Latin, and similarly in Syriac), which, at least from the time of the Romans, played an important part in the history of this region. The Arabian geographers characterize it as

impregnable; and, the approaches being extraordinarily steep, narrow, and well arranged for purposes of defence, it was able to offer a protracted resistance to the Mongolian conqueror Hulagu, and tothe armies of Timur. The castle was for hundreds of years the residence of princes more or less independent. The town has not much commerce or industry, but the surrounding country is distinguished for its excellent water and general fertility, and more especially for its fruit trees and melons. As regards their capacity and the honesty of their dealings, the people of Mardin do not enjoy the best reputation. They are estimated to number from 15,000 to 18,000; in 1870 Professor Socin was informed in the town that there were 600 Jacobite, 300 Catholic Armenian, 200 Catholic Syrian, 30 Chaldzean, and 57 Protestant families. Among the Jacobites are included afew remnants of the old sect called Shemsiye. See Ritter, Erdkunde von Asien, 2d ed., vol. vii.

MARGARET or Angovu, who became the queen of Henry VI. of England, was born at Pont & Mousson in Lorraine on the 24th! March 1429. Her father, "' the good King René," as he was called in later years, did not at the time of her birth possess any of the pompous titles to which he afterwards laid claim, but was simply count of Guise, and younger brother of the existing duke of Anjou. He had, however, married Isabella, daughter of Charles II., duke of Lorraine, and during Margaret's infant years he succeeded to two dukedoms, first Lorraine and then Anjou, aud afterwards

to the crowns of Naples, Sicily, and Jerusalem. Some of these acquisitions, however, were no more than empty titles. THe had a competitor for the duchy of Lorraine against whom he was unsuccessful in war, and he was actually a prisoner in the hands of the duke of Burgundy when the death of Joan II. of Naples first made him nominally a king. He deputed his wife Isabella to go to Naples and take possession of his new kingdom for him, and she took with her while on tluis enterprise her second son Louis and her second daughter Margaret, then in her seventh year. René himself obtained his liberty after a time, and followed his wife to Naples,

but, being defeated by a rival there also, he returned to |

I'rance after more than four years' absence. Before revisiting Lorraine or Anjou, he spent some time in

Provence, and there received a proposal for the marriage |

of Margaret, who had by this time nearly completed her fourteenth year, from Charles, count of Nevers. It was accepted, and the contract was actually signed; but the marriage was delayed on account of some disputes about the settlement, and next year it was set aside for tlie more splendid match offered by the king of England.

This was in 1444. The earl, afterwards duke, of Suffolk, had proposed the match to Henry VI. as a means of terminating the long war with France, and secnring peace upon a Solid basis. Henry fully entered into the scheme, and was content for so great an object, not only to accept a bride without a dowry, but to give up to King René the provinces of Aniouand Maine.

? Most authorities say the 23d, but according to the MS. Jeures of René, cited in the Nouvelle Biographie Générale, the day was the 24th.

"Southwick, according to Fabyan, who is followed by Hall and later writers ; but William Wyrcestre and the anonymous author of the Hinglish Chronicle edited by Davies for the Camden Society, who are both strictly contemporary, say Tichfield. '

the 30th of May Margaret was crowned at Westminster. Suffolk was now high in favour at court, but the policy he had pursued of giving up territory for the sake of peace was not likely to be generally acceptable in itself, and the events of the next few years completed his unpopularity. War broke ont again with France in 1449, and in the course of a single year the whole of Normandy was lost to the English. Suffolk was impeached by the Commons, and the king was persnaded that the best way to protect him was to order him to quit the country. But he was taken and murdered at sea, and for some time the country was in a state of fearful anarchy. Margaret's position was now one that required great tact and delicacy. The king's marriage was already unpopular, and the fact was soon manifest that his wife possessed far higher abilities and greater power of governing than himself. This, together

| with the king's occasional attacks of mental imbecility,

was really the great source of her misfortunes. During Henry's intervals of sanity it was she who really governed, and unfortunately she gave her whole support to the duke of Somerset, whose mismanagement abroad had been the immediate cause of the loss of Normandy. The duke of York vainly endeavoured to procure Somerset's removal, but he was so protected by the court that the complaints of his accuser were utterly unheeded, except during the king's periods of total incapacity, when the lords made York protector. Civil war at last broke out, and Somerset fell at St Alban's in 1455. Party feeling was bitterly exasperated, and Margaret, as we learn from a contemporary French historian, actually instigated an attack on Sandwich by the French out of hatred to the duke of York. At length, in 1460, that nobleman openly challenged the crown as his right and obtained from parliament, with the consent of Henry himself, a settlement of the succession in his favour. But at this time Margaret was out of the way. The king had been taken prisoner the year before by thie Yorkists at the battle of Northampton, and she had sought refuge in Wales and Scotland along with her only son Edward, prince of Wales, then seven years old, who was now disinherited. Margaret's friends took up her cause in the north of England, and the duke of York, going to meet them, fell at the battle of Wakefield, 30th December 1460. Margaret naturally endeavoured to improve her victory by marching on to London. But Edward, earl of March, the duke of

York's son, defeated her adherents on the borders of Wales, while the earl of Warwick with the king in his custody left London to oppose her. The ill-disciplined troops that she brought with her from the north ravaged the country as they went, and made themselves generally detested. But they overthrew Warwick's forces at St Alban's (the second battle fought there in this war), and liberated the king. The earl of March, however, soon came up and entered London, where he was proclaimed king by the name of Edward IV., amid the shouts of the citizens, who had always been devoted to his father. Margaret then thought it advisable to withdraw into the north along with Henry and her son, and Edward and Warwick pursued them into Yorkshire, where the bloody battle of Towton (29th March 1461) utterly crushed for the time the hopes of the house of Lancaster. Henry aud Margaret fled to Scotland, and surrendered Berwick to the Scots as the price of their assistance. Margaret and het son soou after entered England with a body of Scots, who besieged Carlisle, but they were driven back by Lord Montague. Then King Henry accompanied another invasion into the county of Durham which was equally unsuccessful. Next year (1462) Margaret sailed from Kirkcudbright to seek aid in France, and offered the surrender of Calais to Louis XI. if Louis enabled her husband to regain his kingdom. Louis gave her two

thousand men under the command of Pierre de Brézé, and with.these she made a descent upon Northumberland and took Bamborough and some other castles, which, however, were soon after besieged by King Edward's forces, and after a while recovered. King Edward himself, on hearing of her landing, hastened into the north, on which Margaret-took ship to sail for France, but meeting with a storm was driven to land at Berwick and lost all her treasure. On the total failure of this expedition the well-known story is told by a French writer of her wandering with her son in a forest where she was attacked by robbers, and appealing successfully to the loyalty of one of them to save the son of his king.

Soon after, in April 1463, she sailed to Flanders and sought the aid of Philip of Burgundy, but he declined to do more than relieve her poverty, and she retired to a castle in Lorraine, which her father gave her to occupy.

Here Sir John Fortescue, who accompanied her into exile, superintended the education of her son, and composed for his benefit his celebrated treatise on the laws of England. Here also she apparently remained while her husband made further efforts and met with further defeats,—while he lay concealed, for more than a year, in Lancashire, was taken prisoner, and committed tothe Tower. But in 1470, when her old enemy the earl of Warwick, having rebelled against King Edward, sought a refuge in France, Louis XI. induced her, though with great difficulty, to pardon him and concert measures along with him for ler husband's restoration to the throne. The negotiation was cemented by an agreement for the marriage of her son, the prince of Wales, to the earl's daughter after the kingdom should be recovered, and so successful was the project that Edward was actually driven into exile, and for a period of six months Henry was again acknowledged as king. But the return of King Edward and the battle of Barnet once more changed the aspect of affairs before Margaret was able to rejoin her husband, and when she at length landed again in England she was defeated and taken prisoner at Tewkesbury. To add to her misery her only son Prince Edward was butchered after the battle. Four years later, in 1475, on peace being made between England and France, she was ransomed by Louis XI., and returned to her native country. She died at Dampierre near Saumur in Anjou, on the 25th of August 1482.

Principal Authorities.—Bourdigné, Chroniques d'Anjow ct du Maine ; Villeneuve Bargemont, Histoire de René @ Anjou ; William Wyrcestre, Annals, edited by Hearne (with Liber Niger Scaccurit); Fragment relating to Edward 1V., ed. Hearne (with Sprott's Chronicle); English Ohroniele, ed. Davies (Camden Society); Paston Letters ; Rolls of Parliament ; Anchiennes Chronicques d'Engleterre, par Jehan dé Wavrin, edited by Mlle. Dupont ; Lord Clermont's edition of the Works of Sir John Fortescue. Mrs Hookham's Life and Times of Margaret of Anjow (London, 8vo, 1872) is an elabo-

tate and useful work, but not always accurate and discriminating in the use of authorities.

MARGARET or Avsrria (1480-1530), duchess of Savoy, and regent of the Netherlands from 1507 to 1530, was the daughter of the emperor

Maximilian and Mary of Burgundy, and was born at Brussels on January 10, 1480. In 1482 she was betrothed to Charles, the son of Louis XI. (afterwards Charles VIII. of France) ; and in 1497 she was actually married to the infante John of Aragon, who left her a widow a few months afterwards. In 1501 she became the wife of Philibert II. of Savoy, who only survived until 1504; and in 1507 she was entrusted by Maximilian with the regency of the Netherlands and also

1 This is clearly the date intended by William Wyrcestre (p. 496) ; and it agrees entirely with Monstrelet (iii. 96). Yet almost all modern historians (except Lingard) and even biographers of Margaret of Anjou date her departure to Flanders after the battle of Hexham, at which she ¢ortainly was not present, as they would have her.

with the charge of his grandson Charles. She died at Mechlin in 1530.

MARGARET or Austria (1522-1586), duchess of Parma, and regent of the Netherlands from 1559 to 1567, was a natural daughter of Charles V. by Margaret van Gheenst, a Flemish lady, and was born at Brussels in 1522. In 1533 she was married to Alexander, duke of Florence ; and, having been left a widow in 1537, she became the wife of Ottavio Farnese, duke of Parma, in 1542. The union proved an unhappy one, and she for the first time found a sphere for her somewhat masculine abilities in the Netherlands, which were entrusted to her care by her brother Philip II. of Spain on his departure for the peninsula in 1559 (see HoLzanp, vol. xii. pp. 74, 75). It was with much reluctance that she resigned the reins of power into the hands of the duke of Alva in 1567 and retired to Italy. Before her death, which occurred at Ortona in 1586, she had the satisfaction of seeing her son Alexander Farnese appointed to the government which she had occupied some twenty years before.

MARGARET, Sr, queen of Scotland, born in Hungary about 1040, was a daughter of Edward the Atheling, son of Edmund Ironside ; her mother was Agatha, most prob- ably a niece of Queen Gisela of Hungary and of the emperor Henry II. She accompanied her father to Eng- land in 1057, and after the Norman Conquest she was brought (1068) to Scotland, where she

became the wife of Malcolm Canmore in the spring of 1069. She survived her husband, who died in November 1093, by only a few days (see ScottaAND). The chroniclers all agree in depict- ing Queen Margaret as a strong, pure, noble character, who had very great influence over her husband, and through him over Scottish history, especially in its ecclesiastical aspects. Her religion, which was genuine and intense, was of the newest Roman style; and to her are attributed a number of reforms by which the Church of Scotland was considerably modified from the insular and primitive type which down to her time it had exhibited. Among those expressly mentioned are a change in the manner of observ- ing Lent, which thenceforward began as elsewhere on Ash Wednesday and not as previously on the following Monday, and the abolition of the old practice of observing Saturday (Sabbath), not Sunday, as the day of rest from labour (see Skene's Celtic Scotland, book ii. chap. 8), Her sons Edgar, Alexander, and David successively occupied the throne of Scotlaud; her elder daughter, Matilda, became the wife of Henry I. of England in 1101. Margaret was canonized by Innocent IV. in 1251, and by Clement X. she was made patroness of Scotland. Her festival (semi- duplex) is observed by the Roman Church on June 10.

MARGARET (1283-1290), known in Scottish history as the "' Maid of Norway," was, through her mother Mar- garet, who had been married to Eric of Norway, the only grandchild of Alexander IIT. of Scotland, and was born in Norway in 1283. At the death of her grandfather (1286), while she was still an infant, Edward I. of Eng- land arranged for her betrothal to his son, but this policy was defeated by her early death, which took place, it was alleged, in Orkney, as she was on her way to Scotland, in 1290. The circumstances of her death were so obscure that doubts were entertained in some quarters whether she had not rather been spirited away. About 1300 a woman presented herself in Leipsic as the long-lost queen of Scotland ; ultimately, however, she was burnt at Bergen as an impostor.

MARGARET or Vatois. See MARGUERITE.

MARGARITA, an island in the Caribbean Sea, about 8 miles off the coast of Venezuela, constituting along with the lesser islands Blanquilla and

Hermanos the new state of Nueva Esparta. It hasan area of 400 square miles,

consists of two portions united by a low and narrow isthmus, is generally mountainous, and attains its greatest elevation of 4630 feet in Mont Macanao. The pearls froin which Margarita takes its name, and which proved a con- siderable source of wealth in the 16th and 17th centuries, are no longer sought after; but the ordinary fisheries are actively prosecuted, aiid since the War of Independence, agriculture, trade, and industry have all greatly improved. Pompatar is the only harbour, Pueblo del Norte and Pueblo de la Mar being rather open roadsteads. Asuncion, the chief town, contains about 3000 inhabitants. The popula- tion of the island was 16,200 in 1807 (about 8000 being whites), and that of the state 30,983 in 1873.

Discovered by Columbus in 1498, Margarita was in 1524 bestowed by Charles V. on Marccto Villalobos. In 1561 it was ravaged by Lopez de Aguirre, a notorious frecbooter, and in 1662 the town of Pompatar was destroyed by the Dutch. Long included in the government of Cumana, Margarita attained administrative inde- pendence only in the 18th century. In the War of Independence the inhabitants made an effeetive stand against Murillo ; and to this they owe the honour of having their island erected into the state of New Sparta.

MARGARITA, 81, virgin and martyr, is celebrated by the Church of Rome on July 20, but her feast formerly fell on the 13th, and her story is almost identical, even in the proper names, with that of the Greek St Marina (July 17). She was of Antioch (in the Greek story Antioch of Pisidia), daughter of a priest Audesius. She lived in the country with a foster mother, scorned by her father for her Christian faith, and keeping sheep. Olybrius the " preses Orientis" sees her and offers his hand as the price of renunciation of Christianity. Her refusal leads to her being cruelly tortured, and after various miraculous in- cidents, in which a heavenly dove plays a prominent part, she is put to death. Women prayed to St Margarita for easy deliverance. It has been shown by H. Useuer (Legenden der heiligen

Pelagia, Bonn, 1879) that this legend belongs to a group of curious narratives which all have their root ina transformation of the Semitic Aphrodite into a Christian penitent or saint. Of these legends that of St Psractra (g.v.) is perhaps the most important. Marina is a translation of Pelagia, and both are epithets of Aphrodite as she was worshipped on the coasts of the Levant. Pelagia in the legend has Margarito as her second name. The association of the marine goddess with the pearl is obvious, and the images of Aphrodite were decked with these jewels.

MARGATE, a municipal borough, market-town, and watering-place of Kent, England, is situated in the Isle of Thanet, 4 miles west of North Foreland, and by rail 90 niles east of London, with which it has also in summer daily steam communication by water. The streets of the town are regular and spacious, and there are many good villas in the suburbs. There is a marine terrace 2500 feet in length, parallel to which there isan esplanade. The pier, 900 feet long, was constructed by Renniein 1810. A land- ing-place permitting the approach of vessels at all tides was constructed in 1854, and enlarged in 1876. The church of St John the Baptist, founded in 1050, contains some portions of Norman architecture, the remainder being Decorated and Late Perpendicular. It possesses several fine brasses and monuments. Among the other public buildings are the new town-hall, the market, the assembly rooms, the deaf and dumb asylum, and the royal sea-bathing infirmary, which has lately been much enlarged through the munificence of Sir Erasmus Wilson. The old name of Margate was Mereyate, the entrance to the sea. Previous to the last century it was only a fishing village with a small coasting trade, but since then, owing principally to its fine stretch of sand, it has been steadily rising into favour as a watering-place, and is now one of the most favourite resorts

of the middle classes of London. It received municipal privileges in 1857. The population of the municipal borough (384 acres) in 1871 was 11,995, and in 1881 it was 15,889.

MARGHILAN, Baber's Marcutnan, 40° 28' N. lat, 71° 45' E. long., now the administrative centre of the Russian province of FercHana (q.v.), a very old town, with high earthen walls and twelve gates, commanded. by the fort of

Yar Mazar, lies in a beautiful and extra- ordinarily fertile district of the same name, irrigated by canals from the Shahimardan river. The heat in summer is excessive. Population about 40,000, chiefly Usbeg. The principal industry is the production and manufacture of silk; camels' hair and woollen fabrics are also made. The new Russian town, planned by General Skobeleff, is 15 versts distant.

MARGUERITE be Vators. The name Marguerite was common in the Valois dynasty, and during the 16th century there were three princesses, all of whom figure in the political as well as in the literary history of the time, and who have been not unfrequently confounded. The first and last are the most important, but all deserve some account.

I. MaRGUERITE D'ANGOULEME (1492-1549), This, the most celebrated of the Marguerites, bore no less than four surnames. By family she was entitled to the name of Marguerite de Valois; as the daughter of the Count d'Angouléme she is more properly and by careful writers almost invariably called Marguerite d'Angouléme. From her first husband she took during no small part of her life the appellation Marguerite d'Alengon, and fron her second, Henri d'Albret, king of Navarre, that of Marguerite de Navarre. She was born at Angouléme on the 12th April 1492, and was two years older than her brother Francis I. She was betrothed early to Charles, Duke d'Alengon, and married him in 1509. She was not very fortunate in this first marriage, but her brother's accession to the throne made her, with their mother Louise of Savoy, the most powerful woman of the kingdom. She became a widow in 1525, and was sought in marriage by many persons of distinction, including, it is said, Charles V. and Henry VIII. In 1527 she married Henri d'Albret, titular king of Navarre, who was considerably younger than herself, and whose character was not faultless, but who seems on the whole, despite slander, to have both loved and valued his wife. Navarre was not reconquered for the couple as Francis had promised, but ample apanages were assigned to Marguerite, and at Nérac and Pau miniature courts were kept up, which yielded to none in Europe in the intellectual brilliancy of their frequenters. Marguerite was at once one of the chief patronesses of letters that France possessed, and the chief refuge and defender of advocates of the Reformed doctrines. Round her gathered Marot, Bonaven- ture Desperiers, Denisot, Peletier, Brodeau, and many

other men of letters, while she protected Rabelais, Dolet, &e. For atime her influence with her brother was effectual, but latterly political rather than religious considerations made him discourage Lutheranism, and a fierce persecution was begun against both Protestants and freethinkers, a persecu- tion which drove Desperiers to suicide and brought Dolet to the stake. Marguerite herself, however, was protected by her brother, and her personal inclinations seem to have been rather towards a mystical pietism than towards dogmatic Protestant sentiments. Nevertheless bigotry and the desire to tarnish the reputation of women of letters have led to the bringing of odious accusations against her character, for which there is not the smallest foundation. Marguerite died in 1549. By her first husband she had no children, by her second a son who died in infancy, and a daughter, Jeanne d'Albret, who became the mother of Henry IV. Although the poets of the time are unwearied

in celebrating her charms, she does not, from the portraits which exist, appear to have been regularly beautiful, but as to her sweetness of disposition and strength of mind there is universal consent.

Her literary work has not yet been given entirely to the world; but the printed portion of it makes her a considerable figure in French literature. It consists of the Heptameron, of poems entitled Les Margucrites de la Marguerite des Princesses, and of Letters. The Heptameron, constructed as its name indicates on the lines of the Decameron of Boccaccio, consists of seventy-two short stories told to each other by a eompany of ladies and gentlemen who are stopped in the journey homewards from Cautcrets by the swelling of ariver. It was not printed till 1558, ten years after the author's death. Internal evidence is strongly in favour of its having been a joint work, in which more than one of the ncn of letters who composed Marguerite's household took part. It isa delightful book, and strongly characteristic of the French Renais- gance. 'The sensuality which characterized the period appears in

it, but ina less coarse form than in the great work of Rabelais; –

and there is a poetical spirit which, except in rare instances, is absent from Pantagruecl. The Letters are interesting and good. The Marguerites consist of a very miscellaneous collection of poems, mysteries, farces, devotional poems of considerable length, spiritual and miscellaneous songs, &c. Other poems, said to be of equal merit, are still unprinted, or have appeared only in part.

II. The second Marcurrire (1523-1574), daughter of Francis I., married the duke of Savoy in 1559. She is noteworthy as having given the chief impulse at the court of her brother Henry II. to the first efforts of the Pléiade.

Ill. The third Marcunrite (1553-1615), called more particularly Marguerite de Valois, was great-niece of the first and niece of the second, being daughter of Henry II. by Catherine de'Medici. She was born in 1553, When very young she became famous for her beauty, her learning, and the looseness of her conduct. She was married to Henry of Navarre, afterwards Henry IV., on the eve of St Bartholomew's Day. Both husband and wife were extreme examples of the licentious manners of the time, but they not unfrequently lived together for considerable periods, and nearly always on good terms. Later, however, Marguerite was established in the castle of Usson in Auvergne, and after the accession of Henry the marriage was dissolved by the pope. But Henry and Marguerite still continued friends ; she still bore the title of queen ; she visited Marie de' Medici on equal terms; and the king frequently consulted her on important affairs, though his somewhat parsimonious spirit was grieved by her extra- vagance. Marguerite exhibited during the rest of her life, which was not a short one, the strange Valois mixture of licentiousness, pious exercises, and the cultivation of art and letters, and died in 1615. She left letters and memoirs, the latter of which are admirably written, and rank among the best of the 16th century. She is the "Reine Margot" of anecdotic history and romance.

The best editions of the works of Marguerite d'Angouléme are—of the Heptamcron, that of Leroux de Lincy, 3 vols., Paris, 1855 ; of the Letters, that of Genin, Paris, 2 vols., 1842-43; and of the Marguerites, that of Frank, Paris, 4 vols., 1873 ; the Heptameron is also obtainable in several cheap editions. The Mémoires of Marguerite de Valois are contained in the

collection of Michaud and Poujoulat, and have been published separately by Guessard, Lalanne, Caboche, &c. (G. SA.)

MARIA THERESA (1717-1780), archduchess of Austria, queen of Hungary and Bohemia, and empress of Germany, was the daughter of the emperor Charles VI. of Austria, by his wife Elizabeth Christina of Brunswick-Wolfenbiittel, and was born in Vienna on May 13, 1717. By the Pragmatic Sanction of 1713, a settlement which was guaranteed by the priucipal states of Europe, her father had regulated the succession in the imperial family ; and in 1724 accordingly, after the death of the archduke Leopold, her only brother, she was publicly declared sole heiress of the Austrian dominions. In 1736 she married Francis Stephen of Lorraine, who in the following year

became grand-duke of Tuscany ; and on October 20, 1740, she came to the throne, her husband (emperor iu 1745) being declared co-regent. The events of her reign have been briefly summarized under Austria (vol. ill. p. 127- 129) and Huneary (xii. 370). She died at Vienna on November 29, 1780. Of sixteen children whom she bore to Francis, ten reached maturity. Her sons were Joseph IL, who succeeded his father as Holy Roman emperor in 1765; Leopold, grand-duke of Tuscany, afterwards the emperor Leopold II.; Ferdinand, duke of Modena; and Maximilian, elector of Cologne. Of her daughters the best-known is Marie Antoinette, the wife of Louis XVI. of France.

MARIANA, Juan pe (1536-1624), a celebrated Spanish historian, was born of obscure parentage at Talavera de la Reina in 15386. He studied at the university of Alcala, and was admitted at the ageof seventeen intothe Society of Jesus, where he soon attracted notice by his brilliant talents and extensive acquirements. Called to the Collegium Romanum in 1561, he there professed theology four years, and reckoned among his pupils Robert Bellarmine, afterwards the famous cardinal. He then passed into Sicily, where he remained for about two years, and in 1569 he was sent to Paris, where his expositions of the writings of Aquinas attracted large audiences. In 1574 the decline of his health compelled him to give up teaching, and he obtained permission to return to Spain; the rest of his life was passed at the Jesuits' house in Toledo, in a vigorous literary activity which was

interrupted only by the molestations to which his too great independence, liberality, and candour exposed him. He died on February 17, 1624.

His great work, Historia de Rebus Hispania, first appeared in twenty books at Toledo in 1592 ; ten books were subsequently added (1605), bringing the work down to the accession of Charles V., and in a still later abstract of events the author completed it to the accession of Philip IV. in 1621. It was so well received that Mariana was induced to translate it into Spanish. The first part of this in some respeets new work (L/istoria de Lspaiia) appeared in 1601 ; it was completed in 1609, and much enlarged and improved in three subsequent editions which appeared during the translator's lifetime. It has been frequently reprinted since 1624, both in Latin and in Spanish; and an English translation by J. Stevens appeared in 1699. Mariana's Zistory is justly esteemed for the extent of the author's researches, for the general accuracy of his. acquaintance with the materials at his command, for the sagacity of his reflexions and characterizations, and above all for the merit of his style, which, in its simplicity, vividness, and directness, has deservedly becn compared to that of Livy. The modern student may regret but can hardly blame the credulity with which in too many cases he has without the least attempt at his- torical criticism adopted the " received traditions of his country." Of the other works of Mariana, the most interesting is his treatise De Rege et Regis Institutione, of whieh the first edition, dedicated to Philip IJJ., appeared at Toledo in 1599. In its sixth ehapter the question whether it is lawful to overthrow a tyrant is freely dis- cussed and answered in the affirmative,—a circumstance which brought much popular odium upon the Jesuits, especially after the assassination of Henry JV. of Franee in 1610. Sec Bayle's Dictionnaire and Hallam's Literary LMstory, part ii. chap. iv. A volume entitled Z'ractatus VII. Theologici et Historie, published by Mariana at Cologne in 1609, containing in partieulara tract 'On Mortality and Inimortality," and another " De Mutatione Monet," was put upon the Index Expurgatorius, and led to the confinement and punishment of its author by the Inquisition. During his eon- finement there was found among his papers a criticism upon the Jesuits (De las Enfermedades de la Compaiia de Jesus y de sus Remedios), which was believed to have becn written by him. It was not printed until after his dcath (1625).

MARIAZELL, a village in the duchy of Styria, Austria, with about 1200 inhabitants, is very picturesquely situated in the valley of the Salza, amid the Styrian Alps. Its entire claim to notice lies in the fact that it is the most frequented sanctuary in Austria, being visited annually by about 100,000 pilgrims. The object of veneration is a miracle-working image of the Virgin, carved in lime-tree wood, and about 18 inches high. This was presented to the place in 1157, and is now reverently enshrined in a

ees —

chapel lavishly adorned with objects of silver and other costly materials. The Jarge church of which the chapel forms part was crected in 1644 as an expansion of a smaller chureh built in 1363 by Louis I, king of Hungary, after a victory over the Turks. It possesses four lofty towers. In the immediate vicinity of Mariazell there is a very large and important iron foundry, formerly worked by Government, but now leased to a company.

MARIE ANTOINETTE, JosrrHze JEANNE (1755- 1793), queen of France, was the fourth daughter of Maria Theresa and the emperor Francis J., and was born on the 2d November 1755, on the day of the great earthquake at Lisbon, and in the year in which the hereditary policy of enmity between the houses of France and Austria was changed to an alliance between them. From her earliest years she was destined by her mother to sustain this alliance, and was educated, with a view to a marriage with a French prince, by the Abbé de Vermond, who was to have a great influence on her future life. In 1770 Choiseul negotiated her marriage to the young dauphin, which took place on May 16 with the greatest pomp, but which was soon overshadowed by a terrible accident in Paris at the féte given in honour of the marriage. The dauphine soon found her position very difficult ; she was but fourteen, and was intended by her mother to support the Austrian alliance and Choiseul at the court of France. 'This use of her daughters for political purposes has been recently denied by Von Arneth, the able editor of Maria Theresa's letters ; but a consideration of the letters themselves confirms the idea, which was at the bottom of Marie Antoinette's un-popularity in France, that she was only an Austrian spy in a high position. She had hardly arrived at Paris, when her friend and the friend of the

Austrian alliance, Choiseul, was dismissed from the ministry, and she was left alone to steer a difficult course by the advice of the Austrian minis- ter, the Count de Mercy-Argenteau, whose reports of her daily doings to Maria Theresa have been published. In May 1774 Louis XV. died, and Marie Antoinette became queen of France. 'Through the first years of her reign she played a very important .political part, but, except, as in the eases of Poland and the Bavarian succession, when her mother pressed her to maintain the alliance, she chiefly exerted her influence with regard to individuals, not to measures or policies. Thus she effected the dismissal of Turgot, and, by the Abbé de Vermond's advice, the summons of Loménie de Brienne to the ministry, not from political but from personal motives, and obtained enormous presents for her intimate friends without thinking that they were interested in her for selfish motives of their own. This political réle of hers, which was more than suspected, made her intensely unpopular to the French people, and this feeling was increased by her social mistakes. Her extravagance in dress and her passion for the ecard-table had greatly incensed and disgusted her mother ; and, when her mother's death removed her only frank and bold adviser, she became more extravagant and more frivolous than ever. Her passion for play, her love of amusement, her intimacy with the Polignacs and their wild and dissi- pated society, her night visits to masked balls in Paris, and her favours to many officers of her guards and young foreigners at her court were the subject of ribald con- versation in every coterie of Paris. The scandal of the diamond necklace, in which the queen was not to blame, spread her name with infamy all over France as if she had been guilty ; and among the people her extravagance was regarded as a potent cause of their poverty and want. Such was her unpopularity when the states-general met in May 1789; she was believed to be debauched and dissipated, when her real faults were that she was frivolous and careless of publie opinion, Austrian at heart, though queen

of France, and opposed to Necker as she had been to Turgot, and to all the reforms and economies her husband, Bonhomme Louis, was willing to institute. From July 14 onward Marie Antoinette headed the party of reaction and armed opposition to the Revolution, and became unwittingly the means of her husband's unpopularity and downfall ; for she always had

influence enough to prevent his earrying out the frank, honest policy of reform which he desired, but not enough to make him adopt hers in its stead, and is to blame for his vacillations in decisive moments. Left to himself, Louis would, from the begin- ning of his reign, have been a reforming king like Charles III. of Spain, and the great outbreak might have passed over. To trace her policy minutely from 1789 to 1793 is made very difficult by the numerous pretended letters of hers which have been published, and till recently believed in. She inspired the collection of foreign troops round Paris, contrary to the king's opinion, and thus brought on the taking of the Bastille. She was present at the banquet at Versailles which caused the march of the women to Versailles and the transference of the royal family to Paris. When there, she still looked forward to undoing all that had been done, and would never frankly recognize her position. When brought into negotiation with Mirabeau, she refused to trust him or deal frankly with him. Had she done so, she would probably have established a strong constitutional government, but she would not have been the self-willed Marie Antoinette. He advised her to go with the king and royal family to some provincial capital, declare the royal adherence to all the early acts of the assembly, but declare also that its later acts were passed under constraint, and were null and void; but she must not do two things—she must not fly towards the frontier, else she would be suspected of seeking foreign aid, and she must not depend on the army but the people. She would not act while Mirabeau was alive,—she was too independent to act by any one's advice; but when he was dead she did what he had advised her not to do, fled towards the frontier, and to Bouillé's army. The royal family were stopped at Varennes, and brought back to Paris, but from that time were regarded as traitors to France. She had yet two more chances. She might have thrown herself into the hands of Barnave, Duport, and the constitutional party of the constituent assembly, who were ready to rally round their constitutional king, but she would not trust them or take their advice. When she was at the end of her power, when the Tuileries had been stormed, and she was in prison, and the republic proclaimed, Dumouriez was ready, after his victory of Valmy, to turn his army on Panis, dissolve the Jacobins, and re-establish the old constitution, but she would not trust him. It was her last chance. When once the republic was proclaimed, it was evident that Louis must die both to cement its foundations and to remove a dangerous centre of reaction; and in January 1793 Marie Antoinette

became a widow, never to the last recognizing that she had sacrificed her husband to her obstinacy and self-will. Harrowing descriptions have been given of her treatment in prison during the few remaining months of her life, but, though she was separated from her children, she had every material comfort, no less a sum than 1110 livres being spent on her food alone between August and October, at the rate of 15 livres a day. At last her trial came on,—a mock trial indeed, as all those of the time, for her execution was determined before she came before the tribunal. Much has been said of the shameful charges made against her; but, shameful as they were, they were based on a confession made by her son, which, though probably forced from him and utterly false, was yet put In evidence, The trial was soon over, and on the same day, October 16, 1793, she was guillotined.

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It is hard to speak of Marie Antoinette with justice ; her faults were caused by her education and position rather than her nature, and she expiated them far more bitterly than was deserved. She was thoroughly imbued with the imperial and absolutist ideas of Maria Theresa, and had neither the heart nor the understanding to sympathize with the aspiratious of the lower classes. Her love of pleasure and of display ruined both her character and her reputation in her prosperous years, and yet, after a careful examination of many of the libels against her, it may be asserted with confidence that she was personally a virtuous woman, though always appearing to be the very reverse. Innocence is not always its own protection, and circumspection is as necessary for a queen as for any other woman. Her conduct throughout the Revolution is heart-rending ; we, who live after the troubled times, can see her errors and the results of her pride and her caprice, but at the time she was the only indi- vidual of the royal family who could inspire the devotion which is always paid to a strong character. In the Marie Antoinette who suffered on the guillotine we pity, not the pleasure-loving queen, not the widow, who had kept her husband against his will in the wrong course, not the woman, who throughout her married life did not scruple to show her contempt for her slow and heavy but good-natured and loving king, but the little princess, sacrificed to state policy, and cast uneducated and without a helper into the frivolous court of France, not to be loved, but to be

suspected by all around her, and eventually to be hated by the whole people of France.

For lives and memoirs of Marie Antoinette before 1863, as well as engravings of her, the student is referred to a complete and careful bio-bibliography, con- tained in M. de Lescure's Za Vraie Marie Antoinette, Paris, 1863. This work, however, contains many forged letters, purporting to be hers, and leads to the question of Marie Antoinette's published letters. There can be no doubt that very many fabrications by autograph makers for autograph collectors are published as authentic in D'Hunolstcin, Correspondance inédite de Marie Antoinette, Paris, 1864; and in Feuillet des Conches, Louis XVI., Marte Antoinette, et Madame Elisabeth, lettres et documents tnédites, Paris, 1865. The falsity of these letters was shown by Professor Von Sybel and by M. Geffroy in the Revue des Deux Mondes, and still more clearly in the latter's appendix to his Gustave JI. et la cour de France, Paris, 1867, To study Marie Antoinette as she really lived, the student must consult Von Arneth's numcrous publications on her and her mother and brothers, and particularly Aimeth and Geffroy, Marie Antoinette: Corre- spondance secrete entre Marie-Théréese et le Comte de Mercy-Argenteau, Paris, 3 vols., 1874, in which Marie Antoinette's daily life for ten years, from 1770-80, is described for her mother's own eyes, For the affair of the necklace read Carlyle's Zssay, For her imprisonment, trial, and execution, see Campardon's Tribunal Révolutionnaire, vol, i., and the same author's Marte Antoinette & la Conciergerie, Paris, 1863. (H. M. S.)

MARIE DE FRANCE is one of the most interesting figures in the literary history of the Middle Ages. She is also one of the most mysterious. Nothing is known of her except from her own statements, which amount to little more than that her name was Marie and her country France, that she dedicated one of her works to an unnamed king, and another to a certain Count William. She is mentioned by Denis Pyramus, who was her contemporary, and who says that she was very popular, but gives no particulars. Attempts have been made to identify con- jecturally the king and the count,—the most probable hypotheses being that the former was Henry III. of England, and the latter William Longsword of Salisbury ; that is to say, Marie lived in the first half of the 13th century, and rather towards the beginning than the end of that half. Her work which remains to us is entirely poetical, and by no

means inconsiderable in extent. It falls naturally into three divisions. The first consists of lais or narrative poems in octosyllabic couplets. There are fourteen of them, the titles being Gugemer, Equitan, Le Fréne, Le Bisclavaret, Lanval, Les deux amants, Ywenee, Le Laustic ("the Nightingale"), Milon, Le Chaitivel ("the Unhappy One"), Le Chévrefeuille, Eliduc, Graelent, L' Epine. The longest of these contains nearly twelve hundred lines ; the shortest only just exceeds a hundred. The term lai is of Breton origin, and is believed to have had reference originally to the kind of music to which it was performed, But in Marie it is simply a short romance, generally of an amatory character. The merits of these poems are very great. They have much tenderness and delicacy of expression, flowing and melodious verse, and not a little descriptive power. The dialect is decidedly Norman in character, and English words occasionally occur, but are invariably explained in French. Some of these poems were paraphrased by the late Mr O'Shaughnessy in his Lays of France (London, 1872), but the translator indulged to such

an extent in amplification that the effect is very dissimilar to that of the original. The second division of Marie's work is of less poetical but of greater general interest. It consists of an Ysopet (a general term in the Middle Ages for a collection of fables) of one hundred and three fables, of which Marie tells us that Henry Beauclerk translated it from Latin into English, and that for the love of Count William, "the most valiant of this realm," she herself rhymed it from English into French. The fables aro exceedingly well told, with a liveliness, elegance of verse, and ingenious aptness of moral which make Marie a worthy forerunner of La Fontaine. The question has been debated whether the great fabulist was acquainted with her work. All that can be said is that, though it is by no means impossible, and from internal evidence not even wholly improbable, it cannot be said to be very likely. The third of Marie's works is a poem of two thousand three hundred verses, describing the purgatory of Saint Patrick, written at the request of an unidentified "prudom," or man of worship. Marie has been longer and better known than most of the poets of medizeval France, and perhaps she has been relatively a little overvalued, but her positive excellence is very considerable. Her style is a good example of the pure and highly organized language of the 13th century; and despite its great age it can be read by any person acquainted with modern French with a very small expense of attention, and with but slight uso

of glossaries.

The standard edition of Maric's works is by B, de Roquefort, 2 vols., Paris, 1820.

MARIENBAD, one of the prettiest and most frequented watering-places on the Continent of Europe, with a station (about 14 miles 8.E. of the town) on the Kaiser Franz Josephs Railway, lies in a pleasant valley in the district of Tepl, in the north-west of Bohemia, about 18 miles south of Carlsbad, and nearly 2000 feet above the level of the

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sea. The gently-sloping hills which enclose it on all sides except the south are picturesquely wooded with fragrant pine forests. The town has an attractive and clean ap- pearance, and is amply provided with buildings for the lodging and amusement of its thirteen thousand annual visitors, including a theatre and a large kurhaus, The handsome Roman Catholic church and the tasteful little

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English church are among the chief ornaments of the place. The springs resemble those of Carlsbad, except that they are cold, and contain nearly twice the quantity of purgative salts. The water is used both internally and externally, and is deemed efficacious in disorders of the stomach and other organs, skin diseases, gout, and nervous complaints. About one million bottles are annually ex- ported. The curative appliances of Marienbad also include the use of goats’ milk whey, and peat, pine-cone, and gas baths. The climate is healthy and bracing, the mean annual temperature being about 45° Fahr. The springs of Marienbad, though previously used by the peasantry of the district, first came into general notice about the beginning of this century through the instrumentality of Dr Nehr, to whom a monument was erected here in 1857. They belong to the rich abbey of Tepl, which lies about 9 miles to the east. The permanent population of Marienbad was 2009 at the census of 1880.

MARIENBURG (in Polish, Jfalborg), the chief town of a circle in the district of Dantzic, Prussia, lies 30 miles to the south-east of Dantzic, in a fertile plain on the right bank of the Nogat, a channel of the Vistula, here spanned by a handsome railway bridge and by a bridge of boats.

Marienburg contains a large chemical wool- cleaning work and several other factories, carries on a considerable trade in grain, wood, linen, feathers, and brnshes, and is the seat of important cattle, horse, and wool markets, Its educational institutions include a gymnasium and a Protestant normal school. In the old market-place, many of the houses in which are built with arcades in the Italian style, stands a Gothic town-house, dating from the end of the 14th century. The town is also embellished with a good statue of Frederick the Great, who added this district to Prussia, and a monument com- memorating the war of 1870-71. The population in 1880 was 9559. Marienburg is chiefly interesting from its having been for a century and a half the residence of the grand masters of the Teutonic order. The large castle of the order here was originally founded in 1274 as the seat of a simple commandery against the pagan Prussians, but in 1309 the headquarters of tho grand master were transferred hither from Venice, and the ‘ Marienburger Schloss” soon became one of the largest and most strongly fortified buildings in Germany. On the decline of the order in the middle of the 15th century, the castle passed into the lands of the Poles, by whom it was allowed to fall into neglect and decay. It came into the possession of Prussia in 1772, and was carefully restored at the beginning of the present century. This interesting and curious building consists of three parts, the Alte or Hohe Schloss, the Mittel Schloss, and the Vorburg. It is built of brick, in a style of architecture peculiar to the Baltic provinces, and is undonbtedly one of the most important secular buildings of the Middle Ages in Germany.

Of the numerous monographs published in Germany on the castle of Marienburg, it will suffice to mention here Biisehing’s Sehloss der Deutschen Ritter ze Marienburg, Berlin, 1828; Voigt’s Geschichte von Marienburg, Konigsberg, 1824; and Bergau’s Ordenshaupthaus Marienburg, Berlin, 1871.

MARIETTA, a city of the United States, the capital of Washington county, Ohio, lies on the right bank of the Ohio, at the mouth of the Muskingum, 85 miles south-east of Columbus, and is the eastern terminus of the Marietta and Cincinnati Railroad, and the southern terminus of the Cleveland and Marietta Railroad. The surrounding country being rich in petroleum, iron, and coal, the city has become the seat of no inconsiderable industry in the

shape of oil-works, iron foundries, and machine-shops, a rolling mill, tanneries, and carriage, car, bucket, and chair factories. Marietta College, chartered in 1835, and

maintained by voluntary endowment and subscription, is a flourishing institution, with eight instructors and a library of 25,000 volumes, occupying a fine group of buildings in the midst of extensive grounds. The popula- tion of the city has risen from 3175 in 1850 to 5444 in 1880. At the latter date the township, which includes the village of Harmar (1572), contained 8830 persons. Marietta, founded in 1788 by General Putnam, and named in honour of Marie Antoinette, is the oldest town in Ohio. It is built on the site of a remarkable group of prehistorie monuments, the largest of whieh are two enclosures, respeetively 40 and 20 aeres in extent, formed by walls from 20 to 30 feet broad at the base, and still in some places 5 and 6 feet high. See Squier and Davis, Ancient Monuments of the Mississippi Valley. MARIETTE, Aucuste Ferpinanp Francois, elder son of Francois P. Mariette, advocate and town-clerk of Boulogne-sur-Mer, was born in that town on the 11th of February 1821. Educated at the Boulogne municipal college, he distinguished himself in geometry, physics, chemistry, history, Latin, Greek, and English. He also evinced a remarkable talent for art. In 1839, when but eighteen years of age, he went to England in the capacity of professor of French aud drawing at a boys' school at Stratford-on-Avon, which occupation he exchanged in 1840 for that of pattern-designer to a ribbon manufacturer at Coventry. Weary of ill-paid exile, he returned that same year to Boulogne, resumed his interrupted studies, and in March 1841 took his bachelor's. degree (with honourable mention) at Douai. He now became a professor at the college where he had formerly been a student, and for some years supplemented his modest salary by giving private lessons, and writing on historical and archeological subjects for various local periodicals. In the meanwhile his cousin, Nestor L'Héte, the friend and fellow-traveller of Champollion, died; and upon Auguste Mariette devolved the pious task of sorting the multitudinous papers of the deceased savant. The young man thenceforth became passionately interested in Egyptology, devoted himself to the study of hieroglyphs and Coptic, and in 1847 pub- lished a Catalogue Analytique of the Egyptian

Gallery of the Boulogne Museum. He had now found his vocation, and in 1849, being appointed to a subordinate position in the Louvre, left Boulogne for Paris. Entrusted shortly after with a Government mission for the purpose of seeking and purchasing Coptic, Syriac, Arabic, and Ethiopic MSS. for the national collection, he started for Egypt in 1850. Soon after his arrival he made his celebrated discovery of the ruins of the Serapeum and the subterraneous catacombs of the Apis-bulls, buried for probably some two thousand years under the sands of the Libyan desert (see vol. vii. p. 773). His original mission being abandoned, funds were now advanced for the prosecution of his researches, and he remained in Egypt for four years, excavating, discover- ing, and despatching archeological treasures to the Louvre, of which museum he was, on his return, appointed an assistant conservator. In 1858, by permission of his own Government, he accepted the position of conservator of Egyptian monuments to the ex-khedive, Ismail-Pasha, and so removed with his family to Cairo. His history thenceforth becomes a chronicle of unwearied exploration and brilliant success. The pyramid-fields of Memphis and Sakkara, and the necropolises of Meydum, Abydos, and Thebes were ransacked for sepulchral treasures ; the great temples of Denderah and Edfoo were disinterred, and, with their tens of thousands of inscriptions and_bas-reliefs, restored to the light of day; important excavations were carried out at Karnak, Medinet-Habu, and Deir-el- Bahari; Tanis (the Zoan of the Bible) was partially explored in the Delta; and even Gebel Barkal in the far Soudan was made to yield monuments of the Ethiopic kings. The Sphinx was also bared to the rock-level, and the famous

granite and alabaster monument miscalled the " Temple of the Sphinx" was discovered. In the meanwhile Mariette, raised successively to the rank of bey and then of pasha, had founded the '" Kcole Francaise d'iigyptologie" and the "Institut Egyptien," and created ab ovo the museum at Bulak, the richest and by far the most interesting Egyptian collection in the world. Honours and orders were showered upon him. Poor iu purse but rich in fame, he received in 1852 the grand cross of the Legion of Honour and of the Medjidie, in 1855 the Red Eagle (first class) of Prussia, in 1857 the Italian order of SS. Maurice and Lazarus, and in 1858 the Austrian order of

Francis-Joseph. In 1873 the Academy of Inscriptions decreed to him the great biennial prize of 20,000 frances, and in 1878 he was elected a member of the Institute. He was also an honorary member of most of the learned societies of Europe. Though of herculean strength and indomitable energy, he was not proof against over-work of all kinds, physical, mental, and official. Prostrated in 1877 by a first attack of the insidious malady from which only death released him, he lingered for a few years, working to the last, and died at Cairo January 19, 1881. His remains, enclosed in an ancient Egyptian sarcophagus chosen by himself for that purpose, are interred within the precincts of themuseum- garden at Bulak, facing the entrance to that unrivalled collection which is his own noblest monument.

Of Mariette's numerous and important contributions to the literature of Egyptology, we may here especially note the following works, which are not only distinguished for their erudition and accuracy, but for the exquisite grace of style with which they are written :—Le Sérapéwm de Memphis, folio, 1857 and following years ; Dendérah, five folios and one 4to, 1873-75 ; Abydos, two folios and one 4to, 1870-80; Karnak, folio and 4to, 1875; Deir- el-Bahari, folio and 4to, 1877 ; Listes géographiques des pylénes de Karnak, folio, 1875 ; Catalogue du Musée de Boulaq, six editions, 1864-76 ; Apergu de Vhistoire d' Egypte, four editions, 1864-74, &e. His last, and one of his most important works, Les Mastabas de l''Aneten Empire, text and illustrations faesimiled from the original MSS., folio, is now in course of publication, edited by Professor G. Maspero.

MARIGNOLLI, Giovanni pe', a notable traveller to the far East of the 14th century, born probably prior to 1290, and sprung from a noble family in Florence. The family is long extinct, but a street near the cathedral (Via de' Cerretani) formerly bore the name of the Marignolli.

In vol. v. pp. 628-29 some account has been given of the extraordinary episode of intercourse between Europe and China in the first half of the 14th century. In 1338 there arrived at Avignon, where Benedict XII. held his court, an embassy from the great khan of Cathay, bearing letters to the pontiff from the khan himself, and from certain Christian nobles of the Alan race in his service. These latter represented that they had been eight years without a spiritual guide, and earnestly desired one. The pope replied to the

letters, and appointed four ecclesiastics as his legates to the khan's court. The name of Marignolli, a Franciscan of some repute for learning, appears, as John of Florence, third on the letters of commission. We know not what became of his colleagues; he was the chief if not the sole envoy who actually went.

The mission left Avignon in December 1338, picked up the Tartar envoys at Naples, and' sailed across the Black Sea to Caffa, whence they travelled to the court of Mohammed Uzbek, khan of the Golden Horde, at Sarai on the Volga. The khan entertained them hospitably during the winter of 1339-40, and then sent them across the steppes to Armalec or Almaligh, the northern seat of the house of Chaghatai, in what is now the province of Ili. "There," says Marignolli, "we built a church, bought a piece of ground… . . sung masses, and baptized several persons, notwithstanding that only the year before the

bishop and six other minor friars had there undergone |

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glorious martyrdom for Christ's salvation." Quitting Almaligh in 1341, they seem to have reached Peking (by way of Kamil or Hami) in May or June 1342. They were well received by the reigning khan, the last of the Mongol dynasty in China.

*'*The grand kaam, when he beheld the great horses (dextrarios) and the pope's presents, with his letter, and that of King Robert (of Naples) too, with their golden seals, and when he saw us also, rejoiced greatly, being delighted, yea exceedingly delighted with everything. . . . And when I entered the kaam's presence, it was in full festival vestments, with a very fine eross carried before me, and eandles and ineense, whilst Credo in unwm Deum was chaunted, in that glorious palace where he dwells. And when the ehaunt was ended I bestowed a full benediction, which he reeeived with all humility."*

An entry in the Chinese annals fixes the year of Marignolli's presentation by its mention of the arrival of the great horses from the kingdom of Fulang

(farang or Europe), one of which was 11 feet 6 inches in length, and 6 feet 8 inches high, and black all over !

Marignolli stayed at Peking or Cambalec three or four years, after which he travelled: through eastern China to Zayton or CHINCHEW (¢.v.), quitting China apparently in December 1347, and reaching Columbum (Kaulam or Quilon in Malabar) in Easter week of 1348, At this place he found a church of the Latin communion, probably founded by Jordanus of Séverac, who had been consecrated bishop of Columbum by Pope John XXII. in 1328. Here Marignolli remained sixteen months, after which he pro- ceeded on what seems a must devious voyage. First he visited the shrine of St Thomas near the modern Madras, and then proceeded to what he calls the kingdom of Saba, and identifies with the Sheba of Scripture, but which seems from various particulars to have been Java. Taking ship again for Malabar on his way to Europe, he encountered great storms, of which he gives an imaginative account :—

-... 'The sea as if in flames, and fire-spitting dragons flying by, which, as they passed, slew persons on board the other junks, whilst ours remained untouched, by God's graee, and by virtue of the Body of Christ which I earried with me, and through the merits of the glorious Virgin and of St Clare."

They found shelter in the little port of Pervilis (Beru- wala or Berberyn) in the south-west of Ceylon; but here the legate fell into the hands of 'a certain tyrant Coya Jan (Khoja Jahan), an eunuch and an accursed Saracen," who professed to treat him with all deference, but detained him four months, and plundered all the gifts and Eastern rarities that he was carrying home. This detention in "Seyllan" enables Marignolli to give a variety of curious particulars regarding Adam's Peak and other marvels. After this we have only fragmentary notices, showing that his route to Europe lay by Ormuz, the ruins of Babel, Baghdad, Mosul, Aleppo ("' where there were many Chris- tians who dressed after the Latin fashion, and spoke a language very near the French ; at any rate like the French of Cyprus"), and thence to Damascus and Jerusalem. In 1353 he arrived at Avignon, and delivered a letter from the great khan to Pope Innocent VI. In the following year the emperor Charles IV., on a visit to Italy, made Marignolli one of his

chaplains. Soon after, the pope made him bishop of Bisignano; but he seems to have been in no hurry to reside there. He appears to have accompanied the emperor to Prague ; in 1356 he is found acting as envoy to the pope from Florence; and in 1357 he is at Bologna. We know not when he died. The last trace of Marignolli is a letter addressed to him, which was found last century among the records in the Chapter Library at Prague. The writer is an unnamed bishop of Armagh, easily identified with Richard Fitz Ralph, a strenu- ous foe of the Franciscans, who had broken lances in con- troversy with Ockham and Burley. The letter implies that some intention had been intimated from Avignon of sending

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Marignolli to Ireland in connexion with matters then in debate. The wrath of Fitz Ralph is sorely stirred at this, and he brandishes the shillelah in a style of energetic metaphor very like what we have been used to from like quarters in later days.

Fitz Ralph's contemptuous language had probably a good deal of foundation. he fragmentary notes of Marignolli's Eastern travels often contain most vivid remembrauce and graphic description, but combined with an incontinent vanity, and an incoherent lapse from one thing to another, matched by nothing in litcrature but the conversation of Mrs Nickleby. They have no claim to be called a narrative, and it is with no small pains that anything like a narrative can be pieced out of them. Indeed the mode in which they were elicited curiously illustrates how little mediaeval travellers thought of publication. The emperor Charles, instead of urging his chaplain to write a history of his vast journeys, set him to the repugnant task of recasting the annals of Bohemia; and he con- soled himself by salting the insipid stuff by interpolations, & propos de bottes, of his recollections of Asiatic travel.

Nobody secms to have noticed the work till 1768, when the chronicle was published in vol. ii. of the Monwmenta Hist. Bohemix nusquam antehae edita by Father Gclasius Dobner. But, though Marignolli was thus at last in type, no one seems to have read him till 1820, when an interesting paper on his travels was pub- lished by J. G. Meincrt. The late Professor Kunstmann_of Munich also devoted to the subject one of a series of very

intelli- gent papers on the ccclesiastical travellers of the Middle Ages. And the whole of the passages bearing on the journey were ex- cerpted, translated, and commented on by Col. H. Yule in a col- lection printed in 1866.

Monumenta Historica, dc., collegit, &e., P. Gelasius Dobner a S. Catherina, tom. ii., Prague, 1768; Meinert, in Abhandl. der K. Bohm, Gesellsch, der Wissen- schaften, vii.; Kunstmann, in Historische Politische Blittern von Phillips und Gérres, BA, xxxviii. pp. 701,798, Munich, 1859; Wadding, Annales Minorum, vii.;

Sbaralea, Supplem. et Castigatio ad Scriptores Trium Ordd, S. Francisct_ a Wad- dingo, Rome, 1806 3 Cathay and the Way Thither, Hak. Soc., 1866, %

MARIGOLD. This name has been given to several plants, of which the following are the best known :— Calendula officinalis, L., the pot-marigold ; Z'agetes erecta, L., the African marigold; 7 patula, L., the French marigold ; and Chrysanthemum segetwm, the corn marigold, All these belong to the order Composite; but Caltha palustris, L., the marsh marigold, is a ranunculaceous plant.

The first-mentioned is the familiar garden plant with large orange-coloured blossoms, and is a native of the meadows of southern Europe (DC., Prod., vi. p. 451). It is unisexual, the "ray" florets being female, the '" disk " florets male. 'This and the double variety have been in cultivation for at least three hundred years, as well as a proliferous form, C. prolifera, or the "fruitful marigolde " of Gerard (Zerball, p. 602), in which small flower-heads proceed from beneath the circumference of the flower. The figure of "the greatest double marigold," C. multylora maxima, given by Gerard (/.c., p. 600) is larger than most specimens now seen, being 3 inches in diameter. He remarks of "the marigolde" that it is called Calendula "as itis to be seene to flower in the calends of almost euerie moneth." It was supposed to lave several specific virtues, but they are now discredited. "The marigold, that goes to bed wi' the sun," is mentioned by Shakespeare, Winter's Tale, iv. 3.

Tagetes patula, L., and 7. erecta, L. (DC., Prod., v. p. 643), the French and African marigolds, are natives of Mexico, and are equally familiar garden

plants, having been long in cultivation. Gerard figures four varieties of /'os africanus, of the single and double kinds (/.c., p. 609) ; but they do not appear to be specifically distinct ; indeed Parkinson (Par., p. 303, 1629) regarded them as one. Besides the above speeies the following have been intro- duced later, 7. lucida, Cav., 7. signata, also from Mexico, and 7. tenuifolia, Cav., from Peru (Hemsley's Handbook of Lardy Trees, &¢., p. 247).

_ Chrysanthemum segetum, L., the yellow corn marigold, is Indigenous to Great Britain, and is frequent in corn-fields in most parts of England. A decoction of the fresh plant gathered before flowering is acrid, and is said to be useful

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medicinally. When dried it has been employed as hay It is also used in Germany for dyeing yellow (Baxter, Brit. Gen. of Pl., vol. iv. 306). Gerard observes that in his day "the stalke and leaues of Corne Marigolde, as Dioseorides saith, are eaten as other potherbes are."

Caltha palustris, L., the marsh marigold, the " winking Mary-buds" of Shakespeare (Cymb., ii. 3), is a common British plant in marshy meadows and beside water. It bears cordate leaves, the flowers having a golden yellow calyx but no corolla, and blossoming in March and April. The flower-buds preserved in salted vinegar are a good substitute for capers. A double-flowered variety is often cultivated, and is occasionally found wild (Baxter, J.c., vol. ii, 153).

MARINES. With all maritime nations, especially if they be insular and capable of taking the offensive in war, there must frequently be cases in which naval operations can be supplemented by the landing of a force, The armament, equipment, and discipline of the armies and navies of such nations were in early days practically alike. But with the introduction of more regular levies and better organization arose the necessity for having on board ships-of-war an armed body organized to meet the altered condition of things. Sailors were but engaged for periods during which ships were commissioned ; and their previous history and training did not tend to furnish the material required. Regular armies on shore called for

disciplined forces afloat,—that is to say, for marines, or sea soldiers, who should have the steadiness of the troops of the line, be accustomed to the peculiar duties of ship life, and be subordinate to the naval authorities.

Previous to 1664 the British navy had been manned chiefly by "impress"; but in that year an order in council appeared, authorizing the formation of a force of 1200 soldiers, in six companies, to be raised for sea service during the Dutch War. Probably it was recruited from the London Trained Bands, as the Royal Marines, with the 3d battalion of the Grenadier Guards, the East Kent Regiment, and the Royal London Militia, alone possess the privilege of marching through the city with colours flying and bayonets fixed. Recruits were also obtained from the foot guards; and in 1672 companies of the guards were employed on shipboard. The Army List of 1684 shows for the first time the organized battalion of marines, in H.R.H. the duke of York and Albany's maritime regiment of foot or "Admiral's Regiment," which, in that year, mustered on Putney Heath twelve companies, with a full proportion of officers. This stood third in seniority in the line, and eventually became the Coldstream Guards; the 4th, or "Holland Regiment," which also sent companies to sea, and had like the above regiment been raised by the City of London, taking its place as 3d or "Old Buffs." Several other maritime regiments were successively formed and disbanded, until, in 1702, Queen Anne directed the addition to the army of six regiments as a marine corps, while six existing regiments were also appointed "for sea serviee." These were done away with in 1714, three only being retained, as the 30th, 31st, and 32d of the line, Independent companies, for service in the West Indies, were also formed, becoming in 1742 the 49th foot. In 1739 six fresh regiments were levied, and augmented in 1742 to ten, of 1000 men in ten companies each; while three others were collected in America for colonial duty. Though conimanded by generals and colonels of the army, they were to be quartered in the neighbourhood of the dockyards at Portsmouth, Sheerness, Chatham, Deptford, Woolwich, and Plymouth ; and the proportion of officers, viz., 100 men with a captain to twenty with a subaltern, was fixed for the different classes of vessels. No field officer was embarked unless a full battalion were sent, In

1745 two other battalions were specially raised for service at Cape Breton, becoming finally the 50th and 51st foot ; and in 1746 the ten regiments were restored to the army, taking rank from the 44th to the 53d. Previous to their disbandment as inarines they had been partially under the orders of the lord high admiral.

By an order in council of 1755 a force of 5000 men in 50 companies was raised and definitely placed under the naval authorities. They were to be stationed at Chatham, Portsmouth, and Plymouth, the 4th or Woolwich division not being added until 1805; and this body was gradually increased to 19,000 men in 1762, but reduced in 1763 to about 4000, Commissions ceased to be purchasable, but exchange with the army was, for a time, sanctioned. Naval admirals and captains were appointed generals and colonels of marines in 1760, in consequence of a represen- tation from the commandants of divisions that there was an insufficient number of field officers "for the discipline of the service." This absurd anomaly existed until 1833, when tliese useless sinecures were abolished.

The revolt of the American colonies in 1775 led, again, to an inerease in the establishment, which by 1783 liad reached 25,291 men,—followed by a reduction to 4495 the ensuing year. So urgent was the demand for marines during the struggle that men were frequently embarked untrained ; yet, so popular was tlie service, they still "recruited better in every part of the island" than the army. Owing to this unwise policy of reduction, the force, on the outbreak of the French War in 1793, had to be supplemented, as formerly, by companies from the line ; and at its conclusion the marine corps again reaclied a total strength of more than 30,000 men. But there had been differences between the military and naval authorities as to the employment of soldiers from the ariny ; so that from 1815, when the numbers again fell to about 6000, there has been a steady increase, until an establishment suitable to the wants of the navy has been fixed. During the long war, moreover, the necessity for tle formation of a body of marine artillery had become increasingly apparent. The services of marines in this capacity had been previously demanded during the American War, when they were employed in the half-moon battery and citadel at Halifax, and elsewhere in batteries on shore, as some of them had been "trained in tlie service of great guns" by Lieutenant Gillespie of the Royal Artillery. By an

order in council of the 18th August 1804, therefore, "in consequence of the inconvenience of embarking the Royal Artillery," it was directed that one company of marine artillery, composed of the most intelligent and experienced officers and men, should be formed at each division to be employed for the training of the infantry, so as to embark efficient artillery-men in other vessels besides "bombs." This force suffered a reduction to two companies in 1822, since which date it also has been steadily increased ; and in 1862 the artillery companies were separated from the light infantry and formed into a separate division at Fort Cumberland, Portsmouth, whence the headquarters were transferred to Eastney in 1869. In 1869 the Woolwich division was abolished, a depdt for the training of recruits being formed at Walmer. At present the Royal Marine force numbers 48 companies of infantry and 16 of artillery, showing a total force of 2532 artillery and 9862 infantry, at an expendi- ture of £913,456,

Each division of Royal Marines has a total force of 16 companies, with a colonel commandant, second commandant, 4 licutenant- colonels, 14 majors, 20 captains, and 42 subalterns, inclusive of the divisional staff of instructors of gunnery, musketry, &. The headquarter staff, in London, consists of a deputy and an assistant adjutant-gencral, &c. ; and there are, in addition, three generals, three lieutenant-gencrals, and six major-generals on the active list. The men are recruited by special parties ; they are enlisted for

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twelve years, with permission to re-engage for nine more. All recruits undergo their preliminary training at Walmer, and are then drafted to the several divisions, —those who reach a higher standard being allowed to volunteer for the artillery. The standard for infantry and artillery, and the system of pay, equipment, pension, and divisional administration, are similar to those of the line and Royal Artillery respectively. Officers are obtained by open com- petition from the pass-lists for entrance to the Military Academy, Woolwich, and the Royal Military College, Sandhurst. The suc- cessful infantry candidates are drafted to their several divisions, and undergo a course of instruction under the military instructor to the

corps, —those for the artillery receiving a special training for two years at the Royal Naval College, Greenwich.

The Royal Marines, reckoning as part of the naval forces, are accounted for in the navy estimates; though the names of the officers appear both in the Army and Navy Lists. 'They are par- ticularized in the Army Act as subject to military law at stated times, serving on shore under the Act and the regulations in force in the garrisons, where they perform the same duties as the land forces. Afloat they are subject to the Naval Discipline Act ; and a Marine Mutiny Act was formerly passed annually for the 'regulation of Her Majesty's Royal Marinc forces while on shore," stating that they were under the direction of the lord high adiniral, &c. On board ship their duties are of a purely military character, being confined to guard mouuting, assisting to man boats for shore operations, and helping to form the crews for the heavy guns.

'Though under the supreme command of the naval authorities, they

are only obliged to aid in work on deck, and when landed are entirely commanded by their own officers,

The war services of the corps are so numerous that they can be but briefly referred to. First employed at Cork in 1690, they have been present in nearly all the actions in which the navy has since then been engaged ; and between that date and 1800 they took part in 227 sea fights and 70 important operations on shore. At Gibraltar and Manila, at Belleisle and Bunker's Hill, at Negapatam, the Cape, and Acre, they earned the special commendation of the leadcrs, as well as for Lord Howe's victory, and the great sea figlits of Camperdown, Cape St Vincent, and the Nile. Nor were their enemies backward in recognizing their worth. At Belleisle the French, in describing the troops whose valour had been most conspicuous, designated the battalions of marines "les petits gvenadiers"; and at Acre General Berthier bore testimony to the conspicuous gallantry of Major Oldficld, who fell in the attack on the fortress. From 1800 to 1815 they saw constant service in 99 coast operations and 142 naval actions. After the landing at Aboukir Bay in 1801 the " Bull Dogs" received high praise for the way in which they had done their work, At the siege of Gaeta, at Rosas, and at Santa Maura, the marines again distinguished themselves ; and they

took part in the decisive battles at Copenhagen, Trafalgar, San Domingo, and the Dardanelles. 'Yhree battalions were also specially brigaded with the line for active service in America and Holland in 1813-15. Since that period the marines have shared in the naval actions at Algiers, Navarino, Acre, the Baltic, and Black Sea, and have fought by the side of the land forces at the Cape, in India, China, New Zealand, Abyssinia, Ashantee, and Zululand, as also in those numerous petty skirmishes in which the navy has bccn so repcatedly engaged, In the bombardment of Alexandria (1882), and in the operations that followed it, the corps has again secn service by sea and land. Nor have their services been less important in other cases. Though forming part of the ships' companies, and therefore at times suffering from the same grievances, thcy have always been faithful to their trust. In 1797, a period of much sedition throughout the country, all efforts to shake their allegiance were fruitless, and the duke of York especially commended their loyalty and zeal. Between that year and 1802, after the mutinies of the Nore, Spithead, and Bantry Bay, of the "Temcraire," ' Castor," "Impétueux," ' Her- mione," "Gibraltar," and " Excellent," the marines were publicly thanked for their devotion.*

*As part of a ship's company in naval actions, as @ force landed to assist in coast operations, and as troops acting in concert with the army, the marines have won distinction and the commendation of both naval and military authorities for two hundred years. The motto of the corps, " Per mare per terram," nceds no explanation ; the title "Royal" was added in 1802 '*for its many and varied services during the war," and its former facings were altered from white to royal blue; it was also in 1820, by an order in council, placed next in seniority to the 49th Regiment. In 1827 the globe, surrounded by the laurel wreath, for the siege of Belleisle, together with "Gibraltar," in commemoration of the services performed there, was added by George IV. In 1855 the infantry braneh of the corps became "light infantry."*

Although in the '"'armed strengths" of the great European powers marines and marine artillery are mentioned, these trooys have little in common with those in the British navy. In France their duties are to garrison the five military ports and colonies, and to take part in marine and other wars. In Germany the iarine

battalions and artillery divisions at Kiel and Wilhelmshafen are in- tended for coast defence only. In Holland, Austria, and Italy also they have a military organization, but do not form a recognized part of the complements of sea-going ships. America alone einploys marines in the same manner as England; and they have won, as their British comrades have, the approbation of the naval authorities and, on uineteen occasions, the thanks of Congress. Admiral Farra- gut's opinion that "the marine guard is one of the great essentials of a inan-of-war" is corroborated by that of Admiral Wilkes, who considered that "marines constituted the great difference between a man-of-war and a privateer." Formed in 1775 for the "publick defense," they rank as the oldest force in the American service ; and since that time they have shared in land and sea opera- tions in all parts of the world. In the fainous battles between the " Bonhomme Riehard " and "Serapis" in 1777, and in that between the ' Chesapeake" and "Shannon," they displayed brilliant gallantry ; and while on the one hand they at Derne in 1803 first planted the Ameriean flag ona fortress of the Old World, for which exploit '¢Pripoli" is inseribed on their colours, they on the other shared in the hard fighting of the Mexican war as well as all the import- ant coast aetions of the civil war of 1861-65. A proposal to incor- porate them with the army after the struggle met with universal condemnation from the authorities best qualified to judge of their value. At present they number seventy-eight officers. and two thousand men under the command of a commandant, who ranks as brigadier-general, with headquarters at Washington. Their administration, organization, and equipment are, as in England, identical with those of the soldiers of the line. They are enlisted for five years, must be 5 feet 6 inches in height, between eighteen and thirty-five years of age, and able to read and write. The complement on board ship varies from thirteen to fifty-one officers and men, depending on the rating of the vessel. Their device is a globe resting on an anchor and surmounted by an eagle. ' Ever faithful" is the title which Captain Luce, the historian of the force, appropriately applies to them. (CH CE IS)*

MARINI, or Marino, GramBattista (1569-1625), Italian poet, was born at Naples on October 18, 1569. At an early age he secured the powerful patronage of Cardinal Aldobrandini, whom he accompanied from Rome to Ravenna and Turin. His ungoverned pen and dis- ordered life compelled him to take refuge from 1615 to 1622 in Paris, where he was favourably recognized by Mary do' Medici. He died at Naples on March 25, 1625, See [Taty, vol. xiii. p. 511.

MARINUS I. (Martinus IT.) succeeded John VIII. in the pontificate about the end of December 882. On three separate occasions he had been employed by the three popes who preceded him as legate to Constantinople, his mission in each case having reference to the controversy excited by Photius. Among his first acts as pope were the restitution of Formnosus, cardinal bishop of Porto, and the anathematizing of Photius. He died in May or June 884, his successor being Adrian ITI.

MARINUS II. (Martinus IIL), pope from 942 to 946, was preceded by Stephen IX., and followed by Agapetus IT. ;

MARION, Francis (1732-1795), American general, was born in 1732 at Winyah, near Georgetown, South Carolina. In 1759-61 he served as lieutenant in expedi- tions against tlie Cherokees, and in 1775 he was elected a member of the provincial congress of South Carolina, This voted two regiments of infantry, and Marion was elected captain in the second. He was made lieutenant- colonel after the defence of Fort Moultrie at the entrance of Charleston harbour (June 28, 1776), and was present at the unsuccessful attack on Savannah, September 1779. In August he joined Gates, but was detached a few days before Gates's défeat at Camden on August 16; at Nelson's Ferry, on the 20th, he rescued one hundred and fifty of the prisoners from astrong guard. He soon received a general's commission. Pursued by Tarleton and Wemyss, he was driven to North Carolina, but soon returned. After successful skirmishes against superior forces, he formed a camp at Snow's Island in the midst of the swamps of the Pedee and the Santee. In March 1781 he de- feated Watson at Black River; but meanwhile Doyle had

destroyed Marion's camp. In April Lee and Marion took Fort Watson, and in May Fort Motte. In June Greene de- tached Sumter with Marion and

others to make an incursion into the low country. At Quinby Marion's men fought well against Coates; aud in August he made a forced march to Parker's Ferry and rescued Colonel Harden, pressed by a superior force. At Eutaw Springs he commanded the right under Greene. After the British retreat to Charles- ton, Marion went to an important session of the colonial assembly ; on the very day that he returned to his brigade, February 24, 1782, it was surprised and dispersed, Marion arriving too late to recover the day. After the war he occu- pied himself with farming. He died February 27, 1795.

MARIONETTES (probably from morio, a fool or –

buffoon), Fanroccrni (from fantino, a child), or PUPPETS (poupée, a baby or doll), are figures, generally below life- size, suspended by threads or wires and imitating with their limbs and heads the movements of living persons.

The high antiquity of puppets appears from the fact that figures with movable limbs have been discovered in the tombs of Egypt and among the remains of Etruria ; they were also common among the Greeks, from whom they were imported to Rome. Plays in which the characters are represented by puppets or by the shadows of moving figures, worked by concealed performers who deliver the dialogue, are not only popular in India and China at the present day, but during several centuries past maintained an important position among the amuse- ments of the people in most European countries. Goethe and Lessing deemed them worthy of attention; and as late as 1721 Le Sage wrote plays for puppets to perform. Every one remembers in Don Quixote 'the curious puppet show, which represents the play of Melisandra and Don Gayferos, one of the best shows that has been acted time out of mind in this kingdom." Reference to puppet shows is frequent in English literature from Chaucer onward. Thus Davenant says :—

**¢ And man in ehimney hid to dress Puppet that acts our old Queen Bess,*

And man that, while the puppets play, Through nose expoundeth what they say."

The earliest performances in English were drawn or founded upon Bible narratives and the lives of the saints, in the same vein as the " morality" plays which they suc- ceeded. Popular subjects in the 16th century were 7he Prodigal Son and Nineveh, with Jonah and the. Whale. And in a pamphlet of 1641, describing Bartholomew Fair, we read, " Here a knave in a fool's coat, with a trumpet sounding or a druin beating, invites you to see his puppets. Here a rogue like a wild woodman, or in an antic shape like an incubus, desires your company to view his motion." In 1667 Pepys recorded how, at Bartholomew Fair, he found "my Lady Castlemaine at a puppet play, Patient Grizill." Besides 7he Sorrows of Griselda, other puppet plays of the period were Dick Whittington, The Vagaries of Merry Andrew, and The Humours of Bartholomew Fair. Powell's noted marionette show was the subject of an article in Zhe Tatler, 1709, and again in The Spectator, 1711. The latter refers also to Pinkethman, a " motion- maker," in whose scenes the divinities of Olyimpus ascended and descended to the strains of music. An idea of the class of representation may be gathered from an advertisement of Crawley, a rival of Pinkethman, which sets forth—" The Old Creation of the World, with the addition of Noah's Flood," also several fountains playing water during the time of the play. The best scene represented 'Noah and his family coming out of the ark, with all the animals two by two, and all the fowls of the air seen in a prospect sitting upon trees; likewise over the ark is the sun rising in a gorgeous manner; moreover a multitude of

angels in a double rank," the angels ringing bells. "' Like- wise machines descending from above, double, with Dives rising out of hell and Lazarus seen in Abraham's bosom ; besides several figures dancing jiggs, sarabands, and cotntry dances, with the merry conceits of Squire Punch and Sir John Spendall." Yates showed a mov- ing picture of a city, with an artificial cascade, and a temple,—with mechanical birds in which attention was called to the exact imitation of living birds, the quick motion of the bills, just swelling of the throat, and fluttering of the wings. The puppets were wax figures 5 feet in stature. 'Toward the end of the 18th cen- tury, Flockton's show presented five hundred figures at work at various trades. Brown's Theatre of Arts showed at country fairs, from 1830 to 1840, the

battle of Trafalgar, Napoleon's army crossing the Alps, and the marble palace of St Petersburg; and at a still later date Glapton's similar exhibition presented Grace Darling rescuing the crew of the " Forfarshire " steamer wrecked on the Fern Islands, with many ingenious moving figures of quadrupeds, and, in particular, a swan which dipped its head into imitation water, opened its wings, and with flexible neck preened and trimmed its plumage. In these mechanical scenes the figures, painted upon a flat surface and cut out, commonly of pasteboard, are slid along grooves arranged transversely in front of the set scenery, the actions of legs and arms being worked by wires from the hands of persons below the stage, though sometimes use is made of clockwork.

Marionettes proper, and the dolls exhibited in puppet shows (not including Punch and his companion actors), are constructed of wood or of pasteboard, with faces of composition, sometimes of wax; and each figure is suspended by a number of threads to a short bar of wood which is commonly held in one hand of the hidden performer while the finger of his other hand poses the figure or gives action to it by means of the threads. In the mode of constructing the joints, and the greater elaboration with which the several] parts of the limbs are supported and moved, and especially in the fine degrees of movement given to the heads, marionettes have been so improved as to present very exact imitations of the gestures of actors and actresses, and the postures and evolutions of acrobats; and, in addition, ingenious exhibitors such as Theodon, who introduced many novelties from twenty to thirty years ago, have employed mechanical arrangements for accomplishing the tricks of pantomime harlequinade. Among the puppet personages presented in the small street shows arc generally included a sailor who dances a hornpipe, a hoop-dancer, a dancer of the Highland fling, a wooden-legged pensioner, a vaulter on a pole also balancing two chairs, a clown playing with a butterfly, a dancing figure without head until the head rises out of the body, gradually displaying an enormously long neck, a juggler tossing gilt balls which, sliding up and down upon tight invisible threads, fall into his hands again, a milk-woman carrying buckets out of which fly white dolls, and a skeleton, seen at first in scattered parts lying about the stage, but piece successively flying to piece, the body first sitting up, then standing, and finally capped by the skull, when the completed figure begins to dance.

Ombres Chinois are the shadows of figures projected upon a stretched sheet of thin calico or a gauze scene painted as a transparency. The cardboard flat figures are held behind this screen, illuminated from behind,—the performer supporting each fivure by a long wire held in one hand while wires from all the

movable parts terminate in rings in which arc inserted the fingers of his other hand.

MARIOTTE, Epme (died 1684), a celebrated French physicist, was a native of Burgundy. He lived chiefly near Dijon as prior of St Martin sous Beaune, and was one of the first members of the Academy of Sciences, which was founded at Paris in 1666. He died at Paris May 12, 1684. The first volume of the Histoire et Mémoures de V Académie (1733) contains many original papers by him upon a great variety of physical subjects, such as the motion of fluids, the nature of colour, the notes of the trumpet, the barometer, the fall of bodies, the recoil of guns, the freezing of water, &c. His Hssais de Physique, four in number, of which the first three were published at Paris between 1676 and 1679, are his most important works,

and form, together with an elaborate treatise on the per- cussion of bodies, the first volume of the Cruvres de Mariotte (2 vols., Leyden, 1717). The second of these essays (" De la Nature de l'Air ") contains the statement of the law connecting the pressure aud volume of a gas which, though very generally called by the name of Mariotte, was discovered seven years before by Boyle. The fourth essay is a systematic treatment of the nature of colour, with a description of many curious experiments and a discussion of the rainbow, halos, parhelia, diffraction, and the more purely physiological phenomena of colour. The discovery of the blind spot is noted in ashort paper in the second volume of his collected works.

MARITIME LAW. See Sea Laws.

MARITIME PROVINCE, a province of the Russian empire, and part of the general- governorship of Eastern Siberia, is a strip of territory which extends along the Siberian coast of the Pacific from Corea to the Arctic

Ocean, and also includes the peninsula of KamcuatK a (q.v.), the island of Saghalien or Sakhalin, and several small islands scattered along the coast. Its western boundary stretches northwards from the Corean town of King-hing (41° 45’ N. lat.) by Lake Khangka and along the Usuri, keeping to the eastward of the hilly tracts and prairies of northern Manchuria; it then follows an ima- ginary line which runs due north from the mouth of the Usuri to the bay of Udskoy, separating the province from the lowlands and mountain wildernesses of the Amur pro- vince; it next runs along the Stanovoy watershed between the Pacific and the Arctic Ocean, leaving to the west the elevated tracts of the Siberian plateau, and finally it crosses the spurs of this plateau through barren twundras belonging to Yakutsk, reaching the Arctic Ocean at the Chaunskaya Bay (70° N. lat.). The province has a length of 2300 miles and a width varying from 40 to 420 miles; it covers an area of 730,000 square miles, and exhibits very great varieties of climate, scenery, and population. The northern part, known as the land of the Chukchees, occupies the north-eastern peninsula of Asia between the Arctic Ocean on the one side and the Seas of Behring and Okhotsk on the other, and has the character of a barren plateau from 1000 to 2000 feet high, deeply indented by the rivers of the Anadyr basin, and by long fiords, such as the Koluchin Bay (the wintering-place of Nordenskjéld’s “ Vega ™, the Gulf of Anadyr, and the Bays of Penzhina and Ghizhiga. To the north this plateau is bordered by a chain of mountains, the highest known within the Arctic circle, several summits of which reach a height of 8200 feet (Makachinga peak aud others), while the promontories by which the Asiatic continent terminates towards Belir- ing Strait—Serdtze-kamen, Cape Vostochnyi (the most easterly point of Asia), and Cape Chukotskiy—have heights ranging from 1000 to 2000 feet. Only lichens and mosses, with a few dwarf species of Siberian trees, cover this district, in marked contrast to the rich forests of the corresponding part of Arctic America. The fauna, however, is far richer than might have been expected, owing to the migrations of animals along the plateaus of Eastern Siberia, which extend in a north-eastern direction from the very heart of Asia to Behring Strait. The fauna is further enlarged by a few American birds and mammals, which cross the strait when it is frozen. This country, and still more the seas by which it is surrounded, have been for the last two centuries the paradise of hunters, and have supplied Siberian trade with its best furs. Entire species of animals have been exterminated within this short

period ; the renowned blue fox and black sable have nearly disappeared, and the whale, which was hunted a few decades ago by hundreds of American vessels, has become very rare, The sea-otter, of which the party of Steller

killed seven hundred during its eight months' stay on Behring's Island, is rapidly becoming extinct, as well as the sea-lion (Otaria stellert) ; whilst the sea-cow (thytina stelleri) was completely extirpated in the course of forty years. Thanks to the care taken by an American company which las the monopoly of hunting on Behring and Copper Islands, tlie sea-bear (Otaria wrsina), which was likely to inset with tle same fate, is nearly domesticated at present, and multiplies rapidly, yielding no less than twelve thousand skins perannum. The inhabitants of this region, the Chukchees (Tuski, or Chaouktoos), who number no inore than 12,000 souls (according to some authorities only 5000), seem to have immigrated from the south ; their racial characters make them an ethnological link between the Mongols of Central Asia and the Indians of America; they are also very nearly akin in their features and customs to the Eskimo. They are subdivided, how- ever, into two distinct branches, with different customs and languages. Those of the interior support themselves by reindeer breeding (herds of ten thousand being not uucommon) and by hunting ; whilst those of the coast live by fishing, and are very poor. All travellers who have had dealings with Chukchees speak in the highest terms of the character of the former branch, and of the fraternal feelings shown by them in their mutual relations. The Koryaks (about 5000), who oceupy the southern part of this region, are nearly akin to Chukchees They extend their migrations also to the northern part of Kameliatka. Those of the interior are reindeer proprietors and liunters, and like the Chukechees are quite independ- ent, own no superiors, and live in federations of families. They have firmly resisted Russian conquest; and there are tribes among them which still refuse to pay the yasak (tribute in furs) tothe Russian authorities. Their national character is described by travellers as very different from that of the settled Koryaks of the coast, who live in the utmost poverty, and have acquired vicious habits from their intercourse with European and American sailors.

The middle part of the Maritime Proviuce is a narrow strip of land (40 to 60 miles wide) along the shores of the Sea of Okhotsk, including the basin of the Ud in the south, This area is occupied by wild mountains, 4000 to 7000 feet high, forming the eastern border of the high plateau of Eastern Siberia. Thick forests of larch elothe the mountains to nearly one-half of their height, as well as the deep valleys, where short streams discharge into the Pacific the water produced by the melting of accumulations of snow and ice (nakipi, naledi). The undulating hills of the basin of the Ud, which is a continuation to the south- west, between the Stanovoy and Bureya mountains, of the deep indentation of the Sea of Okhotsk, are covered with forests and marshes. Only Tunguses visit these inhospit- able mountain wildernesses and the bays of the coast, living by hunting or fishing. :

The southern part of the province includes two distinet regions. From the north-eastern extremity of the Bureya, or Little Khingan range, of which the group of the Shantar Islands is a continuation, a wide and deep depression runs south-westwards to the junction of the Amur and Usuri, and thence to the lowlands of the lower Sungari. It is for the most part less than 500 feet above sea-level.

The Amur, which takes a north-eastern course after reaching these lowlands, runs close to their eastern boundary, at the foot of the mountains of the sea-coast ; whilst on its left or western bank it spreads into numberless lakes and marshes, large and small, and extensively inundates the swamps at time of flood. The area on the right banks of the Amur and Usuri, between these rivers and the sea-coast, is occupied by a very little known hilly tract consist- ing of several intricate systems of mountains, usually represented on maps as a single range, and known under the general name of Sikhota-alin. The summits reach the height of 5150 feet (Golaya Gora peak) and the average elevation of the few passes is about

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2500 feet. There is, however, one depression in these mountains, occupied by Lake Kizi, which may have been at one time an outflow of the Amur to the sea. The Sikhota-alin mountains are covered with thick impracticable forests, through which a passage can be forced only by means of the hatchet. ‘The lowlands and the count- less islands of the Amur are covered

with a grass vegetation as luxuriant as that of the forests, and present the same difficulties to the pioneer. Herbaccous plants, 7 to 10 feet high, intertwined with numberless climbing plants, cover the soil with an impenetrable thicket, and, when destroyed by fire, rapidly grow again to thcir former height. The flora and fauna of this region (especially in the Usuri district) exhibit a striking combination of species of warm climates with those of subarctic regions; the wild vine clings to the larch and cedar-pine, and the tiger meets the bear and the sable. The quantity of fish in the rivers is immense, and in August the wide channels of the Amur and Usuri literally swarm with the asvending salmon. The mountain-wildernesses are visited by no- madic Tunguses, while the banks of the great rivers are inhabited, besides Russians, by Golds and Orochons, both of Tungusian origin, and the lower Amur by Ghilyaks, closely allied to the Ainos of Saghalien. Manchus and Chinese are scattered here and there among the Russian population on the right bank of the Usuri.

The best part of the Maritime Province is at its southern extreinity, in the valley of the Suifun river, which enters the Pacific in the Gulf of Peter the Great, and on the shores of the bays of the southern coast, where new settlements have appeared since this territory was annexed to Russia in 1860. But even here the climate is very harsh. The warm sca-current of the Kuro-sivo does not reach the coasts of Siberia, while a cold current, originating in the Sea of Okhotsk, brings its icy water and chilling fogs to the coasts of Saghalien, and flows aloug the Siberian shores to the eastern coast of Corea, The high mountains of the sea-coast and the monsoons of the Chinese Sea contribute to produce in the southern parts of the Maritime Province cold winters and wet suinmers, Accordingly, at Vladivostok (in the Gulf of Peter the Great), which has the saine latitude as Marseilles, the average yearly tem- perature is only 89°°5 Fahr., and the harbour is frozen for nearly three months; the Amur and Usuri are frozen in November. Towards the end of sunmer the moist monsoons cause heavy rain- falls, which destroy the harvests and bring about such inundations that even in the two miles wide channel of the Amur the water within a few days rises more than 15 feet, and covers the low- lands to a breadth of 15 to 20 miles; the navigation also becomes dangerous for small river steamers and barges, on account of storms from the Chinese Sea, The sea-coast farther north has a continental and arctic climate. At Nikolayevsk, temperatures as

low as —41°°5 Fahr, are observed in winter, and as high as 94°°6 in summer, the average yearly temperature being below zero (—0°9). At Ayan (56° 27’ N. lat.) the average temperature of the year is 25°°5 (-0°4 in winter, and 50°°5 in summer), and at Okhotsk (59° 21’ N, lat.) it is 28° (-—6° in winter, and 52°‘5 in summer).

Russian settlements occur at intervals throughout the whole of the province, but, with exception of those on the banks of the Amur and Usuri, and the southern ports of the sea-coast, they are mere centres of administration. Anadyrsk on the Anadyr river, Penzhinsk and Ghizhiga at the heads of bays of the same name, Ayan on the coast of the Sea of Okhotsk, and Udskoy Ostrog on the river Ud, all have played an important part in the conquest of Siberia by Cossacks and merchants ; but at present they are only small blockhouses with a few buildings around them, and the seat of local authorities ; the population of none excceds two hundred. Okhotsk, which has given its name to the sea between Kamchatka and the Sikcrian coast, is one of the oldest towns of Hastern Siberia, having been founded in 1649. Until the acquisition by Russia of the Manchurian sea-coast, this port, 700 miles distant from Yakutsk, poor though it is, was an object of special solicitude to the Russian Government for the maintenance of its possessions on the Pacific. It is connected by a bridle path with Yakutsk, and even in 1851-56, during the conquest of the Amur, all communica- tion with the mouth of the Amur was by this route. It has now but 210 inhabitants. Nikolayevsk, on the left bank of the Amur, 23 miles from its mouth, was until lately the capital of the Mari- time Province. Great expectations were formed regarding it when it was founded in 1851. It was provided with machine-works, foundries, and dockyards, and was proclaimed a free port. But the difficulties of navigation and of communication with the interior, and the complete failure of the governmental colonization of the Amur, made the prosperity of the new Russian port on the Pacific impossible, and the seat of government was transferred to the more central Khabarovka. At present Nikolayevsk has only 3500 inhabitants, nearly all military or officials, and a few foreign merchants trading chiefly in groceries and spirits. The port is visited every year by from twenty to twenty-five ships, importing manufactured and grocery wares to the value of abont £100,000, and of wines and spirits estimated at £20,000. On the banks of the Amur,

from Nikolayevsk to the mouth of the Usuri, is a chain of Russian scttlements at distances not exceeding 25 miles. Their

inhabitants, free settlers from Russia, are very badly off on aecount of the difficulties of agriculture in this region, and from the bad selection of sites. Many have inigrated to the sea-coast, whilst those who still remain are for the most part very poor, and almost every year require to be provided by Government with corn brought from T'ransbaikalia. Sofiysk (1000 inhabitants, of whom 700 are military) is a purely military post. Khabarovka, ona high promon- tory at the confluence of the Amur and Usuri, is the present capital of the Maritime Province. It has a settled population of about seven hundred, besides military and officials. A few Russian mer- chants carry on an active trade in furs with natives (about £20,000 a year), in silver money brought from Russia and sold to Chinese, aud in spirits and groceries. The Russian settlements on the right bauk of the Usuri are very like those of the lower Amur. 'The peasants, who have received the name of Cossacks, and have a mili- tary organization, with the exception of a few settlements on the upper Usuri, are mostly in a wretched condition, and sinee 1859 have been dependent for food almost every year on Government aid. A line of posts and settlements connects the villages of the Usuri with the settlements on the shores of the Gulf of Peter the Great. This wide gulf, divided into two long bays,—those of Amur and Usuri, which are counected by an inlet called the Eastern Bosphorus, — is regarded as the principal port of Russia on the Pacific, and the town on the inlet has received the name of Vladivostok ("ruler of the East"); its spacious harbour, very similar to that of Sebastopol, has been called the Golden Horn. At present Vladivostok has, how- ever, merely the aspect of a middle-sized Russian village. One-half of its 8500 inhabitants are Chinese and Coreaus, the other half being military and officials. All necessaries of life, including rye- bread biscuits, coutinue to be imported by sea, and every spring, before the opening of the navigation, provisions become scarce. The trade is in the hands of Chinese, who export stag-horns, sca- weed, and mushrooms to a value of about £10,000 a year, and of Germans, who import groceries and spirits (£218,500 in 1879). The entrance to the harbour is well-fortitied, and the town possesses a machine-work, storehonses, and a

station of the Northern Tele- graph Company. Other settlements (at the Imperial, Vladimir, and Olga harbours, &c.) are developing very slowly. Altogether the Russian population of these beri ements has still a provisional character, and has to overcome great difficulties before it can become gaia of the interior for its means of subsistence. The total population of the Maritime Province is estimated at 20,000 Russians, (12,000 military and officials), and at about 37,000 natives; but this is certainly under the truth. The province is made up of one terri- tory—that of the Usuri—and six cireles (okrught) :—Nikolayevsk, Sofiysk, Petropavlovsk (Kamchatka), Okhotsk, Ghizhighinsk, and Udskoy ; the territory of the Usuri is subdivided into five circles :— Usuri, Suifun, Khangka, Avvakumovo, and Suchan. (P. A. K.)

MARIUPOL, a seaport of Russia, on the northern shore of the Sea of Azoff, at the mouth of the Kalinius, in the government of Ekaterinoslav, 55 miles west of Taganrog. It is connected by a branch railway with the line between Kharkoff and Taganrog, and is situated on the highway between the latter town and the Crimea. The place is said to have been inhabited in remote times under the name of Adamakha; but the present town was built only in 1779 by Greek emigrants from the Crimea who settled on the shores of the Sea of Azoff and on the left bank of the lower Kalmius. Mariupol is the chief town of this district, the 40,000 inhabitants of which are engaged in agriculture, cattle-breeding, and fishing, and sell their produce in the town. In export trade Mariupol ranks next to Taganrog among the ports of the Sea of Azoff; but its harbour is open to the south-east and shallow, the line of 14 feet being 1} miles from the shore, with a narrow strip, 12 to 22 feet deep, which allows larger flat-bottomed ships to approach the town, especially during sonth-east winds. Like all ports on this sea it is becoming more and more shallow. Mariupol is visited every year by about 150 foreign ships (about 30,000 tons) and by 700 to 860 coasting vessels (65,000 tons), mainly carrying wheat and linseed, as also skins and tallow, from the Greek district, and from the provinces of Don and Hkaterinoslavy. The importance of the port may increase when the mineral riches of the district (coal close to the sea-shore, kaolin, and quartz sand) are exploited. Population, with two suburbs, Marinsk and Karasou, 9800.

MARIUS, Carus (155-86 B.c.), is one of the most striking figures in Roman history. Born the son of a

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small farmer at Arpinum (Arpino), the birthplace also of Cicero, in 155 B.c., he worked his way up from this humble origin, in spite of the most determined opposition from the senate and the aristocracy, to the highest posi- tion in the state, was seven times consul, and was spoken of asa third Romulus and a second Camillus. He began life as a soldier, and first saw war in Spain under the great Scipio Africanus, whose good opinion he won, and so rose from the ranks to be an officer. But this was not enough to help him forward, on his return to Rome, in rising to those political offices which were invariably a stepping-stone to the highest military rank. He had, however, when about forty years of age, the good luck to marry a great lady, of patrician rank, Jnlia, the aunt of Julius Caesar; and, being at the same time a popular favourite, as a man of plain and simple tastes, and a brave energetic soldier, he was in 115 3.c. elected praetor, which gave him an opportunity of still further showing his military ability in the thorough subjugation of the trouble- some province of Further Spain (Spain west of the Ebro), where a good officer was specially wanted to check the marauding raids of a number of wild tribes. But it was in the war with Jugnrtha, from 109 to 106 Bc., that he distinctly came to the front as the lieutenant of the consul Quintus Metellus. It would seem that his conduct towards his superior officer was not perfectly straightforward and honourable, as he tried to make the Roman traders in Africa, and through them the people of Rome, believe that the war was intentionally prolonged from corrupt motives. Under the circumstances this was comparatively easy, as political feeling was just at this time particularly bitter, and the senate was reputed, not without some good reason, to be venal and corrupt. Already Marius had achieved some important successes over Jugurtha, and had shown that he was the man to settle a tiresome guerilla war, and now, when he was a little over fifty, in 107 B.c., he was, amid great popular enthusiasm, elected consul for the first time. In the following year, in conjunction with his future political rival, Sulla, he brought the war to a triumphant issue, and passed two ycars in his province of Numidia, which lie thoroughly subdued and annexed to Rome's dominion.

By this time Marius was generally recognized as the ablest general of the day, and in face of the great peril now beginning to threaten Rome from the north of the Alps, where an immense multitude of Cimbri and 'Teutones were hanging on the borders of Italy, public opinion promptly summoned him to the chief command. Two arinies had been utterly destroyed in the neighbourhood of the Lake of Geneva, and it seemed as if a repetition of the disaster of Allia in 390 8.c., and the capture of Rome itself, might be not impossible. Marius, out of unpromising materials and a demoralized soldiery, organized a well- disciplined army, with which he inflicted on the invading hordes two decisive defeats, the first in 102 B.c. at Aqua Sextize (Aix in the department of Bouches du Rhéne, some way north of Marseilles), and the second in the following year at Vercells (Vercelli, about midway between Turin and Milan), the result being that for a period of some ceuturies Rome had nothing to fear from the northern barbarians. Deservedly indeed was Marius elected consul a fifth time, hailed as the "saviour of his country," and honoured with a trinmph of unprecedented splendour.

The really glorious part of his career was now over, and. the remainder of his life is associated with the worst cruelties and horrors of civil war, revolution, and proscrip- tion. The hideous strifes of Marius and Sulla have passed into a proverb. It is indeed a dreadful and monotonous story of bloodshed, but it must be carefully studied if we are to understand the nature of the political changes which had their final development in imperialism. Marius was a

intellectual culture which is indispensable to a statesman, and which the Gracchi, his political ancestors, possessed. As a politician he on the whole failed, though almost to the last he had the confidence of the popular party. But lie unfortunately associated himself with low and vulgar demagogues, men probably more degraded than the worst of the senators and of the aristocracy, and thus, although perhaps he never quite sank to their level, he let himself be guilty of cruel and perfidious acts, which it is hard to reconcile with the character of a brave man anda hero. He was indeed appointed in 88 B.c., after a riot and partial revolution, to the command in

the war in the East with Mithridates, but the triumph of Sulla and the aristocratical party almost immediately afterwards drove him as an outlaw from Rome, and he had to seck safety amid the marshes round Minturne (Garigliano) in Latium. The Gallic trooper sent by the local authorities to strike off the old man's head quailed, it is said, before the fire of his eye, and fled with the exclamation, "I cannot kill Caius Marius." Meantime, in the absence of Sulla, who had left Italy for the Mithridatic war, Cinna's sudden and violeut revolution had put the senate at the mercy of the popular leaders, aud Marius greedily caught at the opportunity of a bloody vengeance, which became in fact a reign of terror in which senators and nobles were slaughtered wholesale. He had himself elected consul, for the seventh time, in fulfilment of a prophecy given to him in early manhood. Thus, full of honours in one sense, but really hated and execrated, he closed his career, dying in the delirium of fever in 86 B.c., at seventy years of age.

Marius was not only a great and successful general, but also a great military reformer. A citizen militia was from his time exchanged for a professional soldiery, which had hitherto been as little liked by the Roman people as it was by our own ancestors. A standing army, their instincts told them, would be a ready tool of despotism; and indeed the changes of which Marius was the author paved the way for the subsequent military imperialism. The Roman soldier was henceforth a man who found his home in the camp, and who had no trade bunt war. A great general could hardly fail to become the first and foremost man in the state. Marius, however, himself did not attempt to overturn the oligarchy, as Cesar afterwards did, by means of the army, but rather by such expedients as the constitu- tion seemed to allow, though they had to be backed up by street riots and mob violence. He failed as a political reformer because the merchants and the moneyed classes, whom the more statesmanlike Gracchi tried to conciliate, feared that they would themselves be swept away by a revolution of which the mob and its leaders would be the ultimate controllers. The farmer's son, the rough blunt soldier, the saviour of his country in middle life, and its curse and pest in his old age, had a decided tinge of fanati- cism and that vein of superstition which is often allied to such natures, In matters so important as canvassing for the consulship he would be guided by the counsels of an Etruscan soothsayer, and would be accompanied in his campaigns by a Syrian prophetess. The fashionable accom- plishments of

the day, and the new Greek culture, were wholly alien to his taste, and he was thus really disqualified for the political life of his time. When his military career was once ended, failure and disgrace became a certainty for him.

For the life of Marius our original sources are a multitude of passages in Cicero's works, Sallust's Jugurthan War, the cpitomes of the lost books of Livy, Plutarch's Lives, &. In Smith's Biographical Dictionary the life is given at great length, and the details stated generally with great accuracy. In Mommsen's History of Rome, bk. iv. chaps. 6, 7, 8, a clear picture of the whole period is

presented to us ; and Niebuhr's Lecturcs on Roman History (Lectures 81-86) may be consulted with great advantage.

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plain, rough, though very able, soldier, without any of the |

MARIVAUX, Pierre CarLet DE CHAMBLAIN DE (1688-1763), novelist and dramatist, was born at Paris on the 4th February 1688. His father was a financier of Norman extraction, whose real name was Carlet, but who after the loose fashion of the period assumed the surname of Chamblain, and then, finding that others of his class had chosen the same, superadded that of Marivaux. M. Carlet de Marivaux, however, was a man of good reputa- tion, and he received the appointment of director of the mint at Riom in Auvergne, where and at Limoges the young Pierre was brought up. It is said that he developed literary tastes early, and wrote his first play, the Pére Prudent et Hqwitable, when he was only eighteen; it was not, however, published till 1712, when he was twenty- four. His chief attention in those early days was paid to novel writing, not the drama. In the three years from 1713 to 1715 he produced three novels—Les Lffets Surprenantes de la Sympathie, La Voiture Embourbée, and a book which had three titles Pharsamon, Les Folies Romanesques, and Le Don Quichotte Moderne. All these books were in a curious strain, not in the least resembling the pieces which long afterwards were to make his reputation, but following partly the

Spanish romances and partly the heroic novels of the preceding century, with a certain intermixture of the marvellous. Then Marivaux's literary ardour took a new phase. He fell under the influence of La Motte, and thought to serve the cause of that ingenious paradoxer by travestying Homer, an ignoble task, which he followed up by performing the same office in regard to Fénelon. His friendship for La Motte, however, introduced him to the Mercure, the chief newspaper of France, where in 1717 he produced various articles of the "Spectator" kind, which were distinguished by much keenness of observation and not a little literary skill. It was at this time that the peculiar style called Marivaudage first made its appearance The year 1720 and those immediately following were very important ones for Marivaux; not only did he produce a comedy, now lost except in small part, entitled LAmour et la Vérité, and another and far better one entitled Arlequin Poli par l' Amour, but he wrote a tragedy, Annibal, which was and deserved to be unsuccessful. Meanwhile his worldly. affairs underwent a sudden revolu- tion. His father had left him a comfortable subsistence, but he was persuaded by friends to risk it in the Mississippi scheme, and after vastly increasing it for a time lost all that he had. His prosperity had enabled him to marry a certain Mademoiselle Martin, of whom

'much good is said, and to whom he was deeply attached,

but who died very shortly. His pen now became almost his sole resource. He had a connexion with both the fashionable theatres, for his Annzbal had been played at the Comédie Frangaise aud his Arlequin Poli at the Comédie Italienne, where at the time a company who were extremely popular, despite their imperfect command of French, were established. He endeavoured too to turn his newspaper practice in the Jfercwre to more account by starting a weekly Spectateur Francais, to which he was the sole contributor. But his habits were the reverse of methodical; the paper appeared at the most irregular intervals ; and, though it contained some excellent work, its irregularity killed it. For nearly twenty years the theatre, and especially the Italian theatre, was Marivaux's chief support, for his pieces, though they were not ill received by the actors at the Frangais, were rarely successful there. The best of a very large number of plays (Marivaux's theatre numbers between thirty and forty items) were the Surprise de Amour (1722), the Triomphe de Plutus (1728), the Jew de

l'Amour et du Hasard (1730), Les Fausses Confidences (1737), all produced at the Italian theatre, and Le Legs, produced at the French, Meanwhile

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he had at intervals returned to both his other lines of composition, A periodical publication called L'Indigent Philosophe appeared in 1727, and another called Le Cabinet du Philosophe in 1734, but the same causes which had proved fatal to the Spectatewr prevented these later efforts from succeeding. In 1731 Marivaux published the first two parts of his best and greatest work, Marvanne, a novel of a new and remarkable kind. As was usual, how- ever, With him whien he ventured on any considerable task, he was very slow with it. The eleven parts appeared in batches at intervals during a period of exactly the same number of years, and after all it was left unfinished. In 1735 another novel, the Paysan Parvenu, was begun, but this also was left unfinished. The year afterwards Marivaux, who was then nearly fifty years of age, was elected of the Academy. Hesurvived for more than twenty years, and was not idle, again contributing occasionally to the Mercure, writing plays, "reflexions" (which were seldem of much worth), and so forth, He died on the 12th February 1763, aged seventy-five years.

The personal character of Marivaux was curious and somewhat contradictory, though not without analogies, one of the closest of which is to be found in Goldsmith. He was, however, unlike Goldsmith, at least as brilliant in conversation as with the pen. He was extremely good-natured, but fond of saying very severe things, unhesitating in his acceptance of favours (he drew a regular annuity from Helvetius), but exceedingly touchy if he thought himself in any way slighted. He was, though a great cultivator of sensibilité, on the whole decent and moral in his writings, and was unsparing in his criticism of the rising Philosophes. This last circumstance, and perhaps jealousy as well, made him a dangerous enemy in Voltaire, who lost but few opportunities of speaking disparagingly of him. Not very much is known of his life, though anecdotes of his sayings are not uncommon. He had good friends, not merely, as has been said, in the rich, generous, and amiable Helvetius, but in Madame de Tencin, in Fontenelle, and even in Madame de Pompadour, who gave him, it is said, aconsiderable

pension, of the source of which he wasignorant. Itis even asserted that annoyance at the discovery of the origin of a bencfit which he thought came directly from the king hastened his death ; and, though this is scarcely likely, luis extreme sensitiveness is shown by many stories, one of which carries out in real life and almost to the letter Farquhar's famous mot as to " laughing consumedly." He had one daughter, who took the veil, the duke of Orleans, the regeut's successor, furnishing her with her dowry.

We have no space here for a detailed criticism of Marivaux's extensive work. The so-called Marivaudage is the main point of importance about it, though the best of the comedies have great merits, and Afarianne is an extremely important step in thie legitimate development of the French novel, —lcgitimate, that is, in opposition to the brilliant but episodic productions of Le Sage. The subject-matter of Marivaux's peculiar style has been generally and with tolerable exactness described as the metaphysic of love-making. His characters, in a happy phrase of Crebillon's, not only tell each other and the reader averting they have thought, but everything that they would like to persuade themselves that they have thought. The style chosen for this is justly regarded as derived mainly from Fontenelle, and through him from the Précieuses, though there are traces of it even in La Bruyére. It abuses metaplior somewhat, and delights to turn off a metaphor itself in some unexpected and bizarre fashion. Now it is a familiar phrase which is used where dignified language would be expected; now the reverse. In the same criticism of Crebillon's which has been already quoted occurs another happy description of Marivaux's style as being " an intro- duction to each other of words which have never made acquaintance, and which think that they will not get on together," a phrase as happy in its imitation as in its satire of the style itself. Yet this fantastic embroidery of language has a certain charm, and suits perhaps better than any other style the somewhat unreal gallantry and sensibilité which it describes and exhibits. The author possessed, moreover, both thought and observation, besides considerable com- mand of pathos. He is not, and is never any more likely to be, generally popular, but he is one of the authors in whom those who do like them are sure to take particular delight.

The best and most complete edition of Marivaux is that of 1781, 12 vols. 8vo. There is a good modern edition of the plays by E, Fournier, and

another of Marianne and the Paysan Parvenu in two volumes. J. Fleury's Marivaur et le Marivaudage (Paris, 1841) is worth consulting by those who are interested in the subject. (G. SA.)

MARK, the traditional name of the author of the Second Gospel. The name Mark occurs in several books of the

New Testament. In the Acts of the Apostles, chap. xii

meittion is made of "Jolin whose surname was Mark," to the house of whose mother, Mary, at Jerusalein, Peter went when miraculously released from prison.1 This John Mark went with Barnabas and Paul on their missionary journey, as far as Perga in Pamphylia, and then, "departing from them, returned to Jerusalem" (Acts xii, 25; xiii. 13). His departure was afterwards the occasion of a 'sharp contention" between Paul and Barnabas; the former "thought not good to take with them him who withdrew from them from Pamphylia, and went not with them to the work"; the latter "took Mark, and sailed away into Cyprus" (Acts xv. 38, 39). On the subsequent history of Mark the Acts of the Apostles are sileut.

The saine name Mark occurs in three Pauline epistles. (1) In Col. iv. 10 tlie writer enumerates Mark among his fellow-workers, mentioning also that he was a nephew (some translate " cousin") of Barnabas, and implying that he was a Jew ("of the circumcision"), He is evidently about to send him, in accordance with a previous intimation, on a special mission to the Colossians ; but there is no evidence, except the statement of the Coptic subscription to the epistle, to show whether the contemplated journey took place. (2) In Philemon 24 the writer also mentions Mark as one of his fellow-workers, ¢.¢., probably in preaching the gospel during his imprisonment at Rome. (3) In 2 Tim. iv. 11 the writer gives the charge to Timothy, "Take Mark and bring him with thee, for he is useful to me for ininistering." It is a plausible conjecture that this is a request that Mark might be brouglit back to Rome after his mission to Colossze.

The same name also occurs in 1 Peter v. 13, '" Mark, my son." This expression has sometimes been taken literally ; but itis more usually understood in a metaphorical sense, as meaning that Peter had converted Mark. Those who take " Babylon" in the same passage to mean Rome

necessarily infer that Mark was with Peter at Rome ; a tradition to the same effect is mentioned in fragments of Clement of Alexandria, preserved in Eusebius, 77. #., ii. 15; vi. 14.

The preponderance of patristic and medizval tradition is in favourof the hypothesis that the same person is designated in all these passages of the New Testament. But other hypotheses have found favour, especially among those writers of various schools who have felt a difficulty in under- standing how the same person should be an intimate com- panion at once of St Paul and of St Peter. It has been supposed (1) that the John Mark of the Acts is the Mark of the Pauline epistles, but not the Mark of 1 Peter; (2) that the John Mark of the Acts, the Mark of the Pauline epistles, and the Mark of 1 Peter are all different; (3) that the John Mark of the Acts is the Mark of 1 Peter, but not the Mark of the Pauline epistles. Into the arguments for these several hypotheses it is unnecessary to enter here; they are of course complicated by the prior question of the authenticity and date of the books of the New Testament in which the name occurs. The most elaborate modern discussion of the question, which arrives at the conclusion that the first of the three hypotheses just mentioned is the true one, is contained in the work of Molini, whose title is given below. But, whether there was only one Mark or more than one, there is a general belief, which rests ulti- mately on the testimony of the presbyter (John) who is quoted by Papias (ap. Euseb., Z/. £., ili. 39, 15), that the second canonical Gospel, or its original, is to be ascribed to the Mark who was the disciple of St Peter.? Of this Mark

1 This double name, the one Jewish, the other Roman, may be com- pared with the double name "Saul, who is also called Paul," in

| succeeding chapters of the Acts ; sometimes the double name, some-

times one or other of the single names, is used. 2 Most of the arguments by which Kienlen (Stud. wu. Jtrit., 1843, pp. 423 sg.) endeavours to show that the Gospel is the work of the

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the evangelist, as of other persons whose names are pro- minent in the New Testament, there is a large mass of traditional biography, in which possible fact and obvious fiction are so closely interwoven as not to be easily dis- entangled, and which would not be worth recording were it not for the later historical associations which have clustered round it.

Of Mark's birth and country nothing is positively known ; the majority of medixval writers state that he was a Levite ; but this is probably no more than an inference from his supposed relationship to Barnabas. The Alexandrian tradition seems to have been that he was of Cyrenan origin; and Severus, a writer of the 10th eentury, adds to this the statement that his father's name was Aristobulus, who, with his wife Mary, was driven from the Pentapolis to Jerusalem by an invasion of barbarians (Severus Aschimon, ap. Renandot, Mist. Patriarch. Alcx., p. 2). In the apocryphal Acts of Barnabas, which profess to be written by him, he speaks of himself as having been formerly a servant of Cyrillus, the high priest of Zeus, and as having been baptized at Iconium. The presbyter Jolin, whom Papias quotes, says distinctly that "he neither heard the Lord nor accompanied Him" (ap, Eusebius, /.¢.) ; and this positive statement is fatal to the tradition, which does not appear until about two hundred and fifty years afterwards, that he was oue of the seventy disciples (Epiphanius, psendo-Origen De recta in Dewm fide, and the author of the Puschal Chronicle). Various other results of the tendency to fill up blank names in the gospel history must be set aside on the same ground ; it was, for example, believed that Mark was one of the disciples who "went back" because of the "hard saying" (psendo-Hippolyt., De LXX. Apostolis in Cod. Baroce. ap. Migne, Patrol. Grec., vol. x. 955); there was an Alexandrian tradition that he was one of the servants at the miracle of Cana of Galilee, that he was the "'man bearing a pitcher of water" in whose house the last supper was prepared, and that he was also the owner of the house in which the disciples met on the evening of the resurrection (Renaudot, J.c.); and even in modern times there has been the conjecture that he was the " certain young man" who "fled naked" from Gethsemane, Mark xiv. 51, 52 (Olshausen).

A tradition which was widely diffused, and which is not in itself improbable, was that he afterwards preached the gospel and presided over the church at Alexandria (the earliest extant testimony is that of Kusebius, Zf. H., ii. 16,

1; ii. 24; for the fully-developed legend of later times see Symeon Metaphrastes, Vita S. Marci, and Eutychius, Origincs Ecclesie Alcwandrine), ‘here was another, though perhaps not incompatible, tradition that he preached the gospel and presided over the church at Aquileia in North Italy. The earliest testimony in favour of this tradition is the vague statement of Gregory of Nazianzus that Mark preached in Italy, but its existence in the 7th century is shown by the fact that in 629 A.p. Mferaclius sent the patriarchal chair from Alexandria to Grado, to which eity the patriarchate of Aquileia had been then transferred (Chron. Patriarch. Gradens., ap. Ughelli, Italia Sacra, tom. v. p 1086 ; for other references to the general tradition see De Rubeis, Monum. Hecles. Aquileien.,c. 1; Acta Sanctorum, ad April. xxv.). It was through this tradition that Mark became connected with Venice, whither the patriarchate was further transferred from Grado; an carly Venetian legend, which is represented in the Cappella Zen in the basilica of St Mark, antedates this eonnexion by picturing the evangelist as having becu stranded on the Rialto, while it was still an uninhabited island, and as having had the future greatness of the city revealed to him (Danduli, Chron., iv. 1, ap. Muratori, Rer. Ital. Script., vol. xii. 14).

The earliest traditions appear to imply that he dicd a natural death (Kusebius, Jerome, and even Isidore of Seville) ; but the Martyrologies claim him as a martyr, though they do not agree as to the manner of his martyrdom. According to the pseudo- Hippolytus he was burned; but Symeon Metaphrastes and the Paschal Chronicle represent him to have been dragged over rongh stones until he died. But, however that may be, his tomb appears to have been venerated at.Alexandria, and there was a firm belief at Venice in the Middle Ages that his remains had been translated thither in the 9th eentury (the fact of the translation is denied even by Tillemont ; the weakness of the evidence in support of the tradition is apparent even in Molini’s vigorous defence of it, lib. ii., c, 2; the minute account which the same writer gives, lib. il..¢ dd, of the discovery of the supposed actual bones of the evangelist in 1811 A.D., is interesting). There was another thongh less widely accepted tradition, that the remains soon after their translation to Venice were retranslated to the abbey of Reichenau on Lake Constance ; a circumstantial account of this retranslation is given in the treatise Ex Miraculis 8. Marci, ap. Pertz, Adon. IHist. a ee ee

Pauline and not of the Petrine Mark are used by other writers in

support of the hypothesis that in its present form it is not the work of which Papias speaks,

German. Script., tom. iv. p. 449. It may be added that the Venetians prided themselves on possessing, not only the body of St Mark, but also the antograph of his Gospel ; this autograph, how- ever, proved on examination to be only part of a 6th-century book of the Gospels, the remainder of which was published by Bianchini as the Bvangeliarium Forojuliense; the Venetian part of this MS..was found some years ago to have been wholly destroyed by damp.

It has been at various times supposed that Mark wrote other works besides the Gospel. Several books of the New Testament have been attributed to him: viz., the Epistle to the Hebrews (Spanheim, Op. Aisccll., vol. ii. p. 240), the Epistle of Jude (cf. Holtzinann, Dic Synoptische Evangclien, p. 378), the Apocalypse (Hitzig, Ucber Johannes Marcus, Ziirich, 1848). The apocryphal Acta Barnabe purport to have been written by him. There isa liturgy which bears his name, and which exists in two forms; the one form was found ina MS. of the 12th century in Calabria, and is, according tu Renaudot, the foundation of the three liturgies of St Basil, St Gregory Nazianzen, and St Cyril ; the other is that Which is used by the Maronite and Jacobite Syrians. Both forms have been published by Renandot, Litarg. Oriental. Collect, vol. i. p. 127, and vol. ii. p. 176, and in Neale's History of the oly Eastern Church; but neither has any substantial claim to belong to the ante-Nicene period of Christian literature.

The syinbol by which Mark is designated in Christian art is usnally that of a lion. Each of the "four living ercatures" of Ezekic] and the Apocalypse has been attributed to each of the four evangelists in turn ; Augustine and Bede think that Mark is desig- nated by the "'man"; Theophylact and others think that he is designated by the eagle ; Anastasius Sinaita makes his symbol the ox ; but medieval art acquiesced in the opinion of Jerome that

he was indicated by the lion. Most of the martyrologies and calendars assign April 25 as the day on which he should be commemorated ; but the Martyr. Hieron. gives September 28, and some Greek martyrologies give January 11, This unusual variation probably arises from early differences of opinion as to whether there was one Mark or more than one,

The work of Canon Molini of Venice, De Vita et Lipsanis §, Marci Evangeliste, edited, after the author's death, by S. Pieralisi, the librarian of the Barberini library, in 1864, gives full information on all that relates to the subject of the present article. (E. HA.)

MARK, Gosprt or, See Gospe.s.

MARKIRCH (in French, Ste-Marie-cux-Mines), a flour- ishing industrial town of Germany, in Upper Alsace, circle of Rappoltsweiler, is prettily situated in the valley of the Leber or Liepvrette, an affluent of the Rhine, near the French frontier. The once productive silver, copper, and lead mines of the neighbourhood are now no longer worked ; and the present chief industries of the place are weaving and dyeing. In and about Markirch there are nearly forty wool and cotton factories, besides numerous looms in the cottages of the weavers; and these produce cloth to the annual value of £625,000. It is estimated that there are about 40,000 workpeople in the industrial district of which Markirch is the centre. The small river Leber, which intersects the town, was at one time the boundary between the German and French languages, and traces of this separation still exist, The German-speaking inhabitants on the right bank were Protestants, and subject to the counts of Rappoltstein, while the French inhabitants were Roman Catholics, and under the rule of the dukes of Lorraine. The population in 1880 was 11,824.

MARLBOROUGH, a municipal and parliamentary borough of Wiltshire, England, situated on the great high- road between London and Bath, and distant 75 miles from the former, 32 from the latter, and 13 from Devizes. It stands on the left bank of the Kennet, a tributary of the Thames, in 51° 25' N. lat. and 1° 43' W. long. It is an agricultural centre, and has a weekly market. In the days of its prosperity forty-two public coaches halted daily at its doors, and it had a fair trade in corn and malt; but its trafic was to a great extent diverted by the opening of the Great Western Railway, and it

now carries on a very small trade in tanning, rope-making, and malting. It consists mainly of a long and broad street, terminated at one end by St Mary's church and the town-hall, and at the other by St Peter's church and the college. The municipal council consists of a mayor, four aldermen, and twelve councillors, and the borough returns one member to parlia-

ment. In 1881 the population of the municipal borough (area 186 acres) was 3343, and of the parliamentary borough (area 4665 acres) 5180.

The name has been a frequent matter for discussion, some declaring it to be the hill (derg) or fortress (burg) of Merlin the Briton, others the A/ar/ borough, in allusion to the surrounding soil, which, however, is chalk. A great British mound exists at the south-west extremity of the town, and a castle was erccted around it by William the Conqueror. This became a somewhat notable place. Henry I. kept Easter here in 1110, and Henry II. granted it to John Lackland. Henry III. held his last parliament here in 1267, and passed the " Statutes of Marleberge." Later the castle served as an occasional royal residence; it was probably dismantled during the Wars of the Roses. The town was besieged and taken during the civil wars, and a few years later (1658) was almost entirely consumed by fire. A large mansion was erected by Lord Seymour in the reign of Charles II. near the site of the castle, and this, after various vicissitudes, was in 1843 converted into " Marlborough College,"—a public school designed mainly for the education of the sons of the clergy.

MARLBOROUGH, a town of the United States, in Middlesex county, Massachusetts, about 25 miles west from Boston, with stations on the Old Colony and the Fitchburg Railways. It lies in a fertile hilly district, and contains a beautiful sheet of water 160 acres in extent, known as Williams Lake. Shoemaking is the staple industry, some of the factories in the department rivalling the largest in the world. There is a good public library ; aud three weekly newspapers are published in the town. The population increased from 8474 in 1870 to 10,126 in 1880. Marlborough, colonized by settlers from Sudbury in 1655, and incorporated in 1661, occupies the site of the Christian Indian village of Okommakamesitt.

MARLBOROUGH, Joun Cuurcuity, Duke or (1650- 1722). In the small manor house of Ashe, situated in the parish of Musbury in Devonshire, but hardly a stone's throw beyond the parish of Axminster, John Churchill the first duke of Marlborough was born 24th of June 1650. Arabella Churchill, his eldest sister, and the mother of the duke of Berwick, was born in the same house on the 28th of February 1648. They were the children of Winston Churchill of Glanville Wotton in Dorset and Elizabeth the fourth daughter of Sir John Drake, who after tlie close of the civil war received his son-in-law into his own house. For a year or two after the Restoration John Churchill went to St Paul's school, and there is a tradition that during this period he showed the bent of his taste by reading and re-reading Vegetius De Me Militari. When fifteen years old he obtained a place in the household of the duke of York, and about the same time his sister Arabella became maid of honour to the duchess, two events which contributed greatly to the advancement of the Churchills. Next year, in 1666, he received, through the influence of his master, a commission in the guards, and left England for service at Tangiers. Such fighting as was waged with the Moors did not accord with his feelings, and he soon returned to his own country. For a few years afterwards Churchill remained in attend- ance at the court, and it was during this period that the natural carefulness of his disposition was shown by his investing in an annuity a present of £5000 given him by acourt beauty. In 1672, when England to her shame sent six thousand troops to aid Louis XIV. in his attempt to subdue the Dutch, Churchill formed one of the company, and soon attracted the attention of Turenne, by whose pro- found military genius the whole army was directed, At the siege of Nimeguen Churchill acquitted himself with such success that the French commander predicted his ultimate rise to distinction. When Maestricht was besieged he saved the life of the duke of Monmouth, and received

the thanks of Louis XIV. for his services. Early in 1678 he was married to Sarah Jennings, the favourite attendant on the Princess Anne, the younger daughter of the duke of York. Her father Richard Jennings, a Hertfordshire squire, had twenty-two brothers and sisters; one of the latter married a London tradesman called Hill, and their daughter Abigail Hill afterwards succeeded her cousin tlie duchess of Marlborough as favourite to Queen

Anne. Sarah Jennings had as little money as her husband, but this deficiency was more than compensated for by an abundance of energy and ambition.

On the accession of Jaines II. the Churchills received a great increase in fortune. Colonel Churchill had been created a Scotch peer in 1682, and as a reward for his services in going on a special mission from the new monarch to Louis XIV. he was advanced to the English peerage under the title of Baron Churchill of Sandridge in Hertfordshire, the village in which the Jennings's property was situated. A step in the army was at the same time conferred upon him, and when the duke of Monmouth attempted his ill-fated enterprise in the western counties the second position in command was bestowed on Lord Churchill. Through his vigilance and energy victory declared itself on the king's side. After the death of Monmouth he withdrew as far as possible from the administration of public business, Whilst on his embassy to the French court he had declared with emphasis that if the king of England should change the religion of the state he should at once leave his service, and it was not long before the design of James became apparent to the world. Churchill was one of the first to send overtures of obedience to the prince of Orange. Although he continued in a high position under James, and drew the emoluments of his places, he promised William of Orange to use every exertion to bring over the troops to his side. James had been warned against putting any trust in the loyalty of the man on whom he had showered so many favours, but the warn- ings were in vain, and on the landing of the Dutch prince at Brixham Churchill was sent against him with five thousand men. When the royal army had advanced to the downs of Wiltshire and a battle seemed imminent, James was disconcerted by learning that in the dead of night his general had stolen away like a thief into the opposite camp. For this timely'act of treachery Churchill received another advancement in the peerage. He had now become the earl of Marlborough and a member of the privy council, a mark of royal favour which during this and the next reign was more than an unmeaning honour. William felt, however, that he could not place implicit reliance in his friend's integrity ; and, with a clear sense of the manner in which Marlborough's talents might be employed without any detriment to the stability of his throne, he sent him with the army into the Netherlands and into Ireland. For some time there was no open avowal of any distrust in

Marlborough's loyalty, but in May 1692 the world was astonished at the news that he had been thrown into the Tower on an accusation of treason. Though the evidence which could be brought against him was slight, and he was soon set at liberty, there is no doubt that Marlborough was in close relations with the exiled king at St Germains, and that he even went so far as to disclose to his late master the intention of the English to attack the town of Brest. The talents of the statesmen of this reign were chiefly displayed in their attempts to convince both the exiled and the reigning king of England of their attachment to his fortunes. The sin of Marlborough lay in the fact that he had been favoured above his fellows by each in turn, and that he betrayed both alike apparently without scruple or without shame. Once again during the Fenwick plot he was charged with treason, but William, knowing that if he

pushed Marlborough and his friends to extremities there were no other statesmen on whom he could rely, contented himself with ignoring the confessions of Sir John Fenwick, and with executing that conspirator himself. Not long afterwards the forgiven traitor was made governor to the young duke of Gloucester, the only one of Anne's numerous children who gave promise of attaining to manhood. During the last years of William's reign Marlborough once more was placed in positions of responsibility. His daughtcrs were married into the most prominent families of the land: the eldest became the wife of the eldest son of Lord Godolphin ; the second, the loveliest woman at the court, with her father's tact and temper and her mother's beauty, married the only son of Lord Sunderland. Higher honours were in store for his family, and they came on the accession of Queen Anne in March 1702. She had not been more than three days. upon the throne before the knighthood of the Garter was conferred upon Marlborough. He was made captain-general of the English troops hoth at home and abroad, and master-general of the ordnance. The new queen did not forget the life-long service of his wife; three positions at the court by which she was enabled to continue by the side of the sovereign as closely as she had lived with the princess were united in her person. The queen showed her devotion

to her friend by another signal mark of favour. The rangership of Windsor Park was granted her for life, with the especial object of enabling Lady Marlborough tolive in the Great Lodge. These were the opening days of many years of fame and power. A week or two after the death of William it was agreed by the three great powers, England, Holland, and Austria, which formed the grand alliance, that war should be declared against France on the same day, and on May 4, 1702, the declaration was made by the three countries. Marlborough was made commander-in-chief of the united armies of England and Holland, but throughout the war his plans were impeded by the jealousy of the commanders who were nominally his inferiors, and by the opposite aims of the various countries that were striving to break the power of France. He himself wished to penetrate into the French lines; the anxiety of the Dutch was for the maintenance of their frontier and for an augmentation of their territory ; the desire of the Austrian emperor was to ensure his son's rule over Spain. To secure concerted action by these different powers taxed all the diplomacy of Marlborough, but he succeeded for the most part in his desires. In the first year of the campaign it was shown that the armies of the French were not invincible. Several fortresses which Louis XIV. had seized upon surrendered themselves to the allies. Kaiserswerth on the Rhine and Venloo on the Meuse soon passed from the hands of the French to the English. The prosperous commercial town of Liége with its commanding citadel quickly capitulated. The successes of Marlborough caused much rejoicing in his own country, and for these brilliant exploits he was raised to the highest rank in the peerage, and rewarded with a handsome annuity. In the spriug of the following year a crushing blow fell upon the duke and duchess. Their eldest and only surviving son, the marquis of Blandford, was seized whilst at King's College, Cambridge (under the care of Hare, afterwards bishop of Chichester), with the small-pox, and died on the 20th February 1703, in his seventeenth year. If the character of the youth which is given by Cole, the Cambridge antiquary, can be accepted as true, and Cole was not likely to be prejudiced in favour of the family of Churchill, his talents had already justified the prediction that he would rise to the highest position in the state,

_The result of the campaign of 1703 inspired the French king with fresh hopes of ultimate victory. The dashing

plans of Marlborough were frustrated by the opposition of his Dutch colleagues. When he wished to invade the French territory they urged him to besiege Bonn, and he was compelled to accede to their wishes. After this digression from his first purpose he returned to his original plan of attacking Antwerp; but, in consequence of the incapacity of the Dutch leaders, the generals (Villeroi and Boufflers) of the French army surprised the Dutch division and inflicted on it a loss of many thousands of men. Marlborough was forced to abandon his enterprise, and all the compensation which he received was the capture of the insignificant forts of Huy aud Limburg. After a year of comparative failure for the allies, Louis XIV. was emboldened to enter upon an offensive movement against Austria; and Marlborough, smarting under the misadven- tures of 1703, and conscious that the war could only be brought to an end by more decisive measures, was eager to meet him. A magnificent army was sent by the French king under the command of Marshal Tallard, with instruc- tions to strike a blow at Vienna itself. Marlborough divined the intention of the expedition, and, without com- municating his intentions to his colleagues, led his troops into Bavaria. The two armies (that under Marlborough and Prince Eugéne numbering more than fifty thousand men, whilst Tallard's forces were nearly ten thousand stronger) met in battle array near the village of Blenheim. The French commander made the mistake of supposing that the enemy's attack would be directed against his position in the village, and he concentrated an excessive number of his troops at that point. The early part of the fight was in favour of the French. Three times were the troops led by Prince Eugéne driven back in confusion ; Marlborough's cavalry failed on their first attack in breaking the line of the enemy. But in the end the victory of the allies was conclusive. Nearly thirty thousand of the French and Bavarians were killed and wounded, and in Blenheim alone ten thousand were made prisoners. Never was a victory more eagerly welcomed than this, and never was a conquering leader more rewarded than Marlborough. On his return to his own country he was received with enthusiasm on all sides. Poets and prose writers were employed to do him honour, and the lines of Addison com- paring the English commander to the angel who passed over "pale Britannia" in the storm of 1703 have been famous for nearly two centuries. The manor of Wood- stock, which was

transferred by Act of Parliament from the crown to the duke, was a reward more after his own heart. The gift even in that form was a noble one, but the queen heightened it by instructing Sir John Vanbrugh to build a palace in the park at the royal expense, and, although the works subsequently caused much anxiety to the duke and duchess, £240,000 of public money was spent on the buildings.

The following year was not marked by any stirring incident. Marlborough was hampered by tedious forma- lities at the Hague and by jealousies at the German courts. The armies of the French were again brought up to their full standard, but the generals of Louis were instructed to entrench themselves behind earthworks and to act on the defeusive. In the darkness of a July night these lines were broken through, and the French were forced to take shelter under the walls of Louvain. Marlborough urged an attack upon them in their new position, but his passionate arguments were spent in vain, and when 1705 had passed away the forces of the French king had suffered no diminution. This immunity from disaster tempted Villeroi in the next spring into meeting the allied forces in an open fight, but his assurance proved his ruin. The battle of Ramillies (22d May 1706) ended in the total rout of the French, and caused the transference of nearly

the whole of Brabant and Flanders to the allies. Five days afterwards the victor eutered Brussels in state, and the inhabitants acknowledged the rule of the archduke. Antwerp and Ostend surrendered themselves with slight loss. Menin held out until three thousand of the soldiers of the allies were laid low around its walls, but Dender- monde, which Louis had forty years previously besieged in vain, quickly gave itself up to the resistless Marlborough. Again a year of activity and triumph was succeeded by a period of languor and depression. During the whole of 1707 fortune inclined to the other side, with the result that early in the next year Ghent and Bruges returned to the allegiance of the French, and Marlborough, fearing that their example might be followed by tle other cities, advanced with his whole army towards Oudenarde. Had the counscls of Vendome, one of the ablest of the French generals, prevailed, the fight might have had a different issue, but his suggestions were disregarded by the duke of

Burgundy, the grandson of Louis, and the battle, like its predecessor, ended in their defeat. After this victory Marlborough, ever anxious for decisive measures, wished

to advance on Paris, but he was overruled. The allied |

army invested the town of Lille, on the fortifications of which Vauban had expended an immensity of thought; and after a struggle of nearly four months, and the loss of thirty thousand men, the citadel surrendered. By the end

of the year Brabant was again subject to the rule of the

allies. The suffering in France at this time weighed so heavily upon the people that its proud king humbled him- self to sue for peace. Each of the allies in turn did he supplicate, and his minister endeavoured by promises of large sums of money to obtain the support of Marlborough to his proposals. 'These attempts were in vain, and when the winter passed away a French army of one hundred and ten thousand, under the command of Villars, took the field. On the 3d of August 1709 Tournay capitulated, and the two leaders, Marlborough and Eugéne, led their forces to Mons, in spite of the attempt of Villars to prevent them. For the last time during the protracted war the two armies met in fair fight at Malplaquet, 11th September 1709, where the French leader had strengthened his position by extensive earthworks. The fight was long and doubtful, and, although the French ultimately retreated under the direction of Boufflers, for Villars had been wounded on the knee, it was in good order, and their losses were less than those of their opponents. The campaign lasted for a year or two after this indecisive contest, but it was not signalized by any such "glorious victory" as Blenheim. All that the English could plume themselves on was the acquisition of a few such fortresses as Douai and Bethune, and all that the French had to fear was the gradual

tightening of the enemy's chain until it reached the walls |

of Paris. The energies of the French were concentrated in the construction of fresh lines of defence, until their com- mander boasted that his position

was impregnable. In this way the war dragged on until the conclusion of the peace of Utrecht.

All that Marlborough had effected on the battlefield during these years of war had not prevented his position from being undermined by party intrigues at home. In the early part of Queen Anne's reign his political friends were to be found among the Tories, and the ministry was chiefly composed of members of that party. After a year or two, however, the more ardent Tories withdrew, and two younger adherents of the same cause, Harley and St John (both of whom were at present content to conceal their animosity to Marlborough), were introduced into the ministry. The duchess, partly through the influence of her son-in-law, the earl of Sunderland, and partly through the opposition of the Tories to the French war, had gone

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over to the Whig cause, and she pressed her views on the sovereign with more vehemence than discretion. She bad obtained for her indigent cousin, Abigail Hill, a small position at court, and the poor relation very soon began to injure the benefactor who had befriended her. With Hill's assistance Harley and St John widened the breach with the queen which was commenced by the imperious manner of the duchess. The love of the two friends changed into hate, and no opportunity for humiliating the family of Marl- borough was allowed to pass away neglected. Sunderland and Godolphin were the first to fall (July-August 1710); a few months later the duchess was dismissed froim her offices ; and, although Marlborough himself was permitted to con- tinue in his position a short time longer, his full was only delayed until the last day of 1711. Life in England had become so unpleasant that he went to the Continent, and he remained abroad until the death of Anne (1st August 1714). Then he once more returned to the shores of England and resumed his old military posts, but he took little part in public affairs. Even if he had wished to regain his commanding position in the country, ill-health would have prevented him from obtaining his desires. Johnson, indeed, says, in the Vanity of Human Wishes, that "the streams of dotage" flowed from his eyes; but it is not desirable to examine too critically the assertions of a poem which relied for its success upon the strength of its comparisons. It is certain that at the time of his death he was

able to understand the remarks of others and to express his own wishes. At four o'clock on the morning of the 16th June 1722, he died at Cranbourn Lodge near Windsor. His remains were at first deposited in West-

/ minster Abbey, in the vault at the east end of King Henry

VII.'s chapel, but they now rest at Blenheim.

His widow, to whom must be assigned a considerable share both in his rise and in his fall, survived till October 1744. Those years were spent in bitter animosity with many within and without her own family. Left by her husband with the command of boundless wealth, she used it for the vindication of his memory and for the justification of her own resentment. Two of the leading opponents of the minis- try, Chesterfield and Pitt, were especially honoured by her attentions. 'To Pitt she left ten thousand pounds, to the other statesman twice that sum and a reversionary interest in her landed property at Wimbledon. Whilst a widow, she received numerous offers of marriage from many titled suitors. She refused them all: from her marriage to her death her heart had no other inmate than the man as whose wife she had become almost a rival to royalty.

Marlborough obtained his first start in life through a handsome pension, and his rapid rise to the highest position in the state was due to his singular tact and to his skill in the management of men. In an age remarkable for grace of manner and for adroitness of compliment, his courteous demeanour and the art with which he refused or granted a favour extorted the admiration of every one with whom he came in contact. Through his consideration for the welfare of his soldiers he held together for years an army drawn from every nation in Christendom. His talents may not have been profound (he possessed "an excellent plain understanding and sound judgment" is the opinion of Lord Chesterfield); but they were such as Englishmen love. Alike in planning and in executing, he took infinite pains in all points of detail. Nothing escaped his observa- tion, and in the hottest moment of the fight the coolness of his intellect shone conspicuous. His enemies indeed affected to attribute his uniform success in the field to fortune, and they magnified his love of money by drawing up balance sheets which included every penny which he had received, but omitted the pounds which he had spent in the cause he had sincerely at heart. All that can be

alleged in excuse of his attempt to serve two masters, the king whom he had deserted and the king who had received him into favour, is that not one of luis associates was with- out sin in this respect.

The books on Marlborough are very numerous. Under his name in the catalogue of the British Museum there arc 121 entries, and 32 under that of his wife. The chief works are Lediard's, Coxc's, and Alison's Lives; a French memoir in 8 volumes, 1808 ; Mayl- borough's Letters and Despatehes, edited by Sir George Murray (5 volumes); and Mrs Creighton's interesting summary. The deserip- tions in Mr John Hill Burton's Reign of Queen Anne of the battle seenes of Marlborough are from personal observation. A good aecount of his birthplace and country will be found in Pulman's Book of the Axe District; and for the home of the duchess the reader ean refer to Mr Cussan's History of Hertfordshire. Long after the death of the duke there were many pamphlcts written on the conduct of his wife from her appearance at court; but they relate to matters of littie interest at the present time. (W. P. C.)

MARLOW, Great, a parliamentary borough of Buck- inghamshire, England, is finely situated on the Thames, and ona branch of the Great Western Railway, 37 miles west of London and 25 south-east of Oxford. It consists principally of two streets which cross each other at right angles. 'The church of All Saints, in the Later English style, erected in 1835, and lately extensively restored, possesses a number of brasses, The former bluecoat school has been reorganized under the endowed schools commis- sion as a grammar school. The town has paper-mills, a brewery, and manufactures of lace and embroidery. It is also a favourite resort for boating and fishing. Marlow, anciently Aferlaw, is a very ancient manor, and for some time after William the Conqueror it was in the possession of the crown. It returned members to parliament from the 28th of Edward I. till the 2d of Edward IL., and th privilege was again restored in the 21st of James L; since 1868 it has returned but one member. The borough includes Great and Little Marlow, Medmenham, and Bisham in Berkshire, which is united with Great Marlow by a suspension bridge, erected in 1835, at a cost of £20,000. The

population of the borough, which has an area of 14,514 acres, 2424 being in the county of Berks, was 6627 in 1871 and 6779 in 1881.

MARLOWE, Curistopuer (1564-1593), the father of English tragedy and the creator of English blank verse, was born at Canterbury in February 1564, and christened on the 26th of that month. John Marlowe, his father, is said, on authority which satisfied the best editor of the poet, to have been a shoemaker by trade ; it is supposed also that he was clerk of his parish, and survived his illustrious son for upwards of eleven years. The boy was educated at the King's School, Canterbury ; matriculated as pensioner of Benet College, Cambridge, March 17, 1581; took the degrec of bachelor of arts in 1583, and that of master of arts four years later. Before this date he had produced the first tragedy worthy of that name in our language, and called into existence that highest and most difficult of all its other than lyrical forms of verse, which alone has proved worthy of acceptance among his countrymen as the fit and adequate instrument of tragic drama. At some uncertain date of his early life he is supposed to have been an actor, and said to have broken his leg in the practice of his profession. But for this and many other traditions of his career and conversation there is no better evidence than that of a religious libeller. His first tragedy of Lamburlaine the Great, in two parts, was successively followed by Doctor Faustus, The Jew of Malta, Edward the Second, and The Massacre at Paris. The tragedy of Dido, Queen of Carthage, was probably completed for the stage after his death by Thomas Nash, the worthiest English precursor of Swift in vivid, pure, and passionate prose, embodying the most terrible and splendid qualities of a social and personal satirist > 4 man gifted also with

some fair faculty of elegiac and even lyric verse, but in no wise qualified to put on the buskin left behind him by the "famous gracer of tragedians," as Marlowe had already been designated by their common friend Greene from among the worthiest of his fellows.

The only authentic record concerning the death of Marlowe is an entry "in the burial-register of the parish church of St Nicholas," Deptford: "Christopher Marlowe, slain by Francis Archer, June 1, 1593." Two Puritan scribblers have left two inconsistent reports as to the circumstances

of this manslaughter. On the morc respect- able authority of Francis Meres the critic (1598) we are told that Marlowe was "stabbed to death" by a "serving- man" of bad character, "a rival of his in his lewd love." The one thing unhappily certain is that one of the greatest among English poets died of a wound received in a brawl (stabbed in the head, according to one account, with his own dagger) at the untimely age of twenty-nine years and three months. Like Sir Walter Raleigh and a few less memorable men of the same generation, he was attacked in his own time not merely as a freethinker, but as a propagandist or apostle of atheism ; nor was the irregularity of his life thought worthier of animadversion than the uncertainty of his livelihood. The informer whose name has survived as that of his most venomous assailant was duly hanged the year after Marlowe's death; and the list of his charges, first published by Ritson, is hardly a docu- ment which can commend itself to any man's confidence as plausibly or even possibly accurate in all its detailed report of the violent and offensive nonsense attributed to the freethinking poet in common conversation " concerning his damnable opinions."

The majestic and exquisite excellence of various lines and passages in Marlowe's first play must be admitted to relieve, if it cannot be allowed to redeem, the stormy monotony of Titanic truculence which blusters like a simoom through the noisy course of its ten fierce acts. With many and heavy faults, there is something of genuine greatness in Zamburlaine the Great; and for two grave reasons it must always be remembered with distinction and mentioned with honour. It is the first poem ever written in English blank verse, as distinguished from mere rhymeless decasyllabics ; and it contains one of the noblest passages, perhaps indeed the noblest in the literature of the world, ever written by one of the greatest masters of poetry in loving praise of the glorious delights and sublime submission to the everlasting limits of his art. In its highest and most distinctive qualities, in unfaltering and infallible command of the right note of music and the proper tone of colour for the finest touches of poetic execu- tion, no poct of the most elaborate modern school, working at ease upon every consummate resource of luxurious learn- ing and leisurely refinement, has ever excelled the best and most representative work of a man who had literally no models before him, and probably or evidently was often if not always compelled to write against time for his living.

The just and generous judgment passed by Gocthe on the Faustus of his English predecessor in tragic treatment of the same subject is somewhat more than sufficient to counterbalance the slighting or the sneering references to that magnificent poem which might have been expected from the ignorance of Byron or the incompetence of Hallam. And the particular note of merit observed, the special point of the praise conferred, by the great German poet should be no less sufficient to dispose of the vulgar misconception yet lingering among sciolists and pretenders to criticism, which regards a writer than whom no man was ever born with a finer or a stronger instinct for perfec- tion of excellence in execution as a mere noble savage of letters, a rough self-taught sketcher or scribbler of crude

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and rude genius, whose unliewn blocks of verse had in them some veins of rare enough metal to be quarried and polished by Shakespeare. What most impressed the author of aust in the work of Marlowe was a quality the want of which in the author of J/anfred is proof enough to consign his best work to the second or third class at most. ‘ How greatly it is all planned !” the first requisite of all great work, and one of which the highest genius possible to a greatly gifted barbarian could by no possibility understand the nature or conceive the existence. That Goethe “had thought of translating it” is perhaps hardly less precious a tribute to its greatness than the fact that it has been actually and admirably translated by the matchless translator of Shakespeare—the son of Victor Hugo ; whose labour of love may thus be said to have made another point in common, and forged as it were another link of union, between Shakespeare and the young master of Shakespeare’s youth. Of all great poems in dramatic form it is perhaps the most remarkable for absolute singleness of aim and simplicity of construction ; yet is it wholly free from all possible imputation of monotony or aridity. Tamburlaine is monotonous in the general roll and flow of its stately and sonorous verse through a noisy wilderness of perpetual bluster and slaughter; but the unity of tone and purpose in Doctor Faustus is not unrelieved by change of manner and variety of incident. The comic scenes, written evidently with as little of labour as of relish, are for the most part scarcely more than transcripts, thrown into the form of dialogue, from a popular prose J/istory of Dr Faustus, and therefore should be set down as

little to the discredit as to the credit of the poet. Few master- pieces of any age in any language can stand beside this tragic poem—it has hardly the structure of a play—for the qualities of terror and splendour, for intensity of purpose and sublimity of note. Inthe vision of Helen, for example, the intense perception of loveliness gives actual sublimity to the sweetness and radiance of mere beauty in the passionate and spontaneous selection of words the most choice and perfect ; and in like manner the sublimity of simplicity in Marlowe's conception and ex- pression of the agonies endured by Faustus under the immediate imminence of his doom gives the highest note of beauty, the quality of absolute fitness and propriety, to the sheer straiglitforwardness of speech in which his agoniz- ing horror finds vent ever more and more terrible from the first to the last equally beautiful and fearful verse of that tremendous monologue which has no parallel in all the range of tragedy.

It is now a commonplace of criticism to observe and regret the decline of power and interest after the opening acts of The Jew of Malta. This decline is undeniable, though even the latter part of the play is not wanting in rough energy and a coarse kind of interest; but the first two acts would be sufficient foundation for the durable fame of a dramatic poet. In the blank verse of Milton alone, who perhaps was hardly less indebted than Shakespeare was before him to Marlowe as the first English master of word-music in its grander forms, has the glory or the melody of passages in the opening soliloquy of Barabas been possibly surpassed. The figure of the hero before it degenerates into caricature is as finely touched as the poetic execution is excellent ; and the rude and rapid sketches of the minor characters show at least some vigour and vivacity of touch.

In Zdward the Second the interest rises and the execu- tion improves as visibly and as greatly with the course of the advancing story as they decline in Zhe Jew of Malta. The scene of the king's deposition at Kenilworth is almost as much finer in tragic effect and poetic quality as it is shorter and less elaborate than the corresponding scene in

'significance and interest.

oo7 Shakespeare's Hing Richard If. The terror of the death- scene undoubtedly rises into horror ; but this horror is with skilful simplicity of

treatment preserved from passing into disgust. In pure poetry, in sublime and splendid imagina- tion, this tragedy is excelled by Doctor Paustus; in dramatic power and positive impression of natural effect it is as certainly tlle masterpiece of Marlowe. It was almost inevitable, in the hands of auy poet but Shakespeare, that noue of the characters represented should be capable of securing or even exciting any finer sympathy or more serious interest than attends ou the mere evolution of successive events or the mere display of emotions (except always in the great scene of the deposition) rather animal than spiritual in their expression of rage or tenderness or suffering. The exact balance of mutual effect, the final note of scenic harmony, between ideal conception and realistic execution is not yet struck with perfect accuracy of touch and security of hand; but on this point also Marlowe has here come nearer by many degrees to Shakespeare than any of his other predecessors have ever come near to Marlowe.

Of The Massacre at Paris it is impossible to judge fairly from the garbled fragment of its genuine text which is all that has come down to us. To Mr Collier, among numberless other obligations, we owe the discovery of a noble passage excised in the piratical edition which gives us the only version extant of this unlucky play, and which, it must be allowed, contains nothing of quite equal value. This is obviously an occasional and polemical work, and being as it is overcharged with the anti-Catholic passion of the time has a typical quality which gives it some empirical That antipapal ardour is indeed the only note of unity in a rough and ragged chronicle which shambles and stumbles onward from the death of Queen Jeanne of Navarre to the murder of the last Valois. It is possible to conjecture, what it would be fruitless to affirm, that it gave a hint in the next century to Nathanicl Lee for his far superior and really admirable tragedy on the same subject, issued ninety-seven years after the death of Marlowe.

In the tragedy of Dido, Queen of Carthage, a servile fidelity to the text of Virgil's narrative has naturally resulted in the failure which might have been expected from an attempt at once to transcribe what is essentially inimitable and to reproduce it under the hopelessly alien conditions of dramatic adaptation. The one really noble passage in a generally feeble and incomposite piece of work is, however, uninspired by the unattainable model to which the dramatists have been only too obsequious in their

subservience. It is as nearly certain as anything can be which depends chiefly upon cumulative and collateral evidence that the better part of what is best in the serious scenes of King IIenry VI. is mainly the work of Marlowe. That he is at any rate the principal author of the second and third plays passing under that name among the works of Shakespeare, but first and imperfectly printed as Zhe Contention between the two Famous LTouses of York and Lancaster, can hardly be now a matter of debate among competent judges. The crucial difficulty of criticism in this matter is to determine, if indeed we should not rather say to conjecture, the authorship of the humorous scenes in prose, showing as they generally do a power of com- paratively high and pure comic realism to which nothing in the acknowledged works of any pre-Shakespearean dramatist is even remotely comparable. Yet, especially in the original text of these scenes as they stand unpurified by the ultimate revision of Shakespeare or his editors, there are tones and touches which recall rather the clownish horseplay and homely ribaldry of his predecessors than anything in the lighter interludes of his very earliest

plays. We find the same sort of thing which we find in their writings, only better done than they usually do it, rather than such work as Shakespeare's a little worse done than usual. And even in the final text of the tragic or wnetrical scenes the highest note struck is always, with one wnagnificent and unquestionable exception, rather in thie key of Marlowe at his best than of Shakespeare while yet in great measure his disciple.

Had every copy of Marlowe's boyish version or perver- sion of Ovid's Hlegies deservedly perished in the flames to which it was judicially condemned by the sentence of a brace of prelates, it is possible that an occasional book- worm, it is certain that no poetical student, would have deplored its destruction, if its demerits could in that case have been imagined. His translation of the first book of Lucan alternately rises above the original and falls short of it,—often inferior to the Latin in point and weight of expressive rhetoric, now and then brightened by a clearer note of poetry and lifted into a higher mood of verse. Its terseness, vigour, and purity of style would in any case have been praiseworthy, but are nothing

less than admir- able, if not wonderful, when we consider how close the translator has on the whole (in spite of occasional slips into inaccuracy) kept himself to the most rigid limit of literal representation, phrase by phrase and often line by line. The really startling force and felicity of occa- sional verses are worthier of remark than the inevitable stiffmess and heaviness of others, when the technical difficulty of such a task is duly taken into account.

One of the most faultless lyrics and one of the loveliest fragments in the whole range of descriptive and fanciful poetry would have secured a place for Marlowe among the memorable men of his epoch, even if his plays had perished with himself. His Passionate Shepherd remains ever since unrivalled in its way—a way of pure fancy and radiant melody without break or lapse. The untitled fragment, on the other hand, has been very closely rivalled, perhaps very happily imitated, but only by the greatest lyric poet of England—by Shelley alone. Marlowe's poem of /Tero and Leander, closing with the sunrise which closes the night of the lovers' union, stands alone in its age, and far ahead of the work of any possible competitor between the death of Spenser and the dawn of Milton. In clear mastery of narrative and presentation, in melodious ease and simplicity of strength, it is not less pre-eminent than in the adorable beauty and impeccable perfection of separate lines or passages.

The place and the value of Christopher Marlowe as a leader among English poets it would be almost impossible for historical criticism to overestimate. To none of them all, perhaps, have so many of the greatest among them been so deeply and so directly indebted. Nor was ever any great writer's influence upon his fellows more utterly and unmixedly an influence for good. He first, and he alone, guided Shakespeare into the right way of work; his music, in which there is no echo of any man's before him, found its own echo in the more prolonged but hardly more exalted harmony of Milton's. He is the greatest discoverer, the most daring and inspired pioneer, in all our poetic literature. Before him there was neither genuine blank verse nor a genuine tragedy in our language. After his arrival the way was prepared, the paths were made straight, for Shakespeare. (Asn. as)

MARLY-LE-ROI, chief place of a canton in the de- partment of Seine-et-Oise, France, 5 miles to the north of Versailles and 3 miles to the south of St Germain-en-Laye, 18, notwithstanding some fine country houses, a dull and unattractive village of 1250 inhabitants, which owes all its celebrity to the sumptuous chateau of Louis XIV. It was originally designed as a simple hermitage to which the king

could occasivually retire with a few of his more intimate friends from the pomp of Versailles, but gradually it grew until it became one of the most ruinous extravagances of the Grand Monarque. The central pavilion (inhabited by the king himself) and its twelve subsidiary pavilions were in-tended to suggest the sun surrounded by the signs of the zodiac. Seldom visited by Louis XV.,and whollyabandoned by Louis XVL, it was demolished after the Revolution, its art treasures having previously been dispersed, and all that now remains consists of a few mouldering ivy-grown walls, some traces of parterres with magnificent trees, the park, which is well stocked with game, and the forest of 83 square miles, one of the most pleasant promenades of the neighbourhood of Paris.

Close to the Seine, half-way between Marly-le-Roi and St Germain, is the village of Port-Marly (500 inhabitants), and 1 mile farther up is the hamlet of Marly-la-Machine. Here, under Louis X1V., an immense hydraulic engine, driven by the current of the river, was erected ; it raised the water to a high tower of 155 metres (508 English feet), where the aqueduct of Marly commenced (2100 English feet in length, 75 in height, with 36 arehes, still well-preserved), carrying the waters of the Seine to Versailles. The first engine of Marly began to work in 1682, but it was necessary to modify it in 1803. In 1826 a steam-engine was substituted, and since 1858 an atmospheric engine has been employed.

MARMONT, Avaustge Fritprric Louis VIESSE DE (1774-1852), duke of Ragusa, and marshal of France, one of Napoleon's earliest friends and most trusted generals, was born at Chatillon-sur-Seine, on July 20,1774. He was the son of an ex-officer in the army, who belonged to the petite noblesse, and had adopted the principles of the Revolution. His love of soldiering soon showing itself, his father took him to Dijon to learn

mathematics prior to entering the artillery, and there he made the acquaintance of Bonaparte, which he renewed after obtaining his com- mission when he served in Toulon. The acquaintance ripened into intimacy ; Marmont became General Bona- parte's aide-de-camp, and accompanied him to Italy and Egypt, winning distinction and promotion as general of brigade, In 1799 he left Egypt with Bonaparte to the mercy of the English; he was present at the revolution of the 18th Brumaire, and organized the artillery for the expedition to Italy, which he commanded with great effect at Marengo. For this he was at once made general of division. In 1801 he became inspector-general of artillery, and in 1804 grand officer of the Legion of Honour. In 1805 he received the command of a corps, with which he did good service at Ulm. He was then directed to occupy Dalmatia with his army; he defeated the Russians on October 30 at Castel Nuovo, and occupied Ragusa. The next five years were the most creditable in his life; he was both military and civil governor of Dalmatia, and has still left traces there both in great public works and in the memories of the people. In 1807 he was made duke of Ragusa, and in 1809, being summoned up to the help of Napoleon, who was closely beset in the island of Lobau, earned the marshal's baton by his conduct at Wagram. In July 1810 he was hastily summoned from his palace, where he lived in Eastern luxury, to succeed Masséna in the command of the French army in the north of Spain, called the army of Portugal. The skill with which he manceuvred hisarmy during the year he com- manded it has been always acknowledged. His relief of Ciudad Rodrigo in the autumn of 1811 in spite of the pre- sence of the English army was a great feat, and in the tactics which preceded the battle of Salamanca he had the best of it. The extension of his left on the 22d July 1812 was, however, fatal, and its result was the great defeat of Salamanca, in which Marmont was severely wounded in the right arm and side. He retired to France to recover, and was still hardly cured when in April 1813 Napoleon gave him the command of the 6th corps. With

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it he served at the battles of Liitzen, Bautzen, and Dresden, and throughout the great defensive campaign of 1814, until the last desperate battle before the walls of Paris, from which he drew back his forces to the commanding position of Essonne. Here he had 20,000 inen in splendid condition, and

was the pivot of all thoughts. Napoleon said uf Essonne, "C'est 14 que viendront s'addresser toutes les intrigues, toutes les trahisons ; aussi y ai-je placc Marmont, mon enfant élevé sous ma tente." Marmont betrayed this trust and suffered for it. On the restoration of the Bourbons he was made a peer of France, and a major- general of the royal guard, and in 1820 a knight of St Esprit and a grand officer of the order of St Louis, but he was never trusted, never popular. He was the major- general of the guard on duty in July 1830, and was ordered to put down with a strong hand any opposition to the ordinances (see France). After persevering some time he gave way, and allowed the republicans to succeed in their revolution. This defection brought more obloquy upon him, and the Duc d'Angouléme even ordered him under arrest, saying, ' Will you betray us, as you betrayed him?" After this Marmont left France and wandered about the Continent for twenty years, publishing many volumes of travels, an edition of Cesar and of Xenophon, and his sprit des Institutions Militaires. Much of his time was spent upon his A/émoires, which are of real value for the military history of his time, though they must be read asa personal defence of himself in various junctures rather than as an unbiassed account of his times. They show Marmont, as he really was, an embittered man, who never thought his services sufficiently requited, a great artillery general indeed, but without the fire of genius which is so striking in several of his contemporaries, and above all, a man too much in love with himself and his own glory to be a true friend or a faithful servant.

For Marmont's military ability consult Napicr, Jomini, and tho historians of the time, particularly General Pelct. His own works are Voyage en Hongrie, &c., 4 vols., 1837; Voyage en Sicile, 1838, Esprit des Institutions Militaires, 1845 ; César; Xenophon; and Mémoires, 8 vols., published after his death in 1856. See also a long and eareful notice by Sainte-Beuve, Causeries du Lwndi, vol. vi.

MARMONTEL, Jean Francois (1723-1799), one of the most distinguished inen of letters in Paris during the latter half of the 18th century, was born of poor parents in Limousin, on the 11th July 1723. After studying with the Jesuits at Mauriac, he taught in their colleges at Clermont and Toulouse ; and in 1745, acting on the advice of Voltaire, he set out for Paris to try for literary honours. From 1748 to 1753 he wrote a succession of tragedies

which,! though for the most part considered prolix and artificial by modern readers, had great success on the stage, and secured to Voltaire's new disciple a good position in literary and fashionable circles. Being now associated with Diderot and D'Alembert, he wrote for the great Encyclopédie a series of articles evincing considerable critical power and insight, which in their collected form, under the title Hiéments de Littérature, still rank among the higher French classics. He also wrote several comic operas, the two best of which probably are Sylvain and Zémire et Azore. In 1758 he gained the patronage of Madame Pompadour, and was soon after appointed manager of the official journal Le Afercwre, in which he had already commenced a series of clegant and attractive tales. These were the Contes Moraux, on which, according to some critics, Marmontel's literary reputation mainly rests. Their merit lies partly in the literary style, which in delicate finish frequently rivals that of his master Voltaire, but mainly in their graphic and charming pictures of

1 Denys le Tyran, 1748; Aristoméne, 1749; Cléopdtre, 1750; Héraclides, 1782; Egyptus, 1753. ,

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French society under Louis XV. After being elected to the French Academy, in 1763, he appears to have been ambitious to create a new literary style, exemplified notably in his dull prose-epic romance Bélisaire, now remarkable only on account of a chapter on religious toleration which incurred the censure of the Sorbonne and the archbishop of Paris. Marmontel retorted in Les Incas, by tracing the cruelties in Spanish America to the religious fanaticism of the Roman Catholic invaders,

After being appointed historiographer of France, secre- tary to the Academy (1783), and professor of history in the Lycée (1786), Marmontel in 1788 wrote a history of the regency, which is of little value. To compensate for this, however, he in 1795 began his Mémoires, the most interesting and valuable if not the greatest of his works, being a picturesque review of his whole life, a literary history of two important reigns, a great gallery of portraits extending from the venerable Massillon, whom more

than half a century previously he had seen at Clermont, to the fiery Mirabeau amidst the tempestuous first years of the French Revolution. Reduced to poverty by the Revolution, Marmontel in 1792 retired from the Reign of Terror to Evreux, and soon after to a cottage near Gaillon, in the department of Eure. To that retreat we owe the Jdémoires, and there, after a short stay in Paris when elected in 1797 to the Conseil des Anciens, he died on the 3lst December 1799.

See Villenave, Notices sur Marmontel ; Sainte-Beuve, Causcrics, vol. iv.; Morellet, Eloge, 1805 ; Edinburgh Review, January 1806.

MARMORA, Sra or. See Brack Sxa.

MARMOT. The word marmot may be considered to include animals belonging to the three following genera:— the true marmots, forming the genus Arctomys (“ bear- mouse”), so called from the thickset, bear-like form of its members ; the prairie marmots of North America, better known as the “prairie dogs” (Cynomys, “dog-mouse”) ; and the pouched marmots, or sousliks, comprising the genus Spermophilus, or seed-lovers, so named from the character of their food. These three genera are all closely allied to each other, and together form the subfamily Arctomyine of the great squirrel family, the Scowride, of which the only other subfamily, the Sciwrinx, consists of the true squirrels (Sciwrus) and the flying-squirrels (Ptero- mys). The members of the marmot subfamily are con- fined to the northern hemisphere, and in fact are almost entirely limited to the north temperate zone, in marked

contrast to the genera of the subfamily Sciwrinex, which

attain their greatest development in tropical or semi- tropical countries.

The Arctomyine agree in the possession of somewhat short, stumpy bodies, comparatively short tails (except in certain sousliks), and long and powerful claws suitable for burrowing. ‘They all have broad, strong, and ungrooved incisors or cutting teeth, two pairs of premolars above and one below, and three pairs of true molars in each jaw. The grinding teeth are all on the whole very similar, the first upper premolar much smaller than the others, and nearly round, the next three teeth triangular in outline, and

each with either two or three transverse grooves upon the crown; the last molar is rather broader and more com- plicated than the others, as is shown in fig. 2. The general form of the skeleton is very similar to that of the true squirrels, but the bones as a rule are stouter and heavier.

1. The following are the generic characters of Arctomys. External form stout and heavy, ears short, tail short and hairy, cheek-pouches rudimentary or abseut. Fore feet with four well-developed toes, and a rudimentary thumb provided with a flat nail; skull (see Mamata, p. 417, fig. 92) similar in general form to that of the other genera, but very much larger and heavier, the post-orbital processes

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stouter, and at right angles to the axis of the skull. cisors broad and powerful. First upper premolar nearly as large as the second. Molar series nearly parallel, scarcely converging behind at all.

The various species of marmot, about ten in number, are all much alike in general appearance, ranging in size from about 15 to 25 inches in length, with tails from 3 to 6 inches long. The following are the species now generally recognized, though the Central-Asiatic forms are still very imperfectly known :—

Arctomys marmotta, Linn., southern Europe, the Alps, Pyrenees, and Carpathians ; A. bobac, Sehreb., eastern Europe and Siberia; A, himalayanus, Hodgs., south-west Tibet; A. hemachalanus, Hodgs., Nepal; A. cauwdatus, Jaequemont, Cashmere; A. dichrous, Anderson, Afghanistan; 4. aureus, Blanford, Turkestan;

Tt will thus be seen that one species only is peculiar to Europe, and three to North America, while at least six, and perhaps more, are found in various parts of Central Asia,— one of these, A. bobac, occurring also as far west as Russia and eastern Germany.

Fic. 1.—Alpine Marmot (Arctomys marmotta). After Brehm.

The following account of the habits of the Alpine marmot, A. marmotta, extracted from Professor Blasius's well-known work on the mammals of Germany, applies, with but little variation, to all the members of the genus.

Marmots live high up in the snowy regions of the mountains, generally preferring exposed cliffs, whenee they may have a clear view of any approaching danger, for which, while quietly basking in the sun or actively running about in seareh of food, a eonstant watch is kept. When one of them raises the ery of warning, the loud piercing whistle so well known to travellers in the Alps, they all instantly take to flight and hide themselves in holes and erannies among the rocks, often not reappearing at the entrance of their hiding-plaees until several hours have elapsed, and then frequently standing motionless on the look-out for a still longer period. Their food consists of the roots and leaves of various Alpine plants, whieh, like squirrels, they lift to their mouths with their fore paws.

For their winter quarters they make a large round burrow, with but one entranee, and ending in a sleeping-place thiekly padded with hay. Here often from ten to fifteen marmots pass the winter, all lying elosely packed together fast asleep until the spring. On awaking, hungry with their long fast, they remove the hay with whieh they stuff up the doors of their burrows, and resume their life of activity and watechfulness. The breeding season is in the early summer, when they bring forth from four to six young ones. Their flesh, although coarse and rank, is eaten by the peasants, and their fur, though of but little value, is also made use of.

2. Our second genus is Cynomys, containing only the well- known " prairie dogs," or more correctly " prairie marmots,"

_ tition, as shown in fig. 2,

MOT

of the United States. The genus may be characterized as follows. Size and form intermediate between Arctomys and Spermophilus. Ears and tail short. Cheek-ponches shallow. Fore feet with five claws, that on the thumb as large as that on the fifth toe, Skull heavily built, the post-orbital processes di- rected outwards. Den-

remarkably heavy, the molar teeth differing from those of Arctomys and Spermophilus by having three instead of two transverse grooves on their crowus. First premolar nearly as large as the second. Molar series strongly converg- ent behind.

Of this genus two ¥ species have been de- \ scribed, very closely allied to each other, but separable by their slightly different size and coloration. The larger and better-known of the two is the eastern prairie marmot, C. /udovicianus, Ord., inhabiting the open prairies of the central United States, while the smaller species, C. columbianus, Ord., is found to the westward as far as the Rocky Mountains.

The habits of the prairie marmots have been so often described that every one is familiar with their custom of forming their burrows in groups or "towns," of sitting outside to watch intruders, and of making the peculiar

Fig. 2.—Under Side of Skull of Cynomys ludovicianus,

| barking sound from which they have derived their

erroneous popular name of prairie dogs. In the burrows made by them there are commonly found three strange and, notwithstanding the earlier travellers' tales, certainly unwelcome visitors, namely, rattlesnakes, owls, and weasels, all of which at times probably prey npon the young marmots. Prairie marmots do not truly hibernate, although in the more northern and colder parts of their range they retire to their burrows during the very severest weather. They feed on grasses and roots, for whose mastication, however, their grinding teeth appear to be unnecessarily powerful.

*3. The last genus to which the name marmot may be applied is that of the sousliks or pouched marmots (Spermophilus), of which the following are the characters Size much smaller than that of Arctomys or Cynomys, and form more slender and squirrel-like. 'ail very variable, from 1 to 8 or 9 iuches in length. Cheek-pouches always present. Fore feet with four well-developed toes * rudimentary thumb, of which the claw may be a present or absent. Skull much more lightly built t a that of either of the preceding genera, aud the ed orbital processes slender and directed backwards. 4 oe series nearly parallel, as in Arctomys, but all much sma 4 and lighter; the*

first premolar simply rounded, never m® than about one-third of the size of the second. 3

The members of this large genus present a far grea 4 range of variation than is found among the true ee ; some of them, such as the Enropean souslik, being xt as large as a common squirrel, almost entirely -.. external ears, and with the tail reduced to a mere 8 4 barely an inch long, while others again ale more – three times this size, with long and often tufted ears a long bushy squirrel-like tails. These a "I other corresponding cranial ones, have caused the

to be divided into the three following subgenera :— Spermophalus proper, containing thirteen or fourteen species, of small size, with rudimentary ear-conches, short stumpy tails, and comparatively large teeth; Otospermophalus, two species, of squirrel-like build, with large and tufted ears, and long bushy tails ; and Jctidomys, with four species, of very slender, weasel-like form, with short ears, long but slender tails, and comparatively small teeth. 'The last two subgenera are confined to North America, while the range of the first is extremely similar to that of Arctomys, although certain species penetrate somewhat farther south in the New World, and none are found so far west in Europe. Professor Blasius gives the following details of the habits of the common European souslik (S. cutellus, ii).

It lives in dry treeless plains, especially on a sandy or clayey soil, and is never found either in forests or on swampy ground. It fornis burrows, often 6 or 8 feet deep, in which food is stored up and the winter sleep takes plaee. Each burrow has but one entranee, whieh is closed up when winter approaches,—a seeond hole, however, being previously formed from the sleeping-plaee to just below the surface of the ground. This second hole is opened the next year, and used as the ordinary entranee, so that the number of closed up holes round a burrow gives an indication of the length of time that it has been occupied. Sousliks ordinarily feed on roots, seeds, berries, &c., but occasionally also on animal food, preying readily on eggs, small birds, and mice, the remains of these latter being often found in their burrows. They bring forth in the spring from four to elght young ones,

which, if taken early, may be easily tamed. They are often eaten by the peasants, the inhabitants of the Russian steppes considering their flesh an especial delieaey. (0. T.)

MARNE, a department of the north-east of France, made up from Champagne-Pouilleuse, Rémois, Perthois, Vallage, and La Brie-Champenoise, districts formerly be- longing to Champagne. Its chief town, Chélons-sur- Marne, is 92 miles in a direct line east of Paris. Bounded on the W. by Seine-et-Marne and Aisne, on the N. by Ardennes, on the E. by Meuse, on the S. by Haute-Marne and Aube, it is situated between 48° 31' and 49° 26' N. lat., and 3° 25' and 5° E, long. Its greatest length from north-east to south-west is 73 miles, and the area 3159 square miles, About one half of this consists of Cham- pagne-Pouilleuse, a monotonous and barren plain covering a bed of chalk 1300 fect in thickness. On the west and on the east it is commanded by two ranges of hills. The highest point in the department (920 fect) is in the hill district of Rheims, which rises to the south-west of the town of the same name, between the Vesle and the Marne, The lowest level (164 feet), where the Aisne leaves the department, is not far distant. To the south of the Marne the hills of Rheims are continued by the heights of La Brie (700 to 800 feet). All these belong geologically to the basin of Paris, They slope gently towards the west, but command the plain of Champagne-Pouilleuse by a steep descent on the cast. On the further side of the plain are the heights of Argonne (860 feet), formed of beds of the Lower Chalk, and covered by forests; they unite the calcareous formations of Langres to the schists of Ardennes, and a continuation of them stretches southward into Perthois and the marshy Bocage. The department belongs entirely to the Seine basin, but of that river there are only 13 miles, in the south-west ; it there receives the Aube, which has 10 miles within the department. The Hag | tiver is the Marne, which runs through the

epartment for 105 miles in a great sweep concave to the ae passing Vitry-le-Francois, Chalons, Epernay, ait = ane In its course through the department it the a – 0 to 213 feet. The principal tributaries are a eae receives the Ornain) on the right, and on and ae = laise, which waters Vassy, the Somme Soude, Pavia een (with its tributary the Dhuis), whence Morin oe ied ; besides the Petit Morin and the Grand

the last three only the upper courses lie within

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the department, The Aisne enters the department at a point 12 miles from its source, and traverses it for 35 miles, watering Ste Menehould. Two of its affluents on the left, the Suippe and the Vesle, on which stands Rheims, have a longer course from south-east to north-west across the department.

Marne has the elimate of the region of the Seine; the annual mean temperature is 50° Fahr., the rainfall about 24 inches. Of the total area about three-fourths eonsists of arable land, and a sixth is under forest, whilst a twenty-fifth is meadow land. Vineyards eover 63°7 square miles. The department is largely stocked with sheep (536,000, of which 133,000 are a mixed merino breed, whose wool is used in the manufacture of merinoeg, flannels, and eashmeres). Cattle are estimated to number 95,260 ; horses, 53,000; pigs, 62,000; goats, 6000; and asses, 6000; these last are used in the narrow pathways which intersect the vineyards. About 600,000 tb of honey and 240,000 tb of wax are produced. The vineyards, though not of great extent, are of high value from the quality of their products. The manufacture of the spark- ling wines of Champagne is an important industry, of which spernay, Rheims, and Chalons are the chief eentres. The yearly exportation is about 20,000,000 bottles, at the average value of half a erown a bottle. Cereals are grown in exeess of the loeal consumption. Corn, hay, rye, barley, potatoes, and beetroot are the ehief crops, Several communes supply the more valuable vege- tables. In 1881 the produce of wine was more than 144 million gallons. The principal orehard fruits are the apple, plum, and cherry. Pine woods are largely planted in Champagne-Pouilleuse. The departinent produees iron ore, phosphate of lime, quantities of turf, and exeellent millstones and stone for building.

The chief industry is that in wool, which has brought together, in the neighbourhood of Rheims, establishments for spinning, earding, dyeing, and weaving. The materials wrought are flannels, merinoes, tartaus, shawls, rugs, and faney articles. In 1879 the ageregate length of the various stuffy measured at Rheims was 12,198 miles. This business alone oceupies 30,000 operatives in the departinent, and produees annually nearly 800,000 pieces, valued at £18,000,000. Hosiery in woollen employs 420 looms, and

in cotton 1800, Marne contains blast-furnaces, iron, copper, and bell foundries, and manufactories of agricultural implements. Besides these there are tanyards, eurrying and leather-dressing establishments, and glassworks, whieh, with sugar-works and breweries, complete the list of the most important industries. Biseuits and gingerbread are a specialty of Rheims. The chief imports are wool, eoal, and colonial wares ; the exports are wine, grain, live stock, stone, whiting, pit-props, and woollen stuffs. Transport is supplied by the river Marne and the canal eonnecting it with the Rhine and with the Aisne, and by 300 miles of railway. The population in 1881 was 421,027, an increase of 116,371 since 1801. There are five arrondissements—those of Chalons (the chef-lieu), Epernay, Rheims, Ste Menehould, and Vitry-le-Francois. The department belongs partly to the arehbishopric of Rheims aud partly to the see of Chalons. Chialons is the headquarters of the 6th army eorps; to the north of the town is the great camp devoted to military exercises.

MARNE, Haute., a department of eastern France, made up for the most part of districts belonging to the former province of Champagne (Bassigny, Perthois, Vallage), with smaller portions of Lorraine and Burgundy, and some fragments of Franche-Comté, It lies between 47° 35’ and 48° 40’ N. lat., and between 4° 40’ and 5° 55” E. long, the capital, Chaumont, being 133 miles east-south-east from Paris in a direct line, and it is bounded on the N.E. by Meuse, on the E. by Vosges, on the §.E. by Haute- Sadne, on the 8. and 8.W. by Céte d’Or, on the W. by Aube, and on the N.W. by Marne. The extreme length from north-north-west to south-south-east is 81 miles, and the area 2402 square miles. Its greatest elevation (1693 feet) is in the plateau of Langres, between the sources of the Marne and those of the Aube; the watershed between the basin of the Rhone on the south and those of the Seine and Meuse on the north, which is formed by the plateau of Langres and the Monts Faucilles, has an average height of 1500 or 1600 feet. The country descends rapidly towards the south, but in very gentle slopes northwards. To the north is Bassigny (“ paybas,” as distinguished from the highlands), a district of country characterized by monotonous flats of small fertility, and generally under wood. The lowest level of the department

is 360 feet. Hydrographically [aute-Marne belongs for the most part to the basin of the Seine, the remainder to those of the Rhone and the Meuse. The principal stream is the Marne, which rises here, and has a course of 75 miles within the department. Among the more important affluents of the Marne are on the right the Rognon, and on the left the Blaise, one of the rivers of France most fully utilized for the supply of water-power. The Saulx, another tributary of the Marne on the right, also rises in Haute-Marne. Westward the department is watered by the Aube and its tributary the Aujon, both of which have their sources on the plateau of Langres. The Meuse also rises in the Monts Faucilles, and has a course of 31 miles within Haute-Marne. On the Mediterranean side the department sends to the Sadne the Apance, the Amance, the Salon, and the Vingeanne. The climate is partly that of the Seine region, partly that of the Vosges, and partly that of the Rhone; the mean temperature is 51° F.,, nearly that of Paris; the rainfall is slightly below the average for France.

Of the total area rather more than one half is arable, about a third is under wood, a twentictl under meadow, and a fortieth is occupicd by vineyards. There arc 39,000 horses (cxtensively bred in Bassigny), 86,000 head of cattle, 170,000 sheep, 58,000 pigs, 6000 goats, 25,000 beehives, and a large quantity of all kinds of poultry. Though not very fertile, the soil is well cultivated, and in 1878 yielded 1,271,363 hectolitres of wheat, 144,348 of barley, 1,446,421 of oats, 1,177,187 of potatocs, besides meslin, rye, buckwheat, dried legumes, colza, beetroot, and hemp. Upwards of 8 million gallous of wine of ordinary quality were produced in 1881. The timber consists chiefly of oak, beech, clm, ash, maple, birch, and aspen ; the orchards produce cherries, apples, pears, and prunes. The department is very rich in iron; the annual output of 300,000 tons is excecded only by that of Meurthe-ct-Moselle. Building and paving stones are quarricd. The warm springs of Bourbonne-les-Bains arc among the longest-known and most frequented in France. The leading industry is the metallurgical ; in 1881 76,000 tous of pig iron and 85,000 of wrought iron were pro- duced. The establishments include blast furnaces, foundries, forges, plate-rolling works, and shops for nailmaking and smith work of various descriptions. St Dizier, the placc of largest population, is the chief centre of manufacture

and distribution. The cutlery trade alone occupies 6000 persons in the neighbourhood of Langres. The departmeut employs 1800 spindles in the woollen manufacture ; glove-making, basket-making, brewing, tanning, and other industries are also carried on. The principal import is coal, while iron, stone, wood, and cereals are exported. The population in 1876 was 253,943, making an increase of 27,288 since 1801. There are three arrondissements (Chaumont, Langres, and Vassy), the capital being Chaumont.

MAROCCO. See Morocco.

MARONITES (Syriac, Mériinédyé ; Arabic, Mawdrina), an ecclesiastical community, and therefore also, according to the usage of the Christian East, a distinct political or social body, found mainly in or near the Lebanon, acknowledg- ing the headship of the pope and the Latin standard of orthodoxy, but still retaining some peculiar privileges, including the use of a Syriac service—which few even of the priests now understand—and permission for the inferior clergy to marry. Maronite writers, trained either at Rome (in the Maronite college, founded by Gregory XIII. in 1584) or under Roman influences, have not unnaturally striven to prove that their church was always in essential accord with the Church of Rome except in ritual, but there is clear evidence that this is incorrect. The earliest references to the Maronites (beginning in the 8th century) leave no doubt that they were Monothelites, and there is contem- porary evidence (William of Tyre) that they only abjured their heresies in 1182, when with their patriarch and some bishops they joined the Latin Church. Even in later times it has cost Rome much pains and money to attach them closely to herself and produce real conformity to Latin or ultimately to Tridentine orthodoxy. The origin of the Maronites and their earlier history are obscure. 'The name 1s no doubt connected with the monastery of St Maron,

near the source of the Orontes, one of the chief monasteries of Syria in the 6th century ;1 the Maronites themselves (Assemani, Bub. Or., i. 496 sq.) have much to tell of their great patriarch John Maron, or rather John of

Maron, who studied at the convent of St Maron, converted the Lebanon to orthodoxy, and died 707 .p. Much of the history of this personage is certainly fabulous."

Though the Maronite college at Rome sent forth some distinguished scholars—the grammarian Amira, Gabriel Sionita, Abraham Ecchellensis, and the three Assemanis— the Maronite community never took on much Western culture. A simple warlike race, they long maintained a great measure of internal freedom under their native nobility, only paying tribute to the pasha of Tripoli; and for a time, when the princely house of Shihab left Islam and became Maronites, they greatly outweighed the Druses in their influence inthe Lebanon.? Since the fall, in 1840, of the Maronite emir Beshir, who was only by outward pro- fession a Moslem, their power has sunk. For their subse- quent history see vol. vii. p. 486, and for statistics, de. at the present time, see LEBANON.

The seat of the Maronite patriarch is at Kanndbin (Ccenobium); the bishoprics are Aleppo, Baalbek, Jebeil, Tripoli, Ehden, Damascus, Beirut, Tyre, and Cyprus.

See in gercral Le Quien, Oricns Christianus, iii. 1-100; Nairon, De origine, cic., Maronitarum, Rome, 1679; Dandini's account of the mission of 1596 in the French translation with R. Simon's notes (Voyage du Mont Lebanon, Paris, 1685); Schnurrer, De Ecclesia Maronitica, 1810-1811; and Rodiger's article " Maroniten" in Herzog's Real-Encycl.

MAROONS. A négre marron is defined by Littré as a fugitive slave who betakes himself to the woods ; a similar definition of cimarron (apparently from cima, a mountain top) is given in the Dictionary of the Spanish Academy. The old English form of the word is symaron (see Hawkins's Voyage, sec. 68). The designation in modern English is applied almost as a proper name to the descendants of those negroes in Jamaica who at the first English occupation in the 17th century fled to the mour- tains. See vol. xiii. p. 550.

MAROS-VASARHELY, a royal free town of Hungary, and capital of the Transylvanian county of Maros-Torda, is situated on the Maros and on the Hungarian Eastern Railway, 50 miles north-east of Hermannstadt, in 46°

30′ N. lat., 24°31’ E. long. It is the seat of the “royal table ” court of appeal for the Transylvanian circle, of royal and circuit courts of law, of a board of works, and of offices of assay and of the Government tobacco monopoly ; as also the headquarters both of the militia and regular infantry for the district. The town is well built, partly upon rising ground, and has a citadel with barracks, three churches (one large and handsome), and a college belonging fo the Calvinists ; Roman Catholic and Greek Orthodox churches, religious houses, and schools ; a public library of 80,000 volumes, with a picture gallery and fine collec- tion of minerals; a theatre, a hospital, and several philan- thropic and industrial institutes. The trade 1s chiefly in timber, planks, materials for house-roofing, graln, ae tobacco, and other products of the neighbourhood. Ee weekly and special markets are held. At the end of the population amounted to 12,843 (6269 males, 6 females), Magyars and Roumanians by nationality.

1 The ruins of this place are described by Robinson, Bib. Researches, iii, 589; Renan, Phénicie, p. 119. 0 We

2 The anw of Bienen ica! to Bar-Hebreeus (Chron. Eccles. ? lL . and placed in the 10th century, was apparently a Monophys! 3 Rove Monophysite as well as Monothelite doctrine was once currel Bross the Maronites appears from various things in their ecclesiastica : which they now try to explain away or reject as ine Ie son

3 See Niebuhr, Reisebeschr., vol. ii,; Volney, Voyages ™® : Rescarches, ii. 506.

MAROT

MAROT, CLEMENT (1496-1544), one of the most agree- able if not one of the greatest poets of France, and a figure of all but the first importance in her literary history, was porn at Cahors, the capital of the province of Quercy, some time during the wiiter of the year 1496-97. He was, however, not @ southern by blood, at least by his father’s side, That father, Jean Marot, whose more correct name appears to have been Mares, Marais, or Marets, was 4 Norman of the neighbourhood of Caen. He was himself a poet of considerable merit, and held the post of eserapuain (apparently uniting the duties of poet laureate and historio- grapher) to Anne of

Britanny. He had however, ou what pusiness or in what capacity is not known, resided in Oahors for a considerable time, and was twice married there, his second wife, whose name is not known, being the mother of Clément. The boy was " brought into France "—it is his own expression, and is not unnoteworthy ag showing the strict sense in which that term was still nsed at the beginning of the 16th century—in 1506, and he appears to have been educated at the university of Paris, and to have then begun the study of the law. But, whereas most other poets have had to cultivate poetry against their father's will, Jean Marot took great pains to instruct his son in the fashionable forms of versemaking, which indeed required not alittle instruction. It was the palmy time of the rhétoriquemrs, poets who combined stilted and pedantic language with an obstinate adherence to the allegorical manner of the 15th century and to the most complicated and artificial forms of the Ballade and the Hondeau. Clément himself practised with diligence this poetry (which he was to do more than any otlier man to over- throw), and le has left panegyrics of its coryphexus Guillaume Crétin, the unfortunate suggester of the Ramina- -grobis of Rabelais. Nor did he long continue cven a nominal devotion to law. He became page to a certain Messire de Neuville, and this opened to him the road of court life. Besides this, his father's interest must have been not inconsiderable, and the house of Valois, which was about to hold the throne of France for the greater part of a century, was devoted to letters. As early as 1514, before the accession of Francis 1, Clément presented to him his Judgment of Minos, and shortly afterwards he was either styled or styled himself facteur (poet) de la reine to Queen Claude. In 1519 he was attached to the suite of Marguerite d'Angouléme, the king's sister, who was for many years to be the mainstay not only of him but of almost all French men of letters. In 1524 he drew 95 livres annually from her as a pension, and he had a post in the household of her husband the Duc d'Alengon. It is certain that Marot, like most of Marguerite's literary court, and perhaps more than most of them, was greatly attracted by her gracious ways, her unfailing kindness, and her admirable intellectual accomplishments, but there is not the slightest ground for thinking that his attachment was other than platonic. Indeed the most famous passage of his poems which relates to the future queen, in which he describes her "sweet refusal with a sweeter smile," is tolerably devisive on the point. It is, however, evident that at this time either sentiment or matured critical judgment effected a great change in his style,

a change which was wholly for the better. At the same time he celebrates a certain Diane, whom it has been sought to identify with Diane de Poitiers. There is nothing to Support this idea and much against it, for it was an almost invariable habit of the poets of the 16th century, when the me whom they celebrated were flesh and blood at all (which was not always the case), to celebrate them under pseudonyms. In the same year 1524, Marot accompanied

rancis on his disastrous Italian campaign. He was wounded and taken at Pavia, but soon released, and he was

back again at Paris by the beginning of 1525. His luck had, however, turned. Marguerite for intellectual reasons, and her brother for political, had hitherto favoured the double movementof Aufkldrung, partly humanist, partly Reforming, which distinguished the beginuing of the century. For- midable opposition to both forms of innovation, however, now began to be manifested, and Marot, who was at no time particularly prudent, was arrested on a charge of heresy and lodged in the Chatelet, February 1526, But this was only a foretaste of the coming trouble, and a friendly prelate, acting for Marguerite, extricated him from his durance before Easter. The imprisonment gave him occasion to write a vigorous poem on it entitled Lnfer, which was afterwards imitated by his luckless friend Dolet. His father died about this time, and Marot seems to have been appointed to the place which Jean had latterly enjoycd, that of valet de chambre to the king. He was certainly a mem- ber of the royal household in 1528, with a stipend of 250 livres, besides which he had inherited property in Quercy. In 1530, probably, he married. Next year he was again in trouble for heresy, and was again rescued ; this time the king and queen of Navarre seem to have bailed him them- selves. In 1532 he published, under the title of Adoles- cence Clémentine, a title the characteristic grace of which excuses its slight savour of affectation, the first printed col- lection of his works, which was very popular, and was fre- quently reprinted with additions. Dolet's edition of 1538 is believed to be the most authoritative. Unfortunately, however, the poet's enemies were by no means discouraged by their previous ill success, and the political situation was very unfavourable to the Reforming party. In

1535 Marot was again summoned to appear on the charge of heresy, and this time he was advised or thought it best to fly. He passed through Béarn, and tlien made his way to Renée of Ferrara, a supporter of the French Reformers as steadfast as her auut Marguerite, and even more efficacious, because her dominions were out of France. At Ferrara he wrote a good deal, his work there including his celebrated Blasons (adescriptive poem, improved upon nicdieval models), which set all the verse writers of France imitating them. But the duchess Renée was not able to persuade her husband, Ercole d'Este, to share her views, and Marot had to quit the city. He then went to Venice, but before very long obtained per- mission to return to France. Francis himself, though a fickle and unsafe patron, was attached to him, and in 1539 gave him a house and grounds in the suburbs. It was at this time that his famous translations of the Psalms appeared. 'The merit of these has been sometimes denied, owing apparently to the absurd partiality which seems il the case of some critics to make it impossible for the reader to appreciate the manner of a work to the matter of whicli he is opposed on political or religious grounds. It is, how- ever, considerable, and the powerful influence which the book exercised on contemporaries is not denied by any one. The great persons of the court chose different pieces, caclt as his or her favourite. They were sung in court and city, and they are said, with exaggeration doubtless, but still with a basis of truth, to have done more than anything else to advance the cause of the Reformation in France. Indecd the vernacular prose translations of the Scriptures were in that country of little merit or power, and the form of poetry was still preferred to prose, even for the most incongruous subjects. At the same time Marot engaged ina curious literary quarrel characteristic of the time, with a bad poet named Sagon. Half the verse writers of France ranged themselvcs among the Marotiques or the Sagontiques, and

'a great deal of versified abuse was exchanged. The victory,

as far as wit was concerned, naturally rested with Marot, but his biographers are probably not fanciful in supposing that a certain amount of odium was created against him by

the squabble, and that, as in Dolet's case, his subsequent misfortunes were not altogether unconnected with a too little governed tongue and pen. Although on his last return into France he had formally abjured his errors, the publication of the Psalms gave the Sorbonne a handle, and the book was condemned by that body. In 1543 it was evident that he could not rely on the protection of Francis, who was probably too selfish in any case to have given him inconvenient help, and who, like many of his family, was disposed to compound with the church for a libertine life by ceremonial devotion and by sacrificing heretics liberally. Marot accordingly fled to Geneva; but the stars were now decidedly against him. He had, like most of his friends, been at least as much of a freethinker as of a Protestant, and, notwithstanding the immense service he had done to the cause by the publication of his Psalms, this was fatal to his reputation in the austere city of Calvin. He had again to fly, and made his way into Piedmont, where he seems to have enjoyed a sort of left-handed protection from Francis, who then held it. But the harassing effect of these constant persecutions, assisted very likely by the careless living which was but too common at the time, proved too much for him, and he died at Turin in the autumn of 1544, aged barely forty-eight.

In character Marot seems to have been a typical Frenchman of the old stamp, cheerful, good humoured, and amiable enough, but probably not very much disposed to elaborately moral life and con- versation or to serious reflexion, He has sometimes been charged, though on no very definite grounds, with a want of independence of character, and his attitude towards his patrons was certainly not that of almost haughty equality which Ronsard brought in ; but it is fair to remember that Marot bclonged almost as much to the Middlc Ages as to the Renaissance, and that in the Middle Ages men of letters naturally attached themselves as dependants to the great. Such scanty knowledge as we have of his relations with his equals is favourable to him. He certainly at one time quarrelled with Dolct, or at least wrote a violent cpigram against him, for which there is no known cause. But, as Dolet quarrelled with almost every friend he ever had, and in two or three cases played them the shabbiest of tricks, the presumption is not against Marot in this matter. Whatever may have becn Marot's personal weaknesses, his importance in the history of French literature is very great, and it is wont nowadays to be rather under- than over-valued. Coming

immediately before a great literary reform—that of the Pléiade—Marot suffered the drawbacks of his position ; he was both eclipsed and decried by the partakers in that reform. In the reaction against the Pléiadc he recovered honour ; but its restoration to virtual favour, a perfectly just restoration, has again unjustly depressed him. Yet Marot is in no sense one of those writers of transition who are rightly obscured by those who come after them. Ife himself was a reformer, and a reformer on perfectly independent lincs, besides which it may be said that he carried his own reform as far as it would go. It has been said that his carly work was eouched in the rhétoriqgueur style, the distinguishing charactcristics of which are elaborate metre and rhyme, allegoric matter, and pedantic language. In his second stage he entirely emancipated himself from this, and became one of the easiest, least affected, and most vernacular poets of France. In these points indced he has, with the exception of La Fontaine, no rival, and the lighter verse writers ever since have taken one or the other or both as model. In his third period he lost a little of this flowing grace and ease, but acquired something in stateliness, while he certainly lost nothing in wit. It is beyond question that Marot is the first poet who strikes readers of French as being distinctively modern. He is not so great a poct as Villon nor as some of his successors of the Pléiade, but he is much less antiquated than the first (whose works, as well as the Roman de la Rose, it may be well to mention that he edited) and not so elaborately artificial as the second. Indeed, ifthere be a fault to find with Marot, it is undoubtedly that in his gallant and succcss- ful effort to break up, supple, and liquefy the stiff forms‘and stiffer language of the 15th century, he made his poetry almost too ver- nacular and pedestrian. In his hands, and while the style Marotique was supreme, French poetry ran some risk of finding itself unequal to anything but graceful vers de société. But it is only fair to remember that for a century and more its best achievements, with rare exceptions, had been vers de société which were not graceful.

There is a very cheap, handsome, and useful edition of Marot by Jannet and liéricault, 4 vols., Paris, 1873; but M. Georges Guiffrey is slowly producing a costly and splendid work, containing a vast quantity of unpublished matter, which will undoubtedly be the standard. This work contains much biographical detail,

which, however, as being still incomplete, is not available to modify former accounts, (G. SA.)

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MARQUESAS ISLANDS, or MenpaXa Tstanpg | (French, Les Marquises), an archipelago of twelve islands — lying between 7° 50’ and 10° 35’ S. lat., and 138° 30’ and 140° 50’ W. long. They extend over 200 miles from§,B. to N.W., and have a total area of 489 square miles. The lower or true Marquesas group consists of the islands Fatouhiya

or Magdalena, Motane or San Pedro, Tahouata or Sta |

Christina, and Hivaoa or Dominica, the last with a coast. line of more than 60 miles. With these is often included the rocky islet of Fetohougo or Hood's, lying in mid- channel to the north of Hivaoa. The north-western or Washington group is formed of seven islands, the four largest being Roa-Poua or Adams, Houahouna or Washington, Noukahiva or Marchand (70 miles in circum. ference), and Hiaou. Along the centre of each island is a ridge of mountains, sometimes attaining an altitude7of 3500 feet, whence rugged spurs forming deep valleys stretch towards the sea. The volcanic origin of the whole archipelago is proved by the principal rocks being of basalt, trachyte, and lava. Except on a few barren peaks the islands are clothed with verdure, and in the valleys, which are well watered with streams and brooks, the vegetation is luxuriant. The flora includes over four hundred known species, many of them identical with those belonging to the Society Islands. The vegetable products comprise bananas, bread-fruit, yams, plantains, wild cotton, bamboos, sugar-cane, cocoa-nut and dwarf palms, and several kinds of timber trees. The land fauna is, however, very poor: there are few mammals with the exception of dogs, rats, and pigs ; and amphibia and insects are also generally scarce. Of twenty species of birds more than half belong to the sea, where animal life is as abundant as at other subtropical Polynesian groups.

The climate of the Marquesas, although hot and humid, is not unhealthy. During the greater part of the year moderate easterly trade winds prevail, and at the larger islands there are often both land and sea breezes; the rainy season, accompanied by variable winds, sets in at the end of November, and lasts for about six months. During this period the thermometer varies from 84° to 91° F; in the dry season its average range is from 77° to 86°.

The inhabitants, a native Polynesian race, have in many respects a great affinity to the Tahitians, but excel them in symmetry of form. They live chiefly on bread-fruit, vegetables, and fish, almost entirely neglect agriculture, but rear hogs and fowls in great numbers. They exchange live stock, timber, vegetables, fruit, and fresh water with traders for iron utensils, firearms, gunpowder, cloth, tobacco, and brandy. They are polite in

their intercourse with strangers, susceptible and courageous, but at the same time excitable, revengeful, addicted to stealing, lazy, and immoral. The efforts of missionaries, whether Protestant or Roman Catholic, have hitherto proved of little avail either in converting them to Christianity or in improving their moral and social condition. At the commence- ment of the present century the population exceeded 20,000, but since then petty warfarc, infectious maladies, and various other causes have greatly reduced its number ; and on the 31st December 1876 it reached only

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In 1842 the Marquesas archipelago was formally taken possession of for France by Captain Du Petit-Thouars; and the French still maintain a nominal protectorate . the islands, with a resident and a small garmson 4 Noukahiva. Since 1861, however, French colonizatiou

has been virtually abandoned. ob

The Marquesas Islands were first discovered 21st July 15 – y Alvaro Mendafia, who, however, only knew of the south-east ar to which he gave the name of Marquesas de Mendoza, a the viccroy of Peru. Cook, pursuing the same track, Pate north this group, with the addition of Fetohougo, in 1774, tne

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-Jonds were first sighted by Ingraham the American in 1791, wae subsequently visited by Marchand (1791) and Hergest

(1792). ‘A more extensive investigation of the archipelago was

ade by Krusenstern in 1804. Of later navigators to the Marquesas thé most noteworthy are Stewart (1829), Bennett (1835), and D’Urville (1838), and, since the date of the French occupation, Dumoulin, Jouan, and above all Jardin.

See C. E. Meinicke, Die Inseln des stillen Oceans, Leipsic, 1875-76 ; Tableau de pop., &e., des col. frang. for 1877.

MARQUETRY. See Furniture.

MARQUETTE, a city and port of entry of the United States, and the county seat of Marquette county, Michigan, lies on @ bluff about 25 feet above a bay of Lake Superior, and is a terminus of the Marquette, Houghton, and Onton- agon, and the Detroit, Mackinac, and Marquette Railroads. Though the population of the city was only 4690 in 1880, Marquette is a place of importance as the chief shipping port for the great iron-ore region of western Michigan 787,150 tons shipped in 1881), and contains a number of blast furnaces, foundries, machine-shops, and powder- mills, while at the same time it has a reputation as a resort for invalids and tourists. A Roman Catholic cathe- dral, convent, and orphan asylum are among the public buildings.

MARQUETTE, Jacques, a Jesuit missionary and explorer, was born in 1637 at Laon in France, and died May 18, 1675, on the banks of a small stream, now known as the Marquette, which has its mouth on the eastern shore of Lake Michigan. Having joined the Society of Jesus, he sailed for Canada in 1666, spent eighteen months in the vicinity of Three Rivers, founded the mission of Sault Sainte Marie on Lake Superior in 1668, and followed the Hurons to Mackinaw in 1671. It is mainly, however, as Joliet's companion in his voyage down the Mississippi in 1673 that Marquette holds a permanent position in the history of discovery in' America.

His narrative, first published in Thevenot's Reeweil de Voyages (Paris, 1681), is printed along with other documents relating to him in Shea's Discoveryand Exploration of the Mississippi Valley (New York, 1852).

MARQUIS, or Marquess, a title and rank of nobility, the second in the ordcr of the British peerage, and there- fore next to duke. The first marquis in England was Robert de Vere, the ninth earl of Oxford, who by Richard IL, lst December 1385, was created marquis of Dublin. On the 13th of October following the patent of this marquisate was recalled, Robert de Vere then having been raised to a dukedom. John de Beaufort, the second legitimate son of John of Gaunt, was created to the second marquisate as marquis of

Dorset, 29th September 1397. From that period this dignity appears to have been dormant till the reign of . Henry VL, when it was revived, and thenceforward it maintained its place in the British peerage.

marquis is "' most honourable," and is styled "my lord marquis." His wife, who also is "most honourable," is a marchioness, and 1s styled "my lady marchioness." The coronet is a citclet of gold on which rest four leaves and as many large pearls, all of them of equal height and connected. The ree and lining, if worn, are the same as in the other coronets. ies : which in representations displays one central a ce two pearls and two half-leaves, when without cap of te 1s shown in the annexed woodcut. The mantle

parament is scarlet, and has three and. a half doublings of ermine,

MARRIAGE, Law or.1 Marriage may be defined here

as the act, ceremony, or process by which the legal rclation- ee ee ee

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See also Huspand anp WIPE and Divorce,

ship of husband and wife is constituted. In most if not all legal systems it takes the form of a contract—the mutual assent of the parties being the prominent and indis- pensable feature of the ceremony. Whether it is really a contract or not,and if so to what class of contracts it belongs, are questions which have been much discussed, but into which it is not necessary to enter. While the consent of parties is universally deemed one of the con- ditions of a legal marriage, all the incidents of the relation- ship constituted by the act are absolutely fixed by law. In the United States it has been expressly decided that marriage is not a contract within the meaning of the constitutional law, which prohibits state enactments "impairing the obligation of contracts." Mr Bishop, however, in his very valuable book on Marriage and Divorce, suggests that a State law permitting the status of

marriage to be created without the consent of both parties would not be constitutional; but that is a difficulty arising out of the peculiar relation of the States to the Union. 'The question whether marriage is merely a contract or more than a contract, whether a purely civil or also a religious act, belongs to a similar order of inquiries. The jurist has only to deal with marriage in so far as it creates the legal status of husband and wife. It should be added that, while marriage is generally spoken of by lawyers as a contract, its complete isolation from all other contracts is invariably recognized. Its peculiar position may be seen at once by comparing it with other contracts giving rise to continuous relationships with more or less indefinite obligations, like those of landlord and tenant, master and scrvant, &c. In these the parties may in general make their rights and duties what they please, the law only intervening when they are silent. In marriage every resulting right and duty is fixed by the law."

Roman Law.—The three primitive modes of marriage were confarreatio, coemptio in manum, and usus, all of which had the effect of placing the woman in the " power" (manus) of her husband, and on the same footing as the children. The first was a religious ceremony before ten wituesses, in which an ox was sacrificed and a wheaten cake broken and divided between the spouses by the priest. Coemptio was a conveyance of the woman by mancipatio, and might be described as a fictitious sale per as et libram, like that employed in emancipation and _ testa- mentary disposition and other processes, Usus was the acquisition of the wife by prescription, through her cohabit- ing with the husband for one year without having been absent from his house three continuous nights. But a true marriage might be concluded without adopting any of these modes, and they all fell into desuetude and with them the subjection of the wife to the manus, Marriage without manus was contracted by the interchange of con- scnt, without writing or formality of any kind. By some jurists it is regarded as incomplete until consummated by delivery of the woman, and is accordingly referred to the class of real contracts. The restrictions as to age, relation- ship by consanguinity and affinity, previous marriage, &c., were in the main those which have continued to prevail in modern Europe with one important exception. 'The consent of the paterfamilias to the marriage of the children under his power was essential.

In the Canon Law, which is related on the one hand to the civil law, on the other to the modern matrimonial law of Europe, although marriage was not merely a contract but a sacrament, the validity of marriages by consent was nevertheless admitted. "When the natural and civil contract was formed," says Lord Stowell, "it had the full ~ 2A. full eollection of juridical opinion as to the legal character

of marriage is to be found in Lord Fraser's Husband and Wife, vol. i, chap. ii.

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essence of matrimony without the intervention of a priest. It had even in that state the character of a sacrament, for it is a misapprehension to suppose that this intervention was required as a matter of necessity even for that purpose before the council of Trent."!

England.—Marriage may be the subject of an ordinary contract on which an action may be brought by either party. It is not necessary that the promise should be in writing, or that any particular time should benamed. The parties were formerly inadmissible as witnesses in this action; but they are now competent to give evidence, subject to the condition that the plaintiff shall not recover "unless his or her testimony shall be corroborated by some other material evidence" (32 & 33 Vict. c. 68). The ordinary defences, ¢.g., fraud, discharge, minority, are available in these actions, and there are also special defences arising from the nature of the contract, such as the bad character of the plaintiff, the relationship of the parties within the prohibited degrees, &c. Promises to marry are not within the nieaning of "agreement made in consideration of marriage" in the statute of frauds, which requires such agreements to be in writing. Contracts in restraint of marriage, t.¢., whose object is to prevent a person from narrying anybody whatever, are void, as are also contracts undertaking for reward to procure a marriage between two persons. These latter are termed marriage brocage contracts.

Any man and woman are capable of marrying, subject to certain disabilities, some of which are said to be canonical as having been formerly under the cognizance of the ecclesiastical courts, others civil. The effect of

a canonical disability as such was to make the marriage not void but voidable. The marriage must be set aside by regular process, and sentence pronounced during the life- time of the parties. Natural inability at the time of the marriage to procreate children is a canonical disability. So was proximity of relationship within the prohibited degrees, which has been made an absolute avoidance of marriage by 5 & 6 Will. IV. c. 54. A pre-engagement to another person was at one time recognized as a canonical disability. Civil disabilities are (1) the fact that either party is already married and has a spouse still living ;? (2) the fact that either party is a person of unsound mind ; (3) want of full age, which for this purpose is fixed at the age of puberty as defined in the Roman law, viz., four- teen for males and twelve for females ; (4) proximity of relationship within the prohibited degrees, already alluded to. The statute which lawyers regard as establishing the rule on this last point is the 32 Henry VIII. c. 38 (repealed in part by 2 & 3 Edw. VI. c. 23, in whole by1 & 2 P. and M. c. 8, but revived by 1 Eliz. c. 1, and so_left as under the Act of Edward), which enacts that "no prohibition, God's law except, shall trouble or impeach any marriage without the Levitical degrees." The forbidden marriages, as more particularly specified in previous statutes, are those between persons in the ascending and descending line zm injinitum, and those between collaterals to the third degree inclusive, according to the computation of the civil law, which reckons from one of the persons related to the common stock and so down tothe other person. The prohibitions extend not only to consanguine: (related by blood) but to affines (related by marriage). A man may neither marry his sister nor his deceased wife's sister, for both are related*

1 Some restrictions on marriage peculiar to the canon law are noticed at the end of this article.

2 A divorce nist does not enable the parties to marry until it is made absolute.

a A marriage in which either of the parties is below the age of con- sent is, however, said to be not absolutely void ; if the parties agree to continue together at the age of consent no new marriage is necessary, but either of them may disagree and avoid the marriage.

MARRIAGE

to him in the second degree ; nor his sister's daughter nor his deceased wife's sister's daughter, for both are in the third degree ; but he may marry his first cousin, for she is in the fourth degree. Consanguinei of either spouse are related by affinity to the other; but the consanguinei of the one are not necessarily related to the consanguiner of the other. Hence two brothers may marry two sisters or a father and son a mother and daughter. A husband is not related to the affines of his wife, and so a man may marry the widow of his deceased wife's brother. The rule as to collaterals includes those related by the half blood and bastards (see Stephen's Commentaries, book iii. c. 9), Other disabilities previously admitted were abolished by the statute of Henry. The Act of 5 & 6 Will. IV. c 54 enacted that 'all marriages which shall hereafter be celebrated between persons within the prohibited degrees of consanguinity or affinity shall be absolutely null and void to all intents and purposes whatsoever." They had previously, as already stated, been only voidable. The Act at the same time legalized marriages within the prohibited degrees of affinity (but not consanguinity) actually celebrated before the 31st August 1835.

The celebration of marriages is now regulated wholly by statutory

'legislation. The most important Acts now in force are the 4 Geo. IV.

ce. 76 andthe 6 & 7 William IV. c. 85.4 The former regulates marriages within the Church of England, but was intended to be of universal application, Jews and Quakers only being excepted by section 81. It requires eitler the previous publication of banns, or a licence from the proper ecclesiastical authority. As to banns, the rule of the rubric, so far as not altered by the statute, is re- quired to be observed. They must be published on three successive Sundays at morning service after the second lesson, in the church of the parish in which the parties dwell ; the bishop may, however, authorize the publication of banns ina public chapel. Seven days' notice must be given to the clergyman of the names of the parties, their place of abode, and the time during which they have lived there. If either party is under age, the dissent of the parents or guardians expressed at the time of publication of banns renders such publication null and void. Licence in lieu of banns may only be granted by the archbishop, bishop, or other authority, for the solemnization of a marriage within the church of the

parish in which one of the parties shall have resided for fifteen days before. Before a licence cau be granted an oath must be taken as to the fact of residence and that the necessary consent has been obtained in the case of persons under age. The father, or lawful guardian, or mother if unmarried, or guardian appointed by the court, is each in order of substitution the proper person to consent to the marriage of a minor, and the place of any such person incapacitated mentally is taken by the lord chancellor. The absence of such consent does not, however, avoid a marriage once solemnized. But if persons wilfully intermarry (unless by special licence) in a place not being a church or public chapel, or without due publication of banns or proper licence, or before a person not in holy orders, the marriage is null and void to all purposes. Marriage must be celebrated with- in three months after banns or licence, and between the hours of eight and twelve in the morning. :

For the relief of the great body of dissenters the Act 6 & 7 Will. IV. c. 85 was passed. It permits marriage to be solemnized in two additional ways,—viz. (1) by certificate of the superintendent regis trar of a district without licence, and (2) by such certificate oe licence. In the first case, notice must be given to the registrar 0 the district or districts within which the parties have resided for seven days previous, which notice is inscribed in 2 i book, open to public inspection at all reasonable times, an -. after suspended for twenty-one days in some conspicuous P fein. the registrar's office. The notice must be accompanied by a ee : ration as to the absence of impediments, necessary ie a Any person whose consent is necessary to an ecclesia ai may forbid the issue of a certificate, but in default of such p ee bition the certificate will issue at the end of the twenty-one : The marriage may then take place on any day within three ai ia 4 of the entry of notice, and in one of the following mie =e Sot certified place of religious worship, registered for the so een a of marriage ; in that case a registrar of the district wit ee icl nesses must be present, and the ceremony must include a sii declaration of assent by the parties and a disavowal of, gs a ment; (2) at the superintendent registrars office, wit

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4 A complete list of the acts regulating the seen ee iv or confirming marriages which through some defect mig be found in Phillimore's Ecclesiastical Law, vol. 1.

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MARRIAGE

declaration, but with no religious service ; (3) in a church according to the usual form, the consent of the minister thereof having been

reviously obtained ; (4) according to the usages of Jews and Buakers. The place of marriage in all cases must have been speci- fied in the notice and certificate. ; ;

In the second case, when it is desired to proceed by licence, notice must be given to the registrar of the district in which one of the persons resides, together with a declaration that he or she has resided for fifteen days therein, that there is no impediment, and that the necessary consents if any have been obtained. The notice ig not exhibited in the registrar's office, and the certificate may be obtained at the expiration of one whole day after entry, together with the licence. No registrar's licence can be granted for a marriage in church or according to the forms of the Church of Eng- Jand,— the ecclesiastical authorities rctaining their monopoly in that respect. Itis also provided that in the case of persons wilfully intermarrying in a place other than that mentioned in the notice and certificate, or without notice or certificate, &c., the marriage shall be null and void. And, as under the former Marriage Act of Geo. IV., a valid marriage between persons one of whom is under age, brought about by fraud or false oath, subjects the offending party toa forfeiture of all property that otherwise might accrue to him from the marriage, a like penalty is provided in like cases under the later Act.

It will be observed that the various rules as to consent of parents, &c., to the marriages of minors are regulations of procedure only. The absence of

tlie necessary consent is nota disability invali- dating a marriage actually solemnized.

The Act 26 Geo. II. c. 38, commonly known as Lord Hardwicke's Act, which forbids the solemnization of marriage without banns or licence, also enacts that "in no case whatsocver shall any suit or proceeding be had in any ecclesiastical court in order to compel a celebration in facie ceclesiw, by reason of any contract of matrimony whatsoever whether per verba de presenti or per verba de futuro." Blackstone observes that previous to this Act " any contract madc per verba de presentt, or in words of the present tense, and in case of cohabitation yer verba de futuro also, was deemed valid marriage to many purposes; and the partics might be compelled in the spiritual courts to celebrate it in facie eeclesiv." In his celebrated judgment in the case of Dalrymple v. Dalrymple, which turned on the effect of promises exchanged between the parties in Scotland, Lord Stowell laid it down "as the basis of the canon law, the known basis of the matrimonial law of Europe," that "in the irregular marriage, 1.¢., sponsalia per verba de presenti, everything was presumed to be complete and consummated in substance but not in ceremony; and the ceremony was enjoined to be undergone as a matter of order. In the sponsalia de futuro nothing was presumed to be complete or consummated either in substance or in ceremony, but if the parties who had exchanged the promise had carnal intercourse with each other the effect was to convert the engagement into an irregular marriage." Onthe other hand, in the case of the Queen v. Millis in the House of Lords on appeal from the Irish Queen's Bench, the position of Lord Stowell was strongly criticized. Lord Lyndhurst's conclusion was that, "although a marriage contracted per verba de presentr was indissoluble, though it could not be released even by the mutual consent of the parties, though either of them might en- force it and compel solemnization, thongh it had the effect of ren- dering voidable a subsequent marriage solemnized in facte ecelesiz, even after the cohabitation and birth of children, thongh it was considered to be of the essence and substance of matrimony—yet by the law of England it did not confer those rights of property or the More Important right of legitimacy consequent on a marriage duly solemnized according to the rites of the church." The lords were equally divided in their decision, and the question has since been agitated not so much with reference to England, where after

the Act of Geo. II. it had a merely historical interest, as to the colonies and the United States (see below), where the common law of Eng- land prevails unless changed by legislation. Dr Lushington in the case of a marriage in New South Wales declared that, when there has been a "fact of consent between two parties to become man and wife," such is 'sufficient marriage to enable me to pronounce when necessary a decree of separation." In the cases noticed the promises had been exchanged before ministers of religion not technically

in holy orders," and the question has accordingly sometimes been ag the form whether, according to the common law, the inter-

eal ae clergyman was necessary to a valid marriage. | The i oe ges in England have been subject to special laws. – oyal Marriage Act of 1772 (12 Geo. III. c. 11), passed in msequence of the marriages of the dukes of Cumberland and ee enacted that "'no descendant of his late majesty George ine a than the issue of princesses married or who may marry within ign families) shall be capable of contracting matrimony coal the Peer lous consent of his majesty, his heirs and suc- of Cae a ed under the great seal. But in case any descendant conse -» being above twenty-five years old, shall persist to atten a marriage disapproved of by his majesty, such descendant, giving twelve months' notice to the privy council, may con-

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tract such marriage, and the same may be duly solemnized without the consent of his majesty, &c., and shall be good except both Houses of Parliament shall declare their disapprobation thereto."

Scotland.—The chief point of distinction, as compared with English law, is the recognition of irregular marriages above noticed. (1) '" A public or regular marriage," says Fraser, "is one celebrated, after due proclamation of banns, by a minister of religion; and it may be celebrated either in a church or in a private house, and on any day of the week at any hour of the day." The ministers of the national church at first alone could perform the ceremony; but the privilege was extended to Episcopalians by 10 Anne c. 7, and to other ministers by 4 & 5 Will IV. c. 28 (2) A marriage may also "be constituted by declarations made by the man and the woman that they

presently do take each other for husband and wife." These declarations "'may be emitted on any day at any time and without the presence of witnesses," and either by writing or orally or by signs, and in any form which is clearly expressive of intention. Such a marriage is as effectual to all intents and purposes as a public marriage. 'The children of it would be legitimate ; and the parties to it would have all the rights in the property of each other, given by the law of Scotland to husband and wife. (3) A promise followed by copula does not, according to Fraser, constitute marriage, unless followed either by solemnization in fucte ecclesix or declarator. On the other hand, in Lorimer's Handbook it is urged that the promise and copula are mere tokens of consent recognized by the law, and that "the date of the marriage is the date of the copula." However this may be, Lord Moncreifi's opinion in the case of Brown v. Burns is admitted on both sides to be good law, viz., that declarator is essential to the constitution of a marriage of this kind, so that, if no such declarator be brought in the lifetime of both parties, the marriage can never be established afterwards. The copula is presumed to have reference to the promise, but evidence may be adduced to show that such was not the case.

By 19 & 20 Vict. c. 96, it is enacted that no irregular marriage shall be valid in Scotland, unless one of the parties has lived in Scotland for the twenty-one days next preceding the marriage, or has his or her usual residence there at the time.

"Habit and repute" has sometimes been spoken of as constituting marriage in the law of Scotland, but it is more correctly described as evidence from which marriage may beinferred. The repute must be the general, constant, and unvarying belief of friends and neighbours, not merely the controverted opinion of a section of them. The co- habitation must be in Scotland, but in one case proof of cohabitation in another country was allowed, as tending to throw light on the nature of the cohabitation in Scot- land.

The consent of parents is not necessary to the validity of the marriage, even of minors, but marriage under tho age of puberty with or without such consent is void.

United States.—The absence of ecclesiastical courts has suggested difficulties as to the extent to which the law of England on this subject

continued to prevail after the revolution. Bishop holds it to be the universal fact running through all the cases that everywhere in the country the English decisions on marriage and divorce are referred to with the same apparent deference which is shown on other subjects to the decisions of the English common law and equity tribunals. The same author observes that "all our marriage and divorce laws, and of course all our statutes on the subject, in so far as they pertain to localities embraced within the limits of particular States, are State lays and State statutes, the national power with us not having legislative or judicial cognizance

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of the matter within those localities." Some of the States have extended the ages below which marriage cannot take place. 'The common law of the States is assumed to be that "a contract per verba de presenti, or per verba de futuro cum copula, constitutes a complete marriage." Conditions, however, may be imposed by the various State legislatures, and as to these the rule has established itself in American jurisprudence that "a marriage good at common law is good notwithstanding the existence of any statute on the subject, unless the statute contains express words of. nullity." Thus in Pennsylvania, where a statute provided that all marriages "should be solemnized before twelve witnesses," marriages not so celebrated were nevertheless held to be good. In New Hampshire justices and ministers of the gospel are authorized to solemnize marriage, and all other persons are forbidden to do so under penalties; yet a marriage by consent, as at common law, without justice or minister, has been held valid. On the other hand, under a very similar statute in Massacliusetts, it was held that "parties could not solemnize their own marriage," and that a marriage by mutual agreement, not in accordance with the statute, was void. Bishop regards this as an isolated exception to the general course of the decisions. So when State legislation requires any particular form to be used the want thereof only invalidates the act if the statute expressly so enacts. Many of the State codes inflict penalties on ministers or justices for celebrating the marriage of minors without the consent of the parents or guardians, The original law as to prohibited degrees has been considerably modified in the States. The prohibition of marriage with a deceased wife's sister is said by Bishop to be all but unknown in the United States, Virginia apparently

being the only one where it is still retained. Some Writers apply the term legislative marriages to cases in which the State by enactment confirms a marriage which was void for some defect. Questions sometimes arise as to whether such enactments are within the constitution of the State.

France.—Articles 144-226 of the Code Napoldon prescribe the qualifications and conditions of marriage. The man must be cightcen and the woman fifteen years of age. Ason under twenty- five, and a daughter under twenty-one, cannot marry without eonsent of the father and mother, or of the father only if they disagree, or of the survivor if one be dead. If both are dead grand- father and grandmother take their place. A man after twenty-five and a woman after twenty-one are still bound formally to ask the consent of their parents; until the age of thirty and twenty-five respectively this request must be repeated twice, and after the third application parties are at liberty to marry without such consent. Even after the age of thirty, formal notice must be served on the parents or grandparents one month before marriage. If neither parents nor grandparents be alive, parties under twenty-one require the consent of the family council. These rules apply to natural children when affiliated ; those not affiliated require the consent of a specially appointed guardian. Marriage is prohibited between all ascendants and descendants in the direct line, and between persons related by marriage in the same line, between brother and sister, between uncle and niece, and brother-in-law and sister-in- law.

Before the solemnization of marriage banns are required to be published on two distinct Sundays, containing the names, occupa- tions, and domiciles of the parties and their parents. The marriage cannot take place until three days after the second publication, and if a year is allowed to elapse fresh banns must be put up. On the day appointed by the parties, and in the parish to which one of them belongs, the marriage is celebrated by the eivil officer or registrar reading over to them the various necessary documents, with the chapter of the code relating to husband and wife, receiving from cach a declaration that they take each other for husband and wife, and drawing up the act of marriage. All this has to be done in the presence of four witnesses.

Marriages contracted abroad between French subjects or between French subjects and foreigners are valid in Franee if celebrated according to the forms of the foreign law, provided the French con- ditions as to banns and consent of parents have been observed.

International Law.—In the "conflict of laws" on the subject of marriage, it has been well settled that the Jew loct governs. If the

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marriage is valid by the law of the country where it is celebrated it is recognized as valid everywhere; if invalid there it is invalid everywhere, "This rule," says Story, "has received the' most deliberate sanction of the English and Amcrican courts and of foreign jurists." The most prominent, if not the only known excel Story considers to be marriages (1) involving incest or polygamy S (2) forbidden by the public law of a country from motives of polic and (8) marriages celebrated in a foreign country under aren stances which impose on the parties the law of their own country Westlake (Private International Law, chap. iv.) lays it down as in. dispensable to the validity of a marriage that the lea loct should be satisfied in respect of forms, consent of parcnts and guardians, and capacity of the parties. The law of the parties' domicile should also be satisfied as to eapacity unless when it imposes incapacity of a penal nature unknown to the lex loci. Story, in reference to the first of the three exceptions alluded to above, attempted to set upa elear and just moral difference between marriages that are incestuous by the law of nature and those that are so by the municipal law of particular States only, with more particular reference to consan- guinity and affinity. "It would be a strong point to put that a marriage perfectly valid between a man and the sister of his former deceased wife in New England would be held invalid in Virginia or England, even though the parties formerly belonged to or were born in the latter country or State. But, as to persons not so belonging, it would be of the most dangerous consequence to suppose that the courts of either of them would assume the liberty to hold such marriage' a nullity merely because their own jurisprudence would not in a local celebration of marriage therein uphold it." This position has been expressly disavowed by the English courts, In Brook v. Brook it was held that an Englishman's

marriage with his deceased wife's sister during a residence in Denmark where the union is lawful is invalid in England. In Hyde v. Hyde in the English divorce court it was held that a marriage contracted in a country where polygamy is lawful between a man and a woman who profess a faith which allows polygamy is not a marriage as understood in Christendom ; and, although it was a valid marriage by the dea loci, and at the time when it was contracted both the man and the woman were single and competent to contract marriage, the court will not recognize it as a valid marriage in a matrimonial suit. The difference in the law of divorce in diffcrent countries produces many complications of thiskind. It appears that a divorce of an English marriage abroad for cause not recognized in England as ground for a divorce will be upheld in England if the parties were domiciled at the time of the divorce in the foreign state; otherwise not. Com- pare also the French rule as to marriages of F rench subjects in foreign countries. The too frequent consequence of these variances is that the same persons are held married in one country and unmarried in another, while their children are legitimate In one country and illegitimate in another. There is no subject in relation to which the establishment of a common code for all civilized nations is more urgently required.

Besides true marriage, with which we have been | exclusively dealing hitherto, inferior forms of union have from time to time been recognized, and may be briefty noticed here. These have all but disappeared from modern society, depending as they do on matu- monial restrictions now obsolete. poe

The institution of slavery is a fruitful source of this kind of debased matrimony. In Roman law no slave could contract marriage whether with another slave or a free person. The union of male and female slaves (coontuberntwm) was recognized for various purposes; a free woman entering into a union with a slave incurred | under the $.C. Claudianum the forfciture of her own liberty; but the bondwoman might be the concubine of a freeman. In the United States, where slavery was said to be regulated by the pun- ciple of the civil law, the marriage of slaves was So far eh that on emancipation eomplcte matrimony took effect an ' children became legitimate without any new ceremony. Such @ least is the purport of the more recent decisions. ie

In Roman law no legal marriage could be contracted unless the was connubiwm between the parties. Originally there was n® Ma nubium between plebs and patricians, and the privilege was ein : after a long struggle by the Lex Canuleia. In later ee e a and Peregrini were excluded from connubium except where t ie a i had been expressly conferred. The great matrimonial Bos early empire (Lex Julia et Papia Poppa) introduced 8 on depending on the condition of the parties which later ee idden extended and perpetuated. Senators under that law w a a lof to marry frecdwomen or women of inferior rank, and the Baar. a freedwoman becoming a. senator was set free from his 1 Eto In the canon law! new restrictions were developed. Person

1 The restrictions are enumerated in the following lines :— Error, Conditio, Votum, Cognatio, Crimen, ia Cultus Disparitas, Vis, Ordo, Ligamen, Honestas, AStas, Affinis, si Clandestinus et Impos, Raptave sit mulier nec parti reddita tute.

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1 themselves not to marry were deemed incapable of marrying. ae of the clergy were forbidden to marry. And dliggatity of faith was reeognized by the early church as a bar to matrimony, e.g. between Christians and pagans, and between orthodox and hereties (see Dictionary of Christian Antiquities, art. “ Marriage ”).

ConcuBINAGE, Which such restrictions tended to develop, is notieed under a separate heading (g.v.). It might be described as marriage Which has no consequences, or only slight and peculiar consequenees, in legal status. In the left-handed or “morganatic”?} marriages of the German royal families we have the nearest approach ever made by concubinage to true marriage, the ehildren being legitimate, but neither they nor the wife acquiring any right to the rank or fortune of the husband. Under the Royal Marriage Act in England a union of this kind has no matrimonial effect whatever.

Differences of religion are no longer regarded in Christian eountries as hindrances to marriage, except possibly in some branches of the Greek

Church. But the marriage of persons of different religions frequently requires the intervention of the law as to the faith of the children, more particularly in Kurope as between Catho- lics and Protestants. In some countries the clergy makc it a con- dition of such marriages that the children shall be educated in the Catholie faith. English law gives the father an indefeasible right to dictate the faith of his children, no matter what engagements he may have entered into (sce INFANT). The practice on this point varies in Europe—the question being ignored in French law, Germany following in some parts the same rule as England, in others giving effect to ante-nuptial stipulations. In Ireland mixed marmiages (%.¢., between Catholic and Protestant) were by 19 Geo. IJ. c. 18 null and void if celebrated by a Catholic priest. This Act is repealed by 38 & 84 Vict. e, 110, which permits mixed marriages to be validly celebrated by an Episcopalian or Roman Catholic clergyman, subject to conditions set forth in section 388. (KE. R.)

MARRYAT, FrepEerick (1792-1848), has never been surpassed as a writer of tales of nautical adventure. His own life supplied him with abundant raw materials for his art. The son of a wealthy London gentleman (who sat in parliament for several years for the boroughs of Horsham and Sandwich, and was a writer of verses and political pamphlets), he distingnished himself as a boy by frequently running away towards sea; and at last, at the age of fourteen, he was allowed to enter the navy. His first service was under Lord Cochrane in the famous "Impérieuse," and no midshipman ever had a livelier apprenticeship to thesea. '" The cruises of the 'Impérieuse' were," he says, "periods of continual excitement, from the hour in which she hove up her anchor till she dropped it again in port; the day that passed without a shot being fired in anger was with usa blauk day." During his two anda half years of service under the daring and active Cochrane, the young midshipman witnessed more than fifty engagements, many of them extremely brilliant, and had experience of every description of service, fighting duels with fairly matched ships of war, engaging gunboats, engaging batteries, storming forts, capturing and cutting out merchantmen. Before the general peace of 1815 he had added considerably to this experience of active service, and gained a wide knowledge of conditions of life on board ship under various commanders. He frequently received

honourable mention for his behaviour in action, and in 1818 he received the medal of the Humane Society for

at least a dozen" gallant rescues. He commanded with distinction in the Burmese war of 1824-25. And hae honours were not confined to gallant exploits ; 8 the inventor of a code of signals, obtained some celebrity as a caricaturist, and was elected an F.R.S. : i brought ripe experience and unimpaired vivacity a 's work when he commenced novelist. His first pro- duction was rank Mildmay, or the Naval Officer, published Ree eee

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*Mingo c so called because the wife's rights were limited to the wala Fi : (donum matutinale). The common law in Germany per- Praia a the royal houses and the higher nobility, and the law of bittigheit) € lower nobility also. Inequality of condition (Unebeu- rand ote not necessary to a marriage of this kind, which may be ution *n persons of equal rank, e.g., with the object of not pre-*

8 the children of a first marriage by allowing full rights to the

offspring of a secor : ; nd. A woman of high rank may make a morganatic alliance with @ man of inferior position, : y 8

in 1829, and his second, published nine months later, The Kings Own. "T think," Washington Irving wrote to him soon after, "the chivalry of the ocean quite a new region of fiction and romance, and to my taste one of the most captivating that could be explored." This was the general feeling. 'The freshness of the new field opened up to the imagination, so full of vivid lights and shadows, light- hearted fun, grinding hardship, stirring adventure, heroic action, warm friendships, bitter hatreds, was felt all the more keenly from its contrast with the world of the his- torical romancer and the fashionable novelist, to which the mind of the general reader was at that date given over. The novels of the sea captain at once won public favour. His first attempt was somewhat severely criticized from an artistic point of view. It was without form, though the reverse of void; he had packed into it matter enough for half a dozen novels. Marryat was accused also of gratify- ing private grudges by introducing real personages too

thinly disguised. He admitted the justice of these criticisms, and rapidly learnt the mechanical part of his new business without losing any of the vivacious charm of his style. The King's Own was a vast improvement, in point of construction, upon Wrank Mildmay ; and he went on, through a quick succession of tales, Vewton Vorster, Peter Simple, Jacob Faithful, The Pacha of Many Tales, Japhet in Search of a Father, Mr Midshipman Easy, The Pirate and the Three Cutters, till he reached his high- water mark of 'constructive skill in Snarley-yow, or the Dog Fiend (1837), If he never surpassed this in story- telling art, lmorous portraiture, and richness of incident, the records of circulating libraries and the pencilled com- ments of their subscribers show that his subsequent works —he produced twenty-four in all duriug his twenty years of authorship—were no less capable of riveting the atten- tion, especially of youthful readers. The following is the list, with the dates of publication:—7Zhe Phantom Ship (1839), A Diary in America (1839), Olla Podrida (1840), Poor Jack (1840), MMuasterman Ready (1841), Joseph Rushbrook (1841), Percival Keene (1842), Monsieur Violet (1842), The Settlers in Canada (1843), The Privateer's Man (1844), The Mission, or Scenes in Africa (1845), The Children of the New Forest (1847), The Lvttle Savage (1847), and Valerie, not completed by» Marryat (1849). Captain Marryat retired from the naval service in 1830, and thereafter worked as hard at literature as any profes- sional man of letters, making special historical and geo- graphical studies for several of the works in the above list. He edited the Metropolitan Magazine for four years (1832-36). Marryat's novels were in the first flush of their success when Dickens was a youth, and they have an interest in the history of literature as forming an im- portant link between Smollett and Fielding and the author of Sketches by Boz He died in 1848. 'There is a biography by his daughter, Florence Marryat.

MARS was a Roman deity whose name las passed into later literature as that of the war god. There grew in Rome a tendency, fostered by Greek influence, to consider Jupiter as the one great god, aud the other deities as repre- senting special sides of his character. Mars tlien was iden- tified with the Greek ARzs (g.v.), and was regarded as almost the same in nature with the warlike element in Jupiter as Feretrius and Triumphator. In the actual worship of the Romans Mars bears a very different character, which, however, lad almost disappeared from the mind of the people before

Augustus built in the Forum his temple to Mars Ultor, the avenger of the murder of Julius Cesar.

Father Mars, Marspiter, Maspiter, Mavors, or Maurs, was the great god of one of the races that composed the Roman state. He is the god of heaven, the giver of light, the opener of the new year ; he hurls the thunder and sends

the rain. In cases of drought the lapis manalis, which was kept in his temple on the Appian Way, was carried through the city by the pondzjices. The first month of the old Roman year was the month of Mars, still called March. On the first day the god had been born; and on the same day various annual ceremonies both political and religious took place; and the holy fire was renewed in the temple of Vesta. When Mamurius Veturius, ze, Mars of the Year (vetus, Greek Féros), was beaten out of the city on March 14, the intention was originally to symbolize the driving away of the old year. The spear sacred to Mars was in its original sense doubtless the lightning, and his sacred shield was, like the egis of Zeus and Athene, the storm shield, ¢.c., the thundercloud. The Sabine words Marmar and Mamers (akin to pappaipw) are evidently names of the heaven-god. The wolf which was sacred to Mars may be compared with the wolves of Zeus Lycaios, and the horse, the sacrifice of Mars, is the horse of the sun, which the Greeks also sacrificed to Helios.

As heaven-god and sender of rain, Mars is the giver of fertility and increase. Hence in some of the oldest cults he is the god of the land, of agriculture, and of the flocks. As he was powerful to send fertility, so he could cause also drought, sterility, and all evil ; and propitiatory ceremonies, such as the Ambarvalia, were consecrated to him. The Arval brothers invoked Mars to assist them and to avert pestilence. In the Robigalia a sheep and a reddish dog were sacrificed by the flamen of Mars to avert mildew from the crops. The sacrifice of the "October horse" in the Campus Martius, whose head the people of the Subura and the Sacra Via struggled for in order to hang it up in their own precincts, had also a

naturalistic and apotropaic character. In times of calamity there was an old Italian custom of dedicating to Marsa ver sacrum. Everything born in this spring was the property of the god; the animals were sacrificed, the young men when they grew up were sent out of the country. Mars seems also to have had some relation to the religious ceremony of marriage. Along with Juno, the goddess of women and of childbirth, he was worshipped by the Roman matrons on June 1 and at the Matronalia on March 1. As god of the land and giver of increase, Mars was also the god of death and the dead ; he was one of the deities invoked by Decius when devoting himself to death. He was likewise the giver of oracles: like Zeus he revealed his will to men by certain signs. His ancient oracle at Tiora Matiene near Care resembled in character the oracle of Zeus at Dodona, in so far as revelation took place by the medium of sacred birds and trees. Woodpeckers were the sacred birds of Mars, and the noise which they made tapping on the trees was one of the simplest methods of revelation. Picus, the woodpecker, was a name or form of Mars, and was ulti- mately individualized as a local hero, an early king of Latium, and son of the god. Faunus, the favouring deity, son of Picus, is pre-eminently the god of prophecy; he also is closely related to the original Italian character of Mars, which he retained far more truly than the great Roman god.

Although the worship of Mars was known both in Latium and in Etruria, it was probably of Sabine origin. Quirinus, an undoubtedly Sabine word, is merely a name of Mars, which never acquired complete individuality ; the feeling always remained alive in Rome that Mars and Quirinus were one, although they had separate priests. _It is in accordance with the Sabine character that the warlike element should have been very strong in their conception of deity ; and thus the Sabine Mars becanie in the Roman pantheon the deity of war. Besides the ceremonies round the altar of Mars in the Campus Martius, the oldest cults of the god in Rome are the Sabine worship of Quirinus on

the Quirinal and the Latin worship of the holy spear of Mars in the temple of Vesta. There likewise grew at an early time a cultus of the god on the Palatine, said to have been founded by Numa, and twelve Salii of the

Palatine existed alongside of the twelve Quirinal Sali The Palatine Salii performed one of the most remarkable ceremonies in the Roman worship of Mars. For many days, beginning from March 1, they danced in armour through certain parts of the city, clashing their lances on their shields, and repeated the prescribed song. The shields which they carried were the twelve sacred anciliq preserved on the Palatine. One of these, it was said, fell from heaven in the time of Numa, and the king, in order to preserve safely this pledge of victory for the state, had eleven others exactly like it made by Mamurius Veturius, The song of the Salii, besides mentioning all the gods of the city, referred to Mamurius, whose name is only a form of Mamers.

Next to Jupiter, Mars was the chief protecting god of the Roman state. Quirinus Mars was the father of the twin-founders of the city, and his sacred wolf was the emblem of the city and the foster-mother of the twins, The Campus Martius outside the city was dedicated to the god from a very early time; there the young men practised their warlike exercises ; there the horse races, equwria, in honour of Mars (February 27) and the sacrifice of the "October horse" took place. There also was held the census every fifth year, followed by the purificatory cere- monial for the whole city, which was dedicated to Mars. When war broke out, the Roman general clashed the shield and spear in the temple of Mars and invoked the god; the spoils of victory belonged to him after Jupiter Feretrius.

There was an ancient temple of Mars outside the Porta Capena on the Appian Way ; and on the ides of July, in conimemoration of the battle of Lake Regillus, the knights had a procession

'¢ From Castor in the Forum, To Mars without the wall."

As the god of war, who marched with his people to battle, Mars was Gradivus; such at least was the later explanation of an old religious name. Inuus Lupercus, the averter, to whom the Lupercalia was dedicated, was prob- ably a local form of Mars; his character as protector of the Palatine city, and the warlike element in him, resemble Mars (see Lupercatta). Silvanus is also closely related to the agricultural god Mars, who is sometimes called Mars Silvanus. A goddess named Nerio or Neriene is sometimes mentioned as wife of Mars. There was also a goddess Bellona,

whose name marks her strictly as the goddess of war; she is called the sister or daughter or wife of Mars. Quirinus, on the Quirinal, had a festival called Quirinalia, on the 17th of February.

See Preller, Rim. Mythol., and the other books on Roman religion ; Marquardt on religious antiquities ; .Unger, «Lupercalia, Rhein. Mus., 1881; Jordan, Stadt Rom; Roscher, Apollo and Mars; and on the Etruscan Mars, Miiller, Ztrusker, ed. Deecke, ii. 57 and 169. ‘a

MARSALA, a seaport on the west coast of Sicily, “ the province of Trapani, 20 miles south of Trapani, to the north of the river Marsala, with a station on the “att between Trapani and Palermo. A flourishing and E.. built town, with wide paved streets, it possesses a a cathedral, a theatre, cavalry barracks (now occuple 4 Government offices), an academy of science and th : and a public library. The Corinthian columns “ : cathedral were originally intended for the cathedra ns Canterbury, and owe their present destination 4 i wreck of the vessel which was conveying them to Eng a After the destruction of its harbour in the latter pat : the 16th century as a precaution against its occupation

the Turkish pirates, the commercial importance of Marsala | commercial and scientific institutions. The population remained in abeyance till the construction of the new port | (1881) is 360,099. to the south of the town. The sea-wall for this was begun The old harbour of Marseilles opens on the west to the in 1818; but it was not till 1835-36 that the pier was Gulf of Lyons; and the famous Rue de la Cannebitre, constructed. A great part of the surface of 44 acres con- | leading east-north-east from the inner end of the harbour, stituting the port 1s now silted up; new works, however, and. continued by the Rue de Noailles, the Allées de on an extensive scale, are being undertaken. ‘The wine Meilhan, and the Boulevard de Longchamps, to the Palais trade, which forms the staple, was commenced in the end | des Arts, forms the first main artery of the town. A of the last century by Woodhouse & Co.; and the wines | second great artery, at right angles to the first, connects first got into favour by being supplied to the English fleet | the Aix gate and its triumphal arch with the grand ‘1 1802. They are for the most part white, and are usually | Promenade du Prado, by the Cours

Belsunce and the Rue fortified.” ‘The number of seagoing vessels that entered | de Rome. North of the old harbour, between the Aix at Marsala in 1863 was 149, with a burden of 9791 tons ; | gate and the sea, lies the old town of Marseilles. The ‘n 1880 there were 249 vessels of 16,645 tons. From | finest streets, the Rue St Ferréol, the Rue Paradis, and the 31,350 in 1861 the population of the commune had in- ereased by 1881 to 40,251; that of the town was 14,105 in 1871, or, with the suburbs of Porta Garibaldi, Porta Mazzara, and Porta Trapani, 17,666.

On the small island of San Pantaleone, about 6 miles north of Marsala, lay the Carthaginian stronghold of Motya (Ital., M ozia). ‘After the destruction of this settlement by Dionysius in 397 B.c. the defeated party established a new eolony on the neighbouring promontory of Lilybeum. It was there that in 276 B.c. the Carthaginians held out successfully against Pyrrhus, who had already driven them from the rest of Sieily ; and it was only after a siege of ten_ years that in the first Punic War they were obliged to surrender the fortress to the Romans. Under its new possessors Lilybeum continued to flourish and beeame the residence of one of the two questors of Sicily. It was still an important eity under the later empire, and when oceupied first by the Goths and then by the Vandals, The Arabs called it Mersa ‘Aly, “ port of ‘Aly,” and Edrisi (12th eentury) deseribes it as a considerable town, whieh, having been ruined, had been restored by Roger I. It was at Mar- sala that Garibaldi began his Sicilian campaign in 1860.*

MARSDEN, Witt1am (1754-1836), an eminent Ori- ental scholar, wasthe son of a Dublin merchant,and was born in 1754. After studying at Trinity College, he obtained an appointment in the civil service of the East India Company, and set sail for Bencoolen, Sumatra, in 1771. |Zv There he soon rose to the office of principal secretary to the |R&s Government, and was at the same time intent on acquiring that intimacy with the Malay language, and that knowledge || go} of the country, which were afterwards the sources of his |/fea literary reputation. Returning to England in 1779 with |\@ a pension, he retired into literary seclusion, and in 1782 produced The History of Sumatra. Marsden was appointed in 1795 second secretary and afterwards first secretary to the admiralty. In 1807 he retired again into private life, and, devoting himself to study, published in 1812 his Grammar and Dictionary of the Malay Language, and in 1817 his translation of the

Zravels of Marco Polo. A pension of £1500, which he had received on his retirement from office, he voluntarily resigned in 1831 for the behoof of the public. In 1834 he presented his rich collection of Oriental coins to the British Museum, and his library of books and Oriental MSS. to King's College, London. He died of apoplexy in October 1836.

Marsden's other works are—Numismata Orientalia, London,

1823-25 ; Catalogue of Dictionari J Je, 17969 and several ee seen woke ie ie running parallel with the Rue de Rome, between it and fe sophical Transactions and the Archeologia. His name will | the foot of the hill upon which is Notre Dame de la Garde. ee in connexion with African philology, as he had | fom La Cannebiére to La Joliette, the centre of the new Lid e an ae it would appear, independently of docks, runs the broad Rue de la République, lined with Con aM ater—drawn attention to the affinity of the i alas ; jj h edhe wh

go and Mozambique languages with those spoken by the Kaffre | fine buildings, and opening a line through the o est part Tain : _ ae Narrative of an Expedition to explore the River | of the town. The entrance to the old harbour is defended

MARSEILLES 7. 386 sq. ' : , by Fort St Jean on the north and Fort St Nicolas on the France, and th (= Marseille), the third largest city of | south. Behind the latter is the Anse (Creek) de la Réserve. rae as: or = Semammereial port of the Mediter- | Beyond this again, situated in succession along the shore, town of Pe detark – lat. and 5° 22' E. long., is the chief | come the old _imperial palace, the Anse du Pharo, the of the 15th epartment of Bouches du Rhone, headquarters military exercising ground, and the Anse des Catalans. th army corps, the seat of a bishop, and of numerous | The new parts of the town extend in this direction to the

- *The ruins of Motya were exe w Vallon d'Endoume behind Fort St Nicolas. To the old Academy, March 1376, p. 288. ae ee, Bee harbour, which covered only 70 acres, the basin of La*

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Joliette (55 acres) was added in 1853. Communicating with the old harbour by a channel which passes behind Fort St Jean, this dock opens on the south into the outer harbour, opposite the palace and the Anse du Pharo; it is separated from the roadstead on the west by a simple jetty. A series of similar basins have since been added alone the shore to the north, viz., the Lazaret or '" Bassin des Docks" (37 acres), that of Arene (59 acres), the "Bassin National," twice as large as the preceding, and the graving dock of 20 acres; a fine revolving bridge, worked by steam, separates the graving dock from the rest. Farther out, the Chateau d'If and the islets of Pomégue and Ratonneau, where vessels formerly did quarantine, have 45 acres of harbour accommodation. The port of Marseilles has in all an area of 422 acres, but there are only 44 miles of quays, an amount of accommodation quite inadequate for the enormous traffic, now amount- ing to more than 3,400,000 tons. Protected on the east by Cape Croisette, and on the west by Cape Couronne, the roadstead of Marseilles and its approaches are lighted by six lighthouses, of which the most distant (130 feet high) is 8 miles south-west of the town, on the Planier rock. The docks along the Lazaret basin cover an area of 45 acres, aud the company to which they belong also holds a large area of ground for their enlargement, and has ex- clusive rights over 14 to 2 miles of quays. 'The ware- houses occupy 27 acres of floor space on their several stories, and the 200,000 tons of goods for which they afford storage are easily manipulated by powerful hydraulic machinery wrought by steam. From the harbour station at the docks the railway is carried up to the principal station, "'Gare St Charles," which commands the town. The Toulon line goes round the zoological gardens, and the whole upper part of Marseilles, and sends a branch to the Prado station. There is a fourth station to the south of the old harbour near the cnstom-house, and at the foot of the steps of St Victor ; it is proposed to join it by a tunnel to the Marseille-Prado station. The large steam vessels for trading with Algiers, the Levant, and the further Hast lie in La Joliette, but the old harbour still displays the ancient characteristics of Marseilles. The old-fashioned Mediter- ranean traders with their lateen sails are crowded together in the Rive Neuve Canal to the south, while the sailing vessels of heavy tonnage are moored to the quay by their sterns. At the end of the old harbour opens out La Cannebiére, so called from former rope-walks, of which it occupies the'site; it is now the liveliest part of tle town, where the principal cafés,

shops, hotels, naval and com- mercial agencies, as well as the Bourse, are found.

Despite its antiquity, Marseilles has no ancient monu- ments. The old cathedral, which superseded a temple of Diana, itself preceded, it is said, by an altar of Baal, has given place to a modern structure, of which the exterior only is completely finished. . It is a Byzantine basilica, in the form of a Latin cross, 460 feet long, built in grey Florentine stone blended with white stone from the neigh- bourhood of Arles. Near the cathedral stands the bishop's palace. The cathedral is situated at the entrance of the harbours, but a more distant church has superior attrac- tions for the sailors,—the celebrated Notre Dame de la Garde, the steeple of which, surmounted by a gilded statue of the Virgin, 30 feet in height, rises 150 feet above the summit of the hill on which it stands, commanding a view of the whole port and town, as well as of the sur- rounding mountains and the neighbouring sea. The pre- sent chapel of Notre Dame de la Garde occupies the site of one built in 1214, Like the new cathedral it is in the Byzantine style, and constructed of the richest materials.

Descending from Notre Dame by steps, with shops on both sides containing objects of devotion, such as medals

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and chaplets, and passing the Promenade Pierre Puget which affords another fine view of the sea, we reach the church of St Victor, close by Fort St Nicolas. Originally an abbey founded about 410 by St Cassian, it was afterwards destroyed by the Saracens, but rebuilt in the 11th century ; destroyed a second time, it was finally restored by Pope | Urban V., a former abbot, who surrounded it in 1350 with) high square crenellated towers. 'Tradition relates that St Lazarus inhabited the catacombs under St Victor 3 and the black Virgin, still preserved there, is popularly attributed to St Luke. The spire of the ancient church des Accoules inarks the centre of Old Marseilles. At its foot are a "Calvary" and a curious chapel of modern construction in rock work. Notre Dame du Mont Carmel, also in the old town, occupies the place of what was the citadel of the Massaliots when they were besieged by Julius Cesar, The new Hotel de la Préfecture, at the end of the Rue St Ferréol the Palais de Justice, and the Bourse, are all

buildings a the last twenty years. The first isa palatial edifice 300 fect long and 260 wide, adorned with statues and bas reliefs eit has a fine staircase and large reception rooms, decorated with paintings. Before the Palais de Justice stands a statue of Berryer. The pediment and peristyle are decorated with bas reliefs by Guillaume. The outer hall is surrounded by beautiful pillars of red marble. The Bourse has in the vestibule a bas relief representing Marseilles receiving the productions of all parts of the world, and allegorical statues of Marseilles and France. The hall is larger than even that of the Bourse at Paris. The hall of the Chamber of Commerce, at whose cost the whole edifice was built, is remarkable for the magnificence of its mural paintings and gildings. 'The Hotel de Ville, an old and unimportant bnilding, stands on the quay to the north of the old harbour. The Palais des Arts de Longchamps, completed in 1870, is a work of consummate taste; it is built at the terminus of the Canal de Marseille, that great work which has metamorphosed the town and its surroundings by bringing into it the waters of the Durance. This canal, which leaves the river opposite Pertuis, has a length of 94 miles, of which more than 15 are underground. It crosses the valley of the Arc, between Aix and Rognac, by the magnificent aqueduct of Roquefavour, comparable with the noblest works of ancient or modern times. The canal then purifies its waters, charged with ooze, in the basins of Réaltort, sets in motion seventy-two mills, which it supplies with upwards of 1200 horse-power, carrying about 200 cubic feet of water per second to the district of Marseilles. Right and left of the Chateau d'Eau, which occupies the centre of the Palais de Longchamps, and is 128 feet in height, are the picture gallery, a fine collection of ancient and modern works, and the natural history museum, remarkable for its conchological department and the interesting collection of ammonites. Behind are exten- sive zoological gardens, with the astronomical observatory, one of the most important in France. The museum of an- tiquities is established in the Palais Borély, in a fine park, recently purchased by the town, at the end of the Prado, and approached by the two finest promenades of the city. It includes a Pheenician collection (containing the ae that support the hypothesis of the Phoenician origin 0 Marseilles), an Egyptian collection, numerous Greek, Latin, and Christian inscriptions in stone, &e. A building within the city, recently finished, 177 feet by 64, with an Te ing facade, contains the school of art and a ., a

library. The triumphal arch of Aix, originally dedica a to the victors of the Trocadero, was in 1830 appropriate to the conquests of the empire.

Marseilles contains large hospitals. The Hotel Dieu in the old

town was founded in 1188, and rebuilt in 1593; it I 0 The Hospice de la Charité, in the same neighbourhood, ®

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dates 600 paticnts, while at the opposite extremity of the town,

r the Prado station, are the modern Hépital de la Conception Pa 800 beds), the military hospital, and the lunatic asylum. "The scientific institutions of the town are also numerous, inelud- ing a faculty of science, an astronomical observatory, a preparatory school of medicine and pharmacy, a musical conscrvatoire, a school of art, a lyeeum, and many private institutions. The principal learned societies are the academy of science, letters, and art, the medical association, and the geographical, statistical, agricultural,

;cultural societies.

anton temperature of Marseilles is 58° Fahr.; frost is rare, and – gnow almost unknown. The heat of summer is tempered during the day by the cooling sea breeze. The most disagreeable wind «5 the mistral, a violent and cold north-west wind, which blows on an average one hundred. and thirty-eight times a year, but has at least the advantage of restoring salubrity to the frequently un- healthy shores of the Mediterranean. The sirocco, a south-east wind, blows some sixty times a year 5 though hot and parching in summer, it softens the winter climate. The east-south-east wind is cold and damp, and brings rain. The Canal de la Durance has greatly modified the climate of Marseilles and its neighbour- hood, for by restoring vegetation it has increased the fogs and rains; there is now an annual rainfall of nearly 24 inches.

Marseilles is at once the largest commercial port of France and a manufacturing town, working up the raw materials brought in by sea from

every part of the world. The leading industry is that of soap-making, which occupics sixty factories with 1200 artisans, aud annually produces 65,000 tons, valued at £2,000,000 sterling. With this manufacture are connected oil and chemical works ; in the former, which employ 2000 to 2500 workmen, 55,000 tons of different oils are produced yearly. The chemical works comprise a dozen mills, manufacturing chiefly the salts bs soda out oe trated acids. 'Two thousand operatives are there employed, an the value of their annual production is estimated at £320,000. There are also three sugar-refineries, producing 65,000 tons of loaf-sugar, of which more than half is re-cxported. Sulphur from Sicily too is refined and converted into sticks or flowers of sulphur, to the value of £80,000. _ Petroleum refining occupies 100 workmen. Metallurgy is another great industry; a large quantity of ore, imported from Elba, Spain, and Algeria, is smelted in the blast furnaces of St Louis in the suburbs. The Mediterranean iron-works and yards, together with other private companies, have large workshops for the construction or repair of marine steam-cngines and every branch of iron shipbuild- ing, employing several thousand workmen. Marseilles is a great centre for the extraction of silver from lead ore ; 16,000 tons of lead and.25 tons of fine silver are separated annually. There are 64 flour-mills with 300 sets of stones, and 100 factories prepare semolina and other cereal pastes, while 34 tanyards dress 500,000 sheep skins and 385,000 goat skins. To this list of industries must be added the manufactories of matches, candles, and wax- vente, ie ee foundries, glass-works, and manufactures of coral, and of Oriental hosiery.

The port of Maccities is the centre of numcrous lines of steamers. The French company of mail steam packets (Messageries Maritimes) despatch their boats regularly to ltaly, Egypt, Réunion, India, China, and the far East, as well as to Greece, Turkey, the Black Sea, Smyrna, and Syria. The Transatlantie Company runs its vessels to Algiers, Tunis, Malta, and the coast of Italy, and has also a regnlar line between Marseilles and New York. Many private com- panies have services to Corsica, Algiers, the coast of Languedoc and of Spain, and the Italian Riviera. Other lines conncet Marseilles with Brazil and La Plata, Havre, and London. Landward there are two lines of railway to Aix, and a third to Toulon, A navigable canal is greatly necded to connect the port directly with the Rhone, in order to avoid the difficulties of egress from the Yiver and to make Marseilles the natural

outlet of the rich Rhone basin. The conntries with which the greatest traffic 1s maintained are Algeria, Spain, Italy, Turkey, and the Russian hes on the Black Sea; next in order come England, Austria, Be western coast of Africa, Réunion, the Cape, British India, naa the Antilles, China, and Senegambia. From the Black Sea, +urkey, and Algeria come the cereals which form the chief imports a point of bulk ; from Italy, Spain, the Levant, China, and Japan Ther et is the import of greatest value (£4,000,000 yearly). a ollow ores and metals, iron, cast iron, lead, and copper; also Co et ato peecaue, ay heat es wool and

» Thee, s dry vegetable foods, petroleum, cocoa ode peppers and other Sica a and ieatites, coal, skins, vale a sponges. The principal exports in respect of and na a woo os es ue fabrics, refined a pee

3 those of greatest bulk are cereals in the form of grain

se pee building materials, oil-cakes, iron and other fi. aa os inetal, wines and spirits, oils, glass and crystal, lead, the fhe Sengoing tonnage, one-third is under the French flag, but asting trade, carried on by French sailors alonc, is almost

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half as large as the ocean trade. The shipowners of the port pos- sess almost seven hundred vessels, without counting tlie hundreds of fishing boats which ply along the coast.

History.—-The Greck colony of Massalia (in Latin, Massilia) was founded by the enterprising mariners of Phocea in Asia Minor, about 600 B.c. The settlement of the Grecks in waters which the Carthaginians jealously reserved for their own commerce was not effected without a naval conflict; it is, indeed, not improbable that the Phoenicians were scttled at Marseilles before the Greek period,

and that the very name of the town is the Phcenician 5, “‘settle-

ment.” Whether the judges (D’DAY, ‘ suffetes ”) of the Phoenician sacrificial tablet of Marseilles were the rulers of a city older than the

advent of the Pheenicians, or were a sort of consuls for Punic residents in the Greck period, is disputed. The fall of the Ionic cities before the Persians probably sent new settlers to the Ligurian coast and cut off tho remote city of Massalia from close connexion with the mother country. Isolated amidst alien populations, the Massaliots made their way by great prudence in dealing with the inland tribes, by the vigilant administration of their oligarchical government, and by frugality and temperance united to remarkable commercial and naval enterprise. Their colonies spread cast and west along the coast from Monaco to Cape St Martin in Spain, carrying with them the worship of Artemis ; the inland trade, in which wine was an important element, can be traced by finds of Massalian coins right across Gaul and through the Alps as far as Tyrol. The Massaliot Pytheas (330-320 3.c.) passed the pillars of Herculcs and visited the coasts of Gaul, Britain, and Germany. 'The great rival of Massalian trade was Carthage, and in the Punic wars the city took the side of Rome, and was rewarded by Roman assistance in the subjugation of the native tribes of the Ligurian mountains. In the war of Cesar and Pompey the aristocratic town took the side of the latter, and made a couragcous but vain resistance to Cesar. In memory of its ancient services the city, " without which," as Cicero says, "Rome had never triumphed over the Transalpine nations," was still left as a civifas libera, but her power was broken and most of her dependencies taken from her. From this time Massalia has little place in Roman history ; it became for a time an important school of letters and medicine, but its commercial and intellectual importance gradually declined into insignificance. The town appears to have becn Christianized before the end of the 3d century, and its reputation partly revived through the names of Gennadius and Cassian, which give it prominence in the history of Semi-Pelagianism and the foundation of Western monachism.

After the ravages of successive streams of invaders, Marseilles was repeopled in the 10th century under the protection of its viscounts. In 1112 the town bought up their rights, and was formed into a republic, governed by a podestat, who was appointed for life, and exercised his office in conjunction with 3 notables, and a munici- pal council, composed of 80 citizens, 8 clerics, and 6 principal tradesmen. During the rest of the Middle Ages, however, the higher town was governed by the bishop, and had its harbour at the ereek of La Joliette. The southern suburb was governed by

the abbot of St Victor, and owned the Port des Catalans. Situated between the two, the lower town, the republic, retained the old harbour, and was the most powerful of the three divisions. The period of the crusades brought great prosperity to Marseilles. The activity of its shipbuilding, the magnitude of its fleet, the import- ance of its commerce and manufactures, allincreased at once. The count of Provence, Raymond Bérenger, Charles of Anjou, and after- wards Alphonso of Aragon, successively attempted to make them- selves inasters of the town; it suffered at different times from incendiarism, pillage, and massacre during the 13th and 14th cen- turies, and in the beginning of the 15th: King René, who had made it his winter residence, however, caused trade, arts, and manu- factures again to flourish. Under Francis I., the disaffected con- stable de Bourbon vainly besieged the town with the imperial forces in 1524. During the wars of religion, Marseilles took an active part against the Protestants, and long refused to acknowledge Henry 1V. 'The loss of the ancient liberties of the town brought on new disturbances under the Fronde, which Louis XIV. came in person to suppress. He took the town by storm, and had Fort St Nicolas constructed. Marseilles repeatedly suffered from the plague, and an epidemic raged from May 1720 to May 1721 with a severity for which it is almost impossible to find a parallel ; Bishop Belsunce, Chevalier Rose, and othcrs immortalized themselves by their courage and devotion.

During the Revolution the people rose against the aristocracy, who up to that time had governed the commune. In the Terror they rebelled against the convention, but were promptly subdued by General Carteaux. The wars of the empire, by dealing a severe plow to their maritime commerce, excited the hatred of the inhabit- ants against Napolcon, who accordingly hailed with enthusiasm the return of the Bourbons and the defeat of Waterloo. The news of the latter provoked a bloody reaction in the town against those suspected of imperialism. Since 1815 the prosperity of the city

has reecived a considerable impulse from the conquest of Algeria and the opening of the Suez Canal. The completion of the canal of the Durance has covered with verdure the formerly arid country surrounding the town, and

the openings made in the old part of Marseilles have improved its sanitary condition. (G. ME.)

MARSH, Gsorcs Perkins, LL.D, (1801-1882), American diplomatist and philologist, was born at Wood- stock, Vermont, March 17, 1801, graduated at Dartmouth College in 1820, and practised law at Burlington, Vermont, devoting himself also with ardour to philological studies. In 1835 he was elected to the State legislature, and in 1842 he became a member of Congress. In 1849 he was appointed United States minister to Turkey, and in 1852 discharged also a special mission to Greece, returning to Vermont iu 1853. In 1861 he became United States ininister to Italy, and died in that office at Vallombrosa, July 24, 1882.

His chief published works are a Compendious Grammar of the Old Northern or Icelandic Language, 1838, compiled and translated from the grammar of Rask ; The Camel, his Organization, Habits, and Uses, 1856; Lectures on the English Language, 1861; Zhe Origin and History of the English Language, 1862 ; Man and Nature, 1864. The last-named work, largely rewritten, was issued under the title The Earth as Modified by Human Action in 1874.

MARSHAL (from Old High German marah, horse, and scale, care-taker), in its original signification a servant of the royal manége, was afterwards a title given in different countries to the holder of various high offices, military and civil. In the time of Philip Augustus the commander of the French forces was called the marshal of France. Under Francis I. the marshals of France became two in number, under Henry ILI. four, and in the time of Louis XIV. their number was raised to twenty. In England the marshal was a high officer of state as far back as the 12th century. Inthe end of the 12th and first half of the 13th century the office was conferred on the earls of Pembroke, from whom it passed by female descent to the family of Bigod, earl of Norfolk. The dignity of earl- marshal was afterwards held successively by the Mowbrays, dukes of Norfolk, the Howards, dukes of Norfolk, and the earlsof Arundel and Norwich. Under a grant by Charles II. to Henry Howard, earl of Norwich, it has descended to and continues in the line of the existing dukes of Norfolk. The marshal was in feudal times (in conjunction with the constable, a still higher officer) the judge in the court

of chivalry, which had cognizance of questions of honour and dignity ; and, when the king headed his army in person, it was the marshal who selected the proper spot for the encampnient of each noble. The constable's powers and duties were superseded in the reign of Henry VIII.; but the earl-marshal is still the head of the Heralds' College, and appoints the officers of arms. In Scotland (an orthography resembling the French maréchal being adopted) the office of marischal, probably introduced under David L., became from the 14th century hereditary in the family of Keith. The Scottish marischal became an earl under the designation of " earl-marischal" in 1458. Marischal College in Aberdeen was founded and endowed by the munificence of George, 5th earl-marischal. The dignity came to an end by the attainder of George, 10th earl-marischal, in 1716. The military title of field-marshal was at first borrowed by the Germans from the French maréchal de champs; and in the Thirty Years' War it meant much what quartermaster-general does now. It was not till last century that the word rose in dignity so as to signify the highest military dignity except that of commander-in-chief. Tt was adopted into the British military system from Germany,—the first field-marshals being John, duke of Argyll, and George, earl of Orkney, made so by George a, ind 7a.

MARSHALL, Joun (1755-1835), chief justice of the United States, was born in Fauquier county, Virginia, on

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September 24, 1755. As lieutenant and captain he served in the revolutionary army from 1775 to 1780. In 178] he began the practice of the law, and two years later removed to Richmond. At various times from 1782 to 1798 he was elected a member of the Virginia legislature in 1788 a member of the Virginia convention for the rati- fication of the constitution; in 1797 he was envoy-extra. ordinary to France, and in 1799 a member of Congress; in 1800 he became secretary of state ; and on January 31, 1801, he was appointed to the chief justiceship, which position he held until his death on the 6th of July 1835. Marshall as a lawyer soon rose to the first rank at the Virginia bar, and acquired also a national reputation, Iu the Virginia convention of 1788 his influence was second only to that of

Madison in securing the adoption of the constitution. But, unlike Madison, he continued, under the constitution, to support the adininistration of Washing- ton and Federalist measures in general. It was as chief

justice of the supreme court of the United States, however,

that Marshall won lasting fame. His reports, filling about thirty volumes, form a work which time will only render more valued. In tlie expounding of public law, whether international or State law, his talents found their freest scope. In these departments of jurisprudence general prin- ciples rather than authority must be sought by the judge, and in their application Marshall has had no equal upon the American bench. It is the peculiar function of the supreme court of the United States to interpret the consti- tution and to guard it from the encroachments of both national and State legislation. To this duty Marshall brought his great and just powers of reasoning, as well as those broad views of government which, during the thirty- four years of his judicial career, gave to the constitution the liberal powers which were necessary to its durability. "The constitution," says Judge Story, "since its adoption, owes more to him than to any other single mind for its true interpretation and vindication." See biography by Henry Flanders in his Lives of the Chief Justices, vol. il. MARSHALL ISLANDS. See Micronesia. MARSHALLTOWN, the county seat of Marshall County, Iowa, United States, is situated on the Iowa

river at the junction of several railways, and in the midst

of a grain and stock producing region. Among its numer- ous industries are sugar-refining, waggon-making, and the manufacture of barbed steel wire for fencing purposes. The population was 3218 in 1870 and 6240 in 1880, and has since increased rapidly. » MARSHMAN, Josnua (1768-1837), a Baptist mis sionary and Oriental scholar, was born on April 20, 1768, at Westbury Leigh, in Wiltshire, where he received somewhat defective school education, and afterwards followed the occupation of a weaver until 1794, when he removed to Bristol to take charge of a small school there. Meanwhile he had been diligent in the cultivation of his talents, which were naturally good ; and he was already man of considerable acquirements when in, 1799 he was sent by the Baptist Missionary Society to join their estab- lishment at

Serampore. Here, in addition to the discharge of his more special duties, he engaged with success 12 the study of Bengali and Sanskrit, and afterwards of Chinese, and accomplished numerous literary task portant of which are mentioned below. Dei! degree of D.D. from Brown University, U.S.A., 1 : His death took place at Serampore on December 2, Dr Marshman translated into Chinese the book of (aed Gospels, and the Epistles of Paul to the Romans and the oh 1 a in 1811 he published The Works of Confucius, con an ica. Original Text, with a Translation, and in 1814 his Clavis | fare. He was also the author of Elements of Chinese Grammar, ie a liminary Dissertation on the Characters and Colloguial Me on ae the Chinese, and was associated with Carey In the preparatio®.

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Sanskrit grammar and of a Bengali-English dictionary. See J. C. Marshman's Life and Times of Carey, Marshinan, and Ward (2 vols., 1859).

MARSIGLI (Latinized Marstuius), Luicr FerpInanp, soldier and savant, was born at Bologna, July 10, 1658, and died in the same city, November 1, 1730. After a considerable course of study in mathematics, natural history, and anatomy, he visited Constantinople, and on his return to Christendom offered his services to the emperor Leopold, then at war with the Turks (1682). Wounded and captured in an action on the river Raab, he was sold to a pasha and accompanied him to the siege of Vienna ; but in 1684 his friends purchased his release, and at the close of the war he was appointed commissioner for fixing the new Dalmatian boundary. In 1703 he was second in command to the count of Arco when Alt-Breisach was surrendered to the duke of Burgundy ; and, though popular opinion acquitted him of blame, Marsigli was cashiered when Arco was condemned to death. Devoting himself to scientific pursuits, he visited Switzerland, and spent a considerable time at Paris and Marseilles. He went to Rome in 1709 at the request of Clement XI., but soon returned to Marseilles to prosecute his investigations into the physical nature of the sea. In 1712 he presented his scientific collections to his native city, and thus gave rise to the Bologna Institute of Science and Art; and about the same time he

established a press, including founts of Oriental characters, for printing the publications of the society.

Marsigli's own works were valuable contributions to knowledge, brought out in very handsome style. Best known are his curious physical history of the sea (Italian, Venice, 1711 ; French, Amster- dam, 1725), with a very laudatory preface by Boerhaave; L'état milttaire del Empire Ottoman (Amsterdam, 1732) ; and Vanubius Pannonico-Mysicus (Hague, 1726). This last, of which only three hundred and seventy-five copies were printed, consists of six huge folio volumes illustrated by nearly three hundred maps and engrav- ings, and furnishes an exceedingly elaborate account of the course of the Danube, of the towns and antiquities along its banks, of its birds, beasts, fishes, &c. See Fontenelle's éloge in Mém. del Acad. des Sciences, Paris, 1730 ; Quincy, Vie de Mons. le Comte de Marsigli, Zurich, 1741.

MARSTON, Jon, was one of the most vigorous satirists and dramatists of the Shakespearean age. He was probably some ten years younger than Shakespeare He has been identified with a gentleman commoner of Brasenose College, Oxford, who entered in 1591, and was admitted B.A. in 1593 as the eldest son of an esquire. If this is the same John Marston that was buried in the Temple Church in 1634, under a tombstone Odlivioni sacrum, the identification of him with the poet is most prob- ably right, for one of Marston's most singular poems is a prayer to Oblivion—

- *Let others pray For ever their fair poems flourish may; But as for me, hungry Oblivion, Devour me quick."*

_In the superfluity of learned allusions and Latin quota- Hons in his plays Marston proclaims the fact that he was a university man. He entered the field of letters in 1598, as @ satirist, with a Scourge of Villany. He was pro- fessedly an imitator of Juvenal, but he wrote rather in the spirit of Skelton, and speedily earned something like Skelton's reputation as a coarse ribald buffoon of astonish- mg energy, girding at the grossest vices of the time in

plain naked words stript from their shirts." There was more of the good- natured chuckling buffoon than of the cynic in Marston's satire, though he did profess unmeasured

Scorn for the vices and fopperies of his age. The coarse ony of his invective pours out as if he loved strong Ae a more than he hated the subjects of his ridicule.

akespeare's Venus and Adonis was one of Marston's first

Me in his Pygmalion's Image (1598) the wooing of

onis by the queen of love is very roughly but very

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cleverly parodied. The freshness and vigour of Marston's vein brought him at once into notice. He is mentioned (inisspelt as Maxton or Mastone) in Henslowe's Diary, in 1599, as "the new poet" receiving payment as part author of aplay; and in the same year he was probably ridiculed by Ben Jonson as "Carlo Buffone" in Lvery Man out of his Humour. He and Dekker had a famous quarrel with Jonson arising out of the latter's attack upon them in the Poetaster (see DEKKER). The literary enemies were re-conciled ; Marston forswore literary quarrels, dedicated a play to Jonson in terms of high eulogy, and was conjoined with Jonson and Chapman in the play of Hastward Ho! some political allusions in which nearly cost the authors their ears. Marston wrote comparatively few plays, pub- lished in quick succession at the following dates :—Antonio and Mellida (1602); Antonio's Revenge (1602); The Malcontent (1604, his first and most powerful play); The Dutch Courtesan (1605); Parasitaster (1606) ; Sophonisba (1606) ; What You Will (1607). Marston then apparently left off play writing; if he lived till 1634, there is no explanation of his sudden stoppage. 'There is very little constructive skill in his plays; the plots are uninteresting. He does little more than send a procession of puppets across the stage, one or more of which "gird at" the others—very "loose libertines" and very contemptible some of them—in the .author's own rough vein of satire. One scene in Antonio and Mellida was much admired by Charles Lamb, and either suggested or was suggested by one of the most powerful situations in Aing Lear. But the passage taken out of the body of the play gives a very misleading idea of its general tenor, or of the general cast of Marston's dramatic work.

MARSYAS was a Phrygian god, whose name has passed into Greek mythology. It is hardly possible to discover the real basis of the legends, as their original form has been so much altered. Marsyas was the god of a small river which rose in a cave in the agora of Celzene, and flows into the Meander. In this cave was hung a hide, which according to the story was the skin of Marsyas suspended there by Apollo. When Athene threw away her flute, Marsyas found it, a subject represented by the sculptor Myron. Proud of his skill, Marsyas challenged Apollo with his lyre. Midas the Phrygian king, appointed judge in the contest, preferred the flute-player, and got his ass's ears in reward for his stupidity. The coutest and the punishment of Marsyas, who was flayed alive by Apollo, were frequent subjects for Greek art, both vase-painting and sculpture. There can be little doubt that this account has been very much altered from its native Phrygian form by the Attic comic poets, with whom Marsyas was a favourite character. With regard to the Phrygian god it is difficult to say more than that he and Silenus and Midas are associated in legend with Dionysus, and that he must therefore belong to the cycle of legends of Cybele (see Preller, Gr. AM/ythol., i. 508). The flute was the favourite instrument in the worship of the goddess. Sacrifices were offered by the people of Celene to Marsyas, and he helped them against the Galatians (Paus., x. 30). A statue of Marsyas was erected in the Roman Forum and in other towns, and is said to have been a symbol of liberty.

MARTEN,}! the name of a group of animals constituting

1 By all old authors of authority, as Ray, Pennant, Shaw, and Fleming, the word is written " Martin,' but this form of spelling is now generally reserved by way of distinction for the bird (see MARTIN). The word, as applied to the animal here described, occurs in most Germanic and Romanic languages:—German, marder; Dutch, marter ; Swedish, murd; Danish, maar; English, marteron, martern, marten, martin, and martlett; French, marte and martre; Italian, martora and martorella; Spanish and Portuguese, marta. Its earliest known use is in the form martes (Martial, Hp. x. 37), but it can scarcely be an old Latin word, as it is not found in Pliny or other classical writers,

a small but well-defined section of the family Alustelide, belonging to the Arctvid or Bear-like division of the order Carnivora (see Mammatta, pp. 439, 440 of the present volume).

The genus Jfustela, as restricted by Cuvier (Jégne Animal, 1817), contains a very natural assemblage of animals commonly called Martens, Sables, Polecats, Stoats, Ermines, and Weasels, all closely allied in structure and habits. A structural division, however, occurs between the two first-named and all the others, especially shown in tle presence of an additional small premolar tooth on each side of each jaw; and, availing himself of this and some other minor characters, Cuvier divided the genus into two subgenera, for the first of which he retained the name of Mustela, and to the second assigned that of Putorzus. Three years later Nilsson (Shand. Fauna, 1820) definitely constituted the two groups into genera, applying to the first the name of A/fartes, by which the animals composing it had been generally designated by the Latin-writing zoo- logists of the preceding century, and keeping A/ustela for the more typical Weasels and their immediate allies. Later zoologists have been divided between the nomencla- ture of Cuvier, which has the priority, and tliat of Nilsson, which on other grounds is preferable. Those who adopt the latter affirm that Cuvier's names, being only used by him in a subgeneric sense, and not binomially, need not be applied generically ; but this is contrary to the practice usually followed in-such cases. Others avoid the difficulty by not breaking up the genus at all, and so apply the term Mustela to all the species. The result is that the generic name of tle Martens in modern zoological works oscillates between MJartes and Mustela, according to the views of the writer.

The following characters apply to the restricted group of Martens proper, by whatever name they are called. Body long, slender, and very flexible, though less so than in the trne Weasels. Head somewhat triangular ; muzzle pointed, the nose extending a little beyond the lips; eyes large and prominent; ears conspicuous, broad, somewhat triangular, rounded at the ends, furred outside and in; limbs short; feet rounded ; toes short, five on each foot, all with short, compressed, curved, sharp-pointed claws. Soles

densely furred between the naked pads. Tail moderately long, more or less bushy. Outer fur long, strong, and glossy ; a very abundant soft under fur.

Vertebre: C7,D14, L6, 8 3, C 18-23. Skull elongated and depressed. Facial portion moderate and rather com- pressed. Zygomata arched and wide but slender. Post- orbital processes small. Auditory bulle large, but not very globose. Mandible with a strong triangular vertical coronoid process and a well-developed angular process.

Dentition: 2 3, ¢4, p 4,m4; total38. Upper incisors in a straiglit transverse line, rather long and compressed ; first and second subequal, third considerably larger. Lower incisors very small, especially the first, and crowded together, the second placed rather behind the others. Canines long and sharp-pointed. Upper premolars : first very small, with simple crown and one root; second and third nearly equal in size and two-rooted, with simple compressed sharp-pointed crowns, with very slightly developed accessory cusps; fourth (the sectorial) with blade consisting chiefly of the central and posterior cusps, the anterior being rudimentary, inner tubercle small and

and Martial often introduced foreign words into his Latin. Its etymology has becn connected with the German "martern," to torment. A second Romanic name for the same animal is fuina, in French fouine (see E. Von Marten's " Ueber Thiernamen," in Der Zoologische Garten, vol. xi., 1870). The term " Marten Cat," often used, is a misnomer, for though soniewhat Cat-like in size, general appearance, and habits, its true affinities are not with the Welida, but, as stated above, with the Bears.

TLE

confined to the anterior part of the tooth. True molar tubercular, about twice as wide transversely as in the antero-posterior direction, having an outer, more elevated but smaller portion, bearing three blunt tubercles ; to fle inner side of this the crown is contracted, and its surface deeply hollowed ; it then expands again into a broad low lobe, with the central part elevated, and a raised, even semicircular, slightly crenated internal border. leer premolars: first very small, simple, and one-rooted ; second third, and fourth increasing slightly in size, with high compressed pointed

crowns and posterior accessory cusps best marked in the third. First molar (sectorial) with well- marked bilobed blade,—heel scarcely more than one-third of the length of the tooth, and a very small inner tubercle. Second molar small, single-rooted, with a low, flattened, subcircular or oval tubercular crown.

In geographical distribution the Martens are limited to the northern hemisphere, ranging throughout the greater part of the northern temperate regions of both Old and New Worlds, as far north as conditions of existence suited to their habits are met with, and southwards in America to 35° N. lat., while in Asia one species is met with as far as the island of Java.

The various species appear to be very similar in their habits. They live in woods and rocky places, and are thorouglily arboreal, spending most of their time in trees, although descending to the ground in quest of prey. They climb with great facility, and are agile and graceful in their movements. Some species are said occasionally to resort to berries and other fruit for food, but as a rule they are strictly carnivorous, feeding chiefly on birds and their eggs, small mammals, as squirrels, hares, rabbits, and moles, but chiefly mice of various kinds, of which they destroy great numbers, and occasionally snakes, lizards, and frogs. In proportion to their size they are among the most bloodthirsty of animals, though less so than the true Weasels. The female usually makes her nest of moss, dried leaves, and grass in the hollow of a tree, but sometimes in a hole among rocks or ruined build- ings, and produces several young at a birth, usually from four to six. Though wild and untameable to a great degree if captured when fully grown, when taken young they are very docile, and have frequently been made pets of, not having the strong unpleasant odour of the smaller Mustelide. The common European Marten appears to have been partially domesticated by the Greeks and Romans, and to have been used to keep houses clear from rats and mice before cats were introduced.! In the same way, according to Hodgson, an allied species, the Yellow- bellied Weasel (Mustela kathiah), "is exceedingly prized by the Nepalese for its service in ridding houses of rats. It is easily tamed; and such is the dread of it common to all murine animals that not one will approach a house where it is domiciled." It is, however, to the great value attached to the pelts of these animals that their importance to man is chiefly due. Though all yield fur of

serviceable quality, the commercial value varies immensely, not only according to the particular species from which itis obtained, but according to individual variation, depending upon ace, sex, season, and other trifling circumstances. The skins from northern regions are more full and of a finer colour and gloss than those from more temperate climates, as are those of animals killed in winter compared to the same individuals in the summer season. 'The caprices of alia have, moreover, set wholly factitious values upon shig 4 shades of colour, recognized and named by experience furriers, but not indicating any specific or other distinctions & R 'On the Domestic Cats, Felis domesticus and mete ei and Modern Times," Journal of Anatomy and Physiology, vol. ii. p. 47, 1868.

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of which zoologists have any cognizance. Enormous numbers of animals are annually caught, chiefly in 'traps,

to supply the demand of the fur trade, Siberia and North America being the principal localities from which they are obtained.

With the exception of the Pekan (Jf. pennant?) all the Martens are so much alike in size, general colouring, and cranial and dental characters that the discrimination of the species, and assign- ment ofthe proper geographical distribution to each, has been a subject which has sorely perplexed the ingenuity and patience of roologists. The following description by Dr Elliott Coues of the external characters of the American Pine Marten (Jf. americana) will apply almost equally well to most of the others. "' It is almost ee to describe the colour of the Pine Marten, except in

neral terms, without going into the details of the endless diversities occasioned by age, sex, season, or other incidents. The animal is 'brown,' of a shade from. orange or tawny to uite blackish ; the tail and feet are ordinarily the darkest, the head lightest, often quite whitish ; the ears are usually rimmed with whitish ; on the throat there is usually a large tawny-yellowish or orange-brown patch, from the chin to the fore legs, sometimes entire, sometimes broken into a number of smaller, irregular blotches,

sometimes wanting, sometimes prolonged on the whole under surface, when the animal is bicolor like a Stoat in summer. The general 'brown' has a greyish cast, as far as the under fur is concerned, and is overlaid with rich lustrous blackish-brown in

Jaces where the long bristly hairs prevail. The claws are whitish ; the naked nose pad and whiskers are black. The tail occasionally shows interspersed white hairs, or a white tip."

The species generally recognized as distinct are the following, the first five belonging to the Old and the last two to the New World.

1, Mustela foina, Erxleben ; the Beech Marten, Stone Marten, or White-breasted Marten.—Distinguished from the following by the ereater breadth of the skull, and some minute but constant dental characters, by the dull greyish-brown colour of the fur of the upper parts, and the pure white of the throat and breast. It inhabits the greater part of the Continent of Europe, but is more southern than the next in its distribution, not being found in Sweden or Norway, nor, according to the recent investigations of Mr Alston, in the British Isles, although included in their fauna by all earlier writers.

9. M. martes, Linn; Martes sylvatica, Nilsson; Af. abietum, Fleming; the Pine Marten (see figure).—Outer fur rich dark brown ; under fur reddish-grey, with clear yellow tips ; breast spot usually yellow, varying from bright orange to pale cream-colour or yellowish-white. Length of head and body 16 to 18 inches ; of tail (including the hair) 9 to 12 inches. This species is extensively distributed throughout northern Europe and Asia, and was formerly

ls,

MPSS Ss European Pine Marten (Mustela martes).

common in most parts of Great Britain and Ireland. Though

commonly called "Pine Marten," it does not appear to have any

special preference for coniferous trees, except that, inasmuch as they

ie ale the greater proportion of the forests of the countries

_ it inhabits, it is more often met with in them than in any

M er, With regard to its recent occurrence in the British Isles, r Alston writes in Proe. of Zool. Society of London, 1879 :—

tc ea eek greatly reduced in numbers by persecution, it still maintains its Indien ua the wilder districts of Scotland, the north of England, Wales, and 3; and oeeasionally specimens are killed in counties where the species was

From life.

po ov" thought to have been long extinct. In Scotland it is still found, though com- paratively rarely, in the Lews and in most of the Highland mainland counties, being perhaps most abundant in Sutherland and Ross-shire, especially in the deer forests. In the Lowlands a Marten is now a very great rarity, but a fine example was killed in Ayrshire in the winter of 1875-76. In the north of England Mr W. A. Durnford says the species is 'still plentiful' in the wilder parts of Cumberland, Westmoreland, and Laneashire, and in Lincolnshire several have been recorded, the latest killed in 1865, by Mr Cordeaux.! In Norfolk one was shot last year ; and I have myself examined a fine example which was shot in Hertfordshire, within 20 miles of London, in December 1872. In Dorsetshire the last is said to have been killed in 1804; but a specimen oecurred in Hampshire about forty years ago, and another in Surrey in 1847, In Ireland the following eounties were enumerated by Thompson as habitats of this speeies : Donegal, Londonderry, Antrim, Down, Armagh, Fermanagh, Longford, Gulway, Tipperary, Cork, and Kerry. The Cat-crann is probably now a rarer animal in Ireland than it was when Thompson wrote; but it still exists in various distriets, espeeially in County Kerry, whenee the society has received several living examples ; and Professor A. Leith Adams states that it has been seen of late years even in county Dublin."

3. M. zibellina, Linneus; the Sable (German, Zobel and Zebel ; Swedish, sabel; Russian, sobel, a word probably of Turanian origin).—Closely resembling the last, if indeed differing from it except in the quality of the fur,

which is the most highly valued of that of all the group. Found chiefly in eastern Siberia.

4, M. flavigula, Boddaert ; the Indian Marten.—Inhabits the southern slopes of the Himalayas, the Nilgiri Hills, the interior of Ceylon, the Malay Peninsula, and Java.

5. M. melampus, Wagner.—Japan.

6. M. americana, Turton; the North-American Sable or Marten.—A species so closcly allied to the European Pine Marten and Asiatic Sable that it is very difficult to assign constant dis- tinguishing characters between them. The importance of the fur of this animal as an article of commerce may be judged of from the fact that 15,000 skins were sold in one year by the Hudson's Bay Company as long ago as 1748, and the more recent anual imports into Great Britain have exceeded 100,000. It is ordinarily caught in wooden traps of very simple construction, being little enclosures of stakes or brush in which the bait is placed upon a trigger, with a short upright stick supporting a log of wood, which falls upon its victim on the slightest disturbance. A line of such traps, several to a mile, often extends many miles. The bait is any kind of meat, a mouse, squirrel, piece of fish, or bird's head. It is principally trapped during the colder months, from October to April, when the fur is in good condition, as it is nearly valueless during the shed- ding in summer. Dr Coues tells us that, notwithstanding the persistent and uninterrupted destruction to which the American Sable is subjected, it does not appear to diminish materially in numbers in unsettled parts of the country. It holds its own partly in consequence of its shyness, which keeps it away from the abodes of men, and partly because it is so prolific, bringing forth six to eight young ata litter. Its home is sometimes a den under ground or beneath rocks, but oftener the hollow of a tree, and it is said frequently to take forcible possession of a squirrel's nest, driving off or devouring the rightful proprietor.

7. M. pennanti, Erxleben; the Pekan or Pennant's Marten, also called Fisher Marten, though there appears to be nothing in its habits to justify the appellation. This is the largest species of the group, the head and body measuring from 24 to 30 inches, and the tail 14 to 18 inches. It is also more robust in form than the others, its general aspect being more that of a Fox

than a Weasel ; in fact its usual name among the American hunters is " Black Fox." Its general colour is blackish, lighter by mixture of brown or grey ou the head and upper fore part of the body, with no light patch on the throat, and unlike the other Martens generally darker below than above. It was generally distributed in wooded districts throughout the greater part of North America, as far north as Great Slave Lake, lat. 63° N., and Alaska, and extending south to the parallel of 35°; but at the present time it is almost exterminated in the settled parts of the United States east of the Mississippi.

See Elliott Coues, Fur-bearing Animals, a 'Monograph of North American Mustelide, 1877; E. R. Alston, 'On the British Martens," Proceedings of the Zoological Society of London, 1879, p. 468. (CW. H. F.)

MARTIAL (M. Vatertus Martiauis) is a writer to

whose merits it is difficult to do justice in the present day.

His faults are of the most glaring kind ; they are exhibited without the least concealment ; and they are of the sort of which modern feeling is most intolerant. Living as he did under perhaps the worst of the many bad emperors who ruled the world in the Ist century, he addresses him and his favourites with the most servile flattery in his lifetime, reviles him immediately after his death (xii. 6), and offers equally fulsome incense at the shrine of his successor. No writer of equal genius has ever sllown such an absence of dignity and independence of character in his relation to his richer friends and patrons. He is not ashamed

1 The Zoologist for June 1882 records the recent capture of a Marten in a trap near Bardney in Lincolnshire.

to be dependent on them for gifts of money, for his dinner, and even for his dress. We cannot feel sure that even what seem his sincerest tributes of regard may not be prompted by the hope of payment. Further, there is no

book in any literature which, both in expressiou and in the things treated of, sins so flagrantly against all instincts of propriety. A certain proportion of the epigrains in every book—perhaps one-fifth or one-sixth (in some books the proportion is much larger)—can be read by no class of readers with any other feelings than those of extreme distaste.

These faults are so unmistakable and undeniable that many readers of ancient literature have formed their whole estimate of Martial from them, and have declined to make any further acquaintance with him. Even those who greatly admire his genius, who find the freshest interest in his representation of Roman life and his sketches of manners and character, and who, after admitting the un- favourable first impression which he is bound to make, believe that they still can discern sufficient indications of the better nature which made him a popular and likeable man in his day, do not attempt to palliate his faults, though they may partially account for them by reference to the morals of his age and the circumstances of his life. The time when "the last of the Flavian line was tearing in pieces the half-lifeless world, and Rome was a bond- slave to a bald Nero," ! was one when literature had either to be silent or to be servile. Martial was essentially a man of letters; there was no other métier for which he was fitted; he was bound either to gain favour by his writings or to starve. Tacitus and Juvenal might have chosen the latter alternative, but they were fortunately spared the necessity of making the choice by the pos- session of independent means. Even Statius, the contem- porary of Martial, whose writings are in other respects irreproachable, is nearly as fulsome in his adulation as Martial. The relation of client to patron had been recognized as an honourable one by the best Roman traditions. No blame had attached to Virgil or Horace on account of the favours which they received from Augustus and Mecenas, or of the return which they made for these favours in their verse. That old honourable relationship had, however, greatly changed its character between the era of Augustus and that of Domitian. Men of good birth and education, and sometimes even of high official position (Juv., i. 117), were not ashamed to gain or increase their living by the acceptance of money doles to provide their daily meal. 'Atria magna colam" is the resource of a man who was too lazy or too incom- petent to become an advocate, and who thought himself too much of a gentleman to adopt any mechanical trade. Martial was merely following a general

fashion in paying his court to "a lord." "Rex" is the common term used for a patron. He made the best of the custom. In his earlier career he used to accompany his patrons to their villas at Baise or Tibur, and to attend their morning levées. Later on he went to his own small country house, near Nomentum, and sent a poem, or a small volume of his poems, as his representative, at the early visit. If his patron was courteous and liberal, he became his friend and entertained him with his wit and social vivacity. If he was mean and exacting, he found in him a subject for his epigrams. The fault of grossness Martial shares with nearly all ancient and many modern writers who treat of life from the baser or more ridiculous side. That he offends worse than perhaps any of them is to be explained, net, apparently, on the ground that he was more of a

us Cum jam semianimum laceraret Flavius orbem Ultimus, et calvo serviret Roma Neroni.—Juyv., iv. 37.

libertine in his life, but on the ground that he had to amuse a public which had become more corrupt than in any other civilized era. Although there is the most cynical effrontery and want of self-respect in Martial's use of Jan. guage, there is not much trace of the satyr in him,—much less, many readers will think, than in Juvenal. Neither is it at all true, as is said by historians of Roman litera- ture (W. §. Teuffel, vol. ii 317, 5), that his epigrams mostly deal with this side of life. At least four-fifths of them are unexceptionable in subject and treatment.

Our knowledge of Martial's life is derived almost entirely from himself. His writings do not, like those of Horace supply materials for a continuous biography, nor do they lay bare every secret of his heart with the self-absorption of Catullus. But, as he writes frankly about everything that interested him, he has not only painted a very life. like picture, or rather drawn a multitude of very life-like sketches of Roman society in his time, but he has clearly marked his own position in and his own relation to that society. His criticism of men and manners enables us to judge of the standard which he applied to life, of the things which he liked and disliked, and of his own temper and disposition. Reference to public events enables us approxi- mately to fix the date of the publication of the different books of

epigrams, and from these dates to determine those of various important events in his life. Thus, as in book x., which was published in 97 or perhaps 98 a.D., he is found celebrating his fifty-seventh birthday (x. 24), the date of his birth may be assigned to the year 40 or 41. The place of his birth was Bilbilis, or Augusta Bilbilis, in Spain, in a "barren and rugged country " near the sources of the Tagus. His name seems to imply that he was born with the rights of Roman citizenship, but he speaks of himself as "sprung from the Celts and Iberians, and a countryman of the Tagus"; and, in contrasting his own masculine appearance with that of an cffeminate Greek, he draws especial attention to "his stiff Spanish hair"—

"Hispanis ego contumax capillis" (x. 65).

In an epigram written nearly thirty years after his removal to Rome he piously commends the soul of a little child, Erotion, to whom he was much attached, to his parents Fronto and Flaccilla, who had gone before to the world of shades (v. 34). Their position in life seems to be indicated by such references to his former home as the phrase " saturse sordida rura case" (x. 96). His home was evidently one of rude comfort and plenty, sufficiently in the country to afford him the amusements of hunting and fishing, which he often recalls with a keen sense of pleasure, and sufficiently near the town to afford him the companion- ship of many comrades, the few survivors of whom he looks forward to meet again after his five and thirty years absence (x. 104). The memories of this old home, of Bilbilis on its mountain site, of the shallow, rapid Salo flowing round the base of the hill ("fluctu tenut sed inquieto "), of ' Gaius hoary with snow and sacred Vadavero with its broken cliffs," of the ilex-grove of Burado (iv. 55) "which even the laziest traveller walks through," and of other spots the rough names and local associations of which he delights to introduce into his verse, attest the enjoy- ment which he had in his early life, and were among te influences which kept his spirit thoroughly alive m the midst of the deadening routine of social life in Rome. But his Spanish home could impart, not only the es vitality which was one condition of his success as 2 Wl

and poet, but the education which made him s0 « plished a writer. The literary distinction obtained by the Senecas, by Lucan, by Quintilian, who

belonged to @ somewhat older generation, and by his friends and contemporaries Licinianus of Bilbilis, Decianus of Emerita, a0

MAR TRPAL

Canius of Gades, proves how eagerly the novel impulse of letters was received in Spain in the first century of the empire, just as a similar impulse had been received in Cisalpine Gaul in the first half of the first century before our era. 'The success of his countrymen may have been the motive which induced Martial's parents to prepare him for a literary career, —

At me litterulas stulti docuere parentes" (ix. 73, 7),

and which induced Martial himself to remove to Rome when he had completed his education. This he must have done some time before the fall, in 65 a.p., of Seneca and Lucan, who were probably his earliest patrons. He speaks of the halls of the Pisos and of Seneca as having been opened to him when he first went to Rome (iv. 40); and in epigrams, addressed to his widow nearly thirty years after the death of Lucan, he speaks of him with grateful admiration, and applies to her the word " Regina," "his lady patroness."

Of the details of his life for the first twenty years or so after he came to Rome we do not know much. He published some juvenile poems of which he thought very little in his maturer years, and he laughs at a foolish bookseller who would not allow them to die a natural death (i, 113). Martial had neither youthful passion nor youth- ful enthusiasm to make him precociously a poet. His faculty ripened with experience and with the knowledge of that social life which was both his theme and his inspiration; and many of his best epigrams are among those written in his last years. From many answers which he makes to the remonstrances of friends,—among others to those of Quintilian,—it may be inferred that he was urged to practise at the bar, but that he preferred his own lazy Bohemian kind of life to more settled and remunerative modes of industry. He made many influential friends and patrons, and secured the favour both of Titus and Domitian. From them he obtained various privileges, among others the " semestris tribunatus," which conferred on him equestrian rank. He failed, however, in his application to the latter for more substantial advantages,

although he commemorates the glory of having been invited to dinner by him, and also the fact that he procured the privilege of citizenship for many persons in whose behalf he appealed to him. The earliest of his extant works, that known by the name of Liber Spectaculorum, was first published at the opening of the Colosseum in the reign of Titus; but the book as it now stands was given to the world in or about the first year of Domitian, 7.¢., about 81 a.p. The favour of the emperor procured him the countenance of some of the worst creatures at the imperial court,—among them of the notorious Crispinus, of Parthenius, Earinus, Regulus, and probably of Paris, the supposed author of Juvenal's exile, on whose death Martial afterwards wrote a eulogistic epitaph. The two books numbered xiii. and xiv., and known by the name of Xenia and Apophoreta,—inscriptions of two lines for presents, —were published between 81 and 86 a.p. In that last year he gave to the world the first two of the twelve books on which his reputation rests. From that time till his return to Spain in 98 a.p. he published a volume almost every year. The first nine books and the first edition of book x. appeared in the reign of Domitian ; and book xi. at the end of 96 «a.p., shortly after the accession of Nerva. A revised edition of book x., that which we now possess, appeared in 98 a.D., about the time of the entrance of Trajan into Rome. The last book was written after three years' absence in Spain, shortly before his death, which happened about the year 102 or 103 a.p.

hese twelve books bring Martial's ordinary mode of life between the age of five-and-forty and sixty very fully

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before us. His regular home for five-and-thirty years was Rome. He lived at first up three pair of stairs ("et scalis habito tribus sed altis," i. 117), and his rooms over- looked the laurels in front of the portico of Agrippa. He had a small and not very valuable country house near Nomentum, in the Sabine territory, to which he occasionally retired as a refuge from the bores and noises of the city (ii. 38, xii. 57). In his later years he had a small house on the Quirinal, near the temple of Quirinus. At the time when his third book was brought out he had retired for a short time to Cisalpine Gaul, in

weariness, as he tells us, of his unremunerative attendance on the levées of the grcat—

- *Non poterat vane tedia ferre toge ” (iii. 4).*

For a time he seems to have felt the charm of the new scenes which he visited, and in a later book (iv. 25) he contemplates, probably with a reminiscence of Horace (Od. ii. 6), the prospect of retiring to the neighbourhood of Aquileia and the Timavus in his old age. But the spell exercised over him by Rome and Roman society was too great to permit of a prolonged absence; and even the epigrams sent from Forum Corneli and the A‘milian Way ring much more of the Roman Forum, and of the streets, baths, porticos, and clubs of Rome, than of the places from which they are dated. So too his motive for his final departure from Rome in 98 a.p. was a weariness of the burdens imposed on him by his social position, and, apparently, the difficulties of meeting the ordinary expenses of living in the metropolis (x. 96); and he looks forward, with a kind of “ nostalgia,” to a return to the scenes familiar to his youth. The well-known epigram addressed to Juvenal (xii. 18) shows that for a time his ideal was realized ; but the more trustworthy evidence of the prose epistle prefixed to book xii. proves that his contentment was of very short duration, and that he could uot live happily away from the literary and social pleasures of Rome (“ bibliothecas, theatra, convictus ”), which supplied both the impulse to his genius and the material on which it could exercise itself. The one consolation of his exile was the society of a lady, Marcella, of whom he writes rather as if she were his patroness,—and it seems to have been a necessity of his being to have always a patron or patroness,—than his wife or mistress. His delight in her society arose from his finding in her one who, though born and bred in this remote province, yet by her natural grace and accomplishment revived for him the charm of Rome.

During his life there, although he never rose to a position of real independence, and had always a hard struggle with poverty, he seems to have known every- body, especially every one of any eminence at the bar or in literature. In addition to Lucan and Quintilian, he numbered among his friends or more intimate acquaintances Silius Italicus, Juvenal, the younger Pliny ; and we find a number of other names, such as those of Julius

Martialis, Faustinus, Bassus, Decianus, Melior, Stella, &c., of men holding a high social, legal, or literary position, whose society and patronage he enjoyed. 'The silence whieh he and Statius, although authors writing at the same time, having common friends, and treating sometimes of the same subjects, maintain in regard to one another may be explained by mutual dislike or want of sympathy. Martial, in many places, shows an undisguised contempt for the artificial kind of epic on which Statius's reputation chiefly rests; and it seems quite natural that the respectable author of the Zhebacd and the Stlve should feel little admiration for either the life or the works of the Bohemian epigrammatist.

The personal faults of Martial, which deny to his

writings, notwithstanding their vivacity, truth, and brilli- ancy, a place among the best poetry of antiquity, have been sufficiently indicated. It remains to ask, What were those qualities of nature and intellect which enable us to read his best work—even the great body of his work— with the freshest sense of pleasure in the present day ?

He had the keenest capacity for enjoyment, the keenest curiosity and power of observation. The ordinary spectacle of Roman life, as it passed before his eyes, was thus vividly apprehended and reproduced by him in all its details ; and the many varieties of character which an over-ripe and decaying civilization produces were quickly seized and graphically sketched. He had also a very just disceru- ment. It is rare to find any one endowed with so quick a perception of the ridiculous who is so little of a carica- turist. He was himself singularly free from cant, pedantry, or affectation of any kind. Though tolerant of most vices, he has a hearty scom of hypocrisy,—of the combination of outward austerity with secret profligacy,—of the man who, while he wears

'¢ Fuscos colores, galbinos habet mores." ?

There are few better satirists of social and literary pre- tenders either in ancient or modern times. Living in a very artificial age, he was quite natural, hating pomp and show, and desiring to secure in life only what

really gave him pleasure. ‘To live one’s own life heartily from day to day without looking before or after, and to be one’s self without trying to be that for which nature did not intend him, is the sum of his philosopliy. It is the philosophy of a man who has passed the middle of life, who has outlived any illusions he may ever have had, and who is quite content that whatever remains to him in the future should be like his present. Further, while tolerant of much that is bad and base,—the characters of Crispinus and Regulus, for instance,—he shows himself genuinely grateful for kindness and appreciative of excellence, He has no bitterness, malice, or envy in his composition, He pro- fesses to avoid personalities in his satire ;—“ Ludimus in- nocui” is the character he claims for it. Pliny, in ths ehort tribute which he pays to him on hearing of his death, says, “He had as much candour as wit and pungency in his writings ” (Zp, iii. 21),

Honour and sincerity (fides and simplicitas) are the qualities which he most admires in his friends). Though many of his epigrams indicate a cynical disbelief in the character of women, yet others prove that he could respect and almost reverence a refined and courteous lady. His dwn life in Rome afforded him no experience of domestic virtue ; but his epigrams show that, even in the age which is known to modern readers chiefly from the Satzres of Juvenal, that virtue was recognized asthe purest source of happiness. The tenderest element in Martial’s nature seems, however, to have been his affection for children and for his dependants. The pathos with which he has recorded their premature death, combined with his fresh enjoyment of outward nature, give to many of his pieces a rank among the serious poetry of the world—‘ inter sanctiora carmina,”—to use a phrase of his own.

The permanent literary interest of Martial’s epigrams arises not so much from their verbal point or brilliancy, though in these respects they are unsurpassed, as from the amount of human life and character which they contain. There is no truer painter of social manuers in antiquity. He enables us better than any other writer to revive the out- ward spectacle of the imperial Rome which we see in its ruins, and to repeople its streets, shops, porticos, baths, and amphitheatres. If Juvenal enforces the lesson of that time, and has penetrated more deeply into the heart of society,

1 ¢“ Whose dress is of a dull colour, his morals a pale green.”

Martial has sketched its external aspect with a much fairer pencil and from a much more intimate contact with it, It is from the immediate impressions and comments of the epigrammatist that the satirist has taken the suggestion of many of his more elaborate pictures and more stern denunciations, But it is not only the peculiarities of Roman customs that live in the writings of Martial, His page, to use his own phrase, "has the true relish of human life" in every age—hominem pagina nostra sapit." He was to Rome in the decay of its ancient virtue and patriotism what Menander was to Athens in its decline, They were both men of cosmopolitan rather than of 4 national type, and had a closer affinity to the life of Paris or London in the 18th century than to that of Rome in the days of the Scipios or of Athens in the age of Pericles, The form of epigram was fitted to the critical temper of Rome as the comedy of manners was fitted to the dramatic genius of Greece. Martial professes to be of the school of Catullus, Pedo, and Marsus, and admits his inferiority only to the first. But, though he is a poet of a less pure and genuine inspiration, he is a greater epigrammatist even than his master. He has indeed made that form of art peculiarly his own. He has applied it to the repre- sentation of a very much greater number of situations, incidents, and characters, and he has done this with the greatest clearness, terseness, and vivacity of style, and witha masterly command over all his metres, except the pure hexa- meter, in which no other writer has been able to treat the familiar matters of the day with the light touch of Horace, Martial, except where he is flattering the emperor,—and then we may sometimes suspect an undercurrent of irony, —is one of the most natural and sensible as he is one of the wittiest and most brilliant of writers. He fails, per- haps, more often in his wit than in his sense. He is full of the happiest phrases, which express admirably for all times, without over-subtlety and without triteness, the judgment and impressions of life formed by direct contact with it, and taken neither from books nor from the opinions of other men, of a thorough man of the world, who had yet some feelings and sensibilities to which men of the world are generally strangers. He wrote naturally because he was completely in harmony with the life of his age. As this is the explanation of his grave offences, it should also be recognized as contributing to his merits as a writer.

Owing probably to the reasons which have excluded his writings from school education, little has been done for the criticism or explanation of Martial for about two centuries. There is a good edition of the text by Schneidewin in the Teubner series of classics. For English readers the Selected Epigrams of Martial, by H, H. Stephenson, and the Martialis Epigrammata Selecta, by Messrs Paley and Stone, may be recommended as a good introduction to the study of this poet. An edition of book i., with a Latin com- mentary by J. Flach, has lately appeared at Tubingen. Further information about him may be obtained in a work by A. Brandt, De Martialis poctx vita et scriptis (Berlin, 1853), and in Friedlinder's Sittengeschichte Roms; and an excellent criticism on his writings is to be found among the prose works of Lessing, (W. Y. 8)

MARTIAL LAW. See Miuirary Law,

MARTIGUES, chief place of a canton in the depart- ment of Bouches-du-Rhéne, France, stands on the southern shore of the lagoon of Berre, and at the eastern extremity of that of Caronte, by which the former is connected with the Mediterranean, Divided into three quarters by canals with numerous bridges, the place has sometimes been called the Venice of Provence. It has a harbour of 10 acres, af iron foundry, workshops for maritime constructions, oil manufactures, and chemical works; the principal industry, however, consists in the preparation of ' boutargue, which is obtained from the roes of the grey mullet caught in the lagoons, and rivals Russian caviare. The population in 1876 was 8093,

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Built in 1282 by Raymond Bérenger, count of Provence, Martigues yas made a viscountship by Joanna I., queen of Naples. Henry IV. made it a principality, 1n favour of a princess of the house of Luxembourg. It afterwards passed into the hands of the duke of Villars.

MARTIN! (French, AMartinet), the Herundo urbica of Linneus and Chelidon urbica of modern ornithologists, a pird very well known throughout Europe, including even Lapland, where it is abundant, retiring

in winter to the south of Africa.? It also inhabits the western part of Asia, and appears from time to time in large flocks in India ; put the boundaries of its range and those of at least one of stg Eastern congeners cannot as yet be laid down. The Martin (or House-Martin, as it is often called, to distinguish +t from the Sand-Martin presently to be mentioned) com- monly reaches its summer-quarters a few days later than the SWALLOW (q.v.), whose habits its own so niuch resemble that heedless persons often disregard the very perceptible differences between them, the Martin's white rump and lower parts being conspicuous as it flies or clings to its "Joved mansionry" attached to our houses, for, as Shakespeare wrote—

artificial escarpment. When beginning its excavation, it clings to the face of the bank, and with its bill loosens the earth, working from the centre outwards, assuming all sorts of positious—as often as not hanging head downwards. The form of the boring and its length depend much on the nature of the soil; but the tunnel may extend to 4, G6, or even 9 fect. The gallery seems intended to be straight, but inequalities of the ground, and especially the meeting with stones, often cause it to take a sinuous course. At the end is formed a convenient chamber lined with a few grass stalks and feathers, the latter always beautifully arranged, and upon them the eggs are laid. The Sand-Martin has several broods in the year, and is much more regular than other Hirundinidz in its departure for the south. The kind of soil needed for its nesting- habits makes it a somewhat local bird; but no species of the Order Passeres has a geographical range that can com- pare with this. In Europe it is found nearly to the North Cape, and thence to the Sea of Okhotsk. In winter it visits many parts of India, and South Africa to the Transvaal territory. In America its range is even more extraordinary, extending (due regard being of course had to the season of the year) from Melville Island to Caigara in Brazil, and. from Newfoundland to Alaska.

The Purple Martin of America,' Hirwndo or Progne purpurea, requires some remarks as being such a favourite bird in Canada and in the United States. Naturally breeding in hollow trees, it readily adapts itself to the nest-boxes which are very commonly set up for its accom- modation ; but its numbers are in some years and places subject to diminution in a manner which has not yet been satisfactorily explained. The limits of its range in winter are not determined, chiefly owing to the differences of opinion as to

the validity of certain supposed kindred species found in South America; but according to some authorities it reaches the border of Patagonia, while in summer it is known to inhabit lands within the Arctic Circle. The male is almost wholly of a glossy steel-blue, while the female is much duller in colour above, and beneath of a brownish-grey.

Birds that may be called Martins ¢ occur almost all over ° the world except in New Zealand, which is not regularly inhabited by any member of the Family. The ordinary Martin of Australia is the Hirundo or Hylochelidon nigricans of most ornithologists, and another and more beautiful form is the Ariel or Fairy-Martin of the same country, Hirundo or Lagenoplastes ariel. This last builds of mud a bottle-shaped nest, as does also the Rock-Martin of Europe, Hirundo or Biblis rupestris; but space fails wherein to tell more of these interesting birds. (A. N.)

MARTIN, Sz, bishop of Tours, was born of heathen parents at Sabaria (Stein am Anger) in Pannonia, about the year 316. When ten years of age he became a cateclumen, and at fifteen, contrary to his own inclination, he entered the army. It was while he was stationed at Amiens that he divided his cloak with the beggar, and on the following night had the vision of Christ making known to his angels this act of charity to Himself on the part of " Martinus, still a catechumen." Soon afterwards he received baptism, and, two years later, having been per- mitted to leave the army, he joined Hilary of Poitiers, who wished to make him a deacon, but at his own request ordained him to the humbler office of an exorcist. In the course of the years that followed he undertook a journey to Pannonia for the purpose of converting his parents, and was successful in bringing his mother within the pale of

' No jutty, frieze, Buttress, nor coign of vantage, but this bird Hath made his pendent bed and procreant cradle." —Macbeth, act i. se. 6.*

This nest, made of the same material as the Swallow's, is, however, a far more difficult structure to rear, and a week or more is often occupied in laying its foundations— the builders clinging to the wall while depositing the mud of which itiscomposed. But, the base once securely fixed, the superstructure is often quickly added till the whole takes the shape of the half or quarter of a hemisphere, and a lining of soft feathers, mixed with a

few bents or straws, fitsit for its purpose. The Martin sets about building very soon after its return, and a nest that has outlasted the winter's storms is almost at once reoccupied ; though if a new nest be needed its construction often involves great delay, for any excess of wet or drought retards the operation, and the work is generally placed in such an exposed situa- tion that heavy driving rains will frequently wash away the half-dried walls. However, the bird mostly perseveres against these and other untowardnesses, contriving in the course of the summer to raise a second or, rarely, a third brood of offspring—though it is certain that the latest broods often die in the nest—apparently through failure of food. Yet what seem to be adults of this species are observed in England every year so late as November, and there are several instances of its appearance within a few days of the winter solstice ; but it is to be remarked that these late birds are almost. certainly strangers, and not natives of the locality in which they are seen.

The Sand-Martin, Hirundo riparia of Linneus and Cotile riparia of modern writers, differs much in appearance and habits from the former. Its smaller size, mouse- coloured upper surface, and jerking flight ought to render it easily recognizable from the other British Hirundinide ; but through carelessness it is seldom discriminated, and, being the first of the Family to return to its northern home, the "early Swallow" of newspaper-writers would seem to be nearly always of this species. Instead of the clay-built nest of the House-Martin, this bird bores, with a degree of regularity and an amount of labour rarely excelled in its Class, horizontal galleries in a natural or

i The older English form, Martlet (French, Martelet), is, except in heralds' language, almost obsolete, and when used is now applied in some places to the Swirt (¢.v.).

z 'Since the publication of the account of this species in Yarrell's

ritish Birds (ed. 4, ii. p. 854), Mr Gurney has informed the writer of men obtained out of a migratory flock flying very high on the Qua'qua' river, lat. 19° 10' S., by the expedition of Messrs Jameson and Ayres, 23d October 1880,

oe 3 In 1840 an example is said to haye been killed at Kingstown in Ireland, the skin of which is in the Dublin Museum of Science and Art. 4The Martin of French colonists (in the Old World) is an Acri- dotheres, onc of the STARLINGS (9.2.).

the church. For some time, doubtless during the Arian troubles, he lived, along with a presbyter friend, an ascetic life on the desert island of Gallinaria near Genoa; in 360 he was again with Hilary at Poitiers, and founded in the neighbourhood the monasterium Locociagense (Licugé). Here his miracles, which included more than one case of restoring the dead to life, were very numerous, and made him so famous that in 371 the people of Tours insisted on having him for their bishop. In this capacity he was extremely zealous and energetic in seeking to extirpate idolatry from his diocese and from France, and by example as well as by precept he did much for the spread of the monastic system. To obtain the privacy that he required for the maintenance of his personal religion, he established the monastery of Marmoutier-les-Tours (Martini mona- sterium) on the banks of the Loire. At Treves, in 385, he was importunate in his entreaties that the lives of the Priscillianist heretics should be given them, and he ever afterwards refused to hold ecclesiastical fellowship with those bishops who had sanctioned their execution. He died at Candes about the year 400, and is commemorated by the Roman Church on November 11 (duplex). He is the patron saint of France, and of the cities of Mainz and Wiirzburg. The Life by his disciple Sulpicius Severus is practically the only source we have for his biography, but it is full of legendary matter and chronological inaccuracies. The feast of St Martin (Martinmas) took the place of an old pagan festival, and inherited some of its usages (such as the Martinsminnchen, Martinsfeuer, Martinshorn, and the like, in various parts of Germany) ; by this circumstance is most probably to be explained the fact that he is regarded as the patron of drinking and jovial meetings, as well as of reformed drunkards.

MARTIN I., pope, succeeded Theodore I, in June or July 649. He had previously acted as papal apocrisiarius at Constantinople, and was held in high repute for learning and virtue. Almost his first official act was to

summon a synod (the first Lateran) for dealing with the Monothelite heresy. It met in the Lateran church, was attended by one hundred and five bishops (chiefly from Italy, Sicily, and Sardinia, a few being from Africa and other quarters), held five sessions or " secretarii" from the 5th to the 3lst of October 649, and in twenty canons condemned the Monothelite heresy, its authors, and the writings by which it had been promulgated. In this condemnation were included, not only the '" Ecthesis" or exposition of faith of the patriarch Sergius for which the emperor Heraclius had stood sponsor, but also the " Typus" of Paul, the successor of Sergius, which had the support of the reigning emperor (Constans IL). Martin was very energetic in publishing the decrees of his Lateran synod in an encyclical, and Constans replied by enjoining his exarch to seize the pope, should he persist in this line of conduct, and send him prisoner to Constantinople. These orders were found impossible of execution for a considerable space of time, but at last Martin was arrested in the Lateran (June 15, 653), hurried out of Rome, and conveyed first to Naxos and subsequently to Constantinople (September 17, 654). After suffering an exhausting imprisonment and many public indignities, he was ultimately banished to Cherson, where he arrived on March 26, 655, and died on the 16th of September following. His successor was Eugenius I. A full account of the events of his pontificate will be found in Hefele's Conciliengeschichte, vol. iii., 1877.

MARTIN II. See Marinus I.

MARTIN III. See Marinus IL.

MARTIN IV., pope from 1281 to 1285, was the suc- cessor of Nicholas [II. He was a native of Touraine, born about 1210, and his proper name was Simon de Brion.

After holding various offices at Rouen and Tours, he was.

made chancellor of France by Louis IX. in 1260, and cardinal by Urban LV. in 1261. He acted as legate for this pope and also for his successor Clement IV. in the negotiations for the assumption of the crown of Sicily by Charles of Anjou, and he is supposed also to have stimn- lated the ambition of Philip ITI. for the imperial dignity in 1273. After the death of Nicholas ITI. (August 1280) Charles of Anjou was able to secure the election of Cardinal Simon by the conclave at Viterbo (February 22, 1281), The Romans declined to receive him within their walls and he was crowned at Orvieto. At the instance of Charles, whose tool he had become, he in November 1281 excommunicated the emperor Michael Palaologus, who stood in the way of the French projects against Greece, —an act by which the union of the Eastern and Western churches was rendered impossible. For three years after the Sicilian Vespers in 1282 all the spiritual and material resources at his command were in vain employed on behalf of his patron against Peter of Aragon. He died at Perugia on March 25, 1285, and was succeeded by Honorius IV, MARTIN V. (Otto di Colonna), pope from 1417 to 1431, was elected on St Martin's day at Constance by a conclave consisting of twenty-three cardinals and thirty delegates of the council, which after deposing John XXIII. had long experienced much perplexity from the conflicting claims of Gregory XII. and Benedict XIII. The son of Agapito Colonna and Catarina Conti, born about 1368, he belonged to one of the oldest and most distinguished families of Rome, became apostolic protonotary under Urban VL, was created cardinal-deacon by Innocent VII., and in 1410 was the delegate of Alexander V. to hear the appeal which had been taken in that year to the papal see by John Huss. He was justly esteemed for his moderation, learn- ing, uprightness, and business capacity, but he failed to achieve, as he might have done, the honour of being a reforming pope. His first act after his election was to

publish a brief confirming all the regulations made by his –

predecessors with regard to the papal chancery,—regula- tions which had long been the subject of just complaint. When the "nations" of the council pressed their plans for reform, Martin submitted a counter scheme, and ultimately entered into negotiations for separate concordats, for the most part vague and illusory, with Germany, England, and France. He left Constance at the close of the council (May 1418), but travelled slowly

through Italy, lingered at Florence, and did not venture to enter Rome until September 1420, when his first task was to seek to restore it to the prosperity and order to which it had become 4 stranger. In accordance with the decree of Constance, confirmed by himself, ordering that councils should be held every five years, he in 1423 summoned the council which met at Pavia and afterwards at Siena; it was some what poorly attended, and this circumstance gave the pope a pretext for dissolving it as soon as it had come to the resolution that "internal church union by reform ought to take precedence of external union." It was prorogued for seven years, and then met at Basel ; shortly after its open- ing Martin died of apoplexy, on February 20, 1431, His successor was Eugenius IV. 'sh MARTIN, Jonn (1789-1854), a popular eo painter, was born at Haydon Bridge, near Hexham, on the 19th of July 1789. On account of his early interest 4 art he was apprenticed by his father to a coachbuiltes learn heraldic painting, but owing to a quarrel ' ; indentures were cancelled, and he was placed un a Bonifacio Musso, an Italian artist, father of the We" known enamel painter Charles Musso. With his aa Martin removed to London in 1806, where he marre | a the age of nineteen, and led a struggling life, 3 and himself by giving drawing lessons, and by painting:

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water colours, and on china and glass. His leisure was occupied in the study of perspective and architecture. His first picture, Sadak in Search of the Waters of Oblivion, was executed ina month. It was exhibited in the Royal Academy of 1812, and sold for fifty guineas. It was followed by the Expulsion (1813), Paradise (1813), Clytie (1814), and Joshua (1815). In 1821 appeared the famous Belshazzar's Feast, which excited much favourable and hostile comment, and was awarded a prize of £200 at the British Institution, where the Joshua had previously carried off a premium of £100. Then came the Destruction of Herculaneum (1822), the Creation (1824), the Eve of the Deluge (1841), and a long series of other Biblical and imaginative subjects, many of which are widely known through engravings. In 1832-33 Martin received £2000 for drawing and engraving a fine series of designs to Milton, and along with Westall he produced a set

of Bible illustrations. He was also much occupied with scliemes for the improvement of London, and published various pamphlets and plans dealing with the metropolitan water supply, sewage, dock, and railway systems. During the last four years of his life he was engaged upon his large subjects of the Judgment, the Day of Wrath, and the Plains of Heaven. He was attacked with paralysis while painting, and died in the Isle of Man on the 17th of February 1854.

The bold originality of Martin's productions startled and attracted the public, but they are without the qualities of solid execution and truth to nature upon which a lasting fame in the arts must be built. His figures are badly drawn, his colouring is hot and unpleasant. To most of his professional brethren his works seemed theatrical and tricky ; and the best lay critics of his time, like Charles Lamb, were disposed to deny that they evinced true imaginative power. His popularity may be said to have culminated in 1828, the year of his Fall of Nineveh ; since then it has been gradually declining.

MARTINA FRANCA, a city of Italy in the province of Lecce, 18 miles north of Taranto, on a hill near the sources of the Tara. It was a fief of the Caraccioli family, and dates from a comparatively modern epoch. 'The ducal palace is one of the finest buildings of its kind in the south of Italy, somewhat similar in style of architecture to the Palazzo Pamfili in Naples. 'The population of the city was 13,088 in 1861; that of the commune has increased from 16,637 in that year to 19,257 in 1881.

MARTINEAU, Harrier (1802-1876), English woman of letters, was born at Norwich, where her father was a manufacturer. The family was of Huguenot extraction, but had adopted Unitarian views. Her education, which included Latin and French, as well as domestic accomplish- ments, was received partly at home, and partly under a Mr Perry, to whose lessons in logical English composition she ascribed something of her later clearness of thought and statement. The atmosphere of her home was indus- tious, intellectual, and austere; she herself was clever, weakly, and unhappy, and was, moreover, already growing deaf. At the age of fifteen the state of her health and temper led to a prolonged visit to her father's sister, Mrs Kentish, who kept a school at Bristol. Here, in the rompanionship of

amiable and talented people, her life became happier. Here, also, she fell under the influence of the Unitarian minister, Dr Carpenter, from whose instructions, she says, she derived "an abominable spiritual rigidity and a truly respectable force of conscience strangely mingled together." From 1819 to 1830 she "gain resided chiefly at Norwich. 'The first part of this period was mainly spent in quiet and almost secret study and in needlework. About her twentieth year her "at eee became confirmed, and she habitually from that

ine used an ear trumpet. In 1821 she began to write anonymously for the Monthly Repository, a Unitarian Pertodical, and was assured by her brother that authorship

. needlework.

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was her proper career, A little later she published Devotional Lxercises and Addresses, Prayers, and Hymns,

In 1826 her father died, leaving a bare maintenance to his wife and daughters. His death had been preceded by that of his eldest son, and was shortly followed by that of the young man to whom Harriet was engaged. Mrs Martineau and her daughters soon after lost all their means by the failure of the house where their money was placed. Harriet had to earn her living, and, being precluded by her deafness from teaching, took up author- ship in earnest and toiled with incredible industry. She reviewed for the Repository at the rate of £15 a year, wrote stories (afterwards collected as Traditions of Pales- time), gained in one year (1830) three essay-prizes of the Unitarian Association, and eked out her income by In 1831 she was seeking a publisher for a series of tales designed as Sllustrations of Political Economy, After many failures she accepted very disadvan- tageous terms, and the first number appeared amidst gloomy prognostications from the publisher. The sale, however, was immediate and enormous, the demand increased with each new number, and from that time her literary success was secured. In 1832 she moved to London; she at once became the fashion, and her acquaintance was eagerly sought. Till 1834 she continued to be occupied with her political economy series and with a supplemental series of Illustrations of Taxation. Four stories dealing with the poor-law came out about the same time. These tales, direct, lucid, written without any appearance of effort, aud yet practically effective, display the characteristic qualities of their author's style. In 1834, when the whole series was complete, Miss Martineau paid a long visit to America. Here her open adhesion to the Abolitionist party, then small and very unpopular, gave great offence, which was deepened by the publication, soon after her return, of Society in America and a Retrospect of Western Travel. An article in the Westminister Review, "The Martyr Age of the United States," introduced English readers almost for the first time to the struggles of the Abolitionists. In these American writings Miss Martineau shows less than her usual calmness and judicial common sense, but it will scarcely be denied that there was some ground for her vchemence. The American books were followed by a novel, Deerbrook,—a story of middle class country life, lacking the delicate humour of Miss Austen or the touch of farce that enlivens Miss Edgeworth's tales, but delightfully clear in style, wholesome in spirit, and well sustained in point of interest. To the same period belong two or three little handbooks, forming parts of a Guide to Service. The

veracity of her Maid of all Work led to a widespread belief, which she regarded with some com- placency, that she had once been a maid of all work herself.

In 1839, during a visit to the Continent, Miss Martineau's health, which had long been bad, broke down entirely. She retired to solitary lodgings in Tynemouth, and remained a prisoner to her couch till 1844. She was still busy, and, besides a novel (The Hour and the Man), published some tales for children, and Life in the Sick-room. These volumes contain some of her best work, and possess a charm of tender feeling to balance the somewhat cold rationality that predominates in most of Miss Martineau's writing. During this illness she for a second time declined a pension on the civil list, fearing to compromise her political independence. Her letter on the subject was published, and some of her friends raised a small annuity for her soon after.

In 1844 Miss Martineau underwent a course of mesmerism, and in a few months was restored to health. Her recovery excited much discussion and controversy.

She herself felé no doubt either of its reality or of its being due to mesmerism, and not unnaturally resented the incredulity of others. She eventually published an account of her case in sixteen Letters on Mesmerism, a proceeding which caused great offence to some members of her family. On finding herself set free from the bondage of ill-health, she removed to Ambleside, where she built herself the house in which the greater part of her after life was spent. In 1845 she published three volumes of Yorest and Game Law Tales, in which the method of her political economy series was again applied. In-1846 she made an Eastern tour with some friends. She was abroad for eight months, visiting Egypt, Palestine, and Syria, and on her return published Zastern Liye. The tendency of this work is to display humanity passing through one after another of the world's historic religions, the conception of the Deity and of Divine government becoming at each step more and more abstract and indefinite. The ultimate goal Miss Martineau believed to be a philosophic atheism, but this belief she did not expressly declare in Hastern Life, considering it to be

outside the province of that book. She published about this time Zousehold Mducation, expounding the modern theory, in which freedom and rationality, rather than command and obedience, are regarded as the most effectual instruments of education. Her practical interest in all schemes of instruction led her to start a series of lectures, addressed at first to the school children of Ambleside, but afterwards extended, at their own desire, to their elders) The subjects of these lectures were sanitary principles and practice, the histories of England and North America, and the scenes of her Eastern travels. At the request of Mr Charles Knight she wrote for him, in 1849, The tlistory of the Thirty Years' Peace,—a characteristic instance of Miss Martineau's remarkable powers of labour. "From the first opening of the books to study for the history to the depositing of the MS. of the first volume at press was," she says, "exactly six months. The second volume took six months to do."

In 1851 Miss Martineau edited a volume of Letters on the Laws of Man's Nature and Development. Its form is that of a correspondence between herself and Mr H. G. Atkinson (in which the latter has much the larger share), and it expounds that doctrine of philosophical atheism to which Miss Martineau had, in astern Life, depicted the course of human belief as tending. The existence of a first cause is not denied, but is declared unknowable, and the authors, while regarded by others as denying it, certainly considered themselves to be affirming the doctrine of man's moral obligation. Mr Atkinson was a zealous exponent of mesmerism, aud the prominence given to the topics of mesmnerism and clairvoyance no: doubt tended to heighten the disapprobation with which the book was received. The reviewers were almost unanimous in condemuation, and the publication caused a lasting division between Miss Martineau and some of her friends.

The new philosophical bent of her studies directed Miss Martineau's attention to the works of Comte, aud she undertook a condensed English version of the Phalosophie Positive. It appeared in 1853, and to most readers is more useful aud intelligible than the original. She had begun in the previous year to write articles, chiefly biographical, for the Daily News. Among these were the Letters from Ireland, written during a visit to that country in the summer of 1852. She also wrote a considerable number of essays upon different manufactures for /Zouse- hold Words, and another

series for the same periodical upon the treatment of blindness, deafness, idiotcy, &c., besides a Guide to Windermere, followed afterwards by a Complete Guide to the Lakes. She had been for many years a con- tributor to the Westminister Review, and was one of the

little band of supporters whose pecuniary assistance, jp 1854, prevented its extinction or forced sale, In the early part of 1855 Miss Martineau found herself suffering from heart disease. Having always felt it one of her duties to write her autobiography, and believing the time before her to be-but brief, she now at once set about this task, and on its completion caused the book to be printed that it might be ready for speedy publication at her death. But her life, which she supposed to be so near its elose was prolonged for other twenty years, her death not taking place until 1876.

These years were by no means idle. She continued to contribute to the Daily News, for which she wrote in all more than 1600 articles, and to the Westminster Review, as well as to other. papers and her biographical sketches were collected and reprinted from the Daily News in a volume which has justly become one of the best- known of her works. In point of styleit is probably the most excellent of them all. The form and method leave nothing to be desired, and the perception of eharacter is shrewd, sincere, and, roughly speaking, reliable. But in reading the book we feel that the biographies, divided by the editor into groups of royal, political, &e., fall far more naturally into two larger classes,—the biographies of persons whom Miss Martineau liked, and the biographies of persons whom she disliked. All are doubtless in a sense true, as all photographs are true, but the difference between a flattering and an unflattering photograph is considerable.

She also produced two books on the government of India, and was eontinually oceupied in promoting schemes of reform and benevolence. Her poorer neighbours owed much to her kindly and enlightened efforts, and her servants found in her a friend as well asa mistress. Her long and busy life bears the consistent impress of two leading eharacteristics,—industry and sincerity. Her work was invariably sound, and its motive invariably respectable. The verdict which she records on herself in the

autobiographical sketch left to be published by the Daily News is probably very near to that which will be recorded by future judgment. She says,—‘’ Her original power was nothing more than was due to earnestness and intellectual clearness within a certain range. With small imaginative and suggestive powers, and therefore nothing approaching to genius, she could see clearly what she did see, and give a clear expression to what she had to say. In short, she could popularize while she eould neither discover nor invent.” Her judgment on large questions was clear and sound, and was always the judgment of a mind naturally progressive and Protestant. Mentally she wasa true daughter of her Huguenot ancestors. But it is impossible to read her autobiography without suspecting that she was subject to eonsiderable prejudices, especially in her judg- ment of persons, and that her temper, particularly in earlier life, was unamiable, hard, and unforgiving. She seems, indeed, to have possessed the sort of disposition which shows to much greater advantage in its relation to juniors, inferiors, and dependants than in its relations to elders and superiors, and which therefore appears more amiable in the closing than in the opening years of life. Her autobiography reveals also a weakness which was perhaps unavoid- able. ‘The publication of her political economy tales brought her into great and sudden notice ; many persons of high position, official and otherwise, desired to enlist her advocacy on the part of their particular projects. She found her help much eourted, and much help eagerly proffered to her. Her deafness, which suffered her to hear only what was directly addressed to herself, assisted to make her a central figure, and to induce the belief that hers was one of the most potent if not actually the most potent voice im English politics. Her deafness was in another direction probably advantageous. It led her to find solitude easier than most com- panionship, and saved her from many distractions of attention. It may indeed fairly be surmised that but for her deafness phe could never have found time to achicve the amazing quantity 0 work that she did, while the courageous, ehcerful, and unobtrusive spirit in which she bore her infirmity remains an example and an encouragement to all her fellow-sufferers. (C. BL.)

MARTINI, Grovawni Battista (1706-17 84), the most learned musician of the 18th century, was born at Bologna on April 25, 1706. His father, Antomo Maria Martini, a violinist, taught him very early the a. of music, and to play the violin; at a later period he learned singing and harpsichord

playing from Padre Pradieri, aud counterpoint from Antonio Riccierl. Having received his education in classics from the fathers of the oratory of San Filippo Neri, he afterwards entered upon ® noviciate at the Franciscan monastery at Lago, ab the close of which he was received into that order on September

i 1722. Continuing his studies in the theory and practice of music with great zeal, he in 1725, though only nineteen years of age, received the appointment of chapel- master in the Franciscan church at Bologna, where his compositions soon attracted much attention. At the invitation of amateurs and professional friends he now opened a school of musical composition at which in the course of his long life several celebrated musicians were trained, including Paolucci, Sabbatini, Ruttini, Zanotti, Sarti, Ottani, and Stanislas Mattei; as a teacher he con- sistently declared his preference for the traditions of the old Roman school of musical composition (see Music). Padre Martini was a zealous and indefatigable collector of musical literature, and is alleged to have been the possessor of the most extensive musical library ever formed. After a lingering illness he died at Bologna on August 4, 1784. His Elogio was published by Pietro della Valle at Bologna in the same year.

The greater number of Martini's sacred compositions remain un- printed, The Liceo of Bologna possesses the MSS. of two oratorios ; and a requiem, with some other pieces of church music, are now in Vienna. Litanie aique antiphone finales B. V. Mariz were pub- lished at Bologna in 1734, as alsotwelve Sonate d'intavolatura ; six Sonate per Vorgano ed il cembalo in 1747 ; and Duetti da Camera in 1763. Martini's most important works are his Storia della Musica (Bologna, 1757-81) and his Saggio di Contrapunto (Bologna, 1774-75). The former, of which the three published volumes relate wholly to ancient music, and thus represent a mere fragment of the author's vast plan, exhibits immense reading and industry, but it is written in-a dry and unattractive style, and is overloaded with matter which cannot be regarded as historical. At the beginning and end of each chapter occur puzzle-canons, some of which are

‘exceedingly difficult ; Cherubini solved the whole of them. The Saggio is a very learned and valuable work, containing an import- ant collection of examples from the best masters of the old Italian and Spanish schools, with excellent explanatory notes. It treats chiefly of the tonalities of the plain chant, and of counterpoints constructed upon them. Besides being the author of several con- troversial works, Martini drew up a Dictionary of Ancicnt Musical Terms, which appeared in the second volume of G. B. Doni’s Works ; he also published a treatise on The Theory of Numbers as applied to Music.

MARTINI, Suone (1283-1344), called also Simone di Martino, and more commonly, but not correctly, Simon Memmi,! was born in 1283. He followed the manner of painting proper to his native Siena, as improved by Duccio, which is essentially different from the style of Giotto and his school, and the idea that Simone was himself a pupil of Giotto is therefore wide of the mark. The Sienese style is less natural, dignified, and reserved than the Florentine ; it has less unity of impression, has more tendency to pietism, and is marked by exaggerations which are partly related to the obsolescent Byzantine manner, and partly seem to forebode certain peculiarities of the fully developed art which we find prevalent in Michelangelo. Simone, in especial, tended to an excessive and rather affected tenderness in his female figures ; he Was more successful in single figures and in portraits than in large compositions of incident. He finished with scrupulous minuteness, and was elaborate in decorations of patterning, gilding, dc.

The first known fresco of Simone is the vast one which he executed in the hall of the Palazzo Pubblico in Siena,— the Madonna Enthroned, with the Infant, and a number of angels and saints ; its date is 1315, at which early period of his life he was already an artist of repute throughout Italy. In §. Lorenzo Maggiore of Naples he painted a life-sized picture of King Robert crowned by his brother, lr—“—s—sC—SC SCia ro Pe ag account of this celebrated early Sienese painter is i Diet and since repeated in a variety of forms.

shows that it is far from correct, the incidents being

_roneous, and the paintings attributed to Simone in various principal

instances not his, We follow the authority of Messrs Crowe and Cavalcaselie,

‘evidence, assigned to Simone.

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Lewis, bishop of Toulouse; this also is extant, but mucli damaged. . In 1320 he painted for the high altar of the church of St Catharine in Pisa the Virgin and Child between six saints ; above are archangels, apostles, and other figures. The compartmented portions of this work are now dispersed, some of them being in the academy of Siena. Towards 1321 he executed for the church of St Dominic in Orvieto a picture of the bishop of Savona kneeling before the Madonna attended by saints, now in the Fabricceria of the cathedral. Certain frescos in Assisi in the chapel of St Martin, representing the life of that ‘saint, ascribed by Vasari to Puccio Capanna, are now, upon strong internal He painted also, in the south transept of the lower church of the same edifice, figures of the Virgin and eight saints. In 1328 he produced for the Sala del Consilio in Siena a work of a very different character—a striking equestrian portrait of the victorious general Guidoriccio Fogliani de’ Ricci.

Simone had married in 1324 Giovanna, the daughter of Memmo (Guglielmo) di Filippuccio. Her brother, named Lippo Memmi, was also a painter, and was frequently associated with Simone in his work ; and this is the only reason why Simone has come down to us with the family- name Memmi. ‘They painted together in 1333 the Annunciation which is now in the Uffizi gallery. Simone kept a bottega (or shop), undertaking any ornamental work commissioned of him, and his gains were large. In 1339 he settled at the papal court in Avignon, where he made the acquaintance of Petrarch and Laura; and he painted for the poet a portrait of his lady, which has not come down to us ; it gave occasion for two of Petrarch’s sonnets, in which Simone is highly eulogized. He also illuminated for the poet a copy of the Comment of Servius upon Virgil, now preserved in the Ambrosian library of Milan. He was largely employed in the decorations of the papal buildings in Avignon, and several of his works still remain —in the cathedral, in the hall of the consistory, and, in the two chapels of the palace, the stories of the Baptist, and of Stephen and other saints. One of

his latest pro- ductions (1342) is the picture of Christ Found by his Parents in the Temple, now in the Liverpool Gallery. Simone died in Avignon in July 1344.

From this account of Simone's principal works it will be perceived that those with which his name and fame are most generally identified are no longer regarded as his. These are the compositions, in the Campo Santo of Pisa, from the legend of 8. Ranieri, and the Assumption of the Virgin; and the great frescos in the Cappellone degli Spagnuoli, in S. Maria Novella, Florence, representing the Triumph of Religion through the work of the Dominican order, &c. Some of the works in question can be proved to have been done many years after Simone's death, and the others belong to a different school and style of art.

MARTINIQUE, one of the West India islands, belonging to the chain of the Lesser Antilles, and consti- tuting a French colony, lies 33 miles south of Dominica and 22 north of Saint Lucia, between 14° 23' and 14° 52' N. lat. and 63° 6' and 63° 31' W. long. The greatest length is 43 miles, the mean width 19; and the surface comprises 244,090 acres, or 380 square miles. A cluster of volcanic mountains in the north, a similar group in the south, and a line of lower heights between them, form the backbone of the island, which culminates in the north-west in Mont Pelée (4430 feet), and has altogether a much more irregular and strongly marked relief than it presents to the eye,—the deep ravines and precipitous escarpments with which it abounds being reduced in appearance to gentle undulations by the drapery of the forests. Of the numerous streams which traverse the few miles of country between the watershed and the sea, about seventy or eighty av 74

are of considerable size, and in the rainy season become deep and too often destructive torrents. The east coast of the island, exposed to the full sweep of the Atlantic, is a succession of inlets, headlands, islands, and rocks; the south coast is much more regular, but bold and steep; and the west alone presents, in the bay of Fort de France, a stretch of mangrove swamp. Of the total area, about 83,990 acres are under cultivation, 83,843 occupied by forest and savanna, and 68,837 by fallow. On an average, according to the

returns for 1874-78 inclusive, 47,440 acres are devoted to the sugar crop, 1290 to coffee, 640 to cotton, and 1660 to cocoa. The mean annual temperature is 81° in the coast region,—the monthly mean for June being 83°, and that of January 77°. Of the annual rain- fall of 87 inches, August has the heaviest share (11:3 inches), though the rainy season extends from June to October ; March, the lowest, has 3°7. Martinique enjoys a remarkable immunity from hurricanes; half a century nlay pass without serious disaster from such a visitation. In 1878 there were 162,861 inhabitants (77,782 males, 85,079 females) in the island, which is thus nearly as densely peopled as Belgium. Since 1848 the increase amounts to about 42,800. Of the twenty-five communes, fourteen have more than 5000 inhabitants ; the largest are Saint Pierre (23,909), Fort de France (15,414), Lamentin (13,409), and Frangois (10,297). The great mass of the population consists of Creole negroes and half-castes of various grades, ranging from the 'Saccatra," who has hardly retained any trace of Caucasian blood, to the so- called "'Sangmélé," with his mere suspicion of negro com- nixture. Marriage is frequently ignored, and of the births no less than 66 per cent. are illegitimate.

Fort de France, the chief town, a place of about 11,000 inhabitants, stands on a bay on the west coast. Since the earthquake of 1839 nearly all the houses are of wood, and have only one story; the streets are laid out with great regularity. An abundant supply of water was in- troduced in 1856. St Pierre, the commercial centre of the island, with about 20,000 inhabitants, lies farther north on the same coast. It consists of a lower and an upper town,—the one close and unhealthy, and the other for the most part well-ventilated and pleasant.

Martinique, also called Madiana or Mantinino, was discovered by Columbus 15th June 1502. It was at that time inhabited by Caribs (Galibis) who had expelled or incorporated an older stock. In 1635 a Norman captain, D'Enambuc, from St Christopher's, took pos- session of the island, and in 1637 his nephew Duparquet became captain-general of the colony, now numbering seven hundred men. In 1654 welcome was given to three hundred Jews expelled from Brazil, and by 1658 there were at least five thousand people exclusive of the Caribs, who were soon after exterminated. Purchased by the French Government from Duparquet's children for

120,000 livres, Martinique was assigned to the West India Company, but in 1674 it became part of the royal domain. The habitants (French landholders) at first devoted themselves to the cultivation of cotton and tobacco; but in 1656 sugar plantations were commenced, and in 1726 the coffee plant was introduced by Desclieux, who, when water ran short during his voyage to the island, shared his scanty allowance with his seedlings. Slave labour having been introduced, there were 72,000 blacks in the island by 1736. Martinique has several times been occupicd by the English. Captured by Rodney in 1762, it was next year restored to the French ; but after the conquest by Sir John Jervis and Sir Charles Grey in 1794 it was retained for eight years ; and,

seized again in 1809, it was not surrendered till 1814.

See Renouard, Stat. de la Martinique, 1822; Sidney Daney, list. de la Martinique, 1846; E. hufz, Etudes hist. et stat. sur la population dela Martinique ; Pardon, La Martinique, 1877 ; H. Rey, Etude sur la col, dela Martinique, 1881.

MARTINSBURG, a town of the United States, the capital of Berkeley county, West Virginia, lies on a plateau above the Tuscarora Creek, in the Shenandoah valley, 80 miles west of Washington. A station on the Baltimore and Ohio Railroad, and a terminus of the Cumberland Valley Railway, Martinsburg is the seat of extensive machine- shops belonging to the former oompany, which were sacked

by the Confederates in 1861. 1870, was 6335 in 1880.

MARTIUS, Cart FRieprich Puitipp von (1794- 1868), a well-known German botanist and traveller ip Brazil. He studied in the university of Erlangen, and on graduating M.D. in 1814 published as his thesis a critical catalogue of plants in the botanic garden of the university. He afterwards devoted himself to botanjcal study, and in 1817 he and Spix were sent to Brazil by the king of Bavaria. They travelled from Rio Janeiro through several of the southern and eastern provinces of Brazil, and ascended the river Amazon to Tabatinga, as well as some of its larger aifluents. In 1820

they returned to Europe with tich collections of plants and animals, as also with stores of information on the geography, ethnology, and products of Brazil. In 1820 he was appointed conservator of the botanic garden at Munich, and in 1826 professor of botany in the university there, and held both offices till 1854, when he resigned them.

While a student Martius had published papers in various scien- tific periodicals, and he continued to do so during his whole life. After his return from Brazil he devoted his chief attention to the

flora of that country, and in addition to numerous short papers he published the Nova Genera et Species Plantarum Brasiliensium

The population, 4863 in

‘ (1828-32, 83 vols.) and Icones selectwy Plantarwm Cryptogamicarwm

Brasiliensium (1827), both works being finely illustrated. An account of his travels in Brazil ppeaed in 3 vols. 4to, 1823-31, with an atlas of plates, and is regarded as one of the most valuable works of travel of the present century. Probably the work by which he is best known is his Historia Palmarwm (1823-50) in 3 large folio volumes, of which one describes the palms discovered by himself in Brazil. In 1840 he began the Flora Brasiliensis with the assistance of the most distinguished European botanists, who undertook monographs of the various orders. Latterly Dr Kichler was associated with him in the editorship of this work, which is still going on, though over eighty parts have appeared. He also edited several works on the zoological collections made in Brazil by Spix, after the death of the latter in 1826. On the outbreak of potato disease in Europe he investigated the state of the diseased plants, and in 1842 published his observations. He also published independent works and short papers on the abori- gines of Brazil, on their civil and social condition, on their past and probable future, on their diseases and medicines, and on the languages of the various tribes, especially the Tupi.

MARTOS, a town of Spain, in the province of Jaen, is situated on the slope of a steep hill, which is surmounted by a ruined castle, 16 miles west-south-west of Jaen. The streets are steep, narrow, crooked, and ill-paved; the

public buildings are of the usual order, and present no feature calling for special remark. The surrounding district is specially productive of oil, and in the neighbourhood of the town are two sulphurous springs much resorted to in

cases of cutaneous disease. Population in 1877, 14,654. Martos perhaps stands on or near the site of the Twcct of Ptolemy.

| By Ferdinand III. it was taken from the Moors in 1225, and given

to the knights of Calatrava ; it was there that the brothers Carvajal, commanders of the order, were in 1410 executed by command of Ferdinand IV. after he had been '"'summoned" by them to 4 meeting at the Divine judgment scat. O'Donnell here gained a victory over the royalist troops in 1854.

MARTYN, Henry (1781-1812), a celebrated missionary, was born on February 18, 1781, at Truro, Cornwall. He came of a mining family, and his father John Martyn was a "captain" or mine-agent at Gwennap. He received his education at the grammar school of his native town under the famous Dr Cardew, entered " John's College, Cambridge, in the autumn of 1797, an in 1801, a month before he was twenty years old, was declared senior wrangler, obtaining soon after the first Smith's prize. In the following year he was chosen a fellow of his college. In the autumn of 1801 he was introduced to Charles Simeon, whose ardent disciple he soon became. It was his intention to devote himself to the bar, but in the October term of 1802 he chanced to hear Simeon speaking of the vast amount of good done 1n India' by a single missionary, William Carey; some time

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afterwards he read the life of the devoted David Brainerd, the enthusiastic apostle of the Indians of North America, and, "filled with a holy emulation," resolved to devote his energies to the work of a Christian missionary. On October 22, 1803, he was ordained deacon at Ely, and afterwards priest, and served as Simeon's curate at the church of Holy

Trinity, taking charge of the neighbouring parish of Lolworth, Still full of the thought of work- ing in heathen lands, he designed to volunteer for the Church Missionary Society, but a sudden disaster in Cornwall deprived him and his unmarried sister of all the provision their father had made for them, and rendered it necessary that he should obtain a salary that would support her as well as himself. He accordingly applied for, and obtained, a chaplaincy under the East India Company. He left for India on July 5, 1805.

For some months he was chiefly located at Aldeen, near Serampore; in October 1806 he proceeded to Dinapore, where he laboured for a time amongst the Europeans, and soon found himself able to conduct divine worship among the natives in their own vernacular language, and to establish schools for their instruction. At the end of April 1809 he was ordered up to Cawnpore, where he made his first attempt to preach to the heathen in his own compound, and had to endure frequent interruptions "amidst groans, hissings, curses, blasphemies, and threatenings " ; neverthe- less he pursued his work among the hundreds who crowded round him, consoling himself that, if he should never see a native convert, God "might design by his patience and continuance in the work to encourage other missionaries." Meanwhile the great business of his life was being diligently carried on. Day after day he occupied himself with learning new languages, and had already, during his residence at [inapore, been engaged in revising the sheets of his Hindustani version of the New Testament. He now translated the whole of the New Testament into Hindi also, and into Persian twice over. He translated the Psalms into Persian, the Gospels into Judso-Persic, and the prayer book into Hindustani, in spite of the constant interruptions caused by excessive weakness of body, and "the pride, pedantry, and fury of his chief moonshee Sabat." Ordered by the doctors to take a sea voyage for his health, he got leave to go to Persia and correct his Persian New Testament, whence he made up his mind to go on to Arabia, and there compose an Arabic version. Accordingly, on October 1, 1810, having seen his work at Cawnpore crowned, on the previous day, by the opening of a church, he left for Calcutta, whence he departed on January 7, 1811, for Bombay, which he reached on his thirtieth birthday. From Bombay he set out for Bushire, bearing letters from Malcolm to men of position there, as also at Shiraz and Ispahan. After a killing journey from the coast he reached Shiraz, and was soon plunged into discussion with the

disputants of all classes, 'Sufi, Moham- medan, Jew, and Jewish-Mohammedan, even Armenian,

_ all anxious to test their powers of argument with the first English priest who had visited them." Having made an unsuccessful journey to Tebriz to present the shah with his translation of the New Testament, he was seized with a fever, which so thoroughly prostrated his energies that, after a temporary recovery, he found it necessary to seek a change of climate. On September 12, 1812, he started with two Armenian servants, crossed the Araxes, rode from Tebriz to Erivan, from Erivan to Kars, from Kars to Erzeroum, from Erzeroum to Chiflik, urged on from place to Place by his cruel Tartar guide, and, though the plague Was raging at Tokat, he was compelled to stop there from utter prostration caused by fever. On the 6th of October rg eo either from the plague or from the weakness of

€ disorders which harassed him from day to day.

By his valuable labours as a translator Martyn had placed por- tions of the Scriptures within the reach of all who could read over one-fourth of the habitable globe, and during his brief life he earned for himself a foremost place among modern missionaries. Macaulay's lines, written in 1818, testify to the impression made by his enthusiastic career of self-devotion.

See Sargent, Memoir of the Rev. Henry Martyn, B.D., 1819; Wilberforce, Jowrnals and Letters of the Rev. Henry Martyn, 1837; Kaye, Christianity in India, 1859; Yonge, Pioncers and Founders, 1874; and The Church Quarterly for October 1881.

MARTYROLOGY, a catalogue or list of martyrs, arranged according to the succession of their anniversaries, and sometimes including an account of their lives and sufferings. The corresponding word in the Greek Church is IMenologion or Analogion; from the Menologia the Synaxaria are compiled. The custom of paying honour to the memory of those who had 'witnessed the good con- fession " in perilous times established itself very early in the Christian church, and one particular manner of commemora- tion was formally reccgnized by at least one ecclesiastical synod before the end of the 4th century; in the 47th canon of the third synod of Carthage (397 a.p.) it is decreed "liceat legi Passiones Martyrum quum anniversarii

eorum dies celebrantur." Apart from the still extant Depositio Martyrum contained in the work of the chrono- grapher of 354, edited in 1850 by Mommsen, the oldest "martyrologies" of which anything is known are the dpxaiwv paptupiwy cuvaywyy, or collection of records of past persecutions, to which Eusebius more than once alludes as having been made by himself, and the treatise On the Martyrs of Palestine, by the same author, the full text of which has been preserved in an ancient Syriac version edited by Cureton, Next to the general martyrology of Eusebius, in chronological order, it has been usual to place the calendar of saints' days referred to in a letter, attributed to Jerome, which purports to be written in answer to bishops Chromatius and Heliodorus, who had asked him to search the archives of Eusebius with the view of enabling them to observe the saints' days with more regularity. This epistle is now admitted to be spurious; ultimately, however, a so-called AMartyrologium Hieronymianum came into existence, but it is not so much a single martyrology as a rude patchwork derived from many ancient church calendars. In its present form it is a meagre list of names and places, but may be said to lie at the foundation of all subsequent Western calendars. Almost contemporary with its last recension is what is known as the Parvum Martyrologium Romanum, found by Ado of Vienne about 850 ; in it many of the dates are changed, and for the first time days are assigned to the chief characters of Scripture. To nearly the same date must be assigned the independent compilation of Bede, which has reached us, however, only as enlarged by subsequent editors. 'The 9th century was very fertile in martyrologies, among which may be mentioned that of Florus, subdeacon of Lyons (c. 830), who was the first cditor of Bede, that of Hrabanus Maurus, an attempted further improvement on Bede and Florus, that of Ado, an enlargement of Florus, but based on the Parvum Martyrologium Romanum, that of Usuard of Paris, the epitomizer of Ado, and that of Notker of St Gall, based on Ado and Hrabanus. The Jartyrologium Romanum was published by Baronius at the command of Pope

tregory XIII. in 1586; the enlarged edition by Rosweyd appeared at Antwerp in 1613. The Cistercian J/artyrology appeared at Rome in 1733 and 1748. The best-known Greek Jfenologion is that prepared in the 9th century by command of the emperor Basilius Macedo ; it was edited in 1727 by Cardinal Hannibal Urbini. An ancient Syriac martyrology, entitled

“the names of our lords the martyrs and victors, with their days on which they won crowns,” written in 412, has been edited, with an English translation, by Professor W. Wright, in the Journal of Sacred

Literature (1866).

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MARULLUS, Micuary TarcHanrota (00, 1500), one of the most brilliant scholars of the golden age of Florentine learning, was born at Constantinople, and at an early age, on the fall of his native city, was brought to Ancona in Italy, where he became the friend and pupil of Pontanus, with whom his name is associated by Ariosto (Orl. Fur. xxxvii. 8). He was a soldier and a poet, and in the latter capacity published epigrams and hymna naturales} Marullus took no part in the work of translation, then so favourite an exercise of scholars, but he was understood to be planning some great work when he perished, 10th April 1500, in the river Cecina near Volterra, Of other incidents in his life his feud with Politian and his marriage to the beautiful and learned Alexandra Scala, whom he praises in his poems, may be noticed. The name of Marullus is Now perhaps most familiar from the brilliant emendations on Lucretius which he left unpublished, and which were used for the Juntine edition. See especially Munro’s Lucretius, 2d ed., p. 6 sq.

MARUM (in Dutch Marwm), Martin Van (1750- 1837), a distinguished Dutch man of science, born at Delft. hough his fame rests chiefly on his electrical researches, he took a prominent position in many depart- ments of natural science, He graduated at Groningen in medicine and philosophy, and his numerous papers take up subjects connected with botany, chemistry, hygiene, natural history, and technology, as well as with his more special department, natural philosophy. In early life his father, who was a skilled mathematician, gave him a thorough training in the one really indispensable science. After his doctorate he for some time attached himself to the celebrated botanist Camper. He then commenced medical practice in Haarlem, but seems to have been too busy with original work to pay proper attention to his numerous patients. He devoted himself mainly to lectur- ing

on physical subjects ; and, after a brief interval, his extensive knowledge and methodical habits led to his being made secretary of the scientific society of huis adopted city. For this post he was specially fitted; and, under his active guidance, the society was advanced to the position of one of the most noted in Europe. He soon became professor of physics, and was entrusted with the care of the celebrated Teyler collection (now the Musée Teyler). He caused to be constructed for this, by Cuthbertson, the gigantic electrical machine which, for a long period, was the most powerful in the world. He also effected great improvements in air-pumps and other pneumatic machines. Though his name is not associated with any discovery of the very first order, the number and variety of his researches (especially in con- nection with electricity) are remarkable, So also is the practical mode in which he regarded his results, always when at all possible from the technological point of view. The work by which he is best known is his Z'reatese on Electricity (Groningen, 1776), in which all that had then been discovered in that science was carefully methodized. Van Marum was a man of quiet but active disposition, and of simple habits and tastes, which probably conduced in no small measure to the extreme length and usefulness of his life.

MARUTSE-MABUNDA, a kingdom in South Africa, stretching from 18° to 14° 25' S. lat. and from about 22° to 28° 25' E. long, with an area estimated at 123,590 square miles. It all belongs to the basin of the Zambesi, and by far the greater proportion lies to the north of that

See Catal. Syr, MLSS. Br. Mus., i.

' 'Two books of epigrams appeared first without date; an enlarged edition, with two additional books, published in]497, contains also the so-called hymns.

river, which forms its south-eastern boundary from the mouth of the Linyanti to the mouth of the Kafue, a dis. tance of about 350 miles. the main part of the territory formerly subject to the Makololo empire, which broke up on the death of Sekeletu in 1864. favourable report. a genial climate render easy the work both of husbandry and cattle-breeding. and white ; the

hemp-like kleen-korn or rosa, maize, water- melons, sugar-cane, ground-nuts, two kinds of beans, and manza are also cultivated. are the usual months for sowing ; but gourds, leguminous plants, and tobacco are sown any time up to December, the growth of the two latter crops being so rapid that they

The kingdoin thus includes Of country and people Dr Holub gives a very Abundance of water, a fertile soil, and

The chief crop is Kaffre corn, red

"September and October

often ripen by January, whilst Kaffre corn and maize are ready by February." Upwards of fifty kinds of wild fruit

are used by the people as food. Salt has to be imported,

and is consequently within the reach only of the wealthier classes. Besides the two great tribes which give their name to the kingdom, there are a large number of vassal tribes of numerical importance—Masupias, Matongas, Makalakas—all considered in the light of slaves by the rulers. The prevailing language is the Sesuto of the nearly extirpated Makololos. See Holub, Seven Years in South Africa, 1881.

MARVELL, Anprew (1621-1678), was born on March 31, 1621, at the parsonage of Winestead in Holderness. He was edncated at Hull grammar school by his father, who had obtained high position in that town, until his admission to Trinity College, Cambridge, on December 14, 1633. There he became ensnared by the Jesuits, who at that time were keen to secure youths of promise at the universities, and by them, probably in the beginning of 1638, was taken to London ; but he was recaptured by his father, and again received into Trinity on April 13 of the same year. He appears to have contributed to the Musa Cantabrigiensis in 1637; and beyond this nothing is known or even conjectured as to his college career. In 1640 his father was drowned under remarkable circumstances, an event which appears to have entirely unsettled him, for by an entry in the College Conclusion book, dated September 24, 1641, we find that he was adjudged by the seniority to

have forfeited the benefits of the college. He used his liberty during the next four years to travel through the Continent, remaining abroad until 1646. It has been assumed that during this journey Marvell became acquainted with Milton, but a comparison of dates shows that this is an error. His first employment was in 1650, as tutor to Lord Fairfax's daughter. During his stay at Nunappleton were written the Poems of the Country and some of the Poems of Imagination and Love. In 1652 he was in communication with Milton, to whom he had probably been introduced by Fairfax, and was by him sent on February 21 to President Bradshaw with a letter urging his appointment as assistant Latin secretary to himself. The post was, however, otherwise filled up, and he was provided instead with another tutorship, that of Cromwell's nephew, Mr Dutton. This has been wrongly stated by several writers as not occurring until six years later. In 1657 the secretaryship again fell vacant, and was then conferred upon him, but he held office for a year only, and no record of his work appears 1n the calendar of state papers. Marvell accepted the Commonwealth as @ practical fact, and the rule of Cromwell as the only guarantee for government at once tolerant and strong. But he lis lost his belief in the monarchical theory. His line 4 godlike good to save a falling king " is well known ; Fo throughout his most vehement invective against ee . there is a great tenderness and desire to spare the king

The assistant secretaryship opened the way to public life, and in 1658 Marvell was elected member for Kingston- ypon-Hull in Richard Cromwell's parliament. From 1663 to 1665 he acted as secretary to Lord Carlisle's embassy to Muscovy, Sweden, and Denmark ; and this is the only official post he ever filled during the reign of Charles. With the exception of this and of shorter unexplained intervals of travel, Marvell was constant in his parliamentary attendance to the day of his death. He seldom spoke in the House, some five or six times in all, but his parliamentary influence is amply established by other evidence; and his correspondence with his constituents, from 1660 to 1678, forms a source of information all the more valuable because by a resolution passed at the Restoration the publication of the proceedings of the House without leave was forbidden. He made it a point of duty to write at each post—that is, every two or three days— both

on local interests and on all matters of public interest. The discreet reserve of these letters, natural at a time when the post-office was a favourite source of information to the Government, contrasts curiously with the freedom of the few private letters which state opinions as well as facts. Marvell's constituents, in their turn, were not unmindful of theirmember. He makes frequent references to their presents, usually of Hull ale and of salmon, and he regularly drew from them the wages of a member, six and eightpence a day during session.

During these years Marvell wrote a good deal of verse, chiefly satire, often very coarse, but always vigorous and full of an honest hatred at corruption. He chose verse inerely as being the usual vehicle of satire, and cared little about form. " He plucked a cudgell from the nearest hedgerow, careless if it became fuel after it had served his turn." It was very different with his prose satires. His peculiar talent was first displayed in the mock King's Speech, issued in 1675. This is written in a vein of genial banter, perhaps the greatest tribute to the influence which the bonhomie of Charles exercised even over such men as Marvell. But his tone soon changed, and The Growth of Popery and Arbitrary Power, published in the year of his death, is a grave indictment of the conduct of ministers of the crown, and, by implication, of Charles himself, since the Restoration. So shrewdly did this strike the conscience of the king that a proclamation, of which Marvell takes laughing notice, offered a large reward for the discovery of the author.

As a political pamphleteer Marvell holdsa high place ; as a Satirist he stands still higher. Tolerance in religion was his creed, and this creed had been lately attacked by a clergyman seeking promotion, Dr Parker, afterwards bishop of Oxford, who asserted in their most extravagant form the claims of the civil magistrate over the consciences of subjects in matters of external religion. Marvell's reply, The Rehearsal Transprosed, is a masterpiece of prolonged banter. It contains passages of lofty indignation, hearty laughter, coarse vituperation 3 but the prevailing tone is that of grave and ironical banter. The effect, as witnessed to by Anthony Wood, Burnet, and other contemporary Writers, was to set the whole public " from the king to the tradesman" in a laugh against Parker. This stung him to an ill-tempered rejoinder, affording Marvell a second °pportunity, of which he availed himself so well that no more was heard from his opponent ; and

Swift was shortly afterwards able to say that people remembered Parker's book only by Marvell's answer. Marvell's second con- troversial work, Mr Smirke, or the Divine in Mode, was written In the same strain and under similar circumstances, _ obtained a success fully equal to that of the vehearsal Lransprosed. It was a defence of Croft,

Ishop of Hereford, against a violent attack by Dr Turner,

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the High Church master of St John's, Cambridge. Prefixed to it was a "short historical essay concerning general councils," intended to show the folly of religious imposi- tions. Several other writings, often ascribed to him, more especially the Parliamenti Angliz Declaratio, A Sensible Question and an Usefull Answer, and the Flagellum Parlia- mentarium, were certainly not his.

As a humorist, then, and as a great " parliament man," no name is of more interest to a student of the reign of Charles II. than that of Marvell. But other qualities entitle him to still higher respect. To a personal charm so great, to wit so brilliant, to learning so extensive, and to sympathies so wide tliat he was at the same time dear to John Milton and courted by Charles IL., he joined the rarest quality of that evil time, a robust and intrepid rectitude. In the very heyday of political infamy, at a time when he says passionately "we are all venal cowards except some few," and when opposition to the court was likely to be resented by personal violence of the brutalest kind, he, a needy man, obliged to accept wages from his constituents, tempted in winning phrases from royal lips by his old schoolfellow Danby, and with nothing to gain from the court by purity, kept his political virtue unspotted and unsuspected. The meaning of this fact can barely be felt by any one who has not read with minute care the annals of that time. When the grossest forms of self- indulgence were the ordinary habits of town life, Marvell was a temperate man, in spite of Aubrey's witness that he "kept bottles of wine at his lodgings and would drink liberally by himself to refresh his spirits and exalt his muse." Lastly, in the worst times of parliamentary vio- lence, he stood forward throughout his career as the

.champion of moderate and tolerant measures. His person

corresponded singularly with his mind, so far as can be judged from the portrait by Hannemann and from the few words of John Aubrey—“ He was of a middling stature, pretty strong set, roundish faced, cherry cheeked, hazel eyed, brown haired. In his conversation he was modest and of very few words.”

He died suddenly in 1678 on his return from Hull to take his seat in August. That he was poisoned, and at the instigation of the court, has been roundly asserted, naturally enough, though without the slightest foundation. The matter has been finally set at rest by a very interesting letter by Dr Samuel Gee in the Atheneum for March 7,

1874,

The following works may be consulted on Marvell :—Life and Works—(1) by Thomas Cooke, 2 vols., 1726 (there is a reprint by Thomas Davies in 1772) ; (2) by Captain Thomson, 3 vols. 4to, 1776 ; (3) by John Dove, 1832; (4) by Edwin Paxton Hood, 1858 ; and essays by Hartley Coleridge in Lives of the Northern Worthies, Henry Rogers in his collected Hssays, and an anonymous author in the Cornhill Magazine for July 1869, and in the Saturday Review for April 26, 1873. All these authorities are mentioned, collated, and corrected in the very important and laborious work of Mr Grosart, whose book, in spite of its excessive mannerism and one or two curious inaccuracies, is indispensable to the student of Marvell’s correspondence and career. (O. A.)

MARWAR. See JopHpur.

MARY! (Mapia, Mapidyu), the mother of Jesus, at the

time when the gospel history begins, had her home in

- *The name (Heb, D119), that of the sister of Moses and Aaron, is*

of uncertain etymology ; many interpretations have been suggested, including “stella maris,” which, though it has attained considerable

currency through Jerome (the Onomasticon), may be at once dismissed. It seems to have been very comnion among the Jews in New Testament times ; besides the subject of the present notice there are mentioned (1) "Mary (the wife) of Clopas," who was perhaps the mother of James "the little" (6 pixpdés) and of Joses (see vol. xiii, pp. 552, 553); (2) Mary Magdalene, ¢.e., of Magdala ; (3) Mary of Bethany, sister of Martha and Lazarus; (4) Mary the mother of Mark (see Mark); and (5) Mary, an otherwise unknown benefactress of the apostle Paul (Rom, xvi. 6).

Galilee, at the village of Nazareth. Of her parentage nothing is recorded in any extant historical document of the lst century, for the genealogy in Luke iii. (cf i. 27) is manifestly that of Joseph. In early life she became the wife of JosepH (g.v.) and also the mother of our Lord (see Jesus1); that she afterwards had other children is a natural inference from Matt. i. 25, which the evangelists, who frequently allude to "the brethren of the Lord," are at no pains to obviate. The few incidents mentioned in Scripture regarding her show that she followed onr Lord to the very close of His earthly career with unfailing motherliness, but the " Magnificat" assigned to her in Luke i. is the only passage which would distinctly imply on her part a high prophetic appreciation of His divine mission. She was present at the crucifixion, where she was commended by Jesus to the care of the apostle John, (John xix. 26, 27), Joseph having apparently died before this time. (It would be idle to inquire why "' the brethren of the Lord," who, whatever their relationship to Mary, must at least have been nearer than John, were ignored in this arrangement.) Mary is mentioned in Acts i. 14 as having been among those who continued in prayer along with the apostles at Jerusalem during the interval between the ascension and pentecost. There is no allusion in the New Testament to the time or place of her death.

The subsequent growth of ecclesiastical tradition and belief regarding Mary will be traced most conveniently under the separate heads of (1) her perpetual virginity, (2) her absolute sinlessness, (3) her peculiar relation to the Godhead, which specially fits her for successful intercession on behalf of mankind.

Her Perpetual Virginity. —This doctrine, as has already been pointed out, was, to say the least, of no importance in the eyes of the evangelists, and so far as extant writings go there is no evidence of its having been anywhere taught within the pale of the catholic church of the first three centuries. On the contrary, to Tertullian the fact of Mary's marriage after the birth of Christ is a useful argu- ment for the reality of the Incarnation against Gnostic notions, and Origen relies upon the references to the Lord's brethren as disproving the Docetism with which he had to contend. The derapHevia, though very ancient, is in reality a doctrine of non-catholic origin, and first occurs in a work proscribed by the earliest papal Index Librorum Prohibi- torum (attributed to Gelasius) as heretical,—the so-called Protevangelium Jacobi, written, it is generally admitted, within the 2d century. According to this very early source, which seems to have formed the basis of the later Liber de Infantia Marizx et Christi Salvatoris and Evan- gelium de Nativitate Mariz, the name of Mary's father was Joachim (in the Leber de Infantia a shepherd of the tribe of Judah, living in Jerusalem); he had long been married to Anna her mother, whose continued childlessness had become a cause of much humiliation and sorrow to them both. The birth of a daughter was at last angelically predicted to each parent separately. From her third to her twelfth year " Mary was in the temple as if she were a dove that dwelt there, and she received food from the hand of an angel." When she became of nubile age a guardian was sought for her by the priests among the widowers of Israel "lest she should defile the sanctuary of the Lord"; and Joseph, an elderly man with a family, was indicated for this charge by a miraculous token. Some time afterwards the annunciation took place; when the

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Vol. xiii. 656 sg., where (p. 659) sufficient reference is made to the coarse view of this event taken by the later hostile Judaism (a view supposed by some to be alluded to even in John viii. 41). We learn from Origen that the story about the soldier Panthera (Mav@hoa) was already upheld by Celsus. The Ebionites and other heretical sects, as is well known, maintained the paternity of Joseph.

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[THE VIRGIN,

Virgiu's pregnancy was discovered, Joseph and she were brought before the high priest, and, though asserting their innocence in all sineerity, were acquitted only after they had been tried with "the.water of the ordeal of the Lord" (Numb. v. 11). Numerous details regarding the birth at Bethlehem are then given. The perpetual pliysical virginity of Mary, naively insisted upon in this apocryphon, is alluded to only with a half belief and a "some say" by Clement of Alexandria (Strom., vii, 16), but became of much importance to the leaders of the churcli in the 4th century, as for example to Ambrose, who sees in Ezek. xliv. 1-3 a prophetic indieca- tion of so great a mystery.2 Those who continued to believe that Mary, after the miraculous birth of Jesus, had become the mother of other children by Joseph came accordingly to be spoken of as her enemies,—Antidicoma- rianitze (Epiphanius) or Antidicomarite (Augustine),— and the first-mentioned author devotes a whole chapter (chap. 78) of his great work upon heresies to their con- futation. For holding the same view Bonosus of Sardica was condemned by the synod of Capua in 391. To Jerome the perpetual virginity not only of Mary but even of Joseph appeared of so much consequence that while a young man he wrote (387) the long and vehement tract Against Helvidius, in which he was the first to broach the theory (which has since gained wide currency) that the brethren of our Lord were children neither of Mary by her husband, nor of Joseph by a former marriage, but of another Mary, sister to the Virgin and wife of Clopas or Alpheus, At last the epithet of dei zap$évos was authoritatively applied to the Virgin by the council of Chalcedon in 451, and the doctrine implied has ever since been an undisputed point of orthodoxy both in the Eastern and in the Western church, some even seeking to hold the Anglican Church committed to it on account of the general declaration (in the Homilies) of concurrence in the decisions of the first four general councils.

Her Absolute Sinlessness.—W hile much of the apocryphal literature of the early sects in which she is repeatedly spoken of as "undefiled before God" would seem to encourage some such doctrine as this, many passages from the acknowledged fathers of the church could be cited to show that it was originally quite unknown to catholicism. Even Augustine repeatedly asserts that she was born in original sin(De Gen. ad lit., x. 18) ; and the locus

classicus regarding her possible immunity from actual transgression, on which the subsequent doctrine of Lombardus and his commentators was based, is simply an extremely guarded passage (De Nat. et Grat., chap. 36) in which, while con- tradicting the assertion of Pelagius that many had lived free from sin, he wishes exception to be made in favour of «qe holy Virgin Mary, of whom out of honour to the Lord I wish no question to be made where sins are treated of,—for how do we know what mode of grace wholly to conquer sin may have been bestowed upon her who was found meet to conceive and bear Him of whom it is certain that He had no sin." A writer so late as Anselm (Cur Deus Homo, u. 16) declares that "the Virgin herself whence He (Christ) was assumed was conceived in iniquity, and in sin did her mother conceive her, and with original sin was she hang because she too sinned in Adam in whom all sinned, and the same view was expressed by Damian. The growth of the modern Roman doctrine of the immaculate conception from the time in the 12th century when the canons of Lyons sought to institute a festival in honour of her "holy con- ception," and were remonstrated with by Bernard, has pean alteady skotched elsewhere (seo InaracuLate CoNczenos)

. . per quam

isi Maria? 2 De Inst. Virg., 'que est hee porta nisi Maria ae

Christus intravit in hune mundun, quando virginali fusus genitalia virginitatis claustra non solvit.

MA

THE VIRGIN. |

The epithets applied to her in the Greek Church are suchi |

as dudAvvTos, mavayvos, ayia; but in the East generally no clear distinction is drawn between immunity from actual sin and original siulessness.

Her Peculiar Relation to the Godhead, which specially fits her for Successful Intercession on Behalf of Mankind.— {t seems probable that the

epithet eordxos (‘ Mother of God”) was first applied to Mary by theologians of Alexandria towards the close of the 3d century; but it does not occur in any genuine extant writing of that period, unless we are to assign an early date to the apocryphal Transitus Mariz, in which the word is of frequent occur- rence. Inthe 4th century it is met with frequently, being used by Eusebius, Athanasius, Didymus, and Gregory of Nazianzus,—the latter declaring that the man whio believes not Mary to have been eordxos has no part in God (Orat., li, p. 738).1 If, as is not uulikely, its use was first recom- mended by a desire to bring into prominence the divinity of the incarnate Word, there can be no doubt that latterly the expression came to be valued as directly honourable to Mary herself and as corresponding to the greatly increased esteem in which she personally was held throughout the catholic world, so that, when Nestorius and others began to dispute its propriety in the following century, their temerity was resented, not as an attack upon the established orthodox doctrine of the Nicene creed, but as threatening a more vulnerable and more tender part of the popular faith. It is sufficient in illustration of the drift of theological opinion to refer to the first sermon of Proclus, preached on a certain festival of the Virgin (xampyupis mapbevixy) at Constantinople about the year 430 or to that of Cyril of Alexandria delivered in the church of the Virgin Mary at the opening of the council of Ephesus in 431. In the former the orator speaks of “the holy Virgin and Mother of God” as “the spotless treasure-house of virginity, the spiritual paradise of the second Adam; the workshop in which the two natures were welded together… . the one bridge between God and men”;? in the latter she is saluted as the “mother and_ virgin,” “through whom (6: js) the Trinity is glorified and worshipped, the cross of the Saviour exalted and honoured, through whom heaven triumphs, the angels are made glad, devils driven forth, the tempter overcome, and the fallen creature raised up even to heaven.” The response which such language found in the popular heart was sufficiently shown by the shouts of joy with which the Ephesian mob heard of the deposition of Nestorius, escorting his judges with torches and incense to their homes, and celebrating the occasion by a general illumination. The causes which In the course of the preceding century had led to this exaltation of the Mother of God in the esteem of the catholic world are not far to seek. On the one hand the solution of the Arian controversy, however correct it may have been

theoretically, undoubtedly had the practical effect of relegating the God-man redeemer for ordinary minds into a far away region of 'remote and awful Godhead," so that the need for a mediator to deal with the very Mediator could not fail to be felt. On the other hand, it must be accepted as a fact abundantly proved by history that the religious instincts of mankind are very ready to pay Worship, in grosser or more refined forms, to the idea of Womanhood ; at all events many of those who became professing Christians at the political fall of paganism entered the church with such instincts (derived froin the

a See Gieseler (Kk G., Bd. i. Abth. 1), who points out instances in which anti- Arianizing zeal went so far as to call David Oeomdrwp, and James aderAPdbcos. j Labbe, Cone., vol. ii. p. 51. Considerable extracts are given by

Ugusti (Denkw. iii); see also Milman (Lat. Christ., i. 185), who

*characterizes much of it as a '*wild labyrinth of untranslatable metaphor,"*

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nature-religions in which they had been brought up) very fully developed. Probably it ought to be added that the comparative colourlessness with which the character of Mary is presented not only in the canonical gospels but even in the most copious of the apocrypha left greater scope for the untrammelled exercise of devout imagination than was possible in the case of Christ, in the circumstances of whose humiliation and in whose recorded utterances there were many things which the religious consciousness found difficulty in understanding or in adapting itself to. Atall events, from the time of the council of Ephesus, to ex- hibit figures of the Virgin and Child became the approved ex- pression of orthodoxy, and the relationship of motherhood in which Mary had been formally declared to stand to God? was instinctively felt to give the fullest and freest sanction of the church to that invocation of her aid which had previously been resorted to only hesitatingly and occasion- ally. Previously to the council of Ephesus, indeed, the practice had obtained complete recognition, so far as we know,

in those circles only in which one or other of the numerous redactions of the Transitus Mariz jassed current. There we read of Mary's prayer to Christ : " Do Thou bestow Thine aid upon every man calling upon, or praying to, or naming the name of Thine handmaid"; to which His answer is, " Every soul that calls upon thy name shall not be ashamed, but shall find mercy and support and confidence both in the world that now is and in that which is to come in the presence of My Father in the heavens." But Gregory of Nazianzus also, in his panegyric upon Justina, mentions with incidental approval that in her hour of peril she "implored Mary the Virgin to come to the aid of a virgin in her danger."5 Of the growth of the Marian cultus, alike in the East and in the West, after the decision at Ephesus it would be impossible to trace the history, however slightly, within the limits of the present article. Justinian in one of his laws bespeaks her advocacy for the empire, and he inscribes the high altar in the new church of St Sophia with her name. Narses looks to her for directions on the field of battle. Heraclius bears her image on his banner. John of Damascus speaks of her as the sovereign lady to whom the whole creation has been made subject by her son. Peter Damian recog- nizes her as the most exalted of all creatures, and apostro- phizes her as deified and endowed with all power in heaven and in earth, yet not forgetful of our race.® In a word, popular devotion gradually developed the entire system of doctrine and practice which Protestant controversialists are accustomed to call by the name of Mariolatry. With reference to this much-disputed phrase it is always to be kept in mind that the directly authoritative documents,*

3'The term @eordxos does not actually occur in the canons of Ephesus. It is found, however, in the creed of Chalcedon.

4 Tt is true that Ireneeus (J7#r., v. 19, 1) in the passage in which he draws his well-known parallel and contrast between the first and second Eve (comp. Justin, Dial. c. Tryph., 100), to the effect that, 'as the human race fell into bondage to death by a virgin, so is it rescued by a virgin," takes occasion to speak of Mary as the "advocata" of Eve ; but it seems certain that this word is a translation of the Greek guvfyopos, and iniplies hostility and rebuke rather than advocacy.

**It is probable that the commemorations and invocations of the Virgin which occur in the present texts of the ancient liturgies of 'St James" and "St Mark" are due to interpolation. In this connexion ought also to be noted the chapter in Epiphaninus (wr., 79) against the "Collyridians," certain women in Thrace, Scythia, and Arabia, who were in the habit of, worshipping the Virgin (det map@évov) as a goddess, the offering of a cake (koAAup{da Tiva) being one of the features of their worship. He rebukes them for offering the worship which was due to the Trinity alone; "let Mary be held in honour, but by no meang worshipped." The cultus was probably a relic of heathenism: ; compare Jerein. xliv. 19.*

*§ "*Numquid quia ita deificata, ideo nostree humanitatis oblita es Nequaquam, Domina. . . . Data est tibi omnis potestas in ceelo et in terra. Nil tibi impossibile." Serm. de Nativ. Marie, ap. Gieseler, K@., Bd. ii. Abth. 1,*

alike of the Greek and of the Roman Church, distinguish formally between " latria " and "dulia," and declare that the " worship" to be paid to the mother of God must never exceed that superlative degree of " dulia" which is vaguely described as " hyperdulia." On the other hand, it must be remembered that the comparative reserve shown by the council of Trent in its decrees, and even in its catechism,! on this subject has not been observed by individual theologians, and in view of the fact of the canonization of some of these (such as Liguori),—a fact guaranteeing the absence of erroneous teaching from their writings,—it does not seem unfair to hold the Roman Church respon- sible for the natural interpretations and just inferences which may be drawn even from apparently exaggerated expressious in such works as the well-known Glories of Mary and others frequently quoted in controversial litera- ture. A good résumé of recent Catholic developments of the cultus of Mary is to be found in Pusey's Hirenzcon.

The following are the principal feasts of the Virgin in the order in which they oceur in the ecclesiastical year. (1) That of the Presentation (Presentatio B. V. M., 7a ecicddia rhs OeordKov), to commemorate the beginning of her stay in the temple, as recorded in the Protevangelium

Jacobi (see above). It is be- lieved to have originated in the East sometime in the 8th cen- tury, the earliest allusion to it being made by George of Nieomedia (9th eentury) ; Manuel Comnenus made it universal for the Eastern empire, and in the modern Greek Church it is one of the five great festivals in honour of the Deipara. It was introduced into the Western Chureh late in the 14th century, and, after having been withdrawn from the calendar by Pius V., was restored by Sixtus V., the day observed both in East and West being November 21. It is not mentioned in the English ealendar. (2) The Feast of the Coneeption (Conceptio B. V. M., Coneeptio Im- maculata B. V. M., cbrdAAnlis tHs aylas"Avyns), observed by the Roman Catholic Chureh on December 8, and by all the Kastern ehurehes on December 9, has already been explained (see IMMAcu- LATE CONCEPTION) ; in the Greek Church it only ranks as one of the middle festivals of Mary. (8) The Feast of the Purification (Oceursus, Obviatio, Presentatio, Festum SS. Simeonis et Annex, Purificatio, Candelaria, txawavth, bravtTh) is otherwise known as CANDLEMAS (q.v.). (4) The Feast of the Annuneiation of thc Virgin Mary (Annunciatio, EvayyeAicpés); see ANNUNCIATION. It may be mentioned that at the Toledan council in 656 it was decreed that this festival should be observed on December 18, in order to keep elear of Lent. (5) The Feast of the Visitation (Visitatio B. V. Af.) was instituted by Urban VI., promulgated in 1389 by Boniface IX., and reappointed by the council of Basel in 1441 in eommemo- ration of the visit paid by Mary to Elizabeth. It is observed on July 2, and has been retained in the English calendar. (6) The Feast of the Assumption (Dormitio, Pausatio, Transitus, Depositio, Migratio, Assumptio, kolunots, weradoracis, avddnwis) has reference to the apocryphal story related in several forms in various docu- ments of the 4th century condemned by Pope Gelasius. Their general purport is that as the time drew nigh for " the most blessed Virgin " (who is also spoken of as " Holy Mary," " the queen of all the saints," " the holy spotless Mother of God"') to leave the world, the apostles were miraculously assembled round her deathbed at Bethlehem on the Lord's day, whereupon Christ descended with a multitude of angels and reecived her soul. After "the spotless and precious body" had been laid in the tomb, " suddenly there shone round them (the apostles) a miraculous light," and it was taken up into heaven. The first Catholie writer who relatcs this story is Gregory of Tours (¢. 590); Epiphanius two centuries earlier had declared that nothing was known as to the circumstances of Mary's death and burial;

and one of the documents of the council of Ephesus implies a belief that she was buried in that city. The Sleep of the Theotokos is observed in the Greek Church as a great festival on August 15; the Armenian Church also commemorates it,

1The points taught in the catechism are—that she is truly the Mother of God, and the second Eve, by whose means we have received blessing and life; that she is the Mother of Pity, and very specially our advoeate ; that her merits are highly exalted, and that her dis- positions towards us are extremely gracious; that her images are of the utmost ntility. In the Mfissaz her intereessions (though alluded to in the eanon and elsewhere) are seldom directly appealed to except in the Litany andin some of the later offices such as those for September 8, and for the Festival of the Seven Sorrows (deereed by Benedict XIII. in 1727). Noteworthy are the versicles in the office for December 8 (The Feast of the Immaculate Conception), ‘‘Tota pulchra es, Maria, et macula originalis non est in te,” and “ Gloriosa dicta sunt de te, Maria, quia feeit tibi magna qui potens est.”

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but the Ethiopic Chureh celebrates her death and burial on tw

separate days. The earliest allusion to the existence of such a festival in the Western Church seeins to be that found in the – ceedings of the synod of Salzburg in 800; it is also spoken of in the thirty-sixth canon of the reforming synod of Mainz, held in 813 it was not, however, at that time universal, being mentioned a

doubtful in the capitularies of Charlemagne. It ought to a observed that the doctrine of the bodily assumption of the Vir it into heaven, although extensively believed, and indeed flo : natural theological consequence from that of her sinless never been declared to be “de fide” by the Church of Rome, and is still merely a “pia sententia.” (7) The Nativity of Mary (Nativitas, yevé0Atov ris Oeoréov), obscrved on September 8, is first mentioned in one of the homilies of Andrew of Crete (¢, 750)

and along with the feasts of the Purification, the Annunciation, and the Assumption, it was appointed to be observed by the synod of Salzburg in 800, but seems to have been quite unknown at that time in tle Gallican Church, and even two centuries later it was by no means general in Italy. In the Roman Chureh a large number of minor festivals in honour of the Virgin are locally celebrated ; and all the Saturdays of the ycar as well as the entire month of May are also regarded as sacred to her. (J. 8. BL.)

MARY I, queen of England (1516-1558), unpleasantly remembered as "the Bloody Mary" on account of the religious persecutions sanctioned under her reign, was a woman whose private history demands no less compassion than her policy as queen (if indeed it was her own) merits the condemnation of a more humane and tolerant age. She was the daughter of Henry VIII. and Catherine of Aragon, born in the earlier years of their married life, when as yet no cloud had darkened the prospect of Henry's reign. Her birth occurred at Greenwich on Monday the 18th February 1516, and she was baptized on the following Wednesday, Cardinal Wolsey standing as her godfather. She seems to have been a singularly precocious child, and is reported in July 1520, when she was little more than four years of age, aS entertaining some visitors by a performance on the virginals. When she was little over nine she was addressed in a complimentary Latin oration by commissioners sent over from Flanders on commercial matters, and replied to them in the same language " with as much assurance and facility as if she had been twelve years old" (Gayangos, iii. pt. 1, 82). Her father, against whom it cannot be said that he depreciated learning, had taken care to give her an excellent education, and was proud of her achievements. About the same time that she replied to the commissioners in Latin he was arranging that she should learn Spanish, Italian, and French. A great part, however, of the credit of her early education was undoubtedly due to her mother, who not only con- sulted the Spanish scholar Vives upon the subject, but was herself Mary's first teacher in Latin. She was also well instructed in music, and among her principal recreations as she grew up was that of playing on the virginals and lute.

It was a misfortune that she shared with many other high-born ladies in those days that her prospects of life were made a matter of sordid bargaining from the first. Political alliances to be cemented by marriages

between persons who were at the time mere infants—or perhaps, more shameful still, between a child and a superannuated debauchee—are among the most repulsive features of the times. Mary was little more than two years old when she was proposed iu marriage to the dauphin, son of Francis I. Three years afterwards the French alliance was broken off, and she was affianced to her cousin the young emperor Charles V. by the treaty of Windsor. No one, perhaps, seriously expected either of these arrangements to endure ; and, though we read in grave state papers of some Curious compliments and love tokens (really the mere counters of diplomacy) professedly sent by the girl of nine to the powerful cousin whom she had never seen, not many years passed away before Charles released himself from ie engagement and made a more convenient match. In 152! a rearrangement was made of the royal household, and it

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was thought right to give Mary an establishment of her own along with a council on the borders of Wales, for the petter government of the Marches. For some years she accordingly kept her court at Ludlow, while new arrange- ments were made for the disposal of her hand in connexion with the latest turn in the tortuous game of diplomacy. She was now proposed as a wife, not for the dauphin as before, but for his father Francis I, who had just been redeemed from captivity at Madrid, and who was only too glad of an alliance with England to mitigate the severe conditions imposed on him by the emperor. Wolsey, how- ever, on this occasion, only made use of the princess as a bait to enhance the terms of the compact, and left Francis free in the end to marry the emperor's sister.

It was during this negotiation, as Henry afterwards pretended, that the question was first raised whether Henry's own marriage with Catherine was a lawful one. The bishop of Tarbes, who was one of the ambassadors sent over by Francis to ask the princess in marriage, had, it was said, started an objection that she might possibly be considered illegitimate on account of her mother having been once the wife of her father's brother. The statement was a mere pretence to shield the king when the unpopu- larity of the divorce became apparent. It is not only extremely improbable in itself,

but is proved to be untrue by the strongest evidence, for we have pretty full con- temporary records of the whole negotiation. On the con- trary, it is quite clear that Henry, who had already for some time conceived the project of a divorce, kept the matter a dead secret, and was particularly anxious that the French ambassadors should not know it, while he used his daughter's hand as a bait for a newalliance. 'The alliance itself, however, was actually concluded by a treaty dated Westminster, the 30th April 1527, in which it was pro- vided, as regards the Princess Mary, that she should be married either to Francis himself or to his second son Henry, duke of Orleans. But the real object was only to lay the foundation of a perfcct mutual understanding between the two kings, which Wolsey soon after went into France to confirm.

During the next nine years the life of Mary, as well as that of her mother, was rendered miserable by the conduct of Henry VIII. in seeking a divorce. During the most of that period mother and daughter seem to have been kept apart, and, though sometimes living at no great distance from each other, were strictly forbidden to see each other. Of the two it may be that Queen Catherine had the hardest trial ; but Mary's was scarcely less severe. Removed from court and treated as a bastard, she was, on the birth of Anne Boleyn's daughter, required to give up the dignity of princess and acknowledge the illegitimacy of her own birth. On her refusal her household was broken up, and she was sent to Hatfield to act as lady-in-waiting to her Own infant sister. Nor was even this the worst of her trials ; her very life was in danger from the hatred of Aune Boleyn. Her health, moreover, was indifferent, and even when she was seriously ill, although Henry sent his own physician Dr Buttes to attend her, he declined to let her mother visit her. So also at her mother's death in J anuary 1536 she was forbidden to take a last farewell of her. i? in May following another change occurred which seemed

© promise some kind of relief. Anne Boleyn, the real cause of all her miseries, fell under the king's displeasure ug Was put to death. Mary was then urged to make a ee submission to her father as the means of recovering ae ae and, after a good deal of correspondence with : ing § secretary Cromwell, she actually did so. The erms exacted of her were bitter in the

extreme, but there _ no chance of making life tolerable otherwise, if indeed she was permitted to live at all; and the poor friendless

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girl, absolutely at the mercy of a father who could brook no contradiction, at length subscribed an act of submission, acknowledging the king as supreme, repudiating the popc's authority, and confessing that the marriage between her father and mother "was by God's Jaw and man's law incestuous and unlawful."

No act, perhaps, in the whole of Henry's reign gives us a more painful idea of his revolting despotism. Mary was a high-spirited girl, and undoubtedly popular. All Europe looked upon her at that time as the only legitimate child of her father, but her father himself compelled her to disown the title and pass an unjust stigma on her own birth and her mother's good name. Nevertheless Henry was now reconciled to her, and gave her a household in some degree suitable to her rank. During the rest of the reign we hear little about her except in connexion with a number of new marriage projects taken up and abandoned successiveiy, one of which, to the count palatine Philip, duke of Bavaria, was specially repugnant to her in the matter of religion. Her privy purse. expenses for nearly the whole of this period have been published, and show that Hatfield, Beaulieu or Newhall in Essex, Richmond, and Hunsdon were among her principal places of residence. Although she was still treated as of illegitimate birth, it was believed that the king, having obtained from parliament the extra- ordinary power to dispose of the crown by will, would restore her to her place in the succession, and three years before his death she was so restored by statute, but still under conditions to be regulated by her father's will.

Under the rcign of her brother Edward VI. she was again subjected to severe trials, which at one time made her seriously meditate taking flight and escaping abroad. Edward himself indeed seems to have been personally not unkind to her, but the religious revolution in his reign assumed proportions such as it had not done before, and Mary, who had done sufficient violence to her own convic- tions in submitting to a despotic

father, was not disposed to yield an equally tame obedience to authority exercised by a factious council in the name of a younger brother not yet come to years of discretion. Besides, the cause of the pope was naturally her own. In spite of the forced declaration formerly wrung from herself, no one really regarded her as a bastard, and the full recognition of her rights depended on the recognition of the pope as head of the church. Hence, when Edward's parliament passed an Act of Uniformity enjoining services in English and com- munion in both kinds, the law appeared to her totally void of authority, and she insisted on having mass in her own private chapel under the old form. When ordered to desist, she appealed for protection to the emperor Charles V., who, being her cousin, intervened for some time not ineffectually, threatening war with England if her religious liberty was interfered with. But Edward's court was composed of factions of which the most violent eventually carried the day. Lord Seymour, the admiral, was attainted of treason and beheaded in 1549. His brother, the Protector Somerset, met with the same fate in 1552. Dudley, duke of Northumberland, then became paramount in the privy council, and easily obtained the sanction of the young king to those schemes for altering the succession which led immediately after his death to the usurpation of Lady Jane Grey. Dudley had, in fact, overawed all the rest of the privy council, and when the event occurred he took such energetic measures to give effect to the scheme that Lady Jane was actually recognized as queen for some days, and Mary had even to fly from Hoddesden into Norfolk. But the country was really devoted to her cause, as indeed her right in law was unquestionable, and before many days she was royally received in London, and took up her abode within the Tower. XV. — 75

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Her first acts at the beginning of her reign displayed a character very different from that which she still holds in popular estimation. Her clemency towards those who had taken up arms against her was altogether remarkable. She released from prison Lady Jane's father, Suffolk, and had difficulty even in signing the warrant for the execution of Northumberland. Lady Jane herself she fully meant to spare, and did spare till after Wyatt's formidable insurrec- tion. Her conduct, indeed, was in every respect con- ciliatory and pacific, and so far as they depended on her personal character

the prospects of the new reign might have appeared altogether favourable. But un- fortunately her position was one of peculiar difficulty, and the policy on which she determined was far from judicious. Inexperienced in the art of governing, she had no trusty councillor but Gardiner ; every other mem- ber of the council had been more or less implicated in the conspiracy against her. And though she valued Gardiner's advice she was naturally led to rely even more on that of her cousin, the emperor, who had been her mother's friend in adversity, and had done such material service to herself in the preceding reign. Following the emperors guidance she determined almost from the first to make his son Philip her husband, though she was eleven years his senior. She was also strongly desirous of restoring the old religion and wiping out the stigma of illegitimacy passed upon her birth, so that she might not seem to reign by virtue of a mere parliamentary settle- ment.

Each of these different objects was attended by difficulties or objections peculiar to itself; but the marriage was the most unpopular of all. A restoration of the old religion threatened to deprive the new owners of abbey lands of their easy and comfortable acquisitions ; and it was only with an express reservation of their interests that the thing was actually accomplished. A declaration of her own legitimacy necessarily cast a slur on that of her sister Elizabeth, and cut her off from the succession. But the marriage promised to throw England into the arms of Spain and place the resources of the kingdom at the command of the emperor's son. The Commons sent her a deputation to entreat that she would not marry a foreigner, and when her resolution was known insurrections broke out in different partsof the country. Suffolk, whose first rebellion had been pardoned, proclaimed Lady Jane Grey again in Leicester- shire, while young Wyatt raised the county of Kent and actually besieged the queen in her own palace at West- minster. In the midst of the danger Mary showed great intrepidity, and the rebellion was presently quelled ; after which, unhappily, she got leave to pursue her own course unchecked. She married Philip, restored the old religion, and got Cardinal Pole to come over and absolve the kingdom for its past disobedience to the Holy See.

But the misgivings of those who had disliked the Spanish match were more than sufficiently justified by the course of events. Mary yielded a loyal and

womanly devotion to a husband who did not too greatly esteem the treasure of her person. Her health, which was feeble before, was bad for the remainder of her days, and she fell under a delusion at first that it was owing to an approach- ing confinement. Disappointment and vexation probably added to her helplessness. The resources of the kingdom were at Philip's command, and he even took ships of the English fleet to escort his father the emperor, on his abdication, to Spaiu. More extraordinary still, he ulti- mately succeeded in committing England to a war against France, when France had made an alliance with the pope against him as king of Spain; so the very marriage which was to confirm England in the old religion led to a war against the occupant of the see of Rome. And it was this

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war with France which produced the final calamity of the loss of Calais which sank so deeply into Mary's heart some months before she died.

The cruel persecution of the Protestants, which has cast

so much infamy upon her reign, began about six months after her marriage ; and it is not difficult to see that it was greatly due to the triumph of ideas imported from the land of the Inquisition. burnt on the 4th February 1555. Gloucester, had been condemned six days before, and suffered the same fate upon the 9th. From this ting the persecution went on uninterrupted for more than three years, numbering among its victims Ridley, Latimer, and Cranmer. and southern parts of England, and the largest number of sufferers was naturally in the diocese of Bonner, bishop of London. are computed to have perished at the stake ; and their fate certainly created a revulsion against Rome that nothing else was likely to have effected. How far Mary herself—

Rogers, the first of the martyrs, was Hooper, bishop of

It seems to have been most severe in the eastern

From first to last nearly three hundred victims

who during the most part of this time, if not the whole

time, was living in the strictest seclusion, sick in body and mind, hysterical and helpless—was personally answer- able for these things, it is difficult to say. To her, no

doubt, the propagators of heresy were the enemies of man- kind, and she had little cause to love them from her own experience. Yet perhaps she hardly realized the full horror of what was done under her sanction. But there can be little doubt what effect it had upon the people; and when Mary breathed her last, on the 17th November 1558, the event was hailed with joy as a national deliver- ance. (J. Ga.)

MARY II. (1662-1694), queen of England, was the eldest daughter of James, duke of York (afterwards James II. of England), by his first wife Anne Hyde, and was born in London on April 30, 1662. Having been educated in the Protestant faith, she was married to William, prince of Orange, on November 4, 1677. After the events of 1688 she followed her husband to England, and was proclaimed by the convention joint sovereign with him on February 13, 1689. She died of small-pox on December 28, 1694 (o.8.). See Burnet's Essay upon the Life of Queen Mary, and the article Witt1am IIT.

MARY (1542-1587), queen of Scots, daughter of King James V. and his wife Mary of Lorraine, was born in December 1542, a few days before the death of her father, heart-broken by the disgrace of his arms at Solway Moss, where the disaffected nobles had declined to encounter an enemy of inferior force in the cause of a king whose systematic policy had been directed against the privileges of their order, and whose representative on the occasion was an unpopular favourite appointed general in defiance of their ill-will. On the 9th of September following the ceremony of coronation was duly performed upon the infant. A scheme for her betrothal to Edward, prince of Wales, was defeated by the grasping greed of his father, whose obvious ambition to annex the crown of Scotland at once to that of England aroused instantly the general suspicion and indignation of Scottish patriotism. In 154 the queen of six years old was betrothed to the dauphin

Francis, and set sail for France, where she arrived on the 15th of August. The society in which the child was thenceforward reared is known to readers of Brantome as well as that of imperial Rome at its worst Is known i readers of Suetonius or Petronius,—as well as that of papa Rome at its worst is known to readers of the diary kept by the domestic chaplain of Pope Alexander V I, Only in their pages can a parallel be found to the gay and "al record which reveals without sign of shame or suspiclon a offence the daily life of a court compared to which the cour

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of King Charles II. is as the court of Queen Victoria to the society described by Grammont. Debauchery of all kinds, and murder in all forms, were the daily matter of excitement or of jest to the brilliant circle which revolved ground Queen Catherine de' Medici. After ten years' training under the tutelage of the woman whose main instrument of policy was the corruption of her own children, the queen of Scots, aged fifteen years and five months, was married to the eldest and feeblest of the brood on April 24, 1558. On the 17th of November Elizabeth became queen of England, and the princes of Lorraine—Francis the great duke of Guise, and his brother the cardinal —induced their niece and her husband to assume, in addition to the arms of France and Scotland, the arms of a country over which they asserted the right of Mary Stuart to reign as legitimate heiress of Mary Tudor. Civil strife broke out in Scotland between Jolin Knox and the queen-dowager,— between the self-styled "congregation of the Lord" and the adherents of the regent, whose French troops repelled the combined forces of the Scotch and their English allies from the beleaguered walls of Leith, little more than a month before the death of their mistress in the castle of Edinburgh, on the 10th of June 1560. On the 25th of August Protestantism was proclaimed and Catholicism suppressed in Scotland by a convention of states assembled without the assent of the absent queen. On the 5th of December Francis II. died ; in August 1561 his widow left France for Scotland, having been refused a safe-conduct by Elizabeth on the ground of her own previous refusal to ratify the treaty made with England by her commissioners in the same month of the preceding year. She arrived nevertheless in safety at Leith, escorted by three of her uncles of the house of Lorraine, and bringing in her train her future biographer, Brantéme, and Chastelard, the first of all

her voluntary victims. On the 21st of August she first met the only man able to withstand her ; and their first passage of arms left, as he has recorded, upon the mind of John Knox an ineffaceable impression of her 'proud mind, crafty wit, and indurate heart against God and His truth." And yet her acts of concession aud conciliation were such as no fanatic on the opposite side could have approved. She assented, not only to the undisturbed maintenance of the new creed, but even to a scheme for tlie endowment of the Protestant ministry out of the confiscated lands of the Church. Her half-brother, Lord James Stuart, shared the duties of her chief counsellor with William Maitland of Lethington, the keenest and most liberal thinker in the country. By the influence of Lord James, in spite of the earnest opposition of Knox, permission was obtained for her to hear mass celebrated in her private chapel,—a licence to which, said the Reformer, he would have preferred the Invasion of ten thousand Frenchmen. Through all the first troubles of her reign the young queen steered her skilful and dauntless way with the tact of a woman and the courage of a man. An insurrection in the north, headed by the earl of Huntly under pretext of rescuing from justice the life which his son had forfeited by his share in a homicidal brawl, was crushed at a blow by the Lord James against whose life, as well as against his sister's liberty, the conspiracy of the Gordons had been aimed, and on whom, after the father had fallen in fight

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"and the son had expiated his double offence on the scaffold,

the leading rebel's earldom of Murray was conferred by the gratitude of the queen. Exactly four months after the battle of Corrichie, and the subsequent execution of a criminal whom she is said to have "loved entirely," had put an end to the first insurrection raised against her, Pierre de Boscosel de Chastelard, who had returned to France with the other companions of her arrival, and in

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November 1562 had revisited Scotland, expiated with his head the offence or the misfortune of a second detection at night in her bed-chamber. In the same month, twenty- five years afterwards, the execution of his mistress,

accord- ing to the verdict of her contemporaries in France, avenged the blood of a lover who had died without uttering a word to realize the apprehension which (according to Knox) had before his trial. impelled her to desire her brother " that, as he loved her, he would slay Chastelard, and let him never speak word." Andin the same month, two years from the date of Chastelard's execution, her first step was uncon- sciously taken on the road to Fotheringay, when she gave her heart at first sight to her kinsman Henry, Lord Darnley, son of Matthew Stuart, earl of Lennox, who had suffered an exile of twenty years in expiation of his intrigues with England, and had married the niece of King Henry VIII., daughter of his sister Margaret, the widow of James IV., by her second husband, the earl of Angus. Queen Elizabeth, with the almost incredible want of tact or instinctive delicacy which distinguished and disfigured her vigorous intelligence, had recently proposed as a suitor to the queen of Scots her own low-born favourite, Lord Robert Dudley, the widower if not the murderer of Amy Robsart; and she now protested against the project of marriage between Mary and Darnley. Mary, who had already married her kinsman in secret at Stirling Castle with Catholic rites celebrated in the apartment of David Rizzio, her secretary for correspondence with France, assured the English ambassador, in reply to the protest. of his mistress, that the marriage would not take place for three months, when a dispensation from the pope would allow the cousins to be publicly united without offence to the church. On the 29th of July 1565 they were accord- ingly remarried at Holyrood. The hapless and worth- less bridegroom had already incurred the hatred of two powerful enemies, the earls of Morton and Glencairn ; but the former of these took part with the queen against the forces raised by Murray, Glencairn, and others, under the nominal leadership of Hamilton, duke of Chatelherault, on the double plea of danger to the new religion of the country, and of the illegal proceeding by which Darnley had been proclaimed king of Scots without the needful constitutional assent of the estates of the realm. Murray was cited to attend the "raid" or array levied by the king and queen, and was duly denounced by public blast of trumpet for his non-appearance. He entered Edinburgh with his forces, but failed to hold the town against the guns of the castle, and fell back upon Dumfries before the advance of the royal army, which was now joined by James Hepburn, earl of Bothwell, on his return from a three years' outlawed exile in France. He had been accused in 1562 of a plot to seize the queen and put

her into the keeping of the earl of Arran, whose pretensions to her hand ended only when his insanity could no longer be concealed. Another new adherent was the son of the late earl of Huntly, to whom the forfeited honours of his house were restored a few months before the marriage of his sister to Bothwell. The queen now appealed to France for aid; but Castelnau, the French ambassador, replied to her passionate pleading by sober and earnest advice to make peace with the malcontents. This counsel was rejected, and in October 1565 the queen marched an army of 18,000 men against them from Edinburgh ; their forces dispersed in face of superior numbers, and Murray, on seeking shelter in England, was received with contumely by Elizabeth, whose half-hearted help had failed to support his enterprise, and whose intercession for his return found at first no favour with the queen of Scots. But the conduct of the besotted boy on whom at their marriage she had bestowed the title of king began at once tojustify the

enterprise and to play into the hands of all his enemies alike. His father set him on to demand the crown matrimonial, which would at least have assured to him the rank and station of independent royalty for life. Rizzio, hitherto his friend and advocate, induced the queen to reply by a reasonable refusal to this hazardous and audacious request. Darnley at once threw himself into the arms of the party opposed to the policy of the queen and her secretary,—a policy which at that moment was doubly and trebly calculated to exasperate the fears of the religious and the pride of the patriotic. Mary was invited if not induced by the king of Spain to join his league for the suppression of Protestantism ; while the actual or prospective endowment of Rizzio with Morton's office of chancellor, and the projected attainder of Murray and his allies, combined to inflame at once the anger and the apprehension of the Protestant nobles. According to one account, Darnley privately assured his uncle George Douglas of his wife's infidelity; he had himself, if he might be believed, discovered the secretary in the queen's apartment at midnight, under circumstances yet more unequivocally compromising than those which had brought Chastelard to the scaffold. Another version of the pitiful history represents Douglas as infusing suspicion of Rizzio into the empty mind of his nephew, and thus winning his consent to a deed already designed by others. A bond was drawn in which

Darnley pledged himself to support the confederates who undertook to punish "certain privy persons" offensive to the state, "especially a stranger Italian called Davie"; another was subscribed by Darnley and the banished lords, then biding their time in Newcastle, which engaged him to procure their pardon and restoration, while pledging them to ensure to him the enjoyment of the title he coveted, with tle consequent security of an undisputed succession to the crown, despite the counter claims of the house of Hamilton, in case his wife should die without issue,—a result which, intentionally or not, he and his fellow couspirators did all that brutality could have suggested to accelerate and secure. On the 9th of March the palace of Holyrood was invested by a troop under the command of Morton, while Rizzio was dragged by force out of the queen's presence and slain without trial in the heat of the moment. The parliament was discharged by proclamation issued in the name of Darnley as king ; and in the evening of the next day the banished lords, whoni it was to have condemned to outlawry, returned to Edinburgh. On the day following they were graciously received by the queen, who undertook to sign a bond for their security, but delayed the subscription till next morning under plea of sickness. During the night she esvaped with Darnley, whom she had already seduced from the party of his accomplices, and arrived at Dunbar on the third morning after the slaughter of her favourite. From thence they returned to Edinburgh on the 28th of March, guarded by two thousand horsemen under the command of Bothwell, who had escaped from Holyrood on the night of the murder, to raise a force on the queen's behalf with his usual soldierly promptitude. The slayers of Rizzio fled to England, and were outlawed; Darnley was permitted to protest his innocence and denounce his accomplices; after which he became the scorn of all parties alike, and few men dared or cared to be seen in hiscompany. On the 19th of June ason was born to his wife, and in the face of his previous protesta- tions he was induced to acknowledge himself the father. But, as Murray and his partisans returned to favour and influence no longer incompatible with that of Bothwell and Huntly, he grew desperate enough with terror to dream of escape to France. This design was at once frustrated by the queen's resolution. She summoned him to declare his reasons for it in presence of the French ambassador and

MARY an assembly of the nobles; she besought him for God's sake to speak out, and not spare her; and at last he left her presence with an avowal that he had nothing to allege, The favour shown to Bothwell had not yet given occasion for scandal, though his character as an adventurous libertine was as notable as his reputation for military hardihood; but as the summer advanced his insolence increased with his influence at court and the general aversion of his rivals, He was richly endowed by Mary from the greater and lesser spoils of the church ; and the three wardenships of the border, united for the first time in his person, gave the lord high admiral of Scotland a position of unequalled power. dangerously wounded by a leading outlaw, whom he slew in single combat; and while yet confined to Hermitage

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In the gallant discharge of its duties he was

Castle he received a visit of two hours from the queen, who

rode thither from Jedburgh and back through 20 miles

of the wild borderland, where her person was in perpetual

danger from the freebooters whom her father's policy had

striven and had failed to extirpate. The result of this daring ride was a ten days' fever, after which she removed by short stages to Craigmillar, where a proposal for her divorce from Darnley was laid before her by Bothwell, Murray, Huntly, Argyle, and Lethington, who was chosen spokesman for the rest. She assented on condition that the divorce could be lawfully effected without impeachment of her son's legitimacy; whereupon Lethington undertook in the name of all present that she should be rid of her husband without any prejudice to the child,—at whose baptism a few days afterwards Bothwell took the place of the putative father, though Darnley was actually residing under the same roof, and it was not till after the ceremony that he was suddenly struck down by a sickness so violent as to excite suspicions of poison. He was removed to Glasgow, and left for the time in charge of his father; but on the news of his progress towards recovery a bond was drawn

up for execution of the sentence of death which had secretly been pronounced against the twice-turned traitor who had earned his doom at all hands alike. On the 22d of the next month (January 1567) the queen visited her husband at Glasgow and proposed to remove him to Craigmillar Castle, where he would have the benefit of medicinal baths; but instead of this resort he was con- veyed on the last day of the month to the lonely and squalid shelter of the residence which was soon to be made memorable by his murder. Between the ruins of two sacred buildings, with the town-wall to the south and a suburban hamlet known to ill fame as the Thieves' Row to the north of it, a lodging was prepared for the titular king of Scotland, and fitted up with tapestries taken from the Gordons after the battle of Corrichie. On the evening of Sunday, February 9, Mary took her last leave of the miserable boy who had so often and so mortally outraged her as consort and as queen. 'That night the whole city was shaken out of sleep by an explosion of gunpowder which shattered to fragments the building in which he should have slept and perished ; and next morning the bodies of Darnley anda page were found strangled in a garden adjoining it, whither they had apparently escaped over a wall, to be despatched by the hands of Bothwell's attendant confederates.

Upon the view which may be taken of Mary's conduct during the next three months depends the whole debatable question of her character. According to the professed champions of that character, this conduct was @ tissue of such dastardly imbecility, such heartless irresolution, and such brainless inconsistency as for ever to dispose of her time-honoured claim to the credit of intelligence and courage. It is certain that just three months and six days after the murder of her husband she became the wife of

her husband's murderer. On the 11th of February she wrote to the bishop of Glasgow, her ambassador in France, 9 brief letter of simple eloquence, announcing her provi- dential escape from a design upon her own as well as her husband's life. A reward of two thousand pounds was offered by proclamation for discovery of the murderer. Bothwell and others, his satellites or the queen's, were instautly placarded by name as the criminals. Voices were heard by night in the streets of Edinburgh calling down

judgment on the assassins. Your days after the discovery of the bodies, Darnley was buried in the chapel of Holyrood with secrecy as remarkable as the solemnity with which Rizzio had been interred there less than a year before. On the Sunday following, Mary left Edinburgh for Setcn Palace, 12 miles from the capital, where scandal asserted that she passed the time merrily in shooting- matches with Bothwell for her partner against Lords Seton and Huntly ; other accounts represent Huntly and Bothwell as left at Holyrood in charge of the infant prince. Grace- fully and respectfully, with statesmanlike yet feminine dexterity, the demands of Darnley's father for justice on the murderers of his son were accepted and eluded by his daughter-in-law. Bothwell, with a troop of fifty men, rode through Edinburgh defiantly denouncing vengeance on his concealed accusers, As weeks elapsed without action on the part of the royal widow, while the cry of blood was up throughout the country, raising echoes from England and abroad, the murmur of accusation began to rise against her also, Murray, with his sister's ready permission, withdrew to France. Already the report was abroad that the queen was bent on marriage with Bothwell, whose last year's marriage with the sister of Huntly would be dissolved, and the assent of his wife's brother purchased by the restitution of his forfeited estates. According to the Memoirs of Sir James Melville, both Lord Herries and himself resolved to appeal to the queen in terms of bold and earnest remonstrance against so desperate and scandalous a design; Herries, having been met with assurances of its unreality and professions of astonishment at the suggestion, instantly fled from court; Melville, evading the danger of a merely personal protest without backers to support him, laid before Mary a letter from a loyal Scot long resident in England, which urged upon her consideration and her conscience the danger and disgrace of such a project yet more freely than Herries had ventured to do by word of mouth; but the sole result was that it needed all the queen's courage and resolution to rescue him from the violence of the man for whom, she was reported to have said, she cared not if she lost France, England, and her own country, and would go with him to the world's end ina white petticoat before she would leave him. On the 28th of March the privy council, in which Bothwell himself sat, appointed the 12th of April as the day of his trial, Lennox, Instead of the crown, being named as the accuser, and cited by Toyal letters to appear at "the humble request and petition of the said Earl Bothwell," who, on the day of the trial, had four thousand armed men

behind him in the streets, while the castle was also at his command. Under these arrangements it was not thought wonderful that Lennox discreetly declined the danger of attendance, even with three thousand men ready to follow him, at the risk of desperate street fighting. He pleaded sickness, asked for more time, and demanded that the accused, instead of enjoying special favour, should share the treatment of other suspected criminals. But, as no particle of evidence on his side was advanced, the protest of his representative was rejected, and Bothwell, acquitted in default of witnesses against him, was free to challenge any persistent accuser to the ancient ordeal of battle. His wealth and power were enlarged by gift of the parliament which met on the

14th and rose on the 19th of April,—a date made notable by the subsequent supper at Ainslie's tavern, where Bothwell obtained the signatures of its leading members to a document affirming his innocence, and pledging the subscribers to maintain it against all challengers, to stand by him in all his quarrels, and finally to promote by all means in their power the marriage by which they recom- mended the queen to reward his services and benefit the country. On the second day following Mary went to visit her child at Stirling, where his guardian, the earl of Mar, refused to admit more than two women in her train. It was well known in Edinburgh that Bothwell had a body of men ready to intercept her on the way back, and carry her to Dunbar,—not, as was naturally inferred, without good assurance of her consent. On the 24th of April, as she approached Edinburgh, Bothwell accordingly met her at the head of eight hundred spearmen, assured her (as she afterwards averred) that she was in the utmost peril, and escorted her, together with Huntly, Lethington, and Melville, who were then in attendance, to Dunbar Castle. On the 3d of May Lady Jane Gordon, who had become countess of Bothwell on February 22d of the year preceding, obtained, on the ground of her husband's infidelities, a separation which, however, would not under the old laws of Catholic Scotland have left him free to marry again; on the 7th, accordingly, the necessary divorce was pronounced, after two days' session, by a clerical tribunal which ten days

before had received from the queen a special commission to give judgment on a plea of somewhat apocryphal consanguinity alleged by Bothwell as the ground of an action for divorce against his wife. The fact was studiously evaded or concealed that a dis- pensation had been granted by the archbishop of St Andrews for this irregularity, which could only have arisen through some illicit connexion of the husband with a relative of the wife between whom and himself no affinity by blood or marriage could be proved. On the day when the first or Protestant divorce was pronounced, Mary and Bothwell returned to Edinburgh with every prepared appearance of a peaceful triumph. Lest her captivity should have been held to invalidate the late legal proceedings in her name, proclamation was made of forgive- ness accorded by the queen to her captor in consideration of his past and future services, and her intention wasannounced to reward them by further promotion; and on the same day (May 12th) he was duly created duke of Orkney and Shetland. The duke, as aconscientious Protestant, refused to marry his mistress according to the rites of her church ; and she, the chosen champion of its cause, agreed to be married to him, not merely by a Protestant, but by one who before his conversion had been a Catholic bishop, and should therefore have been more hateful and contemptible in her eyes than any ordinary heretic, had not religion as well as policy, faith as well as reason, been absorbed or superseded by some more mastering passion or emotion. This passion or emotion, according to those who deny her attachment to Bothwell, was simply terror,—the blind and irrational prostration of an abject spirit before the cruel force of circumstances and the crafty wickedness of men. Hitherto, according to all evidence, she had shown herself on all occasions, as on all subsequent occasions she indis- putably showed herself, the most fearless, the most keen- sighted, the most ready-witted, the most high-gifted and high-spirited of women ; gallant and generous, skilful and practical, never to be cowed by fortune, never to be cajoled by craft; neither more unselfish in her ends nor more unscrupulous in her practice than might have been expected from her training and her creed. But at the crowning moment of trial there are those who assert their belief that the woman who on her way to the field of Corrichie had

uttered her wish to be a man, that she might know all the hardship and all the enjoyment of a soldier's life, riding forth "in jack and knapscull "—the woman who long after- wards was to hold her own for two days together without help of counsel against all the array of English law and English statesmauship, armed with irrefragable evidence and supported by the resentment of a nation—showed her- self equally devoid of moral and of physical resolution ; too senseless to realize the significance and too heartless to face the danger of a situation from which the simplest exercise of reason, principle, or courage must have rescued the most unsuspicious and inexperienced of honest womeu who was not helplessly deficient in self-reliance and self- respect. The famous correspondence produced next year in evidence against her at the conference of York may have been, as her partisans affirm, so craftily garbled and falsified by interpolation, suppression, perversion, or absolute forgery as to be all but historically worthless. Its acceptance or its rejection does not in any degree what- ever affect, for better or for worse, the rational estimate of her character. The problem presented by the simple existence of the facts just summed up remains in either case absolutely the same.

That the coarse and imperious nature of the hardy and able ruffian who had now become openly her master should no less openly have shown itself even in the first moments of their inauspicious union is what any bystander of com- mon insight must inevitably have foreseen. 'Tears, dejec- tion, and passionate expressions of a despair "' wishing only for death," bore fitful and variable witness to her first sense of a heavier yoke than yet had galled her spirit and her pride. At other times her affectionate gaiety would give evidence as trustworthy of a fearless and improvident satis- faction. They rode out in state together, and if he kept cap in hand as a subject she would snatch it from him and clap it on his head again; while in graver things she took all due or possible care to gratify his ambition, by the insertion of a clause in their contract of marriage which made their joint signature necessary to all documents of state issued under the sign-manual. She despatched to France a special envoy, the bishop of Dumblane, with instructions setting forth at length the unparalleled and hitherto ill-requited services and merits of Bothwell, and the necessity of compliance at once with his passion and with the unanimous counsel of the nation,—a people who would endure the rule of no foreign consort, and whom none of their

own countrymen were so competent to con- trol, alike by wisdom and by valour, as the incomparable subject of her choice, These personal merits and this political necessity were the only pleas advanced in a letter to her ambassador in England. But that neither plea would avail her fora moment in Scotland she had ominous evidence on the thirteenth day after her marriage, when no response was made to the usual form of proclamation for a raid or levy of forces under pretext of a campaign against the rievers of the border. On the 6th or 7th of June Mary and Bothwell took refuge in Borthwick Castle, twelve miles from the capital; where the fortress was in the keep- ing of an adherent whom the diplomacy of Sir James Melville had succeeded in detaching from his allegiance to Bothwell. The fugitives were pursued and beleaguered by the earl of Morton and Lord Hume, who declared their purpose to rescue the queen from the thraldom of her husband. He escaped, leaving her free to follow him or to join the party of her professed deliverers. But whatever cause she might have found since marriage to complain of his rigorous custody and domineering brutality was in- sufficient to break the ties by which he held her. Alone, in the disguise of a page, she slipped out of the castle at midnight, and rode off to meet him at a tower two miles dis-

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tant, whence they fled together to Dunbar. The confede- rate lords on entering Edinburgh were welcomed by the citizens, and after three hours' persuasion Lethington, who had now joined them, prevailed on the captain of the castle to deliver it also into their hands. Proclamations were issued in which the crime of Bothwell was denounced, and the disgrace of the country, the thraldom of the queen, and the mortal peril of her infant son were set forth as reasons: for summoning all the lieges of the chief cities of Scotland to rise in arms on three hours' notice and join the forces assembled against the one common enemy. News of his approach reached them on the night of June 14, and they marched before dawn with 2200 men to meet him near Musselburgh. Mary meanwhile had passed from Dunbar to Haddington, and thence to Seton, where 1600 men rallied to her side. On the 15th of June, one month from their marriage day, the queen and Bothwell, at the head of a force of fairly equal numbers but visibly inferior discipline, met the army of the confederates at Carberry Hill, some six

miles from Edinburgh. Du Croc, the French ambassador, obtained permission through the influence of Maitland to convey to the queen the terms proposed by their leaders,—that she and Bothwell should part, or that he should meet in single combat a champion chosen from among their number. Bothwell offered to meet any man of sufficient quality; Mary would not assent. As the afternoon wore on their force began to melt away by desertion and to break up for lack of discipline. Again the trial by single combat was proposed, and thrice the proposal fell through, owing to objections on this side or on that. At last it was agreed that the queen should yield herself prisoner, and Bothwell be allowed to retire in safety to Dunbar with the few followers who remained to him, Mary took leave of her first and last master with passionate anguish and many parting kisses; but in face of his enemies, and in hearing of the cries which burst from the ranks, demanding her death by fire as a murderess and harlot, the whole heroic and passionate spirit of the woman represented by her admirers as a spiritless imbecile flamed out in responsive threats to have all the men hanged and crucified, in whose power she now stood helpless and alone. She grasped the hand of Lord Lindsay as he rode beside her, and swore "by this hand" she would "have his head for this." In Edinburgh she was received by a yelling mob, which flaunted before her at each turn a banner representing the corpse of Darnley with her child beside it invoking on his knees the retribution of Divine justice. From the violence of a multitude in which women of the worst class were more furious than the men she was sheltered in the house of the provost, where she repeatedly showed herself at the window, appealing aloud with dishevelled hair and dress to the mercy which no man could look upon her and refuse. At nine in the evening she was removed to Holyrood, and thence to the port of Leith, where she embarked under guard, with her attendants, for the island castle of Lochleven. On the 20th a silver casket containing letters and French verses, miscalled sonnets, in the handwriting of the queen, was taken from the person of a servant who had been sent by Bothwell to bring it from Edinburgh to Dunbar. Even in the existing versions of the letters, translated from the lost originals and retranslated from this translation of a text which was probably destroyed in 1603 by order of King James on his accession to the English throne, ever in these possibly disfigured versions, the fiery pathos of passion, the fierce and piteous fluctuations of spirit between love and hate, hope and rage and jealousy, have eloquence apparently beyond

the imitation or invention 4 art. Three days after this discovery Lord Lindsay, Lo Ruthven, and Sir Robert Melville were despatched to

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Lochleven, there to obtain the queen's signature to an act of abdication in favour of her son, and another appointing Murray regent during his minority. She submitted, and a commission of regency was established till the return from France of Murray, who, on the 15th of August, arrived at Lochleven with Mortonand Athole. According to his own account, the expostulations as to her past con- duct which preceded his admonitions for the future were received with tears, confessions, and attempts at extenua- tion or excuse; but when they parted next day on good terms she had regained her usual spirits. Nor from that day forward had they reason to sink again, in spite of the close keeping in which she was held, with the daughters of the house for bedfellows. Their mother and the regent's, her father's former mistress, was herself not impervious to her prisoner's lifelong power of seduction and subjugation. Her son George Douglas fell inevitably under the charm. A rumour transmitted to England went so far as to assert that she had proposed him to their common half-brother Murray as a fourth husband for herself; a later tradition represented her as the mother of a child by him. A third report, at least as improbable as either, asserted that a daughter of Mary and Bothwell, born about this time, livedto be anunin France. It is certain that the necessary removal of George Douglas from Lochleven enabled him to devise a method of escape for the prisoner on March 25, 1568, which was frustrated by detection of her white hands under the disguise of alaundress. But a younger member of the household, Willie Douglas, aged eighteen, whose devotion was afterwards remembered and his safety cared for by Mary at a time of utmost risk and perplexity to herself, succeeded on May 2d in assisting her to escape by a postern gate to the lake-side, and thence in a boat to the mainland, where George Douglas, Lord Seton, and others were awaiting her. Thence they rode to Seton's castle of Niddry, and next day to Hamilton Palace, round which an army of 6000 men was soon assembled, and whither the new

French ambassador to Scotland hastened to pay his duty. The queen's abdication was revoked, messengers were despatched to the English and French courts, and word was sent to Murray at Glasgow that he must resign the regency, and should be pardoned in common with all offenders against the queen. But on the day when Mary arrived at Hamilton Murray lad summoned to Glasgow the feudatories of the crown, to take arms against the insurgent enemies of the infant king. Elizabeth sent conditional offers of help to her kinswoman, provided she would accept of English intervention and abstain from seeking foreign assistance; but the messenger came too late. Mary's followers had failed to retake Dunbar Castle from the regent, and made for Dumbarton instead, marching two miles south of Glasgow, by the village of Langside. Here Murray, with 4500 men, under leaders of high distinction, met the 6000 of the queen's army, whose ablest man, Herries, was as much distrusted by Mary as by every one else, while the Hamiltons could only be trusted to think of their own interests, and were suspected of treasonable designs on all who stood between their house and the monarchy. On the 13th of May the battle or skirmish of Langside determined the result of the campaign in three quarters of anhour. Kirkaldy of Grange, who commanded the regent's cavalry, seized and kept the place of vantage from the beginning, and at the first sign of wavering on the other side shattered at a single charge the forces of the queen, with a loss of one man to three hundred. Mary fled 60 miles from the field of her last battle before she halted at Sanquhar, and for three days of flight, according to her own account, had to sleep on the hard ground, live on oatmeal and sour milk, and fare at night like the owls, in hunger, cold, and fear. On the third day from the rout

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of Langside she crossed the Solway, and landed at Workington in Cumberland, May 16, 1568. On the 20th

' Lord Scrope and Sir Francis Knollys were sent from court

to carry messages and letters of comfort from Elizabeth to Mary at Carlisle. On June 11th Knollys wrote to Cecil at ouce the best description and the

noblest panegyric extant of the queen of Scots,—enlarging, with a brave man's sympathy, on her indifference to form and ceremony, her daring grace and openness of manner, her frank display of a great desire to be avenged of her enemies, her readiness to expose herself to all perils in hope of victory, her delight to hear of hardihood and courage, commending by name all her enemies of approved valour, sparing no cowardice in her friends, but above all things athirst for victory by any means at any price, so that for its sake pain and peril seemed pleasant to her, and wealth and all things, if com- pared with it, contemptible and vile. What was to be done with such a princess, whether she were to be nourished in one's bosom, above all whether it could be advisable or safe to try any diplomatic tricks upon such a lady, Knollys left for the minister to judge. It is remarkable that he should not have discovered in her the qualities so obvious to moderu champions of her character,—easiness, gullibility, incurable innocence and invincible ignorance of evil, incapacity to suspect or resent anything, readiness to believe and forgive all things. On the 15th of July, after various delays interposed by her reluctance to leave the neighbourhood of the border, where on her arrival she had received the welcome and the homage 'of the leading Catholic houses of Northumberland and Cumberland, she was removed to Bolton Castle in North Yorkshire. During her residence here a conference was held at York between her own and Elizabeth's commissioners and those appointed to represent her son as king of Scots. These latter, of whom Murray himself was the chief, privately laid before the English commissioners the contents of the famous casket. On the 24th of October the place of the conference was shifted from York to London, where the inquiry was to be held before Queen Elizabeth in council. Mary was already aware that the chief of the English commissioners, the duke of Norfolk, was secretly an aspirant to the peril of her hand; and on October 21st she gave the first sign of assent to the suggestion of a divorce from Bothwell. On the 26th of October the charge of complicity in the murder of Darnley was distinctly brought forward against her in spite of Norfolk's reluctance and Murray's previous hesitation. Elizabeth, by the mouth of her chief justice, formally rebuked the audacity of the subjects who durst bring such a charge against their sovereign, and challenged them to advance their proofs. They complied by the pro- duction of an indictment under five heads, supported by the necessary evidence of documents. The number of English commissioners was increased, and they were bound to preserve

secrecy as to the matters revealed. Further evidence was supplied by Thomas Crawford, a retainer of the house of Lennox, tallying so exactly with the text of the casket letters as to have been cited in proof that the latter must needs be a forgery. Elizabeth, on the close of the evidence, invited Mary to reply to the proofs alleged before she could be admitted to her presence; but Mary simply desired her commissioners to withdraw from the conference. She declined with scorn the proposal made by Elizabeth through Knollys, that she should sign a second abdication in favour of herson. On January 10, 1569, the judgment given at the conference acquitted Murray and his adherents of rebellion, while affirming that

| nothing had been proved against Mary,—a verdict accepted

by Murray as equivalent to a practical recognition of his office as regent for the infant king. This position he was not long to hold; and the fierce exultation of Mary at the

news of his murder gave to those who believed in her coniplicity with the murderer, on whom a pension was bestowed by her unblushing gratitude, fresh reason to fear, if her liberty of correspondence and intrigue were not restrained, the likelihood of a similar fate for Elizabeth. On January 26, 1569, she had been removed from Bolton Castle to Tutbury in Staffordshire, where proposals were conveyed to her, at the instigation of Leicester, for a marriage with the duke of Norfolk, to which she gave a graciously conditional assent ; but the discovery of these proposals consigned Norfolk to the Tower, and on the out- break of an insurrection in the north Mary, by Lord Hunsdon's advice, was again removed to Coventry, when a body of her intending deliverers was within a day's ride of Tutbury. On the 23d of January following Murray was assassinated; and a second northern insurrection was crushed in a single sharp fight by Lord Hunsdon. In October Cecil had an interview with Mary at Chatsworth, when the conditions of her possible restoration to the throne in compliance with French demands were debated at length. The queen of Scots, with dauntless dignity, refused to yield the castles of Edinburgh and Dumbarton into English keeping, or to deliver up her fugitive English partisans then in Scotland; upon other points they came to terms, and the articles were

signed October 16. On the same day Mary wrote to Elizabeth, requesting with graceful earnestness the favour of an interview which might reassure her against the suggestion that this treaty was a mere pre- tence. On November 28 she was removed to Sheffield Castle, where she remained for the next fourteen years in charge of the earl of Shrewsbury. The detection of a plot, in which Norfolk was implicated, for the invasion of England by Spain on behalf of Mary, who was then to take him as the fourth and most contemptible of her husbands, made necessary the reduction of her household and the stricter confinement of her person. On May 28, 1572, a demand from both houses of parliament for her execution as well as Norfolk's was generously rejected by Elizabeth ; but after the punishment of the traitorous pre- tender to her hand, on whom she had lavished many eloquent letters of affectionate protestation, she fell into 'a passion of sickness" which convinced her honest keeper of her genuine grief for the ducal caitiff. A treaty pro- jected on the news of the massacre of St Bartholomew, by which Mary should be sent back to Scotland for immediate execution, was broken off by the death of the earl of Mar, who had succeeded Lennox as regent; nor was it found possible to come to acceptable terms on a like understanding with his successor Morton, who in 1577 sent a proposal to Mary for her restoration, which she declined, in suspicion of a plot laid to entrap her by the policy of Sir Francis Walsingham, the most unscrupulously patriotic of her English enemies, who four years afterwards sent word to Scotland that the execution of Morton, so long the ally of England, would be answered by the execution of Mary. But on that occasion Elizabeth again refused her assent either to the trial of Mary or to her transference from Sheffield to the Tower. In 1581 Mary accepted the advice of Catherine de' Medici and Henry IIL. that she should allow her son's title to reign as king of Scotland conjointly with herself when released and restored to a share of the throne. This plan was but part of a scheme including the invasion of England by her kinsman the duke of Guise, who was to land in the north and raise a Scottish army to place the released prisoner of Sheffield beside her son on the throne of Elizabeth. After the overthrow of the Scottish accomplices in this notable pro- ject, Mary poured forth upon Elizabeth a torrent of pathetic and eloquent reproach for the many wrongs she had suffered at the hands of her hostess, and pledged her honour to the

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assurance that she now aspired to no kingdom but that of heaven. In the spring of 1583 she retained enough of this saintly resignation to ask for nothing but liberty, without a share in the government of Scotland; but Lord Burghley not unreasonably preferred, if feasible, to reconcile the alliance of her son with the detention of his mother, In 1584 the long-suffering earl of Shrewsbury was relieved of his fourteen years' charge through the involuntary good offices of his wife, whose daughter by her first husband had married a brother of Darnley ; and their orphan child Arabella, born in England, of royal descent on the father's side, was now, in the hopeful view of her grandmother, a more plausible claimant than the king or queen of Scots to the inheritance of the English throne. In December 1583 Mary had laid before the French ambassador her first com- plaint of the slanders spread by Lady Shrewsbury and her sons, who were ultimately compelled to confess the false- hood of their imputations on the queen of Scots and her keeper. It was probably at the time when a desire for revenge on hercalumniatress made her think the opportunity good and safe for discharge of such a two-edged dart at the countess and the queen that Mary wrote, but abstained from despatching, the famous and terrible letter in which, with many gracious excuses and professions of regret and attachment, she transmits to Elizabeth a full and vivid report of the hideous gossip retailed by Bess of Hardwick regarding her character and person at a time when the reporter of tliese abominations was on friendly terms with her husband's royal charge. In the autumn of 1584 she was removed to Wingfield Manor under charge of Sir Ralph Sadler and John Somers, who accompanied her also on her next removal to Tutbury in January 1585. A letter received by her in that cold, dark, and unhealthy castle, of which fifteen years before she had made painful and nialodorous experience, assured her that her son would acknowledge her only as queen-mother, and provoked at once the threat of a parent's curse and an application to Elizabeth for sympathy. In April 1585 Sir Amyas Paulet was appointed to the office of which Sadler, accused of careless indulgence, had requested to be relieved ; and on Christmas Eve she was removed from the hateful shelter of Tutbury to the castle of Chartley in the same county. Her correspondence in cipher from thence with her English agents abroad, intercepted by Walsingham and deciphered by his secretary, gave eager

encouragement to the design for a Spanish invasion of England under the prince of Parma,—an enterprise in which she would do her utmost to make her son take part, and in case of his refusal would induce the Catholic nobles of Scotland to betray him into the hands of Philip, from whose tutelage he should be released only on her demand, or if after her death he should wish to return, nor then unless he had become a Catholic. But even these patriotic and maternal schemes to consign her child and reconsign the kingdom to the keeping of the Inquisition, incarnate in the widower of Mary Tudor, were superseded by the attraction of a con- spiracy against the throne and life of Elizabeth. Anthony Babington, in his boyhood a ward of Shrewsbury, resident in the household at Sheffield Castle, and thus subjected to the charm before which so many victims had already fallen, was now induced to undertake the deliverance of the queen of Scots by the murder of the queen of England. It is maintained by those admirers of Mary who assume her to have been an almost absolute imbecile, gifted with the power of imposing herself on the world as a of unsurpassed ability, that, while cognizant of the plot tor her deliverance by English rebels and an invading a, of foreign auxiliaries, she might have been innocently unconscious that this conspiracy involved the simultaneous assassination of Elizabeth. In the conduct and detection

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of her correspondence with Babington, traltor was played off against traitor, and spies were utilized against assassins, with as little seruple as could be required or expected in the diplomacy of the time. As in the case of the casket Jetters, it is alleged that forgery was employed to inter- polate sufficient evidence of Mary's complicity in a design of which it is thought credible that she was kept in sonorance by the traitors and murderers who had. enrolled themselves in her service,—that one who pensioned the actual murderer of Murray and a would-be murderer of Elizabeth was incapable of approving what her keen and practised intelligence was too blunt and torpid to anticipate ag inevitable and inseparable from the general design. In August the conspirators were netted, and Mary was arrested at the gate of Tixall Park, whither Paulet had taken her under pretence of a hunting

party. At Tixall she was detained till her papers at Chartley had undergone thorough research. 'That she was at length taken in her own toils even such a dullard as her admirers depict her could not have failed to understand ; that she was no such dastard as to desire or deserve such defenders the whole brief course of her remaining life bore consistent and irrefragable witness. Her first thought on her return to Chartley was one of loyal gratitude and womanly sympathy. She cheered the wife of her English secretary, now under arrest, with promises to answer for her husband to all accusations brought against him, took her new-born child from the mother's arms, and in default of clergy baptized it, to Paulet's Puritanic horror, with her own hands by her own name. The next or the twin-born impulse of her indomit- able nature was, as usual in all times of danger, one of passionate and high-spirited defiance, on discovering the seizure of her papers. A fortnight afterwards her keys and her money were confiscated, while she, bedridden and unable to move her hand, could only ply the terrible weapon of her bitter and fiery tongue. Her secretaries were examined in London, and one of them gave evidence that she had first heard of the conspiracy by letter from Babington, of whose design against the life of Elizabeth she thought it best to take no notice in her reply, though she did not hold herself bound to reveal it. On the 25th of September she was removed to the strong castle of Fotheringay in Northamptonshire. On the 6th of October she was desired by letter from Elizabeth to answer the charges brought against her before certain of the chief English nobles appointed to sit in commission on the cause. Tn spite of her first refusal to submit, she was induced by the arguments of the vice-chamberlain, Sir Christopher Hatton, to appear before this tribunal on condition that her protest should be registered against the legality of its jurisdiction over a sovereign, the next heir of the English crown,

On the 14th and 15th of October 1586 the trial was held in the hall of Fotheringay Castle. Alone, "without one counsellor on her side among so many," Mary con- ducted the whole of her own defence with courage incomparable and unsurpassable ability. Pathos and indignation, subtlety and simplicity, personal appeal and political reasoning, were the alternate weapons with which she fought against all odds of evidence or inference, and disputed step by step every inch of debatable ground. She repeatedly insisted on the production of proof in her own hand writing as to her

complicity with the project of the assassins who had expiated their crime on the 20th and 21st of the month preceding. When the charge was shifted to the question of her intrigues with Spain, she took her stand resolutely on her right to convey whatever right she possessed, though now no kingdom was left her for disposal, to whomsoever she might choose. One single slip she made in the whole course of her defence ; but

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none could have been more unluckily characteristic and significant. When Burghley brought against her the unanswerable charge of having at that moment in her service, and in receipt of an annual pension, the instigator of a previous attempt on the life of Elizabeth, she had the unwary audacity to cite in her justification the pensions allowed by Elizabeth to her adversaries in Scotland, and especially to her son. It is remarkable that just two months later, in a conversation with her keepers, she again made use of the same extraordinary argument in reply to the same inevitable imputation, and would not be brought to admit that the two cases were other than parallel. But except for this single instance of oversight or perversity her defence was throughout a masterpiece of indomitable ingenuity, of delicate and steadfast courage, of womanly dignity and genius. Finally she demanded, as she had demanded before, a trial either before the estates of the realm lawfully assembled, or else before the queen incouncil, So closed the second day of the trial ; and before the next day's work could begin a note of two or three lines hastily written at midnight informed the commissioners that Elizabeth had suddenly determined to adjourn the expected judgment and transfer the place of it to the star- chamber. Here, on the 25th of October, the commissioners again met ; and one of them alone, Lord Zouch, dissented from the verdict by which Mary was found guilty of having, since the Ist of June preceding, compassed and imagined divers matters tending to the destruction of Elizabeth. This verdict was conveyed to her, about three weeks later, by Lord Buckhurst and Robert Beale, clerk of the privy council. At the intimation that her life was an impediment to the security of the received religion, 'she seemed with a certain unwonted alacrity to triumph, giving God thanks, and rejoicing in her heart that she was held to

be an instrument" for the restoration of her own faith. This note of exultation as in martyrdom was maintained with unflinching courage to the last. She wrote to Elizabeth and the duke of Guise two letters of – almost matchless eloquence and pathos, admirable especially for their loyal and grateful remembrance of all her faithful servants. Between the date of these letters and the day of her execution wellnigh three months of suspense elapsed. Elizabeth, fearless almost to a fault in face of physical danger, constant in her confidence even after discovery of her narrow escape from the poisoned bullets of household conspirators, was cowardly even to a crime in face of subtler and more complicated peril. She rejected with resolute dignity the intercession of French envoys for the life of the queen-dowager of France; she allowed the sentence of death to be proclaimed, and welcomed with bonfires and bell-ringing throughout the length of England ; she yielded a respite of twelve days to the pleading of the French ambassador, and had a charge trumped up against him of participation in a conspiracy against her life; at length, on the Ist of February 1587, she signed the death- warrant, and then made her secretaries write word to Paulet of her displeasure that in all this time he should not of himself have found out some way to shorten the life of his prisoner, as in duty bound by his oath, and thus relieve her singularly tender conscience from the guilt of bloodshed. Paulet, with loyal and regretful indignation, declined the disgrace proposed to him in a suggestion " to shed blood without law or warrant"; and on the 7th of February the earls of Shrewsbury and Kent arrived at Fotheringay with the commission of the council for execu- tion of the sentence given against his prisoner. Mary received the announcement with majestic tranquillity, expressing in dignified terms her readiness to die, her consciousness that she was a martyr for her religion, and her total ignorance of any conspiracy against the life of XV, — 76

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Elizabeth. At night she took a graceful and affectionate leave of her attendants, distributed among them her money and jewels, wrote out in full the various legacies to be con- veyed by her will, and charged her apothecary Gorion with her last messages for the king of Spain. In these messages the whole nature of the woman was revealed. Not a single friend, not a single enemy, was forgotten; the slightest service, the slightest wrong,

had its place assigned in her faithful and implacable memory for retribution or reward. Forgiveness of injuries was as alien from her fierce and loyal spirit as forgetfulness of benefits; the destruction of England and its liberties by Spanish invasion and conquest was the strongest aspiration of her parting soul. At eight next morning she entered the hall of execution, having taken leave of the weeping envoy from Scotland, to whom she gave a brief message for her son; took her seat on the scaffold, listened with an air of even cheerful unconcern to the reading of her sentence, solemnly declared her innocence of the charge conveyed in it and her consolation in the prospect of ultimate justice, rejected the professional services of Richard Fletcher, dean of Peterborough, lifted up her voice in Latin against his in English prayer, and when he and his fellow-worshippers had fallen duly silent prayed aloud for the prosperity of her own church, for Elizabeth, for her son, and for all the enemies whom she had commended overnight to the notice of the Spanish invader ; then, with no less courage than had marked every hour and every action of her life, received the stroke of death from the wavering hand of the headsman.

Mary Stuart was in many respects the creature of her age, of her creed, and of her station; but the noblest and most noteworthy qualities of her nature were independent of rank, opinion, or time. Even the detractors who defend her conduct on the plea that she was a dastard and a dupe are compelled in the same breath to retract this implied reproach, and to admit, with illogical acclamation and incongruous applause, that the world never saw more splendid courage at the service of more brilliant intelli- gence, that a braver if not "a rarer spirit never did steer humanity." A kinder or more faithful friend, a deadlier or more dangerous enemy, it would be impossible to dread or to desire. Passion alone could shake the double fortress of her impregnable heart and ever active brain. The passion of love, after very sufficient experience, she apparently and naturally outlived; the passion of hatred and revenge was as inextinguishable in her inmost nature as the emotion of loyalty and gratitude. Of repentance it would seem that she knew as little as of fear, having been trained from her infancy in a religion where the Decalogue was supplanted by the Creed. Adept as she was in the most exquisite delicacy of dissimulation, the most salient note of her original disposition was daring rather than subtlety. Beside or behind the voluptuous or intellectual attractions of beauty and culture, she had about

her the fresher charm of a fearless and frank simplicity, a genuine and enduring pleasure in small and harmless things no less than in such as were neither. In 1562 she amused herself for some days by living "with her little troop" in the house of a burgess of St Andrews "'like a burgess's wife," assuring the English ambassador that he should not find the queen there, —" nor I know not myself where she is become." From Sheffield Lodge, twelve years later, she applied to the archbishop of Glasgow and the cardinal of Guise for some pretty little dogs, to be sent her in baskets very warmly packed,—"for besides reading and working, I take pleasure only in all the little animals that I can get." No lapse of reconciling time, no extent of comparative indulgence, could break her in to resignation, submission, or toleration of even partial restraint. Three months after the massacre of St Bartholomew had caused

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some additional restrictions to be placed upon her freedom of action, Shrewsbury writes to Burghley that " rather than continue this imprisonment she sticks not to say she will give her body, her son, and country for liberty"; nor did she ever show any excess of regard for any of the three For her own freedom of will and of way, of passion and of action, she cared much ; for her creed she cared something ; for her country she cared less than nothing. She would have flung Scotland with England into the hellfire of Spanish Catholicism rather than forego the faintest chance of personal revenge. instructed in the doctrines of Anglican Protestantism was so transparently a pious fraud as rather to afford confirma- tion than to arouse suspicion of her fidelity to the teaching of her church. Elizabeth, so shamefully her inferior in personal loyalty, fidelity, and gratitude, was as clearly her

Her profession of a desire to be

superior on the one all-important point of patriotism. The saving salt of Elizabeth's character, with all its wellnigh incredible mixture of heroism and egotism, meanness and magnificence, was simply this, that, overmuch as she loved herself, she did yet love England better. Her best though not

her only fine qualities were national and political, the high public virtues of a good public servant ; in the private and personal qualities which attract and attach a friend to his friend and a follower to his leader, no man or woman was ever more constant and more eminent than Mary Queen of Scots. (a. ©. 8.)

MARYBOROUGH, a town of Queensland, Australia, in the county of March, on the left bank of the Mary river, 25 miles from its mouth, about 180 miles north of Brisbane, in 25° 35'S. Jat. and 152° 43' E. long. Itis the principal shipping port for an extensive district, com- municating by steamer and coach with Brisbane and (since 1881) by railway with the Gympie gold-felds, 54 miles to the south. A large shipbuilding yard, saw-mills, dis- tilleries, breweries, and soap-works are among the industrial establishments of the town, and extensive sugar factories exist in the neighbourhood. Besides a handsome court house and town-hall, the public buildings comprise a hospital, a school of arts with a considerable library, and immigration barracks. Gas-lighting and water from the Tinana creek were both introduced in 1879. The popula- tion of the census district in 1876 was 8608, that of the municipal area about 7000. Maryborough had only about 600 inhabitants in 1860; the municipality dates from 1861, and was reincorporated in 1875.

MARYLAND

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the American Union, lies between the parallels of 37° 53' and 39° 43' 26" N. lat., and 75° 4' and 79 33 W. long. It is bounded on the N. by Peunsylvanla and Delaware; E. by Delaware and the Atlantic Ocean ; and S. and W. by Virginia and West Virginia. The total area of the State is 12,210 square miles, of which about 2350 square miles are covered by the waters of the Chesapeake Bay and of the Potomac and other rivers. Topography.—The configuration of the State 1s oe irregular. Its extreme length east and west 18 about a miles, and its breadth varies from 4 to 120 miles. ; e coast-line has no harbours, but a narrow bee an _ shallow lagoon, called Sinepuxent Bay, extend ae . entire length. The central geographical feature © State is the Chesapeake Bay, the greatest inlet a is United States, and one which is navigable te a the largest vessels. The bay at its ocean mouth, oe a

Cape Charles and Cape Henry, is 12 miles oe :, extends north and south about 200 miles ; its brea

ARYLAND, one of the thirteen original States of Plate VII

MARYLAND

the widest point is 40 miles, and its average breadth is 10 miles. It contains many islands, and its shore-line, which ‘, extremely irregular, is deeply indented with estuaries. That part of the State which lies between the bay on the west and the State of Delaware and the ocean on the east is locally known as the Eastern Shore. The surface of this region is for the most part level, and but little raised above the sea. The peninsula between the Potomac river and the west shore of the bay constitutes another geographical division similar in its general features to the Eastern Shore. Its surface, however, is more undulating, and on the north-west it rises to a ledge of Primitive rocks which runs from the Potomac river at a point about 10 miles above Washington city north-east to the Susquehanna river, and separates the tide-water portion of the State from the third division. This latter region gradually rises as it extends westward until it culminates in the mountains of the great Appalachian range, which are called, in Mary- land, the Blue Ridge and the Alleghanies. The principal rivers of the Eastern Shore are the Pocomoke, Nanticoke, Choptank, and Elk. These are rather estuaries than rivers, and are not navigable for any distance from their mouths. The Susquehanna flows into the bay at its head, and is navigable for a few miles. On the western shore are the Potomac, navigable for 125 miles, to Washington city, the Patuxent,—the largest river which is altogether within the State,—navigable for small vessels for 40 miles, and the Patapsco, on which Baltimore city is situated, navigable for 22 miles. The tide rises and falls in all these rivers. With the exception of the Youghiogheny, all the Maryland streams flow into the Chesapeake Bay.

Geology and Minerals.—A. great diversity of geological formation is found in Maryland. The lower part of the Eastern Shore is au alluvial plain, and the numerous islands in the bay are composed of similar alluvial deposits. The northern part of the Eastern Shore, beginning at the Choptank river, is a Tertiary formation, whose strata of sands and clays overspread deposits of marl, which is of great value as a fertilizer. The peninsula on the western

shore of the bay belongs to the same Tertiary formation, which, towards the north-west, gives place to a range of metamorphic rocks. This belt of rocks, which includes a strip of New Red Sandstone, enters the State near the head of the bay, and extends south-west to the Potomac, with an average breadth of about 20 miles. The principal rocks are gneiss, talc-slates, limestone, granite, serpentine, and divers hydrated magnesian silicates. The limestone supplies a marble highly valued as a building material, and the serpentine rocks yield the valuable metallic

element of chromium, which has been extensively and pro-.

fitably worked. Oxides of iron occur in gneiss, and the Jurassic clays contain the brown hematite ores from which iron is manufactured. These ores were worked even during the colonial period, and in 1751 Maryland exported 2950 tons of pig iron to England. Bog iron ore is also found on the Eastern Shore. Beds of different kinds of clays which are used in the manufacture of bricks, porcelain, &c., are abundant, and veins of copper ore are also worked. Passing westward of the metamorphic rocks, we meet a wide belt of Silurian and Devonian formation, and the first ridge of the Appalachian range, beyond which lies the broad Hagerstown valley resting upon Trenton limestone. Numerous parallel: ridges, enclosing valleys of great fertility, and belonging to the Middle Silurian, Devonian, and Carboniferous formations, follow. This belt of lines of elevation nearly parallel with the ocean, which is a characteristic of the Appalachian chain, has, in Maryland, an average breadth of about 40 miles, and trends to the south-west. The mountainous region, which extends to the western extremity of the State, but

with elevations rarely exceeding 2500 feet, begins at Cumberland, and here the Silurian and Devonian forma- tions give place to the Carboniferous. This portion of Maryland is one of the most important bituminous coal regions in America. There are several coal-fields with horizontal seams lying near the surface, but the most con- siderable is that of the George's Creek valley between Dan's Mountain on the east and Savage Mountain on the west. This narrow valley, about 20 miles loug, contains the "big seam" of bituminous coal, of the extraordinary thickness of 14 feet. The Maryland

coal is unequalled in the manufacture of iron and the generation of steam. The number of tons mined in 1881 was 2,261,918, and it is estimated that 550 square miles of Coal-measures remain. This Carboniferous formation also contains deposits of iron ore which are extensively worked.

Climate, Soil, &c.—The climate of Maryland is equable and salubrious, except in some of the lower counties on the bay, which, in summer, are subject to malarious exhalations. The mean annual temperature in the southern part of the State is 56°, in the middle 54°, and in the western 50°. The mean temperature at Baltimore is in spring 53°°8, in summer 76°°2, in autumn 57°°1, in winter 36°°2. The mean annual temperature is 55°°9. The mean annual barometer is 30-064 inches, and the annual rainfall 41°94 inches. The death-rate in the State is 1:81 per cent. In Baltimore city it was 19°34 per 1000 in 1879, and 24°7 in 1880.

The soil of the Eastern Shore, and of the peninsula on the western shore of the bay, is composed of sand and clay, and when properly cultivated is very productive. Much attention is there bestowed upon the growth of peaches and other fruits. The land in the central part of the State, and in the valleys of the mountainous part, is of great fertility. The original forest still covers a consider- able area of the western portion. There are about one hundred species of trees in the State. The deciduous oaks, hickory, chestnut, waluut, cedar, and beech trees are especially abundant. The bay and its estuaries contain inexhaustible beds of the finest oysters, yielding many thousand bushels annually.1 There are several kinds of tortoises, the most highly esteemed of which are the Malaclemys palustris and the Ptychemys rugosa. At least eighty kinds of edible fishes abound in the waters of the State, and swimming birds are very numerous.

Population, Divisions.—The State is divided into twenty-three counties and the corporation of Baltimore city. The counties are— Alleghany, Anne Arundel, Baltimore, Calvert, Caroline, Carroll, Cecil, Charles, Dorchester, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Prince George's, Queen Anne, St Mary's, Somerset, Talbot, Washington, Wicomico, and Worcester. There are five cities—Baltimore, the metropolis of the State, and the seventh city in the United States (popula- tion in 1880, 332,313; in 1870, 267,354), Cumberland (population in 1880, 10,693), Frederick

(8659), Hagers- town (6627), and Annapolis (6498), the capital of the State, and the seat of the naval academy of the United States.

The body of 200 emigrants who colonized Maryland in 1634 had increased twenty-five years later to 12,000. In 1671 the population was 20,000; in 1715, 30,000; in 1748, 130,000, of whom 36,000 were negroes ; in 1761, 164,007 (including 49,675 negroes); in 1775, 200,000 ; in 1782, 254,050 (including 83,362 negroes). The growth of population as exhibited by the decennial census returns of the United States is as follows :—

1In 1880 the amount of capital invested in the Maryland oyster

business was $6,245,876 ; the number of persons employed, 24,877 ; and the oysters taken, 10,569,012 bushels.

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Total.

Free Coloured. Slaves,

White.

208,649 8,048 103,036 319,728 216,326 19,587 105,635 341,548 235,117 33,927 111,502 380,546 260,223 39,730 107,397 407,350 291,108 52,938 102,994 447,040 318,204 62,078 89,737 470,019 417,943 74,728 90,368 583,034 515,918 83,942 87,189 687,049 605,497 175,397 2. 780,894

724,698 210,250 ie 984,943

In 1880 the native-born were 852,187, and the foreign-born 82,806. There were 10,569 more females than males. The number of males of twenty-one years of age and over was 232,106, of whom 144,586 were native white, 38,936 foreign ‘white, and 48,584 coloured. The number of persons over the age of ten years who were unable to read and write was 134,488. The number of families in Maryland was 175,318 ; dwellings, 155,070 ; persons to a square mile (land surface), 94°82; families to a square mile, 17°78;

dwell- ings to a square mile, 15°73 ; acres tu a person, 6°75 ; acres to a family, 35°99 ; persons to a dwelling, 6°03 ; persons to a family, 5°33.

Agriculturc, Manufactures, Commerce.—The following statistics relating to agricultural labour in Maryland are those of the census of 1880. The number of farms was 40,517 (the rate of increase since 1870 being 50 per cent.) ; 27,978 farms were occupied by the owners, 3878 were rented for a fixed money rental, and 8661 were rented for shares of produce. In 19,920 farms the number of acres under cultivation was less than 100, and only 805 farms werc of or above 500 acres' extent. The staple crops are tobacco, maize, and wheat, and the average cash value per acre of crops was $17.82. In the production of tobacco Maryland ranks as the seventh State in the Union. The acreage devoted to it was 38,174 ; the production was 26,082,147 Ib; and the value of the crop in the farmers' hands was $1,825,750. The cereal production was as follows :—Barley, 226 acres, 6097 bushels ; buckwheat, 10,294 acres, 136,667 bushels ; Indian corn, 664,928 acres, 15,968,533 bushels ; oats, 101,127 acres, 1,794,872 bushels; rye, 82,405 acres, 288,067 bushels; wheat, 569,296 acres, 8,004,864 bushels. The live stock on the farms, June 1, 1880, was as follows :—horses, 117,796 ; mules and asses, 12,561; working oxen, 22,246; milch cows, 122,907 ; other cattle, 117,387 ; sheep, 171,184; swine, 335,408.

The statistics of the iron and steel industries for 1880 showed that the number of establishments in Maryland was twenty-three; capital, $4,962,125 ; number of hands, 2763 ; wages paid, $905,090; value of materials, $2,888,574 ; value of products, $4,470,050. The pro- duction of pig iron was 59,664 tons. The cotton manufactures had 2325 looms, 125,014 spindles, used 46,947 bales of cotton, and employed 4159 hands. Baltimore stands eighth in the list of manufacturing citics in the United States. The number of establishments in that city is 3596 ; capital $35,760,108 ; average number of hands employed 55,201 ; annual product $75,621,388.

The large foreign commerce of the State is conducted almost wholly through the port of Baltimore, although there are two other ports ofentry. In 1881 the number of foreign vessels arriving was 1307 ; in 1880, 1508. The number of foreign clearances in 1881 was 1179 ; in 1880, 1683. The

number of vessels registered in the State is 1788. 'The chief imports are iron, coffee, and salt; the chief exports, tobacco, petroleum, and grain. The grain elevators at Baltimore have a capacity of 6,150,000 bushels. In 1880 the value of the forcign imports was $18,643,245, and that of the foreign exports $74,398,971. The aggregate exchanges at the Baltimore clearing house in 1881 were $732,448,141. 'There are one hundred and fifty-two fire and marine insurance companies doing business in the State. In 1881 these received $1,680,109 in pre- miums, and paid losses amounting to $1,015,658. The twenty- nine life insurance companies in the State received in 1881 $1,116,540 in preiniums, and paid losses amounting to $895,092.

Railways and Canals.—The Baltimore and Ohio Railway, incorporated in 1827, is one of the chief lines of communication between the seaboard and the Western States. The numberof miles of all railways in operation wholly within the State is 1048. The Chesapeake and Ohio Canal, begun in 1828, and completed in 1845, at a cost of $11,375,000, extends from Cumberland, along the left bank of the Potomac, to Georgetown, in the District of Columbia, a distance of 184 miles. It there crosses the river by an aqueduct and continues to Alexandria, Va. Its depth is 6 feet, and its width varies from 52 to 70 feet. The Chesapeake and Delaware Canal, connecting the Chesapeake and Delaware Bays, is 12 iniles long, 66 feet wide, 10 fect deep, and cost $3,547,561.

Revenue, Debts, Taxation.—The total aniount of the funded debt of the State on September 30, 1881, was $11,257,560. About one- half of this debt bears interest at 5 per cent., and the remainder at 6 percent. Asan offset to this debt the State owns interest-paying securities amounting to $3,461,085, and non-productive property valued at 25 million dollars. The property assessed for purposes of State taxation in 1881 was valued at $461, 459,989, and the State

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tax was 18} cents on cach $100. The total receipts of the State from all sources were $1,996,641. 'The debt of Baltimore city, on January 1, 1882, was $36,381,351. The city owns productive pro-

erty worth $15,304,596, and unproductive property valued at 5,150,780. The property assessed for city taxation was valued at $247,230, 189, and the city tax was $1°37 on each $100. The debts of the cities and counties, exclusive of Baltimore, amount to nearly two million dollars.

Social Statistics.—In 1881 the average number of convicts in the State penitentiary was 545, nearly one-half of whom were sentenced for larceny. The convicts are employed upon profitable labour, and the institution is not only self-supporting, but is a source.of revenue to the State. The State house of correction received in 1881 414

risoners, most of whom were sentenced for short terms. Provision 1s made for juvenile offenders in houses of reformation and similar establishments. The number of inmates in the almshouses in 1879 was 2384. The M'Donogh Industrial School has an endow- ment of $861,968, and educates and supports about fifty poor boys: annually, The State extends its aid to a hospital for the insane (with 400 inmates), an asylum for the blind, two deaf and dumb asylums, and other charitable institutions. In 1880 there were one hundred and thirty-eight periodicals published in the State. The principal religious denominations are the Methodist, Roman Catholic, Episcopalian, Presbyterian, and Baptist.

Education and Libraries.—Maryland has an excellent system of free public schools supported by State, county, and municipal taxation. In 1881 the number of schools was 2039, the number of pupils 158,909, the number of teachers 3180, and the total expenses $1,604,580. The schools are managed by school com- missioners who, in the counties, are appointed by the judges of the circuit courts, and in Baltimore city are elected by the city council. There is also a State board of education, invested with comprehensive visitorial powers. A number of higher educational institutions are maintained in part by the State. The principal of these are the normal school at Baltimore, St John's College at Annapolis (founded in 1783), the Western Maryland, Maryland Agricultural, Baltimore Female, Washington, and Frederick colleges, In 1881 these colleges had 728 students and 56 instructors, and received from the State $40,300. In Baltimore are two medical colleges—the college of physicians and surgeons, with 10 professors and 380 students, and the medical school of the university of

Maryland, with 10 instructors and 200 students. There are also two dental colleges in the State. The law school of the univer- sity of Maryland has 4 instructors and 60 students. The Johns Hopkins University, at Baltimore, which has an endowment of more than 8 million dollars, was opened in 1876. It has 34 pro- fessors and associates, 20 fellows, 155 students, and 12,000 volumes in its library. The buildings of the Johns Hopkins Hospital, which has a similar endowment of more than 3 million dollars, are now (1882) being erected. The Peabody Institute, which has $1,300,000 in productive funds, the gift of George Peabody, was founded in 1857. It embraces a lecture department, a con- servatory of music, a gallery of fine arts, and a library. The library, containing 75,459 volumes in 1882, is designed to be a collection of such books as are not ordinarily accessible to scholars. The Pratt Public Library, endowed with one million dollars, was founded in 1882. ;

Administration.—The chief executive officer of the State is the governor, who is elected for the term of four years, and receives & salary of $4500 per annum. He is invested with power to grant pardons and reprieves except in cases of impeachment, and a three- fifths vote of the legislature is necessary to overcome his veto of an Act. The legislature, called the General Assembly, meets biennially, and its sessions are limited by the constitution to nippy days. It is composed of a senate, elected for four years Cn being chosen every second year), and a house of delegates, ae for two years. The present number of senators is 26, and a delegates 91. he judicial power of the State is vested in a court of appeals, consisting of 8 judges, in a circuit court and an a a court for each county, in six courts of record for Baltimore cl ‘ ’ and in justices of the peace. The judges are elected by the a for fifteen years, and retire upon attaining the age of seven y years. The justices of the peace are appointed by the governor, with the consent of the senate. The law officers are an at

eneral for the State, and a State’s attorney for each a 4 is the prosecuting officer in all criminal cases. The local oe of the counties are managed by county cominissioners, electe – two years, and those of each city by a mayor and a a a 4 Allelections are by ballot, and cvery male citizen of t Me tite States who has been a resident of the State for one year anc © Fhe district in which he offers to vote for six months re. election is entitled to be

registered as a voter. The ie is stitution was adopted in 1867. Maryland is represente Othe national congress by two senators and six representaty's, a, arms of the State are those prescribed by Lord Pale is a province in 1648, viz.:—quarterly—1st and 4th, paly ; 5 ent and sable, a bend counterchanged ; 2d and 3d, quarterly, 8

and gules, a cross botonny, counterchanged ; erest (which is placed upon a helmet, showing five bars, over a count palatine's coronet), on a ducal coronet proper two pennons, dexter or, the other sable, staves gules; motto, Fatt? maschii parole femine ; supporters, @ ploughman and fisherman, propcr. On the great seal a mantle doubled with ermine surrounds the arms and supporters, as above, and upon a border encircling the seal is engraven the legend, scuto bonxz voluntatis tus coronastt nos. .

History.—The charter of Maryland, which constituted the first proprietary government established in America, was obtained from Charles I. by Sir George Calvert, the first Lord Baltimore, who had been one of the principal secretaries of state to James I. Lord Baltimore died before the patent passed the seals, and it was issued to his son the second Lord Baltimore on June 20, 1632. The naine Maryland (Zerra Mariz) was bestowed upon the colony by Charles I. in honour of his queen Henrietta. Maria. In 1633 Lord Baltimore despatched a number of emigrants, under the command of his brother Leonard Calvert, to colonize the territory. They settled at St Mary's on the 27th March 1634, and the first legislative assembly, which was composed of all the freemen of the province, met in February 1635. Before the grant of the charter a trading station had been established, by William Clayborne of Virginia, upon Kent Island, in Chesapeake Bay, and the early years of the colony were greatly disturbed by contests with him, in which, however, Lord Baltimore was finally successful. The Baltimores were Catholics, and Maryland was designed to be a place of refuge for English Catholics, but, from the earliest period, religious toleration for all Christians was proclaimed and practised. Maryland has always claimed the honour of having been the first govern- ment in which liberty in matters of faith was established by law. Under the charter by which Maryland was made a province of the empire Baltimore was the owner of the soil, and

enjoyed all the rights that had ever been exercised by a count palatine. The laws of the provincial assemblies which received his assent were not subject to the revision of the crown. In 1652 the parliamentary commissioners deposed Lord Baltimore's officers, and appointed a Puritan council to govern the province. After several years of contest between the proprietary and Puritan parties, the power of the former was finally re-established. At the time of the Revolution of 1688 the failure of Lord Baltimore's deputies to proclaim William and Mary gave an oppor- tunity to the disaffected Protestants in the province to incite arevolt, which resulted in the overthrow of their feudal lord. The king and queen approved of this colonial Pro- testant revolution, and Maryland was taken directly under the government of the crown. The Church of England was then established, and disabilities imposed upon Catholics and dissenters. Maryland remained a royal colony until 1714, when, upon the death of the third Lord Baltimore, his son, who was a Protestant, was recognized as the pro- prietary. The province was governed by the Baltimores until the revolution of 1776. The original charter limits included all the present State of Delaware and a large part of Pennsylvania. The grant to William Penn con- flicted with that of Maryland, and a controversy between the two colonies began in 1682, and was not concluded until 1760, when the Penns, armed with a decision of the pay council and a decree in chancery, were successful.

Mason and Dixon's line"'—famous in American politics— was established between the provinces in 1763-67. During the war for independence Maryland furnished her full quota of troops, but refused to ratify the articles of confederation until those colonies which had claims to western lands surrendered them to the general Government. Washington Tesigned his commission as commander-in-chief to the colonial congress at Annapolis in December 1783. Mary- land ratified the constitution of the United States on the

28th April 1788, and in 1790 ceded to the United States 60 square miles of territory, where the national capital is situated. At the outbreak of the civil war Maryland was a slave-holding State, and popular sentiment was divided between the North and the South, but the decisive measures adopted

by the Federal Government made it impossible for the State to leave the Union. The history of the State has been written by M‘Mahon (1831), Bozman (1837), M‘Sherry (1849), and Scharf (1879). The Maryland Historical Society at Baltimore has a large collection of colonial and revolutionary MSS8., newspapers, and historical works, and has published numerous essays upon questions of local history. (w. T. B.)

MARYPORT, a market and seaport town of Cumber- land, England, is situated on the Irish Sea, 29 miles south- west from Carlisle. It is irregularly built, partly on a cliff and partly on the sea-shore. The streets are spacious, but there are no public buildings of importance. The town until 1750 consisted of a few huts called Ellenfoot, when a harbour was constructed by Humphrey Senvhouse, which gave a great impulse to its prosperity. The principal exports are coal to Ireland and pig-iron to the Continent, the principal imports timber and general merchandise. Shipbuilding is carried on to a small extent. In 1881 the number of vessels that entered from foreign and colonial ports was 72, of 35,241 tons burden; the number that cleared 120, of 60,840 tons burden. The coasting trade is much more important, the number of vessels that entered being 1805, of 215,332 tons burden, and the number that cleared 1753, of 187,290 tons, There are rope and sail- cloth works, iron foundries, and saw-mills, also brewing and tanning. The population of the urban sanitary district in 1871 was 7443, and in 1881 it was 8177. There was a Roman camp in the neighbourhood of Maryport, and the district is rich in Roman antiquities.

MASACCIO (1402-1429). Tommaso Guidi, son of a notary, Ser Giovanni di Simone Guidi, of the family of the Scheggia, who had property in Castel S. Giovanni di Val d’Arno, was born in 1402, and acquired the nickname of Masaccio, which may be translated “ Lubberly Tom,” in consequence of his slovenly dressing and deportment. He loved to be alone and at home, neglected “ appearances ” of all sorts, and was constantly wool-gathering when not intently occupied with his work ; he had no vices, however, and would always do a good turn to an acquaintance. From childhood he showed a great inclination for the arts of design, and he is said to have studied under his contem- porary Masolino da Panicale. In 1421, or perhaps 1423, he was enrolled in the guild of the speziali (druggists) in Florence, in 1424 in the guild of painters. His first attempts in painting

were made in Florence, and then in Pisa. Next he went to Rome, still no doubt very young ; although the statement that he returned from Rome to Florence, in 1420, when only eighteen or nineteen, seems incredible, considering what were the works which he undertook in the papal city. These included a series of ° frescos still extant in a chapel of the church of S. Clemente, a Crucifixion, and scenes from the life of St Catherine and of St Clement, or perhaps some other saint. Though much inferior to his later productions, these paint- ings are, for naturalism and propriety of representation, in advance of their time. Some critics, however, consider that the design only, if even that, was furnished by Masaccio, and the execution left to an inferior hand ; this appears highly improbable, as Masaccio, at his early age, can scarcely have held the position of a master laying out work for subordinates ; indeed Vasari says that Lubberly Tom was held in small esteem at all times of his brief life. In the crucifixion subject the group of the Maries is remarkable ; the picture most generally admired is that of

Catherine, in the presence of Maxentius, arguing against and converting eight learned doctors. After returning to Florence, Masaccio was chiefly occupied in painting in the church of the Carmine, and especially in that " Bran- cacci chapel" which he has rendered famous almost beyond rivalry in the annals of painting.

The chapel had been built carly in the 15th century by Felice Michele di Piuvichese Brancacci, a noble Florentine. Masaccio's work in it began probably in 1423, and continued at intervals until he finally quitted Florence in 1428. There is a whole library- shelf of discussion as to what particular things were done by Masaccio and what by Masolino, and long afterwards by Filippino Lippi, in the Brancacci chapel, and also as to certain other paint- ings by Masaccio in the Carmine. He began with a trial piece, a majestic figure of St Paul, not in the chapel; this has perished. A monochrome of the Procession for the Consecration of the Chapel, regarded as a wonderful example, for that early period, of per- spective and of grouping, has also disappeared, though there is some suspicion that it might yet, with due pains and research, be recovered ; it contained portraits

of Brunelleschi, Donatello, and many others. In the cloister of the Carmine was discovered in recent years a portion of a fresco by Masaccio representing a pro- cession ; but this, being in colours and not in monochrome, does not appear to be the Brancacci procession. As regards the works in the Brancacci chapel itself, the prevalent opinion now is that Masolino, who used to be credited with a considerable portion of them, did either nothing, or at the utmost the solitary compartment which represents St Peter restoring Tabitha to life, and the same saint healing a cripple. The share which Filippino Lippi bore in the work admits of little doubt; to him are due various items on which the fame of Masaccio used principally to bo based—as for instance the figure of St Paul addressing Peter in prison, which Raphael partly appropriated ; and hence it may be observed that an eloquent and often-quoted outpouring of Sir Joshua Reynolds in praise of Masaccio ought in great part to be transferred to Filippino. What Masaccio really painted in the chapel appears with tolerable certainty to be as follows, and is ample enough to sustain the high reputation he has always enjoyed : —(1) The Temptation of Adam and Eve ; (2) Peter and the Tribute- Moncy ; (3) The Expulsion from Eden; (4) Peter Preaching ; (5) Peter Baptizing ; (6) Peter Alnsgiving ; (7) Peterand J ohn Curing the Sick; (8) Peter Restoring to Life the Son of King Theophilus of Antioch was begun by Masaccio, including the separate incident of Peter Enthroned, but a large proportion is by Filippino ; (9) the double subject already allotted to Masolino may perhaps be by Masaccio, and in that case it must have been one of the first in order of execution. A few words may be given to these pictures individually. (1) The Temptation shows a degree of appreciation of nude form, corresponding to the feeling of the antique, such as was at that date unexampled in painting. (2) The Tribute-Money, a full, harmonious, and expressive composition, contains a head re- puted to be the portrait of Masaccio himsclf,—one of the apostles, with full locks, a solid resolute countenance, and a pointed beard. (3) The Expulsion was so much admired by Raphael that, with comparatively slight modifications, he adopted it as his own in one of the subjects of the Logge of the Vatican. (5) Peter Baptizing contains some nude figures of strong naturalistic design ; that of the young man, prepared for the baptismal ceremony, who stands half- shivering in the raw air, has always been a popular favourite, and an object of artistic study. (8) The restoration of the young man to life has been

open to much discussion as to what precise subject was in view, but the most probable opinion is that the legend of King Theophilus was intended.

In 1427 Masaccio was living in Florence with his mother, then for the second time a widow, and with his younger brother Giovanni, a painter of no distinction ; he possessed nothing but debts. In 1428 he was working, as we have seen, in the Brancacci chapel. Before the end of that year he disappeared from Florence, going, as it would appear, to Rome, to evade the importunities of creditors. Immediately afterwards, in 1429, when his age was twenty-seven, he was reported dead. Poisoning by jealous rivals in art was rumoured, but of this nothing is known. The statement that several years afterwards, in 1443, he was buried in the Florentine church of the Carmine, without any monument, seems to be improbable, and to depend upon a confused account of the dates, which have now, after long causing much bewilderment, been satisfactorily cleared up from extant documents.

It has been said that Masaccio introduced into painting the plastic boldness of Donatello, and carried out the linear

perspective of Paolo Uccello and Brunelleschi (who had given him practical instruction), and he was also the first painter who made some considerable advance in atmo. spheric perspective. tectural framework of his pictures correspond in a reason- able way to the proportions of the figures.

He was the first to make the archi-

In the Brancacci chapel he painted with extraordinary swiftness,

The contours of the feet and articulations in his pictures are imperfect; and his most prominent device for giving roundness to the figures (a point in which he made a great advance upon his predecessors) was a somewhat mannered way of putting the high lights upon the edges. His draperies were broad and easy, and his landscape details natural, and superior to his age.

in representing the objects of nature correctly, with action, liveliness, and relief. recognized at its right value, and led to notable advances ; and all the greatest artists of Italy, through studying the Brancacci chapel, became his champions and disciples,

In fact, he led the way

Soon after his death, his work was

Of the works attributed to Masaccio in public or private galleries

hardly any are authentic. The one in the Florentine Academy, the Virgin and Child in the Lap of St Anna, is an exception, The so-

called portrait of Masaccio in the Uffizi Gallery is more probably

Filippino Lippi ; and Filippino, or Botticelli, may be the real author

of the head, termed a Masaccio, in the London National Gallery. MASANTELLO (an abbreviation of Tommaso ANIELLO or ANELLO) was the leader of the Neapolitan revolt in For many years the Spanish Government, in straits for money, had exacted large sums from the Two Sicilies, although the privileges granted by Ferdinand and Charles V. had exempted them both from taxes on the necessaries of life and from all external payments whatever. Now, however, under Philip IIL. and Philip IV., the exac- tions, heavy in themselves, were made more oppressive by being farmed out to contractors, while the sums raised were usually conveyed to Spain and spent on purposes often hav- ing no connexion with Naples. Meantime the industrial classes were scourged by the excesses of the nobility and the lawlessness of banditti. At length, at the end of 1646, the duke of Arcos demanded a million ducats in gold ; and it was resolved after much opposition to raise it from fruit, one of the most important articles of food to a southern people. Petitions delayed but did not remove the tax; on June 6 a toll-house was actually blown up, but the viceroy did not give way. The discontent was fomented by Genovino, who had been chosen " elect of the people" (that is, of the district of the city where the common people had the right of! voting) in 1619 by the duke of Osuna's influence, and had been employed by him as an agitator. After the duke's recall he had been long in

prison, and then returned to Naples and became a priest. He selected for his purpose Masaniello, a fisherman of Naples, then twenty-seven years old, well built, intelligent, and very popular in the city. He was so poor, we are told, that he was usually obliged to content himself with selling paper to wrap up the fish that others sold. He had special cause too for hatred to the taxes: his wife had tried to smuggle a bag of flour into the city as an infant ; she = been imprisoned, and his scanty possessions had_ barely sufficed to pay her fine. The temporary success of a rising at Palermo had stirred the people to a sense of their power, and very little was wanted to produce an_ explosion. On July 16, the feast of S. Maria del Carmine, 1t was customary +o make a sort of castle which was defended by one body of youths armed with sticks and stormed by another. Masaniello had been chosen captain of one of these oa and got together four hundred young men, with deol 4 had already raised the cry of " Down with the taxes -. the crisis was precipitated by a quarrel. On Spee : 7th a dispute arose in the market (on which Masaniello

house looked) whether the gardeners or the buyers of their

MASANTELLO

fruit should pay the tax. Finally the owner of the fruit said to have been a kinsman of Masaniello) upset his pasket, saying he would sooner let the people have it for nothing than pay the tax. Masaniello came up; the tax collectors were pelted with fruit and then with stones, and the toll-house was burnt with cries of —“ The king of Spain and plenty ; down with misgovernment and taxes.” The viceroy attempted without effect to quiet the people by romises; his carriage was surrounded, and he escaped with difficulty toSt Elmo. Meanwhile the populace broke open the prisons, and released all charged with offences against the customs. In the evening, by advice of Genovino, a meeting elected officers, and decided on their demands. Masaniello was chosen captain, with one Perrone, who had been in the service of Maddaloni, and at another time a captain of banditti, as his lieutenant. Next day the people went in search of arms; many houses of persons who had made themselves obnoxious to the people, and especially of tax farmers, were sacked, and their contents burnt; but most of the historians of the time state that there were few attempts to appropriate anything, and those few were immediately punished. The duke of Maddaloni, a man of lawless life, but a decided opponent of the viceroy, was selected as a likely intermediary with the people. The latter demanded the original charter granted by Charles V., which was said to have wrongfully come into the viceroy’s own hands, the removal of all taxes imposed since Charles V.’s death, and that the elect of the people should have as many votes as the representatives of the nobles. All was granted ; but the viceroy made entrenchments to guard the approaches to the castle. Next day the sacking of tax farmers’ houses went on. ‘The viceroy attempted to cheat the people by sending documents simply drawn up by himself; and then their rage burst out. Maddaloni was seized and given into custody, but escaped in the night by Perrone’s connivance. The people were summoned to arms. The cardinal archbishop Filomarino, who did his best to mediate between the parties all through, came to them from the viceroy, and it was arranged that he should bring them the document. The seizure of arms went on, and Masaniello marching out of the city disarmed and took prisoners four hundred soldiers, while another body of people did the same with six hundred German mercenaries. On Wednesday Perrone made his appearance at the head of three hundred bandits partly mounted, and fired upon Masaniello, but without injuring him. The people rushed upon them,

and they were killed almost without exception. Some confessed to having been instigated by Maddaloni, and a price was set upon his head. His brother Giuseppe Caraffa was found in a monastery and killed, and his head and foot were set upon pikes. A new elect of the people was chosen, Arpaia, who had been a partisan of Genovino's in the duke of Osuna's time, and had been condemned to the galleys. On Thursday Maddaloni's house was plundered and his property placed in a heap in the market under guard. The castle being short of provisions, Masaniello sent some as a present to the viceroy. The Neapolitan galleys, under Gianettino Doria, arrived the same day, and Masaniello refused permission to land or to come nearer than a mile to the shore, but sent provisions on board. In fact he was now undisputed master of the city, not only organizing the military force in it with surprising ability, but dispensing strict though severe justice. Often he sat inside his little house on the market, sword or loaded gun in hand, while petitions and complaints Were handed to him on the end of a pike through the window ; yet he still went barefoot, dressed as a simple fisherman. The people having assembled consulted together on the terms of agreement; it was settled hy the advice of Genovino that Masaniello should show

the articles agreed on to the duke at the palace (he would not risk himself in'the castle), and that the viceroy should afterwards swear to them in the cathedral. 'Towards evening the procession set out, Masaniello in a dress of cloth of silver pressed upon him by the archbishop. An immense concourse of armed men, estimated at one hundred and forty thousand, lined the way or accompanied him. Before them went a trumpet proclaiming Veva il ré di Spagna ed ul fedelissimo popolo di Napolt. Before enter- ing the palace he exhibited the charter brought by the archbishop, and charged them not to lay down their arms till they had received the confirmation of their rights from the king of Spain. "If Ido not return in an hour," he added, " wreck the city." He was received by the viceroy as an equal. All the conditions were agreed to, the chief being—that the elect of the people should have as many votes as the nobles; that all taxes should be removed except those already existing in Charles V.'s time ; that the viceroy should get the articles ratified by the king within three months; that no punishment should be inflicted on those who had taken part in the rising; and that the people should keep

their arms till the ratification. On the Friday Masaniello dismissed most of his followers to their work, keeping a patrol of four men and a corporal in each street. Next day the ceremony in the cathedral took place; the duke of Canjano read the articles, Masaniello meanwhile correcting and explaining, and the viceroy solemnly swore to observe them: Then Masaniello tore off his rich dress; it was time, he said, to return to his fish, And indeed from this time began his ruin. For a week the care of a city, with hundreds of thousands of inhabitants, had rested upon him; he had been general, judge, legislator, and during the whole time he had hardly slept or eaten, the latter through dread of poison; no wonder if the fisherman's brain reeled under all this. His justice had been severe, but hitherto it had struck men who deserved punishment, the oppressor, the robber, the hired cut-throat ; henceforth every one who ventured to contradict him risked his life, and the only man who could persuade him to mercy was the good archbishop. Five hundred in all, it is said, were put to death by his order ; though it is probable that they were few compared to the lives taken a short time afterwards by the viceroy in defiance of his plighted word. Next day in fact the duke set to work ; Genovino was made president of the chamber in order to detach him from Masaniello, for which he was the more ready as Masaniello was no longer the tool he wanted. Genovino had already prevented the demand for the surrender of St Elmo, which could easily have been enforced, as the fort was not provisioned. . Carlo and Salvatore Cataneo with two others offcred to the viceroy to murder Masaniello, and he welcomed their services. On Sunday Masaniello gave orders for laying down arms and submitting to the viceroy, which were obeyed in some quarters of the city before they could be recalled. He tried in vain to get the viceroy to accompany him to Posilippo, where he drank deeply, and in reckless extra- vagance threw gold into the water to be dived for. Next day his violence continued ; he struck his followers in the street, and condemned several of his officers to death for not immediately executing his orders. He cut out the head from a picture of Maddaloni and set it on a pike. Vitale his secretary, sent on a message to the viceroy, talked of his intention to raise a million ducats for the king by means of forced gifts from the rich; Vitale was detained in the castle on some pretext, and on leaving next morning was killed by the people of the quarter, who had returned to their allegiance. On Tuesday the 16th, the feast of §. Maria del Carmine,

Masaniello went up into the pulpit, and in a wild harangue recapitulated his services. He knew, he

said, his death was near at hand ; then tearing open his dress lhe showed his body emaciated by fatigue and want of food. After some nore wild talk he was disarmed and confined in a cell in the monastery. There the quiet seems to have restored him ; but his assassins soon broke in; he turned to meet them; five shots were at once fired, and he fell dead. His head was cut off and carried through the streets, while his body was dragged about for a while and then buried outside the city. Next day some boys went and dug up the body, washed it, and took the head from the guard in charge of it. The Neapolitans forgot the excesses of the last few days, and only remembered the leader who had won them their great victory. People plucked out his hairs and preserved them as relics, some even prayed to him asa saint. All the priests of the city officiated at the funeral, and even the viceroy was repre- sented by eight of his pages. (G. H. B.)

MASAYA, a town in Nicaragua, Central America, on the east side of the Lake of Masaya, about 55 miles south- east of Managua, and 25 miles north-west of Granada. The population, mostly of Indian blood, is estimated at 15,000 or 18,000 ; but, as nearly every house has its orchard or garden, the buildings are spread over a much larger area than this would suggest. Previous to 1871, when a steam- pump was erected, all the water required had to be carried from the lake, which lies 340 feet below the level of the town. 'The volcano of Masaya on the opposite side of the lake was active at the time of the conquest of Nicaragua in 1522, and the conquerors, thinking the lava they saw was gold, had themselves lowered into the crater at the risk of their lives; it had a great eruption in 1670, and began to smoke again in 1860.

MASCARA, a fortified town of Algeria in the province of Oran, 60 miles south-east of Oran, lies at a height of 1900 feet above the sea, on the southern slope of the first chain of the Atlas mountains, and occupies two small hills separated by the Oued Toudman, 'The walls, upwards of 2 miles in circuit, and strengthened by bastions and towers, give the place a somewhat imposing appearance ; the French part of the town is substantial

and clean; and among the public buildings are three mosques (one used as a church, another as a granary), a large hospital, a small theatre, and the usual establishments attaching to the seat of a sub-prefect and the centre of a military subdivision. A public garden of 10 acres has been laid out in the ravine. The population was 9442 in 1866, and 9240 in 1872.

Mascara (7.¢., place of soldiers) was the capital of a beylik during the Spanish occupation of Oran from the 16th to the close of the 18th century ; but for the most of that period it occupied a site about 2 miles distant from the present position. On the removal of the bey to Oran its importancerapidly declined ; and it was quite an insignificant place when in 1832 Abd-el-Kadir, who had been born in the neighbourhood, chose it as the seat of his power. It was laid in ruins by the French under Marshal Clausel and the duke of Orleans in 1835, and, being again occupied by Abd-el-Kadir in 1838, was again captured in 1841 by Bugeaud and Lamoriciére.

MASCARENE ISLANDS, or Mascarenuas, a group in the Indian Ocean to the east of Madagascar, consisting of Mauritius (fle de France), Réunion (Bourbon), and Rodriguez, Mauritius and Rodriguez belong to Great Britain, Réunion to France. The collective title is derived from the Portuguese navigator Garcia Mascarenhas, by whom Bourbon, at first called Mascarenhas, was discovered in 1505.

MASCARON, Jutzs, was born at Marseilles in 1684, and died at his diocesan city of Agenin 1703. His father was an advocate, and he was himself intended for the law, but he preferred the church. Asa member of the Oratorian congregation he preached in different provincial towns, beginning with Saumur, and in all produced a great effect. Then he went to Paris and quickly established his reputa- tion at a time when the court, dissolute enough in manners,

had already begun to exercise its connoisseurship in matters of sacred eloquence. Several complimentary Speeches of Louis XIV. to Mascaron are handed down by tradition,

He was not, however, in the ordinary sense a courtier: or if so he was a very bold and adroit one. In Lent 1669 he

preached before the king against adultery in the strongest terms. Hither from respect for him or to get rid of him

Louis made him bishop of Tulle, but he still continued

occasionally to preach and to deliver oraisons funebres

before the court. His reputation for these was so high

that the king not unfrequently indicated subjects to him

himself. His crowning success in this way was his funeral

sermon on Turenne in 1675. He was afterwards translated

to Agen, where he died, as has been said; but his appoint

ment was not a banishment, and he was summoned more

than once to preach before the court, notably in his sixtieth

year, when Louis is said to have remarked to him, " Votre

eloquence n'a pas vieilli." Mascaron, though the contem-

porary of Bossuet, belongs to an older school of oratory.

His style is unequal, and his taste not always sure, but

occasionally he has much vigour. Besides the Turenne

address his funeral sermon on the chancellor Séguier ranks

as hischief performance. These, with other similar pieces,

were collected and edited by Father Borde, a member of the

author's own congregation, in 1740.

MASCHERONI, Lorenzo (1750-1800), an Italian geometer, was professor of mathematics at the university of Pavia, and published a variety of mathematical works, the best-known of which is his Geometria del Compasso (Pavia, 1797), a body of constructive geometry in which the use of the circle alone is postulated. Many of the solutions are most ingenious, and some of the constructions of considerable practical importance.

The English reader will find a copious extract from Mascheroni's work in Leslie's Geometry, 8d ed., p. 204. There is a French translation by Carette (Paris, 1798), who also wrote a biography of Mascheroni.

MASINISSA, a Numidian prince whose history is closely intertwined with that of the wars between Rome and Carthage. With true barbarian fickleness, and a keen eye to his own interests, he espoused now one side now the other, inclining however on the whole decidedly in favour of Rome, so much so indeed as to be spoken of by Roman orators and historians as 'a most faithful ally of the Roman people." He was the son of a Numidian king or chief, Gala, whose dominions coincided with the eastern portions of Numidia, and thus bordered on Carthaginian territory, or what is now Tunis. He was educated, like many of the Numidian chiefs, at Carthage, learnt Latin and Greek, it is said, and was in short an accomplished as well as a naturally clever man. Although his kingdom was nominally independent of Carthage, it really stood to it in a relation of vassalage ; it was directly under Carthaginian influences, and was imbued to a very considerable extent with Carthaginian civilization. It was to this that Masinissa owed his fame and success; he was a barbarian at heart, but he had a varnish of culture, and to this he added the craft and cunning in which Carthaginian statesmen were supposed to excel. While yet a young man, he drove his neighbour Syphax, prince of western Numidia, out of the country now eS as Algiers, and forced him to fly to the Moors in the extreme west of Africa. Soon afterwards he appears 1 Spain, fighting for Carthage with a large force of N be cavalry against the Romans under the two Sciplos. : 4 defeat of the Carthaginian army in 206 B.c., which me time at least gave the Romans complete mastery of t 4 south of Spain, led him to

desert his old allies and to cas in his lot with the fortunes of Rome. The | ie Scipio Africanus is said to have cultivated his friendship

MAS—MAS

and done all he could to secure his services for his country. Masinissa now quitted Spain for a while for Africa, and was again engaged in a war with Syphax, in which he was so decidedly worsted that he found himself at last merely the head of a small band of marauders, and was obliged to confine his movements to the coast. Scipio's arrival in Africa in 204 gave him another chance, and no sooner had he joined the Roman general than he quite crushed his old enemy, Syphax, and captured Cirta (Constantineh), the capital of Syphax. Tere occurs the romantic story of Sophonisba, daughter of the Carthaginian Hasdrubal, who had been promised in marriage to Masinissa, but who had subsequently become the wife of Syphax. Masinissa, it is said, wedded her immediately after his victory, but was required by Scipio to dismiss her as a Carthaginian, and consequently an enemy to Rome. 'To save her from such humiliation he sent her poison, with which she destroyed herself. Masinissa was now accepted as a thoroughly loyal ally of Rome, and was confirmed by Scipio in the possession of his hereditary kingdom. In the decisive battle of Zama, 902 .c., which witnessed Hannibal's downfall, he com- manded the cavalry on Scipio's right wing, and materially assisted the Roman victory. For his services on that great day he had given him, under a treaty with Rome, the kingdom of Syphax with its capital Cirta, and thus under Roman protection he became master of the whole of Numidia, and his dominions completely enclosed the Carthaginian territories, now straitened and reduced at the close of the Second Punic War.

Masinissa was still far from satisfied, and it would seem that he almost had thoughts of annexing Carthage itself with the connivance of Rome. He spared no opportunity to harass and annoy the city by pressing unfair claims to some of its best and oldest possessions, and threatening perpetual encroachments. In a war which soon followed he was successful; the remonstrances of Carthage with Rome on the behaviour of their ally were answered by deputing Scipio to arbitrate in the quarrel, but, as though intentionally on the part of Rome, no definite settlement was arrived at, and

thus the relations between Masinissa and the Carthaginians were still unfriendly. Rome, it is certain, deliberately favoured her ally's unjust claims with the view of keeping Carthage weak. Masinissa too was cunning enough to retain the friendship and good opinion of the Roman people by helping them with liberal supplies in their wars in the East, with Perseus of Macedon and with Antiochus. As soon as Carthage seemed to be recovering herself, and some of Masinissa's partisans were driven from the city into exile, his policy was to alarm the fears of Rome, till at last, in 149, war was declared, the Third Punic War, which ended in the final and utter overthrow of Carthage. The king bore some part in the negotiations which preceded the war, and died soon after its commencement in 148 3.c., after a life of ninety and a reign of sixty years.

Masinissa was an able ruler and a decided benefactor to Numidia, the resources of which he developed, while he converted a pcople which had been little better than a plundering tribe into a settled and civilized population, and out of robbers and marauders made efficient and disciplined soldiers. To his sons he bequeathed a well- stored treasury, a formidable army, and even a fleet. Cirta, his el became a famous centre of Pheenician civilization. In fact

asinissa changed for the better the whole aspect of a great part of northern Africa. He had much of the Arab nature, was singularly temperate, and equal to any amount of fatigue. His fidelity to Rome Was not the fidelity of principle, but mercly that of temporary ex- pediency ; it is in the really good work he did for his country

that the noblest side of his character comes into display.

aan Masinissa, Livy and Sallust's Jugurtha must be specially consulted by Oars. English readers may be referred toa very full article in Smith's

Dictionary of Classical. Biography ; "3 Wi d Nieiatins Lecteree l Biography; also to Mommsen's IZistory of Rome an

MASK, or Masque. See Drama, vol. vii. p. 431 s¢.

MASKELYNE, Nevin (1732-1811), astronomer-royal at Greenwich for nearly half a century, was born in London October 6, 1732. 'The great solar eclipse of 1748 seems to have made a deep impression upon him ; and after studying divinity at Trinity College, Cambridge, of which he was elected a fellow in 1756, he determined to devote himself wholly to astronomy. He early became intimate with Bradley, and in 1761 was deputed by the Royal Society to make observations of the transit of Venus at St Helena. During the voyage he introduced into navigation the determination of longitude by lunar distances, a2 method which Mayer's recently published tables had made practically possible. In 1763 he undertook a voyage to Barbados to test Harrison's watches, which, however, lhe reported to be inferior to the method of lunars for determining longitude. In 1765 he succeeded Bliss as astronomer-royal, and thereafter devoted himself with singular energy to the duties of his office, which he held till his death, February 9, 1811.

Maskelyne's first contribution to astronomical literature was 'A Proposal for Discovering the Annual Parallax of Sirius," published in 1760 in the Philosophical Transactions, in which also most of his later original memoirs appeared—e.g., his observations of the transit of Venus (1761 and 1769), observations on the tides at St Helena (1762), astronomical observations at St Helena (1764) and at Barbados (1764). In 1763 le published a small octavo, The British Marincr's Guide, which contains the valuable suggestion that, in order to facilitate the finding of longitude at sea, lunar dis- tances should be calculated beforehand for each year and published in a form accessible to navigators. This suggestion, the germ of the Nautical Almanac, was approved of by the Government, and under the care of Maskelyne the Nautical Almanac for 1767 was pub- lished in 1766. During the remainder of his life Maskelync continued to superintend the publication of this invaluable annual, the Nautical Almanac for 1815 being the last which he prepared. Another valuable service which he rendered astronomy was his in- ducing the Government to print his observations annually. Flam- stced's and Bradley's observations had been private property, and were published as such. The result of Maskelyne's action was the aecumulation and rapid dissemination of a long series of obser- vations which from their continuity and aecuracy have been of inestimable value to astronomers, and form along with the Nautical Almanac his most lasting

monument. The whole work of the ob- servatory was carried on by him and his one assistant in a most methodical manner, Greenwich being in point of organization sceond to none ainongst the observatories of the day. He introduced several improvements in the use of the instruments, being, for example, the first astronomer who measured to tenths of a seeond; aud he prevailed upon the Government to replace Bird's mural quad- rant, which had become untrustworthy, by a repeating circle of 6 feet in diametcr. The new instrument was constructed by Trough- ton ; but Maskelyne did not live to see it completed. In 1772 he suggested to the Royal Society the famous Schehallion experiment for the determination of the earth's density. Forty years previously Bougucr had demonstrated by experiment that Chimborazo in South America affected the dircetion of the plumb-line quite appreciably; but his observations were not made with sufficient care to deduce therefrom any trustworthy result. Maskelyne's experi- ments were made in 1774 (see Philosophical Transactions for 1775), the apparent difference of latitude between two stations on opposite sides of the mountain being compared with the real difference of latitude obtained by triangulatien. From Maskelync's observations Hutton deduced by laborious caleulations that the density of the earth was 4°5 times that of pure water. Playfair subseqnently estimated with greater accuracy the mass of Schehallion, and obtained 4°7 for the earth's mean density. Maskelyne also took a great interest in various geodcsical operations, notably the measure- ment of the length of a degree of latitude in Maryland and Pennsy1- vania (Philosophical Transactions, 1769), which was carried out by Mason and Dixon in 1766-68, and later the determination of the relative longitude of Greenwich and Paris (Philosophical Transac- tions, 1787). Cassini, Legendre, and Méchain conducted the trian- gulation onthe French side; on the English side the work was carried on under the superintendence of General Roy. This triangulation was the beginning of the great trigonometrical survey which has since been extended all over the country. A volume of Sclectzons (London, 1812) contains several papers that were published by Maskclyne as additions to the Nautical Almanac. His observations fill three large folio volumes, and many of them were reprinted in Vince's Astronomy.

MASKINONGE. See PIKr. XV. — 77

MASOLINO DA PANICALE (1383-c. 1440). The life and art-work of this Florentine painter were related by Vasari in a form which is partly demonstrated and partly inferred to be highly incorrect. We shall follow the account supplied, and in many respects carefully vouched, by Messrs Crowe and Cavalcaselle.

Masolino (a name which corresponds to "Tommy ") was said to have been born at Panicale di Valdelsa, near Florence. Itis more probable, however, that he was born in Florence itself, his father, Cristoforo Fini, who was an "imbiancatore" or whitewasher, having been domiciled in the Florentine quarter of 8. Croce. There is reason to believe that Tommaso, nicknamed Masolino, was a pupil of the painter Starnina, and was principally influenced in style by Antonio Veneziano; he may probably enough have become in the sequel the master of Masaccio. His birth took place in 1383; his death later than 1429, perhaps as late as 1440, The only works which can with certainty be assigned to him are a series of wall paintings executed towards 1428, commissioned by Cardinal Branda Castiglione, in the church of Castiglione d'Olona, not far from Milan, and another series in the adjoining baptistery. The first set is signed as painted by ' Masolinus de Florentia." It was recovered in 1843 from a coating of whitewash, and is not a little damaged ; its subject-matter is taken from the lives of the Virgin and of Sts Lawrence and Stephen. 'The series in the baptistery relates to the hfe and death of John the Baptist. The reputation of Masolino had hitherto rested almost entirely upon the considerable share which he was supposed to have had in the celebrated frescos of the Brancacci chapel, in the church of the Carmine in Florence ; he was regarded as tlie precursor of Masaccio, and by many years the predecessor of Filippino Lippi, in the execution of a large proportion of these works. Now, however, from a comparison of the Castiglione with the Brancacci frescos, and from other data, it is greatly doubted whether Masolino had any hand at all in the latter series. Possibly he painted in the Brancacci chapel certain specified subjects which are now either destroyed or worked over. Of other and still existing subjects, hitherto assigned to Masolino on the authority of Vasari and later writers, the authorship is now more reasonably ascribed to Masaccio,—except only that one compartment, that which represents in one half Peter reviving

Tabitha (or curing Petronilla), and in the other half Peter and John healing a cripple, remains in suspense between Masaccio and Masolino. In the Castiglione frescos there is some tenderness of expression, and the nude figures are studied with an amount of care superior to their epoch; generally the parts are well made out, but without unity of composition, or mastery of perspective, or of contrast and chiaroscuro. The merit of these works is not to be compared with that of the Brancacci frescos, unless in the single instance above excepted.

The now ascertained facts of Masolino's life are that towards 1423 he entered the service of Filippo Scolari, the Florentine-born obergespan of Temeswar in Hungary, that lhe stayed in consequence some time in that country, and that, returning towards 1427 to Italy, he painted the works in Castiglione. Thus he resettled in Lombardy, not in Florence; nor is there anything to show that he returned to his Tuscan home at a later date.

MASON, Francrs (1799-1874),an American missionary, son of a Shoemaker in York, England, was born April 2, 1799. After emigrating to the United States in 1818, he practised there the trade he had learned from his father ; but, having studied languages with his minister at Canton, Massachusetts, he in 1827 entered the Newton theological institution. In 1830 he was sent by the American Missionary Union to labour among the Karens in Burmah,

| Burlington Club shortly after his death.

where he translated the Bible into two dialects of their language, and also conducted a training college for native preachers and teachers. In 1852 he published a book of great value on the fauna and flora of British Burmah, of which an improved edition appeared in 1860 under ithe title Burmah, its People and Natural Products. He was also the author of a grammar and vocabulary of the Pali language, besides various translations from it and other Indian dialects. He died at Rangoon, March 3, 1874, See his autobiography, Zhe Story of a Working Man's Life with Sketches of Travel, 1870. MASON, Grorce Hemmine (1818-1872), ARA, was born at Whitley, in 1818, the eldest son of a Stafford. shire county gentleman. Intended for

the medical profes. sion, he studied for five years under Dr Watt of Birming. ham; but he had no taste for science; all his thoughts were given to art. In 1844 he abandoned medicine and travelled for a time on the Continent, visiting France, Germany, aud Switzerland, and finally settling in Rome. His pencil was busy with the picturesque scenery that surrounded him, and with hardly any instruction, except that received from nature and from the Italian pictures that met his eye, he gradually acquired the painter's skill, At least two important works are referable to this period,— Ploughing in the Campagna, shown in the Royal Academy of 1857, and In the Salt Marshes, Campagna, exhibited in the following year. After Mason's return from the Conti- nent, in 1858, when he settled at Wetley Abbey, he con- tinued to paint Italian subjects from studies made during his foreign tour, and then his art began to touch, in a wonderfully tender and poetic way, the peasant life of his native England, and especially of his native Staffordshire, and the homely landscape in the midst of which that life was set. The first picture of this class was Wind on the Wolds, and it was followed—along with much else—by the painter's three greatest works—the Evening Hymn, 1868, a band of Staffordshire mill-girls, seen, their figures dark against the sunset, returning from their work, singing as they walk; Girls Dancing by the Sea, 1869; and the Harvest Moon, 1872. Mason had long suffered from heart disease, which carried him off on the 22d of October 1872. In his work he laboured under the double disadvantage of feeble and uncertain health, and a want of thorough art- training, and consequeutly his pictures were never pro- duced easily, or without strenuous and long-continued effort. His art is great in virtue of the solemn pathos which pervades it, of the dignity and beauty which it reveals in rustic life, of its keen perception of noble form and graceful motion and of rich effects of colour and sub- dued light. In motif and treatment it has most I com mon with the art of Millet and Jules Breton, and of Frederick Walker among Englishmen, An interesting collection of Mason's pictures was brought together by the

MASON, Wrtrram (1725-1797), was about the begin- ning of the last quarter of the 18th century one of the most eminent of living poets, bnt his eminence was owing to the lowness of the poetic level at the time. He Is now

| held in remembrance, not by his poetry, but by his having been the friend, the literary executor, and the biographer of Gray. Born in 1725, the son of a Yorkshire ; entered of St John's College, Cambridge, in 1742, he too | his bachelor's degree in 1745, and seems to have or | decided steadily on a literary career, reading litt ; ¢ | nothing, Gray says, but writing abundance. Pope, a in 1744, and the aspiring young poet lamented en "Museus" in a careful imitation of Miltons Lye " showing an ear for the music of verse and a aoe skill in weaving words together, but not a spark of ar the force. By his Musaus (1747) Mason attracte

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MAS—MAS

notice of Gray, and through his influence was elected a fellow of Pembroke College. Mason was Gray's attached friend, admirer, and poetical pupil to the end of the greater poet's life. More fancy than judgment, and indolence in reading, were the chief faults that Gray found in his young fiend. With his usual penetration, Gray discerned the defects of intellect that lie at the root of the weakness of Mason's poetry. He was painstaking enough and more than enough with his verses, his epithets, his phrases, his figures of speech, his rhymes; but he was deficient in energy of thought, his intellectual grasp was feeble, and he accepted and polished the easy suggestions of fancy instead of exerting himself to find exact expression for his subject. For a modest youth, as Gray describes him, he formed a great ambition, nothing less than the recon- ciliation of the modern with the ancient drama, to be effected by the strict observance of the unities and the restoration of the chorus. His Hlfrida,a tragedy published in 1752 in pursuance of this ambition, is constructed elaborately upon deeply considered principles, but the principles are drawn from pedantic books and not from the dramatic needs of men, as may be judged from the dramatist's opinion that Shakespeare, "in compliance merely with the taste of the time, showed a disregard of all the necessary rules of the drama." frida is highly "incorrect" in two respects—one venial in a play, the other fatal; it abounds in anachronistic allusions and moral improbabilities. Mason's second attempt, Caractacus (published in 1759), is much stronger in construction and situation, but he did not possess the rare art of making his

characters speak out of their own thoughts; they only speak as Mason the poet might have done in their circum- stances if his fancy had beeu quite cool. Both Llfrida and Caractacus were acted in 1776, when Mason had made aconsiderable reputation by his Lnglish Garden (a poem in blank verse, first book published in 1772), his Herozc Episile to Sir W. Chambers in 1773, and his Memozrs of Gray in 1775. The plays were not successful ; Mason did not expect success ; his plays were intended to be read as poems. The manager perhaps had hopes from the novelty of the choruses of Saxon maidens and Druids. The second book of the Znglish Garden was issued in 1777, the third in 1779, the fourth in 1782. Mason took orders in 1754, and soon afterwards was presented to the vicarage of Ashton in Yorkshire, the canonry of York, the prebend of Driffield, and the precentorship of York cathedral. Ashton was his residence till his death in 1797.

MASON AND DIXON'S LINE, a line in the United States between Pennsylvania on the north and Delaware, Maryland, and West Virginia on the south, coinciding with 39° 43' 26-3 N. lat., and famous for a long time as the limit between the "free" and the "slave" States. It derives its name from Charles Mason, F.R.S. (1730-87), and Jeremiah Dixon, two English astronomers who, between 1763 and 1767, surveyed the line for 244 miles west from the Delaware river, leaving only 36 miles of the Pennsylvania boundary to be fixed in 1782-84. This line must not be confounded, as has often been done, with the parallel of 36° 30' N. lat., which was assigned by the "Missouri compromise" of 1820 as the limit to the north of which slavery could not be introduced.

MASS. See Evcnarist and MIssat.

MASSA, or, to distinguish it from several places of the same name, Massa Carrara, a city of Italy, the chief town of tle province of Massa, lies on the left bank of the Frigido, a small stream falling into the Gulf of Genoa about 3 miles lower down. It is 7 84 miles south-east of Genoa by rail, and 26 miles north of Pisa. The ancient part of the city stands on a hill. Among the objects of interest it is sufficient to mention the old ducal palace,

the new cathedral (erected instead of the building de- stroyed by Elisa Bacciocchi because it interfered with the view from the palace windows), the technical school, and the academy of science and literature, originally known as Dei Derelitti. Like Carrara, Massa is largely engaged in the marble trade; it also manufactures silk, oil, and paper. 'The population of the city was 4786 in 1871; that of the commune was 15,017 in 1861 and 18,031 in 1881.

Massa is first mentioned in the 9th century. About the close of the 10th it was bestowed by Otho the Great on the bishops of Luni, and in consequence it came to be distinguished for a time as Massa Lunense. From the bishops it passed to the marquises of Luni (hence Massa del Marchese), and more particularly to a branch of the Malaspina family. After a period in which Lucca, Pisa, the Visconti, the Fieschi, and others were successively in possession it returned, under Florentine protection, to Alberico Malaspina, and finally through the marriage of Ricciarda Mala- spina with Lorenzo Cybo became (1519) Massa Cyber. Raised under Alberico Cybo from being little better than a feudal village to the rank of a fortified town, Massa was in 1568 made the capital of a principality by Maximilian II., and in 1664 the capital of a duchy by Leopold I. By the marriage of Maria Teresa dei Cybci with Duke Ercole III. of Modena it passed to the Este family ; and after the period of the French Revolution, during which it formed part of the duchy of Lucca assigned to Napoleon's sister and brother-in-law, it was restored by the congress of Vienna to Beatrice, duchess of Modena. Massa was made an episcopal sce only in 1828, though the design of giving it this dignity had been entertained and almost realized in 1757. The total area of the duchy of Massa and Carrara was 62 square miles, of which 35 be- longed to Massa.

See Repetti, Diz. della Toscana ; Viani, Memorie della famiglia Cybo ; Muscllini, Ricciarda Malaspina e Lorenzo Cybo ; and Farsetti, Ragton. storico int. della citta

di Massa. MASSACHUSETTS

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ASSACHUSETTS, an Indian name originally applied

to a small hillock bordering on Boston Harbour,

and thence to a neighbouring tribe of Indians. It is the

chief political division of New England, and one of the

original thirteen States of the American Union. It lies

for the most part between 40° and 42° 45’ N. lat., and 70° 30’ and 73° 30’ W. long.

Physical Description.—Its area, of about 7800 square miles, forms in the main a parallelogram, of 160 miles east and west, 50 miles north and south, —with a projection at the south-east and a lesser one at the north-east, which gives a breadth of 90 miles at this part, where it borders upon the ocean, while the general irregularity of this coast-line gives a sea frontage of about 250 miles. No large navig- able river flows in any part, though the Connecticut river, bisecting the State during 50 miles of its course, and fed within it by several lateral streams, has been made navig- able for small craft. The Housatonic, a lesser stream, flows parallel with the Connecticut, farther west. The two valleys are separated by the Hoosac range (1200 to 1600 feet high) of the Berkshire Hills, a part of the Appalachian system, and a continuation of the Green Mountains of Vermont. These, with the Taconic range on the western side of the Housatonic valley, of which the highest peak is Greylock, or Saddleback (almost 3500 feet), in the extreme north-west corner of the State, form the only considerable elevated land. Bordering on the Connecticut, Mount Tom (1200 feet) and a few other hills form conspicuous landmarks. Wachusett (2018 feet), farther east, rises from a level country. The Blue Hills in Milton are the nearest elevation to the coast, and are conspicuous to navigators approaching Boston.

The Merrimac runs for 35 miles through the north-east corner of the State, and affords valuable water-power at Lowell, Lawrence, and Haverhill. A few small streams, useful for mill purposes and irrigation, seek the ocean through Boston, Buzzard’s, and Narragansett Bays, run- ning for the most part through a rolling country. The

Plate IX.

south-east parts of the State are level,—-with a slightly elevated ridge (Manomet) south of Plymouth,—sandy in soil, with tracts of forest, largely white pine, and well watered by ponds. Between Plymouth and Buzzard's Bay there is the most considerable region of untamed soil in the State, where deer are occasionally seen.

South of Cohasset the shore is sandy, with a few isolated rocky ledges and boulders. About Boston, and to the north of it, the shore is rocky and picturesque. Massa- chusetts Bay is a name now applied to the gulf of which the outer limits are Cape Cod and Cape Ann; but in early days it was applied to the enclosed lesser bay on its western side, now called Boston Harbour, the finest road- stead on the coast. The extreme hook of the Cape Cod peninsula forms Provincetown Harbour, which is an excellent and capacious port of refuge for vessels approach- ing Boston. Salem Harbour is the most considerable other haven on the bay; while on Buzzard's Bay New Bedford has a good harbour.

The principal islands lie off the southern coast. The largest is Martha's Vineyard, 21 miles long, with an average breadth of 5 or 6. It has in Holmes's Hole a spacious harbour, much frequented by wind-bound vessels seeking a passage round Cape Cod. The island is interesting as the scene of Mayhew's missionary efforts among the Indians, and it still harbours a remnant of a tribe. It has a popu- lation (4300 in 1880) formerly dependent wholly upon the sea; and of late years it has become a summer resort of much popularity. Farther east, Nantucket, an island of triangular shape, 15 miles long aud 11 wide at its eastern end, is likewise the home of a seafaring folk (popu- lation in 1880, 3727), who still retain in some degree primitive labits, though summer visitors are more and more affecting its life. Nantucket Shoals, south-east of the island, is a large sandbank dangerous to navigation.

Flora and Fauna.—tThe original native trees and plants did not vary from what is common to New England and northern New York. The presence of a dense population has driven some out, and brought in others, including some noxious weeds. The larger wild animals have disappeared except an occasional deer; but smal] game still runs, and even within the municipal

limits of Boston wild foxes are occasionally killed. No very large birds frequent the State, though a stray eagle is sometimes seen. Reptiles of a harmless kind are found, and three kinds of venomous snakes,—the latter even near Boston, particu- larly in the Blue Hills of Milton, Fish are abundant on the coast, and the cod is sometimes used as an emblem of the State, a figure of one hanging in the Representatives' Chamber at the State House. The artificial propagation and preservation of salmon and other edible pond and river fish have been of late carried on successfully under the supervision of a State commission.

Geology.—Professor N. S. Shaler of Harvard University says: "Geologically as well as topographically, the State is divided into four districts, which extend farther than the State limits. In the south-eastern part the whole of Cape Cod and Plymouth county is made up of rearranged glacial drift. Westward, from the shore region to the Connecticut, the rocks are of the Laurentian, Cambrian, and Carboniferous ages. The Connecticut river flows through a basin of Triassic rocks, abounding in reptilian footprints. West of this basin, to the New York line, the surface is occupied by an extensive series of highly metamorphosed rocks, the age of which is doubtful; but the series is certainly as old as the Silurian. The whole surface of the State was greatly affected by the last glacial period, as much so as Scotland or Sweden,

"The economic resources are limited. An area of aboui 290 square miles in the south-eastern part of the State

MASBHBA CH OSG as

shows Carboniferous rocks, containing several coals. The deep drift coating, the profoundly dislocated character of the beds, and the graphitic nature of the coals have made mining unsuccessful. Mines of silver-bearing lead have at times been worked in the north-eastern shore districts, and in the Counecticut valley, but without profit. Emery is now successfully worked in the western district. 'There are also deposits of hematite iron ores all along the border of New York, which are.considerably worked. There are numerous quarries of sienite in the eastern parts of the State, some of red sandstone in the Connecticut valley, and of white marble in the western regions."

Climate.—The climate is a trying one, showing great extremes (20° Fahr. below and 100° above), with about 42 inches of rainfall. The mean average temperature of Boston is 48° Fahr. In the interior it is a trifle lower. Changes are often sudden, and the passage from winter to summer is by a rapid spring. The ocean tempers the climate considerably on the seaboard. Boston harbour has been frozen over in the past, but steam-tugs plying constantly prevent now the occurrence of such obstruction.

Agriculture.—The soil, except in some of the valleys, can hardly be called naturally fertile ; and sandy barrens are common in the south-eastern parts. High cultivation, how- ever, has produced valuable market-gardens about Boston and the larger towns ; and industry has made the tilling of the earth sustaining in most other parts ; while the average sterility of the soil has doubtless had a strong influence in developing a sturdy yeomanry in the rural regions,

In 1875 671,131 tons of hay were cut. On the seaboard some extensive salt marshes yield a hay which is much prized. The corn crop diminished one half from 1855 to 1875. The State produced in 1880 1,797,593 bushels of Indian corn, 15,768 of wheat, 645,159 of oats, 80,128 of barley, 213,716 of rye, 67,117 of buckwheat. In 1879 the average cash value per acre of principal farm- crops was $26°71, which amount is exceeded only in Rhode Island. In the Connecticut valley tobacco is grown, 3358 acres being given to it in 1880, producing 5,369,436 hh, which gives the State the thirteenth rank in the Union. In forty years the sheep have fallen from 384,614 to 65,123 in 1880; and in the same year there were 139,861 horses and 174,859 cows. In 1880 there were 38,406 farms, of which 35,266 were owned by occupants. Most of them were between 20 and 500 acres each, nearly 12,000 having over 100 acres.

The Population and its Condition.—The State is divided into twelve congressional districts, cach entitled to one representative in the Federal Congress, and representing from 151,000 to 181,000 inhabitants. It is divided also into 346 towns, and these are grouped into 14 countics, with au aggregate in 1880 of 1,788,085 inhabitants, of whom the native-born are 1,339,594, and the foreign-born 443,491. This population was divided into 379,710 families, living in 281,188 dwellings, with nearly 222 persons ” the

square mile, and less than an average of 3 acres to e person. Nearly every fifth person is a voter. The total vote in the

residential campaign of 1880 was 282,512. The number ot eA bern within Massachusetts, and living in 1880 out of the State, bu within the limits of the United States, was 1,356,295. The popu- lation at past censuses has been—

WOOK. cect 378,787 | JsO…1 cen 13h pCO MMAR aR cco. 422,845 1850,....:...c00mme . oe THON, .ccsedeccs ee 472,040 | 1860…....0e eam 1,281,066 1820….. s.sescoseesneeD23,100 | DO7O5 is eee Le 18380 .csciicoueeen 610,408 | 18808… :...amenume 1,788,

There were, in 1880, 81 cities and towns of over 10,000 inhabit-

ants. F 44 Births and Deaths.—It is calculated that to every 1000 a ants the births are more than 23, the marriages about 8, as 1880 184, the excess of births over deaths being nearly Py 36 992 44,217 were born, and 15,538 couples were married, W ee raking persons died, at an average age of thirty-two yee were persons over twenty ycars of age, the deaths im 87¢2 Y meee 187,264, with an average age of 51°42, During sixteen y

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average age at death of all conditions was 30°18 years. In twenty years the birth-rate to 1000 persons was 26°2, the death-rate

A board of health, lunacy, and charity supervises the publie hygiene, and the institutions for the msane and paupers. By their reports of 1880 it appears that the prominent causes of death are for the ages from birth to five—diarrhea, diphtheria, neumonia, scarlet fever, and obseure diseases of tho brain and intestines; from five to ten—infectious diseases and obscure diseases of childhood; from ten to fifteen—diphtheria, consumption, and typhoid fever; from fiftcen to. twenty—consuniption and hoid fever; from thirty upward—pneumonia and heart disease, with eaneer from forty to sixty. Paralysis and used gain after forty, and after seventy the greatest portion die of old age. The twelve principal eauses of fatality in all ages are placed in this order:—consumption, pneumonia, diphtheria, heart disease,

old age, cholera infantum, paralysis, caneer, scarlet fever, cephalitis, pronchitis, and apoplexy ; and by these disorders 60 per cent. of all deaths occur. Intermittent fever was known in.the earlier his- tory of the State, but in this century, before 1877, was praetically unknown, except in the form of an occasional epidemic ; but since that date it has made rapid progress in the western parts.

Paupers.—Other tables of the same board show that in J uly 1880 19,318 paupers were receiving, wholly or in part, local or State support; and the same was true of about 3000 insane persons. The average number of inmates of these charitable establishments (State, eity, and town) in 1880 was 7467 persons, At public and private insane asylums there were 4398 cases within the year.

Immigration.—The immigrants from Europe during the year ending September 30, 1880, were 33,636 in number, of whom one- third were Irish, and the males in comparison with the females were as 18 to 15. A large part of this influx merely passed through the State to the west.

Business and Finanee; Commerce and Manufactures.—Up to 1830 the commerce of the State found various outlets besides Boston; but sinee then this city has more and more absorbed the whole foreign trade. The whaling business still remained to other ports, and at one time gave occupation to a thousand ships. The introduction of petroleum gradually diminished this resource of the lesser ports.

The packing of pork and beef was formerly centred in Boston ; but, while nowa similar business tenfold as large is done, it has been greatly exceeded in the west. For many years Massachusetts con- trolled a vast lumber trade, drawing upon the forests of Maine, but the growth of the west has changed the old channels of trade, and Boston carpenters now make large use of western lumber. The American trade with China and India was begun in Salem, and was next controlled in Boston, till this also was lost some years ago to New York. In commercial relations the ehief port of Massachusetts attained its highest influence about forty years ago, when it was selected as the American terminus of the first steamship line (Cunard) connecting England with the United States, but Boston lost the commereial prestige, then won, by the failure of the State to develop railway communieation with

the west, so as to equal tho development effected by other cities. It was between 1840 and 1850 that the eotton manufactures of Massachusetts began to assume large proportions ; and about the same time the manufacture of boots and shoes centred here, and has ever since maintained its pro- minence, much more than one-half of all boots and shoes manufae- tured in the country being tho produet of this State. Again, ice and granite beeame important articles of export; and Quincy granite, from 1849, was sent to various southern ports, having an importanee as a building-stone whieh it has hardly lost now, with the later multiplication of varieties of such stones. Medford ships began to be famed shortly after the beginning of the century, and by 1845 that town employed one quarter of all the shipwrights in the State. From 1840 to 1860 Massachusetts-built ships competed successfully for the earrying trade of the world. Before 1840 500 tons made a large ship, but after the discovery of gold in California the size of ships inereased rapidly, and the lines of their models were more and more adapted to speed. The limit of size was reached in an immenso elipper of 4555 tons, and the greatest speed attained in a passage from San Francisco to Boston in seventy- five days, and from San Franciseo to Cork in ninety-three days. The development of steam navigation for the earrying of large cargoes has driven this fleet from the sea. Hardly 18 per cent. of the exports and imports through Massachusetts is now carried in American bottoms. The grain elevators, which pour corn in bulk into ships at Boston to-day for European markets, are the result of the first attempt at Sel transportation, made in 1843, when -atizens of Pee ticetis sent corn to starving Ireland.

Coast wise steam lines, supported by Massachusetts eapital, had Tun to Philadelphia and Baltimore for some years before the eivil war broke up other less successful ones, which had eonneeted ports farther south. When the war and steam navigation put an end to the supremacy of Massachusetts wooden ships, much of the eapital Which had been employed in navigation was turned into developing

railroad facilities, and coastwise steam lines. Aneffort to establish a European steam line failed. In 1872 the great fire in Boston, de- stroying

$72,000,000 worth of property, made large drains upon tho capital of the State, and several years of depression in business followed, to be sueeeeded by an era of business prosperity still eon- tinuing. The imports of Boston— practically of Massachusetts— for 1880 were $68,649,664; the cxports, $69,178,764. In 1880 322 steamships sailed from Boston for Europcan ports. In 1880 180 steam craft were owned in Massachusetts, with a capacity of 48,917 tons. Massachusetts had in 1880 a fleet of 376 sail of cod- fishing vessels, manned by 4185 men, —three quarters of all belong- ing to one port, Glouecster. In mackerel eatehing 239 vessels are employed. In 1882 20,117 persons were actively engaged in the fisheries, and it was estimatcd that 100,000 people depended on them for support. The eapital invested is $14,334,450, and the product is worth $8,141,750. The total tonnage of the State in 1881 was 430,182, which gave the State rank after New York and Maine. In 1880, of 39,921 business houses, 329 failed, with liabilities at $3,336,954.

A general Act of 1870, with supplements of later ycars, allows of the imeorporation of eompanies under it, and in 1880 such eor- porations, so organized, had $30,150,255 eapital,—and this was in some part money disengaged of late years from navigation and its attendant branches of trade.

While the capital of the State may not have developed even yet, as it might, all that is possible for a system of railway eommuni- cation with the west, it has fostered, and made possible, large facilities in the States of the Mississippi valley and beyond, which may in time so enlarge the terminal facilities of the State's ehicf port as to make it a more important outlet for export of the produce of the west, and give it a distinction justly its due from its geo- graphical position.

In the working of ores the State is not prominent. Five furnaees in 1880 yielded 19,000 tons of pig iron. In wool, the Boston mar- ket is the largest in the country. The State has far more spindles (4,465,290) in cotton manufacture than any other Statc, and not mueh short of half the number in the whole United States (10,921,147). She employs in this business 62,794 hands, or about one-third of the entire foree so employed in the United States.

Massachusetts is the only State in the east, manufacturing textile fabrics, where ten hours is the operative's day; and it is reported b the State bureau of statisties that, equal grades being considered, as much is produecd under her system, per man, loom, or spindle, as in States where eleven hours or more is the rule, and that the Massachusetts operative earns as much or more perday. Canadian Freneh now constitute a eonsiderable proportion of the factory hands. In eertain departments of labour Chinese are beginning to find employment.

Formerly farmers' daughters of native stock were much employed in factories. Operatives of foreign birth or parentage have taken in great part their plaees; and those of native stock have sought other oecupations,—largely in the manufacturing of small wares in the cities, and particularly in departments of trade where skilled labour is essential. Household service is seldom now done, as it formerly was, by women of native stoek,—persons of Irish, Swedish, and Seottish origin, with many from Nova Scotia and New Brunswick, taking their places.

Railways.—The report of the Railroad Commissioners for 1880 shows twenty-nine street railways; capital, $6,144,000; asscts, $10,173,079'84 ; total income, $3,711,378°18; expenses, $3,003, 024'87 ; length of roads, 240 miles ; miles run, 12,516,363; passengers carried, 68,631,842. ; f

Of steam railways there were 3044 miles of single track, of whieh 1893 were main lines; and 27,057 Massachusetts stoekholders held $78,806,559°95 capital stock of the total of $118,738,871°58 ; and 21,615 persons were employed. The total income of these roads was $35,140,374°77; and the dividends declared were $5,987,718°64. Total passengers earried, 45,151,152; freight earried, 17,221,567 tons. Thcre were to passengers in 1880 nine fatal and fifteen other accidents; and one hundred and fifty-seven other persons were injured on the roads.

The Hoosac Tunes that of Mont Cenis the longest in the world, 52 miles in length—pierees the Hoosac mountain in the north-west corner of the State, and opens a second direct railway eommunication with western lines, that of the Boston and Albany having been long without a rival. It cost $9,000,000, the State lending its credit, and was built between 1855 and 1874.

Savings Banks, &c.—In 1880 tho number of open accounts was 706,395 ; amount of deposits, $218,047,922°37 (only exceeded in New York); amount of earnings, $11,894,710°60; ordinary dividends, $7,957,887 °09 ; annual expenses, $581,274 °35 ; number of outstanding loans (none exceeding $3000) 32,320, aggregating $34,203,951°81. The number of banks in 1880 was 164, against 22 in 1834, The number of eo-operative saving fund and loan associations was 16, with $372,462°31 assets.

National Banks.—The report of the comptroller of the currency

for 1880 says: " The thirteen States having the largest capital [in national banks] are Massaeliusetts, New York, Pennsylvania, &e. . . . in the order named." In 1879 the capital of national banks in Massachusetts was $94,748,172, that of New York being $85,706,942. In 1881 there were 242 such banks, with $95,605,000 capital, and $525,827 dividends, and in 1880 they issued $3,693,885 in cireulating bills, Pennsylvania with $2,036,890 coming next.

A report to the commissioner of internal revenue, for the six months ending May 31, 1880, shows Massachusetts to have 218 banking and trust companies, private bankers, and savings banks (not organized under the national law), with an aggregate capital of $5,638,099 ; average deposits to the amount of $208,822, 039. These banks also held investments in United States bonds, amounting to $22,909,377.

Public Debt, &c.—The public debt of the State, January 1, 1881, was $32,799,464 ; the sinking funds, $13,050,192:20; the trust funds $2,890,650°92. The total taxable value was $1,927,855, 430°09. The taxes produeed $4,950,000. The rate of State taxation is much smaller than that of any other State. The State reeeipts were on aecount of revenue $7,881,198; on account of funds, $5,616,418, or $13,497,616 in all.

The Boston stoek exchange stands next to New York in the extent of the securities in which it deals.

Citizens of Massachusetts (16,855 in number) hold 45,138,750 of the United States bonds, and the proportion of holders (23°04 per cent.) to the population of the State is in exeess of that of all other States ; New York, whieh is next, shows 20°24 per cent.

In 1881 the State contributed $2,699,681 as internal revenue to the Federal treasury, being a twelfth rank among the States and Territories.

Social Statistics.—Intellectual Life. —No statement of the influ- ence which Massachusctts has exerted upon the American people, through intelleetual aetivity and even through vagary, is complete without an enumeration of the names whieh, to Americans at least, are the signs of this infinence and activity. In scienee, John Winthrop, the most eminent of colonial scientists; Benjamin Thompson (Count Rumford); Nathaniel Bowditch, the translator of Laplace ; Benjamin Peirce; and Morse the electrician ; not to inelude an adopted citizen in Louis Agassiz. In history, Winthrop and Bradford laid the foundations of her story in the very begin- ning; but the best example of the colonial period is Thomas Hutchinson, and in our day, Bancroft, Sparks, Palfrey, Preseott, Motley, and Parkman. In poctry, the pioneer of the modern spirit in Ameriean verse was Riehard Henry Dana; and later came Bryant, Longfellow, Whittier, Lowell, and Holmes. In philosophy, and the seienee of living, Jonathan Edwards, Franklin, Channing, Emerson, and Theodore Parker. In oratory, James Otis, Fisher Ames, Josiah Quincy, jun., Webster, Choate, Everett, Sumner, Winthrop, and Wendell Phillips. In fietion, Hawthorne and Mrs Stowe, not to embraee the living and younger names of Howells aud Aldrich. In law, Story, Parsons, and Shaw. In polite seholarship, Ticknor and Hillard. In art, Copley, Gilbert Stuart, Washington Allston, William M. Hunt, Horatio Greenough, W. W. Story, and Thomas Ball. What in America was called the ‘ transeendental movement ”—which sprang out of German affilia- tions, and swept in its train many scholarly persons, and resulted in the well-known community of Brook Farm, under the leadership of the late Dr George Ripley—was a growth of Massachusetts, and in passing away it left, instead of traces of an organization, a sentiment and an aspiration for what was called a higher thinking, whieh gave Emerson his friendly sympathizers. It might go without saying that a community which fostered such persons and feelings was not

at all times free from riotousand unbalanced ideas, whieh could inaugurate too many departures from the common course of wisdom.

Education.—Of the 307,321 children between five and fifteen in Massachusetts, 281,757 attend the public sehools, in addition to 25,020 over fifteen, and 1833 under five ; while 27,370 of all ages attend charitable, reformatory, and private schools. The public schools are 5570 in number ; the academies and private sehools, 423. The cost of maintaining the public schools is $5,156,731 per annum. This expenditure is exceeded only in the States of New York, Illinois, Pennsylvania, and Ohio. It is a little more in Iowa.

argely in excess,—7462 women and 1133 men; and of the eom- bined number (8595) 2228 had attended normal schools. The male teaehers on an average receive $67‘54 per month; the women, $30°59. The system includes common, high, and normal seliools, with one normal art sehool, and various evening, industrial, and truant sehools. No diserimination is made as to race, colour, or religious views. The average attendanee is 89 per eent. of the membership. Two-fifths of one per cent. of the native population are illiterate. The State normal schools, where the teachers are

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trained, are five in number, besides the art sehool. upon them was 841 in 1880. Some of the eities and towns maintain their own training schools. Meetings of teachers are held once a month or oftener in various parts of the State, for comparison of views and experienee.

The high schools are 215 in number, with 18,758 pupils and 494 teachers ; and other secondary instruction is given in the business colleges, private academic sehools, and the more distinctive prepara- tory schools, which send their graduates to the colleges. Of these last the most important is Harvard College, the chief department of what is known as Harvard University, which ineludes in addition various professional schools, and other colleges of special studies, This university in 1882 had 1382 students, with a staff of 200 officers and instructors ; and of these students 823 belong to the academic department (Harvard College), where they are allowed wide latitude in the choiee of the studies pursued. The elasses of

undergraduates are recruited largely from the State ; but the estab- lishment of examinations for admission in distant cities, like Phila- delphia, Cincinnati, St Louis, and San Franeiseo, is inereasing the proportion who come from other parts of the country. Harvard University is mainly at Cambridge, 3 miles from Boston, but some of the departments are in the latter eity.

In the extreme west of the State is Williams College, which in 1880 had 227 students ; and in the Connectieut valley is Amherst College, with 339 students. Boston University, in its several departments, had 510 students in 1880; and Tufts College, a few miles from Boston, an- institution supported by the Universalist seet, had 63 students. Two Roman Catholie colleges are main- tained,—Boston College with 80 students, and College of the Holy Cross, at Worcester, of about the same size. Of the various insti- tutions for the instruction of women, two rank with the eolleges for men,—Smith College at Northampton, and Wellesley College, not far from Boston. The ineome of college funds ($425,958) is only exceeded in New York ($710,164).

For agricultural students there are two schools,—one supported by the State at Amherst, and the Bussey Institution, a department of Harvard University. In technologieal seienee there is special instruetion given in the Massaehusetts Institute of Technology (Boston), the Lawrenee Scientific Sehool (of Harvard University), the Free Institute of Industrial Seience (Woreester), and the School of all Sciences (Boston University). In theology, nearly three hundred students in 1880 were divided among the schools at Andover (Congregational), at Boston (in eonnexion with the uni- versity, Methodist), at Cambridge (Harvard University, non-sec- tarian, and an independent Episcopal sehool), at Somerville (Tufts College, Universalist), at Newton (Baptist), and at Waltham (New Chureh). In law there are schools in eonnexion with both Boston and Harvard universities ; and the same is true of medicine, that of the former being of homeopathic tendeney. The State is also sup- plied with special schools of various other sorts, partieularly those for deaf mutes, the blind, and the feeble-minded, in which note- worthy methods have been employed with sueeess.

In 1880 the United States patent office issued letters to an average of one inhabitant of the State in every 1333, a degree of inventive energy only exceeded in Connecticut, where the proportion 1s one in 1020.

The total receipts of the post-office in 1880 were $2,484,692, an amount only exeeeded by New York, Ohio, Pennsylvania, and Illinois, while the State stands seventh in population. ;

The Press.—The earliest printing in the British eolonies was done at Cambridge in this State, where, in 1640, the first book was printed, which is known as the " Bay Psalm-Book," being a version of the Psalms, for singing, made in the colony. — Cambridge still re- tains its pre-eminence in the University and Riverside presses. ; printing-house was not set up in Boston till 1674. In the early part of this century book printing was done at various country presses ; but at present it is all done in Boston, which, with New York and Philadelphia, is now a principal centre of the American book trade, ali.

A single number of two separate ventures to seatter public af 4 gence had appeared in Boston in 1689 and 1690; but ie 2 regular newspaper was not established till 1704, when the Newsletter became the pioneer of the American newspaper Ni a There is at present no newspaper of much influence printed a = of Boston, exeept the Springfield Republican ; and even the at newspapers are generally held to be behind those of New and Chicago in enterprise and power. ; ite

In 1880 there were 35 daily newspapers, with 33 others (en § an annual cireulation for dailies of 86,304,851 ; for weeklies, &C., of 10,204,537), and 392 periodicals of all kinds issued. sa cae

LIibraries.—The State is the most riehly provided "i teen collections of books (apart from sehool libraries) of any int : cat a In the number of volumes the publie library of Boston (40 a the 1882) probably stands at the head of all in the eountry, es fa library of Congress closely follows. Eaeh of these libraries ma. enumeration, however, with large numbers of duplieates, — d that Washington from those received under the Copyright Act, an

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*of Boston from the extensive provision of extra copies for its ten lar departments, largely counterparts of each other. It is popu ‘ * ° . accordingly probable that the library of Harvard University (nearly 300,000 volumes), which has but few duplicates, outranks all others in the country in the count of titles, as 1t is much the largest of all American academic eollections. Of the eight largest libraries in the United States, three are in Massachusetts, the Boston Atheneum, one of the best of the class of proprietary libraries, being eounted with the two already named. The State led in the founding of city and town libraries, supported by public taxes, thirty years ago, and has instituted more of them than exist in all the other States com- pined. After the one at Boston, that at Worcester is the best-known. Collections of fair proportions are attached to the lesser colleges, Amherst, Williams, and Wellesley. The special historical libraries of the American Antiquarian Society at Worcester, the Massa- chusetts Historical Society, the New England Historic Genealogical Society, and Congregational Library, at Boston, added to the depart- ments of the Harvard and Boston libraries, make Massachusetts exceedingly rich in books upon Aincrican history. No one of her libraries has the resources of the rarest of early Americana which will be found in the private collection of the late John Carter-Brown at Providence, and in the Lenox library at New York; but, with access to such private collections as that of Charles Deane at Cam- bridge, the student of American history is probably at less disad- vantage in Massachusetts than in auy other library centre in the States, though the value of the Peter Force collection in the library of Congress is not to be forgotten. In science, sections of the*

Boston public library and the Harvard library are of the most importance, though in physics and natural history the collections of the American Acadenty of Arts and Sciences (Boston) and of the Boston Society of Natural History may well supplement them. In private libraries the State may claim numbers, rather than indivi- dual richness, and is probably surpassed by New York in signal collections. The State itself, in the State House, has a collection of considerable value, confined for the most part to law, public documents, aud American history.

Crime.—A board of prison commissioners (three men and two women) report in 1880 3821 persons in eonfinement, 2070 in county prisons, and 1751 in other institutions. In 1879 there were 16,211 sentences for drunkennvss ; and during the last twenty years 60 per cent. of all sentences for erime were traceable to liquor, or 340,814, in that time, out of 578,458 sentences. Of this aggregate, 332,495 were against chastity, morality, and decency; 55,327 against property ; and 1656 (felouious) and 81,440 (not felonious) against persons. Seventy-five per cent. of criminals are between the ages of eighteen and forty-five.

Fires and Insurancce.—The fires in 1880 were 1722 in number (of which 596 were total), eausing an aggregate loss of $4,454,221, of which 71 per cent. was paid by insurance companies. The causes were in 883 cases reported unknown, and in 294 incendiary.

In life insurance, six Massachusetts eompanies have gross assets of $32,939,505 and gross liabilities of $27,546,554; while com- panies organized without the State and doing business within it have $369,996,657 assets and $328,105,152 liabilities.

_ Government, Militia, d&c.—The State, under the federal constitu- tion, sends two senators to the Congress of the United States, and the most eminent men who have thus represented the common- wealth have been John Quincy Adams, Daniel Webster, Rufus Choate, Edward Everett, and Charles Sumner. The State is also en- titled to twelve members of the National House of Representatives.

The executive department of the State Government is confided to a governor, who is aided by a lieutenant-governor, and eight others, representing so many divisions of the State, who, with the governor and lientenant-governor, constitute the executive council. They are chosen yearly. There are also a secretary of the commonwealth, a treasurer, and auditor. An attorney-general is the State's law officer. The governor, as commander-in-chief of the State militia, has a military staff.

The judges are all appointed by the governor, with the advice and consent of his council, and hold office during good behaviour. The highest court is the supreme judicial court, which has a chief justice and six associate

justices. Among the eminent jurists who have been at the head of this court are John Adams, Theophilus Parsons, aud Lemuel Shaw. A superior court, with a chief Justice and ten associate justices, was established in 1859. Each eounty has its own courts of probate and insolvency. Various larger cities aud towns have police and municipal courts ; while groups of towns have district courts.

The legislative departments are the senate, of forty members, chosen by senatorial distriets ; and a house of representatives, of two hundred and forty members, chosen by districts within the counties, These two bodies form the general court so-called, which 1s chosen yearly, and it elects its own officers. It meets in the aa House, at Boston, a strueture prominently placed on the re point of land in that city, its dome serving as an apex to

e elevation of its sky-line. It was built in 1795-97, but has been enlarged-since, Before it are statues of Daniel Webster, by Powers,

*and Horace Mann, by Miss Stebbins, and within are Chantrey's toga-draped statue of Washington (placed there in 1828), and Thomas Ball's statue of John A. Andrew,—the latter the most eminent of the recent governors, whose term of service covered the period of the eivil war (1861-65), and who acquired the sobriquet of the' *' great war governor."*

Of the incumbents of the twelve principal offices of the Federal Government, this State has furnished, since the organization under the constitution, 34,—a number exceeded by Virginia (40), Penn- sylvania (36), and New York (35).

The enrolled militia (every able-bodied male between eighteen and forty-five years of age in 1880) were 238,762 in number,—the active volunteer militia numbering 334 officers and 4436 enlisted men, organized in two brigades, besides two unattached corps of cadets, one the governor's bodyguard.

History.—It is possible that the coasts of Massachusetts were visited by the Northmen, and by the earliest uavigators who followed Cabot, but the

evidence is that of eonjecture only. Gosnold left the earlicst trace of English acquaintance on its shores, when he discovered and named Cape Cod in 1602, Pring aud Champlain later tracked them, but the map of Champlain is hardly recognizable. The first sufficient explorations for eartographical record were made by John Smith in 1614, and his map was long the basis—particularly in its nomenclature—of later maps. Per- manency of oecupation, however, dates from the voyage of the " May- flower," which brought about a hundred men, women, and children, who had mostly belonged to an English scct of Separatists, originating in Yorkshire, but who had passed a period of exile for religion's sake in Holland. In the early winter of 1620 they made the coast of Cape Cod ; they had intended to make their landfall farther south, within the jurisdiction of the Virginia Company, which had granted them a patent ; but stress of weather prevented their doing so. Finding themselves without warrant ina region beyond their patent, they drew up aud signed, before landing, a eompact of government, which is accounted the earliest written con- stitution in history, After some exploration of the eoast they made a permanent landing, December 21, 1620 (new style), at Plymouth, a harbour which had already been so named on Smith's map in 1616.

The Massachusetts Company had been formed in England in 1628 for the purpose of promotingsettlements in New England. There had been various minor expeditions, during the few years since Smith was on the eoast, before this company, in the Puritan interests, had sent over, in 1628, John Endicott, with a party, to what is now Salem. In 1630 the government of the eompany, with questionable right, transferred itself to their territory, and under the lead of Johu Winthrop laid the foundations anew of the Massachusetts eolony, when they first settled Boston in the autumn of that year. Winthrop remained the governor of the colony, with some interruptions, till his death in 1649, his first rejection eoming from a party of theologi- eal revolt which chose Henry Vane (later Sir Henry Vane) to the office. The early history was rendered unquiet at times by wars with the Indians, the ehief of which were the Pequot War in 1637, aud Philip's War in 1675-76 ; and for better combining against these enemies, Massachusetts, with Connecticut, New Haven, and New Plymouth, formed a confederacy in 1643, considered the ag of the larger union of the colonies which conducted the War of the Revolution (1775-82). The struggle with the

crown, which ended in independence, began at the foundation of the colony, with assumptions of power under the eharter,—which the colonial government was always trying to maintain, and the crown was as assiduously endeavouring to counteract. Theological variances and differences of political views led to some emigration of the early

‘ colonists to Rhode Island. To secure “more room” led others to

go to Connecticut, where they established _a bulwark against the Dutch of New York. An inroad of the Quakers disturbed their peace for several years, and led to violent laws against all such aggressive dissentients. After more than a half century of struggle, the crown finally annulled the charter of the colony in 1685, and after a brief temporary sway of Joseph Dudley, a native of the colony, as president of a provisional council, Sir Edmund Andros was sent over with a commission to unite New York and New England under his rule. His government was espoused by a small ehurch party, but was intensely unpopular with the bulk of the people ; and, before news arrived of the landing of William of Orange in England, the citizens of Boston rose in revolution (1689), deposed Andros, imprisoned him, and re-established their old eolonial form of government. Then eame a struggle, carried on in England by Increase Mather as agent of the eolony, to secure such a form of government, under a new charter, as would preserve as many as possible of their old liberties. Plymouth colony, acting

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through its agent in London, endeavoured to secure a separate existence by royal eharter, but accepted finally union with Massa- chusetts when association with New York became the alternative. The province of Maine was also united in the new provincial charter of 1691, and Sir William Phips came over with it, commissioned the first royal governor. He was a native of Maine, a rough sailor, who had got his knighthood because he had raised treasure from a Spanish wreck in the West Indies. He wasa parishioner of Mather in Boston, and, it was thought, reecived the appointinent through Mather’s influence.

Throughout the eontinuanee of the government under the pro- vincial ehartcr,.there was a constant struggle between the preroga- tive party,

headed by the royal governor, and the popular party, who cherished recolleetions of their practical independence under the colonial charter, and who were nursing the sentiments whieh finally took the form of resistance in 1775. The popular majority kept up the feeling of hostility to the royal authority in recurrent eombats in the legislative assembly over the salary to be voted to the governor. These antagonisms were from time to time forgotten in the wars with the French and Indians, and early in Phips's administration by the unfortunate austerities of the Salem witch- craft delusion. During the earl of Bellomont's administration, New York was again united with Massachusetts, under the same executive. The scenes of the recurrent wars were mostly distant from Massachusetts proper, either in Maine or on Canadian or Acadian territory, although some savage inroads of the Indians were now and then made on the exposed frontier towns, as, for instance, upon Deerfield in 1704, and upon Haverhill in 1708. Phips, who had sueceeded in an attack on Port Royal, had ignominiously failed when he led the Massachusetts fleet against Quebec in 1690. The later expedition of 1711 was no less a failure. The most note- worthy administration was that of William Shirley (1741-49 and 1753-56), who at one time was the eommanding officer of the British forces in North America. He made a brilliant success of the expedition against Louisburg in 1745, William Pepperell, a Maine officer, being inimmediate command. Shirley with Massachusetts troops also took part in the Oswego expedition of 1755; and Massa- chusetts proposed, and lent the chief assistance in, the expedition to Nova Scotia in 1755, which ended in the removal of the Acadians. Her officers and troops played an important part in the Crown Point and second Louisburg expedition (1758).

The beginning of the active opposition to the crown may be placed in the resistance, led by James Otis, to the issuing of writs to compel citizens to assist the revenue officers, followed later by the outburst of feeling at the imposition of the Stamp Act, when Massachusetts took the lead in confronting the royal power. The governors put in office at this time by the crown were not of con- ciliatory temperaments, and the measures instituted in parliament served to increase bitterness of feeling. Royal troops sent to Boston irritated the populace, who were highly excited at the time, when an outbreak, known as the Boston massacre, occurred in 1770, and a file of the garrison troops, in self-defence, shot down a few citizens among the crowd

whieh assailed them. The merchants combined to prevent the importation of goods which by law would yield the crown a revenue; and the patriots, as the anti-prerogative party called themselves, opened communication with those of the other colonies through 'committees of correspondence," a method of the utmost advantage thereafter in forcing on the revolution, by inten- sifying the resistance of the towns in the colony, and by inducing the leaguing of the other colonics. In 1773 a party of citizens, dis- guised as Indians, and instigated by popular meetings, boarded some tea-ships in the harbour of Boston, and, to prevent the landing of their taxable cargoes, threw them into the sea,—an act known in history as the " Boston tea-party." Parliament in retaliation closed the port of Boston,—a proceeding which only aroused more bitter feeling in the country towns, and enlisted the sympathy of the other colonies. The governorship was now given to General Thomas Gage, who commanded the troops which had been sent to Boston. Everything foreboded an outbreak. Most of the families of the highest social position were averse to extreme measures, and a large number were not won over and became expatriated loyalists. The popular agitators, at whose head was Samuel Adams,—with whom John Hancock, an opulent merchant, and one of the few of the richer people who deserted the crown, leagued himself, —forced on the movement, which became war in April 1775, when Gage sent an ex- asp to Concord and Lexington to destroy military stores accumu-

ated by the patriots. This detachment, commanded by Lord Percy, was assaulted, and returned with heavy loss. The country towns now poured in their militia to Cambridge, opposite Boston; troops came from neighbouring colonies, and a Massachusetts general was placed in command of the irregular force which, with superior numbers, at once shut the royal army up in Boston. An attempt of the provincials to seizea commanding hill in Charlestown brought on the battle of Bunker Hill (June 17, 1775), in which the provin- eials were driven from the ground, although they lost much less heavily than the royal troops. Washington, chosen by the con- tinental congress to command the army, arrived in Cambridge in

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July 1775, and, stretching his lines around Boston, foreed its evacuation in March 1776. The State was not again the seene of any conflict during the war. Generals Knox and Lineoln were the most distinguished officers eontributed by the State to the revolu. tionary army. Out of an assessment at one time upon the States of $5,000,000 for the expenses of the war, Massachusetts was charged with $820,000, the next highest being $800,000 for Virginia. Of the 231,791 troops sent by all the colonies into the field, reckoning by annual terms, Massachusetts sent 67,907, the next highest being 31,939 from Connectieut, Virginia only furnishine

26, 678. 4

After the outbreak of the war a provisional government was in ae till a constitution was adopted in 1780, when John Haneoek

ecame the first governor. His most eminent suceessors haye been Samuel Adams (1794-97), Elbridge Gerry (1810-12), Edward Everett (1836-40), and John A. Andrew (1861-66). Governor Bowdoin in 1786 put down an insurrection known as Shay's Rebellion. The Federal Constitution was accepted by Massachusetts by a small majority, and its rejection was at one time imininent, But Massachusetts became a strong Federal State, and suffered heavily under the Embargo Act of 1807, which was laid in the interests of the democratic party. 'The sentiment of the State was also against the war with England in 1812-14; but much of the naval success of the war was due to Massachusetts sailors, In all apportionment of troops at the time, out of 100,000 Massachusetts was to furnish 10,000,—Pennsylvania with 14,000, New York 13,500, and Virginia 12,000, now exceeding her quota,

During the interval till the outbreak 5 the civil war of 1861, Massachusctts was foremost in political change or progress. She opposed the policy which led to the Mexican War; but the State sent one regiment (1057 men) into the field, under the command of Caleb Cushing. The Liberty party, forerunner of the Freesoil and Republican parties, arose among her people, led on by sueh men as William Lloyd Garrison and Wendell Phillips) The Federal domination had been succeeded by the Whig rule in the State, and when its greatest exponent, Daniel Webster, died in 1852, the Freesoil party was gathering force, and after an interval became the Republican party, with

new affiliations, which drew off a majority of the old Whig party. This last political organization expired under the operation,—as it lost also its minority by their Joining the Democratic ranks. Charles Sumner became the most eminent exponent of the new party, and he became the State's senator in the Federal Congress. The feelings which grew up and the movements that were fostered, till they rendered the civil war inevitable, received something of the same impulse from Massa- chusetts which she had given a century before to the feelings and movements forerunning the revolution. When the war broke, it was her troops who first received hostile fire in Baltimore, and, turning their mechanical training to account, opened the obstructed railroad to Washington. In the war which was thus begun, she built, cquipped, and manned many vessels for the Federal navy, but during the early years of the conflict she was not allowed any credit for these sailors on her quota of men; and, when allowanee was finally made in 1864, she showed a record of 22,360 men who had since 1861 enlisted in the navy. In 1862, out of 300,000 men called for, Massachusetts was required to furnish 15,000. During the war all but twelve small towns furnished troops in excess of what was called for, the excess throughout the State amounting in all to over 15,000 men, while the total reeruits to the Federal army were 159,165 men, of which less than 1200 were raised by draft. The State, as such, and the towns spent $42,605,517 19 in the war ; and private contributions of citizens are reckoned in addition at about $9,000,000. This does not include the aid to families of soldiers, paid then and later by the State. ;

Since the close of the war the State has remained generally steadfast in adherence to the principles of the Republican party, and has eontinued to develop its resources. Navigation, which was formerly the distinctive feature. of its business prosperity, has, under the pressure of laws and circumstanees, given place to manufactures, and the developing of carrying facilities on the land rather than on the sea. _ (J. WE)

MASSENA, Anprt (1758-1817), duke of Rivoli, prince of Essling, and marshal of France, the greatest soldier and greatest general of all Napoleon's marshals, and the one man who with education and ambition might have been Napoleon's rival, was the son of a small wine merchant, 4 is said of Jewish origin, and was born at Nice on May ®, 1758. His parents

were very poor, and he began life as : cabin boy. He did not care much for the sea, and in nil enlisted in the Regiment Royal Italien, a regiment 0 Italians inthe pay of France. He quickly rose to be rs officer-adjutant ; but, finding his birth would prevent ‘ ever getting a commission, he left the army in 1789, retire

to his native city, and married. At the sound of war,

however, and the word republic, his desire to see service increased, and he once more left Italy, and joined the 3d battalion of the volunteers of the Var in 1792. In those days when men elected their officers, and nearly all the old commissioned officers were dead or had emigrated, pro- motion toa man with a knowledge of his drill was rapid, and by April 1793 Masséna was chef de bataillon, or colonel. His regiment was one of tliose in the army of General Anseline, which was ordered to occupy Nice, and his knowledge of the country, of the language, and of the people was so useful that in December he was already general of division. In command of the advanced guard he won the battle of Saorgio in August 1794, capturing ninety guns, and after many successes he at last, on November 23, 1795, with the right wing of the army of Italy, won the great victory of Loano, in which four thou- sand Anstrians and Sardinians were put hors de combat. In Bonaparte’s great campaigns of 1796 and 1797 Masséna was his most trusted general of division; in each battle he won fresh laurels, until the crowning victory of Rivoh, from which he afterwards took his title. It was during this campaign that Bonaparte gave him the title of enfant chéri de la victoire, which he was to justify till he met the English in 1810. Masséna’s next important service was in eommand of the army in Switzerland, which united the amy in Germany under Moreau, and that in Italy under Joubert. There he proved himself a great general; the archduke Charles and Suwaroff had each been successful in Germany and in Italy, and now turned upon Masséna in Switzerland. That general held his ground well against the archduke, and then suddenly, leaving Soult to face the Austrians, he transported his army to Ziirich, where, on September 26, 1799, he entirely defeated Suwaroff, taking two hundred guns and five thousand prisoners. His campaign and battle placed his reputation on a level with that of his

compatriot Bonaparte, and he might have made the revolution of Brumaire, but he was sincerely attached to the republic, and had no ambition beyond a desire to live well and have plenty of money to spend. Bonaparte, now first consul, sent him to Genoa to com- mand the débris of the army of Italy, and he nobly defended Genoa from February to June to the very last extremity, giving time for Bonaparte to strike his great blow at Marengo. He now went to Paris, where he sat in the Corps Législatif in 1803, and defended Moreau, but where Napoleon took his measure, and did not interfere with him. In 1804 he was made one of the first marshals of France of the new régime, and in 1805 was decorated with the Grand Eagle of the Legion of Honour. In that year Napoleon needed an able general to keep in check the arehduke Charles in Italy, while he advanced through Germany with the grand army. Masséna was chosen; he kept the archduke occupied till he got news of the sur- render of Ulm, and then on October 30th utterly defeated him in the battle of Caldiero. After the peace of Pressburg had been signed, Masséna was ordered to take possession of the kingdom of Naples, and to place Joseph Bonaparte on the throne. This task done, Napoleon summoned Masséna to Poland, where he as usual distinguished himself, and where he for the time gave up his republican principles, and was made duke of Rivoli. In the campaign of 1809 he covered himself with glory at Landshut and at Eckmiihl, and finally at the little village of Essling, which he held with sueh determination that Napoleon had some right to call his otherwise complete defeat of Aspern a victory. When the retreat to the island of Lobau was ordered, it was Masséna who covered the broken regiments, and held the téte du pont; and on the field of Wagram it was Masséna who, though too ill to ride, directed from his carriage the movements of the right wing, and re-

covered the honour of France. For his great services he was created prince of Essling, and given the princely castle of Thouars. He was then ordered to Spain to "drive the English into the sea." The campaigns of 1810 and 1811, the advance to and the retreat from Torres Vedras, are well known from Napier's history, who does full justice to Wellington's great opponent. Masséna him- self ascribed his failure to the frequent disobedience of his three subordinate generals Ney, Reynier, and Junot, and with some justice ; but he alone could have stayed so long before the lines, and could have

made the long halt at Santarem, which checked Wellington so thoroughly. The retreat was as finely conducted as the advance, and would have been even more triumphant had Ney obeyed orders. Even then he was again ready to try his fortune, and nearly defeated Wellington at Fuentes d'Ofioro, though much hampered by Bessiéres. Recalled with ignominy, his prestige gone, the old marshal felt he had a right to,com- plain of Ney and of Napoleon himself, and, it is said, opened communications with Fouché, and the remnant of the republican party. Whether this be true or not, Napoleon gave his greatest marslial no more employment in the field, but made him merely commandant of the 8th military division, with his headquarters at Marseilles. This command he still held at the restoration of the Bourbons, when Louis XVIII. confirmed him in it, and gave him letters of naturalization, as if the great leader of the French armies had not ceased to be an Italian. When Napoleon returned from Elba, Masséna, probably by the advice of Fouclié, kept Marseilles quiet to await events, the greatest service he could do the royalists, but after- wards imputed to him as a fault. After the second restoration Masséna was summoned to sit on the court martial which tried Marshal Ney, but, thongh he had been on bad terms with that general, and attributed his own disgrace to him, the old soldier would not be his comrade's judge. This refusal was used by the royalists to cruelly attack the marshal, against whom they raked up every offence they could think of, and whose victories they forgot. This annoyance shortened his life, and on the 4th April 1817 the old hero died. He was buried in Pére-la-Chaise, with only the word " Masséna" upon his tombstone.

In private life indolent, greedy, rapacious, ill-educated, morose, on the field of battle Masséna was a man of genius, prompt in resource, indefatigable, perfectly brave, and never knowing when he was beaten. Italian he always was in his indolence, but in his quickness of resource a real compatriot of Napoleon himself.

See Thiébault's Eloge Sunebre, and Koch's Mémoires de Masséna, 4 vols., 1849, a most valuable work, and most carefully compiled. See also the military histories of the cpoch, but in reading Napier's pictures of him and Soult it is well to remember that author's personal friendship with the latter.

MASSILLON, a city of the United States, in Stark county, Ohio, is situated on the Tuscarawas, a head stream of the Muskingum, communicates with Lake Erie by the Ohio canal, and forms an important junction for various lines of railway. It is well known for its coal- mines and white sandstone quarries ; and it also contains blast furnaces, rolling mills, foundries, machine-shops, grist mills, and extensive establishments for the manu-facture of agricultural implements, glass, and paper. The population, 3819 in 1860, was 6838 in 1880.

MASSILLON, Jean Baptistx, was born at Hyéres on June 24, 1663, and died at Clermont on September 28, 1742. He was thus, except Saint-Simon and Fontenelle, the longest-lived of the men of the Siécle de Louis Quatorze. It is noteworthy that, like the majority of the great pulpit orators of his own and the preceding generation, he was a southerner. His father, Francois Massillon, was a notary, and he appears to have been well educated. In 1681] he joined the congregation of the Oratory, which at that time had a high reputation. But, although he had thus chosen

an order where the rules were by no means strict, he was not anxious for easy living or secular renown. 'The credit which he received for his first efforts at preaching startled him, and he sought a much more severe discipline, one indeed which is said to have been of Trappist rigour. Accident, however, made his literary and oratorical talents known to the Cardinal de Noailles, who determined that the church should not lose so well qualified a defender. In obedience to the cardinal, Massillon left the abbey of Septfonds, rejoined the Oratory, and was introduced to the Parisian senlinary of Saint Magloire in 1696. He was soon set to work to preach in the Paris churches, and his reputation spread rapidly from city to court. He preached before Louis XIV, for the first time in Advent 1699. He made a profound impression, and it is reported that his generous elder, Bourdaloue, from whom Massillon himself had learnt much, said of him, "He must increase, but I must decrease." His fame, however, did not lead to immediate preferment. In the first place, the Oratorians were on bad terms with the Jesuits, and were considered too liberal to suit the reign of gloomy

pietism and severe orthodoxy in which Louis's dissolute life closed. In the second, Massillon was neither a flatterer, nor did he resort to the abrupt denunciation of vice which had succeeded in the case of some of his predecessors. Indeed, in the last years of the reign there was nothing (so far as the king was concerned) to denounce, unless it were an excess of orthio- doxy. Louis's famous saying that other preachers made him pleased with them, but that Massillon made him dis- pleased with himself, may have been merely a mot, but it may also have expressed an involuntary truth. However this may be, Massillon, who perhaps desired no office, received none as long as tlie old king lived. The regency was much more favourable to him, and in 1717 he was nominated to tle see of Clermont, with the additional honour of being commissioned to preach the next year's Jeti Caréme or series of short Lent sermons before the young Louis XV. Bishop in 1717, Lent preacher in 1718, Massillon received in 1719 a yet further honour, though this time a secular one, by being elected to the Academy. Various causes, however, combined to remove him from Paris. His own standard of duty was high, and he was not likely in any case to have acquiesced in the position of a non-resident bishop ; the court grew more and more dissolute ; and his advance in years must have somewhat disqualified him from preaching and travelling. He delivered but few sermons in Paris after the Petté Caréme, and preached there for the last time in 1723, when he pronounced the funeral oration of the duchess-dowager of Orleans. The twenty years of life which remained to him were spent at Clermont, where he was distinguished for all good works, especially for exacting the minimum of episcopal dues and expending the maximum on charity.

Massillon's works are made up for the most part of sermons, lec- tures, synodal addresses, and the like. They have becn repeatedly edited, and are easily accessible in two large volumes published by Didot. Asa pulpit orator, if not as a theologian, Massillon prob- ably deserves the highest rank among Frenchmen. His style is yery nearly perfect, uniting the polish of the later age of Louis XIV. with the vigour of the carlier. His thoughts are original and just, and the arrangement of his discourses lucid and orderly without being unduly scholastic. He has usually been contrasted with his predecessor Bourdaloue, the latter having the credit of vigorous denunciation, Massillon of gentle persuasiveness. But few preach- ers can have excelled him in vigour when he chose to be stern. Besides the Petit

Caréme, his sermons on the Prodigal Son, on Death, for Christmas Day, for the Fourth Sunday in Advent, may be cited as perhaps his masterpicccs. But in truth Massillon is singularly free from inequality. His great literary power, his reputation for benevolence, and his known tolcration and dislike of doctrinal disputcs caused him to be much more favourably regarded than most ehurehmen by the philosophes of the 18th century. He acquired the surname of the Racine of the pulpit, but extreme purity of style is almost the only point of contact between the two writers,

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MASSINGER, Puitir (1584-1640), one of the most prolific, scholarly, and powerful dramatists among the immediate successors of Shakespeare. He was born in 1584, went to Oxford (St Alban's Hall) in 1602, and lef; in 1606. This is all that is known of his early life, except that his father, as appears from the dedication of one of his plays (Zhe Bondman), was in the service of the Herberts. That his father's service was not menial is proved by his having once been the bearer of letters from the earl of Pembroke to the queen. The industry of anti- quaries has discovered only one little fact about Massinger between his leaving Oxford in 1606 and his having a comedy performed at court in 1621. This fact is that he joined with two dramatists, Field and Daborne, in asking an advance of £5 from the theatrical capitalist, Henslowe. This painful request, the date of which is conjectured to be about 1614, sets forth that the three petitioners were 'in unfortunate extremitie." In his part of the document Massinger says that he has "ever found" Henslowe "a true loving friend." 'The expression seems to point to his having been connected with plays and players for some considerable time. After 1621 many of his plays were acted and published ; but from the tone of his dedica- tions it is to be inferred that he was often in straits, The eutry in the parish register of St Saviour's—" March 20, 1639-40—buried Philip Massinger, a stranger "—may mean only that Massinger was not a resident in the parish; but it is sadly out of keeping with the dramatist's place in the respect of posterity.

In the barrenness of authentic fact, conjecture has been busy with Massinger's life and character. One of the questions that have been raised about him,—whether or not he was a Roman Catholic,—leads to other

questions that have more than a personal interest. Attempts to fix the political or the religious creed of a dramatist are generally fanciful ; as a rule, when a critic finds an opinion expressed by one of a dramatist's personages with exceptional and striking force, he jumps to the conclusion that the dramatist must have held this opinion himself as a ruling conviction. The evidence that Massinger was a Roman Catholic ata time when the creed was held under pains and penalties is of a more serious kind, though not conclusive. It rests upon three of his plays, The Virgin Martyr (printed in 1622, acted before 1620), The Renegado (acted in 1624), and The Maid of Honour (printed in 1632, but probably acted earlier) In the first of these Massinger was assisted by Dekker. Whether or not the author was a Roman Catholic, it is certain that only a Roman Catholic audience could be expected to enter into the spirit of these plays and applaud at the end; and they are very remarkable theatrical phenomena to have appeared in the reign of James.

The Virgin Martyr, founded on the martyrdom of Dorothea m the time of Diocletian, is, in effect, an old miraele play in five acts. The devil himself appears on the stage, —first in human shape as the servant of a persecutor, hunting out victims and instigating the most cruel tortures ; afterwards in "a fearful shape~ with ay flashing round him. The page of the martyr Dorothea is an an in disguise, who also appears in his own proper shape before the 4 of the play. Dorothca is torturcd on the stage 1D the most a ing fashion, dragged about by the hair, kicked, beet kat cudgels, but her page Angelo stands by, and she is miracu a 4 preserved from hurt. Other miracles are performed on =i 4 A persecutor falls down in a fit when about to proceed to su ve af martyr's constancy to the foulest trials. In the last act a bas a fruit from paradise is brought on, and the chief persect of it is wholly changed in spirit, and drives away his diabo ef . vant by holding up a cross of flowers. At the close the Geatter appear in white robes, transfigured. The Virgin Martyr – resembles the miracle play in the coarseness of the comic scenes : tended to illustrate the power of the devil over the most base @

grovelling natures. The tone of the play throughout is serious aud

: ic devotion of the lofty ; the passions of the persecutors and the i . calvary

martyrs are given with great dramatic force.

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remarkable play to have appeared suddenly amidst the run of secu- lar pieces. [It seems to have been popular, and was several times reprinted before the Restoration. That the Menegado should have found favour is still more remarkable. In itself it is a powerfully constructed play, strong in charaetcr and incident. Massinger's Jeaning to Roman doctrine is supposed to be shown by his making one of his heroiucs—a converted Turk, a sultan's sister—experience complete spiritual transformation after receiving the rite of baptism. But there is a more suggestive and stranger fact than this. The hero of the piece, Franeisco, is a Jesuit priest, treated with profound respect throughout, a man of noble unselfish ainis, running all risks to save aud gain souls, exercising the strongest moral influenee for the wisest and most benevolent purposes. Franciseo's influence per- yades the play, and is erowned with triumph at the end. He sails pack to Venice with a noble lady rescued from the infidel, lier virtue protected by an amulet during her captivity, a renegade military hero restored to his country and the church, a noble Venetian rescucd from spiritual and physical perils, the beautiful sister of the sultan converted to Christianity. That a London audience should have tolerated this glorification of a Jesuit within twenty years of the Gunpowder Plot is an extraordinary fact, of which the explana- tion is still toseek. In the Maid of Honowr the heroine relieves a highly complicated situation at the end by taking the veil, giving a third of her property to a nunnery, a third for pious uses, and a third to an honest, faithful, but to her unattractive lover. For this she is held up as " to all posterity a fair example for noble maids to imitate." Only an audicnce of very pious Catholics could have sympathized with such a conclusion.

Such plays show that Massinger, if not a Roman Catholic, was at least not blinded by the popular hatred of them, but could dwell in rapt admiration on what was noble and lofty in the motives supplied by the Roman Church. The strange thing is tliat he found a manager to produce these plays, or an audience to tolerate them. It may be doubted whether Massinger was ever a popular dramatist. His poverty is not indeed conclusive on this point, for the prices paid for plays were so small that a dramatist could hardly make a

livelihood by play writing, unless he was also an actor or a theatrical manager. Bunt the best qualities of his plays appeal rather to thoughtful politicians, moralists, and students of character than to the simple feelings of the ordinary playgoer. Only one of them, A New Way to Pay Old Debts (printed 1633), has kept the stage, and that chiefly because the leading character, Sir Giles Overreach, a sort of commercial Richard IIL, a compound of "the lion and the fox," provides many opportuni- ties foragreatactor. Like all Massinger's plays, it is most ingenious and effective in construction, but in this as in others he has been more intent upon the elaboration of a plot and the exhibition of a ruling passion than upon winning the love and admiration of his audience for heroes and heroines. The other personages besides Sir Giles are either conventional comic figures, or dim, feebly outlined, uninteresting characters. The reformed prodigal and the two pairs of lovers who outwit the cunning diplomatist by simple means seem poor, joyless, bloodless phantoms when put side by side with the rich life of Shakespeare's youth- fal lovers and reckless scapegraces ; they are mere foils to Overreach ; their life is not displayed, it is only indicated In the dialogue. With the exception of this play, all Massinger's have been relegated to the study since his own time. The Fatal Dowry (printed 1632), in which Massinger had the assistance of Field, was partially resuscitated by Rowe, being made the basis of the Fair Penitent. In Massinger's own judgment, the Roman Actor was "the most perfect birth of his Minerva." It is in effect a study of the tyrant Domitian, and of the results of despotic rule on the despot himself and his court; the intrigues and counter intrigues, the rise of sycophancy, the fall of honesty, the growth of the appetite for blood, the growth and final triumph of the spirit of revenge, are exhibited with great power. Among the dramatists of that great period, Massinger comes next to Shakespeare in the art of opening and developing a plot. The Bondman, the Duke of Milan, and the Great Duke of Florence are also

favonrable specimens of Massinger's power. But what was said by one of his admirers in the dedication of the Crty Madam is perfectly true, that, 'though he composed many plays, he wrote none amiss." The manners and the characters are always clearly conceived, although the dramatist's

strength is put forth in the portrayal of some one-‘ruling passion. ‘The action always marches forward steadily, with as little as possible of irrelevant digression ; so steadily in fact is the main purpose pursued as to pro- duce a certain air of labour and constraint. The language is never mean, and never turgid ; in impassioned situations it wants fire and directness. Ifthe stage were ever delibe- rately employed as an historical school, frequented by audiences anxious to get a clear and vivid impression of important situations, going to the theatre not to be interested against their will but willing to be interested, the dramas of Massinger would furnish excellent models. Several of Massinger’s playsare no longer cxtant. Eight of them were among those destroyed by Warburton’s cook. The most

receut edition of those remaining, nineteen in number, is Cunning- ham’s (1870). Gifford edited Massinger with great eare. (W. M.)

MASSORAH (77019), better Massorzru (13819), a late Hebrew word meaning “tradition,” is the technical term specially applied to the tradition by which Jewish

scholars (Massorets, N00 OY) sought to fix the cor- rect writing and reading of the text of the Old Testa- ment. An oral tradition on disputed points of this sort naturally existed from the early days of the Jewish schools, but the use of a written Massorah in notes on the margin of Bibles, at the end of Biblical codices or of the individual books contained in them, or in separate works appears to have followed the introduction of the vowel points, and to have been influenced by similar labours of Syrian scholars. See Heprew Lanceuace, vol. xi. p. 600.

MASSOWAH, or Mesowan, a town on the Abyssinian eoast of the Red Sea, on a small coral island of the same name, in 15° 30’ N. lat. and 39° 30’ E. long. The height of the island is from 20 to 25 feet above the sea, the length does not exceed $ mile, and the breadth is about } mile. The western half is occupied by the town; in the eastern half are Mohammedan burying-grounds and dismantled cisterns. Most of the dwelling-houses are mere straw huts ; the mosque, the Roman Catholic church, the Govern- ment buildings and custom-house, and the residences of the prineipal merchants are of stone. Water was formerly searce, and had for the most part to be carried from the mainland; but in 1872 an ancient aqueduct fron. Mokullu

was restored, and continued by an embankment to the town. Besides the original Ethiopians, who speak a Tigré dialect corrupted with Arabic, the population, estimated at from 5000 to 6000, comprises Arabs from Yemen and Hadramaut, Gallas and Somalis, and Hindus from Surat. The trade, which consists mainly in exporting hides, butter, Abyssinian coffee, and civet, and importing European and Indian cotton goods and silks, increased in value from about £65,000 per annum in 1865 to from £240,000 to £280,000 between 1879 and 1881.

The island of Massowah (locally Base) has probably been inhabited from avery early date. It was at Massowah (Matzua, as they called it) that the Portuguese landed in 1542 under Christovao da Gaina. or tured by the Turksin 1557, theisland hasremained moreorlessstrictly aTurkish possession ever since. Amilitarycolony of Bosnians settled at Arkiko was appointed, not only to defend it in case of attack from the inainland, but to keep it supplied with water in return for $1400 per month from the town's customs. For some time in the close of last century Massowal was held by the sherif of Mecca, and it afterwards passed under Mehemet Ali of Egypt. The Turks were reinstated about 1850, but in 1865 they handed the island back to Egypt for an annual tribute of 24 million piastres.

See Bruce's Travels, vol. iv. ;Heuglinin Petermann's Mitthcilungen,

1860; Rassam, Brit. Mission to Abyssinia, 1869; Pennazzi in Nuova Antologia, July 1880.

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MASSYS, or Marsys, QuinTIn (1466-1530), was born at Louvain, where he first learned a mechanical art. During the greater part of the 15th century the centres in which the painters of the Low Countries most congregated were Bruges, Ghent, and Brussels. Towards the close of the same period Louvain took a prominent part in giving employment to workmen of every craft. It was not till the opening of the 16th century that Antwerp usurped the lead which it afterwards maintained against Bruges and Ghent, Brussels, Mechlin, and Louvain. Quintin Massys was one of the first men of any note who gave repute to the guild of Antwerp. A legend still current relates how the smith of Louvain was induced by affection for the daughter

of an artist to change his trade and acquire proficiency in painting, A less poetic but perhaps more real version of the story tells that Quintin had a brother with whom he was brought up by his father Josse Massys, a-smith, who held the lucrative offices of clockmaker and architect to the municipality of Louvain. It came to be a question which of the sons should follow the paternal business, and which carve out a new profession for himself. Josse the son clectcd to succeed his father, and Quintin then gave himself to the study of painting. But it is not improbable that as he lived in an age when single individuals were cunning in various branches of design, Quintin was equally familiar with the chisel and file or the brush and pencil. We are not told expressly from whom Quintin learned the profession in which he acquired repute, but his style seems necessarily derived from the lessons of Dierick Bouts, who took to Louvain the mixed art of Memling and Van der Weyden. When he settled at Antwerp, at the age of twenty-five, he probably had a style with an impress of its own, which certainly contributed most importantly to the revival of Flemish art on the lines of Van Eyck and Van der Weyden. What particularly characterizes Quintin Massys is the strong religious feeling which he inherited from earlier schools. But that again was permeated by realism which frequently degenerated into the grotesque. Nor would it be too much to say that the facial peculiarities of the boors of Van Steen or Ostade have their counterparts in the pictures of Massys, who was not, however, trained to use them in the same homely way. From Van der Weyden's example we may trace the dryness of outline and shadeless modelling and the pitiless finish even of trivial detail, from the Van Eycks and Memling through Dierick Bouts the superior glow and richness of transparent pig- ments, which mark the pictures of Massys. The date of his retirement from Louvain is 1491, when he became a master in the guild of painters at Antwerp. His most celebrated picture is that which he executed in 1508 for the joiners' company in the cathedral of his adopted city. Next in importance to that is the Maries of Scripture round the Virgin and Child, which was ordered for a chapel in the cathedral of Louvain. Both altar-pieces are now in public museums, one at Antwerp, the other at Brussels. Both challenge attention for the qualities which have already been described. They display great earnestness in expression, great minuteness of finish, and a general absence of effect by light or shade. As in early Flemish pictures, so in those of Massys, superfluous care is lavished on jewellery, edgings, and ornament. To the great defect of want of

atmosphere such faults may be added as affectation, the result of excessive straining after tenderness in women, or common gesture and grimace suggested by a wish to render pictorially the brutality of jailers and executioners. Yet in every instance an effort is manifest to deveiop and express individual character. This tendency in Massys is chiefly illustrated in his pictures of male and female market bankers (Louvre and Windsor), in which an attempt is

made to display concentrated cupidity and avarice. The other tendency to excessive emphasis of tenderness may be seen in two replicas of the Virgin and Child at Berlin and Amsterdam, where the ecstatic kiss of the mother is quite unreal. But in these examples there is a remarkable glow of colour which takes us past many defects, Expres- sion of despair is strongly exaggerated in a Lucretia at the museum of Vienna. On the whole the best Pictures of Massys are the quietest ; his Virgin and Christ or Eece Homo and Mater Dolorosa (London and Antwerp) display as much serenity and dignity as seems consistent with the master's art. A telling example of his partiality for gro- tesque character in face is an Epiphany in the collection of Mr H. R. Hughesin England. His skill as'a portrait painter has not been sufficiently admired, probably because most of his likenesses have ceased to be identified with his name, Egidius at Longford, which drew from Sir Thomas More a eulogy in Latin verse, is but one of a numerous class, to which we may add the portrait of Maximilian of Austria in the gallery of Amsterdam, a masterpiece which at some future period may afford a clue to other works of similar treatment in English and Continental galleries. Massys in this branch of practice was much under the influence of his contemporaries Lucas of Leyden and Mabuse. His tendency to polish and sinoothness excluded to some extent the subtlety of modulation remarkable in Holbein and Diirer. There is reason to think that he was well acquainted with both these German masters. He probably met Holbein more than once on his way to England, He saw Diirer at Antwerp in 1520. Quintin dicd at Antwerp in 1530. The puritan feeling which slumbered in him was fatal to some of his relatives) His sister Catherine and her husband suffered at Louvain in 1543 for the then capital offence of reading the Bible, he being decapitated, she buried alive in the square fronting the cathedral.

Quintin's son, Jan Massys, inherited the art but not the skill of his parent. The earliest of his works, a St Jerome, dated 1537, inthe gallery of Vienna, the latest, a Healing of Tobias, of 1564, in the niuseum of Antwerp, are sufficient evidence of his tendency to sub- stitute imitation for original thought.

MASTER AND SERVANT. These are scarcely to be considered as technical terms in law. 'The relationship which they imply is created when one man hires the labour of another foraterm. Thus itis not constituted by merely contracting with another for the performance of a definite work, or by sending an article to an artificer to be repaired, or engaging a builder to construct a house. Nor would the employment of a man for one definite act of personal service—e.g., the engagement of a messenger for a single occasion—generally make the one master and the other ser- vant. It was held, however, in relation to the offence of em- bezzlement, that a drover employed on one occasion to drive cattle home from market was a servant within the statute. (See article EmpezziemEnt for definition of "clerk or "servant" in that connexion.) On the other hand, there are many decisions limiting the meaning of "servants under wills giving legacies to the class of servants generally. Thus "a person who was not obliged to give his whole time to the master, but was yet in some sense a servaill, was held not entitled to share in a legacy to the servants. These cases are, however, interpretations of wills where the intention obviously is to benefit domestic servants only. And so in other connexions questions may arise as t0 the exact nature of the relations between the parties—whether they are master and servant, or principal and agent, or landlord and tenant, or partners, &c.

The terms of the contract of service are for the most part such as the parties choose to make them, but in the absence of express stipulations terms will be implied by the law. Thus, "where no time is limited either expressly by implication for the duration of a contract of hiring an

service, the hiring is considered as a general hiring, and in point of law a hiring for a year." But "in the case of domestic and menial servants there is a well-known rule, founded solely on custom, that their contract of service

may be determined at any time by giving a month's warn- ing or paying a month's wages, but a domestic or other yearly servant, wrongfully quitting his master's service, forfeits all claim to wages for that part of the current year during which he has served, and cannot claim the sum to which his wages would have amounted had he kept his contract, merely deducting therefrom one month's wages. Domestic servants have a right by custom to leave their situations at any time on payment of a calendar month's wages in advance, just as a master may discharge them in a similar manner" (Manley Smith's Law of Master and Servant, chaps. ii. andiii.). The master's rightto chastise a servant for dereliction of duty (which appears to be still recognized in some American cases) is no longer sustained in English law, unless perhaps in the case of servants under age, to whom the master stands zx loco parentis.

The following are assigned by Manley Smith as in general sufficient grounds for discharging a servant :—(1) wilful disobedience of any lawful order; (2) gross moral mis- conduct; (3) habitual negligence; (4) incompetence or permanent disability caused by illness.

A master has a right of action against any person who deprives him of the services of his servant, by enticing him away, harbouring or detaining him after notice, con- fining or disabling him, or by seducing his female servant. Indeed the ordinary and only available action for seduc- tion in English law is in form a claim by a parent for the loss of his daughter's services.

The death of either master or servant in general puts an end to the contract. A servant wrongfully discharged may either treat the contract as rescinded and sue for services actually rendered, or he may bring a special action for damages for the breach. A master is bound to provide food (but apparently not medical attendance) for a servant living under his roof, and wilful breach of duty in that respect is a inisdemeanour under 24 & 25 Vict. c. 100.

A servant has no right to demand "a character" from an employer, and if a character be given it will be deemed a privileged communication, so that the master will not be liable thereon to the servant unless it be false and malicious. A master by knowingly giving a false character of a servant to

an intending employer may render himself liable—should the servant for example rob or injure his new master.

For penalties incurred by personating inasters and giving false certificates of character, or by persons offering themselves as servants with false or forged certificates, see 32 Geo. III. ¢. 56.

Reference may be made to the article on LABOUR AND Lazoun Laws for the cases in which special terms have been introduced into

contracts of service by statute (¢.g., Truck Act), and for the recent legislation on the subject generally, including the Employers' Liability Act, 1880.

The master's liability on the contracts of his servant depends on altogether different principles from those on which his liability for negligence has been justified. It is substantially a case of liability as principal for the acts of anagent. The main question in all cases 1s whether the alleged agent had authority to make a contract for his principal, and in the relation of master and servant there may

; uy variety of circumstances giving rise to that presumption. Here the rights of third persons have to be considered, and the master will be held liable to them wherever he has ' by words, con- duet, or demeanour held out his servant asa general agent, whether In all kinds of business or in transacting business of a particular kind,"—even if the servant should aet contrary to express orders, ee example, a horse-dealer sending his servant to market with a

orse to sell will be liable on the servant's warranty, although he

as_been positively ordered not to warrant; whereas an owner sending a stranger to sell would not be liable on a warranty given contrary to express directions,

MASTIC, or MAsTIcu, a resinous exudation obtained from the lentisk, Pistacia Lentiscus, an evergreen shrub of the

natural order Anacardiacee, The lentisk or mastic plant is

indigenous to the Mediterranean coast region from Syria to Spain, but grows also in Portugal, Morocco, and the Canaries. Although experiments have proved that excel- lent mastic might be obtained in other islands in the archi- pelago, the production of the drug has been, since the time of Dioscorides, almost exclusively confined to the island of Scio. The mastic districts of that island are for the most part flat and stony, with little hills and few streams. The shrubs are about 6 feet high. The resin is contained in the bark and not in the wood, and in order to obtain it numerous vertical incisions are made, during June, July, and August, in the stem and chief branches. The resin speedily exudes and hardens into roundish or oval tears, which are collected, after about fifteen days, by women and children, in little baskets lined with white paper or cotton wool. The ground around the trees is kept hard and clean, and fiat pieces of stone are often laid beneath them to prevent any droppings of resin from becoming contaminated with dirt. The collection is repeated three or four times between June and September, a fine tree being found to yield about 8 or 10 ib of mastic during the season. Besides that obtained from the incisions, mastic of very fine quality spontaneously exudes from the small branches. The harvest is affected by showers of rain during the period of collection, and the trees are much injured by frost, which is, however, of rare occurrence in the districts where they grow.

Four qualities of mastic are recognized by the dealers in Scio.

1. Cake, consisting of large pieces, sold chiefly for use in the seraglios, being chewed by women of all ranks throughout the Turkish empire, for the purpose of imparting an agreeable odour to the breath. This quality is worth 120 to 180 piastres per oke (of 2°83 Ib) or even snore.

2. Large tears, worth 90 to 100 piastres.

3. Small tears, valucd at 75 to 80 piastres.

4, Mastic mixed with fragments of leaves and sand, chiefly con- sumed in the manufacture of the Turkish liqueur, or mastic brandy, called raki, and other cordials.

The third sort, in small tears, is that which is chiefly exported to England, the first and second qualities being sent to Turkey, especially Constantinople, also to Trieste, Vienna, and Marseilles.

These varietics are known to the dealers as rvaiord, paArokdpt, wirra, and Prodvda respectively.

Mastic still forms the principal revenue of Scio. In 1871, 28,000 tb of picked and 42,000 Ib of common were exported from that island, the former being worth 6s. 10d. and the latter 2s. 10d. per tb. The average price in London varies from 2s. 6d. to 4s. 6d. per tb.

During the 15th, 16th, and 17th centuries mastic enjoyed a high reputation as a medicine, and formed an ingredient in a large num- ber of medical compounds, but its use in medicine is now almost obsolete,

Mastic occurs in English commerce in the form of roundish tears about the size of peas, some of them, however, being oblong or pear-shaped. They are transparent, with a glassy fracture, of a pale yellow or faint greenish tinge, which darkens slowly by age. When chewed they rapidly soften, by which character they are easily distinguished from Sandarac resin, which while bearing a strong resemblance to mastic occurs in tears of a more cylindrical shape. The mastic which has been imported of late years presents a bright glassy appearance from having been washed free from dust.

Mastic is soluble in turpentine, chloroform, ether, acetone, and oil of cloves; but cold aleohol dissolves only 90 per cent. of it. The soluble portion is called Alpha resin (C2011203), and possesses acid properties. The insoluble portion, Beta resin or Mastiein, is somewhat less rich in oxygen, and is a translucent colourless tough substance insoluble in caustic alkali.

Pistacia Khinjuk, Stocks, and P. cabuliea, St., trees growing throughout Sindh, Baluchistan, and Cabul, yield a kind of mastic which is met with in the Indian bazaars under the name of Austagi- rim, t.e., Roman mastic. This when met with in the European market is known as East. Indian or Bombay mastie. In Algeria P. atlantica, Desf., yiclds a solid resin, which is collected and used by the Arabs asa masticatory. Cape mastic, used by the colonists, but not exported to England, is the produce of Zuryops multifidus, the resin bush, or harpuis bosch, of the Boers,—a plant of the com- posite order growing abundantly in the Clanwilliam district. Dammar resin is sometimes sold under the name of mastic, The West Indian mastic tree is the Bursera gummifera, and the Pern- vian mastic is Schinus Molle; but neither of these furnishes com- mercial resins,

MASTODON (from paords, "nipple," and ddovs, '"'tooth"), a name, suggested by the conical or papillary form of the projections on the molar teeth of some of the species, given by Cuvier to a genus of extinct elephant-like animals. Their position in the suborder Proboscidea of

Mamata (p. 425 of the present volume).

In size, general form, and principal osteological characters the Mastodons resembled the Elephants. It is by the teeth alone that the two groups are to be distinguished, and, as shown in the article just referred to, so numerous are the modifications of these organs in each, and so insensibly do they pass by a series of gradations into one another, that the distinction between the two is an arbitrary and artificial one, though convenient and even necessary for descriptive purposes.

Asin other Proboscideans, the teeth of Mastodons consist only of incisors and molars. The incisors or tusks are never more than a single pair in each jaw. In the upper jaw they are always present and of large size, but apparently never so much curved as in some species of Elephant, and they often have longitudinal bands of enamel, more or less spirally disposed upon their surface, which are not met

with in Elephants. Lower incisors, never found in true Elephants, are present throughout life in some species of Mastodon, which have the symphysis of the lower jaw greatly elongated to support them (as in JZ, angustidens, M.

| pentelict, and M. longirostris (see fig. 1, C). Inthe comm the great order Ungulata has been indicated in the article iba .

American species (Jf. ohioticus, Blumenbach) there were two tusks in the lower jaw in the young of both sexes ; these were soon shed in the female, but one of them was retained in the male. In other species no inferior tusks have been found, at all events in adult life (see figure of Jf twricensis).

The molar teeth are six in number on each side, incregs- ing in size from before backwards, and, as in the Elephants,

with a horizontal succession, the anterior teeth being lost before the full development of the posterior teeth, which gradually move forward, taking the place of those that have been destroyed by wear. This process is, however, not so complete as in the true Elephants, and as many as three teeth may be in place in each jaw at one time, There is, moreover, in many species a true vertical

succession, affecting either the third, or the third and second, or (in one American species, Af. productus) the first, second, and third of the six molariform teeth.

These three

Fic. 1.—JMastodon turicensis (Pliocene). From Sismonda. A, B, Jf. ohtoticus; C, M. longtrostris.

are therefore reckoned as milk molars, and their successors as premolars, while the last three, which are never changed, correspond to the true molars of those animals in which the typical dentition is fully developed. The study of the mode of succession of the teeth in the different species of Mastodons is particularly interesting, as it exhibits so many stages of the process by which the very anomalous dentition of the modern Elephants

may have been derived by gradual modification from the typical heterodont and diphyodont dentition of the ordinary Mammal. It also shows that the anterior molars of Elephants do not corre- spond tothe premolars of other Ungulates, but to the milk molars, the early loss of which in consequence of the peculiar process of horizontal forward-moving succession does not require, or allow time for, their replacement by premolars. It must be noted, however, that, in the Mastodon in some respects the least specialized in tooth-structure, the d/. ohioticus of North America, no vertical succession of the molars has yet been observed, although vast numbers of specimens have been examined.

The Mastodons have, generally speaking, fewer ridges on their molar teeth than the Elephants ; the ridges are also

less elevated, wider apart, have a thicker enamel covering, and scarcely any cementum filling up the space between them. Sometimes (as in J. ohioticus) the ridges are

_ simple transverse wedge-shaped elevations, with straight or

Fic. 2.—Upper Molar of Mastodon arvernensts. From i concave edges. In other species the summits of the ridges are more or less subdivided into conical cusps; and e have accessory cusps clustering around them (as In 4 arvernensis, see fig. 2). When the apices of these are Mi ‘ by mastication, their surfaces resemble circles of dentine,

MAS—MAS

surrounded by a border of enamel, and as the attrition proceeds different patterns are produced by the union of the bases of the cusps, a trilobed or trefoil form being characteristic of some species.

Certain of the molar teeth of the middle of the serics in both Elephants and Mastodons have the same number of principal ridges, and those in front of them have fewer and those behind a greater number. ‘These teeth were distinguished as ‘“‘ intermediate” molars by Dr Falconer, to whose extensive and conscientious researches we owe much of our knowledge of the structure of this group of animals. In the restricted genus Zlephas there

are only two, the last milk molar and the first true molar (or the third and fourth of the whole series), which are alike in the number of ridges; whereas in the Mastodons there are three such teeth, the last milk molar and the first and second true molars (or the third, fourth, and fifth of the whole series). In the Elephants the number of ridges on the intermediate molars always exceeds five, but in the Mastodons it is nearly always three or four, and the tooth in front has usually one fewer and that behind one more, so that the ridge formula (7.¢., 2 formula expressing the number of ridges on each of the six molar teeth) of most Mastodons can be reduced either to 1, 2, 3, 3, 3, 4 or 2, 3, 4,4, 4, 5. The former characterizes the section called Zrtlophodon, and the latter that called Z'etralophodon by Dr Falconer. These divisions are very uscful, as under one or the other all the present known species of Mastodon can be ranged, but observations upon a larger number of individuals have shown that the number of ridges upon the teeth is by no means so constant as implied by the mathematical formule given above. 'Their exact enumeration is even difficult in inany cases, as "talons" or small accessory ridges at the hinder end of the teeth occur in various stages of develop- ment, until they take on the character of true ridges. Transitional conditions have also been sliown, at least in some of the teeth, between the trilophodont and the tetralophodont forms, and again between the latter and what has been called a " pentalophodont " type, which leads on towards the condition of dental structure characteristic of the true Elephants.

The range of the genus Mastodon in time was from the middle of the Miocene period to the end of the Pliocene in the Old World, when they became cxtinct; but in America several species— especially the best-known, owing to the abundance of its remains, which has been variously called M. ohioticus, M. americanus, and M. giganteus—survived quite to a late Pleistocene period.

The range in space will be best indicated by the following list of the generally recognized species. 1. Trilophodont series—d/. angustidens, borsoni, pentelict, pyrenaicus, taptrotdes (or turicensis), virgatidens, from Europe; Jf. falconert aud pandionis, from India ; M. ohioticus, obscwrus, and productus, North America:and Af.andiwm, and humboldtti, South America. 2. Tctralophodont series—JV/. arvernensis, M. dissimilis and

longirostris, from Europe; JL latidens, sivalensis, and peramensis, from India; Jf. mirificus, from North Ameriea, The only two of which remaius have been found

In Great Britain are AL, arvernensis and M. borsoni, both froin the erags of Norfolk and Suffolk.

The range of the genus was thus very extensive, and it has even been supposed to reach to Australia, where no Ungulate mammal has ever been proved to exist. This supposition until very recently has been based upon the evidence of a single molar tooth of an animal undoubtedly belonging to Mastodon, and alleged to have becn brought from near Boree Creek, an affluent of the Lachlan river in the Ashburnham district, New South Wales, by the late Count Strzelecki, and described by Professor Owen in 1844 under the name of M. australis. Its identity with the South American Jf, andiwm has, however, been shown by Dr Falconer, who has thrown grave doubts upon the locality assigned to the specimen. A fragment of a tusk, of the Australian origin of which there is less question, and which presents the characteristic structure only known at present in Elephants and Mastodons, has been lately described by Professor Owen (Proc. ftoy. Soc., March 30, 1882). It was found in a drift-deposit of a ravine in a district of Darling Downs, 60 miles to the castward of Moreton Bay, Queensland. Unfortunately no

other portions of the remains of the animal to which it belonged have been discovered,

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MAS'UDY. Abw'l-Hasan 'Alf ibn Hosein ibn 'Ali el-Mas'udy,! was born at Baghdad towards the close of the 9th Christian century. Great part of his life was spent in travel; in 912-13 a.p. he was at Multan in the Punjab, and also visited Mansura. Three years later he was at Basra and met Abu Zeid, the geographer whose remarks on the extreme East are comprised in Reinaud's felation des Voyages (Paris, 1845). His writings and those of Mastidy are indebted each to the other. In the interval it would seem our traveller had gained that personal acquaintance with Fars and Susiana, and that knowledge of the books of the Persians, of which he speaks in his writings. Once more turning eastward he was at Cambay in 915-16, and soon after at Saimur. Hence he pushed on to Ceylon and sailed to Madagascar, returning to 'Oman in 916-17. In the introduction to the Jeadows he seems also to say that he had journeyed as far as Cliuna. A northern journey carried Mastdy as far as the Caspian Sea. In 926 he was at Palestine, where his curiosity, not limited by religious prejudice, led him to visit the Christian church and describe its relics. In 943-44 he made a careful study of the ruins of Antioch, and subsequently proceeded to Basra. In the same year he composed the Meadows of Gold. The last ten years of lis life were passed in Syria and Egypt. His last work, The Indicator and Monitor, was written 345 a.u., and his death took place in Egypt the same year (956-57 a.p.).2_ The vast journeys of Mas'idy did not pass beyond the lines of com- mercial enterprise among the Moslems of those days, when 'Trak was not unjustly held to be the centre of the world, and the arms, the trade, and the religion of Islam pene- trated to the remotest parts of Asia and Africa, But Mas'idy did not travel for gain. His object was to study with his own eyes the peculiarities of every land, and to collect whatever was of interest for archeology, history, and manners. Singularly free from bigotry— he was himself a Mo'tazilite, one of the heretical sect, as they were reckoned, who held the doctrine of man's free will— he was ready to derive information even from the writings of infidel Persians or of a Christian bishop.? In the range of his observations and the naive uncritical honesty with which he records them he has naturally suggested com- parison with Herodotus, and so competent a judge as Ibn Khaldin gives him the title of imam of Eastern historians, an epithet precisely parallel to that borne by

Herodotus among the historiaus of the West. The parallel, however, must be taken with great deductions. Of the Afeadows, the work by which Mastdy is chiefly known, by far the greater part is an historical compilation, enlivened indeed in some parts by personal recollection of places and the like, but mainly drawn from a vast mass of earlier books which are used in the common paste-and-scissors fashion of Eastern history. Even in the earlier cosmographical chapters the author's vast and miscellaneous reading, which included the Arabic translations of Ptolemy and other Greek writers, is mingled with his original observa-*

1 The surnamie is derived from an ancestor Mas tid, a Meccan, whose son 'Abdalla accompanied Mohammed on his flight to Medina, and is often mentioned in the history of the prophet. Details as to the family are given by Reiske, Ann. Mos., vol. i., note 208.

2 See De Sacy, Chrest., Ist ed., ii. 490.

3 In the Meadows, iii. 69, he tells us that at Fostat (Old Cairo), in 336 A.u., there fell into his hands a chronicle (now lost) by Godmer, bishop of Gironne, whieh he uses for his narrative.

4 Of these the first chapter gives an interesting catalogue,

tions in that ill-digested style so often characteristic of men of prodigious acquisitive power; and the presentation of facts falls as far short of freshness and the artistic charm of the inimitable Grecian raconteur as the shapeless details of universal history, as it appeared to the Moslem, fall short of the epic interest of the great struggle for supre- macy between Eran and Hellas.

Masudy has himself sketched his literary aetivity in the opening chapter of the Afeadows and in his last book The Indicator. In his huge Annals (Akhbar el-Zemdn) and in a seeond work of tess extent (Kitdb el-Awsat) which followed it he summed up the whole cos- inographieal and geographieal seience of his age. These works are lost or known only by fragments, but we possess an abridgment in the author's third great work

The Meadows of Gold and Mines of Precious Stones, of which there are many MSS. in European libraries. It was printed by Barbier de Meynard with a French translation, 9 vols, 8vo, Paris, 1861-77, and at Bulak in 1867 (2 vols. folio). The first volume of an English translation by Sprenger appeared at London in 1841 ; but the work was not continued. The Kitab-el-Tanbih (Indieator and Monitor) exists in MS. at Paris, and has been fully deseribed by De Sacy in Nottees et Extraits, vol. vili., 1810 (reprinted at the end of the Paris edition of the Mcadows, where a list of other works of our anthor is given). See also Quatre- imére in Jour. As. for January 1839, and the article " Masoudy,"' by Reinaud, in the Nowv. Biog. Générale.

MASULIPATAM, the chief town of Kistna district, Madras, India, and a seaport, is situated in 16° 9' N. lat., 81° 11' E. long., with a population in 1871 of 36,316. The export trade is partly to Europe; imports are chiefly local. In 1874-75 235 vessels of 106,000 tons burthen visited the port; the exports (oil-seeds and _ cotton) amounted to £171,400, the imports to £119,600. The town contains the usual district offices, a jail, and several schools, the chief being the high school. It is a flourish- ing station of the Church Missionary Society.

Masulipatam was the earliest British settlement on the Coroman- del coast. An ageney was established there in 1611, and a fortified factory in 1622. During the wars of the Carnatic, the English were temporarily expelled the town, which was held by the French for some years. In 1759 the town and fort were carried by storm by Colonel Forde, and it has been held by the British ever sinee. Weavers form a large portion of the inhabitants of the town, though their trade has greatly declined since the beginning of this century. 'heir operations, besides weaving, include printing, bleaching, washing, and dressing. In former days the chintzes of Masulipatam had a great reputation abroad for the freshness and permanency of their dyes, the colours becoming brighter after washing than before. There is still a small demand for these articles in Burmah, the Straits, and the Persian Gulf; but steam machinery has nearly beaten the hand-loom out of the field. Another speciality was mcetapollams or kerchiefs for the head ; but this industry was ruined by the refusal of the West Indian negroes to wear these kercliiefs after their emancipation. Tartans, ging- hams, towels, and table linen are still manufactured to some extent. The importanee of the plaee is now

declining, and the garrison was withdrawn in 1865. The heaviest blow to the prosperity of the town was given by the great storm-wave of 1864, which swept over the entire town, and is said to have destroyed 30,000 lives.

MATAMOROS, a city of Mexico, in the province of Tamaulipas, on the southern bank of the Rio Grande, about 35 miles from its mouth, and directly opposite Brownsville in Texas. Duilt in an open plain, Matamoros has its streets laid out with great regularity; and the general appearance gives evidence at once of its recent rise into importance and of the influence of the architectural fashions of the United States. The principal building is the large but heavy-looking cathedral. An extensive traffic, both legitimate and contraband, is carried on between Matamoros and Brownsville, and in spite of the bar at the mouth of the river, which in foul weather prevents the entrance eveu of small schooners, the place is not without its value to Mexico as a foreign port. The imports of American and of European goods are valued each at about $1,100,000, with a growing preponderance on the side of the American. Cotton, flax, silk, and woollen goods are the main items in the European list; cottons, leaf tobacco, wheat-flour, machinery, and preserved meats in

the American. are the principal exports apart from coin and bullion, which are largely smuggled to avoid the export duty, The population is about 20,000.

Founded in the beginning of the century, and named in honour of the Mexican patriot Mariano Matamoros, the city has played a part in all the more recent wars. It was captured by General Taylor of the United States in 1846, was in the hands of the im- perialists under Majia in 1864, and was oceupied by the French in

1866.

MATANZAS, or San Carios DE Matanzas, a city and seaport on the north coast of Cuba, and the chief town of a province, lies 52 miles east of Havana, with which it is connected by rail. It is a well-built place of from 36,000 to 40,000 inhabitants, occupying a fine site at the head of the Bay of Matanzas, and separated from its suburbs Pueblo Nuevo and Versailles by the San Juan on the one hand and the Yamurri on the other. In the centre of the principal square is a statue of Ferdinand VIL., and along the east side runs the residence of the commandant, The new theatre is the handsomest building of its kind in Cuba, and the Empresa Academy has the repute of being one of the best educational institutions in the West Indies. As a commercial centre Matanzas ranks next to Havana, having risen rapidly after the removal of the old trade restrictions in 1809. The exports are mainly sugar and molasses. The harbour has been deteriorated by the mud brought down by tle San Juan; but the bay is well sheltered from all winds except the north-east,- which brings in a heavy sea. Matanzas was founded in 1693 by a number of immigrants from the Canary Islands, and in the same year Bishop Compostello laid the first stone of the cathedral. The city suffered severely from a conflagration in 1845. About 24 miles to the east are the beautiful stalactite caves of Bellamar, about 3 miles in extent.

MATARO, a Mediterranean seaport of Spain, in the province of Barcelona, 21 miles to the north-east of that city, is beautifully situated on the lower slopes and at the foot of the range of hills which skirt the coast, and shelter the town from the cold northern winds. The streets of the new town, lying next the sea, are wide and regularly built ; those of the old town, farther up the hill, still preserve much of their ancient character. The parish church of Santa Maria has some good pictures and wood carvings ; other prominent public buildings are the theatre, the civil hospital, and the establishments of the Padres Escolapios. There are small schools of navigation and the finearts. The wine of the neighbourhood, which somewhat resembles port, is shipped in large quantities from Barce- loua ; and the district furnishes fine roses, strawberries, and similar produce for the Barcelona market. There 1s a considerable fishery, the products of which are sent inland to Manresa and other places. The leading industries of Mataré are its linen, woollen, and cotton manutactures, especially of canvas and tarpaulin ; several hundreds of women are employed in the town and neighbourhood in lace-

making ; there are also potteries, machine-making, and chemical works, and shipbuilding is carried on to some extent. The railway to Barcelona, opened in October 1848, was the first to be constructed in Spain. Mataré lias no artificial harbour, several attempts to make i having failed; the trade is carried on chiefly pes 1 Barcelona. The population in 1877 was 17,405. Outs! the town is the much-frequented carbonated munera spring of Argentona, Aint

MATCHES. Till the close of the 18th century and steel with tinder box and sulphur-tipped splints © wood—'‘ spunks” or matches—were the common means % obtaining fire for domestic and other purposes. The a . struck off by the percussion of flint and steel were made

Hides and skins, live animals, and wool

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MATCHES

fall among the tinder, which consisted of carbonized frag- ments of cotton and linen ; the entire mass of the tinder was set into a glow, developing sufficient heat to ignite the sulphur with which the matches were tipped, and thereby the splints themselves were set on fire. Instead of tinder, match-paper or touch-paper, a thick bibulous paper impreg- nated with saltpetre (nitrate of potash), and amadou or German tinder, a thick leathery and porous preparation from the fungus Polyporus fomentarius, were often used.

Tt was not till 1805 that any attempt was made to use chemical agency for the ordinary production of fire. In that year M. Chancel, assistant to Professor Thenard of Paris, introduced an apparatus consisting of a small bottle containing asbestos, saturated with strong sulphuric acid, with splints or +e a — ra and mene! with a mixture of chlorate of potash and sugar. e matches so prepared, when brought into contact with the sulphuric acid in ee ial ignited, oe oe by sl action, firewas produced. It appears also that in the same year phosphorus matches were known in Paris, and in 1809 Derepas proposed to lessen the dangerously great inflamma- bility of ane “— by a an ee mixture of that element with magnesia. is also sai that

M. Derosne made a friction match with a phosphorus tip in 1816. Again in 1823 a phosphorus match was pro- posed, but it came into littleuse. In this case the composi- tion consisted of equal parts of phosphorus and sulphur cautiously melted together in a glass tube. The tube was then securely corked, and, to obtain a light, a splint was introduced into the mixture, and a small pellet detached, which on withdrawal and exposure almost spontaneously ignited. In that year (1823) a decided impetus was given to the artificial evolution of fire by the introduction of the Débereiner lamp, so called after its inventor Professor Dobereiner of Jena. The action of this elegant invention depends on the remarkable property possessed by spongy or highly porous platinum of determining the combination of hydrogen and oxygen and the formation of water at common atmospheric temperatures. In the Débereiner lamp hydrogen is evolved in a suitable vessel by the action of zine on acidulated water. The gas so liberated, when required, is passed through a fine orifice by means of a stop-cock, and impinging on a mass of spongy platinum mounted in a frame it combines with oxygen of the air, thereby developing an intense heat, which quickly causes the ae to glow, and ultimately is sufficiently intense to set the stream of hydrogen itself on fire. The Dobereiner lamp is still Bion seen, but it is chiefly used in connexion with chemical lectures.

The first really practical friction matches were made in England. in 1827, by Mr John Walker, a druggist of oe These were known as "Congreves" alter Sir William Congreve, Bart., the inventor of the a . and consisted of wooden splints or sticks or Cardboard coated with sulphur and tipped with a Inixture of sulphide of antimony, chlorate of potash, and gum. With each box of eighty-four, which was retailed at a ae there was supplied a folded piece of glass paper, the folds of which were to be tightly pressed together, while the match was drawn through between them. In 1830 the so-called '"'Prometheans" were patented by Mr §. Jones of London, These consisted of a short roll of paper with a small quantity of a mixture of chlorate of Be and sugar at one end, a thin glass globule of strong

Phuric acid being attached at the same point. When a sulphuric acid was liberated by pinching the glass : < acted on the mixed chlorate and sugar, pro-

ng fire.

The phosphorus friction match of the present day was tst Introduced on a commercial scale in 1833 ; and it

625

appears to have been made almost simultaneously in several distinct centres. The name most prominently connected with the early stages of the invention is that of Preschel of Vienna, who in 1833 had a factory in operation for making phosphorus matches, fusees, and amadou slips tipped with igniting composition. At the same time also matches were being made by Moldenhauer in Darmstadt ; and for a long series of years Austria and the South- German states were the principal centres of the new industry. Improvements in the manufacture have been numerous ; and the industry is now carried on with a complete system of ingenious labour-saving machinery. The use of phosphorus as a principal ingredient in the igniting mixture of matches has not been free from very serious disadvantages. It is a deadly poison, the free dissemination of which has led to many accidental deaths, and also to numerous cases of wilful poisoning and suicides, Workers also who are exposed to phosphoric vapours are subject to a peculiarly distressing disease which attacks the jaw, and ultimately produces necrosis of the jaw- bone ; it appears, however, that, with scrupulous attention to ventilation and cleanliness, almost all risk of the disease may be avoided. Strenuous efforts have been made by numerous inventors to introduce matches having no phosphorus in their igniting mixture, but hitherto with indifferent success. The most serious objections to the use of phosphorus have, however, been overcome by the discovery of the modified condition of that body known as red or amorphous phosphorus, made by Pro- fessor Anton Von Schrotter of Vienna in 1845, and the utilization of that substance in the now well-known "safety matches" invented by Lundstrom of Sweden in 1855, and first manufactured in the United Kingdom by Bryant & May of London. Red phosphorus is, in itself, a perfectly innocuous substance, and no evil effects arise from freely working the compositions of which it forms an ingredient. The fact again that safety matches ignite only in exceptional circumstances on any other than the pre- pared surfaces which accompany the box—which surfaces and

not the matches themselves contain the phosphorus required for ignition—inakes them much less liable to cause accidental fires than the kinds more commonly in use.

Manufactwre.—The operations carried on in a match factory may be grouped uuder the four heads of preparing the splints, dipping the matehes, box-making, and filling. The varieties of wood principally used for matches are poplar, aspen, yellow pine, and white pine. Splints are either round or quadrangular, the former having been at one time exeeedingly common, when Austrian manufaetures ruled the markets; but, now that Sweden is the prineipal match-manufacturing country, matehes are nearly all square in seetion. For eutting square splints many ingenious machines have been devised, some of which, worked by engine- power, can turn out from 15,000,000 to 17,000,000 splints per day. In Sweden the manufaeturers use prineipally aspen or clean- grained pine wood, preferring sections 12 to 20 inches in diameter, newly felled and full of sap. If dry, the wood must be soaked before it is fit for the operations through which it passes. The timber is eut into bloeks about 15 inehes long—suffieient for seven matehes—and being freed from bark it is fixed in a special form of turning lathe, and by means of a fixed cutting tool aeting on its entire length a continuous veneer or band the thiekness of a match is cut off. With each revolution of the block the knife advanees proportionately to the thickness of the band cut off, and thus a uniformly thiek slice is obtained continuously. At the same time eight small knives eut the vencer into seven separate bands each the length of a mateh, and thus in one operation seven long ribbons of wood the length and thickness of a mateh are obtained. These ribbons are next broken into lengths of from 6 ta 7 feet, knotty pieees are removed, and to eut them into single matehes they are fed into a machine whieh aets somewhat like a straw-ehopper. From 120 to 140 bands are acted on in the apparatus, and a ratehet arrangement feeds them forward the thiekness of a mateh at eaeh stroke of the eutter, whieh thus cuts off 120 to 140 matches per stroke. Worked by hand the machine delivers about 5,000,000 splints per day, and by power it ean be run to turn out double that number. The matches are next

dried in revolving drums in a heated chamber or stove, and there- after they are sifted in a kind of partitioned sieve to free them from fragments and splinters. The sifting process also arranges all the splints in parallel order and in uniform quantities, whereby they may be conveniently bundled and prepared for the dipping which next follows. For the dipping process it is necessary to keep each match free from contact with its neighbour, and indeed 'allow it such a space that each may be fully coated and yet there be no danger of the igniting composition clotting the heads into one mass. To effect this the splints are by an ingenious machine separately arranged at uniform intervals between the lathes of a dipping frame. The dipping frames are made about 18 inches square, and are fitted with 44 movable lathes. Between each pair of lathes 50 splints are inserted by the machine, and when tightened up by screws each frame thus contains 44 × 50=2200 splints placed at regular intervals, the heads of which are all on the same level. A single attendant can place, by aid of the machine, about 1,250,000 matches in the dipping frames per day. The dipping is done ina stove of masonry which contains three square flat-bottomed shallow pans. In the first the splints are heated so as to facilitate the absorption of paraffin; in the second their points are dipped into molten paraffin scale ; and in the third they receive their heads or tips of igniting composition, that mixture being kept in a uniform thin stratum in the pan, or in some cases it is supplied by an endless india-rubber belt which revolves and dips into the composition. A skilful workman can dip from 3500 to 4000 frames, or about 8,000,000 matches, a day. The frames so dipped are afterwards arranged in a heated apartment till the igniting composition is dried, after which the matches are taken out and put up in boxes by hand.

Match splints in the factories of the United Kingdom are generally cut in lengths suitable for two matches, and dealt with in that form throughout. The splint-cutting machine patented by John Jex Long of Glasgow in 1871 differs essentially from the Swedish splint-making machinery above alluded to; it acts on squared blocks two-match length, and is capable of producing up to 17,000,000 matches per day.

The object of dipping in melted paraffin is, of course, to secure more ready ignition of the wood. Sulphur was formerly employed for that purpose ; and enormous quantities of the cheaper matches made on the Continent and in

America continue to be sulphur dipped. The cheaper kinds are frequently " bundle dipped " in the molten sulphur, after which their points are merely pressed against the igniting composition.

The chief element in the igniting mixture of ordinary matches is still common phosphorus, conibined with one or more other bodies which readily part with oxygen under the influence of heat. Chief among these latter substances is chlorate of potash, the body which causes the sharp explosive sound when a common match is struck, and to the use of which there is a strong objection on the Continent from the fear of explosions in dealing with the substance in large quantities. The other oxygen-yielding bodies cominonly found in matches are red lead, nitrate of lead, bichromate of potash, and per- oxide of manganese. The proportions in which any of these bodies is present in various igniting compositions are kept trade sccrets ; they vary greatly, as special regard must be given to matches for damp climates, or for ocean transport, and to other considera- tions. 'The igniting agents are made into a paste with glue or gum as an adhesive agent, a little fine sand or powdered glass, and some colouring ingredient such as cinnabar, smalt, magenta, or Prussian blue. Matches in which amorphous phosphorus takes the place of the common variety, notwithstanding several obvious advantages, have never come into general use. They were shown in the Great Exhibition of 1851 by Bell & Black of London; and Foster & Warwa of Vienna, one of the earliest match-making firms, long continued to make them, as did also Cogniet Pére et Fils of Paris. As made by these and other makers they were difficult to strike, requiring a special rough rubbing surface ; the head frequently broke away in the attempt to light them, and when they did inflame it was with explosive violence and a loud spluttcring noise. Dr Von Schrotter, the discovercr of amorphons;phosphorus, claims to have found a means of preparing combinations of amorphous phosphorus with chlorate of potash and other oxygen-yielding compounds of all degrees of combusti- bility, and he states that Hochstatter of Frankfort now manufactures matches with amorphous phosphorus composition which may be ignited by rubbing on a cloth surface, which inflame quietly, burn without smell or sparking, are not influenced by damp, and are cheaper than common phosphorus matches. The use of amorphous phosphorus—but on the rubbing surface only and not in the dipping composition (safety matches)—was first suggested by

Bottger, but it was not till a patent was secured by Lundstrém in 1855 that the matches were brought into the market. According to J. G. Gentele, the elements of the dipping mixture for the heads are—chlorate of potash, 32 parts; bichromate of potash, 12; red lead, 32; sulphide of antimony, 24; and the ingredients of a suitable rmbbing surface are eight parts of amorphons phosphorus to nine of sulphide of antimony. Tlicre is no doubt, however,

that here too there is considerable diversity in the composition of the mixtures, Igniting compositions entirely free from phosphorus depend for their modcrate degree of efficiency on the use of such agents as chlorate of potash, sulphide of antimony, bichromate of potash, and red lead.

“ Vestas” are matches in which short pieces of ‘ wax taper” are used in place of wooden splints. The taper is prepared by drawing a series of wicks or strands of twenty to thirty fine cotton threads through molten stearin, with some proportion of paraffin. The wax quickly hardens on the threads, agglutinating them to irregular hard strands, which are smoothed and rounded to the required size by being drawn throngh iron plates perforated with holes the size of the requircd taper. The tapers are cut to the match lengths, and set in dipping frames by special machines. The making of vestas is an industry only second in extent to the wooden match mannfacture,—its headquarters being London, Manchester, Mar. seilles, and the north of Italy. Fusees for the use of smokers are made of strips of thick porous paper saturated with galt- petre and bichromate of potash, and tipped with ordinary composition. They are now almost entirely supplanted by vesuvians, which consist of large oval heads on both ends of a round splint. These heads, made by repeated dipping, consist of a porous mixture of charcoal, saltpetre, cascarilla or other scented bark, glass, and gum, and they also are tipped with common igniting composition.

Ordinary match boxes are made of thin veneers or skillets of wood the same as used in splint making. The blocks used yield skillets the exact size of the box or cover to be made, and the niachine which shaves skillets off the block also scores them along the lines by which they must be bent to form the box. The fold. ing, covering with paper, and labelling are operations performed by young girls with remarkable rapidity. In dealing with double

splints, the matches are at the boxing stage cut asunder in small bundles with a lever knife by the box filler, who acquires such delicacy of perccption that at each operation she seizes and divides the exact quantity required to fill two boxes. A good hand will in this way fill 35 to 40 gross of boxes per day.

It is calculated that in the principal European countries from six to ten matches are used for each inhabitant daily. There is no way by which an exact estimate of the extent of the trade in the United Kingdom can be obtained ; but competent author- ities believe the yearly value of the matches made to be not less than £1,500,000, and that the makers turn out about 300,000,000 matches daily. Of all the makers Messrs Bryant & May are by far the most extensive ; and next comes the Bell & Black com- pany, formed of a combination of makers in London, Glasgow, Manchester, and York. In France the right to manufacture matches is a Government monopoly farmed to the Compagnie générale des allumettes ehimiques for an annual payment of 16,000,000 francs, with 6 centimes extra per hundred matches in excess of forty milliards sold yearly. The company has concentrated the whole of the manufacture into twelve establishments, the largest of which are at Marseilles. he effect of the monopoly in France is that matches are very costly, and the average consumption per head throughout the country is considerably less than in other countries. Sweden is the country which in recent years has been most inti- mately identified with the growth of the industry. In that country, including with it Norway, there were in 1880 forty-three match factories, many of them large, that of Jénképing being among the most extensive in the world. The quantity of matches exported that year was about 19,000,000 tb (22,900,000 skal- punds), prob- ably representing 50,000,000,000 matches. The yearly exports have increased four-fold since 1870, and are still rapidly extending. In Germany there are two hundred and twelve factories, which are estimated to make yearly about 60,000,000,000 matches ; and Austria-Hungary—the original seat and centre of the manufacture— possesses one hundred and fifty establishments, whence large ape tities of matches are exported to Rnssia, Turkey, Asia Minor, an the neighbouring states of Italy. Throughout Europe about ‘i tons of phosphorus are annually consumed in _the mannfacture 0 matches, the greater proportion being produced in England.

In the United States a tax of 1 cent per box containing one hundred is levied on matches manufactured in the country, 2 a tion to which there is an ad valorem duty of 35 per cent. on @ matches imported. The internal revenue tax of a cent per i " subject to a reduction of 10 per cent. to manufacturers, wit im additional discount of 5 per cent. on the purchase of the a used for the boxes when quantities exceeding in value $50 are i chased at one time. The result of these fiscal oe i been to favour large monopolizing companies. Although t ~ fhe nearly thirty manufactories in the States at present, practic ~: led match trade of the country is in the hands of, or entirely contr . by, the Diamond Match Company of New York, consisting

saat ing the year 1881 the combination of large manufacturers. During the ¥ 079, 258 revenue derived from the internal tax amounted to $3, ar é while the customs duty on imported matches yielded no ee $6186, these receipts representing probably a conse PA 40,000,000, 000 matches. :

MATE

MATE, or Paracuay TxA, consists of the dried leaves of Tee paraguayensis, St Hil.,1 an evergreen shrub or small tree belonging to the saine natural order as the common holly, @ plant to which it bears some resemblance in size and habit. The leaves are from 6 to 8 inches long, shortly- stalked, oblong wedge-shaped, rounded at the upper end,

- *and finely toothed at the margin. The small white flowers*

Maté (Ilex paraguayensis).

Portion of plant, half natural size. Flower drupe and nuts, twice natural size. Part of underside of leaf showing minute glands, natural size.

grow in forked clusters in the axils of the leaves ; the sepals, petals, and stamens are four in number; and the berry is 4.seeded. The plant grows abundantly in Paraguay, Corrientes, Chaco, and the south of Brazil, forming woods called yerbales. One of the principal centres of the maté industry is the Villa Real, a small town above Asuncion on the Paraguay river ; another is the Villa de San Xavier, in the district between the rivers Uruguay and Parana. Although maté appears to have been used from time

im- memorial by the Indians, the Jesuits were the first to attempt its cultivation. This was commenced at their branch missions in Paraguay and the province of Rio Grande de San Pedro, where some plantations still exist, and furnish the best tea that is made. From this circumstance the names Jesuits' tea, tea of the Missions, St Bartholomew's tea, &c., are sometimes applied to maté. Under cultivation the quality of the tea improves, but the plant remains a small shrub with numerous stems, instead of forming, as in the wild state, a tree with a rounded head. From cultivated plants the leaves are gathered every two or three years, that interval being necessary for restoration to vigorous

growth. The collection of maté is, however, chiefly effected .

by Indians employed for that purpose by merchants, who pay a money consideration to Government for the privilege.

When a yerbal or maté wood is found, the Indians, who usually travel in companies of about twenty-five in number, build wigwams and settle down to the work for about six

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z Mr J. Miers has proved that J. curitibensis, I. gigantea, I. ovali- f : va, I, Humboldtiana, and J, nigropunctata, besides several varieties of these Species, are in general use for preparing maté.

months. Their first operation is to prepare an open space, called a tatacua, about 6 feet square, in which the surface of the soil is beaten hard and smooth with mallets. The leafy branches of the maté are then cut down and placed on the tatacua, where they undergo a preliminary roasting from a fire kindled around it. An arch of poles, or of hurdles, is then erected above it, on which the maté is placed, a fire being lighted underneath. This part of the process demands some care, since by it the leaves have to be rendered brittle enough to be easily pulverized, and the aroma has to be developed, the necessary amount of heat being only learned by experience. After drying, the leaves are reduced to coarse powder in mortars formed of pits in

the earth well rammed. Maté so prepared is called caa gazu or yerva do polos, and is chiefly used in Brazil. In Paraguay and the province of Parana in the Argentine Republic, the leaves are deprived of the midrib before roasting ; this is called caa-miri. A very superior quality, or caa-cuys, is also prepared in Paraguay from the scarcely expanded buds. More recently a different method of dry- ing maté has been adopted, the leaves being heated in large cast iron pans set in brick work, in the same way that tea is dried in China; it is afterwards powdered by machinery.

The different methods of preparation influence to a certain extent the value of the product, the maté prepared in Paraguay being con- sidered the best, that of Oran and Paranagua very inferior. The leaves when dried are packed tightly in serons or oblong packages made of raw hides, which are then carefully sewed up. These shrink by exposure to the sun, and in a couple of days form compact parcels each containing about 200 tb of tea; in this form it keeps well. The tea is generally prepared for use in a small silver-mounted calabash, made of the fruit of Oreseentia Cujete (Cuca) or of Cucurbita lagenaria (Cabago), usually about the size of a large orange, the tapering end of the latter serving fora handle. In the top of the ealabash, or maté,? a circular hole about the size of a florin is made, and through this opening the tea is sucked by nieans of a bom- billa. This instrument consists of a small tube 6 or 7 inches long, formed either of metal or a reed, which has at one end a bulb made either of extremely fine basket-work or of metal perforated with minute holes, so as to prevent the particles of the tea leaves from being drawn up into the mouth. Some sugar and a little hot water are first placed in the gourd, the yerva is then added, and finally the vessel is filled to the brim with boiling water, or milk previously heated by a spirit lamp. A little burnt sugar or lemon juice is sometimes added instead of milk. The beverage is then handed round to the company, cach person being furnished with a bombilla. The leaves will bear steeping about three times. The infusion, if not drunk soon after it is made, rapidly turns black. Persons who are fond of maté drink it before every meal, and consume about 1 02. of the leaves per day. In the neighbourhood of Parana it is prepared and drunk like Chinese tea. Maté is generally considered disagree- able by those unaccustomed to it, having a somewhat bitter taste ; moreover, it is the custom to drink it so hot as to be unpleasant. But in the south-eastern republics it is a much-prized article of luxury, and is the first thing offered

to visitors. The gaucho of the plains will travel on horseback for weeks asking no better fare than dried beef washed down with copious draughts of maté, and for it he will forego any other luxury, such as sugar, rice, or biscuit. Maté acts as a restorative after great fatigue in the same manner as tea. Since it does not lose its flavour so quickly as tea by exposure to the air and damp, it is more valuable to travellers.

Some writers attribute deleterious effects to its use, while others praise it to an almost incredible degree. Its physiological action does not appear to have been carefully worked out, but its extensive use in countries where tea and coffee are known seems to indicate that it may possess virtues peculiar to itself. : :

Its properties appear to be chiefly due to theine or caffeine. Analysed by Dr H. Byasson, 100 grains were found to yield

Grains. Caffeine …....ccceessccssrsscecsscescescceenesreceaeccsecsooeieeesessaeest seater seeeeree 1:850 Glutinous substance or peculiar fatty matter and colouring matter 3°870 Complex glucoside …...cc0-csesecsessetsereeecesensenacen scenes anseseeneneeser ss 2°380 PSAGLIN cece cree ccc eaetesicele sie oeomaalson cle ilaninuls socasts «slsttaWje-vint salssiee=iissislrerieneiee@einei> ts 0°630 Inorganic salts, including i100 ….....cseccesserseerereeteceeeenerereeeenerees 3°920

Malic acid not estimated.

2 The word caa signified the plant in the native Indian language. The Spaniards gave it a similar name, yerba. Maté comes from the language of the Incas, and originally means a calabash. The Para- guay tea was called at first yerva do maté, and then, the yerva being dropped, the name maté came to signify the same thing.

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According to analyses made by Alonzo Robbins it also contains about 1°5 of a peeuliar tannin which does not precipitate potassio- tartrate of antimony, nor tan leather. The glutinous substance resembles in consistence

common birdlime, and is considered by Byasson to be a compound ether, the alcohol of which would be near cholesterin. Since the beginning of the 17th century maté has been drunk by all classes in Paraguay, and it is now used througli- out Brazil and the neighbouring countries. In 1855 the amount of maté annually consumed in South America was estimated by Von Bibra at 15,000,000 tb, and the consumption is now probably three or four times as great; in Brazil it brings in a revenue of about £410,000. In the Argentine Republic alone the consumption is not less than 27,000,000 Ib per annum, or about 13 fb per head, while the proportion of tea and coffee consumed is only about 2 tb of the former and } fb of the latter per head. The export of maté from Brazil to foreign countries has also increased from 2,720,475 kilos in 1840 to 5,206,485 kilos in 1850, 6,808,056 kilos in 1860, 9,507,086 kilos in 1870, and 14,063,731 kilos in 1879-80.

See Scully, Brazil, London, 1866; Manstield, Brazil, &c., London, 1856; Phar- maceutical Journal (3), vol. vii. p. 4; (8), vol. viii. p. 615, 1627; Christy, ew

Commercial Plants, No. 3, London, 1880; Mulhall, Progress of the World, 1880, p. 488 ; Zetischrift Oesterreichischer Apothekerverein, 1882, pp. 273, 285, 310,

MATERA, a city of Italy in the north-east of the province of Potenza, 48 miles from Potenza, on the high road to Bari. Part of it is built on a level plateau and part in deep valleys adjoining, the tops of the campaniles of the lower portions being on a level with the streets of the upper. The prin- cipal building is the co-cathedral of the archbishopric of Acerenza and Matera, formed in 1203 by the union of the two bishoprics, dating respectively from 300 and 398. In 1871 the population of the commune was 14,312 (that of the city 14,262), in 1881 15,700.

Under the Normans Matera, the ancient Mateola, was a count- ship for William Bras de Fer and his successors. It was the chief town of the Basilicata from 1664 till 1811, when the French trans- ferred the administration to Potenza.

MATHEMATICAL DRAWING AND MODELLING. The necessity for geometrical drawings and models is as old as geometry itself. The figure

has formed the basis of many a geontetrical truth; and demonstration by mere inspection of this has frequently to do service for more rigorous proof. So necessary is this visual representation of an idea that there is hardly a branch of mathematics which does not make use of it in the form of tables, symbols, formule, &c. The visual method is especially important in geometry. The figure is to the geometer what the numerical example is to the algebraist—on the one hand limiting the horizon, on the other imparting life to the con- ception. Herein lies the didactic value of the figure, which is the more indispensable the more elementary the stage of instruction. To be able to dispense with it is a faculty acquired only after along and special training. The power of mental picturing is a talent which can be so strengthened by use that even a slightly gifted mind may acquire the power of carrying out a series of geometrical operations without the aid of a figure, provided these do not lead into unfamiliar regions, But each new group of ideas which the geometer would master requires a new graphic setting forth, which not even the experienced can dispense with. Drawings are sufficient in plane geometry; but solid geometry requires models, except in specially simple cases, in which delineation by means of perspective or some conventional metliod may suffice. Then, again, in passing from the geometry of the plane, straight line, and point in space to that of curved surfaces, tortuous curves, &c., new and distinct graphical methods are necessary. The difficul- ties encountered in understanding new groups of geometrical forms are best removed by a careful study of a small number of characteristic models and drawings. As a means of education, the model is lively and suggestive, forming in this way a completing factor in the course of instruction. We remember the pleasure experienced when, after a discussion which has yielded a series of hardly reconcilable properties of one and the same geometrical figure, a model is exhibited which combined these pro-

perties in itself; or the striking manner in which a deformable model either of pasteboard or thread executes its transformations before the eye of the observer and scientific student. The study of the model raises new and unexpected questions, and can even do valuable Service in leading to new truths.

In the more elementary departments of plane 'and solid geometry and descriptive geometry, models are abundant and easily obtainable; but there are comparatively few collections of drawings and models for instruction in higher geometry. There are numerous drawings of algebraic and transcendental curves in the well-known treatises on analytical geometry of Cramer, Euler, Salmon in Frost's Curve Tracing, &c. ; but there is still a deficiency in systematic enumerations of the forms of curves and surfaces of a given order or class. In this connexion we may mention Pliicker's System der analytischen Geometrie (curves of the third order), and Beer's Znumeratio linearum IV. ordinis. A graphical representation of all the characteristics of the singular points of an algebraic curve of the fourth order is given in Zeuthen's Systemer af plane Kurver (1873). As regards tridimensional figuring, the oldest known models for instruction in the higher geometry are the thread models of skew surfaces constructed about the year 1800 under the direction of G. Monge for the Ecole Polytechnique in Paris. In 1830 Th, Olivier of Paris got the same executed in movable form. The great development in moderu times of certain branches especially of the higher geometry has given a new importance to such methods of graphical representation,

Amongst the larger collections we must mention the elegant series of complex surfaces, consisting of twenty- seven items, constructed by the celebrated J. Pliicker of Bonn. After Pliicker's death copies, not very satisfactory, were made from zinc casts. The collection of plaster and thread models published by Muret of Paris (now Delagrave), and intended for instruction in descriptive geometry, con- tains many architectural forms. The wire models of tortuous curves by Professor Wiener of Carlsruhe, and the thread- models of developable surfaces by Professor Bjorling of Lund, merit notice amongst others. Perhaps the largest and most extensive of the collections is that of L. Brill, bookseller in Darmstadt. These represent every depart- ment of the higher and applied mathematics. The cata- logue embraces some seventy numbers, with over a hundred plaster, thread, and metal models. Several series of this collection were prepared in the mathematical department of the technical college of Munich. In the preparation of these models, involving the development of a comparatively novel art, certain practical lessons were gained, especially in the working of plaster models, to which we may direct attention.

We assume that the preliminary designs are prepared with the aid of board, ruler, square, compasses, and such well-known instru- ments as are used by the draughtsman. : 4

The material to be employed, whether wire or thread, interlace pasteboard strips, or plaster, depends upon the special eer of each case, aud upon the purpose aimed at in the construction : the model. Two bundles of parallel disks of cardboard or metal- sheeting, inclined at an adjustable angle, may be used with ie tage in representing a series of different but mutually rae le surfaces, For ruled and developable surfaces the thread model Is to be recommended. The surface is enclosed in a cube, or oe, generally in a region of space bounded by plane walls. As t ee bounding walls are marked the series of points in which t i a cut by the generative lines that are to be represented by a a : Through these points the threads are drawn, and parts of t ee, porting walls are then cut away so as to allow a convenient & , into the interior of the region. The more densely the threa : : strung, the liker is the appearance to that of a continuous sur. ie 4

In the majority of cases plaster will be found the most os wd substance, being easily worked, and giving a result on if clear to the eye. There is the disadvantage, however, me a aa the regions of space bounded by a surface is filled up. Show

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poundaries of the surface be plane or capable of being turned on the lathe, the desired form is best approximated to by working wood or

Jaster blocks. Plaster is not easily worked on the lathe, but a fee surface is readily got by rubbing, and if not too dry it may be cut with the knife. .

‘A surface which cannot be convenicntly approximated to by the above method may be built up of strips cut to pattern, which are then filled in with some plastic material. To accomplish this, a system of sections either parallel or having a single axis is laid

through the region to be filled up ; the bounding lines of these scc- tions are calculated or obtained by geometrical construction. Strips of plate zine are

then cut to the required form and fixed securely by cross-pieces Or soldered if necessary. Betwecn the interstices of this zine seaffolding some plastic material is filled in, such as embossing wax or damp clay ; and thus the form of the surface is rendered. The substance known in trade as plastilin is especially suitable for use in this way, as it retains its plastic property a long time. The finishing touches are given to the surface by means of a sculptor's style. From the clay model a plaster cast is formed and well dried; and its imperfections are removed by means of plaster- files and other instruments familiar to those who work in plaster, Lines which are to be shown on the model are drawn through points already marked on the original clay model, and engraved with fine files, A galvanoplastic copy of such a plaster model, not too deeply deposited, shows the surface even better than the plaster itself.

MATHEMATICS. Any conception which is definitely and completely determined by means of a finite number of specifications, say by assigning a finite number of elements, is a mathematical conception. Mathematics has for its function to develop the consequences involved in the definition of a group of mathematical conceptions. Interdependence and mutual logical consistency among the members of the group are postulated, otherwise the group would either have to be treated as several distinct groups, or would lie beyond the sphere of mathematics.

Asan example of a mathematical conception we may take "a triangle"; regarded without reference tv its position in space, this is determined when three elements are specified, say its three sides; or we may take a "colour sensation," which, on Young's theory, is determined when the amounts of the three fundamental colour sensations that enter into it are stated. As an example of a non-mathematical con- ception we may take "a man," "a mineral," "iron," no one of which admits of being so determined by a finite number of specifications that all its properties can be truly said to be deducible from the definition.

A mathematical conception is, from its very nature, abstract; indeed its abstractness is usually of a higher order than the abstractness of the logician. Thus, for instance, we may neglect the other attributes of a body and consider merely its form ; we thus reach the abstract idea of " form."

But the form of an irregular fragment of stone does not admit of being finitely specified, and is therefore not susceptible of mathematical treatment. If, however, we have a carefully squared cubical block of granite to deal with, for most practical purposes its form is specified by stating that it is a cube, and assigning one element, viz., an edge of the abstract mathematical cube by which we replace it. This example illustrates at once the limits of mathematical reasoning and the nature of the bearing of mathematics on practice.

A variety of words have been used to denote the dependence of a mathematical conception upon its elements. It is frequently said, for instance, that the conception is a "function" of its elements. One word has recently come into use which is very convenient, inasmuch as it draws attention at once to the fundamental idea involved in mathematical conception and to the prime object of mathematical contemplation, viz., ' manifoldness."

_Number is involved in the notion of a manifoldness both directly, as any one can see, and also indirectly in a manner which the mind untrained to mathematical thinking does not so readily understand. Take on the one hand the case of a triangle considered without reference to its position

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but merely as composed of three limited straight lines, it may be completely determined in various ways by assigning three elements. A triangle may therefore be called a triple discrete manifoldness. A plane quadrilateral considered in the same way (being fully determined when four sides and a diagonal are known) is a quintuple discrete manifold- ness ; anda plane polygon of 7 sides a (2x — 3)-ple discrete manifoldness. Consider on the other hand the assemblage of points on a given straight line, they are infinite in number yet so related that any one of them is singled out by assigning its distance from an arbitrarily chosen fixed point on the line. Such an assemblage is called a onefold continuous manifoldness, or simply a onefold manifoldness ; another example of the same kind is the totality of instants in a period of time. The assemblage of points on a surface is a twofold manifoldness; the assemblage of points in tridimensional space is a

threefold manifoldness ; the values of a continous function of x arguments an n-fold manifoldness.

It should be observed that the distinction between discrete and continuous manifoldness is not of necessity inherent in the conception. For one purpose we may treat a conception as a discrete manifoldness, for another as a continuous manifoldness. Thus we have seen that an unlimited straight line may be treated as a onefold con- tinuous manifoldness ; but, if we regard it as a whole, and with reference to the fact that its position in space is determined by four data, it becomes a quadruple discrete manifoldness.

The primary, although not the only, operation in the treatment of a discrete manifoldness is numbering or counting; hence arises the pure mathematical science of number, comprehending (abstract) Arithmetic and its higher branch commonly called the Z'heory, of Numbers. Without entering into a discussion of the definitions and axioms of tlie science of number, it will be sufficient here to remark that all numerical operations are reducible to three fundamental laws commonly called the commutative, associative, and distributive laws. The four fundamental processes, or four species, as they are sometimes called, two of which, addition and multiplication, are direct, and two, subtraction and division, inverse, are solely defined by and derive their meaning from the three laws of operation just mentioned.

A careful consideration of the methods in vogue for dealing with continuous manifoldness shows that they reduce themselves to two, which may be called the synoptic method and the analytic method. In the synoptic method we deduce the properties of a manifoldness by contemplat- ing it as a whole, aiding our understanding, when it is necessary to do so, by a diagram, a model, or any other concrete device more or less refined according to circum- stances. In the analytic method we fix our attention upon the individual elements of the manifoldness, usually defining each element by a definite number of specifications the variation of which leads us from element to element of the given manifoldness. We examine the properties of an element in the most general manner, and from them we predicate the properties of the manifoldness as a whole.

The best and most familiar examples of the synoptic treatment of manifoldness are the different varieties of pure geometry. Among these we

may mention the apagogic geometry of the Greeks, which starts with a collection of definitions and axioms, enunciates and proves proposition after proposition with great attention to strict logical form and with continual reference to the grounds of inference, but pays little attention to the ordering of theorems with a view to mutual illustration, and carefully suppresses all traces of the method by which the propositions were or might have been discovercd. It is true that the Greeks

were in possession of a method, called by them analysis, which had for its object the discovery of geometrical truth. But this consisted merely in taking any proposition suspected to be true and tracing its consequences until one was reached which either contradicted a known proposition or else was true and capable of leading by a direct process of reasoning (synthesis) to the proposition in question. In this we have no trace of the systematic development of geometric truth, and the method was apparently regarded by the ancients themselves as imperfect, for it makes no figure in such of their systematic treatises as have reached us. In somewhat sharp contrast with the Grecian geometry, but still essentially synoptic in method, stand the different varieties of modern geometry,—which aims at greater generality in its definitions, pays less explicit attention to logical form, but arranges geometrical propositions as much as possible in the natural order of development or dis- covery, and above all makes extensive use of the principle of continuity. As examples of the modern geometry may be cited the descriptive geometry (Géométrie Descriptive, Darstellende Geometric) of Monge; the projective geometry (Géométrie Projective, Geometrie der Lage) of Poncelet, Steiner, and Von Staudt; and the geometry of transforma- tion in general, of which projective geometry is but a parti- cular case. There is one other highly interesting form of modern geometry, which, although analytic in some of its developments, and often exhibited in close alliance with other analytical methods, is nevertheless synoptic as to its fundamental principle, viz., arithmic geometry (Abzdhlende Geometrie) or theory of characteristics, which originated in the characteristic equations of Pliicker, and was developed into a powerful special method by Chasles and others. See GEOMETRY and CURVE.

Geometry, however, is not the only field for the synoptic treatment of manifoldness. This is obvious if we reflect that any magnitude whatever may be represented by a line; so that any function of not more than two elements may be represented by a geometrical construction and treated by any method applicable in geometry. Since the famous dissertation of Riemann, On the Hypotheses that form the Basis of Geometry, mathematicians have been familiar with the fact that the methods of geometry suitably generalized can be applied to the treatment of an x-fold manifoldness; and in point of fact the synoptic treatment of manifoldness under the name of n-dimensional geometry has been usefully employed by Cayley and others as an adjunct to the analytic method.

The fundamental characteristic of the analytical treatment of an n-fold manifoldness is the specification of an element by means of 2 continuously varying quantities or variables (see MEASUREMENT). For dealing with continuous as distinguished from discrete quantity we have the special analytical method of the Inrin1rEsIMAL CaLcuuus (q.v.), built upon the notion of a limit, with its various branches, viz., the differential calculus, the integral calculus includ- ing differential equations, the calculus of functions, and the theory of functions in general (see Function). But, whether we make use of the algorithm of the infinitesimal calculus or not, we find upon examination that all ana- lytical operations with continuous quantity fall under the three laws of commutation, association, and distribution, so that they are fundamentally identical with the opera- tions with discrete quantity; the difference so far as there is any consists simply in the greater generality of the operand. The same fact may be looked at instructively in another light. Whether we consider analytical processes in concrete applications or look at them abstractly, we are equally led to the notion of a unit, by the multiplication or subdivision of which all the other quantities that enter into our calculus are derived. The exigencies of continuity are

met by allowing that the multiplication or subdivision of the unit can be carried on to an unlimited extent 3 but in any case where analytical formule have to be reduced to arithmetical calculation (in which of course only a

finite number of figures or arithmetical symbols can be used) the subdivision (or multiplication) of the unit actually stops short at a certain point ; in other words, all our methods are in practice at least, discrete. Here therefore we have the meeting point of discrete and continuous quantity, and on this ground alone we might infer the fundamental identity of their laws of operation.

The abstract science of quantity which we have just seen to be the essential part of the analytic treatment of manifoldness receives the name of ALGEBRA (q.2.). It was found very early in the history of that science that the full development of which it is capable could not be attained without great extension of the idea of quantity. This necessity first arose in connexion with the inverse operations, such as subtraction, the extraction of roots, and the numerical solution of algebraical equations (see Equa-TION), of which root extraction is merely a particular case. In this way arose essentially negative quantities, and the so-called impossible or imaginary quantities. The former may be said to depend on a new abstract unit — 1, and the latter upon new units +~/—]. The numbers having +1 for abstract unit are usually classed as real numbers, and in that case we may regard the ordinary imaginaries of algebra as depending on the new unit +~/—1, or «, defined by the equation .2+1=0. Butthe extension was soon carried farther by the classical researches of Hamilton and Grassmann.1 The theory of sets and the QuUATERNIONS (g.v.) of the former and the Ausdehnungslehre of the latter opened up a boundless field for algebra, and led to a total revolution in our ideas of quantity.

In view of the great extension thus effected in the meaning of quantity, it becomes an interesting if somewhat difficult undertaking to define the word. The following may be taken as a provisional definition :—Quantity as that which is operated with according to fixed mutually consistent laws. Both operator and operand must derive their mean- ing from the laws of operation. In the case of ordinary algebra these are the three laws already indicated, in the algebra of quaternions the same save the law of commuta-tion for multiplication and division, and so on, It may be questioned whether this definition is sufficient, and it may be objected that it is vague; but the reader will do well to reflect that any definition must include the linear algebras of Peirce, the algebras of logic, and others that may be

easily imagined, although they have not yet been developed. This general definition of quantity enables us to see how operators may be treated as quantities, and thus to understand the rationale of the so-called symbolical methods. In combining operations, it is often observed that the combinations of operators fall under a few simple laws, in some cases in fact under the three laws of ordinary algebra; these operators are therefore quantities according to the general definition, and can be treated as such. ;

From the historical development of the analytic metho there is little danger of the error arising that its application is peculiar to any special kind of mene 4 examples of its use in deducing the properties of tri ae. sional space we may cite the Cartesian geometry, f Géométrie de Position of Carnot, and the line eon Pliicker (see Geometry). Its use in the various he a of applied mathematics, of which geometry 1s mere y . of the simplest, is far more common than that 0

1 In this connexion should be mentioned the great service' a 3 Morgan, whose bold speculations on the fundamental eee ee mathematical science have perhaps met with less than their du of appreciation.

synoptic method, although most branches of applied mathe- matics are mixtures using the one or the other, as happens to be convenient. In addition to those already mentioned, we may enumerate the following as among the more im- portant departments of applied mathematics :— Kine- matics ; Abstract Dynamics, including Statics and Kinetics whether of a Particle, of a Rigid Solid, of an Elastic Solid, of a Fluid, or of a Chain; Statistical Mathematics, as exemplified in the Theory of Annuities, and the Kinetic Theory of Gases ; the Mathematical Theory of Diffusion whether of Heat or of Matter; the Theory of Potential ; and soon. See Mrcuanics, HyproMEcHANICS, ANNUI- oes, Heat, Evecrriciry, Macnerism, &c. ;

The two great methods employed in the investigation of manifoldness must of course be, at bottom, identical ; and every conclusion arrived at by the one must he reach- able by the other. The exact nature of the connexion between them will be well seen by studying two instances. One of these is the treatment of areas by Euclid and the treatment by the analytical method,

which are carefully compared in the article Gromerry, vol. x. p. 379. The other is the connexion between the descriptive and the metrical properties of loci. The former include all pro- perties such as intersection, tangency, &c., depending on position merely, and are obviously the natural product of the synoptic method. The latter include all relations involving the lengths of lines and the magnitudes of angles, they depend therefore on expression in terms of a unit, and are the natural product of the analytic method. Never- theless the analytic method furnishes descriptive properties of loci, and by the introduction of "the absolute" descriptive theorems are made to furnish metrical relations, as has been fully shown by Cayley, Clifford, and Klein (see MEASUREMENT). (G. CH.)

MATHER, Cotton (1663-1728), was the most learned and widely known of a family which through four genera- tions enjoyed singular consideration, and exercised com- manding influence upon New England in its first century. Richard, son of Thomas Mather of Lowton (Winwick), Lancashire, England, after studying for a time at Brasenose, Oxford, and teaching and subsequently preaching at Toxteth Park, went to New England, for nonconformity's sake, in the summer of 1635, where, till his death in 1669, at seventy-three, he was pastor of the Congregational church in Dorchester (now a part of Boston),—acquiring large repute, writing three or four instructive and construc- tive treatises upon polity, and being much trusted as to the foundations of both church and state. His youngest son Increase took his first degree at Harvard College in 1656, at seventeen,—returning, after a visit to the old country, in which he served several pulpits, to take at twenty-five the pastorate of the second (or North) church in Boston, which place he held till his death in 1723 at eighty-five, while, in addition, he had been acting, or actual, president of the college most of the time from 1681 to 1701, the author of one hundred and sixty books or tracts, and for four of its most perilous years the choice of all its citizens to represent the Massachusetts colony before the English Government. His wife Maria was daughter of the famous John Cotton, and their first-born received both family names, and when he took his B.A. degree at less than sixteen, at Harvard, in 1678, his promise tempted President Oakes to say in his presence, referring to his two distinguished grandfathers: '"'Cottonus atque Matherus tam re quam nomine coalescant et reviviscant." After a short time spent as tutor, and a period of diligent toil end- mg in the

conquest of an impediment of speech which endangered success in the family profession, he became assistant to his father, in two years being ordained co- Pastor, and holding the pulpit for nearly three and forty

| years, till his death at sixty-five.

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As a private Christian, from his frank diaries, it is clear that he laboured much with himself, in a single year devoting more than sixty days to fasting and twenty nights to vigil. Asa preacher he was conscientious and successful,—always diligently study- ing his discourses, in one year delivering more than seventy public sermons, with nearly half as many in private houses, sometimes thus "pressing a glorious Christ" through eleven successive days, and, with six competitors by his side, maintaining to the last his hold upon the largest congregation in New England, having about four hundred gifted communicants. As a pastor he was exceptionally laborious, —systematically exhorting and praying with his people at their homes, making conscience of spiritualizing every casual interview, and now and then spending days upon his knees with the names of his flock before him to prompt his intercessions for them, and for himself that he might better reach their peculiar need. As a philan- thropist, while abundant in personal benefactions, he origin- ated more than twenty societies for public charity, bore the cost of a school for Christianizing the negroes, and, at the risk of life, in the face of popular opposition medically led, advocated and vindicated the introduction of inocula- tion as a protection against the then terrible ravages of the small-pox. As an author he was learned—publishing in French, Spanish, and Algonkin as well as English—and voluminous, three hundred and eighty-two of his printed works having been catalogued, several of which are elaborate books, and one a folio of 800 pages; while his Biblia Americana, by him considered the great work of his life, remains in six huge volumes of mauuscript to this day. As a scholar he was better known across the sea than any other American of his time, once contemporaneously corresponding with more than fifty learned Europeans, in his forty-seventh year being made doctor of divinity at Glasgow, and receiving election asa Fellow of the Royal Society—in those days eminent distinctions for a colonist. With all this it must be confessed that he had

some grave defects. His common sense was not uniformly equal to his need. Always ambitious and self-opinioned, he was occasionally irritable and conceited. He lacked good taste, and it was his unconcealed grief that he was never elected to preside over Harvard College. His enormous knowledge did not digest well, and his use of learning tended to be crude. He was superstitious, and it was his misfortune that, as to witchcraft, he was not, as with vaccination, in advance of his generation, any more than such men as Richard Baxter and Sir Matthew Hale. Of his works, the Afagnalia and Ratio Discipline are indispensable to the student of New England history.

MATHEW, Tueopatp (1790-1856), popularly known as Father Mathew, the 'Apostle of Temperance," was descended from an illegitimate branch of the Llandaff family, and was born at Thomastown, Tipperary, on October 10, 1790. He received his school education at Kilkenny, whence he passed for a short time to Maynooth ; from 1808 to 1814 he studied at Dublin, where in the latter year he was ordained to the priesthood. Having entered the Capuchin order, he, after a brief time of service at Kilkenny, joined the mission in Cork, which was the scene of his religious and benevolent labours for many years. The movement with which his name is most intimately associated began in 1838 with the establishment of a total abstinence association, which in less than nine months, thanks to his moral influence and eloquence, enrolled no fewer than 150,000 names. It rapidly spread to Limerick and elsewhere, and some idea of its popularity may be formed from the fact that at Nenagh 20,000 persons are said to have taken the pledge in one day, 100,000 at Galway in two days, and 70,000 in Dublin in five days.

In 1844 he visited Liverpool, Manchester, and London with almost equal success. Meanwhile the expenses of his enterprise had involved him in heavy liabilities, and led on one occasion to his arrest for debt; from this embarrassment he was only partially relieved by a pension of £300 granted by the queen in 1847. In 1849 he paid a visit to the United States, returning in 1851. He died at Queenstown on December 8, 1856. See Sather Mathew, a Biography, by J. F. Maguire, M.P. (1863). MATHEWS, Cuartes (1776-

1835), comedian, was born in London, 28th June 1776. His father was what he called 'Ca serious bookseller," and also officiated as minister in one of Lady Huntingdon's chapels. Mathews was educated at Merchant Taylors' School. His love for the stage was formed in his boyhood, partly from admiration of Elliston, with whom he had taken part in private theatricals. According to his own statement, it ripened into an " over- powering, all-absorbing passion," unfitting him for business when he became apprentice to his father, who at length, in 1794, unwillingly permitted him to enter on a theatrical engagement in Dublin. For several years Mathews had not only to content himself with the most thankless parts at an almost nominal salary, but his figure, at this period of life thin and ungainly, and the peculiar twist in his countenance generally awakened the unconcealed ridicule of the audience. In 1798 he obtained a conditional engagement from Tate Wilkinson at York. In 1802 Mathews began to play in London at the Haymarket, and from this time his professional career was an un-interrupted triumph. His special excellence as an actor consisted in his wonderful gift of mimicry, enabling him to grasp the minutest and most individual features of the character he represented. His sense of the purely ludicrous in all its varied phases was perliaps unequalled, and by his marvellous command of facial expression and of different tones and accents of voice he could, when he so willed, completely disguise his personality without even the smallest change of dress. The versatility and origin- ality of his powers were, in public, best seen in his "At Homes," begun in the Lyceum Theatre in 1818, " which," according to Leigh Hunt, "for the richness and variety of his humour, were as good as half a dozen plays distilled." But it was in the social circle that he displayed the finest and rarest traits of genius, while his simple and truly kind-hearted disposition won him an affection and esteem which mere genius could not have purchased. From his infancy the health of Mathews had been uncertain, and the toils of his profession gradually undermined it. He died at Plymouth, of heart disease, 28th June 1835. See Memoirs, by Mrs Mathews, 4 vols., 1838-39. MATHEWS, Cuaries James (1803-1878), comedian, son of the above, was born at Liverpool, 26th December 1803. After attending Merchant Taylors' School he was articled as pupil to an architect, and he continued nominally to follow this business till 1835. His first appearance on the stage was made at the Adelphi, London. In 1838 he married Madame Vestris, then lessee of the Olympic, but neither his management of this

theatre, nor subsequently of Covent Garden, nor of the Lyceum, resulted in pecuniary advantage. As an actor, however, he held from the first an unrivalled place in his peculiar vein of light eccentric comedy. The inimitable easy grace of his manner, and the imperturbable solemnity with which he perpetrated his absurdities, never failed to charm and amuse; his humour was never broad, but always measured and restrained. His range of characters was exceptionally narrow, and he was wholly incapable of representing any form of strong passion. It was as the leading character in such plays as the Game of Speculation, My Awful Dad, Cool as a Cucumber, Patter versus Clatter, and Little

Toodlekins, that he specially excelled. Mathews was one of the few English actors who have played in French successfully—his appearance at Paris in 1863 in a French version of Cool as a Cucumber, written by himself, being received with the utmost approbation. After reaching his sixty-sixth year, Mathews set out on a tour round the world, and on his return in 1872 he continued to prosecute his professional duties without interruption till within a few weeks of his death, on July 26,1878. See Life of Charles James Mathews, edited by Charles Dickens, 2 vols., 1879,

MATILDA, countess of Tuscany (1046-1114), popu- larly known as the Great Countess, was born in 1046 of a race of nobles of Lombard descent. By the dea of her father Boniface the Rich, duke and marquis of Tuscany, she was left, at eight years old, under the guardianship of her mother, Beatrice of Lorraine, heiress to a powerful state, including Tuscany, Liguria, part of Lombardy, Modena, and Ferrara. Her life was a pro- tracted struggle against the schism which rent the church, under a series of antipopes, supported by a large section of the clergy and people of Italy and Germany, as well as by the whole strength of the empire. Against this formidable combination she maintained the cause of the holy see, often single-handed, for years, with varying fortune but undaunted resolution. The champion of several successive pontiffs, she is best known as the ally of Gregory VII., and her hereditary fief of Canossa was, in 1077, the scene of the celebrated penance of Henry IV. in presence of this pope. On the same occasion she made the donation, subsequently renewed in 1102, of her

possessions to the holy see, in right of which the church owned the greater part of its temporal dominions. Matilda was twice married, first to Godfrey of Lorraine, surnamed the Humpbacked, son of her mother's second husband, and secondly to Guelph of Bavaria,—both marriages of policy, which counted for little in her life. She died of gout in 1114, in her sixty-ninth year, and was buried first at San Benedetto, and finally.in the Vatican. Her steadfastness of purpose, strength of character, and loftiness of aim, made her one of the most striking figures even of the age which produced Robert Guiscard, William the Conqueror, Pope Hildebrand, and Godfrey of Bouillon, her nephew by marriage. The contemporary record of her life in rude Latin verse, by her chaplain Donnizone, is preserved in the Vatican Library.

An Italian biography was 'published in Lucea by Francesco Fiorentini in 1642 (new edition by Mansi, 1756), and one in French by Amédée Renée, La Grande Italienne, in 1859.

MATLOCK, a town of Derbyshire, England, is situated on the river Derwent and on the Midland Railway, 149 miles north-west of London and 17 north-west of Derby. It possesses cotton, corn, and paper mills, and in the vicinity there are lead-mines. Abont 14 miles south-east, also on the Derwent, is Matlock Bath, possessing hot medicinal springs. There are in all three springs, the first of which was discovered in 1692. Their mean temperature is 68° Fahr., and applied both externally and internally the water is efficacious in glandular affections, rheumatism, biliary obstructions, and relaxation of the muscular fibres. The fine scenery of the vale of Matlock, and its proximity to the thickly peopled districts of Lancashire and Yorkshire, cause the village to be much frequented in summer not only by invalids but by holiday visitors. There are several large stalactite caverns. Matlock Bank, a mile to the north-east, in a finely sheltered situation, contains several well-known hydropathic establishments. 'The population of the urban sanitary district of Matlock (4513 acres) in 1871 was 3834, and a 1881] it was 4396 ; that of Matlock Bath and Scarthin Nic in the same years was 1386 and 1698. These two districts are conterminous with the civil parish of Matlock.

MATSYS, Quintin. See Massys.

MATTER, Propertizs or. If we knew thoroughly the nature of any piece of matter, the deduction of its proper- ties would be a question of mere reasoning, just as (for instance) the definition of a circle really involves all the properties which mathematical methods have deduced from it, But, as we do not even know what matter is, in the abstract, the converse operation is (at least for the present) the natural and necessary one. We must endeavour from the experimentally ascertained properties of matter to dis- cover what it is. The reader will find the limits of our present knowledge in the article Atom. The properties of natter may be arranged in several classes, thus :—

1. Properties of matter in itself; such as Inertia, Hard- ness, Brittleness, ELASTICITY (g.v.), Density, Compressibility, Viscosity, &c. These depend upon its ultimate structure and upon the law and intensity of the so-called molecular forces, See Atom, ConsTiTuTION or Boprgs, ATTRACTION,

2, Relative properties of different kinds of matter, chemical, catalytic, &c. See Caprmuary Action, CHEM- IsTRY, DiFFUSION, &c.

3. Properties relative to different forms of energy :— Conductivity (Thermal and Electric), Specific Gravity, Specific and Latent Heat, Transparency, Colour, Specific Inductive Capacity, Radiating and Absorbing Power, Mag- netic Retentiveness, &c., Thermo-electric Position, Refrac- tive Index, Reflective Power, Double Refraction, Rotatory Polarization, &c. These will be found mainly under the heads Execrriciry, Heat, Licut, Macnerism, é&c.

MATTEUCCI, Carto (1811-1868), an Ltalian physicist, was born at Forli, June 20, 1811. In 1832, after com- pleting his studies at L'Ecole Polytechnique, Paris, he became professor of physics at Bologna, where he had passed his earlier student days. In 1837 he removed to Ravenna, and in 1840 settled as professor of physics at Pisa. From 1847 he took an active part in politics, and in 1860 was chosen an Italian senator. At the same time he became general telegraph director, and later the superintendent of the meteorological bureaus, He died at Leghorn, June

23, 1868.

He is the author of four scientific treatises :—Leziont di Jistea (2 vols., Pisa, 1841 ; second edition 1851), Leziont sui Senomeni fisico- chimict dei corpi viventi (Pisa, 1844; second edition 1846), Manuale M telegrafia clettrica (Pisa, 1850; and several later editions), and Cours special sur induction, le magnetisme de rotation, &c. (Paris, 1854). His numerous papers were published in the Annales de Chimic et de Physique (1829-58) ; and most of them also appeared at the time in the Italian scientific journals. They relate almost en- tirely to electrical phenomena, such as the magnetic rotation of light, the action of gas batteries, the effects of torsion on magnetism, the polarization of electrodes, &c., sufficiently complete accounts of which are given in Wiedemann's Galvanismus. Nine memoirs, entitled ' Electro-Physiological Researches," were published in the*

Philosophical Lransactions, 1845-60. See Bianchi's Carlo Mat- leucet c T Italia del suo tempo (Rome, 1874).

MATTHEW (Ma6Gatos or MarOaios, t.e., 'AD, a short- ened form of Mattaniah or Mattithiah, equivalent to Theodorus ; comp. vol, xi. p. 370), one of the twelve apostles of Jesus Christ, and, according to tradition, the author of the First Gospel. In its full Hebrew form the name occurs several times in the Old Testament, being borne by more than one person of priestly or Levitical family. Matthew, in the Gospel which bears his name, is described as having been a tax gatherer (reAdvys, Matt. x. 3), and the circumstances of his call to become a follower of Jesus, which he received as he sat at the "receipt of custom" or " tax office" in one of the towns by the Sea of Galilee, are briefly related in chap. ix. 9. It has some- times been doubted, but without any good reason, whether the Precisely parallel narrative relating to " Levi the son . Alpheus" (Mark. ii, 14; Luke v. 27, 28) has reference P. the same person (compare the double names Simon and

ter, Joses and Barnabas, and others). In the lists of

the names of the apostles given in the synoptical Gospels and in the Acts, Matthew ranks third or fourth in the second groupof four. Little is recorded of him except the feast which he gave in his house at the beginning of his discipleship ; the way in which this is related seems to indicate that he was

(comparatively at least) a wealthy man. He was also present in "the upper room" at Jerusalem after the ascension, when Matthias was elected to be the successor of Judas, Tradition has nothing trustworthy to tell about his subsequent career, but there is nothing inherently improbable in the allegation of Eusebius (ZZ, #., iii, 24) that he spent several years in Jerusalem preaching to the Hebrews (and writing the Gospel which — bears his name), or that he afterwards extended his missionary activities in other directions. Socrates (GE. i, 19) speaks of him as having carried the gospel to Ethiopia; the earlier legends, however, embodied in the apocryphal Acta Andrez et Matthxi and Acta et Martyr- ium Matthxi, unanimously point to the regions bordering on the Black Sea (Pontus" and the land of the Anthro- pophagi) as having been the scene of his labours (see the article of Lipsius on the "Apocryphal Acts of the Apostles" in Smith's Dict. of Christ. Biog.; also his Apokr, Apostelgesch., 1883). According to the Gnostic Heracleon, whose statement is quoted and apparently homologated by Clement of Alexandria (Strom. iv. 9), Matthew died a natural death. He is commemorated as*

a martyr by the Greek Church on November 16, and by

the Roman on September 21, the scene of his martyrdom being placed by the Breviary in "Ethiopia"; the same authority affirms that his body was afterwards translated to Salerno, where it now lies in the church built by Robert Guiscard. In Christian art (following Jerome) he is generally regarded as symbolized by the "man" in Ezek, i. 10, Rev. iv. 7.

MATTHEW, Gospet or. Sq. MATTHEW or Panis, one of our most important writers in connexion with English medisval history, was born about the year 1200, or possibly somewhat earlier. His surname was probably derived either from his having been born in Paris or having studied in the university there ; but his English origin is proved by the tone in which he uniformly speaks of foreigners, especially the French, while his knowledge of the French language is attested by the fact of his having written in that language, and also by the introduction of many French words in his Latin writ- ings.

We have it on his own authority, as recorded in an autograph marginal note (MS. Cott., Nero, D. 1, fol. 1656), that he assumed the monastic habit at the

abbey of St Alban's on the 21st of January 1217. In 1236 he accompanied the newly-elected prior of his abbey, John of Hertford, to London, to attend the ceremony of the nuptials of Henry IIT. and Eleanor of Provence ; and in October 1247 he was at Westminster, in order to be present at the celebration of the feast of St Edward the Confessor, when he was desired by the king himself to write an account of the proceedings. The most important event in his tranquil and uneventful life (which was passed chiefly within the walls of his monastery) occurred in the year 1248, when he was sent on a mission to the Benedic- tine monastery of Holm (Throndhjem), which had become involved in difficulties owing to the maladministration of one of its abbots. He returned to England after more than a year's absence, and we can trace him as attending the royal court at Winchester in July 1251, and as present at York on the occasion of the marriage of Henry's daughter with Alexander II. of Scotland, some six months later. In March 1257 Henry himself visited St Alban's, and

See GOospe.s, vol. x. p. 789

remained at the monastery for a whole week. During MATTHIAS (1557-1619), holy Roman emperor, the this time he not only admitted Matthew to his table and | fourth son of the emperor Maximilian IL, was born on the to conversations in his private chamber, but also communi- | 24th of February 1557. He was educated in Germany by cated to him facts and details of an historical character | the diplomatist Busbecq, while his brother, afterwards the derived from his own personal knowledge and experience. | emperor Rudolph II, was trained at the court of Philip II. Among other information, Matthew tells us that Henry | of Spain. In 1577 Matthias went secretly to the Nether. repeated to him from memory the titles of the English | lands, tlie sovereignty of which he unlawfully assumed – baronies to the number of two hundred and fifty. The | but in 1580 he was compelled to withdraw into private last incident recorded by the historian himself with respect | life. He was vain, restless, and ambitious, and intrigued to his own career is the fact that he exerted his influence | incessantly against the emperor Rudolph, a man of weal with Henry on behalf of the university of Oxford, when |

character, with a constitutional tendency to insanity, that body found its privileges endangered by the encroach- | Rudolph passed wholly under the dominion vf the Jesuits ments of the bishop of Lincoln. In his latter years, | and this rendered it easy for Matthias to stir up fis Matthew's growiug infirmities compelled him to have | Protestant subjects against him. In 1595 Matthias was recourse to the aid of a fellow-monk in order to complete | made regent in Austria, and in 1606 the archdukes recog- his works; this assistance is to be traced in the Historia | nized him as head of the house of Hapsburg. Rudolph had Anglorum from 1252 to the end of the work (1253) ; in | to relax his hold over one country after another, and in the Abbreviatio Chronicorum for the years 1253, 1254, | 1611 Matthias was ruler of Hungary, Moravia, Silesia, and 1255; andin the Chronica Majora for the years 1258 Lusatia, and even Bohemia, whose loyalty the emperor and 1259. Matthew died after the month of May 1259, | had tried to secure by many concessions, especially by the and his portrait, as he lay on his couch when dead, was letter of majesty granting religious freedom to Protestant drawn by his fellow-monk. ~ sects. In 1612, after the death of Rudolph, Matthias was

Works.—Matthew Paris's chief work, the Historia Major,—often elected > and his reign was not less disturbed than styled the Chronica Majora,—is a narrative professing to record the that of his predecessor. 'The intervention of Turkey in outlines of human history from the creation, and terminating with | Transylvania led to war, and in 1615 Matthias, being

the year 1259. It was long supposed that Roger of Wendover was ' : , the author of a much larger proportion of the work than was really unsupported by the empire and by his own estates, found

the case ; but the question may be regarded as finally set at rest that he had aro alternative but to conclude peace for twenty by the decisive investigations and conclusions of Dr Luard, as | years on humiliating terms. Protestants and Catholics, stated at length in his prefaces to the volumes of his edition of | bitterly hating each other, formed respectively the Union

the work in the Rolls Series. He concludes that the Historia Major h – and the risi down to the year 1189 was the work of John de Cella, abbot of St cin tae aie hoa e rising power oa

Alban's from the year 1195 to 1214; that it was then continued by Ferdinand, afterwards pa = bigoted prince who Roger of Wendover on the same plan and from the same sources to became king of Bohemia in 1617 and king of Hungary in the year 1235, the whole work down to this date passing for a long | 1618, indicated that even more serious troubles were time as the production of the latter writer exclusively, and being approaching than those with which Rudolph had contended. known as the Flores Historiarum ; that it was then transcribed by , – . Matthew Paris, who, however, made numerous corrections and In the last two y iia of the reign of Matthias, the additions, bnt, in the opinion of Professor Stubbs, "interpreted" Bohemians having rebelled, the first blows in the Thirty rather than 'interpolated'; that it was then continued by the | Years' War were struck. He died on the 20th of March same writer, and is, from 1235 to the year 1259, exclusively his | 1619, '

work. In style, in vividness of narration, and in descriptive power : ' Matthew far excels his two predecessors. "He is algo entitled to the MATTHIAS CORVINUS (1443-1490) 2 king of _. praise of having been a warm advocate of English rights and liber- | S2FY, Was born at Klausenburg m Transy lvania on Mare ties, and a sturdy opponent alike of regal and papal tyranny; in | 27, 1443, and died at Vienna on April 6, 1490. He was fact, the national sentiment may be said first to receive adequate | the younger son of John Hunyady (Corvinus) who died in

expression in his pages. The work, moreover, is not only the best : " " 46 source of information with respect to events in England during the 1456 after having been " governor of Hungary" from 14

reign of Henry III. down to the commencement of the Barons' to 1453. On the death of John, the elder of his two sons Wars, but is also an authority with respect to Continental affairs, | (Ladislaus) was executed by cominand of Ladislaus Post-

especially those of France and the empire. humus, while Matthias was imprisoned at Prague; but

The Historia Anglorum of Matthew is mainly an abridgment of Gee, : : in 1457 his larger work,—the chief feature of difference being the omission

shortly after the king's own death without issue in 1497,

of almost everything relating to foreign events. Sometimes, how- Matthias Hunyady (Corvinus) was elected by the Hungarian ever, details and more particularly personal anecdotes are introduced, | magnates to the vacant throne (January 24, 1458), The with many ee facts ok ae which would be sought leading events of his reign are summarized in the article for in vain elsewhere, and largely illustrate contemporary usages ue and the general condition of society: Besides the above, Matthew Hunaary (vol. xii, p. a pe) braced many coarse wrote an Abbreviatio Chronicorum, extending from the year 1100 to MATTIN G. Under this name are em race ny 4 1255. Of this only one manuscript exists,—that in the author's | woven or plaited fibrous materials used for covering Hoors own handwriting, preserved in the Cottonian collection in the | or furniture, for hanging as screens, for wrapping Up British Museum, and printed in the third voluine of the Historia heavy merchandise, and for other miscellaneous purposes. Anglorum, edited by Sir Francis Madden. Matthew also compiled h ted Ki ¥ dévaae of "coir" matting a Liber Additamentorum or Supplementorum, containing documents In the United Kingdom, under the name : aeetron illustrative of the Greater Chronicle. This is contained in the folio | @ large amount of a coarse kind of carpet 1s made IP F edition of Matthew's writings edited by Wats, and published in | cocoa-nut fibre; and the same material, as well as =i ; 1640. i i and rushes, is largely The Vitex viginti trium Abbatum S. Albani, or Lives of the i a Bani Me | mee door siftits: Per- Abbots of St Alban's, does not bear Matthew's name, but is unques- employed In various forms re aha – is also largely tionably the production of his pen. The biographies which belong forated and otherwise prepared india-rubber 18 2 kinds to the period preceding ae Norman Conquest contain valuable and | utilized for door and floor mats. Matting . ee 7 interesting notices, but also include much of what is evident] : : hroughout India tor fabulous. The Vitex duorum Offarwm, or Lives of the two Ofias,—- lle emtcasivaly empleyet : FE 2 d fly-flaps, &c.; ; Si coverings, the bottoms of bedsteads, fans and ly ap» ©™ the one a mythical character, the other the historic monarch of gente pa h manufactures is Mercia, —is a composition of little value, and some doubt attachesto | and a considerable export trade in such manula akehibe ie pulleershig, Both the foregoing, however, are included in the | carried on. The materials used are ae get

edition by Wats. inci re straw, the bulrushes 4 ype é A Editions. —The best edition of the Historia Major is that by Dr panes se hi i ie a es of the date palm (Phoenvr Luard, published in five volumes in the Rolls Series, 1872-80. Of tena a +8 enya uf ig Ritchiana), the Historia Minor an edition in three volumes in the same series | sylvestris), of the dwarf. palm (Chamezrops

was edited by Sir Frederic Madden, 1866-69. (J. B. M.) of the Palmyra palm (Borassus flabelliformis), of the cocoa

nut palm (Cocos nucifera), and of the screw pine (Pandanus odoratissumus), the munja or mun) grass (Saccharum Munja) and allied grasses, and the mat grasses Cyperus textilis and C. Pangoret, from the last of which the well-known Palghat mats of the Madras Presidency are made. Many of these Indian grass mats are admirable examples of elegant design, and the colours in which they are woven are rich, harmonious, and effective in the highest degree. Vast quantities of coarse matting used for packing furniture, heavy and coarse goods, and plants, &c., are made in Russia fromthe bast or inner bark of the limetree. This industry centres in the great forest governments of Viatka, Nijni- Novgorod, Kostroma, Kazan, Perm, and Simbirsk.

MATTOON, a city of the United States, in Coles county, Illinois, 172 miles south-south-west of Chicago, on the Central Illinois Railroad, which at that point intersects the Indianapolis and St Louis and the Peoria, Decatur, and Evansville Railroads. It had 5742 inhabitants in 1880, has railway carriage works and repair shops, and is rising rapidly in commercial importance.

MATURIN, Cuartes Ropert (1782-1824), novelist and dramatist, perplexed the serious and served as a butt for the more light-minded critics of the first quarter of the 19th century. The bombastic extravagance of his language, the incoherence of his plots, the wild improbability of many of his incidents, the inconsistency of his characters, were obvious and undeniable; but there were so many passages of extraordinary eloquence in his novels, especially in his descriptions of turbulent passion, that, though some pro- nounced him evidently mad, all admitted that it was a madness allied to genius. At

first he published only sermons in his own name, being curate of St Peter's, Dublin. His first novels, The Fatal Revenge (1804), The Wild Irish Boy (1808), The Milesian Chief (1811), were issued under the pseudonym of Deunis Jasper Murphy. All these were mercilessly ridiculed by the press and neglected by the public, but the irregular power displayed in them attracted the notice of some social and literary magnates; and through the influence of Byron and Scott Maturin's tragedy of Bertram was produced at Drury Lane in 1816, with a prologue by Hobhouse, an epilogue by the Hon. George Lamb, and with Kean and Miss Kelly in the leading parts. The magnificent scenic situations, and the character of Bertram (like one of Byron's sombre heroes), make this an effective stage play. It was the first and only success of the author; he returned to "the baffled efforts and the blighted hopes" of which Hobhouse speaks in his prologue. Two more tragedies, Manuel (1817) and Fredolpho (1819), were failures. A poem, Zhe Universe (1821), fell flat. Three novels, Women (1818), Ifelmoth (1820), and The Albigenses (1824), produced a considerable impression, In the preface to Women he admitted that his previous novels had been justly condemned, being an Impossible attempt to revive the exploded style of Mrs Radcliffe, and promised that he would enter on a new vein. But he could not alter his character. The new veln was as wild, fantastic, incoherent, interspersed with passages of really splendid eloquence, as the old. The

Ibigenses was to be the first of a series of historical Tomances, illustrating periods of European history, and it was noticed in the Westminster Review as giving, with all its faults, promise of better things; but the author died in the year of its publication.

_MAUBEUGE, a fortified place of northern France, situated on both banks of the Sambre, 142 miles by rail north-east from Paris, and about 2 miles from the Belgian frontier. Its fortifications were planned by Vauban; the eneeinte is pierced by two gateways, that of France and that of Mons. Maubeuge, besides containing an arsenal and several old convents, is an industrial town, manufac-

turing swords, files, axles, tools, hardware, machinery, porcelain tiles, and paper; in the neighbourhood there are numerous forges. The population in

1876 was 14,400. Maubeuge owes its origin to a double monastery for men and women founded in the 7th century by St Aldegonde. It was burnt by the Normans, by Louis XI., by Francis I., and by Henry IL., and was finally assigned to France by the treaty of Nimeguen. It was fortified by Vauban at the command of Louis XIV., who first saw military service there, under Turenne. Besieged in 1793 by the prince of Coburg, it was relieved by the victory of Wattignies. It was unsuccessfully besieged by the duke of Saxe-Weimar in 1814,

but was compelled to capitulate, after a vigorous resistance, in the following year.

MAULMAIN, or Movutmery, a town in Amherst district, British Burmah, situated on the left bank of the Salwin river, in 16° 30' N. lat. and 97° 38' E. long. At the time of the cession of this part of the province to the British in 1826, Maulmain was a mere waste. It has now developed into a thriving commercial town, ranking next to Rangoon in importance, with a rapidly increasing population and trade. The population, which in 1857 was 23,683, had increased in 1872 to 46,472, and in 1881 to 53,107 (32,895 males and 20,212 females). The principal buildings are Salwin House, originally a private residence, but now the property of the municipality, the hospital, the jail, Protestant and Roman Catholic churches, the custom-house, and other public offices, and the barracks for the garrison of Madras native infantry. For many years timber formed the only export, but with the gradual settlement of the country and increase in agriculture rice and cotton began to be also exported ; besides these, the other staple exports are hides, horns, lead, copper, yellow orpiment, and stick-lac. The principal imports are cotton twist and cloth, woollen piece-goods, wines and _ spirits, sugar, and betel-nuts. In 1880~81 573 vessels (266,010 tons) entered the port, and 536 (265,147 tons) cleared. The value of merchandise imported was £666,810, of treasure £312,190, of merchandise exported £1,389,763, and of treasure £92,817. Shipbuilding forms an important in-dustry of the town.

MAUNDY THURSDAY, the day preceding Good Friday. The word '"maundy" (Middle-English, maundee or maunde, a command) is identical with the "mandatum " of the rubric and anthem of the Missal for the fifth

day in Holy Week, sometimes called 'Dies Mandati" (see this shown at length by Skeat in Ztym. Dict., and in note to Piers Plowman, xvi. 140). The 'mandatum" or "maund" referred to is the "new commandment" of John xiii. 34, but more particularly the precept given to the disciples in the same chapter "to wash one another's feet." The practice by prelates and others of literally and formally carrying out this injunction in a public manner on a given day has long been established both in the East and in the West. Perhaps an indication of it may be discerned as early as the 4th century in a custom, current in Spain, northern Italy, and elsewhere, of washing the feet of the catechumens towards the end of Lent before their baptism ; it was not, however, universal, and in the 48th canon of the synod of Elvira (306 a.p.) it is expressly prohibited (comp. Corp. Jur. Can., c. 104, caus. i. qu. 1). Be this as it may, the "pedilavium," or ceremony of wash- ing the feet of twelve beggars on this day, has now for centuries been observed by the prelates of the Church of Rome, including the pope himself, according to a ritual minutely prescribed in the Missal; it is also practised by the Austrian emperor, the king of Bavaria, and other European sovereigns in the Latin obedience, as well as by the emperor of Russia and others at the head of the Greek Church. In England it was continued by the sovereign even after the Reformation; the last recorded instance of its full performance is in the case of James II., but a dis- tribution of royal alms, consisting of money and clothing,

is still continued. It is on Maundy Thursday also that in the Church of Rome the sacred oil is blessed, and the chrism prepared, according to an elaborate ritual which is given in the Pontijicale.

MAUPERTUIS, Peter Louis Morgav pz (1698-1759), a mathematician and astronomer of considerable reputation in his day, was born at St-Malo, July 17, 1698. When twenty years of age he entered the army, becoming lieu- tenant in a regiment of cavalry, and employing his leisure on mathematical studies. After five years he quitted the army and was admitted in 1723 a member of the academy of sciences. In 1728 he visited London, and was elected a fellow of the Royal Society. In 1736 he acted as chief of the expedition sent by Louis XV. into Lapland to measure the length of a degree

of the meridian within the polar circle, in order to settle the then much disputed question of the oblate figure of the earth, and, on his return home, he became a member of almost all the scientific societies of Europe. In 1740 Maupertuis went to Berlin on the invitation of the king of Prussia, and took part in the battle of Mollwitz, where he was taken prisoner by the Austrians. On his release he returned to Berlin, and thence to Paris, where he was elected director of the

academy of sciences in 1742, and in the following year'

was admitted into the Academy. Returning to Berlin in 1744, Maupertuis married a lady of rank and great beauty, and in 1746 was chosen president of the royal academy of sciences. Finding his health declining, he repaired in 1757 to the south of France, but went in 1758 to Basel, where he died July 27,1759. Maupertuis was unquestionably a man of considerable ability as a mathe- matician, but his restless, gloomy disposition involved him in constant quarrels, of which his controversies with Kénig and Voltaire during the latter part of his life furnish examples.

The following are his most important works :—Zssay on Cs- mology ; Discourse on the Different Figures of the Stars; Essay on Aloral Philosophy ; Philosophical Reflexions, &¢.; Animal Physics; System of Nature ; Elements of Geography ; Account of the Expedi- tion to the Polar Circle, &c.; Laws of Motion; Laws of Rest; Parallax of the Moon; The Comet of 1742; On the Progress of the Sciences. He also contributed a large number of interesting papers to the Memoirs of the academies of Paris and Berlin.

MAU RANIPUR, a town in Jhanstf district, in the North-Western Provinces of India, in 25° 15' N. lat., 79° 11' E. long. The population in 1872 was 16,428. Although now a large trading centre, the town is of quite modern commercial importance, having risen from the position of a small agricultural village through the influx of merchants seeking relief from extortionate demands made by the rajd of a neighbouring native state. It con- tains a large community of wealthy merchants and bankers, A special variety of cloth, known as kharna, is manu- factured and exported to all parts of India. The principal imports are sugar, English piece-goods, silk, metals, and coffee. Trees line many of the streets, and handsome temples ornament the town.

MAURER, Grorc Lupwic von (1790-1872), a distin- guished German jurist and statesman, was born at Erpolsheim in the Bavarian Palatinate, November 2, 1790. He was the son of a Protestant pastor. He received his education at the university of Heidelberg, and afterwards followed for some time the profession of an advocate. In 1812 he went to reside in Paris, where, with the aid of the great libraries of that city, he entered on a systematic study of the ancient legal institutions of Germany. On his return to Bavaria he was appointed substitute for the attorney-general in the district of Spires and Landau. In 1824 he published at Heidelberg his first work, Geschichte des alt-germanischen und namentlich alt-bairischen 6ffentlich- miindlichen Gerichtsverfahren, which obtained the first prize

of the academy of Munieh. In 1826 he was made one of the professors of law in the university of Munich, In 1832, Otho, son of King Louis of Bavaria, having been chosen to fill the throne of Greece, a council of regency was nominated to conduct the government of that country during his minority. Of this council Von Maurer was appointed a member, the others being the Count yon Armansperg, who was president, Major-General K. W. von Heideck, and K. von Abel. They applied themselves energetically, and at first apparently in a spirit of concord, to the task of creating for the new kingdom institutions adapted to the requirements of a modern civilized com- munity. But grave differences soon made themselves felt, Maurer being at variance with the president on important administrative questions. These being referred to King Louis, he decided in favour of the president, and Maurerand Abel were suddenly recalled in 1834. The loss of Maurer was a serious one for Greece ; he was the ablest, most energetic, and most liberal-minded member of the regency, and had already done important work in the juridical and educational organization of the kingdom. It was through his enlightened efforts that Greece had obtained a revised penal code, regular tribunals, and an improved system of civil procedure. Soon after his recall, he published his work entitled Das griechische Volk in Offentlicher, kurchlicher, und privatrechtlicher Benehung vor und nach dem Frethettskampfe bis zum 31 Juli 1834 (3 vols., Heidelberg, 1835-36). This book is a valuable source of information on the history of Greece during the preceding years, its condition before the call of Otho to the throne, and the

labours of the council of regency down to the time of the author's recall. Notwithstanding his removal from office, he does not appear to have forfeited the esteem or goodwill of King Louis. After the fall of the ultramontane ministry of Abel in 1847, he became minister of foreign affairs and of justice, but on attempting to carry out reforms he was overthrown; retiring then from political life, he devoted himself altogether to his- torical and juristic studies, the fruits of which he gave to the world in successive publications, He died at Munich, May 9, 1872.

The following is believed to be a complete list of such of his writings as have not been already mentioned :—Grundriss des deut- schen Privatrechts, 1828; Ueber die batrisehen Stidte und thre Verfassung wnter der rimischen und frénkisehen Herrsehaft, 1829 ; Ueber die dewtsehe Reichsterritorial- und Reehtsgeschichte, 1830 ; Das Stadt- und das Landrechtsbuch Ruprechts von Freising nach 5 miinchener Handschriften, ein Beitrag zur Geschichte des Schwabenspiegels, 1839 ; Ueber die Freinflege (plegium liberale), und die Entstehung der grossen und kleinen Jury in England, 1848; Linlettung zur Geschichte der Mark-, Hof-, Dorf-, wad Stadt-Ver- Jassung und der offentlichen Gewalt, 1854 ; Geschichte der Marken- Verfassung in Deutsehland, 1856; Rede bet der 100-jahrigen Sti- tungsfeier der K. Akademie der Wissenschaften am 28 Marz, 1859 ; Geschichte der Dorf-Verfassung in Deutschland, 2 vols., 1865-66 ; Geschichte der Fronhife, der Bauernhife, und der Hofverfassung um Deutschland, 4 vols., 1862-63 ; Geschichte der Stiédteverfassung vi Deutschland, 4 vols., 1869-71. He also superintended the prepara- tion of a part of the continuation of Jacob Grimm's Weisthiimer, published under the auspices of the academy of Munich, 1866. His researches on the ancient village communities of Germany are of special interest and importance. 4

MAURETANIA, or Mavrrranta (the former is the more correct form of the name, according to coins and inscriptions), was the name given in ancient geography to the district which constituted the north-western angle of the African continent. It comprised a considerable part of the modern empire of Morocco, together with ie western portion of Algeria. But its limits varied much a different times. When it first appears in history the river Mulucha constituted its eastern limit, which separated it from the Numidian tribe of

the Massyli, who held all the country from that river to the Ampsaga; but at a oa period the kingdom of Mauretania was extended to

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Jatter river so as to include the whole territory from the | the Mulucha Cartenna (now Tenes); Iol, surnamed Cesarea, Ampsaga to the Atlantic Ocean. Towards the south it | which was made his capital by Juba II., and continued to be that mn Paanded by the great range of Mount Atlas, and it of Mauretania Cesariensis undcr the Romans (its site is now called

; Cherchell); Icosium (the modern Algiers); Salde (Bujeyal:) ; appears to have been regarded by geographers as extending Igilgili (Jijeli) near the eastern limit of the province; and Sititis

along the coast of the Atlantic as far as the point where (Setif) at no great distance in the interior, a town of considerable

that chain descends to the sea, in about 30° N. lat., | importance, which after the time of Constantine gave the name of

though the Roman province of the name extended but a Mauretania Sitifensis to this eastern portion of the province. The f=)

, once prosperity of this part of Africa under the Roman empire, previous little beyond Sala (Sallee), and it is probable that there | {5 the irruption of the Vandals in 429 a.p., is anon ty te fact

were no towns or permanent settlements farther south. | that no less than one hundred and seventy towus which were The magnificent plain, or rather platean, in which the city episcopal sees are enumcrated in the Notitia in the two provinces of Morocco is situated seems to have been unknown to | °f Mauretania. ancient geographers, and was certainly never included in MAURICE (Mavrictus), St, and his companions are the Roman empire. On the other hand the Gretulians, | commemorated as martyrs by the Roman Church on who inhabited the narrow strip of fertile date-producing |

September 22. The earliest extant form of the legend territory on the southern slopes of the Atlas, though not | relating to them is that of Eucherius, bishop of Lyons included under the name of Mauretania, seem to have | about the middle of the 5th century, who tells us that always owned a precarious subjection to the kings of that | Maurice was in command of the Theban legion (so called country, and in after days to its Roman governors. because raised in the Thebais) when it was sent into the The physical geography of the country will be described | West and attached to the army of Maximian. Themselves under the heading Morocco, though it must be observed | Christians to a man, its members refused to persecute their that the term Mauretania, as used by the Romans, com- | coreligionists, and for this, after having twice been prised also the greater portion of the French colony of | decimated, the legion was utterly destroyed by command Algeria, including the provinces of Oran and Algiers, and | of the emperor at Octodurum (Martigny) near Geneva. A even a part of that of Constantine. The range of Mount | later form of the legend connects it with the expedition of Atlas forms throughout the backbone of the country, from | Maximian against the Bagaude, who are taken to have been which the streams descend to the Mediterranean and the | Christians; the martyrdom of the legion arises out of its ocean. 'The most important of those on the north coast is | refusal to take part in a great sacrifice which had been the Mulucha or Molochath, which in the earliest times con- | ordered at Octodurum; aud another name—that of stituted the eastern limit of the country; it is still called | Exsuperius—is associated with Maurice's. Later still, Muluya. Farther east are the Chinala, the Usar, and the | Gregory of Tours knows of a company of the same legion Ampsaga. Of those that flow westward towards the | which suffered at Cologne (their leader subsequently Atlantic, the most considerable were the Lixus, Subur, | became known as Gereon). The date usually assigned to and Sale. But from the proximity of the mountain | the martyrdom of the Theban legion is 286 a.p.; but it is ranges to the sea none of these streams were of any import- | matter of history that at that period the Christians were ance, or navigable beyond a short distance from the sea. everywhere unmolested in the exercise of their religion A large part of the country is of great natural fertility, | throughout the Roman empire. On the other hand, at no and was in ancient times extensively cultivated, and pro- | later date have we any evidence of the presence of duced large quantities of corn, while the slopes

of Mount | Maximian in the Valais; and, apart from the great a priori Atlas were clothed with vast forests, which, besides other | improbability of the extirpation of a whole legion under kinds of timber, supplied the celebrated ornamental wood | any circumstances on account of its Christian profession, it called Crtrus, for tables of which the Romans gave such | is practically impossible to get over the fact that such fabulous prices, writers as Eusebius, Lactantius, Orosius, and Sulpicius Mauretania, or Maurusia, as it was called by Greek writers, un- poral es nothing of such 4 maciay and SeanLIng questionably signified the land of tho Mauri, a term still retained | °Vent having taken place, But in the long and voluminous in the modern name of Moors, and probably meaning originally | controversy as to the historical character of this legend it

nothing but "black men." The origin and ethnical affinities of | has of course never been attempted to deny that isolated

the race are unknown; but it is probable that the inhabitants of all i i ; : ecount of their this northern tract of Africa along the coast of the Mediterranean a es aaeae Fone Deak a = – M ae Th were kindred races belonging to the family which is represented at | TeS10N Occurred Guring the reign 0 age E

the present day by the Berbers of the mountain districts and the | Cultus of St Maurice and other members of the Theban Tuaricks of the tract south of the Atlas. They first appear in his- | legion occurs chiefly in Switzerland, the region of the Rhine, pa at the time of the Jugurthine War (110-106 z.c.), when and northern Italy; the foundation of the abbey of St

fauretania west of the Mulucha was under the government of a : ; is i i king called Bocchus, and appears to have constituted a regular and Eee gir eee) Seis itemally 'aberied in

organized state. It retained its independence till the time of | Sigismund of Burgundy (515). Augustus, who in 25 B.c. bestowed the sovereignty of the previously MAURICE (Mauvricius Fiavivs Trperivs), emperor of existing kingdom upon Juba II., king of Numidia, at the same time | the East from 582 to 602, was of Roman descent but a native

uniting with it the western portion of Numidia, from the Mulucha : re ; . 39 to the Ampsaga, which now received the name of Mauretania | Of Atabissus in Cappadocia, where he was born about 539,

Cesariensis, while the province that had previously constituted the | He spent his youth at the court of Justin IL, and, having kingdom, or Mauretania Proper, came to be known as Mauretania | joined the army, fought with distinction in the Persian Tingitana, This distinction continued to subsist after the incor- | war (578-581). At the age of forty-three he was declared

poration of the two provinces in the Roman empire under Claudius . oye in 42 A.D., and remained unchanged till the time of Constantine. Cesar by the dying emperor Tiberius II., who bestowed

In the time of Pliny and Ptolemy, Mauretania contained a | Upon him the hand of his daughter Constantina. In the number of flourishing cities and towns, several of which enjoyed | meagre aunals of the reign of Maurice the most conspicuous jhe privileges of Roman colonies, having been founded no doubt | events are the termination of the long struggle in the East

i great part with a view of keeping in check the wild barbarians | —: é ; who still oceupied the greater part of the country. The most with the restoration to the Persian throne of Chosroes IT. by

a of these places were—Tingis, on the site of the modern the Roman general Narses (not the cone: of Italy) in ongier, the capital of the province to which it gave its name; | 591, and the successes of Priscus in the protracted war nxus and Sala, on the coast of the Atlantic, at the mouths of the against the Avars. Some inopportune attempts at army

rivers of the same name; and three towns in the interior of the ai1£ : ° ‘ame province, Zilis, Babba, and Banasa, all of them bearing the reform, and an ill judged refusal to provide a ransom which

ttle of Roman colonies, On the coast of the Mediterranean stood | Might have prevented the massacre of twelve thousand Rusaddir (now Melilla),

within the limits of Tingitana ; and beyond | prisoners in the hands of the enemy, led to a rebellion

among the legions ou the Danube, who declared Maurice unworthy to reign, and, commanded by Phocas, then a simple centurion, but destined to become emperor, marched upon Constantinople. The capital having declared against him, Maurice abdicated and withdrew to Chalcedon, but was pursued and put to death there after having witnessed the murder of five of his sons (November 27, 602). He was the author of a work on military art (otparnyixd) in twelve books, of which there is an edition by Scheffer, published at Upsala in 1664. There is a Vita Mauricit by Theophylact Simocatta.

MAURICE or Nassau, prince of Orange, the younger son of William the Silent, was born at Dillenburg in 1567, and was made governor of the United Provinces after the assassination of his father in 1584. He succeeded his brother as prince of Orange in 1618, and died at the Hague on April 23, 1625. For the leading features of his character and events of his life see HoLLanp, vol. xii. pp. 77, 78.

MAURICE (1521-1553), duke and elector of Saxony, the son of Duke Henry the Pious, was born on the 21st of March 1521. He received a learned education, and at an early age gave evidence of au energetic and ambitious temper. In 1541 he married Agnes, daughter of the landgrave Philip of Hesse, and succeeded his father as duke of Saxony, of the Albertine line. Although a Pro- testant, he held cautiously aloof from the League of Smalkald; and in 1542 and 1543 he received imperial favour by supporting Charles V. against the Turks and the French. In 1546, when Charles V. attacked the League of Smalkald, Maurice sided with the emperor, the result being that he was made elector of Saxony in place of his cousin John Frederick (of the Ernestine line), who was taken prisoner and deposed. At this time Maurice was detested by the German Protestants, who considered him a traitor to his religion; but the tide soon turned. Fearing that the emperor's ultimate aim was to strike at the authority of the princes, he began silently to make pre- parations for war; and Charles V. was imprudent enough to provide him with a pretext for opposition by detaining

the landgrave Philip of Hesse, whose freedom Maurice had guaranteed. In 1551 Maurice concluded a secret treaty with Henry IL. of France against the emperor, and an alliance was also formed with several German priuces. Charles V. refused to believe in the reality of the danger ; but in March 1552 he was startled by the intelligence that Henry II. had entered Germany as an invader, and that Maurice was hastening southward at the head of a powerful army. John Frederick and Philip were at once released, and the emperor, after an ignominious flight, was compelled to sign the treaty of Passau. After the re-establishment of peace Maurice fought for some time against the Turks in Hungary; he then returned to Saxony, and associated himself with the alliance against Margrave Albert of Brandenburg, by whom the treaty of Passau had not been recognized. At Sievershausen, on the 9th of July 1553, the margrave was defeated ; but during the battle Maurice was wounded, and two days afterwards he died in his tent. He was not only a great diplomatist and general, but one of the most enlightened rulers of his age, and his early death was sincerely deplored by his subjects. In his last years he was content " with small diet and little sleep." "Therefore," says Roger Ascham, who had seen him, " he had a waking and working head, and became so witty and secret, so hardy and ware, so skilful of ways, both to do harm to others and to keep hurt from himself, as he never took enterprise in hand wherein he put not his adversary always to the worse."

See Roger Ascham, 4 Report and Discourse of the Affairs and State of Germany; Langenn, Moritz, Herzog und Kurfiirst von Sachsen, 1841; G. Voigt, Moritz von Sachsen 1541-47, 1876.

MAURICE

MAURICE, Joun Freperic Denison (1805-1872) better known without his first name, an English clergyman and theologian, was born in the year 1805. He was the son of a Unitarian minister, and educated in his father's faith, entering Trinity College, Cambridge, as a Noncon- formist, for the sake of the university course, at a time when it was impossible for any but members of the Established Church to obtain a degree. Together with John Sterling, Maurice migrated to the smaller college of Trinity Hall, whence he obtained a first class in civil law in 1827; he then came to London, and

gave himself to literary work, editing for a short time the Athenzum newspaper. During this period of his life he came under the influence of 8. T. Coleridge,—an influence which drew Maurice into conformity, and issued through him in what was known as the Broad-Church school of thought,

When Maurice joined the Church of England, he might no doubt have returned to Cambridge for his degree, or, when he chose Oxford, his terms at Cambridge would have been allowed him, but with characteristic thorough- ness he elected to go throngh the whole Oxford conrse. He entered Exeter College, and obtained a second class in classics in 1831.

The intellectual stir of Oxford life, and the vehement controversies in the clash of which sparks of truth seemed. struck out, were probably among the causes which attracted Maurice to Oxford, and he afterwards took his full share in them, always in a liberal, tolerant, yet strongly Pro- testant spirit. He was ordained in 1834, and after a short interval spent in parish work in the country was appointed chaplain of Guy's Hospital, and became thenceforward a sensible factor in the intellectual and social life of London. Carlyle has told us how "going to Guy's" Sunday after Sunday was a part of Sterling's routine, and an appreci- able number of persons far above the average were attracted to the hospital chapel. In 1840 Maurice was appointed professor of history and literature in King's College, to which in 1846 was added the chair of divinity. These chairs he held till 1853. In that year he published Theological Essays, wherein were stated opinions which savoured, to the principal, Dr Jelf, and to the council, of unsound theology in regard to eternal punishment. Maurice maintained with great warmth of conviction that his views were in close accordance with Scripture and the Anglican standards, but the council ruled otherwise, and he was deprived of his professorships. He held at the same time the chaplaincy of Lincoln's Inn (1846-60), but no attempt was made to deprive him of this. Neither was he assailed in the incumbency of St Peter's, Vere Street, which he held for nine years (1860-69), and where, though his congregation was never large, partly perhaps because no parish or district was apportioned to his church, he drew round him a circle of thoughtful persons, attached in no common degree to himself and to his teaching. _

During his residence in London Maurice was specially identified with two important movements for education, the Working Men's College, and Queen's College for the education of women, while he threw himself with great energy into all that affected the social life of the people. Certain abortive efforts at a true co-operation among work- ing men, and the movement known as Christian Socialism, were the immediate outcome of his teaching, and dingy fostered by himself. In 1866 Maurice was appomte professor of moral philosophy in the university of Cam- bridge. He died on the Ist of April 1872.

Maurice was before all things a preacher. The actual message he had to proclaim was apparently simple ; his two great ie tions, which he strove to impress on all other men, a ie fatherhood of God, and that all religious systems Wise ae a stability lasted because of a portion of truth hie es ce disentangled from the error differentiating them from the aoc

of the Church of England as understood by himself. His love to God as his Father was a passionate adoration which filled his whole

No one who ever heard Maurice read the Lord's Prayer can possibly forget it; the intensity of his convictions in the pulpit made his message seem as luminous and clear as it was brief and concentrated, though his teaching apart from the living voiee had by no means the same character. f

It was the peculiarity of his congregation that those who wanted his advice sought him; having no parish, he had no definite sphere of work beyond the church. Thus his preaching took the lorms now of exposition and now of the resolution of metaphysical difficulties, rather than of direct. dealing with the facts, the sins, and the temptations of human life eommon to all. Feeling this defect, he took fora time a district for parochial visita- tion, but was perplexed and distressed at the experience to whieh he was unequal. With all his affectionateness and desire to give sympathy he was unable even to conceive intellectual difficulties which were not his own. To those who did not demand of him all they needed, but took thankfully what he had to give, he was altogether a stimulating and helpful teacher. He opened new views, and encouraged men to think for themselves, and see what their words

meant. He was even morbidly fearful of founding a party, and was deeply distressed at the name Broad-Church. Those who surrounded him, and were kept together by his personal charm and influence, were learning to think for themselves, and have dis- persed in many directions. There are probably not half a dozen persons who, even nominally, reflect the precise shades of Maurician teaching.

As | Sitar it is extremely doubtful if his work will have a great

and permanent place in the future. His one novel, Hwstace Con- 'pay, is even now unread ; his theological works, though abounding in passages of great beauty, full now and then of a fiery eloquence, are as a whole somewhat obseure. He published too much, and a large number of his works are sermons recast. voice, and we find a class of writing which only the highest excellence can make tolerable out of the pulpit. – Maurice's greatest effect on his time is in his educational work. The Working Men's College, which owes more to him than to any one else, for which he rendered great sacrifices, and which was and ig more fall of his spirit than are most institutions of that of their founders, was a totally new departure in education. Itwas intended to give, and it has largely succeeded in giving, not what is ealled a popular education, but " higher education " to working men, and in combining teachers and taught in a eollege with its social life, and a bond of common interests. Queen's College, in like manner for the higher education of girls, is scarcely less identified with his life, though its influence is not so great, nor ean its work be so widely known,

Both at King's College and at Cambridge Maurice gathered

round him a band of earnest students, to whom he directly taught much that was valuable drawn from wide stores of his own reading, wide rather than deep, for he never was, strictly speaking, a learned man, Still more did he eneourage the habit of inquiry and research, more valuable than his direct teaching. In his power, which has been truly called Socratic, of eonvineing his pupils of their ignorance he did more than perhaps any other man of our time to awaken in those who came under his sway the desire for knowledge and the process of independent thought. _ If, asa social reformer, Maurice's name be forgotten in the future, it will be because in much he was before his time, and gave his eager support to schemes for which the world was not

ready, From a very early period of his life in London the condition of the pcor pressed upon him with consuming foree; the enormous magnitude of the social questions involved was a burthen which he could hardly bear. He threw himself with eharacteristic energy into schemes for a true co-operative system, in which some ardent young inen were then engaged, and in spite of his dislike for systems and party names did not shrink from being known as a Christian Socialist, and taking a keen interest in the paper which bore that name, and was the organ of the movement. That and the Politics for the People, much the same paper under a different name, received his sanction and aid; many strifes between masters and workmen were appeased, if not directly by himself, by those who were aided by his counsel, and were in eonstant intercourse with him. For many years he was the elergyman whom working men of all opinions scemed to trust even if their faith in other religious men and all religious systems had faded, and his power of attract- ing the zealot and the outcast resembled that of the Master whom he followed.

Maurice was twice married, first to a sister of John Sterling, secondly to a sister of his friend Archdeacon Hare. By his family ties and his elosest friendships he came in eontact with few but intellectual people. Thus while he wrote and spoke and worked for the average man he set that average somewhat high. Those who were privileged to know him did not know a more beautiful soul.

The following are Maurice's more important works. Some of them were rewrltten and in a measure recast, and the date given is not necessarily that of

We miss the human |

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the first appearance of the book, but of its more eomplete and abiding furm. Eustace Conway, or the Brother and Sister, a novel, 1834; The Kingdom of Christ, 1842; Christmas Day and other Sermons, 1848; The Unity of the New Testament, 1844; The Epistle to the Hebrews, 1846; The Religions of the World, 1847; Moral and Metaphysical Philosophy (at first an article in the Encyclopedia Metropolt- tana), 1848; The Church a Family, 1850; The

Old Testament, 1851, Theological Essays, 1853; The Prophets and Kings of the Old Testament, 1853, Lectures on Ecclesiastical History, 1854; The Doctrine of Sacrifice, 1854; The Patriarchs and Lawgivers of the Old Testament, 1855; The Epistles of St John, 1857 ; The Com- mandments as Instruments of National Reformation, 1866; On the Gospel of St Luke, 1868; The Conscience: Lectures on Casuistry, 1868; The Lord's Prayer. a Manual, 1870. The greater part of these works were, as has been already notieed, first delivered: as sermons or lectures. Besides this more formal work, Maurice contributed many prefaces and introductions to the works of friends, as to Areh- deacon Hare's Charges, Kingsley's Saint's Tragedy, &e. His oecasional sermons, speeches, periodical writings, and letters to various newspapers need not be here noticed, though they were at the time evidence of his interest in all the life of his time, and his eager and abounding cnergy.

MAURITIUS, formerly called the [ste or FRANCE, an island in the south-western portion of the Indian Ocean, between 57° 18' and 57° 48' E. long., and 19° 58' and 20° 31'S. lat., 550 miles east of Madagascar, and 115 miles north-east of the island of Réunion, 940 miles south-east of the Seychelles, 2300 miles from the Cape of Good Hope, and 9500 miles from England via Aden and Suez. The island is irregularly elliptical—somewhat triangular—in shape, and is 36 miles long from north-north-east to south- south-west, and about 23 miles broad. It is 130 miles in circumference, and its total area is about 713 square miles. The island is surrounded by coral reefs, so that the ports are difficult of access.

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Map of Mauritius.

From its mountainous character Mauritius is a most picturesque island, and its scenery is very varied and beautiful. The most level portions of the coast districts are the north and north-east, all the rest being broken by hills, which vary from 500 to 2700 feet in height. There are three principal masses of mountain: the north-western or Pouce range, in the district of Port Louis ; the south-western, in the districts of Riviére Noire and Savanne ; and the south- eastern range, in the Grand Port district. In the first of

these, which consists of one principal ridge with several

lateral spurs, overlooking Port Louis, are the singular peaks of the Pouce (2650 feet), so called from its supposed resemblance to the human thumb; and the still loftier Pieter Botte (2676 feet), a tall obelisk of bare rock, crowned with a globular mass of stone. The highest summit in the

island is in the south-western mass of hills, the Montagne de la Riviére Noire, which is 2711 feet above the sea. The principal ranges in this mountain mass are three in number, arranged in a triangular form, and are called respectively the mountains of La Pierre Rouge, La Riviére Noire, and Savanne. The south-eastern group of hills consists of one chief range, the Montagne du Bambou, with several spurs running down to the sea. In the interior are extensive fertile plains, some 1200 feet in height, and forming the districts of Moka, Vacois, and Plaines Wilhelms ; and from nearly the centre of the island rises an abrupt peak, the Piton du Milieu de I'fle, to a height of 1932 feet above the sea-level. Other prominent summits are the Trois Mamelles, the Montagne du Corps de Garde, the Signal Mountain, near Port Louis, and the Morne Brabant, at the south-west corner of the island.

The rivers are of course small, and none of them are navigable beyond a few hundred yards from the sea, In the dry season most of them are little more than brooks, although they soon become raging torrents when swollen by the heavy rains of the wet period of the year. The principal stream is the Grande Riviére, with a course of about 10 miles. A remarkable and very deep lake, called Grand Bassin, is found in the south of the island, and is probably the extinct crater of an ancient voleano; other similar lakes are

the Mare aux Vacois and the Mare aux Joncs, and there are some other deep hollows which have a like origin.

The geological structure of Mauritius is undoubtedly a result of volcanic action, all the rocks being of basalt and greyish-tinted lavas, excepting some beds of upraised coral, Columnar basalt is seen in several places. There are many cavernsand steep ravines, and from the character of the rocks the ascents are rugged and precipitous, The island has few mineral productions, although iron, lead, and copper in very small quantities have in former times been obtained.

The climate is pleasant during the cool season of the year, but oppressively hot in summer (December to April), except in the interior plains, where the thermometer ranges from 70° to 80°, while imPort Louis and the coast generally it ranges from 90° to 96°. The mean temperature for the year at Port Louis is 78°°6. During the last thirty years the island has been subject to severe epidemics, which have been extremely fatal. In 1854 a visitation of Asiatic cholera swept off 17,000 people; and in 1867 a still more destructive inroad of malarial fever, of an unusually fatal type, almost paralysed the whole community for many weeks, carrying off 30,000 people, and greatly affecting the finances of the colony. The seasons are divisible into two, the coc] and comparatively dry season, from April to November, and the hotter season, during the rest of the year. From the month of January to the middle of April, Mauritius, in common with the neighbouring islands and the surrounding ocean from 8° to 30° of S. lat., is subject to severe and destructive cyclones, accompanied by torrents of rain, which often cause great destruction to houses and plantations. These hurricanes generally last about eight hours, but they appear to be now less frequent and violent than in former times, owing, it is thought, to the destruc- tion of the ancient forests and the consequent drier condi- tion of the atmosphere.

The soil of the island is of considerable fertility ; it is a ferruginous red clay, but so largely mingled with stones of all sizes that no plough can be used, and the hoe has to be employed to prepare the ground for .cultivation. The woods with which the island was largely clothed when first discovered have been to a great extent cut down, and the greater portion of the plains

is nowa vast sugar plantation. The bright green of the sugar fields is a striking feature

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in a view of Mauritius from the sea, and gives a peculiar beauty and freshness to the prospect. The soil is suitable for the cultivation of almost all kinds of tropical produce and it is to be regretted that the prosperity of the colony depends entirely on one article of production, for the con- sequences are serious when there happens to be a failure more or less, of the sugar crop. Guano is extensively imported as a manure, and by its use the natural fertility of the soil has been increased to a wonderful extent, _ Wor purposes of law and government Mauritius is divided into nine districts, named respectively Port Louis Pamplemousses, Rivitre du Rempart, Flacq, Grand Port, Savanne, Moka, Plaines Wilhelms, and Rividre Noire, The capital and seat of government, the city of Port Louis is situated on the north-western side of the island, at the head of an excellent harbour, a deep inlet about a mile long. This is protected by two forts,—Fort William and Fort George, —-as well as by the citadel in the city, and its value is further increased by three graving docks con- nected with the inner harbour. Lighthouses have been erected on Flat Island and at Cannonier's Point. Port Louis has a population of about 70,000, but from the lofty mountains by which it is enclosed its situation is hot, and from the small amount of tide in the harbour effectual drainage is difficult, so that it is not a very healthy town. The public buildings are of no great architectural beauty, the government house being a three-storied structure with broad verandas, of no particular style of architecture, while the Protestant cathedral was formerly a powder magazine, to which a tower and spire has been added. The Roman Catholic cathedral is more pretentious in style, but is tawdry in its interior. In the city are large barracks and military stores. A maximum contribution of £45,000 is paid to the imperial government by the colony towards the expenses of the troops stationed in the island, but this sum is reduced when the garrison is below a certain standard, In 1880 the amount paid was £29,972. The governor and chief officers of government reside out of Port Louis in the cooler uplands of the interior, as do also a large number of the principal inhabitants, especially since the completion of the railways has made access easy to many portions of the island. The most favourite place of

residence is at Curepipe, a place situated about 1800 feet above the sea; here the climate resembles that of the south of France, and it has been so much resorted to of Jate years that it is rapidly becoming a large town. The construction of the Mauritian railways has given a great impetus to the trade of the colony; the system embraces two lines, of a total length of 87 miles. 'The main roads of the island are kept in good order, but much yet remains to be done before the road system can be said to be complete throughout all the districts. J

The prosperity of Mauritius, as already mentioned, depends almost entirely upon its sugar-crop, and the export trade of the island has greatly increased during the last twenty years, as will be seen by the following statistics:—

1864, 1868. 1878, 1877. 1880,

lGemecves | hospelome | pale Perirda of! Imports … | £2,582,980 | £2,200,098 | £2,454,101 | £2,359,449 } £2,169, Fpouen. 2°949°740 | 2,339,842 | 3,375,401 | 4,201,286 | 3,634,788

Of the imports the principal items are rice (about : fifth of the whole), wheat, and other grains, plain an coloured cottons, and haberdashery. Madagascar supplies cattle to the colony, and also rice, although the greater portion of the latter import comes from India. Horses are imported from the Cape, ponies from Burmah and ro mules from Spain, and sheep from Bombay and the € io, Of the exports, sugar forms of course the great ee amounting, on an average, to nearly nineteen aaa 3 of the whole; the increase in its production 18 6 ow

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by the following figures, giving values of the sugar ex- |

rted :— a 1864. 1871. 1877. 1878. £9,126,511 £2,841,829 £3,783,291 £3,408,020

In 1877 the quantity of sugar exported was 189,164 tons; while in 1854 the quantity was 102,000 tons. The next item is rum, which was exported to the value of £45,386 in 1878; and the production of cocoa-nut oil has increased from 7569 gallons in 1864 to 253,263 gallons in 1878, the latter quantity being worth £37,263. The value of the coffee exported in 1879 was £25,064. The currency consists of rupees and cents ; and on the Ist of May 1878, the metric system of weights and measures came into use in the island.

Mauritius being an oceanic island of small size, its present fauna is very limited in extent, and does not eontain mueh that is interesting. When first seen by Europeans it contained no mammals except a large fruit-eating bat (Pteropus vulgaris), whieh is plentiful in the woods ; but several animals of this class have been introdueed, and are now numerous 1n the uneultivated region. Among these are two monkeys of the genera Maeacus and Cerco-pithecus, a stag (Cervus hippelaphus), a small hare, a shrew-mouse, and the ubiquitous rat. A lemur and one of the curious hedgehog- like Inseetivora of Madagasear (Centetes ceaudatus) have probably both been brought from the larger island. The avifauna resembles that of Madagascar ; there are species of a peeuliar genus of eater- pillar shrikes (Campephagide), as well as of the genera Pratineola, Hypsipetes, Phedina, Tchitrea, Zosterops, Foudia, Collocalia, and Coracopsis, and peeuliar forms of doves and parroquets. The living reptiles are small and few in number, but in the surrounding seas are great numbers of fish ; the coral reefs abound with agreat variety of molluscs; and there are numerous land-shells. The extinct fauna of Mauritius has eonsiderable interest. In eommon with the other Masearene islands, it was the home of the Dodo (Didus ineptus), one of a group of birds ineapable of flight ; there were also Aphan- apteryx, a species of rail, and a short-winged heron (Ardea mega-cephala), which probably seldom flew. The defeneeless eondition of these birds has led to their extinetion sinee the island was colonized. Several species of large fossil tortoises have been dis- eovered ; but, strange to say, they are quite different from the living ones of Aldabra, in the same zoologieal region.

Owing to the extensive destruetion of the primeval forests of the island for the formation of sugar plantations, the indigenous flora of Mauritius is only seen in parts of the interior plains, in the river valleys, and on the hills; and

it is so mueh mingled with trees and plants introdueed from other parts of the world that it is not very easy to distinguish between what is native and what has eome from abroad. The prineipal timber tree is the ebony (Dios-pyros ebeneum), whieh grows to a considerable size. Besides this there are bois de cannelle, olive-tree, benzoin (Croton Benzoe), eolo- phane (Colophonia), and iron-wood, all of whieh are useful in earpentry ; the eocoa-nut palm, an importation, but a tree whieh has been so extensively planted during the last hundred years that it is extremely plentiful ; the palmiste (Palma dactylifera lati- folia), the latanier (Corypha wmbraculifera), and the date-palm. The vacoa or vaeois, a speeies of Pandanus, is largely grown, the long tough leaves being manufaetured into bags for the export of sugar, and the roots being also made of use'; and in the few rem- nants of the original forests the tree which is such a prominent one in the eoast flora of Madagascar, the traveller's tree (Urania speciosa), grows abundantly. A species of bamboo is very plentiful in the river valleys and in marshy situations. A large variety of fruit is produeed, including the tamarind, mango, banana, pine- apple, guava, shaddock, fig, avoeado-pear, litchi, eustard-apple, and the mabolo (Diospyros discolor), a fruit of exquisite flavour, but very disagreeable odour. Many of the roots and vegetables of Europe have been introduced, as well as some of those peculiar to the tropics, ineluding maize, millet, yams, manioc, dhol, gram, &e. Small quantities of tea, riee, and sago have been grown, as well as many of the spices (eloves, nntmeg, ginger, pepper, and allspice), and also cotton, indigo, betel, eamphor, turmerie, and vanilla.

*Mauritius appears to have been unknown to European nations, if not to all other peoples, until the year 1507, when it was discovered by the Portuguese. It had then no inhabitants, and there seem to be no traces of its previous oeeupation by any people, either savage or eivilized. The island was retained for most of the 16th century by its discoverers, but they madc no colonies in it. In 1598 the Duteh took possession, and named the island " Mauritius," in honour of their prinee Mauriee. It had been previously ealled by the Portuguese *'Ilha do Cerné," froin the belief that it was the island so named by Pliny. But, although the Duteh built a fort.at Grand Port, they made no permanent settlement in Mauritius, finally abandoning the island in 1710. Five years afterwards the Freneh, in their turn, took possession of what had seemed so worthless to*

two European powers, but it was half a century before the Govern- ment of France appreciated the valne of their eolony, since from 1715 to 1767 it was held by agents of the French East India Com- pany, by whom its name was again ehanged to " Ile de France." The Company was fortunate in having several able men as governors of its colony, espeeially the celebrated Mahé de Labourdonnais (1785-46), "a man of eminent talents and virtue," who intro- duced the eulture of the sugar-eane, and thus laid a firm foundation for the future prosperity of the island. Under his direction roads were made, forts built, and eonsiderable portions of the forest were eleared, and the present eapital, Port Louis, wasfounded. Labour- donnais also promoted the planting of eotton and indigo, and is justly remembered as the most enlightened and best of all the Freneh governors. The colony eontinued to rise in value during the time it was held by the Freneh erown, and to one of the later governors, De Poivre, was due the introduetion of the elove, nutmeg, and other spices. Another governor was D'Entrecasteaux, whose name is kept in remembrance by a group of islands east of New Guinea.

During the long war between Franee and England, at the eom- meneement of this eentury, Mauritius was a eontinual souree of mueh mischief to English Indiamen and other merehant vessels; and at length the British Government determined upon an expedi- tion for its eapture. This was effeeted in 1810; and upon the restoration of peace in 1814 the possession of the island was eon- firmed to England by one of the provisions of the treaty of Paris. By the eighth artiele of eapitulation it was agreed that the inhabit- ants should retain their own laws, customs, and religion ; and so it happens that, although a British eolony, the island is still largely Freneh in language, habits, and predileetions ; but its name has again been changed to that given by the Dutch. Perhaps the most distinguished of the English governors of the island was Sir Robert Farquhar (1810-28), who did so mueh to abolish the Malagasy slave trade and to establish friendly relations with the rising power of the Hova sovereign of Madagasear.

Mauritius is one of the crown eolonies of Great Britain, and at the head of its administration is a governor, who is assisted by an exeeutive couneil of

seven members, holding the most important Government posts. There is also a legislative council, whieh eon- sists of the samc members as the foregoing, with three others, together with eight of the ehief landed proprietors of the island, who are nominated by the erown. 'The average annual revenue of the colony for the ten years from 1871 to 1880 was £723,876, the average annual expenditure during the same period being £710,261. Up to 1854 there was a surplus in hand, but sinee that time ex- penditure has exeeedcd ineome, and the publie debt is now about £700,000.

The island has largely retained the old Freneh laws, the Codes Civile, de Proeédure, du Commeree, and d'Instruetion Criminelle being still in force, exeept so far as altered by the later laws for the administration of justiee of April 18, 1831. By these the eonrt of appeal was reeonstituted, and a snpreme court of civil and criminal justice was established, under a ehief judge and three puisne judges. The police foree in 1880 ineluded 689 men.

During the last few years great improvements have been effeeted in the edueational system of theeolony. The department of publie instruetion has two branehes, the Royal College, for higher educa- tion, and the sehool department, for primary instruetion. In 1880 the number of Government sehools was 88, with 6077 scholars, and of sehools aided by grants 54, with 4316 seholars, the total teaching staff numbering 178. The annual education vote is about £18,000; and of the seholars 73 per cent. are Roman Catholie, 14 per eent. Hindn, 8 per eent. Protestant, and 5 per eent. Moham- medan. It will be seen from the above figures that the Roman Catholic religion is that professed by the large majority of the white population of Mauritius. The elergy supported by the state inelude the Protestant bishop of Mauritius, with an archdeacon and seven elergymen of the Chureh of England, and three elergymen of the Chureh of Scotland ; and the Roman Catholic bishop of Port Louis, with a viear-general and thirty-four priests. :

The population of the {sland is a very varied one, and eonsists of two great divisions :—those of European blood, ehiefly Freneh and English, as well as numerous half-easte people ; and a large eoloured population, chiefly Hindu coolies, but with representatives from various Afriean and Asiatic regions, Negroes, Malagasy, Parsees, Singhalese, Chinamen, Malays, &c.

The Hindu immigrants now forin more than two-thirds of the inhabitants of Mauritius, as will be secn from the following figures for the year 1881 :—

General…....- 111,783 Indian…..... 249,064 Notalye sc… 360,847 Male. Female Male. Female Male. Female.

58,137 53,646 151,423 97,641 209,560 151,287

The increase of population during the last thirty years is shown by the following figures :-—

1851. 1861. 183,506 313,469

1871, 317,069

1881. 360,847

The system of coolie immigration has been of great value to the colony; andthe arrangements for shipping these Hindu people XV

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are under Government control. But many of the laws have been so unjust to the coloured people, and so much to the advantage of the planters, that gross evils and abuses have arisen. And, unjust as the laws are, their administration has often been still more unfair. The evil grew at length so glaring that in 1871 a royal cominission was appointed, which sat for a long time investigating the subject. Various reforms were recommended, and since then some improvements have been effected. But many of the creole planters are not remarkable for their respect for the rights of eoloured people, and the system is liable to gross abuse unless under vigilant control by higher authority. Much yet remains to be done for the moral and religious instruction of the labourers ; and the presence of a large heathen population, and the prevalence of crime, has been at times a very serious consideration for the colony. The number of coolies arriving in

and leaving the island varies very largely, from a few hundreds annually to several thousands.

The dependencies of Mauritius are the Seychelles group, the islands of Rodriguez and Diego Garcia, the Chagos group, and seventy other smaller islands scattercd over a large extent of the Indian Ocean, and having a total population of about 16,000 souls. Rodriguez is situated 300 miles east of Mauritius. and is cultivated chiefly by colonists from that island.

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MAURUS, Sr, according to the Roman Breviary (January 15), was a Roman of noble birth, and while still a child was placed by his father Eutychius under the discipline of St Benedict, where he soon became a model of all the virtues and endowed with the gift of miracles. Sent by his master into Gaul, he founded a monastery over which he presided for forty years. When he died in 565 he was over seventy. The monastery referred to is that of Glanfeuil or St Maur-sur-Loire. In point of fact it may be said that everything relating to the introduction of the Benedictine order into France, unless the name of him who introduced it be made an exception, is purely

legendary. The famous "Congregation of St Maur" dates from the 17th century, having received papal sanction in 1621 and 1627; it arose out of an earlier " congregation " of reformed Benedictines, which took its name from St Vannes near Verdun, and was sanctioned by Clement VIII.

MAURY, Jean Sirrremn (1746-1817), cardinal and archbishop of Paris, the great opponent of Mirabeau in the constituent assembly, and esteemed his rival in eloquence, was the son of a poor cobbler, and was born at Valréas in the Venaissin, the district in France which belonged to the pope. His quickness was soon observed by the priests of Avignon, where he was educated and took orders, and he determined to get what he could by it. He tried his fortune by writing éloges of famous persons, then a favourite practice ; and in 1771 his éloge on Fénelon was pronounced next best to Laharpe's by the Academy. The real founda- tion of his fortunes was the success of a sermon he preached on St Louis before the Academy in 1772, which caused him to be recommended to the king for an abbacy on the spot. In 1772 he published his Hssai sur P'éloquence de la chaire, which, as well as his Principes d'éloquence, contains much good criticism, and remains a French classic. He became a favourite preacher in Paris, and was Lent preacher at court in 1781, when King Louis XVI. said of his sermon, "If the abbé had only said a few words on religion he would have discussed every possible subject." In 1781 he obtained the rich abbey of Lions, worth 20,000 livres a

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year, and in 1785 he was elected to the Academy. His morals were as loose as those of his great rival Mirabeay but he was famed in Paris for his wit and gaiety as well as for his eloquence and his immorality, In 1789 he was elected a member of the states-general by the clergy of Péronne, and from the first proved to be the most able and persevering defender of the ancien régime. It is said that he attempted to emigrate both in July and in October 1789 – but, whether he did or not, he after that time held firmly a his place, when almost universally deserted by his friends, His life was often in

danger among the people, but his ready wit always saved it, and it was said that one bon mot would preserve him for a month, At last, in 1792, he found it necessary to fly from Paris; the Revolution had gone too far. When he did emigrate he found himself regarded as a kind of martyr to the church and the king, and was at once named cardinal, archbishop i partibus, and extra nuncio to the diet at Frankfort.- He was finally made bishop of Montefiascone, and settled down in that little Italian town,—but not for long, for in 1796 the French drove him from his retreat, and he became ambassador, but with hardly any pay, of the exiled king Louis XVIIL to the pope. Such a life soon wearied a man who had been accustomed to wealth and reputation, and in 1804 he began to prepare his return to France by a well-turned letter to Napoleon, congratulating him on restoring religion to France once more. In 1806 he did return; in 1807 he was again received into the Academy; and in 1810, on the refusal of Cardinal Fesch, was made archbishop of Paris. On the restoration of the Bourbons he was sum- marily turned out of the Academy, and sent to Rome to answer for his disobedience to the pope. There he was imprisoned in the castle of St Angelo for six months, and died in 1817, a year or two after his release, of disease contracted in prison, aud of chagrin.

There are two sides to Maury's character to be discussed. As a eritic he was a very able writer, and Sainte-Beuve gives him the eredit of discovering Bridaine, and giving Bossuet his rightful place as a preaelier above Massillon; asa politician, his wit and eloquence make him a worthy rival of Mirabeau, and an interesting character in the early years of the Revolution. If in later years he forsook his old tenets, and joined Napoleon, his punishment was terribly severc, and it would have been a graceful act if Louis XVIII. had remembered the courageous supporter of Louis XVL, and the pope

the one intrepid defender of the church in the states-general.

The Quvres choisis du Cardinal Maury (5 vols., 1842) eontain what is worth pre- serving. For his life and eharaeter see Vie du Cardinal Maury par son neveu, 1827; Poujoulat, Cardinal Maury, sa vie et ses ceuvres, 1855; Sainte-Beuve, Causeries du Lundi, vol. iv.

MAURY, Marruew Fonrarye (1806—.873), American naval oflicer and hydrographer, was born in Spottsylvania county, Virginia, January -14, 1806. In 1825 he entered the American navy as midshipman, circumnavigating the globe in the "Vincennes," during a cruise of four years. In 1836 he was made lieutenant, and gazetted astronomer to an exploring expedition. In 1839 he met with an accident which resulted in permanent lameness, and unfitted him for active service. Maury was placed in charge of the Depét of Charts and Instruments, out of which have grown the United States Naval Observatory and the Hydrographic Office. He laboured assiduously and with complete success to place the depdt in a state of efficiency. While in the '"' Vincennes," and in subsequent cruises, Maury made many observations as to the winds and currents, and when 1 charge of the Hydrographic Office he set himself to — further data by distributing to captains of vessels specially prepared log-books. So successful was aA : this enterprise that in the course of nine years he 4 collected a sufficient number of logs to make two oe manuscript volumes, each with about two thousand a hundred days' observations. One result was to sa ' necessity for combined action on the part of maritin ; nations in regard to ocean meteorology. This led to a

'nternational conference at Brussels in 1853, which pro- duced the greatest benefit to navigation as well as indirectly to meteorology. One result was the establishment of the meteorological department of the English Board of Trade, now known as the Meteorological Office, which adopted Maury's model log-books. In 1853 he published his Letters on the Amazon and Atlantic Slopes of South America, and in 1855 he was promoted to the rank of commander. On the outbreak of the American civil war in 1861, Maury threw in his lot with the South, and, having lost nearly his all, retired to England, where he was presented with a handsome testimonial raised by public subscription. Afterwards he became imperial commissioner of emigration to Maximilian of Mexico, on whose death he took up his residence in Virginia, where he died on February 1, 1873.

In 1848 Maury published a Treatise on Navigation, which was long used as a text-book in the United Statcs navy. The work, however, by which he is

best known is his Physical Geography of the Sea, the first edition of which was published in London in 1855, and in New York in 1856; it was translated into several European languages. The theorics which it contains are now generally admitted to be quite erroneous. Maury's reputation rests on the eminent services he rendered to navigation and meteorology, he baving been the first to show how the latter could be raised to the certainty of a science. He was essentially a practical man; his great aim was to render navigation more seeure and economical, aud in this he was eminently successful. Other works published by Maury are the papers contributed by him to the Astronomical Observations of the United States Observatory, Lecticrs conccrning Lines for Steamers crossing the Atlantic (1854), Physical Gcography (1864), and Manual of Geography (1871). In 1859 he began the publication of a series of nautical monographs.

MAUSOLUS, or according to his coins Jaussolus (Matoowdos), a king of Caria, whose reign probably began in 377 and terminated with his death in 353 z.c. The part he took in the revolt against Artaxerxes Memnon, his conquest of Lydia, Jonia, and several of the Greek islands along the coast, his co-operation with the Rhodians and their allies in the war against Athens, and the renioval of his capital from Mylasa, the ancient seat of the Carian kings, to the city of Halicarnassus are the leading facts of his history. He is best known, however, from the tomb erected for him by his widow Artemisia with such cultured magnificence that the name of mausoleum has become the generic title of all similar monuments. One of the most curious of the inscriptions discovered at Mylasa details the punishment of certain conspirators who had attempted the life of Mausolus when he was attending a festival in a temple at Labranda. See HaLicaARNassus.

MAXENTIUS, Marcus Avure.ius VaLerius, Roman emperor from 306 to 312, was the son of Maximianus Hereulius, and the son-in-law of Galerius, but on account of his vices and incapacity was left out of account in the division of the empire which took place in 305. A variety of causes, however, had produced strong dissatisfaction at Rome with many of the arrangements established by Diocletian, and the public discontent on October 28, 306, found expression in the massacre of those magistrates who maintained their loyalty to Severus and in the election of Maxentius to the imperial dignity,—an election in which the rest of Italy, as well as Africa,

concurred. With the help of his father, Maxentius was enabled to put Severus to death and to repel the invasion of Galerius; his next steps were first to banish Maximian, and then, after achieving a militarysuccess in Africa against one Alexander, to declare war against Constantine for the conduct towards the old emperor of which he in turn had been guilty at Marseilles. The contest resulted in the defeat of Maxentius at Saxa Rubra, and his death by drowning in the Tiber at the Milvian Bridge on October 28, 312. (See ConstTaNTINE#.) The general testimony to the worthlessness and brutality of his character is unambiguous and unanimous ; less apparent are the grounds for the particular statement of

Gibbon that he was "just, humane, and even partial towards the afflicted Christians."

MAXIMA AND MINIMA. The consideration of the greatest or the least value of a variable quantity, that is restricted by certain conditions, is a problem of which several simple cases were investigated by the early Greek geometers. Thus in Euclid iii. 7, 8 we find the determina- tion of the greatest and least right lines that can be drawn from a point to the circumference of a circle. But the most characteristic problem of the kind in Euclid is that contained in vi. 27, 28, 29. Thus prop. 27, when reduced to its simplest form, is equivalent to the statement thatif a right line be bisected the rectangle under the segments is greater than that under those made by any other point of division. Props. 29 and 30 are, when considered algebrai- cally, reducible to the solution of the equations #(a — x) = 0? aud x(a+x)=6?, coupled with the determination of the maximum value of } for which the solution of the former is possible (see Matthiessen, Grundztige der antiken und modernen Algebra, Leipsic, 1878). Apollonius extended the investigation of Euclid, bk. iil, to the problem of the greatest and least distances of a point from an ellipse, showing that it depended on drawing normals from the point to the curve ; and he reduced the latter problem to finding the points of intersection of the ellipse with a certain; hyperbola.

The text remarkable problems on maxima and minima are said to have been investigated by Zenodorus,! and were preserved by Pappus and Theon of Alexandria. Of these we may mention the following:—(1) among regular

polygons of equal perimeter that of the greatest number of sides contains the greatest area; (2) of polygons of the same perimeter and the same number of sides the regular polygon contains the greatest area; (3) the circle con- tains a greater area than any other curve or polygon of the same perimeter; (4) the sphere contains the greatest volume for a given superficial area.

In the progress of mathematics the terms maxima and minima have come to be used to imply, not the absolutely greatest and least values of a variable magnitude, but the value which it has at the moment it ceases to increase and begins to decrease, or vice versa. For example, if it be said that the height of the barometer is a maximum at any instant it means that up to that time the barometer was rising and then began to fall. In this way it is possible that there should be several maxima and minima in the course of one day, and that one of the minima should be greater than one of the maxima.

The theory of maxima and minima, in the differential calculus point of view, is very simple. Thus, if w be a given function of a variable 2, the values of x for which w

has a maximum or a minimum value are, in general, de-

du

termined by the equation 7 =0. Again, if « be a func-

tion of two variables x and y, then the maximum or ss é ‘ du

minimum values of « must satisfy the equations =a 0 and

du

E =0, There is, however, no real maximum or minimum y

2 2 2, 2

solution if (a) is greater than – ; count of this method, illustrated by examples, is given in vol, xiii, pp. 23, 24.

John Bernoulli's problem (detu Lruditorum, June 1696) of the "brachystochrone," 2.¢., of the curve of quickest descent under the action of gravity, differed essentially

A short ac-

1 Montucla (J/ist. de Math., tom. i. p. 118) erroneously attributed these theorems on isoperimetry to Pythagoras, but his statement is based on a misinterpretation of a passage in Diogenes Laertins. See Bretschneider, Die Geomeirie vor Luklides, pp. 89, 90.

from all problems on maxima and minima which had been previously solved. In this he introduced into mathematics the conception of a new and most important class of problems. James Bernoulli, also, in his solution of this problem of his brother, proposed a more general question, which may be stated as follows :—' Of all curves of the same length described on a given base to determine one such that the area of a second curve, each of whose ordinates is a given function of the corresponding ordinate, or arc, of the first, may be a maximum, or a mininum." Such problems were styled "isoperimetrical,' and come under a class now called relative maxima and minima, in which the maximum or minimum curve is to be determined, not from all possible curves, but from among those which possess a given property. The investigations of the Bernoullis were extended and generalized by other eminent mathematicians, but more especially by Euler, and cul- minated in the invention of the calculus of variations, with an appropriate notation, by Lagrange.

MAXIMIANUS, Marcus Auretius VALERIUS, surnamed Hercutius, Roman emperor from 286 to 305, and again in a doubtful manner for some time prior to 308, was by birth a Pannonian peasaut, but achieved great distinction in the course of long service in the army in almost every quarter of the empire, and, having been made Cesar by Diocletian in 285, received the title of Augustus in the following year (April 1, 286) with the honorary appel- lation of Herculius. In 287 he suppressed the rising of the peasants (Bagaude) in Gaul, but in 289, after a three years' struggle, his colleague

and he were compelled to acquiesce in the assumption by his lieutenant Carausius of the title of Augustus in Britain. After 292, Maximian left tle care of the Rhine frontier to Constantius Chlorus, who had been designated Cesar in that year, but in 297 his arms achieved a rapid and decisive victory over the barbarians of Mauretania, and in November 303 he shared at Rome the triumph of Diocletian, the last pageant of the kind ever witnessed by that city. On May 1, 305, the day of Diocletian's abdication, he also, but without his colleague's sincerity, divested himself of the imperial dignity at Milan, which had been his capital, and retired to a villa in Lucania ; in the following year, however, he was induced by his son Maxentius to reassume the purple. In 307 he brought the emperor Severus a captive to Rome, and also compelled the retreat of Galerius, but in 308 he was himself driven by Maxentius from Italy into Illyricum, whence again he was compelled to seek refuge at Arles, the court of his son-in-law Constantine. Here a false report was received, or invented, of the death of Con- stantine, at that time absent on the Rhine, and Maximian at once grasped at the succession, but was soon driven to Marseilles, where, having been delivered up to his pursuers, he strangled himself in 310 (February).

MAXIMIANUS, Gatertus Vatertus, usually referred to by his name Gatzrius, Roman emperor from 305 to 311, was born near Sardica in Dacia, and originally followed his father's occupation, that of a herdsman, whence his surname of Armentarius. He served with distinction as a soldier under Aurelian and Probus, and in 292 was designated Cesar along with Constantius, receiving in marriage Diocletian's daughter Valeria, aud at the same time having assigned to him as his special charge the care of the Illyrian provinces. In 296, at the beginning of the Persian war, he was removed from the Danube to the Euphrates ; his first campaign ended ina crushing defeat on the same field as that which had proved fatal to Crassus, but in 297, advancing through the mountains of Armenia, and taking the enemy by surprise, he gained a victory over Narses by which his military reputation was more than restored. In 305, on the abdication of Diocletian and

Maximian, he at once assumed the title of Augustus, along with Constantius his former colleague, and, having pro- cured the promotion to the rank of Cesar of Severus a faithful servant, and Daza (Maximinus), his nephew, ih hoped on the death of Constantius to become sole master of the Roman world. This scheme, however, was defeated by the sudden elevation of Constantine at York on the death of lis father, and by the action of Maximian and Maxentius in Italy. After an unsuccessful invasion of Italy in 307 he elevated his friend Licinius to the rank of Augustus, and, moderating his ambition, devoted the few remaining years of his life "to the enjoyment of pleasure and tothe execution of some works of public utility." He died—of the morbus pedicularis, it is said—in May 311, It was at the instance of Galerius that the first of the celebrated edicts of persecution against the Christians was published, on February 24, 303, and this policy of repres- sion was maintained by him until the appearance of the general edict of toleration, running in his own name and in those of Licinius and Constantine.

MAXIMILIAN I, (1459-1519), holy Roman emperor, the son of the emperor Frederick IIT., was born on the 29d of March 1459. In 1477 he married Mary, danghter of Charles the Bold of Burgundy, thus securing for hig fainily the possessions of the house of Burgundy ; and by the mar- riage of his son Philip with the infanta Joanna in 1496 he prepared the way for the association of Spain with the empire under his grandson, Charles V. In 1486 Maximilian was chosen king of the Romans, and in 1493, after the death of his father, he succeeded to the imperial throne. During the reign of Frederick III. the system of private war created profound discontent, and there were urgent demands for the reforin of imperial institutions. Maximilian was never thoroughly in sympathy with this movement, but at his first diet, in 1495, he declared a perpetual public peace ; and he did something for the restoration of order by the establish- ment, in the same year, of the imperial chamber (eichskam- mergericht), and, in 1501, of the imperial Aulie council (Leichshofrath). Another important change was the division of Germany into six, afterwards (in 1512) into ten, circles (A7evse), over each of which was placed a captain. with a force for the punishment of disturbers of the peace. Standing troops, called Landsknechte, were for the first time organized by Maximilian, who also improved the artillery then in use, and issued good police regula- tions. He encouraged science, art, and

literature, devoted much attention to the universities, especially those of Vienna aud Ingolstadt, collected medizval poems, and caused copies to be made of ancient chronicles and other important manuscripts. Through the influence of his second wife, Blanca Sforza, daughter of Duke Galeazzo Sforza of Milan, he was induced to contend for supremacy in Milan and Naples ; but his resources were inadequate for war on equal terms with the kings of France, Charles VITI. and Louis XII, In 1499 he carried on an unsuc- cessful war with the Swiss confederates, the result of which was that, by the peace of Basel, the confederates became practically independent of the empire, On the other hand, he was singularly fortunate in increasing the power of the house of Austria. By the death of his cousin, the arch- duke Sigismund, he inherited Tyrol; he also received Gorz, Gradisca, the Pusterthal, and a part of Bavaria ; and by the marriage of two of his grandchildren with children of the king of Hungary and Bohemia he took the first step towards the ultimate incorporation of these countries with the Austrian hereditary territories. ime wrote several books, and planned the " Weiss-Kumg, 2 kind of poetical autobiography, completed by his Sa secretary, Treizsaurwein von Erentreiz. Maximilian ha some part also in the preparation of Thewerdank, au

allegory setting forth adventures in connexion with his marriage with Mary of Burgundy. At Wels, in Upper Austria, on the 12th of January 1519, he died.

See Kliipfel, Kaiser Mawimilian I., 1864.

MAXIMILIAN II, (1527-1576), holy Roman emperor, son and successor of Ferdinand I., was born at Vienna on the Istof August 1527. He was of a mild and tolerant disposition, and in youth received a favourable impression of Protestantism from his tutor, Wolfgang Severus,—an impression which was not effaced by a residence of three years at the Spanish court. In 1562 he became king of Bohemia and king of the Romans, in 1563 king of Hungary, and in 1564 emperor. At the time of his accession to the imperial throne Hungary was at war with Turkey. The sultan Soliman II. was conciliated by the cession of all the territories he had conquered in Hungary, and by the promise of a yearly tribute of 300,000 florins. Soon

afterwards Soliman renewed the war on behalf of the prince of Transylvania but after his death in 1566 his successor, Selim, concluded with Maximilian an arinistice of eight years. Maximilian's brothers, Ferdinand and Charles, fought incessantly against Protestantism in their respective lands; but it was tolerated by Maximilian in Austria, Bohemia, and Hungary. His authority, however, was greatly limited by the influence of the Jesuits. He died on the 12th of October 1576. Of his eight children (six sons and two daughters) two—Rudolph II. and Matthias—became emperors.

See Koch, Quellen zur Geschichte des Katsers Maximilian IL,

1857-61; and Wertheimer, Zur Geschichte des Tiirkenkriegs Maxi- milians I[., 1875.

MAXIMILIAN (1832-1867), archduke of Austria (Ferdinand Maximilian Joseph) and emperor of Mexico, was the second son of the archduke Francis Charles, and was born in Vienna on July 6, 1832. He was trained for the navy, and ultimately attained a high command in that branch of his country's service. Inu February 1857 he was appointed governor of the Lombardo-Venetian kingdom, and in the same year he married the Princess Charlotte, daughter of Leopold I., king of the Belgians. On the outbreak of the war of 1859, he retired into private life, chiefly at Trieste, until 1863, when at the instance of Napoleon III. he accepted the crown which had been offered to him by the notables of Mexico. He landed at Vera Cruz on May 28, 1864, but from the commencement of his reign found himself involved in difficulties of the most serious kind, which in 1866 made apparent to almost every one outside of Mexico the necessity for his abdicating. This, however, he declined to do. With- drawing, in February 1867, to Querétaro, he there sustained a siege for several weeks, but on May 15 resolved to attempt an escape through the enemy's lines. He was, however, arrested before he could carry out this resolution, and, after trial by court martial, was condemned to death. The sentence was carried out on June 19, 1867, His remains were conveyed to Vienna, where they were buried in the imperial vault early in the following year. See Mexico. Maximilian's papers were published in 1867 in Seven volumes, under the title Aus meinem Leben, Reise- skizzen, Aphorismen, &e.

MAXIMINUS, Carus Jutrus Virus, Roman emperor from 235 to 238, was of barbarian parentage, his father being a Goth and his mother an Alan, and was born in a village on the confines of Thrace, where his immense stature and enormous feats of strength first drew the attention of the emperor Septimius Severus. From being a shepherd he became a soldier, and under Caracalla rose to the rank of centurion. from court during the reign of Elagabalus, but rose to the

first military command under his successor Alexander

He carefully absented himself

Severus. On March 19, 235, the troops saluted him emperor, and shortly afterwards Alexander was put to death. The tliree years of his reign, which were spent wholly in the camp, were marked by great cruelty and oppression; the widespread discontent thus produced culminated in a revolt in Africa and the assumption of the purple by Gorpianus (¢.v.). Maximin, who was in Pannonia at the time, marched against Rome, and passing over the Julian Alps descended on Aquileia; while detained before that city he and his son were murdered in their tent by a body of preetorians. Their heads were cut off and despatched to Rome, where they were burnt on the Campus Martius by the exultant crowd (May 238).

MAXIMINUS, Gaterius VALERIUs, Roman emperor from 308 to 314, was originally an Illyrian shepherd, and bore the name of Daza. His mother was a sister of him who afterwards became the emperor Galerius. He rose to high distinction after he had joined the army, and in 305 he was raised by his uncle to the rank of Cesar, with the honorary appellation of Jovius, Syria and Egypt being the government assigned to him. In 308, after the elevation of Licinius, he insisted on receiving the title of Augustus ; on the death of Galerius in 311 he succeeded to the supreme command of the provinces of Asia, and, when Licinius and Constantine began to make common cause with one another, Maximin entered into a secret alliance with Maxentius. He came to an open rupture with Licinius in 313, sustained a crushing defeat in the neighbourhood of Heraclea on April 30th, and, having fled with extraordinary celerity first to Nicomedia and after- wards

to Tarsus, perished at the latter city in August following. His death was variously ascribed "to despair, to poison, and to the Divine justice." Maximin, in every respect a worthless character, has a bad eminence in the annals of the Christian church as having renewed persecu- tion after the publication of the toleration edict of Galerius.

MAXIMUS, the name of four Roman emperors. In chronological order the first was M. Clodius Pupienus Maximus, who was associated with Balbinus in the imperial dignity by the senate for a short time in 238, before and after the death of the hated Maximin. The second was Magnus Clemens Maximus, a native of Spain, who shared the imperial dignity with Valentinian and Theodosius from 383 to 388. He had accompanied Theodosius on several expeditions, and from 368 held high military rank in Britain. The disaffection of the Roman troops towards the emperor Gratian found expres- sion in 383 in the proclamation of Maximus as emperor, — whether with or without his complicity in the act is uncertain. Voluntarily or under compulsion Maxinius forthwith attacked Gratian in Gaul, and drove him from Paris to Lyons, where the fugitive was murdered. Circum- stances made it difficult for Theodosius at the time to avenge the death of his colleague by war, and an agree- ment was therefore come to by which Maximus was recog- nized as Augustus and sole emperor in Gaul, Spain, and Britain, while Valentinian was to remain unmolested in Italy and Illyricum, Theodosius retaining his sovereignty in the East. A prosperous reign of four years having tempted Maximus, in 387, to pass the Alps, Valentinian was speedily put to flight, while the invader established himself in Milan, and for the time became master of Italy. Theodosius now took vigorous measures: advancing a powerful army by land, he utterly defeated the western troops at Siscia (Sciszek) in Pannonia, and, passing the Julian Alps with great rapidity, came upon Maximus, who had fled to Aquileia, seized him, and caused him to be beheaded (August 388). The third, Maximus Tyrannus, was made emperor in Spain by the Roman general Gerontius,

who had rebelled against Constantine in 408. After the defeat of Geroutius at Arles, and lis subsequent death in 411, Maximus renounced the imperial

title and was per- initted by Constantine to retire into private life. About 418 he rebelled again, but, failing in his attempt, was seized, carried into Italy, and put to death at Ravenna in 422, Lastly, Petronius Maximus was a member of the higher Roman nobility, and had held a large number of public offices, including those of praefectus Rome (420) and of preefectus Italie (439-441 and 445). He was one of the intimate associates of Valentinian, who received his assistance in the palace intrigues which led to tlie death of Aetius in 454; but a brutal outrage committed on the wife of Maximus by the emperor turned his friendship into the bitterest hatred. Maximus was proclaimed emperor im- mediately after Valeutinian's murder in March 455, but reigned for less than three months, having been murdered by some Burgundian mercenaries as he was flying before the Vandals, who, invited by Eudoxia, the widow of Valentinian, had landed at the mouth of the Tiber (May or June 455),

MAXIMUS, Sz, abbot of Chrysopolis, known as "the Confessor" from his orthodox zeal in the Monothelite con- troversy, or as "the monk," was born of noble parentage at Constantinople about the year 580. Educated with great care, he early became distinguished by his talents and acquircments, and some tiie after the accession of the emperor Heraclius in 610 was made his private secretary. In 630 he abandoned the secular life and entered the monastery of Chrysopolis (Scutari), actuated, it was believed, less by any longing for the life of a recluse than by the dissatisfaction he felt with the Monothelite leanings of his master. The date of his promotion to the abbacy is uncertain. In 633 he was one of the party of Sophronius at the council of Alexandria; and in 645 he was again in Africa, when he held in presence of the governor and a number of bishops the disputation with Pyrrhus, the deposed and banished patriarch of Constantinople, which resulted in the (temporary) conversion of his interlocutor to the Dyothelite view. In the following year several African synods, held under the influence of Maximus, declared for orthodoxy. In 649, after the accession of Martin I., he went to RNoine, and did much to fan the zeal of the new pope, who in October of that year held the (first) Latcran synod, by which not only the Monothelite doctrine but also the moderating ecthesis of Heraclius and typus of Constans II. were anathematized. About 653 Maximus, for the part he had taken against the latter document especially, was apprehended by order of Constans and carried a prisoner to Constantinople, and in 655,

after repeated examinations, in which he maintained his theological opinions with memorable constancy, was banished to Byzia in Thrace, and afterwards to Perberis. In 662 he was again brought to Constantinople and was condemned by a synod there to be scourged, to have his tongue cut out by the root, and to have his right hand chopped off. After this sentence had been carried out he was again banished to Lazica, where he died on August 18, 662. He is venerated as a saint both in the Greek and in the Latin Church,—in the former on January and on August 12th and 13th, in the latter on August 13th.

A collection of his works, which are of importance for the history of the Monothelite controversy, was undertaken by Combefis, who published two volumes in 1675 (S. Maximit Confessoris, Grecorum Pheologt, eximiique Philosophi Opera), but did not live to complete his labours. A list of the more important of the writings of Maxi- mus, with bibliographical details, will be found in Sinith's Dictionary of Biography and Mythology; an exhaustive 'Catalogue raisonné," by Wagenmann, occurs in vol. ix. (1881) of the new edition of Her- zog's Keal-Encyklopidie. The details of the disputation with Pyrrhus and of the martyrdom are given very fully aud clearly in Hefele's Conc.-gesch., vol. iii,

MAX—MAX

MAXWELL, James CierK (1831-1879), was the last representative of a younger branch of the well-knowp Scottish family of Clerk of Penicuik. He was educated at the Edinburgh Academy (1840-47) and the university of Edinburgh (1847~50). Entering at Cambridge in 1850, he spent a term or two in Peterhouse, but afterwards migrated to Trinity. He took his degree in 1854 as second wrangler, and was declared equal with the senior wrangler of his year in the higher ordeal of the Smith's prize examination. He held the chair of natural philosoph in Marischal College, Aberdeen, from 1856 till the fusion of the two colleges there in 1860. For eight years subsequently he held the chair of physics and astronomy in King's College, London, but resigned in 1868 and retired to his estate of Glenlair in Kirkeudbrightshire. He was summoned from his seclusion in 1871 to become the first holder of the newly-founded professorship of experimental physics in Cambridge ; and it was under his direction that the plans of the

Cavendish laboratory were prepared. He superintended every step of the progress of the building and of the purchase of the very valuable collec- tion of apparatus with which it was equipped at the expense of its munificent founder the duke of Devonshire (chancellor of the university, and one of its most distinguished alumni). So far for the outline of Maxwell's career, as regards dates, official work, &c. The rest belongs almost exclusively to mathematical and physical science. For more than half of his brief life he held a prominent position in the very foremost rank of natural philosophers. His contribu- tions to scientific societies began in his fifteenth year, when Professor J. D. Forbes communicated to the Royal Society of Edinburgh a short paper of his on a mechanical method of tracing Cartesian ovals. In his eighteenth year, while still a student in Edinburgh, he contributed two valuable papers to the Z'ransactions of the same society—one of which, "On the Equilibrium of Elastic Solids," is remark- able, not only on account of its intrinsic power and the youth of its author, but also because in it he laid the foundation of one of the most singular discoveries of his later life, the temporary double refraction produced in viscous liquids by shearing stress. Immediately after taking his degree, he read to the Cambridge Philosophical Society a very novel memoir On the Transformation of Surfaces by Bending. This is one of the few purely mathematical papers he published, and it exhibited at once to experts the full genius of its author. About the same time appeared his elaborate memoir On Faraday's Lines of Force, in which he gave the first indication of some of those extraordinary electrical investigations which culminated in the greatest work of his life. He obtained in 1859 the Adams prize in Cambridge for a very original and powerful essay On the Stability of Satwrn's Rings. From 1855 to 1872 he published at intervals a series of valuable investigatious connected with the Perception of Colour and Colour-Blindness. For the earlier of these he received the Rumford medal in 1860, The mstru- mients which he devised for these investigations were simple and convenient, but could not have been thought of for the purpose except by a man whose knowledge was co-extensive with his ingenuity. One of his greatest investigations bore on the Kinetic Theory of Gases. Originating with D. Bernoulli, this theory; was advanced by the successive labours of Herapath, Joule, and Lio 4 cularly of Clausius, to such an extent as to put its genera accuracy beyond a doubt. But by far the greatest develop- ments it has received are due to Maxwell, part of whose

mathematical work has recently been still further Bago in some directions by Bolzmann. In this field ae s fric

appears as an experimenter (on the laws of gaseou ae as well as a mathematician. His two latest papers ee

MAX—MAY

with this branch of physics; one is an extension and simplification of some of Bolzmann's chief results, the other treats of the kinetic theory as applied to the motion of the radiometer. He has written an admirable text-book of the Theory of Heat, which has already (1882) gone through several editions, and a very excellent elementary treatise on Matter and Motion. Even this, hike his other and larger works, is full of valuable matter, worthy of the most attentive perusal not of students alone but of the very foremost scientific men.

But the great work of his life was devoted to electricity. He began by reading with the most profound admiration and attention the whole of Faraday's extraordinary self- revelations, and proceeded to translate the ideas of that master into the succinct and expressive notation of the mathematicians. A considerable part of this translation was accomplished during his career as an undergraduate in Cambridge. the MS. on Faraday's Lines of Force, in a form little different from the final one, a year before Maxwell took his degree. His great object, as it was also the great object of Faraday, was to overturn the idea of action at a distance. The splendid researches of Poisson and Gauss had shown how to reduce all the phenomena of statical electricity to mere attractions and repulsions exerted at a distance by particles of an imponderable on one another. Sir W. Thomson had, in 1846, shown that a totally different assumption, based upon other analogies, led (by its own special mathematical methods) to precisely the same results. He treated the resultant electric force at any point as analogous to the flux of heat from sources distri- buted in the same manner as the supposed electric particles. This paper of Thomson's, whose ideas Maxwell afterwards developed in an extraordinary manner, seems to have given the first hint that there are at least two perfectly distinct methods of arriving at the known formule of statical electricity. The step to magnetic phenomena was compara- tively simple; but it was otherwise as regards

electro- magnetic phenomena, where current electricity is essentially involved. An exceedingly ingenious, but highly artificial, theory had been devised by Weber, which was found capable of explaining all the phenomena investigated by Ampére, as well as the induction currents of Faraday. But this was based upon the assumption of a distance-action between electric particles, whose intensity depended on their relative motion as well as on their position. This was, of course, even more repugnant to Maxwell's mind than the statical distance-action developed by Poisson. The first paper of Maxwell's in which an attempt at an admissible physical theory of electromagnetism was made was communi- cated to the Royal Society in 1867. But the theory, in a fully developed form, first appeared in his great treatise on Electricity and Magnetism (1873). 'This work, already in a second edition, is one of the most splendid monuments ever raised by the genius of a single individual. Availing himself of the admirable generalized coordinate system of Lagrange, Maxwell has shown how to reduce all electric and magnetic phenomena to stresses and motions of a material medium, and, as one preliminary, but excessively severe, test of the truth of his theory, has shown that (if the electromagnetic medium be that which is required for the explanation of the phenomena of light) the velocity of light in vacuo should be numerically the same as the ratio of the electromagnetic and electrostatic units. We do hot as yet certainly know either of these quantities very exactly, but the means of the best determinations of each Separately agree with one another more closely than do the various values of either. There seems to be no longer any possibility of doubt that Maxwell has taken the first grand step towards the discovery of the true nature of

The writer had the opportunity of perusing"

electrical phenomena. Had he done nothing but this, his fame would have been secured for all time. But, striking as it is, this forms only one sinall part of the contents of his truly marvellous work.

One of his last great contributions to science was his editing (with copious original notes) the Llectrical Researches of the Hon. Llenry Cavendish, which had been altogether unappreciated by the witlings to whom they had

previously been confided. It now appears that Cavendish, already famous by many other researches (such as the mean density of the earth, the composition of water, &c.), must

-be looked on as, in his day, a man of Maxwell's own stamp

as a theorist, and an experimenter of the very first rank.

This encyclopxdia has been, in its scientific aspects, greatly indebted to Clerk Maxwell. The articles Atom, ATTRACTION, CAPILLARITY, Dirruston, Eruer, &c., were intended as parts merely of one comprehensive system, in which a general résumé of all that is known of the pro- perties of matter should be given in simple yet profound completeness. The reader of these articles cannot but feel how much has been lost when this splendid series cannot be completed by its initiator.

In private life Clerk Maxwell was one of the most lovable of men, a sincere and unostentatious Christian. Though perfectly free from any trace of envy or ill-will, he yet showed on fit occasion his contempt for that pseudo-science which seeks for the applause of the ignorant by professing to reduce the whole system of the universe to a fortuitous sequence of uncaused events.

His collected works will shortly be issued from the Pitt press; and an extended biography, by his former school- fellow and lifelong friend Professor Campbell, has just been published (1882). (Pp. G. T.)

MAXWELL, Sir Wittiam Stiriine-, Bart. (1818- 1878), man of letters, the only son of Mr Archibald Stirling of Keir, Perthshire, and of Elizabeth, second daughter of Sir John Maxwell, seventh baronet of Pollok, Renfrewshire, was born at Kenmure, near Glasgow, in 1818. William Stirling was educated at Trinity College, Cam- bridge, where he graduated in 1839, and afterwards he spent some years on the Continent chiefly in France and Spain. Having succeeded his father as proprietor of Keir in 1846 (when he was made vice-lieutenant of Perthshire), he in 1852 entered parliament as member for that county ; and he was several times re-elected. On the death of his uncle in 1865 he succeeded to the baronetcy and estates of Pollok, in respect of which he assumed the additional naine of Maxwell.

In the same year he became deputy- lieutenant of Lanarkshire, and a like office was conferred on him in Renfrewshire in 1870. The services which his talent, energy, and wealth enabled him to render to literature were recognized in a great variety of ways by numerous universities ; in 1863 he was chosen lord rector of St Andrews, in 1871 the same honour was conferred by Edinburgh, and in 1875 he became chancellor of Glasgow. In the following year he was created a Knight of the Thistle, being the only commoner of the order. He died at Venice on January 15, 1878.

Sir W. Stirling-Maxwell's works, which are invariably character- ized by thoroughness of workmanship and refinement of literary taste, were in some cases issucd for private circulation only, and almost all of them are now exceedingly rare. They include an early volume of verse (Songs of the Holy Land, 1847), and several volumes containing costly reproductions of old engravings, along with valuable explanatory matter. His best-known publications are Annals of the Artists of Spain (1848; 2d ed., 1858), Lhe Cloister Life of Charles V. (1852; 3d ed., 1858), and Velazquez and his Works (1855).

MAY, the fifth month of our modern year, was the third of the old Roman calendar. The name is of doubtful origin. Ovid (Fast, v. 483-90) suggests the three derivations of

muajestas, majores (the patres of the old Roman city), and Maia, the mother of Mercury, to whom the Romans were accustomed to sacrifice on the first day of the month. It was considered unlucky among the Romans to contract marriages during this month, on account of the celebration of the Lemuria, —a superstition of which traces are still to be found among ourselves. In the Roman Catholic Church May is known as " the month of Mary."

May-day is the name given to the first day of the month in England, when, according to ancient custom, all ranks of the people rose at early dawn and went out "a-Maying" to welcome the advent of spring. The customs of the day chiefly took their rise with the Romans. In the southern connties of England they differ materially from those of the northern and western. That

of gather- ing branches of trees and flowers, to deck the person, is still observed in many places.

The May-Pole was once general throughout the country. The assemblage of the people, sanctioned by the presence of the priests, marching on May morning in pro- cession to some neighbouring wood, returned in triumph with the pole, round which were suspended flowers, boughs, and other tokens of the spring season. On one of thiese festive occasions, Henry VIII. assembled his court at Shooter's Hill; and Queen Elizabeth also used to keep "May Games" at Greenwich. The May-pole, once fixed, often remained until nearly the end of the year; and there were sone specially made of durable wood, which remained for many years, and were from time to time resorted to at other seasons of festivity. The last May-pole erected in London, 100 feet in height, was on the spot where the church in the Strand now stands, near Somerset House. Being taken down in 1717-18 it was conveyed to Wanstead Park in Essex, where it was fixed as part of the support of a large telescope set up by Sir Isaac Newton. The May Lady, Maulkin, Jack in the Green, and Morris Dancing are merely variations in the mode of representing the goddess Flora. The chimney sweepers, who are now the principal performers, are probably more interested than any other class iu May sports. For, as the commencement of summer deprives them in a considerable degree of their business occupation, they naturally seek to avail themselves of the customary liberality of festive meetings.

The other principal fixed days observed and noted in the month are May 9, Half-Quarter-Day, and May 15, Whitsunday term,—not to be confounded with Whit Sunday, which is a movable feast.

MAYA. See Mexico.

MAYBOLE, a burgh of barony and market-town of Scotland, in the county of Ayr, 9 miles south of Ayr on the railway to Stranraer, is built on the face of a hill gently sloping to the south. The characteristic features of the place are the old family mansions in the main street, the castle of the earls of Cassilis, and the old church ruins with the Cassilis burial-place. It has recently increased considerably in size, and it is now busy with various manufacturing industries in addition to its staple trade of shoemaking. The population was 3797 in 1871 and 4474 in 1881. New waterworks to supply

60,000 gallons daily were commenced in 1882; the site of the reservoir, about 3 miles south-east of the town, is almost that of the remarkable Lochspouts crannog (see Ayr and Wi igton Arch. and Hrst. Collections, vol. iii.; and Munro, Ancient Scottish Lake Dwellings, 1882).

A charter was granted to the town by Duncan in 1198 ; and the church was bestowed in 1216 on the Cistercian nunnery at North Berwick. In 1516 Maybole became a burgh of regality, and in 1639 the scat of the head courts of Carrick ; but the independence of its local government was long contested by the superiors, the carls

of Cassilis. Cotton weaving was introduced in the 18th century. See J. Paterson, History of Ayr and Wigton, vol. ii., 1864.

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MAYENCE. See Matnz.

MAYENNE, a department of north-western France. three-fourths of which formerly belonged to Lower Maine and the remainder to Anjou, lies between 47° 45’ 10” and 48° 34 30” N. lat., and 0° 2’ E. and 1° 14’ W. long., and is bounded on the N. by Manche and Orne, on the E. by Sarthe, on the S. by Maine-et-Loire, and on the W. by Ille-et-Vilaine, having a maximum length from north to south of 51 miles, a breadth of 39 miles, and an area of 1996 square miles. Its ancient geological forma- tions connect it with Brittany. The surface is agreeably undulated ; forests are numerous, and the beauty of the cultivated portions is enhanced by the hedgerows and lines of trees by which the farms are divided. The highest point of the department, and indeed of the wholc north-west of France, is the Mont des Avaloirs (1368 feet). Hydrographically Mayenne belongs to the basins of the Loire, the Vilaine, and the Sdlune; the first-mentioned has the larger part of the entire area. The principal stream is the Mayenne, which passes successively from north to south through the three most important towns—Mayenne, Laval, and Chateau-Gontier ; by means of weirs and sluices it is navigable below Mayenne, but steamers do not ascend past Chateau-Gontier. The chief affluents are the Jouanne on the left, and on the right the Col- mont, the Ernée, and the Oudon. A small area in the east of the department drains by the Erve into the Sarthe; the Vilaine rises in the west,

and in the north-west the Sélune flows into the English Channel. The climate of Mayenne, which is that of the Sequanian region, is gene- rally healthy except in the neighbourhood of the numerous marshes. The temperature is lower and the moisture of the atmosphere greater than in the neighbouring depart- ments ; the rainfall is above the average for France.

Of the entire area two-thirds are arable, and a twentieth is under wood. A large number of horned cattle are reared (98,000 oxen, 150,000 cows), and in no other French department are so many horses (92,500) found within the same area; the breed, that of Cyaon, is famed for its strength. Craon has also given its name to the most prized breed of pigs in western France. 'There are 83,000 pigs in the department, 80,000 sheep, and 5000 goats. Mayenne produccs excellent butter, poultry, and game, and a large quantity of honey. The cultivation of the vine is very limited, and the most common beverage is cider, of which nearly 9,000,000 gallons are annually made. Agriculture is in a flourishing condition ; in 1878 were produced upwards of 3$ million bushels of wheat, ? million of meslin, nearly an equal amount of rye, 14 million of barley, 2 million of oats, and nearly 3 million bushels of potatoes, besides a large quantity of flax and hemp. The timber grown is chiefly beech, oak, birch, elm, and chestnut. The department produces a little iron-ore and manganese; it isrich in anthracite and coal, of which, however, the annual production has recently decreased from 80,000 tons to 60,000. Marble and granite, limestone, slate, and porphyry are quarricd ; the last-named material is capable of a fine polish, and is also used for paving the streets of Paris. There are several chalybeate springs. The industries include iron and brass found- ing, brick and tile making, brewing, the manufacture of candles, cotton, linen, and woollen thread, and the production of various tex- tile fabrics (that of ticking being the specialty of the department), agricultural implement making, wood and marble sawing, tanning, dyeing, and the like. The population in 1881 was 343,167, The arrondisscments are those of Laval, Chateau-Gcntier, and Mayenne.

MAYENNE, capital of an arrondissement in the above department of France, is an old feudal town irregularly built on two hillocks which overlook the river Mayenne, at the point where the railway from Caen to Laval 1s joined by that from Fougéres to Alengon. The old castle still has towards the river five towers, one of which has retained its conical roof; the

vaulted chambers and chapel are ornamented in the style of the 13th century ; the building is now used as a prison. The church of Notre Dame, dating partly from the 12th century, is the only other building of any special interest. In the Place Cheverus is a statue, by David of Angers, to the eee of that name, who was born in Mayenne. The chic

industry of the place is the cloth manufacture, which occupies 8000 persons in the town and neighbourhood. The population in 1876 was 10,098.

Mayenne had its origin in the castle built here by Juhel, the son of Geoffroy of Maine, in the beginning of the 11th century. It was pesieged by William the Conqueror, and afterwards by the earl of Salisbury ; and the possession of it was disputed by the Royalists and the Leaguers, as also by the Republicans and the Vendeans.

[AYER, Joann Tozras (1723-1762), one of the M ?

test of last century's astronomers, was born at Marbach

rea i ? in Wirtemberg, February 17, 1723. He was brought up at Esslingen in comparatively poor circumstances, and as a mathematician was mainly self-taught. He had already published several original geometrical tracts | when, in 1746, he entered Homann's cartographic establishment at Nuremberg. Here he introduced many improvements in map-making, and gained a scientific reputation which led pmaking, and gaine P

(in 1751) to his election to the chair of economy and mathematics in the university of Gottingen. In 1754 he became superintendent of the observatory, where he laboured with great zeal and success till his death, February 20, 1762. His first important astronomical work was a careful investigation of the libration of the moon (Kosmo- graphische Nachrichten, Nuremberg, 1750), the elements of which and the position of the moon's axis of rotation he determined with much greater accuracy than had previously been done. His great fame rests on his lunar tables, which were published in 1753 along with new solar tables, and transmitted to England in 1755. These tables, which were compared by Bradley with the Greenwich

observa- tions, and found to be sufficiently accurate to determine the longitude at sea to within halfa degree, solved the problem of practically determining longitude anywhere on the earth's surface. An improved set was afterwards published in London (1770), as also the theory (Z'heoria Lune juxta Systema Newtonianum, 1767) upon which the tables are based. They were sent to England by his widow, who in consideration received from the British Governinent a grant of £3000. Appended to the London edition of the solar and lunar tables are two short tracts, —the one on determining longitude by lunar distances, together with a description of the repeating circle (invented by Mayer in 1760), the other on a formula for atmospheric refraction, which applies a remarkably accurate correction for temperature.

Mayer left behind him a considcrable quantity of manuscript, part of which was collected by Lichtenberg and published in one volume (Opera Inedita, Gottingen, 1775). It contains, amongst other papers, an easy and accurate method for calculating eclipses; an essay on colour, in which three primary colours are recognized; a catalogue of nine hundred and ninety-eight zodiacal stars; and a memoir, the earliest of any real value, on the proper motion of fixed stars, which was originally communicated to the Gottingen Royal Society in 1760. The other part still remains in manuscript, and in- cludes papers on atmospheric refraction (dated 1755), on the motion of Mars as affected by the perturbations of Jupiter and the Earth (1756), and on terrestrial magnetism (1760 and 1762). In these last Mayer seeks to explain the magnetic action of the earth by a simple hypothesis. He supposes a small bar-magnet to be placed with its centre at the earth's centre, and calculates the position of equili- brium of a second small magnet at any given point on the earth's surface, assuming the law of magnetic attraction and repulsion to be that of the inverse square. Though the values of the declina- tion and dip calculated according to this theory do not agree with pe observed values, Mayer must be credited with the first really

efinite attempt to establish a mathematical theory of magnetic oe and as the first who gave any experimental evidence in favour of the inverse square of the distance as the law of force. See Han- steen's Magnetismus der Erde.

Be Juuius Ropert (1814-1878), was born at 1 eilbronn, Nov. 25, 1814, studied medicine at Tiibingen,

funich, and Paris, and, after a journey to Java in 1840 as surgeon of a Dutch vessel, obtained a medical post in his hative town. He claims recognition as an independent a priort propounder of the " First Law of Thermodynamics,"

but more especially as having early and ably applied that law to the explanation of many remarkable phenomena, both cosmical and terrestrial. His first little paper on the subject, '" Bemerkungen tiber die Krafte der unbelebten Natur," appeared in 1842 in Liebig's Annalen, five years subsequent to the republication, in the same journal, of an extract from the great memoir of Mour (q.v.). Mayer's statements as to the "indestructibility of force" (as he calls it) were based almost entirely upon scholastic dicta, such as causa xquat effectum, &c. The main experimental fact which he adduces in support of his reasoning as to the convertibility of work and heat is a mere repetition, in a very inadequate form, of a curious experiment made by Dr Reade of Cork, who found (Wicholson's Journal, xx., 1808, p. 113) that water was sensibly heated after being violently shaken ina phial. But Dr Reade states explicitly the precautions he had taken to protect the phial and its contents from heating by the hand of the operator,—— an important detail which is unnoticed by Mayer.

It has been repeatedly claimed for Mayer that he calculated the value of the dynamical equivalent of heat, indirectly no doubt, but in a manner altogether free from error, and with a result according almost exactly with that obtained by Joule after years of patient labour in direct experimenting. Mayer assumed that the heat developed by compression of air is the equivalent of the work spent in the compression. If we had independent proof of this the result would undoubtedly follow.! And it has been urged that the man who, by a single burst of genius, reached at once the goal which others had been painfully seeking, merits an amount of fame commensurate with that due to discoverers like Newton or Galileo. This claim on Mayer's behalf was first shown to be baseless by Thomson and Tait (" Energy," Good Words, 1862). This article gave rise to a long but lively

discussion. A calm and judicial annihilation of the claim is to be found in a brief article by Stokes, Proc. Roy. Soc., 1871, p. 54. See also Maxwell's Theory of Heat, chap. xiii. Mayer entirely ignored the grand fundamental principle laid down by Sadi Carnot, a principle which has done even more for physics than has the conservation of energy itself, viz., that nothing can be concluded as to the relation between heat and work from an experiment in which the working substance is left at the end of an operation in a different physical state from that in which it was at the commencement. Mayer has also been styled the discoverer of the fact that heat consists in (the energy of) motion, a matter settled at the very end of the 18th century by Rumford and Davy. . In the teeth of this statement we have Mayer's own words, '"' We might much rather assume the contrary, —that in order to become heat, motion must cease to be motion."

Mayer's real merit consists in the fact that, having for himself made out, on inadequate and even questionable grounds, the con- servation of energy, and having obtained (though by inaccurate reasoning) a numerical result correct so far as his data permitted, he applied the principle with great power and insight to the cx- planation of numerous physical phenomena. His papers, which have been republished in a single volume with the title Die Mechanik der Wérme (2d ed., Stuttgart, 1874), are of extremely unequal merit. But some, especially those on Celestial Dynamics and Organic Motion, are admirable examples of what really valuable work may be effected by a man of high intellectual powers, in spite of imperfect information and defective logic.

Different, and, it would appear, exaggerated, estimates of Mayer are given in Dr Tyndall's papers in the Phil. Mag., 1863-64 (whose avowed object was "to raise a noble and a suffering man to the position which his labours entitled him to occupy'), and in the extraordinary treatise by Dithring, Robert Mayer, der Galilet des neunzehnten Jahrhunderts, Chemnitz, 1880. Some of the simpler facts of the case are summarized by Tait in the Phil. Mag., 1864, ii. p. 289.

MAYHEM (Mar), an old term of the law signifying an assault whereby the injured person is deprived of a member proper for his defence in fight, e.g., an arm, a leg, a fore tooth, &c. The loss of an ear, jaw tooth, &., was not

mayhem. ‘The most ancient punishment in English law was retaliative—membrum pro membro, but ultimately at common law fine and imprisonment. Various statutes were passed aimed at the offence of maiming and dis-

1 Séguin, three years before, had assumed that the work done by steam or any other expanding substance is the equivalent of the heat which disappears during the expansion. A similar idea, but more accurately expressed, is to be found in Moht’s paper, above referred to.

figuring, which is now dealt with by section 18 of 24 & 25 Vict. c. 100. Mayhem may also be the ground of a civil action, which had this peculiarity that the court on sight of the wound might increase the damages awarded by the ury. ; MAYKOP, a town of the Caucasus, Russia, in the pro- vince of Kuban, on the Byelaya, a tributary of the Kuban, 93 miles to the south-east of Yekaterinodar, the capital of the province. Formerly it was merely a fortified “stanitsa” (village of Cossacks) and the centre for mili- tary operations against western Caucasus. But, owing to its position in a very fertile country where settlers from Russia found plenty of rich soil which had been abandoned by the natives, Maykop has become a wealthy town, and its population has rapidly increased to 22,550. Most of them are still agriculturists, but others are engaged in a brisk trade in the produce obtained from the large and wealthy stanitsas of the surrounding district.

MAYNOOTH, a village in the county of Kildare, pro- vince of Leinster, Ireland, is situated on the Royal Canal and on the Midland Great Western Railway, 15 miles north- west of Dublin. The Royal Catholic College of Maynooth, instituted by the Irish parliament in 1765, is the chief seminary for the education of the Roman Catholic clergy of Ireland. It was supported by a parliamentary grant of £26,000 a year, which at the disestablishment of the Irish Church in 1869 was commuted by the payment of a capital sum fourteen times its amount. The building is a fine Gothic structure by Pugin, erected by a parliamentary grant obtained in 1846. Near the college stand the ruins of Maynooth Castle, built in 1426, and formerly the residence of

the Fitzgerald family. It was besieged in the reign of Henry VIII, in that of Edward VI., and during the Cromwellian wars, when it was demolished. The beautiful mansion of the duke of Leinster is about a mile from the town.

MAYO, a maritime county on the west coast of Ireland, province of Connaught, is bounded N. and W. by the Atlantic Ocean, N.E. by Sligo, E. by Roscommon, 8.E. and 8. by Galway. Its greatest length from north to south is about 75 miles, and its greatest breadth about 65 miles. The total area is 1,318,129 acres, or 2060 square miles.

About two-thirds of the boundary of Mayo is formed by sea, and the coast is very much indented, and abounds in picturesque scenery. The principal inlets are Killary Harbour between Mayo and Galway ; Clew Bay, in which are the harbours of Westport and Newport; Blacksod Bay and Broad Haven, which form the peninsula of the Mullet; and Killala Bay between Mayo and Sligo. The islands are very numerous, the principal being Inishturk (area 1445 acres, and population 132 in 1881), near Kil- lary Harbour; Clare Island (area 3949 acres, population 62) at the mouth of Clew Bay, where there are many islets all formed of drift; and Achil (area 35,838 acres, population 5070), the largest island in Ireland. In the eastern half of the county, where Carboniferous rocks prevail, the surface is comparatively level, with occasional hills consisting chiefly of granite and slate. The western half is very mountainous, but there are a few valleys adjoining the sea-shore. A great portion of the coast extending from Killala to Clew Bay consists of Old Red and Yellow Sandstone. The remainder of the mountainous region consists chiefly of quartzite or alternating beds of quartzite and granite or gneiss schist. Muilrea (2688 feet) is included in a mountain range, lying between Killary Harbour and Lough Mask, which belongs to the Upper Silurian formation. The next highest summits are Nephin (2530 feet), to' the west of Lough Conn, and Croagh Patrick (2370 feet), to the south of Clew Bay. The river Moy flows northwards, forming the boundary of the county

with Sligo, and falls into Killala Bay. The courses of the other streams are short, and except when swollen by rains their volume is small. The principal lakes are Lough Mask and Lough Corrib, on the borders of the

county with Galway, and Loughs Conn, Carrah, Castlebar Cullin, and Carrowmore. Limestone is abundant, and also iron ore, which, however, is not smelted, from want of fuel. There are several valuable slate quarries: and ochres, granite, and manganese are found. Agriculture.—There are some very fertile regions in the level portions of the county, but in the mountainous districts the soil is poor, the holdings are subdivided beyond the possibility of affording proper sustenance to their occupiers, and, except where fishing is combined with agricultural operations, the circumstances of the peasantry are among the most wretched of any district of Ireland, In 1881 there were 179,843 acres, or less than one-eighth of the whole area, under crops, while 545,040 were pasture, 10,702 woods and 521,673 waste. The total number of holdings in 1881 was 37,693, of which 22,914 were less than 15 acres in extent, and

9386 between 15 and 30 acres. The following table shows the areas under the principal crops in 1855 and 1882 :—

Other

Wheat.| Oats. @eteals:

9,556 | 2,193| 745 | 19,229 |183,397 7,960 | 3,964| 286 | 43,363 {175,391

Horses between 1855 and 1882 increased from 17,5381 to 18,050, of which 12,150 were used solely for agricultural purposes, The number of cattle in 1855 was 153,583, and in 1882 it was 162,331, of which 53,153 were milch cows. Sheep in 1855 numbered 265,448, and in 1882 only 225,509, although in 1880 there were as many as 271,282. Pigs in 1882 numbered 62,227, goats 5987, and poultry 632,432. According to the latest return the land was divided among 1483 proprietors, who possessed 1,308,367 acres, at an annual rateable value of £310,140, the rateable value per acre being 4s. 8d. The average size of the properties was 882 acres. No fewer than 21 proprietors, possessed upwards of 10,000 acres, and of these 8 possessed upwards of 20,000, viz., Marquis of Sligo, 114,881 acres; Viscount Dillon, 83,749; Sir R. W. H. Palmer, Bart., 80,990; Earl of Lucan, 60,570; T. S. Carter, 87,773; G. Clive, 35,229; Earl of Arran, 29,644; C. H. Knox, 24,374.

Manufactures and Trade.—Coarse linen and woollen cloths are manufactured to a small extent. There are very productive fishing banks on the coast, especially in the neighbourhood of the islands, and the Moy is a fine river for salmon.

Railways.—The Great Northern and Western Railway crosses the county from near Ballyhaunis to Westport, and a branch from it runs north to Ardnaree near Killala Bay. :

Administration and Population.—The county includes nine baronies and seventy-three parishes. It is in the Connaught circuit. Assizes are held at Castlebar, and quarter sessions at Ballina, Ballinrobe, Bellmullet, Castlebar, Claremorris, Swineford, and Westport. There are twenty-two petty sessions districts within the county, and portions of two other districts. It includes the seven poor-law unions of Bellmullet, Castlebar, Claremorris, Killala, Newport, Swineford, and Westport, and part of the unions of Ballina, Ballinrobe, and Castlerea. Itis in the Dublin military district, subdistrict of Galway ; and there are barrack stations at Castlebar, Ballinrobe, Westport, Foxford, and Ballaghaderreen. In the Irish parliament two members were returned for the county, and two for the borough of Castlebar, but at the Union Castlebar was disfranchised. . ahi

From 77,508 in 1760 the population gradually increased till in 1841 it was 388,887, but in 1851 it had diminished to a. 1871 to 246,030, and in 1881 to 245,212, of whom 119, 421 were cas and 125,791 females. The county contains a portion fe inhabitants) of the township of Ballina, the townships of Cast ae 3855, and Westport, 4469, and the town of Ballinrobe, ee . number of emigrants from 1st May 1851 to 31st December 18 “ 85,481. The number of emigrants in 1881 was 4469, or – oe F, tion of 18°4 to every 1000 of the population. The deat 1188 every 1000 of the population for 10 years ending 31st ae was 13°8, the birth-rate 27°1, and the marriage-rate Bid – a Catholics in 1881 numbered 238,262, Episcopalians 5575, tT¢ 33 terians 925, and Methodists 275. In 1881 as many i, persons could speak Irish only, and 188, 980 Irish and rea – hie

History and Antiqwities.—The name given by Pto a in inhabitants of this district of Ireland was Nagnate. : ma vir. Mayo was the scene of the landing

of the chief colony 0 iinow bolgs, and the battle which is said to have resulted in the ove

and almost annihilation of this tribe took place also in this county, at Moytura near Cong. Along with the greater part of Connaught it was granted by King John to Hubert de Burgo, but after the rebellion against William de Burgo, third earl, headed by Mac William Oughter, the whole province of Connaught remaincd nearly independent of British rule till the time of Elizabeth. In the eleventh year of her reign Mayo was made shire ground, taking its name from the monastery of Maio or Mageo, which was the see of a bishop. Even, however, after this period the Mac Williams continued to exercise very great authority. Large confiscations of the estates in the county were made in 1586, on.the termination of the wars of 1641, and after the restoration of the Stuarts. Killala was the scene of the landing of a French squadron in connexion with the rebellion of 1798.

There are four round towers in the county,—at Killala, Turlogh, Meelick, and Bal or Ballagh. The monasteries were numerous, and many of them of considerable importance—the principal being those at Mayo, Ballyhaunis, Cong, Ballinrobe, Ballintober, Bur- rishoole, Cross or Holycross in the peninsula of Mullet, Moyne, Rosserick, and Strade. Of the old castles the most notable are Downpatrick, on acliff 300 feet in height projecting into the sea, Rockfleet near Newport, said to have been built by the cclebrated Grace O'Malley, Ballylahan Castle near Foxford, and Deel Castle near Ballina, at one time the residence of the earls of Arran.

MAYOR. See Municrpariry.

MAYOTTA. Sec Comores, vol. vi. p. 220.

MAYSVILLE, a city of the United States, the capital of Mason county, Kentucky, lies on the south bank of the Ohio, 69 miles north-east of Lexington by rail. Settled in 1784 and incorporated in 1833, it has grown into a busy place of 5220 inhabitants (1880), with several good public buildings, flour-mills, plough-factories, &c., and is one of the principal hemp-markets in the States.

MAZAMET, an industrial town in the department of Tarn, France, stands on the northern slope of the Monta- gnes Noires (part of the Cevennes), and on the Arnette, a tributary of the Tarn by the Agout. In last century it was an insignificant village, but at present it has 14,000 inhabitants, an increase of prosperity due to the introduction by M. Houlés (whose statue stands in the public square) of the manufacture of a particular kind of woollen fabric sold almost exclusively in France. The factories, driven by water-power, have a total of 45,000 spindles, and an annual turnover of from 15 to 18 millions of francs. Mazamet is connected by a branch line of railway with the town of Castres.

MAZANDARAN, a province of northern Persia, lying between the Caspian Sea and the Elburz range, and bounded E. and W. by the provinces of Astrabad and Gilén respectively, is 220 miles in length and 60 miles in (mean) breadth, with an area of about 10,000 square miles and a population estimated at from 150,000 to 200,000. Mazandaran comprises two distinct natural regions present- ing the sharpest contrasts in their relief, climate, and pro- ducts. In the north the Caspian is encircled by the level and swampy lowlands, varying in breadth from 10 to 30 miles, partly under impenetrable jungle, partly under rice, cotton, sugar, and other crops. 'This section is fringed northwards by the sandy beach of the Caspian, here almost destitute of natural harbours, and rises somewhat abruptly inland to the second section, comprising the northern slopes and spurs of the Elburz, which approach at some points within 1 or 2 miles of the sea, and which are almost everywhere covered with dense forest. The lowlands, rising but a few feet above the Caspian, and subject to frequent flood- mé®, are extremely malarious, while the highlands, culmina- ting with the magnificent Damavand (18,600 feet), enjoy atolerably salubrious climate. But the climate, generally

otand moist in summer, is everywhere capricious and liable tosudden changes of temperature, whence the prevalence of rheumatism, dropsy, and especially ophthalmia, noticed by all travellers, Snow falls heavily on the uplands, where it often lies for weeks on the ground. The direction of the long sandbanks at the river mouths, which project with

remarkable uniformity from west to east, shows that the prevailing winds blow from the west and north-west. The rivers themselves, of which there are as many as fifty, are little more than mountain torrents, all rising on the northern slopes of Elburz, flowing mostly in independent channels to the Caspian, and subject to sudden freshets and inundations along their lower course. The chief are the Safed-rid on the Gilan frontier, the Lar, Hari-rid, Alam-rid, Rustam-ruid, and Ha4rez, and all are well stocked with trout, mullet (safed mahi), carp, sturgeon, and other fish, which with rice form the staple food of the inhabitants, and supply large quantities of caviare for the Russian market. Near their mouths the rivers, running counter to the prevailing winds aud waves of the Caspian, form long sand-hills 20 to 30.feet high and about 200 yards broad, behind which are developed the so-called mzrd-db, or "dead waters,"

'stagnant pools and swamps characteristic of this coast, and

a chief cause of its unhealthiness.

The province abounds in iron ores and in mineral pitch in every state of transition from pure petroleum to the finest naphtha. The chief cultivated plants are rice, cotton, sugar, a little silk, and fruits in great variety, including several kinds of the orange, lemon, and citron. Some of the slopes are covered with extensive thickets of the pomegranate, and the wild vine climbs to a great height round the trunks of the forest trees. These woodlands are haunted by the tiger, panther, bear, wolf, and wild boar in considerable numbers. Of the domestic animals, all remarkable for their small size, the chief are the black, humped cattle somewhat resembling the Indian variety, the yabu (a sturdy breed of horses), and sheep and goats.

Kinneir, Frazer, and other observers speak unfavourably of the Mazandarani people, whom they describe as very ignorant and bigoted, arrogant, rudely inquisitive, and almost insolent towards strangers. The peasantry, however, although called the " Beotians of Persia," are far from dull, and betray much shrewdness where their interests are concerned. In the healthy districts they are stout and well made, and arc the most warlike race in Persia, fur- nishing 5000 cavalry and 12,000 foot to the Government. Of the latter 2000 are always in attendance on the shah at Tehran. They spcak a marked and somewhat rude Persian dialect ; but a

Turki idiom closely akin to the Turkoman is still current amongst the foreign tribes, although they have mostly already passed from the nomad to the settled state. Of thesc intruders the most numerous are the Modaunli, Khojehvand, and Abdul Maleki, originally of Lek or Kurd stock, besides branches of the royal Afshar and Kajar tribes of Turki descent. All these are exempt from taxes in con- sideration of their military service.

The export trade is chiefly with Russia through Baku, where broadcloths, flour, saffron, and bar iron are taken in exchange for the white and coloured calicoes, caviare, rice, and raw cotton of Mazan- daran. Owing to the almost impenetrable character of the country, there are scarcely any roads accessible to wheeled carriages, and the great causeway of Shah Abbas has in many places even disappeared under the jungle. Two routes, however, lead to Tehran, one by Firoz Koh, 180 miles long, the other by Larijan, 144 miles long, both in tolerably good repair. Except where crossed by these routes the Elburz forms an almost impassable barrier to the south.

The administration isin the hands of the prince governor, who appoints most of the beglerbegs and governors of the nine dis- tricts of Am6l, Barfardsh, Mashhad-i-Sar, Sari, Ashraf, Farah-abad, Tennacorben, Kellauristak, and Kujur inte which the province is divided. There is fair security for life and property ; and, although otherwise indifferently administered, the country is quite free from marauders or local disturbances. The revenue is about 105,000 tomans, of which nothing goes to the state treasury, all being required for the governors, troops, pensions, and police. The capital is Sari, the other chief towns being Barfardsh, Mashhad-i-Sar, Ashraf, and Farah-abad.

MAZARIN, Jutes (1602-1661), cardinal, the suc- cessor of Richelieu, and forerunner of Louis XIV., was the elder son of Pietro Mazarini, the intendant of the house- hold of Philip Colonna, and of his wife Ortensia Buffalini, a connexion of the Colonnas, and was born at Piscina in the Abruzzi on July 14, 1602. He was educated by the Jesuits at Rome till his seventeenth year, when he accom-

panied Jerome Colonna as chamberlain to the university of Alcala in Spain. 'There he distinguished himself more by his love of gambling and his gallant adventures than by study, but made himself a thorough master, not only of the Spanish language and character, but also of that romantic fashion of Spanish love-making which was to help him greatly in after life, when he became the servant of a Spanish queen. On his return to Rome he took his degree as Doctor Utriusque Juris, and then became captain of infantry in the regiment of Colonna, which took part in the war in the Valtelline. During this war he gave proofs of much diplomatic ability, and Pope Urban VIII. entrusted him, in 1629, with the difficult task of putting an end to the war of the Mantuan succession. His success marked him out for further distinction. He was presented to two canonries in the churches of St John Lateran and Sta Maria Maggiore, although he had only taken the minor orders, and had never been consecrated priest ; he negotiated the treaty of Turin between France and Savoy in 1632, became vice-legate at Avignon in 1634, and nuncio at the court of France from 1634-36. But he began to wish for a wider sphere than papal negotiations, and, seeing that he had no chance of becoming a cardinal except by the aid of some great power, he accepted Richelieu's offer of entering the service of the king of France, and in 1639 became a naturalized Frenchman. In 1640 Richelieu sent him to Savoy, where the regency of Christine, the duchess of Savoy, and sister of Louis XIII, was disputed by her brothers-in-law, the princes Maurice and Thomas of Savoy, and he succeeded not only in firmly establishing Christine but in winning over the princes to France. This great service was rewarded by his promotion to the rank of cardinal on the presentation of the king of France in December 1641. On the 4th December 1642 Cardinal Richelieu died, and on the very next day the king sent a circular letter to all officials ordering them to send in their reports to Cardinal Mazarin, as they had formerly done to Cardinal Richelieu. Mazarin was thus acknowledged supreme minister, but he still had a difficult part to play. The king evidently could not live long, and to preserve power he must make himself necessary to the queen, who would then be regent, and do this without arousing the suspicions of the king or the distrust of the queen. His measures were ably taken, and when the king died on May 14, 1643, to every one's surprise her husband's minister remained the queen's. The king had by a royal edict cumbered the queen-regent with a council and other restrictious, and it was necessary to get the parlement of

Paris to overrule the edict, and make the queen absolute regent, which was done with the greatest complaisance. Now that the queen was all-powerful, it was expected she would at once dismiss Mazarin and summon her own friends to power. One of them, Potier, bishop of Beauvais, already gave himself airs as prime minister, but Mazarin had had the address to touch both the queen's heart by his Spanish gallantry and her desire for her son's glory by his skilful policy abroad, and he found himself able easily to overthrow the clique of Importants, as they were called. That skilful policy was shown in every arena on which the great Thirty Years' War was being fought out. Mazarin had inherited the policy of France during the Thirty Years' War from Richelieu. He had inherited his desire for the humiliation of the house of Austria in both its branches, his desire to push the French frontier to the Rhine and maintain a counterpoise of German states against Austria, his alliances with the Netherlands and with Sweden, and his four theatres of war—on the Rhine, in Flanders, in Italy, and in Catalonia. This is not the place to examine the campaigns of the last five years of the great war (see Conpt, TURENNE), but it was Mazarin

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alone who directed the French diplomacy of the period, He it was who made the peace of Bromsebro between the Danes and the Swedes, and turned the latter once again against the empire; he it was who sent Lionne to ingle the peace of Castro, and combine the princes of North Italy against the Spaniards, and who made the peace of Ulm between France and Bavaria, thus detaching the emperor's best ally. He made one fatal mistake, —he dreamt of the Trench frontier being the Rhine and the Scheldt, and that a Spanish princess might bring the Spanish Netherlands as dowry to Louis XIV. This roused the jealousy of the United Provinces, and they made a separate peace with Spain in January 1648; but the valour of the French generals made the skill of the' Spanish diplomatists of no avail, for Turenne's victory at Zusmarshausen, and Condé's at Lens, caused the peace of Westphalia to be definitely signed in October 1648. This celebrated treaty belongs rather to the history of Germany than to a life of Mazarin; but two questions have been often asked, whether Mazarin did not delay the peace as long as possible in order to more completely ruin Germany, and whether Richelieu would have made a similar peace. To the first question Mazarin's

letters, published by M. Cheruel, prove a complete negative, for in them appears the zeal of Mazarin for the peace. On the second point, Richelicu's letters in many places indicate that his treatment of the great question of frontier would have been more thorough, but then he would not have been hampered in France itself.

We must now notice that strange period of the Fronde which has always been variously treated, for modern historians have written its history from many different standpoints, all of which can be categorically supported from the varying mémoires of the principal actors. Now, however, thanks to the labours of M. Cousin on the carnets of Mazarin, which contain the substance of his inmost thoughts, and of M. Cheruel on the letters written to and by Mazarin, it is possible to construct a more accurate and trustworthy history of the Fronde than has ever yet been attempted. It is not, however, intended here to trace the whole history of the Fronde, interesting as that would be, but merely to trace the policy of Mazarin throughout tlie epoch, 'The origin of both the Frondes was partly Mazarin's fault. In 1645 the parlement of Paris had pro- tested against certain taxes, and had been checked by a hit de justice; and when, in 1648, it united its members m the Chambre de Saint Louis for the general reform of the kingdom, Mazarin and the queen, instead of holding another lit de justice, calling the states-general, or trans- ferring the parlement out of Paris, any of which measures would have broken its power, foolishly believed in the influence of the victory of Lens, and threw the people of Paris on the side of the parlement by the arrest of Broussel. The Fronde of the princes and the nobles, on the other hand, was largely due to Mazarin's absorption of political power. 'These Frondeurs were not, like their ancestors, moved by great religious and political sympathies, but by merely selfish aims for restoring the old licence of duel and intrigue, and were only united in one sentiment, hatred to Mazarin. 'That this was so was greatly Mazarin own fault; he had tried consistently to play off Gaston of Orleans against Condé, and their respective followers against each other, and had also, as his carnets ie jealously kept any courtier from getting into the eet graces of the queen-regent except by his means, 80 tha F was not unnatural that the nobility should hate him, while the queen found herself surrounded by his creatures fat Events followed cach other quickly ; the day of t ' barricades was

followed by the peace of Ruel, the | Ruel by the arrest of the princes, by the battle of Rethel, and Mazarin's exile to Brill before the union of the two

Frondes. It was while in exile at Briihl that Mazarin saw the mistake he had made in isolating himself and the queen, and that his policy of balancing every party in the state against each other had made every party distrust him. So by his counsel the queen, while nominally in league with De Retz and the parliamentary Fronde, laboured to form a purely royal party, wearied by civil dissensions, who should act for her and her son's interest alone, under the leadership of Mathieu Molé, the famous premier president of the parlement of Paris. The new party grew in strength, and in January 1652, after exactly a year's absence, Mazarin returned to the court. Turenne had now become the royal general, and out-manceuvred Condé, while the royal party at last grew to such strength in Paris that Condé had to leave the capital and France. In order to promote a reconciliation with the parlement of Paris, Mazarin had again retired from court, this time to Sedan, in August 1652, but he returned finally in February 1653. Long had been the trial, and greatly had Mazarin been to blame in allowing the Frondes to come into existence, but he had retrieved his position by founding that great royal party which steadily grew until Louis XIV. could fairly have said "L'Etat, c'est moi." As the war had progressed, Mazarin had steadily followed Richelieu's policy of weakening the nobles on their country estates. Whenever he had an opportunity he destroyed a feudal castle, and by destroying the towers which commanded nearly every town in France, he freed such towns as Bourges, for instance, from their long practical subjection to the neighbouring great lord.

The Fronde over, Mazarin had to build up afresh the power of France at home and abroad. It is to his shame that he did so little at home. Beyond destroying the brick and mortar remains of feudalism, he did nothing for the people. But abroad his policy was everywhere success- ful, and opened the way for the policy of Louis XIV. He at first, by means of an alliance with Cromwell, recovered the north-western cities of France, though at the price of yielding Dunkirk to the Protector. On the Baltic, France guaranteed the treaty of Oliva between her old allies Sweden, Poland, and Brandenburg,

which preserved her influence in that quarter. In Germany he, through Lionne, formed the league of the Rhine, by which the states along the Rhine bound themselves under the head- ship of France to be on their guard against the house of Austria. By such measures Spain was induced to sue for peace, which was finally signed in the Isle of Pheasants on the Bidassoa, and which is known as the treaty of the Pyrenees. By it Spain recovered Franche Comté, but ceded to France Roussillon, and much of French Flanders; and, what was of greater ultimate importance to Europe, Louis XIV. was to marry a Spanish princess, who was to renounce her claims to the Spanish succession if her dowry was paid, which Mazarin knew could not happen at present from the emptiness of the Spanish exchequer. He returned to Paris in declining health, and did not long survive the unhealthy sojourn on the Bidassoa; after some political instruction to his young master, he passed away at Vincennes on March 9, 1661, leaving a fortune estimated at from 18 to 40 million livres behind him, and his = married into the greatest families of France and

aly.

The man who could have had such success, who could have made the treaties of Westphalia and the Pyrenees, who could have Weathered the storm of the Fronde, and left France at peace with itself and with Europe to Louis XIV., must have beena great man ; and historians, relying too much on the brilliant memoirs of his adversaries, like De Retz, are apt torank him too low. That he had many a petty fault there can be no doubt ; that he was avaricious and double-dealing was also undoubted; and his ecarnets show to What unworthy means he had recourse to maintain his influence over the queen. What that influence was will be always debated, but

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both his carnets and the Brith] letters show that a real personal affection, amounting to passion on the queen's part, existed. Whether they were ever married may be doubted; but that hypo- thesis is made more possible by M. Cherucl's having been able to prove from Mazarin's letters that the cardinal himsclf had never taken more than the minor orders, which could always be thrown off. With regard to France he played a more patriotic part than Condé or Turenne, for he never treated with the Spaniards, and his letters

show that in the midst of his difficulties he followed with intense eagerness cvery movement on the fronticrs. It is that immense mass of letters, now in course of publication, that prove the real greatness of the statesman, and disprove De Retz's portrait, which is carefully arranged to show off his enemy against the might of Richelieu. 'To concede that the master was the greater man and the greater statesman does not imply that Mazarin was but a foil to his predecessor. It is true that we find none of thosc deep plans for the intcrnal prosperity of France which shine through Richelieu's policy. Mazarin was not a Frenchman, but a citizen of the world, and ae paid most attention to foreign affairs; in his letters all that could teach a diplomatist, is to be found, broad general views of policy, minute details carefully elaborated, keen in- sight into men's characters, cunning directions when to dissimulate or when to be frank. From first to last the diplomatist pceps forth, and gives the key to his character, and to the causes of his success. Italian though he was by birth, education, and nature, France owed hima great debt for his skilful management during the early years of Louis XIV., and the king owed him yet more, for he had not only transmitted to him a nation at peace, but had educated for him his great servants Le Tellier, Lionne, and Colbert. Literary men owed him also much; not only did he throw his famous library open to them, but he pensioned all their leaders, including Descartes, Voiture, Balzac, and Picrre Corneille. 'The last-named, the greatest of them all, did not care for Mazarin as a paymaster only, but as a statesman; he was a profound royalist, believing that absolutism alone could save France from the horrors of religious wars, or the selfish turbulence of a Fronde, and to Mazarin he applied, with an adroit allusion to his birthplace, in the dedication of his Pompee, the linc of Virgil—

'Tu regerc imperio populos, Romane, memento."

All the earlier works on Mazarin, and early accounts of his ad-ministration, of which the best were Bazin's Histoire de Franee sous Louis XIE. et sous le Cardinal Mazarin, 4 vols., 1846, and Saint-Aulaire's Histoire de la Fronde, have been superseded by M. Cheruel's admirable Histoire de France pendant la minorité de Louis XFV,, 4 vols., 1879-80, which covers from 1643-51, and its sequel Histoire de Franee sous le Ministére de Cardinal Mazarin, 2 vols., 1881-82, which is the first account

of the period written by one able to sift the statements of De Retz and the memoir writers, and rest upon such documents as Mazarin's letters and earnets. To M. Cheruel the Government of France has entrusted the task of editing Mazarin's Letters, of which two volumes have at present appeared, which must be carefully studied by any student of the history of France. For his " earnets" reference must be made to M. Cousin's articles in the Jowrnal des Savants ; for his early life to Cousin's Jeunesse de Mazarin, 1865, and for the careers of his nieces to Renée's Les Nieees de Mazarin, 1856. For the Mazarinades or squibs written against him in Paris during the Fronde, see Moreau's Bibliographie des Mazarinades, 1850, containing an aecount of 4082 Mazarinades. On the Fronde, also, consult Gaillardin's Histoire de Louis XFV., 6 vols., 1876-78, and Feillet's interesting Afisére au temps de la Fronde. Yor his foreign policy, besides his Letters, see Valfrey's Hugues de Lionne, and Mignet's Histotre des Négociations relatives & la Sweeession d' Espagne. (H. M. 8S.)

MAZATLAN, a city and seaport of Mexico, in the state of Cinaloa, on the coast of the Pacific, near the mouth of the Gulf of California, in 23° 18' N. lat. and 106° 56' W. long. It oceupies an attractive situation, but, as the houses are for the most part low, has not an imposing appearance. The port is often visited by English and American vessels, and is consequently the seat of several consular agents. A large smuggling trade was formerly carried on in much the same lines as the present legitimate traffic—export of bullion, dye-stuffs, and pearls, and import of manufactured goods from Europe and fruits and vegetables from San Francisco, In 1878 the value of the imports was about £600,000, that of the exports about £500,000. The population, which contains a large float- ing element, was stated at 12,706 in 1871.

MAZEPPA, Ivan SrepHanovircn (1644-1709), a Cossack chief, best known as the hero of one of Lord Byron's poems, was born in 1644, of a poor but noble

family, at Mazepintzui in the palatinate of Podolia. At an early age he became a page at the court of John Casimir, king of Poland. After some time he returned to his native province ; but, engaging in an intrigue with a

*Polish matron of high rank, he was detected by the injured husband, and was sentenced to be bound naked on the back of an untamed horse. The animal on being let loose gal- loped off to its native wilds of the Ukraine. Mazeppa, half- dead and insensible, was released from his fearful position, and restored to animation by some poor peasants. In a short time his agility, courage, and sagacity rendered him popular among the Cossacks. He was appointed secretary and adjutant to Samoilovitch, their hetman or chief, and succeeded that functionary in 1687. The title of prince was afterwards conferred upon him by his friend and patron, Peter the Great, who long believed confidingly in his good faith, and banished or executed as calumnious traitors all who, like Palei, Kotchubey, and Iskra, ventured to accuse him of conspiring with the enemies of Russia. Bent, however, upon casting off the Russian yoke, Mazeppa became, in his seventieth year, and after much hesitation and inconstancy of purpose, an ally of the Swedish monarch, Charles XII. After the disastrous battle of Pultowa, fought, it is said, by his advice, Baturin, his capital, was taken and sacked by Menshikoff, and his name anathematized throughout the churches of Russia, and his effigy suspended from the gallows. A wretched fugitive, he escaped to Bender, but only to end his life by poison in 1709. Pushkin made Mazeppa the hero of his drama ** Pultowa."*

MAZZARA DEL VALLO, a city of Italy, on the coast of Sicily, in the province Trapani, 13 miles by rail south- east of Marsala. It is surrounded by a wall 37 feet in height, strengthened by towers rising at intervals; and it possesses a castle and a cathedral, both founded by Count Roger in the 11th century. The harbour is spacious but badly sheltered from the south winds. The population of the city was 11,756 in 1871; that of the commune was 10,999 in 1861 and 13,505 in 1881.

Mazara or Mazaris appears from Diodorus Siculus (xiii. 54) to have been a trading establishment of Selinus, and it was captured by the Carthaginian general in 409 B.c. on his march against that city. It was in this neighbourhood that the Saracens landed in 827 a.D.; and the name of Val di Mazzara long indicated one of the three divisions of Sicily.

MAZZINI, Giuseppe (1805-1872), Italian patriot, was born on June 22, 1805, at Genoa, where his father, Hacomo Mazzini, was a physician in good

practice, and a professor in the university. His mother is described as having been a woman of great personal beauty, as well as of active intellect and strong affections. During infancy and childhood his health was extremely delicate, and it appears that he was nearly six years of age before he was quite able to walk; long before this, however, he had learned to read, and otherwise begun to show great intel- lectual precocity.. His first tutor was an old priest who taught him Latin, but his omnivorous reading was not directed by any master. At the age of thirteen he began

to attend classes in the faculty of arts at the university; |

he afterwards studied anatomy with a view to following his father's profession, but finally (1826) graduated in laws. Apart from his professional studies, he took lessons in music, English, and fencing. Of his student days little more is recorded than that his exceptional abilities as well as the remarkable generosity and benevolence of his impulses and aims were quickly recognized by his comrades,—his professors, however, having frequent occasion to complain of his disregard for conventional rules. life during this period, we have only one brief but significant sentence; "for a short time," he says, "my mind was

somewhat tainted by the doctrines of the foreign material- | at Marseilles, urging him to take the lead in the imp

As to his inner |

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istic school ; but the study of history and the intuitions of conscience—the only tests of truth—soon led me back to the spiritualism of our Italian fathers." For some time after his admission as an advocate Mazzini was occupied in the Ufficio dei Poveri ; but, although he seems to have discharged the duties arising from this with zeal and success, he never really overcame his repugnance to the dry and technical details of legal practice. The natural bent of his genius was towards literature, and, in the course of the four years of his nominal connexion with the legal profession,

he wrote a considerable number of essays and reviews, some of which have been wholly or partially reproduced in the critical and literary volumes of his Life and Writengs. His first essay, characteristically enough on "Dante's Love of Country," was sent to the editor of the Antologea Fiorentina in 1826, but did not appear until some years afterwards in the Subalpino. He was an ardent supporter of romanticism as against what he called " literary

- servitude under the name of classicism"; and in this interest

all his critiques (as, for example, that of Giannoni's Evile in the Zndzcatore Livornese, 1829) were penned. But inthe meantime the "republican instincts " which he tells us he had inherited from his mother had been developing, and his sense of the evils under which Italy was groaning had been intensified ; andat the same time he became possessed with the idea that Italians, and he himself in particular, "could and therefore ought to struggle for liberty of country." His literary articles accordingly became more and more suggestive of advanced liberalism in politics, and led to the suppression by Government of the Jndicatore Genovese and the Jndicatore Livornese successively. Having joined the Carbonari, he soon rose to one of the higher grades in their hierarchy, and was entrusted with a special secret mission into Tuscany; but, as his acquaintance grew, his dissatisfaction with the organization of the society in- creased, and he was already meditating the formation of a new association having closer bonds of union and more definite aims when shortly after the French revolution of 1830 he was betrayed, while initiating a new member, to the authorities of Piedmont. He was imprisoned in the fortress of Savona on the western Riviera for about six months, when, a conviction having been found impractic- able through deficiency of evidence, he was released, but upon conditions involving so many restrictions of his liberty that he preferred the alternative of leaving the country. He withdrew accordingly into France, living chiefly in Marseilles. While in his lonely cell at Savona, in presence of "those symbols of the infinite, the sky and the sea," with a greenfinch for his sole companion, and having access to no books but "a Tacitus, a Byron, and a Bible," he had finally become aware of the great mission or "apostolate

(as he himself called it) of his life ; and soon after his release his prison meditations took shape in the programme of the organization which was

destined soon to become so famous throughout Europe, that of La Giovine Italia, or Young Italy. Its publicly avowed aims were to be the liberation of Italy both from foreign and domestic tyranny, and its unification under a republican form of government ; the means to be used were education, and, where advisable, insurrection by guerrilla bands; the motto was to be "God and the people," and the banner was to bear on one side the words " Unity" and "Independence" and on the other " Liberty," " Equality," and " Humanity," to —— respectively the national and the international aims "D April 1831 Charles Albert, "the ex-Carbonaro conspirator of 1821," succeeded Charles Felix on the Sardinian pes and towards the close of that year Mazzini, making himse : as he afterwards confessed, " the interpreter of a hope whic

he did not share," wrote the new king a letter, published ending

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struggle for Italian independence. Clandestinely reprinted, and rapidly circulated all over Italy, its bold and outspoken words produced a great sensation, but so deep was the offence it gave to the Sardinian Government that orders were issued for the immediate arrest and imprisonment of the author should he attempt to cross the frontier. Towards the end of the same year appeared the important Young Italy " Manifesto," the substance of which is given in the first volume of the Life and Writings of Mazzini ; and this was followed soon afterwards by the society's Journal, which, smuggled across the Italian frontier, had great success in the objects for which it was written, numerous "congregations" being formed at Genoa, Leghorn, and elsewhere. Representations were conse- quently made by the Sardinian to the French Government, which issued in an order for Mazzini's withdrawal from Marseilles (August 1832); he lingered for a few months in concealment, but ultimately found it necessary to retire

into Switzerland. From this point it is somewhat difficult .

to follow the career of the mysterious and terrible con- spirator who for twenty years out of the next thirty led a life of voluntary imprisonment (as

he himself tells us) "within the four walls of a room," and "'kept no record of dates, made no biographical notes, and preserved no copies of letters." In 1833, however, he is known to have been concerned in an abortive revolutionary movement which took place in the Sardinian army ; several] executions took place, and he himself was laid under sentence of death. Before the close of the same year a similar movement in Genoa had been planned, but failed through the youth and inexperience of the leaders. At Geneva, also in 1833, Mazzini set on foot L'Hurope Centrale, a journal of which one of the main objects was the emancipation of Savoy ; but he did not confine himself to a merely literary agita- tion for this end. Chiefly through his agency a consider- able body of German, Polish, and Italian exiles was organized, and an armed invasion of the duchy planned. The frontier was actually crossed on February 1, 1834, but the attack ignominiously broke down without a shot having been fired. Mazzini, who personally accompanied the expedition, is no doubt correct in attributing the failure

to dissensions with the Carbonari leaders in Paris, and'

to waut of a cordial understanding between himself and the Savoyard Ramorino, who had been chosen as military leader. In April 1834 the " Young Europe" association "of men believing in a future of liberty, equality, and fraternity for all mankind, and desirous of consecrating their thoughts and actions to the realization of that future" was formed, also under the influence of Mazzini's enthusiasm ; it was followed soon afterwards bya '"' Young Switzerland" society, having for its leading idea the forma- tion of an Alpine confederation, to include Switzerland, Tyrol, Savoy, and the rest of the Alpine chain as well. But La Jeune Suisse newspaper was compelled to stop within a year, and in other respects the affairs of the struggling patriot became embarrassed. He was permitted to remain at Grenchen in Solothurn for a while, but at last the Swiss diet, yielding to strong and persistent pressure from abroad, exiled him about the end of 1836. In January 1837 he arrived in London, where for many months he had to carry on a hard fight with poverty and the sense of spiritual loneliness so touchingly described by himself in the first volume of the Life and Writings. Ultimately, as he gained command of the English language, he began to earn a livelihood by writing review articles, some of which have since been

reprinted, and are of a high order of literary merit; they include papers on "Italian Literature since 1830" and " Paolo Sarpi" in the Westminster Review, articles on " Iamennais," "George Sand," "Byron and Goethe" in the Monthly

Chronicle, and on "'Lamartine," " Carlyle," and "The Minor Works of Dante" in the British and Foreign Review. In 1839 he entered into relations with the revolutionary com- mittees sitting in Malta and Paris, and in 1840 he originated a working men's association, and the weekly journal entitled Apostolato Popolare, in which the admirable popular treatise "'On the Duties of Man" was commenced. Among the patriotic and philanthropic labours undertaken by Mazzini during this period of retirement in London may be mentioned a free evening school conducted by himself and a few others for some years, at which several hundreds of Italian children received at least the rudiments of secular and religious education. The most memorable episode in

his life during the same period was perhaps that which

arose ont of the conduct of Sir James Graham, the home

secretary, in systematically, for some months, opening

Mazzini's letters as they passed through the British post- office, and communicating their contents to the Neapolitan Government—a proceeding which brought about the arrest and execution of the brothers Bandiera, Austrian subjects, who had been planning an expedition against Naples. The prolonged discussions in parliament, and the report of the committee appointed to inquire into the matter, did not, however, lead to any practical resnlt, unless indeed the incidental vindication of Mazzini's character, which had been recklessly assailed in the course of debate. Mazzini did not share the enthusiastic hopes everywhere raised in the ranks of the Liberal party throughout Europe by the first acts of Pius IX., in 1846, but at the same time he availed himself, towards the end of 1847, of the opportunity to publish a letter addressed to the new pope, indicating the nature of the religious and national mission which the Liberals expected him to

undertake. The leaders of the revolutionary outbreaks in Milan and Messina in the beginning of 1848 had long been in secret correspondence with Mazzini; and their action, along with the revolution in Paris, brought him early in the same year to Italy, where he took a great and active interest in the events which dragged Charles Albert into an unprofitable war with Austria; he actually for a short time bore arms under Garibaldi immediately before the re- occupation of Milan, but ultimately, after vain attempts to maintain the insurrection in the mountain districts, found it necessary to retire to Lugano. In the beginning of the following year he was nominated a member of the short- lived provisional government of Tuscany formed after the flight of the grand-duke, and almost simultaneously, when Rome had, in consequence of the withdrawal of Pius IX., been proclaimed a republic, he was declared a member of the constituent assembly there. A month afterwards, the battle of Novara having again decided against Charles Albert in the brief struggle with Austria, into which he had once more been drawn, Mazzini was appointed a member of the triumvirate, with supreme executive power. The opportunity he now had for showing the administrative and political ability which he was believed to possess was more apparent than real, for the approach of the pro- fessedly friendly French troops soon led to hostilities, and resulted in a siege which terminated, towards the end of June, with the assembly's resolution to discontinue the defence, and Mazzini's indignant resignation. That he succeeded, however, for so long a time, and in circum- stances so adverse, in maintaining a high degree of order within the turbulent city is a fact that speaks for itself. His diplomacy, backed as it was by no adequate physical force, naturally showed at the time to very great disadvan- tage, but his official correspondence and proclamations can still be read with admiration and intellectual pleasure, as well as his eloquent vindication of the revolution in his published " Letter to MM. de Tocqueville and De Falloux."

The surrender of the city on June 30 was followed by | at Pisa, and which terminated fatally on March 10, 1879 Mazzini's not too precipitate flight by way of Marseilles | The Italian parliament by a unanimous vote expressed the into Switzerland, whence he once more found his way to | national

sorrow with which the tidings of his death had London. Here in 1850 he became president of the | been received, the president pronouncing an eloquent eulo National Italian Committee, and at the same time entered | on the departed patriot as a model of disinterestedness mA into close relations with Ledru-Rollin and Kossuth. He | self-denial, and one who had dedicated his whole life un- had a hand in the abortive rising at Mantua in 1852, and | grudgingly to the cause of his country's freedom. A public again, in February 1853, a considerable share in tle | funeral took place at Pisa on March 14, and the remains formidable insurrection which broke out at Milan; once were afterwards conveyed to Genoa.

more, in 1854, he had gone far with preparations for re- The published writings of Mazzini, mostly occasional, are ver newed action when his plans were completely disconcerted | voluminous, and have nowhere been exhaustively collected. The by the withdrawal of professed supporters, and by the action Sait (oe bap a ae Pima and continued by of the French and English Governments in sending ships of many of the most important are cam in the partially aati eae war to Naples. The year 1857 found him yet once more | cal work already refcrred to (Life and Writings of Joseph oe in Italy, where, for complicity in short-lived emeutes which | 6 vols., 1864-70), and the two most systematic—" Thoughts upon took place at Genoa, Leghorn, and Naples, he was again Fr eee a eee oe of ee on Ben- laid under sentence of death, Undiscouraged in the | 'anien, StSmouishism, Fourier, and oes ecoomie an pursuit of the one great aim of his life by any such incidents Man," an admirable primer of ethics, dedicated to the Italian as these, he returned to London, where he edited his new | working class—will be found in a volume entitled Joseph Mazzini, a journal Pensiere ed Azione, in which the constant burden beset by se A. Venturi Coa 1875). Mazzini's 'first great of his message to the overcantious practical politicians of | Sergey, be tl ws, was "the renuntaton of he eur of Hi Italy was—-"I am but a voice crying Action ; but the state | we find him still recurring to the long-cherished hope of being able of Italy cries for it also. So do the best men and people | to leave the stormy arena of politics and consecrate the last years of of her cities. Do you wish to destroy my influence? Act." mata pe cohne ofits yout eee uae speci contemam? The same tone was at a somewhat later date " ssumed = Religion, a popular Hilo of Italy, to enable the working ae the letter he wrote to Victor Emmanuel, urging him to | o

apprehend what he conceived to be the “ mission” of Italy in put himself at the head of the movement for Italian unity, | God’s providential ordering of the world, and a comprehensive col- and promising republican support. As regards the events | lection of translations of ancient and modern classics into Italian.

F p None of these was actually achieved. No one, however, can read of 1859-60, however, it may be questioned whether, even the briefest and most occasional writing of Mazzini without

through his characteristic inability to distinguish between gaining some impression of the simple grandeur of the man, the the ideally perfect and the practically possible, he did not j lofty elevation of his moral tone, his unwavering faith in the actually hinder more than he helped the course of events | living God, who is ever revealing Himself in the progressive develop- by which the realization of so much of the great dream of ed of ee ., His last public utterance 1s to be found in a aes . ghly characteristic article on Renan’s Réforme Morale et Intel- his life was at last brought about. As has been said else- leetuelle, finished on March 8, 1872, and published in the Fortnightly where (vol. xiii. p. 487), if Mazzini was the prophet of | Review for February 1874. (J. 8. BL.) Italian unity, and Garibaldi its knight errant, to Cavour MAZZOLA. See PARMIGIANO. alone belongs the honour of having been the statesman by MEAD, Ricwarp (1673-1754), physician, was born on wliom it was finally accomplished. After the irresistible August 11, 1673, at Stepney (near London), where his pressure of the popular movement had led to the establish- father, at one time minister of the parish, had been ment not of an Italian republic but of an Italian kingdom, ejected for nonconformity in 1662. He was sent to Mazzini could honestly enough write, “I too have striven Utrecht, where he studied for three years under Grevius; to realize unity under a monarchical flag,” but candour having decided to follow the medical profession, he then compelled him to add, ‘The Italian people are led astray | went to Leyden and attended the lectures of Hermann by a delusion at the present day, a delusion which has | and Pitcairn. In 1695 he graduated in philosophy and induced them to substitute material for moral unity and physic at Padua, and in the following year he returned their own reorganization. Not so I. I bow my head | to his native place, entering at once on a successful

sorrowfully to the sovereignty of the national will; but practice. His Afechanical Account of Poisons appeared in monarchy will never number me amongst its servants or 1702, and in 1703 he was admitted to the Royal Society, followers." In 1865, by way of protest against the still | to whose Zvransactions he contributed in that year & paper uncancelled sentence of death under which he lay, Mazzini | on the parasitic nature of scabies. In the same year he was elected by Messina as delegate to the Italian parlia- | was also elected physician to St Thomas's Hospital, and ment, but, feeling himself unable to take the oath of appointed to read anatomical lectures at the Surgeons' allegiance to the monarchy, he never took his seat. In| Hall, On the death of Radcliffe in 1714 Mead became the following year, when a general amnesty was granted | the recognized head of his profession; he attended Queen after the cession of Venice to Italy, the sentence of death | Anne on her death-bed, and in 1727 was appointed was at last removed, but he declined to accept such an physician to George II., having previously served him in 'offer of oblivion and pardon for having loved Italy above | that capacity when he was prince of Wales. He died on all earthly things." In May 1869 he was again expelled | P ebruary 16,1754. For his place in the annals of medical from Switzerland at the instance of the Italian Government | science see MepIcing, p. 811 of the present volume. for having conspired with Garibaldi; after a few months | posidcs the Mechanical Account of Poisons, of which a second spent in England he set out (1870) for Sicily, but was | edition appeared in 1708, Mead published a treatise oe i, promptly arrested at sea and carried to Gaeta, where he | Solis et Luna in Corpora Humana et Morbis inde i es Method ' . C : A Short Discourse concerning Pestilential Contagion, and ine fo. was lnprisoned for two months, Events soon made it fo be used to prevent it (1720), De Variolis et Morbillis Dissertatto evident that there was little danger to fear from the contem- (1747), ee Sacra, sive de Morbis insignioribus qut in a plated rising, and the occasion of the birth of a prince was | memorantur Commentarius (1748), On the ae Oe 7 es for restoring him to liberty, The remainder of his | Monita e Peeve Medica (1751). A Life of Mead by ife, spent partly in London and partly at Lugano, presents | @Ppeared in : ; ' no noteworthy Tce For seniors his health had MEADVILLE, a city of the United eg Sei been far from satisfactory, but the immediate cause of his | of Crawford county, P ennsylvania, on the le vid at death was an attack of

pleurisy with which he was seized | French Creek, a tributary of the Alleghany river,

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MEA—MIEA

the junction of the Franklin branch with the main line of the New York, Pennsylvania, and Ohio Railroad, 102 miles from Salamanca. It is a well-built town, maintains a large trade with the oil regions, and has railway and other machine works, glass works, woollen mills, and paper mills. The Meadville theological school was established by the Pnitarians in 1844; and Allegheny College, opened in 1816 as a Presbyterian Church institution, has been carried ou since 1833 by the Methodist Episcopal Church. Meadville was founded by General David Mead as a fortified post in 1789. In 1816 it had only 400 inhabitants; but the num- ber was 3702 in 1860, 7103 in 1870, and 8860 in 1880.

MEASLES (Jforbilli, Rubeola; German, Masern ; French, Rougeole), an acute infectious disease occurring mostly in children. It appears to have been known from an early period in the history of medicine, mention being made of it in the writings of Rhazes and others of the Arabian physicians in the 10th century. For long, how- ever, its specific nature was not recognized, and it was held to be a variety of small-pox. After the non-identity of these two diseases had been established, measles and scarlet fever continued to be confounded with each other ; and in the account given by Sydenham of epidemics of measles in London in 1670 and 1674 it is evident that even that accurate observer had not as yet clearly perceived their pathological distinction, although it would seem to have been made a century earlier by Ingrassias, a physician of Palermo. It is only within a comparatively recent period that measles has come to be universally regarded as a distinct and independent malady.

Like the other eruptive fevers (exanthemata), to which class of diseases measles belongs, its progress is marked by several stages more or less sharply defined.

After the reception of the contagion into the system a period of incubation or latency precedes the development of the disease, during which scarcely any disturbance of the health is perceptible. This period appears to vary in duration, but it may be stated as generally lasting for from ten to fourteen days, whien it is followed by the invasion of the symptoms specially characteristic of measles. These consist in the somewhat sudden onset of acute catarrl of the mucous membranes. Sneezing, accompanied with a watery discharge, sometimes bleeding, from the nose, redness and watering of the eyes, cough of a short, frequent, and noisy character, with little or no expectora- tion, hoarseness of the voice, and occasionally sickness and diarrhoea, are the chief local phenomena of this stage. But along with these there is well-marked febrile disturb- ance, the temperature being elevated (102°-104° F.), and the pulse rapid, while headache, thirst, and restlessness are usually present to a greater or less degree. In some instances, however, these initial symptoms are so slight that they almost escape notice, and the child is allowed to associate with others at a time when, as will be afterwards seen, the contagion of the disease is most active. In rare cases, especially in young children, convulsions usher in, or occur in the course of, this stage of invasion, which lasts as a rule for four or five days, the febrile symptoms, however, showing some tendency to undergo abatement after the second day. On the fourth or fifth day after the invasion, sometimes later, rarely earlier, the characteristic eruption appears on the skin, being first noticed on the brow, cheeks, chin, also behind the ears, and on the neck. It consists of small spots of a dusky red or crimson colour, slightly elevated above the surface, at first isolated, but tending to become grouped together into patches of irregular, occasionally crescentic, outline, with portions of skin free from the eruption intervening. The face acquires a swollen and bloated appearance, which, taken along witli the catarrh of the nostrils and eyes, is almost characteristic,

and renders the diagnosis at this stage a matter of no difficulty. The eruption spreads downwards over the body and limbs, which are soon thickly studded with the red spots or patches. Sometimes these become confluent over a considerable surface, giving rise toa larger area of uniform redness. The rash continues to come out for two or three days, and

then begins to fade in the order in which it first showed itself, namely, from above downwards. By the end of about a week after its first appearance scarcely any trace of the eruption remains beyond a faint staining of the skin. Occasionally during convalescence slight pceling of the epidermis takes place, but much less frequently and distinctly than is the case in scarlet fever. At the com- mencenient of the eruptive stage the fever, catarrh, and other constitutional disturbance, which were present from the beginning, become aggravated, the temperature often rising to 105° or more, and there is headache, thirst, furred tongue, and soreness of the throat, upon which red patches similar to those on the surface of the body may be observed. These symptoms usually decline as soon as the rash has attained its maximum, and often there occurs a sudden and extensive fall of temperature, indicating that the crisis of the disease has been reached. In favourable cases convalescence proceeds rapidly, the patient feeling per- fectly well even before the rash has faded from the skin. Measles may, however, occur in a very severe or malignant form, in which the symptoms throughout are of urgent character, the rash but feebly developed, and of dark purple hue, while there is great prostration of strength, accompanied with intense catarrh of the respiratory or gastro-intestinal mucous membrane. Such cases, always of serious import, are happily rare, occurring mostly in circumstances of bad hygiene, both as regards the individual and his surroundings. On the other hand, cases of measles are often met with of so mild a form throughout that the patient can scarcely be persuaded to submit to treatment. Measles as a disease derives its chief importance in the view of medical men from the risk, by no means sliglit, of certain complications which are apt to arise during its course, more especially inflammatory affections of the respiratory organs, 'These are most liable to occur in the colder seasons of the year and in very young and delicate children. It has been already stated that irritation of the respiratory passages is one of the symptoms characteristic of measles, but that this subsides with the decline of the eruption. Not unfrequently, however, these symptoms, instead of abating, become aggravated, and bronchitis of the capillary form (see BroNcHITIS), or pneumonia, generally of the diffuse or lobular variety (see PNEUMONIA), impart a gravity to the case which it did not originally possess. By far the greater proportion of the mortality in measles is due to its complications, of which those just mentioned are the most common, but which also include inflam- matory affections of the

larynx, with attacks resem- bling croup, and also diarrhoea assuming a dysenteric character. Or there may remain as direct results of the disease chronic oplithalmia, or discharge from the ears, with deafness, and occasionally a form of gangrene affecting the tissues of the mouth or cheeks and other parts of the body, leading to distigurement and even endangering life. Apart, however, from those immediate risks, it deserves to be borne in mind that in measles there appears to be a tendency in many cases for the disease to leave behind a weakened and vulnerable condition of the general health, which may render children, previously robust, delicate and liable to chest complaints, and is in not a few instances the precursor of some of those tubercular affections to which the period of childhood and youth is liable. These various effects or sequele of measles plainly indicate that although in itself a comparatively mild XV, — 83

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ailment, it cannot safely be regarded with indifference. Indeed it is doubtful whether any other disease of early life demands more careful watching as to its influence on the health. Happily many of those attending evils now alluded to may by proper management be averted. Measles is a disease of the earlier years of childhood. Like other infectious maladies, it is admittedly rare, though not unknown, in nurslings or infants under six months old. It is comparatively seldom met with in adults, but this is simply due to the fact that most persons have undergone an attack in early life, since, where this has not been the case, the old suffer equally with the young. All races of men appear liable to this disease, provided that which con- stitutes the essential factor in its origin and spread exists, namely, contagion. Some countries enjoy long immunity from ontbreaks of measles, but it has frequently been found in such cascs that when the contagion has once been introduced the disease extends with great rapidity and virulence. This was shown in two well-known in- stances in recent times,—namely, the epidemic in the Faroe Islands in 1846, where, within six months after the arrival of a single case of measles, more than three-fourths of the entire population were attacked and many perished ; and the similarly produced and still more destructive out- break in Fiji in 1875, in which it was estimated that about one-fourth of the inhabitants were cut off by the disease within a period of about three months (see Fus1). In both these

cases the great mortality has been ascribed to the complications of the malady, specially induced by over-crowdiug, by insanitary surroundings, the absence of proper nourishment and nursing for the sick, and the utter prostration and terror of the people, rather than to any marked malignancy in the type of the disease.! Not a few anthorities, however, while fully recognizing the banefnl effect of these unfavourable conditions, are yet disposed to hold that epidemics of this kind, when occurring in what might be termed a virgin soil, are apt to possess an innate severity. In many lands, such as the United King- dom, measles is rarely absent, especially from large centres of population, where sporadic cases are found in greater or less number at all seasons. Every now and then epidemics arise from the extension of the disease among those members of a community who have not been in some measure protected by a previous attack. There are few diseases so contagious as measles, and its rapid spread in epidemic outbreaks is no doubt due to the well-ascertained fact that contagion is most potent in the earlier stages, even before its real nature has been evinced by the characteristic appearances on the skin. Hence the difficulty of timely isolation, and the readiness with which the disease is spread in schools and families. There is little doubt too that the contagion may be carried from one place to another by persons themselves unaffected, as well as by clothing, &c., although its tenacity and activity in this respect is apparently much less marked than that of small-pox or scarlet fever. Of the nature of the infecting agent nothing certain is known. Recent investigations into the mode of origin of others of the acute infectious diseases, and the discovery in the blood and tissues in the case of some of them of lower forms of organic life (bacilli), which can be isolated and can by inoculation be made to communicate the particular malady to which they are related, give countenance to the opinion, now widely entertained, that the infecting principle of the exanthemata is of this nature. The subject, however, is still under investigation, and more information is wanting before definite statements can be made. Second attacks of measles are occasionally observed, but they are rare. i rs—_W

? Transactions of the Epidemiological Society. London, 1877.

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MEASLES

Preatment.—The treatment of measles embraces the preventive measures to be adopted in the case of an outbreak by the isolation of the sick at as early a period as possible. Epidemics have often, especially in limited localities, been curtailed by such a precaution. In families with little house accommodation this measure is frequently. for the reason already referred to regarding the communic. able period of the disease, ineffectual ; nevertheless where practicable it ought to be tried, for it is a grave error necdlessly to expose the healthy children in family to the risk of infection under the idea that they must necessarily take the disease at some time or other. The unaffected children should likewise be kept from school for a time (probably about three weeks from the outbreak in the family would suffice if no other case occur in the interval), and all clothing in contact with the patient should be subjected to disinfection or thorough washing, In extensive epidemics it is often desirable to close the schools of a locality fora time. As regards special treat- ment, in an ordinary case of measles little is required beyond what is necessary in febrile conditions generally, Confinement to bed in a somewhat darkened room, into which, however, air is freely admitted in such a manneras to avoid the risk of draughts, light nourishing liquid dict (soups, milk, &c.), and mild diaphorctic remedies such as the acetate of ammonia or ipecacuanha, are all that is necessary in the febrile stage. When the catarrhal symptoms are very severe, the hot bath or warm packing to the body generally or to the chest and throat afford relief, and the same measures may with advantage be adopted should the eruption be but feebly developed or tend to recede, and especially should convulsions set in. The Serious chest complications of measles are to be dealt with by those measures applicable for the relief of the particular symptoms (see Broncuiris, Pyeumonta). The inhalation of vapour and the use of the preparations of aminonia are of special efficacy. Diarrhcea is treated by the usual remedics, including carefully administered doses of Dover's powder, chalk, &c. During convalescence the patient must be guarded from exposure to cold, and for a time after recovery the state of the health ought to be watched with the view of averting the evils, both local and constitutional, which but too often follow this disease.

German Measles (Rotheln, or Epidemic Roseola) isa term applied to a contagious eruptive disorder having certain points of resemblance to measles, and, according to some observers, also to scarlet fever, but exhibiting its distinct individuality in the fact that it protects from neither of these diseases. It occurs most commonly in children, and is occasionally scen in extensive epidemics. Beyond con- finement to the house in the eruptive stage, which, from the slight symptoms experienced, is often difficult of accomplishmeut, no special treatment is called for. There is little doubt that the disease is often mistaken for true measles, and many of the alleged second attacks of the latter malady are probably cases of réthela. The chief points of difference are the following :—

1. The absence of distinct premonitory symptoms, tlic stage . invasion, which in measles is usually of four days' duration, – accompanicd with well-marked fever and catarrh, being in rotheln either wholly absent or exccedingly slight, enduring only for one day. . : D, The eruption of rétheln, which, although as regards its ult and manner of progress similar to measles, differs capitis . its appearance, the spots being of smaller size, paler co ni a with less tendency to grouping in crescentic patches. The ra attains its maximum in about one day, and quickly disappears. There is no accompanying increase of temperature in this stage as in measles.

3. The milder character of the symptoms of rotheln ioe. its whole course, and the absence of complications and of ae. subsequent impairment of health such as have been seen to a to mncasles. (J. 0. A.

MEASUREMENT

MEASUREMENT. We propose in the first place to enter into some detail on the fundamental principles of tlie theory of measurement, and in doing so it will be necessary to sketch the very remarkable theory established by Riemanu and other mathematicians as to the foundations of our geometrical knowledge.

Every system of geometrical measurement, as indeed the whole science of geometry itself, is founded on the possi- bility of transferring a fixed figure from one part of space to another with unchanged form. We are so familiar with this process that we are apt not to realize its importance until very

special attention has been directed to the subject. We therefore propose to make a logical examination of the nature of the assumptions involved in the possibility of moving a figure in space so that it shall undergo no altera- tion. We shall find that we require to postulate certain suppositions with regard to the nature of space and to the measurement of distances.

It will facilitate the conception of this somewhat difficult subject to consider the case of hypothetical reasoning beings which Sylvester described as being infinitely attenuated bookworms confined to infinitely thin sheets of paper. We suppose such two-dimensional beings to be absolutely limited to a certain surface. They could have no concep- tion of space except as of two dimensions. The movement of a point would for them form a line, the movement of a line would form a surface. They could conduct their measurements and form their geometrical theories. They would be able to draw the shortest lines between two points, these lines being what we would call geodesics. To these two-dimensioned geometers geodesics would possess many of the attributes of straight lines in ordinary space. If the surface to which the beings were confined were actually a plane, then the geometry would be the same as our geometry. They would find that only one straight line could be drawn between two points, that through a point only one parallel to a given line could be drawu, and that the ends of a line would never meet even though the line be prolonged to infinity.

We might also suppose that intelligent beings could exist ou the surface of a sphere. Their straightest line between two points would be the arc of the great circle joining those two points, They would also find that a second geodesic could be drawn joining the two points, this being of course the remaining part of the great circle. A curious exception would, however, be presented by two points diametrically opposite. An infinite number of geodesics can be drawn between these points and all those geodesics are of equal length. The axiom that there is one shortest line between two given points would thus not hold without exception. There would be no parailel lines known to the dwellers on the sphere. It would be found by them that every two geodesics must intersect, not only in one, but even in two points. The sum of the three angles of a triangle would for them not be constant. It would always be greater than two right angles, and would increase with the area of the triangle. They would thus have no conception of similarity

between two geometrical figures of different sizes. If two triangles be constructed which have their sides proportional, the angles of the larger triangle would be greater than the corresponding angles of the smaller triangle.

It is thus plain that the geometrical axioms of the sphere- dwellers must be very different from those of the plane- dwellers. The different axioms depend upon the different kinds of space which they respectively inhabit, while their logical powers are identical. In one sense, however, the dwellers on the sphere and on the plane have an axiom in common. In each case it will be possible for a figure to be moved about without alteration of its dimensions. A

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spherical triangle can be moved on the surface of a sphere without distortion just as a plane triangle may be moved in a plane. The sphere-dwellers and the plane-dwellers would be equally able to apply the test of congruence. It is, however, possible to suppose reasoning beings confined to a space in which the translation of a rigid figure is impossible. Take, for instance, the surface of an ellipsoid or even a spheroid such as the surface of the earth itself. A triangle drawn on the earth at the equator could not be transferred to the surface of the earth near the pole and still preserve all its sides and all its angles intact.

If a surface admits of a figure being moved about thereon so as still to retain all its sides and all its angles unaltered, then that surface must possess certain special properties. It can be shown that, if a surface is to possess this property,

a certain function known as the "measure of curvature" is to be constant. of the product of the greatest and least radii of curvature. We do not now enter into the proof, but it is sufficiently obvious that a sphere of which the radius is the geometric

The measure of curvature is the reciprocal

mean between the greatest and least radii of curvature at

each point will to a large extent osculate the surface, so that a portion of the surface in the neighbourhood of the point will, generally speaking, have the same curvature as the sphere. at all the different points of the surface, then the curva- ture of the different parts of the surface will on the whole resemble that of the sphere, and therefore we cannot be surprised that the surface possessing this property will

If the sphere thus determined be the same

admit the displacement of a rigid figure thereon without

derangement of its form.

We are thus conducted to a kind of surface the geometry

of which is similar to that of the plane, but in which the axiom of parallels does not hold good. the radii of curvature at every point have opposite signs,

In this surface

so that the measure of curvature which is zero for the plane

aud positive for the sphere is negative for the surface now under consideration.

This surface has been called the " pseudosphere," and its nature has been investigated by Beltrami! In the geometry of two dimensions we can thus

have either a plane or a sphere or a pseudosphere which are characterized by the property that a surface may be

moved about in all directions without any change either in

the lengths of its lines or in the magnitudes of its angles.

The axiom which assumes that there is only one geodesic

connecting two points marks off the plane and the pseudo- sphere from the sphere.

The axiom that only one parallel can be drawn through a given point to a given line marks off the plane from the pseudosphere. The geometry of Euclid is thus specially characterized among all conceiv- able geometries of two dimensions by the following three axioms—(1) the mobility of rigid figures, (2) the single geodesic between two points, (3) the existence of parallels.

A very interesting account of this theory will be found in Clifford's Lectures and Essays, vol. i. p. 317. We shall follow to some extent the method employed by him in order to obtain an idea of the important conception which is called the "curvature of space." Suppose a geodesic be drawn on a surface of constant curvature. Then a piece of the surface adjoining this geodesic can be slid along the curve so as all the time to fit in close contact therewith. If the piece of surface be turned to the other side of the geodesic it will still fit along this side. A

1 Saggio di Interpretazione della Geometria non-Euclidea, Naples, 1868; "Teoria fondamentale degli sparii di curvatura constante," Annali di Matematica, ser. ii. tom. ii. pp. 232-55. Both papers have been translated into French by J. Houél (Annales Scientifiques de l'Ecole Normale, tom. v., 1869). An exceedingly interesting account of the whole subject will be found in Helmholtz, Popular Lectures on a elie translated by Atkinson, second series, London, 1881, pp. 27-71.

line possessing this property is called by Leibnitz a straight line. It can be easily shown that a geodesic drawn on a figure will also be a geodesic when the figure is transferred to any other position. Suppose that the figure be divided into two parts A and B by the geodesic; then the part B can be moved round so as to lie upon A, and the boundary lines of the two portions will be coincident. Now let the two parts while superposed be translated to any other position, then the piece B may be slid off and back to its original position with regard to A. It must still fit, because the whole figure might have been translated before the subdivision took place. It follows that the

division between A and B having been a geodesic in its original position will continue to be a geodesic however the figure may be translated.

In a similar way we obtain the conception of a plane. According to Leibnitz's definition a plane is a surface such that if a portion of the space contiguous thereto be slid along the surface it will continuously fit, and if the portion of space be transferred to the other side of the surface it will fit also. This definition has no meaning except we assume that the bodies may be translated in space without derangement of their dimensions. From any point we can imagine a doubly infinite number of geodesics radiating in all directions ; if a plane be drawn through the point, then all the geodesics touching the plane at that point form what may be called a "geodesic surface." It is shown that geodesic surfaces of this description can alone fulfil the conditions by which planes are to be defined. A doubly infinite number of geodesic surfaces can be drawn through every point. If a rigid body be divided into two parts by a geodesic plane, then no matter how the body be displaced the plane of section will still be geodesic. The plane of section may be made to pass through any point, and the body may then be given such an aspect as shall cause the section to coincide with any geodesic surface through the point, but this necessarily involves that the section shall fit each geodesic surface, in other words, that all the geodesic surfaces shall have a con- stant curvature.

The point which we have now gained is one of very great importance. In our ordinary conceptions of space the geodesic surfaces are of course our ordinary planes, and the common curvature they possess is zero, but the condition that rigid bodies shall be capable of translation with unaltered features does not require that the curvatures shall be zero, it merely requires that the curvatures shall be constant. If we add, however, the postulate of similarity, then the curvatures must be zero, 'The postulate of similarity requires that it shall be possible to construct a figure on any scale and anywhere similar to a given figure. This practically includes the ordinary doctrine of parallels. Lobatchewsky developed the system of geometry on the supposition that the space had a constant curvature different from zero. In this geometry the parallels can be drawn through a given point to a given line, and, to quote Clifford—

‘The sum of the three angles of a triangle is less than two right angles by a quantity proportional to the area of the triangle. The whole of this geometry is worked out in the style of Euclid, and the most interesting conclusions are arrived at, particularly in the theory of solid space, in which a surface turns up which is not plane relatively to that space but which for the purpose of drawing figures upon it is identical with the Euclidean plane.”

The most comprehensive mode of viewing the whole theory is that adopted by Riemann in his celebrated memoir “ Ueber die Hypothesen welche der Geometrie zu Grunde liegen,” 1854 (Abhandl. der kinigl. Glesellsch. zu Gottingen, vol. xiii.).1 The analytical treatment of this a ee ee ee eee

1A translation of this paper was published by Clifford in Nature (vol. viii, Nos. 183, 184, pp. 14-17, 86, 37), and has been reprinted

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subject possesses one obvious advantage. The use of symbols only admits of deductions on purely logical prin- ciples. There is not therefore the risk of tacitly intro. ducing other axioms in addition to those with which we started.

Magnitudes which have only one dimension present the theory of measurement in its simplest form. The length of a straight line may be taken as an illustration of a one-dimensioned magnitude. The velocity of a moving particle, the temperature of a heated body, the electric resistance of a metal, all these and many others are instances of one-dimensioned magnitude, the measure of which is to be expressed by a single quantity. But there may be magnitudes which require more than a single measurement for their complete specification. Take, for instance, a four-sided field which has been duls surveyed. Of what is the measurement of this field to consist? Ifthe number of acres in tlie field be all that is required then the area is expressed by a simple reference to a number of standard acres. If, however, the entire circunistances of the field are to be brought into view, then a simple statement of the area is not sufficient. It can be easily shown that the surveyor must ascertain five independent quantities before the details of the shape of the field can be adequately defined. Four of these quantities may naturally be the lengths of the four sides of the field, the fifth may be one of

the angles, or the area, or the length of one of the diagonals, Speaking generally, we may say that five distinct measurements will be necessary to define the field adequately. The actual choice of the particular measurements to be made is to a great extent arbitrary. The only condition absolutely necessary is that they shall be all independent and free from ambiguity. Once these five quantities are ascertained then all tle other features of the figure are absolutely determined. For instance, the four sides and the diagonal being ascertained by measure- ment, then the other diagonal, the four angles, and the area can all be computed by calculation. The five quantities would determine everything about the field except its actual position on the surface of the earth. If we further desired to have the field exactly localized certain other quantities must be added. The latitude and the longitude of one specified corner of the field would completely indicate that corner, while the azimuth of one side from that corner would complete the definition of its position. We are thus led to see that for the complete delineation of every circumstance relating to the shape of the field and its locality eight different measurements have been required. Two sets of eight measurements differing in any particular can never indicate the same field. It is very important to notice that the number of quantities required is quite independent of the particular nature of the measurements adopted. We might for instance have simply measured the latitude and the longitude of each of the four corners of the field. Once these quantities are known, then the shape of the field, its area, its angles, and its diagonals have all been implicitly determined. Here again we see that as two quantities are required to localize each of the four corners, so eight quantities will be required to fully determine the whole field.

In the operations of analytical geometry we are accustomed to specify the position of a point by the relation which it bears to certain fixed axes. By means of certain quantities, either altogether linear or partly linear and partly angular, we are enabled to specify the position of the point with absolute definiteness. These quantuties

in the collected edition of Clifford's Works, 1882, pp. 55-69. one bibliography of higher-space and non-Euclidean geometry, me ae by George Bruce Halsted in the American Journal of Mathema Pure and Applied, i, 261-276, 384, 385; ii, 65-70.

are called the coordinates of the point. In a similar though more extended sense we may use the word "eoordinates" to express the group of eight magnitudes which we have found to be adequate to the complete specification of tlie field. By the measurement of the field in the most complete sense of the term we mean the measurement of its eight coordinates.

Suppose that an object is completely specified by 2 coordi- nates, then every different group of » coordinates will specify a different object. The entire group of such objects will form what is called a continuously extended manifold- ness. The singly extended manifoldness may be most conveniently illustrated by the conception of time, the yarious epochs of which are the elements in the manifold- ness. Space is a triply extended manifoldness whereof the elements are points. All conceivable spheres form a quadruply extended manifoldness. Allconceivable triangles in space form a manifoldness of nine dimensions. The number of coordinates required to specify the position of an element in a manifoldness is thus equal to the order of the manifoldness itself. It is important to observe that the elements of the manifoldness may be themselves objects of no little complexity. Thus, for instance, the conics forming a confocal group constitute the elements of a singly ex- tended manifoldness.

The essential feature of a singly extended manifoldness is that a continuous progress of an element can take place only in two directions, either forwards or backwards. But a singly extended manifoldness may be regarded as itself an element in a manifoldness of a higher order. Thus the points on a circle form a singly extended manifold- ness, while the circle itself is one element of the manifold- ness which consists of a series of concentric circles. The system of concentric circles may in like manner be regarded as an element in the manifoldness which embraces all systems of concentric circles whose centres lie along a given line. We are thus led to conceive of a multiply extended manifoldness as made up by the successive com- position of singly extended manifoldnesses.

It follows from the conception of a manifoldness that in the case of a singly extended manifoldness the position of every element must be capable of

being completely specified by a single quantity. It becomes natural to associate with each element of the manifoldness a special numerical magnitude. These magnitudes may vary from —a@ to+a; to each magnitude will correspond one element of the manifold- ness, and couversely each element of the manifoldness is completely specified whenever the appropriate number has been assigned. It is quite possible to have this association of numerical magnitude with the actual position of an element independent of any ordinary metrical relations of the system ; it will, however, most usually be found that the numerical magnitudes chosen are such as admit of direct interpretations for the particular manifoldness under con- sideration. Thus, for instance, in the case of the system of concentric circles it will be natural to associate with cach circle its radius, and the position of each circle in the manifoldness will thus be completely defined by the radius. So also in the case of that singly extended manifoldness which consists of colours, it will be natural to employ as the number which specifies each particular colour the wave-length to which that particular colour corre- sponds.

_lf the elements of such a manifoldness can receive a simultaneous displacement, then it is plain that to each element in the original position will correspond an element in the second position. Let and y be the numerical magnitudes correlated to these two elements. Then, since the relation must be of the one-to-one type, it is necessary that the magnitudes x and y must be connected by an equation of the type

any +be+cy+d=0.

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It follows from this that there are a pair of clements which are common to both systems, for if z=y we have the equation

av?+(b+c)at+d=0. The original equation may be written in the form axy+ (b-w)et(c+w)yt+d=0,

and whatever value w may have this equation will lead to the same quadratic for the two common elements. We thus have a singly infinite number of displacements which are compatible with the condition that the

two fundamental elements shall remain unaltered, and it is displacements of this kind which express the movements of a rigid system.

The position of a point is to be defined by three coordinates. In our ordinary conception of coordinates the position of the point is defined by certain measurc- ments, and thus it would seem that the very mention of coordinates had already presupposed the idea of distance. This, however, need not be the case. We can assume a point in space to be completely defined by three purely numerical quantities. It will be supposed that to each group of three coordinates corresponds one point, and that conversely to one point will correspond three coordinates and no ambiguity is to be present. This latter considera- tion will exclude from our present view such cases as those where the position of a point is defined by a line and two angles, because angles are subject to a well-known ambiguity amounting to any even multiple of z. In this case it would not be true that to one point corresponds one set of coordinates, although the converse may be correct.

It is necessary to understand clearly the nature of the suppositions which are made with regard to space by this assumption. Let x, y, 2 and 2', 9', 2' be the coordinates of two points a anda'. Now a, y, 2 can change continu- ously by any law into 2', 9', 2'. Each intermediate stage will give the coordinates of a point. It must thus be possible to pass continuously in an infinite number of ways from the point a to the point a'. We thus assume that space is continuous when we have assumed that its points are represented by coordinates. It must be observed that we predicate nothing as to space which is not involved in the fact that to each point corresponds one group of three coordinates. Tosome extent the considerations now before us will apply to any other continuous manifoldness which requires three coordinates for the complete specification of its elements. 'Take, for instance, a musical note. It can be specified accurately by its pitch, intensity, and timbre. These three quantities may be regarded as the three coordi- nates which will discriminate one sound from the rest. The manifoldness comprising all musical notes is, however, very different from the manifoldness which embraces all the points of space. Each of these manifoldnesses is no doubt continuous, and each of them is of three dimensions, but the conception of distance can have no place in the musical manifoldness. This is due to the absence from the musical manifoldness of

anything parallel with the conception of rigidity in the space manifoldness. These remarks will show that the conception of "distance" is something of a special type even in a three-dimensioned continuous manifoldness.

There are also other three-dimensioned and continuous manifoldnesses from which the conception of distance is also absent. Take, for instance, the manifoldness which embraces all the circles that can lie in a given plane. The points of such a manifoldness are the circles. It is three- dimensioned, for two coordinates will be required for the centre of each circle and one forits radius. It is obviously a continuous manifoldness, for one circle may by infinitely graduated modifications pass into any other. Yet from this manifoldness also the conception of distance is absent. There is no intelligible relation of one circle to another

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which is analogous to the distance which we require to determine.

We shall now give the investigation of Helmholtz, by which the analytical form of the function expressing the distance is to be ascertained (Géttingen Nachrichten, 1868, pp. 193 sq.).

It must be remembered that our definition of a point will be purely analytical. Suppose three different scales of pure quantity each extending from-—a« to+o. Each of these scales is perfectly continuous, so that, no matter how close any two elements in the scale may be, it is always possible to conceive the insertion of an infinite number of intermediate elements. A pointis to be defined for our present purpose as a group of three numerical magnitudes taken one from each of the three scales. This conception may be stated more generally. We can conceive nm different numerical scales. Then a group of x numbers, one from each scale, will define an element of a continuous n-fold manifoldness.

It will be obvicus that unless the theory of distance possess a special character it will not be possible for a rigid body to exist. Take, for instance, five points in a rigid body ABCDE. There are ten different pairs of points and ten corresponding distances; all these ten distances must remain unchanged when the body is displaced. We may assume the position of A

arbitrarily. Then after the dislpacement B must be placed at the right distance from A, but will only be limited by this condition to a certain surface, C must be placed at the right distance from A and from B, thus C will be limited to a certain curve. D must be placed at the proper distances from A, from B, and from C. 'These conditions will be sufficient to define D with complete definiteness. In the same way E will be completely defined by its distances from A, B, and C, but as D and FE are thus fully defined we have no guarantee that the distance DE shall retain, after the translation, the same value which it had before. This then indicates that the function which is to express the distance must have a very special form. Any arbitrary function of the six coordinates of the two points would in general not fulfil the condition that the distance DE after the transforma- tion will retain the same value as it had before. If a greater number of points than five be taken, the conditions

which a rigid system must fulfil become still more nume-_

rous.

Let x, y, 2 be the coordinates of a point in a rigid body free to rotate around a point. We shall assume that x, y, z is in the vicinity of the fixed point, aud that the displacement of the body is such that a second point remains unaltered. In other words, the displacement is to be a rotation around a line joining the two points, and we shall also assume that when this rotation has been completed every point will be restored to its original position, Let n be the angle of rotation around the axis, then x, y, 2 will all be functions of y, and we may assume that the following equations will hold—

d

OF = yx + by + Cy2 adn

Se Met by +2 dn 1 WY + ey

a ra

= gh + Do + C52 dy

In the first place it is plain that these differential coefficients must be functions of 2, y,z, and, these functions being expanded in ascend- ing bia we may oiit all powers above the first. It will also be obvious that the absolute terms must be zero as the origin is by hypothesis to be a fixed point. As the displacement is a rotation, it follows that the differential coefficients must be zero for certain values of x, y, 2 different from zero, but this involves the condition Ca cncmes CouleOle Cie i Dy HC &y » by, Cy

We now procecd to solve the three linear differential equations by

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the well-known process. If we multiply the three equations hy I, m, ” resvectively, and if we determine J, m, n so that

Th=lay+ ma, +n, mh =1by + mb, + nb, nh=ley+ me, + ney, where / is another constant determined by the equation

hy-h, Gy » a =0, by a ee a plSGs » Cya-h

the differential equations then give

- *(12+ my + nz)=h(lx+my+nz),*

whence le+my +nz=Ce™,

We have already seen that one of the values of % must be zero,

whence if the other values be hy and hy we have the threo

equations lyE+ Moy +NgQZ=A Lyx + yy + 042 = Bet 1,0 + mgy nyz= Cele , It is plain that %, and h, cannot be real quautities, for then the quantities a myy +n z and laa + my + 22 could attain any values

from~ o to + o according to the variationsin ». If h, and hg are imaginary then will also the corresponding values of J, m, % be

imaginary. We therefore write hy =0 +t h,=0 -wi 1 =Ay tat Ia=Ag—Ayt

me het Me Ny = Vy + yt

My = Ho — By? Ng = Vy — Vyb so that Age + Mo +72 = Ae cos (wy +c) yet my + y2= Ac sin (wy +c); in which case we have

(Ag@ + Mo + 792)? + (A\e+ wy + yz)? = Aen, But it is plain that unless @ be zero the left-hand side of this equation will be susceptible of indefinite increase, which is contrary to our hypothesis. We are therefore entitled to assume that 6=0. The two roots of the cubic for 4 must, therefore, be pure iniaginaries, and thus we have the condition

+6,e,=0. Finally we have for the determination of 2,.y, z the following three equations :—~ 1y@- Moy + Noe = const. AgLt Moy + y= Acos(wy c) Aye py +me=—Asin(wytc).

It will simplify the subsequent calculations if we now make such a transformation of the coordinates as will enable us to write

X=[pu + Moy + Np Y=Agtt Moy + uz L=iyxrt mytnye-

We shall then have from the results just obtained

The movement corresponding to 7 is such as leaves unaltered all points of which the Y and the Z are equal to zero. ,

Let us now suppose another displacement to be given to the system by a rotation 7' about another axis so chosen that all the points for which X=0 and Z=0 shall remain unaltered. For this condition to be fulfilled we must have the equation

dX

dq eee ie

ao a, X =: 0 + wZ dZ ay! for then each side of these equations will be equal tozero for por which make Xand Z zero. The condition that the roots of 48 be purely imaginary gives us Qy + vag 0 °

=a,X+0+%Z,

MEAP REM EN iT

If the body receives both the rotation » and the rotation 7’ then the joint effect of these two rotations must be equal to that of a single rotation ¢, so that

dX _dX dX ap a dyn dr’ ay _a¥ av dp dn dr’ ah dh dh dp dn dy!’ or uniting the two sets of equations we have dp vY ip xt +(v,-0)Z Fo aX +oY +4. Asthismovement must also be a rotation, the three right-hand mem- bers must be capable of being rendered zero for certain values of X, Y, Z, and therefore we have (remembering that ay-+v,=0) = 0 e

Gy 9 U Ea .

=ajX+0 +Z

a» 9, %

Gz, W,

This condition reduces to

— Ay

W9(¥) —w) — wayyy, =0,

or ay” + wav) — ayy;)=0.

This equation must be satisfied for every value of w ; for, whatevcr be the amplitudes of the two rotations, they must when com- pounded be equal to a single rotation. We therefore have the conditions

a= 0 a%=0.

To satisfy the latter condition either a, or vy) must be equal to zero. We must examine which of these two conditions is required by the

problem. Since ag is cqual to zero we have a Re “4 pik

If y) were zero then the first equation would show X to be con- stant ; and the result would be that Y¥ =a,X7n + 4a,7,X7?+ const. ; or, in other words, Y would be susceptible of indefinite increase with

the increase of. The supposition »,=0 is therefore preeluded, and We are forced to admit that a,=0. The three equations then

reduce to dX ay a, iL af, 2 dy — Og X .

If the body receives a rotation 7” about an axis which leaves X and Y unaltered, we then have

dX = 7 oor

dY e. ln”

The condition that the two roots of & shall be purely imaginary gives us

=f,X+9.Y¥ +0.

; Jot+H=0. Let this rotation and the first rotation be communieated together.

he resulting rotation coul i d have been produced by a rotation and thus we have ! = iat

*dX dX dX dx dn * dn” GOSAY GT dx dn” dn” di dZ du*

dx dy” dy”

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Substituting, we obtain as before

aX bs . mel aa

TAN +n – 0

ar

ax and as before the condition must be fulfilled

| Jo» ’ 0 | =0;

fis ’

jh > Jot® , 0

afy(Jo + w)— afngy=0. This can only be satisfied for all values of w if f)=0 and if JoGo=9. To determine whether g) can be zero, we have the cquations ux an’

SpX + (Got w)¥+0;

—-@

or, expanding,

=guY dY % dy!' —fix hs dy' It can be shown that if gy were zcro then we slionld have Z capable

of indefinite increase ; and hence we see that 7, must be zero, so that the three equations have the form

=fpX+9.¥ .

dX 4 wer Go ay an =X dZ,

Tl ' Let us now sce whether these equations will fulfil the necessary condition for a rotation py. If

aX_aX , aX db dy!" dn"

*qv _aY , dY dy dy! * dy' dZ dZ adZ*

*cy def * ci"? we shall then have by substitution aX a*

ay =0+ GY +myZ

dY = —_—a Ce

WZ, . . ape tN +0. But, if this is to represent a rotation,

SGP t A991 = 0. As this is always to be true, even suppose go, 7), and g, for instance were multiplied by a common factor, it is plain that we must have

JiG2%) = 9

and AJovy = 0.

The first condition is to be satisfied by making g, zero ; for neither of the other possible solutions is admissible if the coordi- nates are to be presented from indefinite inerease. In a similar way the second eondition requires that y, must be zero.

Resuming now the three groups of equations, they are as follows:—

aX dX aX – ay =0 9 dn' wh 9 di fo dY dy dY J adn SOE adn' 0 ' ay" =f, X aZ, ee 1D 8 Rewer

i ae" 3 diy ; Beem De

Finally let us suppose that the body receives all three motions simultaneously. 'The resulting motion must still be a rotation, and thus we have the condition

0. G5 % =0, Fi > —@ a,+tw, 9

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which when expanded gives

o(fi%9- tteJo) » It is therefore necessary that

Ji — 8299 = 9. But, as this is homogeneous in the two component rotations involved,

it does not follow that the separate terms of this equation must necessarily be zero. We satisfy this condition by writing

i= 9

and ka,=— vw.

Let the body next reccive any displacement, 5, 37', and dy", then we have in general

dX dX a ee

with similar equations for 5Y aud 52. By substitution these equations become

dX = — aykZbn! — kf, YSn" BY = — whdn +f, Xdy" 5Z= wVYbn a,X8n'.

If we multiply the first of these equations by X, the second by ZY, and the third by £Z, and add, we find

XdX+4Y8Y +4Z5Z=0 or X?24-4KY24-4Z2=const.

Here we have attained the fundamental property which the coordinates must satisfy. If & be equal to unity then we have the well-known condition of ordinary space and ordinary rectangulai coordinates, but it will be seen that there is nothing in the preced- ing investigation to make it necessary that & should be unity. There are therefore a singly infinite variety of spaces in which it is possible for a rigid body to be displaced. The different values of k& thus correspond to the different "curvatures" whicli a space might have while it still retained the fundamental property which is necessary for measurement by congrucuce.

aX. a >

5y/ +

It will now be proper to study the special charac- teristics of the space with which we are familiar. It has been called flat space or homaloidal space to distinguish it from other spaces in which the curvature is not zero. It is manifest that the characteristic features of our space are not necessarily implied in the general notion of an extended quantity of three dimensions and of the mobility of rigid figures therein. The characteristic features of our space are not necessities of thought, and the truth of Euclid's axioms, in so far as they specially differentiate our spacc from other conceivable spaces, must be established by experience and by experience only.

The special feature of our space, by which it is distin- guished from spherical space on tle one hand and pseudo- spherical space on the other hand, depends upon what Riemann calls the measure of curvature. If the sum of the three angles of a triangle is to be two right angles, and if the geometrical similarity of large figures and small figures is to be possible, then the measure of curvature must be zero. Now all measurements that can be made seem to confirm the axiom of parallels and seem to show tlie measure of curvature of our space to be indistinguish- able from zcro.

It can be proved that the amount by which the three angles of a triangle would differ from two right angles in curved space depends upon the area of the triangle. greater the area of the triangle tlie greater is the difference. To test the famous proposition, Euclid i. 32, it will there- fore not be sufficient to measure small triangles. It miglit be contended that in small triangles the difference between tlle sum of the three angles and two right angles was so small as to be inextricably mixed up with the unavoidable errors of measurement. Seeing therefore that small triangles obey the law, it is necessary to measure large triangles, and the largest triangles to which we have access are, of course, the triangles which the astronomers have found means of measuring. The largest available triangles are those which have the diameter of the earth's orbit as a base and a fixed star at the vertex. It is a very curious

circumstance that the investigations of annual parallax of the stars are preciscly the investigations which would be necessary to test whether one of these mighty triangles had the sum of its three angles equal to two right angles, It must be admitted that the parallax-seeking astronomers have never yet found any reason to think that there is any measurable difference. If there were such a difference it would probably be inextricably mixed up with the annual parallax itself. Were space. really pseudospherical, then stars would exhibit a real parallax even if they were infinitely distant. Astronomers have sometimes been puzzled by obtaining a negative parallax as the result of their labours. No doubt this has generally or indeed al- ways arisen from the errors which are inevitable in inquiries of this nature, but if space were really curved then a nega- tive parallax might result from observations which possessed mathematical perfection.

It must, however, be remembered that even the triangles of the parallax investigations are utterly insignificant when compared with the dimensions of space itself, Even the whole visible universe must be only an uncon- ceivably small atom when viewed in its true relation to infinite space. It may well be that even with the parallax triangles our opportunities of testing the proposition are utterly inadequate to pronounce on the presence or absence

of curvature in space. It must remain an open question whether if we had large enough triangles the sum of the three angles would still be two right angles.

Helmholtz illustrates the subject by considering the representation of space which is obtained in a spherical mirror. A mirror of this kind represents the objects in front of it in apparently fixed positions beliind the mirror. The images of the sun and of other distant objects will lte behind the mirror at a distance equal to its focal length, or, to quote the description of Helmholtz —

"The image of a man measuring with a rule a straight line from the mirror would contract more and more the farther he went, but with his shrunken rule the man in the image would count out exactly the same number of ceutimetres as the real man, And in general all geometrical measurements of lines or angles made with regularly varying images of real instruments would yield exaetly the same results asin the outer world. AJ! congruent bodies would coincide on being applied to one another in the mirror as in the outer world. All lines of sight in the outer world would be repre- sented by straight lines of sight in the mirror. In short I do not see how men in the mirror are to discover that their bodies are not rigid solids and their experiences good examples of the ecorreetness of Euclid's axioms. Bnt if they could look out upon our world as we can look into theirs, without overstepping the boundary, they must declare it to be a picture ina spherical mirror, and would speak of us just as we speak of them ; and if two inhabitants of the different worlds conld communicate with one another, neither sofar as I can see would be able to convince the other that he had the truc, the other the distorted relations. Indeed I cannot see that such a question would have any meaning at all so long as mechani- cal considerations are not mixed up with it."

A very important contribution to this subject has been made by Professor Simon Newcomb, entitled " Elementary Theorems Relating to the Geometry of a Space of Three Dimensions and of Uniform Positive Curvature in thie Fourth Dimension," see Jour. 7. d. reine und angewanite Math., vol. lxxxiii.,-Berlin, 1877.

He commences by assuming the three following postulates :—

1 “That space is triply extended, unbounded, without properties dependent either upon position or direction, and possessing such planeness fin its smallest parts that both the postulates of the fuclidean geometry and our common conceptions of the relations of the parts of space are true for every indefinitely small region 1n ee That this space is affected with such curvature that a right line shall always return into itself at the end of a finite and i. distance 2D without losing in any part of its course that syne with respect to space on all sides of it which constitutes the funda mental property of our conception of it.”

3. “That if two right lines emanate from the same | the indcfinitely smail angle a with each other, their dis

e same point making tance apart

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at the distance 7 from the point of intersection will be given by the equation

Newcomb also assumes that two straight lines intersect only in a single point. He defines a “complete right line ” as one returning into itself, as supposed in postulate 2. Any sinall portion of itis to be conceived as a Euclidean right line. The locus of all complete right lines passing through the same point and touching a Euclidean plane through that point will be called a “ complete plane.” ‘

A “region ” will nean any indefinitely small portion of space in which we are to conceive of the Euclidean gcometry as holding true.

Newcomb then procceds to demonstrato the following proposi-

nS.

“a All completo right lines are of the same Iength 2D. Hence D is the greatest possible distance at which the points can be situated, it being supposed that the distance is measured on the linc of least absolute length.

Il. The complete plane is a Euclidean plane in every region of its extent.

Ill. Every system of right lines passing through a common point A and making an indefinitely small angle with each other are

arallel to each other in the region A' at distance D.

IV. lfa system of right lines pass in the same plane through A

the locus of their most distant points will be a complete right

e.

V. The locus of all the points at distance D from a fixed point Aisa complete planc, and indecd a double plane if we consider as distinct the coincident surfaccs in which the two opposite lines mect.

VI. Conversely, all right lines perpendicular to the same com- plete plane ineet in a point at the distance D on each side of the lane.

VII. For every complete right line there is a conjugate com- plete right line such that every point of the one is at distanco D trom every point of the other.

VIII. Any two planes in space have as a common perpendicular the right line joining their poles, and intersect each other in the conjugate to that right line.

1X. If a system of right lines pass through a point, thcir con- jugates will be in the polar plane of that point. If they also be in the same plane the conjugatcs will all pass through the pole of that plane.

X. The relation between the sides a, b, ¢ of a plano triangle in curved space and their opposite angles A, B, C will be the same as in a Euclidean spherical triangle of which the corresponding sidcs mee

a)" 2? 20° XI. Space is finite, and its total volume admits of being definitely : bya number of Euclidean solid units which is a function of D.

ar

XII. The total volume of space is oy : wv

XIII. The two sides of a complete plane are not distinct, as in a Euclidean surface.

XIY. If moving along a right line we crect an indefinite series | : : . | indeterminate to the extent of any integral number of the pcriods

of perpendiculars each in the same Euclidean plane with the one which precedes it, then on completing the line and returning to our starting point, the perpendiculars will be found pointing in a direction the opposite of that with which we started.

_ Newcomb concludes thus: "It may be also remarked that there is nothing within our experience which will justify a denial of tho possibility that the space in which we find ourselves may bo curved in the manner here supposed. It might be claimed that the dis- tance of the farthest visible star is but a small fraction of the greatest distance D, but nothing more, The subjective impossibility of conceiving of the relation of the most distant points in such a Space does not render its existence incredible. In fact our difficulty is not unlike that which must have been felt by the first man to whom the idea of the sphericity of the earth was suggested in con- ceiving how by travelling in a constant direction he could return to the point from which he started without during his journey fecl- ing any sensible change in the direction of gravity."

A sketch of the non-Euclidean geometry is given by Professor G. Chrystal in the Proc. Roy. Soc. Edin., vol. x., session 1879-80, The study of this paper is recommended to all who desire to study the elements of what has been called '¢pangeo- metry." A more extensive work, which contains the theories of Riemann and Helmholtz, is J. Frischauf's Elemente der absoluten Geometric, Leipsic, 1876.

A fundamental step in the abstract theory of measure- ment was taken by Professor Cayley in his "Sixth Memoir upon Quantics," Philosophical Transactions, vol. cxlix. (1859). The theory thus originated by Cayley has been

more fully developed by Klein in his memoir " Ueber die nicht-Euclidische geometrie," Mathematische Annalen, vol. iv. p. 573. We shall here enter into this theory in some detail, for in it lies the true foundation of geometrical measurement. A sketch of the theory was given by the author of the present article in MZermathena, No. vi. pp. 500-541, Dublin, 1879.

This theory may be regarded merely as a more general- ized method of measuring distances and angles in ordinary space, but the results to whic: it leads are in many respects identical with those to which we are conducted by the theory just discussed. For instance, Newcomb's principle as to the length of the shortest distance between two points never exceeding a certain maguitude is common to his theory and to Cayley's. The theory of Cayley has, however, claims on our attention of a special kind. We here deal with the space with which Euclid has made us familiar, only observing that it is the measurements in that space which are to be conducted on a more general principle.

We commence by assuming the existence of a certain surface called the "fundamental quadric," often called '"'the absolute." By the aid of this quadric and an arbitrary constant ¢ we determine the generalized distance betwecn the points in accordance with the following definition :—- The distance between two points is equal to c times the logarithm of the anharmonic ratio in which the line joining the two points is divided by the fundamental quadric.

Let us first test this theory by a very obvious principle which

any theory of distance ought to fulfil. It is plain that, if P, Q, B be three collinear points, then in ordinary measurement we ought to

have PQ+QR=PR;

but it is easy to see that this condition is fulfilled in the gencralized measurement. Let the line PQ cut tho fundamental quadric in tho two points X, Y, then we have

PQ =c log(PX-+PY) —clog(QX+QY) QR =clog(QX+QY) — clog(RX—RY) PR=clog (PX~PY) —clog(RX+RY) ; whence, as in the ordinary measures, LQ+QR=PR. It is also obvious that ir the generalized as in the ordinary

measures (PQ)= -(QP),

and that the distance betwecn the coincident points is equal to ZeYO.

From an obvious property of logarithms we also learn the im- portant fact that the generalized distance between the points is

Qctr.

Tho distance from any point to its harmonic conjugate with respect to the two fundamental points is cqual to cir. We thus sec that the distance between any two harmonic conjugates is con- stant. It is usual to make the arbitrary constant ¢ equal to— 7-2, in which case we sce that the distance between the two harmonic conjugates is equal to +2. It can also be shown that, if the two absolute points on a riglit line coalesce, then the generalized system of measurement degrades to the ordinary system. The two abso- lute points are at an infinite distance from every other point, so that in the generalized system of measurement every right line has two points at infinity, and in general all the points in space which lie at infinity are situated on the fundamental quadric.

In ordinary geometry we define a circle to be the locus of a point which is at a constant distance from a given point. In the more generalized geometry we retain the same definition of the circle, only observing that the distance to be constant must be expressed in the generalized manner. The plane of course cuts the absolute in aconic section, so that the determination of the circle whose centre is C is the following problem in conic sections :— Through a fixcd point O a straight line OP is drawn which cuts a given conic in the points X, Y; determine the locus of P so that the anhar- monic ratio (O, P, X, Y) shall remain constant.

This problem is most readily solved by projecting the conic into a circle the centre of which is the projection of O. The problem then assumes the very simple form. On the diameter of a fixed

circle a point P’ is taken so that the anharmonic ratio of the four

points consisting of P’, the centre O’, and the two points in which the line O’P’ cuts the circle remains constant. It 1s required to find

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the locus of P’. The solution is obvious, and hence we learn that a conic which has double contact with the fundamental conic is a circle in the generalized sense, and the centre of that circle is the pole of the chord of contact.

A system of conics which have double contact with the fundamen- tal conic in the same two points form a system of concentric circles, and the centre of the system is the pole of the chord of contact. We are accustomed in ordinary geometry to admit that every circle passes through the two imaginary circular points at infinity. This 1s the specialized form of the general theorem which asserts that every circle has double contact with the fundamental conic. The two theorems indeed coincide if the fundamental conic degrades to the infinity of ordinary measurement.

A critical case is presented when the chord through O coincides with either of the two tangents which may be drawn from O to the fundamental conic. The two fundamental points then coincide, and hence the distance between any two points on a tangent to the fundamental conic is equal to zero. We have thus the curious result that in every system of conceutric circles, including even the fundamental conic itself, the two points common to the system of circles are at the distance zero from the centre of the system. In fact the pair of tangents from the centre may be regarded as a conic having double contact with the fundamental conic, and therefore forming one of the circles of the concentric system of which the radius 1s zero,

The readcr will at once perceive the analogy to a well-known phenomenon in ordinary geometry. The equation in rectangular coordinates

$e+ y=0$

denotes edther a citcle of which the radius is zero or the pair of lines

et/-ly=0; in the latter case we are obliged to admit that the distance of any point on either of these lines from their intersection is equal to zero.

We have now to consider the displacement of a rigid figure, and we shall for the present speak only of a plane movement. We shall first show that it is possible for a plane figure to receive such a displacement that the distance between every two points in the figure after the displacement is equal to what it was before.

Let x, y, 2 be the trilinear coordinates of a point in a plane, and suppose that a', y', 2 are the coordinates of the position to which

this point is transferred in accordance with the linear transfor- mation

xe' =ax +by +ez yY=aetvy +ez L=alatb'y +elz]

There are in gencral three points in the plane which are not altered by this transformation ; for, if we assume

a=pc, y=py, 2=o2, we have for p the cubic equation a-p, 6 ne =0. a' Fi b' = p ; ae a" ' ye F cl eA p

The three values of p which satisfy this equation determine the coordinates of the three points. Itis natural to take the sides of the triangle formed by these three points as the three lines of refer- ence, in which case, if a, 8, y be constants, the system of equations assume the simple form

v= an, y =By, 2 =e,

It is easily shown that four collinear points before the transfurma- tion are collinear after the transformation, and that their anhar- monic ratio is unaltered.

This general form of linear transformation must be specialized in order to represent the movement. As no finite movement can either bring a point to infinity or from infinity, it is obvious that the displacement must be such as to leave the fundamental conic unaltered. It is easily seen that the

specification of the transforma- tion in its general form requires eight constants ; viz., the ratios of the nine quantities a, b, ¢, a’, b’, e’, a”, b”, c’. We may imagine five of these constants to be disposed of by the provision that the conic shall remain unaltered. There will still remain three dis- posable constants to give variety to the possible displacements.

Although the fundamental conic will coincide with itself after the transformation, yet it generally happens that each point thereon will slide along the conic during the transformation. It is, how- ever, very important to observe that there arc two exceptions to this statement.

Let O, A, B, C be four points upon the fundamental conic which by transformation move into the positions 0’, A’, B’, C’. If OX be one of the double rays of the systems OA, OB, OC and QA’, OB’,

-

OC’, and if we use the ordinary notation for anharmonic pencils then we have ‘

O(A, B, ©, MaOe Cre, But the anharmonic ratio subtended by four points on a conic at any fifth point is constant, whence O(A’, BY C’, X)=O’(A’, BY, C, X),

O(A, B, C, X)=O(A’, BY, C, X).

Suppose the transformation moved X to X’, then since the harmonic ratio of a pencil is unaltered by transformation we ha

O(A, B, C, X)=0(A’, BY CO, X4;

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and therefore

an- Ve

whence

OA’, B, C, X)=O’(A’BC’X’); but this can only be true if the rays O’X and O’X’ are coincident, in which case X and X’ are coincident, whence it follows that the point X has remained unaltered notwithstanding the transforma- tion. Similar reasoning applies to the point Y defined by the other double ray, and hence we have the following theorem :—

In that linear transformation of the points in a plane whieh con- stitutes a generalized movement, there are two points upon the JSundamental conte whieh remain unchanged.

It also follows that the tangents to the fundamental conic at the points X and Y, as well as the chord of contact, must remain unaltered. These two tangents and their chord of contact must therefore fori the triangle of reference to which we were previously conducted by the general theory of this transformation,

It will now easily appear how a transformation of this kind is really a displacement of a rigid plane. The distance between each pair of points is expressed by an anharmonic ratio; such ratios are unchanged by the transformation, and the two points which lay on the absolute originally are also there after the transformation. It therefore appears that the distance in the generalized sense between every pair of points is unchanged by the transformation, In other words, a rigid system will adinit of a displacement of the kind now under consideration.

If we denote the two tangents at the unaltered points on the conic by x=0, y=0, and the chord of contact by z=0, then the equation to the absolute is ‘ vy —he2=0,

Transforming this equation by the substitution

a’ = at ’ y= By, we sec that the condition a8=-y? must be fulfilled.

It is very remarkable that the fundamental conic is only one of a family of conics, cach of which remains unaltered by the transforma- tion. In fact every generalized circle of which the intersection of the two tangents is the centre has for its equation zy—h’2; and, whatevcr h may be, this circle

remains unaltered by the transfor- mation. Hence we have the following remarkable theorem:—

When a plane rigid system is displaced upon itself there as one point O of the system which remains unaltered, and all the circles which have O as their centre remain unaltered also. ;

It is quite natural to speak of this motion as a "rotation," and thus we may assert the truth in generalized measurement of the well-known theorem in ordinary geometry that

Every displacement of a plane upon itself could have been produced by a rotation of the plane around a certain point in the plane.

Notwithstanding the rotation of the plane round 0, the two tangents from O to the fundamental conic and also their chord of intersection, or the polar of O, remain unaltered; each point on the polar of O is displaced along the polar, and we would in ordinary geometry call this motion a translation parallel to the polar. lt thus appears that, in the sense now attributed to the words rota- tion and translation, a rotation round a point is identical with a translation along the polar of the point. ;

Another point on which the present theory throws light on ie ordinary geometry must be here alluded to. We have seen t 4 the two tangents from O to the fundamental conic remain unchange during the rotation of the plane round O, It certainly does mt paradoxical to assert that a plane, and all it coutains are ee around a point, and that nevertheless this operation does not a " the position of a certain pair of lines in the plane which pass so the point. But have we not precisely the same difficu een ordinary geometry? Let us suppose that a plane pencil of os = rotated through an angle @ about the origin. Thena line throug the origin whose equation before the rotation was

$xt+hy=0$

gay,

becomes after the rotation xcos 6+ysind h(ycosé — asin 6)=0. é ™ The lines thus represented are of course in general different, H they will be the same if 1/?=0. It follows that even in ordinary geometry the two remain unaltered notwithstanding the rotation of

lines etty=9 the plane which

MWHARSUREM EN T

contains them around their intersection. The two lines here referred to are of course those which are drawn through the two circular points at infinity. This paradox is therefore only a degraded form of the property of the tangents to the fundamental "Fite also be readily shown that, ¢f a plane receive two small rotations round two points, then the total rotation produced could have been produced by a single rotation about a ecrtain point on the line joining the two points. ;

Let A, B be the two points and P the pole of the line AB, then a rotation round A will displaee B along the line PB to an adjacent

oint B. The rotation around B will displace A to A' along the time PA; but, if A'B' intersects AB in O, then a single rotation about O would have effected the required displacement of A and B, and therefore of the whole line. For, as the point O in the line AB could only move by displacement into the line A'B', while it ean also only move in the direction OP, it must obviously remain unaltered. .

We are now in a position to inquire how the magnitude of an angle is to be expressed in the present system of measurement. Our definition of the magnitude of an angle must be made consist- ent with the supposition that when the angle is earried round by rotation about.the vertex the magnitude shall remain unaltered. As anharmonic ratios are unaltered by the rotation, it follows that the anharmonic ratio of the pencil formed by the two legs of the angle and the two tangents to the fundamental eonic must remain unaltered. Remembering that the tangents do not move by the rotation, it is natural to choose a function of this anharmonic ratio as the appropriate measure of an angle. The question still remains as to what function should be chosen. The student of ordinary geometry is doubtless aware that the

angle between two lines multi- plied into 2¢ is equal to the logarithm of the anharmonie ratio of the pencil formed by joining the intersection of the two lines to the two imaginary circular points at infinity. This consideration suggests that the angle between the straight lincs in the generalized sense may be appropriately measured by the logarithm of the anharmonic ratio of the pencil formed by the two legs of the angle and the two tangents drawn from their point of interseetion to the fundamental conic. There is also a eonvenienee in assuming the angle to be actually cgwal to ¢ times the logarithm of the anhar- monic ratio, where c is the same constant as is employed in the expression of the distance. In this case the angle between two lines is by a well-known theorem equal to the distance between their poles. There is here an analogy to a well-known theorem in spherical geomctry.

It will now be obvious that, however the angle be situated, its magnitude is unchanged by any displacement of the plane ; for, as we have already seen that the displacement does not alter the dis- tance between the poles of the two lines forming the angle, it follows that the magnitude of the angle itself is unaltered.

Just as in the measurement of distance we find a pair of funda- mental points on each straight line, so in the measurement of angles we find a pair of fundamental rays in each plane pencil. These tays are the two tangents from the vertex of the peneil to the funda- mental conic. In ordinary geometry the two fundamental points on each straight line coalesce into the single point at infinity ; but it is exceedingly interesting to observe that even in ordinary geometry the two fundamental rays on each pencil do not eoincide. It should also be observed that in the degraded circumstances of ordinary geometry it would be impracticable to employ the same constant ¢ for the purpose of both linear and angular measurement.

It is easy to see that the definition of a right angle in the gene- ralized sense is embodied in the statement that "if two corre- sponding legs of an harmonic pencil touch the fundamental conie then the two other legs are at right angles." We also see that all the perpendiculars to a given line pass through a point, z.¢., the pole of the given line; and from a given point a perpendicular ean be drawn to a given line by joining the point to the pole

of the line. The common perpendicular to two lines is obtained by Joining their poles.

The student of modern geometry is already accustomed to think of parallel lines as lines which intersect at infinity, or as lines whose inclination is zero. In speaking of the generalized geometry in a plane, we may define that two straight lines which interseet upon the fundamental conie are parallel. It thus follows that through any point two distinet parallels can be drawn to a given straight line. The only exception will arise in the case where the given linc touches the fundamental eonie. This is precisely the case in which the generalized system of measurement degrades to the ordinary system. It will follow that in the present theory of measurement the three angles of a triangle are together not equal to two right angles. In fact, to take an extreme case, we may suppose the three vertices of the triangle to lie upon the fundamental conic. In this ease each of the three angles, and therefore their sum, is equal to zero,

A sphere in the generalized system of measurement is the locus of a point which moves at a constant distance from a fixed point.

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It can therefore be easily shown that a sphere is a quadric which touches the fundamental quadric along its intersection with the

-polar plane of the centre of the sphere.

In discussing the general ease of the displacement of a rigid system it will simplify matters to suppose that the fundamental quadric has real rectilinear generators. It must, however, be understood that the results are not on that account less general. A displacement must not alter the quadric, and must not deform a straight line. Hence it follows that the only effect of a displace- ment upon a generator of the tundamental quadric will be to con- vey it to a position previously occupied by a different generator. We shall further suppose that the displacement is such that the two generators to which we have referred belong to the same system. Let A, B, C, D be four generators of the first system which by dis- placement are brought to coincide with four other generators A’, B’, 0’, D’. Let X be one generator of

the second system which the displacement brings to X'. Since the anharmonic ratio of the four points in which four fixed generators of the one system are cut by any generator of the other system is constant, we must have, using an obvious notation for anharmonic ratio,

X(ABCD)=X'(ABCD); but, since anharmonic ratios arc unaltered by displacement, we

liave X(ABCD)=X'(A'B'C'D),

X(ABCD)=X'(A'/BC'D).

It therefore follows that the anharmonic ratio in which four generators cut a fixed generator X' is equal to the anharmonic ratio in which the four generators after displacement eut the saine generator X',

If P be a generator which passes through one of the double points on X' determined by the two systems of points in whieh X' is cut by the four generators before and after displacement, we must

have X(A, B, C, P)=X'(A', BY, C7 LP);

henee we see that the generator P will be unaltered by displace- ment. Similar reasoning applies to the generator which passes through the other double point, and of course to a pair of generators of the second system, and hence we have the following remarkable theorem :—

In the most general displacement of a rigid system two generators of each of the systems on the fundamental quadrie remain unaltered.

These four fixed generators are the edges of a tetrahedron. Denot- ing the four faces of this tetrahedron by the equations

whence

x=0, y=0, c=0, w=0, the equation of the fundamental quadric is we+h? yw=0. If the quadric be unaltered by the transformation xe =ax, y= By, 7 yz, wv' =dw, then we must have ay= 5. When this eondition is satisficd, then, whatever A may be, every quadric of the family xzt+hyw=0 will

remain unaltered. ‘ The fainily of quadrics here indicated are analogous to the right eireular cylinders which have for a eommon axis the screw along which any displacement of a rigid body in ordinary space may be effceted. The two lines x=0, 7=0 and y=0, w=0

are conjugate polars with respect to the fundamental _quadric, and both these lines are unaltered by the displacement. Hence we see that in any displacement of a rigid system there are two right lines which remain unaltered, and these lines are conjugate polars with respeet to the fundamental quadrie.

Since the pole of a planc through one of these lines lies on the other line, it appears that @ rotation of a rigid system about a straight line is identical with a translation of the system along its conjugate polar. : ,

Clitford has pointed out the real nature of the lines which are to be called parallel in the generalized system of measurement. We have explained that in the plane two parallel lines intersect upon the fundamental conie; in a eertain sense also we may consider two lines in space of three dimensions to be parallel whenever they interseet upon the fundamental quadric. This is the view of parallel lines to which we are conducted by simply generalizing the property that two parallel lines intersect at infinity. But we can take a different definition of two parallel lines. Let us, forexample, call two lines parallel when they admit of an indefinitely large number of common perpendiculars, It is excecdingly interesting

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to observe that when this condition is fulfilled in the generalized system of measurement the parallel lines so obtained enjoy many of the properties of ordinary parallel lines. The perpendicular dis- tance between such a pair of parallels is constant, and the angles which they make with any common transversal are equal.

It will be shown ina moment that any pair of straight lincs which intersect the same two generators of the same system on the fundamental quadric are parallel in this new sense. The fact is that in the degraded cireumstances of ordinary geometry two quite different conceptions have become confused, A

pair of lines which intersect on the fundamental quadric and a pair of lines which intersect the same pair of generators of the same kind on the funda- nlental quadric are quite different conceptions ; but when the funda- inental quadric degrades to the ordinary infinity then the concep- tions coalesce, and each of them is merely a pair of parallel lines in the ordinary sense of the word. The ordinary properties of parallel lines have all their analogues in the generalized geometry, but these analogues are distributed between the two original sources of parallels. Clifford proposes to retain the word " parallel" in non- Kuclidean space for that conception which exhibits the more reniark- ahle properties of ordinary space, and defines as follows :—

Straight lines which intersect the same two gencrators of the same system on the fundamental quadric are parallel.

Let X and Y be two rectilinear generators of the fundamental quadric belonging to the same system, and let A and B be two straight lines which intersect both Xand Y. Since AX and AY are tangent planes their poles must lie on X and Y respectively, and therefore A' (and B'), the polar of A (and B), must intersect both X and Y. The anharmonic ratio of the four points in which X intersects AB, A'B' respectively is equal to that of the tangent planes drawn at the points where X intersects A'B', AB respectively ; and, as all these tangent planes contain X, their anharmonic ratio must be equal to that in which they are cut by the line Y. It hence follows that the lines X and Y are divided equianharmonically by the four rays A, B, A',B', and therefore the four rays A, B, A', B' must be all generators of the same systen1 on an hyperboloid. An infinite number of transversals can therefore be drawn to intersect these four rays, that is to say, an infinite number of common perpendicu- lars can be drawn to the two rays A and B, and it is easy to show that the lengths of all these perpendiculars are equal.

Clifford has proved the very remarkable theorem that rotations of equal amplitude about two conjugate polars have simply the effect of translating every point operated on through equal distances along parallel lines. This property leads to most important consequences, but it would lead us too far to enter into the sub- ject at present.

A memoir by the present writer on the extension of the theory of screws to space of this description will be found in the Zrans- actions of the Royal

Irish Academy, vol. xxvii. pp. 157-184.

Units of Measurement.—A most excellent account of the units eniployed in scientific measurements will be found in Professor J. D. Everett's Units and Physical Constants, London, 1879. We shall here only give a very brief outline of this branch of the general theory of measurement, referring inquirers to Everett's volume for further details.

Most of the quantities for which measurements are needed can be ultimately expressed by means of (1) a definite length, (2) a definite mass, or (3) a definite interval of time.

It is very important that the units thns referred to should be chosen judiciously, and it must be admitted that the units ordinarily used do not fulfil the conditions which a well-chosen system of units should fulfil. The most scientific system is beyond doubt that which has been suggested by the units comniittee of the British Association. In this system the unit of length is the centimetre, the unit of mass is the gramme, and the unit of time is the second, and the system is therefore often referred to for brevity as the C.G.S. system. The unit of force is termed the dyne, aud it is defined to be the force which, acting upon a gramme of matter for a second, generates a velocity of a centimetre per second. The unit of work is the work done by this force working through a centimetre, and this unit is termed the erg. The unit of power is the power of doing work at the rate of one erg per second, and the power of an engine can be specified in ergs per second. By the prefixes deca, hecto, kilo, mega, we can express a magnitude equal to the unit multiplied by 10, 100, 1000, or 1,000,000 respectively. On the other hand

the prefixes deci, centi, milli, micro, signify the units divided by 10, 100, 1000, or 1,000,000 respectively,

For comparison with tle ordinary units the following statements will be useful. The weight of a gramme at any part of the earth's surface is about 980 dynes, or rather less than a kilodyne. The weight of a kilogramme is rather less than a megadyne, being about 980,000 dynes.

The application of these units to electrical and many other measurements will be found in Professor Everett's book already referred to. On the general principles of appliances for measure- ment, see a paper by Clifford in the Handbook to the Special Loan Collection of Sctentifie Apparatus, 1876, pp. 55-59, reprinted in Clifford's Mathematical Papers, pp. 419-23. (R. S. B.)

MEATH, a maritime county of Ireland, in the province of Leinster, is bounded EK. by the Irish Sea, §.E. by Dublin, 8. by Kildare and King's county, W. by West- meath, N.W. by Cavan and Monaghan, and N.E. by Louth, Its greatest length north and south is about 40 miles, and its breadth east and west about 45 miles. The total area comprises 578,247 acres, or 904 square miles.

The county forms part of the great limestone plain that occupies the central portion of Ireland. In some districts the surface is variegated by hills and swells, which to the west reach a considerable elevation, although the general features of a fine champaign country are never lost. The coast, which is low and shelving, extends to about 10 miles, but there is no harbour of importance. The Boyne, whose banks are specially beautiful, enters the county at its south-west extremity, and flowing north-east to Drogheda divides it into two almost equal parts. At Navan it receives the Blackwater, which flows south-west from Cavan. The Boyne is navigable for barges as far as Navan, where a canal is carried to Trim. The Royal Canal passes along the southern boundary of the county to Dublin. There are no lakes of importance.

Climate and Agriculture.—The climate is genial and favourable for all kinds of crops, there being less rain than even in the neighbouring counties. The principal substratum is limestone, but there are some districts of clay slate. Except a small portion occupied by the Bog of Allen, the county is very verdant and fertile. The soil is principally a rich deep loam resting on limestone gravel, but varies from a strong clayey loam to a light sandy gravel."

The total number of holdings in 1881 was 11,867, of which 1632 were less than 1 acre in extent, and 4800 between 5 and 16 acres. Only 98 were above 500 acres. According to the agricultural statistics for 1881, the area of arable land was 532,708 acres, of 92°4 per cent. of the whole area of the

county, while 9599 acres were under plantations, 11,260 bog and marsh, and 201 barren mountain land. Of the arable land, 60,411 were under tillage, 85,893 meadow and clover, and 386,374 pasture. The following

table shows the area under the different crops in 1855 and 1882 :—

Wheat.| Oats.

64,646 [208,527

ea 82,572 |140,097

12,071

9,904 6,724

4,005

1855] 18,764 ‘86,831

3,109

1882| 2,783 |81,202

Horses between 1855 and 1882 have diminished from 23,310 ia 15,316, an average of 2°9 to every 100 acres under ee oY average for Ireland being 3°2. Cattle in 1855 numbered 135, ue and in 1882 had increased to 176,121, an average of 33 to every acres under cultivation, the average for Ireland being 26°2. al in 1855 numbered 170,582, and in 1882 only 146,749, althoug is 1880 they were 174,578. Pigs in 1882 numbered 19,709, goals 6398, and poultry 318,968. a

iccontine to ile latest return the land was divided ane c proprietors, who possessed 577,846 acres, with a total ann of £544,550. The average size of the properties was 436 pe ee, the average annual value per acre was 18s. 10d. The fo ol four proprietors possessed more than 10,000 acres each : Be, a of Darnley, 21,858 acres; J. L. Naper, 18,868 ; Marquis 0 downe, 12,995 ; and Lord Athlumney, 10,213. a

Manufactures.—Almost the sole industry of the county

agriculture, but coarse linen is woven by hand-looms, and there are a few woollen manufactories.

Railways.—Vhe Dublin and Meath line intersects the county in a north-westerly direction, and separates into several branclies, while the Great Westcrn line skirts the southern boundary.

Administration and Population.—The county ineludes 18 baronies, 146 parishes, and 1626 townlauds. Assizes are held at Trim, and quarter sessions at Dunshauglin, Duleek, Kells, Navan, aud 'rim. 'Two poor-law unions, Navan and Trim, are wholly with- in the county, and parts of Ardee, Celbridge, Drogheda, Dunshauglin, Kilenderry, Kells, and Old Castle. It is in the Dublin military dis- trict, subdistrict of Birr, with barrack stations at Navan and 'Trin. Ecclesiastically it is in the Meath diocese, with portions in Armagh and Kilmore. Previous to the Union it sent fourteen members to par- lianent, but now only the two members for the county are returued.

From 81,516 in 1760 the population in 1821 had increased to 159,183, and in 1841 to 183,828, but by 1851 had diminished to 140,768, in 1871 to 95,558, and in 1881 to 87,469, of whom 44,315 were males and 48,154 females. The principal towns are Navan, 3873 ; Kells, 2822; and Trim, 1586. A portion of the parliamen- tary borough of Drogheda, including 933 of the inhabitants, is also within the county. "he number of births iu the county during the ten years ending 3d March 1881 was 21,293, an average of 23°83 to every 1000 of the population ; of deaths 16,878, an average of 18°4 ; of marriages 3165, an average of 3°5; and of emigrants 10,521, an average of 121. From 1st May 1851 to 8d March 1881 the total number of emigrants was 49,375. Of the population five years old and upwards in 1881, 22°7 per cent. were illiterate, the percentage in 1871 being 29°9. In 1881 there were 3531 persons able to speak Irish, but none were unable to speak English.

History and Antiquities.—According to Ptolemy, Meath was originally inhabited by the Eblani, whose territory extended from. the Boyne to the

Liffey. A district known as Meath, and includ- ing the present county of Meath as well as Westmeath and Long- ford, with parts of Cavan, Kildare, and King's county, was in the 2d century formed by Tuathal into a kingdom to serve as mensal

land of the Ard Ré or over-king. Afterwards it was divided into

Oireamhain, now known as Meath, and Eireamhain, which included the remainder of the old kingdom. The distriet was frequently subject to invasions from the Danes; they were totally defeated at Tara in 980. About 800,000 acres, including all the present county of Meath, was granted by Henry II. to Hugh de Lacy.

The most remarkable antiquarian remains are two round towers, the one at Kells, and the other in the churchyard of Donoughmore, near Navan. At New Grange, near Slane, there is an artificial cavern of a very peculiar construction. A large rath on Tara hill was the meeting-place of the princes before the Danish inva- siou, and the seat of a royal palace referred to in the well-known linesof Moore. A stone on the top of the rath is supposed by some to be the stone of destiny where the ancient monarchs of Ireland were crowned. Monastic buildings were very numerous, among the more important ruins being those of Duleek, which is said to have been the first ecclesiastical edifice in Ireland built of stone and mortar ; the extensive remains of Bective ; and those of Clonard, where also were a cathedral and a very famous college. Of the old fortresses, Trim Castle on the Boyne still presents an imposing appearance. There arc also many fine old mausions.

MEAUX, capital of an arrondissement, and an episcopal see, in the department of Seine-et-Marne, France, and formerly chief town of Haute Brie, is situated 28 miles east of Paris, on the Marne, which runs through the town, and on the Paris and Strasburg Railway. The cathedral, dedicated to St Stephen, dates from the 12th century ; its restoration was begun thirty years ago. From the top of its western tower (250 feet high), in fine weather, the heights of Montmartre and Mont Valérien, near Paris, can be seen. The bnilding, which is 275 feet long and 105 feet high, consists of a nave, two aisles, a fine transept, a choir, and a sanctuary. The choir contains the statue and the tomb of Bossuet, and the pulpit of the cathedral has been reconstructed with the panels of that from which the "Eagle of Meaux"

used to preach. The great window of the south transept contains some magnificent stained glass. The episcopal palace, behind the cathedral, has several very curious old rooms; the buildings of the choir school, which also adjoins the cathedral, are likewise of Some architectural and archeological interest.

L Meaux is the centre of a considerable trade in corn, cheese, eggs, and poultry; and its mills, on the Marne, Provide a great part of the meal with which Paris is supplied. The Canal del'Oureq, which surrounds the town,

and the Marne, furnish the means of transport.

In the-Roman period Meaux was the capital of the Meldi, a small Gallic tribe. It formed part of the kingdom of Austrasia, and afterwards belonged to the counts of Vermandois and Cham- pagne. Its communal charter dates as far back as 1179. Meaux suffered much from the disorders of the Jacquerie, from the Hundred Years' War, and fron the religious wars, during which it was an important Protestant centre. After the League, it was the first town which opened its gates to Henry 1V., in 1594. Placed. as it is on the highroad of invaders marching on Paris from the east of France, Meaux saw its environs ravaged by the army of

Lorraine in 1652, and was laid under heavy requisitions in 1814, 1815, and 1870.

MECCA (K-, Makka), the chief town of the Hijaz in

Arabia,! and the great holy city of Islam, is situated two camel marches (the resting-place being Bahra or Hadda in the Batn Marr), or about 45 miles, almost due east, from Jidda, on the Red Sea? Thus on a rough estimate Mecca lies in 21° 30' N. lat. and 40° E. long.

It is said in the Koran (sur. xiv. 40) that Mecca lies in a sterile valley, and the old geographers observe that the whole Haram or sacred territory round the city is almost absolutely without cultivation or date palms, while fruit trees, springs, wells, gardens, and green valleys are found immediately beyond. Mecca in fact lies in the heart of a mass of rough hills, intersected by a labyrinth of narrow valleys and passes, and projecting into the Tihama

or low country on the Red Sea, in front of the great mountain wall that divides the coast lauds from the central plateau, though in turn they are themselves separated from the sea by a second curtain of hills forming the western wall of the great Wady Marr. The inner monntain wall is pierced by two and only two great passes, and tlie valleys descending from these embrace on both sides the Mecca hills. The north-western pass, through which the Nejd traffic descends to the coast, and which also affords the easiest though longest route from Jidda and Mecca to Taif and thence through the true Hijaz to Yemen, is the Derb el-Seil or torrent path down the well-watered Wady Marr. This Wady skirts the complex of Mecca hills on the north-west from Zeima by Wady Fatima (where it is joined by the great coastroad from Medina and Syria) to Hadda on the Mecca and Jidda road, a distance of perhaps 50 miles. Main roads converge to Mecca from the three points of the Wady just named, the distance of the city from the last two being about 20 miles. J'rom this side the most prominent of the Mecca hills is the northern " Mountain of Light" (J. Nur). The other pass, which affords a shorter mule road to Taif and the southern highlands, but is not practicable for ordinary baggage camels, descends from the summit of J. Kara, and leads through the great W. Na'man, the Wady of the Hodheil, to the plain beneath "Arafa, the most

1 Hijaz is here taken in the usual political sense of the word, The Turkish Waly of the Hijdz has his winter residence at Mecea and his summer quarters at Taif. In a narrower sense the Hijaz is the lofty mountainous country between the central plateau of Nejd (or Negd, as it is called by the natives) and the lowlands of the coast (Tihama). In this sense El-Asma'i reckons Mecca to the Tihama, and well-informed Arabs still follow him.

2 A variant of the name Makka is Bakka (sur. iii. 90; Bekri, 155 sq.). For other names and honorifie epithets of the city see Bekri, ut supra, Azraki, p. 197, Yakut, iv. 617 sy. The lists are in part cor- rupt, and some of the names (Kutha and 'Arsh or 'Ursh, "' the huts") are not properly names of the town as a whole.

3 The upper part of this wédy has two branches, W. Leimun and W. Nakhla. In the latter lie the gardens of Sdla and the village of Zeima with its great hot spring (comp. Yakut, iii, 197). Above Zeima the path is desert.

easterly of the holy sites connected with Mecca. From this point a tolerably level route skirts the Mecca hills on the south, passing very close to Mecca under the opposite side of J. el-Thaur, is joined or crossed by several roads from the south, including the great lowland Yemen road, and ultimately falls into the road from Mecca to Hadda, a little beyond the pillars that define the Haram. The broad valleys through which this southern road leads are not so well watered as W. Marr, but have several fertile spots and a good deal of land cultivable after rain.! From this description the importance of the situation of Mecca will be easily understood. It commands both the great routes connecting the lowlands with central Arabia, and thus has the advantage over Taif, its former commercial rival, which lies indeed on the inland mountain road from Yemen to Nejd behind Mount Kara, but has no ready connexion with the Tihama. Mecca, on the contrary, though apparently secluded in its hills from the main valleys—it is in fact not visible from any point till one is quite close to the town—lies in the focus of all the great roads from north to south or from the coast inland, with the single exception of the mountain road behind Kara; and the low passes that intersect the Mecca hills form a series of practicable short cuts connecting all the chief points of the circle of valleys already described.?

Holding this position, and situated in a narrow and

barren valley quite incapable of supporting an urban |

population, Mecca inust have been from the first a com- inercial town.? In the palmy days of South Arabia it was probably a station on the great incense route, and thus Ptolemy may have learned the name, which he writes Makoraba. At all events, long before Mohammed we find Mecca established in the twofold quality of a com- mercial centre and a privileged holy place, surrounded by an inviolable territory (the Haram), which was not the sanctuary of a single tribe but a place of pilgrimage, where religious observances were associated with a series of annual fairs at different points in the vicinity.4 The com- bination of commerce with religion was no unusual thing in Arabia. Of old the incense trade had its religious features, and indeed in the unsettled state of the country commerce was possible only under the sanctions of religion, and through the provisions of the sacred

truce which pro- hibited war for four months of the year, three of these being the month of pilgrimage, with those immediately preceding and following. The first of the series of fairs in which the Meccans had an interest was at 'OkA4z on the easier road between Mecca and Taif, where there was also a sanctuary, and from it the visiters, drawn from tribes far and uear, moved on to points still nearer Mecca (Majanna, and finally Dhu'l-Majaz, on the flank of J. Kabkab behind 'Arafa) where further fairs were held,®> culminating in the

1 To this description of the valleys surrounding the Mecca group on three sides, which is mainly drawn from personal observation in 1880, it may be added that there is a direct and easy camel route from Zeima to 'Arafa between the Mecca hills and the mountains of the Hodheil. Taking this fact with the statement of Wakidi (Wellhausen's Muh. in Med., p. 341) that every wady in the sacred territory flows outwards into common ground except that at Tan'im (near the Hudud on the Medina road, Yakut, i. 879 ; Ibn Jubair, p. 110) we see that Mecca lies in an isolated group of hills—a sort of outpost of the great mountain wall. :

2 The inland road in ancient times was not so valuable as the coast road to Syria, on account of the scarcity of water (A/uh. in Med., p- 100).

3 Mecca, says one of its citizens, ap. Wakidi (Kremer's ed., p. 196, or Muh. in Med., p. 100), is a settlement formed for trade with Syria in summer and Abyssinia in winter, and cannot continue to exist if the trade is interrupted.

4 Details as to the inhabitants and constitution of Mecca before Islam will be given under MoHAMMED.

® The details are variously related. ~ See Birtnf, p. 328 (E. T., p. 324) ; Asma'i in Yakut, iii. 705, iv. 416, 421; Azraki, p. 129 sg. ;

*special religious ceremonies of the great feast at * Arafa, Kuzah (Mozdalifa), and Mecca itself. calation in the lunar calendar of the heathen Arabs wag designed to secure that the feast should always fall at the time when the hides, fruits, and other merchandise were ready for market,® and*

the Meccans, who knew how to attract the Bedouins by profuse and systematic hospitality, bought up these wares in exchange for imported goods, and so became the leaders of the international trade of Arabia. Their caravans traversed the length and breadth of the peninsula, Syria, and especially Gaza, was their chief goal, and we read that the Syrian caravan intercepted, on its return, at Bedr represented capital to the value of £20,000, an enormous sum for those days.'

The victory of Mohammedanism made a vast change in the position of Mecca. The merchant aristocracy became satraps or pensioners of a great empire; but the seat of dominion was removed beyond the desert, and though Mecca and the Hijaz strove for a time to maintain political as well as religious predominance, as will be . related under MowAMMEDAN EmpPiIrg, the struggle was vain, and terininated on the death of Ibn Zubeyr, the Meccan pre- tendant to the caliphate, when the city was taken by Hajjaj (692 a.p.). On the other hand, the sanctuary and feast of Mecca received a new prestige from the victory of Islam. Purged of elements obviously heathenish, the Ka ba (Caaba) became the holiest site, and the pilgrimage the most sacred ritual observance of Mohammedanism, drawing worshippers from so wide a circle that the confluence of the petty traders of the desert was no longer the main feature of the holy season. The pilgrimage retained its importance for the commercial wellbeing of Mecca; to this day the Meccans live by the Hajj—letting rooms, acting as guides and directors in the sacred ceremonies, as contractors and touts for land and sea transport, as well as exploiting for their own advantage the many benefactions that flow to the holy city ; while the surrounding Bedouins derive a chief part of their support from the camel- transport it demands and from the subsidies and gifts by which they are engaged to protect or abstain from molest- ing the pilgrim caravans. But the ancient "fairs of heathenism" were given up, and the traffic of the pilgrim season, sanctioned by the Prophet in swr. ii. 194, was con- centrated at Mind and Mecca, where most of the pilgrims still have something to buy or sell, so that Mina, after the sacrifice of the feast day, presents the aspect of a huge international fancy fair.® In the Middle Ages this trade was much more important than it isnow. Ibn Jubair in the 12th century describes the mart of Mecca in the eight days following the feast as full of gems, unguents,

preclous drugs, and all rare merchandise from India, ‘Irak, Khorasan, and every part of the Moslem world.®

Mecca, as has been already indicated, lies in a narrow sandy valley running approximately from north to south between the Red Mountain on the west and the loftier chain of J. Abu Kobeys on the east. These ranges, which are partly built on and rise several hundred feet above the valley, 80 enclose the city that the ancient walls only barred the valley at three points, where three gates led intothe town. In the time of Ibn Jubair the gates still stood though the walls were ruined, but now the gates have only left their names to Mberchiahimirtat Meher

Jebel Kabkab is a great mountain occupying angle between W. Na‘man and the plain of “Arafa. The peak “é va north of Sheddad, the hamlet which Burckhardt (i. 115) calls ake ra According to Azraki, p. 80, the last shrine visited was that 0 three trees of ‘Uzz4 in W. Nakhla.

6 So we are told by Birunt, p. 62 (E. T., p. 78).

7 Wakidi, ed. Kremer, pp. 20, 21; Muh. in Med., p. 39. a

8 The older fairs were not entirely deserted till the troubles of th last days of the Omayyads (Azraki, p. 131). ;

9 Tbn Jubair, ed. Wright, p. 118 sq.

Bekri, p. 661.

The system of inter-

MECOA

quarters of the town. At the northern or upper eud was the Bab el Mala, or gate of the upper quarter, whence the road ‘continues up the valley towards Mina aud ‘Arafa as well as towards Zeima and the Nejd. Beyond the gate, in a place called the Hajun, is the chief cemetery, said to be the resting-place of many of the companions of Mohammed. Here a cross-road, running over the hill to join the main Medina road from the western gate,

turns off to the west py the pass of Kada, the point from which the troops of the Prophet stormed the city (A.u. 8).1 Here too the body of Ibu Zubeyr was hung on a cross by Hajjaj. The lower or southern gate, at the Masfala quarter, opencd on tlie Yemen road, where the rain-water from Mecca flows off into an open valley. Beyond, there are mountains on both sides; on that to the east, commanding the town, is the great castle, a fortress of considerable strength. The third or western gate, Bab el-Omra (formerly also Bab el- Zahir, from a village of that name), lay almost opposite the great mosque, and opened on a road leading westwards round the southern spurs of the Red Mountain. This is the way to Wady Fatima and Medina, the Jidda road branching off from it to the left. Considerable suburbs now lie outside the quarter named after this gate; in the Middle Ages a pleasant country road led for some miles through partly cultivated land with good wells, as far as the boundary of the sacred territory and gathering place of the pilgrims at Tarim, near the mosque of 'Aisha. This is the spot on the Medina road now called the "Omra, from a ceremonial connected with it which will be mentioned below.

The length of the sinuous main axis of the city from the furthest suburbs on the Medina road to the suburbs in the extreme north, now frequented by Bedouins, is, according to Burckhardt, 3500 paces.?,- About the middle of this line the longitudinal thoroughfares are pushed aside by the vast courtyard and colonnades composing the great mosque, which, with its spacious arcades surrounding the Kaba and other holy places, and its seven minarets, forms the only prominent architectural feature of the city. The mosque is enclosed by houses with windows opening on the arcades and commanding a view of the Kaba. Immediately beyond these, on the side facing J. Abu Kobeys, a broad street runs south-east and north-west across the valley. This is the Mas or sacred course between the eminences of Safé and Merwa, and has been from very early times one of the most lively bazaars and the centre of Meccan life. The other chief bazaars are also near the mosque in smaller streets. The rest of the town presents no points of individual interest, but its general aspect is picturesque ; the streets are fairly spacious, though ill-kept and filthy; the houses are all of stone, many of them well-built and four or five stories high, with terraced roofs and large pro- jecting windows as in Jidda—a style of building which has uot varied materially since the 10th century (Mokaddasi, p. 71), and gains in

effect from the way in which the dwell- ings run up the sides and spurs of the mountains. Of public institutions there are baths, ribAts or hospices for poor pilgrims from India, Java, &c., a hospital with fifty beds, a public kitchen for the poor, badly administered by the Turkish authorities. A settler from India has recently set up a theological school; but the old colleges around the mosque have long since been converted into lodgings.® The minor places of visitation for pilgrims, such as the birth-places of the Prophet and his chief followers, are not

'This is the cross-road traversed by Burckhardt (i. 109), and described by him as cut through the rocks with much labour.

; Istrakhri gives the length of the city proper from north to south as 2 miles, and the greatest breadth from the Jiy4d quarter east of the great mosque across the valley and up the western slopes as two-thirds of the length.

$ The pious foundations of Mecca have been robbed by their guardians from yery early times. See already Ibn Haukal, p. 25.

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notable. Both these and the court of the grcat mosque are observed to lie beneath the general Icvel of the city, so that it is evident that the site of the town has been gradually raised by accumulated rubbish. The town in fact has little air of antiquity ; genuine Arab buildings do not last long, especially in a valley periodically ravaged by tremendous floods when the tropical rains burst on the surrounding hills. The history of Mecca is full of the record of these inundatious, unsuccessfully combated by the great dam drawn across the valley by the caliph 'Omar (Kutb el-Din, p. 76), and later works of El-Mahdi,5

The fixed population of Mecca in 1878 was estimated by Assistant-Surgeon "Abd el-Razzék at 50,000 to 60,000; but the materials for an estimate are very inadequate where there is so large a floating population—and that not merely at the proper season of pilgrimage, the pilgrims of one season often beginning to arrive before those of the former season have all dispersed. At the height of the season the town is much overcrowded, and the entire waut of a drainage system is severcly felt. Fortunately good water is tolerably

plentiful; for, though the wells are mostly undrinkable, and even the famous Zamzam water very un- wholesome and tainted with sewage, the underground con- duit from beyond 'Arafa, completed by Sultan Selim II. in 1571, supplies to the public fountains a sweet and light water, containing, according to "Abd el-Razzdk, a large amount of chlorides. The water is said to be free to townsmen, but is sold to the pilgrims at a rather high rate.®

Medizeval writers celebrate the copious supplies, especially of fine fruits, brought to the city from Téif and other fertile parts of Arabia. These fruits are still famous; rice and other foreign products are brought by sea to Jidda; mutton is plentifully supplicd from the desert.'? The industries of Mecca all centre in the pilgrim- age ; the chief object of every Meccan—from the notables and sheikhs, who use their influence to gain custom for the Jidda speculators in the pilgrim traffic, down to the cicerones, pilgrim brokers, lodging-house keepers, and semi-mendicant hangers on at the holy places—being to pillage the visiter in evcry possible way. Thus the fanaticism of the Meccan is an affair of the purse; the mongrel population (for the town is by no means purely Arab) has exchanged the virtues of the Bedouin for the worst corruptions of Eastern town life, without casting off the ferocity of the desert, and it is hardly possible to find a worse certificate of character than the three parallel gashes on each cheek, called Tashrit, which are the customary mark of birth in the holy city. The unspeakable vices of Mecca are a scandal to all Islam, and a constant source of wonder to pious pilgrims. The slave trade, which still

4 For details as to the ancient quarters of Mecca, where the several families or septs lived apart from generation to generation, see Azraki, p- 445 sg., and compare Yakubi, ed. Juynboll, p. 100. The modern town is best described by Burckhardt, who gives a plan of the city. The minor sacred places are described at length by Azraki aud Ibn Jubair. They are either connected with genuine memories of the Prophet and his times, or have spurious legends to conceal the fact that they were originally holy stones, wells, or the like, of heathen sanctity.

5 Beladhori, in his chapter on the floods of Mecca (p. 53 sq.), says that 'Omar built two dams.

6 The aqueduct is the successor of an older one associated with the names of Zobeyda, wife of Hartin el-Rashid, and other benefactors. But the old aqueduct was frequently out of repair, and seems to have. played but a secondary part in the medimval water supply. Even the new aqueduct gave no adequate supply in Burckhardt's time.

7 In Ibn Jubair's time (p. 182) large supplies were brought fromthe Yemen mountains. The revenues of Yemen are still mainly expended on the distribution of grain by the sultan in the Hijaz.

8 The corruption of manners in Mecca is no new thing. See the letter of the caliph Mahdi on the subject ; Wiistenfeld, Chron, Mek., iv. 168.

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subsists and is very dear to the Arab heart, has connexions with the pilgrimage which are not yet thoroughly cleared up; but there is no doubt that under cover of the pilgrini- age a great deal of kidnapping and importation of slaves goes on.

Since the fall of Ibn Zubeyr the political position of Mecca has always been dependent on the movements of the greater Mohammedan world. In the splendid times of the caliphs immense sums were lavished upon the pilgrimage and the holy city ; and conversely the decay of the central authority of Islam brought with it a long period of faction, wars, and misery, in which the most notable episode was the sack of Mecca, with circumstances of great barbarity, by the Carmathians at the pilgrimage season of 930 a.p. 'The victors carried off the " black stone," which was not restored for twenty-two years, and then only for a great ransom, when it was plain that even the loss of the palladium could not destroy the sacred character of the city. Under the Fatimites Egyptian influence began to be strong in Mecca; it was opposed by the sultans of Yemen, while native princes claiming descent from the Prophet-—the Hashimite emirs of Mecca, and after thein the emirs of the house of Katada (since 1202)—attained to great authority and aimed at independence ; but soon after the final fall of the Abbasids the Egyptian overlordship was definitively established by

Sultan Bibars (1269 a.p.). The Turkish conquest of Egypt transferred the supremacy to the Ottoman sultans (1517), who treated Mecca with much favour, and during the 16th century executed great works in the sanctuary and temple. The Ottoman power, however, became gradually almost nominal, and that of the emirs or sherifs increased in proportion, culminating under Ghalib, whose accession dates from 1786. Then followed the wars of the Wahhabis (see ARaBra, vol. ii. p. 260) and the restoration of Turkish rule by the troops of Mohammed "Ali. By him the dignity of sherif was deprived of much of its weight, and in 1827 a change of dynasty was effected by the appointment of Ibn 'Aun. Since that time the Turkish authority has again decayed, though Mecca is still nominally the capital of a Turkish province, and has a governor-general and a Turkish garrison, while Mohammedan law is admmmistered by a judge sent from Constantinople. But, except within the larger towns, at which troops are stationed, the Turks are practically powerless, and the real sovereign of Mecca and the Hijaz is the sherif, who, as head of a princely family claiming descent from the Prophet, holds a sort of feudal position in the country. The dignity of sherif (or grand sherif, as Europeans usually say for the sake of distinction, since all the kin of tlre princely houses reckoning descent from the Prophet are also named sherifs), is often conceived as a religious pontificate, and anti-Turkish Arabs contend that if the sultan and the sherif were together in a mosque the latter would lead the prayers as im4m; but it is more correct to regard the sherif as the modern counterpart of the ancient emirs of Mecca already referred to, who were named in the public prayers immediately after the reigning caliph. This dignity long ran in the family of Hasan, son of the caliph "Ali, with which the present sherifs, in spite of changes of dynasty, still count kindred. The influence of the princes of Mecca has varied from time to time accord- ing to the strength of the foreign protectorate in the Hijaz or in consequence of feuds among the branches of the house; at present it is for most purposes much greater than that of the Turks. The latter are strong enough to hold the garrisoned towns, and thus the sultan is able within certain limits—playing off one against the other the two rival branches of the aristocracy, viz., the kin of Ghalib and the house of Ibn'Aun—to assert the right of desig- nating or removing thé sheriff, to whom in turn he owes

the possibility of maintaining, with the aid of considerable pensions, the semblance of his much-prized lordship over tle holy cities. The grand sherif can muster a consider. able force of freedmen and clients, and his kin, holding wells and lands in various places through the Hijaz, act as lus deputies and administer the old Arabic cus- tomary law to the Bedouins. To this influence the Hijaz owes what little of law and order it enjoys. After the sherifs the principal family of Mecca is the house of Sheyb, which holds the hereditary custodianship of the Ka ba.

The Great Mosque and the Kaba.—Long before Mohamnied the chief sanctuary of Mecca was the Ka ba, a rude stone building, so named from its resemblance to a monstrous astragalus or die, of about 40 feet cube, though the shapeless mass is not really an exact cube or even exactly rectangular! The Kaba has been rebuilt more than once since Mohammed purged it of idols and adopted it as the chief sanctuary of Isl4m, but the old form has been preserved except in secondary details ;? so that the " Ancient House," as it is titled, is still essentially a heathen temple, adapted to the worship of Islam by the clumsy fiction that it was built by Abraham and Ishmael by divine revelation as a teniple of pure monotheism, and that it was only temporarily perverted to idol worship from the time when' Amr ibn Lohay introduced the statue of Hobal from Syria? till the victory of Islim. This fiction has involved the superinduction of a new mythology about Abraham, Hagar, and Ishmael over the old heathen ritual, which renlains practically unchanged, 'Thus the chief object of veneration is the ancient fetish of the black stone, which is fixed in the external angle facing Saf&. The building is not exactly oriented, but this may for convenience be called the south-east corner. Its technical name is the black corner, the others being named the Yemen (south-west), Syrian (north-west), and 'Irak (north-east) corners, from the lands to which they approximately point. The black stone is a small dark mass a span long, with an aspect suggesting vol- canic or meteoric origin, fixed at such a height that it can be conveniently kissed by a person of middle size, It was broken by fire in the siege of 683 a.p, (not as many authors relate by the Carmathians), and the pieces are kept together by a silver setting. The history of this heavenly stone, given by Gabriel to Abraham, does not conceal the fact that it was originally a fetish, the most venerated of a multitude of idols and sacred stones which stood all round

1 The following measurements may be cited :—Ibn ‘Abd Rabbih (10th century), south side 20 cubits, north 21, east and west 25 each (so Azraki) ; Ibn Jubair (12th century), sides 54 and 48 spans, height 29 cubits at the highest or south wall, with a slight fall to the north side where the miz4b or water-spout discharges (Azraki, 27 cubits); Burck- hardt, sides 18 paces by 14, height 85 to 40 feet. Other modern measures vary considerably. The height was raised by Ibn Zubeyr from 18 to 27 cubits. Compare Muh. in Mfed., p. 426.

2 The Katba of Mohammed’s time was itself the successor of an older building said to have been destroyed by fire. It was constructed in the still usual rude style of Arabic masonry, with string courses of timber between the stones (like Solomon’s temple). The roof rested on six pillars ; the door was raised above the ground and approached by a stair (probably on account of the floods which often swept the valley) ; and worshippers left their shoes under the stair before ae During the first siege of Mecca (688 a.D.) the building was ae down, and Ibn Zubeyr reconstructed it on an enlarged scale and in better style of solid ashlar work. After his death his most aes innovations (the introduction of two doors on a level with the ground, and the extension of the building lengthwise to include the Hijr) be corrected by Hajjaj under orders from the caliph, but the ee ing retained its more solid structure. The roof now rested on three pill a and the height was raised one-half. The Ka’ba was aga oa rebuilt after the flood of 1626 a.p., but since Hajjaj there seem to have been no structural changes. ; ao

3 Hobal was set up within the temple over the pit that one the sacred treasures. His chief function was connected ye sacred lot to which the Meccans were accustomed to betake themselves in all matters of difficulty.

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the sanctuary in the time of Mohammed. The Prophet destroyed the idols, but he left the characteristic form of worship—the fawdf, or sevenfold circuit of the sanctuary, the worshipper kissing or touching the objects of his yeneration—-and besides the black stone he recognized the so-called ‘southern ” stone, the same presumably with that which is still touched in the tawd4f at the Yemen corner (Afuh. in Med., pp. 336, 425). The ceremony of the tawaf and the worship of stone fetishes was common to Mecca with

other ancient Arabian sanctuaries! It was, as it still is, a frequent religious exercise of the Meccans, and the first duty of one who returned to the city or arrived there under a vow of pilgrimage; and thus the outside of the Kaba was and is more important than the inside. Islim did away with the worship of idols; what was lost in interest by their suppression has been supplied by the invention of spots consecrated by recollections of Abraham, Ishmael, and Hagar, or held to be acceptable places of prayer. Thus the space of ten spans between the black stone and the door, which is on the east side, between the black and 'Irak corners, and a man's height from the ground, is called the A/ultazam, and here prayer should be offered after the tawdf with outstretched arms and breast pressed against the house. On the other side of the door, against the same wall, is a shallow trough which is said to mark the original site of the stone on which Abraham stood to build the Kaba. Here the growth of the legend can be traced, for the place is now called the "kneading-place" (Majan) where the cement for the Kaba was prepared. 'This name and story do not appear in the older accounts. Once more, on the north side of the Kaba, there projects a low semicircular wall of marble with an opening at each end between it and the walls of the house.

mosaic, and is called the Hijr. It is included in the

tawAf, and two slabs of verde antico within it are called |

the graves of Ishmael and Hagar, and are places of accept- able prayer. Even the golden or gilded mézdb (water- spout) that projects into the Hijr marks a place where prayer is heard, and another such place is the part of the west wall close to the Yemen comer.

The feeling of religious conservatism which has preserved the structural rudeness of the Kaba through so many centuries did not interfere with the adoption of costly surface decoration. In Mohammed's time the outer walls were covered by a vail (or kiswa) of striped Yemen cloth. The magnificence of the caliphs substituted a covering of figured brocade, and the sultan still sends with each pilgrim caravan from Cairo a new kiswa of black brocade, adorned with a broad band embroidered with golden inscriptions from the Koran, as well as a richer curtain for the door. The aspect thus given to the Kaba is seen in the woodcut; there are openings to show the two sacred stones? The door of two leaves, with its posts and lintel, is of silver gilt.

The interior of the Kaba is now opened but a few times every year; there is a great scramble for admission—the portable staircase being seldom brought forward—and a great clamour for backshish ; thus the modern descriptions, from observations made under difficulties, are not very complete. Little change, however, seems to have been made since the time of Ibn Jubair, who describes the floor

_} See Ibn Hishim, i. 54; Azralkd, p. 80 (‘Uzzd in Batn Marr); Yakut, tii, 705 (Otheyda) ; Bar Hebreus on Psalm xii.9. Stones worshipped by circling round them bore the name dawér or duwéar (Krehl, Rel. d. Araber, p. 69). The later Arabs not unnaturally viewed such cultus as imitated from that of Mecca (Yakut, iv. 622 ; comp. Dozy, Israeliten te Mekka, p. 125, who draws very perverse inferences).

2 The old kiswa is removed on the 25th day of the month before the pilgrimage, and fragments of it are bought by the pilgrinis as charms. Till the 10th day of the pilgrimage month the Kaba is bare.

The space within is paved with

and walls as overlaid with richly variegated marbles, and the upper half of the walls as plated with silver thickly gilt, while the roof was vailed with coloured silk. Modern writers describe the place as windowless, but Ibn Jubair mentions five windows of rich stained glass from “Trak. Between the three pillars of teak hung thirteen silver lamps. A chest in the corner to the left of one entering contained Korans, and at the ‘Ir4k corner a space was cut off enclosing the stair that leads to the roof. The door to this stair (called the door of merey—Bab el-Rahma) was plated with silver by the caliph Mutawakkil. Here, in the time of Ibn Jubair, the Makdém or standing-stone of Abraham was usually placed for better security, but brought out on great occasions (pp. 131, 161).3

The houses of ancient Mecca pressed close upon the Kaba, the noblest families, who traced their descent from Kosay, the reputed founder of the city, having their dwell- ings immediately round the sanctuary. To the north of the Kaba was the Dar el-Nadwa, or place of assembly of the Koreysh,

where all matters of public interest were discussed. The multiplication of pilgrims after Islim soon made it necessary to clear away the nearest dwellings and enlarge the place of prayer around the Ancient House. "Omar,

'Othman, and Ibn Zubeyr had all a share in this work, but

the great founder of the mosque in its present form, with its spacious area and deep colonnades, was the caliph El- Mahdi, who spent enormous sums in bringing costly pillars from Egypt and Syria. The work was still incomplete at his death in 785 a.p., arid was finished in less sumptuous style by his successor. Subsequent repairs and additions, extending down to Turkish times, have left little of El- Mahd{'s work untouched, though a few of the pillars prob- ably date from his days. 'There are more than five hundred pillars in all, of very various style and workman- ship, and the enclosure—250 paces in length and 200 in breadth, according to Burckhardt's measurement—is entered by nineteen archways irregularly disposed.

After the Kaba the principal points of interest in the mosque are the well Zamzam and the Makim Ibrahim. The former is a deep shaft enclosed in a massive vaulted building paved with marble, and, according to Mohammedan tradition, is the source (corresponding to the Beer-lahai-roi of Gen. xvi. 14) from which Hagar drew water for her son Ishmael. This of course is pure invention, and indeed the legend tells that the well was long covered up and redis- covered by' Abd el-Muttalib, the grandfather of the Prophet. Sacred wells are familiar features of Semitic sanctuaries, and Islam, retaining the well, made a quasi-Biblical story for it, and endowed its tepid waters with miraculous curative virtues. They are eagerly drunk by the pilgrims, or when poured over the body are held to give a miraculous refreshment after the fatigues of religious exercise, and the manufacture of bottles or jars for carrying the water to distant countries is quite a trade. Ibn Jubair (p, 139) mentions a curious superstition of the Meccans, who believed that the water rose in the shaft at the full moon of the month Shabin. On this occasion a great crowd, especially of young people, thronged round the well with shouts of religious enthusiasm, while the servants of the well dashed buckets of water over their heads. The Makam

or stand- ing place of Abraham is also connected with a relic of heathenism, the ancient holy stone which once stood on the Ma‘jan, and is said to bear the prints of the patriarch’s 7 alli ile tn

8 Before Islam the Ka’ba was opened every Monday and Thursday ; in the time of Ibn Jubair it was opened with considerable ceremony every Monday and Friday, and daily in the month Rajab. But, though prayer within the building is favoured by the example of the Prophet, it is not compulsory on the Moslem, and even in the time of Ibn Battta the opportunities of entrance were reduced to Friday and the birthday of the Prophet.

feet. The whole legend of this stone, which is full of miraculous incidents, seems to have arisen from a miscon- ception, the Makam. Ibrahim in the Koran meaning the sanctuary itself; but the stone, which is a block about 3 spans in height and 2 in breadth, and in shape “like a potter’s furnace” (Ibn Jubair), is certainly very ancient. It is now covered up, and no one is allowed to see it, though the box in which it lies can be seen or touched through a grating in the little chapel that surrounds it. In the Middle Ages it was sometimes shown, and Ibn Jubair describes the pious enthusiasm with which he drank Zamzam water poured on the footprints. It was covered with inscriptions in an unknown character, one of which was copied by Fakihi in his history of Mecca. To judge by the facsimile in Dozy’s [sraeliten te Mekka, the character is probably essentially one with that of the Syrian Safa inscriptions, which we now know to have extended through the Nejd and into the Hijaz.}

The general aspect of the great mosque will be best understood by reference to the woodcut, which is taken from a photograph. The photographer has taken his stand on a lofty building facing the black stone corner of the Ka’ba, so that house tops, with high para- pets serving to protect the privacy of the women, who spend much of their time on these terraces, form too prominent a feature in the foreground, and obstruct the view of part of the cloistered area. The background is the Red Mountain; the fort which is seen above the town is not the great castle but a building of the sherif

Ghalib, dating from about the beginning of this century. It will be observed that at two places there are smaller cloistered courts annexed to the main

Mecca—the Great Mosque.

*sacred points is 493 paces long, and the religious ceremony called the '*sa'y" consists in traversing it seven times, beginning and ending at Safé. The lowest part of the course, between the so-called green milestones, is done at a run. This ceremony, which, as we shall presently see, is part of the 'omra, is generally said to be performed in memory of Hagar, who ran to and fro between the two eminences vainly seeking water for her son. The observance, however, is cer- tainly of pagan origin; and at one time there were idols on both the so-called hills (see especially Azraki, pp. 74, 78).*

The Ceremonies and the Pilgrimage.—Before Islam the Ka'ba was the local sanctuary of the Meccans, where they prayed and did sacrifice, where oaths were administered and hard cases submitted to divine sentence according to the immemorial custom of Semitic shrines. But besides this, as we have seen, Mecca was already a place of pilgrimage. Pilgrimage with the ancient Arabs was the fulfilment of a vow, which appears to have generally terminated— at least on the part of the well-to-do—in a sacrificial feast. A vow of pilgrimage might be directed to other sanctuaries than Mecca—the technical word for it (ihlal) is applicd for example to the pilgrimage to Manat (Bekri, p. 519). He who was under such a vow was bound by ceremonial observances of abstinence from certain acts (¢.g., hunting) and sensual pleasures, and in particular was forbidden to shear or comb his hair till the fulfilment of the vow. This old Semitic usage has its close parallel in the vow of the Nazarite. It

icin ee Mame mania eke eo ae aN ee SN 1 See De Vogué, Syrie Centrale: Inscr. Sem. ; Lady Anne Blunt,

Pilgrimage to Nejd, vol i,; and W. R. Smith, in the Athenwum, March 20, 1880,

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colonnade. That to the right, with a polygonal minaret, corre to the ancient Dar el-Nadwa, which Ling ar in the Mie the caliph Motadid. The other minor court is at the Bab Ibrahim Of the two walls of the Ka'ba concealed from view, that to the right is the one adjoining the Hijr. The two-storied pagoda-like buildi facing this wall is the Makam or station for prayer of orthodox Moslems of the Hanafi rite, to which the Turks belong. The similar stations of the other orthodox sects have but one story; that of the Maliki rite is seen to the left of the Ka'ba; the roof of the Hanbali station is just visible in the foreground a little to the left of the 'black " corner ; the Shafi station, which stands on the roof of the Zamzam building, is more prominent a little to the right. Between this and the Makam Hanafi rises the slender gilt spire of the white marble pulpit from which sermons are preached on Fridays and high days. Betwcen the pulpit and the Zamzam is the small chapel of Abraham's stone. It does not rise high enough to be seen in the cut. The two small and ugly domes to the right of the Zamzamare the dome of 'Abbas and the dome of the Jewess, They are used as storerooms, but the former, which has its name from the uncle of the Prophet, was formerly the drinking-place of the pilgrims, In the time of Ibn Jubair it was still used for cooling the Zamzam water. The oval part of the court next to the Kaba within the railing is paved with marble; parts of the area beyond are also paved, part being strewn with gravel. Around the railinga number of glass lamps are lighted at night.

*Safdé and Merwa.—In religious importance these two points or '*hills," connected, as we have scen, by the Mas'a, stand second only to the Ka'ba, Safa is an elevated platform surmounted by a*

triple arch, and approached by a flight of steps.? It lies south-east of the Ka'ba, facing the black corner, and 76 paces from the " Gate of Safa," which is architecturally the chief gate of the mosque. Merwa is a similar platform, formerly covered with a single arch, on the opposite side of the valley. Mountain called J. Kuw'aykian.

It stands on a spur of the Red The course between these two

was not peculiarly connected with Mecca; at Taif, for example, 1t was customary on return to the city after an absence to present oneself at the sanctuary, and there shear the hair(Muh. m Med., p. 381). Pilgrimages to

Mecca were not tied to asingle time, but the were naturally associated with festive occasions, and especially wit the great annual fcast and market already spoken of, when by exten- sive hospitality the citizens did all in their power to attract the worshippers who were at the same time their customers. pilgrimage was so intimately connected with the wellbeing © Mecca, and had already such a hold on the Arabs round about, that the politic Mohammed could not afford to sacrifice 1t sn abstract purity of religion, and thus the old usages were transplante into Isldm in the double form of the 'omra or vow of pilgrimage to Mecca, which can be discharged at any time, and the hajj of p it grimage at the great annual feast. The latter closes with a a to the Ka'ba, but its essential ceremonies lie outside Mecca, at 7 neighbouring shrines where the old Arabs gathered before the Meccan fair. + The 'omra begins at some point outside the Haram or holy aa tory, generally at Tan''im described above, both for convene : and because 'Aisha began the 'omra there in the year 10 0 : Flight. The pilgrim enters the Haram in the antique and acd pilgrimage dress (ihram), consisting of two cloths wound roun Ws person in a way prescribed by ritual. His devotion 1s express?

4 Ibn Jubair speaks of fourteen steps, Aly Bey of four, Hee of three. The surrounding ground no doubt has risen so that the 0 name "hill of Safa" is now inapplicable,

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shouts of Labbeyka (a word of obscure origin and meaning) ; he enters the great mosque, performs the tawaf and the say! with circumstances and prayers which it is unnecessary to detail, and then has his head shaved and resumes hiscommon dress. This ceremony is now generally combined with the hajj, or is performed by every stranger or traveller when he enters Mecca, and the ihram (which involves the acts of abstinence already referred to) is assumed at a considerable distance from the city. But it is also proper during one's residence in the holy city to perform at least one 'omra from Tan'im in connexion with a visit to the mosque of 'Aisha there. The absurd triviality of these rites is ill concealed by the legends of the say of Hagar and of the tawaf being first performed by Adam in imitation of the eircuit of the angels about the throne of God ; but in truth the meaning of

their ceremonies seems to have been almost a blank to the Arabs before Islam, whose religion had become a mere formal tradition. We do not cven know to what deity the worship expressed in the tawaf was properly addressed. There is a tradition that the Ka‘ba was a temple of Saturn (Shahrastani, p. 431); perhaps the most distinctive feature of the shrine may be sought in the sacred doves which still enjoy the protection of the sanctuary. These recall the sacred doves of Ascalon (Philo, vi. 200 of Richter’s ed.), and suggest Venus-worship as at least one element (comp. Herod., i, 181; iii, 8; Ephr. Syr., Op. Syr., ii. 457).

To the ordinary pilgrim the ‘omra has become so much an episode of the hajj that it is often described as a mere visit to the mosque of ‘Aisha ; a bettcr conception of its original significance is got from the Meccan feast of the seventh month (Rajab) graphically described by Ibn Jubair from his observations in 1184 a.p. Rajab was one of theancient sacred months, and the feast, which extended through the whole month, and was a joyful season of hospitality and thanks- giving, no doubt represents the ancient feasts of Mecca more exactly than the ceremonies of the hajj, in which old usage has been overlaid by traditions and glosses of Islim. The ‘omra was per- formed by crowds from day to day, especially at new and full moon.? The new moon celebration was nocturnal; the road to Tan’im, the Masa, and the mosque were brilliantly illuminated ; and the appear- ing of the moon was greeted with noisy music. A genuine old Arab market was held, for the wild Bedouins of the Yemen mountains came in thousands to barter their cattle and fruits for clothing, and deemed that to absent themselves would bring drought and cattle plague in their homes. Though ignorant of the legal ritual and prayers, they performed the tawaf with enthusiasm, throwing them- selves against the Kaba and clinging to its curtains as a child elings to its mother. They also made a point of entering the Kaba, The 29th of the month was the feast day of the Meccan women, when they and their little ones had the Ka’ba to themselves without the presence even of the Sheybis.

The central and essential ceremonies of the hajj or greater pil- grimage are those of the day of ‘Arafa, the 9th of the “ pilgrimage month” (Dhu’l Hijja), the last of the Arab year ; and every;Moslem who is his own master, and can command the necessary means, is bound to join in these once in his life. By them the pilgrim be- comes as pure from sin as when he was born, and

gains for the rest of his life the honourable title of hajj. Neglect of other parts of the pilgrim ceremonial may be compensated by offerings, but to miss the "stand" (wokuf) at'Arafa is to miss the pilgrimage. 'Arafa or "Arafat is a space artificially limited, round a small isolated hill called the Hill of Mercy, a little way outside the holy territory, on the road from Mecca to Taif. One leaving Mecca after midday can easily reach the place on foot the same evening. The road is first northwards along the Mecca valley and then turns eastward. It leads through the straggling village of Mind,occupying a long narrow valley (W. Mina), two to three hours from Mecca, and thence by the mosque of Muzdalifa over a narrow pass opening out into the plain of 'Arafa, which is an expansion of the great W. Namdn, through which the Taif road descends fron Mount Kara. The lofty and rugged mountains of the Hodhey] tower over the plain on the north side and overshadow the little Hill of Mercy, which is one of those bosses of weathered granite so common in the Hijaz. 'Arafa, as we have already seen, lay quite near Dhu'l-Majaz, where, according to Arabian tradition, a great fair was held from the Ist to the 8th of the pilgrimage month ; and the ceremonies from which the hajj was derived were originally an appendix to this fair. Now on the contrary the pilgrim is expected to follow as closely as may be the movements of the Prophet at his " farewell pilgrimage" in the year 10 of the Flight (632 A.p.). He therefore leaves Mecca in pilgrim garb on the 8th of Dhu'l Hijja, called the day of tarwiya (an ob- scure and pre-Islamic name), and strictly speaking should spend the night at Mind. It is now, however, customary to go right on and eneamp at once at 'Arafa, The night should be spent in devotion, but the coffee booths do a lively trade, and songs are as commonas prayers, Next forenoon the pilgrim is free to move about, and towards midday he may if he please hear a sermon. In the after-

1 The latter perhaps was no part of the aneient 'omra; see Snouck-Iurgronj je Het Mekkaansche Feest, 1880, p. 115 Sq. ,

+The 27th was also a great day, but this day was in commemoration of the

rebuilding of the Ka'ba by Ibn Zubeyr.

noon the essential ceremony begins ; it consists simply in " stand- ing " on 'Arafa shouting Labbeyka and reciting prayers and texts till sunset. After the sun is down the vast assemblage breaks up, and arush (technically ifdda, daj, nafr)is made in the utmost confusion to Muzdalifa, where the night prayer is said and the night spent. Before sunrise next morning (the 10th) a second "stand" like that on'Arafa is made for a short time by torchlight round the mosque of Muzdalifa, but before the sun is fairly up all must be in motion in the second ifdda towards Mina. The day thus commenced is the " day of sacrifice," and has four ccremonies—(1) to pelt with seven stones a eairn (jamzat el 'akaba) at the eastern end of W. Mind, (2) to slay a victim at Mind and hold a sacrificial meal, part of the flesh being also dried and so preserved, or given to the poor, (8) to be shaved and so terminate the ikrdém, (4) to make the third ¢fdda, z.@., go to Mecca and perform the tawaf and say (omrat el-ifdda), returning thereaftcr to Mina. The sacrifice and visit to Mecca inay, however, be delayed till the 11th, 12th, or 18th. These are the days of Mina, a fair anda joyous feast, with no special ceremony except that each day the pilgrim is expected to throw seven stones at the jamrat el 'akaba, and also at each of two similar cairns in the valley. The stones are thrown in the name of Allah, and are gene- rally thought to be directed at the devil. This is, however, a custom older than Islam, and atradition in Azrak1, p. 412, represents it as an act of worship to idols at Mina, As the stones are thrown on the days of the fair, it is not unlikely that they have something to do with the old Arab mode of closing a sale by the purchaser throwing a stone (Birtnt, p. 328).4 The pilgrims leave Mina on the 12th or 13th, and the hajj is then over.*

The colourless character of these ceremonies is plainly due to the fact that they are nothing more than expurgated heathen rites. In Islam proper they have no raison d'étre ; the legends about Adam and Eve on 'Arafa, about Abrahain's sacrifice of the ram at Thabir by Mina, imitated in the sacrifices of the pilgrimage, are mere' elumsy afterthoughts, as appears from their variations and only partial acceptance. It is not so casy to get at the nature of the original rites, which Islam was careful to suppress. But old usages were not quickly eradicated, and we find mention of practices con- demned by the orthodox, or forming no part of the Moslem ritual, which may be regarded as traces of an older ceremonial. Such are nocturnal illuminations at Mina (Ibn Batuta, i, 396), 'Arafa, and Muzdalifa (Ibn Jubair, p. 179), and

tawafs performed by the ignorant at holy spots at ‘Arafa not recognized by law (Snouck-Hurgronje, p- 149 sq.). We know that the rites at Muzdalifa were originally connected with a holy hill bearing the name of the god Kuzah (the Edomite Kozé) whose bow is the rainbow, and there is reason to think that the ¢fddas from ‘Arafa and Kuzah; which were not made as now after sunset and before sunrise, but when the sun rested on the tops of the mountains, were ceremonies of farewell and salutation to the sun-god.

The statistics of the pilgrimage eannot be given with certainty and vary much from year to year. The quarantine office keeps a record of arrivals by sea at Jiddah (80,271 for the year 1878 a.p., or 1295 A.H.) ; but to these must be added the great overland cara- vans from Cairo, Damascus, and “Irak, the pilgrims who reach Medina from Yanbu’ and go on to Mecca, and those from all parts of the | peninsula, Burckhardt in 1814 estimated the crowd at ‘Arafa at 70,000, Burton in 1858 at 50,000, ‘Abd el-Razzak in 1858 at 60,000. This great assemblage is always a dangerous centre of infection, and the days of Mind especially, spent under eircumstances originally adapted only for a Bedouin fair, with no provisions for proper cleanliness, and with the air full of the smell of putrefying offal and flesh drying in the sun, produce much sickness.

Literature.—Besides the Arabic geographers and cosmographers, many of whom have been already cited, we have Ibn ‘Abd Rabbih’s description of the mosque, early in the 10th century (kd Farid, Cairo edition, fil. 362 sq.), but above all the admirable record of Ibn Jubuir (1184 a-p.), by far the best account extant of Mecca and the pilgrimage, It has been much pillaged by Ibn Battita. The Arabic his- torians are largely occupied with fabulous matter as to Mecca before Islam ; for these legends the reader may refer to C. de Perceval’s Essci. How little con- fidence can be placed in the pre-Islamic history appears very elearly from the distorted accounts of Abraha’s excursion against the Wijdz, which fell but a few years before the birth of the Prophet, and isthe first event in Meccan history which has confirmation from other sources. See Néldeke’s version of Tabarf, p. 204 sq. For the period of the Prophet Ibn Hishdm and Wa4kid{ are valuable sources in topography as well as history. Of the special histories and descriptions of Mecca published by Wiistenfeld (Chroniken der Stadt Mekka, 3 vols., 1857-59, with an abstract in German 1861), the most valuable is that of Azraif, It

has passed through the hands of several editors, but the oldest part goes back to the begin- ning of the 9th Christian century. MKutb el-Dfn's history (vol. iii, of the Chroniken) goes down with the additions of his nephew to 1592 A.D. ; ;

Of European descriptions of Mecca from personal observation the best is Burck- hardt's Zravels in Arabia (cited above from the 8vo ed., 1829). The Travels of Aly Bey (Badia), London, 1816, describe a yisit in 1807; Burton's Pilgrimage (38d ed., 1879) often supplements Burckhardt; Von Maltzan's Wallfahrt nach Mekka, 1865, is lively but very slight. 'Abd el-Razzdk's report to the Government of India on the pilgrimage of 1858 is speclally directed to sanitary questions. For the pilgrimage see partleularly Snouck-Iurgronje, Het Mekkaansche Feest, Leyden, 1880. (W. B.S.)*

eS 3 The sacrifice is not indispensable except for those who ean afford it and are eombining the hajj with the 'omra. 4 On the similar pelting of the supposed graves of Abii Lahab and his wife (Ibn Jubair, p. 110) and of Abu Righdl at Mughammas, see Néldeke's translation of Tabarf, p. 208.

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MECHANICS |

TRICTLY speaking, the derivation of this word should have prevented the use of it as the designation of a pure science. It has been, however, employed for a long period in English speech in the identical sense that the French attach to Mécanique pure or the Germans to Meine Mechanik. These terms are all employed to denote what we should much prefer to call Abstract Dynamics,—the pure science which (as the derivation implies) treats of the action of Force upon Matter, but which is, correctly, the Science of Matter and Motion, or of Matter and Eneryy. With the view of making clear from the outset the reason for the arrangement adopted in this article, we commence by stating in Newton's own words (accompanied by a paraphrase) the Axiomata, sive Leges Motus, which form the entire basis of our subject. These laws will at once indicate the order in which the subject may most logically be treated. We defer to the end of the article the more

close consideration of the idea introduced by the word "force," as well as general remarks on "energy," &. For the present we are content to regard force as defined for us by Newton's Laws.

Newton's Laws of Motion.

Newton's § 1. Lex I. Corpus omue perseverare in statu suo qui- first law. escendi vel movendi uniformiter in directum, nisi quatenus illud a viribus impressis cogitur statum suum mutare.

Every body continues in its state of rest, or of uniform motion ina straight line, except in so fur as tt is compelled by force to change that state.

-Lex II. Mutationem motus proportionalem esse vi motrici impresse, et fieri secundum lineam rectam qua vis illa imprimitur.

Change of (quantity of) motion is proportional to force, and takes place in the straight line in which the force acts.

Lex IIL. Actioni contrariam semper et zequalem esse reactionem ; sive corporum duorum actiones in se mutuo semper esse cequales et in partes contrarias dirigi.

To every action there is always an equal and contrary reaction; or the mutual actions of any two bodies are always egual and oppositely directed.

§ 2. In 1863 Thomson and Tait (upon whose Treatise on Natural Philosophy much of what follows is based) called attention to the fact that, as regards Lex III., Newton gives in a scholium a second sense in which the words may be interpreted. In the first sense the action and reaction are mere forces, in the second they are the rates at which forces do work. Hence, and for another reason which will appear later, the word "'activity" has been introduced as the English equivalent of the word actvo in Newton's second sense. Here is the passage :—

Si estimetur agentis actio ex ejus vi et velocitate con- junctim; et similiter resistentis reactio sestimetur con- junctim ex ejus partium singularum velocitatibus et viribus resistendi ab earum attritione, colizsione, pondere,

et acceleratione oriundis; erunt actio et reactio, in omni instrumentorum usu, sibi invicem semper equales.

Lf the activity of an agent be measured by its amount and its velocity conjointly ; and wf, similarly, the counter-activity of the resistance be measured by the velocities of tts several parts and ther several amounts conjointly, whether these arise from friction, molecular forces, weight, or acceleration ; —activity and counter-activity, in all combinations of machines, will be equal and opposite.

This may be looked upon as a Fourth Law. But, in strict logic, the First Law is superfluous, because its con- sequences are all implied (by negation) in the statement of

Second law.

Third law.

Scholium.

ee a

the Second. (See § 8 below.) Hence there are, virtually | ouly three laws, so far as Newton's system is concerned,

§ 3. These laws are to be considered as deductions from Basis. observation and experiment, and in no sense as having an Newt: a priort foundation. Their proof, so far as rigorous proof "5. is attainable in physical matters, is commonly looked on as being furnished in the most conclusive form by obser- vational astronomy. The Nautical Almanac, published usually about four years in advance, contains the predicted places of the sun, moon, and principal planets from day to day, in some cases from hour to hour, throughout the year.

The predictions are entirely based upon the laws of |

motion (along with the law of gravitation), and could not possibly be accurate unless these laws are true. So thoroughly satisfactory has hitherto

been the coincidence | between prediction and observation that, when a deviation

occurs, no one dreams of a defect in the principles of the

reasoning. On the contrary, such deviations are utilized for the purpose of correcting our knowledge of the "elements" of the orbits of the moon and planets, or our estimates of the masses of these bodies ; and, as in the brilliant investigations of Adams and Leverrier, they some- times enable us to discover the existence and even assign the position of a planet never before seen.

§ 4. It is not clear in what order, or by whom, these laws Newto: were first discovered. Galileo was undoubtedly acquainted prede- with the first two; and Huygens, Wren, Hooke, an others were acquainted with the Third Law in some of its | many applications. But they were first systematized and, as we have seen, exteuded in a most important manner by Newton. Though they were sadly disfigured in Britain

during the fifty years which elapsed after the revival of |

mathematics in the early part of this century, they have of late been restored to the form in which Newton gave then. This readoption of Newton's simple but comprehensive system has of itself aided in no small degree the recent rapid advance of science.

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One peculiarity of Newton's language must be noticed ren

here, though very briefly, as we will return to the subject foe towards the end of thearticle. A forceissaid to"compel" ~~ a change of state in a body; bodies are said mutually to '"act" on one another, &c. in its literal acceptation, of an anthropomorphic character ; but, if one thinks of the habitual use even in scientific books of such expressions as "the sun rises,"

“the wind blows,” c&c., it cannot be construed into an assertion that force has real objective existence.

Comments on the Laws of Motion.

§ 5. Law J. First of all this law tells us what happens ae to a piece of matter which is left to itself, z.¢., not acted -_ on by forces. It preserves its “state,” whether of rest or of uniform motion in a straight line. This property (which, as we shall presently show, § 7, is considerably extended by Newton himself) is commonly called the “inertia” of matter, in virtue of which it is incapable of varying in any way its state of rest or motion. It may be the sport of forces for any length of time, but so soon a8 they cease to act it remains in the state in which it was left until they recommence their action on 1. Henee, whenever we find the state of a piece of matter changing, we conclude that it is under the action of a force ey forces. Thus, for the present, we have the definition of “force as part of this First Law :— :

Force is whatever changes the state of rest or uniform motion of a body.

I Such language is, of course, |

Inertia.

lative.

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When a body, originally at rest, begins to move, we con- clude that force is acting on it. And when a moving body is seen to change ether the speed or

the direction of its motion, we conclude that this is due to force.t

§ 6. But there is much more than this, even in the First Law. What is "rest"? The answer must be that the term is relative. Absolute rest and absolute motion are terms to which we find it impossible to assign a meaning. Maxwell has well said (in his Matter and Motion) :—

" All our knowledge, both of time and place, is essentially relative. When a man has acquired the habit of putting words together, without troubling himself to form the thoughts which ought to correspond to them, it is easy for him to frame an antithesis between this relative knowledge and a so-called absolute knowledge, and to point out our ignorance of the absolute position of a point as an instance of the limitation of our faculties, Any one, however, who will try to imagine the state of a mind conscious of knowing the absolute position of a point will ever after be content with our relative knowledge."

As will be seen later, the First Law gives us also a physical definition of "time," and physical modes of ineasuring it.

§ 7. Newton's own comment on this law is as follows :—

Projectilia perseverant in motibus suis, nisi quatenus a resistentia aeris retardantur, et vi gravitatis impelluntur deorsum. Trochus, cujus partes cohzrendo perpetuo retrahunt sese a motibus rectilineis, non cessat rotari, nisi quatenus ab aere retardatur. Majora autem planetarum et cometarum corpora motus suos et progressivos et circulares, in spatiis minus resistentibus factos, conservant diutius.

It is particularly worthy of notice that we have here the undisturbed rotation of a body about an axis intro- duced as another of those "states" in which it will con- tinue, in virtue of the First Law, until force acts to compel it to change that state. Also it is to be noticed that Newton adduces a hoop, whose axis is fixed in direction both in the body and in space, as an example of this new form of state maintained in virtue of inertia. Later, it will be seen that the same thing is true of a body free in space and rotating about the principal axis of greatest or of least moment of inertia through its centre of mass."

§8. Law II. What Newton designates by the word motus is, as he has clearly pointed out, the same as is expressed by quantitas motus, that for which we now usually employ the term "momentum." Its numerical value depends not only on the rate of motion, but also on the amount of matter, or "mass," of the moving body, and is directly proportional to either of these when the other is unaltered. But it is regarded by Newton as having direction as well as magnitude. It is, in fact, what in the language of quaternions is called a "vector." The change of such € quantity may be either in numerical magnitude, or in direction, alone, or simultaneously in both. We now see what this Second Law enables us to do. For

(2) Given the mass of a body, the force acting on it, and the time during which it acts, we can calculate the change of motion. This is the direct problem of dynamics of a particle.

(0) Given the mass, and the change of velocity, we can

: The words we have italicized will be seen to have very iniportant bearings on certain old errors which even now crop up, and which have Introduced one of the most inappropriate and apparently ineradicable of terms (" centrifugal force"') into the usual vocabulary of our subject.

~ It is also, in a partial sense, true of a free body of which two Principal axes through the centre of mass have equal moments of Inertia. In that case, as we will show later, even when couples act upon the body, provided they be in planes passing through the third axis, the rate of rotation about that axis remains unaltered, though its direction im space changes. This is approximately the case of the earth, The attractions of the sun and moon on the protuberant parts about the equator produce " precession" and "nutation," but do not influence the length of the day.

calculate the magnitude and direction of the force acting. This is the ¢enverse problem.

(c) We can compare, and so measure, forces by the changes of motion they produce in one and the same body.

(d) We can compare the masses of different bodies by finding what changes of velocity one and the same force produces in them.

(ec) We can find the one force which is equivalent, in its action, to any given set of forces. For, however many changes of motion may be produced by the separate forces, they must obviously be capable of being compounded into a single change, and we can calculate what force would produce that.'

§ 9. Hitherto, we have spoken of the motion of a body,— thus implying (except, of course, in the case of Newton's hoop or that of the earth) that all its parts are moving in exactly the same way. From this point of view every body, however large, may be treated as if it were a single particle. But when the parts of a body have different velocities, as when a rigid body is rotating, or as when a non-rigid body is suffering a change of form, the question becomes much more complex. We cannot at this stage enter into a full explanation, but will take a couple of very simple cases to show the nature of the new difficulties, and thence the necessity for an additional law.

Suppose a bullet to be thrown in any direction. If we know with what force the earth attracts it, the calculation of the path it will pursue depends on the Second Law, which gives all the necessary preliminary information. But let two bullets be tied together by a string: we know by trial that each moves, in general, in a manner very different from that in which it would move if free. The path of each is now, usually, a tortuous curve, while its free path would be plane. It is no longer subject to gravity alone but also to what is called the "'tension" of the string. If we knew the amount of this tension on either of the bullets and its direction, we could calculate, by the help of the Second Law alone, all the circumstances of the motion of that bullet. But how are we to find this tension? Is it even the same for each bullet? This, if answered in the affirmative, would simplify matters considerably, but we should still require to know the amount and direction of the tension. It is clear that, without a further axiom, we cannot advance to a solution of the question.

§ 10. Law III. Furnished with this, in addition to our previous information, we can attack the question with more hope. We see by this law that, whatever force be exerted by the string on one of the bullets, an equal and opposite force, which niust therefore be in the direction of the string, is exerted on the other. Still, the magnitude of these equal forces reniains to be found. But the string in no way interferes with the motion of either bullet unless at is tight, t.e., unless the distance between the bullets is equal to the length of the string. Hence, whenever the un- known force comes into play, at the same time there comes in a geometrical relation of relative position between the two bullets. This supplies the additional equation necessary for the determination of the new unknown quantity.

§ 11. As an additional illustration, suppose the string to be made of india-rubber. The Third Law tells us that the tensions it exerts on the bullets are still equal and opposite. But we no longer have the geometrical condition we had before. We have, however, what is quite sufficient, a

3 It is to be observed here that Newton's silence is as expressive as his speech. When he says "change of motion" we understand that it does not matter what the original motion was; and, when he men- tions only one force, he implies that the effect of any one force is the same whether others are also at work or not. In fact, with Newton there can be no balancing of forces, though there may be balancing of the effects of forces, a very different thing.

Necessity

for a

third law,

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Rigid con- straint.

Variable con- straint.

Transfer- ence of energy.

Division of the subject.

Position,

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knowledge of how the tension of the string depends on its length. 'Thus the tension can be calculated from the relative position of the bullets.

§ 12. Scholium to Law III. On this we will, for the present, remark only that it furnishes us with the means of studying directly the transference of energy from one body or system to another. Experiment, however, was required to complete the application of this part of Newton's systematic treatment of the subject. What was wanted, and how it has been obtained, will be treated of later, The first words of the scholium, however, claim for Newton the discovery of the clause we have extracted from it. For they run thus :— Hactenus principia tradidi a mathematicis recepta, et experientia multiplici confirmata.

§ 13. What has now been said enables us to see the order in which the fundamental ideas should be taken up, so that the necessities of each should be provided for before its turn comes. An indispensable preliminary is the study of motion in the abstract, z.e., without any reference to what ts moving. This is demanded in order that we may be able to apply the Second Law. The science of pure motion, without reference to matter or force, is an extension of geometry by the introduction of the idea of time and. the consequent idea of velocity. Ampere suggested for it the term Cinematique, or, as we shall write it, Kinematics. We include under it all changes of form and grouping which can occur in geometrical figures or in groups of

oints.

We shall then be prepared to deal: with the action of force on a single particle of matter, or on a body which may be treated as if it were a mere particle. Thus we have the Dynamics of a Particle. This, again, splits into two heads, Statics and Kinetics of a Particle. But all this requires the Second Law only. When we have two or more connected particles, or two particles attracting one another or impinging on one another, the Third Law

is required. Next in order of simplicity come the Statics and Kinetics of a Rigid Solid. Then we have to deal with bodies whose form, &c., are altered by forces—flexible bodies, elastic solids, fluids, &c. Finally, we must briefly consider the general principles, such as "conservation of energy," "least action," é&c., which are deducible by proper mathematical methods from Newton's Laws, and of which some at least, if we could more clearly realize their intrinsic nature, would probably be found to express even more simply than do Newton's Laws the true fundamental prin- ciples of abstract dynamics.

We will not restrict ourselves to one uniform course in the application of mathematical methods. Rather, as con- siderations of space require to be attended to, we will vary our methods from one part of the subject to another, so as to exhibit, each at least once, all the more usual processes. And we will endeavour to make the large-type portions of ihe article, in which only the most elementary mathematics will be introduced, a self-contained treatise which may be read by students of very moderate mathematical knowledge.

KINEMATICS,

Position and the Means of Assigning it.

§ 14. Motion (or displacement) consists simply in "change of position." Hence, to describe motion, we must have the means of assigning position. This is, of course, a question of GEOMETRY (q.v.). See also QUATERNIONS.

From these articles it appears that the position of one free point with reference to another (all these space relations are relative, as we have already said) depends on ¢hree numbers, of which one at least must involve the unit of length. In Cartesian rectangular coordinates, we denote these by a, y, z, which indicate respectively the distance of

the point from each of three planes at right angles to each other, and all passing through the origin (or reference point),

From another point of view they may be called " degrees Degree:

of freedom." When the value of one is assigned, say by of free.

w= Gr, the point is said to have lost one degree of freedom, or to

have had imposed upon it one "degree of constraint." Tt of con. must now lie in a plane parallel to the first of the reference straint,

planes, and at adistance a from it. of constraint is applied, say by = b, another degree of freedom is lost. The point's position is limited to lie in a second plane in a given position at right angles to the first. It must therefore lie somewhere on the straight line which consists of the series of points common to the two planes. A third degree of constraint e=C

takes away its one remaining degree of freedom ; and its position is now definitely assigned as the single point of intersection of three given planes.

$15. But constraint may be applied in other ways. Thus if we assign the condition

e+yt+e=a,*

we deprive the point of one degree of freedom by com- pelling it to remain at a distance a from the origin. It is now limited to the surface of a sphere, but its latitude and longitude on that sphere may be any whatever. Here again the imposition of one degree of constraint has taken away one degree of freedom.

When a second degree

§ 16. In general, one degree of constraint may be ex- Exampl: of con- straint,

pressed as

J(%, Ys a)=é. This, when € has an assigned value, is the equation of a definite surface on which the point must lie. Three such conditions determine the position of the point, and may therefore be looked upon as

introducing €, 7, ¢, another set of coordinates, which may be used in place of a, y,z. The number of such systems is, of course, unlimited ; but it is often possible to choose one in which the conditions of a problem are much more simply expressed than they were when expressed in x, y, z The whole question belongs to what is called "change of variables." 'To give an elemen- tary instance of its use,—suppose we take the ordinary simple pendulum, a pellet supported by a fine thread or wire, and oscillating in a vertical plane. If the origin be placed at the point of suspension, and the axis of 2 be vertical, we have two conditions :—

ee tyt+2—a%, where a is the length of the thread; and

y/e=tana,

where a denotes the azimuth of the plane of oscillation. There is but one degree of freedom left, because two degrees of constraint have been imposed. We may choose for this either a, y, or 2; but we should in each case be led to complex expressions. If, however, we consider that all

the freedom left to the pendulum is to oscillate in a given –

plane, we may denote its sole remaining degree of freedom by 0, the angle which the string makes with the vertical ; and form our dynamical equation in terms of this. When 6 is found by dynamical considerations, we have v=asin@cosa, y=asin @sina, 2=4C0S 6.

Here 6 comes in as what is called a coordinate." eee If the pendulum be not limited to one plane, the azimut as well as the angle, of the displacement from the ee may be any whatever. Hence there are two degrees 0 freedom, which are indicated by the generalized coordinates

a and 6.

**s generalized General- ized c0- dinates :*

§ 17. In general, in any system originally with any num- ber m of degrees of freedom, and subjected to a number 2 of degrees of constraint, the whole motion can be fully charac- terized by m — independent quantities, called

generalized coordinates, and corresponding to the degrees of freedom which remain. The elegance and simplicity of a solution often depend in a marked manner upon the choice of these; and the transformation of the general equations from Cartesian to generalized coordinates forms one of the most | powerful and elegant contributions to abstract dynamics

which Lagrange made in the Mécanique Analytique. 'Freedom § 18, A rigid system has only siz degrees of freedom :— ofa three translations for any one of its points, and three inde- | rigil pendent rotations about axes passing through that point. system. "When one point is fixed, it loses the three translations, and has only three degrees of freedom. When a second point is fixed, it loses other two; in fact it can no longer move except by turning round the line joining the fixed points. When a third point, not in line with the other two, is fixed, there is no degree of freedom left ; the system is fixed. Linear § 19. It may be well to notice here that, in all cascs which we relations shall require to eonsider, whatever be the relations among two among different scts of variables whieh we employ alternatively to deter- small mine the relative positions of the parts of any system, the equations ~~*displace*~~ *which give the relations between eorresponding small increments*

ments, of these variables are always Jinear so far as these increments are concerned. Thus, for instance, if we have as above a condition

of the form vi (x, Ys z) = t ' | we deduce from it at once

(fans (F) by + (F) w= 6E.

Here the differential coefficients are partial.

In such eases, any homogeneous function of the second order in dz, Sy, dz, &e., will be represented by a homogeneous function, also of the second order, in df, 5n, &c., however many be the coordinates in the separate systems. When, however, one or more of the equations of eondition involves the clement of ¢ime explicitly, the relations among corresponding small increments of the alternative sets of coordinates, though still linear, will not be homogeneous.) Thus a homogeneous funetion of the second order in one set will be a function of the second order in the other set, but not homo- geneous, unless the inerements are produced instantaneously.

To give a single instanee, suppose that the string of a simple pendulum (not necessarily oscillating in one plane) conéraets uni- formly. We shall now have

x? +4? + 2? = (a — et)?

instead of the equation in the example § 15, and one of our cqua- tions among increments is

Lox + Ydy +252—= —e(a— et)dt,

which, though still linear, is no longer homogeneous in the incre- ments of coordinates.

—

Kinematics of a Point.

§ 20. The one necessary characteristic of the path de- scribed by a moving point is its continaity. There can be no break or gap in it. But, as we study kinematics, at present, solely for its physical applications, we impose a restriction on such complete generality. The path of a moving particle must be one of continuous curvature, unless either (1) the motion ceases and commences again in a different direction (in which case we have two separate and successive states of motion to consider), or (2) an infinite force is applied to the particle (a case which we need not consider), A similar remark, we may say in passing, applies to velocity also. So that, for our purpose, we may confine ourselves to the geometrical properties of the motion of a point whose rate and direction of motion change 'con- tinuously, if at all, and not by fits and starts.

Bact § 21. If the point describe a straight line, that line gives

Lie, the direction of its motion at every instant. If it describe

a curve, the direction of its motion is at every instant that of the corresponding tangent to the curve.

Jontinu: ty of ath of oint.

irec.

MECHANICS

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Let A, B, C, D represent four points on the path taken Change in close succession, in the order in which the moving point °f direc- reaches them. From A the point moves to B, so that the !”- line joining A and B (the tangent) is the direction of motion at A. Similarly the line joining B and C gives the direction of motion at B. ‘The points A, B, C of course lie in one plane. This is the plane in which, for two succes- sive elements of its path, the point is moving. It is there- fore that in which the change of direction of motion takes place, and is called the “ ogculating plane.” And, just as the Osculat- straight line through A and B gives the direction of motion ing at A, so the circle passing through the points A, B, C Plave. determines the “curvature” of the path at A. If we apply the same reasoning to the three successive points B, C, D, we see the difference between a “plane” and a “ tortuous” curve, For, if D lie in the plane ABC, the osculating plane is the same at A and at B; and if the same holds for other successive points the whole bending takes place in one plane. But if D be not in the plane ABC, BCD is the osculating plane at B, and we thus see that successive positions of the osculating plane of a tortuous curve are Tortuous produced by its rotation about the tangent BC to the path ; path. for BC is in both planes ABC and BCD. We shall not have space here to deal in detail with cases of tortuosity ; but it was necessary to point out their essential nature.

§ 22. The curvature of ABC obviously depends upon the Curva- change of direction from AB to BO, and is directly pro- tre. portional to it. But it is obviously greater, for the same amount of change of direction, as ABC is less. In a circle the curvature is the same at all points, and, as the radius is everywhere perpendicular to the tangent, the change of its direction is the same as that of the tangent. Hence the curvature, being the change of direction per wnit length of the arc, is measured simply by the reciprocal of the radius.

Generally, if @ be the angle between the tangent at A and any fixed lincin the oseulating plane, and if s represent the length of the curve measured

from any fixed point on it to A, we have, by the fundamental property of infinitesimals,

36 dp _ Le 77, = curvature. (We will use, as above, the Ictter L for a limit, in the sense in which that term was introduced by Newton.) In a circle we have always (a being the radius)

S=ad, and hencc the curvature

dp _ 1

ds @

so that in general the mcasure of curvature is the reciprocal of the radius of the eirele passing through three consecutive points of the path. For other analytical expressions for curvature see vol. xiii, p. 26.

For a curve in space (whether tortuous or not) we have

*2 2. a 2a \ 2 Curvature == af (Bey (ZB) +(F) , while the direction cosines of the radius of curvature are aa, d*y dz Past' Pasa? Past*

§ 23. The chief properties connected with the curvature Evolute

of a plane curve are made very clear by the artifice of ad : ; f fs 2 involute.

regarding it as an "involute." This idea introduces us to the kinematics of a M flexible and inextensible line. Suppose such a line, held tight, to be wrapped round a cylinder of any form, in a plane perpendicular to its axis, each point of it, when it is unwound in its own plane, will describe a curve whose form e P depends upon that of the transverse Fig. 1. section of the cylinder. Let P,M'M (fig. 1) be such a section of the cylinder; MP, M'P', two positions of the free part of the cord; P, P', the corresponding positions of

Mi

oU

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a definite point of the cord; PP'P, the path described by that point. 'Then PP'P, is one of the involutes of MM'P, ; the others are the curves traced by other points of the string. But, with reference to PP'P,, the curve MM'P, is the '"'evolute." The evolute of such a curve is, iv fact, unique; for it is obvious that the line MP, in any of its positions, is revolving about the point of contact M with the evolute ; so that P describes an infinitesimal arc of a circle of which M is the centre. Thus the evolute of a plane curve is the locus of its centre of curvature. And it is clear from the genesis of the involute that PM=P'M'+MM=P,M'M.

For the analytical discussion of evolutes, see vol. xii. p. 26.

The subject of evolutes is of importance in various branches of physics, especially in optics. In mechanics its chief use is connected with the theory of the pendulum, as it shows how to cause the bob to move in a cycloid, the only path in which the time of oscillation is the same what- ever be the extent of the oscillations.

§ 24. When the line, curved or straight, in which the notion takes place is given, the position of the moving point is at once assigned in terms of a single numerical quantity. In fact it has only one degree of freedom, and its position is known by the length of the arc of the curve from any fixed point to the given position. Insuch a case as this we are not concerned with the direction of the motion, for that is already assigned at every point of the path. We are concerned only with what we may call the "speed" of the motion. (We purposely avoid the use of the term "velocity" here, because it properly includes direction as well as speed, as will be seen later.)

§ 25. Suppose an observer to be watching the motion (as, for instance, a traveller by rail notes the telegraph posts which he passes, referring at each to his watch), and to find that at any time ¢, the moving point was at s,, while at time ¢, it was at s..

Then it is clear that the average speed during this part of the motion is to be found by dividing the number of units of space passed over by the number of units of time employed. For it must be greater as the former-is greater and less as the latter is greater. Hence the average speed

felt by a student when he is told that at a certain part of its course a point has a speed say of 10 miles an hour, while the whole course may be only a few inches. But this arises from the novelty of the conception. It is not meant when we speak of a speed of 10 miles per hour, that the motion necessarily lasts for an hour, or even for a second but only that, of the then speed were to be maintained con- stant for an hour, the moving pownt's path, of whatever form, would be exactly 10 miles long. In actual experience in a railway train we can judge the speed (roughly at least), and we find nothing strange in saying " Now we are going at twenty miles an hour," " Now at six," and so on, And it is clear that, after the steam is put on, the train, how- ever short its run, must go through all rates of speed from zero to its maximum, and then through all of them to zero again, when the steam is cut off and the brake applied. In the language of the differential calculus this becomes ds

The fluxional notation of Newton, in which the dot over a quantity expresses the rate of its increase, 7.¢, its differential coefficient with regard to time considered as the independent variable, is still very convenient in abstract dynamics, and is, in fact, indispensable when we come to the higher generalizations.

We shall, therefore, freely employ it when it is specially useful.

§ 26. Whether uniform or variable, speed depends for Dimen- its numerical value upon the units chosen for linear space '0s of and for time. Its dimensions are [LT~-], and consequently* **?°** *its numerical expression is increased in proportion as the unit of time is increased, and diminished in proportion as that of length is increased. Thus the speed represented by 10 in feet per second becomes*

3600 75

pa80 | }° a7

when expressed in miles per hour.

$27. The rate at which the speed (when not uniform) Rate of _

changes is found by a process precisely similar to that ne employed for the speed itself. Let the speed .

at time ¢, be observed to be »,,

” ty ” ” Ug 3

then the average rate of increase of speed during the

peed,

Bee 4 . . : Measure- is “—?- If the speed has been wnzform during the interval is ment of 2 al 5 -. . Vy uniform motion observed, this average value has coincided with the

variable been greater, at others less, than this average.

actual value all through; and, if the measures of space and time are accurate, we shall get exactly the same value of this ratio whether the interval of time is small or large. Hence, if v be the speed of a uniformly moving point, the space it describes in time ¢is v¢. But if the speed has been variable, it must at some parts of the interval have And the shorter we take the interval the less will be the difference between the greatest and least speeds during its lapse, so that the average speed will coincide more and more nearly with the actual speed. In the language of ‘“ fluxions” (which was invented for the sake of this subject) the measure of the speed at any time ¢, is

Pe ek oan tl é when the interval ¢,—¢, is shortened indefinitely. The accuracy of the preceding process depends entirely upon the limitations we have introduced for the purpose of con- fining ourselves to cases which can occur in ordinary physical problems, For the general reasoning on which it is based is obviously inapplicable to cases in which the speed alters by jerks —at least during the interval con- sidered, small as’it may be. But we are fortunately not required to discuss here the very delicate questions to which this may give rise. Considerable difficulty is sometimes

be -h |

The dimensions of this quantity are obviously (ied? Thus its numerical value is diminished, like that of speed, in proportion as the unit of length is increased. But it is increased in the duplicate of the proportion 1 which the unit of time is increased. For instance a rate of increase of speed of 32°2 feet per second per second (the mere statement is enough to show the double dependence on the time unit) becomes (3600)?

5280

when expressed in terms of miles and hours, .

§ 28, When the rate of increase of speed is uniform, the i ~ above average value is its actual value throughout the interval. Hence with uniform rate of increase= a, 2 spe? V becomes in time ¢

32‘2 =79,036 nearly,

v=V+at.

Also, as it increases uniformly, ue time ¢ is half way between its values at the beginning an end of that time; 7.¢., it is

V+hat.

The space described during the interval is at once found (§ 25) as the product of the interval and the average speed during its lapse ;—t.¢., it is s=Vitgat.*

its average value during

d

d of speed.

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And it is easy to see from these expressions that v?= V2 + 2as, which gives the speed acquired in terms of the space traversed. 29. This is the only case in which the result can be reached without formally using the methods of the integral calculus. 'These expressions enable us at once to solve a

great number of simple questions connected with the

motion of a stone or bullet, under the action of gravity, in a vertical line. For it is found by experiment that gravity impresses, in every second, a downward speed of 322 feet per second on an unsupported body; and, by the Second Law, this is independent of the body's previous motion.

Hence, if a stone be let fall, its speed after ¢ seconds is 32°2¢, and the space fallen through is 16:122, Also, if it fall through s feet, it will acquire a speed whose square is 0? = 64°48,

Again, if a stone be thrown upwards with a speed of 300 feet per second, after ¢ seconds its speed will be 300 – 32°22, and the height to which it has then ascended

: 300

is 300¢-16-122, Thus it stops, and turns, after 39°9

: : . 3800? seconds ; and the greatest height it reaches is gag feet.

From the statement above, putting =v, we find

FT | alas alsa Su a From this expression the preceding results may be at once obtained. Thus, assuming

S=a, we have by integration s8=V+at, 8=5)+ Vé+4aé?. As an instance of the indirect problem—i.e., to find the speed, and its rate of increase, when the law of the motion is given:—suppose

and again

S=ACOSwt.

(This equation describes the simplest form of vibratory motion,

*and will be fully treated later.) We have, by taking the fluxion, &= — adwsinat, §= —aw*coswt= — ws.*

§ 30. Velocity, as we have already said, involves the ideas of speed and of direction of motion conjointly.! To compound two velocities (as is required in the application of Newton's Second Law), we have the following obvious construction. From any fixed point O (fig. 2), draw a line OA representing, in magni- B tude and direction, one of the two velocities. From its

extremity A draw AB repre- '

and again

senting in the same way,

and on the same scale, the

other. Complete the triangle A OAB. Then OB represents, In magnitude and direction (still on the same scale), the resultant velocity. We have called the construction obvious because one has only to think of how \a poiut can be said to have simultaneous velocities, in order to see its truth. Thus, if OA repre- Sents the velocity of a railway train, AB that. of a pas- senger walking in a saloon carriage, O may be looked upon as the position of the point of the carriage at which he began his walk, at the moment when he did begin it; while B represents the position of the point of the carriage which he has reached at the end of his walk, just at the ee ee ed Bh Oe

0

Fig. 2.

'It is, in fact, in the language of quaternions, a " veetor," of Which the speed is the '"'tensor" or length, and of which the

versor assigns the direction. And the laws of eomposition of Velocities are in all respects the same as those of vectors.

moment when he did reach it. Here OA is the velocity of the carriage relative to the earth, AB that of the pas- senger relative to the carriage. B This proposition may be called the triangle of velocities. Another obvious mode of stating it is to complete the parallelogram of which OB is a diagonal (fig. 3); and then we have the same construction

in the form :—If the two velocities

to be compounded, represented a ‘ by OA and OC, be taken as con- Bigs 3:

tiguous sides of a parallelogram, the conterminous diagonal OB represents their resultant.

§ 31. From the triangle of velocities we may pass at once Composi- to the polygon of velocities, which gives us the resultant of tion of Thus, beginning velocities,

any number of simultaneous velocities. as above at any point O (fig. 4), lay off OA, AB, BC (however many there may be) as successive sides of a polygon all taken in the same direction round. The separate velocities may be in one plane or not. When this is done, the final point C is easily seen to be independent of the order in which the separate velocities were taken, and is thus a perfectly definite point. OC, completing the polygon, represents the resultant velocity.

opposite direction round.

Fig. 4. But it is taken zn the If C coincide with O, there is no resultant ;—?. ¢., a point which has, simultaneously, velocities represented bythe successive sides of any polygon, all taken the same way round, is at rest.

In what precedes, we have denoted the position of the moving

point in its known path by the single quantity s. But if we think of its Cartesian coordinates 2, y, z, we sec that in general each of these inust vary during the motion. And just as we represented the whole speed by sso we may speak of « as the speed in the direction of the axis of x, &c. And now we have a hint of a most important character. For, by the ordinary laws of the differential calculus, we have three equations of the form

Now ots the cosine of the inclination of the tangent at s to

the axis of z Andso with y and 4 These give us

du\? (dy\? (dz_. pe 9) 3 el {| oF Oe __.38 M4 G48 pie) +2) +(3)) ee

Hence we see that a speed in any direction may be resolved into three in any assigned directions at right angles to one another; that the speed in any one of these is determined by multiplying the whole speed by the cosine of the angle between its direetion and that of its resolved part ; and that the

square of the whole speed is the sum of the squares of the speeds in the resolved motions. These results, however, can be obtained more directly, and in a more instructive manner, by the consideration of " velocities," and not of inere "speeds." But, before we take this step, let us take the second fluxions of the coordinates, and sce to what they lead us.

dx From pao} x "a : dx dx btain at once (= we obtai n z = ane |

or, introducing in the last term, both as a multiplier and as a divisor, the radius of curvature of the path, ds' Past" p ?

with similar expressions for 7 and 2%. These show that the rates of increase of speed, parallel to the three axes respectively, may be considered as made up of the resolved parts of the two direeted quantities } and s/p. The first isin the direction of the tangent to the path, the second in the direction of the radius of curvature ; and the law of resolution is, for each, multiplication by the cosine of the augle between the two directions concerned. We shal] presently recognize these as the components of the acceleration.*

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Resolue § 32, To resolve a velocity is of course a perfectly in- tion of definite problem, unless the number of conditions requisite velocity. go, gefiniteness be imposed. For, in general, it may be taken as one side of any complete polygon, whether in one plane or not ; and the other sides, all taken in the opposite order round, represent its components.

The only cases which we need consider, in which the con- ditions are such as to ensure one definite solution, are—(1) when a velocity is to be resolved into components parallel and perpendicular to a given line; and (2) an extension of the same case to components parallel respectively to three lines at right angles to one another. In case (1) the given velocity is to be taken as the hypotenuse of a right-angled triangle of which one of the sides is parallel to the given line. In case (2) itis to be taken as the diagonal of a rectangular parallelepiped of which the edges are parallel to the three lines

respectively. In either case the magnitude of each component is found by multiplying the amount of the velocity by the cosine of the angle between its direction and that of the component; and the square of the whole velocity is equal to the sum of the squares of the components. We are now prepared to take up the requisite preliminaries for the application of the Second Law. What, in fact, is

Change "change of velocity"? The preceding statements at once

of velo- enable us to give the answer. For let OA (fig. 5) be the

city. velocity of a point at one instant, OB at a succeeding instant. To convert OA into OB, we must compound with it a velocity represented by AB. AB represents the change. A Hence if, during any motion whatever of a point, a line OA be constantly drawn from a 0 fixed point O, so as to repre- ogy sent at every instant the mag- inci nitude and direction of the velocity of the moving point, the extremity of OA will describe a curve (plane if the original path be plane, but not otherwise, except in certain special cases) which possesses the following important but obvious properties :— (1) the tangent at A is the direction of the change of velocity in the original path ; (2) the rate of motion of A is the rate of change of velocity in the original path. Hence in this auxiliary curve, called the

Hodo- HopocrapH (¢.v.), the velocity represents, in magnitude

graph. and direction, what is called " acceleration" in the original path, And, because the acceleration can thus be repre- sented as a velocity, the laws of composition and resolu- tion of velocities hold good for accelerations also.

Accelera- § 33. Hence, if we desire to know the whole acceleration

tion. in any case of motion of a point, we need only find its components in, and perpendicular to, the tangent to the path. That in the tangent has already been found ; it is 6 or §as in § 29. For that perpendicular to the path we may study the simple case of uniform motion in a circle.

Accelera- § 34, If a point move with uniform speed V in a circle,

tio in the hodograph is

uniform evidently a circle of

motion, radius V, and is de- ‘J A

scribed uniformly in the same time as the orbit (see fig. 6). Hence the speeds in the two circles are as their radii. Let R be the radius of the Fig. 6.

orbit. Then the magnitude of the acceleration in the orbit (the speed in the hodograph) is found from

Avr VER

that is, A=V?/R.

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The direction of this acceleration, being that of the tangent to the hodograph, is perpendicular to the corre- sponding radius of the hodograph, «.e., to the tangent to the orbit. Hence it is along the radius of the orbit and directed inwards to its centre.

§ 35. In other words, to compel a mass to describe an un- The go. _ natural (because curved) path, it must be acted on by a called force directed towards the centre of curvature of the path, We anticipate so far as to introduce here mass and force, ¢..

: : : ; : » force, although, strictly, we are dealing with kinematics. But r the student cannot be too early warned of the dangerous error into which so many have fallen, who have supposed that a mass has a tendency to fly outwards from a centre about which it is revolving, and therefore exerts a “cen- trifugal force,” which requires to be balanced by a “‘cen- tripetal force.” The centripetal force is required if the path is to be curved; it is required for the purpose of producing the curvature, and not because there is any tend-. ency to fly out from the centre. |

§ 36. Thus, in any motion of a point, the whole accel- Compon- eration is the resultant of two parts—the first in the ents of direction of motion and of

magnitude equal to the rate of acoelera- increase of speed, the second directed towards the centre – | of curvature and of magnitude as the curvature and the square of the speed conjointly. The sole effect of the first component is to alter the speed, of the second to alter the direction, of the motion. There is no acceleration per- pendicular to the osculating plane, because two successive values of the velocity, and therefore also the corresponding change of velocity, are in that plane.

§ 37. A very convenient expression for acceleration which Angular changes the direction of motion is furnished in terms of velocity. what is called the 'angular velocity," 2.¢., the rate at which | direction changes. This also is properly a vector, or directed line, perpendicular to the plane in which the | change of direction takes place, and of length proportional . to the rate at which the angle assigning the direction . changes. | § 38. In the case of uniform motion in a circle of radius i

|

|

|

R, with speed V, the time of describing the complete circumference (247R) is 27R/V. Hence the angular velocity is V/R, usually denoted by w. Thus the above expressiou for the acceleration in a direction perpendicular to the path of a point (§ 34) may be written in the form pw', | where p is the radius of curvature of the orbit and w the | angular velocity of that radius. The direction of this | acceleration, as we have seen, is always towards the centre of curvature. :

§ 39. The general difficulty of any question concerning acceleration is usually a purely mathematical one, involving | only such physical considerations as are required for the formation of the differential equations, and for the deter-) mination of the so-called arbitrary constants or arbitrary functions involved in the integrals. We will not now discuss the various forms in which the difficulty may present itself, because in the course of the article many of the more important of these will be fully

treated in con- nexion with motions actually observed among terrestrial or cosmical bodies. i iz

§ 40. We have sufficiently considered (§§ 27-29) uniform ates acceleration in the line of motion. Let us now consider – uniform acceleration in a fixed direction, whether the parallel motion of the point be in that direction or not. This ue the most general case of the motion of an ia 7 line. projectile, on the supposition that its path is —, to a region throughout which gravity 1s sensibly constal alike in direction and in intensity. Two well-known yp perties of the parabola lead to an immediate solution 0 our problem.

Let fig. 7 represent a parabola,

defined completely by

ath of in unre- isted

| yTO- ectile,

‘amples

motion

pro- ‘tile.

t 80 that Tt=

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its focus S and its directrix MN. We suppose it to be placed with its axis vertical, and vertex upwards. Take any point P, join PS, and draw PM perpen- dicular to the directrix. Then

(a) If PQ bisect the angle SPM, it is the tangent to the parabola at P. we

Let Q be any point in the tangent, and let QR, drawn parallel to MP, meet the curve in R. Then we have

() PQ=48P.QR.*

§ 41. Now suppose a point, originally moving along PQ with uniform speed V, to have its motion accelerated in a direction parallel to MP, the acceleration being a, a con- stant. 'Then, after ¢ seconds it would have moved along PQ through a space V?, and parallel to MP through a space fat Hence, if R be its position at that time,

PQ=Vi, QR=4a. From these equations we find at once

2

PQ? =?" or.

N

This relation is of the same form as that already written for a parabola, and (as it does not involve ¢) it holds for every point of the path. Hence the point moves in a parabola whose axis is vertical, which touches PQ (the direction of projection) in P, and in which SP = V2/2a. But these three data determine the parabola. For we have only to draw PM vertical, make the angle QPS = QPM, and measure off the lengths PM and PS each equal to V2/2a. Misa point in the (horizontal) directrix, and S is the focus. Hence the path is completely determined.

It is well to notice that, as V?=2aPM, M is the point which the projectile would just reach if it were projected vertically upwards (§ 29).

*§ 42. If the speed of projection be kept constant, while the direction of PQ alters in a vertical plane, S describes a circle about P as centre. This consideration enables us easily to find the direction o projection that a given object * may be struck. Let O (fig. 8) be the object. Join PO, and let it cut in B the circle MBS (whose centre is P), Draw ON perpendicular to the com- mon directrix, and with radius ON describe a circle about O. This will (in general) cut MBS in two points F and FP'. These are the foci of the $s two paths by either o f which the projectile can reach*

Fig. 8.

0. For by construction FO=ON, so

that O lies on the path whose focus is F. Similarly for F'. To find the most distant point along PO which can be

reached, with the given speed of projection from P, we

have merely to note that, as O is taken farther and farther

from P, F and F' If O be then at pendicular to the

approach B, and finally coincide with it. A, we have AT=AB, where AT is per- directrix. Hence, if we produce AT to BP, we have At=AP. Draw through ¢ a line tm parallel to TM. 'Then A lies on the parabola whose focus is P and directrix mt, This parabola is the envelop of all the possible paths from P. Any point within "it can be reached by two different paths. These come coincident when the point lies on the curve; and HO point outside it can be reached.

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§ 43. Many of the most important cases of motion of a Accelera- point involve acceleration whose direction is always towards tion to a definite "centre" as it is called. In such cases the motion fixed is obviously confined to the plane which, at any instant, aoa contains the centre and the line of motion af the point.

Also the "moment" of the point's velocity about the centre remains constant. Here a slight digression is necessary.

Der.—Given a directed quantity (a velocity, force, dc.) in Moment. a line AB (fig. 9). If a perpendicular OP be drawn to AB Jrom any point O, the "moment" of the directed quantity about O is the product of ats amount by the length of the perpendicular.

If the directed quantity be reversed, the sign of the moment is changed. The moment is, in fact, properly a directed quantity (or vector) perpen- O dicular to the plane OAB. And its

Fig. 9. numerical magnitude is double the area of the triangle OAB.

[S44. The convention usually made as to the sign of rota- Conven- tion about an axis is to regard it as positive when it ig in tion as to the same sense as that in which the earth turns about ‘2 of

angle,

its axis, as seen by a spectator above the north pole. angular

This is in the opposite direction to that of the hands of a velocity, watch. Hence the plane angle AOP (fig. 10), represent- &. ing the change of direction of a line

originally coincident with OA, is : positive, and is looked on as due to rotation about an axis drawn from O upwards from the plane of the 2 ‘ . figure. ‘Thus the rotation of the 0 A

sun and the orbital motions of the Fig. 10, planets take place in the positive direction about axes drawn on the whole northwards from the plane of the ecliptic; or we may put it thus :—seizing an axis by the positive end, we must wnscrew—by the negative end, we must screw—to give positive rotation. And when, later, we consider rotations about three rectangular axes, Ox, Oy, Oz, we shall suppose them so drawn that rotation through a positive right angle about Ox changes Oy into Oz, » OY Oz 5, Ox, ” Oz ”? Ox ” Oy, the three letters being throughout arranged in cyclical order, xyz, y2x, &e. | § 45. Here we must introduce a simple geometrical pro- Geometri- position — | te If any point be taken wm the plane of a parallelogram, and triangles be formed with the pount as vertex and with contiguous sides and the conterminous diagonal as their respective bases, the sum of the areas of the first two triangles is equal to the area of the third. Thus, in areas (fig. 11), OAB+OAC=OAD, If O lie within the angle BAC, as in fig. 12, the propo- sition becomes

3?

OAC-OAB=OAD.

A

Fig. 11. Fig. 12. § 46. Remembering that these areas represent half the

moments of the bases of the respective triangles about the

Equable descrip- tion of areas.

Analy- tical treat- ment of central accelera- tion.

Polar

= ft coordi- nates.

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point O (that of OAB being xegative in the second case above), we see that

The moment of a diagonal of a parallelogram about any point in the plane of the figure ts the (algebraic) sum of the moments of two conterminous sides.

Now, suppose the sides of the parallelogram to represent a velocity and its change. If the direction of the change pass through O, its moment is wil. Hence, for acceleration directed towards a fixed point the moment of the velocity about that point ts constant.

This is commonly expressed by saying that the radzus- vector describes equal areas in equal times about the point to which the acceleration is directed. For the moment of the velocity is double the area so traced in unit of time.

Another way of expressing the same thing is to say, that the angular velocity of the radius-vector is inversely as the square of its length. For the product of the square of the radius-vector and its angular velocity is double the area described by it in unit of time.

The converse of this proposition is also evidently true ; 1.€., when a point moves so that the moment of the velocity about a point in the plane of its motion is constant, its acceleration relative to that point (if any) is directed towards or from that pownt.

§ 47, Analytically : if P be the acceleration, directed towards a fixed point which we choose as origin, we have #= — Peos@= — Pa/r, j= -—Psin@= —Py/r,

(r and @ being the polar coordinates of the moving point ; we have

already seen that the path is necessarily plane). Eliminating P, we have

= idlia Nes O=ay—ye=— (7 6).

Thus xy —yi=r? =const. =h. This may be transformed, at once, by the methods of the differ- ential calculus, into ps=pva=h,

where p is the length of the perpendicular from the origin to the tangent to the path. Conversely, if equal areas be described by the radius-vector in equal times, we have

ré=a2y—yr=h. Whence or

xij —ye=0, t= Qz, i= Qy-

Hence the whole acceleration is Q7, and is directed towards or from the origin.

While we are dealing with these formule we may investigate the general expressions for velocity and acceleration in terms of polar coordinates for a point moving in a plane.

We have From these

x=reosé, y=rsineg.

e%=reosd—résiné, y=rsin 0+7r6cosé. Hence the speed along the radius-vector is zcosé+ysind= ; and that perpendicular to the radius-vector (in the direction in*

which increases) is yoos—zsind=rd.

These expressions might have been written down at once, if we note that 57 and r8é@ are the resolved parts of 5s along, and perpen- dicular to, 7. But we must be careful how we carry this species of reasoning one step further. Taking the second fluxions of x and y, we have ‘ .

& = (# — 76”) cos 0 — (276 +78) sin @,

9 =(#— 76”) sin @ + (270 +76) cosé. Hence the acccleration along the radius-vector is

#cos 0+ sin @=#—762,

and that perpendicular to it (positive when in the direction in which @ increases) is

: le al ig . alien Jos 0 – sin @= 246 +78 =———-(r 6).

*Thus, although * represents truly the speed along 7, # does not represent the acceleration in that direction. It represents, in fact,*

only the acceleration of speed along r. But we have seen that there is acceleration along 7, if its direction changes, even when its length is constaut, %.¢., when the path is circular ; and in that case 76? jg the quantity which we designated as pw? in § 38.

As a verification of these formule, let us consider uniform motion in a straight line.

Here rcosd=a, the equation of the straight line, and atand=Vi,

We have

**=asccotand.6, V=ascc?0.6 =7°6/a; r=Vsine,*

#=Vcos6.0 = 7 -— –

the condition of uniform motion.

Here, although there is no acceleration, # hasa definite value. But | #— 1rP=a®V2/r9 — a2V24f=0, | From the expressions for the acceleration along and perpendicular |

to the radius-vector we at once obtain the result above (§ 46). For, if there be no acceleration perpendicular to the radius-vector, |

we have

from which 726 =const, =h.

We have, in addition to this, the expression for the acceleration towards the origin, #-7@=-P.

#-/r=-P.

This gives r in terms of ¢, and thus reduces (if we please) any ease Reduc- of a central orbit to a corresponding case of rectilinear motion, tiontoa — The difference between the accelerations in the revolving radins- case of vector and in the fixed line is a term depending on the inverse recti- cube of the radius-vector. But the usual mode of procecding is as linear motion. | |

Eliminating 6, we have

follows. Multiply by #d¢ and integrate, then

=, :

P45 = 0 – 2/Par ; | drat HP or (G) ate =C – 2/Par. The left-hand member obviously represents the square of the) velocity, as it is the sum of the squares of # and ré. For we have nt ys | ae doe | This gives a relation between rand @, which is therefore the | polar equation of the ~~*path described. It is usual to employ, instead of r, its reciprocal 1/r—w. With this the equation be*~~ *comes*

»| (dw . ve! Pdu h ((*

Differentiating with regard to 6, and dividing by ine , we ob-

tain finally

FD P Polar' aH t= ab? equation () U of path.

an equation of very great importance. : When there is acceleration T perpendicular to the radius-vector, . as wellas —P along it, this equation takes the form

i)

§ 48. There are two specially important cases of central i? acceleration. The first is that of the gravitation law," " the other that of Hooke's law. We will take these m order, but by very different methods.

§ 49. Planetary Motion.—With the gravitation acceleration varies inversely as the square of the from the point to which it is directed. But, as we have just seen, the angular velocity of the radius-vector, %¢, 0 the direction of acceleration, varies according to the same law. Hence in the hodograph, the linear velocity (whose

magnitude is that of the acceleration in the path) is pro-

Jaw the Plane- °

'stance t2Y, | dista motion. —

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portional to the angular velocity of the tangent (whose direction is parallel to tle acceleration).

Thus, in the hodograph, the angle between successive tangents is proportional to the arc between their points of contact ; and therefore the curvature is constant ;—7.c., the hodograph 1s a circle.

Let A (fig. 13) be the centre of this circle, O the pole of Then

These give at once, by squaring and adding, (¢—a?P+(y- Bp)? =p/h?, | the equation of the circular hodograph. Also, by multiplying the

~ by y, and subtracting it from the second multiplied by z, we lave

h—-Bet+ay=rulh,

the equation of the orbit. This is evidently a conic section of which the origin is a focus,

the hodograph, P any position of the tracing point. OP is, in magnitude and direction,

the velocity in the orbit. But it may

be looked on as consisting of two

) parts, OA and AP. Of these both

are constant in magnitude; but OA _

is constant in direction, while AP is P perpendicular to the direction of ac-

celeration in the orbit. Hence the

velocity in the orbit is the resultant Fig. 13, of two constant parts,—one always in a fixed direction, the other always perpendicular to the radius-vector.

i The directrix corresponding is the ine

Pp ay — Bxet+h=0, and the excentricity is

hr/ a? + BH .

From these the major axis can be calculated.

§ 50. Hiliptic Motion about the Centre.—When a point Central moves uniformly in a circle, the motion presents very differ- accelera- ent

appearances according to the spectator's point of view. set ws: If we suppose him to be situated at a distance very great i a compared with the radius of the circle, he sees what is prac- dius- tically an orthographic projection of the orbit on a plane vector.

This gives the form of the orbit as follows :— t—a(e—y/r), g=a2/r ; so that Th = xe + YY =Cry , or r=e (y+) ; where the meanings of the quantities are obvious.

But if PO cut the circle again in p, Op is proportional to the perpendicular on the tangent to the orbit from the centre of acceleration (because PO.Op is constant) and is at right angles to it (because it is in the direction of the velocity). Hence the path is such that the locus of the foot of the perpendicular from the centre of acceleration on the tangent isa circle. This property belongs excla- sively to conic sections, one focus being the point from which the perpendiculars are drawn.

A third and even simpler mode of treating this most important problem is as follows. Draw OM perpendicular to PA (produced if necessary) and PN perpendicular to OA. Then OM is the resolved part of OP parallel to the tangent at P, 2.¢, it is the speed with which the length of the radius-vector changes. Also PN is the resolved part of OP perpendicular to the fixed line OA, ae, it is the speed with which the moving point travels in a fixed direction. But by similar triangles OAM, PAN, we have

OM: PN: : OA : AP=a constant ratio.

Hence the increment of the radius-vector bears a constant ratio to the simultaneous increment of the distance of the moving point from a fixed line in the plane of motion. This is only a slightly altered form of statement of the focus and directrix property of conic sections.

When O is within the circle, the constant ratio is less than unity, and the conic is an ellipse; when without, the ratio is greater than unity, and we have an hyperbola. When O is on the circumference of the hodograph, the path is a parabola ; for the ratio is unity.

In a subsequent section we will return to this question,

and treat it from the point of view of Kepler's Laws of Planetary Motion.

perpendicular to the line of sight. In general, an ortho- graphic projection of a circle is an ellipse—whose centre is the projection of that of the circle. As equal areas are projected orthographically into equal areas, the appearance is therefore elliptic motion, in which the radius-vector from the centre describes equal areas in equal times. Hence (§ 46) the acceleration is directed towards the centre. But accelerations are projected like velocities, and like lines. Hence, as the acceleration in uniform circular motion is constant, and directed towards the centre, so in elliptic motion, with equable description of areas about the ceutre, the acceleration is towards the centre, and is proportional to the length of the radius-vector.1 But this projected orbit may again be projected orthographically, as often as we please, on different planes. It will always remain elliptical, and with the radius-vector from the centre describing equal areas in equal times. And the acceleration will always be in the same proportion as before to the radius-vector. However different in size and shape these elliptic orbits may be, they have one common property, the time of describing them ts the same.

Thus we see that when the orbit is an ellipse described about its centre of figure the acceleration is central, and proportional to the radius-vector. The time of describing such an ellipse. depends only upon the ratio of the acceleration to the length of the radius-vector; or, if we choose, upon the magnitude of the acceleration at unit distance. And the converse of this proposition is also evidently true. When we look edgewise at the uniformly-described circular path with which we commenced, it is seen projected into a straight line, in which the moving point appears to oscillate. This is the case, for instance, very approximately, with the satellites of Jupiter as seen from the earth. Sun-spots, the red-spot on Jupiter, &c., all appear to move approximately in this way. But the extreme importance of this species of motion is that it is the simplest type of oscillation of a particle of matter displaced from a position of stable equilibrium. The

naly- Simpl ; , vibrations of the ether when homogeneous plane-polarized val? ge pimple as are the geometrical methods above, the direct analy- | 1; : : h it. of the air when a pure musical a tical one is still simpler. For we have ; light 18 passing throngh it, o P

note is sounded, the oscillations of a pendulum (through

Pa: =. small arcs), the simplest vibrations of a pianoforte wire or a tuning-fork, the indications of a tide-gauge when the _ oe ety Y= +4;sino sea is calm,—all are instances of it. Hence the special

Hence, as before (§ 47),

ty —ye=rO=h ; and therefore, by eliminating 72, we have bid

7,310. é,

i= — 5 cos0 . 6, g=-

So that ae Lg eee t-a 7, 108, ¥-B8 +-7- cos 0.

necessity for studying it in detail.

§ 51. Der.—Simple harmonic motion ts the resolved part, san larmo- nic mo-

parallel to a diameter, of uniform circular motion.

tion 1 The elastic force called into play by displacement is, by Hooke's law, proportional to the displacement, and tends to restore the dis- placed particle to its equilibrium position. We mention this, in passing, to show the importance of the present investigation,

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Let a point P (fig. 14) move uniformly in the circle APA'. Then, drawing any diameter AOA', and PM per- pendicular to it, the motion of M is simple harmonic.

The speed and acceleration of M are obviously the resolved parts, along AA', of the speed and ac- celeration of P. Hence if V be the speed of P we have

speed of M= aot Fic, 14, . MO acceleration of M= p69 x acceleration of P MO v2. v? |

=Ppo PO Po? MO. From these expressions we see that, if we call w the angular velocity of OP, so that w= V/PO, we have speed of M@=PM.a, acceleration of M=M0O.o?.

Thus the speed of M increases from A to O,—being zero at A, and V at O; then it falls off to zero at A', and goes through the same numerical values in-the opposite order, when the direction of motion is reversed at A'.

The acceleration of M is always directed towards O. It has its greatest value at A and again at A', and is always proportional to the distance from O. If T be the period of the simple harmonic motion, 1.¢., the period of rotation of P in the circle, we have

Qe le

4

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slip of paper is drawn by clock-work uniformly past the moving point, in a direction perpendicular to its line of motion, and a record is made by mechanical means, b

a pencil, by an electric spark, or (best of all) by photo- graphic processes. When this process is applied to a simple harmonic motion the record is of the general form of the curve in fig. 15. This curve has long been known ag

ee

Fig. 15.

the "curve of sines," or the "harmonic" curve. Allits forms can be deduced from any one of them by mere extension or foreshortening in the vertical or horizontal directions in the figure. It represents the simplest forms into which a vibrating string can be thrown, as well as the instantaneous form of a section of the surface of water along which a simple series of oscillatory

waves or ripples is pass- ing. In this case the form of the section remains the same as time goes on, but the whole figure moves steadily onwards in the direction in which the waves are travelling. This is expressed analytically by the form y=acos(nt — mz),

‘ : : ; pression where # and y are horizontal and vertical coordinates of a point at foy a

the surface of the water, y being measured from the level of the wave, undisturbed surface. When 2 is constant we study, for all time, the simple harmonic rise and fall at a particular place. When ¢ is constant we have the above-figured instantaneous glance of a sec- tion of the whole water-surface.

The rate at which the wave travels is obviously n/m ; for, if we increase é by any quantity +, and 2 by the corresponding quantity nr/m, the value of y is unaltered.

Analyti- cal ex-

where a is the radius of the circle, or, as it is also called, § 54. We have next to consider the result of superposing Compo-

*Ampli- the “amplitude” of the simple harmonic motion. We | or compounding two simple harmonic motions which take sition of tude. inay now write as the characteristic of this species of | place in the same line. The geometrical method amply mele motion suftices for: this purpose provided the periods of the — Pe 19, oS ato atte equal, however different may be their amplitudes and their tions in Re EES | Ee For, if we apps EA (fig. 16) to turn about P in one line. displacement the same plane and with the same a aner ng acecleration * angular velocity as OP about O, the Q . : – | angle OPQ will remain unaltered, and aT § 82. MA a ty ng — at siinple —— hee oe pe triangle OPQ will remain ek. motion the following terms will be found convenient. Pis| oe oo sant size and form while tum- the position at time ¢ of the point moving in the circle. |. bout O. ‘Thus. Q desde P Let E be its position at the zero of reckoning, when ¢= 0. ms ae . ei a ‘c ” circle about O in the given period. Then the angle AOP may be called the “ phase” of the The resolved parts of OP, PQ, alone O R/A simple harmonic*

motion, and AOE the “epoch.” In time c di Od, ‘he o a / i f the phase and epoch are found from | ®2Y “ameter s opel? ae Gnits fig Swnte0 ei P the resolved part of OQ along the Fig. 16. heir enya Ge ee Oy as . |sameline. Hence two simple harmontc motions, of the same EE Ch poster ot SO eRe maerene ep imple hastens period and in the same line, are equivalent to a single simple moplon, be deat, Oye Be pas pene harmonic motion of the common period. The amplitude 220 ROE aetOe, of the resultant simple harmonic motion is OQ, and = OPcos(POE+EOA), depends only upon OP, PQ, and the angle OPQ,—the mason et Oe amplitudes of the two component simple harmonic motions This expression is to be found, perhaps more frequently | and the supplement of the difference of their phases. than any other, in all branches of mathematical physics. § 55. When the difference of phase is m2, or any whole Amp It is in terms, or series of terms, of this form that every | numberof circumferences, the resultant amplitude 1s thesum “9 periodic phenomenon can be described mathematically, as | of the amplitudes of the components, which is its greatest cuit. will be seen later. From the expressions for the longitude | value. When the difference of phase is an odd number of ant. and radius-vector of a planet or a satellite to those of the | semi-circumferences, the amplitude of the resultant 1s the most complex undulations whether in water, in air, or in | difference of those of the components. A the luminiferous medium, all are alike dependent upon it. If we produce QP to meet OA in R, we see that — ; The results obtained geometrically above are easily reproduced | the phase of the resultant simple harmonic motion, 1s Inter from this form :— raediate in value to the phases of the components, which are Leone b— —awain (wt + €); POA and QRA respectively. Its excess over the one, a B= — aes? cos (wt + €)—= — aa”. and its defect from the other,are the angles at Oand Q im Graphic ¢ 53. The simplest graphical method of exhibiting the | the triangle OPQ; and their sines are to one ee. – conta, nature of any kind of rectilineal motion is to compound it | the separate amplitudes QP, PO. Hence, when f ee tien, with a uniform velocity in a direction perpendicular to the | plitudes differ, the phase of the resultant coincides

line in which it isexecuted. This is, in fact, what is done in the majority of self-registering instruments, where a

nearly with that of the component whose amplitude is the greater.

Analytically the resultant motion is expressed by ¢=acos(wt+e)+a'cos(wi+e'), =(acose+a' cose') coswt — (asine+a'sine')sinwt, =Pcos(wt+Q), provided that

Analyti- sal treat- ioent.

|

wm

PcosQ=acose +a' cose', and PsinQ=asine+a'sine'.

These expressions give for the amplitude of the resultant

P= (acose +a' cose')? + (asine +a'sine')?, = (a? + 2aa'cos(e-) +02, This may be put in cither of the forms

nfae ay — daa! sin(e— €) or V(a = af P+ Aaa' coe €), from which the above conclusions follow at once. Also, for the epoch of the resultant, we have | nate a@cose+a@ cose*

intermediate in value to tan ¢ and tan ¢'.

When the periods of the components are not exactly equal, the simple artifice which follows enables us still to apply the same method of composition. We have now

x=acos(wt+t e)+a'cos(w't+e'),

= 0008 (wi + €)+a' cos (wit e'+(w'—w)t). Hence the above values of P and Q will still satisfy the conditions if we write ¢'+-(w'—w)t instead of ¢'. Thus we may treat the two components as being of the same period, but make the epoch of one of them steadily increase with an angular velocity equal to the difference of the angular velocities in the gencrating circles of the components. .

The triangle OPQ will no longer preserve its form ; it will pass continuously through all the various forms which we have seen would be given to it by various differences of phase in the com- | ponent simple harmonic motions. The time in which it returns to | a former value is evidently 2x/(w'-w), which is greater the more nearly equal are the periods of the components.

§ 56. One of the best examples of the principles we have ol. just discussed is furnished by the tides. If there were nd DUE one tide-producing body, we should have (approxi- mately) a simple harmonic rise and fall of the sea-level at any given place twice over in the course of about twenty- four hours, and the phase would depend simply upon the distance of the tide-producing body from the meridian (whether above or below the pole). The joint effect of the sun and moon is practically the resultant of the effects which they would separately produce. Hence, when these

at full moon), the whole rise of the tide is the sum of the

| | | bodies are in conjunction or in opposition (¢.¢., at new or | solar and lunar tides ; and we have what are called "spring

Sompo- § 69. To compound any number of simple harmonic _— of motions, of equal periods, in one line, we may obviously

'han two '@ke them two by two, and apply the preceding process imple OVer and over again till we have as final resultant another

1amo- simple harmonic motion of the common period. lc mo-

teal Or thus :— – %—=Sacos (wt +)=coswtS(acose) — sin wtZ(asine)=Pcos(wi+Q), seriod, Where PeosQ=X(acose), PsinQ=X(asine).

When the separate periods are not equal, and not even nearly equal, it is only in special cases that any simplifica- tion can be effected by analytical processes. But this is not much to be regretted, because for most purposes a

[wo graphic method is sufficiently accurate, and it can always — be easily carried out.

aa § 60. We must now consider the composition of simple ions at Darmonic motions in directions at right angles to each ight other ;—but for the present we confine ourselves to the angles. case in which their periods are equal. In this case we

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When ¢ and ¢ are both positive and less than $2, this is obviously |

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tides." When the moon is in quadrature, the amplitude of Spring the tidal rise or fall is the excess of the lunar over the ee Ben? solar tide, for it is low water as regards the sun when it is — high water as regards the moon, In intermediate positions

'the effect lies between these extremes, but the joint high-

tide lies nearer to the crest of the lunar than to that of the

solar tide. In the first and third quarters of the moon,

high tide is earlier than the high tide due to the moon alone ;

in the second and fourth dater, This is what is called

" priming" and " lagging " of the tides, and is seen at once Priming to follow from the construction given above. Had the and lag- lunar and solar tides been of equal amplitude, spring tides 8'"° would have been of double the altitude of either, and there

would have been no tide at all at the time of neap.

The mode in which we have treated this special case is an illustration of the general method (above described) of combining simple harmonic motions in which the periods are slightly different.

§ 57. What we have said of the tide-waves holds of Compo-

course of all waves in which the separate disturbances are sition of so sniall that the joint effect is found by superposing the ab tt separate effects. Thus when, at sea, two series of waves pene- of equal length mee? at any place, the resultant is still a rally. set of waves of the same length, but the altitudes and phases of the components determine those of the resultant. When crest meets crest, we have waves of the sum of the original amplitudes; when crest meets trough, the difference. In the latter case we have still water when the amplitudes of the components are equal. What is called a "jabble,"—where, for a short time, a portion of a stormy sea is almost calm, and after a little it is violently agitated,—is the result of a number of ' cross seas."

§ 58. If we now consider the instantaneous form of a Common section of the surface, instead of the successive displacements pheno- of one portion of it, we can easily account for a striking ™°" phenomenon which is very frequently observed on a shelv- ing beach. We often notice that every ninth or tenth wave or so is higher than those immediately before or after it. This is the result of superposition of two or more sets of waves in which the distance from crest to crest is different in the different sets. In the joint system we have, represented as in § 53, phenomena akin to the spring*

"and neap tides, and the priming and lagging of the tides.

Fig. 17 shows part of the result when the amplitudes are equal, and the wave-lengths as 15 to 17. It gives also a rough approximation to the whole result when the lengths are as 7 to 8 or as 8 to 9,

know that the acceleration is in the same ratio to the displacement in each of the two rectangular directions. Hence by the general theorem

of § 50 the motion is elliptic, 2 a Be : C with uniform description of Px vA areas about the centre. scam " A To analyse this, suppose, at —_|/ "IN Pu a starting, that their amplitudes ,, [1 Pee at x also are equal. Let OA, Mi

OB (fig. 18) represent the | two rectangular directions. With centre O, and radius equal to the common ampli- ~ tude, describe a circle. Let AOE, BOF represent the Fig. 18.

epochs of the two components (the corresponding circular motion being supposed positive for each), then obviously EOF exceeds by a right angle the difference between the

Simple phases of the motions in OB and OA. Then if P, Q harmonic represent at time ¢ the corresponding positions in the eae common circle, we have arc FQ=are EP; and if perpen- angles, iculars be drawn, PM to OA, and QN to OB, their

intersection S is the position at time ¢ in the resultant motion. The locus of S is, by what has been proved above, an ellipse which touches the sides of the square CDC'D".

When EOF isa right angle, .¢e, when the phases are alike, this ellipse becomes the diagonal CO' of the square touching the circle at the extremities of AA' and BB'. When EOF is three right angles, the ellipse becomes the diagonal DD'. When it is two right angles, or four, «e., when OB is one quarter, or three quarters, of a period in advance of OA, the ellipse becomes the circle ABA'B'. 'Co find in any case whether it is described positively or negatively (§ 44), we have only to notice how OS turns. Now while P is near A, MS remains closely coincident with AC. If, then, Q be anywhere in the semicircle BA'B', N moves in the direction BB' and the angle AOS dumzneshes. Hence the ellipse is described negatively (or in the direction of the hands of a watch) if the epoch of the motion in OB exceeds that of the motion in OA by anything up to two right angles. And similar reasoning shows that, if the excess be from two to four right angles, the ellipse is described positively,

If the amplitudes be not equal, we have only to extend or foreshorten the figure parallel to OA or to OB. The square CDC'D' becomes a rectangle, in which the orbits (all of which, with the exception of the diagonals, are now ellipses) are inscribed. Everything else is as before.

§ 61. When the periods in the two component motions are nearly, but not quite, equal, the phase of one gains gradually on the other, and the path passes continuously through the forms of all the possible ellipses, but

remains possessed of the one property common to them all. It becomes a species of spiral, but in every convolution it touches, in succession, each side of the square or rectangle above discussed.

§ 62. Similar reasoning shows that the superposition of any number of simple harmonic motions in any directions and with any amplitudes and differences of phase, provided the period is the same for all, gives rise to motion in an ellipse about the centre. But this follows more easily from analysis.

Take, first, two simple harmonie motions of the same period parallel to the axes of wand y. 'We have

x=acos(wite), y=a'cos(wtt e'),

Periods nearly equal.

Simple harmonic motions of one period, in any direc- tions.

Eliminating ¢ between these equations, we have at once

a ay , y gael Ony st = 2 goose — ¢)+ ein (e'-€), the equation of an ellipse.

It becomes a circle when and only when

a=a, cos(e'-e)=0,

i.c., when the amplitudes are equal, and the phases differ by an odd number of right angles. It becomes the straight line

z/a—-yla'=0, when e'—« is zero; and zlaty/a=0, when ¢'—e is two right angles. If SOA be ealled 6, we have y _a'cos(wt +e')

Se a acos (wt + €)

=—(cos (e —) —sin(e' — e)tan(wt +)). Hence, taking the fluxion of each side,

f seo?0. 6= – ew sin (e' — e)sec?(wi +).

Thus, as before, 6 is essentially negative, é.¢., the rotation in th ellipse is right-handed if ¢' —¢ lie between 0 and T, lefi-bauldal if it lie between w and 27.

For a simple harmonic motion, denoted by é=acos(wi+e), in a line whose direction cosines are 7, m, », we have the com- ponents Jz, mé, né parallel to the three axes respectively. Hence for the resultant of any number of such, all having the same period, we have ; w=. alcos(wt +) = coswtX(al cose) — sinwi3(alsine). Thus we have three equations of the form x=Acoswit—A'sinwt, y= Beceoswt — B'sinwt, 2=Ccoswt—C'sinwt.

If we take three quantities A, w, v, such that

aAA+pB +vC =0,

AA' + vB' +rC'=0, we have also

Aw+ pyt+ve=0. The first two equations determine without ambiguity the ratios of wand »yto a. Hence the third is the equation of a definite plane in which the path lies. We may now choose this plane as that of a, y. The value of z above becomes identically zero; and the elimination of ¢ between the equations for x and y gives the ellipse as before.

§ 63. When the periods of the simple harmonic motions Periods

are not equal we have not

x= aecos(wt+e), y=a'cos(witte'). ea. It is easy to trace the corresponding curve by points; but, except when there is a simple numerical ratio between w and w', the equation cannot be presented as an algebraic one between xand y. If 2w'=, we may shift the epoch

so that the equations may be written x=acos(2w't +a), y=Woosw't . Eliminating ¢ from the first, by the help of the sccond, we have

2y? 2 a 2-(% os oosa~ 2/1 Yisina. a a a a" This denotes, in general, a curve of the fourth order, of a figure-of- 8 form, as in fig. 19. When a=nm the

curve is a portion of a

ECCS

Fig, 19.

parabola, its vertex being to the right or left as » is odd or even. This parabola corresponds, in the present case, to the straight lines in the case of §62. When the periods differ slightly from the ratio 2:1, the path passes in succession through the forms traced, for- ward and backward alternately; and, each time that it opens out from the parabolic form, the tracing-point describes it in the opposite direction to that in which it deseribed it before the path collapsed into the parabola.

illustrated are sufficient Com- one position

0.

§ 64. The principles already for the examination of every case of this kind. But or two particular cases merit special notice. The case of

plane, we have already noticed (§ 54). Q : circle about P, P its circle about O, and the result 1s uniform circular motion of Q about O. The radius of this circle may be equal to the sum or difference of the radii of the separate circles, or may have any intermediate value, according to the difference of phase. If the periods be not exactly equal, the motion takes place virtually m a circle whose radius continuously oscillates between the above limits. The path is a species of spiral, which hes between two concentric circles of these radii.

§ 65. When the component circular motions are = opposite directions, we have an extremely interesting a0 important case. It is obvious that there must now a positions in which OP and PQ are in the same straight

: : uniform two uniform circular motions of equal periods, 1 ONE greular describes its motions.

line, Let OA, AB (fig. 20) be one of these. Then, in any other position, OP and PQ are equally inclined to OA, The path of Q is an ellipse, of which the major semi-axis OB is the sum of the radii, and the minor axis their difference. Hence when the radii are equal the result is simple harmonic motion in

the line OBB'. Thus we have

the proposition, of very great importance in optics, that a —~—— simple harmonic motion may B

be looked upon as the resultant

of two equal and opposite circular motions in one plane. Fig. 20.

When the periods are not exactly equal, the motion may be regarded as simple harmonic motion, in a line which rotates with uniform angular velocity in a plane. This is the case of Foucault's pendulum, and of plane polarized light passing along the axis of a crystal of quartz, or through a piece of glass or other transparent substance in the magnetic field.

'jeoids, § 66. Uniform circular motions, of different periods,

give epicycloids, &c. A particular case is uniform circular motion superposed on uniform rectilinear motion, in which case we have cycloids, &c. But these we merely mention. § 67. By far the most important of the applications of simple harmonic analysis is summed up in what is called Fourter's THEoREM.—A complex harmonic function,

- with a constant term added, is the proper expression for any

periodic single-valued function, and, consequently, can express any single-valued function whatever between any assigned values of the variable.

To show the importance of this in physics we need take but a single example. The one essential characteristic of a musical sound is its " periodicity." Hence it may be analysed into a series of simple harmonic disturbances. Their respective periods are the fundamental period, its half,

third, fourth part, &c. The first gives the pitch of the note ; the others determine its quality. The investiga- tion which follows is not intended to prove the theorem; it is merely introduced as readily suggesting it.

The essence of periodicity of a function fis that we must have flx+4a]=flx-40]

whatever be 2, provided @ be the period. We may write this as

its '4b et sa)=e #4 f®, or ad ad (g2az- g7 2a) f(z) =0. Now the equation gi® eo i 9 has the real root t=-0, and the infinite series of pairs of imaginary roots ot ca tinV 1 3

where 7 is any integer. Hence

a — ga 4 22/2%0?) (1+ e/42n (14 2/6e2) « so that the differential equation for f(z) gives, besides a constant term, the infinite series of terms due to solutions of cquations of the second order of which the type is :

(sema(Ze) +1)Aa)=0.

The solution of this representative equation gives the following particular integral of the complete equation,

J(x) = Picos (Qiwaa-1+ Qi). Hence the general solution is fi) = Ag+ &° Picos(2imxa~1+ Q:)

=Ayt+ SP Ajcos2inza 1+ 30° B,sin 2iraa-?,

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where the constants are to be determined by special integration, according to the process already described in the article Harmonic ANALYSIS (g.%.).

As a single example, suppose that the value of /(z) is unity from x=0 to =a, and zero from z=a@ to w=2a, This has many applications, as, for instance,

to alternate heating and cooling of one surface of a solid, alternate " make and break" with a battery and a telegraph wire, &c. In this case we have

i Bio Ls, Che S@)=st = pn 5

§ 68. A point describes a logarithmic spiral with constant angular velocity about the pole; find the acceleration.'

Since the angular velocity of SP (fig. 21) and the incli- nation of this line to the tangent are each constant, the linear velocity of Pis as SP. Take a length PT, equal to e.SP, to representit. Then the hodograph, the locus of p, where Sp is parallel and Pp equal to PT, is evidently another logarithmic spiral, similar to the former, and described with the same con- stant angular velocity. Hence pt, the acceleration required, is equal to e.Sp, and makes with Sp an angle equal to SPT. Hence, if Pw be drawn parallel and equal to pt, and t uv parallel to PT, the whole Fig. 21. acceleration Pu may be resolved into Pv and vu; and Pvuw is an isosceles triangle, whose base angles are each equal to the angle of the spiral. Hence Pv and vw bear constant ratios to Pu, and therefore also to SP or PT.

The acceleration, therefore, is composed of a central acceleration proportional to the distance, and a tangential retardation proportional to the velocity. And, if the resolved part of P's motion parallel to any line in the plane of the spiral be considered, it is obvious that in it also the acceleration will consist of two parts—one directed towards a point in the line (the projection of the pole of the spiral) and proportional to the distance from it, the other proportional to the velocity but retarding the motion. Hence a particle which, unresisted, would have a simple harmonic motion has when subject to resistance propor- tional to its velocity a motion represented by the resolved part of the spiral motion just described.

If a be the angle of the spiral, w the angular velocity of SP, we have evidently PT. sina=SP.w.

Hence PT"

Pu=Pu=pt= =p one

T

“wo? sin? a

SP=n?. SP (suppose);

and wu=2Pv. cosa 2°84 PT — ok . PT (suppose).

Thus thecentral acceleration at unit distance is 2? = w?/sin?, and the coefficient of resistance is 24 = 2wcosa/sina.

The time of oscillation is evidently 27/w ; but, if there had been no resistance, the properties of simple harmonic notion show that it would have been 27/n; so that it is increased by the resistance in the ratio coseca : 1, or ni lu2—k The rate of diminution of SP is evidently

*PT. cosa= ce * SP=KSP ; sIna*

that is, SP diminishes in geometrical progression as time inereases, the rate being & per unit of time per unit of length. By an ordinary result of arithmetic (compound interest payable every instant) the diminution of log SP in unit of time is &.

1 The physical application of this problem to pendulum motion, taking place in a medium in whieh there is resistance proportional to the velocity, will be afterwards discussed analytically.

XV. — 87

Resisted harmonic motion.

Relative motion.

Revolv- ing axes.

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Hence, in the resolved part of the motion, the logarithm of the amplitude is diminished, every half vibration, by ker/w.

This process of solution is only applicable to of harmonic vibrations when 2 is greater than & When » is not greater than & the auxiliary curve can no longer be a logarithmic spiral, for the moving particle never describes more than a finite angle about the pole; and then the geo- metrical method ceases to be simpler than the analytical one.

§ 69. What we have said about composition of motions is merely a particular case of the general question of relative motion, which in its main principles is exceedingly simple. It is entirely comprehended in the following pro- positions,—which may be regarded as almost self-evident.

Given the motion of A with regard to a point O, and that of B with regard to A, to find that of B with regard to O.

By compounding the vectors of relative position OA, AB, we have at once the required vector OB. Thus it is obvious that we have only to add the separate com- ponents of the velocity of A with regard to O, and those of B with regard to A, to obtain those of B with regard to O. And, of course, the same rule applies to the accelerations.

If x, y, 2 be the coordinates of A (referred to O) at time t; 2', y', # those of B referred to parallel axes from A; é, 7, ¢ those of B referred to O ; we have at once

t=a+a, n=yty', C=24+2. They give, by differentiation with regard to ¢, f=£4+%, &e., E=# +2', &c., which constitute the analytical proof of the statement above.

§ 70. Hence we have the solution of the further question : Given the motions of A and B with regard to O, to find the relative motion of B with regard to A. In this case, of course, before compounding, the vector of A must have its sign changed.

Another very important case is that in which the motion is referred to axes which are themselves moving. So long as their directions remain unchanged, this reduces itself to the former investigation as a mere question of changed origin; so that we need consider only the effect of the change of direction of the axes. And this is at once de- ducible from the results of last

section. For we have only to consider, iustead of the moving point, its projections on the moving axes, and find their velocities and accelerations relative to fixed axes.

Thus, if the rectangular axes of x and y be fixed, and those of € and 7 be rotating in the same plane, we have a datum of the form,

6=angle {0x=f(t),

iving the position of the moving axes in terms of the time.

5)

resistance

Let be the moving point, and PM perpendicular to O€ (fig. 22). Then, as the polar coordinates of M are t, 0, we have, for its velocity, n Zalong Of, g6along MP.

But these must be combined with the velocity of P relative to M, which consists of

1. *along MP and 7 parallel to g0. Thus the velocities parallel to fixed lines corresponding to the instantaneous positions of Og and Oy are, respectively, £-76 and 9+%6.*

In the same way it is easy to see, by § 47, that the corresponding components of the acceleration are

Fig. 22.

*, ld £*iG= ae?) and #- dS).*

Kinematics of a Rigid Plane Figure, displaced in its own Plane.

_ § 71. When a rigid plane figure is displaced anyhow in its own plane, the displacement may always be regarded as

the result of a definite rotation about a definite axis per- pendicular to the plane.

Let A, B, A',B' (fig. 23) be successive positions of two points of the figure. Bisect AA' by the line Oa perpendi-

Pi.

B' b B Fig. 24, Let these

Fig. 23. cular to it, and let Ob do the same for BB'. perpendiculars meet in O. Then it is clear that the two triangles OAB, OA'B' are similar and equal. Hence AB may be regarded as having passed to the position A'B' by rotation about an axis through O perpendicular to the

plane of the paper. The angle of rotation is AOA' or BOB'. |

The construction fails when Oa and O6 coincide, but in i this case it is evident that the required point O is the point of intersection of BA and B'A' (fig. 24). It also fails when the bisecting perpendiculars are parallel (fig. 25). But then AA' and BB' are equal and parallel, and the dis- placement is a pure transla- tion, the same for every point of the plane figure, which may be regarded as an infinitely small rotation about an infinitely distant —

5 ig. 25. axis.

§ 72. Since any displacement in one plane corresponds Com- in general to a rotation, any two or more rotations about – parallel axes can always be compounded into a single one. rotatiol Of two equal and opposite rotations the resultant is simple apout | translation. This is evident from fig, 26. In both cases parallel A and B are the initial posi- oe tions, A' and B' the finalA positions of the two axes. In the first we begin with the rotation about A, in the B second with that about B.

' AN' B/ § 73. When these equal rotations are simultaneous a instead of successive, the A

figure becomes a rectangle; Fig. 26. —.¢., the translation is per- _ pendicular to the line joining the axes. For in this case we may suppose the two rotations to be each broken up | into successive equal but infinitesimal instalments. And

the principles of infinitesimals show that two such instal- ments, either about the same or about different axes, pro- duce the same ultimate effects whetherthey be applied simul- taneously or successively. The general principle of which ard this is a particular case is' called the "principle of super Fr position of small motions."

Tt is merely an application of notion the fact that infinitesimals of the second order may be neglected in comparison with those of the first order. |

om- The consideration of simultaneous rotations is very important.

es yelocity w, about the origin. tance from the origin is 7. The components are, therefore, t= -— Yo, Y=Xw. If the rotation be about the point a, 6, these become &=—(y—b)o, y=(2-a)o.

gout varallel axes.

C= ew

and °

y=(x-a)Q.

*Sa **

f= == B)Q,

| _ S(aw) (bw) , | we have

have if there were only a single rotation, with angular velocity Q, about an axis passing through the point a, B.

When we see that

3(w) =2=0, L=X(bw), Yy=- aw), so that all points of the figure have equal velocities.

parallel axes, we have

| t= -YSotX(bw), y=rEw— (aw). | If we write 0=Su,

case of pure translation.

|

about an infinitely distant axis. ‘Rolling ncurves of displacements by a series of rotations. Also if we know the positions, in the figure itself, of the points which are successively the axes, and likewise the position which each of them occupies in space at the instant when the rotation about it takes place, we can construct the whole) motion, Let them be O, A, B, C, &c., and O, a, b, ¢, &e., | respectively (fig. 27). Then the figure turns about O till A coincides with a. Next it turns about C | A (or a) till B coincides with 0, and ae

so on. Hence the motion will be represented by the rolling of the poly- gon OABO, fixed in the moving figure, 9 on the polygon Oabc fixed in the

. plane of the motion.

In the limit, when the axis con- b

| tinuously shifts its position in the

figure while the rotation goes on round C it, the polygons become plane curves. oni

Thus we have the fundamental proposition that any motion of a plane figure in its own plane can be represented by the rolling of a curve attached to it, on a curve fixed in space. Both curves are situated at an infinite distance when the motion is one of pure translation.

Kinematics of a Rigid Figure.

Displace —§ 75. When aspherical cap, or skin, moves on the surface ae of a sphere of equal radius with which it is everywhere in

about its Contact, we may make the construction of § 71 with great circles bisecting the areas AA' and BB'. Two great circles (unless they coincide) always intersect at the extremities of one definite diameter. The case of coincidence is met exactly as it was in§ 71. Hence every motion of a spherical skin on a sphere is equivalent to a rotation about a definite axis through the centre of the sphere. Thus any number | of successive or simultaneous rotations about axes passing through one point can be compounded into a single rotation about an axis passing through that point. And the con- struction of § 74 can be carried out with spherical polygons or curves, so that we see that any motion of a rigid figure, one point of which is fixed, can be represented by the rolling of a pyramid or cone, fixed in the figure, upon another fixed in space.

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Suppose a plane figure to rotate in its own plane, with angular _ Then it is obvious that rw, in a 'otations direction perpendicular to 7, is the velocity of a point whose dis-

Hence, when there is any number of simultaneous rotations about

These are the component velocities which the point x, y would

This is the Here a and 8 are (in general) each infinite ;—7.c., we have as resultant a vanishing angular velocity

§ 74. As any displacement of a plane figure in its own ofewve plane is equivalent to a rotation, we may represent a series

§76. The law of composition of simultaneous angular velocities about axes which pass through one point is pre-

cisely the same as that for simultaneous linear velocities Com- of a moving point. The following simple geometrical pro- position cess establishes the proposition for two intersecting axes ; Seat and it is easy to see that it can be extended to any number about of such. Let OA and OB (fig. 28) represent the two axes, axes and let the lengths of these lines 6 whieh (both drawn in the positive direction iptepaest. for the rotation about them) repre- sent the angular velocities corre sponding. Then a point P, in the angle between the positive ends of the axes, is raised above the plane of the paper by rotation about OA, but depressed below it by the rota- tionabout OB. The amounts of the elevation and depression are pro- portional to the distance from either axis, and to the angular velocity about it, conjointly. Hence they will annihilate one another if, perpendiculars PM, PN being drawn to the axes, we have

OA.PM=OB.PN.

This is equivalent to saying that the areas of the triangles OAP, OBP, are equal,—which necessitates that P should lie on the diagonal of the parallelogram of which OA, OB are conterminous sides. Let OC be the diagonal of this parallelogram. From what has been said above it is evi- dent that the displacement of any point in the plane is necessarily proportional to the algebraic sum of the moments of OA and OB about it, and therefore (§ 46) to the moment of OC. Hence all points in the line OC remain at rest, and the figure turns about that line with an angular velocity represented by its length. This analogy to moments shows the reason for the remarkable proposition that angular velocities, about axes which intersect, are to be compounded according to the same law as linear velocities.

§ 77. Any proposition regarding simultaneous linear Analogy velocities or accelerations has thus its counterpart in angular between velocities and accelerations. Thus, as we have seen (§ 36 oy that under acceleration in one plane, always perpendicular to me

Fig. 28.

| the direction of motion, a point moves with uniform velocity, veloci-

so, if a figure be rotating about one axis, and have angular ties. acceleration about a second axis always perpendicular to the first, the direction of the axis about which it rotates is changed, but not the angular velocity.

It is to be noted that in such a case the direction of the axis changes not only in space, but also in the rotating figure itself. This, however, is merely the result of § 36 in a slightly altered form.

If w, be the angular velocity of a figure about the line which, for Com- the moment, coincides with the axis of z, the consequent displace- position

ments during time d¢ of a point x, y, z are (§ 73) of angu- d2—=—ywbt, Sy=%w,50. lar velo- cities

Of course similar results hold for the angular velocities about lines bout for the moment coinciding with the axes of x and of y. The joint . rie . effect therefore is found by adding the various separate values {VO S°° obtained by permuting the letters x, y, in cyclical order. Thus ae Pe 8x = (zwy — Ywz)dE, by = (wz — 2wz)db, dz = (You — Lwy) dt. The right hand members of these equations vanish if Roe 3 eee Fo ee. : Wy Wy Wz These correspond to the two equations of the instantaneous axis, and reproduce, in an analytical form, the result of § 76. The angular velocity about this axis is*

Q=NVeitwZto2. For it is clear that the direction cosines of the displacement of x, y, z are proportional to 2Wy — YWz, Viz 20x; YO — LO, showing that it takes place in a line perpendicular to the plane

Rigid figure anyllow dis- placed.

Angular accelera- tion about a moving axis,

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passing through 2,y,z and (1). It is therefore perpendicular to

1

Also the whole displacement is

*\/ (5x)? + (By)? + (52)? BEV (zy — Yrs)? + (Lez — Sex)? + (You — Lwy)**

~~ LW + Y Oy + ez)? = tr/ (2 O Wwe 2 A. Se eet ee BUN wz + wy + Wz ae ae ii vel vel

The last factor is the distance of 2, y, z from (1). Hence the second is the angular velocity about (1). It appears at once from this result, and from the form of (1), that ae @y saad a 8' 28 are the direction cosines of the instantaneous axis. If the figure be rotating simultaneously about a number of axes, —say with angular velocity w,, about an axis whose direction cosines are 7, 1, 2,, &c.,—we have evidently*

@,= (lw), wy=Z(mw), w, = 3(nw).

From these the single instantaneous axis is found immediately as above.

§ 78. Any displacement whatever of a rigid figure may be effected by means of a screw-motion, 7.e., translation parallel to some definite line, accompanied by a proportion- ate rotation about that line. Let A and A' be successive positions of any point in the figure, and suppose the body to be brought back by a mere translation so that A' coin- cides again with A. Then we have seen (§ 75) that one line of the figure through A is necessarily restored to its original position. Let P be any plane section of the figure, perpendicular to this line, P' its position after displacement. These fully determine the initial and final positions of the whole figure. Shift P into the plane of P' by a translation perpendicular to either, and let P" be its position, P" can (§ 71) be brought to coincide with P' by a rotation in its own plane. Hence the proposition. There is an exceptional case when P" requires only translation to make it coincide with P'. Bnt then the whole figure is merely translated.

§ 79. We haveseen that the straight line representing an angular velocity is to be resolved by the same process as that representing a linear velocity. If we considera figure to be rotating about axes fixed relatively to it, accelerations of angular velocity about these will be represented by changes in the lengths of the lines representing the angular velocities, and will therefore be subject to the same con- ditions as the angular velocities themselves, Thus, as it is obvious that a figure is rotating at any instant with

the same angular velocity about an axis fixed relatively to itself, and about another axis fixed in space, which at the given instant coincides with the former, it follows that the angular accelerations about these axes are equal at that instant.

This is really the same proposition as that 7 is the velocity along a fixed line coinciding with the radius-vector r ($47). But, just as 7#is not the complete acceleration parallel to 7, if 7 be rotating, so the proposition above, though true for the first fluxion of the angular velocity about a moving line, is not generally true for fluxions of higher orders.

As this subject is commonly regarded as somewhat obscure, we may give a more formal examination of it by an analytical process. Suppose w,, w,, w; to be the angular velocities about rectangular axcs OA, OB, OC fixed relatively to a figure, and w the angular velocity of the figure relatively to a line OS fixed in space. Let J, m, n, be the direction cosines of the latter line with regard to tlic former three, then

w= lw, + Mw, + ws, and & = 1a + Mery + Neg + lw, + hog t Nos» But lit mnh+na=0; and if, at a particular instant, we have 7=1, m=0, n=0, this gives also 7=0, so that we have &= 6+ Maw,+nw. m=cos BOS=cos 6 suppose. m= -sind.6.

Now Hence

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But, at the instant in question, 6—47 and 6=o,, so that

m= — Wy. In the same way we see that

R= +e 5 and thus we have W= 0),

:

which is the proposition above given.

§ 80. To complete the kinematics of a rigid figure of which Position one point is fixed, we require to have the means of calculat- of rigid ing its

position, after the lapse of any period during which "sure in

it has been rotating with given angular velocities about . . Ol given axes. "—_

If the axes about which the angular velocities are given axes be fixed in space, the formule of § 77 give at once, for a xed in unit line fixed in the figure, the expressions a

i= NWy — Mz 5

w= lw, Noz,

N=Moz— lwy, Here J, m, » are the direction cosines of the unit line at time ¢; and they satisfy, of course, the condition

litmh+tni=0.

But, except in some special cases, these equations are in- tractable. This, however, is of little consequence, because in the applications to kinetics of a free rigid body the physical equations usually give the angular velocities about lines fixed in the body. Our problem, then, takes the form

§ 81. Given the angular velocities of a figure about each of fixed in a system of three rectangular axes which are rigidly attached the to it, find at any time tts position in space. figure,

It is clear that, if we know the positions of the revolving : axes, referred to a fixed system, with which they at one instant coincided, the corresponding position of the figure is determined. The method usually employed isas follows.

About the common origin of the two sets of axes suppose a sphere of unit radius to be described. Let X, Y, 2 (fig. 29) be the traces on this sphere of the fixed axes, aud A, B; C those of the revolving axes. Draw a great circle ZC so as to meet in A' the quad- rant BA produced. Then it is clear that the figure can be constructed (2.¢, that the data are sufficient for calculation) if

we know (a) the angle XZC,—this we call y; (6) the are ZC, called 6; (c) the angle A'CA, or the are A'A, called ¢. For X, Y, Z are given. Then

Fig, 29.

(a) shows how to draw the great circle ZC, whose pole is N on the great circle XY. Hence (6) gives us the points Cand A'. Wecan next draw the great circle A'N, and A and Bare found on it by ©, for AA=NB=¢. We have

now only to determine these angular coordinates in terms of the angular velocities of the figure about OA, OB, OC, which we denote by w,, w,, w; respectively. The velocity of C along ZC is 6. But it is produced | by the rotations about A and B, Thus we have 6=w,coso+o sing. ; i The velocity of C perpendicular to ZC is sin#. p. This also is part of the result of the rotations about A and B, so that ! sin 6.~= aw, Sing — wcos?. ' The velocity of A along AB is that of A' together with the rate of increase of A'A. Also it is entirely due t rotation about OC. Hence cosé. P+ o=w3.

These three equations determine 0, ¥,@ when oy p are given as functions of ¢.

i

vi

aetrical »rocess.

Rod- rigues's coordt- nates,

Strain,

Stress,

detero- seneoug 'train,

§ 82. The process above is essentially unsymmetrical. The first suggestion of a symmetrical system is due to Euler, and depends upon the general proposition of § 75. What we must seek is the single axis, and the angle of rotation about it, which (by one operation) will bring the system or figure

from its initial state determined by X, Y, Z to its state at time ¢, determined by A, B, C.

Let /, m, 2 be the direction cosines of this axis, w the angle of rotation about it. 'Then by the elementary theorems of spherical trigonometry we find

cosXA=/? +(1-2) cosa,

cos YB=m?+(1 —727) cosa,

cos ZC=n? + (1-7?) cose. Thus, as we have an independent relation among 22, m?, n?, these quantities, as well as w, can all be expressed in terms of the cosines of the three angles between the original and final directions of the three axes severally.

We have other six equations, of which only one need be written, viz. :—

cosYA=/(m(1-—cosa@)+nsinaw. § 83. If we put w=cosha, x=lsinia, y=msiniaw, z=nsiniw, which involve the equation of condition we ee tl, the nine direction cosines of the new positions OA, OB, OC, referred to the fixed lines OX, OY, OZ, become

Wi+e—yr—2, 2(we-+ xy) , 2(x2z— wy) , Q(yu — wz) , w? — x2 4-4? — 22, 2(ys+20x) , (2+ wy) , 2(yz— we) , w? — g—y2 422,

These expressions, rational in terms of the four quanti- ties w, x, y, z, are due to Rodrigues, who, however, gave them in a slightly different form. Ifw,, w,, wz be the angular velocities about OA, OB, OC,

respectively, we have

200 = —xw, —Yw,— 205,

26 = We, — 2W_ + Yw3,

29 = 2 + Way — LW,

22 = — ya, +Xw, + Ww.

If we, wy, w, be the angular ‘velocities about OX, OY, OZ, respectively, we have

2W= —Xwe — Ywy — 202, 2 = Wagttwy — Ywz; LY = — Zw + Wey + Loz, 22 = You — Lwy + Woz.

Each of these sets is equivalent to three independent equations only, on account of the relation

wh + xe +yy+22=0,

Kinematics of a Deformable Figure. Strain.

§ 84. So far we have considered change of position of a

figure of invariable form. We must now consider changes of form and volume in the figure itself. This is required for application to physical problems, such as compression of a liquid or gas, the distortion of a piece of india-rubber, &c. Any such change of volume or form is called a “strain.” The treatment of strains is entirely a kinematical question, until we come to regard them as produced in physical bodies, and consider their cause. _ The system of forces which is said to produce a strain is called a “stress.” But, just as we study velocity as a preparation for the discussion of the effect of force on a free body, so we study strains as a preparation for the discussion of the effects of stress,

§ 85. In order to fix the ideas, it is convenient to suppose the figure which is to undergo strain to be cut up into an Intnite number of similar, equal, and similarly situated Parellelepipeds. This is effected at once by supposing it to be cut by three series of planes, those of each series being

parallel to one another, and equidistant. No two of these three series must be parallel, but the distance from plane to plane need not be the same in any two of the series, If the strain be continuous there will be no finite

difference of effect upon any two neighbouring parallelepipeds ;—but in general their edges, which originally formed three series of parallel straight lines, will become series of curves. No two parallelepipeds of the system will in general be altered in precisely the same manner. This is called "heterogeneous strain."

§ 86. We found it convenient to study uniform speed

EHomo-

before proceeding to consider variable speed, and so we 8eneous

find it convenient to take up first what is called

Homogeneous Strain.—A figure is said to be homo- geneously strained when all parts of it originally equal, similar, and similarly situated remain equal, similar, and similarly situated, however much they may individually have been altered in form, volume, and position.

Now recur to our set of parallelepipeds. After a homogeneous strain these remain equal, similar, and similarly situated. Heuce they must remain parallelepipeds, for they must together still continuously make up the volume of the altered figure. Thus planes remain planes, and straight lines remain straight lines, Equal parallel straight lines remain equal and parallel. Parallel planes remain parallel, ellipses remain ellipses (as is obvious from their properties relative to conjugate diameters), ellipsoids remain ellipsoids, &e.

But we can now easily see how many conditions fully determine a homogeneous strain. For if we know how each of three conterminous edges of any one of the original parallelepipeds is altered in length and direction, we can build up the whole altered system. Hence, to fully describe a homogeneous strain, we require merely to know what changes take place in the lengths and directions of three unit lines not in one plane. Three numbers are required for the altered lengths, and two (analogous, say, to altitude and azimuth, or latitude and longitude, or R.A. and N.P.D.) for each of the altered directions. Hence, in general, a homogeneous strain depends upon, and is fully characterized by, nine independent numbers,

§ 87. The simplest form of strain is tliat which is due

strain,

require, nine con- stants,

Uniform

to uniform hydrostatic stress acting on a homogeneous dilata-

isotropic body. Here directions remain unaltered, and the lengths of all lines are altered in the same ratio. Every portion of the original figure remains similar to itself, its linear, superficial, and volume dimensions being altered as the first, second, and third powers of that ratio.

tion.

Next in order of simplicity is the case in which there Pure are three directions, at right angles to one another, which strain.

suffer no change except as regards length. This state of things would be produced in a homogeneous isotropic body by three longitudinal extensions or compressions in lines at right angles to one another, or by hydrostatic pressure in a homogeneous non-isotropic solid. In this case, if the changes of length above spoken of are all different, an originally spherical figure becomes an ellipsoid, with three unequal axes parallel respectively to the lines whose directions remain unaltered. Every line in the body not originally parallel to one of these is altered in direc- tion. If one of the principal changes of length be an extension, and another a shortening, there will be a cone formed of lines which are not altered in length. This is seen at once by describing from the centre of the ellipsoid a sphere equal to the original sphere. One axis of the ellipsoid being greater than the radius of the sphere, and another less, the ellipsoid and sphere must intersect; and all lines drawn from the common centre to the curve of intersection are unaltered in length (though all altered, as before remarked, in direction).

Pure strain.

Rota- tional strain.

Strain ellip- soid.

Conju- gate of a strain.

Succes- sive applica- tion of conju- gate strains.

Recipro- cal strain.

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When two only of the changes of length are equal, the ellipsoid becomes one of rotation, oblate or prolate as the case may be; and if the radius of the sphere be inter- mediate in value to the axes of this rotation-ellipsoid, we have a right cone of rays unaltered in length.

When all three changes of length are equal we have the simplest possible case,—which has been already treated.

§ 88. The essential element in these particular cases is that three lines at right angles to one another are unaltered in direction by the strain. Here there is a mere change of form, and the strain is said to be "' pure," or " free from rotation." Such a strain, inits most general form, is fully characterised by s¢x independent numbers. For a system of three mutually perpendicular lines is fully given in direction by three numbers, and three more are required for the changes of length which they severally undergo.

But, in general, a strain is not pure. It will be shown, however, below that the principal axes of the ellipsoid into which a sphere is changed by any strain, and which is called the "strain ellipsoid," were originally radii of the sphere at right angles to one another. Hence the strain may be looked upon as made up of two operations, viz., a pure strain, and a rotation through a definite angle about an axis in a definite position in space. The axes of the pure strain are lines fixed in the figure.

§ 89. It is useful, in farther considering the subject, to introduce along with the original strain (thus analysed), another which is called its "'

conjugate." This is defined as composed of an equal pure strain with the first with an equal but opposite rotation. And the separate component operations must be taken in the opposite order in the strain and in its conjugate.

The successive application of the strain and its conjugate thus necessarily leads to the reduplication (or squaring) of the pure part of the strain, and to the annihilation of the rotation. or, call the parts, as operators, P and R. The strain and its conjugate, referred to axes fixed in space, may be either

RP and PR-?} or PR aad R-'P,,

according as the pure strain or the rotation is first applied. The operations in each group are written, from right to left, in the order in which they are performed. Thus RP means the pure strain P, followed by the rotation R.

§ 90. The final results are P? and Pj. In the first case we have the pure strain, followed by the rotation; then (by the conjugate) the rotation is undone, and the pure strain reapplied. In the second we rotate first, then apply the pure strain twice, and finally undo the rotation, Thus the student must be cautioned against the error of sup- posing that the results of applying PR and RP separately are generally the same. Perhaps it will be easier for the reader to consider the "reciprocal," instead of the con- jugate, ofa strain. For if the strain be RP, the reciprocal is obviously P-!R-1; if it be PR, the reciprocal is R-1P-1, Either pair of these, taken in either order, restores the figure to its primitive form. 'The one point to be noticed is that, in whatever order the direct com- ponent operations are supposed to occur in the strain, their reciprocals must be taken in the opposite order in the reciprocal strain. The reciprocal strain simply undoes the strain, and therefore differs from the conjugate by a factor, the square of the pure part of the strain.

From this we have at once, as will be seen later, the means of decomposing a given strain into its pure and its rotational factors. This is effected as soon as we can form the expression for the conjugate strain in terms of that for the strain itself.

§ 91. As, in general, any strain conyerts a spherical

portion of a figure into an ellipsoid, and as an ellipsoid has Shear.

two series of parallel circular sections, it appears that in every strain there are two series of planes of no distortion. The consideration of these planes leads us to a second and very different mode of analysing a strain into simpler components. Perhaps the most elementary mode of con- sidering this subject is by thinking of the motion of water flowing slowly down a uniform channel. We know that water, at ordinary pressures, is practically incompressible ; also that the upper layers of the water in a canal flow faster than those below them. Hence the definition of a " simple shear." Let one plane of a figure be fixed, and let the various planes parallel to it slide over it and over one another, all in the same direction, and with velocities pro- portional to their distances from the fixed plane. It is clear that this shear produces homogeneous strain in the figure, but it is mere change of form without change of volume. The fixed plane and all those parallel to it, are planes of no distortion. But we have seen that there must be two sets of such planes. To find the second set, let us suppose the plane of fig. 30 to be parallel to the common direction of sliding, ' P and perpendicular to the fixed Pe : = = plane. This plane, so defined, ' is the plane of the shear. Let AB be the trace on it of the fixed plane, PQ that of one } / of the sliding planes, PP' the A B amount of its sliding. , Bisect ; PP' in M by a perpendicular, a meeting AB in A. Join AP, take AB= AP, and draw BQ parallel to AP. Consider the strain of the rhomboidal portion APQB of the figure. P moves to P, and Q to Q', where QQ'=PP'. Hence the rhombus remains a rhombus, for AP'=AP=AB. But the lengths of its diagonals have been interchanged. It has been subjected to an elongation of AQ, and a contraction of BP, each in the same ratio (so that their product, z.¢., double the area of the rhombus, remains unaltered), while all lines perpendicular to the plane of the figure remain unaltered. From the symmetry of the rhombus it is obvious that AQ' and BP" are the greatest and least axes of the strain ellipsoid, while AB and AP' are parallel to its circular sections. Planes originally parallel to AP and perpendicular to the paper are therefore the second set of planes of no distortion. The rotational part of the shear may be measured in terms of the angle PAM, but is given directly by PBP', and its axis is perpendicular to the plane of the figure. The most

convenient measure of the shear is the ratio of PP' to AM, or, what involves the same, the angle PAP, Another mode of measuring it is by means of the ratio BP/AQ, =1+¢, suppose. If ¢ be a small quantity, as 1s usually the case with solids, we may write 1 +e for the measure of the shear. Here ¢ indicates the extension pet unit of length along one diagonal of the rhombus, and the contraction per unit of length along the other.

§ 92. It is quite clear

pounded with different forms of pure strain. shears may be taken in an infinite number of ways 80 a to produce the rotational part of the given strain, while . "ol producing deformation without change of volume. @ final adjustment is to be made by a pure strain, whose axes are those of the strain ellipsoid due to the shears. _ a shear depends on four quantities only, two shears and & dilatation furnish the nine constants required for a homo-geneous strain.

1 We here exclude spheres and ellipsoids of rotation. The tet | only one series of circular sections, the former an infinite number.

id that Decom- from what has been sal a

we can analyse a strain by the help of simple shears com- is For the strain.

)fpure js, physically, a most important proposition.

The successive application of two pure strains does not, on except in special cases, give rise to a pure strain. This Thus, for instance, the instantaneous strains of each element of a

erfect fluid in which there is no vortex motion are pure ; and yet, if the element be followed in its motion, it will be found in general to rotate. Its motion is said to be é¢ differentially irrotational."

To prove this proposition by the help of a particular case is simple enough. Take, for instance, a compression in one direction, followed by an equal extension in a different direction. Only when these directions are at right angles to one another is the resultant strain pure.

§ 93. The analytical theory of strains is, at least in its elements, an immediate application of the properties of determinants, usually of the third order. We subjoin a slight sketch of it.

We have seen that it is only necessary, for the full characterizing of astrain, that we should know what becomes of three unit lines not originally coplanar. Take these parallel to the axes (generally oblique) of x,y, 2 Then if the x umit becomes aline which is the diagonal of a parallelepiped with sides a, d, g parallel to the axes, y similarly that of b, e, h, and z of c, f, 7, we see at once that the coordinates of the point originally at x, y, z become

ef =ant by +e yf =dae+ey +fz Fo a ee a= ge + hy +%2

Here it is obvious, from the premises, that the nine quantities a,b,c; d,e, f3 9, h, @ are all real, and altogether independent, at least so far as kinematics is concerned.!_ To obtain an idea of their nature from another point of view, let us suppose the axes to be rectangular, Let unit parallel to 2 become ¢,, in the direction given by the cosines 1,, ™, 2. Similarly, let c, 72, mg, %, belong to a unit originally parallel to y, and 3, U3, m3, 3 to a unit parallel toz. Then the broken line a, y, z becomes 2', y', 2, where

w=Che + Coley + C3132) Yy =CyMyL + CyMgy + CgMms2 Bg eee B= CNL + CoMyyY + Caldz2 j

Though we have introduced threc numbers e along with ninc direction cosines, no greater generality is secured, for there arc three necessary relations, one among each set of cosines.

_ Tofind the characteristic property of a pure strain, let us take it in its most general form. Thus let 1), m, n, now denote a line which, without change of direction, has its length altcred by the strain in the ratio ¢,: 1. Let Zp, ma, Me, Cg and 1g, mg, Ng, es be similar data for the other two of the system of rectangular axes of the pure strain. Theu to ¢hese axcs the coordinates of x, y, = are E=hetmyt+nrez, N= let Mey + Nz, C=1gt + May + 232. The strain converts £ into '=c,£, y into 7'=¢gn, and ¢ into ('=c¢. Hence the final coordinates (to the original axcs) of the point originally at x, y, 2 are w=1e +1n +13¢', y= mE + men' +m3¢", game +n' +130" 5

(A).

(ay.

or, in terms of x, 4, 2, B= (G1) + eal5 + Cgls)ac + (Clymy + Cylgttty + esl 3ms}y + (€yh,2y + Colgite + Cg1gN3)% Yy =(Qmy1, + egMol, + Cytidglg)x + (ey? + em? +e,m3)y + (612242, + CoMo Ng + CgINgNg)z B= (QM, + CyNgle + CgNglg)% + (C1211 + Coldg lity + Cgidgilg)Y + (eyni + egn + e4n3)2

(B).

If we compare this with the general expression above given for a strain, we see that the coefficient of y in the value of 2' is cqual to that of « in the value of y'. Similarly that of z in x' is equal to ae win 2 ; and that of x in 7/ is equal to that of y in 2 ; or

nally

b=d, ec=g, f=h.

2 But when strain is produced in a piece of matter, a limitation comesin. For, to take the simplest case, the strain B= -2,Y=-y,2=—2% implies that the figure to which it is applied has been " perverted," — 1.¢é., changed into its image as sccn in a plane mirror.

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Converscly, when these three conditions are satisfied, and not Pure otherwise, the strain is pure. It is to be observed that & 7, ¢ form strain a rectangular system, and thus the nine direction cosines (usually depends involving si arbitrary numbers) depend here on three numbers on six alone. 'Thus there arc six independent numbers, corresponding to condi- a, ¢, 2, b, e, f, in the gencral expression for the strain. tions.

It is clear, from the elements of coordinate geometry, that the Change of

determinant volume GD by strain. ae Cass pts

represents the ratio in which the volume is increased by the strain." Let us now introduce, in succession to the strain gate

mm WG d strains,

te GP a. ye 2 ee g ht

Conju-

the connected strain adg

OG ib op o 8 G < Goi & which obviously produces an equal change of volume with the

former. Applying these strains in succession, we have as the final result

x" =ax' +dy'+92',

yl' = ba!' + cy' + hz',

a" = et + fy' +42, or, substituting for x', y', 2 their values in terms of &, y, 2, xv' =(a2 +02 +9%)x +(ab+de+gh)yt (act df+gi)z, y" =(bated+hg)u+ (b? +e? +h)y +(be+¢ +hi)z, e"=(catfd+tig)z y(P+f2+eP)z.*

Thus the resultant strain is

(1),

2+ d+? ab + de+gh act df +g bated hg B + be+ of +ho ea +fad+iy eb +fe th e f+ PR which, for simplicity, we will write as on S By OF WEG. eee ik (2). yen 2

It will be observed that this group of nine numbers, if treated as a determinant, constitutes the product of the determinants formed of the two systems above.

This satisfies the criterion of a " pure strain," as given above ; and we thus see that in the successive application of the strains

abe adg ca ef and beh igi i 2% Caf 2

the rotation produced by the first is annihilated by the second. Let A, B, C, &c., be the minors of

a U2 @

ag if Guieet

fa —

correspondirg to a, 0, c, &e. Then by our original equations we have

Ax= Az' + D7 +Gz, Ay=Bz' + Ey' + He', Az=Cal + Fy +12.

Thus the reciprocal of the strain eae abe A/A D/A G/a cal of : strain. def is B/A E/A H/A Gg be C/A F/a T/A.

This is evident from the formule just written. For they express that the new strain converts 2', x', 2' into a, y, 2. r

Apply the resultant strain in succession to this reciprocal. The result is easily forescen from separate terms like the following :—

A(a?+c2+9") + B(ab de gh) + C(ae+df+ gt) =a(Aa+Bb+Ce) d(Ad Be+ Cf) .9(Ag Bh + Cz) =a; &e. ee 2 When this strain is produced in a piece of matter, the numcrical value of the determinant obviously cannot be negative.

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Hence when we apply (2) to a figure previously strained by the reciprocal of (1) the result is the strain (1'). Hence we verify that the latter is the conjugate of (1) ; as it possesses the properties described in § 90, all of which are thus established.

Analysis Toanalyse a strain in the simplest manuer, we must find the axes

of strain. of the strain ellipsoid (§ 88), as well as the original radii of the unit sphere which were distorted into them. It is more direct, however, to consider the ellipsoid which becomes a unit sphere in cousequenee of the strain. 'The equation of that ellipsoid is

(aa + by + ez)? + (dat ey fz)P?(gethyt+izP=1; or, with the notation employed in (2) above, an? + ey? + 12? + 2dxy + 2Byz+ Wyzx=1. But the square of any radius-vector is e+y+2—r, suppose. The maximum radius-vector, therefore, of the ellipsoid is found from the two equations (a + By + yz)da + (dx + ey + Bz)dy + (yx + By + 2z)dz=0, ada + ydy +2dz=0. Hence, » being a numerical quantity to be found, ant by + y= pz, dxt+ey+ Be=py, yet By + z=pz.*

Multiply respectively by x, y, z, add, and take account of the two preceding undifferentiated equations. We thus have

(4).

l=3r,

or » is the reciprocal of the square of the maximum semi-axis required.

But, if we eliminate x, y, and z simultaneously from the preceding linear cquations, we have

ay $ 7 6 e«-p 8B a4 Bp =p

Axes of This cquation is known to have three real positive roots, because

the strain the detcrminant is symmetrical. The roots are the squared

ellipsoid. reciprocals of the semi-axes of the ellipsoid, z.¢., they are the squares of the semi-axes of the strain ellipsoid.

When the three values of p have been found from this cquation, any two of the cquations (4) give in an unambiguous form the corresponding values of the ratios z: y: efor each of them. Thus we know the original positions of the lines which become the axes of the strain ellipsoid. Their final positions are found from these by means of (A). And, since we thus know the original and

final positions of the rectangular system, the method of Rodrigues enables us to calculate the axis and amount of the rotation.

One line, In homogeneous strain, one direction at least is unchanged. at least, This is an addition to, or extension of, the singular result of § 75. unaltered For, if x, y, 2 be shifted to a point on its radius-vector, we must in direc- have

tion. ax + by +cz= ex deteytfe=ey +f; get hy +tz= ez so that a-e b c d e-e f |=0, g kh i-e a cubic equation, which must have one real root. Straina | When the figure is rigid, the strain must be a rotation only. mere Hence in the formule (A') above we have ¢,=¢,.=¢3=1. Thus the rotation. last written equation becomes L-¢e dy 1; M, M_y-e€ Mz |=0; or (by the properties of the direction cosines of a set of rectangular

axes) 1—(1, +m, +ns)(e-) – FB =0. This has, of course, the real root e=1. But we also have L+e(1- (4 +1mg+73))+e=0.

_ This cannot have real roots if the coefficient of ¢ lie between the limits 2 or—2. But these are its greatest and its lcast possible values, For, first, 2,, 17g) 23 may be each = 1 simultaneously. Herc

we have (1 = ar=0 °

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Or two of them may be cach = —1, but then (to avoid perversi the third must be =1. Then we have (P 1 (1+ ¢)?=0. Jn the first case the figure has no rotation.

In the second it rotates through an angle w about the axis of e=1.

The proposition that two pure strains succeeding one another Composi-

usnally give a rotational strain is proved at once by analysis, the pure strains be such that

a =a +dy + cz, a =dx+ ey + bz, zZ=ox + byt iz;

Let tion of

strains,

and a” =a’a! + d’y + cz’, of! =a! + ey + vz, 2!” =c’x7! it by’ +02. Then, writing only the second term of x” and the first of -y” in terms of x, y, z, we have 5

> GS eras +(a’d +de+cbjyyt+ ... y’=(Vated+becjut+..... : oa es oe Ose aoe dgn aH 5 6 ipa

It is clear that, in general, this is not a pure strain. But it is also clear that a third pure strain can be found whose application in succession to the other two will give a pure strain.

For let the last equations be written

“=a e+ by +c” ‘ yf =a”x+ely ne, L=g”ath’y+t‘2 : and let us apply further the pure strain ol” = aa’ + by” +2”, af) == 600″ + ey” + B2”,” 2” = yat’ + By” + w”. Then we have

ee ee HAW + 5e” + yh yt… of” =(8a” + ed” + Bf E+... + Ge ss

There are but three conditions to satisfy, that this strain may be pure. Bunt we may accomplish this in an infinite number of ways, for we have five disposable quantities, viz., the ratios of any five of a, €, t, B, y, 8 to the remaining one. In a preeisely similar manner we may show that three pure strains can be found, such that their resultant is a mere rotation. In fact, all we have to do, since two pure strains in general produce a distortion aceompanicd by rotation, is to apply a pure strain to annilulate the distortion, which can of course always be done.

§ 94. In general when a figure is continuously strained, Hetero- which is usually the case in physical applications, at least sim‘o”s until cracks occur, the strain is not homogeneous. But, on pou. account of the continuity of the strain, portions indefinitely near one another are strained indefinitely nearly alike. Hence we may treat such a case by the ordinary process for homogeneous strain, so long as we confine our attention to small regions of

the figure strained. When there 1s discontinuity in the motion of a fluid, it is the common practice to treat the motion as continuous by the fiction of an infinitely thin vortex-sheet separating the two discontinuously moving portions. This is, in all likelihood, physically true in ordinary fluids; but, so far as the imaginary frictionless fluid of the mathematicians 18 cone cerned, it is a mere analytical artifice to enable us to carry out the investigation. See ATom and HyDROMECHANICS, In which the mathematical theory of " vortex motion" 1s very fully considered. _.

Suppose space to be uniformly occupied by points whieh are dis- Disp placed in a continuous manner. be e : components of the displacement of a point originally situated at sys ; x, y, x The continuity of the displacement requires merely that points. the differential coefficients, of all orders, of ¢, 7, ¢ with respect to 2, y, 2 (and any combination of them) shall be finite. That being assumed, the displacement, parallel to x, of the point whose initia

coordinates were x+8z, y+dy, 2+ 82 (where dz, by, dz are mi nitely small quantities of the first order) is necessarily expressed DY

dt. de dye t éz.

ace

stem of

dt t+ moet Fs Hence the relative coordinate of the es oo vt to the first is changed from 8x to a + Gin 4 by + And

two pure

Let &, , ¢ be the rectangular ments of 9

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| tants similarly for the other relative coordinates. Hence the strain in 1. the immediate vicinity of the point 2, y, z is given by

extended round the boundary of the surface. Hence the double

. integral has the same value for all finite surfaces having the same

dt dt dt boundary ; and, as a consequence, it vanishes when taken over a lt, Ai a closed simply-connected surface. Hence we see at once that it ma y me vanishes for multiply-connected surfaces also. The proof of the dn l a dn equality of the single and double intcgral has only to be established dx dy dz' for a mere surface element. For, when that is done, the common d¢ d¢ d¢ boundary of each pair of elements gives equal portions, with opposite 3 aS ia. signs, in the single integral. ds dy dz Directly connected with the displacements of a group of points, So-called

we have the question, What is the mathematical expression of the equation Fact that the number of points is not altered? There are many ways of con- of answering this; but the following, which is immediately tinuity.

If the differential coefficients are all small quantities, whose squares aud products two and two may be neglected, 7.¢., if the strain is slight, we have for the ratio in which the volume is in-

creased aes a a as @ ge" ag ae es Hence the condition of no change of volume is de dn a dz dy dz

To examine this case more closely, let us suppose that it consists of

_ a pure strain as in § 93 (B), superposed on a rotation wz, wy, wz

about the axes of z, y, andzasin§77. Let these be so small as not to interfere with one another. That compound strain would be

ele +eals +6575 €lyMy teglometeglgmzy—@z eylinjt… +y eyMl, + egMglot egMg!3 + Wz eym} +epm3 + egms €ymym, + .. —Wz Emly +egNala-begnals — Wy GUMS? og oesane +z ent +egn; tens – Comparing with the above, we find at

= 2 2 2

1 te eal ar €l5 ag e315 '

or, if we put e for the "elongation," so that e=1+e,

117 + €n17 + e512,

dx with similar expressions for aa and @¢ F : dy dz These give dt dn a¢ dec dy ag tet 8s- Again we have dn , dé det dy 2(c411m + eglgity + gl yms) ,

= 2(€, 111 + €glomy + €3l3m),

deducible from our recent investigation, seems sufficiently simple.

If 1, m, x be the direction cosines of the normal to an element dS

of a singly-connected closed surface, the number of points which

_ through the element in the time & in consequence of the isplacement ¢8t, dt, (dt at the point x, y, z is

(LE + my +20) pdSdt,

whiere p is the number of points per unit volume at x, y, 2 But at every point inside the closed surface the density is altered from p to p+pst. It will be noticed that & 7, ¢ now stand for the x, y, 2 components of velocity.

Hence, if the excess of the number of points passing into the surface over those escaping be equated to the increase of the number of points included in the closed space, which is calculated from the change of density inside, we have

at f/f (le + my +n¢)pdS = 3t///pdadydz.

If we take for S an elementary rectangular parallelepiped, with edges dz, dy, 52, this becomes at once _ (Ut) , Upn) , Up). – 5, , (da t dg t de) BbyRHBL= pbb B2B4 dp , dp&) , dpm) , apg) dt dk dy dz

If the arrangement is incompressible this becomes, as above, dt dn d¢ dz dy? dz a

In any one of the last four forms the expression is called the ‘equation of continuity,” another of the preposterously ill-chosen terms which have been introduced with only too great success into the nomenclature of our subject.

or =(0.

§ 95. In the strains which we have hitherto considered Changes

: with other two of the same kind. : all parts of a figure were regarded as capable of changing of figure

Also we have three equations of the form

lt d their form and volume; and the strain of any element, °.° of 2 ag _da : : ee : ? jointed a ony dz when not identical with that of a proximate element, was System A ag dt supposed to differ only infinitesimally from it. But there of rigid Bay as is another class of changes of form, for which this restric- parts. ae tion does not hold. The most important case, and the 2w:=T, “ae only one we can here consider, is that of “link-work.”

Here each finite piece is treated as incapable of change of form, and the change of form of the whole depends merely upon the relative motions of the parts. We will further restrict ourselves by the condition that the link-work is such that its form is determinate when the relative position of two of its parts is assigned. Thus, a jointed parallelo- gram is completely determined in form if the angle between

dition These expressions show, simply, that when there is no elementary

(0 Totation the quantity

‘Alon. tdz+ndy+(dz=d¢

is the complete differential of a function of three independent variables. If we combine the condition that there shall be no

| change of volume with those that there shall be no rotation, we can

eliminate ¢, n, ¢; and we arrive at Laplace’s equation

| |

ae Oe? _ : ae ap dA This shows at once how a graphical representation of stationary

distributions of temperature, electric potential, &c., may be given y meaus of a strain.

If dS be an element of a surface at the point z, y, %, and 1, m,

the direction cosines of its normal, the rotation about the normal Is obviously

lwy + Mwy + Nw, The integral of double of this over a finite portion of surface is

H\MGi-2)+=(2-4)+-(8-§)) or TT} (FF Naya + (f ~ Geant) ey

This, as seems to have been first pointed out by Stokes, can be expressed as a simple integral in the form

S (eda + ndy + dz)

= ——————— —— A

two of its sides is assigned. Instead of an angle, we may assign the length of adiagonal ; then the fact that the sum of the squares of the diagonals is equal to that of the squares of the sides determines the other diagonal. This gives us the kinematics of the more complex arrangement called " Jazy-tongs."

One important practical problem in that branch was suggested by a stationary steam-engine, in which it was required to connect, by link-work of some kind, a point (of the piston-rod), which had a to-and-fro motion in a straight line, with another point (of the beam) which had a to-and-fro motion in a circular are.

approach to rectilinearity of the motion of any point of a rod whose extremities move in two circles in the same plane. Thus, if OP, PQ, QO'

(fig. 31) be three bars jointed together at P and Q, having O and O' fixed, and

DONE 8

—

The most important applications of this Lazy- branch of our subject are to what is called "' Mechanism." tongs.

Watt's original Watt's

solution of the problem depends ultimately upon the near ee motion,

Peaucel- lier cell.

Defini- tion of physical particle.

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the whole constrained to move in one plane, it is easy to see that the complete path of any point R of PQ is a species of figure of eight. A por- tion of that curve on each side of a point of inflexion (where the cur- vature vanishes) was found to be sufficiently straight for prac- tical purposes. But the rigor-

Fig. 31.

ous solution of this problem has only been arrived at in recent times; and the beautiful device of Peaucellier, which we will briefly explain, has led.to a host of remark- able investigations and discoveries in a field regarded till

lately as perfectly hopeless. A simple mode of arriving at Peaucellier's result is as follows.

Let PQ, PR (fig. 32) be equal links, and PO a link of a different length, all jointed together at P. Suppose O to be fixed, and Q and R constrained to move in a fixed straight line OQR, what is the relation between OQ and

OR? We have, if PS be perpendicular to QR, OP2=082+SP?, QP2=QS? +SP?;

whence

OP? —- QP?= OS? — QS?=0Q.0OR.

Thus the rectangle under OQ and OR is constant; so that, if R were to describe a straight line, Q would describe a circle having O on its circumference. In practical application, to keep O, Q, R in one line, ¢ the parts of the link-work are doubled symmetrically about that line, so that it takes the form of a jointed rhombus PQP'R (fig. 33) with two equal links, PO, OP' attached at the extremities 6

of a diagonal. As a very

curious result of this ar-

rangement, if OQ have its 0 R length changed by any very

small amount, the corre-

sponding change of length Ps

of OR is directly as OR? Fig. 33.

or inversely as OQ®, Hence, as will be seen later, a con- stant force (towards or from O) acting at Q will be balanced by a force (from or towards O) acting at R and varying inversely as the square of OR.

Fig. 32.

DYNAMICS. Definitions and General Considerations.

§ 96. We commence with a few necessary definitions, A "physical particle" is a purely abstract conception, embody- ing together the ideas of inertia and of a geometrical point. It is, so to speak, a mathematical fiction, embracing only those properties which are required for our temporary purpose. Any mass, however large, can be treated as a particle, provided

the forces to which it is subject are exerted in lines passing through its ‘centre of inertia” or “centre of mass” (this term will presently be defined), so as to be incapable of setting the mass into rotation. This is, to a first approximation, true of planetary motions, but when we look more closely into that question, so as for instance to take account of the oblate forms of the

planets, we have to deal with forces which produce rotatory effects, such as “‘ precession” and “ nutation.”

§ 97. The “quantity of matter” in a body, or the May» “mass,” is proportional to the “volume” and the “ density” density conjointly. The “‘density” may therefore be defined ag | the quantity of matter in unit volume.

If M be the mass, p the density, and V the volume of a homogeneous body, we have at once

M=Vp,

provided we so take our units that unit of mass is the mass of unit volume of a body of unit density. Hence the dimensions of p are [ML~].*

As will be presently explained, the most convenient unit mass is an imperial pound, or a gramme, of matter.

§ 98. The “quantity of motion,” or the “momentum,” Momes of a moving body is proportional to its mass and velocity tum. conjointly. As already stated this is, like velocity, a directed quantity, or “vector.” Its dimensions are, of course, [MLT-]. |*

§ 99. “Change of quantity of motion,” or “ change of Change momentum,” is proportional to the mass moving and the momen- change of its velocity conjointly. tum.

Change of velocity is to be understood in the general sense of § 32. Thus, with the notation of that section, if a velocity represented by OA be changed to another represented by OB, the change of velocity is represented in magnitude and direction by AB.

§ 100. " Rate of change of momentum," or "acceleration Rate of of momentum," is proportional to the mass moving and change) the acceleration of its velocity conjointly. Thus (§ 36))00°" the acceleration of momentum of a particle moving ina curve is MS along the tangent, and Mz?/p in the radius of absolute curvature. The dimensions of this quantity . are [MLT-].*

§ 101. The "vis viva," or "kinetic energy," of a moving Kinetic body is proportional to the mass and the square of the ***8y- speed conjointly. If we adopt the same units of mass ; and velocity as above, there is particular advantage in defining kinetic energy as half the product of the mass into the square of its speed. Its dimensions are [ML'T~****.*

§ 102. "Rate of change of kinetic energy," thus defined, Rate of is the product of the speed into the component of accelera- ag | tion of momentum in the direction of motion.

For / (7) -Biob= va. | The dimensions are [ML'T~]. ;*

§ 103. The 'space-rate of change of kinetic energy " is a

d (Mv? dv TE! ee change 5(2) = Me 5 hg of it. and its dimensions are [MLT~?], the same as those of " force" (§ 104). .

§ 104. "Force," as we have already seen, is any cause Fore. which alters a body's natural state of rest, or of uniform motion in a straight line.

The three elements specifying a force, or the three elements which must be known before a clear notion of | the force under consideration can be formed, are—its place of application, its direction, and its magnitude. The place of application may be a surface, as when one body presses | on another; or it may be throughout the whole mass of a body, as in the case of the earth's attraction for it.

The “ measure of a force” is the rate at which it produces momentum, or the momentum which it produces 1n unit of time, which is the same as what we have already called “rate of change of momentum.” According to this meth of measurement the standard or unit force is that force which, acting on the unit of matter during the unt of

G. i

| |

bitish

C. : system.

time, generates the unit of velocity. The dimensions of force are therefore [MLT~].*

§ 105. Hence the British absolute unit force is the force which, acting on one pound of matter for one second, generates a velocity of one foot per second.

According to the system followed till lately in treatises . on dynamics, the unit of mass is g times the mass of the standard weight, g being the numerical value of the acceleration produced (in some particular locality) by the earth’s attraction. This definition, giving a varying unit of mass, is exceedingly inconvenient. In reality, standards of weight are masses, not forces. They are employed primarily for the purpose of measuring out a definite quantity of matter, not an amount of matter which shall he attracted by the earth with a given force. | § 106. To render our standard intelligible, all that has to be done is to find how many absolute units will produce, in any particular locality, the same effect as does gravity. The way to do this is to measure the effect of gravity in producing acceleration on a body unresisted in any way. The most accurate method is indirect, by means of the pendulum. The result of pendulum experiments made at Leith Fort, by Captain Kater, is that the velocity acquired by a body falling unresisted for one second is at that place 32°207 feet per second. The variation in eravity for one degree of difference of latitude about the latitude of Leith is only

0000832 its own amount. The average value for the whole of Great Britain differs but

little from 32°2; that is, the attraction of gravity on a

pound of matter in the country is 32°2 times the force

which, acting on a pound for a second, would generate a

velocity of one foot per second. Thus, speaking very

roughly, the British absolute unit of force is equal to the weight of about half an ounce. The quantity of

32:2 feet per second per second is usually called g. Its

dimensions are obviously [LT~-?]. And, if M be the mass g, of a body, its weight is Mg. In the Centimetre-Gramme- Second system of units, the absolute unit of force pro- duces in one second, in a mass of one gramme, a velocity of one centimetre per second.

Repre- § 107. Forces (since they involve only direction and entation magnitude) may be represented, as velocities are, by 'tforee. vectors, that is, by straight lines drawn in their direc- tions, and of lengths proportional to their magnitudes respectively.

Also the laws of composition and resolution of any | number of forces acting at the same point are, as we shall | presently show (§ 117), the same as those which we have | already proved to hold for velocities; so that, with the) substitution of force for velocity, § 30 is still true.

Com- § 108. The "component" of a force in any direction is ee therefore found by multiplying the magnitude of the force

Centre mass,

by the cosine of the angle between the directions of the force and the component. The remaining component in this case is perpendicular to the other.

It is very generally convenient to resolve forces into components parallel to three lines at right angles to each other, each such resolution being effected by multiplying by the cosine of the angle concerned.

_ The magnitude of the resultant of two or of three forces in directions at right angles to each other is the square root of the sum of their squares.

§ 109. The "centre of inertia or mass" of any system of material particles whatever (whether rigidly connected with one another, or connected in any way, or quite detached) is a point whose distance from any plane is equal to the sum of the products of each mass into its distance from the same plane, divided by the sum of the masses.

The distance from the plane yz of the centre of inertia

of

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of masses 71, ™, &c., whose distances from the plane are 2X, Ly, &e., is therefore x(mx) , S(m) ' and similarly for the other coordinates. Hence its distance from the plane S=Artpytvze-a=0 a ae = {m(au + py + v2 – @) s(mé D=AE+pytvz-a = Sa ;

And its velocity perpendicular to that plane is

= (me) — du dy dz at di Sm | m (a5 wt +) ~"sm from which, by multiplying by 2m, and noting that 3 is the dis- tance of x, y, 2 from 3=0, we see that the sum of the momenta of the parts of the system in any direction is equal to the momentum in that direction of the whole mass collected at the centre of mass.

The problem of finding the centre of inertia of any given distribution of matter is a question of mere mathematics. We must confine ourselves to a few examples only. And, first, we may note that when a body is symmetrical about a plane the centre of inertia must obviously lie in that plane. 'Thus,

as an ellipsoid and a rectangular parallele- piped have each three planes of symmetry, their centres of inertia lie at their centres of figure, where these planes meet. Again, it is obvious that, if a body can be divided into parts the centres of inertia of which lie on a straight line, the centre of inertia of the whole is in that line. Thus, as a triangular plate may be divided into strips parallel to one side, every one of which has its centre of inertia at its middle point, the centre of inertia of such a plate is the point of intersection of the bisectors of the sides. Its distance from any one side, treated as base, is therefore one-third of the height. Again, if a triangular pyramid (or tetrahedron) be divided into triangular slices by planes parallel to one face treated as base, the centres of inertia of all the slices lie in a straight line. Hence the distance of the centre of inertia from the base is one-fourth of the height. Ifthe base be of any other form, it may be divided into triangles, and thus the whole pyramid (or cone) into tetrahedra, for each of which the same property holds. Hence the centre of inertia of a pyramid divides the line joining the vertex to the centre of inertia of the base in the ratio 3:1. All this is on the supposition that the solids treated of are of uniform density. When we deal either with more complex forms or with heterogeneous bodies, we must in general have recourse to integration.

For a continuous body we must take an element of mass, say pdxbydz, at the point x, y, % instead of the mass m in our original

formula. The sums then become integrals, and we have three expressions of the form

~ Sh) {pxedadydz a Sf fedxdydz :

Here p represents the density at ~, ¥, %;3 and the integration extends through the whole volume of the body.

Thus, for & ommbeencets hemisphere of radius a we have, taking the base as the plane of yz,

a 9 rs (a? — ae 30

gra? 8 The same value would be obtained for any semiellipsoid, whatever be the diametral section, provided @ be the height measured per-

pendicular to the base ; and, in general, from the position of the centre of inertia of any body we may at once find that of the same body homogeneously strained. ; ;

Recurring to the hemisphere, suppose its density to be at every point proportional to the distance from the centre. Then we have, omitting common constant factors of numerator and denominator,

a:

Z wd: ff Na+ rdr oq ae

i ae ff rr/32 + Pdr

t=

is as stated above.

aD!

+

i=

—

Moment of mo- mentum.

Work.

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A uniform hemispherical shell gives &=ta by the well-known result due to Archimedes. From this, by

taking concentric hemispherical elements, we may reproduce the preceding result for a solid hemisphere in the form

a Qrardu.x. ho

0 =<

c= a 9 ye Qrx-dx. x

Here the first factor under each integral sign is the volume of the hemispherical element of radius x, and the second is proportional to its density.

If the density of a thin uniform spherical shell be everywhere proportional to the inverse cube of the distance from an internal point, that point is the centre of inertia. For, if a double cone of small angle be drawn, having that point as vertex, the volumes of the portions of the shell which it cuts out are as the squares of their distances from the vertex. Hence their masses are inversely as their distances from the vertex, which is thus their centre of inertia. The whole shell may be divided into pairs of elements for each of which this is true.

The reader may easily prove that, if the density of a solid sphere be inversely as the fifth power of the distance from an external point, the "' electric image" of that point is the centre of inertia.

It may be proved in the last two examples that this point is not merely the centre of inertia of such distributions of matter, but that it is also a true " centre of gravity" in the sense that the whole attracts, and is attracted by, any other body whatever, as if its whole mass were concentrated in this point.

5

§ 110. By introducing in the definition of moment of velocity (§ 46) the mass of the moving particle as a factor, we have an important element of dynamical science, the 'moment of momentum." The laws of composition and resolution are the same as those already explained. Its dimensions are [ML'T~"].

§ 111. A force is said to " do work " if it moves the body to which it is applied ; and the work done is measured by the resistance overcome, and

the space through which it is overcome, conjointly. The dimensions of work are therefore [MLT-. L] or [ML*T-?], the same as those of kinetic energy.*

Thus, in lifting coals from a pit, the amount of work done is proportional to the weight of the coals lifted ; that is, to the force overcome in raising them ; and also to the height through which they are raised. The unit for the measurement of work, adopted in practice by British engineers, is that required to overcome the weight of a pound through the height of a foot, and is called a " foot-pound."

In purely scientific measurements, the unit of work is not the foot-pound, but the absolute unit force (§ 105) acting through unit of length.

If the weight be raised obliquely, as, for instance, along a smooth inclined plane, the distance through which the force has to be overcome is increased in the ratio of the length to the height of the plane; but the force to be overcome is not the whole weight, but only the resolved part of the weight parallel to the plane; and this is less than the weight in the ratio of the height of the plane to its length. By multiplying these two expressions together, we find, as we might expect, that the amount of work required is unchanged by the substitution of the oblique for the vertical path.

Generally, if s be au are of the path of a particle, S the tangential

component of the applied forces, the work done on the particle between any two points of its path is

JSas,

taken between limits corresponding to the initial and final positions. Referred to rectangular coordinates, it is easy to see, by the law of resolution of forces, § 117, that this becomes

Qe ay dz J(Xa t os 2 Nas

where X is the component force parallel to the axis of x. § 112. Thus it appears that, for any force, the work done

during an indefinitely small displacement of the point of application is the product of the resolved part of the force in the direction of the displacement into the displacement,

From this it follows that, if the motion of a body be always perpendicular to the direction in which a foree acts on it, the force does no work. Thus the mutual normal pressure between a fixed and a moving body, the tension of the cord to which a pendulum bob is attached, the attraction of the sun on a planet if the planet describe a circle with the sun in the centre, are all cases in which no work is done by the force.

In fact the geometrical condition that the resultant of X, Y, Z shall be perpendicular to ds is

da dy dz x 7 +Y is +Z rie oF and this makes the above expression for the work vanish.

§ 113. Work done on a body by a force is always shown Transfo: by a corresponding increase of kinetic energy, if no other mation » forces act on the body which can do work or have work Wo". done against them. If work be done against any forces, the increase of kinetic energy is less than in the former case by the amount of work so done. In virtue of this, however, the body possesses an equivalent in the form of "potential energy," if its physical conditions are such Potentia) that these forces will act equally, and in the same direc- energy. tions, when the motion of the system is reversed. Thus there may be no change of kinetic energy produced, and the work done may be wholly stored up as potential energy.

Thus a weight requires work to raise it toa height, a spring requires work to bend it, air requires work to com- ' press it, &c.; but a raised weight, a bent spring, compressed air, &c., are stores of energy which can be made use of at / pleasure. |

As an illustration of the calculation of work, take the Examples following question. eruk: |

Suppose one end of an elastic string to be attached toa mass resting on the ground, what amount of work must be done, in raising the other end vertically, before the mass | is lifted ? |

| |

.Ifz be at any instant the length of the string, / its original length, its tension is

x—l E—- : Hence the value of x, when the mass is just lifted, is

where W is the weight of the mass. The whole work done is the sum of all the elementary . instalments of the form

a—-l

These must be summed up from x=/ to #=42,, so that the result required is 41 Ww?

It is to be observed that this quantity becomes less in proportion as E is greater, ¢.¢., the less extensible 1s the string. ; |

An interesting variation of the question consists in ge i the upper end of the string to be attached to the rim of a whee . \ rough enough to prevent slipping. Here the various portions : . the string are wound on in a more and more stretched state as the | operation proceeds.

Pat any stage of the operation let x be the unstretched length “ the part already wound on the wheel. The tension of the free pa is then

Ee – (t- 2) ia ae

During the next elementary step of the process a portion dz 18

wound on. But its stretched length is

ldz

i-z”

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From this follows at once (§ 30) the construction of the

Hence the element of work is

Ry 2 l=), “narallelogram of forces” for finding the resultant of

*(i= * two forces acting at the same point, and the “ polygon of*

This must be integrated between the limits 0 and W of forces ” for the resultant of any number of forces acting at pli-9). a point. And, so far asa single particle is concerned, we

l-x ’ have at once the whole subject of Statics. § 118. The second law gives us the means of measuring Measure force, and also of measuring the mass of a body. of mass, For, if we consider the actions of various forces upon 274 °%

: force. the same body for equal times, we evidently have changes sie

El ; or from 2—x=1 to (. =a. ; and the result is

E (W + Blog gp is

which, when E is very great compared with W, gives the previous result,

Further Comments on the First Two Laws of Motwon.

of velocity produced which are proportional to the forces. The changes of velocity, then, give us in this case the means of comparing the magnitudes of different forces. Thus the speeds acquired in one second by the same mass

ohysical § 114, We are now prepared to consider, more closely | (falling freely) at different parts of the earth’s surface give a than we could at starting, the bearing of the various clauses | us the relative amounts of the earth’s attraction at these 7 of of each of Newton’s Laws. Thus, from the first law we places.

nme,

may draw the following immediate consequences.

The times during which any particular body, not com- pelled by force to alter the speed of its motion, passes through equal distances are equal. And, again, every other body in the universe, not compelled by force to alter the speed of its motion, moves over equal distances in successive intervals, during which the particular chosen body moves over equal distances. The earth, in its rota- tion about its axis, presents us with a case of motion in which the condition of not being compelled by force to alter its speed is more nearly fulfilled than in any other which we can easily or accurately observe. Hence the numerical measurenient of time practically rests on defin- ing "equal intervals of time" as times during which the earth turns through equal angles.

§ 115. It has been objected to this statement that we

Again, if equal forces be exerted on different bodies, the changes of velocity produced in equal times must be inversely as the masses of the various bodies. This is approximately the case, for instance, with trains of various lengths drawn by the same locomotive.

Again, if we find a case in which different bodies, each Gravity.

acted on bya force, acquirein thesame time the samechanges of velocity, the forces must be proportional to the masses of the bodies. This, when the resistance of the air is removed, is the case of falling bodies; and from it we conclude that the weight of a body in any given locality, or the force with which the earth attracts it, 1s proportional to its mass, This is no mere truism, but an important part of the grand Law of Gravitation. Gravity is not, like magnetism for instance, a force depending on the quality as well as on the quantity of matter in a particle.

begin by defining uniform motion by the description of equal spaces in equal times, and then employ this defini- | tion as a mode of measuring equal times. The objection,

§ 119. It appears, lastly, from this law that every Transla- theorem of kinematics connected with acceleration has its tion from counterpart in kinetics. 'Thus, for instance (§ 36), we og see that the force under which a particle describes any into

curve may be resolved into two components, one in the kinetics.

however, is not valid; for, if we agree to measure equal intervals by the undisturbed motion of any one physical

leasure t force,

mass, we find that in the successive intervals so determined all other absolutely free physical masses describe successive equal spaces,

$116. Again, from the second law we see that, if we multiply the change of velocity, geometrically determined, by the mass of the body, we have the change of motion (§ 99) referred to in the law as the measure of the force which produces it. In the statement of the second law there is nothing said about the actual motion of the body before it was acted on by the force; the same force will produce precisely the same change of motion ina body whether the body be at rest or in motion with any velocity whatever. Again, nothing is said as to the body being under the action of one force only ; so that we may logically put part of the second law in the following (apparently) amplified form :—

When any forces whatever act on a body, then, whether the body be originally at rest or moving with any velocity and in any direction, each force produces in the body the exact change of motion which it would have produced if tt had acted singly on the body originally at rest.

tangent to the curve, the other towards the centre of cur- vature,—their magnitudes being the rate of change of momentum in the direction of motion, and the product of the momentum into the angular velocity about the centre of curvature, respectively. In the case of uniform motion, the first of these vanishes, or the whole force is perpen- dicular to the direction of motion. When there is no force perpendicular to the direction of motion, there is no curvature, or the path is a straight line.

Hence, if we resolve the forces acting on a particle of mass m,

whose coordinates are z, y, z, into three rectangular components X, Y, Z, we have the equations originally given by Maclaurin, viz., dx d?y dz

ae Xs Mae = Ys mag = 4.

In several of the examples which follow, these equations will be somewhat simplified by assuming unity as the mass of the moving particle. When this cannot be done, it is sometimes convenient to assuine X, Y, Z as the component forces on wnit mass, and the previous equations become

dx

7B =I, ixeae

n

nr

om- : from which 2 may of course be omitted. ; sition § L1y. Since now forces are measured by the changes of {Some confusion is often introduced by the division of forces into ° forces, motion they produce, and their directions assigned by the ‘“‘accelerating” and “moving” forces; and it is even stated occa-

directions in which tliese changes are produced, and since the changes of motion of one and the same body are in the directions of and proportional to the changes of velocity, a single force, measured by the resultant change of velocity, and in its direction, will be the equivalent of any number of simultaneously acting forces. Hence

Lhe resultant of any number of forces (applied at one point) is to be found by the same geometrical process as the resultant of any number of simultaneous velocities.

sionally that the former are of one, and the latter of fowr linear dimensions. ‘The fact is, however, that an equation such as

may be interpreted either as dynamical or as merely kinematical. If kinematical, the meanings of the terms are obvious; if dynamical, the unit of mass must be understood as a factor on the left-hand side, and in that case X is the x-component, per unit of mass, of the whole force exerted on the moving body.]

If there be no acceleration, we have of course equilibrium among

Statical friction.

Kinetic friction.

Equili- brium of a particle.

Attrac- tion.

the forces. Hence the equations of motion of a particle are changed into those of equilibrium by putting aa

§120. We have now all that is necessary for the dynamics of a single particle, with exception of the experi- mental laws of friction. These, very nearly as they were established by Coulomb, we will now give.

To produce sliding of one flat-faced solid on another requires a tangential force which is directly proportional to the normal pressure between the surfaces, and whose actual magnitude is found from this pressure by means of a factor called the "coefficient of statical friction." This coefficient depends upon the nature of the solids, the roughness or smoothness of the surfaces in contact, and the amount of tallow, oil, &c., with which they have been smeared. It also depends upon the time during which they have been left in contact. It is only in extreme cases dependent on the area of the surfaces in contact.

§ 121. When the forces applied are insufficient to pro- duce sliding, the whole amount of friction is not called into play; it is called out to an amount just sufficient to balance the other forces. Thus there are two quite

distinct problems connected with the statics of friction :— the first, to determine the amount of friction called into play under given circumstances; the second, to find the limiting circumstances under which, with friction, equili- brium is possible. When motion is produced, there is still friction (now called " kinetic"). It follows the same laws as does statical friction, only that the coefficient, which is approximately independent of the velocity, is usually considerably less than the statical coefficient.

Statics of a Particle.

§ 122. By § 117, forces acting at the same point, or on the same material particle, are to be compounded by the saine laws as velocities. Therefore the sum of their re- solved parts in any direction must vanish if there is equi- librium; whence the necessary and sufficient conditions are found by resolving in three directions at right angles to one another.

They follow also directly from Newton's statement with regard to work, if we suppose the particle to have any velocity, constant in direction and magnitude (and by § 6 this is the only general supposition we can make, since absolute rest has for us no meaning). For the work done in any time is the product of the displacement during that time into the algebraic sum of the effective com- ponents of the applied forces, and there is no change of kinetic energy. Hence this sum must vanish for every direction. Practically, as any displacement may be resolved into three, in any three directions not coplanar, the vanishing of the work for any one such set of three suffices for the criterion. But, in general, it is convenient to assume them in directions at right angles to each other.

Hence, for the equilibrium of a material particle, it is necessary, and sufficient, that the (algebraic) sums of the applied forces, resolved in any one set of three rectangular directions, should vanish.

This statement gives at once the result that, if X,, Y,, 2,

X,, Y2, Z, &c., be the components (parallel to the three axes) of the forces P|, P,, &c., acting on the particle, we must have

3(X)=0, 3(Y)=0, 3(Z)=0.

When these conditions are not satisfied, there is a resultant force

P, with direction cosines A, mw, v, such that Pa=3(X), Pe=2(¥), Pr=x(Z).

§ 123. By far the most extensive series of examples of the composition of forces acting on a single particle is furnished by the theory of "attraction," where each particle of the attracting mass exerts upon the attracted particle a

force in the direction of the line joining them, and of magnitude depending on their masses and their mutual distance only. See PoTENTIAL.

§ 124. When there are but three forces acting on the Example particle, their directions to give equilibrium must obviously of partic)

*be in one plane. For, if the third were not in the plane *Wili- of the other two, it would have an uncompensated com- ponent perpendicular to that plane. Hence this case is always at once reducible to the triangle or the parallelogram*

of forces; and the magnitudes of each of the three forces

are respectively proportional to the sines of the angles between the directions of the other two.

' Thus, when a pellet is supported by two strings, as in

fig. 34, we may proceed as follows to determine their tensions. Let P be the pellet, of weight W, and let AP, BP be the strings attached to points A and B respectively. Let their tensions be T and T', The remark above shows that the strings must hang in a vertical plane, since the force W acts in a vertical line. Since A, B, and the length of the strings are given, the figureis perfectly definite. Draw Py vertically upwards, and make its length represent, on any assumed scale, the value of W. Draw yf <= parallel to AP, and let it meet BP in 8. Then Sy represents T, and Pf represents T', in direction and also in magni- tude, on the same scale in which yP represents W. This case leads to

nothing but the determination of the tensions, since the form of the figure is definite.

Next, let one of the tensions be given in magnitude. To effect this, we may suppose the end of PB not to be fastened at B, but to pass over a smooth pulley and support a weight Q. Let fig. 35 represent the state of equilibrium, and let the same construc- B tion as before be made. Then we must have yP: P@::W:Q; or, writing it in terms of angles,

sinAPB:sinAPy::W:Q.

A and B and the direction of yP being given, this datum suffices for the drawing of the figure; ¢.¢, for the calculation of the angles. A little con- sideration will show that, however small Q be, provided the string supporting it be long enough, there is always one definite position of equilibrium. The actual calculations in such a case as this are troublesome. It was chosen mainly on that account, so as to show, in a simple case, how pure geometrical pro- cesses may occasionally save the neces- sity of a tedious trigonometrical in- vestigation. But a still simpler method will be afterwards explained, viz., that, for a position of stable equilibrium, the potential energy must be a minimum. Now, to apply this to our example, we see that any downward displace- ment of Q produces an upward motion of P. But when AP is nearly vertical the vertical displacement of P 1s indefinitely smaller than that of Q, so that Q must 90 down. On the other hand if APB be nearly @ straight line, a displacement of P produces an indefinitely smaller displacement of Q. Hence P must go down. And these results are in character independent of the relative magnr tudes of P and Q, provided both be finite.

Finally, let both tensions be constant. Here we must imagine pulleys both at A and at B (fig. 36), with weights

Fig. 36.

‘Friction.

Rand Q attached to the ends of tho strings. But now we see that we must have the limiting condition R+Q>W. This is merely the geometrical

condition that PR+By>Py Here the magnitudes of all three sides of Py are given. Hence its angles are given, and the sole position of equili- prium is at once found.? § 125. Now take the case of a particle resting ona surface. As we are concerned only with the portion of the surface

. immediately contiguous to the position of the particle, we

may substitute for it its tangent plane at that point (except, of course, at singular points, where there may be an infinite number of tangent planes; but such cases we do uot con- sider). Hence the problem reduces itself in all cases to that of a particle resting on an inclined plane.

If the plane be smooth, the particle cannot remain in equilibrium unless some force is present to prevent its sliding down. Let us suppose it to be supported by a force, F, acting upwards along the plane (fig. 37). Then we have three forces at work :— the weight P acting vertically downwards; the supporting pressure of the plane R, which necessarily acts perpendicularly to the surface; and the third force, just mentioned, which we see by previous considera- Fig. 37. tions must be in the plane of the other two, and must therefore lie along the line of greatest slope of the plane. We might construct a triangle of forces as in the previous examples, but we will now vary the process, and resolve the forces in two directions at right angles to one another in their common (vertical) plane.

Let a be the angle of inclination of the plane to the horizon, then the algebraic sum of the components of the forces must vanish both horizontally and vertically. This gives us the two conditions

Feosa—Rsina=0, Fsina+Rcosa—P=0. From these we obtain at once F=Psina,

R=Peose

Now the choice of mutually perpendicular directions in which to resolve was at our option, and we see that had we chosen to resolve along and perpendicular to the plane we should have obtained the last two equations, which are equivalent to, but simpler than, the former ones, which were obtained by resolving horizontally and vertically. Theoretically speaking, it

does not matter which system we choose; in practice, however, it is well to select the directions which will give the required results in the simplest form. The full value of a proper selection will not be felt till we come to the statics of a rigid solid.

If we suppose the plane to be rough, friction alone may suffice to develop the requisite force F, But the utmost value of the friction is (§ 120) wR. Hence the particle will be on the point of sliding if

wR=F=Psina. Divide the members of this equation by those of R=Peosa, and we find p=tana,

Hence, so long as the coefficient of friction is greater than the tangent of the inclination of the plane to the horizon,

1 We have assumed here, what is properly part of the results of the third law of motion, that the tension of a weightless string, passing over a smooth pulley, is in the direction of its length, and of the same amount at all points.

the friction will suffice to prevent sliding. More and more Angle of

is called into play as the inclination of the plane increases, and finally when

tana=p

the particle is just about to slide down. This simple idea, taken along with Coulomb's results (§ 120), points to a very easy method of determining the coefficient of friction aii any two substances. The limiting angle defined Y a=tan-lp

is called, on account of this property, the "angle of repose."

$126. Let us now suppose the particle to be, in part, supported by an elastic string fixed at a point in the plane, and lying in the line of greatest slope. (This modification is introduced to show the nature of cases in which there

are limits between which equilibrium is possible.) We assume " Hooke's Law," viz., that the tension of an elastic string, drawn out from its natural length / to length /', is expressed by

v—1

1 3

where E is a definite constant, representing theoretically the tension which would just double the length of the string.

Our equations are exactly the same as before, only that F consists now of two parts,—one due to friction, the other to the elasticity of the string. Thus

+E Le 5

¥=F; ;

R=Pcosa.

Now, when sliding is about to commence downwards we have Fi=R,

If the particle is about to be dragged upwards, F,=—-pR. Hence for the two extreme positions of equilibrium

4-uPoosa+E-7!=Psina :

Hence the limiting positions of equilibrium of the particle

are given by its distance from the fixed end of the string— Palte (sin a7Fucosa) .

If 7' be less than the smaller of these, gravity pulls the particle down ; if it be greater than the larger of them, the tension of the string pulls the particle up. In intermediate positions the full available friction is not called into play.

§ 127. Next, let a small ring P (fig. 38) be attached to one end of a string. Let the string pass round two smooth pulleys B, C, at different points, then

be passed through the ring, then round two more pulleys D, E, and through the ring again, and so on,—the other end being either fastened to the ring or 3 attached to a fixed point. It is required to find the position of equilibrium of the ring when the string h 7% is drawn tight, by operat- / he gee ing on the lap of it behind ; two of the pulleys.

This is equivalent, from the physical point of view, Fig. 38. to finding the position of equilibrium of a particle acted on by a number of equal forces each directed towards a given point. From the geometrical point of view its solution obviously answers the question, 'Find the point the sum of whose distances from a number of given points is the least possible." The points need not lie all in one plane. The solution is, from the polygon of forces, that in

A

————— oer

repose.

Support by elastic string.

Equili- brium with a system of equal forces tending to given points.

Indeter- minate- ness of solution.

Sliding on in- clined plane.

Plane rough,

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the equilibrium position the laps of the string, from the ring outwards, are parallel to the respective sides of a closed equilateral polygon, taken

all in the same direction. That c~ :

the solution is unique will be seen ab,

at once by considering a displace- 3 ment of the ring, for the resultant ra of the forces obviously tends to goa diminish the displacement. When " J

there are but three forces, their directions must be inclined at me 6

angles of 120° to one another (fig, 39). Thus we have immediately the solution of the celebrated geometrical pro- blem, "Find the point the sum of whose distances from three given points is the least possible."

§ 128, If, in the first problem of § 124 above, the particle were supported by three strings, instead of two, each attached to a fixed point, we should first have to assure ourselves that all three are brought into play. For, if not, the problem is reduced to the former case. The obvious condition is that, when the three strings are simultaneously tight, and the points of suspension are not in one vertical plane, the particle supported shall be situated within the triangular prism formed by vertical planes passing through each pair of points. If this condition be satisfied, the pro- cess for determining the tensions of the strings is merely to construct a parallelepiped, three of whose edges lie along the strings, while the conterminous diagonal is vertical. This leads to an obvious geometrical construction; and, when it is carried out, the lengths of the various edges are to the diagonal as the corresponding tensions to the weight of the particle. When the three points are in one vertical plane, nothing short of infinitely perfect fitting will, in general, bring all three strings simultaneously tight ; and in this case the problem, mathematically considered, is indeterminate.! When the strings are sufficiently exten- sible, all will be brought into play; and, with sufficient data, the problem is determinate.

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§ 129. Here the motion is rectilinear, or at least takes place in some assigned curve.

The simplest case is that of a falling stone, when the effect of the resistance of the air is set aside and the acceleration due to gravity is reckoned the same at all elevations. This has already been treated with sufficient detail as a matter of pure kinematics, §§ 28, 29.

§ 130. When the particle, instead of falling freely, is con- strained by a smooth inclined plane on which it slides, we see that (so long as it moves on the line of greatest slope) its weight Mg has components, Mgsina tangential to the plane and Mgcosa perpendicular to it, a being the inclination of the plane to the horizon. The latter com- ponent produces the normal pressure on the plane, and is the only contributor to it, since there is no curvature. The former produces the acceleration of the motion. Thus the acceleration is now gsina only; but, with this change, the results of § 29 still hold.

§ 131, If the plane be rough, with coefficient of statical friction p, it can furnish (§ 120) a force of friction tending to prevent motion, of any amount up to

pMgcosa.

If this be less than Mgsina, motion will commence, and the force accelerating it will be

_ Mgsina—p'Mgcosa, where p' isthe coefficient of kinetic friction (§121). Thusthe

1 Of course, physically, there is no indeterminateness, even with perfectly inextensible strings.

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same results as in § 29 still hold, but with g (sina ~ p' cosa) instead of g. As we have seen that p'

§ 1382. Asa slightly more complex case, let us now take Boay again the problem of free motion in a vertical line, but falling t allow for the diminution of gravity as the distance from &th the earth increases. ite

The weight of a particle of mass m at the earth's surface is mg. Fraaion At a distance x from the centre, it is, therefore,

where R is the radius of the earth, supposed spherical. This acts downwards, or in the direction opposite to that in which « increases. Hence, equating it, with its proper sign, to the rate of acceleration of momentum, we have for the equation of motion

2

mié= — mgs «

Here the right hand member is a function of « only.] Multiply by

~R+h”

*R R . Ps – =—— J] = ae BV ~Rg(1 rai) RTH This shows the amount of error in the approximate formula (§ 28) for projectiles, — 4V2=gh. *

If the particle be supposed to have been originally at rest, at a Meteori ‘| practically infinite distance from the earth (a case which may occur with a meteorite for instance), we have <=0 when a=, and our formula becomes

C

Hence

%

The speed with which the mass reaches the surface (where a=R) is therefore 4/2gR, 7@.¢., that which it would acquire by falling, under constant acceleration g, through a height equal to the earth’s radius.

In this special case, the second integral is

Be! = a/2gRt+ C’.

The second integral, in its general form, is a little complex ; but we may avoid it by means of a geometrical construction, founded on the results of the investigation of planetary motion soon to be given. |

§ 133. Let us next take a case in which the accelera- Hail- tion depends upon the speed of the moving body. A stone or sufficiently simple one is furnished by a falling raindrop, E op. or hailstone, when the resistance of the air is taken into account. For the moderate speeds with which such bodies move, the resistance varies, at least approximately, as the square of the speed. To avoid needless complexity, we neglect here the variation of gravity due to changes of |! vertical height.

Suppose the particle to have been projected vertically upwards j from the origin with the speed V, and let v be its speed at any time) t, and a its distance from the origin at that time. |

If we assume & to be the speed with which the particle must move so that the retardation due to the resistance may be equal yi g, the

*retardation when the speed is v will be represented by Is **

Let the axis of x be drawn vertically upwards; then the resist- ance acts with gravity, and the equation of motion upwards 1s

wae,

!

|

dv I yey ye . Taal hatha dv g

or oe — a (k? + 0”)

Integrating, aud determining the constants so that, when

g=0, t=0 and v=V, we obtain

*gt _ a = WV – 2) ; i tan ; tan ; tan Pave * 29a lo iP 4+-V? Ke 8 Tye*

Let T be the time at which the speed becomes zcro, and / the corresponding value of x, then E tan ¥, andn=¥ tog (1+ Tr) = tan = and h = oF log ze a

After this the particle begins to return ; the resistance therefore acts against gravity, and the equation of motion is

dv aa Be» or d vane”)

Integrating, and determining the constants so that, when v=0, z=h and t=T, we obtain

29 yO ist. =, ¢- T)=logz | 3 29 ~ ke za? — 2) =log B-e . (It must be remembered that v is now negative.) Let U be the speed with which the particle returns to the point of projection ; then, putting 2-0 in the latter equation, we obtain

U2, _ 20k Ee i = € k2 9 or, substituting for / its value, WY? VW

BU14V72? whence

‘erminal Itis to be observed that & is the “ terminal velocity,” as it is ‘elocity, called, z.¢., the specd to which that of a falling body continually

tends, whether its original speed have been greater or less than this limit.

It is to be observed also that (strictly) we should write g (1—a) for g, where a is the specific gravity of air, to take account of the apparent loss of weight of a raindrop on account of immersion in air,

When & is very large, z.e., the absolute amount of resistance very small, as in the case of air, the general integrals in the second, ease above become, by expanding the logarithms,

ay

29

Gah — 2%) = Ta toat miele

of which the terms independent of & are

Sen g(t Th

vy = 29(h — x). These, if we remember that ¢—T is the time of fall, and A— the space fallen through, are at once recognized as the ordinary formule of § 28. The modification due to the resistance is shown approxi-

mately by the second terms on the right-hand side of the develop- ments above.

The necessity for this double investigation, one part for the ascent, the other for the descent, is due to the non-conservative, or "dissipative," character of the force of resistance.

§ 134. As an illustration of constraint by a smooth curve, let us take the case of a simple pendulum. Let O (fig. 40) be the point of suspension, P the position of the bob at any time ¢ Then, if PG represent the weight of the bob, and be resolved into PH, HG respectively along, and per- pendicular to, the tangent at P, we see A that PH produces the acceleration of the H motion, while the tension of the cord G balances HG and also furnishes the ac- _— Fig. 40. celeration perpendicular to the direction of motion which is required to produce the curvature of the path. PH is

(ceteris paribus) proportional to the sine of PGH, that is, of POA. Hence the acceleration is proportional to the sine of the angular displacement. When that angle is small it may be used in place of its sine. Hence, for small vibra- tions, the acceleration is proportional to the displacement, and the motion is "simple harmonic." The time of vibra-

tion, being (§ 51) 2 /displacement/acceleration, is here

7. all ~ =29 af 4 approximately. gsin@ ge" :

The rigorous solution of the pendulum problem requires the use of elliptic functions.

§ 135. Some very curious properties of pendulum motion are easily proved by geometrical processes. The whole theory of the motion in a vertical plane of a particle attached by a weightless rod to a fixed point, whether it oscillate as a pen- dulum or perform continuous rota- tions, may be deduced from the two following propositions, which are easily established by geometrical processes in which corresponding in- definitely small motions are compared.

(1) To compare different cases of continuous rotation. Let DA (fig. 41) be taken equal to the tangent from D to the circle BPC', whose centre C is vertically under D. Let PAQ be any line through A, cutting Fig. 41. in Q the semicircle on AC. Alsomake DE=DA. Then, if P move under gravity with speed due to the level of D, Q moves with speed due to the level of E, the acceleration due to gravity being reduced in the ratio AC? : 2BC?.

(2) To compare continuous rotation with oscillation. Let two circles touch one another at their lowest points O (fig. 42); compare the arcual motions of points P and p, which are always in the same horizontal line. Draw the horizontal tangent AB. Then, if P move, with speed due to g and level a, continuously in its circle, p oscillates with speed due to level AB and acceleration

*a0? IXO?**

§ 136. Two particles are projected from the same point, in the same direction, and with the same speed, but at different instants, in a smooth circular tube of small bore whose plane is vertical, to show that the line joining them con- stantly touches another circle.

Let the tube be called the circle A, and the horizontal line, to the level of which the speed is due, L. Let M, M' (fig. 43) be simultaneous positions of the particles. Suppose that MM' passes into its next position by turning about O, these two lines will intercept two indefinitely

Fig. 43. small arcs at M and M' which (by a property of the circle)

are in the ratio MO:OM'. Let another circle B be described touching MM' in O, and such that L is the radical axis of A and B. Let MP, M'P' be drawn

perpen- dicular to L. Let M'M cut L in C. Then, by the pro- perty of the radical axis, CO?=CM.CM'; from which we have, by geomet

ye ey ey one CM = OM? OM? or OM?:0M2=PM:P'M'. But (speed at M)?: (speed at M"=PM:P'M'.

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Motion in ver- tical circle.

Geome- trical theor- em.

Cycloi- dal mo- tion.

Tauto- chrone.

Resisted motion of pen- dulum.

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Hence the speeds of M and M' are as MO: OM', and therefore, by what we have stated above about elementary arcs at M and M', the proximate position of MM' is also a tangent to B, which proves the proposition.

It is easily seen from this that, if one polygon of a given number of sides can be inscribed in one circle and circum- scribed about another, an infinite number can be drawn. For this we have only to suppose a number of particles inoving in A with speeds due to a fall from L, and then if they form at any time the angular points of a polygon whose sides touch B they will continue to do so throughout the motion. Fig. 44 shows two forms of a quadrilateral possessing this property.

Fig, 44, Fig. 45.

§ 137. Zo find the time of fall from rest down any are of an inverted cyclord.

Let O (fig. 45) be the point from which the particle commences its motion. Draw OA' parallel to CA, and on BA' describe a semicircle. Let P,P', P" be corresponding points of the curve, the generating circle, and the circle

‘just drawn, and let us compare the speeds of the particle

at P and the point P’, Let P’T be the tangent at P”.

Speed of P” element at P” Speed of P clement at P Ry ge wf A’B_ A’B A’B ~ BP BP’A/ AB 2A’P”“/ AB“

But speed of P=/(2g . A’M) -,/ is Bo ae

Hence speed of P”= raf Pyar . A’B, a constant. And, as the length of A’P”B is 47. A’B,

time from A’ to B in circle=time from O to B in cycloid

AB a

The time of fall to the vertex from all points of the curve is therefore the same. Hence the cycloid is called a ‘ tautochrone.”

§ 138, As an instance of cases in which the acceleration depends upon the speed and the position jointly, take the motion of a simple pendulum in a medium whose resistance varies as the velocity directly. This is the law, at least approximately, for very small speeds, whether the pendulum oscillate in a gas or in a liquid,—and even when the resistance is due to magneto-electric induction, as when the pendulum is a magnetic needle vibrating in presence of a conducting plate or a closed coil. A syn- thetical solution of this problem has already been given under Kinematics in § 68,

Analytically : if 2 be the length of the string, @ its deflexion from the vertical at time ¢, m the mass of the bob, we have evidently

=F

mlé= —mgsind — 6.

, The ratio x/ml may be increased (theoretically) without limit by increasing the surface which the bob exposes, without changing its mass. But it cannot be indefinitcly diminished. We will write 2k for it. If we assume the angle of oscillation to be small, we may write the equation in the form

6+2k6+n?0=0,

where n?= g/l, and k is essentially positive, being greater as the resistance (whether on account of the viscosity of the medium or

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the large surface of the bob in proportion to its mass) is greater, A particular integral of this equation is evidently pag provided pet+2kp+n? =0, or p= -kine—7?,

Hence there are two quite distinct cases of motion, distinguished by different forms of solution, depending on the relative magnitudes of k and. These are separated from one another by the unique case in which k=n,

(a) Let k>n, and let k?-n?=n7

Then both values of p are real and negative,

o-Ae™ + Be™ _ kt t _n' =-s (Ae + Be"), |

If A and B have the same sign, @ diminishes, without changing sign, as ¢ increases. Butif A and B have different signs, the factor in brackets may vanish for one definite value of ¢, and then change sign. After that the whole reaches a maximum and then dimin- ishes without further change of sign. Examples of these cases are furnished—(1) when the pendulum is displaced from the vertical and allowed to fall back; it then approximates asymptotically to its position of equilibrium ; and (2) when it is drawn aside and flung back; in this case it may pass once through the position of equilibrium and then asymptotically return to it.

(6) Let n»>& and let n?-k?=n"?

Here both values of p are imaginary, and we have

g=e-H(Ag tnt —1 + Bent 1) =Pe—"cos(n't+Q).

This may be looked uponas a " simple harmonic motion" (§ 52), of which the amplitude dintinishes in a geometric ratio with the time, the decrement

depending on the resistance alone, while the period is permanently lengthened in the ratio 2: n'. This ratio depends both upon the original period and the resistance, so that for the same medium and same bob it is different for strings of different lengths. This investigation gives an approximation to the gradual dying away (by internal friction or by imperfect elasticity, &c.) of all vibratory movements. The rate of diminution of amplitude, say of torsional vibrations of a wire, is thus a valuable indication and measure of a somewhat recondite physical quantity, which, without this method, would (at present at least) be hard to measure.

(c) When n=4, 7.¢., in the transition case, the equation becomes

6+2n8 n?0=0; whose integral is known to be 6=¢-"™(A Bl)=¢e-(A+Beé),*

This, also, ultimately diminishes indefinitely as ¢ increases ; but, as in case (a), it may either do so coutinuously or after having once passed through the value zero and reached a maximum, according to the relative magnitude and the signs of A and B.

§ 139. When the path is given, the determination of the motion under given forces is, as we have seen, a mere question of integration of the equation for acceleration along the tangent. But more is required if we wish to find the normal pressure on the constraining curve. This is at once supplied by compounding the resolved part of the applied forces in the direction perpendicular to the tangent, with the additional force mV?/p acting from the centre of curvature. But, strictly speaking, all such questions require the application of Law IIL

Thus

Kinetics of a Particle with Two Degrees of Freedom.

gravity is supposed to be uniform and to act in paralle lines throughout the whole path, and the resistance of the air is neglected. This has been sufficiently discussed In §§ 40-42. Itis merely the combination of (1) the uniformly accelerated motion of a stone let fall, with (2) a uniform velocity in a definite direction. Looked at from this point of 'view, it gives an

interesting example of the graphic method applied in § 53 to indicate the nature of simple harmonic motion.

§ 141. We can extend these projectile results so as to take account of the alteration of direction and of intensity

| ‘ 7» § 140. The simplest case is that of a projectile, when Projec-

] tile un- resisted.

|

Plane- tary motion,

Apse.

_ all the trajectories.

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gravity at different points of the path, by remembering as shown in § 49, the path of an unresisted pro- ‘actile is an ellipse, one of whose foci is at the centre of

ropositions,

(1) The locus of the second foci of the paths of all pro- jectiles leaving a given point with a given speed, in a vertical plane, is a circle.

2) The direction of projection, for the greatest range on a given line passing through the point of projection, bisects the angle between the vertical and the line.

(3) Any other point on the line which can be reached at all can be reached by two different paths, and the directions of projection for these are equally inclined to the direction which gives the maximum range.

(4) If a projectile meet the line at right angles, the point which it strikes is the vertex of the other path by which it may be reached.

(5) The envelop of all possible paths in a vertical plane is an ellipse, one of whose foci is the centre of the earth, and the other the point of projection.

To prove these propositions, let E (fig. 46) be the earth's centre, P the point of projection, A the point which the projectile would reach if fired vertically upwards. With centre E, and radius EA, describe a circle in the common plane of projection. This, the circle of zero velocity, cor- responds to the common direc- trix of the parabolic paths in the ordinary theory. If F be the second focus of any path, we must have EP+PF con- stant, because the axis major depends on the speed, not the direction, of projection. Hence (1) the locus of F is the circle AFO, centre P. Again, since, if F be the focus of the path which meets PR in Q, we must have FQ=QS, it is obvious that the greatest range Pq is to be found by the condition Og=gs. O is therefore the second focus of this trajectory, and therefore (2) the direction of projection for the greatest range on PR bisects the angle APR. If QF=QF'= Qs, F and F' are the second foci of the two paths by which Q may be reached ; and, as 4 F'PO= 4 FPO, we sce the trath of (3). If Q bea point reached by the projectile when moving in a direction perpendicular to PR, we must evidently have Z PQF' = 2 PQF = LSQR = 4 EQP; we, EQ passes through F'. When this is the case, the ellipse whose second focus is F evidently meets PR at right angles; and that whose second focus is F' has (4) its vertex at Q. The locus of qg is evidently the envelop of Now Py=P0+0qg=PA+09, Eq=Es—sq=EA—Oq.

e

Fig. 46.

Hence

Py+Eq=PA+AE, or (5) the envelop is an ellipse, whose foci are E and P, and which passes through A.

§ 142. One of the most important problems in this branch of our subject is that of planetary motion, which forms a good typical example of the processes to be employed in the One or two definitions, and a

treatment of central orbits. general property of central orbits, must be premised.

§ 143. Def. An "apse" is a point, in a central orbit, at Which the path is perpendicular to the radius-vector along

which the central force acts.

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The length of the radius-vector is therefore, at such a point, generally a maximum or a minimum. This radius vector, drawn to an apse, is called an " apsidal line."

A central orbit is symmetrical about every apsidal line. The simplest proof of this theorem depends upon the general principle of "reversibility," which holds in all con- servative systems. In fact if, at any instant, the velocity-vector of a particle, moving under the action of a conserva- tive system of forces, be reversed, the particle will simply retrace its previous path. For if we suppose a smooth tube, in the form of the previous path, to be employed to guide it back, the speed at every point will be of the same magnitude as before. The curvature also of the path will be the same; and thus the normal component of the applied forces will balance the so-called centrifugal force, —z.e., will suffice to produce the requisite curvature,—so that there will be no pressure on the tube, and it is not required. Hence since, at an apse, the velocity is perpendicular to the radius-vector, the two halves of the orbit on opposite sides of the apsidal line are similar and equal. Hence, however many apses there may be, there can be at most only two apsidal distances. For the property of symmetry about each apsidal line shows that, if there be more apses than one, the first, third, fifth, &c., must have their apsidal distances equal, as also must the second, fourth, sixth, &e. If there be one apse only, it may correspond either to a minimum or to a maximum value of the radius-vector ; but, if there be more than one, they must be maxima and minima alternately.

§ 144. We now proceed to the gravitation case already promised. We will take, first, the direct problem as in § 49, where the force is assigned and the orbit is to be found.

A particle is projected from a given point in a given direction and Plane- with a given speed, and moves under the action of a central attrae- tary tion varying inversely as the square of the distance ; to determine motion.

the orbit. We have P=pu?, and therefore by the last part of § 47 au Bb = hls i

where / is double the constant area, or

*@& K _ ie *- a) *(" He)-?»*

the integral of which is u-+,=Acos(@+B),

or, as it is usually written,

u= £,{1+ec0s(9—a) } 1 (1). This gives by differentiation at = ~Hesin (9-2) 2 3,2 ae

Let R be the distance of the point of projection from the centre, and g the angle, and V the speed, of projection; then, when @=0,

Uu dé @=0

2

Hence, by (1) Le re

pk and by (2) P wigs —esina.

pR h? cot

From these © tana Ra eee ee

*ie Qh? and P= goons S – ie 1 (4), But h?=V?°R*sin?p,*

V?Rsin Bcos B wherefore tana= 2 VRsin®B (3), 2R2 atn? "y2 : a We ee ie os aC; -v) oy Be Be

---

Now (1) is the general polar equation of a conic section, focus the pole ; and, as its nature depends on the value of the excentricity é given by (4'), we see that

if V?>2u/R, e>1, and the orbit is an hyperbola; if V?= 2u/R, e=1, and the orbit is a parabola; if V?< 2u/R, e<1, and the orbit is an ellipse.

But the square of the speed from rest at infinity to distance R, for the law of attraction we are considering, is 2u/R, and the above conditions may therefore be expressed more concisely by saying that the orbit will be an hyperbola, a parabola, or an ellipse, aceord- ing as the speed of projection is greater than, equal to, or less than, the speed from infinity. Illustrations of this proposition are found in the eases of comets and of meteor swarms.

The speed of a particle moving in a circle is also often taken as the standard of eomparison for estimating the velocities of bodies in their orbits. For the gravitation law of attraction the square of the speed in a eirele of radius R is 4/R; and the above con- ditions may be expressed in another form by saying that the orbit will be an hyperbola, a parabola, or an ellipse, according as the speed of projection is greater than, equal to, or less than \/2 times the speed in a eirele at the same distance.

Supposing the orbit to be an ellipse, we shall obtain its major axis and latus rectum most easily by a different process of integrat- ing the differential equation. Multiplying it by wee and inte-

grating, we obtain i >| du? >| lis g (Fi) +4 a" C+pu.

But when ur » v=V; which gives liye. si al R'

hence

Lae} (au) 2{ atv oh (3) +U oe hee: "ap teu . (5).

Now to determine the apsidal distances, we must put

du a" aud this gives us the condition Qu 22 Y? ws 3 + san – 770 ee SS (6),

which is a quadratic equation whose roots are the reciprocals of the two apsidal distances. But if a be the semi-axis major, and ¢ the excentricity, these distances are a(1-e) and a(1+e). Hence, as the coefficient of the second term of (6) is the sum of the roots with their signs changed, we have Seer ta a(l—e) a(l+e) h®'

h2 or a(1—- he . (7). And the third term is the product of the roots, so that a one | a(l-e) WR hi'

1 3.7

or, by (7), at xt a ee eee poe a." Roa' Jaki and therefore ay =e, ft «= aS)

Equations (7) and (8) give the latus rectum and major axis of the orbit, and show that the major axis is independent of the direc- tion of projection.

Equation (9) gives a useful expression for the speed at any point, and shows that the radius of the circle of zero speed is 2a.

The time of describing any given angle is to be obtained from the formula,

ae P ra, = h=/{wa(1—e)}, by equation (7).*

From this, combined with the polar equation of the ellipse about the focus, we have

a JE ca la oh do JT ua(i-)} /(z aera

measuring the angle from the nearer apse. Integrating, we find the time of describing about the focus an

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angle @ measured from the nearer apse, in the ellipse or hyperb expressed as 2/h of the sectorial area ASP (Ngee § wy vee might have been written down from the condition of uniform moment of momentum.

In the parabola, if d be the apsidal distance, the integral becomes [since e=1, a(1-e)=d, a(1- e)= 2d) ,*

208 ea] t= af (tong + tan? Z) 5 From the result for the ellipse we see that the periodic time is OnN aly é

In the notation commonly employed for the further development

of this most important question we write T=2r/n, where , which is called the " mean motion," is Vala.

§ 145. By laborious calculation from an immense series Kepler's of observations of the planets, and of Mars in particular, avs Kepler was led to enunciate the following as the kine- (kinema- matical laws of the planetary motions about the sun. me

I. The planets describe, relatively to the sun, ellipses of which the sun occupies a focus.

II. The radius vector of each planet traces out equal areas in equal times,

III. The squares of the periodic times of any two planets i: are as the cubes of the major axes of their orbits,

§ 146. We proceed to the znverse problem of § 8 (6), the Conse- determination of the force from the observed motions. quenceso!_

From the second of the above laws we conclude that the Kepla's planets are retained in their orbits by an attraction tending " "~ to the sun. Jf the radius-vector of a particle moving in a plane describe equal areas in equal times about a point) in that plane, the resultant attraction on the particle tends H to that point. For the datum is equivalent to the state- – | ment that there is no change of moment of momentum | about the sun, or that the accelerations all pass through the sun viewed as a point.

From the first law it follows that the law of the intensity of the attraction is that of the inverse square of the dis- tance.

The polar equation of an ellipse referred to its focus is

un {1 +ecosé), where Z is the latus rectum. Pu 2¢ \ Hence i ere enc Te i cosé,

and therefore the attraction to the focus requisite for the deserip- 1

tion of the ellipse is (§ 47) \ p Pu Qh?

AG, Ofer ne PAE

FP nut Fe + w) Tu |

Hence, if the orbit be an ellipse described about a centre of attrac .

.

tion at the focus, the law of intensity is that of the inverse square of the distance. .

From the third law it follows that the attraction of the sun (supposed fixed) which acts on unit of mass of each of the planets is the same for each planet at the same distance.

For, in the last formula in § 144, T? will not vary as a" unless p be constant, 7.¢., unless the strength of attraction of the sun be the) same for all the planets. ; ' |

We shall find afterwards that for more reasons than one Kepler's Law & laws are only approximate, but their enunciation was sufficient to gravita- | enable Newton to propound the doctrine of universal gravitation, tion | al] viz., that every particle of matter in the universe attracts every other (phys! | with an attraction whose direction is that of the line gouning them, and whose magnitude is as the product of the masses directly and as the square of the distance inverscly ; or, according to Maxwell's formulation, between every pair of particles there is a stress of the nature of a tension, proportional to the product of the masses of the particles divided by the square of their distance.

If we take into account that the sun is not absolutely fixed, then, neglecting the mutual attractions of the planets, Kepler's third law should be stated thus :— h

The cubes of the major axes of the orbits are as the squares of "4 periodic times and the swms of the masses of the sun and the planet.

| Janet's notion.

Kepler's

"more ordinary transformations by which the preceding

problem,

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§ 147. We will now indicate, as briefly as possible, the | cients are sines or cosines of multiples of n/. Hence, by substitut- ing these valnes in equation (1) and in the development of (2), we have 7 and @ expressed in series whose terms rapidly decrease, and whose coefficients are sines or cosines of multiples of xt. This is the complete practical solution of the problem. But we must refer the reader to special treatises for the full development of this

subject. Compare § 52.

formule are adapted (for astronomical applications) to numerical calculation.

Suppose APA' (fig. 47) to be an elliptic orbit described about a centre of attraction in the focus S. Also suppose P to be the posi-

tion of the particle at any time ¢. O § 148. We may take an opportunity here of giving a Stability Draw PM oe i be iN sketch of a particular case of the important question of of circular Bt ths auxiliary tear nie "' kinetic stability." The general treatment of this subject oes point Q. Let C be the common / is entirely beyond our limits. But we may investigate its eentre of the eurves. Join CQ. conditions, in the case of a central orbit naturally circular, " et ent pride Atom A' | by a very slight modification of our equations. to S, it is said to be in " peri- _ Whatever be the law of central force, provided it depend on the helion." distance alone, we can write the acceleration due to it as

The angle ASP, or the excess Fig. 47. purf(u),

of the particle's longitude over that of the perihelion, is called the "true anomaly." Let us denote it by 0.

The angle ACQ is ealled the "exeentrie anomaly," and is gene- rally denoted by u. And, if 2x/n be the time of a eomplete revol-

where u is the now reeiprocal of the radius-veetor, as in § 144. The kinematies of the motion is then entirely summed up in the equations

Pu

wie do 1 +u=sf(u), and di =hi.*

ution, né is the eireular measure of an imaginary angle ealled the de? 'mean anomaly ;" it would evidently be the true anomaly if the ' , : particle's angular velocity about S were eonstant. If 1/a be the radius of the circle, the first equation becomes simply

It is easy from known properties of the ellipse to deduce the fol- lowing relations between the mean and execntric, and also between the true and excentric, anomalies :—

a= 7/2).

Now let a slight disturbance be given to the motion, such that h is unaltered, but that « becomes a+. Then we have

ax be api tete= palate).

Expanding to first powers of x only, and thereby assuming that x is always exceedingly small, we have

ax Mor ae = 2(4 = £p(a))=0, the terms independent of x vanishing by the condition for a circular orbit. By eliminating the ratio »/h® we have dx 2f(@)) 2 a6? +k x(1 fa) =0. To secure stability, « must not be capable of increasing indefi- nitely. This leads to the result that the multiplier of xin the above equation must be positive; 7.¢.,

nt=uU—esinu.

u l-e 0 tanz = J (ene e

By far the most important problem is to find the values of @ and y as functions of ¢, so that the direction and length of a planet's radius-vector may be determined for any given time. This gene- rally goes by the name of Kepler's Problem.

Before indicating the systematic development of w, 7, and @ in terms of ¢ from our equations, it may be useful to remark that, if ¢ be so small that higher terms than its square may be negleeted, r may easily obtain developments correct to the first three terms.

*thus uw=nt+esint, =nt +esin(nt+esinnt) nearly, = nt + esinnt + $e*sin 2nt.*

Also "= 1-ecosu, =1-ecos(nt-+esin nt), =1- ecosnt + $e7(1 — cos2nt).

Ana 2 an) {ual -e)} ,

For, if the multiplier were negative, the value of 2 would consist of two real exponential terms, one of which would increase indefi- nitely with the angle @, and would disappear from the value of x

under special conditions only. ; If the multiplier were zero, x would be a linear function of 0.

Hence, in the only case we need consider, we have z—Acos(0 Ne = + B) – F(%) The radins-veetor is therefore a maximum and minimum (7.¢.,

apses occur) alternately as the angle @ increases by successive in- crements each equal to

which may be written a(1 — 6?) do (1+¢eec0s0)? dt

or (1-e)8(1 + ecoss) "= == 70.

Keeping powers of e lower than the third,

= naX(1—e?)},

(a 20080 + §¢2c0520 7 =,

or nt= 6 — 2esin@ + 3e?sin 20 ; ARTIC (a) : whence 6=nt + 2esin6 — $e” sin 20, a f(a)

*=nt +2esin (nt + 2esin nt) — Ze? sin 2né, =nt + 2esinnt + 4e2cosntsin nt — fe*sin 2nt, =nt+2esinnt + $e”sin 2nt.*

Kepier’s Prostem.—To find r and 0 as functions of t from the

Suppose the force to vary as the inverse nth power of the distance. Here f(a) «a”~~2, and we have 1~~ — =1-(n-2)=3-n. Thns

n must be less than 3; ¢.¢., a eircular orbit, with the eentre of foree in the centre, is essentially unstable if the foree vary as the inverse

wations ; ‘ y—a(l—ecosu) . . – - – » (1); third, or any higher inverse power of the distanee. ‘ 9 1 If n=2, which is the gravitation case, the apsidal angle is evi- tan> = a tan Ss oe we » Oy | dently,

§ 149. A very curious result, due to Newton, may be Newton’s indicated here, viz., that, if any central orbit be made Tevolving to revolve in its own plane with angular velocity propor- la tional at each instant to that of the radius-vector in the fixed orbit, it will still be a central orbit ; and the additional force required will be inversely as the cube of the radius- vector.

Generally, in a central orbit,

#-r@=P, ro=h,

mt=w-esinu.,. + as ge (8)

These equations evidently give 7, 0, and ¢ directly for any assigned. value of #, but this is of little value in practice. The method of solution which is commonly adopted is that of Lagrange, and the general principle of it is this :—

We ean develop @ from equation (2) in a series aseending by powers of a small qnantity, a funetion of ¢, the eoefficients of these powers involving u and the sines of multiples of w Now by Lagrange's theorem we may from equation (3) express wu, 1 — eeos2, sinw, sin2u, &c., in series ascending by powers of ¢, whose coeffi-

Brachis- tochrone.

Condi- tions for a maxi- nium.

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But suppose 9 to become ¢@,, where ¢ is a constant, and we have 6=c6,, which is Newton's hypothesis. The above equations become #-702=P+(2-1)r6?, reh,=h; or, as they may be written, #-762=P+(-1)h2/23, 7°6,=h,. From these the proposition is obvious.

Other examples of central orbits will be given when we discuss general principles, such as " least action" and g p pies, "varying action."

The Brachistochrone.

§ 150. A celebrated problem in the history of dynamics is that of the "curve of swiftest descent," as it was called :—

Two points being given, which are neither in a vertical nor in & horizontal line, to find the curve joining them down which a particle sliding under gravity, and starting from rest at the higher, will reach the other wn the least possible tome.

The curve must evidently lie in the vertical plane passing through the points. For suppose it not to lie in that plane, project it orthogonally on the plane, and call corresponding elements of the curve and its projection o and o. Then ifa particle slide down the projected curve its speed at o' will be the same as the speed in the other ato. But o is never less than o', and is generally greater. Hence the time through o' is generally less than that through o, and never greater. That is, the whole time of falling through the

projected curve is less than that through the curve itself. Or the required curve lies in the vertical plane through the points.

Also it is easy to see that, if the time of descent through the entire curve is a minimum, that through any portion of the curve is less than if that portion were changed into any other curve.

And it is obvious that, between any two contiguous equal values of a continuously varying quantity, a maximum or minimum must lie. [This principle, though excessively simple (witness its application to the barometer or thermometer), is of very great power, and often enables us to solve problems of maxima and minima, such as require, in analysis, not merely the processes of the differential calculus but those of the calculus of variations. The present is a good example. |

Let, then, PQ, QR and PQ', Q'R (fig. 48) be two pairs of indefinitely small sides of polygons such that the time of descending through either pair, starting from P with a given speed, may be equal. Let QQ' be hori- zontal, and indefinitely small compared with PQ and QR. The brachisto- chrone must lie between these paths, and must possess any property which they possess in common. Hence if » be the speed down PQ (supposed uniform) and v' that down QR, draw-

Special Problem.

Fig. 48. ing Qm, Q'n perpendicular to RQ', PQ, we must have

Now if 6 be the inclination of PQ to the horizon, 6 that of QR, Qn = QQ' cosd, Q'm= QQ' cos'. Hence the above equation becomes cos) cosé' v v

This is true for any two consecutive elements of the required curve ; and therefore throughout the curve

»«cosé. But v?« vertical distance fallen through (§ 28).

Hence

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the curve required is such that the cosine of the angle it makes with the horizontal line through the point of departure varies as the square root of the distance from that line,—which is easily seen to be a property of the cycloid, if we remember that the tangent to that curve is parallel to the corresponding chord of its generating circle, For in fig. 45, § 137, WP

i == { __ =e. a, AM cos BP'M=cos BAP ar i tw

AB aa/AM.

The brachistochrone then, under gravity, is an inverted cycloid whose cusp is at the point from which the particle descends.

§ 151. Whatever be the impressed forces, reasoning similar to that in last section would show that the oscu- | lating plane of the brachistochrone always contains the _ resultaut force, and that |

v' cosd=veos@, where 0 is now the complement of the angle between the curve and the resultant of the impressed forces.

Let that resultant=F, and let the element PQ=5s, and 6'=6+68. hen

v2 — oy? =2FSssin 8,

or vdv=Féssiné. But v«cos@; which gives dv sin 0 e086' Hence 0/%5 _ _ Feosd.

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But in the limit a= p, the radius of absolute curvature at Q;

and Feos@ is the normal component of the impressed force. Hence we obtain the result that, in any brachistochrone, the pressure on the curve is double of that due to the force acting.

§ 152. Now for the unconstrained path from P to R we have /uds a minimum (§ 202), Hence in the same way as before, ¢ being the angle corresponding to 4, vecos@=v'cos¢' from element to element, and therefore throughout the curve, if the direction of the force be constant. Now, if the velocities in

the unconstrained and brachis- tochrone paths be equal at any equipotential surface, they will be equal at every other. Hence, taking the angles for any equipoten- tial surface,

cos 6cos ¢ = constant.

As an example, suppose a parabola with its vertex upwards to have for directrix the base of an inverted cycloid; these curves evi- dently satisfy the above condition, the one being the free path, the other the brachistochrone, for gravity, and the velocities being in each due to the same horizontal line. And it is seen at once that the product of the cosines of the angles which they make with any horizontal straight line which cuts both is a constant whose mag- nitude depends on those of the cycloid and parabola, its value being \/i/4a, where J is the latus rectum of the parabola, and a the diameter of the generating circle of the cycloid.

Kinetics of a Particle Generally.

§ 153. Here we must content ourselves with a few special aa cases, which will be varied as much as possible. aa

A unit particle moves on a smooth eurve, under the action of any system of forces; find the motion. :

All we know directly about the pressure R on the curve 1s that it is perpendicular to the tangent line at any pont.

Resolve then the given forces acting upon the particle into three, —one, T, along the tangent, which in all cases in_nature will be & function of x, y, z and therefore of s; another, N, in the line of intersection of the normal and osculating planes (or radius of abso- lute curvature); and the third, P, perpendicular to the osculating plane. f R

Let the resolved parts of R in the directions of N and P be hy, R, Now the acceleration of a point moving in any manner 1s CoD

pounded of two accelerations, one Te ors along the tangent to

the path, and the other at towards the centre of absolute curva- p ture, the acceleration perpendicular to the osculating plane being zero; and therefore d's (1).

qa e . . ry . .

sufficient to determine the motion completely.

2

Also p = Ry == N . ° 2 . Py ' @) R, and N being considered positive when acting towards the centre of absolute curvature; this equation determines R,.

Now R, is the reaction which prevents P's withdrawing the particle from the osculating plane ; and therefore

a 7 (3).

(2) and (8) give the resolved parts of the pressure on the curve.

Also R=A/ (R2+ R32), andits direction makesan angle=tan~1(R,/R,) with the osculating plane.

If the result of the investigation should show that at any time R could vanish, the particle must be treated as free until the equations of its free motion show that it is again in contact with the curve.

A particle moves, under given forces, on a given smooth surfuce; to determine the motion, and the pressure on the surface.

- *Let F@,7,2)=0 . (3); be the equation of the surface, R the reaction, acting in the normal to the surface, which is the only effect of the constraint. Then, if A, #, v be its direction cosines, we know that (z) dx*

= (2),

Jie-eren dz dy dz with similar expressions for » and », the differential cocflicients being partial.

If X, Y, Z be the applied forces on unit of mass, our equations of motion are, evidently, #=X+Ra

eat UN a“ so) a oe eQ z2=Z+]y rte equations (3) respectively by z, 7, 2, and adding, we = ei+yjtz=w=Xe+YyiZe . . (4). R disappears from this equation, for its coefficient is At+ py + v2 and vanishes, because the line whose direction cosines are propor- tional to x, &c., being the tangent to the path, is perpendicular to the normal to the surface.

If we suppose X, Y, Z to be a conservative system of forces, the integral of (4) will be of the form

4° = g(a, y,2)+C. aS 2s (5),

and the velocity at any point will depend only on the initial cir- cumstances of projection, and not on the form of the path pursucd.

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This equation, together with the two equations of the curve, is| of the tension of the string must support the weight of

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the bob ; «e.,

Tcosa=mg, where a is the inclination of the string to the vertical. Also the horizontal component of the tension must supply

the force mV?/R (§ 49) requisite for the production of the curvature of the path, z.e.,

Tsina=m——— . isina Eliminating m/T from these equations, we have pass i ad sin’a V2 But, if + be the time of revolution of the bob, Vr=2rilsina . He cosa gl a 7 Aw??? or T=2n gree ; g a.e., the conical pendulum revolves in the period the small vibrations of a simple pendulum whose lengths the

vertical component of that of the conical pendulum (§ 134).

To carry the investigation to cascs in which the pendulum de- scribes a tortuous curve, we require (except for approximate results) the use of elliptic functions. We thus obtain, among others, the following results :-—

The motion will be comprised between two horizontal circles. Let the depths of these circles below the centre be b+e and b-c; then the vertical motion of the bob of the pendulum will be the same as that of a point on a simple pendulum of length 2?/c per- forming complete revolutions in the same periodic tine as the spherical pendulum.

But for one of the most important applications the deflexion from the vertical is always very small, and it is easy to obtain a sufficiently accurate working approximation without the use of elliptic functions. If we put p and gq for the semidiameters of the small elliptic orbit which will then be described by the pen- dulum bob, we find for the apsidal angle

7 30g

(149%...).

Hence, whena pendulum is slightly disturbed in any way, the motion is to a first approximation elliptic as in § 50. But the second approximation shows that this ellipse rotatcs in its own plane, and in the same sense as that in which it is described, with an angular velocity proportional to its arca. Hence the necessity for extreme carc, in making Foucault's experiment (presently to be described), lest the path should even slightly deviate from a vertical plane.

To find B i "e oe § 155. Another very important and useful example is Blackburn eee ee Teenlve'nlong the normel, then furnished by Blackburu's pendulum, which is simply a pendu- P/p=Xa+Ypt+Zv+R, pellet supported by three threads or fine wires knotted Fant,

onical endu- um,

which gives the reaction of the surface; p being the radius of cur- vature of the normal section of the surface through the tangent to the path, and the mass of the particle being taken as unity.

To find the curve which the particle describes on the surface.

For this purpose we must eliminate R from equations (3). By this process we obtain

go ee GX 2-2 (6)

———<—- > — *e . . ?*

A “ v

two equations, between which if ¢ be eliminated, the result is the

differential equation of a second surface intersecting the first in the curve described.

If there be no applied forces, or if the component of the ap- plied force in the tangent plane coincide with the direction of motion of the particle, then the osculating plane of the path of the particle, which contains the resultant of R and the applied force, will be a normal plane, and therefore the path will be a geodesic on the surface.

Thus a particle under no forces on a smooth (or rough) surface will describe a geodesic.

§ 154. An excellent and important ex- ample is furnished by the simple pendulum, when its vibrations are not confined to one vertical plane. When the bob moves in a horizontal plane, the arrangement is called a Fig. 42: “conical” pendulum, and it is a very simple matter, as follows, to find the motion. For the vertical component

ONT

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together at one point C (fig. 50). The two other ends of two of them are attached to fixed points A and B, and the third supports the pellet P, The motion of P is virtually executed on a smooth surface, whose principal curvatures uear the lowest point are 1/CP in the plane of the three threads,

and 1/PE in the plane perpendicular to them,—E being the intersection of the vertical through C with the line AB. Hence for small disturbances of this system, P has a P simple harmonic motion in the plane Fig. 50. of the paper whose period is 27 JCP/g, and another at right angles to it, with period 27 VPE/g. The amplitudes of these motions are arbitrary, and, with the difference of phase, depend entirely on the initial disturbance. Thus we have a very simple mechanical means of producing the combinations treated in § 63; for we have only to make PH: PO: 2a" @7,

and give the bob its proper initial motion.

§ 156. When CE is very small compared with CP, we have a realization of the case of § 61, in which the

Lissa- joux's tuning: forks.

Foucault pendu- lum

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orbit is (at any instant) an ellipse, but in which the ellipse gradually changes its form and position, so as to be always inscribed in a definite rectangle. This experimental arrange- ment is exceedingly instructive. To avoid as far as may be the effects of resistance of the air, the vibrations should be slow, «¢., the wires should be as long as_ possible. The bob should be a ball of lead, containing a tube full of ink which slowly escapes from a fine orifice at its lower end, so as to make a permanent record of the path ona sheet of paper placed below the plane of motion of the bob, but parallel and very close to it. Or, the bob may be furnished with a spike at its lower end, from which induction sparks may be taken so as to pierce a sheet of paper laid on a copper plate below it.

By mere alterations of the point of suspension A, the ratio of w, w' may be varied at pleasure, provided that AC and BC are long enough compared with CP.

§ 157. Lissajoux produced similar curves by attaching plane mirrors to the legs of tuning-forks, and allowing a ray of light, after successive reflexions

from two such mirrors, tofall on a screen. But it seems to have been first pointed out much earlier by Sang, and afterwards developed by Wheatstone, that the same result is obtained by fixing firmly one end of a steel rod, and setting the free end in vibra- tion. There are two planes of greatest and least flexural rigidity (§ 274) in all wires, however carefully drawn. 'These are at right angles to one another ; and the motion of the free end of the wire when slightly disturbed is there- fore precisely that of the bob of the Blackburn pendulum. Another interesting mode of producing the same result is by causing a ray of sunlight to be reflected in succession from four mirrors, all attached, nearly at right angles, to parallel axes. One pair is made to rotate, the two in opposite directions, with one angular velocity. A ray reflected in succession from these is (§ 65) made to oscillate according to the simple harmonic law, in a plane which can be varied at pleasure by altering the relative position of the normals to the two mirrors. The other pair of mirrors supplies the other simple harmonic motion, also in any desired plane.

§ 158. We must next consider the effect of the earth's rotation upon the motion of a simple pendulum. Strange to say it was left for Foucault to point out, in February 1851, that the plane of vibration of a simple pendulum suspended at either pole would appear to turn through four right angles in twenty-four hours,—the plane, in fact, remaining constant in position while objects beneath the pendulum were carried round by the diurnal rota- tion. At the equator, it was pretty obvious that no such effect would occur, at least if the original plane of vibration was east and west. By some process, of which he gives no account, Foucault arrived at the result that the plane of oscillation must, in any latitude, appear to make a complete revolution in 24 x cosec latitude. This curious result has been amply verified by experiment.*

The equations of motion of the pendulum, referred to rectangular

axes fixed in direction in space and drawn from the earth's centre, the polar axis being that of z, are obviously dx xL-a map = i ale mx,

with similar expressions in y and z (a, 6, c being the coordinates of the point of suspension, T the tension, 7 the length of the string, and X, Y, Z the components of gravity),

The equations of motion referred to a new set of axes parallel to the former, but drawn through the point of suspension, are

Pa—-a) ywxe-a aa m oie a?) :

dt? (1).

&c. =&e. Let us now refer the motion to axes turning with the earth, but drawn from the point of suspension. If the axis of ¢ be drawn vertically, and the axes of », ¢ respectively southwards and east-

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wards ; and if wt be the angle at time ¢ between the planes of a and &y, A being the co-latitude of the point of suspension, we haye (assuming that £ intersects z)

cos at =sINACOS wt, cos yé=SiINASiN wl, coszt=cosa, &c.

By means of these expressions we can at once find the values of x—a, y—6, z-c in terms of &, n, ¢ ¢, as follows:

%—-a=ESMACOS wl + 7 COSA Cos wf — (sin wt, y— 6={sinAsin wt + ycosasinwt + (cose, 2—c¢ =ECOSA — SIDA.

Let y be the acceleration due to the attraction of gravity alone and y the angle (ncarly equal to A) which its direction makes with the polar axis. [We have above in effect assumed that its direction lies in the plane of zt, as we have assumed that the axis of é intersects the polar axis, while we know that the centrifugal force lies in their common plane.] Let r be the distance of the point of suspension from the earth's centre, wz the angle its direction makes Then

a@=rsinpcoset, b=rsinusinwl, c=rcosp.

With these data we transform equations (1) from 2, y, 2 to &, », ' The equations immediately obtained are inconveniently long for our columns. But they are easily simplified as follows.

We contemplate small vibrations only; so we may treat & as being practically equal to—/, and omit its differential coefficients, We also omit powers and products of 7, ¢ and all terms in w?, except those in which it is multiplied by a large quantity. For it is known that the centrifugal force at the equator is about 1/289th of gravity, or that approximately

rw? = 9/289.

With these considerations, and the condition that to the degree of approximation desired we have T=mg, we still further simplify ourequations, We are led to recognize that ycosy=gcosa; and thus we have finally

ae. g

an TA ~ 2@ cosas? + -T9=0

a? d TS + 2cosast + £¢—0

These are the equations of the motion of the bob, referred toa horizontal plane fixed to the earth. The middle terms obviously depend upon the earth's rotation.

To interpret equations (2) it is convenient to employ a second change of coordinates—to refer the motion to axes revolving uni- formly in the plane of y, ¢ with angular velocity 2. If p, 3 be the coordinates referred to the new axes, we have by analytical geometry

n=pcosnt—3sin Nt, (=psmNé+3cosNé, the substitution of which in (2) leads to the equations

with the polar axis.

ee)

(3), (4),

—5+>=0,

provided we take N=—wCOSA, .

and omit as before terms of the order w. ll*

(4) shows that the new axes rotate, in the opposite direction to that of the earth, with the component of the earth's angular velocity about the vertical at the place. And, in the plane so revolving, we see by (3) that the bob of the pendulum describes an approxi- mately elliptic orbit, of which a straight line is a particular case.

A circular path being obviously possible, let us assume as par- ticular integrals of (2)

n=ccos(pt+a), ¢=csin(pt+a). The substitution of these values gives the same result p? + 2upcosa —g/1=0 in each of equations (2). .

Put g/7=n?, then the values of p are, to the degree of approxi- mation above employed, -t ~ wcosa, so that the (apparent) angular velocity of a conical pendulum is increased or diminished by wcosA according as its direction of rotation is negative or positive.

§ 159. The preceding problem is a particular case of the gee following general one. To find the motion of a particle subjected to the action of given forces and under varymng constraint. It would lead us to details incompatible with our limits to enter upon a full discussion of so wide a question, but we give one or two simple and useful cases to show the commoner forms of procedure.

A particle wader any forces, and resting on a smooth horizontal plane, ts attached by an inextensible string toa point which moves

straint.

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in a given manner in that plane; to determine the motion of the | thus for the acceleration along the tube

| ticle. P : aa er a i | # seat a, y, #, 9 be the coordinates, at time ¢, of the particle and salt point, @ the length of the string, R the tension of the string, and | whence r= Agvt4 Bee!

a the mass of the particle.

For the motion of the particle we have Suppose the motion to commence at time ¢=0 by the cutting of

a string, length a, attaching the particle to the axis. The velocity

dx es of the particle at that instant along the tube is zero. Hence at £=0 m —=mX& —R——

dt a (1) r=a=—A+B, met =my – RY" : maha;

at a so that A=B=}a, and r—}a(é°"+ 2-4),

In fig. 51 let OM be the initial position of the tube and A that of the particle, and let OL and L Q be the tube and particle at timet. ThenOA=a, arcAP=ael, OQ=7, and we have

arc AP arc AP

with the condition (a – %)?+(y- gP—a?. Now 4, gare given functions of 4, Take from both sides of the eae aS equations (1) the quantities m ie mod , respectively, and we have the equations of relative motion

| nO) mx RE mee 0Q=40A(g OA +g 0A).

. z : 2 Da (2). From this we see that OQ and ; me dD m¥ RY = fie the arc AP are corresponding | dt? a dt values of the ordinate and abscissa

of a catenary whose parameter is a:

OA. Here the vertical pressure Fig. 51.

on the tube is equal to the weight of the particle, while the horizontal pressure is

These are precisely the equations we should have had if the point had been fixed, and in addition to the forces X, Y, and R acting on the particle, we had applied, reversed in direction, the accelerations

of the point's motion with the mass as a factor. It is evident that

the same theorem will hold in three dimensions. The acceler- md 24 ‘ ae “4 25 ~ Ne | ea i= — -¢). | ations ae a are known as functions of ¢, and therefore the r at) baa ores a”)

From this equation, combined with the value of 7, we easily deduce for the horizontal pressure the value

*Qmw*a/ (7? -— a”),*

and it is therefore proportional at any instant to the tangent drawn from Q to the circle APN.

Let the tube be in the form of a circle turning with constant angular velocity about a vertical diameter. Let AO (fig. 52) be the axis, P the position of the particle at any ha time. Let POA=@ denote the particle's posi- Fig. 52. tion, and R the pressure on the tube in the direction of OP.

equations of relative motion are completely determined. Let there be no impressed forecs, and suppose first that the point moves with constant velocity in a straight linc.

Here a a are constant, and therefore no terms are intro-

duced in the equations of motion.

Again, suppose the point's motion to be rectilinear, but uniformly accelerated.

The relative motion will evidently be that of a simple pendulum from side to side of the point's line of motion. In certain cases, when the angular velocity exceeds a certain limit, we shall have the string occasionally untended ; and this will give rise to all impact when it is again tended. While the string is untended the

particle moves, of course, in a straight line. We have dcos8 _ | _ Suppose the point to move, with constant angular velocity w, in a aga 9 Beam, circle whose radius is r and centre origin. d2sin@ Here, supposing the point to start from the axis of «, —. wasing= — Rsiné.

£Z=recoswl, J=rsinel. Eliminating KR,

Hence the equations of motion are, since

(ii) § ui P Org — eo sin@cos@=-—gsind . . . « (1).

*are . ey P inne ‘ a wr, a =-—w’f, The position of equilibrium will therefore be given by Pa —s 2 foe ine: 0: – ‘ g = £) fa: - R= we, | sing=0; or by =y, where cosy =F” oa ~ | Integrating (1), i y-y ai” ts = Rt wy, | (Zz) =C+2e%cosycos@—w*cos*@ . . . (2). (a-#)?+(y-g =a. a the eg to pass through the lowest point with y : z velocity aw,, we have Py -9) _\d*(x — £) Whence eS” = (y= a ~~4) dt? (y~~ 9) de (3) = w? — 2w?cos (1 — cos) + w” sin?*

=u? { (w-a)g-(y- 9) } 3 x

or, in polar coordinates, for the relative motion,

al ot) = —warsin(6— wt),

2

=o ¢! — cosy)? +3 — (cos @- cosy)? ’

2

and a ean never vanish if ©: >4cosy, or wt > 8, that is, if the re @

velocity at the lowest point be greater than that due to the level of

20 A . io d . foe 2 ae ga (0- wt). the highest point. o. E iar – the particle will oscillate ; and, if —-—0, when =a, Now @—wt is the inclination of the string to the radius passing a ~~ dt through the point ; call it ¢, and we

have then (F) — 24 cos8 — cosa) — w°(cos28 — cos'a) , a a w'— sind '
29 de ? = w(cos9 — cosa) 5 — cosa — c0s0) :*

the equation of motion of a simple pendulum whose length is £ ' = w(cos6 — cosa)(2cosy — cosa — cos 4) ; @*

and therefore, if 2cosy —cosa>1, the particle will oscillate through the lowest point. ; If 1>2cosy—cosa> —1, then, putting

2cosy —cosa=cosB,

2

(Z) = w(cos 8 —cosa)(cos B — cos) ,*

The particle therefore moves, with reference to the uniformly revolving radius of the circle described by the point, just as a simple pendulum with reference to the vertical.

A particle moves in a smooth straight tube which revolves with constant angular velocity round a vertical axis to which it is perpen- dicular ; to determine the motion.

Here, referring the particle to polar coordinates in the plane of motion of the tube, we have @=constant=a, P=0 (§ 47), aud

dt and the particle will oscillate on one side of the vertical diameter.

XV. — go

Disturbed

motion.

Pendu- lum.

In each of these three eases the complete solution of the problem can be exhibited in terms of elliptie funetions. In the last two cases, when the ares of oscillation are very small, a sufficient solu- tion may easily be obtained by the usual methods of approxima- tion. This is a particularly instructive example.

§ 160, As a final example of constrained motion of a particle, let us find the form of a curve such O that a particle will slide down any arc of it, from the origin, in the same time as down the chord of that are. If OA, OB (fig. 53) be any two chords, it is plain that the difference of the times down these 6 A chords must be equal to the time of G describing the are AB. But, ifOA make Fig. 53. an angle 6 with the vertical, the time of descent along it is

205.

MV gcosé' And the velocity at A is ,/2gOAcos@, so that the time of describing AB (considered as infinitesimal) is

AB/\/2g0A cos @.

If we put 7 for OA, our condition gives at once a eal d ar dé

*de N/ geosé ~/2g7r.e08 6 where s is the length of the are OA. This equation is easily integrated, and the resulting relation is 7? =a*sin 26,*

which belongs to the well-known lemniscate of Bernoulli. From its form we see that the vertical line from which 0 is measured is a tangent at O; so that the motion in arc commences vertically

§ 161. To complete this elementary sketch of the dy- namics of a single particle we take an instance or two of "disturbed motion." The essence of this question is usually that the disturbing forces are, at any instant, small in com- parison with the forces producing the motion; so that, during any brief period, the motion is practically the same as if no disturbing cause had been at work. But, in time, the effects of the disturbance may become so great as entirely to change the dimensions and form of the orbit described. The mathematical method which has been devised to meet this question depends upon what has just been said. The character of the path is not, at

any particular instant, affected by the disturbance ; but its form and dimensions are. Hence, as the first depends upon the form of the equations which represent it, while the latter depend upon the actual and relative magnitudes of the constants involved, we settle, once for all, the form of the equation as if no disturbing cause had acted. But we are thus entitled to assume that the constants which it involves are quantities which vary with the time in consequence of the slight, but persistent, effects of the disturbance. And, as we know that, if at any moment the disturbance were to cease, the motion would forthwith go on for ever in the orbit then being described, we may assume that in the ex- pressions for the components of the velocity no terms occur depending on the rate of alteration of the values of the constants, This, as will be seen below, very much simpli- fies the mathematical treatment of such questions.

Suppose a eycloidal pendulum, or a simple pendulum vibrating through very small ares, to be subjected to a simple harmonie dis- turbance in the direetion of its motion. The equation of motion will obviously be of the form §+n20=Acosmt, n?=1/9, as in § 184.

The integral of this equation is

where

6=Pcos(nt+ Q)- — x —gcosmet ‘

We sce then that the result is the superposition of a new simple

_ of the original motion. When 2 1s equal to x, the integral changes

the motion is entirely changed. Thus, suppose the pen- With dw _dulum to be at rest at its lowest point when the disturb-

harmonic motion on the natural simple harmonic motion of the undisturbed bob, and that it is altogether independent of the amplitude and phase of the undisturbed motion. So long as the disturbanee is very small, this new part of the motion may be negleeted, unless m is very nearly equal tom. For in

that ease the amplitude of the disturbanee may beeome much greater than that

its form, and we have

6=Pcos(nt+ Q)+Agsinnt,

This shows that, in the special case of a disturbance of Harm, the same period as the undisturbed motion, the nature of motion

ance is applied ; then we have merely g=A_ sinnt, 2n

a simple harmonic motion whose amplitude increases in proportion to the time elapsed since the disturbance com- menced.

§ 162. As another illustration, suppose the point of sus- Point « pension of a simple pendulum to have a simple harmonic sspen-| motion of small amplitude in a horizontal line. sion dis!

Here the equations of motion are (to horizontal and vertical axes)

a-é

MEi= — T—- ’

mij =mg ~ T. ’

But if we suppose the oscillations to be small, we may write z- {= le, y=l, where Z is the length of the pendulum, and @ the angle it makes with the vertical. Then we have

#=16+£=16 + Acosmt, suppose, and y=0, mg=T, 16+ Acosmt= ~~*g@, which is precisely the equation of the preceding investigation. We see from this how to explain the somewhat puzzling Motion phenomenon which we observe when we produce complete o! « sliny rotations of a stone in a sling by a comparatively trifling . motion of the hand. All that is necessary is that the land should have a slight to and fro horizontal motion, in a period nearly equal to that in which the sling and stone would vibrate as apendulum. This result of particle kine*~~ *tics is (like that in § 161) of great*

value in other branches of physics, especially sound, light, and radiant heat. | To illustrate the general principle, let us take the case of one Disturb'

degree of freedom. Then the equation of motion of an unit mass ance must be of the form generall

Hence and

§=04+0,,

where © represents the normal force, and ©, the abnormal or dis- turbing force. Leaving out © for the moment, let the integral of

§=0 be 6=f(a, B, t),

in whieh a and £ are two arbitrary constants. We may now stp- pose a and B to be variable in such a way that the equation shall still be satisfied by this value of @ when the disturbing forces are ineluded. This imposes only one condition on the two independent quantities a and f, so that to determine them eompletely we must impose a second. This we do, as already explained, by making oa expression for the speed independent of the rates of alteration – a and B, and we gain the advantage that our solution will —. at every instant with what would be the aetual future motion the disturbance were suddenly to cease. The speed is

b=f'(a)atf(B)B+SO)- We therefore assume f'(a)at+f(B)B=9. Taking account of this and differentiating again, we have

ss d d 5 th = 7 ft Se PUB) 2 é). 0 dat + 4+ ap B+f'() Hence we have, for the determination of a and 8, the equations a Hayes fae =o

d ? da. d / ap _ dal > ae t apt + a ©).

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this it follows that the sum of the quantities of motion, Conser-

parallel to any fixed direction, of the particles of any vation of system influencing one another in any possible way, 4, and remains unchanged by their mutual action; also that the shanenaect

sum of the moments of momentum of all the particles of momen-

These give the values of : ana 28 , and so completely solve the problem. lh npul- § 163. In a somewhat similar way we may treat the

‘ve effects of a slight disturbance, made once for all, in the

‘| sangeof motion of a particle describing a definite path under given | locity» goes, A single example must suffice. Thus, we have in an elliptic orbit about the focus, § 144 (9),

ee oh

2 yr 2a At the end of the major axis farthest from the focus this becomes

Now if at this point V be made V+8V, without change of direc- tion, we have the condition that in the new orbit a(1 +e) shall have the same value as in the old, since this will still be the apsidal distance.

Desf 1 1-e _ Hence 8(V°) a(ia) and 5/ a(1+e) 0;

:

*. a a se a) abe * ; soma, /{Sa-e fav, and Secs ay l+e*

Ge =~ if a 2 el

which determine the increase of the major axis and the diminution of the excentricity ; and the same method is applicable to more complicated. cases.

A very excellent series of examples of the elementary geometrical treatment of disturbed orbits is to be found in Airy’s Gravitation.

} Third Law. Kinetics of Two or More Particles. eres § 164. We have, by means of the first two laws, arrived |} etween at a definition and a measure of force, and have found how articles. t9 compound, and therefore how to resolve, forces, and also how to investigate the conditions of equilibrium or motion of a single particle subjected to given forces. But more is required before we can completely understand the more complex cases of motion, especially those in which we have mutual actions between or amongst two or more | bodies,—such as, for instance, tensions or pressures or | transference of energy in any form. 'This is perfectly supplied by the third law, on which Newton comments nearly as follows.

§ 165. If one body presses or draws another, it is =. pressed or drawn by this other with an equal force in the hira Opposite direction. If any one presses a stone with his aw, finger, his finger is pressed with an equal force in the opposite direction by the stone. A horse, towing a boat ou a canal, is dragged backwards by a force equal to that which he impresses on the towing-rope forwards. By whatever amount, and in whatever direction, one body has its "motion" changed by impact upon another, this other body has its "motion" changed by the same amount in the opposite direction ; for at each instant during the impact they exerted on each other equal and opposite pressures. When neither of the two bodies has any rotation, whether before or after impact, the changes of velocity which they experience are inversely as their masses. When one body attracts another from a distance, this other attracts it with an equal and opposite force.

§ 166. We shall for the present take for granted that the mutual action between'two particles may in every case be imagined as composed of equal and opposite forces in the straight line joining them, two such equal and opposite forces constituting a "stress" between the particles. rom

Yewton's om-

stress,

4

round any line in a fixed direction in space, and passing tum. through any point moving uniformly in a straight line in any direction, remains constant.

From the first of these propositions we infer that the centre of mass of any system of mutually influencing particles, if in motion, continues moving uniformly in a straight line, except in so far as the direction or speed of its motion is changed by stresses between the particles and some other matter not belonging to the system; also that the centre of mass of any system of particles moves just as all their matter, if concentrated in a point, would move under the influence of forces equal and parallel to the forces really acting on its different parts. From the second we infer that the axis of resultant rotation through the centre of mass of any system of particles, or through any point either at rest or moving uniformly in a straight line, remains unchanged in direc- tion, and the sum of moments of momentum round it remains constant, if the system experiences no force from without, or only forces whose resultant passes through the centre of inertia of the system. 'This principle is some- times called "conservation of areas," a very misleading designation.

§ 167. Newton's scholium, which we treat as a fourth Conse- law, points out that resistances against acceleration are to quences of be reckoned as reactions equal and opposite to the actions oe. by which the acceleration is produced. Thus, if we consider anliiagins any one material point of a system, its reaction against acceleration must be equal and opposite to the resultant of the forces which that point experiences, whether by the actions of other parts of the system upon it, or by the influence of matter not belonging to the system. In other words, it must be in equilibrium with these forces. Hence Newton's view amounts to this, that all the forces of the system, with the reactions against acceleration of the material points composing it, form groups of equilibrating systems for these points considered individually. Hence, by the principle of superposition of forces in equilibrium, all the forces acting on points of the system form, with the reactions against acceleration, an equilibrating set of forces on the whole system. This is the celebrated D'Alem- principle first explicitly stated and very usefully applied bert's by D'Alembert in 1742, and still known by his name. principle.

§ 168. Thus Newton lays, in an admirably distinct and Abstract compact manner, the foundations of the abstract theory of theory of "energy," which

recent experimental discovery has raised "°8Y- to the position of the grandest of known physical laws.

He points out, however, only its application to mechanics.

The actio agentis, as he defines it, which is evidently equivalent to the product of the effective component of

the force into the velocity of the point at which it acts,

is simply, in modern English phraseology, the rate at which the agent works, called the "power" of the agent.

The subject for measurement here is precisely the same as

that for which Watt, a hundred years later, introduced the practical unit of a '"horse-power," or the rate at which an Horse- agent works when overcoming 33,000 times the weight of power. a pound through the distance of a foot in a minute,—that

is, producing 550 foot-pounds of work per second. The

unit, however, which is most generally convenient is that which Newton's definition implies, namely, the rate of doing work in which the unit of work or energy is produced

in the unit of time.

§ 169. Looking at Newton's words in this light, we see that they may be converted into the following :—

'Work done on any system of bodies (in Newton's

Newton's scholium.

Conser- vative system.

Potential energy.

statement, the parts of any machine) has its equivalent in work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent."

When part of the work is done against molecular forces, as in bending a spring, or against gravity, as in raising a weight, the recoil of the spring and the fall of the weight are capable, at any future time, of reproducing the work originally expended. But in Newton's day, and long after- wards, it was supposed that work was absolutely lost by friction.

§ 170. If a system of bodies, given either at rest or in motion, be influenced by no forces from without, the sum of the kinetic energics of all its parts is augmented in any time by an amount equal to the whole work done in that time by the stresses which we may imagine as taking place bétween its points. When the lines in which these stresses act remain all unchanged in length, the sum of the kinetic energies of the whole system remains constant. lf, on the other band, one of these lines varies in length during the motion, the stress in that line will do work or will consume work, according as the distance varies with or against it.

§ 171. Experiment has shown that the mutual actions between the parts of any system of natural bodies always perform, or always consume, the same amount of work during any motion whatever, by which the system can pass from one particular configuration to another ; so that eacli configuration corresponds to a definite amount of kinetic energy. Hence no arrangement is possible in which a gain of kinetic energy can be obtained when the system is restored to its initial configuration. In other words, "the perpetual motion" is impossible.

- The "potential energy" (§ 113) of such a system, in the

configuration which it has at any instant, is the amount of work that its mutual forces perform during the passage of the system from any one chosen configuration to the configuration at the time referred to. It is

generally convenient so to fix the particular configuration chosen for the zero of reckoning of potential energy that the potential energy in every other configuration practically considered shall be positive.

As particular instances of this we may notice many of the results already given: for instance, the ordinary expres- sion for the velocity acquired by a falling stone (§ 28), dy2=ga; for here 4m is the kinetic energy acquired, while mg.a is the work done by the weight (mg) during the fall. Similarly, we have in the motion of a planet, the ex-

v—vi mp

Al ree fe : PvE MY ay pression" of –), which leads to m —, a Ge)

Me. P . Here mK +. the "mean value" of the force for distances from TT.

1

+ to r,, aud therefore the right-hand side is the work done by the force, while the left-hand side is the increase of kinetic energy produced. To put this in an analytical form, we have merely to notice that, by what has just been oe the oe of P la y z af (x4 vis 25; as is independent of the paths pursued from the initial to the final positions, and therefore that 3(Xdx+ Ydy + Zdz) is a complete differential. If, in aceordanee with what has just been said, this be called — dV, — the potential energy, and

a oe

Also, by the second law of motion, if m, be the mass of a particle of the system whose coordinates are 2%, 7, 2, We have

*- de dx dy@y dz oa yy , dz dz – a vation of 2} m(di dt dt de * di a) di=s(Kdie+ Vdyt 206) es,*

The integral is 4x(me)+V=H, that is, the sum of the kinetic and potential energies is con- stant. This is called the " conservation of energy."

In abstract dynamics, with which alone this article Fric.. is concerned, there is loss of energy by friction, impact, tional &c. This we simply leave

as loss, to be accounted for by dissipa- ‘Thermodynamics. >.

§ 172, Hitherto, as we have been dealing with the Other motion of a single particle only, we have not required the side of assistance of even the third law. For, in those cases, already treated, in which one of the forces was not given, it was at all events due to a given constraint, and the geometrical circumstances of the constraint supplied the means of determining it. In fact we were not, in any case, concerned with reaction ; or, to use the more modern form of expression, we were engaged with one half, only, of a stress. When a stone’s motion was investigated, no account was taken of the stone’s attraction for the earth; when we dealt with central forces, the centre was supposed to be fixed; and, even in the cases in which variable constraint was supposed, the curve which produced it was assumed to move in a manner absolutely determined beforehand, and in no way affected by the reaction of the mass acted upon.

But, in nature, circumstances are not so simple. Though, for all practical purposes, we may calculate the motion of an ordinary projectile as if its attraction had no influence upon the motion of the earth, we cannot do so in the case of the motion of the moon about the earth. The mass of the moon is about Jgth of that of the earth, and its gravitation effects on the motion of the earth cannot be | neglected. The moon, in fact, moves faster round the earth than would a projectile of less mass, though moving in . precisely the same relative orbit (§ 146). If the earth’s motion were not accelerated by the reaction of the moon, } the sole crest of the lunar tide-wave would be on the side of the earth next the moon, and there would be full-tide once only in a single rotation of the earth about its axis. We need not give further instances here ; they will pre- sent themselves in almost every case we investigate.

§ 173. To give a general notion of the applications of, oe and necessity for, the third law, we choose a few special of third cases, selected so as to give, in short compass, a sufficiently . general glance at the whole subject.

We take, first, the case of two stones or bullets con- Atwood’s nected by an inextensible string passing over & smooth machine. © pulley. Let their masses be m and m’, Our physical 2 condition is that the tension of the string, whatever be Its value, is the same throughout ; and this is accompanied by the geometrical condition that the length of the string 15

constant, or that the speeds of the two masses are equal but in opposite directions. Hence the amounts of increase of momentum in a given time are as the masses. But they are also as the forces, by the second law. Thus

mim::T-mg:mg—-T. This gives, at once,

i} _2 “alll so that the whole downward force on m’ is

,

te, eset te ee lak! Mon +m!’ and the whole upward force on m is

i Wo 2 Be hb 5 a ae

The motion of the system is therefore of precisely the same

hain- tot.

MECGCHANTCS

character as that of a free mass falling in a vertical line, | it was at starting.

but the acceleration is less, in the ratio of the difference of the two masses to their sum.

174. This is the essence of the arrangement called Atwood’s Machine, which used to be employed for the demon- stration (iu a rough way) of the first and second laws of motion, in certain simple cases, The main feature of the method is the artificial reduction of the acceleration, so that the motion of the falling body is rendered slow enough to be followed by the eye with some degree of accuracy. To prove the first law, a bar of metal was laid across one of two equal jnasses suspended as in the example; and the system was allowed to move under acceleration until the preponderat- ing mass passed through a ring which arrested the bar. The subsequent motion, with no acceleration, was then observed by noting the passage of the falling mass in front of a vertical scale, while the observer also listened to the ticking of a pendulum escapement. For the verification of the second law, so far as uniform force is concerned, the apparatus was adjusted by trial so that the extra load was detached from the preponderating mass after 1, 2, 3,

&c., beats of the pendulum; and the subsequent uniform speed was found to be nearly in proportion to these numbers. And, again, to prove that momentum acquired is, ceteris paribus, proportional to the force, the effects of bars of different masses were compared by the same process.

If « and /-«x be the portions of the string on opposite sides of the pulley at time ¢, we have

)

dx dt?

2

anal —a)=n'g-T= —n'%.

m—=mng-T=mée,

Hence by elimination of T we have

m—a' Mm+m

and by elimination of @ 2mm! ~ m+ Mm:

When one of the masses is vibrating pendulum-wise, the problem assumes a very mueh more diffieult aspect. We will take it later as an example of the application of Lagrange's general method.

§ 175. Let us now suppose these masses, so connected, to be thrown like a chain-shot. We see by § 166 that their centre of inertia moves as if the masses were concentrated there. Also that the moment of momentum is unaffected. Hence we have only to find the initial position and motion of the centre of inertia, and the plane and amount of the initial moment of momentum ; and the complete determina- tion of the motion follows. This case is precisely the same as that of a well-thrown quoit, the rotation of which is about its axis of symmetry. It is, so far as § 166 goes, the case of an ill-thrown quoit, which appears to wabble about in an irregular manner. But these are matters properly to be treated under Kinetics of a Rigid System.

§ 176. Suppose, next, two masses 7, and m, to be con- nected together by an elastic string, the extension of the string being proportional to the tension. Let m, be held in the hand, while m, hangs at rest. Then let the system be allowed to fall. What is the nature of the motion ? Without mathematical investigation it is easy to see that, the moment the masses are left free to fall, the tension of the stretched string will gradually draw them together. When it has thus contracted to its normal length, J, the relative Speed of the two masses will have a definite value. This will continue to be the relative speed until they have passed one another and again arrived at a mutual distance , At that instant the tension of the string comes into play again ; the relative speed becomes less and less, finally

,9, as before,

ye

Then the relative speed becomes again one of approach, increasing steadily till the dis- tance between the masses is 7, This maximum speed of approach continues till, after again passing one another, the particles once more reach the relative distance 7. And so on. All this time, however, their common centre of inertia has been steadily falling with uniformly accelerated speed, as if the masses had been concentrated at it into one. Since / is the unstretched length of the string, if we call EF its modulus of elasticity, its tension at any other length, A, is

paoRpant L

by Hooke's law. Hence, if initially m, were at the origin, and the axis of « be taken vertically downwards, we have for the initial coordinate of m,

'- Mog 1. (X2)o (E +1)

When the masses are moving, the third law informs us that the tension of the string acts equally and in opposite directions on them. Thus the equations of motion are

M,#,=mg+T, Mot, =Mg—-T. By climinating T we have at once

MyE + Moy = (M+ My) – But IM, Ly + Moy = (72, + Me)E ,

if & be the coordinate of the centre of inertia of the two masses. Hence

E=9 ? the ordinary equation for the fall of a stone. Thus Myx, + MyXy=A+ BE+ $(m, + M,)gt?. Sinee z,=0, %,=0, a= (To 44 Yi % ,=0, when t=0, we have

Mm,

A=m,(“2 at J 3 bor MG E

So long as x, – x, >/ we have also

T-H(“77-1).

Hence, multiplying the first of the equations of motion by mz, and the sccond by m,, and taking the difference, we have

My Me(By — ¥) = — (My + m,)b(7% =) : The integral is

and thus

XN My, + Myq = mal + 1}! +3(m,+mMa)gt?.

Ly — %=1+ Peos(nt+Q), P= Wy +My linym, Also, by the data at starting, we have

where

mgt

Henee, finally,

2

a, —— (m,(52 eal \i4 £(m, + my) gt? — Mal — my cosnt) ‘ My +My i

migl E(my + titq) whence the value of x, can easily be found.

As soon as we have nt>4z these values cease to represcnt the coordinates of the two masses, because they are deduced from equations involving constraint which, in the case supposed, has ecased for a time. :

At the instant nt=47 the relative speed of the masses is

a msgl fe +m,)E : E MyMel

and their distance /.

This distance diminishes thenceforward with the above speed until the uppermost stone, having passed the lower one, falls below it toa distance 7. We must, in order to trace the next part of the motion, reapply the differential

&

=hot?+ (1-cosnt) ,

vanishing when the distance between the masses is what | equations above, —integrating them, and determining the

Complex pendu- lum.

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constants by the new conditions. reader.

§ 177. Next let us take the case of a Complex Pendu- lum,—the motion of two or more pellets attached, at different points, to the same thread, supported at one end. 'The general solution of this question presents considerable difficulties, but if we confine our attention to slight disturbances it is easily treated by very elementary processes. In fact, just as a simple pendulum, slightly disturbed in a vertical plane, has simple harmonic motion which may be regarded as the resolved part of conical pendulum motion, so we may treat of a complex conical pendulum, and resolve its motions parallel to any vertical plane.

If there be but two masses attached to the string, it is clear that they must, if the motion is to be a persistent conical one, be always in one vertical plane with the point of suspension. And there are obviously two dispositions of the string which are consistent with kinetic stability.

Let A (fig. 54) be the point of suspension, then the masses may rotate steadily in either of the two configurations sketched. To keep either mass , A moving in a horizontal circle, all that is required is that the resultant force on it shall be horizontal, directed towards the centre, and producing an acceleration equal to V?/R, as in § 34. Let ~~*the whole system turn with angular ve*~~ *locity w, and let the lengths of the strings be @ and 8, their 9) directions making angles 0, ¢ / with the vertical. /*

We will treat only the case in which these angles are so Fig. 54. small that the arcs may be written in place of their sines. Then m requires a horizontal resultant force mabe directed towards the axis,.and M requires M(a6+5¢)w? similarly directed. Also, as the strings are both very nearly vertical, the tension of the lower string may be taken as the weight of M, and that of the upper as the sum of the weights of M and m. 'Treating it, then, as a statical problem, we have for the mass m

mabw? =(M+m)g9- Mg¢ ;

This we leave to the

nu

and for M M(a0+6¢)w= +Mg¢. These formulz correspond to the first configuration, but a change of sign of ¢ adapts them to the second. These two equations involve three unknown quantities w, 0, d. But the ratio, only, of 6 and ¢ is involved, so that two equations are sufficient. [We have confined ourselves to small values of 6 and 4, but have not assigned any limit to their smallness; so that their ratio has still an infinite range of values. | Eliminate the ratio ¢/@ between the two equations ; and we have, putting y for g/w', Maw =(p —b)((M+m)y—- ma), M (y—a)(y- ge It is clear that, because the right-hand member is essentially less than ad, there are always two real values of y, both positive, but one greater than the greater of a, b, the other less than the lesser. These correspond to two values of 4/6,*

one positive, the other negative. § 178. The most general motion, then, of the double complex pendulum, when it vibrates in one plane, con- sists (for each of the masses) of the resultant of two simple harmonic motions, whose periods are

Qr/w — IV d/9,

or

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y having one or other of the two positive values given by the equation above, and being therefore the length of the equivalent simple pendulum. Thus the double com- plex pendulum supplies at once the mechanical means of tracing (by ink, sand, electric sparks, &c, § 156) a graphical representation of the composition of two simple harmonic motions, of different periods, in one line. Analytically thus. For any displacement in one plane we haye,

@ and ¢ being, as before, the deflexions and T, T' the tensions of the strings,

an

i(d 2 w(5,) (acos +bcos$)=Mg-T'cos¢,

four equations to determine , ¢, T, and T'. They become much more manageable if we assume that and ¢ are so small that their squares may be neglected. For then we have sin@=@, cos@=1, &c., and the equations become nud = — TO+'T'¢, 0=mg-T+T', M(a6+5¢)= – T'¢, 0=Mg-T'. T'=Mg, T=(M+m)g, mab= —(M+m)g@+Mg¢, ab +bp=- go. Introducing an arbitrary multiplier A, we have

2

(<) (ma) a0 + rbd ae (M+m)0+(a-M)¢ f.

If we choose A so that

Thus and we have

ae (m+a)ja M+m ° the equation can be put in the form

a? _ _g(M+m) (5) li (m-+A)a (Ostet |

(1),

Now (1) is a quadratic equation in A, and has obviously real roots, a positive root greater than M, and a negative root numerically less than m. Write (1)as the equation of an hyperbola, in the form |

_ Ab A-M B"(m+aya M+m' and we see that A+m=O is an asymptote. The branch on the positive side of this asymptote lies mainly below the axis of A. But « is positive for A=M, and also for A=0.

Fence « must pass through the value zero while ais greater than M, and for another value of A between zero and —m. But it is obvious that, for each of these values of A, m+A is positive. Hence the equation may be written

(Z) O+ep)= -n40+08),

where e and n have two sets of real values given asabove ; and thus we have the complete solution, with the four requisite arbitrary con- stants, in the form

6 + er =P, cos(nyt+Q,),

0 +e, =P, cos (Nat + Qy) –

This applies to every possible set of values of a, b, m, M; for, as we have seen, the two values of A are essentially different, at least so long as neither of the masses becomes zero. Thus, in this parti- cular case, we are not met by the difficulty of equal roots. But it is very interesting to contrast this ~~*ease, when m is much greater than M, and a=8, with the case discussed in § 162 where the point of suspension of a simple pendulum has a horizontal ane harmonic motion of the period of the pendulum and in the vertica. plane in which it vibrates. There the oscillations increase inde*~~ *finitely ; here*

they are in all cases essentially finite, In aan a with the assumptions made. There is, in fact, no increase of the energy of the system.

A very slight modification of the process gives us the result of small displacements not in one plane.

Kinetics of a System of Free Particles.

§ 179. A system of free particles is subject only to in mutual attractions; to investigate the motion of the system. ;

vation of ¢oy Mp Pity

Let, at time ¢, Zn, Yn, zn be the coordinates of the particle whose mass is Mn, and let ¢'(D) be the law of attraction. Let prq

articles. express the distance between the particles mm, and m,; then we

have, for the motion of m,,

2 =

maa = 3 yng (yn) | (1), at? rn f Gre na my ain = MyMn' (yr ye mg (2), dz is en ie Mae == MyMnf'(17'n) rn } (3),

with similar equations for each of the others, the summations peing taken throughout the system. Before we can make any attempt at a solution of these equations, we niust know their num- ber, and the laws of attraction between the several pairs of particles. But some general theorems, independent of these data, may easily be obtained.

First, we have Conservation of Momentwm. In the expression

i eee — OE ae? we have aterm Mpg Umea :

i Dat Lp — 2. and in mq on we have pq

Mary (gp)

P Hence, if we add all the equations of the form (1) together, the result will be

e

ax an, ; My 7a + Ma aa + AO Oo = (i) 5 d®x Eg or 2(m Fe = Gezeny=0- cae ay 123 Similarly Gak™) =0, and pm) 05

where (§ 109) Z, g, 2 is the centre of inertia of the system.

These equations show that the speed of the centre of inertia parallel to each of the coordinate axes remains invariable during the motion; that is, that the centre of inertia of the system remains at rest, or moves with constant speed in a straight line.

Next we have Conservation of Moment of Momentum. For if we multiply in succession equation (1) by y, and equation (2) by x, and subtract, and take the sum of all such remainders through the system of equations of the forms (1) and (2), we have

2[m(xg – y#)]=0. Integrating once, we have =[m(xy — ye)]=2Ag, where the left-hand member is the moment of momentum of the system about the axis of z.

This equation shows (since zy is any plane) that gene- rally in the motion of a free system of particles, subject only to their mutual attractions, the moment of momentum about every axis remains constant.

Finally, we have Conservation of Energy. Multiply (1) by

d » sna aie a a = » (8) by 4 ; and, treating similarly all the other equations, add them all together. _ Let us consider the result as regards the term on the right-hand side involving the product mpinq. Written at length it is

MpMgh' (pq) | pq (+similar terms in y and zh : and the portion in brackets is equal to

adtg

dn (%q — Xp) = (ap — 2q) 7

~ (Xq — ig) Sg — 2») +similar terms in y, 2 R

d oF =. pt'q—(pra) 5

hemes s m(d'x dy d®°y dz =)

dt dt" dt d®° dt di

+z ming (sa) (pq) =0; therefore, on integration, $2(mv?) +3 {mpmq$(prq) } =H. We see therefore that the change in the kinetic energy

of the system in any time depends only on the relative

distances of the particles at the beginning and end of that time, .

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Another general expression for the kinetic energy of a system of Virial. particles, in terms of a function of the mutual forces, and the con- straining forces if there be such, is readily found as follows.

If x, y, z be the coordinates, at time ¢, of the particle m, we have

ad\? BG. (= Sma? + y? + 27) =23m(a? + y +2) + Q(x + YI + 22).*

But if X, Y, Z be the components of the forces (of whatever kind) acting on 7, we have (§ 119)

mé=X, my=Y, mz=Z. Thus

2

(+) Sm (a + y? + 27) = 23m (ak? + 9? +) + 23(Xa+ Vy + Zz). This expression was originally devised by Clausius for application to the kinetic theory of gases. The quantity Sm(a?+ y?+27) is obviously half the sum of*

the three principal moments of inertia of the group of particles about the origin (§ 234).

In all cases of motion of a group, in which this sum is either con- stant or oscillates in an extremely short period about a constant value, the left-hand side may be regarded as (on the average at least) a vanishing quantity. Thus an equivalent of the kinetic energy is expressible as

-$3(Xx+Yy+Zz). This expression is called the "virial."

In so far as it arises from the mutual action between two par-

ticles mp and mz, its value is (in the notation above)

s ' Lq — Lp 17 1, \eep ee – i(me Ma (pq) Lp + Mg My (pq) 42x, ; pq plq with corresponding terms in y and z, altogether

,

=}Mp MqP' (pr q)pha- Hence if we write, generally, r for the distance between two of

the particles, and R for the stress between them as depending on their mutual action, the corresponding part of the virial is

43(Rr).

This is positive when the stresses are of the nature of tension. When the mutual action is due to gravity only,

; 1

gp (pq) = ape, © ji Te

and the part of the virial corresponding to this is

Amp Mq/ v7 q 5

expressing half the exhaustion of the potential energy of the system.

When thé particles are in very great numbers, and enclosed in a Virial of vessel from the sides of which they rebound—as is supposed in the a gas kinetic gas theory—the pressure p, per unit of surface, on the walls contained of the vessel must be taken into account. If 1, m, m be the direc- in a tion cosines of the normal to the element dS of the wall of the vessel. vessel whose coordinates are x, y, 2, the corresponding part of the virial is

4p [dS (la + my + n2)

extended over the whole internal surface. We here assume that p is constant. But lz+my-+nz is the perpendicular from the origin on the plane of dS, so that the integral expresses three times the volume V of the vessel. Hence this part of the virial is SpV. Thus, in the case of a gas not acted on by external forces, the kinetic energy is SpV +$2(Rr).

Impact of Smooth Spheres. § 180. There remains to be treated, so far as particle Impact.

_ dynamics is concerned, the self-contained subject of Jmpact.

In connexion with it we must once more refer to the second and third of Newton's laws. We are now dealing with forces which produce, in finite masses, finite changes of momentum in excessively short periods of time. It is clear from this statement that their effects may be treated altogether independently of finite forces, which may be acting along with them, but which produce during the very short periods in question only infinitesimal results. And, as in general we have no knowledge of the actual force exerted at any instant during the impact, nor of the time during which the action lasts, we confine ourselves to the quantity, called the "impulse," which measures the Impulse. amount of momentum lost by one of the impinging bodies and acquired by the other.

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Impact § 181. When two balls of glass or ivory impinge on one

of small another, tlie portions of the surfaces immediately in contact

spheres. re disfigured and compressed until the molecular reactions thus called into play are sufficient to resist further distortion and compression. At this instant it is evident that the points in contact are moving with the same velocity. But as solids in general possess a certain degree of elasticity both of form and of volume, the balls tend to recover their spherical form, and an additional impulse is generated. 'This is proportional, as Newton found by experiment, to that exerted during the compression, provided neither of the bodies is permanently distorted. The coefficient of proportionality is a quantity determinable by experiment, and may be conveniently termed the " coefficient of resti- tution." It is always less than unity.

§ 182. The method of treating questions involving actions of this nature will be best explained by taking as an example the case of direct impact of one spherical ball on another. It is evident that in the case of direct impact of smooth or non-rotating spheres we may consider them as mere particles, since everything is symmetrical about the line joining their centres. If the impinging masses are of large dimensions, of the size of the earth, for instance, we cannot treat the effects of the impact independently of the other forces involved; for the duration of collision in such a case may be one of hours instead of fractions of a second.

§ 183. Suppose that a sphere of mass M, moving with a speed v, overtakes and impinges on another of mass M, moving in the same straight line with speed 2', and that, at the instant when the mutual compression is completed, the spheres are moving with a common speed V. Let R be the impulse during the compression, then

M(v-V)=M(V-v)=R; Mv+M'v' MM' we? 8 Boar >

From these results we see that the whole momentum after impact is the same as before, and that the common speed is that of the centre of inertia before impact. The quantity V can vanish only if Mv+Mv'=0, that is, if the momenta were originally equal and opposite.

(v-v) .

whence =

This is the complete solution of the problem if the balls

be inelastic, or have no tendency to recover their original form after compression.

§ 184, If the balls be elastic, there will be generated, by their tendency to recover their original forms, an addi- tional impulse proportional to R.

Let ¢ be the coefficient of restitution, and »,,2,' the speeds of the balls when finally separated. Then, as

before, M(V -»,) =cR, M'(v' – V)=eR ;

; ~Mv+M'o' MM', _, whence Mv,=) 7 i ©: we? =, M—-eM'\v+ M(1+e)v' M' ' d (M-eM'jo+M(l+e M_ yy_v; sie ai M+ "a – rer

with a similar expression for 2'.

These results may be more easily obtained by the simple consideration that the whole impulse is (1+e)R; for this gives at once M(v—2,)=M'(,' -v') = (L+e)R.

= If M' be infinite, and v'=0, we have the result of direct in impact on a fied surface, viz., v- v;=(1+e)v ora = — ev.

The ball rebounds from the fixed surface with a speed ¢ times that with which it impinged.

§ 185. Suppose, now, M=M', e=1; that is, let the balls be of equal mass, and their coefficient of restitution unity (or, in the usual but most misleading phraseology, suppose

the balls to be "perfectly elastic"); then 2R=M(v—v') ; |

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v, =v, and similarly o,'=%; or the balls, whatever be their speeds, interchange them, and the motion is the same as if they had passed through one another without exerting any mutual action whatever.

Thus ifa number of equal solitaire balls or billiard balls be arranged in contact in a horizontal groove, and anotlLer equal ball impinge on one extremity of the row, it is re- duced to rest, and the ball at the other end of the row goes off with the original speed of impact. If two im- pinge, two go off, and so on.

§ 186. We may write the above expressions in terms Conser-

:

of the impulse, thus vation of momen-

tum.

M R(1+<) j W

Hence Mv, + M'»,' =Mv+ Mv', whatever e be, or there is no momentum lost. This is, of course, a direct con- sequence of the third law of motion.

Vy=V-

vy =u +

Again 4Mv?$M'0'2=3Mv? $M'v" ~R(1 +0)(v—v') + FRA + a =4Mv? + 4M'o'? 4R°(1- aa | —4Mo? + $M'? = 4(1- aa =e,

The last term of the right hand side is therefore the Loss of kinetic energy apparently destroyed by the impact. When sy. e=0, its magnitude is greatest, and equal to

MM' sousateers ial i om

When e=1, its magnitude is zero; that is, when the coefficient of restitution is unity no kinetic energy is lost.

The kinetic energy which appears to be destroyed in any | of these cases is, as we see from § 171, only transformed— . partly it may be into heat, partly into sonorous vibrations, as in the impact of a hammer on a bell. But, in spite of this, the elasticity may be "perfect." Hence the absurdity | of the designation alluded to in § 185. Also by (2)

nf -o—v 04 Rte) ye | =e(v—-v') by (1). Hence the velocity of separation is ¢ times that of approach.

*§ 187. Two smooth spheres, moving in given paths and Oblique | with given speeds, impinge ; to determine the impulse and ™P*t. the subsequent motion. .*

Let the masses of the spheres be M, M,, their speeds before impact v and ’, and let the original directions of motion make with the line which joins the centres at the instant of impact the angles a, a’, which may be calculated . from the data, if the radii of the spheres be given. |

Since the spheres are smooth, the entire impulse takes place in the line joining the centres at the instant of impact, and the future motion of each sphere will be in the plane passing through this line and its original direction of motion. aan

Let R be the impulse, ¢ the coefficient of restitution ; | then, since the speeds in the line of impact are cose | and v’ cosa’, we have for their final values 2%, 2; after | restitution, by § 184 the expressions ;

MW’ M+M

M M+M’

(1+e)(vcosa—v’cosa’) ,

V1, =VCOS a —

o,/ =v cosa’ + (1+e)(veosa—v’cosa’),

and the value of R is MM’ M+M’ Hence, the sphere M has finally a speed 2, 1n

(1 +e)(veosa —v’cosa’) .

the line

Infinite series of infinit-

esimal

impacts,

joining the centres, and a speed vsina in a known direction perpendicular to this, namely, in the plane through this and its origina] direction of motion. And similarly for the sphere M'. Thus the consequences of the impact are completely determined.

§ 188. When a sphere of mass M impinges directly, with speed V, on another M' at rest, the speed acquired by M'is .

! MV(1+e)

*"M+M * But, if another sphere of mass p, also at rest, be interposed between them, M' will acquire a speed uMV(1+0)? (M +)(M'+ py) ° This is greatest when p is the geometric mean of M and M', and its value is then MV(1+e)? (/M+/M'?* The ratio of this to the speed which M' would have acquired without the interposition of the third sphere is*

1

42MM M+M There is thus a gain by the interposition if, and only if, M+M ~ This condition is always satisfied when the coefficient of restitution is unity, except in the special case of equal masses. If an infinite number of spheres be interposed between M and M', so adjusted as to give the greatest possible speed to M', that greatest speed is V ,/M'/M, provided we have ¢=1.

Continuous Succession of Indefinitely Small Impacts.

§ 189, We may now consider the case of a continuous series of indefinitely small impacts, whose effect is comparable with that of a finite force. One obvious method of considering such a problem is to estimate separately the changes in the velocity produced by the finite forces and by the impacts, in the same indefinitely small time 6¢, and compound these for the actual effect on the motion in that period.

Another way, of course, is to equate the rate of increase of momentum per unit of time to the force producing it.

A mass, under no forces, moves through a uniform cloud of little particles which are at rest. Those it meets adhere to tt. Find the motion.

_At time ¢ let » be the mass, and let x denote its position in its line of motion. Then, as there is no loss of momentum, we have

dy. qi) =0. But if M be the original mass, x the mass of the particles picked up mm unit of length, obviously B —— M + Box ° Substitute and integrate, supposing «+0, #=V, when ¢=0; and

we get (M+ ox)e=MV, from which x can be easily found. It is interesting to observe that we have MPV mers 80 that the mass moves as if acted on by an attraction varying in- versely as the cube of the distance from a point in its line of motion. This problem obviously leads to the same result as the following :—A cannon-ball attached to one end of a chain, which is coiled up on a smooth horizontal plane, is projected along the plane. Determine its motion. § 190. Another excellent instance of the application of this process is furnished by the motion of a rocket, where

tuque.

the motive power depends on the fact that a portion of the mass is detached: with considerable relative velocity. The increase of the momentum of the rocket due to this cause is equal to the relative momentum with which the products of combustion escape. If we suppose the rocket, originally of mass M, to lose eM in unit of time, projected from it with relative velocity V, the gain of momentum in time 6¢ due to this cause is

eMV6. The total upward acceleration is therefore

eMV

M-eme 9° Unless this be positive the rocket cannot rise. It will rise at once if V>g/e,and it cannot rise at all unless MV/M'>g/e, M' being the mass of

the case, stick, &c., which are not burned away, From the above data it is easy to calculate that the

greatest speed acquired during the flight (the resistance of the air being left out of account) is

Dynanucs of a System of Particles Generally.

§ 191. The law of energy, in abstract dynamics, may be expressed as follows :—the whole work done in any time, on any limited material system, by applied forces, is equal to the whole effect in the forms of potential and kinetic energy produced in the system, together with the work lost in friction. This principle may be regarded as compre- hending the whole of abstract dynamics, because the con- ditions of equilibrium and of motion, in every possible case, may be derived from it.

§ 192. A material system, whose relative motions are unresisted by friction, isin equilibrium in any configuration if, and is not in equilibrium unless, the rate at which the applied forces perform work at the instant of passing through it is equal to that at which potential energy is gained, in every possible motion through that configuration. This is the celebrated principle of "virtual velocities," which Lagrange made the basis of his Mécanique Analy-

§ 193. To prove it, we have first to remark that the system cannot possibly move away from any particular configuration except by work being done upon it by the forces to which it is subject ; it is therefore in equilibrium if the stated condition is fulfilled. To ascertain that nothing less than this condition can secure the equilibrium, let us first consider a system having only one degree of freedom to move. Whatever forces act on the whole system, we may always hold it in equilibrium by a single force applied to any one point of the system in its line of motion, opposite to the direction in which it tends to move, and of such magnitude that, in any infinitely small motion in either direction, it shall resist or shall do as much work as the other forces, whether applied or internal, altogether do or resist. Now, by the principle of super- position of forces in equilibrium, we might, without altering their effect, apply to any one point of the system such a force as we have just seen would hold the system in equili- brium, and another force

equal and opposite to it. All the other forces being balanced by one of these two, they and it might again, by the principle of superposition of forces in equilibrium, be removed ; and therefore the whole set of given forces would produce the same effect, whether for equilibrium or for motion, as the single force which is left acting alone. This single force, since it is in a line in which the point of its application is free to move, must move the system. Hence the given forces, to which the single force has been proved equivalent, cannot possibly be

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Motion of a sys- tem of particles,

Condi- tion of equi- librium.

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in equilibrium unless their whole work for an infinitely | mining whether the equilibrium is neutral, stable, or Buergy. small motion is nothing, in which case the single equivalent unstable, in any case. If there is just as much potential 'st of force is reduced to nothing. But whatever amount of free- | energy stored up as there is work performed by the applied oo dom to move the whole system may have, we may always, | and internal forces in any possible displacement, the equili- = by the application of frictionless constraint, limit it to one | brium is neutral, but not unless. If in every possible degree of freedom only; and this may be freedom to | infinitely small displacement from a position of equilibrium execute any particular motion whatever, possible under | there is more potential energy stored up than work done, the given conditions of the system. If, therefore, in any | the equilibrium is thoroughly stable, and not unless, If such infinitely small motion there is variation of potential | in any or in every infinitely small displacement from a energy uncompensated by work of the applied forces, con- position of equilibrium there is more work done than energy straint limiting the freedom of the system to only this | stored up, the equilibrium is unstable. It follows that if motion will bring us to the case in which we have just | the system is influenced only by internal forces, or if the demonstrated

there cannot be equilibrium. But the appli- | applied forces follow the law of doing always the same cation of constraints limiting motion cannot possibly dis- | amount of work upon the system while passing from one turb equilibrium, and therefore the given system under the | configuration to another by all possible paths, the whole actual conditions cannot be in equilibrium in any particular | potential energy must be constant in all positions for configuration if the rate of doing work is greater than that | neutral equilibrium, must be a minimum for positions of at which potential energy is stored up in any possible | thoroughly stable equilibrium, and must be either a motion through that configuration. maximum for all displacements or a maximum for some Neutral § 194, If a material system, under the influence of | displacements and a minimum for others when there is equi- internal and applied forces, varying according to some unstable equilibrium. librium. gefinite law, is balanced by them in any position in which | § 199. We have seen that, according to D'Alembert's Forma- it may be placed, its equilibrium is said to be neutral. | principle, as explained above, forces acting on the different tion of This is the case with any spherical body of uniform material | points of a material system, and their reactions against the oe resting on a horizontal plane. A right cylinder or cone, accelerations which they actually experience in any case of nctiod bounded by plane ends perpendicular to the axis, is also motion, are in equilibrium with one another. Hence, in in neutral equilibrium on a horizontal plane. Practically, | any actual case of motion, not only is the actual work by any mass of moderate dimensions is in neutral equilibrium | the forces equal to the kinetic energy produced in any when its centre of inertia only is fixed, since, when its | infinitely small time, in virtue of the actual accelerations,) longest dimension is small in comparison with the earth's | but so also is the work which would be done by the forces, radius, the action of gravity is, as we shall see ($ 222), ap- | in any infinitely small time, if the velocities of the points proximately equivalent to a single force through this point. | constituting the system were at any instant changed to ; Stable § 195. But if, when displaced infinitely little in any | any possible infinitely small velocities, and the accelerations

eee direction from a particular position of equilibrium, and left | unchanged. 'This statement, when put into the concise ibrium. . : : é : : : 3 : 5 to itself, it commences and continues vibrating, without | language of

mathematical analysis, constitutes Lagrange's ever experiencing more than infinitely small deviation, in | application of the "principle of virtual velocities" to any one of its parts, from the position of equilibrium, the | express the conditions of D'Alembert's equilibrium between equilibrium in this position is said to be stable. A weight | the forces acting and the resistances of the masses to the | suspended by a string, a uniform sphere in a hollow bowl, a | acceleration. It comprehends, as we have seen, every | loaded sphere resting on a horizontal plane with the loaded | possible condition of every case of motion. The " equa- side lowest, an oblate body resting with one end of its | tions of motion" in any particular case are, as Lagrange shortest diameter on a horizontal plane, a plank, whose thick- | has shown, deduced from it with great ease. | ness is small compared with its length and breadth, floating on water, are all cases of stable equilibrium, —if we neglect the motions of rotation about a vertical axis in the second, – third, and fourth cases, and horizontal motion in general let us introduce quantities Sx, &c., consistent with ne oe in the fifth, for all of which the equilibrium is seutrak otherwise perfectly arbitrary, and we have the generat equauion Unstable § 196. If, on the other hand, the system can be displaced zm(#ie+ .. .)=z(Kdzt ..-), . equi- in any way from a position of equilibrium, so that when in which, by D'Alembert's principle, the forces X', Y', 2, due to | a left to itself it ts 1 oo vibrate within infinitely small limits Te Arena to conse eihs the right-hand member of this is, | about the position of equilibrium, but will move farther | of course, equal to the loss of potential energy, $0 that and farther away from it, the equilibrium in this position

Commencing again with the equations of motion of a particle . mé=X+X', my=Vt+Y', mé=Z+Z,

ate _sV=3(Xbn+...); dt banned ener rs "| ya natn a gry hsm P g1 SP (peg snlein+ ...)=-8. . ne

shaped body standing on one end, a board floating edgewise in water, would present, if they could be realized in practice, cases of unstable equilibrium.

In the actual motion of any system we have, for each particle, Sx=xdt, &c., so that we have – ; jae pt +99 + 8)=2(Xt+V9+Z2). § 197. When, as in

many cases, the nature of the equili- — i a ae § 2 above

: . : “ee : . s is the complete statement o » 3 2a brium eg with the direction of displace ment, if unstable The el member is the expression of the algebraic sum 0 for any possible displacement it 1s practically unstable ON | the actiones agentium and of the reactiones resistentium, SO far as the whole. Thus a circular disk standing on its edge, | these depend upon gravity, friction, &e., and the left-hand ne though in neutral equilibrium for displacements in its | that of the reactiones due to the accelerations of the several particles. plane, yet being in unstable equilibrium for those perpen- If the system be conservative, this becomes

dicular to its plane, is practically unstable. A sphere rest- Sm (iedé + 99 + #8)= Ee ;) ing in equilibrium on a saddle presents a case in which |

there is stable, neutral, or unstable equilibrium according MPa Lam(e? + 9+ 2)+V=H

to the direction = which it may be disp laced by rolling ; is of course, the general statement of the conservation of energy.

but practically it is unstable. In Lagrange’s general equation above, as we have stated, the

§ 198. The theory of energy shows a very clear and | variations da, &c., are not usually independent. We must p= simple test for discriminating these characters, or deter- | account of the various constraints imposed on the system. If thes

Non-

conser- vative system.

Action,

_ P

AUConAR ICs

retain the same character throughout the motion they may be ex- pressed by a (generally finite) number of equations of the form

I Yy> "Ay Lay Yor %a9 2 + =)=0.

Fach of these gives rise to a purely kinematical relation affecting some one or more of the quantities dx, &c., of the form

o(()me+ (Zar… =.

By introducing, as usual, a set of undetermined multipliers u, one for each of the conditions of constraint, we obtain on adding all these equations to the general equation above

sn(adx+.. j=al (= + n(2) m(B) 20 ae aa |e.

If there be p particles of the system, there are 3p coordinates x, Y; z, connected by (say) 9 equations of constraint, so that there are 3p-q degrees of freedom, and therefore 3y-q independent co- ordinatcs.

Equating separately to zero the multipliers of 52,, 5y,, &c., in the resultant equation above, we have 3p equations of which we write only one as a type, Viz., —

méi= X + xu(7)

Taken along with the g equations of the form

f=0 these form a group of 38p+q equations, theoretically necessary and sufficient to determine the 3p quantities 2%, 41, %, &¢c., and the ¢ quantities », in terms of ¢. Thus we have the complete analytical statement of the conditions, and the rest of the solution is a question of pure mathematics.

When we deal with a non-conservative system (which is equiva- lent in nature to saying " when we take an incomplete view of thie question"), some of the conditions may vary in character during the motion. This will be expressed analytically by the entrance of ¢ explicitly into one or more of the equations of condition /. But, if we think of the mode of formation of

Lagrange's equation, we see that it was built up of separate equations, such as

mé=K+X',

which are true whether the equations of condition involve ¢ explicitly or not. Each of these was multiplied by a quantity dx, &e., the only limitation on which was that it should be consistent with the conditions of the system at the instant considered, what- ever instant that might be. i

= @):

Hence equation (2) still holds good. When, however, we introduce in that equation multipliers cor- responding to the actual motion of the system, so that 6u=x0l, &C., we find a remarkably simple expression for the energy given to, or

withdrawn from, the system in consequence of the varying con- ditions. For the unintegrated equation (2) now becomes

ad iy qe e +92+27))=2(Xa + Yo+ Zz) – =u(¥) –

where the differential coefficient of f is partial. This follows at

once from cquations of the form

df (a df. =

Yi (7) 4 (F \e+be =0, which are obtained by differentiating the equations of condition with regard tot. When the conditions do not vary, the quantities

(4), &c., all vanish, and we see that the constraint does not alter

the energy of the system.

Least and Varying Action.

§200. To complete our sketch of kinetics of a particle we will now briefly consider the important quantity called "action." This, fora single particle,

may be defined either as the space integral of the momentum or as double the time integral of the kinetic energy, calculated from any assumed position of the moving particle, or from an assigned epoch. For a system its value is the sum of its separate values for the various particles of the system. No one has, as yet, pointed out (in the simple form in which it is all but certain that they can be expressed) the true relations of this quantity. It was originally introduced into kinetics to suit the metaphysical necessity that something should be a minimum in the path of a luminous corpuscle (see an extract from Hamilton in the article Lieut, vol. xiv.

723

598). But there can be little doubt that it is destined to play an important part in the final systematizing of the fundamental laws of kinetics.

_ The importance of the quantity called action, so far as is at present known, depends upon the two principles of "Jeast action" and of "varying action," the first as old as Maupertuis, the other discovered by Hamilton about half a century ago.

The first is—TIf the sum of the potential and kinetic energres Least of a system is the same in all tts configurations, then, of all the action.

sets of paths by which the parts of the system can be guided by frictionless constraint to pass from one given configuration to another, that one for which the action 2s least is the natural one or requires no constraint.

§ 201. Unfortunately it is not easy to give examples of this important principle which can be satisfactorily treated by elementary methods,—except, indeed, the very simplest, such as those furnished by the corpuscular theory of light. Thus it is obvious that, as long as a medium is homogeneous and isotropic, the speed of a corpuscle in it is constant. The action is thus reduced to the product of the constant speed of the corpuscle by the length of its path, Hence the principle at once shows that the path must be a straight line. When the corpuscle is refracted from one such medium into another, the path is a broken line such that the product of each of its parts by the corresponding speed of the corpuscle is the least possible.

This gives the law of the sines, but to agree with experiment the speed would have to be greater in the denser medium than in the rarer.

§ 202. The problem to find change of action as depending on change (nowhere finite) of the mode of passage from one given con- figuration to another (restricted by the condition already men- tioned), is expressed mathematically by

3A =3/Smésds =5/Em/ (eda + pdy +2dz), while T =43me? =4em(e2+97+2)=H-V, Hi being the constant energy of the system, and the integral being taken between limits supplied by the two given configurations.

The first equation gives 3A =/Sm/(dada + dydy + dzdi+ kdda+ yddy + dbz)

=sm(ed0+ ...)+fSm(dade+ dydy+ dz82 — dbx — dydy — d282)

But the integrated part Sm(axdx + ydy + 282), (A) obviously vanishes at both limits, because the initial and final configurations are given.

If we now take the corresponding variation of the expressions for the kinetic energy, we have

aT = smsos = Sm (de + YBY + 282), from which we have [xin dixbic + dydy + 1252) = feat.

by partial integration.

Also we have

dedx + dydy + dbz = (#52 + gdy + 252)dt ; so that finally

BA = /dt[BT — m(adx + Hoy + 252)] , which so far is a mere kinematical result. Butit can be rendered physical by putting — 3V for 5T, in accordance with the above con- dition. This we will suppose done.

If now we desire to make 5A vanish, so as to obtain what is called the "stationary condition," we must make the factor in square brackets in the integral vanish ; 7.¢., we must have

Sm(#dx-+ Hy + 252) + BV =0 for all admissible simultaneous values of dx, dy, dz for the various particles of the system. But this is precisely the general equation which, as we found in § 199 (1), determines the undisturbed motion of the system.

§ 203. The expression 5A ~=0 really signifies that any infinitesi- mal change from the natural mode of passage produces an infinitely smaller change in the corresponding amount of the action between the terminal configurations.

§ 204. It will be noticed that the essential characteristic of the modes of passage considered in this investigation is that all shall have the same terminal configurations, and that the system shall

Change of action.

Station-

ary action.

Varying action,

Charae- teristic fune- tion.

always have the same definite amount of cnergy. All, except the natural mode of passage, in general require constraint in order that they may be described. Hamilton's grand extension of the subjcet depended on comparing the actions in a number of natural modes of passage, differing from one another by slight changes in their ter- ininal configurations, and slight changes in the whole initial energy.

In this new form of statement the-unintegrated part of the ex- pression for 8A vanishes, since all the modes of passage eontem- plated are natural. The alteration of the whole energy, however, adds a special term to the equation, and we can at onee write, from the expression (A) § 202, the equation for the change in the action under the new conditions, viz.,

SA =[Sn(td24 yoy +402) | +00H,

the part in brackets having to be taken between limits correspond- ing to the terminal configurations, and the variations 6x, dy, 6z at these being subject to the conditions of the system.

We cannot here consider this equation in its general form. We content ourselves with the simpler special deductions from it re- quired for completing our sketch of Kinetics of a Partiele.

The last given equation, written in full for a single particle of unit mass, is

SA = [ada + yBy +282] — (¥)5X9 + JodYo + 208%) + E31 ,

where 2, Yo, % is the initial point, and x, y, 2 any other point, of the path. If the particle be altogether free, the seven variations on the right-hand side are independent of one another; and thus we have the following remarkable properties of the quantity A, regarded as a function of seven independent variables (the initial and final coordinates of the particle, and its constant energy), Wiz,

dA\ dz dA_ _ dx (Sn : (3)=- 2 dA\ dy dA\ _ dy (a)-at> (ay,)=~ “a dA_ dz dA\ _ da ()-ar> (ae) ~~ ae

dA _,

cc ‘ Fyrom these we gather at once that A satisfies the partial differ- ential equations

dA\? (dA\?, (dA_ 1a o_v al a See

dA \?2 dA \2 dA\? 3 ee kei we |) =7? =2 = Wi L. 5 SABF cS =) +(G) ~m-2- W) – @)

§ 205. The whole circumstances of the motion are thus dependent on the function A, called by Hamilton the ‘characteristic func- tion.’ The determination of this function is troublesome, even in very simple cases of motion ; but the fact that such a mode of representation is possible is extremely remarkable.

§ 206. More generally, omitting all reference to the initial point, and the equation § 204 (2) which belongs to it, let us cousider A simply as a function of x, y, 2 Then

Any function, A, which satisfies the partial differential equation

(AY (B)(G) -e-20-) eu

possesses the property that = a é = represent the rectangular components of the velocity of a particle in a motion possible under the Sorces whose potential is V.

For, by partial differentiation of (1) we have (= _ ee _dV_dA A dA A A aA at \ah) ae dx dx dx dy dady' dz dxdz' with other two equations of the same form.

But we have also three equations of the form a (aA) _de PA, dy PA, dz PA dt\dz) dt dx? dt dxdy° dt dxdz' Comparing, we see that

dx _dA dy _dA dz dA

at ~dx' dt dy' at de

satisfy simultaneously the two sets of equations. § 207. Also if a, 8 be constants, which, along with H, are in-

volved in a complete integral of the above partial differential equation the corresponding path, and the time of its description, are

given by (3 = adA\ _ dA ay fi) \ae aa

where a, By, € are three additional arbitrary constants,

For these equations give, by complete differentiation with regard to t,

*dxda dt' dyda di * dela dé ~*

MA dx @A dy BA ad

dzdB dt + aya a dzdp dt : (a i

CRIN Eames CP PN Gs)

CA da, A dy A dz dad dt dydii dt = dedi dt

=]

But, differentiating § 206 (1) with respect toa, 8, H respectively, we get

2 2 2

*A dA, A dA, A dA_ 4) dadx dx ° dady dy dadz dz | A dA A dA, WA dA ign de * dpdy dy | die a ° | aA da, A dA, @A dA dHdz dx dHdydy dHdz dz*

a

The values of — &e., in (a) are evidently equal respectively to

dA

those of = &e., in (6). Hence the proposition.

§ 208. ' Equiactional surfaces," ¢.¢., those whose common equa- gurfaces tion 1s of equal*

A=const., Aton,

are cut at right angles by the trajectories. For the direction cosines of the normal are obviously proportional

da dA dA 2 dx dy dz _ ee Bette of oo ew (A).($).(E) abs, 0 7

Thus the determination of equiactional surfaces is resolved into the problem of finding the orthogonal trajectories of a set of given eurves in space, whenever the conditions of the motion are given.

The distance between consecutive equiactional surfaces is, at any point, inversely as the velocity in the corresponding path.

This may be seen at once as follows: the clement of the action, which is the same at all points, is vs (where 5s, being an element of the path, is the normal distance between the surfaces).

§ 209. In consequence of the importance of the method we will Plane- take two examples of its application. First a direct example, then tary one depending on the equiactional surfaces. motion,

To deduce from the principle of 'varying action" the form and mode of description of a planet's orbit.

In this case it is obvious that = represents the attraction of

7

gravity (—u/72). Hence the right-hand member of § 206 (1) may be written 2(H + 4/7). Let us take the plane of xy as that of the orbit, then the equation § 206 (1) becomes

"-(yo(Ghyaa(ner)

It is not difficult to obtain a satisfactory solution of this equation, but. the operation is very much simplified by the use of polar co- ordinates. With this change, (1) beeomes

(Ay) are)

which is obviously satisfied by

(3) =constant=a,

dé dA\? a (3). (a(net) 2 dr r 7 Hence A=a0 + fdrs/2(H + pl) — 2/2? — The final integrals are therefore, by § 207, aA = : adr ; (5), (a) i S 2 /2(H + p/r) — 2/2? dA —— ss ~— & mi (int) -"/ Gace

These equations contain the complete solution of the problem, for they involve four constants, a, a, H, «. (5) gives the equation © the orbit, and (6) the time in terms of the radius-vector.

To complete the investigation, let us assume

pfa2=1/l, W/ar=(2-1)/P,

MECHANICS 725

where 7 and ¢ are two new arbitrary constants introduced in place of and H. With these (5) becomes

0, 0- f i ; PA/(2—1)/P + Qin — 1/r?

adr Z

Sa cos ~1— g-l—J-1

PEP = (Ir = 1/0) ra),

Z ° . ““T¥ee0s(@—a4)’ the general polar equation of conic sections referred to the focus. Also by differentiating (5) with respect to 7, we have r2√2(H + p/r) — 2/7

from which, by (6), we immediately obtain

tre [rraa=—— fread. q, V ul

This involves, again, the equation of equable description of areas. Compare § 144.

§ 210. In a planet’s elliptie orbit the time 1s measured by the area deseribed about one fueus, and the aetion by that deseribed about the

other. j For with the usua] notation we have

dA=tds = tn ; P

by the result of § 47. But in the ellipse or hyperbola, p' being the perpendicular from the seeond foeus,

pp =+0°.

Hence dA= a pds, which expresses the result stated above.

It is easy to extend this to a parabolie orbit, for which, indeed, the theorem is even more simple,

§ 211. Unit partieles are projected simultancously and horizontally in all directions fron every point of a vertical axis, all having the same total energy at starting; find the surfaces of equal aetion.

We may obviously eonfine ourselves to a plane section through the axis. Let x be the vertical coordinate of a particle, measured downwards from the level at which the common energy is wholly potential, & the eoordinate of the point in the axis from which it was projected. Then we have, after the lapse of time ¢,

v=k+hge y=N2gkt

Eliminating ¢, we have the equation of the parabolic path—

y?

ye

To find the orthogonal trajectory (the meridian section of the surface

e=k+

of equal action), differentiate, put — 4 for dy , and eliminate k. We a

dx thus have yyy Nery 27 dc 2h e4Nat—y NatytNe-y or —Vie+y(de + dy) +x — y(de- dy)=0,

so that (a +y)'&(2- y)t=const. If we turn the axes through 47 in their own plane, the coordinates being now and y, a thisequation beeomes d' Hy ni

=ai, B Ly

In fig. 55, AM is Ee the axis. A few of \ the paths are shown by full lines, and two of the seetions of sur- & L faces of equal action ~ by dotted lines, These sections indieate eusps lying on the line AH, whichM Makes an angle 4a with the vertieal, and 4s touched by all the ic paths. The path | fue Whose vertex is G [007 touchesthisline in BH, and therefore passes through the cusp of which the branches

Fig. 55.

HK and HL. HK belongs to all paths whose vertices are above » HL to those (such as ML) whose vertices are below G.

It is worthy of note that, by the first equations above,

wy = (rfl 4g.t), by the substitution of whieh in the equation of action we see how the time of reaching a particular surface of equal action depends upon the position of the starting point. § 212. A very interesting plane example, which has elegant Plane applications in fluid motion, and in the conduction of electric currents eurrents in plates of uniform thickness, is furnished by assuming*

A=logr, or A'=@, where 7 and @ are the polar coordinates of the moving partiele.

In the former, where the curves of equal action are circles with the origin as centre, we have

dA. _ % dA. _y

—=S ££ = dz 72?

adA\? /dA\? 1 mH V=(F) +(a) as

so that the force is central, and its value is

In the second ease, where the curves of equal action are radii drawn from the pole and

A’=@=tan-14 ,

2

we have

GH a “ee ba i The kinetie energy is still 1/272, and the central foree – 1/73, but the paths are circles with the origin as centre. Thus the lines of equal

aetion and the paths of individual particles are convertible. We have also, in each of these cases,

di dg\ _ Canta

This shows (as in § 94) that, whatever be originally the grouping of a set of particles moving all according to one or other of these conditions, the density at any part of the group remains unehanged during the motion. In fact, as it is easy to prove, A and A’ are elementary solutions of the partial differential equation

aA aA at Ol 2? gee Mew » Che ax? + dy? 0 ( ) ? and they are conjugate, in the sense that dA dA’ dA aA’ da dy” dy da

For this reason the paths belonging to the two systems are every- where orthogonal to one another.

Also, as the differential equation (1) for A is linear, any linear funetion of partieular integrals is an integral. Thus, for instance, we may take (p being any constant)

A=logr—pé0, with A’=plogr+é.

These, representing orthogonal sets of logarithmic spirals, possess the same properties with regard to aetion as did the eoncentric eireles and their radii, whieh, in fact, are the mere partieular case when p=0.

§ 213. It is easy to give graphic methods of tracing these eurves Graphic of action by means of an old proeess recently mueh developed by method.

Clerk Maxwell. The present example, thongh a very simple one, is quite sufficient to illustrate the proeess.

Draw, as in fig. 56, a set of cireles whose radii are €°, s, & &e., and a set of radii veetores making with the initial line the*

2" 3%, &e., a beinga quantity which

3a : |

. a successive angles, — , P

may have any convenient value. These lines will form a network, finer as a is smaller. Now suppose we wish to trace the eurve

A= na.

We take the intersection of the eirele whose radius is °° with the radius-veetor corresponding to the angle

(s-n)=. Thus we have for the value of A at the point of intersection

*A=loge**- p=”*

a

=na, as required,

By marking the intersections eorresponding to different values of s, we have a series of points in the required curve which, by adjust-

It will be noticed that in these examples the eurves of equal aetion Anajoo found necessary for tracing the curve of action through them Zibera | and the paths of the particles correspond in steady fluid motion Reiran, manu. to curves of equal pressure and lines of flow, and in eleetrie con- Sao In fig. 56 portions of three separate sets of mutually orthogonal duction to equipotential lines and current lines. In sueh cases in ang logarithmie

spirals have been traced, by using the intersections of | fact, where there is no vortex-motion, the action is closely analogous velocit the fundamental straight lines and eireles. _ to what is called the “ velocity potential” in a fluid. Rotentiy L

ment of the value of a, may be made to lie as close together as is

Generalized Coordinates.

§ 215. By the help of the result already obtained in con- Genera). nexion with least action, we may easily obtain in a simple, ized co- : though indirect, way the remarkable transformation of the ‘inate equations of motion of a system which was first given by Lagrange. We are not prepared to give here the trans- formation to Generalized Coordinates in its most general form; but, even in the restricted form to which we pro- ceed, it is almost invaluable in the treatment of the motion of conservative systems of particles in which the number _ of degrees of freedom is less than three times that of the | particles. The one point to be noticed is that, when we restrict ourselves to a system of this kind, the expression for the kinetic energy, T, is necessarily a pure quadratic function of the rates of increase of the generalized E coordinates. This is obvious from §19. Repeating with os eer = a 7 \ generalized coordinates the investigation of § 202, we have os =

ees ps

p=’ casa = = A=2/Tdt=/(T+H-Vodt. 2386 Henee sA=/(8T +5H – 8V)dt. Fig. 56. Now let 6, ¢, y, &c., be the generalized coordinates, and we have We may pursue the subject much farther, by combining parti- OT = PG + 206+ RE ots eee

cular solutions like those given but taken from different origins. i : We can afford space for one only. Let P, Q (fig. 57) be points on where P, Q, R,... are in general functions of 0, ¢, ¥,... Of the axis of x, distant a and —a from the origin, R any point in the | course V is a function of 6, $, Y.. – alone, and does not involve

= = = =6,, 6, >, y, &e. plane of the figure. Let PR=7,

*Then if A=logr—logr;, mt sA== (Sj) 94+ (3)90— (Ge)0 ae . | A'= 6 $ 0, 3 Q we must have, not only the ae aT -fi (4 dT\ av dV | equation 2 gee) + OH fate! -a\ ag) ao * ao) | PA dA a i ae | 8A necessarily vanishes. Thus, as 0, ¢, WY… – and, therefore,*

their variations, are by their very nature independent of one another, the vanishing of the unintegrated part gives us one equation of motion for each degree of freedom, the type being in all

satisfied by cach of A and A', but also the conditions

dA aA! dA aA' of them the same, Viz., dz dy? dy da'

a aT = aT os dV =(0 This follows at once from the at\ dé ade dé y

— that all the equations are Fig. 57. To exemplify the use of these equations we will take again a few Ex- or In fig. 87 h Ap R. H " 'Ri of the more important cases of constraint already treated, and will amples. § 214. In fig. 57 we have €4=PR/QR. Hence the locus of Ris | then proceed to some others of, interest as well as of somewhat

iJ But we saw that, for any natural motion, the unintegrated part of |

a cirele, whose centre, B, is on QP produced. reeter Gomplaait Again A'— PRQ. The locus of R is, in aren the simple pendulum, 2 being again the length of the string, this case, any circle passing through P and Q. and @ the inclination to the vertical at time ¢, we have obviously |

These circles evidently cut one another orthogonally in R; for : BR, which is a radius of the one, is a tangent to the other. T=4n?6?, V=C—mgleosé. Thus particles moving in a plane, so that the speed at an aT aT adv : point R : inversely as BR . RQ, ae deseribe circles in which PQ Hence (3 \=med ? (G)- (Sy)-m9 isind . isa chord. In this case the curves of equal action are circles de- ' ay fined by the condition that the ratio PR: RQ is constant. Or they Thus the equation of motion 1s may move in the latter system of circles, in which case the former mi?6 + mglsin @=90 system gives the lines of equal action. For the equations in the preceding seetion give

dA\? /dA\? (dA’\? (dA’\? 40 as in § 134.

(Ay, (AY_ (2x _ 4a? § : sss da dy dx dy J ry?’ Suppose the same pendulum to be moving anyhow, @ still denot- ing its inclination to the vertical, and ¢ denoting the azimuth of the plane in which it is displaced, we have

or 5+Zsine-0, ‘

from which the conelusion is obvious. We may easily extend this example to other sets of orthogonal

eurves whose equations are T=4mP(6?sin?0.¢), V=C- mateost A,=pA A’, These give at once | Ay/=-A+pA, (G)-m (22) —mPsinscoss.o% (Fy)=matsint r where A and A’ have their recent values. Or we may extend the = a | example by assuming at starting (33) = APRA (3) =i, (Se) =0. A=mlogr-m,logr, , dp dp de in whieh case it will be found that we must have Hence the two equations are A’=m6-—m,6,. §- sin Ocosd.g?+ sind=0, These pair in b i i | hese pairs may again e combined into a (sin?0.¢)=0. . pA+A’ and -—A4-pA’, and so on. di

»exten- ji sible cord.

Setting | awatch.

Trans- ference | of energy.

Still keeping to easy examples, suppose the cord of the ordi-

nm with nary simple pendulum to be extensible, according to Hooke’s law.

Let a be its length at time ¢ Then the tension is E(a—J)/1, and the work it can do in contracting is the integral of this with regard to A from / to A, Ub:

E(a —1)2/27. V=C+ E(a – 1)?/21 — mgacosé , T = 4m(a262+A2). Thus Lagrange’s equations become =A dt mX — mae? + E(a—1)/l- mgcosé=0 ;

Hence we have

a76)+gasind=0,

equations which could be obtained immediately from the application of the second law, with the help of the kinematical expressions for acceleration perpendicular to, and along, the radius-vector of a plane curve (§ 47). :

Instead of the complex pendulum treated in § 177, we will now take the case of two masses attached at different points to an elastic string, or light helical spring, and consider their vertical vibrations.

Let a, b be the unstretched lengths of the parts of the string, M and m the masses. Then if &, 7 be the vertical displacements at time ¢, we have

T=4(Mi+ m(é+7%)), E 2 2 v-3(£+7) — Mgt — mg(E+7) ;*

so that Lagrange's equations are ee : Sp (ME+m(E+9)) +E —(M+m)g—0, d '3 ' 7] rs ap (MME +) + E— —mg=0.*

The cquilibrium positions are found by supposing the accelera- tions to vanish, so that, if we suppose and 7 to be measured from them, the terms in g will disappear. Hence the solution is of exactly the same nature as that already given for an apparently different problem (§ 178).

We may mention that equations practically the same as these are obtained when we consider the motions of a watch and its balance- wheel, the watch being supported in a horizontal position by ineans of a wire, and oscillating in its own plane by the torsion-elasticity of the wire. The reader of § 242 below will have no difficulty in obtaining this result. It suggests a practical method of "setting" a watch to true time, without turning the hands forward or backward, and without letting it run down.

The following is a simple, but very instructive, example of the transference of energy (back and forward) between two parts of a system. Two bar-magnets of equal mass, length, and strength (fig. 58), are supported horizontally by pairs of parallel strings, so that when at rest they are in one line. One of them is slightly displaced in the direction of its length, find the subsequent motion of both.}

If we can, by any process, find two fundamental states of motion ° which, once established, will be permanent, any other possible motion

Fig. 58. of the system will be a superposition of these two. amplitudes and phases in the components may have any

The

values, so long as the whole disturbance is small. This follows from the fact that the system has two degrees of freedom only,—since we are concerned only with motions in the plane of the figure,

(A) Now one obviously possible motion is a simple harmonic vibration of the whole, without change of distance between the magnets. The period of this vibration is obviously the same as that of either magnet if the other were removed.

(B) Another obviously possible motion is that in which the magnets are, at every instant, equally and oppositely

"We suppose the bars to be so long, in comparison with the dis- tance between them, that we need take account only of the action of their poles which are turned towards one another.

deflected. The period of this oscillation will be less or greater than that of the former according as the poles attract or repel one another.

Now the initial state of motion proposed evidently con- sists of the superposition of (A) and (B) in such a way that there is, at starting, no displacement of either mass, but a definite velocity of one of them only. This cor- responds to simultaneous zero of displacement, with equal velocities, for each of (A) and (B). There is therefore at that instant no displacement of either mass; and one is at rest while the other is moving with double the assigned velocity. If 2a/n, 27/n" be the periods of the two motions, it is obvious that after the time z/(n—7n') the magnets will have interchanged their states so that the arrangement will present exactly the same appearance as at first, 2 looked at from the other side.

Let a be the distance between the ends of the bars when all four strings are vertical. Then, if 6, ¢ be at time ¢ the inclinations of the pairs of strings to the vertical, a becomes

D=a+l(¢- 8),

where 7 is the common length of the strings. The expression for the potential energy due to magnetism is of the form u/D, where p is positive if like poles be turned to one another.

Hence

T=hml?(0? + ¢),

pas CO ae 2 BK V=hnglP+¢)+o+he 8) 5

| Forming the equations as usual, and omitting powers of and | above the first, we have

2 4 es ee ml = mgt (1 rh i a)

mPp= — mgld — &(1- ae — ®)) ;

from which the results already given may be deduced.

Finally, let us take the case of Atwood's machine (§ 173) when Atwood's the masses are equal, and one of them is vibrating through small machine.

arcs.

Let 7, be the polar coordinates of the vibrating mass; then, One mass neglecting powers of higher than the second, we have the general-vibrating.

ized equations 27 — 762 = — 396",

a ag gro.

Put 4gr for r, and 6/2 for 6, and we get

#-TrP—- OF,

ee

= = — 26, =A” 6) 2g

Transform to rectangular coordinates in the plane of motion, x being vertically downwards ; then ;

é—y/x?, 9= -2ylx. This shows that the vertical acceleration of the vibrating particle is very small, but constantly downward. Hence the energy of the vibratory motion is steadily converted into energy of translation of the masses.

When both the equal masses vibrate through small arcs, it is found that the mass whose angular range is the greater has down- ward acceleration with diminishing angular range. Hence it would appear that, if the string be long cnough, the entire motion would be periodic.

§ 216. Before leaving this subject we may form, from the com- plete value of 5A given in last section, the generalized equations corresponding to those of Hamilton’s “ varying action,” as given

*in § 204. We have at once a) (@), (2)-(68).- = (an do} \d6}’?\de) \dej’?’ °° *\dH]~”° But, by the value of T, we have aT : (55)=Po+Ob+ et 2*

aT : (Gj)-Q+Rb+ 7. &c. = &e,

Equili-

These equations give 6, ¢, . . . as homogeneous linear functions of

dT\ (dT dA\ (dA (35) (55) ... that is, of (55) (S , a. Thus,

if we substitute these expressions in the equation

a~s[0()]-[0(2)]*

which is obviously true, because T is a homogeneous function of 4, $, . .. of the second degree, we have a partial differential equation of the form

(G5 wr dA dh r(B)

P\ a6 1\ do =) dp ons

from which A is to be found. The coefficients p, gr…

functions of 9, ¢,... , As an illustration, take again the example in last section, where

two masses are attached to a helical spring, and vibrate in a vertical line. From the value of T there given we have

dA aT ‘ . (Se) (Ge)— Ot me ma – dA dT ‘ P (in)-(Gq)ometm- From these we have the equation for A

m(Fe) – am(T)(a) +(M +m) (j,) — 2m -V).

The value of V is given abovee This equation is, of course, to be treated according to the process illustrated in § 209.

=2H-V),

are, in general, like P,Q, R,.. .

Statics or A Ricip SOLID. § 217. A rigid body, as we have already seen, has at the

brium of utmost six degrees of freedom, three of translation and

rigid solid.

The six condi- tions.

three of rotation. According to Newton’s scholium, the conditions of equilibrium of such a body, under the action of any system of forces, are that the algebraic sum of the rates of doing work by and against the forces

shall be nz/ whatever uniform velocity of translation or of rotation the body may have. For, if this were not so, there would be work done against acceleration, and the body would gain or lose kinetic energy. And this gain or loss would take place even if the body were originally at rest, z.¢., it would not be in equilibrium. To ensure equilibrium then, all that is necessary is that the sums of the components of the forces in any three non-coplanar directions shall vanish, along with the sums of their moments about any three non-coplanar lines. For simplicity it is usual to assume for these direc- tions a system of rectangular axes, and for the lines another system parallel to them and passing through some definite point (say the centre of inertia) of the body. Thus we have at once

3(X)=0, 3(Y)=0, 3(Z)=0; 3(Zy -Yz)=0, 3(Xe-Zxz)=0, 3(Ya-Xy)=0,

where X, Y, Z are the components, parallel to the axes, of a force acting at the point x, y, 2 of the body. If P, with direction cosines A, , v, represent the force acting at x, Y, 2, these equations may be written in the form

3(Pa)=0, %(Pu)=0, 3(Pr)=0 3[P(vy – wz)J=0, 3[P(az—va2)]=0, 2[P(ux—ay)]=0.

These equations correspond to the six degrees of freedom involved.

It is easy to see that it isa mere matter of convenience through what point of the body we draw the lines about which moments are taken. For, if we shift it by quantities a, b, ¢ respectively, the noments become

={Z(y-b)-Y(z-c)}, &e.; =(Zy — Yz) -b3(Z)+c3(Y), &c.;

and, by the first three equations, these quantities are seen to reduce themselves to their first terms. Hence, in forming the equations of equilibrium, simplicity will be gained by choosing as origin a point through which the line of action of one or more of the applied forees passes.

Again, the point of application of any one of the forces may be

but these are

shifted at will anywhere along the line in which the force acts. For the equations of the line in which the force at x, y, z acts are

Zy —Y2'=Zy-Yz, &e.,

so that the expressions for the moments are unaltered if the point of application of the force be shifted to any position along the line in which it acts.

§ 218. In the great majority of treatises on Statics the fundamental propositions of the subject, above given, are deduced from the assumption (as a thing to be proved ex- perimeutally) of the result just established, which is desig- nated the "principle of the transmission of force." Along with it are assumed the parallelogram of forces, and the principle of the "superposition of systems of forces in equilibrium." Since the publication of the Principia, the continued use of such methods must be looked upon as a retrograde step in science.

§ 219. From this category we cannot quite except (so far Couple. at least as the usual modes of treating it are concerned) the valuable idea of the "couple," due to Poinsot. But the term is in such common use, and the idea in its applica- tions sometimes of such importance, that it cannot be omitted here.

A couple is a pair of equal forces acting on the same body in opposite directions and in parallel lines.

From the general conditions already given we see that a couple produces a definite moment of force about a particu- lar axis, but that the axis is determinate merely as regards direction, and not as regards position in space. The forces of a couple do not appear in the first three of the equa- tions of equilibrium. On the other hand, the left hand members of the other three equations may all be regarded as moments of couples. All the properties of couples are contained in these statements. Thus, for instance, it is obvious that, so far as its effects are concerned—

1. A couple may be shifted by translation to any other Trans- position in its own plane. petee ol |

2, It may be shifted to any parallel plane. per

| }

and these give

Ss

3. In either of these it may be turned through any angle.

4. Its forces may be increased or diminished in any Arm of ratio, provided the distance between their lines of action couple. (which is called the "arm" of the couple) be proportion- ately diminished or increased. |

A couple is therefore completely determined by means Axis of | of its "axis," which is a line drawn perpendicular to its couple. plane, and of length representing its moment. And two | couples are obviously to be compounded by treating their axes as if they were forces acting at one point.

§ 220. We will now examine the consequences of the Reduc- six conditions of equilibrium (§ 217) in some of the more a common cases which present themselves. But, before, — doing so, it may make matters clearer if we restate thes@anda conditions in a somewhat different form. ee |

The resultant ofany number of forces, acting at any powts of a rigid body, may be represented by a single force acting at the origin, and a couple of definite moment about a definite line passing through the origin.

For equilibrium of the body this force and couple must separately vanish.

Thus if, in fig. 59, P, acting at Q, forces, and O the origin (chosen at random), we may introduce at O a pair of equal and opposite forces + P, parallel / Q to P. The original force, taken along

be any one of the

° ° -P. with — P at the origin, gives a couple ; 0 and in addition there is +P acting at si? the origin. Fig. 59.

§ 221, When only two forces act on a body, the first

Parallel | forces.

i | "Centre."

Gravity.

- gravity,

condition above shows that they must be equal and oppo- site, aud the second that they must act in the same line, if they are to maintain equilibrium. When only three forces act, the first condition shows that their directions must lie in one plane, the second that their lines of action must be parallel or must meet in one point, if they are to maintain equilibrium.

If their directions meet in one poiut we have again the problem of the equilibrium of a single particle under three forces; for there can be no moment about this point.

When the directions are parallel, one of the forces must obviously be equal to the sum of the other two, and must act in the opposite direction. Also its line of action must lie between those of the other two, for their moments about any point in it must be equal and opposite. Hence it is impossible that any single force should balance a couple, unless we adopt the mathematical fiction of an infinitely small force acting in a line everywhere at an infinite distance; so that its moment may be finite, and equal and opposite to that of the couple.

§ 222. When any uumber of parallel forces act simul- taneously on a rigid body, their resultant is a single force equal to their algebraic sum, with a couple whose plane is obviously parallel to the common direction of the forces. The forces of this couple may be made, by lengthening or shortening the arm, equal to the resultant force. Oue of them will neutralize it, and the other remains the final resultant, which passes through a definite point

called the "centre of parallel forces." Thus any set of parallel forces necessarily has a single force as a resultant, excepting in

the special case when their algebraic sum is zero.

§ 223. Excellent examples are furnished by heavy bodies of moderate dimensions, where the weights of their parts are forces practically in parallel lines. The single re- sultant force, in such cases, is the whole weight of the body. Its direction always passes through the centre of inertia (§ 109) because weight (in any one locality) is proportional to mass. For this reason all heavy bodies of

Centre of moderate dimensions are said to have a "centre of gravity,"

which coincides with the ceutre of inertia. But it must be noticed that the two ideas are radically different, and that, while every piece of matter has a true centre of inertia, it is, in general, only approximately that we can predicate of it that it has a centre of gravity. In fact a body has a true centre of gravity only when it attracts, and is attracted by, all other gravitating matter as if its whole mass were con- centrated in that point. See Porentiat. When there is a centre of gravity in a body, it is necessarily coincident with the centre of inertia. In gravitation cases, where bodies of moderate size are concerned, the resultant is, at least approximately, a single force. But, when we deal with large non-barycentric bodies like the earth, we find that the resultant of the sun's attraction is a force (deter- mining the orbit) and a couple (producing precession, &c.). When a mass is laid on a three-legged table, we find the pressure which each leg supports by simply taking moments about the line joining the upper ends of the other two. The leg is thus seen to support a fraction of the weight of the mass, whose nu- merator is the distance of the centre of gravity of the mass from this line, and its denominator the distance of © the leg from the same line. Thus we have a physical proof of the geomet-

Fig. 60.

tical proposition that if any point, P, be taken in the plane of a triangle ABC (fig. 60), and perpendiculars be drawn from it and from the angles, we have

Pa Aa

*Pe. Py – Tr GC. **

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If the mass of the table is to be reckoned, P must be taken as the centre of gravity of the system of table and load together. If the table be of uniform material, triangular, and supported by legs at its corners, similar reasoning shows that when it is unloaded (or loaded at its centre of gravity) each leg supports one third of the weight.

§ 224, Examples in which the resultant is a single couple are found in rigidly magnetized bodies placed in a uniform magnetic field. As the amounts of N, and 8. magnetism in a body are always equal, there is no force of translation in a uniform field. The resultant couple depends for its magnitude ou the orientation of the body, and the positious of equilibrium are those for which its moment vanishes.

_§ 225. Let Pat x, y, z, be one of a system of parallel forces, their direction cosines being A, w, v. Let Q be the resultant force, and R, with direetion eosines A', »', v', the axis of the resultant eouple. Then our conditions become

Q=x(P), NR=23[P(vy— pel], #R=2[P(az- vex)], »R=2[P(ux—ay)]. _ The last three equations give the following conditions determin- ing R, A, p', :— XR +p2(Pz) -ve(Py)=0, —Ax(Pz)+ywR +v3(Px)=0, ax(Py)-pa(Px)/R =0. From these we have the equation of condition AA + ep' + vv' =0, showing that the axis of the couple is at right angles to the common direetion of the parallel forces. We have also R2=(3(Pzx))? + (=(Py))? + (&(Pz)}? — (AS(Pa) + o3(Py) + v2(P2))?. This expression is of the same form as that in § 77, and we there- fore eonelude that, if a", 4", v" be the direetion cosines of a line in the body such that ae ee =(Px) (Py) =(Pz)' the magnitude of the resultant eouple is direetly as the sine of the angle between this line and the eommon direetion of the parallel forces. In fact the mere form of the three equations above proves this result. In the case of a body of moderate

dimensions, aeted on by gravity, P is the weight of the element at 2, y, 2, and therefore proportional to its mass, so that if the centre of inertia be taken as the origin we have =(Px)=0, =(Py)=0, =(Pz)=0, and there is no ecuple. The whole effeet is therefore the same as if the mass were condensed at the centre of inertia. In the case of a magnet,

and there is no translatory forec. The couple, as we have seen, depends upon the orientation of the body as regards the direction of the line of the earth's magnetie foree.

§ 226. We have seen that any system of forces acting on a rigid body may be reduced to a force anda couple ; also that when the force is in the plane of the couple the resultant can always be put in the form of a single force acting in a definite line in the body. When the force is not in the plane of the couple, we may resolve the couple into two components, the plane of one being parallel, of the other perpendicular, to the force. The first, when compounded with the force, merely shifts the line in which it acts. Thus any system of forces may be reduced to a single force, acting in a definite line called the " central axis," and a couple in a plane perpendicular toit. One of the forces of the couple may now be compounded with the single force, and thus we obtain, as the resultant of any system of forces, a pair of forces in non-intersecting lines not perpendicular tooneanother. This is only one of an infinite number of ways in which fancy, or convenience, may lead us to represent the equivalent of a group of forces. Many very curious theorems have been met with in investigations on this subject. For instance, by compounding one of the forces of the resultant couple with the resultant force (not

XV. — 92

Resultant a eouple,

Reduction

to two forces.

Central axis.

now necessarily perpendicular to its plane) we have a

system of two forces acting in non-intersecting lines. Then we have the following curious proposition, which may

Ry }

The most obvious mode of attacking this question would be to resolve the applied forces into three groups, parallel respectively to three rectangular axes which revolve with them, and to choose those axes so that the sum of the resolved parts does not vanish

easily be proved from the formule already given :—

When a system of forces is reduced in any manner what- ever to two, the volume of the tetrahedron of which these are opposite edges is constant.

Symmet- § 227. The most symmetrical pair of resultant forces is rical re- found thus. Take any point P (fig. 61) in the central axis, duction. snd draw through it a line APA', 7@ perpendicular to it, and bisected , << at P. Substitute for the single force at P its halves acting at A and A' respectively. Combine these respectively with the forces AQ, A'Q' of the couple when AA' is madeitsarm. The system Fig. 61. is thus reduced to tivo equal forces AR, A'R', whose direc- tions are interchangeable by a rotation of two right angles

parallel to any onc of the three. Each of these systems of parallel forces has its own " centre" ($ 222),—so that the final resolution gives three forces, cach of a given magnitude, acting in any mutually perpendicular directions at three definite points in the body. This, however, is not analytically so simple as the following.

We refer the body to fixed axes Ox, Oy, Oz, to be afterwards speci- fied. As the origin and the directions of these axes are at our disposal, we may

impose six conditions. Now suppose the forces to be resolved parallel to a set of rectangular axes Oz', Oy', Oz which will be considered afterwards to rotate with them. Such a system of axes may, at starting, have any assigned position. This gives us three conditions more. Let then A, B, C be the components, parallel to the second sct of axes, of the force applied at the point whose coordinates referred to the first system are @, 6, «. Let the direction cosines of the second system in any of its future positions, referred to the first system, be 4, 7%, 3 lg) Ma, N23 13, Mg, Ng Te- spectively.

Then the foree at a, 6, c has the following components :—

Al, +Bl, +Cl,, parallel to Ox

about the central axis. Am, +Bmt,+Cmg, 1 9» OY General Let P with direction cosines A, m, v be one of the forces, and let. Am +Bn,+Cng, 5, 5, Oz. — %, y, % be its aseed of application. Then The expressions for the resultant force and couple at the origin : X=3(Pa), Y==(Py), Z=(Pv) will evidently depend upon the following twelve quantities, besides are the components of the single force at the origin. the direction cosines, viz :— Also L= [P(vy – 22)] za, 2B, 20, M=3[P(az- vz)] x(Aa), 3(Ab), B(Ac), N=3[P(ux-ay)] 3(Ba), 3(Bb), 2(Be), are the components of the resultant couple. 2(Cm), 2(Cb), (Ce). If we shift the origin to the point a, 6, c the first three quantities Assume 3B=0, 3C=0, i.c., let Ox' be always parallel tothe direc- are unaltered, but the eouples beeome tion of the resultant foree. Next, let L/= L+cY -6Z =(Aa)=0, 3(Ab)=0, 3(Ac)=0, M=M+aZ-cX i.c., let the origin be chosen as the 'centre' (§ 222) of the WoW oN —ay. forces parallel to the resultant force. : As we have still four The point a, b, ¢ is on the central axis if the axis of the resultant conditions to impose, we select the following:— couple be parallel to the single force, @.c., if 3(Ba)=0, = (Be)=0, =(Ca)=0, 2(Cd)=0. Mw . These express that the plane of the couple due to the forces C passes ; a. Sk ae ia through Oy, while that of the forces B passes through Oz L X- eV 432 Write now iid Se ee eee x(A)=B, 2(Bb)= 38, (Co)= Sy. M= ¢X+ceY-aZ, a The force and couple at the origin are N=-dX+aY+eZ. aT a . = Either of these sets gives the equations of the central axis. 3 — eet ark The resultant force and couple are in one plane, and therefore the a (m2B-msy), Alyy, —~ HUB. resultant is a single force in the central axis, when These are equivalent to a single foree if (§ 227)

LX+MY+NZ=0. (Z,Nq— Mly)B— (lymz— Myls)y=0,, By the values of L', M', N', above, we see that this is equivalent seal 3B — Noy =0 : Op This is the required condition. When it is satisfied, the equations LX+MY+NZ=0. of the line in which the single force A acts are any two of When this last condition is not satisfied, we see that the value of MN ~~M C= NMB~~ *My, the left hand member which, from the way in which it occurs, must LQ -meE= Ly, (2), obviously be an invariant, is met—-hn = ~-18 e(XP4 ¥* 4-27), the condition that these three agree being (1). where ¢ has the same value as in the three equations above. Eliminate 7, between the last two, and we get Minding's § 228. One of the most remarkable of the many curious E(m¢— m0) =Tgyn — U9B6 (3).*

Now introduce in (1), in the first of (2), and in (8), Rodrigues's values of the cosines ($ 83), and they become respectively

(yz — wa)B —(yz+we)y=0,

(az — wy)n — (w2+ vy) ¢= (ys + wee)B —(y2— wx)»

CE (wa + ay) — En(cz — wy) = (a+ wy)yn — (wy ~ wa)BE- Rearranging according to y, 2, and yz, (B—y)yz—(Bt+y)wz=0,

(B= y)y2+ (wn xQy – (en — we e (B+ y)ue=0,

[Cet Bet olE- why + Lg – Bye E+ yee 0s the second of which may be put, by means of the first, in the form

theorem. theorems connected with the single resultant of a system of forces is that of Minding. We have seen that, in general, the resultant may be put in the form of a single force and a couple in a plane perpendicular to it. If we now suppose the system of forces to be shifted into a new position such that their points of application, their magnitudes, and the angles between their directions two and two, all remain unchanged, the resultant force will be of the same magni- tude as before, but the couple will in general be different. Of the infinitely infinite number of possible positions which the forces may assume, an infinite number correspond to a zero couple. Minding has shown that the lines of action Mie: ; a

: : : : ee equations involve w, 2, y, 2 in the form of the ratic

of hes sng eutants const of al ines pasing through | [uate ata to the Sethe to a nes hyperbola, in planes perpendicular to each other. The Y=, Solving them, and substituting in the frst we Ul proof of the proposition gives an interesting example of the use of Rodrigues's coordinates (§ 83).

(wn tay — (an – weet 2(B+ ywx=0.

w'? w

finally, a biquadratic in = ;

Ladder 'Yeaning wall. If there be no friction, what force, applied at the

against @ ower end, will just suffice to support it ? wall,

Use of

friction.

- two curves will appear

Hence, if particular values be assigned to &, n, ¢, we find four

*yalues of * Thus, in general, there are four positions of the w*

single resultant force passing through any point.

But, without forming the biquadratie, we may easily obtain Minding's theorem. Suppose we seck the locus of all points in which the plane gy ean be cut by the line of aetion of the single force. We have (=0, and the equations above are reduced to

(B-y)yz-(B+y)wx =0, n(wy — x2) +2(B+y)wa=0, (E-yywy-(E+y)ez = 0. From the last two we find —yne=(B+y)(E-y)v; —-yny=(B+ E+ yes so that finally, by the first, (B? ~ 7X 7 P)=7r,

g 7 a a

(4) and (5) represent an hyperbola and an ellipse, or an ellipse and an hyperbola, respectively, according as B? is greater or less than 7". In either case the vertices of the hyperbola coincide with the foci of the ellipse; so that the two curves are linked together.

It is now easy to see that, from any assigned point of space, the to intersect one another in four points. Two, or all, of these miay in special eases coincide. Lines drawn to these points give the four positions of the single force which can pass through the assigned point.

Examples of Statical Methods and Theorems. § 229. Suppose a ladder to be leaning against a vertical

In the treatment of all questions of this kind the student should commence by making a rough sketch of the situation, indicating all the forces concerned, with the directions in which they ,¢ act. As shown in fig, 62, the wall exerts an outward thrust S on the upper end of the ladder, the ground an upward thrust R on the lower end. The only other force is gravity, which may be supposed to produce a downward force at the middle of the ladder, equal to its whole weight. Unless there be some other horizontal force to balance S, the ladder will obviously slide down. Suppose then a horizontal force F. to be applied Fig. 62. at the lower end, and let the ladder be inclined at an angle a to the horizon. Then our conditions become horizontally S-F=0, vertically W-R=0, and for the couple in the plane of the figure, / being the length of the ladder,

4Wlcosa—Sisina=0.

[The last equation is obtained by taking moments about

A

the lower end of the ladder, this point being chosen

(§ 217) because the directions of two of the forces pass through it.] From these equations we find at once

F=S=4Woota.

It is to be observed that the requisite force F is very small while the ladder is nearly vertical, but increases without limit as it becomes more nearly horizontal.

§ 230. Next let us vary the question by supposing the coefiicient of friction on the ground to be pz. The equations are precisely the same as before, and the limiting value of a for which equilibrium is possible is now to be found by putting FepRupW.

Thus 2u= cota

gives the smallest value of a for which equilibrium is possible. For any larger value of a less friction is called into play.

§ 231. If next we assume the wall also to be rough, a new friction force, G, comes in. The equations (for any given value of a) are

S-F=0, W-R-G=0, 4Wlceosa—Slsina—-Glcosa=0.

Here there is a certain amount of indeterminateness which our formule cannot escape (although of course it does not exist in nature) so long as we are not dealing with the limiting case in which motiou is about to commence. In that case we have the additional conditions G=pS, F=pR.

Thus, in all, there are five equations. These are requisite and necessary because there are four forces S, G, R, F to be determined, as well as the special value of the angle a. The result of eliminating the four forces is

1-2

tan a= ou

§ 232. We may still further vary the question by sup- Man on Let e ladder.

posing 2 man of weight w to ascend the ladder. represent the fraction of the ladder's length which he has ascended. The equations are $-F=0, W+w-R-G=0,

(4 W + ew) cosa, — Slsin'a, — Glcosa,;=0. Introducing the condition that slipping is just about to commence, we obtain

w (1+ p)e-

tana w 1+ W

where a has the value given in § 231. Hence the limiting angle is increased or diminished by the load on the ladder according as ; Q(1+p?)e—2u2Z1-H?,

1.€., M21.

*The ratio w/W does not appear in this condition. But it shows its importance when ¢ is either greater or less than 4. **

Hence, when the ladder is just about to slip, @ man makes it more stable if he stands anywhere on thie lower half of it, but brings it down if he mounts higher. We conclude that, so far as sliding is concerned, it is advan- tageous to make the lower half of a ladder more massive than the upper half.

§ 233. Suppose a ladder, with its lower end resting against a wall, to be supported by a horizontal rail parallel to the wall (fig. 63). This case is chosen because it illustrates definite limits within which stability is ensured.

Let a be the half length of the ladder, a its inclination to the horizon,

b the distance of the rail from ther wall. Suppose the ladder in sucha position that if there were no frietion it would slip downwards. Then the equations of equilibrium are R+Geosa—Ssina=0, F+Seosa+Gsina—-W=0, Sbseca – Wacosa=0.

In the third of these equations the lower end of the ladder has been chosen as the point about which moments are taken, because the lines of action of three of the forces

Fig. 63.

Rotation of rigid solid.

Moment of iner- tia,

pass through it. Here again there is indeterminateness, because there are two places at which friction comes in, and we do not know at which it is most freely exerted. But if the whole be on the point of slipping, we have as before the additional data

heh, G09. These lead to the equation

(1-2?) cosa + 2psina—— seca C a

If we introduce an angle v, such that

*1- 2u cos y= ine? ee this equation becomes b b y cos*acos(a— v) = —_—— _ = — cos? = (a—v) ite) a 9?*

the right-hand member of which must necessarily be less than 1.

This determines the lowest position of the lower end consistent with equilibrium, and the mere change of sign of », and therefore of y, alters it into the equation for the highest. The signs of the friction terms are changed when the direction of slipping is supposed to be reversed.

KINneEtTIcs oF A Ricip SoLip.

§ 234, The motion of a rigid body is, as we have seen, completely determined when we know the motion of one of its points and the relative motion of the body about that point. The point usually chosen is the centre of inertia of the body, and the investigation of its motion comes under the kinetics of a particle, which we have already sufficiently discussed. For we are permitted to suppose the whole mass to be concentrated at that point, and to be acted on by all the separate forces, each unaltered in direction and magnitude. Hence we may now confine ourselves to the study of the

motion about the centre of inertia which, for the moment, we may look on as fixed.

To illustrate, in a very simple manner, the new concep- tions which are required for the study of this question, let us take a uniform circular ring of matter, of radius R, revolving with angular velocity w about an axis through its centre, and perpendicular to its plane. Its moment of momentum is obviously

M.Rw.R or MR'. wo. Its kinetic energy is

AM(Rw)? or $MR2. o?. If it be acted on by a couple C, in its plane, C is the rate of increase of the moment of momentum, or

MR?.#=C. The work done by the couple in time 6 is CwSt , and the increase of kinetic energy is MR?.

By equating these we have (after dividing both sides by w) the same equation as we obtained from the rate of increase of moment of momentum, It will be observed that these equations are of exactly the same form as those for the motion of a particle parallel to one of the coordinate axes, only that w takes the place of a velocity (such as #) while the expression MR? takes the place of M, and the right-hand side is the moment of a force, not a force simply.

§ 235. Hence, generally, we define as follows :—

Der. The "moment of inertia" of a body about any axis is the sum of the products of the mass of each particle of the body into the square of its (least) distance from the axis.

The following theorem enables us at once to find the

wool.

moment of inertia about any line, as axis, from that about a parallel axis through the centre of inertia.

Let the line be chosen as the axis of z, then the moment of

inertia about it is Snr(x? +'). But, if @, g be the coordinates of the centre of inertia, & 7 the coordinates of 7 with reference to that centre, we have "e=E+E, y=G9+n, and the above expression for the moment of inertia becomes Sm (K+ J? + 2EE+ 2Jq +B +7"). By the property of the centre of inertia, § 109, =(mt)=0, S(mn)=0. Hence the above expression consists of two parts:— Sm(é + 7) the moment of inertia about a parallel axis through the centre of inertia, and 3(m) . (#2492) the moment of incrtia of the whole mass supposed concentrated at its centre of inertia.

§ 236. Hence we need study only the moments of inertia about axes passing through the centre of inertia. But we will commence with an origin assumed at hazard.

If.the direction cosines of an axis through the origin be A, », v, the square of the distance of the mass m at a, y, z from it is

ety? +2%— (act py tz). Hence the moment of inertia is G = Sma? +y? 2 — (Aw py +v2)) = Bn((y? + 27)A2 + (2? +27)? + (a? + y?)v? — Qaryru — Qyzuv — Qzava)),*

which may be written

= AA? + 2G gan + Bu? + 2G uy + 2G_vA +Cv?. If we measure off, on the axis, a quantity p whose square is the reciprocal of 4, and call its terminal coordi- | nates & y, &, this equation becomes by multiplying both sides by p? f

1=Aé?+2G3t9 + By? + 2G :n¢+ 2G,¢E + Cc?. |

As the moment of inertia is essentially a positive quantity, | this equation represents an ellipsoid. It must of course | have three principal axes ; and, when these are taken asthe coordinates axes, the terms in &y, yf, and Zé in the above | expression must disappear.

§ 237. Hence at every point of every rigid body there Principal are three " principal axes" of inertia, at right angles to one 4 another. One of them is

the axis of absolute maximum ; moment, another that of absolute minimum.

1

Our equation now becomes, when referred to these axes, } 1=A??+By? +C@,

= Ad?+ Bu? + Cr.*

Thus the moment of inertia about any axis is found from those about the principal axes at that point by multiplying each by the square of the corresponding direction cosine, and adding the results.

For the quantity A was written originally as

zm(y? +2”), Z,¢., it is the moment of inertia about the axis of z We see also that, at every point of a body, there are three rectangular axes such i that the expressions S(mxy), S(myz), Smee) vanish when these are taken as coordinate axes. i.

To find how thesc axes are distributed in a body, let us suppose et | it referred to the principal axes through its centre of inertia, and tion 0 ‘ let M&?, Mk2, Mk? be the moments of inertia about them. _ The prineipa quantities k,, k,, ks are called the principal “radii of gyration. o, Then, by the results above, the moment of inertia about a line Ra a A, #, v through the point a, B, 7 is of gyra

tion. GaM{o2-+ B+ y2— (dat wB+vy)?} + MA + wks + vs)

For a principal axis this is to be a maximum or minimum, with the sole condition

or, dividing by p?,

Vt wr+yr=l.

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Hence, if p be an undetermined multiplier, we have (ki+p)a—a(ad+ But+yr)=0, (ki-+p)u— B(ad+ Butyv)=0; (kitp)y— ylaat Butyy)=0. But, if we consider a surface of the second order ae y 22 tap +p Bap" confoeal with the ellipsoid a ye 2 me ae (RS a xy the direction cosines of its normal at x, y, # are Aare ae fae 5/B2 Dp Hap : Erp' Henee, if this surface pass through the point a, B, y, we lave (it+p)a=Pa, (ki+p)e=PB, (ki p)y=Py, where P is determiued by the equation A But °(fottetme)? – og a nae eke kf We Nip ep +P Substitute this value of P in the preceding equations, and they become identical with those above given for determining the principal axes at a, B, ¥- Hence Binet's Theorem :— The principal axes at any point of a body are normals to the three surfaces of the second order which pass through that point and are confocal with the ellipsoid (a).

Principal § 238. We will here tabulate the values of the moments moments of inertia about principal axes through the centre of inertia, : inet- in a few specially useful cases.

1, Plane uniform circular disk.

Divide it into concentrie rings, of radius 7, of breadth 8r. Then

the moment of inertia about the axis through the centre, and per- pendicular to the plane, of the circle is

a of Qndr=kra'p ,

where a is the radius, and p the mass of a squarc unit, of the disk. But the mass is 7a"p,

so that ke? =4a?. of course, applies to a circular cylinder. Obviously, in the is

kp= kb Bk = da? In fact the moment of inertia about an_axis drawn perpendicular to any plane figure at any point is equal to the sum of the other two about rectangular axes which lie in the planc. The one is Sm(x2 +"), and the others are 3mx? and smy? respectively. 2. Uniform rod of length J, p mass per unit length.

edz = S ’

41 3

M=lp, Mz2=0, Mk} = Mii = 29f” 2

so that h=ki=7,l?.

3. Uniform rectangvlar plate, sides a and 8, axis parallel to b.

Mi? = 20p[ade =,*

so that k?=J,07, and kj = 5%, Hence, by the remark above, k2 = 45 (a? +07). 4. Uniform sphere, radius a, p mass per unit volume. (mx?) = (my?) = 3(m2?) , and therefore the sum of any two is

Here

=33m(2? + y? +27). Thus Miet=Mki=MAg = 4p “ddr = Sempa . But M=$npo°, and thus === 2a?

5. Plane uniform elliptic disk, semiaxes @, b ; p mass of unit area. Moment of incrtia about a is

i aye _ wab’p Mk =2pf, g d= >

ke = 40%.

so that

733

From this follows immediatcly 6. Ellipsoid, semiaxes a, 8, ¢, and of uniform density :—

K=4(V+0), M=t(Pt+a), k= b (a? +0”). From these we can, of course, reproduce the result for a sphere.*

7. Rectangular parallelepiped, edges a, b, ¢:—

kia (Q), Kade (C@), Maas (+0).

The determination of moments of inertia is, like that of centres of inertia, a purely mathematical matter, the full discussion of which would lead us away from the proper objects of this article.

§ 239. The simplest cases that can present themselves so Rotation far as rotation is concerned (for the translational effects on about a rigid body are treated precisely as if it were a mere par- ee ticle, —a process already sufficiently illustrated) are those in which there is one degree of freedom to rotate, te, when the body is rigidly attached to a fixed axis, Here the physical condition is simply that the rate of increase of moment of momentum is equal to the moment of the resultant couple about the axis of rotation.

§ 240. Let us recur to Atwood's machine as a first example, Pulley of and suppose the string not to slip on the pulley, so that the Atwood's pulley must turn. In this case we must observe slatithe ™hine two free parts of the string are now, as it were, separate strings, so that we have no right to assume their tensions to be equal. In fact if they were equal there would be no acceleration of the rotation of the pulley, nor of course of the common velocity of the two masses. We assume that the pulley is symmetrical, and the axis through its centre of inertia.

Let a be the radius of the pulley, and w its angular velocity, then aw is the linear velocity of either mass. Thus the linear acceleration of each of the masses is equal to a times the angular acceleration of the pulley. But the linear acceleration multiplied by the mass is the measure of the force producing it; while the angular acceleration multiplied by the moment of inertia is the measure of the moment of the couple producing it. Thus we have (M being the mass of the pulley, and & its radius of gyration)

Mz? x angular acceleration = (I'-Tha, m' x linear acceleration = m'g-T', m x linear acccleration = T- mg. Eliminating T and T', and taking account of the above relation between the accelerations, we find at ouce : : m' —m Linear Acceleration = —— aa 7 Mee q3 from which, by the last two of our equations, the separate values of T and T' may be found.

If we compare this result with that obtained in § 173, on the supposition that the pulley was perfectly smooth, we see that the only difference is in the addition of Mk?/a? to the sum of tle two masses. Otherwise the nature of the motion remains unaffected. –

§ 241. Let us next take the case of a body of any form Com-

attached to a horizontal axis which does not pass through pound

‘ts centre of inertia. In such a case gravity is the force [esi 8

producing motion, and we have what iscalled a “com- pound pendulum.” Draw through the centre of inertia a line parallel to the axis ; let h be the distance between these lines, and @ the angle which their plane makes (at a given time) with the vertical, The moment: producing angular acceleration is obviously

— mghsing@. Divide by the moment of inertia about the axis, which by a previous proposition (§ 235) is

m(k? + h?) (where & is the radius of gyration about the line drawn through the centre of inertia), and we have for the angular acceleration

gh sin@ ~ Be +h

T34 MECH AWN POIs

In the case of a simple pendulum of length 7, we saw that the angular acceleration is

gsiné

used to be “ How to distinguish between two hollow shells, Rohing one of gold the other of silver, if their diameters and masses of hollow be alike, and both be painted.” If we observe that the ‘tlk.

L Hence the motion of the compound pendulum will be

identical with that of the simple pendulum when, and only from the centre, and its moment of inertia greater. Hence i 2} e

any form of experiment in which the moment of inertia | comes in will suffice to decide the question.

when,

4h 2. (kh)? i =2k+ a Sas

As h and & are necessarily positive (or rather s¢gzless) quantities, the smallest value of / is evidently when b=A. Hence the shortest time in which the mass can vibrate about any axis parallel to the original one corresponds to that of a simple pendulum of length 24. When 4 is made cither less or greater than /, the length of the equivalent simple pendulum increases, and for any assigned value of 1 greater than 2k there are two corresponding values of h, one less and the other greater than k. Their sum, however,

i=

as we see by the coefficient of the second term in the |

equation Panter Sy, is always equal to J.

If then we can find two parallel axes in a rigid body, lying in one plane with the centre of inertia, and on opposite sides of that point, such that the time of oscilla- tion is the same for each, the distance between them is the length of the equivalent simple pendulum. Kater inade use of this proposition in his determination of the length of the second's pendulum, under the circumstances

in which it defined by Act of Parli t tum | snatch Mhagacl gin' ep told eee the moment of inertia is that of the shell alone; if it be

for restoring, in case of loss, the standard yard.

§ 242. Suppose now that a second body is attached to the first by an axis parallel to that about which the first is con- strained to move; and, for

simplicity, suppose the centre of inertia of the first body to be in the plane containing the two axes. Here we have a complex compound pendulum, and it is interesting to compare the motion with that of the complex simple pendulum of §$ 177, 178.

Let m', h', correspond, for the second body, to m, h, for the first, and let a be the distance between the axes. For variety we will adopt Lagrange's method. We have clearly T= (mk262+ mh26? + m'/k pb? +m (a6? + hh? + 2ah' cos (— 9) G8) ,

V =C-mghcosé —1g(acos@ +h'cos¢@) . These would enable us at once to write down the equations of motion, however large be the disturbance, but they are too complex for our present work. Let us then assume ¢ and to be very small, and we have {in(A? +2?) + mae }6+m'ah'p= - (mh+m'a)g,

m(k2+h)\p+mah'6 = —m'gh'¢.

Oe iia as before, by means of an undetermined multiplicr, we ave (mk? +h?) + ma? + andah')6 + (mah! + am'(k? +h'))p

= -g{(mh+m''a)0+am'h'?} – Thus the two values of A are given by the equation

mah' + am (k'? +h') amh?

me+e)+mae+amah mh+ma" This may be written in the form A+A_A B+a C' where B is greater than A; and A, B, C are all essentially positive, if the bodies have been only slightly displaccd from the position of stable equilibrium. The equation gives 24(B-C)a—AC=0, so that the values of a are essentially real and of oppositcsigns. If we write w— B for A, this equation becomes . w?—(B+C)u+(B-A)C=0,

so that the values of A+B are both positive, and therefore the motion of either mass is the resultant of two simple harmonic motions.

§ 243, A well-known puzzle in connexion with this subject

volumes of equal masses are inversely as the densities, the volume of the gold shell is seen to be less than that of the silver one, and therefore, on the whole, its mass is farther

Thus they might be alternately clamped tight to the end of a rod, and the system swung as a pendulum, when the gold sphere would vibrate more slowly than the silver one, Or they might be allowed to roll, not slide, down a rough plane. In this case the work done by gravity on each is the same when they have fallen through equal spaces. But its equivalent is in the form of kinetic energy, partly transla- tional and partly rotational. The relative amounts of these

two depend on the moments of inertia of the spheres, for

the ratio of the translational velocity to the angular velocity is the same for each. Hence the gold sphere, having the

greater moment of inertia, will have the smaller velocity

of translation. Another fori of this question was to have

a shell with a spherical mass inside, which might be either

free to rotate on gimbals, or else be keyed to the outer skin. The keying would of course retard the motion of the whole down a rough plane, for part of the energy due to gravity would then be shared by the internal mass in the form of energy of rotation, from which it would other- wise have been free. Another very instructive form is that of aspherical shell full of fluid. If the fluid be perfect,

infinitely viscous, the moment of inertia is that of shell and fluid as if they constituted one rigid solid; and we may have every intermediate amount. If we suppose the rotation of the outer shell to be suddenly stopped, the infinitely viscous contents would be reduced to rest also. But if they be not infinitely viscous they will not at once be brought to rest, but will be able to put the shell in rotation again if it be at once set free. Thus, in practice, we can tell a raw egg from a hard-boiled egg. 'The first is with difficulty made

to rotate, and sets itself in motion again if it be stopped and at once let go. The second behaves, practically, like a rigid solid.

§ 244. The problem of the rolling of a sphere down arough inclined plane is solved at once, as above, by applying the conservation of energy. For, if x be the coordinate of its centre parallel to the plane, 6 the angle through which it has turned, and a its radius, we have the kinematical condition

x= 08 (due to the perfect roughness of the plane). Also the potential energy lost is

Moxsina, where a is the inclination of the plane to the horizon; and the kinetic energy gained is made up of the two parts,— 4M2? translational, and $M?6? rotational. M(22 + a)@?=2Mgaésina,

2

Hence

+2

or e = 2.*

xsina.

c2 4g?

This shows that the motion is the same as that of a particle sliding down a smooth plane of the same inelina- tion, under gravity diminished in the ratio a +a. And it shows how friction may retard motion without pro- ducing any dissipation of energy.

§ 245. Suppose one point of a rigid plane sheet be made to move in any manner in the plane of the sheet, what will be the consequent rotation ?

Let M be the mass, and &, 7, given in terms of ¢, the coordinates

Varying , con- straint

Ballistic pendu- lum.

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of the point of the sheet whose motion is assigned. Let a, be the relative polar coordinates of the centre of inertia, then : M[E+a(cos)J=X, M[y+a(sind]=¥, Mzk?6 = — Yacos@+Xasin6 ;

_ where X and Y are the forces requisite to produce the motion.

Eliminating them, we find (2 +a°)§ = — a(jcos 0 — Esin 8),

with which we can do no more until further data are specified. Suppose ¢, 7 to move with uniform acccleration p in a direction assigned by a, then

F=pcosa, j=psina, and (x2 + a2)§ = — ap(sinacosé — cosasin #)—apsin(9 — a). The centre of inertia of the mass therefore moves, relatively to

the constrained point, precisely as does a simple pendulum ; but the direction of p is reversed.

Again suppose the constrained point to move uniformly in a circle of radius b, with angular velocity w. We have t=bdcoswt, 7=dsinot,

*(k2 + a2)§ = + w*ab(sin wt cos 6 — cos wtsin 8) ,*

(2+ a 5) – wt) = - wabsin(— wf).

and or

This is, again, the equation of motion of a simple pendulum, but the angle of displacement 0— at is no longer measured froma fixed line but from the uniformly rotating radius of the guide circle. Hence the mass oscillates, pendulum-wise, abont this uniformly revolving line.

§ 246, Let us take, as an instance of impulse, the case of Robins's " ballistic pendulum,"—a massive block of wood movable about a horizontal axis at a considerable distance above it,—employed to measure the velocity of a cannon or musket shot. The shot is usually fired into the block in a

horizontal direction perpendicular to the axis. The impulsive penetration is so nearly instantaneous, and the mass of the block so large compared with that of the shot, that the ball and pendulum are moving on as one mass before the peudulum has been sensibly deflected from the position of equilibrium. This is the essential peculiarity of the ballistic method,—which is used also extensively in electromagnetic researches and in practical electric testing, when the integral quantity of the electricity which has passed in a current of short duration is to be measured. The line of motion of the bullet at impact may be in any direction whatever, but the only part which is effective is the component in a plane perpendicular to the axis, We may therefore, for simplicity, consider the motion to be in a line perpendicular to the axis, though not necessarily horizontal.

Let m be the mass of the bullet, v its velocity, and p the distance of its line of motion from the axis. Let M be the mass of the endulum with the bullet lodged in it, and & its radius of gyration. Then, if w be the angular velocity of the pendulum when the impact is complete, mvp = Mw , from which the solution of the question is easily determined. For the kinetic energy after impact is changed into its equivalent in potential energy when the pendulum reaches its position of greatest deflexion. Let this be given by the angle ; then the height to which the centre of inertia is raised is h(1 – cos), if 2 be its distance from the axis. Thus

Mgh (1 – cos@) =} Mk?w? = Te ‘ eo eee or 9 ee ee ee a Mk gh’

an expression for the chord of the angle of deflexion. In practice the chord of the angle @ is measured by means of a light tape or cord attached to a point of the pendulum, and slipping with small friction through a clip fixed close to the position occupied by that point when the pendulum hangs at rest.

§247. As another example of impulse let us consider the case of a body moving in any way in a plane perpendicular to one of its principal axes. It is required to find what point of the body must be suddenly fixed in order that the whole may be brought to rest ; also, what will be the consequent

impulsive pressure at this point. It is easy to see that Impulse

this is exactly the same question as to find the impulse, required

and its point of application, so that it may produce a4

given motion of a body in a plane perpendicular to one ee

of its principal axes. , The impulse must obviously act in a plane passing

through the centre of inertia. And the physical conditions

are that the change of momentum of translation is equal

to, and in the direction of, the impulse, while the change

of moment of momentum about the centre of inertia is

equal to the moment of the impulse. Let the impulse

acting at the point & 7 have components R, S parallel to

rectangular coordinates in the plane of motion, and let

be the angular velocity, w, » the linear velocities, generated

by it. Then the physical conditions are

Mu=-R, Mv=S, Mi®o—St-Ry.

When wu, v, w are given, R and Sare found from the first two equations, and the third is then the equation of the line in which the impulse must act. Similarly, when the impulse and its line of action are given, we have in terms of these data the quantities w, 2, .

§248, Asa simple practical example, suppose one strikes Centre of a hard object with astick in such a way that his hand is at percus- rest at the instant of the impact ; with what part of the °°” stick must he strike so that there may be no jar on his hand ?

Let € be measured along the stick from its centre of inertia in the direction which it has at the instant of impact. Then the kinematical condition is

V=Aw,

where a is the distance from the hand to the centre of inertia of the stick. Thus, as the impulse S is the sole cause of the stick's being brought to rest, we have

*Mv+S=0, Mk*v/a+Sg=0; so that t= Ja. Hence if the stick be uniform and be held by one end, so that its length is 2a, and therefore 31? =a', we have t= ja; and a+é, the distance of the point of impact from the hand, is at+ja=%.2a, ie, it is at two-thirds of the length of the stick.*

If, however,the hand be moving, at the instant of impact, perpendicularly to the stick with velocity V, the kinematical condition is v—- V=aw, which introduces a corresponding change in the' result.

§ 249. The reaction of the axis is easily calculated. If Reaction the axis about which the body is constrained to rotate on axis. be perpendicular to a plane though the centre of inertia about which the body is symmetrical, and if the applied forces act in that plane, it is clear that the reaction of the axis is a single force in that plane. Let its components be Sand H. Then

S(m%)=(X) +2, Ben#)==(Y)+H, Son(ayj — y#) = B(xY — yX). Let a, 6, be the polar coordinates of the centre of inertia, then 6, 6 are the angular velocity and the angular accelera- tion for all particles of the mass, and we have

~Macos0.@2-Masin@.6=3(X)+2, —Masin0.6?+ Macosé.é=3(Y)+H, M(k2+a2)6 =3(aY — yX). From the third we find 6, and the others give & and H.

When there is no plane of symmetry perpendicular to the axis, there must be two points of it at which reactions are exerted on the revolving body. Let the coordinates of these bearings be ¢, c', and the reactions there =, H, Z, =', H', Z' respectively.

Then we have the six equations (in which =0) 3(m#)=3(X)+E+2' (my) =3(Y)+H+H', 3(mé) =3(Z) +242 ; sm(ay — y#)==(xY ~~—yX), Im(ys~~ 29) =B(yZ —zY)-cH-c'H', Em(c% — v8) =3(2X ~~—@Z) + c+ CR The fourth equation, as before, determines 8, aud we have then four equations to determine &, =', H, H'. The remaining equation de~~ termines only the sum Z+2Z'. In fact by more or less perfect fitting we can throw more or less of the force parallel to the axis on oneor other of the bearings. There is really no indeterminateness in nature, "but we cannot get the information required to evaluate separately Z and Z'.

§ 250. When impulsive forces are applied to the body,

pulse is applied at the origin, the moment of momentum about that point will not be altered by it. In fact many

problems, which present serious complexity when treated

by the direct methods, are solved with comparative ease by

such general considerations as the conservation of moment | of momentum, or the conservation of energy. 'The first

principle holds good when there is no resultant couple, or impulsive couple, round the origiu ; the second when no work on the whole is done by or against the forces or impulses,

§ 253. We have given instances of pure sliding, and of Com. pure rolling, in one plane, and will uow give a single bined instance of combined rolling and sliding. A common but gg

instructive case of the problem we propose to consider is "a |

exactly the same methods may be employed, with the ex- ception that w'—« must be written for #, &c., aud w' —w for 6. The quantities X, Y, Z, =, H, Z, =', H', Z' now denote impulses and not forces.

As a single example of the use of these formule, take the case of

a body rotating, under the action of no force, about an axis through its centre of inertia. Here 3(nz)=0, &c., and zis con- stant. The first two of the six equations last written show that the pairs of forces #, =’ and H, H’ form couples. The fourth equation gives @=wt ; and with this the remaining two become

X(mzy).o2= —cH-cH’= —(c—c/)H,

S(mzx).w?= —cH-c’H/’ = —(c-C)E. The multipliers of w? are each zero if the axis of rotation be a principal axis, aud thus, in this case, there is no stress perpendicular to the axis. When the axisis not a principal axis the left hand terins are generally finite but they vary as the body turns. It is easy to see, however, that together these terms constitute a constant couple always ina plane passing through the axis, rotating with the body and dependent directly on the square of the angular velocity. Thus, to analyse the factor S(mzy), we note that z is constant, and

y=rsin(wt+a),

that of a hoop thrown forwards and at the same tine made to rotate, so that after a time it stops, and finally rolls backwards to the hand. Other cases are furnished by a “following stroke” or a “‘screw-back” with a billiard ball.

Let the axis of x be parallel tothe motion of translation

of a sphere or cylinder moving on a liorizontal plane. Then we have, if F be the friction, a the radius of the hoop or ball, the rate of change of momeutum =F, and that of moment of momentum about the centre = Fa.

So long as sliding continues, F is constant, aud equal to the product Mg of the normal pressure and the coefficient of kinetic friction. Hence at time ¢, if w) and wy be the initial velocities of translation and of rotation,

U=Uy— Gls Pew =k? ww, — pgat. These equations cease to be true when the sliding ceases, i.e, When we have pure rolling, of which the geometrical

coudition is

; : =o where 7, a were the polar coordinates of the mass m at time t=0. . eee 2 | , a Were the p a coordinates o € S at tL This i 4, it L1,=0 | Hence X(mzy) =sin wtX(mzx,) + cos wtB(mzy,) ,

Ke? (tty + Ge)

where z,=7cosa and y,=rsina were the coordinates of m att=0. Similarly we have

&(mzx) = coswt3(mzx,) — sin wtX(mzyy) – These expressions prove the preceding statements.

*~ 0 g(a) **

At time ¢, and ever after we have

ire)

One § 251. Asa final instance of impulse in this branch of the \ point subject, suppose that a rigid plate, moving anyhow in its new City t+ Atay _ KPtog ~ Atty oo own plane, has one of its points suddenly fixed, what will 0 a? K a *

be the subsequent motion? Let the position in space at which the point is to be fixed be chosen as origin, and let the axis of x be chosen so as to pass through the centre of inertia at the moment of fixture. Then, if w, v be the velocities of the centre of inertia, w the angular velocity about it, a its distance from the point to be fixed, the conditions of the impact are w=wu-E/M,

Hence, if the body be projected in the positive direction, sts ultimate motion will be in the negative direction if au, — kw, be negative, 2.¢., if the initial angular velocity be positive, and greater than au, /k2 ; which is $2)/a in the case ofasphere. Thus, at starting, the linear velocity of the point of contact with the plane must bear to that of translation of the ball a ratio of over 7:2

if it is to stop aud returi. In the case of a hoop this ratio must be at least 2: L.

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:

§ 254. We pass now to the case of a rigid body one point Hie only of which is fixed. As we have already seen (§ 234) ead Pio this has only to be compounded with the motion of the point

whole mass, supposed concentrated at the point, in order fixed.

v =v-H/M, w' =o + Ha/MR, —three equations with five unknown quautities. But the

conditions that the point in question is reduced to rest are evidently

w=0, v—-wa=0. 'These furnish the requisite additional data, and the solution is complete. If we eliminate H between the two equa-

tions which contain it, we have

ee! + av =hew+av ; whence by the relation between v' and w' we have

(K+ 0?)o' =K'w+av. These equal quantities, each multiplied by M, represent respectively the moment of momentum about the point before and after its fixture.

§ 252. Thus, asa little consideration will show, we might

have solved the problem at once, so far as the impulsive change of motion is concerned, by noticing that as the im-

to give the most general motion of which a rigid body is capable. The geometrical processes which have been applied to this problem, though in many respects of great power and elegance, cannot be introduced here. We

will therefore give the more important results in a brief ana- lytical form, and then geometrically exhibit their application.

Recurring to the general equations

Sm(xy — y#) =3(xY — yX) =N, &c.,

we may transform the left hand members as follows.

Let wz, @y, #2 be the angular velocities of the body about the fixed axes of 2, y, z respectively. Then (§ 77) we have

~=Lwy—Ywz, &e. From these we have three equations of the type. E= Ley —Yz + Ewy — Yor = 2eby — Yo + (Yoo — Loy) wy — (sews — 20x) We »

aif

Thus we have Li — Yb (U2 + Yd, — Yedy — Leddy + LEwywz — VY wrw, + (a? — Y)waty — LY (we — wy).

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‘ Now if the fixed axes be taken so as to coincide at a particular instant with the principal axes of the body passing through the point which is regarded as fixed, the terms involving factors of the form 3(mxy), &c., necessarily vanish (§ 237). Also we have

Sm(x? — y) = Sm(x? +22 – y? — 2%),

so that, if the principal moments of inertia of the body be A, B, C respectively, the dynamical equations become

Co,+(B-A)wzwy=N, &e.

But it was proved in § 79 that when the angular velocities of a rigid body are referred to moving and to fixed axes, which coincide at a particular instant, not only are the angular velocitics but also the angular accelerations equal at that instant in the two systems. Thus, if w, w2, w3 be

the angular velocities of the body about its papel axes, the equatious just obtained take the form (due to

fuer) Aa, => (C = B)w.03= L ’ ia (AS Cig. Gi, (B= Alain,

When w,, w 2, w; are found, in any particular case, from these equations, the actual orientation of the body at any time can be calculated from them by the kinematical processes of § 81. The position in space of the point of the body which has been hitherto treated as fixed is to be calculated separately by the processes already explained for kinetics of a paxttls, and thus the motion of the body is completely determined—in the sense that the difficulties of the further steps are of a purely mathematical nature. Rigid When the forces applied to the body have a single resultant, body which either vanishes or passcs through the origin, the right-hand under no terms disappear from Euler’s equations. Multiply the equations forces, by wy, we, ws respectively, and add. We thus obtain

Awa, + Baryd, + Coxd3=0, Aw; + Bw? + Cw j= 2T (1),

—the statement that the kinetic energy is constant. Again, multiply by Aw,, Bw,, Cw, respectively, and add. Then we have

A%w 0) + Bwed. + C2ws3=0, Aw? + Bw? + C?w2 = D?

expressing the constancy of amount of moment of momentum.

ut if, in these equations, we now choose to regard w, we, w3 as the coordinates, parallel to the principal axes, of the extremity of a line which represents, in magnitude and direction, the instantaneous axis, we see that that axis is a central vector of each of the ellips- oids (1) and (2). Hence the instantaneous axis describes, re- latively to the body, a cone of the second order. Since T and D are the only arbitrary coefficients in the equations, all the ellipsoids (1) or (2) are similar and similarly situated. The curve of intersec- tion of (1) and (2) projected on the plane of the axes A and B has

the equation A(C — A)w? + B(C – B)w? =2TC – D®.

This represents an ellipse if the terms on the left have the same sign, 7.¢., if C is either greater or less than each of A and B. Hence, if the body be originally rotating about an axis nearly coin- ciding either with the axis of greatest or that of least monicnt of Inertia, it will continue to do so. These two cases are exemplified Tespectively by a quoit and by an elongated rifle bullct,—at least im so far as the resistance of the air docs not interfere with their motion. But if the body be originally rotating about an axis nearly coinciding with the axis of intermediate moment of inertia, the curve indicated by the equation above is an hyperbola or a pair of straight lines through the origin ; and the instantancous axis travels, in general, far away from its first position in the body. We will henceforth look on A, B, C as in descending order of magnitude. It is obvious from the mode in which they are formed that A=B+C only when the body is a plate. Hence, generally, any two of A, B, C are together greater than the third. Also by multiplying (1) by A, and comparing it term by term with (2), we see that 2AT > D2; similarly 2CT< D?.

To complete the examination of the immediate results of Euler's equations in this casc, let us find how the length of the instan- taneous axis, considered as a common vector-radius of the ellipsoids (1) and (2), depends on the time. Let (P= wi tw? +2,

20 =)) a WoWo ae W320 a -(5 34-0, BoA be B C

whence

whence

(2),

(3);

m A.) even = — gpm

where Ais the determinant

ie ae S.C A? b? @

Now (1), (2), (8) are linear equations in w?, w2, w?, and from them we have three equations like

Aw? = BC(C — B) 22+ 2T(B? – C2) + D{C- B)

=BC(C-B){a-a},

Gace)? BC

is, by the remark above, essentially positive. Hence .

A%w?w20? = A®°B2C%(C – B)(B- A)(A – C)(@? — a)(2 — B)(22— c)

= A2B°C%a(a — 22)(b – 22)(¢- 9%),

Thus 22-=V(a-O)(b- W)(e- whence 0? is at once found by elliptic functions. © known, we have @}; Wy, w3, and then by the method of § 81 we have the completo analytical determination of the position of the body in terms of the time.

§ 255. Such a solution, however, fails to give so clear a Poinsot's conception of the nature of the motion as is afforded by rolling the very elegant geometrical representation discovered by @llipsoid. Poinsot. We may arrive at it by considering the tangent plane to (1) at the extremity of the radius Q. If 2, y, z be the current coordinates of that plane, its equation is

Aw,(o, — #) + Ba(w, -¥) + Cws(wg-2)=0, so that the perpendicular from the origin upon it is equal, by (2), to 2T/D, a constant. The direction cosines of this perpendicular are proportional to Aw,, Bw,, Cw, the com- ponent moments of momentum, Hence it is the axis of resultant moment of momentum, and is therefore (§ 166) fixed in direction in space. The tangent plane to (1) at the extremity of the instantaneous axis is therefore a fixed plane, and the ellipsoid (1) rolls upon it as if it were per- fectly rough. From this we can of course find the equation

= -(C-B)(B-A)(A-C).

where

.

I

| of the curve of contact with the plane, and thence that of

the cone, fixed in space, on which the cone of instantaneous axes in the body rolls, as in § 75. The latter cone is of course given by the intersection of (1) and (2).

To complete this beantiful representation of the motion, all that Sylves- is necessary is a method of measuring time, something to show the ter's rate of rolling of the ellipsoid on the fixed plane. Many construe- addition tions have been given for this purpose, such as Poinsot's " rolling to and sliding cone," &c., but none can compare in clegance with that Poinsot's invented by Sylvester. We can only sketch a particular case— construc- sufficient, however, to completely solve the question. tion.

Writing 1, m, " for the direction cosines of the fixed line referred to the principal axes, we have

t=Aw,/D, m=Bo,/D, n=Cw,/D . (4).

Our eqnations (1) and (2) may now be written P/A+m/B+n?/C=2T/D? . fl), Pimt+n=1. (2).

Introducing a factor p, of dimensions the same as 1/A, we have from these a third equation

P(1/A +p) +m(1/B +p) + n°(1/C +p) =2T/D? +p (5). Now consider an ellipsoid oa y Z =f ' . e . 6 [ip eee Oe (6),

which is similar, and similarly situated, to one of the ellipsoids confocal with (1) of § 254. Draw to it a tangent plane perpen- dicular to the line OL, whose direction cosines are (4). We obtain for the determination of the point of contact Q three equations of the form x y z = = = Sa eee f I—sjasp' "Saban? "Sqr °° ot yf of ~/a+ pF OB +a!" Cre

Here x, y, 2 are the coordinates of Q, and the distance of the tangent plane from the origin is E/S. Now (6) gives at once by means of (7)

SP1/A +p) m(1/B p) +22(1/C+p)]=E ; XV. — 93

where S2

Quoit.

Cylinder.

Gyro- scopic pendu- lum.

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*E a a wheuce, by (5), s T/D +p * This is constant, and therefore the new tangent plane is fixed in*

space. aint us now find the angular velocity about the fixed line OL of this plane's poiut of contact Q with the ellipsoid (6).

The direction cosines of the instantaneous axis OP are as @1, Wa, 3. Those of OQ are as 2, y, 2.

And we have obviously by (4) and (7)

ony Wo 3 = 0. x y z

Hence the line OQ lies in the plane containing the instantaneous axis OP and the fixed line OL. The motion of ellipsoid (6) is therefore one of combined sliding and rolling along the new tangent plane. To find the sliding, we must find the angular velocity of Q about the line OL. It is to that about OP, which is Q, in the ratio of the sines of the angles POQ and QOL.

~ 24

But in? os _ (Be + Yes +203) sin POQ ll (2+y? +22)\02 ? and eno gp=d eet ey ator!

(a? + y? +22) D?

By means of the equations (1) and (7) above we find easily sin? POQ D% sin?QOL °*

Hence the angular velocity of Q about OL is Dp, a constant. Now suppose the plane on which the ellipsoid (6) rolls and slides to become perfectly rough, and to be capable of rotating round OL as an axis, there will no longer be sliding of Q, but the plane will be made to rotate with the constant angular velocity Dp. Thus the time of any portion of the motion of the body will be measured out by the angle of forced rotation of this plane. ;

§ 256. As a simple example, let us take the case of a quoit, in which A, the moment of inertia about the axis of figure, is greater than either of the equal quantities B and C, which may be referred to any two perpendicular lines in the plane of the quoit. The equations become

Ad&,=0, so that w is constant, Boa, a (A = B)o,w,= 0 3 Bas +(B—-A)a)e.=0.

Put for a moment 4 han, then we have

®o at NW&s oe 0 3 These give by eliminating w,

5 — Nw ,=0.

Bp af No — 0 . w= Pcos(nt+Q), w3= —2716,=Psin(nt+Q).

The resultant of these is an angular velocity P, abont an axis in the plane of the axes of B and C, and making an angle nt+Q with the axis of B. Hence the instantaneous axis describes in the body a right cone whose axis is that of figure; it moves round it in the same direction as that in which the body is rotating, and with angular velocity x. The fixed cone in space is also, obviously, a right cone and the other rolls on it externally.

If instead of a quoit the body bea long stick or cylinder, we have A=B>C, and the equations become

Aw, w,w,=0, Aw,(A-—C)w30,=0, Ca,=0. The last gives w,=constant, and, if —€

— ec

A

Hence

the first two equations are

@,)—Nw,=0, wtnw,=0. Thus &,+nw,;=0, w,=Pcos(nt+Q), and w,= —Psin(né+Q).

This indicates a rotation of the axis of constant angular velocity P in the negative direction. Everything else is as before, but the cone fixed in the body rolls on the inside of that fixed in space.

§ 257. Next let us take the case of a pendulum bob, supported by a flexible but untwistable wire, and containing a gyroscope whose axis is in the direction of the length of the pendulum. Here we may use, for variety, Lagrange's equations. For simplicity we suppose the centres of inertia of the bob and gyroscope to lie in the axis, and the bob to be syinmetrical about the direction of the length of the pendulum.

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Let the moment of inertia of the whole about the axis of symmetry be A when the gyroscope is supposed to be prevented from turning relatively to the bob, and let the other two principal moments about the point of suspension be B. Let that of the gyro- scope about its axis be C. Then, if be the inclination to the vertical, the azimuth of the pendulum, and y a quantity denot- ing the position of the gyroscope with reference to a definite plane in the bob passing through its axis, we easily find

2T = A(1 —cos6)¢?+ B(6? + sin?6¢*) + CL — (1 —cosd)dP, V=Mgl(1 —cos0)= V,(1 —cos@), suppose, where M is the whole mass, and / the distance from the point of suspension to the centre of inertia of the whole.*

The general treatment of this complex problem cannot be attempted here. We may, however, easily obtain useful and characteristic results in some special simple cases, which will enable us to form a general idea of the nature of the motion.

Thus, suppose if possible @ to be constant. Gyroscopic Pendulum. We easily find the equations

yp —(1 -cosé)¢==const. (A(1 — cos 6) + B cos 6) ¢? — CQP=Vo.

Tum For any assigned values of Q and @, this shows what will be the

corresponding valuc of ¢ But it also shows that if we change simultaneously the signs only of Q and ¢, the value of `is unaltered. Thus, reversal of the direction of rotation of the gyroscope involves reversal of the direction of motion of the bob, if the time of rota- tion is to be unaltered. But to any assigned values of` *and 2 two values of* `correspond. As` *cannot, in the case considered, exceed 3a, the multiplier of ¢? is essentially positive. So is V)=Mgl. Hence the values of @ are real; and one is positive, the other negative. Thus the pendulum, with any rate of rotation of the gyroscope, may be nade to move in any horizontal circle ; but the angular velocity will be greater when it is in the same sense as that of the rotation of the gyroscope than when it is in the opposite*

sense. When @ is so small'that 6" may be neglected, we have : Be? - CQS=Vo, or 2Bd=CO4V4BV, +O.

To give a numerical example, let the mass of the gyroscope be

_ = 2

"1M; let B=Me, C=2— ME, then nv ¢

i ie

» (n-1)2 g n-1\? an ee + /4$+(Se) om

If n=5, c=10, g=101 (which are fair approximations to the dimensions of the ordinary form of the instrument),

20 mi i $= 9+ 10+ eape" : Suppose the gyroscope to revolve 100 times per second, then Q= 2007 practically, and

p= $a tk 4/10 + 4$07=2°518 + 4°089 =6°552 or—1°526. The angular velocity, when the gyroscope is not rotating, would be that of the corresponding conical pendulum, Vg/t= +3°162 ; so that in this case the gyroscopic pendulum would rotate about twice as fast, or only about half as fast, as the ordinary conical pendulum, according as it rotated with or against the gyroscope. If we had taken Q= 107 we should have found

p=3'29 or—3°04, nearly. Thus the slower the gyroscope rotates the slower is the conical

pendulum motion in the same direction, and the quicker that in the opposite direction.

Sratics oF A CHAIN OR PERFECTLY FLEXIBLE CORD. _ § 258. Ax1om. — When a body or system is in equilibrium

under the action of any forces, additional constraints will

not disturb the equilibrium. Compare § 193.

This principle is of very great use in forming the funda: mental equations of fluid equilibrium, and thence those of motion. And we find it of advantage, as will be presently seen, in reducing to elementary geometry the problem of the equilibrium of a chain, or perfectly flexible cord.

We may treat this problem, called that of a " catenary," Cate- by any one of the following methods ~~*—(1) by investi*~~ *atv:*

gating, as a question of statics of a particle, the condi- tions of equilibrium of a single link; (2) by imagining a finite portion of the chain to become rigid in its

This is the Conical Conical

——————— n

equilibrium form,—assuming, by the axiom above, that it will remain in equilibrium, and then treating the question by the methods employed for a rigid body; (3) by employ- ing the energy test of equilibrium as in § 198.

§ 259. We exemplify each of these methods in the specially important case of the ordinary catenary.

A unsform chain hangs between two fixed points, find the tension at any point and the curve in which the chain hangs.

First Method.—Let p be the mass of unit length of the ehain; T the tension at the point x, y, 2; s the length of the ehain to x, ¥, 2

from some assigned point ; and let the axis of y be taken vertieally. Then we have for the equilibrium of the element 6s, considered as a

material particle, la ae. & ode | oe : = ds (re +5 (75)) 0,

any dy adf,,dy a vas +¥9 -(aGte g(a))=°

dz dz @ dz aes = ry (n+ (05)) 0:.

Omitting the terms which caneel one another, and dividing by 6s, these beeome

of de df nag oY az (1G) o(1) =9, (3;)=0-

From the first and third it follows that dz/dx is constant, %.c., the ehain hangs in a vertical plane. We may take it as that of xy, and the equations are reduced to the first two.

The first gives

dat ds

showing that the horizontal eomponent of the tension is constant throughout the whole length of the chain. Substituting for YT in

the second, it beeomes a wv) an ds\dz]- To

The quantity on the right is evidently of [L-1] dimensions, because that on the left is so; and thus we may write

ap Wied Ny ae Hence ais the length of a portion of the ehain whose weight is

equal to the eonstant horizontal component of the tension. The equation now becomes

@y ids 1 ty dy\? de adz a 1+ (St).

Integrating, we have

, ,

» or To=pge.

If we now assume that the axis of y passes through the point at which the chain is horizontal, we have at that point 2= 0,00 = 0,

and therefore C=1. Thus

oe a dy\?dy a

Subtracting, dy be z Q-2—ga-—g `dx . 4 x x Us 2h meere` *3*

no constant being added if we assume the axis of x so that y=a, z=0 together. This is the equation of the curve required.

_If we take the sum, instead of the difference, of the above equa- tions, we find

so that 2s _ g

$ being measured from the axis of y.

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But the tension at x, y is, as above,

ds ° 4 T=Ty = To SHOU –

Hence the tension at any point of the chain is equal to the weight of a length of the chain equal to the ordinate at that point.

Thus if a ehain of finite length be laid over two smooth parallel Chain rails, its ends, when the whole is equilibrium, will be in the omit horizontal line corresponding to the axis of x in the above investi- parallel gation, the middle part of the chain forming part of the eatenary. Ys When a given length 27 of chain rests in equilibrium on two : smooth parallel rails at'the same level, we have therefore s+y=/, while z=), the half distance between the rails.

By the above expressions for y and s in terms of z, this leads to the equation

te ag=l,*

which determines @ when band /are given. From this equation, as the minimum value of the left-hand side oeeurs when a=), we see that the least length of ehain for whieh equilibrium is possible under the conditions is equal to ¢ times the distanee between the rails.

§ 260. Second Method.—The chain being in equilibrium, suppose any finite are of it, as PQ (fig. 64), to becoine rigid. The forces acting on PQ are three —the ten- sions T, and T, at its ends, and its weight W acting at its centre of inertia. But three forces in equi- librium are in one plane (§ 221). Hence the curve is in one vertical plane. Also, as the two tensions are not parallel to one another, the lines of action of all three forces meet in one point. are simply

Fig. 64. Hence there is no couple, and the conditions

T,,cos0,~~T,cos@,=0, T,sin 6, — T,sind,~~ W=0;

where 6,, 0, are the inclinations to the horizon of the tan- gents at the ends of the portion solidified. The first asserts that the horizontal part of the

tension is the same at P and Q, “.e., all through the chain. The second asserts that the difference of the vertical parts of the tensions at any two points is equal to the weight of the part of the chain between them. By proper mathematical methods these data lead to the results already obtained. In fact the equations we have just obtained are the first integrals of the equations in § 259.

§ 261. Third Method.—The potential energy of the chain is as roy qa ’

aS d= constant ; dx

with the sole condition

the limits of integration being fixed, and the same for each expres- sion. Hence, by the rules of the calculus of variations, we have the same equations as before.

§ 262. Still supposing gravity to be the only applied force, there Mass of are many forms of important questions whieh can be solved by either chain to of these methods. We will take some simple, but varied, examples. hang in

Find how the mass of unit length of a chain must vary from point given to point so that the catenary may be an assigned plane curve. curve.

‘We have, as before, a dz at a) shad

but our second equation is now

ad fay \:_ o(rt)=9 >

where » is an unknown funetion of s. Tho third equation, being of the same form as the first, shows that the curve is in a vertical plane, and is thenceforth unnecessary.

Suspen- sion bridge.

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As before, we hava

Tap 7 Lo» d dy ug a £(Z) 7,

Now, from the assigned equation of the catenary, the left-hand member can be expressed as a function of s, and thus we have the solution of the problem. For example, suppose the chain is to hang in an are of an assigned circle. Referred to the lowest poiut of the circle, the equation is

av? = ay — ¥?, where @ is the radius, From this we have SE ee ee dz a-y a so that os Ty sec? — , a a

The tension at the lowest point is thus equal to the weight of a piece of chain like that at the vertex, and of length equal to the radius of the circle; the mass per unit length becomes infinite at the end of a horizontal diameter.

Next find the form of the chain when the mass of any are is pro- portional to its horizontal projection. Thisis arough approximation to the case of a suspension bridge where the roadway is uniform, and much more massive than the chains, to which it is attached throughout by vertical ties. The equations are as before, but the additional condition takes the form

ds ae a a constant. Map Ho ?

BY MoS ae Ty

and the chain forms a parabola whose vertex is downwards, and whose axis is vertical.

This gives

Catenary Asa final example, we have what is called the catenary of wni- of uni- form strength; that is, the form in which a chain hangs when the

form strength.

Limit of span.

tension at cvery point is proportional to the breaking stress at that point. Here we suppose the strength to be proportional to the section, z.c., to the

mass per unit length. ‘This gives the

condition T=cu. d {dy g g ds Hene eae (| eae ad a) eT, | e dx’ or

eal ok (GEN eke oe

dz? a\dz a

ay ten(2 +) a

and the complete integral may be written, by proper selection of origin, in the final form

where a@=c/g. This gives

£ x &% — sec—. a

This curve has obviously two vertical asymptotes dis- tant + $7ra from the axis of y. The quantity a is directly as the tenacity of the material; and thus we see that there is a limit (even in this simplest case) to the span of a chain, however strong, formed of any known kind of matter.

It is a very curious fact that, if we write the equation of this catenary in terms of the are and the radius of curvature, it becomes

identical with that of the common catenary in terms of Cartesian coordinates, horizontal and vertical. For we see at once that

a f ee ee

so that re = a/(1+8in) (1 -sin=) a Ji a

while by the previous equations

d’y EUS det 1 7 cos — p (Sy a ds ~ a ‘ Pe dae Thus finally, a8 8 7. 2¢+€ @, Compare § 259,

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§ 263. When the chain is not uniform, and when it is subject to Catenar the action of other forces than, or besides, gravity, the equations are general d dz d dy d dz aA i) as a TH) ays ae Tae) aa, where X, Y, Z are the component forces on unit mass, These 1 three equations involve the unknown quantities T, x, y, 2, ands only ; for « is supposed to be given in terms of s. Two relations only among x, y, andz are wanted (for sis known in terms y, 2); so that the equations are necessary and sufficient to give relations and the remaining unknown T.

The first members of these equations consist each of two terms:— = multiplied respectively by = ‘ “Y ’ & :

of x, these

*d*x d*y oe.*

de? Page? Page}

p being the radius of curvature of the chain. Hence (§ 22) we conclude that, so far as the tension alone is concerned, the forecs on an clementary unit of length of the chain are dT/ds in the direction of the tangent, and T/p in the direction of the radius of absolute curvature. These must balance the corresponding components of the external forces on theelement. Hence wesee that the resultant of the applied forces lies, at every point, in the osculating plane. Thus we have

and = multiplied by p p

f aT dz dy d2 a | =- (xF +V@e 25.)=-8,

a ax ay Gack

a = (Xegge + Voge +Zp73)= -N. Here S and N are the tangential and normal components of the ge forces per unit length of the chain.

as path — -v@-9, ee =e of par- > ae P ticle.

where 8’ and N’ are the normal and tangential components of the

requisite force. If we write these in the form

o dw? pee te

and suppose that the curve in which the particle moves is the same as the catenary above, while the speed at each point has the same numerical value as the tension, we see that we must

have re

Sag WS See je S'= -ST, 'N'=-NT.

Thus the catenary will be the free path of the particle provided the force applied at any point is equal to the reverse of the product of : that acting on the chain by the numerical value of the tension of i the chain at that point. : J

Conversely, if we take any case of free motion of a particle, a | uniform chain will hang in the corresponding orbit under the action } of the same forces each reversed, and divided by the numerical } value of the speed at the corresponding point of the orbit. Thus we can at once pass from particle kinetics to corresponding cases of catenaries. ;

In the case of a projectile, the path is a parabola, the force is Parabolic © constant and parallel to the axis, and the speed is as the square: catenary. root of the distance from the directrix. Hence, that the parabola may be a catenary under gravity, it must be turned vertex down- wards ; and the mass of the chain per unit length at any point must be inversely as the square root of the distance from the direc- . trix. It is easily found from this that the mass of any are of the chain must be proportional to the length of its horizontal pro- jection, as in the second problem solved in § 262.

In the case of a planet we have

v= (2/r-I1/a). Hence a chain will hang in an ellipse if it be repelled from one : focus by a force varying inversely as the square of the distance, the mass per unit length of the chain being directly as the square root |

ut wheu a unit particle moves in a curve, we have always Catenary |

.

—

Mi;

or

Elliptic catenary. —

of the distance from that focus and inversely as the square root of the distance from the other. If the chain be uniform, the law of

| the repulsive force from the first focus must be 1/s/7%7’ instead of | 1/r?, where 7, 7’ are the distances from the two foci. (§ 264. When a chain or string is stretched over a curved er , surface, the surface must exert a reaction on it to keep ° aa it in its curved form. The preceding investigation has shown that the force normal to a chain per unit length at any point is balanced by T/p per unit of length, which) must therefore be the magnitude of the reaction. We

’ |

‘

_ cord,

i.

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may establish this, however, in a very simple manner, as follows :—

Let AB (fig. 65) be a small portion of the cord, and AC, CB the tangents at its ex- tremities; and let the (small)

exterior angle at C be @. Then, p being the pressure A B per unit length of the a

string, we have at once p. AB=2Tsin }0=T@ ultimately. But AB=pd, so that Dae: Rope If there be friction, and if the element of the rope be just coiled on about to slip, in consequence of the difference of the ten- rough gions at its ends, we have oylinder. : | T'-T=pp.AB=pT0, | so that | T=T(1 + p06). This leads to the formula for the growth of a sum at com- pound interest at ». per cent. payable every instant. Hence for a finite angle a we have ee

It is to be remarked here that neither the dimensions nor the form of the curve on which the cord is stretched, pro- vided only it be plane, have any influence on this result, which involves only the coefficient of friction and the angle between the two free portions of the cord.

Krtvetics or A CHAIN on PERFECTLY FLEXIBLE Corp.

§ 265. The equations of motion of a chain, under the action of any finite forces, are at once formed from those of equilibrium by introducing the forces of resistance to acceleration according to Newton's principle. Here we enter on a subject of extreme importance, but also (at least in the majority of cases) of great mathematical difficulty. Oue valuable result, however, can be obtained by very simple means.

Wave. A uniformly heavy and perfectly flexible cord, placed in | velocity the anterior of a smooth tube in the form of any curve, | and subject to no external forces, will exert no pressure on the tube if rt have everywhere the sume tension, and move | with a certain definite speed. | For, as in § 264, the statical pressure due to the curva- |

on stretched

ture of the rope is T@/o per unit of length (where o is the length of the arc AB in that figure) directed inwards to the centre of curvature. Now, the element o, whose mass is mo (if m be the mass per unit of length), is moving in a

] | curve whose curvature is @/o, with speed v (suppose).

meee = mv°$, and for unit of length

If we

The requisite force is

Hence if T=? the theorem is true.) suppose a portion of the tube to be straight, and the) whole to be moving with speed v parallel to this line, and against the motion of the cord, we shall have the straight part of the cord reduced to rest, and an undula- tion, of any, but unvarying, form and dimensions, running along it with linear speed /T/m.

Suppose the tension of the cord to be equal to the weight of W pounds, and suppose its length 7 feet and its own mass w pounds, Then T= Wg, /m=w, and the speed of the un- dulation is /Wig/w feet per second.

266. As will be shown later, when such an undulation reaches a fixed point of the cord or chain, it is reflected, and runs back along the cord with the same definite speed. | But the reflected form differs from the incideut form in being

turned about in its own plane through two right angles. When the string is fixed at both ends any disturbance runs along it, backwards and forwards, with this speed, and

mv”O’o.

Retlected wave,

TAL

thus (in a piano or harp) administers periodic shocks to the sounding board, causing it to give out a musical note. The interval between these periodic shocks is of course the tine taken by the disturbance in running from end to end of the string. Dividing the length 7 of the string by the speed above reckoned, we find for this interval the value Jul Wg=l /in[We ,

the reciprocal of which is the number of impulses per second. It is thus seen to be directly as the square-root of the tension of the string, inversely as the square-root of its mass per unit of length, and also inversely as its length. These are well-known facts in Acoustics. It is to be observed that there is no necessity for limiting the pro- position above to a plane curve, though we have treated the question asif it weresuch. The demonstration applies even to a knot of any form.

267. We will now consider more particularly the vibra- Vibration tions of a musical string, whose tension is great and its of musical own mass small. string.

Forming the equations of motion as above hinted, we have three of the type

Ohi (lie $(1a)= —p(X-#).

In the special case of a tightly stretched inextensible string, per- forming very small transverse oscillations, we may greatly simplify these by assuming that no external forces act. 'This practically means that the weight of the string is negligible in comparison with the tension. If the axis of x be taken to coincide with the undisturbed position of the string, we have to the second order of small quantities S=2.

With this the equation above written becomes

or the tension is the same throughout. The second and third

equations now become

ei) a az T 4=n79 TY =H. dx MY dae

The y and z disturbances are therefore of the same general character, and perfectly independent of one another. We will therefore con- fine our attention to one of them. From the equations we see that T/u must be of two linear dimensions, and we will therefore write for it a. As this quantity must also be of two negative dimensions in time, @ represents a speed. What speed will be seen imme- diately. The equation in y is now

whose integral is known to be y=f (at —x)+ Fat+2),

where f and F are arbitrary functions. As. we have already seen (§ 53), the first part of the value of y expresses a wave running with speed @ along the axis of a in the positive direction ; the second part a wave in the negative direction with the same speed. Thus we see that any small disturbance whatever, of a stretched string, gives rise to two series of waves propagated in opposite directions with equal speeds. Also, as the equation is linear, the sum of any two or more particular integrals is also an integral. If we suppose one extremity of the string to be fixed at the origin, One end we have the condition 2=0, 7=0, and therefore fixed.

0=f(at) + F(at).

As this holds for all valnes of ¢, the function F is simply the negative of f, so that y=f (at —x) -—f(at+2).

To investigate what becomes of a disturbance which runs along the cord to the fixed end, let us suppose that /(7) (which, by the remark above, may represent any part of a disturbance of the string) is a function which vanishes for all values of r which do not lie between the positive limits p and q, but which for values of r between these limits takes definite values. Then at time ¢=0 we

have y= jf (a) '

for, by hypothesis, f(7) vanishes for all negative values of 7, This denotes a disturbance of the string originally extending from x=p

Both ends fixed.

Oscilla- tions of a chain fixed at

one end.

to 2=q, which runs up to the origin. After the lapse of any inter- val greater than g/a we have y =f(at- 2x),

for at+ax has now become greater than g. This is a wave of exactly the same form as before, but the sign of the disturbance and the direction of its propagation are both reversed. Every portion of a wave is therefore reflected, with simple reversal of the displace- ment, as soon as it reaches the fixed end. For we may take the limits p and q as close together as we choose.

Now suppose the string to have another fixed point at x=1.

Then we have 0=f(at-—1)-f(at+l).

Thus f is (§ 67) a periodic function, of period 22/a, and can there- fore be expressed as a serics of simple harmonic terms of the full period, half period, one-third period, &c. Hence we may write, the coefficient 4 being put in for convenience,

y=42,° Amcosrml- (at — x) +423, By sinwml-l(at — x) —43,° Amcos rml-l(at + x) —4$2,° Bnsinwml -\at+ 2x) = 3° Amsinaml-latsin rml-le— 3° Ba cosrml-latsinarml-lx.*

This expression contains the complete solution of the problem. To adapt it to any particular case, we must know at some definite time (say £=0) the value of y in terms of a, ¢.¢., the initia] disturb- ance ; also the corresponding value of y. We have then

Yo= — 2° Basin aml-lz, N= A" mAmsinwml-le.

As Yo, Y are given in terms of x, we can find, by the process of § 67, the values of Am and Bm, and thence the required value of y.

268. As another example, suppose a uniform chain to be sus- pended by one end, and to make small oscillations in a vertical plane.

We cannot enter here into details; so we simply assume that elementary persistent harmonic solutions are possible, or, what comes to the same thing, that there are permanent forms in which the chain can rotate about the vertical from the point of sus- pension.

If the axis of x be vertical, the equations of motion are

df ,de_ _ se af dy_ x. z(TE) Hg -#), 4 (0%) HY 3

where p is the mass of unit length of the chain. As the oscillations are supposed to be small, we may neglect the change in the ver- tical ordinate of any point of the chain, because it must be of the second order of small quantities if the horizontal displacement is of the first order. Hence we may put everywhere a for s, and therefore consider x to be independent of ¢. Thus the first equa- tion becomes

*av dz *9s whence T=pg(l-2x),*

where J is the length of the chain. The second equation then becomes

Wee ae igh!

The complete integral of this equation would be much more general than we require, for it would express every possible small motion of the chain, however apparently irregular. What we seek are the fundamental modes of simple harmonic oscillation, any number of which, as in the case of a musical string, may be superposed. Hence we may write

y=nsin{(nt+a),

where m is a numerical quantity as yet undetermined, but which is confined to one or other of a series of definite values; 7, on the other hand, is a function of x only. With this value of y the equation becomes

By the usual method of undetermined coefficients we easily find the particular integral Pe nt at

nN no =A 1 Oe gigs t&e.) : 3s Cl):

This series is obviously convergent for all finite values of n?a/g. The general integral is of the form n=B(m, + nologxz)+ Ang; where 7, is a function of x, finite for all values of x, but which we

need not determine. For it is elear that, to suit our present purpose, we must put B=0; otherwise we should have 7 infinite at z=0. Thus (1) is the expression we require under the limita- tions above imposed. ;

The quantity A represents the semi-amplitude of oscillation of the lower extremity of the chain. The condition that the upper end is fixed gives 7)=0 for x=J, 1.¢., vt iP nds

g + pag 2eStG The roots of this equation (which are all real and positive) give the values of » for the several fundamental modes of vibration.

We have y)=0 for the following values of n?2/g: 1°454, 7°62 18°74, 34°79, &e. ;

From these we find for the periods of the various simple dis. turbances the following multiples of the period of a simple pen- dulum_equal in length to the chain, viz., 0°83, 0°36, 0°23, 0°17, &c. When n?7l/g has the least of the above values, the chain is always entirely on one side of the vertical, and the time of a eomplete oscillation is to that of a simple pendulum of the same length as 5:6 nearly.

269. When a free chain, at rest, has an impulsive tension applied Impul- at one end, the calculation of the consequent impulsive tension at sive fae i parts of the chain and the velocities generated is very tension. simple.

For, calling the instantaneous speeds along the tangent and along the radius of absolute eurvature v, and vp respectively, we have

0=1- + &c.

ST = pv, 6s , T/p=pUp ,

where yz is the mass of unit length of chain ats. It is obvious that there can be no impulsive speed perpendicular to the osculating plane. The kinematical condition is simply that an elementary are 8s is not altered in length. But the tangential increment of speed alone would inply an increase of the length of ds in the

ratio 14 Seat: lin time 8. Also the impulsive speed vp would S

imply a diminution of its length in the ratio 1— updé/p: 1 by virtu- ally making it an are of a circle of smaller radius, but subtending the same angle at the centre. Hence, neglecting the square of o¢ as compared with its first power, we find for the kinematical con- dition dv, Up

aoe

This gives, by climinating the impulsive velocities,

ds\ wm ds If the chain be uniform, this becomes

2:

= —_— aon 0 e ds? ~p

The whole kinetic energy generated in the chain by the impulse is

af e((@ 2 Lap Sf 1 Sa) Sal &\ds p

and the condition that this shall be a maximum is the differential equation above. This is a particular case of a general theorem due to Sir W. Thomson, viz. :—

A material system of any kind, given at rest, and subjected to an impulse in any specified direction and of any given magnitude, moves off so as to take the greatest amount of kinetic energy which the specified impulse can give tt. –

The direction in which an element of the chain begins to move is inclined to the tangent at an angle ¢ where

<0 Fees tang= = ja ds

270. It is to be observed that, in such questions as those just Waves of treated, the possibility of an impact's being propagated instan- extension taneously along the whole length of a chain depends upon its ofa assumed inextensibility. When a wire (such as that employed for string.

a distance-signal on railways) is regarded as eatensible, there 18 & definite speed with which a disturbance of the nature ef extension is transmitted along it. ,

Thus, recurring to the equations of § 267, we see taat for the motion of a stretched elastic string in the direction of its length we have

aT ry a aT (X —-%).

If there be no applied forces, X=0. Also, if we use x instead of s to characterize a particular point of the string, we must put e+e for z and 2 for s, — being a function of x and ¢ which denotes at any instant the displacement of that point.

aa 4

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The physical condition is expressed by Hooke's Law in the form

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P'S', about P'l', per unit length of the central line, is the rate of twist. Suppose P' to move with unit velocity along

ERE the distorted central line, and let p, o, 7 be the angular 2 velocities of the system about F'R', P'S', P'T' respec- Hence EZe He tively, then p represents the curvature (or bending) resolved

in the plane S'P'T', o that in R'P'T', while 7 represents the

This expresses (as in § 267) the passage of simultaneous waves. | 4 54

They are now waves of condensation and extension, not of trans- verse displacement. The nature of the interpretation of the equation

: 1ALIC Now, if the elastic forces constitute a conservative system, the Expres- is of the same general character as before, the speed being VE/p.

amount of work done on an element of the body corresponding to a sions for

Dyx E g length 8s of the central line is to be calculated entirely from its forceand

; YNAMICS OF AN LLASTIC SOLID. change of form. It must therefore be expressible in the form couple in

§271. This subject, which is a very extensive and difficult qwss ec of ending

one, and in its generality quite unsuitable for discussion

where w is a function of p, ¢, +; which must be such that the ang here, has already been to some extent treated of under

couples producing the bending are ‘want.

*Exasticiry. We therefore content ourselves with one or dw ae two examples, whose treatment is comparatively simple, dp * do’ while their applications are frequent and of considerable | while that producing the twist is practical importance. an Cylin- § 272. Even so restricted a problem as that of determin- a” drical or ing the form assumed by a wire or thin rod of homogeneous | These again, are functions of p, ¢, 7, and they must, on account pis- isotropic elastic material, under the action of given forces | of the principle of superposition, be linear and homogeneous. For, matic and couples, presents som ewhat formidable difficulties un- | Within the limits to which we have restricted ourselves, the doubling we _ Jess in its unstrained state the wire be straight and truly alike of bending and twist must involve the doubling of each of the 8 ae. : : : ae couples. Thus w must be a homogeneous function of p, o, T of the ally cylindrical or prismatic. And, even with these limitations, | second degree. Hence we may assume straight. the problem again becomes formidable if we introduce the w= UAp?+ Bo? ~~+C2?~~+2Dpa-+2Eor + 2F 7p), oe eeeation of nou-isotropic material 2 =e Beye ey cock, where A, B, C, D, E, Fare quantities depending on the form of the if the radius of Ghinashnne at each point is not very large | section of the wire ‘and the nature of its material at each point. in proportion to the: thickness of the rod in the plane of | This gives (bending, the problem is to*

no appreciable extent simplified | gy; ee ie by the limitation of form of the body. We will therefore ae eee Gone re ge aes og the comparatively simple Cae of the mere bending Hence, when the couples are assigned, the amounts of bending and . and twist of a homogeneous isotropic wire whose natural | twist are at once calculated from them. But the expression above form is cylindrical or prismatic, the amounts of these | is much more general than we require for the limited case we are from various sources being so small as to be superposable. considering. For, if the only couples applied to a portion of the "Bending, Bending lengthens one set of lines of particles originally prism or cylinder considered be in planes a Zz ais . parallel to the axis of the wire and shortens others. length, twist only will be produced. Thus, for 7-=0, 7-0,

Twist lengthens all but one such line, forming them into helices. The more detailed investigation, which we cannot give here, shows that there is one line of particles (the " elastic central line") which passes through the centre of inertia of each transverse section, and which may be treated (under our present limitations) as rigorously unchanged in length. The mutual molecular action of the parts of the wire on opposite sides of any transverse section may of course be reduced to a force and a couple, and the force may be conveniently treated as passing through the centre of inertia of the section. Also the twist and curvature of the wire near this section obviously depend on the couple and not on the force. For the moment of the couple is in general finite, while that of the force (about any point in the corresponding element of the wire) is infinitesimal.

§ 273. Let any two planes, at right angles to one another, be drawn through the elastic central line before distortion ; and let them be cut in lines PR and PS by a transverse section through a point Pof the central line. Also let relly be a tangent to that line. Suppose a similar construction to be carried out for every point P of the central line. Then it is clear that the form of the distorted wire will be completely determined if we know the form assumed by the central line, and the positions taken by the lines PR and PS drawn from each point in it. In their new positions P'T', P'R', and P'S' will still form (in consequence of the limitations we have imposed) a rectangular system; and the nature of the distortion will be clearly indicated by the change of position of this rectangular system as it passes from point to point

of the distorted central line. The plane of rotation of P'T' is the osculating plane of the bending; its rate of rotation in that plane per unit length of the central line is the amount of bending; and the rate of rotation of the system PRs

| form of a circular helix.

p we ought to have also p=—0, o=0. Hence E and F both vanish

and we have simply w=(Ap?+ 2Dpo + Bo? + Cr'). This may be reduced, by properly selecting the planes originally drawn through the elastic central line, to the form w=43(Ap?+ Bo? +Cr'). Now we see that

dw

dw =—Bo, = == (Cire

dp ?? de

§ 274, In a prismatic or cylindrical wire of homogeneous isotropic niaterial, the elastic central line is thus a torsion axis simply. Equal and opposite couples, applied to the ends of such a wire, in planes perpendicular to its length, produce twist in direct proportion to the moments of the couples. There are two planes perpendicular to one another, and passing through this line, such that, if equal and opposite couples in either of these planes be applied at any parts of the wire, the portion between is bent into a circular are in that plane. These are the principal planes of flexure. The quantities A and B which, when multiplied by the amount of bending in either of these planes, give the inoment of the corresponding couple are called the prin-

cipal " flexure rigidities " of the wire. When they are equal Flexure (as in the case of a wire of circular, square, equilateral rigidity.

triangular, &c., section) any plane through the axis is a principal plane of flexure. the wire. In general, when the and a couple applied at the other, the wire assumes: the The exceptions (or rather parti- cular cases) are :—(a) when the plane of the couple con- tains the elastic central line, and there is

mere flexure, without twist ; (6) when the plane of the couple is perpen- dicular to the wire, and there is twist simply.

§ 275. As an example of the preceding theory, take first

C is the torsional rigidity of Torsional wire is fixed at one end Zigidity.

by its own weight.

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This is obviously the same as the case of a plank of double the length, supported by a trestle placed under its middle. We assume as before that the radius of curvature is always very large compared | with the thickness of the plank.

In all such cases we may at once apply the principle of § 258, and suppose one portion of the plank up to a section P to be fixed in its equilibrium position. The curvature immediately contiguous to P will then be simply propor- tional to the moment about P of the forces acting on the unfixed portion. Hence at the free end there will be no curvature, and the curvature at points near that end will be of the second order of infinitesimals; 2.¢., its rate of increase at the end vanishes. ’ Let x be the length of the fixed portion, 2 the whole length of

the plank. Then, as the deflexion y from the horizontal is always very small, the curvature is expressed (§ 22) by

so that we have at once

Ty l-—z ; ; ae of w’da! = — hyg(l- 2)? dx? y x i

where E is the “‘ flexural rigidity ” of the plank, and wits mass per

unit of length. Successive integrations give

dy _ 8 Eo B+ éng (2 2) ’

Ey= A-B(l-2)- sug (0-2), The terminal conditions are

and

ay for z=0, y=0, 2 =0; a?4 a} and for z= 1, “370, T3790:

The last two are obviously satisfied. The two former give

3

=-“—, A=Bl+ gyuglt = – jugl!.

Ey= — pyyg (304 – 4P(0 – 2) + (2-2)4) . Thus the droop of the free extremity (2 =1) is 2 Ae 8 E 8E’ where W is the whole weight. If the plank had been weightless, but loaded at the free end with a weight W, our equation would have been Bey

ax”

Hence

V (2-2), and we should have had

dy , Tr 2

OY HP 4iwi-o

E re +4W(l-2), Ey=A’-B(l-2)-aW(l-2). The terminal conditions at x=0 are as before, so that B’= -4WE, A’= -4W2E+3WP= – 2 WE,

we

and the droop of the free end is 35

ratio of 8:3.

If the plank be again looked on as heavy, but its free end be sup- ported on a trestle which is pressed upwards till it acts with a force W, we find directly

» greater than before in the

@ S37 W(l- 2) -4ug(t-2), dy pw EL-B – 4W(l – 2)? +dug(t-2),*

Ey=A” — BY (1— a) + §W(l-2)8- deug(l- 2). The terminal conditions, at 2=0, are still as in the first case, and they give BY =sWP- bugil, when the amount by which the free end is raised is

. 5WwP ET UWP – gugl®) — 2WE + Peugl!] /E=

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Flexure the case of a uniform plank clamped horizontally at one end, | This is obviously the same as the amount of depression of the of plank and otherwise unsupported.

middle of a plank of length 27 supported by trestles at each end.

§ 276. Hence the droop of the middle of a plank resting on trestles at its ends is to that of the ends when the plank rests on_a single trestle at the middle in the ratio of 5:3.

If the equation expressing the curvature in the first or third cases above be twice differentiated, the common result is Me

4,

Ee — yg.

The simplicity of this expression leads us to seek for the Horizo..| most general form. Suppose the plank to be exposed to tal plaul any system of forces in lines perpendicular to its length der and breadth. Then, if- any transverse section be made, nil the stress between the two portions of the plank will con- forces, sist of forces (+G) and couples (+H) in the plane of length and thickness. Let the applied forces be N per unit of length. Suppose also, as before, that the radius of curvature is very great compared with the thickness, Then the equations of equilibrinm of an element are

dG aH Fede dg (29:

We have also the condition of bending, viz., Ex curvature= EY = i. Ce

Eliminating H and G among these equations, we have dy @H _dG_y- ae dz which of course includes all the previous particular cases.) We may now determine (under the limits imposed) the i form of a uniform plank of any length, supported in a nearly horizontal position at different points in its length, and loaded at any assigned points with any weights. The | importance of this in practice is obvious. § 277. But we may easily take a further step, and in- Vibra- vestigate the oscillatory motion, so long at least as the tion of acceleration parallel to the length of the plank and its rota- Plank tion are negligible. For in such a case, if » be the mass spring. per unit of length, the equation of motion is (§ 199)

*a*y * EON – py.*

}

.

We will consider only the case in which the applied force . N may be neglected. This is practically the case of a | uniform wire or flat rectangular spring. Suppose, further, | that it is fixed at one end and free at the other, like Wheatstone's " kaleidophone," or like the tongue of a reed | organ-pipe.

Then, writing »' for the fraction u/E, we have

a' 5 Ta +nt¥y=0.

A particular integral may obviously be found in the form y= ncos(7t /n? + a) (1), where » (a function of x) and z/n (a constant number) have to be

found ; a is any constant. The substitution of this value of y) leads to

the complete integral of which is n=Aé+ Be-*%+Ccos(tz+D).*

Now, provided the value of i be properly determined, the motion

represented by (1), with the above value of 7, can exist by itself;

and the most general motion of which the spring is capable (under

the limits imposed) consists of superposition of a number of separate

motions of a similar character. Hence this may be treated by itself.

Our limiting conditions in the present case are

r. _9 Me x=0, 1=0, 7 =0 at the fixed end ; | ah dn an and 2=l, aa 9? 5 Fi ta 0 at the free end. |

Now, from the value of 7 above, we have ; 1 dy _ 'oe eee = ain he Bé--Csin(iz+D), Be A c= 4 Be Coos (iz 4D) # de , 1 dy : 2 ae eae Sk 1 2 is ' ® as ¢'* — Bé-* + Csin (iz+ D) Hence we have 0O=A +B +CcosD, 0O=A -B —CsinD,*

O0=Ag"+Be--Ccos(il+D), 0=Aé"—- Be-#4 Csin(i1+D). Eliminating C and D, we have O=Ag"Be-#(A+B)cosi2+(A —-B)sinil, 0=Aé"— Be-#_ (A 4B)sinzl+ (A — B) cosil. _ Eliminate the ratio A/B, which is all that these equations furnish, and we have*

(6% +4 €-#) cosi1+2=0. From this equation the values of 7 must be determined. It is clear that the multiplier of cos7/ is always greater than 2, except in the special case of 7=0, which we obviously need not consider, asit gives /=0, and therefore belongs to the statical problem already considered. Hence as, to make cosi/ negative, iJ must be greater

than 47; and, as gt 46-37 =5 nearly, it is clear that the excess of the first value of 7/ over $m is somewhere about 0°3. The next value falls short of $a by a quantity of the order 74), the next exceeds $4 by a quantity of the order gsy5, &c. The required values arrange themselves in two groups, one of either group being taken alternately. The first group involves arcs a little greater than but rapidly approaching to the values of (4+1)4m; the second consists of arcs a little less than but rapidly approaching to those of (4m + 3)4r. Eftectsof § 278. Some of the simplest, but at the same time pressuté most practically useful, of questions connected with elas- on tubes ticity of solids relate to the changes of form or volume and : c : : é spherical @Xpetienced by circular cylindrical tubes or spherical shells shells, exposed to hydrostatic pressure. A steam-boiler, the cylinders and tubes of an hydraulic press, a fowling-piece or cannon and (on a much smaller

scale) Orsted's piezo- meter, deep-sea thermometers, &c, afford cominon in- stances. All that is necessary for attacking such questions is given in §§ 45, 46 of the article Exasticrry. For it is there shown that, if a homogeneous isotropic elastic solid be subjected to a simple longitudinal stress P, uniform and in a definite direction throughout its whole substance, the result will be linear extension =P (+a) in the direc- tion of P, and linear contraction =P (is- de) in all direc- tions perpendicular to P. The quantities » and &, as explained in the article referred to, are respectively the | "rigidity" and the reciprocal of the " compressibility " of tho solid operated on.

§ 279. The case of the piezometer, in which the vessel holding the liquid whose compression is to be measured is exposed both inside and outside to the same hydrostatic pressure, is seen to correspond to three equal stresses in directions at right angles to one another. These direc-

Equal pres- sures Within and without piezo- ‘meter,

extension is obviously

| i al iy Pte) SP Pi (satae) -2(q-z) }-ze

is negative, as the stress isa pressure. Hence the strain consists in a simple alteration of volume measured by P/E. Every part of the walls of the vessel, as well as its external bulk, and its interior content, is altered to the same extent.

§ 280. In the case of a cylinder, when the internal and ee, external pressures are different, it is clear from symmetry ‘ressure, that the stresses may be resolved at any point of the walls into three at right angles to one another, the first ey ! patallel to, the second (P,) at right angles to, the axis, i and the third (P;) perpendicular to each of the other

Cylinder

MECHANICS

tions may be any whatever, and in each of them the linear’

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two. Ina transverse section of the cylinder, the second of these is radial and the third is tangential to a coaxal cylinder passing through the element considered. We suppose the cylinder closed at both ends, and we make the further assumption (quite exact enough for practical applications, and most important from the point of view of simplicity of calculation) that all transverse sections of the cylinder remain, after distortion, transverse sections. This is equivalent to assuming P, to be constant through- out the walls of the cylinder, Hence, if there be interior pressure only, the value of this stress must be

pressure on end of interior of cylinder Tha? = pp wi. aa Lee ae! SS aoeena ts area of trausverse section of walls of cylinder @?— a?

where IL is the interior hydrostatic pressure, and Ay, @, are the internal and external radii. This stress represents a longitudinal tension of the walls of the cylinder.

Let us consider an element of the cylindrical wall, defined as follows in the unstrained state :—

Draw two transverse sections at distances x and x+6x from one end, two planes through the axis making an (infinitesimal) angle 6 with one another, and two cylinders of radii x and r+6r about the common axis. In the strained state @is unchanged, but x becomes a+, and r becomes r+p. The distance between the transverse

1

sections was 8x; it becomes ar + ba, so that the linear exten-

d sion parallel to the axis is = . The distance between the cylinders

: yeas was 67; it becomes 67+ WP bp , So that the radial extension is = .

The breadth of the base of the wedge-shaped element was 70; it becomes (7+ p)@, so that the linear extension perpendicular alike to

the radial line and to the axis is 2 5

If we now write, for simplicity,

ee eee "3a 06° Gn OR' the three requisite equations betwcen stresses and strains are at once obvious in the form

ee eP,-fP.—-fPs, dx

d P _fP\+eP,-fPs,

We have, however, four unknown quantities ¢, p, P,, and Ps, so that another equation is required. 'This must be supplied by one of the statical conditions of equilibrium of the element above defined, when in its strained state. There is obviously equilibrium in the axial direction, and also parallel

to the base of the element ; but radially we have a case resembling that of an element of a cord as in § 264. Neglecting small quantities of a higher order than those retained, this consideration gives –

d a 5) P,d66×67 = gp (bard08x) 80 , or P3= cs (P,1) .

Solving the four equations, and taking account of the boundary conditions P,= -Mwhen r=a), and P,=0 when r=q,,

we obtain the following values :—

dé aw

2 = e-2

da: ioe t)s

P on % [oa (es

iF =Tes aL 2) +73 f) |; dp az a;

el ey met – 2f)-—1(e : dr Naz aal(e— Re |

or, reintroducing the values of e and f, dé a 1

ery o7.? dz aj—az 3k

p . “la? / 28 aa) =— aot , r a@—-a2\3k rr Qn Seige | ate a\ok 6T? 2n § 281. Thus the nature of the distortion produced in the walls of a cylindrical tube by intcrnal pressure may be described as made up

XV. — 94

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of a uniform dilatation, whose linear meastire in every direction is .. -s a combined with a shear in each transverse section, whose a® —a2 3k ms BE Najat = § 91 (a? —a2)r? Qn °

The shorter axis of this shear is radial, and the magnitude of the shear is obviously greater for smaller values of 7. The inner layer of the walls is thus the most distorted. The amount of the distortion is directly as the pressure, and inversely as the area of the section of the walls.

When the walls are very thin the shear is practically the same throughout their thickness. When they are very thick, the shear

measure is 1 +

near the inner surface is nearly lip however fine be the bore. 7m

; oe ‘ : That near the outer surface is nearly 14-2 = which vanishes a 10

1

when the bore is very fine. Thus it appears that, if a stout tube bursts by the shear produced by internal pressure, little is gained either by making it of extremely great thickness or by making it of very small bore.

The diagrams A and B in fig. 66 show, necessarily on a greatly

exaggerated scale, the nature of the distortion produced at different

Fig. 66.

parts of the wall of the tube. They represent transverse sections of small, originally spherical, elements made by planes at right angles to the axis. The radial diameters are horizontal. A is an element close to the external surface, B an element near the inner surface. The increase per unit voluine of the interior of the tube is

fies {1 aA ——2,(—-+-4 — }; at-a\ k ay n

so that, if the tube be very thick in comparison with its bore, the increase is nearly M1/n. In flint glass this is approximately about ress, When 11 is a ton-weight per square inch. Cylinder © § 282. The reader who has followed the above investigation will under _ find no difficulty in obtaining the

corresponding results for a cylin- external drical tube, closed at both ends and exposed to external pressure II, pressure. in the form :

dt Ta? 1

dx a—a? 3k'*

p Ta ly Rete. '-¢ at-ai (get 7 5a) : do Ma? (1 az 1 dr ata «5 a ma)

The only comments we need make are (1) that the signs of these distortions are now négative ; (2) that they are (so far as change of volume is concerned) greater than for the internal pressure, as a} has taken the place of a3 as a factor in each term involving & ; (3) that the terms involving the rigidity are, except as regards sign,

unchanged. The change of volume of every part of the walls is ie… es at-a? k'

and the change of volume of the interior is

fie, 7. 0) a?-a\ k ray i

(2)

flint glass and about g5o for stecl, when TI is a ton-weight per square inch. There is, however, a peculiarity which (when the walls are thick enough) distinguishes this from the preceding case. For & is usually considerably greater than n, so that a fortiori 3k is greater than 2n. Hence, in the value of dp/dr, the term in 7 is always greater than that in & so long as the pressure is internal. Thus the radial effect is compression at all parts of the walls. But, when the pressure is external, we may (if the walls be thick enough) find a value of x for which 1 "we 2 ae a In glass, this occurs when r=1°6a, nearly. At this distance from the axis there is no radial change of length; at greater distances there is radial compression, and at smaller radial extension. This is indicated in the diagrams C and D in fig. 66, which like the former are greatly exaggerated. They represent the distortion

The numerical value of the factor 1 is about zy for

of small spherical elements of a thick tube,—the first at the inner wall, the second at the outer surface. As before, these are sections made by a plane perpendicular to the axis of the cylinder.

§ 283. In a spherical shell of internal and external radii a) and Spherica} a, the equations become a little more simple on account of the shell more complete symmetry. under

Using the same notation, so far as it is now applicable, we have external

ressure, de £—(¢-f)Py-fP a a

dr The statical equation is

as QrP, = at Ped . With these we obtain, for external pressure TI, the result

a oe A – Neca ge tae ,

from which the other equation may be derived by differentiation. § 284. The propagation of plane waves in an elastic

solid has been discussed in ELASTICITY, and the mechanics of fluids is discussed under HYDROMECHANICS.

GENERAL CONSIDERATIONS.

§ 285. The preceding view of the subject of Abstract General Dynamics has been based entirely upon Newton's Laws of consi- Motion, which were adopted without discussion, as a com- 4 plete and perfectly definite foundation; and the terms — employed, as well as the mode of treatment in general, have somewhat closely followed Newton's system. The only considerable apparent departure from that system is connected with the development of the idea of energy, and its application to the simplification of many of the methods and results. This also was, as we have seen, really introduced by Newton; but it has been immensely extended since his time both by mathematical and by experimental processes. It is time that we should now return to the laws of motion, and examine more closely, in the

light of what we have learned, one or two of the more prominent ideas which they embody. To do so fairly we must go back to Newton's own definitions of the terms which he employs. About many of these, which have already been quoted in §§ 97-113, there is no difference of opinion, But it is otherwise when we come to the

' definition of "force" (S§ 5, 104).

There can be no doubt that the proper use of the term Force. "force" in modern science is that which is implied in the statement of the first law of motion, as we rendered it in §1 from Newton's Latin. It is thus seen to be the English equivalent of the term ws impressa. Newton uses the word vis in other connexions, and with a certain vague- ness inevitable at a time when the terminology of science was still only shaping itself ; but his idea of "force" was perfectly definite, and when ¢his is in his mind the vague word ws is (when necessary) always qualified and rendered precise, either by the addition of «mpressa or in some equally unambiguous way. To render ws by " force," wher- ever it stands without the cmpressa or its equivalents, 1s to introduce a quite gratuitous confusion for which Newton is not responsible. We have only to think of the multitude of terms, such as vs insita (inertia), vis acceleratrix (accel- eration), vs ava (kinetic energy), &c., &c., to see that all such complex expressions must be regarded as wholes, and that v7s does not mean "force" in any one of them.

§ 286. Thus in Newton's view force zs whatever changes (but not " or tends to change") a body's state of rest or of uniform motion in a straight line.

He mentions, as instances, percussion, pressure, and central force.! Under the last of these heads he expressly includes magnetic as well as gravitational force. Thus

1 Vis centripeta. It has been already explained that such words as centripeta include impressa, so that the above rendering of Newton's phrase is the obvious one.

Equili- brium.

Origin of

the idea of force.

Stress,

Tension and pressure,

MECH AN IT Cs

force nay huve different origins, but it is always one and | the same; and it produces, in any body to which it is | applied, a change of momentum in its own direction, and in amount proportional to its magnitude and to the time – during which it acts. | § 287. Thus, from Newton's point of view, equilibrium is not a balancing of forces, but a balancing of the effects of | forces. When a mass rests ov a table, gravity produces in it a vertically downward velocity which is continually neutral- |

ized by the equal upward velocity produced by the reaction | of the table; and these forces, whose origins and places of | application are alike so widely different, are (as forces), in | every respect except direction, similar and equal. And they are so because they produce, in equal times, equal and opposite quantities of motion.

§ 288. The idea of "force" was undoubtedly suggested by the "muscular sense"; and there can be no question as to the vividness of the sensation of effort we experience when we try to lift a heavy weight or to opena massive gate. In this, as in other cases, it is the business of science to find what objective fact corresponds to the subjective data of sensation. It is very difficult to realize the fact, certain as it is, that light (in the sense of brightness) is a. mere sensation or subjective impression, and has no objective existence. Yet we know that, beside those radiations which give us the sensation of light, there are others, in endless series both higher and lower in their refrangibility, to which our eyes are absolutely blind. And the only difference between these and the former is one of mere wave-length or of period of vibration. Similarly, it is very hard to realize the fact that sound (in the sense of noise) is only a sensation; and that outside us there is merely a series of alternate compressions and dilatations of the air, the great majority of which produce no sensible | effect upon our ears. Thus because we know that we should seek in vain for brightness or noise in the

external world, familiar as our senses have rendered us with these conceptions, we are driven to inquire whether the idea | of force may not also be a mere suggestion of sense, corre: sponding (no doubt) to some process going on outside us, | but quite as different from the sensation which suggests it as is a periodic shearing of the ether from brightness, or a periodic change of density of air from noise.

§ 289. So far, we have treated of force as acting on a body without inquiring whence or why ; we have referred to the first and second laws of motion only, and have thus seen | only one half of the phenomenon. As soon, however, as we turn to the third law, we find a new light cast on the question. Force is always dual. To every action there is always an equal and contrary reaction. Thus the weight which we lift or try to lift, and the massive gate which | we open or try to open, both as truly exert force upon our hands as we do upon them. This looking to the other side of the account, as it were, puts matters in a very different aspect. 'Do you mean to tell me," said a medical man of the old school, "that, if I pull a 'subject' by the hand, it will pull me with an equal and opposite force?" When he was convinced of the truth of this state- ment, he gave up the objectivity of force at once.

§ 290. The third law, in modern phraseology, is merely this :—

Every action between two bodies is a stress.

When we pull one end of a string, the other end being | fixed, we produce what is called ¢ension in the string. When we push one end of a beam, of which the other end is fixed, we produce what is called pressure throughout the beam. Leaving out of account, for the moment, the effects | of gravity, this merely amounts to saying that there is stress | across every transverse section of the string or beam. But, in the case of the string, the part of the stress which every |

| of the objective realities in the physical world.

portion exerts on the adjoining portion is a pull; in the case of the beam it is a push. And all this distribution of stress, though exerted across every one of the infinitely numerous cross sections of the string or beam, disappears the moment we let go the end. We can thus, by a touch, call into action at will an infinite number of stresses, and put them out of existeuce again as easily. This, of itself, is a very strong argument against the supposition that

| force, in any form, can have objective reality.

§ 291. We must now say a word or two on the question If we inquire carefully into the grounds we have for believing that matter (whatever it may be) has objective existence,

_ we find that by far the most convincing of them is what

may be called the " conservation of matter." This means that, do what we will, we cannot alter the mass or quantity of a portion of matter. We may change its form, dimen- sions, state of aggregation, &c., or (by chemical processes) we niay entirely alter its appearance and properties, but its quantity remains unchanged. _ It is this experimental result which has led, by the aid of the balance, to the immense developments of modern chemistry. If we receive this as evidence of the objective reality of matter, we must allow objective reality to anything else which we find to be conserved in the same sense as matter is conserved. Now there is no such thing as negative mass; mass is,

| in mathematical language, a signless quantity. Hence the | conservation of matter does not contemplate the simul-

taneous production of equal quantities of positive and negative mass, thus leaving the (algebraic) sum un- changed. But this is the nature of conservation of momentum (§ 165) and of moment of momentum. The only other known thing in the physical universe, which is conserved in the same sense as matter is conserved, is energy. Hence we naturally consider energy as the other objective reality in the physical universe, and look to it for information as to the true nature of what we call force.

§ 292. When we do so, the answer is easily obtained, and ina completely satisfactory form. We give only a very simple instance. When a stone, whose mass is M and weight W, las fallen through a space h towards the earth, it has acquired a speed 2, which (§ 28) is given by the equation

4Mv?=Wh.

This is a particular case of the conservation of energy, but the terms in which it is expressed are those suggested by Newton's laws of motion, and are therefore based on the recognition of "force." The first member of the equation represents the kinetic energy acquired; the second the potential energy lost, or the work done by gravity upon the stone during its fall. Both members therefore express real things, having objective existence.

But the "force" (so-called) which is said to have pro- duced the motion, has the value

W=iMer7/h, ie, it is the rate per unit of length, at which potential

energy is converted into kinetic energy during the fall. In other words, it is merely an expression for the space-rate

at which energy is transformed.

§ 293. Another mode of presenting the case will make this still more clear. The average speed with which the stone falls is (§ 28) /2. Divide both sides of the equation above by this quantity, remembering that 2h/v is the time of falling, which we call ¢ We have thus, as another perfectly legitimate deduction from our premises,

W=Mo/t.

Here the (so-called) force appears in a new light. It is now the time-rate at which momentum is generated in the falling stone.

Objective physical realities.

True nature of force.

Space- rate of transfor- mation of

energy.

Time- rate of change of momen- tum.

Rate.

Potential

energy kinetic.

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§ 294. The statements in the last two sections are, in fact, merely particular cases of Newton's two interpreta- tions of action in the third law, which have already been

discussed ($§ 165, 167).

Analytically, the whole affair is merely this : if s be the space described, v the speed of a particle,

ES SS

di ds'dt "ds"

Hence the equation of motion (formed by the second law) mi=mv=f,

which gives / as the time-rate of incrcasc of momentum, may be

written in the new form

mo = ¢ (ye) = the giving f as the space-rate of increase of kinetic energy.

§ 295. But a mere rate, be it a space-rate or a time-rate, is not a thing which has objective existence. Noone would confound the bank rate of interest with a sum of money, nor the birth or death rate of a country with a group of individual human beings. These rates are, in fact, mere abstract

numbers, by the help of which a man may com- pute interest per annum froin the amount of capital, or the number of infants per annum from the amount of the population. The gradient of temperature, in an irregularly heated body, is a mere vector-rate, by the help of which we can calculate how much energy (in the form of heat) passes ina given time across any assigned surface in the body. To attribute objectivity to a rate is even more ridiculous than it would be to attribute it to a sensation, or to a thought, or to a word or phrase which we find useful in characterizing some material object.

§ 296. On the other hand, all these different kinds of rates have been introduced and continue to be employed, be- cause they have been found to be useful. There is no harm done by retaining them, provided those who use them know that they are introduced for convenience of expression, and not because there are objective realities corresponding to them. Even such a term as "centrifugal force" is some- times useful ; but always under the proviso that he who employs it shall remember that it is only one side of the stress under which a particle of matter is compelled, in spite of its inertia, to move inacurved line. But the term must be taken, like "algebra," "theodolite," " Abracadabra," or any other combination of letters whose derivation is un- certain or unknown, as one and indivisible, to which a certain definite meaning is attached, and as having nothing whatever to do with tlhe meaning or derivation of the word centrifugal, whose embodiment in it is a perennial monumeut to the memory of an old error.

§ 297. The main characteristics of energy, especially from the experimental point of view, have already been discussed under Dynamics (¢.v.) and ENERGY (¢.v.). But there is one point of importance connected with it which comes more naturally here than in either of the articles referred to.

When two measurable quantities, of any kind, are equi- valent to one another, their numerical expressions must involve the same fundamental units, and in the same manner. 'This is obvious from the fact that an alteration of any unit alters in the inverse ratio the numerical measure of any quantity which is a mere multiple of it. And equivalent quantities must always be expressed by equal numbers when both are measured im terms of the same system of units. It appears, therefore, from the conservation of

energy directly, as well as from the special data in §§ 111, 113, that potential energy must, like kinetic energy, be of dimensions [ML?T~?].

Now it is impossible to conceive of a truly dormant form of energy whose magnitude should depend in any way on the unit of time; and we are therefore forced to the con-

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(in some as yet unexplained, or rather unimagined, way) upon motion. For the immediate purposes of this article the question is not one of importance. We have been dealing with the more direct consequences of a very compact set of laws, exceedingly simple in themselves, originally based upon observation and experiment, and, most certainly, true. But reason cannot content itself with the mere consequences of a series of observed facts, however elegantly and concisely these may be stated by the help of new terms and their definitions. We are forced to inquire into what may underlie these definitions, and the laws which are observed to regulate the things signified by them. And the conclusion which appears inevitable is that, whatever matter may be, the other reality in the physical universe, energy, which is never found unassociated with matter, depends in all its widely varied forms upon motion of matter. In some cases we are sure, in others we can as yet only suspect, that it depends upon motions ina medium which, unlike ordinary matter, has not yet been subjected to the scrutiny of the chemist. But the question, in its generality, is one of the most obscure in the whole range of physics. In the articles Atom, ATTRacTION, Etuer, will be found nearly all that is yet known on this profoundly difficult subject. But to what is there said must be added the remark that a state of strain of the ether, whether associated with the propagation of light and radiant heat or with a statical distribution of electricity, represents so much "potential" energy, and must in its turn in some way depend on motion.

§ 298. The remarks of Clerk Maxwell on the nature of Maxwell

the evidence for Newton's jirst law of motion raise a

question, in some respects novel, but in all respects well ™™

worthy of careful study. He says :—

‘Our conviction of the truth of this law may be greatly strengthened by considering what is involved in a denial of it. Given a body in motion, Ata given instant let it be left to itself and not acted on by any force. What will happen? According to Newton’s law it will persevere in moving uniformly in a straight line ; that is, its velocity will remain constant both in direction and magnitude,

*‘*If the velocity does not remain constant let us suppose it to vary. The change of velocity must have a definite direction and magnitude. By the maxim that the same causes will always pro- duce the same effects, this variation must be the same whatever be the time or place of the experiment. The direction of the change of motion must therefore be determined either by the direction of the motion itself, or by some direction fixed in the body. Let us, in the first place, suppose the law to be that the velocity diminishes at a certain rate, which, for the sake of the argument, we may suppose so slow that by no experiments on moving bodies could we have detected the diminution of velocity in hundreds of years. The velocity referred to in this hypothetical law can only be the velocity referred to a point absolutely at rest. For if it isa relative velocity, its direction as well as its magnitude depends on the velocity of the point of reference. If, when referred to a certain point, the body appears to be moving northward with diminishing velocity, we have only to refer it to another point moving northward with a uniform velocity greater than that of the body, and it will appear to be moving southward with increasing velocity. – Hence the hypothetical law is without meaning, unless we admit the possibility of defining absolute rest and absolute Velocity. <.0-0 a.*

“‘It may thus be shown that the denial of Newton’s law is im contradiction to the only system of consistent doctrine about space and time which the human mind has been able to form.”

This is a good example of a valuable application of a Principle

principle which, in its widest scope, is inconsistent with of the true foundations of physical science. It is, in fact, the exceedingly dangerous “

principle of sufficient reason”— which requires for its legitimate use the utmost talent and knowledge on the part of the user.

§ 299. But in all methods and systems which involve the ee i, e aws

motion.

idea of force there is the leaven of artificiality. Zhe tru laws of motion, based entirely on experiments of the most extensive and most varied kinds, are those of the conserva-

clusion that potential energy, like kinetic energy, depends | tion and of the transformation of energy. With the help

sufficient reason.

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of kinematical ideas, it is easy to base the whole science of | work claim the position of “restorers,” not of innovators; and » Pp 2

dynamics on these principles ; and there is no necessity for the introduction of the word “force” nor of the sense- suggested ideas on which it was originally based.

§ 300. Nothing beyond a mere mention has been made above of virtual velocities, and of the so-called element- ary machines. These belong to the subject of Applied Mechanics, separately treated below.

§ 301. The references which have been made to various grand theories, such as action, impulse in general, c&c., have been illustrated by simple cases only. For a detailed examination of these theories the reader is referred to Thomson and Tait’s Natural Philosophy, chap. ii. To the same work he is referred for the general “theory of small oscillations,” the “ dissipative function,” the “‘ignoration of coordinates,” the treatment of

“gyrostatic systems” and of “kinetic stability.” All of these have been exhibited, though in mere particular instances, in the preceding pages.

Treatises on Mechanics.

§ 302. The following works on Mechanics are indispensable :—

1, Newton’s Principia (1st ed., 1687; latest ed., Glasgow, 1871). Here, for the first time, the fundamental principles were systematized, extended (as we have seen) in a most vital particular,

and applied, by the aid of a new mathematical method of immense

power (based entirely on kinematical considerations), to many of the inost important questions of cosmical and terrestrial dynamics,

Newton’s system was first taught in the university of Edinburgh ; and, with brief intervals, his methods also have been habitually kept before the students there. From the time of Maclanrin to that of Forbes the value of the qnasi-geometrical methods in giving a clear insight into the probleins treated has rarely been overlooked. In Cambridge these methods were of later introduction, but they still deservedly figure as a necessary part of the reading of candi- dates for “‘mathematical honours.” It is to be feared, however, that in some other British universities the study of Newton’s methods is not prosecuted to anything like the same extent. But the very reverse seems to be the case in America, where, probably to a considerable extent on this account, mathematical physics is advancing in a most remarkable manner.

2, Lagrange’s Mécanique Analytique (Ist ed., 1788). Thongh objections may fairly be taken to the fundamental method of this work, there can be no question as to the immeuse power and origin- ality ofitsauthor. His “generalized coordinates,” and the equations of motion of a system in terins of these, form one of the most im- portant contributions to the science since the days of Newton. The method of Lagrange, though he was not aware of the fact, is really based upon the consideration of energy ; aud when, in quite recent times, experiment had shown what are the grand laws

of energy, Lagrange's magnificent mathematical methods and results were ready for translation into the new language of science.

3. Hamilton's papers in the Philosophical Transactions for 1833 and 1834. Here the principle of varying action, and the eharacteristic function, were first applied to mechanics ;—though they had been given, some years before, to the Royal Ivish Academy, in their optical applications. Grand as have been the extensions of these new ideas made by Hamilton himself, and by many others, among whom Jacobi and Liouville may be especi- ally mentioned, they have been mainly in a purely mathe- matical direction. We wait for what cannot now be long delayed, the eoming of the philosopher who is to tell us the true dynamical bearings of varying action and of the characteristic function.

4. If to these we add some of the works of Galileo, Huygens, Euler, Maclaurin, and D'Alembert, we have the great landmarks in the history of the subject, as distinguished from its development.

5. The mere enumeration of the more important developments which the subject has received, as distinguished from the absolutely uew grand ideas aud methods introduced, would require a long article. Brilliant examples of what may be done in this direction are furnished by Stokes's 'Report on Recent Researches in Hydro- dynamics" and by Cayley's 'Reports on Theoretical Dynamics" (printed in the British Association Reports for 1846, and for 1857 and 1862). These should be consulted by every student who desires to trace the growth of the subject. 'They have been sne- ceeded, in the same Reports (1880, 1881) by two excellent sum- maries, by Hicks, of ' Recent Progress in Hydrodynamics."*

But Laplace's Mécanique Celeste, Poisson's Mécanique, Poinsot's Théorie Nouvelle de la Rotation, &c., more or less parts of the Immediate outcome of the period when France intellectually dwarfed the rest of the world, are still of far more than mere historic value.

For the English-reading student of modern times, the work of Thomson and Tait will be found suitable. The authors of this

they have (since 1863, when the first short sketch of their work was published) striven with success to re-establisl in Britain Newton's grand yet simple foundations of the subject. But these foundations, as stated above, are only temporarily the best. We have not, as yet, anything uearly so good.

*Other modern works of value are the Analytic Mechanics of the late Professor Peirce (Boston, 1855) and Kirchhofi's Vorleswngen liber Mathematische Physik (Leipsic, 1876). Both are rather of the nature of collections of short treatises on special questions than organized wholes, but both will well repay careful reading. This, in the case of Peirce's work, is rendered extremely puzzling and laborious by the peculiar notations and modes of reference adopted by the author. It is particularly interesting to study the ways in which the fundamental principles are introduced in these works, aud to compare them with the corresponding parts of the works of Newton and Lagrange. Lagrange, Peirce, and Kirchhoff construct each a system as frce from anything but analysis as possible. In fact Lagrange prefaces his work by the characteristic statement, *"On ne trouvera point de Figures dans cet ouvrage. Les méthodes que j'y expose ne demandent ui constructious, ni raisonnemens géométriques ou méchaniques, mais seulement des opérations algébriques, assujetties & une marche réguliere et uniforme. Ceux qui aiment |'Analyse verront avec plaisir la Méchanique en devenir une nouvelle branche." . . . . How far we have considered it ex-pedient to differ from such an authority, a glance at the preceding pages will show.*

A part of the detailed work of several of the examples above given in Dynamics of a Particle has been taken from the elementary treatise (with that title) of Tait and Steele. The English reader who wishes to pursue elementary Statics may profitably consult the treatise of Minchin. The higher parts are discussed in the work of Somoff, Theoretische Mechanik (Leipsic, 1879). An excellent introduction to the use of Generalized Coordinates has been pub- lished by Watson and Burbury (1879). On Lagrange's Generalized Equations the student should also read in Maxwell's J'reatise on Lleetricity and Magnetism, part iv. chap. v. And Maxwell's brief treatise on Matter and Motion should be in the hands of every one commencing the subject.

ANALYSIS OF THE PRECEDING ARTICLE.

Newron's Laws oF Morion, with Comments, assumed as the basis of the article, §§ 1-18.

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MECHANICS

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1. The practical applications of mechanics may be divided into two classes, according as the assemblages of material objects to which they relate are intended to remain fixed or to move rela- tively to each other,—the former class being comprehended under the term "Theory of Structures," and the latter under the term "Theory of Machines." As the details of the theory of structures are dealt with in other articles, it will be treated of here to such extent only as may be necessary in order to state certain general principles applicable to all these subjects. The greater part of the article will relate to machines.

PART I. OUTLINE OF THE THEORY OF STRUCTURES.

2. Support of Structures.—Every structure, as a whole, is main- tained in equilibrium by the joint action of its own weight, of the external load or pressure applied to it from without and tending to displace it, and of the resistance of the material which supports it. A structure is supported either

*by resting on the solid crust of the earth, as buildings do, or by floating in a fluid, as ships do in water and balloons in air. The principles of the support of a floating structure form an important part of HypRoMECHANICS (q.v.). The principles of the support, as a whole, of a structure resting on the land, are so far identical with those which regulate the equilibrium and stability of the several parts of that structure, and of which a summary will presently be given, that the only principle which seems to require special mention here is one which comprehends in one statement the power both of liquids and of loose earth to support structures, and which was first demonstrated in a paper **On the Stability of Loose Earth," read to the Royal Society on the 19th of June 1856, and published in the Philosophical Trans- actions for that year, viz. :—*

Let E represent the weight of the portion of a horizontal stratum of earth which is displaced by the foundation of a structure, S the utmost weight of that structure consistently with the power of the earth to resist displacement, ¢ the angle of repose of the earth ;

then z-(i fang)" E \1-sing/~ To apply this to liquids, ¢ must be made =0, and then > =1, as

E is well known.

3. Composition of a Strueture, and Connexion of its Pieces.—A structure is composed of pieces,—such as the stones of a building iu masonry, the beams of a timber frame-work, the bars, plates, and bolts of an iron bridge. Those pieces are connected at their joints or surfaces of mutual contact, either by simple pressure and friction (as in masonry with moist mortar or without mortar), by pressure and adhesion (as in masonry with cement or with hardened mortar, and timber with glue), or by the resistance of fastenings of different kinds, whether made by means of the form of the joint (as dovetails, notches, mortises, and tenons) or by separate fastening pieces (as trenails, pins, spikes, nails, holdfasts, screws, bolts, rivets, hoops, straps, and sockets).

4, Stability, Stiffness, and Strength.—A structure may be damaged or destroyed in three ways :—first, by displacement of its pieces from their proper positions relatively to each other or to the earth ; secondly, by

disfigurement of one or more of those pieces, owing to their being unable to preserve their proper shapes under the pressures to which they are subjected ; thirdly, by breaking of one or more of those pieces. The power of resisting displacement constitutes stability ; the power of each piece to resist disfigurement is its stiffness ; and its power to resist breaking, its strength.

5. Conditions of Stability.—The principles of the stability of a structure can be to a certain extent investigated independently of the stiffness and strength, by assuming, in the first instance, that each piece has strength sufficient to be safe against being broken, and stiffness sufficient to prevent its being disfigured to an extent inconsistent with the purposes of the structure, by the greatest forces which are to be applied to it. The condition that each piece of the structure is to be maintained in equilibrium by having its gross load, consisting of its own weight and of the external pressure applied to it, balanced by the resistances or pressures exerted between it and the contiguous pieces, furnishes the means of determining the magnitude, position, and direction of the resistances required at each joint in order to produce equilibrium ; and the conditions of stability are, first, that the position, and, secondly, that the direetion, of the resistance required at each joint shall, under all the variations to which the load is subject, be such as the joint is capable of exert- ing,—conditions which are fulfilled by suitably adjusting the figures and positions of the joints, and the ratios of the gross loads of the pieces. As for the magnitude of the resistance, it is limited by con- ditions, not of stability, but of strength and stiffness.

6. Prinetple of Least Resistanee.—Where more than one system of resistances are alike capable of balancing the same system of loads

applied to a given structure, it has been demonstrated by Moseley that the smallest of those alternative systems is that which will actually be exerted, —because the resistances to displacement are the effect of a strained state of the pieces, which strained state is the effect of the load, and when the load is applied the strained state and the resistances produced by it increase until the resistances acquire just those magnitudes which are sufficient to balance the load, after which they increase no further.

This principle of least resistance renders determinate many problems in the statics of structures which were formerly considered indeterminate.

7. Relations between Polygons of Loads and of Resistanees.—In a structure in which each piece is supported at two joints only, the well-known laws of statics show that the directions of the gross load on each piece and of the two resistances by which it is supported must lie in one plane, mnst either be parallel or meet in one point, and must bear toeach other, if not parallel, the proportions of the sides of a triangle respectively parallel to their directions, and, if parallel, such proportions that each of the three forces shall be proportional to the distance between the other two,—all the three distances being measured along one direction.

Considering, in the first place, the case in which the load and the two resistances by which each piece is balanced meet in one point, which may be called the centre of load, there will be as many such points of intersection, or centres of load, as there are pieces in the structure ; and the directions and positions of the resistances or mutual pressures exerted between the pieces will be represented by the sides of a polygon joining those points, as in fig. 1, where P,, 29 Ps, Py represent the centres of load in a structure of four pieces, and the sides of the polygon of resist- ances PPaP5P, Fig. 1.

Tepresent respec- – f

tively the directions and position. of the resistances exerted at the joints. Further, at any one of the centres of load let PL represent the magnitude and direction of the gross load, and Pa, Pd the two resistances by which the piece to which that load is applied is supported ; then will those three lines be respectively the diagonal and sides of a parallelogram ; or, what is the same thing, they will be equal to the three sides of a triangle ; and they must be in the same plane, although the sides of the polygon of resistances may be in different planes. ;

According to a well-known principle of statics, because the loads or external pressures P,L,, &c., balance each other, they must be proportional to the sides of a closed poly- gon drawn respectively parallel to their directions. In fig. 2 construct such a polygon of loads by drawing the lines

Ly, &e., parallel and proportional to, and joined end to end in the order of, the gross loads on the pieces of the structure. Then from the proportionality and paral- lelism of the load and the two resistances applied to each piece of the structure to the three sides of a triangle, there results the following theorem [originally due to Rankine] :— = be oe m

If from the angles of the polygon o : toads ps be drawn lines (Ry, R,, &c.), Fig. 2. each of which is parallel to the resistance (as PPs, &c.) exerted at the joint between the pieces to whieh the two loads represented by the contiguous sides of the polygon of loads (such as ly, L,, &¢.) are applied ; then will all those lines meet in one point (O), and their lengths, measured from that point to the angles of the polygon, will represent the magnitudes of the resistances to which they are respectively parallel. ;

When the load on one of the pieces is parallel to the resistances which balance it, the polygon of resistances ceases to be closed, two of the sides becoming parallel to each other and to the load in question, and extending indefinitely. In the polygon of loads the direction of a load sustained by parallel resistances traverses the

oint O. . 8. How the Earth's Resistance ts to be treated, —When the pressure exerted by a structure on the earth (to which the earth's resistance is equal and opposite) consists either of one pressure, which ' necessarily the resultant of the weight of the structure and ee the other forces applied to it, or of two or more parallel vertica forces, whose amount can be determined at the outset of the

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investigation, the resistance of the earth can be treated as one or more upward loads applied to the structure. But in other cases the earth is to be treated as one of the pieces of the structure, loaded with a force equal and opposite in direction and position to the resultant of the weight of the structure and of the other pressures applied

it.

9. Partial Polygons of Resistance.—In a structure in which there are pieces supported at more than two joints, let a polygon be con- structed of lines connecting the centres of load of any continuous series of pieces. This may be calleda partial polygon of resistances. In considering its propertics, the load at each centre of load is to be held to inelude the resistances of those joints which are not com- prehended in the partial polygon of resistances, to which the theorem of section 7 will then apply in every respect. By constructing several partial polygons, and computing the relations between the Joads and resistances which are determined by the application of that theorem to each of them, with the aid, if necessary, of Moseley's principle of the least resistance, the whole of the relations amongst the loads and resistances may be found.

10. Line of Presswres—Centres and Line of Resistance.—The line of pressures is a line to which the directions of all the resistances in one polygon are tangents. The centre of resistance at any joint is the point where the line representing the total resistance exerted at that joint intersects the joint. The line of resistance is a line tra- yersing all the centres of resistance of a series of joints, —its form, in the positions intermediate between the actual joints of the structure, being determined by supposing the pieces and their loads to be sub- divided by the introduction of intermediate joints ad infinitum, and finding the continuous line, curved or straight, in which the in- termediate centres of resistance are all situated, however great their number. The difference between the line of resistance and the line of pressures was first pointed out by Moseley.

ll. Stability of Position, and Stability of Frietion.—The resist- ances at the several joints having been determined by the principles set forth in sections 6, 7, 8, 9, and 10, not only under the ordinary load of the structure, but under all the variations to which the load is subject as to amount and distribution, the joints are now to be placed and shaped so that the pieces shall not suffer relative dis- placement under any of those loads. The relative displacement of the two pieces which abut against each other at a joint may take place either by turning or by sliding. Safety against displacement by turning is called stability of position ; safety against displace- ment by sliding, stability of friction.

12. Condition of Stability of Position.—If the materials of a struc- ture were infinitely stiff and strong, stability of position at any joint would be insured simply by making the centre of resistance fall within the joint under all possible variations of load. In order to allow for the finite stiffness and strength of materials, the least dis- tance of the centre of resistance inward from the nearest edge of the joint is made to bear a definite proportion to the depth of the joint measured in the same direction, which proportion is fixed, some- times empirically, sometimes by theoretical deduction from the laws of the strength of materials. That least distance is called by Moseley the modulus of stability. The following are some of the ratios of the modulus of stability to the depth of the joint which occur in practice :—

Retaining walls, as designed by British engineers…

Retaining walls, as designed by French engineers…....

Rectangular piers of bridges and other buildings, and arcl

Rectangular foundations, firm Ground …..++..sseeceecesnneceeee stereos cones

Rectangular foundations, very soft Ground ….....s.—ssssseeeeeeeeeeeeres

Rectangular foundations, intermediate kinds of ground…..... 1:3 to

Thin, hollow towers (such as furnace chimneys exposed to high

WINS), SQUATE .....2ccccescnnereereseoe croseteeecen scree ces ccasceeseusersesenees Thin, hollow towers, CiVclar …...
—..s+++-0eeseesesecceeeeeceneenseseeecesesess Frames of timber or metal, under their ordinary or average distri-

Dution Of]Oad ….....e.ceeceeseccceccseeeesencce-
ccteeeeenesssascencsncseceeseccs 1: Frames of timber or metal, under the greatest irregularities of

]OAd …..0ccccecccccsecsstsecsscccescceescensecerseacesseeeeeecesee cscs ssccaccecncesenes 1:3

In the case of the towers, the depth of the joint is to be understood to mean the diameter of the tower.

13. Condition of Stability of Frietion.—If the resistance to be exerted at a joint is always perpendicular to the surfaces which abut at and form that joint, there is no tendency of the pieces to be displaced N by sliding. If the resistance be oblique, let JK (fig. 3) be the joint, C its centre of resistance, CR a line representing the resistance, CN a perpendicular to the joint at the centre of resistance. The angle NCR is the obliquity of the resistance. From R draw RP parallel and RQ perpendicular to the joint; then, by the principles of statics, the eomponent of the resistance normal to the joint is—

mt eth fh et pak bt wo MBO NN WWD

CP=CR .cos

If the joint be provided either with projections and recesses, such as mortises and tenons, or with fastenings, such as pins or bolts, so as to resist displacement by sliding, the question of the utmost amount of the tangential resistance CQ which it is eapable of exerting depends on the strength of such projections, recesses, or fastenings, and belongs to the subject of strength, and not to that of stability. In other cases the safety of the joint against displacement by sliding depends on its power of exerting friction, and that power depen ds on the law, known by experiment, that the friction between two surfaces bears a constant ratio, depending on the nature of the surfaces, to the force by which they are pressed together. In order that the surfaces which abut at the joint JK may be pressed together, the resistance required by the conditions of equilibrium, CR, must be a thrust and not a pull; and in that case the force by which the surfaces are pressed together is equal and opposite to the normal component CP of the resistance. The condition of stability of friction is that the tangential component CQ of the resistance required shall not exceed the friction due to the normal component ;

that is, that CQH f. CP,

where f denotes the coefficient of frietion for the surfaces in question. The angle whose tangent is the coefficient of friction is called the angle of repose, and is expressed symbolically by—

@=tan -)/. Now CQ=CP. tan <PCR ; consequently the condition of stability of friction is fulfilled if

that is to say, if the obliquity of the resistance required at the joint does not exceed the angle of repose ; and this condition ought to be fulfilled under all possible variations of the load.

It is chiefly in masonry and earthwork that stability of friction is relied on.

14. Stability of Friction in Earth.—The grains of a mass of loose earth are to be regarded as so many separate pieces abutting against each other at joints in all possible positions, and depending for their stability on friction. 'To determine whether a mass of earth is stable at a given point, conceive that point to be traversed by planes in all possible positions, and determine which position gives the greatest obliquity to the total pressure exerted between the por- tions of the mass which abut against each other at the plane. T'he condition of stability is that this obliquity shall not exceed the angle of repose of the earth. The consequences of this principle are developed in a paper "On the Stability of Loose Earth," already cited in sect. 2.

15. Parallel Projections of Figures.—lf any figure be referred to a system of coordinates, rectangular or oblique, and if a second figure be constructed by means of a second system of coordinates, rectangular or oblique, and either agreeing with or differing from the first system in rectangularity or obliquity, but so related to the coordinates of the first figure that for cach point in the first figure there shall be a corresponding point in the second figure, the lengths of whose coordinates shall bear respectively to the three corre- sponding coordinates of the corresponding point in the first figure three ratios which are the same for every pair of corresponding points in the two figures, these corresponding figures are called parallel projections of each other. The properties of parallel pro- jections of most importance to the subject of the present article are the following :—

(1) A parallel projection of a straight line is a straight line.

(2) A parallel projection of a plane is a plane.

(3) A parallel projection of a straight line or a plane surface divided in a given ratio is a straight line or a plane surface divided in the same ratio.

(4) A parallel projection of a pair of equal and parallel straight lines, or plain surfaces, is a pair of equal and parallel straight lines, or plane surfaces ; whenee it follows

(5) That a parallel projection of a parallelogram is a parallelo-

ram, and

(6) That a parallel projection of a parallelepiped is a parallel- epiped.

PO) A parallel projection of a pair of solids having a given ratio is a pair of solids having the same ratio.

Though not essential for the purposes of the present article, the following consequence will serve to illustrate the principle of parallel projections :—

(8) A parallel projection of a curve, or of a surface of a given algebraical order, is a curve or a surface of the same order.

For example, all ellipsoids referred to coordinates parallel to any three conjugate diameters are parallel projections of each other and of a sphere referred to rectangular coordinates.

16. Parallel Projections of Systems of Forces. —If a balanced system of forces be represented by a system of lines, then will every parallel projection of that system of lines represent a balanced system of forces. ,

For the condition of cquilibrium of forces not parallel is that | they shall be represented in direction and magnitude by the sides and diagonals of certain parallelograms, and of parallel forces that they shall divide certain

straight lines in certain ratios; and the parallel projection of a parallelogram is a parallelogram, and that of a straight line divided ina given ratio is a straight line divided in the same ratio.

The resultant of a parallel projection of any system of forces is the projection of their resultant ; and the centre of gravity of a parallel projection of a solid is the projection of the centre of gravity of the first solid.

17. Principle of the Transformation of Structures.—Here we have the following theorem :—If a structure of a given figure have stability of position under a system of forces represented by a given system of lines, then will any structure whose figure is a parallel projection of that of the first structure have stability of position under a system of forces represented by the corresponding projection of the first system of lines.

For in the second structure the weights, external pressures, and resistances will balance each other as in the first structure ; the weights of the pieces and all other parallel systems of forces will have the same ratios as in the first structure; and the several centres of resistance will divide the depths of the joints in the same proportions as in the first structure.

If the first structure have stability of friction, the second struc- ture will have stability of friction also, so long as the effect of the projection is not to increase the obliquity of the resistance at any joint beyond the angle of repose.

The lines representing the forces in the second figure show their relative directions and magnitudes. To find their absolute directions aud magnitudes, a vertical line is to be drawn in the first figure, of such a length as to represent the weight of a particular portion of the structure. Then will the projection of that line in the projected figure indicate the vertical direction, and represent the weight of the part of the second structure corresponding to the before- mentioned portion of the first structure.

The foregoing "principle of the transformation of structures" was first announced, though in a somewhat less comprehensive form, to the Royal Society on the 6th of March 1856. It is useful in practice, by enabling the engineer easily to deduce the conditions of equilibrium and stability of structures of complex and unsyinmetrical figures from those of structures of simple and symmetrical figures. By its aid, for example, the whole of the properties of elliptical arches, whether square or skew, whether level or sloping in their span, are at once deduced by projection from those of symmetrical circular arches, and the properties of ellipsoidal and elliptic-conoidal domes from those of hemispherical and circu- lar-conoidal domes ; and the figures of arches fitted to resist the thrust of earth, which is less horizontally than vertically in a cer- tain given ratio, can be deduced by a projection from those of arches fitted to resist the thrust of a liquid, which is of equal intensity, horizontally and vertically.

18. Conditions of Stiffness and Strength.—After the arrangement of the pieces of a structure and the size and figure of thcir joints or surfaces of contact have been determined so as to fulfil the conditions of stability,—conditions which depend mainly on the position and direction of the resultant or total load on each piece, and the

relative magnitude of the loads on the different pieces,—the dimen- | sions of each piece singly have to be adjusted so as to fulfil the con- |

ditions of stiffness and strength, —conditions which depend not ouly ou the absolute magnitude of the load on each piece, and of the resistances by which it is balanced, but also on the mode of distri- bution of the load over the piece, and of the resistances over the joints.

The effect of the pressures applicd to a piece, consisting of the load and the supporting resistances, is to force the piece into a state of strain or disfigurement, which increases until the elasticity, or resistance to strain, of the material causes it to exert a stress, or effort to recover its figure, equal and opposite to the system of applied pressures. The condition of stiffness is that the strain or disfigurement shall not be greater than is consistent with the pur- poses of the structure ; and the condition of strength is that the stress shall be within the limits of that which the material can bear with safety against breaking. The ratio in which the utmost stress before

breaking exceeds the safe working stress is called the factor of safety, and is determined empirically. It varies from three to twelve for various matcrials and structures.

The SrrENcTH OF MaTertats forms the subject of a special article, to which the reader is referred.

PART Il, THEORY OF MACHINES.

19. Parts of a Machine—Frame and Mechanism.—The parts of a machine may be distinguished into two principal divisions, —the frame, or fixed parts, and the mechanism, or moving parts. The frame is a structure which supports the pieces of the mechanism, and to a certain extent determines the nature of their motions.

The form and arrangement of the pieces of the frame depend upon the arrangement and the motions of the mechanism ; the dimen- sions of the pieces of the frame required in order to give it stability and strength are determined from the pressures applied to it by means of the mechanism. It appears therefore that in general the mechanism is to be designed first and the frame afterwards, and that the designing of the frame is regulated by the principles of the stability of structures and of the strength and stiffness of materials, —care being taken to adapt the frame to the most severe load which can be thrown upon it at any period of the action of the mechanism.

Each independent piece of the mechanism also is a structure, and its dimensions are to be adapted, according to the principles of the strength and stiffness of materials, to the most severe load to which it can be subjected during the action of the machine.

20. Definition and Division of the Theory of Machines.—From what has been said in the last section it appears that the depart- ment of the art of designing machines which has reference to the stability of the frame and to the stiffness and strength of the frame and mechanism is a branch of the art of construction. It is there- fore to be separated from the theory of machines, properly speaking, which has reference to the action of machines

considered as moving. In the action of a machine the following three things take place:—

First, Some natural source of energy communicates motion and force to a piece or pieces of the mechanism, called the receiver of power or prime mover. :

Secondly, The motion and force are transmitted from the prime mover through the train of mechanism to the working picce or pieces, and during that transmission the motion and force are modi- fied in amount and direction, so as to be rendered suitable for the purpose to which they are to be applied.

Thirdly, The working piece or pieces by their motion, or by their motion and force combined, produce some useful effect.

Such are the phenomena of the action of a machine, arranged in the order of causation. But in studying or treating of the theory of machines, the order of simplicity is the best ; and in this order the first branch of the subject is the modification of motion and force by the train of mechanism ; the next is the effect or purpose of the machine ; and the last, or most complex, is the action of the prime mover.

The modification of motion and the modification of force take place together, and are connected by certain laws; but in the study of the theory of machines, as well asin that of pure mechanics, much advantage has been gained in point of clearness and sim- plicity by first considering alone the principles of the modifica- tion of motion, which are founded upon what is now known as Kinematics, and afterwards considering the principles of the com- bined modification of motion and force, which are founded both on geometry aud on the laws of dynamics. The separation of kine- matics from dynamics is due mainly to Monge, Ampere, and Willis.

The theory of machines in the present article will be considered under the following four heads :—

I. Purr Mercuanism, or APPLIED KtNEMATICS; being the theory of machines considered simply as modifying motion. I]. AppLieD Dynamics.;

being the theory of machines con- sidered as modifying both motion and force. III. PurposEs AND EFFECTS oF MACHINES, IV, APPLIED ENERGETICS ; being the theory of prime movers and sources of power.

CHap. I. On PurE MEcHANISM.

21. Division of the Subject.—Proceeding in the order of simplicity, the subject of Pure Mechanism, or Applied Kinematics, may be thus divided :—

Division 1.—Motion of a point.

Division 2.—Motion of the surface of a fluid.

Division 3.—Motion of a rigid solid. se

Division 4.—Motions of a pair of connected picces, or of an

"elementary combination" in mechanism. _

Division 5.—Motions of trains of pieces of mechanism. f

Division 6.—Motions of sets of more than two connected pieces,

or of " aggregate combinations."

A point is the boundary of a line, which is the boundary of 4 surface, which is the boundary of a volume. Points, lines, and surfaces have no independent existence, aud consequently those divisions of this chapter which relate to their motions are only preliminary to the subsequent divisions, which relate to the motions of bodies.

Division 1. Motion of a Point.

22. Path and Dircction.—See above, p. 679, § 21.

23. Uniform Velocity.—See p. 680, § 25.

24. Varied Velocity.—See p. 680, § 25.

25. Direct Deviation, or Acceleration and Retardation.—See pp 680, 681, §§ 27-29.

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26. Lateral Deviation or Deflexion—Angular Velocity of Deria- tion—Revolution.—See pp. 681, 682, §§ 31-38.

97. Comparative Motion.—Thc comparative motion of two points is the relation which exists between their motions, without having regard to their absolute amounts. 1t consists of two elements,— the velocity ratio, which is the ratio of any two magnitudes bear- ing to each other the proportions of the respective velocities of the two points at a given instant, and the directional relation, which is the relation borne to each other by the respective directions of the motions of the two points at the same given instant.

It is obvious that the motions of a pair of points may be varied in any manner, whether by direct or by lateral deviation, and yet that their comparative motion may remain constant, in consequence of the deviations taking place in the saine proportions, in the same directions, and at the same instants for both points.

Willis has the merit of having been the first to simplify con- siderably the theory of pure mechanism, by pointing out that that branch of mechanics relates wholly to comparative motions.

The comparative motion of two points at a given instant is |

capable of being completely expressed by one of Sir William Hamilton's Quaternions,—the " tensor" expressing the velocity ratio, and the " versor" the directional relation.

28. Resolution and Composition of Motion.—See p. 681, §$ 30, 31.

99, Rectangular Projection, Resolution, and Composition.— See p. 681, § 31.

30, Resolution and Composition of Deviations. —See p. 681, § 31.

Division 2. Motion of the Surface of a Fluid Mass.

81. General Principle.—A mass of fluid is used in mechanism to transmit motion and force between two or more movable portions (called pistons or plungers) of the solid envelope or vessel in which the fluid is contained; and, when such transmission is the sole

action, or the only appreciable action of the fluid mass, its volume —

is either absolutely constant, by reason of its temperature and pressure being maintained constant, or not sensibly varied.

Let a represent the area of the section of a piston made bya plane verpendicular to its direction of motion, and ¥ its velocity, which is to be considered as positive when outward, and negative when inward. Then the variation of the cubic contents of the vessel in a unit of time by reason of the motion of one piston is va. The condition that the volume of the fluid mass shall remain unchanged requires that there shall be more than one piston, and that the velocities and areas of the pistons shall be connected by the equation—

=. va=0. (1).

32. Comparative Motion of two Pistons.—If there be but two pistons, whose areas are a, and az, and their velocities 7 and %., their comparative motion is expressed by the equation—

aa25 2):

fa 2 (2); that is to say, their velocities are opposite as to inwardness and out- wardness, and inversely proportional to their areas.

38. Applications—Hydraulie Press—Pnewmatie Power-Trans- mitter.—In the hydraulic press the vessel consists of two cylinders, viz., the pump-

barrel and the press-barrel, each having its piston,

and of a passage connecting them having a valve opening towards |

the press-barrel. motion takes place during the inward stroke of the pump-phwger, when the above-mentioned valve is open ; and at that time the press-plunger moves outwards with a velocity which is less than the inward velocity of the pump-plunger, in the same ratio that the area of the pump-plunger is less than the area of the press- plunger. (See HyDROMECHANICS.) ; In the pneuinatic power-transmitter the motion of one piston 1s transmitted to another at a distance by means of a mass of air con- tained in two cylinders and an intervening tube. When the pres-

The action of the enclosed water in transmitting |

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pom 6 BY)

Shifting in a straight line is regulated either by straight fixed guides, in contact with which the moving piece slides, or by com- binations of link-work, called parallel motions, which will be described in the scquel. Shifting in a straight line is usually reciprocating ; that is to say, the piecc, after shifting through a certain distance, returns to its original position by reversing its motion.

Circular shifting is regulated by attaching two or more points of the shifting piece to ends of equal and parallel rotating cranks, or by combinations of wheel-work to be afterwards described. As an exainple of circular shifting may be cited the motion of the coupling rod, by which the parallel and equal cranks upon two or more axles of a locomotive engine are connected and made to rotate simultaneously. The coupling rod remains always parallel to itself, and all its points describe equal and similar circles relatively to the frame of the engine, and move in parallel directions with equal velocities at the same instant.

35. Rotation about a Fixed Axis—Lever, Wheel, and Axle.—The fixed axis of a turning body is a line fixed relatively to the body and relatively tothe fixed

space in which the body turns. In mechanism it is usually the central line either of a rotating shaft or axle having journals, gudgeons, or pivots turning in fixed bear-

| ings, or of a fixed spindle or dead centre round which a rotating

bush turns ; but it may sometimes be entircly Leyond the limits of the turning body. For example, if a sliding piece moves in circular fixed guides, that piece rotates about an ideal fixed axis traversing the centre of those guides. ;

6

Let the angular velocity of the rotation be denoted by a= ‘

‘ then the linear velocity of any point A at the distance 7 from the

axis is ar; and the path of that point is a circle of the radius 7 described about the axis.

This is the principle of the modification of motion by the lever, which consists of a rigid body turning about a fixed axis called a fulcrum, and having two points at the same or different distances from that axis, and in the same or different directions, one of which receives motion and the other transmits motion, modified in direction and velocity according to the above law.

In the wheel and axle, motion is received and transmitted by two cylindrical surfaces of different radii described about their common fixed axis of turning, their velocity-ratio being that of their radii.

36. Velocity Ratio of Components of Motion.—As the distance between any two points in a rigid body is invariable, the projections of their velocities upon the line join- ing them must be equal. Hence it follows that, if A in fig. 4 be a point in a rigid body CD, rotating round the fixed axis F, the component of the velocity of A in any direction AP parallel to the plane of rotation is equal to the total velocity of the point m, found by letting fall Fin perpendicular to AP; that is to say,

is equal to Re

Hence also the ratio of the com- 3 ponents of the velocities of two Fig. 4. points A and B in the directions AP and BW respectively, both in the plane of rotation, is equal to the ratio of the perpendiculars Fm and Fn.

37. Instantaneous Axis of a Cylinder rolling on a Cylinder. —Let a cylinder 0b3, whose axis of figure is B and angular velocity 4, roll

‘ ona fixed cylinder aaa, whose axis of figure is A, either outside (as

sure and temperature of the air can be maintained constant, this |

machine fulfils equation 2, like the hydraulic press.

The amount |

and effect of the variations of pressure and temperature undergone —

by the air depend on the principles of the mechanical action of heat, or THERMODYNAMICS (q.v.), and are foreign to the subject of pure mechanism. Division 3. Motion of a Rigid Solid. 31. Motions Classed.—In problems of mechanism, each solid

piece of the machine is supposed to be so stiff and strong as not to ©

undergo any sensible change of figure or dimensions by the forces |

applied to it,—a op komt which is realized in practice if the |

machine is skilfully designed. ~ : This being the case, the various possible motions of a rigid solid body may all be classed under the following heads : —(1) Shifting

or Translation ; (2) Turning or Rotation ; (3) Motions compounded |

of Shifting and Turning.

The most common forms for the paths of the points of a piece of mechanism, whose motion is simple shifting, are the straight line and the circle.

in fig. 5), when the rolling will be towards the same hand as the

Fig. 5.

Fig. 6.

rotation, or inside (as in fig. 6), when the rolling will be towards the opposite hand ; and at a given instant let T be the line of con- tact of the two cylindrical surfaces, which is at their common inter- section with the plane AB traversing the two axes of figure.

The line T on the surface 0b) has for the instant no velocity in

AY, == 95.

754

a direction perpendicular to AB ; because for the instant it touches, without sliding, the line T on the fixed surface aaa.

The line T on the surface bd has also for the instant no velocity in the plane AB; for it has just ceased to move towards the fixed surface aaa, and is just about to begin to move away from that surface.

The line of contact T, therefore, on the surface of the cylinder bbb, is for the instant at rest, and is the " instantaneous axis" about which the cylinder 6dd turns, together with any body rigidly attached to that cylinder.

To find, then, the direction and velocity at the given instant of any point P, either in or rigidly attached to the rolling cylinder T, draw the plane PT ; the direction of motion of P will be perpendi- cular to that plane, and towards the right or left hand according to the direction of the rotation of bbb; and the velocity of P will be

Gey. FE Aba es Bw ER

PT denoting the perpendicular distance of P from T. The path of P is a curve of the kind called epitrochoids. If P is in the circum: ference of bbb, that path becomes an epieycloid.

The velocity of any point in the axis of figure B is

Us=y. TB . oe . . . . 4);

and the path of such a point is a circle described about A with the radius AB, being for outside rolling the sum, and for inside rolling the difference, of the radii of the cylinders.

Let a denote the angular velocity with which the plane of axes AB rotates about the fixed axis A. Then it is evident that

te6:. AB. oon ws . &

and consequently that gay a « @ 55 “ape a eee ee

AB

For internal rolling, as in fig. 6, AB is to be treated as negative, which will give a negative value to a, indicating that in this case the rotation of AB round A is contrary to that of the cylinder 0d.

The angular velocity of the rolling cylinder, relatively to the plane of axes AB, is obviously given by the equation—

*B=y-4;) Ta | OAs Aeieae eee Whence B= * 4p *

care being taken to attend to the sign of a, so that when that is negative the arithmetical values of y and a are to be added in order to give that of p.

The whole of the foregoing reasonings are applicable, not merely when aaa and 60d are actual cylinders, but also when they are the osculating cylinders of a pair of cylindroidal surfaces of varying curvature, A and B being the axes of curvature of the parts of those surfaces which are in contact for the instant under consideration.

38. Compositionand Resolution of Rotations about Parallel Axes. —See above, p. 691, § 73.

39. Instantaneous Axis of a Cone rolling on a Cone.—Let Ona (fig. 7) be a fixed cone, OA its axis, Obb a cone rolling on it, OB the axis of the roll- ing cone, OT the line of contact of the two cones at the instant under con- sideration. By rea- soning similar to that of sect. 37, it rs ae that OT is the instantaneous axis of rotation of the rolling cone.

Let y denote the total angular velocity of the rotation of the cone B about the instantaneous axis, 8 its angular velocity about the axis OB relatively to the plane AOB, and a the angular velocity with which the plane AOB turns round theaxisOA. It is required to find the ratios of those angular velocities.

Solution.—In OT take any point E, from which draw EC parallel to OA, and ED parallel to OB, so as to construct the parallelogram OCED. Then

gr eel:

ale 2 BS (8).

Or because of the proportionality of the sides of triangles to the sines of the opposite angles,

sin <TOB : sin«TOA : sin<AOB ; as a <% ae

that is to say, the angular velocity about each axis is proportional

to the sine of the angle between the other two.

Demonstration.—From C draw CF perpendicular to OA, and CG perpendicular to OE.

(8, A);

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area ECO Then CF =2 x — Gk?

and C@=2 <=:

..CG:CF:: CE=OD:0E. Let v, denote the linear velocity of the point C. Then ve=a. CF=y. CG ya: CF: CG :: OF POR; which is one part of the solution above stated. From E draw EH perpendicular to OB, and EK to OA. Then it can be shown as

before that EK : EE ::'OC 2OD

Let vz be the linear velocity of the point E fixed in the plane of axes AOB. Then Ug=a. EK .

Now, as the line of contact OT is for the instant at rest on the rolling cone as well as on the fixed cone, the linear velocity of the point £ fixed to the plane AOB relatively to the rolling cone is the same With its velocity relatively to the fixed cone. That is to say,

Be EH=?:=a. EK ; therefore a:§:: EH: EK ::0D:0C,

which is the remainder of the solution.

The path of a point P in or attached to the rolling cone. is a spherical epitrochoid traced on the surface of a sphere of the radius OP. From P draw PQ perpendicular to the instantaneous axis. Then the motion of P is perpendicular to the plane OPQ, and its

velocity is tpy. PQ. «:. coe (9).

The whole of the foregoing reasonings are applicable, not merely when A and B are acieal regular cones, but also when they are the osculating regular cones of a pair of irregular conical surfaces, having a common apex at O.

40. Composition of Rotations about Two Axes meeting in a Point.— See p. 691, § 76.

41. Screw-like or Helical Motion.—Since (see p. 690, §§ 71, 72) any displacement in a plane can be represented in general by a rotation, it follows that the only combination of translation and rotation, in which a complex movement which is not a mere rota- tion is produced, occurs when there is a translation perpendicular to the plane and parallel to the axis of rotation.

Such a complex motion is called screw-like or helical motion; for each point in the body describes a helix or screw round the axis of rotation, fixed or instantaneous as the case may be. To cause a body to move in this manner it is usually made of a helical or screw-like figure, and moves in a guide of a corresponding figure. Helical motion and screws adapted to it are said to be

| right- or left – handed according to the appearance | presented by the rotation to an observer looking

towards the direction of the translation. Thus the screw G in fig. 8 is right-handed.

The translation of a body in helical motion is Fig. 8. called its advance. Let vz denote the velocity of ; advance at a given instant, which of course is common to all the particles of the body ; a the angular velocity of the rotation at the saine instant ; 2r=6°2832 nearly, the circumference of a circle of the radius unity. Then

ga 4. =e a is the time of one turn at the rate a; and peo 2…

is the pitch or advance per turn,—a length which expresses the comparative motion of the translation and the rotation. : d The pitch of a screw is the distance, measured parallel to its axis, between two successive turns of the same thread or helical pro- jection. Pk. Let 7 denote the perpendicular distance of a point in a body moving helically from the axis. Then

Ue =er . s « 1 « Ee

is the component of the vefocity of that point in a plane perpendi- cular to the axis, and its total velocity is amalfuetof; . = ol6 ae (18). The ratio of the

two components of that velocity is em petand sw cia where 6 denotes the angle made by the helical path of the point with a plane perpendicular to the axis.

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42. To find the Motion of a Rigid Body from the Motions of Three Points in it.—See p. 690, § 71, and p. 692, § 78.

Division 4. Elementary Combinations in Mechanism.

43, Dejinitions.—An elementary combination in mechanism con- sists of two pieces whose kinds of motion are determined by their connexion with the frame, and their comparative motion by their connexion with each other, —that connexion being effected either by direct contact of the pieces, or by a connecting piece, which is not connected with the frame, and whose motion depends entirely on the motions of the pieces which it connects.

The piece whose motion is the cause is called the driver; the piece whose motion is the effect, the follower.

The connexion of each of those two pieces with the frame is in general such as to determine the path of every point in it. In the investigation, therefore, of the comparative motion of the driver and follower, in an elementary combination, it is unnecessary to consider relations of angular direction, which are already fixed by the connexion of each piece with the frame; so that the inquiry is confined to the determination of the velocity ratio, and of the directional relation, so far only as it expresses the connexion between forward and backward movements of the driver and follower. When a continuous motion of the driver produces a con- tinuous motion of the follower, forward or backward, and a recipro- eating motion a motion reciprocating at the same instant, the directional relation is said to be constant. When a continuous motion produces a reciprocating motion, or vice versa, or when a reciprocating motion produces a motion not reciprocating at the game instant, the directional relation is said to be variable.

The line of action or of connexion of the driver and follower isa line traversing a pair of points in the driver and follower respectively, which are so connected that the component of their velocity re- latively to each other, resolved along the line of connexion, is null. There may be several or an indefinite number of lines of connexion, or there may be but one; and a line of connexion may connect either the same pair of points or a succession of different pairs.

44. General Prineiple.—From the definition of a line of connexion it follows that the components of the velocities of a pair of connected points along their line of connexion are equal. And from this, and from the property of a rigid body, already stated in sect. 36, it follows, that the components along a line of connexion of all the points traversed by that line, whether in the driver or in the follower, are equal; and consequently, that the velocities of any pair of points traversed by a line of connexion are to each other inversely as the cosines, or direetly as the seeants, of the angles made by the paths of those points with the line of connexion.

- The general principle stated above in different forms serves to solve every problem in which—the mode of connexion of a pair of pieces being given—it is required to find their comparative motion at a given instant, or vice versa.

_ 45. Application to a Pair of Shifting Pieees.—In fig. 9, let P,P, be the line of connexion of a pair of pieces, each of which has a motion of translation or shift- ing. Through any point T in that line draw TV,, TV, re- spectively parallel to the simul- taneous direction of motion of the pieces; through any other point A in-the line of connexion draw a plane perpendicular to that line, cutting TV,, TV, in V,, V.; then, velocity of piece 1 : velocity of piece 2 :: TV, : TV.. Also TA represents the equal components of the velocities of the pieces parallel to their line of connexion, and the line V,V, represents their velocity relatively to each other. |

46. Application to a Pair of Turning Pieces.—Let a, a, be the angular velocities of a pair of turning pieces ; 6), 9 the angles which their line of connexion makes with their respective planes of rotation ; 7, 7, the common perpendiculars let fall from the line of connexion upon the respective axes of rotation of the pieces. Then the equal components, along the line of

connexion, of the velocities of the points where those perpendiculars meet that line are—

P2

Fig. 9.

a@y77COS 01 = Gy7”_ COS By ; consequently, the comparative motion of the pieces is given by the equation Oy <7) cos 6; (15). a, 77,0080, © P(t > > 47. Application to a Shifting Piece and a Turning Piece. —Let a shifting piece be connected with a turning piece, and at a given instant let a, be the angular velocity of the turning iece, 7, the common perpendicular of its axis of rotation and the line of con- nexion, 6, the angle made by the line of connexion with the plane of rotation, 6, the angle made by the line of connexion with the

direction of motion of the shifting piece, v, the linear velocity of that piece. Then @ 7100S 0,;=,00S0, » – » «© » 16)’;

which equation expresses the comparative motion of the two pieces,

48. Classifieation of Elementary Combinations in Meehanism.— The first systematic classification of elementary combinations in mechanism was that founded by Monge, and fully developed by Lanz and Bétancourt, which has been generally received, aud has been adopted in most treatises on applied mechanics. But that elassification is founded on the absolute instead of the comparative motions of the pieces, and is, for that reason, defective, as Willis has pointed out in his admirable treatise On the Principles of Mechanism.

Willis’s classification is founded, in the first place, on comparative motion, as expressed by velocity ratio and directional relation, and in the second place, on the mode of connexion of the driver and follower. He divides the

elementary combinations in mechanism into three classes, of which the characters are as follows :—

Class A: Directional relation constant; velocity ratio constant.

Class B: Directional relation constant ; velocity ratio varying.

Class C: Directional relation changing periodically ; velocity ratio constant or varying.

Each of those classes is subdivided by Willis into five divisions, of which the characters are as follows:—

Division A: Connexion by rolling contact.

xy B: hs BS sliding contact.

33 C; Pe 6 wrapping connectors.

s D: % a link-work.

54 E: – - reduplication. =

In the present article the principle of Willis's classification is followed ; but the arrangement is modified by taking the mode of connexion as the basis of the primary classification, and by removing the subject of connexion by reduplication to the section of aggregate combinations. This modified arrangement is adopted as being better suited than the original arrangement to the limits of an article in an encyclopedia ; but it is not disputed that the original arrangement may be the best for a separate treatise.

49, Rolling Contaet—Smooth Wheels and Raeks.-~In order that two pieces may move in rolling contaet, it is necessary that each pair of points in the two pieces which touch each other should at the instant of contact be moving in the same direction with the same velocity. Inthe case of two shifting pieces this would involve

| equal and parallel velocities for all the points of each piece, so tliat

there could be no rolling, and, in fact, the two pieces would move like one; hence, in the case of rolling contact, either one or both of the pieces must rotate.

The direction of motion of a point in a turning piece being per- pendicular to a plane passing through its axis, the condition that each pair of points in contact with each other must move in the same direction leads to the following consequences :—

I. That, when both pieces rotate, their axes, and all their points of contact, lie in the same plane.

II. That, when one piece rotates and the other shifts, the axis of the rotating piece, and all the points of contact, lie in a plane per- pendicular to the direction of motion of the shifting piece.

The condition that the velocity of each pair of points of contact must be equal leads to the following consequences :—

III. That the angular velocities of a pair of turning pieces in rolling contact must be inversely as the perpendicular distances of any pair of points of contact from the respective axes.

ly. That the linear velocity of a shifting piece in rolling contact with a turning piece is equal to the product of the angular velocity of the turning piece by the perpendicular distance from its axis to a pair of points of contact.

The dine of contact is that line-in which the points of contact are all situated. Respecting this line, the above principles ILI. and IV. lead to the following conclusions :—

V. That for a pair of turning pieces with parallel axes, and for a turning piece and a shifting piece, the line of contact is straight, and parallel to the axes or axis; and hence that the rolling sur- faces are either plane or cylindrical (the term "cylindrical" includ-

| ing all surfaces generated by the motion of a straight line parallel to

itself). VI. That for a pair of turning pieces with intersecting axes the line of contact is also straight, and traverses the point of intersec-

| tion of the axes ; and hence that the rolling surfaces are conical, with /a common apex (the term "conical" including all surfaces gene-

rated by the motion of a straight line which traverses a fixed point).

Turning pieces in rolling contact are called smooth or toothless wheels. Shifting pieces in rolling contact with turning pieces may be called smooth or toothless racks.

VIL. Ina pair of pieces in rolling contact every straight line traversing the line of contact is a line of connexion.

50. Cylindrical Wheels and Smooth Racks.—In designing cylin drical wheels and smooth racks, and determining their comparative motion, it is sufficient to consider a section of the pair of pieces made by a plane perpendicular to the axis or axes.

The points where axes intersect the plane of section are called centres ; the point where the line of contact intersects it, the point of contact, or pitch-point ; and the wheels are described as cirewlar, elliptical, &c., according to the forms of their sections made by that

lane. ; When the point of contact of two wheels lies between their centres, they are said to be in outside gearing ; when beyond their centres, in znside gearing, because the rolling surface of the larger wheel must in this case be turned inward or towards its centre.

From Principle I1I. of sect. 49 it appears that the angular velocity-ratio of a pair of wheels is the inverse ratio of the distances of the point of contact from the centres respec- tively.

For outside gearing that ratio is negative, because the wheels turn contrary ways; for inside gearing it is positive, because they turn the same way.

If the velocity ratio is to be constant, as in Willis's Class A, the wheels must be circular; and this is the most common form for wheels.

If the velocity ratio is to be variable, as in Willis's Class B, the figures of the wheels are a pair of rolling curves, subject to the condition that the distance between their poles (which are the centres of rotation) shall be constant.

The following is the geometrical relation

which must exist between such a pair of curves. (74 See fig. 10. tat Let C,, C, be the poles of a pair of rolling Fig. 10.

curves; T,, T, any pair of points of contact ; U,, U, any other

pair of points of contact. Then, for every possible pair of points

of contact, the two following equations must Le simultaneously fulfilled:—

Sum of radii, C\U, + C,U,=C,T, + C,T, =constant ;

ore, Fee, "hs 2 Glee BORE

A condition equivalent to the above, and necessarily connected

with it, is, that at each pair of points of contact the inclinations of

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|W, in fig. 12, in which case it is a

| zones of the complete cones or disks,

| 12.

|

_ other,

the curves to their radii-vectores shall be equal and contrary ; or, |

denoting by 7, 7, the radii-vectores at any given pair of points of contact, and s the length of the equal arcs measured from a certain fixed pair of points of contact—

oS

ds ds "4 which is the differential equation of a pair of rolling curves whose poles are at a constant distance apart.

For full details as to rolling curves, see Willis's work, already

mentioned, and Clerk Maxwell's paper on Rolling Curves in the Transactions of the Royal Society of Edinburgh, 1849.

(18) ;

A rack, to work witha circular wheel, must be straight. To work |

with a wheel of any other figure, its section must be a rolling curve, subject to the condition that the perpendicular distance from the pole or centre of the whecl to a straight line parallel to the direction of the motion of the rack shall be constant, Let 7, be the radius- vector of a point of contact on the wheel, 2, the ordinate from the straight line before mentioned to the corresponding point of contact on the rack. Then

dx, dry

ds ds is the differential equation of the pair of rolling curves.

To illustrate this subject, it may be mentioned that an ellipse |

rotating about one focus rolls completely round in outside gearing with an equal and similar ellipse also rotating about one focus, the

distance between the axes of rotation being equal to the major axis |

1+eccentricity

(19)

‘ or unequal, be placed in

| tact in a direction at right angles to

of the ellipses, and the velocity ratio varying from To pooemarnaty |

, 1 – eccentricity | 1 +eccentricity ’ rolls in insile gearing, through a limited arc,

between the axes of rotation being equal to the axis of the hyper- eccentricity +1 ——_____-—— and eccentricity —1 unity ; and a parabola rotating about its focns rolls with an eqnal and similar parabola, shifting parallel to its directrix.

51. Conical or Bevel and Disk Wheels.—From Principles III. and VI. of sect. 49 it appears that the angular velocities of a pair of wheels whose axes meet in a point are to each other inversely as the sines of the angles which the axes of the wheels make with the line of contact. Hence follows the following construction (figs. 11 and 12).—Let O be the apex or point of meeting of the two axes OC,, OC,. Theangular velocity ratio being given, it is required to find the line of contact. On OC,, OC, take lengths OA), OAg, re- speetively proportional to the angular velocities of the pieces on

bolas, and the veloeity ratio varying between

an hyperbola rotating about its further focns |

with an equal and | similar hyperbola rotating about its nearer focus, the distance |

| by every line traversing the line

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whose axes they are taken. Complete the parallelogram OA,EA,; the diagonal OET wili be the line of contact rn § 2

When the velocity ratio is variable, the line of contact will shift its position in the plane C,OC,, and the wheels will be cones, with eccentric or

irregular bases. In every case which oceurs in practice, how- ever, the velocity ratio is constant ; the line of contact is constant in position, and the rolling surfaces of the wheels are regular circular cones (when they are called bevel wheels) ; or one of a pair of wheels may have a flat disk for its rolling surface, as

disk wheel. The rolling surfaces of actual wheels consist of frusta or

as shown by W,, W, in figs. 11 and

52. Sliding Contact (lateral): Skew- ia Bo

Bevel Wheels.—An hyperboloid of revolution is a surface resembling a sheaf or a dice box, generated by the rotation of a straight line round an axis from which .

it is at a constant distance, and to which it is inclined ataconstant angle. If two such hyperboloids, equal

the closest possible contact, as in fig. 13, they will touch each other along one of the generating — straight lines of each, which will form their line of contact, and will be inclined to the axes AG, BH in opposite directions. The axes will not be parallel, nor will they intersect each other.

The motion of two such hyper- boloids, turning in contact with each has hitherto been classed amongst cases of rolling contact; but that classification is not strictly correct, for, although the component velocities of a pair of points of con-

the line of contact are equal, still, Fig. 13. as the axes are neither parallel to

cach other nor to the line of contact, the velocities of a pair of points of contact have components along the line of contact which are unequal, and their difference constitutes a lateral sliding.

The directions and positions of the axes being given, and the re-

uired angular veloeity ratio, the following construction serves to determine the line of contact, by whose rotation round the two axes respectively the hyperboloids are generated :—

In fig. 14, let B,C), B,C, be the two axes; BB, their common perpendicular. Through any point © in this common. perpendicular draw OA, parallel to B,C, and OA, parallel to B,C, ; make those lines proportional to the angular veloci- ties about the axes to which they are respectively parallel ; complete the parallelogram OA,EA,, and draw the diagonal OE; divide B,B, in D into two parts, inversely proportional to the angular veloci- ties about the axes which they re- spectively adjoin; through D paral- lel to OF draw DT. This will be the line of contact.

A pair of thin frusta of a pair of hyperboloids are used in practice to communicate motion between a

Fig. 14.

pair of axes neither parallel nor intersecting, and are called skew-bevel wheels.

In skew-bevel wheels the properties A | not possessed by every line traversing the line of contact, but only

of a line of connexion are

of contact at right angles. : If the velocity ratio to be communicated were variable, the point D would alter its position, and the line DT its direction, at different periods of the motion, and the wheels would be hyperboloids of an eccentric or irregular cross-section ; but forms of this kind are not used in practice. ? 53. Sliding Contact (cireular): Grooved Wheels. —As the ad- hesion or friction between a pair of smooth wheels is seldom sufficient to prevent their slipping on each other, contrivances are used to increase their mutual hold. One of those consists in forming the rim of each wheel into a series of alternate ridges and grooves

=

arallel to the plane of rotation ; it is applicable to cylindrical and Pavel wheels, but not to skew-bevel wheels. The comparative motion of a pair of wheels so ridged and grooved is the same with that of a of smooth wheels in rolling contact, whose eylindrical or conica

surfaces lie midway between the tops of the ridges and |

bottoms of the grooves, and those ideal smooth surfaces are called |

the pitch surfaces of the wheels.

The relative motion of the faces of contact of the ridges and grooves is a rotatory sliding or grinding motion, about the line of contact of the pitch-surfaces as an instantaneous axis.

Grooved wheels have hitherto been but little used.

54. Sliding Contact (direct): Tecth of Wheels, their Number and

Pitch.—The ordinary method of connecting a pair of wheels, ora |

wheel and a rack, and the only inethod which insures the exact maintenance of a given numerical velocity ratio, is by means of a series of alternate ridges and hollows parallel or nearly parallel to

the successive lines of contact of the ideal smooth wheels whose |

velocity ratio would be the same with that of the toothed wheels. The ridges are called teeth ; the hollows, spaces. The teeth of the driver push those of the follower before them, and in so doing sliding takes place between them in a direction across their lines of contact.

The piteh-surfaces of a pair of toothed wheels are the ideal smooth surfaces which would have the same comparative motion by rolling contact that the actual wheels have by the sliding contact of their teeth. The pitch-cireles of

a pair of circular toothed wheels are sections of their pitch-surfaecs, made for spur-wheels (that is, for wheels whose axes are parallel) by a plane at right angles to the axes, and for bevel wheels by a sphere described about the common apex. For a pair of skew-bevel wheels the piteh-circles are a pair of con- tiguous rectangular sections of the pitch-surfaces. The pitch-point is the point of contact of the pitch-circles.

The pitch-surface of a wheel lies intermediate between the points of the tecth and the bottoms of the hollows between them. That part of the acting surface of a tooth which projects beyond the pitch- surface is called the face ; that part which lies within the pitch- surfaee, the flank.

Teeth, when not otherwise specified, are understood to be made in one piece with the wheel, the material being generally cast-iron, brass, or bronze. Separate tceth, fixed into mortises in the rim of the wheel, are called cogs. A pinion is a small toothed wheel; a trundlc is a pinion with cylindrical staves for teeth.

The radius of the pitch-circle of a wheel is called the geometrical radius ; a circle touching the ends of the teeth is called the adden- dum eirele, and its radius the real radius; the difference between these radii, being the projection of the teeth beyond the pitch-surface, is called the addendum.

The distance, measured along the pitch-circle, from the face of one tooth to the face of the next, is called the piteh. The pitch and the number of tceth in wheels are regulated by the following principles :-—

I. In wheels which rotate continuously for one revolution or

more, it is obviously necessary that the pitch should be an aliquot part of the cireumference.

In wheels which reciprocate without performing a complete revolution this condition is not necessary. Such wheels are called sectors.

II. In order that a pair of wheels, or a wheel and a rack, may work correctly together, it is in all cases essential that the pitch should be the same in each.

111. Hence, in any pair of circular wheels which work together, the numbers of teeth in a complete circumference are directly as the radii and inversely as the angular velocities.

IV. Hence also, in any pair of circular wheels which rotate con- tinuously for one revolution or more, the ratio of the numbers of teeth and its reciprocal the angular velocity ratio must be ex- pressible in whole numbers.

From this principle arise problems of a kind which will be referred to in treating of Trains of Mechanism.

V. Let », N be the respective numbers of teeth in a pair of wheels, N being the greater. Let ¢, T be a pair of teeth in the smaller and larger wheel respectively, which at a particular instant work together. It is required to find, first, how many pairs of teeth must pass the line of contact of the pitch-surfaces before ¢ and T work together again (let this number be called a) ; and, secondly, with how many different teeth of the larger wheel the tooth ¢ will work at different times (let this number be called 0); thirdly, with how many different teeth of the smaller wheel the tooth T will work at different times (let this be called ¢).

CasE 1. If 2 is a divisor of N,

a=N; -, c=] (20).*

Cask 2. If the greatest common divisor of N and » be d, a

number less than 7, so that n=md, N=Md; then

a=mN=Mn=Mmd; b=M; c=m (21).

} wheel and a rack.

| wheels; B, 1B, B,1B', portions

To7 Case 3 If N and x be prime to each other,

@=2N? 6=N3c=n . + os (22).

It is considered desirable by millwrights, with a view to the pre- servation of the uniformity of shape of the teeth of a pair of wheels, that each given tooth in one wheel should work with as many different teeth in the other wheel as possible. They therefore study that the numbers of tecth in each pair of wheels which work together shall either be prime to each other, or shall have their greatest common divisor as small as is consistent with a velocity ratio suited for the purposes of the machine.

55. Sliding Contaet—Forms of the Teeth of Spur-wheels and Racks. —A line of connexion of two pieces in sliding contact is a line perpendicular to their sur- faces at a point where they touch. Bearing this in mind, the principle of the com- parative motion of a pair of teeth belonging to a pair of spur-wheels, or to a spur-wheel and a rack, is found by apply- ing the principles stated gene- rally in sects. 46 and 47 to the case of parallel axes for a pair of spur-wheels, and to the case of an axis perpendicular to the direction of shifting for a

In fig. 15, let C,, C. be the centres of a pair of spur-

of their pitch-circles, touch- ing at I, the pitch-point. Let the wheel 1 be the driver, and the whecl 2 the follower.

Let D,TB,A;, D,TB,A, be the positions, at a given instant, of the acting surfaces of a pair of teeth in the driver and follower respectively, touching each other at T; the line of connexion of those teeth is P,P,, perpendicular to their surfaces atT. Let OC, Pj, C,P, be perpendiculars let fall from the centres of the wheels on the line of contact. Then, by sect. 46, the angular velocity- ratio is

(23).

The following prineiples regulate the forms of the teeth and their relative motions :—

I. The angular velocity ratio due to the sliding contact of the teeth will be the same with that due to the rolling contact of the pitch-circles, if the line of connexion of the teeth cuts the line of

| centres at the pitch-point.

For, let P,P, cut the line of centres at I; then, by similar triangles,

ac my 7O,P, OL vs 1, 11, (24) ;

which is also the angular velocity ratio due to the rolling contact of the circles B,1B';, B,1B',.

This priuciple determines the forms of all teeth of spur-wheels. It also determines the forms of the teeth of straight racks, if one of the centres be removed, and a straight line Elk', parallel to the direction of motion of the rack, and perpendicular to C,1C,, be substituted for a pitch-circle.

11. The component of the velocity of the point of contact of the teeth T along the line of connexion is

a,.C\P)=a,.C,P, .« (25).

IH. The relative velocity perpendicular to P,P, of the teeth at their point of contact,—that is, their velocity of sliding on cach other,—is found by supposing one of the wheels, such as 1, to be fixed, the line of centres C,C, to rotate backwards ronnd C, with the angular velocity a,, and the wheel 2 to rotate round C, as before, with the angular velocity a, relatively to the line of centres C,C,, so as to have the same motion as if its pitch-cirele rol/ed on the pitch-circle of the first wheel. Thus the relative motion of the wheels is unchanged ; but 1 is considered as fixed, and 2 has the total motion given by the principles of' sects. 37 and 38,—that is, a rotation about the instantaneous axis I, with the angular velocity a,+a,. Hence the relocity of sliding is that due to this rotation about 1, with the radius I'l'; that is to say, its value is

(a +0). IT (26); so that itis greater the farther the point of contact is from the line of centres ; and at the instant when that point passes the line of centres, and coincides with the pitch-point, the velocity of sliding is null, and the action of the teeth is, for the instant, that of rolling contact. '

IV. The path of contact is the line traversing the various positions of the point T. If the line of connexion preserves always the same

position, the path of contact coincides with it, and is straight ; in other cases the path of eontact is curved.

It is divided by the piteh-point I into two parts, —the arc or line of approach described by T in approaching the line of centres, and the are or line of recess described by T after having passed the line of centres.

During the approach, the flank D,B, of the driving tooth drives the face D,B, of the following tooth, and the teeth are sliding towards each other. During the recess (in whieh the position of the teeth is exemplified in the figure by curves marked with accented letters), the face B',A', of the driving tooth drives the flank B',A', of the following tooth, and the teeth are sliding from eaeh other.

The path of eontaet is bounded where the approach commences by the addendum-cirele of the follower, and where the recess ter- minates by the addenduin-eirele of the driver. The length of the path of contaet should be sueh that there shall always be at least one pair of teeth in eontact ; and it is better still to make it so long that there shall always be at least two pairs of teeth in contaet.

V. The obliquity of the aetion of the teeth is the angle EIT= IC, P, =1C,P,.

In practiee it is found desirable that the mean value of the obliquity of action during the eontact of teeth should not exceed 15°, nor the maximuin value 30°.

It is unneeessary to give separate figures and demonstrations for inside gearing. The only modifieation required in the formule is, that in equation 26 the difference of the angular velocities should be substituted for their sum.

56. Involute Teeth. —The simplest form of tooth which fulfils the eonditions of seet. 55 is obtained in the following manner (see fig. 16). Let C,, C, be the eentres of two wheels, B,IB’,, B,IB’, their piteh-eireles, I the piteh-point ; let the obliquity of action of the teeth be eonstant, so that the same straight line P,IP, shall represent at onee the eonstant line of connexion of teeth and the path of eontact. Draw C,P,, C,P, perpendicular to P,IP,, and with those lines as radii deseribe about the eentres of the wheels the circles D,D’}, D,D’,, ealled base-circles. It is evident that the radii of the base-eireles bear to each other the same proportions as the radii of the pitch-eireles, and also that

C,P,=IC, . eos obliquity

CP, =IC,. eos obliquity —

(The obliquity which is found to answer best in practice is about 144°; its cosine is about $4, and its sine about}. These values, though not absolutely exaet, are near enough to the truth for praetieal purposes.)

Suppose the base-eircles to be a pair of eireular pulleys connected by means of a cord whose course from pulley to pulley is P,IP,. As the line of connexion of those pulleys is the same with that of the proposed teeth, they will rotate with the required velocity ratio. Now, suppose a traeing point T to be fixed to the eord, so as to be earried along the path of contaet P,IP,, that point will trace on a plane rotating along with the wheel 1 part of the in- volute of the base-eirele D,D’,, and on a plane rotating along with the wheel 2 part of the Fic. 1 6 involute of the _ base-circle { i a D,D’,; and the two eurves so traced will always touch each other in the required point of contact T, and will therefore fulfil the con- dition required by Principle I. of sect. 55.

Consequently, one of the forms suitable for the teeth of wheels is the involute of a eircle; and the obliquity of the aetion of sueh teeth is the angle whose eosine is the ratio of the radius of their base-eircle to that of the piteh-cirele of the wheel.

All involute teeth of the same pitch work smoothly together.

To find the length of the path of eontact on either side of the piteh-point I, it is to be observed that the distanee between the fronts of two successive teeth, as measured along P,IP,, is less than the piteh in the ratio of cos obliquity: 1; and consequently that, if distances equal to the piteh be marked off either way from I towards P, and P, respectively, as the extremities of the path of eontact, and if, aeeording to Prineiple IV. of seet. 55, the adden- dum-eircles be described through the points so found, there will always be at least two pairs of teeth in action at onee. In practice it is usual to make the path of eontaet somewhat longer, viz., about 2;;th times the piteh ; and with this length of path, and the obliquity already mentioned of 143°, the addendum is about ;3,ths of the piteh,

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The teeth of a rack, to work 'eorrectly with wheels having iy teeth, should have plane surfaces unaudiadae to the ies sp nexion, and consequently making with the direction of motion of the rack angles equal to the complement of the obliquity of aetion. ;

57. Teeth for a given Path of Contact—Mr Sang's Method.—Ip, the preceding section the form of the teeth is found by assuming a figure for the path of contact, viz., the straight line. Any other eonvenient figure may be assumed for the path of eontaet, and the eorresponding forms of the teeth found by determining what curves a point T, moving along the assumed path of contaet, will trace on two disks rotating ronnd the eentres of the wheels with angular velocities bearing that relation to the eomponent velocity of T along TI, which is given by Principle II. of seet. 55, and by equation 25. This method of finding the forms of the teeth of wheels forms the — of an elaborate and most interesting treatise by Mr Edward

ang.

All wheels having teeth of the same pitch, traced from the same path of eontact, work correctly together, and are said to belong to the same set.

58. Teeth traced by Rolling Curves.—If any curve R (fig. 17) be rolled on the inside of the pitch-circle BB of a wheel, it appears, from sect. 37, that the instantaneous axis of the rolling curve at any instant will be at the point I, where it touches the pitch-eirele for the » moment, and that consequently the line AT, traeed by a_tracing- point T, fixed to the rolling curve upon the plane of the wheel, will be everywhere perpen- dicular to the straight line TI; so that the traeed curve AT will be

Fig. 17. suitable for the flank of a tooth, in which T is the point of contact

corresponding to the position I of the pitch-point. If the same rolling eurve R, with the same tracing-point T, be rolled on the outside of any other pitch-eirele, it will have the face of a tooth suitable to work with the flank AT.

In like manner, if either the same or any other rolling curve R' be rolled the opposite way, on the owtside of the piteh-cirele BB, so that the tracing point T' shall start from A, it will trace the face AT' of a tooth suitable to work with a flank traeed by rolling the same curve R' with the same tracing-point T' inside any other piteh- cirele.

The figure of the path of contact is that traced on a fixed plane by the tracing-point, when the rolling eurve is rotated in such a manner as always to touch a fixed straight line EIE (or ET'F', as the case may be) at a fixed point I (or I'). j

If the same rolling eurve and traeing point be used to trace both the faces and the flanks of the teeth of a number of wheels of different sizes but of the same piteh, all those wheels will work eorrectly together, and will form a set. The teeth of a rack, of the same set, are traeed by rolling the rolling eurve on both sides of a straight line.

The teeth of wheels of any figure, as well as of eircular wheels, may be traced by rolling eurves on their pitch-snrfaees; and all teeth of the same pitch, traced by the same rolling curve with the same tracing-point, will work together correctly if their pitch-sur- faees are in rolling contact. 7

59. Epicycloidal Teeth.—The most convenient rolling eurve 1s the eirele. The path of contact which it traces is identical with itself ; and the flanks of

the teeth are internal and their faces ex- ternal epieycloids for whieels, and both flanks and faces are eycloids for a rack.

For a pitch-eircle of twice the radius of the rolling or describing eirele (as it is called) the internal epicycloid is a straight line, being, in fact, a diameter of the pitch cirele, so that the flanks of the teeth for sueh a piteh-cirele are planes radiating from the axis. For a smaller piteh-cirele the flanks would be convex and incurved or under-cut, whieh would be ineonvenient ; therefore the smallest wheel of a set should ¢ have its pitch-cirele of twice ; the radius of the deseribing Fig. 18. eirele, so that the flanks may be either straight or concave. :

In fig. 18, let BB' be part of the piteh-eirele of a wheel with epl- eyeloidal teeth ; CIC' the line of centres ; I the pitch-point ; EJE

——

a straight tangent to the pitch-circle at that point; R the internal and R' the equal external describing cireles, so placed as to touch the pitch-cirele and each other at I. Let DID' be the path of con- tact, consisting of the are of approach DI and the arc of recess ID'. In order that there may always be at least two pairs of teeth in action, each of those arcs should be equal to the piteh.

The obliquity of the action in passing the line of centres is no-

thing; the maximum obliquity is the angle EID=E'ID; and the mean obliquity is one-half of that angle. + It appears from experience that the mean obliquity should not exeeed 15°; therefore the maximum obliquity should be about 30°; therefore the equal arcs DI and ID' should each be one-sixth of a cireumferenee ; therefore the cireumference of the describing cirele should be six times the piteh.

It follows that the smallest pinion of a set in which pinion the flanks are straight should have twelve teeth.

60. Nearly Epicycloidal Teeth—Wiilis's Method.—To facili- tate the drawing of epiecycloidal teeth in praetice, Willis has

ares,-—-one eoncave, for the flank, and the other convex, for the

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63. Stepped and Helical Teeth.—Hooke invented the making of the fronts of tecth in a series of steps with a view to increase the smoothness of action. A wheel thus formed resembles in shape a series of equal and similar toothed disks plaeed side by side, with the teeth of each a little behind those of the preeeding disk. He also invented, with the same object, teeth whose fronts, instead of being parallel to the line of contact of the pitch-cireles, cross it obliquely, so as to be of a serew-like or helical form. In wheel- work of this kind the eontaet of eaeh pair of teeth commences at the foremost-end of the helical front, and terminates at the aftermost end; and the helix is of such a pitch that the eontaet of one pair of teeth shall not terminate until that of the next pair has com- meneed.

Stepped and helical teeth have the desired effect of increasing the smoothness of motion, but they require more difficult and ex- pensive workmanship than eommon teeth ; and helical teeth.are, besides, open to the objeetion that they exert a laterally oblique

: | pressure, which tends to increase resistance, and unduly strain shown how to approximate to their figure by means of two eireular |

face,—and each having for its radius the mean radius of curvature |

of the epicycloidal arc. lowing properties of epieycloids :—

Let R be the radius of the pitch-cirele ; r that of the describing eirele ; @ the angle made by the normal TI to the epieycloid at a given point T, with a tangent to the circle at I; that is, the obliquity of the action at T.

Then the radius of curvature of the epicycloid at T is—

For an internal epieycloid, p=4rsing Bot ‘ : P . ,R+r —_ oy For an external epicycloid, p’=4rsiné Rao

Also, to find the position of the centres of eurvature relatively to the | ave, denoting the chord of the deseribing circle |

piteh-circle, we TI by ¢, c=2rsiné@; and therefore R For th ~¢=2r sin 6,, —— or the flank, p~c=2rsin 9p op.

: R For the face, p’-c=2rsin oR op

(29).

For the A ioe approved of by Willis, sin@é=} nearly; | h

r= (the piteh) nearly ; c=}p nearly ; and, if N be the number of | teeth in tle wheel, = nearly ; therefore, approximately, p N p ~~¢=”~~. 2 N-1¢% f p N oe a hel ey

P85 NFB

Hence the following construction (fig. 19). Let BB be part of the |

piteh-eircle, and a the point where a tooth is to cross it. ab=ac=}p. Draw radii bd, ce; draw fb, eg, making angles of 754° with those radii. Make Of=p’-c, cgy=p-c. From jf, with the radius ja, draw the ecireular are ah; from g, with the radius ga, draw the eireular are ak. “ba ah is the face and ak the 7 ank of the tooth required. ySsS—>

*To facilitate the iroliestion pain of this rule, Willis published Fig. 19. tables of p~c and p’-c, and invented an instrument called the *‘odontograph.”*

61. Trundies and Pin-Wheels.—If a wheel or trundle have cylin- drieal pins or staves for teeth, the faces of the teeth of a wheel

Set off

suitable for driving it are described by first tracing external epi- |

eyeloids, by rolling the piteh-cirele of the pin-wheel or trundle on the piteh-cirele of the driving-wheel, with the centre of a stave for a traeing-point, and then drawing eurves parallel to, and within the epieycloids, at a distanee from them equal to the radius of a stave. Trundles having only six staves will work with large wheels, _ 82. Backs of Teeth and Spaces.—Toothed wheels being in general intended to rotate either way, the backs of the teeth are made similar to the fronts. The space between two teeth, measured on the piteh-eircle, is made about 4th part wider than the thickness of the tooth on the piteh-circle ; that is to say,

Thickness of tooth =; pitch ;

Width of space =, pitch.

The difference of », of the pitch is called the back-lash. The clearance allowed between the points of teeth and the bottoms of

bi a between the teeth of the other wheel is about th of the pitch.

Willis's formule: are founded on the fol- |

the maehinery.

64. Teeth of Bevel- Wheels.—The acting surfaees of the teeth of bevel-wheels are of the eonieal kind, generated by the motion of a line passing through the common apex of the piteh-eones, while its

| extremity is earried round the outlines of the cross seetion of the

| of the teeth, draw on a flat

teeth made by a sphere described about that apex.

The operations of deseribing the exact figures of the teeth of bevel-wheels, whether by involutes or by rolling eurves, are in every respect analogous to those for describing the figures of the

| teeth of spur-wheels, except that in the ease of bevel-whieels all those

operations are to be performed on the surface of a sphere deseribed about the apex instead of on a plane, substituting poles for centres, and great circles for straight lines.

In consideration of the practical diffieulty, especially in the ease of large wheels, of obtaining an accurate spherical surface, and of drawing upon it when obtained, the following approximate method, proposed originally by Tredgold, is generally used :-—

Let O (fig. 20) be the common apex of a pair of hevel-wheels; OB,I, OB,I their pitch eones ; OC,, OC, their axes ; OI their line of contact. Perpendicular to Ol draw A,IA,, eutting the axes in A,, A,; make the outer rims of the patterns and of the wheels portions of the cones A,B,I, A.B,I, of whieh the narrow zones oeeupied by the teeth will be sufficiently near to a spherical surface deseribed about O for praetical pur- poses. To find the figures

surfaee eireular ares ID,, ID,, with the radii Aj], A,I; those ares will be the developments of arcs of the

Fig. 20. _ piteh-eireles B,I, B,I, when the conical surfaces A,B,I, A.B. are

spread out flat. Deseribe the figures of teeth for the developed ares as for a pair of spur-wheels ; then wrap the developed arcs on the cones, so as to make them eoineide with the piteh-eircles, and traee the teeth on the eonieal surfaces.

65. Teeth of Skew-Bevel Wheels.—The crests of the teeth of a skew-bevel wheel are parallel to the generating straight line of the hyperboloidal piteh-surfaee ; and the transverse sections of the teeth at a given pitch-cirele are similar to those of the teeth of a bevel-wheel whose pitch-surface is a cone touching the hyperboloidal surface at the given eircle.

66. Cams.—A cain is a single tooth, either rotating continuously or oseillating, and driving a sliding or turning piece either eon- stantly or at intervals. All the prineiples whieh have been stated in seet. 55 as being

applicable to teeth are applicable to eams; but in designing cams it is not usual to determine or take into considera- tion the form of the ideal piteh-surface, which would give the same comparative motion by rolling contact that the cam gives by sliding contact.

67. Screws.—The figure of a serew is that of a convex or coneave cylinder, with one or more helical projections, ealled threads, winding round it. Convex and concave serews are distinguished technieally by the respective names of male and female ; a short concave screw is called a nut; and when a screw is spoken of with- out qualifieation a convex screw is usually understood.

The relation between the advance and the rotation, which compose the motion of a serew working in contact with a fixed screw or helical guide, has already been demonstrated in sect. 41; and the same relation exists between the magnitudes of the rotation of a screw about a fixed axis and the advance of a shifting nut in which it rotates. The advance of the nut takes place in the opposite direction to that of the advance of the screw in the case in which the nut is fixed. The pitch or axial pitch of a serew has the mean- ing assigned to it in that section, viz., the distance, measured

parallel to the axis, between the eorresponding points in two suc- cessive turns of the same thread. If, therefore, the screw has several equidistant threads, the true pitch is equal to the divided naial pitch, as measured between two adjacent threads, multiplied by the number of threads.

If a helix be described round the screw, crossing each turn of the thread at right angles, the distance between two corresponding points on two successive turns of the same thread, measured along this normal helix, may be called the normal pitch ; and when the serew has more than one thread the normal pitch from thread to thread may be ealled the normal divided pitch.

The distance from threa'l to thread. measured on a circle described about the axis of the screw, called the pitch-circle, may be called the circumferential pitch ; for a screw of one thread it is one circum- one circumference

n Let r denote the radius of the pitch circle ; n the number of threads ; @ the obliquity of the threads to the pitch circle, and of the normal helix to the axis ;

ee

ference; for a screw of 7 threads,

pitch, the axial

P, Eos

_.”*

P, the circumferential pitch ;

(divided piteh ;

{ pitch, the nermal [divided piteh ;

2Qur then Pc=Pa COtO=Pn COS O—= ——- | Pa=Pn sec 6=Pe tan = _2nr tan = (31). : Qerr, sin | Pn=Pe SM =DPa cos @= are

If a screw rotates, the number of threads whieh pass a fixed point in one revolution is the number of threads in the screw. A pair of convex screws, each rotating about its axis, are used as

an elementary eoinbination to transmit motion by the sliding con- |

tact of their threads. Such screws are eommonly called endless screws. At the point of contact of the screws their threads must be parallel; and their line of connexion is the common perpendi- cular to the acting surfaces of the threads at their point of contact. Hence the following principles :—

I. If the screws are both right-handed or both left-handed, the angle between the directions of their axes is the sum of their obli- quities ; if one is right-handed and the other left-handed, that angle is the difference of their obliqnities.

II. The normal pitch for a screw of one thread, and the normal divided pitch for d screw of more than one thread, must be the same in each screw.

ILI. The angular velocities of the screws are inversely as their numbers of threads.

ends of the two shafts. respectively; E,E, a bar sliding in a diaimetral groove in the face of D,; E,E, a bar sliding in a diametral groove in the faee of D,: those bars are fixed together at A, so as to form a rigid cross. The angular velocities of the two disks and of the cross are all eqnal at every instant ; the middle point of the cross, at A, revolves in the dotted circle described upon the line of centres C,C, asa diameter twice for each turn of the disks and cross; the instantaneons axis of rotation of the cross at any instant is at I, the point in the circle C,C, diametrically opposite to A.

Oldham's coupling may be nsed with advantage where the axes of the shafts are intended to be as nearly in the same straight line as is possible, but where there is some doubt as to the practicability or permanency of their exact continuity.

69. Wrapping Connectors—Belts, Cords, and Chains.—Flat belts

| of leather or of gutta percha, round cords of catgut, hemp, or other | material, and metal chains are used as wrapping connectors to

transmit rotatory motion between pairs of pulleys and drums. Belts (the most frequently used of all wrapping connectors) require

nearly cylindrical puileys. A belt tends to move towards that part

of a pulley whose radius is greatest ; pulleys for belts, therefore,

' are slightly swelled in the middle, in order that the belt may

remain on a pulley, unless forcibly shifted. A belt when in motion

| is shifted off a pulley, or from one pulley on to another of equal | size alongside of it, by pressing against that part of the belt which

is moving towards the pulley.

Cords require either cylindrical drums with ledges or grooved pulleys.

Chains require pulleys or drums, grooved, notched, and toothed, so as to fit the links of the chain.

Wrapping connectors for communicating continuous motion are endless.

Wrapping connectors for communicating reciprocating motion have usually their ends made fast to the pulleys or drums which they connect, and which in this case may be sectors.

The line of connexion of two pieces connected by a wrapping connector is the centre line of the belt, cord, or chain; and the comparative motions of the pieces are determined by the principles

of sect. 46 if both pieces turn, and of sect. 47 if one turns and

the other shifts, in which latter case the notion must be recipro- cating.

The pitch-line of a pulley or drum is a curve to which the line of connexion is always a tangeut ; that is to say, it is a curve parallel to the acting surface of the pulley or drum, and distant from it by

_ half the thickness of the wrapping connector.

are circular.

_ tive radii.

Hooke's wheels with oblique or helical teeth are in fact screws | of many threads, aud of large diameters as compared with their |

lengths.

The ordinary position of a pair of endless screws is with their axes at right angles to each other. When one is of eonsiderably greater diameter than the other, the larger is commonly called in practice a wheel, the name screw being applied to the smaller only ; but they are nevertheless both screws in fact.

To make the teeth of a pair of endless screws fit correctly and work smoothly, a hardened steel screw is made of the figure of the smaller screw, with its thread or threads notched so as to form a cutting tool ; the larger screw, or " wheel," is cast approximately of the required figure ; the larger screw and the steel screw are fitted up in their proper relative position, and made to rotate in contact

with each other by turning the steel screw, which cuts the threads ©

of the larger screw to their true figure. 68. Coupling of Parallel Axcs—Oldham's Coupling.—A coupling is a mode of connecting a pair of z. shafts so that they shall rotate in the same direction with the same mean angular velocity. If the axes of the shafts are in the same straight line, the coupling eonsists in so con- necting their contiguous ends that they shall rotate as one piece; but if the axes are not in the same straight line combinations of me- chanism are required. A coupling for parallel shafts which acts by sliding contact was invented by Oldham, and is represented in fig. 21. ©,, C, are the axes of the two

Fig. 21. parallel shafts; D,, D, two disks facing each other, fixed on the

| in which 7,

Pulleys and drums for communicating a constant velocity ratio The effective radins, or radius of the pitch-circle of a circular pulley or drum, is equal to the real radius added to half the thickness of the conneetor. The angular velocities of a pair of connected circular pulleys or drums are inversely as the effec-

A crossed belt, as in fig. 22, A, reverses the direction of the rota- tion communicated ; an wnerossed belt, as in fig. 22, B, preserves that direction.

The length L of an endless belt connecting a pair of pulleys whose effective radii are 71, 7%, With parallel axes whose distance apart is C, is given by the following Z ; formule, in each of which the first term, containing the radical, expresses the length of the straight parts of the belt, and the remainder of the formula the length of the curved parts.

For a crossed belt,—

—— tit L=2n/e? — (7 +72)? + (7% tng -2 sin”) (32, A); and for an uncrossed belt, —

. a L=2V {2 (r, r)?} +a(r, +17) + 2 – %) sin~! ie ee (32, B); is the greater radius, and 7, the less.

When the axes of a pair of pulleys are not parallel, the pulleys should be so placed that the part of the belt which 1s approaching each pulley shall be in the plane of the pulley.

70. Speed-Cones (see fig. 28).—A pair of speed-cones is a Com trivance for varying and adjusting the velocity ratio communicated between a pair of parallel shafts by means of a belt. The speed- cones are either continuous cones or conoids, as A, B, whose velocity ratio can be varied gradually while they are in motion by shifting the belt, or sets of pulleys whose radii vary by steps, as C, D, in which case the velocity ratio can be changed by shifting the belt from one pair of pulleys to another.

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In order that the belt may fit accurately in every possible position on a pair of speed-cones, the quantity L must be constant, in equations 32, A, or 32, B, according as the belt is erossed or uncrossed.

For a erossed belt, as in Aand C, fig. 23, L depends solely on ¢ and on 7,+7p. Now ¢ is constant because the axes are parallel ; there- fore the swm of the radit of the pitch-circles connected in every position of the belt is to be constant. That condition is fulfilled by a pair of continuous cones generated by the revolu- tion of two straight lines inclined opposite ways to their respective axes at equal angles.

For an uncrossed belt, the quantity L in equation 32, B is to be made constant. The exact fulfilment of this eondition requires the solution of a transcendental equation ; but it may be fulfilled with accuracy sufficient for practical purposes by using, instead of 32, B, the following approximate equation :—

L nearly =2¢+a(7, + 79) + (" = (88).

The following is the most convenient practical rule for the appli- cation of this equation :—

Let the speed-cones be equal and similar conoids, as in B, fig. 28, but with their large and small ends turned opposite ways. . Let r, be the radius of the large end of each, 7, that of the small end, r, that of the middle ; and let v be the sagitta, measured perpendi- cular to the axes, of the are by whose revolution each of the conoids is generated, or, in other words, the bulging of the conoids in the middle of their length. Then

7. 'ee (34).

2n=6'2832 ; but 6 may be used in most practical cases without |

sensible error.

h ii at the mi lL end bei] i wate eh ae Pius determined, make | Should K be inconveniently far off, draw any triangle with its sides

the generating curve an arc either of a circle or of a parabola.

71. Linkwork in General.—The pieces which are connected by linkwork, if they rotate or oscillate, are usually ealled eranks, beams, and levers.. The

link by which they are connected is a rigid rod or bar, which may be straight or of any other figure; the straight figure, being the most favourable to strength, is always used when there is no special reason to the contrary. The link is known by various names under various cireumstances, such as coupling-rod, connecting-rod, erank-rod, eecentrie-rod, ke. It is attached to the pieces which it connects by two pins, about which it is free to turn. The effect of the link is to maintain the distance between the axes of those pins invariable ; hence the common perpendicular of the axes of the pins is the line of eonnexion, and its extremities may be ealled the connected points. Ina turning piece, the perpendicular let fall from its connected point upon its axis of rotation is the arm or erank-arm.

The axes of rotation of a pair of turning pieces connected by a link are almost always parallel, and perpendicular to the line of connexion ; in which case the angular velocity ratio at any instant

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is the reciprocal of the ratio of the common perpendiculars let fall |

from the line of connexion upon the respective axes of rotation.

If at any instant the direction of one of the crank-arms coincides with the line of connexion, the common perpendicular of the linc of connexion and the axis of that crank-arm vanishes, and the directional relation of the motions becomes indeterminate.

The |

position of the connected point of the erank-arm in question at |

such an instant is called a dead-point. eonnected point at such an instant is null, unless it also reaches a dead-point at the same instant, so that the line of connexion is in the plane of the two axes of rotation, in which case the velocity ratio is indeterminate. Examples of dead-points, and of the means of preventing the inconvenience which they tend to occasion, will appear in the sequel.

72. Coupling of Parallel Axes.—Two or more parallel shafts (such as those of a locomotive engine, with two or more pairs of driving wheels) are made to rotate with constantly equal angular velocities by having equal cranks, which are maintained parallel by

a coupling-rod of such a length that the line of connexion is equal |

to the distance between the axes. The cranks pass their dead-points simultaneously. To obviate the unsteadiness of motion which this tends to cause, the shafts are provided with a second set of cranks at right angles to the first, connected by means of a similar coupling- rod, so that one set of cranks pass their dead points at the instant when the other set are farthest from theirs.

The velocity of the other |

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73. Comparative Motion of Connected Points.—As the link is a rigid body, it is obvious that its action in communicating motion may be determined by finding the comparative motion of the con- nected points, according to the principles laid down in §§ 71, 78, pp. 690, 692, and this is often the most convenicnt method of pro- ceeding.

If a connected point belongs to a turning piece, the direction of its motion at a given instant is perpendicular to the plane contain- ing the axis and crauk-arm of the piece. If a connected point belongs: to a shifting piece, the direction of its motion at any instant is given, and a plane can be drawn perpendieular to that direction.

The line of intersection of the planes perpendieular to the paths of the two connected points at a given instant is the instantaneous axis of the link at that instant; and the velocities of the connected points are directly as their distances from that axis.

In drawing ona plane surface, the two planes perpendicular to the paths of the conneeted points are represented by two lines (being their sections by a plane normal to them), and the instantaneous axis by a point (fig. 24); and, should the length of the two lines render it impracticable to pro- K duce them until they actually intersect, the velocity ratio of the connected points may be found by the principle that it is equal to the ratio of the segments which a line parallel to the line of connexion cunts off from any two lines drawn from a given point, perpen- dicular respectively to the paths of the connected points.

To illustrate this by one ex- ample. Let C, be the axis, and T, the connected point of the beam of a steam-enginc ; T,T,

Fig. 24.

the connecting or erank-rod; T, the other connected point, and the centre of the crank-pin ; C, the axis of the erank and its shaft. Let v, denote the velocity of T, at any given instant; », that of | T,. To find the ratio of these velocities, produce C,T,, C,T,, till they intersect in K ; K is the instantaneous axis of the connecting rod, and the velocity ratio is

0 1, ::KT, : KTy. (35).

respectively parallel to CT), C,T,, and T,T, ; the ratio of the two

sides first mentioned will be the velocity ratio required. For example, draw C,A parallel to C,T,, cutting T)T, in A; then Ce a. ey Lt ee (36).

74, Eecentrie.—An eccentric circular disk fixed on a shaft, and used to givea reciprocating motion to a rod, is in effect a crank-pin of sufficiently large diameter to surround the shaft, and so to avoid the weakening of the shaft which wonld arise from bending it so as to form an ordinary crank. The centre of the eccentric is its con- nected point ; and its eccentricity, or the distance from that centre to the axis of the shaft, is its crank-arm.

An eccentric may be made capable of having its eceentricity altered by means of an adjusting screw, so as to vary the extent of the reciprocating motion which it communicates.

75. Reciprocating Pieces — Stroke— Dead-Points.—The distance between the extremities of the path of the connected point in a reciprocating piece (such as the piston of a steam-engine) is called the stroke or length of stroke of that piece. When it is connected with a continnously turning piece (such as the crank of a steam- engine) the ends of the stroke of the reciprocating piece correspond to the dead-points of the path of the connected point of the turning piece, where the line of connexion is continuous with or coincides with the crank-arm. ;

Let S be the length of stroke of the reciprocating piece, L the length ofthe line of connexion, and R the crank-arm of the con- tinuously turning piece. Then, if the two ends of the stroke be in one straight line with the axis of the crank,

S=2h: (87) ; and if these ends be not in one straight line with that axis, then S, L« R, and L+R, are the three sides of a triangle, having the angle opposite S at that axis ; so that, if @ be the supplement of the arc between the dead-points,

S? = 2(L? + R?) — 2(L? — R?) cos 6 2L?7+2R?-S?

2(L? — R?)

76. Coupling of Interseeting Axes—Hooke's Universal Joint. —TInter- secting axes are coupled by a contrivance of Hooke's, known as the 'universal joint," which belongs to the class of linkwork (see fig. 25). Let O be the point of intersection of the axes OC,, OC,, and @ their angle of inclination to each other. The pair of shafts C,, C, terminate in a pair of forks F,, F,,in bearings at the extrem1-

XV. — 96

cosé= a8).

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ties of which turn the gudgeons at the ends of the arms of a rec- tangular cross, having its centre at O. This cross is the link ; the connected points are

the centres of the bearings F,, F,. At each instant each of those points moves at right angles to the central plane of its shaft and fork ; therefore the line of intersection of the central planes of the two forks at any instant is the instan- taneous axis of the cross, aud the velocity ratio of the points F,, F, (which, as the forks are equal, is also the angular velocity ratio of the shafts) is equal to the ioe ratio of the distances of those Fig. 25.

points from that instantaneous axis. The mean value of that velocity ratio is that of equality, foreach successive quarter-turn ismade by both shafts in the same time; but its actual value fluctuates between the limits—

Gy i

a, cosé

when F; is the plane OC,0,

. (39).

and "2 = cos@ when F, is in that plane C |

Its value at intermediate instants is given by the following equa-

tions :—let 9), ¢, be the angles respectively made by the central |

planes of the forks and shafts with the plane OC,C, at a given Instant; then cos @=tan ¢, tan dy

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called ¢) and its double 2¢, then one pair of wheels will answer the any and B and C will themselves be the numbers required, hould B and C be inconveniently large, they are, if possible, to be resolved into factors, and those factors (or if they are too sma multiples of them) used for the number

of teeth. Should B or C, or both, be at once inconveniently large and prime, then, instead

of the exact ratio z , some ratio approximating to that ratio, and

capable of resolution into convenient factors, is to be found by the method of continued fractions.

B Should G@ be greater than 6, the best number of elementary combinatious m-—1 will lie between log B~logC

log B — log C log 6 ;

log 3

Then, if possible, B and C themselves are to be resolved each into m—1 factors (counting 1 as a factor), which factors, or multiples of them, shall be not less than ¢ nor greater than 6¢; or if B andC contain inconveniently-large prime factors, an approximate velocity ratio, found by the method of continued fractions, is to be substi- tuted for Fas before.

So far as the resultant velocity ratio is concerned, the order of the drivers N and of the followers » is immaterial ; but to secure equable wear of the teeth, as explained in sect. 54, the wheels ought to be so arranged that, for each elementary combination, the greatest common divisor of N and shall be either 1, or as small as possible.

80. Double Hooke's Coupling.—It has been shown in section 76 that the velocity ratio of a pair of shafts coupled by a universal

"2 . (40). joint fluctuates between the limits cosé@ and a Hence one or both of the shafts must have a vibratory aud unsteady motion, injurious to the mechanism aud framework. 'To obviate this evil a short in- termediate shaft is introduced, making equal angles with the first and last shaft, coupled with each of them by a Hooke's joint, and having its own two forksin the same plane. Let a, a», ag be the angular velocities of the first, intermediate, and last shaft in this

certain arc at each forward stroke and leaves at rest at each back- | ward stroke, is an example of intermittent linkwork. During the forward stroke the action of the click is governed by the principles

of linkwork ; during the backward stroke that action ceases. A eatch or pall, turning on a fixed axis, prevents the ratchet-wheel or rack. from reversing its motion.

Division 5. Trains of Mechanism.

78. General Principles. —A train of mechanism consists of a series of pieces each of which is follower to that which drives it and driver to that which follows it.

The comparative motion of the first driver and last follower is obtained by combining the proportions expressing by their terms the velocity ratios and by their signs the directional relations of the several elementary combinations of which the train consists.

79. Trains of Wheelwork.—Let A,, Ay, Ag, &¢., Am-1, Am denote a series of axes, and a, ay, a3, &C., Om-1, Om their angular velocities. Let the axis A, carry a wheel of N, teeth, driving a wheel of m, teeth on the axis A,, which carries also a wheel of N, teeth, driving a wheel of m3 teeth on the axis As, and so on; the

numbers of teeth in drivers being denoted by N's, and in followers | by ~'s, and the axes to which the wheels are fixed being denoted by |

5.

numbers. Then the resulting velocity ratio is denoted by

a wk oe SS ee

am _™.. Nyt Mee eo INS (41) ;

" ia ty yg . CEs ae

that is to say, the velocity ratio of the last and first axes is the ratio |

of the product of the numbers of teeth in the drivers to the product of the numbers of teeth in the followers.

Supposing all the wheels to be in outside gearing, then, as each elementary combination reverses the direction of rotation, and as the number of elementary combinations m—1 is one less than the number of axes m, it is evident that if m is odd the direction of rotation is preserved, and if even reversed.

It is often a question of importance to determine the number of

tecth in a train of wheels best suited for giving a determinate © It was shown by Young that, to do this |

velocity ratio to two axes. with the least total number of teeth, the velocity ratio of each ele-

mentary combination should approximate as nearly as possible to

3°59. This would in many cases give too many axes; and, as a

useful practical rule, it may be laid down that from 8 to 6 ought to |

be the limit of the velocity ratio of an elementary combination in wheelwork. The smallest number of teeth ina pinion for epicy- cloidal teeth ought to be twelve (see sect. 59),—but it is better, for smoothness of motion, not to go below fifteen; and for involute teeth the smallest number is about twenty-four.

Let & be the velocity ratio required, reduced to its least terms,

and let B be greater than ©. If Fe is not greater than 6, and C lies

between the prescribed minimum number of teeth (which may be

train of two Hooke's couplings. Then, from the principles of sect. 76 it is evident that at each instant @ =, and consequently that

a3=0,; so that the fluctuations of angular velocity ratio caused by the first coupling are exactly neutralized by the second, and the first and last shafts have equal angular velocities at each instant.

81. Converging and Diverging Trains of Mechanism.—Two or more trains of mechanism may converge into one,—as when the two pistons of a pair of steam-engines, cach through its own connecting- rod, act upon one crank-shaft. One train of meehanism may diverge into two or more,—as when a single shaft, driven by a prime mover, carries several pulleys, each of which drives a different machine. The principles of comparative motion in such converging and diverging trains are the same as in simple trains. .

Division 6. Aggregate Combinations.

82. General Principles.—Willis has designated as 'aggregate combinations"' those assemblages of pieces of mechanism in which

| the motion of one follower is the resultant of component motions

impressed on it by more than one driver. Two elasses of aggregate

| combinations may be distinguished which, though not different in

their actual nature, differ in the data which they present to the designer, aud in the method of solution to be followed in questions respecting them.

Class I. comprises those cases in which a piece A is not earried directly by the frame C, but by another piece B, relatively to which the motion of A is given,—the motion of the piece B relatively to the frame C being also given. Then the motion of A relatively to the frame C is the resultant of the motion of A relatively to B and of B relatively to C ; and that resultant is to be found by the prin- ciples already explained in division 3 of this chapter, sects. 34 to 41.

Class II. comprises those cases in which the motions of three points in one follower are determincd by their connexions with two or with three different drivers, so that the motion of the follower, as a whole, is to be determined by the principles of §§ 71, 78, pp. 690, 692. –

This classification is founded on the kinds of problems arising from the combinations. Willis adopts another classification, founded on the odjects of the combinations, which objects he divides into two classes, viz., (1) to produce aggregate velocity, or a velocity which is the resultant of two or more components in the same path, and (2) to produce an aggregate path, that is, to make a given point in a rigid body move in an assigned path by communicating certain motions to other points in that body.

It is seldom that one of these effects is produced without at the same time producing the other; but the classification of Willis

depends upon which of those two effects, even supposing them to occur together, is the practical object of the mechanism.

83. Reduplieation of Cords—Differential Windlass—Bloeks, Sheaves, and Tackle.—The axis C (fig. 26) carries a larger barrel AE and asmaller barrel DB, rotating as one piece with the angular velocity a, in the direction AE. The pulley or sheave FG has a weight W hung to its centre. A cord has one end' made fast to and wrapped round the barrel AE; it passes from A under the sheave FG, and has the other end wrapped round and made fast to the barrel BD. Required the relation between the velocity of trans- lation v, of W and the angular velocity a, of the differential barrel.

In this case v, is an aggregate velocity, pro- duced by the joint action of the two drivers AE and BD, transmitted by wrapping connectors to FG, and combined .by that sheave so ag to act on the follower W, whose motion is the same with that of the centre of FG. =

The velocity of the point F is a,.AC, upward Fig. 26. motion being considered positive. The velocity of the point G is ~—a,.CB, downward motion being negative. Hence (p. 690, §§ 71, 72) the instantaneons axis of the sheave FG is in the diameter FG, at the distance

E

FG AC-BC | AC+EC from the centre towards G ; the angular velocity of the sheave is AC+BC.

*Ag = a) * "=TG er F and, consequently, the velocity of its centre is ee FG AC-BC_ a (AC-BC) ase Fs or the mean between the velocities of the two vertical parts of the*

cord.

If the cord be fixed to the frame-work at the point B, instead of being wound on a barrel, the velocity of W is half that of AF. _

A case containing several sheaves is called a block. A fall-bloek is attached to a fixed point; a running-block is movable to and from a fall-block, with which it is connected by two or more plies ofarope. The whole combination constitutes a tackle or purchase.

The two plies of a rope at opposite sides of a sheave in the fall- block have equal and opposite velocities. _The'tiwo plies at opposite sides of a sheave in the running-block have velocities (as in the case of the sheave FG) differing equally in opposite directions from the velocity of the running-block.

One end of the rope is fastened either to the fall-block or the running-block. The other, or free end, is called the fall. Let v, be the velocity of the fall, v, that of the running-block ; and let it be required to find their ratio; and let velocities towards the fall- block be positive, and from it negative.

Cask 1. If the fastened end of the rope be attached to the fall- block its velocity is 0, and this also is the velocity of the first ply.

. (42),

The rope passes under a sheave in the running-block, so that the |

velocity of the second ply is 2v,. It then passes over a sheave in the fall-block ; the velocity of the third ply is—2v, ; then under a sheave in the

running-block ; the velocity of the fourth ply is 42%, ; — so on,—the general law being this :—let 2 be an even number, then

38 (n+1)® ply= — nv,

=0,, if the fall be the (n+1) ply

Cast 2. If the fastened end of the rope be attached to the run-

ning-block, the velocity of the first ply is v,; of the second, — v, ;

of the third, 3v,; of the fourth, —3v,; and, generally, if » be an odd number,

the velocity of the n® ply=nv,

(48).

velocity of the n® ply =nv, ie (n+1)® ply = — nv, (44). =#,, if the fall be the (n+1)™ ply Generally, — Ls ee V == (45),

— nis the number of plies of rope by which the running-bloek ngs.

The sheaves in a block are usually made all of the same diameter, and turn on a fixed pin, and they have, consequently, different angular velocities. But by making the diameter of each sheave proportional to the velocity, relatively to the block, of the ply of rope which it is to carry, the angular velocities of the sheaves in one block may be rendered equal, so that the sheaves may be made all in one piece, and may have journals turning in fixed bearings. _ This is called White's tackle, from the inventor.

For details and technical ternis see SHIPBUILDING.

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| reciprocating pieceeither exactly ,

84. Differential Serew.—On the same axis let there be two screws of the respective pitches p, and yy, made in one piece, and rotating with the angular velocity a. Let this piece be called B. Let the first screw turn in a fixed nut C, and the second in a sliding nat A. The velocity of advance of B relatively to C is (according to sect, 41) ap,, and of A relatively to B (according to sect. 67) — apy; hence the velocity of A relatively to C is .

a(P — Pe) (46), being the same with the velocity of advance of a screw of the pitch 1 -P>o This combination, called Hunter's or the differential serew, combines the strength of a large thread with the slowness of motion due to a small one. :

85. Epieyclie Trains.—The term epteyelie train is used by Willis to denote a train of wheels carried by an arm, and having certaiu rotations relatively to that arm, which itself rotates. The arm may either be driven by the wheels or assist in driving them. The comparative motions of the wheels and of the arm, and the aygregate paths traced by points in the wheels, are determined by the principles of the composition of rotations, and of the description of rolling curves, explained in sects. 37 to 40.

86. Link Motion.—Let S (fig. 27) be the shaft of a steam-engine, O its axis, Ey the forward eceentrie, suitably placed for moving the slide-valve when the shaft rotates forwards, F its centre, OF its crank-arm, Cy its rod, E, the backward eeeentrie, suitably placed for moving the slide-valve when the shaft rotates backwards, B its centre, OB its crank-arm, C,its rod. L isa long narrow box called the link, jointed at Ty and T, to the eccentric rods ; R is the valve- rod which works the slide-valve, jointed to P, a slider, which, by moving either IL or R, or both, can be adjusted to any required posi-

Fig, 27. When P is at Ty the valve is said to be in full When P is at Ts the valve is said to be in full baekward gearing, being acted upon

tion in the link. forward gearing, being acted upon by Ey alone.

by E, alone. When P is placed in an intermediate position, the valve has an aggregate motion due to the joint action of Ey and Ey. The most exact mode of determining that motion is to make a skeleton drawing of the apparatus in various positions; but an

| approximation to the motion of the valve may be obtained by join-

ing FB, and taking Q so that TP: T,P: : FQ: BQ;

| then the valve will move nearly as if it were worked by one

eccentric, having its centre at Q. eae 87. Parallel Motions (exaet).—A parallel motion is a combination of turning pieces in mechanism designed to guide the motion of a

or approximately in a straight line, so as to avoid the friction which arises from the nse of straight guides for that purpose.

Fig. 28 represents an exact parallel motion, first proposed, it is believed, by Mr Scott Russell.

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The arm CD turns on the | Saher axis C, and is jointed at D to , we the middle of the bar ADB, | _—7 whose length is double of that q'-~ of CD, and one of whose ends ; B is jointed to a slider, sliding Fig. 28.

in straight guides along the line CB. Draw BE perpendicular to CB, cutting CD produced in E, then E is the instantaneous axis of the bar ADB; and the direction of motion of A is at every instant perpendicular to EA, that is, along the straight line ACa. While the stroke of A is ACa, extending to equal distances on either side of C, and equal to twice the chord of the are Dd, the stroke of B is only equal to twice the sagitta; and thus A is guided through a comparatively long stroke by the sliding of B through a comparatively short stroke, and by rotatory motions at the joints C, D, B. (For details, see SrEAM-ENGINE.) hs

88, Parallel Motion—Watt's Approximate (sec fig. 29),.—Let CT, ef be a pair of levers connected by a link Ti, and oscillating about the axes Ce between the positions marked 1 and 3. Let the middle positions of the levers

CT,, ef. be parallel to each other. It is required to find a point P in the link T¢ such that its middle

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position P, aud its extreme positions P,, P, shall be in the same straight line SS, perpendicular to CT,, ct,, and so to place the axes C, con the lines CT,, ef, that the path of P between the positions P,, P., P; shall be as near as possible to a straight line.

5

1 TI

Fig. 29.

The axes C, ¢ are to be so placed that the middle M of the versed sine VT,, and the middle m of the versed sine vé,, of the respective ares whose equal chords T,T,, tt, represent the stroke, may each be in the line SS. Then 'I, and 'I', will be as far to one side of SS as 'I', is to the other, and ¢, and ¢, will be as far to the latter side of SS as ¢, is to the former ; consequently, the two extreme positions of the links T,4,, Ty, are parallel to each other, and inclined to

SS at the same angle in one direction that the middle position of |

the link T,¢, is inclined to that line in the other direction, and |

the three intersections P,, Py, P; areat the same point on the link. The position of the point P on the link is found by the following proportional equation :— te PI PE) 2: TV+ivo: TV: eae :: CM+em:cm :CM)

Suppose the axes C, ¢ to be given, the line of stroke SS, and the length of stroke L=T\T,=¢,t3, and that it is required to find the dimensions of the levers and link. Let fall CM and em perpen- dicular to SS ; then

by LV?

Y= sent} Ban CT=CM+4TV; ct=cm+ hv; Tt =/{ Mm? +3(TV +tv)"}

If C and c¢ are at the same side of SS, the smallcr of the two perpendiculars is to be treated as negative in the formule, and the difference of the versed sines used instead of their sum; and the point P will lie in the prolongation of the link beyond Tt to the side of the longer lever. on either side of their middle positions do not exceed 20°, the intermediate portions of the path of P between P,, P,, and: P; are near enough to a straight line for practical purposes; and that point may be used to guide a sliding piece, such as the piston-rod of a steam-engine, for which purpose this parallel motion was originally invented by Watt.

(47).

(48).

CHAPTER II. ON AppLIED DYNAMICS.

89. Laws of Motion.—The action of a machine in transmitting force and motion simultaneously, or performing work, is governed, in common with the phenomena of moving bodies in general, by two "laws of motion," for which see pp. 676 sq.

90. Comparison of Deviating Force with Gravity. —See pp. 698, 699, §§ 104-106.

91. Deviating Forces Classed—Deflecting Force —Accelerating and Retarding Forces.—See p. 701, $$ 114-119.

_ 92. Division of the Subject.—On this classification of the deviat- ing forces in machines is founded the following division of the subject of dynamics as applied to machines :—

Division 1.—Balanced forces in machines of uniform velocity.

Division 2.—Deflecting forces in such machines.

Division 3.—Working of machines of varying velocity.

Division 1. Balanced Forees in Machines of Uniform Velocity.

93. Application of Foree to Mechanism.—Forces are applied in units of weight; and the unit most commonly employed in Britain is the pound avoirdupois.' The action of a force applied to a body

When the arcs of oscillation of the levers |

is always in reality distributed over some definite space, either a volume of three dimensions or a surface of two. An example of a force distributed throughout a volume is the weight of the body itself, which acts on every particle, however small. The pressure exerted between two bodies at thcir surface of contact, or between the two parts of one body on either side of an ideal surface of separation, is an example of a force distributed over a surface. The mode of distribution of a force applied to a solid body requires to be considered when its stiffness and strength are treated of; but, in questions respecting the action of a force upon a rigid body con- sidered as a whole, the resultant of the distributed force, deter. mined according to the principles of statics, and considered as acting in a single line and applied at a single point, may, for the occasion, be substituted for the force as really distributed. Thus, the weight of each separate piece in a machine is treated as acting wholly at its centre of gravity, and each pressure applied to it as acting at a point called the centre of pressure of the surface to which the pressure is really applied.

94. Forces applied to Mechanism Classed.—lf @ be the obliquity of a force F applied to a piece of a machine,—that is, the angle made by the direction of the force with the direction of motion of its point of application, —then by the principles of Statics, F may be resolved into two rectangular components, viz. :—

Along the direction of motion, P=Fcos@)

*Across the direction of motion, Q=Fsin@ j} * (=e*

If the component along the dircction of motion acts with the motion, it is called an effort ; if against the motion, a resistance, The component across the direction of motion is a lateral pressure ; the unbalanced lateral pressure on any piece, or part of a piece, is deflecting force.. A lateral pressure may increase resistance by causing friction ; the friction so caused acts against the motion, and is a resistance, but the lateral pressure causing it is nota resist- ance. Resistances are distinguished into useful and prejudicial, according as they arise from the nseful effect produced by the machine or from other causes,

95. Work.— Work consists in moving against resistance. The work is said to be performed, and the resistance overcome. Work

_is measured by the product of the resistance into the distance | through which its point of application is moved.

The wnt of work commonly used in Britain is a resistance of one pound overcome

| through a distance of one foot, and is called a foot-pound.

Work is distinguished into. useful work and prejudicial or lost work, according as it is performed in producing the useful effect of the machine, or in overcoming prejudicial resistance.

96. Hnergy—Potential Energy.—Energy means capacity for performing work. The energy of an effort, or potential energy, is measured by the product of the effort into the distance through which its point of application is capable of being moved. The unit of energy is the same with the unit of work.

When the point of application of an effort has been moved through a given distance, energy is said to have been exerted to an amount expressed by the product of the effort into the distance through which its point of application has been moved.

97. Variable Effort and Resistance.—If an effort has different magnitudes during different portions of the motion of its point of application through a

given distance, let each different magnitude of the effort P be multiplied by the length As of the corresponding portion of the path of the point of application ; the sum

Z.PAS ... .'. « +) ee

is the whole energy exerted. If the effort varies by insensible gradations, the energy exerted is the integral or limit towards which that sum approaches continually as the divisions of the path are made smaller and more nunierons, and is expressed by

ft 2423. (51).

Similar processes are applicable to the finding of the work per- formed in overcoming a varying resistance. ;

98. Dynamometer or Indicator.—A dynamometer or indicator is an instrument which measures and records the energy exerted by an effort. It usually consists essentially, first, of a piece of paper moving with a velocity proportional to that of the point of application of the effort, and having a straight line marked on it parallel to its direction of motion, called the zero line; and, secondly, of a spring acted upon and bent by the effort, and carry- ing a pencil whose perpendicular distance from the zero line, as regulated by the bending of the spring, is proportional to the effort. The pencil traces on the piece of paper a line such that its ordinate perpendicular to the zero line at a given point represents the effort P for the corresponding point in the path of the point of effort, and the area between two ordinates represents the energy exerted, ; Pds, for the corresponding portion of the path of the point of effort.

99. Principle of the Equality of Energy and Work.—From the first law of motion it follows that in a machine whose pieces move with uniform velocities the efforts and resistances must balance each

d

other. Now from the laws of statics (see above) it is known that, in order that a systeni of forces applied to a system of connected points may be in equilibrium, it is necessary that the sum formed by putting together the products of the forces by the respective distances through which their points of application are capable of moving simultaneously, each along the direction of the force applied to it, shall be zero, —products being considered positive or negative according as the direction of the forces and the possible motions of their points of application are the same or opposite.

In other words, the sum of the negative products is equal to the sum of the positive products. This principle, applied to a machine whose parts move with uniform velocities, is eqnivalent to saying that in any given interval of time éhe energy exerted is equal to the work performed.

The symbolical expression of this law is as follows :—let efforts be applied to one or any number of points of a machine; let any one of these efforts be represented by P, and the distance traversed by

its point of application in a given interval of time by ds; lct –

resistances be overcome at one or any number of points of the same machine ; let any oue of these resistances be denoted by R, and the

distance traversed by its point of application in the given interval |

of time by ds'; then

Mss 5 5 « a « 602).

The lengths ds, ds' are proportional to the velocities of the |

points to whose paths they belong, and the proportions of those velocities to each other are deducible from the construction of the

Chapter I. 100. Eficieney.—The efficiency of a machine is the ratio of the

useful work to the total work, —that is, to the energy exerted, —and |

is represented by = Reds' _ ERuds = Rads! _ U eek 2 .Rees +e Reds = E.Vds = OE R,, being taken to represent useful and R, prejudicial resistances.

The more nearly the efficiency of a machine approaches to unity the better is the machine.

101. Power and Effeect.—The power of a machine is the energy exerted, and the effect the useful work performed, in some interval of time of definite length, such as a second, an hour, or a day.

The unit of power, called conventionally a horse-power, is 550

2 (ee

foot-pounds per second, or 33,000 foot-pounds per minute, or-

1,980,000 foot-pounds per hour.

102. Modulus of a Machine. —In the investigation of the properties of a machine, the useful resistances to be overcome and the useful work to be performed are usually given. The prejudicial resistances are generally functions of the useful resistances of the weights of the pieces of the mechanism, and of their form and arrangement ; and, having been determined, they serve for the eomputation of the lost work, which, being added to the uscful work, gives the expenditure of energy required. The result of this investigation, expressed in the form of an equation between this erfergy and the useful work, is called by Moseley the modulus of the machine. The general form of the modulus may be expressed thus—

PeUaigU,A)+y(A)... (54),

where A denotes some quantity or set of quantities depending on the form, arrangement, weight, and other properties of the mechanism. Moseley, however, has pointed out that in most cases this equation takes the much more simple form of

MaQeeOUEB, ... (55),

where A and B are constawts, depending on the form, arrangenient, and weight of the mechanism. The efliciency corresponding to the last equation is

U 1

a 56). E 1+A+B/U ° Be)

2 ° ° .

103. Trains of Mechanism.—In applying the preceding prin- ciples to a train of mechanism, it may either be treated as a whole, or it may be considered in sections consisting of single pieces, or of any convenient portion of the train,—each section being treated as a machine driven by the effort applied to it and energy exerted

upon it through its line of connexion with the preceding section, | performing useful work by driving the following section, and losing —

work by overcoming its own prejudicial resistances.

It is evident that the efficiency of the whole train is the product of

the efficicuctes of its sections.

104. Rotating Pieces—Couples of Forees. —It is often convenient to express the energy exerted upon and the work performed by a turning piece in a machine in terms of the moment of the couples oe acting on it, and of the angular velocity. See p. 728, § 219.

The ordinary British unit of moment is a foot-pownd ; but it is to be remembered that this is a foot-pound of a different sort from the unit of energy and work.

If a force be applied to a turning piece in a line not passing through its axis, the axis will press against its bearings with an equal and parallel force, and the equal and opposite reaction of the bearings will constitute, together with the first-nentioned force, a couple whose arm is the perpendicular distance from the axis to the line of action of the first force.

A couple is said to be right or left hauded with reference to the observer, according to the direction in which it tends to turn the body, and is a driving couple or a resisting couple according as its tendency is with or against that of the actual rotation.

Let dt be an interval of time, a the angular velocity of the piece; then ad¢ is the angle through which it turns in the interval dt, and ds=vdt=radt is the distance through which the point of application of the force moves. Let P represent an effort, so that Pr is a driving couple, then

Pds=Pvdt=Pradit=Madt … . (57)

is the energy exerted by the couple M iu the interval dé; and a similar equation gives the work performed in overcoming a resisting eouple. When several couples act on one piece, the resultant of their moments is to be multiplied by the common angular velocity of the whole piece.

105. Reduction of Forces toa given Point, and of Couples to the Axis of a given Piece.—In computations respecting machines it is often convenient to substitute for a force applied to a given point, or a couple applied to a given piece, the equivalent force or couple

. . . . . i a pli e i E i B 5 a is a ‘ f Tr machine by the principles of pure mechanism explaincd in | applied. ta;soine. ciagpapatat (or visieaay Umt ts Loe, Lhe: Toned,

couple, which, if applied to the other point or piece, would exert equal energy or employ equal work. The principles of this reduc- tion are that the ratio of the given to the equivalent force is the reciprocal of the ratio of the velocities of their points of applica- tion, aud the ratio of the given to the equivalent couple is the reciprocal of the ratio of the angular velocities of the pieces to which they are applied.

These velocity ratios are known by the construction of the mechanism, and are independent of the absolute speed.

106. Balanced Lateral Pressure of Guides and Bearings.—The most important part of the lateral pressure on a piece of mechanisia is the reaction of its guides, if it is a sliding piece, or of the bearings of its axis, if it is a turning piece; and the balanced portion of this reaction is equal and opposite to the

_ resultant of all the other forces applied to the piece, its own weight

included. There may be or may not be an unbalanced component in this pressure, due to the deviated motion. Its laws will be considered in the sequel.

107. Friction—Unguents. —The most important kind of resistance in machines is the friction or rubbing resistance of surfaces which slide over each other. The direction of the resistance of friction is opposite to that in which the sliding takes place. Its magnitude is the product of the wormal presswre or force which presses the rubbing surfaces together in a direction perpendicular to themselves into a specific constant already mentioned in Part I., sect. 13, as the coefficient of friction, which depends on the nature and condition of the surfaces of the unguent, if any, with which they are covered. The total pressure exerted between the rubbing surfaces is the resnltant of the normal pressure and of the friction, and its obliquity, or inclination to the common perpendicular of the surfaces, is the angle of repose formerly mentioned in sect. 13, whose tangent is the coefficient of frietion. Thus, let N be the normal pressure, R the friction, T the total pressure, f the co- efficient of friction, and @ the angle of repose ; then

f=tan@ .. . R=fN=Ntaug=Tsing

Experiments on friction have been made by Coulomb, Vince, Rennie, Wood, D. Rankine, and others. The inmost complete and elaborate experiments are those of Morin, published in his Nottous

(58).

| Fondamentales de Mécanique, and republished in Britain in the

works of Moseley and Gordon. The following is an exceedingly condensed abstract of the most important results, as regards machines, of these experiments :—

*Surfacecs. i * Wood ion woods diryse-s:---<-c---<--OciO HERD Costa CA eedncnotpoonecnosanansscan 0°33 Leather on oak, Wet OF UTY .....-secceesseesecnecrececesenccensenseres 0:27 to 6°35 Leather on metals, Ary …...cccccsscsece.ccsesseeceeesceeceeesenseanseres 0°56 Do., WEL. oc. ccesescscecccctes coccecoccsseceercccessecosoes 0°34 Dos, PVOASY. cccncecscccccccccccccecssnsccecccnsncsccsoeces 0°23 O25 He cageBenanascccesnecbocnocbuncagcuacounancoenasdad 0°15 Metals on metals, dry…....c-s:e-sssceetecocsereccnceeeneceeceeacsceeeses 0°15 to 0-2 eS Wibibiceiee. coccctecceseccccasceceseecmecccsstennmscce see can 0°30 Smooth surfaces with ungents, occasionally greased…..... 0°07 to 0°08 Do. do., well (prensed…....:~~.2c0sce~~ 8°05 Do. do., do., best results …. 0°08 to 0°086*

766

It is to be understood that the above-stated law of friction is only true for dry surfaces when the pressure is not sufficient to indent or abrade the surfaces, and for greased surfaces when the pressure is not sufficient to force out the unguent from between the surfaces. If the proper limit be exceeded, the friction increases more rapidly than in the simple ratio of the normal pressure.

The limit of pressure for unguents diminishes as the speed increases. The following are some of its approximate values as in- ferred from experience in railway locomotive and carriage axles :—

Velocity of rubbing in feet per second : 1 2h 5 “SE Wl acter ee

In pivots, the intensity of the pressure is usually fixed at about one ton per square inch.

Unguents should be comparatively thick for heavy pressures, that they may resist being forced out, and comparatively thin for light pressures, that their viscidity may not add to the resistance.

Unguents are of three classes, viz.:—

1. Fatty: consisting of animal or vegetable fixed oils, such as tallow, lard, lard-oil, seal-oil, whale-oil, olive-oil. Drying oils, which absorb oxygen and harden, are obviously unfit for unguents.

2. Soapy: composed of fatty oil, alkali, and water. The best grease of this class should not contain more than about 25 or 30 per cent. of water; bad kinds contain 40 or 50 per cent. The addi- tional water diminishes the cost, but spoils the unguent.

3. Bituminous : composed of solid and liquid mineral compounds

of hydrogen and carbon. 108. Work of Friction—Moment of Friction.—The work per-

formed in a unit of time in overcoming the friction of a pair of |

surfaces is the product of the friction by the velocity of sliding of the surfaces over each other, if that is the same throughout the whole extent of the rubbing surfaces. If that velocity is different for different portions of the rubbing surfaces, the velocity of each

portion is to be multiplied by the friction of that portion, and the |

results summed or integrated.

When the relative motion of the rubbing surfaces is one of rota- tion, the work of friction in a unit of time, for a portion of the rubbing surfaces at a given distance from the axis of rotation, may be found by multiplying together the friction of that portion, its distance from the axis, aud the angular velocity. The product of the force of friction by the distance at which it acts from the axis of rotation is ealled the moment of friction. The

total moment of friction of a pair of rotating rubbing surfaces is the sum or integral of the moments of friction of their several portions.

To express this symbolically, let dw represent the area of a portion of a pair of rubbing surfaces at a distance 7 from the axis of their relative rotation ; p the intensity of the normal pressure at du per unit of area; and f the coefficient of friction. Then the moment of friction of dw is

Sprdu ; the total moment of friction is –

Lf pr.du ; and the work performed inaunitoff * * * * + + time in overcoming friction, when the angular velocity is a, is*

af ve pr.du.

It is evident that the moment of friction, and the work lost by being performed in overcoming friction, are less in a rotating piece as the bearings are of smaller radius. But a limit is put to the diminution of the radii of journals and pivots by the conditions of durability and of proper lubrication stated in sect. 107, and also by conditions of strength and stiffness.

109. Total Pressure between Journal and Bearing.—A single piece rotating with an uniform velocity has four mutually balanced forces applied to it :— (1) the eflort exerted on it by the piece which drives it ; (2) the resistance of the pieee which follows it,— which may be considered for the purposes of the present question

as useful resistance ; (8) its weight; and (4) the reaction of its own –

cylindrical bearings. There are given the following data :—

The direction of the effort.

The direction of the useful resistance.

The weight of the piece and the direction in which it acts.

The magnitude of the useful resistance.

The radius of the bearing 7.

The angle of repose ¢, corresponding to the friction of the journal

onthe bearing. . And there are required the following:—

The direction of the reaction of the bearing.

The magnitude of that reaction.

The magnitude of the effort.

Let the useful resistance and the weight of the piece be com- pounded by the principles of statics into one force, and let this be called the given force.

The directions of the effort and of the given force are either

‘shallow cups of steel or hard bronze.

parallel or meet in a point. If they are parallel, the direction of the reaction of the bearing is also parallel to them ; if they meet in a point, the direction of the reaction traverses the same point,

Also, let AAA, fig. 30, be a section of the bearing, and € its axis; then the direction of the reaction, at the point where it intersects the circle AAA, must make the angle : ¢@ with-the radius of that circle ; that is to say, it must be a line such as PT touching the smaller circle BB, whose radius isr.sin @. The side on which it touches that circle is determined by the fact that the obliquity of the reaction is ,\ such as to oppose the rotation.

Thus is determined the direction of the reactiou of the bearing; and the magni- tude of that reaction and of the effort are ; then found by the principles of the equili- Fig, 30. brium of three forces already stated in Part I., sect. 7 (see also p- 702, § 124).

The work lost in overcoming the friction of the bearing is the same with that which would be performed in overconiing at the circumference of the small circle BB a resistance equal to the whole pressure between the journal and bearing,

In order to diminish that pressnre to the smallest possible amount, the effort, and the resultant of the useful resistance, and the weight of the picce (called above the 'given force") ought to be opposed to. each other as directly as is practicable consistently with the purposes of the machine.

110. Friction of Pivots and Collars.—When a shaft is acted upon by a force tending to shift it lengthways, that force must be balanced by the reaction of a bearing against a pivot at the end of the shaft ; or, if that he impossible, against one or more collars, or rings projecting from the body of the shaft. The bearing of the pivot is called a step or footstep. Pivots require great hardness, and are usually made of steel. The flat pivot is a cylinder of steel having a plane circular end asa rubbing surface. Let N be the total pressure sustained bya flat pivot of the radins 7'; if that pres- sure be uniformly distributed, which is the case when the rubbing surfaces of the pivot and its step are both true planes, the inten- sity of the pressure is

N

are °

A

e ° . (60); and, introducing this value into equation 59; the moment of friction of the flat pivot is found to be

gfNr (61), or two-thirds of that of a cylindrical journal of the same radius under the same normal pressure.

The friction of a conical pivot exceeds that of a flat pivot of the same radius, and under the same pressure, in the proportion of the side of the cone to the radius of its base.

The moment of friction of a collar is given by the formula—

_ p78 apn. – (62), where 7 is the external and 7” the internal radius.

In the cup and ball pivot the end of the shaft and the step present two recesses facing each other, into which are fitted two Between the concave spheri- cal surfaces of those cupsis placed a steel ball, being either a complete sphere ora lens having convex surfaces of a somewhat less radius than the concave surfaces of the cups. The moment of friction of this pivot is at first almost inappreciable from the extreme smallness of the radius of the circles of contact of the ball _ and cups, but, as they wear, that radius and the moment of friction increase.

It appears that the rapidity with which a rubbing surface wears away is proportional to the friction and to the velocity jointly, or nearly so. Hence the pivots already men- tioned wear unequally at different points, and tend to alter their figures. Schiele has invented a pivot which preserves its original figure by wearing equally at all points ina direction parallel to its axis. The following are the principles on which this equality of wear depends :—

The rapidity of wear of a surface measured. in an oblique direction is to the rapidity of wear measured normally as the secant of the obliquity is to unity. Let OX (fig. 31) be the axis of a pivot, and let RPC be a portion of a curve such that at any point P the secant of the obliquity to the normal of the curve of a line parallel to the axis is inversely

Fig 31. proportional to the ordinate PY, to which the velocity of P is

The rotation of that curve round OX will generate

roportional. sty Now let PT be a tangent to the

the form of pivot required.

———a me i —_

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curve at P, cutting OX in T; PT=PY x secant obliquity, and this is to be a eonstaut quantity ; hence the eurve is that known as the tractory of the straight line OX, in whieh PT=OR=constant. This curve is described by having a fixed straight edge parallel to OX, along which slides a slider carrying a pin whose centre is T. On that pin turns an arm, carrying at a point P a tracing-point, peneil, or pen. ; of an ordinary drawing-pen, the plane of the jaws must pass through PT. Then, while T is slid along the axis from O towards

‘ X, P will be drawn after it from R towards C along the tractory. This curve, being an asymptote to its axis, is eapable of being in- |

(a lpg a ig: open J segs onaitipe enable a belt to transinit a given foree between two pulleys.

stop before the angle PTY becomes less than the angle of repose of the rubbing surfaces, otherwise the pivot will be liable to stiek in its bearing.

is ealled, is equal to that of a cylindrieal journal of the radius OR=PT the constant tangent, under the same pressure.

111. Friction of Teeth.—Let N be the normal pressure exerted between a pair of teeth of a pair of wheels; s the total distanee through which they slide upon eaeh other ; » the number of pairs of teeth which pass the plaue of axis in a unit of time; then

OE et ie ks ns

is the work lost in unity of time by the friction of the teeth. The sliding s is composed of two parts, which take plaee during the approaeh and reeess respectively. Let those be denoted by s, and 8, so that s=s,8,. Insect. 55 the velocity of sliding at any instant has been given, viz., w=c(a, a), Where w is that velocity, e the distanee TI at any instant from the point of contact of the teeth to’ the pitch-point, and a, a, the respeetive angular velocities of the wheels.

Let v be the eommon veloeity of the two pitch-circles, 7, 7, their radii ; then the above equation becomes

w=cv|i —+—]}. Ty 73

To apply this to involute teeth, let c, be the length of the approach, ¢, that of the recess, w, the mcan veloeity of sliding during the approach, w, that during the recess ; then

*peas i LS * ai Pe us 1,1 4" O\ rts? 2 2\n 1*

also, let @ be the obliquity of the aetion ; then the times occupied |

by the approaeh and recess are respeetively Ca eee: vcosé' vcosé " giving, finally, for the length of sliding betwecn each pair of teeth, "A _ ate (Lea 881 59 9 cose 1) T, (64), which, substituted in equation 638, gives the work lost in a unit of time by the friction of involute teeth. This result, which is exact

for involute teeth, is approximately true for tecth of any figure. For inside gearing, if 7, be the less radius and r, the greater,

s = – is to be substituted for bs + os : mF? Gi %,

"12." Friction of Cords and Belis,~~A flexible band, such as a eord, rope, belt, or strap, may be used either to exert an effort or a resistance upon a pulley round which it wraps. In either ease the tangential foree, whether effort or resistance, exerted between tlie hand and the pulley is their mutual friction, eaused by and propor~~ tional to the normal pressure between them.

Let' T, be the tension of the free part. of the band at that side towards which it tends to draw the pulley, or from whieh the pulley tends to draw it ; T, the tension of the free part at the other side ; T the tension of the band at any intermediate point of its arc of eon- taet with the pulley; the ratio of the length of that are to the radius of the pulley ; @ the ratio of an iudefinitely small element of that arc to the radius ; F =T, —T, the total frietion between the band and the pulley ; dF the elementary portion of that friction due to the elementary arc d@; f the eoefficient of frietion between the materials of the band and pulley.

Then, aceording to a well-known prineiple in statics, the normal pressure at the elementary are dé@ is Tdé, T being the mean tension

Should the pen have a nib of two jaws, like those |

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The moment of friction of "Schiele's anti-frietion pivot," as it | by being tightened round a pulley.

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When a belt connecting a pair of pulleys has the tensions of its two sides originally equal, the pulleys being at rest, and when the pulleys are next set in motion, so that one of them drives the other by means of the belt, it is found that the advaneing side of the belt is exaetly as much tightened as the returning side is slaekened, so that the mean tension remains unchanged. [Its valuc is given by this formula—

T,+T, ce? +1

whieh is useful in determining the original tension required to

(66),

The equations 65 and 66 are applicable to a kind of brake called a friction-strap, used to stop or moderate the velocity of machines The strap is usually of iron, and the pulley of hard wood. Let a denote the arc of contact expressed in turns and fractions of a turn; then 6 =6°2832a 4 ef? — number whose common logarithm is 2°7288 fa (67).

113. Stiffness of Ropes.—Ropes offer a resistance to being bent, and, when bent, to being straightened again, whieh arises from the mutual friction of their fibres. It inereases with the seetional area of the rope, and is inversely proportional to the radius of the eurve into whieh it is bent.

The work lost in pulling a given length of rope over a pulley is found by multiplying the length of the rope in feet by its stiffness in pounds, that stiffness being the exeess of the tension at the leading side of the rope above

that at the following side, which is neeessary to bend it into a eurve fitting the pulley, and then to straighten it again. :

The following empirical formule for the stiffness of hempen ropes

| have been dedueed by Morin from the experiments of Coulomb :—

Let F be the stiffness in pounds avoirdupois ; d the diameter of the rope in inehes, »=48d? for white ropes and 35d? for tarred ropes ; 7 the effective radius of the pulley in inehes ; T the tension in pounds. Then

For white ropes, F =" (0°0012 + 0 001026n + 0-0012T)

3 (68).

For tarred ropes, F = = (0006 + 00013927 + 0:00168T)

.

114. Friction-Couplings. —Frietion is useful as a means of eom-munieating motion where sudden ehanges either of foree or velocity take plaee, beeause, being limited in amount, it may be so adjusted as to limit the forees which strain the pieces of the meehanisin within the bounds of safety. Amongst eontrivances for effeeting this object are friction-concs. A rotating shaft earries upon a cylindrieal portion of its figure a wheel or pulley turning loosely on

| it, and consequently eapable of remaining at rest when the shaft is

of the band at that elementary arc; consequently the friction on |

that are is dF=fTde. Now that friction is also the difference

between the tensions of the band at the two ends of the élementary | comparatively recent achievements of Joule.

are, ordT =dF =fTdé; which equation, being integrated throughout the entire arc of contact, gives the following formule :—

hyp. logy! = 78 « . 2 aa

(65).

at <) fs wh os 4S ee 8 &

F=T,$_{T,=T,(1-e}$) =T,(e” -1) J

|

| is 772 foot-pounds. _ equivalent,” is the principal experimental datum of the science of | thermodynamies.

in motion. This pulley has fixed to one side, and eoneentrie with it, a short frustum of a hollow eone. Ata small distanee from the pulley the shaft earries a short frustum of a solid cone aeeurately turned to fit the hollow cone. This frnstum is made always to turn along with the shaft by being fitted on a square portion of it, or by means of a rib and groove, or otherwise, but is eapable of a slight longitudinal motion, so as to be pressed into, or withdrawn from, the hollow eone by means of a lever. When the eones are pressed together or engaged, their friction causes the pulley to rotate along with the shaft; when they are disengaged, the pulley is free to stand still. The angle made by the sides of the cones with the axis should not be less than the angle of repose. In the friction- elutch, a pulley loose on a shaft has a hoop or gland made to embrace it more or less tightly by means of a screw; this hoop has short projecting arms or cars.

115. Heat of Friction—Unguents.—The work lost in friction is employed in producing heat. This fact is very obvious, and has been known from a remote period ; but the exact determination of the proportion of the work lost to the heat produeed, and the experimental proof that that proportion is the same under all eir- cumstances, and with all materials, solid, liquid, and gaseons, are The quantity of work which produces a British unit of heat (or so much heat as elevates the temperature of one pound of pure water, at or near ordinary atmospheric temperatures, by one degree of Fahrenheit) This constant, now designated as “Joule’s

The heat produced by frietion, when moderate in amount, is useful in softening and liquefying thick unguents ; but when excessive it

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is prejudicial, by decomposing the unguents, aud sometimes ever by softening the metal of the bearings, and raising their temperature so high as to set fire to neighbouring combustible matters,

Excessive heating is prevented by a constant and copious supply of a good unguent. The elevation of temperature produced by the friction of a journal is sometimes used as an experimental test of the quality of unguents. When the velocity of rubbing is about 4 or 5 fect per second, the elevation of temperature has been found by some recent experiments to be, with good fatty and soapy unguents, 40° to 50° Fahr.; with good mineral unguents, about 30°,

*116. Rolling Resistance. —By the rolling of two surfaces over each other without sliding a resistance is caused which is called some- times "rolling frietion," but .more correctly rol/ing resistance. It is of the nature of a couple, resisting rotation. Its moment is found by multiplying the normal pressure between the rolling surfaces by an arm, whose length depends on the nature of the rolling surfaces, and the work lost in a unit of time in overcoming it is the product of its moment by the angular velocity of the rolling surfaces rela- tively to each other. The following are approximate values of the * arm in decimals of a foot :—*

Oak DpomiOgk 2.20.5 cccbenexseeieesdecadisesaectsseroeetss 0006 (COulamp): Digraiitih: Viligs 'Off. ODM 552 csxneeatiuawenegaceenessasweiseas 0004 3% Cast ION GN CONE ATOM: <.,...θ

117. Reciprocating Forees—Storcd and Restored Energy.—When a force acts on a nachine alternately as an effort and as a resistance, it may be called a reciprocating force. Of this kind is the weight of any piece inthe mechanism whose centre of gravity alternately rises and falls; for during the rise of the centre of gravity that weight acts as a resistance, and energy is employed in lifting it to an amount expressed by the product of the weight

into the vertical height of its rise ; and during the fall of the centre of gravity the weight acts as an effort, and exerts in assisting to perform the work

-of the machine an amount of energy exactly equal to that which had previously been employed in lifting it. Thus that amount of energy is not lost, but has its operation deferred ; and it is said to be stored when the weight is lifted, and restored when it falls.

In a machine of which each piece is to move with a uniform velocity, if the effort and the resistance be constant, the weight of each piece must be balanced on its axis, so that it may produce lateral pressure only, and not act asa reciprocating force. But if the effort and the resistance be alternately in excess, the uniformity of speed may still be preserved by so adjusting some moving weight in the mechanism that when the effort is in excess it may be lifted, and so balance and employ the excess of effort, and that when the resistanee is in excess it may fall, and so balance and overcome the excess of resistance, —thus storing the periodical excess of energy, and restoring that energy to perform the periodical exeess of work.

Other forces besides gravity may be used as reciprocating forces for storing and restoring energy,—for example, the elasticity of a spring or of a mass of air.

In most of the delusive machines commonly called ' perpetual*

motions," of which so many are patented in each year, and which | are expected by their inventors to perform work without receiving | | the position in which the bob will revolve

energy, the fundamental fallacy consists in an expectation that some reciprocating force shall restore more energy than it has been the means of storing.

Division 2, Deflecting Forces.

118. Deflecting Force for Translation in a Curved Path.—In machinery, deflecting force is supplied by the tenacity of some piece, such as a crank,

which guides the deflected body in its curved path, and is unbalanced, being employed in producing deflexion, and not in balancing another force.

119. Centrifugal Forec.—See p. 682, § 35, and p. 701, § 119.

120, Rectangular Resolution of Centrifugal Force.—See p. 701, §§ 117 and 119.

121. Centrifugal Force of a Rotating Body. — The centrifugal force exerted by a rotating body on its axis of rotation 13 the same in magnitude as if the mass of the body were concentrated at its centre of gravity, and acts in a plane passing through the axis of rotation and the centre of gravity of the body.

The particles of a rotating body exert centrifugal forces on each other, which strain the body, and tend to tear it asunder ; but these forces balance each other, and do not affect the resultant cen- trifugal force exerted on the axis of rotation.?

Tf the axis of rotation traverses the centre of gravity of the body, the centrifugal force cxerted on that axis ts nothing.

Hence, unless there be some reason to the contrary, each piece of a machine should be balanced on its axis of rotation; otherwise the centrifugal force will cause strains, vibration, and increased friction, and a tendency of the shafts to jump out of their bearings.

122. Centrifugal Couples of a Rotating Body.—Besides the tend- ency (if any) of the combined eentrifugal forces of the particles of

1 This is a particular case of a more general principle, that the motion of the centre of gravity of a body is not affected by the mutual actions of its parts, for the proof of whieh see p. 718, § 179.

| strneted with pairs of rods and bobs,

, foree and the weight of the bob is a force

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a rotating body to shift the axis of rotation, they may also tend to turn it out of its original direction. The latter tendency is called a centrifugal couple, and vanishes for rotation about a principal axis (see p. 732, § 237).

It is essential to the steady motion of every rapidly rotating piece in a machine that its axis of rotation should not merely traverse its centre of gravity, but should be a permanent axis; for otherwise the centrifugal couples will increase friction, produce oscillation of the shaft, and tend to make it leave its bearings.

The principles of this and the preceding section are those which regulate the adjustment of the weight and position of the cownter. poises which are placed between the spokes of the driving-wheels of locomotive engines.

123. Revolving Pendulum—Governors.—In fig. 32 AO represents an npright axis or spindle; B a weight ealled a 606, suspended by rod OB from a horizontal axis at O, carried by the vertical axis. When the spindle is at rest the bob hangs close to it; when the spindle rotates, the bob, be- ing made to revolve round it, diverges until the resultant of the centrifugal

acting at O in the direction OB, and then it revolves steadily in a circle. This combination is called a revolving, centrifugal, or conical pendulum. Re- volving pendulums are usually eon-

as OB, Cd, hung at opposite sides of the spindle, that the centrifugal forces exerted at the point O may balance each other. Fie, 39 In finding the position in which the 2S, bob will revolve with a given angular velocity e, for most practical eases connected with machinery the mass of the rod may be con- sidered as insensible eompared with that of the bob. Let the bob be a sphere, and from the centre of that sphere draw BH=y perpendicular to

OA. Let OH=z; let W be the weight of the bob, F its eentrifugal force. Then the condition of its steady revolution

y

isW :F::2:y; that is to say, ; consequently

(69).

. a a . ns Or, if n= be the number of turns or fractions of a turn

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in a second, g __0°8165 foot _9°79771 inches) (70); “dn? n® n i ;*

z is called the altitude of the pendulum. If the rod of a revolving pendulum be jointed, as in fig. 33, not to a point in the vertical axis, but to the end of a projecting arm C,

will be the same as if the rod were jointed to the point O, where its prolongation cuts the vertical axis.

A revolving pendulum is an essential part of most of the contrivances called governors, for regulating the speed of prime movers.

The earlier kinds of governors act on the prime mover by the variations of their alti- tude. Thus in Watt’s steam-engine governor

Fig. 33.

the rods, through a combination of levers and linkwork ©, ¢, D,¢@ (fig. 32), act on a lever EF, which acts upon the throttle-valve for the admission of steam so as to enlarge or contractits opening when the speed becomes too small or too great.

In a more recent kind of governors invented by the Messrs

Siemens, which may be called differcntialgovernors, the regulation of the prime mover is effected by means of the difference between the velocity of a

wheel driven by it and that of a wheel regulated by a_re- volving pendulum. Fig. 34 illustrates this class of governors. A isa vertical dead-centre or fixed shaft, about which the after-men- tioned pieces turn; Cisa pulley driven by the prime mover, and fixed to a bevel-wheel, which is seen below it; E is a bevel-wheel

Za

LANs

*| [*

an ¢ | TN

Fig. 34. similar to the first, and having the same apex, To this wheel are hung the bobs B, of which there aré

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usually four, although two only are shown.

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Those bobs form }

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In order to produce a retardation from the greater vcloeity v, to

sectors of a ring, and are surrounded bya cylindrical casing F. | the less velocity 7,, it is necessary to apply to the body a resistance,

When the bobs revolve with their proper velocity, they are ad- justed so as nearly to touch this casing; should they exceed that veloeity, they fly outwards and touch the casing, and are retarded by the friction. For practical purposes their velocity of rotation about the vertical axis may be considered constant. G, G are hori- zontal arms projecting from a socket

which is capable of rotation about A, aud carrying vertieal bevel whcels which rest on K and support C, and transmit motion from C to K. There are usually four of the arms G, G with their wheels, though two only are shown. H is one of those arms which projects, and has a rod attached to its extremity to act on the throttlc-valve of a steam-engine, the slnice of a water-wheel, or the regulator of the prime mover, of whatever sort it may be.

When C rotates with an angular velocity equal and contrary to that of E with its revolving pendulums, the arms G, G remain at rest ; but should C deviate from that velocity, those arms rotate in one direction or the other, as the case may be, with an angular velocity equal to onc half of the difference between the angnlar velocity of Cand that of KE, and continue in motion until the regulator is adjusted so that the prime mover shall impart to C an angular velocity exactly equal to that of the revolving pendulums.

There are various modifications of the differential governor, but they all act on the same principle.

Division 3. Working of Machines of Varying Velocity.

124. General Prineiples.—In order that the velocity of evcry piece of a machine may be uniform, it is necessary that the forces acting on each piecc should be always exactly balanced. Also, in order that the forces acting on each piece of a machine may be always exactly balanced, it is necessary that the velocity of that piece should be uniform.

An excess of the effort exerted on any piece, above that which is necessary to balance the resistance, is accompanied with aecclera. tion; a deficiency of the effort, with retardation.

Whena machine is being started from a state of rest, and brought by degrees up to its proper speed, the effort must be in excess ; when it is being retarded for the purpose of stopping it, the resistance must be in excess.

An excess of effort above resistance involves an cxcess of cnergy exerted above work perfor.ned ; that excess of energy is cinployed in producing aeceleration.

An excess of resistance above effort involves an excess of work performed above energy expended; that excess of work is performed by means of the retardation of the machinery.

When a machine undergoes alternate acceleration and retarda- tion, so that at certain instants of time, occurring at the end of intervals called periods or eyeles, it returns to its original speel, then in each of those periods or cycles the alternate excesses of energy and of work neutralize each other; and at the cnd of cach cycle the principle of the cquality of energy and work stated in sect. 96, with all its consequences, is verified exactly as in the case of machines of uniform speed.

At intermediate instants, howcver, other principles have also to be taken into account, which are deduced from the second law of motion, sect. 89, as applied by the aid of the principles of sect. 90, to dircet deviation, or acceleration and retardation.

125. Energy of Acceleration and Work of Retardation for a Shifting Body.— Let w be the weight of a body which has a motion of trauslation in any path, and in the course of the interval of time At let its velocity be increased at a uniform rate of acceleration from v, to v. The rate of acceleration will be

Bin OF = constant = — 2 ixp 8

v de, and (p. 698, § 104) to produce this acccleration a uniform effort will be required, expressed by Bs Was (% – %) gat

(71).

(The product WP of the mass of a body by its velocity is called

its momentum ; so that the effort required is found by dividing the increase of momentum by the time in which it is produced.)

To find the energy which has to be exerted to produce the accel- eration from v, to V),it is to be observed that the distance through which the effort P acts during the acceleration is

As= “tal :

consequently, the encray of acceleration is

W(Vq— V4)(V_ +24) _ wry — 17) 29 2g

being proportional to the increase in the square of the velocity, and

independent of the trme.

AS (72),

connected with the retardation and the time by an equation identical in every respect with equation 71, except by the substitu- tion of a resistauce for an effort ; and in overcoming that resistance the body performs work to an amount determined by equation 72, putting Rds for Pads.

126. Energy Stored andl Restored by Deviations of Velocity.—Thus a body alternately accelerated and retarded, so as to be brought baek to its original speed, performs work during its retardation exaetly eqnal in amount to the energy exerted upon it during its acceleration ; so that that energy may be considered as stored during the acceleration, and restored during the retardation, in a manner analogous to the operation of a reciprocating force (seet. 117).

Let there be given the mean velocity V = 4(v, + v,) of a body whose weight is w, and let it be required to determine the fluctuation of velocity v,—v,, and the extreme velocities v,, v2, which that body must have, in order alternately to store and restore an amount of energy E. By equation 72 we have

pan 2 = Mi) 2g which, being divided by V=4(v,+%,), gives E_w(t-%) . g 3 and consequently a gk Vw The ratio of this fluctuation to the mean velocity, sometimes called the wnsteadiness of the motion of the body, is

(73).

%M%— Vy

(74).

127. Actual Energy of a Shifting Body.—The energy which must be exerted on a body of the weight w, to accelerate it from a state of rest up to a given velocity of translation v, and the equal amount of work which that body is capable of performing by over- eoming resistance while being retarded from the same velocity of translation v to a state of rest, is

we 2y

This is called the actual energy of the motion of the body, and is half the quantity which in some treatises is called vis viva.

The energy stored or restored, as the case may be, by the devia- tions of velocity of a body or a system of bodies, is the amount by which the actual energy is increased or diminished.

128. Principle of the Conservation of Energy in Machines. —The following principle, expressing the general law of the action of machines with a velocity uniform or varying. includes the law of the equality of energy and work stated in sect. 99 for machines of uniform speed.

In any given interval during the working of a machine, the energy exerted added to the energy restored is equal to the energy stored added to the work performed.

129. Actual Energy of Circular Translation— Moment of Inertia. —Let a body of the weight w undergo translation in acircular path of the radius p, with the angular velocity of deflexion a, so that the

SS ee . . . . .

common linear velocity of all its particles is v=ap. Then the actual cnergy of that body is 2 eae le a (76).

2y 29

By comparing this with the expression for the centrifugal force (wa2/pg), it appears that the actual energy of a revolving body is equal to the potential

cucrgy Fp/2 due to the action of the deflecting force along one-half of the radius of curvature of the path of the body.

The product wp?/g, by which the half-square of the angular velo- city is multiplied, is called the moment of inertia of the revolving body.

130. Actual Energy and Moment of Inertia of Rotation—Radius of Gyration. —See p. 732, §$ 234-237.

131. Exumples of Radii of Gyration.—See p. 733, § 238.

132. Fly-wheels.—A fly-wheel is a rotating piece in a machine, generally shaped like a wheel (that is to say, consisting of a rim with spokes), and suited to store and restore energy. by the periodical variations in its angular velocity. _ ,

The principles according to which variations of angular velocity store and restore energy are the same with those of sect. 126, ouly substituting moment of inertia for mass, and angular for linéar velocity. ; : ‘

Let W be the weight of a fly-wheel, R its radius of gyration, a, its maximum, a, its minimum, and A= 3(a,+ a) its mean angular

velocity. Let

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denote the wnsteadiness of the motion of the fly-wheel; the denom- inator S of this fraction is called the steadiness. Let ¢ denote the quantity by which the energy exerted in each cycle of the working of the machine alternately exceeds and falls short of the work per- formed, and which has consequently to be alternately stored by aeceleration and restored by retardation of the fly-wheel. The value of this periodical execss is— pa Was — a?)

29

frem which, dividing beth sides by A®, we obtain the following equations : — ‘ e RW A? gS R°WA? Se

37. 2

Phe latter of these equations may be thus expressed in words :— The actual energy due to the rotation of the fly, with ts mean angular velocity, ts equal to one-half of the periodieal excess of energy multiplied by the steadiness.

In ordinary machinery S=about 82; in machinery for fine purposes S=from 50 to 60.

The periodical excess ¢ may arise either from variations in the effort exerted by the prime mover, or from variations in the resistance of the work, or from both these causes combined. When but one fly-wheel is used, it should be placed in as direct eonnexion as possible with that part of the mechanism where the greatest amount of the periodical excess originates ; but when it originates at two or more points, it is best to have a fly-wheel in connexion with each of those points. For example, in a machine- work, the steam-engine, which is the prime mover of the various tools, has a fly-whcel on the crank-shaft to store and restore the periodical excess of energy arising from the variations in the effort exerted by the connecting-rod upon the crank ; and each of the slotting machines, punching machines, rivetting machines, and

cdcee veh

(78).

other tools has a fly-wheel of its own to store and restore energy, |

so as to enable the very different resistances opposed to those tools at different times to be overcome without too great unsteadiness of motion.

According to the computation of General Morin, the periodical excess ¢ in steam-engines with single cranks is from ¥5th to nearly

ith of the energy exerted during one revolution of the crank. |

For a pair of steam-engiues driving one shaft, with a pair of

eranks at right angles to each other, the value of ¢ is one-fourth of |

its value for a single cranked engine of the same kind, and of the same power with the two combined.

The ordinary radius of gyration of a stcam-engine fly-wheel is from three te five times the length of the crank-arm. (For further particulars on this subject, see SrEAM-ENG1NE.)

For tools performing nseful work at intervals, and having only their own friction to overcome during the intermediate intervals, ¢ should be assumed equal to the whole work performed at each separate operation.

133. Brakes.—A brake is an apparatus for stopping and diminish- ing the velocity of a machine by friction, such as the friction-strap already referred to in sect. 112. To find the distance s through which a brake, exerting the friction F, must rub in order to stop a machine having the total actual energy-E at the moment when the brake begins to act, reduce, by the prineiples of sect. 105, the various efforts and other resistances of the machine which act at the same time with the friction of the brake to the rubbing surface of the brake, and let R be their resultant,—positive if resistance,

negative if effort preponderates. Then E °=FLR ¢ % (79).

184. Energy distributed between two Bodies—Projection and Propulsion.—Hitherto the effort by which a machine is moved has been treated as a force exerted between a movable body and a fixed body, so that the whole energy exerted by it is employed upon the movable body, and none upon the fixed body. This conception is sensibly realized in practice when one of the two bodies between whrich the effort acts is either so heavy as compared with the other, or has so great a resistance opposed to its motion, that it may, without sensible error, be treated as fixed. But there

are cases in which the motions of both bodies are appreciable, and |

must be taken into account,—such as the projection of projectiles; where the velocity of the recoil or backward motion of the gun hears an appreciable proportion to the forward motion of the pro- jectile ; and snch asthe propulsion of vessels, where the velocity of the water thrown backward by the paddle, serew, or other pro- peller bears a very considerable proportion to the velocity of the water moved forwards and sideways by the ship. In eases of this kind the energy exerted by the effort is distributed between the two bodies between which the effort is exerted in shares propor- tional to the velocities of the two bodies during the action of the

effort ; and those velovities are to each other directly as the portions of the effort unbalanced by resistance on the respective bodies, and inversely as the weights of the bodies.

To express this symbolically, let W,, W, be the weights of the bodies; P the effort exerted between them; S the distance through which it acts; R,, Re the resistances opposed to the effort overcome by W,, W, respectively ; E,, E, the shares of the whela

energy E exerted upon W,, W, respectively. Then E a3 E, : Ky ., W(P-R,) + W,(P-R,) P~R, P-R, » + (86). W,W, WwW, ° Wy

If R,=R,, which is the case when the resistance, as well as the effort, arises from the mutual actions of the two bodies, the above

beeomes, EK : E, : BE, >: W + We: Wo: Wy

that is to say, the energy is exerted on the bodies in shares inversely proportional to their weights; and they receive accelerations in- versely proportional to their weights, according to the prineiple of dynamics,

already quoted in a note to sect. 121, that the mutual actions of a system of bodics do not affect the motion of their common centre of gravity.

For example, if the weight of a gun be 160 times that of its ball, 4189 of the energy exerted by the powder in exploding will be employed in propelling the ball, and 73; in producing the recoil of the gun, provided the gun up to the instant of the ball's quitting the muzzle meets with no resistance to its recoil except the friction of the ball.

135. Centre of Pereussion.—It is obviously desirable that the deviations or changes of motion of oscillating pieces in machinery should, as far as possible, be effected by forces applied at their centres of percussion.

If the deviation be a ¢ranslation,—that is, an equal change of motion of all the particles of the body,—the centre of percussion is obviously the centre of gravity itself; and, according to the second law of motion, if dv be the deviation of velocity to + produeed in the interval dé, and W the weight of the body, then

Re W dv

g | dt — is the unbalanced effort required.

If the deviation be a rotation about an axis traversing the centre of gravity, there is no centre of percussion; for such a deviation can only be produced by a couple of forces, and not by any single Let da be the deviation of angular velocity to be produced in the interval d¢, and I the moment of the inertia of the body; then 4]d(a?)=Iada is the variation of the body's actual energy. Let M be the moment of the nnbalaneed couple required to produce the deviation ; then, by equation 57, sect. 104, the energy exerted by this couple in the interval dt 1s Madt, which, being equated to tha variation of energy, gives

M=1

(81) ;

(82)

da RW da dt gg dt

Now (fig. 85), let the required deviation be a rotation of the body BB about an axis O, not traversing the centre of gravity G, do being, as before, the deviation of angular velocity to be produced in the interval dé. A rotation with the angular velocity a about an axis O may be considered as compounded of a rotation with the same angular velocity about an axis drawn through G parallel to O and a translation with the velocity a. OG, OG being tha perpendicular distance between the two axes. Hence the required deviation may be regarded as compounded of a deviation of translation dv=OG.da, to produce which there would be required, according to equation 82, a force applied at G per- pendicular to the plane OG—

W da

P i ar ee and a deviation da of rotation about an axis drawn through G parallel to O, to produce which there would be required a eouple of the moment M given by equa- tion 83. Accerding to the principles of ‘ statics, the resultant of the force P, ap- Pig. 89. f plied at G perpendicular to the plane OG, and the couple M isa force equal and parallel to P, but applied at a distance GC from G, in the prolongation of the perpendicular OG, whose value is

piM Re CC” #69 Thus is determined the position of the centre of pereussion C,

cerresponding to the axis of rotation O. It is ebvious fro this . equation that, for an axis of rotation parallel te © traversing ©; the

(83).

(84), B

(85).

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eeutre of percussion is at the point where the perpendicular OG meets O.

136. Jmpact.—Impact or collision is a pressure of short duration exerted between two bodies. For the detailed investigation of its laws the reader is referred to MECHANICS, p. 719, § 180 sq.

The effects of impact are sometimes an alteration of the distribu- tion of aatual energy between the two bodies, and always a loss cf a portion of that energy, depending on the imperfection of the elasticity of the bodies, in permanently altering their figures, and producing heat. 'The determination of the distribution of the aetnal energy after collision and of the loss of energy is effected by means of the following principles :—

I, The motion of the common centre of gravity of the two bodies is unchanged by the collision.

Il. The loss of energy consists of a certain proportion of that part of the actual energy of the bodies which is due to their motion relatively to their common centre of gravity.

Unless there is some special reason for using impact in machines, it ought to be avoided, on account not only of the waste of energy which it causes, but from the damage which it occasions to the frame and mechanism.

CuaAPpTer II]. Purposrs AND EFFECTS OF MACHINES.

137. Observing Machines and Working Machines.—The present ehapter must necessarily be limited to some very general observa- tions on the principal classes into whieh machines may be divided, with reference to their purposes and effects, leaving details of par- tienlar examples for treatment under the respective special headings.

Machines inay be divided, in the first instance, into two great divisions, viz. :—

I. Observing Machines, in which either the modification of motion alone, or the balancing of forees alone, is the object in view,—the performance of

work being either null or incidental, and_ being limited to that: which arises from the resistance of the machine.

Il. Working machines, in whieh the performance of work is the |

main object.

138. Olasstfication of Observing Machines.—Observing machines might very properly have been classed as instruments, being de- signed to aid the human senses and memory in obtaining and recording information. They may be divided, in the first instance, into four classes, according as the subject of observation by thcir aid is number, measure, or weight, into—

A. Counting machines.

B. Measuring machines.

C. Copying and drawing machines.

D. Weighing machines. And to these may be added a fifth class, in which the functions of the first four are more or less combined, viz. :—

E. Recording machines.

139. (A.) Cownting Machines. —The most important as well as the most common of counting machines are time-kecpers, which count and indieate the numbers of oscillations of bolies which oscillate isoehronously (viz., pendulums for clocks, balance-wheels for watches and marine chronometers) so as to measnre time. In constructing such machines, the objects to be aimed at are the exact isochronism of the pendulum or balance, and the equable action of the motive power, so that it shall overcome the friction of the mechanism without affecting the rate.

Other counting machines count the oscillations of the beain of a steam-engine, or the revolutions of the cylinder of a gas-meter or of the wheel of a water-meter.

Others perform additions, subtractions, and multiplications, and of these the most elaborate kind (as, e.g., that of Babbage) compute tables of

funetions by the addition of differences.

140. (B.) Measuring Maehines.—Measuring machines are pieces of mechanism, by means of which the motion of some body of the nature of an index through some geometrical magnitude, such asa distance or an angle, is connected with some other motion, either equal or greater or smaller in some given ratio, and capable of being more readily compared with some standard of measure.

To this class belong all those astronomical and surveying instru- ments in which the motion of a line of sight (generally the line of eollimation of a telescope) through a given angle is connected with the notion of an index or vernier round a corresponding arc of a graduated circle ; also those micrometers in which the advance of the end of a screw of fine pitch is measured by observing the simul- taneous are of rotation of a graduated eircle attached to it.

Snch micrometers have attained increased importance by the discovery of Whitworth,—that the mechanical magnifying of small distanees by a train ot screws affords a more accurate means of measurement than optical magnifying by the microscope,—and by the perfection to which that engineer has brought that art of accu- rate workmanship which is necessary in order to render mechanical magnifying possible.

Amongst measuring machines are included the platometers or planimeters of Sang, Morin, and Clerk Maxwell, which measure

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areas by means of mechanism. The amount of resistance in a measuring machine should be perfectly uniform, and sufficiently great to prevent accidental forces from disturbing the machine, without being so great as to render it inconveniently stiff. To combine these objects requires great accuracy of workmanship, together with strength and rigidity in the structure of the frame and mechanism.

141. (C.) Copying and Drawing Machincs.—In copying machinés for enlarging or reducing drawings there is usually a combination of levers and linkwork connecting a tracing-point, which is moved over the lines of the original figure, with a drawing-point, which draws the copy in such a manner that the velocity ratio of their motions is a given constant quantity, and that the directions of their motions make a constant angle.

Mechanism depending for its principle on the theory of the composition of rotations is used to draw ellipses, epicyeloids, epitrochoids, and other curves.

142. (D.) Weighing Machines.—In weighing machines the motion of the mechanisin is used only for the purpose that its cessation, or its becoming an oscillation about a certain position, may indicate the equilibrium of the forces applied to the machine. Those forces may either be weights, which are to be compared with each other, or forces of other kinds, to be compared directly or indirectly with weights.

The machine for eomparing weights which is capable of the most minute accuracy is also the simplest, being the balance, in which the equality of two weights is aseertained by their balancing each other at the ends ofa lever of equal arms. In the steclyard, consisting either of one lever or of a train of levers, the unknown weight has an unchangeable point of application, and is compared with a known weight by shifting the latter along the lever to which it is applied until the machine is balanced ; the ratio of the weights is then the reciprocal of the velocity ratio of their points of applica- tion. The steelyard is more convenient for weighing very heavy loads than the balance, but is not capable of such minute aecuracy.

It is essential to accuracy in balances and steelyards that the friction should be less than the smallest admissible amount of error.

| To diminish the friction as much as possible, the axes of motion are

all knife-edges, as they are termed, of steel or hardened ircn, resting on hard surfaces of hardened iron or steel for ordinary purposes, and of some hard mineral, such as agate, for scientific purposes.

The weight of a column of fluid is determined by balaneing jt against a column of fluid whose weight is known, as in tho barometer, where the weight of a column of the atmosphere is balanced against that of a column of mercury.

Weights are compared with each other indirectly, and other forces compared with weights, by means of their effects in bending a spring,—a convenient method, but not suseeptible of minute accuracy.

The elastic pressure exerted by a finid may be compared with weight, either by balancing the pressure against the weight of a column of a liquid, or by maintaining a piston in equilibrium against that pressure, by means of a weight pressing it directly, or of a weight acting through a steelyard, or of the elasticity of a spring which has been compared with weights.

143. (E.) Recording Machines.—Recording machines may be divided into two classes :—self-registering instruments, which, by the aid of clockwork, record measurements either of space or of force, together with the instants of time at which these measurements were nade; and dynamometers, already mentioned in Chap. Il. of this article, which register measurements of foree, together with the space through which it has acted, thus recording energy or work.

144. Working Machines Classed.—The object or purpose of work- ing machines is to perform uscful work ; and their classification relatively to their objects and purposes is founded on the kind of useful work which they perform. In this point of view they may be elassed as follows :-—

A. Machines for lifting or lowering solid weights. :

B. Machines for the horizontal transport of weights, either eem- bined or not with lifting or lowering.

Machines for projecting solids.

Machines for lifting fluids.

Machines for propelling or projecting fluids.

Machines for dividing bodies. :

Machines for shaping bodies by removing portiens ef them.

Machines for shaping bodies by pressure.

Machines for uniting bodies into fabrics.

. Machines for printing.

K. Machines for producing sound.

L. Miscellaneous machines.

It is not pretended that the above classification (taken fo a eon: siderable extent from the writings of Young and of Babbage) exhausts all kinds of maehines; it is brought forward merely fs an attempt to introduce method toa certain extent into a subject whieh would otherwise be exceedingly confused. |

145. (A.) Machines for Lifting and Lowering Solids. —The most eommon machines of this elass are capstans, cranes, and windlasses.

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They are usually worked by manual labour, but sometimes by

hydraulic cngines, or by steam-engines. The useful resistance, when a load is lifted, being the weight of that load, is in general

greater than the effort exerted by the prime mover, so that the |

mechanism has to be adapted to giving the working-piece a less velocity than the picce to which the effort is applied. In lowering solid loads the weight of the load acts as the etfort, and the energy exerted by it is expended in overcoming the friction of a brake in order that the speed of descent may not be excessive.

146. (B.) Transporting Machines.—The mechanism of transport- ing machines consists of two parts :—that by which the resistance is diminished, as the wheels and axles of vehicles; and that by which the resistance is overcome and the load propelled, eomprising all kinds of locomotive and propelling machinery. In the present work transporting machines are treated of in the articles relating specially to the lines of conveyance to which they are appied.

147. (C.) Machines for Projecting Solids. —This class comprehends all kinds of artillery.

148. (D.) Machines for Lifting Fluids.—See HypRoMECHANICS.

149. (E.) Machines for Propelling or Projecting Fluids,—See the same article.

150. (F.) Machines for Dividing Bodics.—This class comprelends all machines for separating solid masses into parts, whether by digging, cutting, sawing, grinding, tearing, crushing, pounding, pressing out fluids, or otherwise ; and whether applied to earth, stones, metals, timber, fruit, grain, fibres, or other materials.

151, (G.) Machines for Shaping Bodics by Removing Portions of them. — his class of machines toa eertain extent resembles the pre- ceding. It includes machines for cutting, grinding, and polishing blocks of stone into required figures, and for shaping pieces of wood, metal, or other material, whether by éwrning, to produce spherical,

cylindrical, and other enrved surfaces, —by boring, punching, slotting, | or gouging, to prodnee cylindrical, rectangular, or other orifices and |

grooves, —by scerew-cutting, hy planing, by grinding and polishing, to produce eurved or plane surfaces. The most difficnlt and import- ant of all these operations is to produce a surface truly plane ; and the perfecting of this operation by Whitworth is the most im- portant step recently made in Constructive Mechanies, or the art of making machines and instruments. Next in point of difficulty may be placed the art of forming the coneave

reflecting surfaces of great specula for telescopes, such as those of the Iferschels, of Lassell, and of Lord Rosse.

152. (H.) Maehines for Shaping Bodies by Pressure comprehend, amongst others, rolling-mills for iron, steam-hammers, wire- drawing machines, pinmaking and natlmaking machines, coining and other stamping machinery, brickmaking machines, presses for packing and compressing, &c.

153. (I.) Machines for Uniting Bodies into Fabrics eomprise spinning maehinery, whether applied to ropes, yarn, or thread,

weaving machinery of all kinds, papermaking machinery, felting —

machinery, and sewing machinery.

154. (J.) Machines for Printing are used to apply either colouring matters or matters for discharging colour to paper, cloth, and other materials.

155. (K.) Afachines for producing Sound.—See Acoustics and Music.

156. (L.) Miseellancous Machincs.—Therc are numerous machines which perform processes, especially in the preparation of textile fabrics br the market, which it would be almost impossible to class. Examples of such machines will be found by referring to the articles relating to the various branches of manufacture.

CuapTer IVY. AppLtieD ENERGETICS, on THEORY OF PRIME Movers.

157. Prime Movers in gencral— Their Efficiency.—Yrime movers, or receivers of power, are those pieces or eombinations of pieces of mechanism which receive moticn and foree directly from some natural source of energy. The point where the mechanism belong- ing to the prime mover ends and that belonging to the train for

modifying the foree and motion begins is somewhat arbitrary ; in |

general, however, the mechanism belonging to the prime mover may be held to include all pieces which regulate or assist in regulating the transmission

of energy from the source of energy. Thus, in the ordinary rotative steam-engine, the crank-shaft belongs to the prime mover, because it carries the eccentric which moves the valves and the fly-wheel which stores and restores the periodical excess of energy of the engine, and drives the governor (when there is one) which regnlates the admission of steam.

The aseful work of the prime mover is the energy exerted by it upon that piece which it directly drives ; and the 1atio which this

bears to the energy exerted by the source of energy is the efficiency |

of the prime mover. It is often convenient to divide the prime mover into sections,

and resolve its efficiency into factors, each factor being the efficiency |

of one of those sections. Thus the etliciency ofa steam-engine may be resolved into the following factors :—

| Lfficiency of the furnace and botler,—being the proportion of the total heat of combnstion of the fuel which takes effect in heating , and evaporating the water.

Efficiency of the steam in driving the piston,—being the proportion of the energy exerted by the steam on the piston (called the indi- cated energy or power, as being measured by an indicator) to the mechanical equivalent of the heat received by the water.

Epicieney of the mechanism from the piston to the erank-shaft inclu- sive,—being the proportion of the effective energy transmitted by the crank-shaft to the indicated energy.

The product of those three factors is the efficiency of the engine as a whole.

In all prime movers the loss of encrgy may be distinguished into | two parts, —one being the unavoidable eftect of the circumstances , under which the machine necessarily works in the case under con- sideration ; the other the effect of causes which are, or may be, eapable of indefinite diminution by practical improvements. Those | two parts may be distinguished as necessary loss and waste.

The efficiency which a prime iover would have under given circumstances if the wastc of energy were altogether prevented, and the loss reduced to necessary loss alone, is ealled the maximum. or the theoretical efficieney under the given circumstances,

For some prime movers there is a combination of circumstances which makes the theoretical efficiency greater than any other com- bination does. The theoretical efficiency under those circumstances is the absolute maximum efficiency.

The duty of a prime mover is its useful work in some given unit of time, as a second, a minute, an honr, a day. In some cases, snch as that of the work of animals, the duty can be ascertained, while the efficiency ean only be inferred indirectly or conjecturally from the want of precise data as to the whole energy expended.

158. Sources of Energy Classcd.—The sources of energy used in practice nay be classed as follows :—

A. Strength of men and animals. B. Weight of liquids.

C. Motion of fluids.

ID. Heat.

E. Electricity and magnetism.

159. (A.) Strength of Men and Animals.—The mechanteal daily duty of a man or of a beast is the product of three quantities—the effort, the velocity, and the number of units of time per day during which work iscontinued. Itis well known that for each individual nian or animal there is a certain set of

values of those three quantities which make their product, the daily duty, a maximum, and that any departure froin those values diminishes the daily duty. Attempts have been made to represent by a formnla the law of this diminution; but they have inet with imperfect snccess. That which agrees on the whole best with the facts is the formula of Maschek, which is as follows :—let P, be the effort, V, the velocity, and T, the time of working per day, which give the maximum daily dnty, and let P, V, T, be any other set of values of those quantities;

then ce ma ay

One consequence of this formula is, that the best time of working per day for men, and for all animals, is one-third part of a day, or eight hours,—a conclusion in accordance with experience.

The best effort P,, and the best velocity Vj, are much less certain,— | the difficulty of determining their true mean values for particular species being rendered very great by the differences, not only between individuals, but between races or varieties of the same species. The following table of values is proposed by Mascliek as approxi- mately true :—

ae S$ . . « » 2 eo

a :

= | Pie | Va 5600 si PV) PAViTL.

Animals, ———— Frnaa| ancl ae ae iS Feet per! Hours | Foot-Ib] ¢po4-

= Ib. | second. per day.. per sec. fou

| | Mui… sscsseeecee | 1501 | 30 | 25 g | 75 | 2,160,000

| | Horse (draught)..... 600 Ib | 120 4:0 8 480 13,824,000

OX Sec pee reece acess | GOUMD: | 120 2°5 8 500 8,640,000 NGS. ccverdrererscrssesss .| 360 tb veka 2°5 8 180 5,184,000? Stile eee cae 500 th | 100? | 35 8 340 | 10,080,000?

Of the numbers in this table those for the dranght horse are prob- ably the most accurate. For the thorouglibred horse it is certain that the value of V, is much greater, and that of P, much less, than | for the dranght horse,—the effect being probably that the maximum daily duty P,V,T, is nearly the same ; but experimental data are wanting to determine these quantities with precision.

The following table, chiefly extracted from the works of Poncelet and Morin, with the addition of some results of experiments by Lieutenant David Rankine and by the author of this article, shows the daily duty of men and horses nnder certain specified circunt- | stances :—

eine ; rl | r. | Ve | geo”) PV. | PVT. | | th Feet | Hours | Foot-Ib | Foot-tb | ‘ |P- sec. | p. day.! per see.| per day. i ee if SS a | = Man— | 1, Raising his own weight up % < Sec | stair or ladder.....-+ \ is 05 8 #2°5 | 2,038,000 | ee do, d0,..... 10 2,616,000 , 3. (Tread-wheel—sce 1)..... ! 4. Hauling up weig .t with rope 40 0°75 GO “4&0 648,000 | 5. Lifting weights by hand.... 44 0°55 6 | 24-2 522,720 | 6, Carrying weights up stairs. | 143 0-13 6 18°5 399,600 | 7. Shovelling up earth to a} | : ay height of 5 ft. 3 in.....) . = 10 vs 280,800 8. Whecling earth In barrow) up slope of 1 In 12; 4 S aus 7 4 horiz. veloc. 0-9 ft, per = ow | 356,400 sec, (returning empty).. 9, Pushing or pulling hori-) eae . — = H zontally (capstan or oar)) al 20 8 ne | 1,526,400 (12°5 50 ? 62°5) | 10, Turning a crank or winch < 138-0 2-5 8 45 > 1,296,000 ; q 20-0 |14‘4 | 2min.| 288 ile Working pump….....0c.00… 132 25 } GO 5: | 1,188,000 | Pee PUAMMIMENTING wcc-00..sececeseee.. | 15 2 db? ? 489,000 | Hlorse— 13, (Thoroughbred) cantering) min. 225 | and trotting, drawing a = jiu. 5 >) 146 4 447-5 6,444,000 | light railway carriage… } max. 50) | 14. Horse (draught) drawing r ’ . cart or boat, wang? = ‘s lt Ces cisnian aed 160. Horizontal Transport.—When men and animals carry

burdens, or draw or propel loads in eertain vehicles, it is difficult, and sometimes impossible, to determine the duty performed in foot- pounds of work, because of the uncertainty of the amount in pounds of the resistance overcome. In this case, for the purpose of coin- paring performances of the same kind with each other, a unit is employed called a foot-pound of horizontal transport, meaning the conveying of a load of 1 pound 1 foot

horizontally. The follow- ing table, compiled from the sources referred to in sect. 159, gives some examples of the daily duty of men and horses in units of horizontal transport, L denoting the load in fb, V the velocity in feet per second, and '[the number of seconds per day of working:—

1 Vv be

3 ; 3600"

*Ib con- Feet per | Honrs tb. _| veyed second. per day. icoe ; a |e a ee eee | Max— | 15, Walking unloaded, trans-) a l cae port of own weight…... iy sii * | ss 700) | 26,008,008 0. (ORB roeoeenee 140 6 |} 10 |} S40 30,240,000 16. Wheeling load L in tl | wheeled barrow, return- 224 16 10 | 373 | 13,428,000 ingempty;V=} velocity j 17. Do. one-wheeled barrow, do.| 135 1°6 10 295 8,100,000 18. Travelling with burden…... #0 29 7 4 *925 5,670,000 19, Conveying burden, return- : | ing tmloaded…e..cseseese ai i 1. —— 20, Carrying burden for 30 252 ge Siva ait aaa se. onds anal ~~ ht = | ae Horse— a, _ 21, Walki ri rt alw: JOadetnseecrncereeeg | 1500] $6 | 10 | 5400 194,400,000 22. Trotting do. do…..... 750| 72 45 | 5400 | 87,480,000 23, Walking with cart, going – } loaded, returning empty; > | 1500 20 10 | 3000 108,000,000 V=} mean velocity …...) | 972 24. Carrying burden, walking…| 270 3°6 10 | 34,992,000 25. Do. trotting…| 180) 7-2 7 1296 32,659,200*

161. (B.) Weight of Liquids.—(C.) Motion of Fluids.—In water- Wheels and other hydraulic engines the weight and motion of a liquid usually act together as sources of energy.

To determine the necessary loss of energy and the theoretical efficiency, we have the following formule :—

~The power or energy exerted per second is

2

o(H +3) ;

2g the necessary loss-—

ee Q : oy ; ! » ; ; g t a co te dt CO the theoretical effect or useful work per second— y2_ \r2 o(H+) ; 2g the theoretical efficiency— (n+ ¥2%2) (+ ¥2) | 29 , 2g J

where Q denotes the weight of liquid which acts on the wheel or other engine per second; H the vertical fall from the point where the liquid first begins to act directly or indirectly on the wheel or

| Heat employed in producing mechanical

other engine to the point where it eeases to act ; V, the velocity of the liquid when it begins to aet ; and V, the least velocity, when it ceases to act, which will properly discharge the liquid, and pre- vent its accumulating so as to impede the wheel or engine.

(For details as to the actual efficiency and duty and the construc-

| tion of hydraulic engines, see HypRoMECHANICS.)

In windmills, the air, being in notion, presses against and moves four or five radiating vanes or sails, whose surfaces are approximately helical, their axis of rotation being parallel, or slightly inclined in a vertical plane, to the direction of the wind. The best form and proportions for windmill sails, as determined experimentally by Smeaton, are as follows (sce fig. 36):—

Angle of each sail with the plane of rotation—at DE=18°;

Do. do. do. at BC= 7°; OD=} of whip OA; bar DE=}40A; bar BC=30A; AC=-DE.

162. (D.) Heat.—In sect. 157 the three factors into which the efficiency of an engine move:] by heat can be resolved have already been stated. he efficiency of the furnace A and boiler in steam-engines varies from 0°4 ’ to 0°85. It may be considered that the loss of heat to the extent of 0°15 by the chimney is necessary in order to produce a sufficient draught ; any loss

beyond this is waste. The theoretical efficiency of the steam, or other elastic fluid, which serves as the mechanism for converting heat into me- ehanical energy, is regulated by a law which will now be explained.

Heat acts on bodies in two ways—to elevate temperature and make the bodies hotter, and to produce mechanical changes.

B Cc

ee

D

0

Fig. 36.

changes disappears or becomes /atent, as it is termed, and can be reproduced by reversing those mechanical changes. When a cycle

| of mechanical ehanyes, ending by the restoration of the body to its

original eondition, produces mechanical energy, heat disappears to an amount equal to that which would be generated by employ- ing the mechanical energy in overcoming friction, —that is to say, a British unit of heat (or one degree Fahr. in one tb of liquid water) for every 772 foot-pounds of euergy (being the constant already mentioned in sect. 115 as Joule's equivalent), This is called the conversion of heat into mechanical energy.

The efficiency of the fluid in a heat-engine is the proportion which the heat converted into mechanical energy bears to the whole heat received by the water or cther fluid; and the theoretical or maximum value of that efficiency depends solely upon the respective tempera- tures at which the fluid receives heat and rejects the unconverted heat, according to the following law :—let ¢, represent the tempera- ture at which the fluid receives heat, and ¢, the temperature at which it rejects the unconverted heat, as measured from the absolute zero,—that is, from a point 493°°2 Fahr. or

274° C. below the temperature of nielting ice (temperatures so measured are called absolute temperatures) ; then the maximum theoretical efficiency of the water or other fluid in a steam-engine or other heat-engine ts

ht (88). aT

The necessary loss of heat by the fluid is ¢,/¢, of the whole heat

. . . .

| received by it; and any loss beyond this is waste.

The theoretical efficiency of the steam in ordinary steam-engiues seldom exceeds 3th ; the greatest actual efficiency is about $th ; the

efficiency in good ordinary engines is about 0°1 or 0°08, and in

bad and wasteful engines 0°04, or even less. (For details see

STEAM-ENGINE.) me

163. (E.) Electricity and Magnetism.—Electricity developed by chemical action in a galvanic battery has been to a small extent used to produce mechanical energy by alternately magnetizing and unmagnetizing soft-iron bars. . ‘

The data for determining the actual efficiency of such engines are deficient. Their theoretical efficiency depends on the following law demonstrated by Joule :— ; d

Let y, denote the strength of the electric current which would be developed in the conducting wire of the battery if there were no iron bar to be magnetized ;_ -y, the strength to which the current is reduced by the reaction of the iron bar, tending to induce a contrary current. ‘Then the theoretical efficiency of the engine is

aS

The proportion of the energy expended which is necessarily lost is 2/71) and is employed in producing heat in the conducting circuit.

This law is exactly analogous to that of the theoretical efficiency of heat-engines given in equation 88. ; :

There is-reason to believe that electromagnetic engines are cap- able of a higher efficiency than heat-engines ; but the greater cost of the materials consumed renders them much less economical com- mercially. (W. J. M. R.)

(89).

vis

MEC—MEG

MECHITHARISTS, a congregation of Armenian monks, } market still retains some vestiges of the splendid palace

in communion with the churcli of Rome, which has enjoyed papal recognition since 1712. Its founder Mechithar, or Mechitar da Pietro, a uative of Sebaste (Sivas) in Armenia, was born ou February 7, 1676; his original name was Manuk, which he exchanged for that by which he was subsequently known (“‘Comforter”) when he entered thie cloister of the Holy Cross in his native town. In the pursuit of knowledge hie visited various seats of learning in Armenia, and in the years 1691, 1696, and 1699 respectively he attaimed the office of deacon, priest, and vartabed or doctor in theology. Having removed to Constantinople, he founded there in 1701 a religious institute for the intellectual, moral, and spiritual elevation of his countrymen, and for the cultivation of their language and literature. In 1703 sectarian jealousy obliged him to retire to the Morea, where he ultimately found a settlement at Modon, and built a cloister and church (1706-8). The outbreak of hostilities between the Turks and Venetians in 1715 compelled him to take refuge in Venice, where in 1717 he received from the senate the island of San Lazzaro, which ever since has been the home of his order. Mechithar, who died on April 27, 1749, was the author of a Grammatica Armena, printed in 1770, of an Armenian Lexicon, printed in 1744, of an Armenian translation of the Bible, printed in 1734, and of

several commentaries on Biblical books. The order of Mechi- tharists, which, as already mentioned, received formal recognition (from Clement XI.) in 1712, uses the Armenian language and the Syrian rite; its rule resembles thie Benedictine, prominent among the duties of its members being tle proclamation of the gospel and the diffusion of good literature. They have accumulated at San Lazzaro a large library, specially rich in Armenian MSS. ; and their linguistic attaimments are considerable. Among their services to the cause of learning may be mentioned, in addition to the preparation of critical texts of the Armenian classics and of the Armenian version of the Bible, the publication in old translations of various works of Ephraem Syrus, Philo, and Eusebius, of which the originals have been lost. There are establishments belonging to the order elsewhere in Italy (Padua), as well as in Russia and Turkey, in Paris, in Austria-Hungary, and in Germany. Of these the most important is that of Vienna, which has existed since 1810, aud has become 'a sort of learned "academy," receiving honorary members even from beyond the pale of tlhe Roman Catholic Church.

MECHLIN, or Maines, a city of Belgium, in the pro- vince of Antwerp, on the river Dyle, about 14 miles north of Brussels. The general aspect of the town, belted by

' and other towns.

raised on the site by Charles V. in 1530, and on the chief market-place is a monument erected to Margaret of Austria, daughter of the emperor Maximilian. Mechlin js an archiepiscopal see, occupied by a cardinal, primate of Belgium, deriving his spiritual power from Rome, and quite independent of (at times even openly opposed tu) the civil Government. His palace is the headquarters of the Catholic party, and the seat of considerable moral and political influence extending over every parish in the land; the university of Louvain, the Catholic schools, more than four thousand in number, and the great seminary of Mechlin, tle nursery of the Belgian priesthood, are entirely under the direction of the archbishop. The industrial activity of the town, formerly very great, has constantly decreased in the present century, and is now almost extinct, The important corporation of weavers was scattered by the political troubles of the 15th and 16th

centuries ; and the lace trade has gradually been transferred to Brussels There still exist a few special manu- factures, those of carved oak furniture, straw chairs, and wool and linen tissues bemg among the foremost; some tanyards and breweries are also to be found, and the means of communication furnished by the Dyle supply a tolerably brisk market in corn, oils, flax, hemp, and hops. As a railway station Meclilin possesses peculiar importance, being a junction of the chief Belgian Government lines and the great central workshop for constructing and repairing the rolling-stock. The population of Mechlin in 1880 was

| 42,381.

Mechlin appears to have been about the 8th century a mere group of cabins surrounding a noted monastery where St Rombaut, now the patron saint of the town, suffered martyrdom on the 24th of June 775. After having belonged to the first Frankish monarchs, it was given by Pippin the Little to his relative Adon, and passed, at the commencement of the 10th century, under the dominion of the bishops of Liége, in whose name it was governed by the powerful house of Berthold until the year 1338. When this fainily became extinct, Mechlin and the surrounding district were divided in two portions and sold by the bishops to the duke of Brabant and the count of Flanders, the former of whom, ten years later, once more united the whole territory under his own sway. By the marriage of Margaret of Brabant with Philip the Bold, Mechlin was brought under the seeptre of the house of Burgundy, whose fate it shared from that time. Stormed by the French in 1572, by the prince of Orange in 1578, by the English in 1580, the town suffered much during the wars of the 17th and 18th centuries. Napoleon I. had its fortifications razed in 1804, and made it the

| capital of the French " Département des deux Néthes " until 1814, _ when it was comprised in the kingdom of the Netherlands, and it

i

| finally became part of Belgium in 1830. =

MECKLENBURG, a territory in North Germany, on the Baltic Sea, extending from 53° 4' to 54° 24' N. lat.,

/and from 10° 35’ to 18° 57’ E. long., corresponds with

a fine avenue of trees, with well-built houses, extensive |

gardens, and broad airy streets and squares of proverbial cleanliness, is pleasing to tle eye; there is, however, a lack of life and motion, a repose bordering on stagnation; and the area occupied by the town is much too extensive for the population. Mechlin was for many centuries, and is to this day, the religious metropolis of Flanders, and its monunients and curiosities are in general of a sacred deseription. Among the most remarkable is the cathedral church of St Rombold or Rombaut, mainly built in the latter half of the 14th century; the square massive tower, rising 300 feet high and bearing four dials, each 48 feet in diameter, is visible from all the country round. The interior proportions of the edifice are grand, and it contains some fine works of art—statues of the apostles, standing against the pillars of the nave, Vandyck’s picture of the Crucifixion, the Adoration of the Shepherds, by Erasmus Quellin, and others. The church of St John possesses a celebrated triptych of Rubens, and another by the same master is to be seen at Notre Dame. The “Halle” or

tolerable closeness to the old lower Saxon province of the same name, and is now unequally divided into the two grand- duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz. These are so closely related in history, political organiza- tion, natural features, and general development that it 1s convenient to treat them in a single article. ;

MECKLENBURG-SCHWERIN, the seventh state of the German empire in size and the eighth in population, 1s bounded on the N. by the Baltic Sea, on the W. by the principality of Ratzeburg and Lauenburg, on the 6. by Brandenburg and Hanover, and on the E. by Pomerama aud Mecklenburg-Strelitz. It embraces the duchies of Schwerin and Giistrow, the district of Rostock, the prim- cipality of Schwerin, and the barony of Wismar, besides several small “enclaves” in the adjacent territories. Its total area is about 5117 square miles.

MrcKLENBURG-STRELITZ, the eleventh state of the German empire in area and the nineteenth in population, consists of two detached parts, the

duchy of Strelitz on the east of Mecklenburg-Schwerin and the principality of

MECKLENBURG

Ratzeburg on the west. The first of these is bounded by Mecklenburg-Schwerin, Pomerania, and. Brandenburg, the second by Mecklenburg-Schwerin, Lauenburg, and the territory of the free town of Liibeck. Their joint area is 1126 square miles.

~ Mecklenburg lies wholly within the great North-European plain, and its flat surface is interrupted only by one range of low hills, intersecting the country from south-east to north-west, and forming the watershed between the Baltic Sea and the Elbe. Its highest point, the Helpter Berg, is 580 feet above the sea-level. The coast-line runs for 65 miles along the Baltic (without including indenta- tions), for the most part in flat sandy stretches covered with dunes. The chief inlets are the bays of Wismar, Grosse Wiek, Salzhaff, and Kroy, and the roads of Warne- minde. The rivers are numerous though small; most of them are affluents of the Elbe, which itself traverses a small portion of Mecklenburg. Several of the streams are navigable, and the facilities for inland water traffic are increased by a tolerably extensive system of canals. Lakes are very numerous; about four hundred of fair size, eovering an area of 500 square miles, are reckoned in the two duchies. 'The largest is Lake Miritz, 52 square miles in extent. The climate on the whole resembles that of

Great Britain, but the winters are generally more severe ; |

the mean annual temperature is 48° F., and the annual rainfall is about 28 inches. Although there are long stretches of marshy moorland along the coast, the soil is on the whole productive. returns of 1878, about 57 per cent. of the total area of Mecklenburg-Schwerin consisted of cultivated land, 17 per cent. of forest, and 13 per cent. of heath and pasture. In Mecklenburg-Strelitz the corresponding figuies were 48, 20, and 9 per cent. Agriculture is by far the most important industry in both duchies. The following table shows the areas and products of the chief crops in 1880 :—

Mecklenburg-Schwerin. | Mecklenburg-Strelitz. Crops. — ———$ Acres. Tons. Acres. Tons,

REE EN Ss fevenae cs 411,627 243,818 | 68,530 29,619 MSBoiscreskines sss 285,257 188,166 | 49,422 26,743 10°C 108,550 43,420 26,249 93,378 PBATYOY: «2522002000. 44,687 33, 487 10,722 7,244 Potatoes. ..... 92,942 345,233 16,440 70,537 Hay… 259,497 | 333,737 46,805 93,464 Totals…..... | 1,202,560 | 1,187,861 218,159 | 320,985

Besides these, smaller areas are devoted to maize, buck- | The |

wheat, pease, rape, hemp, flax, hops, and tobacco. extensive pastures support large herds of sheep and cattle, including a noteworthy breed of merino sheep. The horses of Mecklenburg are of a fine sturdy quality, and are highly esteemed in Germany. In 1878 the two duchies contained 100,651 horses, 315,712 cattle, and 1,321,916 sheep. Red

deer, wild swine, and various other kinds of game are found | The manufactures of Mecklenburg are of |

in the forests. little importance. Its industrial establishments include a few iron foundries, wool-spinning mills, carriage and machine factories, dye-works, tanneries, brick-fields, soap- works, breweries, distilleries, numerous limekilns and tar- boiling works, tobacco and cigar factories, and about eight hundred mills of various kinds. Mining is also insigni- ficant, though a fair variety of minerals is represented in the district. Amber is found on and near the Baltic coast. Trade, mainly confined to the larger duchy, is tolerably active. Rostock, Warnemiinde, and Wismar are the principal commercial centres. The chief exports are grain and other agricultural produce, live stock, spirits, woed, and wool; the chief imports are colonial produce,

According to the official |

| tive in each assembly.

wool markets of Mecklenburg are largely attended by buyers from various parts of Germany. Fishing is carried on extensively in the numerous inland lakes. Within the last decade the mercantile fleet of Mecklenburg-Schiwerin has doubled the number and quadrupled the tonnage of its ships, these consisting in 1881 of 370 sailing vessels and 11 steamers, with an aggregate burden of 112,388 tons. Mecklenburg-Strelitz has no seaboard. Mecklenburg-Schwerin and Mecklenburg-Strelitz are both limited monarchies under grand-dukes, who are hereditary in the male line. The reigning families are closely related, and possess mutnal rights of succession ; shonld both families become extinct, their possessions pass to Prussia. The constitution, which is common to both the duchies, exhibits few traces of the liberal tendency of modern politics. The temporary modifications brought about by the agitation of 1848 were quickly rescinded, and matters returned to the old semi-feudal arrangements, which deprive the bulk of the people of all share in the government. The constitution as it now exists is based upon an agreement made between the duke of Mecklenburg- Schwerin and his estates in 1755, and adopted in the same year by Mecklenburg-Strelitz. The Landes-Union, or common assembly of the two duchies, consists of repre- sentatives of the Ritterschaft, or landed proprietors, and of the Landschaft, which embraces forty-seven towns. The peasantry is unrepresented, and the principality of Ratze- burg, in Mecklenburg Strelitz, is governed directly by the grand-duke. 'The Landes-Union meets once annually, alternating between Sternberg. and Malchin, When not

| sitting it is represented by a committee of nine members.

Distinct from the Landes-Union are the convocation diet and the deputation dict, which are assemblies of the estates of one or other duchy for special business. In Mecklenburg- Schwerin the executive is placed in the hands of four ministers, holding the portfolios of foreign affairs, domestic affairs, finance, and justice (including education and religion). In Mecklenburg-Strelitz there is one minister, who is aided by a small council. In both duchies the military administration is in the hands of the crown. Mecklenburg-Schwerin has two votes in the federal council of the German empire, and sends six members to the imperial diet, while the smaller duchy has one representa- As no official budget is published in either duchy, it is

impossible to give accurate details of their financial position. In Mecklenburg-Schwerin it is usual to distinguish three branches of revenue, one under the control of the sovereign, one under the joint control of the sovereign and estates, and the third (of small amount) under the sole management of the estates. The income under the first heading is derived from the royal domains, the ordinary taxes, and special votes for special purposes, and famounts to about £600,000. With this sum are defrayed the ordinary expenses of government, inclnding

the annual contribution to the imperial treasnry. The revenue under the second head is about £100,000. The public debt in 1880 amounted to £1,100,000. The

revenues of Mecklenburg-Strelitz are unknown ; its debt is estimated at about £360,000. The private income of the duke, derived from the royal domains, ma‘es him one of the richest princes in Germany. The duchies of Mecklenburg contribute three regiments of infantry, a battalion of rifles, two regiments of dragoons, and four batteries of field artillery to the imperial army.

The educational institutions partake of the high character common to those of the Germanempire. The two duchies contain nine gymnasia, seven ‘ Realschulen,” three normal schools, and an adequate number of schools of a lower grade. There is a university at Rostock, which in

iron, coal, salt, wine, beer, and tobacco. The horse and | 1882 had a teaching staff of 36 professors and an attend-

(40

ance of about 250 students. cent. of the recruits iu Mecklenburg-Schwerin were unable to read and write their names, while all the recruits in Mecklenburg-Strelitz were able to do both. The pre- dominant confession in Meckleuburg is the Lutheran, which is professed by both the grand-dukes. The propor- tion of Roman Catholics, Jews, and members of the Re- formed Church is insignificant. ‘The ultimate spiritual authority is exercised by consistories at Schwerin and Strelitz, Mecklenburg also contains a fair

share of learned societies and benevolent institutions. ‘lhe supreme court of appeal for both duchies, in all criminal and civil cases, is at Rostock.

The population of Mecklenburg-Schiwerin in 1861 was £48,449; in 1871, 557,707 ; in 1875, 553,785; and in 1880, 577,055. The capital is Schwerin (30,146 inhabi- tants), but the most important town is Rostock (36,967 inhabitants). The population of Mecklenburg-Strelitz in 1861 was 99,069; in 1871, 96)982; in 1875, 95,673 ; in 1850, 100,269. The chief town is Neu-Strelitz. About 71 per cent. of the inhabitants are engaged in agricultural pursuits. The proportion of the rural to the urban popu- lation is as 3 to 1, or exactly the reverse ratio to that in the neighbouring Prussia. The peasantry of Mecklenburg still retain numerous traces of their Slavonic origin, especially in their speech, but their peculiarities have been much modified by amalgamation with the German colonists who settled within this district at various times. The townspeople and nobility are almost wholly of Saxon strain. The slow rate of increase in the population of Mecklenburg is chiefly accounted for by the constant stream of emigration. Between 1870 and 1880 the two ducliies contributed in the highest proportion to the emigration from Germany. Out of 595,151 German emigrants who sailel from Bremen, Hamburg, Stettin, and Antwerp within that period, 24,370 came from Mecklenburg- Schwerin anil 2481 from Mecklenburg-Strelitz, represent- ing respectively 4°38 and 2°52 per 1000 inhabitants as the yearly average. Probably another cause of the slow growth of population is to be sought for in the difficulties thrown in the way of the marriage of the peasants by the semi- feudal character of their tenure. It is a significant fact that in 1880 the proportion of illegitimate births in the two duchies amounted to 14 per cent. as compared with 9 per cent. in the entire German empire.

History. —The Vandals, who in the time of Tacitus occupied the

region now known as Mecklenbnrg, were succeeded in the 6th cen- tury by a Slavonie race. Though partly conquered by Charlemagne in 789, this people soon regained their independence, and long offered a successful resistance to all attempts on the part of the German emperors to overcome and Christianize them. At last, in 1160, Duke Henry of Saxony made himself master of the country. The native prince was, however, permitted to retain

his sovereignty, and has transmitted to his descendants ani successors of the present day the distinction of being the only ruling princes of Slavonic origin inGermany. Jn 1160 he was raised by the emperor Frederick I. to the dignity of a prince of the empire. From 1202 till 1227 Mecklenburg was 1nder Danish supremacy ; ad in 1229, two years after its restoration to Germany, there occurred the first of a long series of divisions of the territory, which, with snbsequent reunions, constitute so much of its contplicated history. In 1848 Charles IV. made Mecklenburg a duchy. In 1523 the trials and commotions springing from the rivalry and jealousy of two joint rulers incited the prelates, nobility, and burghers to form a union among them- selves, the eflects of which are visible to the present day,—most prominently in the existence of the common Landes-Union. The Reformation was welcomed by the inhabitants of Mecklenburg in 1524; and about 1555 nearly all the monasteries were suppressed. In 1621, when a new partition took place, the town of Rostock 'with its university and high court" was declared to be held in common. The diet also retained its joint charaeter, and hencefortl alternated between Sternberg and Malchin.

In the Thirty Years' War both Mecklenburg-Schwerin and Mecklenburg-Giistrow—as the parts were then called—incnrred the suspicion of the emperor, who secretly sold them to Wallenstein, aud expelled the dukes in his behalf. They were reinstated, how-

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In 1880-81 only 0:56 per | ever, by Gustavus Adolphus, and at the peave cf Prague in 1635

they both made their peace with the eimperor. At the peace of Westphalia Rostock and some other parts of Mecklenburg tent. tory were given in pledge to Sweden, and they were not redeemed till 1808. The sufferings of the Mecklenburg peasantry during the Thirty Years' War were exceeded in no other part of sorely-tried Germany. Most were reduced to serfdom through yoverty ; in some cases whole villages utterly vanished. In 1695 the Meeklenburg- Giistrow line became extinct ; and, after some contention between the brother and the nephew of the last duke of Mecklenburg. Sehwerin for the vacant succession, the " Hamburg Division "

(March 8, 1701) apportioned to each shares that are represented

by the present duchics. The affixes Sclrwerin and Strelitz are derived from the capital towns of the two dukes. Mecklenburg-Schwerin began its new independent existence bya series of constitutional struggles between its nobility and its rulers. The heavy debt incurred by Charles Leopold, who had joined Russia in a war against Sweden, brovght matters to such a piteh that in 1728 the emperor Charles VI. deposed the duke in favour of his brother Christian Louis. Under this prince, the " Rostock Con- tract," which is still the basis of the constitution, was framed in 1755. During the Seven Years' War Mecklenburg-Schwerin assumed a hostile attitude towards Frederick the Great, and was in conse- quence oecupied by Prussian troops. In 1806 it was overrun by the French, aud in 1808 it jommed the confederation of the Rhine; The duke, however, though he assisted Napoleon in 1812, was the first member of the confederation to renounce it, and in the following year his troops fought against France and Denmark. On joining the Germanic confederation he assumed the title of grand- duke, with the style of royal highness. In and after 1848 the duchy witnessed a considerable agitation in favour of a new and niore liberal constitution, but the subscquent reaction reseinded all the concessions that had been made, and reduced matters to their former feudal condition. In 1819 and 1820 serfdom aud personal bondage were abolished, and various slight ameliorations of the state of the peasantry have since been introduced. Mecklenburg-Strelitz adopted the constitution of the sister duchy by an " Agnitions-Act" in 1755. In 1806 it was spared the inflic- tion of a French occupation through the interest of the king of Bavaria; but in 1818 it was iulcted in the sum of two million thalers for the French army. In 1808 it entered the Rhenish con- federation, but repudiated it in 1813 and joined the alliance against Napoleon. In 1815 the duke assumed the title of grand-duke. Authorities Boll, Geschichte Mecklenburgs, 1855 ; Nizze, Volkswirthschaftliche Zustdnde in Mecklenburg, 1861; Boll, Abrtss der Meckleuburger Landeskunde ; Léger, Topographisches Handbuch f.d. Grossherzogthiimer Mecklenburg-Schwerin und Mecklenburg-Strelitz, Kicl, 1881; the official Staatskalender, published annually; the Bettrdage zur Statistik Mecklenburgs, published by the Statistical Office at Schwerin; Jahrbiicher des Veveins fin Mcck enbiirgische Geschi hte, 1836-1882. For

the recent constitutional struggles see the various worl s of M. Wiggers, the most prominent leader of the den.ocratic party. (J. F. MM.)

MEDALS. See NuMIsMATICs.

MEDEA, the daughter of Metes, king of the Colchians, who were believed to be of Egyptian descent (Herod., ii. 104), and are said to have found a settlement ou the east of the Euxine and to the south of the Caucasus. Medea was one of the "wise women" (witches or sorceresses) of antiquity, and perhaps, like Helen, was a human embodi- ment of some goddess connected with Eastern element- worship, possibly with Hera. For the story of her love for Jason the Argonaut, and of the revenge she took for his desertion of her for another bride, a Corinthian princess, Glance, daughter of Creon, see ARGoNAUTS and Jason, A imore interesting inquiry is the origin of the tale, and its connexion with solar myths.

The legend of the Argonantic expedition is a very ancient one. It is alluded to in the Odyssey (xii. 70), in inore than one passage of A®schylus,! and is given at some length in the fourth Pythian ode of Pindar, the close agreement of which with the Alexandrine compilation by Apollonius Rhodius, entitled Argonautiva, in tour books, shows that, according to the general law of mythology; the main features of the legend differed but little. The original story, it is probable, was contained in a still older epic poem called % Murvas woinors, the authorship of which was ascribed to Prodicus of Phocza.? .

The "Golden Fleece," in quest of which the adventurers

1 He alludes to Phineus and the Lemnia facinora (Eum. 50; Cho. 620), and there were plays composed by him on both these subjects.

2 Pausan., iv. 38, 7. He quotes from it two hexameter verses In 5h, Bs,

made a voyage from the home of Jason, Iolchns in the Thessalian Magnesia, is virtually identical with the fiery robe which Medea prepared for her rival Glauce, the new bride, with the Homeric "gis," and with the

garment smeared with phosphorus which was sent by Deianira to Hercules, and burst into a flame when brought near to a sacrificial fire.! Jason, as the story went, was not allowed by the guardian of the fleece, King Metes, to approach it till he had performed a certain task in putting to the yoke fire-breathing bulls, whicli lie effected by the aid of Medea.

The bull is a well-known symbol of the sun, and it occurs | in the ball-slaying group representing the Persian sun-god |

Mithras. Again, the slaying of a father by a son (the old sun killed by the new one) is seen alike in Gidipus having caused the death of his father Laius, in A4son, the father of Jason, having been restored to life by the magic arts of Medea, and in Pelias having been killed and boiled in a caldron by his own daughters at the instigation of the sorceress. Lastly, the legend tliat Medea was herself the egranddangliter of the Sun, and that she escaped in a car drawn by flying dragons, given to her for safety hy her erandsire,? equally tends to prove that the whole story is of solar origin, and can be explained on that theory alone.

This, indeed, has been well stated by Sir G. W. Cox.? The "dragon chariot is simply the chariot of Indra, Helios, and Achilles; and it is drawn by dragons because the word denoted simply beings of keen sight, and was naturally applied to the creatures which may be supposed to bear the sun across the heaven."

In all these legends about the sun the performance of certain imposed "toils" or labours is included, the idea expressed being the hard necessity of the sun going his daily course in the appointed time in spite of thickening storm-clouds and opposing powers of darkness, through which he has to fight his way, both visibly above and invisibly underneath the earth. Thus Hercules has his twelve labours (the number corresponding to the lunar months), while Jason is not ouly required by his uncle King Pelias to bring the golden fleece, but is commanded by Atetes to tame the bulls as a condition of obtaining it. The name Myjdea may possibly be referred to pydeorOa, "to care for," as Jason may contain the root iaoOa, 'to heal," which is the meaning that Pindar attaches to it, or to tov, the violet-coloured dawn, as in Iocaste, Iamos, and Tolaus.6 In his relation to the snake, which guarded the fleece, and to the dragons' teeth which he sowed*

on the ground ploughed by the fiery bulls, compared with the serpent entwining the staff of the healing god Asclepius, we see that almost invariable connexion that subsists between solar and phallic worship.6 This view is confirmed by the "ship Argo," one of the many sexual symbols of cip-shaped and boat-like form." It is the "ship" which was the Teutonic symbol of the goddess Isis.®

The existing literatnre on the love of Medea for Jason shows how popular was the story in antiquity for its pathos and its sentimen- tahty. Thns the Medea of Kuripides was rendered by Ennius ; Neophron of Sieyon and Melanthius® wrote plays of the same name ; we have the long and fine Pythian ode of Pindar, already referred to, the touching epistle " Medea Jasoni" in the Herotdes of Ovid, and the interesting, beautiful, and too little read Argonautica of

Apollonins. Of eourse, the similarity of the names Mfdo: and Madea led to

1 Soph., Zrach., 765. ?-Eur., Med., 1821; Hesiod, Theog., 958. 3 Mythology and Folklore, p. 264; see also Mythology of the Aryan Nations, pp. 240, 384, 388. Pyth., iv. 119. Cox, Aryan Mythology, pp. 244, 385. Cox, ibid., p. 363. Aryan Mythology, p. 104 and 354. Tae., Germ., 9

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® Ar., Pac., 1012.

Ti etymological speculations on the identity of the nomenclature, and one Medns, a son of Medea, was believed to have been an eponym hero.?° The author of the compilation known as Hesiod's Theogony says that Medeus was a son of Medea by Jason,!! and was brought up, as Jason himself had been, by Chiron in the mountains. Euripides assigns but two ehildren to Medea and Jason,)? and Apollodorus }3 gives their names as Mermerus and Pheres.

MEDELLIN, a town of Colombia, South America, capital of the state of Antioquia, is situated at a height of 4845 feet above the sea, in the valley of

the Rio Porce, a right-hand tributary of the Rio Cauca, and, though 100 miles from the confluence, not more than 16 miles east from the valley of the larger stream. It is a clean and well-built place, but has no public buildings of note. Though the population is estimated at 14,000, there is no great activity except on the market days, twice a week, when the buyers and sellers flock in from the country. See Fr. von Schenck in Petermann's Mittheil., 1880.

MEDFORD, a town of the United States, in Middlesex county, Massachusetts, at the head of navigation on Mystic river, and 5 iniles north-west of Boston by a branch of the Boston and Maine Railroad. It is a busy place, with a considerable variety of imanufactures—woollens, carpets, buttons, bricks, leather, &c. Tufts College, situated near the town on Walnut Hill, was founded by the Universalists in 1853, and named in honour of Charles Tufts, the donor of the 70 acres occupied by the building and its grounds. The endowment amounts to more than $1,000,000. The population of Medford was 5717 in 1870 and 7537 in 1880.

MEDHURST, Water Henry (1796-1857), one of the most distinguished Protestant missionaries to the Chinese, was born in London in 1796. His education began at St Paul's Cathedral school. As he grew up, he learned the business of a printer; and, having become interested in missions to the heathen, he sailed in 1816 for the London Missionary Society's station at Malacca, which was likely to be a great printing-centre. His linguistic powers soon showed themselves. He became proficieut in Malay, in a knowledge of the written characters of Chinese, and in the colloquial use of more than one of its dialects. He was ordained at Malacca in 1819, and was in all missionary labours "more abundant,'—first at Penang, then at Ba-tavia, and finally at Shanghai. To give only the names of his various works, some in English, some in Chinese, would take a considerable space. A dictionary of one of the Fuh-Kien dialects is still valuable; and his Chinese-English and English-Chinese dictionaries (Batavia, 1842) are more coinplete and reliable than any earlier or later works of the saine kind. After the conclusion of the first English war with China he removed to Shanghai in 1848, and there he continued till 1856, laying the foundations, broad and deep, of a successful mission. His principal labour for several years, as one of a committee of delegates of whom he was facile princeps,

was in the revision of existing Chinese versions of the Sacred Scriptures. The result was what should be called a new version of the Bible, marvellously correct in idiom, and faithful to the meaning of the original. The university of New York conferred upon him in 1843 the degree of D.D. Medhurst left Shanghai in 1856, with several members of his family, to try the effect of a visit to England for his failing health. He died, however, two days after reaching London, on the 24th January next year. Strong, spriglitly, versatile, and genial, he was a man of extraordinary gifts and generous soul. No efforts (and many were made) could draw him from his devotion to the work of missions.

MEDIA. See Persia.

10 Pausan., ii. 3, 8. 12 Almtuxos youn, Vv. 1136. Odvre.

1 Theog., 1001. Henee in 969 the dual is used, eiceA- SABI VO Mo8s XV. — 98

178 MEDICAS

MEDICAL JURISPRUDENCE, or, as it is now more usually termed, Forensic Mepicryg, is that branch of state medicine which treats of the application of medical knowledge to the purposes of the law. The term medical jurisprudence, though sanctioned by long usage, is not an appropriate one; since the subject is, strictly speaking, a branch of medicine rather than of jurisprudence ; it does not properly include sanitation or HyGIENE (q.v.), both this and medical jurisprudence proper being distinct branches of state medicine. The connexion between medicine and the law was perceived long before medical jurisprudence was recognized, or had obtained a distinct appellation, It first took its rise in Germany, and sub- sequently, but more tardily, received recognition in Great Britain.

Forensic medicine, or medical jurisprudence proper as distinguished from hygiene, embraces all those questions which bring the medical man into contact with the law, and embraces (1) questions affecting the civil rights of individuals, and (2) injuries to the person.

I. Questions AFFECTING THE Civitor Socian RiGuTs oF INDIVIDUALS.

1. Development of the Human Frame.—The develop- ment of the physical and mental powers of the human being isa matter of the highest importance, and is a factor of great consequence in determining criminal responsibility, civil responsibility, or the power of giving validity to civil contracts, and in determining the personal identity of a living person or of a corpse. Human life is usually di- vided into the five periods of infancy, childhood, youth, manhood, and old age. Some writers increase the number of these, unnecessarily, to seven periods, without any prac- tical advantage.

Infancy is the period from birth till the first or milk set of teeth begin to be shed—usually about the seventh year. During this period the body increases in size and stature more, relatively, than at any other period of exist- ence; and the mental faculties undergo great develop- ment. The milk teeth, twenty in number, are evolved in a definite order, beginning with the central incisors at about six months, and ending with the second molars about the termination of the second year. Trom the size and stature of the body, the development of the teeth, and the more or less advanced state of ossification or solidification of the bony skeleton, conclusions may be drawn as to the probable age of the infant.

Childhood extends from the commencement of the shed- ding of the milk teeth to the age of puberty—usually from the seventh to the fourteenth or fifteenth year. During this period the body expands, as well as the bony structures, without any clearly marked difference in structure being observable between the sexes except as regards the genitals, so that it is impossible to distinguish absolutely between the male and the female skeleton during this period. The milk-teeth are shed, and are replaced by the second or per- manent set, thirty-two in number, though these do not usu- ally all make their appearance during childhood. Marked differences between thie proclivities of the sexes are notice- able even at an early period of childhood, and long before the characteristic functions begin to be developed.

Youth is marked at its commencement by the changes which occur at puberty—the development of the genitals in both sexes, the appearance of hair on the genitals, the appearance of a beard in the male, the

development of the breasts in the female, the appearance of the monthly flow in the female, and the ability to secrete semen in the male. Marked mental changes now occur, and the genera- tive functions are perfected. Youth terminates at the age

of legal majority, twenty-one years; or perhaps the period ought to be extended to twenty-five years of age, ds it is with some nations.

Manhood (or Womanhood) is the period of perfection of all the bodily and mental powers. It ceases in woman with the cessation of the monthly flow at about forty-five years of age; but in man it often extends to a much later period of life.

Old Age begins with the decay of the bodily and mental faculties, and is characterized by wrinkling of the skin, loss of the teeth, whitening of the hair, and feebleness of the limbs. In its later stages decay of the mental faculties, deafness, obscurity or loss of vision, and bowing of the spine are added.

2. Duration of Human Life.—The chances of human life form an important subject of inquiry, which lias been elucidated by the labours of Price, Milne, Farr, and others ; and on deductions from comparisons of birth and death rates is founded the system of annuities, insurance against loss in sickness, and the insurance of lives. Since the establishment of compulsory registration of deaths, our knowledge of the ordinary and extraordinary chances of human life has been much extended, and surer data are now available for calculations of probabilities of life, of survivorships, and of the payments whicli ought to be made in benefit clubs. See INsuRANcE and LonGeEvIrty.

3. Personal Identity.—It might be imagined that there is little danger, with the exercise of ordinary care, of mis- taking one person for another; but the remarkable case of the Tichborne claimant, and some other less-known but perhaps equally singular instances, have demonstrated that mistakes as to the identity of individuals are easily made, and are more frequent than is commonly supposed. Where the identity has to be established or disproved

after long absence, exposure to foreign climates and great hardships, wounds, &c., the problem is often one of extreme difficulty. The data for identifying a person are individual and family likeness, stature, the colour of the eyes, peculiarities of garb and manner, recollection of antecedent events, but more especially marks on the person either congenital or acquired. Such are eve or mother's marks, scars, and disunited or badly united fractures, known to have existed upon the missing person. An accurate solution of the question is, nevertheless, often a matter of the greatest difficulty.

4, Marriage.—Under this head the medical jurist has to deal principally with the nubile age, viewed in the light of nature and according to legislative enactments, and with such physical circumstances as affect the legality of mar- riages, or justify divorce.

In Great Britain the age at which the sexes are first capable of propagating the species is later than in more southern climes. Ordinarily it does not occur before fifteen years of age for the male and fourteen for the female; exceptionally, however, it occurs at the ages of thirteen and of twelve (or even less) respectively in the male and female. By legislative enactment, nevertheless, parents and guardians may, in England at all events, forbid the marriage of young people till the age of legal majonty. The only physical circumstances which in Great Britain form a bar to marriage are physical inability to consummate, and the insanity of one of the parties at the time of marriage. Both those circumstances have been pleaded and sustained in the law courts. In other countries mmor physical cireunistances, as disease, are held to invalidate marriage.

5. Impotence and Sterility.—These may arise from organic or from functional causes,— the former being alone irremediable, and as such taken cognizance of by the law courts. On this subject it is unnecessary to enlarge here.

MEDICAL

6. Prequancy.—This subject presents one of the widest fields for mcdico-legal evidence. The limits of age between which it is possible, the limits of

utero-gestation, and the signs of pregnancy may all in turn be the subjects of investigation.

The limits of age between which pregnancy is possible are usually fixed by the appearance and cessation of the monthly flow; and these ordinarily begin about fourteen and cease at forty-five years of age. Exceptionally they appear as early as the tenth year, and may not cease till the end of the fifth decade of life. Cases, however, have occurred where a woman has conceived before menstru- ating ; and a few doubtfnl cases of conception are recorded in women upwards of fifty, or eveu sixty, years of age. The general fact of pregnancy being limited by the age of puberty on the one hand and the cessation of the monthly flow—or fifty years as the extreme liniit of age— must be accepted as the safest guide in practice.

The limits of utero-gestation are not in England fixed by legislation. The French code fixes the extreme limit of three liundred days, The ordinary period is forty weeks and a half, or two hundred and eighty-three days from the cessation of the last monthly flux. The limit of three hundred days, as fixed by the French code, is perhaps uever exceeded, if ever reached. The uncertainty of females in fixing the exact date of conception lias given rise to the discrepant opinions of physiologists on the subject. It is well known, however, that among the higher animals the period is not a precise one ; and impregnation and conception are doubtless not necessarily coincident.

The signs of pregnancy are of the utmost importance to the medical jurist. He may be called upon to pronounce upon the virtue of a female, to sustain or rebut a plea for divorce, to determine whether a capital sentence shall be carried ont, or to determine whether it is probable that an heir will be born to an estate. Should he err in his judg- ment—and mistakes are very possible in the earlier months of utero-gestation—he may commit a grievous wrong. Medical jurists are in the habit of classifying the signs of pregnancy as uncertain or certain; it is the former which are most regarded by the public, but the latter are alone of probative value to the jurist. The usual and uncertain signs are the cessation of the monthly flow, nausea, sick- ness, a darkening of the areola and the formation of a secondary areola around the nipple, enlargement of the breasts, increased size of the abdomen, the formation of a tumour in the womb, quickening, and the

motions of the foetus. There are also other minor signs of less importance. The certain signs are the uterine souffle, whicli is a peculiar soft sound heard over the abdomen, and synchronous with the maternal pulse ; ballottement, or tle examination for a floating tumour in the abdomen between the fifth and eighth months of pregnancy; and the pulsations of the fostal heart, heard by means of the stethoscope. These pulsations are much quicker than, and not synchronous with, the maternal pulse. This is the only indubitable sign of pregnancy. It is inapplicable before the fourth month of gestation.

7. Parturition.—The imminence of the process of par- turition is of comparatively little interest to the medical jurist; but the signs of recent delivery are all-important. These signs are the bruised, swollen, and lacerated state of the external genitals, relaxation and dilatation of the vagina and womb, the existence of a peculiar vaginal dis- charge known as the lochia, a relaxed and fissured condition of the abdominal walls, a peculiar aspect of the countenance, and the distended state of the breasts due to the secretion of milk. The lochial discharge is the most characteristic sign. All the signs may disappear within ten days of delivery, though this is not usual.

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Connected with parturition, the question of wabdity of the childis not unimportant. After the intra-uterine age of seven months is reached a child is certainly viable. The period at which the foetus becomes viable cannot be stated with certainty ; but five calendar months, or one hundred and fifty days, is perhaps the nearest approximation which can be made. 'The viability of a child is judged by its size and weight, its general state of development, the state of the skin, hair, and nails, its strength or feebleness, the ability to cry, and its power of taking maternal nourish- nent. The question of viability has important bearings upon the crime of infanticide, and the succession to property.

The subject of superfetation, or the possibility of two conceptions having occurred resulting in the birth of twins with a considerable intervening

intcrval, is a very obscure one, and has given rise to much controversy,—its existence being affirmed by some medical jurists, and denied by others. There is much, however (e.g., the existence of a double or bifid womb), to countenance the view that a doubie conception is possible.

In the curious case of a man marrying a woman having possession of an estate of inheritance, and by her having issue born alive and capable of inheriting her estate, the man on the death of his wife holds her lands for life as a tenant by the "'curtesy" of England. Here the meaning of "born alive" is different from the meaning of the same expression as used respecting infanticide. In questions of tenancy by the curtesy it has been decided that any kind of motion of the child, as a twitching and tremulous motion of the lips, is sufficient evidence of live-birth. As regards infanticide, proof of a conclusive separate existence of the child is demanded before live-birth is admitted.

8, Monsters and Hermaphrodites.—Yo destroy any living human birth, however unlike a human creature it may be, is to commit a crime. Blackstone states that a mon- ster which hath not the shape of mankind hath no inherit- able blood; but the law has not defined a monster, nor what constitutes a human form. The same author states that if, in spite of deformity, the product of birth has human shape, it may be an heir. Hermaphrodites are beings with malformations of the sexual organs, simulating a double sex. Physiologists do not admit, however, the existence of true hermaphrodites with double perfect organs, capable of performing tlre functions of both sexes.

9, Paternity and Affiliation.—These are often matters of great doubt. A considerable time may elapse between the absence or death of a father and the birth of his repnted child. As has already been said, three hundred days is the utmost limit to which physiologists would extend the period of utero-gestation. This subjéct in- volves questions respecting children born during a second marriage of the mother, posthumous children, bastardy, and alleged cases of posthumous children.

10. Presumption of Survivorship.—When two or more persons perish by a common accident, when a mother and her new-born child are found dead, and in a few analogons cases, important civil rights may depend upon the

question which lived the longest; and great ingenuity has been displayed in elucidating the disputes which have arisen in the law courts in such cases.

1l. Maladies Exempting from Discharge 6 if Public Duties frequently demand the attention of the medical man. He may be called upon to decide whether a man is able to undertake military or naval service, to act as a juryman without serious risk to life or health, or to attend asa witness at a trial. An endeavour to give a fearless and honest certificate should animaté the medical man in thé discharge of this delicate duty, .

12. Feigned and Simulated Discases often require much

skill and acuteness in order to detect the impeosture. Where there is reason to suppose that a disease is simu- lated, much caution as to procedure is also required.

13. Insanity or Mental Alienation.—This subject pre- sents an enormous field to the medical jurist. A medical man may be required to give evidence in any of the law courts, civil, criminal, or ecclesiastical, before commissions de lunatico inquirendo, or before a magistrate, as to the sanity or insanity of an individual; and he may have to sign certificates of unsoundness of mind with the view of providing for the safe custody and proper treatment of a lunatic. Hence he must be familiar with the chief forms of insanity (see InsaniTy), and be able to distinguish and treat each of these. He will also be reqnired to detect

feigned insanity, and to examine persons charged with |

crime with the view of preventing real lunatics from being treated as criminals.

The terms "unsoundness of mind," applied to the con- dition of the mind itself, and "no compos mentis" to the person whose mind is affected, are legal terms applied to insanity. Lawyers have dispnted as to whether imbecility should or should not be included under the head of insanity ; but medical men include under this category all disorders or defects of the mind

which disqualify a person for managing his affairs, and entering into a binding contract, or which render the individual morally irrespon- sible for his or her otherwise criminal actions. 'There is good legal authority for recognizing four forms of unsound- ness of inind—zdiocy, dementia, mania, and monomanta.

The chief questions respecting unsonndness of mind which present themselves to the medical jurist are—is the person of sound or unsound mind; if unsound, are there real lucid intervals; is he fit to manage his affairs, to contract a marriage, or to execute a will; is he dangerous to others?

As grounds for restraint, the law recognizes only these conditions—danger to himself, inability to manage his own affairs and property, and danger to the person of others. Before an individual can be placed under restraint in an asylunt the certificates of two medical men must be obtained, and the formal order ofa relation or friend. The certificates to be valid must be signed by legally qualified medical practitioners having no interest, direct or indirect, in the patient, or in the asylum to which he is to be sent. The inedical examiners must pay separate visits, each medical man examining the patient separately. The certificates, which remain valid for seven days only, must bear the exact address of the lunatic, his occupation, and the date of the examination; they must also set forth distinctly the grounds of the opinion they express, under the separate heads of facts observed by the examiner, and facts (to be specified) communicated by others. In the case of pauper lunatics one medical certificate only is required, which is supple- mented by an order from a justice of the peace. In urgent cases also one medical certificate suffices for incarceration in an asylum, provided that within three days of the patient's reception two other such certificates are signed by two other medical practitioners, not being connected with the asylum, upon a like examination. The superintendent or proprietor of the asylum must in all cases forward to the commissioners of lunacy a notice of admission within one clear day from the patient's admission. Any infringe- ment of the statutory regulations subjects the person who commits it to a heavy penalty.

Ik. INJURIES TO THE PERSON.

1. Defloration.—The signs of defloration are obscure and uncer- tain; and it is rather by the coexistence of several of the usual marks than the existence of any one sign, that any just conclusion can be arrived at.

2. Rape. —This crime consists in the carnal knowledge of a woman

| the same severity as the murder of an adult.

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forcibly and against her will. The resistance must be to the utinost, else the crime of rape has not been committed in the legal sense of the word. 'The proofs of rape, accordingly, apart from the consistency of the woman's story, mainly depend on the presence of the signs of defloration, and on marks of injury on the man.

38. Mutilation.—This may consist in the cutting or maiming of any member; castration is the most important, and perhaps but rarely effected as a crime. Self-mutilation, giving rise to false accusations, is occasionally resorted to.

4, Criminal Abortion.—The crime of abortion consists in unlaw- fully administering to a woman, or causing to be taken by her (whether she be with child or not), with intent to procure her mis- carriage, any poison or noxious thing, or using for the same purpose any instrument or other means whatsoever ; also in the use of the saine means, with the same intent, by any woman being with child.

5. Honicide.—The legal sense of the term homicide excludes such injuries as are the result of cithcr accident or of suicide. 1t embraces innrder or wilful homicide, manslaughter or culpable homicide, casual homicide, and justifiable homicide.

As a preliminary in all cases of homicide, it is the duty of the medical jurist in the first place to aseertain the fact of death, and to distinguish betwecn rcal and apparent death ; and then to deter- mine, if possible, the ae at which death took place.

Infanticide or child murder is by the British law treated with Indeed infanticide as a crime distinct from murder has no legal recognition. Practically this severity defeats itself, and offences which are really cases of child murder are often treated simply as cases of concealment of birth. The iniquity of the old law which threw the onus of proof of still-birth on the mother now no longer exists, and the law demands strict proof of live-birth at the hands of the prosecution. lience the subject involves very nice points of forensic medieine. The child must be proved to have arrived at the period when thero was a probability of its living (proof of viability) ; and as the estab- lishment of respiration is necessary to prove live-birth the evidences of this act must be carefully investigated. Thesize and position of the lungs, aud the state of the vessels concerned in fcetal circulation, inust be carefully noted. The fcetal lungs are dark, dense, and liver-like in appearance and consistence, and sink when immersed in water; whilst the fully respired lungs are rosy, marbled, and soft and crepitant when handled. Minor degrees of respiration are recognized by the appearance of little groups of dilated air-vesicles, and by the fact that, although the lungs as a whole may sink in water, certain portions of them, into which respired air has pene- trated, float in water even after subjection to firm pressure in the hand. Care must be taken, nevertheless, to exclude buoyancy of the lung due to putrefaction ; in this case the air may be expelled by gentle pressure, and the previously buoyant portion of lung now sinks in water. It is impossible, however, to distinguish eertainly between a lung naturally inflated and one artificially insufflated.

It must be borne in mind that, aithough live-birth cannot be affirmed in the absence of signs of respiration, the presence of theso signs is not proof of live-birth in the legal sense of the term. The law demands for live-birth a separate existence of the child after delivery ; and breathing may take place whilst the child is still either wholly or partially within the maternal passages, and in some special cases whilst still within the woinb itself.

When proofs of respiration—it may be to such an extent as to leave no doubt as to live-birth—have been found, the cause of death is then to be investigated. Wounds, and other forms of injury, must be sought for. There may be signs of strangulation, sufloca- tion, puncture of the fontanelles, and consequent injury to the brain, the administration of a poison, or other

means of procuring death. }t inust be borne in mind that some of these causes may be brought about by omission, or even by accident. Thus strangulation may arise from natural and unrelicved pressure of the navel string on the neck of the child ; suffocation from immersion of the face of the child in the maternal discharges, or by pressure of clothes on the mouth. Death may result from hemorrhage throngh neglect to tie the navel string, or the infant may perish fro exposure to cold.

In the case of exposed infants it is very important to ascertain the real mother. As such exposure usually takes place soon after birth, comparison of the age of the infant with the signs of recent delivery in the suspected mother is the best method of proving the relation.

Ordinary homicide may be accomplished by several modes that may sometimes be ascertained by examination of the body. Of one of the most important of these consideration is deferred to the article Poisons. ;

Death by asphyxia is a common mode of accomplishing homi- cide, as by suffocation, drowning, hanging, strangulation, or by exposure to mephitie air. Suicide and accidental death from these causes are still morecommon. (1) Drowning is thought to produce death occasionally by the suddenness of the shock causing suspen- sion of the functions of circulation and respiration—by shock without a struggle. The usual mode of death appears, however,

to be by the circulation of unoxygenated blood through the brain ; sistible propensity to sleep. The tendency to this forms an extreme

acting as a poison npon that organ ; and this is attended with all the phenomena of asphyxia, as in suffocation. The phenomena attending asphyxia are as follows. As soon as the oxygen in the arterial blood, through exclusion of air, sinks below the normal, the respiratory movements

grow deeper and at the sanie tie more fre- quent; both the inspiratory and expiratory phases are cxaggerated, the supplementary respiratory muscles are brought into play, and the breathing becomes hurried. As the blood becomes more and more venous, the respiratory movements continue to increase both in force and frequency. Very soon the expiratory movements beconie more marked than the inspiratory, and every muscle which can in any way assist in expiration is brought into play. The orderly expiratory movements culminate in expiratory convulsions ; these violent efforts speedily exhaust the nervous system, and the convul- sions suddenly cease and are followed bya period of calm. The calm is oue of exhaustion ; all expiratory active movements have ceased, and all the muscles of the body are flaccid and quiet. But at long intervals lengthened decp inspiratory movements take place ; then these movements become less frequent; the rhythin becomes irregular, so that each breath becomes a more and more prolonged gasp, which becomes at last a convulsive stretching of the whole body ; and with extendcd limbs and a straightened trunk, with the head thrown back, the mouth widely open, the face drawn, and the nostrils dilated, the last breath is taken, 'The above phenomena are not all observed except in cases of sudden and entire exclusion of air from the lungs. gradually diminished (¢.g., in drowning), the phenomena are funda- mentally the same, but with minor differences. The appearances of the body after death from drowning are various. There may be pallor of the countenance, or this may be livid and swollen. Thie air passages are filled with frothy mucus, and there may be water in the stomach. The ends of the fingers are often excoriated fron grasping at objects ; and weeds, &c., are sometimes found grasped in the hands. 'he distinction between murder and suicide by drowning can rarely be made out by examination of the body alone, and is usually 'decided from collateral circumstances or marks of a struggle. Attention must also be paid to the existence of wounds on the body, marks of strangulation on the neck, and the like. (2) Hanging may result in death from asphyxia, or, as is more particularly the case in judicial hanging, some injury is inflicted on the upper portion of the spinal cord, resulting in instant death. The ordinary appearances of death from asphyxia may be found: dark fluid blood, congestion of the brain, intensely congested lungs, the right cavities of the heart full, and the left comparatively empty of blood, and general engorgement of the viscera. Ecchymosis may be found beneath the site of the cord, or a mere parchmenty appear- ance. 'here may

even be no mark of thecord visible. The mark, when present, usually follows an oblique course, and is high np the neck. The fact that a body may be suspended after death, and that if this be done speedily whilst the body is still warm there may be a post-mortem mark undistingnishable from the mark observed in death from hanging, must not be forgotten. (3) Suffocation may occur from the impaction of any substance in the glottis, or by covering np the mouth and nose. It is frequently of accidental origin, as when substances become accidentally impacted in the throat, and when infants are overlaid. 'The pheno- mena are those of pure asphyxia, which have already been detailed. On post-mortem examination the surface of the lungs is found covered with minute extravasations of blood, known as punctated ecchymosis. (4) Strangulation may be accomplished by drawing a cord tightly round the neck, or by forcibly compressing the windpipe (throttling). Hence there may be either a circular mark round the neck, not so oblique as after hanging, or the marks of the fingers may be found about the region of the larynx. Thc cartilaginous structures of the larynx and windpipe may be broken. The mark of the ligature is often low down in the neck. The signs of asphyxia are present in a marked degree. (5) Mephitism.—Death from the-inhalation of irrespirable gases is a mode of assassination seldom employed, but is frequently resorted to on the Continent by suicides, charcoal fuines being commonly used for the pnrpose (see Posons).

6. Death from Starvation.—Cases occur in whieh it is importaut to distinguish this from other modes of death. In such cases the skiu becomes harsh and dry, and may acquire a peculiar odour ; the subcutaneous fat disappears ; the gums shrink away from the teeth ; the tongue and mouth become dark-colonred and dry ; the eyes are bloodshot ; the intestines become thin and their coats translucent ; the gall-bladder is distended. The period of total abstinence from food required to kill an adult is unknown, and greatly depends upon whether there be access to liquid. In some cases persons have been able to subsist on little or no nourishment for long periods, the body being ina state of quasi-hibernation.

7. Death from Extremes of Temperature.—(1) Death from cold is not often observed in the British Isles. A portion only of the body, as the extremity of a limb, may perish from extreme cold. After the first sensation of tingling

experienced on exposure to severe cold, loss of sensation supervenes, with languor and an irre-

In slow asphyxia, where the supply of air is,

‘ a large portion of the cutaneous structures.

| may cause instant death.

danger in such cases. (2) Death from extreme heat usually occurs in the form of burning and scalding, attended with destructiou of Here the cause of death is obvious. The human body is capable of exposure to very hot air —as is seen in Turkish batlhs—for a considerable period with impunity. Sun-stroke is a cerebral affection brought on by too great exposure to a hot atmosphere, especially whilst undergoing fatigue.

8. Death by Lightning.—Lightning or an artificial electric current No visible marks of the effects of the electric current may be left, or the body may be singed or dis- coloured, or the skin may be perforated at one or two spots.

9, Wounds.—The examination of wounds, whether fatal or not, often becomes an important branch of forensie medicine. Wounds are usually divided into contused, laccrated, incised, punctured, and gunshot wounds. For poisoned wounds see Poisons. Eaeh kind of wound requires to be minutely examined and described, as they are in approved works onsurgery. The degrce of danger from each should be familiar to the medical jurist ; and he should recollect that there is no wound which may not become incidentally fatal from improper treatment, pcenliarities of constitution, or accidental inoculation with septic material. Punctured wounds or stabs require minute attention ; for there have been instances in which death has been produced by an instrument so small as a pin thrust into a vital part. Wounds of the head are always dangcrous, especially if the blow has been severe. ‘he person so wounded may die without division of the skin, or fracture of the bones, as happens in what is known as coneussion of the brain. Contusions which do not divide the skin may fracture the skull; or the inner table of the skull may be fractured without the outer being broken or depressed. Even wounds of the scalp may prove fatal, from inflammation

extending towards the brain. Punctured wounds of the head are more danger- ous than cuts, as more likely to excite fatal inflammation. When the brain and its membranes are injured, all such wounds are gene- rally fatal. Wounds of the face or organs of sense are often danger- ous, always disfiguring, and productive of scrious inconvenience. Wounds of the neck ave always very serious wherever more than the skin is divided. The danger of opening large blood-vessels, or wounding important nerves, is imminent ; even the division of a large vein in the neck has proved immediately fatal, from the entrance of air into the vessel, and its speedy conveyance to the heart. A blow on the neck has instantly proved fatal, from injury to animportant nerve, generally the pneumogastric or the sympathietic. Dislocations and fractures of the bones of the neck prove instantly fatal. Wounds of the chest ave always serious when the cavity is penctrated, though persons may recover from wounds of the lungs, and have even survived for some time considerable wounds of the heart. his last is an important fact ; because we are not always to consider the spot where the body of a person killed by a wound of the heart, and apparently remaining where he fell, is found as that in which the fatal wound was inflicted. Instanccs have occurred of yersons surviving severe wounds of the heart for several days. ined ribs are never without danger; and the same may be said of severe contusions of the chest, from the chance of inflammation extending inwards. Wounds penetrating both sides of the chest are generally considered as fatal ; but possibly there may be recovery from such. Wounds of the abdomen, when they do not completely penetrate, may be considered as simple wounds, unless when inflicted With great force, so as to bruise the contents of the abdominal cavity ; in that case they may produce death without breach of surface, from rupture of some viscus, as sometimes happens from blows or kicks upon the belly. Wounds injuring the peritoneum are highly perilous, from the risk of severe inflammation. Wounds of the stomacli or intestines, or of the gall-bladder, generally prove mortal, from the effusion of their contents into the peritoneal cavity pro- ducing fatal inflammation. Wounds of the liver, spleen, or kidneys are generally soon mortal, from the great vascularity of those organs. Wounds of the extremities, when fatal, may generally be con- sidered so from excessive hemorrhage, from the consequences of inflammation and gangrene, or from the shock to the system when large portions of the limb

are forcibly removed, as in accidents from machinery, and in wounds from firearms.

10. Poisonous Food.—Uuder certain conditions, various articles of diet, especially butcher meat, eggs, milk, butter, cheese, and honey, may become possessed of poisonous properties, und this may arise from a variety of causes besides the introduction of known and specific poisons. Moreover, certain kinds of animal food—fish chiefly —may have definite toxic properties. Food may be more or less poisonous —(1) from nnsoundness, either from putridity or decom- position or disease ; (2) from the prescnce of parasites ; (3) from mouldiness, or presence of deleterious microscopic fungi ; and (4) where the flesh is that of animals which have fed on noxious plants, _-and under this head may also be classed poisonons honey, which bees have gathered from poisonous plants. (5) It may be of the nature of poisonous fish, using the term fish in the popular sense. (6) Certain fungi or mushrooms are poisonous. Parasitic diseases would, strictly speaking, come under the first head ; but the pre-

ventive measures to be adopted in the use of food infested with parasites will alone be treated of in this place.

(1) Poisonous Vegetables.—Unsound or even rotten vegetables and fruits may be consumed, and become fertile sources of varied forms of poisoning, especially in hot summers. The symptoms produced by the ingestion of large quantities of unsound fruit or vegetables are of a diarrheal character, not often of an alarming severity, except in the cascs of the young and feeble. They may, however, sometimes attain a fatal severity. The cause is nsually obvious, and the treatment is simple ; mild purgatives, as rhubarb or castor oil, with or followed by opiates, to remove peccant matters from the intestines; and stimulants, as ammonia or alcohol, if there be much collapse. Certain fungi or mushrooms are known to be specifically poisonons, such as the Amanita musearia, or fly-fungns, and others. Certain kinds of mushrooms, usually innocuous, are occasionally poisonous or deleterious ; and the cause of this is not always clear. Poisonous fungi produce narcotic and irritant symptoms.

(2) Poisonous, Zainted, or Putrid Mfeat.—The obvious char- acteristics of good sound ficsh meat are that its colour is red—neither pale pink nor deep purple ; that it is marbled in appearance ; firm and elastic to the tonch, scarcely moistening the fingers ; having a slight and not unpleasant odour; and that when exposed to the air fora day or two it should neither become dry on the surface nor wet and sodden. Sound meat is acid to litmus paper; unsound meat 'nay be neutral or alkaline. Meat may be tainted with physic administered to the animal. Itis a common practice, when a fat and valuable animal is unwell, to physic it, and if its recovery be not speedy to slaugliter it. The meat of such animals may often be met with in our markets, and may induce illness from the physic with which it is contaminated. The effects of simple putridity are most varied. habitnally eat putrid meat, and even prefer it to fresh ; and

the development of rottenncss in eggs for the epicure is an art |

in China. There is no doubt that habit has much to do with the tolerance by the stomach of putrid meat, whether cooked or un- cooked. But tainted game, and indeed all kinds of meat in which putrefaction has commenced, may indubitably produce disease. This is chiefly of a diarrhceal character, preceded by rigors, and attended with collapse and, it may be, convulsions and other signs of a profound affection of the nervous system. effects of such tainted meat are slight as compared with those which are produced by the sausage-poison, developed by a sort of modified putrefaction in certain German sausages. These sausages, when they become musty and soft in their interior, nauseous in odour and flavour, and strongly acid to test paper, acquire a highly poisonous eharacter, and are frequently fatal in their effects. The symptoms produced by the nse of poisonous flesh are gastric pain, vonnting, diarrhcea, depression, coldness of the limbs, and weak irregular action of the heart. Fatal cases end in convulsions and oppressed respiration, death ensuing from the third to the eiglith day. The nature of the sausage-poison, which is probably akin to that of putrid and indeed all non-specitically tainted meats, has been a matter of considcrable controversy. Some have held that the poisonous action is due to the development of rancid fatty acids ; others believe that a so-called catalytic body is produced, capable of setting up by contact a similar catalytic action. Others have regarded the sausage-poison as due to the formation of

pyrogeneous acids during the drying or smoking of the sausages. 'The recent discovery by Selmi of a class of poisonous alkaloids or amides, termed ptomaines, developed during putrefaction of animal matters, on the one hand, and the discovery by Ballard and Klein, still more recently, that the fatally poisonons properties of hams prepared according to the American method may be due to the presence of a parasitic bacillus, point to one or other of these two latter canses as that of the effects of sausage-poison. Others again have referred the effects to the presence of a microscopic fungus—Sarcina botulina. The poisonous nature of the flesh of animals which have fed on certain plants—for example, hares which have fed on certain species of rholodendron, pheasants on the kalmia shrub, &c. —has been abundantly demonstrated, and need only be referred to here. The

honey from bees which have garnered on poisonous plants, as the |

azalea, may likewise be deleterious ; and the fact is of classic interest. The milk even of goats which have browsed on poisonous herbs has also proved poisonous.

(8) Diseased Meat.—The poisonous effects of meat affected with certain pavasites—trichine, cystieerci, trematodes, &c., is an un- doubted fact. Great quantities of meat pass through our markets which is undoubtedly the flesh of animals affected with disease, such as foot-and-mouth disease, pleuro-pneumonia, pig typhoid, the so-called scarlatina of swine, sheep-pox, &c.; and the question is quite undecided as to whether such flesh produces any injurious effects. To stop the sale of such meat. would be to cut off large sources of our meat supplies. The evils attending the use of such diseased meat, when well cooked, have undonbtedly been exagger-ated ; but, on the other hand, there is enough evidence to show that the use of certain kinds of diseased meat may be followed by serious

_ arrived at on general principles. The |

_ and discusses feigned diseases. | laws of the Twelve Tables fix three hundred days as the extremé | duration of ntero-gestation. _ law authorized medical inspections of dead bodies. | of Justinian we find De Statu Hominum ; De Penis et Manumissis ;

| eonnexion between medicine and law.

| stttutio Criminalis Carolina in Germany.

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results. Thus it is generally admitted that the flesh of animals which have suffered from plenro-pneumonia and murrain will sivé rise to boils and carbuneles. Braxy mutton may also producé disease when eaten. "richine will produce trichinosis, flukes, thé tape-worm, &c. Hams are occasionally fatally poisonous; and this has been traced to the presence of certain low organisms known as bacillt.

(4) Poisonous Kish.—F¥ish is sometimes a poisonous article of food. Cases of poisoning by the so-called shell-fish of the British islands are not unfrequently met with. Generally it is the eating of crabs, lobsters, and mussels which produces such results. Thesé are nsually of a distressing rather than of a serious character, nettle-rash being a common symptom. Occasionally, however, fatal results have cnusued froin the use of mussels. In tropical seas poisonous fish are more plentiful—the golden sardine, the bladder fish, the grey snapper, &c.; and, these being eaten by larger fish, as the barracuda, perch, globe-tish, conger ecl, &c., the latter ray in turn become poisonous.

Good cookery, that is, exposure to a sufficiently high temperature for a sufficiently lengthened time, is undoubtedly the best méasure to adopt short of absolute destruction of unsonnd and diseased meat. So long as meat is high-priced, and the effects of diseased meat so little understood and so undefined, it will be impossible to induce medical officers of health and sanitary inspectors to seizé all the diseased and unsound meat which is daily offered for sale. Notwithstanding all that has been said to the contrary, experienced

observers are pretty well agreed that thorough exposure of the meat | thronghout to the temperature at which albumen is coagulated is | destruetive to the parasites of flesh. – Salting is more effective than smoking ; but there is some evidence | toshow that salting may merely hold the life of organisms in lt is well known that some nations

Smoking is less effective.

suspense without entirely destroying their vitality ; and thus in the conversion of salted pork into hains—a process of re-salting and subsequent drying—the specific germ (a bacillus) has been known to be again rendered harmful. 1t is not known whether efficient cooking entirely removes the deleterious effects of flesh affected

_ with other than parasitic disease, as for example pleuro-pnenmonia.

The curative measures for the results of eating poisonons food cannot be specifically described. They are those which must be Symptoms are to be treated, and the powers of the patient sustained until the deleterious matter is removed by the ordinary channels, or the trichine have becomé encysted.

Hisrory oF Forensic MEDICINE.

The true origin of medical jurisprudence is of comparatively recent date, although traces of its principles may be perceived in remote times. Among the ancient Greeks the principles of medical science appear only to have been applied to legislation in certain questions relating to legitimacy. In the writings of Galen we find, however, remarks on the differences between the feetal and the adult lungs; he also treats of the legitimacy of seven months' children, Turning to Rome, we find that thé

It is doubtful whether the Roman In the code

De Sicariis; De Inspiciendo Ventre Custodiendoque Partu; Dé Muliere que peperit undecimo mense ; De Impotentia; De Her- maphroditis,—titles which show obvious traces of a recoguized It was not, however, by the testimony of living medical witnesses that such qnestions were to be settled, but on the authority of Hippocrates.

Medical jurisprudence, as a science, dates only from the 16th cen- tury. In 1507 the bishop of Bamberg introduced a penal code in which the necessity of medical evidence in certain cases was Tre- cognized ; and in 1532 the emperor Charles V. persuaded the diet of Ratisbon to adopt an uniform code of German penal juris: prudence, in which the civil magistrate was

enjoined in all cases of doubt or difficulty to obtain the evidence of medical witnesses, —as in cases of personal injuries, infanticide, pretended pregnancy, simulated diseases, and poisoning, The true dawn of forensic medicine dates, however, from the publication in 1553 of the Con- A few years later Weiher, a physician, having nndertaken to prove that witches anid demoniacs are, in fact, persons subject to hypochondriasis and hysteria, and should not be punished, aroused popular indignation, and was with difficulty rescued from the flames by his patron, William duke of Cleves.

At the close of the 16th century Ambrose Paré wrote on monsters, on simulated diseases, and on the art of drawing up medico-legal reports; Pineau also published his treatise on virginity and defloration. Aboutthe same time as these stimuli to the study of forensic medicine were being made known in Paris, the first system: atic treatise on the science appeared in Sicily in the form of & treatise De Relationibus Medicorum by Fidelé. Paulo Zacchia, thé illustrions Roman medical jurist, moreover, published from 1621

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to 1635 a work entitled Quexstiones Mecdico-Legales, which marks a new era in the history of the science,—a work which displays an ymmense amount of learning and sagacity in an age when chemistry was in its infancy, and physiology very imperfectly understood. The discovery of the circulation of the blood by Harvey soon followed, and gave a new impetus to the study of those branches of forensic medicine having direct relations to physiology; and to Harvey we owe the idea how to apply Galen's observations on the differences between the feetal aud the adult lungs to the elucidation of cases of supposed infanticide. About this time, too, Sebiz published two treatises, on the signs of virginity and on the exaniina- tion of wounds respectively. In the former he contended that the hymen was the real mark of virginity; but this was denied by Augenio and Gassendi. In 1663 Bartholin, a Danish physician, in- vestigated the period of human uterine gestation, a subject which had engaged the attention of Aristotle. He also proposed the

_ honours for medical graduates.

‘hydrostatic test” for the determination of live-birth—a test still |

in use, and applied by observing whether the lungs of an infant

the process in 1677; but it was not till 1682 that it was first practically applied by Jan Schreyer.

Germany, ever the leader in questions of forensic medicine, introduced the first public lectures on medical jurisprudence. Michaelis gave the first eourse about the middle of the 17th cen- tury in the university of Leipsie ; and these were followed by the lectures of Bohn, who also published De Renunciatione Vulnerwin ; cui accesserunt Dissertationes bine de partw enecato, ef an quis yivus mortuusve aquis submersus, strangulatus, aut viulneratus fuerit, and De Officiis Medici Duplicis, Clinict et Forensis, Welsch and Ammian wrote on the fatality of wounds, and Licetus on monsters.

From the time of Ambrose Paré the mode of conducting investi- gations in forensic medicine had attracted attention in France; and in 1608 Henry IV. authorized his physician to appoint persons skilled in medicine and surgery to make medico-legal inspections and reports in all cities and royal jurisdictions ; in 1692, diffi- culties having arisen, Louis XIV.

&e., are justly celebrated. Germany too has industriously pursued the subject, and Casper’s great work on forensic medicine will ever remain a classic in the science. In Russia Dragendortf has greatly contributed to our knowledge of poisons.

Though forensic medicine may be said to have been entirely neglected in England till the beginning of the present century, its progress has siuce been by no means slow or nnimportant ; and the subject now forms a recognized and obligatory portion of medical study. ‘he first lectures delivered in Great Britain were given in the university of Edinburgh in 1801 by the elder Dr Duncan; and the first professorship was held by his son in 1803. Dr Alfred

Swaine Taylor gave the first course of lectures delivered in England, at Guy's Hospital in 1881; and in 1868 the university of London made forensic medicine a separate subject for examination and In 1822 there was not in the English language any treatise of authority either on medical juris-prudence or on any important division of the subject; for it was not

id ay _ till the following year that the useful compendium of Paris and float or sink in water… Swammerdam explained the rationale of |

created hereditary royal |

physicians and surgeons for the performance of like duties. These, |

having become a corrupt and venal body, were suppressed in 1790. The only works on forensic medicine which appeared in France during the 17th century, however, were Gendry's Sur les Moyens de bien rapporter & Justice, and Blégny's Doetrine des Rapports en Chirurgie. Atthe beginning of the 18th century the latter was superseded as a text-book by Devaux's L'art de faire des rapports en Chirurgie. Valentini followed with two works, which were

finally incorporated in his Corpus Juris AMedico-Legale which |

appeared in 1722. This work is a vast storehouse of medico-legal information, and a summary of the knowledge of the time. Professorships for teaching the subject were fonnded in the Ger- man universities early in the 18th century, and numcrous treatises on forensic medicine were published. 'Teichmeyer's Jnstitutiones

Medicine Legalis long formed the text-book of the subject; and |

Alberti, professor of legal medicine at Halle, in his Systema gave to the world a most complete and laborious treatise on the science. precious mine of information. century the Germans were almost the only cultivators of legal medicine. But in France the celebrated case of Villeblanche attracted attention to the subject, and called forth Louis, who ina

memoir on utero-gestation attacked with powerful arguments the |

pretended instances of protracted pregnancy, aud paved the way for the adoption in the Code Napoléon of three hundred days as the limit of utero-gestation, a period in precise accordance with the ancient Roman law of the Twelve Tables. Louis also wrote on

death from hanging, and pointed out the mode by which we may |

distinguish murder from suicide under such cirenmstances. It is

he who is credited with having been the first in France to publicly |

teach the just application of medical knowledge to jurisprudence. Foderé's celebrated Zraité de Médecine Légale appeared in 1798, and marks a new era in the annals of legal medicine.

No British author wrote systematically on forensic medicine till 1788, when Dr Samuel Farr published a short treatise on the Elements of Medical Jurisprudence ; but this was mercly an abridg- ment of an carlier work of Fazelius. Previous writers, as Mead, Munro, Denman, Percival, and the two Hunters, liad, however, dealt with fragments of the subject ; nevertheless the science as a whole was little appreciated or recognized in this country during the last century.

In the present century France took the lead ; and the institution of three professorships of forensic medicine at the end of the 18th century produced excellent fruits.

which revolutionized this branch of medical jurisprudence, and first plaeed the knowledge of poisons upon a scientific basis. Since the time of Orfila, France has never eeased to have one or more living medical jurists, among the most recent of whom we must enumerate Tardieu, whose treatises on abortion, on poisons, on wounds,

In 1814 Orfila, a Spaniard by | birth, but naturalized in France, published his T'oxieologie, a work |

His industrious collection of facts renders his works a | Indeed towards the close of last

Fonblanque was published ; and even half a century ago medical jurisprudence may be said to have been almost in its infaney as compared with what it isnow. Since 1829 Great Britain has pro- duced an abundant crop of literature on forensie medicine. Sir tobert Christison's admirable treatise on TZ'oxieology, Dr A. S. Taylor's Prineiples and Practice of Medical Jurisprudence, the same author's Elements of Alcdieal Jurisprudence, Dr Guy's Forensic Medicine, and Ogston's Lectures on Medical Jurisprudence are well-known and widely eirculated works. The separate memoirs of Taylor, Christison, Guy, and others are also storehouses of facts and deductions in the science.

America, too, has not been behind hand in the race. Wharton and Stillé's AZanual aud Wormley's Toxicology are the best-known works of American authors. ro)

MEDICI. This family is renowned in Italian history for the extraordinary number of statesnien to whom it gave birth, and for its magnificent patronage of letters and art. It emerged from private life and rose to power by means of a very subtle policy that was persistently pursued from generation to generation. The origin of the family is buried in obscurity. Some court historians indeed declare it to have been founded by Perseus, and assert that Benvenuto Cellini's bronze Perscus holding on high the head of Medusa was executed and placed in the Loggia dei Lanzi to symbolize the victory of the Medici over the republic. But this only proves that the real origin of the family is unknown, and equally unknown is the precise signification of the Mcdicean arins—six red balls on a field of gold.

The name appcars in Florentine chronicles as early as the rarly

- close of the 12th century, although only casually mentioned bearers of The the name.

in connexion with various offices of the republic. first of the family to be a distinct figure in listory was

Salvestro dei Medici, who, in the year 1378, took an active Salvestro.

_ part in the revolt of the Ciompi—so-called because it was

‘ were the leading men of the greater guilds.

led by a wool-carder (ciompo), one Michele di Lando, and because the chief share in it was taken by the populace, who held the reins of government for some time, and sought to obtain extended political rights. But, although Michele di Lando was the nominal chief of the revolt, Salvestro dei Medici was its real leader. The latter, although a member of the greater guilds, had joined the lesser and songht to be at their head, in order to lay the foundation of his own power and that of his kindred by attacking the Albizzi, who The victory of the Ciompi, however, was brief, for the excesses of the lower classes brought about a reaction, in which they were crushed, and Michele di Lando sent into banishment. Nevertheless the lesser guilds had gained some ground by this riot, and Salvestro dei Medici the great popularity at which he had aimed. His policy during that period had traced the sole possible road to power in liberty-loving Florence. And this was the road henceforth pursued by the Medici.

On Salvestro’s death in 1388 the Albizzi repossessed themselves of the government, and conducted the wars of the republic. Vieri dei Medici, who seems to have been the next head of the family, understanding the temper of

Hovanni.

Coximo the Elder.

the timcs, abstained from becoming a popular leader, | that he turned it to much pecuniary advantage by means

and left it to his successors to prosecute the task under easier conditions. Then, in the person of Giovanni, son of Bicci dei Medici (1360-1429), another branch of the family arose, and becaine from that time forward its representative branch. Indeed this Giovanni may be con- sidered the actual founder of Medicean greatness. He took little part in politieal affairs, but

realized an immense fortune by trade,—establishing banks in Italy and abroad,

which in his saccessors' hands became the most efficient |

engines of political power. The council of Constance (141 4- 1418) enabled Giovanni dei Medici to realize enormous profits. constant supporter of the lesser guilds in Florence. His- torians record his frequent resistance to the Albizzi when they sought to oppress tlie people with heavier taxation,

and his cndeavours to cause the chief weight to fall npon | _ well aware of the great number of his adherents,

tlie richer classes. For this reason he was in favour of the so-called law of catasto, which, by assessing the property

Besides, like his ancestor Salvestro, he was a |

of loans to the Government and other banking operations, When, however, military affairs went badly, Cusiimo joined the discontented populace in invectives against the war and those who had conducted it. This won him an enormous increase of popularity, but the hatred of the Albizzi and their friends augmented in equa) degree, and a conflict becaine inevitable. The Albizzi, who were far nore impetuous and impatient than Cosimo, were now bent upon revenge. In 1433 one of their own friends, Bernardo Guadagni, was elected gonfalonier, and thereupon Cosimo dei Medici was called to the palace and summarily imprisoned inthe tower. A general assembly of the people was convoked and a "balia" chosen, which changed the Government and sent Cosimo into exile. Undoubtedly

| the Albizzi party would have preferred a heavier sentence,

but they did not dare to attempt their enemy's life, being Cosimo

had some apprehension that he night be poisoned in prison,

of every citizen, prevented those in power from arbitrarily |

imposing taxes that unjustly burdened the people. this way, and by liberal loans of money to all whe were in need of it, he gained a reputation that was practically the foundation-stone of the grand family edifice. Giovanni dei Medici died in 1429 leaving two sons, Cosimo (1389- 1464) and Lorenzo (1395-1440). ceeded the branch that held absolute sway for many genera- tious over the nominal republic of Florence. and gave to Italy popes like Leo X. and Clement VII. On the extine- tion of this elder line in the 16th century, the younger

branch derived from Lorenzo, Cosimo's brother, seemed to |

acquire new life, and for two centuries supplied grand-dukes to Tuscany. Cosimo, surnamed Cosimo the Elder, to dis- tinguish him from the inany others bearing the same name, and honoured after his death by the title of Puter patriz, first succeeded in solving the strange problem of becoming absolute ruler of a republic that was keenly jealous of its liberty, without holding any fixed office, without suppress- ing any previous forin of government, and always preserving the appearance and demeanour of a private citizen. Born in 1389, he had already reached the age of forty at the time of his father's death. He had a certain amount of literary culture, aud throughout his life showed much taste and an earnest love both for letters and art. But his father had mainly trained him to commerce, for which he had a special liking and aptitude. In fact he was devoted to business to the day of his death, and like his forefathers derived pecuniiry advantage from his friendly relations with the papal court. He accompanied Pope John XXIII. to the council of Constance, transacted a vast amount of business in that city, and made very large gains. He then travelled in Germany, and after his return to Florence discharged several ambassadorial missions. At tlie death of his father lhe was possessed of a vast fortune and an extended experi- ence, and inherited the leadership of the opposition to the then dominant party of the greater guilds headed by Rinaldo degli Albizzi, Palla Strozzi, and Niccolé da Uzzano. Of gentle and kindly manners, generous in lending and even in giving money whenever he could gain popularity by that means, at critical moments he frequently came to the succour of the Government itself. He was very dexterous in turning his private liberalities to account for the increase of his political prestige, and showed no less acumen and still

fewer scruples in making use of his political prestige for | Indeed, whenever his own in- | poe ‘ further increased by the friendship of Baldaccio d’Anghiart,

purposes of pecuniary profit. terests were at stake, he showed himself capable of positive villainy, although tlis was always tempered by calculation.

Cosimo proved his skill in these knavish arts during the |

war between Florence and Lucca. He had joined the

From the former pro- |

Tn |

_ his fears, voluntarily shared his meals.

but Federigo dei Malavolti, captain of the palace guard, showed him the utmost kindness, and, in order to soothe On the 3d October the prisoner was sent to Padua, his allotted place of exile.

The Albizzi speedily saw that they had done either too much or too little. While seeking to keep the government entirely in their own hands, they beheld the continual growth of the Medici party. When it was necessary to laake a campaign in Romagna against the mercenary captains commanding the forces of the duke of Milan, it was plainly seen that in banishing Cosimo the republic had lost the only citizen banker in a position to assist it with considerable loans. The Floreitines were defeated by Pic- cinino in 1434, and this event greatly increased the public exasperation against the Albizzi. Meanwhile Cosimo, who had gone to Padua as a private individual, was entertained there like a prince. Then, being permitted to transfer his residence to Venice, he entered on a course of lavish expenditure. He was overwhelmed with letters and appeals from Florence. Finally, on the Ist of September 1434, a signory was elected composed of his friends, and his recall was decreed. Rinaldo degli Albizzi determined to oppose it by force, and rushed to the Piazza with a band of armed inen; but his attempt failed, and he left the country to return no more. The Medici were now reinstated

in all their former dignities and honours, and Cosimo, on the evening of Septeinber 6th, rode past the deserted mansions of the Albizzi and re-entered his own dwelling after an exile of a year. For tliree centuries, dating from that moment, the whole history of Florence was connected with that of the house of Medici.

Cosimo's first thought was to secure himself against all future risk of removal from Florence, and accordingly he drove the most powerful citizens into exile to all parts of Italy. Nor did he spare even his former political adversary, Palla Strozzi, although the latter had been favourable to him during the recent changes. His rigour in this parti- cular case was universally censured, but Cosimo would tolerate no rivals in the city, and was resolved to abase the great families and establish his power by the support of the lower classes. He was accustomed to say that states could not be ruled by paternosters. Still, when cruelty seemed requisite, he always contrived that the chief odinm of it should fall upon others. When Neri Capponi, the valiant soldier and able diplomatist, gained great public favour by his military prowess, and his influence was

captain of the infantry, Cosimo resolved to weaken his position by indirect means. Accordingly, when in 1441 a partisan of the Medici was elected gonfalonier, Baldaccio

Albizzi in urging on this war, and many writers assert | was instantly summoned to the palace, imprisoned,

MEDICI

murdered, and his body hurled from the window. No oue could actually fix this crime upon Cosimo, but the majority believed that he had thus contrived to rid himself of one enemy and cripple another without showing his hand. It was impossible for Cosimo openly to assume the position of tyrant of Florence, nor was it worth his while to become gonfalonier, since the term of office only lasted two months. It was necessary to discover some other way without resorting to violence ; he accordingly employed what were then designated "civil methods." He managed to attain his object by means of the "balie." These nagistracies, which were generally renewed every five years, placed in the ballot bags the names of the candidates from

whom the signory and other chief magistrates were to be chosen. As soon as a "balia" favourable to Cosimo was formed, he was assured for five years of having the government in the hands of men devoted to his interests. He had comprehended that the art of politics depended rather upon individuals. than institutions, and that he who ruled men could also dictate laws. His foreign policy was no less astute. His great wealth enabled him to supply money not only to private indi- viduals, but even to foreign potentates. Philippe de Comines tells us that Cosimo frequently furnished Edward IV. of England with sums amounting to many hundred thousand florins. When Tommaso Parentucelli was still a cardinal, and in needy circumstances, Cosimo made him considerable loans without demanding guarantees of payment. On the cardinal's accession to the tiara as

Nicholas V. he was naturally very well disposed towards |

Cosimo, and employed the Medici bank in Rome in all the affairs of the curia, which brought immense profits to the house. At the time when Francesco Sforza was striving for the lordship of Milan, Cosimo foresaw his approaching triumph, showed him great friendship, and aided him with large sums of money. Accordingly, when Sforza became lord of Milan, Cosimo's power was doubled. Without the title of prince, this merchant showed royal generosity in his expenditure for the promotion of letters and the fine arts. Numerous edifices were raised and public works accom- plished with his purse. Besides his palace in the city, he constructed noble villas at Careggi, Fiesole, and other places. He built the basilica of Fiesole, and that of St Lorenzo in Florence, and enlarged the church and monastery of St Mark. Even in distant Jerusalem he endowed a hospice for the use of pilgrims. The artists of the day comprised men like Donatello, Brunelleschi, Ghiberti, Luca della Robbia, and many others, and Cosimo's magnificent commissions not only developed their powers but stimulated other men of wealth to the patronage of art. Without being a scholar, Cosimo had a genuine taste for letters, and gave them much and efficient patronage. He purchased many Greek and Latin manuscripts ; he opened the first public library at St Mark's at his own expense, and founded another in the abbey of Fiesole. The Greek refugees from Constantinople found a constant welcome in his palace. During the council of Florence (1439-1442), Gemisthus Pletho spoke to him with enthusiasm of the Platonic philosophy.

Cosimo was so deeply attracted by the thenie that he decided to have the young Marsilio Ficino trained in philosophy and Greek learning in order to make a Latin translation of the complete works of Plato. And thus a version was pro- duced that is still considered one of the best extant, and that Platonic academy was founded which led to such important results in the history of Italian philosophy and letters. On the lst of August 1464 Cosimo breathed his last, at the age of seventy-five, while engaged in listening to one of Plato's dialogues.

The concluding years of his life had been years of little

the government to the management of his friends, among whom Luca Pitti was one of the more powerful, and they had ruled with disorder, corruption, and cruelty. The lordship of Florence accordingly did not pass without some difficulty and danger into the hands of Piero, surnamed the Gouty, Cosimo's only surviving legitimate son. Afflicted by gout, and so terribly crippled that he was often only able to use his tongue, the new ruler soon discovered that a plot was on foot to overthrow his power. However, showing far more courage than he was supposed to possess, he had himself borne on a litter from his villa to Florence, defeated his enemies' designs, and firmly re-established his authority. But his success may be mainly attributed to the enormous prestige bequeathed by Cosimo to his posterity. Piero died at the end of five years' reign, on the 3d December 1469, leaving two sons, Lorenzo (1449-92) and Giuliano (1453-78). The younger, the gentler and less ambitious of the pair, was, as we shall presently see, quickly removed from the world. Lorenzo, on the con- trary, at once seized the reins of state with a firm grasp, and was, chronologically, the second of the great men bestowed upon Italy by the house of Medici. In literary talent he was immensely superior to Cosimo, but greatly his inferior in the conduct of the commercial affairs of the house, for which he had neither aptitude nor inclination. In politics he had nobler conceptions and higher ambitions, but he was more easily carried away by his passions, less prudent in his revenge, and more disposed to tyranny. He had studied letters from his earlicst years under the guidance of Ficino and other leading literati of the day, who were constant habitués of the Medici palace. At the age of

cighteen he visited the different courts of Italy in order to gain experience of the world and mankind. At his father's death he was only twenty-one years old, but instantly showed his determination to govern Florence with greater despotism than his father or grandfather. He speedily resorted to the system of the "'balie," and was very dexterous in causing the first to be chosen to suit his purpose. He then proceeded to humiliate the great familics and exalt those of little account, and this was the policy he constantly pursued. His younger brother Giuliano, being of a mild and yielding disposition, had only a nominal share in the government.

Lorenzo's policy was not exempt from danger, but, although prosecuted with less caution, it was still the old astute and fortunate policy initiated by Cosimo. But the grandson bestowed no care upon his commercial interests, although squandering his fortune with far greater lavish-

'ness. Accordingly he was sometimes driven to help himself from the public purse without ever being able to assist it

as Cosimo had done. All this excited blame and enmity against him, while his greed in the matter of the alum mines of Volterra, and the subsequent sack of that unhappy city, were crimes for which there was no excuse. Among his worst enemies were the Pazzi, and, as they formed a very powerful clan, he sought their ruin by competing with them even in business transactions. They were just on the point of inheriting the large property of Giovanni Borromeo when, in order to prevent this, Lorenzo hurriedly caused a law to be passed that altered the right of succession. 'The hatred of the Pazzi was thereby exas- perated to fury. And in addition to these things there ensued a desperate quarrel with Pope Sixtus IV., a man of very impetuous temper, who, on endeavouring to crect a state on the frontiers of the Florentine republic for the benefit of his nephews, found a determined and successful opponent in Lorenzo. Consequently the Pazzi and Arch-bishop Salviati, another enemy of Lorenzo, aided by the nephews of the pontiff, who was himself acquainted with

happiness for Florence. Being old and infirm, he had left | the whole matter, determined to put an end to the family.

Piero the Gouty.

Lorenzo the Mag- nificent.

786

On the 26th April 1478, while Giuliano and Lorenzo were attending high mass in the cathedral of Florence, the former was mortally stabbed by conspirators,.but the latter was able to beat back his assailants and escape into the sacristy. His life saved; and, no longer having to share the government with a brother, Lorenzo profited by the oppor- tunity to wreak cruel vengeance upon his foes. Several of the Pazzi and their followers were hanged from the palace windows; others were hacked to pieces, dragged through the streets, and cast into tlie Arno, while a great many more were condemned to death or sent into exile. Lorenzo seemed willing and able to become a tyrant. But he stopped short of this point. He knew the temper of the city, and had also to look to fresh dangers threatening him from with- out. The pope had excommunicated him, put Florence under an interdict, and, being seconded by the Neapolitan king, made furious war against the republic. These hostilities speedily assumed alarming proportions, and the Florentines began to tire of submitting to so many hard- ships in order to support the yoke of a fellow-citizen. Lorenzo's hold over Florence seemed endangered. But he did not lose heart, and, on the contrary, rose superior to the difficulties by which he was encompassed. He boldly journeyed to Naples, to the court of King Ferdinand of Aragon, who was reputed to be as treaclierous as he was cruel, and succeeded in obtaining from him an honourable peace, that soon led to a reconciliation with Sixtus. Thus at last Lorenzo found himself complete master of Florence, and was in a position to turn lis power to account. But, as the "'balie" changed every five years, it was always re- quisite, in order to retain his supremacy, that he should be prepared to renew the usual manceuvre at the close of that term and have another elected equally favourable to his aims. This was often a difficult achievement, and Lorenzo showed much dexterity in overcoming all obstacles. In 1480 he compassed the institution of a new council of seventy, which was practically a permanent " balia" with extended powers, inasmuch as it not only elected the chief magis- trates, but had also the administration of numerous state affairs. But, this permanent council of his

own devoted adherents once formed, his security was firmly established. By this means, the clironiclers tell us, "liberty was buried," but the chief affairs of the state were always conducted by intelligent and experienced men, who promoted the public

prosperity. Florence was still called a republic ; the old institutions were still preserved, if onlyin name. Lorenzo was absolute lord of all, and virtually a tyrant. His im-

morality was scandalous; he kept an army of spies, and frequently meddled in the citizens' most private affairs, and exalted men of the lowest condition to important offices of the state. Yet, as Guicciardini remarks, "if Florence was to have a tyrant, she could never have found a better or more pleasant one." In fact all industry, com- merée, and public works made enormous progress. The civil equality of modern states, which was quite unknown to the Middle Ages, was more developed in Florence than in any other city of the world. Even the condition of the peasantry was far more prosperous than elsewhere. And Lorenzo's authority was not confined to Tuscany, but was also very great throughout the whole of Italy. He was on the friendliest terms with Pope Innocent VIII., from whom he obtained the exaltation of his son Giovanni to the cardinalate at the age of fourteen. This boy cardinal was afterwards Pope Leo X. From the moment of the decease of Sixtus IV., the union of Florence and Rome became the basis of Lorenzo's foreign policy. By its means he was able to prevent the hatreds and jealousies of the Sforzas of Milan and the Aragonese of Naples from bursting into the open conflict that long threatened, and after his death actually caused, the beginning of new and irreparable

calamities. Hence Lorenzo was styled the needle of the Italian compass.

But the events we have narrated cannot suffice for the full comprehension of this complex character, unless we add the record of his deeds as a patron of letters and his achievements as a writer. His palace was the school and resort of illustrious men. Within its walls were trained the two young Medici afterwards kuown to the world as Leo X. and Clement VII. Ficino, Poliziano, Pico della Mirandola, and all members of the Platonic academy were its constant habitués. It was here that Pulci gave readings of his Aforgante, and Michelangelo essayed the first strokes of his chisel. Lorenzo's intellectual powers were of exceptional strength and versatility. He could speak with equal fluency on painting, sculpture, music, philosophy, and poetry. But his crowning superiority over every other Mecenas known to history lay in his active participation in the intellectual labours that he promoted, Indeed at certain moments he was positively the leading spirit among the literati of his time. He was an elegant prose writer,

and was likewise a poet of real originality. At that period Italians were forsaking erudition in order to forward the revival of the national literature by recur- ring to the primitive sources of the spoken tongue and popular verse. It is Lorenzo's lasting glory to have been the initiator of this movement. Without being—as some have maintained—a poet of genius, he was certainly a writer of much finish and eloquence, and one of the first to raise popular poetry to the dignity of art. In his Amora, his Caccia del Falcone, and his Nencia da Barberino, he gives descriptions of nature and of the rural life that he loved, with the graphic power of an acute and tasteful observer, joined to an ease of style that occasionally sins by excess of homeliness. Both in his art and in his politics he leant upon the people. The more oppressive his government, the more did he seek in his verses to incite the public to festivities and lull it to slumber by sensual enjoyments. In his Ballate, or songs for dancing, and more especially in his carnival songs, a kind of verse invented by himself, Lorenzo displayed all the best qualities and worst defects of his muse. Marvellously and spontaneously elegant, very truthful and fresh in style, fertile in fancy and rich in colour, they are often of a most revolting indecency. And these compositions of one filling a princely station in the city were often sung by their author in the public streets, in the midst of the populace.

Lorenzo left three sons,—Pietro (1471-1503), Giovanni (1475-1521), and Giuliano (1479-1516). He was suc-

ceeded by Pietro, whose rule lasted but for two years. Pietro.

During this brief term he performed no good deeds, and only displayed inordinate vanity and frivolity. His con- duct greatly helped to foment the hatred between Lodovico Sforza and Ferdinand of Naples, which hastened the coming of the French under Charles VIIL., and the renewal of foreign invasions. No sooner did the French approach the frontiers of Tuscany than Pietro, crazed with fear, hastened ¢o meet them, and, basely yielding to every demand, accepted terms equally humiliating to himself and the state. But, returning to Florence, he found that the enraged citizens had already decreed his deposi- tion, in order to reconstitute the republic, and was there- fore compelled to escape to Venice. His various plots to reiustate himself in Florence were all unsuccessful. At last he went to the south of

Italy with the French, was drowned at the passage of the Garigliano in 1503, and was buried in the cloister of Monte Cassino.

The ensuing period was adverse to the Medici, for a republican government was maintained in Florence from 1494 to 1512, and the city remained faithful to its alliance with the French, who were all-powerful in Italy. Cardinal

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*Cardinal year (1513) Cardinal Giovanni was elected pope, and Cardinal Giulio, who had laboured successfully for the Cardinal Giovanni assumed the name of Leo X. He accordingly removed to | reinstatement of his family in Florence in 1512, had been Giulio eg Rome, leaving his brother Giuliano with his nephew | long attached to the person of Leo X. as his trusted (Clement i. Lorenzo in Florence, and accompanied by his cousin | factotum andcompanion. He had been generally regarded *”*

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Giovanni, the head of the family, resided in Rome, playing the patron to a circle of literati, artists, and friends, seeking to increase his popularity, and calmly waiting for better days. The battle of Ravenna wrought the downfall of the fortunes of France in Italy, and led to the rise of those of Spain, whose troops entered Florence to destroy the republic and reinstate the Medici. Pietro had now been dead for some time, leaving a young son, Lorenzo (1492- 1519), who was afterwards duke of Urbino. The following

Giulio, who was a natural son of the Giuliano murdered in the conspiracy of the Pazzi, and was soon destined to be a cardinal and ultimately a pope. Meanwhile his kinsmen in Florence continued to govern that city by means of a “ balia,” although preserving an empty show of republican institutions. And thus, being masters of the whole of central Italy, the Medici enjoyed great authority throughout the country, and their ambition plumed itself for still higher flights. This was the moment when Niccold Machiavelli, in his treatise Zhe Prince,

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counselled them to accomplish the unity of Italy by arming»

the whole country, and expelling its foregin invaders. Leo X., who is only indirectly connected with the history of Florence, gave his name to the age in which he

lived in consequence of his magnificent patronage of art | | fulfilled, long served to keep men's minds in a pleasant

and letters in Rome. But he was merely a clever amateur, and had not the literary gifts of his father Lorenzo. He surrounded himself with versifiers and inferior writers,

who enlivened his board and accompanied him wherever he |

went. of theatrical performances, satires, and other intellectual diversions. His patronage of the fine arts, his genuine affection for Raphael, and the numerous works he caused to be executed by him and other artists, have served to confer an exaggerated glory on his name. He failed to comprehend the significance of the great religious movement already stirring in Germany, and had not the remotest idea of the grave importance of the Reformation, which indeed he unconsciously promoted by his reckless and shameless sale of indulgences. The whole policy of Pope Leo X. consisted in oscillating between France and Spain, in always playing fast and loose, and deceiving both powers in turn. Yet the evil results of this contemptible policy never seemed to disturb his mind. He finally joined the side of the emperor Charles V., and in 1521, at the time of the defeat of the French by the Spanish troops on the river Adda, he ceased to breathe at his favourite villa of Magliana. Giuliano dei Medici had died during Leo's reign, in 1516, without having ever done anything worthy of record. He was the husband of Philiberta of Savoy, was duke of Nemours, and left a natural son, Ippolito dei Medici (1511-1535), who afterwards became a cardinal. Lorenzo, being of more ambitious temper, was by no means content to remain atthe head of the Florence Government hampered by many restrictions imposed by republican institutions, and subject to the incessant control of the pope. In his eagerness to aggrandize his kinsmen, the latter had further decided to give Lorenzo the duchy of Urbino, and formally invested him in its rights, after expelling on false pretences its legitimate

lord, Francesco Maria della Rovere. This prince, however, soon returned to Urbino, where he was joyously welcomed by his subjects, and Lorenzo regained possession only by a war of several months, in which he was wounded. In 1519 he also died, worn out by disease and excess. By his marriage with Madeleine de la Tour d'Auvergne, he had one daughter, Caterina del

He liked to lead a gay and untroubled life, was fond |

Orleans, afterwards king of France. She played a long and sinister part in the history of that country. Lorenzo also left a natural son named Alessandro, inheriting the frizzled hair and projecting lips of the negro or mulatto slave who had given him birth. His miserable death will be presently related. Thus the only three surviving representatives of the chief branch of the Medici, Cardinal Giulio, Ippolito, and Alessandro were all of illegitimate birth, and left no legitimate heirs.

as the mentor of the pope, who had no liking for hard work. But in fact, his frivolity notwithstanding, Leo X. always followed his own inclinations. He had much aptitude for cominand, aud pursued his shuffling policy without any meutal anxiety. Giulio, on the contrary, shrank from all responsibility, inuddled his brains in weighing the reasons for and against every possible decision, and was therefore a better tool of government in others' hands than he was fit to govern on his own account. When Giuliano and Lorenzo died, the pope appointed the cardinal to the government of Florence. In that post, restricted within the limits imposed by republican institutions, and acting under the continual direction of Rome, he performed his duties fairly well. He caressed the citizens with hopes of extended liberties, which, although never destined to be

flutter of expectation ; and when the more impatient spirits attempted to raise a rebellion he speedily quenched it in blood. When, after the death of Leo X. and the very brief pontificate of Adrian VI., he was elected pope (1523) under the name of Clement VII., he entrusted the govern-

ment of Florence to Cardinal Silvio Passerini conjointly.

with Alessandro and Ippolito, who were still too young to do much on their own account.

The pontificate of Leo X. had been a time of felicity to himself if of disaster to Italy andthe church. The reign of Clement, on the contrary, was fatal to himself as well, a result chiefly due to his hesitating temper and continual uncertainty of mind. MHis policy, like that of Leo X., consisted in perpetual oscillation between France and Spain. By lis endeavours to trick all the world, he frequently ended in being tricked himself. In 1525 he was the ally of the French, who then suffered a terrible defeat at Pavia, where their king Francis I. was taken prisoner. The armies of Charles V. triumphantly advanced, without Clement being able to oppose any effectual resistance. Both Rome and Florence were threatened with a fearful catastrophe.

Thus far we have had no occasion to speak of. the Giovanni

younger branch of the Medici, descended from Lorenzo, delle

brother to Cosimo the Elder. Always in obscurity, an always held in check by the elder line, it now seemed to acquire new life, and first entered the arena of history when the other was on the point of extinction. In fact the most valiant captain of the papal forces was Giovanni dei Medici, afterwards known by the name of Giovanni delle Bande Nere. His father was Giovanni, son of Pier Francesco, who was the son of Lorenzo, the brother of Cosimo dei Medici. History has little to tell of the elder Giovanni; but his wife Caterina Sforza, of whom he was the third husband, was a woman of more than masculine vigour. Giovanni dei Medici married her in 1497, but died in 1498, leaving her with one son who was christened Lodovico, but afterwards took his father's name of Giovanni (1498-1526). Trained to arms from his earliest years, this youth inherited all the energy of his. mother,

Medici (1519-89), married in 1533 to Henry, duke of whose Sforza blood seemed to infuse new life into the

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Duke Aless- andro.

younger branch of the Medici. Notwithstanding his extreme youth, he had already achieved the title of the best captain in Italy. He always fought with immense dash and daring, and was devotedly loved and obeyed by his soldiery. He was the only leader who opposed a determined resistauce to the imperial forces. He was seriously wounded at Pavia when fighting on the French side. On his recovery he joined the army of the League, and was much enraged by finding that the duke of Urbino, commander of the Venetian and papal forces, would never decide on attacking. When the imperial

troops were struggling through the marshes of Mantua, |

surrounded on every side, and without stores or ammuni- tion, Giovanni could not resign himself to inactivity like his colleagues in command. He was ignorant that the

imperialists had just received supplies and artillery from the |

duke of Ferrara, and therefore daringly attacked them with

a small body of men without taking any precautions for | citizens who were resolved to achieve the overthrow of They found a leader in Cardinal Ippolito Cardinal

dei Medici, who was then in Rome, embittered by the Ippolito. |

defence. One of the first shots fired by the enemy injured him so fatally that he died a few days after. He was married to Maria Salviati, by whom he had one son, Cosimo (1519-1574), born, as we shall see, to lofty fortunes, for he became the first grand-duke of Tuscany, and indeed. the founder of the grand-duchy and the new dynasty.

Meanwhile the imperial army pursued its march upon Rome, captured the Eternal City after a few hours' combat, and cruelly sacked it during many days (1527). Thanks to his perpetual shuffling and excessive avarice, the pope found himself utterly forsaken, and, being unable to defend the city,

was obliged to seek refuge in the castle of St Angelo, whence he only effected his escape after some months. He thensigned atreaty of alliance with theemperor (1529), who sent an army to besiege Florence and restore the Medici, whom the people had expelled in 1527 on the re-establishment of the republic. After an heroic defence, the city was forced to surrender (1530) ; and, although it was expressly stipulated that the ancient liberties of Florence should be respected, every one foresaw that the conditions would be violated. In fact, pope and emperor immediately began to dispute as to which should be the new lord of the city. Clement VII. had inherited the traditional family dislike for the younger branch of his kin, and so the choice lay between the two bastards Ippolito and Alessandro. The former being a cardinal, the latter was chosen. Alessandro, who already bore the title of duke of Citta' di Penna, came to Florence in 1531, and by imperial patent was nominated head of the republic. According to the terms of this patent, the former liberty enjoyed under the Medicean rule was to remain intact. But no previous ruler of the city had enjoyed hereditary power confirmed by imperial patent, and such power was incom- patible. with the existence of a republic. Moreover, Clement VII. showed dissatisfaction with the uncertainty of the power conferred upon his kinsman, and finally succeeded in obtaining additional privileges. On the 4th of April 1532 a parliament was convoked for the last time in Florence, and, as usual, approved every measure pro- posed for acceptance. Accordingly a new council was formed of two hundred citizens elected for life, forty-eight of which number were to constitute a senate. Alessandro, as duke of the republic, filled the post of gonfalonier, and carried on the government with the assistance of three senators, changed every three months, who took the place of the suppressed signory.

The duke's chief advisers, and the contrivers of all these arrangements, were Baccio Valori, Francesco Vettori, and above all Francesco Guicciardini,—men, especially the two latter, of lofty political gifts and extensive influence. The mind and character of Duke Alessandro were as yet comparatively unknown. At first he seemed very anxious

to win the favour of the people, and disposed to rule with justice and prudence. But soon encountering difficulties that he was unable to overcome, he began to neglect the business of the state, treated his new office as affording the means for increased indulgence in pleasure and vice, and acted as if the sole function of government consisted in lulling the people by festivities and corrupting it by the dissolute life of which he set the example. The question of the moment was the transformation of the old re- publican régime into a princedom; as an unavoidable result of this change it followed that Florence was no longer to be the ruling city to whose inhabitants alone belonged the monopoly of political office. When the leading Florentine families realized, not only that the re- public was destroyed, but that they were reduced to equality with those whom they had hitherto regarded as their inferiors and subjects, their rage was indescribable, and hardly a day passed without the departure of influential

their new ruler.

preference given to Alessandro, and anxious to become his successor with the least possible delay. Under the pressure of terror the duke at once became a tyrant. He garrisoned the different cities, and began the erection in Florence of the Fortezza da Basse, built chiefly at the ex- pense of Filippo Strozzi, who afterwards met his death within its walls.

In 1534 Clement VII. died, and the election fell on Panl I[I., from whom Cardinal Ippolito hoped to obtain assistance for his designs. Accordingly the principal Florentine exiles were despatched on a mission to the emperor Charles V. with complaints of Alessandro's tyranny and lis shameless violation of the terms upon which the city had surrendered. Cardinal Ippolito also represented his own willingness to carry on the government of Florence ina more equitable manner, and promised the eniperor a large sum of money. Reply being delayed by the emperor's

absence, he became so impatient that he set out, accom

panied by several exiles, to meet Charles in 'l'unis, but on the 10th of August 1535 died suddenly by the way, at Itri, poisoned by order of Alessandro. Such at least was the general belief, and it was confirmed by the same fate be- falling other enemies of the duke about the same time. On

the emperor's return from Africa, the exiles presented themselves to him in Naples, and the venerable patriot Jacopo Nardi pleaded their cause. Duke Alessandro, being cited to appear, came to Naples accompanied by Francesco Guicciardini, who by speaking in his defence rendered himself odious to all friends of liberty, and irretrievably tarnished his illustrious name. The cardinal being dead, it was hard to find a successor to Alessandro. On this account, and perhaps to some extent through the emperor's personal liking for the duke, the latter rose higher than before in the imperial favour, married Margaret of Austria, the natural daughter of Charles, and returned to Florence with increased power. And now Alessandro indulged unchecked in the lowest excesses of tyranny, aud although so recently a bridegroom gave way to increased libertinism. His whole time was passed in vicious haunts and in scandalous adventures. In order to conceal the obscurity of his birth, he left his mother to starve, and it was even asserted that he finally got rid of her by poison.

His constant associate in this disgraceful routine was La ro} 2ino ¢

his distant kinsman Lorenzo, generally known as Lorenzin dei Medici. Of the younger branch of the Medici, the latter was second cousin of the Cosimo already mentioned as the son of Giovanni delle Bande Nere. He had much culture and literary talent, but led an irregular life, sometimes acting like a madman and sometimes like a

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villain. He was a writer of considerable elegance, the author of several plays, one of which, the Arzdosio, was held to be among the best of the age, and he was a worshipper of antiquity. Notwithstanding these tastes, when in Rome he knocked off the heads of some of the finest statues of the age of Adrian, an act by which Clement VII. was so incensed that he threatened to have him hanged. There- upon Lorenzino fled to Florence, where he became the friend of Duke Alessandro and his partner in the most licentious excesses. They went together to houses of ill-fame, and violated private dwellings and convents. They often showed themselves in public mounted

on the same horse. All Florence eyed them with disgust, but no one foresaw the tragedy that was soon to take place.

On the evening of January 5th, 1537, after a day

nation of passed in the usual excesses, Lorenzino led the duke to

his own lodging, and left him there, promising shortly to return with the wife of Leonardo Ginori, Alessandro, worn out by the exertions of the day, fell asleep on the couch while awaiting Lorenzino's return. Before long the latter came accompanied by a desperado known as the Scoronconcolo, who aided him in falling on the sleeper. Roused by their first thrusts, the duke fought for his life, and was only despatched after a violent struggle. The murderers then lifted the body into bed, hid it beneath the clothes, and, Lorenzino having attached a paper to it bearing the words, vincit amor patriz, laudumque immensa cupido, they both fled to Venice. In that city Lorenzino was assassinated some ten years later, in 1548, at the age of thirty-two, by order of Alessandro's successor. Thus he was only abont twenty-two at the time he committed the murder. He wrote an Apologia, in which le defended himself with great skill and eloquence, saying that he had been urged to the deed solely by love of liberty. For this reason alone he had followed the example of Brutus and played the part of friend and courtier. The tone of this Apologia is so straightforward, sometimes even so eloquent aud lofty, that we should be tempted to give it credence were it possible to believe the assertions of one who not only by his crime but by the infamy of his previous and subsequent career completely gave the lie to his vaunted nobilityof purpose. By Alessandro's death the elder branch of the Medici became extinct, and thus the appearance of the younger line was heralded by a bloody crime.

When the duke's absence from his own palace was dis- covered on the morning of January 6th, he was at first supposed to have spent the night with one of his mistresses ; but soon, some alarm being felt, search was made, and Cardinal Cybo was the first to discover the murder. Enjoining the strictest secrecy, he kept the corpse concealed for three days, and then had it interred in the sacristy of San Lorenzo. Meanwhile he had hastily summoned Alessandro Vitelli and the other captains, so that, by the time Alessandro's death was made public, the city was already filled with troops.

The cardinal then convoked the council of forty-eight to decide upon a successor. Alessandro's only issue was a natural son named Giulio, aged five. The cardinal favoured his election, in the hope of keeping the real sovereignty in his own hands, But he speedily saw the impossibility of carrying out a design that was ridiculed by all. On the other hand, Guicciardini, Vettori, and others of the leading citizens favoured the choice of Cosimo, the son of Giovanni delle Bande Nere. He was already in Florence, was aged seventeen, was keen-witted and aspiring, strong and handsome in person, heir to the enormous wealth of the Medici, and, by the terms of the imperial patent, was Alessandro's lawful successor. Charles V. approved the nomination of Cosimo, who without delay seized the reins of government with a firm grasp. Like Alessandro, he was named head of the

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republic; and Guicciardini and others who had worked hardest in his cause hoped to direct him and keep him under their control. But Cosimo soon undeceived them by proving that, his youth notwithstanding, he had a will of his own, and was resolved to rule unshackled by republican forms and unhampered by advisers disposed ta act as mentors. The Florentines had now an absolute prince who was likewise a statesman of eminent ability.

On learning the death of Alessandro and the election of Cosimo, the exiles appreciated the necessity for prompt action, as all delay would be fatal to the overthrow of the Medicean rule. They had received money and promises from France; they were strengthened by the adhesion of Filippo Strozzi and Baccio Valori, who had both become hostile to the Medici through the infamous conduct and mad tyranny of Alessandro ; and Strozzi brought them the lielp of his enormous fortune and the prowess of that very distinguished captain, his son Piero. The exiles accordingly met, and assembled their forces at Mirandola. They had about four thousand infantry and three hundred horse ; among them were members of all the principal Florentine families; and their leaders were Bernardo Salviati and Piero Strozzi. They marched rapidly, and entered Tuscany towards the end of July 1537. Cosimo on this occasion displayed signal capacity and presence of mind. Fully informed of the exiles' movements by means of his spies, he no

sooner learned their approach than he ordered Alessandro Vitelli to collect the best German, Spanish, and Italian infantry at his disposal, and advance against the enemy without delay. On the evening of July 31 Vitelli marched towards Prato with seven hundred picked infantry and a band of one hundred horse, and on the way fell in with other Spanish foot soldiers who joined the expedition. At early dawn the following morning he made a sudden attack on the exiles' advanced guard close to Montemurlo, an old fortress converted into a villa belonging to the Nerli. Having utterly routed them, he proceeded to storin Montemurlo, where Filippo Strozzi and a few of his young comrades had taken refugeand barricaded the gates. Knowing that they must either conquer or die, they made a desperate resistance for some hours, and then, overwhelmed by superior numbers, were obliged to yield themselves prisoners. The main body of the army was still at some distance, having been detained in the mountains by heavy rains and difficult passes, and, on learning the defeat at Montemurlo, its leader refused to advance, and turned back by the way he had come. Alessandro Vitelli then re- entered Florence with his victorious army and his fettered captives. Cosimo had achieved his first triumph.

All the prisoners, who were members of great families, were brought before Cosimo, and were received by him with courteous coldness. Soon, however, a scaffold was erected in the Piazza, and on four mornings in succession four of the prisoners were beheaded. Then the duke saw fit to stay the executions. Baccio Valori, however, and his sou and nephew were beheaded on the 20th of August in the courtyard of the Bargello. Filippo Strozzi still survived, confined in the Fortezza da Basso, that had been built at his expense. His family was illustrious, he had numerous adherents, aud he enjoyed the protection of the French king. Nevertheless Cosimo only awaited some plausible pretext to rid himself of this dreaded enemy. He brought him to trial and had him put to the question. But this cruelty led to nothing, for Strozzi denied every accusation and bore the torture with much fortitude. On December 18th he was found dead in his prison, with a blood-stained sword by his side, and a slip of paper bearing these words : exoriare aliquis nostris ex ossibus ultor. It was believed that, having renounced all hope of his life being spared, Strozzi had preferred suicide to death at the hands of the

executioner, Some, however, thought that Cosimo had caused him to be murdered, and adopted this mode of cou- cealing the crime. The young prince's cold-blooded massacre of his captives cast an enduring shadow upon his reign and dynasty. But it was henceforward plain to all that he was a man of stern resolve, who went straight to his end without scruples or half measures. Before long he was regarded by many as the incarnation of Machiavelli's Prince, "inasmuch as he joined daring to talent and

prudence, was capable of great cruelty, and yet could | Guicciardini, who still pre- |

practise mercy in due season." tended to act as mentor, and wlio on account of his many services had a certain influence over him, was obliged to withdraw fron public life and busy himself with writing his /Z¢story at his villa of Arcetri. Hedied in this retreat in 1540, and it was immediately rumoured that tlie duke had caused him to be poisoned. ' This shows the estimation in which Cosimo was now held. It was true that he punished with death all who dared to resist his will. By 1540 sentence of death had beeu pronounced against four

hundred and thirty contumacious fugitives, and during his |

reign one hundred and forty men and six women actually ascended the scaffold, without counting those who perished in foreign lands by the daggers of his assassins. He reduced the old republican institutions to empty forms, by making the magistrates mere creatures of his will. He issued the sternest edicts against the rebels, particu-

larly by the law known as the ' Polverina," from the | This law decreed |

name of its proposer Jacopo Polverini. not only the confiscation of the property of exiles, but likewise that of their heirs, even if personally acquired by the latter. Cosimo ruled like the independent sovereign of a great state, and always showed thie capacity, firmness, and courage demanded by that station. Only, his state being small and weak, he was forced to rely chiefly upon his personal talent and wealth. It was necessary

for him to make heavy loans to the different European sovereigns, especially to Charles V., the most rapacious of them all, and to give enormous bribes to their ambassadors. Besides, he had to carry on wars for the extension of his dominions, and neither his inherited wealth nor the large sums gained by confiscating the estates of rebellious subjects sufficed for all this outlay. He was accordingly compelled to burden the people with taxes, aud thus begin at once to diminish its strength. (

Cosimo bore a special grudge against the neighbouring republics of Siena and Lucca. Although the latter was small and weak, and the former garrisoned by Spaniards, yet the spectacle of free institutions at the frontiers of his own state served as a continual incitenieut to subjects dis-affected to the new régime. In fact Francesco Burlamacchi, a zealous Lucchese patriot, had conceived the design of re-establishing republican government in all the cities of Tuscany. Cosimo, with the emperor's help, succeeded in having him put to death. Lucca, however, was an insig-nificant state making no pretence of rivalry, whereas Siena was an old and formidable foe to Florence, and had always given protection to the Florentine exiles. It was now very reluctantly submitting to the presence of a Spanish garrison, and, being stimulated by promises of prompt and efficacious assistance from France, rose in rebellion and expelled the Spaniards in 1552. Cosimo instantly seized the opportunity, wrote to the emperor in terms that appealed to his pride, asked leave to attack Siena, and begged for troops to ensure the success of his enterprise. As no immediate answer arrived, he feigned to begin negotiations with Henry II. of France, and, by thus arous- ing the imperial jealousy, obtained a contingent of German and Spanish infantry. Thencame a long and bloody war.

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aided by the valour of Piero Strozzi, who fought under the French flag, made a most heroic resistance, even women and children helping on the walls. But fortune was against them. Piero Strozzi sustained several defeats, and finally the Sienese, having exhausted their ammunition and being decimated by famine and the sword, were obliged to capitulate on honourable terms that were shamelessly violated. By the varied disasters of

the siege and the num- ber of fugitives the population was reduced from forty to eight thousand inhabitants. The republicans, still eager to resist, withdrew to Montalcino. Cosimo now ruled the city and territory of Siena in the name of Charles V., who always refused him its absolute possession. After the emperor's abdication, and the succession of Philip IT. to the Spanish throne, Cosimo at last obtained Siena and Ponto- ferra by giving up his claim to a sum of 200,000 ducats that he was to have received from Charles V. In 1559 he also captured Montalcino, and thus formed the grand- duchy of Tuscany, but he continued to govern the new state —.e., Siena and its territories—separately from the old. His rule was intelligent, skilful, and despotic; but his enormous expenses drove him to raise large sums of money by special contrivances unsuited to the country and the people. Hence, notwithstanding the genius of its founder,

_ the grand-duchy held from the first the elements of its future

decay. Cosimo preferred to confer office upon men of humble origin in order to have pliable tools, but he also liked to be surrounded by a courtier aristocracy on the Spanish and French pattern. As no Tuscan aristocracy any longer existed, he created new nobles, and tempted foreign ones to come by the concession of various feudal privileges ; and, in order to turn this artificial aristocracy to someaccount, he founded the knightly order of St Stephen, charged with the defence of the coast against pirates, which in course of time won much honour by its prowess. He also estab- lished a sinall standing army for the protection of his fron- tiers ; but, as we have seen, he generally employed German aud Spanish troops for his wars, and always had a foreign bodyguard. Atthe commencement of his reign he opposed tle popes in order to maintain the independence of his own state; but later, to obtain help, he truckled to then in many ways, even to the extent of giving up to the Inquisition his own confidant, Piero Carnesecchi, who, being accused of heresy, was beheaded and burnt in 1567. In reward for these acts of submission, the popes showed

him friendship, and Pius V. granted him the title of grand- Title of duke, conferring the patent and crown upon him in Rome, grand-

although the emperor had always withheld his consent. 4 Finally, however, the latter confirmed the title to Cosimo's successor. The measure most

injurious to Tuscany was the fiscal system of taxes, of which the sole aim was to extort the greatest possible amount of money. 'The con- sequent damage to industry, commerce, and agriculture was immense, and, added to the devastations caused by the Sienese war, led to their utter ruin. Otherwise Cosimo did not neglect useful measures for the interior prosperity of his state. He was no Mecenas, but nevertheless restored the Pisan university, enlarged that of Siena, had the public records classified, and also executed public works like the Santa Trinit' bridge. During the great inunda- tions of 1557 he turned his whole energy to the relief of the sufferers.

In 1539 he had espoused Eleonora of Toledo, daughter of the viceroy of Naples, by whom he had several children. Two died in 1562, and their mother soon followed them to the grave. It was said that one of these boys, Don Garcia, had murdered the other, and then been killed by the enraged father. Indeed Cosimo was further accused of having put his own wife to death; but neither rumour had

Siena was besieged for fifteen months, and its inhabitants, | any foundation. He now showed signs ef illness and failure

Francesco lt

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ofstrength. He was not old, but worn by the cares of state and self-indulgence. Accordingly in 1564 he resigned the government to his eldest son, who was to act as his lieutenant, since he wished to remain the virtual head of the state and have power to resume the sceptre on any emergency. In 1570, by the advice of Pius V., he married Camilla Martelli, a young lady of whom he had been long enamoured. In 1574 he died, at the age of fifty-four years and ten months, after a reign of thirty-seven years, leaving three sons and one daughter besides natural children. These sons were Francesco, his successor, who was already at the head of the government, Cardinal Ferdinand, and Piero.

Francesco L, born in 1541, began to govern as his father's lieutenant in 1564, and was married in 1565 to the arch- duchess Giovanna of Austria.

On beginning to reign on his own account in 1574, he speedily manifested his real character. His training in the hands of a Spanish mother had made him suspicious, false, and despotic. Holding everyone aloof, he carried on the government with the assistance of a few devoted ministers. He compelled his stepmother to retire to a convent, and kept his brothers at a distance from Florence. He loved the privileges of power without its burdens. Cosimo had known how to maintain his independence, but Francesco cast himself like a vassal at Austria's feet. He reaped his reward by obtaining from Maximilian II. the title of grand-duke, for which Cosimo had never been able to win the imperial sanc- tion, but he forfeited all independence. Towards Philip IT. he showed even greater submissiveness, supplying him with large sums of money wrung from his over-taxed people. He held entirely aloof from France, in order not to awake the suspicions of his protectors. In short, under his rule the history of Tuscany was reduced to a mere record of local and municipal events. To increase his funds, he traded on his own account, thus creating a monopoly that was ruinous to the country at large, and led to an enor- mous number of failures. He raised the tax upon corn to so high a rate that few continued to find any profit in grow- ing it, and thus the Maremme, already partly devastated during the war with Siena, were converted into a desert. Even industry declined under this system of government ; and, although Francesco founded porcelain manufactories and pietra dura works, they did not rise to any prosperity until after his death. His love of science and letters was the only Medicean virtue that he possessed. He had au absolute passion for chemistry, and passed much of his time in his laboratory. Sometimes indeed he gave audience to his secretaries of state standing before a furnace, bellows in hand. He took some useful measures to promote the risé of a new city at Leghorn, which at that time had only a natural and ill-sheltered harbour. The improvement of Leghorn had been first projected by Cosimo I., and was carried on by all the succeeding Medici. Francesco was a slave to his passions, and was led by them to scandalous excesses and deeds of bloodshed. His example and neglect of the affairs of the state soon caused a vast increase of crime even among the people, and, during the first eighteen months of his reign, there occurred no less than one hundred and sixty-eight murders.

In default of public events, the historians of this period enlarge upon private incidents, generally of a scandalous or sanguinary kind. In 1575 Orazio Pucci, wishing to avenge his father, whom Cosimo had hanged, determined to get up a conspiracy, but, soon recognizing how firmly the Medicean rule had taken root in the country, desisted from the attempt. But the grand-duke, on hear- ing of the already abandoned plot, immediately caused Pucci to be hanged from the same window of the Palazzo Vecchio, and even from the same iron stanchion, from which his father before him had hung. His companions, who

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had fied to France and England, were pursued and murdered by the ducal emissaries. Their possessions were con- fiscated, and the " Polverina" law applied so that the con- spirators' heirs were reduced to penury, and the grand-duke gained more than 300,000 ducats.

Next year Isabella dei Medici, Francesco's sister, was strangled in her nuptial bed by her husband, Paolo Giordano Orsini, whom she had betrayed. Piero dei Medici, Francesco's brother, murdered his wife Eleonora of Toledo from the same motive. Still louder scandal was caused by the duke's own conduct. He was already a married man, when, passing one day through the Piazza of St Mark in Florence, he saw an exceedingly beautiful woman at the window of a mean dwelling, and at once conceived a passion for her. She was the famous Bianca Cappello, a Venetian of noble birth, who had eloped with a young Florentine named Pietro Buonaventuri, to whom she was married at the time that she attracted the duke's gaze. He made her acquaintance, and, in order to see her frequently, nominated her husband to a post at court. Upon this, Buonaventuri behaved with so much insolence, even to the nobility, that one evening he was found murdered iu the street. Thus the grand-duke, who was thought to have sanctioned the crime, was able to indulge his passion unchecked. On the death of the grand-duchess in 1578 he was privately united to Bianca, and afterwards married her publicly. But she had no children, and this served to poison her happiness, since the next in succession was her bitter enemy, the cardinal Ferdinand. 'The latter came to Florence in 1587, and was ostentatiously welcomed by Bianca, who was most anxious to conciliate him. On October

18th of the same year, the grand-duke died at his villa of Poggio a Caiano, of a fever caught on a shooting excursion in the Maremme, and the next day Bianca also expired, having ruiued her health by drugs taken to cure her sterility. But rumour asserted that she had prepared a poisoned tart for the cardinal, and that, when he suspiciously insisted on the grand-duke tasting it first, Bianca desperately swallowed a slice and followed her husband to the tomb.

Such was the life of Francesco dei Medici, and all that can be said in his praise is that he gave liberal encourage- ment to a few artists, including Giovanni Bologna, who executed for him the group of the Rape of the Sabines. He was the founder of the Uffizi gallery, of the Medici theatre, and the villa of Pratolino; and during his reign the Della Cruscan academy was instituted.

Ferdinand I. was thirty-eight years of age when, in 1587, Ferdinand

he succeeded his brother on the throne. A cardinal from the |. age of fourteen, he had never taken holy orders. He showed much tact and experience in the management of ecclesi- astical affairs. He was the founder of the Villa Medici at Rome, and the purchaser of many priceless works of art, such as the Niobe group and many other statues afterwards transported by him to Florence. After his accession he retained the cardinal's purple until the time of his marriage. He was in all respects his brother's opposite. Affable in his manners and generous with his purse, he chose a crest typical of the proposed mildness of his rule,—a swarm of bees with the motto Majestate tantum. He instantly pardoned all who had opposed him, and left his kinsmen at liberty to choose their own place of residence. Occa- sionally, for political reasons, he committed. acts unworthy of his character; but he re-established the adiministration of justice, and sedulously attended to the business of the state and the welfare of his subjects. Accordingly Tuscany revived under his rule and regained the independ- ence aud political dignity that his brother had sacrificed to love of ease and personal indulgence. He favoured commerce, and effectually ensured the prosperity of Leghorn, by an edict enjoining toleration towards Jews and

Cosimo WG

heretics, which led to the settlement of many foreigners in that city. He also improved the harbour and facilitated communication with Pisa by means of the Naviglio, a canal into which a portion of the water of the Arno was turned, He nevertheless retained the reprehensible custom of trad- ing on his own account, keeping banks in many cities of Europe. He successfully accomplished the draining of the Val di Chiana, cultivated the plains of Pisa, Fucecchio, aud Val di Nievole, and executed other works of public utility at Siena and Pisa.

But his best energies were |

devoted to the foreign policy by which he sought to >

emancipate himself from subjection to Spain. On the assassination (1589) of Henry III. of France, Ferdinand supported the claims of the king of Navarre, undeterred

by the opposition of Spain and the Catholic League, who |

were dismayed by the prospect of a Huguenot succeeding to the throne of France. He lent money to Henry IV., and strongly urged his conversion to Catholicism; he helped to persuade the pope to accept Henry's abjuration, and pursued this policy with marvellous persistence until his efforts were crowned with success. Subsequently, however, Henry IV. showed faint gratitude for the benefits conferred upon lim, and paid no attention to the expostulations of the grand duke, who then began to slacken his relations with France, and showed that he could guard his independ- ence by other alliances. He gave liberal assistance to Philip II. for the campaign of the latter in Algiers, and to the emperor for the war with the Turks. Hence he was compelled to burden his subjects with enormous taxes, forgetting that while guaranteeing the mdependence of Tuscany by his loans to foreign powers he was increasingly sapping the strength of future generations. He at last succeeded in obtaining the formal investiture of Siena, which: Spain had always considered a fief of her own.

During this grand-duke's reign the Tuscan navy was notably increased, and did itself much honour on the Mediterranean. The war-galleys of the knights of St Stcpheu were despatched to the coast of Barbary to attack Bona, the headquarters of the corsairs, and they captured the town with much dash and bravery. And in the following year (1608) thesame galleys achieved their most brilliant victory in the archipelago over the stronger fleet of the Turks, by taking nine of their vessels, seven hundred prisoners, and a store of jewels of the value of 2,000,000 ducats.

Ferdinand I. died in 1609, leaving four sons, of whom the eldest, Cosimo II., succeeded to the throne at the age of nineteen. He was at first assisted inthe government by his mother and a council of regency. He had a good disposition, and the fortune to reign during a period when Europe was at peace and Tuscany blessed with abundant harvests. Of his rule there is little to relate. His chief care was given to the galleys of St Stephen, and he sent them to assist the Druses against the Porte. On one occasion le was involved in a quarrel with France. Concino Concini, the Marshal d'Ancre, being assassinated in 1617, Louis XIII. claimed the right of transferring the property of the murdered man to De Luynes. Cosimo opposed the decision, and, refusing to recognize the confiscation decreed

_ years of a quiet reign marked by no great event.

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He was fond of luxury, spent freely on public festivities, and detested trouble. Tuscany was apparently tranquil and prosperous ; but the decay of which the seeds were sown under Cosimo I. and Ferdinand I. was rapidly spreading, and became before long patent to all and beyond all hope of remedy. The best deed done by Cosimo II, was the protection accorded by him to Galileo Galilei, who

had removed to Padua, and there made some of his grandest

discoveries. The grand-duke recalled him to Florence in 1610, and nominated him court mathematician and philosopher. Cosimo died in February 1621, after twelve Feeling his end draw near, when he was only aged thirty and all his sons were still in their childhood, he hastened to

arrange his family affairs. His mother, Cristina of Lorraine, and his wife, Maddalena of Austria, were nominated

| regents and guardians to his eldest son Ferdinand IL,

a boy of ten, and a council of four appointed, whose functions were regulated by law. Accordingly, after Cosimo's death, the young Ferdinand was sent to Rome and Vienna to complete his education, and the government of Tuscany remained in the hands of two jealous and quarrel-some women. Thus the administration of justice and finance speedily went to ruin. Out of submissiveness to the pope, the regents did not dare to maintain their legitimate right to inherit the duchy of Urbino, and in 1623 sanc- tioned the transfer of that right to the holy see. They conferred exaggerated privileges on the new Tuscan nobility, which became increasingly insolent and worthless. They resumed the practice of trading on their own account, and, without reaping much benefit thereby, did the utmost damage to private enterprise.

In 1627 Ferdinand II., then aged seventeen, returned to Ferdinané

Italy and assumed the reins of government; but, being of a 1. very gentle disposition, he decided on sharing his power with the regents and his brothers, and arranged matters in such wise that each was almost independent of the other. He gained the love of his subjects by his great goodness; and, when Florence and Tuscany were cruelly ravaged by the plague in 1630, he showed admirable courage, and carried out many useful measures. But he was totally incapable of energy as a statesman. When the pope made bitter complaints because the board of health had dared to subject certain monks and priests to the necessary qnarantine, the grand-duke insisted on his officers asking pardon on their knees for having done their duty. On the death in 1631 of the last duke of Urbino, the pope was allowed to seize the duchy without the slightest opposition on the part of Tuscany. As a natural consequence the pretensions of the Roman curia became increasingly exorbitant ; ecclesiastics usurped the functions of the state ; and the ancient laws of the republic, together with the regulations decreed by Cosimo I. as a check upon similar abuses, were allowed to become obsolete. On the extinction of the line of the Gonzagas at Mantua in 1627, war broke out between France on the one

_ side and Spain, Germany, and Savoy on theother. The grand-

by the French tribunals, demanded that Concini's son should |

be allowed to inherit. Hence followed much ill-feeling and mutual reprisals between the two countries, finally brought to an end by the intervention of the duke of Lorraine. Like his predecessors, Cosimo II. studied to promote the prosperity of Leghorn, and he deserves honour for abandon- ing all commerce on his own account. But it was no praise- worthy act to pass a law depriving women of almost all rights of inheritance. By this means many daughters of the nobility were driven into convents against their will. He gave scanty attention to the general affairs of the state.

duke, uncertain of his policy, trimmed his sails according

to events, Fortunately peace was re-established in 1631.

Mantua and Monferrato fell to the duke of Nevers, as France had always desired. But Europe was again in arms for the Thirty Years' War, and Italy was not at peace. Urban VIII. wished to aggrandize his nephews, the Barberini, by wresting Castro and Ronciglione from Odoardo Farnese, duke of Parma and brother-in-law to Ferdinand. Farnese determined to maintain his rights, and marched his army through Tuscany into the territories of the pope, who is greatly alarmed by the attack. Naturally the grand-duke was drawn into the war to defend his own state and his kinsman. His military operations, however, were of the feeblest and often the most laughable character. At

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last, by means of the French intervention, peace was made in 1644. But, although the pope was forced to yield, he resigned none of his ecclesiastical pretensions in Tuscany. It was during Ferdinand's reign that the septuagenarian Galileo was obliged to appear before the Inquisition in Rome, which treated him with infamous cruelty. On thie death of this great and unfortunate man, the grand-duke wished to erect a monument to him,

but was withheld by fear of the opposition of the clergy. The dynasty as well as the country now seemed on the brink of decay. Two of the grand-duke's brothers had already died childless, and Ippolito, the sole survivor, was a cardinal. Accordingly the only remaining heir was Cosimo III., married to a wife who held him in detestation, and did her best to have her marriage annulled or at least obtain a separation.

Like nearly all his 'predecessors, Ferdinand II. gave

the throne. His eldest son Ferdinand died childless in 1713. The pleasure-loving Giovan Gastone was married to Anna Maria of Saxe-Lauenburg, widow of a German prince, a wealthy coarse woman wholly immersed in domestic occupations, and who seemed little likely to give birth to any children. After living with her for some time in a Bohemian village, Giovan Gastone yielded to his dislike to his wife and her country, withdrew to France, and ruined his health by hisexcesses., After a brief return to Bohemia he finally separated from his wife, by whom he had no family. Thus the dynasty was doomed to extinction. _ Cosimo had a passing idea of reconstituting the Florentine _ republic, but, this design being discountenanced by the Euro-

pean powers, he determined to transfer the succession, after

_ the death of Giovan Gastone, to his sister Anna Maria Louisa,

liberal patronage to science and letters, greatly aided |

therein by his brother Leopold, who had been trained by Galileo Galilei, and who joined with men of learning in founding the celebrated academy Del Cimento, of which he was named president. 'This academy took for its motto

who in fact survived him. For this purpose he proposed to annul the patent of Charles V., but the powers objected to

_ this arrangement also, and by the treaty of 1718 the quad- -ruple alliance of Germany, France, England, and Holland

“Spanish Infante Don Carlos.

the words Provando e riprovando, and followed the experi-

imental method of Galileo. Formed in 1657, it was dissolved in 1667 in consequence of the jealousies and dissensions

of its members, but during its brief existence won renown |

by the number and importance of its works.

Cosimo IIT. succeeded his father in 1670. He was weak, vain, bigoted, and hypocritical. In 1661 he had espoused Louise d’Orléans, niece of Louis XIV., who, being enamoured of Duke Charles of Lorraine, was very reluctant to come to Italy, and speedily detested both her husband and his country, of which she refused to learn the language. She had two sons and one daughter, but after the birth of her third child, Giovan Gastone, her hatred for her husband increased almost to madness. She first withdrew to Poggio a Caiano, and then, being unable to get her marriage annulled, returned to France, where, although supposed to live in conventual seclusion, she passed the greater part of lier time as a welcome visitor at court. Even her testamentary dispositions attested the violence of her dislike to her husband.

Cosimo’s hypocritical zeal for religion compelled his subjects to multiply services and processions, that greatly infringed upon their working hours. He wasted enormous sums in pensioning converts—even those from other countries—and in giving rich endowments to sanctuaries. Meanwhile funds often failed for the payment of Govern- ment clerks and soldiers. His court was composed of bigots and parasites; he ransacked the world for dainties for his table, adorned his palace with costly foreign hangings, had foreign servants, and filled his gardens with exotic plants. He purchased from the emperor the title of “ Highness” in order to be the equal of the duke of Savoy. He remained neutral during the Franco-Spanish war, and submitted to every humiliation and requisition exacted by theemperor. He had vague

notions of promoting agricul- ture, but accomplished no results. At one time he caused

decided that Parma and Tuscany should descend to the The grand-duke made energetic but fruitless protests.

Cosimo III. had passed his eightieth year at the time of his decease in October 1723, and was succeeded by his son Giovan Gastone, then aged fifty-three. The new sovereign was in bad health, worn out by dissipation, and had neither ambition nor aptitude for rule. His throne

_ was already at the disposal of foreign powers, and his only

thought on ascending it was to regain strength enough to pass the remainder of his days in enjoyment. He dismissed the spies, parasites, and bigots that had formed his father's court, abolished the pensions given to converts, suppressed several taxes, and prohibited the organized espionage estab- lished in the family circle. He wished to live and let live, and liked the people to be amused. Everything in fact

_bore a freer and gayer aspect under his reign, and the _ Tuscans seemed to feel renewed attachment for the dynasty

as the moment of its extinction drew near. But the grand- duke was too feeble and incapable to accomplish any real improvement. Surrounded by gay and dissipated young men, he entrusted all the cares of government to a certain Giuliano Dami, who drove a profitable trade by the sale of offices and privileges. In this way all things were in the hands of corrupt individuals ; while the grand-duke, com- pelled to pass the greater part of his time in bed, vainly sought diversion in the company of buffoons, and was only tormented by perceiving that all the world disposed of his throne without even asking his advice. And when, after prolonged opposition, he had resigned himself to accept Don Carlos as his successor, the latter led a Spanish

army to the conquest of Naples, an event afterwards lead-

eight hundred families to be brought over from the Morea |

for the cultivation of the Maremme, where all of them died of fever. But when, after the revocation of the edict of Nantes, French Huguenots offered to apply their labour and capital to the same purpose, the grand-duke's religious scruples refused them refuge. So ruin fell upon Tuscany. Crime and misery increased, and the poor, who only asked for work, were given alms and sent oftener to church. This period witnessed the rise of many charitable institutions of a religious character under the patronage of the grand duke, as for instance the congregation of San Giovanni Battista. But these could not remedy the general decay. Cosimo's dominant anxiety regarded the succession to

ing to the peace of 1735, by which the Tuscan succession

' was transferred to Francesco IT., duke of Lorraine, and _husband of Maria Theresa. Giovan Gastone was finally | obliged to submit even to this. Spain withdrew her garrisons from Tuscany, and Austrian soldiers took their _ place and swore fealty to the grand-duke on the 5th of February 1737. He expired on the 9th July of the same year. Such was the end of the younger branch of the Medici, which had found Tuscany a prosperous country, where art, letters, commerce, industry, and agriculture flourished, and left her poor and decayed in all ways, drained by taxation, and oppressed by laws contrary to every principle of sound economy, downtrodden by thie clergy, and burdened by a weak and vicious aristocracy.

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Giovan Gastone.

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GENEALOGICAL TABLE OF THE MEDICT.

Giovanni d'Averardo, known as Giovanni di Bicci, 1360-1429 =Piccarda Bueri.

Lorenzo, 1395-1440 =Ginevra Cavaleanti.

Cosimo the Elder, 1389-1464=Contessina de' Bardi.

| Giovanni, 1424-1463 =Ginevra degli Alessandri.

'| Piero, 1416-1469 =Lucrezia Tornabuoni, f 1482.

| Maria (nat.)

| Pier Francesco, + 1467 =Laudomia Acciainoli.

Lorenzo il Giuliano, Bianea Nannina | Magnifico, 1453-1478. =Guglielmo =Bernardo =Lionetto Giovanni, 1467-1498 Lorenzo, 1449-1492 dei Pazzi, Rueellai. de' Rossi. =Caterina Sforza Riario, _ eae =Clarice Orsini, Giulio (Clement t ie = Semiramide Appiani.

1488. 711.), 1478- ,

t | Val) 7S Giovanni delle Bande Nere, Pier Francesco, ¢ 1525 ies Be 1498-1526 — =Maria Soderini. Pietro. Giovanni Giuliano, Luerezia Maddaiena Contessina wie ty — 1471-1503 (Leo X.), duke of =Giacomo =Franeeschetto —Piero ' —— 1475-1521, A ened Salviati. Cybo. ve Bo be ots Laudomia Maddalena Giuliano, # 1520. =Philiberta Niceold ee ee ee MM of Savoy. Ridolf, 2. Camilla Martelli, t8 Strozzi. Strozzi, Beziers, | . | | eardinal. ge Lorenzo, Clarice, Ippolito | PO duke of t 1528 {nat.), : Urbino. =Filippo . ardinal, | i. | l 1492-1519 Strozzi. 1511-1535, FRANCESCO, 22 © FERDINAND I., Pietro, Isabella, © Virginia, =Madcleine Fig BE a = oo 1541-1587 BS = 1549-1609 1554-1604 1542-1576 3 =Cesare de la Tour j =1.Joanna-"2 = =Cristinaof =Eleonora =Paolo =8 d'Este, d'Auvergne, Giovanni Maria Elena of Austria, +5 7, Lorraine, of Toledo, Giordano &B duke of f 1519. Salviati, =Giovanni =Jacopo Y. $i5e> BSN + 1637. t 1576. Orsini. ™ Modena. cardinal. delle Bande Appiani, 2,Biancea 2 & 2 Nere.

Cappello, © 7 L | t 1587. [| | | Alessandro Caterina. al ib, Cosmo II.. A e Caterina= Claudia, (nat.), 1519-1589 Innocenzo Cybo lLorenzoCybo Caterina Cybo, Maria, 1590-1621. __= = i Ferdinand =1. Federigo ¢ 1537. =Henry li.. Cardinal, =Ricciarda duchess of +1642 _ =Maria oS. 28 = 5 Gonzaga, — della Rovere, king of Malaspina, Camerino. =Henry{V., Maddalena 2S =—=9 5 duke of hereditary France. princess of king of of Austria, -6 $2 #5 Mantua. prince of Massa, France. + 1631. ~ . $e Urbino; = 2. Leopold ef ¥ = | | 'yro FERDINAND II., Franeeseo, Mattia, ey ae Te i, es era ™ | 1610-1670 + 1634, + 1667. cardinal, Carlo, =Ferdinand =Odoardo Vittoria =Vittoria della + 1675. cardinal, of Austrian Farnese, della Rovere, Rovere, f 1694. t 1663. Tyrol. duke of I Parma.

| Francesco Maria, 1660-1711 (cardinal until 1709) =Eleonora Gonzaga.

| CostMo III., 1642-1723 Marguerite Louise of Orleans, ¢ 1721.

| _ Ferdinand, 1663-1713 =YViolante of Bavaria, + 1731.

| Anna Maria Luisa, 1667-1743 =Joln William of the Palatinate.

GIOVAN GASTONE, 1671-1737 = Anna Maria of Saxe-Laucnburg, ¢ 1741.

MEDICINE PART L—SYNOPTICAL VIEW OF MEDICINE.

EDICINE, the subject-matter of one of the learned

professions, includes, as it now stands, a wide range | of scientific knowledge and practical skill, The history of | its growth from small beginnings in Greece is traced in | the second section of the present article; it remains here to give a synoptical view of medicine, including its scientific or philosophical position, its subdivisions or ramifications as an art aud discipline, and its relations to the body politic.

Setentyfie Position of Medicine.—The science of medicine is the theory of diseases and of remedies. While the notion of disease is necessarily or inevitably correlated with the notion of health, there is no necessary and invari- able relation, but, on the other hand, a merely conventional | association, between a disease and a remedy. 'That part of | the science of

medicine which corresponds to the theory of | remedies is not therefore in a position scientifically inferior to the theory of diseases; for each article of the materia medica—apart from a few inert substances—has a certain effect on the organism in health and in disease, which is ascertainable with scientific precision. Those properties and actions of drugs are the subject of pharmacology and toxicology; the circumstances under which the several articles of the materia medica become remedial are the

subject of therapeutics, and therapeutics is dependent for its scientific position upon the completeness of the theory of diseases, or pathology.

Disease is the correlative of health, and the word is not capable of a more penetrating definition. From the time of Galen, however, it has been usual to speak of the life of the body either as proceeding in accordance with nature («ara dvoww, secundum naturam) or as overstepping the bounds of nature (rapa picw, preter naturam). Taking disease to be a deflexion from the line of health, the first requisite of medicine is an extensive and intimate acquaintance with the norm of the body. The normal condition of the body is capable of being determined without ambiguity ; it 15 the absence from its structures and functions of every disease hitherto known. The structure and functions of the body form the subject of anatomy and physiology.

Physiology is, strictly speaking, the science of that which is xara pvow, or secundum naturam, and it 1s usual to say that the theory of diseases is based upon physiology. – But, although all that was implied in the Hippocratic term dicts (natura) may be claimed as the subject-matter of physiology, yet, in the ordinary connotation of the term, physiology divides the empire with anatomy. To physio- logy the functiors of the body are usually assigned, and to

anatomy its form and structure. But, as a matter of fact, the structures and functions of the organism are not separable ; structure is correlated to function, whether active, dormant, or extinguished, and in like manner function is the twin notion of structure. In the ultimate analysis peither term means anything without the other, and both together mean life. It is owing mostly to its name that physiology is supposed to have a preponderant

interest for the theory of disease; the word anatomy is not well adapted to carry its own half of the structure- and-function dualism. Both in the historical development and in the logical connotation, anatomy is as much

associated with the living and moving body as physiology |

itself; but its etymology has always been against it, and it has become more and more difticult to retain for anatomy anything beyond the technicalities of the dissecting-room. The subject of general anatomy has for the most part dis-

appeared from modern text-books, its place being taken |

by histology, which deals with the minute structure of

the simple tissues, and, in a wider acceptation, with the |

finer anatomy of all the organs aud parts of the body. Histology, like anatomy, has had a somewhat technical or descriptive réle assigned to it; and it is now mainly under physiology that the processes, activities, or living mechanisms of the body fall to be considered. The deve-

the plague, sweating sickness, cholera, yellow fever, typhus fever, relapsing fever, typhoid fever, diphtheria, small-pox, measles, scarlet fever, influenza, dengue. Such also are the cancers, consuinptions, leprosies, and other loathsome infections. This enormous residue is more than the half of disease, and the definition of disease or the scheme of pathology is brought to a test in finding room within its scientific categories for snch maladies as those. The popular imagination in all countries has per- sonified them; medicine in its metaphysical period has regarded them as entities or things in themselves; and it remains to be seen in what way or to what extent medicine in its scientific period will bring them within the category' of perturbations of the physiological life.

In considering, for a moment, where to place cancer in the pathological scheme, we shall arrive at a point of view from which the relation of the acute and chronic infections (or contagions) to diseases of the physiological order may be contemplated at least provisionally. Taking cancers, in a generic sense, to mean tumours that have acquired or are possessed of malignancy, we find that such tumours have many points in common with simple tumours,—that they have grown out of the tissues of particular organs or parts under particular (functional) circumstances, and that

_ they may, in general terms, be traced back to that point at

lopment of the body as a whole, and of its several tissues | and organs, forms the subject of embryology; many of

the physiological types of diseased processes, especially the cellular, are discoverable in the embryological period. For the period of development, no arbitrary separation has been attempted hitherto between structure and function, and embryology is, in theory at least, as much physiolo- gical as anatomical. The development of function is a legitimate and even desirable subdject of scientific study, and a more distinctive place is probably awaiting it in the future; but so indissoluble does the union of structure and function present itself in the period of genesis and growth that the function has hardly as yet come to be abstracted fron the structure, or the structure from the function,

The theory of disease rests, therefore, upon physiology, with its more or less technical adjuncts. Pathology is all

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that physiology is, with the engrossing and difficult element

of perturbation, deflexion, or shortcoming added. By | | biological phenomena altogether analogous to the semi-

virtue of this element of deviation from the line of health, pathology is a discipline apart, with an abundant literature

of its own, and with separate academical institutes and |

chairs. But pathology is also a discipline apart by virtue of concepts proper to itself.

perturbations or failings of function, which may be intri- cate or difficult to analyse, but are still well within sight

of the line of health. Such are the common diseases of |

the orgaus and systems—the inflammations, catarrhs,

degenerations, hypertrophies, and functional derangements | | ens reale subsistens in corpore, appears to satisfy the require-

Without lesion of the respiratory, circulatory, nervous, genito-urinary, locomotor, and cutaneous systems, Con- stitutional or general diseases belong also to the province of perturbations from the physiological course, —such diseases as chlorosis, leukemia, diabetes, gout, rheumatism, scurvy, rickets, Addison's disease, exophthalmic goitre, and the febrile state. Again, congenital deficiencies or malformations, non-cancerous tumours, and the repairing of injuries exemplify no other laws than those of develop- nent and growth.

But with those examples the catalogue of physiological diseases is exhausted. We are left with a vast residue of diseases, which have always bulked largely in the popular mind, and have carried the most terrible associations with them. Such are the pestilences or diseases of peoples :—

A great part of the theory | of disease deals with changes or defects of structure and |

which they left the line of health (see ParHotocy). The tracing back of tumours along the physiological track is often difficult and laborious; but there is no tumour of the

| body whose origins are not at length discoverable within

the limits of physiological action. That which makes any tumour a cancer is something over and beyond; it is a- remarkable acquired property of reproducing its structure in manifold copies, or of infecting the organism of which it is itself a part. The tumour thus becomes a semi-independent power within the body; it may be said, in a political figure, to have acquired autonomy, or to have become imperium tn imperio. A due consideration of such a phenomenon as the infectiveness or cancerousness of some tumours will satisfy one that there are concepts in pathology which carry the investigator entirely beyond physiological bounds or out of sight of the line of health, which bring him face to face with the notion of a disease as a thing in itself, and which thus constitute a peculiar subject-matter. 'There is nothing that we know among

independence which an integral part of the body, or con- dition of the body, manifests towards the organism as a whole, and that, too, strictly in respect of its acquired devious or rebellious habit. The familiar definition of disease, morbus est vita preter naturam, which embodies the notion of divergence from the line of health, makes no provision for an acquired autonomy of a morbid state ; and that definition has to be supplemented by another, which will recognize the possibility of a disease becoming a thing in itself. The old definition of Van Helmont, morbus est

ment; but that definition, although it grew out of the phenomena of disease as observed in fevers, was made tou general, and has now associations that are too exclusively ontological and metaphysical. The supplementary definition should be as far as possible in the terms of the principal definition ; and we shall provide best in the pathological scheme for such a disease as cancer if, in addition to the formula morbus est vita preter naturam, we construct a secondary formula, morbus est wvwm in vivo.

The notion of autonomy acquired by,a morbid state implies, naturally, a pre-autonomous stage of the disease, which had been a mere perturbation of the norm of the body, capable of being measured by the physiological standard. The autonomous stage and the pre-autonomous

stage, which may be demonstrated, in individual cases, for cancers, are a philosophical necessity for all other in- fective diseases that are marked by morphological features,

or by structural characters rooted in and growing out of |

the proper textures of the body. Thus the peculiar skin eruption of small-pox, which is communicable from person to person, along with a distinctive course of fever, must have had pre-autonomous antecedents (not altogether his- torically vague) in certain casual conditions of the skin and associated constitutional disturbance, which had re- curred and become inveterate, and had so attained to a degree of individuality or a point of autonomy at which they began to be propagated as an organic unit. Again, a second group of infections, exemplified by glanders, bovine tubercle, and syphilis, are rooted in deeper textural pro- cesses, which must have been at one time (and may still be) set up by the casual operation of ordinary causes, and at length became the occasion of infective mimicry. It is not so easy to picture (and it is not difficult, with a modern dominant school, to ignore) the casual morbid conditions or ordinary physiological perturbations out of which powerful infections like cholera, typhoid fever, or yellow fever may have arisen; but if the rise and consoli-

dation of their autonomy be a subtle or even untraceable | _ logy or toxicology.

history, yet there are diseases, such as dysentery and

erysipelas, which are apt to occur both as casual or |

spontaneous conditions and as specific infections side by side. Ophthalmia is an example of a purulent catarrh

which is constantly arising de novo in Egypt from local | | general sense the investigation of the physiological action

causes in a non-infective manner, and yet has become, on at least one memorable occasion, a powerful and wide- spread infection for British troops returning from that country and for the home garrisons for many

years subse- quently. Infective pneumonia in cattle, and more rarely in man, is an analogous case. In such an episode we observe the actual rise of the disease-autonomy. Again, all the in- fective diseases have degrees of intensity, at one extreme of which there must occur the vanishing point of their in- fective property ; and those gradations of infectiveness are

nowhere more noticeable than in the relation of cholera |

to choleraic diarrhoea. Further, the remarkable group of climatic fevers are not communicable from person to person (see MALARIA); in that respect, and for the reason that the liability of the patient is anything but exhausted by one attack, they are examples of fevers without autonomy. There is not one of the infections that may not be profit- ably studied from the point of view of its autonomy, and of its more or less obscure pre-autonomous stage. That is a point of view from which even the pestilences and other specific diseases may be regarded as coming within the physiological categories. The large residue of diseases, which are more than perturbations of the physiological life, may still be joined by natural descent to the class of simple perturbations, if we can show for them how their autonomy was acquired, or what was their origin as disease- species.

There is an established place in the history of medicine, and there ought therefore to be room in the definition of disease, for epidemic outbreaks of purely psychical diseased states, such as the dancing madness (Z'anzwuth), and the boys' crusades; the epidemic diffusion of such morbid states is best approached from the point of view of an acquired autonomy (fixed idea) and an infective mimicry.

The physiological definition of disease, morbus est vita preter naturam, affords no place for parasitic diseases. However, the supplementary formula that has been pro- posed to meet the case of diseases existing autonomously in the body, morbus est vivum in vivo, will meet the case of parasitic diseases also. According to many patho- logists of the present generation, the whole class of pesti-

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lences, fevers, and specific infectious generally are caused by certain species of minute parasites invading the body ; according to one form of that hypothesis the distinctive characters or specific marks (morphological and other) vf those diseases are neither more nor less than the appropriate effects wrought upon the textures and fluids of the body by the respective species of parasites. In this way the great group of infective diseases, which are apt to be the stumbling-block of a scientific definition and logical scheme of disease, are easily disposed of by placing them beside the otherwise insignificant group of parasitic diseases. Whether all or any of those diseases

are due in a sense to the invasion of parasites, or wholl | caused by parasites, are questions that naturally fall to be

settled by a careful sifting of a mass of evidence which

_has already proved to be peculiarly rich in opportunities | for mistake.

It may be expected that the facts of infective parasitism and the facts of acquired disease-autonomy will in the end find their place in a common theory of specific diseases, which might be expressed in terms of the physio-logical formula morbus est vita preter naturam with the rider morbus est vivum in vivo.

The theory of remedies, which forms the second division of the science of medicine, is chiefly based upon pharmaco- If pharmacology be considered as not co-extensive with toxicology, it will be taken to be in great part pharmacographia, or the systematic description of articles of the materia medica—their source, preparation, physical properties, and the like. Toxicology is in its

of drugs, a science which is largely dependent upon experi- ments on the lower animals; in a more technical sense toxicology relates to the effects of poisons and the art of detecting them (see Poisons). The physiological action of drugs is the key to their therapeutical action. Thera- peutics has been defined as "the discovery of the means by which a system of forces competent to eliminate any given perturbation may be introduced into the economy." The adaptation of remedies to diseases is, however, greatly

wanting in precision, and continues to be in large part empirical and traditional. It may be objected to the above definition that all diseases are nut reducible to the category of "perturbations," and that there is a certain scientific justification for the doctrine of specifics. Besides the articles of the materia medica proper, agencies such

_as electricity, baths, sea-voyages, and changes of climate

generally, enter into the consideration of therapeutics, and two of those form the subject of special departments, viz., electro-therapeutics and hydropathy. Regimen and diet are also important factors in the treatment of disease ; according to a contention of Hippocrates, it was in the dietetic needs of mankind that the medical art had its origin.

Subdivisions of Medicine as an Art and Discipline.~~—The medical art (avs medendi) breaks away at once from the unity of the theory of disease. While there is but one body of pathological doctrine for either sex, for every period of life, and for every regiun and part of the organism, the practical art divides itself into departments and sub~~ . departments. The most fundamental division is into internal and external medicine, or into medicine proper and surgery. 'The treatment of wounds, injuries, and deformities, with operative interference in general, is the special department of surgical practice (the corresponding parts of pathology, including inflammation, repair, and removable tumours, are sometimes grouped together as surgical pathology) ; and where the work of the profession is highly subdivided, surgery becomes the exclusive pro- vince of the surgeon, while internal medicine remains to the physician. A third great department of practice 1s

formed by obstetric medicine or midwifery, and with obstetrics there is usually associated gynecology, or the diseases peculiar to women. Diseases of children are the subject of a voluminous separate literature. Dermatology (diseases of the skin) is an important province of practice which, like the diseases of women and children, pertains as much to medicine as to surgery. The greatest of the so- called special departments of practice is ophthalmology (diseases and injuries of the eye). Laryngology is a

department that owes its existence mainly to the invention of the laryngoscope, its special province being the treatment of the inflammations (ordinary and specific), tumours, and the like, to which the larynx is liable in common with other parts. Diseases of the ear (otology) form even a more restricted department of practice, owing to the comparative inaccessibility of the chief part of the organ of hearing. The congenital condition of deaf-mutism may or may not be taken as falling within the province of the last-mentioned subdivision. Dentistry or odontology is extremely limited in the range of its subject-matter; but it affords great opportunities for refinements of technical skill, and it is given up to a distinct branch of the profession.

The care of the weak-minded and the insane (psycho- logical medicine) is an integral part of medical practice, inasmuch as it is concerned with diseases of the nervous system and with numerous correlated states of other organs ; but it occupies a unique place by reason of the engrossing interest of the subjective phenomena. Habitual drunkenness is also a subject of special treatment.

A state of war, actual or contingent, gives occasion to special developments of medical and surgical practice (military hygiene and military surgery). Wounds caused by projectiles, sabres, &e., are the special subject of naval and military surgery; while under the head of

military hygiene we may include the general subject of |

ambulances, the sanitary arrangements of camps, and the various forms of epidemic camp sickness.

The administration of the civil and criminal law involves frequent relations with medicine, and the professional subjects most likely to arise in that connexion, together with a summary of causes célébres, are formed into the department of medical jurisprudence. It is the practice in Great Britain to call independent medical evidence on both sides of a cause, whether the proceedings be civil or criminal.

The system of life assurance is based upon the c0-opera- tion of the medical profession. Heredity, constitution, and

diathesis are here the chief subjects of general cousidera- |

tion, while prognosis is the skilled faculty specially called into play.

Relations of Medicine to the Body Politic.—The statutes of the United Kingdom which have direct relation to medicine are (1) those relating to the public health ; (2) those relating to lunacy (and habitual drunkenness) ; (3) those relating to the status of the medical profession, to dentists, aud to pharmaceutical chemists ; (4) those relating to restrictions on the " practice" of anatomy and physiology. There are, besides, several statutes in which medicine is concerned indirectly,—such as the Poor Laws, the Prisons Acts, the Shipping Acts, the Registration of Births and Deaths Act, the Sale of Food and Drugs Act, the Sale of Poisons Act, the Factory and Workshops Act, the Artisans' Dwellings (Metropolitan) Act, the Rivers Pollution Pre- vention Act, the Contagious Diseases (Animals) Act (1878), and the Public Health (Water) Act.

1. Most of the statutes relating to the public health in England and Wales were consolidated by an Act of 1875, the Acts relating to the metropolis being excepted; there are separate statutes of about the same period for Ireland and Scotland. The system of administration is by local

sanitary authorities, in correspondence with the local govert- ment boards in London and Dublin and the board of supervision in Edinburgh. The board in London has a medical department, consisting of a chief medical officer, assistant medical officer, and inspectors, while the Dublin and Edinburgh boards are professionally advised on a some- what different system. The sanitary authorities throughout the United Kingdom are divided into rural, urban, port, and metropolitan (sanitary and nuisance); they are formed out of pre-existing bodies, either the corporations of cities and towns, the improvement commissioners, or the local authorities. A medical officer of health is attached to most of the several sanitary authorities, or to the combined sanitary authorities of a large district ; his duties include making reports on the death-rate and the causes of mortality, the

denunciation of nuisances and unwholesome dwellings, workshops, &c., inquiries into the local causes or favouring circumstances of epidemic outbreaks of disease, measures to prevent the spread of contagion (by disinfec- tion, isolation, and otherwise), and other more occasional duties arising under a variety of statutes. Each sanitary authority is required by law to appoint an inspector of nuisances, who practically carries out the instructions of the medical officer when there is one.

The Vaccination Acts (consolidated 1871) arean import- ant part of the public health law of the kingdom; they are administered by the local government board, for the most part through the agency of the medical profession at large, but in some populous parislies also by means of public vaccination stations. Prosecutions under the Acts are insti- tuted by the parochial authorities. The practice formerly (and not unsuccessfully) resorted to of inoculating with the small-pox has been made a criminal offence ; but there is still much uncertainty as to the theory of vaccination, and, in particular, as to the relation of vaccinia to variola.

Other statutes which were not consolidated in the Public Health Act of 1875 are the Burials Act, the Contagious Diseases Act, and the Quarantine Act. The first of these is administered by a department of the home office, with a medical inspector. The second (1866 and 1869) relates, under a too general title, to the regulation of prostitution in certain garrison towns, the surgeons under the act being appointed by the board of admiralty or the secretary of state for war, and the administration otherwise carried out by the police.

The quarantine laws stand in the somewhat anomalous

| position of statutes which it is not thought desirable to

repeal, while yet they are stripped bare of all their executive machinery. The Quarantine Act can be set in motion, as occasion arises, by an order of council ; not only, however, is there no official medical advice at the disposal of the privy

council, upon which action under the act might be taken,

but there is not even the framework remaining (except the

_ ghost of a quarantine station on the Motherbank between

Portsmouth and the Isle of Wight) of the once considerable quarantine establishment, by which the provisions of the Act might be enforced. On the other hand,' port sanitary authorities enjoy certain limited powers under the Public Health Acts of isolating vessels arriving with contagious

sickness on board. A quarantine at British ports has not

been put in force for many years, opinions being divided

_as to the abstract efficacy and suitableness of quarantine

measures to prevent the importation and diffusion of plague, cholera, or yellow fever (see QUARANTINE). Numerous instances having occurred of the extensive diffusion of scarlet fever, typhoid fever, and diphtheria by means of milk, the privy council has issued an order, under the Contagious Diseases (Animals) Act of 1878, called the Dairies, Milkshops, and Cowsheds Order, with the object of enforcing extreme cleanliness in the premises and appur-

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tenances of the milk trade, and particularly of guarding against the well-known liability of milk to take up effluvia existing or arising near it. The order of council having remained inoperative, it is proposed to deal with the inatter by a new Act of Parliament, to be administered by the local government board. While cows' milk has thus

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*Internat. Medical Congress, London, 1880, vol. iv., sect. ** Public*

- *Health."*

Public Health Law of other Cowntries.—In France there ig al

_ council of health for each district, composed of medical prae- _ titioners, pharmacists, engineers, and other experts, its function

been recognized by the sanitary law as a carrier of certain | of the human contagia, the milk of diseased cows, and | inore especially of tuberculous cows, continues to be sold |

with impunity, the alleged communication of tubercular

disease from the cow to man beiug difficult to prove to |

the satisfaction of the legislature. supervision of the slaughter-houses is thought by many to be a serious defect in the sanitary law of the country ; and there is no doubt that much flesh of diseased animals (especially the tuberculous) is sold merely as inferior meat.

Public Health Law of the United States.—Questions of public health in the United States come under the common law and the statute law. In the larger part of the Union they are subject to the common law only ; in a certain number of the States there is statute law; and there has been since 1879 a national board of health and a quarantine lawestablished by Act of Congress. Generally speaking, the public health procedure of the United States suffers from the want oforganization. Decisionsat common lawrelate chiefly to nuisances, and to the recovery of damages for loss caused by the same. The first attempt at statute law was an Act of 1866 creating a metro-politan sanitary district and board of health for the city of New York ; in 1869 a board of health was created by the State legislature for Massachusetts ; the District of Columbia obtained its board of health in 1870; and other States have followed at intervals, so that there are now at least nineteen State boards of health, New York State and Penusylvania having health boards only for their respec- tive capitals and other individual towns. Besides the municipal boards in those States, there are very few others for towns in the Union,‘and still fewer for counties. The powers and activity of the boards of health are very various; the Massachusetts board has powers amounting to that of a court, while the function of several of the State boards is hardly more than advisory. The sanitary statutcs made by the State legislatures are in some cascs very 1umerous. Wherever questions of quarantine for yellow fever have arisen,

as in Louisiana (New Orleans), Georgia, and Alabama, the State board of health has acquired vigour and has enlisted popular support, in the capitals at least; but in most of the States laissez faire is the ordinary feeling towards the board and its operations. The medical profession in each State is the most powerful force, and the State medical society is not unfrequently in a semi-official connexion with the sanitary board ; on the other hand, it is alleged that the unfortunate sectarian differences in medicine (represented chiefly by homeopathy) have on several occasions prevented the formation of a State board of health, or have tended to paralyse the action of a board already existing. It is a charge also against boards of health, or at least against those in the great political centres, that their efficiency is apt to be impaired by the introduction of irrelevant political considerations in such matters as the making of appointments. The first step towards a national public health law was gained by the Act (approved 3d March 1879) "to prevent the introduction of infectious or con- tagious diseases into the United States, and to cstablish a national

board of health." The board consists of seven members appointed |

by the president and of four officials detached from the public departments of State. Its duties are "to obtain information upon all matters affecting the public health, to advise the several depart- ments of the government, the executives of the scveral States, and

The want of constant |

being purely advisory with respect to nuisances, unwholesome dwellings, schools, food, drugs, epidemics, and the like. The executive power rests with the prefect (to be carried out by the police), and is often not put in motion even when advice ig tendered. In Paris there are two heads of executive, the prefect of the Seine and the prefect of police. The minister of agriculture and commerce is responsible to the chambers. In Prussia there ig a certain amount of bureaucratic care of the public health under the ministry for ecclesiastical, educational, and medical affairs, The minister is advised by a scientific commission (/V issenschaftliche Deputation fiir das Medieinalwesen); and there is a subordinate board for each province, and a medical officer for each district or town (Kreisphysikus, or Stadtphysikus). Numerous offences against the public health are defined in the code, and

penalties fixed (see Eulenberg's work, taken from official sources, Das Medieinal- wesen in Preussen, Berlin, 1874).

2, The lunacy laws have been fully treated of in a special section of the article Insanrry (¢.v.). By an Act of 1879 habitual drunkards have been placed in a position somewhat analogous to that of lunatics, and there are now existing certain licensed asylums for their detention.

3. The Acts relating to the status of the medical profes- sion are known as the Medical Acts. The principal measure, passed in 1858, created a body of twenty-four, called the general council of medical education and registration ; by a subsequent Act the council received a charter of incor- poration, so that it might draw up, and become the publisher and proprietor of, a list and description of ofticinal drugs, which should be called the British Pharmacopeeia, and should supersede previous pharmacopeeias. The principal duty of the medical council is to keep a register of qualified medical practitioners. The preamble of the Act by which the medical register was created asserts the desirability of those in want of medical aid being able to distinguish qualified from unqualified practitioners; and those whose names are on the register are alone presumably qualified. To be aregistered medical practitioner confers a certain positive legal status (right to sue for fees, hold appointments, give certificates, &c.); but there is nothing in the English law to prevent any person whomsoever from practising medicine and taking fees, provided he does not assume misleading titles. Those who are etitled (on pay- ment of five pounds) to have their names inserted in the medical register are graduates in medicine or surgery of the universities of the United Kingdom, licentiates, members, or fellows of the Royal Colleges of Physicians or Surgeons in London, Dublin, and Edinburgh, licentiates or

fellows of the Faculty of Physicians and Surgeons of

the commissioners of the District of Columbia, on all questions sub- | mitted to them, or whenever, in the opinion of the board, such advice |

may tend to the preservation and improvement of the public health."

Quarantine was to be a special object of the board's attention, |

especially the cstablishment, if possible, of a federal quarantine

system which would preserve the legitimate commercial interests of |

the several States and their seaports. A quarantine law passed in

1879 provides that all vessels coming from any foreign port where |

contagious or infectious diseases exist shall obtain a bill of health from the consular officer of the United States at the port of sailing. One of the principal functions of the national board of health hitherto has been to instituto scientific inquiries into the nature and causation of diseases of national importance, such as malarial fever. Among the acknowledged desiderata in the national sanitary law of the United States are a uniform carrying out of the practice of vaccina- tion—there is no vaccination law in certain States, and in others it is imperfectly applied—and a uniform system of registration of births and deaths. Sce Bowditch, Public Hygiene in America, together with a Digest of American Sanitary Law (by Pickering), Boston, 1877; Billings, introduction to Hygienc and Public Health, edited by Buck (Eng. ed., London), and in the Transactions of the

Glasgow, and licentiates of the Apothecaries' Halls of London and Dublin. The council consists of the repre- sentatives of those bodies, of six crown nominees, and the president. The medical council possesses certain judicial and executive powers over tle names on its register ; if, after due inquiry, a registered practitioner

be judged by the medical council to have been guilty of

infamous conduct in any professional respect, the medical council may, if they see fit, direct their registrar to erase the practitioner's name from the register. The medical council keeps also a register (unpublished) of medical students ; whoever has passed a recognized examination 1n arts, and las forwarded a certificate signed by a teacher of medicine that he has bona jide begun the study of niedicine, is entitled to have his name entered in the register of students of medicine, with the date of his com- mencement. The object of the students' register is merely to provide a common and

convenient record of the date of commencement of medical study, and, by implication, of the fact that the examination in arts has been passed.

The medical council owes its title of a "council of educa-

tion" to certain powers possessed by it of visiting the examinations of the universities and corporations, and certain ill-defined powers of visiting the medical schools. The council may, if they see fit, report to the privy council any deficiencies that they may have discovered in the teaching or examining, and the privy council may proceed to further steps. But, beyond publishing the reports of ineir visitations, the medical council do not appear to have had occasion to put the machinery in foree. The state has not otherwise interfered to prescribe the subject- matter or the minimum standard of medical education, although there has been at least one unsuccessful attempt by the Government of the day to establish a uniform minimum. By an Act of 1876 parliament has interposed to affirm the principle that women are entitled to become registered practitioners of medicine.

Under the Dentists' Act of 1878 the profession of dentistry acquired a legal status corresponding to that of the medical profession, the general inedical council having charge of its register also.

Pharmaceutical chemists are now licensed under an Act passed in 1876; since that date licences are granted only to those who pass either the minor or the major examina- tion of the Pharmaceutical Society of Great Britain, a Pharmacy Act for Ireland (1876) having corresponding provisions.

The Medicat Profession in other Countries.—In the United

States there are usually no restrictions upon the practice of

medicine, and in only a few of the States has the medical profession any legal standing. The ordinary medical title is that of doctor of medicinc, and that degree is conferred by a large number of institn- tions after a curriculum of study that varies much in length, and after examinations that

are equally various as tests of proficiency. In France the medical profession is divided into two grades: those in the higher gradc are all doctors of medicine of the faculties of Paris, Lille, Nancy, Bordeaux, Lyons, or Montpellier; those in the

lower grade are ofieiers de santé. In Germany the right to practise is conferred by a state licence granted on passing the staats-examen: the examination, which is almost entirely oral and practical, may be passed in stages at any one of the universities in the empire, the pro- fessors of anatomy, physiology, and pathological anatomy being practically ex ofieto examiners, while the other examiners are very frequently also professors in the medical faculty. The staats-examen is usually passed before the candidate seeks the degree of doctor of | medicine; that degree is almost always taken by those who pass the examination for the state licence, and it is usually conferred after a more or less formal examination of the candidate before the medical faculty, and on the approval of his thesis. In Austria, the right to practise is carried by the degree of doctor of medicine; there is no separate state licence, and no examination except that of the medical faculty of the universities (see Billroth's Lehren and Lernen der medicinisehen Wissenschaften, Berlin, 1876). In most Continental countrics there are penalties directed in effect against practising medicine without the state licence, or the university degree equiva- lent thereto, and in France the law now extends to resident foreign practitioners who have qualified only in their own country, The regulations for the practice of pharmacy in Germany and other Con- tinental countries have long been of a very stringent kind. The training and licensing of midwives is also under state control.

4, Lastly, the state has interposed to restrict the practice" of anatomy and physiology. By the Anatomy Act of 1832 (amended in 1871) licences are required for schools of anatomy, as well as licences for teachers, 'to practise anatomy." Licensed teachers of anatomy are empowered to receive subjects for dissection under certain conditions. 'The Act is administered by the home office, with a staff of four inspectors of anatomy, one for the

| metropolis, one for provincial medical schools in England, and one each for Ireland and Scotland. The Act restricting the practice of physiology is the Vivisection Act of 1876; it is intended for the protection of vertebrate animals liable to be employed alive in physiological experiments, and it resorts to a controlling machinery of licence and inspection similar to that of the Anatomy Act, and under the same

Government department. (@ ¢,)

PART ITI.—HISTORY.

The history of medicine falls naturally under two heads, or might be conceivably written from two different points of view. It might be a history of the medical profession or a history of medical doctrine,—in other words, the history of medicine in its relation to society or in its relation to science. We shall here deal chiefly with the history of medical knowledge, remembering also that the histories of anatomy, of physiology, and of surgery are dealt with in the articles referring to those subjects. But a still more trenchant limitation is necessary to preserve the unity of the subject. Attention can be given to so much only of the history as is directly antecedent to and leads up to the medical science of modern Europe. For this purpose, the history of medicine must start with the earlier period of Greek civilization.

Medicine as Portrayed in the Homeric Poems.—In the |

state of society pictured by Homer it is clear that medicine has already had a history. We find a distinct and organized profession ; we find a system of treatment, especially in regard to injuries, which it must have been the work of long experience to frame; we meet with a nomenclature of parts of the body substantially the same (according to Daremberg) as that employed long afterwards in the writings of Hippocrates ; in short, we find a science and an organization which, however imperfect as compared With those of later times, are yet very far from being in their beginning. The Homeric heroes themselves are represented a3 having considerable skill in surgery, and as able to attend to ordinary wounds and injuries, but there is also a professional class, represented by Machaon and Podalirius, the two sons of

Asclepius, who are treated with great re- spect. It wonld appear, too, from the thiopis of Archinus

(quoted by Welcker and Haeser) that the duties of these two were not precisely the same. Machaon's task was more especially to heal injuries, while Podalirius had received from his father the gift of " recognizing what was not visible to the eye, and tending what could not be healed." In other words, a rough indication is seen of the separation of medicine and surgery. Asclepius appears in Honier as a Thessalian king, not as a god, though in later times divine honours were paid to him. There is no sign in the Homeric poems of the subordination of medicine to religion which is seen in ancient Egypt and India, nor are priests charged, as they were in those countries, with medical functions,—all cir- cumstances which throw grave doubts on the commonly received opinion that medicine derived its origin in all countries from religious observances.

Although the actual organization of medicine among | the Homeric Greeks was thus quite distinct from religion, the worship of Asclepius (or Aisculapius) as the god of 'healing demands some notice. This cult spread very | widely among the Greeks ; it had great civil importance, 'and lasted even into Christian times; but there is no reason to attribute to it any special connexion with the dévelopment of the science or profession of medicine. Sick persons repaired, or were conveyed, to the temples of _ Asclepius in order to be healed, just as in modern times

relief is sought by a devotional pilgrimage or from the _ waters of some sacred spring, and then as now the healing influence was sometimes sought by deputy. The sick "person, or his representative, after ablution, prayer, and | sacrifice, was made to sleep on the hide of the sacrificed animal, or at the feet of the statue of the god, while sacred rites were performed. In his sleep (incubatio, éyxoé-

pois) the appropriate remedy was indicated by a dream.

drugs. The record of the cure was inscribed on the columns or walls of the temple; and it has been thought that in this way was introduced the custom

of " recording cases," and that the physicians of the Hippocratic school thus learnt to accumulate clinical experience. But the priests of Asclepius were not physicians. Although the latter were often called Asclepiads, this was in the first place to indicate their real or supposed descent from Asclepius, and in the second place as a complimentary title. No medical writing of antiquity speaks of the worship of Asclepius in such a way as to imply any connexion with the ordinary art of healing. The two systems appear to have existed side by side, but to have been distinct, and if

they were ever united it must have been before the times |

of which we have any record. The theory of a develop- ment of Greek medicine from the rites of Asclepius, though defended by eminent names, must accordingly be rejected.

Development of Medicine in Greece.—It is only from non- medical writers that anything is known of the development of medicine in Greece before the age of Hippocrates. The elaborate collections made by Daremberg of medical notices in the poets and historians illustrate the relations of the profession to society, but do little to prepare us for the Hippocratic period. Nor is much importance to be attached to the influence of the philosophical sects on

medicine except as regards the school of Pythagoras. That |

philosopher and several of his successors were physicians, but we do not know in what relation they stood to later medical schools. We must therefore hasten onward to the age of Pericles, in which Hippocrates, already called "the Great," was in medicine as complete a representative of the highest efforts of the Greek intellect as were his contemporaries the great philosophers, orators, and trage- dians. The medical art as we now practise it, the character of the physician as we now understand it, both date for us from Hippocrates. The justification of this statement is found in the literary collection of writings known by his name. Of these certainly many are falsely ascribed to the historical Hippocrates of Cos; others are almost as certainly rightly so ascribed ; others again are clearly works of his school, whether from his hand or not. But which are to be regarded as the " genuine works" is still uncertain, and authorities are conflicting.

There are clearly two schools represented in the collection,—that of Cnidus in a small proportion, and that of Cos in far the larger number of the works. The latter was that to which Hippocrates belonged, and where he gave instruction; and accordingly it may be taken that works of this school, when not obviously of a different date, are Hippocratic in doctrine if not in actual authorship.

Lippocratic Medicine.—The first grand characteristic of Hippocratic medicine is the high conception of the duties and status of the physician, shown in the celebrated "Oath of Hippocrates" and elsewhere,—equally free from the mysticism of a priesthood and the vulgar pretensions of a mercenary craft. So matured a professional sentiment may perhaps have been more the growth of time and organization than the work of an individual genius, but certainly corresponds with the character universally attri- buted to Hippocrates himself. The second great quality is the singular artistic skill and balance with which the Hippocratic physician used such materials and tools as he possessed. Here we recognize the true Greek cwdpocivn. But this artistic completeness was closely connected with the third cardinal virtue of Hippocratic medicine,—the clear recognition of disease as being equally with life a process

| spontaneous and normal direction of recovery, by following Moral or dietetic remedies were more often prescribed than |

which alone could the physician succeed. In the fourth place, these views of the "natural history of disease" (in modern language) led to habits of minute observation and accurate interpretation of symptoms, in which the Hippocratic school was unrivalled in antiquity, and has been the model for all succeeding ages, so that even in these days, with our enormous advances in knowledge, the true method of clinical medicine may be said to be the method of Hippocrates.

The actual science of the Hippocratic school was of course very limited. In anatomy and physiology little ad- vance had been made, and so of pathology in the sense of an explanation of morbid processes or knowledge of diseased structures there could be very little. The most valuable intellectual possession was a large mass of recorded observa- tions in individual cases and epidemics of disease. Whether these observations were

systematic or individual, and how they were recorded, are points of which we are quite ignorant, as the theory that the votive tablets in the temples supplied such materials must be abandoned.

Though the Hippocratic medicine was so largely founded on observation, it would be an error to suppose that dogma or theory had no place. The dominating theory of disease was the humoral, which has never since ceased to influence medical thought and practice. According to this celebrated theory, the body contains four humours,—blood, phlegin, yellow bile, and black bile, a right proportion and mixture of which constitute health ; improper proportions or. irre- gular distribution, disease. It is doubtful whether the treatise in which this theory is fully expounded (zrepl dvovcs

_ dv@purov) is as old as Hippocrates himself; but it was re-

garded as a Hippocratic doctrine, and, when taken up and

_ expanded by Galen, its terms not only became the common

property of the profession, but passed into general literature and common language. Another Hippocratic doctrine, the influence of whicli is not even yet exhausted, is that of the healing power of nature. Not that Hippocrates taught, as he was afterwards reproached with teaching, that nature is sufficient for the cure of diseases; for he held strongly the efficacy of art. But he recognized, at least in acute diseases, a natural process which the humours went through,—being first of all crude, then passing through coction or digestion, and finally being expelled by resolu- tion or cris?s through one of the natural channels of the body. The duty of the physician was to foresee these changes, "to assist or not to hinder them," so that "the sick man miglit conquer the disease with the help of the physician." The times at which crises were to be expected were naturally looked for with anxiety ; and it was a cardinal point m the Hippocratic system to foretell them with precision. Hippocrates, influenced as is thought by the Pythagorean doctrines of number, taught that they were to be expected on days fixed by certain numerical rules, in some cases on odd, in others on even numbers,—the celebrated doctrine of "critical days." This false precision can have had no practical value, but may have enforced habits of

minute observation. It follows from what has been said that prognosis, or the art of foretelling the course and event of the disease, was a strong point with the Hip- pocratic physicians. In this they have perhaps never been

excelled. Diagnosis, or recognition of the disease, must /have been necessarily imperfect, when no scientific

nosology, or system of disease, existed, and the knowledge of anatomy was quite inadequate to allow of a precise determination of the seat of disease ; but symptoms were no doubt observed and interpreted skilfully. The pulse is not spoken of in any of the works now attributed

governed by what we should now call natural laws, which | to Hippocrates himself, though it is mentioned in other

could be known by observation, and which indicated the

works of the collection.

LISTORY. |

In the treatment of disease, the Hippocratic school attached great importance to diet, the variations necessary in different diseases being minutely defined. Medicines

were regarded as of secondary importance, but not neglected, |

two hundred and sixty-five drugs being mentioned at different places in the Hippocratic works. Blood-letting was known, but not greatly practised. The highest

importance was attached to applying all remedies at the |

right momeut, and the general principle enforced of making all influences—internal and external—co-operate for the relief of the patient. just mentioned apply more especially to the cure of acute diseases ; but they are the most salient characteristics of the Hippocratic school. In chronic cases diet, exercise, and natural methods were chiefly relied upon.

The school of Cnidus, as distinguished from that of Cos, of which Hippocrates is the representative, appears to have differed in attaching more importance to the differences of special diseases, and to have made more use of drugs. A treatise on the diseases of women, contained in the Hippocratic collection, and of remarkable practical value, is attributed to this school.

The above sketch of Hippocratic medicine will make it less necessary to dwell upon the details relating to sub- sequent medical schools or sects in ancient times. The general conception of the physician's aim and task remained the same, though, as knowledge increased, there was much divergence both in theory and practice,— even Opposing schools were found to be developing some part of the Hippocratic system. Direct opponents or repudiators of the authority of Hippocrates were rare, all generally appealing to his authority. But, insensibly, the least valuable part of the Hippocratic work, the theory, was made permanent ; the most valuable, the practical, neglected.

Post-Hppocratic Medicine.—After Hippocrates the pro- gress of medicine in Greece does not call for any special remark in such a sketch as this, but mention must be made of one great name. Though none of Aristotle's writings are strictly medical, he has by his researches in anatomy and physiology contributed greatly to the progress of medicine.

education which was traditional in such families, and also himself is said to have practised medicine as an amateur. Moreover, his works on natural history doubtless furthered the progress among the Greeks of sciences tributary to medicine, though the only specimens of such works which have come down to us from the Peripatetic school are those of Theophrastus, who may be considered the founder of the scientific study of botany. Among his encyclopedic writings were some on medical subjects, of which fragments only have been preserved. The Peripatetic school may have been more favourable to the development of medicine, as of other departments of natural knowledge, than any other; but there is no evidence that any of the

philosophical schools had important influence on the pro- |

gress of medicine. The fruit of Aristotle's teaching and

example was seen later on in the schools of Alexandria. The century after the death of Hippocrates is a time

almost blank in medical aunals.

decline of Greece after the Macedonian supremacy; but the works of physicians of the period are almost entirely lost, and were so even in the time of Galen. Galen classes them all as of the dogmatic school; but, whatever may have been their characteristics, they are of no import- ance in the history of the science.

Alexandrian School of Medicine—The dispersion of Greek science and intellectual activity through the world by the conquests of Alexander and his successors led to

The principles of treatment |

It should also be remembered that he was | ofan Asclepiad family, and received that partly medical |

It is probable that the | science, like others, shared in the general intellectual |

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| 1t would be useless to repeat them.

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the formation of more than one learned centre. in which medicine among other sciences was represented. Perga- mum was early distinguished for its medical school; but in this as in other respects its reputation was ultimately effaced by the more brilliant fame of Alexandria. It is here that the real continuation and development of Hippo- cratic medicine can be traced.

In one department the Alexandrian school rapidly sur- passed its Greek original, namely, in the study of anatomy. The dissection of the human body, of which some doubtful traces or hints only are found in Greek times, was assiduously carried out, being favoured or even suggested perhaps by the

Egyptian custom of disembowelling and embalming the bodies of the dead. There is no doubt that the organs were also examined by opéning the bodies of living persons,—criminals condemned to death being given over to the anatomists for this purpose.

Two eminent names stand in the first rank as leaders of the two earliest schools of medicine which arose in Alexandria, Herophilus and Erasistratus.

Herephilus was a Greek of Chalcedon, a pupil of the schools both of Cos and of Cnidus. He was especially noted for his profound researches in anatomy (see vol. i. p. 802), and in the knowledge and practice of medicine he appears to have been equally renowned. He professed himself a close adherent of Hippocrates, and adopted his theory of the humours. He also made extensive use of drugs, and of bleeding. The reputation of Herophilus is attested by the fact that four considerable physicians wrote works about him and his writings, and he is further spoken of with the highest respect by Galen and Celsus. By the general voice of the medical world of antiquity he was placed only second to Hippocrates.

Erasistratus was the contemporary and rival of Herophilus. Little is known of his life, except that he spent some time at the court of Seleucus Nicator at Antioch before coming to Alexandria, and that he culti- vated anatomy late in life, after he had taken up his abode in the latter city. His numerous works are also almost entirely lost, fragments only being preserved by Galen and others. Erasistratus, instead of following Hippocrates as Herophilus did, depreciated him, and seems to have been rather aggressive and independent in his views. He appears to have leaned to mechanical explanations of the symptoms of disease, as was especially the case with inflammation, of which he gave the first rational, though necessarily inadequate, theory.

The two schools composed of the followers of Herophilus and Erasistratus respectively long divided between them the medical world of Alexandria, The names of many prominent menibers of both sects have been preserved, but The Herophilists still reverenced the memory of Hippocrates, and wrote numerous commentaries on his works. They produced many eminent anatomists, but in the end seem to have become lost in theoretical

subtleties, and to have maintained too high a standard of literary cultivation. The school of Erasistratus was less distinguished in anatomy than that of Herophilus, but paid more attention to the special symptoms of diseases, and employed a great variety of drugs. It was longer-lived than that of Herophilus, for it still numbered many adherents in the 2d century after Christ, a century after the latter had become extinct.

The Erasistrateans paved the way for what was in some respects the most important school which Alexandria pro- duced, that known as the empiric, which, though it recog- nized no master by name, may be considered to have been founded by Philinus of Cos (280 Bo.), a pupil of Herophilus ; but Serapion, a great name in antiquity, and Glaucias of Tarentum, who traced the empirical doctrine

back to the writings of Hippocrates, are also named among its founders. The most striking peculiarity of the empirics was that they rejected anatomy, regarding it as useless to inquire into the causes of things, and. thus, as they con- tended, being the more minute in their observation of the actual phenomena of disease. They professed that their whole practice was based upon experience, to which word they gave a special meaning. 'Three sources, and three only, could experience draw from :—observation, history (i.e, recorded observation), and judgment by analogy. These three bases of knowledge were known as the "tripod" of the empirics. It should not, however, be forgotten that the empirics read and industriously com- mented on the works of Hippocrates. successful in practical matters, especially in surgery and in the use of drugs, and a large part of the routine know- ledge of diseases and remedies which became traditional

They were extremely |

in the times of the Roman empire is believed to have

been derived from them. In the 2d century the school

became closely connected with the philosophical sect of the

Sceptics, whose leader, Sextus, was an empirical physician. It lived and flourished far beyond this time, when trans- planted to Rome, not less than in its native Alexandria, and appears to be recognizable even up to the beginning of the Middle Ages.

If we look at the work of the Alexandrian schools in medicine as a wholc, we must admit that the progress made was great and permanent. rendered to medicine was undoubtedly the systematic study of anatomy.

why the important sect of the empirics were able entirely to dispense with anatomical knowledge. The doctrines of Hippocrates, though lightly thought of by the Erasistra- teans, still were no doubt very widely accepted, but the practice of the Hippocratic school had been greatly improved in almost every department,—surgery and obstetrics being probably those in which the Alexandrian practitioners could compare most favourably with those of modern times. body of medical doctrine and practice when transplanted to Rome, and ultimately to the whole Roman world.

The greatest service | It is clear that the knowledge of function |

(physiology) did not by any means keep pace with the | knowledge of structure, and this was probably the reason |

We have now to trace the fortunes of this |

Roman Medicine. —The Romans cannot be said to have |

at any time originated or possessed an independent school of medicine. They had from early times a very compli- cated system of superstitious medicine, or religion, related to disease and the cnre of disease, borrowed, as is thought, from the Etruscans ; and, though the saying of Pliny that the Roman people got on for six hundred years without doctors was doubtless an exaggeration, and not, literally speaking, exact, it must be accepted for the broad truth which it contains. When a medical profession appears,

it is, so far as we are able to trace it, as an importation |

from Greece.

The first Greek physician whose name is preserved as having migrated to Rome was Archagathus, who came over from the Peloponnesus in 218 Be. ; but there were probably others before him. When Greece was made a Roman province, the number of such physicians who sought their fortunes in Rome must have been very large. The bitter words of M. Porcius Cato, who disliked them as

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practical side it conformed pretty closely to the Stoic rule of life, thus adapting itself to the leanings of the better stamp of Romans in the later times of the republic. According to Asclepiades all diseases depended upon alterations in the size, number, arrangement, or movement of the "atoms," of which, according to the doctrine of Epicurus, the body consisted. These atoms were united into passages (adpor) through which the juices of the body were conveyed. 'This doctrine, of which the developments need not further be followed, was important chiefly in so far that it was perfectly distinct from, and opposed to, the humoral pathology of Hippocrates. In the treatment of disease Asclepiades attached most importance to diet, exercise, passive movements or frictions, and the external use of cold water,—in short, to a modified athletic training, He rejected the vis medicatrix nature, pointing out that nature in many cases not only did not help but marred the cure. His knowledge of disease and surgical skill were,

as appears from the accounts given by Celsus and Ceelius

Aurelianus, very considerable. Asclepiades had many pupils, who adhered more or less closely to his doctrines,

| but it was especially one of them, Themison, who gave _ permanence to the teachings of his master by framing out

of them, with some modifications, a new system of medical

| doctrine, and founding on this basis a school which lasted”

for some centuries in successful rivalry with the Hippocratic tradition, which, as we have seen, was up to that time the prevailing influence in medicine.

This system was known as methodism, its adherents as the methodici or methodists. Its main principles were that it was useless to consider the causes of a disease, or even the organ affected by the disease, and that it was suffi- cient to know what was common to all diseases, viz., their common qualities (communitates, xowdryres). Of these there were three possible forms—(1) relaxation, (2) con- traction of the minute passages or wépo., and (3) a mixed state, partly lax, partly constricted. The signs of these morbid states were to be found in the general constitution of the body, especially in the excretions. Besides this it was important only to consider whether the disease was acute or chronic, whether it was increasing, declining, or stationary. Treatment of disease was directed not to any special organ, nor to producing the crises and critical dis- charges of the Hippocratic school, but to correcting the mor- bid common condition or “community,” relaxing the body

if it was constricted, causing contraction if it was too lax,

and in the “mixed state” acting according to the pre- dominant condition. This simple rule of treatment was the system or “method” from which the school took its name. The methodists agreed with the empirics in one point, in their contempt for anatomy ; but, strictly speaking, they were dogmatists, though with a dogma different from that of the Hippocratic school. Besides Themison, its systematic

founder, the school boasted many physicians eminent in

he did other representatives of Greek culture, are evidence |

of this. The most eminent of these earlier Greek physicians at Rome was Asclepiades, the friend of Cicero (born 124 B.c. at Prusa in Bithynia). Hecameto Rome as a young man, and soon became distinguished both for his medical skill and his oratorical power. He introduced a system which, so

far as we know, was his own, though fonnded upon the Epicurean philosophical creed ; on the

their day, among whoni Thessalus of Tralles, a half-educated and boastful pretender, was one of the most popular. — He reversed the Hippocratic maxim "art is long," promising his scholars to teach them the whole of medicine in six months, and had inscribed upon his tomb iarpovexys, as being snperior to all living and bygone physicians.

In the 2d century a mnch greater name appears among the methodists, that of Soranus of Ephesus, @ physician mentioned with praise even by Tertullian and Augustine, who practised at Rome in the reigns of Trajan and Hadrian. Soranus is known by a work, still extant in the Greek original, on the diseases of women, and also by the Latin work of Ccelius Aurelianus, three centuries later, on acute and chronic diseases, which is based upon, if not, as some think, an actual translation of, the chief

work of Soranus, and which is the principal source of our knowledge of the methodic school. The work on diseases of women is the only complete work on that subject which has come down to us from antiquity, and shows remarkable fulness of practical knowledge in relation to its subject. [t is notable that an iniportant instrument of research, the speculum, which has been reinvented in modern times, was used by Soranus; and specimens of still earlier date, showing great mechanical perfection, have been found among the ruins of Pompeii. The work on acute and chronic diseases is also full of practical knowledge, but penetrated with the theories of the methodists.

The methodic school lasted certainly for some centuries, and influenced the revival of medical science in the Middle Ages, though overshadowed by the greater reputation of Galen. It was the first definite product of Greek medicine on Roman soil, but was destined to be followed by others, which kept up a more or less successful rivalry with it, and with the Hippocratic tradition.

The so-called pneumatic school was founded by Athenzus, in the Ist century after Christ. According to its doctrines the normal as well as diseased actions of the body were to be referred to the operation of the pneuma or universal soul. This doctrine, crudely transferred from philosophical speculation, was intended t» reconcile the hunoral (or Hippocratic) and solidist (or methodic) schools; but the methodists seem to have claimed Athenzus as one of themselves.

The conflicts of the opposing schools, and the obvious deficiencies of each, led many physicians to try and combine the valuable parts of each system, and to call themselves eclectics. Among these were found many of the most eminent physicians of Greeco-Roman times. It may be sufficient to name Rufus of Ephesus, and Archigenes, who is mentioned by Juvenal.

Although no system or important doctrine of medicine was originated by the Roman intellect, and though the practice of the profession was probably almost entirely in the hands of the Greeks, the most complete picture which we have of medical thought and activity in Roman times is due toa Latin pen, and to one who was, in all prob- ability, not a physician. A. Cornelius Celsus, a Roman patrician, who lived probably in the first century, appears to have studied medicine as a branch of general know- ledge. Whether he was a practising physician or not has been a matter of controversy. The conclusion Supported by most evidence seems to be that he practised on his friends and dependants, but not as a remunerative profession. His well-known work, De Medicina, was one of a series of treatises intended to embrace all knowledge proper for a man of the world. It was not meant for the physicians, and was certainly little tread by them, as Celsus is quoted by no medical writer, and when referred to by Pliny is spoken of as an author, not a physician. There is no doubt that his work is chiefly a compilation ; and Daremberg, with other scholars, has traced a large number of passages of the Latin text to the Greek originals from which they were translated. description of surgical operations the vagueness of the Janguage seems sometimes to show that the author had not performed such himself; but in other parts, and especially in his historical introduction, he speaks with more confidence; and everywhere le compares and criticizes with learning and judgment. The whole body of medical literature belonging to the Hippocratic and Alexandrian ties is ably summarized, and a knowledge of

the state of medical science up to and during the times of the author is thus conveyed to us which can be obtained from no other source, The work of Celsus is thus for us only second in importance to the Hippocratic writings and the works of

| medical authors which are of the highest value.

Galen ; but it is valuable rather as a part of the history of medicine than as the subject of that history. It forms no link in the general chain of medical tradition, for the simple reason that the influence of Celsus (putting aside a few scanty allusions in medieval times) commenced in the 15th century, when his works were first discovered in manu- script or committed to the press. Since then, however, he has been almost up to our own times the most popular and widely-read of all medical classics, partly for the qualities already indicated, partly because he was one of the few of those classics accessible to readers of Latin, and partly also because of the purity and classical perfection of his language.

Of Pliny, another encyclopedic writer, a few words must be said, though he was not a physician. In his Natural History we find as complete a summary of the popular medicine of his time as Celsus gives of the scientific medicine. Pliny disliked doctors, and lost no opportunity of depreciating regular medicine ; nevertheless

_ he has left many quotations from, and many details about,

In thie |

He is useful to us for what he wrote about the history of medi-

cine, not for what he contributed. Like Celsus, he had

little influence on succeeding medical literature or practice.

We now come to the writer who, above all others, gathered up into himself the divergent and scattered threads of ancient medicine, and out of whom again the greater part of modern European medicine has flowed. Galen (see vol. i. 803 and x. 23) wasa man furnished with all the anatomical, medical, and philosophical knowledge of his time; he had studied all kinds of natural curiosities, and had stood in near relation to important political events ; he possessed enormous industry, great practical sagacity, and unbounded literary fluency. He had, in fact, every quality necessary for an encyclopedic writer, or even for a literary and professional autocrat. He found the medical profes- sion of his time split up into a number of sects, medical science confounded under a multitude of dogmatic systems, the social status and moral integrity of physicians degraded. He appears to have made it his object to reform these evils, to reconcile scientific acquirements and practical skill, to bring back the unity of medicine as it had been understood by Hippocrates, and at the same time to raise the dignity of medical practitioners.

Galen was as devoted to anatomical and, so far as then understood, physiological research as tu practical medicine. He worked enthusiastically at dissection, though, the liberty of the Alexandrian schools no longer existing, he could dissect only animals, not the human body. In his anatomical studies Galen had a twofold object,—a philosophical, to show the wisdom of the Creator in making everything fit to serve its purpose, and a practical, to aid the diagnosis, or recognition, of disease. The first led him into a teleological system so minute and overstrained as to defeat its own end ; the second was successfully attained by giving greater precision and certainty to medical and surgical practice in difficult cases. His general physiology was essentially founded upon the Hippocratic theory of the four elements, with which he combined the notion of spirit

| (pneuma) penetrating all parts, and mingled with the

humours in different proportions. It was on this field that he most vehemently attacked the prevailing atomistic and materialistic views of the methodic school, and his conception of the pueuma became in some respects half metaphysical. His own researches in special branches of physiology were important, but do not strictly belong to our present subject.

The application of physiology to the explanation of diseases, and thus to practice, was chiefly by the theory of

‘the temperaments or mixtures which Galen founded upon

the Hippocratic doctrine of humours, but developed with marvellous and fatal ingenuity. The normal condition or temperament of the body depended upon a proper mixture or proportion of the four elements—hot, cold, wet, and dry. From faulty proportions of the same arose the intemperies (“distempers”), which, though not diseases, were the occasions of disease. Equal importance attached to faulty mixtures or dyscrasiz of the blood. By a combin- ation of these morbid predispositions with the action of deleterious influences from without all diseases were pro- dnced. Galen showed extreme ingenuity in explaining all symptoins and all diseases on his system. No phenomenon was without a name, no problem without a solution. And, though it was precisely in his fine-spun subtlety that he departed farthest from scientific method and practical utility, it was this very quality which seems in the end to have secured his popularity and established his pre-eminence in the medical world.

Galen’s use of drugs was influenced largely by the same theories. In drugs were to be recognized the same elementary qualities—hot, cold, moist, dry, &c.—as in the human body; and, on the principle of curing by contraries, the use of one or other was indicated. The writings of Galen contain less of simple objective observation thaa those of several other ancient physicians, all being swept into the current of dogmatic exposition. But there is enough to show the thoroughness and extent of his practical knowledge. Unfortunately it was neither this nor his zeal for research that chiefly won him followers, but the com- pleteness of his theoretical explanations, which fell in with the mental habits of succeeding centuries, and were such as have flattered the intellectual indolence of all ages. But the reputation of Galen grew slowly; he does not appear to have enjoyed auy pre-eminence over other physicians of his time, to most of whom he was strongly opposed in opinion. In the next generation he began to be esteemed only as a philosopher; gradually his system was implicitly accepted, and it enjoyed a great though not exclusive predominance till the fall of Roman civilization.

When the Arabs possessed themselves of the scattered remains of Greek culture, the works of Galen were more highly esteemed than any others except those of Aristotle. Through the Arabs the Galenical system found its way back again to Western Europe. Even when Arabian medi- cine gave way before the direct teaching of the Greek authors rescued from neglect, the authority of Galen was increased instead of being diminished ; and he assumed a position of autocracy in medical science which was only slowly under- mined by the growth of modern science in the 17th and 18th centuries.

But the history of medicine in Roman times is by no means the same thing as the history of the fate of the works of Galen. For some centuries the methodic school was popular at Rome, and produced one physician, Ccelius Aurelianns, who must be pronounced, next to Celsus, the most considerable of the Latin medical writers. His date was in all probability the end of the 4th or beginning of the 5th century, The works bearing his name are, as has been said, entirely based upon the Greek of Soranus, but are important both because their Greek originals are lost, and because they are evidence of the state of medical practice in his own time. The popularity of Ccelius is evidenced by the fact that in the 6th century an abridg- ment of his larger work was recommended by Cassiodorus to the Benedictine monks for the study of medicine.

Before quitting this period the name of Aretaus of Cappadocia must be mentioned. So little is known about him that even his date cannot be fixed more closely than as being between the second half of the lst century and the beginning of the 3d. His works have been much

admired fer the purity of the Greek style, and his accurate descriptions of disease; but, as he quotes no medical author, and is quoted by none before Alexander of Aphrodisias at the beginning of the 3d century, it is clear that he belonged to no school and founded none, and thus his position in the chain of medical tradition is quite uncertain. Alexander of Aphrodisias, who lived and wrote at Athens in the time of Septimius Severus, is best known by

his commentaries on Aristotle, but also wrote a treatise on fevers, still extant.

Ancient Medicine after Galen.—The Byzantine school of medicine, which closely corresponds to the Byzantine literary and historical schools, followed closely in Galen's footsteps, and its writers were chiefly compilers and ency- clopedists. The earliest is Oribasius (3826-403), whose date and position are fixed by his being the friend and court physician of Julian the Apostate. He was a Greek of Pergamum, educated in Alexandria, and long resident in Byzantium. His great work Swaywyai iarpixai, of which only about onethird has been preserved, was a medical encyclopedia founded on extracts from Hippo. crates, Galen, Dioscorides, and certain Greek writers who are otherwise very imperfectly known. The work is thus one of great historical value but of no originality. The next name which requires to be mentioned is that of Aetius (550 a.p.), a compiler who closely followed Oribasius, but with inferior powers, and whose work also has an historical but no original value.

In the West the period after Galen affords little evidence of anything but a gradual though unvarying decline 1 Roman medicine. Ccelius Aurelianus, already referred to

'as the follower of Soranus, must be mentioned as showing

the persistence of the methodic school. An abridgment of one of his writings, with the title of Aurelius, became the most popular of all Latin medical works. As a writer he

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was worthy of a better period of medical literature. Little else was produced in these times but compilations, of the most meagre kind, chiefly of the nature of herbals, or domestic receipt-books; among the authors of which it may be sufficient to name Serenus Sammonicus (3d century), Gargilius Martialis (3d century), and Marcellus Empiricus (5th century). Certain compilations still extant bear the falsely-assumed names of eminent writers, such as Pliny and Hippocrates. A writer with the (perhaps assumed) name of Apuleius Platonicus produced a herbal which held its ground till the 15th

century at least, and wasin the 9th translated into Anglo-Saxon. These poor compilations, together with Latin translations of certain works of Galen and Hippocrates, formed a medical literature, meagre and unprogressive indeed, but of which a great part survived through the Middle Ages till the discovery of printing and revival of learning. Itis important to remember that this obscure stream of tradition flowed on, only partially affected by the influx of Arabian, or even the early revival of purer classical learning.

Arabian Medicine.—The rise of the Mohammedan empire, which influenced Europe so deeply both politically and intellectually, made its mark also in the history of medicine. As in the parallel case of the Roman conquest of Greece, the superior culture of the conquered race asserted its supre- macy over their Arab conquerors. After tlhe Mohammedan conquests became consolidated, and learning began to flourish, schools of medicine, often connected with hospitals aud schools of pharmacy, arose in all the chief seats of Moslem power. At Damascus Greek medicine was zealously cultivated with the aid of Jewish and Chris- tian teachers. In Baghdad, under the rule of Harin el Rashid and his successors, a still more flourishing school arose, where numerous translations of Greek medical works were made. The names of Mesua, or YahyAibn Masawaih (ob. 243 a.u., 857-8 a.D.), celebrated for his knowledge of drugs, and Honein ibn Ishak el "Ibddi (0b. 873) or Joannitius, the translator and commentator of Hippocrates and Galen, belong to this period. Certain writings of Joan- nitius, translated into Latin, were popular in the Middle Ages in Europe, and were printed in the 16th century. At the same time the Arabs became acquainted with Indian medicine, and Indian physicians lived at the court of Baghdad. The Islamite rulers in Spain were not long behind those of the East in encouraging learning and medical science, and developed culture to a still higher degree of perfection. In that country much was due to the Jews, who had already established schools in places which were afterwards the seats of Moslem dominion. From the 10th to the 13th century was the brilliant period of Arabian medicine in Spain.}

The classical period of Arabian medicine begins with Rhazes (Abi Bakr Mohammed ibn Zakarlya el-Razi, 313

A.H., 925-26 a.p.), a native of Ray in the province of |

Dailam (Persia), who practised with distinction at Baghdad; he followed the doctrines of Galen, but learnt much from Hippocrates. He was the first of the Arabs to treat medicine in a comprehensive and ency- clopsedic manner, surpassing probably in voluminousness Galen himself, though but a small proportion of his works are extant. Rhazes is deservedly remembered as having first described small-pox and measles in an accurate manner. Haly, z.e., 'Alf ibn el-'Abbds (0b. 994), a Persian, wrote a medical text-book, known as the " Royal Book," which was the standard authority among the Arabs up to the time of Avicenna, and was more than once translated into Latin and printed. Other writers of this century need not be mentioned here ; but the next, the 11th century, is givenas

1 See Dozy, Cat. Cod. Or. Lug. Bat., ii, 296.

the probable though uncertain date of a writer who had a great influence on European medicine, Mesua the younger of Damascus, whose personality is obscure, and of whose very existence some historians have doubted, thinking that the name was assumed by some medizval Latin writer. The work De Simplicibus, which bears his name, was for centuries a standard authority on what would now be called materia medica, was printed in tweuty-six editions in the 15th century and later, and was used in the formation of the first London pharmacopeeia, issued. by the College of Physicians in the reign of James I. Either to the 10th or the 11th century must be referred the uame of another Arabian physician who has also attained the position of a classic, Abu'l Kasim, or Abulcasis, of EI- Zahra, near Cordova in Spain, Ilis great work, Altasvif, a medical encyclopzedia, is chiefly valued for its surgical portion (already mentioned), which was translated into Latin in the 12th century, and was for some centuries a staudard if not the standard authority on surgery in Europe. Among his own countrymen the fame and posi- tion of Abulcasis were soon eclipsed by the greater name of Avicenna (Ibn Sina).

Avicenna (see vol. iti. p. 152 sq.) has always been re- garded as the cluef representative of Arabian medicine. He wrote on philosoplty also, and in

both subjects acquired the highest reputation through the whole of Eastern Islam. In Mohammedan Spain he was less regarded, but in Europe his works even eclipsed and superseded those of Hippocrates and Galen. His style and expository power are highly praised, but the subject-matter shows little originality. The work by which he is chiefly known, the celebrated ‘“‘canon,” is an encyclopedia of medical and surgical knowledge, founded upon Galen, Aristotle, the later Greek physicians, and the earlier Arabian writers, singularly complete and systematic, but is thought not to show the practical experience of its author. As in the case of Galen, the formal and encyclopedic character of Avicenua’s works was the chief cause of his popularity and ascendency, though in modern times these very qualities in a scientific or medical writer would rather cause him to become more speedily antiquated.

In the long list of Arabian medical writers none can here be mentioned except the great names of the Hispano- Moorish school, a school both philosophically and medi- cally antagonistic to that of Avicenna. Of these the earliest is Avenzoar, or Abumeron, that is, Abi’ Merwdn “Abd el-Malik Ibn Zohr (1113-62), a member of a family which gave several distinguished members to the medical profession. His chief work, Al-Teysir (facilitatio), is thought to show more practical experience than the writings of Avicenna, and to be less based upon dialectical subtleties. It was translated into Latin, and more than once printed, as were some of his lesser works, which thus formed a part of the contribution made by the Arabians to European medicine. His friend and pupil Averrogs of Cordova (q.v.), so well known for his philesophical writings, was also an author in medical subjects, and as such widely read in Latin. The famous Rabbi MarimonipEs (q.v.) closes for us the roll of medical writers of the Arabian school. His works exist chiefly in the original Arabic or in Hebrew translations; only some smaller treatises have been translated into Latin, so that no definite opinion can be formed as to their medical value. But, so far as is known, the independent and rationalistic spirit which the two last-named writers showed in philosophy did not lead them to take any original point of view in medicine.

The works of the Arabian medical writers who have now been mentioned form a very small fraction of the existing literature. Three hundred medical writers in

Arabic are enumerated by Wiistenfeld, and other historians have enlarged the list (Haeser), but only three have been printed in the original ; a certain number more are known through old Latin translatjons, and the great majority still exist in manuscript. It is thus evident that the cireum- stance of having been translated (which may have been in some cases almost an accident) is what has chiefly de- termined the influence of particular writers on Western medicine. But it is improbable that further research will alter the general estimate of the value of Arabian medicine. There can be no doubt that it was in the main Greek medicine, modified to suit other climates, habits, and national tastes, aud with some important additions from Oriental sources. The greater part is taken from Hippo- crates, Galen, Dioscorides, and later Greek writers. The Latin medical writers were necessarily unknown to the Arabs ; and this was partly the cause that even in Europe Galenic medicine assumed such a preponderance, the methodic school and Celsus being forgotten or neglected. In anatomy and physiology the Arabians distinctly went back; in surgery they showed no advance upon the Greeks ; in practical medicine nothing new can be traced, except the description of certain diseases (e.g., small-pox and ineasles) unknown or imperfectly known to the Creeks ;

the only real advance was in pharmacy and the therapeutical |

use of drugs. By their relations with the furtler East, the Arabs became acquainted with valuable new remedies which have held their ground till modern times ; and their skill in chemistry enabled them to prepare new chemical remedies, and form many combinations of those already in use. They produced the first pharmacopeeia, and estab- lished the first apothecaries' shops. Many of the names and many forms of medicines now used, and in fact the general outline of modern pharmacy, except so far as modi- fied by modern chemistry, started with the Arabs. Thus does Arabian medicine appear as judged from a modern

standpoint; but to medieval Europe, when little but a |

tradition remained of the great ancient schools, it was

invested with a far higher degree of originality and im-

portance. It is now necessary to consider what was the state of

medicine in Europe after the fall of the Western empire |

and before tlie influence of Arabian science and literature began to be felt. Salernitan period.

Medicine in the Early Middle Ages: School of Salerno. —In medical as in civil history there is no real break. A continuous thread of learning and practice must have con- nected the last period of Roman medicine already mentioned with the dawn of science in the Middle Ages. But the intellectual thread is naturally traced with greater difficulty than that which is the theme of civil history ; and in periods such as that from the 5th to the 10th century in Europe it is almost lost. The chief homes of medical as of other learning in these disturbed times were the mouasteries. Though the science was certainly not advanced by their labours, it was saved from total oblivion, and many ancient medical works were preserved either in Latin or vernacular versions. The " Anglo-Saxon Jeechdoms" of the 11th century, published in the Master of the Rolls series of medieval chronicles and memorials, admirably illustrate the mixture of magic and superstition with the relics of ancient science which constituted mouastic medicine. Simi- lar works, in Latin or other languages, exist in manuscript in all the great European libraries. It was among tlie Benedictines that the monastic study of medicine first re- ceived a new direction, and aimed at a higher standard. The study of Hippocrates, Galen, and other classics was recommended by Cassiodorus (6th century), and in the original mother-abbey of Monte Cassino medicine was

This we may call the pre-Arabian or |

in Latin hexameters on medical subjects.

studied ; but there was not there what could be called a medical school; nor had this foundation any connexion (as has been supposed) with the famous scliool of Salerno.

The origin of this, the most important source of medica] knowledge in Europe in the early Middle Ages, is involved in obscurity. It is known that Salerno, a Koman colony, in a situation noted in ancient times for its salubrity, was in the 6th century at least the seat of a bishopric, and at the end of the 7th century of a Benedictine monastery, and that some of the prelates and higher clergy were dis- tinguished for learning, and even for medical acquirements. But it has by recent researches been clearly established that the celebrated Schola Salernitana was a purely secular institution. All that can with certainty be said is that a school or collection of schools gradually grew up in which especially medicine, but also, in a subordinate degree, law and philosophy were taught. In the 9th century Salernitan physicians were already spoken of, and the city was known as Civitas Hippocratica. A little later we find great and royal personages resorting to Salerno for the restoration of their health, among whom was William of Normandy, afterwards the Conqueror. The number of students of medicine must at one time have been considerable, and in a corresponding degree the number of teachers. Among the latter many were married, and their wives and daughters appear also in the lists of professors. 'The most noted female professor was the celebrated Trotula in the 11th century. The Jewish element appears to have been im- portant among the students, and possibly among the professors. The reputation of the school was great till the 12th or 13th century, when tlie introduction of the Arab medicine was gradually fatal to it. The foundation of the university of Naples, and the rise of Montpellier, also contributed to its decline.

The teachings of the Salernitan doctors are pretty well known through existing works, some of which have only recently been discovered and published. 'The best-known is the anonymous rhyming Latin poem on health, Regimen Sanitatis Salerni, professedly written for the use of the "king of England," supposed to mean Robert, son of William the Conqueror; it had an immense reputation in the Middle Ages, and was afterwards many times printed, and translated into most European languages. This was a popular work intended for the laity ; but there are

others strictly professional. Among the writers it may be sufficient to mention here Gariopontus ; Copho, who wrote the Anatome Porci, a well-known medieval book ; Joannes Platearius, first of a family of physicians bearing the same name, whose Practica, or medical compendium, was after- wards several times printed; and Trotula, believed to be the wife of the last-named. All of these fall into the first period before the advent of Arabian medicine. In the transitional period, when the Arabian school began to influ- ence European medicine, but before the Salernitans were superseded, comes Nicolaus Prepositus, who wrote the Antidotarium, a collection of formule for compound medi- cines, which became the standard work on the subject, and the foundation of many later compilations. An equally popular writer was Gilles de Corbeil (A5gidius Corboliensis), at one timea teacher at Salerno, afterwards court physician to Philip Augustus of France, who composed several poems Two of them, on the urine and the pulse respectively, attained the position of medical classics.

None of these Salernitan works rise much above the rank of compilations, being founded on Hippocrates, Galen, and later Greek writers, with an unmistakable mixture of the doctrines of the methodists. But they often show much practical experience, and exhibit the naturalistic method of the Hippocratic school. The general plan of

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treatment is dietetic rather than pharmaceutical, though the art of preparing drugs had reached a high degree of complexity at Salerno. Anatomy was as little regarded as it was in the later ancient schools, the empiric and methodic, but demonstrations of the parts of the body were given on swine. Although it cannot be said that the science of medicine was advanced at Salerno, still its decline was arrested at a time when every other branch of learning was rapidly falling into decay; and there can be no doubt that the observation of patients in hospitals, and

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probably clinical instruction, were made use of in learning |

and teaching.

The school of Salerno thus forms a bridge —

between the ancient and the modern medicine, more direct |

though less conspicuous than that circuitous route, through Byzantium, Baghdad, and Cordova, by which Hippocrates and Galen, in Arabian dress, again entered the European world. school actually existed till it was finally dissolved by an edict of the emperor Napoleon I. in the year 1811. Introduction of Arabian Medicine: The Period. — About the middle of the 11th century the Arabian medical writers began to be known by Latin translations in the Western world. Constantinus Africanus,

a monk, was the author of the earliest of such versions |

(1050 a.p.) ; his labours were directed ehiefly to the less

duced till later. For some time the Salernitan medicine held its ground, and it was not till the conquest of Toledo by Alphonso of Castile that any large number of Western scholars came in contact with the learning of the Spanish

philosophical and medical works. Jewish scholars, often under the patronage of Christian bishops, were especially active in the work. In Sicily also the Oriental tendencies of Frederick Barbarossa and Frederick II. worked in the same direction. Gerard of Cremona, a physician of Toledo (1114-87), made translations, it is said by command of Barbarossa, from Avicenna and others. to point out the influence of the crusades in making Eastern ideas known in the Western world. The in-

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medical studies,—the former preserving more of the Galenical tradition, the latter being more progressive and Averroist. The northern universities eontributed little, — the reputation even of Paris being of later growth.

The supremacy of Arabian medicine lasted till the revival of learning, when the study of the medical classics in their original language worked another

revolution, The medical writers of this period, who chiefly drew from Arabian

| sources, have been called Arabists (though it is difficult to

give any clear meaning to this term), and were afterwards known as the neoterics.

The medical literature of this period is extremely voluminous, but essentially second-hand, consisting mainly of commentaries on Hippocrates, Galen, Avicenna, and

_ others, or of compilations and compendia still less original

Though the glory of Salerno had departed, the

than commentaries. Among these may be mentioned the Conciliator of Peter of Abano (1250-1315), the Aggregator of Jacob de Dondi (1298-1359), both of the school of

Padua, and the Pandectey Medicine of the Salernitan

Scholastic

Mattlweus Sylvaticus (0b. 1542), a sort of medical glossary

and dictionary. But for us the most interesting fact is

the first appearance of Englishmen as authors of medical works having a European reputation, distinguished, accord- ing to the testimony of Haeser, by a practical tendency

_ characteristic of the British race, and fostered in the school important and less bulky Arabian authors, of whom Haly — was the most noted; the real classics were not intro- —

of Montpellier.

The first of these works is the Compendium Medicine, also called Laurea or Rosa Anglicana, of Gilbert (Gilbertus Anglicus, about 1290), said to contain good observations on leprosy. A more important work, the Practica seu

Lilium Medicine, of Bernard Gordon, a Scottish professor Moors, and systematic efforts were made to translate their |

_ printed in several editions.

at Montpellier (written in the year 1307), was more widely spread, being translated into French and Hebrew, and Of these two physicians the first probably, the latter certainly, was educated and practised abroad, but John Gaddesden, the author of Z?osa Anglica seu Practica Medicine (between 1305 and 1317),

_ Was a graduate in medicine of Merton College, Oxford, and

It is needless ©

fluence of Arabian medicine soon began to be felt even

in the Hippocratic city of Salerno, and in the 13th century is said to have held an even balance with the older medicine. predominated ; and by the time that the Aristotelian dialectic, in the introduction of which the Arabs had so large a share, prevailed in the schools of Europe, the Arabian version of Greek medicine reigned supreme in the medical world. That this movement coincided with the establishment of some of the older European mniver- sities is well known. The history of medicine in the period now opening is closely combined with the history of scholastic philosophy. Both were infected with the same dialectical subtlety, which was, from the nature of the subject, especially injurious to medicine.

At the same time, through the rise of the universities, medical learning was much more widely diffused, and the first definite forward movement was seen in the school of Montpellier, where a medical faculty existed early in the 12th century, afterwards united with faculties of law and philosophy. The medical school owed its foundation

After this time the foreign influence |

court physician. His compendium is entirely wanting in originality, and perhaps unusually destitute of common sense, but it became so popular as to be reprinted up to the end of the 16th century. Works of this kind became still more abundant in the 14th and in the first half of the 15th century, till the wider distribution of the medical classics in the original put them out of fashion.

In surgery this period was far more productive than in niedicine, especially in Italy and France, but the limits of

—onr subject only permit us to mention Gulielmus de

largely to Jewish teachers, themselves educated in the :

Moorish schools of Spain, and imbued with the intellectual independence of the Averroists.

Its rising prosperity coin-

cided with the decline of the school of Salerno. Montpellier |

became distinguished for the practical and empirical spirit of its medicine, as contrasted with the dogmatic and scholastie teaching of Paris and other universities.

In | Italy, Bologna and Padua were carliest distinguished for , its corresponding

Saliceto of Piacenza (about 1275), Lanfranchi of Milan (died about 1506), the French surgeon, Guy de Chauliac (about 1350), and the Englishman, John Ardern (about 1350). In anatomy also the beginning of a new epoch was made by Mondino de Liucci, or Mundinus (1275~ 1326), aud his followers. Some advance was made in chemistry by the celebrated Arnold de Villanova (1235- 1312), whose medical writings (if the Breviartum Practice be rightly ascribed to him) rise above the rank of compila- tions. Finally, in the 13th and especially the 14th century, we find, under the name

of consz/ia, the first medizeval reports of medical eases which are preserved in such a form as to be intelligible. Collections of consilia were publiched, among others, by Gentilis Fulgineus before 13848, by Bartolomeo Montaguana (died in 1470), and by Baverius de Baveriis of Imola (about 1450). The last-named, we can say from experience, contains much that is interesting and readable.

Period of the Revival of Learning.—The impulse which all departments of intellectual activity received from the revival of Greek literature in Europe was felt by medicine among the rest. Not that the spirit of the science, or of practice, was at once changed. The

basis of medicine through the Middle Ages had been literary and dogmatic, and it was literary and dogmatic still; but the medical literature now brought to light, including as it did the more important works of Hip- pocrates and Galen, many of them hitherto unknown, and in addition the forgotten element of Latin medicine, especially the work of Celsus, was in itself far superior to the second-hand compilations and incorrect versions which had formerly been accepted as standards. The classical works, though still regarded with unreasoning reverence, were found to have a germinative and vivifying power that carried the mind out of the region of dogma, and prepared the way for the scientific movement which has been growing in strength up to our own day.

Two of the most important results of the revival of learning were indeed such as are excluded from the scope of this brief sketch, namely, the reawakening of anatomy, which to a large extent grew out of the study of the works of Galen, and the investigation of medicinal plants, to which a fresh impulse was given by the revival of Dioscorides and other ancient naturalists. The former brought with it necessarily a more accurate conception of physiology, and thus led up to the great discovery of Harvey, which was the turning-point in modern medicine. The latter gave rise, on the one hand, to the modern science of botany, on the other to a more rational knowledge of drugs and their uses. At the same time, the discovery of America, and increased intercourse with the East, by intro- ducing a

variety of new plants, greatly accelerated the progress both of botany and pharmacology.

But it was not in these directions that improvement was first looked for. It was at first very naturally imagined that the simple revival of classical and especially of Greek literature would at once produce the same brilliant results in medicine as in literature and philosophy. The move- ment of reform started, of necessity, with scholars rather than practising physicians, —more precisely with a group

of learned men, whom we may be permitted, for the sake |

of a name, to call the medical humanists, equally enthusi- astic in the cause of letters and of medicine. fields they hoped to expel the evils which were summed up in the word barbarism. Nearly all medieval medical literature was condemned under this name; and for it the humanists proposed to substitute the originals of Hippocrates and Galen, thus leading back medicine tv its fountain-head. Since a knowledge of Greek was still confined to a small body of scholars, and a still smaller proportion of physicians, the first task was to translate the Greek classics into Latin. physicians, chiefly Italians, applied themselves with great ardour. Among the earliest were Nicolaus Leonicenus of Vicenza (1428-1524), Giovanni de Monte or Montanus (1498-1552), and many others in Italy. In northern Europe should be mentioned Gulielmus Copus (1471-

From both |

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the Arabians. The great Aldine press made an important contribution to the work, by editiones principes of Hippo- crates and Galen in the original. Thus was the campaign opened against the medizval and Arabian writers, till finally Greek medicine assumed a predominant position, and Galen took the place of Avicenna. ‘The result was recorded in a formal manner by the Florentine Academy, sometime shortly before 1535: ‘“‘quea, excusso Arabica et barbara servitutis medic jugo, ex professo se Galenicam appel-

lavit et profligato barbarorum exercitu unum totum et solum Galenuin, ut optimum artis medic authorem, in omnibus se sequuturam pollicita est." Janus Cornarius, from whom this is quoted, laments, however, that the Arabians still reigned in most of the schools of medicine, and that the Italian and French authors of works called Practica were still in high repute. The triumph of Galenism was therefore not complete by the middle of the 16th century. It was probably most so, and earliest, in the schools of Italy and in those of England, where the London College of Physicians might be regarded as an off- shoot of the Italian schools. Paris was the stronghold of conservatism, and Germany was stirred by the teachings of one who must be considered apart from all schools—Para- celsus. The nature of the struggle between the rival systems may be well illustrated by a formidable contro- versy about the rules for bleeding in acute diseases. This operation, according to the Arabian practice, was always performed on a vein at a distance from the organ affected. The Hippocratic and also Galenic rule, to let blood from, or near to, the diseased organ, was revived by Brissot (1470- 1522), a professor in the university of Paris. His attempt at reform, which was taken to be, as in effect it was, a revolt against the authority of the Arabian masters, led to his expulsion from Paris, and the formal prohibition by the parliament of his method. Upon this apparently tnfling question arose a controversy which lasted many years,

| occupied several universities, and led to the interposition

| arrogance. To this work several learned | _all traditional and authoritative teachings.

1532) and Giinther of Andernach (1487-1584) better |

known as Guinterius Andernacensis, both for a time pro- fessors at Paris; and, among the greatest, Thomas Linacre (about 1460-1524; see Linacre). A little later Janus Cornarius or Hagenbut (1500-58) and Leonard Fuchs (1501-66) in Germany, and John Kaye or Caius (1510- 72) in England, carried on the work. pier (Champerius or Campegius) of Lyons (1472-1539), a contemporary of Rabelais, and the patron of Ser- vetus, wrote with fantastic enthusiasm on the superiority of the Greek to the Arabian physicians, and possibly did something to enlist in the same cause the two far greater men just mentioned. Rabelais not only lectured on Galen and

Hippocrates, but edited some works of the latter; and Servetus, in a little tract Syruporum universa ratio, defended the practice of Galen as compared with that of

Symphorien Cham- |

of personages no less important than the pope and the emperor, but which is thought to have largely contributed to the final downfall of the Arabian medicine.

Paracelsus and Chemical Medicine.—Contemporary with the school of medical humanists, but little influenced by thei, lived in Germany a man of strange genius, of whose character apd importance the most opposite opinions have been expressed. The first noticeable quality in Para- celsus (c. 1490-1541) is his revolutionary independence of thought, which was supported by his immense personal Himself well trained in the learning and medical science of the day, he despised and trampled upon He began lis lectures at Basel by burning the books of Avicenna and others ; he afterwards boasted of having read no books for ten years; he protested that his shoe buckles were more learned than Galen and Avicenna. On the other hand, he spoke with respect of Hippocrates, and wrote a commentary on his Aphorisms. In this we see a spirit very different from the enthusiasm of the humanists for a purer and nobler philosophy than the scholastic and Arabian versions of Greek thought. There is no record of Paracelsus's knowledge of Greek, and as, at lcast in his student days, the most important works of Greek medicine were very

imperfectly known, it is probable he had little first-hand

acquaintance with Galen or Hippocrates, while his breach with the humanists is the more conspicuous from his lee- turing and writing chiefly in his native German.

Having thus made a clean sweep of nearly the whole of the dogmatic medicine, what did Paracelsus put in its place# Certainly not pure empiricism, or habits of objective observation. He had a dogma of his own, —one founded, according to his German expositors, on the views of the

Neo-Platonists, of which a few disjointed specimens must here suffice. The human body was a "microcosm" which corresponded to the "macrocosm," and contained in itself all parts of visible nature,—sun, moon, stars, and the poles of heaven. 'To know the nature of man and how to deal with it, the physician should study, not anatomy, which Paracelsus utterly rejected, but all parts of external nature. Life was a perpetual germinative process controlled by the indwelling spirit or Archeus ; and diseases, according to the mystical conception of Paracelsus, were not natural, but spiritual. Nature was sufficient for the cure of most diseases ; art had only to interfere when the internal physician, the man himself, was tired or incapable. Then some remedy had to be introduced which should be antago- nistic, not to the disease in a physical sense, but to the spiritual seed of the disease. These remedies were arcana, —a word corresponding partly to what we now call specific remedies, but implying a mysterious connexion between the remedy and the "essence " of the disease. Arcana were often shown to be such by their physical properties, not only by such as heat, cold, &c., but by fortuitous resemblances to certain parts of the body; thus arose the famous doctrine of "signatures," or signs indicating the virtues and uses of natural objects, which was afterwards developed into great complexity. Great importance was also attached to chemically prepared remedies as containing the essence or spiritual quality of the material from which they were derived. The actual therapeutical resources of Paracelsus included a large number of metallic preparations, in the introduction of some of which he did good service, and, among vegetable preparations, the tincture of opium, still known by the name he gave it, laudanum. In this doubtless he derived much advantage from his knowledge of chemistry, though the science was as yet not disen- tangled from the secret traditions of alchemy, and was often mixed up with imposture.

German historians of medicine attach great importance to the revolt of Paracelsus against the prevailing systems, and trace in his writings anticipations of many scientific truths of later times. That his personality was influential, and his intrepid originality of great value as an example in his own country, is undeniable. As a national reformer he has been not inaptly compared to Luther. But his importance in the universal history of

medicine we cannot estimate so highly. The chief immediate result we can trace is the introduction of certain mineral remedies, especially antimony, the use of which became a kind of badge of the disciples of Paracelsus. The use of these remedies was not, however, necessarily connected with a belief in his system, which seems to have spread little beyond his own country. Of the followers of Paracelsus some became mere mystical quacks and impostors. Others, of more learning and better repute, were distinguished from the regular physicians chiefly by their use of chemical remedies. In France the introduction of antimony gave Yise to a bitter controversy which lasted into the 17th century, and led to the expulsion of some men of mark from the Paris faculty. In England "chemical medicine" is first heard of in the reign of Elizabeth, and was in like manner contemned and assailed by the College of Physicians and the Society of Apothecaries. But it should be remembered that all the chemical physicians did not call Paracelsus master. The most notorious of that school in England, a certain Anthony, never quotes Paracelsus, but telies upon Arnold de Villanova and Raymund Lully. From this time, however, it is always possible to trace a school of chemical practitioners, who, though condemned by the orthodox Galenists, held their ground, till in the 17th century a successor of Paracelsus arose in the celebrated Van Helmont.

Consequences of the Revival of Ancient Medicine.—The revival of Galenic and Hippocratic medicine, though ulti- mately it conferred the greatest benefits on medical science, did not immediately produce any important or salutary reform in practical medicine. The standard of excellence in the ancient writers was indeed far above the level of the 16th century; but the fatal habit of taking at second hand what should have been acquired by direct observation retarded progress more than the possession of better models assisted it, so that the fundamental faults of medieval science remained uncorrected.

Nevertheless some progress has to be recorded, even if not due directly to the study of ancient medicine. In the first place the 15th and 16th centuries were notable for the outbreak of certain epidemic diseases, which were

unknown to the old physicians. Of these the chief was the "sweating sickness" or "English sweat," especially pre- valent in, though not confined to, the country whence it is named. Among many descriptions of this disease, that by John Kaye or Caius, already referred to, was one of the best, and of great importance as showing that the works of Galen did uot comprise all that could be known in medicine. The spread of syphilis, a disease equally unknown to the ancients, and the failure of Galen's remedies to cure it, had a similar effect.

In another direction the foundations of modern medicine were being laid during the 16th century, namely, by the introduction of clinical instruction in hospitals. In this Italy, and especially the renowned school of Padua, took the first step, where De Monte (Montanus), already mentioned as a humanist, gave clinical lectures on the patients in the hospital of St Francis, which may still be read with interest. Pupils flocked to him from all European countries ; Germans are especially mentioned ; a Polish student reported and published some of his lectures ; and the Englishman Kaye was a zealous disciple, who does not, however, seem to have done anything towards trans- planting this method of instruction to his own country. Inspections of the dead, to ascertain the nature of the disease, were made, though not without difficulty, and thus the modern period of the science of morbid anatomy was ushered in.

Medicine in the 17th century.—The medicine of the early part of the 17th presents no features to distinguish it from that of the preceding century. The practice and theory of medicine were mainly founded upon Hippocrates and Galen, with ever-increasing additions from the chemical school. But the development of mathematical and physical science soon introduced a fundamental change in the habits of thought with respect to medical doctrine.

These discoveries not only weakened or destroyed the respect for authority in matters of science, but brought about a marked tendency to mechanical explanations of life and disease. When Harvey by his discovery of the circulation furnished an explanation of many vital pro- cesses which was reconcileable with the ordinary laws of mechanics, the efforts of medical theorists were naturally directed to bringing all the departments of

medicine under similar laws. It is often assumed that the writings and influence of Bacon did much towards introducing a more scientific method into medicine and physiology. But, without discussing the general philosophical position or historical importance of Bacon, it may safely be said that his direct influence can be little traced in medical writings of the first half of the 17th century. Harvey, as is well known, spoke slightingly of the great chancellor, and it is not till the rapid development of physical science in England and Holland in the latter part of the century, that we find Baconian principles explicitly recognized.

The dominant factors in the 17th century medicine were

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the discovery of the circulation by Harvey (published in 1628), the mechanical philosophy of Descartes and the contemporary progress of physics, the teaching of Van

Helmont and the introduction of chemical explanations of |

morbid processes, aud finally, combined of all these, and inspiring them, the rise of the spirit of inquiry and innova- tion, which may be called the scientificmovement. Before speaking in detail of these, we may note that by other

influences, quite independent of theories, important addi- |

tions were made to practical medicine. The method of clinical instruction in hospitals, commenced by the

Italians, was introduced into Holland, where it was greatly |

developed, especially at Leyden, in the hands of the celebrated Sylvius. Itis noteworthy that concurrently with the rise of clinical study the works of

Hippocrates were more and more valued, while Galen began to sink into the background.

At the same time the discovery of new diseases, unknown to the ancients, and the keener attention which the great epidemics of plague caused to be paid to those already known, led to more minute study of the natural history of disease. The most important disease hitherto undescribed was rickets, first made known by Arnold de Boot, a Frisian who practised in Ireland, in 1649, and afterwards more fully in the celebrated work of Glisson in 1651. The plague was carefully studied by Diemerbroek (De Peste, 1646) and others. Hodges, of London, in 1665 seems to have

Discovery of the Circulation of the Blood.—The influence of Harvey's discovery began to be felt before the middle of the century. Its merits were recognized by Descartes, among the first, nine years after its publication. For the history of the discovery, and its consequences in anatomy and physiology, we must refer to the article Harvey. In respect of practical medicine, much less effect was at first noticeable. But this example, combined with the Cartesian principles, set many active and ingenious spirits to work to reconstruct the whole of medicine on a physiological or even a mechanical basis,—to endeavour to form what we should now call physiological or scientific medicine, The result of this was not to eliminate dogma from medicine, though it weakened the authority of the old dogma. The movement led rather to the formation of schools or systems of thought, which under various

names lasted on into the 18th century, while the belief in

| the utility or necessity of schools and systems lasted much longer. The most important of these were the so-called

iatro-physical or mechanical and the iatro-chemical schools,

Latro-Physical School.—The iatro-physical school of medicine grew out of physiological theories. Its founder is held to have been Borelli of Naples (1608-79), whose treatise De motu animalium, published in 1680, is regarded

as marking an epoch in physiology. The tendency of the

school was to explain the actions and functions of the body

been the first who had the courage to make a post-mortem |

inspection of a plague patient. Bennet wrote an important work on consumption in 1654. During the same period many new remedies were introduced, the most important being cinchona bark, brouglit to Spain in the year 1640. The progress of pharmacy was shown by the publication of Dispensatories or Pharmacopoix, such as that of the Royal College of Physicians of London in 1618. This, like the earlier German works of the same kind (on which it was partly founded), contains both the traditional (Galenical) and the modern or chemical remedies.

Van Helmont.—The medicine of the 17th century was especially distinguished by the rise of systems; and we must first speak of an eccentric genius who endeavoured to construct a system for himself, as original and opposed to tradition as that of Paracelsus. Van Helmont (1578- 1644) was a man of noble family in Brussels, who, after mastering all other branches of learning as then under- stood, devoted himself with enthusiasm to medicine and chemistry. By education and position a little out of the regular lines of the profession, he took up in medicine an independent attitude. Well acquainted with the doctrines of Galen, he rejected them as thoroughly as Paracelsus did, and borrowed from the latter some definite ideas as well as his revolutionary spirit. The archeus of Paracelsus appears again, but with still further complications,—the whole body being controlled by the archeus influus, and the organ of the soul and its various parts by the archer insvtt, which are

on physical and especially on mechanical principles. The movements of bones and muscles were referred to the theory of levers; the process of digestion was regarded as essentially a process of trituration ; nutrition and secretion were shown to be dependent upon the tension of the vessels, and so forth. The developments of tlus school belong rather to the history of physiology, where they appear, seen in the light of modern science, as excellent though

premature endeavours in a scientific direction. But the

subject to the central archeus. Many of the symptoms >

of diseases were caused by the passions and perturbations of the archeus, and medicines acted by modifying the zdeas of the same arclieus. These and other notions cannot be here stated at sufficient length to be intelligible. It is

influence of these theories on practical medicine was not great. The more judicious of the mechanical or physical school refrained, as a judicious modern physiologist does, from too immediate an application of their principles to daily practice. Mechanical theories were introduced into pathology, in explanation of the processes of fever and the like, but had little or no influence on therapeutics. The niost important men in this school after Borelli were Steno

| (1638-86), Baglivi (1673-1707), and Bellini (1643-1704).

An English physician, Cole (1660-1700), is also usually ranked with them. One of the most elaborate develop- ments of the system was that of Pitcairn, a Scottish physician who became professor at Leyden (1652-1718), to be spoken of hereafter.

Iatro-Chemical School. —The so-called iatro-chemical

school stood in a much closer relation to practical medicine

than the iatro-physical. The principle which mainly distin- guished it was not merely the use of chemical medicines in addition to the traditional, or, as they were called in dis- tinction, "Galenical" remedies, but a theory of pathology or causation of disease entirely different from the prevailing "humoral" pathology. Its chief aim was to reconcile the new views in physiology and chemistry with practical medicine. In some theoretical views, and in the use of

certain remedies, the school owed something to Van

enough to say that on this fantastic basis Helmont con- | structed a medical system which had some practical merits,

that his therapeutical methods were mild and in many respects happy, and that he did service by applying newer

chemical methods to the preparation of drugs. He thus |

had some share, though a share not generally recognized, in the foundation of the iatro-chemical school, now to be spoken of. But his avowed followers formed a small and discredited sect, which, in England at least, can be clearly traced in the latter part of the century.

Helmont and Paracelsus, but took in the main an independ- ent position. The founder of the iatro-chemical school was

Francis de le Bod, called Sylvius (1614-72), belonging

to a French family settled in Holland. Sylvius was for fourteen years professor of medicine at Leyden, where he

attracted' students from all quarters of Europe. He made a resolute attempt to reconstruct medicine on the two pases of the doctrine of the circulation of the blood and

the new views of chemistry. Fermentation, which was supposed to take place in the stomach, played an important

part in the vital processes. Chemical disturbances of these processes, called acridities, &c., were the cause of fevers and other diseases. Sometimes acid sometimes alkaline properties predominated in the juices and secretions of the body, and produced corresponding disturbances. In nervous diseases disturbances of the vital "spirits" were most important. Stillin some parts of his system Sylvius shows an anxiety to base his pathology on anatomical changes. The remedies he employed were partly Galenical, partly chemical. He was very moderate in the use of bleeding.

The doctrines of Sylvius became widely spread in Holland and Germany ; less so in France and Italy. In England they were not generally accepted, till adopted with some modifications by Thomas Willis the great anatomist (1622-75), who is the chief English representa- tive of the chemical school. Willis was as thorough-going a chemist as Sylvius. He regarded all bodies, organic and inorganic, as composed of the three elements—spirit, sulphur, and salt, the first being only found abundantly in animal bodies. The "intestine movement of particles" in every body, or fermentation, was the explanation of many of the processes of life and disease. The sensible properties and physical alterations of animal fluids and solids depended upon different proportions, movements, and com- binations of these particles. The elaborate work Pharma- ceutice Rationalis, based on these materials, had much influence in its time, though it was soon forgotten. But some parts of Willis's works, such as his descriptions of uervous diseases, and his account (the earliest) of diabetes, are classical contributions to scientific medicine. In the application of chemistry to the examination of secretions Willis made some important steps. The chemical school met with violent opposition, partly from the adherents of the ancient medicine, partly from the iatro-mechanical school. Towards the end of the 17th century appeared an English medical reformer who sided with none of these schools, but may be said in some respects to have sur- passed and dispensed with them.

Sydenham and Locke-—Thomas Sydenham (1624-89) was educated at Oxford aud at Montpellier. He was well acquainted with the works of the ancient physicians, and probably fairly so with chemistry. Of his knowledge of anatomy nothing definite can be said, as he seldom refers to it. His main avowed principle was to do without hypothesis, and study the actual diseases in an unbiassed manner. As his model in medical methods, Sydenham repeatedly and pointedly refers to Hippocrates, and he has not unfairly been called the English Hippocrates. He resembled his Greek master in the high value he set on the study of the "natural history of disease"; in the importance he attached to "epidemic constitution," that is, to the influence of weather and other natural causes in

modifying disease; aud further in his conception of the |

healing power of nature in disease, a doctrine which he even expanded beyond the teaching of Hippocrates. According to Sydenham, a disease is nothing more than an effort of nature to restore the health of the patient by the elimination of the morbific matter. The extent to which his practice was influenced by this and other a priori conceptions prevents us from classing Sydenham as a pure empiric, but he had the rare merit of never permitting himself to be enslaved even by his own theories, Still less was his mind warped by either of the two great systems, the classical and the chemical, which then divided the medical world. Sydenham's influence on European medicine was very great. His principles were welcomed as a return to nature by those who were weary of theoretical disputes. He introduced a milder and better way of treating fevers,

especially small-pox, and gave strong support to the use | successful physicians of modern times.

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an advocate of bleeding, and often carried it to excess. Another important point in Sydenham's doctrine is his clear recognition of many diseases as being what would be now called specific, and not due merely to an alteration in the primary qualities or humours of the older schools. From this springs his high appreciation of specific inedicines.

One name should always be mentioned along with Sydenham—that of his friend John Locke. The great sensational philosopher was a thoroughly trained physi- cian, and practised privately. He shared and defended mauy of Sydenham's principles, and in the few medical observations he has left shows himself to be even more thorough-going than the "English Hippocrates." It is deeply to be regretted in the interests of medicine that he did not write more. It is, however, reasonable to suppose that lis commanding intellect often makes itself felt in the words of Sydenham. One sentence of Locke's in a letter to W. Molyneux sums up the practical side of Sydenham's teaching,

*“*You cannot imagine how far a little observation carefully made by a man not tied wp to the four humours [Galen], or sal, sulphur, and mercury, [Paracelsus], or to acid and aleali [Sylvius and Willis] which has of late prevailed, will carry a man in the curing of diseases though very stubborn and dangerous ; and that with very little and common things, and almost no medicine at all.”*

We thus see that, while the great anatomists, physicists, and chemists, men of the type of Willis, Borelli, and Boyle, were laying foundations which were later on built up into the fabric of scientific medicine, little good was done by the premature application of their half-understood prin- ciples to practice. The reform of practical medicine was effected by men who aimed at, and partly succeeded in, rejecting all hypothesis and returning to the unbiassed study of natural processes, as shown in health and disease.

Sydenham showed that these processes might be profit- ably studied and dealt with without explaining them ; and, by turning men’s minds away from explanations and fixing them on facts, he enriched medicine with a method more fruitful than any discoveries in detail. From this time forth the reign of canonical authority in medicine was at an end, though the dogmatic spirit long survived.

The 18th century.—The medicine of the 18th century is notable, like that of the latter part of the 17th, for the striving after complete theoretical systems. The influence of the iatro-physical school was by no means exhausted ; and in England, especially through the indirect influence of Newton’s great astronomical generalizations, it took on a mathematical aspect, and is sometimes known as iatro- mathematical. This phase is most clearly developed in Pit- cairn (1652-1713), who, though a determined opponent of metaphysical explanations, and of the chemical doctrines, gave to his own rude mechanical explanations of life and disease almost the dogmatic completeness of a theological system. His countryman and pupil, George Cheyne, who lived some years at Bath, published a new theory of fevers

_on the mechanical system, which had a great reputation.

Their English contemporaries and successors, Freind, Cole, and Mead, leaned also to mechanical explanations, but with a distrust of systematic theoretical completeness, which was perhaps partly a national characteristic, partly the result of the teaching of Sydenham and Locke. Freind (1675- 1728) in his Hmmenologia gave a mechanical explanation of the phenomena of menstruation. He is also one of the most distinguished writers on the history of medicine. Cole (see above) published mechanical hypotheses concern- ing the causation of fevers which closely agree with those of the Italian iatro-mechanical school. More distinguished in his own day than any of these was Richard Mead (1673-1754), one of the most accomplished and socially Mead was the

of specific medicines, especially Peruvian bark. He was | pupil of the equally popular and successful John Radcliffo

(1650-1714), who had acquired from Sydenham a contempt for book learning, and belonged to no school in medicine but the school of common sense. Radcliffe left, however, no work requiring mention in a history of medicine. Mead, a man of great learning and intellectual activity, was an ardent advocate of the mathematical doctrines. "It is very evident," he says, " that all other means of improv- ing medicine have been found ineffectual, by the stand it was at for two thousand years, and that, since mathe-

maticians have set themselves to the study of it, men |

already begin to talk so intelligibly and comprehensibly, even about abstruse matters, that it is to be hoped that mathematical learning will be the distinguishing mark of a physician and a quack." His Mechanical Account of Poisons, in the first edition (1702), gave an explanation of the effects of poisons, as acting only on the blood. Afterwards he modified his hypothesis, and referred the disturbances produced to the "nervous liquor," which he supposed to be a quantity of the 'universal elastic matter" diffused through the universe, by which Newton explained the phenomena of light, z.¢., what was afterwards called the luminiferous ether. Mead's treatise on Zhe Power of the Sun and Moon over Human Bodies (1704), equally inspired by Newton's discoveries, was a premature attempt to assign

the influence of atmospheric pressure and other cosmical causes in producing disease. His works contain, however, many original experiments, and excellent practical observations. James Keill (1673-1719) applied Newtonian and mechanical principles to the explanation of bodily functions with still greater accuracy and completeness; but his researches have more importance for physiology than for practical medicine.

Boerhaave.—None of these men founded a school,—a re- sult due in part to their intellectual character, in part to the absence in England of medical schools equivalent in posi- tion and importance to the universities of the Continent. An important academical position was, on the other hand, onc of the reasons why a physician not very different in his way of thinking from the English physicians of the age of Queen Anne was able to take a far more predominant position in the medical world. Hermann Boerhaave (1668-1738) was emphatically a great teacher. He was for many years professor of medicine at Leyden, where he lec- tured five hours a day, and excelled in influence and reputa- tion, not only his greatest forerunners, Montanus of Padua and Sylvius of Leyden, but probably every subsequent teacher. The hospital of Leyden, though with only twelve beds available fur teaching, became the centre of medical influence in Europe. Many of the leading English physicians of the 18th century studied there; Van Swieten, a pupil of Boerhaave, transplanted the latter's method of teaching to Vienna, and founded the noted Vienna school of medicine. As the organizer, and almost the constructor, of the modern method of clinical instruction, the services of Boerhaave to the progress of medicine were immense, and can hardly be overrated. In his teaching, as in his practice, he avowedly followed the method of Hippocrates and Sydenham, both of whom he enthusiastically admired. In his medical doctrines he must be pronounced an eclectic, though taking his stand mainly on the iatro- mechanical school. The best known parts of Boerhaave's system are his doctrines of inflammation, obstruction, and "plethora." By the last-named especially he was long remembered, His object was to make all the anatomical and physiological acquisitions of his age, even microscop- ical anatomy, which he diligently studied, available for use in the practice of medicine. He thus differed from Sydenham, who took almost as little account of modern science as of ancient dogma. Boerhaave may be in some respects compared to Galen, but again differed from him in

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| that he always abstained from attempting to reduce hig

knowledge to a uniform and coherent system. Boerhaave | attached great importance to the study of the medical classics, but rather treated them historically than quoted them as canonical authorities. It almost follows from the nature of the case that the great task of Boerhaave's life, a synthesis of ancient aud modern medicine, and the work in which this is chietly contained, his celebrated Jnstitutions, could not have any great permanent value. Nearly the same thing is true even of the Aphorisms, in which, follow. ing the example of Hippocrates, he endeavoured to sum up the results of his long experience.

Hoffmann and Stahl.We have now to speak of two writers in wliom the systematic tendency of the 18th century showed itself most completely.

Friedrich Hoffmann (1660-1742), like Boerhaave, owed his influence, and perhaps partly his intellectual charac- teristics, to his academical position. He was in 1693 appointed the first professor of medicine in the university of Halle, then just founded by the elector Frederick IIL. Here he became, as did his contemporary and rival Stahl, a popular and influential teacher, though their university had not the European importance of Leyden. Hoffmann's "system " was apparently intended to reconcile the oppos- ing "spiritual" and " materialistic" views of nature, and is thought to have becn much influenced by the philosophy of Leibnitz. His medical theories rest upon a complete theory of the universe. Life depended upon a universally diffused ether, which animals breathe in from the atmo- sphere, and which is contained in all parts of the body. It accumulates in the brain, and there generates the " nervous fluid" or pnewma,—a theory closely resembling that of Mead on the "nervous liquor," unless indeed Mead bor- rowed it from Hoffmann. On this system: are explained all the phenomena of life and disease. Health depends on the maintenance of a proper "'tone" in the body,—some diseases being produced by excess of tone, or "spasm" ; others by "atony," or want of tone. But it is impossible here to follow its further developments. Independently of his system, which has long ceased

to exert any influence, Hoff- mann made some contributions to practical medicine ; and his great knowledge of chemistry enabled him to investi- gate the subject of mineral waters. He was equally skilful in pharmacy, but lowered his position by the practice, which would be unpardonable in a modern physieian, of trafficking in secret remedies. Some of these are even to this day sold for the benefit of the orphanage at Halle.

George Ernest Stahl (1660-1734) was for more than twenty years professor of medicine at Halle, and thus a colleague of Hoffmann, whom he resembled in construct- ing a complete theoretical system, though their systems had little or nothing in common. Stahl's chief aint was to oppose materialism. For mechanical conceptions he sub- stituted the theory of "animism,"—attributing to the soul the functions of ordinary animal life in man, while the life of other creatures was left to mechanical laws. The symptoms of disease were explained as efforts of the soul to rid itself from morbid influences, the soul acting reasonably with respect to the end of self-preservation. The anima thus corresponds partly to the "nature" of Sydenham, while in other respects it resembles the archeus of Van Helmont. Animism in its completeness met with little acceptance during the lifetime of its author, but influ- enced some of the iatro-physical school. Stahl was the author of the theory of "phlogiston " in chemistry, which in its day had great importance. ;

Haller and Morgagni.—From the subtleties of rival systems it is a satisfaction to turn to two movements 10 the medicine of the 18th century which, though they did es , extinguish the spirit of system-making, opened up paths o

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investigation by which the systems were ultimately super- seded. -These are physiology in the modern sense, as dating from Haller, and pathological anatomy, as dating from Morgagni.

Albrecht von Haller (1708-77) was a man of even more

encyclopaedic attainments than Boerhaave. He advanced chemistry, botany, anatomy, as well as physiology, and was incessantly occupied in endeavouring to apply his scientific studies to practical medicine, thus continuing the work of his great teacher Boerhaave. Besides all this he was probably more profoundly acquainted with the litera- ture and bibliography of medicine than any one before or since. Haller occupied in the new university of Géttingen (founded 1737) a position corresponding to that of Boerhaave at Leyden, and in like manner influenced a very large circle of pupils. The appreciation of his work in physiology belongs to the history of that science; we are only concerned here with its influence on medicine. Haller's definition of irritability as a property of muscular tissue, and its distinction from sensibility as a property of nerves, struck at the root of the prevailing hypothesis respect- ing aninial activity.

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It was no longer necessary to suppose |

that a half conscious "auima" was directing every move- |

ment. Moreover, Haller's views did not rest on @ priori speculation, but on numerous experiments. the first to investigate the action of medicines on healthy persons. aries learnt was not the iniportance of experiment, but only the need of contriving other "systems" less open to objec- tion; and thus the influence of Haller led directly to the theoretical subtleties of Cullen and John Brown, and only

indirectly and later on to the general anatomy of Bichat. |

He was among |

Unfortunately the lesson which his contempor- |

The great name of Haller does not therefore occupy a very —

prominent place in the history of practical medicine.

had and still preserves a permanent importance beyond that of all the contemporary theorists. In a seriesof letters De sedibus et causis morborum per anatomen indagatis, pub- lished when he was in his eightieth year, he describes the appearances met with at the post-mortem examination as well as the symptoms during life in a number of cases of various diseases, It was not the first work of the kind. Bonet had published his Sepulcretum in 1679; and obser- vations of post-mortem appearances had been made by Montanus, Tulp, Vieussens, Valsalva, Lancisi, Haller, and others. But never before was so large a collection of cases brought together, described with such accuracy, or illustrated with equal anatomical and niedical knowledge. Morgagni's work at once made an epoch in the science. Morbid anatomy now became a recognized branch of medical research, and the movement was started which has lasted till our own day.

The contribution of Morgagni to medical science must be regarded as in some respects the counterpart of Syden- ham's. The latter had, in neglecting anatomy, neglected the most solid basis for studying the natural history of disease ; though perhaps it was less from choice than be- cause his practice, as he was not attached to a hospital, gave him no opportunities. But it is on the combination of the two methods, that of Sydenham and of Morgagni, that modern medicine rests; and it is through these that it has been able to make steady progress in its own field, inde- pendently of the advance of physiology or other sciences.

The method of Morgagni found many imitators, both in his own country and in others. In England the first important name in this field is at the same time that of the first writer of a systematic work in any language on morbid anatomy, Matthew Baillie (1761-1823), who published his treatise in 1793.

Cullen and Brown.—It remains to speak of two system-

_ or feeding treatment .of fevers.

atic writers on medicine in the 18th century, whose great reputation prevents them from being passed over, though their real contribution to the progress of medicine was not great—Cullen and Brown.

William Cullen (1712-90) was a most eminent and popular professor of medicine at Edinburgh. The same academical influences as surrounded the Dutch and German founders of systems were doubtless partly concerned in leading him to form the plan of a comprehensive system of medicine. Cullen's system was largely based on the new physiological doctrine of irritability, but is especially noticeable for the importance attached to nervous action. Thus even gout was regarded as a "neurosis." These pathological principles of Cullen are contained in his First Lines of the Practice of Physic, an extremely popular book, often reprinted and translated. More importance is to be attached to his Nosology or Classification of Diseases, The attempt to classify diseases on a natural-history plan was not new, having been commenced by Sauvages and others, and is perhaps not a task of the highest importance. Cullen drew out a classification of great and needless com- plexity, the chief part of which is now forgotten, but several of his main divisions are still preserved.

It is difficult to form a clear estimate of the importance of the last systematizer of medicine, John Brown (1735- 88), for, though in England he has been but little regarded, the wide thongh short-lived popularity of his system on the Continent shows that it must have contained some elements of brilliancy, if not originality. His theory of medicine professed to explain the processes of life and disease, and the methods of cure, upon one simple principle, —that of the property of '" excitability," in virtue of which the "exciting powers," defined as being (1) external forces and (2) the functions of the system itself, call forth the vital phenomena "sense, motion, mental function, and passion." All exciting powers are stimulant, the apparent debilitating or sedative effect of some being due to a deficiency in the

, degree of stimulus; so that the final conclusion is that " the

whole phenomena of life, health as well as disease, consist in stimulus and nothing else." Brown recognized some diseases as sthenic, others as asthenic, the latter requiring stimulating treatment, the former the reverse ;

but his prac- tical conclusion was that 97 per cent. of all diseases required a "stimulating" treatment. In this he claimed to have made the most salutary reform because all physicians from Hippocrates had treated diseases by depletion and debili- tating measures with the object of curing by elimination. It would be unprofitable to attempt a complete analysis of the Brunonian system ; and it is difficult now to understand why it attracted so much attention in its day. To us at the present time it seems merely a dialectical construction, having its begiuning and end in definitions, the words power, stimulus, &c., being used in such a way as not to correspond to any precise physical conceptions, still less to definite material objects or forces. One recommendation of the system was that it favoured a milder system of treatment than was at that time in vogue; Brown may be said to have been the first advocate of the modern stimulant He advocated the use of '"'animal soups" or beef tea. Further he had the discern- ment to see that certain symptoms, such as convulsions and delirium, which were then commonly held always to indi- cate inflammation, were often really signs of weakness. The fortunes of Brown's system (called, from having been originally written in Latin, the Brunonian) form one of the strangest chapters in the history of medicine. In Scotland, Brown so far won the sympathy of the students that riotous conflicts took place between his partisans and opponents, In England his system took little root. In Italy, on the other hand, it received enthusiastic support, and, naturally,

a corresponding degree of opposition. The most important adherent to Brown's system was Rasori (1763-1837), who taught it as professor at Pavia, but afterwards substituted his own system of contra-stimulus. The theoretical differ- ences between this and the "stimulus" theory need not be expounded. The practical difference in the corresponding treatment was very great, as Rasori advocated a copious use of bleeding and of depressing remedies, such as antimony. Joseph Frank, a German, professor at Pavia, afterwards of Vienna, the author of an encyclopedic work on medicine now forgotten, embraced the Brunonian system, though he afterwards introduced some modifications, aud trans- planted it to Vienna. Many names are quoted as partisans or opponents of the Brunonian system in Italy, but scarcely one of them has any other claim to be remembered.

enthusiasm and controversial heat. to spread the new ideas(though giving them out as his own), but Weikard was the first avowed advocate of the system.

Roschlaub (1768-1835) modified Brown's system into the |

theory of excitement (Lrregungstheorie), which for a time was extreniely popular in Germany. The enthusiasm of the younger Brunonians in Germany was as great as in Edinburgh or in Italy, and led to serious riots in the university of Gottingen. In America the system was

enthusiastically adopted by a noted physician, Benjamin | Rush, of Philadelphia, who was followed by a considerable | France was not more influenced by the new school | In both countries the tendency towards | positive science and progress by objective investigation | was too marked for any theoretical system to have more. In France, however, the | influence of Brown's theories is very clearly seen in the | writings of Broussais, who, though not rightly classed with |

school. than England.

than a passing influence,

the system-makers, since his conclusions were partly based

upon anatomical investigation, resembled them in his at- |

tempt to unite theory and practice in one comprehensive synthesis. The explanation of the meteoric splendonr of the Brunonian system in other countries seems to be as follows. In Italy the period of intellectual decadence had set in,

and no serious scientific ardour remained to withstand the | novelties of abstract theory. In Germany the case was |

somewhat different. Intellectual activity was not wanting, but the great achievements of the 18th century in philo- sophy and the moral sciences had fostered a love of

In | Germany the new system called forth, a little later, no less | Girtanuer first began |

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these views were published in one of his later works.) In treatment of disease Hahnemann rejected entirely the notion of a ws medicatrix nature, and was guided by his well-known principle "similia similibus curantur," which he explained as depending on the law that in order to get rid of a disease some remedy must be given which should substitute for the disease an action dynamically similar, but weaker. The original malady being thus got rid of, the vital force would easily be able to cope with and extinguish the slighter disturbance caused by the remedy,

Something very similar was held by Brown, who taught

that "indirect debility " was to be cured by a lesser degree of the same stimulus as had caused the original disturbance. Generally, however, Hahnemann's views contradict those of Brown, though moving somewhat in the same plane. In order to select remedies which should fulfil the indica- tion of producing symptoms like those of the disease, Hahnemann made many observations of the action of drugs on healthy persons. He did not originate this line of research, for it had been pursued if not originated by Haller, and cultivated systematically by Tommasini, an Italian "contra- stimulist ;" but he carried it out with much elaboration. His results, nevertheless, were vitiated by being obtained in the interest of a theory, and by singular want of discrimination. Hahnemaunn's doctrines met with much opposition on the part of the medical pro- fession, and he was hence led to state his case to the "lay" public as a sort of court of appeal; and thus matters of science were made the theme of much popular controversy. This expedient, in which Hahnemann had been in a small degree anticipated by Brown, contributed largely to the success of his system. The appeal flattered a prevalent belief in the right of private judgement, even in technical and learned subjects. Hahnemann was thus able to take up the position (and not

without justification) of a victim of professional prejudice. The anomalous position into which professional scorn and extra-professional popularity brought him produced a distinct deterioration in the character of his work. In his second period he developed

_ the extraordinary theory of "potentiality" or dynamiza-

abstract speculation; and some sort of cosmical or.

general system was thought indispensable in every depart- ment of special science. Hence another generation had to pass away before Germany found herself on the level, in scientific investigation, of France and England.

Before the theoretic tendency of the 18th century was quite exhausted, it displayed itself in a system which, though in some respects isolated in the history of medicine, stands nearest to that of Brown,—that, namely, of Halme-

mann (see Hommopatny). Hahnemann (1753-1844) was | _accepts nor finds it worth while to controvert.

in conception as revolutionary a reformer of medicine as Paracelsus.

causes of symptoms as useless. While thus rejecting all the lessons of morbid anatomy and pathology, he put for- ward views respecting the causes of disease which hardly bear to be seriously stated. All chronic maladies result either from three diseases—psora (the itch), syphilis, or sycosis (a skin disease), or else are maladies produced by medicines. Seven-eighths of all chronic diseases are pro- duced by itch driven inwards! (It is fair to say that ee ee a

The itch is really an affection produced by the presence in the

skin of a species of mite (Acarus scabiez), and when this is destroyed or removed the disease is at an end.

He professed to base medicine entirely on a | knowledge of symptoms, regarding all investigation of the |

tion,—namely, that medicines gained in strength by being diluted, if the dilution was accompanied by shaking or pounding, which was supposed to " potentialize" or in- crease the potency of the medicive. On this extraordinary principle Hahnemann ordered his original tinctures to be reduced in strength to one-fiftieth ; these first dilu- tions again to one-fiftieth ; and so on, even till the thirtieth dilution, which he himself used by preference, and to which he ascribed the highest " potentiality." Itis hardly

_ hecessary to point out that even the lower dilutions involve

quantities which no analysis can weigh, measure, or even recognize. The still greater eccentricities of Hahnemann's later works need not be recounted. From a theoretical point of view Hahnemann's is one of the abstract systems, pretending to universality, which modern medicine neither In the treatment of disease his practical innovations came at a fortunate time, when the excesses of the depletory system had only partially been superseded by the equally injurious opposite extreme of Brown's stimulant treatment. Hahnemann's use of mild and often quite inert remedies contrasted favourably with both of these. Further he did good by insisting upon simplicity in prescribing, when it was the custom to give a number of drugs, often hetero- geneous and inconsistent, in the same prescription. But these indirect benefits were quite independent of the truth or falsity of his theoretical system.

Positive Progress in the 18th Century.—In looking back on the repeated attempts in the 18th century to construct a universal system of medicine, it is impossible not to

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regret the waste of brilliant gifts and profound acquire- ments which they involved. It was fortunate, however, that the accumulation of positive knowledge in medicine did not cease. While Germany and Scotland, as the chief homes of abstract speculation, gave birth to most of the | theories, progress in objective science was most marked in | other countries, —in Italy first, and afterwards in England and France. We must retrace our steps a little to enumerate several distinguished names which, from the nature of the case, hardly admit of classification.

In Italy the tradition of the great anatomists and . physiologists of the 17th century produced a series of accurate observers and practitioners. Among the first of these were Antonio Maria Valsalva (1666-1723), still better known as an anatomist; Giovanni Maria Lancisi (1654-1720), also an anatomist, the author of a classical work on tlie diseases of the heart and aneurisms; and Ip- | polito Francisco Albertini (1662-1738), whose researches on the same class of diseases were no less important.

In France Jean Baptiste Sénac (1693-1770) wrote also an important work on the affections of the heart. Sauvages, otherwise F. B. de Lacroix (1706-67), gave under the title Nosologia Methodica a natural-history | classification of diseases ; Jean Astruc (1684-1766) con- tributed to the knowledge. of general diseases. But the state of medicine in that country till the end of the 18th century was unsatisfactory as compared with some other parts of Europe.

In England the brilliancy of the early part of the century in practical medicine was hardly maintained to the end, and presented indeed a certain contrast with the remarkable and unflagging progress of surgery in the same period, The roll of the College of Physicians does not furnish many distinguished names. Among these should be mentioned John Fothergill (1712-80), who investi-_ gated the "putrid sore throat" now called diphtheria, and the form of neuralgia popularly known as tic douloureux. | A physician of Plymouth, John Huxham (1694-1768), | made researches on epidemic fevers, in the spirit of Sydenham and Hippocrates, which are of the highest importance. William Heberden (1710-1801), a London physician, called by Samuel Johnson wltimus Romanorum, "the last of our learned physicians," left a rich legacy of practical observations in the Commentaries published after his death. More important in their results than any of these works were the discoveries of Epwarp JENNER (7.v.), respecting the prevention of small-pox by vaccina- | tion, in which he superseded the partially useful but dangerous practice of inoculation, which had been intro- duced into England in 1721. The history of this dis- covery need not be told here, but it may be pointed out that, apart from its practical importance, it has had great influence on the scientific study of infectious diseases. The name of John Pringle (1707-82) should also be mentioned as one of the first to study epidemics of fevers — occurring in prisons and

camps. His work entitled Odser- | vations on the Diseases of an Army was translated into many European languages, and became the standard authority on the subject. —

In Germany the only important school of practical medicine was that of Vienna, as revived by Van Swieten (1700-72), a pupil of Boerhaave, under the patronage of Maria Theresa. Van Swieten's commentaries on the aphorisms of Boerhaave are thought more valuable than the original text. Other eminent names of the same school are Anton de Haen (1704-76), Anton Stérck (1731-1803), Maximilian Stoll (1742-88), and John Peter Frank (1745-1821), father of Joseph Frank before- mentioned as an adherent of the Brownian system, and | like his son carried away for a time by the new doctrines. |

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This, the old " Vieuna School," was not distinguished: for any notable discoveries, but for success in clinical teaching, and for its sound method of studying the actual facts of disease during life and after death, which largely contri- buted to the establishment of the " positive medicine" of the 19th century.

One novelty, however, of the first importance is due to

_a Vienna physician of the period, Leopold Avenbrugger

(1722-1809), the inventor of the method of recognizing diseases of the chest by percussion. Avenbrugger's inethod was that of direct percussion with the tips of the fingers, not that which is now used, of mediate percussion with the intervention of a finger or plessimeter; but the results of his method. were the same, and its value nearly as great. Avenbrugger's great work, the Inventum Novum, was published in 1761. 'The new practice was received at first with contempt and even ridicule, and afterwards by Stoll and Peter Frank with only grudging approval. It did not receive due recognition till 1808, when Corvisart translated the Jnventum Novum into French, and Aven- brugger's method rapidly attained a European reputation. Surpassed,

but not eclipsed, by. the still inore important art of auscultation introduced by Laennec, it is hardly too much to say that this simple aud purely mechanical invention has had more influence on the development of modern medicine than all the "systems" evolved by the most brilliant intellects of the 18th century.

Karly Part of the 19th Century.—It is not possible to carry the history of medicine, in a sketch such as this, beyond the early years of the 19th century, both because the mass of details becomes so large as to require more minute treatment, and because it is difficult as we approach our own times to preserve the necessary historical per- spective. It was, however, in this period that what we regard as the modern school of medicine was formed, and

took the shape which it has preserved to our own days.

The characteristic of the modern school is the adoption in medicine of the methods of research of physical science, and the gradually declining importance attached to theory and abstract reasoning,—hypotheses, though not neglected, being used as means of research rather than as ultimate conclu- sions. Its method may therefore be called the positive method, or that of rational empiricism. The growth of the new school was first seen in two. European countries, in France and England, and must be separately followed in the two. Germany entered the field later.

Ftise of the Positive School in France.—The reform of medicine in France must be dated from the great intel- lectual awakening caused by the Revolution, but more definitely starts with the researches in anatomy and physiology of Marie Francois Xavier Bichat (1771-1802), The importance in science of Bichat's classical works, especially of the Anatomie générale, cannot be estimated here ; we can only point out their value as supplying a new basis for pathology or the science of disease. Among the most ardent of his followers was Frangois

_ Joseph Victor Broussais (1772-1838), whose theoretical

views, partly founded on those of Brown and partly on the so-called vitalist school of Bordeu and Barthez, differed from 'these essentially in being

avowedly based on ana- tomical observations. Broussais's chief aim was to find an anatomical basis for all diseases, but he is especially known for his attempt to explain all fevers as a consequence

_ of irritation or inflammation of the intestinal canal (gastro-

entérite). A number of other maladies, especially general diseases and those commonly regarded as nervous, were attributed to the same cause. It would be impossible now to trace the steps which led to this wild and long since exploded theory. It led, among other consequences, to an enormous misuse of bleeding. Leeches were his favourite

instruments, and so much so that he is said to have used | (1793-1867), and Trousseau (1801-1866), the eloquent

100,000 in his own hospital wards during one year. He was equalled if not surpassed in this excess by his follower Bouillaud, known for his important work on heart diseases. Broussais's system, to which he gave the name of " Médecine Physiologique" did much indirect good, in fixing attention upon morbid changes in the organs, aud thus led to the rise of the strongly opposed anatomical and pathological school of Corvisart, Laennec, and Bayle. Jean Nicolas Corvisart (1755-1821) has already been mentioned as the translator and introducer into France of Avenbrugger's work on percussion. He introduced some improvements in the method, but the only real advance was the introduction of mediate percussion by Piorry in 1828. The discovery had, however, yet to be completed by that of auscultation, or listening to sounds produced in the chest by breathing, the movements of the heart, é&c. The combination of these methods constitutes what is now known as physical diagnosis. Laennec (1781-1826) was the inventor of this most important perhaps of all methods of medical research. Except for some trifling notices of sounds heard in certain diseases, this method was entirely

new. It was definitely expounded in au almost complete form in his work De Vauscultation médiate, published in 1819. Laennec

attached undue importance to the use of the stethoscope, | Hunter (1728-1793), was also a teacher of anatomy, and

aud laid too much weight on specific signs of specific diseases ; otherwise his method in its main features has remained unchanged. The result of his discovery was an entire revolution in the knowledge of diseases of the chest ; but it would be a mistake to forget that an essential factor in this revolution was the simultaneous study of the con- dition of the diseased organs as seen after death. Without the latter, it is difficult to see how the information con- veyed by sounds could ever have been verified. This increase of knowledge is therefore due, not to auscultation alone, but to auscultation combined with morbid anatomy. In the case of Laennec himself this qualification takes nothing from his fame, for he studied so minutely the relations of post-mortem appearances to symptoms during life that, had he not discovered auscultation, his researches in morbid anatomy would have made him famous. The pathologico-anatomical metliod was also followed with great zeal and success by Gaspard Laurent Bayle (1774- 1816), whose researches on tubercle, and the changes of 'the lungs and other organs in consumption, are the founda- tion of most that has been done since his time. It was of course antecedent to the discovery of auscultation. Start- ing from these men arose a school of physicians who endeavoured to give to the study of symptoms the same precision as belonged to anatomical observations, and by the combination of both methods made a new era in clinical medicine. Among these were Chomel (1788- 1858), Louis (1787-1872), Cruveilhier (1791-1874), and Andral (1797-1876). Louis, by his researches on pul- monary consumption and typhoid fever, had the chief merit of refuting the doctrines of Broussais, In another respect also he aided in establishing an exact science of medicine by the introduction of the numerical or statistical method. By this method only can the fallacies which are attendant on drawing conclusions from isolated cases be avoided ; and thus the chief objection which has been made to regarding medicine as an inductive science has been removed. lLouis's method was improved and systematized by Gavarret ; and its utility is now universally recognized. Space does not permit us to trace further the history of this brilliant period

of French medicine, during which the superiority of the school of Paris could hardly be contested. We can only mention the names of Bretonneau (1771-— 1862), Rostan (1790-1866), D'Alibert (1766-1837), Rayer

René Théophile Hyacinthe |

and popular teacher.

Linglish Medicine from 1800 to 1840.—The progress of medicine in England during this period displays the same characteristics as at other times, viz., a gradual and unin- terrupted development, without startling changes such as are caused by the sudden rise or fall of a new school, Hardly auy theoretical system is of English birth ; Erasmus Darwin (1731-1802), the grandfather of the great Charles Darwin, alone makes an exception. In his Zoonomia (1794) he expounded a theory of life and disease which had somie resemblance to that of Brown, though arrived at (he says) by a different chain of reasoning.

Darwin's work shows, however, the tendency to connect medicine with physical science, which was an immediate consequence of the scientific discoveries of the end of the 18th century, when Priestley and Cavendish in England exercised the same influence as Lavoisier in France. The English school of medicine was also profoundly stirred by the teachings of the two brothers William and John Hunter, especially the latter.—who must therefore be briefly mentioned, though their own researches were chiefly concerned with subjects lying a little outside the limits of this sketch. William Hunter (1718-1783) was known in London as a brilliant teacher of anatomy and successful obstetric physician ; his younger brother and pupil, John

practised as a surgeon. His immense contributions to anatomy and pathology cannot be estimated here, but his services in stimulating research and training investi- gators belong to the history of general medicine. They are sufficiently evidenced by the fact that Jenner and Baillie were his pupils.

The same scientific bent is seen in the greater attention paid to morbid anatomy (which dates from Baillie), and the more scientific method of

studying diseases. An instance of the latter is the work of Robert Willan (1757-1812) on diseases of the skin,—a department of medicine in which abstract and hypothetical views had been especially injurious. Willan, by following the natural- history method of Sydenham, at once put the study on a sound basis; and his work has been the starting point of the most important modern researches. About the same time William Charles Wells (1757-1817), a scientific investigator of remarkable power, and the author of a cele- brated essay on dew, published observations on alterations in the urine, which, though little noticed at the time, were of great value as assisting in the important discovery made some years afterwards by Bright.

These observers, and others who cannot be mentioned here, belong to the period when English medicine was still little influenced by the French school. Shortly after 1815, however, when the Continent was again open to English travellers, many English doctors studied in Paris, and the discoveries of their great French contemporaries began to be known. The method of auscultation was soon 1ntro- duced into this country by pupils of Laennec. Jolin Forbes in 1824, and William Stokes of Dublin in 1825, published treatises on the use of the stethoscope. Forbes also translated the works of Laennec and Avenbrugger, aud an entire revolution was soon effected in the knowledge of diseases of the chest. James Hope and Peter Mere Latham further developed this subject, and the former was also ~ known for lis researches in morbid anatomy. The com- bination of clinical and anatomical research led, as in the hands of the great French physicians, to important dis- coveries by English investigators. The discovery by Richard Bright (1789-1858) of the disease of the kidueys known by his name, has proved to be one of the most momentous of this century. It was published in Reports of

Medical Cases, 1827-31. Thomas Addison takes, some- what later, a scarcely infcrior place. ‘he remarkable physiological discoveries of Bell and Marshall Hall for the first time rendered possible the discrimination of diseases of the spinal cord. Several of these physicians were also eminent for their clinical teaching—an art in which Englishmen had up till then been greatly deficient. Although many names of scarcely less note might be

mentioned among the London physicians of the early part of the century, we must pass them over to consider the progress of medicine in Scotland and Ireland. Edinburgh the admirable teaching of Cullen had raised the medical faculty to a height of prosperity of which his successor, James Gregory (1758-1821), was not unworthy. His nephew, William Pulteney Alison (1790-1859), was even more widely known. These great teachers niaintained in the northern university a continuous tradition of suc-

cessful teaching, which the difference in academical and |

other circumstances rendered hardly possible in London. Nor was the northern school wanting in special investi-

ators, such as John Abercrombie, known for his work on | P > }

diseases of the brain and spinal cord published in 1828, and many others. that the Dublin school in this period produced two physiciaus of the highest distinction. Robert James Graves (c. 1800-1853) was a most eiineut clinical teacher and observer, whose lectures are regarded as the model of clinical tcaching, and indeed served as snch to the most popular teacher of the Paris school in the middle of this century, Trousseau. William Stokes (1804-1878) was especially known for lis works on diseases of the chest and of the heart, and for his clinical teaching.

German Medicine from 1800 to 1840.—Of the other countries of Europe, it is now only necessary to mention Germany. Here the chief home of positive medicine was still for a long time Vienna, where the "new Vienna school" continued and surpassed the glory of the old. Joseph Skoda (born 1805) extended, and in some respects corrected, the art of auscultation as left by Laennec. Karl Rokitansky (1804-1878), by his colossal labours, placed the science of morbid anatomy on a permanent basis, and enriched it by numerous discoveries of detail. Most of the ardent cultivators of this science in Germany in the next generation were his pupils. though some great names might be found, as Romberg (1795-1873), the founder of the modern era in the study

of nervous diseases, the general spirit was scholastic and | | Roll of the Royal College of Physicians of London, 2d ed., 1878,

the result barren, till the teaching of one man, whom the modern German physicians generally regard as the regenerator of scicntific medicine in their country, made itself felt. Johann Lucas Schénlein (1793-1864) was first professor at Wiirzburg, afterwards at Zurich, and for

MEDINA, or rather Ex-Mepina (the city), or Mepinat

Rasti ALAg (the city of the apostle of God), a town |

of the Hij4z in Arabia, in 25° N. lat., 40 E. long.,! the refuge of Mohammed on his flight from Mecca, and a renowned place of Moslem pilgrimage, consecrated by the possession of his tomb. The name El-Medina goes back to the Koran (sur. xxxiii. 60); the old name was Yathrib, the Lathrippa of Ptolemy and Jathrippa of Stephanus Byzantius,

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1 This can only be viewed as a very rough estimate. The road from Yanbu' on the Red Sea, which runs somewhat north of east, is by Burton's estimate 132 miles. Fron: Medina to Mecca by the inland or high road he makes 248 miles. The usual road near the coast by Rabigh and Kholeys and thence to W. Fatima cannot be very differ- ent in length. Caravans traverse it in about ten or eleven days.

Turning to Ireland, it should be said ,

In the other Gernian schools, |

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twenty years at Berlin (from 1839-1859). Schénlein's positive contributions to medical science were not large ; but he made in 1839 one discovery, apparently small, but in reality most suggestive, namely, that the contagious disease of the head called favus is produced by the growth in the hair of a parasitic fungus. In this may be found the germ of the startling modern

discoveries in parasitic diseases. His systematic doctrines founded the so-called 'natural history school;" but his real merit was that of the founder or introducer of a method. In the words of Haeser, "Schénlein has the incontestable

merit of having been the first to establish in Germany the

|

- 1821-28, 5 vols.; also in Freneh, Paris, 1815).

exact method of the French and the English, and to impregnate this method with the vivifying spirit of German research." The name of Schénlein thus brings us to the threshold of the modern German school of medicine,— the most scientific and exact in Europe, and in its spirit strikingly in contrast with the theoretical subtlety of German systematists in the last century.

Literature.—The earliest work of authority on the history of medicine is that of Daniel le Clerc (Histoire de la Médecine, Geneva, 1696; Amsterdam, 1704, 1723, &e.), which ends with Galen. Freind's Listory of Physiek (London, 1725-26, 2 vols.) carries on the subject from Galen to the beginning of the 16th century. The first com- plete history is that of Kurt Sprengel (Versuch einer pragmatischen Gesehiehte der Arzneitkunde, Halle, 1792; 38d edition, Halle, Beside these may be mentioned Hecker, Gesehiehte der Heilkunde, Berlin, 1822, and

| Geseh. der neucren Heilkundce, Berlin, 1839; Ch. Daremberg,

Histoire des sciences médieales, Paris, 1870, 2 vols.; Edward Meryon, History of Medicine, London, 1861 (left unfinished, vol. i. only having appeared). The most recent and complete text-book is Hacser's Lehrbuch der Gesehiehte der Mediein und der Epidemisehen Krankheiten (3d edition, Jena, 1875-79, 3 vols., in course of com- pletion), to which the preceding sketch is very largely indcbted. In special departments of the subject the authorities are the following :—For classical medicine: Celsus, De Mcdieina ; Littré, Gurres @ Hippoerate, Paris, 1839-61, 10 vols. (especially vol. i.) ; Francis Adams, Genwine Works of Hippocrates translated, with a Pre- liminary Discourse, London (Syd. Soe.), 1849, and

Paulus digineta, translated, with a Commentary, London (Syd. Soc.), 1844 ; Darem- berg, La Médecine dans Homérc, Paris, 1865, and La Médecine entre Homeére et Hippocrate, Paris, 1869; and W. A. Grecnhill's articles "Galen," " Hippocrates," &c., in Smith's Classical Dictionary, 1844. For Arabian medicine : Wiistenfeld, Geschichte der Arabischen Aerzte und Naturforscher, Gottingen, 1840 ; and Lucicn Leelere, Histoire de la Médecine Arabe, Paris, 1876, 2 vols. For Salcrnitan medicine: Collectio Salernitana, edited by De Renzi, Daremberg, &c., Naples, 1852, 5 vols.; Regimen Sanitatis, with introduction by Sir A. Croke, Oxford, 1830; and Daremberg, L'Ecole de Salerne, Paris, 1861. For medicine in England: John Aikin, Biographieal Memoirs of Medicine in Great Britain, to the time of Harvey, London, 1780; Lives of British Physicians, Loudon, 1830 (chiefly by Dr Macmichael, partly by Dr Bisset Hawkins and Dr H. H. Southey) ; and Munk,

8 vols. For the modern seliools: Hirschel, Geschichte des Brown'- schen Systems und der Erregungs Theorie, Leipsic, 1846; Bouchut, Histoire de la Médecine ct des Doetrines Médieales, 2 vols., Paris, 1873 (comparison of ancient and modern schools); Buckle, History of Civilization in England, 1858-61. (J. F. P.)

Medina stands in a sort of basin at the northern extremity of an elevated plain, on the western skirt of the mountain range which divides the Red Sea coast-lands from the central plateau of Arabia. At an hour's distance to the north it is dominated by Mount Ohod, an outlying spur of the great mouatains, which is now visited by the pious as the scene of the well-known battle (see

| MoHAMMED), and the site of the tomb and mosque of the

*Prophet's uncle Hamza. To the east the plain is bounded by a long line of hills eight or ten hours distant, over which the Nejd road runs. A number of torrent courses (of which W. Kanat to the north, at the foot of Mount Ohod, and W.*Akik, some miles to the south, are the most important) descend from the mountains, forming consider- able streams and pools after rain, and converge in the XV. — 103*

neighbourhood of the town to unite farther west at a place called Zaghdba, whence they descend to the sea through the 'mountains of the Tihama"—the rough country between Medina and its port of Yanbu—under the name of W. Idam. Southwards from Medina the plain extends unbroken, but with a slight rise, as far as the eye can reach. The convergence of torrent courses in the neigh- bourhood of Medina makes this one of the best-watered spots in northern Arabia. The city lies close to one of the great volcanic centres of the peninsula, which was in violent eruption as late as 1266 a.p., when the lava stream approached within an hour's distance of the walls, and dammed up W. Kanat. The result of this and older pre- historic eruptions lias been to confine the underground water, so important in Arabian tillage, which can be reached at any point of the oasis by sinking deep wells. Many of the wells are brackish, and the natural fertility of the volcanic soil is in many places impaired by the salt with which it is impregnated; but the date palm grows well everywhere, and the groves, interspersed with gardens and corn-fields, which surround the city on all sides except the west, have been famous from the time of the Prophet. Thus situated, Medina was originally a city of agriculturists, not like Mecca a city of merchants; nor, apart from the indispensable trade in provisions, has it ever acquired commercial importance like that which Mecca owes to the pilgrimage. Landowners and cultivators are still a chief element in the population of the city and suburbs. The latter, who are called Nawadkhila, and more or less openly profess the Shia opinions, form a sort of separate caste, marrying only among themselves. The townsinen proper, on the other hand, are a very motley race? The mechanical arts, which the true Arab despises, are chiefly practised by foreigners. New settlers remain beliind with each pilgrimage ; and the many offices of profit connected with the mosque, the stipends paid by the sultan to every inhabitant, and the gains to be derived by pilgrim-ciccrones (Muzawwirs) or by those who make it a business to say prayers at the Prophet's mosque for persons who send a fee from a distance, as well as the alms which the citizens are accustomed to collect when they go abroad, especially in Turkey, keep up an idle population greatly in excess of that which the district would naturally support in the present defective state of agriculture. The population of the city and suburbs may be from 16,000 to 20,000 souls.

The city proper is surrounded by a solid stone wall,? with towers and four massive gateways of good architecture, forming an irregular oval running to a kind of angle at the north-west, where stands the castle, held by a Turkish garrison. The houses are good stone buildings similar in style to those of Mecca; the streets are narrow but clean, and in part paved. There isa copious supply of water conducted from a tepid source at the village of Kuba, 2 miles south, and distributed in underground cisterns in each quarter.° The glory of Medina, and the only im-

1 The pilgrimage to Medina, though highly meritorious, is not obli- gatory, and it is not tied to a single season, so that there is no great concourse at one time, and no fair like that of Mecca.

2 A small number of families in Mecca still claim to represent the ancient Ansar, the "defenders" of Mohammed. But in fact the old population emigrated en masse after the sack of Medina by Muslim in 683, and passed into Spain in the armies of Mus4. In the 13th century one old man of the Khazraj and one old woman of the Aus tribe were all that remained of the old stock in Medina (Makkari, i. 187; Dozy, Mus, @' Espagne, i. 111). The aristocratic family of the Beni Hoseyn, who claim descent from the martyr of Kerbela, and so from the Prophet, have apparently a better established pedigree.

3 According to Ibn Khallikan (Slane's 'transl., iii. 927) the walls are of the 12th century, the work of Jamal el-Din el-Ispahani.

4 The Balt or great paved street of Medina, a very unusual feature in an Eastern town, dates from the Ist ceutury of Islam, See Wiisten- feld's abstract of Samhudi, p. 115.

5 Kubé is famous as the place where the prophet lived before he

portant building, is the mosque of the Prophet, in the eastern part of the city, a spacious enclosed court between 400 and 500 feet in length froin north to south, and two- thirds as much in breadth. The minarets and the lofty dome above tlie sacred graves are imposing features, but the circuit is

hemmed in by houses or narrow lanes, and ig not remarkable except for the principal gate (Bab el-Salam) at the southern end of the west front, facing the sacred graves, which is richly inlaid with marbles and fine tiles, and adorned with golden inscriptions. This gate leads into a deep portico, with ten rows of pillars, running along the southern wall. Near the further end of the portico, but not adjoining the walls, is a sort of doorless house or chamber hung with rich curtains, which is supposed to contain the graves of Mohammed, Abubekr, and 'Omar. To the north of this is a sinaller chamber of the same kind, draped in black, which is said to represent the house or tomb of Fatima. Both are enclosed within an iron railing, so closely interwoven with brass wire-work that a glimpse of the so-called tombs can only be got through certain apertures where intercessory prayer is addressed to the prophet, and pious salutations are paid to the other saints. The portico in front of the railing is not ineffective, at least by night light. It is paved with marble, and in the eastern part with mosaic, laid with rich carpets; the southern wall is clothed with marble pierced with windows of good stained glass, and the great railing has a striking aspect ; but an air of tawdriness is imparted by the vulgar painting of the columns, especially in the space between the tomb and the pulpit, which has received, in accordance with a tradition of the Prophet, the name of the Garden (rauda), and is decorated with barbaric attempts to carry out this idea in colour.' The throng of visitors passing along the south wall froin the Bab el-Saldm to salute the tombs is separated from the Garden by a wooden partition about 8 feet high, painted in arabesques. 'The other three sides of the interior court have porticos of less depth and mean aspect, with three or four rows of pillars. Within the court are the well of the Propliet and some palm trees said to have been planted by Fatima.

The original mosque was a low building of brick roofed with palm branches, and much smaller than the present structure. The wooden pulpit from which Mohammed preached appears to have stood on the same place with the present pulpit in the middle of the south portico. The dwelling of the Prophet and the huts of his women adjoined the mosque. Mohammed died in the hut of 'Aisha, and was buried where he died; Abubekr and 'Omar were afterwards buried beside him. Now in 711 A.D. the mosque, which had previously been enlarged by 'Omar and 'Othman, was entirely reconstructed on a grander scale and in Byzantine style by Greek and

Coptic artificers at the command of the caliph Walid and under the direction of ‘Omar ibn ‘Abd el‘ Aziz. The enlarged plan included the huts above named, which were pulled down. Thus the place of the Prophet’s burial was brought within the mosque; but the recorded discontent of the city at this step shows that the feeling which regards the tomb as the great glory of the mosque, and the pilgrimage to It as the most meritorious that can be undertaken except that to Mecca, was still quite unknown. It is not even certaim entered Medina, and the site of the first mosque in which he prayed. It lies amidst orchards in the richest part of the oasis

6 The space between the railing and the tomb is seldom entered except by the servants of the mosque. It contains the treasures of the mosque in jewels and plate, which were once very considerable but have been repeatedly plundered, last of all by the Wahhabis in the beginning of the present century.

7 The word vauda also means a mausoleum, and is applied by Ibn Jubair to the tomb itself. Thus the tradition that the space between

the pulpit and tomb was called by the Prophet one of the gardens of Paradise probably arose from a mistake.

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what was done at this time to mark off the graves. Ibn ‘Abd Rabbih, in the beginning of the 10th century (‘Ikd, Cairo ed., iii. 366), describes the enclosure as a hexagonal wall, rising within three cubits of the ceiling of the portico, clothed in marble for more than a man’s height, and above that height daubed with the unguent called khalik. This

may be supplemented from Istakhri, who calls it a lofty | That there are no gravestones or >

house without a door. visible tombs within is certain from what is recorded of occasions when the place was opened up for repairs. Ibn Jubair (p. 193 sz.) and Samhud{ speak of a small casket adorned with silver, fixed in the eastern wall, which was supposed to be opposite the head of the Prophet, while a silver nail in the south wall indicated the point to which the .corpse

faced, and from which the salutation of worshippers was to be addressed (Burton misquotes). The European fable of the coffin suspended by magnets is totally unknown to Moslem tradition. The smaller chamber of Fatima is pretty modern. In the time of Ibn Jubair and of Ibn Batwta (unless the latter, as is so often the case, is merely copying his predecessor) there was only a small marble trough north of the rauda (or grave) which "is said to be the house of Fatima or her grave, but God only knows." It is more probable that Fatima was buried in the Baki, where her tomb was also shown in the 12th century (Ibn Jubair, p. 198 sg.).

The mosque was again extended by El-Mahdi (781 A.D.), and was burned down in 1256. Of its appearance before the fire we have two authentic accounts by Ibn 'Abd Rabbil early in the 10th century, and by Ibn Jubair, who visited it in 1184. The old mosque had a much finer and more regular appearance than the present one; the interior walls were richly adorned with marble and mosaic

arabesques of trees and the like, and the outer walls with |

stone marquetry; the pillars of the south portico (seven- teen in each row) were in white plaster with gilt capitals, the other pillars were of marble. Ibn "Abd Rabbih speaks of eighteen gates, of which in Ibn Jubair's time, as at present, all but four were walled up. There were then three minarets. After the fire which took place just at the time of the fall of the caliphate, the mosque long lay in a miserable condition. Its repair was chiefly due to

the Egyptian sultans, especially to Kait Bey, whose |

restoration after a second fire in 1481 amounted almost to a complete reconstruction. seems to have remained but some of the columns and part of the walls; and, as the minarets have also been rebuilt and two new ones added, the architectural character is now essentially Egyptian. The great dome above the tomb, the railing round it, and the pulpit, all date from Kait Bey's restoration.

The suburbs, which occupy as much space as the city proper, and are partly walled in, lie south-west of the town, from which they are separated by an open space, the halting-place of caravans. Through the suburbs runs the

watercourse called W. Buthdn, a tributary of W. Kanat, which the Yanbu road crosses by a stone bridge. The suburbs are the quarter of the peasants. Thirty or forty families with their cattle occupy a single courtyard (hésh), and form a kind of community often at feud with its neighbours. The several clans of Medina nist have lived in much the same way at the time of the Prophet. The famous cemetery called Bakf el-Gharkad, the resting- place of a multitude of the "companions" of the Prophet, lies immediately to the west of the city. It once con- tained many monuments, the chief of which are described by Ibn Jubair. Burckhardt in 1815 found it a mere waste, but some of the mosques have since been rebuilt.

History.—The story of the Amalekites in Yathrib and of their conquest by the Hebrews in the time of Moses is purely fabulous,

Of the old building nothing ,

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see Noldeke, Ueber die Amalekiter, 1864, p- 86. The oasis, when it first comes into the light of history, was held by Jews, among whom emigrants from Yemen afterwards settled. From the time of the flight of Mohammed (622 a.p.) till the Omayyads removed the seat of empire from Medina to Damascus, the town springs into historic prominence as the capital of the new power that so rapidly changed | the fate ofthe East. Its fallwas not less rapid and complete, and since the battle of Harra and the sack of the city in 683 it has never re- gained political importance. The history of Medina in this period will be told in the articles MonamMED and MoHAMMEDAN EMPIRE. Mohammed invested the country round Medina with an inviolable character like that of the Haram round Mecca ; but this provision has never been observed with strictness. After the fall of the caliphs, who maintained a governor in Medina, the native emirs | enjoyed a fluctuating measure of independence, interrupted by the | aggressions of the sherifs of Mecca, or controlled by an intermittent Egyptian protectorate. The Turks after the conquest of Egypt held Medina for a time with a firmer hand ; but their rule grew weak, _ and was almost nominal long before the Wahhabis took the city in 1804. A Turko-Egyptian force retook it in 1812, and the Turks still maintain a pasha with a military establishment, while the cadi and chief agha of the mosque (a eunuch) are sent from Constanti- nople. But the

internal government is largely in Arab hands, and is said to be much better than that of Mecca.

Sources.—Medina has been described from personal observation by Burckhardt, who visited it in 1815, and Burton, who made the pilgrimage in 1853. Sadlier on his journey from Kafif to Yanbu‘ (1819) was not allowed to enter the holy city. Burckhardt was prevented by ill health from examining the city and country with his usual thoroughness. Little is added to our information by the report of ‘Abd el-Razzdk, who performed the pilgrimage in 1878, on a medical commission from the English Government. The chicf Arabic authority besides lbn ‘Abd Rabbih and lbn Jubair is Samhtidf, of whose history Wiistenfeld published an abstract in the Gottingen Abhandlungen, vol. ix., 1861. 1t goes down to the end of the 15th century. The topography of the country about Medina is interesting both his- torically and geographically ; Bekrf, Ydkuit, and other Arabic geographers supply much material on this topic, but completer European accounts are wanting to per- Init of its full utilization. Medina now offers a more promising, but also a more perilous, field for an explorer than Mecca. (W. B.S.)

MEDINA SIDONIA, a town of Spain, in the province of Cadiz, and about 21 miles by road westward from that city, stands at a height of 600 feet above the sea-level, on | an isolated hill surrounded by a cultivated plain. Apart from its picturesque airy situation it has nothing to interest the traveller ; the streets are narrow, steep, and dirty, and _ its buildings and ruins are unimportant. The occupations of the inhabitants are connected chiefly with the agriculture and cattle-breeding carried on in the surrounding district ; bricks and pottery are also made to some extent. The population in 1877 was 12,234.

Medina Sidonia has been idcntificd by some with the Astao of Pliny, but it is uncertain whether Jerez is not more probably the locality referred to by that name. Under the Visigoths the place was erected into a bishopric (Assidonia), and attained some im- portance ; in the beginning of the 8th century it was taken by Tarik. In the time of Edrisi the province of Shaduna or Shidona included, among other towns, Scville and Carmona; later Arab

geographers place Shaduna in the province of Seville. The town gives its title to the ducal house of Guzman el Bueno, the hero of Tarifa (1292),

MEDITERRANEAN SEA. The southern shores of | Europe are separated from the northern shores of Africa by the Mediterranean Sea. It extends in a generally east and west direction from longitude 5° 21’ W. to 36° 10’ E. Its length from Gibraltar to its eastern extremity in Syria is about 2100 miles. Its breadth is very various, being 400 miles from the mouth of the Rhone to the Algerian coast, 500 miles from the Gulf of Sidra to the entrance to the Adriatic, and 250 miles from the mouth of the Nile to the south coast of Asia Minor. From the very indented nature of its coasts, the general mass of the water is much cut up into separate seas, which have long borne distinctive names, as the Adriatic, the A®gean, the Sea of Marmora, the Black Sea, &c. » The area of the whole system, including the Sea of Azoff, is given by Admiral Smythe as 1,149,287 square miles. If we deduct that of the Black Sea and Sea of Azoff, 172,506 square miles, we have for the area of the Mediterranean proper 976,781, or, roughly speaking, a million of square miles.

The Mediterranean is sharply divided into two great principal basins, the western and the eastern or Levant

basin. The western possesses a comparatively smooth and unindented coast-line. It is bounded on the south by the coast of Africa and the north coast of Sicily, and it is further enclosed by the coasts of Spain, France, and Italy, which form a roughly arc-shaped coast-line. There are comparatively few small islands in this basin, though some of the more important large ones occur in it. The eastern basin is by far the larger of the two, and extends from Cape Bon to the Syrian coast, including as important branches the Adriatic and the Aigean. ‘The latter is con- uected directly, through the Hellespont, the Sea of Marmora, and the Bosphorus, with the Black Sea. The entrance to the western basin and to the sea generally from the ocean is through the Straits of Gibraltar in 36° N. lat. If this parallel be drawn out through the sea it will be found that the western basin lies almost wholly to the northward, and the main body of the eastern one to the southward of it, the mean latitude of the western basin being about 39° 30’,

and that of the eastern basin 35°. They communicate with each other by the channels separ- ating Sicily from Italy and from Africa. The former is known as the Strait of Messina, and is of insignificant size, the latter is a wide channel apparently without any distinc- tive name, and generally shallow. The greatest depth on the shallowest ridge reaching from the African to the Sicilian coast is under 200 fathoms, and agrees very closely with the corresponding depth at the entrance to the Straits of Gibraltar. ;

Depth.—So far as is at present known, the maximum depth is pretty nearly alike in the two basins, being 2040 fathoms in the western and 2150 fathoms in the eastern. Many lines of soundings have been run in the Mediterranean for telegraph purposes, and they afford a very good idea of the general configuration of the bottom. Between Marseilles and Algiers the depth ranges generally from 1200 to 1600 fathoms; between Naples and Sardinia from 1500 to 2000; between Alexandria and Rhodes from 1200 to 1600; and between Alexandria and Cyprus from 900 to 1100. The basin of the Mediterranean really begins about 50 miles to the westward of Gibraltar. It is here that the shallowest ridge stretches across from Africa to Spain ; the maximuni depth on it is probably not more than 180, and certainly less than 200 fathonis. From this ridge the bottom slopes quickly westward into the depths of the Atlantic, and gently eastward into the Mediterranean. The depth nowhere reaches 1000 fathoms until beyond Alboran Island, 120 miles east of Gibraltar. This is a small low island separated from the mainland on all sides by water of more than 400 fathoms; it must therefore be considered an oceanic as distinguished from a continental island.1_ Further to the north, and off the coast of Valencia, we have the Balearic Islands,—namely, Majorca, Minorca, Iviza, and Formentera. These also must be considered oceanic islands, and indeed two groups of oceanic islands. Iviza and Formentera are isolated both from the Spanish coast and from the other two islands by water of over 300 fathoms depth ; Majorca and Minorca are connected by a bank with no more than 50 fathoms of water on it. Thirty miles east of Minorca there are more than 1400 fathoms; beyond that there are no soundings between the Baleares and the large and important group of Corsica and Sardinia. These islands are continental, being connected with the Italian main- land by the bank on which Elba occurs, and which is covered by little over 50 fathoms of water. The Straits of Bonifacio, which separate Corsica from Sardinia, are also

quite shallow, so that Corsica and Sardinia may be looked on as a secondary peninsula attached to the Tuscan

Continental islands are those separated from the mainland by comparatively shallow seas, generally under 100 fathoms.

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shore of Italy by a shallow bank not more than 15 or 20 niles broad, the deep water coming close up all round it. Almost the saine may be said of Sicily, including the Malta group, but excluding the Lipari group, which is purely volcanic. From Cape Passaro, in the south-east end of Sicily, a line can be drawn connecting it with the town of Tripoli, and without passing over water of more than 300 fathoins.. As has already been said, the west end of Sicily is connected with the coast of Tunis by a ridge in no part covered by more than 200 fathoms of water. Between these two ridges lies a small but comparatively deep basin of 600 to 700 fathoms. At the western extremity of it lies the mountainous island of Pantellaria. The bank on which Malta is situated stretches for nearly 100 miles in a southerly direction from Cape Passaro in Sicily. Opposite, on the African shore, is a similar bank of much larger dimensions, on which are the small islands Lampion and Lampedusa belonging to Italy. In the deep channel between them and Malta is the small but lofty island Limosa. It is entirely volcanic, with an extinct crater on its north-eastern side, and three smaller ones to the south- ward. It resembles the Lipari group off the north coast of Sicily, which rise abruptly out of deep water, being connected by no bank either with the African or the Sicilian coasts. Some of the Lipari group are still active, Stromboli _ and Vulcano being of the number. Off the south coast of Sicily, and between it and the island of Pantellaria, occurs the famous Graham's shoal, the remains of what was for a few weeks an island."

The deepest water of the Mediterranean is found in its widest part between Malta and Crete, and the deep water comes close up to the Italian and Greek coasts, while on the African shore the water shoals more gradually. In the Strait of Messina, close to Reggio, there are depths of over 500 fathoms, and similar depths are found inside gulfs such as those of Taranto (nearly 1000 fathoms), of Corinth, Kalaniata, and others. Also all through the fégean in its many bights and channels very deep water is met with ; in

the Sea of Marmora we have 500 fathoms, and in the Black Sea over 1000 fathoms. All along the south coast of Asia Minor the water is very deep, and the large islands of Cyprus and Crete are both separated by very deep water from the'mainland. If we take the eastern basin, and run along its western and southern coasts from the mouth of the Po along the shore of Italy, Sicily, and Africa to the mouth of the Nile, and even further along the Syrian shore, we do not find a single off-lying island of any importance except the Malta group, while all along the eastern and northern coasts from 'Trieste to Asia Minor the coast is deeply indented, and the water broken up by many large and important islands. These islands are grouped along the west coast of Turkey and Greece, and irregularly throughout the AXgean. The east coast of the Adriatic is studded with islands and inlets, and resembles in this respect the AZgean; the west coast, on the other hand, is low, and the water off it shallow, and there are few harbours. The Adriatic stretchcs in a north-westerly direction for about 460 miles from its entrance between

- *With regard to its appearance and disappearance Admiral Smythe (Mediterranean, p. 111) says :—" It seems that, as early as the 28th of June 1831, Captain Swinburne, in passing nearly over the spot, felt. several shocks of a sea-quake, proving that the cause was then in operation; but on the 19th of the following July the crater had accumulated to a few feet above the level of the sea, and was great activity, emitting vast volumes of steam, ashes, and score. Froni that time it gradually increased in all its dimensions till towards the end of August its circumference was about 3240 feet and its height 107 ; then from October various changes took place, and it entirely dis- appeared in December." Since that time it has changed considerably. In 1868 the least water on it was 15 feet. It has two heads close to- gether, and at the distance of about 20 yards all round there are from 7 to 9 fathoms of water.*

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Cape Sta Maria di Leuca and the island of Corfu to the | level of the Mediterranean would sink until its surface

Venetian shore in the Gulf of Trieste. is about 100 miles. A ridge with little over 400 fathoms appears to run across its entrance. Inside this the water reaches a depth of 765 fathoms, but shoals again rapidly

Its average width |

towards Pelagosa Island, from which to the northward, © \ ‘ would be reduced to two “Dead Seas,” one between

including quite two-thirds of the sea, the depth is under 100 fathoms ; indeed no part of the sea within 150 miles of its northern extremity is over 50 fathoms deep. There is authentic historical evidence of the encroachment of the

[taliau shores on the Adriatic, causing thereby a diminution |

of its area. As a consequence many towns which were

once thriving seaports are now many miles inland; thus |

Adria, which was a station of the Roman fleet, is now 15 mules inland, and there are many similar examples. The large rivers Po and Adige, which bring the drainage of the southern slopes of the Alps to the sea, deliver large quantities of sediment in the course of the year. The dis- tribution of this mud is affected, not only by its own weight tending to make it sink to the bottom, but also by the set

_ “Shearwater ” in the year 1871.!

of the currents, which, running up the eastern coast, turn | to the westward and southward at the upper end of the >

sea, and so tend to distribute the river mud along the bottom in the neighbourhood of the Italian coasts. The fact that towns which were formerly seaports are now

inland does not therefore necessitate the assumption of a | general rise of the land, it is merely a reclamation by © natural agencies of land from the

sea at the expense of | the inland mountainous country. Precisely similar pheno- | mena are observed in the neighbourhood of the mouths of |

the Rhone and of the Nile.

Specific Gravity, Currents, &c.—On the specific gravity |

Dr Carpenter reports many and interesting observations, In round numbers, that of the surface-water of the Atlantic off the Straits of Gibraltar is 1:0260 to 1:0270, that of the western basin of the Mediterranean 1°:0280 to 1:0290, and that of the eastern basin 10290 to 1:0300, while that of the Black Sea is 1:0120 to 10140. It will thns be seen that

the water of the Mediterranean proper is very much salter |

than either the Atlantic on the west or the Black Sea on the east, and this great density of the water affords a use- ful means of recognizing it when investigating the inter- change of waters which takes place at the two extremities of the sea. Both the temperature and the specific gravity of the water are evidences of the local climate. The great concentration of the water shows how dry the atmosphere at the surface must be, and how insignificant the contribu- tions of fresh water. With regard to the balance existing between the two factors, evaporation and precipitation, it would be impossible to give figures with any claim to accuracy, but a rough estimate may be formed by taking such data as Fischer has given. He puts the rainfall over the whole Mediterranean drainage area at 759-4 milli- metres, or almost exactly 30 inches. If we remember that the average rainfall of the eastern slopes of Great Britain is less than 30 inches, and that therefore this may be taken as the maximum yearly supply to the North Sea, we may be

sure that the Mediterranean does not receive more than 30 |

inches of fresh water in the year. With regard to the rate of evaporation over the area of the Mediterranean there is but very meagre information, but wherever it has been observed it has been found to exceed the rainfall, even as much as three times. more than four times the rainfall, at Rome 105 inches, and at Cairo 92 inches. [t may therefore without exaggeration be assumed that the evaporation is at least twice as great as the precipitation.

Putting the latter at 30 inches, we should have 60 inches for the yearly evaporation, and a balance of 30 inches evaporation over precipitation. Were there no provision for making good this deficiency, the

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was so far contracted as to lose no more by evaporation than would be supplied by rain. This condition would probably not be fulfilled before all the AZgean and Adriatic and the whole of the western basin west of the island of Sardinia were laid dry, and what is now the Mediterranean

Sardinia and Naples and the other between Africa and the mouth of the Adriatic. That the level and the salinity of the Mediterranean remain constant is due to the supply of water which enters at the Straits of Gibraltar. The currents in this passage have frequently engaged attention both from their scientific and their nautical interest. The most detailed investigation was that carried out by Captain Nares and Dr Carpenter in H.M.S. From these investiga- tions it appears that there are usually two currents in the Straits at the same time, one superposed on the other. Both are affected by tidal influence, but, after allowing for it, there is still a balance of inflow in the upper and of outflow in the under current, The waters of the two currents are sharply distinguished from each other by their salinity. Further, the upper current appears to affect by preference the iniddle of the channel and the African coast, while the under current appears to crop out at the surface on the Spanish coast. This distribution, however, is much modified by the state of the tide, and it must be remembered that in such places the surface separating the upper and under currents is rarely, if ever, a horizontal plane. That there is a balance of outflow over inflow at the bottom was well shown by the result of soundings as much as 200 miles north-west of the entrance of the Straits, where, in a depth of 1560 fathoms, water of decided Mediterranean origin was got from the bottom. There can be no doubt that this outflow of warm and dense Mediter-

_ ranean water is largely instrumental in causing the com-

paratively very high bottom temperature in the eastern basin of the North Atlantic.

We lave assumed that the balance of water removed by evaporation is 30 inches, or 2°5 feet. If we take the area of the Mediterranean to be 1,000,000 square miles, we have the volnme of water removed-—

v=2°5 × 36 × 10”%=90 × 10” cubic feet.

This quantity of water has to be supplied from the Atlantic without raising the total quantity of salt in the sea. We have seen that the only provision for the removal of the surplus salt is the outward under current in the Straits. Hence the inward upper current must be sufficient to replace the water lost both by evaporation and by the outflow of the under current. We may take the Atlantic water to contain 3°6 per cent. and the Mediterranean to contain 3°9 per cent. of salt. In order that the under current may remove exactly as much salt as is brought in by the upper one, their volumes must be in the inverse ratio of their saline contents, or the volume of the upper current must be to that of the under one in

the ratio 39:36 or 1000: 923; so that only 7-7 per cent.

Thus at Madrid it is 65 inches, or |

of the inflow goes to replace the water removed by evapora- tion, while the remaining 92°3 per cent. replaces the water of the under current. We have then for the total volume of the inward current per annum

100

Vv v=1170 × 10" eubic feet.

la

The width of the Straits from Tarifa to Point Cires is 8

miles, or 48,000 feet, and the average depth of the stream

area is in round numbers 29,000,000 square feet.

may fairly be taken as 100 fathoms; hence the sectional

1 Proc. Roy: Soc. (1872), xx. 97, 414.

Dividing the volume by the area we have for the mean annual flow 1170 × 10

=—99×108~ = 40 × 105 feet.

Reducing this to miles per day, we find that if the above data are correct the inflowing current at the Straits of Gibraltar onght to be equivalent toa current 8 miles wide, 100 fathoms deep, and running with the uniform velocity of 18:3 miles in twenty-four hours. As the currents are reversed with the tides this is the balance of inflow over outflow in the upper current. It is worthy of remark that the flood tide runs to the westward at the surface and the ebb to the eastward. The following table of tides at places inside and outside the Straits will show that the mere differences of level due to the different tidal ranges at adjacent localities are sufficient to cause strong local currents.

i High Water. cris ane oa Rise. Rise. Range ; HM Ft. in. ¥t. in. Ft. in. CUO A .0.3.ncstssvceses 1 30 12 5 8 0 3 6 DENG Lament Acc nessa ness 1 24 1 76 S50 3 16 (WX, oxacdcs octet « ees 12; 39 8 2 Fas (Gomi peste Snr ee 118 12 0 A 8 ies @anegilatareee eso… 1 45 8 0 5 3 2 6 TRE URI: pone ne Oe seee 1 46 6 0 3 6 ie 3 BANC ESIRAS) tase ates cns << 1 49 38 6 Lo GUDTRIMBAT. . CTT iene tamer e coe mere Of oe tf wy 8 PRERURAIIG caiscccecccce ters 22s 26 LEG 0 6 MIPAIBOV ET… cs: se cece eseeuen'- 1 42 8 ie il 2 0 eebchttecssce nactseseeeress 1 46 11 0 fe il oF Mage OP …0… s anne 1 18 12 4 8 0 3 6 a | ae | a | ee

A similar phenomenon is witnessed at the other end of the sea. Here the fresher waters of the Black Sea rush in through the narrow channel of the Dardanelles, causing a surface inflow of comparatively fresh water, while there is an outflow below of denser Mediterranean water. The dimensions of the Straits are too small to make the pheno- menon of any importance for the supply of the Mediter- ranean. The conditions both in the Dardanelles and in the Bosphorus were examined very carefully in the year 1872 by Captain Wharton, R.N., of H.M.S. 'Shear-

water," and his results are published in an interesting report.

to the admiralty, of that date. It is remarkable that the comparatively fresh water of the Black Sea persists without sensible mixture through the Sea of Marmora and into the Dardanelles, while there is constantly a current of Mediterranean water running underneath, and the depth in the two channels is only from 30 to 50 fathoms, There can be little doubt that the saltness of the Black Sea is due wholly to the return current of Mediterranean water enter- ing through the Bosphorus. Were the exit of the Black Sea a channel with sufficient fall to bring the surface of the Sea of Marmora below the level of the highest part of its bottom, so that no return current could take place, the waters of the Black Sea would be fresh.

In the body of the sea the rise and fall are much less than at any of the places in the above table. At Algiers a self-recording tide gauge was set np by Aimé, and from its records he deduced a rise and fall of 88 millim. (say 33 in.) at springs and half that amount at neaps, a fluctuation which would escape ordinary observation, as it would be masked by the effects of atmospheric disturbances. At Venice and in the upper reaches of the Adriatic, the true lunisolar tide seems to be more accentuated than in other parts ; but here also its effects are subordinate to those of the wind. Insummer the Mediterranean is within the northern limit of the north-east trade wind ; consequently, through- out a great part of the year, the winds are tolerably constant

in direction ; and, blowing as they do over large areas of water, they are instrumental in moving large masses of it from one point to another, and so producing streams and currents.

The effect of wind on a surface of water is twofold: it produces the rhythmic motion of waves and the motion of translation of currents. Besides the motion produced by the direct action of the wind on the surface-water, there are currents due in the first instance to the accumulation of water produced by a wind which has been' blowing constantly in one direction. The phenomenon of an abnormally high tidal rise with a gale of wind blowing on shore is one with which inhabitants of the British Islands are familiar. It

is also a matter of frequent observation that, for instance, a south-west gale which exaggerates the height of high water on the western coasts of Britain reduces it on the east coasts. It blows the water on the west coast and off the east coast, so that the difference in the high-water levels on the two coasts is very pronounced. Supposing free communication were quickly made between the two coasts, a current would be the result, and its violence would be much greater than would be due to the local action of the wind on its surface. In the Mediterranean the winds blow during a great portion of the year very constantly from one direction or another, and generally from north and east. The extent of the sea is so great that the slope produced by the transference of the surface water constantly in one direction might have a sine or arc capable of being measured in feet and inches when the radins is as much as 200 miles long. Thus at Port Mahon, in the island of Minorca, according to the Admiralty Sailing Directions, the water rises and falls according to the direction of the wind. With wind from south-east or south-west the water rises, but from north- west or north-east it falls. When northerly or north- westerly winds prevail, and this is the case for two-thirds of the year, a strong current sets to the south-west off Ayre Island, which is reversed in seasons when. south-westerly winds prevail, This current is due to the water escaping round the end of Minorca having been driven southward so as to raise a head on the north coasts of the island. Similarly in the Faro or Strait of Messina the currents, of which the famous Scylla and Charybdis are swirls or eddies, are the evidence of a tendency towards equalizing the levels of the eastern extremity of the western basin and of the western extremity of the eastern basin. In addition to this peculiarity of position with reference to the two basins, it has been found that there is a very strong purely tidal influence at work which alone produces an alteration in — the direction of the currents, and thus adds to the confusion of the waters. At Capo di Faro the rise is scarcely per-ceptible, at Messina it may attain a maximum of 10 to 13 inches. In the Straits of Bonifacio, between Corsica and Sardinia, the currents follow entirely the direction of the prevailing winds, and are at times very rapid. In the channel between Sicily and the African coast the currents also follow the winds. In long periods of calm weather a steady easterly set is observed, no doubt a prolongation or reproduction of the Gibraltar current.

Temperature. —Nothing whatever was known of the temperature of the deep water of the Mediterranean until Saussnre extended to it his classical investigation into that of the Swiss lakes. In October 1780 he sank his thermometer to a depth of 160 fathoms off Genoa and of 320 fathoms off Nice, and at both depths he found the temperature of the water to be 55°°8 F. These observa- tions have a special value, for, owing to Saussure's method of ex- perimenting, his results were not affected by the pressure obtaining at great depths in the sea. Fifty years elapsed before any similar experiments were made, when D'Urville, in the "¢ Astrolabe, made a few observations at the beginning and the end of his famous

expedition. There is some uncertainty about his observations in 1826 and 1829, and also about the later ones of Bérard in 1831, as

we are not informed whether the self-registering instruments used were protceted from pressure or not. Mr Prestwich,! however, who has collected and critically discussed all the older dcep-sea tempera- ture observations, eoncludes, from a eoniparison of their results with those obtained by Aimé with protected instruments, that they were so protected, and adinits their results-into his tables without correction. In the deep water to the northward of the Balearie Islands D'Urville found in April 1826 54°°5 F. in 270 fathoms, and in March 1829 54°-7 at the same depth, and the same temperature (54°°7) in 5380 fathoms. Berard, experimenting in the sea between the Balearic Islands and Algeria, found the temperature of the deep water nearly a degree higher, namely 55°-4 F., in depths of 500 to 1000 fathoms. Aimé? relates his own eareful experiments on the temperature of both surface and deeper water in the neighbourhood of Algiers, and discusses them in connexion with those of other observers with very great ability. He concludes from his own observations and those of Bérard that the nniforin teniperature at great depths is 54°-86 F. From a consideration of the general climate of the Mediterranean, he eomes to the conclusion that the temperature in the deeper layers of the sea ought to be lower than the annual mean of the surface, and that it ought to be not very different from the mean surface temperature in the winter months, Fron: observations at Toulon and Algicrs, he finds that at neither place does the

surface temperature fall below 50° F., and that the mean surface temperatures in the months December, January, February, Mareh, and April is at Toulon 53°:06 F. and at Algicrs 56°°84 F. The mean of these two temperatures is 54°°9 F., which is almost exactly what he finds to be the mean annual temperature of the deepest water of the western basin. During the forty years which have elapsed since Aimé made his experiments and speeulations, further observations have only tended to confirm his theory. It is true that the temperatures observed in the many soundings which have been made of late years have not shown absolute identity of temperature, and it is probable that the greater the refinement in the instruments used the more decided will the local differences appear. Especially it will be apparent that the bottom temperature varies with the climate of the preceding winter, and the distribution of temperature varies much with the prevalence of the winds. At the few stations where the temperature of the sea-water and that of the air are regularly examined, it appcars that the water is generally for the greater part of the year warmer thau the air, and in winter considerably so. The existing observations, however, are too few to justify any very definite statement on the subject. At Palermo the sea is warmer than the air throughout the whole year with the exception of the months May and June. In Algiers Aimé found but little difference ; in autumn and winter the water was slightly warmer, in spring and summer slightly eolder, than the air, In the eastern basin we have first Admiral Spratt's ob- servations in July 1845 in Aigina Gulf. In all his experiments made previous to the year 1860 he determined the temperature of the bottom water by taking that of the mud brought up in the dredge. This is a very excellent method; in fact it is probably the best of all methods if a sufficient quantity of mud be obtaincd. From 1860 he used self-registering unprotected thermometers, which gave results necessarily too high, and it is impossible to apply any reliable correction to them without experimentally determining it on each thermometer whieh was used. By the first method Admiral Spratt found 55°°5 F. at depths between 100 and 200 fathoms.

From these observations it seemed reasonable to eonclude, as Aimé had done, that all over the Mediterranean a practically uni- form temperature is found at all depths greater than 100 or 200 fathoms, and that this temperature is 54° to 56° F. In order thoroughly to investigate this matter, as well as the biological eon- ditions of the deep water of the

Mediterranean, H.MLS. “ Porcupine,” Captain Calver, with Messrs Carpenter and Gwyn Jeffreys, visited the western basin of the Mediterranean in the autumn of 1870. A large number of temperature observations were made in the western basin near its southern evasts, and one sounding with temperature observation in the eastern basin a short distance from the Sicilian eoast, the result of which was to confirm the conelusion arrived at from earlier observations, that, however high the temperature of the surface may be (and it may reach 90° F.), the water becomes rapidly cooler as we go below the surface until we reach a depth of about 100 fathoms, where a tempcrature of 54° to 56° F. is found, and persists without sensible variation to the greatest depths. The average of all the bottom temperatures in the western basin was 54°88 F. Three soundings were made in the intermediate basin to the eastward of Pantellaria in depths of 266, 390, and 445 fathoms, and in each ease the bottom temperature was found to be 56°°5 Peg or about a degree and a half warmer than in the deeper western basin. This is precisely what night have been expected from what we know of inland seas divided into several basins. In summer the shallower basin has usually a higher temperature at the bottom nr ee om

1 Phil. Trans., 1875, part ii. p. 601. 2 Ann, Chem. et Phys., 1845, xv. p. 5.

than is found at the same depth in the deeper one. Only one observation was made in the eastern basin, namely off Cape Passaro, in 1743 fathoms, with a bottom temperature of 56°°0 F. That the temperature in this basin should be lower than in the Pantellaria basin is due to its greater depth, and that it should be higher than is found in the western basin is due to its lower latitude. These researches were further prosecuted in the autumn of 1871 in the ‘ Shearwater,” Captain Nares, accompanied by Dr Carpenter. At two stations in the eastern basin “serial temperatures” were taken. At the first, 35° 54’ N, lat., 16° 23’ E. long., depth 1650 fathoms, the bottom temperature was 56°, or the samme as had been observed the year before in 1743 fathoms ; at the second, 82° 173’ N. lat., 26° 44’ E. long., depth 1970 fathoms, the bottom temperature was 56°°7, and the temperature at all intermediate depths was much higher than at the first station. ‘I’he niean temperature of the water from the surface to a depth of 200 fathoms was, at the first station, 68°°75 F., and + the second 66°78 F., or three degrees*

higher. At the first station all the temperatures down to 100 fathoms are higher than were observed in 1870 in the western basin, but it must be remembered that temperature observations made in different years cannot with justice be elosely compared, as the elimates of the two years are sure to differ considerably, and in the present case the difference in climate between the summers of 1870 and 1871 appears to have been very considerable.

In the autumn of 1881 a very interesting series of observations were made by Captain Magnaghi, hydrographer of the Italian navy, and Professor Gigholi, on board the Italian surveying ship "Washington," in that part of the western basin which is enclosed between the islands Corsica and Sardinia on the one side and the Italian coasts on the other. It is here that the deepest water of the western basin was found; and, apart from the great interest attaching to the physical results obtained, the collections made with the dredge in the comparatively lifeless waters were of the very highest importance, showing, as they did, a practical identity in the abyssal fauna with that of the open oeean. This is the more remarkable as we have hitherto been accustomed to consider the similarity in the fauna of portions of the ocean remotely distant from each other as being due to the likeness of their temperatures. In the Mediterranean, however, the bottom temperature is quite 20° F. higher than is found in great depths anywhere in the open ocean.

For determining the temperature of the dcep water Captain Magnaghi used the half-turn reversing thermometer of Negretti aud Zaimbra, which in itself is a very beautiful instrument. The mechanieal arrangement, however, for reversing, even as improved by Magnaghi, was notso satisfactory, and from eertain irregularities in the temperature observations reported the writer is inclined to think that some of the remarkable results obtained, for instance on the 11th August, are due to this instrumental imperfeetion. On that day the water at 70 metres was found to have a temperature of 25°°1 C., while that at 50 metres was 20°°1C., and that at 90 metres was 16°°7 C. The results obtained in the deep water are no doubt quite reliable, for the temperature is so uniform that a few fathoms more or less in the depth at which it turned would make no difference in the temperature registered. In the more northern parts of this portion of the western basin, off the coast of

Corsica, we find a practically uniform temperature from 250 metres down to the bottom in 2800 metres, the mean bottom temperature being 55°°96 F. Further to the south the temperature of the abyssal water appears to be distinctly higher. Thus between the sonth end of Sardinia and the Bay of Naples, in the deepest water, the praetical uniformity of temperature is not reached until a depth of 1000 metres has been passed, and it is there 56°°7 F. It is un- fortunate that we do not know what the bottom temperature in other parts of the Mediterranean was. In this summer of 1881 it was quite one degree higher than that observed by Dr Carpenter in 1870.

The great value of such a volume of water as an equalizer of tem- perature on its shores must be apparent, though in this respect it is inferior to the Atlantic Ocean in its immediate neighbourhood. Places on the west coast of Spain and Portugal have a much higher winter temperature aud lower summer temperature than places in the same latitude in Italy. The reason of this is simple: on the Atlantic coast the principal winds in winter are from the south-west, and havea warming effect, while insummer the souree of the north- east trade wind is pushed back into the Bay of Biscay, causing in this season constant northerly winds along the eoast of Portugal. The winds of the Mediterranean lave no seas of remote latitudes to draw on either for heating or eooling purposes, though the sandy deserts of Africa which bound its southern coasts have at certain seasons a very decided influence on the elimate. The tempering action of the sea does not extend very far inland, as is evident froin the elimate of inland towns in Italy. As the Mediterranean shores have so much importance as health-resorts, the data pre- sented in the following table are of interest. They are taken ehiefly from Theobald Fischer's Studien tiber das Klima der Mittelmee;- léinder,

Table af mean January temperature (J.), of mean temperature of three winter months, December, January, and February (W.), also Rainfall (R.) in the same three months, for places on the Mediterranean, with those for some others for comparison.

| Place. J. Wo |) Te 4h Place. | J. Wie, {| 3: |

Sets | 8S | Joie cab See eins ui Oepppeecto: 464 | 48:1 [14-2 || Ajaccio… | 50°45 | 52-2 | 8-0 Oportosace-....49:5 |$50:549) 23/1) Ii iniestes…..22-----.../ 39:90) 41e3) | E78 [WIS TG NsSepgcceccoe | 50°54 | 50°9) | 113 |] Corfu …....0eeece0¢/ SOLS | 51°28 | 22° TRABIEA,. wcccns sss | 52-88 | 53°6 9e6 WEA HenSiecs sc scceeten ses 47°57 | 49°2 57 Gibraltar …....| 540 | 545 | 12-4 || Constantinople…... 40°28 | 41°6 | 10-1 Malaga,.....-:..| £0 |57°38 | Jerusalem …....] 48°74 | 49-1 | 12-7 Valencia…..... 50°72 | 52°52 | 4°3 | Port Said….....) 57°38 | 57-2 Mahon…...:<+25 ' §1°62 | 52°52 CAINO ...ssceuvcessccienssls 56°84 | 58-1 Barcelona..... 48°02 49°64} 4:1 |} Alexandria..... 60°0 | 60°71 | 56 Montpellier... :|'12;03"| 43°16 | (9:5 || Suezi.....cse0ceees 56°3 | 56°58 Marseilles..... j43252)|46:04; 35:0 || "Vomisi.....<--..0.0. 53°06 | 55°76 ice, ... sae aes | 46-94 | 48°92] 8°5 |] Algiers .....s0000) 59°18 | 59°65 | 14°4 Mentone..... 48°2 | 48-2 (OE Weerconnesccoccences| SI || 523] EHD San Remo..... 47°48 | 48°38 | 8-0 Genoa .....00- 46-4 | 47°66 | 13-0 ||S. Cruz (Teneriffe).! 63°84 | 64°65 Turin .....006, 32°0 | 35°06 | 4°6 || Funchal (Madeira)..! 60°40 | 61°60 | Milan |32°9 | 35°42] 8-0 | Wemeernt:.-2 36°86 | 39-4 | | Valentia (Ireland)..| 45°00 44°60 | 18°3 Florence ..... 41-54 | 43°16 | 12-0 || Sellly .....008.2.| 44°90 | 45°76 | 12-1 Rome wees, (45-7 |466 | 99 || Jersey.....00. 41°70 | 42-97 | 101 Na@ple@s: ..5.....0 48-2 |} 49°3 ; 10° || Ventnor.....| 41°80 | 42°60 Catania .....5.5661 51°62 527 | 7-5 || Pembroke..... ...| 41°10 | 41-97 | 12-2 Palermo..... 51°62 | 52°7 | 88 | Monach (Hebrides).| 42°90 | 43-27 | 15:9 GUN «se enecesee [dado 1 56:0) "liso (St Wilda. 2o.-....2-.- 44°70 | 44°50 |

i i u

Nature of the Bottom.—In the western basin the bottom consists chiefly of clay of a grey to brownish colour. Without doubt, when freshly collected, the surface layer is reddish-brown and the lower ones dark grey. There is always some carbonate of lime, chiefly due to Foraminifera. The mud very much resembles that obtained from similar depths in those parts of the open ocean whose bottom waters are shut off from free communication by ridges which may not approach within 2000 or 1500 fathoms of the surface, and with the exception of the Foraminifera it much resembles the mnd from enclosed and comparatively shallow basins off the west coast of Scotland.

In the following table the analyses are given of a few sainples on the line of the submarine cable connecting Marscilles with Algiers.

Locality. Composition per Cent.

‘{nsolnble in HCI. | Soluble in T1C1

| | Latltnde | Longitude | a 3 , ‘ | Si0> in

E. ‘Fathoms. Residne. Résitne |CaCO,! FeO;

| : FeO | Al,O;

37° 30°

‘

3° 23° | 1,343 66°15 63°98 | 19°79 | 3°09 | 0°39 | 3-46 eo ae ee 1,469 39°16 79°98 | 38°25 | 2:44 | 0°25 |10°98 | 39° 26° 4° 36’ 782 28°13 78°98 | 47°50 | 2-21 | 0°20 | 2°54 | 42° 47° 5° 11 ee) 43°63 GO1G | 51°52 | 2°09 | 0-33 | 4°26 | Ca a) ee 265 48-04 78°60 40 | 0°36

4°58

| 30°80 2 H |

To the student of the physical conditions of the sea the Mediter- ranean possesses a very high interest ; its size is such as to entitle it to rank among oceans, while it is so completely cut off from the remaining world of water that it presents us with a type which is purely local, and one might almost say provincial. dis Wo 1B)

MEDLAR, Afespilus Germanica, L., of the tribe Pomex of the order Hosacex, regarded by Bentham and Hooker as a subgenus of Pyrus (Gen. Pl., i. 6263; see also DC., Prod., u. G33; Trams. Lim. Soc., xi. 99), is a native of European woods, &c., fron: Holland southwards, and of western Asia (London, Ard., ii. 877). It occurs in hedges, &c., in middle and south England, as a small much-branched spinous tree, but is not indigenous to Great Britain (Hooker’s Stud. Fl. of Br. Isles, 132; Baxter’s Brit. Gen. of Pl.,

493, and Mag. Nat. LYist., vol. ix. 86). The medlar was well known to the ancients. Pickering (Chron. Mist. of Pl., 201) identifies it with a tree mentioned in a Siao-ya ode (She-Aing, ii. 1, 2), 827 Bc. It is the peotiAn of Theophrastus and AMespilus of Pliny. Loudon (.c.) gives three varieties, diffusa, stricta, and sylvestris,— the last being spiny, but losing its spines under cultivation, —as wellas four varieties of fruit. He also mentions several instances of large specimens throughout England. The well-known fruit is globular, but depressed above, with leafy persistent sepals, and contains stones of a hemispherical shape. It is uot fit to eat until it begins to decay. (Hor culture of the medlar see HorticuLtuRE.) The Japanese medlar is Hriobotrya japonica, L, a genus of the same tribe of Mosacez.

| Delft in 1632.

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MED—MEE

MEDOC is the name given to the district in France adjoining the left bank of the Gironde from Ambés, the point where the Garonne and Dordogne unite, to Lespane, where the marshes and polders which border on the mouth of the river begin ; its length varies froin 35 to 40 miles, its breadth from 12 to 5, and the area is about 386 square miles. It is formed by a number of low hills, which

| separate the Landes from the Gironde, and is traversed

only by small streams; the Gironde itself is muddy, and often enveloped in fog, and the region as a whole is very

far from being picturesque; but a fifth part of its soil is

occupied by vineyards, the products of which form the finest growths of Bordeaux. Of these the most esteemed are Chateau-Margaux, Chateau-Laffitte, and Clateau-Latour, Prior to the ravages of the Phylloxera, the annual product of the Médoc district was 40,000 tuns, of which 9000 were of fine quality.

MEDUSA. See Gorcon, vol. x. p. 785. Hyprozoa, vol. xii. p. 547 sy.

MEDYN, a district town of Russia, situated in the government of Kaluga, 39 miles north-west of the capital of the province, on the highway from Moscow to Warsaw. It was formerly known under the naine of Mezetsk, and in the 14th century formed part of the Sinolensk principality. The soil of the surrounding country being rather infertile, the population is engaged to some extent in manufactures of linen, cotton, and paper, and the merchants of Medyn carry on a brisk trade in this produce, as well as in rye, oats, and hemp seed. The population is 8000.

MEER, Jan VAN DER (1632-1675), of Delft,—not to be confounded with the elder or younger Van der Meer of Haarlem or with Van der Meer of Utreclit,—is one of the excellent painters of Holland about whom the Duteh biographers give us little information.1. Van der Meer, or Vermeer, by which naine he is also known, was born in There is a tradition, handed down by the Dutch writers, that he was a pupil of Carel Fabritins, but, in the strict sense of the word, this is almost impossible, for Fabritius was but eight years older than Van der Meer, aud entered the guild of St Luke only one year before our painter. From his early death the works by Fabritius are few, but his contemporaries speak of him as a man of re- markable power, and the paintings now ascertained to be from his hand, and till recently ascribed to Rembrandt,

See also

prove him to have been deeply imbued with the spirit , and manner of that master.

Whether Van der Meer had ever any closer relation to Rembrandt than through com-

_paniouship with Fabritius remains as yet uncertain. In

1653 he married Catherine Bolenes, and in the same year he entered the guild of St Luke of Delft, becoming one of the heads of the guild in 1662, and again in 1670. He died at Delft in 1675, leiving a widow and eight children. His circumstances cannot have been flourishing, for at lus death

he left twenty-six pictures undisposed of, and his widow had to apply to the court of insolvency to be placed under a curator, who, it is interesting to know, was Leeuwenhoek, the naturalist. ,

It is his works, however, that claim our attention. For more than two centuries he has been almost completely forgotten, aud his pictures have been sold under the names EEE Ee

1 'This undeserved neglect seems to have fallen on him at an early period, for Houbraken (Groote Schouburgh, 1718), writing little more than forty years after his death, does not even mention him. The only definite information we have from a contemporary 1s given by Bleyswijck (Beschrijving der Stad Delft. 1687), who tells us that he was born in 1632, and that he worked along with Carl Fabritius, all able disciple of Rembrandt, who lost his life by an explosion of a powder magazine in Delft in 1654, It is to the patient researches of W. Biirger (Th. Dore), Havard, Obreen, Soutendam, and others that we owe our knowledge of the main facts of his life, discovered in the archives of his native town.

and forged signatures of the more popular De Hooch, Metzu, Terborch, and even of Rembrandt. The honour of first recalling the attention of the art-world to this most original painter belongs undoubtedly to Thoré, an exiled Frenchman, who described his then known works in his Musées de la Hollande (1858-60), published under the assumed uame of W. Birger. The result of his researches, continued in his Gulerte Suermondt and Galerie d'Aren-

berg, was alterwards given by him in a charming, though |

incomplete, mouograph (Gazette des Beaux-Arts, 1866, pp. 297, 458, 542). The task has since been prosecuted with success by Havard (Les Artistes I]ollanduis), and by Obreen (.Vederlandsche Kunstgeschiedenis, Dl. iv.), and we are now in a positiou to refer to Van der Meer's works. His pictures are rarely dated, but, luckily for us, one of the most important bears the date 1656, and thus gives us akey to lis styles. The picture referred to is the only one that has figures of life size. It is the Woman and Soldier, with other

two figures, of the Dresden gallery, and is painted with remarkable power and_ boldness, great command over the resources of colour, aud with wonderful expression of life. For strength and colour it more than holds its own beside the neighbouring Renibrandts. To this early period of his career belong, from internal evidence, the Reading Girl of the same gallery, the luminous and masterly view of Delft in the museum of the Hague, La Laitiére and the small street view, both in the collection of M. Six van Hillegom at Amsterdam, Le Soldat et la Fillette qui Rit of M. Double, the Country House in the gallery at Berlin, and others. In all these we find the same brilliant style and vigorous work, a solid impasto and a crisp sparkling touch. His first manner seems to have been influenced by the pleiad of painters circling round Rembrandt, a school which we know lost favour in Holland in the last quarter of the century. During the last ten or twelve years of his life Vau der Meer adopted a second manner. We now find his painting smooth and thin, and his colours paler and softer. Instead of masculine vigour we have refined delicacy and subtlety, but in both styles beauty of tone and perfect harmony are conspicuous. Through all his work may be traced his love of lemon-yellow and of blue of all shades. Of his second style typical examples are to be seen in La Coquette of the Brunswick gallery, in the Woman Reading in the Van der Hoop collection at the Hague, in the Lady at a Casement belonging to Lord Powerscourt (exhibited at Burlington House, 1878), and in the Music Master and Pupil belonging. to the Queen (exhibited at Burlington House, 1876).

Van der Mecr's works are cxtremely rare. There is but one in the Louvre, the Lace Maker; Dresden has the two above-nien- tioned, while Berlin has three, all acquired in the Suermondt collec- tion, and the Czernin gallery of Vienna is fortunate in possessing a fine picture, believed to represent the artist in his studio. In the Arenberg gallery at Brussels there is a remarkable head of a girl, half the size of life, which seems to be intermediate between his two styles. Several of his paintings are to be found in private foreign collections. In all his work there is a singular completeness and eharm. In rendering momentary expression he is a inaster, and his pictures attract by the perfect delineation of character as well as by the technical skill of the painter. with pearly shadows, and the lighting of his interiors is equal and natural. In all cases his figures seem to move in light and air, and in this respect he resembles greatly his fellow-worker De Hooeh, who entered the

guild of St Luke only two years later than Van der Meer. It is curious to read that, at one of the auctions in Amster- dam about the middle of last century, a De Hooch is praised as being " nearly equal to the famous Van der Meer of Delft." So nearly are they allied that the best judges are divided in opinion whether the Dutch Family (" La Promenade") of the academy of Vicnna should be attributed to our painter or to De Hooch.

Doubtless many of Van der Meer's works have yet to be restored to their proper author; but, as he is now in vogue, mucli care will

| In like manuer it ig called in French écume de mer.

have to be used in judging. lus is specially truc in regard to the landscapes and 'still life" subjects which are attributed to him. The task is made more difficult by the diversity of style of this '¢ Protean painter,"' as he is called by Dr Waagen, or, as Birger names him, "the Sphinx of Delft."

MEERANE, a rapidly increasing industrial town in south-eastern Saxony, lies in the district of Zwickau, about 37 miles to the south of Leipsic. It contains an old church, a " Realschule," and a technical school fur weavers. The leading industry is the weaving of woollen and half- woollen cloth, employing 3000 power-looms and 15,000 hand-looms, and producing goods of the annual value of upwards of £200,000. A large proportion of the cloth is exported to America and Japan. Meerane also possesses several important dye-works, besides smaller industrial establishinents of various kinds. The population in 1880 was 22,293.

MEERSCHAUM. 'This German name is applied tu a certain mineral, in consequence of its lightness, softness, and white colour, which suggest a resemblance to "sea foani." By the German mineralogist Glocker it was termed sepvolite, in allusion to its resemblance to the so-called bone of the sepia or cuttle-fish. Possibly the fact that pieces of meerschaum, washed out of their matrix, are occasionally found floating on the Black Sea, may have led to the association of the mineral with marine products. Meer- schaum is an opaque earthy mineral, of white, greyish, or yellowish colour, compact in texture, and breaking with a conchoidal or fine earthy fracture ; it

adheres to the tongue, and is so soft as to be scratched by the nail, its degree of hardness being about 2 or 2°5. Its specific gravity varies from 0°988 to 1:279; hence it floats in sea-water until saturated. Meerschaui is a hydrated silicate of mag- nesium, represented by the formula Mg,Si,O,+2H,O. The value of n, according to some analyses, is 2. Most of our meerschaum comes from Asia Minor, especially from the plains of Eski-shehr, where it occurs in nodular masses, of variable size and irregular shape, distributed through the alluvial deposits of the plain, which are systematically worked for its extraction by means of pits and galleries. The mineral is associated with magnesite, or carbonate of magnesium, and has probably been derived from the neigh- bouring mountains, where a similar carbonate is found in conuexion with serpentine. Meerschaum is found also, though less abundantly, in Greece and in some of the Grecian islands ; at Hrubschitz in Moravia, where it occurs in a serpentinous matrix ; and iu Morocco, where it is used,

| when soft and fresh, as a substitute for soap; while a

coarse variety is found at Vallecas near Madrid, and is employed as a building stone. Meerschaum also occurs in South Carolina.

By far the greatest quantity of meerschaum is used in the manu- facture of tobacco-pipes, a purpose for which it is well fitted:by its porosity. The nodular masses ure first roughly scraped in order to remove the red earthy matrix ; they are then dried, scraped again, and finally polished with wax. In this state the rudely-shaped nodular pieces are sent from the East principally to Vienna and to various parts of Germany. The pipe-bowls, after having been turned and earved, are rubbed with glass-paper and Dutch rushes ; they are next boiled in wax, spermaceti, or stearine, and afterwards sub-

His tone is usually silvery | jected to careful polishing with bone-ash, chalk, &c.

An imitation of meerschaum for common pipes is made of hard- ened plaster of Paris, treated with paraffin, and coloured by gam- boge and dragon's blood. A peculiar preparation, into which potato largely enters, is

said to have been successfully employed in France as a substitute for meerschaum.

MEERUT, or Miratu, a district in the division! of 1 The division lies between 27° 38’ and 30° 57’ N. lat., and between 77° 7' and 78° 42’ E. long., and eomprises the six districts of Dehra

Dun, Saharanpur, Muzaffarnagar, Meerut, Bulandshahr, and Aligarh. The area in 1878 was 11,138 square miles, and the population in 1872

4,977,173.

Meerut and the lieutenant-governorship of the North- Western Provinces, India, lying between 28° 28’ and 29° 18’ N. lat., and 77° 10’ and 78° 14’F. long., is bounded ou the N. by Muzaffarnagar district, on the E. by the Ganges, on the 8. by Bulandshahr district, and on the W. by the Jumna. The area in 1881 was given as 2361 square miles. Meerut forms a portion of the long and narrow plain lying between the Ganges and the Jumna, with a very gentle slope from north to south. Though well wooded in places and abundantly supplied with

Inango groves, it has but few patches of jungle or waste |

land to break the general expause of cultivated soil. Sandy ridges run along the low watersheds which separate the minor channels, but with this exception the whole district is one continuous expanse of careful and prosperous tillage. Its fertility is largely due to the system of irriga- tion canals, which intersect it in every direction. The eastern Jumna canal runs through the whole length of the district, and supplies the rich tract between the Jumna and the Hindan with a network of distributary streams. The main branch of the Ganges canal passes across the centre of the plateau in a sweeping curve, and waters the midland tract. The Antpshahr branch supplies irrigation to the Ganges slope. Besides these natural and artificial channels, the country is everywhere cut up by small water-courses, The

Burh Ganga, or ancient bed of the Ganges, lies at some distance from the modern stream; and on its bank stood the abandoned city of Hastinapur, the legendary capital of the Pandavas at the period of the Mahdbhdrata, said to have been deserted many centuries before the Christian era, owing to the encroachments of the river.

The census of 1872 returned the population of the district at 1,276,104, the Hindus numbering 991,226. Among the higher castes Brahmans muster strong (109,804). The Rajputs (both Hindus and Mohaminedans) number 55,083, and enjoy great social distinction as landholders ; the Banids, or traders (66,942), also now hold considerable landed property. The great cultivating castes are the Chamars (197,273) and Jats (145,514). The Gujars (60,350) are a pastoral tribe, with an ancient character for plunder and cattle-lifting, which is now passing away. The Mohaminedans (281,857) are for the most part the descendants of converted Hindus. The Christian population consists of 2149 Europeans, 142 Eurasians, and 730 natives. Fifteen towns in the district con- tain a population excceding 5000 ; namely, Meerut, 81,386 ; Hapur, 14,544; Sardhana, 12,466 ; Garhmukhtesar, 7962; Bagpat, 7367 2 Ghaziabad, 7365 ; Shahdara, 7257; Baro, 7056; Mawana, 6864 ; Pilkhua, 6239; Khekara, 6045; Tikri, 5698; Kirthal, 5651; Dasna, 5605 ; Chaprauli, 5594.

Meerut is one of the most flourishing and best tilled districts of the Doab. Out of a total area of 1,505,824 acres, as many as 1,048,221 were under cultivation in 1881, 281,095 acres being irrigated by Governinent works, and 303,526 by private individuals. The grazing lands comprehended 242,091 acres, and the waste 185,400. The condition both of agricultural labourers and of artisans and workmen in the towns has considerably improved of late years. About one-half the soil is cultivated by the proprietors themselves, the remainder being about equally divided between tenants with occupancy rights and tenants-at-will. Rents are paid in money, and range from 18s. 10d. per acre for the best canal- watered lands down to 2s. 53d. per acre for "dry" unirrigated soils. The chief exports of the district are grain, cotton, and indigo ; and the principal imports are Manchester goods, English hardware, tobacco, drugs, and spices. The chief commercial centres are Meerut, Ghaziabad, and Bagpat. Besides the great waterways of the Jumna and Ganges, and the navigable canals,

cormmunication is afforded by the East Indian and the Punjab and Delhi Railways ; also by 1505 miles of made roads. In 1876 the district was in the administrative charge of four covenanted civilians, and contained seventeen magisterial and fifteen civil courts. The gross revenue in 1881 was £248,754, of which #208,977 was derived from the land-tax; the cost of officials and police was £27,520. In 1881 there were 214 schools, attended by 6677 pupils. The comparatively high latitude and elevated posi- tion of Meerut make it one of the healthiest districts in the plains of India, The average temperature varics from 57° Fahr. in Janu- ary to 87° in June. The rainfall is small, less than 30 inches annually. The only endemic disease in the district is malarial fever ; but small-pox and cholera occasionally visit it as epidemics.

The authentic history of the district commences with the

Until the llth century it is probable that

Moslem invasions. Meerut was mainly in the hands of predatory native tribes,

such as the Jats and Dors. The first undoubted Mohammedan invasion was that of Kutab-ud-din in 1191, when Meerut town was taken, and all the Hindu temples turned into mosyues. In 1398 Tintar swooped down upon the district, captured the fort of Loni after a desperate resistance, and put all his Hindu prisoners to death. He then proceeded to Delhi, and after his memorable sack of that city, returned to Meerut, captured the town, razed all the fortificatious and houses of the Hindus, and put the male inhabi- tants to the sword. The firm establishment of the great Mughal dynasty in the 16th century, under Babar and his successors, gave Meerut a period of internal tranquillity and royal favour. Afterthe death of Aurangzeb, however, it was exposed to alternate Sikh and Mahratta invasions. From 1707 till 1775 the country was the scene of one perpetual strife, and was only rescued from anarchy by the exertions of the military adventurer Walter Reinhardt, afterwards the husband of the celebrated Begam Samru, who established himself at Sardhana in the north, and ruled a large estate. The southern tract, however, remained in its anarchic condition under

Mahratta exactions until the fall of Delhi in 1808, when the whole of the country between the Jumna and the Ganges was ccded by Sindhia to the British. It was formed into a separate district in 1818. In the British period it has become memorable as being the place where the first outbreak of the great mutiny of 1857 took place.

MEERUT, a city;and cantonment in the above district, is situated about half way between the Ganges and the Jumna, in 29° 0' 41" N. lat. and 77° 45' 3" E. long. The city proper lies south of the cantonments, and although a very ancient town, dating as far back as the days of the Buddhist emperor Asoka (circ. 250 3.c.), Meerut owes its modern importance to its selection by the British Govern- ment as the site of a great military station. In 1805 it is mentioned as "a ruined depopulated town." The canton- ment was established in 1806, and the population rose rapidly to 29,014 in 1847, and 82,035 in 1853. In 1872 the census returned the population (exclusive of the military) at 81,386, viz., Hindus, 47,606 ; Mohammedans, 33,532 ; Christians, 248. The slight decline of populatiou between 1853 and 1872 may probably be attributed to the mutiny of 1857. Most of the streets have a poor appearance, owing to the hasty manner in which they were erected. 'The cantonment, a little to the north of the city, forms the headquarters of a military division. The prin- cipal building is the Meerut church with its handsome tall spire. There are also a Roman Catholic church, mission vhapel, asylum for the relief of Europeans and Christians, andaclub. The Mall is one of the finest drives in India.

MEGALOPOLIS, a city of southem Arcadia, situated in a plain about 20 miles south-west of Tegea, on both banks of the Helisson, about 2} miles above its junction with the Alpheus. Like Messene, it owed its origin to Epamin- ondas, and was founded in 370 3.c, the year after the battle of Leuctra, as a bulwark for the southern Arcadians against Sparta, and as the seat of the Arcadian federal diet, which consisted of ten thousand men. 'The builders of the city were protected by a Theban force, and directed by ten native cecists, who likewise attended to the peopling of the new city, which apparently drew inhabitants from all parts of Arcadia, but more especially from the neighbouring districts of Meenalia and Parrhasia. Forty townships are mentioned by Pausanias (viii. 27, 3-5) as having been incorporated in it. It was fifty stadia in circumference, and was surrounded with strong

walls. Its territory was the largest in Arcadia, extending northward 24 miles. The city was built on a magnificent scale, and adorned with many handsome buildings, both public and private. Its temples contained many ancient statues brought from the towns incorporated in it. On the north side of the Helisson, which divided it into two nearly equal parts, was the agora with four porticos, the gymna- sium, a sacred grove, temples to the Lycean Zeus, Pan Oinoeis, Rhea, Tyche, the great goddesses (Demeter and Core), Zeus Philios (with a statue by Polycletus), Aphro-

dite, Core, Athena Polias, and Hera Teleia. Among the numerous statues which stood in the open air the finest was that of Apollo Epicurius, 12 feet high, brought from the beautiful temple of Basse, which was built by Ictinus, and is still in great part standing. On the south side of the river were the theatre, the largest in Greece, the Thersilion or hall for the assembly of the Arcadian diet, a house built for Alexander the Great, with a statue of Zeus Ammon, the stadium, temples to the Muses, Apollo, and Hermes, to Aphrodite, to Ares, to Dionysus, to Hercules and Hermes, to Artemis Agrotera, to Asclepius and Hygiea, to the son of Asclepius, and to Apollo. Of all these buildings, with the exception of the theatre, hardly a trace remains above ground. The ruins of Megalopolis are near Sinanou.

The foundations of Megalopolis were hardly laid when Agesilaus undertook an expedition in the hope of breaking up the union of which it was the visible sign and capital. He accomplished nothing, and had hardly reached home when the Thebans and their allies under Epaminondas and Pelopidas entered the Pelopon- nesus and marched through Laconia almost unopposed. After the departure of Epaminondas, Lycomedes of Mantinea succeeded in drawing the Arcadian federation away from its alliance with Thebes, in consequence of which it had to make common cause with Athens. An attempt on the part of the federation to use the treasures of the temple of Zeus at Olympia led to internal disgensions, so that in the battle of Mantinea (362) one half of the Arcadians fought on the side of the Spartans, the other on that of the Thebans. After this battle many of the inhabitants of Megalopolis sought te return to their former homes, and it was only by the assistance of threc thousand Thebans under Pammenes that the authorities

were able to prevent them from doing so. In the year 352, when Thebes had her hands full with the so-called Sacred War, the Spartans made an attempt to reduce Megalopolis; but the Thebans promptly sent assistance, and the city was rescued. Not sure of this assistance, the Megalopolitans had appealed to Athens, an appeal which gave occasion to Demosthenes's oration Mep) Meyadorodrtav. The Spartans were now obliged to conclude peace with Megalopolis and acknowledge her autonomy. Nevertheless their feeling of hostility did not cease, and Megalopolis consequently entered into friendly relations with Philip of Macedon. Twenty years later, when the Spartans and their allies rebelled against the power of Macedon, Megalopolis remained firm in its allegiance, and was subjected to a siege of considerable duration. After the death of Alexander, Megalopolis was governed by native tyrants. In the war betwcen Cassander and Polysperchion it took part with the former, and was, in consequence, besieged by the latter. On this occasion it was able to send into the field an army of fifteen thousand. In 234 R.c. Lydiades, the last tyrant of Megalopolis, voluntarily resigned his power, and the city joined the Achean league, In consequence of this it was once morc exposed to the bitter hatred of Sparta. In 222 Cleomenes took and plundered it, and killed or dispersed its inhabitants, but in the year following it was restored and its inhabitants reinstated by Philopcemen, a native of the city. At this time the circuit of its walls always too great, seems to have been contracted. At all events it never again attained political importance, and gradually sank into insignificance. The only great men whom it produced were Philopcemen and Polybius the his- torian. Lycortas, the father of the latter, may be accounted a third. In the time of Pausanias the city was mostly in ruins,

MEGALOSAURUS. See REprizs.

MEGAPODE, the name given generally to a small but remarkable Family of birds, highly characteristic of some parts of the Australian Region, to which it is almost peculiar. The Aegapodiide with the Cracide form that division of the Order Gallinz named by Professor Huxley Peristeropodes (Proc. Zool. Society, 1868, p. 296), aud morphologically seem to be the lowest of the Order, with which apparent fact may perhaps be correlated their singular habit of leaving their eggs to be hatched without incuba- tion, burying them in the ground (as many Reptiles do) or heaping over them a

mound of earth, leaves, and rotten wood. This habit attracted attention more than three hundred years ago,! but the accounts given of it by various

- *Antonio Pigafetta, one of the survivors of Magellan's glorious but disastrous voyage, records in his journal, under date of April 1521, among the peculiarities of the Philippine Islands, then first discovered by Europeans, the existence of a bird there, about the size of a Fowl,*

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travellers were generally discredited by naturalists," and as examples of the birds, probably from their unattractive plumage, appear not to have been brought to Europe, no one of them was seen by any ornithologist or scientifically described until near the end of the first quarter of the present century. The first member of the Family to receive authoritative recognition was one of the largest, inhabiting the continent of Australia, where it is known as the Brush-Turkey, and was originally described by Latham in 1821 under the uame of the New-Holland Vulture, a misleading designation which he subsequently tried to correct on perceiving its, Galline character. It is the Talegallus lathami of modern ornithologists, and is nearly the size of a hen Turkey. Six smaller species of the same genus have since been described, all from New Guinea or the neighbouring islands, but two of them, 7. pyrrhopygius and T, bruyni, have been separated to form 2 group "Apypodius. 'The Australian bird is of a sooty- brown colour, relieved beneath by the lighter edging of some of the feathers, but the head and neck are nearly bare, beset with fine bristles, the skin being of a deep pinkish-red, passing above the breast into a large wattle of bright yellow. The tail is commouly carried upright and partly folded, something like that of a domestic Fowl.

The next form of which we may speak is another inhabitant of Australia, commonly known in England as the Mallee-bird, but to the colonists as the ' Native Pheasant "'—the Lipoa ocellata, described by Gould in the zoological Proceedings for 1840 (p. 126), which has much shorter tarsi and toes, the head entirely clothed, and the tail expanded. Its plumage presents

a pleasing combina- tion of greys and browns of various tints, interspersed with black, white, and buff, the wing-coverts and feathers

which laid its eggs, as big as a Duck's, in the sand, and left them to be hatched by the heat of the sun (Premier Voyage autour du Monde, ed. Amoretti, Paris, A.R. ix. p. 88). More than a hundred years later the Jesuit Nieremberg, in his Historia Naturw, published at Antwerp in 1635, described (p. 207) a bird called " Daie," and by the natives named ' Tapun," not larger than a Dove, which, with its

| tail (!) and feet, excavated a nest in sandy places and laid therein

eggs bigger than those of a Goose. The publication at Rome in 1651 of Hernandez's Hist. Avium Nove Hispanie shews that his papers must have been accessible to Nieremberg, who took from them the passage just mentioned, but, as not unusual with him, misprinted the names which stand in Hernandez's work (p. 56, cap. 220) ' Daic" and "Tapum " respectively, and omitted his predecessor's important addition "Viuit in Philippicis." Not long after, the Dominican Navarrete, a missionary to China, made a considerable stay in the Philippines, and returning to Europe in 1673 wrote an account of the Chinese empire, of which Churchill (Collection of Voyages and Travels, vol. i.) gave an English translation in 1704. It is therein stated (p. 45) that in many of the islands of the Malay Archipelago " there is a very singular bird call'd Zabon," and that " What I and many more admire is, that it being no bigger in Body than an ordinary Chicken, tho' long legg'd, yet it lays an Egg larger than a Gooses, so that the Egg is bigger than the bird itself. . . . In order to lay its Eggs, it digs in the Sand above a yard in depth; after laying, it fills up the hole and makes it even with the rest; there the Eggs hatcli with the heat of the Sun and Sand." He adds further information which need not be quoted here. Gemelli Careri, who travelled from 1663 to 1699, and in the latter year published an account of his voyage ronnd the world, gives similar evidence respecting this remark- able bird, which he calls '* Tavon," in the Philippine Islands (Voy. du tour du Monde, ed, Paris, 1727, v. pp. 157, 158). The Megapode of Luzon is fairly described by Camel or Camelli in his observations on the Birds of the Philippines communicated by Petiver to the Royal Society in 1703 (Phil. Trans., xxiii. p. 1398). In 1726 Valentyn published his elaborate*

work on the East Indies, wherein (deel iii. bk. v. p. 320) he very correctly describes the Megapode of Amboina under the name of " Malleloe," and also a larger kind found in Celebes, so as to shew he had in the course of his long residence in the Dutch settlements become personally acquainted with both.

- *Thus Willughby (Ornithologia, p. 297), or Ray for him, who had, however, only Nieremberg's evidence to cite, and they can scarcely be blamed for their hesitation, considering the number of other marvels narrated by the same worthy father. Buffon also (Oiseaux, ix. p. 436) was just as sceptical in regard to the relation of Careri,*

of the back bearing each near the tip an oval or subcircular patch, whence the trivial scientific name of the bird is given, while a stripe of black feathers with a median line of white extends down the front of the throat, from the chin to the breast. There is but one species of this genus known, as is also the case with the next to be mentioned, which is a singular bird long known to inhabit Celebes, but not fully described until 1846,! when it received from Salomon Miiller (Arch. f. Vaturgeschichte, xii. pt. 1, p. 116) the name of Afacrocephalon maleo, but, being shortly afterwards figured by Gray and Mitchell (Gen. Birds, iii. pl. 123) under the generic term of Megacephalon, has since commonly borne the latter appellation. This is a very remarkable form, bearing a helmet-like protuberance on the back of its head, all of which as well as the neck is bare and of a bright red colour; the plumage of the body is glossy black above, and beneath roseate-white.

Of the Megapodes proper, constituting the genus Megapodius, many species have been described, but authori- ties are greatly at variance as to the validity of several, and here it would be impossible to name all that have been supposed to exist. Some are only known from very young examples—mere chickens; and some have even been described from their eggs alone. In 1870 Mr G. R. Gray enumerated twenty species, of which sixteen were repre- sented in the British Mussum, and several have been described since; but ten years later Professor Schlegel recognized only seventeen species, of which examples of twelve were contained in the Leyden Museum (Jfus. des Pays- Bas, viti., Monogr. 41, pp. 56-86), while M. Oustalet, in his elaborate

monograph of the Family (Anz. Sc. Nat., Zoologie, ser. 6, vols. x. and xi.), admits nineteen species. The birds of this genus range from the Samoa Islands in the east, through the Tonga group, to the New He- brides, the northern part of Australia, New Guinea and its neighbouring islands, Celebes, the Pelew Islands, and the Ladrones, and have also outliers in detached portions of the Indian Region, as the Philippines (where indeed they were first discovered by Europeans), Labuan, and even the Nicobars—though none are known from the intervening islands of Borneo, Java, or Sumatra. Within what may be deemed their proper area they are found, says Mr Wallace (Geogr. Distr. Animals, ii. p. 341) "on the smallest islands and sand-banks, and can evidently pass over a few miles of sea with ease." Indced proof of their roaming disposition.is afforded by the fact that the bird described by Lesson (Voy. Coquille: Zoologie, p. 703) as Alecthelia urvillti, but now considered to be the young of Megapodius freycinett, flew on board his ship when more than 2 miles from the nearest land (Guebé), in an exhausted state, it is true, but that may be attributed to its extreme youth. The species of Mfegapodius are about the size of small Fowls, the head generally crested, the tail very short, the feet enormously large, and, with the exception of Jf. wallacit (Proc. Zool. Society, 1860, Aves, pl. 171), from the Moluccas, all have a sombre plumage.

The extraordinary habit possessed by the Megapodes generally of relieving themselves of the duty of incuba- tion, as before mentioned,—a habit which originally attracted the attention of travellers, whose stories were on that very account discredited,—as well as the highly developed condition of the young at birth, has been so fully described by Gould (//andb. B. Australia, ii. pp. 152- 175), G. R. Gray (Proc. Zool. Society, 1861, pp. 292-296), and Mr Wallace (dfalay Archipelago, i. pp. 415-419 ; ii. pp. 147-149), and so often repeated by other writers, as to

? As we have seen, it was mentioned in 1726 by Valentyn, and a young example was in 1830 described and figured by Quoy and Gaim- ard (Voy. de l'Astrolabe: Oiseaux, p. 239, pl. 25) as the Mega- podius rubripes of Temminck, a wholly different bird.

be very commonly known, and here there seems no necessity to enter into further details concerning it. (A. N.)

MEGARA was the name of two Greck towns, one in Sicily, which has been already described under Hysta, the other on the road from Attica to Corinth. The country which belonged to the city was called Meyapis or Meyapixy ; it occupied the broader part of the isthmus between Attica, Boeotia, Corinth, and the two gulfs, and its whole area is estimated by Clinton at 143 square miles, The range of Mount Geraneia extends across the country from east to west, forming a barrier between continental Greece and the Peloponnesus. The shortest road across this range passes along the eastern side of the mountains, and the most difficult part is the celebrated Scironian rocks, the mythic home of the robber Scirou. The only plain in the rugged little country was the White Plain, in which was situated the only important town, Megara. The town was one of the most important commercial and colonizing centres of Greece in early times, and there is no doubt that its trade, like that of Corinth, owed its origin to the Phcenicians, who found its situation on the isthmus convenient. It became a Dorian city when that tribe conquered tle Peloponnesus. Like many other cities of Greece, Megara was formed out of five villages, which were united on one political foundation ; and this event must have taken place not later than the middle of the Sth century. From this time for two centuries Megara was among the most powerful cities of Greece. Though it had a harbour called Pege on the Corinthian Gulf, and founded a Sicilian colony, Megara Hyblea, in 728 no, yet it did not long compete with Corinth and Coreyra for the western trade. Niszea on the Saronic Gulf was a better harbour, and gave tle Megarians a stronger footing on the eastern seas. In order to keep their hold on the Black Sea traffic, they founded numerous trading stations along- side of their chief rivals, the people of Miletus: Chalcedon and Byzantium on the Bosphorus, and Astacus and Heraclea in Bithynia were colonies of Megara. Wealth and cultnre increased in the city; the country festivals were celebrated in a more elaborate and orderly manner, and Snsarion of Tripodiscus first gave literary form to Grecian comedy, which was soon transferred to Attica.

The situation of Megaris on the isthmus gave it great political power, inasmuch as it commanded all the roads from the Peloponnesus into

continental Greece; and so long as the people continued united under an orderly government they maintained their ligh position. But the development of education prompted the lower classes to demand from the nobles an equal share in the govern- ment, and Megara did not, like Athens and Sparta, produce a constitution which could reconcile the contending parties. A tyrant Theagenes raised himself to supreme power as the leader of the popular party; he made an aqueduct for the city, and appears to have maintained its power and splendour. But he was expelled by the nobles about 600 B.c, and for many years Megara was the scene of continual struggles. The poor, who were indebted to the rich, refused to pay what they counted exorbitant interest, and plundered the houses of the nobles. A vivid picture of the state of the city in the 6th century B.c. is preserved in the writings of the poet Theognis, who belonged to the aristocratic party. Meanwhile Athens was rising to power, and maintained a long war with Megara for the island of Salamis. The Megarians gradually lost strength, and finally Solon wrested the island from them for ever. They sent three thousand troops to fight at Platea. In the wars between Athens and Sparta they were impelled by jealousy of their neighbours of Corinth to join the Athenian alliance, 455-45; but they soon | found that they were only the subjects of Athens, and finally

enrolled themselves among the allies of Sparta.

suffered terribly during the Peloponnesian War: Athenian | ships blockaded their harbours and Athenian armies ravaged |

their land once or twice every year. The long famine in the city is referred to by Aristophanes in the Acharnians. The city maintained a flourishing existence throughout the Greek and Roman periods, but played a very subordinate

They | of Desmarest, and are all from the newest or post-Tertiary y

geological formations of the Argentine Republic and Paraguay, or the lands forming the basin of the Rio de la Plata. Dr Leidy has described, from similar formations in Georgia and South Carolina, bones of a closely allied

species, about one-fourth smaller, which he has named J/.

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part in history. In the unsettled time when the Roman |

empire had decayed, it was often plundered by pirates.

As regards literature, Megara's chief distinction, besides | the poems of Theognis and the comedy of Susarion, was | the school of philosophy founded there by Euclid, a.

disciple of Socrates. fused and difficult subject ; no very early coins can be with certainty attributed to it. The usual types are Apolline. The topography is described by Pausanias, bk. i. Megara is about fonr hours' carriage-drive from Athens. MEGATHERIUM is the name given by Cuvier to a large extinct animal belonging to the order Hdentata (see Mamata, p. 384). A nearly complete skeleton, found on the banks of the river Luxan, near Buenos Ayres, and

The coinage of the city is a very con- |

mirabile. A third species, Jf laurillardi of Lund, is founded upon remains found in Brazil.

The following description will apply especially to the best-known South American form, Mfegatherium amert- canum. In size it exceeded any existing land animal except the elephant, to which it was inferior only in con- sequence of the comparative shortness of its limbs, for in length and bulk of body it was its equal, if not superior.

| The full length of a mounted skeleton from the fore part

of the head to the end of the tail is 18 feet, of which the tail occupies 5 feet. The head, which is small for the size of the animal, presents a general

resemblance to that of the Sloth; the anterior part of the mouth is, however, more elongated, and the malar bone, though branched posteriorly in the same way as that of the Sloth, meets the zygomatic

sent in 1789 to the Royal Museum at Madrid, long | process of the squamosal, completing the arch. The lower

Skeleton of the Megatherinm, from the specimen in the Museum of the Royal College of Surgeons

of England. xy.

remained the principal if not the only source of infor- mation with regard to tlie species to which it belonged, and furnished the materials for many descriptions, notably that of Cuvier, who determined its affinities with the Sloths.!. In 1832 an important collection of bones of the Megatherium were discovered near the Rio Salado, and were secured for the museum of the College of Surgeons of England, and these, with another collection found at Luxan in 1837, and now in the British Museum, supplied the materials for the complete description of the skeleton published by Professor Owen in 1861. Other skeletons have subsequently been received by several of .the Conti-

nental museums, as Milan and Paris, and, consequently, |

our knowledge of the organization of the Megatherium, so far as it can be deduced from the bones and teeth, is as complete as that of any other animal, recent or extinct. The remains hitherto spoken of are all referred to one species, Megatherium americanum of Blumenbach, MM. cuviert

1 An excellent figure of this skeleton, which unfortunately was incorrectly articulated, and wanted the greater part of the tail, was published by Pander and D'Alton in 1821, and has been frequently reproduced in subsequent works.

jaw has the middle part of its horizontal ramus curiously deepened, so as to admit of implantation of the very long- rooted teeth. In number tlie teeth exactly resemble those of the Sloths, being five above and four below on

each side, and they are limited to the lateral parts of the mouth, front teeth being entirely wanting. They resemble those of the Sloths also in their persistent growth, and in their composition of three tissues — vaso-dentine, true dentine, and cement; but they are of prismatic or quadrate form, and the con- stituent materials of different densities are so arranged that, as they wear, two trans- verse ridges of lard dentine remain ata greater elevation tlian the rest of the tooth, producing a very efficient triturating apparatus (see figs. 35 and 36, article Mam- MaLra, p. 385). '[he vertebral column consists of seven cervical, sixteen dorsal, three lumbar, five sacral, and eighteen caudal vertebra. The spinous processes are much better developed than in the Sloths, and are all directed backwards, there being no reversing of the in- clination near the posterior end of the dorsal series, as in most active-bodied mammals. In the lumbar region, the accessory zygapophyses, rudimentary in Sloths, are fully developed, as in the Anteaters.

The tail is large, and its basal vertebrae have strong

| lateral and spinous processes and chevron bones, indicating

great muscular development. The scapnla resembles that of the Sloths in the union of the acromion with the cora- coid, and in the bridging over of the supra-scapular notch. The clavicle is complete and very large much resembling that of man on a large scale. The fore limbs are longer than the hind limbs. The radius and ulna are both well- developed, and have a considerable amount of freedom of movement. The hand is singularly modified. The first digit is represented only by a rudimentary metacarpal, but

| the next three are large, and terminate in phalanges

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adapted for the support of immense claws, the middle one being especially large. The outer or fifth digit has no claw, and it may be considered as certain that the weight of the foot was, in standing and walking, chiefly thrown upon this, and that it was protected by a callous pad below as in the

existing great Anteater, while the other toes were curved | inwards towards the palm, only coming in contact with | The mechanical |

the ground by their outer surfaces. arrangements by which the weight of the body was thrown entirely upon the outer side of the foot are very curious, and are fully described in Professor Owen's memoir. The

pelvis is remarkably wide, even more so than that of the |

Elephant, but it is formed on the samme principle as in the Sloths. The femur is extremely broad and flattened ; the tibia and fibula are short and strong, and united together at each end. The hind foot, contrary to the usual rule in the Hdentata, is even more singularly modified than the hand. The ankle-joint is formed upon a peculiar plan, quite un- like that of the Sloths, or of any other mammal, except the Megatherium's nearest allies. nearly as far backwards as the fore part of the foot does forwards. There is no trace of great toe or hallux, or of its corresponding cuneiform bone. The second toe is rudimentary. Tlie third has an enormous ungual phalanx, which, like those of the hand, is remarkable for the immense

development of the bony sheath which is reflected from |

its proximal end around the base of the claw. The two outer toes have large and very peculiarly-shaped meta- tarsals, but only small phalanges, and no claws. The creature probably walked upon the outer edge of the sole, so that the great falcate claw of the third toe did not come into contact with the ground, and so was kept in a state of sharpness ready for use. The foot was therefore formed upon quite a different principle from that of the Anteaters or Sloths, thongh somewhat like the latter in having two of the toes aborted.

Taking all the various points of its structure together, they clearly indicate affinities both with the existing Sloths and with the Anteaters, the skull and teeth more resembling those of the former, and the vertebral column and limbs the latter. It is also not difficult to infer the food and habits of this enormous creature. That it was a leaf-eater there can be little doubt, but the greater size and more complex structure of its teeth might have enabled it to crush the smaller branches as well as the leaves and succulent shoots which form the food of the existing Sloths. It is, however, very improbable that it

climbed into the branches of the trees like its diminutive congeners, but it is far more likely that it obtained its subsistence by tearing them down with the great hook-like claws of its powerful prehensile fore limbs, being easily enabled to reach them by raising itself up upon the massive tripod formed by the two hind feet, firmly fixed to the ground by the one huge falcate claw, and the stout, muscular tail. The whole conformation of the hinder part of the animal is strongly suggestive of such an action. There can also be little doubt but that all its movements were as slow and deliberate as those of its modern representatives.

An idea at one time prevailed that the Megatherium was covered externally with a coat of bony armour like that of the Armadillos, but this originated in dermal plates belonging to the Glyptodon, a totaily distinct animal, having been accidentally associated with bones of the Megatherium. Similar plates, on a smaller scale, have indeed been found in connexion with the skeleton of both Mylodon and Scelidotherium, animals of the same

family, but never yet with the Megatherium, which we.

may therefore imagine with a covering of coarse hair like that of its nearest living allies, the Sloths and Anteaters,

The calcaneum projects |

MEG—MEH

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MEGHNA, a river of India, forming, in the lower part of its course, the great estuary of the Bengal delta, which conveys to the sea the main body of the waters of the Ganges and the Brahmaputra, which unite at Goaldnda in Faridpur district. The united waters thence roll south— a mighty river of great depth and turbidness, sometimes split up into half a dozen channels by sand-banks of its own formation, sometimes spreading out into a widespread sheet of water which the eye cannot see across. The river enters the sea by four principal mouths, enclosing the three large islands of Dakshin Shahbazpur, Hatia, and Sandwip.

_ [t is navigable by native boats of the largest burden, and

also by river steamers, all the year through; but the navigation is difficult, and sometimes dangerous, on account of shifting sand-banks and "snags," and boisterous weather when the monsoon is blowing. The most favourable season for navigation is between November and February. Alluvion and diluvion are constantly taking place, especially along the seaboard, and in Nodakhali district the land is said to have advanced seawards 4 miles in twenty-three years ; while the islands fringing the mouth are annually being cut away and redeposited in fresh shapes.

The tidal phenomena of the Meghnd surpass those of any other Indian river. The regular rise of the tide is from 10 to 18 feet, and at springs the sea rnshes up in a single wave, known as the "bore,"—on the Meghna a justly dreaded danger to boatmen. It is greatest at the time of the biennial equinoxes, when navigation is sometimes impeded for days together. The tidal wave is suddenly belield advancing like a wall topped with foam of the height of nearly 20 feet, and at the rate of 15 miles an hour; in a few minutes all is over, and the river has changed from ebb to flood tide. A still greater danger is the "storm wave," which occasionally sweeps up the Meghné in the shape of cyclones. The latest and most destructive of these disasters were those of May 1867 and October 1876, when the whole islands and sea-face of the mainland were entirely submerged. In the latter calamity it has been officially estimated that about 19 per cent. of the popula- tion in the mainland portion of Nodkhali, and in the islands of Sandwip and Hatia, were drowned, and that a like proportion subsequently died of cholera and other diseases caused by the results of the storm.

MEHADIA, a market-town in the county of Szdrény, Hungary, is situated on the Bella-Reka, or Bereka, 134 miles north of Orsova, in 44° 55' N. lat., 22° 29' E. jong. The town is small but thriving, and contains Greek Orthodox and Roman Catholic churches, the ruins of a castle, and some interesting Roman antiquities. Melddia is, however, chiefly of importance as the station for the Hercules Baths, distant about 3 miles east from the town, and situated in a narrow pass in the romantic valley of the Cserna. Of the twenty-two hot springs of Mehddia, nine are now in use, the most powerful one being the Hercules, which yields about 5000 cubic feet of water per hour. The springs are all strongly impregnated with salts of sulphur, iodine, bromine, and chlorine, and their average temperature is 70° to 145° Fahr. They are much used for chronic rheumatism, gout, and cutaneous eruptions, and, during the season, which usnally lasts from the middle of

May to the end of September, are resorted to by over |

a thousand visitors. The town of Mehadia has about 2200 inhabitants, principally Roumanians and Germans.

Already in the times of the Romans famous for their healing efficacy, the Thermx Herculis (Fontes Herculis, Aque Herculis) were the resort of emperors, generals, and senators, whose sojourn there is attested by various inscriptions aud relics. The town is the site of the ancient Roman colony of Ad Mediam, near which

the Roman road from the Danube to Dacia passed in its course |

through the valley of the Cserna. Subsequent to the destruction of the Roman empire the baths fell into disuse until 1735; great improvemeuts have been effected in them during the present cen- tury, and receutly a spacious kursaal has been built at the expense of the Hungarian Government. The fortress of Mehadia was often stormed during the wars with the Turks, and notably in 1716, 1738, and 1789.

MEHEMET ALI, or MofamMep 'Ati. vol. vii. p. 760 sq.

See Ecypt,

MEHUL, Evmenne Heyer (1763-1817), one of the

most remarkable composers of France, was born at Givet, in Ardennes, on the 24th of June 1763. too poor to give him a regular musical education, his first ideas of art were derived from a poor blind organist of Givet ; yet such was his aptitude that, when ten years old, he was appointed organist of the convent of the Récollets. 1775 an able German musician and organist, Wilhelm Hauser, was engaged for the monastery of Lavaldieu, a few miles from Givet, and Méhul became his occasional pupil. In his sixteenth year he was taken to Paris by a military officer, and placed himself under Edelmann, a good musician and harpsichord player. His first attempts at

therefore turned his attention to sacred and dramatic |

music. The great composer Gluck received him kindly, and gave him advice in his studies. After various delays

and disappointmeuts during his efforts for six years to |

obtain, at the Grand Opera, a representation of his Cora et Alonzo, he offered to the Opéra Comique his /uphrosine et Coradin, which, being accepted aud performed in 1790, at once fixed his reputation. The critics acknowledged in

it great energy of dramatic expression, and much brilliant |

instrumentation, but objected to a general want of graceful inelody,—a strange complaint, since his style is far more refined than that of either Héroldor Auber. His opera of Stratonice had great success. After several other operas which did not succeed, his Adrien appeared, aud added much to his fame, which was still further increased by his three best works, Le jeune Henrt, Uthal, and Joseph, the finest of the series. He had been appointed one of the four inspectors of tle Paris Conservatory, but that office

made him feel continually the insufficiency of his early |

studies, a want which he endeavoured to remedy by incessant application. Z%moléon, Ariodant, and Biron followed Stratonice, with various success. Uthal can scarcely be expected to live, since, by desire of Napoleon Bonaparte, it was written for an orchestra without violins. Epicure was composed by Méhul and Cherubini jointly ; but the superiority of the latter was evident. Méhul's next opera, Z'rato, failed. After writing forty-two operas, besides a number of songs for the festivals of the republic, cantatas, and orchestral pieces of various kinds, his health gave way, from an affection of the chest, which terminated his life on the 18th of October 1817.

MEIBOM, Hetnatcu (1555-1625), was born at Lemgo on December 4, 1555, and died on September 20, 1625, at Helmstiidt, where he had held the chair of history and poetry from 1583. He was a writer of Latin verses (Parodiarum Horatianarum Libri III. et Sylvarum Labri ITI., 1588), and his talents in this direction were recognized by the emperor Rudolph IL, who ennobled him and made

history of Germany. His Opuscula Historica ad res Germanicas spectantia were edited and published in 1660 by his grandson, Heinrich Meibom (1638-1700), who also was professor of history and poetry at Helinstadt, and incorporated the grandfather's work with his own Aerum Germanicarum Scriptores (1688).

MEININGEN, the capital of the little duchy of Saxe- Meiningen, in central Germany, and the seat of the pro- vincial courts for Saxe-Meiuingen, Saxe-Coburg, aud the Prussian districts of Schmalkalden and Schleusingen, is

situated on the right bauk of the Werra, about 40 miles | to the south of Eisenach.

It consists of an old town and several handsome suburbs, but much of the former has been rebuilt in a modern style since a destructive fire in 1874. The chief buildings are the Elisabethenburg, or

old ducal palace, dating chiefly from 1682, and containing

several collections; the new palace; the new town-house ;

_ the post-office; the barracks; aud the old town church,

His father being |

| drilled actors aud unexcelled sceuic effects.

Tn |

with its two towers, erected in 1003. The theatre has lately attained a European reputation for its admirably The English Garden, a beautiful public park, contains the ducal mortuary chapel and several monuments. The industries,

consisting of brewing and the weaving of woollen and

. town.

cotton cloth, are insignificant. was 11,227.

Meiningcn, which was subject to the bishops of Wiirzburg for up- wards of 500 years (1000-1542), came into the possession of the dukes of Saxony in 1583. At the partition of 1660 it fell to the

The population in 1880

: emma J 4 | share of Saxe-Altenburg, and in 1680 it became the capital of instrumental composition in 1781 did not succeed, and he |

Saxe-Meiningen. MEISSEN, an ancient and important industrial town

| of Saxony is situated on the left bank of the Elbe, between

the streams Meisse and Triebisch, in the district and about 9 miles to the north-west of the town of Dresden. Its

irregular hilly site and numerous fine old buildings give

it a quaint and picturesque appearance, and most of the streets are narrow aud uneven. 'The cathedral, one of the finest Early Gothic edifices in Germany, is con- spicuously situated ou the Schlossberg, 160 feet above the It is said to have been originally founded by the

emperor Otho I, but the present building was begun in

| lofty tower dates from the 15th century.

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the 13th century, and completed soon after 1400. The Within the cathedral are the tombs of several Saxon princes of the 15th and 16th centuries, including those of Albert aud Ernest, the founders of the present reigning lines. Ad-

| joining the cathedral stands the castle, dating originally

from 1473-81, but restored and named Albrechtsburg in 1676. Another thorough restoration was uudertaken in 1863, when a series of historical frescos by celebrated modern artists was begun upon its walls. An old stone

bridge of the 13th century connects the Schlossberg with

St Afra.

the Afraberg, which owes its name to the old convent of The couvent was suppressed by Duke Maurice

in 1543, and 'converted into the "Fiirstenschule," one of

'and Gellert among its former pupils.

the most renowned schools in Germany, counting Lessing The other chief buildings are the town-house, built in 1479, and restored in 1875; the fine old town church, also called the Frauen- kirche or Marienkirche ; and the churches of St Francis, St Nicholas (coeval with the town), and St Afra. Since 1710, immediately after Bottcher's great: discovery, Meissen has been the seat of the manufacture of the so- called Dresden china. Till 1863 the

porcelain factory was in the Albrechtsburg, but in that year it was transferred to a large new building in the Triebisch- thal, close to the town, where about six hundred and seventy hands are now employed. Meissen also

him poet laureate in 1590 ; but his claim to be remembered | contains iron foundries, manufactories of earthenware rests entirely on his services in elucidating the medizval | stoves and pottery, a jute-mill, sugar-refineries, breweries,

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tanneries, &c. A considerable trade the wine produced in the surrounding vineyards. population in 1880 was 14,166.

Meissen, one of the oldest and most interesting towns in Saxony, was founded by the emperor Henry I. in 928 as an outpost against the Wends, and beeaine the capital of a margraviate, which was after- wards merged in the duehy of Saxony. Its margraves were among

is carried on in The

direct aneestors of the present royal house of Saxony. From 965 till 1581 Meissen was also the seat of an important line of bishops, who ranked as prinees of the empire. The town suffered greatly from the Hussites in the 15th century, and it was captured by the

in the Thirty Years' War. In 1687 it was severely handled by the Swedes, and in 1745 it fell into the hands of the Prussians.

Weguweiser durch die Stadt Meissen, 1878.

MEKONG, Mexuone, or Makone, less frequently Nam-Kone, the Da-Kio of the Tibetans, the Lantsang- Kiang or Lankiang of the Chinese, and the Son-Kong of the Anamese, sometimes also called the Cambodia or Camboja, is one of the largest and most remarkable rivers of southern Asia. As it rises in Tibet, probably about

| They are covered when the river is in full flood.

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ME K—MEL

number of wells from 12 to 24 feet deep were sunk down among the granite pebbles which form the bed of the river, just above mean-water mark; and they all yielded water with a greater or less degree of saltness and warmth. The river

_ basin in all the upper section is extremely narrow, being

34° N. lat. and 94° E. long., and reaches the China Sea |

about 10° N. lat., after a somewhat devious course through

Yunnan, Burmah, Siam, Cambodia, and Cochin-China, its

total course may be safely stated at 2000 miles. In spite, regarded as little more than a mountain torrent on an unusually large scale. It certainly forms a very extensive delta (see Cocnin-Cutna, vol. vi. pp. 93, 94), and is navigable for steamboats as far up as Cratieh (about 280

: : : : : . | any afiluents of considerable size. imperial troops in the war of the Smalkaldian League, and again | y e of considerable size

| or Se-Kong on the left. See Die Stadt Meissen und ihre Umgegend, 1855; and 01. Herbst's Praktischer

the most powerful medieval prinees in Germany, and were the | separated by long lines of high mountains from the valley

of the Salwin on the west and from that of the Chin-sha- kiang or River of Golden Sands on the east. Not till the comparatively low country of Siam is reached are there The most important are the Se-nmin and the Udong on the right, and the Attopeu The Se-mun or Ubon river was explored as far as Korat by the Lagrée expedition, and its tributary the Se-dém has been followed by Dr Harmand (Bull. Soc. Géoy., 1877). Both streams have a

rapid and interrupted course. Like the Nile, the Mekong is subject to a great aunual inundation, described as early as the 16th century by Camoens, who calls the river Mecom. At some places the diflerence between floud-mark and ordinary level is from 35 to 40 feet (see Cocuin-Cuina). The first Europeans to make true acquaintance with the river course

_ were the Dutchman Wusthoff and his fellow ambassadors,

who in 1641 ascended as far as Winkyan, i.e., Vienchang ;

_ their narrative is given by Valentijn, and might have been however, of this great length, the Mekong must be |

miles froin the river mouth), but navigation soon becomes | difficult, not through want of water, but from the great |

irregularity of the bed. At Stung-Streng the river measures about 2 leagues from bank to bank, and its current is strong even to violence; it "twists into the sharpest eddies, and drives against the banks with fury." A little higher up are the great cataracts of Kong, Beyond these the channel again becomes navigable as far as Bassac, when it is still about 6500 feet in width; bnt before long the banks close in and the river, narrowed to about 900 feet, pours along a current of extraordinary depth. Above Khemarat the rapids again begin. At Paklay, Mouhot describes the Mekong as larger than the Menam at Bangkok, forcing its way between the lofty mountains with a noise like the roaring of the sea. About 130 miles farther up, at Luang-Prabang, it has again an unob- structed channel about 3000 feet wide; above Sien-kong the river winds through a magnificent plain; but soon

afterwards, in spite of its volume of water, it becomes less |

navigable than before. The great French expedition of 1866-67 touched its course only at one place higher up, Sien-hong ; but other travellers have crossed it at various points in Yunnan. Mr Grosvenor found it, near Yung-feng- chang, at a height of 4700 feet above the sea, a streain of from 60 to 80 yards wide, flowing smoothly and steadily in the floor of a deep gorge (see Coleborne Baker, "Trav. and Res. in Western China," Roy. Geog. Soc. Suppl. Papers, 1882). It is there crossed by an iron suspension bridge, of

Chinese workmanship, consisting of twelve chains with links about 1 foot long (see Gill, River of Golden Sand, vol. ii. p. 330). Higher up, near Tse-ku mission-station, lies the ter- rifie defile to which Cooper (7'rav. of a Pioneer of Commerce, 1871) gave the name of Hogg's Gorge. The head waters of the Mekong have never been traced to their source ; but Huc and Gabet saw the confluence of the two main branches at Tsiamdo (32° N. lat.), and the abbé Desgodins has followed the stream from that point down to Ye-tche in 27° 20'N. lat. (see La Mission du Thibet, Paris, 1872, and the abbé's papers in Bull. Soc. Géog., 1871, 1875, 1876, and 1877). At Yerkalo he observed a curious phenonienon : a

enough to suggest that the Mekong could not form a trade route to the interior. For the French exploration which finally settled the question, see Garnier's Lxpédition, &c., 1873, and the notice of Garnier in vol. x. p. 82.

MELA, Pomponius, a Roman writer on geography. His little work, though a mere compendium, is the only systematic treatise on the subject preserved to us in the Latin language, with the exception of that which forms part of the encyclopedic work of the elder Pliny, and from this circunistance it derivesa value to which it would be little entitled from its intrinsic merits. Nothing is known of the author except his name, and that he was born, as he himself informs us, at a small town called Tingentera in the south of Spain. But the date of his work may be fixed with little doubt from an allusion in the preface to a proposed expedition of the reigning emperor to Britain, which can hardly be referred to any other event than the visit to that island of the emperor Claudius in 43 a.p. This conclusion is accepted by all the recent editors ; the view of some earlier scholars, who understood this passage as referring to the expedition of Julius Cesar, is clearly disproved by the mention of

| several facts which were not anterior to the reign of

Augustus. 'The little treatise is not only a mere abridg- ment, occupying less than one hundred pages of ordinary print, but is so deficient in method and systematic character that we should have supposed it to be little more than a mere schoolbook, were it not that we find the name of the author figuring in a prominent manner among the authori- ties cited by Pliny for the geographical books of his vast compilation.

His general views of the geography of the earth do not differ materially from those which were current among Greek writers from the time of Eratosthenes to that of Strabo, and are well known to us from the great work of the latter author, which was, however, in all probability unknown to Mela, as it certainly was to Pliny. Butin one of his views he stands alone among ancient writers on geography, that after describing the division of the earth into five zones, of which two only were inhabitable, he states as an undoubted fact the existence of antechthones, who inhabited the southern temperate zone, but were inaccessible and consequently unknown to the inhabitants of the corresponding zone in the north, on account of the excessive heat of the intervening torrid zonc. His views

of the division and boundaries of the three continents of Europe, Asia, and Africa coincide with those of Erato- sthenes; and, in common with all ancient geographers from the time of Alexander to that of Ptolemy, he regarded the Caspian Sea as an inlet from the Northern Ocean, corre- spouding to the Persian Gulf on the south. His ideas concerning India are extremely confused and imperfect,— altogether inferior to those possessed by Greek writers long before ; he follows Eratosthenes in supposing that country to occupy the south-eastern angle of Asia, whence the coast trended northwards to Scythia, and then swept round to the westward to the opening of the Caspian Sea. As usual he places the Rhipwan Mountains and the Hyper- boreans near the Scythian Ocean, which he of course con- nects with that supposed to exist.to the north of Europe.

With regard to the west of Europe, on the other hand, his knowledge was somewhat in advance of the Greek geographers, as might be expected from the extension of the Roman dominion and civilization in that quarter, and from a writer who was himself a native of Spain. Accord- ingly we find him possessing a more accurate idea than either Eratosthenes or Strabo of the western coast-line of Spain and Gaul, and its deep indentation by a gulf (the Bay of Biscay) between the projecting headlands of the two countries. Of Britain, on the contrary, he has little to tell us, beyond what we find in Cesar or Strabo, though he appears to have had a clearer ideaof the position of the British Islands than the Greek geographer. He is also the

first ancient writer who mentions the name of the Oreades or Orkneys, which he correctly describes as a large group of islands to the north of Britain. Of 'the north of Europe his knowledge was still utterly imperfect ; but he had a vague notion of the existence to the north of Germany of a large bay, which he calls Codanus Sinus, containing many islands, large and small, among which was one much larger than the rest, which he calls Codanovia,— evidently the same name that reappears in Pliny under the form Scandinavia, which has been attached by modern writers to the great northern peninsula of Europe.

The method followed by Mela in describing the three continents is peculiar and inconvenient. Instead of treat- ing each continent separately, aud describing the countries included in it, he begins at the Strait of the Columns (the Straits of Gibraltar), which was close to his own birthplace, and describes the countries adjoining the south coast of the Mediterranean from Mauretania to Egypt, and afterwards those around the east coast of the same sea with its tributary the Euxine, and then back along the north of the Mediterranean from Scythia to Gaul and Spain. He then begins again with the countries bordering the western and northern ocean from Spain and Gaul round to India, and from thence by Persia and Arabia to the Ethiopians, and thence again round Africa to the straits from which he began. In common with most ancient geographers, he considered Africa as surrounded by the sea, but had a very inadequate idea of its extent towards the south.

The first edition of Pomponius Mela was published in 1471, and it was very often reprinted in the 15th and 16th centuries. The edition of Voss in 1658, with a valuable commentary, became the foundation of all the subsequent editions, of which those by Gron- ovius (in 1685 and 1742) are aniong the best-known and most use- ful. The edition by Tzschucke, in 6 vols. 8vo (1806), contains an overwhelming mass of notes and commentaries, but by far the best text is that of the recent edition by G. Parthey (Berlin, 1867), who has in many instances restored the original readings, which had been displaced by the conjectures of Voss and others. (E. H. B.)

MELANCHTHON, Puitie (1497-1560), was born at Bretten, a town of the lower Palatinate, on February 16, 1497. His father, George Schwartzerd,

was a kinsman of the famous Reuchlin, and by profession an armourer or commissary of artillery under the Palatinate princes. His mother, Barbara Reuter, was a thrifty housewife and

affectionate parent, whose pious character is evidenced by a well-known German rhyme, of which she is the reputed author, beginning Almosen geben armet nicht. His mother's father, John Reuter, who was for many years mayor of Bretten, charged himself with the education of Philip. Taught first by John Hungarus, then by George Simler at the academy of Pfortzheim, where he lived in the house of Reuchlin's sister, young Schwartzerd exhibited remark- able precocity, and speedily won the regard of Reuchlin, who dubbed him Melanchthon (the Greek form of Schwartz-erd), according to the fashion of that age. He lived two years at Heidelberg, and the next three at Reuchlin's university of Tiibingen, where he studied law, medicine, and theology, taking his doctor's degree in 1514. He began soon after to give public lectures on rhetoric, and to comment on Virgil aud Terence, and ere long it be- came known among European scholars that anew brilliant star of learning had risen on the horizon, Erasmus pro-phesying that he would himself be speedily eclipsed. In 1518, on Reuchlin's recommendation, Melanchthon was appointed by the elector of Saxony professor of Greek in the university of Wittenberg. This appointment marked an epoch in German university education; Wittenberg became the school of the nation ; the scholastic methods of instruction were summarily set aside, and in a Discourse on Reforming the Studies of Youth Melanchthon gave proof, not only that he had thoroughly caught the Renaissance spirit, but that he was fitted to become one of its foremost leaders. He began to lecture on Homer and the Epistle to Titus, and in connexion with the former he announced that, like Solomon, he sought Tyrian brass and gems for the adornment of God's temple. Luther himself received a fresh impulse towards the study of Greek, and his transla- tion of the Scriptures, begun as early as 1517, now made rapid progress, Melanchthon helping to collate the Greek versions aud revising Luther's translation. Melanchthon on his part felt the spell of Luther's large personality and spiritual depth, and he seems to have been prepared on his first arrival at Wittenberg to accept the new theology, which indeed as yet existed mainly in subjective form, and as a living

spiritual force, in the person of Luther. To reduce it to an objective system, to exhibit it dialectically, the calmer mind of Melanchthon, with its architectural faculty and delicate moral tact, was requisite. Theologi- cally it is impossible to separate Melanchthon from Luther ; 'the miner's son drew forth the metal, the armourer's son fashioned it." Luther, in whom courage and energy were too much akin to violence and zealous decision to narrow intolerance, and Melanchthon, whose calm deliberation was apt to degenerate into vacillation and whose conciliatory temperament was too much allied to timidity, were eaclt the fit complement of the other. ©

Melanchthon was first drawn into the arena of the Reformation controversy through the Leipsic discussion, of which he was an eager spectator. He had been sharply reproved by Dr Eck for giving aid to Carlstadt (" Tace tu, Philippe, ac tua studia cura nec me perturba"), and he was shortly afterwards himself attacked by the blustering Ingolstadt doctor. Melanchthon replied in a brief treatise —a model of Christian moderation —setting forth Luther's first principle of the supreme authority of Scripture in opposition to the patristic writings on which Eck so boast- fully relied. His marriage in 1520 to Catherine Krapp of Wittenberg increased his own happiness, and gave a domestic centre to the Reformation. In 1521, during Luther's confinement in the Wartburg, Melanchthon occupied the important position of leader of the Reformation cause at the university. He defended the action of the Augus- tinian monks when they substituted for the celebration of the mass the sacrament of the supper partaken of by

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the people under both kinds; but, on the advent of the Anabaptist enthusiasts of Zwickau, he had a still more difficult part to play. Melanchthon was irresolute. In their attacks upon infant baptism they seemed to him to have hit upon a "weak point"; and in regard to their claim to personal inspiration his position was summed up in his own words, " Luther alone can decide; on the one hand let us beware of quenching the Spirit of God, and on the other of being led astray by the spirit of Satan." In the same year he published his Loct Communes Rerum Theologicarum.

After the first diet of Spires (1526), where a precarious peace was patched up for the Reformed faith, Melanchthon was deputed as one of twenty-eight commissioners to visit the Reformed states and regulate the constitution of churches, he having just published a famous treatise called the Libellus Visitatorius, a directory for the use of the commissioners. At the Marburg conference (1529) between the German and Swiss Reformers, Luther was pitted against (Ecolampadius and Melanchthon against Zwingli in the discussion regarding the real presence in the sacrament. How far the candid conciliatory spirit of Melanchthon was biassed by Luther's intolerance is evident from the exagger- ated and inaccurate accounts of the conference written by the former to the elector of Saxony. At the diet of Augsburg (1530) Melanchthon was the leading representa- tive of the Reformation. With anxiety and tears he drew up for that diet the seventeen articles of the evangelical faith, which are known as the " Augsburg Confession." He held conferences with Romish divines appointed to adjust differences, and afterwards wrote an Apology for the Augsburg Confession. After the Augsburg conference further attempts were made to settle the Reformation controversy by a compromise, and Melanchthon, from his conciliatory spirit and facility of access, appeared to the Romanists the fittest of the Reformers to deal with. His historical instinct led him ever to revert to the original unity of the church, and to regard subse- quent Romish errors as excrescences rather than proofs of an essentially anti-Christian system. He was weary of the rabies theologorum, and fondly dreamed that the evangelical leaven, if simply tolerated, would at length purify the church's life and doctrine In 1537, when the Protestant divines signed the Lutheran Articles of Smalkald, Melanchthon appended to his signature the reservation that he would admit of a pope provided he allowed the gospel and did not claim to rule by divine right.

The year after Luther's death, when the battle of Miihlberg (1547) had given a seemingly crushing blow to the Protestant cause, an attempt was made to weld together the iron and clay.of the evangelical and the papal doctrines, which resnlted in the compilation by Pflug, Sidonius, and Agricola of the Augsburg "Interim." This was proposed to the two parties in Germany as a provisional ground of agreement till the decision of the council of Trent. Melanchthon, on being referred to, declared equivocally that, though the Interim was inadmissible, yet so far as matters of

indifference (adzaphora) were concerned it might be received. Hence arose that " adiaphoristic " controversy in connexion with which he has been misrepresented as holding among matters of indifference such cardinal doctrines as justification by faith, the number of the sacraments, as well as the dominion of the pope, feast-days, and soon. The fact is that, in these tentative negotiations, Melanchthon sought, not really to minimize differences, but to veil them under an intentional obscurity of expression. Thus he allowed the necessity of good works to salva- tion, but not in the Romish sense, proposed to allow the seven sacraments, but only as rites which had no inherent efficacy to salvation, and so on, He afterwards retracted

his compliauce with the adiaphora, and never really swerved from the views set forth in the Loci Communes – but he regarded the surrender of more perfect for i perfect forms of truth or of expression as a painful sacrifice rendered to tlie weakness of erring brethren. Luther though he had uttered certain expressions of dissatisfaction with Melanchthon, and had more keenly defended in his last years what was distinctively his own, yet maintained hearty and unbroken friendship with him; but after Luther's death certain smaller meu arose in name of Luther who formed a party emphasizing the extremest points of the doctrine of the latter. Hence the later years of Melanch- thon were much occupied with acrid controversies within the evangelical church; an account of these, however, would be out of place here. His last years were spent in fruitless couferences with his Romanist adversaries, and amid various controversies among the Reformed, but the flame of his piety burnt brightly till the close. He died in his sixty-third year, on the 19th April 1560, and his body was laid beside that of Martin Luther.

Mclanchthon's ever ready pen, clear thought, and elegant style made him the scribe of the Reformation, most publie documents on that side being drawn up by him. He never attained entire in- dependence of Luther, though he gradually modified some of his positions from those of the pure Lutherism with whieh he set out, His development is ehiefly noteworthy in regard to these two lead- ing points—the relation of the evangelium or

doctrine of free grace (1) to free will and moral ability, and (2) to the law and penitentia or the good works eonneeted with repentanee. At first Luther's cardinal doctrine of grace appeared to Melanchthon inconsistent with any view of free will; and, following Luther, he renounced Aristotle and philosophy in general, since " philosophers attribute everything to human power, while the saered writings represent all moral power as lost by the fall." In the first edition of the Loci (1521) he held, to the length of fatalism, the Augustinian doctrine of irresistible grace, working according to God's immutable deerees, and denied freedom of will in matters eivil and religious alike. In the Augsburg Confession (1530), which was largely due to him, freedom is elaimed for the will in non-religious matters, and in the Loci of 1533 he ealls the denial of freedom Stoicism, and holds that in justifieation there is a certain causality, though not worthiness, in the reeipient subordinate to the Divine eausality. In 1535, combating Laurentius Valla, he did not deny the spiritual incapacity of the will per sc, but held that this is strengthened by the word of God, to whieh it can eleave. The will co-operates with the word and the Holy Spirit. Finally, in 1548, he says that the cause of the difference of final destiny among men lies in the different method of treating grace whieh is possible to believers as to others. Man may pray for help and reject graec. This he ealls free will, as the power of laying hold of graee. Melanehthon's doetrine of the three coneurrent causes in conversion, viz., the Holy Spirit, the word, and the human will, suggested the semi- Pelagian position ealled Synergism, which was held by some of his immediate followers.

In regard to the relation of grace to repentance and good works, Luther was disposed to make faith itself the prineiple of sanetifi- cation. Melanehthon, however, for whom ethies possessed a speeial interest, laid more stress on the law. He began to do this in 1527 in the Libcllus Visitatorius, which urged pastors to instruet their people in the necessity of repentance, and to bring the threatemings of the law to bear upon men in order to faith. This brought down upon him the opposition of the Antinomian John Agricola. In the Loci of 15385 Melanehthon sought to put the fact of the co-existenec of justification and good works in the believer on a seeure basis by declaring the latter necessary to eternal life, though the believer's destiny thereto is already fully guaranteed in his justifieation. In the Loci of 1548 he did not retain the doetrine of the necessity of good works in order to salvation, and

*to this he added, in the Leipsic Interim, "that this in no way countenances the error that eternal life is merited by the worthiness of our own works." Melanebthon was led gradually to lay more and more stress upon the law and moral ideas; but the basis of the relation of faith and good works was never clearly brought out by him, and he at length fell back on his original position that we have justification and inheritance of bliss in and by Christ alone, and that good works are neeessary by reason of immutable Divine eommand. en ; *s li i amerarius. See also Matthes, 1". eee ae Charakteristtk Melanchthons als Theologen, Halle, 1845; Rothe's Geddchinissrede auf Melanchthon, 1860 Q Nitzsch, Melanchthon, 1860; Schmidt, Melanchthons Leben, 1864. There is a biography in English by F. A. Cox, 2d ed., London, 1817, The works of Melanchthon, {including his correspondence, are contained in the voluminous Corpus Reforma*

_ torum, edited by Bretschneider and Bindseil. (J. WL)

MEL—MEL

MELANESIA. This term comprises that long belt of island groups which, beginning in the Indian archipelago at the east limits of the region there occupied by the Malay race, aud, as it were, a prolongation of that great island region, runs south-east for a distance of some 3500 English miles, 2.¢., from New Guinea at the equator, in 130° E. long., to New Caledonia just within the Tropic, 167° E. long., and eastwards to Fiji, in 180°. This chain of gronps has a certain geographical as well as ethnical unity. Its curve follows roughly the outline of the Australian coast, and large islands occur, with a number of small ones, along the whole length, with mountains of considerable height, coinciding pretty closely with a line of volcanic action. Melanesia is usually held to begin with New Guinea, this great island being then viewed as the headquarters of that dark Papuan race which, widely and variously modified in all the other groups, occupies the whole region, as the name Melanesia implies; but the race really extends farther west, for the large islands Flores and Timor, with several smaller ones, are also essentially Papuan.

New Guinea, 1490 miles long, and containing about 303,000 square miles, the largest island in the world after Australia, is clothed with almost impenetrable forests, through which mountain ranges rise to a height of

13,000 feet. Parallel to its longer axis, 150 miles to the north, are the Admiralty Islands, all small, with one exception, in which the hills rise to 1600 feet, and which is probably of volcanic origin, as the natives use spearheads and imple- ments of obsidian. A Polynesian element seems to be present, and customs peculiar to both races have been observed. Mr H. N. Moseley, of the " Challenger," found them shrewd but honest traders, with much artistic skill in their carvings and designs. They have nunierals up to 10, with an idiom for 8 and 9, viz., 10-2 and 10-1, which is found also at Yap in the Carolines, and in the Marshall Islands.

Next follow, east, the two large islands of New Britain, about 340 by 23 English miles, with active volcanoes up to 4000 feet, and New Ireland, about 240 by 22 miles. Next comes the Solomon group, 600 English miles in length, with seven large islands from 135 to 90 miles long, all running nortli-west and south-east, with volcanic peaks up to 8000 feet. The forms more characteristic of the New Guinea fauna do not extend beyond this group. Its forest vegetation is especially luxuriant. Then comes Santa Cruz, a small group partly volcanic, but with numerous coral reef islands. Then the Banks and New Hebrides group, over 500 English miles in length, all volcanic except the Torres reef islands in the north. Several spots in this group are occupied by people of purely Polynesian race, immigrants apparently from the eastward. Two hundred miles south- west from the New Hebrides lies the island of New Cale- donia, about 240 by 25 English miles. mountainous, rising to 5380 feet, the rocks being sedi- mentary and plutonic, but there are no volcanoes. It lies half way between Australia and Fiji, 700 miles from each. Being outside the equatorial belt, itis much drier and more barren than the other groups, and its fauna and flora have many Australian and Polynesian affinities. The small Loyalty chain lies 70 miles east of New Caledonia, and parallel to it. Fiji is detached from the other Melanesian groups, and differs from them in various particulars. It consists of two large and about 300 small islands, the total area being about 7400 square miles.

Of the two great Pacific races—the brown Polynesian, and the dark Melanesian—the former, considering the vast region it occupies, is singularly homogeneous both in appearance and language, whereas in

Melanesia even neighbouring tribes differ widely from each other in both respects, Still, all the Melanesians have certain common

It is in parts very

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| characteristics which distinguish them sharply from the other race. They stand at a lower level of civilization, as is well seen at certain spots in Melanesia where isolated Polynesian settlements exist, due probably to involuntary migration, and where the two races, though they have some peculiar customs in common, live in bitter mutual hostility. The Melanesians are mostly "negroid" in appearance, nearly black, with crisp curly hair elaborately dressed; the women hold a much lower position than among the Poly- nesians; their institutions, social, political, and religious, are simpler, their manners ruder and often indecent; they have few or no traditions ; cannibalism, in different degrees, is almost universal; but their artistic skill and taste, as

. with some of the lower African negroes, are remarkable, and they are amenable to discipline and fair treatment. Their languages, amid considerable differences, which, as between the Melanesian proper and the Papuan, are very wide, have features which mark them off clearly from the Polynesian, notwithstanding certain fundamental relations with the latter.

The various Melanesian groups will be found described in detail under separate headings.

MELBOURNE, the capital of the colony of Victoria, and the most populous city in Australia, is situated at the head of the large bay of Port Phillip, on its northern bend known as Hobson's Bay, about 500 miles 8.W. of

| Sydney by land and 770 by sea, the position of the

observatory being 37° 49' 53" S. lat. and 144° 58' 42" E. long. Along the shores of the bay the suburbs

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| 20 Port Phillip and Environs of Melbourne.

extend for a distance of over 10 miles, but the part distinctively known as the “ city” occupies a site about 3 miles inland on the north bank of the Yarra river.

The appearance of Melbonrne from the sea is by no means picturesque. The shipping suburbs of Sandridge and Williamstown occupy the alluvial land at the mouth

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of the Yarra, and, as the district is low and flat, and covered with factories, the prospect is not inviting. But the city itself has a very different aspect: its situation is relieved by numerous gentle hills, which show off to great advantage its fine public buildings; its streets are wide and well kept; and the universal appearance of prosperity, activity, and comfort under its usually clear blue sky impresses the visitor favourably.

That part specially known as the “city” had a popula- tion in 1881 of 65,800. It occupies the two hills of East Melbourne and West Melbourne; the valley that separates them, once occupied by a densely wooded little stream, is now partly filled in, and forms the busy thoroughfare of Elizabeth Street ; parallel to this runs Swanston Street,

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MELBOURNE

and at right angles to these, and parallel to the river, are Bourke Street, Collins Street, and Flinders Street,—the first being the busiest in Melbourne, the second. containin the most fashionable shops, and the third, which faces the river, being given over to maritime pursuits. These streets are the eighth of a mile apart; between them are narrower streets occupied by warehouses and business premises.

Round the "city" lies a circle of populous suburbs. North-east is Fitzroy with 23,000 inhabitants ; farther east, Collingwood, 24,000 ; east of Melbourne, Richmond, 23,400; south-east, Prahran, 21,000; south, Emerald Hill, 25,300; south-west, Sandridge, 8700; north-west, Hotham, 17,800. These all lie within three miles of the general

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Plan of Melbourne.

5. St Patrick's College.

9. Academy of Music. 6. Scotch Church.

10, Theatre Royal. 3. Government Offices. 7. Scotch College. 11, Princes Theatre. 4, St'Patrick's Cathedral. | 8. Opera House. 12. Post-Office.

post-office in Elizabeth Street ; but outside of them, and within a radius of 5 miles, there is a circle of less populous suburbs: to the north, Brunswick,

6200; east, Kew, 4200, and Hawthorn, 6000 ; south-east, St Kilda, 11,600, and Brighton, 4700 ; south-west, Williamstown, 9000, and Footscray, 6000 ; north-west, Essenden and Flemington, 5000. Numerous smaller suburbs fill up the spaces be- tween these,—the principal being Northcote, Preston, Camberwell, Toorak, Caulfield, Elsternwick, and Coburg, with a united population of 19,000.

Fifteen of these suburbs rank as independent muni- cipalities, and many of them have streets which for importance rival the main streets of the city.

The following table shows the growth of the population since 1851 :—

1. Houses of Parliament. 2. Treasury.

13, Town-Hall. 17, University. 21, Anglican Cathedral. 14, Hospital. 18, Mint, 22, Governor's House. 15. Public Library, &c. 19. Law Courts. 23, Observatory.

16, Jail. 20. Custom House.

Total. |

Male.

Melbourne…..... 34,526 | 31,333 | 65,859 SuburbS…....0ceeeeeeee—| 118,785 | 103,263 | 217,048

282,907

Female.

54.993 151,787

206,780 | 191,254

eae .| 148,311 | 134,596

The land on which the city now stands was sold in allotments of half an acre, the prices realized being in June 1837 about £34 each, in November

1837 about £42, and in September 1838 about £120 each. These allotments are now (1882) sold at prices ranging from £20,000 to £40,000. But, though land has thus increased in value, Melbourne is by no means a crowded city;

| the streets are all 99 feet wide, and the parks, squares,

MELBOURNE

and gardens are so numerous that with only one-thirteenth of the population of London it occupies very nearly half as great an area.

The pnblic buildings are generally situated on positions from which they are seen to advantage. The Parliament Houses form a great pile of brickwork with four fronts in freestone, of which the main front is not yet com- pleted ; the interior decorations are highly elaborate. The 'Treasury is a well-proportioned building in free stone; behind it stands a vast building known as the Government offices. On the hill of West Melbourne there is a large structure, newly erected, for the law courts; it has four very handsome fronts, each about 300 feet in length, and the whole is surmounted by a lofty cupola, in the manner of the Capitol at Washington. The public library in Swanston Street forms one of four fronts of a building which was projected on a grand scale, but has never been completed. Much of the interior has been erected, but of the fronts only the main one is yet in existence, its cost having been £111,000. 'The lower story is devoted to sculpture ; on one side there are casts of all the most famous statues; on the other there is a small collection of original works by modern sculptors, together with a gallery containing 8000 engravings and photographs ; to the rear is the picture gallery, a very handsome hall, with oil paintings, chosen from the works of living artists. Another of the interior portions of the building is occupied by the technological museuin, in which are arranged about 30,000 specimens illustrative of the industrial arts. The upper story of the front is devoted to the library, which occupies a chamber 240 feet long; 22 recesses contain each its own special branch of literature, the total number of volumes being 112,000. The book shelves rise to a height of 20 feet, but they are divided by a narrow gallery which runs all round the room, and gives access to the upper tiers. The library is open to the public ; and every visitor ranges at will, being bound by the two conditions only that he is to replace each book

where he found it, and that he is to preserve strict silence. During 1881 there were 261,886 visits made to the room.

The Melbourne University is a picturesque, but by no means imposing mass of buildings, buried among the trees of extensive and well-kept grounds about a mile from the heart of the city. In front of it stands the " Wilson Hall," erected at a cost of £40,000. Behind is the National Museum, containing collections of specimens of natural history. The museum, like all public places in Melbourne, is freely open to the people. About 98,000 visitors entered it in 1881. The university has a staff of 10 professors and 12 lecturers, with about 400 students. There are four courses open to students: arts, law, medi- cine, and civil engineering. Affiliated to the Melbourne University are the two denominational colleges, Trinity and Ormond, in which about 80 students reside, and where provision is made for instruction in theology.

The Exhibition bnilding consists of a nave 500 feet long and 160 feet broad, surmounted by a dome, with two annexes each 460 feet long. Theseare built in brick with cement facings. The mint is a very handsome quadrangle, erected in 1872. In the year 1881 there were three millions of sovereigns coined in it, making a total of sixteen millions since its erection. The governor's residence is a large building on a hill overlooking the Yarra. The general post-office forms only half of a magnificent pile of buildings which will, when completed, include the central telegraph office.

The town-hall, at the corner of Swanston Street and Collins Street, contains, besides the usual apartments for municipal offices, a hall seated for nearly 3000 persons,

| nearly 100 patients.

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and fitted with a colossal organ, on which the city organist performs two afternoons a week, the public being admitted at a nominal charge. Hotham, Richmond, Emerald Hill, Prahran, and Fitzroy have their own town-halls, all costly and somewhat pretentious buildings.

The markets, erected at a cost of £80,000, stand in Bonrke Street. They are handsome in external appear- ance, and ingeniously contrived for convenience within. The observatory is a humble-lookinug building on the St Kilda Road ; it contains an equatorial telescope, which had

| for some years the distinction of being the largest in the

world.

There are two railway stations, one being the terminus of all the country lines, and the other devoted to sub- urban traffic. The suburbs of Williamstown, Sandridge, Footscray, St Kilda, Emerald Hill, Brighton, Elsternwick, Hawthorn, Richmond, and Essendon are connected by rail with the city.

The Melbourne Hospital is in the form of an extensive series of brick buildings, situated close to the public library. There are beds for about 300 patients. The Alfred Hospital, on the St Kilda Road, was built in com- memoration of the visit of Prince Alfred; it has beds for The lying-in hospital can accom- modate 62 persons. The blind asylum has over 100 inmates ; and there are a deaf and dumb asylum, an im- migrants' home, and other charitable institutions.

Melbourne contains many churclies, but few of them will compare with the public buildings in appearance. The Roman Catholic cathedral of St Patrick, when com- pleted, will, however, be a conspicnous ornament to the city. The Anglican cathedral, now (1882) in the course of erection, is to cost about £100,000. The most striking ecclesiastical building is the Scotch church in Collins Street, which divides with Ormond College and the Wilson Hall the honour of being the finest specimen of architecture in the city.

There are in Melbourne, among its numerous state schools, about thirty whose size and proportions entitle them to rank with the architectural ornaments of the city. They have each accommodation for from 600 to 2000 scholars. Abundant provision has been made for secondary in- struction by the denominations and by private enterprise. The Scotch College and the Presbyterian Ladies' College, the Wesiey College and the Wesleyan Ladies' College, the Church of England Grammar School, St Patrick's College and

St Francis Xavier's College, are all connected with the churches; and there are besides between twenty and thirty good private grammar schools.

Melbourne contains the offices of numerous banks, sav- ings banks, and building societies.

The parks and public gardens of Melbourne are exten- sive and handsome. Within the city proper there are four gardens, which have been decorated with a lavish expenditure. The Fitzroy Gardens are one dense network of avenues of oak, elm, and plane, witha 'fern-tree gully " in the middle. Casts of famous statnes abound; and ponds, fountains, rustic houses, and small buildings after the design of Greek temples give a variety to the scene. The Treasury, Flagstaff, and Carlton Gardens are of the same class, but less costly in their decorations. Around the central city there lie five great parks. The Royal Park, of about 600 acres, is lightly timbered with the original gum trees; some portions'of open land are used for recreation. About 30 acres in the centre are beauti- fully laid out to accommodate a very superior zoological collection. The Yarra Park, of about 300 acres, contains the leading cricket grounds; of these the " Melbourne" is the chief, distinguished by its very large stand and the excellence of its pitch. The Botanic Gardens occupy

about 200 acres of land, sloping down to the banks of the river, and laid out with great taste and skill. Albert Park, about 500 acres in extent, is not so elaborately laid out, but contains a small lake, which is much used for boating purposes, as the bay is storiny and exposed. Studley Park, a favourite place for picnics, is a romantic corner on a bend of the upper Yarra, of about 200 acres extent, left entirely in a state of nature.

Besides these parks each suburb has its own "gardens " of moderate extent. At Flemington a large reserve is devoted to racing purposes, where in November the race for the Melbourne Cup is held, the great racing carnival of Australia, attended by about 100,000 persons.

The shipping of Melbourne is very considerable. In 1880 about 1500 vessels entered and cleared again, their tonnage being 960,000. Nearly all

the intercolonial and a small proportion of the foreign vessels ascend the Yarra and unload in the heart of the city. The river was originally navigable for vessels of only 9 feet dranght ; but of late years the channel has been deepened so much that vessels drawing 16 feet can ascend with safety. Great works are nuw in operation by which the course is to be straightened and further deepened ; and the quays which line the river banks will be made accessible to the large vessels which now have to lie in the bay off the Sandridge and Williamstown piers.

Shipbuilding is a comparatively unimportant industry, but a great deal of repairing is done; the graving dock at

Williamstown is able to hold the largest vessels which |

enter the port.

The total values of the imports of Melbourne for 1879 |

and 1880 were respectively £15,035,000 and £14,557,000, and of the exports £12,454,000 and £15,954,000.

In 1881 Melbourne contained 2469 factories, employ- ing 38,141 hands, and converting £8,012,745 worth of raw material into £13,384,836 worth of finished articles. The leading products are leather, flour, clothing, furniture, boots, carriages, preserved meats, ales, soap, candles, cigars, ironwork, jewellery, jams, confectionery, biscuits, and woollens.

The city is abundantly supplied with newspapers, includ- ing three morning and three evening dailies. are published.

The climate of Melbourne is exceptionally fine, the only drawback being the occasional hot winds which blow from

the north for two or three days at a time, and raise the |

temperature to an uncomfortable extent. But the propor- tion of days when the sky is clear and the air dry and mild is large. The mean annual temperature is 57°, which would make the climate of Melbourne analogous

to that of Madrid, Marseilles, or Verona, but without the extremes experienced in those places. Snow falls every year in Italy, while it is unknown in Melbourne; and the highest temperature reached there in summer is below that of the cities mentioned.

As a field for emigration from European countries, Mel- bourne offers many advantages to the industrious mechanic or labourer.

The cost of living is about the same as in London. Rents are higher, and furniture and utensils dearer; but butcher meat, bread, and clothes are cheaper.

There is no city where more has been done for the working-classes or where they have made so good a use of their advantages. Many of their efforts at government (for they have all the power in their hands) have been ill-advised, but individually they have exhibited a prudence of which the community reaps the fruits. It is one of the peculiar features of Melbourne that about three out of every four mechanics who have reached middle life own the neat cottages they occupy.

Two reviews |

MELBOURNE

History.—The city of Melbourne is without exception the most striking instance of the aptitude of the Anglo-Saxon race for colonization. It was not till the opening years of the' present century that the first European sailed through the narrow entrance to Port Phillip, and it was only in 1835 that the white man made his habitation there. In that year John Fawkner sailed up the Yarra in his little vessel the '" Enterprise," laden with materials for a settlement; he was stopped by a slight waterfall in a valley where dense groves of wattle trees all in bloom loaded the air with perfume, and where flocks of white cockatoos whirled aloft when the first stroke of the axe resounded in the forest. This spot is now the centre of a great city 10 miles in length, 6 in breadth, covering an area of 45,000 acres, and peopled by 283,000 persons. So rapid and solid a growth, at a distance from the mother country of the whole extent of the earth, is an example of colonizing enter- prise altogether without parallel.

The settlement was at first called by the native name " Dootigala," but a desire for distinguished patronage caused the portion on the sea-shore, which was then esteemed the more important, to be called " Williamstown," after King William live while the little collection of huts some 3 or 4 miles inland was named " Melbourne," in honour of the prime minister Lord Melbourne.*

For two years a constant stream of squatters with their sheep flowed in from Tasmania; then numerous " overlanders" drove their flocks from the Sydney side across the Murray and settled near Port Phillip. Captain Lonsdale was sent by the Sydney Government to act as police magistrate, but in 18388 Mr Latrobe was placed in charge with the title of superintendent. As the squatters prospered Melbourne increased in size, so that in 1841 it contained 11,000 inhabitants. A period of depression occurred in 1843, followed by several years of the greatest prosperity, till, in 1851, gold was discovered in New South Wales. The district of Port Phillip became infected by the excitement ; many parties scoured that part of the country in search of the precious metal, and six wecks after the first discovery of it there the great riches of Ballarat were made known. 'Within a year from that time a hun- dred thousand men had landed in the colony in order to proceed to the diggings; for several years after the samc number landed every twelve months; and Melbourne increased in population from 30,000 to 100,000 in the course of two or three years.

During the year of the gold discoveries, the Port Phillip district was separated from New South Wales, and formed into a separate colony with the name Victoria. In 1855 the British Government granted to it a complete autonomy ; Melbourne became the capital of the new colony. (A. SU.)

MELBOURNE, Witt1am Lams, sEconD VIscountT (1779-1848), second son of the first Viscount Melbourne,

was born 15th March 1779. After completing his course

_at Trinity College, Cambridge, he studied law at the

university of Glasgow, entered Lincoln's Inn in 1797, and was called to the bar in 1804. In 1805 he married Lady Caroline Ponsonby, daughter of the

earl of Bess- borough, who after her separation from him acquired some fame as a novelist, and was also a friend of Lord Byron. On entering parliament the same year Lamb joined the opposition under Fox, of whom he was an ardent admirer; but his Liberal tendencies were never of a very decided character, and he not unfrequently gave his support to Lord Liverpool during that statesman's long tenure of office. During the short ministry of Canning in 1827 he was chief secretary for Ireland, but he afterwards for a time adhered to the small remnant of the party who supported the duke of Wellington. The influence of Melbourne as a politician dates from his elevation to the peeragein 1828. Disagreeing with the duke of Wellington on the question of parliamentary reform, he in 1830 entered the ministry of Grey as home secretary. For the discharge of the difficult and multifarious duties of this office at such a critical time he was decidedly deficient both in insight and in energy, but his political success was totally independent of his official capacity ; and, when the ministry of Grey was wrecked on the Irish question, Melbourne was chosen to succeed him. Almost immedi- ately he had to give place to a Conservative ministry under Peel, but, the verdict of the country being in his favour, he resumed office in 1835. The period of his ministry was wholly uneventful, and for a considerable time before he resigned in 1841 he had lost the confidence of the

country. From the time of his retirement from office he | as Néldeke, regard the whole as unhistorical and comparatively late

took little interest in politics. He died at Melbourne House, Derbyshire, 24th November 1848.

Lord Melbourne was without even the elementary qualification of diligent attention to details, which in the absence of higher endow- ments sometimes confers on a statesman the greater part of his success. Nor can it be said that in public he ever displayed any of those specious aud brilliant talents which are often found an acceptable substitute for more solid acquirewents. Though he pos- sessed a fine and flexible voice, his manneras a speaker

was inetfec- tive, and his speeches were generally ill-arranged and destitute of oratorical point, notwithstanding his occasional indulgence in in- elegant flights of rhetoric. Indeed his political advancement was wholly due to his personal popularity. He had a thorough know- ledge of the private and indirect motives which influence politicians, and his genial attractive manner, easy temper, and vivacious, if occasionally coarse, wit helped to confer on him a social distinction which for a time led many to take for granted his eminence as a statesman. The most notable and estimable feature of his political conduct is his relation to Queen Victoria, whom he initiated into the duties of sovereign with the most delicate tact and the most friendly and conscientious care.

MELCHIADES, or Mittrapzs (other forms of the name being Meltiades, Melciades, Milciades, and Miltides), was

appears to have been an African by birth, but of his personal history nothing is known. The toleration edicts of Galerius and of Constantine aud Licinius were published during his pontificate, which was also marked by the hold- ing of the Lateran synod in Rome (313), at which Cecilianus was acquitted of the charges brought against him, and Donatus condemned. Melchiades was preceded and followed by Eusebius and Sylvester I. respectively.

MELCHITES. The name of Melchites (Syriac, Malkdyé ; Arabic, .Walakiya, or in the vulgar pronunciation Milkiya) means etymologically the royal party, and so is currently applied in the East to Syrian and Egyptian Christians of the Orthodox Greek Church, adherents of the creed supported by the authority of the king, that is, of the Byzantine emperor. The Melchites therefore are those who accept the decrees of Ephesus and Chalcedon as distinguished from the: Nestorians and Jacobites, and the name reflects in an interesting manner the way in which the doctrinal controversies that agitated the Eastern empire associated themselves with national feelings of antagonism to the imperial rule.

MELCHIZEDEK (PIY220, “king of righteousness ”), king of Salem and priest of “supreme El” (7 ‘elyén), brought forth bread and wine to Abram, on his return from the expedition against Chedorlaomer, and blessed him in the name of the supreme God, possessor (or maker) of heaven and earth.

And Abram gave him tithes of all his booty (Gen. xiv. 18-20). The Bible history tells us no- thing more about Melchizedek (comp. Hebrews vii. 3); but the majestic figure of the king-priest, prior to the priesthood of the law, to whom even the father of all Israel paid tithes, suggested a figurative or typical application, first in Psalm ex. to the vicegerent of Jehovah, seated on the throne of Zion, the king of Israel who is also priest after the order of Melchizedek, and then, after the gospel had confirmed the Messianic interpretation of the Psalm (Matt. xxii. 42 sqg.), to the kingly priesthood of Jesus, as that idea is worked out at length in the Epistle to the Hebrews.

The theological interest which attaches to the idea of the pre- Aaronic king-priest in these typical applications is practically in- dependent of the historical questions suggested by the narrative of Gen. xiv. It is generally recognized that this chapter holds quite an isolated place in the Pentateuchal history ; it isthe only passage which presents Abraham in the character of a warrior, and connects him with historical names and political movements, and there are no clear marks by which it can be assigned to any one of the docu- ments of which Genesis is made up. Thus, while one school of interpreters finds in the chapter the earliest fragment of the politi-

cal history of western Asia, some even holding with Ewald that the narrative is probably based on old Canaanite records, other critics,

in origin. On the latter view, which finds its main support in the intrinsic difficulties of the narrative, it is scarcely possible to avoid the conclusion that the chapter is one of the latest additions to the Pentateuch (Wellhausen). The historical arguments pro and coi may be seen at length in recent commentaries, but especially in Tuch's essay (Z. D. Af. G., i. 161 sq., reprinted in the second edition of his Genesis), which was long viewed as decisive in favour of the narrative, and in Noldeke's Untersuchungen, 1869, p. 156 sq., with which compare Wellhausen in Jahrb. f. D. Th., 1876, p. 414 sq. The Assyrian monuments offer no decisive evidence, but are held to confirm the historical possibility of the proper names (Schrader, KiI.und AT., p. 46 sq.; Delitzsch, Paradies, p. 224). Here we can only speak of the episode of Melchizedek, which, though connected with the main narrative by the epithets given to Jehovah in verse 22, secms to break the natural

connexion of verses 17 and 21, and may perhaps have come originally from a separate source. As the narrative now stands Salem must be sought in the vicinity of " the king's dale,"' which from1Sam. xviii. 18 probably but not necessarily lay near Jerusalem. ThatSalem is Jerusalem, as in Psalm Ixxvi. 2,

| is the ancient and common view, and is necessarily followed by

those who view Melchizedek as a late creation.' Those who hold the opposite view now lean to the identification with the Sarciu of John iii. 23, 8 miles south of Bethshean, which Jerome (Zp. lxxiii. ad Evangelium) confirms by a worthless tradition. In a genuine

_ record of extreme antiquity the union of king and priest in one

pope from July 2, 310, to January 10 or 11, 314. He |

person, the worship of Elas the supreme deity bya Canaanite,! and the widespread practice of the consecration of a tithe of booty can present no difficulty; but, if the historical character of the narrative is denied, the origin of the conception must be placed as late as the rise of the temporal authority of the high priests after the exile. An ancient legend identifies Melchizedek with Shem (Palestinian Targum, Jerome on Isa. xlii, Ephraem Syrus zn loco).

MELCOMBE REGIS. See Weymourn.

MELENDEZ VALDES, Juan (1754-1817), minor poet of Spain, was born at Ribera del Fresno, Badajoz, on March 11, 1754. He was destined by his parents, who were in good circumstances, for an official career ; and accordingly, after having completed his preliminary education at Madrid and Segovia, he went to Salamanca, and duly graduated in laws. At an early age he had begun to write verses in imitation of the then much admired though now justly forgotten Eugenio Lobo; but at Salamanca he came under the influence of the purer literary taste of the elder Moratin, while to the friendship of the cultivated and well-read Cadahalso he owed his introduction to the writings of recent English poets. At the age of twenty-six Melendez obtained the prize of the Spanish Academy for the best

eclogue, one of the unsuccessful competitors being the well-known Iriarte; the poein (Batilo: egloga en alabanza de lu vida del campo, 1780) continues to be highly spoken of by native critics, who echo in various forms the remark of one of the adjudicators, that it was 'redolent of the wild thyme." In 1781 Melendez went to Madrid, where Jovellanos became his friend, and obtained for him in 1783 the appointment of professor of the humanities at Salamanca. In 1784, in competition for a prize offered

| by the city of Madrid, he produced his longest poem, a

"dramatic eclogue" entitled Las Bodas de Camacho ("Camacho's Wedding"), which secured the vote of the

judges, but did not add to his reputation, and soon fell

into neglect. His genius does not seem to have been at all dramatic ; at any rate he was unfortunate in his choice of a subject so little capable of dramatic treatment as the well-known episode in Dor Quixote. In the following year, at the age of thirty-one, he published a little volume of lyrics and pastorals which gave him the first place he still holds among Spanish poets of the 18th century. Several editions were exhausted in a single year. With poetical fame came professional advancement, and in 1789 the "Restorer of Parnassus" (Restaurador del Parnaso), as Melendez is sometimes pedantically called by his countrymen, received a judicial appointment at Saragossa, which in 1791 he exchanged for a chancery

1 On the other hand it is not correct to appeal to the Penulus of Plautus for the epithet 'elyén.

auditorship at Valladolid. In 1797 the publication of a new and greatly enlarged edition of his works, dedicated to the prince of the peace, was followed by his removal to Madrid to a high post in connexion with the treasury. The new poems included somewhat heavy philosophical epistles written after the manner of Youug, and an uumistakably dull epic canto entitled Caida de Luzbel ("The Fall of Lucifer "), suggested by Milton, as well as an Ode to Winter, which showed how well the author had made

himself acquainted with Thomson. On the fall of his friend Jovellanos in 1798 Melendez was ordered away from Madrid, first to Medina del Campo and afterwards to Zamora, and it was not till 1802 that he was permitted to settle in Salamanca. or the next six years his literary activity was but slight, being limited to the production of a short poem on " Creation" and the preparation of an unfinished translation of the Hneid. After the revolution of Aranjuez (1808) Melendez accepted from King Joseph

the post of councillor of state and afterwards that of |

minister of public instruction, a failure of patriotism which involved him in many indignities and even dangers ; in 1813 he was of course compelled to quit his country, and, after sojourning successively at Alais, N imes, and Toulouse, he died in considerable poverty and neglect at Montpellier, on May 24, 1817. During his exile he employed himself in the preparation of a complete edition of his works, with numerous additions and corrections; this was afterwards published, along with a life of the author by Quintana, at the expense of the Government (4 vols. 8vo, Madrid, 1820; reprinted at Paris, 1832, and at Barcelona, 1838).

MELFI, a city of Italy, in the province of Potenza, 30 miles N. of Potenza, on the road and railway between that city and Foggia, is built on a small hill on the lower slopes of Monte Volture. The castle was originally erected by Robert Guiscard, but as it now stands it is mainly the work of the Doria family, who have possessed it since the time of Charles V.; and the noble cathedral which was founded in 1155 by Robert's son and successor, Roger, has had to be subjected to a modern restoration in consequence of the earthquake of 1851. inhabitants ; the commune had 9863 in 1861 and 12,657 in 1881.

Melfi is of doubtful origin, but appears to have existed at least as early as the 4th century. of Apulia in 1041, and provided with fortifications. The council held by Nicholas I. in 1059, that of Urban II. in 1090, the rebellion against Roger in 1133 and the subsequent punishment, the plunder of the town by Barbarossa in 1167, the attack by Richard, count of Acerra in 1190, and the parliament of 1223, in which Frederick II. established the constitution of the kingdom of Naples, form the principal points of interest in the annals of Melfi during the more eventful period of its history. In 1348

Joanna I. of N aples bestowed the city on Niccolo Acciajuoli ; but it was shortly after- wards captured, after a six months' siege, by the king of Hungary, who transferred it to Conrad the Wolf. In 1392 Goffredo Marzano was made count of Melfi; but Joanna II. granted the lordship to the Caracciolo family, and they retained it for one hundred and seven years till the time of Charles V. An obstinate resistance was offered by the city to Lautree de Foix in 1528; and his entrance within its walls was followed by the massacre, it is said, of 18,000 of its citizens. As a bishopric Melfi is directly dependent on the Holy See.

MELIT'A (MeXiry), the classical name for Matra (¢.2.), was also the name borne by the modern Jfeleda, one of the Dalmatian islands, situated immediately to the south of Sabbioncello and to the north of Ragusa. It is about 24 miles in length, averaging about 14 in breadth, and has a good harbour. At one time it was supposed by some authors to have been the scene of the shipwreck of St Paul, but this point has now for some time been conclu- sively settled in favour of Malta. See Smith, Voyage and Shipwreck of St Paul, 1848.

MELITO, bishop of Sardes, a Christian writer of the 2d century, is mentioned by Eusebius (H. Z., iv. 21)

In 1871 the city had 10,945 | be expected to take place.

| Seebeck's discovery of thermo-electricity) in the construction of the

By the Normans it was made the capital | : : : Bee cee Ce na _ tried screens of glass, sulphate of lime, mica, and ice, also of water,

MEL—MEL

along with Hegesippus, Dionysius of Corinth, Apollinaris of Hierapolis, Irenzeus, and others, his contemporaries, as a champion of orthodoxy and upholder of apostolic tradition, Of his personal history nothing is known, and of his numerous works (which are enumerated by Eusebius) only a few fragments are now extant. They included an Apologia addressed to Aurelius some time between 169 and 180 4.D., two books relating to the paschal controversy, and a work entitled "ExAoyaé (selections from the Old

Testament), which contained the well-known catalogue of "the books of the Old Covenant." The fragments have been edited with valuable notes by Routh (Reliquizx Sacre, vol. i, 1814). It seems more than doubtful whether the Apologia of Melito "the Philosopher," discovered in a Syriac translation by Tattam, and subsequently edited by Cureton and Renan, ought to be attributed to this writer

| and not rather to another of the same name.

MELLONI, Maceponio (1798-1854), a distinguished physicist, was born at Parma on April 11, 1798. From 1824 to 1831 he was professor at Parma, but in the latter year he was compelled to escape to Frauce, having taken part in the revolution. In 1839 he went to Naples as director of the conservatory of arts and handicrafts. He was likewise director of the Vesuvius observatory, a post which he held until 1848. Melloni received the Rumford medal of the Royal Society in 1834. In 1835 he was elected correspondent of the Paris Academy, and in 1839 a foreign member of the Royal Society. He died from an attack of cholera on August 11, 1854.

From the Royal Society catalogue of papers we find that Melloni produced eighty-six memoirs by himself, as well as three in connexion with other physicists. These embrace a wide range of subjects, but the reputation of Melloni as a physicist rests more especially upon his discoveries in radiant heat. Men of science were, in the early part of this century, very much in the dark with regard to the nature of the invisible heat rays. Leslic and others had indeed advanced the subject by means of the differential thermometer, but such an instrument was at the best a very poor substitute for the human eye. It was necessary to invent an instrument more nearly capable of doing for the dark rays what the eye does for those of light before any great increase in our knowledge of this subject could This step was taken (shortly after

thermo-multiplier or combination of thermopile and galvanometer whieh formed the subject of a joint memoir by Nobili and Melloni in 1831. In this memoir, after describing their instrument, these physicists confirmed the experiments of Leslie and others. They

oil, alcohol, and nitric acid enclosed in glass, and found an instau- taneous effect produced in the index of their instrument except for ice and water, the source of heat being an iron ball below redness.

| After finding that most substances when used as screens stopped

a much larger proportion of dark heat than they did of light,

| Melloni set himself to discover some body that might be transparent

for dark heat. In this search he was rewarded with complete success. Rock-salt was found to possess this property ; and he immediately proceeded to construct prisms and lenses of rock-salt with which he proved the refraction of dark heat, that is to say, of the heat proceeding from bodies below incandescence. _

Melloni was likewise very successful in studying the action upon dark heat of screens of various substances. His experimentsin this and other directions are described by Baden Powell in his report to the British Association ou Radiant Heat (1840). The rays ot the lamp were thrown upon screens of various materials in such a manner that the effect transmitted from all the screens was of a certain uniform amount. This constant radiation was then inter- cepted bya plate of alum,.and it was found that very pe quantities of heat were transmitted through the alum in the di "i cases. Melloni concludes that the calorific rays issuing from t f various diaphanous screens are, therefore, of different qu – possess what may be termed the diathermancy peculiar to each of t : substances through which they have passed. One of his screen was made of green glass, and he found that a piece of alum haat mitted only 1 per cent. of the heat which had passed through ! te screen. Green glass and alum form, therefore, an antagonisu combination.

These expcriments suggest naturally a new analogy boomy fear heat and light which could not fail to strike Melloni, and accor ney we soon find him describing an experiment with the solar el transmitted through green glass and then intercepted by ©

media, They pass copiously through rock-salt, he tells us, but feebly through alum, and hence Melloni concludes that there are amongst the solar rays some which resemble those of terrestrial heat, and in general that the differences observed between solar and terrestrial heat in the transmission of rays are to be attributed merely to the mixture in different proportions of these several species of rays. An instrument like the thermo-multiplier could not of course remain a monopoly, and shortly after its completion we tind Professor James Forbes making usc of it to prove the polarization of heat as well as to extend our knowledge of refraction. The brilliant researches of this experimentalist were, like those of Melloni, crowned with the Rumford medal of the Royal Society. On September 2, 1839, Arago communicated to the academy of sciences a letter by Melloni, who had found that rock-salt acquires by being smoked the power of transmitting most easily heat of low temperature, or dark heat. Forbes had discovered a similar property in mica split by heat, and he now showed that rock-salt roughened and mica scratched possess similar properties to blackened rock-salt. Melloni on his part took up the subject of polarization, and decided in favour of the cqnal polarizability of heat from different sources, a conclusion that did not then appear to Forbes to be in conformity with his experiments. It is very instructive to notice the loyalty which held both thiese experimentalists to the results of their observations. While Melloni differs from Forbes with regard to polarization, he will not allow the truth of a generalization proposed by Ampére, who had endeavoured to explain on the theory of undulations the identity of light and heat,—the difference of effect being dependent solely on the different wave-lengths, those producing heat being larger than those giving rise to light. plained by this hypothesis, but he mentions some experiments in which he thinks that this theory will not hold. The brilliant generalizer from without has of course a different point of view from the laborious experimentalist within. scientific honour—for it is by the seeming conflict, but in reality the united efforts of workers such as these that the essential element of stability in the structure of scientific knowledge is finally secured.

MELON (Cucumis Melo, 1), a most polymorphic

species of the order Cucurbitacee, the varieties of which | : yen Oates ae | Sporades of the A%gean Sea, situated at the south-west

are grouped by Naudin under ten tribes, while several other plants of less known characters probably belong to it! The melon is an annual herb with palimately-lobed leaves, and bears tendrils. It is moncecious, having male and female flowers on the same plant. The flowers have deeply five-lobed campanulate corollas and three stainens. Naudin observed that in some varieties (e.g., of Cantaloups) fertile stamens sometimes occur in the female flowers. It is a native of south Asia "from the foot of the Himalayas to Cape Comorin," where it grows spontaneonsly, but is*

Melloni admits that many phenomena may be ex- |

| ancient as that

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other hand, the serpent-melon was made to bear ovoid and reticulated fruit.® .

With reference to the early cultivation of the melon, Naudin thinks it is probable that the culture in Asia is as of all other alimentary vegetables. The Egyptians grew it, or at least inferior races of melon, which were either indigenous or introduced from Asia. The Romans and doubtless the Greeks were familiar with

it, though some forms may have been described as

aud habit, but much more so in the fruit, which in some |

varieties is no larger than an olive, while in others it rivals the ponderous fruits of the gourd (Cucurbita maxima, L.). The fruit may be globular, ovoid, spindle-

shaped, or serpent-like, netted or smooth-skinned, ribbed or |

furrowed, variously coloured externally, with white, green, or orange flesh when ripe, scented or scentless, sweet or insipid, bitter or even nauseous, &c. Like the gourd, the melon undergoes strange metamorphoses by crossing its varieties, thongh the latter preserve their characters when

alone. The offspring, however, of all crossings are fertile. As remarkable cases of sudden changes produced by artificially crossing races, M. Naudin records that in 1859

Figari (C. maculatus?) bore quite different fruits from their parents, the former being ten to twelve times their size, ovoid, white-skinned, more or less scented, and with reddish flesh; though another individual bore fruits no larger than a nut. The offspring of m. de Figari after being crossed bore fruits of the serpent-melon. On the

1 For generic characters see Benth. et Hook., Gen. Pl., i. 826; and

for a full account of the species of Cucumis and of the tribes of melon,

by M. Naudin, see Ann. des Sci. Nat., 4 sér., tom. xi. p. 34.

2 Naudin, l.c., pp. 39, 76; see also Gard. Chron., 1857, p. 153, es

and 1858, p. 180.

cucuinbers. Columella seems to refer to the serpent- melon in the phrase wt coluber . . . ventre cubat jlexo. Pliny describes them as pepones (xix. 23 to xx. 6) and Columella as melones (xi. 2. 53); see Pickering, Chron. Hist., of Pl., 229. The melon began to be extensively cultivated in France in 1629, according to Olivier de Serres. Gerard (//erball, 771) figured and described in 1597 several kinds of melons or pompions, but he has apparently included gourds under the same name. Picker- ing observes that the melon was carried by Columbus to America, and by the Portuguese to the Malayan Archi-

| pelago.

The origin of some of the chief modern races, such as "'Cantaloups," '" Dudaim," and probably the netted sorts, is due to Persia and the neighbouring Caucasian regions. The first of these was brought to Rome from Armenia in

the 16th century, and supplies the chief sorts grown for

ye tall sort | ie Branch markets; but many others are doubtless

artificial productions of West Europe.

For cultivation of the melon, see art. HorTICULTURE, and also Gard, Chron., May 6, 1882, p. 596; and for references to French literature on the same see Naudin, wt supra, p. 82.

MELOS (Att. Gr., M7Aos), the modern Milo, one of the

corner of the archipelago, in 36° 45’ N. lat. and 24° 26’ E. long., 75 miles due east from the coast of Laconia. From east to west it measures about 14 miles, from north to south 8 miles, aud its area is estimated at 52 square miles. The greater portion is rugged and hilly, and the culminating point, Mount Elias in the west, reaches a height of 2538 feet. Like the rest of the cluster to which it belongs, the island as a whole is of volcanic origin, with tuff, trachyte, and obsidian among its ordinary rocks. The great

cultivated in the temperate and warm regions of the whole | natural harbour, which, with a depth me HY world. Itis excessively variable both in diversity of foliage — inn avn et fo us to’cut

the island into two fairly equal portions, with an isthmus

‘ not more than 11 miles broad, is evidently the hollow of

the principal crater. In one of the caves on the south coast the heat is still so great that one cannot remain within more than a few minutes, and on the eastern shore of the harbour there is a remarkable cluster of hot sulphurous springs. Sulpliur is found in abundance on the top of Mount Kalamo and elsewhere. In ancient times the alum of Milo was reckoned next to that of Egypt (Pliny, xxxv. 15 [52]), and millstones, salt (from a marsh at the east end of the harbour), and gypsum are still exported. The Melian earth (yj MydAras), employed as a

| pigment by ancient artists, was probably native white-lead.

. . , ‘ Orange, olive, cypress, and arbutus trees grow throughout the offspring of the wild melons m. sauvage de VInde | — Bes 2 ? (C. a as) and m. s. d’Afrique, le petit m. de | the island, which, Pree 00 Qa oan aye ote:

ies 4 : fusion of vegetation.

The vine, the cotton plant, and barley are the main objects of cultivation. Including the neighbouring islands of Antimilos (4 square miles), Cimolos (16 square miles), and Polinos (53 square miles), the total population of Melos was only 5538 in 1879. Antimilo, 53 miles north-west of Milo, is a mere uninhabited mass of trachyte, and is often called Erio- milo or Desert Melos. Cimolos, or Argentiera, less than 1 mile to the north-east, was famous in antiquity for its

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3 See also Naudin, in Youv. rech. sur l. hyb. dans les veg., p. 118,

figs and fuller’s earth (KywdA‘a yy), and contained a considerable city, the remains of which still cover the cliff of St Andrews. Polinos, Polybos or Polivo, and Kaiment, or “ Burned Island,” the //e Brulée or Jsola Bruciata of the French and Italians, lies rather more than a mile south-east of Cimolos. It was in antiquity the subject of dispute between the Melians and Cimolians. It has long been almost uninhabited.

In ancient times the city of Melos, built terrace fashion round a hill in the north-east of the main island, was a place of considerable size; “the western wall, of Cyclopean masonry, is traceable all the way down from the summit to the sea,” and among the ruins are a temple in the Corinthian style and a beautiful little theatre cleared in 1836 by order of the king of Bavaria. Painted vases (the ancient Melians were great makers of this kind of ware), bronzes, gold ornaments, and similar specimens of art workmanship have been recovered froin the debris ; and in 1820 the “ Venus of Milo,” now in the Louvre, the noblest extant representation of

Aphrodite, was found in the neighbourhood of the theatre. The top of the hill is now occupied by Castro, the principal village in the island. Atsome distance to the south-east, at the place called Tripiti (¢.c., rpurnrh, "the perforated "'), lies a remarkable cluster of catacombs containing frescos, &c., of evidently Christian origin. DPalea Chora, about 5 miles farther south-east, is now an almost deserted village, but down to the beginning of the last century it had about 5000 inhabit- ants, and if continued for a time to be considered the capital of the island.

The first occupants of Melos were probably Pheenicians, but the island was Hellenized at au early date by Minyaus and Dorians from Laconia. Though its inhabitants sent a contingent to the

Greek fleet at Salamis, they held aloof from the Attic league, aud |

sought to remain neutral during the Peloponnesian War. But in 416 B.c. the Athenians, having attacked the island and compelled

the Melians to snrrender at discretion, slew all the men capable of |

bearing arms, made slaves of the women and children, and introduced a body of five hundred Athenian colonists. Lysander restored the island to its old Dorian possessors, but it never recovered its former prosperity. There were many Jewish settlers in Melos in tlic beginning of the Christian era, and Christianity was early introduced. During the " Frankish " period the island formed part of the duchy of Naxos, except for the few years (1841-83) when it was a separate lordship under Mareo Sanudo and his daughter.

See Leyeester, ° The Voleanie Group of Milo, Anti-Milo, &c.," in Jour. Roy. Geog. Soc., 1852; Tournefort, Voyage; Leake, Yorthern Greece, vol. iii.;: Prokesch von Osten, Denkwiirdigkeiten, &c.; and Bursian, Geog. von Griechenland, vol, ii.

MELROSE, a village of Roxburghshire, Scotland, on the south bank of the Tweed, 37 miles by rail south- south-east of Edinburgh. Its population has steadily advanced from 966 in 1851 to 1550 in 1881. Though a burgh of barony since 1609, it is a purely agricultural village, and would be of little interest but for the ruins of its abbey, now the property of the duke of

Buccleuch. It was formerly called Little Fordell, and its present name even dates from the foundation of the monastery by David IT. in 11386.

There had been a Columbite monastery of Melrose at the place now known as Old Melrose, about a mile and a half to the east of the village, but this establishinent, probably never of much architectural magnificence, had, according to the Chronicle of the Picts and Scots, been destroyed by Kenneth M'Alpin in 839, and may never have recovered from the disaster. King David's abbey, which he entrusted to a body of Cistercian monks from Rievaulx (Riuall) in Yorkshire, was dedicated on Sunday 28th July 1146 ; it was laid inruins by Edward II. of England in 1322; Bruce caused the work of restoration to be vigorously prosecuted, but the edifice was again burned by Richard IT. in 1885. The abbey church as it now stands consequently belongs in the main to the latter half of the 14th century and the first half of the 15th, with a good many portions of a considerably later date.

Architecturally the abbey may be described as a splendid example of the Middle Pointed style, strongly affected on the one hand by Flamboyant and Perpendicular tendencies, and on the other by the individuality of some of the builders. Cruciform in plan, it measured 214% feet from east to west, the width of the nave being 69 feet, and across the transepts 115§. The noble edifice was damaged by

the English in 1545 ; and since the Reformation it has been altered to suit the necessities of Presbyterian worship (1618-1810), and

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plundered by builders to supply ornaments for houses. The whole building is now in ruins. The west end and a good part of the north side have disappeared ; but the elevation of the south side is nearly entire, both the transepts and the east end are externally in very fair preservation, part of the central tower is standing and the sculptured roof still covers the east end of the chancel, Of the individual features of the building, the great eastern window has been generally most admired since Sir Walter Scott celebrated the moonlit aspect of its "slender shafts of shapely stone." It has

five lights ; the height is 37 feet and the width 16 ; and the upper portion is filled in with delicate tracery of a geometri- cal design. Very beautiful too is the whole gable of the south transept. In the interior, on the north side of the nave, there still stand four of the original square piers, and one of them shows a Norman ‘“‘cap.” The choir, the west end of which is shut off by a massive rood-screen, has been largely “ spoiled by rough 17th cen- tury work”; but enough remains of the decorative detail to provoke the admiration and despair of the modern artist in stone, The facile and at the same time elaborate rendering of vegetable forms, such as the Scotch “ kail,” is particularly striking. It was in the abbey-church of Melrose, where Alexander II. had long before been buried near the high altar, that the heart of Bruce found its final resting-place; and among the many tombs which afterwards gathered under the same roof were those of his faithfnl knight James Lord Douglas, Sir William the dark knight of Liddesdale, and the lero of Chevy Chase.

The ancient muniments of the abbacy have been preserved in the archives of the earl of Morton; they were published by the Bannatyne Club (2 vois., 1837, Liber Sancte Marie de Melros), under the editorship of Cosmo Innes. Among the many interesting docu- ments is one of the very earliest specimens of the Scotch tongue. The Chronica de Mailros, preserved among the Cotton MSS., has been twice printed, —at Oxford (1684) by Fulman, and by the Banna- tyne Club (1835), edited by John Stevenson. From about 1140 till its close in 1265 the chronicle may be considered original ; it was put largely under contribution by later compilers.

See Waleott, The Ancient Church of Scotland; W. Hutehinson, A View of Northumberland, &c., Neweastle, 1778; Adam Milne, Description of the Parish of Melrose, Kelso, 1782; J. Bower, Description of the Abbeys of Melrose and Old Melrose, Kelso, 1813; J. A. Wade, ZWistory of St Mary’s Abbey, Melrose, Edin- burgh, 1861; Fred. Pinehes, The Abbey Church of Melrose (a series of architectural drawings), London, 1879.

MELTON MOWBRAY, a market-town of England, county of Leicester, is pleasantly situated in a fertile vale, at the confluence of the Wreake and Eye, 15 miles north- east of Leicester and 104 north of London byrail. The Eye is spanned by a bridge of four arches. The town consists principally of

two main streets, and is substan- tially built of brick. The church of St Mary, a hand- some cruciform structure partly in the Early English style, and adored by a lofty and richly ornamented tower, was heightened and otherwise enlarged in the reign of Elizabeth, and has also undergone modern improvements. There are largely endowed almshouses and several other charities. Melton is the seatof a celebrated hunting district, in connexion with which there are stables in the town capable of accommodating about eight hundred horses. It is also well known for its pork pies, and has a very large trade in Stilton cheese. There are breweries and tan- neries, as well as an important cattle market. Iron- works have lately been erected. The town possesses great railway facilities. The population of the urban sanitary district in 1871 was 5033, and in 1881] it was 5766.

The old name of Melton was Medeltone, and the place is of con- siderable autiquity. During the Civil War it was in February 1644 the"scene of the defeat, with great slaughter, of the parliamentary forces by the royalists. It is the birthplace of John Henley the orator.

MELUN, capital of the department of Seine-et-Marne, France, 28 miles south-east of Paris by railway, occupies a hill on the right bank of the Seine and the level ground at its foot. It owes its rank as "chef-lieu" to its central position merely; for there are two other towns in the department, Meaux and Fontainebleau, which have a larger population. Melun is near one of the most beautiful parts of the forest of Fontainebleau. Among the rich estates its neighbourhood the most remarkable is the magnificent chateau of Vaux-Praslin, which belonged to Fouquet, superintendant of finances under Louis XIV. The church

of Notre Dame formerly belonged to a nunnery, now occupied by a central house of detention for twelve hundred prisoners. On the apse of the church of St Aspais may be seen a modern medallion in bronze, the work of the sculptor Chapu, representing Joan of Arc as the liberator of Melun. The population in 1881 was 12,145.

Melun is a very aneient town, and has played an important part in history. As early as the time of Cesar's Gallie wars 1t was taken possession of by his lieutenant Labienns, in order to attack Lutetia with greater ease by the right bank of the Seine. It was pillaged by the Normans, and afterwards became the favourite residence of the first kings of the race of Capet ; Robert and Philip I. both died there, During the Hundred Years' War Mclun was given up by Jeanne of Navarre to her brother, Charles the Bad, but was retaken by the dauphin Charles and Dugueselin. In 1420 it made an heroic defence against Henry V. of England and his ally the duke of Bur- gundy. 'Ten years later the people of Melun, with the help of Joan of Are, drove out the English. It was oecupied by the League in 1589, and retaken by Henry IV. in the following year. Jacques Amyot was born there in 1504.

MELVILLE, Henry Dunpas, Viscount (1741-1811), younger son of the Right Honourable Robert Dundas, lord president of the Scottish court of session, was born at Edinburgh in 1741, and was educated at the high school and university there. Becoming member of the faculty of advocates in 1763, he soon acquired a leading position at the bar. After his appointment as lord advocate in 1775, he gradually relinquished his legal practice to devote his attention more exclusively to public business. On entering parliament in 1774, he had joined the party of Lord North, and, notwithstanding his provincial dialect and ungraceful mauner, he soon distinguished himself in the debates by his clear and argumentative speeches. After holding sub-ordinate offices under the marquis of Lansdowne and Pitt, he in 1791 entered the cabinet as home secretary. From 1794 to 1801 he was secretary at war under Pitt, who conceived for hima special friendship. In 1802 he was elevated to the peerage as Viscount Melville and Baron Dunira. Under Pitt in 1804 he again entered office as first lord of the admiralty, when he introduced numerous improvements in the details of the department. His im-peachment in 1806, for the appropriation of balances of public money remaining in his hands, resulted in his ac- quittal, but he never again held office. He died May 27,

1311.

MELVILLE, Anprew (1545-1622), a distinguished Scottish scholar, theologian, and religious reformer, was the younges§ son of Richard

Melville, proprietor of Baldovy, near Montrose, at which place Andrew was born in 1545. His father fell at the battle of Pinkie, fighting in the van of the Scottish army, two years after the birth of his son ; and, his wife having soon after. followed him to the grave, the young orphan, then a gentle and delicate child, was tenderly cared for by his eldest brother Richard and his amiable and pious wife, whose memory the great. scholar ever afterwards cherished with the warmest gratitude aud affection. Ata very early age Melville began to show a strong taste for learning, and his brothcr did every thing in his power to give him the best education the country could then afford. The rudiments of Latin he obtained at the grammar school of Montrose, after leaving which he prosecuted the study of Greek for two years under Pierre de Marsilliers, a Frenchman whom John Erskine of Dun had induced to settle at Montrose; and such was the proficiency Melville made that on going to the university of St Andrews he excited the astonishment of both students and professors by using the Greek text of Aristotle, which no one else there understood, the Latin translation being that which was alone employed in the teaching of logic. On completing his course of study, Melville left St Andrews with the character of " the best poet, philosopher, and Grecian of any young master in the land." He then,

in 1564, being nineteen years of age, set out for France to perfect his education at the university of Paris. He there applied himseif especially to the study of the Oriental languages, but he had also the advantage of attending the last conrse of lectures delivered by Turnebus in the Greek chair, as well as those of the celebrated Ramus, whose niode of philosophizing and plan of teaching he afterwards introduced into the universities of Scotland. From Paris he proceeded to Poitiers for the purpose of studying civil law, and though only twenty-one years of age he was apparently at once made a regent in the college of St Marceon. After a residence of three years, however, the political troubles of the country compelled him to leave France, and he then went on to Geneva, where he was warmly welcomed by Theodore Beza, at whose instigation he was appointed to fill the chair of humanity in the academy of Geneva, which then happened to be vacant. In addition to his teaching, however, he also applied himself to the further prosecution of his studies in Oriental litera-

ture, and in particular acquired from Cornelius Bertram, one of his brother professors, a knowledge of Syriac. While he resided at Geneva the massacre of St Bartholomew in 1572 drove an immense number of Protestant refugees to that city, including several of the most distinguished French men of letters of the time, with whom Melville had now the opportunity of intimate intercourse. Among these were several men deeply learned in civil law and political science, and their society no doubt tended greatly both to increase Melville's knowledge of the world and to enlarge his ideas of civil and ecclesiastical liberty— acquisitions which he must have found of essential service when at a later pcriod as a leader of the General Assembly he had to struggle against the attempts of James VI. to crush the liberties of the church of the Scottish Reforma- tion. In 1574 Melville returned to Scotland, and almost immediately afterwards received the appointment of prin- cipal of Glasgow University, which at the time had fallen into an almost rninous state, the college having in fact been shut up and the students dispersed. Melville, however, with the knowledge of academic methods of training which he had obtained abroad, immediately set himself with immense energy to establish a good educa- tional system, and in a short time his fame spread through the kingdom, and students flocked in from all quarters, till the class-rooms lately empty could not con- tain those who came for admission. After labouring for six years in Glasgow, and having brought the seminary into a state of the most thorough efficiency, it was thought desirable that he should undertake the same duties at St Andrews. He accordingly proceeded there in 1580, and was installed as principal of the new theological college. His duties there comprehended the teaching, not only of theology, but of the Hebrew, Chaldee; Syriac, and Rabbinical languages, and the great ability of his lectures was ulliversally acknowlcdged, and excited quite a new interest in the university. The sweeping reforms, however, which his new modes of teaching necessarily involved, and even some of the new doctrines which he began to intro- duce, such as the non-infallibility of Aristotle, soon brought him into collision with some of the other teachers in the university ; and this, along with the troubles which arose from the attempts of the court to force a bastard system of Episcopacy upon the Church of Scotland, forced him to flee into England in order to escape the consequences of an absurd charge of treason which was made against him, and which seemed to threaten a prolonged imprisonment. and not improbably even his life. After an absence

of. twenty months he returned to Scotland in November 1585,. and in March 1586 resumed his lectures in St Andrews, where he continued to fulfil the duties of his office for

twenty ore years. During the whole of that time, however, his more prominent work was that of contending with unwearied energy and indomitable courage against the encroachments of an unscrupulous and tyrannical Govern- ment upon the liberties of the Scottish Church. Into the details of these it is of course impossible to enter here. But that in the main he and his coadjutors were fighting for the constitutionally guaranteed rights of the church is now admitted by all candid inquirers. (See in particular The History of England from 1603 to 1616, by Samuel Rawson Gardiner, vol. i. chap. ix.). 'The chief charge

against Melville is that his fervour often led him to forget |

the reverence due to an "anointed monarch." Of this, however, it is not very easy now to judge. Manners at that time were rougher than at present. Any thing niore

undignified could scarcely expect to be treated with dignity. Besides, what title had one who was acting in a purely arbitrary and illegal manner to receive other than the plainest dealing,—such as being reminded that though he was king over men he was only "(God's silly vassal?" Melville's rudeness (if it is to be called so) was simply the outburst of just indignation from a brave, true, and

upright man, zealous only for the purity of religion and regardless of consequences to himself, and it contrasts |

nobly with the grovelling sycophancy of most of the English bishops towards James. The close of Melville's career in Scotland was at length brought about by James in characteristic fashion. In 1606 he and seven other clergymen of the Church of Scotland were summoned to London in order "that his majesty might treat with them of such things as would tend to settle the peace of the church." The contention of the whole of these

faithful men was that the only way to accomplish that pnrpose was a free Assembly. Melville delivered his opinion to that effect with his accustomed freedom and boldness, and, having shortly afterwards written a sarcastic Latin epigram on some of the snperstitious practices he had observed in the chapel of Hampton Court, and some eavesdropper having conveyed the lines to the king, he was committed to the Tower, and detained there for the space of four years. On regaining his liberty, and being refused permission to return to his own country, he was invited to fill a professor's chair in the university of Sedan, and there he spent the last eleven years of his brave, active, noble, and useful life. [He died at Sedan in L622. at the age of seventy-seven.

MELVILLE, Grorce Joun Wuyrte (1821-1878), has a right to be regarded as the founder of a school of fashionable novels,—the fashionable sporting novel. He was lamented on his death as the Tyrtaus of the hunting field, the laureate of fox-hunting ; all his most popular and distinctive heroes and heroines, Digby Grand, Tilbury Nogo, the Honourable Crasher, Mr Sawyer, Kate Coventry, Mrs Lascelles, are or would be mighty hunters. The eldest son of Major Whyte Melville, of Mount Melville, Fifeshire, he received his school education, like so many of his heroes, at Eton, entered the army in 1839, became captain in the Coldstream Guards in 1846, and retired in 1849. His first appearance in literature was made soon after, with a translation of Horace into fluent and graceful verse, published in 1850. His first novel was Digby Grand, published in 1853. Although this first effort has a good deal more in it of Lytton's early high-flying style than Whyte Melville's later works, the unflagging verve and intimate knowledge with which he described sporting scenes and sporting characters at once drew attention to him as a novelist with a new vein. His power of sustain- ing interest in hunting and the things connected with

hunting appeared more markedly in his next novel, Tilbury ogo, contributed to the Sporting Magazine in 1853. He showed in the adventures of Mr N ogo, what became more apparent in his later works, that he had a surer hand iy humorous narrative than in pathetic description ; there are many pathetic scenes in his novels, but the pathos js sometimes rather forced, intended to point a moral—rather the pathos of the preacher than the poet. The hero of General Bounce, his next novel in order of publication

(Fraser's Magazine, 1854), little as one would expect it from the title, ends in a painful manner, somewhat out of keeping with the lively middle and beginning. When the Crimean War broke out, Whyte Melville took part in it as a volnnteer in the Turkish contingent; but this was

| the only break in his literary career from the time that he rude, insolent, and brutal than James's own occasional | explosions it would be difficult to match, and a king so |

began to write novels till his 'death in 1878. By a strange accident, he lost his life in the hunting-field, the hero of many a stiff ride meeting his fate in galloping quietly over an ordinary ploughed field.

Twenty-one novels appeared from his pen after his return from the Crimea: —Kate Coventry, 1856; The Interpreter, 1858; Holmby House, 1860; Good jor Nothing, 1861; Market Harborough, 1861; The Gladi- ators, 1863; Brookes of Bridlemere, 1864; The Queen's Maries, 1864; Cerise, 1865; Bones and I, 1868; The White Rose, 1868; Wf or N, 1869; Contraband, 1870; Sarchedon, 1871; Satanella, 1872; Uncle John, 1874 ; Sister Lowise, 1875; Katerfelto, 1875; Rosine, 1876; Roy's Wife, 1878; Black but Comely, 1878. Several of these novels are historical, the G/adiators being perhaps the most famous of them. As an historical novelist Whyte Melville cannot be put on a level with Harrison Ainsworth for painstaking accuracy and minuteness of detail; he makes his characters live and move with great vividness, but he obviously did not know at first hand the history of the periods chosen by him. It is on his portraiture of contemporary sporting society that his reputation as a novelist must rest ; and, though now and then a character reappears, such as the supercilions stud- groom, the dark and wary steeple-chaser, or the fascinating sporting widow, his variety in the invention of incidents is amazing. Whyte Melville was not merely the annalist of sporting society for his generation, bat may also be fairly described as the principal moralist of that society ; he exerted a considerable and a wholesome influence on the manners and morals of the gilded youth of his time. His Songs and Verses and his metrical Legend of the True Cross, though respectable in point of versification, are hardly worth mentioning on their own merits.

MELVILL VAN CARNBEE, Pieter, Baron, an eminent Dutch geographer, was born at the Hague 20th May 1816, and dicd October 24, 1856. He traced his descent from an old Scotch family, originally it is said of Hungarian extraction. Destined for the navy, in which his grandfather had won distinction, Melvill imbibed a taste for hydrography and cartography as a student under Pilaar in the college of Medemblik, and he showed his capacity as a surveyor on his very first voyage to the Dutch Indies (1835). In 1839 he was again in the East, and was now attached to the hydrographical bureau at Batavia. With the assistance of the long-neglected documents collected by the old company, he completed in wonderfully short time his first great hydrographical work—a map of Java in five sheets, accompanied by sailing directions (Amsterdam, 1842; 2d revised edition, 1849),— which was received with great applause. Melvill remained in India till 1845 collecting materials for his second great hydro- graphical work, the chart of the waters between Sumatra and Borneo (two sheets, 1845 and 1846, revised edition of first sheet 1847; compare the descriptive memoir in Tindal and

Swart's Journal, 1846). On his return to Holland Melvill was attached to the naval department with the special charge of studying the history of the hydrography of the Dutch Indies. He also undertook, in connexion with Von Siebold, the publication of the Moniteur des Indes, a valuable series of scientific papers, mainly from his own pen, on the foreign possessions of Holland, which was continued for three years. In 1850 Melvill returned to India as tieu- tenant of the first class and adjutant to Vice-Admiral Van den Bosch ; and after the premature death of this com- mander he was again appointed keeper of the charts at Batavia. He was one of the founders and for a time the president of the new society for natural scjence (185V). In 1853 he obtained exemption from active naval service that he might devote himself to a general atlas of the Dutch Indies ; and under the most unfavonrable circumstances he prosecuted the task with incredible energy. But he was not to see its completion. Just after he had lost his young wife and new-born soa he was called in 1856 to be director of the marine establishment of Onrust; and there he soon fell a victim to climate, dying after much suffering in the hospital of Weltevreden, only forty years of age.

In spite of delays caused by the engraving of the maps in Holland, no fewer than twenty-five sheets were already finished, but it was not till 1862 that the whole plan, embracing sixty sheets, was ably brought to a close by Lientenant-Colonel W. F. Versteeg. The premature loss of Melvill was severely felt not only in Holland but in foreign countries, where, as shown by his connexion with the geographical societies of Paris, London, Berlin, and Bergen, his labours were highly esteemed. His industry and energy were equalled only by the benevolence and warmth of his heart. of the Netherlands Lion, in 1849 that of the Legion of Honour.

MEMEL, the most northerly town in Germany, and the principal seat of the Baltic timber trade, is situated in the district of Kénigsberg, Prussia, at the mouth of the Dange, and on the bank of a sound connecting the Kurische Haff with the Baltic Sea. On the side next the sea the town is defended by a citadel and other forti- fications, and the entrance to the large and fine harbour is protected by a lighthouse. Largely rebuilt since a destructive fire in 1854, Memel contuins several churches, a gymnasium, a school of navigation, an exchange, and various judicial and official establishments. It also possesses large iron-foundries, shipbuilding yards, breweries, distilleries, and manufactories of chemicals, soap, and amber wares. By far the most important interest of the town, however, is its trade, the chief items in which are timber and the grain and other agricultural products of Lithuania. he timber is brought by river from the forests of Russia, and is prepared for exportation by about thirty saw-mills. The annual value of timber exported is about £600,000, In 1880 the port of Memel was entered by 898 ships with an aggregate burden of 164,374 tons, and cleared by 932 vessels with a burden of 164,441 tons. 'The population of Memel in 1880 was 19,660.

Memel was founded in 1252 by Poppo von Osterna, grand master of the Teutonic order, and was at first called New Dortmund and afterwards Memmelburg. It soon acquired a considerable trade, and joined the Hanseatic League. During the 18th, 14th, and 15th centuries it was repeatedly burned down by its hostile neighbours, the Lithuanians and Poles, and in the 17th century it remained for some time in the possession of Sweden. In 1757, and again in 1813, it was occupied by Russian troops. After the battle of Jena, King Frederick William III. retired to Memel; and

there, in 1807, a treaty was concluded between England and Prussia. The poet Simon Dach and the astronomer Argelander were natives of Memel.

MEMLING, Hans, a painter of the 15th century, whose art gave a passing lustre to Bruges in the period of its political and commercial decline. Though much

In 1843 he received the decoration |

845

has been written respecting the rise and fall of the school which made this city famous, it still remains a moot question whether that school ever truly existed. Like Rome or Naples, Bruges absorbed the talents which were formed and developed in humbler centres. John Van Eyck first gained repute at Ghent and the Hague before he acquired a domicile elsewhere, and Memling, we have reason to think, was a skilled artist before he settled at Bruges. Yet if the question should be asked where the manner of Memling was shaped, and where he acquired the skill which he displayed at Bruges, we shall be greatly ata loss to reply. The annals of the city are silent as to the birth and education of a painter whose name was iiaccu- rately spelt by different authors, and whose identity was lost under the various appellations of Hans and Hausse, or Hemling and Memling. But no other city of the Nether- lands has vindicated the right which Bruges had no means of proving. Travellers who came to Bruges were only told that Memling's masterpieces were preserved in the hospital of St John. In one of these pictures it was said a portrait of the artist might be discovered; on the sculptured orna- ments of a porch enframing one of its subjects an incident of the master's life might be traced,—his danger as he lay senseless in the street, his rescue as charitable people carried his body to the hospital. 'The legend grew too, It came to be told how the great artist began life as a soldier who went to the wars under Charles the Bold, and came back riddled with wounds from the field of Nancy. Wandering homeward in a disabled state in 1477, he fainted in the streets of Bruges, and was cured by the Hospitallers. Unknown to them, and a stranger to Bruges, he gave tangible proofs of his skill to the brethren of St John, and showed his gratitude by refnsing payment for a picture he had painted. Unhappily the legend refutes itself. The portrait of Memling is a myth ; the carvings of the

capitals of the porch represent the ordinary incidents attending the reception of patients atan hospital. Memling did indeed paint for the Hospitallers, but he painted not one but many pictures, and he did so in 1479 and 1480, being probably known to his patrons of St John by many masterpieces even before the battle of Nancy.

Memling is only connected with military operations in a mediate and distant sense. His name appears on a list of subscribers to the loan which was raised by Maximilian of Austria to push hostilities against France in the year 1480. When he signed this list his position was that of a resident at Bruges who had probably lived there long enough to acquire a large practice and its advantages in the form of lands and tenements. In 1477, when he is said to have fallen, and when Charles the Bold was killed, he was under contract to furnish an altarpiece for the guild chapel of the booksellers of Bruges; and this altarpiece, now preserved, under the name of the Seven Griefs of Mary, in the gallery of Turin, is one of the fine creations of his riper age, and not inferior in any way to those of 1479 in the hospital of St John, which for their part are hardly less interesting as illustrative of the master's power than the Last Judgment in tlie cathedral of Dantzic. Critical opinion has been unanimous in assigning the altarpiece of Dantzic to Memling, and by this it affirms that Memling was a resident and a skilled artist at Bruges in 1473; for there is no doubt that the Last Judgment was painted and sold to a merchant at Bruges, who shipped it there on board of a vessel bound to the Mediterranean, which was captured by a Dantzic privateer iu that very year. But, in order that Memling's repute shonld be so fair as to make his pictures purchasable, as this had been, by an agent of the Medici at Bruges, it is incumbent on us to acknowledge that he had furnished sufficient proofs before that time of the skill which excited the wonder of such highly cultivated

the possible truth of a report made by a chronicler of the 16th ccntury that Memling had sittings from Isabella, consort of Philip the Good of Burgundy, in the year 1450.

It is characteristic that the very oldest allusions to pictures connected with Memling's name are those which point to relations with the Burgundian

court. The inven- tories of Margaret of Austria, drawn up in 1524, allude to a triptych of the God of Pity by Roger van der Weyden, of which the wings containing angels were by " Master Hans." mony in favour of the preservation of Memling's work than as showing his connexion with an older Flemish craftsman. For ages Roger van der Weyden was acknowledged as an artist of the school of Bruges, until records of undispuicd authenticity demonstrated that he was bred at Tournai and settled at Brussels, Nothing seems more natural than the conjunction of his name with that of Memling as the author of an altarpiece, since, though Memling's youth remains obscure, it is clear from the style of his manhood that he was tauglit in the painting-room of Van der Weyden. Nor is it beyond the limits of probability that it was Van der Weyden who received commissions at a distance from Brussels, and first took his pupil to Bruges, where he after- wards dwelt. The clearest evidence of the connexion of the two masters is that afforded by pictures, and parti-

But this entry is less important as affording testi- |

"patrons ; and thus we come to admit without much difficulty | unreasonable to think that his success as a portrait painter,

t 0 to tl which is manifested in isolated busts as well as in altarpieces, was of a kind to react with effect on the Venetian sehool, which undoubtedly

| was affected by the partiality of Antonello da Messina for trang-

Alpine types studied in Flanders in Memling's time. The portraits of Sir John Donne and his wife and children in the Chiswick altar- piece are not less remarkable as models of drawing and finish than as refined presentations of persons of distinction; nor is any differ- ence in this respect to be found in the splendid groups of father mother, and children which fill the noble altarpiece of the Louvre. As single portraits, the busts of Burgomaster Morcel and his wife in the museum of Brussels, and their daughter the Sibyl Zamn- betha in the hospital of Bruges, are the finest and most interesting of specimens. The Seven Griefs of Mary in the gallery of Turin, to which we may add the Seven Joys of Mary in the Pinakothek of

Munich, are illustrations of the habit which clung to the art of Flanders, of representing a cyele of subjects on the different planes of a single picture, where a wide expanse of ground is covered with incidents from the Passion in the form common to the action of sacred plays, The time came, no doubt, when the players took their

; eue from the painters, as in the Ghent procession, which was

formed on the model of Van Eyck's Adoration of the Lamb. But in Memling's days there werc still some original ' players," and the public was not averse to seeing illustrations of their work. In the

lirst period of the development of Belgian art too, when the Flemings

_ assigned more importance to earved work than to painting, and yet

refused to aceept sculpture without colour, it was natural that the sculptor should multiply incidents on bas-reliefs which were coated with tinting in the semblance of nature. Memling's pictures imitate reliets so far as they abound in variety of episodes, and are marked by absence of contrast in light and shade or want of toning

_ by gradations of atmosphere. Yet with all these peculiarities his

cularly an altarpiece, which has alternately been assigned |

to each of them, and which may possibly be due to the joint labours of both. In this altarpiece, which is a triptych ordered for a patron of the house of Sforza, we find the style of Van der Weyden in the central panel of the Crucifixion, aud that of Memling in the episodes on the wings. in the Zambeccari collection at Bologna, whilst it was attributed to the latter at the Middleton sale in London in 1872. At first, we may think, a closer resemblance might be traced between the two artists than that disclosed in later works of Memling, but the delicate organization of the younger painter, perhaps also a milder appreciation of

the duties of a Christian artist, may have led } femling to observe that his practice has become larger than he can compass

realize a sweet and perfect ideal, without losing, on that account, the feeling of his master. He certainly exchanged the asceticism of Van der Weyden for a senti- ment of less energetic concentration. He softened his teacher's asperities and bitter hardness of expression.

In the very oldest form in which Memling's style is displayed, or

rather in that example which represents the Baptist in the gallery of Munich, we are sapposed to contemplate an effort of the year 1470.

| acquainted with the scenery of the Rhine.

|: 1486.

works are very pleasant to the cye, because they are always graceful and quict. ;

The masterpiece of Memling's later years, a shrine containing relics of St Ursula in the hospital of Bruges, is fairly supposed to have been ordered and finished in 1480 after the painter ia become This shrine is one of the most interesting monuments of medieval art in Flanders, not

: ; : _ ouly because it is beautifully executed, but because it reveals some Yet the whole piece was assigned to the former |

part of the life of the painter who produced 'it, and illustrates the picturesque legend of Ursula and her comrades. The delicacy of finish in its miniature figures, the variety of its landscapes and cos- tume, the marvellous patience with which its details are given, are all matters of enjoyment to the spectator. There is later work of the master in the St Christopher and Saints of 1484 in the academy, or the Newenhoven Madonna in the hospital of Bruges, or a large Crucifixion with scenes from the Passion, of 1491, in the cathedral of Liibeck. But as we near the close of Memling's career we

alone ; and, as usual in such cases, the labour of disciples is substi- tuted for his own. The registers of the painters' corporation at Bruges give the names of two apprentices who served their timé with Memling and paid

dues on admission to the guild in 1480 and These subordinates remained obscure.

It would be easy to form a long list of pictures by Meniling in the gallerics of Berlin, Florenee, London, Madrid, Paris, Rome, and

_ Vienna, and pieces equally remarkable in many private collections

_ of England and the Continent.

The finish of this piece is scarcely, surpassed, though the subject |

is more important, by that of the Last Judgment of Dantzic. But the latter is more interesting than the former because it tells how Memling, long after Roger's death and his own settlement at Bruges, preserved the traditions of sacred art which had been applied in the first part of the century by Roger van der Weyden to the Last Judgment of Beaune. All that Memling did was to purge his mas- ter's manner of excessive stringency, and add to his other qualities a velvet softness of pigment, a delicate trausparence of colours and yielding grace of slender forms. That such a beautiful work ag the Last Judgment of Dantzic should have been bought for the Italian market is not surprising when we recollect that pieture-fanciers in that country were famihar with the beauties of Memling's eomposi- tious as shown in the preferenec given to them by such purchasers as Cardinal Grimari and Cardinal Bembo at Venice, and the heads of the house of Medici at Florence. But Memling's reputation was not confined to Italy or Flanders. The Madonna and Saints which so lately passed out of the Duchatel collection into the gallery of

These have all been described, and are widely known. . The present notice must be closed with the adnnission that pictures tell morc of Memling's life than records. The date of the master's death is not better certified than that of his birth. This much, however, is certain. The trustees of Memling's will appeared before the court of wards at Bruges on the 10th of

| Deeember 1495, and we gather from records of that date and place that Memling died a short time before, leaving behind several

children and a considerable property. (J. A. C.)

MEMMI. Sec Martini, Simone.

MEMMINGEN, a town of Bavaria, in the district of Schwaben and Neuburg, is situated about 35 miles to the south-west of Augsburg, near the river Iller. It is a well- built town, still partly surrounded with walls, and contains

a Roman Catholic and three Protestant churches, a town-

the Louvre, the Virgin and Child of Sir Jolin Donne at Chiswick, |

and other noblespecimens in English and Continental private houses show that his work was as widely known and appreciated as it could be in the state of civilization of the 16th century. It was per- haps not their sole attraction that they gave the most tender and

house of 1580, and several schools and charitable institu- tions, Its industrial products are yarn, calico, woollen goods, and thread. A considerable trade is carried on in

hops, which are extensively cultivated in the neighbour-

delicate possible impersonations of the " Mother of Christ" that |

could suit the taste of that age in any European country. But the portraits of the donors with which they were mostly combined were more characteristic, and probably more remarkable as likenesses than any that Memling's contemporaries could produce. Nor is it

hood, and in wool, leather, and grain. The population in

1880 was 8050.

Memmingen, first mentioned in a document of 1010, belonged originally to the Guelph family. In 1286 it became a free city of the empire, a position which it maintained down to 1802, when it was allotted to Bavaria, In 1529 Memmingen was one of the " pro-

eet

testing"' towns represented at the diet of Spires. During the Thirty Years' War it was alternately occupied by Swedes and Imperialists. In 1800 the French under Moreau gained a victory over the Austrians near Memmingen. Compare Dobel, Afemmingen im Reformationszeitalter, 1877-78.

MEMNON. In the Homeric mythology (or rather the inythology of the Trotca in the much fuller form in which it existed in the times of Pindar and the tragic poets) this hero was called the son of Tithonus (the half-brother of Priam) and Eos (Aurora). Tradition represented him as

an Ethiopian prince who came toassist the Trojans against | the Greeks, and performed prodigies of valour, but was |

at length killed by Achilles, after having himself slain Antilochus, the son of Nestor, an event alluded to in Pindar, Pyth., vi. 32-39,

His story must have been very famous, |

for more than one Greek play was composed bearing the –

title.

The chief source from which our knowledge about Mem-

non as a chief is derived is the second book of the Post- Homeriea, by Quintus Smyrnzus, where his exploits and death are described at length. That Memnon was slain

meaning brave." It las been thought that Méurwr and pyyjpov, "mindful," are but forms of the same word, and that the prophetic power attributed to the head of the Egyptian Memnon, which was said to utter sounds at sunrise, is connected'with this idea. It was said that the sound resembled

the moaning noise or the sharp twang of a harp-string, and it may even be surmised that the syllables mem-non imitated the resonance. The Egyptian head is said to be a bust of King Amenophis;? but if the Greeks fancied it uttered the word memnon, they would have called it by that name. The tendency, however, to give a Greek shape and inflexion to words which sounded bar- barous will sufficiently account for the misnaming of the Statue.

Strabo, lib. xvii. p. 816, declares that he himsclf heard

it in company with Alius Gallus and several of his friends,

and Pausanias (i. 42, 2) says "one would compare the sound most nearly to the broken chord of a harp or a

lute." See also Juv., Sat., xv. 5; Tac, Ann. ii. 61. O 3 ef 3 b]

by Achilles is more than once affirmed by Pindar (Vem.,

vi, 52; Isthm., iv. 41, vii. 54). the Odyssey (xi. 522), with especial praise for personal beauty ; but the allusion to him is quite casual, and is one

He is mentioned also in |

of many proofs that the compilation of that and the sister |

epic presupposes in the reader or hearer a full knowledge of the whole tale of Troy.

Modern philology associates Mem- |

non——like Achilles, whom lie so closely resembles in many | particulars, and like Sarpedon, who seems the representa- |

tive of Memnon in the Iliad—with solar phenomena. He was the son of the dawn; and, though he might vanish from sight for a time, le could not be destroyed, and there-

fore it was said that Zeus, moved by the tears of his.

mother, granted him immortality. In this respect, as also

in wearing bright armour made by Heph:estus, he is tlie | counterpart of Achilles, who symbolizes the mid-day sun | in his glory ; and that Mcmnon is said to have come fron

the far east, ze, from the region of sunrise, is in itself significant. Ovid, in a beautiful elegy on the death of Tibullus, Amor., lib. ili. 9, 3, thus associates the fates of Memnon and Achilles :— Memnona si mater, mater ploravit Achillem, Et tangunt magnas tristia fata deas, Flebilis indignos, Elegeia, solve capillos ; Ah nimis ex vero nunc tibi nomen erit. Like the body of the dead hero Sarpedon (J/., xvi. 681), so that of Memnon was borne tlirough the air, a legend represented on Greek vases of a rather early. date. appears to mean that the sun, the offspring of the dawn, careers through the sky to the place of his departure in the west. Auother account represents Zeus as having sent

forth birds from the funeral-pile of Memnon, which | straightway fought with each other, and many fell back as |

victims to the soul of the hero. The mere fact that a Jfemnonium, or temple in honour

Thebes, both of which places were centres of sun-worship, is a strong confirmation of the probability, derived from his mythical pedigree, that he was really a sun-god. Sir G. W. Cox remarks,! "of Memnon's head the story was told that it retained the prophetic power of the living Helios or of Surya. The story is found in the myth of the Teutonic Wismir, and it might lave been related of Kephalos, the head of the sun ;" and again (p. 267), " Eos, the mother of Memnon, is so transparently the morning that her child must rise again as surely as the sun reappears to run his daily course across the heaven."

With respect to the meaning of the name, it may pos- sibly be the same as Agamemnon, which has a prefix

Y Mythology and Folklore, p. 134.

_ they were described by ‘Abd el-Latif.

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_ Orleans.

Memnon, as an Ethiopian, was of course represented as a black; hence Virgil (2, i. 493) speaks of “ nigri Memuonis arma.” ‘The fignre itself was cut ont of black basalt, but that. is a material not uncommon in Egypt. Speaking quite generally, it seems reasonable to conclude that the Memnon from Ethiopia (which the early Greeks placed in the far east rather than in the south) typifies the eastern sun summoned to oppose the enemies of darkness from the west.

MEMPHIS, the capital of the old Egyptian empire, founded by Menes, the first historical king; see vol. vii: pp. 731, 770. In the time of Strabo (xvii. p. 807) it was the second city of Egypt, inferior only to Alexandria, and with a mixed population like the latter. Memphis was still an importaut though declining place at the time of the Moslem conquest. Its final fall was due to the rise of the Arabic city of Fostat on the right bank of the Nile almost opposite the northern end of the old capital; and its ruins, so far as they still lay above ground, gradually disappeared, being used as a quarry for the new city. – The remains of “ Menf” were still imposing late in the 12th century, when In the Old Testa- ment Memphis is mentioned under the names of Moph (Hos, ix. 6) and Noph (Isa. xix. 13; Jer. ii, 16; Ezek. xxag, 13, 16).

MEMPHIS, a city of the United States, and port of entry, capital of Shelby connty, Tennessee, is situated on tlhe east bank of the Mississippi river just below the mouth of Wolf river, in about 35° 8’ N. lat. and 90° 5’ W. long, 450 miles below St Louis and 826 miles above New The bluff on which the city stands has an average elevation of 474 feet above high-water mark, with a further fall of 36 feet to extreme low water. Memphis is methodically and tastefully planned, and is adorned

| with many elegant private residences and public build-

ve. | ings, conspicuous among the latter being the United of the hero, was erected both at Susa and at Egyptian |

States custom house, located upon the esplanade between Front Street and the river, and built of the best quality of marble, the product of Tennessee quarries. A small park in the centre of the city contains a bnst of Andrew Jackson, The streets are mostly well-paved, and are supplied with water from the Wolf river by the Holly system. The bayou Gayoso, with several branches, inter- sects the city, and prior to 1880 received most of its drainage. Since that date over 40 miles of sewers and more than that length of subsoil drain-tiles have been constructed on the Waring system, providing the city with a superior system of drainage. 2 Sir G. W. Cox, Mythology of the Aryans, p. 268, ed. 2.

3 dauévwh, as the Thebans themselves said, according to Pausanias, cited below.

. 848

Memphis is the largest city uf the Stute, and the niost , important commercial city on the Mississippi between St | Louis and New Orleans. The largest sea-going vessels ascend the river to this point, and navigation is open at all seasons of the year. The city also possesses abundant facilities for transportation by railway in every direction. Memphis ranks as the largest interior cotton-inarket in the United States. The receipts for the season ending Sep- tember 1, 1881, were 470,267 bales, with a value of $23,090,109. 'Theaggregate receipts from the mercantile and manufacturing interests for the year ending September 1, 1882, amounted to about $60,000,000, of which the | trade in groceries and western products contributed nearly | $40,000,000; dry goods, clothing, boots and shoes, and

general merchandise $15,000,000; and various home | manufactures about $5,000,000. There are oil-mills and refineries, whose annual product of about 30,000 barrels of cotton-seed oil, togetlier with otl-cake and re-ginned cotton, amounts to over $1,000,000. numerous foundries, machine shops, flouring-mills, and manufactories of carriages, furniture, and tobacco.

The city contains, besides the usual religious, educational and commercial institutions, a public library of 9000 volumes, three daily and ten weekly newspapers, a chamber of commerce, and a cotton exchange.

Memphis was laid out as a village in 1820, and incor- porated as a city in 1831. Its population at each census

There are also |

since has been as follows :—3360 in 1840, 8841 in 1850, 22,623 in 1860, 40,226 in 1870, and 33,592 in 1880.

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MEMPHIS

According to a census taken on October 1, 1882, the population within the city limits was 47,976 (29,130 white and 18,846 coloured).

During the eivil war Memphis was early occupied by the Union forces (June 6, 1862) after a naval engagement in which Com. modore Davis with a fleet of nine gunboats and rams defeated a similar Confederate fleet of eight vessels, and captured or destroyed all of them but one. ‘The eity was held by Federal troops to the close of the war, with the exeeption of a brief oecupation, in August 1864, by General Forrest, who eaptured several hundred ele but immediately withdrew. The decrease of popnlation

etween 1870 and 1880 was due to the ravages of yellow fever in 1878, 1878, and 1879. ‘The epidemie of 1873 resulted in- over two thousand deaths: In 1878, aeeording to the report of the Howard Relief Assoeiation, the number of those attaeked with the fever was 15,000, and the number of deaths reaehed the total of 5150, of whom 4250 were whites and 900 coloured. At the return of the fever in 1879 better eare and striet quarantine arrangements prevailed, but there were 1595 eases, with 497 deaths. During the epidemics of 1878 and 1879 fully two-thirds of the population fled from the eity, many of whom died of the fever at other places, and a still

larger number did not return. For three months during each year business was wholly suspended, and all ingress or egress exeept for the most necessary purposes was forbidden. The pro- stration of the business of the place left the city almost hopelessly bankrupt, and as a means of relief the legislature of the State in January 1879 repealed the eity's eharter, and, assuming exelusive

‘ eontrol of its taxation and finanees, eonstituted it simply a “‘taxing

district,” placing its government in the hands of a “legislative This anomalous proceeding has been declared consti- tutional by the supreme eourt of Tennessee. Under it Memphis is at least regaining its prosperity, and by thoroughly eleansing, repaving, and sewering its streets, and supervising the eonstruction of buildings, is likely to become one of the healthiest cities on the Mississippi river.

VOLUME FIFTEENTH.

NEIL. AND COMPANY, PRINTERS, EDINBURGH.

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Puates, Vou. XV.—Directions TO BInper.

When insertion throughout the text ds desired, the Plates to be placed opposite the Jollowing pages :-—

Plate I. page 20 . Plate VI. page 320 oe! ee 2 SS 7 » sah. . 186 wo VAHL. , 602 » LV. 4 168 » tc , 611 ra » SOF

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ENCYCLOPADIA ‘BRITANNICA, NINTH EDITION.

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END OF VOLUME FIFTEENTH.

NEITT. AND COMPANY, PRINTERS, EDINBURGH.

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ENCYCLOPADIA

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BRITANNICA NINTH EDITION

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| VOL. XV | MALAY PENINSULA. |) PLATEVI.

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VOL.XV. | | a I

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ENCYCLOPADIA BRITANSA

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Explanation

Ptolemy’s construction in Red

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ENCYCLOPEDIA BRITANNICA

NINTH EDITION

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ENCYCLOPADIA BRITANNICA

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DICTIONARY

OF

ARTS, SCLENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XVI

EDINBURGH: ADAM AND CHARLES BLACK

MDCCCLXXXIII

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ENCYCLOPADIA BRITANNICA.

MEN—MEN

ENA, JUAN bk, one of the Italianizing Spanish poets

of the 15th century, was born at Cordova about

1411. We are informed by Romero, to whom we are indebted for almost all we know about his life, that he had attained the age of twenty-three before he began to give hinself to “the sweet labour of good learning,” pursuing a regular course of study at Salamanca and afterwards at Rome. It was at the latter city that he first became acquainted with the writings of Dante and Petrarch, which afterwards so powerfully influenced his own style. Having returned to Spain, he became a “ veinticuatro,” or magis- trate, of his native town, and was received as a poet with great favour at the court of John II., being made Latin secre- tary to the king and historiographer of Castile. He died suddenly, in consequence of a fall from his mule, in 1456, at Torrelaguna, where the marquis of Santillana, his friend and patron, erected

his monument and wrote his epitaph. De Mena's principal work, El Laberinto (" The Labyrinth "), sometimes called Las J'rescientas ("The Three Hundred ") from the original number of its stanzas, is a didactic allegory on the duties and destinics of man, obviously con- structed on the lines of the Divina Commedia of Dante. The poet, while wandcring in a wood and exposed to the attacks of various beasts of prey, is met by Providence in the guise of a beautiful woman, who offers to guide him safely through the dangers which surround him, and at the same time to explain—'"'as far as they may be grasped by human understanding "—-the dark mysteries of life that weigh upon his spirit. He is then led to the spherical centre of the five zones, where he sees the three wheels of destiny, the past, the future, and the present, and the men belonging to each, arranged in the seven circles of planetary influence. Opportunity is thus afforded for a vast quan- tity of mythological and historical portraiture ; the best sketches are those of the poet's own contemporaries, but the work in general is much disfigured with all sorts of pedantry, and hardly ever attains to mediocrity as a poem. The Laberinto was first printed at Seville in 1496; Nunez and Sanchez accompanied it with commentaries in 1499 and 1582 respectively ; and it is still regarded with a good deal of reverence by the Spaniards as the "magnum opus " of their "Ennius." De Mena was the author of a number of minor poems or "vers de société," written merely for

court circles, and having neither general interest nor per- manent value; most of them are to be found in the Cancionero General. He also wrote a pocm entitled La Coronacion, the subject being the "crowning" of the marquis of Santillana by the Muses and the Virtues on Mount Parnassus. Finally, his Stete Pecados Mortales ("Seven Deadly Sins") is a dull allegory on the antagonism between reason and the will of man. Complete editions of the poems of De Mena appeared in 1528, 1804, and

1840.

MENAGE, Grttes (1613-1692), described by Bayle as "one of the most learned men of his timc, and the Varro of the 17th century," was the son of Guillaume Ménage, king's advocate at Angers, and was born in that city on August 15, 1613. A tenacious memory and an early developed enthusiasm for learning carried him _ speedily through his literary and professional

studies, and we read of him practising at the bar at Angers as early as 1632. In the same ycar he pleaded several causes before the parlement of Paris, and soon aftcrwards he attended the “Grand Tours” at Poitiers, but after having been laid aside by a severe illness he abandoned the legal profession and declared his intention of entering the church. He succeeded in obtaining some sinecure benefices, and lived for some years in the household of Cardinal De Retz (then only coadjutor to the archbishop of Paris), where he had ample leisure for his favourite literary pursuits. Soe time after 1648 he withdrew to a house of his own in the cloister of Notre Dame, where his remarkable conversational powers enabled him to gather round him on Wednesday evenings those much frequented literary assemblies which he called ‘“Mercuriales.” His learning procured for him admission to the Della Cruscan Academy of Florence, but his irrepressible tendency to caustic sarcasm led to his remorseless exclusion from the French Academy. He died at Paris on July 23, 1692. Of the voluminous works of Ménage (fully enumerated in the Dictionnaire of Chauffepié) the following may be mentioned :—Origunes de la Langue Francoise (1650 ; greatly enlarged in 1694) ; Diogenes Laertius Greece et Latine, cum Commentario (1663 and again much improved in 1692); Poemata Latina, Gallica, Greca, et Italica (1656 ; 8th ed., 1687); Origine della Lingua Italiana (1669); and Anti-Baillet (1690).

After his death a volume of Menagiana was publislied ; it was afterwards expanded into two, and, with great addi- tions, into four in the Paris edition of 1715.

MENANDER, the most famous Greek poet of the New Comedy, which prevailed from about the death of Alexander the Great (323 B.c.) to 250, He was born at Athens in 342, and died, it was said, by drowning in the harbour of that city (Pireus) in 291. His social tastes induced him to write plays rather for the upper classes, and to raise comedy to a gentility which it had hardly possessed in the hands of the preceding comic poets. He was the associate, if not the pupil, of Theophrastus, who himself had been a disciple of Plato and Aristotle, and he was the intimate friend and admirer of

Epicurus ; but he algo enjoyed the more distinguished patronage of Demetrius Phalereus (who was likewise a pupil of Theophrastus), and of Ptolemy the son of Lagus.1_ His principal rival in the art was Philemon, who appears to have been more popular with the multitude, and for that reason probably more successful. Tt is said that out of a hundred comedies Menander gained the prize with but eight. All the extant plays of Terence, with the exception of the Phormio, are avowedly taken from Menander; but some of them appear to have been adaptations and combinations of more than one plot, although Terence himself says in the prologue to the Adelphi (11) that he copied the Greek model closely, “verbum de verbo expressum extulit.” Julius Cesar called Terence dimidiatus Menander, as if two halves of different plays had been fitted into one.?

The Attic New Comedy, says Dr Wagner,? “may be designated as essentially doniestic,” t.¢., as opposed to that free discussion of the politics of the day which gave to the Old Comedy the place which is held by the “leading articles” of a modern newspaper. ‘The stock characters were such as the stern or weak father, the son whose follies are seconded by a slave or a hungry parasite, the pettifogger, active in stirring up law suits, and the gascon- ading soldier of fortune.” These and cognate subjects, which formed the stock-in-trade of Menander’s plays, are summed up in two well-known lines of Ovid—

‘‘Dum fallax servus, durus pater, improba lena Vivet, dum meretrix blanda, Menandros erit.” Tt isa good remark of Dr Wagner’s ® that the last-mentioned of these, the meretrix blanda (which probably refers especially to the Thais), “holds the most important and conspicuous part in the New Attic Comedy, while married ladies are continually represented as the plague and bore of their husbands’ lives.” Intrigues with these, generally through the medium of a clever confidential slave, are for the most part the very point or pivot on which the plot turns,

The nore literary Romans greatly admired Menander as a poet. Pliny (WY. H., xxx. 1, § 7) speaks of him as “Menander litterarum subtilitati sine smulo genitus.” Propertius, contemplating a visit to Athens,® anticipates the pleasure of reading Menander in his native city—

‘* Persequar aut studium lingue, Dcmosthenis arma, Libaboque tuos, scite Menandre, sales.”

1 In allusion to this Pliny writes (VV. Z/., vii. 80, § 111), ‘‘ Magnum et Menandro in comico socco testimonium regum Algypti et Mace- doniz contigit classe et per legatos petito; majus ex ipso, regia fortune prelata litteraram conscientia.” This seems to say that Menander had been invited to the courts of Alexander and Ptolemy, as Euripides had been to that of Archelaus, king of Macedonia, but had preferred to write comedies for the Attic stage.

2Thus the Andria, Heautontimorumenos, and Hecyra are described severally in the ¢ctulc prefixed as Greeca or tota Greca Menandru. The Lunuch and Timorumenos are each based on two plays of Menander, and the Adelphi was compiled partly from Menander and partly from Diphilus.

3 Introduction to Terence, p. 6 (Bell, 1869).

4 Professor Jebb, Primer of Greek Literature, p. 101.

DG Giiaes Th Te Y 8thon iis PL Bie

He elsewhere speaks of him as “mundus Menander,” neat, terse, and urbane; and his skill in depicting the character of a fascinating Thais is alluded to here and in i. 6, 3 :— ‘‘Turba Menandree fuerat nec Thaidos olim Tanta, in qua populus lusit Erichthonius,”’

Of this comedy, the Thats, Professor Mahaffy remarks” that perhaps it was the most brilliant of Menander’s plays, “the manners and characters of the personage being painted with thorough experience as well as genius.” Nevertheless, only five verses of this play have been preserved to us, one of which is that quoted by St Paul (1 Cor. xv. 33), “ Evil communications corrupt good manners.” The same critic, in praising Menander’s style as the purest model of the New Attic, observes that a remarkable fcature of the New Comedy was “its uttcr avoidance of rhetoric” (p. 489). The influence which this art had on Euripides is well known. Sophocles was not wholly exempt from a kind of rhetorical pedantry, and the speechcs in Thucydides are so many exercises of the author in that art. But, as rhetoric pertained

essentially to public life, it was likely to have a much less scope in scenes borrowed almost solely from social and domestic experiences.

Menander, however, did not neglect the other branch of a liberal Attic education,—philosophy.

On the whole, our estimate of the spirit and object of Menandcr must be formed rather from his imitator and copyist Terence than from the fragments which remain, about 2400 verses in all, as col- lected by Meineke in his Fragmenta Comicorum Grecorum. For, as Professor Mahaffy well observes,!? the extracts made by Atheneus, our principal authority, have reference chiefly to ‘‘ the archeology of cooks and cookery,” while Stobaus was a collector of yva@mat or wise maxims,—‘‘a most unfortunate and worthless kind of citation.” It follows that no sound conclusions as to dramatic genius, or of the knowledge of human nature, can be drawn from detached verses preserved without the least reference to these par- ticular points. The extraordinary popularity of Menandcr must have been due to literary merit, if not to great originality. Mr Mahaffy observes on this! that ‘‘ there is so much of a calm gentle- manly morality about his fragments, he is so excellent a teacher of the ordinary world-wisdom—resignation, good temper, modera- tion, friendliness—that we can well understand this popularity. Copies of his plays continued long in existence, and were certainly known to Suidas and Eustathius as late as the 11th and 12th cen- turies, if they did not survive to a yet later period.”

In respect of language, Menander occupies the same position in poetry which his contemporary Demosthenes does in prose. In both the New Attie is elaborated with great finish, and with much greatcr grammatical precision than we find in writers of the Old Attic, such as Sophocles and Thucydides. A considerable addition to the vocabulary of every-day life had now been made, as was indeed inevitable from the versatile character of the language and the genius of the people who used it. Many new verb-forms, especially the perfect active,!? now occur, and indeed form a characteristic innovation of the style of Plato. The earlier prose was in its general vocabulary to a considerable extcnt poctical, and such a concurrence of short syllables as in the Platonic dmodedoximaxdres

7 Iist. Class. Gr. Lit., i. p. 488.

8 Pliny calls Menander ‘‘ diligentissimus luxurie interpres,” V. JL, KOK oe

9 Hist. Class. Gr. Lit., i. p. 480. 10 Jhid., p. 480.

Beith, WW. Ele 12 Toid., p. 490.

13 A curious example is dmertaykac:, the transitive perfect of aroxrelvery. Similarly we have the nnusual forms xéxpyxa (frag. 559), ewépnna (727), cvyrexuna (810).

(a. rodoximd er) is ill-suited even to choral metre. The Old Comedy was worked by men of real genius, who ‘ were indeed giants, while the men of Menander’s day only showed how strong and thorough was the culture which in art and literature outlived the decadence of the nation.”?

In all, we have, as collected by Meineke, 1045 fragments of Menander, of which 515 can be referred to known plays, the titles of those quoted from amounting to niuety, and including the Terentian Andria, Adelphi, Hunuchus, Heautontimorwumenos. These fragments contain about 1650 verses or parts of verses, not including a considerable number of words quoted expressly as from Menander by the old lexieographers. Besides all these there are not fewer than 758 monostich verses separately preserved in MSS., though some of these are met with in the other and longer frag- ments. Many of the fragments are obscure, some corrupt ; and they have been a fertile field for critical acumen from the time of Bentley. Not unfrequently we come upon the shrewd or original remark of an observer. Thus (frag. 7) ‘‘A poor man has no relations, for no one acknowledges him, lest he should beg.” Frag. 145, ‘ Every- thing that takes place is brought about by law, necessity, or fashion.” 237, ‘‘The gods do not save men through any human means (prayer or sacrifices); if they did, the human would have more power than the divine.” 275, ‘‘ Poverty is the most easily cured of all evils; any friend can do it by merely putting his hand in his pocket.” 397, ‘‘A poor man who lives ina large town makes himself more wretched than he need ; for he cannot help comparing with his own the luxurious lives of the rich.” 485, “No man realizes the extent of a sin when he commits it; it is afterwards that he sees it.” 460, ‘‘A man is convinced

not so much by what is said as by the manner of saying it.” 474, ‘There is one thing only that hides vulgarity, villainy, and every other fault, —wealth. Everything but that is carped at and criticized.” 517, ‘‘ People who have no merit of their own gencrally boast of their birth and their ancestors. But every living man has ancestors, or he would not bea living man.” 578, ‘‘ Wealth acts on a nan as wind docs on a ship, —it often forces him out of his proper course.” 663, “ Many a young lady says a great deal in her own favour by saying nothing at all.” 688, ‘A man who abuses his own father is practising blasphemy against the gods.” In fact, Menander is echaracteristically a sententious writer, like Euripides, with whom in the general style of his writings, though not, of course, in his somewhat loose and irregular versification, he is sometimes compared. (F. A. P.)

MENCIUS, the Latinized form of Mang-tsze, “Mr Ming,” or “‘ Ming the philosopher,” a name in China only second as a moral teacher to that of Confucius. His statue or spirit-tablet (as the case may be) has occupied, in the temples of the sage, since our 11th century, a place among “the four assessors”; and since 1530 a.p. his title has been “the philosopher Ming, sage of the second degree.”

The Mangs or M&ng-suns had been in the time of Con- fucius one of the three great clans of La (all descended from the marquis Hwan, 711-694 B.c.), which he had en- deavoured to curb, Their power had subsequently been broken, and the branch to which Mencius belonged had settled in Tsiu, a small adjacent principality, the name of which still remains in Tsu hsien, a district of Yenchau Shan-tung. A magnificent temple to Mencius is the chief attraction of the district city. The present writer visited it in 1873, and was struck by a large marble statue of him in the courtyard in front. It shows much artistic skill, and gives the impression of a man strong in body and mind, thoughtful and fearless. His lineal representative lives in the city, and thousands of Mangs are to be found in the neighbourhood.

The dates of some of the principal events in Mencius’s life are fixed by a combination of evidence, and his death is referred by common consent to the year 289 B.c. He had lived to a great age,—some say to his eighty-fourth year, placing his birth in 372 B.c., and others to his ninety- seventh, placing it in 385, All that we are told of his father is that he died in the third

year of the child, who was thus left to the care of his mother. She was a lady of superior character, and well discharged her trust. Her virtues and dealings with her son were celebrated by a great writer in the first century before our era, and for two thousand years she has been the model mother of China.

1 Mahaffy, Ibid., p. 490.

We have no accounts of Mencius for many years after his boyhood, and he is more than forty years old when he comes before us as a public character. He must have spent much time in study, investigating the questions which were rife as to the fundamental principles of morals and society, and brooding over the condition of the country. The his- tory, the poetry, the institutions, and the great men of the past had received his careful attention. He intimates that he had been in communication with men who had been disciples of Confucius. That sage had become to him the chief of mortal men, the object of his untiring admiration ; and in the doctrines which he had taught Mencius recog- nized the truth for want of an appreciation of which the bonds of order all round him were being relaxed, and the kingdom hastening to a general anarcliy.

When he first comes forth from Tsfu, he is accompanied by several eminent disciples. He had probably imitated Confucius in becoming the master of a school, and en- couraging the resort to it of inquiring minds that he might resolve their doubts and unfold to them the right methods of government. One of his sayings is that it would be a greater delight to the superior man to get the youth of brightest promise around him and to teach and train them than to enjoy the revenues of the kingdom. His intercourse with his followers was not so intimate as that of Confucius had been with the members of his selected circle ; and, while he maintained his dignity among them, he was not able to secure from them the same homage and reverent admiration.

More than a century had elapsed since the death of Confucius, and during that period the feudal kingdom of Chiu had been showing more and more of the signs of dissolution, and portentous errors that threatened to upset all social order were widely disseminated. The sentiment of loyalty to the dynasty had disappeared. Several of the marquises and other feudal princes of earlier times had usurped the title of king. The smaller fiefs had been

absorbed by the larger ones, or reduced to a state of helpless dependence on them. Tin, after greatly extend- ing its territory, had broken up into three powerful king- doms, each about as large as England. Mencius found the nation nominally one, and with the traditions of two thousand years affirming its essential unity, but actually divided into seven monarchies, each seeking to subdue the others under itself. The consequences were constant war- fare and chronic misery.

In Confucius's time we meet with recluses who had withdrawn in disgust from the world and its turmoil; but these had now given place to a class of men who came forth from their retirements provided with arts of war or schemes of policy which they recommended to the contend- ing chiefs, ever ready to change their allegiance as they were moved by whim or interest. Mencius was once asked about two of them, "Are they not really great men? Let them be angry, and all the princes are afraid. Let them live quietly, and the flames of trouble are everywhere ex- tinguished." He looked on them as little men, and delighted to proclaim his idea of the great man in such language as the following :—

"To dwell in love, the wide house of the world, to stand in propriety, the correct seat of the world, and to walk invighteousness, the great path of the world ; when he obtains his desire for office, to praetise his principles for the good of the people, and when that desire is disappointed, to practise them alone; to be above the power of riches and honours to make dissipated, of poverty and mean condition to make swerve from the right, and of power and force to make bend,—these characteristics constitute the great man.

Most vivid are the pictures which Mencius gives of the condition of the people in consequence of the wars of the states. 'The royal ordinances were violated; the multi-

tudes were oppressed; the supplies of food and drink |

flowed away like water." It is not wonderful that, when the foundations of government were thus overthrown, speculations should have arisen that

threatened to over- throw what he considered to be the foundations of truth and all social order. ‘A shrill-tongued barbarian from the south,” as Mencius called him, proclaimed the dissolu- tion of ranks, and advocated a return to the primitive simplicity, ‘‘When Adam delved and Eve span.”

He and his followers maintained that learning was quackery, and statesmanship craft and oppression, that prince and peasant should be on the same level, and every man do everything for himself. Another, called Yang-cha, denied the difference between virtue and vice, glory and shame. The tyrants of the past, he said, were now but so many rotten bones, and the heroes and sages were no more. It was the same with all at death ; after that there was but so much putridity and rottenness. The conclusion of the whole matter therefore was—‘ Let us eat and drink ; let us gratify the ears and eyes, get servants and maidens, beauty, music, wine ; when the day is insufficient, carry it on through the night. Each one for himself.” Against a third heresiarch, of a very different stamp, Mencius felt no less indignation. This was Mo Ti, who found the source of all the evils of the time and of all time in the want of mutual love. He taught, therefore, that men should love others as themselves; princes, the states of other princes as much as their own; children, the parents of others as much as their own. Mo, in his gropings, had got hold of a noble principle, but he did not apprehend it distinctly nor set it forth with discrimination. To our philosopher the doctrine appeared contrary to the Confucian orthodoxy about the five relations of society ; and he attacked it without mercy and with an equal confusion of thought. ‘‘Yang’s principle,” he said, ‘“is ‘each one for himself,’ which does not acknowledge the claims of the sovereign. Mo’s is ‘to love all equally,’ which does not acknowledge the peculiar affection due to a father. But to acknowledge neither king nor father is to be in the state of a beast. The way of benevolence and righteousness is stopped up.”

On this seething ocean of lawlessness, wickedness, heresies, and misery Mencius looked out from the quiet of his school, and his spirit was stirred within him to attempt the rescue of the people from the misrule and error. It might be that he would prove the instrument for this pur- pose. “If Heaven,” he said, “wishes that the kingdom should enjoy tranquillity and good order, who is there besides me to bring it about?” He formed his plan, and proceeded to put it in execution. He would go about among the different

kings till he should find one among them who would follow his counsels and commit to him the entire administration of his government. That obtained, he did not doubt that in afew years there would be a kingdom so strong and so good that all rulers would acknowledge its superiority, and the people hasten from all quarters to crown its sovereign as monarch of the whole of China. This plan was much the same as that of Confucius had been ; but, with the bolder character that belonged to him, Mencius took in one respect a position from which "'the master" would have shrunk. The former was always loyal to Chau, and thought he could save the country by a reformation; the latter saw the day of Chau was past, and the time was come for a revolution. Mencius's view was the more correct, but he was not wiser than the sage in forecasting for the future. They could think only of a reformed dynasty or of a changed dynasty, ruling according to the model principles of a feudal con- stitution, which they described in glowing language. They

desired a repetition of the golden age in the remote past ; but soon after Mencius disappeared from the stage of life there came the sovereign of Ch'in, and solved the question with fire and sword, introducing the despotic empire which has since prevailed.

An inquiry here occurs—" How, in the execution of his plan, was Mencius, a scholar, without wealth or station, to find admission to the courts of lawless and unprincipled kings, and acquire the influence over them which he expected?" It can only be met by our bearing in mind the position accorded from the earliest times in China to men of virtue and ability. The same written character denotes both scholars and officers. They are at the top of the social scale,—the first of the four classes into which the population has always been divided. This appreciation of learning or culture has exercised a most powerful influence over the government under both conditions of its exist- ence ; and out of it grew the system, which was organized and consolidated more than a thousand years ago, of making literary merit the passport to official employnient. The ancient doctrine was that the scholar's privilege was from Heaven as much as the sovereign's right; the modern system is a device of the despotic rule to put itself in Heaven's place, and have the making of the scholar in its own hands. The feeling and conviction out of which the system grew prevailed in the time

of Mencius. The dynasties that had successively ruled over the kingdom had owed their establishment not more to the military genius of their founders than to the wisdom and organizing ability of the learned men, the statesmen, who were their bosom friends and trusted counsellors. Why should not he become to one of the princes of his day what f Yin had been to Thang, and Thai-kung Wang to King Wan, and the duke of Chau to Wtiand Ch'ang? But, though Mencius might be the equal of any of those worthies, he knew of no prince like Thang and the others, of noble aim and soul, who would welcome and adopt his lessons. In his eager- ness he overlooked this condition of success for his enter- prise. He might meet with such a ruler as he looked for, or he might reforma bad one, and make him the coadjutor that he required. On the strength of these peradventures, and attended by several of his disciples, Mencius went for more than twenty years from one court to another, always baffled, and always-ready to try again. He was received with great respect by kings and princes. He would not enter into the service of any of them, but he occa- sionally accepted honorary offices of distinction ; and he did not scruple to receive large gifts which enabled him to live and move about as a man of wealth. In delivering his message he was as fearless and outspoken as John Knox. He lectured great men, and ridiculed them. He unfolded the ways of the old sage kings, and pointed out the path to universal sway ; but it was all in vain. He could not stir any one to honourable action. He confronted heresy with strong arguments and exposed it with withering sarcasm ; but he could work no deliverance in the earth. The last court at which we find him was that of Ld, probably in 310 B.c. The marquis of that state had given office to Yo-ching, one of Mencius's disciples, and he hoped that this might be the means of a favourable hearing for himself. So it had nearly happened. On the suggestion of Yo-ching the marquis had ordered his carriage to be

| yoked, and was about to step into it, and proceed to bring

Mencius to his palace, when an unworthy favourite stepped in and diverted him from his purpose. The disciple told his master what had occurred, reproaching the favourite for his ill-timed intervention; Mencius, however, said to him, "A man's advancement or the arresting of it may seem to be effected by others, but is really beyond their power. My not finding in the marquis of Lf a ruler who would confide

me

in me and put my lessons in practice is from Heaven.” He accepted this incident as a final intimation to him of the will of Heaven. He had striven long against adverse cir- cumstances, but now he bowed in submission. We lose sight of him. He withdrew from courts and the public arena, We have to think of him, according to tradition, passing the last twenty years of his life in the congenial society of his disciples, discoursing to them, and giving the finishing touches to the record of his conversations and opinions, which were afterwards edited by them, and con- stitute his works. Living, he may have been a failure ; dead, yet speaking in them, he has been a great power among the ever-multiplying millions of his countrymen. Nor will any thinker of the West refer to them without interest and benefit. Mencius was not so oracular, nor so self-contained, as Confucius ; but his teachings have a vivacity and sparkle of which we never weary, and which is all their own.

We will now attempt to indicate briefly the more important principles which our philosopher thought would have been effectual to regenerate his country, and make an end of misery and heresy within its borders.

And first as to his views on government, and the work to be done by rulers for their subjects. Mencius held with Confucius— aud it was a doctrine which had descended to them both from the remotest antiquity—that royal government is an institution of God. An ancient sovereign had said that “‘ Hcaven, having produced the people, appointed for them rulers, and appointed for then teachers, who should be assisting to God.” Our philosopher, adopting this doctrine, was led by the manifest incompetency of all the rulers of his time to ask how it could be known on what individual the appointment of Heaven had fallen or ought to fall, and he concluded that this could be ascertained only from his personal character and his conduct of affairs. The people must find out the will of Heaven as to who should be their ruler for themselves. There was another old saying which delighted Mencius, —“ Heaven sees as the people see; Heaven hears as the people hear.” He taught accordingly that, while government is from God, the governors are from the people ;—vow popult vox Det.

o claim then of a ‘‘divineright” should be allowed toa sovereign if he were not exercising a rule for the good of the people. “The people are the most important element in a nation ; the altars to the spirits of the land and grain are the second ; the sovereign is the lightest.” Mencius was not afraid to follow this utterance to its consequences. The monarch whose rule is injurious to the people, and who is deaf to remonstrance and counsel, should be dethroned. In such a case ‘killing is no murder.”

But who is to remove the sovereign that thus ought to be removed? Mencius had three answers to this difficult question. First, he would have the menibers of the royal house perform the task. Let them disown their unworthy head, and appoint some better in- dividual of their number in his room. If they could not or would not do this, he thought, secondly, that any high minister, though not allied to the royal house, might take summary measures with the sovereign, assuming that he acted purely with a view to the public weal. His third and grand device was what he called ‘‘ the minister of Heaven.” When the sovereign had become a pest instead of a blessing, he believed that Heaven would raise up some one for the help of the people, some one who should so conduct himself in his original subordinate position as to draw all eyes and hearts to himself. Let him then raise the standard not of rebel- lion but of righteousness, and he could not help attaining to the highest dignity. Mencius hoped to find one among the rulers of his day who might be made into such a minister, and ho counselled one and another to adopt measures with that object. It was in fact counselling rebellion, but he held that the house of Chau had forfeited its title to the throne.

What now were the attributes which Mencius cousidered necessary to constitute a good government according to his ideal of it ? It must be animated by a spirit of benevolence, and ever pursue a policy of righteousness. Its aims must be, first, to make the people well off, and next, to educate them. No one was fit to occupy the throne who could be happy while any of the people were iniserable, who delighted in war, who could indulge in palaces and parks which the poorest did not in a measure share with him, Game laws received his emphatic condemnation. Taxes should be light, and all the regulations for agriculture and cominerce of a character to promote and encourage them. The rules which he suggested to secure those

objects had reference to the existing condition of his country, but they are susceptible of wide application. They carry in them schemes of drainage and irrigation for laud, and of free trade for commerce. But it must be, he contended, that a sufficient

and certain livelihood be secured for all the people. Without this their minds would be unsettled, and they would proeeed to every form of wild licence. ‘They would break the laws, and the ruler would punish them,—punish those whom his neglect of his own duties had plunged into poverty, of which crime was the consequence. He would be, not their ruler, but their “trapper.”

Supposing the people to be made well off, Mencius taught that education should be provided for them all. He gave the marquis of Thang a programme of four kinds of educational institutions, which he wished him to establish in his state—in the villages and the towns, for the poor as well as the rich, so that none might be ignorant of their duties in the various relations of society. But after all, unless the people could get food and clothing by their labour, he had not much faith in the power of education to make them virtuous. Give him, however, a government fulfilling the conditions that he laid down, and he was confident there would soon be a people, all contented, all virtuous. And he saw nothing to prevent the realization of such a government. Any ruler might become, if he would, ‘the minister of Heaven,” who was his ideal, and the influence of his example and administration would be all- powerful. The people would flock to him as their parent, and help him to do justice on the foes of truth and happiness. Pulse and grain would be abundant as water and fire, and the multitudes, well clothed, and well principled, would sit under the shade of their mulberry trees, and hail the ruler ‘‘king by the grace of Heaven.”

Secondly, as to Mencius’s views about human nature. His con- viction of the goodness of that encouraged him to hope for such grand results from good governmeut, and his discussion of this subject gives his priucipal title to a place among philosophical thinkers.

Opinions were much divided about it among his contemporaries. Some held that the nature of man is neither good nor bad ; he may be made to do good and also to do evil. Others held that the nature of some men is good, and

that of others bad ; thus it is that the best of men sometimes have bad sons, and the worst of men good sons. It was also maintained that the nature of man is evil, and whatever good appears in it is the result of cultivation. In opposition to all these views Mencius contended that the nature of man is good. ‘‘ Water,” he said, ‘will flow indifferently to the east or west; but will it flow indifferently up or down? The tendency of man’s nature to goodness is like the tendency of water to flow downwards. By striking water you may make it leap over your forehead ; and by damming and leading it you may make it goupa hill. But such movements are not according to the nature of water; it is the force applied which causes them. When men do what is not good, their nature has been dealt with in this way.”

aticinte had no stronger langnage than this, —as indeed it would be difficult to find any stronger, —to declare his belief of the goodness of human nature. With various, but equally felicitous, illustration he replied to his different opponents. Sometimes he may seen to express himself too strongly, but an attentive study of his writings shows that he is speaking of our nature in its ideal, and not as it actually is, as we may ascertain, by an analysis of it, that it was intended to be, and not as it has been made to become. In fact, his doctrine of human nature is hardly to be distinguished from that of Bishop Butler, while the Christian prelate is left far behind so far as charm of style is concerned.

Our author insists on the constituents of human nature, dwelling especially on the principles of benevolence, righteousness, propricty, and wisdom or knowledge, the last including the judgment of conscience. “These,” said he, ‘“‘are not infused into us from without, Men have these four principles just as they have their four limbs.” But man has also instincts and appetites which seek their own gratification without reference to righteousness or any other control. He met this difficulty by contending that human nature is a constitution, in whieh the higher principles are designed to rule the lower. ‘Some constituents of it are noble and sone ignoble, some great and some small. The great must not be injured for the small, nor the noble for the ignoble.”

One of his most vigorous vindications of his doctrine is the following :—-‘‘ For the mouth to desire flavours, the eye colours, the ear sounds, and the

four limbs ease and rest belong to man's nature. An individual's lot may restrict him from the gratification of them; and in snch a case the superior man will not say, 'My nature demands that pleasure, and I will get it.' On the other hand, there are love between father and son, righteousness between ruler and minister, the rules of ceremony between host and guest, and knowledge seen in recognizing the able aud virtuous, and in the sage's fulfilling the heavenly eonrse ;—these are appointed (by Heaven). But they also belong to our nature, and the superior mau will not say, 'The circumstances of my lot relieve me from them.'" In his preliminary dissertation to the 7th edition of this encyclopedia, Sir James Mackintosh has said that in his sermons' on human nature Butler "taught truths more worthy of the name of discovery than any in the same department of inquiry with

which we are acquainted ; if we ought not to exccpt the first steps of the Grecian philosophers towards a theory of morals." Mencius was senior to Zeno, the onc of those philosophers to whom Butler has most affinity, and it does not appear that he had left anything for either of them to discover.

When he proceeded from his ideal of human nature to account for the phenomena of conduct so different from what they ought to be aceording to that ideal, he was necessarily less successful. They puzzled him and they made him indignantand angry. " There is nothing good," he said, "that a man caunot do; he only does not do it." But why does he not doit? Against the stubborn fact Mencius beats his wings and shatters his weapons,—all in vain. He mentions a few ancient worthies who, he coneeived, had always been, or who had become, perfectly virtuous. Above them all he extols Confucins, taking no notice of that sage's confession that he had not attained to conformity to his own rule of doing to others as he would have them do to him. No such acknowledgment about himself ever came from Mencius. Therein he was inferior to his predecessor: he had a subtler faculty of thought, and a mueh more vivid imagination; but he did not know himself nor his special subject of human nature so well.

Our Hmits will not allow us to go into a detail of his views on other special subjects. A few passages illustrative of his style and general teachings will

complete all that can be said of him here. His thoughts, indeed, were seldom condensed like those of ‘‘ the master” into aphorisms, and should be read in their connexion ; but we have from him many words of wisdom that have been as goads to millions for more than two thousand years. For in-stanee :— :

‘‘Though a man may be wicked, yct, if he adjust his thoughts, fast, and bathe, he may sacrifice to God.”

‘‘When Heaven is about to confer a great office on any man, it first exercises his mind with suffering, and his sinews and bones with toil. It exposes his body to hunger, subjects him to extreme poverty, and confounds his undertakings. In all these ways it stimulates his mind, strengthens his nature, and supplies his in- competencics.”’

‘“The great man is he who does not lose his child-heart.”

‘*The sense of shame is to a man of great importanee. When one is ashamed of having been without shame, he will afterwards not have occasion for shame,” :

‘‘To nourish the heart there is nothing better than to keep the desires few. Here isa man whose desires are few; in some things he may not be able to keep his heart, but they will be few. Here is a man whose desires are many; in some things he may be able to keep his heart, but they will be few.”

‘Benevolence is the distinguishing characteristic of man. embodied in his conduct, it may be ealled the path of duty.”

‘* There is an ordination for everything ; and a man should receive submissively what may be correetly ascribed thereto. He who has the correet idea of what Heaven’s ordination is will not stand beneath a tottering wall. Death sustained in the discharge of one’s duties may be eorrectly ascribed to Heaven. Death under handcuffs and fetters eannot be correctly so ascribed.”

‘‘When one by force subdues men, they do not submit to him in heart. When he subdues them by virtue, in their hearts’ core they are pleased, and

sincerely submit.”’

Two translations of the works of Mencius are within the reach of European readers :—that by the late Stanislaus Julien, in Latin, Paris, 1824-29; and that forming the second volume of Legge’s Chinese Classics, Hong Kong, 1862. The latter has been published at London (1875) without the Chinese text. See also E. Faber, The Mind of Mencius, or Political Economy founded on Moral Philosophy, translated from the German by A. B, Hutchinson (London, 1882). (J. LE.)

MENDELSSOHN, Ferrx (1809-1847). Jakob Ludwig Felix Mendelssohn-Bartholdy, one of the greatest com- posers of this century, was the grandson of Moses Men- delssohn noticed below, and was born in Hamburg on February 3, 1809.

In consequence of the troubles caused by the French occupation of Hamburg, Abraham Mendelssohn, his father, migrated in 1811 to Berlin, where his grandmother, Fromet, then in the twenty-fifth year of her widowhood, received the whole family into her house, No. 7 Neue Promenade. Here the little Felix and his sister Fanny received their first instruction in music from their mother, under whose care they progressed so rapidly that the altogether exceptional character of their talent soon became unmistakably apparent. Their next teacher was Madame Bigot, who, during the temporary residence of the family in Paris in 1816, gave them some valuable instruc- tion, On their return to Berlin they took lessons in thoroughbass and composition from Zelter, in pianoforte- playing from Ludwig Berger, and in violin-playing from

As

Tenning,—the care of their general education being en- trusted to the father of the novelist Paul Heyse.

Felix first played in public on the 24th of October 1818, taking the pianoforte part in a trio by Woelfl. On April 11, 1819, he entered the Berlin Singakademie as an alto, and in the following year began to compose with extraordinary rapidity. His earliest dated work isa cantata, In rithrend fecerlichen Ténen, completed on January 13, 1820. During that year alone

he produced nearly sixty movements, including songs, pianoforte sonatas, a trio for pianoforte, violin, and violoncello, a sonata for violin and pianoforte, pieces for the organ, and even a little dramatic piece in three scenes. In 1821 he wrote five symphonies for stringed instruments, each in three move- ments; motetts for four voices; an opera, in one act, called Soldatenliebschaft ; another, called Die beiden. Piida- gogen ; part of a third, called Die wandernde Comédianten ; and an immense quantity of other niusic of different kinds, some of which, thought worthy of publication by the editors of his posthumous works, now stands before the world in evidence of the precocity of his genius. The original autograph copies of these early productions are now preserved in the Berlin Library, where they form part of a collection which fills forty-four large volumes, all written with infinite neatness, and for the most part carefully dated—a sufficient proof that the methodical habits which distinguished his later life were formed in early childhood. .

In 1821 Mendelssohn paid his first visit to Goethe, with whom he spent sixteen days at Weimar, in company with Zelter. From this year also dates his first acquaintance with Weber, who was then in Berlin superintending the production of Der Lreischtitz; and from the summer of 1822 his introduction, at Cassel, to another of the greatest of his contemporaries, Ludwig Spohr. During this year his pen was even more prolific than before, producing, among other works, an opera, in three acts, entitled Die beiden Neffen, oder Der Onkel aus Boston, and a pianoforte concerto, which he played in public at a concert given by Frau Anna Milder.

It had long been a custom with the Mendelssohn family to give musical performances on alternate Sunday mornings in their dining-room, with a small orchestra, which Felix always conducted, even when he was not tall enough to be seen without standing upon a stool. For each of these occasions he produced some new work,—playing the piano- forte pieces himself, or entrusting them to Fanny, while his sister Rebecka sang, and his brother Paul played the violoncello. In this way Dive leiden Neffen was first privately performed, on the fifteenth anniversary of his birthday, February 3, 1824. Between the 3d and the 31st of March, in this year, he composed his fine symphony in C minor, now known as Op. 10, and soon afterwards the quartett in B minor, Op. 3, and the (posthumous) piano- forte

sestett, Op. 110. In this year also began his lifelong friendship with Moscheles, wlio, when asked to receive him as a pupil, said, “If he wishes to take a hint from me, as to anything new to him, he can easily do so; but he stands in no need of lessons.”

In 1825 Abraham Mendelssohn took Felix to Paris, where among other musicians then resident in the French capital he met the two most popular dramatic composers of the age, Rossini and Meyerbeer, and lived on terms of intimacy with Hummel, Kalkbrenner, Rode, Baillot, Herz, and many other artists of European celebrity. On this occasion, also, he made his first acquaintance with Cherubini, who, though he rarely praised any one, expressed a very high opinion of his talent, and recommended him to write a Kyrie, for five voices, with full orchestral accompaniments, which he himself described as “ exceeding

in thickness” anything he had attempted. From letters written at this period we learn that Felix’s estimate of the French school of music was very far from a flattering one; but he formed some friendships in Paris, which were pleasantly renewed on later occasions. He returned to Berlin with his father in May 1825, taking leave of his Parisian friends on the 19th of the month, and interrupting his journey at Weimar for the purpose of paying a second visit to Goethe, to whom he dedicated his quartett in B minor. On reaching home he must have fallen to work with greater zeal than ever; for on the 23d of July in this same year he completed his pianoforte capriccio in F sharp minor (Op. 5), and on the 10th of August an opera, in two acts, called Die Hochzeit des Camacho, a work of considerable importance, concerning which we shall presently have to speak more particularly. No ordinary boy could have escaped uninjured from the snares attendant upon such a life as that which Mendelssohn now lived. Notwithstanding his overwhelm- ing passion for music, his general education had been so well cared for that he was able to hold his own, in the society of his seniors, with the easy grace of an accomplished man of the world. He was already recognized as a lead- ing spirit by the artists with whom he associated, and these artists were men of acknowledged talent and position. The temptations to egoism by which he was surrounded would have rendered most clever students intolerable.

But the natural amiability of his disposition, and the healthy influence of his happy home-life, counteracted all tendencies towards inordinate self-assertion ; and he is described by all who knew him at this period as the most charming boy imaginable. Even Zelter, though by nature no less repressive than Cherubini, was not ashamed to show that he was proud of him; and Moscheles, whose name was already famous, met him from the first on equal terms. Soon after his return from Paris, Abraham Mendelssohn removed from his mother's residence to No. 3 Leipziger Strasse, a roomy, old-fashioned house, containing an excellent music-room, and in the grounds adjoining a "'Gartenhaus" capable of accommodating several hundred persons at the Sunday performances.' In the autumn of the following year this "garden-house" witnessed a memorable private performance of the work by means of which the greatness of Mendelssohn's genius was first revealed to the outer world—the overture to Shakespeare's Midsummer Nights Dream. The finished score of this famous composition is dated "Berlin, August 6, 1826,"— that is to say, three days after its author had attained the age of seventeen years and a half. Yet we may safely assert that in no later work does he exhibit more originality of thought, more freshness of conception, or more perfect mastery over the details of technical construction, than in this delightful inspiration, which, though now nearly sixty years old, still holds its place at the head of the most brilliant achievements of our modern schools, The over- ture was first publicly performed at Stettin, in February 1827, under the direction of the young composer, who with this bright patent of artistic nobility to support his claim, was at once accepted as the leader of a new and highly characteristic manifestation of the spirit of modern progress. Henceforth therefore we must speak of him, not as a student, but as a mature and experienced artist. Meanwhile Camacho's Wedding had been submitted to Herr General-Musik-Director Spontini, with a view to its production at the opera. The libretto, founded upon an episode in the history of Don Quixote, was written by Klingemann, and Mendelssohn threw himself into the spirit

1 After Mendelssohn's death this house was sold to the Prussian Government ; and the " Herrenhaus" now stands on the site of the garden-house. ,

of the romance with a keen perception of its peculiar humour. The work was put into rehearsal soon after the composer's return from Stettin, produced on April 29, 1827, and received with great apparent enthusiasm ; but, for some reason which it is now impossible to ascertain, a cabal was formed against it, and it never reached a second performance. The critics abused it mercilessly ; yet it exhibits merits of a very high order. 'The solemn passage for the trombones, which heralds the first appearance of the knight of La Mancha, is conceived in a spirit of reverent appreciation of the idea of Cervantes, which would have done honour to a composer of lifelong experience. Even the critics suborned to condemn the work could not refrain from expressing their admiration of this; but it had been decreed that the opera should not live—and it did not.

Mendelssohn was excessively annoyed at this injustice, and some time elapsed before his mind recovered its usual bright tone; but he continued to work diligently for the cause of art. Among other serious undertakings, he formed a choir for the study of the great choral works of Sebastian Bach, then entirely unknown to the public; and, in spite of Zelter's determined opposition, he suc- ceeded, in 1829, in inducing the Berlin Singakademie to give a public performance of the Passion according to St Matthew, under his direction, with a chorus of between three and four hundred voices. The scheme succeeded beyond his warmest hopes, and proved the means of restoring to the world great compositions with which we are all now familiar, but which, at that time, had never been heard since the death of Bach. But the obstructive party were grievously offended ; and at this period Mendelssolin was far from popular among the musicians of Berlin.

In April 1829 Mendelssohn paid his first visit to London. His reception was most enthusiastic. He made his first appearance before an English audience at one of the Philharmonic Society's concerts—then held in the Argyll Rooms—on the 25th of May, conducting his symphony in © minor from the pianoforte, to which he was led by John Cramer. On the 30th he played Weber's Concertstiick, from memory, a proceeding at that time extremely unusual. Ata concert given by Drouet, on the 24th of June, he played Beethoven's pianoforte concerto in E flat, which had never before been heard in the country ; and the overture to A Midsummer Night's Dream was also, for the first time, presented to a London audience. On

-returning home from the concert, Mr Attwood, then

organist of St Paul's Cathedral, left the score of the overture in a hackney coach, whereupon Mendelssohn wrote out another, from memory, without an error. At another concert he played, with Moscheles, his still un-published concerto in E, for two pianofortes and orchestra. After the close of the London season he started with Klingemann on a tour through Scotland, where he was inspired with the first idea of his overture to The Isles of Fingal, returning to Berlin at the end of November. Except for an accident to his knee, which lamed him for some considerable time, his visit was a highly successful one, and laid the foundation of many firm friendships and many prosperous negotiations in the time to come.

The visit to England formed in reality the first division only of a great scheme of travel which his father wished him to extend to all the most important art centres in Europe. After refusing the offer of a professorship at Berlin, he started again, in May 1830, for Italy, pausing on his way at Weimar, where he spent a memorable fort- night with Goethe, and reaching Rome, after many pleasant interruptions, on November 1. No possible form of excitement ever prevented him from devoting a certain time every day to composition ; but he lost no opportunity

of studying either the countless treasures which form the chief glory of the great city or the manners and customs of modern Romans. He attended, with insatiable curiosity, the services in the Sistine Chapel; and his keen power of observation enabled him to throw much interesting light upon them. His letters on this subject, however, lose much of their value through his incapacity to comprehend the close relation existing between the music of Palestrina and his contemporaries and the ritual of the Roman Church. His Lutheran education kept him in ignorance even of the first principles of ordinary chanting ; and it is amusing to find him describing as enormities peculiar to the papal choir customs familiar to every village singer in England, and as closely connected with the structure of the "Anglican chant" as with that of " Gregorian music." Still, though he could not agree, in all points, with Baini, the greatest ecclesiastical musician then living, he fully shared his admiration for the Jmproperta, the Miserere, and the cantus

planus of the Lamentationes and the Hxultet, the musical beauty of which he could understand, apart from their ritual significance.

In passing through Munich on his return in October 1831, he composed and played his pianoforte concerto in G minor, and accepted a commission (never fulfilled) to compose an opera for the Munich theatre. Pausing for a time at Stuttgart, Frankfort, and Diisseldorf, ‘he arrived in Paris in December, and passed four pleasant months in the renewal of acquaintances formed in 1825, and in close intercourse with Liszt and Chopin. On February 19, 1832, the overture to A Midsummer Night’s Dream was played at the conservatoire, and many of his other com- positions were brought before the public; but he did not altogether escape disappointments with regard to some of them, especially the Reformation symphony, and the visit was brought to a premature close in March by an attack of cholera, from which, however, he rapidly recovered.

On the 23d of April 1832 he was again in London, where le twice played his G minor concerto at the Philharmonic concerts, gave a performance on the organ at St Paul’s, and published his first book of Lzeder ohne Worte. He returned to Berlin in July, and during the winter he gave public performances of his Reformation symphony, his concerto in G minor, and his Walpur- gisnacht. In the following spring he paid a third visit to London for the purpose of conducting his Italian symphony, which was played for the first time, by the Philharmonic Society, on the 13th of May 1833. On the 26th of the same month he conducted the performances at the Lower Rhine festival at Diisseldorf, with such brilliant effect that he was at once invited to accept the appointment of general-music-director to the town, an office which included the management of the music in the principal churches, at the theatre, and at the rooms of two musical associations. This post he willingly accepted, and it formed a stepping-stone to a far more important one.

Before entering upon his new duties, Mendelssohn paid a fourth visit to London, with his father, returning to Diisseldorf on the 27th of September 1833. His influence produced an excellent effect upon the church music and in the concert-room ; but his relations with the management of the theatre were not altogether pleasant; and it was probably this circumstance which

first led him to forsake the cultivation of the opera for that of sacred music. At Diisseldorf he first designed his famous oratorio S¢ Pav, in response to an application from the Cacilien-Verein at Frankfort, composed his overture to Die schéne Melusine, and planned some other works of importance. He liked his appointment, and would probably have retained it much longer had he not been invited to undertake the permanent direction of the Gewandhaus concerts at Leipsic, and thus

raised to the highest position attainable in the German musical world. ‘To this new sphere of labour he removed in August 1835, opening the first concert at the Gewand- haus, on the 4th of October, with his overture Dve Meeresstille, a work possessing great attractions, though by no means on a level with the Midsummer Night’s Dream, The Isles of Fingal, or Melusine.

Mendelssohn’s reception in Leipsic was most enthusiastic ;

and under their new director the Gewandhaus concerts prospered exceedingly. Meanwhile S¢ Paul steadily pro-

gressed, and was first produced, with triumphant success, at the Lower Rhine festival at Diisseldorf, on May 22, 1836. On October 3 it was first sung in English, at Liverpool, under the direction of Sir George Smart; and on March 16, 1837, Mendelssohn again directed it at Leipsic.

The next great event in Mendelssohin’s life was his happy marriage, on March 28, 1837, to Cecile Charlotte Sophie Jeanrenaud, whose amiable disposition, surpassing beauty, and indescribable charm of manner endeared her to all who knew her. The honeymoon was scarcely over before he was again summoned to England to conduct St Paul, at the Birmingham festival, on September 20th. During this visit he played on the organ at St Paul’s and at Christ Church, Newgate Street, with an effect which exercised a lasting influence upon English organists. It was here also that he first contemplated the production of his second oratorio, Elijah.

Passing over the composition of the Lobgesang in 1840, a sixth visit to England in the same year, the scheme for the erection of a monument to Sebastian Bach, and other events on which space does not permit us to enlarge, we find Mendelssohn in 1841 recalled to Berlin by the king of

Prussia, with the title of Kapellmeister. Though this appointment resulted in the production of Antigone, Aidipus Coloneus, Athalie, the incidental music to the Jfcdswnmer Night's Dream, and other great works, it proved an endless source of vexation, and certainly helped to shorten the composer's life. In 1842 he came to England for the seventh time, accompanied by his wife, conducted his Scotch symphony at the Philharmonic, again played the organ at St Peter's, Cornhill, and Christ Church, Newgate Street, and was received with all possible honour by the queen and the prince consort. He did not, however, permit his new engagements to interfere with the direction of the Gewand- haus concerts; and in 1843 he founded in Leipsic the great conservatoire which soon became the best musical college in Europe, opening it on April 3, in the buildings of the Gewandhaus. In 1844 he conducted six of the Philhar- monic concerts in London, producing his new J/cdsummer Night's Dream music, and playing Beethoven's pianoforte concerto in G with extraordinary effect. He returned to his duties at Berlin in September, but happily succeeded in persuading the king to free him from his most onerous engagements, and his delight at this relief was un- bounded.

After a brief residence in Frankfort, Mendelssohn returned to Leipsic in September 1845, resuming his old duties at the Gewandhaus, and teaching regularly in the conservatoire. Here he remained, with little in- terruption, during the winter,—introducing his friend Jenny Lind, then at the height of her popularity, to the critical frequenters of the Gewandhaus, and steadily working at Elijah, the first performance of which he con- ducted at the Birmingham festival, on August 26, 1846. The enthusiastic reception of this great work is well known. Unhappily, the excitement attendant upon its production, added to the irritating effect of the worries at Berlin, made a serious inroad upon the composer's health. On his return to Leipsic he worked on as usual, but it was

clear that his health was seriously impaired. In 1847 he visited England for the tenth and last time, to conduct four performances of Hlvjah at Exeter Hall, on the 16th, 23d, 28th, and 30th of April, one at Manchester on the 20th, and one at Birmingham on the 27th. Again the queen and prince

consort received him with marked respect,— one might almost venture to say, affection,—and all seemed prosperous and happy. But the necessary exertion was far beyond his strength. He witnessed Jenny Lind's first appearance at Her Majesty's Theatre, on the 4th of May, and left England on the 9th, little anticipating the trial that awaited him in the tidings of the sudden death of his sister Fanny, which reached him only a few days after his arrival in Frankfort. The loss of his mother in 1842 had shaken him much, but the suddenness with which this last sad intelligence was communicated broke him down com- pletely. He fell to the ground insensible, and never fully recovered. In June he was so far himself again that he was able to travel, with his family, by short stages, to Interlaken, where he stayed for some time, illustrating the journey by a series of water-colour drawings, but making no attempt at composition for many weeks. He returned to Leipsic in September, bringing with him fragments of Christus, Loreley, and some other unfinished works, taking no part in the concerts, and living in the

strictest privacy. On the 9th of October he called on |

Madame Frege, and asked her to sing his latest set of songs. She left the room for lights, and on her return found him in violent pain, and almost insensible. It was the begin- ning of the end. He lingered on, now better now worse, through four weary weeks, and on the 4th of November he passed away, in the presence of his wife, his brother, and his three dear friends, Moscheles, Schleinitz, and Ferdinand David. A cross now marks the site of his grave, in the Alte Dreifaltigkeits Kirchhof, at Berlin.

Mendelssohn's title to a place among the greatest composers of the century is incontestable. His style, though differing but little in technical arrangement from that of his classical predecessors, is characterized by a vein of melody peculiarly his own, and easily distinguishable by those who have studied his works, not only from the genuine effusions of contemporary writers, but from the most successful of the servile imitations with which, even during his lifetime, the music-shops were deluged. In less judicious hands the rigid symmetry of his phrasing might, perhaps, have palled upon the ear; but under his skilful management it serves only to impart an additional charm to thoughts which derive their chief beauty from

the evident spontaneity of their conception. In this, as in all other matters of a purely technical character, he regarded the accepted laws of art as the medium by which he might most certainly attain the ends dictated by the inspiration of his genius. Though caring nothing for rules, except as means for producing a good effect, he scarcely ever violated them, and was never weary of impressing their value upon the minds of his pupils. His method of counterpoint was modelled in close-accordance with that practised by Sebastian Bach. This he used in combination with an elastic development of the sonata-form, similar to that engrafted by Beethoven upon the lines laid down by Haydn. The principles involved in this arrangement were strictly conservative; yet they cnabled him, at the very outset of his career, to invent a new style no less original than that of Schubert or Weber, and no less re- markable as the embodiment of canons already consecrated by classical authority than as a special manifestation of individual genius. Itis thus that Mendelssohn stands before us as at the same time a champion of conservatism and an apostle of progress ; and it is chiefly by virtue of these two apparently: incongruous though really perfectly compatible phases of his artistic character that his influence and example have, for so many years, held in check the violence of reactionary opinion which a little injudicions en- couragement might easily have fanned into revolutionary fury. Happily, this wholesome influence is still at work among us; and in his oratorios, his symphonies, his overtures, his concertos, and his smaller pianoforte pieces Mendelssohn sets before us an ex- ample the value of which is universally recognized, and not likely to be soon forgotten.

Concerning Mendelssohn’s private character there have never been two opinions. Asa man of the world, he was more than ordi- narily accomplished, —brilliant in conversation, and in his lighter moments overtlowing with sparkling humour and ready pleasantry,

| loyal and unselfish in the more serious business of life, and never

weary of working for the general good. As a friend he was un- varyingly kind, sympathetic, and as true as steel. His earnestness as a Christian needs no stronger testimony than that afforded by his own delineation of the character of St Paul ; but it is not too much to say that his heart and life were pure as those of a little child. ;

A complete list of Mendelssohn’s published compositions—one hundred and nine- teen in number, besides some five and twenty unnumbered works of considerable importance—will be found in the thematic catalogue published by Messrs Breit- kopf and Hirtel at Leipsic, and also In Grove’s Dictionary of Music and Musicians, vol. ii. pp. 308, 809. Among his miscellancous writings, we may men- tion a translation of the Andria of Terence, in Gerinan verse, and an immense collection of Ictters, posthumously printed. and caleulated to give the reader a far closer acquaintance with his life and character than any biographcr can hope to convey. CW. 8S. BR.)

MENDELSSOHN, Moszs (1729-1786), philosopher and scholar, well known as Lessing’s friend and the proto- type of his “ Nathan,” was born on September 6, 1729, at Dessau on the Elbe, where his Jewish father made a scanty livelihood by teaching a small school and transcribing copies of the “law.” The leading events of Mendelssohn’s career have been indicated elsewhere (see Juws, vol. xiii. p. 680). His numerous writings include Ueber Evidenz in metaphysischen Wissenschaften (1763), which gained the prize in a competition in which Immanuel Kant took part; Briefe tiber die Empfindungen (1764) ; Phedon, oder tiber die Unsterblichkeit der Seele (1767), an argument for immortality, founded on the nature of the soul as exempt- ing it from the ordinary laws of change, which has been severely criticized by Kant; Jerusalem, oder die religwse Macht und Judenthum (1783), a specially important con- tribution to the question of Jewish emancipation; a number of contributions to his friend Nicolai’s Literatur-briefen and Bibliothek der schinen Wéssenschaften ; one or two tracts in Hebrew; and some new German translations from the Old Testament. The controversy which led to the publication of his Morgenstunden (1785-86), a reply to Jacobi’s Briefe tiber die Lehre Spinoza’s, is said to have been more or less directly the cause of his death, which took place on January 4, 1786 (see Jacont, vol. xiii. p. 537). Of Mendelssohn’s three sons, the second, Abraham, settled as a banker in Hamburg and married a Jewess, Lea Salomon Bartholdy, who bore him four children ; these, by advice of their mother’s brother, himself a conscientious convert from Judaism, were educated as Christians, and thenceforth joined their mother’s second surname to their own. The second of them, Felix, is the subject of the preceding notice. In later life Abraham Mendelssohn was accustomed to

say,—“ When I was young I was the son of my father ; now I am the father of my son.” See The Mendelssohn Family, 1882.

MENDOZA, a city of the Argentine Republic, the only town of the province of Mendoza, lies 700 miles west- north-west of Buenos Ayres, at the foot of the Cordilleras, 2510 feet above the sea-level, in 32° 53’S. lat. and 68° 45’ W. long. It was formerly a frequent stopping-place on the route across the Andes by the Uspallata Pass, and used to rank as one of the best-built towns in the country, but in 1861 it was almost completely destroyed by an appalling earthquake, in which the people, for the most part collected in the churches, perished to the number of about 12,000. Bravard, a French geologist who had often predicted the catastrophe, was one of those who perished. Extensive ruins still mark the site of the old town; the new town, which has been built at a little distance, has grown rapidly. Situated in a richly cultivated district, Mendoza depends mainly on agriculture and fruit-growing.

The city was founded in 1559 by Garcia de Mendoza; and in 1776 it was made the administrative centre of the vice-royalty of La Plata. Sce Mulhall, Handbook of the La Plata States, 1875 ; and Mrs Mulhall, Between the Amazon and the Andes, 1882.

MENDOZA, Disco Hourtapo pbx (c. 1503-1575), novelist, poet, diplomatist, and historian, was a younger son of the member of the illustrious Mendoza family to whom

the government of Granada was entrusted not long after its surrender, and was born in that city about the year 1503. The marquis of Santillana, so prominent a figure at the court of John IL. of Castile, was his great-grandfather. At an early age Mendoza, who had been destined for the church, was sent to Salamanca, where he studied with success, and also, some time between the years 1520 and 1525, produced his Lazarillo de Tormes, the work upon which his literary celebrity largely rests. Having persuaded his father to allow him to enter the army, he served with the

Spanish troops of Charles V. in Italy, and also availed himself of opportunities as they arose to hear the lectures of famous professors at Bologna, Padua, and Rome. In 1538 he was taken into the diplomatic service of the emperor and sent as ambassador to Venice ; there he cultivated friendly relations with the Aldi, and energetically set about collecting a library, not only procuring copies of many old MSS. in the public library of the city, but also sending to Thessaly and Mount Athos for new ones ; it was from his collection that the complete text of Josephus was first printed. For gome time he held the post of military governor of Siena ; and, after having been present in an official capacity in Trent at the beginning of the cecumenical council, he was in 1547 sent as special plenipotentiary to Rome, where he continued to act for some years. In 1554, shortly before the abdication of Charles, he was recalled to Spain, and his official career came to an end. He was never a favourite with Philip IL ; and in consequence of a quarrel with a courtier, in which he had lost his temper badly, he was finally banished from court in 1568. The remaining years of his life, which were spent at Granada, he devoted partly to the study of Arabic, partly to poetical composition, and partly to the preparation of his history of the Moorish ‘nsurrection of 1568-70 (Guerra de G’ranada). He died at Madrid (which he had obtained leave to visit on some business errand) in April 1575.

Mendoza’s Lazarillo de Tormes, though written during his college days, was not published until 1553, when it was printed anonymously at Antwerp. Next year it was reprinted at Burgos, but ultimately it was taken exeeption to by the Inquisition, and the Spanish editions of 1573 and subsequent years are accordingly con- siderably abridged. It is a comparatively short fragment, written in vigorous and bright Castilian, and was the first example in modern literature of the ‘novela picaresca” of whieh Le Sage’s Gil Blas now ranks as the most perfeet specimen. The continuations, first by an anonymous author (1555) and afterwards by H. de Luna (1620), are of very inferior interest. Of Mendoza as a poet all that need be said here is that he followed the modern Italian models quite as far as was compatible with a due regard to his Castilian individu- ality. His history, though of no great bulk, is, like his novel, a work of remarkable literary execution. It relates indeed only toa comparatively brief episode in a chapter of events for which it is

almost impossible to claim much general attention, and it is often needlessly erudite and sometimes provokingly obscure. But as a whole itis singularly well-informed, dignified, and picturesque ; “ the style is bold and abrupt, but true to the idiom of the language, and the current of thought is deep and strong, easily carrying the reader onward with its flood. Nothing in the old chronicling style of the catlicr period is to be compared to it, and little in any subscquent

period is equal to it for manliness, vigour, and truth” (Ticknor). : : tac The first edition of the Guerra de Granada did not appear until the yeeloin. Sete part of the littoral waters between Maine

1610, but was even then incomplete ; the first perfect edition was and Florida, the northern shoals retiring into deeper water that of 1730. The work has frequently been reprinted since. or to more southern latitudes with the approach of cold MENDOZA, ISico Loprz pz, See SANTILLANA. weather. The average size of the menhaden is about 12

MENELAUS, king of Sparta, was the brother of | inches. Although it was long known as a palatable table- AGAMEMNON (q.v.) and the husband of HELENA (9.0.). He | fish, and largely used, when salted, for export to the West was one of the heroes of the Trojan horse, and recovered | Indies, and as bait for cod and mackerel, the menhaden his wife at the sack of the city. On the voyage home- fishery has been developed to its present importance only wards his fleet was scattered off Malea by a storm which within the last twenty years. A large fleet of steamers drove him to Crete; after seven years’ further wandering and sailing vessels is engaged init; anda great number of to Cyprus, Pheenicia, Egypt, Ethiopia, Libya, and the | large factories have sprung into existence to extract the oil, country of the Erembi, he at last had an interview with | which is used for tanning and currying, and for adulterat- Proteus and obtained a favourable wind which brought him | ing other more expensive oils, and to manufacture the refuse home on the very day on which Orestes was holding the | into a very valuable guano. In the year 1877 2,426,589 funeral feast over Adgisthus and Clytsmnestra. After a | gallons of oil and 55,444 tons of guano were produced.

long and happy life in Lacedsemon, Menelaus, as the son- in-law of Zeus, did not die but was translated to Elysium.

MENGS, Antony RAPHAEL (1728-1779), was the most celebrated representative of the eclectic school of painting in the 18th century, and played a great part in the early days of the classic revival. He was born in 1728 at Aussig in Bohemia, but his father, a Danish painter, established himself finally at Dresden, whence in 1741 he conducted his son to Rome. Mengs early showed that active intelligence and large capacity for laborious study which secured him the extraordinary distinction which he en} oyed through life. His appointment in 1749 as first painter to the elector of Saxony did not prevent his spending much time in Rome, where he had married in 1748, and abjured the Protestant faith, and where he became in 1754 director of the Vatican school of painting, nor did this hinder him on two occasions from obeying the call of Charles III. of Spain to Madrid. There Mengs produced some of his best work, and specially the ceiling of the banqueting hall, the subject of which was the Triumph of Trajan and the Temple of Glory. After the completion of this work in 1777, Mengs again returned to Rome, and there he died, two years later, in poor circumstances, leaving twenty children, seven of whom were pensioned by the king of Spain. Besides numerous paintings in the Madrid gallery, the Ascension at Dresden, Perseus and Andromeda at St Petersburg, and the ceiling of the Villa Albani must be mentioned among his chief works. In England, the duke of Northumberland pos- sesses a Holy Family, and the colleges of All Souls and Magdalen, at Oxford, have altar-pieces by his hand. In his writings, in Spanish, Italian, and German, Mengs has put forth his eclectic theory of art, which treats of per- fection as attainable by a well-schemed combination of diverse excellences,—Greek design, with the expression of Raphael, the chiaroscuro of Correggio, and the colour of Titian. His close intimacy with Winkelmann—who constantly wrote at his dictation—has greatly enhanced his historical importance, for he formed no scholars, and the critic must now concur in Goethe’s judgment of Mengs 1 Winkelmann und seine Jahrhundert; he must deplore that so much learning should have been allied to a total want of initiative and utter poverty of invention, and embodied with a strained and artificial mannerism.

Sec Opere di Antonio Raffaello Mengs, Parma, 1780; DMengs' Werke, iibersetat v. G. F. Prange, 1786 ; Zeitschrift fiir bildende Kunst, 1880; Bianconi, Hlogio Storico di Mengs, Milan, 1780; Nagler's Kiinstlerlexikon.

MENHADEN, economically one of the most important fishes of the United States, known by a great number of local names, ‘“‘menhaden” and “mossbunker ” being those most generally in use. In systematic works it appears under the names of Clupea menhaden and Brevoor- tia tyrannus. It is allied to the European species of shad and pilchard, and, like the latter, approaches the coast in its wanderings in immense shoals, which are found throughout

An extensive business is also carried on in converting menhaden of a suitable size into “‘ American sardines.”

A very complete aceount of this fishery is given by G. Brown Goode in ‘‘The Natural and Economic History of the American Menhaden,” United States Commission of Fish and Fisheries, part v., Washington, 1879.

MENIN, a small Belgian town, in the province of West Flanders ; it is traversed by the river Lys, which there forms the boundary between France and Belgium. The population in 1880 was 10,200. Commercially and industrially Menin ranks high for its size, possessing, as it does, important manufactures of linen, oil, soap, é&c., as well as sugar refineries, breweries, and tanneries, and a good corn and cattle market. Tobacco is extensively grown in the neighbourhood, and forms one of the main items of lawful trade, a good deal of illicit traffic also being carried on across the French frontier.

Menin does not appear to have been in any way worthy of note until the 14th century. Philip II. caused it to be fortified in 1578. It was taken by Turenne in 1658. Vauban subsequently sur- rounded it with elaborate works, and made it one of the strongest citadels in France; but all its fortifications were razed in 1744. It belonged to the Netherlands in 1815, and became part of Belgium in 1830.

MENINGITIS (from pijyé, a membrane), a term in medicine applied to inflammation affecting the membranes of the brain (cerebral meningitis) or spinal cord (spinal meningitis) or both.

Of cerebral meningitis there are two varieties :—(1) that due to the presence of tubercle in the membranes of the brain, which gives rise to the disease known as tubercular meningitis, or acute hydrocephalus; and (2) simple or acute meningitis, which may arise from various causes, Among the more common are injuries of the head, exten- sion of disease from contiguous parts, such as erysipelas of the scalp or caries of the bones of the ear, exposure to cold or to extreme heat, the presence of tumours in the substance of the brain. It may likewise occur in the course of fevers, rheumatism, and inflammatory affections, and also as a result of mental overwork, sleeplessness, and alcoholic excess. This latter variety of meningitis is less common than the former, but it is on the whole more amenable to treatment. The symptoms present such a general resemblance to those already described in tubercular meningitis that it is unnecessary to refer to them in detail (see HYDROCEPHALUS), and the treatment is essentially the same for both.

Spinal meningitis, or inflammation of the membranes investing the spinal cord, generally results from causes of a similar kind to those producing cerebral meningitis, — injuries, exposure to cold or sudden changes of tempera- ture, diseases affecting adjacent parts such as the vertebral column or the spinal cord itself, or extension downwards of inflammation of the membranes of the brain. It is said to be most common in males. As in the case of the brain, the membranes become extremely congested ; exudation of lymph and effusion of serum follow; and the spinal cord and roots of the nerves become more or less involved in the morbid process.

The chief symptoms are fever, with severe pain in the back or loins shooting downwards into the limbs (which are the seat of frequent painful involuntary startings), accompanied with a feeling of tightness round the body. The local symptoms bear reference to the portion of the cord the membranes of which are involved. Thus when the inflammation is located in the cervical portion the muscles of the arms and chest are spasmodically contracted, and there may be difficulty of swallowing or breathing, or

embarrassed heart’s action, while when the disease is seated in the lower portion, the lower limbs and the bladder and rectum are the parts affected in this way. At first there

ish

is excited sensibility (hyperesthesia) in the parts of the surface of the body in relation with the portion of cord affected. As the disease advances these symptoms give place to those of partial loss of power in the affected muscles, and also partial anaesthesia. These various phenomena may entirely pass away, and the patient after some weeks or months recover ; or, on the other hand, they may increase, and end in permanent paralysis.

The treatment is directed to allaying the pain and inflammatory action by opiates. Ergot of rye is strongly recommended by many physicians. The patient should have perfect rest in the recumbent, or better still in the prone, position. Cold applications to the spine may be of use, while scrupulous attention to the functions of the bladder and bowels, and to the condition of the skin with the view of preventing bed-sores, is all-important.

‘ Epidemic Cerebro-spinal Meningitis. —This name, as well as cerebro-spinal fever, is applicd to a disease defined in the Nomencla- ture of Diseases as “a malignant epidemic fever, attended by painful contractions of the muscles of the neck and retraction of the head. In certain epidemics it is frequently accompanied by a profuse pur- puric eruption, and occasionally by secondary effusions into certain joints. Lesions of the brain and spinal cord are found on dissection.” This disease appears to have been first distinctly recognized in the year 1837, when it prevailed as an epidemic in the south-west of France, chiefly among troops in garrison. For several years subse- quently it existed in various other localities in F rance, and mostly among soldicrs, At the same time in other countries in western and central Europe the disease was observed in epidemic outbreaks, both among civil and military populations. In 1846 it first showed itself in Ireland, chiefly among the inmates of workhouses in Belfast and Dublin. Numerous outbreaks occurred also about the same period in many parts of the United States. In more recent times the disease has repeatedly appeared both in Europe and America, but it has seldom prevailed extensively in any

one tract of country, the outbreaks affecting for the most ee limited communities, such as garrisons or camps, schools, workhouses, and prisons.

Little is known regarding the causation of this disease. All ages seem liable to suffer, and, as regards sex, males are affected more commonly than females. Occupation and condition of life appear to exercise no influence. It has been observed to oceur most frequently in cold seasons. The question of the contagiousness of cerebro-spinal fever remains still unsettled, but the weight of authority appears to be in favour of the theory of the communica-bility of the disease. It cannot, however, be regarded as contagious in the same degree as some other specific fevers, such as typhus fever, small-pox, or scarlatina.

The following are the more prominent symptoms." After a few days of general discomfort the attack comes on sharply with rigors, intense headache, giddiness, and vomiting. Neuralgic pains in the abdomen, and pain with spasmodic contractions in the muscles of the extremities, occur at an early stage. The headache continues with great severity, and restlessness and delirium supervene, accom- panied with periods of somnolence. The pains and spasms rapidly inerease, the muscles of the neck, spinc, and limbs being specially affeeted. The patient's head is drawn backwards and rigidly fixed, the spine arched, and the arms and legs powerfully flexed, the whole condition bearing a considerable resemblauce to tetanus. For a time there is greatly increased sensibility of the skin, pain being excited by the slightest contact. There is more or less fever present. About the fourth day of the disease an eruption on the skin both of the face and body frequently appears, in the form either of purpuric spots or small clear vesicles. Death may take place in from a few hours to eight or ten days. Should the patient survive the immediate shock of the attack, scrious complications are apt to appear in the form of destructive inflammation of the cyes or ears, inflammation with effusion into certain joints, and paralysis of limbs ; or, again, recovery may take place after a pro- longed convalescence. The mortality appears to vary in different epidemies, in some being as high as 80 per ceut., in others only about 20 per cent. Certain forms of the disease are of malignant character from the first, and very rapidly fatal.

The changes found after death in ccrebro-spinal fever are intense inflammation of the membrane of the brain and spinal cord, with effusion of serum or pus into the ventricular and arachnoid spaces.

The treatment is similar to that of other febrile conditions, but for the special symptoms of pain, spasm, &c., opium seems to have been found of eminent service, while quinine and ergot of rye are also recommended.

MENNONITES is a name borne by certain Christian communities in Europe and America, denoting their adherence to a type of doctrine of which Menno Simons

was, not indeed the originator, but the chief exponent at the time when the anti-psdo-baptism of the congregations vn which he laboured took permanent form in opposition to ordinary Protestantism on the one hand and to the theocratic ideas of the Miinster type of anabaptism on the other. The original home of the views afterwards called Mennonite was in Ziirich, where, as early as 1525, Grebel and Manz founded a community having for its most dis- tinctive mark baptism upon confession of faith. The chief doctrines of these Ziirich Baptists have been already stated in the article Baprists, vol. lii. p. 353. The main interest of the sect lay not in dogma but in discipline. Within the communities evangelical life was reduced to a law of separation from the world, and this separation—enforced by astringent use of excommunication and the prohibition of marriage beyond

(the state being held to be un-Christian)—refusal to take

an oath or use the sword, In their revolt against the cor-

ruptions of the medizeval church the Reformers neither

denied the continuity of the church as an organization nor

impugned the Christian character of the state. The new

sect did both; and their position thus appeared so radically subversive of the foundations of society that it is not sur-

prising, under the imperfect views of toleration then current, that they Protestants as well as from Catholics.

theocracy in opposition to the anti-Christian state. sought only to withdraw from what their conscience con-

demned, content to live as strangers upon earth, and devot- the purity of their own

ing all their energy to preserve communities. The medizval conception of separation from the world as the true path of Christian leavened all middle-class society in Europe, and prepared many to accept separatist views of the church as soon as they were reached by the impulse of revolt against Roman Catholicism ; the pursuit of holiness in a society protected by a strict discipline is an idea which experience has shown to have a great attraction for one class of earnest minds ; hence, in spite of persecutions incomparably fiercer than any of the larger Protestant bodies ever underwent, the new doctrine and praxis rapidly spread from Switzerland to Germany, Holland, and even to France. Each com- munity was quite independent, united to the rest only bya

bond of love. There was no sort of hierarchy, but only

‘“exhorters” chosen by the congregation, of whom the most prominent were also “elders” entrusted with the administration of the sacraments—an organization so easily kept alive or reproduced that the movement could hardly be checked by any persecution short of the total annihila- tion which at length was actually the fate of many of the Swiss communities. The remnants of the Swiss Mennonites broke in 1620 imto two parties, the stricter of which, the Ammanites or Upland Mennonites, were distinguished from the Lowland Mennonites by holding that excommunication of one party dissolved marriage, and by their rejection of buttons and the use of the razor. Their persecution lasted till 1710; a few congregations still remain and keep themselves quite distinct from Baptist bodies of more modern origin. In Germany the Mennonites are some- what more numerous; more

important are the German Mennonite colonies in southern Russia, brought thither in 1783 by the empress Catherine, which in turn have recently sent many emigrants to America. America indeed, and especially Pennsylvania, early became a refuge for the Mennonites of Switzerland, the Palatinate, and Holland, and is now the chief home of the body (175,000 in the United States and 25,000 in Canada). The oldest con- gregation is that of Germantown (since 1683); the most

the brotherhood—involved not only abstinence from worldly vanities but refusal of civic duties

became the objects of bitter persecution from But the Grebelians had no desire, like the fanatics of Munster, to found a new They

perfection had

MEN—MEN

numerous of several divisions are the Old Mennonites, cor- responding to the less strict of the Swiss sections.

All these communities in Europe and America are dis- tinguished by an antique simplicity combined with antique prejudices, by indifference to the interests of the greater world, while at the same time their industry and self-con- centration have made them generally well-to-do. Their religious type has varied very little in the course of centuries, as indeed is not surprising, their theology being ascetic rather than dogmatic or speculative. The Mennonites of Holland, on the other hand, have passed through an interesting and progressive history.

It was in Holland and the adjoining parts of Low Germany that the personal influence of Menno Simons (1492-1559) was mainly felt. He was originally a priest, and was pastor at his native place Witmarsum in Friesland from 1531 to 1536, when convictions long ripening in his mind compelled him to resign his cure. At this time the anti-pado-baptist societies in the Low Countries were much agitated. The views which had just before received their political deathblow at Miinster (see ANABAPTISTS) were not extinct, and even those who did not share them were by no means at one.

Menno attached himself to the Obbenites, who held that on earth true Christians had no prospect but to suffer persecution, refused to use the sword, and looked for no millennium on earth. Menno became one of their elders, and by his wanderings among the scattered and oppressed communities, and especially by the natural eloquence and religious power of his numerous writings, did much to sustain the faith of his associates, to confirm the type of their religious life, and to prevent startling aberrations in doctrine or diseipline. He was not an original thinker; but the love which all felt for the man, and which was kept alive for generations by his writings, gave him the place which the name of Mennonites expresses.

It may be ascribed to the influence of Menno's writings that the Dutch Mennonites, though for a time (since 1554) they broke into fractions on questions of discipline, and especially on the effect of excommunication upon marriage, never fell so far apart as regards the type of their religious life as to preclude the possibility of re- union. The Waterlanders in North Holland, who held the least strict doctrine of excommunication, soon moved farther in the direction of liberality, and exchanged the name Mennonites for that of Doopsgezinden (Baptist persuasion). In 1579 they refused to condemn any one for opinions, even on the incarnation, which the word of Scripture did not pronounce necessary to salvation. They aided William the Silent with money, and from 1581 to 1618 even accepted civil office. Meantime the stricter party had undergone various divisions, which, however, in 1627-32 were reunited on the basis of confessions essentially cimbodying Menno's teachings. They too had learned moderation, at least in their views of excom- munication, and their antithesis to the state was softened since the cessation of persecution in 1581, but especially since in 1672 they were recognized as citizens. On the other hand, the adoption of a confession had deepened the separation between them aud the liberal Doopsgeziuden; but doctrine was never the fundamental principle of the Mennonite communities, confessionalism took no firm root, and the two sections gradually approached, and through a series of partial fusions became at length finally united when the Amsterdam congregations came together in 1801. The persuasion declined much in numbers in the 18th century; since then it has increased, and has now 127 congregations with nearly 50,000 members. The objection to hold eivil office disappeared in 1795; that to carry arms in the war of freedom against Napoleon, Baptism

on profession of faith and the refusal of the oath, tolerance in matters of doctrine without religious indifference, are the chief inarks of the body, which in point of theological culture and general enlightenment, philanthropic zeal and social importance, has long stood very high.

Authorities —The best life of Menno Simons is Cramer's, 1887. De Hoop Scheffer's article in Herzog-Plitt, R. E., is excellent; only one point of conse- quence in his account seems to call for modification,—the book against John of Leyden, said to have been published before Menno joined the Obbenites, is almost certainly spurious. See Sepp, Geschiedkundige Nasporingen, i, (1872) p. 128 sq. The completest edition of Menno's works is that in folio, 1686. Many of them are known only in bad Dutch versions; Menno himself wrote in the " Qostersch" or East Sca Dialect of Low German. For the literature on the Mennonites in general, see De Hoop Scheffer, on whom the foregoing sketch is mainly dependent.

MENSHIKOFF, ALEXANDER Danttovicn (1 672-1729), born at Moscow on the 17th of November (0.s.) 1672, was the son of a poor man, who employed him to sell cakes about the streets of that city. In this humble occupation he attracted the attention of Lefort, one of Peter the Great's most active co-operators, who was pleased with his spright- liness, and took him into his service. Peter, soon afterwards

seeing the youth at Lefort's, was also delighted with him, and took him to be his page. Menshikoff soon became indispensable to the czar, assisting him in his workshop, and displaying signal bravery in the company of his master at the siege of Azoff. He formed one of the suite of Peter during his travels, and worked with him at Saardam and Deptford. Throughout his wars with the Swedes, Men- shikoff was the companion of the czar, and greatly distin- guished himself. For his gallantry at the battle of the Neva, on the 7th of May (o.s.) 1703, he received the order of St Andrew. In 1704 he was made general, and at the request of the czar created a prince of the Holy Roman Enipire. His house on the Vasilii-Ostroff was magnificent ; there ambassadors were received, and banquets were given gorgeous with gold and silver plate. Unfortunately there is a dark side to the picture, and the favourite was guilty of extortion to such an extent as to bring him under

his master’s censure. On the death of Peter the position of Menshikoff became very perilous ; his successes had raised about him a host of enemies eager for his downfall. The Golitzins, Dolgoroukis, and all those who formed what may be called the Old Russian party, wished to proclaim the son of Alexisemperor. Those, however, whose aggrandize- ment was bound up with Peter’s reforms—Menshikof, Apraksin, Bontourlin, Goloffkin, and others—were in favour of giving the crown to Peter’s widow, who accordingly ascended the throne as Catherine I. During her reign the influence of Menshikoff was unbounded, and he virtually governed the country; but the empress died in 1727, after a reign of two years. She had made a will, no doubt at the instigation of the favourite, to the effect that Peter, her grandson, was to be czar under the guardian- ship of Menshikoff, whose daughter Mary was to be married to the youthful sovereign. Under pretence of taking care of the young czar, Menshikoff caused him to be removed to his house and surrounded him with his creatures. He was now at the height of his power; foreign ambassadors remarked that even the great Peter himself was never feared so much. The young czar, however, showed no affection for Mary Menshikoff, and the girl was equally apathetic towards her betrothed, being in love with a member of the family of Sapieha at the time her father had forced her into the engagement. The Dolgoroukis used the aversion of the young prince to his fiancée as a

means of creating dislike to the father. A chain of events was gradually leading to the downfall of the favourite. He was soon refused admittance to the summer palace, whither the young czar had retired. Next he was arrested, and so overpowered was he at his disgrace that he had an apoplectic stroke. In vain did he address letters both to the emperor and his sister. Shortly after, by order of the czar, the fallen magnate departed from St Petersburg, but more like a nobleman retiring to his estate than a culprit going into exile. The people regarded him with dislike, and most of them rejoiced over his fall. On his way a courier arrived with orders to take the ezar’s ring of betrothal from his daughter Mary and give her back her own, which had been worn by Peter II. Menshikoff was not permitted to pass through Moscow, but was conducted to Oranienburg, in the government of Riazan, and there placed under strict surveillance. Soon afterwards the

whole family was banished to Siberia, and arrived at Berezoff towards the end of 1727. Menshikoff's wife died on the journey, and was buried near Kazan. On the arrival of the prisoners they were lodged in a wooden house, consisting of four rooms, But Menshikoff did not long endure the horrors of exile in this inclement region. According to Mannstein, he died (November 12, o.8., 1729) of an apoplectic stroke, because there was no one at Berezoff, as he himself remarked, who understood how to open a vein. The young czar ordered the release from exile of the two remaining children of Menshikoff,—his daughter Mary had died at Berezoff in the same year as her father,—and restored some of their property to them.

MENSHIKOFF, Atex ANDER SERGEIEVICH (1787-1869), great-grandson of Peter's favourite, born in 1787, entered the Russian service as attaché to the embassy at Vienna. He accompanied the emperor Alexander throughout his cam- paigns against Napoleon, and attained the rank of general, but retired from active service in 1823. He then devoted himself to naval matters, and put the Russian marine, which had fallen into decay during the reign of Alexander, on an efficient footing. On the outbreak of the Crimean War he was appointed commander-in-chief, and suffered a severe defeat at the Alma. On the death of the emperox Nicholas in 1855 he was recalled, ostensibly on account of failing health. He died in 1869.

MENSURATION

ENSURATION, or the art of measuring, involves

the construction of measures, the methods of using

them, and the investigation of rules by which magnitudes

which it may be difficult or impossible to measure directly

are calculated from the ascertained value of some associated

magnitude. It is usual, however, to employ the term

mensuration in the last of these senses; and we may

therefore define it to be that department of mathematical

science by which the various dimensions of bodies are calculated from the simplest possible measurements.

The determination of the lengths and directions of straight lines, including what are familiarly known as problems in heights and distances, generally depends on the solution of triangles, and will be discussed in the articles TRIGONOMETRY and Surveyinc. The remaining portions of the subject are the determinations of the lengths of curves, the areas of plane or other figures, and the volumes and surfaces of solids; and it is of mensura- tion as thus restricted that the present article will discuss some of the more important problems.

§ 1. Umits of Length, Area, and Volume,—In measuring any magnitude we select some standard or “unit” to mea-

sure by. Thus in measuring length we take for unit an inch, a foot, or a yard. From the unit of length we derive the units of area and volume. Thus we define the unit of area to be the area of the square described upon the unit of length, and the unit of volume to be the volume of the cube whose edge is the unit of length or whose side is the unit of area. For example, if an inch be taken as the unit of length, the square whose side is 1 inch is the unit of area, and the cube whose edge is 1 inch is the unit of volume. The length of a line, the area of a surface, and the volume of a solid are then expressed by the numbers, whole or fractional, of units of length, area, and volume which they respectively contain. Hence, if 7 denote the linear unit, the length of a line which contains a units is a, or simply a since / is unity; similarly the area of a surface which contains 6 units of area is bm, or simply b, where m is the unit of area.

§ 2. Commensurable and Incommensurable Magnitudes.— When two magnitudes have a common measure, that is, when another magnitude can be found which is contained in each an exact number of times, they are said to be ‘“‘commensurable.” Thus a line 44 and another 3} inches

long are commensurable ; for, if } inch be taken as unit of length, the former contains the unit nine times and the latter seven times. If no common measure can be found, the two magnitudes are said to be "'incommensurable." For instance, 1 and J? have no common measure; for J/%=1:4142…an interminable decimal, and hence no unit, however small, can be found which will be contained in each an exact number of times. If, however, we take J2=1°4, the error will be less than yy; if /2=1°414, the error will be less than zggq, &e. Hence, by taking a sufficient number of figures, we can find a fraction which will differ from /2 by less than any assignable quantity, and therefore we can always find two commensurable magnitudes that will represent two incommensurable ones to any degree of accuracy we please. In what follows we need therefore only consider commensurable lines.

§ 3. Area of a Rectangle.—Let the side AB (fig. 1) con- tain a units and the side BC 6 units of length. If we divide AB into a equal parts, 4 B each equal to the unit of length, and similarly BC into 6 equal parts, and if through the points of division we draw lines parallel to the sides of the rectangle, these lines will di- vide the rectangle into a series of rectangles, each of which is 5 the unit of area, since each is a square whose sides are of unit length. As we have a rows of these rectangles, and b in each row, the whole number of rectangles will be ab. Therefore

Cc Fig, i.

area of ABCD =ad units of area =ab.

PART I.—PLANE FIGURES. Srcrion I.—PLANE FIGURES CONTAINED BY SrraicHt LINES.

A. The Rectangle.

g 4, Let ABCD (fig. 2) be a rectangle, and let AB=CD=a, BC=DA=b, AC=c, and the angle A B BAC=a; it is required to find its area. Sinee a rectangle is completely de- termined when two independent data, one of whieh at least is a length, are given conneeting its parts, we ean de- termine its area in the following eases.

(a) When its length a and its breadth b are given. —It has already been proved 4 (§ 8) that Fig. 2. area of ABCD =ab ;

or the area of a rectangle is equal to its length multiplied by its breadth. Example.—let a=12 feet 6 inches and b=9 inelies, then

area of ABCD =12°5 x ‘75=9°375 square feet. If we make use of logarithms in the above ealeulation we have

log area=loga + logb. loga=log12‘5 =1-0969100

logb=log *75=1°8750613 therefore logarea= °9719713 ; henee area=9°375.

(B) When a side a and the diagonal e are given. —By Euclid i. 47 we have b2 =? —a?, or b=NVo?~~a*, therefore area of ABCD =ab= aN — a; or. log area=loga + $log(c+ a) + $1og(e~~ a). Example.—Let a= 238 and ¢= 456, then loga= log238= 2°3765770 Zlog(c+ a) = $log 694 = 1°4206797 4 log (e – a)=4log218= 1°1692282 log area = 4°9664849 ; area=92573‘1.

therefore hence

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(y) When a side a and a tts inclination to the diagonal are given. — Since

Satana, b=atana,

and therefore area of ABCD =ab= a? tana ; or log area=2loga+Ltana—10. Example. —Let a=36 and a=32° 25’ 15”, then Qloga—2log 36—= 3°1126050 Ltana= Ltan 32° 25’ 15” = 9°8028622 therefore log area = 12°9154672 — 10= 2‘9154672 ; henee area = 823°127.

(3) When the diagonal ¢ and a its inclination to either of the sides ‘are given.—We have

a=ceosa, and b=esina, therefore area of ABCD =a) =c? sin aoosa= $e7sin 2a; or Qarea=c?sin2a, and henee log 2area =2loge + Lsin2a—10.

§ 5. A square being a reetangle whose sides are equal, we can at onee determine its area. When one datum, whieh must be a length, is given the square is completely determined, and hence we have only two eases to eonsider.

(a) When the side is given.—From § 4, a, we have at once

area of square=ab=a xa=a. (8) When the diagonal e is given.—From § 4, B, we have a+at=c%, or at=4e”; area of square=a?= 4c”, or 2area= (ak log 2area = 2 loge.

hence and therefore

B. Right-angled Triangles.

§ 6. The diagonal of every rectangle divides it inte two equiva- lent right-angled triangles (Euel. i. 34), and henee the area of the right-angled triangle ABC (fig. 2) is equal to half the area of the corresponding rectangle ABCD.

0. Triangles Generally.

§ 7. In every triangle there are six elements to be considered, namely, the three sides and the three angles. If any three of A these six be given, provided one is a length, the triangle is eom- pletely determined, and henee its area ean be found. § 8. Length of Perpendiculars of a Triangle.—In the ik ABC (fig. 3) let BC=a, CA=d, AB=c AD the perpendicular . – / CG from A on BC=h, BD=z, Fig. 3. and CD=y. Since BDA and CDA are right angles, we have

=a +h?, and P=y?+h*, ° and therefore B-ay? — a2 =(y+a)(y —2) = aly — 2%) 5

2_ 2

whenee y- RE ; a But y+V=a, and, by solving these equations, we obtain 4 Paar y= oa j Again 2 2 2\ 2 ab)? pe 3 a9 rant yrade- (A) _ (2b)? = (eat of 4a (atb+ob+e-aeta~ bla+b— 9), 7 4a? ’

neice ha Lard+olore-ayeta-latb=¢).

Now let at+d+c=2s, then b+e-a=2(s— a), e+a—b=2(s-)), and a+b-c=2s—¢)-

Therefore, on substituting and redueing, we obtain EON —a)(s—-b)(s—e) » Similarly the porpendieulars from B and C on the opposite sides

are respectively ee 2 4 A/s(s— a)(s— b)(s—¢) » and = Nas —a)(s— b)(s—¢).

9. We now proceed to investigate formule for the area of a

triangle in the following important cases. : : (a) When the base a and the altitude h are given.—Since a

triangle is equel to half a rectangle of the same base and altitude,

we have at onee area ABC =4ah.

Example.—Let a=40 chains and h=14‘52 ehains, then

area=4 × 40 × 14°52=290‘4 square chains.

(B) When two sides a and ¢ and the ineluded angle Bare given. — From fig. 3 4 sinB , and therefore A=csinB ; . henee area=4ah=tacsinB ; or log 2area=loga + loge+Lsin B- 16.

Example.—Let a=40, c=30, and B=380°, then

area =}acsin B=} x 40 × 30 x $= 300. (y) When the three sides a, b, ¢ are given.—From § 8

ae — /s(s — a\(s —b)(S —¢) ,

and therefore

area=4ah=4a x 4 V/s(s— a)(s — b)(s—¢c)= /s(s — a)(s — b)(s —e) ; or logarea = 4 {logs +log(s — a) +log(s—b)+log(s—c)t. Since 2s=a+b+¢, we

have –

area of triangle = }V2(a?b? + b%e? + ca) — (a? + bt +c). Example 1.—Let a=18, b=14, and c=15, then

s—4(134+14415)=21, s-a—21-13=8, s—b=21-14=7, ands—c=21-15=6;

therefore area=/21×8×7×6=84. Eeample 2.—Let a=255, 6=238, and c=221, then logs=log357= 2°5526682 log(s—a)=1log102—= 2-0086002 log(s—b)=log119= 2°0755470 log(s—¢c)=1log136= 2°1335389 therefore log area = 4(8°7703543) =4°3851771 ; henee area = 24276.

(3) When any two angles B and © and the adjacent side a are given. — Since

Se gate *® emt' ~ sink ' and therefore (by 8) , Ae ' PaaBenC 5.» ight. area = faesin B=—— 7 — , where A=180°- (B+C),

or log2area=2loga + Lsin B + LsinC + LeosecA – 30.

Sinee all the angles of a triangle are given when any two are given, we ean find the area of a triangle when any two angles and any one side are given. Thus, when A, B, and care given, we know C also, and the problem reduees to a case of the preceding,

(e) When the three medians a, B, y arc given.—If a, b, c be the three sides of a triangle, and a, B, y the three medians, i.¢., the lines drawn from the 'angles to the middle points of the opposite sides, then by well-known geometrical propositions we have

4(a? + B+?) =3(a? +0? +e), 16 (028? + Bry? + ya") = 9(a?0?-+ Be? + ca?) , and 16(a4+ 64+ y4)=9(a4 + b4 + ct), Now (§ 9, +) area of triangle

therefore

=4V2(00? + Pe + 8a?) — (a4 4 OF e), = §NV2 — (at + B44 74).

D. Paraitlelograms.

§ 10. The opposite sides and angles of a parallelogram being equal, three independent data, one of which at least A D is alength, are necessary and ‘sufficient to determine it completely.

In the parallelogram ABCD

(fig. 4) let BC=DA=a,

AB=CD=2, AC=c, AE=h, B E C the angle ABC=a and Wie. 4 AOD=8. Rs

Since the diagonal AC divides the parallelogram into two equi- valent triangles, we obtain (a) area of ABCD =2 area of triangle ABC =2x$axh ($9, a)=ah; (8) area of ABCD=2 area ABC=2 x Jadsina (§ 9, 8)=absina;

o1 logarea=loga + log} +Lsina—10 ; (y) area of ABCD =2 area ABC=2(ABO + CBO) =2{4BO, AOsin AOB + $BO.COsin COB} =2{ 4BO, ACsing } =4$BD.ACsinB=iedsing, or – log2area=loge+logd+Lsing-10.

15

§ 11. If the parallelogram be equiangular (a rectangle), c=d, and area =$c? sing. If it be egwélateral (a rhombus), B=90°, and area =}ed. If it be both equiangular and equilateral (a square), c=d and B=90°, and area = 4c? as before (§ 5, B).

KE. Trapeziums. § 12. To determine a trapezium completely four data are neces- sary and sufficient,

In the trapezium ABCD (fig. 5) let BO=a, CD =b, DA=c, AB=d, A D

B EF Cc Fig. 5. and AK perpendicular to BC=A, and draw AF parallel to CD, then (a) area ABCD =area ABC +arca ADC

= tah + ch

=2(a+e)h; or the area is equal to half the sum of the parallel sides multiplied

by the perpendicular between them. Again, area of ABF =4BF x AE (§ 9, a)=3(a-c)h,

also area of ABF =Vs(s— AB)(s— BF)(s— FA), where 2s=AB+BF+FA; hence h= Vals — AB)(s— BF)(s— FA), therefore

(8) area of ABCD =4(a-+0)h—-*“n/s(5— AB) — BFY6— FA)

= 3°” !./(—aabterdatb—c-d\atb—epdlasb=04d),

a-¢ AB=d, BF=a-c, and FA=CD=).

since Thus we ean find the area of a trapezium in terms of its sides. § 13. Ifc=0, ABCD becomes a triangle, and its area

=4V(-a+b+d)\(a+b-d)\(a+b+d\a—b+d). Again, if c=a, then also b=d, and ABCD becomes a parallelo-

gram, and its area takes the indeterminate form a as it should do,

since four sides do not completely determine a parallelogram,

F. Quadrilaterals Generally.

§ 14. A quadrilateral is completely determined when five inde-

pendent data are given. We consider the following cases.

(a) When any diagonal and the perpendiculars on it from the

opposite vertices are given.

The quadrilateral ABCD (fig. 6) =ABD+BCD =4BD.AE+4BD.CF =4$BD(AE+ CF) ;

or the area is equal to half the product of the diagonal and the sum of the perpendiculars. x If the diagonal BD fall B without the figure, as in the coneave quadrilateral ABCD (fig. 7), then it is elear that

area ABCD =4BD(AE – CF). D

(B) When the diagonals and C their “ineluded angle are J given.—In the quadrilateral Fig. 6. ABCD (fig. 8, p. 16) let BD=h, AC=h, and angle DEA=a, then

ABCD =ABD+ BCD =43BD.AEsina+4BD.CEsina (§ 10, y)

=4$h(AE+CE)sina

=thksina; . or the area is equal to the product of the diagonals and the sine of their contained angle. A

The same result holds when one of the dia- gonals falls without the quadrilateral, as in fig. 7, as the reader ean easily verify.

(y) When the four sides and the angle be- tween the diagonals areB i mH. – D given.—lf a, b, ce, d be Fig. 7 the sides and a the angle Pil between the diagonals it can easily be shown that

area of quadrilateral =4(a? — 62+ c?- d’)tana.

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(5) When the four sides are given and the opposite angles are supplementary.—In fig. 8 let AB=a-. BC=)b, CD=c, DA=d, AC=h, angle ABC=a, angle A CDA=,, and let a+B=180°, then areaof ABCD =ABC+ ADC

=fabsina+4edsinp. But B D sin B=sin (180° — a)=sina, therefore area of ABCD =4(ab+cd)sina. This gives us the area of the Fig. 8. quadrilateral in terms of the four sides and one angle. Again we have

a? +b? — 2abcosa—h? =? +d? — 2cd cos =c? + d? + 2cd cosa.,

a? +b? — d? therefore C0Sa= oh ted)” and hence _(at+b+e-d\a+b—-c+d) 1+cosa= Dab + ed) , and © _ _(c+d+a-—b)(e+d—-a+d) 1-cosa= Qiab + ed) ;

From this we obtain sin? = (1+cosa)(1 —- cosa) (b+ce+d-alo+d+a—b\ (d+a+b—e)atbt+e-d) f 4(ab + cd)? ;

Now let at+b+c+d=2s, then 4(ab + cd) sina =V/(s — a)(s — b)(s — ¢)(s — d) 5 therefore area of ABCD —V(s —a)(s—b)(s—c)(s-) ,

or log area =4{log(s— a) + log (s — b) +log(s- c) + log (s— d)}. If d=0, the quadrilatcral becomes a triangle, and its area is

V/(s—a)(s – b)(s — ¢)s as before. In extracting the square root of sin a we take the positive sigu, since the angle a is less than two

right angles.

G. Regular Polygons.

§ 15. Since a regular polygon is both equilateral and equiangular, a circle can be inscribed within it and also described about it, and thus the » straight lines drawn from the common centre of the two circles to the vertices of the polygon divide it into » triangles equal in every respect. Therefore the arca of the polygon is equal to times the area of any one of these triangles. § 16. Radius of Inscribed and Cirewmscribed Circles.—Let AB (fig.

9)=a be a side of a regular polygon B of nm sides; let C be the centre of

the inscribed and cireumscribed

circles, CD=r the radius of tho E

former, and CE=R the radius of the Fig. 9.

latier. The angle ACB is evidently equal to the mth part of four right angles, that is)

ACB = 280 st AD ~~sacB=" Now AD =3~~ CDtan ACD = rtan 8 ; and AD =.= ACsin ACD=Rsin therefore r=aXx peot Se ‘ and 180° ;

R=a x }cosec n

§ 17. Perimeter of Polygon.—The perimeter of the polygon of

180 Or Rasen. ; n

n sides is na, t.€., 2nrtan

From this it follows that the perimeters of the inscribed and circum- scribed regular polygons of n sides of a circle of radius 7 are

2nrsin and nr tan respectively.

818. Area of Polygon. (a) In terms of r.—The area of polygon

=nACB=nAD.CD=nx tan

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(g) In terms of R.—The triangle ACB j =}AC. CBsinACB=4R’sin =,

aud therefore area of polygon =nR?sin 5 ,

(y) In terms of a.—The triangle ACB

a a 1BO- ar, Vas0F =4AB. CD=— Mom a 4acot ee es ‘ nm -2, 180? and therefore arca of polygon =a? x = ee f – 180° or log 4area=logn + Leot —— +2loga—10. n

From aand £ it follows that the areas of the inscribed and circum- scribed regular polygons of 2 sides of a circle of radius 7 are

dnr?sin _ and nrtan 8° respectively. n

§ 19. In the formula ($ 18, y) for the area of a polygon, the factor ® cot has a definite value for every value of », and hence, if we find its value ouce for all for a large number of values of 2, and tabulate the results, we can find the area of a regular polygon of sides by multiplying the square of its side by the appropriate tabular value.

Again, if a=1 we have

180°

180° Ae — 4co

and R =4cosec-—; n

and thus we obtain in a similar manner the radius of the inscribed and circumscribed circles by multiplying the side by the appro-

priate tabular valuc of } cot as — and 4cosec se respectively. § 20. The following table contains the values of cot t and

80°

their logarithms, and the values of hoot and beosee=®” for all

values of » from 8 to 12.

n ” cot ~ Logarithms. cot 180” 4 cosec 180” 4 n n n 8 0°4330127 1°6365006 028867 57735 4 1-0000000 0-0000000 0°50000 70710 5 1:7204774 0°2356490 C‘68819 85065 6 2°5980762 0°4146519 0°86602 1°0000 a 3°6339124 0°5603745 1:0383 11528 8 4:8284271 0°6380568 12071 1:3065 9 6°1818242 0°7911166 1:3737 1:4619 10 76942088 0°8861640 1°5388 1:6180 11 9°3656407 0:9715375 1:7028 17747 ah) 111961524 1:0490688 1:86u0 1.9318

Let A denote the area of a polygon of sides and A’ the cor-

responding tabular value of 7 cot se » then A=a’A’, or log A=2loga+tlog A’.

H.—Length of the Radius of the Inscribed, Escribed, and : Circumscribed Otreles of a Triangle. § 21. (a) Radius of Inscribed Circle. —Let O A (fig. 10) be the centre of the circle inscribed in the triangle ABC and F touching the sides in D, EK, and F. Join OA, OB, and OC. The E angles at D, HE, F are right angles (Eucl. iii.

18), Let BO=a, CA

=), AB=c, and OD

—OE=O0F=r. 22 D C Now ABC=BO

+ COA +A0B Fig. 10.

=hor+hbr+her=hatbt+or=rs ; pares of ABC _ \/s(s — a)(s — b)(s —¢) Ss Ss (8) Radius of Escribed Circles. —Let OD =OE=OF =ra, then ABC=ACO + ABO — BOC =hbrat $cra- hara=hb te – a)ra=Trals —)., area of ABC _ A/s(s – a)(s - b)(s– 6) _ fe –b)(s–c) s-a@ Similarly

C= 8—-a@ ae = Is(s —a)(s—b a er — amd re = = a

whence

and 7%=

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(y) Radius of Circumscribed Circle.—Let AD (fig. 12)=p the | perpendicular from A on the side BC, and AE=2K the diameter

A

E Fig. 11. Fig. 12. of the circle, then (Eucl. vi. C) we have 2Rxp=bxe, therefore 2R x ap=abe, Now ap=2A, where A denotes the area of ABC; fteieas R abe abe

~ 4a 4n/s(5=a)(s—B)(s—c) Example.—Let a=18, b=14, and c=15; then r will be found to be 4, ra 104, 7» 12, 7, 14, and R 8}.

Section I].—PLANE FIGURES CONTAINED BY CURVED Lines.

A. The Cirele.

§ 22. Circumference of a Circle.—If we inscribe in any circle a regular polygon of x sides, and also circumscribe a regular polygon of the same number of sides, it is clear that the perimeter of the circle is intermediate between the perimeters of the inscribed and circumscribed polygons, and that the difference between the peri- meters of the inscribed and circumscribed polygons can be made as small as we please by sufficiently

increasing ». A similar state- meut holds with reference to the areas of the circle and the in- scribed and circumscribed polygons. With the above assumptions it is easily proved that. the circumference of acircle bears a constant ratio to its diameter. Hence we have

: Circumference = C= constant x radius =coustant x 7. It is usual to denote this constant by 2m, and therefore C=2n1=ad, where d is the diameter of the circle.

§ 23. Numerical Value of x.—The constant mw being, as can be easily proved, an interminable decimal, we can only approximate to its value, but this we can do to any degree of accuracy we please.

If s and o denote respectively a side of the inscribed and cireum- scribed polygons of sides, and s’ and o’ a side of the inscribed and circumscribed polygons of 2n sides, it can easily be shown that

= (8) #7 = 2r r—Nr2— (452 j

Ss (a) o/h hay?

where r is the radius of the circle,

If we take r=} we find, by means of these formule, and by assuming the value of s when n=6, that the perimeter of inscribed polygon of 96 sides=3‘140 . . . . , and the perimeter of circum- scribed polygon of 96 sides=3‘142. .. .

From this we learn that the circumference of the circle, in this case m, is greater than 3°140… . and less than3°142…., and therefore as far as the second place of decimals

w=3‘14, By taking greater and greater values of nm we obtain closer and closer approximations to 7.

The preceding method for approximating to the value of m is the simplest afforded by elementary geometry, and is also the oldest ; but better and more rapid methods are furnished by the higher mathematics. The

calculation of has been carried to 707 places of decimals, the following being the first 20 figures in the result: —

3°1415926535897 9323846 .

For all practical purposes it is sufficient to take

355

§ 24. The following table contains the functions of w that are of most frequent occurreuce in mensuration :—

-call a “radian.”

17

| Number. | Logarithm. Number. Logarithm. 7 3‘1415927 | 04971499 ed 9°8696044 | 0-9942997 Qa 6-2831853 | 0°7981799 1 4x | 125663706 | 1-0992099 a 0°0168869 | 2-2275490 di 1:5707968 | 0°1961199 6m dar 1:0471976 | 0-0200286 ft 17724539 | 0°2485750 dor 0‘7853982 | 1-8950899 4x | 0-5235988 | I-7189986 | 3/, | 1-4645919 | o-1657166 ie 0°3926991 | 15940599 1 py 0-2617994 | 1°4179686 = 0°5641896 | 1°7514251 dr 41887902 | 0°6220886 Vo T 2 ? 1 : il = 0°3183099 | 1‘5028501 || ~=—- | 0°28920948 | 1-4503951 : 2/ ar .

6

= 12782395 | 0-1049101 | 3/— 12407010 | 0:0936671

1 3

in 0°0795775 | 2-9007901 $/5— 0°6203505 | 1-7926371 7 4a

180 3

—, | 57°2957795 | 1:7581226 || logem | 1°1447299 | 0-0587030

§ 25. Units of Angular Measwrement.—In measuring lines we select some line of constant length as the standard or unit ; simi- larly in measuring

angles we require to take some angle of constant magnitude as unit angle. The right angle is by its mature the simplest unit Dic angle, but, for convenience, we take the B voth part of a right angle for unit, and call it a degree, which is subdivided into sixty equal parts called minutes,

_and these again into sixty equal parts A

called seconds. For theoretical purposes we define the unit angle to be the angle subtended at the centre of a circle by an are equal to the radius. This angle we In many treatises the radian measure of an angle is called Fie, 13 the circular measure. oars

§ 26. The radian is a constant angle,—Let OA (fig. 18)=are AB =r, then AOB=radian, and let AOD =90°; then

are AD=4X 2rr= har;

aud, since angles at the centre of a circle are proportional to the arcs on which they stand (Eucl. vi. 33), number of degrees in radian AOB_ AB_ or nuinber of degrees in AOD AD ar therefore number of degrees in radian =90°x 2 = 57°° 2957795 =constant.

§ 27. Number of Radians in any Angle.—Let AOC (fig. 18) be any angle, AOB the radian, and AC=s ; then

number of radiansin AOC_ ACs, . one radian AB r

_ 2 . -=;

therefore number of radians in AOC =— ‘

If AOC=90°, then s=4z7, and number of radians= 47 ; there are thus m radians in two and 27 in four right angles.

When r=1 we have number of radians=s, and hence in some treatises for the number of radians in an angle we find the length of the arc given.

§ 28. To transfer from degrecs to radians and conversely.—Let x denote the number of degrees in an angle, and @ the number of

radians in the same, then, since — ee f 180° + wae o _ LBO (a) O=T0° (B) x ae 6.

§ 29. The following table contains the values of @ for values of x up to 180°, and also for minutes and seconds.

: $ g g & | Radi-

a Radian, a Radian. E Radian. || 2 | Radian. § an.

a a a S| 0 || 8 | -000 1 °0174533 |; 61 | 1°0641508 || 121 | 2°1118484 1 | 002909 1 | 0048 2. *0349066 || 62 | 1°0821041 || 122 | 2°1293017 2 | 005818 2 | 0097 3 *0523599 || 63 | 1:0995574 || 123 | 2°1467550 8 | 008727 3 | 0145 4 *0698132 || 64 | 1:1170107 || 124 | 2°1642083 4) 011636 4 | 0194 5 *0872665 || 65 | 1°1844640 || 125 | 2°1816616 5 | 014544 5 | 0242 6 *1047198 || 66 | 1°1519173 || 126; 2:1991149 6 | 017453 6 | 0291 7 *1221730 || 67 | 1°1693706 || 127 | 2°2165682 7 | 020362 7 0339 8 *1396268 || 68 | 1:1868239 || 128 | 2°2340214 8 | 023271 || 8 | 0388 9 *1570796 || 69 | 1°2042772 || 129! 2°2514747 9 | 026180 9 0436

10 “1745329 || 70 | 1°2217305 || 130 | 2°2689280 |! 10 | 029089 i

20) °3490659 |! 80 | 1:3962034 || 140 | 2°4434610 || 20 | 058178

30 *5235988 || 90 | 1°5707963 || 150 | 2-6179939 |, 30 | 087266

40 *6981317 ||100 | 1°7453293 || 160 | 2-7925268 || 40 | 116355

50 *8726646 ||110 | 1°9198622 | 170| 2-9670597 || 50 | 145444

1°0471976 |/120 | 2°0948951 || 180} 3°1415997 || 60 | 174533 |

tude of any one of the m equal triangles of which this polygon is made up. Now in the limit, when 2 is indefinitely increased, P becomes the are AB=s, a result which we symbolize thus— L = P=are AB=s.

eC

As an example of the use of this table we proceed to find the value of 6 when =68° 45’ 17”°8. When 2=68° 9=1‘1868239 , w=40′ O= ‘0116355, w= B’ O= ‘0014544, w=10″ 6= ‘0000485, z= 7″ 6= °0000389, and when x=0““8 d= ‘0000039, therefore when «= 68° 45’ 178 86=1°2000001.

§ 30. Combining the results of §§ 27 and 28 we obtain

Similarly L._,, p=tadius=”.

a= Again, the area of the sector is equal to the area of the polygon when the broken line AB becomes the are AB, that is,

sector= 1) ,, *4=-L*,.. $pxP ~tle_? x me –

(a) ga, whewe Mee =$7rs.

4 180 id ¥ § 34. Let S denote the area of.a sector of a cirele, then, by means ee, of the above result and § 27, we have

er * (a) S=dsr

(B) S=4rd. r=4r°0.

§ 35. We proceed to find the area of a sector of a cirele in the fol- lowing additional cases :—

(a) When the chord of the sector and the radius of the circle are given. —In fig. 14 let AB=2c, and let AC=7, then we have ACR aD. @,

2: ° ac whence ACB and therefore @ is known, and S ean be found by § 34.

ACB has two values, the smaller one giving the area of the minor, and the larger that of the major conjugate sector.

(B) When the chord and height of the chord are given.—Let DE (fig. 14) =h and AB=2c, then

(y) s=rO=— 2. Te

§ 81. Length of Arcs of Cireles. —The following are the more im- portant cases:— : :

(a) In terms of the chord of the arc and the radius of the eircle.— Let AB (fig. 14)=2c, AC=7, and AEB=s, then

AD=}AB=c=rsin$C, whenee C is known, and therefore the are s is found (§ 80, +).

(8) In terms of the height of the arc and the radius of the circle.—

Let DE=Ah=height of arc, then

CD=CE-DE=r-Ah,

gin

and ; cos 4C = cD atih ; AC?=72=AD2+ DC?=c?+(r—h)?, whence

7 ; 2

wanes © le Bomady ell Metre : pee ans , and therefore by previous case the area can be found. e (y) When the chord and angle subtended at the centre are given.

—Let AB (fig. 14) =2c and ACB=8@, then

E sin —— or 7 7 ms sin 46’

therefore area of sector =4r?0=4 (= r x0 sin 40

§ 36. Area of a Circle. —The circle being a sector whose arc is the

whole circumference we obtain at once area of circle=4r x s=}r x 2nr=r*.

An independent proof of this proposition might be given by means of the inscribed and circumscribed polygons, and from the area of a circle the area of a sector can be deduced. The infini- tesimal calculus affords a simple and elegant proof (see § 44).

§ 37. If A denote the area, r the radius, @=27 the diameter, and C the circumference of a circle, we have

E E Fig. 14. Fig. 15. § 82. Huygens’s Approximation to the Length of a Circular Arc.—

Lot AB (fig 15) —p be the chord of the are AEB, and AE~EB~g ms ee eee that of half the arc, then the are AEB=4 (8q – p) approximately. – ae ns i os hal For, let 7 denote the radius, s the arc AEB, and 20 the angle (y) == 8 : r al vw wv = B=p=2AD=2 6=2rsin — ; 2 ACB, then 0—s-. Again, AB=p (ine Pees oe sae –

seed a .. 4 : Cad RE SM vie Ss Whence we see that the area of a circle is obtained by multiplying

d ; ” (a) the square of its radius by r=3‘14159 Now sind = 6 —~ [3 + [5 &e. 5 (g) the radius by half the eircumferenee,

2 1

the square of the circumference by —— = ‘07957

therefore p=2r ea eC) – &e. oY . p ” oe

2r (8\ ar) *|5\2r (8) the square of the diameter by 4r= ‘78539 .

3 3 § 88. Again, from the above formule we deduce

“-7-3 7 Pree (a) pote A= “5641896 x A, Similarly 8q=16r } = ij e Varo ae ce q dr [B\ a +5\ Gr Pe (B) ee — a T

¥ e=2\/ eA =8‘5449077 x A,

thus obtaining radius, diameter, and eircumference from area.

§ 39. Area of a Cireular Ring. —Let r and 7, denote the radii of

the outer and inner circles respect-

ively (fig. 17), then the area of the

space between them

=n —arian(rtry)(r- rl

The circles need not be concentric,

and the reader should note that the

area of the ring is equal to the area

of an ellipse whose major and minor

axes are 7-+7, and r— 7, (see § 51).

g 40. Arca of the Sector of an

Annulus.—Let angle ACB=6@ in fig.

17, then the area of ABED_ .

=sector ACB —sector DCE Fig. 17.

= $770 as $ri 6, = 40(r+ryr— 7) –

2 oe a ee wle- oe ee

Hence, neglecting powers of = hee r

yond the fourth, we obtain

89—P ge cas ‘2th (: ‘Feson)

approximately.

In practice it is sometimes more eonvenient to use the equivalent form

=29 +3(2q-p). s=29 + §(29—p) | _> $33. Arca of Sector of a Circle. — Cc
LE Let the sector be OAB (fig: 16). P Divide the arc AB into x equal parts,

Fig. 16. and draw the chords of these. Let P denote the perimeter of the broken line AB, A the area of the polygou AOB, and p the alti-

Again, let AB=/, DE=1,, and CA-CD=r-r,=A, then

r= “3 and 7,;= – ; therefore

ren=a (+h) and

area of sector=4$0(7+7,)(r -—7,)=40 (A) =th(1+1,).

§ 41. Arca of a Segment of aCirele.—(a) When theradius and the angle subtended at the centre are given.—In fig. 14, let AEB be a segment of a circle, then its arca

=sector ACB — triangle ACB.

= 470 – 477 sin 6 (S$ 9, 34)

=4$r°?(–sin). If the segment be greater than a semicircle sing is negative and the formula becomes

47°(0 +sin6@),

as is also geometrically evident: We might in a similar manner find the area of a segment of a circle

(8) when the chord and radius are given, ‘(y) when the chord and its height are given,

(5) when the radius and height of the chord are given,

(e) when the chord and angle subtended by the chord are given.

In all these cases the method of proceeding is obvious, a segment being the difference between a sector and a triangle.

§ 42. Area of a Lune.—Let ADB and ACB (fig. 18) be two seg- ments of circles, then the area of the lune ADBC D

= segment ADB — segment ACB.

Hence if we so choose our data that we can determine the areas of the two segments we have only to take their difference to find the area of the lune. A B

§ 43, Area of a Circular Zone. ~— ‘ Let AB and CD (fig. 19) be two Fig. 18. parallel chords, then the area of the zone ABCD

=circle — segment AHB – segment DFC; or =segment AED + trapezium ABCD + segment BGC =2 segment AED + trapezium ABCD.

§ 44. The INFINITESIMAL CALCULUs (g.v.) furnishes a simple and elegant proof of the formule for the areas of a circle and a sector. If y=¢(x) be the equation to a plane curve referred to rectangular

H

F Fig. 19.

Fig. 20.

axes, then the area between the curve, the axis of x, and two ordinates corresponding to the abscisse a and 6 is represented by

the integral Pa “ple)dee. a

Let 2 and y be the coordinates of P (fig. 20), then if OP=r the equation to the circle is y2=7r? —z?, and therefore

. Ss area of quadrant AOB=/” VP? — da

0

‘Te. she #2 Poe le = & eo, dr i ia Ay: sin + ? | z *

and therefore area of whole circle = 27°.

§ 45. If the equation to a plane curve be given in polar coordi- nates, the area bounded by two radii and the curve is equal to

6

A * 20 ‘

01

where 6, and , are the values of corresponding to the limiting radii.

19

For example, let AOP (fig. 20) be @, then arca of circle

Qarr? sia ar? as before.

The area of a sector can be found in a similar manner.

B. The Parabola.

§ 46. Length of an Are of any Plane Curve.—If a plane curve be referred to rectangular axes, then the length of any arc of the

wma | 14 (BY Pan {14 (2)

taken between proper limits, .¢., the extremities of the arc. See INFINITESIMAL CALCULUS. § 47. Are of a Parabola.—Let the axes of coordinates be the axis

Fig. 21.

of x and the tangent at the vertex A (fig. 21), then, the equation to the parabola being y?=2mx, where m=2a=4 latus rectum, we

lave da

i. 2 , and hence

y ae Ap-/ 4 14+ Et ay 0 m

yy? + me m 4 ty? +m ; ae ee a therefore whole arc PAP’= DSi +m? + mlog, (aie m Since y?=2mzx,, the formula may be written

are PAP’ =\/4z? +9? 4. Yi log. (key , 2a, Yy § 48. Arca of a Parabola.—Taking the equation to the parabola in the form y*= 4px, we get

fo area of segment PAP” (fig. a1)=2/ 2 nuda

ay8 —ipha,t=$2,9- 33

From these formule we see that the area of a parabolic segment varies directly as the cube of the square root of the abscissa, and directly as the eube of the ordinate, and that it is equal to 3 rectangle PQQ’P”, or 3 triangle PTP”.

A similar relation holds for the segment cut off by any chord, and thus the area of any parabolic segment can be determined in terms of any data that are sufficient to de- termine the segment.

§ 49. Area of a Parabolic Zone.—Let PM (fig. 22) =y,, QN=y, AM=a2,, AN=a,, and let the ordinates be inclined to the axis at an angle a.

Area of zone PQQ’P’=segment PAP’ — segment QAQ’

3 3

é. — Sane. Fig. 22.

2

Now y} = 4px, and y; =4pa,, therefore p4- p, and hence on Ly — 2.

substituting for p we have area of zone :

ye – “) : By =o :

=$(x, — 2% (Bau sina=¥$ = (y? + Yo+y?2)sina.

1-2) ag BF yg Ott Miva t Ys) C. The Ellipse.

§ 50. Cirewmference of an Ellipse.—The eqnation to the ellipse

2 2

ae ao : being — + 5 =1, whereaand bare the semiaxes, we have @

20

dy ba Sa, a ae OO

and therefore (fig. 23)

2 22) L a? — ey a —F (3 da, where e=—;— at — a § ;

This integral may be shown to be equal to the series

ra @ 41.384 1. 3. be ™ a” 2 F.0 7,6.” —)” a rapidly converging series when ¢ is a small fraction. By taking more and more terms of the above series we can B dag as nearly aS we please to the circumference of an ellipse. For example, we have quadrant AB KX

7 e Ta eN\s

a } (2a)? + (26) ! 3 nearly. Fig. 23

arc of quadrant AB= ‘ .

/

2

§ 51. Area of an Ellipse. —We have at once

a a : area = of yaad = e Va? ada. 0 aly

a But A /a? — x*de: is the area of the quadrant of a circle of radius a. Thus

2

area of ellipse = 4-7 7 (§ 44)

=7ab.

The following proof is worth the reader’s attention. By a well- known theorem in conic scctions the orthogonal projection of a circle on a given plane is an ellipse. Now, if A denote the area of any plane figure, A’ the area of the projected figure, and @ the angle between the planes it can easily be shown, by dividing the two areas by planes indefinitely near to each other and perpendicular to the common section of the planes, that é

Acosé=A’. In the case of the circle and ellipse A=a? and cosa ;

: b hence area of ellipse= ma? x —-= ab.

8 52. Area of an Ellipse in terms of a Pair of Conjugate Diame- ters.—Let a’ and 0’ denote the semiconjugate diameters, and a the angle between them, then by an elementary property of the ellipse

ab=a’b’sina; hence area of ellipse =7a’b’sina. D. The Hyperbola.

§ 53. Arca of a Segment of an Hyperbola.—The equation of an

2

hyperbola being a – x =

» we have Oa y= No -a*; hence (fig. 24) Lin area of the segment PAP’ = 2 zd Vx? = ada a ae == ablog. pas a a

=241- aloge(2 + Hs) ;

§ 54. Areca of a Sector of an Hyperbola.—The sector PAPC is equal to triangle PCP’ — segment PAP’ 21 y ot a > b)

=ablog.(“1.4.3) . a

5. Area of a Zone of an Hyperbola.—In fig. 24 the zone

= XY — MY, — abloge(

=segment QAQ’ – segment PAP’

= Belg — ablog,(a tn) — ayy, + ab log,(EP i) bl aY> aR bar, = LoYo — XY) — WO LOG. ay, + bx, ’ where iL i

%, y, and a, Y_ are the coordinates of P and Q respectively.

MENSURATION

If the axes of coordinates be inclined at an angle a, we multiply the above results by sina to obtain the correct areas.

Q

Q Fig. 24.

§ 56. Area bounded by an Hyperbola and its Asymptotes.—The equation of an hyperbola referred to its asym ptotes is of the form ey =C. Let CM’ (fig. 25)=2,, CM=2., Q’M’=y,,Q M=y,, then, if a be the angle between the asymptotes,

area of quara’= / *ysinade x2

‘ x1 “dar ‘ x , Ys =csinaf —=c’sin alog,(21) esinalog. 4a |, tg bo x 1 C

Fig. 25.

2

. c2 since 2, =— and 2,=—. 41 Yo a? +b? ; Qab Now C= 4 and sina= se and therefore (a) area Sablog.(== sabog ¥*-) : Xq al Again, let MM’=2,~~2, =p, then CH= XY, =UYg= PYY2 | therefore Yo“ mq’ — 2% Jog (2) sina— 222 Jo (22) sina. a) a Q Yo. \ : Yo~~“N . yy

Again, since day, sina= he? sina=ho,y,sina , triangle QCM =Q’CM’, and hence the sector QCQ’=QMM’‘Q’.

The corresponding results for a rectangular hyperbola are ob- tained by substituting in the above formule $a? for c? and 1 for sin a.

we have

Srorion II].—PuLANE IRREGULAR, RECTILINEAL, AND CURVI-LINEAL FIGURES.

A. Irregular Rectilineal Figures.

§ 57.. The area of any irregular polygon can be found by dividing it into triangles, trapeziums, &c., in the most convenient manner, and adding together all the areas. For example,

ABCDEF (fig. 26)=CKB + BKHA+ AHF + FGE+ EGID + DIC.

iN B

A C G F HB 4 FCG D re

Fig. 26. “Fig. 27.

It may sometimes happen that some of the component figures have to be subtracted instead of added; for example,

ABCDE (fig. 27)—AFHE+ BCG – AFGB – EDH.

§ 58. Again, the irregular rectilineal figure P\P,. . . PsPy (fig. 28) can be broken up into a series of triangles and trapeziunis as shown in the figure, and hence its area can be found.

§ 59. A figure made up of straight lines may be measured by cutting it up into triangles by lines drawn from some one vertex to the others. For example (fig. 29),

ABCDEF=ABC + ACD + ADE+ AEF.

If the polygon be concave some of the triangles will have to be subtracted.

F

it P. P, By

Fig. 28. Fig. 29. § 60. Area of a Polygon in terms of the Coordinates of tts Angular

Points.—Let the coordi- nates of P, Q, R (fig. 30) be

(a, 1); (oy Yo), and (Xs, Ys) respectively, and let the axes be inclined at an angle a Draw PL, QM, and RN parallel to OY, then

LM =OM- OL =2,-2%,

MN=ON – OM=a, – %,, and

NL =ON-OL =%,—- 2.

D

Fig. 30.

Now PQR=PLMQ+QMNR- PLNR.

But PLMQ=PLM+QMP=PLM+QLM =$PL‘LMsina+4QM °‘LMsin(180° —- a) (§ 9, 8) = 4(@_ — %)(Y, + Yo) Sin a.

Similarly QMNR=}3(a, – %)(Yo +3) Sina,

and PLNR =4(2,3 — 2,)(y3+ y;) sin a; hence

area of PQR=$sina{y,(a», — 25) + Yo(23— 21) + Y5(% — Xe) } ; or in the notation of determinants =hksinag |1 1 1

%y %y Xs

Yi Yo Ys When thie axes are rectangular sina=sin90°=1, and the formula for the area becomes a {yy (aq — %3) + ales = y) + Y(— ay) }

1 1

< %y Wy By

Yi Yo Ys

§ 61. The area of any rectilineal figure of ” sides can be found by taking any point within the figure and joining it to the n vertices of the figure, thus dividing it into nm triangles the area of each of which can be obtained as in the preceding case.

We may, however, find the area of the figure directly.

For example, in fig. 31

PQRST = PP’T’T +TT’S’S + SS’R’R — RR’‘Q’Q – QQ’P’P,

and in fig. 82 . PQRSTU =PP’U’‘U + RR’Q’Q + TT’S’S — PP’Q’Q – RR’S’S – TT’U’U.

Fig. 31.

Fig. 32.

B. Irregular Curvilineal Figures.

§ 62. Length of any Curve.—If we divide the given arc into an even number of intervals and re- B gard these as approximately circu- lar, we can find an approximation D EB to the length of the arc by means of Huygens's formula, § 32. For example, if we divide ABC (fig. 33) into four parts in D, B, and EH, and draw the chords AD, AB, DB, BE, Fic. 33 BO, and EC, then A Oo C are AC=AD+DB+BE+EC+3(AD+DB+ BE+ EC – AB – BC)

approximately.

21

For other methods of approximation, see Rankine's Rules and Tables. :

§ 68. Area of an Irregular Curvilineal Figure.—For rough ap- oe the following, called the trapezoidal method, may be used :—

Divide A,A, (fig. 34) into m equal parts, and through the points

Ane Ana

Fig. 34.

of division draw the ordinates, called by surveyors offsets, A,P,, A,P,, &c.

Let A,P,=s,, AgP,=s,, &c., AnPa=Sn, and

dpa ddim. 2 Re hyeel,

Join P,P,, P,P;, &c., then the area of the polygon AyAnP»P,Py =A A,PLP s+ MoM PLPL a . . 5 , "dn utpPaPact =$a(s, +3) +$0(8,53) . » +40(82-1+8n) (§ 18, a) =a{4(51+5n)+5g+53+ . . . .+Sn-r1}-

If we take uw sufficiently great the difference between the area of the polygon and the curvilineal figure can be made as small as we please, in other words, the smaller we make a the more accurately will the above formula represent the area of the curvilineal figure.

The curve may either be wholly convex or wholly concave to the line A,An, or partly con- vex and partly concave.

§ 64. Simpson's Rule.—Let A,An (fig. 34) be divided into an even number of equal parts, and as before through the points of division draw the ordinates A,P,, AgPs, &e.

a part of 1 gaye bi = = ae vided; join P,P3, and throug ton BS Fic. 36. P, draw BC parallel to P,P; to i & 8

meet A,P, in B and A3P; in. Conceive a parabola to be drawn through P,P,P, having its axis parallel to the ordinates, then

A,P,P,P3;A,= trapezium A,P,DP,A,+parabolic segment P\P,P, =a(s, + 83) 4a {sy~(s, +53) } =ha(s, + 439 +55) « Now when the points P,,P.,P, are near cach other the parabolie curve will coincide very nearly with the given curve; hence

A,P,P.P3A3= 4a(s, + 48,+53) very nearly.

P. p D i"

As A, A, Ay

Similarly AgPaP,A5= $a(8,+ 484+8,), &¢. ; hence whole area of figure = ha {5,+5n +2(83 +55 +2… +Sn-2) F4(Q rst… + $n-1)} 3

whence the rule:—add together the two extreme ordinates, twice the sum of the intermediate odd ordinates, and four times the sum of the even ones, and multiply this result by one-third of the common distance between the ordinates; the result is the area,—aceurately if _ the curved boundary be the arc of a parabola, in other cases ap- proximately.

The curve may either be wholly convex or wholly concave to the line A,An, or partly convex and partly concave, provided in the latter case the points of contrary flexure occur only at the odd ordinates, for otherwise the intermediate arcs could not be even approximately parabolic. When points of contrary flexure occur ordinates may be drawn at these points, and the intermediate arcs being found separately may be added to obtain the whole area.

§ 65. In the two preceding sections we investigated two formule for approximating to the areas of curvilinear figures. We now proceed to consider the subject more generally.

Ppx Ep Pret

Ai Ap Ap» Anti Fig. 37.

Let the equation to the curve P,P,Pn+1 (fig. 37) agree with the

equation y= A+Ba+Ca?+ .... +Ka”for n+1 points between P, and P,»41, then the area of the curvilinear figure bounded by the straight lines AyP,, A,Anti, and AnsiPn4i and the curve PyPn41 will agree very nearly with the curvilinear figure bounded by the same straight lines and the curve whose equation is y=A+Ba+ C22?+.... +Ka, and the greater the number of common points the closer will be the agreement.

Let A,Anii be divided into x equal parts, each equal to h, then AjAnp=nh. Now

whenz=0, y=y,=—A; when 2=h, y=Yy.=A+Bh+Ch?+ .... +Kh”;

when 7=2h, y=yg=A+B(2h)+C(2h)?+ .. . . +K(2h)”; when = % yoo pean hse BOph) + OL ph)* > ae . : + K(ph)*; wheu — yntilamts hem ROCKS nae . ; + K(nk)*. From these »+1 equations the »+1 quantities A, B,....K

can be determined as funetions of y,, Ya, . . + + Yn4i1, and h. Next let A,Anji be divided into m equal parts each equal to h.

Thus mh=nh and hence hah Now the area of the rectangle ApApyiP,R=ApAp4i X ApPp. But A,Pp=yp=A+B(ph)+C(ph)+ .... +K(ph)

2

=A+BRm mn o(2”) ” +K(2mt) m m m since i ; and ApApy aha ; therefore area of A,R nh \ & p pe « nh > ty Buh gt Cnr 3 +... +Kn”h meri §° Hence the area of the whole figure 7 Pee. foe , 2B anol” nee ie , ore Bigs nh mm + Buh gt Cath st .. + Kain So SH 9 as – Sn L,,-..™ A ed Bnh-s + Cn*h; Pa ha siete eet Kanth” i where S,=1% +2743″ + a Now if we take the limit of each of the terms 8 8, 8 S., m? mi? m3? °° °° mnt? we obtain area of curvilincar figure B C K) mh. Bete nthe —_ nh n +p nht anh Be a ahs +e ‘‘

From this general result we can deduce ‘‘ Simpson’s Rule” and also another rule called ‘* Weddle’s Rule.”

Thus let n=2; that is, assume that the curve under consideration has-three points in common with the curve whose equation is y=A+Bau+Cx*, t.¢e., with a parabola, then

YW=A, Yg=A+Bh +Ch?, Y3=A+2Bh+ 4Ch?.

Now the area is approximately

=2h{ A +4B2h +40 2°72}

= §h{6A+6Bh + 8Ch?}

=$h{y+ 4. +y3}, Simpson’s Rule. If we now put x=6, we have area of curvilinear figure

=6h {A + 4B6h+ 4CO7A? + 4D6%R3 + LEGS + AFORE + TC6SA5 } Now y= A, Yo=A+Bh+Ch?+ .... +GA8,

Y7=A+ B(6h)+C(6h)?+ 2… G(6h)8,

From this system of equations we can determine A, B, ©,... G, and substituting the values so obtained in the above expression we obtain the following remarkable formula for the approximate area:

area = yh { (1 +Y3+Y5t+Yz) + Yat 5(Yo+Y4tYo)} .

This formula, called Weddle's Rule, gives the closest approximation to the curvilinear area that can be obtained by any simple rule.

We are now in a position to find the approximate area of any irregular plane figure. For the given figure can be divided into plane rectilinear and curvilinear figures, the areas of which can be separately determined by the rules already given. For example, APQRS (fig. 38)

=ABC+APD+BRC- DQB- ASC.

R Fig. 38. PART II. SOLIDS. Section I. Sontps CONTAINED BY PLANES.

A. Prisms, Pyramids, and Prismatoids.

§ 66. Volume of a Right Prism.—First let the prism be a rect- angular parallelepiped (fig. 39), and let the side AB contain a units of length, BC 0 units of length, and CD c units of length. If we divide AB into a equal parts, BC into 6 equal parts, and CD into ¢ equal parts, and if, through the points of division we draw planes parallel to the sides of the parallelepiped, these planes will divide it into a series of parallelepipeds, whose edges are each equal to the unit of length. Each horizontal layer contains ad of these cubes, and sinee there are ¢ Fj layers the whole number of cubes ig. 39. will be abc. But each of these is the unit of volume, and therefore

volume of ABCD =abe=ab x c=area of base ABC x altitude c,

In the above demonstration we have assumed the edges to be commensurable, but from § 2 it follows that the proof will hold also when the edges are incommensurable. If the parallelepiped be cut by a plane BGE it will be divided into two equal triangular right prisms, and hence volume of righttriangular prism = 4ad x c=areaof its base x altitude. Since every prism can be divided into triangular prisms as in fig. 40, we have at once volume of right prism A'ABCDE=A'ABC + A'ACD + A'ADE = ABC x BB'+ ACD x CC'+ ADE x DD' =(ABC+ ACD + ADE) x altitude (since BB'=CC' = DD' =altitude) =area of base ABCDE x altitude.

Fig. 40. Fig. 41.

§ 67. Volume of an Oblique Prism.—Draw the right section A” B”C”D”E” (fig. 41), and let A’ denote its area and A the area of the base A’B’C’D’H’. Let 7 denote the length of the prism, h its altitude, and a the angle between the planes A’B’/C’D’R’ and A“ BCD” EK”,

Conceive the part above the right section placed at the other extremity of the prism. Then we have a right prism, whose volume= A’ x1 (§ 66); but A’=Acos a, since A’ is the projection of A (§ 51),

and b= h ; hence cosa

volume= A’ x/=Acosa x hss i rans COS a

or the volume of any prism is equal to the area of its base multi- plied by its altitude.

tg EE

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§ 68. Surface of a Prism.—Since the lines A”B”, B’C”, &c. (fig. 41), which make up the perimeter of the right section are all in one plane perpendicular to the parallel edges A’A’”’, B’B”, &c., they are perpendicular to these edges and are therefore the altitudes of the parallelograms A’B’B’” A”, B’C’C’’B”, &c., respectively. The lateral surface of the prism is equal to the sum of these parallelo- grams, and therefore =A’A” x A”B” + B’B” x BYC” + = A’AM(A”B’ + BiG za A’A” =B/B” =&c. ; or the lateral surface of any prism is equal to the perimeter or its right section multiplied by the length of the prism.

If the prism be right, that is, if the faces be perpendicular to the base, then its lateral surface is equal to the perimeter of its base inultiplied by its length.

The whole surface of any prism is obtained by adding to the lateral surface the areas of its bases.

§ 69. If the prism be regular, that is, if the bases be regular polygons, then

since

180° n of sides each of length a, and therefore

yolume=a?x — cot 18 ×1, : 4 v0)

area of base =a? x 7 cot (§ 18, +), where » is the number

where h is the altitude of the prism. Again, if the prism be right and regular, then

its lateral surface = nah + 2a? x 7 cot 180″ : nu

$70. Volume of a Pyramid. —Let VABC (fig. 42) be for sim- plicity a triangular pyramid. Divide VA into » equal portions, and through the points of section draw planes parallel to the base ABC, and Vv through BC and through the inter- sections of these planes with VBC draw planes parallel to VA. Let h denote the altitude of the pyramid, then the distance of the base of the 7» prism from the vertex V

aa kNL

and, if A denote the area of ABC, we A have

base of 78 prism 77h?_ 1 7? B

< ar er te De since, by a well-known theorem in solid geometry, the areas of sections of a pyramid made by planes parallel to the base are proportional to the squares of their altitudes.

Thus we have

2

base of 7*® prism = A, and therefore n

2

its volume=—— A x x ($ 67) nN vi)

hA

=o 2 . ne” Therefore volume of whole pyramid ROP sk EPH bAL,

=hAL,

or the volume of any pyramid is equal to onc-third of the area of its base multiplied by its height.

From this we see that pyramids on equal bases are to one another as their altitudes.

If the pyramid be regular, that is, if its base be a regular polygon the perpendicular through whose centre passes through the vertex,

its volume = } x a? x Sve xh.

2

un + 1)(20 + a) Aw x4; 6 ?

‘ N= 3

§ 71. Surface of a Regular Pyramid.—The lateral surface of the regular pyramid VABCDEF (fig. 48) is equal to the sum of the areas of the m congruent triangles which make up the lateral surface of the pyramid.

Now area of triangle VAB=3AB x VG; hence whole lateral surface=4nAB‘VG=4nal, where / is the slant height and a the length of the side of the base.

Again, if VO=h=altitude of pyramid, we have

2 3

1=VG=/V0?+0G?= fare cot? ~°

cS ? VT

23

therefore whole surface = base + lateral surface

180° 2 ° ih ee ete f+ = cot? = 4 a 4

n

Fig, 43.

§ 72. The Prismatoid.—If we have a polyhedron whose bases are two polygons in parallel planes, the number of sides in each being the same or different, and if we so join the vertices of these bases that each line in order forms atriangle B with the preceding line and one side of either base, the figure so formed is called a ‘‘prismatoid,” and holds in stereometry a position similar to that of the trapezium in planimetry. To make the investiga- tion of the volume of the prisinatoid as simple as possible, we take the case where the lower base is a polygon of four and the upper one or three sides.

Let ABCDEFG (fig. 44) be the pris- matoid, of which ABC or A, is the upper and DEFG or Ag; the lower base, , and let HLM be the Fig. 44. section equidistant from the bascs. Take any point P in this section and join it to the corners of the prismatoid. We thus divide the polyhedron into two pyramids PABC and PDEFG, and a series of polyhedra of which CPDE may be taken as a specimen.

Let & be the altitude of the prismatoid, then 4h is the altitude of each of the pyramids PABC, PDEFG, and hence ‘

volume of PABC =hA,, and volume of PDEFG=3hA3.

Again join PH, PL, and LD, then volume of CPDE=2 volume of CPDL, since DE=2HL, and volume of CPDL=2 volume of CPHL, hence volume of CPDE=4 volume of CPHL.

Now volume of CPHL=3h x area of HLP, and therefore volume of CPDE=4h x area of HLP.

Similarly the volume of every such polyhedron is $f x the area of its own portion of the middle section. Hence if A, denote the area of the middle section we have

volume of prismatoid = §1A,$hAy hAg = $h(A,4A, Ay). § 73. Volume of the Frustwm of a Pyramid.—Let A’A”’B’B’’C’C” (fig. 45) be a frustum of the pyramid VA’B’C’, and let A, and Ag

denote the areas of the ends A’B/C’, A/”B”C” respectively. Let VP=x=altitude of pyramid VA”B”C”, and let PQ==altitude of

frustum. m _% \P_As ___ An/As Now (=e) a whence e-J s ay

24

Again frustum = V.A’B/C’ – VA”’B’O” =3{ Ay(a+h) – Age}

=1{ a,(hr/Ay) Af ha/Ag)\ “VA ~V/ Ag] 8\N/ AV Aa = §h(Ay+V/A,A,+A,) ; a formula which applies to the frusta of all pyramids regular and irregular. The above result may be otherwise expressed. For, let A’B’ =a,

and A”’B’” =a, then, if A”B’C” be a section equidistant from the ends of the frustum, A”B” =a_=4(a, + ag).

Now A,=paj and A3=pa? (see § 70); hence A,=area of A”B’C” =pa? = (a5) which gives

4A,=pat + 2payay + pa? =A, 2\/A\A, Ag; therefore volume of frustum

= §h(2A,+2VA,A,+2A,)=3h(A, +4A,4A,) 5 or the volume of the frustum of a pyramid is obtained by adding the areas of the ends to four times the area of the middle section, and multiplying the sum by one-sixth of the alti- tude.

The above result can be ob- tained at once from § 72, since A’B’C’A”’B””“C” is a prismatoid with similar bases.

§ 74. Surface of the Frustum of a Regular Pyramid.—In fig. 45 let the perimeter of A;=p,, that of A,=p,, and that of A3=Dz, and let VD’=i,, VD” =1,, and therefore D’D’” = VD’- VD” =1,-2,=1. The lateral surface of the frustum is

Fig. 45. equal to the difference between the lateral surfaces of the pyramids

VA’B’C’ and Varn’ O”, = 47,1 — dps. ag 0b. we have 1) = 3 Nag ps Pi- Ps therefore lateral surface of frustum

2 2 + 3

AC me

or the lateral surface of the frustum of a regular pyramid is equal to the product of the slant height and the perimeter of the section equidistant from the ends.

Otherwise.—The top and base being regular polygons, the inclined faces are congruent trapeziums. Let Z be the height of each trapezium, and let there be n of them, then

area of each face 7 (Pt +f) , 2X

But, since Dil iy

and

and therefore the area of lateral surface = (1 +03) =lp,.

§ 75. If h the altitude of the frustum be given, we deduce the slant height and then proceed as before. Thus let VP=hz,,

ae and using the same notation as in §$ 72, 73, and 74 we lave

i… ee.” , which gives, 2047 4s)_ yh hy-hy a- Gs E By Ge | Ch =e Again = 22h? +42 cot? 180 ang 1-(= 4) hi; n ay

whence 7 is known since 7, is known in terms of h.

When the pyramid is irregu- lar the lateral planes are non- congruent trapeziums, the areas of which can be found separately by § 12, and hence the whole surface.

§ 76. Volume of the Frustum of a Triangular Prism.—Let A denote the area of ABC (fig. 46), and let hy, ha, hg be the altitudes of A’, B’, C’ respectively with reference to the plane ABC. Divide the frustum into three pyramids B’A’AC, B’ABC, and B’A’CC’ by the planes B/AC and B’A’C. These three pyramids are respectively equal to BA’AC, B’ABC, and ABCC’; hence volume of frustum = 3h, A + gh. A + 4h, A

=gA(h, +h, +hs).

Fig. 46.

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§ 77. If the prism be right or oblique, the volume of a frustum is equal to one-third of the area of its right section multiplied by the sum of the parallel edges. For divide the frustum AA’B/C’ (fig. 47) into two frusta by a plane A”B’C” of area A at right angles to the edges, then

AA’B’C’= AA”B’O” + A” A’B’C’ _ PA(AA” of BB” + CC”) +4A (A’AY + B’B” +C’C”) = tA(AA” + BB’ +CC” + AA” + B/B’ + CrC”y = 5A (AA’+ BB’+CC’),

Again, since every prism can be divided into triangular prisms, we can find by repeated applications of the above proposition the volume of the frustum of any prism whatever. For example, if

B

rN

Fig. 47. Fig. 48,

the base of the frustum of a right prism AA’B’C’D’ (fig. 48) be a rectangle 12 feet by 6 fect, and the parallel edges in order 6, 4, 10, and 12 feet, then A=area of base=12 × 6=72 square feet. Frustum = ABCA’B’C’ + ADCA’D’U’ = 4x $A(AA’+ BB’+CC’) +4 x $A(AA’ + CC’ + DD’) =¢A(2AA’+20C’+ BB’ + DD’) =576.

§ 78. Volume of a Wedge.—The wedge (fig. 49) being merely the frustumn of a triangular prism, we have at once

volume=}A(FE +AD+BC), where A is the area of its right section ; otherwise, the wedge may be con- B Cc sidered a prismatoid Fig. 49 : g. 49. whose upper base is a straight line, and hence its volume= 3h(4A,+ As), since A,=0.

B. Regular Polyhedra.

§ 79. The regular polyhedra are five in number, namely, the tetrahedron, cube, octahedron, dodeeahedron, and icosahedron, whose solid angles are formed respectively by three equilateral triangles, three squares, four equilateral triangles, three pentagons, and five equilateral triangles.

Since a regular polyhedron admits of having a sphere inscribed within it and described about it, it can easily be shown that the volume of the polyhedron

Tv o T cos— cot?— =a° x a os — – 5; 24 (v =) (mn at) } +’ — cos{ —+ — }eos{ — —- — mm 2 m aud from § 18, y, it follows that the surface of the polyhedron ants in i = q cots where ¢=the number of faces, m =the number of faces in each solid angle, n=the number of edges in each face, and a=the length of each side.

The following table contains the surfaces and volumes for the five regular polyhedra whose edge is 1.

Polyhedron.

Surface. Volume.

1°7320508

6-0000000

3°4641016 20°6457788 8°6602540

071178511 10000000

0°4714043

76631189

2°1816950

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The surface and volume of a regular polyhedron whose edge is a is obtained by multiplying the surface and volume of a similar polyhedron whose edge is 1 by a* and a® respectively.

Srction 1]. SOLIDS CONTAINED BY SURFACES WHICH ARE NOT ALL PLANES.

A. The Cylinder.

§ 80. Volume of a Cylinder (fig. 50).—Inscribe in the cylinder a olygonal prism of which the number of sides may be increased indefinitely. Then in the limit the base of.the prism becomes the pase of the cylinder, and the volume of the prism the volume of the cylinder. Now by § 67 we have voluine of prism =area of base x altitude; hence volume of cylinder =area of base x altitude.

§ 81. Surface of a Right Cylinder.—As above, in the limit the base of the prism becomes the base of the cylinder, and the surface of the prism the surface of the cylinder. Now the lateral surface of prism

=perimeter of right section x length

=perimeter of base x length, in the case of a right prism (§ 68); hence lateral surface of right cylinder=circumference of base x length.

Vv

A

Fig. 50. Fig. 51.

B. The Cone. § 82. Volume of a Cone (fig. 51).—Inscribe within the cone a pyramid of which the number of sides may be indefinitely in-

creased, then in the limit the base of the pyramid becomes the base of the cone and the volume of the pyramid the volume of the cone.

By § 70 volume of pyramid = § base x altitude, ani hence volume of cone=4 base x altitude. § 83. Volume of the Frustum of a Cone.—From § 78 we find that the volume of the frustum of a pyramid = §h(A, + VAjAg + As) 3 hence, since in the limit the frustum of the pyramid becomes the frustum of the cone, we have

volume of conical frustum = $h(A,‘VA,A, Az),

where A, and A, are the areas of the terminating planes of the frustum. ,

Let the terminating planes be circles of radii r, and rs, then volume of frustum

=4h(mr? + aryrs + 72) = bah(rit+7yrgt75) Again, by the same section we have volume of frustum of pyramid =4/(A, + 4A,+A3),

therefore volume of conical frustum=$2h(ri+4r3+73), where r, is the radius of the circular section parallel to the ter- ninating planes and equidistant from them.

§ 84. Surface of a Right Cone.—The lateral surface of a regular pyramid is by § 71

=4perimeter of base x slant height ;

hence, since in the limit the surface of the pyramid becomes the sur- face of the cone, the lateral surface of a right cone is equal to half the circumference of its base multiplied by the slant height.

Thus the lateral surface of a right cone of slant height 7 and the radius of whose base is 7 is equal to

BxXQrrxXl=arl,

and whole surface=lateral surface + area of base =amrl+nrr? = ar(l + r) 3 Again, if h, the altitude of the cone, be given, we have l=N +P,

and therefore whole surface=ar(Vi2+77 +7).

§ 85. Surface of the Frustum of a Right Cone.—The lateral surface of the frustum of a regular pyramid is equal to the product of thie slant height and the perimeter of its middle section (§ 74); hence

25

in the limit we find that the lateral surface of the frustum of a right cone is equal to the product of its slant height and the cir- cumference of the section equidistant from its parallel faces.

Let r; and rg denote the radii of the ends of the frustum, and 7 the length of the slant height, then ; 7,=4(71 +73) =radius of middle section,

and therefore lateral surface =2mr, x 7= 2m x (7, +73) X2=al(r, +75) 5 and whole surface = wr? + w1(r, +73) + 772. If h, the altitude of the frustum, be given, we have

t=Vh24 (7-73).

C. The Sphere.

§ 86. Surface of a Spherical Zone.—Let AB (fig. 52) be a small] arc of the sphere, and Iet AA’, BB’ be perpendicular to the axis XX’, to find the surface of the zone generated by the are AB. Join AB, and draw OP perpendicular to AB, .. BD parallel to XX’, and PP’ “ parallel to AA’ or

BB’. The chord AB generates the frustum of a cone, whose lateral surface =2nPP’ x AB.

But, since the triangles ABD and OPP’ are similar,

Ab. OR i jes Bb PP’) Fig. v2. therefore area of conical frustum =27.0P. BD =27.O0P. A’B’.

Similarly the area of the frustum generated by BO=22.0Q.B’C’.

But in the limit when the chords AB, BO, &c., are indefinitely diminished, the perpendiculars OP, OQ, &c., become each = 7, and hence by summing all the areas we get in the limit

area of zone=2rxr x (projection of arc on axis of revolution). Hence the convex surface of a segment of a sphere is equal to the circumference of a great circle multiplied by the height of the seg- ment or zone.

§ 87. Surface of a Sphere.—The whole sphere being a zone whose height is 27, we obtain at once

surface of sphere=2ar x 2r=4m7″ or the surface of a sphere is equal to four great circles.

The total surface of the cylinder circumscribing the sphere of radius 7 is 6rr?, hence the surface of the sphere = 3 surface of cir- cumscribing cylinder.

§ 88. Surface of w Lune, a Spherical Triangle, and a Spherical Polygon. — It is shown in spherical trigonometry that

(a) the area of a lune included between two great circles of a sphere of radius r, and whose inclination is @ radians, is

26rs (g) the area of a spherical triangle whose angles are A, B, C is {(A+B+C-=-7)r°; (y) the area of a spherical polygon of r sides is {P- (r -2)r}r®, where P is the sum of its angles.

§ 89. Measurement of Solid Angles.—A convenient unit for the measurement of plane angles is the ‘‘radian.” If we assume that each unit of surface of a sphere subtends the saime solid angle at the ceutre, we can deduce a very convenient unit for the measurement of solid angles. This unit, which has received the name ‘‘stera- dian,” we define to be the solid angle subtended at the centre of a sphere by a portion of the surface whose area is 7°.

§ 90. Number of Steradians in an Angle.—Let A be the angle at the centre of a sphere, and let S be the portion of the surface of the sphere which it intercepts, then

number of steradians in A_ S

1 fi

For example, if A be a plane solid angle, S=a hemisphere =2rr?; hence the number of steradians B D

: : S D4 in a plane solid angle Ao Ss and therefore the nnmber of steradians in _, the solid angle at apoiut=4x. Thissolid angle is sometimes called a steregon.

Hence, if we can find the surface sub- tended by any solid angle, we can always find its magnitude in terms of the unit solid angle. — C

§ a1. Ppisane of a Sphere.—Let ABC A Fig. 58.

(fig. 58) be the quadrant of a circle, draw DB and DC tangents to it, then, if AD be joined and the whole ot be conceived as AVi, — 4

= Tv,

26

rotating round AB, ABD, ABC, and ABDC will generate a conc, a heniisphere, and a cylinder respectively.

Now draw two parallel planes EFGH and E’F’G’H’ very near each other and perpendicular to AB, and draw FF’ and GQ’ parallel to AB, then, by § 80,

volume generated by EHH’E’=7EH?x EF’, EGQ’E’ =rKG? x EF’, » of EFF’E’ =cEF? x EEX’. Thus volume generated by EFF’E’ + volume generated by EGG’H’ = n(EF? + EG?) x EE’ =2(HA?+ EG?) x EE’ =7(AG?) x EE’ =7EH? x ER’ =volume generated by EHH’L’. Therefore in the limit, when the number of slices is indefinitely in- creased, and their thickness indefinitely diminished, we have volume of cone generated by AF + volume of spherical zone generated by CG =volume of cylinder generated by CH. Let r=radius of sphere, = AE=height of zone ACGE, then volume of cone= $ah? x h= §rh’, and volume of cylinder=a7? xh, volume of spherical zone = 1°h — 4xh3 = 4rh(8r2 -h?).

he) 39

therefore

The height of a hemisphere is 7, therefore volume of hemisphere = 4r (37? — 7?) =3ar3 , and volume of whole sphere=§zr° , a result readily obtainable by the infinitesimal calculus, or by inscribing within the sphere a series of triangular pyramids whose vertices all meet at the centre of the sphere, and the angles of whose bases all rest on the surface. In the limit the altitude of each pyramid becomes the radius of the sphere, and the sum of the bases of the pyramids the surface of the sphere ; hence

volume= 4S x r=} x 4ar? x r= 4nr3,

The volume of the circumscribing cylinder =r? x 2r=2zr’, therefore volume of sphere=% volume of circumscribing cylinder.

§ 92. Let S denote the surface of a sphere and V its volume, then from §§ 87 and 91 we have

ww 8 ON (B) S=n/a(6V)?5

1 =

(y) V=—_=v/(S)8; 6 5 oe formule which give the radius in terms of the surface or volume, the surface in terms of the volume, and the volume in terms of the surface. § 93. Volume of a Spherical Shell, —Let r and r, denote the radii of the two spheres, then

volume of shell= V =$ar? — 4ar°

er (a) r= yer

=$x(r3 =) =$r(r-—r)(ritnyrtr).

Now let 7; —r=h, then

Oe ue

V=4arih € ch suet ’

ry ‘Y If h be small compared with 7,, then 7/7, is very nearly equal to 1, and we have approximately

V=$arjh(it+1+1)=4ar2h, Again, if h be nearly equal to 7,, ris very small, and 7/7, is also very small, so that we have approximately V=$rr7h. § 94. Volume of a Spherieal Segment.—Let CRC’ (fig. 54) be a

section of a spherical segment whose

altitude RQ is p, then, if OQ=A, R ‘ volume of segment CROC’ =volume of C—O hemisphere — volume of zone AA’C’C

= §ar? – deh {3r?-h2}, § 91. B B’

= §nr — 4n(r—p) {812- (r-p)} =$mp?(3r —p).

If we put p=2r, we obtain as before

volume of sphere= 4rr° .

Again if CQ=a, we have

CQ?= a? =RQ.R’Q = p(2r-p), R’

2 2

whence r= 1” ; Fig. 54,

volume of segment =4ap (8a} +p). § 95. Volume of a Spherical Frustwm.—When one of the termi-

therefore

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nating planes passes through the centre we have already found that the volume = irh(r?— h?), where A is its altitude. Now suppose that neither of the terminating planes passes through the centre; for example, to find the volume of the frustum BB’C’U. Let RQ=p and RP=q, then BB’C’C=segment RBB’ – segment RCC’ = ¢mgq (3a; +9”) — dap (3a,+p*), where @ and a, are the radii of the ends CU’ and BB’, : Let g-p=h=height of frustum, and, since, from the geometry of the figure, ap ab tg p q we have volume= grh{3(a? +02) + h?}, a result which may also be obtained by considering BB/C’C as the difference of the two zones AA’C’C and AA’B’B.

D. Spheroid.

§ 96. Surface of a Prolate Spheroid.—The prolate spheroid is the solid generated by the revolution of an ellipse about its major axis, If S be the surface generated by an are of the curve, then

aaa *S=2a/y ft + (32) dx, taken between proper limits.

ae

Qo,

In the case before us ab. S=2rb? + 2ar—sin-1e, é where ¢ is the eccentricity (INFINITESIMAL CALCULUS, art. 179).

§ 97. Surface of an Oblate Spheroid.—The oblate spheroid is the solid generated by the revolution of an ellipse about its minor axis

(fig. 55).

2

Here surface = 2a? + ne log, Bar

MEAG art. 179). § 98. Volume of a Spheroid.—We have volume of prolate spheroid

+ ‘ : ar € ” ae = ane f“(4 – va) =4rab?. a 0 ve

Similarly volume of oblate spheroid=$2a7O.

(INFINITESIMAL CALCULUS,

i)

Thus, volume of prolate spheroid §mab?_ 0 . (a) volume of oblate spheroid $na*b a ’ sphere described on major axis §ma>_ a? (8) prolate spheroid ~ pea Be’ tay sphere described on minor axis $rb3 0?

oblate spheroid — ~ $marb a § 99. Volume of a Segment af a Spheroid. (a) The prolate spheroid.—This segment is generated by the

revolution of AMP (fig. 23, p. 20) about AM, and hence its volume = 7 Pd = “ “ieee -2\de= = x ew -h) 0 ao 0 3 a? Y

where A is the origin and AM=h. (B) The oblate spheroid.—The segment in this case is generated by the revolution of BMP (fig. 55) about BC, and hence

h 2 ie 27,2 its volume= 7 Yde= aes i “(Qber —2x)\da= z x oF (3) ~h),

0

where B is the origin and BM=A. § 100. Volume of the Frustum of a A Spheroid when one of the Terminating 24

Planes passes through the Centre.

(a) The prolate spheroid.—The frustum in this case is generated by the revolution of BCMP about CM (fig. 28).

Now volume generated by BOMP B’ B

=volume generated by BCA — volume generated by PMA

Q

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= }nai? ~ 2 x = (8a -h)

op Pp =— Xx Bk a2 -#*) , where A’

3° i k=OM=height of frustum=a-h. mae ai (B) Lhe oblate spheroid.—_We can show in a similar manner that the volume generated in this case

The above formule may be put into another form. Thus, in the case of the prolate spheroid, since the point P lies on the ellipse b°x? + a?y? = a7b?, we have

b°k? + a*b} =a°b?,, where 6,= PM, which gives

iy 6? — b*) ik? BaP ie :

MENS URATION

whence, by substitution, the volume of prolate frustum = 4k(20? + d?).

Similarly we can show that the volume of the oblate frustum = Ink(2a? +.a?), where a,=PM.

These formule play an important part in the gauging of casks.

E. Paraboloid.

§ 101. Surface of a Paraboloid.—Let the equation to the para- bola be y°=4az, and let the coordinates of P (fig. 21, p. 19) be a, y,, then the surface of the paraboloid geuerated by the revolution of AM about AP

Ly dy \? fe a= xta =$aVa { (a, +a) -a’} :

§ 102. Volume of a Paraboloid.—With the same notation we have

vy vy volume~a/. y’da=4ra cde = ha x dav, xa, =hry? Xx; : OT at 0

or the volume of a paraboloid generated by the revolution of a part of a parabola between the vertex and any point is equal to half the volume of the circumseribing cylinder. § 103. If the coordinates of Q be 2, y,, then the volume of the frustum PP’Q’Q = har { ype, — yin, } = Leah — ah) = bays tyi)h , where h=MN ; henec the volume of the frustum of a paraboloid is equal to half the sum of the areas of its ends multiplicd by its height. EF. Eilipsoid. § 104. Volume of an Ellipsoid.—The equation to the ellipsoid being ee ae ee’ ae’ the equation to the elliptic section at the distance z from the origin is

Now if we draw an indefinite number of parallel planes per- pendicular to the axis of z, each slice will be an infinitely thin cylindrical plate, and accordingly the whole volume of the ellipsoid

=/Adz, where A is the area of the elliptic section.

2

But Amnad(1 3 =) ,§ 51,

volume=at /“(1 = = dem Smabe . ae .

The sphere being an ellipsoid whose axes are all equal, we obtain as before

therefore

volume of sphere = $ra? = $27.

G. Hyperboloid.

$105. Volume of an Hyperboloid.—The hy perboloid is generated by the revolution of the hyperbolic segment ANP about AN (fig.

24, p. 20). If the coordinates of P be x, y%, then z }? volume of hyperboloid=a/ ‘yd araf “e -a)da Pie 2a? ab?h? Saas Oty jo Ot

where h= AN=a,-a. Agaiu, since x,, y, is on the curve, we have

9 2

a*y? —~ B(a+h)?= — a®b?, which gives oe a rok whence : hy? 3at+h 1 f hy wn volume of hyperboloid a? Soay

H. Solids to which the “‘ Prismoidal Formula” applies. § 106. It was shown in § 72 that the volume of any polyhedron bounded by two parallel planes and by plane rectilinear figures = $h(A,4A, As),

where A,, A, and A, denote respectively the areas of the two ends and of the middle seetion.

We now procecd to show that the same formula determines the ‘

volumes of all solids bounded by two parallel planes, provided the area of any section parallel to these planes can be expressed as a rational integral algebraie function of the third degree in «, where x is the distance of the section from cither plane.

|

revolution.

| awash tohtQshtert …. ths) t4gteit..-.

27

Let ¢(z)=A+Ba+Ox?Dz3 .... +Ka” denote the area of the section in question.

Now the solid between the sections (0) and (4) is equal to the solid between the sections (0) and ¢(2) plus the solid between the sections ¢(2) and $(4). Hence if the prismoidal formula is to hold in this case, we have

dh {o(0) + 46(2) + $(4)} = gh {p(0) + 49(1) + o(2)} + eh { o(2) + 49(3) + 9(4)} ,

where h is the distanee between the sections $(0) and $/4). Hence we have

$(0) — 4p(1) + 6f(2) — 49(3) + G(4)=0.

Now 9(0)=A =s@live =44 -08 oe 6 =4D-4E- 5… ~ 4k +6$(2)=6A412B+240+48D+96E+ .... +6°2°K

- 49(3)= – 4A – 12B – 36C – 108D – 324K-— .... -4:3”K

+ $(4)=A+4B416C+64D+256E+ .... +4°K.

Therefore O=0+04+0+0+24E4+PF+ .... 4+7TK.

Hence E=F=....K=O, and therefore ¢(”) must be a func- a of the third degree in order that the prismoidal formula may apply.

§ 107. If we take ¢(=A+ Ba + Ca? + Da’, there will be as many possible varieties as there are combinations of four things, one, two, three, and four together, ¢.e., 24-1=15 varieties. Corresponding to each of these there will be at least one solid thie area of a seetion of which at a distance 2 from one of the parallel planes is o(=A+Ba+Cux?+Da3, and at Icast one solid of revolution generated by the curve whose equation is of the form

my? = (x2) =A+ Bu+Ca? + Da}. As space prevents us discussing al] the cases that may arise, we content onrselves by giving three examples as illustrations.

(a) Volume of an ellipsoid.—Here $(x) = Ba + Ca.

Let 2a, 2b, and 2e be the axes of which 2a is the greatest, then h=2a, A,=0,, Ag=0, and Ay=-be ; therefore volume = $h(A, + 4A, + Ag) = 3a(4mbe) =$rabe, which agrees with the result in § 104.

(8) Volume of a sphere. —Here ry? = (x) = Ba + Ca’.

Let 7 be the radius of the sphere, then A=2r, A;=0, A,=0,

and A,g=r*, hence, as before (§ 91), ;

volume of sphere = }A(A, 4A, Az) = (nr) = ar,

(y) Volume of a right circular cone.—Here ry? = (x) =Ca*.

Let r=radius of base and h the altitude, then A,;=0, A,;=-77°, and A,=(4r)? ; hence

volume of cone=gh{A,+4A, + Ag} =dh{ar?+ ar} = dar’.

In a similar manner we can determine the volumes of a cylinder, a prolate spheroid, an oblate spheroid, &c.

$ 108. In general, if in any solid we have

¢(2) =A + Ba + Cx? + Da,

where A, B, ©, and D are known constants, then, if 4 be the length

of the solid, A,=9(0)=A, A,=$(bh)=A + BRR) + C(4A)? + D(RK) Asg=¢ (h)=A+ BA+ Ch? + DA}, and therefore volume of solid =§h(A, 4A_ As) = Ah+4Bh?+4Ch?+4Dh‘.

I. Solids of Revolution in General.

$109. Volume of any Solid of Revolution.—Let P,P, ... Pn (fig. 34) be the generating curve, and A,... . An the axis of Divide the curve into portions in the points P,, P,, &c., and draw the chords and tangents of the small arcs P,Pe, P,P,, &c., then it is evident that the solid generated by the curve is greater than the sum of the conical frusta traced out by the chords and less than the sum of the conical frusta traced out by the tangents. Hence, by increasing the number of chords, namely, by increasing the points of division of the curve, we can make the difference between these sums as

small as we please, and therefore by this method we can approximate as closely as we please to the volume of the solid generated.

Assuming that the points P,, P,, P; are so near eaeh other that the solid generated differs little from the frustum of a eone, and using the same notation as in § 63, we have volume generated by

P,P,Pg=§rAjAg(s? + 482 +52) = de2A,A.(si + 495 +85) = bra(s? +452 +83) similarly the volume generated by P,P4Ps=4ma(s? + 487 + 83) ; whence the volume generated by the whole eurve P,P)... – le + 82-1)}3

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: 5 ee 7G: or (since ws? = —1. , ms} =—?., &c.) 4a

2

4a mie [oh + oh 4 ch +5 + tees Pg) FMA +h + oo a5 beR=1)}s

a formula more convenient in practice, as it is sometimes more easy to measure equidistant cireumferences than equidistant radii.

J. Theorems of Pappus.

§ 110. The following general propositions concerning surfaces and solids of revolution, usually called Guldin’s theorems, are worth the reader’s attention. ;

If any plane curve revolve about any external axis situated in its plane, then

(a) the surface of the solid which is thereby generated is equal to the product of the perimeter of the revolving curve and the length of the path described by the centre of gravity of that peri- meter ;

(B) the volume of the solid is equal to the product of the area of the revolving curve and the length of the path described by the centre of gravity of the revolving area.

We content ourselves with an example or two of the application of these theorems, referring to the article INFINITESIMAL CALCULUS for the proofs.

Example 1.—To find the surface and volume of a circular ring. — Let w be the distance of the centre of the generating curve, in this case a circle, from, the axis of rotation, and 7 the radius of the circle, then

perimeter of generating curve=2rr, area of generating curve=n7”, and

path described by the centre of gravity either of the perimeter or area=27a ; hence

surface of ring =29r x 2ra=4n°ra, and volume of ring= mr? x 2na=29° “a,

Example 2.—To find the volume swept out by an ellipse whose axes are 2a and 2b, revolving about an axis in its own plane whose distance from the centre of the ellipse is c.

Here area of generating curve = ab, and path described by centre of gravity of area =2nc ; hence

volume generated = rab x 2mc=2nabe.

Example 3.—A circle of r inches radius, with an inscribed regular hexagon, revolves about an axis @ inches distant from its centre, and parallel to a side of the hexagon ; to find the difference in area of the generated surfaces and volumes.

Here perimeter of cirele=2zr,

and perimeter of hexagon =12 x rsin30° (§ 17)

=r

also area of circle= 77”, and area of hexagon =8r?sin 60° (§ 18, 8)

=3\/3r ; hence difference of surfaces generated =47°ra —12rar=4rar(r – 38);

and difference of volumes generated = 2r*ra — Bar72V/ 3a =rr’a(2r — 38V3).

PART III. GAUGING.

§ 111. By gauging is meant the art of measuring the volume of a cask, or any portion of it. The subject is one of great interest and practical importance, but space will only permit us to discuss it very briefly. If the cask whose capacity we wish to determine be a solid of revolution, then its volume can at once be computed, either exactly or approximately, by the methods already described.

MEN—MEN

It is usual to divide casks into the following four classes according to the nature of the revolving curve :—

(a) the middle frustum of a spheroid ;

(8) the middle frustum of a parabolic spindle ;

(y) two equal frusta of a paraboloid, united at their bases ;

(3) two equal frusta of a cone, united at their bases. ,

Casks of the second, third, and fourth variety are rarely met with in practice, and we shall accordingly confine our attention to the first kind, which is considered the true or model form of cask.

Let ABCD (fig. 56) be a section of the cask, and assume it to be the middle frustum of a prolate spheroid, then

its volume = 471(207+0?)k , where b=OY, b,=AX, and k=XX’ (§ 99).

YY’ is called the bung diameter, and AB or CD the head diameter.

An imperial gallon contains 277°274 cubic inehes, and therefore the number of gallons in the above cask

_ a2 +0i)k ot mage

3x O77 2747 Bal Ban + Ph 2d? + d? z =n Se @

~~(shh \e where d=2b, d,—9, ; whence we have the rule:—to the square of the head diameter add twice the square of the bung diameter, multiply the sum by the length and divide the result by 1059°1, and the answer is the con~~ tent in imperial gallons.

Casks as ordinarily met with are not true spheroidal frusta, but it is better to consider them as such, calculate their capacity on this assumption, and then make allowance for the departure from the spheroidal form. The de- termination of the properallowance to be made in each case is a matter depending on the skill and ex- perience of the gauger, and pro- ficiency in the art can only be attained by considerable practice.

§ 112. If the cask be very little curved, we obtain an approxima-

Fig. 56. tion to its capacity by considering it as made up of two equal frusta

of a cone, united at their bases. Hence from § 83 we have volume of cask = 4rh(r? + ryrg+73) nearly. Here we neglect the small volumes generated by APY, YSD, BQY’, and Y’RC; and therefore the volume is too small. If we put 7,73=77 we obtain volume= $rh(2r? +73) , which isa little too large, and therefore the true volume lics between these two limits, and a very close approximation to it is said to be given by the formula Ah {Qr? +72 – (ir? -12)}.

§ 118. Ullage of a Cask.—The quantity of liquor contained in a cask partially tilled and the capacity of the portion which is empty are termed respectively the wet and dry ullage.

(a) Ullage of a standing cask.—By means of the method applied in § 105, the following rule is deduced :—

Add the square of the diameter at the surface, the square of the diameter at the nearest end, and the square of double the diameter half-way between ;

multiply the sum by the length between the surface and the nearest end, and by °000472.

The product will be the wet or dry ullage according as the lesser portion of the cask is filled or empty.

(8) Ullage of a lying cask.—The ullage in this case is found approximately on the assumption that it is proportional to the seg- ment of the bung circle cut off by the surface of the liquor. The rule adopted in practice is

ullage=% content x segmental area. (W. T.*)

MENTAL DISEASES. See Insanrry.

MENTON (Ital., Afentone), a cantonal capital in the department of Alpes-Maritimes, France, situated 15 miles north-east of Nice, on the shores of the Mediterranean. The town, which has a population of about 8000, rises like an amphitheatre on a promontory by which its semi- circular bay (5 miles wide at its entrance, and bounded on the W. by Cape Martin and on the E. by the cliffs of La Murtola) is divided. It is composed of two very distinct portions : below, along the sea-shore, is the town of hotels

and of foreigners, which alone is accessible to wheeled vehicles; above is that of the native Mentonese, with steep, narrow, and dark streets, spread over and clinging to the mountain, around the strong castle which was once its protection against the attacks of pirates. Facing the south-east, and sheltered on the north and west by high mountains, the Bay of Menton enjoys a delicious climate, and is on this account much frequented by invalids re- quiring a mild and equable temperature. The mean for the year is 61° Fahr., exceeding that of Rome or of

Pisa, and equalling that of Naples. Frost occurs on the average only once in ten years ; in one particular year the thermometer did not fall below 46° Fahr. In summer the heat is never very great, the temperature rarely exceeding 86° Fahr. Winter and summer are the most agreeable seasons; in autumn the rain storms are accompanied by sudden changes of temperature,

and in spring the sea breezes are apt to be violent. Besides the charms of its climate, Menton offers those of an almost tropical vegetation. Lemon-trees, olive-trees, and pines, rising above each other in successive stages, adorn the sur- rounding slopes. The district produces forty millions of lemons yearly, and this is the principal source of its natural wealth. The olive-trees are remarkable for the great size they have attained in the course of the centuries during which they have continued to bear. Of their wood a multitude of fancy objects are made for sale to strangers. The origin of Menton is unknown. During the Middle Ages it

was suecessively ocenpied by the Saraeens, the Genoese, and the princes of Anjou. In the middle of the 14th eentury it was pur-

chased as a single domain by the Grimaldis, lords of Monaeo. During the times of the republic and the first empire it belonged to Franee; but in 1815 it again beeame the property of the

prinees of Monaeo, who subjected it to such exaetions that in 1848

its inhabitants, weary of finding their reasonable demands put off

with empty promises, proclaimed their town free and independent, under the proteetion of Sardinia. Menton, with the neighbouring commune of Roquebrune, was united to France in 1860, at the same time as Nice and Savoy.

MENTZ. See Marnz. .

MENZEL, Wotreane (1798-1873), poet, critic, and historian, was born June 21, 1798, at Waldenburg in Silesia, studied at Breslau, Jena, and Bonn, and after living for some time in Aarau and Heidelberg finally settled in Stuttgart, where, from 1830 to 1838, he had a seat in the Wiirtemberg “landtag.” His first work, a clever and original volume of poems, entitled Streckverse (Heidelberg, 1823), was followed in 1824-25 by a popular Geschichte der Deutschen in three volumes, and in 1829 and 1830 by Riibezahl and Narcissus, the ballads upon which his reputation as a poet chiefly rests. In 1851 he published the romance of Jurore, a lively picture of the period of the Thirty Years’ War ; his other very numerous writings

include Greschichte Huropa's, 1789-1815 (1853), and histories of the German war of 1866 and of the Franco-German war of 1870-71. From 1825 to 1848 Menzel edited a "Literaturblatt" in connexion with the Morgenblatt ; in the latter year he transferred his allegiance from the Liberal to the Conservative party, and in 1852 his "Literaturblatt" was again revived in that interest. In 1866 his political sympathies again changed, and all his energies were employed to oppose the " particularism" of the Prussian "junkers" and the antiunionism of South Germany. He died on April 23,1873. His large private library of 18,000 volumes was afterwards acquired for the university of Strasburg.

MEPHISTOPHELES, the name of one of the personi- fications of the principle of evil. In old popular books and puppet-plays the word appears in 'various forms,— as Mephistopheles, Mephistophiles, Mephistophilis, and Mephostophilis. In the Tragical History of Doctor Faustus, Marlowe writes '" Mephistophilis"; in the Merry Wives of Windsor we find " Mephistophilus." The etymo- logy of the word is uncertain. According to one theory, it may be taken to represent pypworodiAns ; in which case the meaning would be "one who loves not light." Another theory is that the word is a combination of the Latin "mephitis" and the Greek #iAos, signifying "one who loves noxious exhalations." Probably it is of Hebrew

origin, —from 729, a destroyer, and b8p, taken to mean a liar. This view is supported by the fact that almost all

the names of devils in the magic-books of the 16th century spring from the Hebrew. In the old Faust legends the character of Mephistopheles is simply that of a powerful and wicked being who fulfils Faust's commands in order to obtain possession of his soul. Marlowe attributes to him a certain dignity and sadness, and there can be little doubt that the Mephistophilis of the Tragical History suggested some important traits of Milton's Satan. The name has been made famous chiefly by Goethe, whose conception of the character varied at different periods of lus career. In the fragment of Maust published in 1790, but written many years before, 'Mephistopheles has a clearly marked individuality ; he is cynical and materialistic, but has a man's delight in activity and adventure, and his magical feats alone remind

us that he is preternatural. In revising and extending this fragment, which forms the chief portion of the first part of /‘aust, Goethe treated Mephistopheles as the representative of the evil tendencies of nature, especially of the tendency to denial for its own sake, rather than as a living person. This character Mephistopheles maintains in the second part, where, indeed, the name often stands for a pure abstraction.

See Julius Mosen, Fuwust; Diintzer, Enlduterungen zw Goethe’s Werken: Faust ; Vischer, Gocthe’s Faust.

MEQUINEZ (the Spanish form of the Arabic Aftkndsa), a town of Morocco, the ordinary residence of the emperor, is situated in a fine hilly country about 70 miles from the west coast and 35 west-south-west of Fez on the road to Sallee, in 34° N. lat. and 5° 35’ W. long. The town-wall, with its four-cornered towers, is kept in good condition ; and a lower wall of wider circuit protects the luxuriant gardens with which the outskirts are embellished. In the general regularity of its streets, and in the fairly substantial character of its houses, Mequinez ranks higher than. any other town in Morocco; but it possesses few buildings of any note, except the palace, and the mosque of Mulei Ismael, which serves as the royal burying-place. At one time the palace (founded in 1634) was an imposing structure, but the finest part has been allowed to go to ruin. In 1721 Windhus described it as “about 4 miles in circumference, the whole building exceeding massy, and the walls in every part very thick ; the outward one about a mile long and 25 feet thick.” The best part consisted of oblongs enclosing large open courts or gardens. Mortar or concrete was the principal material used for the walls, but the pillars were in many cases marble blocks of great beauty and costliness (A Journey to Mequinez, London, 1725). Most of the inhabitants of Mequinez are connected more or less directly with the court. Their number has been very variously estimated by different travellers. Graberg de Hemsé gives 56,000 in 1834, Rohlfs in 1861 from 40,000 to 50,000, and Conring in 1880 about 30,000. The town was formerly called Tdékarart. drisi refers the present name to a Berber chief Meknas. .

MERAN, a favourite health resort, and the capital of a district in South Tyrol, Austria, is picturesquely situated at the foot of the vine-clad

Ktichelberg, on the right bank of the Passer, about. half a mile above its junction with the Adige, and 45 miles to the south of Innsbruck. Meran proper consists mainly of one long narrow street, called the Laubengasse, flanked by covered arcades. Ina wider sense, the name is often used to include the adjacent villages of Untermais, Obermais, and Gratsch. The most noteworthy buildings are the Gothic church of St Nicholas, with its lofty tower, dating from the 14th and 15th centuries ; the Spitalkirche, built in the 15th century, and restored in 1880; and the quaint old Fiirstenhaus, or residence of the counts of Tyrol. The town contains a gymnasium, a nunnery and school for girls, an institution for sick priests, and several other charitable establishments.

Meran owes its high reputation as a resort for consumptive and nervous invalids to the purity of its air and its com- parative immunity from wind and rain in winter. It stands in 46° 41’ N. lat., at a height of 1050 feet above the sea, and has a mean annual temperature of about 54° Fahr. Meran enjoys three seasons, being also visited in spring for the whey-cure and in autumn for the grape-cure. The arrangements for the comfort of the visitors are very com- plete ; and the environs afford opportunity for numerous pleasant walks and excursions. The favourite promenade of the inhabitants is on a massive dyke, built to protect the town against the encroachments of the Passer. Nearly twenty old castles and chateaus are visible from the bridge over the Passer, the most interesting being Schloss Tyrol, an ancient edifice which has given its name to the entire country. Meran is now frequented by about 6500 patients and 8000 to 9000 passing travellers annually. In 1880 its population, including Obermais and Untermais, amounted to 5334 souls.

Meran is probably the representative of the Roman Urbs Majensis, afterwards Doan as. Mairania. It became a town in 1290, and down to 1490 was the capital of the counts and dukes of Tyrol. The town suffered somewhat during the Peasants’ War in the 16th century, and subsequently from destructive Hoods. As a liealth- resort it has been known for about forty years. The whole region in which it lics is singularly rich in historic interest.

Authorities —Beda Weber, Meran; Diiringsfeld, Aus Meran, 1868; Noé, Der Frithling von Meran; Stampfer, Chronik von Meran, 1867, and Geschichte der Stadt Meran, 1872; Pircher, Meran als Klimatischer Kurort, 1870; Plant, Pihrer durch Meran, 2d ed., 1879; Knoblauch, Jferan, 5th ed., 1881,

MERCATOR, Gerarpus (Latinized form of Gerhard Kramer) (1512-1594), mathematician and geographer, was born at Rupelmonde in Flanders, May 5, 1512. Havy- ing completed his studies at Louvain, he devoted him- self to geography, and, after being for some time attached to the household of Charles V., he was appointed cosmo- grapher to the duke of Juliers and Cleves in 1559, taking up his residence at Duisburg, where he died December 2, 1594. One of his earliest cartographical works was a terrestrial globe (1541), followed in 1551 by a celestial globe. In 1552 he published a treatise De usu annuli astronomict (Louvain), and at Cologne in 1569 his Chrono- logia, hoc est temporum demonstratia… ab initio mundi usque ad Annum Domini 1568, ex eclipsibus et observa- teonibus astronomicis, sacris quoque Bibliis, &c. In the same year was published the first map on Mercator's well-known projection, with the parallels and meridians at right angles, for use in navigation. At Cologne, in 1578, appeared his Tabule geographicx.ad mentem Ptolemei restitute et emend- atx. The work by which he is chiefly known is his atlas, published in 1594 at Duisburg, in folio, under the title of Atlas, sive Cosmographice meditationes de fabrica mundi. It contains, besides the maps, cosmographical and other dissertations, some of the theological views in which were condemned as heretical ; it was completed by Hondius in 1607. Several of the maps had been previously published separately, the atlas being delayed to allow Ortelius to complete his. Mercator also published in 1592 a Har- moma Hvangeliorum.

MERCURIAL AIR-PUMP. This name is given to two distinct instruments, one of which is founded on statical, the other on hydrodynamical principles.

1. The Statical Pump.—The famous spiritualist Sweden- borg was the first to conceive an air-pump in which a mass of mercury, by being made to rise and fall alternately within a vertical vessel, should do the work which in the ordinary instrument is assigned to the piston. He pub- lished a description

of his pump in 1722; but it is questionable whether his design was ever realized. Of numerous subsequent inventions the only one which, in fact, has survived is the admirably simple and yet efficient instrument first described in 1858, but constructed some

time before, by H. Geisler of Bonn, which at once, and justly, met with universal acceptance.

The general scheme of Geisler's pump is shown in fig. 1. A and B are pear-shaped glass vessels connected by a long narrow india-rubber tube, which must be sufficiently strong in the body (or strengthened by a linen coating) to stand an outward pressure of 1 to 14 atmospheres. A terminates below in a harrow vertical tube c, which is a few inches longer than the height of the barometer, and to the lower end of this tube the india-rubber tube is attached which connects A with B. To the upper end of A is soldered a glass two- way stop-cock, by turning which the vessel A can either be made to com- municate through s and a hole in the hollow cock with the vessel to be ex- hausted (I., fig. 2), or through g with the atmosphere (IL, fig. 2), or can be shut off from both when the cock holds an intermediate position. The apparatus, after having been carefully cleaned and dried, is charged with pure and dry mer- cury, which must next be worked back- wards and forwards between A and B to remove all the air-bells. The air is then driven out of A by lifting B toa sufficient level, turning the cock into position IL, and letting the mercury flow into A until it gets to the other side of the stop-cock, which is then placed in the intermediate pesi- tion. Supposing the vessel to be exhausted to have already been securely connected with b, we now lower the reservoir B so as to re- duce the pressure in A sufficiently below the tension in the gas to be sucked in, and, by turning the cock into position I., cause the gas to expand into and al- most fill A. The cock is now shut against both a and 6, the reservoir lifted, the gas contents of A discharged through a, and so on, until, when after an exhaustion mer- cury is let into A, the metal strikes against the top without interposition of a gas-bell. In a well-made apparatus the pressure in the exhausted vessel is now reduced to 5); or 5 of a milli- metre, or even less. An absolute vacuum

cannot be pro- duced on account of the unavoidable air-film between the mercury and the walls of the apparatus.

Fria. 1.—Geisler’s Mercurial Air-Pump.

Fig, 2.—Arrangements of Stop-Cock in Air-Pump.

The great advantage of the mercurial over the ordinary air-pump is that it evacuates far more completely than the latter, that it affords direct and unmistakable evidence of the exhaustiveness of its work, and—last not least—that it enables one to transfer the gas sucked out to another vessel withont loss or contamination, so that it can be measured and analysed. On account of this latter feature more especially, the instrument is highly valued as an auxiliary in gasometric researches. Without it the researches on which rests our present knowledge of the gases of the blood could not have been carned out. The actnal instrument, as constructed for various kinds of work, has of course various complexities of detail omitted in the above description. For these the reader must refer to hand- books of practical physiology.

As it takes a height of about 30 inches of mereury to balance the pressure of the atmosphere, a Geisler pump necessarily is a somewhat long-legged and unwieldy instrument. It can be eon- siderably shortened, the two vessels A and B brought more closely together, and the somewhat objectionable india-rubber tube be dis- pensed with, if we connect the air-space in B with an ordinary air- pump, and by means of it do the greater part of the sucking and the whole of the lifting work. An instrument thus modified was eonstructed by Poggendorff (see his Annalen, vol. exxv. p. 151, 1865), and another, on somewhat different principles, by Prof. Dittmar (see the ‘‘ Challenger” Reports).

Even a Geisler’s stop-eoek requires to be lubricated to be abso- lutely gas-tight, and this occasionally proves a nuisance. Hence a number of attempts have been made to do without stop-cocks alto- gether. In Topler’s pump! this is attained by using both for the inlet and the outlet vertical eapillary glass tubes, soldered, the former to somewhere near the bottom, the latter to the top of the vessel. These tubes, being more than 30 inches high,

obviously act as efficient inercury-traps ; but the already considerable height of the pump is thus multiplied by two, This consideration has led Alexander Mitscherlich (Pogg. Ann., cl. 420, 1873), and quite lately F. Neisen (2. f Instrumentenkunde, 1882, p. 285) to intro- duce glass valves in lieu of stop-eocks. As glass floats on mercury, such valves do not necessarily detract from the exhaustive power of the pump.

2. The Dynamic Pump.—This was invented in 1865 by H. Sprengel. The instrument, in its original (simplest) form (fig. 3), consists of a vertical – capillary glass tube a of about 1 mm. bore, provided with a lateral branch 6 near its upper end, which latter, by an india- rubber joint governable by a screw- clamp, communicates with a funnel. The lower end is bent into the shape of a hook, and dips into a pneumatic trough. The vessel to be exhausted is attached to 0, and, in order to extract its gas contents, a properly regulated stream of mer- cury is allowed to fall through the vertical tube. Every drop of mer- cury, as it enters from the funnel, entirely closes the narrow tube like a piston, and in going past the place where the side tube enters entraps a portion of air and carries it down to the trough, where it can be collected. If the vertical tube, measuring from the point where the branch comes in, is a few inches greater than the height of the barometer, and the glass and mer- cury are perfectly clean, the apparatus slowly but surely produces an almost absolute vacuum.

The great advantages of Sprengel’s pump lie in the simplicity of its construction and in the readiness with which it adapts itself to the collecting of the gas. It did excellent service in the hands of Graham for the extraction of gases occluded in metals, and since then has become very popular in gas-laboratories, especially in Britain. Many improvements upon the original construction have been proposed. One of these which deserves mention is to pass the mercury, before it enters the “falling” tube, through a bulb in which a good vacuum is maintained, by means of an ordinary air- pump or a second “ Sprengel.” (W. D.)

MERCURY was the Roman god who presided over barter, trade, and all commercial dealings. His nature is probably more intelligible and simple than that of any other Roman deity. His very name, which is connected with merzx, mercator, &c., shows that he is the god of merchandise and the

patron of merchants. In the native Italian states no merchants and no trade existed till the influence of. the Greek colonies on the coast introduced Greek customs into the cities of the land. All the usages

Fic. 3.—Sprengel's Air-Pump.

1 See Dingler's Polytechn. Journal, 1862 ; an improved form by Bessel-Hagen is described in Wiedemann's Annalen, xii, 425, 1881.

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and terminology of trade, and all the religious ceremonies connected with it, were borrowed by the Romans from the Greeks. It was no doubt under the rule of the Tarquins, when the prosperity of the state and its intercourse with the outer world were so much increased, that merchants began to ply their trade in Rome. Doubtless the merchants practised their religious ceremonies from the first, but their god Mercurius was not officially recognized by the state till the year 495 B.c. Rome frequently suffered from scarcity of corn during the unsettled times that followed the expulsion of the Tarquins. Various religious innovations were made to propitiate the gods; in 496 the Greek worship of Demeter, Dionysus, and Persephone was established in the city (see LipER), and in 495 the Greek god Hermes (¢.v.) was introduced into Rome under the Italian name of Mercurius (Livy, ii. 21, 27). Preller thinks that at the same time the trade in corn was regu- lated by law, and a regular college of merchants was instituted. This collegiwm was under the protection of the god; their annual festival was on the Ides of May, on which day the temple of the god had been dedicated at the southern end of the circus maximus, near the Aventine ; and the members were called mercuriales as well as mercatores. 'The Ides of May was chosen as the feast of Mercury, obviously because Maia was the mother of Hermes, 7.¢., of Mercury (see Maia); and she was wor- shipped along with her son by the mercuriales on this day. According to Preller, this religious foundation had a political object ; it established on a legitimate and sure basis the trade between Rome and the Greek colonies of the coast, whereas formerly this trade had been exposed to the capricious interference of the Government officials for the year. Like all borrowed religions in Rome, it must have retained the rites and the terminology of its Greek original (Festus, p. 257). Mercury became the god, not only of the mercatores and of the corn trade,

but of buying and selling in general; and it appears that, at least in the streets where shops were common, little chapels and images of the god were erected. There was a spring dedicated to Mercury between his temple and the Porta Capena; every shopman drew water from this spring on the Ides of May, and sprinkled it with a laurel twig over his head and over his goods, at the same time entreating Mercury to remove from his head and his goods the guilt of all his deceits (Ovid, Fastt, v. 673 sg.). The art of the Roman tradesman was evidently like that of an Oriental tradesman in modern times, and the word mercurialis was popularly used as equivalent to "cheat." In the Latin poets Mercury is often gifted with some of the manifold characters of the Greek Hermes, but this finer conception seems to have had no real existence in Roman religion.

Roman statucttes of bronze, in which Mercnry is represented, like the Greek Hermes, standing holding the cadueeus in the one hand and a purse in the other, are exeeedingly eommon. The eaduceus must have been introduced as a symbol of Mercury at a very early time, for it is found on Italian coins as early as the 4th eentury before Christ, and we learn that several were kept as sacred objects in the adytum of the sanctuary at Lavinium (Dion. Hal., i. 67). But its foreign origin is shown by the fact that, although it was a sign of peace, it was never borne by the fetiales, the old Italian heralds. The very name is derived from the Greek xnpdxecov. Preller's view (Rom. Myth.) that mercuriales and mercatores are the same guild is a tempting one, but its truth is very doubtful. Mommsen thinks that mercuriales were a purely local guild, viz., the pagani of the Circus valley.

MERCURY, in chemistry, is a metal (symbol Hg) which is easily distinguished from all others by its being liquid at even the lowest temperatures naturally occurring in moderate climates. To this exceptional property it owes the synonyms of quicksilver in English (with the Germans quecksilber is the only recognized name) and of hydrar- gyrum (from t8wp, water, and épyupos, silver) in Greeco-Latin.

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This metal does not appear to have been known to the ancient Jews, nor is it mentioned by the earlier Greek writers. Theophrastus (about 300 B.c.) mentions it as a derivative of cinnabar. With the alchemists it was a

substance of great consequence. Being ignorant of its susceptibility of freezing into a compact solid, they did not recognize it as a true metal, and yet, on the authority of Geber, they held that mercury (meaning the predominating element in this metal) enters into the composition of all metals, and is the very cause of their metallicity. When, about the beginning of the 16th century, chemistry and scientific medicine came to merge into one, this same mysterious element of “mercury ” played a great part in the theories of pathology ; and the metal, in the free as in certain combined states, came to be looked upon as a powerful medicinal agent, which position, on purely em- pirical grounds, it continues to hold to the present day.

Mercury occurs in nature chiefly in the form of a red sulphide, Hg, called cinnabar, which, as a rule, is accom- panied by more or less of the reguline metal,—the latter being probably derived from the former by some secondary reaction, The most important mercury mines in Europe are those of Almaden in Spain and of Idria in Mlyria ; these until lately furnished the bulk of the mercury of commerce, but they are now almost eclipsed by the rich deposits of New Almaden in California. Considerable quantities of mercury are said to be produced in China and in Japan ; minor deposits are being worked in the Bavarian Palatinate, in Hungary, Transylvania, Bohemia, and Peru. At Almaden the ore forms mighty veins traversing micaceous schists of the older transition period; in Illyria it is dis- seminated in beds of bituminous schists or compact lime- stone of more recent date.

Chemically speaking, the extraction of mercury from its ores is a simple matter. Metallic mercury is easily vola- tilized, and separated from the gangue, at temperatures far below redness, and cinnabar ata red heat is readily reduced to the metallic state by the action of iron or lime or atmospheric oxygen, the sulphur being eliminated, in the first case as sulphide of iron, in the second as sulphide and sulphate of calcium, in the third as sulphurous acid gas. To the chemical mind a close iron retort would suggest itself as the proper kind of apparatus for carrying out these operations, but this idea is acted wpon only in a few small establishments, —for instance, in that of Zwei- briicken in the Palatinate, where lime is used as a decom- posing agent. In all the large works the decomposition of

the cinnabar is effected by the direct exposure of the ore to the oxidizing flame of a furnace, and the mercury vapour, which of course gets diffused through an immense mass of combustion gases, is sought to be recovered in more or less imperfect condensers.

At Almaden this roasting distillation is effected in prismatic furnaces, which, by a second upper (brick) grating are divided into two flats, the lower one serving for the generation of a wood fire, while the upper accommodates the ore, which is introduced through an opening in the dome-shaped roof. To avoid an excessive dilu- tion of the mercury vapour with combustion gases, part of these are led out laterally into a chimney and the rest allowed to strike up through the heap of ore. The large mass of metalliferous vapour produced passes out through a system of pipes inserted laterally into the dome and so arranged that they follow first a descending and then an ascending plane, to lead ultimately into a condensation chamber which communicates in its turn with a chimney. The pipes are formed each of a large number of elongated pear-shaped carthenware adapters (called aludels), which are telescoped into one another as in the case of the iodine-distillation apparatus, the joints being luted with clay. The lowest row of aludels, which Tie in the line of intersection of the two inclined planes, are pierced with holes below, so that what arrives as liquid mercury there runs out into a gutter leading to a reservoir. What of mercury vapour remains uncondensed in the aludels passes into the chamber, the intention being to have it condensed there ; in reality a large proportion of the mercury passcs out through the chimney (and

through the numerous leaks in the aludels) into the atmosphere to poison the surrounding vegetation and the workmen. Similar furnaces to the Almaden ones are used in Idria and at New Almaden; only the condensation apparatus are a little less im- perfect. But in all three places the loss of metal is very consider- able; at New Almaden it is said to amount to close upon 40 per cent.

The mercury obtained is purified mechanically by straining it through dense linen bags, and then sent out into commerce in leather bags, or in wrought-

iron bottles provided with screw plugs, each holding about 75 tb avoirdupois.

According to Balling's Metallurgische Chemie (Bonn, 1882), the production of mercury in the years named was as follows :—

Austria, exclusive of Hungary (1880).....0.0008 369 tons. IBhmNgUIy (TEI) cgnoaennanihdooabanaranonnantonEppndenno0eds si) bp Ma irons. « RUS» vont cidseetne vase Ses 02 OMS oe ds GD, JORDIN. (USS) scpocoonese: eaonon003 cape sap aoc0dbeHononaaGabo 929 =~, UWiniitedSs tatest (USO ica cts siccureidanacatemenss «05% 2054) 5

Assuming the amount to be the same from year to year, this gives a total of 3587 tons.

The price of the metal is subject to immense fluctuations ; it generally ranges from 2s. to 7s. 6d. a pound avoirdupois.

Commercial mercury, as a rule, is very pure chemically, so that it needs only to be forced through chamois leather to become fit for all ordinary applications ; but the metal, having the power of dissolving most ordinary other metals, is very liable to get contaminated with these in the labora- tory or workshop, and requires then to be purified. For this purpose a great many chemical methods have been proposed, which, however, all come to this, that the base admixtures are sought to be removed by treatment with nitric acid, oil of vitriol, or other agents which act preferably on the impurities. The best of these methods is that of Briithl, who shakes the metal with a solution of 5 grammes of bichromate of potash and a few cubic centi- metres of sulphuric acid in one litre of water, until the red chromate of mercury, first produced, has disappeared, and its place been taken by green chromic sulphates. The supernatant liquor and chromic scum are washed away by a powerful jet of water, and the clean metal is dried and filtered through a perforated paper filter. 'The only really exhaustive method is redistillation out of a glass apparatus. Unfortunately the operation is difficult of execution, as mercury "bumps" badly on boiling; but this can be avoided by distilling the metal in a perfect vacuum. An ingenious apparatus for this purpose, in which the distilled metal itself is made to keep up the vacuum, was con- structed lately by Leonhard Weber. A U-tube, the limbs

of which are longer than the height of the barometer, is filled with pure mercury, and inverted, the one linb being made to dip into a vessel with pure, the other into another containing the impure, mercury. This second limb is inflated above so that the meniscus is about the middle of the bulb. This bulb is heated, and the conse- quence is that the metal there distils over into the first limb to add to the supply of pure metal, the impure rising up in the second by itself to maintain a constant level. Dewar has modified the apparatus so that there is no need of a supply of pure metal to start with. Absolutely pure mercury does not at all adhere to any surface which does not consist of a metal soluble in mercury. Hence the least quantity of it, when placed on a sheet of paper, forms a neatly rounded-off globule, which retains its form on being rolled about, and, when subdivided, breaks up into anumber of equally perfect globules. The presence in it of the minutest trace of lead or tin causes it to “draw tails.” A very impure metal may adhere even to glass, and ina glass vessel, instead of the normal convex, form an irregular flat meniscus.

Properties.—The pure metal is silver-white, and retains its strong lustre even on long exposure to ordinary air. At – 3878 C., ae, — 37°°9 F. (Balfour Stewart), it freezes,

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with considerable contraction, into a compact mass of regular octahedra, which can be cut with a knife and be flattened under the hammer. The specific gravity of the frozen metal is 14°39; that of the liquid metal at 0° C. is 13595 (water of 4° C.=1). Under 760 mm. pressure it boils at 357°°3 C. (675°‘1 Fahr.) (Regnault). At very low temperatures it seems to be absolutely devoid of volatility (Faraday); but from — 13° C. upwards (Regnault) it exhibits an appreciable vapour tension.

The following table gives the tensions ‘“‘»,” in millimetres of mercury of 0° C., for a series of centigrade temperatures “¢” according to Regnault :—

t= 0° 10° 20° HO, ~1CO> 150° 200° p= 02 08 04 ‘11 “75 4°27 19°90 tape” 300° 350° 400° 450° 500° p=715°75 242°1 663°2 1588 3384 6520

According to the same authority, its average coefficient of expansion / per degree C. is as follows : —

0-100° C. 0-200° C. 0-300° C. k= 0001815 *0001841 0001866 or 1/5510 1/5482 1/5359

Its specific heat in the liquid state is ‘03332; that of the frozen metal (between —78° and – 40° C.) is 0319 (Regnault). Its electric conductivity is ;’, of that of pure silver (Matthiesen). Its conductive power for heat is greater than that of water, and is proved (by Herwig) to be perfectly constant from 40° to 160°C. Its vapour density (air of the same temperature and pressure = 1) is 6-976 (Dumas), or 100:93 for hydrogen=1. Hence its molecular weight (H,=2) is 201:86. The atomic weight, by chemical methods, was found= 200-0 (Erdmann and Marchand) ; hence mercury-vapour molecules consist of single atoms. Mercury does not appreciably absorb any chemically inert gas.

Mercury is in constant requisition in the laboratory. It is used for the collecting and measuring of gases, in the construction of thermometers, barometers, and manometers, for the determination of the capacity of vessels, and many other purposes. In medicine it serves for the preparation of mercurial ointment and of “hydrargyrum cum creta” (the chief component of “blue ‘pills”); both are obtained by diligently triturating the metal with certain proportions of grease and chalk respectively until it is “ deadened,” 2.e., subdivided into invisibly small globules (see below).

Alloys.—Mercury readily unites directly with all metals (except iron and platinum) into what are called amalgams. In some cases the union takes place with considerable evolution of heat and large modification of the mean pro- perties of the components. Thus, for instance, sodium when rubbed up with mercury unites with it with deflagra- tion and formation of an alloy which, if it contains more than 2 per cent. of sodium, is hard and brittle, although sodium is as soft as wax and mercury a liquid. Liquid amalgams of gold and silver are employed for gilding and silvering objects of copper, bronze, or other base metal. The amalgam is spread out on the surface of the object by means of a brush, and the mercury then driven off by the application of heat, when a polishable, firmly adhering film of the noble metal remains. Copper amalgam containing from 25 to 33 per cent. of

the solid metal, when worked in a mortar at 100° C., becomes highly plastic, but on standing in the cold for ten or twelve hours becomes hard and crystalline. Hence it is used for the stuffing of teeth. A certain amalgam of cadmium is similarly employed.

Oxides.—There are two oxides of mercury, namely, an oxide, Hg,0, called mercurous, and another, HgO, called mercuric oxide. The latter can be produced directly by kecping the metal for a long tine in air at a temperature somewhat below its boiling point,

when the oxide is gradually formed as a red powdery solid. This solid has long been known as “red precipitate,” or as mercwrius

Uh ¥ 33

precipitatus per se. Priestley made the important discovery that the “precipitate” when heated to dull redness is reduced to metal, with evolution of what has since been known as oxygen gas; but it was reserved for Lavoisier to correctly interpret this experiment, and thus to establish our present views on the constitution of atmospheric air. The oxide is easily prepared by heating any nitrate of the mctal as long as nitrous fumes are seen to go olf (when it remains as a scaly mass, black when hot, red after cooling), or clse by precipitating the solution of a mercuric salt with excess of caustic potash or soda, when it comes down as an amorphous yellow precipitate, which is free of combined water. Mercurous oxide, a black solid, can be obtained only indirectly, by the decom- position of mercurous salts with fixed causticalkalies. Both oxides are insoluble in water, but dissolve in certain, and combine with all, aqueous acids with formation of mercury salts and elimination of water. Thus, for iustance, Hg,0 + 2HNO;=H,0 + Hg,(NO,)., Mercurous nitrate HgO + 2HNO;=H,0 + Hg(N O,),. Mercuric nitrate.

The Nitrates.—When metallic mercury is set aside with its own weight of nitric acid of 1:2 specific gravity, at ordinary tempera- tures, the normal mercurons salt Hg,(NOs), is gradually produced, and after a day or two is found to have separated out in colourless crystals. These are soluble (somewhat sparingly) in water acidu- lated with nitric acid, but are decomposed by the action of pure water, with formation of difficnltly

soluble basic salts. When this salt (or the metal itself) is treated with excess of nitric acid it is oxidized into mercuric nitrate Hg(NOg)o, a white crystalline salt, readily soluble in water without decomposition.

The Sulphates.—Cold aqueous sulphuric acid does not act upon mercury, but the hot ee roctmatel acid converts it first into mercnrous and then into mercuric sulphate, with evolution of sulphurous acid.

Hg, + 2H,SO,=2H,0 + SO, + Hg,S0,, Hg,SO, + 2H,SO,=2H,0+S0,+2HgS0,.

Both salts form white erystalline magmas. The mercurous salt is difficultly soluble in water, and consequently producible by precipitation of the nitrate with sulphuric acid. The mercuric salt, when treated with water, is decomposed with formation of a ycllow insoluble basic salt, which has long been known as turpethum mine- rale. Its composition is SO,. 3HgO when produced by excess of hot water. Mercuric sulphate is of importance chiefly as forming the basis for the manufacture of the two chlorides.

The Chlorides. —These are both extensively used medicinal agents. The mercuric salt, HgCl,, known in medicine as corrosive sub- liniate, is prepared by mixing the sulphate intimately with common salt, and subjecting the mixture to sublimation, a little binoxide of manganese being added to oxidize the mercurous salt, which is generally present as an impurity. The process is conducted in a glass flask buried in a hot sand-bath. When the decomposition is accomplished, the sand is removed from the upper half of the flask and the temperature raised so that the chloride HgCl, produced sublimes up and condenses in the upper part as a "'sublimate." The salt, as thus produced, forms compact crystalline crusts, which, when heated, melt into a limpid liquid before volatilizing. It is soluble in water, 100 parts of which at 10°, 20°, 100° dissolve 6°57, 7°39, 54 parts of salt. Corrosive sublimate dissolves in 3 parts of alcohol and in 4 parts of ether. This salt, on account of its solubility in water, is a deadly poison. Mercurous chloride, Hg,Cl., better known as ''calomel" (from «adds, fair, and péaas, black, because it becomes dead-black when treated with ammonia, nicr- curic chloride yielding a white product), is prepared by mixing corrosive sublimate with the proper proportion of metallic mercury (HgCl, : Hg) or mercuric sulphate with salt and mercury in the proportions of HgSO, : Hg : 2NaCl, and subjecting the mixture to sublimation in glass

flasks. The salt Hg,Cl, is thus obtained in the form of white, opaque, crystalline crusts, which, when heated, volatilize, without previously melting, into a mixture of HgCl, and Hg vapour, which, on cooling, recombine into calomel. Tor medicinal purposes the sublimate is reduced to an impalpable powder, washed with water to remove any corrosive sublimate that may be present, and dricd. Being insoluble in water, it acts far less violently on the organism than mercuric chloride does. Its action, no doubt, is due to its very gradual conversion in the stomach into mercury and corrosive sublimate. Finely divided calomel can be produced, without trouble, by the precipitation of a solution of mercurous nitrate with hydrochloric acid or common salt; but this preparation is liable to be contaminated with mercurous nitrate, and, even when pure, has been found to act far more violently than ordinary calomel does. Hence its use is not tolerated by the pharmacopmias. According to Wohler a mercurous chloride, more nearly equivalent to the sublimed article, is produc- ible by heating corrosive sublimate solution with sulphurous acid—

2HeCl, + H,S0,+ H,O=H,S0, + 2HCl+ Hg,Clo. RV = 5

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The writer is unable to say whether Wohler’s calomel has ever found its way anywhere into medicinal practice.

The Iodides.—The mercuric salt Hgl, is produced in two ways, viz., first by mixing the two clementary components intimately and subjecting the mixture to sublimation, and secondly by pre- cipitating corrosive sublimate solution with its exact equivalent of iodide of potassium. In the first case the salt is obtained in yellow erystals, which, on the slightest touch with a solid body, assume and then permanently retain a rich scarlet colour. The precipita- tion process at once yields the scarlet salt. The salt is insoluble in watcr, but soluble in alcohol and in iodide of potassium solution. The mercurous salt Hg,I, is obtained by precipitating mercurous nitrate with iodide of potassium as a dirty-green powder insoluble in water. Both iodides are used medicinally.

The Sulphides.—Mercurous sulphide, Hg,S, does not scem to exist. ‘he mercuric salt, HgS, exists in two modifications, of which one is amorphous

and has a black colour, while the other is erystalline and red. The black one is obtained by precipitation of solutions of mercuric salts with excess of sulphurctted hydrogen, or by direct synthesis. The right proportions of mercury and flowers of sulphur are rubbed together in a mortar until the whole is converted into a jet-black uniform powder. This preparation (the wthiops mineralis of the pharmaceutist), however, is apt to be contaminated with uncombined sulphur and mercury. Application of a gentle heat causes exhanstive combination. The red sulphide, HIg8S, occurs in nature as cinnabar, and can be produeed artificially from the black. The artificial preparation, known as vermilion, is highly valued as the most brilliant, stable, and innocuous of all mineral red pigments. Vermilion can be produced from the black sulphide in two ways, viz., first by sublimation, and secondly by treatment of it with fixed alkaline sulphide solution. According to Brunner, 100 parts of mercury are mixed intimately with 38 parts of flowers of sulphur, and the «thiops is digested, with constant agitation, in a solution of 25 parts of potash in 150 parts of water at 45°C. (the water lost by evaporation being constantly replaced), until the preparation has come up to its maximuin of fire and brilliancy, which takes a good many hours. Purely sublimed vermilion has a comparatively dull colour, aud must be manipulated with alkaline sulphide solution to give it the necessary fire. The action of the alkaline sulphide consists probably in this, that it dissolves succes- sive instalments of the amorphous preparation and redeposits them in the crystalline form.

Mereuric Derivatives of Anvmonia.—(1) Recently precipitated oxide HgO is digested, cold, in carbonic-acid-frce ammonia, and the mixture allowed to stand for a few days. The liquor is then decanted off, and the precipitate washed with alcohol and then with ether, and dried over sulphuric acid. The product is a yellow solid base (“ Millon’s base”) of the composition

IN al + 4HgO + H,O — N.Hg,0 . 2H,O + 2H,O .

It is insoluble in alcohol and in ether, and requires 18,000 parts of cold water for its solution. It readily unites with all acids, forming salts, which, as a rule, are insoluble in water. Hence all ordinary salt solutions, when shaken with the base, are decomposed with eliniination of the base of the

salt. Thus, for instance, even such salts as alkaline nitrates, chlorides, or sulphates are decom- posed with formation of solutions of caustic alkali,

(2) A body N,He,I,+2H,0, @.¢., of the composition of the iodide corresponding to the oxide in (1), is produced as a brown precipitate when ammonia oran ammonia salt is added to a solution of mercuric iodide in iodide of potassium mixed with large excess of caustic potash or soda (“ Nessler’s reagent”). In very dilute solutions of ammonia Nessler’s reagent produces only a brown or yellow color- ation, which, however, is so intense that soypogoth of ammonia in about 50 cubic centimetres of liquid becomes clearly visible.

(3) The chloride NH,Hg. Cl of the “‘ammonium” NH,Hg is produced as au insoluble white precipitate when ammonia is added to a solution of corrosive sublimate. This substance is known in medicine as infusible white precipitate, in contradistinction to (4).

(4) The fusible white precipitate was at one time supposed to be identical with (3), and is obtained by boiling it with sal-ammoniac solution. Its composition is NH,HgC1+NH,Cl=N,H,. Hg. Cl,.

Analysis.—Any ordinary solid mercury compound, when heated in a sublimation tube with carbonate of soda, yields a sublimate of metallic mercury, which, if necessary, needs only to be scraped together with a wooden spill to unite into visible globules. From any mercury-salt solution the inetal is precipitated by digestion with a piece of bright copper-foil. The precipitated mercury forms a coat- ing on the copper, which becomes silvery on being rubbed with blotting paper. When the quicksilvered copper is heated in a sub- limation tube, it reassumes its red colour with formation of a sub- limate of mercury.

Solutions of mercurous salts with hydrochloric acid give a white precipitate of calomel, which, after filtration, is easily identified by its becoming jet-black on treatment with ammonia. From mercuric solutions hydrochloric acid precipitates nothing; but stannous chloride, in its twofold capacity as a chloride and a reducing agent,

yields a precipitate of calomel. On addition of an excess of reagent the precipitate becomes grey through conversion into finely divided quicksilver. Sulphuretted hydrogen, when adied very gradually to an acid mercuric solution, gives at first an almost white precipi- tate, which, on addition of more and more reagent, assuines suc- cessively a yellow, orange, and at last jet-black colour. ‘The black | precipitate is HgS, which is identificd by its great heaviness, and by its being insoluble in boiling nitric and in boiling hydro- chlorie acid. A mixture of the two (aqua regia) dissolves it as chloride. (W. D.)

Therapeutics of Mercury.

The use of mercury as a therapeutic agent is of com- paratively recent date. To the Greeks and Romans its value was unknown, and the Arabian physicians only used it for skin affections. It was not till the middle of the 16th century that the special properties of mercury were fully appreciated, but since that time the metal has con- tinued to hold a high though fluctuating value as a medicine. At first the metal in a finely divided state or in vapour was used ; but very soon its various compounds were found to be endowed with powers even greater than those of the metal itself, and with the discovery of new compounds the number of mercurial medicines has largely increased. .

The preparations now in use may be thus classified. (1) Of the preparations containing metallic mercury the chief members are blue pill (pilula hydrargyri), grey powder (hydrargyrum cum creta), and blue ointment (unguentum hydrargyri). The first consists of mercury, liquorice root, and confection of roses, the second of mercury and chalk, the third of mercury, suet, and lard. The power of the three preparations seems to depend on the fine state of subdivision of the mercury they contain; mercury in its ordinary liquid state seems devoid of medicinal properties. It is thought by some that the fine subdivision of the metal leads to the formation of a little oxide, and that the efficacy of the preparations in part depends on this. (2) Three oxides of mercury are employed in medicine,—the red, from which is made red precipitate ointment (unguen- tum hydrargyri oxydi rubri), the yellow, an allotropic form of the red, and the black oxide. The yellow and black oxides suspended in lime water form respectively yellow and black

wash (lotio flava and lotio nigra). (3) The chlorides of mercury form a very important group: calomel (hydrargyri subchloridum) is a white heavy powder ; corrosive sublimate (hydrargyri perchloridum) is a heavy crystalline substance. (4) Two iodides are used

medicinally ; they are known from their colour as the

green and red iodides. (5) Nitrate of mercury enters into the composition of a powerful caustic known as the acid nitrate of mercury. It is also the active principle of citrine ointinent (unguentum hydrargyri nitratis). (6) In this class only ammoniated mercury and its ointment commonly known as white precipitate ointment, are contained. Of the many compounds not included in the above classifica- tion the oleate and albuminate are the most important.

Mercurial preparations are largely employed as external appli- cations. Several of them are potent agents for the destruction of the lower forms of animal life, and hence are employed to destroy parasites having their habitat in skin, hair, and clothing. ‘I’he white and red precipitate ointments are specially effective in the destruction of pediculi, and blue ointment is occasionally used for the same purpose. Corrosive sublimate is, however, the most energetic of the mercurial parasiticides, and recent obscrvations seem to show that it is superior to almost all other substances as a germ destroyer. It is sometimes used to get rid of ringworm. It should be remembered that corrosive sublimate is a powerful irritant to the skin, and also an active poison.

Acid nitrate of mercury is a caustic, and by it warts and small growths are sometimes removed ; it is also one of the caustics occa- sionally applied to prevent the spread of lupus.

In skin diseases snercurial preparations are largely used, especially in some forms of eczema. A few grains of the red oxide or of ammoniated mercury in an ounce of zinc ointment are often found of great service in this ailment; citrine ointment is also useful.

Calomel ointment is not irritating, but rather tends to soothe. It is therefore sometimes applied to irritable rashes ; in pruritus ani it is of special value. Mereurial preparations are not usually found of benefit in sealy eruptions. In acne a weak solution of corrosive sublimate is often most effeetive.

Preparations of mercury are often used to heal ulcers, especially those of syphilitie origin. Black wash is one of the commonest applications for this purpose. The red oxide ointment is at times employed to stimulate indolent ulcers, and it. is capable of remov- ing exuberant granulations (proud flesh), which sometimes retard the healing of wounds.

Mereury is largely used externally to promote the absorption of

inflammatory products, especially in the neighbourhood of joints. The blue ointment is frequently employed for this purpose, more rarely a plaster containing mercury or a mercurial liniment. Yor effecting the absorption of goitre (Derbyshire neck) the ointment of the red iodide is often relied on, especially in India, where it is eustomary to expose the patient's neck to the sun after rubbing it with the ointment. In enlargements of the liver and spleen the applieation of mercurial ointment sometimes secms to promotc re- duction in size.

Taken internally in coutinucd doses, mereury produces a peculiar effect known as salivation. First a metallic taste is experienced ; this is followed by soreness of the gums, an undue flow of saliva, and feetor of the breath. Further administration of the drug may increase greatly the salivary flow, and also lead to swelling of the tongue, ulceration of the mouth, and even disease of the jaw-bone. At the same time the blood becomes impoverished, and feverishness with loss of flesh occurs. A single large dose—rarely too a single small dose—may produce some of the above symptoms. They may also follow the inhalation of the metal or its compounds, or their absorption through the skin. The long-continued inhalation of the vapour of mercury acts likewise on the nervous system, caus- ing a peculiar kind of trembling. Mercurial tremor 1s sometimes seen in looking-glass makers, often in those who work in quick- silver mines.

Internally mercury is eliefly given for two purposes—(1) to check inflammation and cause the absorption of the products it gives rise to, and

(2) to antagonize the syphilitie virus and remove the evils it eauses. Some years ago the belicf in the power of mercury to control inflammation was almost universal, and it was largely administered in almost all inflammatory affeetions, but of late it has been much less used, both because it seems doubtful whether it has really the power it was once supposed to have and because of the possibility of evil results froin its continued use. In peritonitis and iritis it is still often employed, small doses of ealomnel being given. Not unfrequently too it is administered in pericarditis and hepatitis, but in pneumonia, pleurisy, and most other inflammatory affections its use is now disearded by many physicians. As an antidote to the syphilitic poison it is still held in high esteem, though opinions vary mueh as to the extent of its power. There can be little doubt that, given in an early stage of the disorder, it minimizes the secondary symptoms; but it eannot be relied on to prevent their oceurrenec. It aids in removing the secondary symptoms, and tends to the avoidance of tertiary manifestations, which nevertheless sometimes occur even when inercury has been freely given. The eustom of giving mercury till profuse salivation is established has long been abandoned ; the aiin now is so to give it as to prevent salivation occurring ; for this purpose blue pill, calomel, and corrosive sublimate are given in very small doscs, but if the gums become tender the dose is decreased or the administration stopped.

Mercurial treatment is sometimes earricd out by rubbing the blue ointment into the skin, sometimes by exposing the patient to the fumes of calomel ; syphilitie eruptions are often treated by such fumigation. More rarely mercury is introduced by injceting the albuminate or some other preparation under the skin or by means of suppositories. In children grey powder is generally used when mer- curial treatment is required. Children bear mercury well.

Blue pill, calomel, and grey powder are often used as purgatives, and a power of promoting the secretion of bile is attributed to them. Experimentally it has not been proved that they stimu- late the liver functions, but there is good reason for believing that they promote the expulsion of bile from the body. Grey powder is especially valued as a mild and efficient aperient for ehildren, and is often given in the early stage of diarrhoea to expcl the irritating contents of the bowel.

The use of ealomel in tropical dysentery, once very prevalent, has within the last few years been abandoned. (10), diy Ike)

MERGANSER, a word originating with Gesner (Z/ist. Animalium, iii. p. 129) in 1555, and for a long while used in English as the general name for a group of fish-eating Ducks possessing great diving powers, and forming the genus Mergus of Linnxus, now regarded by ornithologists as a Subfamily, Mergine, of the Family Anatede. The

Mergansers have a long, narrow bill, with a small but evident hook at the tip, and the edges of both man- dibles beset by numerous horny denticulations, whence in English the name of “Saw-bill” is frequently applied to them. Otherwise their structure does not much depart from the Anatine or Fuliguline type. All the species bear a more or less developed crest or tuft on the head. Three of them, Jfergus merganser or castor, M. serrator, and I. albellus, are found over the northern parts of the Old World, and of these the first two also inhabit North America, which has besides a fourth species, Jf. cucullatus, said to have occasionally visited Britain. J/. merganser, commonly known as the Goosander, is the largest species, being nearly as big as the smaller Geese, and the adult male in breeding-attire isa very beautiful bird, conspicuous with his dark glossy-green head, rich salmon-coloured breast, and the upper part of the body and wings black and white. This full plumage is not assumed till the second year, and in the meantime, as well as in the post- nuptial dress, the male much resembles the female, having, like her, a reddish-brown head, the upper parts greyish-brown, and the lower dull white. In this condition the bird is often known as the “Dun Diver.” This spccies breeds abundantly in many parts of Scandinavia, Russia, Siberia, and North America, and of late years has been found to do so in Scotland, usually making its nest in the stump of a hollow tree or under a slab of rock. Jf. serrator, com- monly called the Red-breasted Merganser, is a somewhat smaller bird; and, while the fully-dressed male wants the delicate hue of the lower parts, he has a gorget of rufous mottled with black, below which is a patch of white feathers, broadly edged with black. The male at other times and the female always much resemble the preceding. It is more numerous than the Goosander, with a somewhat more

southern range, and is not so particular in selecting a sheltered site for its nest. Both these species have the bill and feet of a bright reddish-orange, while JY. albellus, known as the Smew, has these parts of a lead colour, and the breeding plumage of the adult male is white, with quaint crescentic markings of black, and the flanks most beauti- fully vermiculated—the female and male in undress having a general resemblance to the other two already described —but the Smew is very much smaller in size, and, so far as is known, it invariably makes its nest in a hollow tree, as ascertained first by Wolley (Zbis, 1859, pp. 69 et seq.). This last habit is shared by Jf. cucullatus, the Hooded Merganser of North America, in size intermediate between M. albellus and M. serrator, the male of which is easily recognizable by his broad semicircular crest, bearing a fan- shaped patch of white, and his elongated subscapulars of white edged with black. The conformation of the trachea in the male of M. merganser, M. serrator, and M. cucullatus is very like that of the Ducks of the genus Clangula, but M. albellus has a less exaggerated development more resembling that of the ordinary Fuligula.1 From the southern hemisphere two species of MJergus have been described, Jf, octosetaceus or brasilianus, Vieillot (NW. Dees. @Hist. Naturelle, ed. 2, xiv. p. 222; Gal. des Otseaux,

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1 Hybrids between, as is presumed, Jf. albellus and Clangula glaucion, the common Golden-eye, have been described and figured (Eimbeck, /sis, 1831, 300, tab. iii. ; Brehm, Naturgesch. aller Vég. Deutschlands, p. 980; Naumann, Véq. Deutschlands, xii. p. 194, frontispiece ; Kjerbdlling, Jour. fiir Ornithologie, 1853, Extraheft, p. 29, Naumannia, 1853, p. 327, Ornithol. Danica, tab. lv., suppl. tab. 29) under the naines of Mergus anatarius, Clangula angustirostris, and Anas (Clangula) mergotdes, as though they were a distinct species ; but the remarks of M. de Selys-Longchamps (Bull. Ac. Se. Bruselles, 1845, pt. ii, p. 854, and 1856, pt. ii. p. 21) leave little room for doubt as to their origin, which, when the eryptogamic habit and common range of their putative parents, the former unknown to the author last- named, is considered, will seem to be still more likely.

tom. il, p. 209, pl. 283), inhabiting South America, of which but few specimens have been obtained, having some general resemblance to JZ. serrator, but much more darkly coloured, and Jf, australis, Hombron and Jacquemont (Ann. Sc. Nat. Zoologie, ser. 2, xvi. p. 320; Voy. au Pol Sud, Oiseaux, pl. 31, fig. 2), as yet known only by the unique example in the Paris Museum procured by the French Antarctic expedition in the Auckland Islands. This last species may perhaps be found to visit New Zealand, and should certainly be looked for there.

Often associated with the Mergansers is the genus Merganetta, the so-called Torrent-Ducks of South America, of which three species are said to exist; but they possess spiny tails and have their wings armed with a spur. Whether they should be referred to the Mergine or the Erismaturine—the Spiny-tailed Ducks proper—is a ques- tion that further investigation must decide. (A. N.)

MERGUT, a district of British Burmah, between 9° 58’ and 13° 24’ N. lat. It forms the southernmost district of the Tenasserim division, and is bounded on the N, by Tavoy, KE. and S. by Siam, and W. by the Bay of Bengal, with an area of 7810 square miles. Two principal ranges cross Mergui from north to south, running almost parallel to each other for aconsiderable distance, with the Tenasserim river winding between them till it turns south and flows through a narrow rocky gorge in the westernmost range to the sea, Amongst these mountain ranges and their subsidiary spurs are several fertile plains, densely clothed with luxuriant vegetation. the water’s edge to the loftiest mountain on the eastern boundary, may be regarded as almost unbroken forest, only 73 square miles being under cultivation. The timber trees found towards the interior, and on the higher elevations, are of great size and beauty, the most valuable being teak, then-gan (Hopea odorata), ka-ynyeng (Dipterocarpus tuber- culutus), &c. The coast-line of the district, studded with an archipelago of two hundred and seven islands, is much broken, and for several miles inland is very little raised above sea-level, and is drained by numerous muddy tidal creeks, Southwards of Mergui town it consists chiefly of low mangrove swamps alternating with small fertile rice plains. After passing the mangrove limits, the ground to the east gradually rises till it becomes mountainous, even to the banks of the rivers, and finally culminates in the grand natural barrier

dividing British Burmah from Assam, The four principal rivers are the Tenasserim, Le-gnya, Pakchan, and Palouk, the first three being navigable for a considerable distance of their course. Coal is found in the district on the banks of the Tenasserim and its tributaries. Gold, copper, iron, and manganese are also found in various parts of the district.

From the notices of early travellers it appears that Mergui, when under Siamese rule, before it passed to the Burmese, was a rich and densely peopled country. On its occupation by the British in 1824-25 it was found to be almost depopulated—the result of border warfare and of the cruelties exercised by the Burmese con- querors. At that time the entire inhabitants only nuinbered 10,000 ; in 1876 they had increased to 51,846 (26,767 males and 25,079 females). Classified according to religion, there were—Buddhists, 48,750 ; Mohammedans, 2533 ; Hindus, 3538 ; Christians and others, 210. The district contains only one town (Mergui) with more than 5000 inhabitants. Only 73 square miles of the district area were under cultivation in 1876, but this area is steadily though slowly increasing. The principal manufactures are sugar-boiling and tin- smelting. Mergui carries on a flourishing trade with Rangoon, Bassein, and the Straits Settlements. The chief exports consist of rice, rattans, torches, dried fish, areca-nuts, sesamum seeds, molasses, sea-slugs, edible birds' nests, and tin. The staple imports are piece goods, tobacco, cotton, earthenware, tea,and sugar. The imperial revenue in 1876 amounted to £18,208. The climate is remarkably healthy, the heat due to its tropical situation being moderated by land and sea breezes. The rainfall in 1876 amounted to 1654 inches. The prevalent diseases are simple and remittent fevers, bronchitis, rheumatism, and small-pox,

Indeed, the whole district, from

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Merrcut, chief town of the above district, is situated on an island at the mouth of the Tenasserim river. The population (10,731 in 1876-77) consists of many races— Talaings, Burmese, Malays, Bengalis, Madrasis, Siamese, and Chinese. Considerable trade is carried on with other Burmese ports and the Straits Settlements. The harbour admits vessels drawing 18 feet of water.

MERIDA, a city of 7390 inhabitants (1877), in the province of Badajoz, Spain, lies about 36 miles by rail eastward from Badajoz, on the Madrid and Badajoz line, on a small eminence on the right bank of the Guadiana. It is connected by a branch line of rail with Llerena on the south-east. The population is mostly agricultural. The city owes its interest entirely to its Roman remains, which are numerous and extensive. Of these one of the most important is the bridge of 81 arches of granite, erected by Trajan ; it is 2575 feet long, 26 feet broad, and 33 feet above the bed of the river; it was unfortunately seriously injured during the siege of Badajoz in 1812. Of the colossal wall that formerly surrounded the town all that remains is a fine fragment, built of dressed stone, on the spot formerly occupied by the castellum, and where the provisor of the order of Santiago afterwards had _ his residence (E] Conventual). In the town are some relics of temples of Diana, Mars, Fortuna, Jupiter, and others ; and the Arco de Santiago, 44 feet high, also dates from Trajan's time; it has unfortunately been stripped of its marble casing. Of the aqueduct from the laguna of Albuera thirty-seven enormous piers are still standing, with ten arches in three tiers built of brick and granite. To the east of the city is the circus, measuring some 1356 by 335 feet ; the eight rows of seats still remain. Further east- ward is the almost perfect theatre, and near it are the remains of the amphitheatre, or, as some prefer to call it, naumachia (Baiio de los Romanos).

Augusta Emerita was built in 25 B.c. by the emeriti of the fifth and tenth legions who had served in the Cantabrian war under Augustus. It rose to great splendour and importance as the eapital of Lusitania. During the Gothic period it beeame an episcopal see,

and several provincial councils known to history were held there. It was taken by Musa in 711, and reconquered by Alphonso in 1228.

MERIDA, the capital of the Mexican state of Yucatan, stands in a great plain in the north of the peninsula, on a surface of limestone rock, about 25 miles from the port of Progreso on the Gulf of Mexico, with which it is connected by a railway opened in 1880. It is a well-built city, with broad streets and squares ; and the flat-roofed stone houses, after the style introduced by the Spaniards, give a Moorish colour to the general view. Besides the cathedral, an im- posing edifice of the 16th century, the

bishop’s palace, and the Government house (all of which are situated in the prin- cipal square), the most notable building is the Franciscan monastery (1547-1600), which once harboured within its high and turreted walls no fewer than two thousand friars, but has been allowed to fall into complete decay since their expulsion in 1820. For a long time Merida has had the reputation of being one of the principal seats of culture in Mexico; and it possesses, besides the ecclesiastical seminary, schools of law, medicine, and pharmacy, a literary institute, a public library, a theatre, and a considerable number of periodical publications. Commercially it has shared in the prosperity which Yucatan in recent years owes to the development of the Sisal hemp trade ; and its manu- factures embrace cotton goods, cigars, sugar, andrum. The population, estimated about 1840 as 25,000, was found in 1871 to number 33,025. The Mayas still form numeri- cally the strongest element. Previous to the Spanish conquest the site of Merida was occupied by the Maya town of Tehoo, which contained so great a number of artificial stone-mounds that the new-comers had abundant material for all their buildings. The foundation of the

city dates from 1542, and it was made a bishopric in 1561. Compare Stephen’s Yucatan.

MERIDEN, a city of the United States, in New Haven county, Connecticut, 18 miles from New Haven by rail. It is a busy manufacturing town; the population has ‘nereased from 3559 in 1850 to 7426, 10,495, and 18,340 in 1860, 1870, and 1880. The Britannia Company alone employs upwards of 1000 hands, and sends out every year nearly $3,000,000 worth of Britannia metal and electro- plated goods ; and tin-ware, cutlery, brass-work, flint glass, guns, and woollen goods are also manufactured in the town. The State reform school had 307 inmates in 1880. A fortified tavern erected by Belcher in 1660 on the road between Boston and New Haven was the nucleus of Meriden; but the place was not incorporated as a town till 1866, and became a city in 1867.

MERIMEE, Prosprr (1803-1870), novelist, archseo- logist, essayist, and in all these capacities one of the greatest masters of French style during the century, was born at Paris on September 28, 1803, and died at Cannes on

the 23d of the same month sixty-seven years later, having lived just long enough to know that ruin was threatening France. Not many details have been published in reference to his family, but his father seems to have been a man of position and competence. Mérimée had English blood in his veins on the mother's side, and was always considered, at least in France, to look and behave more like an Englishman than a Frenchman. He was educated for the bar, but entered the public service instead. A young man at the time of the romantic movement, he felt its influence strongly, though his peculiar tempera- ment prevented him from joining any of the céteries of the period. This temperament was indeed exhibited by the very form and nature of the works in which he showed the influence of romanticism. Nothing was more prominent among the romantics than the fancy, as Mérimée himself puts it, for "local colour," the more unfamiliar the better. Mérimée exhibited this in an unusual way. In 1825 he published what purported to be the dramatic works of a Spanish lady, Clara Gazul, with a preface stating circumstan- tially how the supposed translator, one Joseph L'Estrange, had met the gifted poetess at Gibraltar. This was followed by a still more audacious and still more successful supercherie. In 1827 appeared a small book entitled La Guala (the anagram of Gazul), and giving itself out as translated from the Illyrian of a certain Hyacinthe Maglanovich. This book, which has greater formal merit than Clara Gazul, is said to have taken in Sir John Bow- ring, a competent Slav scholar, the Russian poet Poushkin, and some German authorities, although not only had it no original, but, as Mérimée declares, a few words of Illyrian and a book or two of travels and topography were the author's only materials. In the next year appeared a short dramatic romance, La Jacquerie, in which all Mérimée's characteristics are visible—his extraordinary faculty of local and historical colour, his command of language, his grim irony, and a certain predilection for tragic and terrible subjects which was one of his numerous points of contact with the men of the Renaissance. This in its turn was followed by a still better piece, the Chronique de Charles IX., which stands towards the 16th century much as the Jacquerie does towards the Middle Ages. All these works were to a certain extent second-hand, being either directly imitated or prompted by a course of reading on a particular subject. But they exhibited all the future literary qualities of the author save the two chiefest, his wonderfully severe and almost classical style, and his equally classical solidity and statuesqueness of construction. For the latter there was not much

opportunity in their subjects, and the former required a certain maturity and self-discipline which

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Mérimée had not yet given to himself. These were however, displayed fully in the famous Corsican story of Colomba, published in the momentous year 1830. This all things considered, is perhaps Mérimée's best tale.

He had already obtained a considerable position in the civil service, and after the revolution of July he was chef de cabinet to two different ministers. He was then appointed to the more congenial post of inspector of historical monuments. Mérimée was a born archeologist, combining linguistic faculty of a very unusual kind with the accurate scholarship which does not always accompany it, with remarkable historical appreciation, and with a sincere love for the arts of design and construction, in the former of which he had some practical skill. In his official capacity he published numerous reports, some of which, with other similar pieces, have been republished in his works. He also devoted himself to history proper during the latter years of the July monarchy, and published numerous essays and works of no great length, chiefly on Spanish, Russian, and ancient Roman history. He did not, however, neglect novel writing during this period, and numerous short tales, almost without exception master- pieces, appeared, chiefly in the Revue de Paris. He travelled a good deal, both for his own amusement and on official errands; and in one of his journeys to Spain, about the middle of Louis Philippe's reign, he made an acquaintance destined to influence his future life not a little—that of Madame de Montijo, mother of the future empress Eugenie. Mérimée, though in manner and language the most cynical of men, was a devoted friend, and shortly before the accession of Napoleon III. he had occasion to show this. His friend Libri was accused of having stolen valuable manuscripts and books from French librarics, and Mérimée took his part so warmly that he was actually sentenced to and underwent fine and imprisonment. He had been elected of the Academy in 1844, and also of the Academy of Inscriptions, of which he was a prominent member. Between 1840 and 1850 he wrote more tales, the chief of which were Arséne Guillot and Carmen.

The empire made a considerable difference in Mérimée's life. He was not a very ardent politician, but all his sympathies were against democracy, and he had therefore no reason to object to the Bonapartist rule, especially as his habitual cynicism and his irreligious prejudices made legitimism distasteful to him. But the marriage of Napoleon III. with the daughter of Madame de Montijo at once enlisted what was always the strongest of Mérimée's sympathies—the sympathy of personal friend- ship—on the emperor's side. He was made a senator, and continued to exercise his archeological functions ; but his most important réle was that of a constant and valued private friend of both the "master and mistress of the house," as he calls the emperor and empress in his letters. He was occasionally charged with a kind of irregular diplomacy, and once, in the matter of the emperor's Cesar, he had to pay the penalty frequently exacted from great men of letters by their political or social superiors who are ambitious of literary reputation. But for the most part he was strictly the "ami de la maison." At the Tuileries, at Compiégne, at Biarritz, he was a con- stant though not always a very willing guest, and his influence over the empress was very considerable and was fearlessly exerted, though he uscd to call himself, in imita- tion of Scarron, "le bouffon de sa majesté." His oceupar tions during the last twenty years of his life were numerous and important, though rather nondescript. He found, however, time for not a few more talcs, of which more will be said presently, and for two correspondences, which arc not the least of his literary achievements, while they have an extraordinary interest of matter. One of these consists

of the letters which have been published as Lettres & une Inconnue, the other of the letters addressed to Sir Antonio Panizzi, the late librarian of the British Museum. Various, though idle and rather impertinent, conjectures have been made as to the identity of the inconnue just mentioned. It is sufficient to say that the acquaintance extended over many years, that it partook at one time of the character of love, at another of that of simple friendship, and that Mérimée is exhibited under the most surprisingly diverse lights, most of them more or less amiable, and all interest- ing. The correspondence with Panizzi has somewhat less personal interest. Mérimée made the acquaintance origin- ally by a suggestion that his correspondent

should buy for the Museum some MSS. which were in the possession of Stendhal's sister, and for some years it was chiefly confined to correspondence. But Mérimée often visited England, where he had many friends (among whom the late Mr Ellice of Glengarry was the chief), and certain similarities of taste drew him closer to Panizzi personally, while during part of the empire the two served as the channel for a kind of unofficial diplomacy between the emperor and certain English statesmen. These letters are full of shrewd apergus on the state of Europe at different times. Both series abound in gossip, in amusing anecdotes, in sharp literary criticism, while both contain evidences of a cynical and Rabelaisian or Swiftian humour which was very strong in Mérimée. This characteristic is said to be so prominent in a correspondence with another friend, which now lies in the library at Avignon, that there is but little chance of its ever being printed. A fourth collection of letters, of much inferior extent and interest, has been printed by M. Blaze de Bury under the title of Lettres & une autre Inconnue. In the latter years of his life Mérimée suffered very much from ill health. It was necessary for him to pass all his winters at Cannes, where his constant companions were two aged English ladies, friends of his mother. The terrible year found him completely broken in health, and anticipating the worst for France. He lived long enough to see his fears realized, and to express his grief in some last letters, and he died on September 23, 1870.

Mérimée's character (which has been unwarrantably slandered by those to whom political differences or his sarcastic intolerance of "pose" in literature made him obnoxious) was a peculiar and in some respects an unfortunate one, but by no means unintelligible, and perhaps in a minor degree not uncommon. Partly by tempera- ment, partly it is said owing to some childish experience, when he discovered that he had been duped and determined never to be so again, not least owing to the example of Beyle, who was a friend of his family, and of whom he saw mnuch, Mérimée appears at a comparatively carly age to have imposed upon himself as a duty the maintenance of an attitude of sceptical indifference and sarcastic criticism. He certainly succeeded. Although, as has been said, a man of singularly warm and affectionate feelings, he obtained the credit of being a cold-hearted cynic; and, although he was both independent and disinterested, he was abused as a hanger-on and toad-eater of the imperial court. Both imputations were wholly undeserved, and indeed were

prompted to a great extent by the resentment felt by his literary equals on the other side at the cool ridicule with which he met them. But he deserved in some of the bad as well as many of the good senses of the term the phrase which we have applied to him of a man of the Renaissance. He had the warm partisanship and amiability towards friends and the scorpion- like sting for his foes, he had the ardent delight in learning and especially in matters of art and belles lettres, he had the scepticism, the voluptuousness, the curious delight in the contemplation of the horrible, which marked the men of letters of the hnmanist period. Like thein he was a man of the world, and a man who without any baseness liked a king's palace bettcr than a philosopher's hovel. Like thein he had an acute judgment in matters of business, and like

them a singular consciousness of the nothingness of things. Even his'

literary work has this Renaissance character. It is tolerably ex- tensive, amounting to some seventeen or eightecn volumes, but its bulk is not great for a life which was not short, and which was occupied at least nominally in little clse. About a third of it con- sists of the letters already mentioned, which will always be to those who delight in personal literature the most attractive part, and which, though in a fragmentary fashion, are really important

as throwing side lights on history. Rather more than another third consists of the ofticial work which has been already allnded to— reports, cssays, short historical sketches, the chief of which latter is a history of Pedro the Cruel, and another of the curious pretender known in Russian story as the false Demetrius. Some of the literary essays, such as those on Beyle, on Turguenief, &c., where a personal element enters, are excellent. Against others and against the larger historical sketches—admirable as they are—M. ''aine's criticism that they want life has some force. They are, however, all marked by Mérimée's admirable style, by his sound and accurate scholarship, his strong intellectual grasp of whatever he handled, his cool unprejudiced views, his marvellous faculty of designing and proportioning the treatment of his work. It is, however, in the remaining third of his work, consisting entirely of tales either in narrative or in dramatic form, and

especially in the former, that his full power is perceived. He translated a certain number of things (chiefly from the Russian); but his fame does not rest on these, on his already-mentioned youthful supercheries, or on his later semi- dramatic works. There remain about a score of tales extending in point of composition over exactly forty years, and in length from that of Colomba, the longest, which fills about one hundred and fifty pages, to that of L'Enlevement de la Redoute, which fills just half adozen. They are unquestionably the best things of their kind written during the century, the only nouvelles that can challenge comparison with them being the very best of Gautier, and one or two of Balzac. The motives arc sufficiently different. In Colomba and Mateo Falcone, the Corsican point of honour is drawn on; in Carmen (written apparently after reading Borrow's Spanish books), the gipsy eharacter ; in La Vénus d'llle and Lokis (two of the finest of all), certain grisly superstitions, in the former case that known in a milder form as the ring given to Venus, in the latter a variety of the were-wolf fancy. Arsene Gwillot is a singular satire full of sarcastic pathos on popular morality and religion ; La Chambre Bleue, an 18th-century conte, worthy of Crébillon for grace and wit, and superior to him in delicacy ; The Capture of the Licdoubt just mentioned is a perfect piece of description ; L' Abbé Aubain is again satirical ; La Double AMéprise (the authorship of which was objected to Mérimée when he was elected of the Academy) is an exercise in analysis strongly impregnated with the spirit of Stendhal, but better written than anything of that writer's. These stories, with his letters, assure Mérimée's place in literature at the very head of the French prose writers of the century. He had undertaken an edition of Brantéme for the Bibliothéque Elzévirienne, but it was never completed.

Mérimée's works have only been gradually published since his death. The latest, The Letters to Panizei, which have also ap- peared in English, bears date 1881. There is as yet no uniform or handsome edition, but almost everything is obtainable in the collections of MM. Charpentier and Calmann Lévy. (G. SA.)

MERINO. See SHeep and Woot.

MERIONETH (Welsh Meirionydd), a maritime county of North Wales, is bounded N. by Carnarvon and Denbigh, S.E. by Denbigh and Montgomery,

and W. by Cardigan Bay. It is triangular in shape, its greatest length north-east to south-west being 45 miles, and its greatest breadth north-west to south-east about 30miles. The area is 385,291 acres, or about 600 square miles. Next to Carnarvon, Meri- oneth is the most mountainous county in Wales. If the scenery is less bold and striking than that of Carnarvon, it excels it in richness, variety, and picturesque beauty. Its lofty mountains are interpenetrated by dark deep dells or smiling vales. The outlines of its rugged crags are softened and adorned by rich foliage. The sea views are frequently fine, and rivers, lakes, and waterfalls add a romantic charm to the valleys. The highest summits in the county are the picturesque Cader Idris (which divides into three peaks,—one, Pen-y-Gadair, having an altitude of 2914 feet), Aran Fawddwy (2955), Arenig-fawr (2818), Moel-wyn (2566), Rhobell-fawr (2360). The finest valleys are those of Dyfi, Dysyni, Talyllyn, Mawddach, and Festi- niog. The river Dyfrdwy or Dee rises 10 miles north-west of Bala, and, after passing through Bala Lake, flows north- east by Corwen to Denbighshire. The Dyfi risesin a small lake near Aran Fawddwy, and expands into an estuary of Cardigan Bay. The Mawddach or Maw, from the north of Aran Fawddwy, has a course of 12 miles south- west, during which it is joined by several other streams. The Dwyryd and other streams unite in forming the estuary of Traeth Bach. The finest waterfalls are the,

Rhaiadr-y-Glyn near Corwen, Rhaiadr Du, and Pistyll Cain, the latter 150 feet high. The lakes are very numerous, but small, the largest being Bala Lake, or Pim- plemere (in Welsh, Llyn Tegid, fair lake), 4 miles long by 1 broad, and Llyn Mwyngil (lake in a sweet nook) in the vale of Talyllyn. Both are much frequented by anglers. On account of frequent indentations the coast-line is about 100 miles long. Sandy beaches intervene between the rocky shores. Frequent shoals and sandbanks render navigation very dangerous. There are only two harbours of importance, Barmouth and Aberdovey.

A mountain tract of the county 15 miles from north to south by 10 from east to west, stretching from the coast inland, is of the Cambrian age, composed of grits, quartzose, and slates, and comprising the Merionethshire anticlinal. This tract is enclosed on the north, east, and south by the Menevian,

Lingula, Tremadoc, and Arenig beds, which are pierced by numerous dykes and intrusive masses, mostly greenstone. Rhobell-fawr is one of the greatest igneous masses in the whole area of the Lingula beds. The Arenig beds are interstratified with and overlaid by accumulations of volcanic ashes, felspathic traps, or lava flows, which form the rugged heights of Cader Idris, the Arans, the Arenigs, Manod, and Moel-wyn; and these are in turn overlaid by the Llandeilo and Bala beds, the latter includ- ing the Bala limestone. Extensive slate quarries are worked near Festiniog, mostly underground, in strata of the Llandeilo age, giving employment to about 4000 men. Gold, lead, copper, and manganese have been obtained in various places.

Climate and Agriculture.—The climate varies much with the elevation, in some places being bleak and cold, and in others re- markably equable and genial. At Aberdovcy it is proverbially mild, and the myrtle grows in the open air. Al] attempts to intro- duce fruits have proved abortive in most parts of the county. The soil is generally thin and poor, with fertile tracts in the valleys. A great portion of the moss has been reclaimed within late years.

According to the agricultural returns for 1882, there were 154,406 aeres, or considerably less than half the total area, under cultiva- tion, Of this as much as 119,188 acres were permanent pasture, and 13,755 under rotation grasses. Of the 17,312 acres under corn crops, 11,282 were under oats and 4807 under barley. Potatoes oeeupied 2392 aeres, and turnips only 1496 acres. The area under woods extended to 15,049 acres,

The total number of horses in 1882 was 6088. A breed of ponies is peculiar to this county and Montgomeryshire. The rearing of horned cattle and dairy farming are largely carried on, but the number of cattle (37,648) is considerably under the average of Wales generally. On the other hand the number of shcep in 1882 was 400,553, a larger number than in any other county of Wales, and mueh beyond the general average in the principality. They are a small hardy breed, which grow heavy fleeces. Goats frequent the loftier crags.

Aecording to the latest return the number of proprietors was 1695, possessing 308,374 acres, with a gross annual value of £188,253. Of the

owners 1044, or 62 per cent., possessed less than 1 aere, the average extent of the properties being 189 acres, and the average value per acre a little over 12s. There were ten proprictors who possessed over 5000 acres, viz., Sir W. W. Wynn, 20,295; R. J. L. Price, 17,718; T. P. Lloyd, 16,975; Mrs Kirkby, 18,410; Hon. C. H. Wynn, 10,504; A. J. G. Corbet, 9847; Sir E. Buckley, 87388; W. E. Oakeley, 6018; W. O. Gore, 5497; and R. M. Rickards, 5701.

Manufacturcs.—Woollen goods are manufactured in_ various places, especially at Dolgelly. They are principally coarse druggets, kerseymeres, and flannels. The knitting of stockings was a great industry at the close of last eentury, the value of the sales at Bala being estimated at from £17,000 to £19,000 annually.

Railways.—The Cambrian Railway skirts the coast from Port- madoc to Aberdovey. At Barmouth Junction a braneh of the same crosses to Dolgelly, where it is joined by a branch of the Great Western Railway. Anothcr braneh of the Great Western unites Bala and Festiniog, and the latter place has railway connexion both with Llandudno Junction and with Portwadoc.

Administration and Population.—Merioncthshire comprises five hundreds and thirty-three civil parishes. It has one court of quarter sessions, and the number of petty sessional divisions is six. Mcclesi- astically it is partly in the dioeese of Bangor, partly in that of St Asaph, The county returns one member to parliament. There is

no municipal or parliamentary borough. The towns returned in 1881 as urban sanitary distriets are Bala (1653), Barmouth (1512), Dolgelly (2457), Festiniog (11,272), and Towyn (8368). Sinee 1801 the population has nearly doubled. From 29,506 in that year it had increased in 1851 to 88,963, in 1871 to 46,598, and in 1881 to 54,798, of whom 27,576 were males, and 27,217 females.

History and Antiquities. —Originally Merioneth belonged to the territory of the Ordoviees, and under the Romans it was ineluded in Britannia Secunda. There are many Celtic, Roman, and medi- eval remains. Caer Drewyn on the Dee, near Corwen, was a British cainp. There are numerous croimlechs

in various parts of the county. especially near the sea-coast. The Via Occidentalis of the Romans passed through Merioneth from south to north, and at Tomen- y-Mur was joined by a branch of the South Watling Street, the Castell Tomen-y-Mur being supposed to be identical with the Roman station of Heriri Mons. The immense ruin of Castel-y- Bere was originally onc of the largest castles in Wales, but has not been oecupied since the time of Edward 1. During the Wars of tlie Roses the castle of Harlech, still a fine ruin, was held by the Lancastrians, and was the last in Wales to surrender. Of ecelesi- astical remains the most important is Cymmer Abbey, founded by the Cistereians in 1198, a very fine ruin eontaining architecture of various periods from Norman to Perpendicular. There are numer- ous interesting old churches.

MERLIN. See Fatcon.

MERMAIDS anp MERMEN, in the popular mythology of England and Scotland, are a class of beings more or less completely akin to man, who have their dwelling in the sea, but are capable of living on land and of entering into social relations with men and women.! Thiey are easily identified, at least in some of their most important aspects, with the Old German Meriminni or Meerfrau, the Icelandic Hafgufa, Margygr, and Marmennill (mod. Marbendill), the Danisli Hafmand or Maremind, the Irish Merrow or Merruach, the Marie-Morgan of Brittany and the Morforwyn of Wales ;? and they have various points of resemblance to the vodyany or water-sprite and the rusalka or stream-fairy of Russian mythology. The typical mermaid (who is much more frequently described than the merman) has the head and body of a woman, usually of exceeding loveliness, but below the waist is fashioned like a fish with scales and fins. Her hair is long and beautiful, and she is often represented, like the Russian rusalka, as combing it with one hand while in the other she holds a looking-glass. At other times, like the rusalka, she is seen engaged in the more prosaic occupation of washing or beating clothes ; but this, as, for example, in Hugh Miller’s terrible Loch Slin legend, is a sign of some impending calamity. For a time at least a mermaid may become to all appearance an ordi- nary human being; and from a very striking Irish legend (“The Overflowing of Lough Neagh and Liban the Mer- maid,” in Joyce’s Old

Celtic Romances) it is evident that a human being may also for a time be transformed into a mermaid.

The-mermaid legends, both English and other, may be grouped as follows. A. A mermaid or mermaids either voluntarily or under compulsion reveal things that are about to happen. Thus the two mermaids (merewip) Hadebure and Sigelint, in the Mibelungenlied, disclose his future course to the hero Hagen, who, having got possession of their garments, which they had left on the shore, compels them to pay ransom in this way. According to Resenius, a mermaid appeared to a peasant of Samsée, foretold the birth of a prince, and moralized on the evils of intem-

1 The name mermaid is eompounded of the A.-S. mere, a lake, aud megd, amaid; but, though mere wif oceurs in Beowulf, mere-maid does not appear till the Middle English period (Chaucer, Romauwnt of the Rose, &c.). In Cornwall the fishermen say merry-maids and merry- men. The connexion with the sea rather than with inland waters appears to be of later origin. ‘The Mermaid of Martin Meer” (Roby’s Traditions of Lancashire, vol. ii.) is an example of the older force of the word; and such ‘‘meer-women” are known to the country-folk in various parts of England (¢.g., at Newport in Shrop- shire, where the town is some day to be drowned by the woman’s agency).

2 See Rhys, ‘ Welsh Fairy Tales,” in Y Cymmrodor, 1881, 1882.

perance, &e. (Kong Frederichs den andens Krinike, Copenhagen, 1680, p. 302). B. A Mermaid imparts supernatural powers to a human being. Thus in the beautiful story of “The Old Man of Cury” (in Hunt’s Popular Romances of the West of England, 1871) the old man, instead of silver and gold, obtains the power of doing good to his neighbours by breaking the spells of witchcraft, chasing away diseases, and discovering thieves. John Reid, the Cromarty shipmaster, was more selfish,—his “wishes three” being that neither he nor any of his friends should perish by the sea, that he should be unin- terruptedly successful in everything he undertook, and that the lady who scorned his love should scorn it no more. C. A mermaid has some one under her protection, and for wrong done to her ward exacts a terrible

penalty. One of the best and most detailed examples of this class is the story of the ‘‘Mermaid’s Vengeance” in Mr Hunt’s book already quoted. D. A mermaid fulls in love with a human being, lives with him as his lawful wife for a time, and then, some compact being unwittingly or intentionally broken by him, departs to her true home in the sea. Here, if its mermaid form be accepted, the typical legend is undoubtedly that of Melusima, which, being made the subject of a full-fledged romance by Jean d’Arras, became one of the most popular folk-books of Europe, appearing in Spanish, German, Dutch, and Bohemian versions. Melusina, whose name may be a far-off echo of the Mylitta (Venus) of the Pheenicians, was married to Raymond of Lusignan, and was long afterwards proudly recognized as one of their ancestors by the Luxembourg, Rohan, and Sassenaye families, and even by the emperor Henry VII. Her story will be found in Baring Gould’s Myths of the Middle Ages. K. A mermaid falls in love with a man, and entices him to go and live with her below the sea; or a merman wins the affection or captures the person of an earthborn maiden. This form of legend is very common, and has naturally been a favourite with poets. Macphail of Colonsay successfully rejects the allurements of the mermaid of Corrievrekin, and comes back after long years of trial to the maid of Colonsay.!_ The Danish ballads are especially full of the theme ; as “Agnete and the Merman,” an ante- cedent of Matthew Arnold’s “Forsaken Merman”; the “Deceitful Merman, or Marstig’s Daughter”; and the finely detailed story of Rosmer Hafmand (No. 49 in Grimm). .

In relation to man the mermaid is usually of evil issue if not of evil intent. She has generally to be bribed or compelled to utter her prophecy or bestow her gifts, and whether as wife or paramour she brings disaster in her train. In itself her sea-life is often represented as one of endless delights, but at other times a mournful mystery and sadness broods over it. The fish-tail, which in popular fancy forms the characteristic feature of the mermaid, is really of secondary importance; for the true Teutonic mermaid—probably a remnant of the great cult of the Vanir—had no fish-tail;? and this symbolic appendage occurs in such remote mythological regions as to give no clue to historical connexion. The Tritons, and, in the later representations, the Sirens of classical antiquity, the Pheenician Dagon, and the Chaldean Oannes are all well- known examples ; the Ottawas and other American Indians have their man-fish and woman-fish (Jones, Traditions of the North

American Indians, 1830); and the Chinese tell stories not unlike our own about the sea-women of their southern seas (Dennis, Folklore of China, 1875).

Quasi-historical instances of the appearance or capture of

1 See Leyden's ''The Mermaid," in Sir Walter Scott's Border Minstrelsy.

2 Karl Blind, '* New Finds in Shetlandic and Welsh Folk-Lore," in Gentleman's Magazine, 1882.

mermaids are common enough,' and serve, with the frequent use of the figure on signboards and coats of arms, to show how thoroughly the myth had taken hold of the popular imagination. A mermaid captured at Bangor, on the shore of Belfast Lough, in the 6th century, was not only baptized, but admitted into some of the old calendars as a saint under the name of Murgen (Notes and Queries, Oct. 21, 1882); and Stowe (Annales, under date 1187) relates how a man-fish was kept for six months and more in the castle of Orforde in Suffolk. As showing how legendary material may gather round a simple fact, the oft-told story of the sea-woman of Edam is particu- larly interesting. The oldest authority, Joh. Gerbrandus a Leydis, a Carmelite monk (0b. 1504), tells (Annales, &e., Frankfort, 1620) how in 1403 a wild woman came through a breach in the dike into Purmerlake, and, being found by some Edam milkmaids, was ultimately taken to Haarlem and lived there many years. Nobody could understand her, but she learned to spin, and was wont to adore the cross. Ocka Scharlensis (Chronijk van Lriesland, Leeuw., 1597) reasons that she was not a fish because she could spin, and she was not a woman because she could live in the sea; and thus in due course she got fairly established as a genuine mermaid. Vosmaer, who has carefully investigated the matter, enumerates forty writers who have repeated the story, and shows that the older ones speak only of a woman (see " Beschr. van de zoogen. Meermin der stad Haarlem," in Verh. van de Moll. Maatsch. van K. en Wet., part 23, No. 1786). As for the stuffed mermaids which have figured from the days of Bar- tholomew Fair downwards, it is enough to mention that exhibited in

the Turf Coffee-house, London, in 1822, and carefully drawn by Cruikshank (compare Chambers, Book of Days).

The best account of the mermaid-miyth is in Baring Gould's Myths of the Middle Ages. See also, besides works already men- tioned, Pontoppidan, who in his logically credulous way collects much matter to prove the existence of mermaids; Maillet, Zed/i- amed, Hague, 1755; Grimm, Deutsche Mythologie, i. 404, and Alidién. Heldentlieder, 1811; Waldron's Description and Train's Hist. and Stat. Acc. of the Isle of Man ; Folklore Society's Record, vol. ii; Napier, Hist. and Trad. Tales connected with the South of Seotland ; Sébillot, Traditions de la Haute Bretagne, 1882, aud Contes des Marins, 1882. (H. A. W.)

MEROE, in classical geography (Strabo, xvii. 2,2; Pliny, ii. 73, v.10; Ptol., p. 201), was the metropolis of ASthiopia, situated on an island of the same name between the Nile and the Astaboras (Atbara). The "island" is only an inaccurate name for the fertile plain between the two rivers. This Meroe, first mentioned by Herodotus (ii. 29 sq.), succeeded an older Ethiopian kingdom of Napata lower down the Nile, originally subject to and civilized from Egypt, but which afterwards became independent and even sent forth an Ethiopian dynasty to reign in Egypt, to which the So and Tirhaka of the Bible belonged (see Erutopra), The name of Meroe in the form Merawi is now given to Napata. The later Meroe retained its independence when Egypt fell under foreign sovereigns. Diodorus (iii. 6) describes it as entirely controlled by the priesthood till a native prince Ergamenes destroyed the sacerdotal caste in the time of Ptolemy II. Queen Candace (Acts viii. 27) was probably sovereign of Meroe; see Lepsius's Letters, Eng. tr., pp. 196, 206; and comp. Strabo, xvii. 1, 54 for

3 Compare the strange account of the quasi-human creatures found in the Nile given by Theophylactus, fistoriz, viii. 16, pp. 299-302 of Bekker's ed.

- See the paper in Jour. Brit. Arch. Ass., xxxviii., 1882, by H. S. Cuming, who points out that mermaids or mermen occur in the arms of Earls Caledon, Howth, and Sandwich, Viscounts Boyne and Hood, Lord Lyttleton, and Scott of Abbotsford, as well as in those of the Ellis, Byron, Phené, Skeffington, and other families. The English

heralds represent the creatures with a single tail, the French and German heralds frequently with a double one.

a Queen Candace in Augustus's time when the Romans under Petronius advanced to Napata. Meroe was visited by Greek merchants ; and the astronomical expedition of Eratosthenes determined its latitude with great accuracy. An exploring party in the reign of Nero found that the country below Meroe, formerly the site of many towns, had become almost wholly waste (Pliny, vi. 29). From the 6th to the 14th century of our era the Christian (Jacobite) realm of Dongola occupied the place of the older kingdom. The ruins of Meroe and Napata were fully explored by Lepsius in 1844, and the monuments are pictured in his Denkmdler.

MERSEBURG, the chief town of a district of the same name in the Prussian province of Saxony, is situated on the river Saale, 10 miles to the south of Halle and 17 to the west of Leipsic. It consists of a quaint and irregularly built old town, with two extensive suburbs, and contains six churches and several schools and charitable institutions. The cathedral is an interesting old pile, with a Romanesque choir of the 11th, a transept of the 13th, and a Late Gothic nave of the 16th century. Among its numerous monuments is that of Rudolph of Swabia, who fell in 1080 in an encounter with his rival Henry IV. It contains two paintings by Lucas Cranach. Contiguous to the cathedral is the Gothic chateau, formerly the residence of the Saxon princes and the bishops of Merseburg. The town-house, the post-office, and the "'standehaus " for the meetings of the provincial estates are also noteworthy buildings. The industries of Merseburg consist of the manufacture of card- board and coloured paper, dyeing, glue-boiling, machine- making, calico-printing, tanning, and brewing. Its popu- lation in 1880 was 15,205.

Merseburg (i.¢., ''mareh-town") is one of the oldest towns in Germany. From the 9th eentury down to 1007 it was the eapital of a countship of its own name, and from 968 to 1543 it was the seat ofa bishop. In the 10th, 11th, and 12th eenturies it was a favourite residenee of the German emperors, and at this time its fairs enjoyed the importanee afterwards inherited by those of Leipsic. The town was repeatedly visited by

destructive conflagrations in the 14th to 17th centuries, and also sutfered severely during the Thirty Years' War. From 1656 to 1738 it was the residence of the dukes of Saxe- Merseburg. The great vietory gained by the emperor Henry I. over the Huns in 933 is believed to have been fought on the Keuseh- berg near Merseburg.

MERTHYR TYDFIL, or Mertuyr Typvit, a parlia- mentary borough and market-town of Glamorganshire, South Wales, is situated in a bleak and hilly region on the river Taff, and on several railway lines, 25 miles north-north-west of Cardiff and 30 east-north-east of Swansea. The town, which consists principally of the houses of work- men, is for the most part meanly and irregularly built, and at one time, on account of its defective sanitary arrange- ments, was frequently subject to epidemics of great severity. Within recent years great improvements have taken place, and the town now possesses both a plentiful supply of pure water and an excellent system of sewage. There are also some good streets with handsome shops, while in the suburbs there are a number of private residences and villas inhabited by the wealthier classes. Apart from its extensive iron and steel works, the town possesses no feature of interest. It is situated in the centre of the South Wales coal basin, and the rich coal-mines in the vicinity supply great facilities for the iron industries. At Merthyr Tydfil, which is said to have received its name from the martyr- dom of a British saint Tydfil, there were smelting-works i. : very early period, but none of any importance until

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ture of bar iron developed with great rapidity, but since then the production of steel has largely taken its place. The borough returns two members to parliament. The population of the urban sanitary district in 1871 was 51,949, and in 1881 it was 48,857; the population of the

From about forty years ago until 1875 the manufac- |

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parliamentary borough, which includes the parish of Aber- dare and parts of the parishes of Llanwonno and Merthyr Tydfil and of Vainor (Brecon), and has an area of 29,954 acres, was in the same years 97,020 and 91,347.

MERV, Merv, or Maovr,! a district of Central Asia, situated on the borderland of Iran and Turan.

The oasis of Merv lies in the midst of a desert, in about 37° 30’ N. lat. and 62° E. long. It is about 250 miles from Herat, 170 from Charjui on the Oxus, 360 from Khiva, and 175 from Gawars, the nearest point in the newly acquired (1881) Russian territory of Akhal.

The great chain of mountains which, under the name of Paropamisus and Hindu-Kush, extends across the Asiatic continent from the Caspian to China, and forms the line of ethnic demarcation between the Turanian and Indo- Germanic races, is interrupted at a single point ; that point is on the same longitude with Merv. Through or near the

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Neighbourhood of Merv,

trouée or gap which nature has created flow northward in parallel courses the rivers Heri-rud (Tejend) and Murghab, until they lose themselves in the desert of Kara-kum—that large expanse of waste, known also as Turcomania, which spreads at the northern foot of the mountains, and stretches from the lower Oxus to the Caspian.

Whether as a satrapy of Darius and subsequently as a province of Alexander, whether as the home of the Parthian race, whether as a bulwark against the destructive waves of Mongol invasion, or later as the glacis of Persian Khorasan, the valleys of those rivers—the district of Merv

1 Merv is the modern Persian name. The river Margus, now the Murghab, on which was built the ancient city, is derived from Margu, the name of the province as reeorded in the Behistan inscriptions of Darius. Spiegel

connects the name Margy with old Bactrian meregho, bird, in allusion to the numerous swarms of birds that gather there. So, too, the river name Murghab means bird-water. The district ap- pears to have been known iu the 5th eentury as Marv-i-rud, so that the river was then the Marv. The name Merdm for the district occurs in the Armenian geography ascribed to Moses of Khorene, written probably in the 7th century (ed. Patkanoff). Maour is the Uzbek name, and of eomparatively recent date.

—have ever been important outposts on the borders of Iran. In bye-gone epochs their banks have, under powerful rulers, been studded with populous and flourishing cities, which bore the name of “ Sovereign of the Universe” (Merv Shah-«rjehan), and vied for fame with “ Balkh, the Mother of cities”; of late times, with weakness or absence of govern- ment, those same banks have become choked with fallen battlements and ruins, the home of the snake and the jackal.

Merv has soared to prosperity or fallen to decay accord- ing to her political status at the moment, and history, which repeats itself, may yet have to sing her praises in the future as it has done in the past. All that human life in the desert requires is there,—water in abundance, and a soil unsurpassed for fertility. Good government is alone wanting to turn those natural gifts to full account.

The present inhabitants of the district are Turcomans of the Tekke tribe, who, like the other tribes inhabiting Turcomania, enjoyed until the approach of the Russians virtual independence, and acknowledged allegiance to no one,—a pastoral people who eked out a miserable existence by the trade of passing caravans, and in bad times pillaged the neighbouring and equally barbarous states, to whose reprisals they were in turn subjected.

From the year 1869, the date of the establishment of the Russian military settlement at Krasnovodsk on the east shore of the Caspian, the wave of Russian conquest has gradually swept eastwards along the northern frontier of Persia until it has for the moment stopped at the outer- most border of the

Akhal Turcoman country, which was incorporated in 1881 by Russia as the result of the defeat of that tribe at Geok Tepe. Among the districts still farther east, to which the Russians give the name of Eastern Turcomania, is that of the Merv Tekke Turcomans, kinsmen of the Akhal Tekkes, the most recent of Russia's subjects. The district of the Merv Tekkes may be taken to be that included between the lower Murghab below Yulutan, where the river enters the plain, and the Persian frontier from Sarakhs to Gawars.

A reference to the map will show the strategical import- ance of this district, situated at the point of meeting of two lines, of which one is the strategic line of Russian advance on Herat from Krasnovodsk to Sarakhs, and the other the strategic line of advance on the same place from Tashkend through Bokhara. The capital of the district is, moreover, the crossing-point of the Herat-Khiva and Meshed-Bokhara trade routes.

Consequently this district, a solitary oasis in a vast desert, guarantees to its possessor the command of an important avenuc betwecn north and south, and, in the

event of its falling into Russian hands, will give that power |

in addition a valuable link in the chain of connexion between her recent acquisitions on the Persian frontier and those in Turkestan, the forging of which has been persistently advocated by Russian writers for years past. One of these, Colonel Veniukoff, frankly admits that it is the political results—" the consolidation of friendly relations with the Turcomans"—and not commercial interests merely, that are primarily looked to, and openly states that the forward movement in Central Asia "cannot end otherwise than by the annexation to Russia of the whole of Turan."

Whether by design or by the force of circumstances, the recommendations of those writers have been translated into facts, and Russia with her advanced post at Askabad is now within 400 miles of Herat, which Sir Henry Rawlinson designates as the key of India. The occupation of the Merv Tekke country would bring Russia to within 250 miles of Herat. From Askabad she is in connexion with the Caspian by a good line of communication, part of which from the sea to Kizil Arvat) is by rail ; and hence facilities

are offered for bringing up not only the resources of the Caucasus but of the whole of European Russia. While Russian troops are within 400 miles of Herat, the British troops at Quetta are more than 500 miles from Herat.! These remarks serve to explain the very natural suspicion with which Great Britain has regarded the occupation one after another of important strategical points along that route by which alone Russia can strike at India, —the same line by which Napoleon meditated a Russo-French invasion in the early part of this century.

In the matter of Merv and the neighbouring Turcoman districts diplomacy has not been idle. As early as 1869, when an inter- change of opinions was taking place between the Russian and British Governments with respect to the demarcation of a neutral zone between the two empires, Great Britain objected to the Russian proposal that this zone should be Afghanistan, ‘‘ because of the near approach to India that would be thereby afforded to

Settlements and Inhabited Centres.—Of towns or even villages, fixed centres of habitation, there are none, ac- cording to Mr O’Donovan, the latest European traveller to Merv. The present political and military capital of Merv is Koushid Khan Kala, a fort which serves rather as a place of refuge against sudden attacks than as a habita- tion. It is situated on the east bank of the most westerly branch of the Murghab, about 25 miles bclow the dam at Porsa Kala. In form it is oblong, measuring 1? miles long by # mile broad, is constructed entirely of earth, revetted on the exterior slope with sun-dried brick; the ramparts are 40 feet high, and are 60 feet at the base. The fort is built in a loop of the river, which protects it on two sides ; between it and the river is an “obali,” or nomad village of huts and tents, some thousand in number, disposed in rows, but there is no town or settlement.

Twenty-five miles east of Koushid Khan Kala lie the ruins of the Greek city of Antiochia Margiana, showing traces of a high civilization. According to Strabo (xi. 2) the Merv oasis at this period was surrounded with a wall measuring 1500 stadia (185 miles). Mr O’Donovan found the trace of the fort of Iskander to have been quadrangular, with a length of side of 900

yards. This was probably the fort built by Alexander, about 328 B.c., on his return from

1 Concurrently with the consolidation of her position in Turcomania, Russia has of late been showing less military activity on the side of her Turkestan district. It is probable that her recent explorations at the sources of the Oxus have demonstrated the impracticability of directing any offensive movement against India from that side. Hence the line of strategical advance has been shifted from Tashkend to Tiflis.

Sogdiana after the capture of Bessus. The city was destroyed in 666 A.D. by the Arabs, who built a new one, afterwards known as Sultan Sanjar, about 1000 yards away, and occupying an area, according to Mr O'Donovan, of about 600 yards square. The towers are still extant, and inside can be seen the ruins of a most elaborate tomb, in which the supposed bones of Sultan Sanjar are enshrined. It has always been a place of pilgrimage for the faithful. Not far to the south-west lies the site of the last city of Merv, that which existed up to a hundred years ago, when it was laid waste by the Bokharians. It bears the name of its gallant defender Bairam Ali.

These three ruins are all that remain of that which flourished of yore as "sovereign of the universe."

At the time of the visit of Burnes, Abbott, Shakespear, and Taylour Thomson, about the fourth decade of the century, Merv was under the jurisdiction of Khiva, and the administrative centre was at Porsa Kala, where the dam is situated. This place is now also a waste of mud ruins, uninhabited.

Rivers.—The Heri-rud (or Tejend, as the river is

named below Sarakhs) runs a course of some 280 miles,

within Afghan borders. On reaching the Persian fron- tier it turns north and forces a channel through the mountain chain near Sarakhs. Beyond Sarakhs

the river is Turcoman on both banks, runs close to the Khelat mountains, and in the latitude of Askabad loses itself in – the marshes formed by the spring floods. It is probably the Ochus of ancient geography, which watered Nissa, once the capital of Parthia, and joined the Oxus just before the latter river disembogued into the Caspian (Rennell's Herodotus). The Tejend is fordable at all points below Sarakhs except in the early spring after the melting of the snows. On the road from Meneh to Merv the river is sluggish, 50 yards wide and 4 feet deep in February. The river-bed is sunk 12 to 15 feet below the level of the surrounding country, and has immense quantities of drift wood on its banks; trees and luxuriant herbage clothe the immediate borders. At midsummer the river runs nearly dry, and does not reach Sarakhs. The Kashaf-rud, which flows near Meshed, is one of its chief affluents. The Murghab takes its rise in the northern slopes of the Paropamisus, and runs parallel to the Heri-rud at a distance of 70 miles from it. On this river lies the plain or oasis of Merv, irrigated by means of an elaborate system of dams and canals cut from the main river. Beyond the limits of the oasis the Murghab "hides its streams in the sand," like the Tejend. The river at Porsa Kala (near the principal dam) is 80 yards wide, at Koushid Khan Kala 30 to 40 yards wide. In summer it is much swollen by the melting of the snows, and its stream is then barely fordable. The water is yellow in colour from suspended matter. Formerly a great deal of the country, now a waste, between the two rivers was also cultivated by the agency of water derived from canals cut from the Tejend. These canals extended to Kucha Kum in the desert, rendering the journey between the two rivers much easier than in the present day. From the Murghab was also cut, among others, the Kara-i-ab canal, which ran for a distance of 40 miles towards the Tejend. Recent explorers affirm that there is no reason why these canals should not be again filled from those rivers, wien the intervening country, "an argil- laceous expanse" (O'Donovan), would become culturable.

Communication. —Merv is surrounded on all sides by desert. On the north, west, and east this desert is sandy and arid; water is exceedingly scarce, the wells being sometimes 60 or 70 miles apart, and easily choked. To the south of Merv, between the rivers Murghab and Tejend, there are traces of past cultivation, of irrigating canals, and of considerable settlements. Between

the Tejend and Askabad the road lies through a populous well-cultivated country (Persian territory) by way of Kahka and Lutfabad.

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‘There are no roads in Merv,—nothing but mere tracks. Many wide and deep irriyating canals have to be crossed ; bridges are few

and bad. The inhabitants cross by inflated skins.

The following tracks lead to the Persian frontier from Merv :—(1)

via Mahmur or Chungul to Lutfabad—eight days on camels; (2) via

Shahidli to Mehna—120 mmiles ; (3) via Shahidli to Fort Cherkeshli and Meshed,—for 85 miles between the Murghab and Tejend there

is scarcely any water; (4) via Sarakhs to Meshed, 9 or 10 marches

for camels, and, according to Petrusevitch, without water between Merv and Sarakhs—120 miles.

To the Afghan frontier lead (1) the track vé@ Sarakhs and up the Heri-rud to Herat—fit for a coach, according to Sir Charles Mac- Gregor and Mr Lessar ; and (2) a practicable track, used by Abbott and Shakespear, up the Murghab and Kushk rivers.

To the Oxus in Bokharian territory lead several tracks, the chief of which is that to Charjui—nine marches for camels. Water is scarce.

To Khiva by the direct track is 360 miles. Water is scarce.

Population.—The Turcomans, according to Sir Henry Rawlinson and others, are descendants of the Ghuz or Komani, a race of Turks who inigrated westward from their homes in_the Altai before the Christian era, and penetrated even to the Danube. From sub- sequent intermixture with Persian and Caucasian eoples, they exhibit variations from the true Tartar type. According to Baron de Bode the Turcoman closely resembles both in

appearance and in speech the Nogai Tartar and the Tartar of Kasan on the Volga.

They are an independent race, as wild and free as their native desert, brave and very impatient of control—‘‘ Wild warriors in stormy freedom bred” (Moore). They have a very evil reputation for brigandage and murder, so much so that the Bokharians and Khivans have a proverb—‘‘If you meet a viper and a Mervi, com- mence by killing the Mervi ind then despatch the viper.” Of late years a change for the better has taken place, and recent travellers among them state that the Mervis show an inclination to lead a more settled life and to establish an elementary form of government (Medjliss), and that it is no longer accounted an honour among them to kill their neighbours. Opium smoking and arrack drink- ing are apparently widespread vices (O’Donovan); at the saine time they are described as clever and intelligent.

The Merv Tekkes (like the Akhal Tekkes) are classed in two great divisions —the Toktamish and the Otamish. Each of these divisions consists of two clans, and each clan is subdivided into families. The two claus of the Toktamish are called Beg and Wakil; those of the Otamish, Suchmuz and Bukshi. The clans of Beg and Wakil are the most powerful, and occupy that part of the oasis which lies on the right or east bank of the Murghab. The Suchmuz and Bukshi have their tents on the left or west bank.

There is no machinery of governinent, and no taxes are levied. Whatever government there be is of a patriarchal nature. Each family has a ketkhoda (patriarch), who represents the family in matters of policy, but can only act in accordance with the wishes of the clan. Theaksakals, or grey beards, are also useful in settling intertribal disputes, but they are tolerated only so long as they do not act in opposition to the tribesmen. For external affairs and in time of war the ketkhodas exercise a certain amount of power. The authority of ketkhodas and aksakals is, however, overriden by the laws of custom or usage (deb) and the less respected laws of religion. The injunctions of deb are paramount. It sanctions the alaman, or plundering raid, and in general regulates the ‘Turcoman’s daily life ; its prescriptions are more Pee than those of the Koran.

The Tekkes marry young. The father purchases for his twelve- year-old son a child-wife for 500 to 2000 krans (£20 to £80). A young widow of twenty-five is much more valuable, but a woman over forty is not worth the price of a camel. On the conclusion of the bargain, the priest reads a prayer from the Koran, and the marriage becomes valid.

The dress of the men consists of a long tunic of coarse crimson silk reaching below the knees, with a white sash through which is stuck a dagger ; an outer robe of brown eamel-hair cloth, a huge sheepskin hat, trousers and slippers or amber-coloured knee-boots, complete the costume. Thewomen are exceedingly fond of trinkets, rings, and amulets, which accompany their movements with a sound as it were of bells. Their dress consists of the same red silk robe as the men wear, witha sash round the waist, and high-heeled boots, red or yellow.

The religion is Suni Mohammedan ; Oriental Turk.

The numbers of Merv Tekkes on the Murghab and Tejend are variously estimated, but may be stated approximately at 40,000 tents, including 5000 tents of the Salor tribe. These 40,000 tents represent a population of 200,000 to 250, 000 souls. The Salors and Sariks at Yulutan and Panjdeh, higher up the Murghab, are given at 11,000 tents, or some 60,000 souls.

Products, Arts, and Manufactures. —The country in all times has been renowned throughout the East for its fertility. Strabo tells us “that it was not uncommon to meet with a vine whose stock could hardly be clasped by two men with outstretched arms, while

their language Jagatai or

A

clusters of grapes might be gathered two cubits in length.” The Arab traveller Ibn Haukal, writing in the 10th century, remarks that ‘the fruits of Merv are finer than those of any other place, and one cannot sec in any other city such palaces with groves and streams and gardens.” A local proverb says, ‘‘Sow a grain to veap a hundred.” All cereals and inany fruits grow in great abund- ance.

The Turcomans possess a famous breed of horses,—not prepos- sessing in appearance, being somewhat leggy and long in the back and neck, but capable of accomplishing long distances—50 or 60 miles—for several days in succession, and with very little food. Their great peculiarity appears to be their hairlessness ; the coat is very fine, the mane and tail very scanty. This breed of horses, as well as the wealth of the Merv Tekkes in camels and flocks, is fast disappearing.

The Turcomans are noted as excellent workers in silver and as armourers, ani their carpets are superior to Persian. They also make felts and a rough cloth of shcep's wool.

One of the chief occupations of the male sex is the repair of the dains and the clearing of the canals, upon the efficiency of which their existence is dependent. The services of a large number of workmen are always held in readiness for the purpose. In 1878 the unusual mass of water in the Murghab carried away the dam, and the drying up of some of the canals nearly led to a failure of the crops.

Climate.—The position of Merv, in the midst of sandy deserts in the heart of Asia, makes the climate in the heat of summer most oppressive. The least wind raises clouds of fine sand and dust, which fill the air, render it so opaque as to obscure the noonday sun, and make respiration difficult. In winter the climate is very fine. Snow falls rarely, and melts at once.

fistory.—The name Merv, or some similar form, occurs at a very early period in the history of the Aryan race. Under Mouru we find it mentioned with Bakhdi (Batkh) in the geography of the Zend Avesta (Vendidad, fargand i., ed. Spiegel), which dates prob- ably from a period anterior to the conquest of Bactria by the Assyrians, and thercfore at least one thousand two hundred years before the Christian era. Under the name of Margu it occurs in the cuneiform inscriptions of Darius Hystaspis, where it is referred to as forming part of one of the satrapies of the ancient Persian empire (Inscriptiones Behistant, ed. Kossowicz). It afterwards becaine a pro- vince (Mapy:avy) of the Greco-Syrian, Parthian, and Persian king- doms. On the Margus—the Epardus of Arrian and now the Murghab — stood the capital of the district, Antiochia Margiana, so called after Antiochus Soter, who rebuilt the city founded by Alexander the Great.

About the 5th century, during the dynasty of the Sasa- nids, Merv was the seat of a Christian archbishopric of the Nestorian Church. In the middle of the 7th century the flood of Arab conquest swept over the mountains of Persia to the deserts of Central Asia. Merv was occupied 666 a.p. by the lieutenants of the caliph Othman, and was constituted the capital of Khorasan. From this city as their base the Arabs, under Kuteibe bin Mustim, early in the 8th century brought undcr subjection Balkh, Bokhara, Ferghana, and Kashgaria, and penetrated into China as far as the province of Kan-su. In the latter part of the 8th century Merv became obnoxious to Islam as the centre of heretical propaganda preached by Mokannah (Haschem ben Hakem), the ‘veiled prophet of Khorasan,” who claimed to be the incarnation of the Deity. In 874 Arab rule in Central Asia came to an end. Dur- ing their dominion Merv, like Samarkand and Bokhara, became one of the great schools of science, and the celebrated historian Yakut studied in its libraries. About 1037 the Seljukian Turks crossed the Oxus from the north and vaised Toghrul Beg, grandson of Seljuk, to the throne of Persia, founding the Seljukian dynasty, with its capital at Nishapur. A younger brother of Toghrul, Daoud, took possession of Merv and Herat. Toghrul was succeeded by the renowned Alp Arslan (the great lion), whose sway was so vast that, according to tradition, no fewer than twelve hundred kings, princes, and sons of kings and princes did homage before his throne. Alp Arslan was buried at Merv. It was about this time that Merv reached the zenith of her glory. During the reign of Sultan Sanjar of the same house, towards the middle of the 11th century, Merv was overrun by the Turcomans of Ghiz, and the country was reduccd to a state of miscry and desolation. These Turcomans, the ancestors of the present tribes of Turcomania, were probably introduced into the country by the Seljukian Turks as military colonists. They formed the van of their armies, and rendered efficient service so long as the dynasty lasted, and after- wards took part in the wars of Tamerlane.

In 1221 Merv opened its gates to Toulai, son of Jenghiz, khan of the Mongols, on which occasion the inhabitants, to the nuinber of 700,000, are said to have been butchered. From this time forward Merv, which had been the chief city of Khorasan, and was popularly supposed to contain a million inhabitants, com- menced to Janguish in obscurity. In the carly part of the

14th century Merv was again the seat of a Christian archbishopric of the Eastern Church. On the death of the grandson of Jenghiz Khan

Merv became included in the possessions of Toghluk Timur Khan (Tamerlane), in 1380. In 1505 the decayed city was occupied by the Uzbeks, who five years later were expetled' by Ismail Khan, the founder of the Suffavean dynasty of Persia. Merv thencefor- ward remained in the hands of Persia until 1787, when it was attacked and captured by the emir of Bokhara. Seven years later the Bokharians razed the city to the ground, broke down thie dains, and converted the district into a waste. About 1790 the Sarik Turcomans pitched their tents there. When Sir Alexander Burnes traversed the country in 1832, the Khivans were the rulers of Merv, the nomad population being subject to them. About this time the Tekke Turcomans, then living at Orazkala on the Heri-rud, were forced to migrate northward in consequence of the pressure from behind of the Persians. The Khivans contested the advance of the Tekkes, but ultimately, about the year 1856, the latter be- came the sovereign power in the country, and have ever since resisted all attempts at reconquest.

Authorities.—Besides the standard travels of Wolff, Ferrier, Vambery, Burnes, Abbott, Mouravieff, and others, the following works and papers of more recent date may be consulted with advantage :—Sir H. Rawlinson's England and Russia in the East; O'Donovan's correspondence with the Dazly News, 1880-81; O'Donovan's "Merv," Proc. Roy. Geog. Soc.; Col. Stewart's 'Country of the Tekke Turcomans," Proc. Roy. Geog, Soc., with excellent map; "The New Russo- Persian Frontier, 1881,' Proc. Roy. Geog. Soc.; Girard de Rialle, Mémoire sur VAsie Centrale; Sir H. Rawlinson, ' Road to Merv," Proc. Roy. Geog. Soc.: Col. Baker's Clouds in the East; Captain Napier's " Reports," Jour, Roy. Geog. Soc.; Hutton's Central Asia; Marvin's Merv; Col. Potto's Steppe Campaigns ; Sir Charles MaeGregor's Journey through Khorassan; Boulger's England and Russia in Central Asia; Captain Butler's Communications to the Public Press ; Lessar's " Journeys,' Proc. Roy. Geog. Soc.; O'Donovan's Merv Oasis; Papers on the Turcomans, &¢e., by Col. Petrusevitch, Proc. Imp. Kuss. Geog. Soc,, Caucasus section; Col. Grodekoff's Journey from Tashkend to Persia, 1880;

Captain Kuropatkin’s Turcomania, 1880; Col. Veniukoff’s Progress of Russia in Central Asia, 1877, and other papers by the same author; Col. Kostenko’s “ Turkestan,” Jour, R, U.S. Instn.; Schuyler’s Turkistan ; eo.respondence on Central Asia pre- sented to parliament, &c. (F.C. 1. C.)

MERYON, Cwarums (1821-1868). The name of Méryon is associated with that spirited revival of etching in France which took place in the middle of the 19th century,—say from 1850 to 1865,—but it is rather by the individuality of his own achievements, and the strength of his artistic nature, than by the influence he exercised that Méryon best deserves fame. ‘No doubt his work encouraged others to employ the same medium of expression, and so great was his own perfection of technique that he may well have been made a model; but, after all, the medium he selected, and in which he excelled, was but the accident of his art; he was driven to it in part by stress of circum- stances—by colour blindness ; and, even with colour blind- ness, his extraordinary certainty of hand and his delicate perception of light, aided by his potent imagination, would have made him a great draughtsman not alone upon the copper.

Charles Méryon was born in Paris in 1821. His father was an English physician, his mother a French dancer. It was to his mother’s care that Méryon’s childhood was confided. She was supplied with money, and she gave the boy passionate affection, if not a wise training. But she died when he was still very young, amd Méryon in due time entered the French navy, and in the corvette “Le Rhin” made the voyage round the world. He was already a draughtsman, for on the coast of New Zealand he made pencil drawings which he was able to employ, years after- wards, as studies for etchings of the landscape of those regions. The artistic instinct developed, and, while he was yet a lieutenant, Méryon left the navy. Finding that he was colour-blind, Méryon determined to devote himself to etching. He entered the work-room of one Bléry, from whom he learnt something of technical matters, and to whom he always remained grateful. Méryon was by this time poor. It is said that he might have had assistance from his kindred, but he was too proud to ask it. And thus he was reduced to the need of executing for the sake of daily bread much work that was wholly mechanical and irksome. Resolutely, though unwillingly, he became the hack of his art, doing frequently, from the day when he was first a master of

it to the day when insanity disabled him, many dull commissions which paid ill, but paid better than his original works. Among learner's work, done for his own advantage, are to be counted some studies after the

Dutch etchers such as Zeeman and Adrian van de Velde. Having proved himself a surprising copyist, he proceeded to labour of his own, and began that series of etchings which are the greatest embodiments of his greatest con- ceptions—the geries called " Eaux-fortes sur Paris." These plates, executed from 1850 to 1854, are never to be met with as a set; they were never expressly published as a set. But they none the less constituted in Méryon's mind an harmonious series. For him their likenesses and their contrasts were alike studied ; they had a beginning and an end; and their differences were lost in their unity.

Besides the twenty-two etchings "sur Paris" character- ized below, Méryon did seventy-two etchings of one sort and another,—ninety-four in all being catalogued in Wedmore's Méryon and Méryon's Paris ; but these include the works of his apprenticeship and of his decline, adroit copies in which his best success was in the sinking of his own individuality, and dull and worthless portraits chiefly of forgotten celebrities. Yet among the seventy-two prints outside his professed series there are at least a dozen that will aid his fame. 'Three or four beautiful etchings of Paris do not belong to the series at all. Two or three etchings, again, are devoted to the illustration of Bourges, a city in which the old wooden houses were as attractive to him for their own sakes as were the stone- built monuments of Paris. But generally it was when Paris engaged him that he succeeded the most. Hc would have done more work, however,—though he could hardly have done better work,—if the material difficulties of his life had not pressed upon him and shortened his days. He was a bachelor, unhappy in love, and yet, it is related, almost as constantly occupied with love as with work. The depth of his imagination and the surprising mastery which he achieved almost from the beginning in the technicalitics of his craft were appreciated only by a few artists, critics, and connoisseurs, and he could not sell his etchings, or could sell them only for about 10d. a piece. The fact that his own original work was of incaleulably greater value than his best copies of his most

celebrated forerunners had not yet impressed itself upon anybody. Disappointment told upon him, and, frugal as was his way of life, poverty must have told on him. He became subject to hallucinations. Enemies, he said, waited for him at the corners of the streets ; his few friends robbed him or owed him that which they would never pay. A very few years after the completion of his Paris series, he was lodged in the madhouse of Charenton. Its order and care restored him for a while to health, and he came out and did a little more work, but at bottom he was exhausted. In 1867 he returned to his asylum, and died therein 1868. In the middle years of his life, just before he was placed under con- finement, he was much associated with Bracquemond and with Flameng,—skilled practitioners of etching, while he was himself an undeniable genius,—and the best of the portraits we have of him is that one by Bracquemond under which the sitter wrote that it represented “the sombre Méryon with the grotesque visage.” And it did.

There are twenty-two picces in the Eaux-fortes sur Paris. Some of them are insignificant. That is because ten out of the twenty- two were destined as headpiece, tailpiece, or runniug commeutary on some more important plate. But each has its value, and certain of the smaller pieces throw great light on the aim of tlie entire set. Thus, one little plate—not a picture at all—is devoted to the record of verses made by Méryon, the purposc of which is to lament the life of Paris. The ntisery and poverty of the town Méryon had to illus- trate, as well as its splendour. The art of Méryon is completely misconceived when his etchingsare spoken of as views of Paris, They are often ‘‘ views,” but they are so just so far as is compatible with their being likewise the visions of a poet and the compositions of an

artist. It was an epic of Paris that Méryon determined to inake, coloured strongly by his personal sentiment, and affected here and

there by the occurrences of the moment,—in more than one casc, for instance, he hurried with particular affcction to etch his impression

judged.

of some old-world building which was on the point of destruction. Nearly every etching in the series is an instance of technical skill, but even the technical skill is exercised most happily in those etch- ings which have the advantage of impressive subjects, and which the collector willingly cherishes for their mysterious suggestiveness or for their pure beauty. Of thesc, the Abside de Notre Dame is the general favourite ; it is commonly held to be Méryon's master- piece. Light and shade play wonderfully over the great fabric of the church, seen over the spaces of the river. As a draughtsman of architecture, Méryon was complete ; his sympathy with its various styles was broad, aud his work on its various styles unbiassed and of equal perfection—a point in which it is curious to contrast him with Turner, who, in drawing Gothic, often drew it with want of appreciation. It is cvident that architecture must enter largely into any representation of a city, however much such representation may be a vision, and however little a chronicle. Besides, the archi- tectural portion even of Méryon's labour is but indirectly imagina- tive ; to the imagination he has given freer play in his dealings with the figure, whether the people of the street or of the river or the people who, when he is most frankly or even wildly symbolical, crowd the sky. Generally speaking, his figures are, as regards draughtsmanship, ''landscape-painter's figures." They are drawn more with an eye to grace than to correctness. But they are not '"landscape-painter's figures" at all when what we are concerned with is not the method of their representation but the purpose of their introduction. They are scen then to be in exceptional accord with the sentiment of the scene. Sometimes, as in the case of La Morguc, it is they who tell the story of the picture. Sometimes, as in the case of La Rue des Mauvais Gargons,—with the two passing women bent together in secret converse,—they at least suggest it. And sometimes, as in L'Arche du Pont Notre Dame, it is their expressive gesture and eager action that give vitality and animation to the scene. Dealing perfectly with architecture, and perfectly, as far as concerned his peculiar purpose, with humanity in his art, Méryon was little called upon by the character of his subjects to deal with Nature. He drew trees but badly, never representing foliage happily, either in detail or in mass. But to render the char-

'acteristics of the city, it was necessary that he should know how to

pourtray a certain kind of water—river-water, mostly sluggish—and a certain kind of sky—the grey obscured and lower sky that broods over a world of roof and chimney. This water and this sky Méryon is thoroughly master of ; he notes with observant affection their changes in all lights.

Méryon's excellent draughtmanship, and his keeu appreciation of light, shade, and tone, were, of course, helps to his becoming a great etcher. But a living authority, himself an eminent etcher, and

admiring Méryon thoroughly, has called Méryon by preference a

great original engraver, —so little of Méryon's work accords with Mr Haden's view of etching. Méryon was anything but a brilliant sketcher; and, if an artist's succcss in etching is to be gauged chiefly by the rapidity with which he records an impression, Méryon's suc- cess was not great. There can be no doubt that his work was laborious and deliberate, instead of swift and impulsive, and that of some other virtues of the etcher—‘‘ sclection” and ‘‘abstraction ” as Mr Hamerton has defined them—he shows small trace. But a genius like Méryon is a law unto himself, or rather in his practice of his art he makes the laws by which that art and he are to be He was a great etcher, and by his most claborate labour he seemed somehow to ensure the more completely for his picture that virtue of unity of impression which, it may well be admitted, oftener belongs to rapid than to deliberate work. In Méryon's etchings the hand-work never seems to be in arrear of the thought. As long as the hand-work must continue, the thought and passion are retained. Méryon knows the secrets of his craft as well as did the older masters of it; but he turns them to his own purposes. He is unexcelled in strength and in precision, nor is he often rivalled in delicacy, These qualities, and others more distinctly technical, which it would take too long to insist on here, students find in his etchings. But the incommunicable charm of Meéeryon's prints and their lasting fascination are due to the fact that, behind all technical qualities, and as their very source and spring, there lies the potent imagination of the artist, poetical and vivid, direct- ing him what to see in his subject, and how to see it. (F. WE.)

MESCHERYAKS, or Mzscuers, a people inhabiting eastern Russia. Nestor regarded them as Finns, and even now part of the Mordvinians (of Finnish

origin) call themselves Meschers. Klaproth, on the other hand, supposed they were a mixture of Finns and Turks, and the Hungarian traveller Reguli discovered that the Tartarized Meschers of the Obi closely resembled Hungarians. They formerly occupied the basin of the Oka (where the town Meschersk, now Meschovsk, has maintained their name) and of the Sura, extending north-east to the Volga. After the conquest of the Kazan empire by Russia, part of

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them migrated north-eastwards to the basins of the Kama and Byelaya, and thus the Meschers divided into two branches. The western branch became Russified, so that the Mescheryaks of the governments of Penza, Saratoff, Ryazan, and Vladimir have adopted the customs, language, and religion of the conquering race; but their ethnogra- phical characteristics can be easily distinguished in the Russian population of the governments of Penza and Tamboff. The eastern branch has taken on the customs, language, and religion of Bashkirs, with whom their fusion is still more complete. They can be distinguished from their neighbours only by their more peaceful character. This Bashkir-Mescheryak branch was estimated by Rittich in 1875 to number 138,000. They make 6 per cent. of the population of the government of Upa, and 22 per

cent. in the district of Birsk. The number of the western |

Mescheryaks is unknown, and could hardly be estimated on account of their mixture with Russians. It is only in the governmentof Penza thatthey have maintained their national features ; there they make 3 per cent. of the population. MESCHOVSK, a district town of Russia, in the govern- ment of Kaluga, 45 miles to the south-west of the capital of the province. It is an old town supposed to date from the 13th century, and it is often mentioned in Russian annals under the names of Mezetsk, Mezechevsk, or Meschorsk. About the end of the 14th century it was embraced in Lithuania, and it was ceded to the Moscow “ oreat principality” in 1494, It wasoften pillaged by Tar- tars in the 16th century, and during the great disturbances

of 1610 all its inhabitants were killed by the Zaporoghi | Cossacks, and the fort was taken by Poles, who returned it |

to Russia only after the treaty of Deulin. The country

round Meschovsk is not fertile; but, from its position on |

old established routes to the south, the town has become a centre of considerable trade. takes place on the grounds of the very old Petrovsk monastery, is important to the surrounding districts for the export sale of horses, grain, hemp, hempseed oil, and

coarse linen, and for the import trade in cottons, woollens, |

and earthen and glass wares, the whole turn-over reaching about £100,000. Population, 7400.

MESHED (properly Mesh-hed, z¢., “place of martyr- dom,” ‘‘shrine”), a city of northern Persia, capital of Khoras4n, 472 miles east of Tehran, 201 miles north-west of Herat, 36° 17’ 40” N., 52° 35’ 29” E., lies on a plain watered by the Keshaf-rud, a tributary of the Heri-rud, and is surrounded by mud walls 4 miles in circumference, with a dry ditch 40 feet deep at some points, which could be

flooded from the neighbouring reservoir and watercourses. | Within this enclosure is a strong citadel, with good walls 25 | feet high, residence of the prince governor of Khordsan. |

There are five gates, from one of which, the Bala Khiaban, the Khiaban main street runs right through the city, form-

ing a fine boulevard planted with plane and mulberry trees, | and with a stream of dirty water running down its whole |

length. In the centre is an open parallelogram 160 yards by 75, encircled by double-storied cloisters, and pierced on the long side by a high arched porch leading directly to the great mosque, whose gilded dome rises above the shrine of the famous Im4m Riza.!_ The marble tomb of the saint,

1“Ali Riza (or el-Rida), the eighth imam of the Shi‘a, is the ‘AH ibn Musa from whom the party of Alides had such hopes under the caliphate of Mamim (see MonamMepaNnisM). He died at Tus, 818 a.D., and was buried by Mamun’s orders in the vicinity of that town beside the grave of Harin el-Rashid. To the Alides he was a martyr, being believed to have been poisoned by the caliph. Ibn Batita, who describes both shrines (iii. 77 sq.), tells how the pious visitors to the shrine of ‘Ali ibn Musd used to spurn with their feet the tomb of Rashid. In his time a considerable town had been formed around the shrine under the name of Meshhed el-Rida and ultimately the new town eclipsed the older city of Tus.

Its annual fair, which |

which is the most venerated spot in the whole of Persia, and yearly visited by from 80,000 to 100,000 pilgrims, is surrounded by a silver railing, and approached by a flight of inlaid marble steps. Eastwick, the only European before O’Donovan who penetrated as far as the parallelograni, describes the mosque as large enough to contain three thousand people. It is flanked by two gilded minarets, one of which, 120 feet high, is extremely beautiful, with an exquisitely carved capital, built by Shah Abbds. The fagade is entirely covered with blue and white enamelled tiles. To the mosque are attached as many as two thousand attendants and retainers of all sorts, including no less than five hundred mollahs. Beyond the dome is Gauhar Shah’s handsome mosque, surmounted by an immense blue dome, and also flanked by two minarets. In the main street is a public kitchen supported by the enormous revenues of the shrine, where eight hundred devotees are daily supplied with food gratuitously. The only other notable buildings in the place are some colleges and twenty- two caravanserais, one of which is of great size. Meshed does a considerable local and transit trade to the yearly value of about 600,000 tomans, and its bazaars are always well stocked with silks, velvets, felts, cottons, shawls, carpets, lacquer work, lambskins, hardware, glass, chira, and other goods from South Persia, India, Turkestan, and Russia. The European trade is now entirely controlled by Russia, and European manufactured articles are mostly all from that country. Thechief manufactures are silk, satin, velvet, and checked-cotton

fabrics, carpets, shawls, noted sword blades, shagreen, and turquois jewellery. Within the enclosures are extensive cemeteries far exceeding the local requirements, large numbers of the faithful being brought from all parts of the Shi‘a world to be buried in the vicinity of Rizdé’s shrine under the belief that their eternal salvation is thereby ensured. .

Some 10 miles west of Mcshed is a powder factory, formerly under Colonel Dolmage, where powder of excellent quality is pro- duced. The district, although irtile, does not produce sufficient for the inhabitants, so that much grain has to be imported from Kurdistan and Nishapur. The climate is very severe in winter, with much snow; in summer it is less sultry than might be expected, the temperature ranging from 76° F. to 90° or 92° F., and in excep- tional years 94° to 98° F. The population is variously estimated at from 45,000 (Connolly) and 60,600 (Ferrier) to 80,000 and 100,000 (Kastwick), The settled residents, exclusive of pilgrims and foreign traders, are estimated by O’ Donovan at 50,000.

The main caravan routes from Khiva, Bokhara, Samarkand, and Herat converge at Meshcd, whence lines of traffic radiate to Kichan for the Atrek valley and the Caspian, to Nishapur and Bostam for Tehran, to Tabas for Isfahan, to Khaf for Sistan and Kirman. It thus occupies a position in north-eastern Persia analogous to that of Tabriz in the north-west.

MESHED-ALI, «.e., the shrine of the “martyr” Ali, is ‘a town of Asiatic Turkey, province of Baghdad, 50 miles south of Kerbela, close to the ruins of Kufa, and 2 miles west of the Hindiye branch of the Euphrates, the reputed burial-place of the caliph Ali? It stands on the east scarp of the Syrian desert, and is enclosed by nearly square brick walls flanked by massive round towers dating from the time of the caliphs. Under the gilded dome of the great mosque, which occupies the centre of the town, is the shrine of Ali, which is held by the Shia as at least as holy as the Kaaba itself. Any Moslem buried within sight of the dome being certain of salvation, large numbers of bodies are yearly sent from all parts for interment here. Besides the mosque with its richly decorated facade, the only noteworthy building is a good bazaar supplied from Baghdad and Basra. The town itself, which Lady Anne

2 Whether the place really contains the grave of Ali was long disputed, and the story given in defence of its claims is doubtless apocryphal. The dome was built under the Abbasids, and the resting- place of the caliph unknown ‘or concealed under the Omayyads (Ibn Haukal, p. 163).

Blunt describes as “an ideal Eastern city, standing in an absolute desert, and bare of all surroundings but its tombs,” consists of narrow gloomy streets lined by houses closcly packed together. The locality is properly named Najaf, and gives its name to the neighbouring lake, a large depression filled by an eruption of the river, and ranging from 6 to 20 fect in depth. The accumulated treasures of the shrine were carried off by the Wahhabites when they capturcd this place early in the present century. The population ig estimated at 7000, including several Indian Mohammedans under the protection of the British resident at Baghdad.

The aspect of the shrine in the 14th century is described by Ibn Batita, i 414 sg. A plan of the town and description of its splendour before the Wahhabites pillaged it is given by Niebuhr. See also Ibn Jubair, p. 214; P. Teixeira, Itin., eap. iv. MESHED HOSEIN, properly MesHuEep Hoser. Kereta, vol. xiv. p. 48.

MESMER, MESMERISM. Sce vol. xv. p. 277. MESOPOTAMIA, the “‘ country between the rivers,” is a purely geographical expression, the countries which it com- prehends never having formed a self-contained political unity! It was first introduced by the Greeks at or after the time of Alexander, but probably had its origin in the earlier Aramexan name béth nahrin (the country between the rivers), to which again corresponds the Biblical Aram Vaha- rayim.2 As early as 700 B.c. “the country of two rivers ” is mentioned on the Egyptian monuments under the name Naharina, but no such designation appears in the cunei- form inscriptions (though the territory formed part of the Assyrian as it afterwards did of the Persian empire). The most settled period in the history of Mesopotamia was probably under Persian-Greek rule. Xenophon applies the name Syria to the extremely fertile district which he traversed after having crossed the Euphrates at Thapsacus, The country beyond the Araxes (Chaboras 1) he calls Arabia, —a desert region in which his army had to suffer great hardships until it reached the “gates of Arabia.” Even in later times

Mesopotamia was included under the name Assyria, or was reckoned part of Babylonia.

These statements of Xenophon already indicate a demarcation of the territory afterwards called Mesopotamia, as well as its division into two sections, The fertile portion, inhabited by agricultural Aramzans, stretched. from the Euphrates to the Chaboras; the desert portion, thc home of wandering tribes, extended to the Tigris. It would be rash, however, to conclude from this that Mesopotamia designated the whole territory between the Euphrates and Tigris; indeed it is possible that Aram Naharayim, the Aram of the country of the two rivers, originally meant only the main portion of the fertile country inhabited by Syrians. In this case the two boundary rivers must have been, not the Euphrates and the Tigris, but the Euphrates and the Chaboras. After the final occupation of the country by the Romans (156 a.D.), the political province of Mesopotamia was practically confined to this more limited district. Though in ordinary usage the Euphrates and Tigris are considered as the two rivers which bound Mesopotamia, the one bank of the river cannot be geographically separated from the other, and consequently narrow strips of country on the right bank of the Euphrates and on the left bank of the Tigris must be reckoned to the country “between” the rivers. On the other hand, the country between the sources of the Euphrates and the Tigris has from early times been

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1 Mecowotapia, more exactly 4 méon TOY ToTapGr, scil. xapa or Zupla.

2 In the more recent parts of Genesis Padan Aram takes the place of Aram Naharayim. But this perhaps is the name of a smaller district in the neighbourhood of Harran.

reckoned not to Mesopotamia but to Armenia. In this direction the Masius range forms the proper boundary, and it is only on rare occasions that theoretical geographers extend the name Mesopotamia over the more northern districts, Sophene, &c. Purely theoretical too, and not to be approved, is the extension of the definition so as to include the land of Babylonia (‘Irak ‘Arabi), that is, the country as far south as the confluence of the Euphrates and Tigris, or even as far as their embouchure in the Persian Gulf.

From what has been said it appears that Mesopotamia reaches itsnorthern limitsat the points wherethe EUPHRATES (q.v.) and the Tigris break through the mountain range and enter the lowlands. In the case of the Euphrates this takes place at Sumeisdt (Samosata), in that of the Tigris near Jeziret ibn ‘Omar (Bezabd&) and Mosul (Nineveh). Consequently the irregular northern boundaries are marked by the lowland limits of those spurs of the Taurus mountains known in antiquity as Mons Masius and now as Karaje Dagh and Tur ‘Abdin. Towards the south the ancient boundary was the so-called Median Wall, which, near Pirux Shapur, not much to the south of Hit (the ancient Is), crossed from the Euphrates in the direction of Kadisiya (Opis) to the Tigris. There the two rivers approach each other, to diverge again lowcr down. At the same place begins the network of canals connecting the two rivers which rendered the country of Babylonia one of the richest in the world; there too, in a geological sense, the higher portion of the plain, consisting of strata of gypsum and marl, comes to an end; there at one time ran the line of the sea-coast; and there begin those alluvial formations with which the mighty rivers in the course of long ages have filled up this depressed area. Mesopotamia thus forms a triangle lying in the north-west and south-east direction, with its long sides towards the north and south- west. It extends from 37° 30’ to about 33° N. lat. and from 38° to 46° E. long., and has an area of some 55,200 square miles. The points at which the rivers issue from among the mountains have an absolute altitude of between 1000 and 1150 feet, and the plain sinks rapidly towards the southern extremity of Mesopotamia, where it is not more than about 165 fect above the sea. As a whole tlie entire country consists of a single open stretch, save that in the north there are some branches of the Taurus—the Nimrtd Dagh near Orfd, the long limestone range of ‘Abd-el ‘Aziz, running north-north-west, and farther to the east the Sinjar range, also of limestone,

7 miles broad and 50 miles long, running north-north-east. Between these two ranges—near the isolated basaltic hill of Tell Kékab (Hill of Stars)—runs the defile by which the waters of the Chaboras, swollcn by the Jaghjagha and other affluents from the Masius, find their way into the heart of Mesopotamia. The Khaébur proper, the ancient Chaboras, which rises in the three- hundred copious fountains of Ras-ain (the ancient Rheszena), and ultimately falls into the Euphrates near Karkisiya (Circesium), forms the boundary between the two, or more correctly the three, great divisions of Mesopotamia. These divisions are (1) the northern country to the west of the Khabur, (2) the northern country to the cast, and (3): the steppeland. In the country to the north-west of the Khabur we must probably, as already mentioned, recognize the true ancient Aram Naharayim. Under the dominion of the Seleucids it bore the name of Osrhocne, or better Orrhoene, and was for a time the seat of a special dynasty which at a later date at any rate was Arabian (Abgar). The capital of this kingdom was Orfa (Roha), the Edessa of the Greeks and Romans, the Orrhoi of the Syrians ; it was ata later date a Roman colony, and bore also the name of Justinopolis. This once flourishing city lies on the small river Daisan (the ancient Scirtus). South of Edessa lie

the ruins of HARRAN (see vol. xi. p. 454). In the Mongolian period Harran fell into decay, and at present it is a mere heap of ruins. A third town of this region is Serug (Gen. xi. 20); in the Greek period it was called Batne, but the Syrians retained the name Serug, which is still in use (Sertj). The town lies between Harran and the Euphrates, in a plain to which it gives its name. On the left bank of the Euphrates lay Apamea (the modern Birejik), connected with Zeugma on the other side by a bridge, and farther south, at the mouth of the Bilechas (modern Belik), was the trading town and fortress Nicephorium, founded by command of Alexander, and completed by Seleucus Nicator, in memory of whose victory it was nanied. From the emperor Leo it received the designation Leonto- polis. The spot is now known as Rakka (see below). Farther up the fruitful valley of the Belik lay the town of Ichnze (Chne). Farther south lay Circesium (Chaboras of Ptolemy, Phaleg of Isidor), not to be identified, as is usually assumed, with Carchemish ; from the time of Diocletian it was strongly fortified. The site

is at present occupied by a wretched place of the name Karkisiyé. Carchemish probably lay near the bridge of Membij, the present Kalat el-Nejm.

In ancient times a highly flourishing district must have stretched along the river Chaboras (Khabur) to its principal source at Ras-ain (‘“ Fountain-head,” Syr. Risk aina, the Rheszena of Ptolemy), a town which was for some time called Theodosiopolis, because after 380 a.D. it was extended and embellished by Theodosius. Justinian fortified it. The strip of completely desert country which now stretches along the lower course of the Khabur was called in antiquity Gauzanitis, and corresponds to the Gozan of 2 Kings xviii. 6 (Guzana or Guzanu in the cuneiform inscriptions).

The country to the east of the upper Khabur is in many respects similar to that which has just been described. As the watershed of the Tigris is not far distant, the Masius range sends down into Mesopotamia only insignificant streams, the. most important being the Hermas, the Mygdonius of the Greeks. On its banks was situated Nisibis, the chief city of the district, which commanded the great road at the foot of the mountains leading through the steppe, which here from the scarcity of water comes close up to the edge of the hills. In the old Assyrian empire Nasibina was the seat of one of the four great administrative officials. In the time of the Seleucids the site was occupied by the flourishing Greek colony of Antiochia Mygdonia ; but the new designation, transferred to the river and the vicinity of Nisibis from the Mace- donian district of Mygdonia, afterwards passed out of use. Nisibis was an important trading city, and played a great part in the wars of the Romans against the Persians. Captured by Lucullus, surrendered by Tigranes, recovered by Trajan, again abandoned by Hadrian, once more occu- pied under Lucius Verus, and strongly fortified by Severus, it was at length raised to be the capital of the province, and remained the frontier fortress of the Romans till in the time of Jovian it was ceded to the Persians. After the loss of Nisibis the emperor Anastasius in 507 founded to the north-west the fortress of Dare or Daras (the modern Dara), also called Anastasiopolis, which from the reign of Justinian, who increased its strength, remained for a time the residence of the dua Mesopotamiz, Besides these strongholds, many fortified posts were

established by the Byzantine empire in this district. Antoninopolis must be mentioned as an important town; this was refortified by Constantine under the name of Constantia, and. has left its ruins near Tela between Harran and Nisibis. Mardin too was a fortress of a similar kind, and the town of Singara, at the southern foot of the mountain of the same name, was an advanced post of the Roman power.

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The south or steppe portion of Mesopotamia was from early times the roaming-ground of Arabic tribes; for Xenophon gives the name of Arabia to the district on the left bank of the Euphrates to the west of the Khabur ; and elsewhere it is frequently stated that the interior at a distance from the rivers was a steppe inhabited by Arabes Scenitz (Tent Arabs). Along the bank of the two great rivers ran a belt of cultivated country, and the rocky islands of the Euphrates were also occupied by a settled population. On the Euphrates, beginning towards the north, we must mention first Zaitah or Zautha, south-east of Circesium; next Corsothe, at the mouth of the Mascash ; then Anatho or Anathan, the modern Ana; and finally Is (Hit). On the Tigris the point of most importance is Carnz (Kawai of the Anabasis), south from the mouth of the Great Zab near the present Kal‘at Sherkat; and not far distant towards the interior was Atrz or Hatrze, also called Hatra, the chief town of the Arab tribe of the Atreni. It was besieged without success by Trajan and Severus ; by the 4th century it was already destroyed; but the interesting ruins, which can scarcely be visited owing to the plundering habits of the Bedouins, still bear the name of El-Hadhr. They le in the heart of the steppe, and were formerly well supplied with water.

All these districts came in 640 a.D., or perhaps a little earlier, into the power of the Arabs, who named them Jezira (island) or Jezfret Akur,! and divided them according to tribes into three portions, the land of Bekr, of Rebi‘a, and of Modhar. The district of Modhar ran along the side of the Euphrates, and its chief towns were Orfa and Rakka; the district of Rebf‘a comprised the plain of Mosul as far as the country on the Khaébur (chief towns Mosul and Nisibis), and the district of Bekr (Diyér Bekr) the more mountainous country to the west of the upper Tigris (chief town Amid or Diarbekr). In general the Arabs consider a part of the mountain territories

which lie between the two rivers to belong to Jezfra, as is best seen from the following notice given by Abulfeda:—

‘*El-Jezira is the land between the Tigris and the Euphrates, yet many places on the other side of the Kuphrates, which properly belong to Syria, are also included, as well as places and even dis- tricts on the east side of the Tigris. The exact boundary line thus runs from Malatia by Sumcisat, Kal‘at er-Rim (Rum-Kala of the maps), and Bire (Birejik) to the point opposite Membij, and then by Balis, Er-Rakka, Karkisiya, Er-Rahaba (on right bank), and Hit to Anbar. Here the Euphrates ceases to form the boundary, which runs across to the Tigris in the direction of Tekrit, and ascends the Tigris as far as Es-Sinu (Senna) to El-Haditha and Mosul, thence to Jeziret ibn ‘Omar, then to Diarbekr, and so back to Malatia.”

From the Arabic geographers and travellers we gain the impression that a great part of Mesopotamia, with the ex- ception of the southern steppe of course, must at that time have been ina very flourishing condition ; the neighbourhood of Nisibis especially is celebrated as a very paradise. In fact it is only since the Turkish conquest of the country under Sultan Selim in 1515 that it has turned into a desert and gradually lost its fertility. As the nomadic Arabs have continually extended their encroachments, agriculture has been forced to withdraw into the mountains; and this is especially true of the western portions of Mesopotamia, the district of Ras-ain, and the plain of Harran and Serdj, where huge mounds give evidence that the whole country was once covered with towns and villages. Under the Turks El-Jezira does not form a political unity, but be- longs to different pashaliks.

From this brief survey it appears that Mesopotamia, like Syria, constitutes an intermediate territory between the great eastern and western monarchies, —Syria inclining

1 Philostratus (c. 200 a.p.) already reports that the Arabs called Mesopotamia vices.

more to the west, and Mesopotamia to the east. virtue of its position it frequently formed both the object and the scene of contest between the

armies of those mighty monarchies, and it is wonderful how a country so often devastated alinost always recovered. The roads, it is true, which traversed the territory were not mere military highways, but the main routes of traffic for Central Asia, Western Asia, and Europe. It is only in modern times, and since these lines of commercial intercourse have ceased to be followed, that the general condition of things has been so entirely altered.

The number of roads which in ancient times traversed —

the country was very considerable ; the Euphrates formed not a barrier but a bond between the nations on either side; at many places there were at least boat-bridges (zeugma) across. One of the most important of the ancient crossing-places must be sought, where in fact it still exists, at Birejik, the ancient Apamea-Zeugma. From this point a great road led across to dessa (Orfa); there it divided into two branches, the northern going by Amid (Diarbekr) and the other by Mardin and Nisibis to Mosul (Nineveh). In quite recent times, in order to avoid the direct route across the desert and through the midst of the Bedouins, the post-road makes a great circuit from Nisibis by Jezfret ibn“Omar to Mosul. A second route crossed the Euphrates somewhat more to the south, and joined the other wa Harran and Rhessena. The principal crossing of the earlier times (Xenophon) was at Thapsacus, almost opposite Rakka; and it will be remembered also how important a part Thapsacus (Tiphsah) plays in the Old Testament. Sometimes a route along the Euphrates to Babylonia was followed, as is still frequently done by caravans at the present day; but even in ancient times this course was attended by more or less difficulty, tlie country being occupied by the chiefs of independent Arab tribes, with whom the travellers had to come to terms.

The ancient condition of things must consequently be considered as essentially analogous to that of the present day ; the central districts away from the rivers were occu- pied at certain seasons, according as they yielded pasture, by nomadic cattle-grazing tribes, the physical character of the country being then and now the same on the whole as that of the Syrian desert, which belongs not to Syria but properly to Arabia. On the banks of the rivers were settled half-nomadic Arab tribes,—tribes, that is, which were more or less on the way to the agricultural stage, or which, having

become altogether agricultural, had never- theless, owing to frequent intercourse with the Bedouins, lost little of their original character, and even maintained their independence. The same movement takes place over and over again: Arab tribes migrating from Arabia, that officina gentium, gradually settle down wherever circun- stances prove favourable, and by this very change in their mode of life make their first step towards civilization. In this way a continual stream of Arabs has flowed into the civilized countries of Mesopotamia. On the Assyrian monuments are figures of Arabs riding on camels ; evidently the Assyrians had carried on war against the Bedouins settled in their territory. At an early period the Tai Arabs were the neighbours of the Arameeans, and consequently all Arabs bear in Syriac the name of Taydyé. The district between Mosul and Nisibis received the name Béth ‘Arbayé from its being occupied by Arabs. These Tai Arabs, whose original home was Central Arabia, are still settled partly near Nisibis and partly east of Mosul; but they have to some extent lost their old noble Bedouin manners. The wandering Arab tribe which at the present time is dominant in Mesopotamia is the Shammar; they have driven back the Aneze, the most powerful tribe of the

Syrian desert. It is only two cr three generations ago that the Shammar came from Nejd ; but they have already broken up into two great parties. The head of the one division is Ferh4u, who has more or less completely sub- mitted to the Turks, and has consequently obtained the title of pasha ; to him adhere the Shammar tribes between Mosul and Baglidad, and those also to the east of the Tigris. The head of the tribes who roam over the greater part of Mesopotamia—pasturing their camels and sheep to the east of tlie Chaboras in the colder season and to the north in the hotter—is the chivalrous Faris. These western tribes are totally independent of the Turkish Government, and have offered determined opposition to the attempts of the authorities at Dér to force them to a settled way of life; they still lay the peasants of Mesopotamia under contribution by exacting Khuwwe, “ brotler-money,” or a portion of grain. The Shammar live in almost perpetual feud with their relations to the east, and especially with the Aneze on the Syrian bank of the Euphrates, the so-called Shamtye. Many other Bedouin tribes might here be mentioned ; but it may be enough to name the Delém

on the Euphrates as an example of a tribe just in process of becoming agricultural. In the northern parts of Mesopo- tamia there are a number of tribes of mingled Kurds and Arabs which have toa greater or less degree abandoned their tents for fixed habitations and the tillage of the ground; such are the Beraziye near Orfa, the Milliye between Orfa and Mardin, and the Kikiye nearer Mardin and also in the neighbourhood of Mosul. It is extremely hard to obtain trustworthy statistical information about the number of the Bedouins; the Shammar may have a total strength of some 3500 tents. In the difficult contests which it has to carry on with those independence-loving tribes, the Turkish Government acts in general on thie principle divide et impera.

The Kurdish element only appears sporadically in the true Mesopotamian plain; but the Yezidis, who form the population of the Sinjar range, may be referred to this stock. He who encounters the uncanny figure of one of these people will hardly be able to restrain a slight shudder, especially if he remembers the graphic descriptions of the Yezidi robbers in Morier's Ayesha. Of the old Aramean peasantry there are no longer any important remains in the plain, the Aramezans having withdrawn farther into the Kurdish highlands, where, in spite of their wild Kurdish neighbours, they are more secure from exactions of every kind. The plain of the northern country of the two rivers was at one time richly cultivated, and owed its prosperity to this industrious people, who formerly played so distin- guished a part as a connecting link between the Persians and the Roman empire and afterwards between the Western and the Arabian world, and whose highest culture was developed in this very region. Quite otherwise is it now. In the plain there are almost no remains of the common Aramean tongue. Apart from the scattered areas in whicli Kurdish prevails, the ordinary language is a vulgar Arabic dialect ; but both Kurdish and Aramean (Syriac) have exercised an influence on the speech of the Arab peasant. Finally it must be mentioned that certain Turcoman hordes roam about the Mesopotamian territory.

In climate and in the character of its soil, as well as in its ethno- graphic history, Mesopotamia holds an intermediate position. In this aspect also we must maintain the division into two quite distinct zoues. The southern half consists mainly of grey, dreary flats covered with selenite ; and gypsum

everywhere makes its appearance a little below the surfacc ; bitumen is not unfrequent, and here and there it rises in petroleum wells. In the solid strata of gypsum and marl the rivers have carved out valleys, from a quarter to half a mile broad and froin 40 to 50 or even 100 feet deep, which with their arable soil contrast with the barren surface of the more elevated desert (chél). Lspecially below Balis there are marl-hills capped with gypsum, and alluvial plains (so-called Adwis) of considerable extent

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; Morocco, make up the list of the indigenous kinds. In the wide belt of swamp which lines the Shatt el-“Arab in the low country of ‘Irak ‘Arabi there are boundless reaches of gigantic sedge inhabited by a rich fauna, especially of birds such as pelicans and flamingoes. From the south, or in other words from the true desert and oasis

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have been formed. The banks of the rivers arc there lined with a luxuriant growth of tamarisks. Occasional swamps and small lagoons occur ; and the marl shows a more or less marked efflores- cence of salt. In this part of the country frost is rare even in

winter; in summer the heat is of extraordinary intensity, and dwring the whole season from May to the close of October it is but slightly modified by the night-dews. During the sand storms which frequently blow from the West Arabian desert, the tempera- ture may rise to 50° C. (122° Fahr.), and this same excess of heat will then prevail through seven degrees of latitude in the whole valley of the Euphrates and Tigris from the Persian Gulf to the foot of the mountains. For, considering the strong radiation which takes place over what is now the uniform surface of the Mesopotamian soil with its almost complete absence of evaporation, there is nothing to hinder this warm zone extending in summer to the upper half of the country. In winter, on the other hand, this latter region has quite a different climate. From the mild coasts of the Mediterranean the cold increases from west to east. In the spurs of the Taurus, consequently, the winter cold extends far to the south,

and the influence of the snow-covered ridges spreads far into the Mesopotamian plain. Snow and ice are thus not unfrequent in the higher part of the plain, and the temperature may fall as low as —10° C. (14° Fahr.), especially if the cold north winds are blowing. That inland region too is cut off from the influence of the mild air of the Mediterranean by the coast ranges. For this reason the vegetation is of a less southern character than that of the Mediter- ranean countries in the same latitude. In the spring the green is soon parched out of existence. In this way the northern district of Mesopotainia combines strong contrasts, and is a connecting link between the mountain region of western Asia and the desert of Arabia. On the other hand the country to the south of Mesopotamia, or ‘Irak, has a warm elimate, and towards the Persian Gulf indeed the heat reaches the greatest extremes.

In Upper Mesopotamia, strictly so called, agriculture has suffered an extraordinary decline; in spite of excellent soil, very little of the land is turned to account. In the western district the fertile red- brown humus of the Orfa plain, derived from the lime of Nimrid Dagh, extends to about 12 miles south of Harran, With a greater vainfall, and an artificial distribution of the water such as existed in olden times, agriculture would flourish. If spring rains are only moderately abundant, wheat and barley grow to a great height, and yield from thirty to forty fold. Rice is also grown in the richly watered hill-encircled district of Serj and on the banks of the Khabir. Next, millet and sesamnm are the chief crops,—the latter being grown for the sake of its oil, as the olive docs not sueceed in this region. The abundance of wheat may be estimated from the fact that during Layard’s residence in Mosul a eamel-load of 480 tb was worth four shillings. Durra (Holcus Sorghum and H. bicolor), lentils, pease, beans, and vetches are also grown, as well as cotton, safflower, hemp, and tobacco. Afcdicago sativa furnishes fodder for horses. Among the fruits the most noteworthy arc the cucumbers, melons, and water-melons planted in great abundance on the hanks of the smaller streams. The figs of the Sinjar mountains are celebrated for their exceptional sweetness. Timber trees are few; plane trees and white poplars are planted along the streams, and a kind of willow and a sumach flourish on the banks of the Euphrates. The palm-trees which appear on’ the banks of both the rivers farther south do not come so far north. On account of the hot dry summer the orange does not succeed. Of the great forest which

existed (?) near Nisibis in the time of Trajan no trace remains; but the slopes both of the Masius mountains and of the Jebel ‘Abd-el ‘Aziz, as well as, more especi- ally, those of the Sinjar range, are still covered with wood.

The wide treeless tracts of the low country of Mesopotamia are covered with the same steppe vegetation which prevails from Central Asia to Algeria, but there is an absence of a great many of the arborescent plants that grow in the rockier and_more Uregular plateaus of western Asia and especially of Persia. This comparative poverty and monotony of the flora is partly due to the surface being mainly composed of detritus, and partly to the eultivation of the country in remote antiquity having ousted the original vegetation and left behind it what is really only fallow ground untouched for thousands of years. Endless masses of tall weeds, belonging to a few species, cover the face of the country,—large Crucifere, Cynarex, and Umbellifere disputing the possession of the soil in company with extraordinary quantities of liquorice (Glycyrrhiza glabra and echinata) as well as Lagonychium and the white cars of the Jmperata. In autumn the withered wecds are torn up by the wind and driven immense distanees. Among the aromatic plants, which even Xenophon mentions in Mesopotamia, the first place belongs to the species of wormwood (Artemisia), which cover wide areas, and the second to Labiatx, such as species of thyme and Salvia, which, how- ever, become rarer in the low country. With few exceptions there are none but cultivated trees, and these are confined to the irrigated districts on the Enphrates and the Shatt ; a few willows, a Pyrus, tamarisks, a Rhus, a Rubus, on the banks of the rivers, and the willow-like Populus euphratica, which grows from Dzungaria to

country of Arabia, the date-palm spreads up the valley to some little distance above Baghdad ; and especially along the Shatt it yields rich crops of fruit, which are exported to India. With the

exception of a few truffles, capers, liquorice, and such like, there are

few wild food-plants. ‘The cycle of vegetation begins in November.

The first winter rains clothe the plain with verdnre, and by the beginning of the year a number of bulbons plants are in bloom— Amaryllide, Liliacee,

and Colchicum. The full summer develop- ment is reached in June; and by the end of August cverything is burnt up.

The lion is said to roam as far as the Khabur; but in any case it is at least much less frequent than in the time of the Assyrians, when the lion-hunt was a recognized form of sport. The wild ass too is very rare ; but on the other hand wild swine, hyenas, jackals, eheetahs, and foxes are extremely abundant. Wolves are said to exist in the plain, and among others a variety of black wolf (Canis lycaon). Particularly numerous in the steppe are the antelope species ; and herds of gazelles are frequently met with. Beavers are said to have been observed on the Euphrates. Jerboas, moles, por- eupines, and especially the common European rat, abound in the desert ; bats are numerous ; and the long-haired desert hare is also found. Among the domestic animals in this steppe country the camel holds the first place; and next come goats and sheep; but the Bedouin sheep is not the ordinary fat-tailed variety. The common buffalo is often kept by the Arabs and Turcomans on the Euphrates and the Tigris; and on the Euphrates we also find the Indian zebu, which is still more frequent in the districts farther to the sonth. Bird-life is very rare in the sonthern parts of the plain; though on the Euphrates there are vultures, owls, ravens, &c., as well as falcons (? Tinnunculus alaudarius) which are trained to hunt. Among game-birds are some kinds of doves, francolins, part- ridges, wild ducks and geese, and in the steppe bustards. The ostrich seems almost to have disappeared. Large tortoises are numerous.

In conclusion it is necessary in supplement to the article Irak to say something of the district of Babylonia, often (thongh wrongly) included under the naine Mesopotamia. Here we have to do with a fundamentally different region, for it consists in the main of alluvial formations, a few scattered reaches of sand only now and then appearing in the level depression not filled up by the alluvium. The mass of solid matter which the rivers bring down and deposit is very considerable ; it has been ascertained that the maximum proportion for the Euphrates in the month of January is 5, and at other times zig; for the Tigris the maximum is yoy. As regards the physical character of the alluvia, in the most northerly portion the soil is pebbly, the pebbles consisting almost solely of variously coloured flints and occasional small fragments of gypsum. This is succeeded by a continnous

formation of clayey soil, in part argillaceous and argillo-calcareous, but eovered with mould and sand, or the more tenacious clay of frequent inundations.

In general, the northern plains of the interior have a slight but well-defined southerly inclination with local depressions. The territory undulates in the central districts, and then sinks away into mere marshes and lakes. The clay, of a deep blue colour, abounds with marine shells, and shows a strong efflorescence of natron and sca-salt, the latter derived from the decomposition of vegetable matter. When the soil is parched up the appearance of the mirage (serdb) is very common. As extensive inundations in spring are caused by both the rivers, especially the Tigris, great alterations mnst have taken place in this part of the country in the course of thousands of years. It has been asserted that in former times the alluvial area at the mouth of the river increased one mile in the space of thirty years; and from this it has been assumed that about the 6th century B.c. the Persian Gulf imust have stretched from 45 to 55 miles farther inland than at present. The actual rate of increase at the present time is about 72 feet per annum. For this reason we cannot decide much in regard to the former physical configuration of southern Babylonia, but it is at least certain that the Euphrates and the Tigris reached the sea as inde- pendent rivers. Ritter estimates that in the time of Alexander the Great the embouchnres were still separated by a good day’s journey ; and, though they cannot now be traced, great alterations have probably taken place in the upper portions of the rivers as well as in the country near the mouths. Assyriologists tell us that more than thirty-five canals are known by name from the Babylonian period ; but it is extremely difficult, or rather it has proved hitherto impossible, to identify them either with those actually existing or with those mentioned in classical authors, in the Babylonian Talmud, or in Arabian writers. ‘To the west of the Euphrates was to be found the Pallacopas channel, and we still have the Hindiye channel in the same quarter. The country between the rivers more

particularly was traversed by such secondary branches. Beginning

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from the Euphrates we must mention the Saklawiye channel (Nahr ‘Isd), the Nahr Melik, the Nahr Zembcraniye, and especially the Nahr-en-Nil, constructed by the famous Omayyad governor Hajjaj. Eastwards from the Tigris strikes the great Nahrawan channel; and right through the country of the two rivers runs the Shatt-el Hai from Kut-el—Amara, almost due south to the Euphrates, parallel with the Shatt-el-Kehr. Many of these have been silted up; from those, however, which are still maintained there is derived a considerable revenue, and by the restoration of many of the old channels, traces of which are met with at every step, the country might be again raised to that condition of high civilization which it enjoyed not only in antiquity but partly even in the time of the latcr caliphs. The classical writers are unanimous in their admiration of this country; and it is at least certain that nowhere else in the whole world was the principle of the application of canals to the exigencies of agriculture worked out so successfully. The most luxuriant vegetation was diffused over the whole eountry ; and three crops were obtainable in the year, It is this alone which makes it intelligible how this region in the most remote antiquity attained a high civilization, and for centuries played, it may be said, one of the principal parts in the history of the world. In the matter of civilization, indeed, no country of the ancient world was its equal; a multitude of great cities once flourished within its borders. Even the Arabic writers are unanimous in regard to the extremely favonrable influence which the charactcr of the country exercised on the intellectual activity, spirit, and capacity of its inhabitants. We need not here discuss the question recently started as to whetlier the Biblical garden of Eden is to be sought in this locality, two eanals of the Euphrates and Tigris being identificd with the Gihon and Pison of Gen. ii.; but it is certain at least that this lower country of the two rivers might well pass in antiquity for the xe plus ultra of civilization, and exercised the most powerful political and intel- lectual influence on the surrounding regions. The question often raised as to whether the Semites were derived from this district may also be left untouched. From the Bible we know that an ancient name of the district was Shinar, though this has not hitherto been discovered in the cuneiform inscriptions, The name Kush is applied in the Bible to its oldest non-Semitic inhabitants. The northern half of the country was called Akkad, the southern Sumer, But it must not be forgotten that the rivers never formed ethnographie and political boundaries ; and thus Sumer extended to the coast of the Persian Gulf and Akkad as far as the Lower

Zab, the eastern affluent of the Tigris. As a less ancient designation of the whole country may be reckoned mat Kalda, the country of the Chaldeans (Hebr., erets Kasdim) ; originally Kalda is said to have designated central Babylonia. Of still later date is the naine derived froin the capital, the eountry of Babel (erets Babel), as an equivalent of which md Babila appears in the cuneiform inscriptions (in the Darius lists Babirw). From this was developed the Greek designation Babylonia, BaBvAwvia (as early as Xenophon). That the country was densely peopled may be gathered from the fact that about 704 B.C. eighty-nine fortified towns and eight hundred and twenty smaller places in the Chaldean country were captured during one military expedition. Of separate districts of the country we may mention Karduniash, the district in the vicinity and especially to the north of Babylon ; and southward by the sea-coast the important country of Bit Yakin, governed by kings of itsown. Ata later date we find on the coast and at the mouth of the Pallacopas canal the maritime town of Teredon, which is also mentioned by the classical writers. Besides Babylon and Borsippa, the larger cities were the double city of Sippar (Sefarvayim, 2 Kings xvii. 24, 31) and Akkad on the left bank of the Euphrates on the present Nahr ‘Isa ; Erech, i.¢., Warka, on the left bank of the Euphrates; Ur on the Palla- eopas, not far from the place where the Shatt-el-Hai falls into the Tigris ; Nippur, 7.e., Tell Niffer; Kutha (2 Kings xvii. 24), Kalne (Gen. x. 10), in the north, Opis at the junction of the Adhem (Physcus) with the Tigris. Huge mounds give evidence of the extent of these cities. A number of the canals were navigable, and at the same time, when the bridges were destroyed, they formed defensive moats against the incursion of enemies from the north. And the same purpose was served by the great wall (after- wards the Median Wall of the Greeks) which ran across the country from river to river between the points of their nearest approach. During the period of Greek domination a Greek city, Selcucia, which afterwards attained great prosperity, was founded by Scleucus I. in an extremely favourable situation on the right bank of the Tigris. In the south of the country, too, there was a Greck seaport town first called Alexandria on the Tigris and afterwards Antiochia. After the conquest of Babylonia by the Parthians (130 B.c.) a small Arabian kingdom grew up in those parts called Characene or Mesene, after the town of Chare or Maisan. It was under Parthian and for a time under Roman supremacy. The city of Vologesia, founded by Vologeses to the south-west of Babylon, near Ullais, in the ncighbourhood of the later

Kifa, was one of the capitals of the Parthian power. In the time of the Sasanids, too, as well as in that of the Parthians, the country of the lower

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Euphrates and Tigris played a leading part ; it formed in fact the main centre of the Persian kingdom. The city of Ctesiphon founded by the Greeks on the east side of the Tigris opposite Seleucia, was the winter residence of the Parthian kings, and the imperial capital of the Sasanids. Under the naine of Madain (The Cities) it continued to flourish till the rise of Baghdad in the 9th century. The neighbourhood of Ctesiphon was called in the time of the Sasanids Suristan, a translation of the Aramean desig- nation Béth-Aramayé, ‘country of the Syrians,” for the land was inainly occupicd by Arameeans. By a notable substitution the Avabs afterwards gave the name Nabat, z.c., Nabateans, to these Aramean peasantry, who, it nay be added, were already found in these parts at the time of the Babylonian empire.

On the west side of the Tigris the Arab kingdom of Titra formed the bulwark of the Sasanid power. As the result mainly of the battle of Kadisiya (east of Hira) in 635 a.p., the whole of this wealthy country fell into the hands of the Moslems, and it soon con- stituted the eentre of their power, especially when the Abbasids, with true political insight, transferred thither the capital of the empire and founded Baghdad. The chief cities of the older Arabic period were Kufa (in the neighbourhood of the earlier Hira to the south of ancient Babylon) and Basra (or Bussoray, g.v.) in the neighbourhood of the earlier Maisan. After these two cities the country was divided into the Sawad, ‘‘rich arable district,” of Basra and that of Kifa. Sawad was also employed as a name for the whole country ; and more or less identical with this designa- tion is the name ‘Irak still in use. Sometimes also the term Sawad- el-‘Irak is employed ; but at a later date the country is distinguished as ‘Trak “Arabi (Arabian ‘Trak) from the Persian ‘Irak ‘Ajemi to the east, the ancient Media. The Arabian geographer Yakut makes the distinction that the country called Sawad reaches farther to the north (viz., to the district of the Upper Zab).

Abulfeda gives the boundaries of ‘Irak as follows:—‘‘In the west of the country lie El-Jezira and the desert, in the south the desert, the Persian Gulf, and Khuzistan, in the east the inountain country as far as Holwan (near the

principal pass through the Zagrus range). Thence the boundary runs again towards Mesopotainia. Thus the greatest breadth of ‘Irak is in the north, and its narrow extremity is formed by the island ‘Abbddan in the Shatt-el-‘Arab (the united Euphrates and Tigris) to the south of Basra.” From what has been said it appears that ‘Irak extended far beyond the country between Euphrates and Tigris. Abulfeda says clearly that ‘Irak lies on the Tigris as Egypt on the Nile ; for according to this view the Tigris flows through the middle of the country. ‘Irak consequeiutly lies between 30° and 34° 30’ N, lat. and between 44° and 48° 30’ EK. long.; of its area it isimpossible to form an estimate under such varying conditions. For some details see BAGHDAD.

From the union of the rivers upwards, in the case of the Euphrates as far as 26° N. lat. (above Rakka), in that of the Tigris to 35° N. lat., the valleys are known as ez-26r, the depression, in opposition to the more elevated desert-plateau. It has been surmised that in this name is to be recognized the Dura of the Old Testament (Daniel iit. 1).

Very little of the ancient condition of the eountry has been pre- served ; and there are now but few remains of ancient buildings, scarcity of stone having all along led to the use of bricks. ‘Irak has played its part. It is only by the expenditure of immense sums, far beyond the financial capacity of the Turkish Govern- ment, that the ancient canals could be restored and the swamps formed by them drained. The whole land falls into two unequal portions,—an extensive dry steppe with at any rate a healthy desert climate, and an unhealthy region of swamps. There is a good deal more agriculture along the Euphrates than along the Tigris ; but swamps, with almost impenetrable reed thickets, com- posed of a kind of Agrostis, are at the same time much more exten- sive. The slightly more elevated districts are the special habitat of the date palm, which by itself forms dense groves bordering the banks particularly on the lower Euphrates, for a distance of several days’ journey. This part of the country consequently has a some-what monotonous but in its own way imposing aspect.

ministrative and diplomatic skill of the Turkish officials to the test. The Turkish influence has here made at one time great advance and at another

lost all the ground it had gained,—the rich and powerful sheikhs of the Muntefitch sometimes becoming for a season rulers over the whole of Southern ‘Irak and even over the town of Basra. The present writer once visited the great sheikh Nasir in his camp near Stk-esh-Shiyukh ; and he received the impression of having to do with a very remarkable and astute personage.

The old Syrian population of ‘Irak has almost entirely dis- appeared; the few remnants left are distingnished by a special religion, in regard to which see the article MaNpmans. Ethno- graphically the country is subject to a double influence. On the one hand the connexion with Nejd, the central plateau of Arabia, continues uninterrupted; the emigration from that region being mainly directed towards ‘Irak and Jezira. In Baghdad even, the ‘Aoél-Bedouins from Central Arabia have a quarter of their own. With the earnings obtained in these rich districts the emigrants return to their homes. But quite as strong at least is the infln- ence of Persia. Persian customs are in fashion; in Baghdad there is an important Persian quarter ; and Kerbela and Meshed ‘Ali to the west of the Euphrates may be considered regular Persian ‘‘enclaves.” In these places are buried the son-in-law of Mohammed, the caliph Ali, and his son Hosein (in Kerbela), the chief saints of the Shiite sect ; and their tombs are not only shrines of pilgrimage to the living, but the dead are brought by countless caravans from Persia to be buried in ground which they have made holy. The neighbourhood of Kerbela reeks with the odour of corpses; and from the midst of them pestilence has often begun its march. Throughout the whole of ‘Irak the Shiites have many ad- hereuts,—for example, the Khazael already mentioned. Persian influence prevails on the Arab population of ‘Irak, and the inter- mingling of the races can still be very clearly traced ; in this dis-tant corner of the Turkish empire a more international tone prevails than in any other district. And, however small when compared with former times the commercial and intellectual intercourse of various nations in these regions may be at the present day, the atteutive observer must notice that such intercourse does still exist, though within restricted limits. No trace, indeed, is to be found of that rich intellectual development which was produced in the time of the caliphs through the reciprocal action of Persian and Arabic elements. Still the quickwittedness of the inhabitants of ‘Irak makes a decided impression on the traveller passing through Asiatic Turkey

; and one might venture to prophesy that the country might to some extent recover its former position in the world, especially if English influence from India were more widely extended, and should lead to the construction of a railway. The trade which passes through ‘Irak is even now not unimportant ; horses, for example, are exported in considerable numbers from southern ‘Irak to India. But it might be very much improved, as the country, it is said, could support five hundred times as many inhabitants as it actually contains. There is also a considerable export of dates, a fruit which forms the chief sustenance of a great number of the inhabitants; and the breeding of cattle (especially buffaloes) is extensively carried on. Only a few steamboats as yet navigate the majestic rivers. Communication by water is carried on by means of the most primitive craft. Goods ave transported in the so-called ‘“ terrades,” moderately big high-built vessels, which also venture out into the Persian Gulf as far as Kuweét. Passengers are conveyed, especially on the Euphrates, in the meshhtf, a very long and narrow boat, mostly pushed along the river bank with poles. The Mesopotainian ‘‘ kelleks ’—rafts laid on goatskin bladders—come down as far as Baghdad, where round boats made of plaited reeds pitched with asphalt are in use. At Basra, on the other hand, we see the ‘‘belem,” boats of a large size, having the appearance of being hollowed out of tree trunks, and partly in fact so constructed. Throughout ‘Irak in general Indian influence is partially at work ; in the hot summer months, for instance, when the natives live in underground apartments (serdab), the Indian punkah is used in the houses of the rich. As regards language, the local Arabic dialect has evidently been affected on the one hand by Persian, on the other by the Bedouin forms of specch.

See Ritter, Die Erdkunde von Asien, 2d ed. vol. vii., 10th and 11th parts, Berlin, 1843, 1844; Chesney, Expedition for the Survey of the Rivers Euphrates and Tigris, 2 vols., London, 1850; W. Ainsworth, Researches tn Assyria, Gabylonia, and

Chaldwa, London, 1838; Fr. Delitzsch. Wo lag das Paradies? Leipsic, 1881. Map: Kiepert, Die Euphrat- und Tigrislander, Berlin, 1854. (A. SO.)

MESSENE, the chief city of Messenia, founded, under the auspices of Epaminondas, as a bulwark against the Spartans. After the battle of Leuctra

that general sent to all the exiled Messenians,—in Africa, Sicily, or Italy,—and invited them to return to the land of their fathers. Many came with eagerness, and in 369 B.c. the city was built by the combined army of Thebans under Epaminondas and Argives under Epiteles, assisted by the Messenians

themselves. The site was chosen in conformity with a vision which appeared to Epaminondas, and the walls were raised to the sound of flutes playing the airs of Sacadas and Pronomus. The citadel was erected on the summit of Mount Ithome, and the city on its southern slope and in the adjoining valley. City and citadel were enclosed by a wall 47 stadia in length. Near the centre of the city was the agora, with a famous spring called Arsinoe, and various temples and statues, among the latter an iron statue of Epaminondas. The Hierothysion con-

‘tained many statues of gods and heroes, among them a

bronze statue of Epaminondas. In the gymnasium were statues of Hermes, Hercules, and Theseus by Egyptian artists. In the stadium was a bronze statue of the great hero Aristomenes, who had a sepulchral monument elsewhere in the city. On the summit of the citadel was a famous spring called Clepsydra, and near it a temple of Zeus Ithomatas, with a statue by the famous Argive artist Ageladas, executed originally for the Messenian Helots who settled in Naupactus (see Mxssenia). It was in honour of this statue that the festival of the Ithomea was performed.

The situation of Messene is one of the finest and most romantic in the world. The view of Mount Ithome, with its level summit and its ancient and medizval ruins, as one issues from the Langadha Pass in the Taygetus mountains, is beautiful beyond description. And the view from the summit of the mountain itself, which rises, steep and rugged, to the height of 2631 feet, and is crowned by the ruins of fortifications of Cyclopean workmanship, is enchanting, hardly equalled by any other in Greece. Near the middle of the ruins of the lower city stands a wretched village named Mavrommati (Black Eye), so called from the Turkish name of the spring Arsinoe, which still flows as plentifully as in the old days. These ruins are

the most imposing in Greece, and furnish the finest existing specimen of Hellenic military architecture. Almost the entire circuit of the ancient walls can be traced, and in some places they are standing to their full height. They are built of large hewn stones laid in beautifully regular layers without mortar, and are surmounted by towers, of which there seem to have been originally over thirty. Seven of these are still in a good state of preser- vation, and bear testimony to the thoroughness of the great, enterprise undertaken by Epaminondas. Two gates can still be distinguished, one on the slope of Mount Ithome, the other (the northern or Megalopolis gate) on the north side. The latter is a dipylon or double gate, opening into a circular enclosure 62 feet in diameter. The walls of this enclosure are built with extreme care, and the soffit stone of the inner portal, which has been partly moved from its place, reminds one of the lintel of the so-called treasury of Atreus at Mycene. Itis 18 ft. 8 in. x 4 ft. 2 in. x2 ft. 10 in. Within the town several ancient sites can still be distinguished—the stadium, the theatre, and several temples.

MESSENTIA (in Homer Messene), a state of Greece, and the most westerly of the three peninsulas of the Pelopon- nesus. Its area is a little over 1160 square miles. It is separated from Elis and Arcadia on the north by the river Neda and the Nomian mountains, and from Laconia on the east by the lofty range of Taygetus. The other sides are washed by the sea, which indents its shores with four gulfs or bays,—Messenia, Phcenicus, Pylus, and Cyparissus. On its south-west corner are the Cinussz Islands, and oppo- site the bay of Pylus (Navarino) the famous Sphacteria. The interior is divided by mountain chains into fertile plains, watered by rivers, the chief of which is the Pamisus (with its tributaries Leucasia, Charadrus, Amphitus, and Aris), falling into the Messenian Gulf. The great valley

of this river is divided, near Mount Ithome, into two distinct parts, the plain or basin of Stenyclarus on the north, and the plain of Macaria, so called from its extreme fertility, on the south. The climate is delightful.

The earliest inhabitants of Messenia were Leleges, whose capital was at Andania. After these came AXtolians, whose chief centre was at Pylus. After the Dorian conquest the country was divided by Cresphontes into five

parts, whose chief cities were respectively Stenyclarus, Pylus, Rhion, Hyamia, and Mesola. The towns of Messenia were not numerous. Homer mentions Pylus (the seat of the Thessalian Neleids), Amphigeneia (possibly the same as Ampheia), Dorion, AZpeia (possibly Methone), Cichalia, Phare, Antheia (probably the later Thuria), Pedasus, and Tra (the later Abia). Other important towns were Asine, Corone, Limnez, Carnasium, Cyparissia, and, finally, Messene.

Of the history of. Messenia before the Dorian invasion little is known except a few fables related by Pausanias. ‘Two generations after the Trojan war, the country was invaded by the Dorians, who expelled the Neleids and conferred the sovereignty upon Cresphontes, who seems to have been a popular king. Perhaps for this reason he was put to death by the chiefs along with all his sons exeept Apytus. Apytus was restored to the throne by the Arcadians, took vengeance for his father’s death, and beeame very popular. His linc lasted through several generations. We know little of the subsequent history of Messenia until the date of the Messenian wars, waged against Sparta. The ostensible and immediate causes of these wars are variously assigned ; but the true cause was the cupidity of Sparta. Our chief trustworthy authority for the history of them is the old elegiac poet Tyrtzus ; but so little is known about them that it is a matter of doubt in which of them the great hero Aristomenes won his fame. The date of the first was from 743 to 724, of the second from 685 to 668 or, aecording to others, from 648 to 631 B.c. Ithome was the eentre of action in the first, Hira in the seeond. The result of these wars was the complete subjuga- tion of Messenia to Sparta. Its territory was parcelled out among Spartans, and its towns handed over to Periceci and Helots. Many of the inhabitants took refuge in Areadia, but still more in Italy and Sieily. A very large number settled in Rhegium, whose chiefs for many generations were of Messenian stoek. About 200,000 remained behind in bondage. After the second war a large number of Messenians settled on the Sicilian coast at Zanele, to which they subsequently gave the name Messana (see Messina). In 464 B.c. the Messenian Helots, taking advantage of an earthquake at Sparta, revolted, and, though they were finally eompelled to surrender in 455, they did so only on condition of being allowed to retire to Naupactus on the Corinthian Gulf. Thiscity had bcen offered them as a residence by the Athenians, ever glad to favour the foes of Sparta. Here the Messenians remained for sixty

years, until the loss of the battle of Agospotami deprived them of the protection of the Athenians. They were then driven out, and had to find homes in Cephallenia and Zaeynthus, or among their kinsmen in Rhegiuin and Messana. Some even went to Africa, and took up their abode at Euesperide or Hesperide, afterwards called Berenice. Things remained in this condition until 369 B.c., when Epaininondas, having broken the power of Sparta, rent from her Messenia, and, colleeting from all quarters the deseendants of the exiled inhabit- ants, helped them to found the city of Messrnr (q.v.). Sparta never gave up her claim to Messenia, and made many attempts to reconquer it, but without success. The Messenians maintained their independence until 146 B.c., when, with the Acheans, they were redueed under the power of Rome. From that time they fall into the baekground of history. In the Middle Ages the country, like the rest of the Peloponnesus, was largely overrun by Slavic tribes, as is shown by the numerous Slavic local names occurring in it. At the establishment of Greece as a kingdom, Messenia was constituted into a provinee, with a governor or nomarch residing at Kalamata (officially Kalamai), the ancient Phare. The country, though beautiful and fertile, is still in a deplorably baekward con- dition, and the population is sparsc and semi-barbarous. Agricul- ture languishes, and the roads and bridges are few and bad. More deeds of violence occur in Messenia than in any other part of Greece. With the exeeption of Kalamata, it contains no town of importance. Navarino, on the Gulf of Pylus, was the scene of the destruction of the Turkish ficet in 1827.

MESSIAH (Dan. x. 25, 26), Messtas (John i. 41; iv. 25), are transcriptions (the first form modified by reference to the etymology) of the Greek Meooias (Meotas, Meceéas), which in turn represents the Aramaic XID (méshthd), answering to the Hebrew myn, “the

anointed.”! The Hebrew word with the article prefixed occurs in the Old Testament only in the phrase “the anointed priest” (Lev. iv. 3, 5, 16; vi. 22 [15]), but “‘ Jehovah’s anointed” is a common title of the king of Israel, applied in the historical books to Saul and David, in Lam. iv. 20 to Zedekiah, and in Isa. xlv. 1 extended to Cyrus. In the Psalms corresponding plirases (My, Thy, His anointed)? occur nine times, to which may be added

the lyrical passages 1 Sam. ii. 10, Hab. iii, 13. In the intention of the writers of these hymns there can generally be no doubt that it refers to the king then on the throne, or, in hymns of more general and timeless character, to the Davidic king as such (without personal reference to one king);° but in the Psalms the ideal aspect of the kingship, its religious importance as the expression and organ of Jchovah's sovereignty, is prominent. When the Psalter became a liturgical book the historical kingship had gone by, and the idea alone remained, no longer as the interpretation of a present political fact, but as part of Tsrael's religious inheritance. It was impossible, however, to think that a true idea had become obsolete merely because it found no expression on earth for the time being ; Israel looked again for an anointed king to whom the words of the sacred hymns should apply with a force never realized in the imperfect kingship of the past. Thus the psalms, especially such psalms as the second, were neces- sarily viewed as prophetic; and mcantime, in accordance with the common Hebrew representation of ideal things as existing in heaven, the true king remains hidden with God. The steps by which this result was reached must, however, be considered in detail.

The hope of the advent of an ideal king was only one feature of that larger hope of the salvation of Israel from all evils, the realization of perfect reconciliation with Jehovah, and the felicity of the righteous in Him, in a new order of things free from the assaults' of hostile nations and the troubling of the wicked within the Hebrew community, which was constantly held forth by all the prophets, from the time when the great seers of the 8th century B.c. first proclaimed that the true conception of Jehoval's relation to His people was altogether different from what was realized, or even aimcd at, by the recognized civil and religious leaders of the two Hebrew kingdoms, and that it could become a practical reality only through a great deliverance following a sifting judgment of the most terrible kind. The idea of a judgment so severe as to render possible an entire breach with the guilty past, and of a subsequent complete realization of Jchovah's kingship in a regenerate nation, is common to all the prophets, but is expressed in a great variety of forms and images, con- ditioned by the present situation and needs of Israel at the time when each prophet spoke. As a rule the prophets | directly connect the final restoration with the removal of the sins of their own age, and with the accomplishment of such a

work of judgment as lies within their own horizon; to Isaiah the last troubles are those of Assyrian invasion, to Jeremiah the restoration follows on the exile to Babylon; Daniel connects the future glory with the overthrow of the Greek monarchy. The details of the prophetic pictures show a corresponding variation; but all agree in giving the central place to the realization of a real effective kingship of Jehovah ; in fact the conception of the religious subject

1 The transcription is as in Terootp, Peootp for WW}, Onomastica, ed. Lag., pp. 247. 281, Bac. B ii. 8. For the termination as for Nm, see Lagarde, Psali. Memph., p. vn. .

2 The plural is found in Psalm cv. 15, of the patriarehs as conse- erated persons. :

3 In Ps. Ixxxiv. 9 [10] it is disputed whether the anointed one 1s the king, the priest, or the nation as a whole, The second view 1S perhaps the best.

as the nation of Israel, with a national organization under Jehovah as king, is common to the whole Old Testament, and forms the bond that connects prophecy proper with the so-called Messianic psalms and similar passages which theologians call typical, ¢.¢., with such passages as speak of the religious relations of the Hebrew commonwealth, the religious meaning of national institutions, and so necessarily contain ideal elements reaching beyond the empirical present. All such passages are frequently called Messianic; but the term is more properly reserved as the specific designation of one particular branch of the Hebrew hope of salvation, which, becoming prominent in post-canonical Judaism, used the name of the Messiah as a technical term (which it never is in the Old Testament), and exercised a great influence on New Testament thought, —the term “the Christ” (6 xpirrds) being itself nothing more than the translation of “the Messiah.”

In the period of the Hebrew monarchy the thought that Jehovah is the divine king of Israel was associated with the conception that the human king reigns by right only if he reigns by commission or “unction” from Him.

Such was the theory of the kingship in Ephraim as well as in Judah (Deut. xxxiii.; 2 Kings ix. 6), till in the decadence of the northern state Amos (ix. 11) foretold the redintegration of the Davidic kingdom, and Hosea (iii. 5; viii. 4) expressly associated a similar prediction with the condemnation of the kingship of Ephraim as illegitimate. So the great Judean prophets of the 8th century connect the salvation of Israel with the rise of a Davidic king, full of Jehovah's Spirit, in whom all the energies of Jehovah's transcendental kingship are as it were incarnate (Isa. ix. 6 sq.; xi. 1 sg.; Micah v.). This conception, however, is not one of the constant elements of prophecy ; indeed the later prophecies of Isaiah take a different shape, looking for the decisive interposition of Jehovah in the crisis of history without the instru- mentality of a kingly deliverer. Jeremiah again speaks of the future David or righteous sprout of David's stem (xxili. 5 sg. ; xxx. 9); and Ezekiel uses similar language (xxxiv., xxxvil.); but that such passages do not necessarily mean more than that the Davidic dynasty shall be con- tinued in the time of restoration under a series of worthy princes seems clear from the way in which Ezekiel speaks of the prince in chaps, xlv., xlvi. As yet we have no fixed doctrine of a personal Messiah, but only material from which such a doctrine might by and by be drawn. The religious view of the kingship is still essentially the same as in 2 Sam. vil., where the endless duration of the Davidic dynasty is set forth as part of Jehovah's plan of grace to His nation.

There are other parts of the Old Testament—notably 1 Sam. vin., xii.—in which the very existence of a human kingship is represented as a departure from the ideal of a perfect theocracy. And so, in and after the exile, when the monarchy had come to an end, we find pictures of the latter days in which its restoration has no place. Such is the great prophecy of Isa. xl.—lxvi., in which Cyrus is the anointed of Jehovah, and the grace promised to David is transferred to ideal Israel ("the servant of Jehovah") as a whole (Isa. lv. 3). So too there is no allusion to a human kingship in Joel or in Malachi; the old forms of the Hebrew state were broken, and religious hopes expressed themselves in other shapes.t In the book of Daniel it is collective Israel that appears under the symbol of a "son of man," and receives the kingdom (vii. 13, 18, 22, 27).

Meantime, however, the decay and ultimate silence of the living prophetic word concurred with the prolonged political servitude of the nation to produce a most

important change in the type of the Hebrew religion. The prophets had never sought to add to the religious unity of their teaching unity in the pictorial form in which from time to time they depicted the final judgment and future glory. For this there was a religious reason, To thei the kingship of Jehovah was not a mere ideal, but an actual reality. Its full manifestation indeed, to the eye of sense and to the unbelieving world, lay in the future; but true faith found a present stay in the sovereignty of Jehovah, daily exhibited in providence and interpreted to each generation by the voice of the prophets. And, while Jehoval’s kingship was a living and present fact, it refused to be formulated in fixed invariable shape. But when the prophets ceased and their place was taken by the scribes, the interpreters of the written word, when at the same time the yoke of foreign oppressors rested continually on the land, Israel no longer felt itself a living nation, and Jehovah’s kingship, which presupposed a living nation, found not even the most inadequate expression in daily political life. Jehovah was still the lawgiver of Israel, but His law was written in a book, and He was not present to administer it. He was still the hope of Israel, but the hope was all dissevered from the present ; it too was to be read in books, and these were interpreted of a future which was no longer, as it had been to the prophets, the ideal development of forces already at work in Israel, but wholly new and supernatural, The present was a blank, in which religious duty was summed up in patient obedience to the law and penitent submission to the Divine chastisements ; the living realities of divine grace were but memories of the past, or visions of “the world to come.” The scribes, who in this period took the place of the prophets as the leaders of religious thought, were mainly busied with the law; but no religion can subsist on mere law; and the systematization of the prophetic hopes, and of those more ideal parts of the other sacred literature which, because ideal and dissevered from the present, were now set on one line with the prophecies, went on side by side with the systematization of the law, by means of a harmonistic exegesis, which sought to gather up every prophetic image in one grand

panorama of the issues of Israel's and the world's history. The beginnings of this process can probably be traced within the canon itself, in the book of Joel and the last chapters of Zechariah ;? and, if this be so, we see from Zech. ix. that the picture of the ideal king early claimed a place in such constructions. The full development of the method belongs, however, to the post-canonical literature, and was naturally much less regular and rapid than the growth of the legal traditions of the scribes. The attempt to form a schematic escha- tology left so much room for the play of individual fancy that its results could not quickly take fixed dogmatic shape ; and it did not appeal to all minds alike or equally atalltimes. It was in crises of national anguish that men turned most eagerly to the prophecies, and sought to con- strue their teachings as a promise of speedy deliverance in such elaborate schemes of the incoming of the future glory as fill the Apocatypric LITERATURE (q.v.). But these books, however influential, had no public authority, and when the yoke of oppression was lightened but a little their enthusiasm lost much of its contagious power. It is not therefore safe to measure the general growth of eschatological doctrine by the apocalyptic books, of which Daniel alone attained a canonical position. In the Apocrypha eschatology has a very small place; but there is enough to show that the hope of Israel was never forgotten, and that the imagery of the prophets had

1 The hopes which Haggai and Zechariah connect with the name of Zerubbabel, a descendant of David, hardly form an exception to this statement,

2 See J OFL, vol. xifi, p. 706, and Stade's articles ''Deuterozacharja," Z. f. ATliche Wiss., 1881-82. Compare Dan. ix. 2 for the usc of the older prophecies in the solution of new problems of faith.

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moulded that hope into certain fixed forms which were taken with a literalness not contemplated by the prophets themselves. It was, however, only very gradually that the figure and name of the Messiah acquired the pro- minence which they have in later Jewish doctrine of the last things and in the official exegesis of the Targums. In the very developed eschatology of Daniel they are, as we have seen, altogether wanting, and in the

Apocrypha, both before and after the Maccabee revival, the everlasting throne of David's house is a mere historical reminiscence (Sirach xlvii. 11; 1 Mac. ii. 57). So long as the wars of independence worthily occupied the energies of the Pales- tinian Jews, and the Hasmonzan sovereignty promised a measure of independence and felicity under the law, in which the people were ready to acquiesce, at least, till the rise of a new prophet (1 Mac. xiv. 41), the hope that con- nected itself with the house of David was not likely to rise to fresh life, especially as a considerable proportion of the not very numerous passages of Scripture which speak of the ideal king might with a little straining be applied to the rising star of the new dynasty (comp. the language of 1 Mac. xiv. 4-15). It is only in Alexandria, where the Jews were still subject to the yoke of the Gentile, that at this time (c. 140 B.c.) we find the oldest Sibylline verses (iii, 652 sg.) proclaiming the approach of the righteous king whom God shall raise up from the East (Isa. xli. 2) to establish peace on earth and inaugurate the sovereignty of the prophets in a regenerate world. The name Messiah is still lacking, and the central point of the prophecy is not the reign of the deliverer but the subjec- tion of all nations to the law and the temple.!

With the growing weakness and corruption of the Hasmoneean princes, and the alienation of a large part of the nation from their cause, the hope of a better kingship begins to appear in Judea also; at first darkly shadowed forth in the Book of Enoch (chap. xc.), where the white steer, the future leader of God's herd after the deliverance from the heathen, stands in a certain contrast to the in- adequate sovereignty of the actual dynasty (the horned lambs) ; and then much more clearly, and for the first time with use of the name Messiah, in the Psalter of Solomon, the chief document of the protest of Pharisaism against its enemies the later Hasmonzans. 'The struggle between the Pharisees and Sadducees, between the party of the scribes and the party of the Hasmonzan aristocracy, has been described in Israry (vol. xiii, p. 423 sy.) It was a struggle for mastery between a secularized hierarchy on the one hand, to whom the theocracy was only a name, and whose whole interests were those of their own selfish politics, and on the other hand a party to which God and the law were all in all, and whose influence depended on tlie main- tenance of the doctrine that the exact fulfilling of the law according to the precepts of the scribes was the absorbing vocation of Israel. This doctrine had grown up in the political

nullity of Judea under Persian and Grecian rule, and no government that possessed or aimed at political independence could possibly show constant deference to the punctilios of theschoolmen. The Pharisees themselves could not but see that their principles were politically impotent ; the most scrupulous observance of the Sabbath, for example—and this was the culminating point of legality —could not thrust back the arms of the heathen. Thus the party of the scribes, when they came into conflict with an active political power, which at the same time claimed to represent the theocratic interests of Israel, were compelled to lay fresh stress on the doctrine that the true deliverance of Israel must come from God and not from man. We haveseen indeed that the legalism which accepted

1In Sibyll., iti. 775, vndv must undoubtedly be read for vidv.

sT8) Jehovah as legislator, while admitting that his executive sovereignty as judge and captain of Israel was for the time dormant, would from the first have been a self-destructive position without the complementary hope of a future vindication of divine justice and mercy, when the God of Israel should return to reign over his people for ever. Before the Maccabee revival the spirit of nationality was so dead that this hope lay in the background ; the ethical and devotional aspects of religion under the law held the first place, and the monotony of political servitude gave little occasion for the observation that a true national life requires a personal leader as well as a written law. But now the Jews were a nation once more, and national ideas came to the front. In the Hasmonzan sovereignty these ideas took a political form, and the result was the secular- ization of the kingdom of God for the sake of a harsh and rapacious aristocracy. The nation threw itself on the side of the Pharisees; but it did so in no mere spirit of punctilious legalism, but with the ardour of a national enthusiasm deceived in its dearest hopes, and turning for help from the delusive kingship of the Hasmonzans to the true kingship of Jehovah, and to His vicegerent the king of David’s house. It is in this connexion that the doctrine and name of the Messiah appear in the Psalter of Solomon. ‘The eternal kingship of the house of David, so long forgotten, is seized on as the proof that the Hasmonzeans have no divine right.

‘¢Thou, Lord, art our king for ever and ever. . . . Thou didst choose David as king over Israel, and swarest unto him concerning his seed for ever that his kingship should never fail before Thee. And for our sins sinners (the Hasmonzans) have risen up over us, taking with force the kingdom which Thou didst not promise to them, profaning the throne of David in their pride. But Thou, O Lord, will cast them down and root out their seed from the land, when a man not of our race (Pompey) rises up against them… . Behold, O Lord, and raise up their king the Son of David at the time that Thou hast appointed, to reign over Israel Thy servant; and gird him with strength to crush unjust rulers; to cleanse Jerusalem from the heathen that tread it under foot, to cast out sinners from Thy inheritance; to break the pride of sinners and all their strength as potter’s vessels with a rod of iron (Ps. ii. 9); to destroy the law- less nations with the word of his mouth (Isa. xi. 4); to gather a holy nation and lead them in righteousness. . . . He shall divide them by tribes in the land, and no stranger and foreigner shall dwell with them; he shall judge the nations in wisdom and righteousness. The heathen nations shall serve under his yoke; he shall glonfy the Lord before all the earth, and cleanse Jerusalem in holiness as in the beginning. From the ends of the earth all nations shall come to see his glory and bring the weary sons of Zion as gifts (Isa. 1x. 3 sq.); to see the glory of the Lord with which God hath crowned him, for he is over them a righteous king taught of God. In his days there shall be no unrighteousness in their midst; for they are all holy, and their king the anointed of the Lord (xpiorbs xupios, mis-translation of M71) Mw). He shall not trust on horses and riders and bowmen, nor heap up gold and silver for war, nor put his confi- dence in a multitude for the day of war. ‘The Lord is king,’ that is his hope. . . . He is pure from sin to rule a great people, to rebuke governors and destroy sinners by his mighty word. In all his days he is free from offence against his God, for He hath made him strong by the Holy Spirit. . . . His hope is in the Lord; who can do aught against him? Strong in deeds and mighty in the fear of the Lord, he feedeth the flock of the Lord in truth and righteous-ness, and suffereth not one of them to stumble in the pasture… . So it beseemeth the king of Israel whom God hath chosen to lead the house of Israel… . God hasten His mercy on_ Israel to deliver them from the uncleanness of profane foes. The Lord is our king for ever and ever.” — Psalt. Sol. xvii.

This conception is traced in lines too firm to be those ofa first essay; it had doubtless grown upas an integral part of the religious protest against the Hasmonxans. And while the polemical motive is obvious, and the argument from prophecy against the legitimacy of a non-Davidic dynasty is quite in the manner of the scribes, the spirit of theocratic fervour which inspires the picture of the Messiah is broader and deeper than their narrow legalism. In a word, the Jewish doctrine of the Messiah marks the fusion of Pharisaism with the national religious feeling of the

Maccabee revival. It is this national feeling that, claim- ing a leader against the Romans as well as deliverance from the Sadducee aristocracy, again sets the idea of the kingship rather than that of resurrection and individual retribution in the central place which it had lost since the captivity. Henceforward the doctrine of the Messiah is at once the centre of popular hope and the object of theological culture. The New Testament is the best evidence of its influence on the masses (see especially Matt. xxi. 9); and the exegesis of the Targums, which in its beginnings doubtless reaches back before the time of Christ, shows how it was fostered by the Rabbins and preached in the synagogues.: Its diffusion far beyond Palestine, and in circles least accessible to such ideas, is proved by the fact that Philo himself (De Pram. et Pen., § 16) gives a Messianic interpretation of Num. xxiv. 27 (LXX.). It must not indeed be supposed that the doctrine was as yet the undisputed part of Hebrew faith which it became when the fall of the state and the antithesis to Christianity threw all Jewish thought into the lines of the Pharisees. It has, for example, no place in the Asswmptio Mosis or the Book of Jubilees, But, as the fatal struggle with Rome became more and more imminent, the eschiato- logical hopes which increasingly absorbed the Hebrew mind all group themselves round the person of the Messiah. In the later parts of the Book of Enoch (the “symbols” of chaps. xlv. sq.) the judgment day of the Messiah (identified with Daniel’s “Son of Man”) stands in the forefront of the eschatological picture. Josephus (B. J. vi. 5, § 4) testifies that the belief in the immediate appearance of the Messianic king gave the chief impulse to the war that ended in the destruction of the Jewish state; after the fall of the temple the last apocalypses (Baruch, 4

Hzra) still loudly proclaim the near victory of the God-sent king; and Bar Cochebas, the leader of the revolt against Hadrian, was actually greeted as the Messiah by Rabbi Akiba (comp. Luke xxi. 8). These hopes were again quenched in blood ; the political idea of the Messiah, the restorer of the Jewish state, still finds utterance in the daily prayer of every Jew (the Sh'médné Hsré), and is en- shrined in the system of Rabbinical theology ; but its his- torical significance was buried in the ruins of Jerusalem." But the proof written in fire and blood on the fair face of Palestine that the true kingdom of God could not be realized in the forms of an earthly state, and under the limitations of national particularism, was not the final refutation of the hope of the Old Tcstament. Amidst the last convulsions of political Judaism a new and spiritual conception of the kingdom of God, of salvation, and of the Saviour of God's anointing, lad shaped itself through the preaching, the death, and the resurrection of Jesus of Nazareth. As applied to Jesus the name of Messiah lost all its political and national significance, for His victory over the world, whereby He approved hiniself the true captain of salvation, was consummated, not amidst the flash of earthly swords or the lurid glare of the lightnings of Elias,

1 The Targumic passages that speak of the Messiah are registered by Buxtorf, Lex. Chald., s.v.

2 False Messiahs have continued from time to time to appear among the Jews. Such was Serenis of Syria (eirca 720 a.D.). Soon after, Messianic hopes were active at the time of the fall of the Omay- yads, and led to a serious rising under Abu 'Isa of Ispahan, who called himself forerunner of the Messiah. The false Messiah David Alrui (Alroy) appeared among the warlike Jews in Azerbijan in the middle of the 12th century. The Messianic claims of Abraham Abu- lafia of Saragossa (born 1240) had a cabalistic basis, and the same studies encouraged the wildest hopes atalater time. Thus Abarbanel calculated the coming of the Messiah for 1503 a.p.; the year 1500 was in many places observed as a preparatory season of penance ; and throughout the 16th century the Jews were much stirred and more than one false Messiah appeared. For the false Messiah Sabbathai, see vol, xiii. p. 681.

but in the atoning death through which He entered into the heavenly glory. Between the Messiah of the Jews and the Son of Man who canie not to be ministered to but to minister, and to give his life a ransom for many, there was on the surface little resemblance; and from their standpoint the Pharisees reasoned not amiss that the marks of the Messiah were conspicuously absent from this Christ. But when we look at the deeper side of the Messianic conception in the Psalter of Solomon, at the heartfelt longing for a leader in the way of righteousness and acceptance with God which underlies the aspira- tions after political deliverance, we see that it was in no mere spirit of accommodation to prevailing language that Jesus did not disdain the name in which all the hopes of the Old Testament were gathered up. The kingdom of God is the centre of all spiritual faith, and the perception that that kingdom can never be realized without a personal centre, a representative of God with man and man with God, was the thought, reaching far beyond the narrow range of Pharisaic legalism, which was the last lesson of the vicissitudes of the Old Testament dispensation, the spiritual truth that lay beneath that last movement of Judaism which concentrated the hope of Israel in the person of the anointed of Jehovah.

It would carry us too far to consider in this place the details of the Jewish conception of the Messiah and the Messianic times as they appear in the later apocalypses or in Rabbinical theology. See for the former the excellent summary of Schiirer, NTZliche Zeit- geschichte, $§ 28, 29 (Leipsic, 1874), and for the latter, besides the older books catalogued by Schiirer (of which Schoettgen, Hora, 1742, and Bertholdt, Christologia Judworum, 1811, may be specially named), Weber, Alisynagogale Theologic (Leipsic, 1880). For the whole subject see also Drummond, 7’he Jewish Messiah (London, 1877), and Kuenen, Religion of Israel, chap. xii. For the Messianic hopes of the Pharisees and the Psalter of Solomon see especially Wellhausen, Phariséer wnd Sadducter (Griefswald, 1874). In its ultimate form the Messianic hope of the Jews is the centre of the whole eschatology, embracing the doctrine of the last troubles of Israel (called by the Rabbins the “ birth pangs of the Messiah”’), the appearing of the anointed king, the annihilation of the hostile enemy, the return of the dispersed of Israel, the glory and world- sovereignty of the elect, the new world, the resurrection of the dead, aud the last judgment. But even the final form of Jewish theology shows much vacillation as to these details, especially as regards their

sequence and mutual relation, thus betraying the inadequacy of the harmonistic method by which they were derived from the Old Testament and the storiny excitement in which the Messianic idea was developed. It is, for example, an open question among the Rabbins whether the days of the Messiah belong to the old or to the new world (A34 pbiya or 8320 pdiyn), whether the resurrec- tion embraces all men or only the righteous, whether it precedes or follows the Messianic age. Compare MILLENNIUM.

We must also pass over the very important questions that arise as to the gradual extrication of the New Testament idea of the Christ from the elements of Jewish political doctrine which had so strong a hold of many of the first disciples—the relation, for ex- ample, of the New Testament Apocalypse to contemporary Jewish thought. A word, however, is necessary as to the Rabbinical doc- trine of the Messiah who sutfers and dies for Israel, the Messiah son of Joseph or son of Ephraim, who in Jewish theology is distinguished from and subordinate to the victorious son of David. The devel- oped form of this idea is almost certainly a product of the polemic with Christianity, in which the Rabbins were hard pressed by argu- ments from passages (especially Isa. liii.) which their own exegesis admitted to be Messianic, though it did not accept the Christian inferences as to the atoning death of the Messianic king. That the Jews in the time of Christ believed in a suffering and atoning Messiah is, to say the least, unproved and highly improbable. See, besides the books above cited, De Wette, Opwscula; Wiinsche, Die Leiden des Messias, 1870. The opposite argument of King, Zhe Yalkut on Zechariah (Cambridge, 1882), App. A, does not really prove more than that the doctrine of the Messiah Ben Joseph found points of attachment in older thought. (W. RB. 8.)

MESSINA, a city and seaport at the north-east corner of Sicily, capital of the province of the same name,? is

3 The province occupies the north-east corner of the island, and is 60 miles iu length by 30 in breadth. It is chiefly occupied with moun- tain ranges and valleys ; there are few plains. The largest river is the

situated on the Straits of Messina (at this point about 4 miles wide), 8 miles north-west of Reggio and 130 miles east by north of Palermo, in 38° 15’ N. lat., 15° 30’ E. long. The town is built between the sea and a range of sharp and rugged hills, called the Dinnamare, 3707 feet at their highest point. It runs in a semicircle round the harbour, and presents a picturesque appearance from the sea, as the houses rise in tiers upon the slope of a hill, and behind are the wooded mountains.

Messina is the second town of Sicily in importance and in size. Its population was 97,074 in 1850, 111,854 in 1871, and 126,497 in 1881. Itis an archiepiscopal see, and has a university, founded by the Jesuits in 1548, with a public library of 56,000 volumes.

The excellence of its harbour makes Messina an import- ant trading town. The harbour is formed by a tongue of low land which runs out from the shore in the form of a sickle, and encloses a round basin, open to the north only, where the entrance channel is about 500 yards wide. This basin is 11 miles in circumference, and is of such depth that the largest vessels are able to use it. It is estimated that 1300 steamers, with a total of 1,000,000 tons burthen, and 9000 sailing ships, with a total of 500,000 tons bur- then, enter the port yearly. The exports of Messina consist chiefly of oranges, lemons, raisins, wine, oil, liquorice, and hides. Thereis no prominent manufacture; but silk stuffs are made in considerable quantities. Many of the inhabit- ants are engaged in fishing, chiefly for tunny. Sword-fish also are captured with the harpoon in the Straits during July and August. Coral fishery is a trade of the people. The hills behind Messina produce a strong dark wine, inferior to that which is made in other parts of the island.

Messina has few buildings of importance or antiquity. The sieges and earthquakes from which the town has suffered destroyed most of its monuments. After the great earthquake in 1783 the city was almost entirely rebuilt. The cathedral, the principal building, isa church of the Norman period. It was begun in 1098 by Count Roger I, and finished by his son Roger IJ. The church is in the

form of a Latin cross, 305 feet long and 145 feet wide in.

the transepts. The lower half of the facade is encrusted with slabs of red and white marble. It has three Gothic portals, with pointed arches and rich ornamentation, belonging to the period of the Anjou dynasty. The nave contains twenty-six columns of Egyptian granite, said to have been brought from an ancient temple of Poseidon which stood near the Faro. The mosaics of the apses date from the year 1330. In the choir are the sarcophagi of the emperor Conrad IV. (d. 1254), of Alphonso the Generous (d. 1458), and of Antonia, widow of Frederick IIT. of Aragon. In 1254 the cathedral was seriously damaged by fire; in 1559 the campanile was burned down; in 1783 the earthquake overthrew the campanile and the transept. The building therefore offers a mixture of styles,—first Norman, then Gothic, then Early Renaissance, finally Barocco and Modern Gothic.

The history of Messina begins very early. It is said to have been founded, on the site of a more ancient Sicilian town, by pirates from Cume, in 732 B.c. It took its earlier name of Zancle (a sickle) from the shape of its harbour. The number of its inhabit- ants was increased by an influx of Chalcidians under Crateemenes : and in 649 B.c. the town was sufficiently prosperous and populous to establish a colony at Himera. The Samians occupied Zancle for a short time after Miletus had been captured by the Persians in 494 B.c. In the following year the city felL-into the hands of Anaxilas, tyrant of Rhegium, who introduced a population of

Messenians, from Messenia in the Peloponnesus ; and they changed the name of the place to Messana, in the Doric pronunciation, to

Alcantara. The chief towns are Messina, Castroreale, Mistretta, Patti, and Milazzo. The population in 1854 was 380,279, in 1871 420,649, and in 1881 467,233.

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remind them of their fatherland. The sons of Anaxilas were ex- pelled from the government of Messina in 466 B.c., and a republic established ; and this government was continued until Messina fell into the hands of the Carthaginians during their wars with Dionysius the elder of Syracuse (396 B.c.). The Carthaginians destroyed the city; but Dionysius recaptured and rebuilt it, During the next fifty years Messina changed masters several

times, till Timoleon finally expelled the Carthaginians in 343 B.c. In the wars between Agathocles of Syracuse and Carthage, Messina took the side of the Carthaginians. Agathocles's mercenaries, the Mamertines, treacherously seized the town in 288 B.c. and held it. They came to war with Hiero II. of Syracnse, after Agathocles's death ; and Hiero's allics, the Carthaginians, helped him to reduce Messina. The Mamertines appealed for help to Rome, which was granted, and this led to a collision between Rome and Carthage, which ended in the First Punic War. At the close of that war, in 241 B.c., Messina became a possession of the Romans. During the civil wars which followed the death of Julius Casar, Messina held with Sextus Pompeius; and in 35 B.c. it was sacked by Octavian's troops. After Octavian's proclamation as emperor he founded a colony here; and Messina continued to flourish as a trading port. In the division of the Roman empire it belonged to the emperors of the East; and in 547 a.p. Belisarius collected his fleet here before erossing into Calabria. The Saracens took the eity in 831 A.p.; and in 1061 it was the first permanent conquest made in Sicily by the Normans under Roger d'Hauteville. In 1190 Richard Ceeur de Lion with his crusaders passed six months in Messina. He fell out with Tancred, the last of the Hauteville dynasty, and sacked the town. In 1194 the city, with the rest of Sicily, passed to the house of Hohenstaufen under the emperor Henry VI., who died there in 1197. At the time of the Sicilian Vespers (1282), which drove the French out of Sicily, Messina bravely defended itself against Charles of Anjou, and repulsed his attack. Peter I. of Aragon, through his commander Ruggiero di Loria, defeated the French off the Faro; and from 1282 to 1718 Messina remained a possession of the Spanish royal house. In 1571 the ficet fitted out by the Holy League against the Turk assembled at Messina, and in the same year its eommander, Don John of Austria, eelebrated a triumph in the city for his victory at Lepanto. Don John's statue stands in the Piazza dell' Annuziata. For one hundred years, thanks to the favours and the concessions of Charles V., Messina enjoyed great prosperity. But the internal quarrels between the Merli, or aristocratic Pekar and the Malvezzi, or democratic faction, fomented as they were by the Spaniards, helped to ruin the city (1671-78). The Messinians suspected the Spanish court of a desire to destroy the ancient senatorial consti- tution of the city, and sent to France to ask the aid of Louis XIV. in their resistance. Louis despatched a fleet into Sicilian waters, and the French occupied the city. The Spaniards replicd by appealing to Holland,

who sent a fleet under Ruyter into the Mediterranean. The French admiral, Duquesne, defeated the combined fleet of Spain and Holland, but, notwithstanding this victory, the French suddenly abandoned Messina in 1678, and the Spanish occupied the town once more. The senate was suppressed, and Messina lost its privileges. This was fatal to the importance of the city, and it never recovered. In 1743 the plague carried off 40,000 inhabitants. The city was partially destroyed by earth- quake in 1783. During the revolution of 1848 against the Bourbons of Naples, Messina was bombarded for three consecutive days. In 1854 the deaths from cholera numbered about 15,000. Garibaldi landed in Sicily in 1860, and Messina was the last city in the island taken from the Bourbons and made a part of united Italy under Victor Emmannel.

Messina was the birthplace of the following celebrated men: Dicearchus, the historian (cir, 322 B.c.); Aristocles, the Peri- vatetic; Euhemerus, the rationalist (cir. 316 3B.o.); Stefano rotonotario, Mazzeo di Ricco, and Tommaso di Sasso, poets of the eourt of Frederick II. (1250 A.p.) ; and Antonello da Messina, the painter (1447-99), five of whose works are preserved in the university gallery. During the 15th eentury the grammarian Constantine Lascaris taught in Messina; and Bessarion was for a time archimandrite there.

METALLURGY, a branch of applied science whose object is to describe and scientifically criticize the methods used industrially for the extraction of metals from their ores. Of the large number of metals enumerated in the handbooks of chemistry, the vast majority, of course, lie outside its range; but it is perhaps as well for us to point out that in metallurgic discussions even the term “metallic,” as applied to compounds, has a restricted meaning, being exclusive of all the light metals, although one of these, namely aluminium, is being manufactured industrially. The following table enumerates in the order

of their importance the metals which our subject at present XVI. — 8

is understood to include; the second column in each case gives the chemical characters of the native compounds utilized, italics indicating ores of

subordinate importance. The term “oxide” must be understood to include carbon- ate, hydrate, and occasionally (when marked in the table with *) silicate.

Metal. Character of Ores.

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Nickel and cobalt…….0.c.0006 Arsenides.

Platinum and platinum metals… Reguline.

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We have separated the last two from the rest because the methods used for their preparation are more of the character of laboratory operations, and because we do not mean to include these in our general exposition of metal- lurgic principles. The history of metallurgy, up to the most recent times, is obscure. It is only since about the beginning of this century that the art has

come to be at all scientifically criticized; and in the case of the most important processes all that science has been able to do has been merely to put her stamp upon what experience has long found to be right. Great and brilliantly successful scientific efforts in the synthetic line are not wanting, but they all belong to recent times. Science, by its very nature, aims at publicity ; empiricism at all times has done the reverse; hence a history of the development of the art of metallurgy does not and cannot exist. A few historical notes on the discovery of certain of the useful metals are given in the introduction to Mzrats (g.v.).

General Sequence of Operations.—Occasionally metallic ores present themselves in the shape of practically pure compact masses, from which the accompanying matrix or ‘“‘gangue” can be detached by hand and hammer. But this is a rare exception. In most cases the “ore,” as it comes out of the mine, is simply a mixture of ore proper and gangue, in which the latter not unfrequently predomi- nates so much that it is not the gangue but the ore that really occupies the position of what the chemist would call the impurity. Hence, in general, it is necessary, or at least expedient, to purify the ore as such before the libera- tion of the metal is attempted. Most metallic ores are specifically heavier than the impurities accompanying them, and their purification may be (and generally is) effected by reducing the crude ore to a fine enough powder to detach the metallic from the earthy part, and then washing away the latter by a current of water, as far as possible. In the case of a “reguline” ore, such as auriferous quartz, for instance, the ore thus concentrated may consist substan- tially of the metal itself, and require only to be melted down and cast into ingots to be ready for the market. This, however, is a rare case, the vast majority of ores being chemical compounds, which for the extraction of their metals demand chemical treatment. The chemical operations involved may be classified as follows :—

1. Fiery Operations.—The ore, along in general with some kind of “flux,” is exposed to the direct action of a powerful fire. The fire in most cases has a chemical, in addition to its obvious physical function. It is intended either to burn away certain components of the ore—in which case it must be so regulated as to contain a sufficient

excess of unburned oxygen; or it is meant to deoxidize (“reduce”) the ore, when the draught must be restricted so as to keep the ore constantly wrapped up in combustible flame gases (carbonic oxide, hydrogen, marsh-gas, &c.). The vast majority of the chemical operations of metallurgy fall into this category, and in these processes other metal- reducing agents than those naturally contained in the fire (or wind) are only exceptionally employed.

2. Amalgamation.—The ore by itself (if it happens to be a reguline one), or the ore plus certain reagents (if it does not), is worked up with mercury so that the metal is obtained ultimately as an amalgam, which can be separated mechanically from the dross. The purified amalgam is subjected to distillation, when the mercury is recovered as a distillate while the metal remains.

3. Wet Processes.—Strictly speaking, certain amalgama- tion methods fall under this head; but, in its ordinary acceptance, the term refers to processes in which the metal is extracted either from the natural ore, or from the ore as it is after roasting or some other preliminary treatment, by means of an aqueous acid or salt solution, and from this solution precipitated—generally in the reguline form—by some suitable reagent.

Few methods of metal extraction at once yield a pure product. What as a rule is obtained is a more or less impure metal, which requires to be “refined” to become fit for the market. We now pass to the individual con- sideration of the several steps referred to.

Comminution of Ores. —Assuming the ore to be given in the shape of large lumps, these must first be broken up into small stones (of about the size of those used for macadamizing a road) before they can go to the grinding-mill. This formerly used to be done by hand- work; nowadays it is preferably effected by means of an American invention called the stone-breaker (fig. 1). This consists essentially of two substantial verticaliron plates; one is fixed, the other is connected withan excentric worked by an engine so as to alternately dash against and recede from the former. The

lumps of ore, in passing through this jaw-like contrivance, are broken up into smaller fragments fit for

Fic. 1.—American Stone-Breaker.

the mill. For the production of a coarse powder revolving cylinders are often employed. Two cylinders of equal diameter and length, made of iron, steel, or stone, are suspended by parallel axes in close proximity to each other. The width of the slit between them can be made to vary according to the requirements of the case. The cylinders are made to revolve in opposite directions, so that the stones when run into the groove formed by their upper halves are drawn between them and are crushed into bits of a size dependin,

on the least distance between the two surfaces. Exceptionally haste stones might bring the machine to a standstill or cause breakages ; hence only one of the two axes of rotation is absolutely fixed ; the cushions of the other are only held in relatively fixed positions, each between a couple of guiding rails, by means of powerful springs at their backs. The springs are made of alternate disks of india- rubber and sheet-iron, and yield appreciably only to very strong pressures. Whenan exceptionally hard stone comes on, they yield

and allow it to pass through uncrushed. Sometimes two sets of cylinders are arranged one above the other, so that the grit from the upper falls into the jaws of the lower set to receive further eom- minution. The diameter of the cylinders is from a foot to a yard, their length from 9 inches to a yard, the velocity of a point on the periphery a foot to a yard per second. The quantity of ore reduced

er hour per horse-power is about 5 cubic feet for quartz or other tee minerals, and about 14 eubic feet for minerals of moderate hardness.

For the production of a relatively fine powder the pounding-mill is Reval used, which, in its action, is analogous to a mortar and pestle. The mortar is a rectangular trough, while the pestle is replaced by a parallel set of heavy

metal or metal-shod beams, which (by means of a revolving cylinder with cogs eatching oa jections on the beams) are lifted up in succession and then let fall by their own weight so as to pound up the ore in the trough. The ore is supplied from a prismatic reservoir with a sloping bottom leading into a canal through which the stones slide into the trough. A current of water, which constantly flows into the trough from below, lifts up the finer particles and carries them away over the edge of the trough into a settling tank.

The object pursued in powdering an ore is to et aoe it for being purified by washing. But the velocity with which a solid particle falls through water depends on its size as well as on its specific gravity—an increase in either accelerating the fall; henee, where the difference in specifie gravity between the things to be separated is small, the washing must be preceded by a separation of the ore- powder into portions of approximately equal fineness. This is often effected by passing the ore through a system of sieves of different width of mesh superposed over one another, the coarser sieve always occupying the higher position. Sometimes the sieves are made to ‘go dry,” sometimes they are aided in their action by a eurrent of water which, more effectually than mere shaking, pre- vents adherence of dust to coarser parts. ;

Another contrivance is the ‘‘ Drum” (fig. 2). A long perforated circular cylinder made of sheet-iron, open at both ends, is suspended, in a sloping position, by a revolving shaft passing through its axis. The size of the perforations is generally made to increase in passing from the upper to the lower belts of the cylinder. While the drum

Fic. 2.—Drum.

is revolving, the ore, suspended in water, flows in at the upper end, and in travelling down it casts off first its finest and then its coarser parts, the coarsest only reaching the exit at the lewer end. The several grades of powder produced fall each into a separate division of the collecting tank.

The drum, of course, is subject to endless modifications, A very ingenious combination is H. E. Taylor’s ‘‘ Drum Dressin Machine” (fig. 3). It consists

of three truncated eone-shape drums D, fixed co-axially to the same horizontal revolving shaft,

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Fig. 3.—Taylor’s Drum Dressing Machine. so that the narrow end of No. 1 projects into the wider end of No. 2,

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and No. 2 similarly into No. 8. The drums are not perforated, but are armed inside with screw-threads formed of strips of sheet metal

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fixed edgeways to the drum, The ore grit to be dressed is placed in a hopper A, and from it, by a worm B fixed to the revolving shaft, is being screwed forward into a short fixed truncated cone C projecting into the revolving drum No. 1, into which it flows in a eonstant current. The rotary motion of the drum tends to convey the ore along the spiral path prescribed by the screw-thread towards the other end, and from it into drum No. 2, and so on. But the ore in each drum meets with a jet of water E impelling it the opposite way, and the effect is that, in each drum, the lighter parts follow the water, and with it run off over the entrance edge to be collected in a special tank, while the coarser parts roll down the spiral path toward the next drum to undergo further parting. The tank or pit for drum 1 receives the finest and lightest parts, that of drum 2 a heavier, that of drum 3 a still heavier portion, while only the very heaviest matter finds its way out of the exit end of No. 3 into a fourth receptacle.

Of the large number of other ore-dressers, only two need be men- tioned here.

The ‘‘Clausthal Turn-Table” consists of a circular table, the sur- face of which rises from the periphery towards the centre so as to form a very flat cone of about 170°, which is fixed co-axially to a ver- tical rotary shaft. At

the apex of the table, surrounding the shaft, but independent of its motion, there isa cireular trough of sheet zinc, divided into two compartments; one receives a stream of water carrying the ore, the other a supply of pure water. A large annu- lar trough of sheet zinc is placed below the periphery of the table, so as to receive whatever may fal] over the edge. It also is divided into compartments, as shall be explained further on. Supposing the table to be at rest, a sector of about 60° of it would be constantly run over by the ore-mud out of the first compartment of the upper trough. This mud current would suffer partial separation into heavier and lighter parts,—rich ore resting in the higher and poorer in the lower latitudes, and a still poorer ore falling over the periphery into the lower trough. The same happens with the moving table; only each sector of such partially analysed ore under- goes further purification by passing through about 90° of water- shower. After passing this, it meets with a perforated fixed water- pipe going up radially to about half the radius of the table. This pipe also carries sweeping brushes, so that the belt of ore from the lower latitudes of the table is swept off into the corresponding section of the receiving trough. What of ore remains on the higher latitudes subsequently meets with a similar arrangement which sweeps it off into its compartment. If the table turns from the left to the right, and we follow the process, beginning at the left edge of the ore-mud compartment, it will be seen that a first sector of the receiving trough gathers the light dross, a suceeeding one an intermediate product, a third the most highly purified ore. The “intermediate” is generally run into the ore-mud trough of a seeond table to be further analysed.

In the “‘ Continuous Wash-Pumps” (Continuirliche Setzpnmype) of the Harz, three funnel-shaped vessels (one of which is shown in fig. 4) are set in a frame beside one another, but at different levels, so that any overflow from No.1 runs into No. 2 and thence into No. 3. Each funnel communicates below with its own compart- ment of a common cistern. Into each funnel a riddle with narrow meshes is in- serted somewhere near the upper end, while, beside the riddle, there is a pump of short range, which, by means of an excentrie, is worked so that the piston alternately goes rapidly down and slowly up. The mode of working is best explained by an example. At Breinigerberg in Rhenish Prussia the apparatus serves to separate a complex ore into the following four parts, which we enumerate in

the order of their specific gravities—(1) galena (the heaviest), (2) pyrites, (3)

blende, (4) dross, Sieve No. 1 is charged with granules of galena, just

large enough not to slip through the meshes, No, 2 similarly with granules of : pyrites, No, 3 with those of blende. The crude ore-mud goes into sieve 1; the jerking action of the pump alternately tosses the particles up into the water and allows them to fall; the heaviest naturally come down first, but what is most striking is that nothing will pass through the bed of galena but what is at least as heavy as galena itself. In a similar manner No, 2 aud No. 8

Fia, 4.—Continuous Wash-Pump.

funnels sift out the pyrites and the blende respectively, so that almost nothing but dross runs off ultimately. The apparatus is said to do its work with a wonderful degree of precision, and of eourse is susceptible of wider application, but it eeases to work when the raw material is a slime so fine that the particles fall too slowly.

Modes of Producing High Temperatures.—Most of what is to be said on this topic has already been anticipated in the articles Fur., Furnaces, and Bettows; but a few notes may be added on specially metallurgic points.

Furnace Materials.—In a metallurgic furnace the working parts at least must be made of special materials capable of withstanding the very high temperatures to which they are exposed and the action of the fluxes which may be used. No practically available material fully meets both requirements, but there is no lack of inerely fire-proof substances.

Of native stones, a pure quartzose sandstone, free from marl, may be named as being well adapted for the generality of structures; but such sandstone, or indeed any kind of fire-proof stone, is not always at hand. What is more readily procured, and eonsequently more widely used, is refractory brick, made from ‘‘ fire-clay.” The characteristic chemical feature of fire-clays is

that in them the elay proper (always some kind of hydrated silicate of alumina) is associated with only small proportions of lime, magnesia, ferrous oxide, or other protoxides. If the percentage of these goes beyond eertain limits, the bricks, when strongly heated, melt down into a slag. The presence of free silica, on the other hand, adds to their refrac- toriness. In fact the best fire-bricks in existence are the so-called Dinas bricks, which eonsist substantially of silica, contaminated only with just enough of bases to cause it to frit together on being baked. Dinas bricks, however, on account of their high price, are reserved for special cases involving exceptionally high temperatures. Amongst ordinary fire-bricks those from Stourbridge enjoy the highest reputation. It follows from what has just been said that, in a metallurgic furnace, lime-mortar eannot be used as a cement, but must be replaced by fire-clay paste.

In the construction of cupels, reverberatory furnaces, &¢., only the general groundwork is, as a rnle, made of built bricks, and this groundwork is coated over with some kind of special fire-proof and flux-proof material, such as bone-ash, a mixture of baked fire-clay and cokes or graphite, or of quartz and very highly silicated slags, &c. These beddings are put on in a loose powdery ferm, and then stamped fast. They offer the advantage that, when worn ont, they are easily removed and renewed. The powerful draught which a metallurgic fire needs can be produced by a chimney, where the fuel forms a relatively shallow howe spread over a large grating; but, when closely-packed deep inasses of fuel or fuel and ore have to be kept ablaze, a blast becomes indispensable.

Chimneys. —The efficiency of a chimney is measured by the velocity V with which the air ascends through it, multiplied by its section ; and the former is in roughly approximate accordance with the formula

Veaby2ii(T=T,)T,,

where h stands for the height of the chimney, g for the acceleration of gravity (32°2 feet per second), and T and T, for the absolute temperatures (meaning the temperatures counted from ~ 278° C.) of the air within and the air without the ehimney respectively, while & is a factor meant to account for the resistances which the air, in its progress through the furnace, &c., has to overcome. In practice T is taken as the mean temperature of the

chimney gases, which theoretically is not nnobjectionable ; but the weakest point in the formula is the smallness and utter inconstancy of the factor k, which, according to Péclet, generally assumes some value of the power 4, +, &c. Yet the formula is of some use as enabling one to see the way in which V depends on hf and (T-T,)/T, con- jointly, —to see, for instance, how deficient chimney height may be compensated for by an increase of temperature in the chimney gases, and vtee versa.

Blowing-Machines.—Of the several kinds of blowers described under BELLOWs (9.¥.), the ‘‘ fans” are the best means for producing large volumes of wind of relatively small but steady pressure ; ‘‘bellows” are indicated in the case of work on a relatively small scale requiring moderate wind pressure; while the “cylinder blast” comes in where large masses of high-pressure wind are required. Two highly interesting blowing-machines, however, are omitted in that article, which may be shortly described here.

The ‘‘ Water Blast” (Wassertrommelgeblise) is interesting historically, having been used metallurgically in Hungary for many eenturies. A mass of water, stored up ina reservoir, is made to fall down continuously through a high narrow vertical shaft having air-holes at its upper end. The vertical column of water sucks in air through these holes and carries it down with it into a kind of inverted tub standing in a reservoir kept at a eonstant level. Air and water there separate, the former flowing away through a pipe into a wind-box, from which it is led to its destina- tion.

METALLURGY

The ‘‘Cagniardelle” (figs. 5, 6), so called fromits inventor Cagniard Latour, also utilizes water to earry air, but in quite another way. By means of a round shaft passing through its axis, a cylindrical drum of sheet-metal is suspended slantingly in a mass of water, so that the lower end is fully immersed, while of the upper end the segment above the upper side of the shaft is uncovered. The space between shaft and drum is eonverted into a very wide screw-shaped eanal by a band of sheet-metal hermetically fixed edgeways to the two. Both the top and the bottom end of the drum are partially closed by flat

SSS ZEEE EEN SSSA ‘ XS Ss RSS SS ANS

bottoms soldcred or riveted to the respective edges; the lower one leaves a ring-shaped opening between its edge and the shaft, which serves for the introduction of a fixed air-pipe bent so as to reach up to near the top of the drum's air-space ; in the upper bottom three quadrants are closed, the fourth is open. Supposing the screw-canal, traced from below, to go from the left to the right, the drum is made to revolve in the same sense, and the effect is that, in each revolution, the screw-canal at its top end swallows a eertain volume of air which, by the succeeding entrance of the water—whieh, of course, moves relatively to the screw —is pushed towards and ultimately into the air-space at the bottomend. The Cagniardelle yields a perfectly continu- ous blast, and, as it is not encumbered with any dead resistances except the friction of the shaft against its bearings (which ean be reduced to very little) and the very slight friction of the water against the screw-canal, it utilizes a very large percentage of the energy spent on it. This percentage, accord- ing to experiments by Schwamkrug, amounts to from 75 to 84°5; in the ease of the cylinder-blast it is 60 to 65 per cent. ; with bellows, about 40 per eent.; with the ‘‘ Wassertrommelgeblise” 10 to 15 per cent. Hence the ‘‘ Wassertrommelgeblase”’ stands last in relative efficiency ; but we must not forget that it alone directly utilizes native energy, while, in the eylinder blast, for example, 100 units of work done by the steam-engine involve a vastly greater energy spent on the engine as heat.

To maintain a desired temperature in a given furnace eharged in a certain manner, the introduction of a certain volume of air per unit of time is necessary. But this quantity, in a given blowing- machine, is determined by the over-pressure of the wind, as measured by a manometer, the velocity of the wind being approxi-

mately proportional to »/M/(B+M), where M stands for the height of the mercury-manometer, and B for that of the barometer. Hence the practical metallurgist, in adjnsting his blast, has nothing to do but to see that the manometer shows the reading which, by previous trials, has been proved to yield an adequate supply of wind.

Fuel.—In some isolated eases the ore itself, by its combustion, supplies the necessary heat for the operation to be performed upon it. Thus, for instance,

the roasting of blackband iron-stone is effected by simply piling up the ore and setting fire to it, so that the ore is at the same time its own furnace and fuel; in the Bessemer process of steel-making, the burning carbon of the pig- iron supplies the heat necessary for its own combustion; and a similar process has been tried experimentally, and not without suceess, for the working up of certain kinds of pyrites. But, asa tule, the high temperatures required for the working of ores are pro- duced by the combustion of extraneous fuel, such as wood, wood- charcoal, coal, coke. Of these four, wood-charcoal is of the widest applieability, but not much used in Britain on account of its high price. High-class coke or pure anthracite, volume for volume,

Fig. 6.

ee Terehei.n Uh GY

gives the highest temperature. Wood or coal is indicated when a voluminous flame is one of the requisites. Obviously fuel of the same kind and quality gives a higher calorific intensity when, before use, it is deprived by drying of its moisture, or wlien it is used in conjunction with a hot instead of a cold blast. This latter prin- ciple, as every one knows, is largely discounted in the manufacture of pig-iron, where nowadays coal, with the help of the hot blast, is made to do what formerly could only be effected with charcoal or coke. For further information see Furr and JRon.

Chemical Operations. —In regard to processes of amalgamation and to wet-way processes, we have nothing to add to what was given in a previous paragraph ;1 we therefore here confine ourselves, in the main, to pyro-chemical operations.

The method to be adapted for the extraction of a metal from its ore is determined chiefly, though not entirely, by the nature of the non-metallic component with which the metal iscombined. The simplest case is that of the reguline ores where there is no non- inetallic element. The important cases are those of GoLD, BisMUTH, and MERCURY (@.¥.).

Oxides, Hydrates, Carbonates, and Silicates.—All iron and tin ores proper fall under this heading, which, besides, comprises certain ores of copper, of

lead, and of zine. In any case the first step consists in subjecting the crude ore to a roasting pee the object of which is to remove the water and carbonic acid, and burn away, to sonie extent at least, what there may be of sulphur, arsenic, or organic matter. The residue consists of an impure (perhaps a very impure) oxide of the respective metal, which in all cases is reduced by treat: ment with fuel at a high temperature. Should the metal be present in the silicate form, lime must be added in the smelting to remove the silica and liberate the oxide.

In the case of zinc the temperature required fur the reduction lies above the boiling point of the metal ; hence the mixture of ore and reducing agent (charcoal is generally used) must be heated in a retort combined with the necessary condensing apparatus. In all the other cases the reduction is effected in the fire itself, a tower- shaped blast furnace being preferably used. The furnace is charged with alternate layers of fuel and ore (or rather ore and flux, see be- low), and the whole kindled from below. The metallic oxide, partly by the direct action of the carbon with which it is in contact, but principally by that of the carbonic oxide produced in the lower strata from the oxygen of the blast and the hot carbon there, is re- duced to the metallic state ; the metal fuses and runs down, with the slag, to the bottom of the furnace, whence both are withdrawn by the periodic opening of plug-holes provided for the purpose.

Sulphides.—Iron, copper, lead, zinc, mercury, silver, and anti- mony very frequently present themselves in this state of combin- ation, as components of a very numerous family of ores which may be divided into two sections: (1) such as substantially consist of simple sulphides, as iron pyrites (FeS,), galena (PbS), zine blende (ZnS), cinnabar (HgS); and (2) complex sulphides, such as the various kinds of sulphureous copper ores (all substantially com- pounds or mixtures of sulphides of copper and iron) ; bournonite, a complex sulphide of lead, antimony, and copper ; rothgiltigerz, sulphide of silver, antimony, and arsenic ; falilerz, sulphides of arsenic and antimony, combined with sulphides of copper, silver, iron, zinc, mercury, silver; and mixtures of these and other sul- phides with one another.

In the treatment of a sulphureous ore, the first step as a rule is to subject it to oxidation by roasting it in a reverberatory or other furnace, which, in the first instance, leads to the burning away of at least part of the arsenic and part of the sulphur. The effect on the several individual metallic sulphides (supposing only one of these to be present) is as follows :—

1. Those of silver (Ag,S) and mercury (HgS) yield sulphurous acid gas and metal; in the case of silver, sulphate is formed as an intermediate product, at low temperatures. Metallic mercury, in the circumstances, goes off as a vapour, which is collected and con- densed ; silver remains as a regulus, but pure sulphide of silver is hardly ever worked.

2. Sulphides of iron and zine yield the oxides Fe,03 and ZnO as

final products, some basic sulphate being formed at the earlier stages, more especially in the case of zinc. The oxides can be reduced by carbon.

3. The sulphides of lead and copper yield, the former a mixture of oxide and normal sulphate, the latter one of oxide and basic sulphate. Sulphate of lead is stable at a red heat ; sulphate of copper breaks up into oxide, sulphurous acid, and oxygen. In practice, neither oxidation process is ever pushed to the end; it is stopped as soon as the mixture of roasting-product and unchanged sulphide contains oxygen and sulphur in the ratio of 0.:S. The access of air is then stopped and the whole heated to a higher temperature, when the potential SO, actually goes off as sulphurous- acid gas and the whole of the metal is eliminated as such. This method is largely utilized in the smelting of lead (from galena) and of copper from copper pyrites. In the latter case, however, the

1 Examples are given in GoLp and Corrrr. See also SILVER.

sulphide Cu, has first to be produced from the ore, which is done substantially as follows. The ore is roasted with silica until a certain proportion of the sulphur is burned away as SOQ,, while a corresponding proportion of oxygen has gone to the metal part of the ore. Now it so happens that copper lias a far greater affinity for sulphur than iron has;

hence any locally produced oxide of copper as long as sufficient sulphide of iron is left, is sure to be reconverteil into sulphide, and the final result is that, while a large quautity of oxidized iron passes into the slag, all the copper and part of the iron separate out asa mixed regulus of Cu,S and FeS (‘‘mat”). This regulus, by being fused up repeatedly with oxidized copper ores or rich copper slags (virtually with CuO and silica), gradually yiclds up the whole of its iron, so that ultimately a regulus of pure subsul- phide of copper, Cu,S (‘‘fine mat”), is obtained, which is worked up for metal as above explained.

4, Sulphide of antimony, when roasted in air, is converted into a kind of alloy of sulphide and oxide; the same holds for iron, only its oxysulphide is quite readily converted into the pure oxide Fe,O, by further roasting. Oxysulphide of antimony, by suitable processes, can be reduced to metal, but these processes are rarely used, because the same end is far more easily obtained by ‘‘precipitation,” 7@.¢., withdrawing the sulphur by fusion with metallic iron, forming metallic antimony and sulphide of iron. Both products fuse, but readily part, because fused antimony is far heavier than fused sulphide of iron is. A precisely similar method is used occasionally for the reduction of lead from galena. Sulphide of lead when fused together with metallic iron in the proportion of 2Fe:1PbS yields a regulus (=1Pb) and a “mat” Fe,8, which, however, on cooling, decomposes into FeS parts of ordinary sulphide and Fe parts of finely divided iron. What we have just been explaining are only two special cases of a more general metallurgic proposition. According to Fournct, any onc of the metals copper, iron, tin, zinc, lead, silver, antimony, arsenic, in general, is capable of desulphurizing or precipitating (at least partially) any of the others that follows it in the serics just given, and it does so the more readily aud completely the greater the number of intervening terms. Hence, supposing a complete mix- ture of these metals to be melted down under circumstances adinit- ting of only a partial sulphuration of the whole, the copper has the best chance of passing into the ‘‘mat,” while the arsenic is the ae to be eliminated as such, or, in the presence of oxidants, as oxide.

Arsenides.—Although arsenides are amongst the commonest impurities of ores generally, ores consisting essentially of arsenides are comparatively rare. The most important of them are certain double arsenides of cobalt and

nickel, which in practice, however, are always contaminated with the arsenides or other compounds of foreign metals, such as iron, manganese, &c. The general mode of working these ores is as follows. The ore is first roasted by itself, when a part of the arsenic goes off as such and as oxide (both volatile), while a complex of lower arsenides remaius. This residue is now subjected to careful oxidizing fusion in the presence of glass or some other fusible solvent for metallic bases. The effect is that the several metals are oxidized away and pass into the slag (as silicates) in the following order, —first the manganese, secondly the iron, thirdly the cobalt, lastly (and very slowly) the nickel ; and at any stage the as yet unoxidized residue of arsenide assumes the form of a fused regulus, which sinks down through the slag as a ‘‘sneis.”” (This term, as will readily be understood, has the same meaning in reference to arsenidesas “mat” has in regard to sulphides.) By stopping the process at the right moment, we can produce a speis which contains only cobalt and nickel, and if at this stage also the flux is renewed we can further produce a speis which con- tains only nickel and a slag which substantially is one of cobalt only. The composition of the speises generally varies from AsMcz,. to AsMe,, where ‘‘ Me” means one atomic weight of mctal in toto, so that in general IMe=xFe+yCo+zNi, where e+y+tz=1. The siliceous cobalt is utilized as a blue pigment called ‘‘smalte”; the nickel-speis is worked up for metal, preferably by wet processes.

Minor Reagents. —Besides the oxidizing and reducing agents natu- rally present in the fire, and the ‘‘ fluxes” added for the production of slags, there are various minor reagents, of which the more im- portant may be noticed here. One—namely, metallic iron as a desulphurizer-—has already been referred to.

Oxide of lead, PbO (litharge), is largely used as an oxidizing agent. At a red heat, when it melts, it readily attacks all metals, except silver and gold, the general result being the formation of a mixed oxide and of a mixed regulus, a distribution, in other words, of both the lead and the metal acted on between slag and regulus. More important and more largely utilized is its action ou metallic sulphides, which, in general, results in the formation of three things besides sulphurous acid gas, viz., a mixed oxide slag includ- ing the excess of litharge, a regulus of lead (which may include bismuth and

other more readily reducible metals), and, if the litharge is not sufficient for a complete oxidation, a “mat” comprising the more readily sulphurizable metals. Oxide of lead, being a most powerful solvent for metallic oxides generally, is also

largely used for the separation of silver or gold from base metallic oxides.

Metallic lead is to metals generally what oxide of lead is to metallic oxides. 1t accordingly is available as a solvent for so to say licking up small particles of metal diffused throughout a mass of slag or other dross, and uniting them into one regulus. This naturally leads us to consider the process of ‘‘ cupellation,” which discounts the solvent powers of both metallic lead and its oxide. This process serves for the extraction of gold and silver from their alloys with base metals such as copper, antimony, &c. The first stcp is to fuse up the alloy with a certain proportion of lead, which is determined by the weight of base metal to be eliminated, and is always sufficient to produce a lead-alloy of lowfusing point. This alloy is heated on a shallow dish-shaped bed of bone earth to red- ness, and at this temperature subjected to the action of air. The base metals (copper, &c.) are oxidized away, the first portions as an infusible scum containing little oxide of lead, the latter in the form of a solution in molten litharge. Lead is, in general, less oxidiz- able than the other base metals; hence the last instalment of liquid litharge which runs off is pure, and the ultimately remaining regu- lus consists of silver and gold only. These latter may be separated by nitric acid or boiling oil of vitriol, which converts the silver into soluble salts and leaves the gold.

Oxide of iron, and also binoxide of manganese, are used for the decarburation of pig-iron. The oxygen of the reagent burns the carbon of the pig into carbonic acid, while the metal of the reagent becomes iron and FeO or MnO respectively, the oxides uniting with the silica added as such, or formed by the oxidation of the silicon of the pig, into a fusible slag,

Iron pyrites, FeS,, is employed for the preliminary concentration of traces of gold diffused throughout slags or base ores. The reagent, through the action of the heat, gives up one-half of its sulphur, which reduces part of the

metallic oxides present. The gold and silver unite with what is left of protosulphide of iron (FeS) into a inat, which is then worked up for the noble metals.

Fluxes. —Practically speaking, all ores are contaminated with more or less of gangne, which in general consists of infusible matter, and consequently, if left unheeded in the reduction of the metallic part of the ore, would retain more or less of the metal disseminated through it, or at best foul the furnace. To avoid this, the ore as it goes into the furnace is mixed with ‘‘ fluxes” so selected as to convert the gangue into a fusible ‘‘slag,” which readily runs down through the fuel with the regulus and separates from the latter. The quality and proportion of flux should, if pos- sible, be so chosen that the formation of the slag sets in only after the metal has been reduced and molten ; or else part of the basic oxide of the metal to be extracted may be dissolved by the slag and its reduction thus be prevented or retarded. Slags are not, as one might be inclined to think, a necessary evil; if an ore were free from gangue we should add gangue and flux from without to producea slag, because one of its functions is to form a layer on the regulus which protects it against the further action of the blast or furnace gases. Fluxes may be arranged under the threc heads of (1) fluor-spar (which is swi generis), (2) basic fluxes, and (8) acid fluxes.

Fluor-spar owes its name to the facility with which it fuses up at a red heat with silica, sulphates of lime and barium, and a few other infusible substances into homogeneous masses. It shows little tendency to dissolve basic oxides, such as lime, &c. One part of flnor-spar liqnefies about half a part of silica, four parts of sulphate of lime, and one and a half parts of sulphate of baryta. Upon these facts its wide application in metallurgy is founded.

Carbonate of soda (or potash) may be said to be the most power- ful of basic fluxes. It dissolves silica and all silicates into fusible glasses. On the other hand, borax may be taken as a type for the acid fluxes. Ata red heat, when it forms a viscid fluid, it readily dissolves up all basic oxides into fusible complex borates. Now the gangue of an ore in gencral consists either of some basic material such as carbonate of lime (or magnesia), ferric oxide, alumina, &c., or of silica (quartz) or some more or less acid silicate,

or else of a mixture of the two classes of bodies. So any kind of gangue might be liquefied by means of borax or by means of alkaline carbonate ; but neither of the two is used otherwise than for assay- ing; what the practical metal-smelter does is to add to a basie gangue the proportion of silica, and to an acid ore the proportion of lime, or, indirectly, of ferrous or perhaps manganous oxide, which it may need for the formation of a slag of the proper qualities. The slag must possess the proper degree of saturation. In other words, taking SiO, +MeO (where MeO means an equivalent of base) as a formula for the potential slag, » must have the proper value. If is too small, z.e., if the slag is too acid, it may dissolve up part of the metal tobe brought out as a silicate ; if x is too great, z.¢., the slag too basic, it may refuse to dissolve, for instance, the ferrous oxide which is meant to go into it, and this oxide will then be reduced, and its metal (iron in our example) contaminate the regulus. In reference to the problem under discussion, it is worth noting that oxides of lead and copper are more readily reduced to metals than oxide of iron Fe,0, is to FeO, the latter more readily to FcO than

FeO itself to metal, and FeO more readily to metal than manganons oxide is. Oxide of calcium (lime) is not reducible at all. The order of basicity in the oxides (thcir readiness to go into the slag) is precisely the reverse.

Most slags being, as we have scen, complex silicates, it is a most important problem of scientific metallurgy to determine the relations in this class of bodies between chemical composition on the one hand and fusibility and solvent power for certain oxides (CaO, FeO, SiO, &c.) on the other. Now the composition of a silicate can be stated in an infinite number of ways; but there must be one mode of formulation which reduces the law to its simplest terms. The mode adapted by metallurgists is something like the following. lf we start with the quantity H,Cl, of muriatic acid or the quantity H,S0, of sulphuric acid, it is clear that to convert eithcr into a normal salt we require such a quantity of base as will convert the Hi, of the acid eompletely into water; but the quantity of base that does so is that containing one atomic weight of oxygen. Hence it is reasonable to define the quantities K,O of potash,! Na.O of soda,} CaO of lime, MgO of magnesia, FeO of ferrous oxide, }.A1,0.(=alO) of alumina, 4Fe,0,(=feO) of ferrie oxide, as representing each ‘‘ one equivalent ” of base also in

reference to silica, although silica has a characteristically indefinite basicity. Most slags are alloys or com- pounds of silicates of Al,O, or Fe,Og, and of silicates of protoxides (CaO, &c.), hence their general composition is

n(RO + a#SiO,) + m[(fe or al)O+ xSi0,] «

This introduction will enable the reader to understand the

following mode of classifying and naming composition in silicates,

Nanie. Formula. Oxygen Ratio, z

Base. Acid. J, Singulo-silicates…..0….:...ss+re» 48i02+1M0 ihe Be i Pa TD. ABIESINGHEESY... ...020e005) 1M0 1 2 1 DED, TricSilicdtests.:.s.. s sesccverse eterna §Si0,+1M0 1 3 3

The names are the metallurgic ones ; scientific chemists designate Class J. as orthosilicates, Class 11. as metasilicates, Class III. as sesqui- silicates. In the formule M stands for K,, Ca, Fe, &c., or for al= Al, fe=2Fe, &c.; or, shortly, MO for one equivalent of base as above defined. It should be possible to represent each quality of a

silicate as a function of a, ~, and of the nature of the individual bases

that make up the RO and (fe or al) O respectively. Our actual knowledge falls far short of this possibility. The problem, in fact, is a very tough one, the more so as it is complicated by the existence of aluininates, compounds such as Al,03.38CaO, in whicli the alumina plays the part of acid, and the occasional existence of compounds of fluorides and silicates in certain slags. ‘The following notes on the fusibility of simple silicates are taken from Plattner’s researches,

Of the lime silicates, the tri-silicate melts at 2100° C., the bi- silicate at 2150°.

Magnesia silicates are most refractory. The bi-silicate and tri- silicate melt in the oxyhydrogen flame at 2250°.

Of manganous silicates, the easily fusible bi-silicate is yellow or red; the tri-silicate is more refractory.

Of cuprous (Cu,O) silicates, the bi-silicate is violet, and melts pretty easily; the singulo-silicate is red, dense, and rather refractory.

Cupric silicates, as slags, hardly exist,—the CuO being always reduced to at least Cu,O.

Lead silicates all melt readily into yellowish transparent glasses. But they have no standing as slags.

As regards the ferrous silicates, the singulo-silicate (orthosilicate) fuses at 1790° (this is about the composition of iron-puddling slag) ; the bi-silicate is less readily fusible.

Ferric silicates (unmixed) do not exist as slags,—the FeO, being reduced in the fire to 1FeO, although Fe,O, occasionally replaces part of the Al,O, in complex silicates.

Alumina silicates are all infusible in even the hottest furnace fires. They begin to soften in the oxyhydrogen flame at abont 2400°. But certain aluminates, for instance the salt 3 Ca0.1A1,0, according to Sefstro6m, melt at furnace heats.

The fusing points of mixtures of two simple silicates cannot be calculated from those of the components. In many cases it is lower than either of the latter two. ‘Thus for instance most magnesia- lime silicates fuse,—tho bi-silicate combination (Mg, Ca)OSiO, most readily.

Alumina silicates become fusible by addition of a sufficient pro- portion of silicate of lime at about 1918°. The singulo-silicate and bi-silicate combinations melt into grey glasses. Magnesia acts like lime, and so, in a more limited sense, do ferrous and manganous oxides ; but their double compounds with Al,O, and silica are more viscid when fused.

Plattner’s work is a bold attempt to deal synthetically with the problem here presented, but it does not go the length of even an approximate solution. No

one seems to have done much to con- tinue it; hence in the meautime the metallurgist has, for his

1 Few slags contain more than traees of alkalies,

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guidance, to rely on the very numerous analyses which have been made of slags actually produced (by the rule of thumb) in successful metallurgical operations. For some of such slags also Plattner has determined the fusing points. He found for (1) Freiberg lead slag, 9RO, BalO, 8Si0,; oxygen-ratio, 3:4; melting-point at 1317° C. ; (2) Freiberg crude slag, 15RO, 3al0, 18S8i0,; oxygen-ratio, 1:1; melting-point at 1331° C. ; (8) Freiberg black-copper slag, 24FeO, Al,Oz 15Si0,; oxygen-ratio, 9 :10 ; melting-point at 1838° C.; (4) High-furnace slag, 6CaO, 3al0, 9Si0,; oxygen-ratio, 1:1; inelting-point at 1431° C.?

Metallurgic Assaying.—To assay an ore originally meant to execute a set of tentative experiments on a small scale in order to find out the proper mode of working it practically. But nowadays the term is always used in the sense of an analysis carried out to determine the money-value of an ore. For this purpose, in many cases it is sufficient to determine the percentages of the metals for which the ore is meant to be worked. But sometimes nothing short of a complete analysis will do. This holds more especially of ores ofiron. As this metal is cheap, the value of an ore containing it depends as much on the nature and relative quantities of the im- purities as on the percentage of metal. The proved absenceof sulphur and phosphorus may be worth more than an additional 5 per cent. of iron, which latter again would perhaps not compensate for the proved presence ofa large percentage of uncombined silica.

An assay to be of any value must start with a fair ee of the object of sale. The fulfilment of this condition in all cases is difficult. ‘The general method is, from say a given ship load of ore, to take out (say) half a ton of ore from

a large number of different places and to crush this large sample into small fragments of uniform size, which are well shovelled up together. From different parts of this ore-heap a sample of the second order—amounting to, say, 20 ib—is then drawn, and rendered more homogeneous by finer powder- ing and mixing. From this sample of the second (or perhaps froin one of the third) order quantities of 1 or 2 tb are bottled up for assaying. At the same time the moisture of the ore is determined, ona large scale, by some conventional method, such as the drying of 1 or 2 tb in an open basin at 100° C., and weighing of the residue as dry ore. This is done at the sampling place by the firms concerned. The assayer further pounds up and mixes his sample, and then pro- ceeds to determine the percentages of moisture and metal in his own way. He has always the choice between two methods, the dry and the wet. For the majority of gold or silver ores, and for cobalt and nickel ores almost as a rule, certain dry-process tests are preferred as the most exact analytically. In almost all other cases it may be said that the wet method is susceptible of the higher degree of pre- cision, yet even in some of these cases the old dry-process tests are preferred to the present day. For instance, all copper ores in the British Isles are sold by the result of the Swansea assay, a kind of imitation of the process of sulphureous copper-ore smelting; and this, singularly, is adhered to even in the case of such cuprifcrous materials as are worked by the wet way, although the Swansea assay is well known to lose about 1 per cent. of the copper present. A copper-smelter thercfore had better buy 5 per cent. than 10 per cent. copper-pyrites cinders, because in the first case he pays only for four-fifths, while in the laiter he must pay for nine-tenths of the copper present. ‘To compensate for this anomaly, empirical methods have been contrived for calculating prices. (W. D.)

METALS. The earliest evidence of a knowledge and use of metals is found in the prehistoric implements of the so-called Bronze and Iron ages. In the earliest periods of written history, however, we meet with a number of metals in addition to these two, The Old Testament mentions six metals—gold, silver, copper, iron, tin, and lead. The Greeks, in addition to these and to bronze, came also to know mercury; and the same set of metals, without additions, forms the list of the Arabian chemists of the 8th and of the Western chemists of the 13th cen- tury. During the 15th century Basilius Valentinus dis- covered antimony; he also speaks of zinc and bismuth, but

their individuality was established only at a later period. About 1730-40 the Swede Brand discovered arsenic and cobalt (the former is not reckoned a metal by modern chemists), while the Englishman Ward recognized the individuality of platinum. Nickel was discovered in 1774 by Cronstedt, manganese in 1774 by Scheele. The brothers D'Elhujart, in 1783, prepared tungsten ; Hjelm, in 1782, isolated molybdenum from molybdic oxide, where

1¥or further information on slags, see Berthier, Traité des essais par la vote séehe; Winkler, Exfahrunyssitze iber die Bildung der Sehlaeken, Freiberg, 1827; Plattner, Vorlesungen tiber allgemeine Hiittenkunde, i, 28 sq.; Percy, Aletallurgy.

its existence had been conjecturally asserted by Bergmann in 1781. Uranium, as a new element, was discovered by Klaproth in 1789 ; but his metallic " uranium," after having been accepted as a metal by all chemists until 1841, was then recognized as an oxide by Péligot, who subsequently isolated the true metal. Tellurium was discovered by Miiller von Reichenbach in 1782 (again by Klaproth in 1798) ; titanium, by Klaproth in 1795; chromium, by Vauquelin in 1797; tantalum, by Hatchett in 1801, and by Ekeberg in 1802. Palladium, rhodium, iridium, and osmium (which four metals always accompany platinum in its ores) were discovered, the first two by Wollaston in 1803, the other two by a number of chemists; but their peculiarity was established chiefly by Smithson Tennant.

After Davy, in 1807 and 1808, had recognized the alkalies and alkaline earths as metallic oxides, the existence of metals in all basic earths became a foregone conclusion, which was verified sooner or later in all cases. But the discovery of aluminium by Wohler in 1828, and that of magnesium by Bussy in 1829, claim special mention. Cadmium, a by no means rare heavy metal, was discovered only in 1818, by Stromeyer.

Of the large number of discoveries of rare metals which have been made in more recent times only a few can be mentioned, as marking new departures in research or offer- ing other special points of interest. In 1861 Bunsen and Kirchhoff, by means of the method of spectrum analysis, which they had

worked out shortly. before, discovered two new alkali-metals which they called cesium and rubidium. By means of the same method Crookes, in 1861, discovered thallium ; Reich and Richter, in 1863, indium ; and Lecoq de Boisbaudran, in 1875, gallium. The existence of the last-named metal had been maintained, theoretically, by Mendelejeff, as early as 1871. The existence of vanadium was proved in 1830 by Sefstrém; but what he, and sub- sequently Berzelius, looked upon as the element was, in 1867, proved to be really an oxide by Roscoe, who also succeeded in isolating the true metal.

The development of earlier notions on the constitution of metals and their genetic relation to one another forms the most interesting chapter in the history of chemistry (see AtcuEMy). What modern science has to say on the matter is easily stated: all metals properly so called (i. all metals not alloys) are elementary substances ; hence, chemically speaking, they are not “constituted ” at all, and no two can be related to each other genetically in any way whatever. Our scientific instinct shrinks from embracing this proposition as final; but in the meantime it must be accepted as correctly formulating our ignorance on the subject. All metallic elements agree in this that they form each at least one basic oxide, or, what comes to the same thing, one chloride, stable in opposition to liquid water. This at once suggests an obvious definition of metals as a class of substances, but the definition would be highly artificial and objectionable on principle, because when we speak of metals we think, not of their accidental chemical relations, but of a certain sum of mechanical and physical properties which unites them all into one natural family. What these properties are we shall now endeavour to explain.

All metals, when exposed in an inert atmosphere to a sufficient temperature, assume the form of liquids, which all present the following characteristic properties. They are (at least practically) non-transparent ; they reflect light in a peculiar manner, producing what is called “metallic lustre.” When kept in non-metallic vessels they take the shape of a convex meniscus. These liquids, when exposed to higher temperatures, some sooner others later, pass into vapours. What these vapours are like is not known in many cases, since, as a rule, they can be produced only at

very high temperatures, precluding the use of transparent vessels, Silver vapour is blue, potassium vapour is green, many others (mercury vapour, for instance) are colourless. The liquid metals, when cooled down sufficiently, some at lower others at higher temperatures, freeze into compact solids, endowed with the (relative) non-transparency and the lustre of their liquids. These frozen metals in general form compact masses consisting of aggregates of crystals belonging to the regular or rhombic or (more rarely) the quadratic system. But in many cases the crystals are so closely packed as to produce an apparent absence of all structure. Compared with non-metallic solids, they in general are good conductors of heat and of electricity. But their most characteristic, though not perhaps their most general, property is that they combine in themselves the apparently incompatible properties of elasticity and rigidity on the one hand and plasticity on the other. To this remarkable combination of properties more than to anything else the ordinary metals owe their wide applica- tion in the mechanical arts. In former times a high specific gravity used to be quoted as one of the characters of the genus; but this no longer holds, since we have come to know of a whole series of metals which float on water. Let us now proceed to see to what degree the mechanical and physical properties of the genus are developed in the several individual metals.

Non-Transparency.—This, in the case of even the solid metals, is perhaps only a very low degree of transparency. In regard to gold this has been proved to be so; gold leaf, or thin films of gold produced chemically on glass plates, transmit light with a green colour. On the other hand, those infinitely thin films of silver which can be produced chemically on glass surfaces are absolutely opaque. Very thin films of liquid mercury, according to Melsens, transniit light with a violet-blue colour; also thin films of copper are said to be translucent. Other metals, so far as we know, have not been more exactly investigated in this direction.

Colour.—Gold is yellow ; copper is red; silver, tin, and some others are pure white; the majority exhibit some modification or other of grey.

feflexion of Inght.—Polished metallic surfaces, like those of other solids, divide any incident ray into two parts, of which one is refracted while the

other is reflected, — with this difference, however, that the former is completely absorbed, and that the latter, in regard to polarization, is quite differently affected! The degree of absorption is different for different metals. According to Jamin, the remaining intensity, after one and ten successive perpen- dicular reflexions respectively from the metal-mirrors named, is as follows (original intensity = 1) :—

Silver. Steel,

Speculum Metal.

IL Je, |] 10) Uk.

Th Uk |] LO Ue. IL 18s, || aly 1k

IREW mete oserciesscceeee 929 | “478 | *692 | °035 | 609 | -007
WWCWOW ic. Sees ress. ‘905 | °839 | *682 | -010 | °599 | -006 ho codon
caRasneond 867 | °242 | *599 | -006 | ‘599 | -006

This shows the great superiority of silver as a reflecting medium, especially in the case of repeated reflexion.

Crystalline Form.—Most (perhaps all) metals are capable of crystallization, and in most cases isolated crystals can be produced by judiciously managed partial freezing. The crystals belong to the following systems :—regular system —silver, gold, palladium, mercury, copper, iron, lead; quadratic system—tin, potassium; rhombic system—anti- mony, bismuth, tellurium, zinc, magnesium.

Structure.—Perhaps all metals, in the shape which they assume in freezing, are crystalline, only the degree of

1 This may be the cause of the peculiarity of metallic lustre.

ALS

visibility of the crystalline arrangement is very different in different metals, and even in the same metal varies according to the slowness of solidification and other circumstances.

Of the ordinary metals, antimony, bismuth, and zine may be mentioned as exhibiting a very distinct crystalline structure: a bar-shaped ingot readily breaks, and the erystal faces are distinctly visible on the fracture. Tin also is crystalline: a thin bar, when bent, ‘creaks” audibly from the sliding of the crystal faces over one another ; but the bar is not easily broken, and exhibits an apparently non-crystalline fracture.—Class I.

Gold, silver, copper, lead, aluminium, cadmium, iron (pure), nickel, and cobalt are practically amorphous, the crystals (where they exist) being so closely packed as to produce a virtually homogeneous mass.—Class IT.

The great contrast in apparent structure between cooled ingots of Class I. and of Class IJ. appears, however, to be owing chiefly tothe fact that, while the latter crystallize in the regular system, metals of Class J. form rhombic or quadratic crystals. Regular crystals expand equally in all directions; rhombic and quadratic ores expand differently in different directions. Hence, supposing the crystals immediately after their formation to be in absolute contact with one another all round, then, in the case of Class IJ., such con- tact will be maintained on cooling, while in the case of Class I. the contraction along a given straight line will in general have different values in any two neighbouring crystals, and the crystals consequently become, however slightly, detached from one another. The crystalline structure which exists on both sides becomes visible only in the metals of the first class, and only there manifests itself as brittleness,

Closely related to the structure of metals is their degree of plasticity” (susceptibility of being constrained into new forms without breach of continuity). This term of course includes as special cases the qualities of ‘ malle- ability” (capability of being flattened out under the hammer) and “ductility” (capability of being drawn into wire) ; but it is well at once to point out that these two special qualities do not always go parallel to each other, for this reason amongst others that ductility in a higher degree than malleability is determined by the tenacity of a metal. Hence tin and lead, though very malleable, are little ductile. The quality of plasticity is developed to very different degrees in different metals, and even in the same species it depends on temperature, and may be modified by mechanical or physical operations. A bar of zinc, for instance, as obtained

by casting, is very brittle; but when heated to 100° or 150° C. it becomes sufficiently plastic to be rolled into the thinnest sheet or to be drawn into wire. Such sheet or wire then remains flexible after cooling, the originally only loosely cohering crystals having got intertwisted and forced into absolute contact with one another,—an explanation supported by the fact that rolled zinc has a somewhat higher specific gravity (7‘2) than the original ingot (6°9). The same metal, when heated to 205° C., becomes so brittle that it can be powdered in a mortar. Pure iron, copper, silver, and other metals are easily drawn into wire, or rolled into sheet, or flattened under the hammer. But all these operations render the metals harder, and detract from their plasticity. Their original softness can be restored to them by “annealing,” z.e., by heating them to redness and then quenching them in cold water. In the case of iron, however, this applies only if the metal is perfectly pure. If it contains a few parts of carbon per thousand, the annealing process, instead of softening the metal, gives it a “temper,” meaning a higher degree of hardness and elasticity (see below).

What we have called plasticity must not be mixed up

with the notion of softness, which means the degree of facility with which the plasticity of a metal can be dis- counted. ‘Thus lead is far softer than silver, and yet the latter is by far the more plastic of the two. The now famous experiments of Tresca (Comptes Rendus, lix. 754) show that the plasticity of certain metals at least goes considerably farther than had before been supposed. He operated with lead, copper, silver, iron, and some other metals. Round disks made of these substances were placed in a closely fitting cylindrical cavity drilled in a block of steel, the cavity having a circular aperture of two or four centimetres below. By means of an hydraulic press, applied to a superimposed piston, a pressure of 100,000 kilos was made to act upon the disks, when the metal was seen to “flow” out of the hole like a viscid liquid. In spite of the immense rearrangement of parts there was no breach of continuity. What came out below was a compact cylinder with a rounded bottom, consisting of so many layers superimposed upon one another. Parallel experiments with layers of dough or sand plus some connecting material proved that the particles in all cases

moved along the same tracks as would be followed by a flowing cylinder of liquid. Of the better known metals potassium and sodium are the softest; they can be kneaded between the fingers like wax. After these follow first thallium and then lead, the latter being the softest of the metals used in the arts. Among these the softness decreases in about the following order :— lead, pure silver, pure gold, tin, copper, aluminium, platinum, pure iron. As liquidity might be looked upon as the ne plus ultra of softness, this is the right place for stating that, while most metals, when heated up to their melting points, pass pretty abruptly from the solid to the liquid state, platinum and iron first assume, and throughout a long range of temperatures retain, a condition of viscous semi-solidity which enables two pieces of them to be “welded” together by pressure into one continuous mass. Potassium and sodium might probably be welded if their surfaces could be kept clear of oxide.

According to Prechtl, the ordinary metals, in regard to the degree of facility or perfection with which they can be hammered flat on the anvil, rolled out into sheet, or drawn into wire, form the following descending series :—

Hammering. Rolling into Sheet. Drawing into Wire. Lead. Gold. Platinum. Tin. Silver Silver Gold Copper. Iron.

Zine Tin. Copper Silver Lead Gold. Copper. Zine Zinc Platinum. Platinum. Tin. Tron, Tron. Lead.

To give an idea of what can be done in this way, it may be stated that gold can be beaten out to leaf of the thick- ness of zg5, mm.; and that platinum, by judicious work, can be drawn into wire ggjo5 mm. thick.

By the hardness of a metal we mean the resistance which it offers to the file or to the engraver’s tool. Taking it in this sense, it does not necessarily measure, e.g., the resistance of a metal to abrasion by friction. Thus, for instance, 10 per cent. aluminium bronze is scratched by an edge-tool made of ordinary steel as used for knife-blades. And yet it has been found that the sets of needles used for perforating postage stamps last longer if made of aluminium bronze than they do if made of steel.

Elasticity.—Al\ metals are elastic to this extent that a change of form, brought about by stresses not exceeding certain limit values, will disappear on the stress being removed. Strains exceeding the “limit of elasticity” result in permanent deformation or (if suffi- ciently great) in rupture. Where this limit lies is in no case pre- cisely known. According to Wertheim! (who has done more for our knowledge of the subject than any one else) and Hodgkinson,

1 Annales de Chimie et de Physique [iii.], vol. xii.

the real law seems to be pretty much as indicated by the two curves on the accompanying diagram, where, in reference to a metallie wire, stretched by an appended weight, the abscissa always means the numerical value P of the weight, the ordinate of the upper eurve the total elonga- tion caused by P, the ordinate of the lower curve that part of the elong- ation which re- mains when P is removed, so that the piece of the ordinate between the two eurves gives the tempor- ary (‘‘elastic’”’) ex- pansion. From P=0 a to a somewhat indefi- 6~

nite point (a or A) ° = – x both curves are nearly straight lines, the lower almost coinciding in its beginning with the axis of abscisse ; from that point onwards these two curves approach each other, and at a short distance from the point of rupture they rapidly converge towards intersection. For any value of P which lies fairly on the safe side of A, we have ap- proximately

=—€ ’

where A means the clastic (or substantially the total) expansion, J the length, and g the square section of the wire or cylindrical bar operated upon. The reciprocal of e(viz. E=1/e) is called the “modulus of elasticity.”

Wertheim has determined this constant for a large number of metals and alloys. Heused three methods: one was to ineasure the elongations produced, in a wire of given dimensions, by a succession of charges; the other two consisted in causing a measured bar to give off a musical note by (a) longitudinal and (6) transversal vibra- tion, and counting the vibrations

per second. The following table gives some of his results. Column 2 gives the constant E for millimetre and kilogramme. Hence 1000/E is the elongation in millimetres per metre length per kilo, Column 8 shows the charge causing a permanent elongation of 0°05 mm. per metre,—which, for practical purposes, he takes as giving the limit of elasticity ; column 4 gives the breaking strain. Values of E in square brackets [5 are derived from vibration experiments; the rest from direct measurements of elongations. Numbers in round brackets ( ) do not necessarily refer to the same specimen as the other data.

For Wire of 1 Square mm. Seetion, Weight (in Kilos) eausing

Name E. Permanent Elongation | Breakage. of yobs: Lead, (raw …...:.0cssssscesessssssesssseteseees 1,803 0°25 21 ao (AMMB AIO saat sisaansnngeetnaeiere 1,727 0-20 8 Tin, UTAWN vsccccccserssecsesersceressessereeree| [3,928] 0°45 (2°45) go ATTICA] cisccecscccrscnsesersecssncessaans [4,060] 0:20 Cadmium, Craw …..scccscerssrserserscceece [5,757] 2°24 an BNMEAIC ....02.c0.00000 000 [4,777] Gold, Graw…....c.00 ,132 13°5 27 », annealed 5,585 3°0 10 Silver, drawn….. 7,358 11°38 29 », annealed…..... 7,141 2°6 16 Zine, pure, east in mould. 9,021 Zine, OTCINALY, ATAWN.....0.-seeseerereeenes 8,735 0°75 13 m is MiNGA|d ss s6..ccsisceaaeees [9,467] 1:00 Pelladita) GEAWRsaccsiesseassesscocscenees| LE 75D 18 ; ANNEAL... .....00-ceseersevecee 9,789 under 6 27 COPPED), GAWD ecie.s0. escenevase’ voseanvaeses 12,449 12 40 nm ANNCALE .....ceserseeersereeeseeerore 10,519 under 3 30 Platinum wire, medium thickness,) GAAS, ra wsiniatsoisaxoenacatsvnensvcenes tees f aps ie) a jy. BRNCAIED verses seceacaerss sane 15,518 (14) Platinum wire, thick, drawn.. 15,987 34 – ¥ 15,622 93 Iron,? drawn….. 20,869 82 a 61 5, 2 annealed.. 20,794 under 5 47 Niekel,? drawn… §x6l1 CODES” 4 exeseewnteencesseennnvsncenieata 2×61 PAT TRAE ei grwanssansexenssiaeneevcsuabaveaties 7,040 Aluminium bronze 4…..00ccccecseessecees 10,700 FESTUS aie cies etinsianine’s sostios sethsion Saas yeKon 8,543 German SUVEr G)esnssersess sweeter cores) LOSS

The above numbers may be assumed to hold for temperatures from 15° to 20°C. Wertheim executed determinations also at other tem- peratures; but, as his numbers do not appear to reveal the true

2 From Du Brery. 3 ‘Approximate, by H. St Clair Deville. 4 From deflexion of hammered bar of 5 min. thiekness, charged in the middle ; determined by W. Dittmar.

5 Composition, ZnCug (Wertheim). 6 Composition, ZnyCu,3Ni; (Wertheim). XVI

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relations between E and temperature, we quote the results of Kohlrausch and Loomis, who found the following relations between the modulus E, for 0° C. and the value E; for +2° C.:—

fron: Ez=E(1—* 000483 ¢—-0000001222).

Copper: E¢=Eo(1 —* 000572 ¢—-0000002822).

Brass: Ez =Eo(1—* 000485 ¢—-0000013622). Thus, for these three metals at least, the value of E diminishes, when temperature increases, at pretty much the same rate per degree of temperature.

Specific Gravity.—This varies in metals from °594 (lithium) to 22°48 (osmium), and in one and the same species is a function of temperature and of previous physical and mechanical treat- ment. It has in general one value for the powdery metal as obtained by reduction of the oxide in hydrogen below the melting point of the metal, anothcr for the metal in the state which it assumes spontaneously on freezing, and this latter value again, in general, is modified by hammering, rolling, or wire-drawing, &c. These mechanical operations do not necessarily add to the density ; stamping, it is true, does so necessarily, but rolling or drawing occasionally causes a diminution of the density. Thus, for instance, chemically pure iron in the ingot has the specific gravity 7°844; when it is rolled out into thin sheet, the

value falls to 7°6; when drawn into thin wire, to 7‘75 (Berzelius). The follow- ing table gives the specific gravities of all metals (except a few very rare ones) according to the most trustworthy modern de- terininations. Where special statements are not made, the numbers may be assumed to hold for the ordinary temperature (15° to 17° or 20°C.), referred to water of the same temperature (specific gravity =1) asa standard, aud to hold for the natural frozen metal.

Name of Metal. Speclfie Gravity. Authority WAGLIMIIPS, :.ccarceenes eeccseeotsesessieens SOL Bunsen. EGRASSIGIN srvscsecscsvacesvecsesscadssatene 875 Baumhauer, OCU besscaiscessscsest coscssserscsenncees “9735 5 RULDUGMU Neeser terdtverceener re eesecnse 1°52 Bunsen. Calcium …... 1°578 Bunsen and Matthiesen. Magnesium.. | 1°743 Bunsen, (ORIRHTITS << .sc.ssvcosseesces 168 Setterberg. BEL IMUMA,;s:cavtecessssetecsesseanstseesd 2°1 Debray. Strontium…..... pasonoonO paneersecieu arses MNCLO Aluminium, pure, ingot…....., 2°583 at 4° Mallet, 1880. Aluminium, ordinary, hammered] 2°67 Bartum,....sseecesee Bebosthocioncrnacce ..| over 4° Clarke. ZAvcOniUIM:.....+5. 4°15 Troost. Vanadium, powder 55 Roscoe. Gal… 6.655006 vee| OL Lecog de Boisbaudran. Lanthanum…..... Ria sivasswecececereed 6°163 on DIG ae HAIN. .cscnssss.scescesessoisess sees 6°544 Hillebrandt and Norton, OHIUIN, sceversssesccrcerearcstars Secucce 6°728 ay A PATHCIMROMY,. .)7.cc25.cecce-nssecr nocerens «| 6°715 at 16° Marchand and Scheerer, ; COV oye Webi aasercaansonnninn.,cocpacrcncn | 6°81 Wohler. ZANG MINTZ Obes. scssetecseceteceresnsen ces | 67915 Karsten, 39, ONECUOUUN, senceammsclessscecceesse|| MLCe Manganese…....000 7:14 to 7:2 Brunner, Tin, See neRali ts ale cimas | 7°29 to 7299 Various authorities. » crystallized by galvanic cur: cae eee rent from solutions…..... Gude Weds Mailer. ANGUUN over ccsesersesincssercsseerssesssce 7°42 Richter. Iron, chemically pure, ingot…. 7T°844 Berzelius. jy) UNINNSHEGiie… «estteeas ese os 76 an » Wrought, high quality…..... 78 to 7°9 INDCIG] te Otis oscccssscrecsssesvouseeses 8°279 Riehter. » forged…... 8°666 ” Cadmium, ingot…... 8°546 Schroder. ” hammercd 8°667 op COR cccassceesssnesteonedencccasanes 85 to 87 Molybdenum, containing 4 to 5 : per cent. Of CAarboll…..c.ece } oe a

CoppelnuatlGrescarsascentnerssieneees 8°94 te NCHBibe castuecuenscecee sac steeeene 8°92 Marchand and Schcerer. » wire or thin sheet… 8°94 to 8°95 ” ” » @lectrotype, pure…. 8°945 Hampe, [iH CATE cs paecoognesnonoopacuapauoinscatcoan 9°823 at 12° Holzmann, Silver, cast…..... 10°4 to 10°5 ” 1, Stamped 10°57 G. Rose. Lead, very slowly frozen…..... 11°254 Deville. » quickly frozen in cold water} 11°363 “p Paladin rersssesscoressecee-esoerstiets|ldetuntiecccs Deville and Debray. Shacibbleseeneisoncnac ..| 11°86 Crookes, Rhodium…..... Sod | PL Bunsen. . Ruthenium…..... —| 12°26 at 0° Deville and Debray. Mercury, liquid. we] 13°595 at 0° H. Kopp. 5 SOIC)... «000 Ssoreesucwecsssoeus 14°39 below-—-40° Tungsten, compact, by H, from 16°54 Chloride Vapour…....0.ceeeee ‘ 2 Wohler, 1855. as reduced by hydro- : gen, DON GISG pentoonoanacsoonsncce ; fe a LOR EST HEE ce nacononneooaonsqonpnooGodDoNDoNG 18°33 Péligot, 1868. Gold, ingot… «| 19-265 at 13° Matthiesen. 49) SUAINIPE.., 00… .eccccesccsersvers 19°31 to 19°34 G. Rose. owder, precipitated by , ae » ferrous sulphate…..... i 19°55 to 1972 ” Platinum, pure 21°46 }Ulab ia) SeAcnesopaso 60nd «| 22°40 (O)S 2018 00 ga ogncconnncqnesobanoadacaEnnsonacde 22°477 Deville and Debray,1876.

Thermite Properties.—The specific heats of most metals have been determined very carefully by Regnault. The general result is that, conformably with Dulong and Petit’s law, the ‘‘atomic heats” all come to very neatly the same value (of about 6°4); 7.2, atomic weight by specific heat=6°4. Thus we have for silver by theory 6°4/108 = °0593, and by experiment 0570 for 10° to 100° C.

A L®

The expansion by heat varies greatly. The following table gives the linear expansions from 0° to 100°C. according to Fizeau (Comptes Rendus, \xviii. 1125), the length at 0° being taken as unity.

Name of Metal. ie epi

Platinum, cast “000 907 Gold, cast… “001 451 Silver, cast,..... “001 936 Copper, native, “001 708 CoOpperntantilCial occ… ceveveccetencseernaceersccssmacveceswesnerasceovles seeresie “001 869

Tron; soft Washieed TormeleCtrOM AGNES, cccccccnrecsesssesnrescaseusensen “001 228 » reduced by hydrogen and Conipressed…….....csssesseeeseee “001 208 Custisteel) Emplish annewlediccsessscsrersascr:scceasssesecscesvecassscccesces “001 110 Bismuth, in the direction of the @xi8…....:—0.0,-scccserescsecesecocsens “OOL 642 ay AL TASES LUOTARU Stee. senses aseessstirscsccatncesscsiscesisay sss ‘001 239

of mean expansion, calculated,.....cscccccseccesesses 001 374 Tin, of Malacca, compressed powder… “002 269 TGA, GOSH cscs: cescseessssseeeseseeeeesds 002 948 Zinc, distilled, compressed pOwder,.....0c2eseeeeeerere ‘002 905 Cadmium, distilleu, compressed powder…....0….5 003 102 ATUNMNTUINICABE.. nscssccacrsencepcescsssssssesseeiancseerectirer 002 336 Brass (71°5 per cent. copper, 28°5 per CeMt. ZINC)....-..sececceeeceeees “001 879 Bronze (86°3 per cent. copper, 9°7 per cent. tin, 4°0 per cent. zine).| °001 802

The coefficient of expansion is constant for such metals only as crystallize in the regular system ; the others expand differcntly in the directions of the different axes. To eliminate this source of uncertainty these metals were cmployed as compressed powders. The cubical expansion of mercury from 0° to 100° C. is °018153 =rsler (Regnault).

Fusibility and Volatility. —The fusibility in different metals is very different, as shown by the following table, which, besides including all the fusing points (in degrees C.) of metals which have been determined nunierically, indicates those of a selection of other metals by the positions assigned to them in the table. Of the temperatures given, those above (say) 500°C. must be looked upon as rough approximations. ~

Fusing Point.

Name of Metal. Authority. IMGNCUI\ieetescsidcteeswecsterteasnesccnenerectmers pC —58°8 B. Stewart. Cesium… +26 to 27 Setterberg. (CGI biG Nogmapeopoooonoce racoctoncmnacuodgarEccodsndan 30°1 L. de Boisbaudran. RaDidium,.....-..0…s52-2+0s° 38°5 Bunsen. POtASSIUM

….00….cceoserersenecceeeecrscnansaneees 62°5 9 Sodium…. 95°5 3 Lithium.. 180°0 ?

i Fay bSO09 Baasgoonncnnonnosonn6edo 176 Richter (?) J Ro pracbobpepmeqoadsnbpdedoeqcOOcHERncoobnespaCIOSs0n 228 Rudberg. V8} 150010 bsosecsncgndascor ace ede) Oop papb gos UOC00NCG 264 i Hielllum’.....0.+6. 290 Lamy. GHATITUs ccecscrecceresteserssscntcesesaderesrnas 320 Rudberg. Lead… 825 ” Antimony 425 ZANC..... 415 Person. Be Cope auacc COceee Reevtrecesasrernene 412 Daniell. Incipient Red Heat…....0.s0…000 525 Pouillet. MOG GIVGS ILE enssnssrecraasnentssssneeses PAUMEAVUT Weve cccrscerssccceses serscrisiasesessiesne.s ONE RYRIRED THGQE ct-cccsccrevastsnese 700 Pouillet. SUVers.cccecsccs A ietaeacitacgs tee toeeesecetentareets 1,040 Becquerel. (El els arasennarccnocngcniboneradbondaabdcoascanonsonnd 1,100 Yellow Heat.. ea 1,100 Pouillet. (OU) NSP ocoenasnocncoon ae 1,200 Tron, WYOMBHt…....0ecceceee pombdGeC Meceeereses 1,300 to 1,400 pp ecelhannc.01 Ne] URES yeaceooeee oneacponoancoan higher (070) l Reereooentatdocdocoaccnoeransnoacoococaocousoec. 1,400 Nickel….. einiaee 1,600 Uranium ? Dazzling Wht Heat, ...ccsecssoes 1,500 to 1,600 | Pouillet.

Palladium is barely fusible at the highest wind-furnace heat. The following melt only in the oxyhydrogen flame:—

DET GUTAUMEI oe ence eles slociseclunsislensienisiecaiucleveises esis 2,000 TOO COIES aermeppoandonesedoud Cococoogoconssorsonne%0 Rhodium. as UUIMOTIUTM es ancctec seine scosaeens celts esanes = scscne Max. Temp. of Oxyhydrogen Flame…. 2,870 Bunsen.!

Osmium does not melt at 2,870”, «.¢., is as yet infusible.

Of the volatility of metals we have little precise knowledge ; only the following boiling points are known numerically :—

Name of Metal. Boiling Point. Authority. MGR CUGVareaiasernssceraneces rececscdesessssreuntaes 357°3 Regnault. GAG sc5- sic cesseecoscccasaccsesesescsseunrane 860 Deville and Troost.

ZiNC®....5.. 1,040 7 7 Potassium below 1,040 | Dewar and Dittmar. SOCUUL araeniencaesntscteraMettnscerredusstsiees above 1,040 0) ays

For practical purposes the volatility of metals may be stated as follows:—

1. Distillable below redness: mercury.

2. Distillable at red heats: cadmium, alkali metals, zinc, mag- nesium.

3. Volatilized more or less readily when heated beyond their fusing points in open crucibles: antimony (very readily), lead, bismuth, tin, silver.

1 Bunsen, Jahresb. f. Chem, 1867, p. 41; Phil. Mag., xxiv. 489.

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4. Barely so: gold, (copper). ;

5, Practically non-volatile : (copper), iron, nickel, cobalt, alu- minium; also lithium, barium, strontium, and calcium.

In the oxyhydrogen flaine silver boils, forming a blue vapour, while platinum volatilizes slowly, and osmium, though infusible, very readily.

Latent Heats of Liquefaction—Of these we know little. The fol- lowing numbers are due to Person—ice, it may be stated, being 80.

Latent

Metal. ee

NPOMCIY cocsecsessevevserceeeeeeeeeo| 2-82 || Cadmium ae. 5°37 || Silver.. 12°4 ZNQOl sss

Metal.

TBSg 7 1h annon enoocepapeeeaeenmenscoca

Of the latent heats of vaporization only that of mercury has been determined,—by Marignac, who found it to be 103 to 106 units.

Conductivity.—Conductivity, whether thermic or electric, is very differently developed in different metals; and, as an exact know- ledge of these conductivities is of great scientific and practical importance, much attention has been given to their numerical determination. The following are the modes in which the two conductivities have been defined as quantities.

1. Thermic.—Imagine one side (1) of a metallic plate, D units thick, to be kept at the constant temperature ¢,, the other (II) at t, After a sufficient time each point between I and II will be at a constant intermediate temperature, and in every unit of time a constant quantity Q of heat will pass from any circumscribed area S on I to the opposite area S on II, according to the equation

—, Sti = #2) eI.

1 is called the (internal) conductivity of the metal the plate is made of. It is, strictly speaking, a function of ¢, and ¢,; but within a given small interval of temperatures it may be taken as a constant. ;

2. Electric. —When a given constant battery is closed successively by different wires of the same sort, then, according to expericuce, the strength I of the current (as measured for instance by the heat- equivalent of the electricity flowing through the circuit in unit of time) is in accordance with the equation

A/I=1+rl/s ,

where 7 is the length and s the square section of the wire, while A is a constant which, for our purpose, need not be defined in regard to its physical meaning; r measures the specific resistance of the particular metal. Supposing a certain silver wire on the one hand ani a certain copper wire on the other, when substituted for each other, to produce currents of the same strength, we have

11)/8\=Pale /325 whence

1) [72=8y19/(s 9h) =k where & is the computed value of the ratio on the right-hand side. Hence, taking 7, the resistance of copper, as unity, we have 7,=k, 1.¢., k gives us the specific resistance of silver, that of copper being taken=1. In this relative manner resistances are usually measured, silver generally being taken as the standard of compari- son. Supposing the relative resistance of a metal to be R, the re- ciprocal TR is called its ‘‘ electric conductivity.” For the same metal R varies with the temperature, the higher temperature cor- responding to the higher resistance. The following table gives the electric conductivities of a number of metals as determined by Matthiesen, and the relative internal thermic conductivities of (nominally) the same mctals as determined by Wiedemann and Franz, with rods about 5 mm. thick, of which one end was kept, at 100° C., the rest of the rod in a ‘‘ vacuum” (of 5 mm, tension) at 12°C. Matthiesen’s results, except in the two cases noted, are from his memoir in Pogg. Ann., 1858, ciii. 428.

Relative Conductivities.

Metais, Electric. Thermic, Copper, commercial, No. 3 18-8° 5 i INO MO Meee. 22°6 » chemically pure, hard drawn °C 2830 Gon mnocncacg cD EEO EERE EE eee “748 Gold, pure 21°8 “548 » absolutely pur 19°0 ESTAS SMe sec sssecessiccacees “25 Tin, pure 21°0 154 Pianoforte wire 20°4 PRDIRE Glneanste ten sect cce sv cocécsesveucoressscaverwesasavace 101 Baa meee ees cc scccesvensvcsooovesaeunivnsees “108 Lead, pure c Wes 079 Platinum 105 ,, 20°% “094 German silver 0767 ,, 18:7 073 Bismuth os 0119 ,, 13°8 Aluminium “196 ,, 19:6 Mereury, “cOOTaO SAAC SAREE 0163 ,, 22°8 PUI MGI MPNLICMMO Geet c ror cevetesessssezsevseseececes.a.coacvasaoses 1-000 0 1:000

1 Published in 1860, aud declared by Matthiesen to be more exact than the old numbers.

Going by Matthiesen’s old numbers, we find them to agree fairly with Wiedemann and Frauz’s thermic conductivities, which supports an obvious

and pretty generally received proposition. Matthie- sen’s new numbers for gold and copper, however, destroy the har- mony.

Magnetie Properties.—Iron, nickel, and cobalt are the only metals which are attracted by the magnet and can beeome magnets themselves. But in regard to their power of retaining their mag- netism none of them comes at all up to the compound metal steel. See MAGNETISM.

Chemical Changes.

The chemical changes which metals are liable to may be classified according to the loss of metallicity involved in them. We will adopt this principle and begin with the action of metals on metals, which, as experience shows, always leads to the formation of truly metallic compounds.

Any two or more metals when mixed together in the liquid state unite chemically, or at least molecularly, in this sense that, although the mixture, on standing (hot), may separate into layers, each layer is a homogeneous solution or “alloy” of, in general, all the components in one another. With binary combinations the following two cases may present themselves :—(1) the two metals mix permanently in any proportion ; or (2) either of the two metals refuses to take up more than a certain limit-proportion of the other ; hence a random mixture of the two metals will, in general, part into two layers,—one a solution of A in B, the other a solution of B in A. The first case presents itself very frequently; it holds, for instance, for gold and silver, gold and copper, copper and silver, lead and tin, and any alloy of these two and bismuth. Many other cases might be quoted. A good example of the second case is lead and zinc, either of which dissolves only a very small percentage of the other. In the preparation of an alloy we need not start with the components in the liquid state; the several metals need only be heated together in the same crucible when, in general, the liquid of the more readily fusible part dissolves the more refractory compo- nents at temperatures far below their fusing points. Molten lead, for instance, as many a tyro in chemical analysis has come to learn to his cost, readily runs through a platinum crucible at little more than its own fusing point.

A homogeneous liquid alloy, when solidified suddenly, say by pouring it drop by drop into cold water, necessarily yields an equally homogeneous solid. But it may not be so when it is allowed to freeze gradually. If, in this case, we allow the process to go a certain way, and then pour off the still liquid portion, the frozen part generally presents itself in the shape of more or less distinct crystals; whether this happens or not, the rule is that its composition differs from that of the mother liquor, and consequently from that of the original alloy. This phenomenon of “liquation,” as it is called, is occasionally utilized in metallurgy for the approximate separation of metals from one another ;? but in the manipulation of alloys made to be used as such it may prove very inconvenient. It does so, for instance, in the case of the copper-silver alloy which our coins are made of ; in a large ingot of such sterling silver the core may contain as much as 0°3 per cent. of silver more than the outer shell.

The existence of crystallized alloys, as the phenomenon of liquation generally, strongly suggests the idea that alloys generally are mixtures, not of their elementary com- ponents, but of chemical compounds of these elements with one another, associated possibly with uncombined remnants of these. This notion is strongly supported by the fact that the formation of many alloys involves an obvious evolution of heat and a decided modification in what one would presume to be the properties of the corresponding

2 A good illustration is afforded by the process of Pattinson as used for concentrating the silver in argentiferous lead. See Leap.

mixture. The case of sodium amalgam may be quoted as a forcible illustration, What goes by this name in laboratories is an alloy of two to three parts of sodium with one hundred parts of mercury, which is easily produced by forcing the two components into contact with each other by means of a mortar and pestle, when they unite, with deflagration, into an alloy which after cooling assumes the form of a grey, hard, brittle solid, although mercury is a liquid, and sodium, though a solid, is softer than wax. Similar evidence of chemical action we have in the cases of brass (copper and zinc), bronze (copper and tin), aluminium bronze (copper and

aluminium), and in many others that might be quoted. ‘here are indeed a good many alloys the formation of which is not accompanied by any obvious evolution of heat or any very marked change in the mean properties of the components. But in the absence of all precise thermic researches on the subject we are not in a position to assert the absence of chemical action in any case. Indeed our knowledge of the proximate composition of alloys is in the highest degree indefinite—we do not even know of a single composite metal which has been really proved to be an unitary compound, and hence the important problem of the relation in alloys between properties and composition must be attacked on a purely empirical basis. What has been done in this direction is shortly summarized in the following paragraphs.

Colour.—Most metals are white or grey ; so are the alloys of these metals with one another. Gold alloys generally exhibit somc- thing like the shade of yellow which one would expect from their composition ; its amalgams, however, are all white, not yellow. Copper shows little tendency to impart its characteristic red colour to its alloys with white or grey metals. Thlius, for instance, the silver alloy np to about 30 per cent. of copper exhibits an almost pure white colour. The alloys of copper with zinc (brass) or tin (bronze) are reddish-yellow when the copper predominates largely. As the proportion of white metal increases, the colour passes succes- sively into dark yellow, pale yellow, and ultimately into white. Aluminium bronze, containing from 5 to 10 per cent. of aluminium, is golden-yellow.

Plasticity. —This quality is most highly developed in certain pure metals, notably in gold, platinum, silver, and copper. Of platinum alloys little is known. The other three, on uniting with one another, substantially retain their plasticities, but the addition of any inetal outside the group leads to deterioration. Thus, for instance, according to Karsten, copper, by being alloyed with as little as 0°6 per cent. of zinc, loses its capability of being forged at a red heat ; it cracks under the hammier. Antimony or arsenic to the extent of 0°15 per cent. renders it unfit for being rolled into thin sheet or drawn out into fine wire, and makes it brittle in the heat; 0°1 per cent. of lead prohibits its conversion into leaf.

Hardness, Elasticity, Tensile Strength.—In reference to these qualities, we shall confine ourselves to some very striking changes for the better which the metals (1) gold, (2) silver, (3) copper suffer when alloyed with moderate proportions (10 per cent. or so) of (1) cop- per, (2) copper, (3) tin, zinc, or alumininm respectively. Any of these five combinations leads to a considerable increase in the three qualities named, although these are by no means highly developed in the added metals; most strikingly it does so in the case of alumi- nium bronze (copper and aluminium), which is so hard as to be very difficult to file, and is said to be equal in tensile strength to wrought iron. To illustrate this we give in the following table, after Matthiésen, the breaking strains of double wires, No. 23 gauge, in Ib avoirdupois, for certain alloys on the one hand and their components on the other.

4 Separate Metals. Alloys.

cea se sa ‘Gun metal, 12 per cent. of tin…..... 80-90 Ce ma \ Standard (22tcanat)/ coldeerssyese 10-70 Pee as } anioy, nee SEN y OU eren eens

Speeifie Gravity.—This subject has been extensively investigated by Matthiesen, Calvert and Johnson, Kuppfer, and others. In discussing the results it is convenient to compare the values (S) found with the values (S)) calculated on the assumption that the volume of the alloy is equal to the sum of the volumes of the com- ponents. Let p,, po, pg…stand for the relative weights of the com- ponents, P for their joint weight, §,,S,,8,...for their specific gravities, and we have

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where the expression on the right hand obviously means the con- joint volume V, of the components ; but the actual volume of the alloy formed by their union is, in general, V=V,(1+e), where ¢ means the expansion (or, when negative, the contraction) of unit- volume of mixture. Hence the real value

S=S)/(1-+-e) 5) whence

e=(S9—S)/S.

Matthiesen’s investigation (Pogg. Annalen for 1860, vol. cx. p. 21) extends over a large number of binary alloys derived from the metals named in the following table. He naturally began by procuring pure specimens of these metals and determining their specific

gravities. The results (each the mean of a number of determina- tions) were as follows :— Specific Adopted Name. Gravity S t Atomic at °C. Weight. ZSOLT TO) AR poe nocnon bot icaanoncacoodaopsnonkeecosnoddan 6°713 14°3° 1223 Tin 77294 PIF} 118 Cadmium 8°655 10°5 112 Bismuth 9°823 12°3 208 Silver 10°468 13°2 108 Lead 11°376 13°5 207°4 Mercury.. 13°573 14°5 200 Gold 19°265 12°8 197

In thesc, as in all the subsequent determinations for the alloys, the weighings were reduced to the vacuum, and the valnes for S referred to water at 4° C. as unity. From eight metals twenty-eight different kinds of binary alloys can be produced; of these twenty- eight combinations eighteen were selected; in each case the two com- ponents were fused together in a variety of properly chosen atomic proportions, and the specific gravities of these alloys were determined. The net results are summarized in the following table, which, for each combination A, B, in the first two columns gives the con:- position in multiplies of the ‘‘atomic-wcights” given in the table just quoted, while column 8 gives the values of ¢ as calculated by the writer from Matthiesen’s numbers for Sy and 8. Hence, for example, in the accompanying entries the first line shows that the union into an alloy of twice 118 parts , of tin and once 197 parts of gold in- Tin and Gold.

volves an expansion from 1 volume into Sn nN ; 1°004 ; the second that the union of once

118 parts of tin with four times 197 parts 9 1 +004 of gold involves a contraction from 1 4 —*028

1 volume into 1 — °028.

; :

Antimony and Tin. | Antimony, Bismuth. Antimony, Lead.

Sb Bi e Sb Pb e

Sb Sn e 12 to 8 iL +002 2 |1tol2 0 2) il cal +7008 2 1 4-006 i 1 +“006 1 1to2 | +008 2 1 0 1 3 to 10 | +7005 3 1 +0067 1 —25| 1 0

20 to 100 0 5

Tin, Cadmium.

Tin, Silver.

sn Cd e Sn Bi é Sn

Ag e 6 1 +004 22 a 0 18 iL — 002 4 1 +005 4 1 — “002 9 1 — 006 2 1to8 0 3-1 1 —‘005 6 1 —‘008 2 12 —001 1 2 — 005 3 1 — 013 1 4 to 60 0 2 1 —019 a 1 — 024 1 2 — 047 i 4 — “038

Tin, Gold. Tin, Lead. Cadmium, Bismuth.

Sn Au e sn | Pb e ca | Bi | e

50 1 0 6 1 +:003 3 1—36 | 0 15—6 1 —°002 4 1 +°002

4-25 1 +7002 2 1 0 :

2 1 004 1 il +0015 Cadmium, Lead.

3 3) +008 1 2-4 | +-005

1 i +012 il 6 +7004 é

il 2 —015 -— —_ —

1 4 — +028 1-36 | 0 to 0025

Bismuth, Gold.

Au ée

Bismuth, Silver. Lead, Gold.

Lae] o> > fat a

ROR eee CN oe WEDD Ee ed et

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To make these numbers trustworthy it would be necessary to de- termine their probable errors ; and this Matthiesen has not done. It would appear that any value of ¢ from 0 to (say) 002 counts for nothing, and anything up to ‘004 certainly must be taken as not proving much either way. If this is correct, then

(1) No contraction or expansion is proved in the cases Sb, Bi; Cd, Bi; Cd, Pb; Au, Ag;

(2) A contraction (from 0°5 to 4°7 per cent.) is proved for Sn, Ag; Bi, Ag; Bi, Au; Pb, hay, Pb, BY; Mesa; Hig; Fb; Sn, Bi(?); Au, Ag (7);

(3) An expansion (from ‘5 to 0°8 per cent.) is proved for Sb, Sn; Sb, Pb; Sn, Cd (2); Sn, Pb (?); certain cases of Sn, Au and Pb, Ag;

(4) In the two series Sn, Au and Pb, Ag, thereate cases both of expansion and of contraction.

Thermic and Electric Propertics.—The specific heat of an alloy, so far as we know, is always in approximate aecordance with Dulong and Petit’s law. Thus the specific heat of Cu,Al, is

(5+1) x 6-4 5×63°5+1X27’ with about the same degree of correctness as the ‘‘ constant” 6°4 can claim for itself.

Expansion.—Matthiesen, from numerous determinations made with alloys and their components, concludes that the expansion of an alloy (from 0° to 100° C.) is nearly equal to the sum of the ex- pansions of its componcuts. Supposing, for instance, one volume of gold to expand (from 0° to t) by a, and one volume of silver by 8; then an alloy of four volumes of gold and three volumes of silver expands by (4a+388)/7 per unit.

Fusibility.—In the case of an alloy the melting-point and the freezing-point are, in general, separated bya greater or less interval of temperature, and the latter in itself may have two values as shown by Rudberg, who found that when a fused alloy of tin and lead is allowed to freeze the thermometer becomes stationary at two suc- cessive points, as shown in the following table, where « means the number of atomic weights of tin united with y of lead in the given case, and the temperatures are in centigrade degrees.

Deersascocceroocestecevcesesececes 0 1 1 3 4 12 ro Utetpteaeaiadisess-+ss+es, ses ce 20> 8 1 1 1 1 0 First POiIt ….cccsceceasecnes (325°) 280° 240° 187° 187° 210° 228°) Seeond point …..... pooped (825°) 187° 187° 187° 187° 187° 228°)

We see that the first point varies with, while the second, within the range of the experiments, proved independent of, the proportion in which the two metals are united.

The melting-point of many alloys lies below that of even the most fusible component, as illustrated in the following tables, where the numbers mean parts by weight.

Tin and Lead (Rudberg).

Per cent. of Lead.

Per cent. of Tin.

100

Melting-point.

Melting- point.

Name

of Alloy. Tin. | Lead.

Bismuth. | Cadmium. PMI W MOINS! 0: o/-s’seecovavevaccerensn

All these alloys melt in boiling water.

The electric conductivity of alloys qua alloys has been investi- He confined himself to binary alloys derived The main results of his

gated by Matthiesen. from a certain set of elementary metals.

: ; researches are given in ELEcrriciry, vol. viii. p. 51. For the Bismuth, Lead. Lead, Silver. Gold, Silver. practical electrician it is important ae observe how very much the Bi Po | e Pp | Ag e Au | Ag : conductivity of copper is impaired by very minute admixtures even ida. – ___| | of metals that are good conductors, and also by non-metallic con- 0—20 1 0 1 4 — “005 1 6 —:004′ tamination, especially with *T6 1 | —*403 1 a yee: Siiel : =004 , especially with oxygen (present as Cu,Q). 12 1) | 1005 j) 1 1 0 i — 004 ‘ : 3 | | 007 || 2 1 | 4-003 || 1 1 |) eer Metallic Substances Produced by the Union of Metals with 4 Oe ae. hae ee fe ees Small Proportions of Non-Metallic Elements. =3 = 4 —-002. : ti 1 |e ea) | bugle — eee Hydrogen, as was shown by Graham, is capable of 1 2 031 SE se EE le y ? iy : 4 : = 7020 || Aerewry, Tin. Mercury, Lead. * uniting with (always very large proportions of) certain ‘ 4) a8 | | | metals, notably with palladium, into metal-like compounds. 1 1g | 00k || He wee |? ie : But those hydrogen alloys, being devoid of metallurgic 1 ae 1) te interest, fall better under the heading PALLADIUM. — 003 a 5 Tale ool £ | sete Oxygen.—Mercury and copper (perhaps also other

metals) are capable of dissolving their own oxides with formation of alloys. and unfit for its ordinary applications. pure to start with, suffers considerable deterioration in plasticity. But the presence of moderate proportions of cuprous oxide has been found to correct the evil influence of small contaminations by arsenic, antimony, lead, and other foreign metals. good qualities to this compensating influence.

Mercury, by doing so, becomes viscid. Copper, when

Most commercial coppers owe their

Arsenic combines readily with all metals into true

arsenides, which latter, in general, are soluble in the metal itself. of arsenide generally leads to considerable deterioration in mechanical qualities.

The presence in a metal of even small proportions

Phosphorus.—The remark just made might be said to

hold for phosphorus were it not for the existence of what is called “phosphorus-bronze,” an alloy of copper with phosphorus (z.¢., its own phosphide), which possesses valu- able properties. effect is produced by from 1 to 1} per cent. of phosphorus.

According to Abel, the most favourable

Such an alloy can be cast like ordinary bronze, but excels the latter in hardness, elasticity, toughness, and tensile strength. See PHospHoRUs.

Carbon.—Most metals when in a molten state are

capable of dissolving at least small proportions of carbon, which, in general, leads to a deterioration in metallicity,

except in the case of iron, which by the addition of small percentages of carbon gains in elasticityand tensile strength

with little loss of plasticity (see Iron).

Silicon, so far as we know, behaves to metals pretty much like carbon, but our knowledge of facts is limited. What is known as “cast iron” is essentially an alloy of iron proper with 2 to 6 per cent. of carbon and more or less of silicon (see Iron). Alloys of copper and silicon were prepared by Deville in 1863. The alloy with 12 per cent. of silicon is white, hard, and brittle. When diluted down to 4‘8 per cent., it assumes the colour and fusibility of bronze, but, unlike it, is tenacious and ductile like iron.

Action of the More Ordinary Chemical Agents on Simple Metals.

To avoid repetition, let us state beforehand that the metals to be referred to are always understood to be given in the compact (frozen) condition, and

that, wherever a series of metals are enumerated as being similarly attacked, the degree of readiness in the action is (so far as our knowledge goes) indicated by the order in which the several members are named,—the more readily changed metal always standing first.

Water, at ordinary or slightly elevated temperatures, is decomposed more or less readily, with evolution of hydrogen gas and formation of a basic hydrate, by (1) potassium (formation of KHO), sodium (NaHO), lithium (LiOH), barium, strontium, calcium (BaOzH,, dc.) 50(2) magnesium, zinc, manganese (MgO,H,, die.),

In the case of group 1 the action is more or less violent, and the hydroxides formed are soluble in water and very

strongly basylous; metals of group 2 are only slowly attacked, with formation of relatively feebly basylous and practically insoluble hydrates. Disregarding the rarer elements (as we propose to do in this section), the metals not named so far may be said to be proof against the action of pure water in the absence of free oxygen (air).

By the conjoint action of water and air, thallium, lead, bismuth are oxidized, with formation of more or less sparingly soluble hydrates (ThHO, PbO,H,, BiO,H,), which, in the presence of carbonic acid, pass into still less soluble basic carbonates. ;

Iron, as everybody knows, when exposed to moisture and air, “rusts,” that is, undergoes gradual conversion into a brown ferric hydrate, Fe,O,7H,O ; but this process never takes place in the absence of air, and it is questionable whether it ever sets in in the absence of carbonic acid. What is known is that iron never rusts in solutions of caustic alkalies or lime (which reagents preclude the pre- sence of free carbonic acid), while it does so readily in ordinary moist air containing CO, When once started the process proceeds with increasing rapidity, the ferric hydrate produced acting as a carrier of oxygen; it gives up part of its oxygen to the adjoining metal, being itself reduced to (perhaps) Fe,O,, which latter again absorbs oxygen from the air to become ferric hydrate and so on (Kuhlmann).

Copper, in the present connexion, is intermediate between iron and the following group of metals.

Mercury, if pure, and all the “ noble” metals (silver, gold, platinum, and platinum-metals), are absolutely proof against water even in the presence of oxygen and carbonic acid.

The metals grouped together above under 1 and 2 act on steam pretty much as they do on liquid water. Of the rest, the following are readily oxidized by steam at a red heat, with formation of hydrogen gas,—zinc, iron, cadmium, cobalt, nickel, tin. Bismuth is similarly attacked, but slowly, ata white heat. Aluminium is barely affected even at a white heat, if it is pure; the ordinary impure metal is liable to be very readily oxidized.

Aqueous Sulphuric or Hydrochloric Acid, of course, readily dissolves groups 1 and 2, with evolution of hydro- gen and formation of chlorides or sulphates. The same holds for the following group (A) :—[manganese, zinc, magnesium] iron, aluminium, cobalt, nickel, cadmium. Tin dissolves readily in strong hot hydrochloric acid as SnCl, ; aqueous vitriol does not act on it appreciably in the cold ; at 150° it attacks it more or less quickly, accord- ing to the strength of the acid, with evolution of sul- phuretted hydrogen or, when the acid is stronger, of sulphurous acid gas and deposition of sulphur (Calvert and Johnson). A group (B), comprising copper, are, substantially, attacked only in the presence of oxygen or air. Lead, in sufficiently dilute acid, or in stronger acid if not too hot, remains unchanged. A group © may be formed of mercury, silver, gold, and platinum, which are not touched by either aqueous acid in any circumstances,

Hot (concentrated) oil of vitriol does not attack gold, platinum, and platinum-metals generally ; all other metals (including even silver) are converted into sulphates, with evolution of sulphurous acid. In the case of iron, ferric sulphate, Fe,(SO,),, is produced ; tin yields a somewhat indefinite sulphate of its binoxide SnO,.

Nitric Acid (Aqueous).—Gold, platinum, iridium, and rhodium only are proof against the action of this powerful oxidizer. Tin and antimony (also arsenic) are converted by it (ultimately) into hydrates of their highest oxides

SnO,, Sb,O, (As,O;),—the oxides of tin and antimony being insoluble in water and in the acid itself. All other metals, including palladium, are dissolved as nitrates, the oxidiz- ing part of the reagent being generally reduced to nitric

oxide, NO, or sometimes to N,O, or N,O,. Iron, zine, cadmium, also tin under certain conditions, reduce the dilute acid, partially at least, to nitrous oxide, N,O, or nitrate of ammonia, NH,.NO, = N,O + 2H,0.

Aqua Regia, a mixture of nitric and hydrochloric acids, converts all metals (even gold, the "‘ king of metals," whence the name) into chlorides, except only rhodium, iridium, and ruthenium, which, when pure, are not attacked.

Caustic Alkalies.—Of metals not decomposing liquid pure water, only a few dissolve in aqueous caustic potash or soda, with evolution of hydrogen. The most important of these are aluminium and zinc, which are converted into aluminate, Al,O,3(K, or N a,)O, and zincate, ZnO.RHO, where R=K or Na respectively. But of the rest the majority, when treated with boiling sufficiently strong alkali, are attacked at least superficially; of ordinary metals only gold, platinum, and silver are perfectly proof against the reagents under consideration, and these accordingly are used preferably for the construc- tion of vessels intended for analytical operations involving the use of aqueous caustic alkalies. For preparative purposes iron is universally employed and works well ; but it is not available analytically, because a superficial oxida- tion of the empty part of the vessel (by the water and air) cannot be prevented. According to the writer’s experience basins made of pure malleable nickel are free from this drawback ; they work as well as platinum, and rather better than silver ones do. There is hardly a single metal which holds out against the alkalies themselves when in the state of fiery fusion ; even platinum is most violently attacked. In chemical laboratories fusions with caustic alkalies are always effected in vessels made of gold or silver, these metals holding out fairly well even in the presence of air. Gold is the better of the two. Iron, which stands so well against aqueous alkalies, is most violently attacked by the fused reagents. Yet tons of caustic soda are fused daily in chemical works in iron pots without thereby suffering contamination, which seems to show that (clean)

iron, like gold and silver, is attacked only by the conjoint action of fused alkali and air, the influence of the latter being of course minimized in large-scale operations.

Oxygen or Air.—The noble metals (from silver upwards) do not combine directly with oxygen given as oxygen gas (O,), although, like silver, they may absorb this gas largely when in the fused condition, and may not be proof against ozone, Os. Mercury, within a certain range of tempera- tures situated close to its boiling point, combines slowly with oxygen into the red oxide, which, however, breaks up again at higher temperatures. All other metals, when heated in oxygen or air, are converted, more or less readily, into stable oxides. Potassium, for example, yields peroxide, K,O, or K,O,; sodium gives Na,O,; the barium-group metals, as well as magnesium, cadmium, zinc, lead, copper, are converted into their monoxides MeO. Bismuth and antimony give (the latter very readily) sesquioxide (Bi,O, and Sb,O,, the latter being capable of passing into Sb,O,). Aluminium, when pure and kept out of contact with siliceous matter, is only oxidized at a white heat, and then very slowly, into alumina, Al,O,. Tin, at high temperatures, passes slowly into binoxide, SnO,,.

Sulphur.—Amongst the better known metals, gold and aluminium are the only ones which, when heated with sulphur or in sulphur vapour, remain unchanged. All the rest, under these circumstances, are converted into sulphides. The metals of the alkalies and alkaline earths, also magnesium, burn in sulphur-vapour as they do in oxygen. Of the heavy meals, copper is the one which exhibits by far the greatest avidity for sulphur, its subsulphide Cu,S being the stablest of all heavy metallic sulphides in opposition to dry reactions. See METALLURGY.

Chlorine.—All metals, when treated with chlorine gas at the proper temperatures, pass into chlorides. In some cases the chlorine is taken up in two instalments, a lower chloride being produced first, to pass ultimately into a higher chloride. Iron, for instance, is converted first into FeCl,, ultimately into Fe,Cl,, which practically means a mixture of the two chlorides, or pure Fe,Cl, as a final product. Of the several products, the chlorides of gold and platinum (AuCl, and PtCl,) are the only ones which

when heated beyond their temperature of formation dissociate into metal and chlorine. The ultimate chlorina- tion product of copper, CuCl,, when heated to redness, decomposes into the lower chloride, Cu,Cl,, and chlorine. All the rest, when heated by themselves, volatilize, some at lower, others at higher temperatures,

Of the several individual chlorides, the following are liquids or solids, volatile enough to be distilled from out of glass vessels :—AsCl,, SbCl,, SnCl,, BiCl,, HgCl,, the chlorides of arsenic, antimony, tin, bismuth, mercury re- spectively. The following are readily volatilized in a current of chlorine, at a red heat :—AI,Cl,, Cr,Cl,, Fe,Cl,, the chlorides of aluminium, chromium, iron. The follow- ing, though volatile at higher temperatures, are not vola- tilized at dull redness :—KCl, NaCl, LiCl, NiCl,, CoCl,, MnCl,, ZnCl, MgCl, PbCl,, AgCl, the chlorides of potassium, sodium, lithium, nickel, cobalt, manganese, zinc, magnesium, lead, silver. Somewhat less volatile than the last-named group are the chlorides (MCl,) of barium, strontium, and calcium.

Metallic chlorides, as a class, are readily soluble in water. The following are the most important exceptions: —chloride of silver, AgCl, and subchloride of mercury, Hg,Cl,, are absolutely insoluble; chloride of lead, PbCl,, and subchloride of copper, Cu,Cl,, are very sparingly soluble in water. The chlorides AsCl,, SbCl,, BiCl,, are at once decomposed by (liquid) water, with formation of oxide (As,O,) or oxychlorides (SbC1O, BiClO) and hydro- chloric acid. The chlorides MgCl, Al,Cl,, Cr,Cl,, Fe,Cl, suffer a similar decomposition when evaporated with water in the heat. The same holds in a limited sense for ZnCl, CoCl,, NiCl,, and even CaCl,. All chlorides, except those of silver and mercury (and, of course, those of gold and platinum), are oxidized by steam at high temperatures, with elimination of hydrochloric acid.

The above statements concerning the volatilities and solubilities of metallic chlorides form the basis of a number of important analytical methods for the separation of the respective metals.

For the characters of metals as chemical elements the reader is referred to the article CHEmMisTRY and to the special articles on the different metals. (Ww. D.)

METAL-WORK. Among the many stages in the de- velopment of primeval man, none can have been of greater moment in his struggle for existence than the discovery of the metals, and the means of working them. The names generally given to the three prehistoric periods of man's life on the earth—the Stone, the Bronze, and the Iron age—iniply the vast importance of the progressive steps from the flint knife to the bronze celt, and lastly to the keen-edged elastic iron weapon or tool. The length of time during which each of these ages lasted must of course have been different in every country and race in the world. The Digger Indians of South California have even now not progressed beyond the Stone Age; while some of the tribes of Central Africa are acquainted with the use of copper and bronze, though they are unable to smelt or work iron.

The metals chiefly used have been gold, silver, copper and tin (the last two generally mixed, forming an alloy called bronze), iron, and lead. The peculiarities of these

various metals have naturally marked out each of them for special uses and methods of treatment. The durability and the extraordinary ductility and pliancy of gold, its power of being subdivided, drawn out, or flattened into wire or leaf of almost infinite fineness, have led to its being used for works where great minuteness and delicacy of execution were required ; while its beauty and rarity have, for the most part, limited its use to objects of adornment and luxury, as distinct from those of utility. In a lesser degree most of the qualities of gold are shared by silver, and consequently the treatment of these two metals has always been very similar, though the greater abundance of the latter metal has allowed it to be used on a larger scale and for a greater variety of purposes.

Bronze is an alloy of copper and tin in varying propor- tions, the proportion of tin being from 8 to 20 per cent. The great fluidity of bronze when melted, the slightness of its contraction on solidifying, together with its density and hardness, make it especially suitable for casting, and allow of its taking the impress of the mould with extreme sharp- ness and delicacy. In the form of plate it can be tempered and annealed till its elasticity and toughness are much increased, and it can then be formed into almost any shape under the hammer and punch. By other methods of treatment, known to the ancient

Egyptians, Greeks, and others, but now forgotten, it could be hardened and formed into knife and razor edges of the utmost keenness. In many specimens of ancient bronze small quantities of silver, lead, and zinc have been found, but their presence is probably accidental.

In modern tines, after the discovery of zinc, an alloy of copper and zine called brass has been much used, chiefly for the sake of its cheapness as compared with bronze. In beauty, durability, and delicacy of surface it is very inferior to bronze, and, though of some commercial importance, has been of but little use in the production of works of art.

To some extent copper was used in an almost pure state during medizval times, especially from the 12th to the 15th century, mainly for objects of ecclesiastical use, such as pyxes, monstrances, reliquaries, and croziers, partly on account of its softness under the tool, and also because it was slightly easier to apply enamel and gilding to pure copper than to bronze (see fig. 1). In the medieval period it was used to some extent in the shape of thin sheeting for roofs, as at St Mark's, Venice ; while during the 16th and 17th centuries it was largely employed for ornamental domestic vessels of various sorts.

Tron.1—The abundance in which iron is found in so many places, its great strength, its remarkable ductility and malleability in a red-hot state, and the ease with which two heated surfaces of iron can be welded together under the hammer combine to make it specially suitable for works on a large scale where strength with lightness are required—things such as screens, window-grills, orna- mental hinges, and the like.

In its hot plastic state iron can be formed and modelled under the hammer to almost any degree of refinement, while its great strength allows it to be beaten out into leaves and ornaments of almost paper-like thinness and delicacy. With repeated hammering, drawing out, and annealing, it gains much in strength and toughness, and the addition of a very minute quantity of carbon converts

1 Some recent analyses of the iron of prehistoric weapons have brought to light the interesting fact that many of these earliest specimens of iron manufacture contain a considerable percentage of nickel. This special alloy

does not occur in any known iron ores, but is invariably found in meteoric iron. It thus appears that iron was manufactured from meteorolites which had fallen to the earth in an alinost pure metallic state, possibly long before prehistoric man had learnt how to dig for and smelt iron in any of the forms of ore which are found on this planet.

it into steel, less tough, but of the keenest hardness. The large employment of cast iron is comparatively modern, in England at least only dating from the 16th century ; it is not, however, incapable of artistic treatment if due regard be paid to the necessities of casting, and if no attempt is made to imitate the fine-drawn lightness to which wrought iron so readily lends itself. At the best, however, it is not generally suited for the finest work, as the great contrac- tion of iron in passing from the fluid to the solid state renders the cast somewhat blunt and spiritless.

Among the Assyrians, Egyptians, and Greeks the use of iron, either cast or wrought, was very limited, bronze being the favourite metal for i

almost all purposes. The difficulty of smelt- ing the ore was prob- ably one reason for this, as well as the now forgotten skill which enabled bronze to be tempered to a steel-likeedge. Ithad, however, its value, of which a proof occurs in Homer (J/. xxiii.), where a mass of iron is mentioned as being one of the prizes at the funeral games of Patroclus.

Methods of Manipu- lation in Metal- Work. —Gold, silver, and bronze may be treated in various ways, the chief of which are (1) casting in a mould, and (2) treatment by hammering and punch- ing (French, repoussé).

The first of these, casting, is chiefly adapted for bronze, or in the case of the more precious metals only if they are used on a very small scale. The reason of this is that a repoussé relief is of much thinner substance than if the same design were cast, even by the most skilful metal-worker, and so a large surface (G may be produced with a very small expendi- ture of valuable metal.

Casting is probably the most primitive method of metal-work.

Fia. 1.—Monstrance of Copper Gilt; Italian work of the 15th century. This has passed through three stages, the first being represented by solid castings, such as are most celts and other implements of the prehistoric time ; the mould was formed of clay, sand, or stone, and the fluid metal

was poured in till the hollow was full. The next stage was, in the case of bronze, to introduce an iron core, prob- ably to save needless expenditure of the more valuable metal. The British Museum possesses an interesting Etruscan or Archaic Italian example of this primitive

device. It is a bronze statuette from Sessa on the Volturno, about 2 feet high, of a female standing, robed in a close- fitting chiton. The presence of the iron core hag been made visible by the splitting of the figure, owing to the unequal contraction of the two metals. The forearms, which are extended, have been cast separately and soldered or brazed on to the elbows.

The third and last stage in the progress of the art of casting was the employment of a core, generally of clay, round which the metal was cast in a mere skin, only thick enough for strength, without waste of metal. The Greeks and Romans attained to the greatest possible skill in this process. Their exact method is not certainly known, but it appears probable that they were acquainted with the process now called @ cire perdue—the same as that employed by the great Italian artists in bronze, and still unimproved upon even at the present day. Cellini, the great Florentine artist of the 16th century, has described it fully in his 7rattato della Scultura. If a statue was to be cast, the figure was first roughly modelled in clay—only rather smaller in all its dimensions than the future bronze; all over this a skin of wax was laid, and worked by the sculptor with modelling tools to the required form and finish, A mixture of pounded brick, clay, and ashes was then ground finely in water to the consistence of cream, and successive coats of this mixture were then applied with a brush, till a second skin was formed all over the wax, fitting closely into every line and depression of the modelling. Soft clay was then carefully laid on to strengthen the mould, in considerable thickness, till the whole statue appeared like a shapeless mass

of clay, round which iron hoops were bound to hold it all together. The whole was then thoroughly dried, and placed in a hot oven, which baked the clay, both of the core and the outside mould, and melted the wax, which was allowed to run out from small holes made for the purpose. Thus a hollow was left, corresponding to the skin of wax between the core and the mould, the relative positions of which were pre- served by various small rods of bronze, which had pre- viously been driven through from the outer mould to the rough core. The mould was now ready, and melted bronze was poured in till the whole space between the core and the outer mould was full. After slowly cooling, the outer mould was broken away from outside the statue, and the inner core as much as possible broken up and raked out through a hole in the foot or some other part of the statue. The projecting rods of bronze were then cut away, and the whole finished by rubbing down and polishing over any roughnesses or defective places. The most skilful sculptors, however, had but little of this after-touching to do, the final modelling and even polish which they had put upon the wax being faithfully reproduced in the bronze casting.

The further enrichment of the object by enamels and inlay of other metals was practised at a very early period by Assyrian, Egyptian, and Greek metal-workers, as well as by the artists of Persia and medizval Europe.

The second chief process, that of hammered work (Greek, sphyrelata; French, repoussé), was probably adopted for bronze-work on a large scale, before the art of forming large castings was discovered. In the most primitive method thin plates of bronze were hammered over a wooden core, rudely cut into the required shape, the core serving the double purpose of giving shape to and strengthening the thin metal.

_ A further development in the art of hammered work consisted in laying the metal plate on a soft and elastic bed of cement made of pitch and pounded brick. The design was then beaten into relief from the back with hammers and punches, the pitch bed yielding to the protuberances which were thus formed, and serving to pre-

vent the punch from breaking the metal into holes. The pitch was then melted away from the front of the embossed relief, and applied in a similar way to the back, so that the modelling could be completed on the face of the relief, the final touches being given by the graver. This process was chiefly applied by medieval artists to the precious metals, but by the Assyrians, Greeks, and other early nations it was largely used for bronze.

The great gates of Shalmaneser II., 859-824 3.c., from Balawat, now in the British Museum, are a remarkable example of this sort of work on a large scale, though the treatment of the reliefs is minute and delicate. The “ Siris bronzes,” in the same museum, are a most astonishing example of the skill attained by Greek artists in this repoussé work (see Brénsted’s Bronzes of Siris, 1836). They are a pair of shoulder-pieces from a suit of bronze armour, and each has in very high relief a combat between a Greek warrior and an Amazon. No work of art in metal has probably ever surpassed these little figures for beauty, vigour, and expression, while the skill with which the artist has beaten these high reliefs out of a flat plate of metal appears almost miraculous. The heads of the figures are nearly detached from the ground, their sub- stance is little thicker than paper, and yet in no place has the metal been broken through by the punch. They are probably of the school of Praxiteles, and date from the 4th century B.c. (see fig. 2).

Fie. 2.—One of the Siris Bronzes.

Copper and tin have been but little used separately. Copper in its pure state may be worked by the same methods as bronze, but it is inferior to it in hardness, strength, and beauty of surface. Tin is too weak and

brittle a metal to be employed alone for any but small objects. Some considerable number of tin drinking-cups and bowls of the Celtic period have been found in Corn- wall in the neighbourhood of the celebrated tin and copper mines, which appear to have been worked from a very early period. The existence of these mines was known to the Phcenicians, who carried on a considerable trade in metals with the south-west corner of England and the Scilly Isles —probably the Cassiterides of Pliny and other classical writers.

The use of lead has been more extended. In sheets it forms the best of all coverings for roofs and even spires. In the Roman and medieval periods it was largely used for coffins, which were often richly ornamented with cast work in relief. Though fusible at a very low temperature, and very soft, it has great power of resisting decay from damp or exposure. Its most important use in an artistic form has been in the shape of baptismal fonts, chiefly between the 11th and the 14th centuries. The superior beauty of colour and durability of old specimens of lead is owing to the natural presence of a small proportion of silver. Modern smelters carefully extract this silver from the lead ore, thereby greatly impairing the durability and beauty of the metal.

As in almost all the arts, the ancient Egyptians excelled in their metal-work, especially in the use of bronze and the precious metals. These were worked by casting and hammering, and ornamented by inlay, gilding, and enamels with the greatest possible skill.

From Egypt perhaps was derived the early skill of the Hebrews. Further instruction in the art of metal-working came probably to the Jews from the neighbouring country of Tyre. The description of the great gold lions of Solomon’s throne, and the laver of cast bronze supported on figures of oxen, shows that the artificers of that time had overcome the difficulties of metal-working and founding on a large scale. The Assyrians were perhaps the most remarkable of all ancient nations for the colossal size and splendour of their works in metal ; whole circuit walls of great cities, such as Ecbatana, are said to have been covered with metal plates, gilt or silvered.

Herodotus, Athenzus, and other Greek and Roman writers have recorded the enormous number of colossal statues and other works of art for which Babylon and Nineveh were so famed. The numerous objects of bronze and other metals brought to light by the excavations of the last forty years in the Tigris and Euphrates valleys, though mostly on a small scale, bear witness to the great skill and artistic power of the people who produced them ; while the recent discovery of some bronze statuettes, shown by inscriptions on them to be not later than 2200 B.C., proves how early was the development of this branch of art among the people of Assyria.

The Metal-Woerk of Greece.—The poems of Homer are full of descriptions of elaborate works in bronze, iron, gold, and silver, which, even when full allowance is made for poetic fancy, show clearly enough a very advanced amount of skill in the working and ornamenting of these metals among the Greeks of his time. His description of the shield of Achilles, made of bronze, enriched with bands of figure reliefs in gold, silver, and tin, could hardly have been written by a man who had not some personal acquaintance with works in metal of a very elaborate kind. Again, the accuracy of his descriptions of brazen houses— such as that of Alcinous, Od. vii. 81—is borne witness to by Pausanias's mention of the bronze temple of Athena XaAxlouxos in Sparta, and the bronze chamber dedicated to Myron in 648 3.c., as well as by the discovery of the stains and bronze nails, which show that the whole interior of the so-called treasury of Atreus at Mycenze was once

covered with a lining of bronze plates. Of the two chief methods of working bronze, gold, and silver, it is probable that the hammer process was first practised, at least for statues, among the Greeks, who themselves attributed the invention of the art of hollow casting to Theodorus and Rheecus, both Samian sculptors, about the middle of the 6th century B.c. Pausanias specially mentions that one of the oldest statues he had ever seen was a large figure of Zeus in Sparta, made of hammered bronze plates riveted together. With increased skill in large castings, and the discovery of the use of cores, by which the fluid bronze was poured into a mere skin-like cavity, hammered or repoussé work (Greek, sphyrelata) was only used for small objects where lightness was desirable, or for the precious metals in order to avoid large expenditure of metal. The colossal statues of ivory and gold by Phidias were the most notable examples of this use of gold, especially his statue of Athena in the Parthenon, and the one of Zeus at Olympia. The nude parts, such as face and hands, were of ivory, while the armour and drapery were of beaten gold. The comparatively small weight of gold used by Phidias is very remarkable when the great size of the statues is considered.

A graphic representation of the workshop of a Greek sculptor in bronze is given on a fictile vase now in the Berlin Museum (see Gerhard's Z'rinkschalen, plates xii. xiii.), One man is raking out the fire in a high furnace, while another behind is blowing the bellows. Two others are smoothing the surface of a statue with scraping tools, formed like a strigil. A fourth is beating the arm of an unfinished figure, the head of which lies at the workman's feet. Perhaps the most important of early Greek works in cast bronze, both from its size and great historical interest, is the bronze pillar (now in the Hippodrome at Constanti- nople) which was erected to commemorate the victory of the allied Greek states over the Persians at Plateea in 479 B.C. (see Newton's Travels in the Levant). It is in the form of three serpents twisted together, and before the heads were broken off was at least 20 feet high. It is cast hollow, all in one piece, and has the names of the allied states engraved on the lower part of the coils. Its size and the beauty of its surface show great technical skill in the founder's art. On it once stood the gold tripod dedi- cated to Apollo as a tenth of the spoils. It is described both by Herodotus and Pausanias.

Marble was comparatively but little used by the earlier Greek sculptors, and even Myron, a rather older man than Phidias, seems to have executed nearly all his most im- portant statues in metal.

Additional richness was given to Greek bronze-work by gold or silver inlay on lips, eyes, and borders of the dress ; one remarkable statuette in the British Museum has eyes inlaid with diamonds, and fret-work inlay in silver on the border of the chiton.

The mirrors of the Greeks are among the most important specimens of their artistic metal-work. These are bronze disks, one side polished to serve as a reflector, and the back ornamented with engraved outline drawings, often of great beauty (see Gerhard, Htruskische Spiegel, 1843-67).

The Greek workman, in fact, was incapable of making an ugly thing. Whatever the metal or whatever the object formed, whether armour, personal ornaments, or domestic vessels, the form was always specially adapted to its use, the ornament natural and graceful, so that the commonest water-jar was a delight alike to him who made it and those who used it.

In metal-work, as in other arts, the Romans were pupils and imitators of the Greeks. Owing to the growth of that spirit of luxury which in time caused the extinction of the Roman empire, a considerable demand arose for magni-

ficent articles of gold and silver plate. The finest speci- mens of these that still exist are the very beautiful set of silver plate found buried near Hildesheim in 1869, now in the Berlin Museum. They consist of drinking vessels, bowls, vases, ladles, and other objects of silver, parcel-gilt, and exquisitely decorated with figures in relief, both cast and rcpoussé. There are electrotypes of these in the South Kensington Museum.

When the seat of the empire was changed from Rome to Byzantium, the latter city became the chief centre for the production of artistic metal-work. From Byzantium the special skill in this art was transmitted in the 9th and 10th centuries to the Rhenish provinces of Germany and to Italy, and thence to the whole of Western Europe ; in this way the 18th-century smith who wrought the Hamp- ton Court iron gates was the heir to the mechanical skill of the ancient metal-workers of Pheenicia and Greece.

In that period of extreme degradation into which all the higher arts fell after the destruction of the Roman empire, though true feeling for beauty and knowledge of the subtleties of the human form remained for centuries almost dormant, yet at Byzantium at least there still survived great technical skill and power in the production of all sorts of metal-work. In the age of Justinian (first half of the 6th century) the great church of St Sophia at

| Constantinople was adorned with an almost incredible

amount of wealth and splendour in the form of screens, altars, candlesticks, and other ecclesiastical furniture made of massive gold and silver.

Metal-Work in Italy.—It was therefore to Byzantium that Italy turned for metal-workers, and especially for gold- smiths, when, in the 6th to the 8th centuries, the basilica of St Peter’s in Rome was enriched with masses of gold and silver for decorations and fittings, the gifts of many donors from

Belisarius to Leo III., the mere catalogue of which reads like a tale from the Arabian Nights. The gorgeous Pala d'Oro, still in St Mark's at Venice, a gold retable covered with delicate reliefs and enriched with enamels and jewels, was the work of Byzantine artists during the 11th century. This work was in progress for more than a hundred years, and was set in its place in 1106 a.p., though still unfinished (see Bellomo, Pala d'Oro di S. Marco, 1847).

It was, however, especially for the production of bronze doors for churches, ornamented with panels of cast work in high relief, that Italy obtained the services of Byzantine workmen (see Garrucci, Arte Cristiana, 1872-82). One artist named Staurachios produced many works of this class, some of which still exist, such as the bronze doors of the cathedral at Amalfi, dated 1066 a.p. Probably by the same artist, though his name was spelled differently, were the bronze doors of San Paolo fuori le Mura, Rome, careful drawings of which exist, though the originals were destroyed in the fire of 1824. Other important examples exist at Ravello (1197), Salerno (1099), Amalfi (1062), Atrani (1087); and doors at Mon- reale in Sicily and at Trani, signed by an artist named Barisanos (end of the 12th century); the reliefs on these last are remarkable for expression and dignity, in spite of their early rudeness of modelling and ignorance of the human figure.

Most of these works in bronze were enriched with fine lines inlaid in silver, and in some cases with a kind of niello or enamel. The technical skill of these Byzantine metal-workers was soon acquired by native Italian artists, who produced many important works in bronze similar in style and execution to those of the Byzantine Greeks. Such, for example, are the bronze doors of San Zenone at Verona (unlike the others, of repoussé not cast work) ; those of the Duomo of Pisa, cast in 1180 by Bonannus, and of the

Duomo of Troia, the last made in the beginning of the 12th century by Oderisius of Benevento. Another artist named Roger of Amalfi worked in the same way; and in the year 1219 the brothers Hubertus and Petrus of Piacenza cast the bronze door for one of the side chapels in San Giovanni in Laterano. One of the most important early specimens of metal-work is the

gold and silver altar of Sant? Ambrogio in Milan. In character of work and design it resembles the Venice Pala d'Oro, but is still earlier in date, being a gift to the church from Arch- bishop Angilbert II. in 835 a.p. (see Du Sommerard, and D'Agincourt, Moyen Age). It is signed wovinivs MAGISTER PHABER ; nothing is known of the artist, but he probably belonged to the semi-Byzantine school of the Rhine provinces ; according to Dr Rock he was an Anglo- Saxon goldsmith. It is a very sumptuous work, the front of the altar being entirely of gold, with repoussé reliefs and cloisonnée enamels; the back and ends are of silver, with gold ornaments. On the front are figures of Christ and the twelves apostles; the ends and back have reliefs illustrating the life of St Ambrose.

The most important existing work of art in metal of the 13th century is the great candelabrum now in Milan cathedral. It is of gilt bronze, more than 14 feet high; it has seven branches for candles, and its upright stem is supported on four winged dragons. For delicate and spirited execution, together with refined gracefulness of design, itis unsurpassed by any similar work of art. Every one of the numerous little figures with which it is adorned is worthy of study for the beauty and expression of the face, and the dignified arrangement of the drapery (see fig. 3).

Fic. 3.—Boss from the Milanese Candelabrum.

The semi-conventional open scroll-work of branches and fruit which wind around and frame each figure or group is devised with the most perfect taste and richness of fancy, while each minute part of this great piece of metal-work is finished with all the care that could have been bestowed on the smallest article of gold jewellery. Though some- thing in the grotesque dragons of the base recalls the Byzantine school, yet the beauty of the figures and the keen feeling for graceful curves and folds in the drapery point to a native Italian as being the artist who produced this wonderful work of art. There is a cast in the South Kensington Museum.

During the 13th and 14th centuries in Italy the wide- spread influence of Niccolo Pisano and his school encouraged the sculptor to use marble rather than bronze for his work. At this period wrought iron came into general use in the form of screens for chapels and tombs, and grills for windows. These

are mostly of great beauty, and show remarkable skill in the use of the hammer, as well as power

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in adapting the design to the requirements of the material. Among the finest examples of this sort of work are the screens round the tombs of the Scala family at Verona, 1350-75,—a sort of net-work of light cusped quatrefoils, each filled up with a small ladder (scala) in allusion to the name of the family. The most elaborate specimen of this wrought work is the screen to the Rinuccini chapel in Santa Croce, Florence, of 1371, in which moulded pillars and window-like tracery have been wrought and modelled by the hammer with extraordinary skill (see Wyatt, Metal- Work of Middle Ages). Of about the same date are the almost equally magnificent screens in Sta Trinita, Florence, and at Siena across the chapel in the Palazzo Pubblico. The main part of most of these screens is filled in with quatre-foils, and at the top is an open frieze formed of plate iron pierced, repoussé, and enriched with engraving.

In the 14th century great quantities of objects for ecclesiastical use were produced in Italy, some on a large scale, and mostly the works of the best artists of the time.

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Fic. 4.—Silver Repoussé Reliefs from the Pistoia Retable.

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The silver altar of the Florence baptistery is one of the chief of these; it was begun in the first half of the 14th century, and not completed till after 1477

(see Gaz. des Beaux Arts, Jan. 1883). A whole series of the greatest artists in metal laboured on it in succession, among whom were Orcagna, Ghiberti, Verrocchio, Ant. Pollajuolo, and many others. It has elaborate reliefs in repoussé work, cast canopies, and minute statuettes, with the further enrichment of translucent coloured enamels. The silver altar and retable of Pistoia cathedral (see fig. 4), and the great shrine at Orvieto, are works of the same class, and of equal importance.

Whole volumes might be devoted to the magnificent works in bronze produced by the Florentine artists of this century, works such as the baptistery gates by Ghiberti, and the statues of Verrocchio, Donatello,. and many others, but these come rather under the head of sculpture.

Some very magnificent bronze screens were produced at this time, especially that in Prato cathedral by Simone, brother of Donatello, in 1444-61, and the screen and bronze ornaments of the tomb of Piero and Giovanni dei Medici in San Lorenzo, Florence, by Verrocchio, in 1472.

At the latter part of the 15th century and the beginning of the 16th the Pollajuoli, Ricci, and other artists devoted much labour and artistic skill to the production of candle- sticks and smaller objects of bronze, such as door-knockers, many of which are works of the greatest beauty. The candlesticks in the Certosa near Pavia, and in the cathedrals of Venice and Padua, are the finest examples of these.

Niccold Grossi, who worked in wrought iron under the patronage of Lorenzo dei Medici, produced some wonderful specimens of metal-work, such as the candlesticks, lanterns, and rings fixed at intervals round the outside of the great palaces (see fig. 5). The Strozzi palace in Florence and

Fig. 5.—Wrought Iron Candle-Pricket ; late 15th-century, Florentine work.

the Palazzo del Magnifico at Siena have fine specimens of these,—the former of wrought iron, the latter in cast bronze. At Venice fine work in metal, such as salvers and vases, was being produced, of almost Oriental design, and in some cases the work of resident Arab artificers. In the 16th

century Benvenuto Cellini was supreme for skill in the production of enamelled jewellery, plate, and even larger works of sculpture (see Plon's Ben. Cellini, 1882), and John of Bologna in the latter part of the same century inherited to some extent the skill and artistic power of the great 15th-century artists. Since that time Italy, like other countries, has produced little metal-work of real value. Spain.—From a very early period the metal-workers of Spain have been distinguished for their skill, especially in the use of the precious metals. A very remarkable set of specimens of goldsmith's work of the 7th century are the eleven votive crowns, two crosses, and other objects found

in 1858 at Guarrazar, and now preserved at Madrid and in Paris in the Cluny Museum (see Du Sommerard, Musée de Cluny, 1852). Magnificent works in silver, such as shrines, altar crosses, and church vessels of all kinds, were pro- duced in Spain from the 14th to the 16th century,—especially a number of sumptuous tabernacles (custodia) for the host, magnificent examples of which still exist in the cathedrals of Toledo and Seville. The bronze and wrought iron screens—vrejas, mostly of the 15th and 16th centuries—to be found in almost every im- portant church in Spain are very fine examples of metal- work. They generally have moulded rails or ballusters, and rich friezes of pierced and repoussé work, the whole being often thickly plated with silver. The common use of metal for pulpits is a peculiarity of Spain; they are sometimes of bronze, as the pairs in Burgos and Toledo cathedrals, or in wrought iron, like those at Zamora and in the church of San Gil, Burgos. The great candelabrum or tenebrarium in Seville cathedral is the finest speci- men of 16th-century metal-work in Spain; it was mainly the work of Bart. Morel in 1562. It is of cast bronze enriched with delicate scroll-work foliage, and with num- bers of well-modelled statuettes, the general effect being very rich and graceful. Especially in the art of metal- work Spain was much influenced in the 15th and 16th centuries by both Italy and Germany, so that numberless Spanish objects produced at that time owe little or nothing to native designers. At an earlier period Arab and Moor- ish influence is no less apparent.

England.—In Saxon times the English metal-workers, especially of the precious metals, possessed great skill, and appear to have produced shrines, altar-frontals, retables, and other ecclesiastical furniture of considerable size and magnificence.

Dunstan, archbishop of Canterbury (925-988), . like Bernward, bishop of Hildesheim a few years later, and St Eloi of France three centuries earlier, was himself a skilful worker in all kinds of metal. The description of the gold and silver retable given to the high altar of Ely by Abbot Theodwin in the 11th century, shows it to have been a large and elaborate piece of work decorated with many reliefs and figures in the round. In 1241 Henry ITI. gave the order for the great gold shrine to contain the bones of Edward the Confessor (see W. Burges in Gleanings from Westminster). It was the work of members of the Otho family, among whom the goldsmith's and coiner's crafts appear to have been long: hereditary. Countless other important works in the precious metals adorned every abbey and cathedral church in the kingdom.

In the 13th century the English workers in wrought iron were especially skilful. The grill over the tomb of Queen Eleanor at Westminster, by Thomas de Leghton, made about 1294, isa remarkable example of skill in weld- ing and modelling with the hammer (see fig. 6).

The rich and graceful iron hinges, made often for small and out-of-the-way country churches, are a large and important class in the list of English wrought iron-work. Those on the refectory door of Merton College, Oxford, are a beautiful and well-preserved example dating from the 14th century.

More mechanical in execution, though still very rich in effect, is that sort of iron tracery work produced by cutting out patterns in plate, and superimposing one plate over the other, so as to give richness of effect by the shadows produced by these varying planes. The screen by Henry V.'s tomb at Westminster is a good early specimen of this kind of work. :

The screen to Bishop West's chapel at Ely, and that round Edward IV.'s tomb at Windsor, both made towards the end of the 15th century, are the most magnificent

METAL-WORK

English examples of wrought iron, in which every art and feat of skill known to the smith has been brought into play to give variety and richness to the work.

Much wrought-iron work of great beauty was produced at the beginning of the 18th century, especially under the superintendence of Sir Christopher Wren (see Ebbetts, Iron Work of 17th and 18th Centuries, 1880). Large flowing leaves of acanthus and other plants were beaten out with wonderful spirit and beauty of curve. The gates from Hampton Court are the finest examples of this class of work (see fig. 7).

From an early period bronze and latten (a variety of brass) were much used in England for the smaller objects both of ecclesiastical and domestic use, but except for tombs and lecterns were but little used on a large scale till the 16th century. The full-length recumbent effigies of Henry III. and Queen Eleanor at Westminster, cast in bronze by the "'cire perdue" process, and thickly gilt, are equal, if not superior, in artistic beauty to any sculptor's work of the same period (end of the 13th century) that was produced in Italy or elsewhere. These effigies are the work

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Fia. 6.— Part of the " Eleanor Grill."

of an Englishman named William Torel (see Westminster Gleanings). The gates to Henry VIL's chapel, and the screen round his tomb at Westminster (see fig. 8), are very elaborate and beautiful examples of '"latten" work, show- ing the greatest technical skill in the founder's art. In latten also were produced the numerous monumental brasses of which about two thousand still exist in England. Though a few were made in the 13th century, yet it

was not till the 14th that they came into general use. They are made of cast plates of brass, with the design worked upon them with the chisel and graver. All those, how- ever, to be seen in English churches are not of native work—great quantities of them being Flemish imports (see Cotman, Waller, and Boutell on Monumental Brasses).

In addition to its chief use as a roof covering, lead was sometimes used in England for making fonts, generally tub-shaped, with figures cast in relief. Many examples exist : e.g., at Tidenham, Gloucestershire ; Warborough and Dorchester, Oxon ; Chirton, Wilts ; and other places.

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Germany.—Unlike England, Germany in the 10th and 11th centuries produced large and elaborate works in cast bronze, especially doors for churches, much resembling the contemporary doors made in Italy under Byzantine influence. Bernward, bishop of Hildesheim, 992-1022, was especially skilled in this work, and was much influenced in design by a visit to Rome in the suite of Otho III. The bronze column with winding reliefs now at Hildesheim was the result of his study of Trajan’s column, and the bronze door which he made for his own cathedral shows classical influence, especially in the composition of the drapery of the figures in the panels,

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Fic. 7.—Part of one of the Hampton Court Gates.

The bronze doors of Augsburg (1047-72) are similar in style. The bronze tomb of Rudolph of Swabia in Mersburg cathedral (1080) is another fine work of the same school. The production of works in gold and silver was also carried on vigorously in Germany. ‘The shrine of the three kings at Cologne is the finest surviving example.

At a later time Augsburg and Nuremberg were the chief centres for the production of artistic works in the various metals. Herman Vischer, in the

15th century, and his son and grandsons were very remarkable as bronze founders. The font at Wittenberg, decorated with reliefs of the apostles, was the work of the elder Vischer, while Peter and his son produced, among other important works, the shrine of St Sebald at Nuremberg, a work of great finish and of astonishing richness of fancy in its design (see Doebner, Christliches Kunstblatt, 1866, Nos. 10-12). The tomb of Maximilian I., and the statues round it, at Innsbruck, begun in 1521, are perhaps the most meritorious German work of this class in the 16th century, and show consider- able Italian influence.

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In wrought iron the German smiths, especially during the 15th century, greatly excelled. Almost peculiar to Germany is the use of wrought iron for grave-crosses and sepulchral monuments, of which the Nuremberg and other cemeteries contain fine examples. Many elaborate well- canopies were made in wrought iron, and gave full play to

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Fie. 8.—Part of Henry VII.’s Bronze Screen.

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the fancy and invention of the smith. The celebrated 15th-century example over the well at Antwerp, attributed to Quintin Massys, is the finest of these.

France.—From the time of the Romans the city of Limoges has been celebrated for all sorts of metal-work, and especially for brass enriched with enamel. In the 13th and 14th centuries many life-size sepulchral effigies were made of beaten copper or bronze, and ornamented by various-coloured “champlevé” enamels. The beauty of ‘ these effigies led to their being imported into England ;

most are now destroyed, but a fine specimen still exists at Westminster on the tomb of William de Valence (1296). In ornamental iron-work for doors the French smiths were pre-eminent for the richness of design and skilful treatment of their metal. No examples probably surpass those on the west doors of Notre Dame in Paris—now unhappily much falsified by restoration. The crockets and finials on the fléches of Amiens and Rheims are beautiful speci- mens of a highly ornamental treatment of cast lead, for which France was especially celebrated. In most respects, however, the development of the various kinds of metal- working went through much the same stages as in England.

Persia and Damascus.—The metal-workers of the East, especially in brass and steel, were renowned for their skill

Fria. 9.—Brass Vase, pierced and gilt ; 17th century Persian work.

even in the time of Theophilus, the monkish writer on the subject in the 13th century. But it was during the reign of Shah Abbas I. (d. 1628) that the greatest amount of skill both in design and execution was reached by the Persian workmen. Delicate pierced vessels of gilt brass, enriched by tooling and inlay of gold and silver, were among the chief specialties of the Persians (see fig. 9).

A process called by Europeans ‘“‘damascening” (from Damascus, the chief seat of the export) was used to produce very delicate and rich surface ornament. A pattern was incised with a graver in iron or steel, and then gold wire was beaten into the sunk lines, the whole surface being then smoothed and polished. In the time of Cellini this process was copied in Italy, and largely used, especially for the decoration of weapons and armour. The repoussé process both for brass and silver was much used by Oriental workers, and even now fine works of this class are pro- duced in the East, old designs still being adhered to.

ME T— Recent Metal-Work.—In modern Europe generally the |

arts of metal-working. both as regards design and tech- nical skill are not in a flourishing condition. The great bronze lions of the Nelson monument in London are a sad example of the present low state of the founder's art. Coarse sand-casting in England now takes the place of the delicate "'cire perdue" process. .

Some attempts have lately been made in Germany to revive the art of good wrought-iron work. The Prussian gates, bought at a high price for the South Kensington Museum, are large and pretentious, but unfortunately are only of value as a warning to show what wrought iron . ought not to be. Some English recent specimens of ham- mered work are more hopeful, and show that one or two

smiths are working in the right direction.

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METAP

|i term metaphysic, originally intended to mark the

place of a particular treatise in the collection of Aristotle’s works, has, mainly owing to a misunderstanding, survived several other titles,—such as “ First Philosophy,” “Ontology,” and “Theology,” which Aristotle himself used or suggested. Neo-Platonic mystics interpreted it as signifying that which is not merely “after” but “beyond” physics, and found in it a fit designation for a science which, as they held, could not be attained except by one who had turned his back upon the natural world. And writers of a different tendency in a later time gladly accepted it as a convenient nickname for theories which they regarded as having no basis in experience, in the same spirit in which the great German minister Stein used the analogous title of ‘‘ metapolitics ” for airy and unpractical schemes of social reform. A brief indication of the contents of Aristotle’s treatise may enable us to give a general definition of the science which was first distinctly constituted by it, and to determine in what sense the subjects which that science has to consider are beyond nature and experience. .

For Aristotle, metaphysic is the science which has to do with Being as such, Being in general, as distinguished from the special sciences which deal with special forms of being. There are certain questions which, in Aristotle’s view, we have a right to ask in regard to everything that

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vols, xii.~~xvi.; Catalogue of works of art in metal exhibited in 1861 at Ironmongers’ Hall; Texier, Diettonnatre @’ Orfévrerie, 1857 ; Virgil Solis, Designs for Gold~~ and Silver-Smiths, 1512 (facsimile reproduction, 1862). PracricAL TREATISES: Theophilus, Diver- sarum

METAMORPHOSIS. This term has been employed in several distinct senses in biology. During the early part of the century it was constantly used to include the current morphological conceptions, as, for instance, of the parts of a flower as modified or “metamorphosed ” leaves, or of the segments of a skull as modified vertebra. It is still frequently employed to denote that progressive change from the general to the special undergone by all developing tissues and organs (see BioLocy, EMBRYOLOGY), but in this sense is conveniently superseded by the term “differentiation.” In the process of animal development, two types are broadly distinguishable,—a fcetal type, in which development takes place wholly or in greater part either within the egg or within the body of the parent, and a larval type, in which the young are born in a condition more or less differing from that of the adult, while the adult stage again is reached in one of two ways, either by a process of gradual change, or by a succession of more or less rapid and striking transformations, to which the term metamorphosis is now usually restricted. Metamorphosis is generally regarded as having been brought about by the action of natural selection, partly in curtailing and reducing the phases of development (an obvious advantage in economy of both structural and functional change), and partly also in favouring the acquirement of such sccondary characters as are advan- tageous in the struggle for existence. Freshwater and terrestrial animals develop without metamorphosis much more frequently than marine members of the same group, a circumstance which has been variously explained. For details of metamorphoses see the articles on the various groups of animals; see also Balfour’s Comparative Hm- bryology, 1880-81.

HYSIC

presents itself as real. We may ask what is its ideal nature or definition, and what are the conditions of its realization ; we may ask by what or whom it was produced, and for what end; we may ask, in other words, for the formal and the material, for the efficient and the final causes of everything that is. These different questions point to different elements in our notion of Being, elements which may be considered in their general relations apart from any particular case of their union. These, therefore, the first philosophy must investigate. But, further, this science of being cannot be entirely separated from the science of knowing, but must determine at least its most general

principles. For the science that deals with what is most universal in being is, for that very reason, dealing with the objects which are most nearly akin to the intelligence. These, indeed, are not the objects which are first presented to our minds ; we begin with the particular, not the universal, with a zparov jyiv which is not tpérov gvoer; but science reaches its true form only when the order of thought is made one with the order of nature, and the particular is known through the universal. Yet this conversion or revolution of the intellectual point of view is not to be regarded as an absolute change from error to truth ; for Aristotle holds that nihil est in rntellectu quod non prius in sensu, in the meaning that in sense perception there is already the working of that discriminative intelli-

gence! which, beginning in sense perception, with the dis- tinction of particular from particular, can rest only when it has apprehended things in their universal forms or defini- tions. Looking at knowledge formally, the highest law of thought, the law of contradiction (or, as we might call it, to indicate Aristotle's meaning more exactly, the law of de- finition or distinction), is already implied in the first act of perception by which one thing is distinguished from another. Looking at it materially, the reason of man is to be con- ceived as potentially all that is knowable ; 2.¢., objects are so related to it that for it to know them in their essential definitions is only to know itself. The aim of science, in this view, is to break through the husk of matter, and to apprehend things in their forms, in which they are one with the mind that knows them. Hence also it follows that in rising to the most universal science, the science of Being in general, the mind is not leaving the region of immediate experience, in which it is at home, for a far-off region of abstractions. Rather it is returning to itself, apprehend- ing that which is most closely related to itself, and which therefore, though it is late in being made the direct object of investigation, is yet presupposed in all that is, and is known.?

Metaphysic, then, is the science which deals with the principles which are presupposed in all being and knowing, though they are brought to light only by philosophy. Another trait completes the Aristotelian account of it. It is theology, or the science of God. Now God is vénots voyoews, pure self-

consciousness, the absolute thought which is one with its object, and He is therefore the first cause of all existence. For, while the world of nature is a world of motion and change, in which form is realized in matter, this process of the finite can be explained only by referring it back to an unmoved mover, in whom there is no distince- tion of matter and form, and who is, therefore, in Aristotle's view, to be conceived as pure form, the purely ideal or theoretic activity of a consciousness whose object is itself. Such a conception, however, while it secures the independ- ence and absoluteness of the unmoved mover, by removing him from all relation to what is other than himself, seems to make his connexion with the world inexplicable. We can on this theory refer the world to God, but not God to the world. Hence Aristotle seems sometimes to say that God is the first mover only as He is the last end after which all creation strives, and this leads him to attribute to nature a desire or will which is directed towards the good as its object or end.

Aristotle then brings together in his metaphysic three elements which are often separated from each other, and the connexion of which is far from being at once obvious. It is to him the science of the first principles of being. It is also the science of the first principles of knowing. Lastly, it is the science of God, as the beginning and end of all things, the absolute unity of being and thought, in which all the differences of finite thought and existence are either excluded or overcome.

To some this description of the contents of Aristotle's treatise, and especially the last part of it, may seem to be a confirmation of all the worst charges brought against metaphysic. For at both extremes this supposed science seems to deal with that which is beyond experience, and which therefore cannot be verified by it. It takes us back to a beginning which is prior to the existence as well as to the consciousness of finite objects in time and space, and on to an end to which no scientific prophecy based upon our consciousness of such objects can reach. In the

1 Advauis xpitixyn, Anal. Post., ii. 99d.

2 What is said here as to the intelligence is partly taken from the De Anima. 'he necessary qualifications of the above general state- ment of Aristotle's views will be given subsequently.

former aspect of it, it has to do with notions so abstract and general that it seems as if they could not be fixed or tested by reference to any experience, but must necessarily be the playthings of dialectical sophistry. In the latter aspect of it, it entangles us in questions as to the final cause and ultimate meaning of things, questions involving so comprehensive a view of the infinite universe in which we are insignificant parts that it seems as if any attempt to answer them must be for us vain and presumptuous, On both sides, therefore, metaphysic appears to be an attempt to occupy regions which are beyond the habitable space of the intelligible world—to deal with ideas which are either so vague and abstract that they cannot be fastened to any definite meaning, or so complex and far- reaching that they can never by any possibility be verified. For beings like men, fixed within these narrow limits of space and time, the true course, it would seem, is to "cultivate their gardens," asking neither whence they come nor whither they go, or asking it only within the possible limits of history and scientific prophecy. To go back to the beginning or on to the end is beyond them, even in a temporal, still more in a metaphysical, sense. That which is tpérov dice: escapes us even more absolutely than the prehistorical and pregeological records of man and his world. That which is voraroy dice. escapes us even more absolutely than the far-off future type of civilization, which social science vainly endeavours to anticipate. Our state is. best pictured by that early Anglican philosopher who compared it to a bird flying through a lighted room ''between the night and the night." The true aim of philosophy is, therefore, it would seem, to direct our thoughts to the careful exam- ination and utilization of the narrow space allotted to us by an inscrutable power, and with scientific self-restraint to refrain from all speculation either on first or on final causes.

The main questions as to the possibility and the nature of metaphysic, according to Aristotle's conception of it, may be summed up under two heads. We may ask whether we can in any sense reach that which is beyond experience, and, if so, whether this "beyond" is a first or a last principle, a pre-condition or a final cause of nature and experience, or both. The former question branches out into two, according as we look at metaphysic from the objective or the subjective side, or, to express the matter more

accurately, according as we consider it in relation to those natural objects which are merely objects of knowledge, or in relation to those spiritual objects which are also subjects of knowledge. We shall therefore consider meta- physic, first, in relation to science in general, and, secondly, in relation to the special science of psychology. The latter question also has two aspects ; for, while the idea of a first cause or principle points to the connexion between metaphysic and logic, the idea of a last principle or final cause connects metaphysic with theology. We shall there- fore consider in the third place the relation of metaphysic to logic, and in the fourth place its relation to religion and the philosophy of religion.

1. The Relation of Metaphysic to Science.—The beginnings of science and metaphysic are identical, though there is a sense in which it may be admitted that the metaphysical comes before the scientific or positive era. The first efforts of philosophy grasp at once at the prize of absolute knowledge. No sooner did the Greeks become dissatisfied with the pictorial synthesis of mythology by which their thoughts were first lifted above the confusion of particular things, than they asked for one universal principle which should explain all things. The Ionic school sought to find some one phenomenon of nature which might be used as the key to all other phenomena. The Eleatics, seeing the

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futility of making one finite thing the explanation of all other finite things, tried to find that explanation in the very notion of unity or being itself. We need not underestimate the speculative value of such bold attempts to sum up all the variety of the world in one idea, but it is obvious that they rather give a name to the problem than solve it, or that they put the very consciousness of the problem in place of the solution of it. Science is possible only if we can rise from the particular to the universal, from a subjective view of things as they immediately present themselves to us in perception to an objective determination of them through laws and principles which have no special relation to any particular set of events or to any one individual subject. But this is only one aspect of the matter. To advance from a conception of the world in ordine ad individuum to one in ordine ad universum, and so to

discount and eliminate what is merely subjective and.

accidental in our first consciousness of the world, is the beginning of knowledge. But little is gained unless the universal, which we reach through the negation of the particulars, is more than their mere negation; unless it is a law or principle by means of which we can explain the particulars. Now the defect of early philosophy was that its universal was “the one beyond the many,” not the ‘‘one in the many,”—in other words, that it was not a law or principle by which the particulars subsumed under it could be explained, but simply the abstraction of an element common to them. But the process of knowledge is a process that involves both analysis and synthesis, negation and reaffirmation of the particulars with which we start. If we exaggerate the former aspect of it, we enter upon the wa negatiwa of the mystics, the way of pure abstraction and negation, which would open the mind to the ideal reality of things simply by shutting it to all the perceptions of sensible phenomena. And, if we follow out this method to its legitimate result, we must treat the highest abstraction, the abstraction of Being, as if it were the sum of all reality, and the Neo-Platonic ecstasy in which all distinction, even the distinction of subject and object, is lost as the only attitude of mind in which truth can be apprehended.

In the philosophy of the Socratic school we find the first attempt at a systematic as opposed to an abstract theory— the first attempt to bring together the one and the many, and so to determine the former that it should throw light upon the latter. Yet even in Plato the tendency to oppose the universal to the particular is stronger than the tendency to relate them to each other, and in some of his dialogues, as, ¢.g., in the Phxdo, we find a near approach to that identification of the process of knowledge with abstraction which is the characteristic of mysticism. Aristotle, therefore, had some ground for taking the Platonic principle that “the real is the universal” in a sense which excludes the reality of the individual. Yet, though he detected Plato’s error in opposing the universal to the particular, and though, at the same time, he did not entirely lose sight of the truth which Plato had exagger-

_ated, that the particular is intelligible only through the universal, Aristotle was not able to escape the influence of that dualism which had marred the

philosophy of his predecessor. Hence the effect of his protest against a philosophy of abstraction was partly neutralized by his separation between the divine Being as pure form and nature as the unity of form and matter, and again by his separation of the pure reason which apprehends the forms of things from the perceptions of sense which deal with forms realized in matter. And after Aristotle's time the tendency of philosophy was more and more to withdraw from contact with experience. The Neo-Platonic philosophy, and the Christian theology which was so strongly

influenced by it, contained, indeed, an idea of the recon- ciliation of God and nature, and hence of form and matter, which must ultimately be fatal to dualism, and therefore to the method of mere abstraction. But the explicit meaning of the philosophy of the Middle Ages was still dualistic, and the mode in which the Aristotelian formule were wrought into the substance of Christian doctrine by the scholastics tended more and more to conceal that idea of the unity of opposites which was involved in Christianity. Hence medieval realism presented, in its most one-sided form, the doctrine that " the real is the universal," meaning by the universal nothing more than the abstract. And, as a natural consequence, the modern insurrection of the scientific spirit against scholasticism took its start from an equally bald and one-sided assertion of the opposite principle, that "the real is the individual," meaning by that the individual of immediate perception. If Platonism had dwelt too exclusively on one aspect of the process of knowledge, viz., that it seeks to rise above the particular, the sensible, the subjective, to the universal, the intelligible, the objective, as if in the latter alone were reality to be found, modern men of science learnt from their first nominalistic teachers to regard the universal as nothing more than an abbreviated expression for the particulars, and science itself as a mere generalization of the facts of sensible perception. But this view of scientific knowledge, as a mere reaflirma- 'tion of what: is immediately given in sense, is as imperfect as the opposite theory, which reduces it to the mere negation of what is so given. An ideal world utterly and entirely divorced from the phenomenal, and an ideal world which is simply a repetition of the phenomenal, are equally meaningless. The processes of science have both a negative and a positive side; they involve a nega- tion of the particular as it

is immediately presented in sense, but only with a view to its being reaffirmed with a new determination through the universal. The fact as it is first presented to us is not the fact as it is; for, though it is from the fact as given that we rise to the knowledge of the law, it is the law that first enables us to understand what the fact really means. Our first consciousness of things is thus, not an immovable foundation upon which science may build, but rather a hypothetical and self-con- tradictory starting-point of investigation, which becomes changed and transformed as we advance.

The nominalism of scientific men in modern times is due to two special causes, one of which has alrcady been mentioned. It is partly due to the traditions of a time when medizval realism was the great enemy of science. The Baconian protest against the “anticipation of nature ” was a relative truth when it was urged against a class of writers who supposed that true theories could be attained without regard to facts ; the Baconian assertion of the necessity of attending to axvomata media was tlie necessary correction of the tendencies of mystics, who supposed that philosophy could attain its end by grasping at once at absolute unity, and contented themselves, therefore, with a unity which did nothing to explain the differences. But, when the former was turned into the dogmatic assertion that the mind is, or ought to be, passive in the process of knowledge, as having in itself no principle for the explanation of things, and when the latter was turned into the dogmatic assertion that science can only proceed from part to part and never from the whole to the parts, these relative truths became a source of error. And this error was confirmed and increased by the mistaken views of those who first tried to correct it. For these, admitting that scientific truth is entirely derived from external experience, only ventured to assert the existence of a priort knowledge alongside of, and in addition to, that which is a posterzore. In other words, they sought in inner experience a basis for XVI — 1!

those beliefs which outward experience seemed unable to support. But this basis was soon found to be treacherous. Introspection, observation of the inner life as opposed to and distinguished from the outer life, could be only an observation of the facts of the individual consciousness as such; and to

base religion and morality on such a founda- tion was to treat God and right as subjective phenomena, which do not necessarily correspond to any objective reality. Nor was this conclusion really evaded by the assertion of the self-evidencing necessity of such ideas and beliefs, or of the principles upon which they are founded. For this necessity, as a subjective phenomenon, might be accounted for otherwise than by the supposition of their objective validity. Such scepticism, further, was favoured by the progress of science, which, as it advanced from physics to biology and sociology, became more and more in- consistent with the idea of an absolute breach between inner and outer experience, and narrowed the sphere which had been hitherto reserved for the former. Man, it was urged, is but a part in a greater whole, not exempted from the law of action and reaction which connects all parts of that whole with each other. His individual life contains only a few links in a chain of causation that goes back to a beginning and onward to an end of which he knows nothing. And, as Spinoza says, vis gua unaqueque res in existendo perseverat a causis externis infinite superatur. Hence to treat ideas which are only states of the individual consciousness as the explanation of the world, instead of treating them as phenomena to be explained by its relation to that world, seemed to be an absurdity. The particular beliefs and tendencies of the mind were to be regarded, not as ultimate facts in reference to which everything is to be interpreted, but rather as facts which are themselves to be referred to more general causes and laws. It thus appeared that the attempt to divide truth into an a posteriori and an a priori part, the latter of which should find its evidence in an inner experience as the former in an outer experience, is an illusive pro- cess. If the a priort is reduced to the level of the a posteriori, it becomes impossible to base on the a priori any beliefs that go beyond the range of subjective experience. If the self and the not-self are taken simply as different finite things, which we can observe in turn, their relations must be brought under the general laws of the connexion of finite things with each other; and the phenomena of mind must be treated, like the phenomena of matter, as facts to be accounted for according to these laws.

But this of itself indicates a way of escape both from the introspective theory and from the empiricism to which

it is opposed. For it suggests the question——What is the)

source of those very laws which guide the procedure of science in accounting for facts, psychological facts among others?) When a scientific psychologist of the modern school attempts to show how by habituation of the individual and the race the necessity of thought expressed in the law of causation was produced in the minds of the present generation of men, it is obvious that his whole investigation and argument presuppose the law whose genesis he is accounting for. A glaring instance of such circular reasoning is found in the writings of the most prominent representative of the school in the present day. Mr Spencer begins by laying down as a first postulate of science that necessity of thought must be taken as a criterion of truth. It is by the continual aid of this postulate that he constructs his system of nature, and finally his psychological theory of the development of consciousness in man. Yet the main object of this psychological theory seems to be to account for the very necessities with which the author starts. Obviously sucha

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philosophy contains elements of which the author is imperfectly conscious; for it involves that mind is not only the last product but the first presupposition of nature, or, in other words, that in mind nature returns upon its first principle. But to admit this is at once to lift the conscious being as such above the position which he would hold as merely a finite part of a finite world. It is to assert that nature has an essential relation to a con- sciousness which is developed in man, and that in the growth of this consciousness we have, not an evolution which is the result of the action of nature as a system of external causes upon him, but an evolution in which nature is really “coming to itself,” 7.¢, coming to self-conscious- ness, in him.

Now it was Kant who first—though with a certain limitation of aim—brought this idea of the relativity of thought and being to the consciousness of the modern world. In the Critique of Pure Reason, thought, indeed, is not set up as an absolute priws, in relation to which all existence must be conceived, but it is set up as the prius of experience, and so of all existences which are objects of our knowledge. Experience is for Kant essentially relative to the conscious self; it exists through the necessary subsumption of

the forms and matter of sense under the categories, as, on the other hand, the consciousness of self is recognized as essentially dependent on this process. On this view, the a priori and a posteriori factors of experience do not really exist apart as two separate portions of knowledge. If they are severed, each loses all its mean- ing. Perceptions in themselves are void; categories in themselves are empty. We do not look outwards for one kind of truth and inwards for another, nor do we even, by an external process, bring facts given as contingent under principles recognized as necessary ; but the a prior is the condition under which alone the a posteriori exists for us. Even if it is allowed that the facts of inner and outer experience contain a contingent element or matter, given under the conditions of time and space, yet neither time nor space nor the facts of experience conditioned by them exist for us except as elements of an experience which is organized according to the categories.

This is the essential truth which Kant had to express. It is marred in his statement of it by the persistent influence of the abstract division between contingent matter given from without and necessary principles supplied from within, a division essentially inconsistent with the attempt to show that the contingent matter is necessarily subsumed under these principles, and indeed exists for us only as it is so subsumed. But Kant himself puts into our hands the means of correcting his own inadequacy, when he reduces the inaccessible thing in itself, which he at first speaks of as affecting our sensibility and so giving rise to the contingent matter of experience, to a noumenon (voovpevov) which is projected by reason itself. The Dialectic exhibits the idea of thought as not only constituting finite experience but also reaching beyond it, though as yet only in a negative way. The mind is, on this view, so far unlimited that it knows its own limits ; it is conscious of the defects of its experience, of the con- tingency of its sensible matter, and the emptiness and finitude of its categories; and by reason of this conscious- ness it is always seeking in experience an ideal which it is impossible to realize there. Thought measures experience by its own nature, and finds it wanting. It demands a kind of unity or identity in its objects which it is unable to find in the actual objects of experience. It is this demand of reason which lifts man above a mere animal existence, and forces him by aid of the categories to determine the matter of sense as a

world of objects ; yet, as this finite world of experience can never satisfy the demand

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of reason, the consciousness of it is immediately com- bined with the consciousness of its limited and phenomenal character. The student of the Critique of Pure Reason cannot but recognize the strange balance between the real and the phenomenal in which it ends, allowing to man the consciousness of each so far as to enable him to see the defects of the other, —so that by aid of the pure identity of reason he can criticize and condemn the “blindness” or unresolved difference of experience, and by means of the concreteness and complexity of experience he can condemn the “‘empty” identity of reason.

In order, however, to understand the full bearing of Kant’s criticism of knowledge, and at the same time to find the meeting-point of the opposite currents of thought which alternately prevail in it, it will be necessary to consider the subject a little more closely. The lesson of the Critique may be gathered up into two points. In the first place, it is a refutation of the ordinary view of experience as something immediately given for thought and not con- stituted by it. In the second place, it is a demonstration of the merely phenomenal character of the objects of experience, 7.¢., the demonstration that the objects of experience, even as determined by science, are not things in themselves. Both these results require to be kept clearly in view if we would understand the movement of thought excited by Kant. On the one hand Kant had to teach that what is ordinarily regarded as real, the world of experience, is transcendently ideal, 7.¢., is determined as real by a priori forms of thought. On the other hand he had to teach that the world so determined is empirically and not transcendentally real, 7.¢., its reality is merely phenomenal. With the former lesson he met the man of science, and compelled him to renounce his materialistic explanation of the world as a thing which exists in independence of the mind that knows it. The world we know is a world which exists only as it exists for us, for the thinking subject; hence the thinking subject, the ego, cannot be taken as an object like other objects, an object the phenomena of which are to be

explained like other phenomena by their place in the connexion of experience. Having, however, thus repelled scientific materialism by the proof that the reality of experience is ideal, Kant refuses to proceed to the complete identification of reality with ideality, and meets the claims of the metaphysician with the assertion that the reality of experience is merely phenomenal. Hence he rejects any idealism that would involve the negation of things in themselves beyond phenomena, or the identification of the objects of experience with these things. The reality we know is a reality which exists only for us as conscious subjects, but this, though it is the only reality we can know, is not the absolute reality.

It is, however, to be observed that the nature of this opposition between phenomena and things in themselves seems to change as we advance from the Analytic, where the existence of such things is presupposed, to the Dialectic, where the grounds of that presupposition are examined. At first the opposition seems to be between what is present in consciousness and what is absolutely beyond conscious- ness. The matter of experience is regarded as given exter- nally in the affections of the sensible subject,—affections caused by an unknown thing in itself, of which, however, they can tell us nothing. On the other hand the form of experience, the categories and principles of judgment which turn these affections into objects of knowledge, are not pure expressions of the real nature, the pure identity, of the subject in itself, but only products of the identity of the self in relation to the sensibility and its forms of time and space. Hence, on both sides we must regard expe- rience as merely phenomenal, alike in relation to the

noumenal object and in relation to the noumenal subject, which lurk behind the veil and send forth into expe- rience on the one side affections which become objects through their determination by the unity of thought, and on the other side an identity of thought which becomes self-conscious in relation to the objects so determined by itself.

Kant, however, having thus answered the question of the possibility of experience by reference to two things in themselves which are out of experience, is obliged to ask himself how the consciousness of these two things in themselves, and the criticism of experience in relation to them, is

possible. And here, obviously, the opposition can no longer be conceived as an opposition between that which is and that which is not in consciousness. For the things in themselves must be present to consciousness in some fashion in order that they may be contrasted with the phenomena. If, therefore, phenomena are now regarded as unreal, it must be because we have an zdea of reality to which the reality of experience does not fully correspond. In the Analytic Kant had beenspeaking as if the real con- sisted in something which is not present to the conscious subject at all, though we, by analysis of his experience, can refer to it as the cause of that which is so present. Now in the Dialectic he has to account for the fact that the conscious subject himself is able to transcend his experience, and to contrast the objects of it as phenomenal with things in themselves.

Now it is obvious that such an opposition is possible only so far as the thought, which constitutes experience, is at the same time conscious of itself in opposition to the experience it constitutes. The reason why experience is condemned as phenomenal is, therefore, not because it is that which exists for thought as opposed to that which does not exist for thought, but because it imperfectly corresponds to the determination of thought in itself. In other words, it is condemned as unreal, not because it is ideal, but because it is cmperfectly ideal. And the absolute reality is represented, not as that which exists without relation to thought, but as that which is identical with the thought for which it is. In the Dvalectic, therefore, the noumenon is substituted for the thing in itself, and the noumenon is, as Kant tells us, the object as it exists for an intuitive or perceptive understanding, 7.¢., an under- standing which does not synthetically combine the given matter of sense into objects by means of categories, but whose thought is one with the existence of the objects it knows. It is the idea of such a pure identity of knowing and being, as suggested by thought itself, which leads us to regard our actual empirical knowledge as imperfect, and its objects as not, in an absolute sense, real objects. The noumena are not, therefore, the unknown causes by whose action and reaction conscious experience is produced ; they represent a unity of thought with itself to which it finds: experience inadequate. This higher unity of thought with itself is what Kant calls reason, and he identifies it with the faculty of syllogizing. Further, he finds in the three forms of syllogism a guiding thread which brings him to the recognition of

three forms in which the pure unity of reason presents itself to us in opposition to the merely synthetic unity of experience, a psychological, a cosmo- logical, and a theological form. In each of these cases the empirical process of knowledge is accompanied, guided, and stimulated by an idea which nevertheless it is unable to realize or verify. In psychology we have ever present to us an idea of the identity of the self, which is never realized in our actual self-consciousness, because the self of which we are conscious is manifold in its states and because it stands in relation to an external world. The idea of simple identity is, therefore, something we may set

before us as the goal of an ideal psychology, to which we may approximate in so far as we can trace unity of faculty through all the differences of mental phenomena, but to which we can never attain owing to the nature of the matter with which we deal. Again, in our scientific attempts to explain our external experience, the unity of reason takes the form of an idea of the world as a completed infinite whole, which contains all. the objects known to us and all other possible objects ; but this cannot be realized in an experience which is conditioned by space and time, and is, therefore, ever incomplete. The idea of totality is, therefore, an ideal, which guides and stimulates our scientific progress, without which such a thing as science could not exist, but which at the same time can never be realized by science. Lastly, the unity of reason takes a third form in which identity and totality are combined,— as the idea of a unity in which all differences, even the difference of subject and object, are transcended,—the idea of a unity of all things with each other and with the mind that knows them. This idea also is one which science can neither surrender nor realize. It cannot surrender it without giving up that striving after unity without which science would not exist; and it cannot realize it, for the difference between the world, as it is presented to us in actual experience, and the subjective determination of our thinking consciousness cannot be overcome. We can, indeed, use the idea that the world is an organic whole, determined in relation to an end which consciousness sets for itself, as an heuristic principle to guide us in following the connexion of things with each other ; but, as we cannot by means of any such idea anticipate what the facts of external experience will be, so we cannot prove that for a mind other than ours the unity of things

which we repre- sent in this way might not take a quite different aspect. Indeed we have reason to think it would; for, while we always think of a designing mind as using materials which have an existence and nature independent of the purposes to which they are put, the absolute mind must be conceived as creating the materials themselves by the same act whereby they are determined to an end. We must con- ceive it, in short, as an intuitive understanding for which end and means, objective and subjective, are one, or, in other words, as an intelligence whose consciousness of itself is or contains the existence of all that is object for it.

This new view of the things in themselves as nowmena or ideals of reason involves a new attitude of thought towards them different from that dogmatic attitude which is provisionally adopted in the Analytic. Accordingly, we now find Kant speaking of them, not as things which exist independently of their being conceived, but as " prob- lematical conceptions" of which we cannot even determine whether they correspond to any objects at all. They are "'limitative" notions which have a negative value, in so far as they keep open a vacant space beyond experience, but do not enable us to fill that space with any positive realities. They are like dark lanterns which cast light upon the empirical world, and show what are its boundaries, but leave their own nature in obscurity. All that we can say of the noumenal self or subject is that it corresponds to the unity implied in all knowledge, but whether there is such a self, independent of the process of empirical synthesis and the self-consciousness which accompanies that process, we cannot tell. All that we can say of the noumenal reality of the objective world is that it corresponds to the idea of the objects of experience as a completed whole in them- selves apart from the process whereby we know them, but whether there is any such real world independent of the process of experience it is impossible to say. Lastly, all that we can say of God is that He corresponds to the idea

of the unity of all things with the mind that knows them,— an ideal which is involved in all knowledge,—but whether the realization of this idea in an intuitive understanding is even possible we have no means of determining, how- ever we may suspect that understanding and sensibility are "branches

springing from the same unknown root." The Criticism of Pure Reason ends, therefore, in a kind of seesaw between two forms of consciousness—a thinking consciousness, which transcends experience and sets before us an idea of absolute reality, but which cannot attain to any knowledge or even certitude of any object corresponding to this idea, and an empirical conscious- ness, which gives us true knowledge of its objects, but whose objects are determined as merely phenomenal and not absolutely real.

The equipoise thus maintained between the empirical and the intelligible world is, however, in the Criteque of Practical Reason, overbalanced in favour of the latter. What the theoretical reason could not do "in that it was weak through the flesh," through its dependence on the very empirical consciousness which it sought to transcend, is possible to the practical reason, because it is primarily determined by itself. In our moral consciousness we find ourselves under a law which calls upon us to act as beings who are absolutely self-determined or free, and which, therefore, assures us that our intelligible self is our real self, and conclusively determines our empirical self in contrast with it as phenomenal. Thus the moral law gives reality to the intelligible world; or, as Kant expresses it, "the idea of an intelligible world is a point of view beyond the phenomenal which the reason sees itself compelled to take up, in order to think of itself as practical." In other words, the moral law presupposes freedom or determination in the rational being as such, and makes him regard him- self, not merely as a link in the chain of conditioned existences in time and space, but as the original source of his own life. The blank space beyond the phenomenal thus begins to be filled up by the idea of a free causality. which again postulates a world adequate and conform- able to itself. And the man who, as an empiric individu- ality, is obliged to regard himself merely as an individual being determined by other individual beings and things is authorized as a moral being to treat this apparent necessity as having its reality in freedom, and to look upon himself as the denizen of a spiritual world where nothing is determined for him from without which is not simply the expression of his own self-determination from within. "Thus we have found, what Aristotle could not find, a fixed point on which reason can set its lever, not in any present or future world, but in its own inner idea of freedom,—a point fixed for it by the immovable moral law, as a secure basis from which it can move the human will, even against the opposition

of all the powers of nature.”! Starting from this idea of freedom, therefore, Kant proceeds to reconstruct for faith the unseen world, which in the Critique of Pure Reason he had denied as an object of knowledge. Nor is he content to leave the two worlds in sharp antithesis to each other, but even in the Critique of Practical Reason, and still more in the Critique of Judgment, he brings them into relation to each other, and so gives to theoretical reason a kind of authority to use for the explanation of the phenomenal world those ideas which of itself it might be inclined to regard as illusive.

In all this, however, it is difficult to avoid seeing a partialretractation of Kant’s first viewas to the irreconcilable opposition of the phenomenal and the noumenal. For, in the first place, the moral imperative is addressed to a self

1 Kant, i, 638 (Rosenkranz’s edition).

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which is at one and the same time regarded in both characters, and which is called upon to subsume under the moral law acts which otherwise derive their character and

meaning from the relations of the phenomenal world. That |

the particular nature of men as phenomenal individuals can be the means of realizing the universal law of reason is

implied in all Kant’s statements of the latter, and particu- |

larly in his conception of men as constituting together a “kingdom of ends”; for it is difficult to conceive this kingdom otherwise than as an organic unity of society, in

which each individual, by reason of his special tendencies |

and capacities, has a definite office to fulfil in realizing ©

the universal principle that binds all the members of the kingdom to each other. The summum bonum, again, 1s said to consist in the union of

happiness with goodness, i.e. of the empirical conditions of man's individual life as a sensible subject with the pure self-determination of the intelligible self; and God is postulated as a Deus ex machina to bind together these two unrelated elements,— a conception which shows the difficulty into which Kant

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experience without enabling us to transform it; they must show how ideas of the supersensible can so far be present to our thought as to make visible the boundaries of the prison of sense in which we are confined, without in any way enabling us to escape from it.

Is this possible? We may gather up the Kantian antithesis in the assertion that experience is the imperfect

| realization of an ideal of knowledge, derived from reason,

with materials, derived from sense and understanding, the nature of which is such that they can never be brought into correspondence with the ideal. But this ideal, in all its three forms, as we have seen, is simply the idea of a pure

unity or identity in which all differences are lost or

has brought himself by defining them as unrelated. Still |

more obvious is the effort of Kant to get beyond the

Judgment. For in that work he maintains that the con- sciousness of the beautiful and the sublime is or involves a harmony of the understanding or the reason with sense ; and, what is still more important, he points out that the

ciliation of freedom and necessity, of the intelligible and the phenomenal. our moral consciousness to apply to the whole course of the things in the phenomenal world, and so to regard it as a process to realize the moral ideal. No doubt he again partially retracts this view when he declares that

we must treat the idea of final causality as merely a subjective principle of judgment, which, even in the case of living beings, is to be regarded only as necessary for us as finite intelligences. But such saving clauses, in which Kant recurs to the dualism with which he started, cannot hide from us how near he has come to the renunciation of it. —

When we regard Kant in this way as asserting from one point of view an absolute limit which from another point of view he permits us to transcend, it becomes obvious that his philosophy is in an unstable equilibrium, which cannot but be disturbed by any one who attempts to develop or even to restate his ideas. Hence we need not wonder that those who take in earnest his denunciations of any attempt to transcend experience generally,—like Professor Huxley,—reject as worthless all Kant's later work; and that, on the other side, those who take in earnest his ideas of freedom, of organic unity, of an intuitive under, standing, and of a summum bonum in which freedom and. necessity meet together, are compelled to break through the arbitrary line which he drew between knowledge and belief. In favour of the former course it is easy in many places to appeal to the letter of Kant. In favour of the latter it need only be pointed out that, in Kant's view, all experience rests upon, or is in its development guided by, those ideas which yet he will not permit us to treat as sources of knowledge. Hence the principles of the Critique cannot legitimately be used against metaphysic, except by those who are prepared to admit the ideas of reason, up to the point to which he admits them, as ideas that limit and direct our experience, —while rejecting all use of them to cast light upon that which is beyond experience. In other words, they must maintain the possibility of a purely negative knowledge, of the knowledge of a limit by one who yet cannot go beyond it. They must show how we

can have an ideal of knowledge which enables us to criticize | itself the pattern.

This idea, he argues, we are authorized by |

dissolved—whether they be the differences of the inner or of the outer life, or finally the difference of inner and outer, subjective and objective, from each other. Kant's view therefore is, in effect, this, that thought carries with it the consciousness ofan identity or unity, to which our actual experience in

none of its forms fully corresponds. On the other hand, Kant does not hesitate equally to con- demn the identity of thought as “empty” and subjective,

because it does not contain in itself nor can evolve from dualism of his first view of things in the Critique of |

itself the complex matter of experience. But this alternate condemnation of experience as unreal from the point of view of the ideas, and of the ideas as unreal from

the point of view of experience, seems to show that both are | unreal, as being abstract elements, which have no value save idea of organic unity, without which we cannot explain the | phenomena of life, contains in it a possibility of the recon. |

in their relation to each other, and which lose all their mean- ing when separated from the unity to which they belong. According to this view, ideas and experience, noumena and phenomena, if they are opposed, are also necessarily related to each other. If our empirical consciousness of the world of objects in space and time, as determined by the categories, does not correspond to the unity or identity of thought which is our ideal of knowledge, yet that idea of unity or identity is set up by thought in relation to experience, and cannot, therefore, be essentially irrecon- cilable with it. The two terms may be opposed, but their opposition cannot be absolute, seeing that they are in essential relation to each other. It is a great logical error not to discern that a negative relation is still a relation, i.e., that it has a positive unity beyond it. This positive unity may not, indeed, be consciously present to us. in our immediate apprehension of the relation in question, but it is necessarily implied init. Now it is just because, in his separation of noumena and phenomena, Kant omits to note their essential relativity that he is forced to regard the former as a set of abstract identities of which nothing can be known, and the latter as the imperfect products of a synthesis which can never be completed or brought to a true unity. Yet the value of his whole treatment of the ideas of reason in relation to our intellectual and moral experience arises from the fact that in practice he does not hold to this abstract separation of the two elements. Ideas absolutely incommensurable with experience could neither stimulate nor

guide our empirical synthesis; they could not even be brought into any connexion with it. When, therefore, Kant brings them into this connexion, he necessarily alters their meaning. Hence the pure abstract identity which excludes all difference is changed, in its application, into the idea of an organic unity, of which the highest type is found in self-consciousness, with its trans- parent difference of the subjective and objective self. It would be absurd and meaningless to say that science seeks to reduce experience to an abstract identity, in which there is no difference, unless for this were tacitly substituted what is really an entirely different proposition, that science seeks to find in the infinitely diversified world of space and time that unity in difference of which self-consciousness has 1n It is in reference to the former kind

of identity—the abstract oneness of formal logic—that Kant proves that it is impossible for experience to be made adequate to ideas. But it is only of the latter kind of identity—the oneness of self-consciousness—that it can be said that it furnishes a guiding principle to scientific investigation or an ideal of knowledge. The same con- fusion is still more evident in Kant's account of our moral experience, in dealing with which he directly attempts to get synthetic propositions out of the pure identity of reason, in other words, to draw definite moral laws out of the logical principle of non-contradiction. Whatever success he attains is gained by substituting for the formal principle of self-consistency the positive idea of consistency with the self, and again by conceiving this self as a concrete individual, the member of a society, and so standing in essential relation to other selves. The pure abstraction from all the external results of action and from all motives of desire, which at the beginning of the Metaphysic of Ethics Kant declares to be essential to morality, is modified and indeed transformed, as we go on, by the admissions that other rational beings are not external to us in any sense that excludes their good from being an end of our endeavour, and that the desires are no¢ irrational and immoral except in so far as they are directed to the pleasures of the sensuous individual (which in a conscious being they never entirely are). Both in the speculative and in the practical sphere, therefore, the absolute opposi- tion of the ideal or noumenal to the empirical disappears, as soon as Kant attempts to apply it.

For in both the abstract identity of formal logic, which is really the meaning of the noumenon as absolutely opposed to and incommensurable with experience, gives way to the unity of self-consciousness,—a unity which is so far from being absolutely opposed to the difference of the empirical consciousness that it necessarily implies it. For self- consciousness presupposes the consciousness of objects ; though it is opposed to that consciousness, it is essentially correlated with it, and therefore its opposition cannot be regarded as absolute, or incapable of being transcended. These considerations may throw some light on the relation of the Analytic and Dialectic of Kant, and on the nature of the opposition of noumenon and phenomenon as it is presented in the latter. In the deduction of the categories, Kant pointed out the essential relation of the objective world of experience to what he called the "transcendental unity of apperception"; ze, he pointed out that the unity of consciousness is implied in all its objects. This unity, he further showed, must be conceived as "capable of self-consciousness "; but it actually becomes conscious of self only in relation, though also in opposi- tion, to the other objects determined by it. Now itis this consciousness of itself in opposition to other objects which is the source of Kant's "ideas of reason," of the dissatisfac- tion of the mind with its empirical knowledge, even in its scientific form, and of the demand for a higher kind of know- ledge to which experience is not adequate. That a standard is set up for experience by which it is condemned is simply a result of the further development of that unity which is implied in experience—a result of the progress of thought from consciousness to self-consciousness, and of the contrast between the former and the latter. The problem with which Kant's Dialectic attempts to deal, and which it treats as insoluble, is, therefore, simply the problem of raising con- scrousness to the form of self-consciousness ; in other words, of attaining to a knowledge of the world of experience as not merely a "synthetic," and therefore imperfect, unity of things external to each other, but as an organic unity of transparent differences, a self-differentiating, self-integrating unity, such as seems to be presented to us in pure self-consciousness, Nor can this problem be regarded as insoluble ; for the

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unity of self-consciousness is identical with the unity of consciousness ; it is only that unity become self-conscious, Hence the point of view at which consciousness and self- consciousness seem to be absolutely opposed to each other,— the highest point of view which Kant distinctly reaches,— can be regarded only as a stage of transition from the point at which their relative difference and opposition is not yet developed to the point at which they are seen to be the factors or elements of a still higher unity.

The later philosophy of Germany, from Kant to Hegel, is little more than the development of the idea just stated in its twofold aspect. In the first place, it is an attempt to show what is involved in the idea of thought or self- consciousness as in itself an organic whole, a many-in-one, a unity which expresses itself in difference, yet so that the difference remains transparent, and therefore is immediately recognized as expression of the unity. In the second place, it isan attempt to bridge over the difference between thought or self-consciousness and the external world of experience, and to show that this opposition also is subordinated toa higher unity. Or, to put it more directly, the idealistic philosophy of Germany seeks, on the one hand, to develop a logic or metaphysic which bases itself, not, like formal logic, on the idea of bare identity, but on the idea of self-consciousness; and, on the other hand, to show, in a philosophy of nature and spirit, how, by means of this logic, the opposition of thought to its object, or of the a priori to the a posteriort in knowledge, may be transcended. In the third and fourth sections of this article something more will be said of the manner in which this task was fulfilled. Here only a few words are necessary to sum up the results reached, and to give more distinctness to the new ideal of knowledge which those results suggest. We have seen that Kant’s critical attitude , involved two things,—on the one hand, the assertion that the existence we know is necessarily existence for thought, and, on the other hand, the denial that that which exists for our thought is absolute reality, a denial which again involves the presence to our thought of an ideal of know- ledge, by which our actual knowledge is condemned. This ideal, however, was falsely conceived by Kant as an identity without any difference, and, in this sense, he does not hesitate to apply it even to self-consciousness itself. For, in a remarkable passage,! he attempts to prove that the consciousness of self is not a knowledge of the self, by a simple reference to the duality of the self knowing and the self

known, arguing that the ego “stands in its own way,” just because it exists only for téself, 2.e., because in knowing itself it presupposes itself. Kant evidently thinks that to know the real self it would be necessary to apprehend it in simple identity as purely an object without reference to a subject, or purely a subject without reference to an object. Yet to this it seems sufficient to answer that such an object or subject would lose its character as object or subject and become equivalent to mere being in general, and that, as such being is a mere abstraction, to know it cannot be the ideal of knowledge. If therefore there be a unity or identity of thought which is not realized in ex- perience, and in reference to which we can regard experience as an imperfect form of knowledge, it cannot be found in this abstract identity of being. In truth, as we have seen, it is found in that very idea of self-consciousness which Kant is criticizing. Just because we are self-conscious, and there- fore oppose the unity of the conscious self to the manifold- ness of the world in space and time, do we seek in the world of space and time for a transparent unity which we cannot at first find there. But, when this is seen, we find in Kant himself the partial solution of the difticulty.

1 Kritik, p. 279 (Rosenkranz’s edition), ef. Hegel, v. p. 258.

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Gelf-consciousness presupposes consciousness ; for, while the apprehension of objects in consciousness 1s possible only ‘n relation to the unity of the self, yet it is only in relation to and distinction from these objects that we are conscious of that unity. Hence the two opposites, self and not-self, are bound together, and presuppose a unity which reveals itself in their opposition, and which, when made explicit, must reconcile them. If, therefore, self- consciousness, in its first opposition to consciousness, gives rise to an ideal of knowledge to which our empirical knowledge of objects is inadequate, this arises from the fact that not only empirical knowledge but also the ideal to which it is opposed is imperfect, or that they both point to a unity which is manifested in their difference, and which is capable of containing and resolving it. In other words, the opposition of science to its ideal, which Kant has stated in his Antinomies, is not an absolute opposition, but one the origin and end of which can be seen.

This opposition reaches its highest point in the con- trast between the transparent unity of self-consciousness, in which the difference of knower and known is evanescent, and the essential manifoldness and self-externality of the world in space, in which the differences seem to be insoluble. We must, indeed, think of self-consciousness as having life in itself and therefore as differentiating itself from itself; but this differentiation is held within the limit of its unity, it isa separation of movements which are separated only as they are united. On the other hand, the world in space presents itself as the sphere of external determination, in which things are primarily disunited and act only as they are acted on from without, and in which this external influence never goes so far as to destroy their reciprocal externality. In this sense it is that the opposition of mind and. matter was taken by Descartes, and it is a survival of the same mode of thought that leads many even now to draw absolute lines of division between a priort and a posteriort, between ideas and facts, between spiritual and natural. Kant and Fichte give a new aspect to the difficulty by showing that the difficulty is one of recon- ciling consciousness and self-consciousness, and that in consciousness there is already present the unity which is manifested in self-consciousness, as, on the other hand, it is only through consciousness and in opposition to it that self-consciousness is possible. And Fichte made a further step when he attempted to show that the categories and the forms of perception, time and space, which Kant had taken as inexplicable facts, are implied in this contrast of con- sciousness and self-consciousness. The error that clings to Fichte's speculations is, however, that he treats conscious- ness merely as a necessary illusion which exists simply with a view to self-consciousness, and hence is led to regard self-consciousness itself—because it is essentially related to this necessary illusion—as a schema or image of an unknowable absolute. In fact, in the end Fichte falls back upon the abstract identity in which Kant had found his noumenon, and so ends his philosophy with mysticism. Even Schelling, though he saw that the absolute unity must be one that transcends the difference of self and not- self, did not finally escape the tendency to merge all difference in absolute oneness. On the other hand, it was the endeavour of Hegel to proceed in the opposite way,— not to lose self-consciousness or subjectivity in a mere unity of substance, but rather to show that the absolute substance can be truly defined only as a self-conscious subject. And just because he did this he was prepared to take a further step, and to

regard the external world, not as Fichte regarded it, as merely the opposite of spirit, nor as Schelling regarded it, as merely the repetition and co-equal of spirit, but rather as its necessary manifestation

or as that in and through which alone it can realize itself. His doctrine therefore might be summed up in two proposi- tions,—first, that the absolute substance is spiritual or self- conscious, and, secondly, that the absolute subject or spirit can be conceived as realizing itself only through that very world of externality which at first appears as its opposite. Tn both respects Hegel's philosophy reverses the via nega- tiva of mysticism, and teaches that it is only through the exhaustion of difference that the unity of science, of which the mind contains in itself the certitude, is to be realized. For mind or spirit, viewed in itself, is conceived as a self- differentiating unity, a unity which exists only through opposition of itself to itself. And it is but a necessary result of such a conception that spirit can fully realize its unity only through a world which in the first instance must present itself as the extreme opposite of spirit. Hence the process of thought in itself, which is exhibited in the logic, ends in the opposition to thought of a world which is its negative counterpart. And the "absolute spirit" of Hegel is thus, not pure self-consciousness, but that more concrete unity of self-consciousness with itself which it attains through and by means of this world.

The effect of this view upon the relation of metaphysic to science, which we are at present considering, is noticeable. It does not, as is often supposed, supersede science by an a priori construction of the universe, nor does it leave the results of science unchanged and simply provide for it a deeper foundation. The latter was the point at which Kant and Fichte stopped; for, while they showed the relativity of experience to the principle of self-consciousness, they conceived that the function of metaphysic is completed in showing the phenomenal character of the objects of science, and in reserving a free space beyond the phe- nomenal world for "God, freedom, and immortality." Schelling, on the other hand, as he did not adopt this merely negative view of the relation of spirit to nature or of a priori to empirical truth, was obliged to reinterpret the latter by the former. As, however, he did not recog- nize any distinctions which were not merely

quantitative, he was led to apply the same easy key to every lock, and to think that he had explained all the different forms of existence, organic and inorganic, when he had merely pointed out a certain analogy between them. The meta- physic of Hegel, whatever may be said of the actual philosophy of nature produced by its author, contains no necessity for any such arbitrary procedure. In his Logie, indeed, he attempts to give us im abstracto the movement of thought in itself, from its simplest determination of being as qualitative or quantitative, through the reflective categories of substance and cause, up to its full conscious- ness of itself in its organic unity. And in so doing he of course gives us an account of the various categories which science uses in the interpretation of nature. He further attempts to show that the highest categories of science are in themselves imperfect and self-contradictory,—in other words, that they mark a stage of thought which falls short of that unity of being and knowing after which science is striving, and which is the presupposition as well as the goal of all intelligence. But, while he does this, he clearly acknowledges two things,—on the one hand that nature is essentially different from pure self-consciousness, and that therefore logic can never by direct evolution of its categories anticipate the investiga- tions of science, and, in the second place, that the final interpretation of nature through the highest categories presupposes its interpretation by the lower categories, and cannot be directly achieved without it. In other words, ee eee Ee

1 This subject—the progress of thought from lower to higher cate- gories and methods—will be more fully discussed in the third section.

science must first determine the laws of nature according to the principles of causality and reciprocity, ere philosophy can be in a position to discover the ultimate meaning of nature by the aid of higher principles. “The philosophy of nature,” says Hegel, “takes up the material which physical science by direct dealing with experience has prepared for it at the point to which science has brought it, and again transforms this formed material without going back to experience to verify it. Science must, therefore, work into the hands of philosophy, in order that philosophy in its turn may translate the lower universality of the understanding realized by science into

the higher universality of reason, and may show how in the light of this higher universality the intelligible world takes the aspect of a whole which has its necessity in itself. The philosophic way of looking at things is not a capricious attempt, once ina way for a change, to walk upon one's head after one has got tired of walking upon one's feet, or

to transform one's work-a-day face by painting it over; |

but, just because the scientific manner of knowing does not satisfy the whole demand of intelligence, philosophy must supplement it by another manner of knowing." !

The result then may be briefly expressed thus. Kant

and his successors showed the relativity of the object of |

knowledge to the knowing mind. He thus pointed out that the ordinary consciousness, and even science, are abstract and imperfect modes of knowing, in so far as in their determination of objects they take no account of a factor which is always present, to wit, the knowing subject. For their purposes, indeed, this abstraction is justifiable and necessary, for by it they are enabled within their pre- scribed limits to give a more complete view of these objects in their relation to each other than if the attempt had been made to regard them also in relation to the knowing

subject. At the same time the scientific result so arrived |

at is imperfect and incomplete, and it has to be recon- sidered in the light of a philosophy which retracts this provisional abstraction. or it must be remembered that the fact that science looks at things only in their relation to each other, and not to the knowing mind, narrows the points of view or categories under which it is able to regard them, or, in other words, limits the questions which the mind is able to put to nature. Just because science does not treat its objects as essentially related to the mind, it is unable to rise to what Hegel calls the point of view of reason, or of the "notion"; i.e. it is obliged to treat objects and their relations merely under a set of categories, the highest of which are those of causality and reciprocity, and it is incapable of attaining to the conception of their organic unity. In other

words, it is able to reach only a synthetic unity of given differences, and it cannot discover a principle of unity out of which the differences spring and to which they return. Now philosophy goes beyond science just because, along with the idea of the relativity of things to the mind, it brings in the conception of such a unity. Tts highest aim is, therefore, not merely, as Kant still held, to secure a place for the supersensible beyond the region of experience, but to reinterpret experience, in the light of a unity which is presupposed in it, but which cannot be made conscious or explicit until the relation of experience to the thinking self is seen,—the unity of all things with each other and with the mind that knows them.

2. Relation of Metaphysic to Psychology.—It has already been shown that the doctrine that the thinking subject is presupposed in all objects of knowledge—or, in other words, that existence means existence for a conscious self —1s not to be taken in a psychological sense. The idea that all science is based on psychology, and that, therefore,

1 Hegel, vii. p. 18.

metaphysic and psychology are identical, cannot be retained by any one who has entered into the full meaninggof the Kantian criticism. It is, however, so natural a mi8inter- | pretation of it, and it is so much favoured by the letter of | the very book in which it was first decisively refuted, that it will be useful to point out more directly the fallacy involved in it, especially as this will place us in a better position to determine the true relation of the two parts of philosophy thus confounded.

| The misunderstanding first took a definite form in the introduction to Locke's Hssay, in which he proposes to | provide against any undue application of the intellectual _ powers of man to problems which are too high for them, | by first examining and measuring the powers themselves. | Stated in this way, it is obvious that the proposal | involves an absurdity ; for we have nothing to measure with, except the very powers that are to be measured. To see round our knowledge and find its boundary, we must stand outside of it, and where is such a standing ground to be found? We cannot by knowing prescribe limits to _ knowledge, or, if we seem to be able to do so, it can only | be because we compare our actual knowledge with some idea of knowledge which we presuppose. In this way the ancient sceptics—and modern writers like Sir W. Hamilton and Mr Spencer who have followed them—turned the _ duality involved in the idea of knowledge against its unity, and argued that, because we cannot know the object except as different from and related to the subject, we cannot know it as it is in itself. Obviously in this _ argument it is involved that in true or absolute knowledge | the object must not be distinguished at all from the subject, | —to which the easy answer is that without such distine- tion knowledge would be impossible. The sceptic argu- _ment, therefore, lands us in the unhappy case pictured in the German proverb: "If water chokes us, what shall we drink?" The object cannot be known if it ds distinguished from the subject, and it cannot be known if it is not distinguished from the subject. Obviously the one objection is as good as the other, and both combined _ only show that the idea of knowledge involves distinction | as well as unity, and unity as well as distinction. The sceptic insists on one of these characteristics to the exclusion _ of the other, and condemns our actual knowledge because it contains both. In Kant there is undoubtedly some trace | of the same fallacy, in so far as the idea by contrast with which he condemns the objects of experience as pheno- 'menal is the idea of an abstract identity without any difference ; but we have seen that with him this abstract identity is on the point of passing into an altogether different idea—the idea of self-consciousness as the type of knowledge.

It appears, then, that the idea of measuring our powers before we employ them rests on a paralogism ; for what is really meant is that we abstract one of the elements of the idea of knowledge, and then condemn knowledge for

having other elements in it. It is possible to criticize and con- demn special conceptions as not conforming to our idea of knowledge ; but it is not possible to criticize the idea of knowledge itself ; all we can do is to explain it. It is possible to see the limited and hypothetical character of certain of our ideas or explanations of things, because we are conscious that in developing them we have left out of account certain elements necessary to the whole truth; | but this criticism itself implies, as the standard to which we appeal, a consciousness of truth and reality, a consciousness which we cannot further criticize. Here, therefore, we come upon what must seem to all who think it admissible to question the very possibility of knowledge an inevitable reasoning in a circle. We can answer objections only by means of the very idea which they dispute. But the

answer is nevertheless a good one; for the objector also stands within the very circle which he seeks to break, and has ne means of breaking it except itself. As soon as he speaks, he can be refuted by his own words ; for his doubts also presuppose that unity of the intelligence and the intelligible world which he pretends to deny.

The error, however, cannot be fully corrected until we consider what gives it plausibility. The confusion of the metaphysical with the psychological problem is due to the fact that the being who is the subject of knowledge, for whom all exists that does exist, appears to be one, and only one, of the many objects of knowledge. When we say that existence means only an existence for a thinking self, we seem to be identifying the whole world with the feelings and ideas of men, ¢.¢., with certain phenomena that belong to the life of a class of beings which only forms a part of that world, —phenomena, moreover, that are not exactly the same in any two of that class of beings. If we are to escape this difficulty it is obvious that we must be able to separate the conscious self or subject, as it is implied in all knowledge, from the nature of man as a being who “though formally self-conscious ” is yet “part of this par- tial world,” ¢.¢., one of the objects which we know along with and in distinction from other objects, and in whom “the self-consciousness which is in itself complete, and which in its completeness includes the world as its object,” is only progressively

realized! Metaphysic has to deal with con- ditions of the knowable, and hence with self-consciousness as that unity which is implied in all that is and is known. Psychology has to inquire how this self-consciousness is realized or developed in man, in whom the consciousness of self grows with the consciousness of a world in space and time, of which he individually is only a part, and to parts of which only he stands in immediate relation. In con- sidering the former question we are considering the sphere within which all knowledge and all objects of knowledge are contained. In considering the latter we are selecting one particular object or class of objects within this sphere,— although no doubt it must make a great difference in our treatment of this object that we have to consider it as existing not only for us but for itself. If nature " becomes self-conscious in man," it is impossible to treat man merely aS One among the other objects of nature. But it is not less true that he zs one of those objects, and, in this point of view, the department of sciencé and philosophy that deals with his life is as distinct from metaphysic— which deals with the conditions of all knowing and being —as is astronomy or physics. In both cases we have before us objects which we may consider in themselves apart from their relations to the conscious subject, and in both cases we must take cognizance of these relations if we would have a complete and final view of those objects. It is possible to have a purely objective anthropology or psychology—which abstracts from the relation of man to the mind that knows him—just as it is possible to have a purely objective science of nature. Such a natural science of man, however, will necessarily abstract at the same time from the fact that in man is manifested that universal principle in relation to which all things are and are known. Tn other words, it will omit that distinctive characteristic of man's being in virtue of which he is a subject of knowledge and a moral agent. Hence the abstraction in this case is more likely to lead to positive error, more likely to produce not only an imperfect but a distorted view of the object. Inorganic nature, if we take it in itself, is not untruly viewed, under the categories of causality and reciprocity, as a collection of objects externally determined by each other ; the error lies only in taking it as if it could exist

} Hume, vol. i. p. 181 (Green's edition).

in itself. Even organic beings do not suffer much injustice in being brought under such categories ; for, though, as living and still more as sensitive beings, they involve in themselves and in their relation to the world a kind of unity of differences to which the categories of external relation imperfectly correspond, yet they are not such unities for themselves, but only for us. In other words, the principle through which they are and are known is still external to them. Hence also they are determined by outward influences, though these influences act rather as stimuli to what we may call the self-determined movement of their own life than as mechanical or chemical forces which change it. But in man, in so far as he is self-con- sclous,—and it is self-consciousness that makes him man, —the unity through which all things are and are known is manifested; and therefore he is emancipated, or at least is continually emancipating himself, from the law of external influence. Nature and necessity exist for him as that from which his life starts, in relation to which he becomes conscious of himself, against which he has to assert himself, and in the complete overcoming of which lies the end of all his endeavour. Nature is the negative rather than the positive starting-point of his existence, the presupposition against which he reacts rather than that on which he proceeds ; and, therefore, to treat him simply as a natural being is even more inaccurate and misleading than to forget or deny his relation to nature altogether. A true psychology must, however, avoid both errors : it must conceive man as‘at once spiritual and natural ; it must find a reconciliation of freedom and necessity. It must face all the difficulties involved in the conception of the absolute principle of self-consciousness,—through which all things are and are known,—as manifesting itsclf in the life of a being like man, who ‘comes to himself” only by a long process of development out of the uncon- sciousness of a merely animal existence.

This problem first presented itself in a distinct form in the discussions of the Socratic school as to the nature of knowledge, discussions which turn mainly upon the relation of the conscious to the unconscious element in thought. Socrates, by his method more than by any direct state- ment, drew attention to the fact that all particular judg- ments in morals involve or presuppose a universal principle. At the same time he pointed out that, so far from this universal principle being known to those who are con- tinually making such judgments, they are not even conscious of its existence. They

constantly use general terms whose meaning they have never even thought of defining. The beginning of a rational life for them must therefore lie in their becoming conscious of their ignorance, a… conscious that they have been all along judging, and therefore acting, on untested and even unknown assump- tions. They must bring the unconscious universal to the light of day and define it, for until that is done it is impossible to live a moral, that is, a rational life. ‘‘ Virtue is knowledge,” 2.¢., it is acting, not according to opinions, or particular judgments,—whose universal is unknown, and which therefore may be regarded as expressing merely the impulses or habits of the individual,—but in view of a universal principle determined by reason.

The onesidedness of this view—which absolutely con- demns as vice all virtue that is not based on conscious principle—was partly corrected by another part of the doctrine of Socrates, who taught that knowledge is some- thing that must be evolved from within the mind, and not merely communicated to it from without. For this implies that the moral principle may be present in men’s minds, and may rule their thoughts and actions, long before they become directly conscious of it. They are rational although they have never thought about reason, and they.

do not wait for scientific ethics to judge and act morally, any more than they wait for logic to reason correctly. It is this line of thought which is universalized and mythically expressed by Plato in his doctrine of “ reminiscence.” According to this myth, we were conscious of ideas or universals in our pre-natal state; we forgot them in the shock of birth into this mortal life; but in feeling or sharing the rapture of the poet or the lover we recall them as identified or confused with individual objects which “are like them, or partake in them.” The same explana- tion is given of the practical skill of the general and the statesman, and even of the “ right opinion” which guides the ordinary good man. Such opinion is neither knowledge nor ignorance: not knowledge, for general principles or ideas are not in it present to the mind as ideas, and there- fore the particular cannot be distinctly subsumed under them ; yet not ignorance, for the ideas are after all present, though wrapped up in the particulars or confused with them.

Nay, in the Theetetus, Plato endeavours to show that the pure particular without the universal, sensations without ideas, cannot enter into our consciousness at all, and that therefore the lowest point to which a conscious being can descend is “opinion,” in which particular and universal, sensible and intelligible, are mingled together. In other words, no conscious being can apprehend the particular except through the universal, though that uni- versal may be present only wm consciousness and not to it. The task of philosophy is therefore only to make men “recollect themselves,” ze, to make self-conscious that universality of thought in which all rational beings “partake,” or which, in the language of later philosophy, constitutes reason. The imperfection of Plato’s view lay, however, in this, that, while he clearly recognized that the condition of all consciousness of the particular is the universal, he did not see with equal clearness that the universal has a meaning only in relation to the particular. And this tendency to separate universal from particular is naturally accompanied by a tendency to set the subjective against the objective, and to regard the world, not as the manifestation of reason, but as a dualistic world, in which reason is chained to a lower principle—a world which can at best only give a hint or suggestion to the mind to enable it to recollect itself and recover for itself its own treasures. Thus the false method of introspection, the “high priort road” of mysticism, was at least opened up by Plato, if he did not altogether forsake the narrower and harder way to the spiritual world through nature and experience.

The great step in advance taken by Aristotle was due to his seeing the danger of this tendency. Those, however, who have maintained that Aristotle is the great a posteriori philosopher,—as Plato is the great @ priori philosopher,— have entirely mistaken the bearing of Aristotle’s criticism of the Platonic theory. As strongly as Plato does Aristotle maintain that reason is Suvdme. mévra ra voyntd, and that, therefore, the apprehension of truth by the mind is not a mere external communication of it to the mind, but rather is the mind coming to a consciousness of itself, As firmly as Plato does he declare that truth in its highest form is self-evidencing, 7.e., that the principles of science, the laws of nature, when once they have been discovered, are seen to be true by their own light. His statements to this effect have been neglected or explained away, because they were supposed to be inconsistent with his still more frequently reiterated assertions that it

is only from experience and by induction that the truth of things can be discovered. Writers of a later day,—who came to Aristotle with an idea of a fixed opposition between a proort and a posteriori, and who held that the only possible alternatives were either to divide knowledge between the

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two or to explain away one of them,—could not comprehend that Aristotle might be in earnest both in asserting that knowledge is derived from experience and in asserting that it is an apprehension by reason of that which is identical with itself and needs no extraneous evidence. But Aristotle started with no such fixed opposition. On the contrary, any one who reads the last chapter of the Posterior Analytics will see that he had no difficulty in maintaining that knowledge begins in the apprehension of 76 Kal' éxaorov in sense perception, and that it proceeds from many perceptions to experience, and from many experiences to science ; while at the same time he declared that the principles of science have their evidence in them- selves. And the meaning of this declaration is shown in the De Anima, where we find him speaking of knowledge as the realization in the ' passive reason " of man of an "active reason " which is eternal and unchangeable, and which in the consciousness of itself includes the knowledge of all things. Of this realization, indeed, there is in man only the potentiality or capacity, but just because this is a pure or universal capacity, because, as Aristotle puts it, it has no quality or determination of its own to stand between it and its objects, it is a capacity in which the absolute reason can realize itself, a capacity of knowing all things. Here we have Plato's myth of reminiscence freed from the metaphor of memory, and reduced to scientific terms; for that myth simply meant that the evolution of knowledge is the development of the mind to the consciousness of itself, and of all that is potentially in it. Only, by the combination of this doctrine with the idea of the necessity of induction, Aristotle at the same time guards against the purely subjective interpretation to which in Plato it was liable. For the process by which the mind "comes to itself" is conceived as a process by which at the same time it rises from the particular to the universal, from the yropipa ypiv to the yrapysa drAGs, from the bare apprehension of the facts of experience to the knowledge of them through their principles or laws.

Yet Aristotle was as little able as Plato to work out fully a theory of the relation between the universal and the individual reason; and the cause of this failure was in both cases. substantially the same. In Plato's philosophy, the ideal tended to divorce itself from the phenomenal world in such wise that the latter was regarded only as suggesting or partaking in the former, but not as entirely explicable by it. It was not merely that, to the mind of the individual in its progress, the veil was only gradually lifted from the rationality of the world, but that in the world there. was an irrational element from which the mind could save itself only by flight inta the region of abstrac- tion. And, though Aristotle by his doctrine of the essential relation of ideas to experience, or of the development of the mind to the acquisition of knowledge of the world, seemed to be on the way to correct this error, yet he too shrinks from regarding the phenomenal world as in itself intelligible. To him also an irrational matter mingles with things, and is in them a source of contingency and imper- fection. Chance is not merely the reflexion upon the world of our imperfect knowledge, but a fact of experience, and there is therefore a region in which our best science cannot rise above generality to universality. In this way there remains for Aristotle an absolute a posteriori, a reality which cannot be understood, and which we can scarcely conceive as existing at all for the divine intelligence. At this point the Aristotelian philosophy appears to stand between two alternatives, either that, in the sense of pantheism, the finite world and its contingency is an illusion, or that it is con- tingent only for the growing intelligence of man, which fully understands neither itself nor the world which is its object. Aristotle, however, does not choose either horn of

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the dilemma, and leaves us therefore with an unresolved dualism between thought and its object; and this again necessarily involves a dualism between the active reason, which, as he asserts, realizes itself in man, and the passive reason which constitutes his nature as a finite being.

In the Middle Ages the Platonic and Aristotelian idea that the apprehension of objective truth is one with the evolution of the mind to self-consciousness seemed to be entirely lost. Knowledge of the finite world was regarded as indifferent, and knowledge of the infinite was conceived to

be something given on authority, and in reference to which the mind was confined to an attitude of passive reception or implicit faith, No greater slavery of the spirit can be conceived than that in which even the truths of religion and morality—the truths that regard the inmost life of the spirit itself—were taken as a lesson to be learned by rote from the lips of a teacher. Yet the consciousness that such truth, if it was to be received by the mind, still more if it was to transform the mind, could not be entirely foreign to it, found a voice in the scholastic philosophy. And the compromise or truce between faith and reason expressed in the saying of Anselm credo ut intelligam,—according to which reason was to confine itself to the analysis and demonstration of the data received in implicit faith from the church,—prepared the way for the recognition that the two are not essentially at variance. The mind that proceeds from veneratio to delectatio, from awe and submission to the doctrine to enjoyment and appreciation of it, must already in its awe and submission have the beginnings of an intelligent appreciation. Anselm's saying might be understood simply as meaning that we must have spiritual experience ere we can understand the things of the spirit. And in this sense it was adopted by the Reformers to express an idea almost the opposite of that with which the scholastics had associated it,—the idea that the direct apprehension of spiritual truth as entering into the inner life of the subject, as identified with his very consciousness of self, is the basis of all knowledge of it. In the Protestant church of the period after the Reformation, we find a growing tendency to insist on the subjectivity of religion, in the same exclusive and one-sided way in which the medieval church had insisted on its objectivity. In some extreme representa- tives of Protestantism this went so far as to lead to a disregard, almost to a rejection, of all objective doctrine, and a reduction of theology to an account of the religious consciousness. On the other hand, while religion was thus made subjective, science claimed to be purely objective, and the followers of Bacon seemed to adopt towards nature the same attitude of passive receptivity which the medizval Christian was taught to hold towards the church. While man was to learn everything from himself in religion, he was to learn nothing from himself in science. His aim must be to exclude subjective idola, in other words, to accept the facts as they were given, and keep himself out of the way. The inevitable result of this difference of view as to the nature of knowledge in these two different regions was, however, on the one hand a withdrawal of religion from all

connexion with finite interests, and, especially from the attempt to connect religious principles with the knowledge of the finite world, and, on the other hand, an increasing tendency in those who represented finite science to regard religion as something merely subjective and even individual, as a feeling which could not be translated into thought or made the basis of any knowledge of the objective world.

The opposite principles of certitude which were thus set up for religious truth and truth of science need only to be brought together and contrasted to betray that they test upon opposite abstractions, neither of which expresses

the complete nature of truth or knowledge. On the one hand the truths of religion were maintained just because they were not, or were not merely, objective, but were capable of being tested by inner experience, and identified with the self-consciousness of the individual. On the other hand the truths of science were maintained because they were not, or were not merely, subjective, but were capable of being verified in objective experience. It was rightly seen on the one side that mere subjective feelings or opinions have no validity for any one but the subject of them, and on the other side that what is merely objective or externally given can have permanent value and interest for the intelligence only as it ceases to be mere isolated and unrelated fact—nay, that, even when science has discovered law and order in nature, it still wants the highest value and interest so long as that law and order are not seen as standing in essential relation to the intelligence itself. The idea of truth or knowledge as that which is at once objective and subjective, as the unity of things with the mind that knows them, enables us to understand the con- demnation which the religious mind passed upon a merely external dogma, and even its lack of interest in a science which presented itself as an account of merely objective or external facts. And it enables us also to understand the way in which scientific men insisted upon objective fact as the basis of all knowledge, and the disrespect which they felt for a religion which seemed to admit that it had no such support. What is wanted to clear up the confusion on both sides is the growth of the perception among scientific men that the objectivity which they are seeking cannot be mere objectivity (which would be unmeaning),

but an objectivity that stands in essential relation to the intelligence, and, on the other hand, the growth of the perception among religious men that the subjectivity of religion only means that God, who is the objective principle by whom things are, and are known, is spiritual, and can therefore be revealed to the spirit. When these two cor- rections have been made, it must become obvious that the religious consciousness is not the consciousness of another object than that which is present in finite experience and science, but simply a higher way of knowing the same object. And in this it is also involved that the two ideas of a priori and a posteriori, of that which is evolved from within and that which is given from without, are not essentially opposed to each other, but that the a posteriori is simply the first form of a consciousness which in its ultimate development must become a priori.

In that philosophy of compromise which was initiated by Descartes, one part of knowledge was regarded as innate, or developed from within, and another part as empirical, or imparted from without. In the second period of the history of modern philosophy this compromise was broken, and the names of Locke and Leibnitz—though with some hesitation on both sides—represent respectively the theories that all knowledge is a postertort and that all knowledge is a priort. The compromise seemed to be renewed with Kant, but the form in which it was renewed pointed, as has been already shown, to something more than a com- promise, for his doctrine was that the a postercor: element, the facts, exist for us only under a priori conditions, or, in other words, that what is usually called a posteriors is in part @ priort. The criticism of this view need not be repeated. It is sufficient here to say that if, as Kant shows, the elements are inseparable or organically united, it is impossible to allege that so much belongs to the one and so much tothe other. Furthermore, the consciousness of an essential difference in the elements of knowledge is possible only so far as that difference is transcended by the unity of knowledge. We can distinguish the a priori from the a posteriori only on condition that we can transcend

the distinction, and this means that the distinction itself is not absolute, but that there is a point of view from which the a posterior? may be regarded as

a priori, and that which is given from without to the spirit may be referred to its own self-determined development. — : Now it is just here that we come upon the turning-point of the philosophical controversy, in the form which it has taken in modern times. The problem may be expressed thus— In what sense can we apply the idea of development to the human spirit? Are we to treat that development as merely adetermination from without, or as an evolution from within, or as partly the one and partly the other? In a sense all writers of the present day would admit that this last is the case. For, on the one hand, even the Darwinian theory accounts for development by aid of what we may call the a priort tendency of the individual to maintain itself in the struggle for existence, though it supposes that the condition or medium in which the indi- vidual is placed determines the direction in which that development proceeds. And, on the other hand, no one now would adopt the Leibnitzian theory that the indi- vidual is a monad, whose self-development is entirely con- ditioned by itself in such a sense that all the relations which it has to other existences are merely apparent, and that the coincidence of its life with the life of the world is the result of a pre-established harmony. On both sides, therefore, the idea of self-determination would be admitted, though the tendency of the Darwinians would be to regard this self-determination as something merely formal; and on both sides it would also be admitted that the self-determination does not exclude a determination from with- out, though extreme opponents of Darwin might be inclined to reduce this determination to a mere stimulus or external condition of the development of the nature of the subject to which the stimulus is applied. The question, however, remains whether, after all, this opposition of without and within is an absolute one, or whether there is any point of view from which it may be transcended. To Aristotle it seemed possible to answer this question in the affirmative, because he conceived that the reason of man is a pure or universal dvvayis, the evolution of which to complete self- consciousness is one with the process whereby the objective world comes to be known. Yet, as Aristotle admitted the existence in the world of a material principle which was essentially different from the ideal principle of reason, he was obliged to limit his statement as to the possible unity of the subjective and the objective consciousness, and to say merely that “in things without matter the knower is identical with the known.” But this would immediately lead to the conclusion that the pure development of reason must be secured

by abstraction from all finite and material objects, rather than by a thorough comprehension of them. The freedom of the spirit, on this theory, must be a negative and not a positive freedom, a freedom won, not by over- coming the world, but by withdrawing ourselves from its influence. It remained, therefore, for modern philosophy to work out the Aristotelian idea that the rational being as such, in spite of its necessary relation to and depend- ence on an external world, is never in an absolute sense externally determined. And, as we have already seen, the Kantian philosophy brought this problem within the reach of solution, in so far as it showed, first, that objective existence can have no meaning except existence for a thinking self, and, secondly, that existence for a thinking self means existence the consciousness of which is " capable of being combined with the consciousness of self." Add further to these propositions what was shown by Kant's successors, that that only can be combined with the con- sciousness of self which is essentially related to it, and we arrive at an idealistic theory of the world, which enables

us at once to understand the relative value of the distinc- tion between self-determination and determination from without, and at the same time to see that its value is only relative. If it be true that nothing exists which is not a possible object of consciousness, and again that there is no possible object of consciousness which is not essentially related to self-consciousness, then the phenomena of the external world, which at first present themselves under the aspect of contingent facts, must be capable of being ulti- mately recognized as the manifestation of reason; and the history of the conscious being in his relations with that world is not a struggle between two independent and unrelated forces, but the evolution by antagonism of one spiritual principle. It is, on this view, the same life which within us is striving for developnient, and which without us conditions that development. And the reason why the two terms, the self and the not-self, thus appear to be independent of each other, or to be brought together only as they externally act or react upon each other, lies in this, that the object is imperfectly known, and the subject is imperfectly self-conscious. This, however, does not make it less true that in self-consciousness is to be found the prin- ciple in reference to which the whole process may be explained, and therefore that the self-conscious subject, as such, lives a life which

belongs to him, not merely as one object among others, but as having in himself the principle from which the life and being of all proceeds.

From this point of view, as has been already indicated, the relative value of a theory of human development, such as that which might be based on the ideas of Darwin, would not bedenied. The conscious being may be regarded simply as an externally determined object, and the incorrect- ness of this assumption will not entirely destroy the value of the results attained, especially if, as is often the case with those who seek to construct a natural science of man, the assumption itself is not very strictly adhered to, but corrected by the tacit admission of other conceptions some- what inconsistent with it. But, at the same time, it would require to be pointed out that such a science is necessarily abstract and imperfect, as it omits from its view the central fact in the life of the object of which it treats. It can do nothing to account for man's consciousness, or his capacity of becoming conscious, of the influences by which he is supposed to be determined; or, to put it from the other side, it takes for granted that the objects that influence man are intelligible objects, "capable of being combined with the consciousness of self," without seeing how much is involved in this assumption. Now it is evident that the consciousness of an influence cannot be explained by the influence itself, nor even by that taken together with the nature of the sensitive beings subjected to it. It is evident also that an influence mediated by consciousness is not, strictly speaking, an external influence, but that it is already transformed, and in process of being further transformed, by the development of the self to which it is present. For the dawn of consciousness, in which the external object first comes into existence for us as opposed to the self, is at the same time the beginning of the process by which its externality is negated or over- come. Self-consciousness is that which makes us indi- viduals in a sense in which individuality can be predicated of none but a self-conscious being. For, in determining himself as a self, the individual at the same time excludes from himself every other thing and being, and determines them as external objects. He emancipates himself from the world at the same time that he repels the world from himself. Yet this movement of thought, by which his individuality is constituted, is also that by which he is lifted above mere individuality, for, in becoming conscious of self and not-self in their opposition and relation, he ceases to

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be simply identified with the one to the exclusion of the other. His finite individuality is regarded by him from a universal point of view, in which it has no less and no more importance than any other individuality, or in which its greater or less importance is determined only by its place in the whole. On this universality of consciousness rests the possibility of science and of morality. For all science is just a contemplation of the world 7 ordine ad universum and not in ordine ad indinduum ; and all morality is just action with a view to an interest which belongs to the agent, not as this individual, but as a member of a greater whole, and ultimately of the absolute whole in which all men and all things are included.

In this nature of the conscious subject lies ‘also the possibility of metaphysic in the sense of Aristotle, as that science which goes back to a zparov dice, a beginning which is prior to the existence in consciousness of the individual self, and onward to an end in which the divisions of the finite consciousness are transcended,—as including, in short, ontology, or metaphysic in the narrower sense, on the one side, and theology, or the philosophy of religion, on the other. In truth, these two extremes of science are necessarily bound together: we can only go back to the beginning if we can go on to the end; we can only recover the first unity if we can anticipate the last. Or, to free the subject more definitely from the associations of. time, we cannot apprehend the unity which is involved or pre- supposed in all the differences of our conscious life except in so far as we can look at our individual existence from the point of view of the whole to which it belongs. This will become evident if we consider the nature of the limits which have to be transcended by such a science. The individual conscious subject, as he finds himself at first, is but one being in a world that stretches out, apparently without limits, on every side of him. Of the things by which he is immediately surrounded he sees but a small part, and the influences which he receives from them are, as he knows, like the wave that breaks upon a shore from an unknown ocean, only the last partial expression of impulses that come from regions beyond his ken. Again, he finds himself as

one in a changing series of beings, of which he knows only the last preceding terms, and he is aware that in a few years he, as one of this series, will cease to be. He is thus to himself a definitely limited being, and though his knowledge of himself and his world may be gradually widened so as to reach some little way back into the past, and anticipate a little of the future, or may go outwards in space to embrace a widening circle of existences around him, yet he always stops at a limit, of which he is conscious that it is no absolute limit, but simply an arbitrary halting-place where vision grows indistinct and imperfect. When he reflects upon himself from this point of view, he is forced to regard himself as but a fragment, and a fragment of an unknown whole, by which his whole being is determined to be what it is. His highest knowledge seems to be but a consciousness of his ignorance, his highest freedom a determination by motives the ultimate meaning of which is hid from him.

So far there seems to be no room for any metaphysical knowledge, any knowledge of ourselves and our world which is other than relative and in ordine ad individuum. But further reflexion shows that in this very consciousness of limit there is implied a consciousness of that which is beyond limit. While we proceed from part to part, beginning with ourselves and our immediate surroundings, and follow- ing out lines of connexion that lose themselves in the dis- tance, we are guided by a consciousness of the whole as a unity through which the parts are determined. Nay, it is Just the presence of this consciousness that makes us capable of what seems the piecework of our knowledge, in which,

by the aid of the principle of causality, we connect parti- cular with particular, and so gradually extend the sphere of light into the encompassing darkness. For that principle simply means that the limited external object does not sufficiently explain to us its own existence, and that therefore we are forced to explain it by a reference to something beyond it. It means, in other words, that we cannot rest in that which is not a _ self-bounded, self-determined whole. The application of the category of external determination has therefore an essential reference to the higher category of self-determination. The mere endlessness of space and time has no meaning

except in opposition, yet in relation, to the true infinity of which we find the type in self-conscious thought. Or, to put it in the Kantian form in which it is already familiar to us, the consciousness of the objective world in space and time stands in essential relation to the unity of self-conscious- ness. And if when we regard the former exclusively we are forced to view ourselves as insignificant and short- sighted finite beings in an infinite universe, gvhen we regard the latter we are enabled to see that 4 all this universe there is revealed only that spiritual principle which we find also in ourselves. In this way a new light is thrown on our first consciousness of ignorance. The strivings of our reason after knowledge can no longer be regarded as strivings after an unknown goal, but rather after a goal which it has prescribed for itself. The narrow limits of our individual life are not removed, but they cease to be for us the limits of a narrow circle of definition within a formless infinite. They become the limits of a sphere within a sphere, a sphere which is defined by the idea of knowledge or self-consciousness itself, and in which therefore, however we may wander, we are everywhere at home. In religious language, the sphere is not a mere universe, but God, who is without us only as He is within us, so that “by the God within we can understand the God without.”

Again, as this consciousness takes man beyond his immediate existence, and enables him to determine it in relation to an absolute unity of all things in God, so it enables him to go back to a unity which is behind or prior to that existence. For, if the individual can look at himself as he looks at others, and at others as he looks at himself, 2.¢., from a point of view which is unaffected by his individuality, and in which that individuality is for him only what it is for impartial reason, he can have nothing in him which binds his consciousness to his individuality as mere individuality ; as therefore he can go beyond himself to apprehend the whole in which his individuality has a place, there is nothing to prevent him from going back upon himself, and upon the conditions which are prior to his own individual being. Heis not tied to his immediate life, and can go below it just as he can rise above it.

“O God, I think Thy thoughts after Thee,” said Kepler. In reading the “thoughts” written in the planetary system, Kepler was discovering the meaning of that which is simpler and more elementary than the existence of

man, as a cycle of mechanical relations are simpler and more elementary than self-consciousness. Yet it was a true feeling that led him to connect this descent into the mechanical world with God. For it is only in virtue of the same faculty which enables us to rise to the absolute life which includes and subordinates our own that we can so free us from the image of our own conscious life as to apprehend and fix in thought the simpler relations of purely physical existence. But the same faculty of going back upon ourselves has a still deeper manifestation. Not only can we abstract from ourselves so as to under- stand the inorganic world, we can also abstract from our- selves so as to understand the conditions which are prior

to the thought, and therefore to the existence, of any objective external world at all, the universal conditions of the knowable and therefore also of reality. In doing so, to use Hegel's metaphor, which is but an extension of Kepler's, we are "thinking what God thought and was before the creation of the world," @.e., we are thinking the spiritual unity presupposed in all knowledge, and therefore in all objects of knowledge—the consciousness in relation to which everything is, and is known.

3. The Relation of Logic to Metaphysic.—The ordinary view of logic is based on two presuppositions which tend to separate it almost entirely from metaphysic : itis based on the presupposition of an opposition, or at least a merely , external relation, between thought and its object, and again of an opposition, or merely external relation, between the form or method and the content or matter of thought. The intelligence is regarded as dealing with an object which is given to it externally, and to which, therefore, it can be true only if it leaves it unchanged and introduces into it nothing of its own. Truth, to use a well-known definition, is the agreement of our conceptions with their objects, and in bringing about this agreement all the concessions must be on the side of thought. Conformably to this view, the processes of thought must be purely analytic; 7.e., thought may break up the given idea of the object into its con- stituent elements, and again out of these elements it may recompose the idea in its unity, but it can add nothing and take nothing away. It is like an instrument which alternately dissects a solid mass into smaller parts and again mechanically presses them together, but which

never penetrates and dissolves the hard matter, still less fuses it into a new form by bringing it into contact with new chemical elements.

This conception, like much of the philosophy of which it is a specimen, is a kind of exaggerated caricature of one aspect of the philosophy of Aristotle. Aristotle is the great analytic philosopher. He first laid down boundaries in that continuous domain of science which Plato had first | surveyed. Not that he ever completely lost sight of the unity or continuity of the different sciences which he thus distinguished. His unrivalled speculative genius is shown nowhere more clearly than in those not unfrequent utterances of speculative insight into the unity of things different, by which, as at a stroke, he makes his own landmarks and all landmarks to disappear. Yet such utterances generally stand by themselves, and do not alter the general analytic spirit of his philosophy. They are not so developed as to show distinctly the merely relative character of the divisions and distinctions which are set up, or the limits of the sphere within which they hold good. Hence it was easy for minds which possessed something of Aristotle's keenness of understanding without his speculative depth to neglect such expressions, or to explain them away. And this process of degradation was the more rapid as the philosophy of Aristotle soon ceased to be studied in his own writings, and became a traditionary possession of the schools. In this way we may partly explain how logic came to be regarded by medieval philosophy as a form of thought which could be altogether separated from the matter, and by the application of which that matter could be in no way affected or changed. But for such a view, indeed, it is difficult to conceive how the schoolmen could have ventured to apply any logical processes at all to the sacred matter of dogma. The idea of externally adding anything to the faith once delivered to the saints was excluded by the principle of authority ; and the idea of developing out of that faith anything that was not immediately contained in it had not yet presented itself to any one. Hence the business of thought seemed to be purely formal and analytic, and it was only on the plea of its being such that

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its activity could be tolerated at all. Nor was this view of logic at once changed by the revolt against scholasticism. The first philosophical

exponents of the modern scientific movement, while they rejected the matter of dogma as fictitious, or at least as transcending the sphere of positive knowledge, and while they substituted in its place, as the object of investigation, the facts of experience, did not realize any more than the schoolmen that the form and method of knowledge could be other than analytic of given matter. Bacon, their protagonist, was above all solicitous to guard against any subjective anticipatio nature; nor did he see that the questions which, in his theory of forms, he proposed that science should ask of nature themselves involved any preconceived theory regarding it. Conscious, as every true scientific man must be, that the study of nature involves a constant self-abnegation, a patient self- distrustful course of experiment and observation, he and his followers did not realize the presuppositions that make the inquiry possible, and by which it must be guided. Still less did they recognize that the separation between the mind and its object which they took for granted can only be a relative division, 7.¢, a division on the basis of a unity, and that therefore the self-abnegation of the mind in its investigation of facts cannot be an absolute self-abnegation, but is only the first step on the way to the discovery that the facts are intelligible, and so essentially related to the intelligence. Hence to them logic still seemed a mere analytic process, the end and aim of which was understood to be that a world, existing in itself out of relation to thought, should be reproduced in a more or less imperfect image am thought. And, when it came to be suspected by a less naive philosophy of experience that, after all, certain presuppositions, not given in experience itself, were involved in the scientific interpretation of it, various expedients were devised to reduce these presupposi- tions in an indirect way to empirical truths,—expedients of which Mill’s attempt to base the law of causality upon an inductio per enumerationem simplicem may be taken as the type.

When we go back to Aristotle,—who was the “ founder of logic” in the sense that he was the first who treated logical method as a separate branch of science,—we find that his division of logic from metaphysic is by no means so definite and complete as it was made by some of his successors. The verification of the highest principle of thought, the law of contradiction, is treated by him as the business of metaphysic. And, though he separates the idea of truth from the idea of reality, and regards the former

as involving a relation of thought to a reality which is determined in itself independent of that relation, yet he does not regard this independence as by any means absolute. Truth is defined by him as a connexion or distinction of ideas which corresponds to a union or separation of things, but does not necessarily so correspond. This definition, however, holds good only in so far as things are not scientifically known, or in so far as things not essentially related are brought together xara ovpP_eByxds. Where necessity comes in, and is apprehended by reason, the case is different. For in that case we have not merely an external synthesis, but an essential identity, 7.e., a unity of elements which can neither be, nor be known, apart from each other. In relation to the principles of science, therefore, Aristotle holds that error, ¢.e., a corinexion of ideas not corresponding to a connexion of things, is impos- sible, and that the only alternatives are knowledge and ig- norance. Either we possess the idea or we do not possess it; as Aristotle otherwise expresses it, in thought we are either in contact with the things or not in contact with them; there is no third possibility. The meaning of Aristotle becomes clearer when we remember that, according to his

view, the intelligence, in apprehending the indivisible unity of elements in the object, is at the same time apprehending the unity of the object with itself. The mind cannot be deceived in regard to that which forms a part of its con- sciousness of itself. In freeing the essential conception of the object from the contingency of matter, science has freed the object from that which made it foreign to intelligence, and the relation of thought to things ceases to be one of correspondence, and becomes one of identity.

The legitimate inference from this view of the relation of the intelligence to the intelligible world would seem to be that the partial separation of thought from its object and its imperfect correspondence with it is characteristic of our first empirical consciousness of things, and of the progress from that consciousness to science, but that in completed science the division ceases. The esse of things is not their percipi, but their entelligi. But, if this be taken as the truth, then it can no longer be supposed that the process by which scientific knowledge is attained con- sists simply in an analysis of the object as it is given in immediate perception. On the contrary, it must be

held that, if our thought has to submit itself to the object, and to be brought into conformity with it, by a process of induction, it is equally true that in this process the object also must be changed, that it may be brought into con- formity with the principle of thought. The genesis of science, according to this view, is not merely an analysis of given facts, but a process of vital transformation by which consciousness on the one side and the object on the other are brought into unity with each other. The idea, indeed, of an empty process, a process in which the activity of the mind is merely formal, is one which will not stand the slightest examination. A mind without categories, if such a thing were conceivable, would have no questions to ask in relation to the object presented to it, and could therefore get no answers. Those who make a pretence of approaching a subject in an absolutely receptive attitude, and without any presuppositions, only show that they are unconscious of the categories by which their thought is ruled; and they will be most slavishly guided by these categories just because they are unconscious of them. The schoolmen, when they applied their logical principles to the matter of Christian dogma, did not recognize that they were doing more than analysing and bringing out clearly the meaning of that dogma. But the effect of their work was to turn the system of divinity into a collection of insoluble puzzles; for the doctrine was a doctrine of reconciliation between divine and human, infinite and finite, universal and particular, and the principle of their method was to treat all these oppositions as absolute. In like manner it might be shown that the analysis of social phenomena which was made in the last century was inadequate and superficial, Just because of the latent assumption of individualism on which it proceeded, and that the greater success of writers like Comte and Spencer does not arise merely or mainly from their being more careful observers of the phenomena of social life, but in great part from the fact that, rather by the unconscious movement of opinion than by any distinct metaphysic, their minds have become possessed by more adequate categories.

The idea that the process of thought is merely formal, or analytic of given matter, is, however, an error that has a truth underlying it. This is the truth expressed by Aristotle in his much misunderstood comparison of the Intelligence of man to a tabula rasa, upon which nothing at first is written, and again in his assertion—already quoted—that the mind is a pure

Svvauis, without any distinguishing quality of its own which could prevent it from apprehending the real nature of other things. In

other words, self-conscious reason is not a special thing in the world, but the principle through which all things are, and are understood ; and hence, as regards the distinction of things from each other, it is in the first instance undeter- mined and indifferent, and therefore open to be determined in one way or another, according to the object to which it is directed. But this simply means that the conscious subject, as such, is not bound to his own individuality, but can regard things, nay, in a sense, must regard them, from a point of view which is independent of it. This is what makes possible the self-restraint and self-abnegation pre- scribed to the scientific man, whose whole duty, as it is often said, is to keep himself out of the way and let the objects speak, to lay aside all subjective zdola and prejudices that stand between him and the reality of things. This at first sight may seem to be equivalent to the assertion that the mind ought to be in a state of simple passivity or receptivity towards objects. What is really meant, how- ever, is not that the intelligence should go out of itself, or cease to be itself, that it may know its object, but simply that it should show itself in its universality, or freedom from the limits of the individual nature. The self-abnega- tion of science is an endeavour, so to speak, to see the object with its own eyes, but this it can do only in so far as the consciousness for which the object is is that con- sciousness in relation to which alone all objects are, and are understood. Or, to put it in another form, the con- scious self in its scientific self-abnegation does not give itself up to another, and become purely passive ; it only gives up all activity which is not the activity of that universal thought for which and through which all things are. Hence, when it has so abnegated itself, its most intense constructive activity is just beginning, though, just so far as the self-abnegation has been real, that constructive activity has become one with the self-revelation of the object. As, however, it is only through the constructive activity of thought that there exists for us any object at all, so it is only through its continued activity that the conception of the object is changed, till it is completely revealed and known. And this activity involves a con- tinuous synthesis, by which an ever wider range of facts is brought together in an ever more

definite unity, until the mind has, if we may use the expression, exhausted its store of categories upon the world, and until the world has completely revealed itself in its unity with itself and with the mind. \

To combine these two ideas—on the one hand that science begins in a self-abnegation by which the mind renounces all subjective prejudices, and thereby attains a purely objective attitude, and on the other hand that this purely objective attitude is not a mere attitude of reception, but one in which the mind is continually transforming the object by its own categories, —to see that the universality of the mind in knowing is not mere emptiness, and that its activity is synthetic just when it is most free from all pre-suppositions extraneous to the nature of its object,—is one of the greatest difficulties of the student of metaphysic. Universality at first looks so like emptiness, and a universal activity so like a merely formal activity, that it is no wonder that the one should be mistaken for the other. But if we make such a confusion, we may soon be forced to choose between a sensationalism that makes knowledge impossible and a mysticism which makes it empty. The pure identity of thought with itself which is involved in the process of analysis is put on the one side, and the manifold matter of experience which is the object of thought on the other, and between these opposites no mediation is possible. If we take our stand upon the latter, we are forced to reject all mental synthesis as invalid, because it involves a subjective addition to the

facts; if we take our stand on the former, we are com- pelled to regard all objective experience as irrational, because it does not correspond to the pure identity of thought. J In Aristotle's view of logic it cannot be said that this difficulty is clearly solved, though he seems to have seen the error of both extremes. On the one land he often recognizes the synthetic character of the process of induc- tion, as when he speaks of the universal idea or law as a central principle, in which we must find the key to all the difficulties suggested by different aspects of a given subject. Yet in other places we trace the influence of a merely ana- lytic conception of that process as a process in which the

universal is to be reached by abstracting from the peculi-'

arities of individuals. And this conception of it is favoured by Aristotle's metaphysical theory, according to which the forms of things in the finite world are manifested in a resisting matter, a matter which prevents them from being perfectly or universally realized. Tor, in so far as this is the case, the facts will not be entirely explained by the knowledge of the form, and the knowledge of the form must be obtained, not by combining all the facts, but rather by abstracting from them. Again, in Aristotle's account of the process of thought in the Prior Analytics, he regards it as a formal deductive process; and, though in the Posterior Analytics he attempts to give a synthetic meaning to the syllogism by treating it as the method in which the properties of a thing may be proved of it, or combined with it, through its essential definition, yet this adventitious meaning bestowed upon the syllogistic process does not alter its essential nature. The ultimate source of this inadequate view of the process of thought seems to lie in Aristotle's imperfect conception of the unity or identity which is for him the type of knowledge. For, though, both in the Metaphysic and the De Anima, he defines that identity as self-consciousness or as a consciousness of objects which is identical with self-consciousness, yet he does not seem

clearly to distinguish between a unity in which there is no |

difference and a unity in which difference is transcended and reconciled. This seems to be shown by his description of the principles which reason appreliends as individua or indi- visible unities, rather than unities which imply, while they transcend, difference. Yet, in this definition of the unity of knowledge as self-consciousness, Aristotle has implicitly admitted that there is a duality or difference in the unity itself, and this might have been expected to modify his conception of the relation of consciousness to its objects. For, as self-consciousness is not simple like a chemical element, but only in the sense that it is an indissoluble unity of opposites, it might have been anticipated that one who had realized self-consciousness as the principle of knowledge would be able to regard the opposition between the consciousness of self and the consciousness of the world as itself also capable of being conceived as a unity.

This misconception of Aristotle may be shown in another way. In the Metaphysic we find him laying down what is called the logical law of

contradiction as the ultimate principle of knowledge. The meaning of this principle, however, as Aristotle states it, is simply that thought in its essence is definition or distinction. If, as Heraclitus says, everything at once is and is not, if we cannot attach any definite predicates to things by which they may be distinguished from each other, then, as Aristotle argues, thought is chaos, and knowledge is impossible. If determination be not negation, if the assertion of A be not the negation of not-A, then there is no meaning in words. The criticism to be made on this view is obviously, not that it is a false statement of the law of thought, but that it is an imperfect statement of it,

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Thought is undoubtedly distinction ;. and, if all distinction be confounded, no meaning can be apprehended or ex- pressed. But thought is also relation and connexion of the things distinguished, and this aspect of it is equally important with the other.» Aristotle shows his one-sided- ness—a one-sidedness which throws him into opposition to Plato, but which enables him to correct Plato only by falling into the opposite error—when he exclusively fixes his attention on the “ differentiating” aspect of knowledge, and takes no notice of the “integrating” aspect of it. It is easy to see that this exclusive attention to one side of the truth may lead in many ways to a distorted view both of the world and of the intelligence that apprehends it. If Heraclitus be interpreted as simply denying the right of thought to introduce its definiteness into the flux of sense, nothing but absolute scepticism can come out of his philosophy ; and Aristotle was right in maintaining that it is only as the flux is brought to a stand, and the universal is fixed as a permanent and definite object of thought,! that knowledge becomes possible. But, on the other hand, if distinction be taken as absolute, if the definite assertion of a thing be taken as a negation of all relation to what it is not, if the fixity of thought be taken as an abstract self- identity which excludes all the movement of finite things wherein they show their finitude and pass beyond them- selves into other things, then knowledge will be equally impossible. Our consciousness, on such a theory, would be disintegrated into parts which would own no connexion with each other; nor would it be possible for us to think of things as, in spite of their differences, bound together into the unity of one world. The law of contradiction or

distinction, therefore, is likely to lead to serious miscon- ceptions, unless it be complemented by a law of relation— a law expressing the truth that there is a unity which transcends all distinction. For all intelligible distinction

| —all distinction of things in the intelligible world—must

be subordinate to their unity as belonging to that world, and therefore essentially connected with each other and with the intelligence. In such a world, in other words, there can be no absolute distinctions or differences (not even between being and not-being); for distinction without relation is impossible, and a conception held in absolute isolation from all correlated conceptions ceases to have any meaning. This does not, of course, imply a negation of the law of contradiction within its own sphere, but it does imply that that sphere is limited, and that there is no absolute contradiction. All opposition is within a pre- supposed unity, and therefore points to a higher reconcilia- tion, a reconciliation which is reached when we show that the opposition is one of correlative elements.

The great step in logical theory which was taken by the idealistic philosophy of the post-Kantian period was simply to dissipate the confusion which had prevailed so long between that bare or formal identity, which is but the beginning of thought and knowledge, and that concrete unity of difference, which is its highest idea and end. It was, in other words, to correct and complete the concep- tions of thought as analytical, and as externally syntheti- cal, by the conception of it as self-determining, to show that it is a unity which manifests itself in difference and opposition, yet in all this, even when it seems to be dealing with an object which is altogether external to it, is really developing and revealing itself. This new movement of thought might, in one point of view, be described as the addition of another logic to the logic of analysis and the logic of inductive synthesis which were already in existence. But it was really more than this ; for the new logic was not merely an external addition

1 Apewhoavros Tob KabdAou év rH WuxH, An. Post., ii, 19.

wrt’ APH Y SiC

to the old logics, it also put a new meaning into these logics by bringing to light the principles that were involved in them. At the same time it broke down the division that had been supposed to exist between logic and meta-physic, between the form or method of thought and its matter. It showed that thought itself contains a matter from which it cannot be separated, and that it is only by reason of this matter that it is able to ask intelligent questions of nature, and to get from nature intelligible answers. A short space must be devoted to explain this relation of the three logics to each other.

The analytic logic fairly represents our first scientific.

attitude to the world, in which we concentrate our attention upon the facts as they are given in experience, with no thought of any mental synthesis through which they are given. ‘To ourselves we seem to have to do with an object

which is altogether independent of our thought, and what |

we need in order to know it is to keep ourselves in a purely receptive attitude. All we can do is to analyse what is given, without adding anything of our own to it. It has, however, already been pointed out that this apparent self- abnegation is possible only because, in abnegating our indi- vidual point of view, we do not abnegate the point of view that belongs to us as universal or thinking subjects. In other words, the objectivity of knowledge thus.attained is not the ceasing of the activity of our thought, but rather of all that interferes with that activity. We seem to abstract from ourselves, but what we do abstract from is only the individuality that stands between us and the world. The scientific observer who has thus denied himself, however, is not necessarily conscious of the meaning of what he has done. The immediate expression of his consciousness is not “JT think the object,” but “it, the object, is”; and the more intensely active he is the more his activity is lost for him in the object of it. His whole work is, for himself, only the analysis of given facts, and for the rest he seems to have nothing to do but to take the world as he finds it. The voice of nature to which he listens is for him not his own voice but the voice of a stranger, and it does not occur to him to reflect that n&ture could not speak to any one buta conscious self. His business is to determine

things as they present themselves, to enumerate their

qualities, to measure their quantities ; and his logic accord- ingly is a logic governed by the idea of the relative com- prehension and extension of the things which he thus names and classifies. Such an analytic logic seems to be all that is necessary, because the only predicates by which things are as yet determined are those which are involved in their presence to us in perception, and as perceived they seem to be at once given in all their reality to the mind that apprehends them.

A step is taken beyond this first naive consciousness of things, whenever a distinction is made between appearance and reality, or whenever it is seen that the things perceived are essentially related to each other, and that therefore they cannot be known by their immediate presence to sense, but only by a mind which relates that which is, to that which 1s not, immediately perceived. If "' the shows of things are least themselves," we must go beyond the shows in order to know them; we must seek out the permanent for that which is given as transient, the law for the plenomenon, the cause for the effect. The process of thought in know- ledge therefore is no longer lost in its immediate object, but is, partly at least, distinguished from it. For just in proportion as the reality is separated from the appearance does the knower become conscious of an activity of his own thought in determining things. From this point of view nature is no longer an object which spontaneously reveals itself to us, but rather one which hides its meaning from us, and out of which we must wring its secret by persistent

questioning. And, as this questioning process obviously has not its direction determined purely by the object itself, it becomes manifest that the mind must bring with it the categories by which it seeks to make nature intelligible. To ask for the causes of things, or the laws of things, pre- supposes that the immediate appearance of them does not correspond to an idea of reality which the mind brings with it, and by which it judges the appearance. Nature is supposed to be given to or perceived by us as a multi- tude of objects in space passing through successive changes in time ; and what science seeks is to discover a necessity of connexion running through

all this apparently contingent coexistence and succession and binding it into a system. Science, therefore, seems to question nature by means of an idea of the necessary interdependence and connexion of all things, as parts of one systematic whole governed by general laws—an idea which it does not get from nature, but which it brings to nature. Hence the logic in which this process of investigation expresses its consciousness of itself will be a synthetic logic, a logic built on certain prin- ciples which are conceived to be independent of experience, and by the aid of which we may so transform that experi- ence, so penetrate into it or get beyond it, as to find for it

| a better explanation than that which it immediately gives of

itself. The Posterior Analytic, in which Aristotle brings in the idea of cause to vivify the syllogistic process, or supply a real meaning to it, may already be regarded as a first essay in this direction. And the theory of inductive logic, as explained by Bacon and his successors down to Mill, is a continuous attempt to determine what are the principles and methods on which experience must be questioned, in order to extract from it a knowledge which is not given in im- mediate perception.

It was, however, Hume who first brought into a clear light the subjectivity of the principles postulated in this logic, and especially of the principle of causality, which is the most important of them. In thus contrasting the sub- jectivity of the principles of science with the objectivity of the facts to which they are applicd, it was his intention to cast doubt on the science which is based on the applica- tion of the former to the latter. The principles, he main- tains, are not legitimately derived from the facts, therefore they cannot legitimately be used to interpret them. They are due to the influence of habit, which by an illegitimate process raises frequency of occurrence into the universality and necessity of law, and so changes a mere subjective association of ideas into an assured belief and expectation of objective facts. The answer given by Kant to this sceptical criticism of science involved a rejection of that very opposition of subjective and objective upon which it was based. Without necessary and universal principles, the experience of things as qualitatively and quantitatively dctermined objects, coexisting in space and passing through changes in time (or even the determination of the successive states of the subject as

successive), would itself have been impossible. Hence necessity of thought cannot be derived from a frequent experience of such objects. It is true that the determination of things as permanent sub- stances reciprocally acting on each other, according to uni- versal laws, goes beyond the determination of them as qualified and quantified phenomena in space and time. But both determinations are possible only through the same a priori principle, and we cannot admit the former determination without implicitly admitting the latter. As, therefore, it is through the necessity and universality of thought that objects exist for us, even before the application to them of the principles of scientific induction, and as the application of those principles is only a further step in that a priori synthesis which is already involved in the perception of these objects, we have no reason for treating

the former kind of synthesis as objectively valid which does not equally apply to the latter.

This vindication of the principles of induction has, how- ever, a further consequence, which was not clearly seen by Kant. It is fatal to the antithesis of the “given” and the “known,” of what is perceived and what is conceived, of natura materialiter spectata and natura formalier spectata, which he still admitted. For that antithesis really rested on the idea that there is no universal and necessary principle of determination of things involved in the apprehension of them as qualified and quantified phenomena in space and time. So soon, therefore, as it 1s seen that there is such a principle, and that the first deter- mination of things as objects of perception is duc to the same a priort synthesis which determines them in the second place as objects of experience, the ground for that contrast between reality and appearance on which the theory of induction rested is taken away. Kant, indeed, finds a new meaning for that contrast by interpreting it as referring, not to the opposition between things as they are given and things as they are known, but to a supposed opposition between things as they are given and known in experience and things as they are in themselves out of experience. however, only means that the former antithesis has broken down, and that therefore the ideal of knowledge based

upon it has yielded to a new ideal. The so-called things in themselves are noumena, the objects of an intuitive or perceptive understanding, 7.¢., objects in which the contrast of perception and conception, of given and known, is tran- scended. We can make Kant's theory consistent only by supposing him to mean that the conception of the world as a system of substances determining each other according to universal laws does not yet satisfy the idea of know- ledge which reason brings with it. In other words, just as science from the point of view of necessary law found something wanting in the conception of the world as a mere complex of quantified and qualified phenomena in space and time, so philosophy, in view of a still higher ideal of knowledge, may condemn the conception of the world as a system of objects determined by necessary laws of relation as itself inadequate and imperfect. And we have seen that this higher ideal is that which is involved in the unity of self-consciousness. Unfortunately Kant was unable, as Aristotle had been unable,.to distinguish this idea from the idea of an abstract identity in which there is no room for even a relative difference of perception and conception, and therefore the perceptive understanding was named by him only to be rejected.

If, however, we correct this inadequacy of Kant's state- ment, as his later works enable us partly to correct it, we see that it involves a new idea of knowledge and a new logic,—a logic governed by the idea of organic unity and development, just as the analytic logic had been governed by the idea of identity, and as the inductive logic had been governed by the idea of necessary law. For, if the unity of self-consciousness be our type of knowledge, truth must mean to us, not the apprehension of objects as self-identical things, distinguished from each other in quantity and quality, nor even the determination of such things as standing in necessary relations to each other. It must mean the determination of the world (and of whatever in it is in any sense an independent reality, so far as it is so independent) as a unity which realizes itself in and through difference, a unity which is indeed determined, but deter- mined by itself. In a view of the world which is governed by this category, correlation must be reinterpreted as organic unity, and causation as development. Its logical method must be neither analytical nor synthetical, or rather it must be both at once, z.e., it must endeavour to

This new antithesis of reality and appearance, .

exhibit the process of things as the evolution of a unity which is at once self-differentiating and self-integrating, which manifests itself in difference, that through difference it may return upon itself. Further, as this logic arises simply out of a deeper consciousness of that which was contained in the two previous logics, so it first enables us to explain them. In other words, the advance from the analytic to the inductive logic, and again from the inductive to what may be called the genetic logic, may itself be shown to be a self-determined development of thought, in which the first two steps are the imperfect manifestation of a principle fully revealed only in the last step. The consciousness of self-identical objects, independent of each other and of thought, is thus only the beginning of a pro- cess of knowledge which reaches its second stage in the determination of these objects as essentially related to each other, and which finds its ultimate end in the knowledge of the correlated objects as essentially related to the mind that knows them. Or if, in this last point of view, things are still conceived as having a certain relative independence of the mind, it can only be in so far as they are in the Leibnitzian sense monads, or microcosms,—.e., in so far as they are self-determined, and so have, in the narrower circle of their individual life, something analogous to the self-

completed nature of the world, when it is contemplated in

its unity with its spiritual principle.

Such a genetic logic is inconsistent with any absolute distinction between the a priori and a posteriori element in knowledge. For here the a priori is not simply a law of necessary connexion to beapplied to an external matter, but a principle of organic development, a principle which, from the very nature of it, cannot be applied to a foreign matter. To treat the world as organic is to apply to it a category which is inconsistent with its being something merely given or externally presented to thought. The relation of things to thought must itself be brought under the same category of organic unity which is applied to the relation of things to each other in the world, otherwise the externality of the world to the thought for which it is will contradict the conception of the world as itself organic. Hence the distinction of @ priori and a posteriori, so far as it is maintained at all, must

shrink to something secondary and relative. It can be maintained only as a distinction of thought from its object, which presupposes their ultimate unity. From this point of view logic may be said to deal with the a priori, in so far as it treats the general conditions and methods of knowledge without reference to any parti- cular object. Logic must exhibit abstractly the process by which the intelligence establishes its unity with the intelli- gible world; or, to put it in another way, it must demon- strate that the being of things can be truly conceived only as their being for thought. It is limited to the a priori, in the sense that it ends with the idea that the esse of things is their zntelligi, and does not consider how this real intelligence or intelligible reality manifests itself in the concrete world of nature and spirit.

In this sense logic cannot be separated from metaphysic if metaphysic be confined to ontology. They are simply two aspects of one science, which we may regard either as determining the idea of being or the idea of knowing. The process of knowing is never really a formal process; it always involves the application of certain categories, and these categories are simply successive definitions of being or reality. We cannot separate the category from the movement of thought by which it is evolved and applied, nor the transition from lower to higher categories from changes of logical method. Hence a logic divorced from metaphysic inevitably becomes empty and unreal, and a metaphysic divorced from logic reduces itself to a kind of dictionary of abstract terms, which are put in no living

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relation to each other. For such a logic and such a meta-

physic must rest on the assumption of an absolute division between being and thought, the very two terms the unity of which it must be the utmost object of both logic and metaphysic to prove and. to produce.

4. The Relation of Metaphysic to Philosophy of Religion. —The possibility of a “first philosophy,” as we have already seen, is essentially bound up with the possibility of what we may calla last philosophy. It is only in so far as we can rise above the point of view of the individual and the dualism of the ordinary consciousness—in so far, in other words, as wecan have at least an anticipative consciousness of that last unity in which all the

differences of things from each other and from the mind that knows them are explained and transcended—that we are able to go back to that first unity which all these differences pre- suppose. The life of man begins with a divided conscious- ness, with a consciousness of self which is opposed to the consciousness of what is not-self, with a consciousness of a multiplicity of particulars which do not seem to be bound together by any one universal principle. Such division and apparent independence of what are really parts of one whole is characteristic of nature, and in spirit it is at first only so far transcended that it has become conscious of itself. A conscious difference, however, as it is a difference in consciousness, is no longer an unmediated difference, It is a difference through which the unity has begun to show itself, and which therefore the unity is on the way to subordinate. And all the development of consciousness and self-consciousness is just the process through which this subordination is carried out, up to the point at which the difference is seen to be nothing but the manifestation of the unity. Just so far, therefore, as this end is present to us,—so far as we are able to look forward to the solution or reconciliation of all the divisions and oppositions of which we are conscious and to see that there is an all- embracing unity which they cannot destroy,—is it possible that we should look back to the beginning or first unity, and recognize that these divisions and oppositions are but the manifestations of it. Thus the extremes of abstractness and of concreteness of thought are bound up together. The freedom of intelligence by which we get rid of thecomplexity of our actual life, and direct our thoughts to the simplest and most elementary conditions of being and knowing, is possible only to those who are not limited to that life, but can regard it and all its finite concerns from the point of view of the infinite and the universal. In this sense it is true that religion and metaphysic spring from the same source, and that it is possible to vindicate the rationality of religion only on metaphysical principles. The philosophy of religion is, in fact, only the last application or final expression of metaphysic; and, conversely, a metaphysic which is not capable of furnishing an explanation of religion contradicts itself.

This last remark affords us a kind of criterion of a true metaphysic. Can it or can it not explain religion? If it cannot, it must be equally unable to explain its own possi- bility, and therefore implicitly it condemns itself. Thus a pantheistic system, which loses the subject in the absolute substance, cannot

explain how that subject should appre- hend the substance of which itis but a transitory mode, nor, on the other hand, can it explain why the substance should manifest itself in and toa subject. And the same criticism. may be madeonall theoriesin which thefirst or metaphysical unity is abstractly opposed to the manifoldness and con- tingency of things. Not only of Spinoza, but also of Kant, of Fichte, and even of Schelling, it might with some truth

«be said that their absolute is like the lion’s den, towards which all the tracks are directed, while none come from it. It is essential that the first unity should be such as to

explain the possibility of difference and division, for, if it is not, then the return to unity out of difference is made as accidental as the difference itself. When Aristotle repre- sented the Divine Being as pure self-consciousness, pure form without matter, he found himself unable to account for the existence of any world in which form was realized in matter. When therefore he speaks of the process of the finite world by which it returns to God, and attributes to nature a will, which is directed to the good as its final cause, his theory seems to be little more than a metaphor in which the analogy of consciousness is applied to the unconscious. For, if the Divine Being is not manifested in the world, any tendency of the world to realize the good becomes an inexplicable fact. A similar difficulty is, as we saw, involved in Kant’s confusion of the bare identity of understanding with the absolute unity of knowledge. Reducing the unity of self-consciousness to such a bare identity, Kant could not be expected to see, what Aristotle had not seen, that pure self-consciousness is essentially related to anything but itself. Hence the various attempts which he made in his ethical works and in his Criticism of Judgment to find a link of connexion between the noumenal and the empirical were necessarily condemned even by him- self as the expressions of a merely regulative and subjective principle of knowledge. Even Fichte, who found in the thought, which is for him the prius of all existence, a principle of differentiation and integration which explained how self-consciousness in us should be necessarily correlative with the consciousness of a world, was unable to

free him- self from the Kantian opposition of a noumenal identity in which there is no difference to a phenomenal unity which is realized in difference. Hence by him also the return out of difference is regarded as an impossibility, or as a processus in infinitum, and the absolute unity as that which is beyond all knowledge and only apprehended by faith.

If we look to completely elaborated theories, and dis- regard all tentative and imperfect sketches, it may fairly be said that all that has as yet been done in the region of pure metaphysic is contained in two works, in the Jfeta- physic of Aristotle and the Logic of Hegel, And up toa certain point the lesson which they teach is one and the same, viz., that the ultimate unity which is presupposed in all differences is the unity of thought with itself, the unity of self-consciousness, and that in this unity is con- tained the type of all science, and the form of all existence ; in other words, I=I is the forniula of the universe. The difference between these two works has, however, already been indicated. With Aristotle, because he neglects the essential relation of self-consciousness to consciousness, or of the conscious self to the world of objects in space and time, the unity of self-consciousness tends to pass, as it did pass with the Neo-Platonists, into a pure identity without difference. In the Hegelian logic, on the other hand, self- consciousness is interpreted as a unity which realizes itself through difference and the reconciliation of difference—as, in fact, an organic unity of elements, which exist only as they pass into each other. In other words, it is shown that the differentiating movement by which the subjective — and the objective self are opposed and the integrating movement by which they are reunited are both essential. Hence we cannot think of the conscious self as a simple resting identity, but only as an active self-determining principle ; nor can we think of its self-determination as a pure affirmation of itself, without any negation, but only as an affirmation which involves a double negation—an opposition of two elements which yet are essentially united. Each factor in this unity, in fact, is necessarily conceived as passing beyond itself into the other; the subject is subject only as it relates itself to the object, the object is

object only as it relates itself to the subject. It is this tension against each other of elements which yet are corre- lated and indissolubly united, this self-surrender to each other of elements which yet are maintained in their distinc- tion, which constitutes the organic unity of thought in itself, and separates it from the mere abstract unity of mysticism. When, however, the concrete or self-differen- tiating character of the unity of self-consciousness is appre- hended in this way,—so that it is impossible to confuse its indivisible unity with the simplicity of that which is one merely because it has no differences in it,—the problem of the relation of pure self-consciousness to the world in space and time ceases to be insoluble. Thought, as it 1s seen to have difference in itself, is no longer irreconcilable with the world of difference; nor is it necessary to introduce a foreign ty to make their connexion intelligible. or, as thought is a principle of difference as well as of unity, of analysis as well as of synthesis, and as it cannot realize itself in its unity except through the utmost development of difference, abstract self-consciousness, with its transparent or merely ideal difference, cannot be its ultimate form. On the contrary, the consciousness of self is possible only in distinction from, and in relation to, a world of objects. In other words, the unity of the thinking subject pre- supposes, not merely the opposition of the subjective and the objective self, but also the opposition of the self in its pure self-identity to a world of externality and difference. The pure intelligence, which is the prius of all things, must not, therefore, be regarded—as Aristotle regarded it—as merely theoretical, but also as practical. It must be con- ecived as a living principle, a principle which only in self- manifestation can be conscious of itself, and to the very nature of which, therefore, self-manifestation is essential. In this way Hegel—just because he grasped the concrete character of the unity of thought in itself—was enabled to understand the necessary unity of thought or self-conscious- ness with the world, and to heal the division of physics from metaphysic, which Aristotle had admitted.

Schelling and others who have raised objections to the Hegelian method have specially directed. their criticisms against this transition from logic to the philosophy of nature, from pure self-consciousness to the external world in space and time. In doing so, they have practically fallen back upon the Aristotelian theory, with its opposition of God, as pure form, to the finite world. But this in effect is to deny that “the real is the rational” or

intelligible, and to introduce into the world, as the ground of its distinction from reason, a purely irrational or contingent element. A modern follower of Schelling's later positive philosophy only draws the necessary consequence from this view when he teaches the pessimist creed that the highest good is the negation or extinction of the finite. Nor can we wonder that the same writer who denies that the absolute self-consciousness is essentially related to or manifested in the world should proceed to reduce this self-consciousness to a mystic identity which comes out of itsclf and becomes self-conscious only by an inscrutable act of will. The fact, indeed, that those who deny the possibility of a rational transition from self-consciousness to the world are forced by the logic of their position to reduce self-consciousness to an abstract identity may be regarded as a kind of indirect proof that the principle of self-consciousness, truly conceived, does involve that transi- tion. Another step in the same direction may be made if we consider how the Cartesian philosophy treated the same opposition, which it also regarded as absolute. By Descartes mind and matter, thought and extension, are defined as abstract opposites, every quality of each finding its contradictory counterpart in a quality of the other.

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itself and knows itself as it is, which has no discretion of parts or capacity of division or determination from without. Matter is essentially discrete or infinitely divided ; it is a pure passivity ; and all its determination comes to it from' without. The world is therefore, as it were, 'cut in two with a hatchet," divided into two unrelated existences, which are held together only by the will of God. | Spinoza cuts the knot, and avoids the arbitrariness of this solution, by treating extension and thought as two attributes separated only in respect of our intelligence, but each expressing fully the absolute substance. And something like the same view has been revived in recent times, by writers like Lewes and Mr Spencer, who speak of feelings and motions as two opposite "aspects" of the same fact. When we ask, however, for whom these attributes or aspects are a unity, it becomes clear that the intelligence which is regarded as standing on one side of the dualism must also be taken as transcending it, and relating the two sides to each other. Moreover, the correspondence of the two attributes upon which Spinoza insists and their contra- riety upon which Descartes insists, when

taken together, give us the idea of a correlative opposition, 7.¢., of an opposi- tion of elements which yet are necessary to each other. Tf, therefore, they cannot be simply identified as Spinoza identifies them, yet they need no external bond such as Descartes introduces to combine them ; for they cannot exist apart from each other. Their opposition is held within the limits of their unity, and is no absolute con- tradiction, but rather an opposition which exists only as it is transcended. In other words, it is an abstract opposi- tion, 7.¢., it is an opposition of elements which seem to be irreconcilable till it is observed that they are correlative, that each exists or has a meaning only as it relates itself to, or passes out of itself into, the other, and that each, held in its abstraction and separation from the other, loses all the meaning that it seemed to have. For, as in an organic body each member or organ lives only in tension against the others, yet only as continually relating itself to the others, so the utmost opposition of mind to matter, of the intelligence to the intelligible world, presupposes their unity, and is only the realization of it.

There is here, however, something more than an ordinary case of correlation, for in this unity of opposites mind appears twice, once as one of the opposites, and again as the unity which transcends the opposition. This ambiguity becomes most obvious in theories like that of Mr Spencer, who speaks of “ two consciousnesses,” which cannot be resolved into each other, but yet which strangely form inseparable parts of one and the same consciousness. What, however, is really involved in such a statement is that the external world, which in the first instance presents itself as absolutely opposed in nature to the subject whose object it is, is yet one with that subject, and that therefore the antagonism of mind to its object is only the last differentia- tion through which it realizes its unity with itself. In Hegel’s language, that which presents itself as other than mind is its other—‘an other which is not another,” whose difference and opposition to itself it overreaches and over- comes. We must, therefore, regard the independence and externality of nature, its indifference, and even, as it seems, opposition, to the development of the moral and intellectual life of man, as merely apparent. For man, in this point of view, is not merely one natural being among others, but the being in whom nature is at once completed and transcended. If, therefore, at first he appears to stand in merely accidental and external relations to the other existences among which he finds himself,

yet the whole process of his life—the process by which he comes to know the external world, and by which, reacting upon it, he

Mind is a pure self-determined unity, which is as it knows | makes it the means to the realization of an individual and

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social life of his own—is the negation of this contingency and externality. In all this process he is showing himself to be a being who can only know himself as he knows the objective world, arid who can only realize himself as he makes himself the agent of a Divine purpose, to which all things are contributing.

Such an idea of man's relation to the world is necessarily involved in any theory that goes beyond that subjective idealism or sensationalism which denies to him every

object of knowledge except his own states of feeling, and

every end of action except his own pleasures and pains. Recent speculation, indeed, has suggested a compromise by which this dilemma is supposed to be evaded, and mankind are represented as forming an organic unity in themsclves, though they are still conceived as standing in an external and accidental relation to nature, the forces of which by their knowledge and skill they have subdued and are more and more subduing to their service. Such a compromise we find in the philosophy of Comte, the first writer who, starting from an apparently empirical basis, was able to break through the individualistic prejudices of the school of Locke. In the latter volumes of his Positive Philosophy, still more in his Posztive Politics, Comte so far transcends individualism as to deny the externality of men to each other, and to declare that "the individual, as such, is an abstraction," and that in reality he cannot be separated from the social organism, which is thus not merely an extraneous condition of his development, but essential to his very existence as man. Thus individual men exist only through the universal—through the spirit of the family, of the nation, of humanity, which manifests itself in them as a principle of life and development. Yet this organic unity, according to Comte, is in contact with a world which in relation to it is

external and contingent. Nature has not its final cause in man, but on the contrary is, at first, rather his enemy ; and itis to humanity itself that the praise is due if to a certain extent the enemy has been turned into a servant. The unity of life which manifests itself in humanity cannot therefore be considered as a universal principle, as the principle of the whole universe, but simply as the principle of the limited existence of man,

which is hemmed in on every side by external and, in the –

main, unknown conditions. If humanity therefore is an organism, it is an organism existing in a medium which in reference to it is inorganic, 7.e., in a medium which has no essential relation to the life which animates man.

It is obvious, however, that this theory is an illogical attempt to find a standing ground between two opposite philosophies,—between the philosophy which treats man merelyas a naturalindividual, placed among other individual beings and things, and which therefore regards his relation to them as something accidental and external, and the philo- sophy which treats him as a spiritual subject, a conscious and self-conscious being, and regards him therefore as having no merely external relations either to other men or to nature. Comte shrinks from regarding the world without us as the manifestation of that spiritual principle which is also within us, which constitutes our very nature as individual men, and therefore connects us with the world at the same time that it separates us from it. Yet he recognizes the existence in us of a principle which is so far universal that it constitutes a community between all men. He thinks that the individual can transcend himself, so far as to see all things, not indeed from a Divine point of view, sub specie xternitatis, but from the point of view of universal humanity, and that in conformity with this theoretical consciousness, he can live a practical life of altruism, 7.¢., a life in which he identifies his own good with the good of humanity. But the philosophy that has gone so far must logically go further. Itis impossible to treat humanity as

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an organism without extending the organic idea to the con- ditions under which the social life of humanity is developed. The medium by aid of which, or in reacting against which, the organized being maintains itsclf is an essential part of its life; it remains organic only in so far as it can mould itself to its conditions, and its conditions to itself. This is true even of the animal organism in relation to its small circle of conditions, which, however, is part of a larger circle to which the animal has no relation. Buta conscious being is a wniversal centre of relations; there is nothing which it, as conscious, cannot make part of its own life. Hence the application of the organic idea to it in- volves its application to the whole world. And, if the recognition of a universal principle manifested in humanity naturally led Comte to the idea of the worship of humanity, the recognition of a universal principle manifested in man and nature alike must lead to the idea of the worship of God.

The rationality of religion, then, rests on the possibility of an ultimate synthesis in which man and nature are regarded as the manifestation of one spiritual principle. For religion involves a faith that, in our efforts to realize the good of humanity, we are not merely straining after an ideal beyond us, which may or may not be realized, but are animated by a principle which within us and without us is necessarily realizing itself, because it is the ultimate principle by which all things are, and are known. This absolute certitude that we work effectually because all the universe is working with us, or, in other words, because God is working in us, can find its explanation and defence only in a philosophy for which “the real] is the rational, and the rational is the real.” And such a philosophy, beginning with the Kantian doctrine that existence means existence for a spiritual or thinking subject, must go on to prove that that only can exist for such a subject which is the manifestation of thought or spirit ; and, conversely, that spirit or intelligence is essentially self-manifesting, or, in other words, that it cannot be conceived except as standing in essential relation to an external and material world. Finally, if nature be thus regarded as a necessary manifestation of spirit, it can be opposed to spirit only in so far as spirit in its realization becomes opposed to itself. In other words, nature must be regarded as, from a higher point of view, included in spirit. Nature exists that it may show itself to be spiritual in and to man, who transcends it yet

implies it, who finds in it the necessary basis of his thought and action, but only that he may build upon it a higher spiritual life.

Nature is made better by no mean

But nature makes that mean: so over the art

Which, you say, adds to nature is an art

Which nature makes." Only the order of precedence suggested by these words must be inverted. For, as nature only is for spirit, so the spiritual energy which reacts upon nature is that which manifests for the first time what nature in reality is. It is the consciousness of this—z.e., of the identity of that which is realizing itself within and without us,—the consciousness that the necessity which is the precondition of our freedom is the manifestation of the same spirit which makes us free—which turns morality into religion. For it is this alone which enables us to regard the realization of the highest ends of human life as no mere happy accident, or as a conquest to be won by the cunning of man from an unfriendly or indifferent destiny, but as the result towards which all things are working.

In this philosophy, which finds its most adequate expression in the works of Hegel, there are two things which may be distinguished—the general idealistic view of the world, and the dialectical movement of thought in

which Hegel develops and expresses it. And there are perhaps many at the present. time who are prepared to accept the former, but who yet suspect, or even reject, the latter. And no doubt there is much in Hegel's Logic and Philosophy of Spirit, and still more in his Philosophy of Nature, which there is reason to regard with distrust. In clever hands that are not checked by a sufficient con- sciousness of the whole, the Hegelian dialectic may be made into the means of producing a seeming proof of any- thing. Nor is it always easy to determine how far Hegel himself was tempted by an impatient consciousness of the

universality of his method to employ it in cases where the |

others; he is preventing their interests from becoming his ; all things are his, and his only, who has died to himself, But if this be the truth of morality, it is something more, for “ morality is the nature of things.” We cannot separate the law of the life of man from the law of the world in which he lives. And, if it is the nature of things, as it is the nature of spirit, that he who loseth his life shall save it, the world must be referred to a spiritual principle, and the Christian doctrine of the nature of God is only the converse of the Christian law of ethics. To Hegel, starting

from this point, a new light was thrown on the Fichtcan

treatment of the idea of self, and the Fichtean proof that the

conditions of its successful application were wanting. | consciousness of self implies a relation to an object which Sometimes he seems to forget, what he himself teaches, that | is opposed to the self, and which yet from another point science must first have generalized experience and deter- | of view—since an object exists only for a subject—cannot

mined it by its finite categories, ere it is possible for philosophy to give its final interpretation. Yet, when we

be anything but an element of its own life. It was seen

| that this movement of thought is no mere fluctuation

realize the nature of that interpretation, and of the trans- | between contradictory positions, to be terminated finally by formation of science which philosophy by means of it | an ipse dixit of faith, but that the unity of the opposite

proposes to effect, it becomes clear that the dialectic of Hegel is no extraneous addition to his idealism, but is part and parcel of the same movement of thought. For this dialectic rests on the idea that thought or self-conscious- ness finds in its own organic unity the ultimate key to all difficulties in regard to the objects of thought and their relations to each

other and tothe mind. Self-consciousness, as has been already shown, is implicitly the whole web of categories which it throws over the world, and by aid of which it makes the world intelligible. All these it contains in itself; and, as it proceeds to determine the meaning of things, it simply produces its store, and exhausts itself on the object. Now, if it be idealism, in the strict sense of the word, to make thought or self-conscious- ness the principle and ultimate explanation of all that exists, it is obvious that we cannot separate idealism from such a dialectic as this, which is nothing more than the mind's consciousness of its own movement or process of sclf-affirmation. If to find thought in things be more than an empty word, then the movement or process which thought is must explain at once the transition from thought to what in opposition to it we call " things," and must give us the means of reconciling that opposition. In other words, the same movement by which thought deter- mines itself as self-conscious, 7.¢., as a unity realized through 'difference, must also be conceived as the explanation of the difference between pure thought and the world, and as the solution of that difference in the idea of absolute spirit. Such idealism has a close relation to Christianity ; it may be even said to be but Christianity theorized. It has often been asserted that Hegel's philosophy of religion is but an artificial accommodation to Christian doctrine of a philo- sophy which has no inherent relation to Christianity. If, however, we regard the actual development of that philo- sophy it would be truer to say that it was the study of Christian ideas which first produced it. What delivered Hegel from the mysticism in which the later philosophies of Fichte and Schelling tended to lose themselves, and led him, in his own language, to regard the absolute "not merely as substance but as subject,"'—what made him recognize with Fichte that the absolute principle is spiritual, and yet enabled him with Schelling to see in nature, as the opposite of spirit, the very means of its realization,— was his thorough appreciation of the ethical and religious meaning of Christianity. In the great Christian aphorism that "he who loseth his life alone can save it" he found a key to the difficulties of ethics, a reconciliation of hedonism and asceticism. For what this saying implies is that a spiritual or self-conscious being is one who is in

contradiction with himself when he makes his individual:

self his end. In opposing his own interest to that of

elements is apprehensible by the intelligence, and that indeed it is tts presence to the intelligence which makes the consciousness of opposition possible. It was in this sense that Hegel could say that that unity of opposites which had been called unintelligible by previous writers was just the very nature of the intelligence, and that only a view of the world guided by this idea could be properly intelligible, while every other view must contain in it an unsolved contradiction, an element that remains permanently impervious to thought.

The-great objection to a metaphysic like this, at least an objection which weighs much in the minds of many, is that which springs from the contrast between the claim of absolute knowledge which it seems to involve and the actual limitations which our intelligence encounters in every direction. If the theory were true, it is felt we ought to be nearer the solution of the problems of our life, practical and speculative, than we are; the riddle of the painful earth ought to vex us less; we ought to find our way more easily through the entanglement of facts, and to be able to deal with practical difficulties in a less tentative manner. Yet there is really no antagonism between such a doctrine and a consciousness of the limita- tion of our faculties; nay rather, it is only on such a theory that a rational distrust of ourselves can be based. When Aristotle meets the warning that we should think finite and human things since we are finite and human with the answer that we ought rather, so far as in us lies, to rise to what is immortal and divine, he is not denying the limits of man's knowledge and power ; on the contrary, he is rather pointing to the very principle which makes us conscious of those limits; for it is just because there is in man a principle of infinity that he knows his finitude, and, conversely, it is just in the consciousness of this finitude that he rises above it. one who has in himself the measure of his own weakness, and who, if he "trembles like a guilty thing surprised," is yet conscious that he is trembling before himself. This truth is often expressed by Kant with special relation to the moral consciousness, as where he contrasts the limitation of man, as a sensible being, occupying an infinitesimal space in the boundless world of sense, with his freedom from all limitation as a personal self, a member of the truly infinite world of intelligence. But it is not necessary to adopt Kant's abstract division of the sensible from the intelligible world to see that the consciousness of the greatness of the problem which has to be solved in

human life and thought is deepened and widened by that very idea of philosophy which yet gives us the assurance that the problem is not insoluble, and even that, in principle, it is already solved (E. ©.)

A rational humility is possible only to °

MET—MET

METAPONTUM, or Merapontivm (the first form is that generally found in Latin writers, but Thucydides, Strabo, and other Greek authors employ the latter form), was a city of Magna Greecia situated on the Gulf of Tarentum, near the mouth of the river Bradanus, and distant about 24 miles from Tarentum and 14 from Heraclea. It was founded by an Achean colony about 700 3.c., though various traditions existed which assigned it an earlier origin. But according to the only historical account it was a joint foundation from Sybaris and Crotona, to which, as usual in similar cases, was Joined a body of fresh settlers from the mother country, under the command of a leader named Leucippus. The object of its establishment was without doubt to strengthen the Achzan element in Magna Greecia, as opposed to the increasing power of the Tarentines, but at the same time to occupy a territory which was remarkable for its fertility. It was to this cause that Metapontum owed the great prosperity to which it attained at an early period, and appears to have continued to enjoy for several centuries, though it never assumed a prominent place in history. It was, however, one of the cities that played a conspicuous part in the political troubles arising from the introduction of the Pythagorean principles into the cities of Magna Greecia, and it was there that the philosopher himself ended his days. His tomb was still shown there in the time of Cicero.

At the time of the Athenian expedition to Sicily (415 B.c.) Metapontum appears to have been an opulent and powerful city, whose alliance was courted by the Athenians; but they contented themselves with a very trifling support. In 332 B.c., at the time of the expedition of Alexander, king of Epirus, into Italy, it was one of the first cities to espouse his cause, and enter into an alliance with him ; and they appear to have in like manner lent an active support to Pyrrhus at a later period. Down to this time, therefore, Metapontum seems to have retained its position as one of the principal cities of Magna Grecia, and there is no evidence of its having suffered

materially from the establishment of the Lucanians in its immediate neighbourhood. Nor have we any account of the precise period at which it passed under the dominion of Rome, or the conditions under which it became subject to the great republic. But it was the Second Punic War which gave the fatal blow to its prosperity. After the battle of Cann in 216 B.c. it was among the first cities in the south of Italy to declare in favour of Hannibal, and after the fall of Tarentum in 212 z.c. it not only received a Carthaginian garrison, but became for some years the headquarters of Hannibal. Hence, when the defeat of Hasdrubal at the Metaurus (207 B.c.) compelled him to abandon this part of Italy, and withdraw into the fastnesses of Bruttium, the whole mass of the inhabitants of Metapontum abandoned their city, and followed him in his retreat.

From this time Metapontum sunk into a poor and incon- siderable town; though it was still existing as such in the days of Cicero, it soon fell into complete decay, and Pausanias tells us that in his time nothing remained of it but a theatre and the circuit of the walls. All remains of these have since disappeared, but the site is still marked by the ruins of a temple, which occupy a slight elevation on the right bank of the river Bradanus, about 2 miles from its mouth. The surrounding plain, so celebrated in ancient times for its fertility, is now desolated by malaria, and almost uninhabited ; and the remains of the city itself, between the site of the temple and the sea, are in great part buried in the alluvial deposits of the neighbouring rivers.

Some excavations were carried on upon the spot by the Duc de Luynes in 1828, and the results of his researches were published by him in a special work (Métaponte, fol., Paris, 1833).

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METASTASIO (1698-1782). Pietro Trapassi, the Italian poet who is better known by his assumed name of Metastasio, was born in Rome, January 6, 1698. THis father, Felice Trapassi, a native of Assisi, came to Rome and took service in what was termed the Corsican regiment of the papal forces. He subsequently married a Bolognese woinan, called Francesca Galasti, and established himself in business as a sort of grocer in the Via dei Cappellari. Two sons and two daughters were the fruit of this marriage. The eldest son, Leopoldo, must be mentioned, since he played a part of some importance in

the poet’s life. Pietro, while quite a child, showed an extraordinary talent for improvisation, and often held a crowd attentive in the streets while he recited impromptu verses on a given subject. It so happened that, while he was thus engaged one evening in the year 1709, two men of high distinction in Roman society passed by and stopped to listen to his declamation. These were Gian Vincenzo Gravina, famous for legal and literary erudition, famous no less for his dictatorship of the Arcadian Academy, and Lorenzini, a critic of some note. Gravina was at once attracted by the boy’s poetical talent and by his charm of person; for little Pietro was gifted with agreeable manners and considerable beauty. The great man interested himself in the genius he had accident- ally discovered, made Pietro his protegé, and in the course of afew weeks adopted him. Felice Trapassi was glad enough to give his son the chance of a good education and introduction into the world under auspices so favourable. Gravina, following a fashion for which we may find: pre- cedents so illustrious as that of Melanchthon, Hellenized the boy’s name Trapassi into Metastasio; and this name remained with him for life. Gravina intended his adopted son to be a jurist like himself. He therefore made the boy learn Latin and begin the study of law. At the same time he cultivated his literary gifts, and displayed the youthful prodigy both at his own house and in the Roman coteries. Metastasio soon found himself competing with the most celebrated improvisatori of his time in Italy. Days spent in severe studies, evenings devoted to the task of improvis- ing eighty stanzas at a single session, were fast ruining Pietro’s health and overstraining his poetic faculty. At this juncture Gravina had to journey into Calabria on business. He took Metastasio with him, exhibited him in the literary circles of Naples, and then placed him under the care of his kinsman Gregorio Caroprese at a little place called Scaléa. In country air and the quiet of the southern sea-shore Metastasio’s health revived. It was decreed by the excellent Gravina that he should never improvise a line again. His great facility should be reserved for nobler efforts, when, having completed his education, he might enter into competition with poets who had _be- queathed masterpieces to the world.

Metastasio responded with the docility of a pliant nature to his patron’s wishes. At the age of twelve, while attend- ing to classical and legal studies, he translated the J/iad into octave stanzas; and two years later he composed

a tragedy in the manner of Seneca upon a subject chosen from Trissino's Italia Liberata—Gravina's favourite epic. It was called Giustino, Gravina had it printed in 1713; but the play is lifeless ; and forty-two years afterwards we find Metastasio writing to his publisher, Calsabigi, that he would willingly suppress it. Caroprese died in 1714, leaving Gravina his heir ; and in 1718 Gravina also died. Metastasio inherited from the good old man a property, consisting of house, plate, furniture, and money, which amounted to 15,000 scudi, or about £4000. At a meeting of the Arcadian Academy, amid the tears and plaudits of that learned audience, he recited an elegy on the patron who had been to him so true a foster-father, and then settled down, not it seems without real sorrow for his loss, to enjoy what was no inconsiderable

fortune at that period. Metastasio was now twenty. During the last four years he had worn the costume of | abbé, having taken the minor orders without which it was | then useless to expect advancement in Rome. His romantic history, personal beauty, charming manners, and distin- guished talents made him fashionable. That before two years were out he had spent his money and increased his reputation for wit will surprise no one. He now very sensibly determined to quit a mode of life for which he was not born, and to apply himself seriously to the work of his profession. Accordingly he went to Naples, and entered the office of an eminent lawyer named Castagnola. | It would appear that he articled himself as clerk, for | Castagnola, who was a stern master, averse to literary trifling, exercised severe control over his time and energies. While slaving at the law, Metastasio did not wholly neglect the Muses. In 1721 he composed an epithalamium, and | probably also his first musical serenade, Hndimione, on the occasion of the marriage of his patroness the Princess Pinelli di Sangro to the Marchese Belmonte Pignatelli. But the event which fixed his destiny was the following. In 1722 the birthday of the empress had to be celebrated with more than ordinary honours, and the viceroy applied | to Metastasio to compose a serenata for the occasion. He | accepted this invitation with mingled delight and trepida- tion ; for Castagnola looked with no favour on his clerk's poetical distractions. It was arranged that his authorship should be kept a profound secret. Under these conditions Metastasio produced Gli

Ortc Esperidi. Set to music by Porpora, it won the most extraordinary applause. The great Roman prima donna, Marianna Bulgarelli, called La Romanina from her birthplace, who had played the part | of Venus in this drama, was so enraptured with the beautics of the libretto that she spared no pains until she had dis- covered its author. Asked point-blank whether he had not written the words of the successful play, Metastasio was obliged to answer, Yes! La Romanina forthwith took possession of him, induced him to quit his lawyer's office, and promised to secure for him fame and independence, if | he would devote his talents to the musical drama. It was | thus that the opera, already partially developed by the Cesarean poet, Apostolo Zeno, attained perfection. The right man had been found for maturing this form of art which the genius of the age demanded, but which was still but incomplete. In La Romanina's house Metastasio became acquainted with the greatest composers of the day,— with Porpora, from whom he took lessons in music ; with Hasse, Pergolese, Scarlatti, Vinci, Leo, Durante, Marcello, all of whom were destined in the future to set his plays to melody. Here too he studied the art of singing, and learned to appreciate the style of such men as Farinelli. His singularly pliant genius discerned the conditions which the drama must obey in order to adapt itself to music in the stage it then had reached. Gifted himself with extra-ordinary facility in composition, and with a true poetic | feeling, he found no difficulty in producing plays which, while beautiful in themselves, judged merely as works of literary art, became masterpieces as soon as their words were set to music, and rendered by the singers of the greatest school of vocal art the world has ever seen. Read- ing Metastasio in the study, it is impossible to do him justice. Our only chance of rendering him a portion of his due is to approach these lyrical scenes—so passionate in their emotion, so cunningly devised for musical effect— with the phrases of Pergolese or Paesiello ringing in our ears, and to imagine how a Farinelli or a Caffariello voiced those stanzas which demand for their artistic realization the "linkéd sweetness long drawn out" of melodies as the Italian school developed them. In short, Metastasio is a poet whose poetry leapt to its real life in the environment |

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of music. The conventionality of all his plots, the absurdities of many of his situations, the violence he does to history in the persons of some leading characters, his

i “damnable iteration” of the theme of love in all its

phases, are explained and justified by music. He can stil] be studied with pleasure and profit. But our only chance of understanding the cosmopolitan popularity he enjoyed

| is by remembering that at least one half of the effect he

aimed at has been irrecoverably lost.

Metastasio resided with La Romanina and her husband in Rome. The generous woman, moved by an affection half maternal half romantic, and by a true artist’s admiration for so rare a talent, adopted him more passionately even than Gravina had done. She took the whole Trapassi family—tfather, mother, brother, sisters—into her own house, She fostered the poet’s genius and pampered his caprices.

Under her influence he wrote in rapid succession the

Didone Abbandonata, Catone in Utica, Ezio, Alessandro nel? Indie, Semiramide Riconosciuta, Siroe, and Artaserse, These dramas were set to music by the chief composers of the day, and performed in the chief towns of Italy. Every month added to Metastasio’s renown. But meanwhile La Romanina was growing older; she had ceased to sing in public ; and the poet felt himself more and more dependent in an irksome sense upon her kindness. He gained 300 scudi (about £60) for each opera; this pay, though good, was precarious, and he longed for some fixed engagement. Abandoning himself gradually to despondent whims and fancies, it became clear that some change in his condition was desirable. And the opportunity for a great change soon presented itself. In September 1729 he received the offer of the post of court poet to the theatre at Vienna, with a stipend of 3000 florins. This he at once accepted. La Romanina unselfishly sped him on his way to glory. She took the charge of his family in Rome, and he set off for Austria.

In the early summer of 1730 Metastasio settled at Vienna in the house of a Spanish Neapolitan, Niccold Martinez, where he resided until his death. This date marks a new period in his artistic activity. Between the years 1730 and 1740 his finest dramas, Adriano, Demetrio, Issipile, Demofoonte, Olimpiade, Clemenza di Tito, Achille in Seiro, Temistocle, and Attilio Regolo, were produced for the imperial theatre. Some of them had to be composed for special occasions, with almost incredible rapidity—the Achille in eighteen days, the Jpermnestra in nine. Poet, composer, musical copyist, and singer did their work together in frantic haste. The impress of the peculiar circumstances under which they were created is still left upon them, not only in negligence of style, but also in an undefinable quality which marks them out as products of collaboration. But what must always surprise us is that they should be as good as they are. Metastasio understood the technique of his peculiar art in its minutest details. The experience gained at Naples and Rome, quickened by the excitement of his new career at Vienna, enabled him almost instinctively, and as it were by inspiration, to hit the exact mark aimed at in the opera.

At Vienna Metastasio met with no marked social success. His plebeian birth excluded him from aristocratic circles, parative failure, he enjoyed the intimacy of a great lady, the Countess Althann, sister-in-law of his old patroness the Princess Belmonte Pignatelli. She had lost her husband, and had some while occupied the post of chief favourite to the emperor. Metastasio’s liaison with her became so close that it was even believed they had been privately married. From his letters to his friend La Romanina, and to the great singer Farinelli, who reigned supreme at the court of Madrid, we learn the little details of the poet’s life in

But, to make up in some measure for this com-—

its wearisome monotony, and come to comprehend his character, at once generous and timid, selfish and ainiable, prudent almost to excess of caution, and personally cold in contradiction with the fervour of his sentimental muse. The even tenor of this dull existence was broken in the year 1734 by the one dark and tragic incident of his biography. Jt appears

that La Romanina had at last got tired of his absence. Little satisfied with his friendly but

somewhat reticent communications, impatient to see him |

once again, inquisitive perhaps about the terms on which he lived with his new mistress, she resolved to journey to Vienna. Could not Metastasio get her an engagement at the court theatre? The poet at this juncture revealed his own essential feebleness of character. To La Romanina he owed almost everything as a man and as an artist. But he was ashamed of her and tired of her. He vowed she

should not come to Vienna, and wrote dissuading her from |

the projected visit. The tone of his letters alarmed and irritated her. It is probable that she set out from Rome,

but died suddenly upon the road. Nothing can be said for |

certain about her end, or about the part which Metastasio may have played in hastening the catastrophe. All we know is that she left him her fortune after her husband's life interest in it had expired, and that Metastasio, overwhelmed with grief and remorse, immediately renounced the legacy. This disinterested act plunged the Bulgarelli- Metastasio household at Rome into confusion. La Romanina's widower married again. Leopoldo Trapassi, and his father and sister, were thrown upon their own resources. The poet in Vienna had to bear their angry expostulations upon his ill-timed generosity, and to augment the allowances he made them.

As time advanced the life which Metastasio led at Vienna, together with the climate, told upon his health and spirits. From about the year 1745 onward he writes complainingly of a mysterious nervous illness, which plunged him into the abyss of melancholy, interfered with

his creative energy, and constantly distressed him with the | He wrote but

apprehension of a general breakdown. little now, though the cantatas which belong to this period, and the canzonet Ecco quel fiero istante, which he

sent to his friend Farinelli, rank among the most popular of his productions. It was clear, as his latest and most genial biographer, Vernon Lee, has phrased it, that “what ailed him was mental and moral ennui.” In 1755 the Countess Althann died, and Metastasio was more than ever reduced to the society which gathered round him in the bourgeois house of the Martinez. He sank rapidly into the habits of old age ; and, though his life was prolonged till the year 1782, very little can be said about it. On the 12th of April he died, bequeathing his whole fortune

of some 130,000 florins to the five children of his friend —

Martinez. He had survived all his Italian relatives.

During the long period of forty years in which Metastasio may be almost said to have overlived his originality and creative powers his fame went on increasing. In his library he counted as many as forty editions of his own works. They had been translated into Freneh, English, German, Spanish, even into Modern Greek. They had been set to music over and over again by every composer of distinetion, each opera receiving this honour in turn from several

of the most illustrious men of Europe. They had been sung by the |

best virtuosi in every capital, from Madrid to St Petersburg, from London to Constantinople. The critics of all nations vied in raising Metastasio’s eredit to the skies. There was not a literary academy of note which had not conferred on him the honour of membership. Strangers of distinction passing through Vienna made a point of in the Kohlmarkt Gasse. Letters of congratulation, adulation, sympathy, respect, condolence, poured in upon him. And yet, during the whole of this long period, he was gradually outliving the artistic conditions upon which that fame was really founded. It has been already pointed out that Metastasio cannot rank as a poet in the unqualified sense of that word, but as a poet eollaborating with the musical composer and performer.

paying their respects to the old poet at his lodgings |

more, was intended for a certain style of music—for the musie of omnipotent vocalists, of thaumaturgieal soprani. With the changes effected in the musieal drama by Gluck and Mozart, with the development of orehestration and the rapid growth of the German manner, a new type of libretto came into request. Metastasio's plays fell into undeserved neglect, together with the musie to which he had linked them. Farinelli, whom he styled "¢twin-brother,"' was the true exponent of his poetry ; and, with the abolition of the class of singers to which Farinelli belonged, Metastasio's music suffered eclipse. It was indeed a just symbolic instinct which made the poet dub this unique soprano his twin-brother.

The musical drama for which Metastasio composed, and in work- ing for which his genius found its proper sphere, has so wholly passed away that it is now difficult to assign his true place to the poet in Italian literary history. Compared with Shakespeare, or even with Racine, he hardly merits the title of a dramatist. His inspira- tion was essentially emotional and lyrical. Instead of creating characters, he created situations for the display of very varied fecl- ings, for all the feelings in fact to which melody allies itsclf. But in doing this he showed a capable playwright's faculty. His per- sonages act and react upon each other. Their characters, though not in harmony with history or fact, are clearly traced and cleverly sus- tained. Eaeh of the dramatis persone is an emotion incarnate and consistent, admirably fitted for musical effect and contrast. The clash and combat of passions are vividly presented, with the smallest possible expenditure of rhetoric, in' the dialogues intended for recitative. The climax of emotion is cadenced in appropriate stanzas, with simple but effective imagery, at the close of each important scene. The chief dramatic situations are expressed by lyrics for two or three voices, embodying the several contending passions of the agents brought into conflict by the circumstances of the plot. The total result is not pure literature, but literature supremely fit for musieal effect. Language in Metastasio's hands is exquisitely pure and limpid. Of the Italian pocts, he professed a special adiniration for Tasso and for Marini. But.he avoided the eou- ecits of the latter, and was no master over the refined richness of the former's diction. His own style reveals the improvisatore's facility. Or the Latin poets he studied Ovid with the greatest pleasure, and from this predilection some of his own literary qualities may be de- rived. The pedantic rules of Aristotclian poctics never touched an

artist who felt his real vocation to be the interpretation of music. For historical propriety, for the psychology of character, for unity of plot, for probability of ineident, he had a supreme disregard. It was indeed his merit to have disearded all these considerations. His poetry was the twin-sister of Italian melody, and he was right in trusting entirely to music and action on the stage to render his con- ceptions vital. What, therefore, he gained during his own lifetime, while the musical system to which he subordinated his genius was yet living, he has since lost when, as now, he must be studied by

| readers who have only a faint aud dim conception of that perished art. For sweetness of versification, for limpidity of diction, for

delicacy of sentiment, for romantic situations exquisitely rendered in the siinplest style, and for a certain delicate beauty of imagery sometimes soaring to ideal sublimity, he deserves to be appreciated so long as the Italian language lasts.

There are numerous cditions of Metastasio's works. That by Calsabigi, Paris, 1755, 9 vols. 8vo, published under his own superintendence, was the poet's favourite. Another of Turin, 1757, and a third of Paris, 1780, deserve mention, The posthumous works were printed at Vienna, 1795. The c:llected editions of Genoa, 1802. und Padua, 1811, will probably be found most useful by the general student. Metastasio's life was written by Aluigi, Assisi, 1783; by Charles Bui ney, London, 1796 ; and by others; but by iar the most vivid sketch of his biography will be found in Vernon Lee's Studies of the 18th Century in Italy, London, 1880, a work which throws a flood of ight upon the development of Italian dramatic musie, and upon the place occupied by Metastasio in the artistie movement of the last century. (J. A. 8S.)

METCALFE, Cuar.es THEOPHILUS METCALFE, BARON (1785-1846), a distinguished administrator, was born

| at Calcutta on January 30, 1785; he was the second son

of Thomas Theophilus Metcalfe, then a major in the Bengal army, who afterwards became a director of the Kast India Company, and was created a baronet in 1802. Having been educated at Eton, where he read extensively,

he in 1800 sailed for India as a writer in the service of the Company. After studying Oriental languages with success at Lord Wellesley's college of Fort William, he, at the age of sixteen, received an appointment as assistant to Lord Cowley, then resident at the court of Sindhia; in 1802 he became assistant in the office of the chief secretary; in 1803 he was transferred to that of the governor-general, and in 1806 to that of the commander-in-chief. On August 15, 1806, he became first assistant to the resident at Delhi, and in 1808 he was selected by Lord Minto for the difficult

His poetry, further- | post of envoy to the court of Ranjit Sinh at Lahore; here,

on April 25, 1809, he successfully concluded the important treaty securing the independence of the Sikh states between the Sutlej and the Jumna. Four years afterwards he was made principal resident at Delhi, and in 1819 he received the appointments of secretary in the secret and political de- partment, and of private secretary to the governor-general (Lord Hastings). From 1820 to 1823 Sir Charles (who succeeded his brother in the baronetcy in 1822) was resident at the court of the nizam, but in the latter year he was com- pelled by the state of his health to retire from active service ; in 1825, however, he was so far restored as to undertake the residency of the Delhi territories. Two years after- wards he obtained a seat in the supreme council, and in February 1835, after he had for some time been governor of Agra, he, as senior member of council, provisionally succeeded Lord William Bentinck in the governor-general- ship. During his brief tenure of office (it lasted only till March 28, 1836) he originated or carried out several important measures, including that for the liberation of the press, which, while almost universally popular, complicated his relation with the directors at home to such an extent that he withdrew from the service of the Company in 1838. In the following year he was appointed by the Melbourne administration to the governorship of Jamaica, where the difficulties created by the recent passing of the Negro Emancipation Act had called for a high degree of tact and ability. Sir Charles Metcalfe's success in this delicate position was very marked (see vol. xiii. p. 551), but

unfor- tunately his health compelled his resignation and return to England in 1842. Six months afterwards he was appointed by the Peel ministry to the governor-generalship of Canada, and his success in carrying out the policy of the home Government was rewarded with a peerage shortly after his return in 1845. He died at Malshanger, near Basingstoke, September 5, 1846. See J. W. Kaye's Life and Corre- spondence of Charles Lord Metcalfe, London, 1854.

METELLUS, the name of the most important family of the Roman plebeian gens Cecilia. They rose to distinction during the Second Punic War, and Neevius satirized them.

Quintus Cacitrus MeETELLUus MAcEDoNIcUs, preetor 148 B.c. in Macedonia, defeated Andriscus in two battles, and forced him to surrender. He then superintended the conversion of Macedonia into a Roman province. He tried unsuccessfully to mediate between the Achzean league and Sparta, but, when the Achzans advanced, he defeated them easily near Scarpheia; Mummius soon after super- seded him, and returning to Italy he triumphed in 146. Consul in 143, he reduced northern Spain to obedience. In 181 censor with Q. Pompeius (the first two plebeian censors), he proposed that all citizens should be compelled to marry. He was a moderate reformer, and was con- sidered the model of a fortunate man; before his death in 115 three of his sons had been consuls, one censor, and the fourth was a candidate for the consulship.

Quintus Caciiius Mrrettus Numipicus, whose repu- tation for integrity was such that when he was accused of ex- tortion the jury refused to examine his accounts, was selected to command against Jugurtha in 109 B.c. He subjected the army to rigid discipline, and aimed solely at seizing Jugurtha himself; he defeated the king by the river Muthul, and next year, after a difficult march through the desert, took his stronghold Thala. Marius, however, accused Metellus of protracting the war, and received the consulate for 107. Metellus returned to Rome and triumphed. Saturninus, whom as censor he tried to remove from the senate, passed in 100 an agrarian law, inserting a provision that all senators should swear to it within five days. All complied but Metellus, who retired to Asia. After Saturninus was killed, he returned, but died shortly after under suspicion of poison.

Quintus Cactus Merettus Pius, so called from his efforts to restore his father Numidicus, commanded in the Social War, defeating Q. Pompedius (88 3.c.). Sulla on departing gave him proconsular command over South Italy. When Marius returned, the soldiers, who had no confidence in Octavius, wished Metellus to command, but he refused. Metellus retired to Africa and afterwards to Liguria, resuming his former command on Sulla's return, In 86 he gained a decisive victory over Norbanus at Faventia. In Sulla's proscriptions he pleaded in favour of moderation. Consul in 80 with Sulla, he went to Spain next year against Sertorius, who pressed him hard till the arrival of Pompeius in 76. Next year Metellus defeated Sertorius's lieutenant Hirtuleius at Italica and Segovia, and joining Pompeius rescued him from the consequences of a check at Sucro. From this time Sertorius grew weaker till his murder in 72. Metellus had previously set a price on his head. In 71 he returned to Rome and triumphed. He was an upright man, of moderate ability.

Quintus Cacitius Merrettus Pius Scipio, son of Scipio Nasica, was adopted by the preceding. He was accused of bribery in 60 B.c., and defended by Cicero. In August 52 Pompeius procured him the consulate. Scipio in return supported Pompeius, now his son-in-law. On war being resolved on, Scipio was sent to Syria. His extor- tions were excessive, and he was about to plunder the temple of Artemis at Ephesus when he was recalled by Pompeius. He commanded the centre at Pharsalus, and afterwards went to Africa, where by Cato's influence he received the command. In 46 he was defeated at Thapsus ; in his flight to Spain he was stopped by a cor- sair, and stabbed himelf. His connexion with two great families gave him importance; but he was selfish and licentious, and his violence drove many from his party.

Quintus CaciLius METELLUs CELER, preetor 63 B.c., was sent to cut off Catiline's retreat northward. Consul in 61, his personal influence prevented the holding of the Com- pitalia, which the senate had forbidden and the tribunes permitted. He opposed the agrarian law of the tribune L. Flavius, and stood firm even though imprisoned ; the law had to be given up. He

also tried, though fruitlessly, to obstruct Cesar's agrarian law in 59. He died that year under suspicion of poison given by his wife Clodia,

METEMPSYCHOSIS, the transmigration of the soul, as an immortal essence, into successive bodily forms, either human or animal. one of the characteristic doctrines of Pythagoras, appears to have originated in Egypt. This indeed is affirmed by Herodotus (ii. 123) :—"The Egyptians are, moreover, the first who propounded the theory that the human soul is immortal, and that when the body of any one perishes it enters into some other creature that may be born ready to reccive it, and that, when it has gone the round of all created forms on land, in water, and in air, then it once more enters a human body born for it; and this cycle of existence for the soul takes place in three thousand years."

Plato, in a well-known passage of the Phadrus, adapts, as was his wont, the Pythagorean doctrine to his myth or allegory about the soul of the philosopher. That soul, he says, though it may have suffered a fall in its attempt to contemplate celestial things, still is not condemned, in its first entrance into another form, to any bestial existence, but, according to its attainments, 7.c., to the progress which it has made in its aspiration for celestial verities, it passes, in nine distinct grades, into the body of some one destined to become a philosopher, a poet, a king, a general, a seer, &e. ; or, if very inferior, it will animate a sophist or an autocrat (ripavvos). Plato extends the cycle of existence to ten thousand years, which is subdivided into periods of a thousand years, after the lapse of which the souls undergo

This doctrine, famous in antiquity, and

judgment, and are admitted to everlasting happiness or condemned to punishment.! It is after the period of a thousand years, he adds, that the human soul comes into a beast, and: from a beast again into a man, if the soul originally was human.

Pythagoras, who was said to have travelled in Egypt,’ brought this fantastic doctrine into Magna Grecia, and made it a prominent part of his teaching. He declared that he had himself been Euphorbus, the son of Panthus, in the time of the Trojan War, and had successively inhabited other human bodies, the actions of all which he remembered.? Closely connected with his theory of metem- psychosis was his strict precept to abstain from animal food, even from eggs, from some kinds of fish, and (for some unknown, probably symbolical, reason) from beans.‘ There can be no doubt that the Egyptian custom of pre- serving the mummies of cats, crocodiles, and some other creatures had its origin in the notion that they had been inhabited by souls which might some day claim these bodies for their own. We cannot suppose that Plato or the later Greeks really believed in the transmigration of souls, though there are many allusions to it, generally of a somewhat playful character. Thus Menander, in the play called The Inspired Woman ® (@copopovpevn), supposes soine god to say to an old man, Crato, ‘When you die, you will have -a sccond existence; choose what creature you would like to be, dog, sheep, goat, horse, or man.” To which he replies, “‘ Make me anything rather than a man, for he is the only creature that prospers by injustice.”

Absurd and fantastic as such a doctrine as metem- psychosis appears at first sight to be, it was in reality a logical deduction from primitive ideas about the nature of the soul. It is necessary to explain these ideas (which have important bearings on other questions) in order to show that metempsychosis was almost a necessary corollary to the belief that the soul was the vital or animating prin- eiple,—that the one distinction between organic and inor- ganic was the existence in the former of a yy.

The difference between a dead body and a living body —or rather, one principal difference—was that the living animal breathed ; and it was observed that, as soon as the breath left the body, not only did warmth and motion cease, but the body began to decay. Life, therefore, was breath, an opinion tacitly expressed by the Greek and Roman vocabulary, animus, anima (dvepos), Wrxy, Tvedpa, spiritus. But breath is air, and air is eternal and imperish- able in its very nature. Therefore the “soul,” or portion of air which gave animation to the body, did not perish at the dissolution of the body, but it was returned to the element of which it was composed, and out-

of which it came. It followed that, from the countless millions of “souls” emancipated from bodies in all time, and still flitting about invisibly in space, the air must literally swarm with souls,—a doctrine taught by Pythagoras.® Hence, any creature, human or bestial, that first drew the breath of life, might, so to say, swallow a soul, ¢.e., take in with the act of respiration the very same particles of air which had animated some former body. For, although the soul was air, and returned to its kindred element, it was supposed to retain a peculiar character in intelligence

}P. 249 A. Comp. Rev. xx. 2,13; Virg., in. vi. 745, ‘Donec longa dies, perfecto temporis orbe, concretam exemit labem,” &e.

“ Diogen. Laert., viii. 1, 3; Lucian, Gallus, § 18 sg., where the doctrine of metempsychosis and the stories about the pre-existence of Pythagoras are wittily satirized.

- Lucian, Gallus, §§ 4, 5; Diodor. Sic., x. §§ 9, 10; Hor., Od. i. 28, 10, ‘‘habentque Tartara Panthoiden iterum Oreo demissum.” ~

- Gallus, 19,33. For fanciful reasons for the prohibition of beans, see Lucian, Vitarwm Auctio, § 5. 5 Frag. 222, Meineke.

4 ® Diogen. Laert., viii. 1, § 32, elva: wdyra tov hepa wuxav euMTAEwY.

(ppdvycis), remembrance of tle past, and knowledge and experience gained insome former existence. Any creature which first breathed might or might not inhale this or that soul, just as a net thrown into the water may catch this or that fish, or no fish at all. But if no “soul” was inhaled the creature was believed for that reason to die; and the different degrees of intelligence observed in different men and animals led to the notion that there must have been a difference in the souls that first animated them. Even the belief that the soul, especially near the time of dissolu- tion from the body, could foretell future events was based on the notion of intelligence and conscicusness resulting from experiences of the past.’

As all the science of modern times cannot say precisely what life is, nor how it first came upon this earth, it is not wonderful that so obvious, though wholly erroneous, an explanation should have presented itself to primitive man when first he began to inquire into the causes of things. The extension of life, by the same term yvx7, to plants and apparently non-breathing things, which, however, had birth, growth, and death, was a development of a philosophic age, and we are not surprised to find Aristotle recognizing one form of life as vegetable, purixov.8 The irrational confusion of “soul” with sentient bodily functions, the attribution to spirits (eiSwAa) of motion, speech, or other muscular and material action, though still common, while metempsychosis is derided or forgotten, is in reality, perhaps, a less excusable superstition.

The Romans inherited the doctrine of metempsychosis from Ennius, the poet of Calabria, who must have been familiar with the Greek teachings which had descended to his times from the cities of Magna Grecia. In his Annals, or Roman history in verse, Ennius told how he had seen Homer in a dream, who had assured him that the same soul which had animated both the poets had once belonged to a peacock, a story that might seem to indicate Indian traditions, The Pavo Pythagorcus and the Somnia Pythagorea are referred to by Persius and Horace, as well as by Lucretius.?

Theories suggesting element-worship naturally led to the notion that air and ether (upper air) were divine.!° Hence every soul, as being but a portion of it, was in itself divine, and therefore immortal. We thus see that the doctrine of the immortality of the soul, whether attained by a sound or a vicious course of reasoning, was an inevitable conclu- sion for early thinkers. Pantheism taught that all the universe was pervaded by a divine mind, and Virgil cites the opinion of some, that the intelligence of bees was due to a portion of this universal mind residing in them, a view closely allied to the doctrine of nietempsychosis.!!_ A divine thing might be polluted, but not destroyed; hence the notion of purifying souls by airing them or burning away a material defilement is enlarged upon by Virgil in the sixth book of the Aneid (724 sq.). (imc, Pe)

METEOR, METEORITE. The term meteor, in ac- cordance with its etymology (yeréwpos), meant originally something high in the air. It has

been applied to a large variety of phenomena, most of them of brief duration, which have place in the atmosphere. Disturbances in the air are aerial meteors, viz., winds, tornadoes, whirlwinds, typhoons, hurricanes, &c. The vapour of water in the atmosphere creates by its forms and precipitations the aqueous meteors, viz., clouds, fogs, mists, snow, rain, hail,

7 Diodor. Sic., xviii., § 1. 8 Kthics, lib. i. 13.

® Wers., Sa. vi. 9; thor., Pret. ii. 1, 52; Laeret., i. 124.

10 % Stos ai@hp,Prometheus exclaims, Ausch., Prom., 88. 1 Georg. iv. 219 — His quidam signis, atque lheec exempla secuti, Esse apibus partem diving meutis et haustus

AEtherios dixere ; deumt namque ire per omnes Terrasque tractusque maris calumque profundum.

&c. The effect of light upon the atmosphere and its con- tents causes certain luminous metcors, viz., rainbows, halos, parhelia, twilight, mirage, &c. Discussion of all these, and of like phenomena, belongs to METEOROLOGY (q.v.).

Another class of luminous meteors, known as shooting or falling stars, fireballs, bolides, &c., have their place in the upper parts of the atmosphere. But by reason of their origin from without they, and the aerolites or meteor- ites which sometimes come from them, belong properly to astronomy. The term meteor is often used in a restricted sense as meaning one of these latter phenomena. The present article will treat of them alone.

The most remarkable of the meteors (and the most instructive) are those which are followed by the falling of stones to the earth. These have since the beginning of the present century attracted so much attention, and the phenomena have been so frequently examined and described by scientific men, that they are very well understood. The circumstances accompanying the fall of stones are tolerably uniform. A ball of fire crosses the sky so

bright as to be visible, if it appears in the daytime, sometimes even at hundreds of miles from the meteor ; and if it appears in the night it is bright enough to light up the whole landscape. It traverses the sky, generally finishing its course in a few seconds. It suddenly gocs out, either with or without an apparent bursting in pieces, and after a short period a loud detonation is heard in all the region near the place where the meteor has disappeared. Sometimes only a single stone, sometimes several are found. For some falls they are numbered by thousands, About three thousand were obtained from the fall of L'Aigle in 1803, scattered over a region about 7 miles long and of less breadth. A like number was obtained from the fall of Knyahinya on June 9, 1866. At Pultusk a still larger number were collected, scattered over a larger space, by a fall in January 1868. From the Emmet county (Iowa) fall, May 10, 1879, a similarly large number have been secured.

These meteors leave behind them in the air a cloud or train that may disappear in a few seconds, or may remain an hour. They come at all times of day, at all seasons of the year, and in all regions of the earth. They come irrespective of the phases of the weather, except as clouds conceal them from view.

Let us describe one or two of these meteors more in detail, On the evening of the 2d of December 1876, persons in or near the State of Kansas saw, about eight o'clock in the evening, a bright fireball rising from near where the moon then was in the western sky. It increased in brilhancy as it proceeded, becoming so bright as to compel the attention of every one who was out of doors. To persons in the northern part of the State the meteor crossed the southern sky going to the east, to those in the southern part it crossed the northern heavens. 'To all it went down near to the horizon a little to the north of east, the whole flight as they saw it occupying not over a minute.

The same meteor was seen to pass in nearly the same way across the heavens from west-south-west to east-north- east by inhabitants of the States of Nebraska, Towa, Missouri, Wisconsin, Illinois, Michigan, Kentucky, Indiana, Ohio, Pennsylvania, and West Virginia. But besides this there were heard near the meteor's path, four or five minutes after its

passage, loud explosions like distant cannonading, or thunder, or like the rattling of empty waggons over stony roads. So loud were these that people and animals were frightened. East of the Mississippi river these explosions were heard everywhere within about 60 miles of the meteor's path ; and in Bloomington, Indiana, sounds were heard supposed to come from the meteor even at a distance of nearly 150 miles from it. Over central

Illinois it was seen to break into fragments like a rocket, and over Indiana and Ohio it formed a flock or cluster of meteors computed to be 40 miles long and 5 miles broad. The sky in New York State was wholly overcast. Persons in Ohio and Pennsylvamia, who from their situation could look over the cloud last, saw the meteor passing on eastward over New York. From many places in the State itself came accounts of rattling of houses, thundering noises, and other like phenomena, which at the time were attributed to an earthquake.

At one place in northern Indiana a farmer heard a heavy thud as of an object striking the ground near his house. The next morning he found on the snow a stone of very peculiar appearance weighing three-quarters of a pound, which from its character there is every reason to believe came from the meteor. By putting together the various accounts of observers, the meteor is shown to have become first visible when it was near the north-west corner of the Indian Territory, at an elevation of between 60 and 100 miles above the earth. From here it went nearly parallel to the earth's surface, and nearly in a right line, to a point over central New York. During the latter part of its course its height was 30 or 40 miles. It thus traversed the upper regions of the air through 25° of longitude and 5° of latitude in a period of time not easily determined, but probably about two minutes.

A somewhat similar meteor was seen in the evening of July 20, 1860, by persons in New York, Pennsylvania, New England, &c., which first appeared over Michigan, at a height of about 90 miles. The light was so brilliant as to call thousands from their houses. It passed east-south- east, and over New York State, at a height of about 50 miles, broke into three parts which chased each other across the sky. At New York city it was seen in the north, while at New Haven it was in the south. At both places the

apparent altitude was well observed, and its true height proved to be about 42 miles above the earth's surface between the two cities. It finally disappeared far out over the Atlantic Ocean. It is doubtful whether any one heard any sound of explosion that came from this meteor, and no part of it is known to have reached the ground. The velocity was at least 10 or 12 miles per second, or fifty times the velocity of sound. These two meteors were evidently of the same nature as those which have furnished so many stones for our museums, except that the one was so friable that it has given us but one known fragment, while the other was only seen to break in two, not even a sound of explosion being known to have come from the meteor.

Next to the stone-producing meteor is the fireball, or bolide, which gives generally a less brilliant light than the former, but in essential appearances is like it. The meteor of July 20, 1860, above described, though unusually brilliant, was one of this class, and represents thousands of bolides which have been seen to break in pieces. The bolides leave trains of light behind them just as the stone meteors do; they travel with similar velocities both apparent and actual, and in all respects exhibit only such differences of phenomena as would be fully explained by differences in size, cohesion, and chemical constitution of stones causing them.

Next to the bolide is a smaller meteor which appears as if one of the stars were to leave its place in the heavens, shoot across the sky, and disappear—all within the fraction of a second. Some meteors of this class are as bright as Venus or Jupiter. Some are so small that though you look directly at the meteor, you doubt whether you see one or

not. In the telescope still smaller ones are seen that are invisible to the naked eye. Meteors comparable in bright- ness to the planets and the fixed stars are usually called shooting stars.

These various kinds of meteors differ from all other luminous phenomena so as to stand in a group entirely alone. Though they have been sometimes regarded as separable among themselves into three or four different species, and for purposes of description may still be so divided, yet they all seem to have a like astronomical charactcr, and the differences are only those of

bigness, chemical constitution, velocity, &c. There appears to be no clear line of distinction between the stone-producing and the detonating meteors, nor between those heard to explode and those seen to break in pieces, nor between these and the simple fireballs, nor between the fireball and the faintest shooting star.

Altitudes of Meteors.—-The first important fact about the meteors is the region in which they become visible to us. In hundreds of instances observations have becn nade upon the luminous path of a meteor at two or more stations many miles apart. When such stations and the path are properly situated relatively to each other, observa- tions carefully made will show a parallax by which the height of the meteor above the earth, the length and di- rection of the path, and other like quantities may be con:- puted. ‘The general result from several hundred instances is that the region of meteor paths may be in general regarded as between 40 and 80 miles above the earth’s surface. Some first appear above 80 miles, and some descend below 40 miles. But an altitude greater than 100 miles, or one below 25, except in the case of a stone- furnishing meteor, must be regarded as very doubtful. Thus the meteor paths are far above the usual meteoro- logical phenomena, which (except auroras and twilight) have not one-tenth of the height of the meteors. But with reference to all other astronomical phenomena they are very close to us. The comets, for example, are well- nigh a millionfold, and even the moon is a thousandfold, more distant from us.

Velocitres of Meteors.—When the length of a luminous path is known, and the time of describing it has been observed, it is easy to compute the velocity in miles. Unfortunately the large meteors, describing long paths, come at rare intervals, and unexpectedly, and it is a happy accident when one is observed by a person accustomed to estimate correctly short intervals of time. On the other hand, the total time of visibility of the shooting stars, which come so frequently that they may be watched for, is usually less than a second. It is not easy to estimate correctly such an interval, where the beginning and ending are not marked by something like a sharp click. Hence all estimates and computations of velocities of meteors are to be received with due regard to their uncertainty. We may only say in general that the velocities computed from good observations are rarely if ever under

8 or 10 miles a second, or over 40 or 50 miles, and that some have far greater velocities than others, The average velocity seems to be nearly 30 miles.

What makes the Luminous Meteor.—The cause of a meteor is now universally admitted to be something that enters the earth's atmosphere from without, with a velocity relative to the earth that is comparable with the earth's velocity in its orbit, which is 19 miles per second. By the resistance it meets in penetrating the air the light and other phenomena of the luminous train are produced. Under favourable circumstances, portions of these bodies reach the earth's surface as meteorites.

Meteoroids.—A body which is travelling in space, and

which on coming into the air would under favourable |

circumstances become a meteor, may be called a mieteor- oid.

The meteoroids are all solid bodies. It would hardly be possible for a small quantity of gas out in space to retain such a density as would enable it on coming into the air to go 10 or 100 miles through even the rare upper atmosphere, and give us the clear line which a shooting star describes. Even if a liquid or gaseous mass can travel as such in space, it would be instantly scattered on striking the air, and would appear very unlike a shooting star or bolide.

Numbers of Meteors.—Of the larger meteors there are in the mean six or eight per annum which in the last fifty years have furnished stones for our collections. A much larger number have doubtless sent down stones which have never been found. Thus Daubrée estimates for the whole earth an annual number of six or seven hundred stone-falls.

But of the small meteors or shooting stars the number is very much larger. Any person who should in a clear moonless night watch carefully a portion of the heavens would, in the mean, see at least as many as eight or ten shooting stars per hour. A clear-sighted and practised observer will detect

somewhat more than this number. Dr Schmidt of Athens, from observations made during seventeen years, obtained fourteen as the mean hourly number on a clear moonless night for one observer during the hour from midnight tol a.m. A large group of observers, as has been shown by trial, would see at least six times as many as a single person, By a proper consideration of the distribution of meteor paths over the sky, and in actual altitude in miles, so as to allow for mists near the horizon, it appears that the number over the whole globe is a little more than ten thousand times as many as can be seen in one place. This implies that there come into the air not less than twenty millions of bodies daily, each of which, under very favourable conditions of absence of sunlight, moon- light, clouds, and mists, would furnish a shooting star visible to the naked eye. Shooting stars invisible to the naked eye are often seen in the telescope. The numbers of meteors, if these are included, would be increased at least twentyfold.

How densely Space is filled with Meteoroids.—By assuming that the absolute velocity of the meteors in space is equal to that of comets moving in parabolic orbits (we have good reason to believe that this is nearly their true velocity), we may prove from the above numbers that the average number of meteoroids in the space that the earth traverses is, in each volume equal to that of the earth, about thirty thousand. In other words, there is in the average to every portion of space equal to a cube whose edge is about 210 miles one meteoroid large enough to make a shooting star bright enough to be visible to the naked eye. Such meteoroids would, upon an equable distribution, be each in round numbers 250 miles from its near neighbours. All these num- bers rest upon Dr Schmidt's horary number fourteen, and for a less practised observer and a less clear sky they would be correspondingly changed. How much they would need to be altered to represent other parts of space than those near the earth's orbit is a subject of inference rather than of observation.

Motion in Space.—The meteoroids, whatever be their size, must by the law of gravitation have motions about the sun in the same way as the planets and comets, that is, in conic sections of which the sun is always at one focus. The apparent motions of the meteors across the sky imply that these motions of the meteoroids relative to the sun cannot as a rule be in or near the plane of the ecliptic. For if they were there, since the motion of the earth

is also in the ecliptic, the motion of the meteoroids relative to the earth would be in the same plane. This would involve

that all the meteor paths as seen on the sky would if pro- duced backward cross the ecliptic above the horizon. In fact there is no tendency of this kind. Hence the meteor- oids do not move in orbits that are near the ecliptic as the planets do, but like the comets they may and usually do have orbits of considerable inclinations.

Numbers through the Night.—There are more meteors scen in the morning hours than in the evening. If the meteors had no motion of their own in space, the earth would by its motion receive the meteors only on the hemi- sphere that was in front. There would be no meteors secn in the other hemisphere. On the other hand, if the meteors had such large velocities of their own as that the earth's velocity might be neglected in comparison, and if the directions of the meteors' motions were towards all points indiscriminately, then as many would be seen in one part of the night as another. In fact there are about three times as many seen in the morning hours as in the evening. The law of change from evening to morning gives a means of proving that the mean velocity of meteors is so great that they must in general be moving in long orbits about the sun. In this respect also the meteoroids resemble comets, and are unlike planets, in their motions. Of the stone-furnishing metcors more are seen in the day than in the night, and more in the earlier hours of the night than in the later. This is probably due to the fact that more persons are in a position to see the stonc-falls at the periods of greater abundance.

Star Showers.—While the avcrage number of shooting stars for a single observer at midnight may be regarded as tolerably constant, there have been special epochs when many more have been seen. In certain instances the sky has been filled with the luminous trains, just as it is filled by descending snowflakes in a snowstorm, making a veritable shower of fire. One of the best-observed, though by no means the most brilliant, of these showers occurred on the evening of the 27th of November 1872. Some of the observers of that shower, counting singly, saw at the ratc of eight or ten thousand shooting stars in the course of two hours. The distances of the

meteoroids in the middle of the swarm which the earth then passed through, cach from its nearer neighbours, would be 30 or 40 miles.

The following quotations show the impression made by star showers in times past :—

‘In the year 2386 fof the Hegira] there happened in Egypt an earthquake on Wednesday the 7th of Dhu-]-Ka‘dah, lasting from the middle of the night until morning ; and so-called flaming stars struck one against another violently while being borne eastward and westward, northward and southward, and no one could bear to look toward the heavens on account of this phenomenon.”

“Tn the year 599 [of the Hegira], on the night of Saturday, on the last day of Muharram, stars shot hither and thither in the heavens, eastward and westward, and flew against one another like a scattering swarm of locusts, to the right and left ; people were

thrown into consternation, and cried to God the Most High with confused clamour.”

‘These meteors [November 12, 1799] might be compared to the blazing sheaves shot out from a firework.” *

‘“The phenomenon was grand and awful; the whole heavens appeared as if illuminated with sky rockets.”

November 18, 1833. ‘‘Thiek with streams of rolling fire; scarecly a space in the firmament that was not filled at every instant.”

‘« Almost infinite number of meteors; they fell like flakes of snow.

November Meteors or Leonids.—These quotations all refer (except possibly the first) to a shower which has appeared in October and November of many different years since its first known occurrence on the 13th of October 902 a.p. Dates of these showers are given in the following table :—

Oct. 18, 902. Oct. 17, 1101. Oct. 28, 1602, Nov. 13, 1883. Oct. 15, 981. Oct. 19, 1202, Nov. 9, 1698. Nov. 14, 1866, Oct. 14, 984. Oct. 23, 1866. Nov. 12, 1799. Nov. 14, 1867. Oct. 15, 1002. Oct. 25, 1538. Nov. 13, 1832. Nov. 14, 1868.

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On several years after 1833, and before and after 1866-68, there were unusual numbers of those metcors seen on the mornings of November 13, 14, and 15, though per- haps they would have been unnoticed had there not been special watching for them. It will be scen that all these showers are at intervals of a third of a century, that they are at a fixed day of the year, and that the day has moved steadily and uniformly along the calendar at the rate of about a month ina thousand years. The change of twelve days in the 17th century is due to the change from old to new style.

The only explanation of this periodical display that is now seriously urged, and the one which is universally accepted by astronomers, is that there is a long thin stream of metcoroids, each of which is travelling about the sun in a conic section. These conic sections are all nearly parallel, and have nearly the same major axis, cxtending out about as far as to the orbit of Uranus, and each requir- ing the common period of thirty-three and a quarter years. The length of the stream is such that the most advanced members are six or eight years ahcad of the hindermost, and they all cross the earth's orbit with a velocity of about 26 miles a second. Since the earth plunges through the group nearly in the opposite direction, the velocity with which they enter the air is 44 milesa second. One of the facts which have greatly aided us in arriving at this explanation is that these meteors in all the years and through all hours of the night cross the sky

as we look at them in lines which diverge from a point |

near the centre of the sickle in the constellation Leo ; hence the paths in the air are parallel. This implies that their velocities relative to the sun are all parallel and equal to each other. The radiation from Leo has given to them the name Leomds.

Orbit of the Leonids.—This orbit, common to all the Leonid meteors, is inclined to the ecliptic at an angle of 17° (or rather 163°, since the motion is retrograde), has a major axis of 10°34, a periodic time of 33°27 years, and a peri- helion distance a little less than unity.

The above orbit, and that alonc, explains the several appearances of the November meteors, the annual and the thirty-three year periods, the radiation from Lco, and the change of day of the month in the course of the centuries. This it does so completely that the result has never been questioned by astronomers. Shortly aftcr the publication by Professor Adams in 1867 of the last link in the chain of the proof of this orbit, there was also published the definitive orbit of the comet 1866 I. That the comet was running almost exactly in the orbit of the metcors was at once recognized. In fact the comet is itself, in a sense, a meteoroid, and the principal member, so far as we know, of the group. Leonids had been seen in 1863, two years and two months in advance of the comet, while those of 1866 were ten months behind it. Those of later years (a few Leonids were seen even in 1870) were extended along the line of the comet's path behind it. The leaders of this long file of meteoroids had passed up beyond the orbit of Jupiter long before those which brought up the rear had crossed that planet's orbit going down toward the sun, The thickness of the stream is less than the ten-thousandth part of its length. In the densest part that we have recently passed through—namely, that traversed in 1833— the density of the stream may be expressed by saying that each meteoroid must in the mean have been 10 or 20 miles from its nearest neighbours.

What makes this Comet and these Meteors describe the same Orbit about the Sun?—Its path might have been inclined to the ecliptic at any angle instead of 163°. Or,

with this inclination, its plane might have cut the earth's ©

orbit at any other place than where the carth is on the 14th

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of November. Or, happening to have these two elements in common, it might have passed the earth's orbit nearer the sun or farther away from it

than the earth is. Or, having these three things in common, it might, by a slight difference in velocity, have had a periodic time much more or much less than thirty-three years. Or, with all these in common, it might have crossed the earth's orbit at a far different angle than the meteors. These several independ- ent elements for the comet and the meteors are substantially identical, and this identity proves almost beyond doubt that between the two either there is now an actual or else there has been in the past a causal connexion. That there is now any physical connexion is thoroughly disproved by the immense magnitude of the stream, and by the isolation and distances from each other of the individual components. It seems difficult to find any cause that should bring into such a strangely shaped group bodies that had originally orbits distributed at random. Hence we are apparently forced to conclude that these meteoroids have something common in their past history. In fact they seem to have been once parts of a single body, and these common elements are essentially those of the parent mass. By some process not yet entirely explained they have become separated from the comet, thrown out of the control of its attractive power, and so left to travel each one in its own orbit. If the cause of separation was not too violent, each new orbit would necessarily be but slightly different from that of the comet. Very small variations in velocity, and hence in periodic time, would in the course of ages scatter the several individuals along the orbit even to the length of many hundreds of millions of miles.

The Meteor Group is not the Comet's Tail._—These meteoroids must be carefully distinguished from the comet's tails. The former follow or precede the comet exactly in the comet's path; the particles that compose the latter are driven off by the sun's repulsion directly away from the comet's path. The meteoroids and the comet have orbits with nearly common elements; the orbits of the particles of the tail have elements that are unlike each other, and unlke those of the comet. The

meteoroids are undoubtedly solid masses; the tails are.

pulverulent or gaseous.

Twin Comets of 1366.—The comet 1866 I. is probably not the only one that has been connected with the November meteors. In 1366, a few days after the earth went through the meteor streani, a comet appeared in the northern

heavens, and, passing directly in the line of the stream so close to the earth as to describe an arc of 90° in a single day, disappeared in the constellation Aquarius. Immedi- ately upon its disappearance a second comet was seen in the north, which foHowed nearly in the same path. The Chinese accounts are not sufficiently exact to furnish independent orbits for them, but both comets were undoubtedly members of the Leonid stream. The comet 1866 I. may be identical with one of them.

The Andromeds and Biela's Comet.—Mention has been made of the star shower of November 27, 1872. The periodical comet known as Biela's, which makes three revolutions in twenty years, passes very near the carth's orbit at a longitude corresponding to November 27, but by reason of its direct motion the node has had considerable motion in longitude as the result of perturbations. Meteors having the same orbits as Biela's comet would have a radiant in the constellation Andromeda, that is, would eross the sky in lines diverging from a point in that constellation. They might, however, be at dates after or even before November 27.

Unusual numbers of meteors were seen December 7, 1798, by Brandes. A like abundance was seen December 7, 1888 ; and, as they had been expeeted, and radiation was now looked for, they were found to diverge from a point in Andromeda. Hence they have been called Andromeds. Sinee 1852 Biela's comet itself has been entirely lost. The star shower of November 27, 1872, previously referred to, had a radiant in Andromeda, and in every

way appeared as though its meteors had once been parts of Biela's comet.

The Perseids and the Comet 1862 II].—There is a third epoch when meteors appear in unusual numbers, viz., the 9th to 11th of August. This ‘‘sprinkle,” as it may be called, has been seen con- stantly at the time named for nearly fifty years, and there are on reeord accounts of similar appearances in the earlier years before its annual character had been discovered. Some observers have thought that there were evidences of a variation having a long period, but the proof seems as yet unsatisfactory, and the display may be regarded as tolerably constant from year to year. On every 10th of

August we may confidently expect a display of meteors that shall be at least four or five times as numcrous as those of ordinary nights. The radiant is in the constellation Perscus, and hence the name Perseids.

The comet 1862 III., which has a period of more than a hundred years, passes close to the earth's orbit, nearly cutting it at the place of this shower, and has a velocity and direction corresponding to this radiant. Hence a connexion of the Perseid meteors with this eomet is presumed, like that which the Leonids and Andromeds have with the eomet 1866 I. and Biela. The meteors are distri- buted along this orbit more regularly than along either of the other two, and at the same time the breadth of this group is a hundred times greater than that of the Leonids. We must for the present regard it rather as a mctcor ring, the meteoroids being scattered along the entire conic section which the comet describes. This ring has an inclination of 118° with the ecliptic.

Meteors of April 20-21—Lyraids.—About the 20th of April there have been several quite brilliant star showers, the earliest on record having been in the year 687 B.c. On that day meteors have been observed whieh radiated from Lyra, and to these the name Lyraids has been givén. The comet 1861 I. passes near the earth's orbit in that longitude, and any metcors having such a connexion with it as is proved for the Leonids with comet 1866 I. would also radiate from Lyra.

Again, at several other periods of the year, meteors have been seen in unusual numbers which seem to be connected with eertain comets.

Meteor Radiants.—We have thus definite proof that the earth at certain epochs plunges through nieteor streams, and that these streams travel along the same track as cer- tain comets. The question is at once asked—Do not the sporadic meteors, those which are seen on any and all nights of the year, belong to similar streams? An immense amount of labour has been spent in observing the paths of meteors, and classifying them, so as to detect and prove the existence of radiant points. As many as a thousand such radiants have been suggested by the different investigators. Some of these are duplicates, some will prove to be acci- dental coincidences ; but a goodly number may reasonably be expected to endure the test of future observations. Such will show the existence of meteor streams, and per- haps

will be connected with comets that are now known, or that may hereafter be discovered.

The radiants have been spoken of as if they were points in the heavens. This is so nearly true as to justify all the conclusions that have been deduced above. JBut in fact a radiant, even in the star showers in which it is most sharply defined, must be regarded as a small area. The apparent meteor paths when produced backward do not exactly meet in a point. If they be treated as proceeding from a small area, it does not appear that this is a long narrow one. Hence it may be shown that the paths of the meteors in the air are not exactly parallel either to a line or toa plane. This can hardly be due to a want of parallelism of the paths before the meteoroids meet the

earth, but is rather due to their glancing as they strike the

air. These facts add nota little to the difficulties to be overcome by the energetic observers and investigators who are trying to deduce order out of an apparent chaos.

Meteorites.—The fragments which fall immediately after the disappearance of large meteors have been carefully collected and preserved in mineralogical museums, and have been studied with special interest. The largest collections in Europe are in Vienna, Paris, London, and Berlin, some of these representing over three hundred localities. In the United States there are large collections at New Haven, Amherst, and Louisville. ;

In several respects these fragments differ at first sight from terrestrial rocks. ;

They are when found almost always covered in part or entirely with a very thin black crust, generally less than =i; of an inch in thickness. This crust may have a bright lustrous surface, or it may be of a lustreless black. It has evidently been melted, yet so rapidly as not to change in the least the parts of the stone immediately adjacent. Streaks showing the flow of the melted matter are often seen on the surface. Upon some surfaces are what appear to be deposits of the melted matter that has flowed off from the others. Some

surfaces are only browned, showing an apparently recent fracture, and some cracks are found in stones which are not yet completely broken in two.

The surfaces very often have small cup-like cavities, sometimes several inches in diameter, sometimes like deep imprints in a plastic mass made by the ends of the fingers, and sometimes still smaller. These "'cupules" have not only various sizes in different stones, but even in the same stone differ considerably from one surface to another. They appear in meteorites that are almost exclusively iron, as well as in those mainly destitute of that metal, and they may be regarded as a characteristic of meteorites.

The meteorites have usually metallic iron as one of their component parts. Native iron is very rare indeed among terrestrial minerals, and its presence in the meteorites is therefore characteristic. Sometimes the iron forms the principal part of the body, giving it the appearance of a mass of that metal. Sometimes it forms only a connected framework which is filled in with mineral matter. Sonie- times particles of iron are scattered through a stony mass ; and a few meteorites are said to be destitute of metallic iron altogether. The metallic iron is always accompanied with nickel.

The stony meteors when broken or cut through have usually a greyish interior, and often exhibit a peculiar globular structure. From the small rounded grains that give it this appearance, the name chondrite (from ydvdpos, a ball) has been applied to this kind of meteorite. Some- times the irregular fragments are compacted into a kind of breccia.

The pieces as we find them are always apparent frag- ments of some larger mass, and there is no structural appearance which would indicate that the mass might not be a fragment of a still larger one. In some of the falls fragments picked up at a distance of miles from each other fit together in their simply browned surfaces, showing that they were true fragments recently separated. In some cases surfaces of the stones are partially polished. In some a cross section of the stone exhibits thin black lines as though the melted matter of the surface had been forced into the crevices of the partially broken stone.

The stones when seen to fall, if at once picked up, are usually too warm to be taken in the hand. But cases are on record in which the stones were

excessively cold. They sometimes, on striking the ground, penetrate into it from] to 3 feet. In extreme cases large ones have struck much deeper into soft earth. Sometimes they are broken to pieces by the impact with the hard earth.

The stones are usually not very large. Although the light of the meteor is such as sometimes to be seen over a region 1000 miles in diameter, and the detonation gives phenomena suggestive of an earthquake over many counties, yet a stone exceeding 100 tb is quite exceptional in our col- lections. The total weight secured at any fall has rarely if ever amounted toa thousand pounds. Theaverage weight of nine hundred and fifty perfect specimens of the Pultusk fall in the Paris museum is 67 grammes, or less than 2} oz. One of the Hessle meteorites in the Stockholm museum weighs less than 1 grain. Many of the Emmet county mete- orites (May 10, 1879) are not much larger, though the largest specimen of that fall weighs nearly 500 ib.

Meteors traversing the Atmosphere.—We can now get a very good idea of the history of that part of a meteorite's life between its entrance into the air and its arrival at the earth. It is entirely invisible until it has reached that height at which the density of the air is enough to create con- siderable resistance. Up to that time it moves almost exclusively in obedience to the sun's attraction. The earth's attraction may be neglected, especially during the passage through the air. Since the velocity is a hundred times that of sound, the elasticity of the air is impotent to remove it from in front of the meteorite, or to prevent a high degree of condensation, Perhaps the air is liquefied immediately in front of the stone. Heat is developed in it enormously, and the stone being pressed closely against the hot air is melted, with an intense light. The condensed air charged with the melted matter is pushed aside, and left behind nearly in the wake of the meteor to form the train. The brightness of the train rapidly diminishes behind the meteor, so that the light of the meteor and the train, modi- fied by irradiation, make the whole appear to a distant eye of the shape of a pear or candle-flame. The stone being a poor conductor of heat, and itself rigid, is not heated in the interior either by condensation or conduction, and may reach the ground with its surface only heated, while the interior is as cold as it had been out in space.

If the stone is a small one it will soon be used up by this intense fire. Until its front surface is rounded by the flame, the irregular resistances may cause

such a stone to glance. But if the stone is larger it will lose velocity less rapidly. As it comes down into the region where the air is more dense, it willin spite of loss of velocity meet greater resistance. The air pressed hard against it burns it un- equally, forming cupules over its surface. The pressure of the air cracks the stone,—perhaps scaling off small frag- ments, perhaps breaking it into pieces of more uniform size. In the latter case the condensed air in front of the meteor being suddenly relieved will expand, giving the terrific explosion which accompanies such breaking up. In either case a fragment may have still velocity enough to burn on for an instant in its new path and then come invisibly to the earth, covered with a coating, the greater part obtained after the principal explosion. In the latter part of the course the original velocity has almost all dis- appeared, so that the sound travels faster than the meteor. The air's resistance exceeds the earth's attraction, and the stones strike the ground only with the force of a spent cannon ball. It is no doubt in violent disruption that some of the fractures are made in such a way as to give the rubbed and polished surfaces.

Trains of Meteors.—The smaller meteors generally have no perceptible train. Only in exceptional cases do the trains of ordinary shooting stars remain visible longer than a fraction of a second. An unusual number of the Leonids have a bluish train. But the brighter shooting stars and the larger meteors sometimes have trains that endure for minutes, and in extreme cases for an hour. Such trains are at first long narrow lines of light, though much shorter

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than the track of the meteor. They begin at once to broaden in the middle and to fade away at one .or both

ends. or three convolutions. The white cloud floats slowly away

among the stars, coiling up more and more, and finally fades out of sight. The cause of all this seems to be as follows. The heated air charged with the debris of the meteor is by the meteor's impact driven off horizontally, causing the narrow train to spread into a cloud. The currents of air differing in direction at different altitudes twist the cloud into its varied fantastic forms. Attempts to obtain the spectrum of the trains have been made, and

sodium and magnesium lines have been thought to be detected in them. The observation, however, is one that is not easy to make or confirm. The trains have often colours other than white, and in the case of the brighter meteors different colours are seen in the different parts of the train.

Magmtude.—Some computations have been made of the size of the shooting star meteoroids from the mechanical equivalent of the light developed by their disintegration. If all the energy of the meteor is changed into light, then these computations would be conclusive. But a part is spent in disintegrating and burning the stone, a part in heating the air, and a part in giving dircct motion to portions of air. A computation based on the light developed gives only a lower limit to the size.

It seems probable that the larger meteors might be safely regarded as weighing on entering the air only a few hundreds or at most a few thousands of pounds. The smallest visible shooting stars may be equal in size to coarse grains of sand, and still be large enough to furnish all the light exhibited by them. The largest shooting stars furnish matter enough to fill with thin trains cubic miles of space, but this need not require a very large mass.

Mcteoric Irons.—There have been found at various times on the surface of the earth masses of metallic iron combined with nickel.

These have been so like the irons which have been known to fall, both in their structure and in composition, that they have been without hesitation classed among the metcoric irons. A mass of this charactcr weighing 1635 tb, found in Texas, is in the Yale College Museum. The Chareas (Mexico) iron in the Paris museum is about the saine size. A ring-shaped mass. somewhat smaller, fron Tuczon, is in the United States National Muscum in Washington. A still larger mass is in the British Museum, and many other large masses are in public collections or private possession.

Widmannstitten Figures.—Ifin any of the meteoric irons, whether seen to fall or found on the earth, a section is cut and polished and then etched with acids, a series of peculiar lines are developed which are known as Widmannstitten figures. he lines of iron unattacked by the acid consist of an irregular grouping of parallel rulings often lying along the faces of a regular

octahedron. The exhibition of these figures and the combination of iron with nickel have been usually considered conclusive evidence of the meteoric origin of any iron mass.

Nickel Iron of Ovifak.—In1870 Baron Nordenskiéld, in his voyage to Greenland, found on the shore of the island of Disco fifteen iron masses, the largest of which weighed 20 tons, all in an area of half an acre. In the basaltic rocks not far distant other iron masses were found embedded in the basalt. The presence of nickel with the iron, and the development of lines like the Widmannstitten figures, were at once accepted as proof of their meteoric origin, in Spite of the combination with basalt. A more complete examina- tion has, however, established the terrestrial origin of these irons, and given reasons to hope for new discoveries of relations existing between the earth and the meteors. The additional discovery of small particles of metallic iron in certain other igneous rocks ee that the union of the Ovifak irons with basalt is not excep- tional.

Chemical Constitution of the Metcorites.—No new element has been found in the meteorites. Three elements most widely distri- buted and most important ainong the meteorites—iron, silicon, and oxygen—are also most abundant in our earth. Daubrée gives the following lists of elements, arranged somewhat in the degree of

their importance, in meteorites (Maskelyne adds lithiuin and antimony) :—

Presently tleey become curved, sometimes with two |

Tron. Titanium. Arsenic. Magnesium. Tin. Phosphorus. Silicon. Copper. Nitrogen. Oxygen. Aluininium. Sulphur. Nickel. Potassiuin. Chlorine. Cobalt. Sodium. Carbon. Chromium. Calcium. Hydrogen. Manganese.

Minerals in Meteorites.—Among the minerals in the meteorites there are several which occur in the rocks on the earth. Among these are cited by Daubrée peridote, pyroxene, enstatite, triclinic felspar, chromite, magnetic pyrites, iron oxide, graphite, and probably water. Several minerals, however, are found which, so fur as now known, are peculiar to the

meteorites :—metallic nickel- iron, phosphide of iron and nickel (schreibersite), sesquisulphide of chromium and iron (daubréelite), sulphide of calcium (oldhamite), and chloride of iron (lawrencite).

Meteorites of different falls are in general unlike ; but there are many instances in which the stones of two falls arc so similarly constituted that it is not easy to distinguish them.

In four falls (Alais, Cold Bokkeweld, Kaba, and Orgeuil) the stones contain little or no iron. In these carbon appears not as graphite but in union with hydrogen and oxygen, and also with soluble and even deliquescent saline matters. The combinations are such as to suggest the existence of humus and organic remains. But after careful search nothing of this kind has been detected in them. In general the meteorites show no resemblance in their mechanical or mineralogical structure to the granitic and surface rocks on the earth. One condition was certainly necessary in their formation, viz., the absence of free oxygen and of cnough water to oxidize the iron and other elements. Perhaps it is to this fact that are due the resemblances between these minerals and those of the deep-seated rocks of the earth in the formation of which free oxygen and water were also not present.

Gases in Meteorites.—The meteoric stones and irons when reduced to fine particles and placed in the vacuum of a Sprengel air- pump give offsmall quantities of gases which may be reasonably pre- sumed to have been occluded by the irons at some time in their earlier history. Professor Graham found hydrogen in meteoric irons. Professor Wright has shown that a moderate heat drives off from the stony meteorites carbonic acid and carbonic oxide with a small amount of hydrogen. As the heat increases the proportion of hydrogen (and even some nitrogen) increases till at a full red heat tho hydrogen given off is by far the largest portion. From the irons similar gases are given off, but the carbon compounds are not so large a component as hydrogen. The spectra seen in the tails of comets are not strikingly like those of any of these gases, But it is impossiblo to reproduce in the laboratory the conditions under which the matter of comet’s tails is giving off its light. We cannot therefore say that these gases may not be the important parts of the cometic coma and tails.

Metcoroid as Part of a Comet.—Assuming that the metcorite and meteoroid once formed an integral part of a comet, not a little information is given us of the nature of this mysterious body. There is room also for speculation.

First, the comet may be a single hard body which comes from the cold of space into the heat of the sun, and there has frag- ments broken off, just as a stone is shattered in a hot fire. The nucleus of some of the comets must be very small because invisible in the telescope, and an impulse that would raise a stone on the earth only a few inches would send it permanently away from such a comet. The exposure of new surfaces to the heat of the sun might give occasion for the development of gas to form the comet's tail.

Or, secondly, the comet may bea tolerably compact aggregation of small bodies not in contact, each one being of the size of a meteoroid, and kept near to the rest, not by cohesion, but by their combined attraction. The total mass being small, some members of the group near the comet's perihelion passage can be by the sun's perturbing action thrown out into orbits quite independent of the comet itself, and yct such as relative to the sun shall resemble that of the main group. Perturbations resembling tidal waves might be preparing other members to be cast off at the next perihelion passage of the comet.

In either case, if we suppose, as seems probable, that the eomet came from outside the solar system, and that a disturbance by a large planet changed the original hyperbolic orbit into an ellipse, the eomet must have passed that planet as a very compact group, if not in a single mass, else the disturbance that changed the orbit would have scattered the group beyond the power of a future recog- nition of the common origin of the fragments.

Meteorotds as Fuel of the Sun.—The idea has been held by distinguished physicists that the meteoroids in falling into the sun furnish by their eoneus3ion a supply for the heat which the sun is constantly sending off into space, —that they are in fact the fuel of the sun. Such a view, however, receives but little support from facts which we know about meteors. The metcoroids of the August and two November periods are evidently permanent

uiembers of the solar system moving in closed orbits. The sainc is by inference highly probable for most of the other meteoroids, and inay be true of all of them. Permanent members of the solar system, however, if they ever fall into the sun, do so only after a long period of perturbation. If any meteoroids come from stellar spaces and have any uniform or random distribution of velocities or direc- tions, only a very small portion of these would hit the sun's surface. The far greater portion would go on in hyperbolic orbits. But the earth receives the impact of its portion of these foreign meteoroids, both in their inward and outward course, and in addition encounters a full share of the permanent members of the solar system, of which the sun receives very few or none. It is not hard to show that a supply of meteoroids to the sun sufficient to make good its daily loss of heat would require that the twenty million meteoroids which the earth daily encounters, even if all were from stellar space, should have an average weight of hundreds of tons. The facts do not warrant the admission of any such magni- tude even for the large meteors, much less for the ordinary and small shooting stars. Whatever be the souree of the sun's heat, all the meteoroids of which we know anything are totally inade- quate to supply the waste.

The literature of meteors and metcoroids is very much scattered. It is mainly contained in the scientific journals and in transac- tions of learned societies. The series of valuable Reports of the Luniinous Meteor Committee of the British Association contains not only the record of an immense amount of original observations, but also year by year a digest of most of the important memoirs.

Meteoric science is a structure built stone by stonc by many builders. In this article no attempt has been made to assign to each builder the credit for his contribution. (H. A. N.)

METEORA, a remarkable group of rock-built monas- terics in Thessaly, in the northern side of the valley of the Peneus, not quite 20 miles north-east of Triccala, and in the immediate vicinity of the village of Kalabaka, Stagus, or Stagoi (the ancicnt Aiginium). From the Cambunian chain two

vast masses of rock are thrust southward into the plain, surmounted by a number of huge isolated columns

from 85 to 300 feet high, “some like gigantic tusks, some like sugar-loaves, and some like vast stalagmites,” but all consisting of iron-grey or reddish-brown conglomerate of gneiss, mica-slate, syenite, and grecnstone. On the summit of these rocky pinnacles—accessible only by aid of rope and basket let down from the top, er in some cases by a series of almost perpendicular ladders climbing the cliff to the mouth of a tunnel—stand the monasteries of Metcora (ri Meréwpa).’ At one time they were twenty-four in number; but Holland (1812) and Hughes (1814) found them reduced to ten; at Curzon’s visit (1834) there were only seven; and in 1853 not more than four of these were inhabited by more than two or three monks. Meteora par excellence is the largest and perhaps the most ancient. The present building was erected, according to Leake’s reading of the local inscription, in 1388 (Bjérnstahl, the Swedish traveller, had given 1371), and the church is one of the largest and handsomest in Greece. St Barlaam’s and St Stephen’s (the latter founded by the emperor John Cantacuzene) are next in importance. The decorations of the churches contain a large amount of material for the history of Byzantine art, not much inferior in value to the similar treasures at Athos.

Unless the identification with the Ithome of Homer be a sound one, there is no direct mention of the rocks of Meteora in ancient literature, and Professor Kriegk suggests that this may simply be due to the faet that they had not then taken on their present re- imarkable form, Aginium, however, is deseribed by Livy as a strong place, and is frequently mentioned during the Roman wars; and Stagus appears from time to time in Byzantine writers.

See Holland, Travels in the Jonian Isles, &c., 1815; Mughes, Travels in Greece and Albania, 1830; Curzon, Visit to Monasteries in the Levant, 1819; Leake, Nor-

thern Greece ; Professor Kriegk in Zeitschr. f. allg. Erdk., Berlin, 1853; Tozer, Researches in the Iighlands of Turkey, 1869.

METEOROLOGY

ETEOROLOGY, in its original and etymological sense, included within its scope all appearances of the sky, astronomical as well as atmospherical, but the term

is now restricted to the description and explanation of the |

phenomena of the atmosphere which may be conveniently grouped under weather and climate. Thcse phenomena rclate to the action of the forces on which the variations of pressure, temperature, humidity, and electricity of the atmosphere depend, but in an especial sense to the aerial inovements which necessarily result from these variations.

In the more exact development of metcorology, the scientific investigation of climate long preceded that of weather. Humboldt's work on Jsothermal Lines, published in 1817, must be regarded as the first grcat contribution to metcorological science. The importance of this inquiry into the distribution of terrestrial tempcrature it is scarcely possible to overestimate, for, though the isothcrmals were necessarily to a considerable extent hypothetical, there cannot be a doubt that they presented a first sketch of the principal climates of the globe. Dove continued and extended the investigation, and in his great work On the Distribution of Heat on the Surface of the Globe, published in 1852, gave charts showing the mean temperature of the world for each month and for the year, together with charts of abnormal temperature. To this, more than to any other work, belongs the merit of having popularized the science of meteorology in the best sense, by enlisting in its service troops of observers in all parts of the civilized world.

In 1868 another scries of important charts were pub- lished representing by isobaric lincs the distribution of the mass of the earth's atmosphere, and by arrows the prevail- ing winds over the globe for the months and the year. By these charts the movements of the atmosplierc and the

immediate causes of these movements were for the first time approximately stated, and some knowledge was thereby attained of some of the more difficult problems of metcorology. It was shown that the prevailing winds are the simple result of the relative distribution of the mass of the earth's

atmosphere, in other words, of the relative distribution of its pressure, the direction and force of the prevailing winds being simply the flow of the air from a region of higher towards a region of lower pressure, or from where there is a surplus to where there is a deficiency of air. It ison this broad and vital principle that meteorology | rests, which is found to be of universal application throughout the science, in explanation, not only of prevail- ing winds, but of all winds, and of weather and weather changes generally. One of the more important uses of the principle is in its furnishing the key to the climates of the different: regions of the earth; for climate is practically determined by the temperature and moisture of the air, and these in their turn are dependent on the prevailing winds, which are charged with the temperature and moisture of the regions they have traversed. The isobaric charts show further that the distribution of the mass of the earth's atmosphere depends on the geographical distri- bution of land and water in their relations to the sun's heat and to radiation towards the regions of space m different seasons. . .

In 1882 Loomis published a map showing the mean rainfall of the globe. This map and others that have been constructed for separate countries show conclusively that the rainfall of any region is determined by the prevailing winds considered in relation to regions from which they have come, and the physical configuration and temperature of the part of the earth's surface over which they blow.

'The maximum rainfall is precipitated by winds which,

having traversed a large breadth of ocean, come up against and blow over a mountainous ridge lying across their path, and the amount deposited is still further increased if the winds pass at the same time through regions the temper- ature of which constantly becomes colder. On the other hand, the rainfall is unusually small, or nz/, when the pre- vailing winds have not previously traversed some extent _ of ocean, but have crossed a mountain ridge and advance at the same time into lower latitudes, or regions the temperature of which is markedly higher.

While the observational data for the determination of the geographical distribution of the prime elements of climate, viz., the pressure, temperature, moisture, and movements of the atmosphere and the rainfall were being slowly but surely collected, the great importance of the study of weather came gradually to be recognized. Additional impetus was given to this branch of study from its intimate bearings on the eminently practical question of storm warnings. Synchronous weather maps, showing the weather over a considerable portion of the earth's surface, were constructed, and some advance was made in tracing the progress of storms from day to day. Unques- tionably one of the first problems of meteorology is to ascertain the course storms usually follow and the causes by which that course is determined, so as to deduce from the meteorological phenomena observed, not only the certain approach of a storm, but also the particular course that storm will take. The method of practically conduct- ing this large inquiry in the most effective manner was devised by the genius of Leverrier, and begun to be carried out in 1858 by the daily publication of the Bulletin Inter- national, to which a weather map was added in September 1863. This map showed graphically for the morning of the day of publication the atmospheric pressure, and

_the direction and force of the wind, together with tables of temperature, rainfall, cloud, and sea disturbance from a large number of places in all parts of Europe. From such weather maps forecasts of storms are framed and suitable warnings issued ; but above all a body of information in a very handy form is being collected, the careful study and discussion of which is slowly but gradually leading to the issue of more exact and satisfactory forecasts of weather, and to a juster knowledge of these great atmospheric move- ments which form the groundwork of the science.

The most cursory glance is sufficient to show that the ever-changing physical phenomena with which it is the business of meteorology to deal are all referable to the action of the sun, it being evident that if the sun were blotted out from the sky a cold lifeless uniformity would rapidly take possession of the whole surface of the globe. Meteorological phenomena naturally group themselves into two great classes,—those dependent on the revolution of the earth on its axis, and those dependent om its revolution round the sun taken in connexion with the inclination of its axis to the plane

of its orbit. “The science thus divides itself into two great divisions, the first comprising diurnal phenomena and the second annual phenome “«.-

DrurNAL Marcu of PHENOMENA. _ Temperature.—Of the daily changes which take place in the atmosphere, the first place must be assigned to those which relate to temperature, seeing that on these all other changes are either directly or indirectly dependent. Obser- vations of the temperature of the air are therefore of the first importance in meteorology. A perfectly accurate observation of the temperature of the air is unquestionably among the most difficult to make of all physical observations, the difficulty being to eliminate the effects of radiation of surrounding objects. The nearest approach yet made to the solution of this important problem of physical inquiry

was made by Dr Joule in a communication to the Philosophical Society of Manchester (November 26, 1867, Proe., vol. vii. p. 35). But the manipulative skill and time demanded by the method there detailed render it quite unsuitable for general adoption anywhere in collecting the observational data required in the determination of this important element of climate. It is therefore necessary to fall on some method which, while it gives results that can only be regarded as approximate, secures the essential element of uniformity among the observations.

Fig. 1 represents Stevenson’s louvre-boarded box for the ther- momieters, whieh is now very widely used for temperature observa- tions. The box is made of wood, and louvred all round so as to protect the thermometers inside from radiation, and at the same time seeure as free a circulation of air as is consistent with a satisfactory proteetion from radiation. The box is painted white, both inside and outside, and screwed to four stout wooden posts, also painted white, firmly fixed in the ground. The posts are of such a length that when the thermometers are hung in position the bulbs of the niinimum thermometer and hygrometer are exaetly at the same height of 4 feet above the ground, the maximum thermometer being

JH Fia, 1.—Thermometer Box.

hung immediately above the minimum thermometer. This ther- mometer box is placed over a plot of grass, and in a free open space to which the sun’s rays have free access during as much of the day as surrounding conditions admit of. It will be observed that the thermometers are suspended on cross-laths in the centre of the box and face the door, which should always open to the north. It is not possible to overestimate the importanee of seeing that uniformity of height above ground and method of protecting the thermometers is secured, sinee in no other way is it possible to obtain results from different places which shall be comparable with each other and thus supply satisfactory materials for the investigation and development of comparative climatology.

A desired uniformity is yet far from being attained among the meteorological systems of different countries. Thus in Russia the box for the protection of the thermo-

‘meters is made of zinc, on the supposition that such a box

follows more closely the changes of temperature of the air than a box of wood. Owing to these international diversi- ties of observation, it is extremely desirable that steps were taken to ascertain, by Joule’s method of observing, the approximate errors peculiar to each sort of thermometer box, in order that the temperatures of different countries may be compared together in a more satisfactory manner than has yet been possible.

Interchanges of temperature among bodies take place by conduction, convection, and radiation. In meteorology the most important illustrations of conduction are the pro- pagation downwards through the earth’s strata of the changes of the temperature of the surface as it is heated during the day and cooled during the night, and the pro- pagation of the same changes of temperature through the lowest stratum of the air which rests on the surface. Since sand and light loose soils are much worse conductors of heat than clay and dense soils, it follows that loose soils

and tracts of sand are subject during the day to higher temperature and during the night to lower temperature near the surface than dense soils, and that frosts and extreme temperatures do not penetrate so far into loose as into dense soils. It is on these differences that some of the more striking features of climates depend. As snow is one

of the worst conductors of heat, owing to the quantity of air’

filling the interstices among the ice crystals, it protects the soil it covers by setting a limit to the depth to which the severe frosts of the surface penetrate, and by arresting the escape of the heat of the soil upwards to the air.

The communication of heat from one part of the earth to another by convection is seen on a grand scale in the winds and in the currents of the ocean. It is seen also in the ascending and descending currents of the atmosphere everywhere, which have their origin in the daily and unequal changes of temperature to which the surface of the earth is subject. he direct and beneficial effect which results from atmospheric and oceanic circulation is a more equable distribution of temperature over the globe, thus moderating the rigours of the polar regions and the heat of the tropics. ;

An interchange of heat is constantly going on among bodies exposed to each other, whatever be their tempera- ture. This mode by which heat is communicated from one body to another is called. radiation. Radiant heat proceeds in straight lines, diverging in all directions from the source, is only in a limited degree influenced by the air through which it passes, and is not diverted from the straight course by the wind. The intensity is proportional to the temperature of the source, and is greater according to the degree of inclination of the surface on which the rays fall.

If then a body be placed in the presence of other bodies, some colder and some warmer than itself, it will from this mutual interchange of temperature receive more heat from the warmer bodies than it radiates to them, and conse- quently becomes warmer ; but it will receive less heat from the colder bodies than it radiates to them, and its temperature consequently falls. This is precisely the condition in which the earth is placed in space, When a part of the surface is turned towards the sun, that part of the surface

receives more heat than is radiated from it; and the temperature consequently rises most in that region which for the time is perpendicular to the sun's rays, and least round the annulus where the inclination of the surface is greatest. On the other hand, since the hemisphere turned from the sun radiates more heat than it receives from the cold regions of space, the temperature there falls. Owing to the essentially distinct conditions under which the earth is placed with respect to radiation, the subject falls naturally to be divided into two heads, solar radiation and terrestrial radiation.

Solar Radvation.—Of the sun's rays which arrive at the earth's surface, those which fall on the land and solid bodies generally are wholly absorbed by the thin surface layer exposed to the heating rays, the temperature of which consequently rises. Whilst the temperature of the surface increases, a wave of heat is propagated downwards through the soil. The intensity of the daily wave of temperature rapidly lessens with the depth at a rate depending on the conductivity of the soil, until at about 4 feet below the surface it ceases to be measurable. Part of the heat of the surface layer is conveyed upwards through the air by the convection currents which have their origin in the heating of the lowermost stratum of air in direct contact with the heated surface of the land.

Altogether different is the influence of the sun's rays on water. In this case the sun's heat is not all, indeed very far from all, arrested at the surface, but penetrates to a

considerable depth. The depth to which the influence of the sun is felt has been shown-by the observations made during the cruise of the ‘‘Challenger” to be, roughly speaking, about 500 feet below the surface of the sea, The rate at which, in perfectly clear water, this heat is distributed at different depths is a problem that has not yet been worked out. Since water is a bad conductor, the heat thus distributed does not, as takes place with respect to land, penetrate to still lower depths by conduction, but only by different densities prevailing at the same depths, whether these different densities be due to different temperatures or different degrees of salinity. Thus one of

the more important distinctions between land and water surfaces in their bearings on climate is that nearly all the sun’s heat falling on land is arrested on the surface, whereas on water it is at once diffused downwards to a

great depth. In examining temperatures of the sea taken –

at different depths, it is surprising to note the rapidity with which changes of temperature are felt at considerable depths, especially in cases when the temperature of the air rises rapidly, accompanied with strong sunshine.

In shallow water the sun’s heat raises the temperature much higher than that of deep water, this being obvious from the consideration that nearly the whole of the sun’s heat which falls on the surface is utilized in raising the temperature of the shallow layer of water; in other words, it is, so to speak, concentrated through a small depth of water instead of being diffused through a great depth.

Surface Temperature of the Sea.—The importance of a knowledge of this datum of meteorology will be at once recognized when it is kept in view that three-fourths of the earth’s surface is water, that the temperature of the air resting on this surface is in close relation to the temperature of the surface, and that the latter has, through the intervention of the winds, direct and. important bearings on the temperature of the air over large portions of the land surfaces of the globe. During the years 1859-63 Captain Thomas, while engaged on the survey of the islands on the north-west of Scotland, made observa- tions of the temperature of the surface of the sea every hour of the day at all seasons, and with sufficient frequency for the determination of the diurnal range of the temperature of the surface. The daily minimum, 0°-17 below the mean, occurred near 6 A.m.; the mean was reached about 1] a.m., the maximum, 0°‘13 above the mean, between 3 and 4 p.m., and the mean again shortly before 2. A.m. Thus the daily oscillation of the temperature

of the surface of the sea amounted on the north-west of — In lower latitudes the amount of —

Scotland only to 0°°3. the daily fluctuation is somewhat larger, but everywhere it is comparatively small, if care be taken to make the observations properly, or at a distance from land, where the influence of the heated or cooled land is not allowed to vitiate the results.

During the voyage of the “Challenger” a complete system of meteorological observations, including the tem-

perature of the surface of the sea, was made every two

hours as part of the scientific work of the cruise. These are now being discussed, and the writer of this article is, by permission of the Lords Commissioners of H.M. Treasury, allowed to use such of the results as have been already arrived at.

The diurnal march of the temperature of the surface of the North Atlantic has been determined from observations made on one hundred and twenty-six days from March to August 1873 and in April and May 1876, the mean latitude of all the points of observation being nearly 30 N., and the longitude 42° W. The following variations from the mean show the phases of this diurnal oscillation :—

TEMPERATURE. |

2 A.M. – 0°24 10 A.M. 0°06 6p.M. 0°26 4 ,, —0°33 Noon 0°24 Chess 0:02 6, —0°29 2P.M. 0°47 10 ” —0°19 8 ,, .—0°12 Me , Ona7 Miduight -—0°35

Thus in mid Atlantic, about 30° N. lat., where the sun’s heat is strong, and at the time of the year when the sun is north of the equator, the diurnal fluctuation of the tempera- ture of the surface is only 0°°80. It is highly probable that nowhere over the ocean does the mean daily fluctuation of the temperature of the surface quite amount to a degree. This small daily fluctuation is a prime factor in meteorology, particularly in discussions relating to atmospheric pressure and winds.

Temperature of Air over the Open Sea.—The following shows the daily march of the temperature of the air over the North Atlantic on a mean of the

same one hundred and twenty-six days for which the temperature of the sea has been given:—

arom. – 1°13 10 A.M. 0°78 Gwe WPs} 4 ,, -1:40 Noon 1°45 8 ,, -—0°30 Gm;, — L741 2p.mM. 1°80 10 ,, ~-0°80 omy) — Or2l 4 ,, 1°56 Midnight — 1-02

The amplitude of the daily fluctuation of the air is thus 3°21, or nearly four times greater than that of the sea over which it lies. During the same months the “Challenger” was lying near Jand on seventy-six days. The observations made on these days show a greater daily range of temperature of the air than occurred out in the open sea. The minimum, — 2°:05, occurred at 4 A.M., and the maximum, 2°33, at noon, thus giving a daily range of 4°38. The occurrence of the maximum so early as noon is doubtless occasioned by the greater strength of the sea breeze after this hour, this maintaining a lower tempera- ture. Part of the increased range of the temperature of the air as compared with that of the sea was no doubt due to the higher temperature during the day and the lower during the night on the deck of the “Challenger” as compared with that of the air. But, after making allow- ance for this disturbing influence, it is certain that the temperature of the air has a considerably larger daily range than that of the sea on which it rests, The point is one of no small interest in atmospheric physics from the im- portant bearings of the subject on the relations of the air and its aqueous vapour to solar and terrestrial radiation. The hourly deviations from the mean daily temperature of the air at two places, one near the equator and the other in the north temperate zone, and both near the sea, viz., Batavia (6° 8’ S. lat., 106° 48’ E. long., mean temperature 78°7) and Rothesay (55° 50’ N, lat., 5° 4’ W. long., mean temperature 47°:3), are these :—

Batavia, Rothesay. — Batavia. | Rothesay, LaM.-32 | 1PM. +57 +2°4 2, -3°6 ia) 2 ,, +56 +27 3 ,, —4°0 —2:1 3 4, +5°2 +2°8

4 ,, -4:3 —2°2 4 ,, +4: +2°6

5, -47 aan 1 5 4, +3°3 cecil | 6 ,, -4°9 —2°0 Oy ced +175

1 7, —48 = 15) | 7 45 FO +0°9 8 ,, -22 -—0°9 8 ,, —0‘4 +0°2 9 ,, -0°5 — 0°2 Dis, = 142 -~04 | LOD 2°83 +0°5 105, -fs | -Os | ll ,, +4°4 fea wy Tt |

— 28 “-12 =| Noon +5°4 +19 | Midnight – 2°8 -155

The times of the four phases of the daily temperature at Batavia are—minimum about 5.50 a.m., mean 8.45 A.M., maximum 1.20 p.m., and mean 7.40 p.m.; while for Rothesay the same times are 4.30 a.m, 9.15 A.M., 3 P.M., and 8.20 p.m. At Batavia, where the days and nights are nearly equal during the year, there is little variation in

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these times through the months; but at Rothesay, where the days are much longer in summer than in winter, there is considerable variation in the times of occurrence of these phases. The following table shows the times of the phases for a number of selected places in the northern hemisphere for the two extreme months, January and July :—

January. July.

Min. | Mean. | Max. | Mean.| Min. | Mean.|} Max. | Mean.

A.M. A.M. PM. rM. AM. A.M. Pou. P.M. UTS) ta 6.6 9.40 | 1.30 | 6.35 | 3.40 | 7.40 | 0.50 | 7.30 MGronta.. os. 6.20} 10.0 | 1.50 | 9.40 | 3.50 | 8.15 | 3.45 | 8.10 Phitadelphia..| 6.50 | 10.0 | 2.40 | 8.45 | 5.0 | 8.40 | 3.10 | 8.0 JE IRA peerapage Archangel,....| 6.0 | 10.40] 1.30] 9.0 | 2.40 | 8.36 | 2.50 | 8.50 Rothesay…....| 5.30 | 10.10 | 2.80] 8.0 | 3.380]9.0 | 3.15 | 8.50 Oxfords fc. .. <00 (220 | LORTO 1 F2I0 720 32401 S74 55 S10″ Shah Madrid 6.50 | 10.5 | 2.40 | 8.35 | 4.40 | 8.50 | 2.50 | 8.35 Geneva ….. ...}6.0 {10.0 | 2.0 {8.0 | 38.15 | 8.15 | 2.50 | 8.10 St Bernard….| 4.80] 8.25 | 0.55 | 6.45/3.0 | 8.10] 1.20 | 7.50 Bogostovsk….] 5.30 | 9.25 | 1.30] 8.15 | 3.40] 7.35] 2.5 | 8.4 ry aes . ye Me amg 6.50] 9.50 | 2.35 | 7.45 | 4.30 | 8.20 | 2.40 | 8.25 MUNG io 33 cccee’s os F107) S985 08) 25251 /°7,50 1 550. 1985 |) Salonesal5 Catewtta…..... 6.30 | 9.35 | 2.30 | 8.20 | 5.30 | 8.45 | 0,40 | 7.30 Bombay…...../6.0 | 9.10 | 2.10]8.5 | 5.301) 9.0 | 1.30 | 6.30 | Madras Meee edi: 5.40} 8.0 | 0.40] 6.45 15.0 | 8.45] 1.25 | 6.50

During the night in summer the temperature falls con- tinuously from the effects of terrestrial radiation till the earliest dawn, when the daily rise in the temperature sets in owing to the heat reflected from the upper strata of the atmosphere, which have begun to be heated and lighted up by the rays of the morning sun. It will be observed that the time of the daily minimum temperature occurs earliest in high latitudes and latest in low latitudes. During winter, on the other hand, the minimum tempera- ture takes place in several regions some time before dawn. At this season the two chicf causes on which changes of temperature depend are the sun and the passage of cyclones and anticyclones ; and it is probable that those cases where the minimum occurs markedly before the dawn are, whcre not occasioned by purely local disturbing causes, due to the mean diurnal times of occurrence of the changes of temperature which accompany the great atmospheric dis- turbances of cyclones and anticyclones.

In July the daily maximum tempcrature occurs generally from 2 to 4. p.m. At places, however, near the sea, which are within the immediate influence of the sea breeze, and in places at some distance from the sea, such as Calcutta, where the wind, being cssentially a sea wind, attains its greatest daily velocity and the sky at the same time is much clouded, the maximum occurs nearly two hours earlier. In high situations, such as the St Bernard hospice, the highest daily temperature also occurs nearly two hours sooner than on the plains below. In the winter months the maximum is about an hour earlier than in the summer.

In investigating the daily curves of temperature, Sir David Brewster drew several interesting conclusions from them. By dividing the daily curve of temperature, deduced from the mean of the year, into four portions, at the points

| representing the two daily means and the two extremes,

he showed that the four portions approximate to parabolas, in which the temperatures are the abscisss and the hours the ordinates. The correspondence between the observed and calculated results is so close that the difference did not in any case exceed a quarter of a degree Fahrenheit. This interesting result is true for places at which the horizon is open all

round, so that no shadows of hills, trees, or buildings fall on the places where the thermo- meters are kept during the day. If a hill rises to the

north of the plaee, by which the sun’s rays are never obstrueted, it exereises little, if any, influenee on the observations ; but if one or more hills obstruet the rays of the sun after it has risen above the horizon, such obstruc- tion affects the temperature while, and for some time after, the position in whieh the thermometer is plaeed is shaded from the sun.

Brewster further made the important remark that the mean of observations made at any pair of hours of the same name, such as 8 A.M. and 8 P.M., 9 A.M. and 9 P.M., &c., does not differ much from the mean temperature of the day. The pairs of hours whieh approximate closest to the true daily mean are 9 a.m. and 9 p.m., 10 a.m. and 10 P.M, 3AM. and 3 p.M., and 4a.mM.and4p.m. The inean of four hours at equal intervals from eaeh other gives a result still closer to the true mean temperature.

In organizing any system of meteorological observation, by which it is intended to develop the climatology of the country, the de- termination of the hours of observation is a question of the first importance. If only two observations be made daily the best hours are 9 A.M. and 9 p.M., or 10 A.M. and 10 p.M.; and if there be four observations the best hours are 3 and 9 A.M. and 3 and 9 P.M., or 4 and 10 A.M. and 4 and 10 p.m. If there be three observa- tions the best hours are 9 A.M. and 8 and 9 p.m., or 10 A.M. and 4 and 10 p.m.; but in these cases it is essential that the observations of a minimum thermometer be added to the tempera- ture observations. Theso hours are further strongly recommended hy the consideration that they are approximately coincident with the diurnal phases of atmospheric pressure, an exact knowledge of which lies at the root of nearly all climatological inquiries. The three equidistant hours which have been adopted in several countries, viz., 6 A.M, and 2 and 10 p.m., are only good as regards the temperature, not as regards atmospheric pressure. With re- spect to two daily observations, the hours 8 A.M. and 1 p.M., which have been adopted in some countries, are singularly unsuitable

‘for the furnishing of the observational data required in the de- velopment of the climatologies of these countries; and, what is still more serious in a science where international co-operation is so imperatively demanded, these observations cannot be used with any satisfaction in such deeply important inquiries as the cam- parative climatologies of Europe.

The times of oeeurrenee of the highest, lowest, and mean daily temperatures, and the amount of the daily range of temperature, are in a great degree influeneed by the covering or want of covering of the earth’s surface on which the air rests. When the ground is eovered with vegetation, the whole of the solar heat falls on the vegetable covering ; and, as none falls immediately on the soil, its temperature does not rise so high as happens where there is no vegetable covering to shade the surface from the sun. The temperature of plants exposed to the sun is not so high as that of exposed soil in the vieinity. As regards forests, the four diurnal phases of temperature occur later than in the open eountry, and the maximum and minimum are less deeided; and, since the maximum temperature of the air in forests falls short of the maximum in the open toa eonsiderably greater extent than the minimum under trees is above the minimum in the open, it follows that the mean temperature of the air in forests is less than that of the open country adjoining. The reason of the differenee is that the chilling effects of nocturnal radiation penetrate lower down among the trees than do the heating effeets of solar radiation ; and as the soil is not heated direetly by the sun its temperature is lower, and consequently that of the air over it is also lower. A cleared space in a forest, sheltered by the sur- rounding trees, but open to the sun, has a warmer and moister atmosphere in spring and summer and very much moister in autumn than prevails in the open eountry adjoining, and has also the diurnal differences of range peeuliar to a warmer and moister atmosphere.

One of the most important elements of climate is dis- closed by the differenee between the hour of lowest and the hour of highest mean temperature respeetively, or, as

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it is usually expressed, by the daily range of temperature. We have seen that as regards the sea in the north-west of Scotland the difference is only 0°°3 and in the Atlantic about 30°N. lat. 0°°8, and that probably the diurnal range of temperature of the surface of the sea nowhere amounts to adegree. In the same part of the Atlantic the daily range of the temperature of the air resting on the ocean is 3°°2, and on the sea near land 4°°4, On advaneing on the land, the daily range of temperature rapidly increases, and the rate of increase is greatly augmented when an inland position is arrived at to which any sea breezes that may prevail do not extend.

The true daily range of temperature is stated by obser- vations made with.maximum and minimum thermometers, Generally speaking, the amount of the range increases as the latitude is diminished, and as the distance from the sea is inereased, but above all it inereases in proportion to the dryness of the climate.

The differences of this vital element of climate are strikingly shown in the meteorology of India. In the Report for 1880 the following are the mean daily ranges of March of that year at a few places: at Goa 5°‘4, Bombay 11°-2, Kurrachee 23°°5, Jacobabad 37°°4, and Pachbudra (lat. 25° 55’ N., long. 72°18’ E.) 41°°3. ‘In the last case, undoubtedly one of the greatest mean daily ranges of tem- perature meteorology has yet recorded, the mean of the days was 103°°4 and of the nights 62°-1. As March is altogether witlrin the season of the north-east monsoon, the general drift of the wind over western India, where these are situated, is from the interior towards the sea, subject as regards Bombay and Goa to the influences of the land and the sea breeze. On the other hand, in June, when the south-west monsoon has fairly set in, the following are the mean daily ranges of temperature at the same places: at Goa 5°°6, Bombay 8°:2, Kurrachee 10°, Jacobabad 27° °6, and Pachbudra 24°*1. These show in a striking manner the powerful influence of the moister atmosphere spread over India by the south-west monsoon, under which the daily range of tempera- ture falls at Kurraohee from 28°°5 to 10°, and in the excessively arid climate of Pachbudra from 41°38 to 24°1. In these dry climates of the basin of the Indus, whilst the rainfall both in March and in June is practically nil, yet the relative

humidity of the atmosphere is widely different. Thus the humidities for March and June respectively at 4 p.m., when the temperature is nearly the maximum for the day, are 48 aud 77 for Kurrachee, 18 and 30 fer Jacobabad, and 11 and 86 for Pachbudra. It is not so much the amount of cloud that determines the degree of fierceness of the sun's heat in these climates as the relative humidity, or the dryness of the air, as pointed out by Strachey in 1866, Thus at Jacobabad less than half the amount of cloud appears in the sky in June as compared with March, but the relative humidities are 30 and 18, and the daily range of temperature 27°‘6 and 87° °4. If we except the dry arid wastes of Persia and Arabia, there is perhaps no other region of the globe where the daily range of temperature approaches that of the valley of the Indus. Thus in the dry climates of such places as Sacramento (California) in summer it amounts only to about 30°, at Madrid to 27°, and Jerusalem 24°. In central districts in the south of England it is about 20°; farther north it falls to 15°; and in the islands in the north, whose climate is strictly insular in its character, the summer daily range is only 10°. In Arctic regious, such

as Spitzbergen and Boothia Felix, the range in winter varies

from 0°°0 to 1°70; in May, when the sun has reappeared and continues to rise and set, it rises to 14°; but in July, when the sun does not set, the range sinks to 10°.

But maximum and minimum thermometers not only show the mean daily range of temperature, they are also of great utility in giving observations for the determination The mean temperature may be accepted as the mean of the twenty-four hourly observa- tions of the day. If with such a system of observation daily readings of the maximum and minimum thermometer be eompared, the value of the latter observations in questions of mean temperature may be arrived at. Double series of observations of this deseription have been made at many plaees. The following shows a eomparison of the mean of maximum and minimum daily temperatures with means from observations made twenty-four times daily,

the former exceeding the latter means in nearly all eases :—

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HUMIDITY. |

Spring. |Summer. | Autumn.| Winter.| Ycar. TSE aegeeeeepeoeey aaceees —-03 |-02 |-0°2 |-0°2 |-0°2 GS Mlouititiauee.... cesses sees 1:0 0-7 Ogfeen |) 059 0°8 eee 0°6 0°6 0°6 0°7 0°6 IMGMECHITISK;. «. cc: cec-ssee. 01 0°3 0°6 IO” |) Wes RV GUTIM eee rs cass cscce woe 0°5 0°5 Osa 0°8 0°6 iemberin DURE .....0… 0° Ore 07 06 | 06 UI GR ier i aatie RVI STMUT ANG ro rct ease ce onesies 074 0°5 Ol |-0O-1 0°2 (Ghepan cll eeeeeeeeeeeeeeene 07 0°8 0°6 0°0 0-4 NPOUNESAN Ac ieceec. cos. sv eee 0°4 0°3 0°3 0°3 0°3

These results show remarkable uniformity, and it may be inferred from them that mean temperatures deduced from maximum and minimum observations are about half a degree above the true mean temperature. In general climatological inquiries, observations with these thermo- meters have the strong recommendation of supplying from observations taken once a day the data for the determina- tion of the mean temperature and mean daily range of localities ; to which falls to be added the further advantage of giving results more uniformly comparable for different places than could be afforded by observations made with a common thermometer at any single hour or pair of hours daily.

Daily Variation of the Humidity of the Atr.—The gaseous envelope surrounding the earth is composed of two atmospheres, quite distinct from each other,—an atmosphere of dry air and an atmosphere of aqueous vapour. The dry air, which consists of oxygen and nitrogen, is always a gas, and its quantity remains constant ; but the aqueous vapour does not continue permanently in the gaseous state, and the quantity present in the air is, by the ceaseless processes of evaporation and condensation, constantly changing. If the aqueous vapour remained permanently and unchanged in the atmosphere, or were not liable to be condensed into cloud or rain, the mixture would become as complete as that of the oxygen and nitrogen of the air. The equilibrium of the vapour atmo- sphere, however, is being constantly disturbed by every change of temperature, by every instance of condensation, and by the unceasing process of evaporation. Since dry air further materially obstructs the free diffusion of the aqueous vapour, it follows that the law of the independent pressure of the vapour and

of the dry air of the atmosphere holds good only approximately. The aqueous vapour, however, constantly tends to approach this state. Since, then, the independent and equal diffusion of the dry air and the aqueous vapour is, owing to these disturbing causes, never reached, the important conclusion follows that the hygrometer can never indicate more than the local humidity of the place where it is observed. Hygrometric observa- tions can therefore be regarded only as approximations to a true indication of the quantity of aqueous vapour in the atmosphere over the place of observation. It is, however, to be added that, while in certain cases the amount of vapour indicated is far from the truth, yet in averages, particularly

| long averages, a close approximation to the real amount is

reached if the hygrometer be at all tolerably well exposed and carefully observed.

Aqueous vapour is constantly being added to the air from the surfaces of water, snow, and ice, from moist surfaces, and from plants. The rate of evaporation increases with an increase of temperature, because the capacity of the air for vapour is thereby increased. The atmosphere can contain only a certain definite amount of vapour, according to the temperature ; when therefore the air has its full complement of vapour,’ or when, in other words, it is saturated, evaporation ceases. Thus the rate

of evaporation is greatest when the air is driest or freest |

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from vapour, and least when the air is nearest the point of saturation. Since currents of air remove the moister and substitute drier air over the evaporating surfaces, evapora- tion is much more rapid during wind than in calm weather. As air expands under a diminished pressure, its temperature consequently falls, and it continues to approach nearer to the point of saturation, or become moister; and, as it contracts under an increased pressure, its temperature rises and it recedes from the point of saturation or becomes drier. Hence ascending currents of air become moister with every

addition to the ascent, and descending currents drier as they continue to descend. Thus as winds ascend the slopes of hills they become moister, but when they have crossed the summit and flow down the other side they become drier in proportion to the descent, and all the changes may be experienced from extreme dryness to saturation in the same mass of air, which all the time has practically had its amount of aqueous vapour neither added to nor diminished.

In an atmosphere of air and aqueous vapour perfectly mixed, the elastic force of each at the surface of the earth is the pressure of each. In this case the elastic force of aqueous vapour would be the pressure of the whole vapour in the atmosphere over the place of observation. This pressure is expressed in inches of mercury of the barometer. If we suppose the total barometric pressure to be 30-000 inches, and the elastic force of vapour to be 0°745 inch, the pressure or weight of the dry air, or air proper, would be 29°255 inches, and of the aqueous vapour 0°745 inch. From this it follows that the elastic force of vapour may be regarded as indicating the quantity of aqueous vapour in the air at the place of observation, or it may be designated the absolute humidity of the air.

The diurnal variation in the elastic force of vapour in the air is seen in its simplest form on the open sea. Grouping together all the hygrometric observations made on board the “Challenger” on the North Atlantic at a distance from land, from March to July 1873 (eighty-four days), we have for that time a mean elastic force of 0°659 inch, and the following diurnal variation :—

Inch. Inch. Inch.

2 A.M. — °015 | 10 A. M.+ ‘004 6 p.M. + °007

4 ,, – ‘020 Noon +:017 8 ,, +002

6 ,, -— 016 2 P.M. + °020 10 ,, — 005

8 ,, -:007 4 ,, °017 Midnight 008 Hence the minimum (020 inch) occurs at the hour

when the temperature of the surface of the sea and air resting over it falls to the daily minimum; it then rises to the mean a little after 9 a.m., and to the daily maximum (+°020 inch) at 2 p.m, when the sea and air are also near the daily maximum, and falls to the mean shortly before 9 P.M.

Treating the observations made near land by the “Challenger” during the same months, the following is the diurnal variation disclosed :—

Inch. Inch. Inch. 2 A.M. — ‘008 10 A.M. + °014 6P.M. ‘000 44, — 009 Noon +-011 g ., — 004 6 ,, – 010 2P.M.+°007_ . 10 ,, — ‘005 8 ,, ~70e8 4 4, +°015 ‘Midnight — +007

The disturbance induced by proximity to land in the distribution of the aqueous vapour in the lower strata of the atmosphere is very striking. The maximum and

.minimum no longer follow the corresponding phases of the

temperature of the surface of the sea and of the air. The disturbing agents are the sea and land breezes and their effects. Under the influence of the land breeze the time of the minimum humidity is delayed till about 6 A.m.; and under the influence of the sea breeze and its effects the amount of the aqueous vapour shows a secondary minimum from noon to2 p.m. It is to be here noted that this midday

minimum occurs at the hours of the day when the surface of the land is most highly heated, the ascending current of heated air rising from it therefore strongest, and the resulting breeze from the sea towards the land also strongest. Now it does not admit of a doubt that the diminution in the amount of the aqueous vapour noted on board the “Challenger” near the shore points to an intermixture with the air forming the sea breeze of descending thin air-filaments or currents to supply the place of the masses of air removed by the ascending currents which rise from the heated surface of the land. At Batavia, on the north coast of Java, and at Bombay, the aqueous vapour is also subject to a secondary minimum during the warmest hours of the day. ee ;

During the summer months this secondary minimum is best marked at inland places such as Peking, Nertchinsk, Barnaul, Tiflis, and Ekaterinburg, but the time of its occurrence is about two hours later than it is over the North Atlantic. Over all these places at this season the ascending current from the heated land in the interior of Asia is very strong. On the other hand the lowering of the amount of aqueous vapour scarcely if at all appears as a feature in the summer climate of St Petersburg, and not at all in that of Sitka, where the sea breeze is equally not a constant feature of the climate of the district.

In the excessively dry, rainless, and hot climate of Allahabad, in April the diurnal minimum of the aqueous vapour occnrs from 11 a.M. to6 p.M., the time of absolute minimum being 2 and

3 P.M. During all other hours of the day the amonnt of the |

vapour is above the mean, a secondary minimum occurring from 1 to 4 aM. At Allahabad, at this time, the absolute maxi- mum vapour pressure oceurs at 8 A.M. Quite similar to this is the diurnal distribution of the aqneous vapour in July at Lisbon and Coimbra, the ninimum occurring from 10 A.M. to 8 p.m. At this time of the year the climate of this part of the peninsula is hot and dry and the rainfall insignificant in amount. As this region lies between the high atmospheric pressure so characteristie a feature of the meteorology of the Atlantic in summer and the comparatively low pressure over the continents southward and eastward, the winds are almost wholly north-westerly. In this connexion it is instruetive to note that the time of maximum vapour pressure is from 4 to 7 A.M., when the velocity of the wind is near the minimum, and the chicf minimum vapour pressure from noon to 4 P.M., when the velocity of the wind and ascend- ing currents reach the daily maximnin. These results show that the diminution in the vapour pressure during the hours when temperature is highest, which characterizes the climates of large tracts of the globe, is due to descending air-filaments or currents, which necessarily accompany the ascending currents that rise from the heated land.

At Geneva during the summer mionths the vapour curve exhibits two daily minima very strongly marked, the one shortly before sunrise and the other from 2 to4 p.M., and two maxima, one from 8 to 11 a.m. and the other from

6 to 10 P.M.; and with these the diurnal variations of cloud are in accordance. The peculiarly marked features of the vapour eurve at Geneva arc probably due to the size of the lake, which is large enongh to give rise to a decided breeze during the day from the lake all round its shores and during the night to a breeze from the land all round upon the lake. On the setting in of the breeze, the mass of air composing it, having been for some time resting on the lake, is rather moist, and thus one of the daily maxima is brought about from 8 to 11 a.m. As the breeze continues.the air supplying it is necessarily drawn from the higher strata of the atmosphere more copiously than in different situations; and, having thus acquired increased dryness in the descent, and having blown over the lake for too short a distance to materially influence its moisture, the air becomes constantly drier, till the minimum from 2 to 4 p.M. is reached. ‘he lake breeze thereafter begins to diminish in force, and the air consequently becomes moister till the maximum vapour pressure of the day occurs when the lake breeze dies away and the land breeze has not yet sprung up. In the wintcr months, when these breezes do not prevail, the curve of diurnal vapour pressure shows only one maximum and minimum,

The relative humidity of the atmosphere must not be confounded with its vapour pressure or absolute humidity. The relative humidity, or, as it is more frequently called, the humidity, of the air is the degree of its approach to saturation. Complete saturation is represented by 100

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and air absolutely free of vapour by 0, the latter state of things never occurring in the atmosphere, a humidity of 10 being of rare occurrence even in such arid regions as those of Arabia. The great significance of this element of climate is in its relations to the diathermancy of the air, and consequently to solar and terrestrial radiation. It is supposed that perfectly dry air would allow rays of heat to pass through it with at most only a very slight

increase to its temperature therefrom. Let, however, a

little aqueous vapour be added to it, a partial obstruction to the passage of radiant heat is offered, and the tempera- ture of the mixture, or common air, is sensibly ‘raised. Hence, other things being equal, the less the amount of vapour the more are the effects of radiation felt, or the greater the heat of the days and the cold of the nights. The mere amount of vapour in the air does not determine the degree of radiation, but it is the amount of vapour together with a certain temperature—in other words, the absolute and relative humidity of the air taken together— that determines the heating power of the sun and the degree of cold produced by terrestrial radiation.

The diurnal variation of the relative humidity is very different from that of the vapour pressure, and presents features of the simplest character. The following are the diurnal variations from the mean humidity 80 over the North Atlantic, from the “Challenger” observations in 1873 :—

2AM. +2 10 A.M. -1 6 P.M. -1 4 ,, +2 Noon -2 : Cleans 0 6 Srl 2PM. —3 LOM teal ‘Sues 0 4, -2 Midnight +2

Thus the maximum humidity occurs from midnight to

4 a.M., or when the daily temperature is at the minimum, and the minimum humidity at 2 p.m., when the tempera- ture is at the maximum, the curve of humidity being thus inverse to that of the temperature. With two slight modifications this is the diurnal humidity curve for all climates and seasons. In the calm which intervenes in the morning between the land and the sea: breeze the humidity continues high, or even increases, though at the time the diurnal increase of temperature has already set in. The other modification is seen in the humidity curves for Nertchinsk and Barnaul during winter, these curves being not inverse but coincident with the daily curves of temperature. In the climates of Central Asia in winter, the amount of vapour is very small, and the increase to the relative humidity during the day is probably occasioned by the more active evaporation from the snow during the day and the stillness of the air favouring the accumulation of aqueous vapour near the surface of the earth.

Next to the winds, the aqueous vapour of the atmo- sphere, in the diverse ways in which in different localities it is distributed through the hours of the day, plays the most important part in giving to the different parts of the globe its infinitely diversified climates.

Dew.—Dew is deposited over the earth's surface on comparatively clear and calm nights. As the cooling by terrestrial radiation continues, the temperature of objects on the surface is gradually lowered to the dew-point, and when this point is reached the aqueous vapour begins to be condensed into dew on their surfaces. The quantity deposited is in proportion to the degree of cold produced and the quantity of vapour in the air. Dew is not deposited in cloudy weather, because clouds obstruct the escape of heat by radiation, nor in windy weather, because wind continually renews the air in contact with the surface, thus preventing the temperature from falling sufficiently low. When the temperature is below 32°, dew freezes as it is deposited, and hoar-frost is produced. The dew-point practically determines the minimum temperature

of the night,—because if the temperature falls a little below the dew-point the liberation of heat as the vapour is condensed into dew speedily raises it, and if it rises higher the loss of heat by radiation speedily lowers it. This consideration suggests an important practical use of the hygrometer, it being evident that by ascertaining the dew-point the approach of frost or low temperature likely to injure vegetation may be foreseen and provided against.

Diurnal Oscillations of the Barometer.—The general character of the daily oscillations of atmospheric pressure is shown by the two curves of fig. 2. The solid line gives the mean oscillation for Bombay and the

10 A.M. 4 P.M.

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aH Fia. 2.—Daily Oscillations of Atmospheric Pressure.

dotted line that for Vienna, these two curves being to a large extent typical of diurnal barometric oscillations in tropical and temperate regions as regards the two maxima and minima and the time of their occurrence.

A series of twelve maps of the globe were prepared for June, showing, for all stations whence observations have been obtained, the deviations at noon, 2 p.m., 4 P.M, &c., Greenwich mean time, from the mean daily pressure ; and four lines were drawn indicating the positions of the two daily maxima and minima at these hours. For fully 30° north and south of the equator the lines of maxima and minima run north and south, but in higher latitudes these directions are changed, and the changes are chiefly conspicuous as regards the A.M. maximum and the p.m. minimum. Thus, for example, at 6 p.m. (G. M. T.) the line of P.M. minimum is for the latitude of London near 16° W. long. ; in 30° N. lat. it is in 35° W. long., in which the line runs south as far as 30° §. lat.; its course thence turns south-westwards to near the Falkland Islands, 60° W. long. Hence in June the p.m. minimum occurs about three hours earlier in the Falkland Islands than to the south-west of Ireland, thus showing in a striking manner the influence of season on this phenomenon. In the middle and higher latitudes in summer, proximity to the sea delays the time of occurrence of the A.M. maximum and the P.M. minimum; whilst in continental situations the A.M, Maximum occurs much earlier than in lower latitudes, and the P.M. minimum nearly as late as at places near the sea. In cases where the lines of maxima and minima cross @ region such as southern and western Europe, whose surface is diversified by large tracts of land and sheets of water, the deflexions are of a remarkable character.

The retardation of the time of occurrence of the A.M. maximum is greatest in situations which, while eminently insular in character, are at the same time not far from an extensive tract of land. Of this Holland presents the best example in Europe ; and there the a.m. maximum, which at Paris occurs at 8 a.m., does not occur at Utrecht till 9.30 a.m., at Amsterdam till

12.30 P.M., andat Helder till 2PM. There is thus as regards the same diurnal pheno- menon in June a difference of six hours between Paris and Helder. Sicily and the south of Italy on the one hand and Madrid on the other present also the most striking contrasts. Again at Sitka (56° 50’ N. lat., 135° W. long.), which has one of the most truly insular climates in the world, the A.M. maximum is delayed to 2.30 p.m. ; whereas

at Astoria, ten degrees to southward, it occurs at 9.30 A.M., and at Fort Churchill, in California, as early as 7 aM. There is thus as regards the same phenomenon a difference of 75 30™ between Sitka and Fort Churchill.

From hourly observations made in this month at the base, the top, and two intermediate points on Mount Washington (N. H.) it was found that the time of occur- rence of the A.M. maximum at the base of the mountain, which is 2898 feet above the sea, was 8 a.M.; at 4059 feet, 10 a.M.; at 5533 feet, 11 a.m.; and at the top, 6285 feet, noon. Hence, as regards the time of occur- rence, the influence of an isolated mountain like Mount Washington brings about a result similar to what is observed in insular situations. But the analogy is even closer. In insular climates the minimum in the early morning is very greatly in excess of that in the afternoon ; and the same relation is observed on the top of Mount Washington, where the former is —0°020 inch and the latter —0-004 inch. Again in continental climates the minimum in the early morning is much the smaller of the two, and the same relation was observed at the base of the mountain, where the observed minima were respectively 0°006 inch and 0°020 inch. The differences presented by the daily curve of pressure at the top as compared with that at the base of the mountain have their explanation in the effects which follow the diurnal range of temperature. As the temperature is at the minimum at the time of least pressure in the morning, the atmosphere is more condensed in the stratum between the base and the top, and conse- quently the barometer at the top reads relatively lower. As the temperature continues to rise during the day, the stratum of air above the base of the mountain expands, thus placing more air above the barometer at the top, so that, while at the base pressure begins to fall at 8 a.m., at the top it continues to rise till

noon, simply from the mechanical upheaval of the air owing to the higher tempera- ture. In the afternoon, when the minimum at the base falls to — 0°020 inch, itis only — 0-004 inch at the top, this relatively higher pressure at the top being due to expansion from temperature. The peculiar feature of the pressure curve at the top is essentially a temperature effect.

The diurnal oscillations of the barometer occur alike over the open sea and over the land surfaces of the globe. The atmosphere over the open sea, as already shown, rests on a floor or surface subject to a diurnal range of temperature so small as to render that temperature practically a constant both day and night. This considera- tion leads to the vital and all-important conclusion that the diurnal oscillations of the barometer are not caused by the heating and cooling of the earth's surface by solar and terrestrial radiation and by the effects which follow these diurnal changes in the temperature of the surface, but that they are primarily caused by the direct and immediate heating by solar radiation, and cooling by nocturnal radia- tion to the cold regions of space, of the molecules of the air, and of its aqueous vapour. 'These changes of tem- perature are instantly communicated through the whole atmosphere from its lowermost stratum resting on the earth's surface to the extreme limit of the atmosphere, which the flight of meteors proves to be not less than 500 miles. There are important modifications affecting the amplitude and times of occurrence of. the four prominent phases of the phenomena observed over land surfaces, the temperature of which is being superheated during the day and cooled during the night; but it is particularly to be noted that the barometric oscillations themselves are inde- pendent of any changes of temperature of the floor on which the atmosphere rests.

Let us first look at the phenomena in the simplest form as found in the Pacific, or in the midst of the largest water

surface of the globe. tions of pressure from observations made on board the "Challenger," September 1 to 12, 1875, in mean latitude 1° 8' S. and long. 150° 40' W., the mean being 29°928 inches :—

Inch. Inch. Inch. 2 AM. —-0°012 10 a.m. 0°0382 6 P.M. — 0°028 4 ,, -0°022 Noon 0°006 SB) sy 0°004 (DAA 0°0038 2p.mM. —0°043 10 ” 0°013 BP ,; 0°028 4 ,, —0°055 Midnight 0°012

The most striking feature in these oscillations is the amplitude of the range from the A.M. maximum to the P.M. minimum, amounting to 0°087 inch, and the rapidity of the fall from 10 a.m. to 2 p.m. The same feature appears in all means deduced from observations made at least 12° on each side of the equator.

From October 12 to 22, 1875, in mean lat. 35° 1’8., long. 134° 35’ W., the mean atmospheric pressure was 30°298 inches, and the difference between the A.M. maximum and the p.m. minimum was only 0°036 inch ; and from July 12 to 19, 1875, in mean lat. 36° 16’ N. and long. 156° 11’ W., the mean pressure was 30°328 inches, and the difference between the A.M. maximum and P.M, minimum was only 0°025 inch, Thus, with a mean pressure in the Pacific about lat. 35°-36° N. and S. much greater than

near the equator, the oscillation is much less, being in the.

North Pacific less than a third of what occurs near the equator. Similarly, this oscillation is small (or even smaller) in the high-pressure areas in the North and South Atlantic as compared with the same oscillation near the equator.

It is well known that aqueous vapour absorbs the heat rays of the sun considerably more than does the dry air of the atmosphere ; how much more physicists have not yet accurately determined. Consequently air heavily charged with aqueous vapour will be heated directly by the sun’s rays as they pass through it in a greater degrce than comparatively dry air is. Now it is shown further on that the prevailing surface winds outflow in every direction from the areas of high mcan pressure in the Atlantic and Pacific about lat. 36° N. and 8. Since, notwithstanding, the pressure continues high, it necessarily follows that the high pressure is maintained by an inflow of upper currents, and as the slow descending movement of the air connects the inflowing upper currents with the outflowing prevailing winds of the surface, it follows that the air over high- pressure areas is very dry, and that it is driest where pressure is highest and the high-pressure area best defined.

Hence over the best-defined anticyclonic regions the air will be least raised in temperature through all its height by the heat rays of the sun.

On the other hand, between these high-pressure areas of the great oceans therc is a belt of comparatively low pressure towards which the north and south trades pour their vapour unceasingly. The atmosphere of this belt of low pressure is thns highly saturated with aqueous vapour which riscs in a vast ascending stream of moist air to the higher regions of the atmosphere. These equatorial regions thus present to the sun a highly saturated atmosphere reaching to a very great height. It is in these regions therefore that the atmosphere will be most highly heated by the sun's heat rays as they pass through it. the most striking facts of meteorology is the suddenness with which this barometric oscillation increases in amplitude on entering on these parts of intertropical regions; and the rapidity with which its amplitude diminishes on advancing on the high-pressure regions of the horse -latitudes is equally striking. The following are the mean oscillations in the middle regions of the four great oceans about lat. 36° from the A.M. maximum to the P.M. minimum about the time of the year in each case when the sun

The following are the mean varia- |

One of |.

North Pacific, 0°025 inch; South Atlantic, 0°024 inch; and North Atlantic, 0°014 inch. These amplitudes diminish as the ocean becomes more land-locked with continents, or as the anticyclonic region becomes better defined and currents of air are poured down more steadily from the higher regions of the atmosphere.

If the temperature of the whole of the earth's atmosphere were raised, atmospheric pressure would be diminished, for the simple reason that the mass of the atmosphere would thereby be removed to a greater distance from the earth's centre of gravity. Quite different results, however, would

follow if the temperature of only a section of the earth's atmosphere were simultaneously raised, such as the section comprised between long. 20° and 60° W. The immediate effect would be an increase of barometric pressure, owing to expansion from the higher temperature ; and a subsequent effect would be the setting in of an ascending current more or less powerful, according to the differences between the temperature of the heated section and that of the air on each side. These are essentially the conditions under which the morning maximum and aftcrnoon minimum of atmospheric pressure take place.

The earth makes a complete revolution round its axis in twenty-four hours, and in the same brief interval the double-crested and double-troughed atmospheric diurnal tide makes a complete circuit of the globe. The whole of the diurnal phenomenon of the atmospheric tides is there- fore rapidly propagated over the surface of the earth from east to west, the movement being most rapid in equatorial regions, and there the amplitude of the oscillations is greater than in higher latitudes under similar atmospheric, astronomical, and geographical conditions. Owing to the rapidity of the diurnal heating of the atmosphere by the sun through its whole height, some time elapses bcfore the higher expansive force called into play by the increase of temperature can counteract the vertical and lateral resist- ance it meets from the inertia and viscosity of the air. Till this resistance is overcome, the barometer continues to rise, not because the mass of atmosphere overhead is increased, but because a higher temperature has increased the tension or pressure. When the resistance has been overcome, an ascending current of the warm air sets in, the tension begins to be reduced, and the barometer falls and continues to fall till the afternoon minimum is reached. Thus the forenoon maximum and afternoon minimum are simply a temperature effect, the amplitude of the oscillation being determined by latitude, the quantity of aqueous vapour overhead, and the sun's place in the sky.

All observations show that over the ocean, latitude for latitude, the amplitude of the oscillations is greater in an atmosphere highly charged with aqueous vapour and less in a dry atmosphere. It is also to be noted that in very elevated situations, particularly in tropical regions, the amplitude is greater proportionally to the whole pressure than at lower levels, This is

what is to be expected from the law of radiant heat by which more of the heat rays of the sun is absorbed by the air, and particularly by its aqueous vapour, mass for mass, in the higher than in the lower strata.

When the daily maximum temperature is past, and the temperature has begun to fall, the air becomes more condensed in the lower strata, and pressure consequently at great hcights is lowered. Owing to this lower pressure in the upper regions of the air, the ascending current which rises from the longitudes where at the time the afternoon pressure is low flows back to eastward, thus increasing the pressure over those longitudes where the temperature is now falling. This atmospheric quasi-tidal movement occasions the P.M. increase of pressure, which

is highest in the heavens :—South Pacific, 0-036 inch ; | reaches the maximum from 9 P.M. to midnight, according

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OSCILLATIONS. |

to latitude and geographical position. This maximum is therefore caused by accessions to the mass of the atmosphere overhead, contributed by the ascending currents from the longitudes of the afternoon low pressure immediately to westward.

As midnight and the early hours of morning advance, these contributions become less and less and at length cease altogether, and pressure continues steadily to fall. But between the time when the increase of pressure from the overflow through the upper regions of the atmospliere ceases and the time when pressure increases from the heat

rays, direct or indirect, of the returning sun, or during the |

hours of the night when the effects of nocturnal radia- tion are the maximum, pressure is still further reduced from another cause. Radiation towards the cold regions of space takes place, not only from the surface of the globe, but also directly from the molecules of the air and its aqueous vapour. The effect of this simultaneous cool- ing of the atmosphere through

its whole height is neces- sarily a diminution of its tension. Since this takes place at a more rapid rate than can be compensated for by any mechanical or tidal movement of the atmosphere from the regions adjoining, owing to the inertia and viscosity of the air, pressure continues to fall to the morning minimum. This minimum is thus due, not to the removal of any of the mass of air overhead, as happens in the case of tlie afternoon minimum, but to a reduction of the tension or pressure of the air consequent upon a reduction in the temperature through radiation from the aerial molecules towards the cold regions of space. morning minimum is largest in the equatorial regions, and it diminishes with latitude; but the rate of diminution with latitude through anticyclonic and other regions is generally less and more uniform than in the case of the afternoon minimum.

The amplitude and times of occurrence of the phases of the diurnal barometric tides are subject to great modifica- tions over the land. The amplitude of the oscillation from the morning maximum to the afternoon minimum is greatest where the atmosphere is driest and the sky

clearest, and least-where the atmosphere is highly saturated —

and the sky more frequently and densely covered with

clouds, being thus generally the reverse of what is observed ©

to take place over the open sea. The meteorology of India affords the most striking illustrations of this remark. At Bombay in April during the dry atmosphere and clear skies of the north-east monsoon, the oscillation is 0°118 inch; but in July during the humid atmosphere and clouded skies of the south-west monsoon it falls to 0°067 inch. In the Punjab, where the air is drier, it is much greater, rising in exceptional years, suchas 1852, to 0°187 inch. The much greater amplitude of this oscillation on land as compared with the open sea is entirely due to the heating of the earth. By this heating of the surface the lower strata of the air become also highly heated and the tension is increased ; and, since the air does not expand freely, vertically and laterally, from its inertia and viscosity, the barometer rises. When, however, the resistance is overcome, the ascending current which sets in is stronger owing to its higher temperature. Since this higher temperature which has its origin in the superheated surface is in addition to

the direct heating of the air by the heat rays of the sun as they pass through it, the morning maximum and the afternoon minimum over land are both more extreme than over the open sea. It follows that this oscillation is much larger over land, and largest in climates where insolation is strongest.

In places already referred to where the morning maxi- mum is greatly retarded, such as Helder, Sitka, Valentia, and Falmouth, the afternoon minimum in the summer

In the open ocean the |

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months is singularly small,—so small indeed that it does not fall so low as the mean pressure of the day. This peculiarity in the diurnal barometric tide is in all prob- ability due to their insular position to the westward of a more or less extensive tract of land, by which a tidal overflow is propagated through the upper regions from the continental towards the insular situations. This tidal overflow receives its impulse from the ascending current from the land, which rises sooner and stronger from inland than from insular situations. On the other hand, on the open sea, and away from land in regions where the morn- ing maximum and afternoon minimum are both small, the minimum always falls below the mean of the day, and the time of occurrence of the maximum is not retarded as is the case in insular situations. A map of deviations froin the daily mean pressure of the morning minimum in summer shows, as regards the middle and higher latitudes, that it is greatest near the sea, and least in inland con- tinental situations. Indeed in the interior of the Old-World continent the dip in the curve in the early morning is so small that the minimum does not fall below the daily mean pressure, but at most places remains considerably above it. The same relations are seen in north-western Europe, where the morning minimum is—0°020 inch at Valentia and Falmouth, —-0°018 inch at Helder, and—0°012 inch at Amsterdam, whilst at Kew it is only -0°002 inch. From its compact form aud relations to the surrounding ocean, the Spanish Peninsula well illustrates the peculiarities of this phase of the pressure. The deviations from the daily mean pressure of the morning minimum are at Lisbon — 0:022 inch and Coimbra —0°011 inch, but at

Madrid in the interior + 0°009 inch,—pressure in the last case, just as happens in the interior of Asia, not falling so low as the daily mean.

The larger minimum near the sea arises from the higher temperature there during the night as compared with more inland situations, from which results a tidal overflow through the upper regions from the sea towards the land, as the temperature of the latter falls lower than the sea during the night. The effect of this overflow is to reduce the pressure over those regions whence it proceeds and to increase it in those regions over which it advances. The shallowing of the morning minimum is greatest in the higher latitudes of continental climates and most complete at great elevations, where in some cases the minimuin vanishes,—in other words, where the amount of aqueous vapour is small and the time is short during which no part of the atmosphere overliead is touched by the sun's rays. Since the peculiarity is observable in the curves over nearly the whole continent, appearing even in the low latitudes of Calcutta and Madras, it might be suggested whether we have not evidence here of a vast tidal movement propagated through the higher regions towards that trough-like section of the atmosphere as it moves westwards over the continent where the temperature of the lower strata of the air is about the minimum of the day and pressure also about the minimum.

Reference has been made under ATMOSPHERE to tlie smallness of the range from the a.m, maximum to the P.M. minimum in the North Atlantic during summer. Tlus phase in the diurnal distribution of pressure is represented in fig. 3, which shows for June the mean amount of the oscillation by lines of 10, 20, 40, 60, 80, and 100 thousandths of an inch, or 0°010 inch, 0°020 inch, é&e. This abnormality begins in March, attains the maximum in June, and terminates in October. It is thus confined to the warmer months of the year, and, unlike most meteorological phenomena, is not cumulative, but follows the sun, so that its maximum occurs in June, and not in.

| July as that of the temperature of the air, or in August as

the temperature of the sea. The smallness of this range over the North Atlantic, which is less than occurs in any other ocean in the same latitudes, is to a large extent caused by the small dip in the diurnal curve of the after-noon minimum.

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If the map of the distribution of pressure over the globe for July be examined (fig. 17) it is seen that this part of the Atlantic is occupied by a well-defined area of high mean pressure,—higher indeed than occurs at any season over any ocean; and it is shown below that out of this area the surface winds blow in all directions. But, since air is constantly being drained out of this region by the wind without diminishing the pressure, it follows of necessity that the high pressure must be maintained by accessions of air received from above through the upper currents. Now the regions whence such accessions can come are the upper currents which have their origin in the ascending currents that rise from the heated plains of Africa, Europe, the belt of calms, and the two Americas sur- rounding the North Atlantic. It is evident that the major portion of each day's overflow of air from the continents through the upper regions of the air upon the Atlantic, whether this overflow takes place by convection currents or from a tidal movement similar to what has been already described, will take place during mid afternoon. In other words, the overflow will occur about the time of the after- noon minimum of the Atlantic, thus diminishing the dip of this minimum, and so producing the abnormally small range now under examination. It is in favour of this view that the abnormality follows the sun's course and is not cumula- tive, and is felt also on both sides of the Atlantic, even although the weather on the east side is dry and all but rainless, and on the west moderately moist and characterized by a rather copious rainfall. It is also full of significance that the peculiarity is most strikingly seen in that part of the ocean of the globe which is closcly hemmed in by large masses of land.

Influence of the Moon on Atmospheric Pressure.—Fifteen years' hourly observations have been made at Batavia and discussed by the late Dr Bergsma in their relation to the lunar day, which was assumed in the calculations to com- mence with the time of the upper transit of the moon.

The result of the inquiry is that atmospheric pressure at Batavia has a lunar tide quite as distinctly marked as the ordinary diurnal barometric tide, except that its amplitude is much less. The four phases are these :—

1st max. + 0°0022 inch at lunar hour 1 Ist min. — 0°0021 7

2d max. +0°0025 2d min. —0°‘0024

2? 39 9

3? 29 23 13

33 2? 23 19

The lunar tide has the important difference that its phases follow the moon’s apparent course much more closely than the ordinary diurnal fluctuations of the barometer follow that of the sun. The two maxima occur about the lst and 13th, and the two minima about the 7th and 19th, whereas these four daily phases of the diurnal barometric fluctua- tion occur with respect to the sun’s apparent course from

one to six hours later. It is interesting to note that in the higher latitudes in inland situations during winter, or at times and in situations where the disturbing influences of temperature and humidity tend towards a minimum, the times of occurrence of the four phases of the daily oscilla- tion of the barometer approximate to those of the daily lunar atmospheric tide.

Since a distinct lunar tide is traced to the attractive influence of the moon, it follows that the attractive influence of the sun will enter as one of the several causes which determine the phases and amplitude of the diurnal barometric curve. It also follows from the much legs attractive influence of the sun than that of the moon on the earth’s atmosphere that the effects of the sun’s attrac- tion on the pressure will be wholly concealed by the much larger effects of the other forces concerned in determining the diurnal oscillation, except in the case or cases where the variation in the fluctuation

is small at 1 and 7 a.m. and 1 and 7 p.m. Now at places north of lat. 45° N. the variation at 1 a.m. is small during the winter, and it is a singular fact that some years ago Rykatchew of St Petersburg drew the attention of meteorologists to the existence at these northern stations of a faintly marked third maximum ; and it is further of importance to remark that, at many places where on the mean of years the third maximum is scarcely or not at all marked, it appears in the mean of some of the separate years. Thus, though it does not appear in the mean of the twenty years ending 1873 at Greenwich for January, it appears in nine of the individual years. It is highly probable that this maxi- mum, which may be named Rykatchew's maximum from its discoverer, is due to the attractive influence of the sun, its amplitude and time of occurrence being in accordance with such a supposition.

Diurnal Variation of the Force of the Wind.—During the three and a half years' cruise of the "Challenger," ending with May 1876, observations of the force and direction of the wind were made on 1202 days, at least

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Fic. 4.—Diurnal Force of Wind at Sea and near Land.

twelve times each day,—650 of the days being on the open sea and 552 near land. The observations of force were made on Beaufort's scale 0-12, being the scale of wind- force observed at sea. The mean diurnal force of the wind on the open, sea and near land respectively is shown

[BAROMETRIC OSCILLATIONS, —

WIND FORCE. |

in fig. 4, where the figures on the left are Beaufort's scale, and those on the right the equivalents in miles per hour. The solid line shows at the different hours of the day the mean force on the open sea, and the dotted line the mean force near: land.

As regards the open sea it is seen that the diurnal variation is exceedingly small, there being two apparent slight maxima, about midday and midnight respectively. On examining, however, the separate means for the North and South Atlantic, North and South Pacific, and the Southern Ocean, there is no uniform agreement observable among their curves, the slight variations which are met with being different in each case. It follows therefore that the force of the winds on the open sea is subject to no distinct and uniform diurnal variation. The difference between the hour of least and greatest mean force is less than a mile per hour.

Quite different is it, however, with the winds encountered by the "Challenger" near land, the force of the wind there giving a curve as pronouncedly marked as the ordinary diurnal curve of temperature.

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The minimum |

12s

maximum, with a sky half covered the velocity is three-fourths greater, and with a sky wholly covered the velocity is only a half more. On the other hand at the strietly inland situation of Vienna, with a elear sky the velocity is double, and with a sky half covered it is two-thirds greater, but with a covered sky the diurnal varia- tion in the wind's velocity becomes irregular and faintly marked. Hann has also examined the winds at Vienna, and found that winds of a velocity not exeeeding 30 kilometres an hour show a mean diurnal inerease from 11 kilometres at 6 A.M. to 16°8at1p.M., but that winds of velocity exeeeding 30 kilometres an hour exhibit only a faintly marked and irregular increase of velocity during the day.

In offering an explanation of this remarkable fact regard- ing the diurnal variation in the velocity of the wind in all climates, it is to be remarked that the minimum velocity occurs when terrestrial radiation and its effects are greatest, but the increase of the velocity closely follows the sun, and the maximum is reached nearer the time the sun crosses the meridian than perhaps any of the other maxima or minima of meteorology which are dependent on the sun's diurnal course. It is also to be noted that the winds over the open sea are practically uninfluenced by solar and terrestrial radiation, for there the diurnal curve of variation in the force of the wind is all but a straight line.

occurs at 2 to 4 a.m. and the maximum from noon to 4 | On nearing land, however, the wind's force exhibits a P.M, the absolute highest being at 2 p.m. The curves | diurnal curve of variation as distinctly marked as, and

constructed for each of the five oceans from the observa- tions near land give one and the same result, or a curve closely accordant with the curve of diurnal temperature. The differences between the hours of least and greatest force are as follows :—Southern Ocean 64 miles, South Pacific 43 miles, South Atlantic 34 miles, and North Atlantic and North Pacific 3 miles per hour.

_ In the case of each ocean the velocity of the wind on the open sea is considerably in excess of that near land, but in no case does the maximum velocity near land, attained about midday, reach the velocity of the wind on the open sea. The 650 daily observations on the open sea give a mean hourly velocity of 174 miles, whereas the 552 near land give a velocity of

only 12} miles per hour. The difference is greatest at 4 A.M., when it amounts to upwards of 6 miles an hour, but is diminished by the rising temperature till at 2 p.m. it is less than 3 miles an hour.

At Mauritius, which is situated within the south-east trades, the minimum velocity of the wind is 9°7 miles per hour, occurring from 2to 3 A.M., from which it rises to the maximum 18°5 miles from 1to2 p.M., the influence of the sun being thus to double the wind's velocity. At Batavia, situated in a region where the mean baro- metric gradient is much smaller, the differences are still more de- eided. From 1 to 6 a.m. 85 per cent. of the whole of the obser- vations are calms, whereas from noon to 2 P.M. only 1 per cent. are calms. In all months, the minimum velocity occurs in the early morning, when the temperature is lowest, and the maximum from 1 to 3 p.M., when the temperature is highest, the mean minimum aud maximum velocities being to each other as 1 to 21. At Coimbra the mean maximum hourly velocity is five times greater than the minimum hourly velocity in summer, whercas in Winter it is only about a half more. At Valentia, in the south- west of Ireland, one of the windiest situations in western Europe, the three summer months of 1878 gave a mean hourly velocity of 13°3 miles per hour, the minimum oscillating from 10 to 11 miles an hour from 9 p.M. to 6 A.M., and the maximum exceeding 16 miles an hour from 11 A.M. to5 p.M. The absolute lowest hourly mean was 10 miles at 11 p.m., and the highest 18 miles at 1 P.M., the velocity about midday being thus nearly double that of the night. Many observations might be added to these, including those published by Hann, Koppen, Hamberg, and others, which go to establish the fact that the curves of the diurnal variation of the velocity of the wind generally conform to the diurnal curves of temperature. The curves are most strongly marked during the hottest months ; and the maximum velocity occurs at 1 P.M. or shortly thereafter, being thus before the time of occurrence of the maximum temperature of the day, and the minimum in the early morning, or about the time when the temperature falls to the lowest. The rule also holds good with all winds, whatever be their direction. The exceptions to this rule are so few and of such a kind that they are probably to be attributed to causes more or less of a local character.

Hann has shown, for a number of places in northern Europe, that with a clear sky the velocity is doubled from the minimum to the

bearing a close resemblance to, the analogous curve of temperature; while on the land itself these features become still more decidedly pronounced. Lastly, the amount of the diurnal variation of the temperature of the surface of the sea is less than a degree, wliereas over all land surfaces the diurnal variation of the temperature is large, even where the ground is covered by vegetation, and enormously large over sandy wastes.

From this it follows that, so far as concerns any direct influence on the air itself, solar and terrestrial radiation exercise no influence on the diurnal increase of the velocity of the air with the increase of its temperature,—or, if any influence at all, such influence must be altogether insig- nificant, as is conclusively shown by the wind observations of the “Challenger” over each of the five great oceans of the globe. The same observations show that on nearing land the wind is everywhere greatly reduced in force. The retardation is greatest during the hours when the daily temperature is at the minimum; and it is particularly to be noted that, though the temperature rises considerably, no marked increase in the velocity sets in till about 9 a.M., when the temperature has begun to rise above the daily mean. From this time the increase is repid (see fig. 4) ;

. the maximum is reached shortly after the period of strongest

insolation ; and the velocity falls a little (but only a little) during the next three to five hours, according to season, latitude, and position, and falls again to near the minimum shortly after the hour when the temperature is at the mean. Even at the maximum, the velocity near land falls considerably short of the velocity which is steadily maintained over the open sea by night as well as by day. The period of the day when the wind’s velocity is in- creased is practically limited to the hours when the tempera- ture is above the daily mean, and the influence of this

higher temperature is to counteract to some extent the re-

tardation of the wind’s velocity resulting from friction and from the viscosity of the air. The increase in the diurnal velocity of the wind is in all probability due to the super- heating of the surface of the ground and to the consequent ascensional movement of the air, tending to counteract the effect of friction and of viscosity between the lowermost stratum of the air

and the ground. It is of importance in this connexion to keep in view the fact that in cloudy weather a temperature much higher than might have been supposed is often radiated from the clouds down upon the earth's surface,! which accounts for the phenonienon of the

1 Journal of Scottish Meteorological Society, vol. ii. p. 280.

diurnal variation in the wind's velocity occurring frequently also in cloudy weather. On the other hand, during the night, when terrestrial radiation is proceeding, the tempera- ture of the surface falls greatly, and instead of an ascensional movement in the lower stratum of the air there is rather a tendency towards a descensional movement (if the wind be light there is an actual movement) of the lowest air stratum down the slopes of the country; and since the friction between the wind and the surface of the earth is thereby increased the diurnal velocity of the wind falls to the minimum during these hours (see also p. 196).

Among the most marked exceptions to the general rule of the diurnal distribution of wind force may be cited the bitterly cold furious blasts of wind encountered in narrow valleys in such mountainous regions as the Alps during clear and comparatively calm nights. These are simply the out- rush of the cold air poured into the upper basins of the valleys by the descensional currents from the slopes which the chilling effects of terrestrial radiation set in motion. On the other hand, the air of the valleys becomes heated and expands during the day, thus giving rise to a warm wind blowing up the valleys, which, on account of the vapour it carries with it from the lower levels, fre-

quently covers the higher slopes and tops of the mountains |

with cloud and drizzling rain. Diurnal Variation in the Direction of the Wind.—In all climates near seas and other large sheets of water, where

the distribution of atmospheric pressure is tolerably equable, | tion is to generate, through the cooling of the land and the air

or the barometric gradient small, and the sun heat moderately strong, land and sea breezes are of daily occurrence. In such places a breeze from the sea gradually sets in in the morning, which gradually rises to a stiff breeze during the heat of the day and again towards evening sinks toa calm. Soon after this a breeze sets in from the land, blows strongly seaward during the night, and dies away in the morning, giving place to the sea breeze as before. These breezes are occasioned by the surface of the land being heated in a much higher degree

than that of the sea during the day; the air over the land |

being thereby made lighter ascends, and its place is supplied by the cooler air of the sea breeze drawn land- ward, and partly also by. descending currents, as shown by the humidity observations of the “Challenger,” which indicate increasing dryness when the sea breeze is strongest. Again during the night the temperature of the land and of the air over it falls below that of the sea, and the air of the land thus becoming heavier and denser flows over the sea as a land breeze. As the best-marked and most fre- quently occurring cases of the sea breeze begin some distance out at sea and gradually approach the land, it is very probable that, as suggested by Blanford, the ascend-

ing heated air flows seaward as an upper current, and that | the increased barometric gradient thus caused largely |

accounts for these breezes.

Sea and land breezes are thus determined by the relative posi- tions of the land and its coasts, subject to a further modification arising from the rotation of the earth. Thus on the coast of the Gulf of Lyons the sea breeze from the south veers to south-west and dics away as a west wind, while the land breeze from the north gradually veers to north-east and dies away as an east wind. On the coast of Algeria, on the other hand, the sea breeze veers from north to north-east and dies away in the east, whereas the south land breeze veers to south-west and dies away in the west. Sea breezes also occur in such unsettled climates as that of Seotland, when the weather conditions are favourable. These conditions are presented when an anticyclone overspreads the eountry, with its accompanying fine settled

weather, small variation in the distri- bution of atmospheric pressure, clear skies, and consequently strong sunshine. Under these conditions the following are the veerings of the wind off the coast of Berwickshire. In the morning the wind is north-west till about 10 a.m., when it veers to north, falling all the

time till finally itsinks toa calm. A little before noon it springs up |

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[WIND DIRECTION,

from north-cast or cast, veers to south-east from 2 to 3 P.M., where it eontinues till 7 p.M., about which timeit vecrs to south and then south-west, diminishing in force and finallysinking toacalm. About sunset it springs up from west, veering to north-west. during the night, where it continues till the following morning. The wind thus virtually makes the round of the compass, is strongest from north- west and south-east and weakest at north-east and south-west, being thus strongest when its course is perpendicular to the line of coast.

The observations made by the ‘‘ Challenger ” in the region of the north-east trades in 1873 show a small diurnal variation in the direetion of the wind, the variation being from E. 47° 5’ N. at 2 to 6 A.M. to E. 56° N. at 10 A.M. to 2 p.., the variation being thus 8° 55’ towards north during the hottest hours of the day. At Mauritius observatory, which is several miles from the sea, the daily period in the direction of the wind is from E. 22° 15’ §, at 4 a.M., being the most southerly point, to E. 7°S. at 1 p.m., and thence back to E. 22° 15’ S. at 4 a.m. The diurnal varia. tion is 15° 15’, and thus the influence of the sun impresses on the wind at this observatory a more truly easterly character.

At the Austrian naval station at Pola, near the head of the Adriatic, the daily variation in the direction of the wind is well- marked. Starting from a point cast of south at 5 a.M., it gradually veers round to westward, the most westerly point, almost due west, being reached at 5to 6 p.M., after which it gradually shifts back to its starting point inthe morning. Here we have evidently a diurnal wind-system different from that of the land and the sea

breeze, Pola is situated near the south-western extremity of the peninsula of Istria, and the direction in the early morning of east by south is

| the direction the wind would take if a small anticyclone overspread

the peninsula ; and the direction from the west in mid afternoon is the direction the wind would have at Pola if the peninsula were occupied by a small cyclone with the lowest pressure in the centre. Now the influence of solar radiation is to form, through the ascending current from the heated land, a diminution of pressure over the land,—in other words, what is essentially a cyclone. On the other hand, during the night the influence of terrestrial radia-

resting above it, a relatively higher atmospheric pressure in the interior of the peninsula with its characteristic system of out- blowing winds.

At Coimbra, in July 1878, the diurnal variation of the wind's direc. tion was from W. 49° 37' N. at 2 to 6 A.M. to W. 338° 15' N. at 4 to 6 p.M., theamount of the variation being thus 16° 22' in the direction of west. At Valeutia, in the south-west of Ireland, during the summer months of 1878 the diurnal variation of the wind's direction was from W. by S. at 7 to 9 am. to S.W. by W. at 5 to 7 p.M. The variation was thus froma point nearly south to a point nearly south-west, or through nearly 45° in the direction of west. On the other hand, at Aberdeen during the same mouths of 1878, the diurnal variation of the wind's direction was from S.W. at 6 to 7 a.m. to S. by E. at 12 to 4 p.M., the variation being thus 56° from south-west in the direction of east through south. Attention is here drawn to the exactly opposite ways in which the diurnal veering or shifting of the wind takes places at Valentia and Aberdeen, but partieularly to the important circumstance that in cach case the diurnal changes in the wind's direction which actually occur are precisely those that would take place on the supposition that during the hottest hours of the day an ascensional movement of the air sets in from the heated lands of the British Islands, and that an in-draught takes place all round, which with the descending currents makes good the loss caused by the up-draught. Thus then both the diurnal increase in the wind's velocity and the change in its direction which observation shows to take place during the hottest hours of the day are traced to the same cause, viz., the heating of the surface by the sun, the

heating of the lowest stratum of air resting on the surface, and the ascensional movements which are the neces- sary result.

It is instructive to note that at Nukuss, at some distance to the south of the Sea of Aral, where the summer direction of the wind is northerly, the north component is at the daily maximum at4 P.M., having shifted into this direction from north-east, where it is at 94.M. Much or nearly everything remains to be done in working out this problem in its praetical details as one of the important elements of climatology, with the view of arriving at some definite knowledge of the influence of physical eonfiguration aud different vegetable coverings of the surface on radiatiou and on the velocity and direction of the wind.

Diurnal Variation in the Amount of Cloud.—Mists and fogs are visible vapours floating in the air near the surface of the earth, and clouds are visible vapours at a consider- able height. These forms of visible vapour are all produced by whatever lowers the temperature of the air below the dew point,—such as radiation from the molecules of the atmosphere towards the cold regions of space, the simple

expansion of the air of ascending currents, the mixing of | sheet of cirro-stratus cloud is extended, under which

cold air with air that is warm and moist, and the cooling of the air in contact with the surface of the earth when its temperature has been lowered by nocturnal radiation.

The forms of clouds are endless. Since clouds are subject to certain distinct modifications from the same causes which produce other atmospheric phenomena, the face of the sky may be regarded as indicating the operation of these causes, just as the face of man indicates his mental and physical states. Hence the importance of the study of clouds, and hence the necessity

of a nomenclature of clouds as the basis of accurate and comparable observations. An adequate nomenclature of clouds is still a desideratum. Luke Howard's classification, which continues to hold its ground as a provisional nomenclature, was proposed by him in 1803, and by it clouds are considered as divided into seven kinds. Of these, three are simple forms, the cirrus, the cumulus, and the stratus ; and four intermediate or compound, the cirro-cwmulus, the ctrro-stratus, the cumulo-stratus, aud the cumulo-cirro-stratus, nimbus, or rain cloud.

The cirrus cloud consists of wavy, parallel, or divergent filaments, which may increase in any or all directions. It is the cloud of the least density, the greatest elevation, and the greatest variety of figure. It is probable that the particles composing it are minute crystals of ice or snow- flakes. The cirrus is intimately connected with the great movements of the atmosphere ; and it is solely from the movements of the cirrus that we have any direct know- ledge of the upper currents of the atmosphere. In recent years much has been done, particularly by Professor Hildebrandsson of Upsala and Clement Ley, in investi- gating the relations of this cloud to storms and other changes of weather.

The cumulus is the name applied to those convex or conical heaps of clouds which increase upwards from a horizontal base. They are generally of a very dense structure, are formed in the lower regions of the atmo- sphere, and are carried along by the aerial current next the earth. They form the tops of the ascending currents which rise from the heated ground, and have a diurnal period so well marked that they are often named the "cloud of the day." The form of stratus comprehends those mists and fogs which in the calm evening of a warm summer day make their appearance in the bottom of valleys and over low-lying grounds, and sometimes spread upwards over the surrounding country like an inundation; they have an equally well marked daily period, and are frequently called the "cloud of night." The cirro- cumulus is made up of small roundish masses, lying near each other, and quite separated by intervals of sky. It may be considered as formed from the cirrus by the fibres of that cloud breaking, as it were, and collapsing into roundish masses, thus destroying the texture but retaining the arrangement of that cloud. This singularly beautiful cloud is commonly known as a mackerel sky, and is of most frequent occurrence during dry

warm summer weather. The cirro-stratus consists of horizontal masses thinned towards the circumference, bent downwards or undulat- ing, and either separate or in groups. Since this cloud has great extent and continuity of substance, but little perpendicular depth or thickness, it is the cloud which most frequently fulfils the conditions for the phenomena of coronx, solar and lunar halos, parhelia or mock suns, and paraselenee or mock moons. ‘The cumulo-stratus is formed by the cirro-stratus blending with the cumulus, or spreading underneath it as a horizontal layer of vapour. The cumulo-cirro-stratus, or nimbus, is the well-known rain-cloud, which consists of a cloud or system of clouds from which rain is falling. At a considerable height a

cumulus clouds drift from windward ; these rapidly in- creasing unite and appear to form one continuous grey mass from which the rain falls. The breaking up of the lower grey mass indicates that the rain will soon cease. When a rain-cloud is seen at a distance, cirri appear to shoot out from its top in all directions; and it is observed that the more copious the rainfall the greater is the dis- play of cirri. The cirrus, cirro-cumulus, cirro-stratus, cumulo-stratus, and nimbus are connected more or less closely with the great atmospheric movements of the cyclone and anticyclone. In what follows here only the amount of sky covered will be taken into account, and not the species of cloud covering.

The diurnal variation in the amount of cloud in the sky on the open sea is very small. The following are the means of two hundred and seventy-seven days’ observations on board the “Challenger,” stated in percentages of sky covered :—

2 A.M. 59 10 A.M. 58 6PM. 57 4 ,, 59 Noon 56 Sis so Gr &. g62 2P.M. 58 MO BY/ 8 ,, 62 4 ,, 59 Midnight 57

Two maxima are here indicated, the one about or shortly after sunrise and the other in the early part of the afternoon ; and two minima, the one at noon and the other from sunset to midnight. The difference between the extremes is only 6 per cent. of the sky.

At Batavia the daily maximum is from 6 to 11 p.M., and the minimum from 8 to 11 AM., the extremes being 52 per cent. at 9 A.M. and 69 per cent. at 7

P.M.,—a difference of 17 percent. Of four daily observations at Mauritius, the maximum is 50 per eent. at 1P.m. and the minimum 38 per cent. at6 A.M. At ee observations of clouds have been made five times daily, and six years' results give the maximum 63 per cent. at 9 p.m. and the minimum 52 per eent. at 9 A.M. At this place, during July and August, the greatest amount of cloud occurs at 6 P.M., and in these months the rainfall at Coimbra is very small. The minimum is more pronounced at 9 A.M. than at any other period; in winter this phase oeeurs about four hours later. At the continental situation of Vienna, during the warm months of the year the maxi- mum is at 2 p.M., with a secondary maximum about 6 A.M., and the minimum from 10 P.M. to 2 a.M.; but during the cold months the maximum is at 6 A.M. and the minimum during the evening and night. In the Rocky Mountains, the chief maximum, 57 per eent., is at 3 P.M., with a secondary one 30 per cent. at 5 A.M.; and the chief minimum 20 at 3 A.M. and a secondary one 29 at 11 P.M. At Helsingfors the maximum of cloud occurs from 10 A.M. to 2 P.M., and the minimum from 10 p.m. to 2 A.M.

Much yet remains to be done with regard to the determination of the diurnal variation of cloud, but from the above one or two deductions of a general character may be drawn. A maximum occurs in the morning and continues till shortly after the sun has risen, and this maximum is more decidedly pronounced over the open sea than over land. Its appearance is without a doubt due to the general cooling of the atmosphere through its whole height by terrestrial radiation, and its disappearance to the heating of the air, which commences about sunrise. Then follows one of the diurnal minima, which continues till midday, or a little later; in other words, it continues till, owing to the diurnal heating of the air by the sun, the ascending current has fairly set in. The period of this ascending current marks the second maximum, which during the warmer months is larger than the morning maximum over land. The cumulus is the characteristic cloud of this maximum. These clouds are merely the summits of the ascending currents which rise from the heated land, where the aqueous vapour is condensed in cloud by the expansion which takes place with increase of height.

These cumulus clouds throw a not unimportant light on the behaviour of the ascending currents which rise from the surface when heated by the sun,—inasmuch as they

point to the fact that the current ascending from the surface is broken up and thereafter grouped into separate well-defined ascending currents, which are marked out and overtopped by these cumuli; and further it is probable, from their well-defined position, that the air composing the ascending currents is not only warmer but also more humid than the air in the clear interspaces at the same heights. It may also be regarded as highly probable that it is down through these clear interspaces that the descend- ing air-filaments shape their course in their way to take the place of the air-molecules that ascend from the heated surface of the earth. ;

The secondary minimum occurs from about sunset onwards during the time of the P.M. maximum of atmo- spheric pressure. In a highly saturated atmosphere, which is so characteristic a feature of many tropical climates at certain seasons, this time of the day is remarkable for the amount of cloud; and it is during those seasons and hours that heat-lightning, or lightning without thunder, attains its annual and diurnal maximum period, which is from six to eight hours later than that of thunderstorms. The morning maximum, shortly before and after sunrise, has two quite distinct and characteristic clouds accompanying it. One of these is the cumulo-stratus, which is a con- sequence of the cooling of the atmosphere through all its height by nocturnal radiation. As the colouring of the cloudlets is often singularly fine, it has been a favourite theme with poets of all ages andclimes. The other, which results from the cooling of the surface of the earth by terrestrial radiation and thence of the lower stratum of the atmosphere, is quite different, being a low creeping mist, appearing first in low-lying situations, and gradually extending upwards as the temperature falls. Fog is a well-known form of this cloud, having its diurnal maximum in the morning and early part of the day.

Diurnal Variation in the Amount of the Rainfall.— From the sixteen years during which hourly observations of the rainfall were made at Batavia Dr Bergsma has given a table showing the diurnal variation, of which the follow- ing shows how much per cent. of the total daily amount fell every two hours :—

Midt. to2 A.m. 8°7 | 8 A.M.to10 A.M. 5°5 4 P.M. to6 P.M. 13°5

2am,,,4 5, 64510 ,,, Noon 68 | 64, ,,8 4, 10s CR ee me: as | | Noon .,22.@. 0:5 | 8 ,, ,, l0be ee Curae Fre aati CS ng I NI) gy Wb, 7

The diurnal curve of rainfall is thus very distinctly marked at Batavia. The minimum is from 6 to 10 a.m. and the maximum from 2 to 6 p.m.,—10°7 per cent. falling during the four hours ending 10 a.m., but 25-7 per cent. in the four hours ending 6 P.M.

The observations were arranged and averaged by Dr Bergsma with the view of seeing how far the phases of the moon influence the rainfall. The results for the eight phases of the moon, beginning with new moon, showing the mean amount of rain in twenty-four hours during the seventeen years cnding 1880, are these :-—0‘243, 0-236, 0-198, 0-181, 0:212, 0-183, 0°189, and 0‘208, and daily mean 0°205 inch. The influence of the moon’s phases on the rainfall at Batavia is thus quite decided from these seventeen years ; for, while the mean daily rainfall is 0°205 inch, it riscs at full moon to 0°248 inch, from which time it gradually falls to 0°181 inch at the third octant, rises to 0°212 inch at the fourth oetant, falls again to 0°188 inch at the fifth octant, and finally rises to the maximum at the time of new moon.

At Coimbra, where the rainfall has been obsorved every two hours for the six years ending 1881, the mcans show a minimum of 3°08 inehes from midnight to 2 a.M., a maximum of 4:03 inches from 2 to 4 A.M., a second minimum of 3‘20 inches from 10 A.M. to noon, and a seeond maximum from 2 to 4 p.m. These four phases of the rainfall are pretty nearly accordant with the four phases of the barometric pressure, the maximum periods being near the times of minimum pressure, and the minimum periods near the times of maximum pressure. The rainfall at Philadelphia shows a decided maximum at 6 P.M. and minimum at3 A.M. At Vicnna during the summer half of the year there are three maxima and three minima in the curve of the daily rainfall, the chief

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[DIURNAL RAINFALL,

maximum, whieh is nearly double of each of the other two, occurring from 2 to 4 P.M., and the chief minimum from 3 to 6 A.M. At this place the

number of hours of rain has been recorded, showing two maximum periods, the first from 2 to 8 A.M. and the second from 4 to 7 P.M. Since: the time of maximum amount indieates a number of hours for the fall under the mean of the day, it follows that the showers from 2 to 4 P.M. are often very heavy. At Prague the chief maximum is from 2 to 6 P.M. and the minimum from 1 to 6 A.M. At Zechen the maximum is from 2 to 7 Poe with a secondary maximum from 5 to 8 A.M., and the minimum from midnight to4.4.M. At Bern the maximum fall is from 7 p.m, to midnight. Twenty-one years' observations at Calcutta show the maximum occurrence of rainfall during the rainy season from June to October to be from 11 A.M. to 6 P.M., the absolute maximum

being from 2 to 8 P.M. and the minimum from 9 P.M. to 1 A.M.;-

and during the hot dry season from March to May the maximum is from 5 to 9 p.M., and the minimum from midnight to 9 a.m.

The data already collected show the general occurrence of a diurnal maximum from about 11 a.m. to 6 P.m., and this feature of the curve is particularly well seen in the rainfall of continental climates during the summer half of the year. A marked diminution of the rainfall is very generally observed from about sunset to midnight, when the diurnal amount of cloud in many climates falls to the

minimum, and the evening maximum of atmospheric —

pressure takes place. The time of the morning minimum pressure from about 2 to 6 A.M. is, curiously, strongly marked in some places with an increase, while in others it is as strongly marked with a diminution, in the rainfall. The " Challenger" observations show that the occurrence of rain on the open sea is inversely as the temperature, 684 days' observations giving 96 cases from 9 to 4 P.M, and 135 from midnight to 2 a.M., these being the minimum and maximum periods.

Diurnal Variation of Thunderstorms.—It has just been remarked that a prominent feature of the diurnal rainfall in continental climates during the summer months is the increased rainfall from about 11 a.m. to 6 P.M., and the Vienna observations point to unusually heavy falls occur- ring at these

hours. This is caused by the rains which accompany the thunderstorms of these regions. The following table gives for the hours of the day the times of occurrence of thunderstorms at Ekaterinburg in the Ural

Mountains during the fourteen years ending 1872 :-— .|May.| June./ July. | Aug. | Sept.| Year,

Midnight to 1 A.M…... 1 A.M.

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Hence the thunderstorms at this place have a diurnal period as strongly marked as any other meteorological phenomena, and in this respect Ekatermburg is fairly representative of extratropical continental climates during summer. For the fourteen years no thunder occurred

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THUNDERSTORMS. |

during the six months from October to March. The mean of the six hottest months shows the maximum to take place from 3 to 4 p.M. aud the minimum from 4 to 5 a.M., these being the times of occurrence of the two minima of pressure. At this season, however, the morning minimum pressure is but faintly marked in such climates as those of Siberia. During

the twelve hours from 9 a.m. to 9 P.M., when the temperature is above the daily mean, 717 of the whole number occurred, thus leaving only 139 for the twelve hours when the temperature is below the daily mean. The great majority of the thunderstorms occur during the part of the day when the ascensional movement of the air from the heated ground takes place, and they attain the maximum when the temperature and this upward movement are also at the maximum. Owing to

the westerly winds from the Atlantic which prevail over

Europe and western Siberia during summer, the maximum rainfall of the year occurs over this extensive region in this season ; and the importance and significance of the inquiry into this element of climate lie in the fact that the greater portion of the summer rains is discharged over these regions by the thunderstorm. The “Challenger” observations on the open sea show the maximum occurrence of thunder- storms to be from 10 p.m. to 8 a.M., 22 being observed during these ten hours and 10 during the other fourtecn hours of the day,—a result which suggests that over the ocean terrestrial radiation is more powerful than solar radiation in causing vertical disturbances in the equilibrium of the atmosphere.

Atmospheric vapour and ascending currents thus play an important part in the history of these thunderstorms. Where the climate is dry and rainless, like that of Jerusalem in summer, thunder is altogether unknown. On the other hand, where during a particular season an anticyclone with its vast descending cuirent in the centre remains over a region, as happens over the centre of the old continent during the winter, over that region thunder is equally unknown during that season. Further, in such places as Lisbon and Coimbra, where the summer rainfall is small and its occurrence infrequent, thunderstorms become less frequent, and the hours of their occurrence are later in the day than they are before and after the dry season.

The thunderstorms at Mauritius call for special notice. There are two maxima in the diurnal curve, the larger from noon to 4 P.M. and the smaller from 8 to 6 A.M., which are near the times of the barometric minima ; and two minima, from 9 P.M. to 1 A.M. and from 8 to 10 A.m., these being near the times of the barometric maxima. But the important point as regards the thunderstorms of Mauritius is that for twelve years none were recorded in

June and July, one only in August, one in September, and three in October. The annual period of the thunderstorms of this island extends from near the end of October to the middle of May, or during the time of the greatest rainfall, practically none occurring during the rest of the year. But rain continues to fall during the four months of no thunder, the mean monthly rainfall being then about 2 inches, falling, however, in September to 1°37 inches. During these four months, therefore, there is in the air the aqueous vapour, and, these being dry months, there is the condition of ascending currents. There appears, however, to be then ,wanting another element which scems essential to the electrical manifestations of the thunderstorm, viz., the con- ditions which give masses of descending cold air along with the ascending current of warm moist air, During the months when thunder is of no unusual occurrence the high pressure of Asia repeatedly advances, as Dr Meldrum has pointed out, elose on Mauritius ; and so frequently is this the case that he considers the belt of calms between the two trade winds to stretch in a slanting direction from Madagascar to Ceylon. As long as this state of things occurs with more or less frequency, the conditions of a descending cold current of large volume are provided, and thunder- storms occur. But during June, July, August, and September, when atmospheric pressure is low in Central Asia, and there is an unbroken crease of pressure from Asia southwards to Mauritius, and while Mauritius remains in the heart of the south-east trades, the conditions of deseending cold currents of any considerable

volume are not present, and thunder is there unknown at that season.

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Now in situations which afford the three conditions of aqueous vapour, ascending eurrents, and deseending cold currents, whilst the diurnal and annual periods are quite distinctly marked, the phenomena are more uniformly distributed through the hours of the day and months of the year than elsewhere. Pola and Fiume, at the head of the Adriatic, being shut in and encompassed by lofty Alps, are illustrations. At Fiume the greater maximum oecurs from 11 A.M. to 4 p.m. and the smaller from 2 to 4 A.M., and the minima from 10 P.M. to1 A.M. and 5 to9A.mM. While during the

twelve hours the temperature is above the mean of the day from May to September the number of the thunderstorms here was 245 for the nine years ending 1879, the number during the twelve hours the temperature is under the mean was 185. The compara- tively large number during the colder hours of the night is no doubt due to the warm moist atmosphere of this confined sea and the close proximity of the Alps.

There is still another set of conditions favouring the develop- ment of thunderstorms in certain elimates which the observations made at Stykkisholm in the north-west of Iceland illustrate. During the fourteen years ending 1879 there occurred here twenty- three thunderstorms, but there was only one in the six warm months from April to September; in other words, the thunder- storms of this climate are essentially winter phenomena. Further, of the twenty-three hours in which they occurred, only three were at a time of the day when the sun was above the horizon, viz., twice in Mareh and once in September; in other words, the thunder- storms of Stykkisholm are nocturnal phenomena. _ It is instructive to observe that in the north and north-west of Scotland thunder occurs inost frequently during the night and in winter, whereas in central, southern, and eastern districts it occurs most frequently during the day and in summer,—the thunderstorms in the former case approximating in type to those of Iceland and in the latter to those of Ekaterinburg. A little reflexion shows that in north- western Europe it is during winter and during night that warm moist ascending and cold dry deseending currents are most fre- quently brought into close proximity during the great Atlantic storms of the season; and it is at the changes of wind, humidity, and temperature accompanying the passage of the centres of the cyclones that the thunder peals are heard. On the other hand, in the east and south of Scotland it is during the hot months of the year that these ascending columns of warm moist air and descending columns of cold dry air are most frequently brought together, and there, accordingly, thunder with the heavy rains which accompany it is of most frequent occurrence from 11 A.M. to 5 p.M. from May toSeptember ‘These essentially different types of thunderstorms have been classed by Mohn as heat thunderstorms and cyclonic thunderstorms.

Given an initial difference of clectric potential, it is easy to understand from the effects which follow the sudden extraordinary condensations of the

aqueous vapour that take place how the most violent thunderstorms are pro- duced. The difficulty is to account for the production of the initial difference of electric potential,—how, for example, in the same great aerial current of the south-west monsoon, this difference of potential is produced in the

molecules of aqueous vapour at Calcutta but not in the

aqueous vapour at Mauritius. It is to the physicist that meteorologists still look for the explanation.

Diurnal Period in the Occurrence of the Whirlwind, Waterspout, Dust Storm, and Tornado.—Whirlwinds, waterspouts, dust storms, and tornadoes are essentially the same, differing from each other only in their dimensions, their intensity, or the degree in which the moisture is con- densed into visible vapour, while the hailstorm and the rainstorm are simply the manner and degree of the pre- cipitation accompanying them. In several important respects they differ widely and radically from cyclones (see ATMOSPHERE, vol. iii. p. 33). The largest tornadoes are of so decidedly smaller dimensions when compared with the smallest cyclones as to admit of no shading of the one into the other. Cyclones occur at all hours of the day and night, whereas whirlwinds and tornadoes show a diurnal period as distinctly marked as any in meteorology. Finally, cyclones take place under conditions which involve unequal atmospheric pressures or densities at the same heights of the atmosphere, due to inequalities in the geographical distribution of temperature and humidity; but whirlwinds occur where for the time the air is unusually warm or moist, and where consequently temperature and

humidity diminish with hcight at an abnormally rapid rate. Cyclones are thus phenomena resulting from a disturbance of the equilibrium of the atmosphere considered horizon- tally, but whirlwinds and tornadoes have their origin in a vertical disturbance of atmospheric equilibrium.

Among the most remarkable of the tornado-swept regions of the globe are certain portions of the United States ; and to the examina- tion of these the

meteorological service of the States has given special attention by a systematic, careful, and minute observation of the attendant phenomena.and the destructive effects. The tornadoes of the last eighty-seven years, numbering about six hundred, have been classed under the different States where they are reported to have occurred, and fig. 5 shows this relative distribu-

tion over the States. The areas of greatest frequency are at long distances from each other. That part of the great basin lying west of the Mississippi, including the States of Iowa, Missouri, Kansas, and Nebraska, is the region in which tornadoes are most frequent. Tornadoes occur at all seasons, being most frequent, however, from April to September, and least frequent in December and January.

The hour of occurrence of one hundred and sixty-two of the tornadoes is given in the official report as follows :—

Midt. to 2 A.M. 2 8Aa.M.to10 a.m. 1 4p.M.to 6 P.M. 52 DAUM. 55)4, Gs 5D 110 4; « Boom 7% 6 55-4, 8 , ee Bes On 155 3 Noort ;; 2806, 16 8 es 210 « Sie 6 4, os 8 ” 4 2P.M.,, 4 ” 47 10 99,009 Midt. 4

Thus the diurnal period of tornadoes is analogous

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for temperature, wind velocity, and thunderstorms. The atmo- spheric conditions which appear invariably to precede the formation of the tornado are violent contrasts of temperature and humidity immediately to the north and south of the path to be traversed by the storm. It is highly interesting to observe from fig. 5 that the region of most frequent occurrence of tornadoes is the region where a large number of the cyclones of the United States appear to originate (aud the same region Loomis has shown to be remark- able for violent contrasts of temperature occurring within limited spaces and times), and that, as appears in the regions of the Alleghanies, they decrease in frequency with height.

Fig. 6 shows the waterspout in different aspects. A black cloud covers the sky, from which a projection is let down in the form of an inverted cone, as at A, which continues to increase and extend downwards. The sea immediately beneath is soon thrown into violent agitation, showing that the whirling movement which began in the clouds has extended to the sea, and is doubtless continuous throughout, though the portion of the column from A downwards is not yet made apparent by the condensation

_of its contained vapour into cloud. As the whirling move- ment of the column becomes more intensely developed, the increased rapidity of the gyrations brings about increased rarefaction of the air within, with the inevitable result of increased condensation of the vapour into cloud downward. The protrusion of the cloud and its extension downwards are thus not due to the descent of vapour from the clouds, but to the visible condensation of the vapour of the spirally ascending air-currents arising from an increasing rarefac- tion due solely to the accelerated rate of the gyrations, the

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Fic. 5.—Distribu- tion of Tornadoes in the United States.

condensation being analogous to that of the cloud seen in exhausting an air-pump.

Under each of the columns of fig. 6 the surface of the sea is seen to be more or less heaped up, as well as in violent agitation, showing that atmospheric pressure immediately under the gyrating columns is less than it is all round. On land, when the tornado passes directly over a dwelling house or other closed building, it often happens that the whole building, walls and roof, is thrown outward with great violence, the wreckage presenting the appearance of a sudden explosion, proving that atmospheric pressure outside the building was instantaneously and largely reduced, and the building shattered to fragments by the expansion of the air within. It is in this way that the tornado does some of its most dreadful work.

The wind of the tornado reaches a velocity probably. never equalled in cyclones. During the Ohio tornado of February 4, 1842, large buildings were lifted entire from their foundations, carried several rods through the air, and then dashed to pieces, some of the fragments being carried distances of 7 and 8 miles ; and large oaks nearly 7 fect in girth were snapped across like reeds. This tornado swept — on its course at the rate of 34 miles an hour, and at one

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“the mean time being nearly six minutes and a half.

TORNADOES. |

place did its fearful work in the brief space of a minute.

The tornado which passed over Mount Carmel (Illinois),

June 4, 1877, swept off the spire, vane, and gilded ball of the Methodist church, and carried it bodily 15 miles to north-eastward. The velocity of the ascending currents which kept this heavy object suspended in the air for 15 or 20 miles must have been very great.

Of the tornadoes the progressive courses of which were recorded, 310 advanced towards N.E., 38 towards S.E., 16 towards E.N.E., 14 towards E., 7 towards N.N.E., 5 towards E.S.E., and 3 towards $.S.E. The course is thus always

of the strong air-currents which blow along the surface of the ground and converge vorticosely round the base of the column. A form commoniy seen is shown in fig. 7, which represents several dust columns grouped together, each whirling independently round its own axis with incurving air-currents at the base, while the whole group of columns is borne bodily forward, and presents striking aspects as the forms and relative positions of the columns are changed. The importance of the observations made on dust storms as leading to a correct understanding of the whirlwind consists in this that it affords conclusive evidence that

there is a strong inflow of the

Fig. 6.—Forms of Waterspouts,

towards some easterly direction, the great majority being towards the north-east. The velocity of their onward movement varied from 12 to 60 miles an hour, the average being 30 miles an hour. The time occupied in passing a particular spot varied from 10 seconds to half an hour, The width of the path of destruction marked with debris and other relics of the violence of the tornado varied from 40 to 10,000 feet, the average being 362 yards. The direction of the whirling movement of the tornado was invariably from right to left, or the opposite of the movement of the hands of a watch, resembling in this respect the vorticose move- ment of cyclones in the northern hemisphere. The passage of the tornado cloud is often described as accompanied with remarkable noises, which observers variously charac- terize as terrible, deafening, a terrific crash, the roar of a thousand trains of cars, or the uproarious din of innumer- able pieces of machinery.

The usual position of the gyrating columns of cloud is vertical ; but occasionally a curving form or slanting direction is assumed. It is probable that to these latter forms many stationary or slowly moving dangerous squalls are to be referred, which spring up with unexpected suddenness in lakes and arms of the sea in mountainous regions.

The dust storm of India, Arabia, and Africa is a well- marked type of the whirlwind. Previous to the outbreak of a dust storm the air is unusually calm and sultry, just as happens in the case of the tornado. The simplest form of the dust storm is that of a tall acrial column of sand moving onwards, and drawing into itself, as it whirls round In its course, dust and other light bodics within the sweep

air along the surface of the ground all round vorticosely towards the base of the whirl- wind, and that these same in- flowing air-currents afterwards ascend through the air along the central axis of the whirl- wind, carrying with them the evidence of their ascent in the visible solid particles of dust, sand, and other light objects they whirl up with them in their ascending course.

Owing to the extreme dryness of the air-currents involved in the dust storm, the rarefaction generated by the rapidity of the = gyrations is insufficient to pro- = duce condensation of the aqueous _ vapour in the interior of the column. Quite different, how- ever, is it with waterspouts and tornadoes, where, in the great majority of cases, the air near the surface before being drawn into the ascending vortex is of a high temperature and near the point of saturation. From the extreme rarefaction to which these air-currents are subjected, owing to their sudden ascent in a rapidly gyrating column, excessive coudensation follows, with an aqucous precipitation at times so astonishing that it can only be fittingly described as an aerial torrent of solid water, or an acrial avalanche of hail and ice.

Certain tracts of the ocean in- cluded —_— within what. may be called permaneut anticyclones, or where atmo- spheric pressure is higher than all round, are char- acterized by an absence or com- parative absence of rain. These regions are also remarkable for clear skies and strong sun heat. _ Similarly small anticyclonic areas occur- ring between or in the vicinity of cyclones are characterized by dry air and clear skies, and it is under these conditions that the strongest sun heat is felt. When, as repeatedly

Fia 7.—Dust Storm.

happens in the warmer months of the year, anticycloncs remain practically stationary for some time, the lowermost strata of the air become abnormally heated,—thus bringing about a vertical disturbance of the equilibrium of the atmo- sphere out of which whirlwinds originate. It is under these conditions that white squalls or fair-weather whirlwinds occur, the originating cause of this special form being the great dryness of the air due to its place in the anticyclonc, and the abnormally rapid diminution of temperature and humidity with height owing to the strong insolation through the clear dry atmosphere. The clouds accompanying the white squalls are at a great height, but the commotion and boiling of the sea under them and following them as they drift onwards show that the squalls are true whirlwinds, the vapour column of the waterspout not being formed solely on account of the extreme dryness of the air which ascends the columns. The white squall accompanies fine weather, and its appearance is sudden, its duration bricf, and its destructive power at times so dreadful that it has been known to strip a ship of every sail and mast in a few seconds, and leave it rolling a helpless log amidst the tremendous sea which follows it. In sailing through such regions a close lookout should be made, particularly when the weather looks singularly fine, the skics beautifully clear, the air calm or nearly so, and the temperature and moisture of the air on board the vessel noticeably high. Diurnal Period of Hail.—The hail here referred to is round, hard, and compact, and in the form of clear or granular ice, the hailstones sometimes being found when broken across to be composed of alternate layers of these two states of ice. The following figures show the number of times it has occurred during the different hours of the day at Coimbra during the last six years :— Midt. to 2a.mM. 0 | 84a.m.tol0 A.M. 38 N55 4 5, TL 710y 4. 4, Noon 20 An in tee Be

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A diurnal period is thus well-marked at Coimbra, where forty-eight out of the fifty-nine cases have occurred from 10 a.m. to 4 p.m. This period is essentially the same as those calculated for a large number of places in representa- tive climates, care having been taken to limit the inquiry to the

particular hail described above. The important point to be noticed in the diurnal period of hail is that the time of maximum is about two hours earlier than the maximum period of thunderstorms. The maximum period for the thunderstorm is when the ascending current from the heated land is at its greatest force for the day ; but the maximum period for hail is some time before the ascending current has fully established itself, or at that time of the day when the vertical disturbance of the atmosphere is greatest,—in other words, when atmospheric temperature and vapour fall with height at a much greater rate than the normal. In the higher latitudes hail falls almost exclusively during the warmer months of the year. In regions where the summer climate is practically rainless no hail falls ; and where the rainfall is small and at distant intervals few cases of hail occur. Thus at Coimbra, where little rain falls in summer, hail was recorded as having fallen only once in the six years during the four dry hot months from June to September.

All hail is probably connected immediately with whirl- winds, more or less developed ; and it is when the hail- storm is one of the phenomena attendant on the tornado or on @ great thunderstorm that it assumes its most destructive form. The theory of the formation of hail las been stated by Ferrel in his Meteorological Researches for the Use of the Coast Pilot, part ii. p. 85. The vapour carried aloft by the gyrations of the tornado is below a certain height condensed into cloud and rain, but above that height into

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snow. Let the raindrops formed below be carried up into the snow region by the powerful ascending currents of the tornado and be kept suspended there a little while, and they become frozen into hail. If now these be thrown quite outside the gyrations of the tornado, they fall to the carth as a shower of compact homogeneous hailstones of clear ice of ordinary size. If, however, they are caught in the descent and carried in toward the vortex by the inflowing currents on all sides, they are again rapidly carricd aloft into the freezing region. A number of such revolutions of ascent and descent

may be made before they fall to the earth. While high up in the snow region, the hailstones reccive a coating of snow; but, while traversing the region lower down where rain yet unfrozen is carried up, they receive a coating of solid ice. Thus alternate coatings of snow and ice are received, and the number of each sort indicates the number of revolutions described before the hailstones fell to the ground. When the nucleus is com- posed of compact snow, as is generally the case, the hailstone had its origin high up in the snow region asa small ball of snow, or soft hail (Graupel in German and grésil in French); but when it is composed of clear ice throughout it was formed in the rain region, carried up into the snow region and there frozen, and immediately afterwards fell to the ground.

MonrTHLY, ANNUAL, AND IrrEGULARLY REcURRING PHENOMENA.

The Temperature of the Sea.—Figs. 8 and 9, represent- ing the distribution of the temperature of the surface water of the ocean for the two extreme months February and August, are reproduced chiefly from The Wind and Current Charts for Pacific, Atlantic, and Indian Oceans, published by the British Admiralty in 1872.

In February (fig. 8) the temperature of the surface of the sea falls to the annual minimum over the northern hemisphere, and rises to the maximum in the southern hemisphere. The course of the isothermals more closely follows the latitudes in the Pacific, Indian, and South Atlantie Oeeans; but the divergence from the latitudes is great and striking over the North Atlantie. The wider and more open the ocean the more does the distribution of the temperature approach the normal; and the more confined the oeean the greater is the divergence from the normal. The key to the anomalous distribution of the temperature of the ocean is furnished by the charts of the distribution of atmospheric pressure and the prevailing winds of the globe. So far as observation has gone it would appear that the surface currents are practically altogether caused by the prevailing winds over the respective oceans, subject to such deflexions in their courses as are oceasioned by the land.

In the southern hemisphere the currents on the west side of the Indian Occan flow southwards along the east coast of Africa, and, since the

currents here pass from lower to higher latitudes, the temperature along the whole extent of this coast is raised consider- ably above the normal. On the other hand, since the eurrents on the west coast of Africa flow from south to north—in other words, from higher to lower latitudes—the ocean currents whieh impinge on this coast have a temperature much under the normal. The winds and currents on the coasts of South America are precisely analogous to those of Africa, and the distribution of the temperature of the sea is also similar. The temperature of the occan on the east coast of that continent is for the same latitudes everywhere higher than on the west coast. Even in the smaller continent of Australia the same law holds good.

In the northern hemisphere a different distribution of the tem- perature of the sea is seen at this season. Inthe Atlantic the tem- perature is very mueh higher on the west of Europe than'on the east of Ameriea. On the east of Amcrica from Wilmington to Boston occur the most rapid transitions in the mean temperature of the ocean anywhere on the globe, the temperature falling in that short distance from 70° to 30°, whereas on the castern side of the Atlantic these isothermals pass Cape Verd Islands and Spitzbergen respectively. In the winter months the prevailing winds of the east side of North America are north-westerly, whilst in the central and eastern portion of the Atlantic they are south-westerly, thus pouring along the east coast of America the iey currents of the Aretic regions, but over the central Atlantic and along the western shores of Europe the warm waters of southern climates. The

easterly and south-easterly winds of Scandinavia in winter lower the isothermals along these coasts. A striking feature of the winter isothermals of the Atlantic is the singularly high temperature along the centre stretehing from Spitzbergen towards the south-west and extending ina modified degree as far south as the West Indies. In the Pacific this feature of the mid-ocean temperature is much less

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pronounced, and the excess of temperature on the west of America over what oceurs in the same latitudes of eastern Asia is not so great as the difference observable between the two sides of the Atlantic.

The highest mean temperature in February (85°) oceurs in the Indian Ocean to the south-west of Sumatra, and there is a patch the

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Fia. 8.—Isothermals of the Surface of the Sea for February.

temperature of which is 84° to the north of Madagascar. highest means in the Atlantic are 82° in the north-east angle of the Gulf of Guinea, and 81° off the north-east coast of Brazil. In the Pacifie the highest are 83° to the north of the Fiji Islands and 81° near the Marshall Islands.

The

In Angust (fig. 9) the southern half of the Red Sea shows a mean temperature of 90°, being the highest mean recorded for the ocean anywhere at any season. Patches showing a summer mean of 85° occur in the Chinese Sea to the east of Tonquin, in the Bay of Bengal to the east of southern India, about Socotra, and to the

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Fic, 9.—Isothermals of the Surface of the Sea for August.

west of Central America. But the most extensive regions of high temperature are in the west of the Paeific between long. 165° E. and the Philippines northward nearly to Japan and south- ward to New Guinea, and

the Gulf of Mexieo and the adjoining part of the Atlantic as far cast as long. 57° W. A patch of remarkably low temperature oecurs in the Pacific a little to the

west of Galapagos, where the mean is only 70°, being 10° lower than what occurs anywhere else near the equator at this season.

The influence of currents is strongly expressed in the temperature of all the oeeans. In the south of Asia the monsoons are 8. W., S., and S.E. Under the impulse of these monsoonal winds an extensive surface drift of the waters of the equatorial regions is

carried northwards towards scuthern Asia, and consequently very high temperatures characterize these seas in summer. It is instruc- tive to note the effect on the temperature of the sea resulting from the region of high atmospheric pressure in the North Atlantic at this season. Out of this anticyclonic region the winds blow in all directions, giving rise to surface currents tlowing in the same direc- tions. Thus to the west of Africa the winds and currents are from north to south ; and hence the temperature of this part of the ocean is abnormally reduced. On the other hand, on the west side of this high pressure area, the prevailing winds and currents are from south to north, and it will be seen that the temperature of the whole of the region swept by the southerly winds is abnormally raised. On the north side of the area, the winds and currents are westerly as far as about long. 35° W., and over that space the isothermals follow the parallels of latitude. Farther to eastward and northward the prevailing winds become south-westerly, thus propelling north- wards along the western shores of Europe, by oceanic surface drifts, the warmer waters of southern latitudes. Meanwhile the currents of cold water and ice drifts from the Aretic regions keep the tempera- ture off America to the north of Newfoundland at a figure con- siderably lower than is observed in any other region in the same latitudes. In August similar relations exist as in January between the east and west coasts respeetively of South Africa, South America, and Australia, all of which are readily explained by the charts of mean atinospheric pressure and the resulting prevalent winds.

One of the most striking facts of ocean temperature is that the temperature of the Southern Ocean from about 50° to 60° S. lat. is practically the same in January and August, a circumstance due ehiefly to the magnificent icebergs of that ocean.

The Temperature of the Land.—In regions where the rainfall is distributed through all the months of the year, and where snow covers the ground for only a small part of the year, the mean temperature of the soil nearly equals that of the air. But when the year is divided into wet and dry seasons, and when snow lies during a considerable portion of the year, the mean annual temperature of the soil may be above or below that of the air. The greatest difference between the temperature of the soil and that of the air occurs where the surface of the ground is covered during several months with snow. Snow is a bad con- ductor of heat, and thus obstructs the free propagation of the cold produced by radiation downwards into the soil, and the escape of heat from the soil into the air. In this way, over a considerable portion of the Russian empire, the temperature of the soil is considerably in excess of that of the air. Thus at a place 120 miles south of Archangel the temperature of the soil is 10° higher than that of the air; and at Semipalatinsk it is 9° higher.

The daily changes of temperature only affect the soil to depths of about 4 feet. The precise depth varies with the degree of the sun-heat and with the nature of the soil. Similarly the heat of summer and the cold of winter give rise toa larger annual wave of heat propagated downwards, the amplitude of which diminishes with the depth till it ceases to be perceptible. Principal Forbes showed from observations on the Calton Hill, Edinburgh, that the annual variation is not appreciable lower than 40 feet below the surface, and that under 25 feet the change of temperature through the year is small. The depth at which the annual variation ceases, or where the temperature remains constant, is a variable depending on the conductivity and specific heat of the soil or rock, but particularly on the difference between the summer and winter temperatures. ‘The rate at which the annual wave of temperature is propagated downwards is so slow that at Edinburgh, at a depth of 24 feet, the highest annual temperature does not occur till January 4, and the lowest till about July 13, thus revers- ing the seasons at this

depth. At Greenwich, at a depth of 25} feet, these phases of the annual temperature occur on November 30 and June 1.

Professor Everett in the Report of the British Association for 1879 has summarized the results of the observations of underground tem- perature, The temperature of the surface of the ground is not

sensibly influenced by the flow of heat from below upwards, but is determined by atmospheric and astronomical conditions, The tem-

perature gradient is defined as the rate of inercase of the temperature downwards, and it may be taken as averaging one degree Fahrenheit for every 50 or 60 feet, the exact ratc in particular eases being very variable. Thus the temperature gradient of the soil is about five times steeper than the temperature gradient of the air. The temperature gradient is steepest beneath gorges and least steep beneath ridges ; and hence the underground annual isothermals are flatter than the uneven surfaces above them. This is the ease even with the uppermost isothermal of the soil, and the flattening inereases as we pass downwards until at a considerable depth they become horizontal. Where the surface of the ground and the iso- thermal surfaces beneath it are horizontal, the flow of leat is verti- cal, and the saine quantity of heat flows across all sections which lie in the same vertical. In this case the flow across a horizontal area of unit size is equal to the product of the temperature gradient by the conductivity, if the latter term be used in an extended sense, so that it includes convection by the percolation of water, as well as conduction proper; and hence, in comparing different strata in the same vertical, the gradient varies in the inverse ratio of the conductivity.

Since the effects of the cold generated by nocturnal radiation mostly accumulate on the surface of the earth, but the effeets of solar radiation are spread to some height by ascending eurrents from the heated ground, it might be expected that the annual tempera- ture of the surface layer of the soil would be lower than that of the air resting over them. Observations prove that such is the ease. Springs which have their sources at greater

depths than that to which the annual variation penetrates have a constant temperature throughout the year, and if they do come from a depth considerably greater than this they may be regarded as giving a very close approximation to the mean annual temperature of the place. The temperature of cellars is also very near the mean annual temperature of the locality; at any rate this temperature may be secured for cellars anywhere.

Distribution of Temperature in the Atmosphere.—Of the larger problems of meteorology, the distribution of tempera- ture in the atmosphere over the land surfaces of the globe was the first that received an approximate solution (by Humboldt). But as regards the ocean, which comprises three-fourths of the earth's surface, the question of the monthly and annual distribution of temperature in the atmosphere over it can scarcely yet be said to have been seriously looked at. The isothermals of the temperature of the atmosphere which cross the oceans continue still to be drawn essentially from observations made on the islands and along the coasts of these oceans. The first step towards the solution of this vital problem in climatology and other branches of meteorology is the construction of charts of mean monthly temperature of the surface water of the sea over all parts of the ocean from which observa- tions for the purpose are available. In prosecuting this line of inquiry, excellent work has been done by the Meteorological Office as regards parts of the Atlantic between the tropics and the ocean to the south of Africa, and also by the Dutch, French, and German meteorologists. With such charts it would not be difficult, by a careful comparison during the same intervals of time between the temperature of the surface of the sea and that of the air resting over it, to construct monthly charts of the tempera- ture of the atmosphere over the oceans of the globe.

In this connexion the whole of the observations of the tempera- tures of the air and sea made on board the ‘‘ Challenger” have been examined, and sorted into one hundred and seventy-fonr groups aceording to geographical position, and the differences entered on a ehart of the ronte of the expedition. Inthe Southern Ocean between latitudes 45° and 60° the temperature of the sea was lower than that of the air, the mean difference being i°°4. The temperature of the air is here higher owing to the prevailing W.N.W. winds, and that of the sea lower owing to the numerous icebergs.

To south of lat. 60° S. the sea was nearly 2°°0 warmer than the air, the result in this ease being due to the open sea, which keeps up a higher surface temperature, and to an increased prevalence in these higher latitudes of southerly winds, thus lowering the temperature of the air.

The period during which the temperature of the sea exceeded that of the air was from June 1874 to March 1875, or during that part of the cruise from Sydney to New Zealand, and through the East India Islands to Hong Kong and thence to the Admiralty Islands. During the whole of this time, except when passing the north of Australia, the sea was much warmer than the air, the

general excess being from 2° to 3°, rising even near Tongatabu to | is raised. Sinrilarly in the North Pacific from lat. 40° to 30° the

upwards of 4°. The climate of the southern part of this extensive region at the seasons visited has a large rainfall, mueh cloud, and consequently a comparatively small evaporation and sunshine. In June, when the “Challenger” passed the north of Australia, the elimate was very dry, the sunshine strong, and the evaporation large, and there the sea was slightly colder than the air. In the Atlantic between lat. 20° N. and 20°S. the sea was everywhere warmer, the mean excess being about a degree; and in the Pacific between lat. 30° N. and 30° S. the sea was also warmer, the mean exeess being a degree and a half.

On the other hand, in the Atlantic from lat. 40° to 20° N. the sea was, on the mean, half a degree colder than the air. This region is remarkable for the high pressure which overspreads it, for the winds and currents whieh flow out in all directions, for its clear skies, strong sunshine, and consequently large evaporation, by which the temperature of the surface of the sea is lowered, and that of the air resting on it, being open to the heating influence of the sun,

temperature of the surface of the sea was half a degree lower than that of the air.

These remarks apply only to the observations made strictly on the open sea, Near land very great differences were observed which varied with season. Thus at Hong Kong during the latter half of November 1874 the sea was 3° °7 warmer than the air, the low temperature of the air at this season being caused by the lower temperature of the land and the northerly winds whieh then prevail; on the other hand, at Valparaiso in November and December of the following year the sea was 5°°8 colder than the air during the three weeks the ‘‘Challenger”’ was there, the difference being due to the cold oceanic current which sweeps northwards past that coast, and the rapid increase in the temperature of the air at that time of the year. These results will help us in gaining some knowledge of the temperature of the air over the oceans of the globe in February and August, taken in connexion with a careful examination of the sea temperature of these months represented in figs. 8 and 9.

Fie. 10.—January Isothermals of the Surfaee of the Globe.

The distribution of temperature over the surface of the globe is shown by figs. 10 and 11, which represent the temperature of the two extreme months January and July for the eleven years 1870 to 1880. The region of highest temperature, which may be regarded as comprised between the north and south isothermals of 80°, forms an irregularly shaped zone, lying in tropical and partly in subtropical countries. On each side of this warm zone the tempera- ture diminishes towards the poles, and the lines showing successively the gradual lowering of the temperature are, roughly speaking, arranged parallel to the equator, thus showing in an unmistakable manner the predominating influence of the sun as the source of terrestrial heat. While this decrease of temperature corresponds in a general way to what may be called the solar climate, there are great deviations brought about by disturbing causes.

Among these disturbing causes the unequal distribution of land and water holds a prominent place. In January the earth presents to the perpendicular rays of the sun the most uniform surface, or the largest water surface, and in July.the most diversified surface, or the greatest extent of land. Hence the

zone of the earth’s surface comprised between the isothermals of 80° is less irregular, and also Spreads over an area more restricted, in January than in July. In July the areas enclosed by the isothermals of 80° and 90° are much larger in the Old World than

in the New, it being the former which presents the larger |

land surface to the perpendicular rays of the sun; and in January, the summer of the southern hemisphere, the most extensive area of high temperature occurs in Africa and the least in Australia, the high-temperature area of South America being intermediate. In contrast to this the belt of temperature exceeding 80° is of least breadth where it crosses the Pacific and Atlantic Oceans, the absolute minimum breadth being in July in the Pacific, the largest ocean, where the disturbing influence of the land is least. During the cold months of the year, when the sun’s heat is least and the effects of terrestrial radiation attain the maximum, the greatest cold is over the largest land surfaces which slant most to the sun. Thus the lowest mean temperature that occurs anywhere or at any season on the globe is ~55°°8 at Werchojansk (lat. 67° 34’ N., long. 133° 51’ E.) in north-eastern Siberia. In Arctic America the lowest isothermal is ~~—40°°0. During the winter the ocean everywhere maintains a higher tem~~ perature in all regions open to its influence, as is seen, not only in the higher latitudes to which the isothermals push their way as they cross the Atlantic and Pacific, but also in their irregular courses over and near the Mediterranean, Black, Caspian, and Baltic Seas, Hudson’s Bay, the mouth of the St Lawrence, the American lakes, and all other large sheets of salt and fresh water. The disturbing influence of sheets of water on the temperature in all seasons is very strikingly shown when the isothermals are drawn for every

degree, these marking out the prominent features of local | 12 and 13 represent eharts of temperature of this deserip- climates, a knowledge of which is of so great importance to | tion for the British Islands for 1870-1880 from the the agrieulturist, the horticulturist, and the invalid. Figs. Jour. of Scot. Meteor. Soc., vol. vi. In the winter of the

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Fia. 11.—July Isothermals of the Surface of the Globe.

southern hemisphere the depressing influenee of the land | east of Australia and in the’basin of the La Plata, a lower on the temperature is but slightly felt, owing to the small | temperature prevails in the interior. Another prominent disturbing eause operating on the —

I ¢ 5 (-) 52°

54°

Ss ; 43° |: Bc eee ‘Fia. 13.—Mean Temperature of the British Islands in July. Fic, 12.—Mean Temperature of the British Islands in January. .

mean temperature is to be found in the seasonal areas of extent of the land surfaees and the eomparatively low | low and high mean pressure in their connexion with the pre-

latitudes to whieh they extend southwards. In the south- | vailing winds. Of these the most marked is the system of

quMPFRATURE. |

low pressure about Iceland during the winter months (see fig. 14). Since this region of low pressure gives to western Europe its prevailing south-west and south winds, and to North America its north-west winds in winter, it is plain that the temperature of western Europe is thereby abnormally

raised by the simple fact of its prevailing winds coming from the ocean and from lower latitudes, and that the temperature of North America is abnormally lowered by its prevailing winds coming from the Arctic regions and from land. The opposite action of these two winds, which are part and parcel of the same atmospheric disturbance about Iccland; is shown from the fact that, while the mean temperature of the south coast of Hudson's Bay in January is — 20°, in the same latitude in the Atlantic to the west of Scotland it is as high as 44°, or 64° higher. A similar though less striking result accom- panies the low-pressure area in the north of the Pacific in winter.

Another area of low mean pressure which powerfully affects the temperature is the low barometer which over- spreads the interior of Asia during the summer months (see fig. 17). Since from this disposition of the pressure the prevailing winds of Europe and western Asia are north- west and west, and over eastern Asia south-east and east, it follows that the temperature is abnormally raised on the eastern side and depressed on the western side of the con- tinent by the direction from which they severally receive their prevailing winds. This is well shown by the course of the summer isothermals of 80°, 70°, 60°, and 50° across the Old Continent.

Since the strongest insolation occurs where the air is driest, the hottest summer climates are met with in those tropical and subtropical regions where no rain falls. The most extensive of the rainless regions during the summer months is perhaps that which extends from the Punjab westwards through Persia, Arabia, and North Africa, to Spain. This is the region where the hottest climates of the globe are to be encountered. Similarly no rain falls at this time of the year in lower California and the States adjoining, and this feature of the climate, taken in con- nexion with the relatively low temperature of the coast due to the winds and ocean currents from the north which sweep past it, results in sharp contrasts of temperature within short distances such as have no parallel in any other climate.

Of the areas of seasonal high mean pressure, the high barometer of Central Asia in winter stands out in character- istic prominence (see fig. 14). Now, since the prevailing winds which necessarily form a part of this feature are south and south-west over Russia and western Siberia, the tempera- ture of

these inland regions is considerably higher than would otherwise be the case. prevailing winds are north-west in eastern Asia, the tempera- ture of these regions is thereby abnormally depressed. It is this consideration chiefly which explains how it is that, while the mean January temperature in latitude 60° and longitude 120° E. is — 30°, in the same latitude but in longitude 43° E. the mean temperature is 10°, or 40° higher, even though both regions are equally continental in their character.

The high mean pressure in the summer in the Atlantic between Africa and the United States has with its system of winds the most decided influence in bringing about the abnormal distribution of the temperature of that and adjoining regions. Since on its west side the prevailing winds are necessarily southerly, the temperature ofthat region is abnormally raised, and, on the other hand, since on its east side the winds are northerly, the temperature of the region is abnormally depressed. The result of these two opposite winds is seen in the slanting direction of the

On the other hand, since the.

isothermal of 80° across the Atlantic, which slanting direction is continued far into the interior of North America for the reasons already stated.

These important bearings of cyclonic and anticyclonic areas on temperature and climate may be thus summarized. The tempcrature is abnormally raised on the east sides of cyclonic areas, and abnormally depressed on the west sides; but, on the other hand, temperature is abnormally raised on the west sides of anticyclonic areas and depressed on their east sides. In the southern hemisphere these direc- tions are reversed. .

Another set of influences, powerfully affecting the tem- perature, come into play where the surface of the land rises above the sea into elevated plateaus, lofty peaks, or mountain ranges. Thus it has been observed on Ben Nevis and other mountains that the wind during the day in summer exhibits an ascensional tendency due to the circumstance that the temperature of the

surface of the mountain is heated in a much greater degree than the air strata at the same levels all around it. An ascensional current consequently rises from the mountain, which is maintained at a steadily stronger rate than at lower levels, because the drain from the updraught is easily supplied from the free surrounding atmosphere. It is the strong insolation at high elevations in the summer months whicli explains the excessively high day-temperatures encountered in the Rocky Mountains; and from the same conditions, viz., the rarity and purity of the atmosphere, by which terrestrial radiation is but little checked, come the low temperatures of the nights of these climates in , the same season. From this cause it follows that the elevated lands in the interior of continents tend to reduce mean atmo-spheric pressure in summer to a greater extent than would otherwise be the case. In winter, on the other hand, the temperature of elevated regions in the interior of continents is very much colder than that of the surrounding atmosphere at the same heights, because in such regions the air is exceedingly dry and rare, and consequently radiation to the cold regions of space but little checked. Hence down the slopes of these high lands there are poured in all directions descending currents of very cold air, which intensify the rigours of the winters experienced on the low lands round their base, where accordingly the lowest mean winter temperatures occur. These elevated lands thus materially add to the high atmospheric pressure of the interior of continents during the cold months of the year.

But it is ocean streams and ocean currents which produce the greatest abnormalities in the distribution of the tempera- ture of the air, and a glance at figs. 10 and 11 will show that it isin the North Atlantic where this cause is most strikingly seen. The increase thus accruing to the winter temperature is greatest about the north of Norway. It is

.also very great in the British Islands; thus, if no more

heat were received than is due to their position on the globe in respect of latitude, the mean winter temperature. of Shetland would be 3° and that of Londou 17°. But mainly owing to the heat given out by the Gulf Stream and other warm currents of the Atlantic their mean winter temperatures are respectively about 39°°5 and 39°, Shetland being thus benefited 36°°5 and London 22°. The chart of the winter temperature of the British Islands well

illustrates the influence of the surrounding ocean in maintaining a higher temperature. It will be seen that the south-west of Ireland is 7° warmer than the east coast of England in the same latitudes. The strong drift current from near Behring's Strait southward along the coast of America has a powerful influence, particularly in lowering the summer temperature of that coast,— thus bringing about, im con- junction with the dry rainless climate of the interior, what are perhaps the most violently contrasted climates, within

narrow limits, as regards their temperature. The deflexions of the isothermals near the Baltic, Mediterranean, Black, and Caspian Seas and the freshwater lakes of America all point to the disturbing influence of these sheets of water on the temperature. Neh-

The height and direction of mountain ranges 1s an important element in determiriing climate. If the ranges are perpendicular to the prevailing winds and of a con- siderable height, they drain the winds of much of their moisture, thus causing to places to leeward colder winters and hotter summers, by partially removing their protecting screen of vapour, and exposing them more completely to solar and terrestrial radiation. Of this Norway and Sweden and the British Islands form excellent illustrations. It is this that makes the most important distinctions among climates in regions near each other, as respects both animal and vegetable life. With regard to the decrease of temperature with height, very much yet remains to be done before an approximation to the law of decrease can be stated. During the five months observations were made on Ben Nevis in the summer of 1881 the dificrence between the mean temperature at sea-level adjoining and at the top of the Ben, 4406 feet above the sea, was Tore, which shows a mean decrease of 1° Fahr. for every 280 feet of elevation. 'The actual differences from day to day varied from 1°-4 to 23°°2. As Ben Nevis forms a peak, and is in the very middle of the strong winds from the Atlantic, it is highly probable that this rate of decrease is a close approximation to the true decrease of the tempera- ture of the air during the summer months in that part of the British Islands. When observations are made on elevated plateaus of some extent, the rate of decrease deduced from the observations

will be less than the true rate in the free atmosphere in summer and greater in winter. The rate is thus a variable quantity, varying with latitude, situation, dampness or dryness of the air, calm or windy weather, and particularly with the season of the year. One degree Fahrenheit for every 300 is the rate of decrease generally assumed.

Amount of Aqueous Vapour.—It is scarcely possible to overestimate the importance of a knowledge of the hori- zontal and vertical distribution in the atmosphere of its aqueous vapour, for it may be truly said that it forms one of the prime factors in all the larger problems of atmo- spheric physics.

Still less is known of the vertical distribution of aqueous vapour. It decreases, like temperature, with the height, and if the statement generally made be at all correct, that half of the whole vapour of the atmosphere is contained in the lowest. 6000 feet, and that at 20,000 feet high there is only about a tenth of what is at the earth's surface, the rate of decrease with height proceeds at a greatly more rapid rate than is consistent with the supposition that it forms an independent vapour atmosphere existing under its own pressure. The establishment of an increased number of high-level stations, and a more systematic inquiry than has yet been attempted into the upper currents of the atmo-

sphere, are much necded in the further development of this branch of meteorology. In carrying out the inquiry, invaluable assistance will be obtained from observations of the diurnal range of the barometer and from well-devised methods of observing the cffects of solar radiation at the earth's surface.

Amount of Cloud.—In Scotland, which lies completely within the region swept by the south-westerly winds from the Atlantic, and presents a well-defined mountain. range lying across the track of these winds, the clouds have a distinct annual period. In the west, at places quite open to these westerly breezes, the amounts of cloud in spring, summer, autumn, and winter are respectively 67, 69, 71, and 74, and the annual mean 70.! In the

east, in such districts as East and Mid Lothian, which have extensive ranges of hills between them and the Atlantic, the propor- tions are 59, 63, 62, and 60, and the annual mean 61. Thus about a tenth more of the sky is covered with cloud at the western as compared with the eastern situations, and the distribution of cloud differs materially in western and eastern climates. In the west winter is the cloudiest season, but in the east it is summer, and these are respec- tively the months.when niost rain falls in the several climates. Everywhere spring is the season when the sky is clearest. In England, owing to tlie protection afforded by Ireland and Wales to the west and the comparative absence of ranges of hills, the amount of cloud is less than in Scotland, and it is more equally distributed over the country. The minimum amount occurs in spring, and the maximum in winter and autumn.

Some of the best illustrations of the seasonal variation in the distribution of cloud are afforded by the Old Continent. These variations are the simple consequence of the systems of wind caused by the high winter and low summer pressures of that conti- nent. In eastern Siberia the prevailing winds in winter are N.W. or continental, and in summer S.E. or oceanic; and accordingly at Ajau, Nertchinsk, and Blagoweshtchensk the mean amounts of cloud in these two seasons are 18 and 44. On the other hand, in western Siberia and eastern Europe the prevailing winds im winter are S.W., or from lower to higher latitudes, and im summer N.W., or from higher to lower latitudes. – Kazan may be taken as fairly representing this extensive region, and there the amounts pf cloud for the four seasons beginning with winter are 71, 48, 44, and 62, As the N.W. winds of summer rise over the Ural mountains in their course, condensation of the aqueous vapour is inereased, and hence over this region the cloud in winter and suminer is nearly the same, the mean amounts at Bogoslovsk, Ekaterinburg, and Zlatoust being respectively 53 and 52. At Tiflis and Kutais, situated on the high ground which lies between the Black Sea and the south of the Caspian Sea, the means for winter and summer are 53 and 55. On the eastern coast of the Black Sea the westerly winds of summer are accompanied with the annual maximum eloud, the winter and summcr amounts at Redut-Kale being 59 and 69. In Central Siberia, to which the S.W. winds of winter do not extend, and to the north of latitude 55°, the amount of cloud is much diminished, and the cloudiness of summer is nearly the same as that of winter.

In India, in all regions which lie open to the summer monsoon, the minimum amount of cloud occurs during the winter and the maximum in summer,—the mean amounts being 19 and 74 at Calcutta, 16 and 86 at Bombay, 48 and 71 at Colombo, and 25 and 90 at Rangoon. At Trincomalee, on the east coast of Ceylon, and thus exposed to the rains of the N.E. monsoon of winter, and largely protected from the rains of the S.We monsoon of summer, the amounts of cloud in these seasons are 52 and 59. At Darjiling (6912 feet) and Chakrata (7022 feet high), both on the Himalayas, whither the summer monsoon penetrates, the mean amounts are respectively 53 and 86, and 43 and 73, At Leh, in Kashmir, the amounts are 59 and 51, the excess being thus in winter. In the Punjab and to westwards, or those regions I southern Asia to which the summer monsoon does not extend, the eloud in winter is everywhere greater than in summer. Thus the amounts are 24 and 18 at Mooltan, 38 and 25 at Peshawar, 27 and 19 at Jacobabad, and at Quetta, in Baluclristan, 5500 feet high, 42 and 14, Similar relations as to cloud obtain in Australia and the other continents where high pressures rule in the interior dnring

1 Jn this section the amount of cloud is stated in percentages of the sky eovered with cloud.

~ year.

ATMOSPHERIC PRESSURE. |

the cold inonths and low pressures during the warm months of the The maximum cloud occurs with winds froin the sea and winds advancing into the colder regions of higher latitudes, and the minimum with winds which have traversed an extensive track of Jand and .winds advancing into the warmer regions of lower lati- tudes. As the subject, however, is essentially one with rainfall, it

is not necessary to prosecute it further.

The other atmospheric movements on which the amount of cloud depends are the ascending and descending currents of the atmosphere,—the ascending currents with clouded skies occurring in the belt of calms and over cyclonic areas and regions, and the descending currents with compara-

tively clear skies over anticyclonic regions. The region of maximum vapour and densest cloud-screen on the globe is the equatorial belt of calms between the trades, which has an annual movement northward and southward with the sun as already explained. To ascensional movements is to be ascribed part of the cloudiness of the southern and eastern sides of the winter cyclonic regions of the North Atlantic and North Pacific, and of the cyclonic regions of low summer pressure in the interior of Asia and other continents. On the other hand the comparatively small

amount of cloud in the anticyclonic regions of the Atlantic and Pacific Oceans, and in the high-pressure regions of the interior of Asia and other continents during the cold months of the year, is due to the vast down-currents which occupy the centres of the anticyclones, and which become relatively drier as they descend owing to the increasing pressure to which the air is subjected.

Distribution of Atmospheric Pressure.—The importance of a knowledge of the distribution of atmospheric pres- sure, or of the mass of the atmosphere, over the globe in its varying amounts from month to month is self- evident. Observations teach us that winds are simply the movements of the atmosphere that set in from where there is a surplus towards where there is a deficiency of air; and observations also teach that isobaric maps (¢.e., maps showing the relative distribution of mean pressure) and maps showing the prevailing winds are in accordance with each other. Since prevailing winds to a large extent determine the temperature and rainfall of the regions they traverse, isobaric maps may be considered as furnish- ing the key to the more important questions of meteoro-

Fic. 14.—January Isobars of the Globe and Prevailing Winds.

logical inquiry. At the time of the first publication of isobaric maps of the globe in 1868, it was impossible to do more than present the subject in its

broad general features, owing to the scantiness and quality of the materials then existing. ‘But since then meteorological stations have been largely multiplied in all parts of the civilized world, and the general adoption of the issue of storm warnings has necessitated the use of more accurate

barometers and uniform methods of observing. Since.

there is thus now the means of a more exact representation of. this fundamental datum of meteorology, we have prepared a new set of isobaric maps, showing the distribu- tion of the earth’s atmosphere and the prevailing winds for January (fig. 14), July (fig. 17), and the year. They have been constructed from mean values calculated for the same eleven years (1870-80 inclusive) as the isothermal maps figs. 10 to 13, pressure of 30-0 inches and upwards being represented by solid lines, and of 29-9 inches and under by dotted lines, while the arrows show the directions of the prevailing winds at the localities indicated by the respective arrow-points.

Mean Atmospheric Pressure in January (fig. 14).—In this month, when the influence of the sun on the northern hemisphere falls to the minimum, the greatest pressures are massed over the continents of that hemisphere, and the least pressures over the northern parts of the Atlantic and Pacific Oceans, over the Antarctic Ocean and southern hemisphere generally. In the southern hemisphere there are three patches where pressure rises to 30 inches, viz., in the Atlantic between South America and Africa, south of the Indian Ocean, and in the Pacific between Australia and South America.

In the northern hemisphere, on the other hand, pressure rises in Central Asia to upwards of 30°5 inches, the mean pressure for January being at least 30°4 inches at Peking, etnigslatical, and Yenisei, and fully 30°5 inches at Irkutsk and Nertchinsk, in the upper basin of the Amur. This is the region where the normal atmospheric pressure attains to a maximum which is much higher than is reached in any other region or at any other time of the year. It will be observed that this region of highest pressure occupies a position near the centre of the largest continent. The area of high barometer is continued westward through Europe, through the horse latitudes of the Atlantic to Carolina, and thence through the United States to California, whence it crosses the Pacific to Asia. This belt of high pressure thus

completely encircles the globe, broadening as it passes the land and contracting as it crosses the ocean. Its greatest breadth is over Asia and its least over the Pacific, or where land and ocean attain respectively their maximum dimensions.

Pressures greatly under the average cover the northern portions of the Pacific and Atlantic and also the greater part of the Arctic regions. In the north of the Pacific the normal pressure falls to about 29°6 inches between Kamchatka and Alaska. In the north of the Atlantic, however, a still lower mean pressure obtains over a narrow belt stretching from Iceland to the south of Green- land, the normal at Stykkisholm in the north-west of Iceland being 29°385 inches, and at Ivigtut in Greenland 29-361 inches. This low average for Ivigtut is the lowest normal known, to occur any-where and at any season in the northern hemisphere, and it is significant that the place is immediately to the north of that part of the Atlantic where a considerable number of the storms which sweep over Europe have their origin, and where not a few of the storms which cross the Atlantic from America develop intensity.

It has been secn that the highest mean pressure occurs near the centre of the largest extent of land; but as regards the two oceans the lowest pressure is met with in the northern division of the Atlantic, which is the lesser ocean. An inspection of fig. 14 shows, however, that the low-pressure area of the Atlantic is bounded to southward by systems of much higher pressures than are to be found in the Pacific. The result of this arrangement is that much stronger winds blow northward over the Atlantic and round upon Iceland; and, as these more quickly advance into colder latitudes, there is thus a greater and more frequent concentration of vapour

and lowering of the barometer in the north of the Atlantic. The:

heavy rainfall of north-western Europe may be referred to as con- firming this view. ;

A belt of low pressure passes through the equatorial regions quite round the globe. This marks the well-known region of calms towards which on either

hand the trade winds blow. In the Atlantic it lics quite north of the equator even in January, when the sun's course is farthest to southward, and it lies nearly parallel with the equator. On the other hand, in the Indian Ocean the position of the line of lowest pressure is to the south of the equator and not parallel with it, but taking a slanting course from near the north of Madagascar towards Sumatra, thence towards the low pres- sure which prevails at this season in Australia ; its course is then a little to northwards, and crosses the Pacific to the central regions of South America. Its path is thus a devious one, being north of the equator only in the eastern part of the Pacific and in the Atlantic, but elsewhere to the south of it, being drawn farthest southward when under the inflnence of the regions of low pressure which now occupy central Australia, central and southern Africa, and central South America. In this trough of barometric depression nearly all the tropical storms of the Indian Ocean have their origin.

There are several important modifications of the isobaric lines as originally published. In 1868 the region of lowest pressure in the northern hemisphere in winter was represented as extending from Iceland to north-eastward ; now the area of lowest pressure is seen to extend from Iccland soutli-westward to Greenland. In connexion with this point Captain Hoffmeyer discussed the weather of the North Atlantic during several winter months, and published the results in 1878, which conclusively showed that the meteorology of Greenland and Iceland exerts on the distribution of atmospheric pressure a powerful influence not before properly recog- nized, resulting in the mean minimum of pressure being localized distinctly to the south-west of Iceland, and that in addition to this minimum there are two subordinate minima, one in Davis Straits and the other in the Arctic Ocean midway between Jan Mayen and the Lofoten Isles. The investigation further established the fact that, when any particular one of these three minima plays an important part, the other two either do not appear at all or occupy quite a subordinate place, and that according as one or other of these minima of pressure predominates so is the character of the weather, as regards mildness or severity, of the winter of north- western Hurope and regions surrounding the North Atlantic. As regards the British Islands, the displacement of the minima to west- ward of the position shown in fig. 14 means milder winter weather, whereas a position more in the direction of the north of Norway means severer winter weather.

‘Another change implying important consequences is seen in the United States, where, instead of one, two distinct centres of maximum pressure occur, or rather the high pressure of the western and central States is separated from that of the south- eastern States by a region of lower pressure occupying the region of the Mississippi States. Professor Loomis first drew attention to this peculiarity in 1879 in an inquiry into the’ distribution. of pressure over the United States, and established the fact that there are two distinct areas of high pressure, the larger having its centre in Utah, and the less overspreading the greater portion of the south- eastern and southern States, and that these two areas of high pres- sure are clearly separated from each other by a broad extensive region of lower pressure stretching in a south-western direction from the region of the great lakes to western Texas. The reason assigned by Professor Loomis is undouhtedly correct, that the relatively low normal pressure of the Mississippi States is due to the fact that the path usually taken by the barometric minima of

American storms in the earlier part of their course is from Texas to the lakes. Since, on the other hand, the centres of comparatively few storms, with their low barometer readings, cross the southern and south-eastern States, the normal winter pressure is higher there than it is along the Mississippi. ’

Another important modification occurs in India, where the isobar. of 30 inches is deflected to the south-east toward Madras and thence towards the north-east to near Akyab in Arakan. This remarkable defiexion well shows the important influence exerted on the course of the isobar by large well-defined sheets of water and” extensive tracts of land. The distribution of pressure here indicated, by which south of lat. 22° the normal pressure is considerably higher in the east than in the west of India, has, through the agency of the winds resulting from it, the most intimate and vital bearings on the distribution of the winter rains and temperature over con- — siderable portions of India ; and the same relations hold, but in a degrec still more striking, in the meteorology of Ceylon.

The remarkable effect in interrupting or changing the course of — the isobars is particularly well illustrated by the lines in the region of the Aral, Caspian, and Black Seas. As the point is of no small importance in meteorology, and is best illustrated by the Mediter-

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Fia. 15,—Isobars of Europe for January.

ranean and the countries to the north of it, we subjoin a map of this part of Europe (fig. 15), showing the normal pressure with greater distinctness and fulness than could be shown on fig. 14, the isobars being drawn for every half-tenth of an inch.

Here we see two distinct areas of. high pressure, the one in Hungary and the other in the Peninsula, where the normal pressure exceeds 30°20 inches. The latter is the larger of the two, and may be regarded as the prolongation of the region of high pressure which characterizes the Atlantic immediately to the south-west at this” season. The high-pressure area included within the isobar 30°15 inches is of peculiar interest. In the Peninsula it covers a pret broad areca, but to the north-east it contracts to a narrow neck between the Bay of Biscay and the Gulf of Lyons, and again expands to north-eastward covering the distance from Carlsruhe to Modena, its prolongation eastward being there somewhat suddenly inter- rupted. At some distance to the eastward the second region of high pressure is met with, which is properly a part of the high pressure that overspreads the interior of the Old Continent in the winter, months, its western limit being the isobar of 80°15 inches, which passes round by Pinsk, Cracow, Vienna, Laibach and the upper southern slopes of the basin of the Danube, Sebastopol, and thence southward in the direction of Cyprus.

The position of the latter of these regions of high pressure is approximately midway between the south coasts of Asia Minor and the Baltic. In other words, its position occupies the interior of this part of the Old Continent ; ma it is instructive to note that the position of the Black Sea and the Greek archipelago in the south portion of this region pushes the isobar of 80°15

inches a good deal to northward. The position of the region of high pressure in the Peninsula, France, and Switzerland is also decidedly inland. It does not, however, exactly occupy the middle space of the land lying between the Mediterranean and the North Sea, owing n0 doubt to the circumstance that the very steep barometric gradient from France to Iceland greatly lowers the pressure over the whole of the northern half of France. It follows that the abnormally high pressure which so remarkably characterizes the interior of the Old Continent during the cold months of winter is represented, though in a greatly reduced form, westwards through the central districts of that continent. ;

These two regions of high pressure are separated from each other

by a large area of comparatively low pressure overspreading the | of Great Britain from the Isle of Wight to Cape Wrath. This

greater portion of the Mediterranean Sea, —marked off in fig. 15 by | shows on a comparatively small seale the influence of the land in

| the isobar of 30°10 inches, within which ag id is everywhere less

than 30°10 inches. This region includes an area of still lower

ressure within the isobar of 30°05 inches, bounded by Sicily,

Corfu, Athens, and Crete. Hence the singularly low pressure which

characterizes the northern part of the Atlantic at this season has its

analogue in the south of Europe, which is ‘unquestionably due to

the higher temperature and larger humidity of the climates of southern Europe which they owe to the Mediterranean.

It is deserving of special notice that, while the increase of the | normal pressure of January from Genoa to Geneva is 0°081 inch, | it is only 0°021

inch from Trieste to Riva, and that to the north of the Adriatic as far as latitude 50° pressure is considerably lower

than obtains to the west and east of that region. An examination of the daily weather maps of Europe shows that not unfrequently the storms of north-western Europe on advancing as far to east- ward as Denmark seem to connect themselves in some degree with Mediterranean storms prevailing at the time through a north and sonth prolongation ofa os of low pressures. The comparative frequency with which this occurs is probably occasioned by the general drift to eastward of the atmosphere of Europe, considered as a whole, taken in connexion with the high mountainous ridge which bounds the Adriatic on its eastern side, from which it follows that the air overspreading the deep basin of the Adriatic is often

‘highly saturated with vapour, and this highly saturated air is drawn northwards through central Europe when north-western storms of Europe with low barometric depression centres pass across Denmark and the Baltic. Thus the low normal pressure to the north of the Adriatic, separating the two regions of high pressure to the east and west of it,,is in some respects analogous to the low normal pressure of the Mississippi valley, which separates the higher normal pressures of the Rocky Mountains and of the south- eastern of the United States.

The influence of land and water respectively in the cold season of the year is well shown in fig. 16, which represents for every 0°020 inch the normal pressure over the. British Islands in January, drawn from means calculated for two hundred and ninety-five stations.

It is in the winter months that the isobars of the British Islands

erowd most closely together, and in accordance therewith strong

j winds are then most prevalent. The crowding of the isobars ; reaches the maximum in January, forming what is probably the i steepest mean monthly barometric gradient that occurs at any . season anywhere on the globe. The point, however, to which attention is here drawn is the remarkable influence of St George’s

| Channel and the Irish Sea in diminishing the pressures as they Fic. 16 — Isobars of the British Islands for January.

‘ cross these seas, and of the land in increasing the pressure, which

is seen in the curves occupying approximately the central districts | raising the normal pressure, and of the sea in lowering it, during the f

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BO GO _ & 60 Gis) 100 120 Fra. 17.—July Isobars of the Globe and Prevailing Winds, othe months of the year, just as is seen on the grand scale in central Mean Atmospheric Pressure in July (fig. 17).—In this month the theria and the north of the Atlantic. physical conditions are the reverse of what obtains in January, the

lg ee ee effects of the influence of the sun on the temperature and humidity ee Journal of Scot. Meteorological Society, vol. vi. pp. 4-21. of the atmosphere rising to the maximum in the northern and fall-

ing to the minimum in the southern hemisphere. With the solar conditions reversed, a comparison of figs. 14 and 17 shows that the distribution of atmospheric pressure in July is, considered in a broad sense, the reversc of what takes place in January. j

In the sduthern hemisphere atmospheric pressure during the winter season is above the general average of 30 inches between lat. 10° and 40° 8. This belt of high pressure encircles the globe, and embraces four regions where pressure rises considerably above this general high average. These regions are 10 South Africa, about lat. 20°, where it rises to a little above 30°20 inches; in Australia, where it rises on the Murray river very nearly to 30°20 inches ; in South America, where in the basin of the La Plata, about lat. 30°, it rises to 30°13 inches; and in the ocean to westwards, where it reaches 30°02 inches. The point to be noted with respect to the position of these centres of high pressure at this season is that they occur over surfaces between latitudes 20° and 36°. As compared with January, pressure in July over nearly the whole of this broad belt of the southern hemisphere is about two-tenths of an inch higher, which is the simple result of season. A comparison of January and July shows that this large aecession to the pressure of the southern hemisphere is accompanied by an extraordinary dimi- nution of pressure over the continents of the northern hemisphere.

Now, just as the greatest excess of pressure during the winter of the northern hemisphere occurs in the continent of Asia, so the greatest

diminution of pressure in the summer months takes place in thesame continent. ‘The position, however, of these two extremes is far from being in the same region or even near each other. In the Old Continent the maximum occurs in the valley of the upper Amur, where, at Nertchinsk, the normal pressure in January is about 30°500 inches ; whercas the lowest normal pressure in July is 29°412 inches, and occurs, so far as observation enables us to locate it, at Jacobabad on the west side of the basin of the Indus. The difference of these two normals is 1‘188 inch ; and over no inconsider- able portion of central Asia the normal pressure of July is an inch less than that of January. In other words, the influence of the sun in summer as exerted on the temperature and aqueous vapour of the atmosphere and atmospheric movements resulting therefrom is so powerful as to remove a thirtieth part of the whole mass of the air from this extensive region.

The large extension in recent years of good meteorological stations over the Russian and Indian empires enables us to lay down with much greater precision than formerly the lines of pressure. Of the changes indicated by the new isobars, the most important perhaps is the position of the region of minimum pressure in Asia, which is now scen to occupy the basin of the Indus, and thence stretches over a somewhat broad region to westward ncarly as far as the head of the Persian Gulf. The point is of no small importance in atmo- spheric physics, inasmuch as it places the region of least normal pressure in July as closc geographically to the region where at the time terrestrial temperature is highest as the region of highest normal pressure in January is situated with respect to the region where in that month terrestrial temperature is lowest in Asia.

The July isobars of India are of singular interest, and imply con- sequences of the utmost practical advantage to the empire. From Cutch southward the normal pressure is everywhere higher, and considerably so, along the whole of the west than it isin the east in the same latitudes, the difference being approximately half a tenth of aninch. This is represented on the map by the slanting of the isobars from north-west to south-east as they cross this part of India ; and it is to be noted that the east and west coasts of Ceylon show the same manner of distribution of the pressure. The consc- quence of this peculiarity in the distribution of the pressure is that the summer monsoon

blows more directly from the ocean over western and southern India than would have been the case if the isobars had lain due east and west, and thus probably precipitates in its course a more abundant rainfall over this part of the empire. But a more important consequence follows from the geographical distribution of the pressure over the valley of the Ganges. If the normal pressure there had diminished in the manner it does over India to the south of the Gangetic valley, the winds would have been south-westerly and the summer climate practically rainless. This, however, is not the case,~~but the normal pressure diminishes westwards along the valley of the Ganges, as the following mean July pressures will show :—Calcutta, 29°576 inches ; Patna, 29°535 inches ; Lucknow, 29°522 inches ; Roorkee, 29°505 inches ; and in crossing westward into the Punjab pressure falls still lower—to 29°439 inches at Mooltan and 29°412 inches at Jacobabad. Indeed pressure in July is 0°220 inches lower at Jacobabad than at Sibsagar on the Brahmaputra, nearly in the same latitude. It necessarily follows from this distribution of the pressure that the summer mon~~ soon, which blows northward over the Bay of Bengal, is deflected into an E.S.E. wind which fills the whole valley of the Ganges distributing on its way a most generous rainfall over that magnifi- ecnt region. :

The influence of the land in lowering the pressure in summer is well illustrated by the course of the isobars over western Siberia

and Russia, where pressure is seen to fall relatively lowest along |

the middle line of the Old Continent. In this connexion it is interesting to note the course of the isobar of 29°90 inches over that part of Europe where the breadth of the land is considerably increased—between the Baltic and Constantinople. In contradis- tinction to this the influence of the Aral, Caspian, and Black Seas in maintaining a higher pressure appears in the remarkable pro- longation eastward of the isobars of higher pressure over the region of these seas, being in striking contrast to the lower pressures which prevail to the north and south.

The lowering of the normal pressure is very decided in the inland regions of Spain, North Italy, and Scandinavia. The cffect is most strongly seen in Spain, the largest and compactest of these regions, Thus, while the normal pressure diminishes between Lisbon and Barcelona from 30°086 to 30°048 inches, the sea-level pressure at Madrid falls nearly to 30°000, and the pressure at Saragossa and Valladolid is nearly as low. This lowering of the pressure over the interior influences materially its summer climate. As remarkable an illustration of the principle as can be pointed to anywhere is seen in the north of Italy; for, while the normal pressure at Moncalieri is 29°941 inches, at Genoa on the coast the relatively high normal of 29°992 inches is maintained, the distance of the two places being about 40 miles. To the east pressure rises to 29°970 inches at Venice, and to westward to 30°023 inchesat Geneva. Over Scandi- navia, along the west coast from the Arctic circle southward, the normal pressure equals or exceeds 29°80 inches, the variation being comparatively small ; and along the coast from the head of the Gulf of Bothnia to the south-east of Sweden pressure also exceeds 29°80 inches, and the increase from north to south proceeds at a slow rate. In, however, the strictly inland districts to the north-east of Christiania, which lie immediately to the east of the Scandinavian mountains, and sheltered by that lofty range from the winds of the Atlantic, pressure is considerably lower than it isalong the east and west coasts of the peninsula. Owing to this peculiar distribution of the pressure, the winds which necessarily result from it give a much finer summer climate to the south-east of Norway and to the strictly inland part of Sweden than would otherwise be the case.

The remarkable curving northward of the isobar of 29°80 inches so as to include Lapland within it points probably to the influence of the White Sea and the wonderful ie system of Lapland in maintaining a higher summer pressure over that country, by which the northerly winds that blow towards the low-pressure region of Central Asia, to the serious deterioration of the summer climate of northern Sibcria, do not extend so far to westward as Lapland.

The distribution of the normal pressure over North America is quite analogous to what prevails over Asia, but, the continent being less, the diminution of pressure in the interior is also correspond- ingly less. The

highest normal pressure, 30°077 inches, is found in the south-east in Florida, and the lowest, 29°780 inches, in Utah, the difference being thus 0°297 inch. Another region of relatively high pressure is in the north-western States and British Columbia to the north; the maximum, near the mouth of the Columbia river, reaches 80°062 inches, being thus nearly as high as what oecurs in Florida. These two regions are merely extensions of important high-pressure areas which at this season are highly characteristic features of the meteorology of the North Pacific and North Atlantic respectively.

Of these two regions of high pressure the one overspreading the Atlantic between the United States and Africa is the more striking, being not only the region where pressure is highest anywhere on the globe during the months of June, July, and August, but where the normal pressure reaches the highest point attained at any season over the ocean. The highest point reached by the normal pressure over the land at any season occurs, as has been pointed out, near the centre of Asia, or approximately in the middle region of the largest continuous land surface on the globe during the coldest months of the year. On the other hand, the highest pressure over the ocean occurs during the warmest months of the year, and not over the largest water surface, but in the middle regions of the North Atlantie, where the breadth is only about half that of the water surface of the North Pacific.

From the essential differences between these two sets of pheno- mena it may be inferred that the extraordinarily high pressure which is so marked a feature of the meteorology of Central Asia during the cold months of the year is a direct consequence of the lowering of the temperature of the land of Asia and of the atmo- sphere resting on it during the time of the year when the effects of solar radiation are at the annual minimum, and of terrestrial radia- tion at the annual maximum. But the determination of the place and time of highest pressure over the ocean must be regarded as indirectly brought about. The physical conditions under which it occurs are these :—it happens (1) at the time of the year when the earth presents the largest surface of land to the sun, and (2) over that part of the occan which is most completely surrounded by these highly heated land surfaces. This high summer pressure of the Atlantic has its origin in the upper currents of the atmosphere.

Mean Atmospheric Pressure for the Year.—The distribution of the annual atmospheric pressure may be considered as representing

the sums of the influences directly and indirectly at work throughout the year in inereasing or diminishing the pressure of the atmosphere. There are two regions of high pressure, the one north aud the other south of the equator, which pass completely round the globe as broad belts of high pressure. ‘The belt of high pressure in the southern hemisphere lies nearly parallel to the equator, and is of nearly uniform breadth throughout; but the belt north of the equator has a very irregular outline, and shows great differences in its breadth and its inclination to the equator. ‘These irregularities wholly depend on the peculiar distribution of land and water which obtains in the northern hemisphere.

These two zones of high pressure enclose between them the com-

paratively low pressure of the tropies, through the centre of which runsa narrower belt of still lower pressure, towards which the trade- winds on either hand blow. Considered in a broad sense, there are only three regions of low pressurc, the equatorial one just referred to, and one round cach pole bounded by or contained within the zones of high pressure just described. The most remarkable of these, so far as it is known, is the region of low pressure about the south pole, which remains low throughout the year, playing the principal réle in the wind systems of the Antarctic zone, in its heavy snowfall and rainfall, and in the enormous ice- bergs which form so striking a feature of the water of the Southern Ocean. * The depression around the north pole contains within its area two distinet eentres of still lower pressure, the one filling the northern part of the Atlantic and the other that of the Pacific. Of these two the low-pressure area round Iceland is the deeper, and is probably oceasioned by the steeper barometrie gradients and stronger winds which prevail over the North Atlantic. The broad equatorial zone of low pressure also contains two distinct regions characterized by still lower pressures. The larger of the two stretches agross southern Asia from Assam to the head of the Persian Gulf, and is entirely due to the very low pressures which form so marked a feature in the summer meteorology of that part of Asia. The regions of the middle Indus and upper Ganges occupy

the centre of this low- pressure area, where normal pressure falls short of 29°80 inches. The second area of lowest equatorial pressure is in the centre of Afriea.

It may be here pointed out that the whole of these areas of low mean annual pressure possess the common characteristic of an excessive amount of moisture in the atmosphere. The Arctic and Antarctic zones of low pressure, and the equatorial Loma reauze zone generally, may be regarded as all but wholly occasioned by the com- paratively large amount of vapour in their atmosphere. As regards the region of low pressure of southern Asia in summer, it is remarkable that, whilc the eastern half which overspreads the valley of the Ganges is characterized by a moist atmosphere and large rainfall, the western half of it is singularly dry and practically rain- less, and that the central portion of this remarkable depression oeeupies a region where at the time the climate is one of the driest and hottest anywhere to be found on the globe. Hence, while the vapour is the more important of the disturbing influences at work in the atmosphere, the temperature also plays no incouspicuous part direetly in destroying atmospheric equilibrium, from which result winds, storms, and many other atmospheric changes.

The Prevailing Winds of the Globe.—If atmospheric pressure were equal in all parts of the earth we should have the physical conditions of a stagnant atmosphere. Such, however, is not the case. Let there be produced a concentration of aqueous vapour over a particular region, or let one region show a higher temperature than what prevails around it, then from the different densities, and consequently different pressures thereby produced, the equilibrium of the atmosphere is destroyed, and, as might be expected from the laws of aerial fluids, move- ments of the air, or winds, set in to restore the equili- brium. Now every one of the isobaric maps we have given, as well as every isobaric map which has been made from recorded observations, indicates very considerable disturbance of the equilibrium at the surface of the earth. All observation shows that the prevailing winds of any region at any season of the year are simply the expression of the atmospheric movements which result from the dis- turbance of the equilibrium of the atmosphere indicated by the isobaric maps for that season and region.

All winds may be regardedas caused directly by differences of atmospheric pressure, just as the flow of rivers is caused by differences of level, the motion of the air and the motion of the water being both referable to gravitation. The wind

blows from a region of higher towards a region of lower

to the south of it §.E. winds.

pressure,—in other words from where there is a surplus to where there is a deficiency of air; and this takes place whether the differences of pressure be measurable by the barometer, as is generally the case, or not readily measur- able, as in the case of sea breezes, squalls, and sudden gusts of wind which are of short duration.

So far as is known, differences of atmospheric pressure, and consequently all winds, originate in changes occurring either in the temperature or the humidity of the air over restricted regions. Thus, if two regions contiguous to each other come to be of unequal temperature, the air of the

‘warmer. region, being specifically lighter, will ascend, and

the heavier air of the colder region will flow in below to take its place. Of this class of winds the sca and land breezes are the best examples. Again, if the air of one region comes to be more highly charged with aqueous vapour than the air of surrounding regions, the air of the more humid region being lighter will ascend, while the heavier air of the drier regions will flow in below and take its place. Since part of the vapour will be condensed into cloud or rain as it ascends, heat is thereby disengaged, and the equilibrium still further disturbed. In this way originate gales, storms, tempests, hurricanes, and all the more violent commotions of the atmosphere, except some of the forms of the whirlwind, such as dust storms, in the production of which very great differences of temperature are more immediately and exclusively concerned.

The Trade-Winds.—From fig. 14, giving the isobarics for January, it is seen that atmospheric pressure in the Atlantic is lower near the equator than it is to north and south of it; and the arrows indicate that to the north of the tract of lowest pressure N.E. winds prevail and These are the well- known N.E. and S8.E. trade-winds, which thus blow from regions of high pressure towards the tract of lower pressure situated midway between them. The trade-winds do not blow directly to where the lowest pressure is, but ina slant- ing direction at an angle of about halfa degree. The devia- tion from the direct course is due to the influence of the rotation of the earth on its axis from west to east,—an influence to which all winds and all currents of the ocean are subject.

In virtue of this rotation, objects on the earth's surface at the equator are carried round towards the east at the rate of about 17 miles a minute. On receding from the equator, however, this rate of velocity is being continually diminished, so that at 60° N. lat. it is only about 84 miles a minute, and at the poles nothing. From this it follows that a wind blowing along the earth's surface in the direc- tion of the equator is constantly arriving at places which have a greater eastward velocity than itself. As the wind thus lags behind, these places come up, as it were, against it, the result being an east wind. Since, therefore, the wind north of the equator is under the influence of two forces—one, the low pressure near the equator, drawing it southwards, and the other, the rotation of the earth, deflecting it eastwards—it will, by the law of the composi- tion of forces, take an intermediate direction, and blow from north-east. For the same reason, south of the equator the south is deflected into a south-east wind.

In the Atlantic the north trades prevail between latitudes 7° and 30° N., and the south trades between lati- tudes 3° N. and 25° S. These limits are not stationary, but follow the sun, being farthest to the south in February and to the north in August. The tract of low pressure between these wind systems is named the region of calms, owing to the calm weather which often prevails there, and it is also characterized by the frequent occurrencé of heavy rains. This region of calms varies its position with that of the sun, reaching its most northern limit, lat. 11° N.,

in August, and its most southern, lat. 1° N., in February. Its breadth varies from 3° to 8°, and it lies generally parallel to the equator. It is to be noted that, in the Atlantic, the region of calms is at all seasons north of the equator.

North and south trades also prevail in the Pacific Ocean, separated by a region of calms, which would appear, how-

ever, to be of less breadth and to be less clearly defined |

than is the region of calms in the Atlantic. In the eastern portion of the Pacific the region of calms lies at all seasons to the north of the equator, but in the western division it is considerably south of the equator during the summer months of the southern hemisphere, this southerly position being in all likelihood occasioned by the extraordinarily high pressure in Asia in its relations to the low pressure in the interior of Australia at this season. During the summer months of the northern hemisphere the region of calms

wholly disappears from the Indian Ocean and from the.

western part of the Pacific Ocean, there being then an unbroken diminishing pressure from the latitude of Mauritius and Central. Australia northwards as far as the low pressure of Central Asia.

the higher limits of the north and south trades. Except in the Pacific, where, owing to the greater breadth of that ocean, they spread over a considerable extent, these regions appear but in circumscribed patches, such as characterize the meteorology of the North and South Atlantic about latitudes 26° to 36°. Of these regions of calms the most important is that marked off by the high pressure in the North Atlantic, between the United States and Africa. This is the region of the Sargasso Sea, where the weather is characterized by calms and variable winds, and the ocean by its comparatively still waters. These are known to seamen as the “horse latitudes,” and. are essentially different from the equatorial region of calms. The latter, as has been stated, is the region of low pressure at the meeting of the north and south trades, where the climate is distinguished for its general sunlessness and heavy rainfall. On the other hand, the calm regions in the Atlantic and Pacific Oceans about the tropics have an atmospheric pressure

abnormally high, clear skies, and the weather generally sunny and bright, with occasional squalls.

Numerous observations made in all parts of the globe establish the fact that, while the surface winds within the tropics are directed towards the equatorial region of calms

in such a manner that the general intertropical movements.

of the atmosphere or prevailing winds are easterly, the prevailing winds of the north and south temperate zones are westerly. The westing of these great aerial currents is due to the same cause that gives easting to the trade-winds, viz., the rotation of the earth round its axis. For, as an aerial current advances into higher latitudes, it is constantly arriving at regions having a less rotatory velocity than itself ; it thus outstrips them and leaves them behind ; in other words, it blows over these places as a westerly wind. . While, however, the general prevalence of westerly winds has been established over the extratropical regions of Europe, Asia, Africa, America, and Australia, the direc- tions which in different seasons and at different places are actually found to prevail often differ very widely from west. An examination of the winds at one hundred and fifteen places pretty well distributed over the northern hemisphere reveals the instructive fact that almost every place shows two maximum directions from which winds blow more frequently than from the other directions, and that one of these two directions shows a considerable excess over the other. Thus, for example, the following are, on a

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[PREVAILING WINDs,

twenty years' average, the numbcr of days at Greenwich each wind prevails during the year:—N., 41; N.E., 49; E,, 23; 8.E., 21; S., 34; 8.W., 103; W., 38; N.W., 2450 calms, 32. Hence 8.W. and N.E. winds are there more prevalent than winds from any other direction, and of these two winds the greater maximum direction is 8.W. If the two maximum directions be sorted into groups, then the greater maximum direction occurs as follows :—

from 8.8.W. to W. at 47 places » WW, Soe . Benes 7 aie | ee Oe » ee. See and the other maximum direction is from 8.8.W. to W. at 20 places » aN. 3, ee » NaN. ,, 2G, 22 ” . Sein + ee.

This result of observation, so different from what was long accepted as being in accordance with the gencrally received

‘ theory of the movements of the atmosphere, teaches the

important lesson that the region towards which the extra- tropical winds of the northern hemisphere are directed is

| not the region of the north pole. Regions of light and variable winds and calms occur at |

Prevailing Winds in January.—On examining fig. 14,

‘ which shows the distribution of atmospheric pressure in

January, it is seen that pressure is abnormally low over the northern portion of the Atlantic—the lowest occurring between Iceland and South Greenland —from which it rises as we proceed in a 8.W. direction towards America, in a S. direction over the Atlantic, and in a 8.E. and E, direction over Europe and Asia. Now what influence has this remarkable atmospheric depression on the prevailing winds over this large and important part of the earth’s surface? The arrows in the figure, which indicate the prevailing winds, and which have been laid down from observations, answer this question.

At stations on the east side of North America the arrows show a decided predominance of north-west winds; at the more northern places the general direction is more northerly, whereas farther south it is more westerly. In the Atlantic between America and Great Britain, in the south of England, in France and Belgium, the direction is nearly 8.W. In Ireland and Scotland it is W.S.W.; in Denmark and the north-west of Russia 8.8. W. ; from St Petersburg to Tobolsk §.W.; on the west of Norway generally 8.S.E.; and in Greenland, the north of Iceland, and about Spitzbergen N.E. Hence all the prevailing winds in January over this extensive portion of the globe may be regarded as the simple expression of the difference of atmospheric pressure

which prevails over the different parts of the region. In truth the whole appears to flow vorticosely, or in an in-moving spiral course, towards the region of low pressure lying to the south-west of Iceland, and extending eastward over the Arctic Sea north of Russia. The only marked changes in these directions of the wind thus broadly sketched out are the deflexions caused by the various mountain systems which lie, so to speak, embedded in these vast aerial currents; of these the winds in the south of Norway afford excellent illustra- tions.

The influence which this peculiar distribution of the pressure over the north of the Atlantic exercises im . absolutely determining the winter climates of the respective countries is most instructive. It is to this low pressure, which draws over the British Islands W.S.W. winds from the warm waters of the Atlantic, that the open, mild, and, it must be added, rainy winters of these islands are due. The same region of low pressure gives Russia and Western Siberia their severe winters; and it is the same consideration that fully explains the enormous deflexion of the isothermal lines from Norway eastwards and gouth-

eastwards over the Old Continent. J’inally, the same low pressure draws over British America and the United States, by the N.W. winds which it induces, the intensely dry cold air-current of the Arctic regions. At Portland, Maine,

which is swept by these cold north-westerly winds, the — normal temperature in January is 23°°6, whereas at,

Corunna, on the coast of Spain, in nearly the same latitude, where south-westerly winds from the Atlantic prevail, the mean temperature of the month is 49°-1, or 25°°5 higher.

The region of low atmospheric pressure in the north of the Pacific is accompanied by prevailing winds over the region embraced by it and by climatic effects in all respects similar to the above. In Vancouver Island the prevailing winds in January are §.W., at Sitka E.S.E., on Great Bear Lake E.N.E., in Alaska N.E., in Kamchatka N.N.E., and in Japan N.W. the wintcr

climate of Vancouver and adjoining regions is mild and humid, and that of the north-east of Asia dry and intensely cold.

On the other hand, abnormally high pressure rules over the continent of Asia at this season, and as regards this region of high pressure the arrows represent the winds as blowing outwards from it in all directions. Over the interior of Asia, where the highest normal pressures are, observations show a marked prevalence of calms and light winds, but around this central region the prevailing winds in January are—at Calcutta N., at Hong-Kong E.N.E., at Peking N.W., on the Amur W.N.W., S.E. at Nijni- kolynisk and S.S.W. at Ustjansk (in the north of Siberia), and at Bogoslovsk S.W. Hence from this extensive region, where pressure is abnormally high, or where at this season there is a large surplus of air, the prevailing winds flow outwards in all directions towards the lower pressure which surrounds it. Owing to the excessive dry- ness of the air of Central Asia, terrestrial radiation is less obstrueted there than anywhere else on the globe, and consequently the temperature falls very low, the mean of January at Werchojansk being — 55°°8, which is the lowest mean monthly temperature known to occur on the earth's surface. And, since the winds blow outwards from the dry cold climates of the interior, temperatures are low, even on the coasts. Of this China affords good illustrations. Thus the mean January temperature of Pcking is 22°°7 and of Zi-ka-Wei, near Shanghai, 35°-4, whereas at Corfu and Alexandria the normal temperatures for January are respectively 50°°9 and 58°°0, or 28°:2 and 22°°6 higher than in corresponding latitudes on the coast of China.

The winds of the United States in winter, taken in connexion with the peculiar distribution of pressure already described, are very interesting. There are two regions of high pressure, one in the south-eastern States and the other and larger one in the States around Utah; and between these there is interposed a trough of lower pressure extend- ing from Chicago to the south-west of Texas. On the western side of this depression the winds are north- westerly, but to the east of it they become W., W.S.W., and in some places §.W., and again on nearing the Atlantic seaboard they become north-westerly. In connexion with

In accordance with these winds |

the region of higher pressure in the west, the prevailing |

winds are seen to flow outward from it. pressure diminishes everywhere to southward of a line drawn from the Canaries to Bermuda, thence westward in

The normal |

nearly the same latitude to Texas, and then to west-north- |

west to San Francisco. The tract of lowest pressure Stretches from the basin of the Amazon in the direction of

the isthmus of Panama in about latitude 8° N., and thence |

1s continued westward for a considerable distance into the Pacific in nearly the same latitude. It follows from this distribution of the pressure that the north trades in a more or less modified form prevail over South America to the

north of the Amazon, and in the Pacific to the north of lat. 8° N., probably as far to westward as long. 150° W.

The low-pressure systems which prevail during the summer months in South America and South Africa have each its corresponding system of winds all round. It is, however, in Australia, as being the most compact and isolated continent, that the influence of the summer sun in lowering the pressure is best illustrated. In that continent the lowest pressure occurs in the region situated about midway between the north coast and the tropic of Capricorn, over which the normal pressure does not exceed 29°80 inches. Further, everywhere in Australia pressure diminishes from the coast on advancing upon the inland districts. It follows from this disposition of the pressure that all round the island the prevailing winds in summer blow from the sea towards the interior ; and accordingly it is in these months that the

greater part of the rain falls. From the low pressure of the interior southwards to Bass's Straits pressure rises continuously, the increase in the normal over this space being about 0°200 inch. To north- ward it also rises continuously to beyond the north of China, the increase on this side being about ? of an inch. In this case the greater part of the increase occurs over the continent, the rate of increase from the north of Australia to the Philippine Islands being only about the rate of increase which obtains southward towards Bass's Straits. It will be shown when the subject of the rainfall is examined that it is the relative excess of these high pressures, the one in the south of Australia and the other in the south-east of Asia, that determines the position of the area of low pressure in Australia in particular years, and with that position the degree and extent to which the whole of the northern portion of Australia is watered by the rainfall. Thus, when pressure is more than usually high in the south-east of Asia, and either low or not ex- cessive in the south of Australia, then the low-pressure region is pushed farther southward into the interior, and with it the rainfall spreads inland over a wider area and to a greater depth.

Prevailing Winds mn July.—In the winter of the southern hemisphere, the geographical distribution of pressure is exactly the reverse in Australia of what obtains during the summer months. Everywhere all round it increases on advancing from the coast into inland districts. The lowest pressure, about 30°00 inches, occurs on the north coast, and the highest over the basin of the Murray river and its affluents, where it rises generally to 30°18 inches. On the south coast it is generally about 30°12 inches, falling, however, at Gabo Island, in the extreme south-east, to 30°050 inches, and to 29°836 in the south of New Zealand. From the Murray river the diminution of pressure is continuous to the north, even to the low pressure of Central Asia. From this arrangement of the pressure, the prevailing winds blow from the interior towards the surrounding ocean all round Australia, with the single exception of the extreme south-west of the continent, where the prevailing winds are south-westerly, being here essenti- ally an outflow of the high pressure which overspreads the Indian Ocean to the westward. As these §.W. winds are from the ocean, the rainfall at Perth in July is fully 6 inches, and it is high over south-western districts of West Australia. The prevailing winds round Australia are S. I. on the north coast, 8.W. at Brisbane, W.N.W. at Sydney, N. at Melbourne, N.E. at Adelaide. These all

represent an outflow from the high-pressure regions of the interior modified by the influence of the. earth's rotation, and, in correspondence with the reversal of the distribution of the pressure, are directions the reverse of the prevailing winds of January.

In July the central and southern parts of Asia are

highly heated by the summer sun, and, besides, the rainfall over southern parts is excessive. Consequently atmospherie pressure is very low, being fully 0:40 inch lower in the Punjab than it is in the south of Ceylon. From the interior pressure rises continuously on advancing to the eastward, southward, westward, and northward, and from all these directions the prevailing winds of summer flow inwards upon the interior, and these bring rain or parching drought according to the vapour they bring from the occan they have traversed, and according as they advance into warmer or colder regions. The prevailing summer winds of Asia, being an inflow inwards upon the interior, have, gencrally speaking, exactly the reverse direction of that prevailing in winter.

The winds of Europe are mainly determined by the extraordinarily high pressure of the Atlantic in its relations to the low-pressure systems of Central Asia and Central Africa at this time. The winds in the Spanish Peninsula are north-west ; in the north of Africa they are northerly, and again north-westerly in Syria. The winds of the British Islands and western Europe have less southing and more northing than the prevailing winds of winter, and to the east of long. 40° E. they become decidedly north-west. It is to the Atlantic origin of these winds that the summer climates of these large and important regions owe the con- paratively large rainfall of this season, it being at this time that the rainfall reaches the annual maximum. The bear- ing of the low-pressure areas and mountain systems of the north of Italy and Scandinavia on the climates of these countries will be afterwards refcrred to.

The centre of lowest pressure in North America is over the central States about Utah, from which it rises all round, least to northward and most in south-easterly and north-westerly directions. In California N.W: winds necessarily blow in- wardsupon thiscentral low-pressure area; and, as these winds pass successively over regions the temperature of which con- stantly increases, the summer climate is rainless. On the other hand, southerly and south-easterly winds from the Gulf of Mexico blow up the western side of the basin of the Missis- sippi inwards upon the low-pressure area of the centre, de- positing in their course, in a rainfall more or less abundant, the moisture they have brought from the Gulf. To the north of lat 50°, and to westward of Hudson's Bay, the prevail- ing winds become easterly and north-easterly, distributing over Manitoba, Saskatchewan, and neighbouring regions, as they continue their westerly course towards the low- pressure area, the rainfall they have transported thither from the wide expanse of Hudson's Bay. An attentive examination of the arrows of fig. 17 shows that the prevail- ing winds over all the States to the east of the Mississippi river arc rather to be regarded as an outflow from the region of very high pressure over the Atlantic to south- eastward. Thus in Florida the winds are S.E., in the southern States §., and in the lake region, in the New Eng- land States, and on the Atlantic seaboard S.W. Since the origin of these winds is thus essentially oceanic, and since in their course northwards no mountain range erosses their path, the whole of this extensive region enjoys a large but by no means excessive rainfall, which, taken in connexion with the temperature, renders the summer climate of these States one of the best to be met with anywhere on the globe for the successful prosecution of agricultural industries.

The remarkable protrusion of high pressures from the southern hemisphere, where they are massed at this time of the year, northwards into the Atlantic is, as has already been referrcd to, one of the outstanding features of the metcorology of the summer months of the northern hemi- sphere. In the central area of this large region the climate is remarkable for its prevailing calms, light winds, occasional

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_ gravitation.

squalls, and elear skies. From this comparatively calm_ space the wind blows outwards in all directions towards and in upon the surrounding regions of low pressure. These winds, owing to the high temperature, clear skies, and strong sunshine of the region from which they issue, earry with them a great amount of vapour near the surface, by which to a large extent the north of South America, the east of North America, the greater part of Europe, and a large por- tion of Africa are watered. The prevailing winds over this region are further interesting, not merely from the striking illustration they give of the intimate relation of the winds to the distribution of the pressure, but as being of no small importance in determining the best routes to be taken over this great highway of commerce, and the more so inasmuch as the currents of the ocean are coincident with these pre- vailing winds. .

In the Antarctic regions, or rather to the south of lat. 45° §., the normal atmospheric pressure is low at all seasons, there being a gradual diminution of pressure to 29°20 inches about lat. 60° S. Pressure is probably even still lower nearer to the south pole, as seems to be indi- cated by the observations made by Sir James C. Ross, and in the “Challenger” and other expeditions. Over this zone the prevailing winds are W.N.W. and N.W. This is the region of the “‘ brave west winds,” the “ roaring fortics ” of sailors, which play such an important part in navigation, and which determine that the outward voyage to Australia be round the Cape of Good Hope and thence eastward, and the homeward voyage eastward round Cape Horn, tlic globe being thus circumnavigated by the double voyage. That the general drift of these winds is inwards upon the south pole is strongly attested by the existence of the enormously thick wall of ice which engirdles these regions, from which are constantly breaking away the innumerable icebergs that cover the Southern Ocean, none of which is ever seen of a calculated thickness less than 1400 feet. The snow and rainfall which must take placc in the south polar regions for the formation of icebergs. of such a thickness must be peculiarly licavy, but not heavicr than might be expected from the strength and degree of satura- tion of the “roaring forties” which unceasingly precipitate their moisture over these regions.

To sum up:—so far as the prevailing winds are con- cerned, it has been shown that where pressure is high, that is to say, where there exists a surplus of air, out of such a region winds blow in all directions; and, on the other hand, where pressure is low, or where there is a deficiency of air, towards such a region winds blow from all directions in an in-moving spiral course. This outflow of air-currents from a region of high pressure upon a region of low pres- sure is reducible to a single principle, viz., the principle of Given as observed facts the differences of pressure, it is easy to state with a close approximation to accuracy what are the prevailing winds, before calculating the averages from the wind observations. Indeed so pre-dominating is the influence of gravitation where differences of pressure, however produced, exist that it may practically be regarded as the sole force immediately concerned in causing the movements of the atmosphere. If there he any other force or forces that set the winds in motion independently of the force called into play by differences of mass or pressure, their influence must be altogether insig- nificant as compared with gravitation.

It has been abundantly proved that the wind does not blow directly from the region of high towards that of low pressure, but that, in the northern hemisphere, the region of lowest pressure is to the left of the direction towards which the wind blows, and in the southern hemisphere to the right of it. This direction of the prevailing wind with reference to the pressure is in strict accordance with Buys

PREVAILING WINDS. |

Ballot's Law of the Winds, which may be thus expressed :~~— the wind neither blows round the centre of lowest pressure in circles, or as tangents to the concentric isobaric curves of storms or cyclones, nor does it blow directly towards the centre ; but it takes a direction intermediate, approaching, however, more nearly to the direction and course of the circular curves than of the radii to the centre. The angle formed by a line drawn to the centre of lowest pressure from the observer's position and a line drawn in the diree~~ tion of the wind is not a right angle, but an angle of from 60° to 80°.

From its importance in practical meteorology Buys Ballot's law may be stated in these two convenient forms. (1) Stand with your back to the wind,

and the centre of the depression or the place where the barometer is lowest will be to your left in the northern hemisphere, and to your right in the southern hemisphere. This is the rule for sailors by which they are guided to steer with refer- ence to storms. (2) Stand with the high barometer to your right and the low barometer to your left, and the wind will blow on your back, these positions in the southern hemisphere being reversed. It is in this form that the prevailing winds of any part of the globe may be worked out from the isobaric charts (figs. 14 and 17).

From the all-important consequences which flow from the geographical distribution of the pressure it is evident that the regions of low and of high normal pressure must be regarded as the true poles of the prevailing winds on the

earth's surface, towards which and from which the great.

movements of the atmosphere proceed. From the unequal distribution of land and water, and their diffcrent relations to solar and terrestrial radiation, it follows that the poles of pressure and of atmospheric movements are, just as happens with respect to the poles of temperature, very far from being coincident with the north pole. Thus during the winter months the regions to which the origin of the great prevailing winds of the northern hemisphere are to be referred are Central Asia, the region of the Rocky Mountains, and the horse latitudes of the Atlantic, and the regions towards and in upon which they flow are the low-pressure systems in the north of the Atlantic and Pacific Oceans, and the tract of low pressure within the tropics towards which the trade-winds blow. In the summer inonths the reversed conditions of pressure-distri- bution then observed are attended with corresponding changes in the prevailing winds; and, generally speaking, if the south polar region be excepted, the poles of highest and lowest pressure and atmospheric movemeuts are at no time coincident with the north pole. It is this considera- tion which affords the true explanation why prevailing winds at so large a proportion of stations in the northern hemisphere do not blow in the dircctions in which true equatorial and polar winds should blow.

The causes which bring about an unequal distribution of the mass of the earth's atmosphere are mainly these two— the temperature and the moisture of the atinosphere con- sidered with respect to the geographical distribution

of land and water. Owing to the very different relations of land and water to temperature, as already stated, the summer temperature of continents greatly exceeds that of the ocean in the same latitudes. Hence the abnormally high temperature which prevails in the interior of Asia, Africa, America, and Australia during their respective summers, in consequence of which the air, becoming speci- fically lighter, ascends in enormous columns thousauds of miles in diameter. On arriving at the higher regions of the atmosphere it flows over neighbouring regions where

_ the surface temperature is lower, and thus the atmospheric pressure of the highly heated regions is diminished.

Surface winds set in all round to take the place of the

air removed from the continents by these ascending currents, and since these necessarily are chiefly winds from the ocean. they are highly charged with aqueous vapour, by the presence of which, and by the condensation of the vapour into cloud and rain, the pressure over continents at this season is still further and very largely diminished. Air charged with vapour is specifically lighter than when without the vapour; in other words, the more vaponr any given quantity of atmospheric air has in it the less is its specific gravity; and, further, the condensation of vapour in ascending air is the chief cause of the cooling effect being so much less than that which would be experienced by dry air. From these two principles, which were established by Dalton, Joule, and Sir William Thomson, it follows that the pressure of vapour in the air, and its condensation, exercise a powerful influence in diminishing the pressure. The great disturbing influences at work in the atmosphere are the forces called into play by its aqueous vapour ; and it is to these, co-operating with the forces called into play by the differences of temperature directly, that the low normal pressure of the continents during the summer is to be ascribed. The degree to which the lowering of the pressure takes place is, as was to havo been expected, greatest in Asia, the largest continent, and least in Australia, the smallest continent, while in America it is intermediate.

The influence of the aqueous vapour in diminishing the pressure is well seen in the belt of calms in the tropics between the north and the south trade-winds. Since these winds import into the belt of calms the vapour they have taken up from the sea on their way thither, the climate is characterized by a highly saturated atmosphere and heavy rains. Again the air in regions near the Atlantic contains much more vapour and is of a higher temperature during winter than is observed at places in the interior of con- tinents in the same latitudes. It-follows thus that the air over the north of the Atlantic and the regions adjoining is specifically lighter than in the regions which surround them. We have here therefore the physical conditions of an ascending current ; and it is plain that the strength of this current will not merely be kept up but increased by the condensations of the vapour into cloud and rain which take place within it, by which a higher temperature and a greater specific lightness are maintained at the surface of the earth and at various heights in the atmosphere than exist over surrounding regions at the same _ heights. Accordingly it is seen from the winter isobars that an enormous diminution of pressure occurs over these regions, and also over the north of the Pacific and the Antarctic, as compared with the continents.

Since, on the other hand, dry and cold air is specifically heavy, the winter isobars show that where temperature is low and the air very dry pressure is high. Of this Asia and North America are striking examples during December, January, and February, and Australia, South Africa, and South America during June, July, and August.

Since vast volumes of airare thus poured into the region where pressure is low without increasing that pressure, and vast volumes flow out of the region where pressure is high without diminishing that pressure, it necessarily follows that the volumes of air poured into the region of low normal pressure do not accumulate over that region, but must somehow escape away into other regions, and that the volumes of air which flow out from the region of high normal pressure must have their place supplied by fresh accessions of air poured in from above. That the same law of relation observed between sca-level pressures and surface winds obtains between pressures at different heights and winds at the same heights is simply a necessary inference. We are therefore justified in expecting that

ascending eurrents will continue their ascent till a height is attained at which the pressure of the air composing the currents equals or just falls short of the pressure over the surrounding regions at that high level. On reaching this height the air, no longer buoyed up by a greater specific levity than that of the surrounding air, will cease to ascend, and expanding horizontally will thenceforth flow over as an upper current towards those regions which offer the least resistance to its course; that is to say, it will flow over upon those regions where, at that height, pressure happens at the time to be least. Now from the known densities of air of different temperatures and humidities It is evident that the overflow of the upper current will take place towards and over that region or regions the air of which in the lower strata of the atmosphere happens to be colder and drier than that of the other surrounding regions,—because, being denser, a greater mass of air is condensed or gathered together in the lower strata of the atmosphere, thus leaving a less mass of air, or a diminished pressure, in the higher region of the upper current.

If this be so, then the extraordinarily high pressure of Central Asia during winter is to be ascribed to these two causes :—(1) the low temperature and excessive dryness of the air of this extensive region; and (2) its relative proximity to the low pressure of the Atlantic to the north- west, the low pressure of the Pacific to the north-east, and the low pressure of the belt of calms to the south. Similarly, since in summer the temperature of air resting over the Atlantic between Africa and the United States is much lower than that of the land, the ascending currents which arise from the heated lands of Africa, Europe, and North and South America, as well as from the region of calms immediately to the south, all of which are remark- able for a low normal pressure, will on reaching the upper regions of the atmosphere flow towards this part of the Atlantic, because there, the temperature being lower and the density of the air composing the lower strata being greater, pressure in the upper regions is less, And, since the surface winds are constantly flowing outwards from this region of abnormally high pressure, thus draining away the air pourcd down upon it by the upper currents which converge upon it, extreme. saturation does not take place, and the air consequently is relatively dry and cool. That this view generally represents

the movements of the upper currents has been strongly confirmed within the last few years by Professor Hildebrandsson and Clement Ley in their researches into the upper currents of the atmosphere based on observations of the cirrus cloud.

From these considerations it may be concluded that the winds which prevail near the earth's surface are known from the isobaric lines, the direction of the wind. being from regions where pressure is high towards regions where it is low, in accordance with Buys Ballot's law; and that the upper currents may be inferred from the isobaric lines taken reversely, together with the isothermal lines taken directly. In other words, the regions of lowest pressure, with their ascending currents and relatively higher pressure at great heights as compared with surrounding regions, point out the sources or fountains from which the upper currents flow; and the isothermals, by showing where on account of the relatively low temperatures the greater mass of the air is condensed in the lower strata of the atmosphere and sea-level pressure consequently is high,

thus diminishing the pressure of the upper regions, point |

out the regions towards and upon which these upper currents of the atmosphere flow. The facts of the diurnal oscillations of the barometer in the different regions already diseussed afford the strongest corroboration of these views.

The term "monsoon" has long been applied to the pre-

| and, besides, by the rainfall they bring they spread fertility

vailing winds in southern Asia which blow approximately from §.W. from April to October, and from N.E. from November to April. The term is now, however, generally applied to those winds connected with continents which

are of seasonal occurrence, or which occur regularly with the periodical return of the season. Since they are caused immediately by the different temperatures and pressures which form marked features of the climates of continents in winter and summer respectively, they are most fully developed round the coast of Asia, owing to the great extent of that continent. The monsoons of different parts of the coasts of Asia differ widely in diréction from each other. Thus in winter and summer respeetively they are W.N.W. and E.N.E. at the mouth of the Amur, N. and S.S.E. at Shanghai, N.E. and S.W. at Rangoon, N. and W.S.W. at Bombay, N.W. and S.W. at Jerusalem, and S.S.W. and N.N.E. at Archangel. The Indian winter monsoon generally begins to break up in March, but it is not till about the middle of May, when the normal pres- sure has been decidedly diminished over the heated interior, that the summer monsoon acquires its full strength and the heavy monsoonal rains fairly set in. In October, when the temperature has fallen considerably and with the falling temperature the pressure of the interior has risen, the summer monsoon begius to break up, and this season is marked by variable winds, calms, and destructive hurricanes. As the temperature continues to fall and pressure to rise, the winter monsoon again resumes its sway. Monsoons, equally with the trade-winds, play a most important part in the economy of the globe. The relatively great force and steadiness in the direction in which they blow, and the periodical change in thcir direc- tion, give facility of intercourse between different countries ;

over extensive regions which otherwise would be barren wastes.

The winds of Australia are also strictly monsoonal, but owing to the small extent of that continent, and conse- quently the smaller differences there are between the normal pressure of the interior and that of the surrounding coasts in summer and winter respectively, they are less strongly marked than are the monsoons of southern Asia ; and particularly they neither blow with the same force nor so steadily from the same point of the compass. For the same reason the Australian climates are characterized by the occurrence of more frequent droughts than are the climates of southern Asia, and the same remark applies to the climates of southern Africa.

Since the Malay archipelago lies during the summer of the northern hemisphere between the high pressure of central Australia and the low

pressure of Asia, and during the winter between the high pressure of Asia and the low pressure of central Australia, it follows that the winds of these islands are eminently monsoonal in their character, being in summer southerly and in winter northerly. The result of this peculiar wind system of the archipelago is to give to these islands a singular diversity of climates, which will be more particularly referred to under rainfall.

At Zanzibar the prevailing wind in July is S.E., but in January, when the low pressure of the interior is situated much farther to southward, it is N.E.; and the same influence is felt, though in a greatly modified degree, as far as Mauritius, where the S.E. trade changes nearly into E. during the summer. On the other side of Africa the S.E. trade of the South Atlantic is changed into a S.W. monsoon on the coast of the Gulf of Guinea.

In the southern, central, western, and northern regions of North America the prevailing winds have a well-marked monsoonal character. The prevailing winds of winter and summer respectively are N.E. and §.S.E. at New Orleans,

N.W. and S.W. in Utah, N. and 8S. at Fort Yuma (California), E.S.E. and N.W. at Portland (Oregon), and S and E.N.E. at Fort York, Hudson Bay. These winds are readily accounted for by the distribution of pressure over the continent in winter and summer. On the Atlantic seaboard of the United States the prevailing winds of winter vary from N.W. in the New England States to W. in South Carolina ; whereas in summer they vary generally from §.8.W. in South Carolina to 8.W. in the New Eng- land States. Hence over the eastern States the summer winds are not directed towards the low-pressure region of the interior of the continent, but are determined by the relations of their pressure to the high pressure of thie Atlantic to the eastward, and to the lower pressure over- spreading the Atlantic to the N.E. This influence of the Atlantic may be considered as felt westward through the States as far as the Mississippi.

Though not so decidedly marked, the winds of Europe, except the extreme south, are also monsoonal. In winter they flow from the land towards the region of low pressure in the north of the Atlantic; but in summer the

arrows, representing the prevailing winds, show that all but the ex- treme south of Europe is swept by westerly winds, which flow in a vast continuous stream from the Atlantic towards the central regions of the Old Continent, and which deposit in their course the rains they have brought from the ocean.

Similarly, monsoons prevail on the coasts of Brazil, Peru, North Africa, and many otlier regions which happen to lie between other regions whose temperatures, and therefore pressures, differ markedly from each other at different times of the year.

These are the chief prevailing winds of the globe when

the differences of the normal atmospheric pressure are such as to cause a decided and steady movement of the atmo- sphere over a large portion of the earth's surface, resulting in well-marked prevailing winds. But there are other winds which are greatly influenced by local causes, such as the nature of the ground, whether covered with vegetation or bare; the physical configuration of tlie surface, whether level or mountainous ; and the vicinity of extensive sheets of fresh or salt water. An important characteristic of winds in their practical relations to climate is their quality, —they being warm or cold, dry or moist, according to their direction and the nature of the earth's surface over which they have just passed. Thus in the northern hemisphere southerly winds are warm and moist, while northerly winds are cold and dry. In Europe south- westerly winds are moist and easterly winds dry, while in the New England States and Canada north-easterly winds are cold and raw and north-westerly winds cold and dry.

In particular regions certain meteorological conditions occur at stated seasons intensifying these cffects, resulting in excessive drought, heavy rains, intense or great heat, thus giving rise to the following among other well-known winds. The east winds of the British Islands occur chiefly in spring, but also in a less degrce in November, being in the latter case often accompanied with fog. The winds here referred to are dry and parching, and their deleterious influence on the health is seen, not merely in the discomfort and uneasiness they impart to the less robust of the popu- lation, but also in the largely increased mortality which they cause from consumption and all other diseases more or less connected with the nervous

system. In the countrics bordering on the north of the Atlantic, atmo- spherie pressure reaches the annual maximum in May, and it is above the average during the other two spring months. ~ In these months the normal pressure approaches nearer to

what obtains farther south, and an examination of daily weather maps shows that this is due to the repeated _ occurrence in spring of very high pressures in the north of

Europe while pressures much lower prevail to southward. Now these east winds are simply the outflow from these regions of high pressure to northward. Northerly and even westerly winds which are truly outflows from what may be styled Arctic anticyclonic areas bring with them qualities as noxious as those of tlie east wind itself, and prove as injuri- ous to healtli and vegetation. The cold dry wind of April 29, 1868, which blasted and shrivelled up vegetation in Scot- land, particularly in the western counties, as effectually as if a scorching fire had passed across them, was a west wind.

In the south of Europe, during the winter and early spring, peculiarly dry, cold, and violent northerly winds are of occasional occurrence. Of these winds the ‘‘mistral” is one of the most notorious, which is a steady, violent, and cold north-west wind blowing from central. and eastern France down on the Gulf of Lyons. It is particularly trying while it lasts to invalids who are spending the winter at the various popular sanataria which are scattered along this part of the Mediterranean coast. The great. cold that took place in the north of Italy and south of France in the beginning of 1868 was a good example of the mistral. The meteorological conditions under which it occurred were unusually low pressure over the Mediterranean to southward (29°450 inches), whilst at the same time pressure rose steadily and rapidly on _pro- ceeding northward to 30°905 inches in the north of Russia. From this geographical distribution of the pressure, northerly winds swept southwards over Europe, carrying with them the low temperatures of the higher latitudes, and became still colder and dricr on crossing the Alps

before they made the descent on the shores of the Mediter- ranean, The cold tempestuous winds which descend from the Julian Alps and sweep over the Adriatic, and the dreaded ‘‘gregale” of Malta, which is a dry cold north-east wind, are in their character and origin quite analogous to the mistral.

The ‘‘northers,” or *‘ nortes,” are peculiarly dry cold strong winds which repeatedly occur from September to March in the States bordering on the Gulf of Mexico, and are perfectly analogous to the mistral. The conditions under which ‘lie occur are a pressure lower than usual to the south or south-east over the Gulf of Mexico, together with a pressure even higher than the high normal which is so marked a feature of the meteorology of the Rocky Mountains during the colder months. When, as most frequently happens, they occur in the wake of a storm, their disagreeable qualities of extreme dryness, cold, and violence are all intensified. From.a temperature of upwards of 80° experienced as the storm comes up the thermometer rapidly falls to 18° or even lower ; and, as the low temperature often occurs with a wind blowing with great violence, the northers prove most deleterious. A violent wind with a tem- perature of 18° is altogether unknown in the British Islands.

The ‘‘ pampero” isa strong, dry, cold wind which blows across the a of the River Plate of South America, occurring at all seasons,

ut most frequently during the spring and summer from October to January. They are preceded by casterly winds, a falling pressure, a rising temperature, and increased moisture. A pampero is de- scribed by Dr D. Christison, and its appearance figured, in the Journal of the Scottish Meteorological Society, vol. v. p. 342, as seen advancing on the morning of November 28, 1867, in central Uruguay. In the early morning the wind blew rather strongly from north-east, and by and by clouds were seen moving very slowly from the west, throwing out long streamers eastwards. As they advanced, two dense and perfectly regular cloud-masses appeared in front, one behind the other, in close contact yet not intermingling,—the one being of a uniform leaden grey, while the other was as black as the smoke of asteamer. On arriving over- head, the front, though slightly wavy in appearance, was seen to be quite straight in its general direction, and the bands were of uniform breadth. They rushed forward at great speed under

the other clouds without uniting with them, preserving their forms unbroken, being borne onward by an apparently irresistible force, as if coni- posed of some solid material rather than vapour. They extended probably 50 miles in length, but as they took only a few minutes to pass their breadth was not great, and they appeared to diminish to mere linesin the distant horizon. At the instant the first cloud- band arrived overhead, the wind'chopped round from north-east to north and then to south-west; a strong cold blast at the same time seemed to fall from the leaden cloud, and continued to blow till both bands had passed. No rain or thunder occurred at this time, but in the confused rabble of clouds which followed low thunder continued to roll, and in a quarter of au hour rain fell, and for some hours thereafter wind, rain, and thunder continued, but only to a moderate degree. The low temperature and rising barometer and change of wind are the constant and most striking characteristics of the pampero. On one occasion.the temperature fell 44° in four- teen hours, and on another occasion the fall was only 4°. Rain is a usual accompaniment, but on rare occasions the pampero passcs off and no rain falls.

Rainfall.—Whatever tends to lower the temperature of the air below the dew-point isa cause of rain. It is there- fore to the winds we must chiefly look for an explanation of the rainfall, and the broad principles of the connexion may be stated to be these five :—(1) when the winds have previously traversed a considerable extent of ocean, the rainfall is moderately large; (2) if the winds advance at tle same time into colder regions, the rainfall is largely increased, because the temperature is sooner reduced below the point of saturation ; (3) if the winds, though arriving from the ocean, have not traversed a considerable extent of it, the rainfall is not large; (4) if the winds, even though having traversed a large extent of occan, yet on arriving at tle land proceed into lower latitudes or regions markedly warmer, the rainfall is small or nil; (5) if a range of mountains lics across the onward path of the winds, the rainfall is largely increased on the side facing the winds, and reduced over the regions on the other side of the range. The reason here is that, the air on the windward side of the ridge being suddenly raised to a greater height in crossing the range, the temperature is further reduced by mere expansion, and a more copious

precipita- tion is the result ; whereas on the leeward side as the air descends to lower levels it becomes gradually drier, and accordingly the rainfall rapidly diminishes with the descent.

We have drawn attention to the diminished velocity of the wind over land as compared with the open sea (p. 125). From this it follows that an envelope of stiller air or air of less velocity than that of the prevailing wind broods over the Jand, and hy its presence forces the prevailing wind toa greater height, thus tending to increase the rainfall. If the foreshore rises within a few uuiles to a height of 200 or 300 fect, the result is very striking when the wind from the sea blows straight upon it. Thus at Spittal, near Lerwick, on September 1877, a N.E. wind blew straight ashore at an estimated velocity of 25 miles an hour. To eastward the sky was singularly clear down to the horizon, but to westward all the country beyond a mile from the shore was enveloped in what appeared a dense mist or fog. About 15° to castward of the zenith of an observer on the shore, the thinnest rack of cloudlets was seen emerging withont intermission from the deep stainless blue of the sky, which as they drifted landward increased so rapidly in volume and density that the zenith was three-fourths covered with clouds. A similar phenomenon was seen in September 1879 on board the Orkney steainer at the magnificent cliff of Hoy Island, Orkney. A heavy storm had just cleared away, and a strong W.N.W. wind was blowing right against the cliff. The sky was absolutely cloud- less all ronud, except the upper 800 fect of Hoy Hill, 1570 feet high, which was enveloped in a thick mist that stretclied away to wind- ward, some distance to westward of the stcamer’s course, which was about 2 miles from land. The western termination of the cloud was the thinnest rack of cloud, which emerged unceasingly from the blue sky ata distance not less than 4 miles to wind- ward of the cliff. The constituent parts of the cloud itself were in rapid motion eastward, but, owing to the fresh accessions it was constantly receiving, the cloud itsclf appeared stationary. Thus the wind was forced upward into the atmosphere for some consider- able distauce to windward of the ridge lying across its path.

It is this dragging effeet of the land on the wind, and the con- sequences which result from it, that explain how it is that during storms of wind and rain from the north-east the rainfall over the foreshores of the Firth of Forth,

the Moray Firth, and the Pentland Virth looking to the north-east is so much in excess as compared with the rest of Scotland. The same principle explains the heavy rainfall in plains at sonic distance from the range of hills lying across the wind's path and on the side of the rain-bringing winds.

For short intervals of time-the heaviest rainfalls occur with tornadoes, waterspouts, and some other forms of the whirlwind, the reason being that not only is there rapid expansion due to the rapid ascent of the air, but also great rarefaction is produced by the extreme velocity of the aerial gyrations round the axis of the tornado. On August 1, 1846, 3°12 inches of rain fell at Camberwell, London, in two hours and seventeen minutes. Of heavy falls may be mentioned 4°60 inches in London, April 13, 1878 ; 6:00 inches at Tongue, September 7, 1870; 5-36 inches in Monmouthshire, July 14, 1875; 6°62 inches at

- deposits.

fulfilled during the summer

Seathwaite, Cumberland, November 27, 1848; and 7:12 inches at Drishaig, Argyllshire, December 7 to 8, 1863. But it is in lower latitudes that the heaviest single showers have been recorded. 'The following are among the most remarkable :—at Joyeuse, France, 31:17 inches in twenty- two hours; at Genoa, 30-00 inches in twenty-four hours; at Gibraltar, 33-00 inches in twenty-six hours; onthe hills above Bombay, 24°00 inches in one night; and on the Khasi Hills, India, 30-00 inches on each of five successive days.

As regards the ocean, there are no available data from which an estimate could be formed as to the amount of the rainfall, since the rainfall statistics of the ocean must be regarded as giving hardly anything more than the comparative frequency of the. fall. It is, however, certain that the equatorial belt of calms in the Atlantic and Pacific between the trades is the region where the ocean rainfall reaches the maximum, and the parts of these oceans are the rainiest which are the longest within the belt of calms as it

shifts its position northward and south- ward with season. While the cloud-screen is undoubtedly dense, and the rainfall frequent and heavy, the careful observations of the ‘ Challenger” and ‘“ Novara” show that the statements generally made as to these points are greatly exaggerated. .

In the regions of the trades the rainfall is everywhere small over the open sea, seeing that the trade-winds are essentially an outflow from anticyclonic regions, and their original dryness is to a large extent maintained because their course is directed into regions which become con- stantly warmer. Thus at Ascension, lat. 8° 45’ S., which is throughout the whole year within the 8.E. trades, the mean rainfall for the two years 1854-55 was only 88 inches. At St Helena, which lies constantly within the same trades, five years give a mean rainfall of 5°36 inches on the coast ; but in the same island at a height of 1763 feet the annual amount rises to 23°98 inches. Malden Island and some other islands in the Pacific, about long. 150° W., and for some distance on each side of the equator, have been pointed to by Scott as practically almost rain- less, as is shown by their containing extensive guano These islands are situated somewhat similarly to Ascension with respect to the zone of calms. In Mauritius the annual rainfall on a mean of four years was 30 inches at Gros Cailloux, but at Cluny, only 16 niles distant, for the same four years it was 146 inches; in regard to which Meldrum remarks that at Cluny, which is in the vicinity of mountains and forests, in the south- east of the island, and thus directly exposed to the trade wind as it arrives from the sea, the rainfall in almost any month is from four to six times greater than at Gros Cailloux on the north-west coast, where neither mountam nor forest exists, and where the §.E. trade arrives con- siderably drained of its moisture.

From what has been said it is evident that the heaviest rains will be brought by the winds which have traversed the greatest extent of ocean within the tropics, and which accordingly of all ocean winds have the highest temperature and humidity. These conditions are most completely months of the northern hemisphere by the winds which, commencing from near lat. 30° S., blow home on southern Asia as the well-known S.W. monsoon of these regions. Accordingly it is by the winds of this monsoon that a larger rainfall is distributed over a larger portion of the earth’s surface than occurs anywhere else in any season; and this large rainfall is in many regions still

farther greatly increased by the mountain ranges which lie across the path of the rain- bringing winds. é

It is on these winds that the rainfall of India chiefly depends. Along the whole of the west coast from thie

Gulf of Cambay southward, and on the Western Ghats, the rainfall is excessive. .The following are some of the more interesting annual means in inches beginning with Bombay and proceeding southwards :—Bombay, 74; Matheram, 247; Mahabaleshwar, 252; Ratnagiri, 104; Baura, 255; Goa, 102; Karwar, 115; Honawar, 139; Mangalore, 134; Cannanore, 132; Calicut, 116; and Cochin, 114. In the west of Ceylon the rainfall is also heavy, being at Colombo 87, at Galle 91, and at Ratnapura, at some distance inland among the hills, 149. Since the S.W. monsoon is drained of much of its moisture in crossing these mountains, a greatly diminished rainfall is distributed over the interior and east side of India, and on the eastern slopes of Ceylon.

If now we cross to the eastern shores of the Bay of

Bengal, we again encounter an excessive rainfall along these °

coasts and up the slopes of the mountains looking down on them. Thus from south northward the following are among the more characteristic rainfalls in inches :— Nancowry, 102; Port Blair, 116; Mergui, 152; Tavoy, 196; Maulmain, 189; Rangoon, 100; Bassein, 98 ; Sandoway, 212 ; Akyab, 198; and Chittagong 104. On the other hand, at Thyetmio, inland on the Irawadi, the annual rainfall is only 48 inches.

We have shown how, in accordance with the peculiar distribution of pressure in India in summer, the monsoon is diverted up the valley of the Ganges as an E.S.E. wind, distributing on its way, even to the head of the valley, in a generous rainfall the moisture it has brought from the Indian Ocean and the Bay of Bengal. The rainfall does not extend farther westward than the basin of the Ganges, and the precipitation is most copious along the lower Himalayas, the largest falls being recorded at heights about 4000 feet,

—being, as pointed out by Hill, near the level at which the summer monsoon is cooled just below its dew-point. The following are some of the larger rain- falls in inches, beginning with the more western :—Mus-sooree, 95; Naini Tal, 92; Khatmandu, 57; Dazrjiling, 121; Kurseong, 154; Buxa, 219; Kuch Behar, 131.

The rainfall is very large in the north-east angle of the Bay of Bengal and thence northwards towards Bhutan, or at the angle where the summer monsoon from the bay curves round to a westerly course on its way up the Ganges. Thus at Noakhally, on the coast, it amounts in inches to 109 ; at Tura, on the Brahmaputra, immediately to west of the Garo Hills, 129; at Silchar and Sylhet to eastward, 117° and 155; whilst at Cherrapunji, on the Khasi Hills, it rises to 493°19 inches on a mean of twenty- four years. This last rainfall is the largest known on the globe, the causes of which are the highly saturated state of the monsoon on its arrival at the lower Ganges, the high mountain range of Burmah to eastward of Bengal, which turns the monsoon to the north, and the protrusion westwards of the Khasi and Garo Hills so as to lie in the line of that branch of the monsoon which passes from the lower Ganges into the basin of the Brahmaputra above Goalpara. The consequence is that the highly saturated air of the monsoon in its passage across the Khasi IIills is suddenly raised to a height of about 6000 feet, and being thereby reduced far below the point of saturation the superabundant moisture is precipitated in unequalled deluges of rain, The amount of the annual rainfall at all these places is determined, essentially if not altogether, by the rains of the summer monsoon, the relative intensity of which over India may be taken to be fairly represented by the rainfall of July.

The rains which accompany the N.E. monsoon of the winter months may be represented by the rainfall for January. These are heaviest in Ceylon, especially on its

east slopes, and in southern India, or where the N.E. |

monsoon arrives after having traversed a large extent of ocean. The fall for the month exceeds 6 inches over a large portion of the east coast, whilst at Colombo in the west the rainfall is only half that amount, and farther north at Pattalum the January rainfall is only 1°82 inches. In southern India the amount varies from about 1 to 2 inches. Blanford pointed out in 1873 (Phil. Trans., vol. clxiv. p.

618) that, while the surface winds of northern India in win-

ter are northerly, on the Himalayas, especially the north- west portion, southerly winds prevail during the cold months. It is these upper southerly winds which bring the winter rains to the Punjab, Upper India, and the highlands of Assam. It is further to be noted that winter rains also occur in Central India, where the prevailing surface winds are from cast and north-east. The mean rainfall of January at Mussoorce is 2°00 inches and at Naini Tal 2°86 inches, and in Assam, at Sibsagar, 1°13 inch. Over a large tract of the east side of southern India from Nellore southward, including Ceylon, the maximum rainfall for the year occurs in the months of October and November.

Rainfall of the Malay Archipelago and Australia.—Under the direction of the late Dr Bergsma, systematic observations of the rainfall of the Malay archipelago were begun in 1879, the number of stations being 150. The results of the first three years show that the mean annual rainfall over the archipelago varies from about 60 inches in Timor to upwards of 200 inches at some spots among the western slopes of Sumatra. But the most important feature in the rainfall in its relations to climate is not the absolute amount' that falls annually, but rather the manner of its distribution through the months of the year. Over the greater number of the islands rain falls copiously every month; but as regards some of the islands the year is divided into dry and wet seasons as marked as are scen in the climates of India. The kcy to this essential difference among the climates is the distribution of atmospheric pressure during the months of the year from south-eastern Asia to Australia, with the resulting prevailing winds. During the winter months atmospherie pressure is high in south-eastern Asia and low in the interior of Australia, the difference being about threc-quarters of an inch. Since between these two regions the fall in the mean pressure is

practically uninterrupted, the Malay archipelago lying between them is swept by northerly winds (fig. 14). As these winds have traversed a great breadth of ocean in their course, they arrive in a highly saturated state, and consequently deposit a copious rainfall, particularly on the northern slopes of the higher islands. Henee in these months the rainfall over the islands without exeeption is large, the mean monthly amount being in many eases more than 80 inehes. These winds continue their course to southward towards the low-pressure region in the interior of Australia, and deposit along the north coasts of that continent a monthly rainfall rising generally to from 14 to 20 inehes. On advancing into the interior, the mean amount gradually diminishes at the successive telegraphic stations to 3°50 inches at Alice Springs near the tropic of Capricorn. The amount of the rainfall for any particular year, and the distance from the coast to whieh the rains penetrate inland, depend essentially on the height of the winter pressure of south-eastern Asia as compared with the low mean pressure of central Australia, by which the strength of the northerly monsoon is regulated.

On the other hand, during the summcr of the northern hemisphere pressure is high in the interior of Australia and low in China, the mean difference being about half an inch. Between the two regions the fall in the mean pressure is continuous and uninterrupted, and asa consequence southerly winds prevail over the intervening archi- pelago. These winds, as they advance from tlic continent into lower latitudes, are absolutely rainless inthe north of Australia, aud over Timor and the other Malay islands which are separated from Australia only by a comparatively narrow belt of sea. During the three years no rain whatever fell in Timor in July and August, and the fall in June, September, and October was small. As, however, the winds pursue their course to northward, they eagerly liek up moisture from the sea, so that by the time they arrive at Amboyna they have become so saturated that the monthly rainfall there rises to nearly 80 inelies. Again at some distance to the west of Timor rain falls more or less regularly every month, the amount increas- ing in proportion to the extent of ocean traversed by the S.E. winds, which advanee towards these islands from the direetion of Australia. These marked differenees among the climates of the Malay archipelago, whieh, since they really depend on the geo- graphical distribution of land and sea of this part of the globe, must be regarded as permanent differences, have played no inconspicuons part in the singular

distribution of animal and vegetable life which characterizes the archipelago.

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In July the prevailing wind in West Australia is N.W., and the rainfall reaches the maximum for the year, whereas in January the wind is §.E., and the rainfall is the minimum. Similarly in January since the winds of the southern half of South Australia and Victoria are from the south, and thus blow towards warmer regions, the rainfall is either at the annual minimum, or it is small. But ou rounding the coast and proceeding northward, the wind becomes E., then N.E., and ultimately N. in the north of Queensland. With this prevalence of oceanic and equatorial winds, the rainfall at this time of the year rapidly rises over the whole of the eastern slopes, till at Cape York it is about 20 inches. In the basins of the Murray and Darling rivers, which are shut off from the east by the mountain ranges of New South Wales, the rainfall is only about an inch and a half. On the other hand, to south of the latitude of Sydney, including Tasmania, the maximum rainfall occurs in winter over those regions which slope south towards the sea, On crossing the mountain range of Victoria into the basin of the Murray river, the rainfall rapidly diminishes. In the north of New Zealand the winter rainfall is the heaviest ; but farther south, where westerly winds prevail with some steadiness through the year, the rainfall is more equally distributed through the months ; and, as the prevailing winds are westerly, the heaviest rainfall is in the west of the islands. Thus at Hokitika in the west near sea-level, and not far from a lofty range of mountains to the east, the annual amount reaches 120 inches, and at Bealey inland at a height of 2104 feet it 1s 106 inches. At Wellington the annual rainfall is 52 inches, at Southland 46, at Dunedin 34, and at Christchurch 25, thus showing, in the rainfall of the two sides of the island, extremes nearly as great as in Scotland.

Rainfall of Europe.—As regards rainfall, Europe may be conveniently divided into two distinct regions, —western and northern Europe, extending in a modified degree through the interior of the continent into Siberia, and the countries bordering on the Mediterranean. hand, a great continent on the other, and a predominance of westerly winds are the determining circumstances in the distribution of the rainfall over western Europe. Hence

the rainiest regions are to be found in the west, where mountain ranges stretch north and south. The annual rainfall exceeds 80 inches over a considerable district, including the greater part of Skye and portions of the counties of Inverness and Argyll to the south-east, in the lake district of England, and in the more mountainous parts of North Wales,—these three districts being the wettest in Europe. As Ireland presents no continuous range of mountains opposing the westerly winds of the Atlantic, no Irish rain-gauge shows a mean rainfall of 80 inches. A point of some interest is suggested by the rain- fall of the counties of Kirkcudbright and Dumfries in Scotland. These counties offer to the westerly winds a series of valleys sloping south to the Solway Firth, which show successively a diminished rainfall on advancing east- ward till at several places in Nithsdale and Annandale it does not exceed 40 inches. Butin Eskdale, farther to the east, the rainfall instead of falling increases to about 60 inches. The reason is that the westerly winds are obstructed in their onward course by the range of hills by which Eskdale is bounded on the east, in surmounting which the winds are much reduced in temperature, and their superabundant moisture falls in copious rains immediately to westward of the ridge. The cause of the larger rainfall of Eskdale is thus analogous to that of the large rainfall of the coast in the north-east of the Bay of Bengal immediately under the Assam range of mountains. In England the largest annual rainfall is 146 inches at Sea- thwaite in the Lake district, in Scotland 128 inches at Glencroe in Argyll, whilst in Ireland the largest is only 76 inches. The driest part of the British Islands is an extensive district to south-south-west of the Wash, with a rainfall of about 21 inches.

METEOROLOGY

A vast ocean on the one

[RAINFALL.

In the west of Norway the rainfall in inches is 72 at Bergen, 51 at Aalesund, 46 at the Naze and in the Lofoten Isles, falling to 10 at the North Cape. At Christiania, Upsala, and a large part of the east of Scandinavia the rainfall is about 21 inches, falling to 16 inches on the north coast of the Gulf of Bothnia. In Russia and Siberia it rises only at a few places to 20 inches, several districts of this extensive region having an annual rainfall of 10, 5,

3, or even 2 inches. The rainfall of Spain presents great extremes—from 68 inches at Santiago to 13 inches at Saragossa. In France and the plains of Germany the average varies from 35 to 20 inches, but in mountainous regions these figures are greatly exceeded, rising through all gradations to upwards of 100 inches at some points in the Alps.

An important distinction between the manner of distri- bution of the rainfall in the west of Europe and at more inland ‘places is that the greater part of the annual quantity of the west falls in winter, whilst in the interior the amount in summer is greater than in winter. The rainfall of January and July shows this in a very forcible manner. The summer climates of the extreme south of Europe and North Africa are rainless, and over exten- sive regions in the south of Europe adjoining the July rainfall does not amount to an inch. Over these dry regions the prevailing winds of summer are northerly, and hence the drought which characterizes them. On the other hand, the rainfall in the interior of the continent is large. In January the maximum rainfall occurs on the mountains and high grounds overlooking the Atlantic, and the minimum on the plains of Russia.

Owing to the way in which Europe is broken up by the seas which diversify its surface, the time of the year when the rain attains the maximum differs greatly in different regions. This phase of the rainfall occurs, indeed, accord- ing to locality, in all months except February, March, and — April. The month of occurrence of the annual maximum

rainfall over Europe is shown by fig. 18. A similar map

Fria. 18.—Showing Month of Maximum Rainfall in Europe.

representing the month of least rainfall shows still greater uniformity in a regular succession of the months in passing from region to region. Thus the month of least rainfall is January on the lower Volga, February in western Russia and the greater part of central Europe, March in the north of France and south of Great Britain, April farther to the north,

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“RAINFALL. |

May in Scotland north of the Grampians, June in Orkney, Shetland, Iceland, the west of Ireland, and the north-west of France, and July over the whole of the south of Europe. The driest month occurs nowhere in Europe in any of the five months from August to December.

Rainfall of North America.—West of the Rocky Mountains the rainfall is very unequally distributed, the annual amounts varying from 86 inches at Astoria, near the mouth of the Columbia river, to 8 inches at Sau Diego on the coast, and 3 inches at the head of the Gulf of California. Over the whole of the region between the Cascade and Rocky Mountaius the rainfall at all seasons is extremely small, this being indeed that feature in the climate to which the formation of the cations of that region is chiefly to be referred. On the other hand, in the United States and Canada to east of long. 100° W. the distinguishing feature of the rainfall is the comparative equablencss of its distribution, an annual rainfall exceeding 50 inches occurring only over restricted districts, and a rainfall as low as 20 inches being scarcely met with anywhere. The regions where the rainfall excecds 50 inches are Florida, the lower basin of the Mississippi, aud the Atlantic seaboards of Nova Scotia and New- foundland.

In January the annual maximum rainfall occurs over the whole of the west coast from Sitka to lower California; but in the interior between long. 120° and 95° W. the amount is everywhere small, and over a considerable part in the south-west of this region no vain falls. The region of largest rainfall extends from Louisiana to West Virginia, where the mean varies from 4 to 6 inches, Over nearly the whole of the Dominion of Canada, by much the greater

art of the winter precipitation is in the form of snow, which has on carefully measured and recorded by the Metcorological Ser- vice. The average snowfall for January exceeds 30 inches at St John’s, Newfoundland, in Anticosti, Prince Edward Island, and in many other regions. \

In July the rainfall is everywhere small in the west, a large part of this extensive region being absolutely rainless. The remarkable dryness of the climate at this season is due to the N. W.

winds that set in towards the low pressure of the interior, which

thus blow towards warmer regions. The rainfall to the east of tte Roeky Mountains is distributed by the winds which are connected with the low-pressure region of the interior and with the high- pressure region of the Atlantic. The result is two regions of larger rainfall, the one in the south-east of the States and the other to the west of the lakes. The summer winds of the south-eastern coasts are southerly, and as they are anticyclonic in their origin and have in their course traversed some extent of ocean, they arrive well- but not super-saturated, and pour down a rainfall in July of 6 inches and upwards glong the coasts and for some distance inland from Louisi- ana to Chesapeake Bay. Further, since in July these winds attain their maximum force and persistency, the rainfall at the same time reaches the maximum along the whole coast from Boston to some distance west of New Orleans. Since the summer winds blow in the line of the Alleghany mountains and not across them, the ramfall diminishes in ascending their slopes. The comparative equableness of the rainfall over the eastern States is the necessary result of the winds' passing into higher latitudes, and, therefore, cooler regions. A broad region where the rainfall is less than on each side of it, extends from Michigan to the south-west as far as Canadian River. To the west of the lakes the rainfall rises above 4 inehes, and, since over this region the winds become somewhat easterly as they flow towards the low-pressure area, it is probable that the larger rainfall of this prairie region has its origin in no small degree in the evaporation of the lakes. On ascending the higher reaches of the Mississippi, the amount diminishes, but scarcely falls lower than 2 ates being thus analogous to the summer rains of the Upper Ganges. On crossing the water-parting into the basin which drains into Hudson Bay, we encounter E. and N.E. winds laden with vapour licked up in their passage over Hud- son's Bay, which they distribute in a generons rainfall of probably 3 to 5 inches over the rising colonies of Manitoba and Saskat- chewan. An important point in the climate of the States is that over neatly the whole of the extensive region stretching between Alleghanies and Rocky Monntains, except the south coast already referred to, the annual maximum rainfall does not occur in summer but in spring, the month of largest rainfall in the great majority of cases being May. In the basin of Hudson's Bay July is the month of largest rainfall. _ Rainfall of Central and South America.—The following are, in inches, the larger and more interesting annual rainfalls round the coasts:—Vera Cruz, 182; Belize, 75; Maracaibo, 163; Cardeas, 155; Georgetown, 95;

Paramaribo, 142; Cayenne, 140; Para, 71; Pernambuco, 109; Buenos Ayres, 34; Bahia Blanea, 19; Puerto Montt, 102; Valdivia, 109; Valparaiso, 100; Serena, 93; Lima, 9; and a large part of Peru, nil. A remarkable feature of the rainfall of South Ameriea is the large amounts that fall in the basins of the Orinoco and Amazon; the fall is 91 inches in the

‘Vera Cruz, 5°10 and 35°90.

upper basin of the Madeira, and 112 inches at Yquitos (lat. 3° 40’ S., long. 72° 57’ W.). The reason is that this immense region, where pressure appears to be almost constantly low, is open to the highly saturated winds that blow from the equatorial Atlantic. Quite different is the distribution of the rainfall over the La Plata basin. The annual falls, in inches, are 92 at Joinville, 58 at Corrientes, 44 at Monte Vidco, 36 at Parana, 24 at Santiago, 22 at San Luis, and only 6 at Mendoza. The fall rapidly rises in ascending the eastern slopes of the Brazil mountains facing the South Atlantic; thus, while the amount at Rio Janeiro is 45 inches, on the lulls to northward it is 116 inches.

In January northerly winds prevail on the south coasts of the Gulf of Mexico and the Caribbean Sca, and as they have their origin in the high pressure of the American continent, and in crossing the sea pass into lower latitudes, the January rainfall of these coasts is comparatively small. In July, however, the prevail- ing winds are easterly, and as they have traversed a large extent of the equatorial waters of the Atlantic they are highly saturated, and consequently the July rainfall of these coasts is everywhere very large. The following are, in inches, the January and July rainfalls :—Caracas, 1°00 and 14°04; Guatemala, 0°28 and 10°79; The seasonal distribution of the rainfall in the basin of the Amazon is the reverse of this. In January the position of the belt of calms is about lat. 3° N., and as pressure is relatively low over the basin of the Amazon, especially its southern slopes, the trades and the west portion of the region of calms unitedly spread their highly saturated air over the whole region as far as the Andes, resulting in one of the most widespread heavy rainfalls anywhere to

be met with. On the other hand, since in July the belt of calms is about lat. 10° N., the saturated atmosphere of the tropical regions no longer flows up the Amazon, but is carried westward into the Caribbean Seaand Gulf of Mexico. Hence at this season the rainfall of the Amazon vallcy is small. The following are, in inches, the January and July falls :—Para, 6°51 and 3‘26; Manaos, 7°33 and 1°82; upper Madeira, 15°90 and 0°30; and Yquitos, 10°24 and 4°26. On the La Plata in January pressure is low, and as winds consequently blow from the ocean in upon the region of low pressure the rainfall is large ; but as pressure is high in the interior in July the rainfall in that month is small. The following are, in inches, the January and July rainfalls :—Buenos Ayres, 2°37 and 1°70; Parana, 4°63 and 1°32; Corrientes, 5°24 and 2°67; Joinville, 14°26 and 3°55; and San Luis, 2°63 and 0:00.

Rainfall of Africa.—As regards the rainfall, Africa presents the greatest diversity in its climates. The following are the annual amounts in inches at various points on or near the coast :—Port Said, 2; Alexandria, 8; Tunis, 12; Algiers 31; Oran, 17; Mogador, 50; mouth of the Senegal, 17; Goree, 21; Sierra Leone, 126; Christiansborg, 23; St Thomas, 40; Gaboon, 106; Loanda, 11; Cape Town, 23; Mossel Bay, 12; Port Elizabeth, 24; Durban, 43; Zanzibar, 58; and mouth of the Zambezi, 61. In the north of the continent, the rainfall rapidly diminishes inland, and over the great desert of Sahara practically none falls. In the interior of Algiers it diminishes, the amount at Laghouat being 17 inches, and at Biskra 9. In Egypt the rainfall is limited to a narrow strip along the coast; at Cairo the annual fall scarcely amounts to an inch. The January and July rainfalls are, in inches, as follows :—Port Said, 0°46 and 0°00; Alexandria, 1°95 and 0°20; Algiers, 4°43 and 0-04; Biskra, 0°56 and 0°08; St Louis (Senegal), 0°28 and 3:00; Goree, 0°00 and 4:06; Sicrra Leone, 0°69 and 24°20; Christiansborg, 0°50 and 2°00; Katunga, 0°11 and 4°76; Gaboon, 9°35 and 0°48; Cape Town, 0°28 and 3°83; Durban, 5:00 and 1°70; Pretoria, 6°07 and 0°71; and Zanzibar, 2°02 and 2°35. At Zanzibar the heaviest rains oceur about the equinoxes, the mean for April being 14°55 inches, and for October 6°80 inches.

In the case of this, as the other continents, the explanation of the different amounts is to be had in the seasonal changes of wind. In the north the winter rains are to a very large extent the aecom- paniment of the

Mediterranean storms of that season, but in summer pressure is diminished in the interior and increased in the Atlantic to the north-west, resulting in strong steady northerly winds, which as they advance into hotter regions are unaccompanied with rain. The heavy summer rains from Senegambia to the Gold Coast are due to the strong monsoonal winds which set in towards the interior, thus drawing over these coasts the highly saturated air of the belt of calms and of the trades immediately to the north and south of it. Since in winter the belt of calms is reinoved 8° of latitude farther to the south, and the temperature of the interior is greatly reduced, it follows that the winds blowing on these coasts from the sea are drier and less strong, and consequently the rainfall is small. At Sierre Leone the absolutely driest month is February, 0°31 inch, and the wettest September, 29°15 inches. On the other hand, at Gaboon (lat. 0°25’ N.) the dry season is from June to August, when the belt of calms is farthest to the north ; and the absolutely rainiest about the equinoxcs, the mean of March being 14°70 inches and October 19°52 inehes. At Loanda (lat. 8° 49’ S.) the annual amount is only a tenth of what falls at Gaboon, and it

falls wholly during the summer months of the southern hemisphere. In South Africa pressure in January is lowest in the interior, towards which prevailing winds from the ocean blow, and as these advance into regions becoming rapidly hotter the rainfall all round the coast and for some distance inland falls to the annual minimum. But in more strictly inland districts which are at a considerable elevation the rainfall reaches the maximum at the samc season. Thus the amounts in inches for January and July are—tor Pretoria, 6:07 and 0°71; Maritzburg, 4°23 and 0°21; Graham’s Town, 2°89 and 1°51; Lower Nel’s Poort, 1°33 and 0°49; and Aliwal North, 1°55 and 0:00. In the winter months pressure in the interior is high, and the rainfall consequently small. Though on the coast winds from the arid interior frequently prevail, yet the storms that sweep eastward past South Afriea precipitate over large portions of the southern slopes of this part of the globe what must in the main be regarded as a generous rainfall. It follows that ‘the climates of these important colonies range themselves into

two perfectly dis- tinct classes,—the climates of the inland regions and the Natal coast, where the rains oceur during the hottest months, and the climates of the other regions, where the annual rains occur during the coldest months. Little is accurately known regarding the rain- fall of the interior of Africa. It is certain, however, that it is small, or nil, over the extensive region of the Sahara, and that it is large from about 15° N. lat. to some distance south of the equator. Probably the rainicst part of Africa is the region extend- ing from the Victoria Nyanza northwards to and including the gathering grounds of the two great tributaries of the Nile.

Snow.—Snow takes the place of rain when the tempera- ture is sufficiently low to freeze the condensed moisture in the atmosphere. Snow is composed of crystals, either six- pointed stars or hexagonal plates, which exhibit' the greatest variety of beautiful forms, one thousand dif- ferent kinds having been observed. These numerous forms Scoresby reduced to five principal varieties :—(1) thin plates, comprising several hundred forms of the most ex- quisite beauty ; (2) a nucleus or plane figure, studded with needle-shaped crystals ; (3) six-sided, more rarely three-sided, crystals ; (4) pyramids of six sides; (5) prismatic crystals, having at the ends and middle thin plates perpendicular to their length. In the same snowfall the forms of the crystals are generally similar. The flakes vary from 0°07 inch to an inch in diameter, the smallest occurring with low temperatures and the largest when the temperature approaches 32°, If the temperature is alittle higher, the snow-flakes are partially thawed in falling through it, and fall as sleet. The white colour of snow is caused by the combination of the different prismatic colours of the minute snow-crystals. The density of snow is far from uniform ; it is generally from ten to twelve times lighter than an equal bulk of water, but varies from eight to sixteen times lighter than water.

The limit of the fall of snow near sea-level coincides roughly with the winter isothermal of 52°, since in places where the mean winter temperature is no higher than 52° that of the air falls occasionally to 32° or lower during the winter months. As regards Europe, the southern limit is about Gibraltar; in North America it is Savannah, New Orleans, the mouth of the Rio Grande, the head of the Gulf of California, and San Francisco. In Europe, north of lat. 60°, snow falls generally on an average of from 80 to 110 days in the year. At Upsala the number of days is 61, at Warsaw 45, Aberdeen

42, Oxford 18, Ostend 15, Brus- sels 27, Tarum (in the south-west of Jutland) 12, Copen- hagen 23, Vienna 33, Odessa 19, Sebastopol 12, Milan 11, Trieste 6, Saragossa 5, Madrid 3, and Lisbon 1. In Greenland the number of days exceeds 80, and this figure is nearly reached in Newfoundland and the north- east seaboard of Nova Scotia. At Quebec the mean days of snow are 66, Halifax 64, Winnipeg 54, Detroit 34, Cape Henry 13, St Louis 11, mouth of the Columbia River 7, and Charleston 2. In Russia the time of the year when snow falls most frequently is December and January, exceptin the south of the empire, where February is the month of the most frequent occurrence of snow. But to the north of a line drawn from the entrance of the

Gulf of Finland through Warsaw, Cracow, Salzburg, and

Santiago March is the month of maximum occurrence in

the great majority of instances ; while to the south of this line it is January and in several cases December.

The largest falls of snow occur in the Antarctic regions, as is well attested by the magnificent icebergs of solidified snow which break off all round from the lofty walls of ice that engirdle the Southern Ocean. Excepting perhaps in the Dominion of Canada, no data have been anywhere collected from which even a rough estimate could be formed as to the mean annual amount of snow that falls in different parts of the globe. »

Snow-Line.—The snow-line marks the height below which all the snow that falls annually melts during summer. No general rule can be stated for this height in different climates owing to the many causes determining it. These are the exposure of mountain slope to the sun (and hence, other things being the same, it is higher on the south than on the north sides of mountains), exposure to the rain- bringing winds, the steepness of the mountains, and the degree of dryness of the air. Hence the position of the snow-line can be known by observation only. It falls only little on either

side of the equator to lat. 20°; from lat. 20° to 70° it falls equably, but from lat. 70° to 78° much more rapidly. To this general rule there are many excep- tions. It is 4000 feet higher on the north than the south side of the Himalayas, owing to the larger snowfall on the south, and the greater dryness of the climate of the north side, and therefore the greater evaporation from the snow there. It is higher in the interior of continents than near the coasts, because the precipitation is less and summer heat greater. In the Caucasus it is 11,063 feet high, but only 8950 in the Pyrenees. In South America it rises from the equator to lat. 18°, and more on the west than on the east slopes of the Cordilleras, owing to the large precipitation on the east and'small precipitation and arid climate of the west side of that chain of mountains. It is as high in lat. 33° 8. as in 19° N., but south of that latitude it rapidly sinks owing to the heavy rains brought by the moist N.W. winds of these regions. In the south of Chili it is 3000 feet lower than in the same latitudes in Europe, and 6000 feet lower than in the extremely arid climates of the Rocky Mountains.

Storms.—If weather charts representing a large part of the northern hemisphere be examined, two distinct systems of pressure are seen which change their forms and positions on the earth's surface from day to day. The one set are systems of low pressure marked off by concentric isobars enclosing pressures successively lower till the centre is approached; and the other systems of high pressure marked off by concentric isobars enclosing pressures becom- ing successively higher towards the centre. The former of these arc called cyclones, and the latter anticyclones. These areas of low pressure are the distinguishing characteristics of the hurricanes and typhoons of tropical regions, and of the ordinary storms of higher latitudes, and they may all be conveniently grouped under the general name of cyclones. Fig. 19 shows a storm which was passing across north- western Europe on the morning of November 2, 1863, and it may be taken as fairly representing the general features of cyclones. In the figure the arrows fly with the wind, and the force of the wind is indicated by the number of feathers on the arrows.

It will be seen that the winds indicate, not a circular movement round the centre of lowest pressure, but a vorticose motion inwards upon that centre, the motion being opposite to that of watch-hands. In other words, the wind

follows Buys Ballot's law, already explained. The winds are strongest where the isobars are closest together ; or they are generally proportioned to the " baro-

metric gradient,"—a term introduced by Stevenson in 1867. Cyclones have diameters seldom less than 600, and ° they occasionally exceed 3000 miles; the cyclone of fig. 19 'had a diameter of about 1200 miles. The cyclones of the Mediterranean are usually of smaller dimen- sions than those of north-western Europe and America. 'The rates at which cyclones advance over the earth's: surface vary greatly, the average in America being 24 miles an hour, in the Atlantic 20 miles, and jn Europe 26 miles. A 'rate as high as 70 miles au hour has occurred in the British Islands; sometimes they remain stationary, and more. rarely their course is for a time retrograde. 'The temperature and humidity increase at those places towards and over which the front part of the storm is advancing, and fall at those places over which the front part of the storm has already passed. In other words, the temperature and humidity rise as pressure falls and fall as pressure rises. This is the important climatic significance of cyclones. Thus a succession of low pressures passing eastwards in courses lying to northward of the British Islands are the essential conditions of open winters ; whereas, if the cyclones follow courses lying to southward, the winters 7 severe. Ina cyclone the broadest feature of weather is an.area of rain about or rather somewhat in front of the centre, sur- rounded by a ring of cloud, outside which the sky is clear. The precise form and position of these areas have been shown by Abercrombie to vary with the type of pres- sure distribution, with the intensity of the cyclone, and with the rate of its progress, and they are also influenced by local, diurnal, and seasonal variations.

The chief point of difference between American and European storms is essentially the result of the mean winter pressures to the west and north-west of their respec- tive storm-tracks. Owing to the high winter pressure in the interior of America, the barometer rises in the wake of the storms of the United States more rapidly, the wind veers round more quickly and more uniformly to N.W., N.N.W., and N. and keeps longer in these directions, and the temperature and humidity fall to a greater degree, than happens in

Europe. In the New England States and Canada the easterly winds of the storms, coming as they do from the Atlantic, are disagreeably cold, damp, and misty in a degree and with a frequency much greater than occurs with the same winds in the British Islands.

The chief points of difference between the hurricanes and typhoons of the tropics and the cyclones of higher latitudes are these :—tropical cyclones are of smaller dimensions, show steeper barometric gradients and therefore stronger winds, and advance at a slower rate over the earth's surface. Another point of difference is that a large number of the hurricanes of the West Indies and the typhoons of eastern Asia first pursue a westerly course, which gradually becomes north-westerly, and on arriving at about lat. 30° they recurve and thereafter pursue a course to north-east- wards. The tropical cyclones of the Indian Ocean south

_ Fig. 19.

of the equator also first pursue a westerly course, which | Hebrides.

lat. 30° recurve to the south-east. Many of the cyclones of India have their origin to westwards of the Nicobar Islands, pursue a course to north-westward, and die out in the valley of the Ganges ; and, similarly, a considerable number of the cyclones of the West Indies pursue a westerly course through the Gulf of Mexico, and several die out in the States.

The most dreadful attendant on tropical cyclones is the storm-wave, caused by the in-blowing winds and the low pressure of the centre of the storm. When this wave is unusually high and is hurled forward on a low-lying coast at high water it becomes one of the most destructive agents known. The Bakarganj cyclone of October 31, 1876, was accompanied by a wave which flooded the low grounds to the east of the delta of the Ganges to heights varying from 10 to 45 feet, by which more than 100,000 human beings perished.

Tracks of Cyclones of North America, Atlantic, and Europe.—tIn the Physical Atlas of the Atlantic Ocean, issued under the direction of Dr. Neumayer of the Deutsche Seewarte, plate 28 shows by shadings the mean positions of the centres of cyclones and by lines their mean tracks. The following are the regions where the lowest barometer of storms has been most frequently found:—the region to west-south-west of the lakes of the United States; the Gulf of St Lawrence ; mid-Atlantic about lat. 35° long. 52°; to the south-west of Greenland ; to the south-west of Iceland, which is by far the most important of the whole; to the south-west of the Lofoten Isles; the region embracing Denmark, the south of Scandinavia, and Finland ; and, as secondary centres of frequency, the south of the British Islands, Corsica and part of Italy adjoining, and the north- east of the Adriatic. The great importance of these centres, where the lowest barometers are most frequently found, consists in the indication they give of the precise regions either where many storms originate or where they are either retarded or arrested in their course. As regards the origin of storms, the centre west of the Mississippi is the region where most of the United States storms originate, the centre in the Gulf of St Lawrence is where many of the great Atlantic storms have their origin, and the centres in mid-Atlantic and to the south-west of Iceland are the regions where the storms of north-western Europe chiefly originate, The centres on the south-west of Greenland, the Lofoten Isles, Denmark, and the south of the British Islands, all appear to suggest that storms are retarded in their onward courses on coming up against large masses of land,—which may, in part at least, be occasioned by the heavy rainfalls that mark these parts of their courses.

Of all storm tracks the most frequently taken is that by the storms of the United States, which pursue an easterly course through the lakes to the Gulf of St Lawrence. A considerable number of storms follow a course from Nova Scotia to Davis Straits; but the larger number take a north-easterly course through the Atlantic towards Iceland and thence past the north of Norway. Among the less frequent but important tracks are these :—from near New Orleans along the east coast of the States towards Nova Scotia; from mid-Atlantic to south of Ireland and thence through France to the north of the Mediterranean; and from the Atlantic about lat. 42° long. 40° in a north- easterly course quite outside but at no great distance from the British Islands, and thence towards the North Cape. Of the tracks more

immediately affecting British weather are one from Iceland in a south-easterly direction through the North Sea and Germany, and four tracks which start from near Scilly:—(1) to the south-east as already described ; (2) eastward through the north of Germany ; (3) north-east to Christiania; and (4) north through Ircland and the These are the storm tracks which chiefly give

gradually changes to south-west, and often on arriving about | the United Kingdom its easterly and northerly winds.

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The Inclination of Winds to the Isobars.—The vorticose motion of the winds in a cyclone towards and in upon the centre has been already pointed out. One of the more important practical problems of meteorology is the deter- mination of the angle of inclination of the winds to the isobars in the different segments of the cyclone, not only. from the application of the results of the inquiry to the theory of storms but also to practical navigation. The first real contribution to the subject, based on accurate measure- ments, was made by Clement Ley in 1873.1 From the observations made at fifteen places in north-west Europe examined by him he showed that the winds incline from districts of higher towards those of lower pressure at a mean angle of 20° 51’; that the inclination is much greater at inland than at well-exposed stations on the coast, the respective angles being 28° 53’ and 12° 49’; and that the greatest inclinations are with S.E. winds. Then follow S.W., N.E., and N.W. winds, the last showing the least inclination. | Whipple has recently compared the winds at Kew with the barometric gradients for the five years ending 1879, with the result that the greatest inclination is 63° with S.E. winds, the least 35° with N.E. winds, and the mean for all winds 52°.

As regards the open sea, Captain Toynbee has shown, from a careful investigation of the great Atlantic storm of August 24, 1873, that the mean angle of inclination calculated from one hundred and eight observations was 29°, the mean at the three selected epochs examined varying from 25° to 31°.

Barometric Gradient and Velocity of the Wind.—In inquiring into the relation of the velocity of the wind to the barometric gradient, it is necessary to have some definite information as to the increase of the velocity with height above the ground. Stevenson recently made observations on this point on winds varying from 2 to 44 miles an hour from the surface up to a height of 50 feet, from which he has drawn the following conclusions :—(1) the spaces passed over in the same time by the wind increase with height above the ground; (2) the curves traced out by these variations of velocity from 15 to 50 feet high coincide most nearly with parabolas (fig. 20)

Fig. 20. having their vertices in a horizontal line 72 feet below the surface ; (3) between 15 feet and the ground there is great disturbance of the currents, so that the symmetry of the curves is destroyed ; (4) the parameters of these parabolas increase directly in the ratio of the squares of the velocities

of the different gales. If x be the velocity of the wind

1 Journal Scottish Meteorological Society, vol. iv. p. 66.

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at height H above the ground, the parameter of the corresponding parabola is x?/(H +72); and as « varies the parameter will vary as x? or as the square of the velocity of the gale. It follows that, to render wind observations _ comparable, it is necessary that anemometers be placed at one uniform height above the ground, and that standard height not lower than 15 feet above the surface. It is very desirable that the inquiry were prosecuted up toa height of 100 feet ; and it is of the utmost importance that the variation in the diurnal velocity be at the same time determined at different heights from 15 feet upwards. Stevenson also made wind observations on the Calton Hill, Arthur’s Seat, and the Pentland Hills, in the vicinity — of Edinburgh, up to a height of 1600 feet above sea-level. It is from observations made at stations on knolls and peaks at different heights above the sea, and at different heights above the surfaces of their summits, that the

problem of the variation of the wind's velocity at different heights with the same barometric gradient can be ascer- tained. In carrying the inquiry to considerable heights,

the results cease to be comparable with those obtained

at lower levels, unless in those cases where neighbouring heights are available for data from which the barometric gradient at the observed height can be calculated. The results of observations as to the velocity of atmospheric currents at very great elevations in the atmosphere deduced from the apparent movements of the higher clouds are altogether incomparable with the winds near the surface of the earth, for these among other reasons :—the heights of the clouds can be at best but imperfectly ascertained; the motion of the clouds, particularly the higher clouds, may be only apparent, it being sometimes difficult to distinguish between the formation and dissolution of clouds and their motion ; and above all, since the higher clouds are usually

'the accompaniments of the greater weather changes, their

movements are the result of barometric gradients towards a knowledge of which we are absolutely powerless to take a single step. , As regards surface winds, Clement Ley in 1881, and Whipple more recently and with greater fulness, have calculated the mean wind velocities for twelve gradients,— the gradients being derived from the daily weather charts of the Meteorological Office for the five years 1875 to 1879 at 8 a.m., and the corresponding wind data being obtained from the hourly readings of the Kew anemograph. The barometric gradient is for 15 nautical miles, and the following are the velocities for the twelve gradients on the mean of the year :— Velocity.

Gradient. ° Velocity. Gradient. inch. miles. inch. miles. 0°002 5'0 0°017 150 0°005 70 0°020 16°5 0°007 75 0°022 19°1 0010 9:2 0°025 22°0 0°012 11°6 0°027 22°0 0-015 12°6 0:030 25°5

The influence of season is very strongly marked. The velocities for the same gradients in order are—October to December, 12°5 miles; July to September, 12°6 miles; January to March, 14°8 miles; and April to June,

17-2 miles. From those observations of Whipple it follows that during the six months when the temperature is falling the velocity for the same gradients is least, while the velocity is greatest during the six months when the temperature is rising, and absolutely greatest during the three months ending June, when the greater part of the annual increase of temperature occurs. It is evident that the observed increase in the velocity of the wind for the same gradients is to be referred to the same cause that brings about the diurnal inerease in the wind's velocity, viz. the wind blowing over a warmer surface than itself.

WEATHER MAPS. |

Whipple has also sorted the winds according to the eight points of the compass, with results of the greatest interest. If N.W., N., N.E., and E. winds be grouped together as polar, and S.E., 8, S.W., and W. winds as equatorial winds, the mean hourly velocity of the polar winds, for the same gradients, is 11 miles in excess of the equatorial winds. Now, since polar winds pass into lower latitudes, the surface of the earth over which they blow is warmer, whereas the surface is colder than the equa- torial winds which blow over it. It follows that the increased velocity of polar winds is referable to the same conditions which result in the diurnal increase in the wind's velocity and the greater velocity for the same gradients of winds when the annual temperature is rising, since in all these cases the winds blow over a surface of a higher temperature than their own.

It is evident from these considerations that for the development of the law of the relation of the wind's velocity to the barometric gradient with an exactness sufficient to warrant us in expressing that relation in a general mathematical formula much yet remains to be done. In truth, as regards the various formule submitted by Ferrel, Mohn, Hann, Everett, and others, we have no choice but to allow the justness of Strachan's criticism (Modern Meteorology, p. 98) that the theoretical values furnished by the formule do not accord with the actual values, and that therefore a satisfactory formula is yet to be found. Ere such a formula need be looked for, the conditions must be fulfilled for the preliminary work of sup- plying the observational data required. The "Challenger" observations prove that, with gradients substantially the same, the velocity of the wind is greater on the open sea

than near land ; and we have seen that the velocity varies with the hour of the day, and generally is increased as the temperature of the surface rises above that of the air blow- ing over it, and diminished as the temperature of the surface falls below that of theair. It is evident that observations on the open sea will afford data for the simplest solution of the problem ; but on land the diurnal, seasonal, and non- periodic changes of temperature greatly complicate the problem, and render necessary for its solution observations specially designed for the purpose. It is not easy to see how these can be obtained but by carrying out the plan pro- posed in 1875 by Stevenson of establishing strings of well- equipped meteorological stations planted sufficiently close that the barometric gradients may be determined within the limits of accuracy required. Observations made twelve times daily for a year, at stations so arranged, would supply the observational data for the solution of this funda- mental problem in meteorology. ‘Till some such proposal be carried out, the problem remains unsolved, for barometric gradients based on the widely separated existing stations are too uncertain and rough and the wind observations are wanting in that comparability which alone can satisfy the inquiry.

Weather and Weather Maps.—Weather is the state of the air at any time as respects heat, moisture, wind, rain, cloud, and electricity; and a change of weather implies a change in one or more of these conditions. Of these changes the most important as regards human interests are those which refer to temperature, wind, and rain; and, as these are intimately bound up with the distribution of

atmospheric pressure, the latter truly furnishes the key to weather changes.

These relations are well shown by the International Monthly Weather Maps issued by the United States Signal Service. Of these that for December 1878 is a striking example. This month was characterized over the globe by unusually abnormal weather. A line drawn from Texas to N ewfoundland, across the Atlantic, the north of France, and Germany, thence round to south-east, through the Black Sea, the Caucasus, India, the East India Islands, and

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Australia to the South Island of New Zealand, passes through a broad and extended region where pressure was throughout con- siderably below the mean of December, and this low pressure was still further deepened in various regions along the line. An- other line passing from Australia, through the Philippine Islands, Japan, Manehuria, Behring's Strait, and Alaska, also marks out an extensive region where pressure was uninterruptedly below the mean.

On the other hand, pressure was above the average, and generally largely so, over the United States to west of longitude 90°, over Greenland, Iceland, the Faroes, Shetland, and a large portion of the Old Continent bounded by a line drawn from Lapland round by Lake Balkhash, Canton, Peking, to the upper reaches of the Lena. Another area of high pressure extended from Syria, through Egypt and East Africa, to the Cape; and part of a third area of high pressure appeared in the North Island of New Zealand. As regards North Ameriea, the greatest excess of pressure, 0°196 inch above the mean, occurred in the Columbia Valley, from which it gradually fell on proceeding eastward to a defect from the average of 0°146 inch near Lake Champlain and to northward, rising again to near the mean on the north of Nova Scotia. To the north and north-east exceedingly high pressures for these regions and the season prevailed, being 0°635 inch above the mean in Iceland, 0°500 in the south of Greenland, and at the three stations in West Greenland, proceeding northward, 0°445, 0°402, and 0°346 inch.

West Greenland being thus on the west side of the region of high pressure which occupied the northern part of the Atlantic, and on the north-east side of the area of low pressure in the States and Canada, strong south winds set in over that coast, and the tempcrature at the four Greenland stations, proceeding from south to north, rose to 1°71, 8°°8, 12°71, and 14°-4 above the means. As the centre of lowest pressure was in the valley of the St Lawrence about Montreal, strong northerly and westerly winds predominated to westward and southward, where consequently temperature was below the average, the deficiency at Chicago and St Louis being 9°-5; and, winds being easterly and uortherly in California, the tem-

erature there was also under the mean. On the other hand, in the

ew England States, the greater part of the Dominion of Canada, and West Greenland temperature was above the average. Pressure was much higher at St Michael's, Alaska, than to south-westward at St Paul's, Behring's Strait, and hence, while temperature at St Paul's was 2°°9 below the normal, it was 12°°0 above it at St Michael's, where strongly southerly winds ruled. With thesc strong contrasts of pressure, America presented contrasts at least as striking in the distribution of the temperature. Along the south of Lake Michigan the November temperature was 13°°7 above the normal, whilst the December tempcrature was 9°°5 below it, the difference there between the two consecutive months being thus 23°°2.

As regards Europe, Iceland was on the east side of the patch of high pressure which overspread the north of the Atlantic, and hence northerly winds prevailed there and temperature fell 7°'2 below the mean, presenting thus a marked contrast to the high temperature of West Greenland at the time. In Europe, the area of lowest pressure occupied the southern shores of the North Sea, extending thence, though in a less pronounced form, to south-eastward. Hence over the whole of western Europe winds were N.E., N., and in the south-west of Europe W.; and hence everywhere from the North Cape to the north of Italy temperature was below the normal, in some places greatly so, the deficiency being 10°°4 in the south of Norway and 12°:2 in the south of Scotland. On the other hand, on the cast side of this area of low pressure winds were southerly and temperature consequently high. In some localities in Russia the excess above the mean was 15°°0, and over a large proportion of European Russia the excess was not less than 9°:0. This region of high temperature extended eastward into Siberia as far as the Irtish, being coterminous with the western half of the anticyclonic region of high pressure which overspread central Siberia, But over the castern portion of the anticyclone northerly winds prevailed, with the inevitable accompaniment of low ten.- peratures over the whole of Eastern Asia, the deficiency at Ner- tchinsk on the upper Amur being 6°°8. Here again, just as in America, Grecnland, and Iceland, places with atmospheric pressure equally high presented the strongest contrasts of temperature. Thus at Bogoslovsk, on the Ural Mountains, pressure was 0°211 inch and at Nertchinsk 0°154 inch above the normals, but Bogoslovsk on the west side of the high pressure area had a temperature 15°°0 above, whilst at Nertchinsk it was 6°°8 below the average.

At this time of the year the mean pressure falls to the minimum in Australia, but during December 1878 the usually low pressure was still further diminished. Pressure at this season also falls to the annual minimum in the North Pacific and North Atlantic, and it has been seen that the low pressure of these regions was likewise still further diminished. But in the ease of the Atlantic it was attended with a most important differenee. The centre of lowest pressure, usually located to the south-west of Iecland, was removed some hundreds of miles to the south-east, and an unwonted development of extraordinarily high pressure appeared to the north-

ward, overspreading the extensive region of Baffin's Bay, Greenland, Iceland, Faroes, and Shetland. It was to this region of high pres- sure, particularly in its relations to the low-pressure region to the south-east of it, that the extreme severity of the weather in the British Islands at the time was due. Now this high-pressure region was intimately connected with, and doubtless occasioned directly by, upper atmospheric currents from the widely extended region of low pressure to southward, with its large centres of still lower pressure in the North Sea, mid-Atlantic, and United States, wherc pressures were respectively 0°307, 0°322, and 0°146 inch under the normals. 'Thus, with the single exception of the high-pressure area about Greenland, the ineteorological peculiarities which render December 1878 so memorable over nearly the whole globe arose out of a distribution of the earth's atmosphere essentially the same that obtains at that time of the year, but the usual irregularities in the distribution of the pressure appeared in more pronounced characters.

Taking the all-important bearings of these areas of high and low pressure on weather and climate into consideration, along with the abnormal concentration of aqueous vapour over extensive regions which they imply, it is evident that, when the meteorologist will be in a position to forecast, on scientific grounds, the weather of the coming season for the British Islands, it is to the Atlantic he will require to look for the data on which thé forecast is based.

These questions, which the International Weather Maps of the United States enable us to discuss, are of the first importance in meteorology, whether we

consider the ampli- tude of the atmospheric changes they disclose (these being often so vast as to embrace four continents at one time, besides being profoundly interesting from their direct bearings on the food supplies and commercial intercourse of nations) or regard the larger problems they present, with hints towards their solution, which underlie physical geography, climatology, and other branches of atmospheric physics. The discussion presents the great atmospheric changes as influenced by oceans and continents, including the subordinate but important parts played by mountain ranges, extensive plateaus, and physically well-defined river basins in determining the development, course, and termination of these changes.

Weather Forecasts and Storm Warnings.—It is in tropical and subtropical countries that an isolated observer may, with a close approximation to certainty, predict the approach of gales and hurricanes. In these regions atmo- spheric pressure and the other meteorological conditions are so constant from day to day that any deviation, even a slight one, from the average of the hour and season in respect of pressure, the direction and strength of the wind, and the direction and amount of cloud, implies the presence of a storm at no great distance. Dr Meldrum has practically worked out this problem at Mauritius with great success. At the Royal Alfred Observatory there the mean pressure at sea-level in January at 9 a.m. is 29°966 inches, from which it falls to 29°904 inches at 4 p.M., then rises to 29-980 inches at 10 p.m., and again falls to 29°927 at 4 A.M. The mean direction of the wind and the diurnal varia- tion, both as regards direction and force, have been stated (p. 125). Suppose then that the barometer is observed to fall after 9 A.M. more rapidly than is due to the usual daily barometric tide, that in the afternoon it does not indicate the second maximum or that it continues to fall instead of rising,—or suppose, in short, any deviation from the mean daily march,—then it is certain that there is somewhere an atmospherical disturbance near enough to Mauritius to influence the pressure. The direction in which the disturbance is from Mauritius is readily known from the wind, and the distance of the storm closely approximated to by noting the rate and amount of the fall of the barometer, in connexion with the changes of the wind and the clouds,—the rate and progressive motion of the storm being known chiefly from the veerings of the wind. For a good many years past notifications have

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-fact that the British Islands are immediately bounded by

winds are northerly and easterly and temperature low, and —

[WEATHER FORECASTS,

been sent to the daily newspapers when observations show — that a storm is not far from the island, stating its position and probable course from day to day. The scheme of storm warnings at Mauritius has been entirely successful, and the result is of great value, since it shows what may be done at an isolated station in the ocean, or what may be done in ships at sea. In this connexion it is not possible to overestimate the importance to seamen of a knowledge of the hourly variations of the barometer and its mean monthly heights over the ocean tracks of commerce.

In passing from Mauritius to the British Islands we pass from a region where the forecasting of storms and weather is simplest and easiest to the region where it is most complex and difficult, particularly for the western districts of these islands. The great difficulty lies in the

the Atlantic to westwards; and, since practically every storm and nearly all weather changes come from that direction, no telegraphic communication of their approach can be received. ‘The Meteorological Office in London has therefore no choice but to base the forecasts on such of the observations telegraphed to the office as experience has shown to be the precursors of storms and other weather changes. The more important of these observations are the falling and rising of the barometer taken in connexion with changes in the direction and force of the wind. Since on the north side of the track of the centre of the storm

on the south side winds are southerly and westerly and temperature high, one of the most important points to be ascertained is the probable path the centre of the coming storm will take. Though a good deal remains to be accomplished in the development of this phase of storms, yet much has recently been done in this direction by close examination of the changes of pressure in the region of the anticyclone contiguous to the advancing storm

and by the changing positions of the rain area near the centre of the cyclone.
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As regards Europe, the facility of forecasting storms increases as distance from the west coasts is increased. Thus to the middle and eastern districts of the British Islands, were a day and night watch established in the west, forecasts ~~of almost every storm could be issued, the exceptions being those small cyclones or satellite cyclones, as they are called, originating within the British Islands themselves, which are frequently characterized at once by their severity and by the rapidity of their onward course. In the United States, the system of weather forecasting 1s perhaps the best in temperate regions,—a result due to the admirable system organized and developed under the direction of the late General Myer, and adequately sub~~ sidized by the Government, but above all to the facilities to detect and track the storms in the region where nearly all of them have their origin, to west of the Mississippi, before they advance upon the more thickly peopled States.

Meteorology sustained a heavy loss by the death in 1877 of Leverrier, who was not only the keenest-sighted of physicists but also the prince of organizers of systems of meteorological observation. His last great service to the science was the establishment of a system of observation, by which the propagation of rain, hail, and other weather phenomena could be followed and recorded from commune to commune over France. ‘This scheme for the investiga- tion of the vitally important bearing on the meteorology of a country of a comprehensive observation of its rainfall, hail, and thunderstorms, through numerous observers possessing sound local information, is not only eminently just in science, but is calculated to be attended with the greatest benefits to agricultural and other public interests. The practical advantages of the scheme, it need scarcely

be added, can only be reaped after a very large expendi- ture of labour and money in organizing a comprehensive parochial scheme of observation, systematically and per- sistently carried through and discussed.

Further details regarding meteorological phenomena will be found in the articles ATMOSPHERE, BAROMETER, CuimaTE, Hycrometry Ozonz,

RaincaucE, SEA, and T0ERMOMETER. (A. B.)

TERRESTRIAL MAGNETISM.

1. In the preceding portion of thisarticle some account has been given of the influence which the sun and moon exert upon the air, the earth, and the ocean, their strictly tidal effects being left to be ‘separately dealt with. The discussion of the influence of these bodies on what may be termed the movables of the earth will not be complete, however, without embracing an account of the changes wliich they produce in the eartl’s magnetism. An account of the earlier magnetic observations has already been given under the heading MaGNneTIsM, and our task will now be to give in the first place a description of the best and most recent instruments by which the magnetic state of the earth is determined, embracing therein observatory instruments, those adapted for travellers whether by land or by sea, and differential magnetometers. We shall next give a short account of the magnetic system of the earth and of its secular variation; and we shall then investigate the changes con- nected with terrestrial magnetism depending on the sun and moou. In performing this task we shall be led to conclude that the sun’s power is variable, and we shall therefore examine whether this con- clusion is likewise borne out by strictly meteorological observations. Finally, we shall venture on remarks embodying a provisional working hypothesis, and our object will be gained if this should be found to suggest certain lines of thought to those interested in the subject which may lead them to examine and discuss the very great mass of observations at present existing.

INSTRUMENTS FOR DETERMINING THE MAGNETIC STATE OF THE EARTH.

(a) Observatory Instruments.

2. Declinometer.—It is that end of the needle which points to the north magnetic pole of the earth of which the position is invari- ably noted even when the observation is made in the southern hemisphere. The difference of this position from true geographical north denotes what is called the variation or declination (east or west) of the needle. East is often reckoned negative and west positive. The instrument by which this information is

obtained. is ealled the declinometer. The unifilar magnetometer, which is the form of declinometer now used, is described and figured in MAGNETISM, vol. xv. p. 238.

3. Dip Circle.—The instrument by which the magnetic dip or inclination is observed contains a thin needle about 3 inchies long, the centre of gravity of which coincides as accurately as possible with the axis of motion of the needle. The needle has two axles consisting of two very fine cylinders of hard steel standing at right angles to the plane of the needle, and great attention must be paid to keep these axles in a state of perfect polish and dryness. By means of these the needle can oscillate freely on two horizontal agate rounded edges, the one axle lying on the one edge and the other axle on the other. If the centre of gravity coincides exactly with the axis of motion, and if there be no adhesion or friction between the axles and the agate edges, the ueedle must settle into such a position that its magnetic axis lies in the true line of dip.

The position of the ends of the needle is read by means of two microscopes which move round on a cross piece carrying verniers. To view the position of the lower end of the needle we move round the lower microscope until the cross wire in its field of view (extend- ing in the line between the two microscopes) symmetrically cuts the extremity of the needle. The lower vernicr isthen read. The same process is repeated for the upper vernier, and the mean of the two readings is taken. This mean will accurately denote the position of the needle if the circle is properly set.

The sources of error in a dip observation are—(1) a want of symmetry in_mass, the centre of gravity of the necdle not being coincident with the axis of motion; (2) the vertical circle being erroneously set ; (3) a want of symmetry in magnetism, the mag- netic axis not being coincident with the axis of figure; (4) excen- tricity, the axis of rotation of the ncedle not passing through the centre of the circle ; (5) friction and adhesion of the axles as they test on their agate supports. This last source of error is guarded against by taking great carc of the axles, and by inserting them gently into a piece of cork before each observation ; the agate supports ought also to be rubbed with cork. Then, again, when the needle has assumed its position, before reading it is geutly raised by means of a lifter, the handle for turning

which is shown in the figure towards the right. It is then gently lowered, and this pro-

cess is repeated until no apparent change of position is produced by the operation.

4, We shall now describe a complete dip observation. The first point is to make the needle to swing in the plane of the magnetic meridian. In order to accomplish this, after levelling the instru- ment, the verniers are set for 90°, that is, for a vertical position of the needle. The whole instrument is now turned round its hori- zontal circle until the extremities of the needle are bisected by the wires of the two microscopes, and the position of the vernier of the horizontal circle is then read. ‘The needle is next reversed so that the microscope shall view its other flat side; it is made vertical as before, and the position of the horizontal circle read once more. Next the face of the instrument is turned round 180°, and the same two operations repeated. We have thus four readings of the hori- zontal circle, and if we take the mean of these we shall have ascer- tained with sufficient accuracy the position of that plane for which the needle is vertical. Now this plane must be removed 90° from the magnetic meridian, for in such a planc the horizontal magnetic force of the earth would have no resolved portion acting in the plane of the needle’s motion, so that the needle would practically be under the sole influence of the vertical magnetic force, aud would therefore point in a vertical direction. By this means therefore we obtain the magnetic meridian, and thus know the plane in which we ought to swing the needle. The needle must now be read in the following positions:—(a) face of instrument east—face of needle to face of instrument ; (8) face of instrument west—face of needle to face of instrument ; (vy) face of instrument west—back of needle to face of instrument ; (5) face of instrument ecast—back of needle to face of instrument. Finally, the poles of the needle must be reversed, by rubbing them with powerful bar magnets in a direction opposite to that in which they were previously rubbed, and four observations taken corresponding tothe above. ‘The mean of the eight observations so obtained will give us the true dip.

The turning round of the face of the instrument from east to west is made to counteract any error due to erroneous setting of the vertical circle. The reversal of the face of the needle is made to counteract any error due to the centre of gravity of the needle not being quite coincident in the direction of the needle's breadth with its axis of motion, and likewise any error due to want of symmetry of the magnetic axis. The correction for excentricity is made by reading both ends of the needle. Finally, the reversing of the poles of the needle is intended to counteract any error due to tle ceutre of gravity of the needle uot being coincident in the direction of the needle's length with its axis of notion.

Dr Joule! has suggested a modification of the dip circle in which the needle is hung on fine threads on which it rolls instead of rest- ing on agate supports.

5. Horizontal Force Magnctomcter.—The theory of the instrument for determining the horizontal component of the earth's magnetie force has already becn given in the article Magnetism, vol. xv. pp. 238 sg., and the instrument is shown in two forms, '¢did., figs. 28 and 29. The corrections necessary for accurate results are explained in a paper by G. M. Whipple (Proc. Roy, Soc., 1877).

(8B) Instruments adapted for Travellers by Land.

6. Declinometer.—For travellers by land the unifilar instrument (§ 2), mounted on a tripod stand and duly levelled, is perhaps the most accurate kind of declinometer.

For this purpose it is furnished with a transit mirror by means of which an image of the sun may be thrown into the field of view of the telescope, and —the geographical position of the station as well as the apparent time of the observation being known—an azimuth thus determined. In order that such an observation may: succeed, the following points must receive attention.

In the first place the axis of the mirror must be horizontal; the adjustment for this is made by means of a riding level. Secondly, the normal to the plane of the mirror must be perpendicular to the axis. The adjustment for this is made by a screw attached to the baek of the mirror. Take some object

sufficiently elevated and reflect it into the telescope, getting the object bisected by the wire of the telescope. Then reverse the mirror in its bearings. If the object remains still bisected by the wire no correction requires to be made, but if not the screw at the back of the mirror must be moved until the object is in precisely the same position in both observations. Thirdly, the line of collimation of the tclesecope must be perpendicular to the plane of the mirror. In order to obtain this there is a collimating eye-piece attached to the telescope by which the sun's light may be made to illuminate the cross wires. Now turn the transit mirror until the reflexion of the illuminated cross wires coincides with the wires themselves, in which case the line of collimation of the telescope must be perpendicular to the plane of the mirror. When this correction has been once made, note the circle reading of a small verniecr which moves with the mirror and always set the mirror so as to give this reading.

1 Proc, Lit. and Phil. Society, Manchester, vol. viii. p. 171.

By these means an accurate reading of the sun's bearing may be made ; and, the position of the place and the time of observation being known, there are tables which enable the azimuth to be at once determined.

7. Lloyd's Method of Determining the Total Foree.—While the dip circle and the horizontal force magnetometer may be used by travellers in addition to their use as observatory instruments, the Rev. Dr Lloyd has devised a new method of determining the total force. Tht ordinary method of obtaining this is first to find the

dip and the horizontal force, from which the total force can be at.

once determined by the equation, —total foree=horizontal force x secant dip. This method is, however, open to objection in high magnetic latitudes where the horizontal foree is very small and the dip approaches 90°. Now in Lloyd's method this objection is over- come. Another circumstance which renders his method pecuharly convenient for high magnetic latitudes, where a traveller's equip- ment must be kept as light as possible, is the fact that it only requires the addition of two needles to an ordinary dip circle in order

to give the required determination. These needles must be carefully kept from contact with other magnets, and their poles never reversed.

Here as before we have two unknown quantities to determine, the one being the magnetic moment of the magnet and the other the total force of the earth. We must, therefore, obtain two results, the one embodying the product of the earth's total foree into the magnetic moment of the needle, while the other gives the ratio between these two quantities.

8. In order to determine the former of these, let the needle have a grooved wheel of radius r attached to its axle as in fig. 21, and over this wheel let an accurately known weight W be

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Fig. 21.—Dip Cirele.

suspended by means of a very fine silk thread. The best way of doing this is to have a thread with two hooks of preeisely equal weight at each end and then attach the preponderating weight W to one of these hooks. When this is done a new position of 'equili- brium will be taken by the needle. If we suppose that m denotes the magnetic moment of the needle, that 7 is the angle of dip at the

place, and that 7 denotes the angle which the needle in its deflected |

position makes with the horizon, the weighting being so made that 7» shall be less than 7, then it is clear that the needle has been defleeted out of its position of equilibrium through an angle 7-7. If we call this angle w and designate by R the total force at the place, we obtain the following equation of equilibrium :— mRsinu=Wr . 2s te ars (2);

on the supposition (which is very nearly but not strictly correct) that W denotes a constant force at all latitudes.

9. Next, in order to determine the ratio between this needle's force and that of the earth, let it be removed and employed to deflect another substituted in its place.

METEOROLOGY

_observed by means of an azimuth compass

[TERRESTRIAL MAGNETISM,

When using it thus as a deflector it should be laid in a frame in an invariable position as in fig. 21. This frame is at right angles to the line between the two microscopes, and as both pieces move together the best plan is to turn the whole round until the deflected needle is visible in the centre of the field of the microscopes, in which position it is of course perpendicular to the deflecting needle. By always keeping to this arrangement we secure an invariable distance between the poles of the two needles. Suppose therefore that we have employed the needle as a deflector in the above manner, and that the deflected needle has thus been made to assume a position denoting an angle 7' with the horizon. It has therefore been deflected from its position of equilibrium by an angle ¢— 7! (4 denoting the dip as before); calling this angle of deflexion w', we obtain — the following equation of equilibrium :—

Rsinw =mU

(2),

U being a function depending upon the distance of the needles and on the distribution of free magnetism in them.

10. If we multiply together equations (1) and (2), we obtain

R'sin wsin wu' =UWr (3), in which wu, w' are determined by observation, while W and r may be regarded as constants. U is, as we have said, a

function de- pending upon the distance of the two needles and upon the distri- bution of free magnetism in them.

The magnetic moment of these needles is of course liable to altera- tion, but if they are carefully guarded from contact with magnets we may imagine that while their intensity alters, becoming weaker for instance, this nevertheless does not sensibly affect the distribu- tion of the free magnetism within them, in which case the funetion U may be regarded as constant quantity. The results obtained by this method of Lloyd's fully confirm this hypothesis regarding U;; but it is essential that the two additional needles, the deflector and the deflected needle, should have their poles at no time either reversed: or disturbed.

Assuming therefore the constancy of the quantity U, its value may be easily determined at any base station where the total force has been determined independently by the ordinary method. a

11. Having thus determined the value of U, or at once of UWr (which we 'may call c), let us carry our instrument to a different station and make the requisite observations. We thus obtain

c B™ AS Saul ho ata (4).

As this method is specially adapted for high latitudes, the dip circle employed (fig. 21) ought to be one for which the agate supports are horizontal, so as to adinit of the needle being visible when the dip is nearly equal to 90°. It will also be noticed that, if the deflecting — needle have the same temperature when it is used in equation (1) which it has when used in equation (2), then m in the one case is strictly equal to m in the other, and thus no temperature correction is rendered necessary.

12. A slight modification of the method now described is some- times adopted. Instead of employing separate weights, which may be easily lost, two small holes are bored in the deflecting needle near each end. The one of these is filled with a suitably heavy brass peg when the observations are to be made in the higher magnetic latitudes of the northern hemisphere, and the other is filled in a similar manner when the observations are to be made near the southern pole. In this case therefore we must readjust the

instrument as we pass from the one hemisphere to the other. A slight change must be made in the formula when this method is adopted, for it is clear that the weight will not now aet always at the same constant leverage. If the weight be called W and its leverage when the needle is horizontal 7, we shall have to modify equation (1) as follows:—

mRsinu=Wrceosy (a

Equation (2) will, however, remain unaltered, and hence equation (8) will become ;

R’sinusinw’ =UWreosy . . . + » (6). If the quantity UWr be determined at the base station and called c’, we shall have R= if he de 2 + «ie a en (7). sin wsin wv :

(y) Instruments adapted for Travellers by Sea. 13. Azimuth Compass.—At sea the declination is generally invented by Kater This is exhibited in fig. 22, It consists of a magnet with a graduated compass card attached to it. At the side of the instru- ment opposite the eye there is a frame which projects upwards

| from the plane of the instrument in a nearly vertical direction, and

this frame contains a wide rectangular slit cut into two parts Dy a wire extending lengthwise. The eye-piece is opposite this frame, and the observer is supposed to point the instrument in such a

_the eye is to be so placed that pre-

TERRESTRIAL MAGNETISM. |

manner that the wire above mentioned shall bisect the sun’s visible disk. There is a totally reflecting glass prism which throws into the eye-piece an image of the scale of the graduated card, so that the observer, having first bisected the sun’s disk by the wire, must next read the division of the scale which is in the middle of the field of view. He thus obtains a reading of the sun’s position ; let uscall this 100°. From this, knowing the geographical posi- tion of his station and the time of the observation, he may de- duce an

azimuth ; let us imagine that this is 70° W. Thus a reading of 100° corresponds to aposition 70° W. Suppose next that the instrument is so ad- justed that when the magnetic & axis of the magnet is between Mi Tm = the eye-piece and the wire the a reading is 0°. It is thus clear cn that the magnetic meridian is 100° removed from the position 70° W. Let us imagine that the instrument is so graduated that this denotes a position 30° E. We have thus obtained the ar netic declination. If the vessel be at rest the plan generally adopted is to take the reading of the sun when rising and also when setting; a mean between the two will give that which cor- responds to a geographical meridian.

14. Fox's Dip Cirele.—This instrument, contrived by Robert Were Fox, is more especially useful for observations at sea. In this case it must be placed on a gimball stand and duly levelled before commencing the observation. The following are the peculi- arities of this instrument :—(1) the needles have two fine pivots or axles which are inserted into jewelled sockets ; (2) in order to avoid parallax there are two graduated circles, the one farther from the eye than the other, and when reading the needle

' Fig. 22,—Azimuth Compass.

ciscly the same reading shall be given by both circles,—the true position of the needle being thus obtained; (3) there is a rubber made of bone or ivory and roughened, the object of which is to rub a prolongation of the socket on the back of the instrument,—the fric- tion which this rubbing causes enabling the needle to find its true position; (4) to avoid as much as possible all effects due to friction and adhesion, the entire socket arrangement may be turned round. The axles of the needle are thus compelled to be in contact with a different set of particles. An- other way of varying the suspension is to use a magnetic deflecting arrange-

17. Early in the history of such instruments it was found that hourly observations were exceedingly laborious, and attempts were made to construct a set of self-recording magnetometers. 'he first set of such

instruments which were brought into systematic opera- tion were those devised and constructed by the late Charles Brooke, which have been at continuous work in the Greenwich Observatory since 1848. In 1857 John Welsh devised a fresh set of self-record- ing instruments, and introduced them into the Kew Observatory. These, with certain slight modifications, have formed the type of ° instruments supplied to a large number of magnetie observatories all over the globe.

18. As we cannot conveniently record changes of dip by a differential instrument, changes of vertical force are measured instead by a balance or vertical force magnetometer. We have thus in a differential system, whether adapted to eye observation or to continuous photographic registration, three instruments, namely, the declination, the horizontal force, and the vertical force mag- netometers or magnetographs as the case may be. The most recently constructed instruments are adapted both for photographie registration and for eye observation through a telescope. The advantage of eye observations is that we see what is taking place at the very moment of its occurrence, whereas we only obtain the phologeapiite record some time after the changes to which it relates have actually happened.

Weshall therefore describe—(a) the three instruments of the Kew pattern as adapted to eye observations ; (8) these instruments as adapted to continuous registration by photography ; (y) the method of determining their cf coefficients ; (5) the method of determin- ing the temperature coefficients of the force instruments.

19. Kew Instruments—LEye Observations.—Fig. 23 shows us these instruments arranged in the relative positions recommended by Lloyd so as magnetically to interfere with one another as little as

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ment attached to the back of the

apparatus. Suppose that a reading

of the position of the needle so de-

flected is now taken. Next reverse

the position of the deflecting arrangement, which is done by turn- ing a movable circle attached to this arrangement 180° round; let the position of the needle be again read. On the hypothesis that the needle is equally deflected on opposite sides of its true position in these two observations, the mean reading will give the true

dip. The principle of the method of observing with this circle is |

precisely the same as that already described for observations on shore with an ordinary inclinometer.

_ 15. Fox's Intensity Arrangement is merely a modification of that introduced by Lloyd, and already described in § 7.2

(3) Differential Magnetometers and Self-Recording Magnetographs. 16. In addition to determinations at fixed intervals of time, it is a point of much interest and importance to keep a continuous record of all the magnetic changes which take place at a few selected stations. This is accomplished by means of differential magneto- meters. It is, however, necessary to continue to use absolute

instruments side by side with differential magnetometers, because

the latter (with the exception of the declination instrument) are badly fitted for recording changes of long period, such as the secular changes of the horizontal and the vertical force. The reason of this will presently be seen.

1A great deal of detailed information regarding instruments for absolute deter- mination and the methods of observing with them isto be found in the Admiralty Manual of Scientific Inquiry in an artiele on 'Terrestrial

Magnetism," by Sabine and Welsh. A treatise on Terrestrial and Cosmical Magnetism, by E. Walker, may likewise be consulted with much advantage.

Fig. 23.—Kew Instruments.

ossible. We are supposed to be viewing the whole from the south.

o. 1 to the right is the declination instrument, No. 2 that for the horizontal force, and No. 3 in the distance behind the central pillar (No. 4) the vertical force magnetometer. Figs. 24, 25, 26 give us the details of these three instruments in the same order as above. Connected with each instrument there is a circular mirror, or rather two semicircular mirrors, made of perfectly plane glass. One semicircular half of each mirror is attached to the magnet and moves with it, while the other half is firmly attached to the

'marble slab. Each magnet is enclosed in a gun-metal case with

windows of perfectly plane glass ; eacli gun-metal case is covered with a glass shade; and the whole is air-tight, and capable of exhaustion. Each magnet too is provided with a copper damper with the view of checking its oseileations, In fig. 23 will be seen two pillars of smaller size. The right-hand pillar carries a tele- scope, with a scale attached, to record the position of the declination magnet. The scale is reflected from the semicircular mirror moving with the magnet, and the position of this reflected scale as viewed in the telescope indicates the position of the magnet. The optical arrangement for the other instruments is similar, except that the vertical force mirror has a horizontal and not a vertical axis. The telescopes for viewing the force instruments are attached to the left-hand pillar of smaller size. .

20. The Declinometer ? (fig. 24) consists of a magnet about 5 inches long suspended by a silk thread freed from torsion as completely as

2 For a detailed account cf the Kew magnetographs, sce British Association

Reports, 1859. XVI. — 21

possible. To keep the state of the thread constant the glass shade should be rendered air-tight, and should contain some substance for absorbing moisture, such as chloride of calcium. It is clear that if the state of the thread remains =

the same, and if the position of the magnetic axis of the magnet docs not change, this instrument -should record faithfully the various changes of declination.

The Horizontal Force Magneto- meter is exhibited in fig. 25. Here the magnet! has been twisted round into a position at right angles to the magnetic meridian. It is sus- pended by means of two very fine steel wires some little distance apart, and thus the instrument is often called the bifilar magneto- meter. These wires have the plane passing through their lower ex- tremities differing very consider- ably from that of their upper. If tho magnet should suddenly lose its magnetism the whole arrange- ment would be twisted round until the two planes coincided. This differenee of plane gives rise to a couple tending to twist the magnet round in one direction while the horizontal magnetic force of the earth constitutes an equal and opposite couple, the two couples keeping the magnet in equilibrium. The couple depending upon the bi- filar arrangement may — for the present be re- – =

arded as eonstant, that : § epending on the hori- Fia. 24.— Deelinometer. zontal force of the earth as variable. If the latter increase or diminish, the magnet will be slightly twisted round in one direction or the other.

In the Vertical Foree Magnetometer (fig. 26), the magnet is balanced by means of a knife-edge resting on an agate plane. B means of two screws working hori- zontally and vertieally the centre of gravity may be thrown to either side of the point of suspension, or it may be raised or lowered and the sensibility of the magnet when balanced thereby inereased or diminished. These screws are so arranged that there is a preponder- ance of weight towards the south side of the magnet. This is neutralized partly by the magnetic foree tending to pull the north end down and. partly by a slip of brass standing out horizontally towards the north side. Let us suppose the system to be in equilibrium at a eertain temperature ; if the tem- perature rise (since brass expands more than steel), the leverage of the weight at the

north side will increase more than that of the weight at the south. There will thus be a slight preponderance towards the north, and _ = this may be arranged & so as to neutralize to a great extent the de- crease in the magnetie & moment which an in- & crease of temperature : : produces. =

21. Magnetographs. Fic. 25.—Horizontal Foree Magnetometer. —The arrangement by means of which these instruments are con- verted into self-recording magnetographs is very simple. In fig. 23 we see a gas flame burning behind a vertical slit and placed end- wise in order to render its light more intense. The light from this illuminated slit passes through a lens, and being reflected from the mirror of the declination magnet throws an image of the

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1 All the magnets are of the same size.

slit upon some sensitized paper in the central box. To speak more properly, two images are thrown, one reflected from the upper and movable half and the other from the fixed half of the mirror, The sensitive paper is wrapped round a horizontal cylinder (fig. 27), and the two images are therefore thrown upon different parts of

Fig. 26.—Vertieal Foree Magnetométer.

this cylinder. But before reaching the cylinder these two images are by means of a hemicylindrical lens (shown in fig. 27) crushed into two dots of light. The cylinder moves round regularly by clock-work once in twenty-four hours, and hence the eourse on the moving paper of the dot of light which comes from the fixed half- mirror will be a straight line, while that of the dot from the moving half-mirror will be a curved line depending on the motions < a magnet. When the paper is devcloped theso lines appear ack,

The arrangement for the horizontal force instrument is precisely similar to that for the deelinometer ; for the vertical force it is somewhat differcnt, the illuminated slit being horizontal and not vertical, while the mirror oscillates on a horizontal axis and not on a vertieal one ; the hemieylindrical lens too and the cylinder are vertical and not horizontal. It was found necessary to put the plane of motion of the vertical force magnet 15° out of the magnetic meridian for the following reason. The axes of the telescopes are respectively 30° inclined to the tubes which go from the magneto-

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Fic, 27.Magnetograph.

meters to the central box, and hence had the vertical force magnet swung in the magnetic meridian it would have becn necessary to place the mirror inclined at the angle of 15° to the axis of motion of the magnet. This was tried, but it was found that in this posi- tion of the mirror the correction for temperature was so excessive that the instrument became a thermometer and not a magnetometer. The mirror was therefore put in a plane passing through the axis of motion of the needle, the needle being made to move in a plane inclined 15° to the magnetic meridian.

22. Scale Coefficients of Differential Instruments.—It is necessary to know the value of one division of the scale in the magnetometer or of one inch difference in the ordinate of the curve impressed on the photographic paper in the magnetograph. In the declination instrument it is only necessary to obtain the angular deviation cor responding to one division, and this may be done at once by a series of measurements. In the horizontal and vertical force instruments we wish to obtain the value of one division in parts of force. There is more than one method by which this can be accomplished,

but that of John Allan Broun is probably the simplest, and it is, we believe, the one adopted at most of the various observatories pos- sessing self-recording instruments. It is given in the British Association Reports, 1859.

23. Temperature Coefficients of Differential Force Instruments.— Broun has devoted a great deal of attention to the subject of these coefficients, and has come to the eonclusion that the best and most unobjectionable method of determining them 18 to

compare the instrumental readings on days when the tempera- ture is high with the readings on days when the temperature is

.. By differential instruments the components of a force affeet- ing the maguet are determined in three directions at right angles to each other. It does not, however, follow that this force is entirely due to changes in the magnetism of the earth, We know that certain forees connected with the sun affect the earth's mag- netism, and on certain occasions at least these forces manifest them- selves as currents in the upper regions of the atmosphere and in the crust of the earth. Nowsuch currents will have a direct effect upon the needle as well as an indirect effect through the changes whieh they may produce in the magnetism of the earth. The total influence on the needle will therefore be made up of these two ele- ments, the one denoting the direct influence on the needle of the disturbing foree, and the other the indirect influence through the change produced in the earth's magnetism. No attempt has yet been made to separate the action of these two elements.

25. Self-reeording instruments after the Kew pattern have beeu supplied to observatories at the following places :—

Batavia. Mauritius,

Coimbra (Portugal). Kolaba (Bombay). Lisbon. Vienna.

St Petersburg. Zi Ka Wei (China). Florence. San Fernando (Spain). Stonyhurst. Potsdain.

Utrecht (declination only). Brussels,

Melbourne. Nice.

There are also self-recording magnetographs of other patterns at Toronto, Montsouris (Paris), Greenwich, Wilhelmshaven (?), Cape Horn, and Havana (?).

We understand that Professor W. G. Adams is at present engaged in making a comparison of simultaneous curves from vari- ous stations of these lists.

MAGNETIC PoLES oF THE EARTH—SECULAR VARIATION.

26. Magnetic Poles of the Earth.—In the article MAGNETISM it has been shown that Dr Gilbert of Colchester had at a very early period grasped the important truth that the earth is a magnet, a truth which was afterwards mathematically demonstrated by Gauss. It was reserved for Halley, the contemporary of Newton, to show that the earth must be regarded as having two poles in the northern and two poles also in the southern hemisphere, so that, unlike ordinary magnets, its magnetic system has four poles altogether. Before proceeding further it will be desirable to state what it was that Halley actually did and what are the conclusions to be derived from his investigations. It has been remarked by Professor Stokes that, while in an ordinary bar magnet we may practically regard the pole as having a physical reality and as being the cause of well- known attractions and repulsions, we are not entitled a priori to assume that a point of maximum force in a large spherical magnet like the earth must necessarily be the scat of attractions and repul- sions after the same manner as the pole of an ordinary bar magnet. It is to be determined by observation to what extent the earth actually preserves an analogy to an ordinary magnet. Now Halley's conclusions were derived from the pointing of the declination needle, since in his day there were no observations possible on total magnetic force. He argued that there are two points or poles in the northern hemisphere to which the needle appears to be attracted, one in the upper region of America and one above Siberia. So far this conclusion is hardly anything more than a formal one derived from the grouping together of observations, He asserted that these would be as they are known to be if we imagine two such poles or foci of force each exercising a causal influence

on the magnetic needle, And the justification of Halley's way of regarding the earth is found in the fact that when force observations came to be made two such foei of force were actually found to exist. We do not,

however, mean to imply that these foci have causal properties exactly similar to the poles of a bar magnet, for this is not the case.

In order to exhibit the process of reasoning which led Halley to his conclusion, let us first imagine that the earth has only a single pole or force-focus in the northern hemisphere, and that this is coincident with its geographical pole; then, assuming that this pole has a causative influence on the needle's declination, we should – tig all needles to point everywhere due north. If, however, this pole be not coincident with the north pole of the earth, let us draw a meridian cirele passing through the magnetic pole and complete

_ itround the earth so as to divide the earth into two halves. At all Shy a We are indebted to Mr Gordon—and to his publishers Messrs Sampson Low &

-» Who have obtained them for us—for the sketches of the instruments for absolute determinations, with the exception of that of Kater's eompass, for which we are indebted to Mr J. J. Hicks. For the sketch of the self-reeording mag-

Me etphs together and in detail we are indebted to the Kew eomnmittce and to 1G. M. Whipple, direetor of the Kew Observatory.

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points in this meridian circle the needle might be expected to point due north, while in the one half of the earth so divided it should point to the east and in the other half to the west of true north. — In the next place let us imagine that the earth has two north mag- netic poles or foci of equal strength, both being at the same latitude, while their difference in longitude is 180°, and let us draw a com- plete circle of meridian passing through these poles (fig. 28). Let us start from a point in this circle under one of

these poles and pursue our journey eastwards along a circle of latitude. At first the needle will point due north. As we move east- wards the needle will point west- wards to the pole we are leaving until we come to a region half-way between the two poles, where it will be equally solicited by each, and will therefore again point due north. Let us call the space we have travel-led over since we set out A. As we proceed the needle will now be under the predominant influence of the second pole to our right, and will therefore point to the east until we arrive at the meridian under the second pole. This second space which we have travelled over let us eall B. As we proceed we pass through a space C where the needlo again points to the west until being once more equally influenced by the two poles it will point due north. After this we pass through a space D of easterly variation until we arrive once more at the point from which we started.

Thus there are now four spaces instead of two, and these are shown in fig. 28, where the centre of the circlo represents tho north geographical pole of the earth, and its circumference the equator. If polo 2 be inferior in power to pole 1 the spaces B and © will be smaller in size than A and D.

27. This last is an arrangement of things that agrees very well with the results of observation, if we add that the two poles are not precisely 180° removed from one another in longitude. Fig. 302 represents lines of equal magnetic variation in 1882. There are two lines extending throughout both hemispheres at all points of which there is no variation, and also an oval-shaped district in the northern hemisphere throughout all points in the circumference of which we have no variation. These facts are inconsistent with the hypothesis of a single pole, but they are quite consistent with that of two poles or foci of force, one in northern America and the other in northern Asia, the former being stronger than the latter. In order to see this let us take our stand at the great line of no varia- tion which passes through North America and travel eastwards. We are just south of the American Lg or focus, while the Asiatic pole or focus is nearly 180° off, and hence the needle points due north. As we proceed eastwards we leave the American or strongest pole to the westward of us, and hence we have a region of west variation which we have agreed to call A. As we begin to approach the eastern side of Europe we get nearer the Asiatic pole or focus, and at length the line of no variation is reached, tho tendency of the American pole to

pull the needle to the west being balanced by the tendency of the Asiatic pole to pull it to the east. After this, easterly variation predominates throughout a region B until at length we come to a point in the western boundary of the oval where’ we may imagine ourselves to be direetly south of the Asiatic pole, while the American pole is nearly 180° distant; once more the needle points due north. As we still travel eastwards we leave the Asiatic pole, which is now the predominant one, to our left, and hence we have here a region C of westerly declination. At length we come to the eastern boundary of the oval, where the tendency of the Asiatic pole to pull the needle to the west is balanced by the tendency of the American or stronger pole (acting now towards the right) to pull it to the east, so that we have once more a point of no variation. After this the American pole predominates, and we have a large region D of easterly variation until we travel round once more to the point from which we started.

28. This train of argument receives, as we have already men- tioned, corroboration from the fact that in the map of total foree we perceive two foci of maximum force, one in northern America aud the other in northern Asia, that in America being the strongest. This evidence was not, however, in existence at the time of Halley, and his hypothesis of two poles does the greater credit to his sagacity, inasmuch as he had to deduce it from a comparatively smal] number of observations of declination and dip, those of forco being altogether wanting.

29. We have hitherto spoken of two poles or, more properly, Soci of maximum force, the positions of whieh are of course best pointed out in fig. 29; but we have seen that the existence of such

Fig. 28,

2 We are indebted for the admirable eharts given in figs. 29-32 to the kindness of the hydrographer, Captain Sir Frederick Evans, who, in order to save time, allowed us to make use of the information he had embodied even before it was officially published, and who likewise plaeed his plates at our disposal.

foci was first conjectured from the behaviour of the lines of variation or declination. Now it will be noticed by looking at the variation map (fig. 30) that all the lines of equal magnetic variation appear to converge toa point in the extreme north of the American continent. This point is not, however, coincident with the chief focus of force, which lies decidedly to its south ; but it is no doubt coincident with the point denoting a dip of 90°, the locality of

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M E Magnetic Equator ar line of no dep

[TERRESTRIAL MAGNETISM. —

which may be inferred from the map of magnetic dip (fig. 31), and it is likewise no doubt coincident with the position of a zero of — horizontal foree which may be inferred from the map of horizontal force (fig. 32). Thus we have a point to the extreme north of ; America which has the following properties :—(1) the various lines of declination converge to it ; (2) the needle points vertically down- wards at it; and (3) the horizontal force vanishes at it. At this

Frc. 29. —The Earth's Magnetism as shown by the Distribution of Lines of Equal Total Force, in Absolute Measure (British miles), with the Position of the Magnetic Poles and Equator, —approximately for 1875.

balanced ncedle, having no hori- zontal force acting upon it, will point in any direction.

This point is, strictly speaking, the pole of verticity, but, inas- niuch as there is only one such point in each hemisphere, these may for convenience sake be termed the magnetic poles, so that we speak of two centres or foci of maximum force and one pole in each hemi- sphere.

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In the northern hemisphere Sir Frederick Evans! assumes the stronger or American focus to be in 52° N. and 90° W., and the weaker or Siberian focus in 70° N. and 115° E. In. the southern hemisphere he assumes the position of the stronger focus to be 65° S. and 140° E., and of the weaker focus probably 50° S. and 130°E., these being thus not far separated from each other or from the magnetic pole. The nearness together of the southern foci is prob

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Fic. 30.—Lines of Equal Magnetic Variation, 1882.

ably the reason why the total force is greater at the southcrn than it is at the northern foci.

The magnetic pole (of verticity) in the northern hemisphere was reached by Sir James Ross in 1831. The position of vertical dip was observed by him to be 70° 5’ N. and 96° 43’ W. The magnetic pole (of verticity) in the southern hemisphere was nearly attained

by the same navigator in a voyage made in 1839-48. is probably 734° S. and 1474° E. : . The line of no dip is called the magnetic or dip equator—its position is given in figs. 29 and 31. The line connecting all the

Its position

1 Elementary Manual for the Deviation of the Compass in Iron Ships.

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points where the magnetic intensity is least is called the dynamic | evidence to show that either the pole of verticity or the centre of

equator, It coincides very nearly with the dip equator. force to the north of America has perceptibly changed its place,

i 80. Secular Variation.—The earth then as a magnet must be | there is, on the other hand, very strong evidence to show that we

supposed to have two sets of centres of force. We shall next | have a change of place on the part of the Siberian focus and also on attempt to show that these centres cannot be regarded as constant | the part of its analogue in the southern hemisphere.

both in position and intensity. ’ Table I. (p. 166), given by Gilpin (Phil. Trans., 1806),! exhibits

It should be premised that, while there is no well-established | the change in the position of the needle in Great Britain from

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-567

Fia. 31.—Lines of Equal Magnetie Dip, 1882.

| the earliest observations up to the beginning of the present | for instance, the line of no variation depending on a balance between ! century. it and the American focus—should be drawn in towards it, or they 31, Between the dates recorded in this table the ncedle has been | should travel westwards; but if the latter supposition is true, or pointing more and more to the west, which implies eitherarelative | this focus has been moving eastwards while retaining its force, the increase in the power of the American as compared to the Siberian | lines to the east of it should be found moving eastwards also. There focus, or a motion of the Siberian focus from west to east. On the | is strong evidence that the latter is the case, and that in the first supposition the lincs to the eastward of the Siberian foeus— | northern hemisphere there has been a long-continued progression

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Fia, 32.—Lines of Equal Horizontal Foree, 1882.

to the eastwards of the system of magnetic lines on both sides of | at Bushey Heath (Herts) during 1817-20, and at Kew from 1858

the Siberian focus. In the southern hemisphere also we have proof | to 1882.

that the analogous focus has been travelling, not from west to east, It would appear from Table II. that the maximum westerly

but from east to west. declination was reached in 1818, and that the needle has since that 82. There is some reason to believe that the eastward motion of | date been travelling eastwards. A similar change has taken place

the Siberian foeus has been recently reversed, and that it is now

going from east to west. Table II. shows the declination observed 1 Taken from Walker’s Magnetism.

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at other stations; and, although these ehanges are not strietly | change has probably taken place in the movement of one set of the simultaneous at the various stations, they have yet beensuffieiently | magnetie foei of forec. ,

general and near together in point of time to indieate that some 33. Halley sought to explain the four-pole theory and to aecount Tan.E Il.—Changes of Declination in England,—at Bushey Heath

TABLE I.—Sccular Change of Variation in Great Britain. Yor 1817-20, and at Kew from 1868.

| Observer. Date. | Declination. a Declination West. Declination West. Change. -———— i s = = 7 lated 1817 24 386 4 26 CL) ne a cere 1580 | 11 15H 75 1818 24 38 25 20 18 62 (CET eee oe rR 1622; 6 OK. 95 1819 24 36 14 90 10 31 GML BARR osccsisin 5. coietsieg nok aceiee inne 16384 4 6K. 10°6 1820 24 34 30 20 © til NGI ie ene reine neta me siinsiece Sestene . 1657 0 OF 10°2 1858 a1 64 8 19 57 44 Grolila rad) ecccescnavs saree ecu cars 1665 1 22W. 9°7 51 Halley Sha TR T EID or: 1672 2 80 W, 10°5 HELE @panbede dace ononndasenay tooo 1692 | 6 OW 16-0 7 Craigs. ch. co sswmamatewnaasat ee el 1728 | 14 17 W 81 rt GaN SHD c.g doancungw (oPsasmeesiees 1748 | 17 40W 8°4 Ti aherd On rccinucsevearawcemeaacmeg 1773 | 21 9W 93 IPN yr isigerasvorngavetonontanee’ 1787 | 28 19W 47 a eee eee 1795 | 28 57 W 12 eee ote cose 1802 | 24 6W. 0-7 (Gall yi Rep taceenotede choco coogtnee 1805 | 24 8W.

Taste III.—Evhibiting certain Years’ Values of Declination at Various Places. se a ee ee ee

Toronto Makerstoun. Trevandrum. Cape of Good Hope. Hobart Town.

Declination. – Declination. Detiination. Declination. Declination. 1841 1 14°3 W. 1841 25 33°7 W. 1854 0 25°896 EK. 1605 0 30°0 E. 1843 9 53:32 E 1842 1 19°1 W. 1842 25 28°4 W. 1855 0 26°026 E. 1609 0 12°0 W 1844 9 54°93 E. 1845 1 29°1 W. 1843 25 22°9 W. 1856 0 26°400 E 1622 2 00 W 1845 9 56°47 E. 1846 1 30°8 W. 1844 25 17°1 W. 1857 0 27°278 K 1675 8 14:0 W 1846 9 58°42 Kh 1847 1 33:2 W. 1845 25 11°3 W. 1858 0 28°769 E 1691 11 00 W. 1847 9 59°28 EK. 1848 1 35°4 W. 1846 25 6°0 W. 1859 0 30°406 E 1751 19 1570 W. 1848 9 60°61 E. 1849 1 36°9 W. 1847 24 59°6 W. 1860 0 32°034 E 1775 21 14:0 W. 1850 1 38°6 W. 1848 24 51°8 W. 1861 0 34‘318 E 1788 24 4:0 W. 1851 1 40°9 W. 1849 24 45°2 W. 1862 0 36°654 E 1792 24 31°0 W. 1856 1 56:3 W. 1850 24 39:0 W. 1863 0 39°123 E 1818 26 81:0 W. 3 1857 2 0°5 W. 1851 24 31°3 W. 1864 0 41°603 E 1836 28 30°0 W. 1858 2 25 Ww. 1852 24 25:2 W. 1865 0 44:007 E 1839 29 9:0 W. 1859 2 et Ws 1853 24 18°7 W. 1866 0 46°310 E 1841 29° 6:2 W. 1860 2 10°6 W. 1854 24 11°8 W. 1867 0 47°590 E 1842 29 5:9 W. 5 1861 2 14°4 W. 1855 24 5°3 W. 1868 0 48°687 E 1843 29 6:0 W. ‘ 1862 LOT Wi 1869 0 49°7385 E 1844 29 6:2 W. 1863 2 19°1 W. 1845 29 7:4 W. 1864 2 21-0) W. 1846 29 87 W. 1865 2 24°38 W, 1847 29 12°4 W. 1866 2 27°6 W. 1848 29 14:0 W. 1867 2 29°38 W. 1849 | 29 162 W. . q 1868 2 33°2 W. 1850 29 18°38 W 1869 2 87°1 W. | 1870 2 41:9 W. | 1871 2 47-9 W. | .

Taste 1V.—Exhibiting certain Years’ Values of Dip and Horizontal Force at Various Places. The years in this Table are from April to April ; thus 1845 means the year from 1st April 1845 to 31st March 1846.

London.or Kew. Toronto. Hobart Town. Cape of Good Hope.

Dip. Hor. Force. “Dip. Hor. Force. Dip. | Hor. Force.

1857 | 68 24°87} 1857 3°7899 | 1845 | 75 15°50| 1845 3°5476 | 1842 | 70 42°2| 1846 4°5054 | 1841 |53 91 1858 | 68 22°56] 1858 3°7950 | 1846 | 75 14°58| 1846 3°5419 | 1843 | 70 38°2 | 1847 4°5001 | 1842 | 53 15°3 1859 | 68 21°41] 1859 3°8007 | 1847 | 75 15°30| 1847 3°5384 | 1844 | 70 33°3 | 1848 4°4991 | 1843 | 53 20°2 1860 | 68 19°29] 1860 3°8063 | 1848 | 75 18°32} 1848 3°5339 | 1845 | 70 32°0 | 1849 4°4997 | 1844 | 53 20°4] 1861 | 68 17°42} 1861 3°8121 | 1849 | 75 18°94] 1849 3°5367 | 1846 | 70 33°0 | 1850 44998 | 1845 | 53 293) 1862 | 68 14°89 | 1862 3°8165 | 1850 | 75 19°98 | 1850 3°5322 | 1847 | 70 34°5 18638 | 68 11°71] 1863 3°8216 | 1851

| 75 20°42) 1851 3°5299 | 1848 | 70 35°7 1864 | 68 9°31] 1864 3°8284 | 1852 | 75 20°52| 1852 3°5154

1865 | 68 8°50} 1865 3°8306

1866 | 68 5°44) 1866 3°8391

1867 |68 2°62] 1867 3°8467

1868 | 68 2°13] 1868 3°8493

1869 | 68 0°41} 1869 3°8551

1870 | 67 57°98| 1870 3°8585

1871 | 67 56°12} 1871 3°8640

1872 | 67 53°60} 1872 3°8712

1873 | 67 51°19} 1873 3°8777

1874 | 67 49°64] 1874 3°8828

TERRESTRIAL MAGNETISM, |

for the secular change by imagining a solid globe or ¢erella,} con- centric with the earth but rotating independently of the external shell and having a slightly different period of rotation,—the shell having two poles and the terella two others. While eontinuing to admire Halley's sagacity, we shall not now be disposed to allow sueh a constitution of the interior of the earth, but will rather be led to look to some external influence as the cause ofthe secular variation.

'While we have strong evidence that the Siberian focus has ehanged its position, we caimot assert that the American focus has bcen absolutcly stationary, or that. neither focus has experienced any changes of force. On these points we must be content to be guided by observation alone.

34. It has been supposed by some magneticians that it is possible to compute with something like eertainty the particulars of the motions of the magnetic foci. Hansteen more espeeially (1811-19) computed both the geographical positions and probable periods of revolution of this dual system of foci of force round the terrestrial

ole. Sir Frederick Evans has discussed in connexion with the sub- ject all the most recent observations," and points out two objections to any such theory as that of Hansteen, viz., (1) that, while a mag- netic turning point has been reached in certain regions, there are large portions of the earth in which this ehange has not yet been accomplished, and (2) that in eertain districts of the earth very great changes in force have taken plaee. ''If we turn," he says, ''to the continent of South America and its adjacent seas, we shall find a diminution of the intensity of the earth's foree now going on in a remarkable degree. An examination of the recent observations made by the 'Challenger' officers at Valparaiso and Monte Video, compared with those made by preceding observers, shows that within half a.century the whole force has respectively diminished one-sixth and one-seventh,—at the Falkland Islands one-niuth." On the whole, while there is strong evidence that the Siberian focus has until recently been travelling eastwards, and its analogue west- wards, and evidenec less conclusive that recently a turning point in this motion has been reached, we are disposed to think with Sir Frederick Evans that a formal theory like that of Hansteen does not agree with recent observations. We shall revert to this subject.

35. In Tables III. and IV. certain yearly values of declination, dip, and horizontal force are given for various stations.

INEQUALITIES IN OR CONNECTED WITH TERRESTRIAL MAGNETISM DEPENDING ON THE Sun.

36, As there is a marked likeness between the ways in which the sun dominates over the two great divisions of terrestrial phenomena, meteorology and magnetism, let us endeavour to dosstiie the sun's effect upon the latter by referring to its influence on the former, the chief peculiarities of which are well known to all. We find that the temperature of the air at a given station is subject to a diurnal fluctuation Se its minimum value shortly before sun- rise and its maximum early in the afternoon. We

find likewise that the mean temperature for the day, as well as the amplitude of this diurnal oscillation, depends upon the season of the year, both being greatest about midsummer and least about midwinter. Now, if this were the only manifestation of sdlar influenee upon this fs eg element, it would be possible to predict the temperature or any hour of any day once the mean temperature, the diurnal variation of temperature, and the modification of these for different seasons of the year had been well ascertained, But this amount of tegularity is very far from taking place,—the march of temperature being frequently interrupted, cloaked, perhaps even reversed, by the advent of peculiar weather. Thus we may have very cold weather in midsummer and very warm weather in midwinter, or we may have a very cold afternoon and a very warm early morning, by which means the ordinary conditions of temperature will be completely reversed. In like manner weather interferes even to a greater extent with the diurnal oscillation of the atmospheric pressure, so that, in British latitudes at least, it is only possible to obtain this correctly by means of a long series of observations,

eather, however, does not eonsist of a perfectly lawless inter- ference with periodical phenomena, but is subject to laws of its own, some of which we are beginning to discover. Sometimes weather may exalt or depress the diurnal fluctuation of temperature without otherwise affecting its charaeter; but sometimes too the turning- points and the general appearance of this fluctuation are greatly influenced by peculiar weather.

37. Now it is believed that we have something of this kind in those fluctuations depending on the sun to which the elements of terrestrial Magnetism are subject. Let us take the declination as the most easily studied of the three magnetic elements, and oo we are engaged in eonsidering the traces denoting the

uctuations of declination as derived from a set of self-recording magnetographs in Great Britain. Here we shall at once be able to recognize in an unmistakable manner the diurnal variation depend- mg upon the position of the sun, in virtue of which a freely-

1 eye? ae ° . a > ° ie 8 Terrestrial and Cosmical Magnetism, where the subjeet is well

? In his lecture to the Royal Geographical Society, March 11, 1878,

suspended magnetic needle reaches the easterly extreme of its range about eight in the morning, and the westerly about two in the afternoon. We shall likewise perceive that the range of this diurnal fluetuation is greatest at midsummer and least at mid- winter. In fine, the characteristics of this fluctuation, depending as they do upon the hour of the day and the season of the year, are not very different from those exhibited in the diurnal fluctua- tion of atmospherie temperature. But, however thoroughly we may have ascertained the mean declination and its diurnal oscilla- tion, as well as the modifications of these depending on the season of the year, we shall nevertheless find it impossible to predict the exact position of a frecly-suspended magnet at any moment of a particular day. Here then too we have something which may be ealled magnetic weather, and which interferes with the regular progress of the systematic fluctuations of the magnet. Magnetic weather has, like its meteorological analogue, a set of laws of its own, some of which we are beginning to find out. Sometimes magnetic weather may exalt or depress the diurnal fluctuation of declination without affecting its eharacter, but it is imagined that at other times the turning points and general appearance of this fluctuation may be greatly influenced by peeuliar magnetic weather.

38. There is, however, a kind of magnetic change which, so far as we know at present, is not analogous to anything in meteorology, and introduces an additional element of complexity in any attempt to analyse the fluctuations of terrestrial magnetism. We mcan the well-known magnetie disturbances or storms whieh oceur simul- taneously in places very widely apart. Under these eireumstances it beeomes a question how we can best deal ina practical manner with this complieated system of things.

We do not think that with our present knowledge any better system can be adopted than that first introduced by Sir Edward Sabine in his discussion of the results of the colonial magnetic observatories. Suppose that we have hourly magnetie observations at a station, then first of all we should arrange

these into monthly groups—each hour by itsclf. We should then reject as disturbed observations all those which differ by more than a certain amount from their respective normals of the same month and hour,—the normals being the liourly means in each month after the exclusion of all the disturbed observations, This method enables us, by its exclusion of disturbances, to ascertain with much accuracy the true form of the solar-diurnal variation of the magnetic elements at a given place corresponding to every month of every year, provided only that the observations are sufficiently numerous. On the other hand it will probably fail in accurately giving us the variations from day to day of the ranges of these diurnal fluctuations eaused by the advent of peculiar magnetic weathcr,—inasmueh as the reeords of the extreme effects of such weather will probably be cut off from the undisturbed observations and reckoned among the disturbances.

For instance, it is known that the solar influence on terrestrial magnetism varies from year to year, and it is suspected that there are also short-period fluctuations of solar influence. It would not, however, be a safe proceeding to attempt to estimate numerically this last-mentioned element of fluctuation by taking the suecessive diurnal ranges of those observations at any station, reckoned as undisturbed, by the above proccss, and plotting them as suceessive ordinates of a eurve, and then supposing that this curve would give us.a true graphical representation of solar ehanges. It would rather probably represent such changes with the tops and bottonis of the larger fluctuations cut off. But if the undisturbed observa- tions fail in this respect we can hardly be wrong in supposing that there has been eliminated from them, as far as possible, all influcnee due to magnetic storms, and hence that they will afford us a much better means of estimating small fluctuations, sueh, for instance, as those due to the moon, than we eould have had without their aid.

Finally, with regard to that portion of the observations selected as disturbed, we are probably not certain that every such observa- tion represents a true disturbance, or that the absolute times of occurrence of the various observations selected as disturbed at one station will be the same as those at another. Nevertheless Sir Edward Sabine has shown that at the Kew Observatory eertain laws of disturbance deduced from the whole body of

observations sclected as disturbed are elosely reproduced when this selection is made on a narrower basis—ninety-live days of prominent disturbance being alone taken. With these prefatory remarks we shall now proceed to discuss the diurnal inequality of terrestrial magnetism.

39. Total Diurnal Inequality Defined.—It will be seen further on that disturbed as well as undisturbed observations arc subject to a diurnal variation, but these two variations are different, and the name diurnal inequality is generally given to the compound varia- tion which is the joint resultant of the two. Solar-diwrnal vartation is that portion of the eompound inequality which refers to undisturbed observations, while that whieh refers to disturb- ances has received the name of disturbanee-diurnal variation. It would appear that in the United Kingdom, and perhaps throngh- out Europe, the total diurnal inequality is not very greatly different either in character or range from its most. important component the solar-diurnal variation, at least so far as the

declination is concerned. When the diurnal oscillation of a frecly-suspended magnet was first observed, the subject of magnetic disturbances was not understood, and the early individual deter- minations which have been handed down to us are not such as to justify the expenditure of any very great labour upon them for the purpose of separating the disturbed from the undisturbed obser- vations. Inasmuch, however, as the total diurnal inequality of declination (which is in reality the element given by these early observations) does not greatly differ from the solar-diurnal varia- tion, we may with much justice and little risk of error give the history of these early observations in connexion with that of the solar-diurnal variation of declination, whieh is by far the best known, and perhaps the most important, of all the various magnetic changes produced by solar influence. ’

40. Solar-Diurnal Variation of Declination. —Graham, an instru- ment maker of London, discovered in 1722 that a freely-suspended magnetie needle is subject to a diurnal oscillation of definite char- acter.) The next observer was Canton, who in 1756 began a series of nearly four thousand observations, which he communicated to the Royal Society on December

18, 1759, and from which he coneludes that the range of the diurnal variation is greater In summer than in winter. Macdonald's observations at Fort Marlborough in Sumatra in 1795 (Phil. Trans., 1796), and Duperrey's in the tropics in 1825, were perhaps the first that might lead us to conclude that the amplitude of the diurnal oscillations of the needle is less in the tropics than in middle latitudes, and that the motion of the needle in the southern hemisphere is in the opposite direction to that in which it moves in the northern hemisphere at the same hour.

41. Semiannual Inequality.2-—The existence of these early observations had led some magneticians prematurely to conjecture that there must be a line somewhere near the equator at which there is no horary variation in declination. In 1847 Sabine com- municated to the Royal Society the results of five years' observations at St Helena, showing that at that station for the half of the year beginning at the vernal and ending at the autumnal equinox the motion of the needle corresponds nearly to that in the northern hemisphere, whilst for the other half it corresponds nearly to that in the southernhemisphere. Sabineafterwardsconfirmed and extended his conclusions regarding the semiannual inequality by discussing the results obtained at the various colonial magnetic observatories. More recently, as the result of twelye years' observations at Trevandrum, at an observatory established by the rajah of Travancore, John Allan Broun gave in a very complete form the laws of change of the solar-diurnal variation of magnetic declination near the equator, showing the extinction of the mean movement near the equinox.

42. Perhaps the best way of exhibiting what really takes place is the following, which is that adopted by Sabine.

The mean annual value of the solar-diurnal variation is of what may be called the northerly type in places of middle latitude in the northern hemisphere, aud of what may be called the southerly type in places of middle latitude in the southern hemisphere. Now it us take a northern station, and consider the mean form of its solar- diurnal variation for the six months beginning with the vernal equinox. Here we shall have an oscillation of the northerly type with a range greater than the annual range. For these six months, therefore, we may imagine that the annual range has

been supple- mented by the superposition on it of a variation with a type similar to its own. At the same station, during the other six months, the solar-diurnal variation is less than the mean of the year, as if the annual variation had been depressed by the superposition on it of a variation with a type the opposite of its own, that is to say, with a southerly type. At a station in the southern hemisphere, again, the mean annual form of the solar-diurnal oscillation is of the southerly type, reduced during the six months beginning with the vernal equinox by the superposition on it of a variation of northerly type, and increased during the other six months as if by the super- position of a variation of southerly type. Thus when the sun is north of the equator we may superpose a variation of the northerly type upon both hemispheres, with the effect of increasing the range in the northern hemisphere and diminishing it in the southern ; and while the sun is south of the equator we may superpose a varia- tion of the southern type upon both hemispheres, with the effect of diminishing the range in the northern and increasing it in the southern hemisphere.

Near the equator, as at Trevandrum, where Broun made his observations, we find the mean annual value of the solar-diurnal variation to be extremely small, if not altogether evanescent. During the six months beginning with the vernal equinox the type is entirely northerly, while for the remaining six months of the year it is entirely southerly in character. In fine, at this station the solar-diurnal variation changes its character at the equinoxes, at which time we have, as already observed, an extinction of the mean movement,—not indeed an absence of all variation, but rather a

1 See Walker, Terrestrial and Cosmical Magnetism.

2 This is the name used by Sabine, but its appropriateness may perhaps be questioned.

variation having an undecided character, which for a few days may be of one type and then of the very opposite. There is movement, but no mean movement. f

43. In the following table (V.) the solar-diurnal variation ig given for Kew, Trevandrum, and Hobart Town. Of these

laces the first denotes a station in middle latitude (northern Daniaiewe the second an equatorial station, and the third 9 station in middle latitude (southern hemisphere).

3 Kew. Trevandrum. Hobart Town.

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za Sept. | March. Year. Sept. | March. Tear. Sept. | March. Year, 0 | —6°15 | —4-12 | —5-13 || —1-30 +0°07 | —0°61 || +0°35 | +2°35 | 41°35 1 | —7°42 | —4:96 | —6°19 || —1°25 | +0°35 | —0°45 || +2°15) +4°85 | +3°50 2 | —6:94 | —4°67 | —5°81 || —0°85 | +0°56 | —0°15 || +3°15 | +5°95 | +4555 3 | —5:21 | —3°35_| —4°28 || —0°85 | +0°61 | +0°13 || +3°30) +5°50 | +4-40 4 | —8°25 | —1°95 | —2°60 || +0°03 | +0°53 | +0°28 || +2°40 | +4°30 | +3-35 5 | —1°47 | —1°05) —1°26 |} +0°15 | 0°33 | 4-0°24 |) +1°30 | +2°70 | +2-00 6 | —0°32 | —0°46 | —0°39 |) +0°05 | +0°22 | +0713 || +0°75 | +1°55 | +115 7 | +0°22 | 40°21 | +0°22 || —0°15 | +0°23 | +0-04 || +0°20 | +080 | +-0:50 8 | +0°44 | +0-92 | +0°68 || —0°30 | +0°19 | —0-05 || —0°30 | +.0°30 | +0°00 9 | +0°52 | +1°45 | +0°99 || —0°28 | +0°13 | —0°08 |} —0°85 | —0°25 | —0°55 10 | +0:70 | +1°77 | 41°24 |; —0°20 | +0°09 | —0-06 || —1°10 | —0°70 | —0°90 11 | +0°90 | +1°84 | +1°37-|| —0°07 | +0°10 | +0°01 || —1°15 | —0°85 | —1°00 12 | +1°19 | +1°67 | +1°48 || +0°07 | +0°11 | +0:09 || —1°10 | —0°80 | —0-95 13 | +1°23 | +1°84 | +1:29 || +0°18 | +0°08 | +0:13 || —0°75 | —0°75 | —0°75 14 | 41°56 | 41°22 | +19 || +0°27 | +0-02 | +0°15 || —0°40 | —0°70 | —0°55 15 | 41°93 | +1:09 | +1°51 || +0°29 | —0°11 | +0°09 || —0°15 | —0°65 | —0-40 16 | +2°58 | +1°17 | +1°88 || +0°31 | —0°28 | +002 || —0°-02 | —0°78 | —0-40 17 | +3°60 | +1°43 | +2°51 || +0°48 | —0°45 | +0°01 || —0°10 | —1:40 | —0-75 18 | +4°59 | +1°54 | +3-07 || +1°02 | —0°66 | +0°18 || —0°28 | —2-37 | —1°30 19 |

+5°31 | +1°85 | +3°58 || +1°48 | —0°84 | +0°32 || —0°50 | —3°80 | —2:15 20 | +5-20| +2°40 | +3:°80 || +1°20 | —0°72 | +0°24 |] —1°25 |) —5°25 | —3 25 21 | +3:57 | +2°32 | +2°95 || +0°47 | —0°36 | +0-06 || —2°10 | —5:30 | —3:70 22 | 40°38} +0-54 | +0°46 || —0°32 | —0°13 | —0°22 || —2°20 | —8‘80 | —3:00 23 | —3-18 | —2-18 | —2°68 || —0°93 | —0°07 | —0°50 || —1°40) —0°80 | —1°15

In this table deflexions towards magnetic east are reckoned positive, deflexions towards magnetic west negative. The scale is in minutes of are.

Also in fig. 38 we have a graphical representation of the solar- diurnal variation for the whole year at these three stations, from which it will be seen that the range at Trevandrum is extremely small, and that the curve for Hobart Town is opposite in appearance _ to that at Kew.

Fig. 33.

Finally, in fig. 34 we have a graphical representation of the semi- annual inequality or difference from the whole year’s mean of the two

half-yearly means of Table V., the one half-year (that with thiek lines) commencing at the vernal and the other at the autumnal equinox. It will be seen from this figure that the semiannua inequality is of the same character in both hemispheres, the likeness extending even to its minor peculiarities.

44, Change from Month to Month.—Charles Chambers, director of the Kolaba Observatory, Bombay, remarks (Zrans. Roy. 800-5 December 10, 1868) that ‘‘the regular progression from month to month in the diurnal variation is so distinctly shown in the Bombay observations as to lead, on a first inspection, to the supposition that the law of variation is identical throughout the year, the extent only (ineluding a reversal of direction) varying from mouth to mouth. But in this respect a different exposition © the character of the variation in different months shows that the first thought would be inaccurate.” He then proceeds to discuss

at length the monthly values of the solar-diurnal variation at Bombay. Broun has likewise (Trevandrum observations) discussed at length the solar-diurnal variation at the Trevandrum Observa- tory. It would hardly be of service to reproduce here the results of these discussions; but when such analyses become sufficiently

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extensive they may be expected to throw light upon the cause of the solar-diurnal variation.

In the following table we have mean monthly values of the declin- ation range at the Kew Observatory corresponding to forty-eight points in the year—derived from sixteen years' observations :—

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TaBLE VI.—Containing Monthly Means (unit =22':04) for Forty- eight Points in the Year of the Kew Solar-Diurnal Declination Ranges. Thus Janwary (0) gives the monthly mean of which the middle date is the very commencement of the year, January (1) that for one week after the commencement, and so on.

Mean Value. Mean Value. Mean Value.

312 May (0) "599 Sept. (0) 594

328 (1) 581 (1) "577

340 (2 "573 (2 554

362 6) "586 6) "532 Oct.

It will be seen from this table that, while we have a maximum about the summer and a minimum about the winter solstice, we have unmistakable indications of maxima at or about the equinoxes. This does not take place at a tropical station such as Trevandrum.

45. Behaviour near the Magnetic Pole.—Figs. 83 and 34 exhibit the most prominent features of the ser aiuaell eeintias of declina- tion in the extra-tropical regions of the northern hemisphere. If an observer stand over the centre of the needle and look towards the marked end, or that which points to the north, he will perceive a deflexion towards his right hand which will reach its extreme about 8 A.M. and a deflexion towards his left hand which will reach its extreme about 2 p.m. But are these deflexions to the right and left hand of geographical or of magnetical north? This question has been answered by Sabine in his discussion of the results of hourly observations of the magnetic declination at Port Kennedy (Phil. Trans., 1868, p. 660). ‘This station is 72° 0’ 49” N. lat. and 94° 19’ W. long., and here the marked end of the needle, while it points towards the magnetic pole, points in reality about 35° to the west of south. Now the marked end of the needie when viewed at 8 A.M. 1s seen at Port Kennedy to have moved to the geographical west but to the magnetical east. It would thus seem that throughout the extra-tropical regions of the northern hemisphere the 8 a.M deflexion of the needle is always towards the magnetic east but not always towards the geographical east, while the deflexion at 2 P.M. will always tend towards the magnetical west but not always towards the geographical west. In fine the oscillations have

reference to the north magnetic pole of the earth and not to the north geographical pole. No observations of this nature have been made in the southern hemisphere.

46. Long-Period Inequalities of Declination Range.—It was first observed by Lamont that the yearly values of the diurnal range of magnetic declination at Munich presented signs of a long-period variation. In 1852 Sabine (Phil. Trans., 1852, p. 103) showed that this inequality corresponded in its progress with that of the frequency of black spots on the surface of the sun.

The existence of black spots on the disk of the sun was long ago known to the Chinese. In Europe they were first scientifically observed after the invention of the telescope, and it was deduced from their behaviour that the sun revolves about his axis in about twenty-six days. Hofrath Schwabe of Dessau, from a long series of forty years' observations of the sun, was the first to show that the state of the sun's surface as regards spots was not uniform, but that their frequency was subject to an inequality the average period of which was about eleven years. Other inequalities both of longer and shorter periods have been supposed to exist, but the eleven- yearly period is the most prominent and is best assured. Although the sun-spot catalogue of Schwabe is the first with pretensions to completeness, yet Professor Rudolf Wolf has endeavoured to render observations of sun-spots made at different times and by different observers comparable with each other, and has formed a list exhibit- ing approximately the relative number of sun-spots for each year. This list extends back into the 17th century, and is of great valuc in confirming past all doubt the existence of the eleven-yearly period. It will appear below that the sun is probably to be regarded as giving out most light and heat at those times when sun-spots are most frequent. The most accurate and now universally adopted method of estimating sun-spots is to take the spotted area expressed in millionths of the sun's visible hemisphere.

To return from this digression, —the correspondence between sun- spots and declination ranges detected by Sabine was of such a nature that years of large declination range agreed with those of many sun- spots, and vice versa. In the same year with Sabine (1852) Dr Rudolf Wolf and M. Gautier

independently remarked the same coin- cidence. Subsequent discussions have entirely confirmed the fact of this connexion, and in May 1879 William Ellis (Phil. Trans., 1880, p. 541) showed that the observations made at the Greenwich Observatory during the years 1841-77 indicated a relation of this nature between the diurnal ranges of horizontal force as well as those of magnetic declination on the one hand and the amount of sun-spot frequency on the other. The general character of this coincidenco between sun-spot frequency and declination range is exhibited graphically in fig. 39 below.

47. Ratios of Ranges in Years of Maximum and Years of Mini- mum Sun-Spot Frequency.—Broun (Trans. Roy. Soc. of Edin., vol. xxvii.) has shown that the ratios of the diurnal ranges of declination in years of maximum to those in years of minimum sun-spot frequency for places widely apart on the surface of the earth are very neatly alike. This will be seen from the following table :—

Taste VII.—Ratios of Declination Ranges in Years of Maximum and of Minimum Sun-Spot Frequency.

Ratio \ min. Observer,

Mean (oe

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1°74

Cassini and Arago.

Gauss.

Lamont.

Lloyd.

Kay.

Younghusband and Lefroy. Broun.

1°66 1°52 1°57 1°51 1°56

Hobart Town TOrOutOss saccccdiaiees ses Trevandrum

48. Closeness of Correspondence—Lagging behind of Ranges.— Stewart has shown from a discussion of the declination ranges at Kew, Trevandrum, and Prague (Proc. Ruy. Soc., March 22, 1877, February 8, 1878, May 16, 1878) that this correspondence between the state of the sun's surface and the diurnal range of declination extends to inequalities of short period as well as to that of which the period is sk ramen eleven years, but that a particular state of the sun's surface precedes in point of time that of the declination range to which it corresponds, —in fine, that the solar cause precedes the terrestrial effect, which latter lags behind to an extent that is sometimes considerable. These conclusions have been confirmed by Ellis (ut supra), and have likewise been extended by him to the horizontal force. The close nature of this correspondence, as well as the lagging behind of the terrestrial magnetic effect, will be seen from fig. 35. ;

There are indications that this lagging behind of the magnetic effect is greater for sun-spot inequalities of long than for those of short period, a method of behaviour quite similar to what we find in meteorological phenomena.

49. Analysis of Long-Period Inequalities. ~~ no sun-spot

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data sufficiently accurate for a discussion, in a complete manner, of questions relating to solar periodicity before the time when Sehwabe had finally matured his system of solar observations, which was not until the year 1832. We have, however, a much longer series of the diurnal ranges of magnetic declination, which we have secn to

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Fig. 35.

follow very closely all the variations of sun-spot frequency, so it is conceivable that they may give usa better estimate of true solar activity than that which can be derived from the direct measure- ment of spotted areas.

These considerations have induced Messrs Stewart and Dodgson to attempt an analysis of the diurnal ranges of magnetic declination, their method being that which has been pursued by Baxendell and probably other astronomers with observations of variable stars.1 The observations at their disposal for this research were those which had been used by Professor Elias Loomis in his comparison of the mean daily: range of the magnetic declination with the extent of the black spots on the sun (American Journal of Science and Arts, vol. 1. No. cxlix.). These observations are recorded as monthly means of diurnal declination range, and it was found neeessary to multiply each by a certain factor, first on account of the change of declination range from one month to another, and secondly to bring them all to the standard of the Prague observa- tions, —Prague being the place where the longest series of such obser- vations has been made. For this latter purpose preeisely the saine correetions were applicd as those made by Professor Loomis.

The resnlt of this analysis has been to indicate the existence of three inequalities,—two dominant ones with periods of about ten and a half and twelve years, and a subsidiary one with a period of about sixteen and a quarter years. By these means the observed annual values of declination range have been reproduced with an average error of 39’. The amount of agreement between the observed and ealculated values will be seen from the following diagram (fig. 36).

50. Notwithstanding the considerable amount of agreement

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Fig. 36.

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between the results of observation and caleulation which appears in the diagram, it would seem that the series of observed values at present obtainable is too short to render the analysis a very accurate one. It will certainly not bear carrying back forty or fifty ycars beyond its starting point, which was in 1784, and it would be very hazardous to earry it forward any consider-

1 Proc. Lit. and Phil. Society of Manchester, March 8, 1881,

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able length into the future. It will be secn that calculation indicates a maximum of declination range about 1884, but not so pronouneed a maximum as that of 1871. Here then we have a prevision which observation will either fulfil or contradiet, giving us a practical test of the value of this analysis.

51. The remarks now made would seem at first sight to imply that we are not yet furnished with sufficient yearly records either of declination ranges or of aecurate sun-spot observations to enable us to analyse the long-period solar inequality with such completeness as to carry our calculations more than a very short distance into the future with any chance of success, and

that we may have to wait for another hundred years' observations before we are able to do so. On reflection, however, it would seem that long-period inequalities may be caused by the superposition of those of short period, and thus that an analysis of the latter may lead to that of the former. It would relieve us if this were found to be the case; for the observations at our disposal may be sufficient to enable us completely to analyse short-period inequalities, assuming that we have in such the elements of a true periodicity.

A remark made by the authors of the above analysis would seem to indicate that a connexion of this nature between long and short periods does in all probability exist. It isa well-known fact that the so-called eleven-yearly oscillations of declination range are at certain times large and at other times small. Thus, for instance they have been large for the last forty ycars, but they were small about the earlier part of the present century. Now it is clear from an inspection of the observations (see fig. 36) that a series of large oscillations is accompanied with an exaltation of the base line, or line denoting average efficiency, while a series of small oscillations is accompanied with a depression of the same. The result is a long-period curve of the base line, the beat period, so to speak, of the eleven-ycarly inequality.

Now a phenomenon precisely similar occurs in connexion with shorter periods. If we take inequalities having a period of three or four months, we find that such are alternately well-developed or of large range and badly-developed or of small range, and that a large range of such is accompanied with an exaltation of the base line or line of average efficiency, while a small range is accompanied with a depression of the same. The result is a curve of the base line of which the period is roughly speaking eleven years. May we not therefore imagine that the so-called eleven-yearly period, or, to speak more correctly, the ten and a half and twelve-yearly periods into which the eleven-yearly period may perhaps be analysed, may be in reality beat periods for shorter disturbances? Is it not there- fore possible that a study of these shorter periods may give us information regarding the nature of the eleven-yearly period, whether for sun-spots or declination ranges, which the small series of actual observations is incompetent to afford?

52. Declination-Range Wcather.—Allusion has already been made to magnetical weather as perhaps having laws similar in some respects to those which regulate meteorological weather. Now the diurnal ranges of magnetic declination and those of atmospheric temperature present us with elements of the two weathers that can easily be diseussed. Again there is strong evidence for supposing that an element of meteorological weather, such, for instance, as temperature-range, travels as a rule from west to east, so thata

eculiar style of temperature-range might be expected to appear frst in America and some days afterwards in Great Britain. It becomes therefore a question for inquiry whether this travelling from west to east applies also to magnetical weather as evidenced by the diurnal declination-range. Stewart is of opinion that this law of travelling applies to both, but that magnetical weather travels faster than meteorological (see Proc. Roy. Soc., January 10, October 23,1879, and June 9, 1881). From the preliminary discussion made by him it would appear that Kew lags behind Toronto as regards phase of magnetical weather by 1°6 days, that Prague lags behind Kew 0°7 days, and that Trevandrum lags behind Kew by 9°7 days. This conclusion cannot, however, be regarded as established until it is confirmed by a more complete discussion of observations.

58. Disturbance-Diurnal Variation of Declination.—Magnetic storms (§ 38) were so named by Baron Humboldt, one of the first observers of such phenomena. From observations at Paris, Berlin, aud Freiburg he found that very frequently, though not universally, these three stations were simultaneously affected by such storms. The observation of magnetic disturbances was afterwards pursued ina systematic manner by Gauss and Weber of Gottingen. Term days were instituted for this purpose by these observers, —that is to say, periods each of twenty-four hours length during which observa- tions were simultaneously made at intervals of five minutes at Gottingen and about twenty other stations distributed generally over the continent of Europe. Finally, the establishment by the British Government of the colonial magnetic observatories, and the energy and sagaeity of their director, Sir E. Sabine, have very greatly increased our knowledge of these remarkable phenomena.

Sabine has not merely separated the disturbed from the undis- turbed observations as explained in § 38, but he has divided the former into two categories—(1) those tending to increase westerly

declination and either element of force, and (2) those tending to diminish the same. He finds that these two categories obey different laws, from which he argues that there are at least two scts of disturbing forces. In fact, if we have to give up the idea ofa single force of constant type, it is natural to ask if the phenomena of dis- turbance can be approximately represented as due to the unitcd action of two independent types of force. It was probably some such idea that led Sabine to separate disturbances into these two categories above mentioned. Herc there is no attempt to assert that these two types represent an ultimate and complete analysis of the forces concerned. We merely use the separation as the most convenient method at our disposal in the present state of our know- ledge for ascertaining whether there be indications of a dual system.

M4. ‘Results in the Northern Hemisphere.—Sabine’s method of viewing the phenomena has enabled him to obtain the disturbance- diurnal variation for the following stations :-

MRE eie ere aatie.s.- sce seccoctvcrerse. OL OO N. lab, 0° 8’ W. long. RNR cereessissececcoscesecereres BO OL Nw 55 DG) GH) 1 4; RIOT DGS, +. .sccucsescs.ckctisveescssesee 51 19 N. ,, Ase Qe. 5, or Le 43 40 N. ,, Tn 0 We 4, PRU CHINICUY «0.0 dePEMEIAITOW vo cencssenseseeseds-cnpeccces wa 2M. a 156 15 W. ,,

The above stations have been so chosen that Kew may be regarded as on one side and Peking and Nertchinsk as probably on the other side of the Asiatic pole, while Toronto may be regarded as on one side and Port Kennedy and Point Barrow as on the other side of the American pole (§ 29). The qnestion as to what influence, if any, these poles have upon the disturbance-diurnal variation of declination is thus one which may be answered by examining the results obtained at these various stations. For this purpose, instead of recording the aggregate disturbances at the various hours, the result is expressed in ratios,—the mean hourly ratio for the day

being taken as unity, or in other words the whole body of disturbances for the twenty-four hours being reckoned as twenty-four. The results of this method are graphically represented in fig. 37, where in the left-hand curves Kew time is used, and in the right-hand curves local time, cach starting at 04.!

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55. At all the various stations one curve exhibits unmistakably a single progression, while the other exhibits more or less dis- tinctly a double progression. At Kew, Toronto, Port Kennedy,

1If we refer to a paper b – y C. Chambers, direetor of Bombay Observatory (Phil. Trans., 1868), it will be seen that westerly disturbances at Bombay pre- on the same characteristics as westerly at Peking or Nertehinsk, the maximum ing about twenty-two or twenty-three hours Bombay astronomical time.

and Point Barrow it is the easterly disturbances which exhibit this single progression; while, on the other hand, at Peking and Nertchinsk, stations which are oppositely related to the Asiatie magnetic centre, it is the westerly disturbances which do so. It is imagined by Sabine and others that this peculiar reversal is due to the fact that Kew and its associated stations may be regarded as on one side and Peking and Nertchinsk as on the other side of the movable magnetic system.

Sabine has likewise remarked that the single-progression curves, whether denoting easterly or westerly disturbances, exhibit maxima which take

place not far from the same absolute time. We have therefore plotted all the left-hand curves according to Kew time, that the eye may readily see the amount of simultaneity which their corresponding phases exhibit. It will be noticed that there is a very striking.simultaneity between the maxima of Kew, Toronto, Peking, and Nertchinsk, but that the maxima for Port Keunedy and Point Barrow, while both occurring about the same time, fall at a time decidedly if not very greatly different from that of the other maxima. Indeed the time of maximum for Port Kennedy and Point Barrow is not far from the time of minimum for the other stations. Now it has been noticed by Sabine that Port Kennedy and Point Barrow may be regarded as on one side of the American magnetic centre of intensity, while Toronto and the other asso- ciated stations are on the other side. Itseems therefore possible to connect this last fact with the change in the time of maximum. Sabine has likewise remarked that the aggregate amount of dis- turbances is much greater at Point Barrow than at any other station. Now Point Barrow is likewise that spot where auroras are most frequent. Thus in the phenomena we are now discussing there is first of all a marked reference to the Asiatic pole ; secondly, a reference not so marked, perhaps, to the American pole; and thirdly, a reference to the centre of auroral activity. Sabine, whose experi- ence of such matters is very great, appears to think most of the reference of these phenomena to the Asiatic pole. He thinks that ‘‘of the two magnetic systems which are distinctly recog- nizable in the magnetism of the globe one has a terrestrial and the other a cosmical source,” and that it is ‘‘the latter of these two systems which, by its progressive translation, gives rise to the phenomena of secular change and to those magnetic cycles which owe their origin to the operation of the secular change,” con- curring with the conclusion of Walker that ‘‘the magnetic influence at any point of the globe is the result of two distinct magnetic systems, the principal of which is the magnetism proper of the globe, having its (northern) point of greatest attraction in the north of the American continent, whilst the weaker system is that which results from the magnetism induced in the earth by cosmical action, and of which the northern point of greatest attraction is at present in the north of the Asiatic continent. Thus the direction of the magnet at any point results from the supcr- position of these two systems, the nearest pole being always pre- dominant over the more remote” (Phil. Trans,, 1868). While dis- posed to think that something of this nature should be accepted as a working

hypothesis, we would, however, point out that the Asiatic pole cannot be regarded as accounting for all the pheno- mena of disturbances, but that the focus of disturbance is probably nearer the focus of auroras than it is to cither of the foci of magnetic intensity.

The right-hand curves representing these disturbance-diurnal variations which have two maxima are, except for Port Kennedy and Point Barrow, decidedly irregular. Sabine remarks also that, instead of having a reference to absolute time like those with one progression, their reference is rather to local time. We have therefore plotted all these curves according to local time; nevertheless this reference does not come out with very great distinctness ; but it must be remembered that our analysis of disturbances into easterly and westerly, although, in the hands of Sabine, it has given us much new information, has no claim to be regarded as final and complete.

56. Results in the Southern Hemisphere.—Table VII}. shows the disturbance-diurnal variation of declination exhibited for St Helena, 15° 56’°7 S. lat., 5° 40’°5 W. long.; Cape of Good Hope, 33° 56’ S. lat., 18° 28’°75 W. long.; Hobart Town, 42° 525 S. lat., 147° 27‘5 E. long.

At St Helena and the Cape the easterly disturbances present the appearance of a single progression, while the same remark slightly modified applies to the easterly disturbances at Hobart Town. Again the times of easterly maxima for St Helena and the Cape are very nearly simultancous, while Hobart Town, which we may regard as situated on the opposite side of the chief southern magnetic centre from St Helena and the Cape, has its maximum nearly coincident in absolute time with the minimum of the other two stations. It would thus seem that the chief magnetic centre of the south is similar in its action as regards these phenomena to the chief mag- netic centre of the north. Again the absolute time of single max1- mum for the south as determined by St Helena and the Cape is about twelve hours different from the corresponding time for the north as determined by Kew, Toronto, Peking, and Nertchinsk. All this is in favour of the working hypothesis already mentioned.

Tas.e VIII. Local St Helena. Cape of Good Hope. Hobart Town. Astro- so ie Easterly | Westerly | Easterly | Westerly Easterly | Westerly

ours. | Ratios. | Ratios. | Ratios. | Ratios. | Ratios. | Ratios.

0 3°24 2°46 2-1 1°6 114

1 3°17 2°39 au 1:2 1:26

2 Gr 1°88 16 1:0 1:32

3 2:00 1°44 1E6) 0°8 1°40

4 0°89 29) 0°8 07 1°39

5 0°34 0°76 0°4 06 1°32

6 0°14 0°45 0-4 0°8 1:16

7 0°05 0°50 Ou 1:2 0°62

8 0°03 0°44 O71 Ais 0°40

@) 0°03 0:37 0°2 12 0°32 10 0:07 0°43 0-1 ed 0°28

11 0:00 0°42 0°2 0°8 0°74

12 0-00 0°31 0-3 07 0°62 ‘ 13 0:00 0°32 0-4 0°6 0°55 0

14 0:01 0°24 02 0°6 0°63 a 15 0:00 0°29 0-4 0°5 0°85 < 16 0:00 0-28 O-4 0°4 1:07 0°84 17 0°08 0°24 0°5 0°4 0°87 0°47 18 0°39 0°42 1:0 0°8 1:02 0°44 iy 0°87 0°89 18 1:2 1°53 0°53 20 1°52 1°52 2°3 1°4 1°58 0:70 21 2°51 1°72 2°3 iy 1:41 0°55 22 3°08 210A 2°5 1°8 1°27 0°55 23 2°78 2°60 2°7 ily 1°24 0°62 ;

cr

Finally, the westerly disturbances at the three southern stations bear greater marks of a double progression and of irregularity just as they did in the

northern hemisphere, and moreover like their northern analogues they are regulated by local rather than by absolute time.

57. Distribution of Declination Disturbance over the Various Months of the Year.—Broun was probably the first to remark in redueing the Makerstoun observations that the disturbances were greatest at the equinoxes and lcast at the solstiees. His method was to find for each month the mean diurnal inequality, and then to consider the difference of each individual observation from the mouthly mean for that hour as a disturbance, the summation of all such differences for the month denoting the monthly disturbance value. The following table embodies the results at various stations—those at Toronto, Hobart Town, and the Cape being given by Sabine, and that at Bombay by C. Chambers, who has pursued Sabine's method of separating disturbances :—

TABLE IX.—Monthly Distribution of Declination Disturbances,

Cape of

Good Hope. Hobart Town,

Easterly. Westerly. Easterly. Westerly. Easterly Westerly. Easterly Westerly.

NH ORS

September… October Novembcr.. December..

SSR EEOC Ss DARANAMNINSHEADS BSERSRDAUSESSE SORrERronrEooSS Mk WONNDNHSNDA®W BSRe2Ssvssaasy eo S&S Solo Sete wy vokawwocad gia BEE OSSOORHHH WOSSAADKROBHOM Legh ag SY te ES WAN NAUWDANYEEG DWNDRHONAHAN HOH OSCOnHHH Vdswarmawdareesa SREssSarkse x

58. A careful inspection of this table, without attempting a more complete analysis, will, it is thought, lead to the following con- clusions :—

(1) Although for any station the distribution of the easterly dis- turbances over the various hours of the day is generally different from that of the westerly, yet the same law of distribution over the various months of the year is followed by the easterly and by the westerly disturbances at any station—the law at one station being. however, different from that at another. ,

(2) In all stations there is first an annual inequality exhibiting a maximum generally a short time after the summer solstice witha corresponding minimum for the winter solstice, and secondly a semi- annual inequality exhibiting a maximum generally a little after each equinox.

(3) The equinox maximum is very conspicuons at Toronto; but the summer maximum is most conspicuous at the other stations.

59. In § 38 it was observed that the observations selected as dis- turbed at any station may nevertheless be a mixture of what may be termed true disturbances and of the more prominent specimens of magnetic weather. The truth of this statement would appear to be borne out by the laws now given. In one of these we find that dis- turbances, at all stations, havea maximum about the time of the summer solstice and a corresponding minimum about the time of the winter solstice. But the absolute time of the summer solstice for

stations north of the equator corresponds with that of the winter solstice for stations south of the line. It would therefore appear that in so far as this law is concerned such disturbances lack the element of simultaneity. On the other hand, a law of this nature would naturally hold for magnetic weather. For at any station the diurnal range of declination is greatest at the summer solstice, and henee any considerable proportional variation of this would, if repre- sented by a fixed scale, present the appearance of being greatest likewise at this time. The question thus arises whether this law does not rather apply to magnetic weather than to real disturbance,

Again the semiannual inequality of disturbance exhibits through- out the globe a maximum at the equinoxes, and thus presents the element of simultaneity which was wanting in the annual. This law may therefore refer to true disturbance, and this view is sup- ported by the fact that the aurora— which may be regarded as the universal accompaniment of great and simultaneous disturbances— obeys, as we shall afterwards see, in those stations where it has been well observed, this very same law, that is to say, it has like- wise maxima at the equinoxes.

60. Distribution of Declination Disturbances over Various Years, —In 1852 Sabine discovered (Phil. Trans., 1852, p. 103) that dis- turbances have a long-period inequality allied to that of sun-spots in such a way that a maximum and a minimum of disturbance coincide with a maximum and a minimum of sun-spot frequency.

This will be seen from the following table (X.), in which we have the relative values of declination disturbance at Toronto and Hobart Town compared with the number of groups of spots observed on the sun's disk :—

Values of Declination Disturbance.

Groups of Sun-Spots, Toronto. Hobart Town.

1843 0°55 0°48 34 1844 0°73 0°82 52 1845 0°62 0°67 114 1846 1°26 1°03 157, 1847 1°40 1°44 257 1848 1°43 1°60 330

61. The following table (XI.) exhibits the same thing for Bombay. The first column of this table is derived from the magnetic results of C. Chambers, while the sun-spot areas are those of Messrs De la Rue, Stewart, and Loewy.

Aggregate Values (in Minutes) of Declination Disturbances.

1532°1

Sun-Spot Areas,

1852 1313 1297 1211

1421°6 951°8 1240°5 691°1

We may conclude from these tables that declination disturbanees march with sun-spots, but that the alliance between these two phenomena is probably not so intimate as that between declina- tion ranges and sun-spots.

62. Distribution of Declination Disturbances over the Surface of the Globe. —It is well known that disturbances are comparatively small near the equator, while they are great near the magnetie poles, and greatest of all perhaps near the position of maximunl auroras. If we adopt Sabine's system of separating disturbed from undisturbed observations, it is thus clear that the same separating value cannot be adopted at all stations. At first sight this would scem to introduce an element of uncertainty in the estimation of disturbances, but it was soon found by Sabine that no very great nicety is required in this matter. Not only do the laws which regu: late disturbances at a given station remain comparatively unaffected by the magnitude of the separating value, but it is likewise easy to tell whether the aggregate disturbance value at one station is de- cidedly greater or less than at another. Probably at present it would be impossible to obtain more definite information than this.

63. The following table (XII.) exhibits the proportion between the aggregate amount of easterly and that of westerly disturbanees of the declination at various stations in both hemispheres :—

Name of Station. Easterly. Westerly. Monon borssccusesss suet) pe

Point Barrow 1°63 il Port Kennedy 1°85 1 Carlton Fort . 1°74 1 Kiewit. oscs s-mes-s somaumesemaeecescen est aemas 1:19 1 PEKING Miisscectsccesscenecesecce ecees ieee ileal BOMPAV sc avessceerscesesseeceeonetisess eeeeee 1°6 1 SU HieIBnAy ce. csscoscee cece teense cree 1°30 Cape of Good Hope …....ssccesseeeeee 1 1°51 Mobart "lowill (2.~~eccssesccoessersssscessene 1 1°40 Falkland Isles……..~~.— 0008 1°66 1

64. Annual Variation of Declination.—The declination fluctua-

tions of short period hitherto discussed are not necessarily accom-

nied by a permanent change of mean position of the needle. We have now to inquire whether there be any fluctuations of long period (besides the secular change discussed in §$ 80-33) tending to alter perceptibly the position of the magnetic needle. This leads us at once to the annual variation, for our knowledge of which we must look to the later-made and more accurate observations, in which all possible sources of error have been carefully eliminated. Broun has made an exhaustive experimental inquiry into the various sources of error whieh could possibly influence his declination needle at Trevandrum. His conclusion was that the variations of torsion of a well-made thread are not sufficient to produce a sensible effect upon the position of a powerful magnet. In fact Grubb's magnet, weighing 6000 grains, and Adie's, weighing 1100 grains, give almost identical results. 'We may extend these con- clusions to other observatories where well-devised instruments have been established, and look with much confidence to such instru- ments registering correctly the secular as well as the annual change of declination that may be taking place at each locality.

65. The following table (XIII.), borrowed, with the exception of the Trevandrum and Bombay results, from E. Walker's Terrestrial Maynetism, shows the annual variation at seven stations :—

Observation Years,

Mean Annual

>

3

1858-62 1844-48 1841-49 1841-46 1845-51 1854-69 1859-65

WOH ROONEY oo er ho orto co RPaANS9I0 6

Tanne XIV.—Showing the Mean Annual Variation for each Month of the Year at Seven Stations.

7 e

Rs i = | ‘Trevandrum. : – | 2 |\we| 3 > oie |i | s 2 2 & 2 SS 2 «| Grubb.| Adie. | 3 — P non “ u “ u “

— 2°4 | +64°2 | —22°2/ + 1:2} + 6:3} 4+11:0

— 1:2} —10°8 | —28‘7 | + 3°4/ + 8-7} +16°3

—13°8 | —62°4 | —24:1| + 5°6| 4+ 8:7 | 4+ 9°8!

+ 8:4 | —58°2 } —20°6 | + 1°6) + 2:2} 4+ 1:7

— 3°6 | —61°8 | —12°2/ — 2°8; — 8:2) 4+ 1°6

—19°8 | —48°2 | — 4°5| — 87} —10°5| 4+ 0-4 |

+ 18) — 4:8) +13°6| — 8:0} —11°1} — 8°9

+ 7:2 | +25:2 | +27°6 | + 1:2} — 3:0} 4+ 1:2

+ 7:2 | +42°6 | 38°5} 4 3°3] — 1°3 | —18°2

— 3°0 | +29°4 | +42°9| + 7:1] + 3:2 | —10°9

+18°0 |} +43°2| + 7:9) 4+ 23/4 26/4 3:1

+10°2 | +49°8 | +16°7| — 4:99} — 1:2) — 7°0

Here + indicates that the marked pole of the needle is to the west and — that it is to the east of its mean position for the year.

66. Tocancel the irregularities of this table let us take the means from April to September and from October to March, the former embracing the months around the June solstice and the latter those around the December solstice (Table XV.):—

Means from October to March.

Mcans from April to September.

“ “ RTOS Te vas tsicoss0csssecoscusescress —23°7 +31°8 Eee ssh isaciecssss.sssecisceces — 45 +17°1 Meteecsccntss 0. — 54 + 69 Cape of Good Hope —28’°7 +30°9 Hobart Town …. —18°7 +17°3

Trevandrum…

It will be seen from the above that the means for Trevandrum and Bombay present opposite signs to those for the other stations. The whole amount for Trevandrum is no doubt very small, and Chambers does not regard the evidence for Bombay as conclusive ; but on the whole it would appear that two observatories near one another present evidence of a similar behaviour in declination, and we are therefore disposed to regard it as a reality.

67. Semiannual Variation of Declination.—If we look at the numbers of Table XIV., we shall see that there are traces of turning points at the equinoxes. Let us, in order to exhibit this, compare together the sums for the six months grouped around the two equinoxes with those for the six months grouped around the two solstices—that is to say, eompare the sums for February, Mareh, April, August, September, October, with those for November, December, J anuary, May, June, July—and we thus obtain the following table (XVI.):—

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Sums around Sums around Equinoctial Mouths. | Solstitial Months.

sewn penta cclerinesc’ceiscciceesaneessiseiascncos +104°2 —85’°7 PHOMOMUOs.c.c>—cscccecessscccevcoseets tocane + 96°4 —21°0 STHPEM@IGIARN. «205s-c-cnc rc: vcens-ensnoscesae- + 42 + 4°8 (CHIE. Cs tin acopagganiconsadtoncascAgconecndosceBEe + 47°4 —34°2 GAG NOW) senass-cesescceccvsaccenasesse — O7 +425°6

— 19°0 H

+ 02

68. Solar-Diurnal Variations of the Horizontal and Vertieal Com- ponents of Magnetie Force.—Although self-recording magnetographs have been established in many observatories throughout the globe, yet, owing to the peculiar difficulties of the task, and the labour of the process of reduction, very little has been done towards determin- ing the solar-diurnal variation of the horizontal and vertieal compon- ents of the earth's magnetic force. Senhor Capello of the Lisbon Observatory has, however, made progress with his reductions, and has already published valuable information regarding the solar- diurnal fluctuation of the two force elements at his observatory.

In his attempts to climinate the disturbances of horizontal and vertical force by the method of Sir E. Sabine, Senhor Capello has experienced considerable difficulty, more particularly with the records of the vertical force magnetograph. This instrument and the bifilar have very often been found by him to change their position of equilibrium after strong perturbations. Again there is generally, for any hour, a variation at the beginning and end of the month from the monthly normal value for that hour owing to change of temperature, and this cannot be completely corrected inasmuch as the coefficient of temperature is not exactly known. These two causes combined tend to falsify the results when the plan adopted is the method of comparison between the individual values of any hour and the normal monthly average of that hour. Senhor Capello has found it necessary to seleet and extract the disturbances, not directly from the hourly values, but by comparing the variation of an individual day with the average diurnal variation derived from the month.

To illustrate this method by means of an example, let us imagine that the sum of the twenty-four hourly values for a particular day is 24,000, and that the average monthly diurnal variation would indicate that a particular hour of this day should have a value 990, then, if the value for this hour should prove to be greater or less than 990 by more than a certain amount, it would be set aside as a disturbed observation. Senhor Capello rather thinks it will be desirable somewhat to modify this method, and he eoncludes his remarks

by observing that for this and other similar questions it is most necessary that directors of establishments possessing magnetographs should agree together to employ the same method in their reductions in order that their results may be compar- able with each other. With the view of adding weight to these remarks, we may quote the observation of Sir William Thomson, that our ability to analyse mathematically that influenee which produces the diurnal variation will depend upon our knowing at a certain number of stations the exact nature of this diur- nal variation for each of the three magnetic elements. A complete theory of this diurnal influence must therefore wait upon the concerted action of the directors of the various establishments possessing magnetographs.

69. Change in Horizontal Foree Range from Month to Month.— Although we do not possess finally accurate determinations of the solar-diurnal variations of either element of the force, yet we are in possession of information regarding the ehange in the diurnal range of the horizontal force from month to month at the Greenwich Observatory. William Ellis has given us the following table (Phil. Trans., 1880) representing the monthly mean diurnal range of horizontal force at that observatory expressed in ten-thousandths of the whole horizontal force. In the formation of these means, days of great magnetic disturbance were rejected, and also certain other days on which there prevailed a smaller but considerable amount of disturbance estimated according to a general standard formed in the examination of many thousands of photographs.

TABLE XVII.—Aonthly Mean Diurnal Range of Horizontal Force at Royal Observatory, Greenwieh.

July. Aug. Sept. 272″ W20°2 “Der2

Oct. 19°8

Nov. Dec. 14:3 11°6

Jan, Feb. Mar. 13° 14:8 201

April. 27°4

May. June. 26°9 273

Thus, like the declination range (§ 43), the horizontal force range has a maximwin in summer and a minimum in winter, and exhibits a tendency towards maxima at the equinoxes.

70. Long-Period Inequalities of Horizontal Force Range.— Lagging Behind.1—Ellis has compared the diurnal range of the horizontal force as well as that of the declination at Greenwich with the period of sun-spot frequency, his comparisons extending fron 1841 to 1877, and he has deduced the following conelusions:—

1 Secchi (Wolf's Astronomische Mittheilungen, No. 21) seems to have been the first to indicate a relation between the state of the sun's surfacc and the diurnal variation in the horizontal forec.

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(1) The diurnal ranges of the magnetic elements of declination and horizontal force are subject to a periodical variation, the duration of which is equal to that of the known eleven-ycar sun- spot period.

(2) The epochs of minimum and maximum of magnetic and sun- spot effect are nearly coincident, the magnetic epochs on the whole occurring somewhat later than the corresponding sun-spot epochs. The variations of duration in different periods appear to be similar for both phenomena. ;

(3) The occasional more sudden outbursts of magnetic and sun- spot energy, extending sometimes over periods of several months, appear to occur nearly simultaneously, and progress collaterally.

71. Disturbanee-Diurnal Variation of Foree Components.—We may derive the following conclusions from the results obtained by Sabine for the observatories of Toronto, Kew, and St Helena. For cach element there are two categories, namely, those disturbances which tend to increase and those which tend to diminish the clement in question.

(1) At Toronto the disturbances increasing both elements of force well represent single progressions with maxima occurring for both about 4 or 5 hours local time. Again the disturbances decreasing both elements represent fairly well single progressions with maxima occurring for both at about 14 or 15 hours local time.

(2) At Kew the disturbances increasing both elements represent well single progressions with maxima occurring for both about 5 hours local time. On the other hand, the disturbances decreasing the horizontal force represent signs of a double progression and those decreasing the vertical force signs of a single progression, the maximum for the latter falling between the two maxima for the former, and occurring at 14 hours local time.

(3) There is not the same close correspondence betweéh the progress of the disturbances which tend to increase both elements nor between the progress of those which tend to decrease both clements at St Helena as there is for the other stations, nor is there the same likeness between the numbers for St Helena and those of Toronto or Kew as there is between the numbers of Toronto and those of Kew.

72. The fact that the disturbance-diurnal variations of the two force elements at Kew are very like each other while neither of them is very like the corresponding declination variation (§ 54) receives confirmation from a visual inspection of the Kew curves. In the Philosophical Transaetions for 1862 Stewart thus describes the result of an inspection of the disturbances of these curves for the years 1858, 1859, 1860 (disturbance years) :—

‘There are twenty-two cases in which the declination is raised or lowered along with the horizontal force, and only seven cases of an opposite deseription. Also there are twenty-two eases in which the declination is raised or lowcred along with the vertical force, and only eleven eases of an opposite description. Finally, there are thirty-one cases in which both forees are raised or lowered together, and only two eases of an opposite description. There is therefore a decided tendency in the eurvcs of all the elements to be raised or lowered simul- taneously, but this tendency is stronger between the horizontal and vertical foree curves than between either of these and the declination. It may at the same time be affirmed that with the exception of the disturbance of August to Septem-

ber 1859 there is no very prominent ease in which the three elements do not rise or fall together.”

73. Peaks and Hollows.—These are certain small but abrupt mag- netic changes which from the fact that they generally fall within the separating value are not usually regarded as disturbances. These changes can only be brought to tight where there is a continuous record of magnetic phenomena such as that derived from self- recording magnetographs. They were first studied at the Kew Observatory by Stewart (Phil. Trans., 1862). We have seen that more than one type of force must be concerned in producing magnetic disturbances. This is confirmed by the appearance of the Kew records, from which it may be seen that no disturbance of any magnitude is due to the action of a single force varying merely in amount but not in direction. For if there were only one type of force the distance at any moment of a point in the curve of onc of the elements from its normal position should bear throughout a disturbance an invariable proportion to the distance of a correspond- ing point in the curve of another of the elements from its normal ; but this is by no means the case.

But even if several independent forces are at work it may be thought unlikely that at the same moment a sudden change should take place in all; there is thus a probability that sudden changes of force, as exhibited in peaks and hollows, are changes in one of the elementary forces concerned. Even if the change is not a very abrupt one, provided that we confine ourselves to such peaks and hollows as present a similar appearance for all the curves, we may suppose that we are observing changes in one only of the elementary disturbing forces ; for it is unlikely that two or more independent forces, changing independently, should produce similar appearances in all of the three curves.

Assuming it as probable that similarity of appearance in the curve variations of the three elements denotes a simplicity in the disturbing force, Stewart has discussed all such peaks and hollows at Kew extending over the first two years of their production, and has obtained a result which is embodied in the following table:—

VMiPDpHOROL OG Y

TABLE XVIII.—Hourly Ratios and Frequeney of the Kew Peaks and Hollows, the Vertieal Foree Disturbanee being taken as Unity.

Number of . | Observations.

Decli- nation.

Number of Observations,

2°14

1:97

1°86 1°81 1°38

157

1°82 1°60

1:33 1:30

We OHNO RIH IY

74, It will be seen from this table that the ratio between simul- taneous peaks and hollows of the two components of the force is very nearly constant, the horizontal force disturbance being about double that of the vertical force, so far as size on the curve is concerned, It will also be seen that there is a very marked diurnal range in the ratio which the declination peak or hollow bears to that of the vertical force, this ratio being greatest about 7 A.M. About this hour we have also most peaks and hollows, while in the evening and early morning hours there is so great an absence of these phenomena that the ratios are doubtful.

75. A preliminary comparison between the peaks and hollows at Lisbon and at Kew has been made by Capello and Stewart (Proe. Roy. Soc., January 28, 1864) with the following conclusions,

(1) The Kew peaks and hollows are simultaneously produced at Lisbon in all the elements, but to a smaller extent than at Kew.

(2) The direction is the same at both stations for the declination and horizontal force peaks and hollows, but it is reversed in the case of the vertical force, so that a sudden small increase of vertical force at Kew corresponds to a diminution of the same at Lisbon.

It would be manifestly impossible to discuss with any advantage the nature and origin of these peculiar changes until more exten- sive observations of them have been made. As the peak and hollow force is probably of a simple nature, a further knowledge of its character may be of much importance to the theory of terrestrial magnetism.

It is interesting to remark that we have in peaks and hollows the same close relation between the variations of the two force elements that we find in the larger disturbances.

It is believed too that during violent disturbances a certain change of type is produced in the peak and hollow force, and more especially is this remarkable in the great disturbance in August and September 1859, where the declination would scem to march in the opposite direction from the two components of the force. We have seen that the same peculiarity characterized on this occasion the larger and more apparent magnetic changes. We shall afterwards refer to a circumstance which may perhaps throw light upon this peculiarity (§ 93), meanwhile we conclude by again remarking that during comparative magnetic calms the peak and hollow force shows signs of remaining constant in type, and that it is therefore of great importance that the directors of observatories possessing self-recording magnetographs should take united action to observe this force.

76. Other Inequalities of the Disturbanee-Diurnal Variation of the Foree Components.—Sabine has shown that disturbances of the force components present a distribution over the various months of the year very similar on the whole to that which is exhibited by dis- turbances of declination. He has likewise shown that disturbances of the force components present a distribution over various years similar to that exhibited by disturbances of declination. Finally, we may probably conclude that disturbances of the

force components are smallest at those portions of the earth’s surface where disturb- ances of the declination are smallest, and largest at those portions where such disturbances are largest.

77, Annual and Semiannual Variation of Horizontal Foree and Dip.—Broun (Trans. Roy. Soe. Edin. for 1861) has discussed the results obtained by Sabine at his magnetical stations, and has shown that differential and absolute obscrvations agree in telling us that the horizontal force is smallest at the equinoxes and greatest at the solstices. Whipple has recently obtained the same result from the Kew observations.

We have deduced the following table (XIX.) from the various absolute determinations that have been made at sundry places. In it the annual and semiannual variations of declination, horizontal force, and dip are exhibited, ‘‘increase” denoting a push to the west, and ‘‘ decrease” a push tothe east. The method of obtaining these has already been indicated in $$ 66, 67.

ee ee

1 We ought to mention that, with the execption of the one occasion already alluded to, a peak of one element always corresponds to a peak of another ele- ment, and a hollow of one element to a hollow of another.

TERRESTRIAL MAGNETISM. |

Effect on Declination.

At June Solstice compared to

At Equinoxes compared to Solstices.

Station.

Ra @NSEOTIM OT IC W..,..-c0.-0e0ccnsececscssceres Increase. Decrease. TERROR eros corr vccoccncscccreeceneneccssssseses Increase, Decrease, Cape of Good Hope.. Increase. Decrease. Hobart Town. Decrease. Decrease. Trevandrum Decrease, Increase. Bombay …. Unédccided.

Increase. BPAY get trates cecsccs :cccveccecessteseicaesneces Undecided. Decrease.

78. In discussing the results of this table we shall assume that the sun acts, and in all probability acts indirectly, upon the

magnetic system of the earth. This point will afterwards be further examined. Meanwhile, assuming this indirect action of the sun, and assuming, to fix our thoughts, that it is in close alliance with the convection system of the earth's atmosphere, we can readily imagine that such solar action would act most strongly on the earth's magnetic poles at the solstices, and that in the June solstice the pole or poles in the northern hemisphere and in the December solstice those in the southern hemisphere would be most afiected. Now a strong action of this kind upon either magnetic pole may well be presumed to increase the general magnetism of the earth, or at least that portion of it which is most readily affected by external action, that is to say, the induction system. Again, if the solar magnetie influence is connected with the convcetion currents of the earth, we can readily imagine that the influence in the northern hemisphere where there is much land should exceed that in the southern hemisphere where there is much water.

If these views be reasonable we might expect two things to follow:—(1) the earth's induction system should be strouger at the solstices than at the equinoxcs, and (2) it should be more especially strong at the June solstice, when the sun acts in the northern hemi- sphere. We must bear in mind, however, that so vast is the earth that a stimulus applied to its particles most susceptible of magnetism may not be instantaneously propagated throughout its mass, but that time may enter as an element of the question, in which ease, inasmuch as the action of the sun at the June solstice is in the northern hemisphcre, a station near the south pole may not fully partake of the magnetic effects of this action.

79. An hypothesis of this nature would appear to be consistent with the results of Table XIX.

In the first placc, if the earth should become stronger as a magnet in one or in both of its magnetie systems this would show itself by an increase of

horizontal force at least in all such stations as those at whieh absolute observations are made. An influence which increases the horizontal force at these various stations is therefore naturally regarded, and was regarded by Broun, as one increasing the strength of one or both of the magnetic systems of the earth— whether of one or of both will presently appear. We may therefore assume from our observations that one or both of the earth's mag- netic systems are strongest at the solstices.

In the next place we may imagine that the changes of declination and dip which the table exhibits as occurring at the solstices are the very changes which would be wrought in these elements by an Increase of power in the earth. For we see very well that an Increase of horizontal force at the various stations may be regarded as denoting an increase of the earth's magnetic power. We cannot, however, sec with equal facility what changes would be produced in the declination and dip by an increase in power of one or both of the magnetic systems; but we may well imagine that such changes of these elements as are found to accompany an increase of horizon- tal force are those that denote an increase of the earth's power.

We have thus ascertained the probable nature of those changes of the three elements which denote an increase of power. Now it will be noticed from the table that the effect at the June as compared with that at the December solstice is of the opposite nature to the effect at the equinoxes as compared with the solstices, —that is to say, the earth is more powerfully affected in June than in December, the only well-established exception to this being Hobart Town in the far south. _ But, assuming that time is an element in the develop- ment of this preponderating influence acting in the north, it is easy to see why Hobart Town should not exhibit its full effect.

It remains to determine from the observations themselves which of the magnetic systems it is that exhibits these oscillations. Analogy would of course point to the induction system, but it is desirable to determine this from the observations themselves.

In § 54, when discussing the disturbance-diurnal variation of declination, it was found that Toronto and Kew may be regarded as on one side of the Siberian pole, while Peking, Nertchinsk, and Bombay are on the other. Now, if it be this pole that is influenced by the oscillations under discussion,

we might expect that the influ- ence on declination at Toronto and Kew should be the opposite of that at Trevandrum and Bombay. We find by the table that this is the case, and we are thus inelined to attribute these changes to the Siberian instead of the American pole. It would thus appear

PETEOROL OG Y

December Solstice.

rs

Effect on Dip.

Effect on Horizontal Force.

At June Solstice compared to

At Equinoxes compared to

At Equinoxes compared to

At June Solstice compared to

Solstices. December Solstice. Solstices. December Solstice. Decrease. Inappreciable. Increase. Decrease. Decrease. Increase. Inappreciable. Decrease, Decrease. Increasc.

Decrease. Decrease. Decrease. Decrease.

that the observations of Table XIX. bear out the provisional working hypothesis which we have ventured to introduce. It is quite pos- sible that these remarks may not stand the test of more completc inquiry, but they are here introduced rather as denoting a method of looking at the subject which ought we think to be pursued than as embodying conclusions of a final nature.

80. Lifect of the State of the Sun’s Surface upon the Absolute Magnetism of the Earth.— We have now to consider whether the state of the sun’s surface permancntly influences the magnetism of the earth. It will at once be seen

that any such action will appar- ently manifest itself as an oscillation in the secularchange. We must, however, carefully guard ourselves against prematurely concluding that it implies a variation in the amount of true secular change. There may be two distinct things—true secular change due to one cause, and action depending on sun-spots due to another. These, from the nature of the case, are necessarily mixed up together in the yearly changes which we examine; it does not, however, follow that there is any real identity between them. We shall now give onc example of the method to be pursued in the attempt to detect a solar influence of this nature. Let us turn to Table III., and take the decli- nation yearly values at Toronto from 1856 to1871. Subtracting the value for 1856 from that for 1871, we find that the westerly declina- tion had increased in fifteen years 51’°6, that is to say, at the mean rate of 3’°44 per annum. Again, the average deelination for the sixteen years 1856-71 is 2° 20’°8 corresponding to the epoeh at the commencement of the year 1864. Taking the average value and epoch, andalso the average yearly increase above given, we are able to construct the following table (XX.), in whieh caleulated and observed values at Toronto are compared together :—

Observed. Calculated. Difference,

° f oe 4

1 56°30 1 +1°30 2 0°50 1 +2°06 2 4°50 2 +2°62 2 7:40 Z -+2°08 2 10°60 2 1‘84 2 14°40 2 – -2°20

2 15:70 2 +0-06

2 19°10 2 -+-0°02 2 21°90 2 —0°62 2 24°80 2 —1°16 2 27°60 Dez —1°80 2 29°80 2 —3°04 2 33°20 z —3°08 2 37°10 2 3f —2°62 2 41:90 2 4: —1°26

2 47:90 2 +1:30

It may be gathered from this table that the years which corrc- spond to minimum sun-spots have in the last column a greater negative or lower positive sign than those which correspond to maximum sun-spots, and

hence we may conelude that at Toronto the tendency of many sun-spots is to increase the westerly declination.

81. Performing a similar operation for all those cases in which we have a sufficiently extensive series of observations to work upon, we obtain the following table :—

TABLE XXI.—Hfeet of Numerous Sun-Spots on the Values of Magnetic Elements.

Station. Declination. Tforizontal Force. Dip.

deteacetiecnsccescsaseeoscans Increase. Inappreciable. Increase. Merssacesdscascccsensea2 Increase. Increase. Increase. Badescssseeess Increase (2). Uncertain. Increase.

Cape of Good Hope…..... Decrease.

MRC VANGCUM:.....—05 Increase.

82. We have good grounds for supposing that the sun is most powerful when there are numerous spots on his surface, and therefore the above table represents a state of things which we may imagine to be caused in one way or another by increased solar power. Now the most natural hypothesis is to imagine that an increase of spots acts in producing an increase of disturbances, and that for those stations at which the disturbances tend on the whole to affect the elements in a definite direction there will be left behind a permanent effeet in this direction. A comparison of Table XXI. with Table XII. will, however, show that this explanation is not valid. For instance, at Toronto and Kew disturbances tend rather to diminish

than to increase the westerly declination, while the effect of numer- ous sun-spots is to increase it. Again, at the Cape the tendency of disturbances is to increase the westerly declination, while that of numerous sun-spots is to decrease it. At Trevandrum again (if we judge of it by Bombay) the effect of disturbances will be to increase the easterly declination, while that of

sun-spots is to decrease it. Again, it is believed that at Kew and Toronto the supposed disturb- ance effect on the dip agrees in character with the sun-spot effect. On the whole, therefore, there is no definite relation between the two effects. ;

Now if we take Hobart Town, the Cape, and Trevandrum in the above table, we find from Table XIX. that these stations seem to indicate that the magnetic state of the earth is most powerful at times of maximum sun-spots. Kew and Toronto, however, so far as declination and dip are concerned, appear to go the other way. If, however, we suppose that during the several years of maximum sun-spots the American pole as well as the Siberian is affected, and that on such occasions of long continuance the former has more influence than the latter, we shall be able to reconcile our results with the hypothesis of increased solar action. We can understand too that time must be an important element in any influence communicated to the American pole, and that, although such influence might be apparent at Toronto and Kew, which are comparatively near the pole, it would not be apparent at the other stations of Table XXI. We shall recur to this subject when dis- cussing secular change.

VARIOUS PHENOMENA CONNECTED WITH THE SUN AND’ WITH TERRESTRIAL MAGNETISM.

83. Closeness in Time between Solar Changes and™Magnetic Disturbanees.—Loomis (American Journal of Seience, vol. 1.) has registered the extent of sun-spots for the six days preceding and following each of the great magnetic disturbances at Green- wich, and has compared these values with that for the very day of the disturbance. In this manner he has treated all the days of great magnetic disturbance at Greenwich for a period of twenty- three years, with the exception of those cases in which very few observations of sun-spots were made. The cases of disturbance thus treated amount to one hundred and thirty-five, and the following result has been obtained :—

TABLE XXII.—Lxtent of Spotted Solar Surface.

Days before Storm. Storm. Days after Storm. – F Cw « A? Be oP tb! 2 @ 2 oS 46 ean 0 – c c . < : “ . : ci F 2 IBS Days, ¢47°9 50° 54’S 53° 52°3 48-9

57°9 49-0 45°1 49°3 45°6 45°2 45°3

From this result Loomis draws the following eonclusions:— (1) great disturbances of the earth's magnetism are accompanied by unusual disturbances of the sun's surface on the very day of the magnetic storm ; (2) the great disturbance of the sun's surface which accompanies a terrestrial magnetic storm is generally heralded by a smaller disturbance three or four days previous, succeeded by a comparative calm which immediately precedes the magnetic storm.

84. There is one instance on record of a sudden solar change which was practically simultaneous with a magnetic disturbance.! On September 1, 1859, a little before noon, R. C. Carrington was observing by means of a telescope a large sun-spot, when, to quote his own words—

" Within the area of the great north group (the size of which had previously excited general remark) two patches of intensely bright and white light broke out. . . . I noted down the time by the chronometer, and, seeing the outburst to be very rapidly on the increase, and being somewhat flurried by the surprise, I hastily ran to call some one to witness the exhibition with me, and on returning within sixty seconds was mortified to find that it was already much changed and enfeebled. Very shortly afterwards the last trace was gone; and, although I maintained a strict watch for nearly an hour, no recurrence took place. . .. The instant of the first outburst was not fifteen seconds different from 115 18m Green- wich mean time, and 114 23m was taken for the time of disappearance. In this lapse of five minutes, the two patches of light traversed a space of about 35,000 miles. . . . It was impossible, on first witnessing an appearance so similar to a sudden conflagration, not to expect a considerable result in the way of alteration of the details of the group in which it occurred; and I was certainly surprised on referring to the sketch which I had carefully and satisfactorily finished before

the occurrence, at finding myself unable to recognize any change whatever as |

having taken place. The impression left upon me is that the phenomenon took place at an elevation considerably above the general surface of the sun,

and —o altogether above and over the great group in which it was seen pro- jected.

“‘It has been very gratifying to me to learn that Mr Hodgson chanced to be observing the sun at his house at Holloway on the same day, and to hear that he was a witness of what he also considered a very remarkable phenomenon.”

At the very moment when Carrington observed this pheno- menon the three magnetic elements at Kew were simultaneously disturbed. This disturbance occurred as nearly as possible at 115 15m a.M., affecting all the elements simultaneously, and commencing quite abruptly. The first or most abrupt portion of the disturbance lasted only about three minutes for all the elements ; but after that there was a more gradual change in the

1 Phil. Trans., November 21, 1861.

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same direction before the curve turned. This more gradual eon. tinuation of the first sudden movement lasted about seven minnteg for all the elements, This magnetic disturbance was, however. in reality a small one, and was followed by a very great disturbanea which took place not many hours afterwards.

85. Simultaneity of Changes of Horizontal Foree at Various Parts of the Earth:—We have already (§ 79) alluded to the superiori

| of the horizontal force in indicating by its changes what is taking

place in the magnetic system of the earth. If this system be strengthened as a whole we shall no doubt find the horizontal force increased in value at our various stations, while if the earth’s power be weakened asa whole we shall find the horizontal force diminished, Broun has discussed this subject at.

great length in a memoir already mentioned, and has embodied his observations in numerical — results from which the following table has been extracted :—

TABLE XXIII.—Daily Means of Horizontal Force at Makerstoun, (M.), Trevandrum (T.), Singapore (S.), and Hobart Town (H.).

1844, M. | T. March 17

18

ced ” ” ”

21°30 20°11 21°73 22°00 23°15 22°47 22°30 23°71 25°22 22°24 22°16 5°97

17-06

11°54 07°62 08°55 07°83

09-06

08°14 09°58 10°09 09°48 10°81 07°52 03°50 02°27

This table shows a considerable likeness between the daily changes — of the horizontal force at the four stations. For instance, we haye a minimum which occurs on March 5 at Makerstoun and Mareh 6 at the other stations ; we have likewise a well-defined maximum occurring at all stations on March 14, and another occurring at Trevandrum on March 25, and at the other stations on March 26, Finally we have a well-defined minimum occurring at Trevandrum on March 81, and at the other stations a day earlier. 3

Broun has extended a similar treatment to daily means for every hour, and fig. 88 conveys a good idea of the amount of simul- taneity which obtains in the changes of such values of horizontal force at stations far apart.

86. Recurrence of Disturbances at Intervals of about Twenty-sia Days.— Broun? and likewise Hornstein’ have observed that there is a tendency in

large magnetic changes to recur at intervals of about twenty-six days. At first it was natural to suppose that we have here a magnetical indication of the true time of the sun's synodical rotation, the interval between two disturbances denoting that which elapses between two presentations to the earth of a peculiarly powerful solar meridian. It seems unlikely, however, that there is a really permanent one-sidedness of this kind in our luminary; but the result of observation seems to show that for a limited period, say two or three years, certain meridians of the sun appear to be peculiarly powerful. The cause of this we shall not here diseuss, but simply treat the phenomenon as a fact derived from observation. Broun in his paper above quoted (Phil. T'rans., 1876) makes the following remarks :—

"We have seen that when one side of the sun is presented to the earth the magnetic force of the latter is greater than when the other side is turned towards us; we may even say that the intensity is greatest for a given solar meridian ; this, however, may be simply an integral effect resulting from the actions due to all the meridians. But can we suppose when a great and sudden increase or diminution of the earth's magnetic force occurs that this is produced by some change occurring on a particular solar meridian? This does not seem at all improbable.

"Tn order to examine the facts, all the cases were noted during the years 1844 and 1845 in which the daily mean horizontal force diminished one-thousandth of its whole value within an interval of three days; they were found to be twenty- eight in number. If we call the solar meridian presented to us on the 1st January 1844 the zero meridian (0), and consider the time of rotation to be twenty-six days, and that there are twenty-six meridians, we find that the solar meridians presented to us when these great movements occurred may be arranged in a few groups, as in the following table" (Table XXIV., p. 177].

" An examination," continues Broun, "of this table will show that nearly half of the great changes began when the eighth meridian after the zero had while five began near the twelfth after, and five near the zero itself. . . . ; any doubt existed as to the possibility of these being mere accidental coincidences, it would be removed, I think, by a consideration of the marked succession occur ring between July 31 (No. 18) and December 11,

1845 (No. 28)... If we neglect the two cases of July 31 and August 26, which commence at +6 and +5 respectively, we have five cases of successive solar rotations in which the diminu- tions of intensity began on the +8 day. This exact recurrence at the end twenty-six days of a marked diminution of force proves, it seems to me, that the 7 are all due to the sun, whose time of rotation must be nearly twenty-six

ays.

“ An examination will show that the sudden diminutions of terrestrial magnetic force are in nearly every case preceded by a sudden increase.”

In the above extract we have given the author’s exact words, but, while thinking with him that these actions are due to the sun, it does not appear to us to follow that the time of the sun’s rotation

2 Phil. Mag., August 1858; Phil. Trans., 1876. 3 Vienna Acad. S., June 16, 1871.

‘ 8cems also to indicate that

must be nearly twenty-six days. This assumes that the meridian of peculiar power is fixed on the solar surface. It does not, however, seem impossible to imagine that such a meridian may have a proper motion of its own, and indeed the planetary hypothesis of the origin of sun-spots would rather lead to this conclusion. But if this be the case we shall be unable to deduce from recwrent magnetic dis- turbances the true value of the period of solar rotation. j

87. Repetitions of Magnetic Changes.—J. B. Capello, director of

the Lisbon observatory (Proc. Roy. Soc., October 1868), has remarked \ ee

that at periods of dis- turbance there are nearly § synehronous movements of the de- clination needle during corresponding hours for two, three, or more days. He thus describes these phenomena :—

“In some cases the re-

tition is only in two or three parallel movements; jn others there are truc periods of repetition of some hours in duration. The repeated periods are: not entirely similar, their phases being so modified that in some cases their identity ean only be recognized by a very minute investigation. The same periods, when re- peated, have not always the same total duration ; nor do they recommence at the same precise hour, but sometimes earlier and sometimes luter, the differences varying from a few minutes to two or three hours. We also see that the greatest number of repetitions be- long to the night hours, that is to say, those hours when the movements of the needle are easterly. In the morning hours there do not appear to be any well-marked repetitions. There are twenty-four examples now given, fifteen of which show repetition on two days, eight on three davs, and only one where the ewe appears repeated for four days. It appears that all the facts exhibited in these examples agree with the .cosmical theory; the cause (existing in the sun or in space) appears to con- tinue sometimes during two, three, or several days with- ont undergoing remarkable trausformations, The re-petition, being sometimes earlier sometimes later,

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\TREVANDRUM

the eause possesses a proper movement; the cause per- sists, but only comes again into operation when the earth by its diurnal rota- tion is placed in a similar position or conjunction to that of the preceding days.”

Stewart, having coin- pared Capello’s curves with the corresponding traces of the declina- tion at Kew, found that the’ Lisbon disturb- anees are almost in- variably reproduced at Kew at the same time, only to a greater ex- tent, and also that the Same amount of simi- larity which the various Lisbon curves exhibit is exhibited in the corresponding Kew curves. The strongest point in favour of the h pothesis is, he thinks, ‘‘ not So much the repetition of a single disturbance as the repetition of a complicated disturbance in most if not all of its sinuosities.” Several examples of this occur in the diagrams. It would seem that Something of the above nature was suspected by Humboldt, the earliest investigator of disturbances. Humboldt was

astonished to discover the frequency with which nocturnal perturbations oeeurred, sometimes recurring at the same hour on several successive

a bul

Fig. 38.

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TABLE XXIV.—Cases in which the Earth’s Magnetic Force dimin- ished One-thousandth of its Value or more in 1844-45 (§ 86).

Change of Force in Hun- dred- thou- sandths.

Solar Meridians.

Date (Jan. 1,

1844=0).

No. of Case.

—3to +1 and others.

5 to 10. 1 to 14,

+8 to +10

87 to 89

1 —360 2 {110t0116| —104 +11 to +12 3 |141 to 143| —107 +11 to +12 4 |189to 190} —116 7to 8 5 |213 to 214} —175 5to 6 6 |221t0222| —135 +13 to +14 7 |267to 270} —115 +7 to +10 8 [278 to‘274| —104 +13 to +14 9 |292 to 294) —268 6to 8 10 | 823 to 325} —130 +13 to +14 11 [361 to 364); —165 12 1/378 to 375| —210 +9 to +11 13 | 383.to 385| —163 14 |416 to 417; —118 15 |467 to 469! —350 16 | 526 to 528} —110 6to 8 17. |570 to’ 571| —154 18 |577 to580| —102 6to 9 19 |603 to 604] —101 5to 6

20 |606 to 607; —159 8 to 2 21 |682 to 633) —153 8 to 9 22 —126 (=4 to =?) 23 ~—118 +8 to + 9 24 |668 to 670} —100 (—8 to —6) 25 |684 to 687| —100 +8 to +10 26 |696 to 698} —110 (—6 to —4) 27 +|702 to 708} —291 —0to +1 28 |710to 712} —122 +8 to +10

nights (Walker's Magnetism, p. 80). gestions before dismissing this subject.

(1) If we imagine that these changes are caused by the solar influence acting vertically on some susceptible region of the earth, then, inasmuch as they occur at the evening or early night hours, this region must lie considerably to the west.

(2) The region must also have a proper motion of its own (sce Capello's remark). Is it possible that this proper motion is on the whole from west to east,—a motion which we know is pursued by meteorological weather, and in which it is imagined (§ 52) that magnetical weather as defined by us likewise participates ?

88. Comparison of Declination Changes at Stations near each other.—Messrs Sidgreaves and Stewart (Pro. Roy. Soc., October 1868) have compared together certain curves of the Kew and. Stonyhurst declination magnetographs. These magnetographs are of the same pattern, and it was found that on ordinary occasions the declination traces at both stations were precisely alike. This was confirmed by placing the curves the one over the other, when they were found to coincide even in their most minute features. In times of dis- turbance, however, it was found that the motions exhibited by the Stonyhurst curves were greater than those at Kew, and this excess of Stonyhurst over Kew depended not so much on the absolute size of the disturbance as on its abruptness.

This feature of the comparison is exhibited in the following table (XXYV.), in which the excess of Stonyhurst over Kew in scale divisions is compared with the abruptness of the disturbance, this element being measured by the changes oceurring in unit of time:—

We would make two sug-

Group II. Group IV.

Group [. Group III.

Execss Excess Excess Abrupt- Abrupt- Abrupt- (under 5). ness. — ness. (under 2 387 6 4:2 i) 2 6°4 6 2°6 0 -3 4:0 8 6°3 7 0 31 5 3°3 0

0 31 8 8:7 8

4 2°9 5 3°d 15 6-4 1 1°8 = 6:3 11 4°9 4 3°3 9 4-7 13 74 3 5°2 5 471 a) 3°7 6°6 49 11 6°5 22 79

Means 1

It is very desirable that further comparisons of this nature should be made.

89. Auroral Displays.—These are very frequent if not continuous near the magnetic poles, while in middle latitudes they are the in- variable accompaniments of all considerable magnetic storms. Near the equator they hardly ever occur.

There is a considerable variety in the forms assumed by these displays, and it is possible that this may denote a corresponding variety in the cause or causes which give rise to this phenomenon.

Loomis (Smithsonian Report for 1865) specifies five such varieties : (1) a horizontal light like the morning aurora or break of day; (2) an arch of light which frequently extends entirely across the heavens from east to west and cuts the magnetic meridian

RV = 23

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nearly at right angles,—in the polar regions five such arches have been seen at once; (3) slender luminous beams or columns well- defined and often of a bright light; (4) the corona, the centre of which is invariably near the magnetic zenith, but not always exactly coincident with it; and (5) waves or flashes of light.

90. Auroras exhibit the same annual variation as magnetic dis- turbances, and are most frequent about the equinoxes—a fact first observed by Maizan. Kaemtz in his Meteorology gives the follow- ing table, which is applicable to European auroras.

Taste XXVI.—Monthly Frequency of European Auroras.

Jan, Feb. Mar. April Muay. June. July. Oct. Nov.

229 307 440 312 184 65 87 497 285

Loomis again in the memoir already quoted gives the distribu- tion of American auroras over the various months derived from one hundred and thirteen years' observations at New Haven and Boston, twenty-five years' observations at New York, and two years' obser- vations in Canada. His results are represented in the following table :—

Dee.

225

Aug.

217

Sept.

405

Taste XXVII.—Monthly Frequency of American Auroras.

| Bis ep New York. | Canada. | Sum. |

OWEMATY. ...02. cet… seettreecesenerne 81 76 16 February.

It appears from this table that American like European auroras exhibit a maximum of frequency about the equinoxes.

91. Since auroras and magnetic disturbances go together, it is natural to imagine that we should have great auroral displays in years of maximum sun-spots. This is found to be the case, and in the following table (KX VIII.) Wolf’s proportional numbers denot- ing sun-spot frequency are compared with the number of auroras witnessed in Europe and America as compiled by Loomis. It will be seen from this table that years of maximum auroras coincide very well with years of maximuni sun-spots.

Sun-Spot | Auroral Sun-Spot Auroral | | Sun-Spot! Auroral Number. Number. Number. | Number. || Number. | Number.

a ——J eS | ——_—$ —<—-—| | ___ ——_}|_—. 1750 83°1 31 | 1794 38°0 14 || 1837} 136°9 42 1751} = 52°1 30 ||1795} 23'8 7 |) 1888] 1041 60 1752} 45-9 17 ||1796| 15°6 8 |1839| 83:4 65 1753| 28-9 15 1797 65 5 || 1840 61°8 80 1754) 18°5 11 || 1798 4°6 6 1841} 38°5 67 1755 9°3 10 1799 71 4 1942 23-0 53 1756 12°2 9 |;}1800| 15:6 6 18438 13-1 37 1757| 31°9 7 | {1801} 33:9 6 1844 19°3 39 1758, 47°1 14. 1802) 54:7 6 1845 $8°3 48 1759| 54:6 16 1803| 70-7 6 1846] 59°6 54 1760| 64:7 23 «(|| 1804| 71:4 14 || 1847 97°4 76 1761} 80°2 22 1805| 48:0 14 =} 1848] 124-9 72 1762} 60°0 19 1806| 28-4 13 || 1849] 95-4 69 1763| 48-4 16 1807} 11°1 4 ||1850| 69:8 49 1764| 36°7 al 1808 72 2 1851| 63-2 65 1765| 92-4 8 1809 Bal 1 11852} 52:7 67 1766 14:1 5 1810 0°0 1 | 1853 38°5 63 1767| 35-9 9 || 1811 16 0 1854] 21°0 35 1768! 66:8 30 1812 4°9 1 || 1855 TT 20 1769| 10374 40 1813} 126 4 || 1856 51 11 1770} = 98°5 41 1814) 16:2 5 1857} 22-9 21 1771} 86°6 24 1815| 35:2 5 1858| 56:2 37 1772| 65-7 26 1816} 46:9 5 111859} 90°38 50 1773| 39-7 33 1817| 39:9 7 ~~ ||1860] 94:8 48 1774| 9 aT-4 33 1818| 29:7 11 1861} 77:7 36 1775 8°8 22 1819} 23-5 10 1862/ 61:0 28 1776| = 21-7 26 1820 16:2 8 /1868} 45:4 29 1777| 92-0 38 1821 671 4 1864| 45-2 33 1778| 151-7 69 1822 3°9 2 |/1865) 31:4 34 1779| 123-4 70 1823 2°6 1 1866| 14:7 31 1780} 89-2 67 1824 81 1 |! 1867 8:8 22 1781; 66°5 57 1825| 16-2 4 1868} 36°8 33 1782| 38:7 57 1826} 35:0 12 1869} 78-6

1783} 29°5 47 1827} 51:2 17 ‘{/1870| 131-8

1784} 10:3 39 1828} 62-1 21 1871| 113-8

1785| 26-7 56 1829} 67°2 25 1872 92:7

1786) 81-2 84 1830| 67:0 25 1873 677

1787| 128-2 108 1831! 50-4 20 1874} 43°17

1788| 133-3 105 1832; 263 13 1875 18°9

1789! 116-9 84 1833| 9-4 11 | 1876 11:7

1790; 90-6 68 1834} 13:3 19 dasa 111

1791| 67°6 46 1835 59-0 15 || 1878 3°38

1792! 59-9 37 1836| 119°3 82 |} 1879 Ti |1793| 47-3 23

In fig. 39 a graphical representation is given of the likeness which subsists between the progress of auroral frequency, spot frequency, and declination ranges.

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92. While the results now given leave little doubt as to the fact of a connexion of some sort subsisting between sun-spots on the one hand and mag- netic disturbances and auroras on the other, yet it is desirable to obtain evidence as to the closeness of the connexion betwecn auroras and sun-spots similar to that which was exhibited in § 82, and which showed thecloseconnexion in point of time . between sun-spots 570 and gain. Loomis has wit , this view treated Fig. 39. auroras in precisely the same way in which he treated disturbances, and has obtained the following table : —

Mean daily range of magnetic

JN

TABLE XXIX.—2Zxtent of Spotted Solar Surface.

Days before Aurora, Aurora, “Days after Aurora. és 1s Ba 1 2 3 4 3

Mean of 503 52-7 510 51-2 531537 605 54-8 525 533 51-4 53-3 507

251 Days.

From which he concludes that ‘‘auroral observations in the middle latitudes of America are generally accompanied by a maximum disturbance of the sun’s surface on the very day of the aurora.”

98. Earth Currents.—These are electrical currents which take place in the moist crust of the earth, and were first detected by W. H. Barlow (Phil. Trans., 1849). At a later period they were systematically observed and studied by C. V. Walker (Phil. Trans., 1862). They are now continuously recorded by photography at the Royal Observatory, Greenwich. arth currents are particu- larly strong during magnetic disturbances. Sir George Airy has graphically compared together certain magnetic disturbances as recorded by the Greenwich self-recording magnetographs and the simultaneous earth currents recorded by appropriate galvanometers (Phil. Trans., 1868), and finds it almost impossible to avoid the con- clusion that the magnetic disturbances are produced by terrestrial galvanic currents below the magnets. The likeness between the two systems of graphical representations is unquestionably very strike ing. But, while there is no doubt an intimate connexion between earth currents and magnetic disturbances, there is one cireum- stance which should make us pause before assigning the former as the complete and efficient cause of the latter. It is thus indicated by Lloyd :1—

“‘ When we examine the eurves in whieh Mr Barlow has represerted the eourse of the galvanometrie deflexions eaused by the earth eurrents, we observe that the regularity of that eourse is continually interrupted by rapid reciprocating moye- ments in whieh the needle oscillates from one side to the other of the zero alternately. These movements are similar to those of the magnetometers with whieh we are familiar; but they are mueh more rapid, and bear a larger propor- tion to the regular ehanges. . ..I have seleeted for ealeulation the obser- vations made during tlie six hours eommeneing at 3 a.m. on May 29, 1848, that being a period of comparative disturbanee. The sum of the changes of the galvanometer needle during that period, on the Derby and Rugby line, was equivalent to 571 divisions of the instrument—the mean duily range for the entire week being 11°4 divisions

and the ratio=50. ... The sum of the changes of the Greenwich declinometer during the same period was only 67 minutes, the mean daily range being 12°4 ininutes, In like manner the sum of the ehanges of the horizontal foree was ‘0158 and the mean daily range ‘0034. The ratio is aceordingly the same for the two magnetie elements, and its amount is 4°6, or less than one-tenth of the eorresponding ratio in the ease of the galvano- metrieal ehanges. We learn therefore that the rapid ehanges of the earth eurrents are mueh greater in proportion to the regular daily changes than the eorresponding movements of the magnetometers.”

We shall return to this subject in a subsequent part of this article.

94. Inequalities in Terrestrial Magnetism caused by the Moon.— Kreil in 1841 was the first to point out that the moon has a small influence on the position of the declination needle, and shortly afterwards the same fact was independently discovered by John Allan Broun. The more recent observations of Sabine and of Broun, but especially those of the latter, have thrown much light upon the nature of this action. As the lunar influence is not generally large, it is necessary to free the observations from the results of other inequalities, and this has beendone by the two observers above mentioned. The results given in Table XXX. have been obtained by Sabine (see Walker’s Afagnetism). ,

_ 95. Thus (1) the mean effect of the moon upon the declina- tion needle is to cause in each lunar day a double oscillation, and Sabine has shown that the lunar influence upon the other magnetic elements is of a similar type. (2) The turning points for both hemispheres are in all cases not far removed from the lunar hours = oe

1 Trans. Roy. Irish Acad., xxiv. 115.

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~TasbeE XXX.—Mcan Lunar-Diurnal Variation in Declination.

ee Kew. Toronto. | Peking. | StHelena.| Cape. Hobart “” ut au” ” ut u” 0 — 62 | ~~189 | — 42 496 | +89 | +59 7 — 96 — 16°5 — 3‘3 +0°3 + 6°4 +8°3 2 — 84 — 95 — 1‘5 — 2‘2 + 21 +8°5 3 = e0~~|+— on | “yor —42 |-— 96 | +64 4

— 0°6 + 9°2 +2°6 —d’l — 65 +27 5 +40 | 4159 | 43-7 Se el Reet eee 6 + 9:0 +181 +3°9 —2°9 — 79 —5‘3 7 +11°3 +15°3 +3°0 —0°3 — 49 —73 8 + 9°6 + 82 +1°3 +2°6 — 03 —7°2 9 + 47 — 04 —0°6 +4°9 +47 —49 10 — 01 —10°7 —2°2 +61. + 86 —1°0 il — 55 —17°3 —3‘1 +59 +10°6 +3°4 12 — 96 —19°4 —2:9 – bet + 9°9 +7°2 B —113 | —163 | —1-7 419 | +67 | 494 14 — 95 — 89 +0:2 —0‘8 +15 +8‘8 1b —54 | +10 | 42:3 =81. | —35 | +63 16 — 06 +10°8 +40 —4‘4 — 79 +21 17 + 51 +17°8 +50 —t4 —10°3 —2:7 18 ° + 85 +20°2 +48 —31 —10‘1 —6‘7 19 + 98 +1774 +3°5 —1°0 — 73 —91 20 + 88 +10°2 +15 +15 — 27 —91 21 + 74 + Or —0°8 +3°5 + 2-4 —68 22 + 2-4 — 93 —2°9 +44 + 67 —2°8 23 — 16 —15°9 — 4‘1 +41 + 9:2 +1°8

Tn this table + indicat«s that the north end of the magnet is to the east and — that it is to the west of its mean pesition.

0, 6, 12,18. (3) In the northern stations we have a maximum westerly deflexion about the hours 0 and 12 and a maximum easterly deflexion about the hours 6 and 18, while in the southern stations the aetion is the reverse of this. (4) The oscillations would appear to be most decided at those stations, such as Toronto and Hobart Town, that are far removed from the equator.

96. Annual Variation of Lunar Lffect.—Broun has recently studied with much success the peculiarities of the lunar influence at Trevandrum, and has obtained some very unexpected results. His first result was that the nature of the lunar influence upon the de- elination needle at Trevandrum depends upon the time of the year, and that the southern type of lunar action predominates at Trevan- drum during the winter and the northern type during the summer months. If we take the mean of the whole year, then probably the southern type will be found to predominate.

97. Mean Lunar-Diwrnal Variation during the Day and during the Night.—Broun has shown that the action of the moon on the declination needle at Trevandrum is greater in every month of the year during the day than during the night. The following table (XXX1.) gives the day and night ranges for the various months and their ratios :—

It would appear from Broun’s observations that there is a difference of type as well as a difference of range.

98. Lunar-Diurnal Variation with Reference to the Moon’s Distance. —Both Sabine and Broun have shown that this variation

is greater for perigee than for apogee. Broun has found that the mean ratio of the apogee effect to the perigee effect is as 1 to 1°24 nearly. He remarks that “the ratio of the moon’s mean distance from the earth in the half orbit about apogee is to that in the half orbit about perigee nearly as 1:07 is to 1; as the cube of 1:07 is 1°28 nearly, we see that the mean ranges of the curves for the two distances are in the approximate ratios of the inverse cubes of the moon’s distanee‘from the earth, as in the theory of the tides.”

99, Lunar-Diurnal Variation with Reference to the State of the Sun’s Suwrface.—Kreil in a memoir presented to the Imperial Academy of Science in 1852 considers that the observations at Prague and Milan tend to show the existence of a solar period in the lunar variations. Sabine (Phil. Trans., 1856) has diseussed the Toronto observations and also (Phil. Trans., 1857) the Hobart Town observations with the view of deciding this important point, and has come to the conclusion that there is no systematic difference in the lunar-variation corresponding to the decennial period of the solar- diurnal variation, but merely such casual fluctuations as might be Teasonably expected, considering the shortness of the periods which they represent.

We have made a preliminary discussion of Broun’s Trevandrum observations with the view of throwing a little more light on this subjeet. For this purpose we have taken the ranges of the lunar- diurnal variations recorded by him for each month of each year. We have in the first place grouped these ranges together into threes, representing quarterly results, and have then compared together these quarterly results for years of small and for years of

great sun-spot frequency,—assuming the years 1854-56 and 1863-64 to represent the former, and the years 1857-62 to represent the latter. We have thus obtained the following result :—

TABLE XXXII.—Relation between Lunar-Diurnal-Ranges of Declination at Trevandrum and Sun-Spot Frequency.

| Great Sun-Spot | Small Snn-Spot

Frequency. Frequeney. February, March, ne a ee 0°501 0-493 Miatge ACY DI) Aeesssc ec tesntvsnc Mar sceascsnsed “464 *380 August, September, October…….....sescssesseees 504 °419

November, December, January…….....ccesseeee

It would appear from this table that sueh ranges are greater at years of maximum than at years of minimum sun-spot frequency. Nevertheless the proof is not conelusive, inasmuch as associated with such lunar ranges we may have remnants of solar disturbance, the tendency of which might possibly be to increase the apparent

range. Now such disturbances are more frequent at times of maximum sun-spots, and it might therefore be conjectured that this tendency would be to increase the apparent lunar range at such times above the range corresponding to years of minimum sun-spots. On the whole we are not disposed to think that the evidence already adduced is sufficient to deeide this question as a inatter of fact either in the one direction or in the other.

100. Variation in the Diurnal Range of Declination depend- ing upon the Age of the Moon.—Capello (Annals of Lisbon Observa- tory, 1876) and Stewart (Proc. Roy. Soc., 1877) have separately found that the range of declination is greatest about the times of new and full moon, a result recently confirmed by C. Chambers of Bombay. The following are the results recorded by Stewart derived from 197 lunations at the Kew Observatory :—

TABLE XXXIIIL.—Variation of Diwrnal Range of Declination with Moon’s Age, (0) denoting New and (4) Full Moon.

Phase of lunation…..... (0) (1) (2) (8) (4) (5) (6) (7) Value of range…..... 619 512 499 499 507 508 499 503

101. Larth Currents cansed by Lunar Inflnence.—Mr Alexander J. S. Adams (Nature, March 3, 1881) has made use of a telegraph wire the ends of which were connected with the earth, the one at Cardiff and the other at London. He observed the currents on this wire every quarter of an hour from March 28 to April 26, 1879. He believes that such are earth currents, and that they have a lunar-diurnal variation. There are during the lunar day, according to this observer, four electrical maxima, two positive and. two nega- tive, each maximum being divided from the next by a zero or point of no current. His results likewise exhibit a regular retarda- tion or lagging of the earth-current variations behind the corre- sponding phase of the moon to the extent of nearly three honrs, but.these require confirmation from further observations.

THE EFFECT OF SOLAR VARIABILITY ON THE METEOROLOGY OF THE EARTH.

102. We may learn from the preceding paragraphs that the sun exercises a more powerful influence npon the magnetism of the earth at times of maximum than at times of minimum sun- spots. It remains now to find whether a similar variability obtains in the phenomena of terrestrial meteorology. For this purpose we may divide the meteorological elements into the four divisions of pressure, rainfall, wind, and temperature, inquiring in what manner these are affected by solar inequalities.

108. Pressure.—In 1871 Baxendell (Memoirs of the Lit. and Phil. Society of Manchester, 1871-72), from an analysis of eleven years of the Radcliffe observations, Oxford, came to the conclusion that in years of maximum sun-spots the maximum barometric pressure occurred under north-east winds and the minimum under south- west, while in years of minimum sun-spots the maximum and minimum pressures took place respectively under north and south- east winds. He came likewise to the conclusion that, besides this difference in distribution of the convection currents of the earth, the forces which give rise to the movements of the atmosphere appear to be more energetic in years of maximum than in ycars of ininimum sun-spots.

104. A study of the isobaric lines would appear to be the best method of obtaining information upon this important point. It is well known that during summer the interiors of large continents have a peculiarly low and

the surrounding oceans a peculiarly high atmospheric pressure; while a disposition exactly the reverse obtains during the winter months. All this is no doubt due to solar action, and we might therefore imagine that when the sun is peculiarly powerful these peculiarities of distribution will be found to be increased in prominence, while they will be diminished at times of comparatively weak solar influence.

The distribution of pressure has been studied with much suceess by the Indian meteorologists, including Messrs Archibald, Blanford,

Broun, Charles and Frederick Chambers, Eliot, and Hill, and the following conelusion is the result of their labours. We may assume that the Indo-Malayan region has for the mean of the year a barometrie pressure probably below the general average of the earth, We might therefore imagine thatduring years of powerful solar influence this peculiarity would be increased. Now these observers have found that in this Indo-Malayan region the barometer is abnormally low during times of maximum sun- spots. Again, western Siberia is a district which in the winter season has a pressure decidedly above the average, and we should therefore imagine that during years of powerful solar influence this winter pressure should be peculiarly high. But this is what Blanford has found in his diseussion of the Russian stations to correspond with years of maximum sun-spots.? d

Again, Frederick Chambers has enunciated the following laws as resulting from his discussion of various meteorological reeords:—

(1) Variations of the sun-spot area are succeeded some months afterwards in the Indo-Malayan region by corresponding abnormal barometric variations, a high barometer corresponding to a mini- mum of sun-spots.?

(2) This lagging behind is greater for easterly than for westerly stations. In other words, this, like other meteorological phenomena, appears to travel from west to east.

We may therefore conclude that the barometric evidence as far as it goes is in favour of the hypothesis that the sun is most powerful at times of

maximum sun-spots.

105. Rainfall—Heights of Rivers and Lakes.—In 1872 Mel- drum of the Mauritius Observatory brought forward evidence showing that the rainfalls at Mauritius, Adelaide, and Brisbane were on the whole greater in years of maximuminau in years of minimum sun-spots Shortly afterwards it was shown by Lockyer (Nature, December 12, 1872) that the same law was observable in the rainfalls at the Cape of Good Hope and Madras.

Meldrum has since found that the law holds for a great num- ber of stations, including eighteen out of twenty-two European observatories, with an average of thirty years' observations for each. The results are exhibited in the following table (XXXIV.) :-—

c . . Number of Years; Exeess (+) or defeet (—) in

Name of Observatory. of Observation, | maximum Sun-Spot years, Inches. Sb AGLCYSUDI Per acevcs=-vesesessiaces 41 +13°08 25 CHMSHAMIA. 25. 2e5.0cccsecssecse sees 31 +19°65 SPE OUMDULGHitscessccccnsreeesias 51 +66°85 4 MRCOMIESDULL ssssssccccnes sess sey 19 —22°79 GMISCEM secuecccotessccarisescstececers 11 +10°95 6. Utrecht. .....+00. eee 11 + 0°44 1 MUUNStEY 2. ...5.0.0. one 19 +22°02 8. Greenwich …..... 52 +11°73 OUMRUGSIA I esyerests sce veneers 53 +49°90 LO, SBONNE: «..00.60085 BOOCB HOR DCCAGACEEDGG iki + 8:90 MY BBDUSSEIS)csecessccsnesae 41 +13°84 TO SPER GUC Sees: scsssess ecorescese 89 +23°57 WS: DRAWS cic. HAS Witoniiaieesscse-REM OV 2) 25s secre cacysisessclsesisesiesesee 41 — 6°16 VS. eMGlan s,s <2.0.5< Bd 39 – 11°81 19. Rome….. 18 +18°30 20. Lisbon 11 + 5:05 21. Palermo 41 + 4°55 22. Athens… ll +10°86

It would, however, appear from the observations of Governor Rawson that the rainfall in Barbados forms an exception to this rule, being greatest about the times of minimum sun-spots,

106. Gustav Wex in 18733 showed that the recorded depth of water in the rivers Elbe, Rhine, Oder, Danube, and Vistula for the six sun-spot periods from 1800 to 1867 was greater at times of maximum than at times of

minimum sun-spot frequency. These conclusions have since been confirmed by Professor Fritz.*

Quite recently Stewart (Proc. Lit. and Phil. Soe. of Manchester, 1882) has treated the evidence given by Fritz as regards the Elbe and Seine in the following manner. He divides eaeh sun period, without regard to its exact length, into twelve portions, and puts together the recorded river heights corresponding in time to similar portions of consecutive sun periods. He finds by this means residual differences from the average representing the same law whether we take the whole or either half of all the recorded observations, and whether we take the Elbe or the Seine. ‘The law is that there is a maximum of river height about the time of maximum suu-spots and another subsidiary maximum about the time of minimum sun-spots. There is some reason too to think that the Nile and Thames agree with those rivers in exhibiting a maximum about the time of maximum sun-spots and a subsidiary maximum about the time of minimum sun-spots, only their subsidiary maximum is greater than it is for the Elbe and Seine.

1 Nature, November 25 and December 2, 1880.

2 Nature, Mareh 18, 1880.

3 Ingenieur Zeitschrift, 1873.

4 Ueber die Beziehungen der Sonnenflecken Periode zu den Magnetischen und Meteorologischen Erscheinungen der Erde, Haarlem, 1878.

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107. In 1874 G. M. Dawson came to the conclusion that the levels of the great American lakes were highest about times of maximum sun-spots. In this investigation the value of the evidence derived from rivers and lakes is no doubt greater than that derived from any single rainfall station, inasmuch as in the former ease the rainfall of a large district is integrated and irregularities due to local influence thus greatly avoided.

108. Dy Hunter, director-general of statisties in India, has recently shown (Nineteenth Century, November 1877) that therecorded famines have been most frequent at Madras about the years of minimum sun-spots—years likewise associated with a diminished rainfall.

109. Winds and Storms.—Meldrum of the Mauritius Obser- vatory found in 1872, as the result of about thirty years' obserya- tions, that there are more cyclones in the Indian Ocean during years of maximum than during years of minimum sun-spots.® The connexion between the two is exhibited in the following table:—

TABLE XXXV.—Comparison of the Yearly Number of Cyelones occurring in the Indian Ocean with the Yearly Number of Spots on the Sun. i!

Char- acter as regards Sun- Spots.

1847

Max. 1848

1849

1850

1851

1852

1853

|; 1854

1855 1856 1857 1858

| 1859

1860

| 1861

1862 1863 1864

is

‘Number

total |, of | Number of Cyclones

in Max, | Cyclones. and Min}

Periods.

| |

Number | Number of Whole | of Strong Gales, Gales.

Number of Hurti- eanes.

Number of Storms.

| |

23

Se

Min, 13

DLO PDOANDWDOM

~~ —~

Max. 39

ta

1866 1867 1868 1869 1870 1871 1872 1873*

Min,

31

SS Sn nD

=

Max.

KON kK PRNNNNN PNK HON BRON DION O We OM WNN NWR HEN NNAWEN BD CUW SHOOT SCR WWNCOHCOHNNORNOMFOCOOFOCOCONOS

NWHRONAONAOCH WH

} He S> GD bO C9 C9 SO RNS ND Or Or 1 69 CO NS OO Cg et Ct RCO OD Or a

- Up to May 31,

In 1873 M. Poéy* found a similar connexion between the hurmi- canes of the West Indies and the years of maximum sun-spots. He enumerated three hundred and fifty-seven hurricanes between 1750 and 1878, and stated that out of twelve maxima ten agreed.

110. In 1877 Mr Henry Jeula, of Lloyd’s, and Dr Hunter found that the casualties on the registered vessels of the United Kingdom were 174 per cent. greater during the two years about maximum than during the two years about minimum in the solar cyele.

111. Zemperature.—Baxendell, in a memoir already quoted, was the first to conclude that the distribution of temperature under different winds, like that of barometric pressure, is sensibly in- fluenced by the changes which take place in solar activity. In 1870 Piazzi Smyth published the results of an important series of observations made from 1837 to 1869 with thermometers sunk in the rock at the Royal Observatory, Edinburgh. He con- cluded from these that a heat wave oceurs about every eleven years, its maximum being not far from the minimum of the sun-spot eycle. Sir G. B. Airy has obtained similar results from the Greenwieh ob- servations, In

1871 E. J. Stone examined the temperature obser vations recorded during thirty years at the Cape of Good Hope, and came to the conclusion that the same cause which leads to an exeess of mean annual temperature at the Cape leads equally to dissipation of sun-spots. Dr W. Képpen in 1873 diseussed at great length the connexion between sun-spots and terrestrial temperature, and found that in the tropics the maximum temperature occurs fully a year before the minimum of sun-spots, while in the zones beyond the tropics it oceurs two years after the minimum. The regularity and magnitude of the temperature wave are most strongly marked in the tropics.

112. The evidence now given appears at first sight to be antago nistic to that derived from the other elements both of magnetism and meteorology, and to lead us to conclude that the sun heats us most when there are fewest spots on its surface. This conclusion will not, however, be strengthened if we examine the subject wit greater minuteness.

5 Br, Assoc. Reports, 1872. 6 A. Poty, Sur les Rapports entre les Taches Solaires et les Ouragans des Antilles, de V' Atlantique-Nord, et de ' Ocean Indien Sud.

TERRESTRIAL MAGNETISM. |

Seientifically we may regard the carth as an engine, of which the sun is the furnace, the equatorial regions the boiler, and the polar regions the condenser. Now this engine may be supposed to work iu the following manner. Hot air and vapour are carried along the upper regions of the atmosphere from the equator to the poles by means of the anti-trade winds, while in return the cold polar air is carried along the surface of the earth from the poles to the equator, forming what is known as the trade-winds. When- ever the sun's heat is most powerful both trades and anti-trades should be most powerful likewise. But we live in the trades rather than in the anti-trades—in the surface currents, and not in the upper currents of the earth's atmosphere. When, therefore, the sun is most powerful is it not possible that we might have a parti- eularly strong and cold polar current blowing about us? Thesame thing would happen in the case of a furnace-fire ; the stronger the fire the more powerful the hot draught up the chimncy, the more powerful also the cold draught from without along the floor of the room. It might thus follow that a man standing in the furnace-

room near the door might be chilled rather than heated when the furnace itself was roaring loudest. In fact temperature is a pheno- nienon due to many causes. Thus a low temperature may be due (1) to a deficiency in solar power, (2) to a clouded sky, (3) to cold rain, (4) to cold winds, (5) to cold water and ice, (6) to cold pro- duced by evaporation, (7) to cold produced by radiation into space.

Blanford has recently shown that at certain Indian stations alow mean temperature occurs when there is an unusually large rainfall and a great amount of clouds, a result in accordance with the conclusions previously enunciated by Professor Piazzi Smyth. Records of maximum aud minimum temperature must not there- fore be too closely associated with a maximum and minimum of solar power, ;

118. Considerations of this nature have induced Stewart to imagine (Vatwrc, June 16, 1881) that the true connexion between sun-spots and terrestrial temperature is more likely to be discovered by a study of short-period inequalities of sun-spots than by that of the eleven-year period in which there is time enough to change the hygrometric state of the atmosphere and the whole convection system of the earth. He has accordingly discussed at some length two prominent sun-spot Sa ie of short period (about twenty-four days), and endeavoured to see in what way they affect terres- trial temperature. From this it appears that a rapid increase of sun-spots is followed in a day or two by an increase of the diurnal temperature range at Toronto. Now an increase of diurnal tempera- ture range most probably denotes an increase of solar energy, and we are thus led to associate an increase of solar heat with a large development of spots. This, however, is a point which requires further investigation.

114. General Conclusion.—On the whole we may conclude that the meteorological motions and processes of the earth are probably most active at times of maximum suu-spots, and that they agree with maguetical phenomena in representing-the sun as most power- ful on such occasions, although the evidence derived from mieteor- ology is not so conclusive as that derived from magnetism.

HYPpoTuETICAL VIEWS REGARDING TUE CONNEXI1ON BETWEEN THE STATE OF THE SUN AND TERRESTRIAL

MAGNETISM.

115. Principles of Discussion.—In the following discussion we claim only to advance a working hypothesis, with the view of sug- gesting further inquiries into the subject of terrestrial magnetism. It seems therefore desirable that we should limit ourselves to such yrobable or possible causes as are known to exist and to operate on the earth. These various agents or causes will be described, and we shall endeavour to show that converging lines of evidence point im several cases to certain of these as being most likely to produce that particular type of effect which is exhibited in terrestrial magnetism. This course will in our view most readily suggest further inquiries with the view of confirming or disproving the various points of this working hypothesis. Believing that the introduction of any unknown cause can only be justified when known causes have been found insufficient to account for the pheno- nena in question, we have not advocated any direct magnetic action of the sun upon the earth. We have refrained from this for two reasons, —first, because from what we now know of the sun it appears to us unlikely that it should exercise an influence of this nature upon the earth, since a body at a high temperature possess- Ing very strong magnetic properties is unknown to us; and, secondly, we shall see further on that such an influence will not explain the best- understood magnetic changes, nor is there in our opinion any magnetic phenomenon for the explanation of which it appears absolutely necessary to resort to this hypothesis. In fine, without presuming to deny the possibility of unknown influences of this nature, it does not appear to us that the time has yet arrived when we are called upon to resort to such as necessary aids to the discovery of further truth.

_ 116. Nature of Solar Variations.—It is quite certain that there 1s a variability in the visible appearance of the sun’s disk, which exhibits sometimes a comparatively large amount of spotted area

while on other occasions it is entirely free from spots. Now it has been remarked by Thomson that were the sun an incandescent solid its surface

would become cool in a few minutes. The astonishing property whicli our luminary possesses of pouring out continuously a vast amouut of radiant energy must unquestionably depend upon machinery of great power by means of which fresh hot particles are rapidly brought from the interior to the surface, while those particles which have given ont their light and heat are rapidly hurried downwards to be recruited from the great storehouse of heat in the sun's centre. In fine, a gigantic system of convection currents of this nature forms the essential condition without which the sun would not be able to continue shining as it does.

The mottled appearance of the sun's disk as scen through a tele- scope denotes no doubt the existence of a vast system of ascending aud deszending currents, the hot matter rising from beneath being denoted by the brighter portions and the cold matter descending from above by the darker portions of the structure. On certain occasions and in certain regions of the sun the scale of these pheno- mena is greatly increased, and we have a huge up-rush of bright and a corresponding down-rush of black matter—in fine, the well- known sun-spot with its bright faculous appendages. Whenever sun-spots arc very frequent we should therefore expect the convection system of the sun to be particularly powerful, and the great velocity and size of the red flames or the higher portions of the convection system observed around the sun's limb on such occasions confirm us in this supposition. And if the convection system of the sun be particularly powerful when there are most spots on its surface, it would seem to follow that the radiation from our luminary should on such occasions be particularly powerful also. The spectroscope leads us to the same conclusion. It would appear from the obscr- vations of Lockyer and others that at times of maximum sun-spots certain definite regions of the sun when examined spectroscopically present all the appearances of a very high temperature.

We are unable to contirm these conclusions by direct observations of the sun's heating power. Actinometrical determinations have not yet been made with sufficient accuracy and persistence to decido this point experimentally. We have, however, evidence of an in- direct nature derived from terrestrial magnetism and meteorology all tending to make us think that the sun is most powerful during times of maximum sun-spots. We have seen that on

such occasions the solar influence upon the magnetism of the earth is peculiarly tte in more than one way, and that its influence on meteoro-

ogy is then peculiarly powerful also, although we are hot so certain of this latter fact as of the former.

We may therefore take it to be most probable that the sun is most powerful at times of maximum sun-spots, and proceed from this basis to propound the two following questions:—in the first place, what is the nature of the solar influence upon terrestrial magnetism ? and, secondly, why is this influence so much more easily perceived than certain forms of solar influence upon meteorology ?

117. Diurnal Magnetic Variations—Hypotheses regarding them.— The various speculators on the cause of these phenomena havo ranged over the whole field of likely explanations. (1) It has been supposed that the sun acts directly as a magnet upon the magnetism of the earth. (2) It has been imagined that convection currents established by the sun's heating influence in the upper regions of the atmosphere are to be regarded as conductors moving across lines of magnetic force, and are thus the vehicle of electric currents which act upon the magnet. (3) Faraday, reasoning from his discovery that oxygen is patamagnetic, and becomes weaker in its power when heated, and stronger when cooled, supposed that tho_ sun by heating certain portions of the atmosphere renders them less magnetic while others, not subjected to any heating influence are rendered more magnetic. The action is equivalent to a dis- placement by means of the sun of the magnetic matter of the earth, and involves a displacement of the lines of force. Here too the solar action is associated with the great mass of the atmosphere. . (4) It has been supposed by Christie and by De la Rive that the heat of the sun produces in the atmosphere and in the earth thermo- electric eurrents which produce the daily magnetic variations. It is not easy to perceive how we could have thermo-electrie currents in the upper regions of the atmosphere, but there is no obvious objection to the generation of such currents in the crust of the carth. Thus the first hypothesis has no reference to the atmosphere what- ever; the second deals with the upper atmospheric regions, the third with the great body of the atmosphere, while the fourth, as we have ventured to modify it, has reference-to the crust of the earth.

118. Discussion of these Hypotheses.—Dr Lloyd and Mr C. Chambers! have both shown that direct solar magnetic action will not account for the peculiarities of the diurnal magnetic variation.

‘Again (§ 48) we have strong evidence that changes in the range of

the daily magnetic variation lag behind corresponding solar changes in point of time. Now this kind of behaviour is ineonsistent with direct magnetic action, and points rather to an indirect magnetic effect caused by the radiaut cnergy of the sun.

1 Proc. Royal Irish Academy, February 22,1858; Phil. Trans., 1863.

119. Let us therefore dismiss the hypothesis of direct action and consider that of Faraday. We know both from observations of the declination and horizontal force (Proc. Roy. Soe., March 22, 1877, and Phil. Trans., 1880, p. 541) that the action of the sun in pro- ducing diurnal variations of these elements is one and a half times as powerful at epochs of maximum as it is at epochs of minimum sun-spot frequency. It is hardly credible that there should be such a great difference on these occasions in the sun’s heating effect upon the great bulk of the atmosphere. Metcorologists have never observed such a difference, nor is there any marked corresponding inequality of diurnal temperature range. Meteorological evidence is thus against the diurnal magnetie changes being due to the heating up by the sun of the great mass of oxygen which constitutes the magnetic portion of the earth’s atmosphere. Again,.as there is a preponderance of hot oxygen in the northern hemisphere during the June and in the southern hemisphere during the December solstice, there ought according to this theory to be a well-marked annual variation of the magnetism of the earth, the northern hemi-sphere being at the same time differently affected from the southern.

. But there are no traces of such a phenomenon, the annual and semi- annual variations which we have already described (§$ 64-67) being of quite a different nature, and none of them very large.

120. Precisely the same objections apply with even greatcr force to the fourth hypothesis. It seems impossible to allow that any heating effect of the crust of the earth caused by the sun can be one and a half times as great at epochs of maximum as it is at epochs of minimum sun-spot frequency.

121. We are thus driven by the method of exhaustions to look to the upper regions of the earth's atmosphere as the most probable seat of the solar influence in producing diurnal magnetic changes, and it need hardly be said that the only conceivable magnetic cause capable of operating in such regions must be an electric current. Now we know from our study of the aurora that there are such currents in these regions—continuous near the pole and occasional in lower latitudes. A good deal has been said about the difficulty of imagining a daily set of currents to be generated in regions of such imperfect conductivity, but we shall see by and hy (§ 134) that there seems ground for imagining that their conductivity may be much greater than has hitherto been supposed.

122. Analogies between the Meteorological and Magnetical Systems of the Earth.—We have in the first place a zone of maximum ter- restrial temperature, the middle line of which is nearly coincident not only with the geographical but likewise with the magnetical equator. Again, there are possibly in the northern hemisphere two poles of greatest cold, which possibly do not greatly differ in position from those spots which we have called magnetic poles or foci. About the southern hemisphere we have no information.

Furthermore we believe that the hot air is carried from the zone of greatest heat to the place or places of greatest cold by means, no doubt, of the return trades which blow in the upper atmospheric regions. The hot air divides at this zone, one part blowing north- wards in the northern and another southwards in the southern hemisphere. Now this zone, from which the anti-trades divide, has an annual motion of its own, being found farthest north at the June solstice and farthest south at that of December. Probably too the northern system is strongest in June and the southern system in December. If we now turn to the solar-diurnal variation of magnetic declination, we find here also a northern and a southern system (§ 41), the

type of the one being antagonistic to that of the other. We find also that the northern system is strongest in June and the southern system in December.

Again, it seems probable from what we have now said that the anti-trades, strictly speaking, have reference not to the geographical equator and poles but to the zone of maximum and the poles of minimum temperature. Now, turning once more to the diurnal oscillations of the declination needle, it seems probable that the directions east and west must be interpreted as having a reference not to the geographical but to the magnetical pole (§ 45).

These analogies must be taken for what they are worth. Our object in introducing them has reference to the previous discussion, from which we concluded that the magnetic influence of the sun is probably due to currents in the upper region of the atmosphere— the cause of which we were content to leave in abeyance. Now these analogies would lead us to suggest that this cause, whatever it is, may perhaps be found to be related to the convection system 5 Aig earth on the one hand and to the magnetic system on the other.

123. Analogies between Meteorological and Magnetieal Weather. — These remarks are borne out by the further analogy which appears to subsist betwixt what we have termed meteorological and imag- netical weather. Let us take the solar-diurnal variation of declina- tion. Not only is this variation similar in form to the diurnal variation of atmospheric temperature (§ 37), but the ranges of the two have a similar annual variation. And, as the element of meteorological weather affects the orderly march of the temperature range, just so the element of magnetical weather affects the orderly march of the declination rauge.

Furthermore, just as temperature-range weather progresses from west to east ($ 52), so declination-range weather would seem to pro- gress in the same direction as the other (§ 52) although at a greater rate. It will doubtless require a more extended investigation to

make us quite sure of this latter point; nevertheless we do not.

perceive the validity of the objection that is sometimes made to the hypothesis of progress in magnetic weather on the ground that magnetic influences are kuown to affect all portions of the globe simultaneously. It will, we think, be perceived that in the above statement no supposition whatever is made with respect to the rate of propagation of a magnetic influence through the earth; this may be instantaneous or it may not. It is supposed that we have here a travelling cause of excitement, say a travelling cause of currents in the upper regions of the atmosphere which progresses from west to east and always produces its most marked effect above those regions where it passes—just as the sun itself in passing from east to west produces a magnetic effect the various phases of which travel from east to west with the sun which causesthem. We think too that this hypothesis of travelling causes of magnetic change is strengthened by the facts observed by Capello and described in § 97.

124. If, however, the objection made to this hypothesis refers to the fact disclosed by Broun ($ 85) that changes of horizontal force appear to take place simultaneously at distant parts of the earth's surface, then we think that analogy should lead us not to deny the possibility of a travelling magnetic excitement, but rather to suggest the possibility of there being some meteorological influence which, like the magnetical one above mentioned, may be found to take place simultaneously at different parts of the earth's surface. Now Broun (Proc. Roy. Soe., May 11, 1876) has given us preliminary evidence for supposing that there are simultaneous barometric vania- tions. For instance, there was a barometric maximum at Hobart Town, Peking, the Cape, St Helena, Makerstoun, Singapore, Madras, Simla, Ekaterinburg, and Bogoslovsk about the end of March or first day of April 1845. There appears to have been a simultaneous increase of the horizontal force of the earth at various stations much about the same time, and there also appears to have been a short-period maximum of spots on the solar surface. Broun has likewise registered simultancous barometric variations at Singa- pore, Madras, and Simla, for the first three months of 1845. From these it would seem that simultaneous barometric maxima are possibly coincident with rapidly increasing sun-spot areas.

Again is it not absolutely certain that if there is a sudden increase of solar power this must mean an increase of heat communicated to the earth,

although it may be difficult or cven impossible to obtain experimental evidence of such a fact? All these are sub- jects which require further investigation.

125. Further Remarks on the Solar-Diurnal Variation of Declination.—In § 24 we have asked how far the action of the solar- diurnal force upon a freely-suspended magnet is due to currents acting directly upon the magnet and how far to a change produced in the magnetism of the earth. Some light appears to be thrown on this point by the behaviour of the needle at places near the magnetic pole where the dipping needle is nearly vertical. On opposite sides of this locality the declination needle points in oppo- site directions. Now suppose that we have a set of sucli needles placed all round this region. It seems a legitimate generalization trom the observations described by Sabine (§ 45) to conclude that if we place ourselves above the centre of any of these needles at 8 A.M., and look towards its marked pole, we shall find it in every case deflected towards the right, while if we look towards the same pole at 2 p.m. we shall find it deflected to the left. Now if we imagine that at 8 A.M. there are above these magnets (in the upper atmospheric regions) electrical currents of which the horizontal components form a set of positive currents flowing from the pole on all sides, then. by the known laws of such currents the marked pole of all these needles will be deflected towards the right. And if at 2 p.m. the resolved portions of such currents should be flowing towards the pole, then the marked poles of all these needles will be deflected towards the left. It thus appears that this peculiar magnetic behaviour might easily be explained by a hy pothetical distribution of currents. And in fact in such regions we have im- dubitable evidence of the existeuce of currents in the upper regions of the atmosphere. On the other hand this behaviour could not easily be explained by the hypothesis of some definite temporary magnetic system set up by the solar influence in the earth, for m such a case we should imagine that similar poles of all the needles ought to be deflected towards the pole of this temporary system, which is not the case. =

126, Another point for consideration is the possible complexity of the solar-diurnal variation. For we may imagine (1) that the sun acts in such a manner as to produce a diurnal variation ; (2) 1t may also act like the moon (§ 94) and produce a semidiurnal varia- tion ; (3) these possible actions may be

accompanied by induced currents in the upper regions of the atmosphere and in the crust of the carth ; (4) it is possible that the sun’s rays may affect these variations or some of them in the way in which Broun found that the Junar variation at Trevandrum was affected by the sun. It

was found by him that the lunar action was considerably increased when the sun was above the horizon of the place.

127. We have pointed out (§ 119) that, while there is a marked

likeness in many respects between the diurnal variation of dcclina- tion and that of atmospheric temperature, we have yet no long- period fluctuation of the diurnal range of temperature at all com- parable in magnitude to the magnetic fluctuations. It does not, however, seem difficult to account for this difference if-we imagine that the magnetic fluctuations take their origin in the upper atmo- spheric regions, while the temperature fluctuations are due to the lower regions of the earth’s atmosphere. For, as the sun increases in power from times of minimum to times of maximum sun-spot frequency, we may immagine that a continuously increasing amount of aqueous vapour will be taken into the earth’s atmosphere. _ Now the experiments of Tyndall and others induce us to think that the air would under such circumstances become more and more opaque for certain rays of the sun, and thus a continuously decreas- ing proportion of the sun’s heat would be able to penetrate into the lower atmospheric regions. This latter influence would there- fore opcrate to cloak, perhaps to a considerable extent, the effect of the sun’s increasing power ; and this may very well be the reason why the temperature range at the earth’s surface does not exhibit the same eleven-yearly inequality as the declination range,

128. There seems, however, reason to believe that if we go from long to short period inequalities there is a much greater similarity in the range of the magnetical and the meteorological changes (§113). The explanation seems tobe that in the short-period changes the sun has not time to alter sensibly the constitution of the atmo- sphere, and hence the proportional increase of effect experienced in ibe upper atmospheric regions is more nearly the same as that experienced near the surface of the earth.

129. Magnetie Disturbanees.—There is strong evidence that the most important disturbances break out very nearly simultaneously at widely different parts of the earth, and that they even affect both hemispheres at the same time. Very little, however, is known about the modus operandi of the forces concerned in producing such disturbances. For instance, it is not known whether a disturbance permanently affects the magnetic state of the earth, ¢.g., whether one of the magnetic elements before a disturbance begins is sensibly different in value from what it is after the disturbance has ceased to exist. On the other hand we know (1) that disturbances break out on the very day when there are rapid changes taking place on the sun's surface (§ 83); (2) that they generally begin by momentarily increasing the horizontal force, but that the type quickly changes, so that during most disturbanccs the horizontal force is diminished (§ 86); (3) that large disturbances take place more particularly about the equinoxes, when, we have reagon to believe, the horizontal force of the earth is at a minimum (§ 77). May we not possibly conclude from these habits of action that at times of disturbance the earth is magnetically in a delicate state of equilibrium, perhaps having more magnetism than its surroundings would strictly warrant, and being therefore inclined to part with some, and that a sudden increase of solar activity, tending, as such ehanges probably do, at first to exalt the magnetism of the earth, nevertheless destroys its magnetic balance and gives it ultimately the opportunity of parting with some of its magnetism? This can only be regarded as a speculation, inasmuch as we do not know whether or not a disturbance produces any permanent influence upon the magnetism of the earth.

130. Auroras and Earth Currents. —There is no doubt that these phenomena denote electric currents in the upper regions of the atmosphere and in the moist conducting crust of the earth. The point in dispute is with respect to the origin of such currents. Soine are inclined to regard auroras as peculiar manifestations of atmosphierical electricity in high latitudes, while others imagine that such a peys are rather of the nature of induced currents generated by small but abrupt changes taking place in the magnetism of the earth. The advocates of the first view do not deny that currents taking place somehowin the upper at mospheric regions will have their conditions modified, to some extent at least, by the inducing influence of magnetic changes. Nor will the advocates of the induction hypo- thesis be disposed to

deny the possibility or even the certainty that displays due to atmospherical electricity and not dissimilar to some kind of aurora take place in some region of the atmosphere. But the first party regard auroras rather as the cause than as the effect of mag- neticchanges, whereas the advocatesof induction regard such displays rather as the effect than as the cause of changes somehow produced in the magnctisin of the earth. And here it is desirable to remark that the advocates of the induction hypothesis take for granted the magnetism of the earth and the changes thereof as phenomena for which they do not profess to account, whereas unless we go to some absolutely unknown cause (and this is against our present pro- gramme) we must look to atmospherical electricity as likely to throw light upon the origin of terrestrial magnetism. We cannot therefore dispense with regarding atmospherical electricity as an agent which may have played an important part in the development of the present magnetical condition of the earth, but we are yet of opinion

that, under the present state of things, the theory which holds by atmospheric electricity must largely be supplemented by the induc- tion hypothesis if it is to explain the peculiarities in type or form of the phenomena which observation brings before us.

131. Professor Tait in his essay on thunderstorms attributes one kind of aurora to atmospherical eleetricity. Such an aurora is, he believes, the manifestation of almost continuous discharges, like those given by a Holtz machine in a vacuum tube. The cause is condensation of vapour going on very slowly in very large spaces of air. The electricity is due to previous contact of particles of air and vapour. ‘The result is that the air-particles in the mixture in time acquire a definite difference of potential from those of vapour, — so that, when the latter aggregate, a misty region well charged is the result, and this discharges to the oppositely electrified air all round.

132. Again, Professor Stokes, without attempting to account for the origin of atmospherical electricity, has produced an hypothesis with the view of ‘explaining the intimate connexion subsisting between auroral displays,

earth currents, and magnetic changes on the one hand and outbursts of sun-spot activity on the other. His idea is that two somewhat distant atmospheric regions A and B are charged, let us say, with positive and negative electricity respec- tively ; A induces in the ground below it a charge of negative, Ba charge of positive electricity. At first things are held in this state: A cannot discharge either through the upper atmospheric regions to B or through the lower regions to the ground bencath it, while B is in a position precisely similar. Presently, however, an increase of the radiative power of the sun is produced. Such an increase would probably imply not merely an increase in general radiation but a particular increase in such actinic rays as are absorbed in the upper regions of the carth's atmosphere. The layer of atmosphere between A and B will therefore greedily absorb such rays, its tem- perature will rise, and, as is known to be the case for gases, the electrical conductivity of the stratum will be increased.

133. This hypothesis certainly affords a good explanation of the promptness with which disturbances follow increased solar activity (§ 83). Unless we are to resort to some unknown cause it is diffi- cult to think of any other possible explanation of this fact. Such an explanation appears too to receive corroboration from the fact (§ 97) that the lunar influence on the earth's magnetism as observed at Trevandrum is greater during the day than during the night, — greater possibly too at times of maximum than at times of minimum sun-spots. We are therefore disposed to accept this explanation of the way in which increased solar activity produces magnetic dis- turbance as the best that has been brought forward.

134, This does not, however, decide the disputed point how far these clevated currents are due to athioaphinial decntety and how far to induction. The argument against the possibility of induced currents in these regions is derived from experiments with vacuuin tubes, such as those recorded by Messrs De la Rue and Miiller, which would seem to indicate that enormous differences of potential would be required to produce electrical currents in elevated regions, where the atmosphere is very rare.

Indeed, on account of these experiments, the measurements of the old observers, who sometimes assigned a height of 'more than 100 miles to the aurora, have been called in question, and it has been supposed against direct

observation that these phenomena must always occur in regions much less elevated. It would appear too that such reasons were influential in determining Professor Stokes to regard the aurora as produccd by atmospherical electricity which, as we know from ordinary lightning, presents us with enormous differences of potential ; but it is to be remarked that he has care- fully guarded himself against the possibility of laboratory experi- ments with vacuum tubes not being strictly analogous to that which takes place in the upper atmosphericregions. Now it would appear that recent experiments by Hittorf throw some doubt upon the strictness of this analogy. The high difference of potential required to force the current through vacuum tubes is, according to this observer, due in great part if not entirely to the passage of the fluid from the terminal to the residual air of the tube, so that the poten- tial requisite to pass a current through a tube of double length is not sensibly greater than that required for a tube of single length. The whole subject is one which demands further investigation; meanwhile we are not disposed to assert the impossibility of induc- tion currents taking place in the upper atmospheric regions.

135. Let us now consider whether the form or type of the earth currents observed during disturbances favours the presence of induc- tion to any sensible extent. The remarks of Dr Lloyd already quoted (§ 93), which are confirmed by the Greenwich observations, seem to be decisive in this respect. These may be interpreted in

the following manncr. In a magnetic disturbance we have fre- quently a general displacement of the various elements—the hori- zontal force, for instance ; now on the curve which represents this slow but considerable displacement a large number of comparatively small but very abrupt changes are superimposed. These latter appearances are invariably accompanied by quick and strong alter- nations from positive to negative of the earth enrrents, while the former slow motion, although it may be of large range, hardly appears to have any galvanic equivalent at all. This would appear to favour the induction hypothesis, according to which small but abrupt magnetic changes should give rise to strong earth currents

alternately positive and negative without reference to the position of the magnet above or below its normal at the time. :

136. Another fact bearing upon this hypothesis is that mentioned in § 88. From this it would appear that on ordinary occasions the curves recording the progress of the declination needle at Kew and Stonyhurst are as nearly as possible identical, but on occasions of disturbance the range at Stonyhurst is greater than that at Kew by an amount not apparently depending so much on the magnitude of the disturbance as on its abruptness. The introduction of the element of abruptness would appear to be in favour of the mix- ing up to some extent of induced currents with the phenomena in question.

137. Sir George Airy has not been able to detect any resemblance in form between the regular diurnal progress of the magnet and that of the earth cnrrents. 1t seems, however, possible that the peaks and hollows alluded to in § 73 may form an important and integral part of the daily magnetic movement, and there even appears to be some evidence that the diurnal progress of the earth currents bears a nearer resemblance to that of the peaks and hollows than it does to the progress of the smoother curve which is nsually held to represent the diurnal variation. But this is a question which can only be decided by more prolonged investigations.

138. To conclude, there can be no doubt that at times of great magnetic disturbance we have currents in the upper atmospheric regions and in the crust of the earth which, so far as we can see, must either be due to atmospherical electricity or to induction, or to a mixture of both. The proportions of this mixture can only be decided by further inquiry and by the multiplication of stations where atmospherical electricity and earth currents may be observed. It ought to be mentioned that the experience of the Kew observers, as far as this extends, scems unfavourable to the hypothesis of a connexion between auroras and atmospheric electricity.

139. Lunar-Semidiurnal Variation.—From the fact observed by Broun (§ 98) that the moon’s magnetic influence is as nearly as possible inversely proportional to the cube of the moon’s distance from the earth, it is impossible to refrain from associating it either directly or indirectly with something having the type of tidal action, but in what way this influence

operates we cannot tell. Is it possible that the earth currents observed by A, Adams (§ 101) are induction enrrents generated in the conducting crust of the earth by the magnetic change caused by the moon,—inasmuch as these currents were found by him to be strongest in one direction abont the lunar hours 3 and 15, when the lunar-diurnal magnetic effect is changing most rapidly in one direction (§ 95), while they were found to be strongest in an opposite direction about the lunar hours 9 and 21, when the lunar-diurnal magnetic effect is changing most rapidly in an opposite direction ?

140. We might perhaps expect from the analogy of the tides that the sun should possess a semidiurnal magnetic effect similar in type to that of the moon. Now Sir George Airy in his analysis of the earth currents observed at Greenwich (Phil. Trans., 1870) during days of tranquil magnetism has detected in such currents a semi- diurnal inequality having maxima in one direction at solar hours 3 and 15, while it has maxima in the opposite direction at solar hours Sand 21. The reference to solar hours in this inequality is thus precisely similar to that which the inequality observed by Adams bears to lunar hours. :

141. If there are induced currents of this nature in the crust of the earth, we might naturally suppose that there will be correspond- ing currents in the upper regions of the earth's atmosphere, and in accordance with the suggestion made by Professor Stokes (§ 132) we might perhaps suppose that these currents will be strongest when the upper atmospheric regions are heated by the sun and thereby rendered better conductors. Isit not possible to suppose that the influence of daylight upon the lunar magnetic effect discovered by Broun (§ 97) may be due to this cause, and may it not also induce us to recognize the possibility of a maximum lunar influence (§ 99) at times of maximum sun-spots, when there is reason to believe that solar radiation is most powerful ?

142. Seewlar Variation.—Sabine and Walker are agreed in regarding this variation as cosmical in its origin, and they are apparently of opinion that it is caused by some change in the con- dition of the sun. It seems difficult if not impossible to attribute it to anything else, since the terella of Halley cannot be now regarded as having a physical existence. Again it is more than possible—it is probabie—that there are solar variations of much

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longer period than eleven years. On the other hand the evidence given in § 81, tending toshow that an access of sun-spots produces a change in the magnetic state of the earth consistent with the hypo- thesis that the magnetizing power of the sun has then been augmented, requires to be confirmed by more observations; and even then it is certain that this magnetic change produced by a considerable change in spotted area is extremely small. We cannot therefore regard the very large secular magnetic change as due to a non-cumulative magnetic influence of some long-continued solar variation ; nor does it scem possible to attribute the change to solar influence at all unless we regard this influence as producing results of a cumulative nature.

It is possible, however, to regard solar influence as producing a cumulative effect in one of two ways, or by a combination of both. For (1) time is necessarily an element in any influence acting upon the hard-iron system of the earth—presuming the earth to possess There are in fact indications in the results of § 82 that a system of this kind is perhaps connected with the American pole ; yet, even allowing the influence of time, it seems difficult to account for the peculiarities of the secular variation by an hypo- thesis of this nature. But (2) any long-continued variation of solar power would no doubt act cumulatively in producing an increase or diminution of the large ice-fields round the poles of the earth. In the course of time this cumulative change in the extent and dis- position of these might perceptibly alter the distribution of the convection currents of the earth—and these, according to the views herein indicated, might in their turn perceptibly alter the earth’s magnetie systeni.

143. Concluding Remarks. —If we agree to look for an explanation of terrestrial magnetism and its changes to strictly terrestrial pro- cesses, we may derive some assistance in onr search from such con- siderations connected with symmetry as enable us, for example, at once to perceive that when two perfectly similar things are rubbed together we cannot have

electrical separation, because there is no reason why the one should be positively and the other negatively electrified. Suppose then that an observer stands at the equator and looks towards the north, and then turns his back upon the north and looks towards the south. In the first position let him regard the northern system of meteorological processes and motions, and in the second the southern. Now if syminetry obtained abso- lutely in these systems—that is to say, if the observer, whether he regarded the northern or the southern system of things, had in either case precisely similar phenomena at his right hand and at his left—then we should see no reason why the earth should be a magnet, or why one hemisphere should be the seat of magnetism of the one kind rather than of the other. If then we regard meteoro- logica] processes and motions as being in some way the cause of terrestrial magnetism, we must direct our attention to that peculiar element which causes a want of perfect symmetry such as we have described in metcorological phenomena. This element can hardly be anything else than the rotation of the earth, which is from left to right to an observer facing the north, but from right to left to an observer facing the south.

144. Now if we look upon the terrestrial meteorological system modified by the earth's rotation as having produced somehow in the past the magnetic state of the earth, it seems most natural to regard the system which formerly produced this magnctic state as being likewise that which at present maintains it in its efficiency, and which also accounts for the various magnétic changes which take place. It would seem therefore that terrestrial meteorology and terrestrial magnetism are probably cognate subjects, and that they ought to be studied together in the well-founded hope that the phenomena of the one will help us to explain those of the other.

Furthermore, if these meteorological processes—deriving their one-sided character from the earth's rotation—are to be regarded as accounting not only for the origin but for the maintenance of the earth's magnetic system, we can hardly fail to imagine that these processes must derive part of the energy which they exhibit from that of the earth's rotation. Tidal energy we knowis derived from this source ; but we must likewise regard part of the energy displayed in convection currents whether in the air or in the oceamt as derived no doubt from the same source. And we may perhaps allow that

in the phenomena of tidal action, as well as in those of convection currents of the air and ocean, there may be, not merely a transmutation of actual energy directly through friction into heat, but likewise a transmutation of it, ultimately perhaps into heat, but first throngh the iutermediate agency of electrical currents which serve to maintain the magneiic state of the earth and to produce magnetic changes.

Now if this be the case, if there be a large and complicated system of tidal and convection currents all tending to change the rotative energy of the earth ultimately into heat, whether directly through friction or indirectly through the medium of electricity, it is surely impossible with the present state of our knowledge to calculate with the smallest pretensions to accuracy at what rate this transmutation is taking place, and hence at what rate the velocity of the earth's rotation is being slowly diminished. (B.S.

METHODISM

I. WESLEYAN METHODISM.

HE history of Wesleyan Methodism embraces—(1) the Methodism of Oxford, which was strictly Anglican and rigidty rubrical, though it was also more than rubrical ; (2) the evangelical Methodism of the Wesleys after their conversion (in 1738), of which the Wesleyan doctrines of conversion and sanctification were the manifesto and inspiration, while preaching and the class-meeting were the great motive and organizing forces,—a movement which before Wesley's death had developed into a form containing, at least in embryo, all the elements of a distinct church organization, although in its general designation and deliberate claims it purported to be only an unattached spiritual society ; and (3) Wesleyan Methodism since the death of Wesley, which, by steps at first rapid and after- wards, though leisurely, distinct and consecutive, assumed an independent position, and has grown into complete development as a church.

1. Oxford Methodism.—This began in November 1729, when John Wesley, returning to Oxford from Lincolnshire, where he had been serving his father as curate, found that his brother Charles, then at Christ Church, had induced

a few other students to join him in observing weekly com- munion. John Wesley's accession lent weight and character to the infant association. Their first bond of association, . besides the weekly communion, was the common study of the Greek Testament, with which they joined regular fasting, the observance of stated hours for private devotion, the visitation of the sick, of the poor, and of prisoners, and the instruction of neglected children. They never themselves adopted any common designation, but of the variety of derisive names they received from outsiders that of "Methodists" prevailed, —a sobriquet the fitness of which, indeed, as descriptive of one unchanging and insepar- able feature of Wesley's character (which he impressed also on his followers), was undeniable.

This first Oxford Methodism was very churchly. Between 1733 and 1735, however, a new phase was devel- oped. Its adherents became increasingly patristic in their sympathies and tendencies, and Wesley came much under the influence of William Law. In regard to this period of his history, Wesley himself says that he

"Bent the bow too far, by making antiquity a coordinate, rather than a subordinate, rule with Scripture, by admitting several doubtful writings, by extending antiquity too far, by believing more practices to have been universal in the ancient atch than ever were so, by not considering that the decrees of a provincial synod could bind only that province, and the decrees of a general apped only those provinces, whose representatives met therein, that most of those decrees were adapted to particular times and Occasions, and, consequently, when those occasions ceased, must cease to bind even those provinces."

It was in 1736, during his residence in Georgia, whither he had gone as a missionary of the Propagation Society, that he learnt those lessons. Notwithstanding his ascetic severity and his rubrical punctilios, the foundations of his High-Churchmanship were gradually giving way. When he returned to England he had already accepted the – doctrine of "salvation by faith," although he had not as yet learned that view of the nature of faith which he was afterwards to teach for half a century. He had, however, a$ in the journal of his homeward voyage he tells us, learned, "in the ends of the

earth," that he "who went to America to convert .others was never himself converted to God." In this result his Oxford Methodism came to an end.

The original Methodism of Oxford never at any one time seems to have numbered as many as thirty adherents.

There was a set called '" Methodists," but there was no organization, no common bond of special doctrine or of discipline ; there were habits and usages mutually agreed upon, but there was no official authority, only personal influence. The general features of the fraternity, if frater- nity it may be called, seem to suggest closer analogies with the "Tractarian" school in its earlier stages than with anything else in modern history, and the personal ascendency of John Wesley may remind us in some measure of the influence exercised a century later by J. H. Newman. There was no more any germ of permanent organization in the Oxford Methodism of 1735 than in the patristic and "Tractarian" school of Oxford of 1833.4

2. Methodism after Wesley's Conversion.—John Wesley landed at Deal, on his return from Georgia, on February 1, 1738. His journals on the homeward voyage, says Miss Wedgwood,? "chronicle for us that deep dissatisfac- tion which is felt whenever an earnest nature wakes up to the incompleteness of a traditional religion; and his after life, compared with his two years in Georgia, makes it evident that he passed at this time into a new spiritual region." .... . "By Peter Bohler,' in the hands of the. great God," he writes in his journal, 'I was, on March 5, fully convinced of the want of that faith whereby we are saved." This "conviction" was followed on March 24 of the same year (1738) by his " conversion."

Like most good men of that age in England, Wesley, before he came under the influence of his Moravian teacher, had regarded faith as a union of intellectual belief and of voluntary self-submission—the belief of the creeds and submission to the laws of Christ and to the rules and services of the church, acted out day by day and hour by hour, in all the prescribed means and services of the church and in the general duties of life. From this conception of faith the element of the supernatural was wanting, and equally that of personal trust for salvation on the atone- ment of Christ. The work of Bohler was to convince Wesley that such faith as this, even though there might be more or less of divine influence unconsciously mingling

with its attainment and exercise, was essentially nothing else than an intellectual and moral act or habit, a natural operation and result altogether different from the true spiritual faith of a Christian. ‘This conviction led him a few days afterwards to stand up at the house of the Rev. Mr Hutton, College Street, Westminster, and declare that five days before he had not been a Christian. When warned not thus to despise the benefits of sacramental grace, he rejoined, ‘‘When we renounce everything but faith and get into Christ, then, and not till then, have we reason to believe that we are Christians.” It is true that for several years after this he remained High-Church in

1 One evidence of this is to be found in the early and wide diverg- ence of the various members of the Oxford Methodist company, after their brief association at the university came to an end. We know which way the Wesleys went ; we know also the separate path that their-friend Whitefield made for himself. John Clayton, the Jacobite churchman, settled at Manchester, renounced the Wesleys after they began their evangelical movement, and remained an unbending High- Churchman to the end. Benjamin Ingham became a great evangelist in Yorkshire, founded societies, and, with his societies or churches, took the decisive step of leaving the Church of England and embracing the position of avowed Dissent. The saintly Gambold, a poet as well as a theologian and preacher, became a Moravian bishop. James Hervey was in after life a famous evangelical clergyman, holding ‘‘Low” and Calvinistic views. These were the chief of the Method- ists of Oxford.

2 John Wesley and the Evangelical Reaction of the 18th Century.

8 A disciple of Zinzendorf, who had settled in London,

some of his principles and opinions, but nevertheless his ritualism was dead at its roots.

This experience also made Wesley an evangelist. He had a forgotten gospel to preach,—the gospel by which men were to be converted, as he had been, and to be made “new creatures.” And this result, this new birth, was not dependent on any churchly form or ordinance, on any priestly prerogative or service, or on any sacramental grace or influence. ‘To raise up, accordingly, by his preaching and personal influence, a body of converted men, who should themselves become witnesses of the same truth by which he had been saved, was henceforth to be Wesley’s life-;work. This was the inspiration under which he became a great preacher; this also made him an organizer of his living witnesses into classes and societies. In the pulpit was the preaching power ; in the class-room was the private and personal influence. The vital link between the pulpit and the class meeting was the doctrine and experience of “conversion.” Thus Wesleyan Methodism is derived, not from Wesley the ritualist, but from Wesley the evangelist.

Wesley’s doctrines offended the clergy. His popularity as a preacher alarmed them. The churches were soon shut against him. He attended the religious meetings— on a Church of England basis—which had existed in London and elsewhere for fifty years, so far as these were still open to him, the Moravian meetings, and meetings in the rooms of private friends, but these were quite insufficient for the zeal and energy of himself and his brother, who had been “converted” a few days before himself. Accordingly, in 1739, he followed the example set by Whitefield, and preached in the open air to immense crowds. In the same year also he yielded to the urgency of his followers and to the pressure of circumstances, and, becoming possessed of an old building called ‘‘the Foundery,” in Moorfields, transformed it into a meeting- house. Here large congregations came together to hear the brothers. About the same time, in Bristol and the neighbouring colliery district of Kingswood, he found him- self obliged, not a little against his will, to become the owner of premises for the purpose of public preaching and religious meetings. Here was the beginning of that vast growth of preaching-houses and meeting-rooms, all of them for nearly fifty years settled on Wesley himself, which, never having in any way belonged to the Church of England, became, through Wesley, the possession of the Methodist Connexion.

The religious societies through which the Wesleys, after their conversion, exercised at first their spiritual influence were in part, as has been intimated, Moravian,—that in Fetter Lane, of which the rules were drawn up by Wesley himself in 1738 (May 1), being the chief of these,—and in part societies in connexion with the Church of England, the successors of those which sprang up in the last years of the Stuarts, as if to compensate for the decay of Puritanism within the church. In 1739, however, a strong leaven of antinomian quictism gained entrance among the Moravians of England (Béhler himself having left for America in the spring of 1738); and Wesley, after vainly contending for a time against this corruption, found it necessary formally to separate from them, and to establish a society of his own, for which a place of meeting was already provided at the Foundery. This was the first society under the direct control of Wesley, and herein was the actual and vital beginning of the Wesleyan Methodist Society, that is, of Wesleyan Methodism. Hence the Wesleyans celebrated their centenary in 1839. It was not, however, till 1743 that Wesley published the Rules of his Society. By that time not a few other local societies had been added to that at the Foundery, the three chief centres

being London, Bristol, and Newcastle. Hence Wesley called his Society, when he published the ‘‘ Rules” in 1748, the “ United Societies.” His brother’s name was joined with his own at the foot of these Rules, in their second

edition, dated May 1, 1743, and so remained in all later

editions while Charles Wesley lived. Those Rules are still the rules of Wesleyan Methodism. Since Wesley’s death they have not been altered. During his life only one change was made of any importance. In 1743 the offerings given weekly in the classes were for the poor, there being at that time no Conference and no itinerant preachers except the two brothers; after a few years the rules pre- scribed that the weekly contributions were to go “ towards the support of the gospel.” The Society is described as “a company of men having the form, and seeking the power, of godliness, united in order to pray together, to receive the word of exhortation, and to watch over one another in love, that they may help each other to work out their

salvation.” ‘The only condition previously required of those who desire admission into these societies” is ‘a desire to flee from the wrath to come, and to be saved from their sins.” The customary contribution was a minimum of a penny a week or a shilling a quarter.

In 1739 these societies were not divided into “classes.” But in 1742 this further step in organization was taken, and the change is recognized in the rules of 1743. Leaders were appointed to these classes, and became an order of spiritual helpers and subpastors, not ordained like lay elders in the Presbyterian churches, but, like them, filling up the interval between the pastors that “labour in the word and doctrine” and the members generally, and furnishing the main elements of a council which, im after years, grew up to be the disciplinary authority in every “society.” In every society there was from the beginning a ‘‘steward ” to take and give account of moneys received and expended. After a few years there were two distinct stewards, one being specially appointed to take care of the poor and the “‘poor’s money,” the other being, in general, the “society steward.” And, finally,—though hardly, perhaps, during Wesley’s lifetime,—in the larger societies there came to be two stewards of each description. The leaders and stewards together constituted “ the leaders’ meeting,” of which, however, the complete circle of func tions grew into use and into recognition only by degrees.

ne Rules of the Society, which are strict and searching, relate to worship, to conduct, and to the religious life, but do not once mention or refer to the Church of England, the parish church, or the parish clergy. The only authority at first was the personal authority of the two brothers, exercised either directly or by their official delegates. After years had passed away the leaders’ meeting came to have an important jurisdiction and authority, but its rights and powers were neither defined nor recognized until after Wesley’s death. From first to last there is no trace or colour of any Anglican character in the organization. Moravians or Dissenters might have entered the fellow- ship, and before long many did enter it who had either been Dissenters or, at any rate, had seldom or never entered a church. What would to-day be called the “unsectarian ” character of his society was, indeed, i Wesley’s view, one of its chief glories. All the time, however, this “unsectarian” society was only another “sect” in process of formation.

Wesley for many years before his death had seen that, unless the rulers of the church should come to adopt in regard to his society 4 policy of liberal recognition, this might be the outcome of his life-work. And it would seem as if in his private confidences with himself he had come in the end at times to acquiesce in this result.

Still more decisive, however, was the third step in the

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development of Wesley's "Society." The clergy not only excluded the Wesleys from their pulpits, but often repelled them and their converts from the Lord's Supper. This

was first done on a large scale, and with a systematic'|

harshness and persistency, at Bristol in 17 40e- "Under these circumstances the brothers took the decisive step of administering the sacrament to their societies themselves, in their own meeting-rooms, both at Bristol and at Kings- wood. This practice having thus been established at Bristol, it was not likely that the original society at the Foundery would rest content without the like privilege, especially as some of the clergy in London acted in the same manner as those at Bristol. There were therefore at the Foundery also separate administrations. Here then, in 1740, were two—if we include Kingswood, three—separate local churches, formed, it is true, and both served and governed by ordained clergymen of the Church of England, but not belonging to that church or in any respect within its government. As thereafter during Wesley's life one of the brothers, or some cooperative or friendly clergyman, was almost always present in London and in Bristol for the administration of the sacraments, these communions, when once begun, were afterwards steadily maintained, the Lord's Supper being, as a rule, administered weekly. Both on Sundays and on week days full provision was made for all the spiritual wants of these "societies," apart altogether from the services of the Church of England. The only link by which the societies were connected with that church—and this was a link of sentiment, not an organic one—was that the ministers who served them were numbered among its "' priests."

In 1741 Wesley entered upon his course of calling out lay preachers, who itinerated under his directions. To the societies founded and sustained with the aid of these preachers, who were entirely and absolutely under Wesley's personal control, the two brothers, in their extensive journeys, administered the sacraments as they were able. The helpers only ranked as laymen, many.ofthem, indeed, being men of humble attainments and“6f unpolished ways. For the ordinary reception of the sacraments the societies in general were dependent on the parish clergy, who, how- ever, not seldom repelled them from the Lord's table. So also for the ordinary opportunities of public worship they often had no resource but the parish church. The simple service in their preaching-room was, as Wesley himself insisted, defective, as a service of public worship, in some important particulars; besides which, the visits of the itinerants were usually, at least at first, few and far between. Wesley accordingly was urgent in his advices and injunctions that his societies generally should keep to their parish churches ; but long before his death, especially as the itinerant preachers improved in quality and increased in number, there was a growing desire among the societies to have their own full Sunday services, and to have the sacraments administered by their\own preachers. The development of thése preachers into ministers, and of the societies into fully organized churches, was, if not the Inevitable, at any rate the natural, result of the steps which Wesley took in order to carry on the work*that was continually opening up befgre him.

In 1744 Wesley held his first Conference. The early Conferences were chiefly useful for the settlement of points of doctrine and discipline and for the examination and accrediting of fellow- labourers. They met yearly. Conferences were a necessity for Wesley, and became increasingly so as his work continued to grow upon him. It was inevitable also that the powers of the Conference, although for many years the Conference itself only existed as it were on sufferance, and only exercised any authority by the per- mission of its creator and head, should continually increase. The result was that in 1784 Weslcy could no longer delay the legal

constitution of the Conference, and that he was compelled, if he would provide for the perpctuation of his work, to take measures

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fer vesting in trustees, for the use of ‘‘the people called Mcthod- ists,” under the jurisdiction of the Conference as to the appoint- inent of ministers and preachers, all the preaching places and trust property of the Connexion. The legal Conference was defined as consisting of one hundred itinerant preachers named by Wesley, and power was given to the ‘‘ legal hundred ” continually from the first to fill up the vacancies in their own number, to admit and expel preachers, and to station them from year to year, no preacher being allowed to remain more than three years in one station.

By this measure Wesley’s work was consolidated into a distinct religious organization, having a legally corporate character and large property rights. And yet Wesley-would not allow this great organization to be styled a ‘“‘church.” It was only a “‘society ” —the ‘‘ United Society ””—the Society of ‘‘the people called Method- ists’”—the ‘‘ Methodist Society.” And of its members all who were not professed Dissenters were by him reckoned as belonging to the Church of England, although a large and iwereasing pro-

| portion of them seldom or never attended the services of that

church. The explanation of this apparent inconsistency is that Wesley admitted none to be Dissenters except such as were so in the eye of the law —those who, ‘‘for conscience sake, refused to join in the services of the church or partake of the sacraments administered therein”—and that he interpreted ‘‘the Church of England” to mean, as he wrote to his brother Charles, ‘‘ all the belicvers in England, except Papists and Dissenters, who have the word of God and the sacraments adininistered among them.”

But Wesley was to carry his Society to a yet higher piteh of development, and one which made it still more difficult to dis- tinguish its character from that of a distinct and separate church. In 1738 Wesley had been theoretically a High-Churchman. For some time even after he had entered npon his course of irregular and independent evangelism he continued to hold, in the abstract, High-Church views. But in 1746 he abandoned once for all his ecclesiastical High-Churchmanship, although he never becaine either a political or a latitudinarian Low-Churchman after the standard and manner of the 18th century. He relates in his journal under date January 20, 1746, how his views were revoln- tionized by reading Lord (Chancellor) King’s

account of the primitive church. From this time forward he consistently main- tained that the ‘uninterrupted succession was a fable which no man ever did or could prove.” One of the things taught him by Lord King’s book was that the office of bishop was originally one and the saine with that of presbyter; and the practicab inference which Wesley drew was that he himself was a ‘‘ Scriptural Episco- pos,” and that he had as much right as any primitive or missionary bishop to ordain ministers, as his representatives and helpers, who should administer the sacraments, instcad of himself, to thie societies which had placed themselves under his spiritual charge. This right, as he conceived it to be, he held in abeyance for nearly forty years, but at length he was constrained to exercise it, and, by so doing, in effect led the way towards making his Society a distinet and independent church.

In 1784, the American colonies having won their independence, it became necessary to organize a separate Methodisin for America, where Methodist societies had existed for many years. Wesley gave formal ordination and letters of ordination to Dr Coke, already a presbyter of the Church of England, as superintendent (or bishop) for America, where Coke ordained Francis Asbury as presbyter and superintendent (or bishop), and Coke and Asbury together ordained the American preachers as presbytcrs. From that ordination dates the ecclesiastical commencement of American Episcopal Methodism—in which the bishops are only chief among the presbyters whom they superintend, superior in office but of the same order. The Episcopal Methodism of America represents to- day the largest aggregate of Protestant communicants and worship- pers of the same ecclesiastical name to be found in any one nation in the world.

The following year (1785) Wesley ordained ministers for Scot- land. There his societies were quite outside of the established Presbyterianism of the day, with its lukewarm “ moderatism ”’, while the fervid sects which had seceded from the state church would hold no terms with Arminians like Wesley and his followers. Hence Wesley was compelled to make special provision for the administration of the sacraments in Scotland. He therefore ordained some of his ablest and most dignified preachers, was eareful to give them formally in his correspondence the style and title of ‘‘ Reverend,” and appointed them to administcr the sacra- ments north of the Tweed.

At length, in 1788, Weslcy ordained a number of preachers (Mr Tyerman says seven) to assist him in administering the sacraments to the societies in England; and of these he ordained one (Alexan- der Mather) to be superintendent (or bishop), his brother Charles being now dead, and Dr Coke sometimes absent for long periods in America. The number of societies which demanded to have the sacraments administered to them in their own places of worship continually increased, and their claims were often too strong to be resisted, especially when the parish priest was cither a public

opponent of the Mcthodists or a man of disreputable conduct. Before Wesley's death (in 1791) it would seem that there were more than a dozen of his preachers who had at different times, in Scot- land or in England, been ordained to administer the sacraments.

The foregoing view of the development of Methodism as an organization, during the lifetime of its founder, will have conveyed a general idea of its structure and polity. There is one cardinal, though variable, element in its organization, however, of which there has as yet been no occasion to speak. The societies of Methodism—each of these consisting of one or more ‘‘ classes ”— were themselves grouped into circuits, each of which was placed under the care of one or more of Wesley's Conference preachers, who were called his ‘‘ assistants” or ‘‘helpers,” the assistant being the chief preacher of a circuit, and the helper being a colleague and subordinate. The ‘‘assistants” were directly responsible to Wesley, who had absolute power over them, and exercised it between the Conferences. The same power he equally possessed in the Conference, at the yearly meetings, but he made it a rule, during his later life, to take counsel with the Conference as to all inatters of importance affecting the permanent status of the preachers personally, or relating to the societies and their govern- ment. He thus prepared the Connexion, both preachers and people, to accept the government and the legislative control of the Conference after his death.

At the time of Wesley's death there were in Great Britain, the Isle of Man, and the Channel Islands, 19 circuits, 227 preachers, and 57,562 members. In Ireland there were 29 circuits, 67 preachers, and 14,006 members. There were also 11 mission circuits in the West Indies and British America, 19 preachers, and 5300 members. The uumbcr of members in the United States was returned as

43,265.

It has already been explaincd that in connexion with each society there was a leaders' meeting, of which society stewards and poor stewards as well as leaders were members. It must here be added that each cireuit had its quarterly meeting, of which, at first, only the society stewards and the general steward (or treasurer) for the circuit, in conjunction with the itinerant preachers, were necessary menibers. Leaders, however, in soine

circuits were very early, if not from the first, associated with the stewards in the quarterly meeting, or at Icast had liberty to attend. The quarterly meeting was not defined in Wesleyan Methodism until the year 1852. The leaders' meeting had no defined authority until some years after Wesley's death. Discipline, including the admission and expulsion of members, lay absolutely with the ''assistant," subject only to appeal to Mr Wesley. Many years, however, before Wesley's death it had become the usage for the ''assistant," or, in his absence, the ''helper," his colleague, to consult the leaders' meeting as to important questions either of appointment to office or of discipline. As the consolidated '' society" approached towards the character of a **church," the leaders' meeting began to acquire the character and functions of a church court, aud private members to be treated, in regard to matters of discipline, as having a status and rights which might be pleaded before such a ''court." The rights, indeed, which, soon aftcr Wesley's death, were guaranteed to leaders' meetings and meinbers of society had, there can be no doubt, so far grown up, before his death, as to be generally recognized as undeniable.

'' Bands"? were a marked feature in early Methodism, but in later years were allowed, at least in their original form, to fall out of use. Thereis no reference to them in the '' Minutes of Conference" after 1768, although till after Wesley's death they held a place in the oldest and largest societies. Originally there were usually in each considerable society four bands, the members of which were collected from the various society classes—one band composed of married and another of unmarried men, one of married and another of un- married women. All the members of society, however, were not of necessity meinbers of bands. Some maturity of experience was expected, and it was the responsibility of the "'assistant " to admit intv band orto exclude from band. After Mr Wesley's death, where ''bands"' so called were kept up, they lost their private character, and became weekly fellowship meetings for the society.

The ''love-feast"" was a meeting the idea of which was borrowed from the Moravians, but which was also regarded as reviving the primitive institute of the agape. In the love-feast the members of different societies come together for a collective fellowship meeting. One feature of the meeting—a

memory of the primitive agape—is that all present eat a small portion of bread or cake and drink of water in common.

It may be supposed that in such asystem as Methodism a large number of preachers and exhorters, from all the social gradés included within the societies, conld not but be continually raised up. These, during Wesley's life, acted entirely under the directiouis of the assistant, and were by him admitted or excluded, subject to an appeal to Wesley, Once a quarter—often in conjunction with the circuit quarterly meeting—a meeting of these local lay helpers, called ‘‘local preachers,” was held for mutual consultation and arrangement, and to examine and accredit candidates for the office.

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3. Wesleyan Methodism after Wesley's Death (1791). —When Wesley died the Conference remained as the bond of union and fountain of authority for the Connexion, But between the meetings of Conference Wesley had acted as patriarch and visitor with summary and supreme jurisdiction. The first need to be supplied after his death was an authority for the discharge of this particular func tion. In America Wesley had organized a system of bishops (presbyter-bishops), presbyters or elders, and deacons or ministers on probation. Among some of those preachers who had been most intimate with Wesley there was a conviction that his own judgment would have approved such a plan for England. No document, how- ever, remains to show that such was his desire. The only request he left behind him for the Conference to respect was one which rather looked in another direction—the well-known letter produced before the Conference on its first meeting after his death by his friend and personal attendant, Mr Bradford, in which he begged the members of the legal hundred to assume no advantage over the other preachers in any respect. The preachers, accordingly, in their first Conference after Wesley's death, instead of appointing bishops, each with his diocese or province, divided the country into districts, and appointed district committees to have all power of discipline and direction within the districts, subject only to an appeal to the Conference, all the preachers exercising equal rights also in the Conference, the “legal hundred” merely confirming and validating pro forma the resolutions and decisions of the whole assembly.

At first the preachers stationed in the districts were instructed to elect their own chairmen, one for each district. But the plan was speedily changed, and the chairmen were elected each year by the whole Conference; and this method has been maintained ever since. The “ district meetings”—as they are generally called—are still “com- mittees” of the Conference, and have ad interim its power and responsibilities as to discipline and administration. Originally they were composed exclusively of preachers, but before many years had passed circuit stewards and district lay officers came to be associated with the preachers during the transaction of all the business except such as was regarded as properly pastoral.

The relation of the Conference to the government of the Connexion having thus been determined, the question which next arose, and which occupied and indeed convulsed the Connexion for several years (1792-95), was that of the administration of the sacraments, especially of the Lord’s Supper, to the societies. The societies generally insisted on their right to have the sacraments from their own preachers. Many of the wealthier members, however, and in particular a large number of the trustees of chapels, opposed these demands. At length, between 1794 and 1795, after more than one attempt at compromise had been made by the Conference, the feeling of the societies as against the trustees became too strong to be longer resisted, and accordingly at the Conference of 1795 the “plan of pacification” was adopted, the leading provision being that, wherever the majority of the trustees of any chapel, on the one hand, and the majority of the stewards and leaders, on the other, consented to the administration of the sacraments, they should be administered, but not 10 opposition to either the one or the other of these authorities. In England the Lord’s Supper was always to be adminis- tered after the Episcopal form ; in Scotland it might still, if necessary, be administered, as it had commonly been before, after the Presbyterian form. In any case, however, “full liberty was to be left to give out hymns and to use exhortation and extemporary prayer.” The result was that within a generation the administration of the sacraments

to the societies came to be the universal rule. By this legislation the preachers assumed the powers of pastors, in accordance, however, only and

always with the desire and choice of their flocks. No formal service or act of ordination was brought into use till forty years after- wards. All preachers on probation for the ministry, after the completion of their probation, were ‘‘ received into full connexion ” with the Conference, this reception im- plying investment with all pastoral prerogatives. Modern Methodism has developed more fully and conspicuously the pastoral idea.

No sooner was the sacramental controversy settled than the further question as to the position and rights of the laity came to the front in great force. A comparatively small party, led by Alexander Kilham, imported into the discussion ideas of a republican complexion, and demanded that the members in their individual capacity should be recognized as the direct basis of all power, that they should freely elect the leaders and stewards, that all distinction in Conference between ministers and laymen should be done away (elected laymen being sent as delegates from the circuits in equal number with the ministers), that the ministry should possess no official authority or pastoral prerogative, but should merely carry into effect the decisions of majorities in the different mectings. course of a very violent controversy which ensued, pamphlets and broadsheets, chiefly anonymous, from Kilham’s pen, advocating his views and containing gross imputations on the ministers generally, and in particular on some not named but distinctly indicated, were disscminated through the societies. The writer was tried at the Conference of 1796, condemned for the publication of injurious and unjustifiable charges against his brethren, and by a unani- mous vote expelled from the Conference. In the follow- ing year he founded the ‘‘ New Connexion,” the earliest of the organized secessions from Wesleyan Methodism.

Views much more moderate than Kilham’s prevailed in the Connexion at large. At the Leeds Conference of 1797 the basis was laid of that system of balance between the prerogatives of the ministers and the rights of the laity which has been maintained in its principles ever since, and which, in reality, has governed the recent provisions (1877-78) for the admission of lay- representatives into the Conference not less than the former developments of Wesleyan Methodism. The admission of members into the society had, up to 1797, been entirely in the hands of the itinerant preachers,—that is, the “assistant,” hence- forth to be styled the “ superintendent,” and his

“helpers.” The new regulations, without interfering with the power of the ministers to admit members on trial, declared that “the leaders’ meeting shall have a right to declare any person on trial improper to be received into society, and after such declaration the superintendent shall not admit such person into society” ; also that ‘“‘no person shall be expelled from the society for immorality till such immorality be proved at a leaders’ meeting.” For the appointment of church officers (leaders and stewards) the following regulations were made, the second based on recognized usage, the first on general but not invariable practice :—

: In this regulation it was assumed that the old rule of society by which a member disqualifies and vritually expels himself by con- tinued absence from class, without reason for such absence, still held good. The case provides only for expulsions for ‘‘ immorality.” Subsequent legislation has introduced a provision which ensures to any meniber before he ceases to be recognized on account of non- attendance the right of having his case brought before a leaders’ meeting if he desires it. This rule of 1797 has always been under- Stood by the Conference as constituting the leaders’ meeting in effect

a jury, leaving the superintendent with his colleagne or colleagues |

as advisers to act as judge. Appeal has always Jain from the leaders’ meeting to the district meeting, and, finally, to the Conference.

In the

“1. No person shall be appointed a leader or steward, or be removed from his oflice, but in conjunction with the leaders’ mcet- ing, the nontination to be in the superintendent, and the approba- tion or disapprobation in the leaders’ meeting.

**2. The former rule concerning local preachers is confirmed, — viz., that no man shall receive a plan as a local preacher, without the approbation of a local preachers’ meeting.”

The Conference at the same time made several provisions for carrying out the process, which had been going on for some years, of denuding itself of direct responsibility in regard to the disbursement of the Connexional funds. The principle was established that such matters were to be administered by the district committees acting in corre- spondence with the quarterly meetings of the circuits. It was also provided that circuits were not to be divided without the consent of the respective quarterly meetings ; and, finally, it was resolved that, in the case of any new rule made by the Conference for the Connexion, its action within a circuit might be suspended for a year by the quarterly meeting, if it disapproved of the rule. If, how- evcr, the Conference, after twelve months' interval, still adhered to the new rule, it was to be binding on the whole Connexion.

The powers of district committees, as defincd by former Conferences, were in 1797 confirmed and enhanced, special powers being given to special meetings of these committecs convened when necessary to settle the affairs of a distracted circuit. In the same Conference all the principal rules of Methodism, in regard both to the ministers and the laity, were collected and (in a sense) codificd, including the new regulations adopted that same ycar; and tlie whole, under the title '"' Large Minutes," was accepted as binding by the Conference, each minister being required to sign his acceptance individually. This compendium, itself based on one which had been prepared by Wesley, is still accepted by every Wesleyan minister on his ordina- tion as containing the rules and principles to which he subscribes. During the sitting of this critical Conference at Leeds an assembly of delegates from bodies of trustees throughout the kingdom was simultaneously held. The form of the regulations enacted by the Conference was, to a considerable extent, determined by the nature and form of the requests made by this body of trustees. There was one request, however, which the Conference distinctly declined to grant—namely, that for lay delegation to the Conference. The Conference replicd that they could not admit any but regular travelling preachers into their body, and preserve the system of Methodism entire, particularly the "itinerant plan." It was not until many years after- wards that anything was heard again as to this matter.

By the settlement now described the outlines of Methodism as an organized church were fairly completed. Many details have since been filled in, and many changes have been made in secondary arrangements, but the principles of development have remained unchanged. The Connexion after 1797 had a long unbroken period of peaceful progress. The effect of the ‘“ Kilhamite ” separa- tion, indeed, was after 1797 not greatly felt by the parent body. The number of Methodists in the United Kingdom in 1796, the year of Kilham’s expulsion, was 95,226; in 1797 it was 99,519; in 1798 the New Connexion held its first Conference, and reported 5037 members, the number of the parent body being 101,682. Nor was it till 1806 that the New Connexion reached 6000.

During the period of quiet growth and development which followed 1797 the influence of one superior mind (Dr Jabez Bunting, 1779-1858) was to prevail with increasing sway. This was to be the period of the gradual development of lay co-opcration in the administration of the various departments of Connexional extension and enterprise—a development which prepared the way for the important legislation of 1852 and following years, and for the ultimate settlement of the respective provinces and powers

of the ministers and laity which was made in 1877-78. It was also to be the period of the gradual completion of the pastoral idea, in its practical application to the ministers of the body. This period may be defined as extending from the revolutionary epoch of 1791-97 to the epoch of political and municipal reform agitation, 1828-35, which eoincides with a second period of politico- ecclesiastical agitation in Wesleyan Methodism.

In 1797 the Conference, as alrcady mentioned, had refused to allow elected laymen—or Jay delegates—any place either in the Conference or in district committees. Within a few years after 1800, however, the practice grew up for the circuit stewards to attend the district committees during the transaction of financial business, and in 1815 this usage was recognized in the Minutes of Conference as an established ‘‘rule,” and it was enacted that no general increase of the ineome of the ministers should be sanctioned by the Conference until approved by a majority of the district committees

during the attendance of the cirenit stewards. Since the adoption of this rule the lay element in the district committees has steadily increased and developed. Another characteristic and important feature in the organization of Wesleyan Methodism, which grew into distinct form and prominence during the period now under review, was that of the administration of all the Con- nexional departments, except such as were regarded as properly pastoral, by means of mixed departmental committees, appointed at eachi successive Couference. These committees made recommenda- tions to the Conference in regard to such new legislation as they thought desirable and to the appointment of the members of com- mittee; and, for each department, a large committee of review, of which the members of the ordinary committee of management formed the nucleus, eame to be held each year immediately before the Conference. In these committees the numbers of ministers and of laymen were equal. On this principle, between 181] and 1835, provision had been made for the management of all the funds of the Connexion and their corresponding departments of administra- tion. The first mixed ecomniittee appointed by the Conference was the conmiittee of privileges in 1803.

The development of the pastoral position aud character of the ministers of the body after 1797 could not but advance on a line parallel to the development of the position and elaims of the laity. In 1818 the usage of the Conference was conformed to what had long been the ordinary unofficial custom, and the preachers began to be styled in the Wesleyan Methodist Magazine and in other official publications ‘‘ Reverend,” a fact which may seem trivial, but which in reality was of important significance.

In 1884, after the idea had been long entertained and the project had been repeatedly discussed, it was determined to establish a theological institution for the training of ministerial candidates. There are now four eolleges, with two hundred and fifty students. In 1886 the practice of ordination by imposition of hands was adopted.

Such advances, however, as these in the general organization and development of the Connexion, and especially in the status and professional training of the ministers, could not be made in such a body without offence being given to some, whose tendencies were to disallow any official

distinction between the ministry and the laity, and who also objected to the use of the organ. This levelling element was strong in the West Riding of Yorkshire, and in 1828, on the placing of an organ in Brunswick Chapel, Leeds, by the trustees, with the consent of the Conference, a violent agitation broke out. The consequence was a disruption, the first since 1798, under the title ‘‘ Protestant Methodists.” But this was absorbed, some years later, in a more considerable secession. In fact, the Connexion was in 1828 entering on a period of agita- tion. The current of political affairs was approaching the rapids of which the Reform Act marked the centre and the point of maximum movement.

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new secession was known first as the ‘‘ Wesleyan Methodist Associa- tion”; but for a number of years past it has been merged in a stil] larger body of seceders designated ‘‘ The Methodist Free Churches,” Its leader at the first was the Rev. Dr Warren, who left it, however, not many months after it was formed, and took orders in the Church of England.

The controversies of 1835-36 left their mark on the legislation and official documents of the Connexion. The principles of 1797 remained intact, some farther guards only being added to prevent any danger of hasty or irresponsible action on the part of super- intendents, and at the same time ‘‘minor district meetings” being organized in order to facilitate appeals. One error was, however, committed by the Conference. In 1797 no provision had been made for bringing the circuit, through its quarterly meeting, into direct relations with the Conference. In 1836 a right of direct memorial to the Conference was given to the circuit quarterly meeting ; but it was so fenced round with eonditions and limitations as to make it practically inoperative, and at the same time provocative of sus- picion and irritation.

The effect of the secession of 1836 on the general progress of the Connexion was not great. The number of members reported in 1835 in Great Britain and Ireland was 371,251 (there being a decrease in England of 951), in 1836 381,369, in 1887 384,728. For the next ten years the advance of the Connexion in numbers and in general prosperity was apparently

unprecedented. The Centenary Fund of 1839-40 amounted to £221,000. In the midst, however, of all the outward prosperity of Methodism—partly perhaps in con- sequenee of it—very perilous elements were at work. The revolu- tionary ideas of the Chartist period (1840-48) and of Continental politics (1848-49) reacted on Wesleyan Methodism as the political ideas of 1791 aud of 1831 had done at those epochs. The embers of old controversies—eeclesiastical, quasi-political, and personal— still smouldered, and at length burst into fresh flame. From 1844 a strong spirit of opposition to the leaders of the Connexion, and especially to Dr Bunting, was fanned by the circulation of anony- mous ‘‘fly leaves” of a very scurrilous character. At the same time the policy of the Conference and of the ministers in their cir- cuits had proceeded more than was wise on the old lines. The general administration relied too much on the footing of implicit confidence on the part of the people and on the power of official prerogative in the hands of the minister. The memorial law of 1836 was indicative of the too exclusive spirit of pastoral govern- ment which had prevailed. The wisdom of Dr Bunting had for five and twenty years led the way in gradually liberalizing both the polity and the policy of Methodism, and adapting them to the changing conditions of the times. But this wisdom secms to, have found its limits before 1849, when the internal dissensions reached their climax. In that year James Everett, the chief author of the fly sheets, and two other ministers, Samuel Dunn and William Griffith, who had identified themselves with him, were expelled. A disastrous agitation followed. No distinct secession took place till after the Conference of 1850. The union of the ‘‘ Methodist Free Churches,” in which was incorporated the ‘‘ Wesleyan Association” (of 1836), was formed by the seceders. The ‘‘ New Connexion” also received some thousands of the sceeders into its ranks, But by far the greatest part of those who left went with neither of these bodies.

Between 1850 and 1855 the Connexion in Great Britain and Treland lost 100,000 members, and not till 1856 did it begin to recover. In that year the numbers were returned as 282,787, showing a small increase over the preceding year. Since then peace and unity have prevailed unbroken.

The convulsion of 1849-52 tanght the Connexion, and in par- ticular the Conference, lessons of the highest importance. In 1852 the quarterly

meeting was so defined as to make it the great repre- sentative meeting of the circuit, including stewards, leaders, local preachers, and trustees. The right of memorial to the Conference was given to it in the widest and freest sense. These powerful bodies invite ministers to the eircuits, or decline so to do, deter mine and pay their ‘‘allowances,” as salaries to ministers are still ealled in the Connexion, and review all the interests of the circuits, spiritual or financial. They had also conferred upon thei in 1852 the right to appoint a cireuit jury of appeal from the verdict and findings of a leaders’ meeting in certain eases of discipline. Since 1852 Conference legislation has still proceeded in the direction of recognizing and enlarging the functions and rights of the laity. The comniittee of review system, already spoken of, had been con- siderably developed between 1835 and 1849, and included every department of ordinary administration. In 1861, however, whilst a representation of the departmental executive committees formed still the leading element in each committee of review, a great m- provement was made in their constitution by giving to each of the districts of British Methodism the right to send a lay representative ee ee ee

1 This ‘‘Warrenite” secession, as at first It was cominonly called, gave rise to & lawsuit which led to the judicial recognition by the Court of Chancery of the Conference Deed Poll of 1784, and the “Large Minutes” of 1797, as documents haying the forec of public law in the administration of Wesleyan Methodism.

to attend these preparatory Conference committces. In 1877 and 1878 the final and natural consummation of the whole course of advance sinee 1791 was effected in the constitution of the united Conference of ministers and lay representatives. The ministers mcet by themselves to discharge the functions whieh belong to them as the common pastorate of the Connexion. As to all the points involved in their speeific character and common responsibility, as the mutually exchanging and itinerating pastors in common of a vast eommon floek, they take mutual counsel ina separate assembly. The Conference, in its ministerial-and-lay or representative session, meets after the pastoral business is completed, and oecupies a full week between Sundays in discussing and settling the business of all the

fnnds and the general administrative departments of the body. The Conference in its pastoral session assembles on the last Tuesday in July, that session closing on the Friday or Saturday week following ; the representative session occupies the following week. It is legally neeessary that tle decisions of the Conference in both its sessions should be confirmed and validated by the vote of the "'legal hundred." This confirmation is, however, given as a matter of course.

The Conference in its pastoral session is not formally representa- tive. To each district is assigned by the preceding Conference a certain amount of representation, there being at present thirty-five districts. 'The numbers allocated to the distriets vary according to eircumstances. The total number of ministers and laymen com- posing the Conference in its representative session is 480, or 240 ministers and 240 laymen. The basis of the lay representation in the Conference is the constituency of lay officials in the district committees. The Connexion at large is represented by the lay officials of the general Connexional departments. The business transacted in the Conference during its representative scssion re- lates to all the Connexional departments of general administration, yiz., the eommittce of privileges, foreign missions, the maintenance and education fund (and the schools) for ministers' children, chapel affairs (general, metropolitan, and provincial), the home mission and contingent fund, district sustentation funds, army and navy evangelization, lay mission work, the worn-out ministers' and ministers' widows' fund, the theological institution with its four colleges, Sunday and day schools and the children's home and orphauage, higher education, the extension fund of Methodism, alterations and divisions of circuits and districts, and the Lord's Day observance and temperance questions.

The president of the Conference is chosen by the ministers by ballot on the opening of the pastoral session. After the eleetion of president follows that of secretary. 'These elections, however, cannot take place until the vacancies in the hundred have been filled up. Such vacancies are caused by death, by absence for two years together without a dispensation, by expulsion, or by super- annuation, which takes place ordinarily after two years' retirement from the full work of the ministry.

The principal statistics of the denomination at the last Conference (1882) were as follows :—

Retired

‘ On : . On | orSuper- | Sunday Members. Trial. Ministers. Trial. | numerary | Seholars. Ministers. Great Britain…..... 393,754 | 40,653 1,549 81 829,666 Treland.,.,.....| 24,475 776 200 18 Foreign missions.1| 89,369 | 12,934 848 198

Of the Sunday scholars in Great Britain, 177,965 were over fifteen years of age, and 93,127 were members of society or on trial as members.

Wesleyan Methodism in Ireland has always becn part and parcel of British Methodism, but since 1782 it has had a eal Confer- ence of its own. The aets of this Conference are, in accordance with a provision in the Conferenee Deed Poll, made valid by the concurrence with them of a delegate from the British Conference, who is to the Irish Conference what the legal Conference is to the British Conference. Ten ministers of the Irish Conference are members of the ‘‘legal hundred” of the British Conference. The

‘plan of pacification ” of 1795 was not carried out at the time by the

Irish Conference. In the year 1816, however, it was adopted in Treland. The result was a seeession which assumed the designation “Primitive Wesleyans,” a very different body from the Primitive Methodists of England. In 1878 the Primitive Wesleyans were reunited to the parent Counexion. The nnmber of members in Ireland has, owing to emigration, not increased of late years. The last return showed 24,475 members,

Affiliated Conferences.—For more than twenty years there were several ‘affiliated Conferences” of British Methodism. But there are now only two —the French Methodist Conference, and that of South Africa,—the latter constituted quite recently (1882). Since 1852 Freneh Methodism has been under an aftiliated Conference. The dimensions of the French Connexion, however, are very small, and it is dependent to a eonsiderable extent on pecuniary aid fur-

! Chiefly in the West-Indies, Africa, India, and China.

nished by the Wesleyan Missionary Soeiety. The last statistical return showed 1769 members, 126 members on trial, 27 :ninisters, 1 minister on trial, and 3 supernumerary or retired ministers. The British Conference has a right of veto as to certain points of legis- lation in the ease of affiliated Conferences.

Australasian Methodism was for more than twenty years under an affiliated Conference, dating from 1854. Since 1876, however, the Australasian Conference has been independent. The General Conference meets once in three ycars, having under it our annual Conferences—one for New South Wales and Queensland, another for Victoria and Tasmania, a third for South Australia, and a fourth for New Zealand. These Confercnces—the general and the annual— are all mixed and representative after the same general pattern as the British Conference. They have also under their charge, and as part of their Connexion, the Wesleyan missions in Tonga and Fiji, which were begun by the parent body before the original affiliated yearly Conference for Australasia was organized. The numbers in 1881 were for the Methodism of Australia 28,310 members with 362 ministers, and for the South Sea missions 33,411 members with 16 missionarics of European blood and a very large number of native ministers and assistant ministers.

Canadian Methodism was also affiliated till 1873, when it became an independent Connexion. It includes six provincial annual Con- ferences and one General Conference which meets every three years. The General Conference is mixed and representative; the annual Conferences are purely ministerial. Canadian Methodism occupies a powerful position in the Dominion. It numbers as nearly as can be ascertained about 116,000 members, and is strongest in Upper Canada. It possesses a uuiversity—the Victoria University in Upper Canada.

The Doctrines of Methodism.—In doctrine all branches of Methodism are substantially identical. | Wesley’s doctrines are contained in fifty-three sermons known as the “four volumes” and in his Votes on the New Testament. The Conference has, however, published two catechisms, one for younger the other for older children, of which a new and carefully revised edition has lately been completed.? In general, Wesleyan theology is

to be described as a system of evangelical Arminianism. In _ particular, Wesleyan divines insist on the doctrines of original sin, general redemption, repentance, justification by faith, the witness of the Spirit, and Christian perfection,—or, as it has been customary for Methodists to say, the doctrines of a “present, free, and full salvation.” By the witness of the Spirit is meant a consciousness of the Divine favour through the atonement of Jesus Christ. Wesleyans have often been represented as holding the Calvinistic doctrine of “assurance.” The word, however, is not a Wesleyan phrase, and assurance, so far as it may be said to be taught by Methodists, signifies, not any certainty of final salvation, but merely a “sense of sin forgiven,” ?

II. AmMERIcAN Eptscopat METHopDIsM.

The beginnings of American Methodism are traceable to the year 1766, when a few pious emigrants from Ireland introduced Methodism into New York. On receiving an appeal in 1768 from the New York Methodists, who were engaged in building a preaching-house, Wesley laid the case of America before the Conference at Leeds in 1769, and two preachers, Boardman and Pilmoor, volunteered to go to the colonies. Boardman went to New York, Pilmoor to Philadelphia. In 1771 two other Methodist itinerants, Francis Asbury—the most famous name in American Methodism—and Richard Wright, went out to America. In 1773 Thomas Rankin, a preacher of experience sent out

2 Besides Wesley’s Sermons and Notes, his Appeals and his treatise on Original Sin, in reply to Dr Taylor of Norwieh, should be read in order to appreciate his theological views. After these may be partieularly noted Joseph Benson’s Commentary, Watson’s Institutes (3 vols.), Dr Pope’s Compendium of Theology (3 vols.), the series of Fernley Lectures, especially that by the Rev. B. Gregory on “The Holy Catholie Chureh,” and Dr Rigg’s Discourses and Addresses,

3 For the history and constitution of Wesleyan Methodism the following works may be consulted ;—Wesley’s Works, espeeially his Journals; Southey’s Wesley; Tyerman’s Wesley; Rigg’s Living Wesley, and Churchmanship of John Wesley ; Jackson’s Life of Charles Wesley; Minutes of Conference, vol. i., 1744-98; Dr George Smith, History of

Wesleyan Methodism, 3 vols.; Dr Abel Stevens, MZistory of Methodism, 3 vols. ; Pierce, Polity of Methodism; Dr Williams, Constitution and Polity of Wesleyan Methodism; Rigg, Connexional Economy, and the Minutes, 1877 to 18S1.

by Wesley, held the first Conference in Philadelphia, when there were 10 itinerant preachers and 1160 members. After the breaking out of the War of Independence the English Methodist preachers were unpopular, and all but Francis Asbury went back to England. At the end of the war, however, in 1784, Wesley sent out Dr Coke, and American Methodism was organized as an independent church, with Dr Coke and Francis Asbury as its presbyter-bishops. The history of American Methodism since that period is too vast and complicated for any attempt to be inade to summarize it here. Methodism is more properly national in its character as an American church than any church in the States. In Massachusetts and some other of the New England States it is less powerful than Con- gregationalism, which still retains there much of its ancient predominance ; in the city of New York it is less powerful than Presbyterianism, and, indeed, occupies a position less generally influential than might have been expected. But in Philadelphia it is very powerful; so also in Baltimore aud in Cincinnati; if not strong in New York city, it is very strong in the State; and generally throughout the western and mid-western States it is the prevalent form of faith and-worship. In the south, also, it 1s more powerful than any other church.

American Methodism is Episcopal. Butits Episcopacy is neither prelatical nor diocesan. The bishops are superintcnding presbyters, and they visit the whole territory of Methodism in rotation, hold- ing (presiding over) the annual Conferences. These Conferences are purely ministerial. But the General Conference, which meets once in four years, and which is the Conference of legislation and final appeal, is mixed and representative. The first General Conference was held in 1792, the first delegated or representative Conference in 1812, the first mixed or ministerial-and-lay Gencral Conference in 1872. There were till lately no district assemblies in the Episcopal Methodism of America, and now there are but few. The bishops maintain the unity of the Connexion in the interval between the

General Conferences, by their visitation and by their conjoint council, A sub-episcopal class of ministers also, called presiding elders, supplement the action and superintendency of the bishops. These preside over districts, holding all the circuit quarterly meet- ings, and holding the district mectings, if any such meetings have been organized.

American Episcopal Methodism is distributed into five distinct sections or churches, which, however, differ from each other in no points of any importance as respects organization or discipline, still less doctrine. ‘The American Methodist Episcopal Church South beeame a separate organization in 1847 by reason of the slavery controversy. The coloured churches, of which there are three, sprang up distinctly from local causes. The following are the latest available statisties:—

Itinerant | Local Lay Ministers. | Preachers. Members. Methodist Episcopal Churcli…….....ssccsceses 12,323 | 1,717,567 es : >> South, – 5,868 837,831 African “ ne é 9,760 891 ,044 Methodist Episcopal Zion Church 3,750 300,000 Coloured Methodist Episcopal Church…..... 63 683 112,000 20,266 32,384 | 3,858,442

In the Methodist Episcopal Church alone there are one hundred annual Conferences, visited by twelve bishops. This ehurch has more than twenty universities, of which some are distinguished schools of learning. Boston University is one of the most recent and one of the chief. The principal foreign missions are in India, China, and Japan. The Methodist Church South also has some influential universities, particularly that at Nashville, and has missions, in particular in Japan and China.

Besides these Methodist Episcopal churches, with their total of 8,358,000 church members, there are two other ehurehes whieh do not assume the name at all, but are yet essentially Methodist in doctrine and discipline, not varying in any important particulars from the Episcopal Methodism of America. Of these one is called the United Brethren, with 157,000 members, the other the Evan- gelieal Association, with 113,000 members.!

Non- Episcopal American Methodism.—The bodies included under this head are chiefly secessions from the original stock of American Methodism,

founded on principles of demoeratic church government, analogous to those of the English Methodist secessions. The only

1The best authority as to American Methodism is Dr Abcl Stevens's Hisforys in 6 vols. The statistics are given in the Methodist_Year Book, New York, 1852.

considerable body, however, is the Methodist Protestant Chureh, with 125,000 members. The minor bodies, four in number, count altogether less than 60,000 members, the principal being the American Wesleyan Church, with 25,000 members,

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The bodies still to be noticed, while differing as to points of church government, agree as to doctrine and in general as to the means of grace and as to inner spiritual fellowship with the parent "Connexion." They all maintain class-meetings and love-feasts, have leaders' meetings and quarterly meetings, and largely employ local preachers.

The Methodist New Connexion was founded in 1797-98 by Alexander Kilham, who died in 1798. Its general principles are indicated above. Its statistics for 1881 were as follows:—183 ministers and 27,770 members (including those on mission stations, besides 3882 on trial), and 74,744 Sunday scholars.?

United Methodist Free Churches. —This organization in its original form must be identified with the Wesleyan Methodist Association of 1836. That body first absorbed into itself, in great part, the '*Protestant Methodists" of 1828. It was afterwards greatly in- creased, and its organization in some points modified, when a large number of the seceders from the parent Connexion in 1850-52 joined itsranks. The main body of its Conference does not consist, like that of the New Connexion, of an equal number of circuit ministers and elected circuit lay delegates, but of circuit delegates, whether ministerial or lay, elected without any respect to office, ministerial or other. Its circuits also are independent of the control of the Conference.

The Comnexional bond, accordingly, in this denomina- tion is weak, and the itinerancy is not universal or uniform in its rules or its operation. The amalgamation between the Wesleyan Methodist Association and the ‘‘ Wesleyan Methodist Reformers” of 1850 took place in 1857. At that time the combined churehes numbered 41,000. At present (1881-82) they number 72,839, in- cluding 7772 members on the mission stations, besides 7824 on trial, The number of ministers is 392, with 40 retired or ‘‘ supernumerary” ministers. The number of Sunday scholars is 190,957.%

Primitive Methodism.—In this earnest and hard-working denomi- nation the ministers, of whom some are women, are very literally ‘‘the servants of all.” The Conference is composed, in addition to twelve permanent members, of four members appointed by the pre- ceding Conference, and of delegates from district meetings. The principle of proportion is that there should be two laymen to one minister or ‘‘ travelling preacher,” and the ‘‘ travelling preachers” have no pastoral prerogative whatever. The Conference is supreme, and the Connexional bond is strong. This body was founded by Hugh Bourne and William Clowes, local preachers who were separated from the Wesleyan Connexion, the former in 1808, the latter in 1810, because of their violation of Conference regulations as to camp meetings and other questions of order. The Conference had, in 1807, pronounced its Judgment against camp meetings, which had been introduced into the country from America, whereas Bourne and Clowes were determined to hold such meetings. Founded thus by zealous and ‘‘ irregular” lay preachers, ‘‘ Primi- tive’? Methodism, as the resulting new body called itself, bearsstill in its organization, its spirit, and its customs strong traees of its origin. It has been a very successful body, aiming simply at doing evangelistic work, and is now numerous and powerful, numbering among its ministers, not only many useful preachers, but some of marked originality and power and also of superior cultivation. There has for many years past, if not from the beginning, been 4 very friendly feeling between the old Wesleyan Connexion and the Primitive Methodists. Its latest statistics (1881-2) show 1149 travelling preachers, 185,312 members, and 383,350 Sunday scholars.*

Bible Christians. —The Primitive Methodists sprang up in the midland counties, the Bible Christians in Cornwall. These elosely resemble the ‘‘

Primitives” in their character and spirit. Their founder was a Cornish local preacher called O’Bryan. Henee the Connexion is often known as the Bryanites, and Cornish emigrants have propagated this denomination widely in the colonics. The Conference is composed of ten superintendents of distriets, the president and secretary of the preceding Conference, lay delegates, one from each district meeting, and as many of the travelling preachers as are allowed by their respective district meetings attend. In general it may be said that the ministerial and lay members of the Conference are about equal in number. The returns for 1881-82 showed in England (chiefly the west and south of Eng- Se eee eS eee

2 See Jubilee Volume of the New Connexion; also the General Rules and the Minutes of Conference, 1881, published nt the New Connexion Book-Room.

3 See Foundution Deed of the United Methodist Free Churches; also Minutes of Conference, 1881, 119 Salisbury Square. F

4 See John Pette, History of the Primitive Methodist Connexion; also Minutes of Conference, 1881, 6 Sutton Strect, London, E.

land) and in the Channel Islands 136 itincrant preachers, 21,209 members (besides 690 on trial), and 36,335 Sunday scholars. In Canada the number of membcrs was 6652, and in Australia and New Zealand 3671.1

The Wesleyan Reform Union. is an aggregate of local Mcthodist secession churches, loosely held together by a Conference, and is one of the results of the great Methodist disruption of 1851-52. The returns for 1881-82 showed 18 ministers and 7728 members.

eumenieal Methodist Conference.—This Conference was held in City Road Chapel, London, in September 1881. Representatives were present from all the Methodist bodies throughout the world, and it was estimated that these represented not less than 5,000,000 of members and 20,000,000 of population. Whilst in church organization thcse bodies differed, as has been shown above, in doctrine and in respect of their purely spiritual discipline

and means of grace, they were all agreed in principal mattcrs. The Conference was entirely practical in character. The object was to promote zeal and union among the constituent bodies as to all practical points of Christian sympathy and activity, at home and abroad, and especially as to home mission work, general philan- thropy, Christian education, and a Christian use of the press. There were 400 represcntatives present from the Methodist bodies in all

arts of the world.”

Welsh Calvinistie Methodists. —Between the Methodisin of Wales and that of England there was never any other than incidental connexion. Indeed, although the name of the Welsh movement was borrowed from the English, not only was Welsh Methodism quite independent in its origin, but in reality its beginning, as an evangelical movement, was earlier than that of English Methodism. From Wesleyan Methodism, furthermore, Welsh Methodism was throughout distinguished by the fact that it was Calvinistic in its doctrine. For some years Whitcticld’s name was placed by the leaders of Welsh Methodism at the head of their movement, but the connexion was not at any time much more than nominal, Whitefield being, indeed, too often and too long together in America to excrcise any real presidency over the Methodisin of the Principality.

Distinction, however, must be made between Welsh Mcthodism as an evangelistic movement and as an organization. In its later and distinctly organized form, its main elements date from 1811, while the actual unity and the final consolidation of the organization date from so recent a period as 1864. At that date we find the Calvinistic Methodism of North and of South Wales for the first time united in a common organization and government, and brought under the supreme control of one ‘‘ General Assembly.”

The spiritual awakening from which Welsh Calvinistic Method- ism derived its earliest inspiration and impulse began in 1735 and 1736, almost contemporaneously and quite independently, in three different counties of South Wales. owell Harris, a gentleman of some position, born and bred at Trevecca in the parish of Talgarth, county of Brecon, is the most prominent name connected with early Welsh Methodism. His first strong religious

convictions and im- pulses date from 1735. He was sent to Oxford in the autumn of that year to “cure him of his fanaticism,” but remained only one term. On his return to Wales he began to exhort and preach in private houses and in such buildings as he could obtain the use of, being then and throughout his life a simple layman. Of learning or theology he had but little; but he was an extemporary preacher of prodigious vehemence, and often of overwhelming power and pathos. While Harris was thus preaching in the county of Brecon, Daniel Row- lands had been spiritually awakened at Llangeitho in Cardiganshire, the two men knowing nothing whatever of each other. Rowlands was an ordained clergyman, of some learning and of great eloquence. He was a pulpit orator, and carefully prepared his powerful discourses. In Pembrokeshire, again, in that same ycar 1735-86, Howell Davies began to preach the same doctrine in the same spirit as the other two preachers, and with cffects scarcely, if at all, less remarkable. The work thus begun in three distinct centres within the space of one year was in strict connexion with the Established Church, and so continued to be throughout the last eentury. These single-minded preachers pursued their work im Wales knowing nothing of the parallel work which Whitefield had just begun in England. In 1738, however, Whitefield, in the west of England, heard of Howell Harris, and in that year the two revivalists met in Cardiff. In 1739 Howell Harris had begun to extend his preaching tours far and wide, visiting not only South but North Walcs, and, whcrever he went, founding religious societies in connexion with the Church of England, of a character resembling those called Dr Woodward’s societies, which had long been in existence throughout England, the chief difference being that the Welsh societies were ‘evangelical,’ Calvinistic, and revivalist. It was in the same year that Wesley founded his society in England. In 1742 the clergymen connected with eee

1 See Bible Christian Memorial Volume, 1866 ; Mfinut Book-Room, 26 Paternoster Row. j a een NS,

See Proceedings of Fir ; ist Zi i f. Room, City ene fF First Methodist Ecumenical Conference, Wesleyan Book-

the Welsh movement were ten in number, and there were labour- ing in concert with these forty lay ‘‘exhorters,” as they were called. In that year the first ‘‘association” of Welsh Calvinistic Methodists was held at Waterford or Watford, in Glamorganshire. Whitefield consented to preside, and joined his preaching to that of the Welsh evangelists. The first Calvinistic Methodist Conference was held at Waterford, under Whiteficld’s presidency, on January 5, 1743, cightcen montlis carlier than Wesley’s first Conference. For a short time the Calvinistic Methodism of Wales was linked to that of England. After.1748, however, Whitefield ceased to act as in any sense the official head of the Calvinistic Methodists of England, and their organization, always loose, was gradually dissolved.

There was no Wesley in Welsh Mcthodism, and accordingly there was no organic unity among the societics of carlier Welsh Mcthod- ism. Each local society was under the care of an ‘‘exhorter,” an unpaid layman. A number of these local societies were grouped together into a district, over which an ‘‘ overseer” had charge. He also was usually an unpaid layman, although exercising many of the functions of a spiritual pastor. Sometimes, however, as in the case of Rowlands, he was a parish clergyman. The societies attended their parish churches and there reecived the sacrainents. The meeting- or preaching-houses for the societies were vaguely called ‘‘ houses for religious purposes.”

In 1751 Howell Harris ceased to itinerate and retired to Trevecca. From this time his leadership in the Methodist movement secms to have come to an end, and the movement languished for many years after. Not till 1762 is any ‘‘ revival” chronicled. In 1763 Row- lands was obliged to quit his curacy at Llangeitho and leave the Established Church. His people built hima chapel. He thus, after 1763, became a Dissenting minister ; and, retaining his fame and much of his power to the end of his course, he died in 1790,

Fifty years had now passed since the first societies of Welsh Mcthodism had been established by Howell Harris, and the niove- ment, instead of having grown to strength and maturity, appeared to have spent its force, almost in all dircctions, at least so far as any outward signs could show. But the Rev. Thomas Charles of Bala was to be one of the chief means of reviving it. He, like the earlier Methodists, was a churchman; he had taken his degree at

Oxford and served a curacy in Somersetshire. The doors of the Established Church having been closed against him because of his style of preaching, he joined the Welsh Methodists in 1785, and his first sphere of marked influence was in North Wales. In 1791 he took a leading part in a great revival of which Bala was the centre. From this period may be dated the second spring of Welsh Calvinistic Methodism, from which its later successes were to grow. Charles zealously and successfully promoted the establishment of ‘circulating schools” and of Sabbath schools. He was, in fact, the soul of the great Christian cducating movement in Wales which began in the last decade of the 18th century; and it was through his earnest zeal in sceking to provide Bibles for his Welsh schools, especially the Sunday schools, that the British and Foreign Bible Society was established. Though Methodism came then to be effectually rooted in the soil of the Principality, it was not till 1811 that the Welsh Calvinists took that step in the direction of ecclesiastical independence which the English Wesleyans had taken sixteen years before by calling their preachers to the official position of pastors and ordaining them to administer the sacraments.

From 1790 till almost the present time the work of gradually moulding the constitution of Welsh Calvinistic Methodism has proceeded. The ‘‘rules regarding the proper mode of conducting the quarterly association” were drawn up by Charles and agreed upon in 1790. In 1801 the Order and Form of Chureh Government and Rules of Diseipline were published. In 181], as has been shown, niinistcrial ordination was initiated. In 1828 the Con-Session of Faith was promulgated. And in 1864, as has been already inentioned, the first ‘‘General Assembly ” was held, and the two associations of North and South Wales respectively were united into one body. The constitution is now a modified Pres- byterianism, each church managing its own aflairs subject to successive appeal to the monthly meeting of the county and the quarterly association of the province, while the latter body may refer the decision to the annual General Assembly.

The Welsh Mcthodists (or Welsh Presbyterians, as they are now often called) have two theological colleges, one at Bala and the other at Trevecca. They havealso a foreign missionary society, with missions in Brittany, among their congeners of the Celtic race, and in Bengal.

In recent years this church has made great progress. In 1850 the number of members was 58,678, in 1870 it was 92,735, and in 1880 the returns showed 1174 churches, 118,979 communicants, 185,635 Sunday scholars. The number of ministers is not officially given, but is estimated at 600. The North and South Wales associations are now also known as synods. (J. H. RI.)

8 See W. Williams, Welsh Calvinistic Methodism, a Historical Sketch; The Life and Times of Howell Harris ; Tyerman, Life of the Kev. George Whitefield; The Diary of the Calvinistic Methodisis, 1882.

METHODIUS, the apostle of the Slavs, was a native of Thessalonica, and was born about the year 825. His nationality is unknown, but most probably he was a Grecized Slav; the family of which he was a member appears to have been one of considerable social distinction, and he himself had already attained high official rank in the government of Macedonia before he determined to abandon his secular career and embrace the monastic life. His younger brother Constantine (better known as Cyril, the name he adopted at Rome shortly before his death) had also distinguished himself as a secular " philosopher a in Constantinople before he withdrew to the cloister and to solitude. Constantine about 860 had been sent by. the emperor Michael III. to the Khazars; in response to their request for a Christian teacher, but had not remained long among them ; after his return to within the limits of the empire, his brother and he laboured for the instruction of the Slavonic or Slavonicized population, especially by means of translations of the Scripture lessons and the liturgical books used in Christian worship. About the year 863, at the invitation of Rastislav, king of " Great Moravia," who desired the Christianization of his subjects, but at the same time that they should be independent of the Germans, the two brothers went to his capital (its site is unknown), and, besides establishing a seminary for the education of priests, successfully occupied themselves in preaching in the vernacular and in diffusing their religious literature. After four years they seem to have received and accepted an invitation to Rome from Pope Nicholas IL, who had just been engaged in his 'still extant corre- spondence with the newly

converted Bulgarian king ; his death occurred before their arrival, but they were kindly received by his successor Hadrian IJ. Constantine died in Rome, but Methodius, after satisfying the pope of his orthodoxy and obedience, went back to his labours in “Moravia” as archbishop of Pannonia. His province appears to have been, roughly speaking, co-extensive with the basins of the Raab, Drave, and Save, and thus to have included parts of what had previously belonged to the pro- vinces of Salzburg and Passau. account were made at Rome, nominally on behalf of the archbishop of Salzburg, but really in the interests of the German king and his Germanizing ally Swatopluk, Rastislav’s successor ; they were not, however, immediately successful. In 879, however, Methodius was again suni- moned to Rome by Pope John VIIL., after having declined to give up the practice of celebrating mass in the Slavonic tongue ; but, owing to the peculiar delicacy of the relations of Rome with Constantinople, and with the young church of Bulgaria, the pope, contrary to all expectation, ulti- mately decided in favour of a Slavonic liturgy, and sent Methodius (880) back to his diocese with a suffragan bishop, and with a letter of recommendation to Swatopluk. This suffragan, a German named Wiching, unfortunately proved quite the reverse of helpful to his metropolitan, and through his agency, especially after the death of John VIII. in 882, the closing years of the life of Methodius were embittered by continual ecclesiastical disputes, in the course of which he is said to have laid Swatopluk and his supporters under the ban, and the realm under interdict. The date of the death of Methodius is variously given ; the most trustworthy tradition says that it tock place on April 6, 885. He was buried at Welehrad (probably Stuhlweissenberg). The Greek Church commemorates St Cyril on February 14 and St Methodius on May 11; in the Roman Church both are commemorated.on March 9.

See Schafarik’s Slawische Alterthiimer, where the original authorities are fully referred to. The subject of the present notice is most probably not to be identified with the Methodius, a painter

and monk, who, according to a well-known legend, converted Boris of Bulgaria by means of a picture of Christ’s second coming.

In 871 complaints on this.

METHYL, a chemical term which until lately was used in two radically different senses, namely, as designating either the atom-group CH,, which in numberless chemical formule figures as a “radical” (compare CHEMISTRY, vol, v. p. 552), or a gaseous substance of the same composition, which, however, nowadays is generally called “ dimethyl,” to distinguish it from the radical. A gas of the composi- tion and the specific gravity (C,H, + H, = 15) corresponding to C,H, can be produced in two principal ways,—first, by the decomposition of zinc-ethyl by water (Frankland)—

Zn(CyH,)o+ 20H . H=Zn(OH),-+CjHgH ; and, secondly, by the electrolysis of acetate of potash solution (Kolbe), we have virtually)

2CH, . COOH =(CHy), +200, | +H. + pole.

—pole.

These two gases used to be distinguished as two different substances,—Frankland’s being looked upon as hydride of ethyl, C,H,.H, Kolbe’s as “real methyl” (CH,)(CH,), until Schorlemmer proved their identity by showing that both, when treated with chlorine, yield the same identical chloride of ethyl, C,H,.Cl. This confirmed the now generally adopted notion that the radical ethyl itself is nothing but methylo-methyl, H,C—CH,**, so that the filling up of the gap** by an H must necessarily produce “hydride of ethyl” and “dimethyl” in one. The “true methyl” which chemists used to dream of, and which, when treated with chlorine, would yield two CH,Cl’s analogous to HH + CIC] = HCl + HCl, does not, and according to our present knowledge cannot, exist. A quasi apology for it is “marsh gas,” CH,, the principal component of the gas mixture which bubbles up from any marshy pond when its mud is stirred up with a stick. It is always produced when vegetable matter decays in the presence of water, and in the relative or absolute absence of air. What everybody knows as “‘fire-damp” is nothing but a (neces- sarily explosive) mixture of air with impure marsh gas, produced in the constantly progressing metamorphosis of the coal deposits ; in certain districts streams of marsh gas are issuing forth from cracks in the earth ; the “holy fire” of Baku is such a marsh-gas spring, which, having

once caught fire by accident, continues burning to this day. Perfectly pure marsh gas can only be obtained from zine- methyl, Zn(CH,),, by its decomposition with water (vide supra) ; a nearly pure preparation is procurable by heating a mixture of acetate of potash or soda and caustic alkali to dull redness :—

CH, . COONa + NaOll =NasCO,+CH,H. Acetate. Carbonate.

Marsh gas can be prepared synthetically by the action of bisulphide of carbon vapour and sulphuretted hydrogen (both producible from their elements) on red-hot copper, CS, + 2H,8 + 8Cu = 4Cu,S + CH, (Berthelot). A mixture of marsh gas and chlorine, when exposed to direct sunlight, explodes with formation of hydrochloric acid and char- coal. In diffuse daylight only part of the hydrogen 1s eliminated and “replaced” by its equivalent in chlorine, which in general leads to the formation of four bodies : CH,Cl=CH,+Cl,~~HCl, chloride of methyl; CH,Cl chloride of methylene; CHCl,, chloroform ; CCl, tetra~~ chloride of carbon. Of these several chloromethanes, as they are called, the first here interests us more than any of the rest, because from it any other methyl compound can be produced by the substitution of the proper kind of radical for the Cl of the CH,Cl. Thus, for instance, We can convert it into methyl-alcohol by treating the chloride with aqueous caustic potash at 100° C. (Berthelot). This is a most important synthesis, because it is this methyl alcohol that, in practice, always serves as the starting — point in the preparation of other methyl compounds. _

Methyl-Alcohol.—This substance, in ordinary pracket,

Mer 2 iY

is never made synthetically, but simply extracted from wood-spirit, a commercial substance which is produced industrially in the dry distillation of wood. The wood- spirit is contained in the aqueous portion of the tar pro- duced in this operation, along with aceticacid. To recover both, the tar-water is neutralized with lime and distilled, when the acetate remains, while the spirit distils over, along with a deal of water, which, however, is easily removed, as far as necessary, by redistillation and rejection of the less volatile parts. The “crude” wood-spirit, as thus obtained, is not unlike in its

general properties to ordinary spirit of wine, from which, however, it is easily distinguished by its abominable smell. The ordinary commercial article, besides a variable percentage of water, contains from 35 to 80 per cent. of methyl-alcohol ; the rest consists chiefly of acetone, but besides includes dimethyl-acetal, C,H,(OCHs),, acetate of methyl, and numerous other minor components. In Great Britain large quantities of wood-spirit are used for the making of methylated spirit, a mixture of ordinary spirit of wine with one-ninth of its volume of wood-spirit, which is allowed to be sold duty free for the preparation of varnishes, and for other industrial purposes. In former times, here as elsewhere, wood-spirit itself used to be employed as a cheap substitute for spiritus vini; but this is no longer so, since the aniline-colour industry has created a large demand for pure methyl-alcohol. Hence in some Continental works the wood-spirit, instead of being sent out as such, is being worked up for its components, by the following sequence of operations :—(1) dehydration by lime; (2) heating, under an inverted condenser, with caustic soda, to convert the acetate into hydrate of methy] ; (3) destruction of the bad smells by mild oxidation ; (4) distillation in a kind of Coffey's still, whereby it is split up into approximately pure alcohol, acetone, and " tails."

The new industry led to the invention of the following technical methods for the determination, in a given spirit, of the percentages of real methyl-alcohol and of acetone.

The alcohol is determined by saturating 5 c.c. of the spirit with hydriodic acid (volatilization of alcohol and iodide of methyl being avoided by means of a cold-water bath and an inverted condenser), and the product poured into water. Iodide of methyl separates out as a heavy oil, which is measured as it is. According to direct trials 5 c.c. of pure methyl-alcohol yields 7°45 c.c. of crude iodide (Krell, Kriémer and Grodzky).

For the determination of the acetone the following reagents are required (Krimer) :—(1) a solution of iodine, prepared by dissolv- ing I,=254 grammes of iodine, by means of (say) 500 grammes of iodide of potassium, in water, and diluting to 1 litre; (2) a solution of caustic soda containing twice (NaOH) grammes per litre ; (3) aleohol-free ether. Ten c.c. of the soda are placed in a gra- duated cylinder and mixed intimately, first with 1 c.c. of

the spirit, then with 5 ¢.c. of the iodine solution. Jodoform separates out (if acetone is present) in minute yellow crystal plates ; this product is “shaken out” by means of 10 c.c. of ether, and determined by evaporating an aliquot part of the cthereal layer in a tared watch-

glass to dryness and weighing the residue. C,H,O yields CHI; hence 1 part of iodoform indicates 0°28 parts of acetone.

The formula of methyl-alcohol and its true chemical character were correctly ascertained by Dumas and Péligot as early as 1834; yet pure methyl-alcohol may be said to have been an unknown substance until 1852, when Wohler _ taught us to prepare it, by first extracting the CH, of the CH,OH in the wood-spirit as oxalate of methyl, and then decomposing the (purified) oxalate with water.

The most convenient raw material to use nowadays is the rommercial “pure” alcohol; if wood-spirit is employed it had better first be purified by distillation over caustic soda (vide supra). The formation of the oxalate then is best effected (according to Alexander Watt) as follows :—500 grammes of oxalic acid crystals are mixed with 200 c.c. of oil of vitriol ; then 500 e.c. of the spirit are added, the whole kept for a time at 80° C. , and then allowed to stand cold for twenty-four hours.

i one large crop of oxalate erystals—partly (CH;).0,0,, partly 3- Hl. C,0,—1s separated from the liquor by pressure and subse-

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angut drying over vitriol, and then decomposed by distillation with water.

The aqueous alcohol thus obtained is dehydrated by the well- known methods used in the preparation of ordinary absolute alcohol.

According to Krimer, a purer preparation than Wohler’s is obtained by extracting the methyl as formiate instead of as oxalate, which is easily effected by digesting the wood-spirit with a formic acid of 1°22 specific gravity, and purifying the formic ether by fractional distillation. This cther boils at 32°, the oxalate at 161° C., hence a proper combination of the two

methods should be infinitely supcrior to either. What now follows must, in gencral, be understood to refer to Wohler’s preparation.

Pure methyl-alcohol is a colourless liquid similar in its general properties, in its behaviour to other chemically inert liquids, and in its action as a solvent to ordinary absolute alcohol, from which, however, it differs by the entire absence from it of all spirituous odour. A pre- paration which smells of wood-spirit may be condemned at once as impure. According to H. Kopp, its specific gravity is 0°8142 at 0° ©. and 0°7997 at 16°-4. If the volume at ¢° be V, then (from 0° to 61°)

V=1+ 0001134¢+1°364 × 10-8? + 8-741 × 10-97,

The boiling point is 64°°6 to 65°-2. The tension-curve was determined by Regnault and by Landolt; but the results of the two observers do not agree except (approximately) at P=760 mm. Methyl-alcohol has quite a characteristic tendency to “bump ” badly on distillation, which, however, can be prevented by addition of a small fragment of tin- sodium, which produces a feeble but sufficient current of hydrogen. Its specific heat is 6713 ; latent heat of vapour, 26°4 ; combustion heat, 5307 per unit weight (Favre and Silbermann). The refractive index for the D (sodium) ray is 1:3379 + 0013 for 10° = 5° C. (Dale and Gladstone). Methyl-alcohol mixes with water in all proportions with contraction. Since Wohler’s discovery a table for the specific gravities of aqueous methyl-alcohols has been constructed experimentally by A. Dupré ; but unfortunately his alcohol boiled at 58°:7, and ‘con-

sequently must have becu something different from what generally goes by this name.

In its chemical reactions methyl-alcohol, CH,.OH, is very similar to ordinary (ethyl) alcohol, C,H,.OH, and consequently, in the same sense as the latter, analogous to water, H.OH. Thus, for instance, metallic sodium and potassium dissolve in either alcohol with evolution of hydrogen and formation of etlrylates or methylates of the alkali metals. Example—

CH,OH + Na=CH,. ONa+3H,.

The two methylates crystallize from the solution with crystal-alcohol, which can be driven off in an atmosphere of hydrogen by heat, without decomposition of the salts themselves. Water at once decomposes them into caustic alkali and alcohol, CH;.ONa+H.OH = NaOH + CH,OH. Yet the reverse reaction takes place when the alcohol is treated with a large excess of caustic soda.

The action of acids on methyl-alcohol is in gencral quite analogous to that on, for instance, caustic soda, with this important difference, however, that what in the case of NaHO goes on so readily in aqueous solutions with CH,.OH succeeds only under circumstances precluding the accumulation of water. In these circumstances we have, for instance,

_(1) CIH+0H. CH,=H,0+C1. CH, ; (2) (C,H,0,)H+ OH. CH,=H,0+0,H,0,. CH, ; Acctic acid. Acetic ether and so on with all monobasic acids. A dibasic acid XHIL may act as (X)H, or as (XH).H; thus, for instance, (8) (C,0,H)H+0H. CH,=H,0+0,0,. HCH, ;

Oxalic acid. Methyl] oxalic acid.

(4) (C,0,)H, +200 . CH, =2T1,0 + 0,0, . (CH), ; Methyl] oxalate.

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A tribasic ‘acid forms two methyl acids and one neutral ether; we have, for instance,

(5) (From PO,H,); PO,(CH,)Hy; PO,(CH,).H ; PO,(CHg)s-

It would, however, be a great mistake to suppose that whether, for instance (Ex. 3 and 4), the monomethyl or the dimethyl compound is formed depends on the quantity of methyl-alcohol employed per unit of acid. This depends far more largely on other conditions, as will be illustrated in next paragraph. The methyl-salts of oxygen acids are called esters, in opposition to the chloride, bromide, iodide, sulphide, and oxide, which are set apart asethers. Broadly speaking, ethers are not, while esters are, readily decomposed by water into their cogeners ; but the nitrate CH, . NO, behaves in this respect like an ether.

Action with Sulphuric Acid.—Methyl-alcohol mixes with oil of vitriol with considerable evolution of heat and (always only partial) conversion of the two ingredients into methyl- sulphuric acid. Equal volumes of acid and alcohol give a good yield. To prepare pure methyl sulphates, dilute the mixture largely with water, avoiding elevation of temperature (which would regenerate the ingredients), and saturate with carbonate of baryta. Filter off the sulphate of baryta to obtain a solution of the pure methyl sulphate SO,.CH,. ba (where ba=3Ba=1 eg.), from which this salt is easily obtained in crystals. From the baryta salt any other methyl sulphate is readily obtained by double decomposition with a solution of the respective sulphate ; the acid itself, for instance, by means of sulphuric acid. At higher temperatures the reaction between vitriol and methyl-alcohol results in the formation of methyl-ether, (CH,),O, or of normal sulphate of methyl, (CH,)s50,,. The ether is a gas condensable into a liquid which, under pressure of one atmosphere, boils at — 21° C.

The gas dissolves in about one thirty-seventh of its volume of

water ; far more largely in alcohol and in ether; most abundantly |

in oil of vitriol, which dissolves about six hundred times its volume of methyl-ether gas, thus affording a very handy means for storing up the gas for use. The solution needs only be diluted with its own volume of water to be broken up into its components (Erlenmeyer).

Liquefied oxide of methyl is now being produced on the manufacturing scale, and sold as a powerful refrigerating agent. One part of sulphuric acid is mixed with a little over one part of dehydrated wood-spirit, and the mixture heated to 125° to 128° C. (180° being carefully avoided), when methyl-ether goes off. When the mixture is exhausted, more wood-spirit is added to the residue so as to re-establish the original specific gravity (of 1°29), and the heating resumed, which again furnishes a supply of the gas, and so on. This proves that the process is not, as used to be supposed, one of mere dehydration, but a cycle

etherification, as shown by the equations :— (1) SO,H,+ CH,OH=SO,, HCH3+H,0. (2) SO,.H.CH,+ H. 0. CH;=SO,HH+CH,.0.CH3. The ester, SO, (CH,), though obtainable by distillation of the

alcohol with 10 parts of vitriol, is more conveniently prepared from | ; i ; ype “was never seen outside a chemical museum, is now being

pure methyl-sulphuric acid by distillation in vacuum at 1380°-140° C; thus : —2S0,CH,. H=S0,H,+S0,(CHs).. liquid, smelling like peppermint, specific gravity 1°327 at 18°; it boils at 187° to 188° C.

Chloride of methyl, CH,Cl, readily produced by the action of hydrochloric acid gas and hot methyl-alcohol (preferably

It is a colourless |

in the presence of chloride of zinc as an auxiliary dehy- | drator), is a gas which, under ordinary pressure, condenses |

into a liquid at – 23°C. The gas, at ordinary temperatures

absorbed by water, which, however, at 6° unites with it into a solid hydrate. Condensed methyl chloride has become an article of commerce, being largely produced from trimethylamine (vide izfra) and used as a powerful

_ methyl-alcohol, and trimethylamine. (though very readily soluble in alcohol), is only sparingly —

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frigorific agent, as well as for the extraction of perfuntes from flowers. Regarding nitrite of methyl, NO—-O—CH,, its interesting isomeride nitromethane, O,N—CH,, and nitrate of methyl, NO,CH,, we must refer to the hand- books of organic chemistry.

Todide of methyl, CHg, is obtained by distilling methyl- alcohol with hydriodic acid, which latter is best produced off-hand by addition to the alcohol of iodine and amorphous phosphorus. It is a colourless liquid of 2°269 specific gravity, boiling at 42°°5 C., insoluble in water.

Organic Methyl-Esters—The more volatile ones are in general easily obtained by distillation of the respective acid with methyl-alcohol, or with methyl-alcohol and oil of vitriol (virtually SO,.H.CH,);-the less volatile

ones more conveniently by passing hydrochloric acid gas into a methyl-alcoholic solution of the acid. We have no space for the individual substances; but the salicylate C,H,O,.CH, may just be named as being the principal component of the essential oil of Gaultheria procumbens (wintergreen oil).

Methylamines.—The general result of the action of ammonia on an ester is the formation of alcohol and acid amide. Example—

(0,H,0)— OCH, + HNH,=CH,. O11 +C,H,0. NH.» Acetate of methyl. Acetamide.

With iodide of methyl this reaction is an obvious im- possibility ; what really takes place (as A. W. Hofmann has shown for this and all analogous cases) is that the iodide unites with the ammonia into the HI compound HI.NH,CH, of a base NH,CH,, which can be separated from the acid by distillation with caustic potash, and when thus liberated presents itself as a gas surprisingly similar (almost to identity) to ammonia. The analogy extends to the action on iodide of methyl, which, in the case of methyl. amine, NH,CH,, leads to the formation of dimethylamine, NH.(CH,),; and from the latter again trimethylamine, N(CH,),, can be prepared by a simple repetition of the operation. These three amines are closely analogous in their chemical character to ammonia, the points of differ- ence becoming the more marked the greater the number of (CH,)’s in the molecule. ‘Trimethylamine, having lost all its ammonia-hydrogen, cannot possibly act upon iodide of methyl like its analogues. What it really does is to unite with the iodide into “iodide of tetramethyl-ammonium,” I. N(CH,), analogous to iodide of ammonium, INH, we should say, if it were not the reverse, because the organic iodide (unlike its prototype, which is an ammonium compound only in theory), when treated with moist oxide of silver (virtually with AgOH), really does yield a solution of a true analogue of caustic potash in the shape of

of reactions analogous to those in the ordinary process of | hydroxide of tetramethylammonium, N(CHs),. OH.

In regard to the actual preparation of these several bodies, which is not so simple as might appear from our exposition of their mutual relations, we

must refer to the handbooks of organic chemistry. But we must not omit to state that trimethylamine, which only the other day

manufactured on a large scale, and promises to play an important part in industrial chemistry. The waste liquors obtained in the distillation of alcohol from fermented beet: root molasses serve as a raw material for its preparation. These liquors, when evaporated to dryness and subjected to dry distillation, yield, besides tar and gases, an aqueous liquid containing large quantities of ammonia, acetonitrile, This liquor is neutral- ized with sulphuric acid, and distilled, when the nitrile and the methyl-alcohol distil over, to be recovered by proper methods. From the mixed solution of the sulphates of ammonia and trimethylamine the former 1s separate

out as far as possible by crystallization ; the mother-liquor

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is distilled with lime; the volatile bases are absorbed in hydrochloric acid ; the hydrochloric solution is evaporated ; and the sal-ammoniac which comes out at first is, as far as possible, fished out. The last mother-liquor is evaporated to dryness, and in this form represents commercial trimethylamine hydrochlorate. It is this product which serves for the preparation of methyl chloride (vide supra), the process being founded upon the fact that a concentrated solution of the salt, when heated, breaks up 3HCl . N(CH,), into 2N(CH,), of free trimethylamine + NH,. CH,HCl of hydrochlorate of monomethylamine and 2CH,Cl of methyl chloride.

These processes are being carried out industrially by Vincent in France. But this base trimethylamine seems destined to do more than provide us with a new refrigerat- ing agent. The attempt has been made—it would appear, with success—to utilize it for the preparation of pure carbonate of potash from native chloride of potassium, just as ordinary ammonia, in the famous ammonia-soda process, serves for the conversion of common salt into soda-ash.

Methyl Cyanides.—There are two distinct bodies which, by com- position and by synthesis, are both CH;+NC; they are named “acetonitrile”?

(formerly called simply cyanide of methyl) and isocyanide of methyl or methylcarbamine respectively.

Acetonitrile was discovered by Dumas in 1847. It may be pre- pared by the distillation of a mixture of methylsulphate and of cyanide of potassium; but is obtained more easily and in a purer state by distilling acetamide with phosphoric anhydride. Acetate of ammonia may be used instead of the amide, but it does not work so well.

CH,. CO. O(NH,) CH,;.CO.(NH,) CH,. CN Acctate of NH, Acetamide Nitrile =A (say). =A-H,0. =A-2H,0.

It is a colourless liquid of a pungent aromatic odour, with specific gravity *805 at 0°, and boils at 82°C. When heated with aqueous potash (at the wrong end of a condenser) it breaks up with for- ation of ammonia and acetate of potash. Whence we conclude that the methyl is combined more directly with the carbon of the cyanogen, thus :

N{C—CH,} +2H,0 =NH,+CH,. COOH. Acctie acid.

This conclusion is supported by the action on the nitrile of nascent

hydrogen, which leads to the formation of ethylamine, thus (Men-

dius) :— NC—CH,+4H=H,N—CH,CHs3. Etliylamine. In either case we pass from a monocarbon to a dicarbon body, Virtually from methyl to ethyl alcohol.

The isocyanide is prepared by heating iodide of methyl with cyanide of silver (CH3I ; 2NCAg) and ether in a sealed-up tube to 130° to 140°, to produce the crystalline body AgNC + NCCH, (and Agl). The double cyanide, when distilled with some water and cyanide of potassium, breaks up into its components,—the NCAg forming (NC),AgK ; and the cyanide of methyl distils over. Itis a colourless liquid, characterized by quite an unbearably irritating and sickening smell. The specific gravity is °756 at 14°, the boiling point 59° C. It combines with hydrochloric acid into a crystalline salt which is readily decomposed by water into methylamine and

formic acid. Whence we conclude that in this case the cyanogen is tied to the methyl by its nitrogen ; thus :—

C{N—CH,} +2H,O=H. COOH +NH,. CH,. Formic acid. Methylamine.

The methyl here remains methyl, being separated by an N from the cyanogen-carbon, which latter passes into formic acid.

We inust not close this section without at least referring to the methylphosphines, as being a set of bodies related to PH 6 (phosphine) as the methylamines are to NH, (ammonia), and similar to these in their chemical character, in so far as they are bases. The points of difference betwecn the two series are of pretty much the same sense as those between the two prototypes. Thus, for stance, while trimethylamine N(CH,), is a strong base, but inert to oxygen gas, trimethylphosphine is a relatively feeble base, but in contact with air greedily absorbs oxygen with formation of an oxide P(CH;),0, the like of which in the nitrogen series has no existence.

Sulphur Compounds of Methyl.—Substances analogous to methyl- alcohol and methyl-ether respectively can be obtained by the dis- tillation of methyl sulphate of potassium with strong solutions of

the potassium sulphides KHS and K,§ respectively. The body CH,.SH is knowm as methyl-mercaptane, the other (CH,),8 as sulphide of methyl. Both are very volatile stinking liquids. Sulphide of methyl claims a special interest as being the starting point for the preparation of an important class of bodies called trymethyl sulphine compounds. ‘The sulphide (CH3),8 readily unites with the iodide CH,] into crystals of iodide of trimethyl sulphine, (CH)3S. I, a substance which is closely analogous in its chemical character to the iodide of tetramethyl-ammonium. Moist oxide of silver, for instance, converts it into a strongly basic hydrate, S(CH,),. OH, which in its avidity for acids almost beats its analogon in the nitrogen family. An investigation of its salts was Scie by Crum Brown and Blaikie.

Methyl Arsenides.—Arseniferous bases constituted like mono- or di-methylamine (bodies such as ASH,CHsg, analogous to NH,.CHzs) do not seem to exist. What we do know of are—(1) a trimethyl- arsine and the iodide and the hydroxide of tetramethylarsonium, —As(CH3)3, As(CH),J, and As(CH3),0H,—bodies discovered by Cahours and Riche; (2) a whole series of monomethylic bodies, As(CH,)X, (where X=Cl, Br, or X,=O,S), discovered by Baeyer in 1857 ; (3) the kakodyle compounds, a series of bodies, As(CH3).. X or As(CH3).. Xg, which were discovered and investigated by R. Bunsen in 1842. This great investigation marks an epocli in the history of organic chemistry, and our article would not be complete without at least a short summary of its results. Bunsen started in his investiga- tion with a liquid which had been obtained by Cadet as early as 1760, by the dry distillation of equal parts of white arscnic and anhydrous acetate of potash, and which nobody cared to investigate because it emits fumes which have an indescribably sickening smell and an intensity of poisonous action, compared with which that of white arsenic itself appears insignificant. It was reserved for Bunsen to attack this awful substance and force it to give an account of itself. According to Bunsen, Cadet's liqnid is substantially an oxide, (AsC,H,).0, which has strongly basic properties, readily exchang- ing its O for Cl,, &c. To obtain the pure substance, the liquor is distilled with corrosive sublimate and hydrochloric acid, which in the first instarice yields the pure muriate of the base As(CH,),Cl, in the form of a liquid volatile above 100° into vapours which take fire spontaneously in air. From this chloride of kakodyle the pure oxide is obtained by distillation with caustic potash. The pure oxide emits no fumes; its specific gravity is 1:462; it boils near 150°. A mixture of its vapour with air detonates at 50° C. From the chloride again, Bunsen obtained tlic free radical kakodyle, (AsC, Hg), by treatment with metallic zine in a special apparatus, so constructed that all the several operations involved could be eairied out without bringing the contents in contact with air, — a necessary precaution, because kakodyle is a liquid which takes fire in air spontaneously even at ordinary temperatures. Pure kakodyle is a heavy colourless liquid boiling at about 170° C., and freezing at — 6°. When exqitel to oxygen or chlorine it sufters destructive combustion ; but on slow access of air it is oxidized into its oxide, (AsC,H,).0, and kakodylic acid; with chlorine water it unites into the chloride which it came from ; it also unites directly with sulphur and other elements; in short, it is exactly to

kako- dyle compounds what potassium is to potash and potash salts, ‘*a true organic element,” as Bunsen himself put it. This dis- covery of Bunsen’s was greeted with an enthusiasm which it is difficult in these days to realize. With us now, a radical is intrinsically a fiction ; it was dilferent in 1842. By the isolation of kakodyle the ‘‘ radical” notion suddenly rose from an unproved hypothesis to the rank of a theory based on experiment. Still, however much our theorctical notions nay shift, Bunsen’s research will stand as a piece of monumental scientific work.

Kakodylic acid, As. O.(CH3)..OH, is most conveniently pre- pared from the oxide by addition of water and oxide of mercury, — H,O+2Hg0O supplying the H,+ O03 required for 1(AsC,H,),0. This is a crystalline monobasic acid, soluble in water. Unlike the kakodylides of the As. Xg type, it has no smell, and is no very violent poison. It takes six grains of it to kill a rabbit. –

Metallic Methides.—Examples of thesc are—Sb(CHg), ; Sb(CHs); ; Mg(CH;), ; Zn(CHg), ; Pb(CHg),; Al(CH3)3; Sn(CH,),. To give an idea of the chemical character of this interesting class of bodies we choose zinc-methyl as a representative example, and state briefly the chief points of its chemical history. This body was discovered by Frankland in 1849. It is prepared by boiling iodide of methyl] over granulated zinc in a flask connected with an inverted condenser, and so contrived otherwise that the contents are protected against access of moisture and oxygen. Under these circumstances the two in- gredients gradually unite into a non-volatile and solid compound IZn.(CH;). When this body is heated with more of iodide of methyl, it undergoes decomposition, with formation of iodide of zinc and of dimethyl gas, I—Zn—CH,CH3] =ZnI,(CHs)., which reaction to some extent takes place unavoidably in the pre- paration of the zinc salt, however great an excess of metal may be taken. Whatsurvives needs only to be subjected to dry distillation (in the absence of air) to yield a distillate of zinc-methyl :—

21—Zn—CH,= Zul, + Zn(CHsg),.

Zine-methy] is a colourless liquid of 1°386 specific gravity at 10°5, which boils at 46° C. ; in contact with air it takes fire. Water decomposes it at once

into hydrate of oxide of zinc and marsh gas, Zn(CH)o= Zn(OH),+2CH,H. Of other reactions the following may be named. (1) When digested with sodium, it yields a preeipi- tate of metallic zinc, and a double compound of itself and sodium- methyl. This latter unites readily with carbonic acid into aeetate of soda, NaCH,+CO,=CH,—CO—ONa (Wanklyn). (2) With chloride of acetyl it forms acetone, Zn(CH3).+2CH3. CO. Cl= ZnCl, +2CO(CH,).(Freund) (3) Under somewhat different condi- tions, including the presence of an excess of Zn(CHg)., a compound is produced which with water, yields tertiary butyl-alcohol (Boutle-

row): CO(CH,).+ Zn(CH).= C(CH)3. O- Zn@H.— A: A+2H.OH =Zn(OH),CH, C(CHy)3 — OH.

Tertiary alcohol.

(W. D.)

METRONOME, an instrumeut for denoting the speed at which a musical composition is to be performed. Its invention is generally, but falsely, ascribed to Johann Nepomuk Maelzel, a native of Ratisbon (177 2-1838). It consists of a pendulum swung on a pivot ; below the pivot is a fixed weight, and above it is a sliding weight that regulates the velocity of the oscillations by the greater or less distance from the pivot to which it isadjusted. The silent metronome is impelled by the touch, and ceases to beat when this impulse dies; it has a scale of numbers marked on the pendulum, and the upper part of the sliding weight is placed under that number which is to indicate the quickness of a stated note, as M.M. (Maelzel’s Mctronome) a 60, or $= 72, or ‘= 108, or the like. The number 60

implies a second of time for each single oscillation of the pendulum,— numbers lower than this denoting slower, and higher numbers quicker beats. The scale at first ex- tended from 50 to 160, but now ranges from 40 to 208. A more complicated metronome is impelled by clock-work, makes a ticking sound at each beat, and continues its action till the works run down; a still more intricate machine has also a bell which is struck at the first of any number of beats willed by the person who regulates it, and so signifies the accent as well as the time.

The earliest instrument of the kind, a weighted pendulum of variable length, is described in a paper by Etienne Loulié (Paris, 1696; Amsterdam, 1698). Attempts were also made by Enbrayg (1732) and Gabory (1771). Harrison, who gained the prize awarded by the English Government for his chronometer, published a description of an instru- ment for the purpose in 1775. Davaux (1784), Pelletier, Abel Burja (1790), and Weiske (also 1790) described their various experiments for measuring musical time. In 1813 Gottfried Weber, the composer, theorist, and essayist, proposed a weighted ribbon graduated by inches or smaller divisions, which might be held or otherwise fixed at any desired length, and would infallibly oscillate at the same speed so long as the impulse lasted; this, the simplest, is also the surest, the most enduring, the most portable, and the cheapest invention that has come before the world, and one can but wonder that it has not been universally accepted. Stdckel and Zmeskall produced each an instru- ment; and Maelzel made some slight modification of that by the former, about the end of 1812, which he announced as a new invention of his own, and exhibited from city to city on the Continent. It was, as nearly as can be ascertained, in 1812 that Winkel, a mechanician of Amsterdam, devised a plan for reducing the inconvenient length of all existing instruments, on the principle of the double pendulum, rock- ing on both sides of a centre and balanced by a fixed and a variable weight. He spent three years in completing it, and it is described and commended in the Report of the Netherlands Academy of Sciences, August 14,1815. Maelzel thereupon went to Amsterdam, saw Winkel and inspected his invention, and, recognizing its great superiority to what he called his own, offered to buy all right and title to it.

Winkel refused, and so Maelzel constructed a copy of the instrument, to which he added nothing but the scale of numbers, took this copy to Paris, obtained a patent for it, and in 1816 established there, in his own name, a manu- factory for metronomes. When the impostor revisited Amsterdam, the inventor instituted proceedings against him for his piracy, and the Academy of Sciences decided in Winkel’s favour, declaring that the graduated scale was the only point in which the instrument of Maelzel differed from his. Maelzel’s scale was needlessly and arbitrarily

complicated, proceeding by twos from 40 to 60, by threes from 60 to 72, by fours from 72 to 120, by sixes from 120 to 144, and by eights from 144 to 208. Dr Crotch con- structed a time-measurer, and Henry Smart (the violinist, and father of the composer of the same name) made another in 1821, both before that received as Maelzel's was known in England. In 1882 James Mitchell, a Scotsman, made an ingenious amplification of the Maelzel clock-work, reducing to mechanical demonstration what formerly rested wholly on the feeling of the performer. Although ""Maelzel's metronome " has universal acceptance, the silent metronome and still more Weber's graduated ribbon are greatly to be preferred, for the clock-work of the other is liable to be out of order, and needs a nicety of regulation which is almost impossible ; for instance, when Sir George Smart had to mark the traditional times of the several pieces in the Dettingen Te Deum, he tested them by twelve metronomes, no two of which beat together. The value of the machine is exaggerated, for no living performer could execute a picce in unvaried time throughout, and no student could practise under the tyranny of its beat ; and conductors of music, nay, composers themselves, will give the same piece slightly slower or quicker on different occasions, according to the circumstances of performance. METSU, Gasriet, a Dutch painter of celebrity (born in 1630, died after 1667), is one of the few artists of renown in Holland whose life has remained obscure. Houbraken, who eagerly collected anecdotes of painters in the 18th century, was unable to gather more from the gossip of his contemporaries than that, as early as 1658, Metsu, at the age of forty-three, submitted to a dangerous surgical operation. The inference drawn by superficial readers from this statement has been that death immediately ensued. A more careful perusal would have shown that Houbraken knew that Metsu had given lessons to De Musscher in 1665. Local records now reveal that Gabriel was the son of Jacques Metsu, who lived most of his days at Leyden, where he was three times married. The last of these marriages was celebrated in 1625, and Jacomma Garnijers, herself the widow of a painter, gave birth to Gabriel in 1630. Connected by both his parents with art, Metsu was probably taught first by his father and then by Gerard Dow. He probably finished his training under Rembrandt. So far back as 1648, but a few days earlier than Jan Steen, who is said to have painted his portrait, Metsu was registered in the painters' corporation at Leyden; and the books of the guild also tell us that he remained a member in 1649. In 1650 he ceased to subscribe, and works

bearing his name and the date of 1653 give countenance to the belief that he had then settled at Amsterdam, where he continued his studies under Rembrandt. His companions at the time would naturally be De Hooch and Van. der Meer, whose example he soon followed when it came to his turn to select the class of subjects for which his genius fitted him. Under the influence of Rembrandt he pro- duced the Woman Taken in Adultery, a large picture with the date of 1653, in the Louvre, in which no one would suspect the painter of high life or taverns were it not that his name is written at full length on the canvas. The artist who thus repeated the gospel subjects familiar t0

Flinck and Eeckhout was also acquainted with the Oriental wardrobe of Rembrandt, and ready to use it, like all his contemporaries. But he probably observed that sacred art was ill suited to his temper, or he found the field too strongly occupied, and happily for himself, as well as for his admirers, he turned to other subjects for which he was better fitted. We may doubt whether he triéd the style of allegory as illustrated in a picture of Justice Protecting Virtue and Chastising Vice in the gallery of the Hague. ‘There is every reason to think that this rough and frosty composition was wrought by quite another master. What Metsu undertook and carried out from the first with surprising success was the low life of the market and tavern, contrasted with wonderful versa- tility by incidents of high life and the drawing-room. In each of these spheres he combined humour with expres- sion, a keen appreciation of nature with feeling, and breadth with delicacy of touch, unsurpassed by any of his contem- poraries. In no single instance do the artistic lessons of Rembrandt appear to have been lost upon him. The same principles of light and shade which had marked his school- work in the Woman Taken in Adultery were applied to subjects of quite a different kind. A group in a drawing- room, a series of groups in the market-place, a single figure in the gloom of a tavern or parlour, was treated with the utmost felicity by fit concentration and gradation of light; a warm flush of tone pervaded every part, and, with that, the study of texture in stuffs was carried as far as it had been by Terburg or Dow, if not with the finish or the brio of De Hooch. Metsu’s pictures are all in such admirable keeping, and so warm and harmonious in his middle or so cool’ and harmonious in his closing

time, that they always make a pleasing impression. They are more subtle in modulation than Dow's, more spirited and forcible in touch than Terburg's; and, if Terburg may of right claim to have first painted the true satin robe, he never painted it more softly or with more judgment as to colour than Metsu. .

That Metsu married and became a citizen of Amsterdam in 1659 would only prove that his residence in the com- mercial capital of the Netherlands was later than historians have generally assumed. But there is no reason to think that Metsu claimed his citizenship at once. The privileges of a burgess were given in exchange for a payment of dues, and these painters had various ways of avoiding unless they married. One of the best pictures of Metsu's manhood is the Market-place of Amsterdam, at the Louvre, respecting which it is difficult to distribute praise in fair proportions, so excellent are the various parts, the characteristic move- ment and action of the dramatis persone, the selection of faces, the expression and the gesture, and the texture of the things depicted. A tin can in the arm of a cook is a marvel of imitation, but the cook's face is also a marvel of expression. Equally fine, though earlier, are the Sportsman (dated 1661) and the Tavern (also 1661) at the Hague and Dresden Museums, and the Game-Dealer's Shop, also at Dresden, with the painter's signature and 1662.

Metsu is one of the painters of whose skill Holland still pre- serves examples, yet whose best pictures are either in England or in France or in the galleries of Germany. The value of his works is large, and at the Pommersfelden sale in 1867 the Jealous Husband Dictating his Wife's Letters, though but one of several replicas, was bought by Lord Hertford for little short of £2000, while for the Ride of the Prince of Orange, in the Gsell collection at Vienna, £3000 was paid by Baron Rothschild in 1873. (J. A. C.)

METTERNICH, Cremens Wenzesiavs, PRINcE (1773- 1859), first minister of Austria from 1809 to 1848, was the son of a Rhenish nobleman employed in high office by the Austrian court. He was born at Coblentz in 1773. At the age of fifteen he entered the university of Strasburg. The French Revolution was then beginning. Everywhere

the spirit of hope gave to men's language an exaltation and a confidence hardly known at any other epoch. But the darker reality soon came into view. Metternich was a witness of the riot in which the town-hall of Strasburg was pillaged by a drunken mob ; his tutor subsequently became a member of the revolutionary tribunal in Alsace. If we are to trust to Metternich's own account of the formation of his opinions, the hatred of innovation, which was the ruling principle of his later life, arose from his experience of the terrible results which followed at this time from the victory of so-called liberal ideas. But in reality Metternich was an aristocrat and a conservative by birth and nature. His sentiment in things political was that of a member of a refined and exclusive society which trusts to no intelli- gence but its own, and hardly sympathizes with larger interests. The aggressions and violence of the Revolution from 1789 to 1799 gave Metternich an historical basis for his political theories, but the instinctive preferences of his own mind were the same from first to last. He began life as a young man of fashion and gallantry. His marriage in 1795 with the Princess Kaunitz, a granddaughter of the famous minister, fixed him in the highest circle of Austrian nobility. His first contact with the great political world was at the congress of Rastadt in 1798, where, under the auspices of the victorious French republic, arrangements were made for compensating the German princes and nobles whose possessions on the left bank of the Rhine had been ceded to France by the peace of Campo Formio. Metternich was the accredited agent of a group of Westphalian nobles; his private letters give a vivid picture of the rough and ° uncourtly diplomatists who had succeeded to the polished servants of the old French monarchy. In 1801 Metternich was appointed Austrian ambassador at Dresden, and in 1803 he was promoted to Berlin; but he had hardly become as yet a prominent man in Europe. His stay at Berlin was the turning-point of his life. The war of the third coalition was impending. Austria united with England and Russia against Napoleon, and the task of the youthful ambassador was to win over the court of Berlin to the cause of the allies. Metternich seems to have done all that it was possible for him to do; but Prussia persisted in its neutrality. The earnestness with which Metternich had worked against France did not prevent him from remaining on the friendliest terms with M. Laforest, the French ambassador at Berlin ; and so agreeable an account of him was transmitted to Paris by his rival that, at the close of the conflict, Napoleon himself requested that Metternich might henceforward represent Austria at

the Tuileries. Metternich was accordingly sent to Paris in 1806. This was the beginning of the period when Austria, humbled but not exhausted by the blow of Austerlitz and by the losses accompanying the peace of Pressburg, deter- mined, under the leadership of Count Stadion, to prepare for another war on a greater scale. But the sudden over- throw of Prussia, and the alliance between France and Russia which was made at Tilsit in 1807, added immeasur- ably to the difficulties of the court of Vienna. It became clear that Napoleon was intending to. dismember Turkey, and to gain for himself some part of the spoils of the Otto- man empire. Metternich's advice was that Austria should endeavour to detach the czar from the French alliance, and by this means frustrate the plan of partition; but, should Russia hold fast to Napoleon, that Austria itself should unite with the two aggressors, and secure its share of Turkey. Oriental affairs, however, fell into the background, and in the summer of 1808 Metternich was convinced that Napoleon was intending to attack Austria, though not im- mediately. He warmly supported Count Stadion's policy in raising the forces of Austria to the highest strength ; and, although he did not share the minister's hopes in a

general rising throughout Germany, he expressed in his despatches no distrust of the power of Austria to cope with Napoleon, This is the more singular because, after the disastrous issue of the campaign of 1809, Metternich seems to have taken credit for having opposed the policy of war. Napoleon again captured Vienna; the battle of Wagram was lost ; and after a long negotiation Austria had to purchase peace by the cession of part of Austrian Poland and of its Illyrian provinces. Metternich, who had virtually taken Count Stadion's place immediately after the battle of Wagram, was now installed as minister of foreign affairs. The first striking event that took place under his administration was the marriage of Marie Louise, daughter of the emperor Francis, to his conqueror Napoleon. To do justice to Metternich's policy it must be remembered that the alliance of Tilsit between France and Russia was still in existence, and that Austria was quite as much threatened by the ezar's designs upon Turkey as by Napoleon's own aggressions. Metternich himself seems, in spite of his denials, to have been the real author of the family union between the houses of Hapsburg

and Bonaparte,—a most politic, if not a high-spirited measure, which guaranteed Austria against danger from the east, at the same time that it gave it at least some prospect of security from attack by Napoleon, and enabled Metternich to mature his plans for the contingency of an ultimate breach between France and Russia. In 1812 this event occurred. Metternich, in nominal alliance with Napo- leon, sent a small army into southern Russia, allowing it to be understood by the ezar that the attack was not serious. Then followed the annihilation of the French invaders. While Prussia, led by its patriots, declared war against Napoleon, Metternich, with rare and provoking coolness, held his hand, merely stating that Austria would no longer regard itself as a subordinate ally, but would act with all its force on one side or the other. The result of this reserve was that Metternich could impose what terms he pleased on Russia and Prussia as the price of his support. The armies of these two powers, advancing into central Germany, proved no match for the forces with which Napoleon took the field in the spring of 1813 ; and the hard-fought battles of Liitzen and Bautzen resulted in the retreat of the allics. After the combatants had made an armistice, Met- ternich tendered Austria's armed mediation, requiring Prussia to content itself with the restoration of its territory east of the Elbe, and leaving Napoleon's ascendency in Germany almost untouched. Napoleon, after a celebrated interview with Metternich, madly rejected terms so favour- able that every Prussian writer has denounced Metternich's proposal of them as an act of bitter enmity to Prussia. On the night of the 10th of August the congress of Prague, at which Austria, as armed mediator, laid down conditions of peace, was dissolved. Metternich himself gave orders for the lighting of the watch-fires which signalled to the armies in Silesia that Austria had declared war against Napoleon. The battle of Leipsic and the campaign of 1814 in France followed, Metternich steadily pursuing the policy of offering the most favourable terms possible to Napoleon, and retarding the advance of the allied armies upon the French capital. Metternich had nothing of that personal hatred towards the great conqueror which was dominant both in Prussia and in England ; on the contrary, though he saw with perfect clearness that, until Napoleon's resources were much diminished, no one could be safe in Europe, he held it possible to keep him in check without destroying him, and looked for the security of Austria in the establishment of a balance of power in which neither Russia nor France should preponderate, while Prussia should be

strictly confined within its own limits in northern Germany. The assistance of the Austrian army, which

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was no doubt necessary to the allies, had, so far as related to Prussia, been dearly purchased. When, at the beginning of 1813, Prussia struck for the freedom of Germany, its leading statesmen and patriots had hoped that the result of the war of liberation would be the establishment of German unity, and that the minor German princes, who had been Napoleon's vassals since 1806, would be foreed to surrender part of their rights as sovereigns,~~and submit to a central authority. This dream, however, vanished ag soon as Austria entered the field as an ally. It was no part of Metternich's policy to allow anything so revolu~~ . tionary as German unity to be established, least of all under the influence of Prussian innovators. He made treaties with the king of Bavaria and Napoleon's other German vassals, guaranteeing them, in return for their support against France, separate independence and sove- reignty when Germany should be reconstructed. Accord- ingly, though the war resulted, through Napoleon's obstinate refusal of the terms successively offered to him, in the limitation of France to its earlier boundaries and ina large extension of Prussia's territory, the settlement of Germany outside Prussia proceeded upon the lines laid down by Metternich, and the hopes of unity raised in 1813 were disappointed. A German confederation was formed, in which the minor sovereigns retained supreme power within their own states, while the central authority, the federal diet, represented, not the German nation, but the host of governments under which the nation was divided. Metternich even advised the emperor Franais of Austria to decline the old title of German emperor, dis- liking any open embodiment of the idea of German unity, and preferring to maintain the ascendency of Austria by a gentle pressure at the minor courts rather than by the avowed exercise of imperial rights. In this unprogressive German policy Metternich was completely successful. His great opponent, Stein, the champion of German unity and of constitutional systems, abandoned his work m despair, and refused the useless post of president of the diet, which Metternich, with a kind of gentle irony, offered to him.

The second branch of Metternich's policy in 1813-14 was that which related to Italy. Following the old maxims of Austrian statesmanship, Metternich aimed not only at securing a large territory beyond the Alps but at making the influence of Austria predominant throughout the Italian peninsula. The promises of national independence which had been made to the Italians when they were called upon to rise against Napoleon were disregarded. In the secret clauses of the first treaty of Paris the annexation of both Lombardy and Venetia was guaranteed to Austria, and the rest of Italy was divided into small states as of old. Napoleon's return from Elba led to the downfall of Murat, who had been allowed to retain the kingdom of Naples, and to the reunion of this country with Sicily, under the Bourbon Ferdinand. After the second overthrow of Napoleon, Metternich endeavoured to make every Italian sovereign enter into a league under Austria's presidency. Ferdinand of Naples accepted the position of vassal, but the pope and the king of Sardinia successfully maintained their inde- pendence. With the construction of the German federation, and the partial construction of an Italian federation, both under

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of Prussian writers, because he did not work for German unity, is to ignore the existence of such a thing as state- policy. Judged by the ordinary standards of practical statesmanship, not by the philosophy of history, Metternich's action in 1813 and 1814 was that of a very superior man; and the qualities of calmness and dexterity which he displayed would have given an infinitely greater effectiveness to the life of his great rival Stein, who in patriotic and moral enthusiasm was so far above him.

The second part of Metternich's career, which extends from 1815 to 1848, is that of a leader of European conser- vatism. It is difficult to describe his attitude towards almost all the great questions which were now arising as any but one of absolute blindness and infatuation. He acknowledged that exceptional circumstances in the past had made it possible for England to exist under a constitution; he knew that France would not surrender the Charta given to it by King Louis XVIII.; but in all other great states he maintained that there were no alter- natives but absolute monarchical government and moral anarchy. His denunciations of liberals and reformers

everywhere and at all times are perfectly childish ; and in many instances his hatred of change led him into errors of judgment not surpassed in the annals of political folly. When Napoleon fell, there was a prospect of the introduction of constitutional government throughout a great part of Europe. King Frederick William, stimulat- ing the efforts of the Prussian people against France by the hopes of liberty, had definitely promised them a constitu- tion and a general assembly. The czar had determined to introduce parliamentary life into the kingdom of Poland, and even hoped to extend it, after some interval, to Russia. The Federal Act drawn up for Germany at the congress of Vienna declared that in every state within the German league a constitution should be established. Against this liberal movement of the age Metternich resolutely set his face. Though wide general causes were at work, the personal influence of the Austrian statesman had no small share in prolonging the existence of autocratic government, and in developing that antagonism between the peoples and their rulers which culminated in the revolutions of 1848. The nature of the Austrian state, composed of so many heterogeneous provinces and nationalities, no doubt made it natural for its representative to defend and exalt the principle of personal sovereignty, on which alone the unity of Austria was based ; the relation of Austria to Italy rendered the growth of the sentiment of nationality a real source of danger to the house of Hapsburg ; but Metternich's abhorrence of constitutional and popular ideas was more than the outcome of a calculating policy. He was not a man of much faith, but one belief he held with all the force of religious conviction, —namely, the belief that his own task and mission in the world was to uphold established authority. All efforts to alter the form or to broaden the basis of government he classed under the same head, as works of the spirit of revolution; and in one of his most earnest writings he places side by side, as instances of evil sought for its own sake, the action of the secret societies in Germany, the Carbonaria of Italy, and the attempts of the English to carry the Reform Bill. Working on prin- ciples like these, and without the shadow of a doubt in his own wisdom, Metternich naturally proved a great power at a time when the sovereigns who had inclined to constitu- tional ideas began to feel the difficulties in the way of putting them into practice. Metternich's advice, tendered with every grace of manner and with the most winning and persuasive art, was indeed not hard for rulers to accept, for he simply recommended them to give up nothing that they had got. It was at the

congress of Aix-la-Chapelle (1818) that the retrograde tendency, which was now suc-

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j ceeding to the hopes of 1815, first gained expression. An agitation among the students at the German universities had caused some scandal in the previous year, and secret societics had just been discovered in Russia. Metternich plied the king of Prussia with arguments for withholding the national representation which he had promised to his people, and stimulated the misgivings which were arising in the mind of the czar, hitherto the champion of European liberalism. A few months later the murder of Alexander's German agent, Kotzebue, by a fanatical student gave Metternich an excellent pretext for organizing a crusade against German liberty. A conference of ministers was held at Carlsbad. The king of Prussia allowed his representative to follow Metternich's lead. The resistance of the constitutional minor states proved of no avail; and a series of resolutions was passed which made an end of the freedom of the press throughout Germany, and subjected the teaching and the discipline of the universities to officers of state. A commis- sion was established at Mainz to investigate the conspiracies which Metternich alleged to have been formed for the over-throw of all existing governments, and for the creation of 4 German republic, one and indivisible. In the following year new articles were added by Metternich's direction to the original Federal Act, the most important being one that forbade the creation in any German state of an assembly representing the community at large, and enforced the system of representation by separate estates or orders, each possessed of certain limited definite rights, and all alike subordinate to the supremacy of the crown. Metternich would gladly have made an end of the parliamentary con- stitutions which had already come into being in Bavaria and the southern states; but he was unable to attack them openly, and had to confine himself to the advocacy of strict monarchical principles through his representatives at these courts. With regard to Prussia, however, he was completely successful. The king of Prussia broke his promise of establishing a national representation, and satisfied his conscience by creating certain powerless pro- vincial diets, exactly as Metternich had recommended him. Throughout Germany at large a system of repression

was carried out against the advocates of constitutional right. The press was silenced ; societies were dissolved ; prosecu- tions became more and more common. While Metternich imagined himself to be stifling the spirit of discontent, he was in fact driving it into more secret and more violent courses, and convincing eager men that the regeneration of Germany must be sought not in the reform but in the overthrow of governments.

Meanwhile revolution broke out in Spain and Italy. Ferdinand of Spain, who had restored despotism, was com- pelled, in March 1820, to accept the constitution of 1812 which he had subverted. The same constitution was accepted a few months later by Ferdinand of Naples. Spain was outside Metternich's range, but his hand fell heavily upon Naples. A congress of the great powers was held at Troppau in October 1820. Metternich, who was president, as he had been at Vienna, and continued to be in later congresses, completely won over the czar to his own views. Resolutions in favour of an intervention, if neces- sary by force of arms, against the Neapolitan liberal Govern- ment were adopted by Austria, Russia, and Prussia, though England and France held aloof. The congress was then adjourned to Laibach in Carniola, whither Ferdinand of Naples was summoned, in order that he might mediate between the powers and his people, and induce the latter to give up a constitution which offended the three northern courts. Ferdinand's journey and mediation were an impos- ture as regarded the Neapolitans; he pretended that he went to negotiate on behalf of his people, when in fact his

intention was exactly the same as Metternich's, namely, to

have absolute monarchy restored. The proceedings of the congress at Laibach were a farce. A letter was concocted by Metternich for King Ferdinand to send to his subjects, informing them that the powers would not permit the constitution to exist, and that, in default of their submission, the allied courts would employ force. The British Government, while protesting against the joint action of the three powers as an assumption of international sovereignty, was perfectly willing that Austria, as a state endangered by the Neapolitan revolution, should act on its own account. Metternich, however, continued to treat the Neapolitan question as the affair of Europe, and

maintained his concert with Russia and Prussia. Early in 1821 an Austrian force, acting in the name of the allies, entered central Italy. The armies opposed to it col- lapsed, and the Austrians entered Naples on March 24. But in the meantime a revolution broke out in Pied- mont, which threatened to cut off the Austrians from their supports, and to raise all Italy against them. For a moment the bold action of Metternich seemed to have resulted in immense danger both to his own conservative policy and to the peace of Europe ; for it was believed that the Piedmontese revolution would be answered, not only by a general Italian movement, but by a rising against the Bourbons in France. The cloud, however, passed away. Order was quickly restored in Piedmont ; Lombardy was safcly held by Austrian garrisons; and the conclusion of the Italian difficulties, in which Metternich had played a very difficult part with great resolution and dexterity, was his complete and brilliant personal triumph. No statesman in Europe at this moment held a position that could com- pare with his own.

At the congress of Verona, held in 1822, the affairs of Spain were considered by the powers. In the end, the Spanish constitution was overthrown by a French invading army ; but, thongh the arm employed was that of France, the principle of absolutism which animated the crusade was that which Metternich had made his own. A severe check, however, now met him in another quarter. Greece had risen against Turkish rule in 1821. The movement was essentially a national and a religious one, but Metternich treated it as a Jacobinical revolt against lawful authority, — confusing, or affecting to confuse, the struggle for national independence with the shallow and abortive efforts of politi- cal liberalism in Italy and Spain. towards the Greeks was for some time one of unqualified hostility. If, under the pressure of the Tilsit alliance, he had once been willing that Austria should join Russia in dismembering Turkey, he had now reverted to the principle of maintaining Turkey at all costs against a Russian advance southwards; and he attributed the Greek move- ment to the efforts of Russian agitators unauthorized by the czar. His desire was that the sultan should deprive Russia of all possible cause for complaint as regarded its own separate interests, and so gain freedom to deal sum- marily with the Greeks. Metternich’s hopes failed, partly through the obstinacy of the Turks, partly through the wavering conduct of Alexander, and partly through the death of Castlereagh and the accession of Canning to power. It

was in great part owing to Canning's moral support that Greece ultimately became an independent state; and the extraordinary violence of Metternich's language whenever he mentions this English statesman marks only too well the opposite character of his aims. No politician has left a more damning record against himself than Metternich in his bigoted abuse of Canning. The Greek question, however, was only the first on which the judgment of events was now beginning to declare itself against Metternich and all his principles. The French revolution of 1830 shattered the moral fabric which he

revolution of that year ended his political career.

Metternich's attitude'

had so proudly inaugurated, and in great part himself raised, in 1815. England and France now made any revival of the kind of presidency that he had once held in Europe impossible. ing troops into the papal territory when revolutionary movements broke out there in 1831 and 1832, though war with France seemed likely to result from this step. was as unsparing as he had been in 1819 in suppressing the agitation which after 1830 spread from France to Germany; and the union of the three eastern courts was once more exhibited in the meeting of the monarchs which took place at Miinchengriitz in 1833, and in a declaration delivered at Paris, insisting on their right of intervention against revolution in other countries. czar of Russia, Nicholas, who was now the real head of European conservatism ; and the stubborn character, the narrow, unimaginative mind,

The accord that grew up _ between

He was indeed bold and rapid in throw-

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of this prince made it impossible for Mctternich to shape his purposes by that

delicate touch which had been so effective with his pre- decessor. without a rival. whom he had worked for

But in Austria itself Metternich continued In 1835 the emperor Francis, with nearly thirty years, died. Metternich, himself falling into the mental habits of old age, remained at the head of the state till 1848. The He resigned office with the dignity of demeanour which had never failed him ; his life was scarcely safe in Vienna, and the old man came for a while to England, which he had not visited since 1794. Living on till June 1859, he saw every great figure of his earlier life, and many that had ap- peared on the horizon since his own prime, pass away; and a few more months of life would have enabled him to see the end of that political order which it had been his life- work to uphold ; for the army of Napoleon III. was crossing the Sardinian frontier at the moment when he died, and before a second summer had gone Victor Emmanuel had been proclaimed king of Italy.

Metternich was a diplomatist rather than a statesman. His influence was that of an expert manager of individuals, not of a man of great ideas. All his greatest work was' done before fifty ; and at an age when most statesmen are in the maturity of their powers he had become tedious and pedantic. His private character was very lovable. He was an affectionate if not a faithful husband, a delightful friend, and a most tender father. The ex- cessive egotism which runs through his writings gives perhaps an impression of weakness which did not really belong to his nature. Drawn by a firmer pen, the scene in which he describes himself labouring in the German conferences of 1820, while his favourite daughter was dying in an adjoining room, would have been one of the most affecting things in political biography. The man who could so have worked and felt together must have possessed no ordinary strength of character, no common force of self-control.

The collection of Metternich's writings published by his family under the title of Denkwiirdigkeiten, along with French and English editions, contains letters and despatches of great value. The autobiography is not always trustworthy, and must be read with caution. Gentz's correspondence is of

first-rate importance for the years 1813-30. Original papers are also contained in various German works upon particular events or movements, as lM Oncken for the negotiations of 1813 ; Welcker, Aegidi, Nauwerck

for German affairs in 1819 and following years ; Prokesch von Osten for Eastern affairs. (C. A. ae

METZ, the capital of German Lorraine, and one of the strongest fortresses in Europe, is situated at the confluence of the Moselle and the Seille, 80 miles to the north-west of Strasburg, and 190 miles to the east of Paris. It is the seat of a military governor, the judicial and administra tive authorities of Lorraine, a Roman Catholic bishop,

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Protestant and Jewish consistories, and a chamber of com- merce. The general appearance of the town is quaint and irregular, but there are also many handsome modern streets. The Moselle flows through it in several arms, crossed by fourteen or fifteen bridges. In the south-west corner of the town is the esplanade, an extensive open space com- manding a fine view of the fertile “Pays Messin” around Metz. ‘The most interesting of the ten city gates is the Porte d’Allemagne or Deutsches Thor, a castellated structure erected in 1445, and still bearing traces of the siege of Charles V. Metz contains seven Roman Catholic churches,

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two Protestant churches, and a synagogue. The cathedral, with huge pointed windows, slender columns, and numerous flying buttresses, was begun in the 13th century, and finished in 1546, and belongs to the decadence of the Gothic style. The Gothic churches of St Vincent and St Eucharius, and the handsome garrison-church, completed in 1881, also deserve mention.

Among secular buildings the most important are the large covered market, the town-hall, the palace of justice, the theatre, the governor's house, and the various buildings for military purposes. The public library contains 35,000 volumes, including an

Metz and Neighbourhood.

1. Palace of Justice. 2. Prefecture.

extensive collection of works relating to the history of Lorraine. In the same building is the museum, which contains a picture gallery, a numismatic cabinet, and a collection of specimens of natural history. Metz also possesses several learned societies and charitable institu- tions, a gymnasium, three seminaries, and a military academy. The cemetery of Chambitre contains the graves of 8400 French soldiers who died here in 1870.

The commerce and industry of Metz have not yet entirely recovered from the blow inflicted by the with- drawal of French capital in 1871. The principal articles of manufacture are leather, coarse cloth and canvas, gun-

3. Cathedral.

4. Town-Hall and Governor's House.

powder, arms, needles, billiard tables, hats, and artificial flowers. There are several large iron-works in the neigh- bourhood. The trade of Metz is chiefly carried on in leather, timber, wine, brandy, liqueurs, beer, preserved fruits, and hardwares. A large annual fair is held here. The civil population of Metz, which in 1869 amounted to 48,066, sank in 1872 to 33,134. Since then it has steadily increased, and in 1881 was 43,275, about half of whom were Germans. The garrison of Metz consists of 10,000 men, or including the surrounding forts nearly 16,000. The total of 58,813 includes 17,000 Pro-

| testants and 1600 Jews.

History.—Metz, the Gallic Divodurum, was the chief town of the Mediomatrici, and was also called by the Romans Mediomatrica, a name from which the present form has been derived by contraction. Cesar describes it as one of the oldest and most important towns in Gaul. The Romans, recognizing its strategieal importance, fortified it and supplied it with water by an imposing aqueduct, the remains of which still exist. Under the Roman emperors Metz was connected by military roads with Toul, Langres, Lyons, Stras- burg, Verdun, Rheims, and Treves. Christianity was introduced in the 3d century of our era. In the middle of the 5th century the town was phindered by the Huns under Attila ; subsequently it eame into the possession of the Franks ; and in 512 it was made the capital of Austrasia. On the partition of the Carolingian realms in 843 Metz fell to the share of the western kingdom as the eapital of Lorraine. Its bishops, whose creation reaches back to the 4th century, now began to be very powerful. Metz acquired the privileges of a free imperial town in the 12th century, and attained great commercial prosperity. In 1552 it fell into the hands of the French through treachery, and was heroically and successfully defended against Charles V. by the young duke of Guise. It now sank to the level of a French provincial town, and its population dwindled from 60,000 to 22,000 (1698). At the peace of Westphalia Metz, with Toul and Verdun, was formally ceded to France, in whose possession it remained for upwards of two centuries. In August 1870 the successes of the German troops compelled Marshal Bazaine and the French army of the Rhine to seck shelter behind the fortifications of Metz, which was forth- with subjected by the Germans to a rigorous blockade. After an investment of ten weeks, during which not a single shot was fired at the town, Bazaine capitulated, surrendering to the victors an army of nearly 180,000 men, several hundred cannon, and an iminense quantity of military stores of all kinds. By the peace of Frankfort in 1871 Metz was again united to the German empire. Marshal Fabert and Generals Custine and Kellermann were natives of Metz.

As a fortress Metz has always been of the highest importance, and it now ranks with Strasburg as one of the two great bulwarks of the west frontier of Germany. The original town-walls were replaced by ramparts in 1550, and the citadel was built in 1566. In 1674 the works were reconstructed by the celebrated military engineer Vauban. Under Napoleon I11. the fortress was strength- ened to meet the demands of modern warfare, and since 1871 the

Germans have spared neither time nor money in completing and supplementing his plans. The present fortifications of Metz con- sist of two lines—an inner circle of bastions and ramparts enclosing the city itself, and an outer circle of large detached forts on the surrounding hills. The inner line is strengthened by two citadels, one of which is advanced as a téte-de-pont on the lett bank of the Moselle. The outer circle consists of nine or ten large forts, con- nected with each other by smaller fortifications and commanding all the approaches to the city. They form a large fortified camp with a circumference of 15 miles, within which are twelve villages and numerous country-houses and farms. The most distant of the outlying forts is about 34 miles from the cathedral. Their names and positions may be seen on the annexed plan. Previous

to 1870 the fortress of Metz had never succumbed to an enemy.

Sources of Information.—Westphal, Geschichte der Stadt Metz, 1875-78 ,; Georg Lang, Metz und seine Umgebungen, 1888, and Statistisch-topographisches Hand- buch fiir Lothringen. The official German account of the blockade, of Metz'in 1870 will be found in the history of the Franco-German war issued by the general staff at Berlin, 1872 sg. A succinct account is given by Gcorg Lang, Die Kriegs- operattonen um Metz im Jahr 1870, 2d ed., Mctz, 1880.

MEULEN, Antony FRANCIS VAN DER (1634-1690), was called to Paris about 1666 by Colbert, at the instance of Le Brun, to fill the post of battle painter to Louis XIV. Born in 1634 at Brussels, he had at an early age eclipsed his master Peter Snayers, and the works executed by him for the king of France during the campaigns of Flanders (1667) so delighted Louis that from that date Van der Meulen was ordered to accompany him in all his expedi- tions. In 1673 he was received into the French Academy, and attained the grade of councillor in 1681. Lodged in the Gobelins, richly pensioned, and loaded with honours, he died at Paris in 1690. Detached works from his hand are to be seen in various collections, but he is best repre- sented by the series of twenty-three paintings, mostly executed for Louis XIV., now in the Louvre. They show that he always retained his Flemish predilections in point of colour, although in other respects his style was modified by that of the French school.

See Mém. inédit. Acad. de Peintwre, 1854 ; Descamps, Vies des Peintres Flamands.

MEURTHE-ET-MOSELLE, a department in the north- east of France, formed in 1871 out of those parts of the

old departments of Meurthe and Moselle which continued French, and deriving its name from the two principal rivers: which water it. Prior to 1790 it belonged to ancient Lorraine, or to one or other of the bishoprics of Toul, Metz, and Verdun. It lies between 5° 25’ and 7° 5’ E. tong, and 48° 25’ and 49° 5’ N. lat., and is bounded on the E. by Alsace-Lorraine, on the N. by Belgium and the grand- duchy of Luxemburg, on the W. by the department of Meuse, and on the S. by that of Vosges. The superficial area is 2020 square miles. Geologically Meurtheet Moselle has five well-marked regions following each other in regular succession from east to north-west. On the frontier of Alsace are the Vosges mountains, of Trias sandstone (grés Vosgiens), with a maximum elevation of 3000 feet. A narrow band of variegated sandstone divides the Vosges from the second region, formed of shelly limestone, which extends as far as the Meurthe on the north and the Moselle on the west. The third region is formed by the variegated marls which cover the rich saline strata of the neighbour- hood of Nancy. The Jura limestones of the Lias and Oolite, to the north-west and west of the department, form the last two regions. Here there is a maximum elevation of 1400 feet, and the plateau of Briey stretches out towards that of the Ardennes. Between the Vosges and the Ardennes the valley of the Moselle runs from south to north, forming the main artery of the department; the lowest level (570 feet) occurs where the river leaves it.

Only a small part of the drainage of Meurthe-et-Moselle

flows into the Meuse. The Moselle runs north-west from its entrance into the department as far as Toul ; north-east

from Toul to Frouard, where it receives its principal affluent, the Meurthe, and becomes navigable ; north from

Frouard to Pagny-sur-Moselle, passing to Pont & Mousson, The principal affluents of the Moselle are the Madon and the Orne on the left, and on the right, besides the Meurthe, the Seille, which in one part of its course forms the boundary of Alsace-Lorraine. The Meurthe, which flows to the north-west from Raon l'Etape to Frouard, passes on to Baccarat, Lunéville, St Nicholas, and Nancy, and is swelled on the right by the Vezouse and the Sanon, and on the left by the Mortagne. The principal tributary of the Meuse within the department is the Chiers, which takes its course by Longwy and Longuyon. Climatologically Meurthe-et-Moselle belongs to the Vosgian region. Its mean annual temperature is 52° Fahr., being 2° Fahr lower than that of Paris (which has the same latitude). The thermometer in severe winters falls to 13° Fahr., while in summer it reaches 100° Fahr. This is to be accounted for by the general elevation of the department, the proximity of the mountains, the arrangement of the valleys (which lie open towards the north), and the distance from the sea.

More than half of the department consists of culturable land, one- fourth of forests, and one-tenth of meadow land. In 1878 there were 54,346 horses, more than 100,000 sheep, 85,000 pigs, 74,000 cattle, 15,000 goats, 21,000 dogs, and 17,000 hives of bees. The crops for the same year amounted to 454,192 quarters of wheat, 37,500 quarters of barley, 35,078 quarters of rye, 570, 884 quarters of oats, 9,079,125 bushels of potatoes, and 76,868 tons of beet-root. Hops, tobacco, colza, hemp, and flax also occupy a considerable area. The annual yield of the vineyards (56 square miles in extent) exceeds £900,000; the wines of Toul are the best. The most common fruit trees are the pear, the apple, the walnut, the elierry, and the plum. Of forest trees the oak and the wych-elm are most frequent in the west of the department, the beech and the fir in the Vosges. The Freneh school of forestry has its seat at Nancy. The metallurgic industry is highly developed, and has made vely rapid progress within the last few years. Even in 1872 there was a consumption of 350,000 tons of coal, four-fifths of which came from Saarbruck, and the remaining fifth from Belgium. 1” 1877 the iron ore obtained amounted to 1,000,000 tons, of which two-thirds came from the beds near Nancy, the remainder from the neighbourhood of Longwy. In 1880 the department produced a third of the pig-iron made in France (inore than 500,000 tons).

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In 1877 the yield was 43,000 tons. Besides blast-furnaces, forges, and rolling-mills, there are manufactories of files and boring tools, agricultural implements, and furniture. In the production of salt the department holds the first rank in France; the salt-bearing traets cover more than 150 square miles, the beds having a mean thicknessof 65 feet. The principal salt-working eentres (St Nicolas, Varangeville, and Rosiéres-aux-Salines) lie between Nancy and Lunéville ; the annual value of rock-salt and refined salt produced exceeds £500,000; subsidiary to this production is an important manufacture of soda salts. The other chemical products are prussiate of potash, bone-black, wax-candles, soap, and matches. Stone quarrying and the manufacture of plaster and linte are also important branches of industry. The fiint-glass manufactory of Baccarat, which employs nearly 1500 workmen, is well known; that of plate-glass at Cirey (with 1000 workmen) produces plates of great size. The faience

manufactories of Lunéville, Toul, and Longwy are important. Mention may also be made of the manufacture of window-glass, watch-glasses, and drinking-glasses, The tobaeco manufacture at Nancy employs 1000 workmen; tan- ning, glove-making, hat-making in felt and straw, wool-spinning, and the manufacture of army clothing are also carried on. Naney is renowned for its embroidery, which is, however, diminishing in importance. It also possesses factories for cotton spinning and cotton stuffs, and for hosiery. The starch manufactories and the breweries, especially that of Tantonville, the largest in France, are highly productive. Nancy also carries on distilleries, grain- mills, paper-mills, manufactories of pasteboard objects, and a large printing establishment. The commerce of the department is effee- tively served by 300 miles of railway (the principal line being that from Paris to Strasburg through Nancy), by a number of good roads, and by several navigable rivers and canals. The main waterway is formed by the canal between the Marne and the Rhine, which runs by Toul and Nancy, and traverses the department from west toeast. This canal communicates with the Moselle, which is navig- able from Frouard downwards, and with the new eastern canal, which reascends the Moselle as far as Epinal, and which is intended to unite the Meuse and the Moselle with the Saéne and the Rhone. The population of Meurthe-et-Moselle in 1881 was 419,317 in- habitants. It constitutes the diocese of Nancy, has its eourt of appeal at Nancy, and forms a part of the district of the 6th army corps (Chalons-sur-Marne). There are 4 arrondissements (Nancy, Bricy, Lunéville, and Toul), 29 cantons, and 597 communes. The eapital is Nancy, and the other principal towns are Pont & Mousson, formerly the seat of a university ; Longwy (5064), a fortified place ; and Baccarat (6013), celebrated for its glass-works.

MEUSE, Maezsz, or Maas, a river of France, Belgium, and Holland, discharging into the North Sea or German Ocean, has a course (variously measured) of some 500 or 00 miles, about 300 miles lying within France. Rising in the department of Haute-Marne (1342 feet), at a point where the plateau of Langres borders on the Monts Faucilles, it follows a winding course, first from south to north, then to north-west, and afterwards to north, across the depart- ments of Vosges, Meuse, and Ardennes, passing by Neufchateau, Vaucouleurs, Commercy, St Mihiel, Verdun, Sedan, Méziéres, and Givet. Naturally navigable below Verdun, it has been made so from

Troussey, where it meets the canal which unites the Marne to the Rhine, and from this point to Liége it admits vessels of from 6 to 7 feet draught. After traversing a wide valley covered by green meadows, the Meuse, below Méziéres, flows through narrow gorges confined between rocky walls 200 or 300 feet high, formed by the plateau of the Ardennes. The hills of the Argonne, by which it is hemmed in on its upper course, prevent its receiving any important affluent before the Chiers and the Semoy, which both fall into it on the right in the Ardennes. At the point where it leaves France its ordinary volume is about 1000 cubic feet. In Belgium it runs picturesquely between the districts of Famenne and Condroz on the right, and those of Les Fagnes and Hesbaye on the left. Above Dinant it receives the Lesse, whose valley is celebrated for its wonderful grottoes, and at the foot of the citadel of Namur it is joined on the left by its principal affiuent, the Sambre, whose north-easterly direction it takes. It then takes its course through the busy valley in which Huy, Seraing, and Liége are situated, receiving the Ourthe on its right. Resuming a northerly direction, then taking one to the north-west, and finally one to the

west, the Meuse passes in front of the Dutch citadel of Maestricht to Roermonde, so called from its confluence there with the Roer, and to Venlo, where the canal between the Meuse and the Scheldt begins. Flowing thence through an absolutely unbroken plain, it finally joins the Rhine, to which it gives its own name, although the volume of its waters is twenty times less than that of the German river. It is at Gorcum that the Waal, the first separate arm of the Rhine, brings to the Meuse two-thirds of the waters of that river. The Meuse soon after divides into two

-branches. While the Merwede flows due west, the southern

arm falls into the Biesbosch, an estuary of the sea, formed four hundred and fifty years ago by an irruption of the sea over a country then cultivated and thickly peopled, and now the subject of attempts at reclamation. On reaching Dordrecht, where the river navigation and sea navigation meet, and where the rafts which come down from the Black Forest are broken up, the Meuse again divides into two arms. The Old Meuse flows due west, while the northern arm joins the Lek, a second branch of the Rhine, and

continues its course to Rotterdam. This is the most important branch of the estuary of the Meuse, and efforts are being made to regulate and deepen its channel by con- structing one of those grand canals in which the Dutch are so skilful. Schiedam and Vlardingen, both on the right, are the last places of importance on the banks of the river.

MEUSE, a department in the north-east of France, formed out of a part of Lorraine and portions of the Three Bishoprics, the Clermontais, and Champagne, derives its name from the river by which it is traversed from south to north. It lies between 4° 52’ and 5° 50’ E. long., and between 48° 25’ and 49° 38’ N. lat., and is bounded on the N. by Belgium and the department of Ardennes, on the E. by that of Meurthe-et-Moselle, on the S. by those of Vosges and Haute-Marne, and on the W. by those of Marne and Ardennes. Of its superficial area (2405 square miles), about one-half belongs to the basin of the Meuse, which is enclosed to the east and west by the eastern and western Argonnes. On the north-east it is watered by the Orne, a tributary of the Moselle, and the Chiers, which runs by Montmédy, and joins the Meuse a little beyond the northern limit of the department. The other half sends its waters to the Seine through the Aire, a tributary of the Aisne, both of which take their rise here, and by the Ornain, an affluent of the Saux, these two last being tributary to the Marne. The Meuse receives no important river in its course through this department. The highest elevation (1388 feet) occurs to the south-west, on the line of the ridge which separates the basin of the Meuse from that of the Seine. The heights gradually sink from south to north, but seldom fall below 1000 feet. The hills of the western Argonne similarly sink rapidly down to the valley of the Saux, where the lowest level of the department (377 feet) is reached. The climate of Meuse is transitional between the region of the Seine and that of the Vosges ; its winters are less severe than those of the latter, but it is not so temperate as the former. The mean annual temperature is 52° Fahr. As at Paris, the maximum cold is 9° Fahr.; the greatest heat rarely exceeds 95° Fahr.

More than half the surface of the department consists of cultur- able lands, one-fourth of forest, one-tenth of meadow land. The proportion of horses is larger than in any other French depart- ment, exeept La Manche. There are 53,800 horses, 90,000 -cattle, 145,000 sheep, 125,000 pigs, and nearly

30,000 bechives. Cereals, potatoes, and beet-root are the chief crops (in 1877 465,966 quarters of wheat, 104,660 quarters of barley, 585,355 quarters of oats, 7,677,374 bushels of potatoes, besides pulse, hemp, and colza). The vineyards produced more than 6,600,000 gallons of wine of good quality. The forests, whieh are principally of oak, are rieh in game, as are the rivers in fish. The mineral wealth of the depart-

ment includes iron ore, good freestone, and fossil phosphates of lime. There are blast-furnaces, iron, copper, and bell foundries, wire- works, and manufactories of files, hardware, and edge tools. The cotton-spinning factorics employ 15,000 spindles and 32,000 frames ; the woollen manufacture employs 5000 spindles, and some hundreds of persons are employed in the spinning and weaving of hemp, flax, and jute. The glass-works (particularly the manufactory of painted window-glass, transferred after the war of 1870 from Metz to Bar- le-Duc), paper-mills, saw-mills, and flour-mills, as well as the manufactures of lime, tiles, and fire-bricks, are worthy of mention. Hosiery and embroidery also give occupation to a great number of workshops, and the department is celebrated for its confectionery. Meuse contains more than 300 miles of railway,—the principal lines being that from Paris to Strasburg through Bar-le-Duc and Com-

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I. ANCIENT MEXICO.

HE name Mexico is connected with the name of the group of American tribes calling themselves Mexica

(sing. Memicatl), or Azteca. The word is related to or derived from the name of the Mexican national war-god Mexitl, better known as Huitzilopochtli. The Aztecs from the 12th century appear to have migrated from place to place over the mountain-walled plateau of Anahuac, the country “ by the water,” so called from its salt lagoons, and which is now known as the valley of Mexico. About 1325 they founded on the lake of Tezcuco the permanent settle- ment of Mexico Tenochtitlan, which is still represented by the capital city Mexico. The name Mexico was given by the Spanish conquerors to the group of countries over which the Aztec power more or less prevailed at the time of the European invasion. Clavigero (Storia Antica del Messico, vol. i.) gives a map of the so-called “Mexican empire,” which may be roughly described as reaching from the present Zacatecas to beyond Guatemala; it is notice- able that both these names are of Mexican origin, derived respectively from words for “straw” and “wood.” Eventu- ally Mexico and New Mexico came to designate the still

vaster region of Spanish North America, which (till cut down by changes which have limited the modern republic of Mexico) reached as far as the Isthmus of Panama on the south and took in California and Texas on the north. Mexico in this wide sense is of high interest to the anthropologist, from the several native American civiliza- tions which appear within its limits, and which con-

veniently if loosely group themselves round two centres,

the Mexican proper and the Central American.

When early in the 16th century the Spaniards found their way from the West India Islands to this part of the mainland of America, they came in view of nations cultured high above the level they had hitherto met with in the New World. Here were not rude and simple tribes like the islanders of the Antilles, but nations with organized armies, official administrators, courts of justice, high agriculture and mechanical arts, and, what struck the white men especially, stone buildings whose architecture and sculpture were often of dimensions and elaborateness to astonish the builders and sculptors of Europe. How a population of millions could inhabit a world whose very existence had been till then unknown to geographers and historians, and how its nations could have reached so high a grade of barbaric industry and grandeur, was a problem which naturally excited the liveliest curiosity of scholars, and gave rise to a whole literature. Hernandez and Acosta shared the opinion of their time that the great fossil bones found in Mexico were remains of giants, and it was argued that, as before the deluge there were giants on the earth, there- fore Mexico was peopled from the Old World in ante- diluvian times. On the other hand the multitude of native American languages suggested that the migration to America took place after the building of the tower of

mercy, that from Paris to Mctz through Verdun, and the branch line to the Meuse. The chief waterways are the canal connecting the Marne with the Rhine, and the canal of the Meuse; the two together have a length of 146 miles. The population of the depart- ment in 1881 was 289,861,—a small number in proportion to its extent, and with a tendency to decrease.

LEcclesiastically it forms the diocese of Verdun ; it has its court of appeal at Nancy, and constitutes part of the district of the army corps of Chalons- sur-Marne. There are 4 arrondissements, —Bar-le-Duc, Commerey, Montmédy, and Verdun,—28 cantons, and 586 communes. Bar- le-Duc (population in 1881, 17,485) is the capital; Commercy has 5260 inhabitants and Montmédy 3000; St Mihiel (5915), on the Meuse, has good churches and some remarkable rocks, and is the seat of the departmental assize court.

| Babel, and Siguenza arrived at the curiously definite result that the Mexicans were descended from Naphtuhim, son of Mizraim and grandson of Noah, who left Egypt for Mexico shortly after the confusion of tongues. Although such speculations have fallen out of date, it is to be remembered in their favour that they were stepping-stones to more valid argument ; especially they induced the collection of native traditions and invaluable records of races, languages, and customs, which otherwise would have been lost for ever. Even in the present century Lord Kingsborough was led to spend a fortune in printing a magnificent compilation of Mexican picture-writings and documents in his Antiquities of Mexico by his zeal to prove the theory advocated by | Garcia a century earlier, that the Mexicans were the lost tribes of Israel.

Real information as to the nations of Mexico before Spanish times is very imperfect, but not altogether want- ing. Itis derived partly from inspection of the natives themselves, their. languages and customs, which may be now briefly considered, before going on to the recollections _ handed down in the native picture-writings and oral tradi- tions. The remarks made by the accurate and experienced observer Alexander von Humboldt, who had seen more American tribes than almost any traveller, are still entitled to the greatest weight. He considered the native Americans of both continents to be substantially similar in race-characters. Such a generalization will become sounder if, as is now generally done by anthropolo- gists, the Eskimo with their pyramidal skulls, dull complexion, and flat noses are removed into a division by themselves. Apart from these polar nomads, the American indigenes group roughly into a single race or division of mankind, of course with local variations. If our attention is turned to the natives of Mexico especi- ally, the unity of type will be found particularly close. The native population of the plateau of Mexico, mainly Aztecs, may

still be seen by thousands without any trace of mixture of European blood ; and the following description may give a fair idea of their appearance. Their stature 1s somewhat low, estimated about 5 feet 3 inches, but they are of muscular and sturdy build. Measurements of their skulls show them mesocephalic (index about 78), or inter- mediate between the dolichocephalic and brachycephalic (narrow and wide skulled) types of mankind. The face 1s oval, with low forehead, high cheek-bones, long eyes sloping outward towards the temples, fleshy lips, nose wide and in some cases flattish but in others aquiline, coarsely moulded features, with a somewhat stolid and gloomy expression. Thickness of skin, masking the muscles, has been thought the cause of a peculiar heaviness in the out- lines of body and face ; the complexion varies from yellow- brown to chocolate (about 40 to 43 in the anthropological

1 References may be found in Bancroft, Native Races of the Pacific States, vol. i. pp. 24, 573, 618, 646.

scale); eyes black; straight coarse glossy black hair ; beard and moustache scanty. Among variations from this type may be mentioned higher stature in some districts, and lighter complexion in Tehuantepec and elsewhere. If now the native Americans be compared with the races of the regions across the oceans to their east and west, it will be seen that their unlikeness is extreme to the races east- ward of them, whether white Europeans or black Africans. On the other hand they are considerably like the Mongoloid peoples of North and East Asia (less so to the Polynesians) ; so that the tendency among anthropologists is now generally to admit a common origin, however remote, between the tribes of Tartary and of America. This original connexion, if it may be accepted, would seem to belong to a long-past period, to judge from the failure of all attempts to discover an affinity between the languages of America and Asia. At whatever date the Americans began to people America, they must have had time to import or develop the numerous families of languages actually found there, in none of which has community of origin been satisfactorily proved with any other language-group, at home or abroad. In Mexico itself the languages of the Nahua nations, of which the Aztec is the best-known dialect, show no

connexion of origin with the language of the Otomi tribes, nor either of these with the languages of the regions of the ruined cities of Central America, the Quiché of Guatemala and the Maya of Yucatan. Indeed, within the Mexican limits, there are various other languages which, so far as philological research can at present decide, are independent of one another. The remarkable phenomenon of nations so similar in bodily make but so distinct in language can hardly be met except by supposing a long period to have elapsed since the country was first inhabited by the ancestors of peoples whose language has since passed into so different forms. The original peopling of America may well date from the time when there was continuous land between it and Asia.

It would not follow, however, that between these remote ages and the time of the discovery of the New World by Columbus no fresh immigrants can have reached America.

We may put out of the question the Scandinavian sea- |

rovers who sailed to Greenland about the 10th century, and appear afterwards to have coasted New England (see America, vol. i. p. 706), but do not seem to have found their way far enough southward for their visit to have any effect on Mexico. Butat all times communication has been open from East Asia and even the South Sea islands to the west coast of America. The importance of this is evident when we consider that Japanese junks now drift over by the ocean current to California at the rate of about one a year, often with some of the crew still alive (see C. W. Brooks in Bancroft, vol. v. p. 51; Overland Monthly, San Francisco, 1872, p. 353), Further north, the Aleutian islands offer a line of easy sea passage, while in north-east Asia, near Behring's Strait, live Chukchi tribes who carry on inter-course with the American side; the presence of Eskimo in this partof Asia (see Nordenskidld, Voy. of Vega,vol. ii. pp. 13, 81) is so plainly due to local migration that it is neglected in comparing the languages of the two continents. Asiatics such as Japanese or Kurile Islanders, if they found their way in small numbers to America and merged into native tribes, might hardly leave descendants distinguishable from the rest of the population even in the first genera- tion, nor introduce their own language. Such assertions as that the Guatusos of Costa Rica are a tribe with fair skin and

flaxen hair, and that Japanese words may be detected among the Indians of British Columbia, are examples of evidence which may be worth further sifting; but in an account like the present no proofs can be admitted unless far better authenticated than these.

| gestive of importation from Asia.

interest to the question of Asiatic influence in America, is that, though neither the evidence of features nor of language has substantiated it, there are details of Mexican civilization which are most easily accounted for on the supposition that they were borrowed from Asia. They do not seem ancient enough to have to do with a remote Asiatic origin of the nations of America, but rather to be results of comparatively modern intercourse between Asia and America, probably since the Christian era. Humboldt (Vues des Cordilléres, pl. xxiii.) compared the Mexican calendar with that in use in eastern Asia. The Mongols, Tibetans, Chinese, and other neighbouring nations have a cycle or series of twelve animals, viz., rat, bull, tiger, hare, dragon, serpent, horse, goat, ape, cock, dog, pig, which may possibly be an imita- tion of the ordinary Babylonian-Greek zodiac familiar to ourselves. The Mongolian peoples not only count their lunar months by these signs, but they reckon the successive days by them, rat-day, bull-day, tiger-day, &c., and also, by combining the twelve signs in rotation with the ele- ments, they obtain a means of marking each year in the sixty-year cycle, as the wood-rat year, the fire-tiger year, &c. This method is highly artificial, consisting, not in mere numbering, but in combining series of different terms so that the same combination does not recur till the end of the period. Thus the reappearance of its principle in the Mexican and Central-American calendar (see p, 212) is sug- Humboldt also discussed the Mexican doctrine, represented in the native pictures, of four ages of the world belonging to water, earth, air, and fire, and ending respectively by deluge, earthquake, tempest, and conflagration. The resemblance of this to some versions of the Hindu doctrine of the four ages or yuga is of so remarkable a closeness as hardly to be accounted for except on the hypothesis that the Mexican theology con- tains ideas learnt from Asiatics. Among Asiatic points of resemblance to which attention has since been

called is the Mexican belief in the nine stages of heaven and hell, an idea which nothing in nature would suggest directly to a barbaric people, but which corresponds to the idea of successive heavens and hells among Brahmans and Buddhists, who apparently learnt it (in common with our own ancestors) from the Babylonian-Greek astronomical theory of successive stages or concentric planetary spheres belonging to the planets, &c. The Spanish chronicles also give accounts of a Mexican game called patolli, played at the time of the conquest with coloured stones moved on the squares of a cross-shaped figure, according to the throws of beans marked on one side; the descriptions of this rather complicated game correspond closely with the Hindu backgammon called pachist (see Tylor in Jour. Anthrop. Inst., vol. viii. p. 116).

The native history of Mexico and Central America is entitled to more respect than the mere recollections of savage tribes, inasmuch as here memory was aided by something like written record. The Mexican pictures so far approached writing proper as to set down legibly the names of persons and places and the dates of events, while the rude drawings which accompanied these at least helped the professional historians to remember the tradi- tions repeated orally from generation to generation. Thus actual documents of native Aztec history, or copies of

1 The appendix to Prescott's Conquest af Mexico contains an interesting summary of analogies between the civilization of Mexico and that of the Old World, but some of the arguments are very incon- clusive. One which has been often cited turns on the likeness alleged by Naxera between the Chinese language and that of the Otomi nation of Mexico (whose name survives in that of their town Otompan, now Otumba). The examination of an Otomi grammar (such as Lléments de la Grammaire Othomi, Paris, 1863) will, however, convince the philological reader that the resemblance is hardly of an amount to

What gives a more solid | found a theory of a Chinese connexion upon.

them, are still open to the study of scholars, while after the conquest interpretations of these were drawn up in writing by Spanish-educated

Mexicans, and histories founded on them with the aid of traditional memory were written by Ixtlilxochitl and Tezozomoc; the most important of these picture-writings, interpretations, and histories may be found in Kingsborough's Antiquities of Mexico. In Central America the rows of complex hieroglyphs to be seen sculptured on the ruined temples probably served a similar purpose up to the time of the Spanish invasion. The documents purporting to be histories, written down by natives in later times, thus more or less represent real records of the past, but the task of separating the preponder- ant mythical part from what is real history is of the utmost difficulty. Among the most curious documents of early America is the Popol-Vuh or national book of the Quiché kingdom of Guatemala, a compilation of traditions written down by native scribes, found and translated by Father Ximenez about 1700, and published by Scherzer (Vienna, 1857) and Brasseur de Bourbourg (Paris, 1861). This book, composed in a picturesque barbaric style, begins with the time when there was only the heaven with its boundaries towards the four winds, but as yet there was no body, nothing that clung to anything else, nothing that balanced itself or rubbed together or made a sound ; there

was nought below but the calm sea alone in the silent | Alone were the Creator, the Former, the Ruler, |

darkness. the Feathered Serpent, they who give being and whose name is Gucumatz. Then follows the creation, when the creators said "Earth," and the earth was formed like a cloud or a fog, and the mountains appeared like lobsters from the water, cypress and pine covered the hills and valleys, and their forests were peopled with beasts and birds, but these could not speak the name of their creators, but could only chatter and croak. So man was made first of clay, but he was strengthless and senseless and melted in the water; then they made a race of wooden mannikins, but these were useless creatures without heart or mind, and they were destroyed by a great flood, and pitch poured down on them from heaven, those who were left of them being turned into the apes still to be seen in the woods. After this comes the creation of the four men and their wives who

are the ancestors of the Quichés, and the tradition records |

the migrations of the nation to Tulan, otherwise called the Seven Caves, and thence across the sea, whose waters were divided for their passage. It is worth while to mention these few early incidents of the national legend of Guatemala, because their Biblical incidents show how native tradition incorporated matter learnt from the white men. Moreover, this Central-American document, mythical as it is, has an historical importance from its bringing in names belonging also to the traditions of Mexico proper.

Thus Gucumatz, “ Feathered Serpent,” corresponds in name |

to the Mexican deity Quetzalcoatl ; Tulan and the Seven Caves are familiar words in the Aztec migration-traditions, and there is even mention of a chief of Toltecat, a name plainly referring to the famed Toltecs, of whom further account will be given in their place in Mexican history. Thus the legends of the Popol-Vuh confirm what is learnt from comparing the culture of Central America and Mexico proper, that, though the nations of these districts were not connected by language, the intercourse and mixture between them had been sufficient to implant in them much common civilization, and to justify the anthropologist in including both districts in one region. Historical value of the ordinary kind may be found in the latter part of the Popol-Vuh, which gives names of chiefs down to the time when they began to bear Spanish names, and the great city of Quiché became the deserted ruin of Santa Cruz. The Maya district of Yucatan has also some vestiges of native

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‘ traditions in the manuscript translated by D. Pio Perez (in Stephens, Incidents of Travel in Yucatan) and in the remarkable 16th century Lelacion de las Cosas de Yucatan by Diego de Landa, published by Brasseur de Bourbourg (Paris, 1864). As in the Guatemala traditions, we hear of ancient migration from the Mexican legendary region of Tula; and here the leaders are four famous chiefs or ancestors who bear the Aztec name of the Tutul-Xiu, which interpreted means “Bird-Tree.” Unfortunately for the historical standing of these four ancestors, there are in the Aztec picture-writings representations of four trees each with a bird perched on it, and placed facing the four quarters, which make it probable that the four Tutul-Xiu of tradition, in spite of the circumstantial detail of their wars and migrations,

may be only mythic personifications of the four cardinal points (see Schultz-Sellack in Zeitsch. f. Ethn,, 1879, p. 209). Nevertheless, part of the later Maya records may be genuine,—for instance, when they relate the war about three centuries before the Spanish conquest, when the king of Chichen-Itza destroyed the great city of Mayapan. Though the names and dates of Central-American native kings have too little interest to general readers for traditions of them to be dwelt on here, they bring into view one im- portant historical point, that the wondrous ruined cities of this region are not to be thought monuments of a perished race in a forgotten past, but that at least some of them belong to history, having been inhabited up to the conquest, apparently by the very nations who built them.

Turning now to the native chronicles of the Mexican nations, these are found to be substantial dated records going back to the 12th or 13th century, with some vague but not worthless recollections of national events from times some centuries earlier. These last-mentioned traditions, in some measure borne out by linguistic evidence of names of places, tribes, and persons, point to the immigration of detachments or branches of a widespread race speaking a common language, which is represented to us by the Aztec, still a spoken language in Mexico. This language was called nahuatl, and one who spoke it as his native tongue was called nahuatlacatl, so that modern anthro- _ pologists are following native precedent when they use the term Nahwa for the whole series of peoples now under consideration.!_ Earliest of the Nahua nations, the Toltecs are traditionally related to have left their northern home of Huehuetlapallan in the 6th century ; and, though this remote date cannot be treated as belonging to genuine history, there is other evidence of the real existence of the nation. Their name ‘oltecatl signifies an inhabitant of Tollan, “land of reeds,” a place which, as has been already pointed out, appears elsewhere in the national traditions of this region, and has a definite geographical site in the _ present Tulan or Tula, north of the valley of Anahuac, where a Toltec kingdom of some extent seems to have had its centre. To this nation is ascribed not only the oldest but the highest culture of the Nahua nations; to them was due the introduction of maize and cotton into Mexico, the skilful workmanship in gold and silver, the art of build: ing on a scale of vastness still witnessed to by the mound of Cholula, said to be Toltec work ; the Mexican hieroglyphic writing and calendar are also declared to have been

of Toltec origin. With the Toltecs is associated the mysterious tradition of Quetzalcoatl, a name which presents itself in Mexican religion as that of a great deity, god of the aur, and in legend as that of a saintly ruler and civilizer. His brown and beardless worshippers describe him as of another race, a white man with noble features, long black hair and full beard, dressed in flowing robes. He came from Tullan

1 Tt should be noticed that this word is not etymologically con-

nected with the somewhat similar word Anahuac, of whieh the mean- ing is given at page 206,

or from Yucatan (for the stories differ widely), and dwelt twenty years among them, teaching men to follow his austere and virtuous life, to hate all violence and war, to sacrifice no men or beasts on the altars, but to give mild offerings of bread and flowers and perfumes, and to do penance by the votaries drawing blood with thorns from their own bodies. Legend tells stories of his teaching men picture-writing and the calendar, and.also the artistic work of the silversmith, for which Cholula was long famed ; but at last he departed, some say towards the unknown land of Tlapallan, but others to Coatzacualco on the Atlantic coast on the confines of Central America, where native tradition still keeps up the divine names of Gucumatz among the Quichés (see p. 208) and Cukulcan among the Mayas, these names having the same meaning as Quetzalcoatl in Aztec, viz., “Feathered Serpent.” Native tradition held that when Quetzalcoatl reached the Atlantic he sent back his companions to tell the Cholulans that in a future age his brethren, white men and bearded like himself, should land there from the sea where the sun rises, and come to rule

the country. That there is a basis of reality in the Toltec |

traditions is shown by the word toltecatl having become among the later Aztecs a substantive signifying an artist or skilled craftsman. It is further related by the Mexican historians that the Toltec nation all but perished in the 11th century by years of drought, famine, and pestilence, a few only of the survivors remaining in the land, while the rest migrated into Yucatan

and Guatemala, where, as has been already pointed out, their name is commemorated in local records. After the Tolfecs came the Chichimecs, whose name, derived from chichi, “dog,” is applied to many rude tribes; the Chichimecs here in question are said to have come from Amaquemecan under a king named Xolotl, names which being Aztec imply that the nation was Nahua; at any rate they appear afterwards as fusing with more cultured Nahua nations in the neighbourhood of Tezcuco. Lastly is recorded the Mexican immigration of the seven nations, Xochimilca, Chalca, Tepaneca, Acolhua, Tlahuica, Tlascalteca, Azteca. This classification of the Nahuatlac tribes has a meaning and value. It is true that Aztlan, the land whence the Aztecs traced their name and source, cannot be identified by geographers, while the story of the separation of the seven nations at the place called Chicomoztoc or Seven Caves looks like national legend rather than real history. But the later stages of the long Aztec migration seem historical, and the map of Mexico still shows the names of several settlements recorded in the curious migration-map published by Gemelli Careri (Giro del Mondo, Venice, 1728) and commented on by Humboldt; – among these local names are Tzompanco, “ place of skulls,” now Zumpango in the north of the Mexican valley, and Chapultepec, “grasshopper hill,” now a suburb of the city of Mexico itself, where the Aztecs are recorded to have celebrated in 1195 the festival of tying up the “ bundle of years” and beginning a new cycle. The- Aztecs moving from place to place in Anahuac found little welcome from the Nahua peoples already settled there, whose own history was indeed one of incessant jealousy and quarrel. One of the first clear events of the Aztec arrival is their being Made tributary by the Tépanecs, in whose service or alliance they began to manifest their warlike prowess in the fight near Tepeyacac, where now stands the famous shrine of Our Lady of Guadalupe. Thus they overcame in arms the Acolhuas, their superiors in civilization, who had made Tezcuco a centre of prosperity and improvement. By the 13th century the Aztecs by their ferocity had banded their neighbours together against them; some were driven to take refuge on the reedy lake shore at Acoculco, while others were taken as captives into Culhuacan. The king of this district was Coxcoxtli,

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whose name has gained an undeserved reputation even in Europe as ‘‘Coxcox, the Mexican Noah,” from a scene in the native picture-writing where his name appears together with the figure of a man floating in a dug-out tree, which has been mistaken even by Humboldt for a rcpresen- tation of the Mexican deluge-myth. Coxcoxtli used the help of the Aztecs against the Xochimilco people, but his own nation, horrified at their bloodthirsty sac- rifice of prisoners, drove them out to live for years in want and misery on the islands and swamps of the great salt lagoon, where they are said to have taken to making their chinampas or floating gardens of mud heaped on rafts of reeds and brush, which in later times were so remarkable a feature of Mexico. As one of the Aztec chiefs at the time of the founding of their city was called Tenoch, z.e., ‘“Stone-cactus,” it is likely that from him was derived the name Tenochtitlan or “ Stone-cactus place.” Written as this name is in pictures or rebus, it probably suggested the invention of the well-known legend of a prophecy that the war-god’s temple should be built where a prickly pear was found growing on a rock, and perched on it an eagle holding a serpent; this legend is still commemorated on the coins of Mexico. Mexico- Tenochtitlan, founded about 1325, for many years after-wards probably remained a cluster of huts, and the higher civilization of the country was still to be found among the other nations, especially among the Acolhuas in Tezcuco. The wars of this nation with the Tepanecs, which went on into the 15th century, were merely destructive, but larger effects arose from the expeditions under the Culhua king Acamapichtli, where the Aztec warriors were promincnt, and which extended far outside the valley of Anahuac. Especially a foray southward to Quauhnahuac, now Cuer-navaca, on the watershed between the Atlantic and Pacific, caused the bringing of goldsmiths and other craftsmen home to Tenochtitlan, which now began to rise in arts, the Aztecs laying aside their rude garments of aloe-fibre for more costly clothing, and going out as traders for foreign merchandise. In the 14th century the last great national struggle took place. The Acolhuas had at first the advantage, but Ixtlilxochitl did not follow up the beaten Aztecs but allowed them to make peace, whereupon, under professions of submission, they fell upon and sacked the city of Tezcuco. The next king of Tezcuco, Nezahualcoyotl, turned the course of war, when Azcapuzalco, the Tepanec stronghold, was taken and the inhabitants sold as slaves by the conquering Acolhuas and Aztecs; the place thus de- graded became afterwards the great slave-market of Mexico. In this war we first

meet with the Aztec name Moteuczoma, afterwards so famous in its Spanish form Montezuma. About 1430 took place the triple alliance of the Acolhua, Aztec, and Tepanec kings, whose capitals were Tezcuco, Mexico, and Tlacopan, the latter standing much below the other two. In fact the Aztecs now became so predominant that the rest of native history may be fairly called the Aztec period, notwithstanding the picturesque magnificence and intellectual culture which made Tezcuco celebrated under Nezahualcoyotl and his son Nezahualpilli. When the first Moteuczoma was crowned king of the Aztecs, the Mexican sway extended far beyond the valley plateau of its origin, and the gods of conquered nations around had their shrines set up in Tenochtitlan in manifest inferiority to the temple of Huitzilopochtli, the war-god of the Aztec conquerors. The rich region of Quauhnahuac becaine tributary ; the Miztec country was invaded southward to the Pacific, and the Xicalanca region to what is now Vera Cruz. It was not merely for conquest and tribute that the fierce Mexicans ravaged the neighbour-lands, but they had a stronger motive than either in the desire to obtain

multitudes of prisoners whose hearts were to be torn out XVI. — 27

‘ Tehuantepec,

by the sacrificing priests to propitiate a pantheon of gods who well personified their bloodthirsty worshippers. The desire for war-captives as acceptable victims is related to have brought about an almost incredible agreement among nations of the Mexican alliance, that they should from time to time fight battles among themselves in order to provide prisoners for the altars. Thus there was something of the character of a religious war in the expedition made in 1469 under Axayacatl as. far down the isthmus as whence the Mexican army came back with loads of rich plunder and thousands of captives, and the later ravaging of the Totonac region as far as the Atlantic, when the inhabitants were taken for sacrifice and their land recolonized by Aztecs. Ahuitzotl left the Aztec empire (as it is often somewhat ambitiously called) at the height of apparent power, but the cruel oppression of the subject regions had made their life almost unbearable, and the second Moteuczoma, coming to a rule already liable to break up from

within, weakened it still more by upholding the class of chiefs or nobles against the common people who as warriors and traders had in great measure made the ptosperity of the allied nations. The Mexicans had long tried to subjugate the stubborn little nation of Tlax- callan (Tlascala), which had obstinately held out, though so hemmed in that for years the people lived without salt, this being no longer to be had from the sea-coast. Moteuczoma made a last effort to crush them, but in vain, and when the Spaniards came they were there as ready-made allies planted on the high road to Mexico. From the date when

the festival of the new cycle was first celebrated in

Govern- ment.

Palaces, &e.

Chapultepec six 52-year periods had passed when in 1507 the new fire symbolizing the beginning of a new cycle was kindled for the last time on the breast of a human victim. Rumours of the coming of the Europeans may have before this date spread from Cuba, but in 1517 Cordova touched in Yucatan, and in 1518 Grijalva was on the east coast of Mexico, and the Aztecs first met the white men, in whom they saw, partly with hope and partly with fear, the fulfilment of the prophecy that Quetzalcoatl should one day return. With the Spanish conquest under Hernando Cortes (see Cortxs) the native history of Mexico comes to an end.

CIVILIZATION. While the prairie tribes of America lived under the loose sway of chiefs and councils of old men, the scttled nations of

Mexico had attained to a somewhat highly organized government. This may be seen by the elaborate balance of power maintained in the federation of Mexico, Tezcuco, and Tlacopan, where each king was absolute in his own country, but in war or other public interests they acted jointly, with powers in something like the proportion in which they divided conquered lands and spoil, which was two-fifths each to Mexico and Tezcuco and one-fifth to Tlacopan. The suc-

cessor of the Aztec king was customarily a chosen brother or nephew, —

the eldest having the first claim unless set aside as incompetent, and having to be atried warrior ; this mode of succession, which has been looked on as an elaborate practical device for securing practical advantages, seems rather to have arisen out of the law of choice

‘among the descendants of the female ‘line, found in American tribes

of much lower culture. Something like this appears in the succes-

sion of kiugs of Tezeuco and Tlacopan, which went to sons by the“

principal wife, who was usually of the Aztec royal family. The Mexican chronicles, however, show instances of the king’s son suc- ceeding, or of powerful chiefs being elected to the kingship. The term republic is sometimes used to describe the little state of Tlascala, but this was in fact a federation of four chiefs, with an assembly of nobles. In the Zapotec district the Wiyatao or high- priest of Zopaa was a divine ruler before whom all prostrated them- selves with faces to the ground; he was even too sacred to allow his foot to touch the earth, and was only seen carried in a litter. The accounts given by the Spanish and native Mexican writers of the courts and palaces of the native kings must be taken with some reserve, from the tendency to use descriptive terms not actually untrue, but which convey erroneous ideas taken from European architecture ; thus what are called columns of porphyry and jasper supporting marble balconies might perhaps be better described as piers carrying slabs, while the apartments and terraces must have

been more remarkable for number and extent than architectural grandeur, being but low one-storied buildings. The principal palace of Mexico consisted of hundreds of rooms and halls ranged round three open squares, with women’s apartments, granaries, storehouses, menageries, aviaries, of such extent that one of the companions of Cortes records having four times wandered about till he was tired, without seeing the whole. Not less remark- able was the palace of Tezcuco, surrounded with its groves and pleasure- gardens ; and, though now hardly anything remains of the buildings above ground, the neighbouring hill of Tezcotzinco still has its stone steps and

terraces ; and the immense embankment carrying the aqueduct-channel of hewn stone which supplied water to basins cut in the solid rock still remains to prove that the chron- iclers' descriptions, if highly-coloured, were at any rate genuine. Till the last century the gigantic figures of Axayacat] and his son Monte- zuma were to be seen carved in the porphyry hill of Chapultepec, but these as well as the hanging gardens have been destroyed, and only the groves of ahwehuete (cypress) remain of the ancient beanties of the place. That in the palace gardens flowers from the tierra caliente were transplanted, and water-fowl bred near fresh and salt pools fit for each kind, that all kinds of birds and beasts were kept in well-appointed zoological gardens where there were homes even for alligators and snakes,—all this testifies, not merely to barbaric ostentation, but to a cultivation of natural history which was really beyond the European level of the time. From the palaces and re- tinues of thousands of servants attached to the royal service may be inferred at once the despotic power of the Mexican rulers and the heavy taxation of the people ; in fact some of the most remarkable of the picture-writings are tribute-rolls enumerating by hundreds and thousands the mantles, ocelot-skins, bags of gold-dust, bronze hatchets, loads of chocolate, &c., furnished periodically by the towns. Below the king was a numerous and powerful class of nobles, the highest of whom (élatoant) were great vassals owing little more than homage and tribute to their feudal lord, while the natural result of the unruliness of the noble class was that the king to keep them in check increased their numbers, brought them to the capital as councillors, and balanced their influence by military and household officers, and by a rich and powerful merchant class. The nobles not only had privileges of rank and dignity, but substantial power over the plebeian or peasant class (macehualli), who submitted to much the same oppression and extortion at their hands as was customary in the Old World. The tenures of land in Mexico were those generally appearing in barbaric countries where invasion and inilitary despotism have encroached on but not totally superseded the carlier tribal laws. The greatest estates belonged to the king, or had been granted to military chiefs whose sons succeeded then, or were the endowments of temples, but the calpullt or village community still survived, and each freeman of the tribe held and tilled his portion of the common lands. Below the freenien were

the. slaves, who were war-captives, persons enslaved for punishment,

or children sold by their parents. Prisoners of war were mostly doomed to sacrifice, but other classes of slaves were mildly treated, retaining civil rights, and their children were born free. The superior courts of law formed part of the palace, were tribunals in the principal cities, gver each of which presided a supreme judge or cihudcoatl, who was irremovable, and whose criminal decisions not even the king might reverse ; he appointed the lower judges and heard appeals from them ; it is doubtful whether he judged in civil cases, but both kinds of suits were heard in the court below, by the tlacatecatl and his two associates, below whom were the ward-magistrates. Lands were set apart for the maintenance of the judges, and indeed nothing gives a higher idea of the elaborate civilization of Mexico than this judicial system, which culminated in a general court and council of state presided over by the king. The laws and records of suits were set down in picture-writings, of which some are still to be seen ; sentence of death was recorded by drawing a line with an arrow across the portrait of the condemned, and the chroniclers describe the barbaric solemnity with which the king passed sentence sitting on a golden and jewelled throne in the divine tribunal, with one hand on all ornamented skull and the golden arrow in the other. Among the resemblances to Old-World law was the use of a judicial oath, the witness touching the ground with his finger and putting it to his lips, thus swearing by Mother Earth. The criminal laws were of extreme severity, even petty theft being punished by the thief being enslaved to tle person he had robbed, while to steal a tobacco pouch or twenty ears of corn was death; he who pilfered in the market was then and there beaten to death, and he who insulted Xipe, the god of the gold- andsilver-smiths, by stealing his precious meta was skinned alive and sacrificed to the offended deity. Though aloe-beer or ‘‘pulque” was allowed for feasts and to invalids in moderation, and old people over seventy seem to be represented in one of the picture-writings as having liberty of drunkenness, young men found drunk were clubbed to death and young women stoned. Such a Draconian standard prevailing, it is hardly needful to enumerate the special penalties of such offences as witchcraft, fraud, removing landmarks, adultery, &., which differed as to

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whether the criminal had his heart cut out on the altar, his head crushed between two stones, &c. ; while even lesser punishments were harsh, such as that of slanderers, whose hair was singed with a pine-torch to the scalp. :

Based on conquest as the Aztec kingdom was, and with the craving for warlike glory fostered by the most bloodthirsty religion the world ever saw, it follows that the natiou was above all other pursuits organized as a fighting community. To bea tried soldier was the road to honour and office, and the king could not be en- throned till he had with his own hand taken captives to be butchered on the war-god's altar at his coronation. The common soldiers were promoted for acts of daring, and the children of chiefs were regularly trained to war, and initiated by being sent into battle with veterans, with whose aid the youth took his first prisoner, but his future rise depended on how many captives he took un- aided in fight with warlike enemies ; by such feats he gained the dignity of wearing coloured blankets, tassels, and lip-jewels, and reached such'military titles as that of '' guiding eagle." The Mexican military costumes are to be seen in the picture-writings, where the military orders of princes, eagles, and tigers are known by their braided hair, eagles' beaks, and spotted armour. The common soldiers went into battle brilliant in savage war-paint, but those of higher rank had helmets like birds and beasts of prey, armour of gold and silver, wooden greaves, and especially the ichcapilli, the quilted cotton tunic two fingers thick, so serviceable asa protection from arrows that the Spanish invaders were glad to adopt it. Thearchers shot well and with strong bows, though their arrows were generally tipped only with stone or bone ; their shields or targets, mostly round, were of ordinary barbaric forms; the spears or javelins had heads of obsidian or bronze, and were some- times hurled with a spear-thrower or aédat/, of which pictures and specimens still exist, showing it to be similar in principle to those used by the Australians and Eskimo, The most characteristic weapon of the Mexicans was the maquahuitl or '' hand-wood," a club set with two rows of large sharp obsidian flakes, a well- directed blow with which would cut down man or horse. These two last-mentioned weapons have the look of highly-developed savage forms, while on the other hand the military organization was in some respects equal to that of an Asiatic nation, with its regular companies commanded each by its captain and provided with its standard. Thearmies were very large, an expedition often consisting of

several divisions each numbering eight thousand men, but the tactics of the commanders were quite rudimentary, consist- ing merely of attack by arrows and javelins at a distance, gradu- ally closing into a hand-to-hand fight with clubs and spears, with an occasional feigned retreat to draw the enemy intoan ambuscade. Fortification was well understood, as may still be seen in the remains of walled and esearped strongholds on hills and in steep ravines, while lagoou-citics like Mexico had the water approaches

defended by fleets of boats, and the causeways protected by towers and ditches; even after the town was entered, the pyramid- temples with their surrounding walls were forts capable of stubborn resistance. It was held unrighteous to invade another nation with- out a solemn embassy to warn their chiefs of the miseries to which they exposed themselves by refusing the submission demanded, and this again was followed by*a declaration of war, but in Mexico as in other more eultured countries this act of national morality degene- rated into a ceremonial farce, where tribute was claimed from some neighbouring nation, or an Aztec god was offered to be worshipped in their temples, in order to pick a quarrel as a pretext for an invasion already planned to satisfy the soldiers with lands and plunder, and to mcet the priests' incessant demands for more human sacrifices.

Among thie accounts of the Mexican religion are some passages referring to the belief in a supreme deity. The word ¢eot?, god, has been thought in some cases to bear this signification, but its meaning is that of deity in general, and it is applied not only to the sun- god but to very inferior gods. It is related that Nezahualeoyotl, the poet-king of Tezcuco, built a nine-storied temple with a starry roof above, in honour of the invisible deity called Tloquenahuaque,

'he who is all in himself," or Ipalnemoan, ' he by whom we live," who had no image, and was propitiated, not by bloody sacrifices, but by incense and flowers. Those who adopt the opinion of Asiatic admixture in Mexican culture will use it to account for this remark- able religious phenomenon, less easily accounted for by native development, while also the appearance of a rival deity of evil, bearing the name of Tlacatecolotl, or '' man-owl," is mysterious. These divinities, however, seem to have had little or no place in the popular faith, which was occupied by polytheistie gods of more

ordinary barbaric type. Tezcatlipoea was held to be the highest of these, and at the festival of all the gods his footsteps were expected to appear in the flour strewn to receive this sign of their coming. He was plainly an aneient deity of the race, for attributes of many

Inds are crowded together in him, and he was prayed to in inter- minable formulas for help in war and for health and fortune, to deliver the nation froma wicked king, or to give pardon and strength to the penitent who had confessed his sins and been purified by wash-

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ing. Between him and Quetzalcoatl, the ancient deity of Cholula, there had been old rivalry, as is related in legends of Quetzalcoatl coming into the land to teach men to till the soil, to work metals, and to rule a well-ordered state; the two gods played their famous match at the ball-game, and Tezcatlipoca, in the guise of a hoary-headed sorcerer, persuaded the sick and weary Quetzalcoatl] to drink the magic pulque that sent him roaming to the distant ocean, where he embarked in his boat and disappeared from among men. These deities are not easily analysed, but on the other hand Tonatiuh and Metztli, the sun and moon, stand out in the distinctest personality as nature gods, and the traveller still sees in the huge adobe pyramids of Teotihuacan, with their sides oriented to the four quarters, an evidence of the importance of their worship. The war-god Huitzilo- pochtli, of whom one legend relates a supernatural conception in the ancient Tullan, while another story declares lim to have been (like the Chinese war-god) a deified warrior-chief, was the rea] head of the Aztec pantheon ; hisidol remains in Mexico, a huge block of basalt on whieli is sculptured on the one side his hideous personage, adorned with the humming-bird feathers on the left hand which signify his name, while the not less frightful war-goddess Teoyao- miqui, or ‘‘divine-war-death,” occupies the other side. Centeotl, the goddess of the all-nourishing maize, was patroness of the earth and mother of the gods, while Mictlanteuctli, lord of dead-land, ruled over the departed in the dim under-world. Numbers of lesser deities presided over elasses of society, events, and occnpations of life, such as Tlazolteotl, goddess of pleasure, worshipped by eourtesans, Tezcatzoncatl, god of strong drink,

whose garment in griin irony clothed the drunkard’s corpse, and Xipe, patron of the gold- smiths, Below these were the usual crowd of nature-spirits of hills and groves, whose shrines were built by the roadside to receive offer- ings from passers-by. The temples were called teocalli or ‘‘ god’s house,” and the teocallis of the greater deities rivalled in size as they resembled in form the temples of ancient Babylon. They were pyramids on a square or oblong base, rising in successive terraces to a small summit-platform. The great teocalli of Huitzilopochtli in the city of Mexico stood in an immense square, whence radiated the four principal thoroughfares, its eourtyard being enclosed by a square, of which the stone wall, called the coatepantii or serpent-wall from its sculptured serpents, measured nearly a quarter of a mile on each side. In ‘the centre, the oblong pyramid of rubble cased with hewn stone and eemented, 375 × 300 feet at the base, and rising steeply in five terraces to the height of 86 feet, showed conspicuously to the city the long proeessions of priests and victims winding along the terraces and up the corner flights of steps. On the paved platform were three-story tower temples in whose ground-floor stood the stone images and altars, and before that of the war-god the green stone of sacrifice, humped so as to bend upward the body of the victim that the priest might more easily slash open the breast with his obsidian knife, tear ont the leart and hold it up before the god, while the captor and his friends were waiting below for the earease to be tumbled down the steps for them to earry home to be cooked for the feast of vietory. Before the shrines reeking with the stench of slaughter, the eternal fires were kept burning, and on the platform stood the huge drum covered with snakes’ skin, whose fearful sound was heard for miles. From the terrace could be seen seventy or more other teniples within the enelosnre, with their images and blazing fires, and the tzompantli or ‘‘skull-place,” where the skulls of victims by tens of thousands were skewered on cross-sticks or built into towers. There also might be seen the flat circular temalacatl or ‘‘spindle-stone,” where captives armed with wooden weapons were allowed the mockery of a gladiatorial fight against well-armed champions. The great pyramid of Cholula with its hemispherical temple of Quetzalcoatl at the top, now an almost shapeless hill surmounted by a church, was about thrice as long and twice as high as the teocalli of Mexico. A large fraction of the Mexican population were set apart as priests or attendants to the services of the gods. The rites performed were such as are found elsewhere, prayer, sacrifice, processions, dances,

chants, fasting and other austerities, but there are some peculiari- ties of detail. Prayers and other formulas have been copied down by Sahagun and other chroniclers; of endless prolixity, but not without occasional touches of pathos. The following are a few sentences from a prayer to Tezcatlipoca, interceding for the poor: “*O our lord, protector most strong and compassionate, invisiblo and impalpable, thou art the giver of life ; lord of all, and lord of battles, I present mysclf here before thee to s1y some few words concerning the need of the poor people, the people of none estate or intelligence… . Know, O Lord, that thy subjects and servants suffer a sore poverty, that eannot be told of more than that | it isa sore poverty and desolateness. The men have no garments nor the women to eover themselves with, but only rags rent in every part that let the wind and eold in… . If they be mer- chants, they now sell only cakes of salt and broken pepper ; the people that have something despise their wares, so that they go out to sell from door to door and from house to house ; and when they sell | nothing they sit down sadly by some fence. or wall, or in some corner,

Pieture- writing.

licking their lips and gnawing their nails for the hunger that is in them, they look on one side and the other at the mouths of those who pass by, hoping peradventure that one may speak some word to them. O compassionate God, the bed on which they lie is not a thing to rest upon, but to endure torment in; they draw a rag over, them at night and so sleep. . O our Lord, in whose power it 1s to give allcontent, consolation, sweetness, softness, prosperity, and riches, for thou alone art lord of all good, have merey upon them, for they are thy servants. . . . I supplicate thee that thou wilt lift up their heads with thy favour and aid, that thou wilt see good that they enjoy some days of prosperity and tranquillity, so that they may sleep and know repose, having prosperous and peaceable days of life. . . . Should this nation, for whom I pray and entreat thee to do them good, not understand what thou hast given, thou canst take away the good and pour out cursing, so that all evil may come upon them, and they become poor, In need, maimed, lame, blind, and deaf; then indeed they shall waken and know the good that they had and have not, and they shall call upon. thee and lean

toward thee; but thou will not listen, for in the day of abundance they would not understand thy goodness towards them.” These prayers seem essentially genuine ; indeed there was no European motel from which they eould have been imitated ; but at the same time it must be remembered that they come down in Spanish writ- ing, and not untouched by Spanish influence, as in one passage where there is a mention of sheep, an animal of course unknown to the native Mexicans, As to sacrifice, maize and other vegetables were offered, and occasionally rabbits, quails, &c.; but, in the absenee of cattle, human sacrifice was the chief rite, and cannibalism prevailed at the feasts. Incense was constantly used, especially the copalli (copal) well known to us for varnish; little terra-cotta censers are among the commonest of Mexican antiquities. Long and severe religious fasts were customary at special seasons, and drawing blood from the arms, legs, and body, by thrusting in aloe-thorns, and passing sharp sticks through the tongue, was an habitual act of devotion recalling the similar practices of devotees in India. The calendar of religious festivals for the whole conrse of the Mexican year has been preserved. Each 20-day period had one or more such celebrations. In the month of the ‘diminishing of waters ” the rain-gods or Tlalocs were propitiated by a procession of priests with music of flutes and trumpets carrying on plumed litters infants with painted faces, in gay clothing with coloured paper wings, to be sacrifieed on the mountains or in a whirlpool in the lake. It is said that the people wept as they passed by; but if so this may have been a CY formality, for the religion of these nations must have quenched all human sympathy. In the next month the god Xipe-totec, already mentioned, had his festival called the ‘‘flaying of men” from the human victims being flayed, after their hearts were torn out, for young men to dress in their skins and perform danccs and sham fights. The succeeding festival of Camaxtli was marked by a severe fast of the priests, after which stone knives were pre- pared with whieh a hole was cut through the tongue of each, and numbers of stieks passed through. For the great festival of Tez- catlipoga, the handsomest and noblest of the captives of the year had been chosen as the incarnate representative of the god, and paraded the streets for public adoration dressed in an embroidered mantle with feathers and garlands on his head and a retinue like a king; for the last month they married him to four girls representing four goddesses ; on the last day wives and pages escorted him to the little temple of Tlacochcalco, where he mounted the stairs, breaking an earthenware flute against each

step; this was a symbolic fare- well to the joys of the world, for as he reached the top he was seized by the priests, his heart torn out and held up to the sun, his head spitted on the tzompantli, and his body eaten as sacred food, the people drawing from his fate the moral lesson that riches and pleasure may turn into poverty and sorrow. The manner of the victim's death in these festivals afforded scope for variety; they dressed them and made them dance in character, threw them into the fire for the fire-god, or crushed them between two balanced stones at the harvest-festival. The ordinary pleasures of festivals were mingled with all this, such as dances in beast-masks, sham fights, and children's games, but the type of a religious function was a sickening butchery followed by a cannibal feast.

The Mexican priesthood, being the educated class, were much concerned with the art of picture-writing, which they had developed to a stage quite above the rude figures of the American hunting- tribes, and used systematically as a means of recording religious festivals and legends, as well as keeping calendars of years and recording the historical events which occurred inthem. Facsimiles of several of these interesting documents, with their translations, may be seen in Kingsborough. On inspecting these it will be seen that their main principle is pictorial. Gods are represented with their appropriate attributes,—the fire-god hurling his spear, the moon- goddess with a shell, &c.; the scenes of human life are pictures of warriors fighting with club and spear, men paddling in canoes, women spinning and weaving, Xe. An important step towards phonetic writingappears, however, in the picturc-names of places and persons. The simplest forms of these depict the objects signified by the name,

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as where Chapultepec or ''grasshopper-hill" is represented by a grass-hopper on a hill, or a stone with a cactns on it stands for Tenoch or "'stone-cactus," the founder of Tenochtitlan. The system had, however, risen a stage beyond this when objects were drawn to represent, not themselves, but the syllables forming their names, as where a trap, an eagle, a pricker, and a hand are put to- gether not to represent these objects, but in order that the syllables of their names mo-quawh-zo-ma should spell the word Moquauh-zoma (sce Aubin's introduction to Brasscur, Hist. dw Memique, vol. i. p.

Ixviii.). The analogy of this to the manner in which the Egyptian hieroglyphs passed into phonetic signs is remarkable, and writing might have been invented anew in Mexico had it not been for the Spanish conquest. The Aztec numerals, which were vigesimal or reckoned by scores, were depicted by dots or circles up to 20, whigh was represented by a flag, 400 (a score of scores) by a feather, and 8000 (a score of scores of scores) by a purse; but for convenience these symbols might be halved and quartered, so that 534 might be shown by one feather, one quarter of a feather, one flag, one-half of a flag, and four dots. The Mexican calendar depended on the combination of numbers with pictnre-signs, of which the four principal were the rabbit, reed, flint, house— tochtli, acatl, tecpatl, calli. The cycle of 52 years was reckoned by combining these signs in rotation with numbers up to 13, thus:— 1 rabbit, 2 reed, 8 flint, 4 house, 5 rabbit, 6 reed, &c. By accident this calendar may be cxactly illustrated with a modern pack of cards laid out in rotation of the four suits, as, ace of hearts, 2 of spades, 8 of diamonds, 4 of clubs, 5 of hearts, 6 of spades, &c. In the Mexican ritual calendar of the days of the year, the same method is carried further, the series of twenty day-signs being combined in rotation with numbers up to 13; as this cycle of days only reaches 260, a series of nine other signs are affixed in addition, to make up the 365-day year. It is plain that this rotation of signs served no useful purpose whatever, being less convenient than ordinary counting such as the Mexicans employed in their other calendar already mentioned, where the 20-day periods had eaeh a name like our months, and their days had signs in regular order. Its historical interest depends on its resemblance to the calendar-system of central and eastern Asia, where among Mongols, Tibetans, Chinese, &c., series of signs are thus combined to reckon years, months, and days; for instance, the Mongol cycle of 60 years is recorded by the zodiac or series of 12 signs—mouse, bull, tiger, &c., combined in rotation with the five male and female elements—fire, earth, iron, water, wood; as ‘‘male-fire-bull” year, &c. This comparison is worked out in Humboldt’s Vues des Cordilleres, as evidence of Mexican civilization being borrowed from Asia. Naturally the Mexican calendar-system lent itself to magic in the same way as the similar zodiac-signs of the Old World, each person’s fate being affected by the qualities of the signs he was born under, and the astrologer-priests being called in to advise on every event of life. Of all Mexican festivals the most solemn was that of the xiuhmolpilli, or ‘‘ year-binding,”

when the 52- year cycle or bundle of years came to an end. It was believed that the destruction of the world, whieh after the Hindu manner the Mexicans held to have already taken place three or four times, would happen again at the end of a cycle. As the time drew near, the anxious population cleansed their houses and put out all fire, and on the last day after sunset the priests, dressed in the garb of gods, set out in procession for the hill of Huixachtla, there to watch for the approach of the Pleiades to the zenith, which gave the anspicious signal for the lighting of the new fire. The finest of the captives was thrown down and fire kindled on his breast by the wooden drill of the priest ; then the victim's heart was torn ont, and his body flung on the pile kindled with the new flame. The people watching from their flat housetops all the country round saw with joy the flame on the sacred hill, and hailed it witha thank-offering of drops of blood drawn from their ears with sharp stonc-flakes. Swift runners carried burning brands to rekindle the fires of the land, the sacred fire on the teocalli of the war-god blazed up again, and the people began with feasting and rejoicing the new cycle.

Mexican education, at any rate that of the upper class, was a Educa- systematic discipline much under the control of religion, which tion.

here presents itself under a more favourable light. After the birth of a child, the tonalpowhqui or ''sun-calculator" drew its horoscope from the signs it was born under, and fixed the time for its solemn lustration or baptism, performed by the nurse with appropriate prayers to the gods, when a toy shield and bow were provided if it was a boy, or a toy spindle and distaff if it was a girl, and the child received its name. An interesting picture-writing, to be seen in Kingsborough, shows the details of the boy's and girl's education, from the early time when three small circles over the | child show it to be. three years old, and a drawing of half a tortilla or corn-eake shows its allowance for each meal; as they grow older the lads are seen beginning to carry burdens, paddle the canoe, and fish, while the girls learn to spin and weave, grind maize, and cook,——good conduct being enforced by punishments of increasing severity, up to pricking their bodies with aloe-thorns and holding

Mar- riages,

Funerals.

Agricul- ture and food.

Clothing and orna- ments,

Metal- work, |

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their faces over burning chillis. The schools were extensive build- ings attached to the temples, where from an early age boys and girls were taught by the priests to sweep the sanctuaries and keep up the sacred fires, to fast at proper seasons and draw blood for penance, and where they received moral teaching in long aud verbose formulas. Those fit for a soldier's life were trained to the use of weapons and sent early to learn the hardships of war; ehildren of craftsmen were usually taught by their fathers to follow their trade; and for the children of nobles there was elaborate instruction in history, picture-writing, astrology, religious doctrines, and laws. Marriages depended much, as they do still in the East, on comparison of the horoscopes of the pair to ascertain if their birth-signs were com- patible. Old women were employed as go-betweens, and the marriage ceremony was condueted by a priest who after moral exhortations united the young couple by tying their garments together in a knot, after which they walked scven times round the fire, casting incense into it ; after the performance of the marriage ceremony the pair entered together on a four days' fast and penance before the marriage was completed. The funeral rites of the Mexicans are best seen in the ceremonies at the death of a king. The corpse laid out in state was provided by the priest with a jug of water for his journey, and with bunches of cut papers to pass him safely through each danger of the road—the place where the two mountains strike together, the road guarded by the great snake and the great alligator, the eight deserts and the eight hills; they gave him garments to protect him from the cutting wind, and buried a little dog hy his side to carry him across the nine waters. Then the royal body was invested in the mantles of his patron-gods, especially that of the war-god, for Mcxican kings were wairiors ; on his face was placed a mask of turquoise mosaic, and a green chalchihuite-stone as a heart between his aa In older times the dead king was buried on a throne

with his property and dead attendants round him. But after cremation came in a mourning procession of servants and chiefs carried the body to the funeral pyre to be burnt by the demon-dressed priests, after which the crowd of wives and slaves were exhorted to serve their lord faithfully in the next world, were sacrificed and their bodies burnt. Conimou people would not thus be provided with a ghostly retinue, but their simpler funcral ceremonies were as far as they went similar to those of their monarch.

The staple food of the Mexicans before the conquest has continued with comparatively little change among the native race, and has even been adopted by those of European blood. Maize or Indian corn was cultivated on patches of ground where, as in the Hindu jém, the trees and bushes were burut and the seed planted in the soil manured by the ashes. A sharp-pointed planting stick, a wooden shovel, and a bronze-bladed hoe called a coatl were the simple implements. The Mexicans understood digging channels for irrigation, especially for the cultivation of the cacahuati, from which they taught the Europeans to prepare the beverage chocollatl ; these native names passed into English as the words cacao, or cocoa, and chocolate. Other vegetables adopted from Mexico are the tomata (tomatl) and the chill7, used as flavouring to native dishes. The maize was ground with a stone roller on the grinding stone or metlatl, still known over Spanish America as the metate, and the meal baked into thin oval cakes called by Aztecs tlaxcalli, and by Spaniards tortilla, which resemble the chapati of India and the oat-cake of Scotland. The Mexicans were also skilful makers of earthen pots, in which were cooked the native beans called by the Spanish frijoles, and the various savoury stews still in vogue. The juice extracted by tapping the great aloe before flowering was fermented into an intoxicating drink about the strength of beer, octli, by the Spaniards called pulgwe. Tobacco, smoked in leaves or eanc-pipes or taken as snuff, was in use, especially at feasts. It is related that in old times Mexican clothing was of skins or woven aloe and palm

fibre, but at the time of the conquest cotton was largely cultivated

in the hot lands, spun with a spindle, and woven in a rudimentary loom without a shuttle into the mantles and breech-cloths of the men and the chemises and skirts of the women, garments often of fine texture and

embroidered in colours. Ornaments of gold and silver, and jewels of polished quartz and green chalehihuite were worn,—not only the ears and nose but the lips being pierced for ornaments. The artificers in gold and silver melted the metals by means of a reed-blowpipe and cast them solid or hollow, and were also skilled in hammered work and chasing, as some fine specimens remain to show, though the famous animals modelled with gold and silver fur, feathers, and scales have disappeared. Iron was not known, but copper and tin ores were mined, and the metals com- bined into bronze of much the same alloy as in the Old World, of which hatchet blades and other instruments were made, though their use had not superseded that of obsidian and other sharp stone flakes for cutting, shaving, &c. Metals had passed into a currency for trading purposes, especially quills of gold-dust and T-shaped pieces of eopper, while cocoa-beans furnished small change. The vast size of the market-squares with their surrounding porticos, and the importance of the caravans of merchants who traded with other nations, show that mercantile had risen into some proportion to

nilitary interests.

The stone sculptures such as that remaining of Xochicalco, which is

figured by Humboldt, as well as the ornamented woodwork, feather-

mats, and vases, are not without artistic merit. The often-cited poems attributed to Nezahualcoyotl may not be quite genuine, but at any rate poetry had risen above the barbaric level, while the mention of ballads among the people, court odes, and the chants of temple choirs would indicate a vocal cultivation above that of the instrumental music of drums and horns, pipes and whistles, the latter often of pottery. Solemn and gay dances were frequent, and a sport called the bird-dance excited the admiration of foreigners for the skill and daring with which groups of performers dressed as birds let themselves down by ropes wound round the top of a high mast, so as to fly whirled in circles far above the ground. The ball-game of the Mexicans, ealled ¢dachtli, was, like tennis, the pas- time of princes and nobles ; special courts were built for it, and the ball of india-rubber (perhaps the first object in which Europeans became acquainted with

this valnable material) might not be touched by the hands, but was driven against the walls by blows of the kuee or elbow, shoulder or buttock. The favourite game of patolli has been already mentioned for its similarity to the pachisi of modern India.

_ The accounts given by Spanish writers of the Central Americans Central- in their state after the Spanish conquest are' very scanty in coin- American They bring culture.

parison with the voluminous descriptions of Aztec life. out perfectly, however, the fact of close connexion between the two civilizations. Some Central-American peoples were actually Mexican in their language and culture, especially the Pipils of Guatemala and a large part of the population of Nicaragua, but these were descend- ants of Aztecs or allied peoples who in the comparatively modern times of Aztec power invaded and colonized these distant countries (see Buschmann, Aztek. Ortsnamen, viii., ix.). With regard to the Central-American nations proper, especially the Mayas of Yucatan and the Quichés of Guatemala, who dwelt in the cities and wor- shipped in the temples of Chichen-Itza and Uxmal, Palenque and Copan, the problem of Aztec connexion is deeper and obscurer. How closely related these nations were in institutions to the Mexicans appears, not only in their using the same peculiar weapons, such as the spear-thrower and the toothed club or maquahuitl, but in the similarity of their religious rites, such as drawing blood from their bodies as an act of penance, and sacrificing human victims by cutting open the breast and tearing out the heart; the connexion 'is evideut in such special points as the ceremony of marriage by tying together the garments of the couple, or in holding an offender's face over burning chillis as a punishment; the native legends of Central America make mention of the royal ball-play, which was the same as the Mexican game of tlachtli already mentioned. At the same time many of the Central-Amcrican eustoms differed from the Mexican; thus in Yucatan we find the custom of the youths sleeping in a great bachelor's house, an arrangement common in various parts of the world, but not in Mexico ; the same remark applics to the Maya exogamous law of a man not taking a wife of his own family name (see Diego de Landa, Relacion de Yucatan, ed. Brasseur de Bourbourg, p. 140), which does not correspond with Mexican custom. We have the means of comparing the personal appearance of the Mexicans and

Central Americans by their por- traits on early sculptures, vases, &c. ; and, though there does not appear any clear distinction of race-type, the extraordinary back- sloping foreheads of such figures as those of the bas-reliefs of Palenque prove that the custom of flattening the skull in infancy prevailed in Central Ameriea to an extent quite beyond any such habit in Mexico. It is from the ruined cities now buried in the Central- American forests that we gain the best information as to the nations who built them. The notion sometimes propounded that these famous Cities were of great antiquity and the work of extinct nations has no solid evidence ; some of them may have been already aban- doned before the conquest, but others were inhabited, and by the ancestors of the Indians who now build their mean huts and till their patches of maize round the relics of the grander life of their ancestors. In comparing these ruins through the districts of Yucatan, Chiapas, Guatemala, and Honduras, it is evident that, though they are not the work of a single nation, but of two or more highly distinct in language, yet these nations had the great bond of a common system of pictorial or written characters. One speci- men of a Central-American inscription may give a general idea of them all, whether it be from the sculptured fagade of a temple sketched by Catherwood, or from the painted deerskin called the Dresden Codex (reproduced in Kingsborough), or from the ehapter of Diego de Landa where he professes to explain and translate the eharacters themselves. These consist of combinations of faces, circles, lines, &c., arranged in compartments in so eomplex a manner that hardly two are found alike. How they conveyed their meaning, how far they pictorially represented ideas or spelt words in the different languages of the country, is a question not yet answered in a eomplete way; Landa’s description (p. 320) gives a table of a number of their elements as phonetically representing letters or syllables, but, though there may bea partial truth in his rules, they

i s. Nor was the wealth and luxury of Mexico and Art and surrounding regions without a corresponding development of art. pastime.

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are too insufficient or too erroneous to serve for any general decipher- ment. Most of what has becn written on this enticing subject is worthless, but a

promising attempt has been made by E. 8. Holden, who has analysed the combined figures into their elementary lines (First Annual Report of Bureau of Ethnology, Smithsonian Insti- tution, Washington, 1881; see also Charencey, Mélanges de Philologve ct de Palévgraphie Américaines, Paris, 1883). One point as to the Central-American characters is clear, that part of them are calendar- signs recording dates. From the accounts given by Landa and other writers it is plain that the Central-American calendar, reckoning the year in twenty-eight periods of thirteen days, was the same 1n its principle of combining signs as that of Mexico here mentioned at page 212. The four leading Maya signs called kan, m uluc, 1%, cawac corresponded in their position to the four Aztec signs rabbit, reed, flint, house, but the meanings of the Maya signs are, unlike the Aztec, very obscure. A remarkable feature of the Central-American ruins is the frequency of truncated pyramids built of hewn stone, with flights of steps up to the temple built on the platform at top. The resemblance of these structures to the old descriptions and pic- tures of the Mexican teocallis is so striking that this name is habitu- ally given to them. The teocallis built by the Nahua or Mexican nations have been mostly destroyed, but two remain at Huatusco and Tusapan (figured in Bancroft, vol. iv. pp. 448, 458), which bear a strong resemblance to those of Palenque. On the whole it is not too much to say that, in spite of differences in style, the best means of judging what the temples and palaces of Mexico were like is to be gained from the actual ruins in Central America. On the other hand, there are features in Central-American . architecture which scarcely appear in Mexican. Thus at Uxmal there stands on a terraced mound the long narrow building known as the governot’s house (Casa del Gobernador), 322 feet long, 39 feet wide, 26 feet high, built of rubble stone and mortar faced with square blocks of stone, the interior of the ehambers rising into a sloping roof formed by courses of stonework gradually overlapping in a “‘ false arch.” The same construction is seen in the buildings forming the sides of a quadrangle and bearing the equally imaginary name of the nunnery (Casa de Monjas); the resemblance of the interior of one of its apartments to an Etruscan tomb has often been nuticed (see Fergusson, History of Architecture, vol. i. ; Viollet-le-Duc, in Charnay). Attempts to trace the architecture of Central America to direct derivation from Old-World types have not been successful, while on the other hand its decoration shows proof of original inven- tion, especially in the imitations of ne | which, as the above-

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MEXICO

British Honduras, where the boundary lines are still partly undetermined, W. by the Pacific Ocean. Lying between 33° and 15° N. lat. and 87° and 117° W. long., Mexico stretches about 1950 miles north-north-west and south- south-east, with a mean breadth of 400 miles, varying from about 1000 in 26° N. to 130 at the narrowest part of the Tehuantepec isthmus. It has a coast-line of nearly 6000 miles,—about 4200 on the Pacific and 1600 on the Atlantic. The seaboard is little varied either by deep inlets, bold headlands, broad estuaries, or large islands. On the west side are the vast Gulf of California, in outline somewhat resembling the Red Sea, and so named by some of the early navigators, and the open Bay of Tehuantepec, besides the smaller inlets of Acapulco and San Blas, forming two of the finest harbours in the world, and almost the only safe ones in the republic. On the east side the coast is mostly. beset by lagoons and sand- banks, with no good havens, Campéche, Vera Cruz, Tampico, and Matamoras being all little better than open roadsteads exposed to the fierce "'nortes," or north-easterly gales, that sweep the Gulf of Mexico for a great part of the year. Of headlands the most prominent are Capes 8S. Lucas and Palmas at the south extremity of Lower California, Cor- rientes south from San Blas, and Catoche in the north- east of Yucatan. Besides this peninsula, which projects north-north-east, the only other is that of Lower California, which projects south-south-east parallel to the mainland. The islands are few in number, and all of insignificant size, . the most noteworthy being Tiburon and Angel de la Guarda in the Gulf of California, the uninhabited Revillagigedo group in the Pacific, and Cozumel off the Yucatan coast. Mexico comprises altogether twenty-seven confederate states, one territory, and the Federal District, with areas, populations, and chief towns as under :?—

mentioned architects have pointed out, passed into sculptured Area in | Popula- Popula- ornament when the material of construction became stone instead States pm (1880) Capital. (87780 of wood. Thus the architectural remains, though they failactually | | a. to solve the historical problem of the high culture of the nations Gi (SOnOra.cas.0.:0---ssee0es0-) 81,022 |

189,140} Ures …..cssecs-e.| 9,700 round the Gulf of Mexico, throw much light on it when their g penal 18 ehnoahue seteeeeneess 12 evidence is added to that of religion and customs. Whether Mexican & ee holt piers 14’363 i caiae Sl aa a a ee civilization was a barbaric copy of that which flourished in the now a (Tamar pas eee 28,659 | 144,747 | Ciudad Victoria ….| 7,800 deserted Central-American cities, or whether the nations who built & | Vera Cruz. cesses 27,433 | 504,970 | Jalapa ….....| 12,400 these cities themselves raised toa higher level a civilization derived EB ewe a Eo ie nee al ae spentity % iin from Mexico, two things seem probable, —first, that the civilizations | | Z | Yucatan… “] 323658 | 285,384 Me 32,000 of Mexico and Central America were pervaded by a common influence Sinaloa .. ...| 25,927 | 167,093 | Culiacan….. 7,878 in religion, art, and eustom ; second, that this common element | | , plore teen pee ye ae So a ats0 Hh shows traccs of the importation of Asiatic ideas into America. = Meme us 217809 | 648.857 Nordin BUT aang kes ee secccecsecee ’ st MOVCIIA pcccesssevoes eee ’

Among works of reference on the ancient history and civilization of Mexico Sy | CERES Ohepecouncesocnccon: ‘ 308,716 | Bravos….. 3,800 and Central America may be mentioned H. H. Bancroft, Zhe Native Races of the OAJACH).....20:cse2:-ccress 718,194 | Oajaca,..... ...| 26,228 Pacific States of North America, London, 1875-6 (contains the most complete CDIAWAS...ccsescs-0 5 ,769 | 219,735 | San Cristobal …..... 8,500 summary, with references to original authorities); Brasseur de Bourbourg, Durango….0…0+ 2,643 | 190,846 | Durango ….....). 27,119 Histoire des Nations Civilisées du Merique et de l Amérique- Centrale, Paris, Zacatecas….:.....c0006| 26,585] 413,603 | Zacatecas …..... «| 32,000 1857-59 (a valuable collection of materials, but the author’s own views are mostly Aguas Calientes…..... «| 2,216 | 140,430} Aguas Calientcs…..} 31,872 fanciful); Prescott, History of the Conquest of Merico: Clavigero. Storia Antica « || San Tes POtOSi/ccc-.... 28,889 | 506,799 | San Luis Potosi.,..| 34,300 del Messico, Cescna, 1780 (contains the substance of earlicr writers, such as @ | Guanajuato…..... 11,130} 788,202] Guanajuato …....; 56,112 Gomara, Torquemada, Acosta, Boturini, &c.). For special topics:—Lord Kings- | | 3 4 Querétaro.. 3,429 | 179,915 | Querétaro . 27,560 borough, Antiquities of Mexico, London, 1831-48(contains facsimiles and inter- | | 2 | Hidalgo…..... . 8,480 | 434,096 | Pachuca… 12,500 pretations of

picture-writings, the native chronicles of Ixtlilxochit] and Tezozo- Ol Me wilde cs arcctstces 9,598 | 696,038 | Toluca ….....0.. +00 12,700 moc, a reprint of Sahagun, &c.); A. von Humboldt, Vues des Cordilleres, et MONCIOS)....60s6 1,898 | 154,946 | Cuernavaca …..... ..| 16,320 Monumens des Peuples Indigenes de T Amérique, Paris, 1816 (Mexican civilization Puebla…..... 11,761 | 704,372| Puebla….....06| 64,588 picture-writing, calendar, &¢.). Travels and descriptions of antiquities, &c.: — Tlaxcala …....e0.- v-| 1,498 | 183,498 | Thaxcala…..sessesce 4,300 Dnpaix (in Kingsborough); C. Nebel, Viaje Pintoresco y Arqueologico sobre la Federal Distuict-.. 1 “85 | 354,340 | Mexico….e.~.00.| 241,110 Republica Mejicana. Paris, 1839; F. de Waldeck, Voyage Pittoresque et Archéo- Lower California ; logigque dans la Province d Yucatan, Paris, 1838, and Palenqué et Autres Ruines, (Territory) ..... } 59,033 23,195 | La Paz. soe. «sser0ee 2 ae a ae pate eg Ruines Américaines, av cc texte par Viollet-le-Duc Sas | as

aris, 1563; J. L. Stephens, /ncidents o7 Travel in Central Ameri ; id 9 5 York, 1841; Incidents of Travel in Yucatan, New York. 1858: Bray fe. Tew 763,804 (9,577,279

: $ l Brantz Mayer Mexico, New York, 1854; Tylor, Anahuac, or Mexico and the Mexicans, Borcca,

1861, &e.

Since the appearance of A. von Humboldt’s classic Physical work on New Spain, as Mexico was called in the colonial features. times, this region has continued to be regarded as forming Plateaus

(E. B. T.)

Plate I. II, THE REPUBLIC OF MEXICO.

and

Mexico, Aztec Meritli1 (Estados Unidos de Mexico), is a federal republic in North America, bounded N. by the United States (California, Arizona, and New Mexico), E. by Texas and the Gulf of Mexico, S. by Guatemala and

1 In this, as in allother Aztec names, the (or 7) represents the English sound sh; hence Mexttli and Mexico should be properly pronounced Meshitli, Meshico, But they do not appear to have ever been so pro- nounced by the Spaniards, who naturally gave to the x its ordinary Spanish sound of the German ch.

a main link in the vast: chain supposed to stretch across the entire length of the American continent from Cape

? These figures, in the absence of scientific surveys and a trust-. worthy census, are necessarily more or less approximate. The areas are those of Ripley and Dana, based on A. Garcia Cuba's Carta geo- grafica (Mexico, 1874); the populations of the states and capitals are the estimates of Emiliano Busto in his Estadistica de la Republica Mexicana (Mexico, 1880). A writer in the Times of December ds

eee estimates the whole population at 12,000,000, much too high a ignre.

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Horn to Behring's Strait. But more recent research, and especially the surveys made by the French staff during the military operations between 1861-—67,! have shown that this grand generalization must be abandoned. In remote geological epochs a marine channel seems to have flowed between the northern and southern sections of the New World at the isthmus of Panama, while Mexico itself appears to be mainly a distinct geographical region of relatively recent upheaval. Here there nowhere exists a continuous mountain range, to which might propcrly be applied the designation 'Cordillera of the Andes," an expression which in any case is not current north of the isthmus of Tehuantepec. Mexico forms, on the contrary, a vast table-land, somewhat in the shape of a cornucopia, with its narrow end tapering to the south-south-east, its convex and concave sides facing the Pacific and Atlantic respectively, and with a general inclination northwards. Most of the so-called Cordilleras are merely the "cumbres " or escarpments of this plateau, which falls abruptly towards the Atlantic, and through.a series of well-marked terraces (formerly lacustrine basins) towards the

Pacific. Thus the carriage road from the capital runs in tolerably easy stages successively through the Tetla (8000 feet), Mescala (5500), Papagallo (1800), and Peregrino (1600) valleys down to Tepes within 40 miles of the seaport of San Blas. But the southern central plateau of Anahuac maintains its mean elevation of 7000 to 8000 feet almost everywhere to within 35 or 40 miles of the Atlantic. Hence the railway opened in 1872 between Vera Cruz and the capital has had to be carried by tremendously steep gradients to a height of nearly 8000 feet within a total distance of 263 miles.? The general but gradual northerly tilt of the table-land is shown by the altitudes of the capital, Durango, Chihuahua, and Paso del Norte on the United States frontier, which are respectively 7600, 6630, 4600, and 3800 feet.

At the same time the scarps rise in many places con- siderably above the mean level of the plateau, which is itself intersected and broken into a number of secondary valleys by several short cross ridges, generally following the normal direction from north-north-west to south-south- east. The most continuous range is the Sierra Madre of the Pacific, which may be traced at a mean elevation of over 10,000 feet from Oajaca to Arizona, and which from Guadalajara to the northern frontier is crossed by no carriage route. Parallel to this is the Lower Californian range (Sierra de la Giganta, 3000 feet), which, however, falls abruptly eastwards, like the Atlantic escarpments. The Californian peninsula seems to have been detached from the mainland when the general upheaval took place which produced the vast chasm now flooded. by the Gulf of California. Corresponding with the Sierra Madre of the Pacific on the west are the more interrupted eastern scarps of the central plateau, which sweep round the Gulf of Mexico as the Sierras Madres of Nuevo-Leon and Tamaulipas at an elevation of about 6000 feet. These are crossed by the carriage routes from Tula to Tampico (highest pass 4820 feet), from Saltillo to Monterey (3400), and at several other points.

Of the-central cross ridges the most important orogra- phically and historically is the Cordillera de Anahuac,?

1 The results of these surveys are embodied in the Carte du Mexique, scale 1: 3,000,000, published at Paris in 1873.

2 In the steepest parts the mean is 2°51 in 100, or 1334 feet to the mile. The exact elevation of the capital above the sea at Vera Cruz appears to be 7550 feet, or 80 more than Humboldt's estimate.

3 The term Anahuac, meaning in Aztec ‘‘ near the water,” seems to have been originally restricted to the central lacustrine basin of Tenochtitlan. But when the Aztecs reached both oceans they extended it to the Pacific coast between Tututepec and Guatemala (Anahuac- Ayotlan), and to the Atlantic coast between the Alvarado and Tabasco rivers (Anahuac-Xicalanco). The original use of the word is

which surrounds the Mexican (Tenochtitlan) and Puebla valleys, and which is supposed to culminate with Popo-

| catepetl (17,853 feet) and Ixtaccihuatl (15,705).4 But

these giants belong to a different or rather a more recent system of igneous upheaval, running from sea to sea between 18° 59’ and 19° 12’ N. in almost a straight line east and west, consequently nearly at right angles to the main axis of the central plateau. The line is clearly marked by several extinct cones and by five active or quiescent volcanoes, of which the highest is Popocatepetl, lying south of the capital nearly midway between the Pacific and Atlantic. East of this central point of the system are Citlaltepetl, better known as the Peak of Orizaba (17,176 feet), 70 miles inland, and San Martin or Tuxtla (9708 feet) on the coast south of Vera Cruz, to which correspond on the west the recently upheaved Jorullo (4000 feet) in Michoacan, Colima (12,800) near the coast in Jalisco, and the volcanic Revillagigedo group in the Pacific. South of this line, and nearly parallel, are the Sierras of Guerrero, and south of the Tehuantepec isthmus those of Oajaca and Soconusco towards the Guatemala frontier. In the same direction run the islands of Cuba and Hayti, which probably belong to the same Central- American system.

Mexico is thus physically connected through its older plateau formations with the North-American table-lands, and through its more recent volcanic upheavals with the Central-American igneous region. But as it advances northwards this region loses in underground energy ; hence, notwithstanding the remarkable upheaval of Jorullo in 1759, the Mexican

cones show little signs of activity,® and the land is now scarcely ever wasted by violent eartli- quakes. Such phenomena are most frequent in the Puebla valley ; but, although often accompanied by the peculiar underground rumblings known as bramidos, they are seldom of a destructive character. The natives speak of them rather as temblores, or “tremblings,” than true terremotos.®

In a region where lofty ranges and plateau forma- Hydro- tions with steep escarpments approach almost everywhere graphy.

to within a few miles of the coast, little space is left for the development of large river basins. Most of the streams are little more than mountain torrents rushing impetuously from terrace to terrace seawards. Many also

\ still current amongst the natives as practically synonymous with Central Mexico. As a strictly geographical expression it is vaguely and often incorrectly used by modern writers.

4 This elevation is based on the calculations of Humboldt, Glennie, and Gerolt ; but in 1857 Sonntag assigned an extreme height of over 17,000 feet to the highest peak of Ixtaccihuatl. Popocatepetl is usually supposed to be the highest point of North America; but the recent United States surveys have transferred this honour to Mount Elias on the Alaska coast, which appears to be certainly over 19,000 feet high.

° Popocatepetl emits smoke, whence its name, meaning in Aztec **¢Smoking Mountain,” from popoca “to smoke,” and tepetl ‘** moun- tain.” Since the conquest three eruptions have been reported (1519, 1539, 1540); but the geological evidence seems to indicate that there has been no volcanic action for thousands of years. Orizaba, whose native name means ‘‘Star Mountain,” has been quiescent since 1566. Colima still frequently ejects ashes and smoke; but both Jorullo and Tuxtla are quiescent, the last having been silent since the violent eruption of March 2, 1793. Even the .Mal-pays, or hot dis- trict round Jorullo, has cooled down, and is now again clothed with vegetation.

§ It is noteworthy that the seismic waves flow normally along the indicated line from east to west, thereby confirming Huniboldt’s view that under

about 19° N. there is a deep rent in the earth's crust, through which at different periods the underground fires have broken at various points between thé Gulf of Mexico and the Revilla- vigedo group. ‘‘ Only on the supposition that these volcanoes, which are on the surface connected by a skeleton of volcanic rocks, are also united under the surface by a chain of volcanic elements in continual activity, may we account for the earthquakes which in the direction mentioned cause the American continent, from the Gulf of Mexico to the Pacific Ocean, to oscillate atthe same time”’ (Egloffstein, p. 37).

flow through the profound rocky gorges or barrancas, as they are here called, which form a characteristic feature of the Mexican table-lands.1 On the east side some of these barrancas, here running mostly west and east, attain depths of 800 to 1000 feet in the unfossiliferous limestones of that region ; and even on the west coast the De Beltran caiion is flanked by sheer rocky walls over 500 feet high. Hence the rivers are almost useless for irrigation purposes, and available as means of communication only for short distances in their lower reaches, where they flow through the narrow alluvial strips of level coast-lands to the sea. Even the Rio Grande del Norte, which is by far the largest, and which forms the frontier line between Mexico and Texas, is navigable by large vessels only for a few miles above its port of Matamoras. The Rio Grande de Santiago, the largest on the Pacific side, is almost every- where obstructed by falls and rapids. On this coast the next in importance is the Mercala, or Rio de las Balsas, which, like the Panuco, Alvaredo, Coatzacoalas, Grijalva, and Usumacinta flowing to the Gulf of Mexico, is subject to sudden freshets during the rains.

At this season the waters which find no seaward outlet are collected in the depressions of the plateaus, where extensive tracts remain flooded for several months at a time. But these lacustrine basins of the Anahuac and Chihuahua table-lands, standing at elevations of from 4000 to 7000 feet, are, by evaporation under semi-tropical suns, rapidly reduced to their normal level. The diminished size of the Anahuac lakes shows that since the conquest a steady process of desiccation has been going on, due prob-

‘ably to the reckless destruction of the upland forests by

the European settlers. None of these lakes are of great size except Lake Chapala, which is traversed by the Rio ‘trande de Santiago, and has a reputed area of about 1300 square miles. Amongst those of the plateau especially noteworthy for their magnificent scenery are Tezcuco and Chalco, in whose sparkling waters are reflected the sur- rounding volcanic peaks and extinct craters of the Anahuac table-land, with a background formed by the Cordilleras, whose snowy summits rise here and there high above the dark pine forests of the lower slopes.

In the higher ranges the prevailing formations are granites, which seem also to form the foundation of the plateaus, above which rise the traps, basalts, mineral- bearing porphyries, and more recent lavas. Hence Lyell’s theory that Mexico consisted originally of granitic ranges with intervening valleys subsequently filled up to the level of the plateaus by subterranean eruptions. Igneous rocks of every geologic epoch certainly to a large extent form the superstructure of the central plateau. But the Mexican table-land seems to consist mainly of metamorphic forma- tions, which have been partly upheaved, partly inter- penetrated and overlaid by igneous masses of all epochs, and which are chiefly represented by shales, greywacke, greenstones, silicious schists, and especially unfossiliferous limestone. All these formations are alike remarkable for the abundance and variety of their metalliferous ores, such as silver, silver-glance, copper, and gold. Gneiss and micaceous schists prevail in Oajaca and on all the southern slopes facing both oceans. But the highest ranges are formed mainly of plutonic and volcanic rocks, such as granites, syenites, diorites, mineral-bearing trachytes, basalts, porphyries, obsidian, pearlstone, sulphur, pumice, lavas, tufa, and other recent volcanic discharges. Obsidian (itztlc) was the chief material formerly used by the natives

1‘ Near the mountain ranges, from which the water after heavy rains rushes down in innumerable forest streams, these ravines are filled with incredible rapidity as high as 80 feet, —the torrent importing (sic) trees and bearing away rocks with a thundering noise and irresistible power ” (Egloffstein, p. 22).

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in the manufacture of their cutting implements, as shown by the quarries of the Cerro de las Navajas (“‘ Knife Cliff ”) near Zimapan. Vast deposits of pumice and the purest sulphur are found at Huichapa and in many of the craters. But immeasurably the most valuable rocks are the argentiferous porphyries and schists of the central plateau and in Sinaloa, unless they are destined to be rivalled by the auriferous deposits of Sonora.? Horizontal and stratified rocks, of extremely limited extent in the south, are largely developed in the northern states, and chalk becomes very prevalent towards. the Rio Grande and Rio Gila valleys. To this chalk and to the sandstones are probably to be referred the sandy plains which cover vast tracts in North Mexico, stretching thence far into New Mexico and Texas. Here the Bolson de Mapimi, a vast rocky wilderness inhabited only by wild tribes, occupies a space of perliaps 50,000 square miles in Coahuila and parts of the surround- ing states.

None of the horizontal layers seem to be very rich in ores, which are found mainly in the metamorphic, palzeozoic, and hypogene rocks of Durango, Chihuahua, and the south. Apart from Sinaloa and Sonora, which are now known to contain vast stores of the precious metals, nearly all the historical mines lie on the south central plateau at eleva- tions of from 5500 to 9500 feet. A line drawn from the capital to Guanajuato, and thence northwards to the mining town of Guadalupe y Calvo in Chihuahua, and southwards to Oajaca, thus cutting the main axis of upheaval at an angle of 45°, will intersect probably the richest known argentiferous region in the whole world. The central group of mines in the three mineral districts of Guanajuato, Zacatecas, and Catorze (San Luis Potosi), which have yielded more than half of all the silver hitherto found in Mexico, lie between 21° and 24° 30’ N., within an area of about 13,000 square miles. Here the Veta Madre – lode of Guanajuato alone produced £504,000 between 1556 and 1803, besides £10,000 of gold. This metal, however, occurs chiefly, not on the plateau in association with silver, but on the slopes facing the Pacific, and apparently in greatest abundance in Sonora, near the. auriferous region of New California. In recent times over half of the silver produced in the whole world has been supplied by Mexico, and the total yield of the precious metals between 1537 and 1880 was as under :8—

Gold. Silver. Total.

15387 to 1821…... 1821 to 1880…...

£14,000,000 | £418,000, 000 10,000,000 | 180,000,000

£482, 000,000

190,000, 000

£24,000,000 | £598,000,000 | £622,000,000

Of other minerals the most important are copper, found ina pure state near the city of Guanajuato, and associ- ated with gold in Chihuahua, Sonora, Guerrero, Jalisco,

2 On the general character and distribution of the igneous formations Von Egloffstein remarks: ‘‘Intimate relations exist between the metalliferous and non-metalliferous porphyries. The metalliferous por- phyry is less frequent, but constitutes the most important formation, bearing the precious metals, . . . embracing the rich lodes of Real-del- Monte, Pachuea, Chico, Capula, and Santa Rosa, all of great richness and magnitude. They further form the mineral districts of Augan- gueo, Oro, Huautla, &c., and part of the mountains of Zimapan and Istapa-del-Oro. The lodes found in this porphyry are charactcrized by their magnitude and the consistency of the ores they contain. . . The richest ores of native silver and sulphuret, chloride, and oxide of silver are found in the lodes of Real-del-Monte, Pachuca, and Santa Rosa. . . . The gold seems to exist in small particles in the meta- morphic porphyry mountains, whence it is carried by the rains to the valleys as the rocks become disintegrated” (pp. 6-8).

3 Times correspondent, December 7, 1882. Guanajuato seems to be still the greatest producer, yielding from £1,500,000 to £1,750,000 yearly, although the great Valenciana mine is flooded, and of the hun- dred opened only fifty-two are now worked (Geiger).

Cliniate and. vegeta- tion.

Michoacan, and elsewhere; iron in immense masses in Michoacan and Jalisco, and in Durango, where the Cerro del Mercado is a solid mountain of magnetic iron ore ; lead associated with silver, especially in Oajaca; tin in Michoacan and Jalisco; sulphur in many craters ; platinum recently found in Tlaxcala and Hidalgo; cinnabar also recently in Morelos and Guerrero; “steppe salt” in the sandy districts of the north; “bitter salt” at Tepeyac; coal in limited quantities at various points; bismuth in many parts; marble, alabaster, gypsum, and rock-salt in great abundance throughout the plateau and the sierras. In 1882 there were open altogether 569 mines :—541 silver, 14 gold, 4 copper, 4 lead, 3 salt, 2 coal, and 1 mercury. Intersected about midway by the Tropic of Cancer, and stretching across seventeen parallels of latitude, Mexico, from its position alone, necessarily enjoys a great diversity of climate. But from its peculiar configuration this feature is affected far more by the relief of the land than by its distance from pole or equator. This is especi- ally true of the more fertile and populous section lying within the torrid zone, where three distinct climatic regions are distinguished, not according to their horizontal, but according to their vertical position. The temperature falling steadily with the elevation of the land, which here rises rapidly from sea-level to nearly 18,000 feet above the surrounding waters, the low-lying coast-lands, up to about 3000 feet on the scarps and terraces of the central plateau, are comprised within the first zone of terras calientes, or “hot lands.” Within this zone are included all the sandy and marshy tracts fringing the Gulf of Mexico, the lower slopes facing eastwards and exposed to the hot and moist winds from the Caribbean Sea, and most of Yucatan and the Tehuantepec isthmus, besides the narrow strip between the uplands and the Pacific which broadens northwards along the east side of the Gulf of California. Here the mean temperature varies from 77° to 82° Fahr., seldom falling below 60°, but often rising to 105°, and in the sultry districts of Vera Cruz and Acapulco to 110°. The extreme north-western parts of this region come almost within the rainless zone, and the Californian peninsula itself is subject to excessive droughts, rendering it almost uninhabitable. But farther south the climate on both seaboards may be described as humid, hot, and extremely unhealthy, especially for Europeans. Yellow fever and black vomit are here endemic. But these scourges are at least compensated by a magnificent tropical

vegetation and extensive virgin forests abounding in valuable timbers, dyewoods, and medicinal and other useful plants. Of the 114 species of trees and cabinet woods, 17 of oil-bearing plants, and over 60 of medicinal plants and dyewoods indigenous to Mexico, and often differing specifically from kindred varieties in Central and South America, by far the larger part are repre- sented in the tierras calientes. Amongst the most im- portant of these forest plants are mahogany, rosewood,

? Lorenzo Castro, Mexico in 1882. According to this authority the total yield of the Mexican mines between 1537 and 1880 was £776,276,000, while another estimate based on a report of the Mexican mint gives it at £930,786,000. Of this a large amount has been coined in Mexico, where there were eleven mints at work in 1876, with a total annual yield of about £5,000,000. The total coinage since the conquest has been estimated as high as £600,000,000, not more than 5 percent. of this being gold. With regard tocoal, the ex- istence of which in Mexico has been recently denied by Mr Bigelow in Harper's Magazine, official returns for 1882 give a list of over twenty places where it has been found, though nowhere as yet in large quan- tities. Petroleum also appears to be very abundant in several localities. Amongst other natural products mention should be made of amber, found on the Yucatan coast. Mineral springs are very numerous everywhere on the plateaus and terrace-lands. The most famous are El Pefion and N, Sefiora de Guadelupe near the capital, and Aguas Calientes farther north.

copal, caucho (india-rubber), jalap, sarsaparilla, and vanilla. Here also maize, supplying the staple food of the people, yields prodigious returns, multiplying from two hundred to four hundred fold, and affording two, three, and even four successive crops within the year. Rice, indigo, cotton, tobacco, and coffee all thrive well, while sugar, cocoa, the banana, and several varieties of beans are largely cultivated. The tobacco of Vera Cruz and Tabasco, the coffee of Colima, and the cocoa of Oajaca and Chiapas are of unrivalled excellence.

To the "hot lands" succeed in vertical position the tuerras templadas, or "temperate lands," which comprise all the higher terraces and the central

plateaus themselves between about 3000 and 8000 feet. With a mean tempera- ture of from 62° to 70° Fahr., and oscillating between such moderate extremes as 50° and 86°, this region enjoys one of the very finest climates on the globe. The Puebla and Anahuac table-lands are described by enthusiastic travellers as “terrestrial Edens,” with a perennial spring symbolized by the evergreen oak, cedars, and many analogous plants, which here attain their greatest perfec- tion. The transition from the lower zone is often very gradual; and, while endemic fevers cease altogether at altitudes of 2700 and 2800 feet, the tropical flora invades many parts of the terrace lands, and even of the plateaus to heights of 4000 and 5000 feet.2 A certain uniformity is thus imparted to the Mexican landscape by the wide range of the maize, wheat, tobacco, vine, coffee, and other plantations, as well as by the palms, evergreens, mango, olive, orange, lemon, yucca, and an endless variety of the cactus family, one species of which forms hedges 20 feet high on the Anahuac uplands. The central zone is on the whole drier than the southern lowlands, although the scarps facing seawards are often wrapped in the fogs and mists of the intercepted moisture-charged atmospheric currents. The heaviest recorded rainfall (90 to 100 inches) occurs in the healthy Huatusco district of Vera Cruz, at an altitude of 4380 feet.

In the highest zone of tierras frias, or “cold lands,” embracing all the highlands from about 8000 feet upwards, the rainfall is five times less than on the tierras templadas. Hence snow rests throughout the year only on the four most elevated peaks of Popocatepetl, Orizaba, Nevada de Toluca (15,000 feet), and Ixtaccihuatl. Characteristic both of the tierras frias and templadas~is the maguey (Agave mexicana), whose fruit is edible, and whiose fermented juice has from time immemorial supplied the famous pulgue, or national beverage of the Mexicans. From the fibre of the heniquen, an allied species, is pro- duced the “Sisal hemp” of commerce, which has in recent years become the staple export of Yucatan.

Speaking generally, the four seasons are clearly marked north of 28° N. lat. only. South of that parallel they merge in the estacion de las aguas, or rainy season, from May to October, and the estacvon seca, or dry season, which prevails for the rest of the year. The rains generally begin on the east coast,

gradually moving westwards. In the Pacific the moist atmospheric currents are deflected northwards, whence the striking contrast between the

2 On the Amilpas plateau, which stretches south of Popocatepetl at amean height of 5000 to 5400 feet, “coffee, sugar, and indigo are culti- vated, and most of the tropical fruits grow luxuriantly ” (Egloffstein, p. 17). The saine authority gives the limits of vegetation in this region at 12,614 feet, and the snow-line at 14,960 feet. He observes that ‘‘ nothing is more surprising to the traveller than the varieties of climate under this zone, which vary according to the different elevations above the sea. In a few hours we descended from the cold regions of the fir and the oak, on the heights of Ozumba, to a hot climate, tierra caliente, where we found the most luxuriant vegetation, passing in that short time through successive changes of the most diversified species of trees, plants, birds, insects” (p. 22).

Fauna.

Agricul- ture.

Indus- tries,

Trade.

wooded slopes of British Columbia and the treeless crests of the arid Lower Californian peninsula.

In its fauna no less than in its flora Mexico forms a land of transition between North and Central America. In common with the north it has several varieties of the bear, the wolf, coyote, skunk, bison, squirrel, _ beaver, marten, otter, rattlesnake, heloderm,! mocking-bird, and many wild fowl; while its monkeys (five species), puma, jaguar, ocelot, sloth, tapir, alligators (two species), iguana, boa, scorpions, tarantulas, and numerous brilliantly coloured parrots, trogons, and humming-birds connect it with the southern regions. Peculiar to Mexico, and distinguishing it from most

tropical and subtropical lands, are its song- sters, of which, besides the mocking-bird (zeuzontl), as many as twenty species have been enumerated. The coasts are well supplied with fish and turtles, while the pearl fisheries of the Gulf of California continue to be a source of wealth to that otherwise unproductive territory, yielding in 1875 pearls to the value of £16,000, and £28,000 worth of shells. All the European domestic animals thrive well, and vast herds of cattle, horses, and sheep are found on the well-stocked ranchos of the northern states. Here some of the more prosperous breeders own from twenty to thirty thousand head of oxen, and next to the precious metals hides and cattle are among the chief articles of export.

But in the south stock-breeding yields everywhere to agriculture as the chief occupation of the people. Being largely volcanic, the soil is here extremely fertile wherever water can be had in sufficient quantities for irrigation purposes. Next to maize, which with beans and chilli forms the almost exclusive food of the Indians, the most important crop is probably sugar, of which over 60 million pounds are annually produced in the state of Morelos alone. Coffee is extensively cultivated on the lower slopes, and now exported in considerable quantities, especially to the United States. The tobacco and cotton crops are yearly increasing in importance, while from the maguey is extracted, besides pulque, a spirit called mezcal to the annual value of about £750,000. The aborigines are partly employed as free labourers on the plantations, and partly hold small plots liable to a light Government tax. The food crops thus raised were valued in 1873 at £14,500,000, the agricultural produce at £30,000,000, and the landed property at £85,000,000, but the last item was estimated by the minister of finance at fully three times that sum. The value of arable freehold land was stated in 1882 to be from £1 to £3 per acre, accord- ing to its proximity to or remoteness from rivers.

Of the industries strictly so called, those directly connected with agricultural interests have alone acquired any considerable develop- ment. Such are sugar refining, carried on on a vast scale, especi- allyin Morelos ; brewing and distilling, chiefly from maguey; paper- making from various pulps and fibres ; grist-mills and saw-mills, especially in Puebla, Querétaro, Guadalajara, and Saltillo. A few iron foundrics have been at work for some years, and stout hand- woven cotton and woollen fabrics are produced in

many of the large towns. The rebozos (shawls) of Leon and Salvatierra have a wide repute, while Texcoco and Puebla are noted for their porcelain and glass-ware. Among the petty industries are clay and rag figures, artificial flowers, wooden toys, and gold filigree work, in the produc- tion of which the natives often display remarkable taste and skill.

But all these manufactured wares are solely intended to supply the local wants, so that the exports have hitherto been restricted almost exclusively to the produce of the land and of the mines. Of the former the chief items are coflee, Sisal hemp, tobacco hides, lumber, cochineal, indigo, and other dyes, sarsaparilla, vanilla, orchil, india-rubber. But the precious metals still continue to constitute fully two-thirds of all the exports, which in 1882 had a total estimated value of about £6,000,000. In the same year an

1A specimen of this curious creature, the only known venomous lizard (Heloderma suspectum), reached the London Zoological Gardens in 1882; its habitat is the north of Mexico, and New Mexico, Arizona, and Texas,

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equal suni represented the imports, the leading items of which were cotton, linen, silk, and woollen goods, metals, hardware, machinery, and provisions. Although diplomatic and consular relations with Great Britain have been suspended since 1867, that country still continues to enjoy by far the largest share of the foreign trade, taking about £2,000,000 of the exports, and sending in return about two-thirds of all the imports, for 1882. Next in importance, in descending order, is the trade with the United States, France, Germany, Spain, and Columbia.

Probably four-fifths of the exchanges now pass through Vera Cruz, which, since the opening of the railway to the Anahuac plateau, has become the natural out-port of the capital and all the central states. It is connected by several lines of ocean steamers with Liverpool, Southampton, St Nazaire, and the Atlantic States of North America. On the Pacific seaboard, where the trade is largely in German hands, Acapulco and the other ports also enjoy regular steam communication with San Francisco and Panama. No accurate returns are available of the shipping; but the yearly arrivals in all

the Mexican ports are stated to average about five thousand,—not more than one-fifth under the national flag.

Till recently the means of internal locomotion were mainly

Com-

limited to the wretched bridle-paths from the central plateau over munica-
the sierras and terrace-lands down to a few points on both coasts, tion.

and to twenty-four regular lines of diligences under one manage- inent. But since the completion of the line from Vera Cruz to the capital, with a branch to Puebla, the Mexican railway system has acquired a considerable development. The Inter-Oceanic line across the Tehuantepee isthmus is in progress ; the Great Central Trunk line running northwards through Chihuahua will ere long effect a junction with the North-American net- work; and at the end of 1882 there had been opened to traffic altogether 2219 miles. For that year the number of passengers carried was 8,250,000, and of mer- chandise 273 miillion tons, with net earnings £940,000, or £800 per mile. Still more developed is the telegraph system, which is now extended to all the state capitals, and through the Mexico-Mata- moras line to the United States and the rest of the world. The 8150 miles open in 1882 forwarded 750,000 messages, or in the proportion of 8 per 100 inhabitants.

For the same year the estimated revenue was £6,140,000, and expenditure £6,300,000. The foreign debt is stated to be £19,600,000, and the internal about £10,000,000, or altogether at the rate of £3 per head of the population. Most of the foreign debt is owned in England, but the British claims had long been practically repudiated by the Mexican Government. At the end of 1882, however, a semi-official suggestion was made that a settle- ment might be effected by Mexico paying 1 per cent. on the capital for the first ten years, 2 for the second, and 3 there- after, the whole suin, amounting to £16,000,000, to be liquidated in fifty years.2 The revenue is chiefly derived from the customs, and about £1,750,000 of the expenditure is absorbed by the army, the peace footing of which is 22,500 men of all arms. Beyond a few coastguard steamers maintained mainly for revenue purposes, there is no navy. An indication of financial improvement is afforded by the establishment in 1882 of the Mexican National Bank by a

French company with a capital of £4,000,000. ‘This bank is privileged to issue paper money up to £12,000,000, in return allow- ing the supreme executive to overdraw their account up to £2,000,000. A further symptom of revival is presented by the increasing business of the general post-office, which in 1880 forwarded 4,406,000 letters and packages through 873 offices.

Education also has made marked progress since the final separation of church and state in 1857. In that year the old university of Mexico, a purely ccclesiastical institution after the model of Salamanca and the Sorbonne, was abolished, or rather was re- placed by special schools of law, medicine, letters, agriculture, mines, sciences, fine arts, and commerce, and a military college. These, as well as numerous lower schools, including two hundred in the capital alone, are all maintained by the state, while national schools are supported by public grants in all the large towns, and higher institutions in the capitals of the several states. There are in all nearly five thousand public schools, besides establishments for the deaf and dumb, the blind, and juvenile delinquents, and numerous charitable foundations maiutained by voluntary contri- butions.

Roman Catholicism, which under the Spanisli rule was alone tolerated, continued after the separation to be the state religion till 1857. none are Officially recognized. The great majority of the Indios Jideles, mestizoes, and creoles still adhere at least outwardly to the Roman Church, which is administered by a hierarchy of three arch- bishops (Mexico, Morelia, and Guadalajara) and twelve bishops. But by the organic laws of 1856 and 1859 all ecclesiastical estates, at one time comprising over one-third of the soil, were nationalized,

Z This advance towards a settlement was put forward in the Two Republics of December 5, 1882, a Mexican journal which reflects the views of the Government on all matters of foreign policy.

Finance.

Educa- tion.

Religion.

Since then, while all churches enjoy equal protection,

Admiuis- tration.

History. Colonial period.

ME XTC O

the regular clergy suppressed, and their monasteries, together with | with a people of superior culture

all other superfluous ecclesiastical strnctures, appropriated by the state. During the last few years American Protestant missions have claimed some partial success, and the so-called '* Church of Jesus," an undenominational body of a somewhat original type, has found a number of adherents, especially on the Anahnac table- land. But the Jndios bravos, or uncivilized aborigines, everywhere follow the old spirit worship, while the Christianity of the Fideles is little more than a cloak for the continuous practice of the furmer Aztec heathenism. The pomp of the Roman ritual is supplemented by the feasts of the national worship, and the Pagan deities of the old cult are still represented by the saints of the Roman calendar}

Mexico constitutes at present a confederation of states modelled on that of the North-American Union, and administered according to the constitution of 1857 as amended in 1873-74. By popular suffrage are chosen the president, the upper house (fifty-two members), and the supreme judiciary for four years, and the lower house (two hundred and twenty-seven members) for two years. The senate, abolished in 1853, was restored in 1874, and the chief justice is ex officio vice-president. The federal states, which are divided into a number of administrative districts, enjoy full autonomy in all local matters. The several constitutions are modelled on that of the central government, and like it comprise three departments—legislative, executive, and judicial. Each state is repre- sented in the federal congress in the proportion of one member for every 80,000 inhabitants, and in the federal senate by two members elected by suffrage in the local congress, All external affairs and questions of general interest are reserved for the central government. The constitution as now established thus represents in theory the complete overthrow of medizvalism, and the

absolute triumph of the new ideas which in the Old World are still in so many places struggling for the ascendency.

It is this struggle between privilege and popular rights that lends its human interest to the otherwise monotonous record of unresisted oppression and apparently aimless revolutions which characterize the early and the later periods of Mexican history, from the overthrow of the native rule down to the present day. The early or colonial period covers exactly three hundred years,—from the death in 1521 of Guatemozin, last of the Aztec emperors, to the withdrawal of the last Spanish viceroy, Don Juan O'Donoju, in 1821. During these three centuries the attitude of the masses was one rather of sullen submission than of active resistance to grinding oppression. By the Spanish Govern- ment Mexico was looked on merely as a vast metalliferous region, to be jealously guarded against foreign intrusion and worked exclusively for the benefit of the crown. The natives were evangelized chiefly for the purpose of being employed as slaves above and below ground, and thus was introduced from the West Indies the system of reparti- muentos, or distribution of the aborigines on the plantations and in the mines. But, while this system proved fatal to the natives of Cuba and Hayti, where it had to be replaced by negro labour, the hardier populations of the Anahuac plateau successfully resisted its blighting influences. It proved in fact more disastrous to the oppressor than to the oppressed. In those days Spain was commonly compared to a sieve, never the richer for all the boundless wealth drawn from the New World. But the aborigines derived at least some advantage from contact and partial fusion

1 On the general state of religion in Mexico Bates well remarks:— "The educated classes conform to the outward ceremonies and ordi- nances of the church, while inwardly believing little or nothing of its dogmas. The lower grades of society are, on the other hand, steeped in the most grovelling superstition, intensified by many traditional Indian reminiscences. This section of the community yields a blind obedience to the clergy, notwithstanding the severe laws with which the Government has endeavoured to counteract the influence of the priests. Even so recently as 1874 a genuine case of witch-burning occurred in Mexico."'—Central America, p. 34.

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This fusion, which may be regarded as the chief outcome of the colonial admini-

stration, has contributed to the formation of the present exceedingly complex Mexican nationality, in which the Indian continues to be the predominating element. Taking the whole population at less than ten millions, its ethnical distribution appears to be at present as under :—

i, MBP bleed: Vrtevs.o—.. 35.2. «. canecss-coccece.neesees see 5,000,000 2. Mestizoes (half-caste Indians and whites) ..... 3,000,000 3. Creoles (whites of Spanish descent) .....ccccceseceee 1,500,000 4. Gachupines ? (Spaniards by birth).....00..c00000. 50,000 5. Other Europeans and Americans ….....00ceeccc0eeee 100,000 6. Walled meer gee 6… occ cocscccesceseceses secsccees 10,000 7. Zambos or ‘*Chinos” (Indo-Africans) .....0000.c00cc008 45,000 8. Mulattoes (Burafricams).....cccccccccccssecsseceses oe 5,000

Under the Spanish administration, which was marked on the surface by few stirring events, such as warlike expedi- tions, civil strife, or serious intcrnal troubles, Mexico, or New Spain, formed a viceroyalty at one time stretching from the isthmus of Panama to Vancouver’s Island. Antonio de Mendoza, appointed in 1535 after government by audzencias had proved a signal failure, was the first of sixty-four viceroys who ruled with almost autocratic power, but scarcely any of whom has left a name in history. Don Juan de Acufia (1722-34) is mentioned as having been the only native American among them, and Don Juan V. G. Pacheco (1789-94) had at least the merit of betraying some regard for the social welfare of his subjects. Under him a regular police, the lighting and draining of towns, and other municipal improvements were introduced.

But down to the early years of the present century all emoluments in church and state, most of the large planta- tions, of the mines, and of the commerce of the country, continued to be monopolized by the privileged gachupines, whom the creoles and mestizoes had already begun to regard as aliens. Hence the first reactionary movements, stimulated by Napoleon’s deposition of King Ferdinand and arrest of the viceroy Hurrigaray in 1808,

were aimed rather against odious class distinctions and the intolerable oppression of these aliens than against the abstract rights of the Spanish crown. The long smouldering spirit of discontent at last broke into open revolt in 1810 at Guanajuato, under the leadership of Don Miguel Hidalgo. After his defeat and execution in 1811, the struggle was continued by Morelos, who, like Hidalgo, was a priest, and shared his fate in 1815. But he had already called a national assembly at Chilpanzinco, and by this body Mexican independence was for the first time proclaimed in 1813. A guerilla warfare kept the national spirit alive till a fresh stimulus was given to it by the Spanish revolution of 1820. Under the leadership of the ‘ Liberator” Iturbide, Mexican inde- pendence was again proclaimed on February 24, 1821, and the same year the capital was surrendered by O’Donoju, the last of the viceroys. But even after the revolt had thus been crowned with success a change of personnel rather than of system was contemplated ; nor was Iturbide proclaimed emperor until the Mexican crown had been’ declined by a royal prince of Spain.

Almost simultaneously with this event the republican Period of

standard had been raised by Santa Anna at Vera Cruz ee d .

(December 1822). Thus the nation had no sooner got ri of foreign rule than it became torn by internal dissension. But henceforth the struggle is not so much against the privileged classes as between Conservative and Liberal principles,—the former represented chiefly by the church and the superstitious populace, the latter by the more enlightened but not less unscrupulous sections of the com- munity. From both the Indios Bravos, that is, about a third of the whole population, hold entirely aloof, and take advantage of the public disorders to continue their aggres-

2 From the Aztec Gatzopin, centaur; also known as Chapetones.

sive warfare against all alike! Events now follow in quick succession, and as many as three hundred successful or abortive revolutions are recorded during the brief but stormy life of Mexican national independence.2 But amid the confusion of empires, republics, dictatorships, and military

usurpations, succeeding each other with bewilder- ing rapidity, the thoughtful student will still detect a steady progress towards the ultimate triumph of those Liberal ideas which lie at the base of true national freedom. A brief tabulated summary of the more salient incidents in

this eventful struggle must here suffice :—

1821-23, Mexican independence acknowledged by Spain ; regency under Iturbide, who (1822) is elected hereditary constitn- tional emperor; in December Santa Anna proclaims the republic in Vera Cruz.

1823-24. Provisional Government; Iturbide abdicates ; withdraws to London, but returning is shot (1824).

1824. First Liberal constitution, —“ Acta Constitutiva de la Federa- cion Mexicana,” then comprising nineteen states and five territories; first president D. Felix Victoria, known as ‘‘Guadalupe Victoria.”

1828-30. Contested presidencies of Pedraza, Guerrero, and Busta- mente.

1835. Reaction of the church party; constitution of 1824 abolished ; the confederate states fused in a consolidated republic under Santa Anna as president, but practically dictator.

1836. Tcxas refusing to submit seccdes, defeats and captures Santa Anna.

1837. Santa Anna returning resunies office.

1839. Bravo’s brief presidency followed by much anarchy.

1841-44. Santa Anna’s first dictatorship with two others.

1844, Constitution restored with Santa Anna president ; banished same year, he is succeeded by Canalizo.

1845. Herrera president ; disastrous war with United States to recover Texas.

1846. Santa Anna again president.

1848. Treaty of Guadalupe ; California and New Mexico ceded to United States.

1853. Santa Anna’s second dictatorship; treaty of Mesilla (negotiated by Gadsden) ceding extensive territory to United States and reducing Mexico to its present limits; great financial embar- rassment; ‘‘Plan of Ayutla’; flight of Santa Anna followed by universal chaos.

1855. Provisional Government under President Comonfort.

1856. Constitutional convention ; radical reforms; rupture with Spain.

1857. Liberal constitution of March 11; suspended December 1; Comonfort dictator ; the reaction supported by the church, large part of the army, and all Conservatives; opposed at Vera Cruz by Vice-president Benito Juarez at the head of the “Puros,” or advanced Liberals; the “War of Reform” begius, and lasts till 1860.

1858-59. In the capital Comonfort is deposed by Zuloaga, who abdicates in favour of Miramon, general of the Conservative forces; but, declining the presidency, Miramon_ restores Zuloaga; British legation violated; in Vera Cruz the United States envoy MacLean acknowledges Juarez, who introduces further Liberal measures.

1860. Capitulation of Guadalajara; flight of Miramon from the capital ; triuinph of the Liberals.

1861. Triumphal entry of Juarez into the capital ; further radical reforms ; marriage declared a civil coutract ; celibacy and ecclesiastical tribunals suppressed ; confiscation of church property valued at £75,000,000 and over a third of the soil ; final separation of church and state; Spain, France, and England urge claims for losses of their subjects resident in Mexico; convention of London ; intervention of the allies, who occupy Vera Cruz in December.

1862. England and Spain withdraw, their claims having been settled by negotiation ; war continued by France.

1868-64. The capital occupied by the French; Louis Napoleon dreams of a universal fusion of the Latin races ; offers the Mexican imperial crown to the Austrian archduke Ferdinand Maximilian, who accepts, and arrives in June 1864.

1867. After diverse issues the French withdraw; Maximilian,

abandoned to his fate, is captured and shot at Querétaro (June 19).

1 In December 1882 a party of seventy-five Mexicans and Americans were massacred in the state of Chihuahua by a band of Bravos.

2 Between 1821 and 1868 the form of government was changed ten times; over fifty persons succeeded each other as presidents, dictators, or emperors; both emperors were shot, Iturbide in 1824, Maximilian in 1867, and according to some calculations there occurred at least three hundred pronunciamientos.

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1867-69. Various pronunciamientos by Santa Anna and others. 1871-72. Juarez president; he dies in office July 1872 ; succecded by his secretary Lerdo de Tejada.

| 1873-74. The Liberal constitution of 1857, which had been twice

suspended (1858—60 and 1863-67), is now largely amended, and continues to be henceforth the organic law of Mexico. 1876. Tejada succeeded by Porfirio Diaz. 1880. Manuel Gonzalez, reigning president

Since 1869 the Liberal party has succeeded in preserving peace at home and abroad, while establishing democratic institutions on a firm basis. A. v. Humboldt’s gloomy anticipations® have not been realized, and for the first time in its chequered history Mexico may look forward with some confidence to a bright future. The plague spot is the uncivilized Indian element. But with boundless natural resources at its disposal, a wise

administration may hope to over- come that difficulty, and gradually effect a complete fusion of the antagonistic racial elements.

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III. THE CITY OF MEXICO.

Mexico, the capital formerly of the Aztec empire and of the Spanish colony of New Spain, and now of the republic, state, and federal district of Mexico, stands on the Anahuac plateau, 7524 feet above sea-level, 2} miles from the south- west side of Lake Tezcuco (Texcoco), the lowest and largest of six basins filling the deepest depression inthe hill-encircled Mexican valley. Situated in 19° 25' 45" N. lat. and 99° 7' W. long., it is 173 miles by rail from Vera Cruz on the Atlantic, 290 from Acapulco on the Pacific, 285 from Oajaca, 863 from Matamoros on the United States frontier. Mexico is the largest and finest city in Spanish America, forming a square nearly 3 miles both ways, and laid out with perfect regularity, all its six hundred streets and lanes running at right angles north to south and east to west, and covering within the walls an area of about 10 square miles, with a population (in 1880) of 230,000. Most of the inhabitants are pure-blood Indians or mestizoes ; but the foreigners, chiefly French, English, Germans, Americans, and Spaniards, monopolize nearly all the trade, and as capitalists, bankers, merchants, and dealers enjoy an influence out of all proportion to their numbers. A large portion of the natives are mendicants or vagrants, and the distinctly criminal element (26,470 in 1878) is kept in order by a police force of 1320 men; yet in that year there were as many as 5370 knife-attacks and 3250 robberies. The

3 Consulted shortly before his death as to the future prospects of Mexico, with which his name was so intimately associated, Humboldt

ventured to prophesy that ‘‘ die Vereinigten Staaten werden es an sich reissen und dann selbst. zerfallen.”

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broad, well-paved, and gas-lit streets present a picturesque appearance with their quaint two- and three-storied stone houses gaily painted in white, red, yellow, or green, and terminating everywhere with a background of rugged sierras or snowy peaks which, owing to the bright atmo- sphere at this elevation, seem quite close, although really 30 or 40 miles distant. All the main thoroughfares con- verge on the central Plaza de Armas (Plaza Mayor, or Main Square), which covers 14 acres, and is tastefully laid out with shady trees, garden plots, marble fountains, and seats. Here also are grouped most of the public buildings, towering above whicli is the cathedral, the largest and most sumptuous church in America, which faces the north side of the plaza on the site of the great pyramidal teocalli or temple of Huitzilopochtli, titular god of the Aztecs. This edifice, which was founded in 1573 and finished in 1657, at a cost of £400,000 for the walls alone, forms a Greek cross 426 feet long and 203 wide, with two great naves and three aisles, twenty side chapels, and a magnifi- cent high altar supported by marble columns, and_ sur- rounded by a tumbago balustrade with sixty-two statues of the same rich gold, silver, and copper alloy serving as candelabra. The elaborately carved choir is also enclosed by tumbago railings made in Macao, weighing 26 tons, and valued at about £300,000. In the interior the Doric style prevails, Renaissance in the exterior, which is adorned by a fine dome and two open towers 218 feet high. At the foot of the left tower is placed the famous calendar stone, the most interesting relic of Aztec culture. The east side of the plaza is occupied by the old viceregal residence, now the National Palace, with 675 feet frontage, containing. most of the Government offices (ministerial, cabinet, treasury), military headquarters, archives, meteorological department with observatory, and the spacious hall of ambassadors with some remarkable paintings by Miranda and native artists. North of the National Palace, and apparently forming portions of it, are the post-office and the national museum of natural history

and antiquities, with a priceless collection of Mexican remains. Close to the cathedral stands the Monte de Piedad, or national pawnshop, a useful institu- tion, endowed in 1744 by Terreros with £75,000, and now possessing nearly £2,000,000 of accumulated funds. Facing the cathedral is the Palacio Municipal (city hall), 252 feet by 122, rebuilt in 1792 at a cost of £30,000, and containing the city and district offices, the corporation jail, and the lonja, or merchants' exchange. Around the Plaza San Domingo are grouped the convent of that name, said to contain vast treasures buried within its walls, the old inquisition, now the school of medicine, and the custom-house. In the same neighbourhood are the church of the Jesuits and the school of arts, ''an immense work- shop, including iron and brass foundries, carriage and cart mending, building and masonry, various branches of joinery and upholstery work, and silk and cotton hand-weaving " (Brocklehurst). Other noteworthy buildings are the national picture gallery of San Carlos, the finest in America, in which the Florentine and Flemish schools are well represented, and which contains the famous Las Casas by Felix Parra; the national library of St Augustine, with over 100,000 volumes, numerous MSS., and many rare old Spanish books; the mint, which since 1690 has issued coinage, chiefly silver, to the amount of nearly £400,000,000 ; the Iturbide hotel, formerly the residence of the emperor Iturbide; the Mineria, or school of mines, with lecture-rooms, laboratories, rich mineralogical and geological specimens, and a fossil horse 3 feet high of the Pleistocene period. Owing to the spongy nature of the soil, the Mineria and many other structures have settled out of the perpendicular, thus often presenting irregular lines and a rickety appearance. Among the twenty

scientific institutes mention should be made of the Geogra- phical and Statistical Society, whose meteorological depart- ment issues charts and maps of unsurpassed excellence,

Besides the chief market south of the National Palace there are three others, all well stocked with meat, fish, and especially vegetables, fruits, and flowers grown mainly on the chinampas, or floating gardens of Lakes Chalco and Xochimileo. These gardens, which were far more numerous in

the Aztec times, are formed by placing layers of turf on the matted aquatic vegetable growths to a height of 2 or 3 feet above the water, and securing them by long willow poles driven through them to the bottom, where they take root. They form plots 100 to 200 feet long by 20 to 100 broad, and are firm enough to support the huts of the cultivators. From the still extant illuminated tribute-rolls it appears that the Aztec rulers derived a large share of the taxes from these gardens, which at that time also covered the brackish waters of Lake Tezcuco.

Before 1860 half of the city consisted of churches, convents, and other ecclesiastical structures, most of which have been sequestrated and converted into libraries, stores, warehouses, and cven stables, or pulled down for civic improvements. Nevertheless there still remain fourteen parish and thirty other churches, some of large size with towers and domes, and their number has now been increased by six Protestant churches including the Anglican cathedral in San Francisco Street. This is the leading thoroughfare, and is rivalled in splendour only by the new Cinco de Mayo Street running from the National Theatre to the cathedral.

The city is supplied by two monumental aqueducts, from Chapul- tepec and the south-west, with good water at the rate of 44 gallons per day per inhabitant.

Its industries are varied but unimportant, consisting chiefly of gold and silver work, coarse glazed and unglazcd pottery of peculiar form and ornamentation, paper, feather-work remarkable for its taste and beautiful designs, toys, rosaries, crucifixes, religious pictures, lace, and some weaving.

Mexico enjoys an equable climate, witha temperature varying from 70° to 50° F., but rendered unhealthy by the exhalations from the lakes and the bad drainage. The death-rate in 1876 was 59 per 1000, and 45 in 1878, pneumonia being most fatal (12 per cent. of the total). Standing at the lowest level of a lacustrine valley, 1400 square miles in extent, and completely encircled by hills with no natural outlet, the city has always been subject to floodings from the overflow of the neighbouring freshwater Lakes Zumpango and Xaltocan on the north and Xochimileo and Chalco on the south, which, in the 17th century, laid the whole district under water in

1607, and again for five years from 1629 to 1634. To remedy the evil the engineer Martinez began in 1607 the great cutting 13 miles long through the Nochistongo hill in order to draw off the discharge of Lake Zumpango, the highest in the valley, to the river Tula, a tributary of the Panuco, flowing to the Atlantic. This work, which cost the lives of 70,000 natives, was completed in 1789; but the result was not satisfactory, and the city is still often flooded.

The chief public promenades are the Alameda, planted with stately beeches; the Vega, skirted by the Vega Canal, and adorned with tle colossal bust of Guatemozin, the last of the Aztec em- perors; the Paseo de la Riforma, a fine avenue 3 miles long running south to the famous castle of Chapultepec, a place intimately asso- ciated with the names both of Montezuma and Maximilian. The present castle, erected in 1785 by the viceroy Galvez on the site of Montezuma's palace, commands a superb view of the city and sur- rounding district, and is approached by avenues of gigantic cypresses (Cupressus disticha) dating from Aztec times, growing to a height of 120 feet, and measuring from 30 to 40 feet round the stem. Other good roads with horse or steam trams lead to Tacubaya and the '*' Noche Triste" tree, where Cortes is traditionally supposed to have rested after the disastrous retreat from Mexico on the night of June 30, 1520, to the pleasant suminer suburb of Tacubaya, and to the renowned shrine of Our Lady of Guadalupe, 3 miles to the east on thie border of Lake Tezcuco. Here stands the most famous church in Mexico, erected to commemorate the legendary apparitions of the Madonna to the Indian Juan Diego in December 1531, and still visited by thousands of pilgrims or sightseers.

Mexico dates either from the year 1325 or 1327, when the Aztees after long wanderings over the plateau were directed by the oracle to settle at this spot. For here had been witnessed the auspicious omen of an eagle perched on a nopal (cactus) and devouring a snake. Hence the original name of the city, Tenochtitlan (nopal on a stone), changed afterwards to Mexico in honour of the war god Mexitli. With the progress of Aztec culture the place rapidly im- proved, and about 1450 the old mud and rush houses were replaced by solid stone structures erected partly on piles amid the islets of Lake Tezcuco, and grouped round the central enclosure of the great teocalli. The city had reached its highest splendour on the arrival of the Spaniards in

1519, when it comprised from 50,000 to 60,000 houses, with perhaps 500,000 inhabitants, and seemed to Cortes ‘like a thing of fairy creation rather than the work of inortal hands” (Prescott). It was at that time about 12 miles in circum-

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fcrence, every where intersected by cauals, and connected with the mainland by six long and solidly constructed causeways, as 1s clearly shown by the plan given in the edition of Cortes’s letters published at Nuremberg in 1524 (reproduced in vol. iv. of H. H. Bancroft’s History of the Pacific States, Sau Francisco, 1833, p. 280). After its almost total destruction in November 1521, Cortes employed some 400,000 natives in rebuilding it on the same site ; but since then the lake seems to have considerably subsided, for although still 50 square miles in extent it is very shallow, and has retired 24

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miles from the city. During the Spanish rule the chief event wag the revolt of 1692, when the municipal buildings were destroyed, Since then Mexico has becn the scene of many revolutions, and after the battle of Chapultepec (September 18, 1847) the city was held by the United States troops till the treaty of Guadalupe, May 1848. But since the disorders ending with the death of Maximilian it has turned to peaceful ways, and has become a great centre of civilizing influences for the surrounding semi-barbarous peoples. (A. HH. He)

MEYERBEER, Giacomo (1791-1863), first known in Germany as Jakob Meyer Beer, was born at Berlin on September 5, 1791,1 of a wealthy and talented Jewish family. His father, Herz Beer, was a banker ; his mother, Amalie (née Wulf), was a woman of high intellectual culture ; and two of his brothers distinguished themselves in astronomy and literature. He studied the pianoforte, first under Lauska, and afterwards under Lauska’s master, Clementi. When seven years old he played Mozart’s Con- certo in D Minor in public, and at nine he was pronounced the best pianist in Berlin. For composition he was placed under Zelter, whose lessons were soon exchanged for those of Bernard Weber, then director of the Berlin opera, by

whom he was introduced to the Abbé Vogler. Struck by his brilliant talent, Vogler invited him to Darmstadt, and in 1810 received him into his house, where he formed an intimate friendship with Karl Maria von Weber, who, though his senior by eight years, shared the daily lessons he received from the abbé in counterpoint, fugue, and extempore organ-playing. At the end of two years the grand-duke appointed Meyerbeer composer to the court. His early works, however, were far from successful,—his first opera, Jephtha's Geliibde, failing lamentably at Darmstadt in 1811, and his second, Wirth und Gast (Alimelek), at Vienna in 1814. These checks discouraged him so cruelly that he feared he had mistaken his vocation.

Nevertheless, by advice of Salieri, he determined to study |

vocalization in Italy, and then to form a new style. But at Venice he was so captivated by the style of Rossini that, renouncing all thought of originality, he produced a suc- cession of seven Italian operas—Tomilda e Costanza, Semiramide riconosciuta, Edouardo e Cristina, Emma di Rosburgo, Margherita @ Anjou, L'Esule di Granata, and II Crociato in Egitto—which all achieved a success as brilliant as it was unexpected. Against this act of treason to Ger-

man art Weber protested most earnestly ; and before long —

Meyerbeer himself grew tired of his defection, though the success of JJ Crociato was so great that he was crowned upon the stage. to review his position fairly and dispassionately, and he could not conceal from himself the fact that he was wast- ing in imitation powers which, rightly used, might make his name immortal. For several years after this he pro- duced nothing in public; but, in concert with Scribe, he planned the work which first made known the reality of his transcendent genius—his first French opera, Robert le Diable. Opéra in 1831, and received with acclamation. It was the first of its race, a grand romantic opera, abounding with scenes of startling interest, with situations more powerfully dramatic than any that had been attempted either by Cherubini or Rossini, with mysterious horrors and chivalric pomp, and with ballet music such as had never yet been heard, even in Paris. Its popularity exceeded all previous expectation ; yet for five years after this signal triumph Meyerbeer appeared before the public no more. We cannot

doubt that his motive for this retirement was the determination to produce something greater still ; and

1 Or, according to some accounts, 1794.

An invitation to Paris in 1826 led him |

This gorgeous drama was produced at the Grand |

in some respects his next opera, Les [Tuguenots, really was greater, though it fell short of the deep romance which ren- dered Robert le Diable so incomparably captivating.

The first performance of Les [Zuguenots took place in 1836. In gorgeous colouring, in depth of passion, in con- sistency of dramatic treatment, and in careful delineation of individual character, it is at least the equal of Robert le Diable. In two points only did its interest fall short of that inspired by the earlier work. Meyerbeer had shown himself so great a master in his treatment of the super- natural that one regretted the unavoidable omission of that powerful element in his second grand opera; and, more important still, the fifth act of Les Huguenots was so arranged by the librettist as to render effective musical treatment impossible. The substitution of a noisy fusillade for a legitimate dramatic situation was fatal to the antici- pated climax. The music which accompanies this division of the work is necessarily inferior to all that precedes it. The true interest of the drama culminates at the close of the fourth act, when Raoul, leaping from the window, leaves Valentine fainting upon the ground. The spectator needs not to be told that the former will be shot down the moment hé arrives in the street, or that the latter will mourn for him to the end of her days. Neither musically nor dramatically does anything more remain to be said ; and therefore it is that those who quit the theatre when the curtain falls for the fourth time carry away with them a far more perfect ideal than those who remain to the end.

After the production of Les Huguenots Meyerbeer again retired from public view, and spent many years in the pre-

_ paration of two of his greatest works—the greatest of all

except the two we have already mentioncd—L’A fricaine and Le Prophéte. The libretti of both these operas were furnished by Scribe ; and both were subjected to countless changes of detail before they satisfied the composer’s fastidious taste; in fact, the story of L’Africaine was more than once entirely rewritten.

Meanwhile Meyerbeer accepted the appointment of kapellmeister to the king of Prussia, and spent some years at Berlin, where he produced Hin Feldlager in Schlesien, a German opera, in which the matchless cantatrice Jenny Lind made her first appearance in Prussia, with unprecedented success. Here also he com- posed, in 1846, the overture to his brother Michael’s drama, Struensee. But his chief care at this period was bestowed upon the worthy presentation of the works of others. He began by producing his dead friend Weber’s EHuryanthe, with scrupulous attention to the composer’s original idea. With equal unselfishness he procured the acceptance of Rienzi and Der Iliegende Holldnder, the first two operas of Richard Wagner, who, then languishing in poverty and exile, would, but for him, have found it impossible to obtain a hearing in Berlin. With Jenny Lind as prima donna and Meyerbeer as conductor, the opera flourished brilliantly in the Prussian capital; but the anxieties of ie thankless period materially shortened the composer’s ife,

Meyerbeer produced Ze Prophéte at Paris in 1849; and, if it did not at first create so great a sensation as Les ITuguenots, this was simply because it needed to be better

known. In 1854 he brought out L’Etoile du Nord at the Opéra Comique, and in 1859 Le Pardon de Ploermel (Dinorah). His last great work, L’Africaine, was in active preparation at the Académie when, on the 23d of April 1863, he was seized with a sudden illness, of which he died on the 2d of May. L’Africaine was produced with pious attention to the composer’s minutest Wishes, on April 28, 1865, and fully justified the expectation which had been raised by his long and painstaking consideration of its details. Upon this, in conjunction with Robert le Diable, Les Huguenots, and Le Prophéte, his fame now almost entirely rests.

Meyerbeer’s genius has been criticized with widely different re- sults. Mendelssohn thought his style exaggerated ; Fétis thought

him one of the most original geniuses of the age; Wagner calls |

him ‘‘a miserable music-maker,” and ‘‘a Jewish banker to whom it occurred to compose operas.” But the reality of his talent has been recognized throughout all Europe ; and, in spite of the acknowledged crudity of his system of phrasing, and the inequality of merit too plainly observable even in his greatest works, his name will live so long as intensity of passion and power of dramatic treatment are regarded as indispensable characteristics of dramatic music. (W. S. R.)

MEZIERES, a fortress of the first class, and the capital of the department of Ardennes, France, is 161 miles to the north-east of Paris by railway, on a peninsula of the Meuse, which almost entirely surrounds the town, and separates it from its more important suburb, Charleville. The fortifications, which, as well as the citadel, are the work of Vauban, are pierced by four gates, giving access to the town, the streets of which are narrow and winding. The parish church, erected in the 16th century, contains two inscriptions in commemoration respectively of the raising of the siege of Méziéres in 1521 and the marriage of Charles IX. with the daughter of the emperor Maximilian II., which was celebrated at Méziéres in 1570. The north and south portals, the glass of the windows, and the lofty vaultings of the church are worthy of remark. The hdtel de ville contains several interesting pictures relating to the history of the town. The iron industry, the only one of any importance, is being gradually transferred to Charle- ville. The population in 1881 was 6120.

Founded in the 9th century, Méziéres was at first only a strong- |

hold belonging to the bishops of Rheims, which afterwards became the property of the counts of Rethel. The town was increased by successive immigrations of the people of Liége, flying first from the emperor Otho, and afterwards from Charles the Bold ; and also by concessions from the connts of Rethcl. Its walls were built in the 13th century, and in 1521 it was successfully defended by Bayard against the imperialists. The anniversary of the deliverance of the town is still observed yearly on the 27th of

September. The school of military engineering, since transferred successively to Mctz and Fontainebleau, was originally founded at Méziéres.

MEZO-TUR,} a corporate town in the Cis-Tisian county,

of Jasz-Nagy-Kun-Szolnok, Hungary, situated on the right bank of the Berettyd, and on the railway from Arad to Szolnok, in 47° 1’ N. lat., 20° 39’ E. long. It has Roman Catholic and Calvinist churches and schools, a judicial court for the circuit, and the usual Government offices, but can boast of few buildings of special interest. Horses, oxen, and sheep are reared in great numbers on the wide- spreading communal lands, which are productive also of cereals, and especially wheat, rape-seed, and maize. On the 31st December 1880 the population amounted to 20,649 (10,265 males, 10,384 females), mostly Magyars by nationality.

MEZZOFANTI, Gruszprx (1774-1849), cardinal, whose colloquial linguistic acquirements have become proverbial, was born, September 17, 1774, at Bologna, where his father followed the occupation of a carpenter. Educated first at one of the “scuole pie,” and afterwards at the

1 Mezo is a Magyar word, signifying Field, prefixed to many agri- cultural localities in Hungary.

episcopal seminary of his native city, he was ordained to the priesthood in 1797, and in the same year became pro- fessor of Arabic in the university, but shortly afterwards was deprived on account of his refusal to take the oath of allegiance to the Government of the Cisalpine Republic. In 1803, however, he. was appointed assistant librarian of the institute of Bologna, and soon afterwards was reinstated as professor of Oriental languages and of Greek. The chair was suppressed by the viceroy in 1808, but again rehabilitated on the restoration of Pius VII. in 1814, and continued to be held by Mezzofanti until his removal from Bologna to Rome in 1831, when he received certain ecclesi- astical appointments and the rank of monsignore. Mean- | while his progress in the acquirement of languages had been rapid and untiring, and in 1833 he was appointed to succeed Mai as

chief keeper of the Vatican Library. His promotion to the cardinalate, and the duties of director of studies in the Congregation of the Propaganda, followed in 1838. He died at Rome, during the absence of the pontifical court at Gaeta, on March 15, 1849.

Mezzofanti's peculiar talent, comparable in many respects to that of the numerous '"calenlating boys" who have been the wonder of their contemporaries, was not combined with any exceptional measure of intellectual power, and accordingly prodnced nothing that has not perished with him. It seems to be well established, however, that he spoke with considerable fluency, and in some cases even with attention to dialectic peculiarities, some fifty or sixty languages of the most widely separated fainilies, besides having a less perfect acquaintance with many others. See Manavit, Zsquisse historique sur le Cardinal Mezzofanti, Paris, 1854: and Russell, Life of the Cardinal Mezzofanti, London, 1857.

MEZZOTINT. See Eneravine.

MIAUTSE. The Miautse or Meaou-tsze of southern China are one of the aboriginal tribes of the country. At one time they occupied a considerable portion of the rich and fertile lands which now form the central province of the empire, but as the Chinese advanced southwards they were driven, like the Ainos in Japan and the Welsh in Britain, into the more inaccessible districts until they were compelled to seck refuge from the invaders in the mountain ranges, in the provinces of Yunnan, Kwei-chow, Kwang-se, and Kwang-tung, where they are found at the present day. This line of mountains extends for about 400 miles, and, being in many parts high, steep, and rugged, it forms a convenient shelter for them. As early as. the reign of king Seuen (about 800 B.c.) we read of an expedi- tion having been sent to drive them out of Hoo-nan, and since that time they have been periodically attacked either to punish them for misdeeds or to make them yield up vineyards coveted by Chinese Ahabs. The last important campaign against them was undertaken by the emperor K'een-lung, who, having completely subjugated the Eleuths, was desirous of bringing under his yoke these mountain tribesmen. But the same success which had attended his arms in the north did not follow them to the south. The first expedition was utterly defeated, and the general in command paid the penalty of discomfiture with his head. The leader of a second expedition, having learned wisdom by the fate of his predecessor, purchased the submission of the Miautse by a large bribe. As soon as the unsuspecting savages had been thus lulled into security a third army was set in motion against them. This time, being unpre- pared, they suffered a crushing defeat, and were compelled to purchase peace by swearing allegiance to their conquerors. But, though the Chinese thus gained sovereignty over them, they have since deemed it wise to content themselves with but the shadow of authority. No real jurisdiction is ever exercised over these hardy mountaineers. They are allowed to govern themselves on their own patriarchal system. The old men of each tribe manage the affairs of their juniors, and command an obedience which would be utterly refused | to the mandate of any mandarin. In figure the Miautse,

both men and women, are shorter and darker complexioned than the Chinese, their faces also are rounder and their features sharper. In disposition, too, they are very unlike their civilized neighbours. They are brave, passionate, suspicious, revengeful, and indifferent to cold and hunger ; they are free and easy in their manners, and are as noisily joyous as the Chinese are grave and sedate. They are divided into between forty and fifty clans, each of which is distinguished by a name which is generally derived either froin some physical characteristic, or from some custom, or from the habitat of the clan, as, for example, “The Black Miau, the narrow-headed Miau,” so named from their manner of dressing their hair, “the six-valley Miau,” &c. Among these clans there exist wide differences of culture, some being im no way removed from savages, while others who have been brought under the influence of Chinese civilization show themselves apt and ready learners. Very few of them, so far as is known, possess any written records. The Yaou-jin, or Goblin clan, are said to have books, which, though they are now unable to read, they still regard with reverent awe. “

clans the ‘‘couvade” is an established custom. Their funeral rites |

vary according to the districts, those living within reach of the influ- ence of the Chinese having adopted their customs, while those more remote still hang their dead in baskets from trees, or lay them in the ground and disintcr them yearly to wash their bones. In dress they are fond of bright colours, and commonly wear loose but short jackets, sometimes with and sometimes without trousers. The men wear turbans wound round their hair, which is raised above the head in the shape of a spiral shell, and the women either don a kind of cap, or dress their hair in the shape of a rain’s horn. For inany years the relations of the Miautse with the Chinese Govern- iment have been generally of a peaceable nature, and in the Peking

Gazette of April’ 1881 there was published a new system of |

government by which it is hoped that the incorporation of the mountaineers into the empire may become more real and complete.

See Sketches of the Miau-tsze, translated by £.C. Bridgman ; J. Edkins, The Miau- tsi Tribes, their History; and ‘Quaint customs in Kwei-chow,”

Cornhill Magazine, January 1872.

MICAH (3%) is the short form of a name which in various modifications—Micaiaha, Micaiéhu, Micciah—is common in the Old Testament, expressing as it does a fundamental point of Hebrew faith : Who is like Jehovah ? The name was borne among others by the Danite whose history is given in Judg. xvii. sy., by the prophet who opposed Ahab's expedition to Ramoth-Gilead (1 Kings xxli.), and by the subject of the present article, the con- temporary and fellow-worker of Isaiah, whose name is prefixed to the sixth in order of the books of the minor prophets.!

It is at once apparent that the book of Micah divides itself into at least two distinct discourses, chap. vi. 1 forming a new commencement; and from what we know in general of the compilation of the prophetic collection we cannot at once determine whether the second discourse, which has no title, is to be ascribed to the author of the immediately preceding prophecy, or is to be regarded as an independent and anonymous piece. To decide this question, if it can be decided, we must begin by a separate study of the earlier chapters to which the title in Micah i. 1 directly belongs. These again fall into two parts. Chaps. i.—iil. (with the exception of two verses, ii. 12, 13) are a predic-

1 A confusion between the two prophets of the name has led to the insertion in the Massoretic text of 1 Kings xxii. 28 of a citation from Micah i. 2, rightly absent from the LXX.

| tion of judgment on the sins of Judah and Ephraim. In

a majestic exordium Jehovah Himself is represented as coming forth in the thunderstorm (comp. Amos i. 2) from His heavenly palace, and descending on the mountains of Palestine, at once as witness against His people, and the executer of judgment on their sins. Samaria is sentenced to destruction for idolatry ; and the blow extends to Judah also, which participates in the same guilt (chap. i.). But, while Samaria is summarily dismissed, the sin of Judah is analysed at length in chaps. ii. and ii1., in which the prophet no longer deals with idolatry, but with the corruption of society, and

particularly of its leaders—the grasping aristocracy whose whole energies are concentrated on devouring the poor and depriving them of their little holdings, the unjust judges and priests who for gain wrest the law in favour of the rich, the hireling and gluttonous prophets who make war against every one “that putteth not into their mouth,” but are ever ready with assurances of Jehovah’s favour to their patrons, the wealthy and noble sinners that fatten on the flesh of the poor. The prophet speaks with the strongest personal sympathy of the sufferings of the peasantry at the hands of their lords, and contemplates with stern satisfaction the approach of the destroyer who shall carry into exile “the luxurious sons” of this race of petty tyrants (i. 16), and leave them none to stretch the measuring line on a field in the congregation of Jehovah (ii. 5). The centre of corrup- tion is the capital, the city of Zion, grown great on the blood and wrongs of the provincials, the seat of the cruel princes, the corrupt judges and diviners. For their sake, he concludes, Zion shall be plowed as a field, Jerusalem shall lie in ruins, and the temple hill return to jungle. iui, 12),

: The situation thus sketched receives its elucidation from the data supplied by the title (i. 1) and confirmed and rendered more precise by a remarkable passage in Jeremiah. According to the title Micah flourished in the reigns of Jotham, Ahaz, and Hezekiah; according to Jeremiah (xxvi. 18 sq.) the prophecy of the destruction of Jerusalem just cited was spoken under Hezekiah, and bore fruit in the repentance of king and people, by which the judgment was averted. The allusion beyond doubt is to Hezekiah’s work of religious reformation (2 Kings xviii. 4 sg.). It is hardly possible to separate this reformation from the influ- ence of Isaiah, which did not become practical in the conduct of the state till the crisis of Sennacherib’s invasion ; and the conclusion that Hezekiah was not from the first a reforming king, which is forced on us by many passages of Isaiah, is confirmed by the prophecy of Micah, which, after Hezekiah’s accession, still represents wickedness as seated in the high places of the kingdom. The internal disorders of the realm depicted by Micah are also prominent in Isaiah’s prophecies ; they were closely connected, not only with the foreign complications due to the approach of the Assyrians, but with the break-up of the old agrarian system within Israel, and with the rapid and uncompen- sated aggrandisement of the nobles during those pro- sperous years when the conquest of Edom by Amaziah and the occupation of the port of Elath

by his son (2 Kings xiv. 7, 22) placed the lucrative trade between the Mediterranean and the Red Sea in the hands of the rulers of Judah. On the other hand the democratic tone which distinguishes Micah from Isaiah, and his announcement of the impending fall of the capital (the deliverance of which from the Assyrian appears to Isaiah as the necessary condition for the preservation of the seed of a new and better kingdom), are explained by the fact that, while Isaiah lived in the centre of affairs, Micah was a Morasthite or inhabitant of Moresheth Gath, a place near

| the Philistine frontier so unimportant as to be mentioned

Mi ¢ AW

only in Micah i. 14.1. The provincial prophet sees the capital and the aristocracy entirely from the side of a man of the oppressed people, and foretells the utter ruin of both. But this ruin does not present itself to him as involving the captivity or ruin of the nation as a whole; the congregation of Jehovah remains in Judea when the oppressors are cast out (il. 5); Jehovah's words are still good to them that walk uprightly ; the glory of Israel is driven to take refuge in Adullam, as in the days when David's band of broken men was the true hope of the nation, but there is no hint that it is banished from the land. Thus upon the prophecy of judgment we naturally expect to follow a prophecy of the redintegration of Jehovah's kingship in a better Isracl, and this we find in i. 12, 13 and in chaps. iv., v. Both passages, however, present difficulties. The former seems to break the pointed contrast between ii. 11 and iii. 1, and is therefore regarded by Ewald as an example of the false prophecies on which the wicked rulers trusted. The thought, however, is one proper to all true prophecy (comp. Hos. i. 11 [ii. 2], Isa. xi. 11 sy., Zeph. ii. 14, Jer. xxxi. 8), and precisely in accordance with chaps. iv., v., even in the details of expres- sion and imagery." It is indeed possible that these verses are a separate oracle of Micah, which did not originally stand in its present connexion. The sequence of thought in chaps iv., v., on the other hand, is really difficult, and has given rise to much complicated discussion. There isa growing feeling among scholars that iv. 11-13 stands in direct contradiction to iv. 9, 10, and indeed to iii. 12. The last two passages agree in speaking of the capture of Jerusalem, the first declares Zion inviolable, and its capture an impossible profanation. Such a

thought can hardly be Micah’s, even if we resort to the violent harmonistic process of imagining that two quite distinct sieges, separated by a renewal of the theocracy, are spoken of in consecutive verses. An interpolation, however, in the spirit of such

passages as Ezek. xxxviii., xxxix., Joel iii. [iv.], Zech. xiv., |

is very conceivable in post-exilic times, and in connexion

with the growing impulse to seek a literal harmony of all |

prophecy on lines very different from the pre-exilic view in Jer. xxvi., that predictions of evil may be averted by repentance. Another difficulty lies in the words “and thou shalt come even to Babylon” in iv. 10. Micah unquestionably looked for the destruction of Jerusalem as

‘ That Micah lived in the Shephela or Judean lowland near the Philistine country is clear from the local colouring of i. 10 sq., where a number of places in this quarter are mentioned together, and their names played npon in a way that could hardly have suggested itself to any but a man of the distriet. The paronomasia makes the verses difficult, and in i. 14 none of the ancient versions recognizes More- sheth Gath as a proper name, The word Morasthite (Afé6rashti) was therefore obscure to them; but this only gives greater weight to the traditional pronunciation with 6 in the first syllable, which is as old as the LXX., and goes against the view, taken by the Targum both on Micah and on Jeremiah, and followed by some moderns (including Roorda), that Micah came from Mareshah. When Eusebius places MwpacGci near Eleutheropolis it is not likely that he is thinking of Mareshah (Maresa), for he speaks of the former as a village and of the latter as a ruin 2 miles from Eleutheropolis. Jerome too in the pit. Paule (Ep. eviii.), speaking as an eye-witness, distinguishes Morasthim, with the chureh of Micah’s sepulchre, from Maresa. This indeed was after the pretended miraculous diseovery of the relies of Micah in 385 a.D.; but the name of the village which then existed (Pref. in Mich.) can hardly have been part of a pious fraud.

- The figure of the shepherd gathcring a scattered flock certainly does not presuppose a total captivity,-as Stade (Z. f. AT. He lee Lil Sq.)

argues.

3 See, besides the commentaries, Ndldeke in the Bibel-lex., iv. 214; a paper by Oort and two by Kuenen in TZhcol. Tijdsch., 1872; Well- hausen-Bleek, Hinleitung, p. 426; Stade, 7.c., and zbid., iii. 1 sg. Stade goes so far as to make the whole of Micah iv., V. presuppose thie exile, and to find still later additions in iv. 5-1 Ob, We Gy Ole 4B SE Giescbrecht, Theol. LZ., 1881, col. 443 sq., rejects chap. iv. only. The arguments cannot be here cited at length, but they are tacitly kept in view in what follows.

well as of Samaria in the near future and by the Assyrians (i. 9), and this was the judgment which Hezekiah's repent- ance averted. If-these words, therefore, belong to the original context, they mark it.as not from Micah's hand ; but it is easy to see that they are really a later gloss. The prophetic thought is that the daughter (population) of Zion shall not be saved by her present rulers or defensive strength ; she must come down from her. bulwarks and dwell in the open field; there, and not within her proud ramparts, Jchovah will grant deliverance from her enemies. This thought is in precise harmony with chaps. i—iii., and equally characteristic is what follows in chap. v. Micah's opposition to present tyranny expresses itself in recurrence to the old popular ideal of the first simple Davidic kingdom (iv. 8) to which he had already alluded ini. 15. These old days shall return once more. Again gucrilla bands (ayIx"nN3) gather to meet the foe as they did in the time of Philistine oppression. A new David, like him whose exploits in the district of Micah's home were still in the mouths of the common people, goes forth from Bethlehem to feed the flock in the strength of Jehovah, The kindred Hebrew nations are once more united to their brethren of Israel (comp. Amos ix. 12, Isa. xvi. 1 sq.). The remnant of Jacob springs up in fresh vigour, inspiring terror among the surrounding peoples, and there is no lack of chosen captains to lead them to victory against the Assyrian foe. In the rejuvenescence of the nation the old stays of that oppressive kingship which began with Solomon, the strong- holds, the fortified cities, the chariots and horses so foreign to the life of ancient Israel, are no more known; they disappear together with the divinations, the soothsayers, the

idols, the maggebas and asheras of the high places. Jehovah is king on Mount Zion, and no inventions of man come between Him and His people.

The elements of this picture, drawn so largely from the most cherished memories of the Judseans, could not fail to produce a wide impression, especially when the invasion of Sennacherib, although it spared Jerusalem, fulfilled in the most striking way a great part of Micah's predictions of judgment. Of this we have evidence, not only in Jer. xxvi., but in the political and religious ideas of the book of Deuteronomy. The picture of the right king (Deut. xvii. 14 sq.) and the condemnation of the high-places alike follow the doctrine of Micah.

A difficulty still. remains in the opening verses of chap. iv. Micah iv. 1-8 and Isa. ii. 2-4 are but slightly modified recensions of the same text, and as Isa. ii. is older than the prophecy of Micah, while on the other hand Micah iv. 4 seems the natural completion of the passage, it iscommon to suppose that both copy an older prophct. But the words have little connexion with the context in {saiah, and may be the quotation of a copyist suggested by ver. 5. On the other hand it has been urged that the passage belongs to a later stage of prophetic thought than the 8th century B.c. There is, however, no real difficulty in the idea that foreign nations shall seek law and arbitrament at the throne of the king of Zion (comp. the old prophecy Isa. xvi.); and the mention of the temple as the seat of Jehovah's sovereignty may be illustrated by Isa. vi., where the heavenly palace (Micah i. 3) is at least pictured in the likeness of the temple on Zion. At the same time the Jerusalem of Micah iv. 8 is the Jerusalem of David not of Solomon, the ideas of iv. 1-4 do not reappear in chap. v., and the whole prophecy would perhaps be more consceutive and homogeneous if iv. 6 (where the dispersed and the suffering are, according to chap. ii., the victims of domestic not of forcign oppression) followed directly on iii. 12. ;

The sixth chapter of Micah presents a very different situation from chaps. iv. Jehovah appears to plead with his people for their sins, but the sinners are no longer a careless and oppressive aristo- cracy buoyed up by deceptive assurances of Jehovah's help, by pro- pheecies of wine and strong drink; they are bowed down by a religion of terror, wearied with attempts to propitiate an angry God by countless offerings, and even by the sacrifice of

the first-born. Meantime the substance of true religion—justiee, charity, and a humble walk with God—is forgotten, frand and deceit reign in all classes, the works of the house of Ahab are observed (worship of foreign gods), Jehovah's judgments are multiplicd against the land, and the issuc can be nothing clse than its total desolation. All

these marks fit exactly the evil times of Manassch as described in 2 Kings xxi, Chap. vii. 1-6, in which the public and private cor- ruption of a hopeless age is bitterly bewailed, obviously belongs to the same context (comp. vol. xiii. p. 415). Micah may very well have lived into Manasseh's reign, but the title in i. 1 does not cover a prophecy which certainly falls after Hezekiah's death, and the style has nothing in common with the earlier part_of the book. It is therefore prudent to regard the prophecy, with Ewald, as anony- mous. Ewald ascribes the whole of chaps. vi., vii. to one author. Wellhausen, however, remarks with justice that the thread is abruptly broken at vii. 6, and that verses 7-20 represent Zion as already fallen before the heathen and her inhabitants as pining 1n the darkness of captivity. The hope of Zion is in future restora- tion after she has patiently borne the chastiscmeut of her sins. Then Jehovah shall arise mindful of His oath to the fathers, Israel shall be forgiven and restored, and the heathen humbled. The faith and hope which breathe in this passage have the closest affinities with the book of Lamentations and Isa. x].-1xvi.

We have seen that the text of Micah has suffered from redactors ; it is also not frec from verbal corruptions which make some places very obscure. The LXX. had many readings different from the present Hebrew, but their text too was far from sound. Of commentaries on Micah, that which deals most fully with the question of the text is Roorda's Latin work, Leyden, 1869. The most elaborate book on Micah is Caspari's (Ueber Micha den Morasthiten und seine prophetische Schrift, Christiania, 1851-52). In English Pocock's Commentary (2d ed., 1692) and Cheyne's Micah (1882) are to be noted. See also the literature on the minor prophets in general cited under Hossa, and W. R. Smith's Prophets of Israel (1882). (W. R. S.) MICHAEL OND, "who is like God ?") appears in the Old Testament as a

man’s name, synonymous with Micaiah or Micah. In the book of Daniel the same name is given to one of the chief “princes” of the heavenly host, the guardian angel or “prince” of Israel (Dan. x. 13, 21; xii. 1), and as such he naturally appears in Jewish theosophy as the greatest of all angels, the first of the four who surround the throne of God (see GasriEL). It is as guardian angel of Israel, or of the church, the true Israel, that Michael appears in Jude 9 and Rey. xfi. 7. In the Western Church the festival of St Michael and All Angels (Michaelmas) is celebrated on September 29th ; it appears to have grown out of a local celebration of the dedication of a church of St Michael either at Mount Garganus in Apulia or at Rome, and was a great day by the beginning of the 9th century. The Greek Church dedicates November 8 to St Michael, St Gabriel, and All Angels.

MICHAEL, the name of several Byzantine emperors.

MicnarL I. (Rhangabé) was an obscure nobleman who had married Procopia, the daughter of Nicephorus I, and been made master of the palace; his elevation to the throne was due to a revolutionary movement against his brother-in-law Stauracius, who reigned only two months after the death of Nicephorus on the battlefield (812). Elected as the tool of the bigoted orthodox party in the church, Michael diligently persecuted the Iconoclasts on the northern and eastern frontiers of the-empire, but meanwhile allowed the Bulgarians to ravage a great part of Macedonia and Thrace; having at last taken the field in the spring of 813, he was defeated near Bersinikia, and Leo the Armenian was saluted emperor in his stead in the following summer. Michael, after having been compelled to become a monk, was permitted thenceforward to live unmolested in the island of Prote, where he died in 845. _ Micuazn II. (The Stammerer), a native of Amorium in Phrygia, was of humble origin, and began life as a private soldier, but rose by his talents and assiduity to the rank of general. He was one of those who had favoured the election to the throne of his old companion in arms Leo the Armenian in 813, but, detected in a conspiracy against the government of that emperor, had been sentenced to death in December 820 ; his partisans, however, suc- ceeded in assassinating Leo on the morning of Christmas Day, and called Michael from the prison to the throne. The principal features of his reign (820-829) were a pro- tracted struggle (of nearly three years) against his brother general, Thomas, who

aimed at the throne, the conquest of Crete by the Saracens in 823, and the beginning of their

in his policy towards the image worshippers (his own sympathies were iconoclastic), he incurred the wrath of the monks by entering into a second marriage with Euphrosyne, daughter of Constantine VL., who had previously taken the veil. He died in October 829, and was succeeded by Theophilus his son.

MicwarL III. (The Drunkard) was the grandson of Michael the Stammerer, and succeeded his father Theophilus when only three years of age (842). Until his majority at the age of eighteen the affairs of the empire were managed by the empress-regent his mother Theodora ; his education was shamefully neglected, and it was during this period that Michael formed the disgraceful personal habits which are indicated by his surname. In 861 Michael, together with his uncle Bardas, undertook an expedition against the Bulgarians, which resulted in the conversion of

the Bulgarian king, who thenceforth bore the Christian

name of Michael. The emperor had been less successful in the campaign which he led in person against Omar of Melitene in 860, but in 863 his uncle Petronas gained an important victory over the Saracens in Asia Minor. The year 865 was marked by the first appearance of the Russians in the Bosphorus. Michael was assassinated in his palace in 867 by Basilius the Macedonian, whom he had associated with himself in the empire in the previous year.

MicnarL IV. (The Paphlagonian) owed his eleva- tion to Zoe, daughter of Constantine IX., the last of the Macedonian dynasty; this princess was married to Romanus III., but becoming enamoured of Michael, her chamberlain, she poisoned her husband and married her attendant (1034). Michael, however, being of a weak character and subject to epileptic fits, possessed the supreme power only in name, and was a mere instrument in the hands of his brother, John the Eunuch, who had been first minister both of Constantine and Romanus. John’s diplomacy was successful in keeping

the Arabs in the archipelago and Egypt quiet for some time, and he was at last able to secure a victory for the imperial arms at Edessa in 1037. The attempt to recover Sicily in the following year with the help of the Normans was less pro- sperous, and in 1040 the island wholly ceased to. be a Byzantine province. About the same time, the Bulgarians having overrun Macedonia and Thrace, and threatening Constantinople, the indolent and infirm emperor, to the surprise alike of friends and foes, put himself at the head of the army, and not only drove the enemy beyond the frontier, but followed them into their own territory. He died, shortly after his triumph, on December 10, 1041.

MicuarL V. (Calaphates or The Caulker), nephew and successor of the preceding, derived his surname from his father Stephen, who had originally followed the occu- pation of a caulker of ships. He owed his elevation (December 1041) to his uncle John, whom along with Zoe he almost immediately banished; this led to a popular tumult and his' dethronement after. a brief reign of four months (April 1042). He lived for many years afterwards in the quiet obscurity of a monastery.

MicHaet VI. (The Warlike) was already an old man when chosen by the empress Theodora as her successor shortly before her death in 1056. His government was feeble in the extreme, and he was at last compelled to abdicate by Isaac Comnenus, who had defeated his army in Phrygia (August 1057). He also spent the rest of his life in @ monastery.

MicuarEL VII. (Ducas or Parapinaces) was the eldest son of Constantine XI. Ducas, by whom along with his brothers Andronicus [. and Constantine XII. he was invested with the title of Augustus; this joint succession took place in 1067, but in 1071 it suited the policy of the

attacks upon Sicily (827). Conciliatory on the whole | uncle Joannes Cesar to make Michael sole emperor. For

this position Michael, whose "character was degraded, rather than ennobled, by the virtues of a monk and the learning of a sophist," was by no means fitted, and at length two generals of the name of Nicephorus,

surnamed Bryennius and Botaniates, simultaneously rebelled against him in 1078; with hardly a struggle he resigned the purple and retired into a monastery, where he afterwards received the title of archbishop of Ephesus.

‘Micuazt VIII. (Paleologus), born in 1234, was the son of Andronicus Paleologus Comnenus and _ Trene Angela the granddaughter of Alexius Angelus, emperor of Constantinople. At an early age he rose to distine- tion, and ultimately became commander of the French mercenaries in the employment of the emperors of Nicea.

there accept the ‘‘filioque” and papal supremacy. The union thus brought about between the two churches was, however, extremely distasteful to the Greeks, and the persecution of his “schismatic” subjects to which the emperor was compelled to resort weakened his power so much that Martin IV. was tempted to enter into alliance with Charles of Anjou and the Venetians for the purpose of reconquering Constantinople. The invasion, however, failed, and Michael so far had his revenge in the “ Sicilian Vespers,” which he helped to bring about. He died in Thrace in December 1282, and was succeeded by his son Andronicus IT.

Micuart IX. (Paleologus) was the son of Andronicus II., and was associated with him on the throne from 1295, but predeceased him (1320).

MICHAELIS, Joann Davin (1717-1791), one of the most influential scholars and teachers of last century, belonged to a family which had the chief part in main- taining that solid discipline in Hebrew and the cognate languages which distinguished the university of Halle in the period of Pietism. Johann Heinrich Michaelis (1668-

1738) was the chief director of Francke’s Collegium |

Orventale Theologicum, a practical school of Biblical and Oriental philology then quite unique, and the author of an annotated Hebrew Bible and various exegetical works of reputation, especially the Adnotationes uberiores in Hagio- graphos, 1720. had as fellow-worker his sister’s son Christian Benedict Michaelis (1680-1764), the father of Johann David, who

In his chief publications J. H. Michaelis |

was likewise influential as professor at Halle, and a very sound scholar, especially in Syriac. J. D. Michaelis was trained for academical life under his father's eye. Halle was not then the best of universities ; a. narrow theological spirit cramped all intellectual activity, and the eager viva- cious youth, already distinguished by a love for realities and a distaste for small pedantries, found much of the teaching wearisome enough. He acquired, however, a good know- ledge of the Latin classics,—Greek, he tells us, was hardly taught at all, and his knowledge of Greek literature was gained by his own reading in later years,—learned all that his father could teach, and was influenced, especially in philosophy, by Baumgarten, the link between the old Pietism and Semler, while he cultivated his strong taste for history under Ludwig. In the winter-semester 1739-40 he qualified as university lecturer. One of his disserta- tions was.a defence of the antiquity and divine authority of the vowel points in Hebrew. His scholarship still moved in the old traditional lines in which no further pro- gress was possible, and he was also much exercised by religious scruples, the conflict of an independent mind with that submission to authority at the expense of reason encouraged by the type of Lutheranism in which he had been trained. A long visit to England in 1741-42 lifted him out of the narrow groove of his earlier education. In passing through Holland he made the acquaintance of the great Schultens, whose influence on his philological views was not immediate, but became all-powerful a few years later. England offered to him no such commanding per- sonal influence, and he was not yet able to turn to profit the stores of the great libraries, but his personality was strengthened by contact with a larger life, and his theo- logical views were turned aside from the pietistic channel. Michaelis never ceased to regard himself as essentially orthodox, though he did not feel able fully to subscribe the Lutheran articles, and more than once declined on this account to be professor of theology. But his views acquired a distinctly rationalistic complexion, and the orthodoxy of his Géttingen lectures and publications on

| dogmatic (delivered from a philosophical chair) is of a very Eastern church to attend the council of Lyons (1274) and |

washed-out kind. His really useful work, however, lay in other directions ; the change of his theological views was important because it relieved him from trammels that hampered the free course of his development as a scholar. From England Michaelis went back to Halle ; but he felt himself out of place, and in 1745 gladly accepted an invitation to G6ttingen as privat-docent. In 1746 he became extraordinary, in 1750 ordinary, professor, and in Gottingen he remained till his death in 1791. In the first years of his new position Michaelis passed through a second education. In the young and intellectually vigorous Georgia Augusta he came under the powerful personal influence of such men as Gesner and Haller. His intellect was active in many directions ; universal learning indeed was perhaps one of his foibles. Literature—modern as well as ancient—occupied his attention; one of his works was a translation of four parts of Clarissa; and transla- tions of some of the then current English paraplrases on Biblical books manifested his sympathy with a school which, if not very learned, attracted him by its freer air. His Oriental studies were reshaped by diligent perusal of the works of Schultens ; for the Halle school, with all its learning, had no conception of the principles on which a fruitful connexion between Biblical and Oriental learning can be established. His linguistic work indeed was always hampered by the lack of MS. material which is felt in his philological writings, e.g., in his valuable Supplementa to the Hebrew lexicons (1784—92).1 He could not become

1 By a strange fortune of war it was the occupation of Gottingen by the French in the Seven Years' War, and the friendly relations he

such an Arabist as Reiske; and, though for many years the most famous teacher of Semitic languages in Europe, he had little of the higher philological faculty, and neither his grammatical nor his critical work, highly praised as it then was, has left a permanent mark, with the exception perhaps of his text-critical studies on the Peshito.! His tastes were all for realia—history, antiquities, especially geography and natural science; in his autobiography he half regrcts that he did not choose the medical profession. Here he found a field hardly touched since Bochart, in whose foot- steps he followed in the Spicdlegium geographiz Hebreorum exteree post

Bochartum (1769-80). To his impulse we owe the famous Eastern expedition of Von Haven, Forskal, and Nicbuhr. He prepared the instructions for their journey, and drew up a series of questions and elucidations to guide their researches, which place in strong relief his compre- hensive grasp of all that was then known of the East, and the keen delight in the knowledge of tangible and natural things, paired with a sober and patient judgment, which was his chief intellectual characteristic. this knowledge was turned to the profit of Biblical study ; in his exegetical writings, for example, one of the main features is what was then the novelty of illustrations from Eastern travel. In spite of his doctrinal writings—which at the time made no little noise, so that his Compendium of Dogmatic (1760) was confiscated in Sweden, and the knighthood of the North Star was afterwards given him in reparation—it was the natural side of the Bible that really attracted him, and no man did more to introduce the modern method of studying Hebrew antiquity as an integral part of ancient Eastern life. The permanent

influence of his works indeed has not been great, and many | of them are now hardly readable ; for, with all his historic |

tastes and learning, he had no large historic conceptions, and, what is closcly akin to this defect, was singularly deficient in imagination and poetic sympathy. But the vivacity of his mind, his manysidedness, his singularly attractive though discursive method of lecturing, and above all his power of fecling and inspiring interest in

every kind of fact, was a potent stimulus much needed in |

the Germany of that age, and did not soon die. Different

The best part of |

as the three men are, there is a true historic nexus between |

the threc great Gottingen Orientalists, Michaelis, Eichhorn, and Ewald.

The personal character of Michaelis can be read between the lines of his autobiography with the aid of the other materials collected 7 the editor

Hasseneamp (J. D. Michactlis Lebensbeschreibung, &e.,

98). i not enough to read his books, now for the most part dull enough to us ; we inust see the upright vivacious laborious man, with a good deal of worldly prudenee and a good deal of temper, mueh absorbed in his manifold academie activities in the university and

Royal Society of Gottingen, yet ever full of interest in the larger world, and of shrewd judgments aud lively talk, with a strong sense of his rights and dignity, yet with a good and warm heart; shining espeeially in the leeture-room, where he dealt forth knowledge with discursive hand from a full store, displaying the methods as well as the results of his all-sided research, not without a touch of the vanity of tle polyhistor, and loving to leave the chair under a storm of applause at a parting bou-mot which he acknowledged at the door in a backward glance of triumph. i full list of his works. Besides those already mentioned it is suffi- eient to refer to his New Testament Jntroduction (the first edition, 1750, preceded the full development of his powers, and is a very different book from. the later editions), his reprint of Lowth's Prelectiones with important additions (1758-62), his German translation of the Bible with notes (1773-92), his Orientalische und Exegetische Bibliothek (1775-85), and Neue O. and E. Bib. (1786-91), his Aosaisehes Recht (1770-71), and his edition of Castle's Lexicon Syriacum (1787-88). His Litterarischer Brief- weehsel (1794-96) contains much that is interesting for the history of learning in his time. (W. RB. 8.)

formed with the offieers, that procured him the Paris M8. from which he edited Abulfeda's deseription of Egypt. 1 Cure in Actus Apostolorum Syriacos, 1755.

To understand the secret of his enor i iis, OS) : 4 : : : is one a along with Poujoulat also edited and in part wrote Vouvelle

The same volume contains a'

MICHAUD, Josepu (1767-1839), French historian and publicist, was born of an old family on June 19, 1767, at Albens, Savoy, was educated at Bourg-en-Bresse, and afterwards engaged in literary work at Lyons, where the events of 1789 first called into activity the dislike to revolutionary principles which manifested itself throughout the rest of his life. In 1791 he went to Paris, where, not without danger, he took part in editing several royalist journals. In 1794 he started La Quotidienne, for his con- nexion with which he was arrested after the 13th of Vendémiaire; he succceded in escaping his captors, but was sentenced to death par contwmace by the military council. Having resumed the editorship of his newspaper on the establishment of the Directory, he was again proscribed on the 18th of Fructidor, but at the close of two years returned to Paris when the consulate had superseded the Directory. His Bourbon sympathies led to a_ brief imprisonment in 1800, and on his release he for the time abandoned journalism, and began to write or edit books. Along with his brother and two colleagues he published in 1806 a Biographie moderne, ou dictionnaire des hommes gui se sont fait un nom en Europe depuis 1789, the earliest work of its kind; in 1808 the first volume of his fistovre des Croisades appeared, and in 1811 he originated the Biographie Universelle. In 1814 he resumed the editor- ship of the Quotedienne, and in the same year was elected Academician. In 1815 his brochure entitled Histowre des quinze Semaines ou le dernier régne de Bonaparte met with extraordinary success, passing through twenty-seven editions within a very short time. His political services were now rewarded with the cross of an officer in the Legion of Honour and the modest post of king’s reader, of which last he was deprived in 1827 for having opposed Peyronnet’s “Toi d’Amour” against the freedom of the press. In 1830-31 he travelled in Syria and Egypt for the purpose of collecting additional materials for the J/istowre des Croisades; his correspondence with a fellow explorer, Poujoulat, consisting practically of discussions and eluci- dations of various important points in that” work, was afterwards published (Correspondance d’Orient, 7 vols., 1832-35). The Bibliothéque des Crotsades, in four volumes more, contained the “ pitces justificatives ” of the Ilistotre. Michaud died on September 30, 1839, at Passy, where his home had been since 1832. His L/tstowre des Croisades was published in its final form in six volumes in 1841 under the editorship of his friend Poujoulat (9th ed., with appendix, by Huillard-Brcholles, 1856). Michand

Collection des Mémoires pour servir & VHistoire de France, 32 vols., 1836-44. See Sainte-Beuve, Causeries du LIundi, vol. vii.

MICHAUX, Anpri (1746-1802), a French botanist, best known for his works on the flora of North America and as a botanical traveller. In 1779 he spent some time botanizing in England, and in 1780 he explored Auvergne, the Pyrenees, and the north of Spain. In 1782 he was sent by the French Government on a botanical mission to Persia. His journey began unfavourably, as he was robbed by Arabs of all his equipments execpt his books ; but he gained influential support in Persia, having curcd the shah of a dangerous illness. After two ycars he returned to France with a fine herbarium, and also intro- duccd numerous Eastern .plants into the botanic gardens of France. In 1785 he was sent by the French Govern- ment to North America, and travelled through Canada, Nova Scotia, and the United States as far west as the Mississippi. The outbreak of the French Revolution deprived him of means to continue his work in America, and in 1796 he returned to France. He was shipwrecked, and lost most of his collections on the voyage. In 1800

he went to Madagascar to investigate the flora of that island, and died there in 1802. His work as a botanist was chiefly done in the field, and he added largely to what was previously known of the botany of the East and of America. He also introduced many plants into Euro- pean botanic gardens. He wrote two valuable works on North-American plants,—the Histoire des chénes de lV Amérique Septentrionale (1801), with 36 plates, and the Flora Boreali-Americana (1803), 2 vols., with 51 plates.

MICHAUX, Francois AnpRE (1770-1855), son of the preceding, was, like his father, employed by the French Government to explore the forests of North America with a view to the introduction into France of trees valuable for their wood or other products. He was very success- ful in carrying out this object. He published in 1810-13 a Histowre des Arbres forestréres de ? Amérique Septentrionale, in 3 vols., with 156 plates, a work full of information on the characters, uses, distribution, and other points of interest in the various species. In 1817-19 a translation of it appeared under the title

Morth American Sylva. He also wrote a Voyage a Uouest des Monts Alléghanys, 1804, besides articles in scientific magazines.

MICHELANGELO (1475-1564). Michelangelo Buon- arroti, best known simply as Michelangelo, the last and most famous of the great artists of Florence, was the son of Ludovico Buonarroti, a poor gentleman of that city, and of his wife Francesca di Neri. Ludovico was barely able to live on the income of his estate, but made it his boast that he had never stooped to add to it by mercantile or mechani- cal pursuits. The favour of the Medici procured him em- ployment in some minor offices of state, and in the autumn of 1474 he was appointed resident magistrate of Caprese, in the Casentino, for a period of six months. Thither he accordingly repaired with his family, and there, on March 6, 1475, his second son Michelagniolo or Michelangelo was born. Immediately afterwards the family returned to Florence, and the child was put to nurse with a marble- worker's wife of Settignano. His mother's health had already, it would seem, begun to fail; at all events in about two years from this time, after she had borne her husband two more sons, she died. While still a young boy, Michelangelo determined in spite of his father's opposition to be an artist. He had sucked in the passion, as he himself used to say, with his foster-mother's milk. After a sharp struggle, his stubborn will overcame his father's pride of gentility, and at thirteen he got himself articled as a paid assistant in the workshop of the brothers Ghirlandaio. Domenico Ghirlandaio, bred a jeweller, had become by this time the foremost painter of Florence. In his service the young Michelangelo laid the foundations of that skill in fresco with which twenty years afterwards he confounded his detractors at Rome. He studied also, like all the Florentine artists of that age, in the Brancacci chapel, where the frescos of Masaccio, painted some sixty years before, still victoriously held their own; and here, in a quarrel with an ill-conditioned fellow-student, Torrigiani, he received the blow of which his face bore the marks to his dying day.

Though Michelangelo's earliest studies were directed towards painting, he was by nature and predilection much more inclined to sculpture. In that art he presently received encouragement and training under the eye of an illustrious patron, Lorenzo dei Medici. . On the recommendation, it is said, of Ghirlandaio, he was trans- ferred, before the term of his apprenticeship

as a painter had expired, to the school of sculpture established by Lorenzo in the Medici gardens. Here he could learn to match himself against his great predecessor, Donatello, one of whose pupils was the director of the school, and to com- pare the works of that master and his Tuscan contemporaries

with the antiques collected for the instruction of the scholars. Here, too, he could listen to discourses on Platonism, and steep himself in the doctrines of an enthusiastic philosophy which sought to reconcile with Christian faith the lore and the doctrines of the Academy. Michelangelo remained a Christian Platonist to the end of his days; he was also from his youth up a devoted student of Dante. His powers of mind and hand soon attracted attention, and secured him the regard and favour of his patrons in spite of his rugged, unsociable exterior, and of a temper which at best was but a half-smothered volcano.

Michelangelo had been attached to the school and house- hold of the Medici for barely three years when, in 1492, his great patron Lorenzo died. lLorenzo’s son Piero dei Medici inherited the position, but not the qualities, of his father ; Florence soon chafed under his authority; and towards the autumn of 1494 it became apparent that disaster was impending over him and _ his adherents. Michelangelo was constitutionally subject to dark and sudden presentiments: one such seized him now, and, without awaiting the popular outbreak which soon followed, he took horse with two companions and fled to Bologna. There, being now in his twentieth year, he was received with kindness by a member of the Aldovrandi family, and on his commission executed two figures of ‘saints, and one of an angel, for the shrine of St Dominic in the church of St Petronius. After about a year, work at Bologna failing, and his name having been included in his absence on the list of artists appointed to provide a new hall of assembly for the Great Council of Florence, Michelangelo returned home. The strange theocracy established by Savonarola was now in force, and the whole character of civic life at Florence was for the time being changed. But Michelangelo was not left without employment. He found a friend in another Lorenzo, the son of Pierfrancesco dei Medici, for whom he at this time executed a statue of

the boy St John. Having also carved a recumbent Cupid in imitation of the antique, it was suggested to him by the same patron that it should be so tinted and treated as to look like a real antique, and sold accordingly. Without increasing the price he put upon the work, Michelangelo for anwuse- ment lent himself to the counterfeit, and the piece was then actually sold for a large sum to a Roman collector, the cardinal San Giorgio, as a genuine work of antiquity,—the dealer appropriating the profits. When presently the cardinal discovered the fraud, he caused the dealer to refund ; but as to Michelangelo himself, it was represented to the young sculptor that if he went to Rome, the amateur who had just involuntarily paid so high a tribute ‘to his skill would certainly befriend him. He set forth accord- ingly, and arrived at Rome for the first time at the end of June 1496. Such hopes as he may have entertained of countenance from the cardinal San Giorgio were quickly dispelled. Neither did the banished Piero dei Medici, who also was now living at Rome, do anything to help him. On the other hand Michelangelo won the favour of a Roman nobleman, Jacopo Galli, and through him of the French cardinal Jean de Villiers de la Grolaie, abbot of St Denis. From the former he received a commission for a Cupid and a Bacchus, from the latter for a Dieta, or Mary lamenting over the body of Christ,—works of which probably all three, the last two certainly, are preserved.

Michelangelo’s stay in Rome at this time lasted five years, from the summer of 1496 till that of 1501. ie interval had been one of extreme political distraction at Florence. The excitement of the French invasion, the mystic and ascetic regimen of Savonarola, the reaction which led to his overthrow, and finally the external wars and internal dissidences which preceded a new scttlement, had all created an atmosphere most unfavourable to art.

Nevertheless Ludovico Buonarroti, who in the troubles of 1494 had lost a small permanent appointment he held in the customs, and had come to regard his son Michelangelo as the mainstay of his house, had been repeatedly urging him to come home.

A spirit of family duty and family pride was the ruling principle in all Michelangelo’s conduct. During the best years of his life he submitted

himself sternly and without

a murmur to pinching hardship and almost superhuman —

labour for the sake of his father and brothers, who were ever selfishly ready to be fed and helped by him. Having now, after an illness, come home in 1501, Michelangelo received the request from the cardinal Francesco Piccolomini to adorn with a number of sculptured figures a shrine already begun in the cathedral of Siena in honour of the most distinguished member of his house, Pope Pius IL Four only of these figures were ever executed, and those not apparently, or only in small part, by the master's hand. A work of greater interest in Florence itself had diverted him from his engagement to his Sienese patron. This was the execution of the famous colossal statue of David, popularly known as the Giant. It was carved out of a huge block of marble on which another sculptor, Agostino d'Antonio, had begun unsuccessfully to work forty years before, and which had been lying idle ever since. Michelangelo had here a difficult problem before him. Without much regard to tradition or the historical character of his hero, he carved out of the vast but cramped mass of material a youthful, frowning colossus, which amazed every beholder by its freedom and science of execu- tion, and its victorious energy of expression. All the best artists of Florence were called in council to determine on what site it should be set up, and after much debate the terrace of the Palace of the Signory was chosen, in preference to the neighbouring Loggia dei Lanzi. Here accord- ingly the colossal David of Michelangelo took, in the month of May 1504, the place which it continued to hold ever after- wards, until ten years ago, in 1873, it was removed for the sake of protection to a hall in the Academy of Fine Arts. Other works of sculpture by the same indomitable hand also belong to this period: among these another David, in bronze, and on a, smaller scale; a great rough- hewn St Matthew begun but never completed for the cathedral of Florence; a Madonna and Child executed on the commission of a merchant of Bruges; and two un- finished bas-reliefs of the same subject.

Neither was Michelangelo idle at the same time as a painter. Leaving disputed works for the moment out of sight, he in these days at any rate painted for his and Raphael's common patron, Angelo Doni, the Holy Family now in the Uffizi at Florence. And in the autumn of 1504, the year

of the completion of the David, he received from the Florentine state a commission for a work of monumental painting on an heroic scale. Leonardo da Vinci had been for some months engaged on his great cartoon of the Battle of Anghiari, to be painted on the wall of the great hall-of the municipal council. The gonfaloniere Soderini now procured for Michelangelo the commission to design a companion work. Michelangelo chose an incident of the Pisan war, when the Florentine soldiery had been surprised by the enemy in the act of bathing: he dashed at the task with his accustomed fiery energy, and had carried a great part of the cartoon to completion when, in the early spring of 1505, he broke off the work in order to obey a call to Rome which reached him from Pope Julius IJ. His unfinished cartoon showed how greatly Michelangelo had profited by the example of his elder rival, Leonardo, little as, personally, he yielded to his charm or could bring himself to respond to his courtesy. The work of Michielangelo's youth is for the

most part comparatively tranquil in character. His early sculpture, showing a degree of science and perfection un- equalled since the antique, has also something of the antique serenity. It bears strongly the stamp of intel- lectual research, but not by any means that of storm or strain. In the cartoon of the Bathers, he on the other hand appropriated and carried further the mastery, which Leonardo had first asserted, over every variety of violent action and every extreme of energetic movement. In it the qualities afterwards proverbially associated with Michelangelo—his furza, his terribilita, the tempest and hurricane of the spirit which accompanied his unequalled technical mastery and knowledge—first found expression.

With Michelangelo's departure to Rome early in 1505 the first part of his artistie career may be said to end. It will be convenient here to recapitulate its principal results in sculpture and painting, both those preserved, and those recorded but lost.

ScuLPTURE.—Florence, 1489-94. Head of a Fawn, National Museuin, Florence (?). Condivi describes Michelangelo's first essay in sculpture as a head of an aged faun with a front tooth knocked out, this latter point having been an afterthought suggested by Lorenzo dei Medici. The head is

commonly identified with one in the National Museum at Florence, which, however, bears no marks of Michelangelo's style, and is in all probability spurious. I/adonna Seated on a Step, Casa Buonarroti, Florence. This bas-relief is a genuine example of Michelangelo's carly work in the Medicean school under Bertoldo. It is executed in low relief in imitation of the technical style of Donatello; but the attitudes and characters of the figures, and the long-drawn, somewhat tormented folds of drapery, recall rather the manner of Jacopo della Quercia. Cen- tawromachia, Casa Buonarroti. A fine and unquestionably genuine work in full relicf, of probably somewhat later date than the last- mentioned ; Michelangelo has followed the antique in his con- ception and treatment of the nude, but not at all in the arrange-ment of the subject, which occurs frequently in works of ancient art.'

Bologna, 1494-95. Kneeling Angel, supporting the shrine of St Dominic. This is the figure, with crisp hair, short resolute features, and drapery clinging to show the limbs, on the right- hand side of the spectator as he fronts the altar. The prettier and more engaging figure at the opposite end was long taken to be Michelangelo's work, but is really that of Niccold dell Arca. Michelangelo also finished the figure of St Petronius on the cornice of the same altar, begun by the same Niccold, and exccuted one of St Proculus which has perished.

Florence, 1495-96. St John in the Wilderness, Berlin Museum. During the year between Michclangelo's return from Bologna and his first departure to Rome he executcd, as has been narrated above, a statue of S. Giovannino for Lorenzo di Pierfrancesco dei Medici. This had for centuries been supposed lost, when in 1874 it was declared to have been found in the possession of Count Gualandi- Rossalmini at Pisa. Vehement and prolonged discussions arose as to the authenticity of the work, and at last it was bought for the Berlin Muscum, where its genuineness is with apparently good reason maintained. The stripling saint stands naked but for a skin about his loins, holding a honeycomb in his left hand and lifting to his mouth a goat's horn full of honey with his right. Restoration of an antique group of Baechus and Ampelus, Uffizi Gallery, Florence. This interesting restoration of an antique torso, by the addition of a head, the lower part of the legs, and the accessory figure of an attendant genius, a plinth, and mask, is not one of the works traditionally ascribed to Michelangelo; but has lately, and as it

seems rightly, becn claimed for him on internal evidence. Recumbent Cupid, bought by the cardinal San Giorgio as an antique. This work, which played an important part in Michel- angelo’s history, is unfortunately lost.

Rome, 1495-1501. Kneeling Cupid, South Kensington Mnseum, London. This beautiful statue of an athlctie youth kneeling on the right knee, looking over his right sboulder, with the right hand lowered and the left raised, and having a quiver on the ground beside him, is acknowledged on internal grounds as an early work of Michclangelo. There is some ambiguity about the. character and action of the personage; but the work is usually identified with the Cupid which Michelangelo is recorded to have executed at this time for Jacopo Galli. Baechus and Young Faun, National Museum, Florence. This is unquestionably the ‘‘ Bacchus” eommissioned by the same patron. The finely-framed but soft- limbed youthful god, his weight supported somewhat staggeringly on the left leg, holds up a wine cup m his right hand, and with his loosely-hanging left hand holds a cluster of grapes, at which a child-faun standing a little behind him grasps and nibbles. The surface highly finished and polished, as in the Berlin St Jobn. Virgin Lamenting the Dead Christ, St Peter’s, Rome. This group, executed for the French abbot of St Denis, is.the finest of all

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mt 4 ft

Miehelangelo’s early senlptnres, and one of the finest of his life: |

It still reealls the ideals of some of the earlier Tuscan masters, especially Jacopo da Quereia ; but the execution is of a mastery and nobility unprecedented in Italian art. The Virgin, in drapery of magnificent design, with her left knee somewhat raised and her right hand slightly extended, sits holding on her lap the dead Christ,—a figure of splendid frame and modelling as well as of admirable pathos and dignity in expression.

Florence, 1501-6. Four Saints decorating the Shrine of Pius JUG. in the cathedral of Siena. These figures represent the only part which Michelangelo ever completed of his contract with the car- dinal Piccolomini and his heirs. They are evidently carried out by the hand of pupils only.

Virgin and Child, Liebfrauenkirche, Bruges. This pleasing group has been since the days of Albert Diirer attributed to Michelangelo, and bears the manifest stamp of his design, though its execution may be partly by inferior hands. It is placed elose to the tombstone of a member of the Moscheroni (or Moskeron) family. We know that Michelangelo executed at this time, for one of this very family, a work which the aucient biographers describe as having been in bronze,—a imedal- lion in that metal, says explicitly Vasari; but it is probably really the marble groupin question. Virgin and Child, Royal Academy, London. This beautiful unfinished circular relief is identified with one recorded to have been executed by the master for Taddeo Gaddi. Virgin and Child, National Museum, Florenee,—a similar relief, also unfinished, originally ordered by Bartolommeo Pitti. Youthful David, Academy of Arts, Florence. Of this colossal work, whieh in spite of its scale and subject has still, in grace of pose and style, a considerable artistic affinity with the earlier Bacchus and St John, enough has been said, Figure of David, a small statue in bronze. Several extant works have been pointed out as probably identical with this lost statue ; but the claims of none have been generally acknowledged.

PAINTING. —Holy Family, Uffizi, Florence. This circular picture, painted for Angelo Doni, and mentioned by the earliest biographers, is the dnly perfectly well-attested panel-painting of Michelangelo which exists. His love of restless and somewhat strained actions is illustrated by the action of the Madonna, who kneels on the ground holding up the child on her right shoulder ; his love of the nude by the introduction (wherein he follows Tuca Signorelli) of some otherwise purposeless undraped figures in the background. Virgin and Child with Four Angels, National Gallery, London. This unfinished painting, marked by great grace as well as severity of feeling and design, was formerly attributed to Domenico Ghirlandaio, but is now commonly held to be the earliest extant picture by Michel- angelo. Ofhis manner, especially in the design and treatment of the drapery, it bears evident marks; but the execution seems like that of some weaker pupil or companion, perhaps Ridolfo Ghirlandaio or Granacci. Kntombinent of Christ, National Gallery, London. This ae also unfinished, has in like manner been mucli con- tested. Its composition is unfortunate ; weaker hands have dis- figured some portions of the work ; but the extraordinary excellence of other portions, and the grandeur of some of the actions, render

it probable that the work is one begun and afterwards abandoned by Michelangelo himself. Cartoon of the Battle of Anghiari. Of this famous lost work (begun, though apparently not completed, in the period now engaging us) the only anthentie record is contained in two early engravings, one by Marcantonio and the other by Agostino Veneziano. An elaborate drawing of many figures at Holkham Hall, well known and often engraved, seems to be a later cento destitute of real authority.

Michelangelo had not been long in Rome before Pope Julius devised fit employment for him. That capacious and headstrong spirit, on fire with great enterprises, had conceived the idea of a sepulchral monument to commemorate his glory when he should be dead, and to be executed according to his own plans while he was still living. He entrusted this congenial task to Michelangelo. The design being approved, the artist spent the winter of 1505-6 at the quarries of Carrara, superintending the excavation and shipment of the necessary marbles. In the spring he returned to Rome, and when the marbles arrived fell to with all his energy at the preparations for the work. For a while the pope followed their progress eagerly, and was all kindness to the young sculptor. But presently his disposition changed. In Michelangelo's absence an artist who was no friend of his, Bramante of Urbino, had been selected by Julius to carry out a new architectural scheme, commensurate with the usual vastness of his con- ceptions, namely the rebuilding of St Peter's church. To

the influence and the malice of Bramante Michelangelo |

attributed the unwelcome invitation he now received to interrupt the great work of sculpture which he had just begun, in order to decorate the Sixtine chapel with frescos. Soon, however, schemes of war and conquest interposed to divert the thoughts of Julius, not from the progress of his Own monument merely, but from artistic enterprises altogether. One day Michelangelo heard him say at table to his jeweller that he meant to spend no more money on pebbles either small or great. To add to the artist's discomfiture, when he went to apply in person for payments due, he was first put off from day to day, and at last actually with scant courtesy dismissed. At this his dark mood got the mastery of him. Convinced that not his

employment only but his life was threatened, he suddenly took horse and left Rome, and before the messengers of the pope could overtake him was safe on Florentine territory. Michelangelo's flight took place in April 1506. Once among his own people, he turned a deaf ear to all overtures made from Rome for his return, and stayed throughout the summer at Florence, how occupied we are not distinctly informed, but apparently, among other things, on the continuation of his great battle cartoon. During the same summer Julius planned and executed the victorious military campaign which ended in his unopposed entry at the head of his army into Bologna. Thither, under strict safe-conduct and promises of renewed favour, Michelangelo was at last prevailed on to betake himself. Julius received the truant artist kindly, as indeed between these two volcanic natures there existed a natural affinity, and ordered of him his own colossal likeness in bronze, to be set up, as a symbol of his conquering authority, over the principal entrance of the church of St Petronius. For the next fifteen months Michelangelo devoted his whole strength to this new task. The price at which he undertook it left him, as it turned out, hardly any margin to subsist on. Moreover, in the technical art of metal casting he was inexperienced, and an assistant whom he had summoned from Florence proved insubordinate and had to be dismissed. Nevertheless his genius

| prevailed over every hardship and difficulty, and on the

21st of February 1508 the majestic bronze colossus of the seated pope, robed and mitred, with one hand grasping the keys and the other extended in a gesture of benedic- tion and command, was duly raised to its station over the church porch. Three years later it was destroyed in a revolution. The people of Bologna rose against the authority of Julius; his delegates and partisans were cast out, and his effigy hurled from its place. The work of Michelangelo, after being trailed in derision through the streets, was broken up and its fragments cast into the furnace.

Meanwhile the artist himself, as soon as his work was done, had followed lis reconciled master back to Rome. The task that here awaited him, however, was after all not the resumption of the papal monument, but the execution of the series of paintings in the Sixtine chapel which had been mooted before his departure. Painting, he always averred, was not his

business; and he entered with misgiving and reluctance upon his new undertaking. Destiny, however, so ruled that the work thus thrust upon him remains his chief title to glory. His history is one of

indomitable will and almost superhuman energy, yet of will

that hardly ever had its way, and of energy continually at war with circumstance. The only work which in all his life he was able to complete as he had conceived it was this of the decoration of the Sixtine ceiling. The pope had at first proposed a scheme including figures of the twelve apostles only. Michelangelo would be content with nought so meagre, and furnished instead a design of many hundred figures, embodying all the history of creation and

of the first patriarchs, with accessory personages of prophets and sibyls dreaming on the new dispensation to come, and, in addition, those of the forefathers of Christ. The whole was to be enclosed and divided by an elaborate framework of painted architecture, with a multitude of nameless human shapes supporting its several members or reposing among them,—shapes mediating, as it were, between the features of the inanimate framework and those of the great dramatic and prophetic scenes themselves. Michelangelo’s plan was accepted by the pope, and by May 1508 his preparations for its execution were made. Later in the same year he summoned a number of assistant painters from Florence. Trained in the traditions of the earlier Florentine school, they were unable, it seems, to interpret Michelangelo’s designs in fresco either with sufficient freedom or sufficient uniformity of style to satisfy him. At any rate he soon dismissed them, and carried out the remainder of his colossal task alone, except for the necessary amount of purely mechanical and subordinate help. ‘The physical conditions of prolonged work, face upwards, upon this vast expanse of ceiling were adverse and trying in the extreme. But after four and a half years of toil the task was accomplished. Michelangelo had during its progress been harassed alike by delays of payment and by hostile intrigue. The absolute need of, funds for the furtherance of the undertaking had even constrained him at one moment to break off work, and pursue his inconsiderate master as far as Bologna. His ill-wishers at the same time kept

casting doubts on his capacity, and vaunting the superior powers of Raphael. That gentle spirit would by nature have been no man's enemy, but unluckily Michelangelo's moody, self- concentrated temper prevented the two artists being on terms of amity such as might have stopped the mouths of mischief-makers. Once during the progress of his task Michelangelo was compelled to remove a portion of the scaffolding and exhibit what had been so far done, when the effect alike upon friends and detractors was overwhelm- ing. Still more complete was his triumph when, late in the autumn of 1512, the whole of his vast achievement was disclosed to view.

The main field of the Sixtine cciling is divided into four larger alternating with five smaller fields. The following is the order of the subjects depicted in them:—(1) the dividing of the light from the darkness; (2) the creation of sun, moon, and stars, and of the herbage ; (3) the creation of the waters; (4) the creation of man; (5) the creation of woman; (6) the temptation and expulsion ; (7) an enigmatical scene, said to represent the saerifiec of Cain and Abel, but rather resembling the sacrifice of Noah ; (8) the deluge ; (9) the drunkenness of Noah. The figures in the last three of these scenes are on a smaller seale than those in the first six. In numbers 1, 3, 5, 7, and 9 the field of the picture is reduced by the encroach- mente of the architectural framework and supporters. These sub- jects are flanked at each end by the figure of a seated prophet or sibyl alternately; two other prophets are introduced at each ex- tremity of the series, making seven prophets and five sibyls in all. In the angles to right and left of the prophcts at the two extremitics are tlie Death of Goliath, the Death of Judith, the Brazen Ser- pent, and the Punishment of Hainan. In the twelve lunettes above the windows, and the similar number of triangular vaulted spaccs over them, are mysterious groups, or pairs of groups, of figures, whieli from Michelangelo's own time have usually been known as Aucestors of Christ. The army of nameless architectural and subordinate figures is too numerous to be here spoken of. The work represents all the powers of Michelangelo at their best. Disdaining all the aceessory allurements of the painter's art, he has coucentrated himself upon the exclusive delineation of the human form and face at their highest power. His imagination has eonceived, and his knowledge and certainty of hand have enabled him to realize, attitudes and combinations of unmatched variety and grandeur, and countenances of unmatched expressiveness and power. But.he has not trusted, as he came

later to trust, to science and acquired knowledge merely, neither do his personages, so far

as they did afterwards, transeend human possibility or leave the |

facts of actual life bchind them. In a word, his sublimity, often in exeess of the oeeasion, is here no more than equal to it ; more- over it is combined with the noblest elements of grace and even of tenderness.

As for the intellectual meanings of his vast design, |

ANGELO

over and above those which reveal themselves at a first glance or by a bare degeription,—they are from the nature of the ease in- exhaustible, and can never be perfectly defincd. Whatever the soul of this great Floreutine, the spiritual heir of Dante, with the Christianity of the Middle Age not shaken in his mind, but expanded and transcendentalized, by the knowledge and love of Plato,—whatever the soul of such a man, full of suppressed tender- ness and righteous indignation, and of anxious questionings of coming fate, could coneeive, that Michelangelo has expressed or shadowed forth in this great and significant scheme of paintings. The details it must remain for every fresh student to interpret in his own manner.

The Sixtine chapel was no sooner completed than Michelangelo resumed work upon the marbles for the monument of Julius. But four months only had passed when Julius died. His heirs immediately entered (in the summer of 1513) into a new contract with Michelangelo for the execution of the monument on a reduced scale. What the precise nature and extent of the original design had been we do not know, but the new one was extensive and magnificent enough. It was to consist of a great quadrilateral structure, two courses high, projecting from the church wall, and decorated on its three unattached sides with statues. On the upper course was to be placed the colossal recumbent figure of the pope under a canopy, and beside it mourning angels, with prophetic and allegoric personages at the angles,— sixteen figures in all. The lower course was to be enriched with twenty- four figures in niches and on projecting pedestals :—in the niches, Victories trampling on conquered Provinces ; in the pedestals, Arts and Sciences in

bondage. The entire work was to be completed in nine years' time. During the next three years, it would seem, Michelangelo brought to completion three at least of the promised figures, and they are among the most famous of all exist- ing works of the sculptor's art,—namely, the Moses now in the church of 8. Pietro in Vincoli at Rome and the two "Slaves" at the Louvre.

The Moses, originally intended for one of the angles of the Lee course, is now placed at the level of the eye, in the centre of the principal face of the monument as it was at last finished, on a deplorably reduced and altered scale, by Michelangelo and his assistants in his old age. The prophet, heavily bearded and draped, with only his right arm bare, sits with his left foot drawn back, his head raised and turned to the left with an expression of in- dignation and menace, his left hand laid on his lap and his right grasping the tables of the law. The work, except in one or two places, is of the utmost finish, and the statue looks like one of the prophets of the Sixtine eciling done in marble. The ''Slaves" at the Louvre are youthful male figures of equally perfect execution, nude but for the band which passes over the breast of one and the right leg of the other. One, with his left hand raised to his head aud his right pressed to his bosom, and his eyes almost closed, seems succumbing to the agonics of death; the other, with his arms bound behind his back, looks upward still hopelessly struggling. There is reason to believe that all three of these figures were finished between 1513 and 1516. The beginnings of other figures or groups intended for the same monument are to be found at Florence, where they were no doubt made and then abandoned some years later, — viz., four rudely blocked figures of slaves or prisoners, in a grotto of the Boboli gardens, and the so-called Vietory in the National Museum, an unfinished group of a combatant kneeling on and crushing to death a fallen enemy; with these may be associated a wax model. known as Hercules and Cacus in the South Ken- sington Museum, and the figure of a crouching man at St Peters- burg.

By this time (1516) Michelangelo's evil star was again in the ascendant. Julius H. had been succeeded on the papal throne by a Medici under the title of Leo A, be Medici, too, had about the same time by force and fraud re-established their sway in Florence, overthrowing the free institutions that had prevailed there since the days of Savonarola. Now on the one hand this family were the hereditary friends and patrons of Michelangelo; on the

other hand he was a patriotic son of republican Florence ; so that henceforward his personal allegiance and_ his political sympathies were destined to be at conflict. Over

much of his art, as has been thought, the pain and per- plexity of this conflict have cast their shadow. For the present the consequence to him of the rise to power of the Medici was a fresh interruption of his cherished work on the tomb of Julius. Leo X. and his kinsmen insisted that Michelangelo, regardless of all other engagements, must design and carry out a great new scheme for the enrich- ment of their own family church of San Lorenzo in Florence. The heirs of Julius on their part showed an accommodating temper, and at the request of Leo allowed their three-years'-old contract to be cancelled in favour of another, whereby the scale and sculptured decorations of the Julian monument were again to be reduced by nearly a half. Unwillingly Michelangelo accepted the new com- mission thus thrust upon him for the church facade at Florence; but, having once accepted it, he produced a design of combined sculpture and architecture as splendid and ambitious in its way as had been that for the monu- ment of Julius. In the summer of 1516 he left Rome for Carrara to superintend the excavation of the marbles. Michelangelo was now in his forty-second year. Though more than half his life was yet to come, yet its best days had, as it proved, been spent. All the hindrances which he had encountered hitherto were as nothing to those which began to beset him now. For the supply of materials for the facade of San Lorenzo he had set a firm of masons to work, and had himself, it seems, entered into a kind of partnership with them, at Carrara, where he knew the quarries well, and where the industry was hereditary and well understood. When all was well in progress there under his own eye, reasons of state induced the Medici and the Florentine magistracy to bid him resort instead to certain new quarries at Pietrasanta, near Serravalle in the territory of Florence. Hither, to the disgust of his old clients at Carrara and to his own, Michelangelo accordingly had to transfer the scene of his labours. Presently he found himself so impeded and enraged bythe mechanical difficulties of raising and transporting the niarbles, and by the disloyalty and incompetence of those with whom he had to deal, that he was fain to throw up the commission

altogether. The contracts for the fagade of San Lorenzo were rescinded in March 1518, and the whole magnificent scheme came to nothing. Michelangelo then returned to Florence, where proposals of work poured in on him from many quarters. The king of France desired something from his hand to place beside the two pictures he possessed by Raphael. The authorities of Bologna wanted him to design a facade for their church of St Petronius ; those of Genoa to cast a statue in bronze of their great commander, Andrea Doria. Cardinal Grimani begged hard for any picture or statue he might have to spare; other amateurs importuned him for so much as a pencil drawing or sketch. Lastly his friend and partisan Sebastian del Piombo at Rome, ever eager to keep up the feud between the followers of Michelangelo and those of Raphael, besought him on Raphael's death to return at once to Rome, and take out of the hands of the dead master's pupils the works of painting still remaining to be done in the Vatican chambers. Michelangelo complied with none of these requests. All that we know of his doing at this time was the finishing a commission received and first put in hand four years previously, for a full-sized statue of a nude Christ grasping the Cross. This statue, completed and sent to Rome in 1521 (with some last touches added by subordinate hands in Rome itself), stands now in the church of Sta Maria sopra Minerva; there is little in it of the Christian spirit as commonly understood, although, in those parts which Michelangelo himself finished, there is extreme accomplishment of design and workmanship. The next twelve years of Michelangelo's life (1522-34) were spent at Florence, and again employed principally in

the service of his capricious and uncongenial patrons, the Medici. The plan of a great group of monuments to deceased members of this family,~~to be set up in their mortuary chapel in San Lorenzo, seems to have been formed, and preparations to have been made by Michelangelo for its execution, as earlyas 1519. It was not, however, until 1524, after Leo X. had died, and his successor Adrian VI. had been in his turn succeeded by another Medicean pope, Clement VII., that any practical impulse was given to the work. Even then the impulse was a wavering one. First Clement proposed to associate another artist, Sansavino, with Michelangelo in his task. This proposal being on Michelangelo's peremptory demand abandoned, Clement next~~

~~distracted the artist with an order for a new archi~~ tectural design,—that, namely, for the proposed Medicean or “Laurentian” library. When at last the plans for the sepulchral monuments took shape, they did not include, as had been at first intended, memorials to the founders of the house’s greatness, Cosimo and Lorenzo the Magnificent, or even to Pope Leo X. himself, but only to two younger members of the house lately deceased, Giuliano, duke of Nemours, and Lorenzo, duke of Urbino. Michelangelo brooded long over his designs for this work, and was still engaged on its execution—his time being partly also taken up by the building plans for the Medicean library—when political revolutions interposed to divert his industry. In 1527 came to pass the sack of Rome by the Austrians, and the apparently irretrievable ruin of Pope Clement. The Florentines seized the occasion to expel the Medici from their city, and set up a free republican government once more. Naturally no more funds for the work in San Lorenzo were forthcoming, and Michelangelo, on the invitation of the new signory, occupied himself for a while with designs for a colossal group of Samson and the Philistines, to be wrought out of a block of marble – which had been rough-hewn already for another purpose by Baccio Bandinelli. Soon, however, he was called to help in defending the city itself from danger. Clement and his enemy Charles V. having become reconciled, both alike were now bent on bringing Florence again under the rule of the Medici. In view of the approaching siege, Michelangelo was appointed engineer-in-chief of the fortifications. He spent the early summer of 1529 in strengthening the defences of San Miniato; from July to September he was absent on a diplomatic mission to Ferrara and Venice. Returning in the middle of the latter month, he found the cause of Florence hopeless from internal treachery and from the overwhelming strength of her enemies. Onc of his dark seizures overcame him, and he departed again suddenly for Venice. Not cowardice, but despair of his city’s liberties, and still more of his own professional pro- spects amid the turmoil of Italian affairs, was the motive of his departure. For a while he remained in Venice, negotiating for a future residence in France. Then, while the siege was still in progress, he returned once more to Florence ; but in the final death-struggle of her liberties he bore no part. When in 1530 the city submitted to her conquerors, no mercy was shown to most of those who had taken part in her defence. Michelangelo believed himself in danger with the rest, but on the intervention of Baccio Valori he was presently taken back into favour and

employment by Pope Clement. For three years more he still remained at Florence, engaged principally on the com- pletion of the Medici monuments, and on the continuance of the Medicean library, but partly also on a picture of Leda for the duke of Ferrara.

The statues of the Medici monument take rank beside the Moses and the Slaves as the finest work of Michelangelo's central time in sculpture ; moreover, though some of the figures are unfinished, they constitute as actually executed a complete scheme. They

consist of a Madonna and Child (left imperfect because the marble was shortin bulk), and of the two famous monumental groups, each consisting of an armcd and seated portrait-statue in a niche, with two emblematic figures reclining on each side of a sarcophagus below. The portraits are treated not realistically but typically. In that, of Lorenzo seems to be typified the mood of brooding and concentrated inward thought preparatory to warlike action ; in that of Giuliano, the type of alert and confident practical survey immediately preceding the moment of action. To this contrast of the meditative and active characters corresponds to some extent a contrast in the emblematic groups accompanying the portraits. At the feet of the Duke Giuliano recline the shapes of Night and Day,— the former a female, the latter a male personification,—the former sunk in an attitude of deep but uneasy slumber, the latter (whose head and face are merely blocked out of the marble) lifting himself in one of wrathful and disturbed awakening. But for Michelangelo's unfailing grandeur of style, and for the sense which his works con- vey of a compulsive heat and tempest of thought and feeling in the goul that thus conceived them, both these attitudes might be charged with extravagance. As grand, but far less violent, are those of the two companion figures that recline between sleep and waking on the sarcophagus of the pensive Lorenzo. Of these, the male figure is known as Evening, and the female as Morning (Crepuseolo and Aurora). In Michelangelo's original idea, figures of Earth and Heaven were to be associated with those of Night and Day on the monument of Giuliano, and others of a corresponding nature, no doubt, with those of the Morning and

Evening Twilight on that of Lorenzo; these figures afterwards fell out of the scheme. Michel- angelo's obvious and fundainental idea was, as some words of his own record, to exhibit the elements, and the powers of earth and heaven, lamenting the death of the princes; it is a question of much interest, but not to be discussed here, what other ideas of a more personal and deeper kind may have conflicted or come into association with thesc, and found expression in these majestic works of art, whereof no one who looks upon them can escape the spell.

Michelangelo had never ceased to be troubled by the heirs and executors of Julius, as well as by luis own artistic con- science and ambition, concerning the long-postponed comple- tion of the Julian monument. Agreement after agreement had been made, and then from the force of circumstances broken. In 1532, on the completion of the Medicean monu- ments at Florence, he entered into a new and what he firmly

meant to be a binding contract to complete the work, on a

scale once more very greatly reduced, and to set it up in the .

church of 8. Pietro in Vincoli in Rome. But once more the demands of the pope diverted his purpose. Clement insisted that Michelangelo must complete his decorations of the Sixtine chapel by painting anew the great end wall above the altar, adorned until then by frescos of Perugino. The subject chosen was the Last Judgment, and Michelangelo began to prepare sketches. For the next two years he lived between Rome and Florence, and in the autumn of 1534, in his sixtieth year, settled finally and for the remainder of his life at Rome. Immediately afterwards Pope Clement died, and was succeeded by a Farnese under the title of Paul III. Even more than his predecessor, Paul insisted on claiming the main services of Michelangelo for himself, and forced him to let all other engagements drift. For the first seven years after the artist's return to Rome, his time was principally taken up with the painting of the colossal and multitudinous Last Judgment. This being completed in 1541, he was next compelled to undertake two more great frescos, one of the Conversion of Paul and another of the Martyrdom of Peter, in a new chapel which the pope had caused to be built in the Vatican, and named after himself Capella Paolina.

The fresco of the Last Judgment in the Sixtine chapel is probably the most famous single picture in the world. In it Michelangelo shows more than ever the omnipotence of his artistic science, and the fiery daring of his conceptions. The work exhibits the athletic unclothed human form in every variety and extremity of hitherto unattempted action and predicament. But of moderation, as well as of beauty and tenderness, it is almost entirely devoid. Whether from the complexion of his own thoughts, and the sxva indignatio that was native to his breast, or from the influ- ence of the passionate and embittered theological temper of the time, Michelangelo has here neglected the consolatory aspects of Christianity, and insisted on its terrific aspeets almost exclusively.

Neither in the qualities of colour and execution is the work, so far as the condition of either adinits comparison, comparable for charm to the earlier and far more nobly-inspired frescos of the ceiling. It is to these, and not to the Last Judgment, that the student must turn if he would realize what is best and greatest in the art of Michelangelo.

The frescos of the Pauline Chapcl are on their part in part so injured as to be hardly susceptible of uscful study or criticism. In their ruined state they bear evidence of the same tendencics that made the art of Michelangelo in its latest phase so dangerous an example to weaker men,—the tendency, that is, to seek for energy and violence of action both in place and out, for ‘‘ terrible- ness” quand méme, and to design actions not by help of direct study from nature, but by scientific deduction from the abstract laws of structure and movement. At best these frescos can never have been happy examples of Michelangelo’s art.

During the fifteen years (1534-49) when Michelangelo was mainly engaged on these paintings, he had also at last been enabled to acquit himself, although in a manner that can have been satisfactory to none concerned, of his engagements to the heirs of Julius. Once more the influence of the pope had prevailed on them to accept a compromise altogether to their disadvantage. It was agreed that the Moses executed thirty years before should be the central figure of the new scheme ; assistants were employed to carve two smaller flanking figures of female personifications ; and the

three were in 1545 set up in 8. Pietro in Vincoli in. combination with an architectural structure of rich but incongruous design. During the saine years the long-pent human elements of fervour and tenderness in Michelangelo's nature had found vent and utterance such as they had never found before. He had occasionally practised poetry in youth, and there are signs of some transient love-passage during his life at Bologna. But it was not until towards his sixtieth year that the springs of feeling were fairly opened in the heart of this solitary, this masterful and stern, life-wearied and labour- hardened man. Towards that age we find him beginning to address impassioned sonnets, of which the sentiment is curiously comparable to that expressed in some of Shake- speare's, toa beautiful and gifted youth, Tommaso Cavalieri. Soon afterwards he made the acquaintance of the pious, accomplished, and high-souled lady, Vittoria Colonna, widow of the Marquis Pescara. For twelve years until her death, which happened in 1547, her friendship was the great solace of Michelangelo's life. On her, in all loyalty and reverence, he poured out all the treasures of his mind, and all his im- prisoned powers of tenderness and devotion. He painted for her a crucifixion of extraordinary beauty, of which many imitations but not the original have come down to us. She was the chief inspirer of his poetry,—in which, along with her praises, the main themes are the Christian religion, the joys of Platonic love, and the power and mysteries of art. Michelangelo's poetical style is strenuous and concentrated like the man. He wrote with labour and much self-correc- tion ; we seem to feel him flinging himself on the material of language with the same overwhelming energy and vehemence,—the same impetuosity of temperament, com- bined with the same fierce desire of perfection,—with which contemporaries describe him as flinging himself on the material of marble.

'And so the mighty sculptor, painter, and poet reached old age. An infirmity which settled on him in 1544, and the death of Vittoria Colonna in 1547, left him broken in health and heart. But his strength held on for many a year longer yet. His father and brothers were dead, and his family sentiment concentrated itself on a nephew, Leonardo, to whom he showed unremitting practical kind- ness, coupled with his usual suspiciousness and fitfulness of temper. In almost all his relations the old man con- tinued to the end to manifest the same loyal and righteous heart, accompanied by the same masterful, moody, and estranging teniper, as in youth. Among the artists of

the younger generation he held a position of absolute | send him to the famous Collége or Lycée Charlemagne,

ascendency and authority; nor was his example, as we have said, by any means altogether salutary for them. During the last years of his life he made but few more essays in sculpture, and those not successful, but was much employed in the fourth art in which he ex- celled, that of architecture. IIT. he built the palace called after the name of the pope's family the Farnese. On the death of Antonio da San Gallo he succeeded to the onerous and coveted office of chief architect of St Peter's Church, for which he remodelled all the designs, living to see some of the main features, including the supports and lower portion of the great central dome, carried out in spite of all obstacles according to his plans. Other great architectural tasks on which he was engaged were the conversion of a portion of the Baths of Diocletian into the church of Sta Maria degli Angeli, and the embellishment and rearrangement of the great group of buildings on the Roman Capitol. At length, in the midst of these vast schemes and responsibilities, the heroic old man's last remains of strength gave way. He died on the threshold of his ninetieth year, on the 18th of February 1564.

For the bibliography of Michelangelo, which is extensive, see the useful though very imperfect compilation of Passerini, Bibliografia di Michelangelo Buonarroti, &c., Florence, 1875. The most import- ant works, taken in chronological order, are the following :—P. Giovio, supplement to the fragmentary Dialogus de viris litteris allustribus, written soon after 1527, first published by Tiraboschi, Storia ~~della Letteratwra italiana, Modena, 1871; G. Vasari, in Vite degli piu cccellenti architettori, pittori, e seultori, &c., Florence, 1550; A. Condivi, Vita di Michelangelo Buonarroti, 1553; this account, for which the author, a pupil and friend of the master's, had long been collecting materials, was much fuller than that of Vasari, who made use of it in rewriting his own life of Michelangelo for his second edition, which appeared after the master's death (1568). The best edition of Vasari is that by Mila~~ nesi, Florence, 1878-83; of Condivi, that by Gori and Mariette, Pisa, 1746. The first additions of importance were published by Bottari,

. Raccolta di leticre sulla pittura, &c., Rome, 1754 (2d ed., by

Ticozzi, Milan, 1822); the next by Gaye, Carteggio inedito, 1840. Portions of the correspondence preserved in the Buonarroti archives were published by Guasti in his notes to the Rime di Michelangelo Buonarroti, 1863, and by Daclli in Carte Michelangelesche inedite, Milan, 1865. Complete biographies of Michelangelo had been meanwhile attempted by J. Harford, London, 1857, and with more power by Hermann Grimm, Leben Michelangelo's, Hanover (5th ed., 1879). A great increment of biographical material was at length obtained by the publication, in the four hundredth year after Michelangelo's birth, of the whole body of his letters preserved in the Buonarroti archives,—JZettere di Michelangelo Luonarroti, ed..G. Milanesi, Florence, 1875. This material was first employed ina connected narrative by A. Gotti, Vita di Michel- angclo, Florence, 1875. Next followed C. Heath Wilson, Life and Works of Michelangelo Buonarroti, F lorence, 1876, the technical remarks in which, especially as concerns the fresco-paintings, are valuable. Lastly, the combined lives of Michelangelo and Raphael by Professor A. Springer in Dohme's scrics of Kunst u. Kiinstler, Leipsic, 1878, contain the best biography of the master which has yet appeared. Of the poems of Michelangelo the best edition is that already referred to,—G. Guasti, Rime di Michelangelo Buonar- rott, 1863; in earlier additions the text had been recklessly tampered with, and the rugged individuality of the master's style smoothed down. An' edition with German translations was published by Hasenclever, Leipsic, 1875; for the English student the translations by Mr J. A. Symonds, in Sonnets of Michelangelo and Cam- panella, London, 1878, are invaluable. (S. C.)

MICHELET, Jures (1798-1874), one of the most voluminous and remarkable writers of France, and one who only lacked a keener power of self-criticism to make him one of the greatest, was born at Paris, August 21, 1798. He: belonged to a family which had Huguenot traditions, and which was latterly occupied in the art of printing. His father was a master printer, but seems not to have been very prosperous, and the son at an early age assisted him in the actual work of the press. A place was offered him in the imperial printing office, but his father was able to

where he distinguished himself. He passed the university examination in 1821, and was shortly after appointed to a professorship or rather mastership of history in the Collége Rollin. Soon after this, in 1824, he married. The period of the Restoration and the July monarchy was one of the most favourable to rising men of letters of a somewhat scholastic cast that has ever been known in France, and Michelet had powerful patrons in Villemain, Cousin, and others. But, though he was an ardent politician (having from his childhood embraced republicanism and a peculiar variety of romantic free-thought), he was first of all a man of letters and an inquirer into the history of the past. His earliest works were school books, and they were not written at a very early age. Between 1825 and 1827 he produced divers sketches, chronological tables, &c., of modern history. His Précis of the subject, published in the last-mentioned year, is a sound and careful book, far better than anything that had appeared before it, and written in a sober yet interesting style. In the same year he was appointed maitre de conférences at the Ecole Normale. Four years later, in 1831, the Introduction & P Histoire Universelle showed a very different style, exhibit- ing no doubt the idiosyncrasy and literary power of the writer to greater advantage, but also displaying the peculiar visionary qualities which make Michelet the most stimulat- ing but the most untrustworthy (not in facts, which he never consciously falsifies, but in suggestion) of all historians. The events of 1830 had unmuzzled him, and had at the same time improved his prospects, and put him in a better position for study by obtaining for him a place in the Record Office, and a deputy-professorship under Guizot in the literary faculty of the university. Very soon afterwards he began his chief and monumental work, the Histoire de France, which occupied him for about forty years, and of which we shall speak presently. But he accompanied this with numerous other works, chiefly of erudition, such as the @uvres Choisies de Vico, the Mémoires de Luther écrits par lui-méme, the Origines du Droit Lrancais, and somewhat later the Procés des Templiers. 1838 was a year of great importance in Michelet’s life. He was in the fulness of bis powers, his studies had fed his natural aversion to the principles of authority and ecclesiasticism, and at a moment when the revived activity of the Jesuits caused some real and more pretended alarm he was appointed to the chair of history at the Collége de France. Assisted by his friend Quinet, he began a violent polemic against the unpopular order and the principles which it represented, a polemic which made their

lectures, and especially Michelet's, one of the most popular resorts of the day. He published, in 1839, a History of the Roman Republic, but this was in his graver and earlier manner. . The results of his lectures appeared in the volumes Le Prétre, la Femme, et la Famille and Le Peuple. These books do not display the apocalyptic style which, borrowed to a certain though no very great extent from Lamennais, characterizes Michelet's later works, but they contain in miniature almost the whole of his curious ethico- politico-theological creed—a mixture of sentimentalism, communism, and anti-sacerdotalism, supported by the most eccentric arguments, but urged with a great deal of eloquence. The principles of the outbreak of 1848 were in the air, and Michelet was not the least important of those who condensed and propagated them: indeed his original lectures were of so incendiary a kind that the course had to be interdicted. But when the actual revolu- tion broke out Michelet, unlike many other men of letters, did not attempt to enter on active political life, and merely devoted himself more strenuously to his literary work. Besides continuing the great history, he undertook and

carried out, during the years between the downfall of Louis Philippe and the final establishment of Napoleon IIL, an enthusiastic Histoire de la Révolution Francaise. Despite or because of its enthusiasm, this is by no means Michelet's best book. The events were too near and too well known, and hardly admitted the picturesque sallies into the blue distance which make the charm and the danger of his larger work. In actual picturesqueness as well as in general veracity of picture, the book cannot approach Carlyle's ; while as a mere chronicle of the events it is inferior to half a dozen prosaic histories older and younger than itself. The coup d'état lost Michelet his place in the Record Office, as, though not in any way identified with the republic administratively, he refused to take the oaths to the empire. But the new régime only kindled afresh his republican zeal, and his second marriage (with Mademoiselle Adéle Malairet, a lady of some literary capacity, and of republican belongings) seems to have further stimulated his powers. While the history steadily held its way, a crowd of extraordinary little books accompanied and diversified it. Sometimes they were expanded versions of its episodes, sometimes what may be called commentaries or companion volumes. In some of the best of them natural science, a new

subject with Michelet, to which his wife is believed to have introduced him, supplies the text. The first of these (by no means the best) was Les Femmes de la Révolution (1854), in which Michelet's natural and inimitable faculty of dithyrambic too often gives way to tedious and not very conclusive argument and preaching. In the next, Z'Oiseaw (1856), a new and most successful vein was struck. The subject of natural history was treated, not from the point of view of mere science, nor from that of sentiment, nor of anecdote, nor of gossip, but from that of the author's fervent democratic pantheism, and the result, though, as was to be expected, unequal, was often excellent. L'Jnsecte, in the same key, but duller, followed. It was succeeded by L'Amour (1859), one of the author's most popular books, and not unworthy of its popularity, but perhaps hardly his best. These remarkable works, half pamphlets half moral treatises, succeeded each other as a rule at the twelve months' interval, and the succession was almost unbroken for five or six years. L' Amour was followed by La Femme (1860), a book on which a whole critique of French literature and French character might be founded. Then came Za Mer (1861), a return to the natural history class, which, considering the powers of the writer and the attraction of the subject, is perhaps a little disappointing. The next year (1862) the most striking of all Michelet's minor works, La Sorciére, made its appearance. Developed out of an episode of the history, it has all its author's peculiarities in the strongest degree. It isa nightmare and nothing more, but a nightmare of the most extraordinary verisimilitude and poetical power. This remarkable series, every volume of which was at once a work of imagination and of research, was not even yet finished, but the later volumes exhibit a certain fall- ing off. The ambitious Bible de [Humanité (1864), an historical sketch of religions, has but little merit. In Za Montagne (1868), the last of the natural history series, the tricks of staccato style are pushed even farther than by Victor Hugo in his less inspired moments, though—as is inevitable in the hands of such a master of language as Michelet—the effect is frequently grandiose if not grand. Nos Fils (1869), the last of the string of smaller books published during the author's life, is a tractate on educa- tion, written with ample knowledge of the facts and with all Michelet's usual sweep and range of view, but with visibly declining powers of expression. But in a book published posthumously, Le Banquet, these powers reappear at their fullest.

famishing populations of the Riviera is (whether true to fact or not) one of the best things that Michelet has done. To complete the list of his miscellaneous works, two collec- tions of pieces, written and partly published at different times, may be mentioned. These are Les Soldats de la Révolution and Légendes Démocratiques du Nord. :

The publication of this series of books, and the comple- tion of his history, occupied Michelet during both decades of the empire. He lived partly in France, partly in Italy, and was accustomed to spend the winter on the Riviera, chiefly at Hyéres. At last, in 1867, the great work of his life was finished. As it is now published it fills nineteen volumes. The first of these deals with the early history up to the death of Charlemagne, the second with the flourishing time of feudal France, the third with the 13th century, the fourth, fifth, and sixth with the Hundred Years' War, the seventh and eighth with the establishment of the royal power under Charles VII. and Louis XI. The 16th and 17th centuries have four volumes apiece, much of which is very distantly connected with French history proper, especially in the two volumes entitled Renaissance and Réforme. 'The last three volumes carry on the history of the 18th century to the outbreak of the Revolution. The characteristics which this remarkable history shares with Michelet's other works will be noted presently. At present it may be remarked that, as the mere division of subjects and space would imply, it is planned on very original principles. Michelet was perhaps the first historian to devote himself to anything like a picturesque history of the Middle Ages, and his account is still the most vivid though far from the most trustworthy that exists. His inquiry into manuscript and printed authorities was most laborious, but his lively imagination, and his strong religious and political prejudices, made him regard all things from a singularly personal point of view. Circumstances which strike his fancy, or furnish convenient texts for his polemic, are handled at inordinate length, while others are rapidly dismissed or passed over altogether. Yet the book is undoubtedly the only history of France which bears the imprint of genius, and in this respect it is not soon likely to meet a rival.

Uncompromisingly hostile as Michelet was to the empire, its downfall and the accompanying disasters of the country once more stimulated him to activity. Not only did he write letters and pamphlets during the struggle, but when it was over he set himself to complete the vast task which his two great histories had almost covered by a History of the Nineteenth Century. He did not, however, live to carry it further than Waterloo, and the best criticism of it is perhaps contained in the opening words of the introduction to the last volume—‘“‘l’Age me presse.” The new republic was not altogether a restoration for Michelet, and his professorship at the Collége de France, of which he con- tended that he had never been properly deprived, was not given back to him. He died at Hyéres on the 9th of February 1874, and an unseemly legal strife between his representatives took place as to his funeral.

The literary characteristics of Michelet are among the most clearly marked and also among the most peculiar in French litera- ture. A certain resemblance to Lamennais has been already noted, and to this may be added an occasional reminiscence of the manner of Bossuet. But in the main Michelet, even in the minor details of style, is quite original and individual. His sentences and paragraphs are as different as possible in construction and rhythm from the orderly architecture of French classical prose. A very frequent device of his (somewhat abused latterly) is the omission of the verb, which gives the sentence the air of a continued interjection. Elsewhere he breaks his phrase, not finishing the regular clause atall. In these points and many others the resemblance to his contemporary Carlyle is very striking; and, different as were their points of view, their manners of seeing were by no means unlike. History to Michelet is always picturesque; it is a series

The picture of the industrious and | of tableaux. Allusion has becn already made to the singular per-

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spective in which these tableaux are drawn, a perspective so strange that a reader unacquainted with the actual size and relation of the objects

represented is certain to be deceived. Nothing indeed is further from Michelet's purpose than deceit. Although a strong republican, an ardent anti-sacerdotalist, and a patriot of fanatical enthusiasm, he is always scrupulously fair as far as he understands what he is doing. For instance, his hatred for England and Englishmen is one of the most comically intense passions in litera- ture. He is never tired of exclaiming against their diabolical pride, their odious jealousy of France, their calculating covetousness, and so forth. In his excited imagination the long drama of European history is a kind of conflict of Ormuzd and Ahriman, in which Frauce, it is needless to say, plays the first part and England the second. Yet he is never unfair to English fortitude and coolness, never (after the childish fashion of some of his countrymen) slurs over English victories, and often expresses genuine 'admiration (mixed, it is true, with a shudder or two of aversion) for the master- ful ways and constantly advancing prosperity of the English people. So, with all his dislike to the priesthood, he never is chary of praise to pope or mouk whenever it can fairly be given, and, with all his republicanism, he is never weary of worshipping the heroism of a great king. But his poetical fashion of dealing with events, his exaggeration of trivial incidents into great facts of history, his fixed ideas, especially in reference to the intellectual and social condition of medieval times, the evils of which he enormously exaggcrates, and his abiding prejudices of a general kind combine to distort his accounts in the strangest fashion. A laborious person might pick out of contemporary authors a notable collection of erroneous views of which Michelet is not so much the author as the suggester, for it is wlien his brilliant cxaggerations are torn from their context and set down in some quite other context as sober gospel that they are most utisleading to those who do not know the facts, and most grotesque to those who do. This is especially the case in regard to literature. Michelet began his great work too early to enjoy the benefit of the resurrection of old French literature which has since taken place; and though his view of that literature partakes of the amorous enthusiasm which colours his view of everything French, it is astoundingly incorrect in detail. The most reinarkable passage of all perhaps is the passage in his Renaissance relating to Rabelais, Ronsard, and Du Bellay, a passage so widely inconsistent not only with sound criticism but with historic fact that the author(a very rare thing with him) makes a kind of half apology for it elsewhere. Of the work of the age of chivalry proper, the chansons de

gestes, the Arthurian romances, the early lyrics and dramas, he evidently knew but little, aud chose to subordinate what he did kuow to his general theories of the time. Even much later his praise and blame, though trausparently honest, are quite haphazard. Unless, therefore, the reader be gifted with a very rare faculty of applying the ‘‘ grain of salt” to what he reads, or unless lie be well acquainted with the actual facts before coming to Michelet’s version of them, he will almost certainly be misled. But despite this grave drawback (which attends all picturesque history) the value of Michelet merely as an historian is immense. Not only are his separate tableaux, the wonderful geographical sketch of France in the beginning of the book, the sections devoted to the Templars, to Joan of Arc, to the Renaissance, to the Cainisards, almost unequalled, but the in-spiriting and stimulating effect of his work is not to be surpassed. If his reconstruction is often hazardous and conjectural, sometimes definitely aud demonstrably mistaken, and nearly always difficult to adjust entirely to the ascertained facts, it is always possible in itself, always instinct with genius, and alwayslife-like. There are no dead bones in Michelet ; they are if anything only too stirring and lively. These criticisms apply equally to the minor books, though these are necessarily fuller of the author’s somewhat weari- some propaganda, and less full of brilliantly painted facts. The great fault of Michelet as of not a few other modern authors is the comparatively improvised and ephemeral character of too much of lis work. His immense volume is, much of it, mere brilliant pamphleteering, much more mere description equally brilliant but equally liable to pass. Nevertheless he is (especially in French, the language par excellence of measured and academic perfection) so characteristic and singular a figure in his turbid eloquence and fitful flashing insight that he is never likely to lose a place, and a notable one, in literary history.

Almost all Michelet’s works, the exceptions being his translations, compilations, &c., are published in uniform size and in about fifty volumes, partly by Marpon and Flammarion, partly by Calmann Lévy. (G. SA.)

MICHELL, Jonny, an eminent English man of science of the 18th century. He received his university education at Queen’s College, Cambridge. His name appears fourth in the Tripos list for 1748-49 ; and in 1755 he was moderator in that examination. He was a fellow of his college, and became

successively Woodwardian professor of geology (in 1762) and rector of Thornhill in Yorkshire.

He was elected a member of the Royal Society in the same year as Henry Cavendish (1760). He died in 1793. In 1750 he published at Cambridge a small work of some eighty pages, entitled A Treatise of Artificial Magnets, in which 1s shown an easy and expeditious method of making them superior to the best natural ones. Besides the descrip- tion of the method of magnetization which still bears his name, this work contains a variety of acute and accurate magnetic observations, and is particularly distinguished by a lucid exposition of the nature of magnetic induction. He is now best known as the original inventor of the torsion balance, which afterwards became so famous in the hands of its second inventor Coulomb. Michell described it in his proposal of a method for obtaining the mean density of the earth. He did not live to put his method into practice ; but this was done by Henry Cavendish, who made, by means of Michell's apparatus, the celebrated determination that now goes by the name of Cavendish's experiment (Phil. T'rans., 1798).

Michell's other contributions to science are—‘‘ Conjectures con- cerning the Cause and Observatious upon the Phenomena of Earth- quakes," Phil. Trans., 1760; ‘‘Observations on the Comct of January 1760 at Cambridge," J6., 1760 ; ‘* A Recommendation of Hadley's Quadrant for Surveying," Jb., 1765; ‘* Proposal of a Method for measuring Degrees of Longitude upon Parallels of the Equator," 7b., 1766 ; ‘‘ An Inquiry into the Probable Parallax aud Magnitude of the Fixed Stars," Jb., 1767; ‘‘On the Twinkling of

the Fixed Stars," Jb., 1767 ; ‘‘On the Means of Discovering the Distance, Magnitude, &c., of the Fixed Stars," Zb., 1784.

MICHELOZZI, MicuEtozzo (1391-14721), was a Florentine by birth, the son of a tailor, and in early life a pupil of Donatello. He was a sculptor of some ability in marble, bronze, and silver. The statue of the young St John over the door of the Duomo at Florence, opposite the Baptistery, is by him ; and he also made the beautiful silver statuette of the Baptist on the altar-frontal of San Giovanni. Michelozzi's great friend and patron was Cosimo I. dei Medici, whom he accompanied to Venice in 1433 during his short exile.

While at Venice, Michelozzi built the library of San Giorgio Maggiore, and designed other buildings there. The magnificent Palazzo dei Medici at Florence, built by Cosimo, was designed by him ; it is one of the noblest specimens of Italian 15th-century arclitec- ture, in which the great taste and skill of the architect has combined the delicate lightness of the earlier Italian Gothic with the massive stateliness of the Classical style. With great engineering skill Michelozzi shored up, and partly rebuilt, the Palazzo Vecchio, then in a ruinous condition, and added to it many important rooms and staircases. When, in 1437, through Cosimo's liberality, the monastery of San Marco at Florence was handed over to the Dominicans of Fiesole, Michelozzi was employed to rebuild the domestic part and remodel the church. For Cosimo I. he designed numerous other buildings, mostly of great beauty and importance. Among these werea guest-house at Jerusalem, for the use of Florentine pilgrims, Cosimo's summer villa at Careggi, and the strongly fortified palace of Cafagiuolo in Mugello. For Giovanni dei Medici, Cosimo's son, he built a very large and magnificent palace at Fiesole. In spite of Vasari's statement that he died at the age of sixty-eight, he appears to have lived till 1472. He is buried in the monastery of San Marco, Florence. Though skilled both as a sculptor and engineer, lis fame chiefly rests on his architectural works, which claim for him a position of very high honour even among the greatest names of the great 15th-century Florentines.

MICHIGAN, one of the States of the American Union, Plate II.

situated in the region of the great lakes. It lies between 41° 49 and 47° 32' N. lat., and 82° 24' and 90° 31' W. long., the centre of the State being 670 miles north of west from New York, the nearest point on the seaboard. The area is 58,915 square miles. The State consists of two

natural divisions, known as the Upper and the Lower Peninsula. The Upper or Northern Peninsula is bounded on the N., E., and §. by Lakes Superior, Huron, and Michigan, and on the W. by the river St Mary and the State of Wisconsin. The Lower Peninsula is bounded on the W., N., and E. by Lakes Michigan, Huron, St Clair, and Erie, and the St Clair and Detroit rivers, and on the S. by the States of Ohio and Indiana. The general contour of the

Lower Peninsula approaches that of a horse-shoe, with an average width of about 200 miles from east to west and a length of about 300 miles from north to south. Its surface gradually rises in gentle undulations from the surrounding lakes to an elevation of about 400 feet above Lake Huron, no point reaching an altitude of more than 600 feet. The Upper Peninsula is much more rugged in contour and surface, at some points reaching an elevation of about 1100 feet. The territory was originally covered with forests, with only here and there asmall open prairie. It abounds in fine inland lakes, with areas varying from a few acres to several miles. The rivers are not large enough to be navigable, but they afford ample water-power, and are particularly valuable for floating down the logs of the lumbering districts. less than about 1600 miles in length ; and along the whole of this distance vessels of 2000 tons may pass without losing sight of land.

Geological Formation.—The Lower Peninsula occupies the central part of a great basin, the borders of which extend to the east as far as London, Ontario, and to the west as far as Madison, Wisconsin. Within these limits the traveller starting in any direction from the centre of the State encounters successively the outcropping edges of older and older strata. The whole series has been likened to a nest of wooden dishes; it embraces not only the Laurentian and Huronian systems but also the numerous groups that go to make up the Silurian, the Devonian, the Carboniferous, and the Quaternary systems. These several formations are covered almost universally with a drift of finely comminuted and triturated rock, borne thither by moving glaciers and floating icebergs, or washed to its present position by currents of water, while the surface was still submerged. This loose material varies in thickness, sometimes extending to a depth of 200 or 300 feet. While the lower formations contain almost inexhaustible deposits of copper, iron, gypsum, and salt, the surface soil is pre-eminently fertile, uniting all the mineral constituents necessary for the most luxuriant growth of plants. There are limited areas of light and somewhat sterile drift soil; but even these have shown themselves under proper treatment to be capable of yielding a rich vegetation. For the most part the drift soil is composed of a mixture of clay with sand and gravel. It is easily cultivated, is retentive of moisture, and is sufficiently porous to prevent the injury of crops by excessive rains.

Climate and Natural Products.—The mean temperature of Lansing, the capital of the State, as determined by observations extending through eighteen years, is 46°°71 Fahr., or about the same as that of Berlin. During the summer months the mean temperature is nearly the same as that of Vienna ; in the winter it is nearly that of Stockholm, The annual rainfall during the eighteen years previous to 1882 was about 3linches. This is very evenly distributed throughout the year, though a little more than half the amount falls in the five months from May to October. The average snowfall in the centre of the State is about 4 feet, though it is seldom that more than 12 inches lie on the ground at any one time. The winter temperature is much modified by the open water of the adjacent lakes. The severe winds are commonly from the west and north-west ;

The coast-line of the State is not |

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but in sweeping across the open waters of Lake Michigan they are so far softened as to make the climate much milder than that found in the same latitude on the western side of the lake. This peculiarity is specially favourable to the growth of fruits. Peaches are grown successfully along the 45th parallel, and figs thrive in the open air in lat. 423°. The modifying influence of the lake winds also gives great variety to the flora. The predominant woods are oak, maple, beech, elm, ash, cherry, hickory, walnut, basswood, and pine. All these grow luxuriantly in the vast forests of the State, and afford. an abundant supply of the best timber. There are 165 species of trees and shrubs indigenous to Michigan; and the entire flora of the State makes a list of 1634 species.

Cereals and Fruits.—The most important crop of Michigan is wheat, and the average yield per acre, as shown by the latest census, is greater than that of any other State in the Union. The acres sown in 1879 were reported as 1,822,749, and the amount produced as 35,532,543 bushels. These figures show that Michigan is fourth in rank of the wheat- producing States, the number of bushels grown being exceeded by the crops of Illinois, Ohio, and Indiana. In 1879 the yield in bushels of the other principal cereals is

shown by the following figures :—Indian corn, 32,461,452 ; oats, 18,190,793; barley, 1,204,316; rye, 294,918; buck-

wheat, 413,062; clover seed, 313,063; pease, 538,332. The crop of potatoes in the same year was 8,025,475 bushels, and the hay amounted to 1,051,115 tons. Of

_ the fruits grown in the State apples are the most important, _and these are believed to be unsurpassed in excellence in

any country in the world. The sales in 1880 were 4,834,936 bushels, a considerable quantity going to the markets of Europe. Next in importance is the peach crop, annually gathered from more than fifty of the counties of the State. In 1880 the peach orchards were reported as covering 12,908 acres, and the fruit sold as amounting to 413,418 bushels. The long coast-line of Lake Michigan affords easy access to market even for the most perishable fruits. Besides the facilities thus afforded, the railroads that now thread the State, with an aggregate length in March 1882 of 4332 miles, afford abundant means of rapid transportation. As the fruit belt extends from north to south more than 200 miles, the danger of disastrous competition in the markets is obviated by prolongation of the season of ripening. At the meeting of the State Horticultural Society held in 1881 it was reported that the average value of the peach crop per acre was above $125. The ten volumes of the Zransactions of the. State Horticultural Society published since its organization in 1870 show that the development of fruit culture within the last decade has been much more rapid than in any other State.

Lumber.—The timber produce in Michigan is of superior quality, and the amount is so great that about two-thirds of the best lumber sold in New York, Philadelphia, and Boston go out from its mills. The logs are borne along the lakes, rivers, and small watercourses to the booms of mills situated at convenient points, where the lumber is sawed and shipped for the different markets of the world. Of these manufacturing districts those known as the Saginaw, the Grand River, and the Muskegon valleys are the most important. The Saginaw receives the waters of the Tittabawasse, the Cass, the Flint, the Shiawasse, the Bad, the Pine, the Chippewa, the Tobacco, and their numerous tributaries, draining a vast region that still

yields an undiminished supply of pine. The forests of the western parts of the State are easily accessible by the Grand River and its tributaries, while those still farther north find a natural outlet through the numerous streams that flow into Lake Michigan. On the banks of these watercourses are

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some of the largest and finest mills of the world. In 1854, when the first effort was made to collect statistics of this industry, it was found that there were only sixty-one mills in operation, and that the entire annual product was only 108,000,000 feet. Highteen years later, in 1872, it was estimated that the annual product was not less than 2,560,000 feet of oak, 12,700,000 of staves, 300,000,000 lath, 400,000,000 shingles, and 2,500,000,000 of sawed pine. The number of saw-mills had already reached about 1500, the number of persons employed 20,000, and the capital represented $25,000,000. In 1881 the manufacture of pine lumber amounted to 3,919,500,000 feet, the value of which exceeded $60,000,000. The aggregate value of the forest products of the State was estimated in 188] to have reached more than $1,000,000,000. Forestry Bulletin, No. 6, issued December 1, 1881, estimated the amount of standing white pine of merchantable quality at 35,000,000,000 feet, and the amount of standing hard wood at 700,000,000 cords. Besides these amounts, the same authority estimates the amount of hemlock at 7,000,000,000 feet, with 7,000,000 cords of bark, and an aggregate of 70,000,000 of cedar and tamarack. It is probable that before many years the hard wood produced by the State will approach in value the figures representing the value of the pine now sent to the markets of the world. It is probable that Michigan for many years to come will maintain its precedence as a lumber-producing State.

Mineral Resources.—Of the mineral products of Michigan the most important is iron, As early as 1842 the report of the first State geologist, Dr Douglas Houghton, called attention to the presence of hematite ore, though for a considerable time after this it was not found in such quantities as to make it certain that mining could be made profitable. Before 1860, however, it became known that iron in the Upper Peninsula not only existed in vast quantities, but also that it was of superior quality. From that time iron-mines were rapidly developed, until in 1881 they had come to exceed

in value, though not in amount, even the products of Pennsylvania. In 1880 the product was 1,834,712 tons, with a value at the mines of $6,034,648, as against the yield in Pennsylvania of 2,185,675 tons, with a value of $5,517,079. The product of Michigan in 1882 was 2,948,307 tons of ore, with a market value of about $25,000,000. minerals are of extraordinary richness,—62°9 per cent. being the average of the first-class ores, while the furnace books often show a much higher yield.

Next in importance to the iron-mines are those of copper. These are also situated in the Northern Peninsula, in the mountain range of trappean rocks which crown the point of land extending northwards into Lake Superior. This secondary peninsula or cape, known as Keweenaw Point, rises to an average height of about 600 feet above the lake, the highest pinnacles reaching nearly double that altitude. This point contains what are- believed to be the richest copper-mines ever discovered ; the metal is not found as an ore, but as virgin copper almost chemically pure. It has only to be separated from its rocky matrix, when it is ready for the market. The largest of the copper-mines, that at Calumet, has built up an industry which employs 2000 men, and its total product of refined copper in 1882 was no less than 50,770,719 tb, or one-eighth of. the annual production of copper in the world. In quality the copper of the Lake Superior district is such that it commands the highest price at home and abroad. Its tenacity is remarkable, and therefore it is eagerly sought after for cartridges by all the great military powers. In 1882 the copper-mines paid dividends amounting to $2,900,000, — making an aggregate of $28,248,000 since they were opened.

The Michigan |

| dust, while the staves for barrels are made from

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Within a few years the salt-works of Michigan have also come to exceed those of any other State in the Union. The first well was sunk in 1859-60, but in 1882 the pro- duction was found to have exceeded that of the famous works in New York, and to have amounted in that year to no less than 3,204,921 barrels. The extraordinary development of this industry is due to several causes. A careful system-of inspection by State authority has kept

its salt unsurpassed in purity. The salt basin is not only accessible by navigable waters, so as to have the advantage of cheap transportation, but the wells are situated in the great lumber-producing districts, and the manufacture is thus carried on at very small expense, in connexion with the saw-mills. The power is furnished by the same engines, the exhausted steam is used for the evaporation of brine during the day, and during the night evapora- tion is still carried on by means of refuse wood and saw- rejected timber. By this system the best quality of salt is obtained at a minimum expense. The chief reservoir of salt is the series of sandstones and shales constituting the Waverly group. This salt-producing rock covers no less than about 8000 square miles, and it is safe to presume that the supply is inexhaustible. The average depth of the wells is about 800 feet, but in some localities wells sunk to nearly 2000 feet have been remunerative. Important salt-works have recently been developed in the western part of the State.

There are also certain other minerals of considerable importance. Deposits of gypsum, easily accessible, prac- tically inexhaustible in quantity, and superior in quality, are found in several localities both in the eastern and in the western parts of the Lower Peninsula. In the outskirts of Grand Rapids the deposit crops out at the surface, and at an average depth of from 40 to 70 feet extends over an area of 10 or 12 square miles. The rock is easily quarried,

_ and is either ground for use as a fertilizer or calcined into

| plaster of Paris.

The deposits of coal are supposed to

cover about 8000 square miles, but as yet the product

_at any one point has not been very considerable.

In quality the coal is highly bituminous, and is not sufficiently pure to be useful for smelting or for the manufacture of gas. For these reasons the stock of coal in the State is practically untouched. If future explorations and experi- ments should make these deposits available, a new era in the manufacture of iron will be the result. At present the coal for smelting the

Lake Superior ores is brought chiefly from Ohio and Pennsylvania. Quarries of lime- stone and of sandstone have been opened in various parts of the State. The brown stone of the Upper Peninsula is of excellent quality, and is capable of receiving a high finish. The supply is inexhaustible, and the accessibility of the quarries by water gives promise of a thriving industry. The grindstones taken from the Huron county quarries are of superior quality, and the slates found in unlimited quantities on the shores of the Huron Bay are unsurpassed in point of durability and colour. Clays and sands of commercial value are found in great abundance. Though the manufacture of glass is yet in its infancy, sands in large quantities have been discovered in Monroe county suitable for the manufacture of plate glass of excel- lent quality. Brick and tile clays are found in all parts of the State. Though native silver has been found in small

| quantities in the Upper Peninsula, the systematic mining

of this metal has not yet been carried on with successful results. The Report of the commissioner of mineral statistics for 1882 shows that, except as to coal, Michigan is the foremost of all the States in mineral wealth. Fisheries. —The geographical position of Michigan explains the

fact that its fresh-water fisheries arc the most produetive in the United States. The most important varieties of fish are lake-trout,

sturgeon, bass, pickerel, herring, brook-trout, grayling, and white- fish. General laws for the protection of fish have been passed ; and a fish commission has been maintained for some ycars for the purpose of propagating the best varieties and planting them in waters adapted to their natural development. Up to the close of 1880 the commissioners had planted about 80,000,000 young white- fish, 1,000,000 silver eels, 1,000,000 lake-trout, 2,000,000 salon, and 500,000 brook-trout, besides smaller nuinbers of shad, grayling, pike, and bass. Excellent results have followed, especially in the multiplication of white-fish, salinon, and eels. In 1879 the total ‘take ® was 24,013,100 Ib, of which 12,902,250 Ib were white-fish, the most valuable lake-fish known to epicures and to commerce.

During winter large quantities preserved by freezing are. taken to Eastern markets, where they are readily sold at a high price.

Educational Institutions.—As early as 1785 the law of congress which provided for the sale of lands north of the Ohio river reserved for the support of public schools ‘¢section 16” of each township. This fundamental law devoted to educational purposes one-thirty- sixth of all the lands of that vast domain known as the north- western territory. The ‘‘ordinance of 1787,” by which this territory was organized, further provided that ‘‘schools and the means of education shall for ever be encouraged.” In 1826 this congressional action was supplemented by a grant to Michigan of two townships of land for the founding and support of a university. When Michigan became a State in 1837, its educational policy took definite form. The constitution provided, not only that the grant of “section 16” should be devoted exclusively to the support of schools of the primary grade, but also that the State and not each township should be the custodian of the lands so appropriated. The constitution expressly provided that the proceeds from the sale of ‘school lands” should be held by the State as a perpetual fund, the interest of which should be annually applied to the sup- port of primary schools. The lands devoted to school purposes 1 Michigan under these provisious amounted to 1,077,209 acres, of which, in September 1881, 675,000 acres had been sold. On the sum realized by these sales, $3,095,679, the State pays interest at 7 per cent., and the resulting income, amounting to $216,645, is annually distributed to the schools. This source is supplemented from local taxes, so that in 1881 the totalsum realized from all sources for the primary schools was $3,644,778.

The schools organized under State law are known as graded and ungraded. In the small districts where the schools are under the charge of but one or two teachers, grading is impracticable. Of ungraded districts there were in 1881 6120, attended by 219,570 children, while the graded schools were 404 in number, with an attendance of 152,043. The school census includes all children between the ages of five and twenty, amounting in 1881 to 518,317, of whom there was an average attendance of 391,401. To all children of school age the public schools are frec, though a fee may be re- quired for advanced studies in the high schools. The immediate administration of the schools is entrusted to school officers clected annually

by the tax-payers of the individual districts. The State constitution requires that a free scliool shall be in session at least three months of every year in each district. In districts of more than 30 and less than 800 children, the law requires at least five months of school; while in districts of more than 800 children, the session must be not less than nine months in length. In the graded schools the division is into primary schools, grammar schools, and high schools, each of these divisions retaining the scholar ordinarily four years. At the end of the course the student is ready for the university, to which, under certain restrictions provided by the university itself, he is admitted on diploma from the high school. The university of Michigan, situated at Ann Arbor, was first opened for instruction in 1841. It now (1883) consists of the department of literature, science, and the arts, the department of medicine, the department of law, the college of homeopathic medicine, the school of pharmacy, the college of dental surgery, -and the school of political science. Connected with the medical departments are the State hospitals. In 1881-82 there were 86 officers of instruction and 1534 students. The total income for the year 1879-80 froin Federal grant, State grants, and fees was $231,339. The general control of the university is placed in the hands of eight regents elected by popular suffrage at the biennial spring elections, two regents being chosen at each election. The normal school, situated at Ypsilanti, and generously supported by the State, may be said to complete the school system.

Charitable and Reformatory Institutions.—A school for the deaf, dumb, and blind, instituted underan Act passed in 1848, is situated at Flint, about 60 miles north-west of Detroit ; in February 1882 it had 249 pupils. In 1879 a distinct school for the training of the blind was established at Lansing. ‘The ‘‘State public school for dependent and neglected children” is devoted to the systematic education of such children as otherwise would have to be maintained in the county poorliouses. The pupils are divided into ‘‘familics” of about thirty each, and are cared for in separate cottages, each cottage being under the charge of a ‘‘cottage manager.” The school receives dependent children of sound health, and free from

contagious disease ; and it is made the duty of the officers having charge of the poor to send all such children between the ages of three and twelve to it. This institution, the pioneer of its kind, and one of the most useful of charitable schools, is situated at Cold- water, 132 miles south-west of Detroit. In February 1882 there were 320 children and 21 officers and teachers. The ‘‘ Reform School” at Lansing is designed to reclaim juvenile offenders who have been convicted of some offence. A farm of 224 acres connected with the school is, in considerable part, tilled by the boys. The number of inmates in February of 1882 was 325. A similar school at Adrian has recently been instituted for girls. There are State asylums for the insane at Kalamazoo (715 patients) and Pontiac (499 patients). The legislature of 1881 provided for the establish- ment of an additional asylum in one of the northern counties of the Lower Peninsula.

Population.—In 1837 the State had 174,647 inhabitants. The numbers according to the different census returns from 1840 are given in the following table :—

Density per Census, Total Males. _ Females. Square Mile. 1840 212,267 113,788 98,479 3°77 1850 397,654 209,897 187,757 7°07 1860 749,113 394,694 854,419 iP 1870 1,184,059 617,745 566,314 20°01 1880 1,636,937 862,678 774,259 27°80

At the last census 388, 508 of the inhabitants were of foreign birth, 97,346 being natives of the United Kingdom, 89,085 Germans, aud 16,445 Scandinavians. In point of population the State, which was twenty-third in 1840, now stands ninth in the Union.

The following are the principal cities in the State, with popu- lation at the census of 1880:—Detroit, 116,340 ; Grand Rapids City, 32,016 ; Bay City, 20,693; East Saginaw City, 19,016; Jackson City, 16,105; Muskegon City, 11,262 ; Saginaw City, 10,525 ; Port Huron, 8883; Flint City, 8410; Lansing (the State capital), 8319 ; Ann Arbor, 8061; Adrian City, 7849 ; Battle Creek, 7063 ; Manistee, 6930; West Bay City, 6397; Alpena City, 6153; Ishpeming, 6039.

History and Government.—The State of Michigan is part of the territory that was first settled by the French, and until the fall of Canada into the

hands of the British after the middle of the 18th century was under the government of New France. The territory was explored by Jesuit missionaries in the 17th century ; but, although it was known at an early period that the lands were of exceptional excellence, very little progress was made in develop- ing the resources of the territory until after the completion of the first half-century of the American Union. The surveyors eniployed by the general government to inspect the lands and report as to their fitness for settlement by the soldiers of the war of 1812 appear to have derived their impressions almost exclusively from the low lands in the south-eastern corner of the territory. The report, accordingly, was not favourable ; and consequently the tide of immigration that had already begun to set in flowed steadily past Michigan into the territories farther west. It was largely for this reason that the early development of Indiana, Illinois, Iowa, and Wisconsin was somewhat more rapid than that of Michigan. But gradually the false impressions concerning the soil and climate were dispelled ; and within the past few years the increase of the population and the growth of wealth have been very rapid. In 1851 the valuation of the State for purposes of taxation (which excludes much valuable property) was $30,976,270; in 1861, $172,055,808 ; in 1871, $630,000,000; at 1881, $810,000,000. The State constitution, adopted in 1837 at the time of admission to the Union, has been modified in some minor particulars ; but in most respects it remains unchanged. The governor is elected for two years, with no restriction as to re-election. The legislature meets biennially in the first week of January, and usually continues in session till May. The supreme court consists of.four judges chosen by popular vote for terms of eight years, one being elected every second year. Judges have been so frequently re-elected that the office may be said to be practically a permanent one, with a provision for termination in case of need. The State is divided into twenty-two judicial districts, in each of which a circuit court sits for the trial of causes of original jurisdiction, and of causes appealed from the justice courts. The judges of the circuit courts are also elected by popular suffrage. On political questions voting is open to all naturalized citizens of the male sex more than twenty-one years of age unless prevented by some natural disqualification. At school meetings the right of suffrage is extended so as to include tax-payers of either sex.

Authorities.—Frederick Morley, Michigan and its Resources, compiled under authority of the State, 2d ed., Detroit, 1882; Walling's Atias of Michigan, with an. Account of the Topography, Climate, and Geology of the State, by Alex.

Winchell, LL.D.; James V. Campbell, Outlines of the Political History of Michigan; Reports of the Secretary of the State Pomological Society of Michigan

| from 1871 to 1880 ; Report of the Commissioner of Education for 1880; Forty fifth

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Annual Report of the Superintendent of Public Instruction of the State of Michigan Jor the year 1881; Reports of the Geological Survey of the State of Michigan, 4869-80, 4 vols. ; Special Report of Commissioner of Mineral Statistics, March 1883 ; Forestry Bulletins for 1881. (C. K. A.)

MICHIGAN, Lake. See Sr LAwReEnce.

MICHIGAN CITY, a town of the United States, in Laporte county, Indiana, on the south-east shore of Lake Michigan, 40 miles east-south-east of Chicago. As a lake-port and a junction for several railroads, it is a place of considerable prosperity. It is the largest lumber- market in the State, and one of the largest in the west, and has numerous manufacturing establishments, The northern State prison (with 577 convicts at the close of 1880) is one of the principal buildings. The population increased from 3985 in 1870 to over 10,000 in 1883,

MICHMASH (W130, DID2'2), the scene of one of the most striking episodes in Old Testament history (1 Sam. xlv., comp. vol. xii. p.. 403), was a place in Benjamin, about 9 Roman miles north of Jerusalem (Onom., ed. Lag., p. 280). Though it did not rank as a city (Josh. xviii, 21 sg.), Michmash was recolonized after the exile (Neh. xi. 31), and, favoured by the possession of excellent wheat- land (Mishna, Men. viii. 1), was still a very large village (Maxyds) in the time of Eusebius. The modern Makhmas is quite a small place.

The historical interest of Michmash is connected with the strategical importance of the position, commanding the north side of the Pass of Michmash, which madc it the headquarters of the Philistines and the centre of their forays in their attempt to quell the first rising under Saul, as it was also at a later date the head- see of Jonathan the Hasmonzan (1 Mac. ix. 73). From

erusalem to Mount Ephraim there are two main routes. The pre- sent caravan road keeps the high ground to the west near the water- shed, and avoids the Pass of Michmash altogether. But another route, the importance of which in antiquity may be judged of from Isa, x. 28 sq., led southwards from Ai over an undulating plateau to Michmash. Thus far the road is easy, but at Michmash it descends into a very steep and rough valley, whieh has to be crossed before reascending to Geba.! At the bottom of the valley is the Pass of Michmash, a noble gorge with precipitous craggy sides. On the north the crag is crowned by a sort of plateau sloping backwards into a round-topped hill. This little plateau, about a mile east of the present village of Makhmds, seems to have been the post of the Philistines, lying close to the centre of the insurrection, yet possessing unusually good communieation with their establishments on Mount Ephraim by way of Ai and Bethel, and at the same time

eommanding the routes leading down to the Jordan from Ai and from Michmash itself.

MICKIEWICZ, Apam (17 98-1855), Polish poet, was born in 1798, near Nowogrodek, in the present government of Minsk, where his father, who belonged to the schlachta or lesser nobility, had a small property. The poet was educated at the university of Vilna; but, becoming involved in some political troubles there, he was forced to terminate his studies abruptly, and was ordered to live for a time in Russia. He had already published two small volumes of miscellaneous poetry at Vilna, which had been favourably received by the Slavonic public, and on his arrival at St Petersburg he found himself admitted to the leading literary circles, where he was a great favourite both from his agreeable manners and his extraordinary talent of improvisation. In 1825 he visited the Crimea, which inspired a collection of sonnets in which we may admire both the elegance of the rhythm and the

rich Oriental colouring. The most beautiful are The Storm, Bakchi- serat, and Grave of the Countess Potocka,

In 1828 appeared his Konrad Wallenrod, a narrative poem describing the battles of knights of the Teutonic order with the heathen Lithuanians. Here, under a thin

veil, Mickiewicz represented the sanguinary passages of

arms and burning hatred which had characterized the long feuds of the Russians and Poles, The objects of the poem, although evident to many, escaped the Russian censors,

- So Isa. x. 28 deseribes the invader as leaving his heavy baggage at Michmash before pushing on through the pass.

poet exhibited all the signs of premature old age ;

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and it was suffered to appear, although the very motto, taken from Machiavelli, was significant : “ Dovete adunque Sapere. come sono duo generazioni da combattere ; bisogna essere volpe e leone.” After a five years’ exile in Russia the poet obtained leave to travel ; he had secretly made up his mind never to return to that country or Poland so long as it remained under the government of the Muscovites. Wending his way to Weimar, he there made the acquaintance of Goethe, who received him cordially, and, pursuing his journey through Germany, he entered Italy by the Spliigen, visited Milan, Venice, and F lorence, and finally took up his abode at Rome. There he wrote the third part of his poem Daady, the subject of which is the religious commemoration of their ancestors practised among Slavonic nations, and Pan Tadeusz, his longest poem, by many considered his masterpiece. A graphic picture is drawn of Lithuania on the eve of Napoleon’s expedition to Russia in 1812, In 1839 Mickiewicz left Rome for Paris, where his life was for some time spent in poverty and unhappiness. He had married a Polish lady, Selina Szymanowska, who became insane. In 1840 he was appointed to the newly founded chair of Slavonic languages and literature in the Collége de France, a post which he

was especially qualified to fill, as he was now the chief representative of Slavonic literature, Poushkin having died in 1837, He was, however, only destined to hold it for a little more than three years, his last lecture having been given on the 28th of May 1844. His mind had become more and more disordered under the influence of religious mysticism. His lectures became a medley of religion and politics, and thus brought him under the censure of the Government. A selection of them has been published in four volumes. They contain some good sound criticism, but the philological part is very defective, for Mickiewicz was no scholar, and he is obviously only well acquainted with two of the literatures, viz., Polish and Russian, the latter only till the year 1830, A very sad picture of the declining days of Mickiewicz is given in the niemoirs of Herzen. At a comparatively early period the unfortunate poverty, despair, and domestic affliction had wrought their work upon him. In 1849 he founded a French newspaper, La Tribune des Peuples, but it only existed a year. The restoration of the French empire seemed to kindle his hopes afresh ; his last composition is said to have been a Latin ode in honour of Napoleon III. On the outbreak of the Crimean War he was sent to Constantinople to assist in raising a regiment of Poles to take service against the Russians. He died suddenly there in 1855, and his body was removed to France and buried at Montmorency.

Mickiewicz is held to have been the greatest Slavonic poet, with the exception of Poushkin. Unfortunately in other parts of Europe he is but little known; he writes in a very difficult language, and one which it is not the fashion to learn. There were both pathos and irony in the expression used by a Polish lady to a foreigner, '* Nous avons notre Mickiewicz & nous." He is one of the best pro- ducts of the so-called romantic school. The Poles had long groaned under the yoke of the classicists, and the country was full of legends and picturesque stories which only awaited the coming poet to put them into shape. Hence the great popularity among his countrymen of his ballads, each of them being eonnected with some national tradition. Besides Konrad Wallenrod and Pan Tadeusz, attention may be called to the poem Grazyna, which describes the adventures of a Lithuanian chieftainess against the Teutonic knights. It is said by Ostrowski to have inspired the brave Emilia Plater, who was the heroine of the rebellion of 1830, and after having fought in the ranks of the insurgents, found a grave in the forests of Lithuania, A fine vigorous Oriental piece is Farys. Very good too are the

odes to Youth and to the his- torian Lelewel ; the former did much to stimulate the efforts of the Poles to shake off their Russian conquerors. It is enough to say of Mickiewicz that he has obtained the proud position of the repre- sentative poet of his country ; her customs, her superstitions, her history, her struggles are reflected in his works.

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MICKLE, Wittiam Junius (1734-1788), son of the minister of Langholm, Dumfriesshire, holds a respectable place among the imitative minor poets of the 18th century. He wrote a poem on Knowledge—carefully versified, pointing a moral on the vanity of intellectual pride— at the age of eighteen, entered into business as a brewer at his father's request and against his own inclinations, soon became bankrupt, went to London on outlook for work as a man of letters, solicited patronage In vain, earned a living hardly by writing for Magazines, made some impression in 1765 by "a poem in the manner of Spenser" called the Concubine (afterwards Syr Martyn), was appointed corrector to the Clarendon Press, and finally took a place among the leading poets of that very barren time by a translation of the Lusiad of Camoens into heroic couplets (specimen published 1771, whole work 1775). So great was the repute of the work that when Mickle— appointed secretary to Commodore Johnstone—visited Lisbon in 1779 the king of Portugal gave him a public reception. As a translator of Camoens Mickle has been superseded, but he aimed, not at close rendering of the original, but at making a poem which should be worthy of a permanent place in English literature. This ambition he was not capable of fulfilling, though he had great fluency and vigour. It may be doubted whether the fashionable forms which he imitated were the best suited to his natural gifts. He shows delight in lively action, a sense of dramatic effect, and, in the Concubine, the sub- stance of which might have been conceived by Crabbe, considerable fulness of detail in coarse realistic painting. Certainly, if the Scottish poem There 's nae luck aboot the hoose was Mickle's, he mistook his medium. Scott read and admired Mickle's poems in his youth, and, besides founding Kenilworth on the ballad of Cumnor Hall, was a good deal influenced by him in style. Mickle's prose is lively and vigorous.

MICROMETER, an instrument generally applied to telescopes and microscopes for measuring small angular distances with the former or the dimensions of small objects with the latter.

Before the invention of the telescope the accuracy of astronomical observations was necessarily limited by the angle that could be distinguished by the naked eye. The angle between two objects, such as stars or the opposite limbs of the sun, was measured by directing an arm furnished with fine ‘‘sights” (in the sense of the “sights ” of a rifle) first upon one of the objects and then upon the other, or by employing an instrument having two arms each furnished with a pair of sights, and directing one pair of sights upon one object and the second pair upon the other. The angle through which the arm was moved, or, in the latter case, the angle between the two arms, was read off upon a finely graduated arc. With such means no very high accuracy was possible. Archimedes concluded from his measurements that the sun’s diameter was greater than 27’ and less than 32’; and even Tycho Brahe was so misled by his measures of the apparent diameters of the sun and moon as to conclude that a total eclipse of the sun was impossible. Maestlin in 1579 determined the relative positions of eleven stars in the Pleiades (Historia Ccelestis Lucit Baretti, Augsburg, 1666), and Winnecke has shown (Monthly Notices R. A. S., vol. xxxix. p. 146) that the ae error of these measures amounted to about ar he

1 Grant, History of Physical Astronomy, p. 449.

- This is an astonishing accuracy when the difficulty of the objects is considered. Few persons can see with the naked eye—much less measure—more than six stars of the Pleiades, although all the stars measured by Maestlin have been seen with the naked eye by a few individuals of exceptional powers of eye-sight.

The invention of the tclescope at once extended the possibilities of accuracy in astronomical measurements. The planets were shown to have visible disks, and to be attended by satellites whose distance and position angle

relative to the planet it was desirable to measure. It became, in fact, essential to invent a “micrometer” for measuring the small angles which were thus for the first time rendered’ sensible. There is now no doubt that William Gascoigne, a young gentleman of Yorkshire, was the first inventor of the micrometer. Crabtree, a friend of his, taking a journey to Yorkshire in 1639 to see Gascoigne, writes thus to his friend Horrocks. “The first thing Mr Gascoigne showed me was a large telescope amplified and adorned with inventions of his own, whereby he can take the diameters of the sun and moon, or any small angle in the heavens or upon the earth, most exactly through the glass, to a second.” ‘The micrometer so mentioned fell into the possession of Mr Richard Townley of Lancashire, who exhibited it at the meeting of the Royal Society held on the 25th July 1667.

The principle of Gascoigne’s micrometer is that two pointers, having parallel: edges at right angles to the measuring screw, are moved in opposite directions sym- metrically with and at right angles to the axis of the telescope. The micrometer is at zero when the two edges are brought exactly together. The edges are then separated till they are tangent to the opposite limbs of the disk of the planet to be measured, or till they respectively bisect two stars, the angle between which is to be determined. The symmetrical separation of the edges is produced and measured by a single screw; the fractions of a revolution of the screw are obtained by an index attached to one end of the screw, reading on a dial divided into 100 equal parts. The whole arrangement is elegant and ingenious, A steel cylinder (about the thickness of a goose-quill), which forms the micrometer screw, has two threads cut upon it, one-half being cut with a thread double the pitch of the other. This screw is mounted on an oblong box which carries one of the measuring edges; the other edge is moved by the coarser part of the screw relatively to the edge attached to the box, whilst the box itself is moved relatively to the axis of the telescope by the finer screw. This produces an opening and closing of the edges symmetrically with respect to the telescope axis. Flam- steed, in the first volume of the Historia Coclestis, has

Gas- coigne’s micro- meter,

inserted a series of measurements made by Gascoigne ~

extending from 1638 to 1643. These include the mutual distances of some of the stars in the Pleiades, a few observa- tions of the apparent diameter of the sun, others of the distance of the moon from neighbouring stars, and a great number of measurements of the diameter of the moon. Dr Bevis (Phil. Trans., 1773, p. 190) also gives results of measurements by Gascoigne of the diameters of the moon, Jupiter, Mars, and Venus with his micrometer.

Delambre gives? the following comparison between the re- sults of Gascoigne's measurements of the sun's semi-diameter and the computed results from modern determinations :—

Gascoigne. Conn. d. Temps. October 25(008:). acer Ge oralOd 16' 100 An Ol a5) eeeeacecteee ie Wale' 1G) 4 December) 2) eee ee Ge 16' 168

Gascoigne, from his observations, deduces the greatest variation of the apparent diameter of the sun to be 35"; according to the Connaissance des Temps it amounts to 323.3 These results prove the enormous advance attained im accuracy by Gascoigne, and his indisputable title to the credit of inventing the micrometer.

Huygens, in his Systema Saturnium (1659), describes a micrometer with which he determined the apparent

® Delambre, Hist. Ast. Moderne, vol. ii. p. 590.

diameters of the principal planets. He inserted a slip of metal, of variable breadth, at the focus of the tele- scope, and observed at what part it exactly covered the object under examination ; knowing the focal length of the telescope and the width of the slip at the point observed, he thence deduced the apparent angular breadth of the object. The Marquis Malvasia in his Bphemerides (Bologna, 1662) describes a micrometer of his own invention. At the focus of his telescope he placed fine silver wires at right angles to each other, which, by their intersection, formed a network of small squares. The mutual distances of the intersecting wires he determined by counting, with the aid of a pendulum clock, the number of seconds required by an equatorial star to pass from web to web, while the telescope was adjusted so

that the star ran parallel to the wires at right angles to those under investigation.! In the Phil. Trans., 1667, No. 2], p. 373, Auzout gives the results of some measures of the diameter of the sun and moon made by himself, and this communication led to the letters of Mr Townley and Dr Bevis above referred to. The micrometer of Auzout and Picard was provided with silk fibres or silver wires instead of the edges of Gascoigne, but one of the silk fibres remained fixed while the other was moved by a screw. It is beyond doubt that Huygens independently discovered that an object placed in the common focus of the two lenses of a Kepler telescope appears as distinct and well-defined as the image of a distant body; and the micrometers of Malvasia, Auzout, and Picard are the natural developments of this discovery. Gascoigne was killed at the battle of Marston Moor on the 2d July 1644, in the twenty-fourth year of his age, and his untimely death was doubtless the cause that delayed the publication of a discovery which anticipated, by twenty years, the combined work of Huygens, Malvaison, Auzout, and Picard in the same direction. .

As the powers of the telescope were gradually developed, it was found that the finest hairs or filaments of silk, or the thinnest silver wires that could be drawn, were much too thick for the refined purposes of the astronomer, as they entirely obliterated the image of a star in the more

Pearson, Bessel, Struve, Dawes, &c., or the successive productions of the great artists Ramsden, Troughton, Fraunhofer, Ertel, Simms, Cooke, Grubb, Clarke, and Repsold. It will be sufficient to describe those forms with which the most important work has been done, or which

have survived the tests of time and experience.

Before astronomical telescopes were mounted parallactically, the Position Indeed, angles.

measurement of position angles was seldom attempted. in those days, the difficulties attached to such measures, and to the lleasurement of distances with the filar micrometer, were exceed- ingly great, and must have taxed to the utmost the skill and patience of the observer. For, on account of the

diurnal motion, the direc- tion of the axis of the telescope when directed toa star is always changing, so that, to follow a star with an altazimuth mounting, the observer requires to move continuously the two handles which give slow motion in altitude and azimuth.

Sir William Herschel was the first astronomer who measured Herschel's position angles; the instrument he employed is described in Phil. instru- It was used by him in his earliest ment.

Trans., 1781, vol. 1xxi. p. 500. observations of double stars (1779-83); but, even in his matchless hands, the measurements were comparatively crude, because of the difficulties he had to encounter from the want of a parallactic mount- ing. In the case of close double stars he estimated the distance in terms of the disk of the components. For the measurement of wider stars he invented his lamp-micrometer, in which the components of a double star observed with the right eye were made to coincide with two lucid points placed 10 feet from the left eye. The distance of the lucid points was the tangent of the magnified angles sub- tended by the stars to a radins of 10 feet. This angle, therefore, divided by the magnifying power of the telescope gives the real angular distance of the centres of a double star. With a power of 460 the scale was a quarter of an inch for every second.

The Modern Filar Micrometer.

When equatorial mountings for telescopes became more general, no filar micrometer was considered complete which was not fitted with a position circle.6 The use of the spider line or filar micrometer becaine universal; the methods of illumination were improved ; and micrometers with screws of previously unheard-of fineness and accuracy were produced. These facilities, coupled with the wide and fascinating field of research opened up by Sir William Herschel's discovery of the binary character of double stars, gave an impulse to micrometric research which has continued unabated to the present time. A still further facility was given to the use of the filar micrometer by the introduction of clock- work, which caused the telescope automatically to follow the diurnal motion of a star, and left the observer's hands entirely at liberty."

The modern filar micrometer has now assumed forms of five types. Classifica-

Type A.—Micrometers in which there are two webs, each iov- tion of able bya fine screw with a divided head, This is the usual English micro- form of filar micrometer. meters,

powerful telescopes. To obviate this difficulty Professor Felice Fontana of Florence (Saggio del real gabinetto di Jistca

e di storia naturale, 1755) first proposed the use of spider webs in micrometers,? but it was not till the attention of Troughton had been directed to the subject by Rittenhouse that the idea was carried into practice.2 In 1813 Wollaston proposed fine platinum wires, prepared by surrounding a

platinum wire with a cylinder of silver, and drawing out |

the cylinder with its platinum axis into a fine wire.t The surrounding silver was then dissolved by nitric acid, and a platinum wire of extreme fineness remained. But experience soon proved the superiority of the spider web ; its perfection of shape, its lightness and elasticity, have led to its universal adoption.

Beyond the introduction of the spider line it is unneces- sary to mention the various steps by which the Gascoigne micrometer assumed the modern forms now in use, or to describe in detail the suggestions of Hooke,5 Wren,

Type B.—Micrometers in which one web is movable by means of a fine screw with a divided head, and the other by a screw without a divided head. The Jatter screw, in ordinary use, is only employed to change the coincidence-reading of the two webs, for eliminating the errors of the micrometer screw. This is the ordi- nary German form of micrometer as originally made by Fraunhofer and since by Merz, and employed by the Struves and other principal Continental astronomers down to the present day.

Type C.—A similar form of micrometer to B, except that the coincidence-point cannot be changed,—there being no second screw to alter the position of the fixed web. .

Type D.—A micrometer somewhat similar in general construction to form B, except that, in addition to means of changing the zero point, there is a screw head by which a fine movement can be given to the whole micrometer box, in the direction of the axis of the micrometer screw. This is the modern form of micrometer as cou- structed by Repsold. } ;

Type E.—Micrometers fitted with two eye-pieces for measuring angles larger than the field of view of au ordinary eye-piece.

The micrometer of type A is due to Troughton ; it is represented Trough- in figs. 1, 2, 3. Fig. 1 is a horizoutal section in the direction of ton's filar the axis of the telescope. The eye-piece ab consists of two plano- micro-

Smeaton, Cassini, Bradley, Maskelyne, Herschel, Arago,

1 Mém. Acad. des Sciences, 1717, p. 78 sq. 2 In 1782 (Phil. Trans., vol. 1xxii. p. 163) Sir W. Herschel

writes :—"I have in vain attempted to find lines sufficiently thin to extend them across the centres of the stars, so that their thickness might be neglected." It is a matter of regret that Fontana's sugges- tion was unknown to him.

3 Quekett in his Treatise on the Microscope ascribes to Ramsden the practical introduction of the spider web in micrometers. The evidence appears to be in favour of Troughton.

4 Phil. Trans., 1818, pp. 114-118.

> Dr Hooke made the important improvement on Gascoigne's micrometer of substituting parallel Aairs for the parallel edges of its original construction (Hooke's Posthumous Works, p. 497).

convex lenses a, b, of nearly the same focal length, and with the two meter.

6 Herschel and South (Phil. Trans., 1824, part ili. p. 10) claim that the micrometer by Troughton, fitted to their 5-feet equatorial telescope, is the first position micrometer constructed capable of measuring position angles to 1’ of arc. . ;

7 So far as we can ascertain, the first telescope of large size driven by clockwork was the 9-inch equatorial made for Struve at Dorpat by Fraunhofer; it was completed in 1825. ‘The original idea appears to be due to Passement (Afém. Acad., Paris, 1746). In 1757 he pre- sented a telescope to the king, so accurately driven by clockwork that it would follow a star all night long.

convex sides facing each other. They are placed at a distance apart less than the focal length of a, so that the wires of the micrometer, which must be distinctly seen, are beyond 6.1 The eye-piece slides into the tube cd, which screws into the brass ring ¢/f, through two openings in which the oblong frame, containing the micrometer slides, passes. These slides are shown in fig. 2, and consist of brass forks & and J, into which the ends of the screws o and p are rigidly fitted. The slides are accurately fitted so as to have no

sensible lateral shake, but yet so as to move easily in the direction ©

of the greatest.length of the micrometer box. Motion is communi- cated to the forks by female screws tapped in the heads m and

Peed

Wwsseser

Fig. 1.

Fig. 2,

‘acting on the screws o and p respectively. Two pins q, 7, with spiral springs coiled round them, pass loosely through holes in the forks k, 1, and keep the bearings of the heads m and m firmly pressed against the ends of the

micrometer box. Thus the smallest rotation of either head communicates to the corresponding slide mo- tion, which, if the serews are accurate, is proportional to the amount through which the head is turned. Each heal is graduated into 100 equal parts on the drums w and », so that, by estimation, the reading can easily be carried to zjy5th of a revolution. The total number of revolutions is read off by a scale attached to the side of the box, but not seen in the figure.

Two spider webs are stretched across the forks, one (é) being adouead in a fine groove cut in the inner fork &, the other (s) in a similar groove cut in the outer fork 7. These grooves are simultane- ously cut im sitw by the maker, with the aid of an engine capable of ruling fine straight lines, so that the webs when aceurately laid in the grooves are perfectly parallel. A wire st is stretched across the centre of the field, perpendicular to the parallel wires. Each movable web must pass the other without coming in contact with it or the fixed wire, and without rubbing on any part of the brass-work. Should either fault occur (technically called ‘fiddling ”) it is fatal to accurate measurement. One of the most essential points in a good micrometer is that all the webs shall be so nearly in the same plane as to be well in focus together under the highest powers used, and at the same time absolutely free from “fiddling.” For measuring position angles a brass circle gh (fig. 3), fixed to the tele- scope by the serew 7, has rack teeth on its circumference that receive the teeth of an endless serew w, which, being fixed by the arms xx to the oblong box mn, gives the latter a motion of rotation round the axis of the telescope; an index upon this box points out on the graduated circle gh the angular rotation of the instrument.

The English micrometer stil] retains the essential features of Troughton’s original construc- tion above described. The later English artists have somewhat changed the mode of conimuniecating motion to the slides, by attaching the screws permanently to the micrometer head and tapping each micrometer screw into its slide. Instead of making the shoulder of the screw a flat bearing surface, they have

Fig. 3.

AS GEL

Fig, 4, given the screw a spherical bearing resting in a hollow cone (fig.

4) attached to the end of the box. The French artists still retain Troughton's form. Simms (Troughton's successor) and Cooke (of York), for symmetry and more effectual elimination of "' the loss of time" (called by the Germans ''todter Gang," and sometimes in English "back-lash"'), have provided two pins with spiral springs,

' This is known as Ramsden's eye-pieee; it was made originally by him.

MICROMETER

| 6). The pressure of this

[TYPES OF FILAR

like g and r (fig. 2), one on each side of the screw which moves each slide.

Grubb of Dublin, with the intention of avoiding the variation of pressure exerted by the spiral springs when the slide is at different distances from the head of the serew, lias adopted the following plan. Whiere the screw enters the slide he has a nut » attached toa strong spring pp (fig. 5), the pres- sure of which exerts a con- stant tension in the axis of the serew, tending to bring the threads into close econ- tact, in opposite directions, with their bearings in the nut 2 and the slide g. The pressure of this spring is regulated by the screws s, s, tapped into the thickened ends of the springs. For maintaining the spherical shoulder of the serew in close and constant pressure on its conical bearing he has attached a conical bear- ing to the spring p’p’ (fig.

on the upper part of the spherical shoulder is regu- lated by the screws s’, s’, passing through elongated holes in the spring pp’, and et into the end of the OX,

Fig, 6.

The screws of micrometers are generally made with 50 or 100 threads to the inch. Troughton’s method of reading the number of whole revolutions by a silver scale is inconvenient, because :}5th or even 5th of an inch is too small a quantity to read easily with the naked eye, especially with the faint illumination that it is

desirable to use when measuring faint objects. Different methods, including the ‘‘ comb” (see below) and various kinds of ‘‘ counters,” have been introduced with more or less success ; but recently the Repsolds of Hamburg have SN AS contrived a plan at ae so AQ Qk (CCX 9 simple and so efficient that Fig. 7. it will be unnecessary to describe those methods which this plan is certain to super- sede (see below, type D). Grubb has introduced a. Fic. 8 s modification in the form of gBt Ds the slides with a view to avoid the friction of one slide against the other. On the inner side of

the brass plate which forms the bottom of the box (#.e,, the side opposite to the eye-piece) four V-shaped furrows are placed (fig, 7); and at each end of the slides are pro- jections (fig. 8, end view) which fit into these furrows. The slides are kept down in their places by springs attached to them, which press upon the inner side of the lid ofthe box, ; Troughton's mode of giving rotation to the position circle is now abandoned. A much quicker motion in position angle than can be obtained without slow motion is often desirable, since, in observing very close double stars, the uncertainty of each point- ing may amount to several degrees in the most accurate measure- ments. The plan of a pinion working in a toothed wheel is often employed, but that also is too slow. Most modern micro- meters are now fitted with a clamp and slow motion screw (see fig. 9, type B). This permits observation of position angles of very close objects by simple rotation of the box with the hand; while the slow motion, after clamping, permits the more delicate movements that are required in measuring the position angle of objects farther apart.

"The Cookes and Grubb have for years almost invariably trans- ferred the position circle from the micrometer to the telescope tube. The whole eye-cnd with its focussing arrangements rotates, and its rotation can be measured by a circle attached to the butt end of the tube. here is considerable convenience in this arrangement. One position circle only is required for all the micrometers that may be employed with the instrument; and the orientation of reticulated diaphragms, or the adjustment of the direction of the slit of a spectroscope, may also be accomplished by the same means. But, after a very extended experience of all'the various types of existing mouutings, the present writer does not hesitate to eXpress a decided preference for a position circle attached to the micrometerand a rigidattachment of the eye-end to the telescopetube, —having never seen an eye-end attached to a position circle on the butt end of the

| telescope-tube in which, after the wear and tear of a few years,

some looseness or shake could not be detected. This isa fatal fault, especially in those delicate observations of difference of declina- tion which have latterly formed so prominent a feature in refined micrometrie research,

On the other hand, in some good old micro- meters at the Royal Observatory, Cape of Good Hope, that are fitted with attached position cireles, there is no trace of shake or wear after fifty years of work.

MICROMETER.] 245 astronomy have been executed. In this micrometer the screw s is mounted on its own slide and has a divided head precisely like the screw S (fig. 9). The plate pp is elongated towards s, and the corresponding bush B is attaehed to this elongation. The serew s/ is shifted to another part of the eye-picce slide, so that it does not interfere with the increased diameter of the screw s. Fraunhofer’s micrometer in this form belongs to type A, but is quoted under

Fraun- The micrometer of type B represented in fig. 91 is the original | type B for convenience of description. hofer’s Merz micrometer of the Cape Observatory, made on Fraunhofer’s It is not necessary to give a figure representing type C. Such filar model. § is the head of the micrometer screw proper, s that of tho | micrometers have been generally constructed on Troughton’s type micro- screw moving the slide to whieh the so-called “ fixed web” is (figs. 1, 2, 8) with the omission of one of the serews, and with meter attached, s’ that of a screw which moves the eye-piece E. C is the | one or more of the modifications described in detail under type MAY tal spose de: se gp See one he wonder at the poor adaptation of means to ends or the marvellous ined Pee bs . rong en eadered sizictly parelle patience and skill whieh, with such means, led to such results.2. It The micrometer screw is mounted on the slide which carries the ees oat Sorat rp ete ae all irony e inovable web. Fig. 10 shows a plan of this slide; the Siviged | ive heads of his micrometer (Mem. R. A. S., vol. xxxv. p. 189). dren a bie wecow,, (2: aided for wake of gn aim a His slipping piece gave motion to the micrometer by two slides, screw S has shoulder at a carefully fijed ank a> one in right ascension the other in declination, so that “either of bearing 90.09.16 work. ancotly te 0 hols. in the War Pebe epee the webs can be placed upon either of the components of a double oo; the other extremity of the screw is formed into a pivot, which star with ease and certainty.” fits a hole in the brass piece 88. The end of this pivot—hardened, All micrometers nsed, in conjunction with a microscope, for read- polished, and sigitly Pounde@—rests on the flat surface of an agete ing

the divisions of transit circles, heliometer seales, &c., are of the haa wig tayamees in thaws of the slide, iad. kept firmly in its type C. The reading micrometer is shown in fig. 11. C is the place by the brass piece 68. By careful adjustment of the screws | bYPe ©: ” dhieclivs, 1D tar laeothdiew tox. W the grad- 0, @ sufficient pressure may be left upon « to slightly bend the strong tin i hedd of tha Serew. Gi the aulled head spring _ thus ae all end-shake anal preventing easy by which the serew cc 4s tarne d, A an eye- aetion of the screw. ne screw passes at the : ei ee : 0 ai same time through the bush 5 ishéwn in piece sliding in a tube B, aa (fig. 12) the slide, ‘plan and.elevation, fig. 10) attached to pp (fig. 9); and there is a fine saw cut, which can be narrowed by the small screw 7, to close the bush upon the micrometer screw with a view of preventing “‘loss of time.” The spider web w is cemented on the further side of the thin plate wv, the varnish being applied in the countersunk holes shown by the dotted eircles u,u. The slide is counter- sunk to about half its thickness within the area indicated by oovo, in order to allow the adapter of the eye-piece to come sufficiently : Fig. 12. close to the webs. _The oaks was origin- and 6, 6 the spiral springs. The focal length of the objective ally moved by a pinion Working in a rack z and the distance between the optical centre of the lens and the (fig. 9); but the screw s’ applied by Simms webs are so arranged that images of the divisions are formed in was found by Maclear to be more convenient Fie. 10. the plane of the webs, and the piteh of the screw is such that one for the purpose. Beyond this, and the grad- 3 .:. _ | division of the scale corresponds with some whole number of re- uation of the edge of the circle with more strongly cut divisions volutions of the screw, than those originally engraved on the face of the circle, the instru- There is what is technically called a ‘‘comb” inserted in the ment remains and is figured in its original form. Pistor and | sicrometer box at d (fig. 12),—its upper surface being nearly in the Martius (Berlin) have also made excellent instruments of the plane of the wires. This comb does not move with reference to the above type. There is a celebrated micrometer of their make, with box, and serves to indicate the whole revolution of which a fraction Dunsink which, in the hands of Brunnow at Dunsink (Dublin), some of | i, read on the head. In fig. 12 a division is represented bisected by miero- the most perfect and refined investigations ever made in practical | cross webs, and five revolutions of the screw eorrespond with one meter, 1 When it is

remembered that the measurements of the Strnves, Dembowski, | division of the scale. In all modern reading micrometers the eross

Seeeli, the Bonds, Maclear, and of most modern Continental astronomers have been made with Fraunhofer or Merz micrometers, it is not too much to say that fig. 9 represents the instrument with which three-fourths of the astronomical measurements of the last fifty years have been made.

webs of fig. 12 are replaeed by parallel webs embracing the division

2 The late Professor Watson used to say, quaintly aud with truth, “ After all, the best part of the micrometer is the man at the small end! ”

(fig. 13). The means for changing the length of the tube and the distance of C from the scale are omitted in the figure. These appli- ances are required if the ‘‘run” has to be accurately adjusted. By ‘‘run” is meant the difference between the intended whole number of screw-revolutions and the actual measure of the space between two adjacent di- visions of the scale in turns of the screw divided by the number of intended revolutions. In delicate researches Fic. 13 two divisions of the scale should always be read, not *’8 “° merely for inereased accuracy but to obtain the corrections for ‘“‘run” from the observations themselves.

Repsold’s _ Fig. 14 represents an important type of reading micrometer by the reading Repsolds. Here the web-frame is mouuted on the serew itself. The micro- limiting plane of motion is at py, where the end of the micrometer meter, serew bears upon the hardened, flattened end of the screw s, and is kept in bearing against this plane by the spiral spring g. Rotation q

:

Fig. 14. of the wire-frame is prevented by the small stud m which passes through the web-frame and projects slightly on both sides of it, just barely touching the inner surfaces of the top and bottom of the inicrometer box. The web-frame thus rests solely on the screw and on the point m, and

therefore follows it absolutely and accurately. Micro-” The comparative merits of the various micrometers are discussed meter by Lord Lindsay and Mr Gill (Dunecht Publications, vol, ii. pp. errors, 53-55, 1877). lf the screw of the Repsold micrometer is bent, so

that, for example, the end of the frame next the screw-head is raised

and that next the end p lowered, a twist will be given to the web-

frame, and the centre of the wire will be moved nearer to the micro-:

meter head than it should be, while the reverse effect will follow when

the head has been turned through 180°. The effect of a similar

error on the other micrometers described would be of a much less

amount. They are, however, liable to errors of another character.

If, as in Troughton’s original micrometer, the shoulder is square,

the hole in the end of the box may be left sufficiently wide to allow

for a small error in the parallelism of the screw-matrix with the

motion of the slide, but the smallest bend in the screw causes the

shoulder no longer to bear flat, but to ride on its edge, thus intro-

ducing an extremely uncertain form of error. If the shoulder is

spherical, fitting into a hollow cone on the end of the box, as in the

micrometers of Simms, Cooke, and Grubb, an alinost inconceivable

aceuracy of construction is implied in drilling the matrix of the

screw in the slide so that its axis and that of the cone shall be in

the same straight line, and both parallel to the motion of a point in the slide. Any departure from perfect accuracy in this respect has the effeet of bringing different portions of the spherical shoulder to bear on different parts of the cone for different revolutions, and introduces errors of a character by no means easy to deal with. In addition to these objections there always is the greater objection of employing as a delicate contact-measuring surface one that is exposed where oil is used. Dust and oil will arrange themselves in layers of variable and uncertain thickness and defeat all attempts to seeure absolutely consistent results. In Repsold's micrometer the point @appui is a small hardened and polished bearing, requiring little lubrication, and perfectly protected from dust; the errors of the serew (some of them exaggerated, certainly) are faithfully reproduced, and consequently determinable, and beyond this the work to be done by the screw is reduced to a minimum,—no slide-friction having to be overcome. If we are to regard as the most perfect instrument, ''not that which has absolutely the smallest errors, but that which reproduces its errors with the most perfect consistency," undoubtedly Repsold's form of micrometer is best. In order to avoid the exaggeration of the screw-errors produced by the non-symmetrical position of the serew in Repsold's micro-

meter, Stone, in December 1879, exhibited at the Royal Astronomical Society, and described (Monthly Notices, p. 270), a modification of Repsold's instrument. But, both in his statement of the compara- tive merits of the Troughton and Repsold micrometers and in the new form which he figures, Stone overlooks a strong point in the Rep- Lindsay- sold form, and in that proposed by Lord Lindsay mf Gill three years

Gill mi- previously,"—namely, the avoidance of all friction of the slide, and erometer, the elimination of all error or strain that may occur from a want of parallclism in the axis of the matrix and the motion of the slide.

The Lindsay-Gill micrometer will be better understood from the following description. In fig. 15 Ss is the micrometer screw ; its

1 Dunecht Publications, vol. ii., footnote p. 55, Dunecht, 1877.

METER:

cylindrical axis is nicely ground to fit a hole.in the side of the box at @;* the same axis, but ground toa somewhat smaller cylinder, fits neatly but smoothly a hole in the web-frame at b. A screw, cut on the same axis, is tapped into the web- frame ats, and the axis terminates in a pivot which fits a hole ina brass plate cc. The end of the pivot—hardened and slightly rounded —rests on a flat agate? bearing a, which is imbedded in the plate B, and securely held in sitw by pressure of the platé cc. The plate B is firmly attached to the bottom of the box. 4, g are spiral springs mounted on pins. Both springs and pin pass freely through the web-frame at p, , and the pins (but not the springs) pass freely through the frame at n, 2.4 The parallel webs for observing the division (fig. 13) are mounted on the forked end of the frame at ww.

The web-frame is narrower and thinner than the breadth and height of the interior of the box, and is only prevented from rotat- ing by the delicate touch of the projecting ends of the pin m on the inner surfaces of the top and bottom of the box. It appears that a frame so mounted fulfils all theoretical con- ditions of accuracy. It is perfectly free to follow the motion of the screw and accurately to reproduce its errors, notwithstanding any reasonable faults of workmanship; and no permissible shake or fouling of the bearing

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Fig. 15. at @ can produce sensible error in the distance between the bearing

surface of the agate plane and the spider webs. The motion is pro- duced with the minimum of friction; and the “feel” of the screw is therefore as delicate and perfect as it is possible to make it.

The micrometer of type D shown in fig. 16 has recently Repsold’s been made by the Repsolds for the Cape Observatory. As this micro- instrument combines eter, all their most recent s modifications, we de- scribe it in detail. Fig. 17 represents the same micrometer with the upper side of the box removed. The letters in the descrip- tion refer to both figures.

S is the head of the micrometer screw, s that of the screw by which the micrometer box is moved relative to the plate / (fig. 16), s that of the screw which moves the eye- piece slide. K is the elamp in __ position angle, P the slow mo- tion screw in position angle ; pp is the posi- tion circle, R, R its two readers. The lat- ter are in fact little microseopes carrying a vernier etched on glass, in lieu of a filar micrometer.

Fig. 16.

These verniers can be read to 1’, and estimated to 0’:2. D is the drum-head which gives the frae- tion of a revolution, d that which gives the whole number of revo- lutions, I is the index or pointer at which both drums are read. This index is shown in fig. 17, but only its mode of attachment (X,

fig. 17) in fig. 16. The teeth of the pinion z, fig. 17, are cut on the axis of the micrometer screw. The drumd and its attached tooth wheel are ground to turn smoothly on the axis of the serew. The pinion z and the toothed wheel d are connected by an intermediate wheel and pinion Y; the numbers of teeth in the wheels and pinions are so proportioned that twenty-four revolutions of the micrometer screw produce one revolution of the drum and wheel d. (This is the description of Repsold's counter referred to under type A.) The divisions of both drums are conveniently read, simultaneously, by

2 There would be some advantage in allowing the screw's axis to pass witha little shake through the hole in the end of the box at a, and then, extending the length of the larger eylinder, transfer the bearing from a to a well-fitting hole in a pieee fixed like B to the bottom of the box. This form would also give some facilities of construetion, and all the oiled surfaces would be perfeetly protected.

3 Sapphire is better; the agate bearing of such a serew has been found very sensibly worn.

4 If it is desired to prevent possible eontact of these pins with the frame, the ends of the pins may be made to enter guiding holes in ce,

the lens ¢; at night the lamp which illuminates the webs and the position circle also illuminates the drum-heads (see on illumination below). aaaais the web-frame (fig. 17), Byis a single rod consisting of two eylinders accurately fitting in the ends of the micrometer box, the larger cylinder being at 8. There is a hole in the web- frame which smoothly fits the larger cylinder at 6', and another which similarly fits the smaller cylinder at 7. A spiral spring, coiled round the cylinder -, resting one endon the shoulder formed by the difference of the diameters of the cylinders 6 and y and the other on the inside of the web-frame, presses the latter continuously towards y. Contact of the web-frame of the micrometer with the side of the box at y would therefore take place, were it not for the micrometer screw. This screw fits neatly in the end of the box at e, passes looscly through the web-frame at ¢', is tapped into the frame at ¢', and its end rests on a flat

hardened surface at ¢. Rota- tion of the web-frame about By is prevented by the heads of the screws at m; the head of the screw on the lower side of the frame reposes on the plane vy, that on the upper side (fig. 17) touches lightly on the inner surface of the lid of the box. Such rotation can obviously be controlled within limits that need not be further considered. But freedom of rotation in the plane of the paper

of the screws. The position of the box relative to the plate f, in the direction of measurement, depends therefore on the distance between the end of the screw s and the fixed stud. A screwing in of s thus causes the box to move to the left, and vice versa. Rotation of the box round CC is prevented by downward pressure of the spring Z on a projection attached to the side of the box. The amount of this pressure is regulated by the screw 2'.

The short screw whose divided milled head is « shifts the zero of the micrometer by pushing, without turning, the short sliding rod whose flat end forms the point @appui of the micrometer screw at ¢. The pitch of the screw ois the same as that of the measuring screw (50 threads to the inch), and its motion can be limited by a stop to half a revolution.

The five fixed webs are attached to the table 77, Which is secured to the bottom of the box by the screws p. The three movable webs are attached to the projections AA on the frame aa. The plane surfaces rr and AA are composed of a bronze of very close texture, whieh appears capable of receiving a finish having almost the truth and polish of an optical surface. It seems also to take a very clean V cut, as the webs can be laid in their furrows with an astonishing ease and precision. These furrows have apparently been cut én situ . with a very accurate engine; for not the slightest departure from parallelism can be detected in any of the movable webs relative to the fixed webs. Extraordinary care has evidently been bestowed in adjusting the parallelism and distance of the planes 7 and A, so that the movable. wires shall almost, but not quite, touch the sur- face +. The varnish to fix the webs is applied, not on the surface 7 asis usual, but on a bevel for the yurpose,! the position of the webs depending on their tension to oat them in their furrows. The result is that no trace of ** fiddling" exists, and the mov- able and fixed webs come sharply together in focus with the highest powers. Under such powers the webs can be brought

into apparent contact with such preeision and delicacy that the uncertainty of measurement seems to lie as much in the estimation of the frac- tion of the division of the head as in the accuracy of the contact. It is a convenient feature in Repsold's micrometer that the webs are very near the inner surface of the top of the box, so that the eye is not brought inconveniently close to the plate when high powers are used.

Micromcters of the type E have been invented by Alvan Clark and Clark's Grubb. Clark's micrometer was exhibited at the June meeting of micro- the Royal Astronomical Society in 1859 (Monthly Notices R.A. S., meter for vol. xix.). It is capable of measuring angles up to about one degree. large It is "furnished with two eye-pieces, composed of small single angles. lenses, mounted in separate frames, which slide in a groove and can be separated to the required distance. A frame carrying two parallel spider lines, each mounted separately with its own micro-

-meter screw, slides in a dovetailed groove in front of the eye-pieces ; and by a free motion in this frame each web can be brought opposite its own eye-lens. In using this micrometer, the first step is to set the position-vernier to the approximate position of the objects to be measured. Then the eye-lenses are separated till each is opposite its own object. The frame containing the webs and their micrometer screws is then slid into its place; and the webs, having been separated nearly to their proper distance by their free motion in the frame, are plaeed precisely on the objects by their fine screws, the observer's eye being carried rapidly from one eye-lens to the other a few times, till he is satisfied of the bisection of each of the objects by its own web. The frame is then removed for reading off the measure by means of an achromatic microscope, on the stage of which it is placed." The advantages which Clark claims are these :—

'1, Distances can be observed with great accuracy up to about one degree, and the angles of position also.

'**2. The webs, being in the same plane, are perfectly free from parallax, and are both equally distinct, however high the magnify- ing power may be.

'*3. The webs are also free from distortion and from colour.

‘4, A different magnifying power may be used on each of the objects;—which may be advantageous in comparing a faint comet: with a star.” ; he

It appears to us that the method of removing a slide in order to measure the interval between the webs is liable to objection, not only because of the risk to the webs, but because the taking of measurements of such a different character with a different instrument is inconvenient and troublesome. It is true that the intervals between the webs could be measured by an assistant, and two or more different slides be employed to save time ; but astronomers will probably generally prefer the method introduced by Grubb described below. It is understood that Clark has since improved this instrument by an ingenious arrangement of prisms, which permits both webs, even though separated one degree in a large telescope, to be seen in the same eye-piece. The arrangement is not described, and is said to be, as yet, somewhat troublesome to arrange previous to measurement, though when arranged it gives very good results. ‘ , r

Grubb (Scientific Procecdings of Royal Dublin Society) thus describes

Fig. 17.

(fig. 17) is only prevented by good fitting of the holes £’, y’; and, since the weight of the slide is on one side of the screw, misfit here will have the effect of changing the reading for coincidence of the movable with the fixed web in reverse positions of the micrometer. With the Cape micrometer a systematic difference has been found in the coincidence point for head above and head below amounting to 0°14, This corresponds, in the Cape instrument, with an excess of the diameters of the holes over those of the cylinders of aboutzsigath of an inch,—a quantity so small as to imply good workmanship, though it involves a systematic error which is very much larger than the probable error of a single determination of the coincidence point. The obvious remedy is to make all measures on opposite sides of the fixed web before reversing in position angle,—a precau- tion, however, which no careful observer would neglect. In measur- ing differences of declination, where the stars are rought up by the diurnal motion, this precaution cannot be adopted, because it is necessary always to bisect the preeeding star with the fixed web. But in Ad measures index error can always be eliminated by bisecting both stars with the same web (or different

webs of known interval fixed on the same frame), and not employing the fixed web at all. Had the spring ¢ been placed as in fig. 14, and the cylinders B and y been made to bear like the pivots of a transit on seg- mental bearings in the frame at g’ and +’, it is probable that the difference in coincidence points would not have existed. Such a modification appears advisable, unless this construction, by leaving the end m less free, should make the “ feel’? of the serew less sweet and perfect. The discordance in zero when known to exist is really of no consequence, because the observations can be so arranged as to eliminate it.

The box is mounted on a strong hollow steel cylinder CC (fig. 17) by holes y, @in the ends of the box, which fit the cylinder closely and smoothly. The cylinder is rigidly fixed in the studs C, C, and these are attached to the foundation plate f. The cylinder contains towards 7 a sliding rod, and towards 6 a compressed spiral spring. There is thus a thrust outwards of the spring upon the hollow cap W (attached outside the box), and a thrust of the rod upon the end

1 The marks of varnish so applied will be seen in fig. 17.

Grubb’s duplex micro- meter,

what he calls his ‘‘duplex micrometer,” shown in perspective in fig. 18 :—“ A plate of glass about 24 inches square is ruled with twenty- one lines in one direction ~yth inch apart, and two lines in the other direction 2 inches apart. The extreme lines of the set therefore form a perfect square of 2 inches. These lines are ruled with execeding accuracy and care, but provision is left for ascertaining any errors that remain either as to distance or want of perfect squareness. Along one side of the square is mounted a micro- meter frame in the ordinary way, actu- ated by a screw of one hundred threads to the inch. This micrometer frame earries eleven lines corresponding exact- ly to each alternate line in the glass reticule, sothatwhen & the first spider line is made coincident with the first dia- : mond line on the Tic 18 glass the last spider ee As line will be eoincident with the last line on the glass, and each of the spider lines will be coincident with all the odd numbers of diamond lines, 1, 3, 5, 7, 9,11, 18,15, 17,19, 21.

Over this glass plate is placed a brass cap in whieh two eye-pieces are mounted, one sliding in a groove at right angles to the other,—so that, while one has its journey baekwards and forwards on the horizontal line, the other has its journey on the vertieal line, according to how the eap is placed, for this cap is capable of rotation to meet various circumstances.

‘* How to Use the Instrument.—1. The two stars are brought on the horizontal line, and the distance measured from centre to centre along that line, This distance is measured by eounting the number of spaces on the glass, adding the residue as measured by the micrometer screw. Thus the screw is never used for larger measures than ;yth inch, and therefore errors of screw and temperature errors are much reduced. In bisecting, one star is bronght into the field of one eye-picce, and a bisection is made with one of the diamond lines by moving the micrometer by one or other of its slipping piece screws. Then the other eye-piece is moved till the second star is seen, and a bisection is made with the nearest spider line by moving the micrometer head. Then the eye can be moved back to the first eye-piece, and the bisection checked, and again back to the other eyepiece. When it is seen that both are satisfactory the measure ean be read off. 2. The micrometer is turned round till the horizontal line becomes parallel to the path of apparent motion of the star. This is easily found by stopping the clock and allowing the star to run along the horizontal wire. Now the other star will be found to cross the vertical line somewhere, while the first star is on the horizontal line. This second star is then bisected on the vertical line, while the first star is bisected by one of the spider lines ; thus the difference in right ascension is found. We then have two sides of a right-angled triangle and of course all the elements are known.

““ To Ascertain the Errors (if any) of the Distance of the Lines. — Of course, the usual plan of taking transits ean be adopted, and to ascertain if the lines be perfectly at right angles a special additional eye-picce is provided, so that transits ean be taken aeross each diagonal of the square.”

This instrument has great advantage over Clark’s in ease of adjustment and use, and has done good work at the University Observatory, Oxford (Mem. R. A. S., vol. xlvii. pp. 5-12). Professor Pritchard claims too much when he estimates its work as equal in accuracy with that of the heliometer—at least

the published results do not confirm such a view. But it is a very valuable instrument for measuring objects too faint for the limited aperture of most heliometers, and which at the same time are farther apart than the field of view of an ordinary eye-piece,

The accuracy of the duplex micrometer would be very greatly increased if Clark's idea (above mentioned) of viewing both widely

separated webs in one eye-piece of high power eould be reduced to a convenient practical form.

Method of Webbing the Filar Micrometer.

The webbing of a micrometer is a process that should be familiar to all practical astronomers. English opticians usually proceed as follows. A spider (the variety is marked by a cross on the back, and is found in English gardens about deeayed wood) is canght, and placed on a wire.fork. The insect immediately attaches a web to the wire and begins to lower itself by a web to the ground. This web is wound upon the fork till ten or twelve turns, separated by a convenient space, have been secured. A brush with varnish is

then pagsed along the prongs ; the webs are thus secnrely fixed to the fork. The parallel prongs of the fork must be sufficiently far apart to allow the web-frame of the micrometer to pass between them. The frame to be webbed is placed on a flat dull black surface between the prongs of the fork, the latter being earefully arranged 'so that one of the webs lies nearly in the furrow ruled in the frame for its reception. As the web-frame is generally thicker than the fork, the web will now be stretched across the former, with a certain amount of tension, and is brought into the furrow with a finely pointed piece of soft wood. If the surface of the frame is well polished, and the furrows sharply eut, without ' burr," the web should leap sharply and decidedly into its place. Each end of the web is then secured by a drop of shellac varnish, which should be allowed to harden thoroughly before the frame is touched. 'The webs can be very readily so handled against a black

back- ground, with the aid of a hand lens of 2 or 3 inches focus. In experienced hands this method gives good results, but the following, which is generally followed on the Continent, is prefevable.

A web, about 2 inches longer than the width of the frame, is unwound from a cocoon,! and small pieces of lead are attached to its extremities by beeswax. One end of the web, with its attached lead, is laid on a piece of eork floating in a tumbler of water ; the other end is allowed to hang down in the water, where it becomes thoroughly saturated and untwisted. It is then laid across the fork, and dropped into its furrows in the manner above described, the little lead weights exerting a definite tension. Varnish ? is immediately applied to secure the webs, and the frame is not touched till it is dry.

The bevel-edge of the web-frame introduced by Repsold (type D) offers great facilities for aceurate webbing, and should be cmn- ployed in all future micrometers.

Illumination of Micrometers.

When micrometer observations are made by night it is necessary to have some mode of rendering the webs visible, —either by rays of light at right angles to the axis illuminating the webs, or by rays nearly eoincident with the axis of the telescope. In the former case we get bright webs in a dark field, in the latter dark webs on a bright field.

In the older telescopes bright web illumination is produced by small lamps with nozzles that enter the tubes L, L (fy 5. 9). The illumination is regulated in colour and intensity by wedges of coloured or darkened glass passing through slides in the nozzles. But it is inconvenient to have lamps so near the observer’s eye, and it is at least very difficnlt to obtain a perfectly dark field when the wires are illuininated in this way. :

The Clarks, in their micrometer of the great Washington tele- seope, have made the end of box T (fig. 15) transparent, and light is thrown on the webs from a lamp held by an assistant. Holden has very recently applied a lamp ingeniously hung so as to preserve its vertieality and the constant direction of its light in a similar way, adding a plain silvered mirror inside the box

and opposite the lamp, so as to illuminate the webs symmetrically. In the Clarks' and Holden's methods it is only the webs at right angles to the screw that are illuminated.

For illumination of the field, in very old telescopes, light was thrown on a small ivory refleetor fixed outside the object-glass in the axis of the telescope by an arm fitting on the cell of the lens. This involved the aid of an assistant to direet lamplight on the ivory reflector, or the very frequent change of a lamp support. _After- wards the light from an attached lamp was intro- duced through a hole in the teleseope-tube and thrown upon an ellipti- eal plane (generally dull- gilt) having its eentre part eut away sufficiently to avoid interruption of the cone of rays from the object-glass. "Many in- genious modes of sus- pending the lamp have been invented for the pur- pose of securing a eon- stant direction of its light

Fig. 19. coupled with verticality of the lamp. One of the best of these, dne

to Cooke, is shown in fig. 19. Lis the lamp, P a prism to reflect

1 It ts asserted that webs from cocoons are more elastie, better shaped, and more durable than those obtained during an effort of the inseet to eseape. The best webs we have seen were from a cocoon obtained in Holland, but we have been unable to ascertain the name of the variety of spider.

2 Argelander used to apply two drops of varnish at each end of his webs, He first fixed each extremity by a drop of shellac varnish, and after that had dried he applied a drop of eopal varnish nearer the eentre of the frame; the latter took a long time to harden, but gaye ultimately a mueh stronger attachment.

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its light into the tube, D a'disk to regulate the quantity of light, Ba disk with glasses to regulate the eolour of the light, S a spring to clamp the disks, C the counterpoise of the lamp, G a poise to preserve the horizontality of the axis CL. But astronomers owe to the genius of Grubb the introduction of a more efficient and convenient system, viz., the performance of all necessary illu- mination of an astronomieal telescope by a single lamp, and tle perfect

control of the illumination of the field or webs, and the regulation of these as to intensity or colour by simple motions from the eye-end. It is impossible to speak too highly of Grubb's efforts in this direction ; he has broken the ground in this department of astronomical engineering, and rendered the working of so huge an instrument as the Vienna telescope of 27 inehes aperture not only convenient, but easier for a siugle observer than that of a very small telescope of the older constructions.

But in the illumination of the field wires and scales of a micro- meter Grubb's original method has recently been surpassed by one which is due to the Repsolds. We shall therefore describe the latter.

Fig. 20 represents the eye-end of a telescope. The reader will recognize the micrometer (figs. 16 and 17) previously described. L is a paraffin lamp fitting by a bayonet joint into a copper cover ce. This effectually defends its glass chimney against accident, and protects the lamp from wind. The simple means by whieli this lamp is made to preserve its ver- tieality in all positions of the telescope is evident from the figure. By this lamp alone the bright wire or bright field illumi- nation is given at pleasure, and with any desired intensity, simply by movement of the small pin p.

The position circle and the head of the micrometer are also illu- minated, as well as the deelina- tion circle, by the same lamp. AB is a eylindrical box, ending in a truneated cone towards A. It is shown, mid-section, inaplane _ passing through the teleseope axis, © in fig. 21, where all details un- necessary to the explanation of the illumination art omitted, and pro- portion of parts is sacrificed to elearness. P is a prism (fig. 21) that rotates with the lamp and reflects its light into AB. The flame of the lamp is in the focus of the lens i, so that the rays hbeeome parallel after passing J through it. There is a sliding Fig. 20. motion to perfect this adjustment. There is a well-polished flat annular reflector of speculum metal rr (fig. 21), which reflects light upon the double mirror M (fig. 20), whence it is diverted to the two opposite points on the declination circle that are read by micrometer microscopes from the eye-end (the latter are omitted for sake of clear- ness),

The little handle at p' and the dotted lines p'z represent an iris-diaphragm, very ingeniously constructed, mount- ed on a plate of transparent glass.

There is a flat ring of brass, carrying

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four pins, which is turned by the handle p’, in a plane at right angles to Pn,

These pins work in spiral slots cnt in four slides. Thus

Fig. 21,

rotation of the ring causes the four slides to approach or recede from a centre. When the handle y’ is in the rials of its range, the slides together form a disk as large as the hole in the diaphragm dd, and thus prevent all light from entering the telescope tube. When

p’ is pushed to one side of its range the slides niove outwards leaving ” a square opening in the centre so that the light falls on the prism 7,

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whence it is diverted to a silvered reflector eemented on the middle of the inner surfaee of the objeet-glass, and is then reflected back along the axis of the telescope to illuminate the field at w. When p’ is pushed to the other side of its range the slides approaeh and overlap at the centre, excluding light from n and allowing it to fall upon the reflector s instead. From s the light is thrown upon the. webs w, w by reflexion from a white papier maché surface laid on the inside of a thin hollow brass truncated cone zz. The edge of this cone forms the circle seen within rr in fig. 17. All stray light is preveuted by the light-guard tube mm, whieh is attached to and moves with the rotating part of the micrometer. The result is to produce a symmetrical illumination of the whole system of webs in a perfectly dark field. It is also obvions that by placing p’ at an intermediate position between the centre and the extremes of its range any desired modification of bright wire or bright field iHu- mination can be obtained at pleasure. a sl

The light falling on the papier maché hollow cone is intercepted at three points by prisms, one of which « is shown in section, These prisms are inserted in the cylinder which carries the foundation plate of the micrometer

box and rotate with it, Two of them divert light upon the reflectors (seen from different points of view in figs. 16, 17, 20). The third prism after two reflexions (figs. 16, 20) illuminates the micrometer head. The whole arrangement is in the highest degree elegant, and we have found it most simple and convenient in practiee. The screen C (figs. 20 and 21)—made of thin copper and attached to AB—effectu- ally protects the observer's eye from stray light from the lamp.

It has been found essential, in bright field illumination, when the highest accuracy is desired, to have the illuminating rays parallel with the telescope axis.

In the best telescopes of the future some plan like that of Rep- sold's, above described, will doubtless be adopted. It is probable also that with the introduction of condensers, in conjunction with the incandescent carbon light in vacuum, electricity will ultimately supersede the oil or paraffin lamp in illuminating astronomieal instruments, A small ''Swan lamp" can be plaeed anywhere, is unaffected by wind, and gives off comparatively little heat. These are most valuable qualities for the purpose in.question.

The astronomer-royal (Mr Christie) has reeently used luminous paint to render the measuring pointer of the Greenwich speetroscope visible at night. This paint, after exposure during the day to sun- light, shines at night with a dull phosphorescence sufficient to make the micrometer pointer, to which it is applied, faintly visible, and, it is stated, with very satisfactory results.

On the use of the filar micrometer consult Struve, Mensura Micrometrice, St Petersburg, 1837; Brunnow, Practical and Spherical Astronomy; Chauvenel, Practical and Spherical Astronomy; Brunnow, Astronomical Observations and Researches made at Dunsink, Dublin, 1870, 1873, 1879; Ball, ibid.; Kaiser, Leiden Observations; and the papers of Dembowski in the Astronomische Nachrichten.

Double-Image Micrometers. The discovery of the method of making measures by double

images is stated to have been first suggested by Roemer abont 1678. Roemer.

Bnt no sueh suggestion occurs in the Basis Astronomiw of Horre- bow (Copenhagen, 1735), which contains the only works of Roemer that remain to us. It would appear that to Savary is due the first invention of a micrometer for measurement by double image. His heliometer (describ- ed in a paper com- munieated to the Royal Society in 1748, and printed, along with a letter from Short, in Phil. Trans., 1758, p. 156) was constructed by cutting from a com- plete lens abcd the equal portions aghc and acfe (fig. 22). Fie. 22 The segments gbh & AS . and ¢fd so formed were them attached to the end of a tube having an internal diameter represented by the dotted circle (fig. 28). The width of eaeh of the portions aghc and acfe cut away from

the lens was made slightly greater than the foeal : <

length of lens x tangent of sun’s greatest dia- Fig. 24.

Co

Fig. 23.

meter. Thus at the focus two images of the sun were formed nearly in contact as in fig. 24. The small interval between the adjacent limbs was then measured with a wire micrometer.

Savary also deseribes another form of heliometer, on the same Savary.

principle, in which the segments aghe and acfe are utilized by cementing their edges gh and ef together (fig. 25), and eovering all exeept the portion indieated by the unshaded eircle. Savary ex- presses preference for this seeond plan, and makes the pertinent remark that in both these models ‘‘the rays of red light in the two solar images will. be next to eaeh other, which will render the sun’s disk more easy to be observed than the violet ones.” This

he mentions ‘‘ because the glasses in these two sorts are somewhat | prismatical, but mostly those of. the first model, which could | therefore bear no great charge” (magnifying power).

A third model proposed by Savary consists of two complete lenses of equal focal length, mounted in cylinders side by side, and attached to a strong brass plate (fig. 26). Here, in order to fulfil the purposes of the pre- vious models, the distance of the centres of the lenses fron each other should only slightly exceed the tan- gent of sun’s diameter x focal length of lenses. Savary dwells on the difficulty both of procuring lenses sufficiently equal in focus and of accurately adjusting and centring them.

In the Jfém. Acad. de Paris, 1748, Bouguer de- scribes an instrument which he calls a heliometer. Lalande in his Astronomic (vol. ii. p. 639) mentions such a heliometer which had been in his possession ? from the year 1753, and of which he gives a representation on Plate XXVIII., fig. 186, of the same volume. Bouguer’s helio-

meter was in fact similar to that of Savary’s

a r

third model, with the important difference that, instead of both object-glasses being fixed, one of them is movable by a screw provided with a divided head. No auxili- ary filar micrometer was required, as in Savary’s heliometer, to measure the interval between the limbs of two adjacent images of the sun, it being only necessary to turn

with the attached semi-lenses, move in slides fixed to the plate CC, — simultaneous motion, in contrary directions, being communicated to them

by turning the handle E, which drives a concealed pinion that works in the two racks seen in the highest part of the figure. The amount of separation of the semi-lenses is measured by a scale 5 inches long, subdivided to #;th of an inch, and read by a vernier on the plate F to jth ofan inch. In practical use this micrometer has never given satisfactory results (see Mosotti in the Efemeride of Milan for 1821). It must be remembered, however, that when Dollond gave preference to this type he had not invented the achromatic object-glass ; his preference was fully justified under these circumstances. So far as we kuow no heliometer with a divided achromatic object-glass was ever made by the elder Dollond on the principle of his first type. His son, however, made what he ealled an object-glass micrometer, which was a great improvement on the elder Dollond's second type.

In the older construction the brass mountings of the semi-lenses obstructed the light entering the telescope in proportion to their separation, and the images were so coloured as to prevent the use of any but very low powers. In the later construction the movable segments are formed from a negative achromatic lens of much larger aperture than the object-glass of the telescope with which the micrometer is employed ; and, for convenience in monnting, the segments gbh and edf (fig. 22) are removed. In the fine example of this instrument at the Royal Observatory, Cape of Good Hope, the movable lenses consist of segments of the shape gach and eacf (fig. 22) cut from a complete negative achromatic combination of 8} inches aperture and about 41 feet focal length, composed of

the screw with the divided head to change Fig. 26. a double concave flint lens and a double convex crown. This is the distance between the object-glasses till applied to an excellent achromatic telescope of 34 inches aperture the two images of the sun are in contact as and 42 inches focal length. The instrument is represented in in fig. 27. The differences of the readings fig. 30; the same letters indicate the analogous parts of fig. 29. of the screw, when converted into are, afford The frame CC, moved by the means of measuring the variations of teeth on its outer edge, the sun's apparent diameter. Fic. 2 carries one of the halves

Dollond. On the 4th April 1754 Dollond com- ig. 27. G of the lens, and a simi-

municated a paper to the Royal Society of London (Phil. Trans., vol. xlviii. p. 551) in which he shows that a micrometer can be much more easily constructed by dividing a single object-glass through its axis than by the employment of two object-glasses. He points out—(1) that a telescope with an object- glass so divided still produces a single image of any object to which it may be directed, provided that the optical centres of the seginents are in coin- cidence (7.c., provided the segments retain the same relative positions to each other as before the glass was cut); (2) that if the segments are separated in any direction two images of the object viewed will be produced ; (3) that the most convenient , direction of separation for micrometric purposes is Fig. 28. to slide these straight edges one along the other as the figure on the margin (fig. 28) represents them: ‘‘ for thus they may be moved without suffering any false light to come in between them ; and by this way of removing them the distance between their centres may be very conveniently measured, viz., by having a vernier’s division fixed to the brass work that holds one segment, so as to slide along a scale on the plate to which the other part of the glass is fitted.”

Dollond then points out three dif- ferent types in which a glass so divided and mounted may be used as a micrometer :—

“‘1, It may be fixed at theendof 4 a tube, of a suitable length to its #7 focal distance, as an object-glass, — the other end of the tube having an eye-glass fitted as usual in astronomi- cal telescopes. –

“2. It may be applied to the end of a tube much shorter than its focal distance, by having another convex glass within the tube, to shorten the focal distance of that which is cut in two.

‘*3. It may be applied to the open end of a reflecting telescope, either of the Newtonian or the Cassegrain construction.”

lar frame with teeth car- ries the other half F. A scale 84inches long is fastened like an edge-bar to the frame of the seg- ment G, and each inch is subdivided into twenty parts, which are read off

Fig. 30.

by a vernier to z¢5yth of an inch, and, by estimation, this can easily be carried to gg/ggth or spgath of an inch. The two movable frames are imbedded in a fixed plate HH, screwed to the adapter B, having a eircular hole in its middle equal to the diameter of the

object-glass. The slide of the segment G is moved by turning the milled head to the right of A, and the other segment F by means of a rack and pinion on the opposite side, the latter being turned from the eye-end by a handle not seen in, the figure. A screw is provided for clamping the slide of the segment G, as it is intended that only the segment F shall be moved in making the final bisection. There is an index attached to the slide of G, reading on a rough scale engraved on the plate H, which is obviously intended for setting the optical centre of the segment G approxi- mately as far from the optical axis of the telescope on one side as the optical centre of the segment F will be on the other side during the intended measurement. This arrangement not only permits the measurement of angles twice as great as would be possible if one segment were fixed, but is also important in increasing the symmetry of the measures, The vernier is placed at one end of the scale when the optical centres of the segments are in coincidence, and is provided with screws at I, which are intended for adjusting the zero of the scale. The younger Dollond has in this model retro- graded, in some respects, from the admirable example of his father, who, as shown in fig. 29, not only gave the lenses automatic opposite motion symmetrically with respect to the axis of the telescope, but seems also to have provided for entire elimination of index error by making it possible to observe all angles on opposite sides of zero—a precaution possible in the later form only when very small angles are measured. Rotation of the micrometer in position angle is provided for as in the earlier form, but the in- strument is not furnished with a position circle.

With one of these instruments of somewhat smaller dimensions Tries- (telescope 24 inches aperture and 34 fcet focus) Triesnecker made a necker’s series of measurements at the observatory of Vienna which has measure- been recently reduced by Dr Schur of Strasburg (Nova Acta der ments. Ksl. Leop.-Carol. Deutschen Akademie der Natursforseher, xv.

No. 3). The angle between the stars ¢ and g Urse maj. (708”°55) was ineasured on four nights; the probable error of a measure on one night was + 0”°44. Jupiter was measured on eleven nights in the months of June and July 1794 ; from these measures Schur derives the values 35’°39 and 37”-94 for the polar and equatorial diameter respectively, at mean dis’ ance, corresponding with a compression 1/14°44, These agree satisfactorily with the corresponding values

Dollond adds his opinion that the third type is ‘*much the best and most convenient of the three” ; yet it is the first type that has survived the test of time and experience, and which is in fact the modern heliometer

Fig. 29 illustrates Dollond’s divided object-glass heliometer of the third type. A is the end of the

Pig. 29) reflecting telescope, upon which the adapter B is fitted. B carries a wheel (not seen in the figure) formed of a ring racked at the outer edge, and fixed to the brass plate CC, so that a pinion moved by the handle D may turn it into any position. Two plates F, G, |

? ht angle between the components of the double star 61 Cygni and | | a. An equiconvex lens…..... arbitrary=p ibeas observed the great comet of 1811. He also observed the eclipse of | | ® 5 * the sun on May 4, 1818. In the discussion of these observations i kal ee 7, Abth. 5, p. ») he found that the index error of the scale changed systematically in different position angles | phe Jens b is divided. and CH of tipasienenisni by Dees ic wee ing peneen of the direction of gravity | micrometer screw. The magnifying power is mo a. ie isa as : iy Bee dee ae een, but which | the Jens @ for another in which p hasa different value. The magni- epended solely on the direction. of the measured position angle | fring power of the eye-piece is that of a single lens of focus=4p. relative to a fixed radius of the object-glass. Bessel attributed this | “1’ig50 Valz pointed out that the other optical conditions could ue eames aed ee hel Oe bg ie with great | be equally satisfied if the divided lens were made concave instead of care the necessary corrections. But he was so delighted with the | convex, with the advantage of giving a larger field of view (IJonthly general performance of the instrument, with the sharpness of the Noises Vol. x 160) sd images, and the possibilities which a kindred construction offered ‘ie IS din Eatin GReCRSeNeNEs

enttonedta His for the measurement of considerable angles with micrometric Report of the R. A. §. council, February 1865. It consists in the accuracy, that he resolved, when he should have the choice of | introduction by Simms of a fifth lens, but no satisfactory descrip- heliom telescope for the observatory, to secure some form of | tion has ever appeared. There is only one practical published 4 oe, difficul otal as want é investigation of Airy's micrometer that is worthy of mention, Nor te it duitcult to imagine the probable course of reasoning viz., that of Kaiser (Annalen der Sternwarte in Leiden, iii. pp. which led Bessel to select the model of his new heliometer. Why, 111-274). The reader is referred to that paper for an exhaus- he might ask, should he not select the simple form of Dollond's | tive history and discussion of the instrument.> It is somewhat first ty pr ; Given the achromatic object-glass, why should not it be surprising that, after Kaiser's investigations, observers should con- divided? This construction would give all the advantage of the | tinue, as many have done, to discuss their observations with this younger Dollond's object-glass micrometer and more than its sharp- | instrument as if the screw-value were constant for all angles. ness of definition, without liability to the systematic errors which Steinheil (Jowrnal Savant de Munich, 28th February 1843) describes Stein- may be due to want of homogeneity of the object-glass ; for the lenses | 4 «+ holiométre-oculaire" which he made for the great Pulkowa re- heil's will not be turned with respect to each other, but, in measurement, fractor, the result of consultations betwecn himself and the elder ocular will always have the same relation in position angle to the line | Struve. It is essentially the same in principle as Amici's micro- micro- joining the objects under observation. It is true that the scale will meter, except that the divided lens is an achromatic positive instead meter, require to be capable of being read with much greater accuracy than | o¢ g negative lens. Struve (Deseription de [' Observatoire Central de roooth ofan inch—for that, even in a telescope of 10 feet focus, would | pyzzora pp. 196, 197) adds a few remarks to Steinheil's descrip- correspond with 2" of are. But, after all, this is no practical diffi- tion, in Which he states that the images have not all desirable eulty,—for screws can be used to separate the lenses, and, by these precision,—a fault perhaps inevitable in all micrometers with screws, as in a Gascoigne micrometer, the separation of the lenses | givided lenses, aud which is probably in this case aggravated by can be measured ; or we can have scales for this purpose, read by | the fact that the rays falling upon

the divided lens have considcr- microscopes, like the Troughton? circles.of Piazzi or Pond, or those | apje convergence. He, however, successfully employed the instru- of the Carey circle, with almost any required accuracy. ; ment in measuring double stars, so close as 1” or 2”, and using a Fraun- Whether Bessel communicated such a course of reasoning, to power of 300 diameters, with results that agreed satisfactorily hofer, Fraunhofer, or whether that great artist arrived independently at amongst themselves and with those obtained with the filar micro-

35°21, 37”°60, 1/15°69 afterwards obtained by Bessel (Kénigsberger

Beobachtungen, xix. 102). From a series of measures of the angle

between Jupiter’s satellites and the planet, made in June and Jnly

1794 and in August and September 1795, Schur finds the mass

1

of Jupiter = , a result which accords perfectly with

1048 °55-1°45 the received value of the mass derived from modern researches. The probable errors for the measures of one night are +0”-577, +0”°889, +0542, -+17-096, for Satellites I., II., III., and IV. respectively. It is probable that Triesnecker deduced the index error from his measures of the diameter of Jupiter, as, in 1794, the measures of diameter are made on the same nights with those of the measures of distance of the satellitcs, and it is possible that i of diameter may have been made in 1795 but not pub- ished.

Considering the accuracy of these measures (an accuracy far sur- passing that of any contemporary observations), it is somewhat sur- prising that this form of micrometer was never systematically used in any sustained or important astronomical researches, although a number of instruments of the kind were made by Dollond. Probably the last example of its employment is an observation of the transit of Mercury (November 4, 1868) by Mr Mann,

at thé Royal Observatory, Cape of Good Hope (Monthly Notices R. A. S., vol. xxix. p. 197-209). The most important part, however, which this type of instrument seems to have playcd in the history of astronomy ariscs from the fact that one of them was in the posses- sion of Bessel at Konigsberg during the time when his new obser- vatory there was being built. In 1812 Bessel measured with it the

like conclusions, we have been unable to ascertain with certainty. The fact remains that before 18202 Fraunhofer had completed one or more of the five heliomieters (3 inches aperture and 39 inches focus) which have since become historical instruments. In 1824 the great Kénigsberg heliometer was commenced, and it was com- pleted in 1829.

To sum up briefly the history of the heliometer. The first appli- cation of the divided object-glass and the employment of double images in astronomical measures is due to Savary in 1743. To Bouguer. in 1748 is due the true conception of measurement by double image without the auxiliary aid of a filar micrometer, viz., by changing the distance between two object-glasses of equal focus. To Dollond in 1754 we owe the combination of Savary's idea of the divided object-glass with Bouguer's method of measurement, and the construction of the first really practical heliometers. To Fraunhofer, some time not long previous to 1820, is due, so far as we can ascertain, the construction of the first hcliometer with an

1 The circles by Reichenbach, then almost exclusively used in Germany, were read by verniers only.

2 The diameter of Venus was measured with one of these heliometers at the observatory of Breslau by Brandes in 1820 (Berlin Jahrbuch, 1824, p. 164)

achromatic divided object-glass, 7.¢., the first heliometer of the modern type.

Double-Image Mierometers with Divided Lenses.

Various micrometers have been invented besides the heliometer for measuring by double image. Ramsden's dioptric micrometer consists of a divided lens placed in the conjugate focus of the inner- most lens of the erecting eye-tube of a terrestrial telescope. The inventor claimed that it would supersede the heliometer, but it has never done anything forastronomy. Dollond claims the independ- ent invention and first construction of asimilar instrument (Pearson's Praetieal Astronomy, vol. ii. p. 182). Of these and kindred instru- ments only two types have proved of practical value. Amici of Modena (Afem. Soe. Jtal., xvii. (1815) pp. 344-359) describes a micrometer in which a negative lens is introduced between the eye-piece and the object-glass. This lens is divided and mounted like a heliometer object-glass; the separation of the lenses produces the required double image, and is measured bya screw. Dawes has very successfully used this micrometer in conjunction with a filar micrometer, and finds that the precision of the measures is in this way greatly increased (Monthly Notices, vol. xviii. p. 58, and Mem. Rk. A. S., vol. xxxv. p. 147).

In the improved form 4 of Airy's divided eye-glass micrometer (Alem. K. A. S., vol. xv. pp. 199-209), the rays from the object- glass pass successively through lenses as follows.

Distance from F

Lens. next Lens.

ocal Length.

meter.

3 For description of the earliest form see Cambridge Phil. Trang., vol, ii., and Greenwich Observations, 1840.

4 We understand that a very thorough investigation of Airy's double-image micrometer used by Dr Copeland at Mauritius on Lord Lindsay's expedition has been made by him, and will soon be published. :

5 Dawes (Monthly Notices, January 1858, and Mem. R. A. S., vol. xxxv. p. 150) has suggested and used a valuable improvement for producing round

images, instead of the elongated images which are otherwise inevitable when the rays pass through a divided lens of which the optical centres are not in coincidence, yiz., ‘‘ the introduction of a diaphragm having two circular apertures touching each other in a polnt coinciding with the line of collimation of the telescope, and the diameter of each aperture exactly equal to the semidiameter of the cone of rays at the distance of the diaphragm from the focal point of the object-glass.”’ Practically the difficulty of making these diaphragms for the diffcrent powcrs of the exact required equality is insuperable; but, if the observer is content to lose a certain amount of light, we see no reason why they may not readily be mado slightly less. Dawes found the best method for the purpose in question was to limit the aperture of the objcct-glass by a diaphragm having a double circular aperture, placing the line joining the centres of the circles approximately in the position angle under measurement. Dawes successfully employed the double circular aperture also with Amici’s micrometer. The present writcr has success- fully used a similar plan in measuring position angles of a Centauri with the helio- meter, viz., by placing eireular diaphragms on the two segments of tlie object- glass.

If Struve had employed a properly proportioned double

Rochon’s miero- meter.

circular diaphragm, fixed symmetrically with the axis of the telescope in front of the divided lens and turning with the micrometer, it is probable that his report on the instrument would have been still more favourable. ‘This particular instrument has historical interest, having led Struve to some of those criticisms of the Pulkowa heliometer which ultimately bore such valuable fruit (see below).

Raven (Phil. Trans., vol. xix. p. 419) has suggested the division of the small speculum of a Cassegrain telescope and the production of double image by micrometrie rotation of the semi- specula in the plane passing through their axis. Brewster (Zney. Brit., 8th ed., vol. xiv. p. 749) proposes a plan on a like principle, by dividing the plane mirror of a Newtonian telescope. Again, in an ocular heliometer by Steinheil double image is similarly

produced by a divided prism of total reflexion placed in parallel rays. But practically these last three methods are failures. In the last the field is full of false light, and it is not possible to give sufficiently minute and steady separation to the images ; and there are of necessity a collimator, two prisms of total reflexion, and a small telescope through which the rays must pass; consequently there is great loss of light.

Micrometers Depending on Double Refraction.

To the Abbé Rochon (Jour. de Phys., liii., 1801, pp. 169-198) is due the happy idea of applying the two images formed by double refraction to the construction of a micrometer. He fell upon a most ingenious plan of doubling the amount of double refraction of a prism by using two prisms of rock-crystal, so cut out of the solid as to give each the same quantity of double refraction, and yet to double the quautity in the effect produced. The combination so formed is known as Rochon's prism. Such a prism he placed between the object-glass and eye-piece of a telescope. The separation of the images increases as the prism is approached to the object- glass, and diminishes as it is approached towards the eye-piece.

Arago (Comptes Rendus, xxiv., 1847, pp. 400-402) found that in Roehon's micrometer, when the prism was approached close to the eye-piece for the measurement of very small angles, the smallest imperfections in the crystal or its surfaces were incon- veniently magnified. He therefore selected for any particular measurement such a Rochon prism as when fixed between the eye and the eye-piece (7.¢., where a sunshade is usually placed) would, combined with the normal eye-piece employed, bring the images about to be measured nearly in contact. He then altered the magnifying power by sliding the field lens of the eye-piece (which was fitted with a slipping tube for the purpose) along the eye-tube, till the images were brought into contact. By a scale attached to the sliding tube the magnifying power of the eye-piece was deduced, and this eombined with the angle of the prism employed gave the angle measured. If p" is the refracting angle of the prism, and n the magnifying power of the eye-piecc, then p"/n will be the distance observed. Arago made many measures of the diameters of the planets with such a micrometer.

Dollond (Phil. Trans., 1821, pp. 101-103) describes a double- image micrometer of his own invention iu which a sphere of rock- erystal is substituted for the eye-lens of an ordinary eye-piece. In this instrument (figs. 31, 32) a is the sphere, placed in half-holes on

Fig. 31.

Fig. 32, * the axis bb, so that when its principal axis is parallel to the axis of

the telescope it gives only one image of the object. Ina direction perpendicular to that axis it must be so placed that when it is moved by rotation of the axis bd the separation of the images shall be parallel to that motion. The angle of rotation is measured on the graduated circle C. The angle between the objects measured is=r sin 20, where r is a constant to be determined for each mag- nifying power employed,! and @ the angle through which the sphere has been turned from zero (7.e., from coincidenee of its prin- cipal axis with that of the telescope). The maximum separation is consequently at 45° from zero. The measures can be made on both sides of zero for eliminating index error. There are eonsider- able difficulties of eonstruction, but these have been successfully

1 Dollond provides for ehanging the power by sliding the lens d nearer to or farther from a. ;

.divided

overcome by Dollond; and in the hands of Dawes (Jfem. R. A. 8., xxxv. p. 144 sg.) such instruments have done valuable serviee. They are liable to the objection that their employment is limited to the measurement of very small angles, viz., 13” or 14” when the magnifying power is 100, and varying inversely as the power. Yet the beautiful images which these micrometers give permit the ineasurement of very diffieult objects as a check on measures with the parallel-wire micrometer.

The Modern Heliometer. The Kénigsberg heliometer is represented in fig. 33.

every respect the usual Fraunhofer mounting. fixed on a telescope- tube, made of wood, in Fraunhofer’s usual fashion. To _ this adapter is attached a ™ 4; flat circular flange h. The slides earrying the segments of the object-glass mounted on a

Fig. 38. plate, which is fitted and ground to rotate smoothly on the flange

are

h. Rotation is communicated by a pinion, turned by the handle c (concealed in the figure), which works in teeth cut on the edge of the flange 2. The eounterpoise w balances the head about its axis of rotation. ‘The slides are moved by the screws a and 8, the divided heads of which serve to measure the separation of the segments. These screws are turned from the eye-end by bevelled wheels and pinions, the latter connected with the handles a’, ’. The reading micrometers e, f also serve to measure, independently, the separation of the segments, by scales attached to the slides; such measurements can be employed as a check on those made by the screws. The measurement of position angles is provided for by a graduated circle attached to the head. There is also a position circle, attached at mz to the eye-end, provided with a slide to move the eye-piece radially from the axis of the telescope, and with a micrometer to measure the distance of an object from that axis. The ring which carries the supports of the handles @’, U, ¢ is capable of a certain amount of rotation on the tube. The weight of the handles and their supports is balanced by the counterpoise 2. This ring is necessary in order to allow the rods to follow the micrometer leads when the position angle is changed. Complete rotation of the head is obviously impossible because of the inter- ference of the declination axis with the rods, and therefore, in some angles, objects cannot be measured in two positions of the circle. He object-glass has an aperture of 64 inches, and 102 inches focal ength. :

There are three methods in which this heliometer can be used.

First Method.—One of the segments is fixed in the axis of the telescope, and the eye-piece is also placed in the axis. Measures are made with the moving segment displaced alternately on opposite | sides of the fixed segment.

Second Method.—One segment is fixed, and the measures are made as in the first method, excepting that the eye-piece is placed symmetrically with respect to the images under measurement. For this purpose the position angle of the eye-piece micrometer is set to that of the head, and the eye-piece is displaced from the axis of the tube (in the direction of the movable segment) by an amount equal to half the angle under measurement.

Third Method.—The eye-piece is fixed in the axis, and the segments are symmetrically displaced from the axis each by an amount equal to half the angle measured.

Of these methods Bessel generally employed the first because of its simplicity, notwithstanding that it involved a resetting of the right ascension and declination of the axis of the tube with each reversal of the segments. The chief objections to the method are that, as one star is in the axis of the telescope and the other dis- placed from it, the images are not both in focus of the eye-piece,? and the rays from the two stars do not make the same angle with the optical axis of each segment. Thus the two images under

measurement are not defined with equal sharpness and symmetry.

The second method is free from the objection of non-coincidence in focus of the’ images, but is more troublesome in practice from the necessity for frequent readjustment of the position of the eye-piece. The third method is the most symmetrical of all, both in obser- vation and reduction; but it was not employed by Bessel, on the ground that it involved the determination of the errors of two screws instead of one. On the other hand it is not necessary to reset the telescope after each reversal of the segments.*

2 The distances of the optical eentres of the segments from the eye-pieee are in this method as 1: secant of the angle under measurement. In Bessel’s heliometer this would amount to a difference of ,4§,th of an inch when an angle of 1° is measured. For two degrees the difference would amount to

nearly j,th of an inch. Bessel confined his measures to distances considerably less than 1°.

3 In criticizing Bessel's choice of methods, and considering the loss of time involved in each, it must be remembered that Fraunhofer provided no means of

No part of Kénigs- the equatorial mounting is shown in the figure, as it resembles in berg An adapter / is helio-

Bonn helio- meter.

MICRO

When Bessel ordered the Kénigsberg heliometer, he was anxious

to have the segments made to move in cylindrical slides, of which .

the radius should be equal to the focal length of the objecet-glass. Fraunhofer, however, did not execute this wish, on the ground that the mechanical difficulties were too great.

Wichmann states (Kénigsb. Beobach., xxx. p. 4) that Bessel had indicated, by notes in his handbooks, the following points which should be kept in mind in the eonstruction of future heliometers:— (1) The segments should move in cylindrieal slides ;! (2) the serew should be protected from dust ;? (3) the zero of the position circle should not be so liable to change ; (4) the distance of the optical centres of the segments should not change in different position angles or otherwise;* (5) the points of the mierometer serews should rest on ivory plates ;° (6) there should be an apparatus for changing the sereen.® ;

The elder Struve, in deseribing the Pulkowa heliometer," made by Merz in 1839 on the model of Bessel's heliometer, submits the following suggestions for its improvement : §—(1) to give automatic- ally to the two segments simultaneous equal and opposite move- ment ;° and (2) tomake

the tube of brass instead of wood; to attach the heliometer head firmly to this tube; to place the eye-piece perma- nently in the axis of the teleseope; and to fix a strong eradle on the end of the deelination axis, in which the tube, with the attached head and eye-pieee, could rotate on its axis.

Both suggestions are important. The first is originally the idea of Dollond (fig. 29); its advantages were overlooked by his son (deseription of fig. 30), and it seems to have been quite forgotten till resuggested by Struve. But the method is not available if the separation is to be measured by screws; it is found, in that ease, that the direetion of the final motion of turning of the screw must always be sueh as to produee motion of the segment against gravity, otherwise the ‘‘loss of time” is apt to be variable. Thus the simple connexion of the two serews by cog-wheels to give them automatie opposite motion is not an available method unless the separation of the segments is independently measured by scales.

Struve’s seeond suggestion has been adopted in nearly all suceced- ing heliometers. It permits complete rotation of the tube and measurement of all angles in reversed positions of the eirele ; the handles that move the slides can be brought down to the eye-end, inside the tube, and consequently made to rotate with it; and the

‘ position eirele may be plaeed at the end of the cradle next the eye-

end where it is convenient of aeecss. Struve also points out that by attaehing a fine seale to the foeussing slide of the eye-piece, and knowing the evefficient of expansion of the brass tube, the means would be provided for determining the absolute change of the foeal length of the object-glass at any time by the simple proeess of focussing on a double star. This, with a knowledge of the tempera- ture of the serew or seale and its coefficient of expansion, would enable the change of serew value to be determined at any instant. Or, if we suppose the temperature of the instrament to be the same in all its parts, the changed seale value becomes simply a function of the reading of the foeal scale.

It is probable that the Bonn heliometer was in course of con- struction before these suggestions of Struve were published or dis- cussed, sinee its construction resembles that of the Kénigsberg and Pulkowa instruments. Its

dimensions are similar to those of the former instrument. Bessel, having been consulted by the cele- brated statesman Sir Robert Pecl, on behalf of the Radcliffe trus- tees, as to what instrument, added to the Radcliffe Observatory,

reading the screws or even the heads from the eye-end. Bessel's practice was to unclamp in declination, lower and read off the head, and then restore the telc- scope to its former declination reading, the clockwork meanwhile following the stars in right ascension. The setting of both lenses symmetrically would, under such circumstances, be very tedious. :

1 This most important improvement wonld permit any two stars under measure- ment each to be viewed in the optical axis of each segment. The optical centres of the segments would also remain at the same distance from the eye. piece at-all angles of separation. Thus, in measuring the largest as well as the smallest angles, the images of both stars would be equally symmetrical and equally well in focus. Modern heliometers made with cylindrical slides measure angles over two degrees, the images remaining as sharp and perfect as when the smallest angles are measured. :

2 Bessel found, in course of time, that the original corrections for the errors of his screw were no longer applicable. He considered that the changes were due to wear, which would be much lessened if the screws were protected from dust.

3 The tube, being of wood, was probably liable to warp and twist in a very uncertain way. .

4 We have been unable to find any published drawing showing how the seg- ments are fitted in their cells.

5 We have been unable to ascertain the reasons which led Bessel to choose tvory planes for the end-bearings of his screws. He actually introduced them in the Kénigsberg heliometer in 1840, and they were renewed in 1848 and 1850.

6 A screen of wire gauze, placed in front of the segment through which the fainter star is viewed, was employed by Bessel to equalize the brilliancy of

the images under observation, An arrangement, afterwards described, has becn fitted in modern heliometers for placing the screen in front of either segment by a handle at the eye-end.

7 This heliometer resembles Bessel's, except that its foot is a solid block of granite instead of the ill-conceived wooden structure that supported his instru- ment, The object-glass is of 7-4 inches aperture and 123 inches focus.

8 Description de l' Observatoire central de Pulkowa, p. 208.

® Steinheil applied such motion to a double-image micrometer made for Struve This instrument suggested to Struve the above-mentioned idea of employing a similar motion for the heliometer.

would probably most promote the advancement of astronomy.

strongly advised the selection of a heliometer. The order for the instrument was given to the Repsolds in 1840, but. ‘‘ various circum- stances, for which the makers are not responsible, eontributed to delay the completion of the instrument, which was not delivered before the winter of 1848.”1° The building to receive it was com- meneed in March 1849 and completed in the end of the same year. This splendid instrument has a superb objeet-glass of 74 inches apertnre and 126 inches foeal length. The makers availed them- selves of Bessel's suggestion to make the segments move in cylin- drieal slides, and of Struve's to have the head attached to a brass tube ; the eye-piece is set permanently in the axis, and the whole rotates in a eradle attached to the declination axis. They provided a splendid, rigidly mounted, equatorial stand, fitted with every luxury in the way of slow motion, and seales for measuring the displacement of the ségments were read by powerful micrometers from the eye-end.” It is somewhat eurious that, though Struve's seeond suggestion was adopted, his first was overlooked by the makers. But it is still more eurious that it was not afterwards earried out, for the communieation of automatic symmetrical motion to both segments only involves a simple alteration previously de- seribed. But, as it eame from the hands of the makers in 1849, the Oxford heliometer was

incomparably the most powerful and perfect instrument in the world for the highest order of mierometric research. It so remained, unrivalled in every respect, till 1873; it remains still, optieally, the most powerful heliometer in the world; and, with a few alterations, it might almost rival the most recent instruments in practical convenience and aceuracy. These altera- tions, all of which could be made without great difficulty, are the following :—

(a) Beyond the automatic symmetrical motion above-described, the instrument should be fitted with means for adjusting the screens from the eye-end (see footnote ® in last column).

(6) The arrangement of the scales should be changed. At present both seales are read separately by separate micrometers, each relative to a separate fiducial line. What the observer requires is the difference of the readings of the two seales, and this ean obvi- ously be most quiekly and accurately obtained if the edges of the two seales are brought together, and both are read, relatively to each other, by the same micrometer.

(c) The unsatisfactory motion in position angle should be replaced by the aetion of a pinion-(attached to the cradle) in the tecth of a wheel (attached to the tubc).!” ;

(d) The position cirele should be read by telescopes or microscopes attached to the cradle, and accessible from the eye-end.

(e) It would add greatly to the rapidity of work and the ease of the observer if a small declination cirele were attached to the eross- head, eapable of being read from the eye-end.

As the transit of Venus of 1874 approached, preparations were set on foot by the German Government in good time ; a commission of the most eelebrated astronomers was appointed, and it was re- solved that the heliometer should be the instrument chiefly relied on. The four long-negleeted small heliometers made by Fraunhofer were brought into requisition. Fundamental alterations were made upon them:—their wooden tubes were replaced by tnbes of inetal; means of measuring the foeal point were provided ; symmetrical motion was given to the slides ; seales on each slide were provided instead of serews for measuring the separation of the

segments, and both scales were read by the same micrometer mieroscope ; a metallie thermometer was added to determine the temperature of the seales. These small instruments have since done admirable work in the hands of Sehur, Hartwig, Kustner, and Elkiu.

The Russian Government ordered three new heliometers (each of Russian 4inehes aperture and 5 fect focal length) from the Repsolds, and the helio- design for their construction was superintended by Struve, Auwers, meters.

Fig. 34. and Winncecke, the last-named making the necessary experiments at

Carlsruhe. Fig. 34 represents the type of instrument which re-

10 Manuel Johnson, M.A., Radcliffe observer, Astronomical Observations made at the Radcliffe Observatory, Oxford, in the year 1850, Introduction, p. iii.

11 The illumination of these scales is interesting as being the first application of electricity to the illumination of astronomical instruments Thin platinum wire was rendered incandescent by a voltaic current; a small Swan light and condenser

ould probably now be found more satisfactory. . m2 This has pt recently carried out by Stone, the present Radcliffe observer, on Gill’s suggestion.

sulted from their labours. The brass tube, strengthened at the bearing points by strong truly-turned collars, rotates in the cast- iron cradle g attached to the declination axis. a@ is the eye-plece

quired by Gill in 1879, he changed the manner of imparting the motion in question. A square toothed racked wheel was applied to the tube at r (fig.

34). This wheel is acted on by a tangent screw whose bearings are attaehed to the cradle ; the screw is turned by

: : oer ding both scales. fixed in that axis, 6 the micrometer for reading bo c means ofp handle. snppewiad igs Seema

attached to the cradle, and coming within eonvenient reach of the observer's hand. The tube turns smoothly in the racked wheel, or can be clamped to it at the will of the observer. This alteration and the new cqua- torial mounting have been admirably made by Grubb; the result is completely success- ful. The instrument so altered has been in eonstant use at the Cape Observatory since March 1881 in determining the paral- lax of the more interesting southern stars.

Still more reeently the Repsolds have com- Yale pleted a new heliometer for Yale College, College New Haven, United States. The object-glass helio- is of 6 inches aperture and 98 inches focal meter,

Lord A similar heliometer was made by the Lind- Repsolds to the order of Lord Lindsay say's for his Mauritius expedition in 1874. It helio- differed only from the three Russian in- meter. struments in having a mounting by the

Fig. 35.

c, d are telescopes for reading the position circle p, e the handle for quick motion in position angle, f the slow niotion in position angle, g the handle for changing the separation of the segments by acting on the bevel-wheel 9/ (fig. 35). % is a milled head con- nected by a rod with #' (fig. 35), for the purpose of interposing at pleasure the prism 7 in the axis of the reading micro- ineter; this enables the observer to view the graduations on the face of the metallic thermometer 77 (composed of arod of brass and a rod of zinc). 7 is a milled head eonnected with the wheel 7'2' (fig. 35), and affords the means of placing the screen s (fig. 34), counterpoised by w over either half of the object-glass. & clamps the telescope in declination, » clamps it in right ascension, and the handles m and Z provide slow motion in declination and right ascension respectively.

The details of the interior mechanism of the ‘‘head”’ will be almost evident from fig. 35 without description. The screw, turned by the wheels at g’, acts in a toothed arc, whence, as shown in the figure, equal and opposite motion is eom- municate to the slides by the jointed rods v, v. The slides are kept firmly down to their bearings by the rollers r, 7, 7, r, attached to axes which are, in the middle, very strong springs. Side- shake is prevented by the screws and pieces k, k, k,k. The scales are at n,n; they are fastened only at the middle, and are kept down by-the brass pieces ¢, ¢.

Cookes in which the declination circle reads from the eye-end.!_ This instru- ment was afterwards most generously lent by Lord Lindsay to Gill for his ex- pedition to Ascension in 1877.2

These four Repsold heliometers proved to be excellent instruments, easy and convenient in use, and yielding results of very high accuracy in measuring dis- tances. Their slow motion in position angle, however, was not all that could be- desired. When small movements were communi- cated to the handle e¢ (fig. 34) by the tangent serew J, acting on a small toothed wheel clamped to the rod eonnected with the driv- ing pinion, there was apt to be a torsion of the rod rather than an immediate action. Thus the slow motion would take place by jerks instead of with the necessary smoothness and eertainty. When the heliometer part of Lord Lindsay’s heliometer was ae- ee eee

1 For a detailed description of this instrament see Dunecht Publications, vol, ti.

2 Mem. Royal Astronomical Society, vol. xlvi. pp. 1-172

length. The mounting, the tube, objective- cell, slides, &c., are all of steel. The in- strument is shown in fig. 36. The circles for position angle and declination are read by micrometer microscopes illuminated by the lamp L; the scales are illuminated by the lamp 7. T is part of the tube proper, and turns with the head. The tube V, on the contrary, is attached to the cradle, and merely forms a support for the finder Q, the handles at fand p, and the moving ring P. The latter gives quick motion in position angle; the handles at p clamp and give slow motion in position angle, those at f elamp

Fig. 36,

and give slow motion in right ascension and deelination. a is the eye-piece, b the handle for moving the segments, ¢ the micro- meter microscope for reading the scales and scale micrometer, d@ the micrometer readers of the position and declination circles, ¢ the handle for rotating the large wheel E which earries the screens. The hour circle is also read by microscopes, and the instrument ean be used in both positions (tube preceding and

3 The primary object was to have the object-glass mounted in steel cells, which more nearly correspond in expansion with glass. It became then desirable to make the head of stecl for sake of uniformity of material, and the advantages of steel in lightness and rigidity for the tube then became evident,

Revers- ing prism.

‘construction the lenses are much closer together and

fellowing) for the climination of the effect of flexure on the position angles.

There is very little left to criticize in this instrument. It embraces the results of all knowledge and experience on the subject to the present time. In one point, however, modern heliometers have a disadvantage compared with the- older forms. A great advance in accuracy was, no doubt, made when the screw was abandoned as a means both of moving and measuring the displace- ment of the slides.1_ But it is obviously much quicker to read and record the indication of one screw-head than to’bisect two or four scale-divisions and enter the corresponding readings. Auwers, in his researches on the parallax of 61 Cygni,? was able, with the K6nigsberg heliometer, to make forty pointings in about an hour; it is quick work to make sixteen pointings (reading two divisions on each scale at each pointing) with the modern heliometer in the same time, when attention is paid to the desirable reversals of the segments and of the position circle and the resettings in right ascension and declination. Now time during opportunities of good definition (or otherwise)? is too precious to be sacrificed, if it can be saved even by ten-fold labour afterwards. Carrington‘ has suggested the possible use of photography to record the readings of astro- nomical circles, and since his day ‘‘Swan lights” and ‘sensitive dry plates’’ seems to have brought his suggestion within the range of practice. A special microscope, fitted with an aplanatic photo- graphic objective and a well-contrived carrier, might be made automatically to expose a different part of a narrow dry plate, by mere pressure or turning of a button after each bisection. Each plate might easily record the sixteen bisections which constitute a complete measure of two pairs of stars (as in a parallax determina- tion). As it is only necessary to photograph two divisions of each scale, the photographic enlargement of these divisions need only be limited by the sensitiveness of the plates and the power of the illumination to produce a picture in a conveniently short space of time. The plates employed at night could be conveniently developed the following day and measured with a special apparatus at any convenient time and with almost any desired accuracy.

Were such a system reduced to practice it would at least double, perhaps treble, an observer's possible output of work.

Gill has introduced a powerful auxiliary to the accuracy of helio- meter measures in the shape of a reversing prism placed in front of the eye-piece, between the latter and the observer's eye. If measures are made by placing the image of a star in the centre of the disk of a planet, the observer may have a tendency to do so systematically in error from some acquired habit or from natural astigmatism of the eye. But by rotating the prism 90° the image is presented entirely reversed to the eye, so that in the mean of measures made in two such positions personal error is eliminated. Similarly the prism may be used for the study and elimination of personal errors depending on the angle made by a double star with the vertical. The best plan of mounting such a prism has been found to be the following. J', 2 (fig. 37) are the eye lens and field lens respectively of a Merz positive eye-picce. In this

— ——

the diaphragm for the eye is much farther from the lenses than in Ramsden's eye-piece. 'The prism p is fitted accurately into brass slides (care

l Fig. 37. as to be taken in the construction to place the prism so that an object in the centre of the field will so remain when the eye-piece is rotated in

its adapter). There isa collar, clamped by the screw at S, which is so adjusted that the eye-piece is in focus when pushed home, in its adapter, to this collar. The prism and eye-piece are then rotated together in the adapter.

On the theory of the heliometer and its use consult Bessei, Astronomtsche Untersuchungen, vol. i.; Hansen, Ausfiihrliche Methode mit dem Fraunhoferschen Heliometer anzustellen, Gotha, 1827; Chauvenct, Spherical and Practical Astro- nomy, vol. ii. pp. 403-436, Philadelphia and London, 1876; Seeliger, Theorie des Heliometers, Leipsic, 1877; Lindsay and Gill, Dunecht Publications, vol. ii., Dunecht (for private circulation),

1877; Gill, Memoirs of the Royal Astronomical Society, vol. xlvi. pp. 1-172.

Micrometers which Involve the Employment of the Diurnal Motion.

Advantage is often taken of the diurnal motion to measure the relative positions of stars. The varicties of reticules and scales that have been employed are far too numerous even for mention in detail. The following are the means and methods by which most work has been done, and they are typical of all the others, In the focus of his meridian telescope Lacaille had a brass diaphragm in

1 Screws, as Auwers's discussion of Besscl's observations (" Parallaxe von 61 Cygni," Abhandlungen der Kénigl. Akad. der Wissenschaften zu Berlin, 1868) has shown, are apt to wear and change their errors. It is, besides, undesirable to apply force and friction to a delicate standard of mcasure.

2 Astron. Nachrichten, No. 1416.

3 For example, in determining the diurnal parallax of a planct the most favourable conditions are limited on the one hand by the uncertainties of refrac- tion at large zenith distances, and on the other by the small parallax factors of small zenith distances. It would probably be best to secure all the observations between 50° and 60° ZD, and this would only be possible with special facilities for 'reading the scales.

4 Monthly Notices R. A, S., vol. xxx. p. 46.

which was cut a hole, having parallel, sharp, straight edges of the La- shape shown in fig. 38. The longer diagonal of the rhomboid caille's so formed was at right angles, and the shorter parallel, to the yhom- diurnal motion. The method of observation consisted in noting boid the instant of ingress and egress of each star which presented itself. : The mean of the times thus

noted for each star gave the time of its transit over the imaginary line a4, whilst the difference between

the instant of ingress and that of a

egress (converted into are by the known approximate declination) gave the length of the chord traversed by the star parallel to the imaginary line cd. Hence (the dimensions of the rhomboid being known) the differ- e— ence of the star's declination from the line cd became known (the ob- server was of course careful to note whether the star passed to north or south of cd). Thus every star that crossed the field was observed, all their right ascensions were referred ; to the clock-time of passing ab, and Pig. 38.

all their declinations to that of cd; hence their mutual differ-

ences of right ascension and declination were known. In this

way, in the short space of ten months, Lacaille observed nearly ten thousand stars at the Cape of Good Hope in the years 1751-52.5 Fraunhofer's ring micrometer consists of a ring of steel, very truly Ring mi- turned, mounted in a hole cut in a circular disk of glass. he ring is crometer placed in the focus of a telescope, and viewed by a positive eye-piece.

The observer notes the instants when the two objects enter and

emerge from each side of thering. The only data required for com-

puting the difference of right ascension and declination of the two

objects are the times above mentioned, the diameter of the ring,

and the approximate declination of one of the objects. The latter

is always known. The methods of determining the former and of reducing the observations are to be found in every work on practical astronomy. The ring micrometer has been largely used in observ-

ing comets,

Argelander, in making his famous survey of the northern heavens,® Arge-
employed a semicircle of glass, the straight edge of which (truly lander's
ground) crosses the centre of the field of view at right angles to the scale.
diurnal motion of the stars. Differences of right ascension were directly
observed at this edge, whilst differences of declination were noted by strong
dark lines drawn at right angles to the edge at each 10' ofare. A telescope of
3 inches aperture with a magnifying power of 10 diameters commanded a
field of 3° 20' in declination. One observer was placed at the telescope,
another at the clock. The

G

'telescope observer marked the instant when the star touched the

glass edge, by calling sharply the word ''eight" or "'nine,"' &c., which also
indicated the magnitude; the same observer also noted and recorded the
reading of the declination scale (whcre the star crossed it), without
removing his eye from the telescope. The clock observer wrote down the
magnitude called out by the tclescope observer, and the instant by the clock
when the word was given. The two records were then compared after the
observations of the night were over. In this way Schonfeld and Krueger
(Argelander's assistants) observed and catalogued about three hundred
thousand stars. The probable error of an observation is about +0°7 sec. in
right ascension and +0'*4 in declination. ie

Bond? employed a very similar arrangement, differing only from Bond's
Argelander's in having the scale cut on a sheet of transparent mica mica
tvsoth of an inch in thickness. Very oblique illumination was declino-
employed, and the divisions and figures were seen bright upon a meter. dak
background. The range of declination was limited to 10', the scale was
divided to 10", the right ascensions were observed by chronographic
registration, and the great refractor of the Cambridge U. S. Observatory
(with an aperture of 15 inches and power of 140) wasemployed. The
probable errors in right ascension and declina- tion were found to be +0°06
sec. in right ascension and +0"°6 in declination—results of marvellous
accuracy considering the amount of work accomplished in a short time aud
the faintness (eleven to twelve magnitudes) of the stars observed.

We were on the point of criticizing Bond’s programme as some- Peters’s what too ambitious for realization without cooperation (it would zones, take about twenty-six thousand hours of observing to carry out the scheme for the northern hemisphere alone) when we received from Peters of Clinton, U. S., the first twenty maps of a series which will include the whole of the sky between declination + 30° and—30° If we consider that all the stars in these maps of the eleventh magni- tude or brighter have been observed by a method similar to Bond’s, that the enormous additional labour of frequent revision has been undertaken, and all stars visible with a power of 80 in a telescope of 13 inches aperture (about fourteenth magnitude) have been filled in

5 Lacaille, Celum Australe Stelliferum, Paris, 1763, and A Catalogue of 9766 Stars, from the Observations of Lacaille, London, 1847. ;

6 Atlas des Nérdlichen Gestirnten Himmels, Bonn, 1863, Introduction. _

7 Annals of the Astronomical Observatory, Harvard College, vol. i. part ii.

Berlin deelino- graph.

Parallel glass micro- lneter,

Ghost niicro- meter.

by alignment, and that all this results from the unaided labour of a single observer, we find that our ideas of the possible have to be modi- fied, when such a man undertakes a work with persistent unity of purpose for more than twenty years (1860-83).

There is an ingenious mode of registering differences of declination that has heen in use at the Berlin Observatory sinee 1879, and is deseribed by Dr Knarre in the Zeitschrift fir Instrumentenkwnde for July 1881. The instrument is ealled a deelinograph. It has a web moved in deelination by a quick-aeting serew ; the same sae earries a travelling prieker or point. The observer having biseete a star by the wire has simply to eompress an india-

rubber ball eon- neeted by a flexible tube with a thin metal box made on the prin- ciple of the vacuum ehamber of an aneroid barometer. The ex- pansion of this box so produced. brings a sheet of paper in eontaet with two priekers, one the movable prieker before mentioned, the other a fixed prieker. The aetion of the vacuum box also automatically shifts the paper (a long roll) by a small quantity at each observation, so that sueeessive observations are reeorded in regular order. To obtain the observed differences of deelination it is then only necessary to measure with a glass seale (divided for the speeial teleseope to 10”) the distance of each reeord of the moving prieker from the fixed prieker. It is found, with this declinograph on the Berlin equatorial, that the observed deelina- tions have only a probable error of +0°°9. It is obvious that by using a chronograph in eonjunction with this instrument both right aseensions and deelinations could be recorded with great aecuraey and rapidity.

Miscellaneous Micrometers.

Clausen in 1841 (Ast. Nach., No. 414) proposed a form of micro- meter eonsisting of a divided plate of parallel glass placed within the eone of rays from the objeet-glass at right angles to the teleseope axis. One half of this plane remains fixed, the other half is movable. When the inelination of the movable half with respect to the axis of the telescope is ehanged by rotation about an axis at right angles to the plane of division, two images are pro- duced. ‘The amount of separation is very small, and depends on the thickness of the glass, the index of refraetion, and the focal length of the telescope. Sceehi (Comptes Rendus, xli., 1855, p.

906) gives an account of some experiments with a similar miero-

méter ; and Porro (Comptes Rendus, xli. p. 1058) elaims the original invention and eonstruetion of such a micrometer in 1842. Clausen, however, has undoubted priority. Helmholtz in his ‘‘ Ophthalmo- meter” has employed Clausen’s principle, but arranges the plates so that both move symmetrieally in opposite direetions with respeet to the teleseope axis. Should Clausen’s micrometer be employed as an astronomical instrument it would be well to adopt the im- provement of Helmholtz.

Burton and Grubb (Monthly Notices, vol. xli. p. 59), after calling attention to Lamont's paper (Jahrbuch der K. S. 6. Miinehen, p. 187) and Littrow's paper (Proc. of Vienna Acad. of Sciences, vol. xx. p- 253) on a like subject, proeeed to deseribe a most ingenious form of ‘‘ Ghost Micrometer,” in whieh the image of a fine line or lines ruled in (or rather cut through) a silver film deposited on glass is formed at the eommon foeus of an objeet-glass and eye-pieee of a teleseope.

For the use of micrometers in connexion with the mieroscope see p. 277 of the present volume. (Dy GI.) :

MICRONESIA. The term “Micronesia” embraces that region of the Pacific north of the great Melanesian islands, where, either perhaps from a greater or more rapid subsidence, or from the decreasing activity northwards of the coral builders, the islands become, generally speaking, smaller and fewer, and finally cease. Accordingly, except- ing the Marianas or Ladrones, which are of volcanic origin, and a few isolated instances of elevation in the Carolines, the Micronesian islands, though many of the groups cover a vast area, are almost without exception very small low coral (atoll) formations. Besides the LADRONE and CaRroLinE IsLanps (q.v.) Micronesia includes the Marshall and Gilbert groups, and some geographers include the Anson group, a number of small widely-

scattered islets to the west of Hawaii, the Magellan group farther west, and the Bonin Islands north of the Ladrones.!

North-easterly winds prevail during the winter months over the Marshalls, Ladrones, and Carolines, except in the extreme west, while between May and September the influence of the monsoon causes unsettled weather from the west, with heavy gales. In the Gilberts the south-east trade-wind brings fine weather at this season.

The ethnological features of Micronesia are much more definite than the geographical, for its populations form one great branch of the fair Polynesian race, distinguished from the other by well-marked differences in appearance, language, and institutions. Its ethnological relations are not

thoroughly understood. The proximity of Japan and the Philippines on the west and of the Papuan and South Polynesian islands on the south and south-east suggests, what in fact we.find, a combination of elements in different degrees of fusion. In some places the oblique Mongolian eye is noticed, and (along with certain Indo-Chinese customs) there is often a scantiness of beard and general “Malay” look which increases westwards, and seems to imply relations with the archipelago subsequent to the departure tlience of the pure Polynesians. In the Gilberts tle traces of Polynesian (Samoan) influences are evident, and are confirmed by tradition. Among the Carolines and the Marshalls darker and more savage communities are’ found, suggesting a Melanesian element, which is further traceable in the Ebon (Marshall) and other languages.

Each of the four groups, from long isolation, has devel- oped peculiarities of its own. The most advanced were the “Chamorros” of the Ladrones, owing to the greater natural resources of the islands, and perhaps more frequent contact with influences from the west; but as a separate people they no longer exist, having been nearly extermin- ated by the Spaniards in the 17th century. Next in advancement come the Carolines. The general type is a well-proportioned rather slightly built figure, with small and regular features; head high and well-proportioned, but forehead rather retreating, and narrow at the temples ; cheek bones and chin slightly prominent ; colour somewhat darker than tlie Polynesians, the Marshalls being darker and more vigorous than the Carolines, while the Gilbert type is still darker and coarser. The upper class greatly surpasses the common people in physique and intelligence.

There is a peculiar division of society into septs or clans, the membership of which constitutes the closest tie. Persons of the same sept must not intermarry, and when two islands or communities meet in war the members of one sept, however widely separated by distance of space or time, will not injure or fight with each other. Each community is usually composed (but there are local differ- ences) of—(1) an upper class of chiefs, from among whom the head (¢amol or ros) is chosen ; (2) a lower but still noble class; and (3) common people, mostly without rights of property. These last are only allowed one wife. Assemblies of the chiefs everywhere limit the kingly authority. In the Marshalls the sovereign has lost his control over

many of the atolls, and in the Gilberts the above distinctions have nearly disappeared; the headship has lapsed, and, especially in the southern islands, the man of largest substance is the most powerful, and sometimes establishes a local supremacy. Here and there are traces, as In Tonga, of a spiritual sovereign, the descendants probably of a conquered dynasty. Succession is through the female side, which assures to women a certain position,

} These islands, whieh contain a mixed immigrant population, are elaimed, and have been reeently surveyed, by Japan. But they were annexed to England by Captain Beeehey in 1827. (See Von Kittlitz, Denkwiirdigkeiten einer Reise nach… . Mikronesien, &e., vol, ii.)

oi C=*M 1,C

and leads besides to some curious. results (see paper by Kubary in Das Ausland, 1880, No. 27). The upper class are the keepers of traditions, boat-builders, leaders of expeditions ; tattooing is generally done by them, the amount increasing with a man's rank; the custom here still has definite religious associations. Both sexes are

tattooed. The people are singularly amiable and well.

disposed, but will repay ill usage with treachery. The women (although chastity is not expected before marriage) are somewhat more moral than the Polynesians, and are treated with respect, as are the aged. The natives are – polite and hospitable to strangers (except on the poorer and ruder islands), bright and intelligent, active traders, expert cultivators and fishermen. They have a hand-loom from which beautiful fabrics of banana, hibiscus, and other fibres are produced. The Marshall Islanders are the boldest and most skilful navigators in the Pacific. Their voyages of many montlis' duration, in great canoes sailing with outrigger to windward, well-provisioned, and depending on the skies for fresh water, help to show how the Pacific was colonized. They have a sort of chart, medo, of small sticks tied together, representing the positions of islands and the directions of the winds and currents. A two-edged weapon, of which the blade is of sharks' teeth, and a defensive armour of braided sennit, are also peculiar to the islands; a large

adze, made of the 7ridacna gigas, was formerly used in the Carolines, probably by the old builder race.

The languages of Micronesia, though grammatically alike, differ widely in their vocabularies. They have the chief characteristics of the Polynesian, with Malay affinities, and peculiarities such as the

usc of suffixes and inseparable pronouns and, as in Tagal, of the infix to denote changes in the verb; in the west groups there is a tend-

ency to close syllables and double consonants, and a use of the pala-

tals ch, j, sh, the dental th, and s (the last perhaps only in foreign ‘words), which is alien to the Polynesian. ‘These letters are wanting in the Gilbert language, which differs considerably from all the others, and has much greater affinities with the Polynesian.

The religious myths are generally identifiable with the Polynesian, but a belief in the gods proper is overshadowed by a general deification of ancestors, who are supposed from time to time to occupy certain bloeks ofstone, set up near the family dwelling, and surrounded by circles of smaller ones. These stones are anointed with oil, and worshipped with prayer and offerings, and are also used for purposes of divination, in which, and in various omens, there is a general belief. In the Marshalls, in place of these stones, certain palm trees are similarly enclosed. The spirits also sometimes inhabit certain birds or fishes, which are then ¢abw, as food, to the family ; but they will help to catch them for others. All this closely recalls the karwars or ancestral images of New Guinea. Temples are very rare, though these blocks of coral are sometimes surrounded by a roofless enclosure opening to the west. The bodies of the dead, and sometimes even of the sick, are despatched to sea westwards, with certain rites; those of the chiefs, however, are buried, for the order has something essentially divine about it; their bodies therefore are sacred, and their spirits naturally assumed the position above described. Such a belief greatly strengthens the king’s authority, for the spirits of his ancestors are necessarily nore powerful than any other spirits. Thus too it comes that the chiefs, and all belonging to them, are tabu as regards the common people. There are various other subjects and occasions of tabu, but the institution has not the

oppressive and all-pervading character which it has in Polynesia. Its action is often economical or eharitable, e.g., the ripening cocoa-nuts are tabu as long as the bread- fruit lasts, thus securing the former for future use ; or it is put on after a death, and the nuts thus saved are given to the family— a kindness to them, and a mark of respect for the dead.

The flora of the Gilbert and Marshall groups is of the. usual |

oceanic character, with close Indo-Malay affinities. It is much poorer than that of the Carolines,! with its Moluccan and Philip- pine elements, and this again is surpassed by that of the Ladrones. In the Gilberts the scattered woods of cocoa-palm and Pandanus have little undergrowth, while the south Marshalls, being within the belt of constant precipitation, have a dense growth of (mostly) low trees and shrubs, with here and there a tropieal luxuriance and variety unusual on atolls. The Pandanus grows wild profusely, and

is of exceptional importance, being the chief staple of food, so that |

1 About 180 species have been observed on Kusaie, one-fourth of all the plants being ferns.

the cocoa-nut, which, however, flourishes chiefly in the Gilberts, is used mainly to produce oil for exportation. The bread-fruit grows chiefly in the south Marshalls. The taro (Arum cordifolium and others) is cultivated laboriously, deep trenches being cut in the solid rock for its irrigation, but this and other plants of cultiva- tion, and indeed the vegetation generally, fall off in number and quality northwards, Various vegetables are grown on soil im- ported for the purpose. Marine plants are rare. Wilkes found on Makin Island, Gilbert group, a ‘ fruit resembling the gooseberry,” called “teiparu,” from which a preserve is made. This seems very like the tipari or Cape gooseberry of India (Physalis perwviana). And their £araka, a drink made from the sap of the flower-stalk of the cocoa-palm (unfermented before the arrival of Europeans), recalls the arrack of southern Asia.

The fauna, like the flora, becomes poorer eastwards, birds being mucli more numerous on the high islands than on the atolls, where the few are chiefly aquatic. On Bonabe (Puynipet) out of twenty- nine species eleven are sea birds, and of the remaining eighteen seven are peculiar to the island. From the Pelews fifty-six species are recorded (twelve peculiar), and from the neighbouring Mackenzie group (Ulithi) twenty (six peculiar). Yet curiously no species is recorded common to these two groups and peculiar to them. The comiuon sowl is found everywhere, wild or tame, and in some places is kept for its feathers only. The rat and a Pteropus are the only indigenous land mammals. The Indian erocodile is found as far east as the Pelews. There are five or six lizards, including a Geeko and Ablephorus. Insects are numerous, but of few kinds. Scorpions and centipedes are common, but are said to be harmless.

The houses in the Gilberts and Marshalls (much less elaborate than in the Carolines) consist merely of a thatched roof resting on posts or on blocks of coral about 3 feet high, with a floor at that level, which is reached from an opening in the centre. On this the prineipal people sleep, and it serves as a storehouse in- accessible to rats, which infest all the islands.

The Marshall arehipelago consists of two nearly parallel chains of atolls, from 100 to 300 miles apart, the west known as Ralik, the east as Ratak. They lie between 4° 30’ and 12° N., and between 165° 15’ and 172° 15’ E., and run about N.N.W. and S8.S.E. They were discovered in 1529 by Saavedra, who, observing the fine tattooing of the inhabitants (the first allusion to the practiee in the Pacific), called them Los Pintados. Among modern voyagers Wallis first visited them in 1767; Captains Marshall and Gil- bert reached them in 1788, and Kotzebue (1816) explored them more thoroughly. Each group contains fifteen or sixteen atolls, which range from 2 to 50 miles in circumference. An anomalous feature is reported on soine of them, viz., that the greater pro- portion of land, or at all events of soil, is not found as usual on the windward side of the lagoon, for the prevailing north-east wind sweeps, it is said, the materials of which the soil of such islands is composed across to the lee side. Jaluit Island is the commercial emporium of the whole region. There is a curious tradition on Ebon Island of the Darwinian fact that the atoll once formed the barrier reef of an island

now sunk beneath the lagoon. The popula- tion of Ratak is about 6000, of Ralik 4000; there is little intercourse between the two groups.

The Gilbert archipelago, discovered by Byron in 1765, is geographically a south continuation of the Marshalls, the ehannel separating them being 50 leagues wide. It lies between 2° 40’ 8. and 3° 20’ N., and between 172° 30’ and 177° 15’ E., and con- tains sixteen atolls, not including two hilly islands, Banaba and Nawodo, which lie 5° to 6° to the west. Several have good anchorages inside the lagoon, with entrances on the lee side. On some the lee or west reef is wanting, owing to the abrading foree of tle west storms. During these large trees are washed ashore, their roots containing pieces of fine basalt, of whieh implements are made. There is a far larger proportion of land to submerged reef and lagoon than in the Marshalls, the land sometimes rising 20 feet above the sea, whereas in the Marshalls the average level of the reef rock is less than a foot above the surface; but, though the supply of fresh water is exceptionally great, in faet enough for the luxury of a bath, the soil (especially in the south) is very much less productive. Yet the population, about 50,000, is exceptionally dense. The usual scattered houses are replaced by compaet rows of roofs which, shaded by coeoa-palin, and each with its boat-shed below, line the shore. Their numbers are unchecked either by the constant practice of abortion or. by fighting, to whieh they are much addieted, their weapons being more formidable than those of their neighbours. This exceptional vigour may be due to the decidedly hybrid chavacter of the racc. Hawaiian missionaries, under American superintendenee, have laboured here since 1857.

See also Findlay’s Suiling Directions for the North Pacific; Roper’s North Pacific Pilot and Nautical Magazine, vols. xxxi. and xxxy, Other authorities are Gerland in Waitz’s Anthropologie der Naturvélker, vol. y.; Meinicke, Die Inseln des Stillen Oceans; Hale’s Ethnography and Philology of Wilkes’s U.S. Exploring Expedition; Kotzebue and Chainisso, Entdeckungsretse in die Sudsee ; Proc, Zuol. Soc., 1872 and 1877. (C. T.)

MICROPHONE. See TELEPHONE. ~ XVI. — 33

HE microscope is an optical instrument for the ex-

amination of minute objects or parts of objects,

which enlarges the visual pictures formed upon the retina of the observer by the rays proceeding from them.

Microscopes are distinguished as simple or compound. In the former, the rays which enter the eye of the observer come from an object brought near to it after refraction through either a single lens or a combination of lenses acting as a single lens,—its action as a ‘‘magnifier ” depend- ing on its enabling the eye to form a distinct image of the object at a much shorter distance than would otherwise be possible. The latter consists of at least two lenses, so placed relatively to the object, to the eye, and to one another that an enlarged image of the object, formed by the lens placed nearest to it (the ‘ object-glass ”), is looked at through the lens nearest the eye (the “eye-glass”), which acts as a simple microscope in “magnifying” it; so that the com- ponnd microscope may be described as a simple microscope used to look at an enlarged image of the object, instead of at the object itself.

History of the Simple Microscope.—Any solid or liquid transparent medium of lenticular form, having either one convex and one flat surface or two convex surfaces whose axes are coincident, may serve as a ‘‘magnifier,”—what is

ing the rays which pass through it as to cause widely diverging rays to become either parallel or but slightly divergent. ‘Thus if a minute object be placed on a slip of glass, and a single drop of water be carefully placed upon it, the drop will act as a magnifier in virtue of the con- vexity of its upper surface; so that when the eye is brought sufficiently near it (the glass being of course held horizontally, so as not to distort the spherical curvature of the drop) the object will be seen much enlarged. And if a small hole be made in a thin plate of metal, and a minute drop of water be inserted in it, this drop, having two convex surfaces, will serve as a still more powerful magnifier. There is reason to believe that the magnify- ing power of transparent media with convex surfaces was very early known. . A convex lens of rock-crystal was found by Layard among the ruins of the palace of Nimrud. And it is pretty certain that, after the invention of glass, hollow

spheres blown of that material and filled with water were commonly used as magnifiers (comp. vol. xiv. p. 577). The perfection of gem-cutting shown in ancient gems, especially in those of very minute size, could not have been attained without the use of such aids to the visual power; and there can be little doubt that the artificers who could execute these wonderful works could also shape and polish the magnifiers best suited for their own or others' use. Though it is impossible to say when convex lenses of glass were first made by grinding, it is quite certain that they were first generally used to assist ordinary vision as "spectacles," the use of which can be traced back nearly six centuries; and not only were spectacle-makers the first to produce glass magnifiers (or simple microscopes), but by them also the telescope and the compound microscope were first invented. There seems no reason to believe, however, that lenses of very high magnifying power (or short focus) were produced until a demand for them had been created by the introduction of the compound microscope, in which.such lenses are reqnired as '"'object-glasses"; and the difficulty of working lenses of high curvature with the requisite accuracy led in the first instance to the employment of globules made by fusing the ends of threads of spun glass. It was in this

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way that Robert Hooke shaped the minutest of the lenses with which he made many of the numerous discoveries recorded in his Micrographia; and the same method was employed by the Italian microscopist Father Di Torre. It seems to have been Leeuwenhoek that first succeeded in grinding and polishing lenses of such short focus and

| perfect figure as to render the simple microscope a better

instrument for most purposes than any compound micro- scope then constructed,—its inferiority in magnifying power being more than counterbalanced by the superior clearness of the retinal picture. And, in despair of any such modi- fication in the compound form as shonld remove the optical defects which seemed inherent in its plan of construction, scientific opticians and microscopic observers alike gave their chief attention for a considerable period to the improvement of the simple

microscope. In order that the nature of these improvements may be understood, the principle of its action must be first explained.

The normal human eye has a considerable power of self- adjustment, by which its focal length is so varied that it forms equally distinct pictures of objects brought within ordinary reading distance (say 10 inches) and of objects whose distance is many times that length,—the size of the

| visual picture of any object diminishing, however, with essential being that it shall have the power of so refract- |

the increase in the distance to which it is removed, and the amount of detail distinguishable in it following the same proportion. Thus a man who looks across the street at a placard posted on the opposite wall may very distinctly see its general form and the arrangement of its heading, and may be able to read what is set forth in its largest type, whilst unable to separate the lines, still more to read the words, of what is set forth below. But by crossing the street so as to bring his eye nearer the picture he finds himself able to read the smaller type as easily as he before read the larger,—the visual picture on his retina having been magnified, say 10 times in linear dimension, by the reduction of the distance of his eye from 40 feet to 4. Similarly, if he holds a page of excessively minute type at arm's length (say 40 inches) from his eye, he may be unable to read it, not because his eye does not form a distinct retinal' picture of the page at that distance, but because the details of that picture are too minute for him to distinguish them. But if he brings the page from 40 inches to 10 inches distance, he may be able to read it without difficulty,—the retinal picture being enlarged four

_times linear (or sixteen times superficial) by this approxi-

mation. Now the rays that enter the eye from each point of a remote object diverge so little as to be virtually parallel ; but the divergence increases with the approxima- tion of the object to the eye, and at 10 inches the angle of their divergence is as wide as permits the ordinary eye to bring them to a focus on the retina. When the object is approximated more closely, an automatic contraction of the pupil takes place, so that the most diverging rays of each pencil are cut off, and a distinct picture may be formed (though not without a feeling of strain) when the object is (say) from 5 to 8 inches

distant,—giving still greater minuteness of visual detail in conformity with the increase of size. A further magnifying power may be obtained without the interposition of any lens, by looking at an object, at 2 or 3 inches distance, through a pin-hole in a card; for by thus cutting off the more divergent rays of each pencil, so as to admit only those which can be made to converge to a focus on the retina at that distance, a distinct and detailed picture may be obtained, though at the expense of a great loss of light. Moreover,

MICRO

although an ordinary eye does not form a distinct picture of an object at less than from 10 to 6 inches distance, a ‘“‘myopic” or “short-sighted ” eye (whose greater refractive power enables it to bring rays of wider divergence to a focus on the retina) may form an‘ equally distinct picture of an object at from 5 to 3 inches distance ; and, as the linear dimensions of that picture will be double that of the preceding, the object will be “magnified” in that propor- tion, and its details more clearly seen.

The effect of the interposition of a convex lens between the eye and an object nearly approximated to it primarily consists in its reduction in the divergence of the rays of the pencils which issue from its several points, so that they enter the eye at the moderate divergence which they would have if the object were at the ordinary nearest limit of distinct vision. And, since the shorter the focus of the lens the more closely may the object be approximated to the eye, the retinal picture is enlarged, causing the object to appear magnified in the same proportion. Not only, however, are the component rays of each pencil brought from divergence into convergence, but the course of the pencils themselves is changed, so that they enter the eye under an angle corresponding’ to that under which they would have arrived from a larger object situated at a greater distance ; and thus, as the picture formed upon the retina by the small object ab, fig. 1, corresponds in all

Fie, 1,—Action of Simple Microscope.

respects with that which would have been made by the same object AB of several times its linear dimension viewed at the nearest ordinary limit of

distinct vision, the object is seen (by the formation of a “virtual image”) on a magnified scale,

It is obvious that the “magnifying power” of any convex lens so used is measured by the ratio between the dimensions of the retinal picture formed with its assistance and those of the picture formed by the unaided eye. Thus, if by the use of a convex lens having 1 inch focal length we can form a distinct retinal image of an object at only an inch distance, this image will have ten times the linear dimensions of that formed by the same object at a distance of 10 inches, but will be only eight times as large as the picture formed when the object can be seen by ordinary vision at 8 inches distance, and only four times as large as the picture of the same object formed by a myopic eye at a distance of 4 inches. It is usual to estimate the magnifying power of single lenses (or of com- binations that are used as such) by the number of times that their focal length is contained in 10 inches,—that of 1 inch focus being thus taken as ten times, that of !, inch as one hundred times, and so on. But the rule is obviously arbitrary, as the actual magnifying power varies in each individual with the nearest limit of distinct vision. Thus for the myopic who can see an object clearly at 4 inches distance, the magnifying powers of a 1 inch and ;!, inch lens will be only 4 and 40 respectively. The amplifying power of every single convex lens, however, is impaired (1) by that inability to bring to the same focus the rays which

fall upon the central and the marginal parts of its surface which is called “spherical aberration,” and (2) by that dispersion of the rays of different wavelengths, in virtue of their different refrangibilities, which produces coloured fringes around the points and lines of the visual picture, and is therefore called “chromatic aberration” (see Licut), These aberrations increase with the “ angle of aperture ” given to the lens, that is, with the proportion between the diameter of its actual “opening” and the focal distance of the object; and thus, when a single lens of very short focus is used in order to gain a high magnifying power, such a reduction of its aperture by a perforated diaphragm or “stop” becomes necessary (in order, by excluding the peripheral rays, to obtain tolerable “definition ” with

freedom from false colour) that the amount of light admitted to the eye is so small as only to allow the most transparent objects to be thus viewed, and these only very imperfectly. In order to remedy this draw- back, it was proposed by Sir D. Brewster to use instead of glass, in the construction of simple microscopes, such transparent minerals as have high refractive. with low dispersive power; in which case the same optical cffect could be obtained with lenses of much lower curvature, and the aperture might be proportionately enlarged. This combination of qualities is found in the diamond, whose index of refraction bears such a proportion to that of glass that a diamond lens having a radius of curvature of 8 would give the same magnifying power as a glass lens whose radius of curvature is 3, while the "longitudinal aberration " (or distance between the foci of central and of marginal rays) would be in a diamond lens only one-ninth of that of a glass lens having the same power and aperture. Put- ting aside, however, the costliness of the material and the difficulty of working it, a source of imperfection arises from a frequent want of homogeneousness in the diamond crystal, which has proved sufficient to make a lens worked from it give a double or even a triple image. Similar attempts made by Mr Pritchard with sapphire proved more successful ; and, as 'a sapphire lens having a radius of curvature of 5 has the same focus and gives the same magnifying power as a crown-glass lens having a radius of 3, it was found to bear a much larger aperture without serious impairment by either spherical or chromatic aberration. As the sapphire, however, possesses the property of double refrac- tion, the duplication of the markings of the object in their retinal image constitutes a very serious drawback to the utility of lenses constructed of this mineral; for, though the double refraction may be reduced almost to nothing by turning the convex side of the lens towards the object, yet, as this is the worst position in regard to spherical aberration, more is lost than is gained. Fortunately, however, for biological investigators working with simple microscopes, the imtroduction of the Wollaston doublet superseded the necessity of any further attempts at turning costly jewels to account as high-power magnifiers. Wollaston Doublet.—This consists of a combination of two plano-convex lenses, whose focal lengths (as directed by Dr Wollaston) should be as 3 to 1, with their plane sides turned towards the object,—the smaller lens being placed lowest, and the upper lens at a distance of one and a half times its focal length above it. This construction, how- ever, has been subsequently

improved—(1) by the introduc- tion of a perforated diaphragm between the lenses ; (2) by amore effective adjustment of the distance between the

‘two lenses, which seems to be inost satisfactory when it

equals the difference of their respective focal lengths, allowance being made for their thickness; and (3) by the division of the power of the lower lens (when a shorter focus than ;‘5 inch is required) into two, so as to form a “triplet.” When combinations of this kind are well

constructed, spherical aberration is almost wholly got rid |

of, and chromatic dispersion is so slight that the angle of aperture may be considerably enlarged without much sacrifice of distinctness. Such “doublets” and “triplets,” having been brought into use in England while the com- pound microscope still retained its original imperfections, proved very serviceable to such as were at that time prosecuting minute biological investigations : for example, the admirable researches of Dr Sharpey on ciliary action in animals (1830-35) and Mr Henry Slack’s beautiful dissections of the elementary tissues of plants, as well as his excellent observations on vegetable cyclosis (1831), were made by their means. No one, however, would now

use Wollaston “doublets” or “triplets ” of high power in place of a compound achromatic microscope ; and for the simple microscopes of low power that are useful either for dissecting or for picking out minute specimens

larger field and more light. As a hand-magnifier the | “Coddington” lens—which is a sphere of glass with a | deep groove ground out of its equatorial portion—has many advantages! By making this groove sufficiently deep, both spherical and chromatic aberrations can be rendered almost insensible ; and, as the rays falling on any part of the spherical surface can only pass to the eye either through or near the centre, the action of every part of that surface is the same, so that the image of the object will be equally distinct (when properly focussed) whether its parts lie nearer to the axis of the

sphere or more remote from it, or the axis be itself turned to one side or the other. Again, it was mathematically shown by Sir John Herschel in 1821 that by the combination of a meniscus with a double con- vex lens—the four surfaces of these lenses having certain proportionate curvatures—spherical aberration could be entirely extinguished for rays parallel to the axis, the combination being thus an “‘aplanatic” doublet, while another combination, which he termed a “ periscopic ” doublet, gives a remarkable range of oblique vision with low powers, and almost entirely extinguishes chromatic aberration, although at the expense of residual spherical aberration. These combinations have been mounted both as hand-magnifiers and as single microscopes, for both which purposes they are much superior to single lenses of the same magnifying power. But such combinations have been greatly improved by the introduction of concaves of flint glass, so as to render them achromatic as well as aplanatic ; and nothing, according to the writer’s experi-. ence, can now be used with greater advantage for all the purposes answered either by the simple microscope or the hand-magnifier than Browning’s “ platyscopic ” lenses or the “achromatic doublets” of Steinheil of Munich. Each of these combinations gives a large flat field, with plenty of light, admirable definition, and freedom from false colour.

At the period when ‘“‘ doublets” of very short focus were used in order to obtain high magnifying power, it was requisite to mount these on such a stand as would enable the focal adjustment to be made, and would admit the use of a special illuminating apparatus with great exaetness. But now that. eomparatively Tow powers only are employed the ordinary raek-and-pinion movement is quite sufficient for their focal adjustment, and nothing more is required

1 Tt is diffieult to understand how the name of Coddington came to be attaehed to the grooved sphere, seeing that he neither was nor claimed to be the inventor of it. Dr Wollaston’s first ‘‘ doublet” consisted of a pair of plano-convex lenses with their plane surfaces opposed to each other, and a diaphragm with central aperture placed |, between them. Sir D. Brewster showed that this construction is most advantageous when the two lenses are hemispheres, and the central / aperture between their two plane surfaces is filled up by a tratisparent eement having the same refraetive index as glass.

And from this the transition is obvions to the grooved sphere, which had been made for Sir D. Brewster long before the high commendation it reeeived from Mr Coddington brought it into general repute.

(such as | diatoms) other constructions are preferable, as giving a |

SCOPE

for the illumination of the object than a concave mirror beneath the stage when it is transparent, and a condensing lens above when it is opaque. The various patterns of simple microseope now made by different makers vary in their construetion, chiefly in regard to portability, the size of their stages, and the mode in whieh ‘‘ rests”’ or supports to the hands are provided. These, in Continental in- struments, are very commonly attached to the stage ; but, unless the stage itself and the pillar to which it is fixed are extremely massive, the resting of the hands on the supports is apt to depress the stage in a degree that affects the focal adjustment ; and where portability is not an object it scems better that the hand-supports should be independent of the stage. For a laboratory mieroscope, the pattern represented in fig. 2 has been found very eonvenient, — the framework being of mahogany or other hard wood, the stage

Fig. 2.—Laboratory Dissecting Mieroseope. being large enough to admit a dissection or carry a water-trough of considerable size, and the bent arm that earries the ‘‘ powers” being made capable of reversion, so as to permit the use of lenses of very long as well as of very short focus, As it is desirable that the stage should not be acted on chemically by sea-water, acids, or other reagents, it may be made either of a square of plate-glass or of a plate of ebonite with an aperture in the middle ; and either of these may be made to slide in grooves in the side supports, so that one may be substituted for the other. The arm may be easily made (if desired) to earry the body of a compound microscope, so as to apply it to the examination of objects dissected or otherwise prepared under the simple microscope, without transferring them to another instrument. A portable form of simple microscope is shown in fig. 30.

Compound Microscope.-—The placing of two convex lenses in such relative positions that one should magnify an enlarged image of’a small

near object formed by the other naturally soon followed the invention of the telescope, and seems to have first occurred to Hans Zansz or his son Zacharias Zansz, spectacle-makers at Middelburg in Hol- land, about 1590. One of their compound microscopes, which they presented to Prince Maurice, was in the year 1617 in the possession of Cornelius Drebell of Alkmaar, who then resided in London as mathematician to king James I. In order to make clear the successive stages by which the rude and imperfect microscope of that period has, after remaining for two centuries unimproved in any essential particular, been developed within the last half-century into one of the most important instruments of scientific research that the combination of theoretical acumen and manipulative skill has ever produced, it is necessary to explain the principle of its construction, and to show wherein lay the imperfection of its earlier form.

In its simplest construction, as already stated, the compound microscope consists of only two lenses,—the “object-glass” CD, fig. 3, which receives the light-rays direct

from the object AB placed near it, and forms an enlarged

but reversed image A’B’ at a greater distance on the other side, and the “eye-glass” LM, which receives the rays that diverge from. the several points of this image as if they proceeded from the points of an actual object occupying the position and enlarged to the dimensions A’B’, and brings these to the eye at E, so altering their course as to

MicokoscoP &

act as a simple microscope in magnifying that image to the observer. It was early found useful, however, to interpose another lens FF, fig. 4 (the “ field-glass”), between the object-glass and the image formed by it, for the purpose of giving such a slight convergence to the pencil of rays as shall reduce the dimensions of the image, and thus allow a larger part of it to come within the range of the eye-

Fic. 4.—Diagram of Complete Compound Microscope.

Fig. 3.—Diagram of Simplest Form of Compound Micro- scope.

glass, so that more of the object can be -seen at once.

And it was soon perceived that the eye-glass and the

field-glass might be advantageously combined into an

“eye-piece,” in which a perforated diaphragm might be

inserted at the focal plane of the image (¢.e., in the focus of

the eye-glass), so as, by cutting off the peripheral portion of the field of view, to linit it to what can be seen with tolerable distinctness.

It is obvious that the magnifying power of such an instrument would depend (1) on the proportion between the size of the image formed at BB and. that of the actual object, and (2) upon the magnifying power of the eye-glass. And further the proportion which the size of the image bears to that of the object depends upon two factors,—(1) the focal length of the object-glass, and (2) the distance between the object-glass and the plane BB occupied by the image it forms. If we diminish the focal length of the-object-glass, the object must be brought nearer to it, so that, while the distance of the image on the other side remains unchanged, that distance comes to bear a larger proportion to the distance of the object, and the size of the image is augmented in a cor- responding ratio. On the other hand, the object-glass remaining unchanged, the distance at which it forms the image of the object can be increased by a lengthening of the

of the distance between the object-glass and the object, the proportion which the former bears to the latter is augmented, and the image is correspondingly enlarged. Thus an

increase in the magnifying power of the compound micro-

scope may be gained in three modes, which may be used either separately or in double or triple combination,—viz., (1) shortening the focus of the object-glass, (2) lengthening the tube of the microscope, and (3) increasing

the magnify- ing power of the eye-glass by shortening its.focus. This, it may be remarked, also lengthens the distance of the image from the object-glass, by bringing the focal plane BB nearer the eye-glass. The second of these methods was not unfrequently used in the older microscopes, which were sometimes made to draw out like telescopes, so as to increase the amplifying power of their object-glasses. But, whilst very inconvenient to the observer, such a lengthen- ing of the one distance involved such a shortening of the other as greatly impaired the distinctness of the image by increasing the aberrations of the object-glass, so that this method came to be generally abandoned for one of the other two.

When lenses of from 1 to 4 inches focus were used as object-glasses, and their apertures were restricted by a stop to the central part of each, tolerably distinct images were given of the larger structural arrangements of such objects as sections of wood or the more transparent wings of insects,—which images would‘bear a further moderate enlargement by the eye-glass without any serious deterioration either by want of definition or the introduction: of colour-fringes. But when lenses of less than 1 inch focus were employed in order to obtain a higher magnifying power, the greater obliquity of the rays so greatly increased their aberrations

‘that defective definition and the introduction of false

colours went far to nullify any advantage obtainable from the higher amplification; while the limitation of the aperture required to keep these aberrations within even moderate limits occasioned such a loss of light as most seriously to detract from the value of the picture. On the other hand, the use of deeper eye-pieces to enlarge the images formed by the object-glasses not only brought out more strongly all the defects of those images, but introduced a new set of errors of their own, so that very little was gained by that mode of amplification. Hence many of the best of the older microscopists (notably LEEUWENHOEK, g.v.) made some of their most valuable discoveries by the use of the simple microscope ; and the amount of excellent work thus done surprises every one who studies the history of microscopic inquiry. This was still more the case, as already stated, when the use of single lenses of very short focus was superseded by the introduction of the Wollaston doublet. And the substitution of these

doublets for the single lenses of object-glasses, while the single lens of the eye-glass was replaced by a Herschel's aplanatic doublet, and the field-glass was a convex lens whose two curves had the proportion of 1:6 (the form of least spherical aberra- tion), constituted the greatest improvement of which the instrument seemed capable in pre-achromatic times.

It has been only within the last sixty years (1820-30) that the microscope has undergone the important improve- ment which had been worked out by Dollond in the refracting telescope more than sixty years previously,—namely, the correction of the chromatic aberration of its objectives by the combination of concave lenses of flint-

1 This combination was made in the first microscope of which the writer became possessed, about the year 1830 ; and he well recollects the great superiority to any compound microscope of the old construc- tion which was proved by its power of separating the lines on the Menelaus scale, and of bringing into view the details of the structure of animalcules, with a clearness that only an achromatized object-glass

tube of the microscope; and, as this involves a shortening | could surpass.

glass with convex lenses of crown, while their spherical } front of the previous one, increased the angle of the trans-

aberration is corrected by the combination (as in Herschel's aplanatic doublet) of convex and concave surfaces of different curvatures. The minute size and high curvature of the lenses required as microscopic objectives were long considered as altogether precluding the possibility of success in the production of such combinations, more especially as the conditions they would have to meet differ altogether from those under which telescopic object-glasses are employed. For the rays from distant objects fall upon the latter with virtual parallelism ; and the higher the power required the longer is the focus given to them, and the smaller is the deflexion of the rays. In the microscope, on the other hand, the object is so

closely approximated to the objective that the rays which proceed to it from the latter have always a very considerable divergence; and the deflexion to which they are subjected increases with that reduction of the focal length of the objective whicli is the necessary condition of the increase of its magnifying power. And thus, although the telescopic “triplet” worked out by Dollond (consisting of a double-concave of flint glass, interposed between two double-convex lenses of crown) can be so constructed as to be not only completely aplanatic (or free from spherical aberration) but almost completely achromatic (or free from chromatic aberration), this construction is only suitable for microscopic objectives of long focus and small angular aperture, the rays falling on which have but a very moderate divergence. And though, as will presently appear, some of the early attempts at the achromatization of the microscope were made in this direction, it was soon abandoned for other plans of construction, which were found to he alike theoretically and practically superior.

It seems to have been by. Professor Amici, then of

the achromatization of microscopic objectives; but, these attempts not proving successful, he turned his attention to the production of a reflecting microscope, which was a decided improvement upon the non-achromatized compound microscopes then in use. In the year 1820, however, the subject was taken up by Selligues and Chevalier of Paris, who adopted the plan of superposing three or four com- binations, each consisting of a double-convex of crown cemented to a plano-concave of flint. The back combina-tion (that nearest to the eye) was of somewhat lower power than those placed in front of it, but these last were all of the same focus, and no attempt was made by these opticians to vary the construction of the several pairs thus united, so as to make them correct each others’ aberrations. Hence, although a considerable magnifying power could be thus obtained, with an almost complete extinction of chromatic aberration, the aperture of these objectives could not be greatly widened without. the impairment of the distinctness of the image by a “coma” proceeding from uncorrected spherical aberration.

In ignorance, it would appear, of what was being done by the Paris opticians, and at the instigation of Dr Goring (a scientific amateur), Mr

Tulley—well known in London as an able constructor of telescopic objectives—began, about the year 1824, to work object-glasses for the micro- scope on the telescopic plan. After many trials}! he succeeded, in 1825, in producing a triplet of 75 inch focus, admitting a pencil of 18°, which was so well corrected as to perform very satisfactorily with an eye-piece giving a magnifying power of 120 diameters. He afterwards made a similar triplet of shorter focus, which, when placed in

1 Jt is due to Mr Joseph J. Lister to mention that Tulley's final success with this low power seems to have been attained by working on @ suggestion given him by that gentleman. See Monthly Micro- scopical Journal, vol. iii. (1870), p. 184.

i

mitted pencil to 38°, and bore an eye-piece giving a magnifying power of 300 diameters. These triplets are said by Mr Ross to have never been exceeded by any similar combinations for accurate correction throughout the field. Having come into possession, at the end of 1826, of an objective of Chevalier's construction, Mr J. J. Lister carefully examined its properties, and compared them with those of Tulley's triplets; and this comparison having led him to institute further experiments he obtained results which were at first so conflicting that they must have proved utterly bewildering toa less acute mind,? but which finally led him to the enunciation of the principle on which all the best microscopic objectives are now constructed. For he discovered that the performance of such com- posite objectives greatly depends upon the relative position of their component combinations,—the effect of the flint plano-concave upon the spherical aberration produced by the double-convex of crown varying remarkably according to the distance of the luminous point from the front of the objective. If the radiant is at a considerable distance, the rays proceeding from it have their spherical error under- corrected ; but, as the source of light is brought nearer to the glass, the flint lens produces greater proportionate effect, and the under-correction diminishes, until at length a point is reached where it disappears entirely, the rays being all brought to one point at the conjugate focus of the lens. This, then, is one aplanatic focus. If, however, the luminous point is brought still nearer to the glass, the

influence of the flint continues for a time to increase, and the opposite condition of over-correction shows itself. But, on still further approximation of the radiant, the flint comes to operate with less effect, the excess of correction

diminishes and at a point still nearer to the glass vanishes, Modena, about 1812, that the first attempts were made at

and a second aplanatic focus appears. From this point onwards under-correction takes the place of over-correction, and increases till the object touches the surface of the glass. As every such doublet, therefore, has two aplanatic foci for all points between which it is over-corrected, while for all points beyond it is under-corrected, the optician is enabled to combine two or more doublets with perfect security against spherical error. This will be entirely avoided if the rays be received by the front glass from its shorter aplanatic focus, and transmitted through the back glass in the direction of its longer aplanatic pencil. By the approximation of the two doublets over-correction will be reduced, while their separation will produce under-cor- rection ; and thus, by merely varying the distance between two such combinations, the correction of the spherical error may be either increased or diminished according to a definite rule. Slight defects in one glass may thus be remedied by simply altering its position in relation to the other,—an alteration which may be made with very little disturbance of the colour-correction. This important principle was developed and illustrated by Mr Lister in a memoir read to the Royal Society on January 21, 1830, On some Properties in Achromatic: Object-glasses, applicable to the Improvement of the Microscope ; and it was by work- ing on the lines there laid down that the three London opticians Ross,? Powell, and James Smith soon pro-

> Thus he found that, while each of Chevalier’s doublet combina- tions, when used singly, presented a ‘“‘bur” or “coma” outwards, this coma, instead of being exaggerated by the combination of two of these doublets, was much diminished. On the other hand, while two of Tulley’s triplets, cach of which performed admirably by itself, were used together, the images of all objects not in the centre presented a strong bur inwards with an under-correction of colour.

3 In 1837 Mr Lister gave Mr Ross a projection for an objective of s inch focus, in which a triple front was combined with two doublets. The great superiority of this lens, admirably executed by Mr Ross, caused him to adopt its plan as the standard one for high powers; and it is still in general usc,—the back lens also being sometimes made as a triplet.

duced microscopic objectives that surpassed any then con- structed on the Continent, while the subsequent adoption of the same principles by French and German opticians, as also by Professor Amici of Florence, soon raised their objectives to a corresponding level.

It has proved more advantageous in practice to make the several components of an achromatic objective correct each others' aberrations than to attempt to render each perfect in itself; and the mode in which this is accomplished will vary with the focus and angular aperture given to each combination. Thus, while a single '" telescopic triplet " answers very well for the lowest power usually made (4 inches focus), and the same plan may be used— though at the sacrifice of angular aperture—for objectives of 3 inches, 2 inches, and even | inch focus, the best per- formance of these powers requires the combination of two doublets. And, while this last system also serves for objectives of 2 inch and 4 inch of low angle, a third com- ponent is required for giving to these objectives the aperture that renders them most serviceable, as well as for all higher powers. Instead of combining three achromatic doublets, however, many makers prefer placing in front a plano-convex of crown, and adding a third lens of crown to the doublet at the back, still using a doublet in the middle,— the whole combination thus consisting of six lenses, four of crown and two of flint. Further, Mr Wenham has shown that the whole colour-correction may be effected in the middle by interposing a double concave of dense flint between two double-convex lenses of crown,—the back lens, as well as the front, being then a plano-convex of crown, making five lensesin all. This plan of construction, though suitable to objectives of moderate angular aperture, and advantageous in regard to comparative simplicity and economy of construction, does not seem so well adapted for objectives to which the largest attainable aperture is to be given,—these being usually

constructed with a triplet in front, a doublet in the middle, and a triplet at the back, so as to consist of eight separate lenses. And the first-class constructors of achromatic objectives in the United States usually place in front of these, in their highest powers, a single plano-convex of crown, by the addition of which a greater working distance can be obtained. But, as every such addition increases the liability' to error from imper- fections in the centring and grinding of the lenses (as well as loss of light by the partial reflexion of oblique rays from their surfaces), it is obvious that the most exact workmanship, involving a proportionate costliness, is required to bring out the full effect of such complex con- struction. And where angular aperture is regarded as the

quality of primary importance it will be usually found | 1 AHH | English inch as 11,529 to the inch Pa Whar i AM

preferable to have recourse to objectives constructed on either the "water" or the "oil" immersion system, to be presently described.

The great increase thus attained in the perfection of the corrections of microscopic objectives for both spherical and chromatic aberration of course rendered it possible to make a corresponding increase in their angular aperture. The minute scales of the wings of butterflies and other insects were naturally. among the objects much examined ; and it was soon perceived that certain lines and other markings became clearly discernible on these scales with objectives of what was then considered

large angle which were utterly. undistinguishable with |

non-achromatized microscopes (however high their magnify- ing power), and very imperfectly shown under achromatic objectives of small angle. Hence these scales came to be used as "' test-objects," for judging of the "definition" and "resolving power" of microscopic objectives,—the former property consisting in the clearness, sharpness, and freedom from false colour of the microscopic images of boundary

_ lines, and depending on the accuracy with which the aber- rations are corrected, while the latter term designates that | power of separating very closely approximated markings | which is now known to be a ant

“function” of aperture. The ji insect-scales formerly most valued (/jiiiii# for these purposes were those of //i¥ the Morpho menelaus (fig. 5) and |i] the similarly lined scales of the |} Polyommatus argus (azure-blue), {f the “‘battledoor” scales of the same butterfly (fig. 6), the ribbed scales of the Lepisma saccharina (sugar-louse), and the minute and pecuharly marked scales of the Lepidocyrtus curvicollis (fig. 7), commonly known as the Podura. The writer recollects the time when the satisfactory ‘“resolu- tion” of the first three of these tests was considered a sufficient proof of the goodness of even high-power objectives, and when the Podura-markings, if visible at all, could only be dis- tinguished as striz. The further opening-out of” the aperture, however, enabled these striz sere

to be resolved into rows of ‘“ exclama- tion marks”; and, while there is still f some uncertainty as to the precise } structure of which these markings are }}} the optical expression, practical op- Wis ticlans are generally agreed that the [i Podura-scale is very useful as a test for definition, with even the highest objectives, though it only serves as a test for a very moderate degree of re- solving power. For the latter purpose it has been completely superseded by the closely approximated markings of the silicified envelopes of certain pi ¢. — Battledoor diatoms (which, however, show them- Scale of Polyomma- selves in very different aspects accord- vs a7gus.

ing to the conditions under which they are viewed, figs. 8-11), and also by lines artificially rved on glass, as in Nobert’s “‘test-plate,” the number of lines in the nineteen bands of which is stated by M. Nobert to range from 1000 to 10,000 to a Paris line, while Dr Royston Pigott gives the numbers in an fil

Fig. 5.—Scale of Morpho menelaus.

Vy

in the first band, and 112,595 in the nineteenth. This last dimension (as will afterwards appear) approaches the minimum distance at which such

markings are theoretically separable by any magnifying power of the micro- scope.

The enlargement of the angle of aperture of microscopic ob- jectives and the greater complete- ness of their corrections, which were obtained in the first in- Fic. 7.—Test-Scales of Podura stance by the adoption of Mr (Zépidocyrius | cir gi Lister’s principles, and were de- gcale; B, small scale, more monstrated by the resolution of

faintly marked.

the test-objects then in use, soon rendered sensible an imperfection in their performance under certain circum stances, which had previously passed unnoticed ; and the

important discovery was made by Mr Andrew Ross that a very decided difference exists in the precision of the image according as the object is viewed with or without a covering of thin glass, as also according as this cover is thin or thick.1 As this difference increases in proportion to the widening of the aperture, it would obviously be a

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| constructive modification to meet the new condition.

Fig. 10. Fig. 11.

Portious of Siliceous Valve of Pleurosigma angulatum, from a Photo- graph taken by Central Illumination. Magnified 2000 diameters.

source of great error and embarrassment if a means could not be found for its rectification. Its optical source, how- ever, having been found by Mr Ross to lie in the “negative aberration” which is produced in the rays proceeding from the object to the front glass of the objec- tive by the interposition of the plane-glass cover, and which increases with its thickness, his practical ability | enabled him at the same time to indicate the remedy, which consists in under-correcting the front lens and over-correcting the two pos- terior combinations, and in making the distance between the former and the latter capable of adjustment by means of a screw-collar, as shown in fig. 12. For when the front pair is approxi- 5, mated most nearly to the next, and its distance from the object is in-creased, its excess of positive aberration is more strongly exerted upon the other two pairs than it is in the con- Fic. 12.—Section of Adjusting Achromatic trary conditions, and Object-Glass. A, uncovered ; B, covered. thus neutralizes the negative aberration produced by the interposition of the covering-glass. This correction is not needed for objectives of low or medium power and small angle of aperture ; but it should always be provided when the angle exceeds 50°,—unless (as is now generally done

1 Trans, Soc. of Arts, vol. li,

in the case of objectives constructed for students’ use) the maker adjusts them originally, not for uncovered . objects, but for objects covered with glass of a standard thickness, say 0°005 or 0:004 inch. A departure from that standard to the extent of one or. two thousandths of an inch in either direction, though extremely injurious to the performance of objectives whose aperture is 125° or more, scarcely makes itself perceptible in those of 90° or 100°. And the same may be said in regard to the

| immersion-objectives next to be described, which are _ peculiarly suitable to the purposes of minute histological

research.

Immersion System.—It was long since pointed out by Professor Amici that the introduction of a drop of water between the front surface of the objective and either the object itself or its covering-glass would diminish the loss of light resulting from the passage of the rays from the object or its covering-glass into air, and from air into the front glass of the objective. It was obvious to him, more- over, that when the rays enter the object-glass from water,

instead of from air, both its refractive and its dispersive

action will be so greatly changed as to need an important This modification seems never to have been successfully effected by Amici himself; but his idea was taken up by the two eminent Paris opticians, MM. Hartnack and Nachet, who showed that the application of what is now known as the "immersion system " to objectives of short focus and large

| angular aperture is attended, not merely with the advan- | tages expected by Professor Amici, but with others on which

he did not reckon. As the loss of light by the reflexion of a portion of the incident rays increases with the obliquity

_ of their incidence, and as the proportional loss is far smaller _when the oblique rays pass into glass from water than

'when they enter it from air, the advantage of increas-

ing the angular aperture is more fully experienced with "immersion" than with "dry" objectives,—just as Professor Amici anticipated. But, further, the immer-

_ sion system allows of a greater working distance between _ the objective and the object than can be attained with a dry or air objective having the

same angular aperture ;

and this increase affords not only a greater freedom of manipulation, but also a greater range of “ penetration ” or “focal depth.” Further, the observer is rendered so much less dependent upon the exactness of his cover-correction that it is found that water-immersion objectives of high power and considerable angular aperture, extremely well adapted for the ordinary purposes of scientific inves- tigation, can be constructed without it,—a small departure from the standard thickness of covering-glass to which such objectives are adjusted by the maker having scarcely any effect upon the distinctness of the image. It is now the practice of several makers to supply two fronts to objectives of ;‘5 or 3}; inch focus, one of them fitting the objective for use “dry” (that is, in air), whilst the substitution of the other converts it into a water-immersion objective. And in the objectives constructed on Mr Wenham’s system no change in the front glass is needed, all that is necessary for making them work as immersion-lenses being a yet closer approximation of the front lens to the second combination, which can be made by the screw-collar.

Within the last few years, however, the immersion system has- undergone a still further and most important development, by the adoption of a method originally suggested by Mr Wenham (though never carried out by him), and independently suggested by Mr Stephenson to Professor Abbe of Jena, under whose direction it was first worked out by Zeiss (the very able optician of Jena), who has been followed by Powell and Lealand of London, as

‘| well as by several other constructors of achromatic objec-

tives both in England and elsewhere, with complete success. This method consists in the replacement of the water previously interposed between the covering-glass and the front glass of the objective by a liquid having the same refractive and dispersive powers as crown-glass, so that the rays issuing at any angle from the upper plane surface of the covering-glass shall enter the plane front of the objec- tive, without any deflexion from their straight course, and without any sensible loss by reflexion,—even the most

oblique rays that proceed from the object keeping their direction unchanged until they meet the back or convex surface of the: front lens of the objective. It is obvious that all the advantages derivable from the system of water- immersion will be still more thoroughly attained by this system of “homogeneous” immersion, provided that a fluid can be obtained which meets its requirements. After a long course of experiments, Professor Abbe found that oil of cedar wood so nearly corresponds with crown-glass, alike in refractive and in dispersive power, as to serve the purpose extremely well, except whén it is desired to take special advantage of the most divergent or marginal rays, oil of fennel being then preferable. There are, however, strong objections to the use of these essential oils in the ordinary work of research ; and it seems not unlikely that a solution of some one or more saline substances will be found more suitable. In addition to the benefit conferred by the water-immersion system, and more completely attained with the homogeneous, it may be specially pointed out that, as no correction for the thickness of the covering- glass is here required, the microscopist can feel assured that he has such a view of his object as only the most per- fect correction of an air-objective can afford. This is a matter of no small importance, for while, in looking at a known object, the practised microscopist can so adjust his air-objective to the thickness of its covering-glass as to bring out its best performance, he cannot be sure, in regard to an unknown object, what appearances it ought to pre- sent, and may be led by imperfect cover-correction to an erroneous conception of its structure.

It has been recently argued that, as the slightest variation in the refractive index of either the immersion fluid or the covering-glass, a change of eye-pieces, or the least alteration in the length of the body—ina word, any circumstances differing in the slightest degree from those under which the objective was corrected—must afleet the performance of homogeneous-immersion objectives of the highest class, they should still be made adjustable. The truth of this contention can, no doubt, be proved, not only theoretically, but practically, the introduction of the adjustment enabling an experi- enced manipulator to attain the highest degree of perfection in the exhibition of many mounted objects, which cannot be so well shown with objectives in fixed settings. But it may well be questioned whether it is likely to do the same service in the hands of an ordi- nary working

histologist, and whether the scientific investigator will not find it preferable, when using these objectives, to accept what their maker has fixed as their point of best performance. The principal source of error in his employment of thei lies in the thickness of the optieal section of the object; for the rays proceeding from its deeper plane, having to pass through a medium intervening between that plane and the cover-glass, whose refractive and dispersive indices differ from those of the glass and' immersion-fluid, cannot be brought to so aecnrate a focus as those proceeding from the plane immediately beneath the cover-glass. The remedy for this, how- ever, seems to lie rather in making the preparation as thin as possible than in the introduetion of what is likely, im any but the most skilful and experienced hands, to prove a new source of error. Every one who has examined muscular fibre, for example, under a dry objective of very high power and large aperture, well knows

that so greatan alteration is produced in its aspect by the slightest

change in either the foeal adjustment or the cover-correction that it is impossible to say with certainty what are the appear- ances which give the most correct optical expression ofits structure. This being a matter of judgment on the part of each observer, it seems obvious that the nearest approach to a correet view will be probably given by the focal adjustment of the best homogeneous immersion-objectives, in fixed settings, to the plane of the prepara- tion immediately beneath the cover-glass (see Jour. Roy. Micros. Soc., 1882, pp. 407, 854, 906).

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In every particular in which the water-immersion system is superior to the dry, it is itself surpassed by the oil or other homogeneous system, the anticipa- tions of those by whom it was suggested being thus fully realized. But the advantages already spoken of as deriv- able from the use of the ‘‘immersion system ” are altogether surpassed by that which the theoretical studies of Professor Abbe have led him to assign to it, and of which he has practically demonstrated its possession. Tor he has shown (as will be explained below) that the interposition of either water or oil so greatly increases the real “aperture” of the objective that immersion-objectives may

be constructed having a far greater virtua! aperture than even the theo-retical maximum (180°) of the angular aperture of an air-objective.

The same eminent physicist, working on the basis supplied by the mathematical investigations of Professor Helmholtz and himself on the undulatory theory of light, has further established an entirely new doctrine in regard to the production of highly magnified representations of closely approximated markings. All that has hitherto been said of the formation of images by the compound microscope relates to such as are produced, in accordance with the laws of refraction, by the alteration in direction which the light-rays undergo in their passage through the lenses interposed between the object and the eye. These dioptric images, when formed by lenses free from spherical and chromatic aberration, are geometrically correct pictures, truly representing the appearances which the objects them-selves would present were they enlarged to the same scale and viewed under similar illumination. And we seem justified, therefore, in drawing from such microscopic images the same conclusions in regard to the objects they picture as we should draw from the direct vision of actual objects having the same dimensions. The principal source of error in such interpretations arises out of the ‘interference ” to which the rays of light are subjected along the edges of the minute objects through which they pass, or along any such lines or margins in their inner part as are sufficiently opaque to throw a definite shadow. For every such shadow must be bordered, more or less obviously, by inter- ference- or diffraction-spectra; and thus the images of strongly-lined objects with very transparent intermediate spaces may be so troubled or confused by these “ diffraction- spectra” as to render it very doubtful what interpretation is to be put upon their appearances.

A good example of this kind is afforded by the scales of the gnat or mosquito, whieh are composed of a very delicate double membrane, strengthened by longitudinal ribs on both sides, those of the opposite sides uniting at the broad end of the scale, where they generally terminate as bristle-shaped appendages beyond the intermediate membrane. These are crossed by fine markings, which are probably ridge-like corrugations of the membrane, common to both sides of the scale. Between each pair of longitudinal ridges there may be seen, under certain adjustments of foens and illumi- nation, three uniform parallel rows of beads, whieh have been

supposed to represent a true strueture in the membrane. By Dr Woodward (colonel in the United States army), however, it has been shown that this beaded appearance is merely the result of the ‘‘inter- ferences” produced by the longitudinal and transverse lines of the scale. For the longitudinal diffraction-lines are clearly seen, alike in the microscopic image and in photographs (fig. 13), to extend into empty space beyond the contour of the scales, almost as far as the ends of the bristles in which the parallel ribs terminate; and they vary in number with the varying obliquity of illumination, so

that in the same scale two, three, four, or even five rows of beads ean be seen, and photographed at pleasure, in every intercostal

space.!

Every microscopist who has worked much with high powers is well aware of the difficulty of distinguishing between real and spectral mmarkings,—a difficulty which can only be overcome by training and experience. It seems,

1 Monthly Micros. Jour., vol. xv. (1876), p. 253. XVI. — 34

however, to have been now fully ascertained by Pro- fessor Abbe that it is only through such diffraction-spectra

that the microscope can make us acquainted with the

minutest structural features of objects, since, according to the calculations of Professor Helmholtz and himself

(based on the constants of the undulatory theory), no—

amount of magnifying power can separate dioptrically two lines, apertyires, or markings of any kind, not more than xsoo Of an inch apart. The visual differentiation or “resolution ” of lines or other markings whose distance lies

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lat, showing Beaded Markin from a Photograph by Colonel Dr

Woodward. within that limit is entirely the result of "'interference,"— | the objective receiving and transmitting, not only dioptric rays, but the inflected rays whose course has been altered in their passage through the object by the peculiar disposi- tion of its particles, and combining these rays into a series of diffraction-spectra, the number and relative position of which bear a relation to the structural arrangement on which their production depends. If the objective be per- fectly corrected, and all the diffraction-spectra lie within its field, these will be recombined by the eye-piece so as to form a secondary or " diffraction " image, lying in the same plane with the dioptric image, and coinciding with it, while filling up its outlines by supplying intermediate details. But where the markings (of whatever nature) are so closely approximated as to produce a wide dispersion of the inter- ference-spectra, only a part of them may fall within the range of the objective ; and the recombination of these by the eye-piece may produce a' diffraction-image differing more or less completely (perhaps even totally) from the real structure ; while, if they should lie entirely outside the field of the objective, no secondary or diffraction image will be produced. And thus, while the general form of such an object as a diatom-valve may be correctly given in a dioptric image, its surface may appear quite unmarked under an objective of small aperture, however great its magnifying power, though covered with regularly disposed markings when seen through an objective of wider aperture with perhaps only half the magnifying power.

It is obvious, however, that, while the dioptric image represents the actual object, the diffraction-image thus formed by the reunion of a portion of the interference pencils is only an optical expression of the result of their | partial recombination, which may represent something entirely different from the real structure. For it has been proved experimentally, by placing finely-ruled gratings in | the position of objects, and by limiting the apertures of objectives by diaphragms with variously disposed perfora- tions, that the same arrangement of lines shall be presented to the eye by differently lined surfaces, and different arrangements by similarly lined surfaces, according to the | numbers and relative positions of the reunited

spectra. Hence it is clear that there must be an essential difference in character and trustworthiness between the images dioptrically formed of the general outlines and larger details of microscopic objects and those representations of |

gs produced by Diffraction ;

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| their diffraction-spectra,! and that the confidence to be | placed in the latter class of representations will be greater in proportion to the completeness of the recombination of the separated interference-spectra, which, again, will be _ proportional (accurate correction of the aberrations being assumed) to the aperture of the objective.? | The combined ‘advance of scientific theory and of _ practical skill in the application of it have now brought up the compound achromatic microscope to an optical per-

| fection that renders it capable of actually doing almost

everything of which, in the present state of optical theory, it can be regarded as capable. The resolution of Nobert’s nineteenth band, having 112,595 lines ~ to an inch, which was long regarded as the crux of “=~ microscopists, is now found so easy as to leave little ~-4 room for doubt that, if a new test were obtainable g- having the minimum visibile of 118,000 lines to the inch, an oil-immersion objective would be found to resolve it. But the experience of the past makes it evident that, as no limit can be set to the advance of optical theory, results yet more remarkable may be still expected to arise, every such advance being turned to account by the practical skill which experience has — now enabled the best constructors of achromatic ob- Jectives to attain.3

The progressive improvements thus effected in the construction of microscopic objectives have been accompanied by other improve- ments, alike in the optical and in the mechanical arrangements by which the best performance of these objectives can be secured; and it will be desirable now to describe in succession the most approved forms of the eye-piece, the

objective, and the illuminating apparatus respectively, and then those of the instrument as a whole, point- ing out the special adaptiveness of each to the requirements of different classes of scientific investigators.

Eyer-Pirecrs.

It very early became obvious to those who were engaged in the achromatization of microscopic objectives that their best performance was obtained when the image given by them was further enlarged by the eye-piece known as the Huygenian, as having been devised by Huygens for his telescopes. ‘It consists of two plano-convex lenses (KE and FF, fig. 4), with their plane sides towards the eye ; these are placed at a distance equal to half the swn of their focal lengths,—or, to speak with more precision, at half the sum of the focal length of the eye-glass, and of the dis- tance from the field-glass at which an image of the object-glass would be formed by it. A ‘stop” or diaphragm BB must be placed between the two lenses, in the visual focus of the eye-glass, which is, of course, the position wherein the image of the object will be formed by the rays fips 2 into convergence by their passage throngh the field-glass. uygens devised this arrange- ment merely to diminish the spherical aberration ; but it was subse- quently shown by Boscovich that the chromatie dispersion was also in great part corrected by it. Since the introduction of achromatic object-glasses for compound microscopes, it has been further shown that nearly all error may be avoided by a slight over-correction of these, so that the blue and red rays may be caused to enter the eye ina parallel diréction (though not actually coincident), and thus to produce a colourless image. Thus let N, M, N (fig. 14) repre- sent the two extreme rays of three pencils, which without the field-glass would form a blue image convex to the eye-glass at BB, and a red one at RR; then, by the intervention of the field-glass,

_abhie image concave to the eye-glass is formed at B’B’, and a red

‘ Thus it is still a moot point whether the microscopic appear- ances seen in the siliceous valves of diatoms (figs. 8-11) are the optical representations of elevations, depressions, or perforations, or of internal molecular arrangements not involving any inequality of surface,

- This doctrine was first fully developed by Professor Abbe in the Archiv fiir Microsk. Anatomie, vol. ix. (1874), and is more fully ex- pounded in his subsequent contributions to Jour. Roy. Micros. Soc. See also the papers of Mr Stephenson and Mr Crisp in that journal, and in the preceding Monthly M: tcroscopical Journal.

3 Any good workman can now make by the dozen such small-angled 4 inch objectives as Mr A. Ross produeed with much pains and labour fifty years ago. It was not until 1844 that, with the honourable fessor Amici had then accomplished,

he produced a +p inch of 135°, which, by taking advantage of some

their finer details which are given by the recombination of

very heavy flint-glass he had, he afterwards increased to 170°,

MICROSCOPE

one at R’R’. As the focens of the eye-glass is shorter for blue rays than for red rays by just the difference in the place of these images, their rays, after refraction by it, enter the eye in a parallel direetion, and produee a picture free from false colour. If the object-glass had been rendered perfectly achromatie, the blue rays, after passing through the field-glass, would have been brought to a foeus at b, and the red at 7 ; so that an error would be produced, which would have been increased in- stead of being corrected by the eye-glass. Another advantage of a well-constructed Huy- genian eye-piece is that the image produeed by the meet- ing of the rays after passing through the field-glass is by it rendered concave towards the eye-glass instead of convex, so that every part of it may be in focus at the same time, and the field of view thereby rendered flat.? N

Two or more Huygenian eye- pieces, of different magnify- ing powers, known as A, B, C, &c., are usually supplied with a compound microscope. The utility of the higher powers will mainly depend upon the excellence of the objectives ; for, when an achromatie combination of small aperture which is sufficiently well corrected to perform very tolerably with a ‘“‘low” or ‘‘shallow” eye-piece is used with an eye-piece of higher magnifying

power (com- monly spoken of asa ‘‘ deeper” one), the image may lose more in brightness and in definition than is gained by its amplifieation, while the image given by an objective of large angular aperture and very perfect correction shall sustain so little loss of light or of definition by ‘‘deep eye-piecing” that the increase of magnifying power shall be almost clear gain. Hence the modes in which different objectives of the same power, whose performance .with shallow eye-pieceés is nearly the same, are respectively affected by deep eye-picces afford a good test of their respective merits, since any defeet in the correc- tions is sure to be brought out by the higher amplification of the image, while a deficiency of aperture is manifested by the want of light. The working microscopist will generally find the A eye-piece most suitable, B being occasionally employed when a greater power is required to separate details, whilst C and others still deeper are useful for the purpose of testing the goodness of objectives, or for special investigations requiring the highest, amplification with objectives of the finest quality. But he can commit no greater error than habitually to use deep eye-pieces for the purposes of scientific research, especially when (as in the study of living objects) long-continued and nnintermitted observation is necessary. For the visual strain thus occasioned is exactly like that resulting from the habitual use of magnifying spectacles in reading, requir-ing the book to be held within 2 or 3 inches of the eye. And all experienee shows that this feeling of strain eannot be dis- regarded, without the most injurions consequences to vision.

For viewing large flat objects, such as transverse sections of wood or of Hchinus spines, nnder low magnifying powers, the eye-piece known as Kellner’s may be employed with advantage. In this eonstruction the field-glass, which is a donble-convex lens, is placed in the focus of the eye-glass, without the interposition of a diaphragm ; and the eye-glass is an achromatic combination of a plano-concave of flint with a double-convex of crown, which is slightly under-corrected, so as to neutralize the over-correction given to the objectives for use with Huygenian eye-pieces. A flat well-illuminated field of as much as 14 inehes in diameter may thus be obtained with very little loss of light; but, on the other hand, there is a certain impairment of defining power, which renders the Kellner eye-piece unsuitable for objects presenting minute struetural details; and it is an additional objeetion that the smallest speck or smear upon the surface of the

field-glass is made so unpleasantly obvious that the most careful eleansing of that surface is required every time that this eye-pieee is used. Hence it is better fitted for the occasional display of objects of the eharaeter already specified than for the ordinary wants of the working microseopist.

Solid eye-pieces, consisting of cylinders of glass with convex ends, are sometimes used in place of the Huygenian, when high magni- fying power is required for testing the performanee of objectives. The lower surface, which has the lesser convexity, serves as a

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Fia. 14.—Seetion of Huygenian Eye- Pieee, adapted to Over-Correeted Mieroseopie Objeetives.

1 The reader may be referred to Mr Varley's investigation of the properties of the Huygenian eye-pieee in the fifty-first volume of the Transactions of the Society of Arts; and to-the article ''Microscope,"' by Mr Ross, in the Penny Cyclopedia, reprinted, with additions, in the English Cyclopedia.

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field-glass, while the image formed by this is magnified by the highly convex 'upper surface to which the eye is applied, —the advantage derivable from this construction lying in the abolition of the plane surfaces of the two lenses of the ordinary eye-piece.?

A "positive" or Ramsden's eye-piece—in which the field-glass, whose convex side is turned upwards, is placed so much nearer the eye-glass that the image formed by the objective lies below instead of above it—was formerly used for the purpose of mierometry,-—a divided glass being fitted in the exact plane occupied by the image, so that its-seale and that image are both magnified together by the lenses interposed between them and the eye. The same end, how- ever, may be so readily attained with the Huygenian eye-piece that no essential advantage is gained by the use of that of Ramsden, the field of which is distinct only in its centre.

OBJECTIVES.

It has been seen that one of the principal points in the con-

struction of microscopic objectives to which the attention of their makers has been constantly directed has been the enlargement of their ‘‘aperture,”’—this term being understood to mean, not their absolute opening as expressed by linear measure, but their eapacity for receiving and bringing to a remote eonjugate focns the rays diverging from the several points of a near object. The aper- ture of an objective has been usually estimated by its ‘‘angle of aperture, ’’—that is, by the degree of divergence of the most extreme rays proceeding from the axial point of the object to the margin of the objective (fig. 15) which take part in the formation of the image. It is pointed out, however, . by Professor Abbe that, in the ease of single lenses used as objectives, their apertures are really propor- tional, not to their respective angles of aperture, but to the ratio between the actual diameter or clear opening of each to its focal distanee, a ratio which is simply expressed by the sine of its semiangle. And in the case of eombinations of lenses it ean be demonstrated mathematically that their respective apertures are de- terminable—other conditions being the same—by the ratio of the dia- meters of their back lenses, so far as Fic. 15.—Seetion of Achromatic these are really ntilized, to their Object-Glass, eomposed of respective focal lengths,—this ratio three pairs of (flint and being expressed, as before, by the sine eTown) lenses. abe is its angle of the semiangle of aperture (sin w). of aperture. The difference between these two modes of comparison ean be readily made obvious by reference to the theoretical maximum of 180°, whieh is attained by opening out the boundaries of the angle abe (fig. 15) until they eome into the same straight line, the sine of the semiangle (90°) then becoming unity. For, while an objective having an angle of 60° would count by comparison of angles as having only one-third of the theoretical maximum, its real aperture would be half that maximnm since the sine of its semiangle (30°)=}. And, as the sines of angles beyond 60° increase very slowly, an objective of 120° angle will have as much as 87 per cent. of the theoretical maximum of apertnre, although its angle is only two-thirds, or 66°6 per cent., of 180°. It henee becomes obvious that little is really gained in real aperture by the opening-out of the angle of microscopic objectives to its greatest practicable limit

(whieh may be taken as 170°), while such extension—even if unattended with any loss either of definition or of colour-correction —necessarily involves a great reduction alike in the working dis- tance and in the,focal depth or penetration of the combination, as will be presently explained.

Numerical Aperture.—It has now been demonstrated by Professor Abbe that, independently of the advantages already specified as derivable from the application of the immersion system to objectives of short focus and wide aperture, the real aperture: of an immer- sion objective is considerably.greater than that of a dry or air objective of the same angle,—the comparative apertures of objec- tives working through different media being in the compound ratio of two faetors, viz., the sines of their respective semiangles of aperture and the refractive indices of the ‘‘immersion” fluids. It is the produet of these (nsinw) that gives what is termed by Professor Abbe the ‘‘numerical aperture,’’—which serves, therefore, as the only true standard of comparison, not only between dry or air and water or oil immersion lenses, but also between immersion lenses adapted to work respectively with water, oil, or any other interposed fluid. That the angle of aperture expressed by the same number of degrees must correspond with very different work- ing apertures in dry, water immersion, and oil or homogeneons immersion objectives becomes evident when we consider what

2 These eye-pieces are much in vogue in the United States, where they are made of extremely short foci,—even to ,’, inch.

happens when divergent peucils of rays pass from one medium into another of higher refractive index. For such divergent pencils, proceeding from air into water or oil, will be closed together or eompressed ; so that the rays whieh, when au object is mounted in air, spread out over the whole hemisphere then form .comparatively narrow pencils, and ean thus be utilized by an immersion objective of smaller aperture than is required in a dry objective to admit the most diverging rays of air-pencils. It follows, therefore, that a given angle in a water or oil immersion objective represents a much larger aperture than does the same angle in an air-objective ; and thus it comes to pass that by opening out the angle of immersion objectives

they may be made to receive and utilize rays of much greater divergence than can possibly enter dry objectives of even maximum aperture.

The following table, abridged from that given by I rofessor Abbe for every 0°02 of numerical aperture from 0°50 up to the maximum of 1°52, brings this contrast into elear view :—

Numerical Aperture Table.

Theoretical |

| Angle of Aperture (=2u). or Resolving | Pene-

F —_ eee ae ee —— jtUMi-| a rin | trating Numerical Power, in

A pestigs | Dry Water- | Homogeneons- as. Lines to | Power

(nsinuw=a).| Objec- | Immersion| Immersion | (a2 anIneh | (*)

| | tives | Objectives | Objectives) | a=0-5269n; a)‘ (n=1). | (n=1°33). (n=1‘52), =line E).

° i’d oF , ‘4 1 aan 1°52 180 0 2°310 146,528 658 | 1°42 138 12 2°016 136,888 “T04 1°33 O L22 6: 1:770 128,212 ‘752 i268 4 ees 111 59 1-588 | 121,464 ‘794 1:18 oie 101 50 1°392 113,752 *847 2 siete 94 56 1:254 107,968 893 1°06 AGG 88 26 1°124 102,184 “943

1:00 180 0 82 17 1:000 96,400 1000

0°94 76 24 884 90,616 1064 0°86 68 54 ‘740 82,904 1:163 0°80 63 81 “640 77,120 1250

0-76 60 0 *578 73,264 1-316

0:70 54 50 “490 67,480 1-429 | 0°62 48 9 384 59,768 1:613 | 0°56 43 14 “314 53,984 1°786 | 0°50 38 4 1950) 48.200 | 2-000

Thus, taking as a standard of comparison a dry objective of the maximum theoretical angle of 180°, whose numerical aper- ture is the sine of 90°, or

1:00, we find this standard equalled by a water-immersion objective whose angle of aperture is no more than 973°, and by an oil or homogeneous immersion objective of only 82°,—the numerieal apertures of these, obtained by multi- plying the sines of their respective semiangles by the refractive index of water or of oil, being 1:00 in each ease. Each, there- fore, will have as great a power of reeeiving and utilizing divergent rays as any dry objective ean even theoretically possess.

But, as. the actual angle of either a water or an oil immersion objective can be opened out to the same extent as that of an air or dry objective, it follows that the aperture of the former ean be augmented far beyond even the theoretical maximum of the latter. Thus the numerical aperture of a water-immersion lens of the mlaximuin angle of 180° is 1°33, or one-third greater than that of an air-lens of the same angle; and this aperture would be given by an oil-immersion objective of only 122°. Again, the numerical aperture of an oil-immersion objective having the theo- retical maximum angle of 180° would be 1°52, or more than one- half greater than that of an air-lens of the same angle. And the numerical . apertures corresponding to angles of 170°, which have been actually attained in both eases, fall very little short of the proportions just given. a

So, again, an oil-immersion objective whose angle of aperture is only 60° has as high a numerical aperture (0°76) as a water- iminersion objective of 694°, oras a dry objective of 99°; and a dry objeetive of 140° has no greater a numerical aperture (0°94) than a water-immersion of 90° or an oil-immersion of 763°.

This important doetrine may be best made practically intelligible by a comparison of the relative diameters of the baek lenses of dry with those of water and oil immersion objectives of the. same power, from an ‘‘air-angle” of 60° to an ‘‘oil-angle” of 180°,—these diameters expressing, in each case, the opening between the extreme pencil-formiug rays at their issue from the posterior surface of the combination, to meet in its conjugate foeus for the formation of the image, the relation of which opening in each ease to the focal length of the combination is the real measure of its aperture (fig. 16). Thus the dry objective of 60° angle (5 in fig. 16) has its air-angle represented by sinw=4=0°50 numerical aperture. The dry objeetive of 97°

(4) has its air-angle represented by sinw= {=0°75 numerical aperture. And the dry objective having the’ (theoretical) angle of 180° (3) has its air-angle represented by sinw =1°00 numerical aperture,—this corresponding to 96° water- angle and 82° oil-angle. But the water-immersion lens having the (theoretical) angle of 180° (2) has its water-angle represented by nsinu=1°33 unmerical aperture. And the oil-immersion

SCOPE

lens having the (theoretical) angle of 180° (1) has its oil-angle represented by mnsinw=1°52 ‘numerieal aperture.”! These theoretical apertures for water and oil immersiou lenses having becn found as nearly attainable in practice as the theoretical maximum for dry objectives, such lenses ean utilize rays from objects mounted in balsam or other dense media, ; whieh are entirely lost for the image (since they do not exist physieally) when the same object is in air or is observed through a film of air. And this loss eannot be compensated by an increase of illumination; because the rays which are lost are different rays physi- cally from those obtained by any illnmi- nation, however intense, through an aeriform medium.

It is by inereasing the number of diffrae- tion-spectra that the additional rays thus received by objeetives of great numerical aperture impart to them an increased resoly- ing power for lined and dotted objects, — the truth of the image formed by the reeom- bination of these spectra being (as already shown) essentially dependent on the number of them that the objective may be eapable of reeeiving. ,

But whilst the resolving power of micro- seopie objectives imereases in the ratio of their respective numerical apertures, and whilst their illuminating power (dependent npon the quantity of light that passes through them) increases with the square of the numerical aperture, the case is reversed with another most important quality, —that of penetration or focal depth; for this diminishes as the aimitioal aperture in- creases, until nothing but what is precisely in the focal plane ean be even diseerned with objectives possessed of the highest resolving power, Thus, the penetrating power of an Fic. 16.—Relative Dia- objective of 60° air-angle being expressed meters of Back Lenses as 2000, an extension of that angle to 764° of Air, Water, and reduces it to 1°613, an extension to 89° Oil Immersion Objec- reduees it to

1‘429, and an extension to 99° tives. reduees it to 1°316; further extension to 118° reduces it to 1‘163, while an objective whose air-augle is 140° has a penetrating power of only 1:064. So, again, the oil-immersion objective which has the numerical aperture of 1:00 corresponding to the theoretical air- angle of 180° has a penetrating power of 1°000; this is brought down to 752 when its angle is so increased as to make its numerical aperture 1°33, equalling the theoretical maximum of a water- immersion objective, and is ‘658 at the theoretical maximum (1°52) of an oil-objeetive.

Heuee it is clear that, as some of the qualities to be sought in microscopie objectives are absolutely incompatible, a preference is to be aceorded to objectives of greatest resolving power but very little penetration, or to those of moderate resolving power and great eee aeeording to the uses to whieh they are to be applied; and some general principles will now be laid down in regard to this matter, based alike on science and experience,

In the first place, a marked distinction is to be drawn between those objectives of low or moderate power which are to be worked dioptrically and those of high power which are to be worked dif- fractively. The objects on which the former are to be for the most part used are either minute transparent bodies having solid forms which the observer should be able to take in as wholes (as in the ease of Polycystina, the larger diatoms, Infusoria, &e.); or trans- pareit seetious, dissections, or injections, whose parts lie in different planes, the general relations of which he desires to study, while reserving their details for more special serutiny ; or opaque objeets, whose strueture can only be apprehended from the examination of their surfaces, when ~~the inequalities of those sur~~ faces are seen in their relations to each other. In all these eases it is desirable that microscopic vision should resemble ordinary Vision as much as possible. If the eye were so constructed as to enable us to discern only those parts of an objeet that lie pre- eisely in the plane to which we focus it, our visual eoneeptions of the forms and relations of these parts, and eonsequently of the object as a whole, would in general be very inadequate, and often erroneous. It is because, while focussing our eye successively on the several planes of the object, we ean see the relation of each to what is nearer and more remote that we can readily aequire a visual econeeption of its shape as a whole, and that unmistakable pereeption of solid form which is given by the

combination of the two dissimilar perspectives of near objects in binocular vision

1 The dotted circles in the interior of 1 and 2, of the same diameter as 3, show the excess in the dinmeters of the back lenses of the water and vil objectives over that of the dry at their respective theoretical limits.

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(p. 278) could not possibly be formed if onr vision were strictly limited to the exact plane for which our eyes are focussed. Hence it is obvious that, in the case of objectives of low and

for the want of which no other excellence can compensate, — the opening-out of their apertures being only advantageons in so far as it does not seriously interfere with their penetrating power. It is, no donbt, quite possible to construct a 1 inch

objective with an aperture so large that, when the requisite ampli- |

fieation has been gained by deep eye-piccing, it shall resolve – the lined “tests” ordinarily nsed for a 4, or to construct an

objective of y ineh focus which shall in like manner do the | But, as such objectives are thereby spoiled |

ordinary work of a }. for their own proper work, the loss to the microscopist is but poorly compensated by his ability to resolve with them, under snch deep eye-pieces as cannot be habitually used without serions risk to the eye-sight, the lined and dotted tests which can be mnch better shown under objectives of shorter focus and wider aperture, with eye- pieces of low amplification. For, whilst deep eye-picces cannot he habitually employed for continuons obscrvation, without putting a strain upou the eyes resembling that which resnlts from the constant use of a magnifying glass, even the very highest objectives may be used continnonsly for long periods in combination with shallow eye-pieces, with scarcely any fatigne, and therefore (it is probable) without sensible injury.’

In estimating the goodness of a microscopic objective, five distinct qualities have to be separately considcred:—(1) its work- ing distance, or the actnal interval between its front lens and the objeet on which it is focussed; (2) its penetrating power, or focal depth; (8) the flatness of its field; (4) its definition, or power of giving a distinct image of all well-marked features of an object, and especially of their boundary lines; and (5) its resolving power, by which it separates closely approximated lines, dots, or striz.

1. The ‘‘ working distance” of an objective has no fixed relation to its focal length,—the latter being estimated by its equality in power with a single lens of given radius of curvature (such as 1 inch, + inch, 7 inch, &c.), while the former varies with the mode in whieh the combination is constructed and with the aperture given to it. For low and moderate powers, ranging up to ys inch focus, good working distance is especially important, alike because it is closely related to penetrating power, and also because it facilitates the use of side-illumination for opaqne objects. And in sueh objectives of high power as are to be used, not for the resolution of lined or dotted tests, but for the observation of living and moving objects of extreme minuteness, good working distance is no less important, on account of its relation to focal depth. In the case of those objectives, on the other hand, in which resolving power is made the first consideration, it is only needful that the working distance shall be such as to permit the interposition of a thin glass cover; and this, although necessarily diminished with the widening of the aperture, can be always obtained by the adoption of the immersion system.

2. The ‘penetrating power” or “focal depth” of an objective may be defined as consisting in the vertical range throngh which the parts of an object not precisely in the focal plane may be seen with sufficient distinctness to enable their relations with what lies exactly in that plane to be elearly traccd out, —just as would be done by ordinary vision if the object were itself enlarged to the dimen- sions of its microscopic image. The close relation between this quality and the preceding becomes obvious when it is considered that the longer the working distance of an objective the less will the distinctness of the image it forms be affected by any given alteration (say the zy}5q of an inch) in its focal adjustment. Con- sequently, of two objectives having the same magnifying power but different working

distances, that one will have the most focal depth whose working distance is the greater. On the other hand, as the penetrating. power of an objective is redueed in direct accordance with the increase of its numerical aperture, it mnst be sacrificed wherever the highest resolving power is to be attained. Hence, as already remarked, this attribute will be very differently valued by different observers, according to the work on which they are respectively engaged. For the general purposes of biological research, not only with low or moderate (for the reasons already stated), but also with high powers, a considerable amount of focal depth is essential. It is impossible, for example, to follow satisfactorily the movements of an Ameba, or to study the ‘‘eyelosis” in the cell of a Vallisneria, or to trace the distribution of a nerve-thread, with an objective in whieh focal depth is so completely sacrificed to aperture that nothing can be discerned save what is precisely in the focal plane, since, instead of passing gradationally from one focal plane to another, as the observer can do with an objective of good penetration, he ean only get a sucees- sion of ‘‘dissolving views,” with an interval of ‘‘chaos” between

1 Henee, for work of this kind, the shallower eye-picees and longer tubes of English mieroscopes are to be preferred to the deeper eye-picees and shorter tubes of the ordinary Continental model, the shallowes! eye-picces of the latter being usually equal in power to the ordinary b cye-pieces of the former.

each pair. When, on the other hand, it is desired to scrutinize with the greatest precision snch minute details as are presented in one

| and the same focal plane (as, for example, those of the thinne: moderate amplification, focal depth or penetration is a qnality : ‘ ae eee

possible film of tissue spread out between a glass slide and its cover- ing glass), the microscopist will prefer an objective in which focal depth is subordinated to aperture, for the sake of the resolving power which he can thns command. And it will often happen in biological research that it is advantageous thus to bring objcctives of the latter class to bear upon objects which conld not have becn detected in the first instance save by objectives of mueh inferior resolving power but greater focal depth.

3. The ‘‘flatness of the field” afforded by the objective is a condition of great importance to the advantageous use of the miero- scope, since the extent of the area clearly seen at one time practi- cally depends npon it. Many objectives are so constructed that, even when the object is perfectly flat, the foci of the central and peripheral parts of the field are so different that, when the adjust- ent is made for one, the other is more or less indistinct. Hence, when the central part of the area is in focus, no more information is gained respecting the periphcral than if the latter had been alto- gether stopped out. With a really good objective, not only shonld the image be distinct over the whole ficld at once, but the marginal portion should be as free from colour as the eentral. As imperfec- tion in this respect is often masked by the contraction of the aperture of the diaphragm in the eye-picee, the relative merits of two objectives, as regards flatness of field, should always be tested under an eye-piece giving a large aperture.

4, The ‘defining power” of an objective, which depends upon the completeness of its corrections for spherical and for chromatie aberration, and upon the accurate centring of its component lenses, is an attribute essential to its satisfactory performance, whatever may. be its other qualities,—its importance in scientific research being such that no superiority in resolving power ean compensate for the want of it; and,

thongh it is possible to obtain perfect correction for spherical aberration up to the highest practicable limit of angle, yet the difficulty of securing it increases rapidly with the augmentation of aperture, the want of it being made perceptible, especially when deep eye-pieces are put on, by the blurring of clearly-marked lines or edges, and by general ‘‘fog.” Perfect colonr-correction, on the other hand, is not possible for dry lenses of the widest angle, on aeconnt of the irrationality of the secondary spectrum ; but this may be neutralized by the use of the immersion system, As already stated, what has to be aimed at in the construction of microscopic objectives is not absolute colour-correction, but a slight degree of over-correction, which, by compensating the chromatic dispersion of the Hnygenian eye-piece, shall produce an image free from false colour. As this can be secured far more easily in the construction of objectives of moderate than in those of very wide aperture, the cost of the former is proportionally smiall,—an additional reason for the preference to be given to them on other grounds, in regard to all save very special kinds of microseopic work.

5. ‘Resolving power,” being that by which very minnte and closely approximated markings—whether lines, strie, dots, or apertures—can be separately discerned, is a fumetion which is only of primary importance in objectives whose amplifying power specially fits them for the stndy of objects of this class. It appears from the mathematical researches of Professor Abbe that the maximum resolving power (with a theoretical angle of 180°) would be capable of separating 146,528 lines to the inch ; but he considers the limit of visual resolution depending on the power of the eye to be about yrvstz of au inch; and this limit secms to have been nearly reached. To make such a separation distinctly perceptible, an amplification of at least 3000 linear would be requisite ; and this can only be obtained either by the use of an objective of very high power (such as 3’s inch focus) in combination with a low or medinm eye-piece or by putting a very deep eye-piece npon an objective of lower power (snch asa 4 ineh),—the former method, for the reasons already given, being decidedly preferable. For the resolution of less closely approximated markings objectives of sy, ao, iz, and A inch answer very well; and the resolving power which they reqnire may be obtained without any excessive widening of the aperture. For the loss of resolving power consequent upon the contraction of the angle of a watcr-immersion objective to 128}° is only one-tenth of the theoretical

maximmm 128,212 ; while a redue- tion to 1052° only lowers the number of separable lines to 102,184 to the inch,—thus diminishing the resolving power by little more than one-fifth, while the working distance and focal depth of the combination are greatly increascd, and perfect definition is more certainly attainable. The 4 inch is (aceording to the writers experience, which is confirmed by the theoretical deductions of Professor Abbe) the lowest objective in whieh resolving power should be made the primary qnalification,—the 3, %, a and 3%5 inch being specially suited to kinds of biological work in which this is far less important than focal depth and dioptric precision. This view is strengthened by the very important cousideration that the resolving power given by wide aperture cannot be utilized, except by a method of illumination that causes light to pass through

270 WL he Q the object at an obliquity corresponding to that at which the most divergent rays enter the objective. Now, although in the case of objects whose markings are only superficial such obliquity may not be productive of false appearances (though even this is scarecly con- ceivable), it must have that effeet when the object is thick enough to have an internal structure ; and the experience of all biological observers who have carried ont the most delicate and difhieult investigations is in accord, not only as to the advantage of direct illumination, but as to the deceptiveness of the appearances given by oblique, and the consequent danger of error in any inferences dyvawn from the latter. Thus, for example, the admirable researches of Strassburger, Fleming, Klein, and others npon the changes pinch take place mm cell-nuclei during their subdivision can only be followed and verified (as the writer can personally testify) by examination of these objects under axial illumination, with objec- tives of an angle so moderate as to possess focal depth enough to follow the wonderful differentiation of component parts brought out by staining processes through their whole thickness, — The most perfect objectives for the ordinary purposes of scientific research, therefore, will be obvionsly those which combine exact definition and flatness of field with the widest aperture that can be given without an inconvenient reduction of working distance and loss of the degree of focal depth suitable to the work on which they are respectively to beemployed. ‘These last attributes are especially needed in the study of living and moving objects ; and, in the case of these,

dry objectives are decidedly preferable to immersion, since the shitting of the slide which is reynisite to enable the moye- ment of the ohject to he followed is very apt to produce disarrange- nent of the interposed drop. And, owing to the solvent power which the essential oils employed for homogeneous Immersion have for the ordinary eements and varnishes, such care is necessary in the use of objectives constrneted to work with them as can ouly be given when the observer desires to make a very minnte and critical examination of a securely-mounted object. _ The following table expresses the magnifying powers of objectives constructed on the English scale of inches and parts of an inch, with the 10 inch body and the A and B eye-pieces usually supplied by English makers, and also specifies the angle of aperture which, in the writer's judgment, is most suitable for cach. He has the satistac- tion of finding that his opinions on this latter point, which are based on long experience in the microscopic study of a wider range of animal and vegetable objects than has fallen within the purview of most of his contemporaries, are in aceordance with the conclu- sions drawn by Professor Abbe from his profound investigations into the theory of microscopic vision,! which have been carried into practical accomplishment in the excellent productions of Mr Zeiss,

Magnifying | Magnifying | > u . ‘ ¥oeal Angular Power. __ || Foeal Angular | _ _ Power. ut Length. | Aperture. A Eye-| B Eye- Length. | Aperture. A Eye- | B Eye- picee. | picee. | piece. | picee. peas area | a: ae aes + inches 9 12 18 Linch. | 50-80 | 200 | 300 fe 1 | 1s 27 a; 95 250 | 875 24 I i 2a S0 Ui car 110 300 450 like 4 20 | 36 Ba Gee 5, 140 400 | 600 L oA 30 50 vi) {| py ” 150 500 | 750 © gs 40 75 112 | * , 160 600 | 900 a Gh 45 100 150 | sy 170 800 1200 els ” 70 125 187 | |

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For ordinary biological work, the 3, 5, and 34 objectives, with angles of from 100° to 120°, will be found to answer extremely well if constructed on the water-immersion system.

Kach of these powers should be tested upon objects most snited to determine its capacity for the particular kind of work on which it is to be employed ; and, in such testing, the application of deeper eye- pieces than can be habitually employed with advantage will often serve to bring ont

marked differences between two objectives which seem to work almost eqnally well under those ordinarily used, — defects in definition or colour-eorrection, and want of light, which might otherwise have escaped notice, being thus made apparent. No single object is of such general utility for these purposes as a large well-marked Podura scale ; for the eye which has been trained to the use of a particular specimen of it will soon learn to recognize by its means the qualities of any objective between 1 inch and 3 inch focus ; and it may be safely asserted that the objective which most clearly and sharply exhibits its characteristic markings is the best for the ordinary work of the histologist.

For the special attribute of resolving power, on the other hand, tests of an entirely different order are required ; and these are fur- nished, as already stated, either by the more ‘diffienlt ” diatoms, or by the highest numbers of Nobert’s ruled test-plate. The diatom-valve at present most in use as a test for resolving power is the Amphipleura pellucida, the lines on which were long supposed to be more closely approximated than those of Nobert’s

1 See his paper ou ‘‘ The Relation of Aperture and Power inthe

Microseope,” in Jour, Roy. Micros. Soc., 1882, pp. 300, 460.

nineteenth band, being affirmed by Mr Sollitt to range from 126 to 130 in zs of an inch. But the admirable photographs of this valve obtained by Colonel Dr Woodward haye confirmed the conelusion long previonsly expressed by the writer, that this esti- mate was far too high, being based on the ‘‘spurious lineation” produced by diffraction, aud show that the strie on the largest

| valves do not exceed 91, while those on the smallest are never more

numerous than 100, in zy455 of an inel. The saine admirable manipulator has also obtained excellent photographs of another very difficult test-diatom, Surirclla gemma, from which it appears that its transverse strize count longitudinally at the rate of 72,000 to the inch, whilst the beaded appearances into which these may be resolved eount transversely at the rate

of 84,000 to the inch. Thus it appears that the complete resolution of these “vexatious” diatoms does not require by any means the maximum of aperture, but is probably dependent at least as much on the perfection of the corrections and the effeetiveness of the illumination.

It must be understood that there is no intention in these remarks to undeivalue the efforts which have been perseveringly made by the ablest constructors of microscopic objectives in the direction of enlargement of aperture. For these efforts, hesides increasing the resolving power of the instrument, have done the great service of producing a vast improvement in the quality of those objectives of moderate apertwre which are most valuable to the scientific biolo- gist ; and the mieroscopist who wishes his armamentum to be com- plete will provide himself with objectives of those different qualities, as well as different powers, which shall best suit his particular reqnirements.?

ILLUMINATING APPARATCS.

Every improvement in the optical performance of the compound achromatic microscope has called forth a corresponding improve- ment in the illumination of the objects viewed by it, since it soon eaine to be apparent that without such improvement the full ad- vantage of the increased defining and resolving powers of the objectives could not be obtained. For the illumination of trans- parent objects examined by light transmitted through them under low powers of moderate angle a converging pencil of rays reflected upon their under surface by a concave mirror is generally snflicient, — a ‘‘condenser ” being only needed when the imperfect transparcucy of the object requires the transmission of more light through it. And the microscopist engaged in ordinary biological studies, who works on very transparent objects with objectives of 4 or 4 inch focus, or #5 inch immersion, will find that the small concave mirror of short focus with which the Continental niodels are fur- nished (sce fig. 28) will generally prove sufticient for his needs. This mirror is usually hnng at snch a distance beneath the stage that parallel rays falling on it are brought to a focus in the object as it lies on a slip of glass resting on the stage; and thus, when the instrument is used by day, the light of a bright clond (which is pre- ferable to any other) gives a well-illuminated field, even with the powers last-

mentioned. But when lamplight is used its divergent rays are not brought toa focus in the object by a mirror that is fixed as just stated ; and the distance of the mirror beneath the stage should be made capable of increase (which is easily done by attaching it to a lengthening bar), so as to obtain the requisite focal convergence. Still the best effects of objectives of less than # inch foes cannot be secured without the aid of an achromatic condenser, interposed between the mirror and the object, so as to bring a larger body of rays to a more exact convergence,

When objectives of still higher power are employed, the employ: ment of such a eondenser becomes indispensable ; and when thie highest powers are being used by lamplight, it is desirable to dis- pense with the mirror altogether, and to place the flame exactly in the optic axis of the microscope. The condenser should be an achromatic eombination, corrected for the ordinary thickness of the glass slip on which the object lies, and capable of being so adjnsted as to focus the illuminating pencil in the object.

As it is often found desirable that an object should be illuminated by central rays alone, or that the quantity of light transmitted through it should be reduced (for bringing into view delicate details of strmeture which are invisible when the object is flooded with light), every microscope shonld be provided with some means of cutting off the outer rays of the illuminating cone. The ‘‘dia- phragm-plate ” ordinarily used for this purpose is a disk of. black metal, pivoted to the under side of the stage, and perforated with a graduated series of apertures of different diameters, any one of which can be brought, by the rotation of the disk, exactly into the optie axis of the microseope. But the required effeet can be much more advantageously obtained by the “iris-diaphragm,” in which a humber of converging plates of metal are made so to slide over each other by the motion of a lever or screw that the aper- ture is either enlarged or diminished, while always remaining prac- tically circular as well as central; and in this manner a continuous

_? See the remarks of Mr Dallinger,—whos highest powers to the study of the minutest that of any living obseryer,—in Jour. Roy,

¢ experienee in the application of the living objeets is probably greater than Micros, Soc., Deceinber 1882, p. 843.

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view of the object is obtained, with a gradational modification of the light. Another method, commonly adopted in German microscopes, is to place a draw-tube in the optic axis between the stage and the mirror, and to drop into the top of this tube one of a set of ‘‘stops” perforated with apertures of different sizes; this allows a gra- dational effect to be obtained by raising or lowering the tube, so as to place the stop nearer to or more remote from the object ; but it is not nearly so convenient as the iris-diaphrdgm; and the effect of the stop is not nearly so good when it is removed to some dis- tance beneath the object as when it is very near to the under sur- face of the glass object-slide. When an achromatic condenser is used, either a diaphragm-plate or an iris-diaphragin should be placed below its back lens, so as to cut off any required proportion of the outer rays that form its illuminating cone.

Such an arrangement, while suiting all the ordinary requirements of the microscopist who uses the highest powers of his instrnment for the purposes of biological investigation (as, for example, in the study of Bacteria or of the reproduction of the Monadina), does not serve to bring into effective use the special resolving power pos- sessed by objectives of large aperture. It has long been known that for the discernment of very closely approximated markings oblique ilInmination is advantageous,—an objective which exhibits such a diatom-valve as Plewrosigma angulatum with a smooth un- marked surface when illuminated by the central rays of the achro- matic condenser making its characteristic markings (figs. 8-11) distinctly visible when the central rays of the condenser are kept back by a stop, and the object is illuminated by its convergent mar- ginal rays only. And it has also been practically known for some time that the resolution of lined or dotted tests can be often effected by mirror illumination alone, if the mirror be so mounted as to be able to reflect rays through the object at such obliquity to the optic-axis of the microscope as to reach the margin of a wide- angled objective. Bnt it has only been since Professor Abbe’s researches have given the true theory of ‘‘ resolution” that the special advantage of obliqne

illumination has been fully compre- hended, and that the best means have been devised for using it effectively. Two different systems have now come into use, each of which has its special advantages.

One consists in the attachment of the illuminating apparatus (mirror and achromatic condenser) to a ‘‘ swinging tail-piece ”’ (see fig. 32), which, moving radially upon a pivot whose axis intersects the optie axis at right angles in the plane of the object, can trans- mit the illnminating pencil through it at any degree of obliquity that the construction of the stage allows. The direction of this pencil being of course limited to one azimuth, it is reqnisite, in order to bring out its full resolving effect, that the object should be made to rotate, by making the stage that carries it revolve round the optic axis, so that the oblique pencil may impinge upon the lines or other markings of the object in every direction successively. It will then be found that the appearances presented by the sane object often vary considerably,—one set of lines being shown when the object lies in one azimuth, and another when its azimuth has been changed by rotation through 60°, 90°, Various contrivances have also been devised for throwing very oblique illuminating pencils on the object by means of prisms placed beneath the stage.

Illumination of at least equal obliquity to that afforded by the swinging tail-piece may now, however, be obtained by the use of condensers specially constructed to give a divergence of 170° to the rays which they transmit when nsed immersionally, by bringing their flat tops into approximation to the under side of the glass slide on which the object is mounted, with the interposition of a film of water or (preferably) of glycerin. By using a central stop, marginal rays alone may be allowed to pass; and these will be transmitted through the object in every azimuth at the same time. But diaphragms with apertures limiting the transmitted rays to one part of the periphery may be so fixed in a tube beneath the condenser as to be easily made to rotate, thus sending its oblique pencils through the object in every azimuth in succession. And where this rotation of the diaphragm brings out two sets of lines at a certain angular interval a diaphragm with two marginal openings at a corresponding angular distance will enable both to be seen at once, Numerous arrangements of this kind have been devised by those who devote their special attention to the reso- lution of difficult diatom-tests ;

but they are of little or no use to those who use the microscope for biological research.

For the illumination of the surfaces of opaque objects which must be seen by reflected light the means employed will vary with the focal length of the objeetive employed. For large bright objects viewed nnder a low magnifying power good ordinary daylight is sufficient ; but if the surface of the object is dull, reflecting but little light, the aid of a bull’s-eye or large bi-convex lens must be employed in order to give it sufficient brilliance. This aid will always be required by lamplight ; and by a proper adjustment of the relative distanees of the lamp and the object the rays from the lamp may be made either to spread themselves over a wide area or to converge upon a small spot. The former is the method suitable

or some other angle. |

to large objects viewed wider a low magnifying power ; the latter to the illumination of small objects which arc to be examined under objectives of (say) 1 inch or 2 ineh focus. “Another method which may be conveniently had recourse to when the microscope is pro- vided with a swinging tail-piece is to turn this on its pivot until the concave mirror is brought above the stage, so that rays which it gathers cither from natural or artificial sonrees may be reflected downwards upon the surface of the object.

The illumination of an opaque object to be seen witha higher power than the $ or 4 inch objectives was formerly provided for by a concave speculnm (termed a Lieberkiihn after its Inventor), with a perforation in the centre for the passage of the rays to the objec- tive to which it is fitted, —the enrvatnre of the speculum being so adapted to the focus of the objective which carries it that, when the latter is dnly adjusted, the rays : reflected upwards aronnd the object from the mirror to the speculum shall converge strongly on the ob- ject. The various disadvantages of this mode of illumination, however, have caused it to be now generally superseded by other arrangements. For powers between 14 inch and ix inch, and even for a 4 or 4 inch of small angle and good working distance, nothing is so convenient as the parabolic speculum or side- illuminator (¥, fig. 17)

invented by the late Richard Beck. This is attached to a spring-clip that slides HIME on the tubes of low-power objec- = tives, so that its distance from the ——) : object and the direction of its re- FSS flected pencil are readily adjusted ; Fic. 17.—Beck's Parabolic Side- and for nse with higher powers it Illuminator, with Crouch's may be either monnted on a separ Adapter. ate arm attached to some part of the stand of the microscope, or may be hung in the manner shown in fig. 17 from an '"adapter " A interposed between the objective and the body. By rotating the collar B and making use of the joints C, C, the lengthening rod D, and the ball and socket E, any position may be given to the. speculum F that may best suit the objective with which it is used.

When, however, it is desired to illuminate objects to be seen under objectives of* high power and very short working distance, side illumination of any kind becomes difficult, though not absolutely impossible ;! and various modes have been devised for the illumina- tion of the object by means of light sent down upon it, through the objective, from above.. This is done in the vertical illuminator of Messrs Beck (fig. 18)—the original idea of which was first Cc

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Fic. 18. —Beck's Vertical Hluminator.

given by the American Professor H. L. Smith—by a disk of thin glass B, b, attached to a milled head by which its angnlar position may be adjusted, and introduced by a slot A, é into the interior of an adapter that is interposed between the objective C, ¢ and the nose ¢ of the body. The light which enters at the lateral aperture A, a, falling upon the oblique surface of the disk C, 0, is reflected downwards, and is concentrated by the lenses of the objective upon the object beneath. The lateral aperture may be provided with a diaphragm, with openings of different sizes, for diminishing the false light to which this method is liable ; or a sereen with a small aperture may be placed between the lamp and the

1 Sce a method devised by Mr James Smith, in Jour. Roy. Micros, Soc., vol. iii, N.S., 1880, p. 398.

illuminator, at any distance that is found to produce the best effects. In using this illuminator, the lamp should be placed at a distance of about 8 inches from the aperture; and, when the proper adjust- ments have been made, the image of the flame should be seen upon the object. The illumination of the entire field, or the direction of the light more or less to either side of it, can easily be managed by the interposition of a small condensing lens placed at about the dis- tance of its own focus from the lamp. The objects viewed by this mode of illumination with dry-front objectives are best uncovered, since, if they are covered with thin glass, so large a proportion of the light sent down upon them is reflected from the cover (especially when objectives of large angle of aperture are employed) that very little is seen of the objects beneath, unless their reflective power is very high. With immersion objectives, however, covered objects may be used. Another method of vertical illumination long since

this effect.

devised by Mr Tolles has recently been brought into notice by Professor W. A. Rogers of Boston (U. S.). It consists in the in- troduction of a small rectangular prism at a short distance behind the front combination of the objective, so that parallel rays enter- ing its vertical surface pass on between its parallel horizontal sur- faces until they mect the inclined surface, by which they are reflected downwards. In passing through the front combination of the objective, they are deflected towards its axis; but, as their angle of convergence is less than the angle of divergence of the rays proceeding from the object, the reflected rays will not meet in the focal point of the lens, but will be so distributed as to illuminate a sufficient area. By altering the extent to which the prism is | pushed in, or by lifting or depressing its outer end by means of a | milled-head screw, the field of illumination can be regulated. The working of this prism with immersion-objectives is stated by Mr Tolles to be peculiarly satisfactory.

Black-Ground Illumination.—There are certain classes of objects which, though sufficiently transparent to be seen with light trans- mitted through them, are best viewed when illuminated by rays of such obliquity as not to pass directly into the objective,—such a proportion of these rays being

retained by the object as to render it self-Iuminons, when, all direct light being cut off, the general field is perfectly dark. This method is particularly effective in the case of such delicate mineral structures as the siliceous tests of Poly- cystina and the ‘‘frustules” of Diatomacew. And it is one ad- vantage: of this kind of illumination that it brings out with considerable effect the solid forms of objects suited to it, even when they are viewed monocularly. Two modes of providing this illumination are in use, each of which has its special advantages. One consists in placing a central stop either upon or immediately beneath a condenser of wide aperture, which shall cut off all rays save those that, after passing through the object (as in fig. 20), diverge at an angle greater than that of the objective used; so that, while the ground is darkened, the object is seen, brightly standing out upon it. But if the divergence of the rays is but moderate (say 60°), and the angle of the objective is large (say 90°), the most divergent rays of the condenser will enter the mar- ginal portion of the objective, and, the field not being darkened, the black-ground effect will not be produced. This method has the great convenience of allowing black-ground illumination to be substituted for the ordinary illumination under different powers, without any other change in the apparatus than the turning of a diaphragm-plate fitted with stops of different sizes suitable to the several apertures of the objectives; and the modern achro- matic condensers of wide aperture can be thus used with objectives of 120° angle.

An excellent black-ground illumination is also given by the para- bolic illuminator (fig. 19), originally worked out as a silvered speculum by Mr Wenham, but now made as a paraboloid of glass that reflects to its focns the rays which fall upon its internal surface. A diagrammatic section of this instrument, showing the course of the rays through it, is given in fig. 20, the shaded portion repre- senting the paraboloid. The parallel rays r, 7’, 7”, entering its lower surface perpendicularly, pass on until they meet its parabolic surface, on which they fall at such an angle as to be totally reflected by it, and are all directed towards its focus F. The top of the paraboloid being ground out into a spherical curve of which F is the centre, the rays in emerging from it undergo no refraction, since each falls perpendicularly upon the part of the surface through which it passes. A stop placed at S prevents any of the rays reflected upwards by the mirror from passing to the object, which, being placed at F, is illuminated by the rays

reflected into it from all sides of the paraboloid. Those rays which pass through it diverge again at various angles ; and if the least of these, GFH, be greater than the angle of aperture of the object-glass, none of them can enter it. The stop is attached to a stem of wire, which passes vertically through the paraboloid and terminates in a knob beneath, as shown in fig. 19; and by means of this it may be pushed upwards, so as to cut off the less divergent rays in their passage towards the object, thus giving a black-ground illumination with objectives of an angle of aperture much wider than GFH. In using the paraboloid for delicate objects, the rays which are made to enter

SCOPE

it should be parallel; consequently the plane mirror should always be employed ; and when, instead of the parallel rays of daylight, we are obliged to use the diverging rays of a lamp, these should be rendered as parallel as possible, previously to their reflexion from the mirror, by the g : Be I TTT interposition of the ‘‘bull’s-eye” so ad- justed as to produce There are many cases, however,

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Fics. 19, 20.—Wenhamn’s Parabolie Iluminator.

in which the stronger light of the concave mirror is preferable. When it is desired that the light should fall on the object from one side only, the circular opening at the bottom of the wide tube that carries the paraboloid may be fitted with a diaphragm adapted to cover all but a certain portion of it; and, by giving rotation to this diaphragm, rays of great obliquity may be made to fall upon the object from every azimuth in succession.

In order to adapt this paraboloid to objectives of very wide angle of aperture, a special modification of it, originally devised by Mr Wenham, has been latterly reintroduced under the designation of ‘¢immersion-paraboloid,” with most excellent effect. This consists in making the top of the paraboloid flat instead of concave, and in interposing a film of glycerin between its surface and the under surface of the glass slide carrying the object. Only rays of such extreme obliquity are allowed to pass into the slide as would be totally reflected from its under surface if they fell upon it through air; and, as these illuminate the object without passing into the objective, it can be thus examined under even the highest powers,

BrnocuLtAR MICROSCOPES. .

Stercoscopic Binoculars. —The admirable invention of the stcreo- scope by Professor Wheatstone has led to a general apprecia~ tion of the value of the conjoint use of both eyes, in conveying to the mind a conception of the solid forms of objects such as the use of either eye singly does not generate with the like certainty or effectiveness (see STEREOSCOPE). This conception is the product of the mental combination of the dissimilar perspective projections which our right and left retin receive of any object that is suffi- ciently near the eyes for the formation of two images that are sen- sibly dissimilar. Now it is obvious that a similar difference must exist between the two perspective projections of any object in relief that are formed by the right and left halves of a microscopic ob- jective and that this diflerence must increase with the angular aperture of the objective. And the fact of this difference may be easily made apparent experimentally, by adapting a semicircular ‘“stop” to any objective of from 20° to 30° angle in such a manner that it can be turned so as to cover either its right or its left half ; for not only will the two images of any projecting object formed by the rays transmitted through the two uncovered halves be found sensibly different, but, if they be photographed or accurately drawn the ‘‘ pairing” of their pictures in the stereoscope will bring out the form of the object in vivid relief. What is needed, therefore, to give the true stereoscopic effect to a binocular microscope is a means of so bisecting the cone of rays transmitted by the objective that its two lateral halves shall be transmitted the one to the right and the other to the left eye, and that the two images shall be crossed (the image formed by the right half of the objective being

sent to the left eye, and that formed by the left half of the objective being sent to the right eye) in order to neutralize the reversing effect of the microscope itself. If this crossing does not take place, the effect . will be rendered ‘‘ psendoscopic,” not ‘‘orthoscopic,’—its projec- tions becoming depressions, and its depressions being brought out as prominences. It was from a want of due appreciation of this fact that the earlier attempts at constructing a stereoscopic binocular gave representatious of objects placed under it, not in their true orthoscopic, but in their pseudoscopic aspect. This was the case, for example, with the binocular microscope first devised by

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Professor Riddell of New Orleans in 1851, which separated the cone | to devisea construction by which it might be obtained without the

of rays by a pair of rectangular prisms so placed edge to edge above the objective that the rays passing through its right half were reflected horizontally to the right side, to be changed to the vertical

drawbacks inevitable in the working of Riddell’s and Nachet’s instru-

| ménts; and he soon succeeded in accomplishing this on a plan whieh

direction and sent to the right eye by a lateral rectangular prism, |

while the rays from the left half of the objective were sent to the left eye in a similar manner. Professor Riddcll describes the “‘conversion of relief” produced by this arrangement with the ordinary eye-piece as making a metal spherule appear ‘‘as a glass ball silvered on the under side, and :

a crystal of galena like an empty box.” And to render the images ‘normal and natural” he found himself obliged to use erecting eye- pieces, which should produce a second reversal of the images that had been reversed in their first formation.} Subsequently, however, Professor Riddell devised and perfected another arrangement giving a true orthoscopic effect, which, after being long disre- garded, has been latterly taken up and brought into

use by Mr Stephen- son. The cone of rays passing up- wards from the objective mects a ~~pair of prisms (A, A fig. 21) fixed immediately above its back lens, which divides it into two halves ; each of these is subjected to internal reflexion from the inner side of the prism through which it passes; and the slight separation of the two prisms at their upper end gives to the two pencils B,B, on their emergence from the upper surfaces of the prisms, a divergence which directs them through two obliquely~~ placed bodies to their respective eye-pieccs. By this internal reflexion a lateral reversal is produced, which neutralizes that of

Fie, 21,-—Riddell's Binocular Prisms.

the ordinary microscopic image, so that, while cach eye receives |

the image formed by its own half of the objective, the pairing of the two pictures produces a true orthoscopic efiect.?

About the sane date MM. Nachet of Paris succeeded in devising a binocular that should give a true orthoscopic image, by placing above the object-glass an equiangular prism (P. fig. 22) with one of its sur- faces parallel to its back lens, which, receiving the pencils ab forming the right half of the cone, internally reflects them obliquely upwards to the left, and in like manner reflects the pencils a'b' from the left half of the cone obliquely upwards to the right. These pencils, pass- ing out of the left and right oblique faces of the prism at right angles (so as not to undergo either refraction or dispersion), enter right and left lateral prisms, also at right angles, and, after being internally reflected by these, ae out vertically, at right angles to.their upper sur- faces, through two parallel bodies (fig. 23), whose eye-pieces bring them to a focus in the right and left eyes respectively. The distance between these bodies may be adjusted to the varying distances between the axes of individual pairs of eyes, by adjust- ing screws at their base, which vary the distance of the latera} prisms from the central. This instrument gives a theoretically perfect representation of a microscopic object in relief, as it would appear if enlarged to the size of its image, and brought to within about 10 inches of the eye; and its chief practical defect is that, as the two bodics are parallel, instead of being slightly converg- ent, it cannot be continuously used without an uncomfortable strain. But, as its performance depends upon the accuracy of the seven plane surfaces of the three prisms,

and on the correctness of their relations to each other, it is liable to considerable error from imperfections in its construction ; and, as the instrument can only be used for its own special purpose, the observer must be provided with an ordinary single-bodied microscope for the examination of objects unsuited to the powers of the binocular. This last objection applies also to Professor Riddell's model.

It was for these reasons that Mr Wenham, fully impressed with the advantages of stereoscopic vision to the microscopist, set himself

Fic. 22.—Nachet's Binocular Prisms.

1 See Silliman's Journal, vol. xv., 1853, p. 68; and Quart. Jour. of Micros. Sci., vol. i., 1853, p. 236. 2 Quart. Jour, of Micros. Sci., vol. ii,, 1854, p. 18,

| (a, fig. 24) is intercepted by

| two bodies (which, by varying _ the angles of the prism, may be made greater or less, so as

has proved not only convenient but practically satisfactory, notwith- standing its Fessrasica! im- : San te perfection. Only the right half of the cone of rays pro- ceeding upwards from the right half of the objective

a prism placed immediately over that half of its back lens, which, by two internal re- flexions (as shown in fig. 25), sends its pencils obliquely upwards into the left-hand or secondary body L, whilst the peucils of the left half-cone pass uninterruptedly into the right-hand body R, and form an image that suffers no other deterioration than that which results from the halving of the angular aperture and the con- sequent loss of light. The moderate convergence of the

to accord with the ordinary ; convergence of the optic axes in the individual observer) is much more generally suitable than the parallelism of MM. Nachet's earlier instrument; and the adjustment 'requisite for variation of distance between the eyes can be made by simply lengthening or shortening the bodies by drawing out or pushing in the diverging eye-pieces.

It may be fairly objected to Mr Wenham's method (1) that, as the rays which pass through the prism and are obliquely reflected into the secondary body traverse a longer distance than those which pass on uninter- ruptedly into the een body, the image formed by them will be somewhat larger than that which is formed by the other set, and (2) that the image formed by the rays which have been subjected to the action of the prism nust be inferior in distinctness to that formed by the uninterrupted half of the cone of rays. But these objections are found to have no practical weight. For it is well known to those who have experimented upon the phe- nomena of stereoscopic vision (1) that a slight difference in the size of the two pictures is no bar to their perfect combination, and (2) that, if one of the pictures be good, the full effect of relief is given to the image, even though the other picture be faint and imperfect, pro- vided that the outlines of the latter are suffi- ciently distinct to represent its perspective projection. Hence if, instead of the two equally half-good pictures which are obtain- able by MM. Nachet's original construction, we had in Mr Wenham's one good and one Fic. 24.— Wenham's indifferent picture, the latter would be de- Stereoscopic Bin- cidedly preferable. But, in point of fact, the ocular Microscope. deterioration of the second picture in Mr Wenham's arrangement is less considerable than that of both pictures in the original arrangement of MM. Nachet; so that the optical performance of the Wenham binocular is in every way superior. It has, in addi- tion, these further advantages over the preceding :—first, the greater comfort in using it (especially for some length of time together) which results from the convergence of the axes of the eyes at their usual angle for moderately near objects ; second, that this binocular arrangement does not necessitate a special instrument, but may be applied to any microscope which is capable of carry- ing the weight of the secondary body,—the prism being so fixed in a movable frame that it may in a moment be taken out of the tube or replaced therein, so that when it has been removed the principal body acts in every respect as an ordinary microscope, the entire cone of rays passing uninterruptedly into It ; and, third, that the simplicity of its construction renders its derangement almost impossible. Hence it is the one most enerally preferred by microscopists who use the long-bodied English model.

For short-bodied Continental microscopes, however, MM.

Fic. 23.—Nachet’s Binocular Microscope.

have devised an arrangement of two prisms, based on Mr Wenham’s fundamental idea of deflecting one half of the cone of rays into a secondary body, whilst the other half proceeds onwards without ehange of direction into the principal body. And it is an interest-

ing feature in this construction that, by a simple change in the

position of the dividing prism, the true ‘‘ orthoscopic” image may be made, by a ‘conversion of relief,” to become ‘‘ pseudoscopic. The effect of stereoscopic projection may be attained, however,

without a double body, by the insertion of a snitably constructed |

binocular eye-piece into the body of any ordinary monocular. micro- scope. A plan of this kind was first successfully worked out by Mr Tolles (the very able optician of Boston, United States), who interposed a system of prisms similar to that devised by MM. Nachet (fig. 22), but on a much larger scale, between an ‘‘erector” (resembling that used in the eye- piece of a day telescope) and a pair of ordinary Huygenian eye-pieces, the ecntral or dividing prism being placed at or near the plane of the sceondary image formed by the erector, while the two eye- pieces are placed immediately above the lateral prisms,—the ; ; combination thus making that division in the pencils forming the secondary (erected) image which it makes in the Nachet binocular in the pencils emerging from the objective. ;

A stereoscopie eye-piece of a very different construction has been recently devised by Professor Abbe, who, making use, for the division between the two eye-pieces of the rays going to form the first image, of an arrangement of prisms essentially similar to that devised by Mr Wenham for his non-stereoscopic binocular (fig. 27), obtains cither an orthoscopic or a

pseudoscopic effect by placing on each eye-piece a cap with a semicircular diaphragm, so as to extinguish half of each of the cones of rays that form the two retinal images. While in one position of the diaphragms trne stereoscopic or orthoscopic relief is given, it is sufficient to turn the diaphragms into the opposite position to obtain a pseudo- scopic conversion.? It appears, however, that this arrangement, though possessing points of great interest in relation to the theory of binocular vision, is not likely to supersede the ordinary Wenham

rism.

: It must be obvious to every one who studies with sufficient attention the conditious under which true stereoscopic reliefcan be given that no combination of two dissimilar retinal perspectives can be satisfactory unless the visual pictures represent with tolerable distinctness the features of the object that lie in different focal planes. This is provided for, in ordinary vision, by the power of accommo- dation possessed by the eye, which, while focussed exactly to any one plane, can also include in its visual picture (within certain limits) what is either nearer or more remote. Now it seems prob- able that, as Professor Abbe has urged, this power of accommoda- tion comes into play in microscopic stereoscopy, but there can be no question that the visual distinctness of the parts of an object lying within and beyond the focal plane, and therefore the com- pleteness of the stereoscopic image, mainly depends upon the ‘‘ focal depth ” of the objective employed, —which, as already explained, is a function of its angular aperture. When, however, objectives of long focus and small aperture are employed in binocular microscopy, although each of the two perspective projections may be fairly distinct throughout, the effect of solid relief will be very incon- siderable, because the pictures are not sufficiently dissimilar to one another,—the ease being exactly analogous to that of the stereo- scopie combination of two photographic portraits taken at an angle of no more than a few degrees from each other. Still, with an objective of 14 inches focus and an angular aperture of from 15° to 20°, a very distinct separation is made of the focal planes of trans- parent sections of structures having no great minutenéss of detail, ~—such, especially, as injected preparations,—the solid forms ot their capillary networks being presented to the mind’s eye with: a vividness that no’ monocular representation of

them can afford. When a 1 inch objective of 20° or 25° is used, the stereoscopic effect becomes much more satisfactory ; so that objects of moderate pro- jection (such as many of the siliceous Polycystina, Diatomacce, &c.) can be seen in nearly their natural projection, and, if the focal adjustment is made for a medium plane, with tolcrable distinctness both of their nearer and remoter parts. With a 2 inch of 30° or 35°, the stereoscopic relief becomes more pronounced ; but the diminution of the focal depth prevents the several planes of objects in strong relief from being as distinctly seen at the same time, A

Fic, 25.—Wenham's Binocular Prism.

1Sce Trans. of Roy. Micros. Soc., N.S., vol. xv., 1867, p. 105; and Monthly Micros. Jour., vol. i., 1869, p. 31. 2 See Jour. of Roy. Micros. Soc., 2d ser., Vol. i., 1881, p. 298.

_ as to produce a highly exaggerated stereoscopic effect.

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4 inch objective of about 40° of aperture, however, affords the most satisfactory results with suitable objects,—full stereoscopic relief being gained without exaggeration, so as to present, ¢.g., the discoidal diatoms and the smaller Polycystina in their true forms, whilst their nearer and more remote parts are seen with sufficient distinctness to require only a very slight adjustment of the focus for their perfect definition. Still more minute objects may be well shown by #sths and 3th objectives whose angular aperture does not exceed 50°; but it can be shown both theoretically and practically? that the dissimilarity of the two perspective projections of objects in relief formed by objectives of any angle much exceed- ing 40° is such as to exaggerate the stereoscopic effect; besides which, every enlargement of angular aperture so greatly diminishes the focal depth of the objectives that only those parts of the objects which lie very near the focal plane can be seen with distinctness sufficient for the formation of a good stereoscopic image. Hence, for the purposes of minute histological research, the stereoscopic binocular is (in the present writer's opinion) almost valueless ; since, if any distinct perspective differentiation can be gained with

_ objectives of the short focus and enlarged angle that are most

suitable to such investigations, that differentiation will be so great If such objectives be used binocularly at all, they must be so mounted that

_ their back lenses are in very close proximity to the prism ; and the

_ the same shape and size as his ordinary

| (transparent) object must be illuminated by an achromatic condenser

of sufficient aperture ~~to send through it pencils of sufficient diver~~ gence to produce the secondary image. ‘ In regard to the advantage derived from the use of the stereo- scopic binocular, with the powers, and upon the objects, suitable to produce the true effect of solid form, the writer can unhesitat- ingly assert, as the result of a long and varied experience, that in no other way could he as certainly or as vividly image those forms to himself, and that in prolonged work upon such subjects he is conscious of a great saving of fatigue, which seems attributable not merely (perhaps not so much) to the conjoint use of both eyes as to the absence of the mental effort required for the interpretation of the microscopic picture, when the solid form of the object has to be ideally constructed from it (chiefly by means of the information obtainable through the focal adjustment), instead of being directly presented to the mind’s eye.4

Non-Stereoscopic Binoculars.—The great comfort which is experi- enced by the microscopist in the conjoint use of both eyes has led to the invention of more than one arrangement by which this can be secured when those high powers are required which cannot be employed with the ordinary stereoscopic binocular. This is accomplished by Messrs Powell and Lea- land by taking advantage of the fact that, when a pencil of rays falls obliquely upon the surface of a refracting medium, a part of it is reflected with- out entering that medium at all. In the place usnally occupied by the Wenham prism they interpose an inclined plate of glass with parallel sides, through which one portion of the rays ‘‘pro- ceeding upwards from the whole aperture of the objective passes into the principal body with very little change in its course, whilst another portion is reflected from its surface into a rectangular prism so placed as to direct it obliquely upwards into the

secondary body (fig. 26). Although there is a decided difference in brightness between the two images, that formed by the reflected rays being the fainter, yet there is marvellously little loss of definition in either, even when the =; inch Fie, 26 objective is used. The disk and prism are fixed 18. . in a short tube, which can be readily substituted in any ordinary binocular microscope for the one containing the Wenham prism.

Other arrangements were devised long ago by Mr Wenham," with a view to obtain a greater equality in the amount of light-rays form- ing the two pictures; and he has latterly carried one of these into practical effect, with the advantage that the compound prism of which it eonsists has so nearly

stereoscopic prism as to be capable of being mounted in precisely the same manner, so that the one may be readily exchanged for the other. The axial raya, proceeding upwards from the objective, enters the prism ABDEF (fig. 27) at right angles to its lower face, and passes on to ¢, where it meets the inclined face AB, at which this prism is nearly in contact with the oblique face of the right-angled

Fig. 27.

3 See The Microscope and its Revelations, 6th ed., pp. 42-44.

4A very elaborate investigation, by Professor Abbe, "On the Conditions of Orthoscopic and Pseudoscopic Effects in the Binocular Microscope," will be found in the Jour. of the Roy. Micros. Soc., 2d scr., vol. i., 1881, p. 203.

5 Transactions of the Micros. Soc., N.S,, vol. xiv., 1866, p. 105,

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prism ABC, By internal reflexion from the former and cxternal reflexion from the latter about half the beam J is refleeted within the first prism in the direction cb, while the other half proceeds straight onwards through the second prism, in the direction ca', so as to pass into the principal body. 'The reflected half, meeting at d the oblique (silvered) surface DE of the first prism, is again reflected in the direction dd', and, passing out of that prism per- pendicularly to its surface AF, procecds towards the seeondary body.

The two prisms must not be in absolute contact along the plane AB, since, if they were, Newton’s rings would be formed ; and much nicety is required in their adjustment, so that the two reflexions may be combined without any blurring of the image in the secondary body.

For the prolonged observation, under high powers, of objects not requiring the extreme of perfection in definition, —such, for example, as the study of the cyclosis in plants,—great advantage is gained from the coujoint use of both eyes by onc of the above arrangements.

MECHANICAL CONSTRUCTION OF THE MICROSCOPE.

The optical arrangements on which the working of the compound achromatic microscope depends having now been explained, we have next to consider the mechanical provisions whereby they arc brought to bear upon the different purposes which the instrument is destined toserve. Every complete microscope must possess, in addition to the lens or combination of lenses which affords its magnifying power, a stage whereon the object may securely rest, a concave mirror for the illumination of transparent objects from beneath, and a condensing- lens for the illumination of opaque objects from above.

1. Now, in whatever mode these may be connected with each other, it is essential that the optical part and the stage should be so disposed as either to be altogether free from tendency to vibra- tion or to vibrate together ; since it is obvious that any movement of one, in which the other does not partake, will be augmented to the eye of the observer in proportion to the magnifying power employed. In a badly-constructed instrument, even though placed pee a steady table resting upon the firm floor of a well-built house, when high powers are used, the object is seen to oscillate so rapidly at the slightest tremor—such as that caused by a person walking across the room, or by a carriage rolling by in the street—as to be frequently almost indistinguishable ; whereas in a well-constructed instrument scarcely any perceptible effect will be produced by even greater disturbances. Hence, in the choice of a microscope, it should always be subjected to this test, and should be unhesitatingly rejected if the result be unfavourable. If the instrument should be found free from fault when thus tested with high powers, its steadiness with low powers may be assumed; but, on the other

hand, though a microscope may give an image free from perceptible tremor when the lower powers only are em jloyed, it may be quite unfit for use with the higher. The method still adopted by some makers, of supporting the body by its base alone, is the worst possible, especially for the long body of the large English model, since any vibration of its lower part is exaggerated at its ocular end. The firmer the support of the body along its length the less tremor will be seen ‘in the microscopic image.

2. The next requisite is a capability of accurate adjustment to every variety of focal distance, without movement of the object. It is a principle universally recognized in the construction of good microscopes that the stage whereon the object is placed should be a fixture, the movement by which the focus is to be adjusted being given to the optical portion. This movement should be such as to allow free range from a minute fraction of an inch to three or four inches, with equal power of obtaining a delicate adjustment at any part. It should also be so ateurate that the optic axis of the in- strument should not be in the least altered by any movement in a vertical direction, so that, if an object be brought into the centre of the field with a low power, and a higher power be then substituted, the object should be found in the centre of its field, notwithstand- ing the great alteration in the focus. In this way much time may often be saved by employing a low power as a ‘‘finder”’ for an object to be examined by a higher one; and when an object is being viewed by a succession of powers little or no readjustment of its place on the stage should be required. A rack-and-pinion adjustment, if it be made to work both tightly and smoothly, answers sufficiently well for the focal adjustment, when objectives of low power only are employed. But for any lenses whose focus is less than half an inch a “fine adjustment,” or ‘‘slow motion,” by means of a screw-move- inent operating either on the object-glass alone or on the entire body (preferably on the latter), is of great value ; and for the highest powers it is quite indispensable. It is essential that in this motion there should be no ‘‘lost time,” and that its working should not produce any ‘“‘twist” or displacement of the image. In some miero- scopes which are provided with a fine adjustment the rack-and- pinion movement is dispensed with, the ‘‘ coarse adjustment” being given by merely sliding the body up and down in the socket which grasps it; but this plan is only admissible where, for the

sake of extreme cheapness or portability, the instrument has to be reduced to the form of utmost simplicity, as in figs. 28, 29.

3. Scarcely less important than the preceding requisite, in the case of the compound microscope, especially with the long body of the ordinary English model, is the capability of being placed in either a vertical or a horizontal position, or at any angle with the horizon, without deranging the adjustment of its parts to each other, and withput placing the eye-piece in such a position as to be incon- venient to the observer. It is certainly a matter of surprise that some microscopists, especially on the Continent, should still forego the advantages of the inclined position, these being attainable by a very small addition to the cost of the instrument; but the incon- venience of the vertical arrangement is much less when the body of the microscope is short, as in the ordinary Continental model ; and there are many cases in which it is absolutely necessary that the stage should be horizontal. This position, however, can at any time be given to the stage of the inclining microscope, by bringing the optic axis of the instrument into the vertical direction, In ordinary cases, an inclination of the body at an angle of about 55° to the horizon will usually be found most convenient for uncon- strained observation; and the instrument should be so constructed as, when thus inclined, to give to the stage such an elevation above the table that, when the hands are employed at it, the arms may rest conveniently upon the table. In this manner a degree of support is attained whieh gives such free play to the muscles of the hands that movements of the greatest nicety may be executed by them, and the fatigue of long-continued observation is greatly diminished. When the ordinary camera lucida! is used for drawing or measuring, it is requisite that the microscope should be placed horizontally. It ought, therefore, to be made capable of every such variety of position ; and the stage must of course be provided with some means of holding the object, whenever it is itself placed in such a position that the object would slip down unless sustained.

4, The last principle on which we shall here dwell, as essential to the value of a microscope designed for ordinary work, is simpli- city in the construction and adjustment of every part. Many in- genious mechanical

devices have been invented and executed for the purpose of overcoming difficulties which are in themselves really trivial. A moderate amount of dexterity in the use of the hands is sufficient to render most of these superfluous ; and without such dexterity no one, even with the most complete mechanical facilities, will ever become a good microscopist. There is, of course, a limit to this simplification ; and no arrangement can be objected to ou this score which gives advantages in the examination of difficult objects, or in the determination of doubtful questions, such as no simpler means can afford. The meaning of this distinction will become apparent if it be applied to the cases of the mechanical stage and the achromatic condenser. For, although the mechanical stage may be considered a valuable aid in observation, as facilitating the finding of a minute object, or the examination of the entire surface of a large one, yet it adds nothing to the clearness of onr view of either ; and its place may in great degree be supplied by the fingers of a good manipulator. Ou the other hand, the use of the achromatic condenser not only contributes very materially, but is absolutely indispensable, to the formation of a perfect image, in the case of many objects of a difficult class ; the want of it cannot be compensated by the most dexterous use of the ordinary appliances ; and consequently, although it may fairly be considered superfluous as regards a large proportion of the purposes to which the micro- scope is directed, whether for investigation or for display, yet as regards the particular objects just alluded to it is ano less necessary part of the instrument than the achromatic objective itself.

Asa typical example of the simplest form of eompound micro- scope that is suitable for scientific research,—which, with various modifications of detail, is the one generally employed on the Con- tinent, —the Ificroscope de dissection et d’observation (fig. 28) of M. Nachet, especially as constructed for portability (figs. 29-31), seems particularly worthy of description. In its vertical form (fig. 28) the solid foot to which the mirror is pivoted gives support to the pillar F, to the top of which the stage P, having a diaphragm-plate beneath it, is firmly attached. On the top of this pillar the tubu- lar stem: A is fitted in such a manner that it may be removed by unscrewing the large milled head L,—though, when this is well screwed down, the stem stands quite firmly. This stem bears at its summit a short horizontal arm, which carries a strong vertical tube that firmly grasps the ‘‘

body” of the microscope, while per- mitting this to be easily slid upwards or downwards, so as to make a “coarse adjustinent” of the focus. The ‘‘fine adjustment’ is made by turning the milled head V, whieh either presses down the outer tube of the stem, or allows it to be raised by the upwari pres- sure of a strong spiral spring in its interior. By unscrewing the milled head L, the stem A with its arm and compound body can be detached from the pillar ; and, a small light arm H holding either single lenses or doublets being slid into this, a convenient dissecting microscope is thus provided. The only drawback in the construe- tion of this simple model is its not being provided with a joint for

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1 A camera lucida adapted for use with the vertical microscope has been de-

yised by M. Nachet.

the inclination of the body ; but this is introduced into the port- able form of the instrument shown in fig. 29, the basal portion of which (fig. 80) can be used, like that of the preceding model, asa simple microscope, and, by a most ingenious construction, can be so folded as to lie flat in a shallow case (fig. 81) that holds also the upper part with the objectives of both the simple arm and the com-

Fia. 28.—Nachet’s Combined Simple and Compound Microscope.

pease body. M. Nachet now connects his objectives with the ody of his microscopes, not by a screw, but by a cylindrical fitting held in place by the pressure of a spring-clip against a projecting shoulder. This method not only allows one objective to be re- moved and replaced by another much more readily than does the screw-fitting, but also renders the centring of different objectives more exactly con- formable. It may be safely affirmed that a very large proportion of the microscopic work of the ii half- century, which has given an entirely new aspect to bio- logical science, has been done by in- struments of this simple Continental type.

A larger model, however, was from the first adopted by English opti- cians; and, as a as example of the general plan of construction now most followed both in England and in the United States, the im- proved Jackson- ona oe + pa Fic. 29.—Nachet’s Portable Compound Microscope. Ross (fig. 32) may be appropriately selected. this instrument carries two pillars, between which is swung npon a horizontal axis (capable of being fixed in any position by a tighten- ing screw) a solid ‘‘ limb,” with which all the other parts of the instrument are connected, —a plan of construction originally devised by Mr George Jackson. The binocular body, having at its lower end (as in fig. 24) an opening into which either of the Wenham prisms can be inserted, and at its top a rack movement for adjusting the eye-

| scale and vernier at | its edge ; and it can | be fixed in any azi- | muth by a clamping- | serewbeneath. Rect- |; angular

The tripod base of

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pieces to the distance between the eyes of the observer, is attached to a racked slide, which is so acted on by the large double milled

Fic. 80.—Nachet’s Portable Lae tiaegs o Microscope; on the left as set up for use, on the right as having the stage P turned back upon the joint O, so as to lie flat on the bottom of the case.

head in the upper part of the limb as to give a ‘‘ quick” upward or downward motion to the body; while the “slow” motion, or fine

Fic. 81.—Nachet’s Portable Compound and Dissecting Microscope, as packed in case,

adjustment, is given by meaus of the vertical micrometer screw at the back of the limb, which raises or lowers a second slide behind the rack.1 The stage is .

supported upon a firm ring, which is immovably _ fixed,

not to the limb, but to a strong conical pivot which passes through the limb, to be clamped by a serew-nut at its back,—the purpose of this being to allow the whole stage to be inclined to one side or the other at any angle, so that a solid object may be viewed sideways or from below, as well as from above. Upon this ring the stage rotates horizontally, its angular move- ment being mea- sured by a gradnated

movement is given to the traversing platform which carries the ob- ject by two milled

Microscope.

heads on the’right of the stage, the whole construction of which is adapted to allow — of extreme obliqnity to be thrown upon the iv

object from beneat

On the strong pivot by which the stage is

1In the older form of construction still retained by some makers the fine adjustment acts directly on the objective, the fitting of which is made to slide up and down within the nose of the body ; but this plan is attended with many disadvantages.

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attached to the limb (the axis of which passes through the point at which the object-plane is intersected by the optie axis of the

body) is hung the swinging tail-piece invented by Mr Zentmayer of |

Philadelphia, whieh, carrying the whole illuminating apparatus, may be so set as to give to the axis of the illuminating pencil any required degree of obliquity. To the upper part of it 1s attached a rack-and-pinion movement carrying the ‘‘substage,” which is

provided with two milled-headed screws for centring it pre- |

cisely with the microscope-body. Into this may be fitted the

achromatic condenser, parabolic illuminator, polarizing prism, or |

any other kind of illuminating apparatus ; whilst at its lower end it carries the mirror, the position of which may be varicd by sliding its fitting up or down the ‘“‘tail-piece,” or by turning the arm which carries it to one side or the other ; while, if direct illumina- tion from a lainp should be preferred, it may be turned altogether aside. By swinging the tail-piece round above the stage, oblique light may be reflected from the mirror, through the condenser, upon the upper surfaces of objects. this instrument is of about 745 inch focus, with a large back lens ; behind which are placed an iris-diaphragm for reducing the light to the central rays, and a diaphragm-plate with apertures of the

various forms most suitcd for the resolution of lined objects by |

oblique rays.

No instrument, in the writer’s judgment, is better adapted than this for the highest purposes of microscopical research. It works admirably with every power from the lowest to the highest, and is capable of receiving any one of the numerous pieces of apparatus which have been devised for special rescarches of various kinds. The detailed description of these not being here admissible, it will be sufficient to indicate the polariscope and the spectroscope as the most important of these accessories.

MICROMETRY.

The microscopist has constant need of some means of taking exact measurements of the dimensions of the minute objects, or parts of objects, on the study of which he is engaged ; and the accuracy of the operation will of course be proportioned to the correctness of the standard used, and the care with which it is applied.

The instruments employed in microscopic micrometry arc of two kinds, the measurement being taken in one by the rotation of a fine screw with a divided milled head, whilst in the other a slip of glass ruled with lines at fixed distances gives a scale which forms a basis of computation. ach of these has its advantages and its disadvantages.

The stage-micrometer constructed by Frauenhofer was formerly much used by Continental microscopists, and has the advantage of indicating the actual dimensions of the objects to be measured ; but it has the two special disadvantages that a sufficiently small value cannot be conveniently given to its divisions, and that any error in its construction and working is augmented by the whole magnifying power employed. This instrument has now, however, almost entirely given place to one of those to be next described.

The screw-micrometer ordinarily used in astronomical measure- ments (see MicROMETER) cau be adapted to the eye-piece of the microscope in a manner essentially the same as that in which it is applied to the telescope, —its two parallel threads—of which one is fixed and the other made to approach towards or recede from this by the turning of the serew—being placed in the focus of the eye- glass, and being therefore seen as lines crossing its field of view. The object is so focussed that its image is formed in the same plane ; and, the latter being brought into such a position that one of its ends or margins lies in optical contact with the fixed line, the screw is turned so as to bring the movable line into the like coincidence with the other. But the distance between the lines, as given by the number of divisions of the micrometer, will here be the measure- ment, not of the object itself, but of its magnified image ; and the value of these divisions, therefore, will depend upon the amplifica- tion given by the particular objective used. Thus, suppose each division of the micrometer to have an actual value of y5}y5th of an inch, and the visual image to have one hundred times the linear dimensions of the object, the theoretical micrometric value of each division would be 74,th of z54y5th, or onc-millionth, of an inch,— a degree of minuteness, however, not practically attainable. It is necessary, moreover, to determine the micrometric value of the divisions of the micrometer, not only for every objective, but for variations in the conditions under which that objective may be employed, as regards the length of the tube or ‘‘body” of the microscope, which is varied not only by the draw-tube, but also, in many cases, in the working of the fine adjustment or slow motion, and also, in the case of the large-angled powers furnished with adjustment for thickness of the covering-glass, for the degree of separation of the front- from the back-glasses of the objective, which makes a very sensible difference in its magnifying power. This

determination is made by means of a divided glass stage- micrometer put in the place of the object, so that the lines ruled upon it at fixed intervals shall be projeeted upon the field of view. The stage-micrometer is usually ruled either to 1000ths of an inch or

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100ths of a millimetre; and it isconvenicnt that one of the divisions of its image should be made to coincide exactly with a certain number of divisious of the serew-micrometer. This may be done by lengthen- ing the draw-tube, so as to increase the amplification of the scale until coincidence has been reached; and the exact amount of this lengthening should be noted, —as should also the precise position of the milled head of the slow motion (if it acts on the objective, instcad of on the body as a whiole), and of the adjusting screw-collar of the objective itself. Thus, if two lines of the stagc-micrometer separated by 1000th of an inch be brought into coincidence with the two threads of the eye-piece micrometer, separated by forty divisions of the screw milled head, the value of each of those divi- sions is zg}yyth of an inch. If the above conditions be precisely recorded for each objective used in micrometry, the micrometric value of the divisions remains the same for that objective, whenever it is employed under the same conditions.

The condenser usually fitted to |

The errors to which micrometers are subject arise (1) from in- equalities in the ruling of the stage-micrometer, (2) from irregulari- ties in the screw of the eye-piece micrometer, (3) from “ lost time ” in its working, and (4) from the thickness of its threads. In order _ to eliminate the first and second, it is well to determine the rela- tion of the divisions of the two micromcters by the comparison of a considerable number of both; the third proceeds from an imper- fection of workmanship which, if it shows itself sensibly, entirely destroys the value of the instrument, while the fourth can be rectified by the exercise of skill and judgment on the part of the observer. For, if the micrometer is so constructed as to read zero when one thread lies exactly upon the other, its divisions indicate the distance between the axes of these threads when separated ; and the dimensions of any object (such as a blood-corpuscle) lying between their borders will obviously be too great

by half the thick- ness of the two threads, that is, by the entire thickness of one thread. When, on the other hand, the measurement is being made (as of the distances of the strie on diatoms) by the coincidence between certain lines on the object and the axes of the threads of the micrometer, the dimensions indicated by the divisions of the screw 1illed-head will be correct. :

The costliness of a well-constructed screw-micrometer being a formidable obstacle to its general use, a simpler method (devised by Mr George Jackson) is more commonly adopted, which consists in the insertion of a ruled-glass scale into the focus of an ordinary

Huygenian eye-piece, so that its lines are projected on the field of view. ‘his scale (ruled, like an ordinary measure, with every fifth line long, and every tenth line double the length of the fifth) is fixed in a brass inner frame, that has a slight motion in the direc- tion of its length within an outer frame; and this last, being intro- duced through a pair of slits into the eye-piece just above the diaphragm, and being made to occupy the centre of the field, is brought exactly into focus by unscrewing the eye-glass as far as may be requisite. When the image of the object to be measured is brought by the focal adjustment of the object-glass into the same plane, a small pushing-screw at the end of the micrometer (whose action is antagonized by a spring at the other end) is turned until one of the long divisions of the scale is brought into optical contact with one edge of the image of the object to be measured, and the number of divisions is then counted to its other edge,—the operation being exactly that of laying a rule across the real object if enlarged to the size of its image. The micromctric value of each division of this eye-piece scale must be carefully ascertained for each objective, as in the case of the screw-micrometer, the error arising from in- equality of its divisions being eliminated as far as possible by taking an average of several, The principal point of inferiority in this form of micrometer is that, as its divisions eannot be made of nearly so small a value as those of the screw-micrometer, an estimate of fractional parts of them often becomes necessary, whieh is objectionable as involving an additional source of error. To meet this objection, Hartuack has introduced the diagonal scale used in mathematical instruments before the invention of the vernier. Another mode of making micrometric measurements, which for some purposes has

considerable advantages, is to employ a stage- micrometer in combination with some form of camera lucida attached to the eye-piece of the microscope, so that the image of its divisions may be projected upon the same surface as that on which the image of the object is thrown. By first using the ruled stage-micrometer, and marking on the paper the avcrage distance of its lines as seen in the central part of the field, and then ruling the paper accordingly, the micrometric value of the divisions so projected may be exactly determined for the objective employed and the distance of the drawing-plane from the eye-piece, —so that, when the image of any object is projected under the same conditions, the dimensions of that image or of any parts of it can be cxactly measured upon the divided scale previously projected, and the true dimen- sions of the object: thus easily ascertained. If, for example, the lines of a stage-micrometer ruled to the thousandth of au inch should, when thus projected, fall at a distance of an inch apart, then the applieation of an ordinary scale of inches (divided into ; tenths) to the image of an object projected by the same objective

and on the same plane would give its real dimensions in thousandths of an inch, while the tenths of the inch scale would represent a real dimension of as many ten-thonsandths. _ It is often desirable to make such measurements from careful tracings of the outlines of objects, rather than from the visual images, —this plan being especially advantageous when the exact dimensions of many similar objects have to be compared, as in the case of blood-cor- puscles, precise measurements of which are not unfrequently required in judicial inquiries. It was by the use of this method that the late Mr Gulliver made his admirable scrics of measurements of the average and extreme dimensions of the blood-corpuscles of different animals, And more recently Mr Dallinger has shown,—by first

MIDAS, king of Phrygia, is one of those half-legendary |

heroes in whom religious legends have gathered round a real person. The name Midas the king, MIAAI FANAKTE], occurs ona very ancient tomb in the valley of the Sangarius, the legendary seat of the Phrygian kingdom (liad iii. 189), The Phrygian monarchy was destroyed by the Cimmerians about 670 B.c., and the last king Midas com- mitted suicide by drinking

bull’s blood. The name Midas became in Greek tradition the representative of this ancient dynasty, but all that is told of him is religious myth. He is a figure in the cycle of Cybele legends, the son of the goddess and her first priest. He is also closely connected with the cultus of Dionysus, like the two heroic personages Marsyas and Silenus. The Midas legend was known on Mount Bermius in Macedonia, and must at one time have existed in Greece; two cities Midea, in Argolis and in Beeotia, recall the Phrygian city Mideium.

See Herod. viii. 188; Xen., Anad., i. 2, 13; Paus. i. 45, &c.

MIDDELBURG, in Holland, the ancient capital of the province of Zealand, situated in the middle of the island of Walcheren, is mentioned as early as 1153, and receives the title “town” in a charter granted it in 1227. It has all the characteristics of an old and worn-out place. The population (25,000 in 1739) had sunk to 12,000 or 13,000 by the beginning of the 19th century, and has only begun recently to increase again, being 15,939 in 1882. The dwelling-houses, which in 1739 were about 3800, are riow but 3000, and of these about 600 are unoccupied. The vast warehouses and imposing mansions once belonging to wealthy families, which have either died out or left the place, call up the memory of that prosperity which Middel- burg enjoyed before its extensive trade, with the East and West Indies, with England and Flanders, was ruined by the war with England and the French occupation. By the opening of the railway (1872) and of the ship canal (1873) to Flushing Middelburg was lifted out of its isola- tion, and, with the assistance of the chamber of commerce, manufacturing industries (iron, machinery, furniture, oil, cigars, &c.) were established ; but the prosperity anticipated for Flushing, and consequently for Middelburg, remains unrealized. One of the chief sights of Middelburg is the splendid town-house, for the most part erected in 1512-13, with its front gable adorned with twenty-five statues of counts and countesses of Holland and Zealand ; it contains the archives, and a most valuable antiquarian and historical collection. The abbey, begun in 1150, has frequently been the residence of royal visitors (Maximilian, Philip the Fair, Charles V., and so on down to Napoleon I., and William L., IL., and IIT.) ; part of it is now an hotel, and part of it is occupied by the provincial authorities. The great hall of the building, in which the states of Zealand assemble, is adorned with beautiful

tapestries by Jan de Maccht, repre- senting the heroic feats of the men of Zealand in the contest with Spain. What was formerly the nave of the abbey church is now the New Church, and the ancient choir constitutes the Choir Church. The former contains a fine pulpit resting on an eagle, the monument of William, king

| with rapid strides.

making a very finc camera Incida tracing of Bacterium termo under an amplification of 2000 diameters, and measuring the breadth of its body in the mode above indicated (which gave it as gytqqth of an inch), and then by magnifying his tracing from five to ten diameters, and comparing, by meaus of the screw-micrometer, the breadth of the flagellum with that of the body (which last proved to be just ten times as great),—that, althongh the theorctical limit of resolving power for closely approximated lines is y4¢sqgth of an inch, a semitransparent filament whose breadth is not greater than sscsssth of an inch may be clearly discerned, and even measured with a close approximation to accuracy (Jour. of Royal Micros. Society, vol. i., 1879, p. 169). (W. B. C.)

of the Romans (d. 1256), and the tombs of Jan and Cornelis Evertsen, two naval heroes who fell in the war against England in 1666; the latter has the monuments of the learned Hadrian Junius and of Jan Pieterszoon. The provincial court, the corn exchange, the Hof St Joris and the Hof St Sebastian (formerly buildings belonging to the guilds of archers, and now places of amusement) deserve mention. The great museum of Zealand antiquities, col- lected by the Zealand Society of Arts and Sciences (founded at Flushing in 1769 and transferred to Middelburg in 1801), shows that the town is the intellectual centre of the province.

The principal facts in the history of Middelburg are the sieges by: the Flemings in 1288, 1296, and 13038 (the last resulting in the capture of the town by Guy of Dampierre); the recovery of the town from the Spaniards in 1574, after an investment of nearly two years; the frequent disturbances among the townsfolk in the 17th and 18th centuries; the surrender to the

English in 1809; and the arrival and departure of the French in 1809 and 1814.

MIDDLEBOROUGH, a town of the United States, in Plymouth county, Massachusetts, 34 miles south of Boston. Tt has a handsome town-hall and a public library, manufac- tures woollen goods, straw goods, shovels, shoes, carriages, &e., and in 1880 had 5237 inhabitants.

MIDDLESBOROUGH, situated near the mouth of the Tees, on its south bank, in the North Riding of Yorkshire, has now become the principal seat of the English iron trade. It is a municipal and parliamentary borough, locally governed by a mayor and corporation, and returns a member to parliament. The earlier history of the place is meagre. Where Middlesborough now stands (Graves's History of Cleveland) there were at one time a small chapel and priory founded by Robert de Brus of Skelton Castle. These were dedicated to St Hilda, and with some lands were given by De Brus to the abbey of St Hilda at Whitby in 1130. The priory fell into ruins at the time of the Reformation, and no trace now remains beyond some stones built into the wall of a brewery. The mayor's chair also is made from a fragment. In 1801 there were upon the site of- Middlesborough only four farm-houses. In 1829 a company styling itself the Middlesborough Owners bought 500 acres of land, and commenced building the town. In 1830 the Stockton and Darlington Railway was extended from Stockton to Middlesborough ; four years later the town was lighted with gas; and after six years more a public market was established. The census of 1831 showed the population to be 154; that of 1841 showed 5709. In 1842 the opening of the docks gave additional importance to the town. First containing an area of 9 acres, they

were extended in 1872 to 12 acres, with 1700 feet of

quays. Vessels of 3000 tons burden can be accommodated.

| From the year 1851, when J. Vaughan discovered the

presence of ironstone in the Eston Hills, the town advanced When the jubilee of the town was held in 1881 (a year late) the population had risen to 55,934, the area to 2731 acres, and the rateable value to £140,000,

_the population of the parliamentary borough (area 4715

acres) being 27,145. In the district there are upwards of

Plate ILI.

MID—

130 blast furnaces, besides large iron and steel works; and

the Thomas-Gilchrist process of making steel promises for |

Middlesborough importance in the future as a steel entre- pot. The make of pig-iron in 1880 was 1,991,032 tons. There are also shipbuilding, potteries, chemical works, and a salt trade. Middlesborough is well laid out, nearly all the streets lying at right angles to one another. Many of the churches and the exchange are handsome buildings, while the station of the North Eastern Railway is probably the finest in the north of England. A splendid park of 72 acres, the gift of the late H. F. W. Bolckow, adds greatly to the amenity of the town.

MIDDLESEX, an inland county in the south-east of England, lying between 51° 25’ and 51° 40’N. lat., and between 0° and 0° 36’ W. long. On the south it is divided from Surrey and Kent by the Thames, on the east from Essex by the Lea, on the west from Buckinghamshire by the Colne, and on the north from Hertfordshire by a partly artificial and very irregular line. Although with the ex- ception of Rutland it is the smallest county in England, its population is exceeded by that of Lancashire only. Its total area is 181,317 acres, of which 2592 acres are common or waste lands. The longest straight line that can be drawn in the county is one of nearly 28 miles from the north-eastern extremity near Waltham Abbey to the south-western at Staines. From north to south in the broadest part the distance is about 15 miles.

Surface and Geology.—The greater portion of the county is flat, although there are sufficient undulations to allow of a proper drainage of the land. A range of hills runs along the Hertfordshire border by Barnet, Elstree, Stanmore, and Pinner, averaging 400 feet in height ; another range occupies

the ground just north of London by Hornsey, Highgate, and Hampstead; Harrow occupies an isolated eminence between the two ranges.

The county lies entirely within the basin of the Thames, and the London Clay extends over a large portion of the surface. This formation stretches from the mouth of the estuary of the Thames to the neighbourhood of Mazrl- borough. It attains its greatest breadth (little short of 30 miles) in the neighbourhood of London, and extends north- ward until it is lost beneath the drift of Suffolk and Norfolk. The following is a table of the various beds of rock which occur at the surface, with their greatest thick- ness (in feet) in the district :—

Alluvium (recent river deposits).....cs.ceecseereeees 15 Post-Pliocene Tertiaries.

Post-glacial beds (brick-earth, gravel, &c.).....45 50 Glacial drift (boulder clay, gravel, &c.).....sseseeees 80 Hocene Tertiarics.

Lower Bagshot sands…..... ee ess es nioe ies sn bias 100 Monel oink Claipreseeccisssibionvce ccs esciccesvassesseserenccssceoeee 420 Woolwich and Reading beds…,.....:..scesssessecesere 90 Cretaccos.

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Chalk comes to the surface in so very few places that it is scarcely worth mention. It is seen near Harefield and on the north-west side of South Mimms. The depth from the surface to the chalk varies greatly in different parts of the county. This has been proved by the borings for wells; thus at Isleworth the depth is 400 feet and at Hampstead 378, while at Ruislip it is 76 feet and at Pinner only 60. The Reading beds (plastic clays) are brought to the sur- face at Windsor. They follow roughly the course of the river Colne from the north of Uxbridge along the flank of the hills north-eastward, but are sometimes cut back south- ward along small side valleys. An outlying mass is exposed at Pinner. The Bagshot sands, consisting of gravel and sand permeable to water, once stretched over the whole extent of the London Clay, but they are now to be found only on the high grounds at Hampstead, High-

gate, and Harrow. A corner of the main inass enters the south-west corner of the county near Littleton. Beds of brick-earth occur in the drift between West Drayton and Uxbridge.

Several deep borings in the London basin prove the existence beneath the chalk of beds which do not crop out in Middlesex. Three of these are in the county; and the most interesting is that at Meux's Brewery, Tottenham Court Road (about 1146 feet), which passes through the following formations :—gravel and clay, 21 feet; London Clay, 64 feet; Reading beds, 51 feet; Thanet sand, 21 feet; chalk, 655 feet; Upper Greensand, 28 feet; gault, 160 feet ; Lower Greensand, 64 feet ; Devonian, 80 feet.

ftivers and Canals.—The Thames is very tortuous in the 44 miles of its course from Staines to Blackwall, and makes a remarkable bend at the eastern limit of the county where it forms the so-called Isle of Dogs. The width at Staines is 200 feet, at Chiswick opposite Barnes 340 feet, at Hammersmith 525 feet, at Fulham 820 feet, at Westmin- ster Bridge 1100 feet, but at London Bridge it is less than 800 feet ; above the junction of the Lea at the Isle of Dogs the width is 1350 feet. The ordinary rise of the tide at London Bridge is 16 feet, and the tide-way ends at Ted- dington. The port of London begins below London Bridge, and the channel for from 2 to 3 miles is called the Pool.

The Colne from Hertfordshire enters Middlesex at the north-western corner of the county. It then runs south, joining the Thames at Staines, and in its course divides Middlesex from Buckinghamshire for 15 miles. After the river leaves Uxbridge it divides out into several small channels. The Lea from Hertfordshire enters Middlesex at the north-eastern corner of the county near Waltham Abbey.. It runs south, dividing Middlesex from Essex for 15 miles, and falls into the Thames at Bow Creek. Several branches flow off from the river during its course. The Brent from Hertfordshire enters Middlesex near Finchley. It takes a circuitous direction southward through the middle of the county by Hendon, Kingsbury, Twyford, Greenford, and Hanwell to the town of Brentford, where it unites with the Thames. Where the river crosses the Edge- ware Road (about 3 miles south of the town of Edgeware) it is expanded by artificial means into an

extensive reser- voir. The Cran (or Yedding Brook) rises in the district between Harrow and Pinner and flows under Cranford Bridge; it crosses Hounslow Heath, and bends round to Twickenham and Isleworth, where in a divided stream it falls into the Thames.

There were several other small streams in the neighbour- hood of London which have left their mark in the names of places, but which are now merely sewers, such as the Wallbrook, the Westbourn, the Tyburn, the Fleet river, &e. The last-mentioned, which runs into the Thames near Blackfriars Bridge, was formerly navigable as far as Holborn Bridge ; but, the Fleet Ditch, as it was then called, having become in the last century a dangerous nuisance, the lord mayor and citizens were empowered by Act of Parliament to arch it over. The work was commenced in 1734, and in 1737 Fleet market, cecupying the site of the space from Holborn Bridge to Fleet Bridge, was opened to the public. The New River, an artificial water-course con- structed by Sir Hugh Myddelton in the reign of James I. to supply London with water, runs through the county from north to south a little to the west of the river Lea, It derives its waters from the springs of Amwell and Chadwell, increased by a cut from the Lea, in the neighbourhood of Ware, and enters Middlesex from Hertfordshire about 2 miles north of Enfield. It passes Enfield, Tottenham, Hornsey, and Stoke Newington, and is received into the reservoir in Clerkenwell known as the New River Head.

The Grand Junction Canal Icaves the Thames at Brent-

ford, proceeds in a westerly direction by way of Hanwell and Cranford to West Drayton; thence in a northerly direction it follows the valley of the Colne. It passes Uxbridge, and after leaving the county takes its further course by Rickmansworth through Hertfordshire. The Paddington Canal leaves the Grand Junction Canal at Cranford, and passes Northolt, Apperton, Twyford (where it is carried over the Brent by an aqueduct), and Kensal Green. At Paddington it joins the Regent’s Canal, which passes the north of Regent’s Park, and after proceeding through the eastern portions of London joins the Thames at Limehouse. The Regent’s Canal is joined to the river Lea by means of Sir George Duckett’s Canal, and thus there is a through communication from the north-eastern corner of the county to the

south-eastern corner, thence from east to west, and northward to the north-west corner.

Climate, Soil, Agriculture, d&c.—The climate of the county is equable and good, and the shelter of the northern hills makes the air mild. Highgate, Hampstead, and some other parts are supposed to be specially healthy, and are recommended for invalids by the medical profession.

The heavy poor clay in the north and north-western por- tion of Middlesex is chiefly covered with permanent grass. In some parts it has been made fit for arable cultivation by the addition of chalk, lime, and ashes. The rich deposits from the Thames have formed a soil which when well manured is specially suitable for market gardens. From its nearness to London the district has long been famous for high farming, and the divisions devoted to different kinds of farming are well marked. The greater part of Gore and Ossulston hundreds, portions of Spel- thorne and Edmonton hundreds, and a strip down the western side of Elthorne hundred are devoted to meadow and pasture. The arable land is chiefly found on the western side, and between the Great Western Railway and the Thames. It is also to be seen in the north-western district. With the constant increase of London, houses have encroached upon the fields, and most of the market gardens which were situated in the neighbourhood of Islington and Hackney have disappeared. The strip of land by the Thames from Brentford to Chelsea was given up almost entirely to market gardens, but Fulham is fast being built over.

According to the returns for 1882, the area occupied by grain and green crops, grass, &c., was 116,470 acres. Of this amount, 16,887 acres were under corn crops (wheat, 6410; barley, 3083; oats, 3895; and beans and pease, 2636); 13,451 under green crops (ineluding potatoes, 3019; turnips, 1539; mangolds, 1692; cabbage, &c., 1188); 3025 under clover and grasses sown in rotation; and 82,782 under permanent pasture. Orchards occenpied 3419 acres; market gardens, 6900; nursery grounds, 447; and woods, 2382. In the same year the horses numbered 5939 (4188 used for agri- cultural purposes); cattle, 23,283 (cows, 15,390); sheep, 23,916; and pigs, 12,035.

The following were the landowners in the eounty (exclusive of London) at the time of the Domesday survey:—the king, the arch- bishop of

Canterbury, the bishop and eanons of London, the abbeys of Westminster and Holy Trinity at Caen, the nunnery of Barking, the Earls Roger and Morton, Geoffrey de Mannevele, Ernulf de Hesding, Walter Fitz Other, Walter de St Walery, Richard Fitz Gilbert, Robert Gernon, Robert Fafiton, Robert Fitz Roselin, Robert Blund, Roger de Raines, William Fitz Ansculf, Edmund de Salisbury, Aubrey de Vere, Ranulf Fitz Ilger, Derman, Countess Judith, and the king's almoners.

In 1873, according to the Return of Owners of Land, the total nuniber of owners in the county (also exclusive of London) was 11,881, of whom 9006 owned less than an acre. The extent of lands (including common or waste lands) is given as 145,605. The gross estimated rental was £1,611,655. Sixteen owners eaeh pos- sessed over 1000 acres. The crown owned 2882 acres (annual value £5503); the duchy of Lancaster, 2278 acres (£4492) ; Eeclesi- astical Commissioners, 1308 acres (£46,519) ; All Souls' College, Oxford, 1818 acres (£4724); Christ Church, Oxford, 1132 acres (£1635) ; and King's College, Cambridge, 1097 (£1084).

Many villages of Middlesex, especially those near to London, were formerly famous for their mineral springs,

Some places are still supplied with water from wells ; but the Barnet, the East Middlesex, the Grand Junction, the West Middlesex, and the New River Water Companies serve a large part of the county.

Manufactures and Trade.—There is little to remark with regard to the manufactures of the county outside of London. Brick-making and tile-making have always flourished, and malting, distilling, and soap-making are favourite industries. Gunpowder mills exist at Twickenham and Bedfont. The market-towns for corn are Uxbridge, Brentford, and Staines, for cattle and sheep Southall. A horse and cattle fair is held at South Mimms and Barnet.

Railways and Roads.—As London is the centre of the railway system of England, it is evident that many of the lines must run evel Middlesex. For similar reasons it is well provided with roads,

Population. —The total population of Middlesex was 2,539,765 in 1871 and 2,920,485 in 1881, or excluding the seven metropolitan boroughs lying within the county 276,028 in 1871 and 394,089 in 1881. Most of the towns and villages have largely increased during the period between 1871 and 1881 ; the populations of Acton and Tottenham have more than doubled, and Chiswick, Ealing, Edmonton, and Willesden have almost doubled. Of the larger places the least increase has been at Brentford, which numbered 10,271 in 1871, and reached 11,808 in 1881. At the time of the Domesday survey the population of Middlesex, exclusive of London, was 2302.

Government.—Unlike other counties, Middlescx has no high sheriff appointed by the sovereign. It is subject to the City of London, and one of the sheriffs appointed by the lord mayor is sheriff for Middlesex. When Henry I. came to the throne he gave the city an extensive charter, and one of the privileges either granted or confirmed by the king was the perpetual sheriffwick of Middlesex.

The whole of the county is included in the diocese of London, and is divided between the archdeaconries of London and Middlesex. When Henry VIII. created the bishopric of Westminster he allotted the whole county (the parish of Fulham alone excepted) for its diocese. Edward VI., a dissolved the bishopric in the fourth year of his reign.

The county is divided into six hundreds, which remain the same as they were at the time of the Domesday survey, except that the name of one has been changed: —Ossulston (Osulvestane D.), Edmon- ton (Delmetone D.), Gore (Gara D,), Elthorne (Heletorne or Helethorne D.), Spelthorne (Speletorne or Spelethorne D.), Isle- worth (Honeslaw D., 7.¢., Hounslow). The division into hundreds is now merely a name, and a record of a former system of local government.

There are thirty-two poor-law unions, but the unions beyond London are only eight in number, viz., Brentford, Edmonton, Fulham, Hackney, Hampstead, Hendon, Staines, Uxbridge.

The majority of hospitals are in London, but there is a training hospital at Tottenham, St John’s Hospital at Twickenham, and cottage hospitals at Enfield, Ealing, Hayes, Hillingdon, Sudbury, and Teddington. The Royal]

India Lunatic Asylum is at Ealing, and the two county asylums at Colney Hatch and Hanwell.

The county is within the jurisdiction of the central criminal court and alsoof the metropolitan police(with the exception of the City).

Parliamentary Representation. —There are nine constituencies in Middlesex, returning nineteen members, viz., two for the county, four for the City of London, two for each of the boroughs of West- minster, Finsbury, Marylebone, the Tower Hamlets, Chelsea,' and Hackney, with one for the university of London.

In the parliament of 1295 Middlesex was represented by two members ; in 1298 London sent two members as well as the county. For the parliament of 1820 and subsequent parliaments London eleeted four members, but it does not appear that all were allowed to sit. From the 15th century, however, the city has always sent four members to parliament. In 1547 Westminster first sent her two members, aud from that time until 1832 the only seats were those for the county and the two boroughs. In 1832 the boroughs of Finsbury, Marylebone, and Tower Hamlets were added, and in 1866 the boroughs of Chelsca and Hackney and the university of London.

History.—The district now included in Middlesex was largely occupied by forest up to a comparatively recent period, and its population must always have been very sparse. A few prehistoric remains have been discovered at various times,—bones of the

| elephant, hippopotamus, deer, &c., at Old Brentford, elk horns

near Chelsea Hospital, fossil teeth, fish, fruit, &c., at Highgate, and quite recently, in 1879, while the foundations were being dug out for Drummond's New Bank at Charing Cross, a large number of prehistoric animal remains. Flint instruments have also been found to cover a considerable area. During the British period the district is supposed to have been inhabited by the Trinobantes, but

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the late Dr Guest affirms that the valley of the Lea was the western boundary of that tribe. In answer to the question—What became of the district betwecn the Lea and the Brent? this great authority states that the district was merely a inarch of the ‘‘ Catuvellauni,” a eommon through which ran a wide trackway, but in which was neither town, village, nor inhabitcd house. Dr Guest also declares that the boundaries of the Catuvellaunian state, a central kingdom formed or much extended by Cassivellaunus, can be traced in part along the northern limit of Middlesex by following an earthwork valled Grimesditch ‘‘from Brockley Hill to the woodland of the Colne Valley and thence to the Brent, and down the Brent to the Thames.” ! Some earthworks and encampments still exist which are attributed to the Britons.

When the country was under Roman rule great improvements, due to the growing importance of Londinium, were made in this district. Several roads in connexion with the city must have been constructed, more especially the great northern and eastern roads. Dr Guest does not believe that the present Watling Street could have had any connexion with the Watling Street which came down the Edgeware Road, passed along by Park Lane, and erossed the Thames at Westminster. In the Antonine Itinerary mention is made of three stations, viz., Londinium, Sulloniace, and Pontes. Sulloniacee is now Brockley Hill ; Pontes is supposed by Stukeley to mean Staines, but Horsley held that it was intended for Old Windsor, and others supported the claims of Colnbrook and Long- ford. Ronian camps have been found in many parts of the county, and Dr Stukeley supposed that the Brill, near St Pancras, was the site of the battle between Boadicea and the Roman legions which has left a slight record in the name of Battle Bridge. The Roman remains found at different times are too numerous to mention here in detail. Coins, urns, and tiles were found at Enfield, a sepulchral um at Hampstead, and numerous gold coins and ornaments at Bentley Priory, Great Stanmore, in 1781.

Cowey Stakes, about a furlong west of Walton Bridge, is supposed to be the locality of the ford by which Julius Cesar crossed the Thames. Caesar makes special mention of the sharp stakes which he had to encounter, and Bede says that the remains of the stakes were to be seen in his day. Camden was the first to fix upon this us the spot where Cesar crossed, and he is

supported by Dr Guest, but the indentification is not undisputed. Although a ford existed here as late as 1807, and stakes were found up to the end of the 18th century, it has been affirmed that they were placed in their nosition with another object than to oppose an eneiny's progress. Ferien remains have been found at Shepperton near Halliford, at the Middlesex end of the ford. A vase was dug up in 1817, and the remains of a Roman cemetery have also been discovered.

As to the earliest Saxon occupation we are left very much to con- jecture, and the name itself is somewhat of a puzzle. It is evident that no tribe could have cbtained the name of Middle Saxons until after the settlement of the districts on each side of it by the Kast and the West Saxons. As Middlesex was for a period dependent upon the kingdom of Essex, it is probable that the name did not come into use until London had become a Saxon city, although there is reason to believe that previously Saxon settlements had been made on several places by the river and elsewhcre. Bede tells us that London was in the hands of King Seberct in 604, and was then the chief town of Essex. Just a century afterwards—that is, in 704 —the king of the East Saxons granted away land at Twickenham, showing that Middlesex was then dependent upon Essex. It is worthy of note that the two districts now forming the eounties in which London and Southwark are situated were separated from the kingdoms to which they originally belonged probably on account of the importance of the city of London and the borough of Southwark, Middlesex from the kingdom of Essex and Surrey or the South Ridge (A.-S. Su%-rige) from the kingdom of Kent.

Middlesex appears never to have been independent. The admini- strative shire was let to the men of London and their heirs to_be held in farm of the king and his heirs, and ‘‘ the subject shire has to submit to the authority of the sheriffs chosen by the ruling eity. 7

Middlesex is only once mentioned in the Saxon Chronicle, under date 1011, where it is noticed as one of the districts overrun by the Danes. One manuscript (A. Winchester) mentions the Middle Saxons as receiving the true faith under their alderman Peada in 653 ; but this is evidently a mistake of the scribe, for the fact is taken from Bede, and he writes Middle Angles, as do the other MSS. of the Chronicle.

1 “Teeture on the Origin of London,” Atheneum, 1866, No. 2022.

2 Freeman, Vorman Conquest, vol. v (1876) p. 468.

3 In the above passage from the Chroniele, where the districts overrun by the Danes in 1011 are enumerated, the shires, whieh took their names from their chief towns, are distinetly marked off from the distriets whieh took their names from the peoples who inhabited them. Of the latter there are, besides the Middle Saxons, the East Angles, the Kentings, and the South Saxons. Middlesex ls styled an administrative shire, beeause it was not historically a shire, but only one for the purposes of administrative organization. Of the present forty counties twenty-cight are and twelve are not shires, Wessex was divided into six shires, and Mercia into eighteen, with the subsequent addition of Rutland, takcn

_The Saxons appear to have settled over a large portion of the district, and for the purpose of settlement they must have made considerable clearings in the vast forest of Middlcsex. There seems to be good reason for beheving that previous to their coming the roads passed throngh waste lands. By the time of Edward the Confessor a large proportion of the present towns and villages were in existence. Mr Elton, in his Origins of English History,* mentions a curious fact with relation to the tenures which prevailed in some of these places. He alludes to a ring of manors encircling ancient London where the custom of Borough English or junior right was prevalent.5 He then goes on to point out that in this cluster of manors there are several varicties of the custom:—‘‘ Its benefit in Islington and Edmonton was confined to the youngest son; at Ealing, Acton, and Isleworth it extended to the brothers and male eollateral heirs ; and in a great number of instances the privilege was given to females as well as to males in every degree of rclation- ship. These variations are of no very great importance, the custom being modified in all parts of the country by the rule that special proof must be given of any extension of that strict form of Borough English for the benefit of the younger son of which alone the eourts have cognizance. But it is of the greater interest to observe that in several places near London ‘it is the custom for the land to descend to the youngest, if it is undcr a particular

value of five pounds, but if it is worth more, it is parted among all the sons' (First Real Property Commission Evidence, p. 254)."

The great forest of Middlesex continued long after the Norman Conquest, and even as late as the reign of Elizabeth portions of it still existed quite close to London. Fitz Stephen, the monk of Canterbury and secrctary of Thomas a Becket, mentions in his interesting description of London the immense forest with its densely wooded thickets, and its coverts of game, stags, fallow deer, boars, and wild bulls. A few years after Fitz Stephen's death, in the reign of Henry I1I. (1218), the forest was disafforested, and some of the wealthy eitizens took the opportunity of purchasing land and building uponit. Matthew Paris, in his life of the twelfth abbot of St Albans, describes the woods contiguous to the Watling Street between London and St Albans as almost impenetrable, and so much infested by outlaws and by beasts of prey that the numer- ous pilgrims who travelled along the Roman road to the shrine of Albanus were exposed to imminent danger,

There is little further history that can be told of Middlesex. There are many intcresting incidents connected with some of the places, but corporate life has been crushed out of the eounty by the greatness of London. Not a single place except London has grown into importance, and nowhere outside of London is there a building of first-rate interest. The villages on the Thames early began to increase in size on account of the convenience of locomotion supplied by the river. It is only sinee the cxtension of the railway system that the villages to the north and north-west of London have grown in size, and this growth has been mainly due to the building of houses for the use of the Londoners.

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(it is believed) from Northamptonshire. Yorkshire was taken from Northumbria, Laneashire from Cumbria, and, last of all, Monmouthshire fiom Wales, by an Act of Henry VIIL.'s reign.

4 Pp, 188-89, and note. ;

5 Mr Corner gives the number cf instances he has found at sixtcen.

MIDDLETON, a market and manufacturing town of Lancashire, is situated on the Irk, near the Rochdale Canal, and on the Lancashire and Yorkshire Railway, about 5 miles north of Manchester and 4 west of Oldham. It includes the township of Tonge, an isolated portion of the parish of Prestwich. The church of St Leonards is an old structure of mixed architecture, with a low square tower. 'The oldest portion of the building dates from the 12th century, but the main portion from 1412, and the south aisle from 1524, It underwent extensive restoration in 1869. The Queen Elizabeth Grammar School, a build- ing in the Tudor style, was founded in 1572. There are public baths and a free library. The prosperity of the town dates from the introduction of manufactures at the close of last century. The staple trade is the spinning and weaving of cotton, and the other industries include silk weaving, calico printing, bleaching, dyeing, ironfounding, and the manufacture of soap and chemicals. There are several collieries in the neighbourhood. The town was at an early period in possession of the Bartons, from whom it passed by marriage in the 16th century to Sir Ralph de Assheton. The population of the urban sanitary district of Middleton and Tonge in 1881 was 18,952.

MIDDLETON, Conyers (1683-1750), the earliest and most eminent example of the spirit of theological rational- ism in the English Church of the 18th century, was the son of the rector of Hinderwell near Whitby, and was born at Richmond in Yorkshire, on December 27 (or, according to another account, on August 3), 1683. He graduated at Cambridge, took orders, and in 1706 obtained a fellowship, which he soon resigned upon contracting an advantageous marriage. In 1717 a dispute with Bentley, upon

an extortionate demand of the latter on occasion of Middleton's being created D.D., involved him in an acrimonious con- troversy, which called forth several pamphlets from his pen full of powerful invective, and among them his first considerable literary performances, the Remarks and Further Remarks on Bentley's Proposals for a New Edition of the Greek Testament (1721). "You have laid Bentley flat upon his back," wrote Colbatch. "I scorn to read what the rascal has written," wrote Bentley,—who, how- ever, only resorted to this affected disdain after a fruitless attempt to fix the authorship upon Colbatch, but who might justly have commented upon the impropriety of Middlcton's endeavour to visit his grievances upon the text of the New Testament. Private resentment and uncurbed personality were throughout his life too frequently the motive and the note of Middleton's controversial publica- tions. In 1723 he was involved in a lawsuit by person- alities against Bentley, which had found their way into his otherwise judicious tract on library administration, written on occasion of his appointment to the honourable office of university librarian. In 1726 he gave great offence to the medical profession by a dissertation contend- ing that the healing art among the ancicnts was only exercised by slaves or freedmen. Between the dates of these publications he visited Italy, and made those observa- tions on the pagan pedigree of Italian superstitions which he subsequently embodied in his Letter from Rome (1729). This cogent tract, while establishing the author's main proposition with abundant learning and wit, gave at the

'same time the first clear indication of the anti-supernatural-

istic bias of his intellect, and probably contributed to |

prepare the storm which broke out against him on his next publication (1731). In his remonstrance with Waterland on occasion of the latter's reply to Tindal's Christianity as Old as the Creation, Middleton takes a line which in his day, could hardly fail to expose him to the reproach of infidelity. He gives up the literal truth of the primeval Mosaic narratives; and, in professing to indicate a short

and easy method of confuting Tindal, lays principal stress on the indispensablencss of Christianity as a mainstay of social order. This was to resign nearly everything that divines of the Waterland stamp thought worth defending. Middleton was warmly assailed from many quarters, and retreated with some difficulty under cover of a sheaf of apologetic pamphlets, and a more regular attendance at church. A freethinker in the strict sense of the term he certainly was ; but how far freedom of thonght was carried by him it is not easy to ascertain. His adversaries—some of them men who gravely maintained that Egyptian civilization originated in the age of Solomon—were unable to fix any serious imputation upon him ; on the other hand it is clear that the natural attitude of his mind towards supernatural pretensions was one of suspicion, and that his temperament was by no means devout. That he was nevertheless not incapable of a disinterested hero-worship was evinced by his next important publication, the elegant but partial Life of Cicero (1741), a work which, if far below the standard of modern exactness, may yet compare in spirit and exccution with the best productions of the [talian Renaissance. It is, indeed, as remarked by Forsyth, “rather an historical composition, in which Cicero is the principal figure, than the portrait of the man himself”; and Dr Parr has pointed out Middleton’s unacknowledged obligations to the forgotten Bellendenus, which, however, with the ardour of a discoverer, he seems to have considerably overrated. The work was undertaken at the instance of Lord Hervey, in correspondence with whom also originated his disquisition on Zhe Roman Senate, published in 1747, The same year and the follow- ing produced the most important of all his writings, the Introductory Discourse and the Free Inquiry concerning the miraculous powers then commonly deemed to have subsisted in the church after the apostolic age. In com- bating this belief Middleton indirectly established two pro- positions of capital importance. He showed that ecclesi- astical miracles must be accepted or rejected in the mass ; and he distinguished between the authority due to the early fathers’ testimony to the belicfs and practices of their times and their very slender credibility as witnesses to matters of fact. Some individual grudge seems to have prompted him to expose, in 1750, Bishop Sherlock’s eccentric notions of antcdiluvian prophecy, which had then been before the world for a quartcr of a century. The same year he died of a decline at his scat at Hildesham in Cambridgeshire, leaving a widow, but no children.

Middleton’s most ambitious work is obsolete from no fault of his, but his controversial writings retain a permanent place in the history of opinion. In his more restrieted sphere he may not in- appropriately be compared to Lessing. Like Lessing’s, the character of his intellect was eaptious and iconoclastic, but redeemed from mere negation by a passion for abstract truth, too apt to slumber until called into activity by some merely personal stimulus. His diction is generally masculine and harmonious. Pope thought him and Hooke the only prose writers of the day who deserved to be cited as authorities on the language. Parr, while exposing his plagiarisms, heaps encomiums on his style. But his best qualities, his impatience of superstition and disdain of mere external authority, are rather moral than literary. As ascholar he is rather elegant than profound; as a controversialist he has more vigour than urbanity, and more wit than humour. He has been unjustly attacked both as author and as man by De Quincey, who strangely accuses his style of eolloquialism, and taxes him with eating the church’s bread while denying her doctrines. In fact Middleton’s private means were ample, his ecclesiastical emoluments trifling, and his candour obstrueted his path to much more considerable pre- ferment. The best general view of his intelleetual character and influenee is to be found in Leslie Stephen’s English Thought in the Eighteenth Century, ehap. vi. A handsome edition of lis works, containing several posthumous tracts, but not including the Life of Cicero, appeared in 1752.

MIDDLETON, Tuomas (c. 1570-1627), held a leading place among the dramatists of the reign of James I. His

popularity would seem to have first come to a height about 1607. ‘This is a fair inference from the fact that in this and the following year a whole swarm of comedies from his pen were licensed and published—A Z’rick to Catch the Old One, The Family of Love, The Phenix, Michaelmas Term, Your Live Callants, A Mad World My Masters. Only the first of these kept the stage after the author’s own generation, though in point of wit and constructive skill it is not superior to Zhe Phoenix (a serious comedy) or Your Five Gallants (a bustling and gaily humorous farcical comedy). The plot of the Z’rick bears a family likeness to that of Massinger’s Vew Way to

Pay Old Debts; the titles in fact might be interchanged. A ruined scapegrace outwits his creditors and a usurious uncle by coming to town with a courtesan and passing her off as a widow with a fortune, whom he treats with deferential friendship, but hardly dares to love, ruined and hopeless as he is. His uncle lends him money that he may woo in proper state ; his creditors also intrigue to have the honour of supplying him with all the needs of fashion; and the lady receives many costly presents from aspirants to her hand and fortune. Though Middleton was apparently not in high popularity till 1607, lhe had made his debut as a satirist ten years before ; and if Malone is right in his conjecture that the Mayor of Queensborough is identical with the Randall Earle of Chester mentioned by Henslowe in 1602, he had done dramatic work of a much higher kind. Like The Changeling, a later production, in which Middleton had the assistance of Rowley, the tragedy of the Mayor is named after a character in the insignificant comic underplot. Such a title scares away readers weary of half-intelligible Elizabethan fun and satire; but Simon the comic mayor is a very subordinate figure in the play, and the tragic portions alike in situation, characterization, and language rank among the very noblest productions of the Shake- spearian age. There are scenes in the Changeling also which Mr Swinburne, with a judgment that will not be disputed, assigns to Middleton, unsurpassed for intensity of passion and appalling surprises in the whole range of Elizabethan literature. The execution of these scenes is far beyond any power that Rowley showed in single-handed work, but well within the scope of the author of the Mayor of Queensborough and Women Beware Women. This last play, in which every one of the characters important enough to be honoured with a name perishes at the end in a slaughter so rapid as to be somewhat confus- ing, was apparently one of Middleton's later works, and the simple and measured development of the plot in the first acts seems to show traces of the influence of Massinger. Middleton's verse, when charged with the expression of impassioned love, contains many echoes of the verse of Romeo and Juliet, as if his ear had been fascinated by it in his youth. His language generally proclaims him an admiring disciple of Shakespeare's; and in daring and happy concentration of imagery, and a certain imperial confidence in the use of words, he of all the dramatists of that time is the disciple that comes nearest the master. The Witch, by which Middleton's name has of late been linked with Shakespeare's in groundless speculation as being part author of Macbeth, is

by no means one of Middleton's best plays. The plot is both intricate and feeble, as if the play had been written with a view to the half-comic spectacular exhibition of the witches, with their ribald revelry, their cauldrons, hideous spells, and weird incantations. Charles Lamb's comparison of Middleton's witches with Shakespeare's is one of the most exquisite morsels of criticism; but, when he says that Middleton's witches are "in a lesser degree fine creations," he ought perhaps to have added that' they are merely embodiments of the vulgar superstition, put on the stage to excite

laughter rather than fear among a half-believing audience, an audience ready to laugh at them in the light and ina crowded meeting, whatever each might do in the dark alone. That Middleton had any share in Macbeth is a conjecture resting solely on the fact that the opening words of the song of the witches about the cauldron in Shakespeare's Macbeth occur also in the incantations about a cauldron in the last act of Middleton's Witch, and that Middleton's song was inserted by Davenant in an '""amended " reproduction of Afacbeth. If either borrowed the words of this song from the other, that is no evidence of further co-operation ; besides all that is common to tle two was probably as much public property as a nursery rhyme. There is no evidence as to whether The Witch appeared before or after Macbeth. Middleton co-operated with Dekker in the Roaring Girl ; with Rowley in A Lar Quarrel, The Spanish Gipsy, and The Changeling; and with Jonson and Fletcher in The Widow (one of the few of Middleton's plays reproduced after the Restoration). Towards the close of his life Middleton got into difficulties with the privy council from writing a very clever political play apropos of Prince Charles's unsuccessful wooing of the Spanish infanta in 1623. The chief personages in Spanish politics and their manceuvres were represented with most ingenious skill in the pieces and movements of A Game at Chess. This play was stopped by royal authority, and the prosecution of the author was allowed quietly to drop. The few unimportant facts known in Middleton's private history are collected in Mr Dyce's admirable edition of his plays. He enjoyed the office of city chronologer, and was often employed to write pageants and masques, in one

case at least contracting for the whole exhibition, besides fur- nishing the words. He died in 1627, and was buried at Newington Butts.

MIDDLETOWN, a city and port of entry of the United States, and one of the shire towns of Middlesex county, Connecticut, lies on the right bank of the Con- necticut river, about 30 miles from its mouth, directly oppo- site the well-known Portland quarries, and 24 miles from New Haven by rail. Built on ground rising gently from the river, with its principal streets keeping the direction of the valley, and the cross streets climbing the slope, Middle- town is a place of considerable attractiveness, and the views from the higher points are particularly fine. Water Street, with the wharves and shipping, Main Street, with the commercial houses and hotels, and High Street, with its mansions and gardens and trees, are the leading lines of the city. On the high grounds behind stand the handsome buildings of the Wesleyan (Methodist Episcopal) University. The institution, mainly organized by Wilbur Fisk, D.D., was chartered in 1831. To the two buildings with which it started have been added Rich Hall, with the library of about 30,000 volumes, Judd Hall, with scientific collections of great value, the Memorial Chapel, erected in the centenary year of American Methodism, and the Observa- tory Hall. Since 1872 the courses of the university have been open to both sexes. In 1882 the number of pro- fessors was 20, and of students 191, including 14 females. The Berkeley Theological School (Main Street), founded by the Episcopal Church in 1854, had in 1882 7 pro- fessors and 41 students, with a library of 17,000 volumes. A hill 1} miles to the south-east of the city is occupied by the State General Hospital for the Insane, the principal building having a frontage of 768 feet, and the grounds extending to 230 acres; and on another hill to the south- west of the city stands the State industrial school for girls. As vessels drawing 10 feet of water can reach its wharves, Middletown carries on a considerable trade by the river. In 1882 1613 vessels, with a burden of 240,000 tons, entered the port, and 1613 vessels, with a burden of 350,000 tons,

cleared; and the Middletown district owned 83 sailing vessels and 22 steamers. Both the silver and the lead mines which were formerly worked in

the vicinity have been abandoned, but cast-iron, britannia, and silver-plated goods, sewing-machines, pumps, webbing, and tape are among the local manufactures. The population of the city increased from 5182 in 1860 to 6850 in 1880. First settled in 1636, Middletown was incorporated as a town in 1654, and as a city in 1784.

MIDDLETOWN, a manufacturing village of the United States, in Wallkill township, Orange county, New York, 55 miles N.N.W. of New York, at the junction of four railroads. It is a clean well-built place, in the midst of a fine dairy-farming and stock-raising district, manufactures saws, files, felt hats, blankets, agricultural implements, printers' materials, &c., and is the seat of the State Homeopathic Insane Asylum. The population was 6049 in 1870 and 8494 in 1880.

MIDHURST, an ancient parliamentary borough and market-town of Sussex, is picturesquely situated on a gentle eminence above the south bank of the West Rothcr, on three railway lines, 50 miles south-west of London and 12 north from Chichester. The church of St Denis (re- stored in 1881~83) is chiefly Perpendicular in style, but the lower part of the embattled tower is probably Norman. At the grammar school, founded in 1672, Richard Cobden and Sir Charles Lyell were educated. A new public hall was opened in 1882, The old castle of the De Bohuns stood on a mound above the river, now overgrown with trees. In ancient times a commandery of the Knights of St John of Jerusalem had jurisdiction over the district now forming the liberty of St John. The prosperity of the town depends chiefly on agriculture. A market is held weekly, and a fair three times a year. The population of the parlamentary borough, which has an area of 26,172 acres, was 6753 in 1871, and 7221 in 1881.

Midhurst is not mentioned in Domesday, being included under Easebourne, In the reign of Henry 1. it was held by the king as a minor barony. In the time of Edward 1. it passed into the possession of the De Bohuns. From the time of Edward II. till 1882 it returned two menibers to parliament, but since then only one.

MIDIAN was one of the peoples of North Arabia whom the Hebrews recognized as distant kinsmen, representing them as sons of Abraham's wife Keturah. The word Keturah means "incense"; thus the sons of Keturah

are the “incense-men,” not indeed inhabitants of the far south incense-land, but presumably the tribes whose caravans brought the incense to Palestine and the Mediterranean ports. So the Midianites appear in connexion with the gold and incense trade from Yemen (Isa. lx. 6), and with the trade between Egypt and Syria (Gen. xxxvii. 28, 36). At the time of the exodus the pastures of the Midianites, or of the branch of Midian to which Moses’s father-in-law (Jethro or Raguel, or Hobab) belonged, lay near Mount Horeb (Exod. iii. 1); and Num. x. 29 sq. implies that the tribe was at home in the desert of the wanderings. The Kenites, who, in spite of their connexion with Amalck (1 Sam. xv. 6), had friendly relations with Israel, and ulti- mately coalesced with the tribe of J udah, are represented in Judg. i. 16, iv. 11 as the kin of Moses’s father-in-law. The Kenites, however, can have been but one fraction of Midian which took a separate course from their early relations to Israel.1_ The main body appear in Judg. vi. as a powerful Bedouin confederation, invading Canaan from the castern desert, and ravaging the land as similar tribes have done in all ages when Palestine lacked a strong

1’The admixture of Midianite elements in Judah and the other border tribes of Israel is confirmed by a comparison of the names of the Midianite clans in Gen. xxv. 4 with the Hebrew genealogies (1 Chron. ii. 46, iv. 17, v. 24; Gen. xlvi, 9). i

government. With their defeat by Gideon and another defeat by the Edomites in the field of Moab, probably about the same time (Gen. xxxvi. 35), the recorded history of Midian closes.

A place Midian is mentioned 1 Kings xi. 18, and in later times the name lingered in the district east of the Gulf of ‘Akaba, where Kusebius knows a city Madian in the country of the Saracens and Ptolemy places Modiana. Still later Madyan was a station on the pilgrim route from Egypt to Mecca, the second beyond Aila (Elath). Here in the Middle Ages was shown the well from which Moses watered the flocks of Sho‘aib (Jethro), and the place is still known as ‘‘the caves of Shoaib.” It has considerable ruins, which have been described by Riippcll (Reisen, 1829) and Burton (Land of Midian, 1879).

MIDNAPUR, a district in the lieutenant-governorship of Bengal, India, between 21° 37’ and 22° 57’ N. lat., and between 86° 35’ 45” and 88° 14’ E. long., is bounded on the N. by Bankura and Bardwan, on the E. by Hooghly and Howrah, on the §. by the Bay of Bengal, and on the W. by Singbliun and Maénbhum, with an area of 5082 square miles. Its general appearance is that of a large open plain, of which the greater part is under cultivation. In the northern portion the soil is poor, and there is little wood. The country along the western boundary, known as the Jungle Mahals, is undulating and picturesque ; it is almost uninhabited. The eastern and south-eastern portions are swampy and richly cultivated. The chicf rivers of the district are the Hooghly and its three tribu- taries, the Rupnarayan, the Haldi, and the Rasulpur. The Midnapur high-level canal runs almost due east and west from the town of Midnapur to Ulubaria on the Hooghly 16 miles below Calcutta, and affords a continuous navigable channel 53 miles in length. There is also a tidal canal for navigation, 26 miles in length, extend- ing from the Rupnarayan river. The jungles in the west of the district yield lac, tasar silk, wax, resin, fire- wood, charcoal, &c., and give shelter to large and small game,

The census of 1872 returned the population of Midnapur at 2,540,963 (1,257,194 males and 1,283,769 females), including only 122 Europeans and 157,030 Mohammedans. The aboriginal tribes belong chiefly to the jungles and hills of Chutia Nagpur and Ban- kura ; the most numerous of them are Santals (96,921) and Bhumijs (35,344). Of high-caste Hindus the returns show 136,500; and the number of Kayasths is given as 101,668. Among the semi-Hindu- ized aborigines, the most numerous are the Bagdis, a tribe of culti- vators, fishermen, and day-labourers (76,825). Beclonging to agri- cultural castes there are 1,018,686. The four nmnicipalities are Midnapur (31,491), Chandrakona (21,311), Ghatal (15,492), and Tamluk (5849). Rice is the staple crop. Irrigation is effected chiefly from the high-level canal. Rent rates vary from 104d. an acre for the puorest quality of rice land to 18s. an acre for the best irrigable lands. The district suffers occasionally from drought ; floods are common, and very disastrous in their results. The prin- cipal exports are rice, silk, and sugar; and the chief imports con- sist of cotton cloth and twist. Salt, indigo, silk, mats, and brass and copper utensils are manufactured. Apart from the rivers, com- munication is afforded by 482 miles of road. The total revenue in 1870-71

was £262,578, and the expenditure £53,777. The pre- vailing diseases are fever, diarrhoea, dysentery, and cholera. The average mean temperature is 80° Fahr., and the average annual rainfall 66 inches.

The early history of Midnapur centres round the ancient town of Tamlik, which in the beginning of the 5th century was an import- ant Buddhist settlement and maritime harbour. The first con- nexion of the English with the district dates from 1760, when Mir Kashn ceded to the East India Company Midnapur, Chittagong, and Bardwan (then estimated to furnish one-third of the entire revenue of Bengal) as the price of his elevation to the throne of Bengal on the deposition of Mir Jafar.

Mipnapvr, chief town and headquarters station of the above district, is situated on the north bank of the Kaséi river, with a population in 1872 of 31,491. The town has a large bézdr, with commodious public offices. Itis healthy, dry, and well supplied with water. An American mission maintains an excellent training school, together with a printing press, and has founded several village schools in

the district. Its efforts have been particularly successful among the Santals, and some of the earliest and most valuable works on their language have issued from the Midnapur mission press. A brisk manufacture of brass and copper utensils takes place in the town ; it is also the centre of a large indigo and silk industry.

MIDRASH. Like all nouns of a similar form Midrash is the equivalent of the Niph‘al participle,’ and as such yields as many modified meanings as the root Darosh (Y77), to search, &c., itself has. The practical significa- tions, however, of Midrash, taken in historical order, are as follows:—(1) a book of records; (2) a recension of older, especially historical, materials; (3) search in and explanation of the Scriptures, notably the Pentateuch (in which case the plural is invariably Midrashoth) ; (4) theory as distinguished from practice ; (5) a college for study and teaching ; (6) an Agadic (that is, a free) explanation, in contradistinction to an //alakhic one ; (7) a collection of such free explanations (in which case the plural is Midrashim and occasionally also Midrashoth). Of these seven significations (1) and (2) are

to be found in the Bible,? (3) and (4) are mentioned for the first time in the Mish- nah, (5) is to be met with in the Midrash,* while (6) and (7) are to be found in early Rabbinic writings.®

The subject of this article will be—(1) the nature of Midrash in the sense of Agadah, to the exclusion of Halakhah (for which see MisHNAH), and (2) the develop- ment of this Midrash Agadah into books (Midrashim).

The thinking reader of the Scriptures cannot have failed to observe that by the side of their ceremonial element, be it negative or affirmative, permissive or jussive, there is also often to be met with (and sometimes so as to be insepar- able from it) a spiritual element. This spiritual element rests chiefly on feeling or emotion, and produces pious works only indirectly. Now the explanation or application of this element, either by the Scriptures themselves or by the rabbis, is traditionally called Midrash Haggadah (recitation, preaching) or Midrash Agadah ® (binding the soul to God and all that is godly).

This Haggadah or Agadah varies considerably both in nature and form. In its nature it sometimes humours, at other times threatens ; it alternately promises and admon- ishes, persuades and rebukes, encourages and deters. In the end it always consoles, and throughout it instructs and elevates. In form it is legendary, historical, exegetic, didactic, theosophic, epigrammatic ; but throughout it is ethical.

And varied as was and is the Midrash Agadah, so varied have been its fortunes. Whilst at times it stood very high in the estimation both of the teachers and the con- gregations in Israel,' it sank at other times very low indeed. Nay, at one and the same time, whilst some

1 Comp. Nehem. viii. 8, where NIP2 evidently stands for N7PI3. See also Kimhi on 2 Chron. xiii. 22, and Schiller-Szincssy, Exposition, &c., Cambridge, 1882, p. 11. 29 Chron. xiii. 22 and xxiv. 27.

3 See Nedarim, iv. 8, and Aboth, i. 17.

4 Bereshith Rabbah, c, xiii, (on Gen. xxv. 22): 95m xd xbny 2. TDYQ OW) Sys wotnd xdx. Midrash is used in the East to this day for Beth

Hammidrash. See MS. Oo. 6, 638 (of the University

Library, Cambridge), leaf 135a, lower margin Gwasps wisp on

-+ ew Dv).

5 Rashi (e.g., on Gen. iii, 8) and Tosaphoth, passim.

6 Those who identify this word as merely the Chaldaic form of the Hebrew Haggadah (and they have, certainly, some authority on their side) ought to write it Aggadah (7J4N), which, however, is not the traditional spelling of it (TIN). Singularly enough, the Latin religto is similarly derived by some from religare and by others from religere,

7 Siphere on Deut. § 49: ‘‘If thou wishest to know Him who but spake and the world came into being, learn Zaggadah; for by so doing thou wilt recognize the Holy One (blessed be He!) and cling to His ways !”

87, Y., Maseroth, iii. 4: ‘ And R. Ze’crah was teasing those rabbis of the Agadah.”:

rabbis exalted it to the skies,® other rabbis treated it with hatred,!° or, worse still, with contempt. There have actually been teachers whose treatment of it differed with the difference of the occasion.1? The fact is the Jews liked or disliked the Afidrash Agadah according to their

political condition on the one hand and their proximity

to Jewish professors of Christianity on the other. In the hour of prosperity the Jews preferred the Halakhah ;™ in that of adversity they ran to hear the consoling words of the Agadah.* When near Judzo-Christians, whose religious strength and argument chiefly rested on Agadah, the Jews disliked it; when among themselves, or when dwelling among Gentiles (heathen or Christian), they showed their wonted partiality for it.

But, whatever were the likings or dislikings of the Jews for the Midrashoth, it is certain that these traditions were early 16 committed to writing, and

formed into special volumes, known as “ Books of Agadah.” 7 Such were first some of the Zargumim and then the AMidrashim. Against writing down the traditional explanations of the Mosaic ceremonial there existed a distinct law,!’ which was observed down to near the end of the 6th century. At an earlier period isolated disciples only, in order to refresh their memory, wrote down short Halakhic notes, which, how- ever, they kept in secret..9 The Z’argumim and Midrashim, on the other hand, were composed very early and were numerous, while their extensive contents were circulated in public.

The Midrash, from whatever point of view it may be regarded, is of the highest value. It is of the lighes value, of course, to the Jew as Jew first, inasmuch as he finds there recorded the noblest ideas, sayings, and teach- ings of his venerable sages of early times. In the next place it has value to the Christian as Christian, since only by these ideas, teachings, reasonings, and descriptions can the beautiful sayings of the Founder of Christianity, the reasonings of the apostles, and the imagery of the sublime but enigmatic Apocalypse be rightly understood. But its importance appeals also to the general scholar, because of the inexhaustible mines of information of all kinds it con- tains. The philologist will find here numerous hints on lexi- cography and grammar, chiefly, of course, of the Semitic languages, but also of other tongues, notably Greek and Latin. The historian will gather here a rich harvest on geography, chorography, topography, chronology, nuiis- matics, &c. The philosopher will find here abundant and

9 Tbid.: ‘‘Then said to him R. Bo bar [son of] Kohano, Why dost thou tease them? Ask, and they will surely answer thee a

107, Y., Shabbath, xvi. 1: ‘‘ He who holds it forth becomes burned by it; he who listens to it gets no reward.”

11 bid. : ‘I never in my life looked into Agadic books.”

2 Jhid.: ‘Let the hand of him who wrote it be cut off”; and com- pare with this T. B., Bobo Bathro, 1230: ‘“goodly pearl.”

13 Beginning of Pesikotho Bahodesh Iasshelishi: ‘ First when the money was at hand one desired to hear the word of the Afishnah and the word of the Talinud….”

14 [bid.: ‘Now, however, when the money is not to be got, and, moreover, when we are sick in consequence of the (treatment by the) government, one pines for the word of the Bible and for the word of the Agadah.”

16 T. Y., Shabbath, xvi. 1, and T. B., Shadbath, 116a : gelia and other Christian writings.”

16 See Tosephto Shabbath, xiv.: ‘I remember that one brought before Rabban Gamliel the elder [St Paul’s teacher] the book of Job (in the) Chaldaic paraphrase”; and T. Y., Ailayim, ix. 4: ‘At that time I ran (my) eyes through the whole Book of the Psalms (in the form) of the Haggadah [Agadah of the Psalms].” R. Hiyya Rubboh belonged to the middle of the 2d Christian century.

WNNHTINI MAD. See T. B., Berakhoth, 23a, Temurah, 140, and the Talmudim, passim.

18 ‘T. B., Gittin, 600: ‘*In the college of R. Yishm‘ael it was taught, ‘These [see Exod. xxxiv. 27] thou oughtest to write down, but thou must not write down Halakhoth.’”

19 ‘T B., Shabbath, 6b: ‘

‘The Hvan-

valuable notices on logic, psychology, metaphysics, theo- logy, theosophy, esthetics, rhetoric, poetry, mathematics, geometry, astronomy, zoology, botany, biology, morphology, chemistry, medicine, physics, &c.

“from the ancients I gather understanding” (cxix. 100)— will find here valuable information on ancient ethnography in the full sense of the term— politics, political economy, law, military science, naval affairs, dc.

covery thought to belong to a recent age was well known

to these ancient doctors. ‘

The sources of the Agadah are five :—(1) the Targumim and especially those on the Prophets and Hagiographa ; (2) the non-canonical Mishnah (Mathnitho Boraitho ; sec MisunaH), which contains many valuable pieces, the age of which is often anterior, in essence if not in form, not only to those contained in the canonical Mishnah, but also to the sayings of the New Testament ; (3) the canonical (officially recognized) Jfishnah, which contains several entire treatises of an Agadic nature, as Aboth,! Middoth, &ec.,7 and numerous pieces scattered here and there among the Halakhah; (4) both Talmudim® (the Palestinian and Babylonian), which have thousands of Agadic notices interspersed in their Halakhoth; and (5) the Midrashim, kar eLoxyv. It is of the last alone, as represented by their principal collections, that we give an historical enumeration here :—

(1) Megillath Ta’anith is an historical Midrash consisting of twelve Perakim, and is called so on the principle of lwcus a non lucendo, seeing that in it are enumerated the days of the year on which a Jew must uot fast. The Aramaic part of it alone consti- tutes the real Jfegiliah, and belongs to the beginning of the 2d Christian century. The editio princeps came out at Mantua, 1513, 4to ; but cheap editions have been printed at Warsaw and elsewhere.*

(2) Sepher Yezirah is a philosophico-cabbalistic Adrash divided into six Perakim, which, in their turn, are subdivided into Mishniyyoth. It is variously ascribed to the patriarch Abraham and to R. 'Akibah, the illustrious teacher, who suffered martyrdom under Hadrian. To this rabbi the book, no doubt, belongs both in substance and form.® It has gone through numerous editions, the ed. prime, being of 1562 (Mantua, 4to), and has been translated into Latin, German, and English (New York, 1877).

(3) Othiyyoth de-Rabbi 'Akibah is a quasi-cabbalistie Midrash on the alphabet, belonging, ia essence if not in form, to the aforesaid teacher and martyr. #d. prine., Constantinople, 1520, 4to.

(4) Massekheth Hekhaloth is an astronomico-cabbalistie Adrash in seven Perakim. It is ascribed to R. Yishma'el the high priest.

+ A valuable edition of this treatise (in Hebrew and English) has been published by Dr C. Taylor, Cambridge, 1878.

? To these we may add, for the sake of convenience, although they do not, strictly speaking, belong to the canonical Mishnah, the Perek Rabb. Meir and the Agadis parts of the Massekhtoth Ketannoth.

- *Two collections of Talmudic Agadoth were made early in the 16th century:—(1) Haggadoth Hattalmud, Constantinople, 1511, folio, of which apparently only five copies are in existence, the finest of these being preserved in the University Library of Cambridge ; and (2) 'En Ya'akob (or 'En Yisrael), of which numerous and cheap editious exist, the ed. prince. being that of Salonika, 1516-22.*

4 Almost all that the latest critics have said concerning the age of the various Targumim and Midrashim will have to be unsaid. Not only are negative statements difficult of proof; in this case they are absolutely incorrect. We shall only give two examples. The state- ment ' Vayyikra Rabbah cannot be early, as Rashi did not know of it, since he nowhere mentions it," is doubly incorrect: Rashi does quote it (¢.g., on Haggai i. 1). Again the statemeut '" We must not omit to observe that no early Jewish commentator—Rashi, Ibn Ezra, &c.— mentions the Targum either to Proverbs or to Job and Psalms; Nathan ben Jechiel (12th century) is the

first who quotes it," contains a re- ductio ad absurdum in itself. For Nathan b. Yehiel was, as is well known, a somewhat older contemporary of Rashi (od. 1105), and lived full a hundred years before Ibn 'Ezra!

5 See T. B., Synhedrin, 65b and 67d. Inthe former place it distinctly speaks of the Sepher Yegirah (71S? DD), and, although in the latter place it speaks of the Milekhoth Yezirah (18) mi5n), there cannot be a doubt that Sepher (15D) and HHilekhoth (mada) are there identical. Moreover, Alishniyyoth and Halakhoth are, in a cer-

tain sense, convertible terms (see MisHNAH); and our book (as remarked above) consists of Afishniyyoth.

The statesman—parti- cularly if he be inclined to follow the Psalmist's advice—

The true scholar will find out by the study of the Agadah that many a dis-

MiDdDRASH

Judging from internal evidence on the one hand, and from what is

known of R. Yishma'el in the Zalmudim and Midrashim (Babli

Berakhoth, 7a and elsewhere) on the other hand, there seems to be

no valid reason for doubting that he is the author of this small but

sublime book. This Midrash is printed in the collection Areze

Lebanon (Venice, 1601, 4to) under the title of " Pireke Hekhaloth"

and " Massckheth Hekhaloth," and a MS. of it is preserved in the

University Library of Cambridge (Dd. 10. 11. 7. 2). The work,

however, called "'The Greater and the Lesser Zekhaloth," in thirty – Perakim, printed in this century, somewhere in Poland, contains,

besides the ancient literature, a good deal of matter which is of inch later date.

(5) Seder ‘Olam (the Greater and the Lesser) are two historical Midrashim, the former of which belongs to the 2d century, whilst the latter (which is a mere extract of the former) belongs to a late age indeed (the Gaonaic). They have been repeatedly printed, always together, the ed. prine. being Mantua, 1513, 4to,

(6) Haggadah shel Pesah is a liturgical Midrash of the middle of the 2d century, as far as its main portions go. It exists now in three principal and several minor recensions in accordance with the various rituals (see Mauzor), and is recited at the domestic service of the first two Passover evenings. The editions are too nunierous to be mentioned, the ed. prine. being Constantinople, 1505, folio.

(7) Megillath Antiokhos treats ostensibly, as its name indicates, of the sufferings of the Jews under Antiochus Epiphanes, and their deliverance from his tyranny, but in reality of their sufferings under Hadrian and their deliverance under Antoninus Pius. The Aramaic text, with the exception of a few interpolations, belongs to the middle ofthe 2dcentury. This little “roll” was for the first time published by Filipowsky (London, 1851, 32mo). A MS. copy of the Hebrew is preserved in the University Library of Cambridge (Dd. 8. 34).

(8) Zohar (Midrash Hazzohar, Midrasho shel Rabbi Shim’con b. Yohai, Midrash Yehi Or, &c.) is a cabbalistic Midrash on the Pen- tateuch, Canticles, Ruth, and part of Lamentations. It is variously ascribed to the famous R. Shim‘con (disciple of R. ‘Akibah, &c.) and to R. Mosheh b. Shemtob of Leon (a second-rate cabbalist of the time of Nahmanides and Ibn Addereth). The Zohar belongs, strictly speaking, to neither of these, whilst, in a certain sense, it belongs to both. The fact is—the nucleus of the book is of Mishnic times, and R. Shim’eon b. Yohai was the author of the Zohar in the same seuse that R. Yohanan was the author of the Palestinian Talmud, ¢.¢., he gave the first impulse to the composi- tion of the book. But R. Mosheh of Leon,®on the other hand, was the first not only to copy and disseminate the Zohar in Europe, but also to disfigure it by sundry explanatory interpolations. For nore details see Lumby, “ Introduction to

the Epistle of Jude," in the Speaker's Commentary, vol. iv. p. 888. The first two editions of the Zohar' on the Pentateuch came out simultaneously (Mantua, 1558-60, 4to, and Cremona, 1558, folio), and the ed. prine. on Canticles, Ruth, and part of Lamentations came out at Salonika (1597, 4to). The best, though by no means critical, edition on the Pentateuch is that of Brody, 1878, Svo. Of translations, such as they are, there exist those of Knorr v. Rosenroth, Kabbala denudata (vol. i., Sulzbach, 1677, aud vol. ii., Frankfort, 1684, 4to), and Tholuck, Wichtige Stellen, &c. (Berlin, 1824, 8vo), &c.8

(9) Pestkotho® (commonly, but by mistake, called Pestkta) derab Kohano is a homiletic Afidrash consisting of thirty-two Pesiktoth for the principal festivals and fasts, and the historically noted sabbaths aud other days. It is of the end of the 3d or the beginning of the 4th century. Having been but rarely quoted since the 12th century, so that most scholars knew of it only

8 R. Mosheh of Leon is a fair sample of the mediocrity of his time in cabbalistic lore, and combined, as is usual, with his mediocrity an illimitable vanity; see MS. Dd. 11. 22 (Cambridge University Library), leaf 2a: " And I adjure every one who should deeply study this book, or who should copy it, or read it, that he do not blot out my name from my property (inheritauce), for I have composed it…." This statement alone would suffice to prove that R. Mosheh of Leon could never have ascribed a book composed by hiinself to anybody else.

7 The Zohar, cleared of the main works by which it is surrounded, aud of the interpolations by which it has been disfigured both by its first European copyist and by others down even to our own days, was begun in Palestine late in the 2d or early iu the 3d century, and finished, at the latest, in the 6th or 7th century. It is impossible that it should have been composed after that time and before the Renaissance, as both language and contents clearly show.

8 Whilst the principal editions of the many textual extracts made from the Zohar (as the Fdderoth, &c.) need not be specified here, those of the following supplementary and kindred works ought to be men- tioned:—(1) Tikkune Hazzohar (ed. prine. Mantua, 1557, 4to), and (2) Zohar Hadash (ed. prine. Cracow, 1603). Nor should the Kontres missepher Hazzohar,

Hibburo Pinyono (by the otherwise very learned Yitshak b. Mosheh of Satanow) be passed over. It is a mere imitation of the Zohar,—an imposition of a kind which is a disgrace to literature.

**For the three Midrashin—Mekhilto, Siphro, and Siphere—sce under MIsHnau.*

aw hf AS A

indirectly, it was long considered lost, till, in 1868, Salomon Buber of Lemberg, a man cf learning, wealth, and love for the ancient literature of his nation, edited it from four MSS., one of which (formerly in possession of Carmoly) is now preserved in the Uni- versity Library of Cambridge (Add. 1497). The printed edition appeared at Lyck, 8vo.

(10) Pesikto Rabbathi, consisting in the latest edition of eighty- four Piskoth, is a Midrash of the same nature, and, in its main part, almost of the same date, as (9). Both drew from the same sources. This Afidrash has been edited five times,—the latest, best, and cheapest edition being that of Friedmann (Vienna, 1880, 8vo).

(11) Tanna debe Kiiyyahu consists of two parts, the Greater (Rabbo) and the Lesser (Zutto),—the former in thirty-one and the latter in twenty-five Perakim. It is an exegetical Afidrash, the name of which is alrealy known to the Bereshith Rabbah (ec. liv.) and the Babylonian Talmud (Kethuboth, 106a). It is only un- critical criticism that can declare it a Gaonaic work, although, like all other old books of the Jews, it is not without later additions, Ed. princ., Venice, 1598, 4to. There are modern and cheap Polish editions.

(12) Midrash Rabbah (N31) or Rabboth (N34) is chiefly an exegetical and homilctical Mfzdrash on the Pentateuch and the " Five Rolls" (Hamesh Megilloth, t.e., Canticles, Ruth, Lamenta- tions, Ecclesiastes, and Esther). It is called Rabbah either from the third (the first distinctive) word of its beginning ("YUIT 925 . ++ 4435) or from its being the most voluininous! Alidrash ; hence also Rabbo (N17). The Midrash on Canticles (and Ecclesiastes) is now and then also called Afidrash Hazitha (fromm the first distine- tive word of the beginning NM). These ten Aidrashim are, certainly,

of various styles and ages; yet none of them is, inter- polation excepted, later than the beginning of the 5th century.? It is remarkable that, although the Afegidloth themselves had been carly attached to the Pentateuch (since they were long before the 10th century, and still are, read through the synagogal year, even as was and still is the Pentateuch itself), the Rabloth had no common editio princeps'—that on the Pentateuch appearing for the first time

1The Rabbah on Genesis has 100 Parshiyyoth, that on Exodus 52, that on Leviticns 37, that on Numbers 28, and that on Deuteronomy 11. These five Midrushim are quoted according to their chapters. The Rabbah on Canticles accommodates itself to the sacred text, and Is quoted accordingly. Ruth has 8 Parshiyyoth, and is quoted according to these. Lamentations has 1 chapter consisting of 33 introductions (Pethihotho Dehakkime), accommodating itself, for the rest, to the sacred text. Ecclesiastes has 8 Sedarim, and Esther has 6 Parshiyyoth. At various times various modes of quoting these A/idrashim are current,—the most common and most expedient, however, being that of quoting them according to the verses of the Bible.

2 Here might with advantage be mentioned some pieces of literature which are kindred in nature, although some of them are of much earlier date, whilst others are much later, than the ten Afidrashimn just mentioned :—(1) Agadath Bereshith on Genesis, in eighty-three chapters, —edited for the first time by R. Menahem de Lonsano in his Shete Yadoth, Venice, 1618, 4to; (2) Midrash Vayyisa'u on Genesis xxxv. 5, in one chapter,—to be found in Jellinek's Bet ha-Midrasch, Leipsic, 1855, 8vo; (8) amplifications of chapter lxx. of our Afidrash Rabbah, on Genesis xxviii. 22, by the incorporation of the whole Apocryphon TYobit in Aramaic, &c. (see The Book of Tobit, &c., Oxford, 1878, 8vo); (4) Afidrash Vayyosha' on Exodus xiv. 30, xv. 1-18,—printed at Constantinople, 1519, 4to; a MS. of this Midrash is preserved in the University Library, Cambridge (Add. 854) ; (5) Midrash 'Asereth Maddibberoth on Exodus xx.,—priuted in Jellinck's Bet ha-Midraseh, Leipsic, 1858, 8vo ; (6) Alidrash Petirath Aharon on Numbers xx. 238-29; (7) Midrash Petirath Mosheh on Deuteronomy xxxiv.; (8) Midrash Abbo Gorion on Esther; the last three are to be found in the before-mentioned Bet ha-Midraseh ; (9) Midrash Shemuel, also called, from

its beginning, ‘th la‘asoth Ladonai, Constantinople, 1517, folio; (10) Midrash Yonah, Prague, 1595, 4to; (11) Midrash Tillim (Tehillim), 1512; (12) Midrash Mishele, 1517; the last two are printed at Constantinople, and in folio; (13) Sepher Hayyashar (iu which a good many old traditions are preserved, although it is, of course, not the one mentioned in various books of the Bible), Venice, 1625, 4to; (14) Dibere Hayyamim shel Mosheh, Constanti- nople, 1516, 4to; a fragment of this is to be found in MS. Add. 532. 4 in the University Library of Cambridge ; (15) Yosephon (or Josippon), various works of Flavius Josephus worked up rather freely, Mantua, 1480, folio,—translated into Latin (German and Spanish) several times ; (16) Zerubbahel, Constantinople, 1519, 8vo ; (17) Elleh Ezkerah on the “Ten Martyrs.” For several other smaller Midrashim see Jellinek’s Bet ha-Midrasch, i. and ii., 1858, iii., 1855, iv., 1857, all at Leipsic ; v., 1878, and vi., 1877, both at Vienna; and comp. also Horowitz, Sammlung Kleiner Midrasehim, i., ii., Frankfort, 1881-82. The Midrashim on Isaiah and on Job seem now irretriev- ably lost.

3 As if to compensate for this drawback, the well-known Cornelio Adelkind brought out at Venice, in 1545, two editions of the Rabboth ou the Pentateuch aud Afegilloth, the one at Bombergi’s house and the

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in 1512 (Constautinople, folio), and that on the Afegilloth in 1519

(somewhere in Italy, medor 3A, alsoin folio).4 The latest and best edition is that of Vilna, 1880, folio. A translation in German is now coming out at Leipsie, by Dr A. Wiinsche.

(18) Pireke de-Rabbi Elvezer (also called Loraitho de-Rabbi Elvezer) is an astronomico-thcosophical Midrash consisting of fifty-four Perakim. It goes through the so-called “ eighteen bene- dictions,” the signs of the zodiac, &c., but is unfinished. It belongs, no doubt, to the 5th century. The fact that the name “ Fatima ” occurs in it is no proof whatever that the book is post-Mohanimedan, as that name must have becn already known to the idolatrous Arabs, Ed. prin., Constantinople, 1514, and with a Latin translation, Leyden, 1644, both editions being in 4to. There are also now to be found cheap editions (Lemberg, Warsaw).

(14) Tanhuma is an excgetical and homiletical Afdrash on the whole Pentateuch. It is quoted according to the Parshiyyoth of the week. Although originally of the end of the 5th or the beginning of the 6th century, it has now two principal additions, which form part of the book :—(1) several of the Shectloth of Rab Ahai Gaon (of the 8th century), and (2) several pieces of the Yesod of R. Mosheh Haddarshan, of Narbonne (of the 11th ccutury), On its relation to the "Yelammedenu" (often quoted in the 11th century, but supposed to be lost) light will soon be thrown by the before-mentioned Salomon Buber, who is now preparing a critical edition of it. The ed. prine. of the Tankuma is Constantinople, 1522, folio; and a very valuable MS. copy of it is in the Cam- bridge University Library (Add. 1212),

(15) Bahtr is a small cabbalistic Afidrash ascribed to the pre- Mishnic teacher, R. Nehunuyah b. Hakkanah,—no doubt from its beginning with the words.- AIPA JA ANN 137 WRK. Nahmanides (00. c. 1268) quotes this book often in his commentary on the Pentateucl, under the names of Sepher Habbahir, or of – Midrusho shel Rabbi Nehunyah b. Hakkanah. Some have pro- nounced this work a late fabrication, but others, who have thoroughly studied it, justly describe it as "old in substance if not inform." d. prine., Amsterdain, 1651, 4to. A cheap edition appeared at Lemberg (1865, 8vo), and a MS. of this work is pre- served in the University Library of Cambridge (Dd. 10. 11. 4).

(16) Valkut is the only existing systematic if not exhaustive collection of the Agadoth on the whole Bible. Its author drew not only from most of the Midrashim named in this article, but also from the Boraithoth (see Misunau), both Talmudim, and the Midrashic works now lost (as the Abkhir, Hasshekhem, or Hashkem, &c.).6 This fact constitutes one of the principal points ofits value. The author was R. Shim'eon, brother (and not son) of R. Helbo, and father of the distinguished grammazian, critic, and divine R. Yoseph Kara. He lived somewhere in the north of France in the 11th century. The ed. prine. of the Yalkut on Ezra, Nehemiah, and the books of Chronicles came out at Veuicc, 1517, folio (in the first Rabbinie Bible); that on the Prophets and Hagiographa in 1521, and that ou the Pentateuch in 1526-27, both at Salonika, and in folio. An English translation of the whole work has been undertaken by a band of Rabbinic scholars in Cambridge. The first instalment, "The Yalkut on Zechariah," by E. G. King, B.D.,

Hebrew lecturcr of Sidney Sussex College, appeared in 1882. This specimen, besides giving a correct trans- lation, contains many valuable notes.

*(17) Lekah Tob is a Midrash on the Pentateuch and the five Megilloth, by R. Tobiyyaliu b. Eh'ezer of Greece, who lived during the crusade of 1096. This work draws, certainly, upon the old and well-known Midrashim, and as such it would have thoroughly deserved the censure passed upon it by the witty but somewhat irreverent Abraham Ibn 'Ezra (in his preface to his commentary on the Pentateuch). But the Lckah Tob has also most valuable explanations both by the collector himself and by his father (R. Ehtezcr), a faet passed over by Ibn 'Ezra in silence. The Lekah Tob on Leviticus, Numbers, and Deuteronomy canie out for the first time at Venice, in 1546, folio, under the title of Pesiito Zuttarto (see Icaf 980 in the postscript by the editor, NNp*DHN NNW, which explains the somewhat vague title on the title- page MND IN KNW XNpP'D}). = In_ 1753-54 it was repul- lished at Venice, with a Latin translation, by Blasius Ugolinus in his Thesaurus Antiquitatum Sacrarum (xv.-xvi.) under the name of Pesictha. The Lekah Tob on Genesis and Exodus was*

other at Giustiniani's. These two editions differ in nothing but in the title-pages, &c., and the vignettes of the various books. The former edition is in possession of Dr W. Aldis Wright, aud the latter in that of DrC. Taylor. The fact of these editions having appeared, simultaneously is, apparently, unknown to the bibliographers.

4It is noteworthy that in this edition Ahashverosh, 1.¢., Esther, stands between Lamentations and Ecclesiastes, with which latter the Midrash on the Megilloth ends. > :

5 We may mention here the ed. prine. of three cabbalistic-Midrashic collections which go under the name of Valkut :—(1) Yalkut Hadash, Lublin, 1648, 4to; (2) Yalkut Reubeni Hakkatan, Prague, 1660, 4to; and (3) Yalkut Reubeni Haggadol. Wilhermsdorf, 1681, folio.

published, with a critical commentary, at Vilna, by Salomon Buber (1880, 8vo), where also simultancously a third edition of this Midrash on the last three books of Moses, with a short commentary on it, came out by Aharon Mosheh Padova, of Carlin. The Lekah Z'ob on the five Afegilloth is as yet unpublished ; there exist, how- ever, several good MSS. of it, both in public and private libraries, the finest copy in every respect being that preserved in the Uni- versity Library, Cambridge (Add. 378. 1). ;

(18) Menorath Hammaor is a scientific, though incomplete, collection of the principal Agadoth of the Talmudim and Midrashim, by R. Yizhak Abohab the elder(flourished 13th century). The editions, with and without translations, are very numerous, ~~— the ed. prince. being Constantinople, 1514, folio. 'There are trans~~ lations in Spanish, Judeo-German, and German, but not in English.

We append two specimens of Midrashim,—the first from

Pesikotho, leaf 1270, and the second from Midrash Shemoth Rabbah, cap. il.

First Specimen.—The loly One (blessed be Ife!) said to the Prophets,! Go ye and comfort ye Jerusalein !

Then went Hosea to comfort her and said, The Holy One (blessed be He!) sent me to thee to comfort thee. She said, What hast thou in thine hand to comfort me? The Prophet said (xiv. 6 [5]), "1 will be as the dew unto Israel!" But Jerusilem said to him, Only yesterday thou toldest me (ix. 16), " Ephraim is sinitten, their root is dried up, they shall bear no fruit: yea, though they bring forth, yet will 1 slay even the beloved fruit of their womb!" and now thou speakest to ine thus. Which shall we believe, the first or the second prophecy ?

Then went JorkL to comfort her and said, The Holy One (blessed be He!) sent me to thee to eomfort thee. She said to him, What hast thou in thine hand to eomfort me? The Prophet said (iv. 18), "And it shall come to pass in that day that the mountains shall drop down new wine, and the hills shall flow with milk, &¢c.!" But Jerusalein said to him, Only yesterday thou toldcst me (i. 5), " Awake, ye drunkards, and weep; and howl, all ye

drinkers of wine, becanse of the new wine; for it is cut off from your mouth!" and now thou speakest to me thus. Which shall we believe, the first or the second prophecy?

Then went Amos to comfort her and said, The Holy One (blessed be He!) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to comfort me? nacle of David that is fallen!" But Jerusalem said to him, Only yesterday thou toldest me (v. 2), 'The Virgin of Israel is fallen; she shall no more rise!" and now thou speakest to me thus. Which shall we believe, the first or the second prophecy ?

Then went Micau? to comfort her and said, The Ffoly One (blessed be He!) sent me to thee to eomfort thee. She said to him, Whut hast thou in thine hand to comfort me? The Prophet said (vii. 18), " Who is a God like unto Thee, that pardoneth iniquity and passeth by the transgression of the remnant of His heritage?" But Jerusalem said to him, Only yesterday thou toldest me (i. 5), " For the transgression of Jacob is all this, and for the sins of the house of Isracl, &c.!"? and now thou speakest to me thus. Which shall we believe, the first or thie second prophecy ?

Then went NAuum to comfort her and said, The Ffoly One (blessed be Te!) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to eomfort me? The Prophet said (i. 1 [i. 15]), " For the wicked shall no more pass through thee!" But Jerusalem said to him, Only yesterday thou toldest ine (i. 11), " There is one come out of thee that imagineth evil against the Lord, a wicked counsellor!' and now thou speakest to me thus. Which shall we believe, the first or the seeond prophecy ?

Then went Hasakkux to comfort her and said, The Holy One (blessed be He!) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to comfort me? The Prophet said (iii. 13), " Thou wentest forth for the salvation of Thy people, even for the salvation: with Thine Anointed One!" But Jerusalem said to him, Only yesterday thou toldest ine (i. 2), " O Lord, how long shall I ery and Thou wilt not hear, even cry out unto Thee of violence and Thou wilt not save!" and now thou speakest to me thus. Which shall we believe, the first or the second prophecy ?

Then went Zepuanian to comfort her and said, The Holy One (blessed be Ie!) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to comfort me? The Prophet said (i. 12), ' And it shall come to pass af tliat time that 1 shall seareh Jerusalem with lights!" But Jerusalem said to him, Only yesterday thou toldest me (i, 15), '* A day of darkness and glocminess! " and now thou speakest to me thus. Which shall we believe, the first or the second prophecy?*

Then went Ifaccat to comfort her and said, The Holy One (blessed be He!) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to comfort me? The Prophet said (ii, 19), 'Is the seed yet in the barn! Yea, as yet the vine and the fig tree and the pomegranate and the olive tree hath not brought forth: from this day will 1 bless you!" But Jerusalem said to him, Only yesterday thou toldest me (i. 6), "" Ye have sown much and bring in little, &c.1" and now thou speakest to me thus. Which shall we believe, the first or the second prophecy.

'Then went ZecHarian to comfort her and said, The Holy One (blessed be He !) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to comfort me? The Prophet said (i. 15), "Aud F am very sore displeased with the heathen that are at ease: for 1 was but a little displeased and they helped forward the affliction!" But Jerusalem said to him, Only yesterday thou toldest me (i. 2), " The Lord hath been sore displeased with your fathers! " and now thou speakest to me thus. Which shall we believe, the first or the last prophecy ?

Then went Maracni to comfort her and said, The Holy One (blessed be He!) sent me to thee to comfort thee. She said to him, What hast thou in thine hand to eomfort me? The Prophet said (iii. 12), "And all nations shal} eal] you blessed : for ye shall be a delightsome land!" But Jerusalem said to him, Only yesterday thou toldest me (i. 10), '1 have no delight in you!" and now thou speakest to me thus. Which shall we believe, the first or the last prophecy ?

Then went all the Prophets to the Moly Oue (blessed be He!) saying to lim Lord of the Universe, Jerusulem will not accept consolation at our hands. Then the Holy One (blessed be Het) said to them, '1 and you will together go to comfort her; and this is why it says (Isaiah xl. 1), Comfort ve,.comfort

ye MY PEOPLE, comfort her wird Mn.3 Comfort her, ye eelestial ones! comfort her, ye terrestrial ones! Comfort her, ye living ones! comfort her, ye dead ones! Comfort her in this world! comfort her in the world to come !

1 Comp, Pestkto Rabbathi, cd, Friedmann, leaf 138d,

2 See Pesikto Rubbatht (ed. Friedmann, leaf 1385), where it says (before the paragraph on Vahum), " "Obadyah prophesied for Edom, and Yonah for Nineveh," This, it is true, is a mere gloss; but it is the true reason why these two prophets are left out,

3 There is a play here upon the meaning of the Hebrew $)9}), whieh may be read either 'Ammd ("iny people") or "Jmmt (with me").*

The Prophet said (ix. 11), 'In that day will 1 raise up the taber- |

MIE—MIE

lg

Seconp SprcimeN.—And whom does He try? The righteous one; for it says s. xi. 5), " The Lord trieth the righteous." And by what does Ie try him? by the feeding of sheep. David Te tried by sheep and found him a good shepherd, for it says (Ps. Ixxviii. 70), " And He took him from the 'restraints' of sheep." What is the meaning of 'd/immikhieoth?' Theroot is the same as that of 'vayytk- kale [haggeshem] (Gen. viii. 2), " And the rain was restrained." David restrained the big shecn in favour of the small ones. He bronght out first the young ones, so that they should feed on the tender herbs; then he brouglit ont the old ones that they should feed on the less tender herbs; and, tinally, he brought out the strong sheep that they should feed on the coarser herbs. Upon this the Holy One (blessed be lle!) said, He who understandeth to feed sheep according to their strength, let him come and feed My people! And this it is what is written (Ps. lxxviii. 71), " From following the ewes great with young He brought him to fved Jacob His people!"" And the same wus the case as regards Moses, whom the Holy One (blessed be He!) tried by sheep. Our rabbis say, When Moses our teacher (peace be upon him!) was feeding the sheep of Jethro in the wilderness, a kid ran away from him, and Moses ran after it till they came*

to a mountuiu- hollow. When it had reached the monntain-hollow there was a pool of water, and the kid stood still in order to drink. When Moses reached the kid he said to it, 1 did not know that thou didst run away from me because thou wast thirsty and faint. Thereupon he put it on his shoulders and walked back with it to the flock. Then said the Holy One (blessed be He!), Thou art compassionate in the feeding of sheep belonging to mere flesh and blood (man); as thou livest, thou shalt feed My flock, even Israel! Behold, this it is that is written (Exod. iii. 1), '© And Moses was feeding the flock, &c." (S. M. S.-S.)

MIEDZYRZECZ PODLASKI (Russian, Mejiryechie), a district town of Russian Poland, in the government of Siedlce, 16 miles to the east of the government capital, on the railway between Warsaw and Brest-Litovskiy. It is first mentioned in the year 1390 as a feudal dominion of King Yaghello. After frequently changing hands it became the property of the Czartoryski, and afterwards of the Potocki family, whose palace is still to be scen in the town. Its 10,000 inhabitants—half of whom are Greek nonconformists, and half Jews and Poles—carry on some trade in bristles, and pursue minor industries.

MIERIS, the name of a family of artists who practised painting at Leyden for three generations in the 17th and 18th centuries.

I. Frans van Mirnis, the elder, son of Jan van Micris, a goldsmith and diamond setter, was born, according to Houbraken, at Leyden on the 16th of April 1635, and died there on the 12th of March 1681. His father wished to train him to his own business, but Frans preferred drawing to chasing, and took service with Abraham Tor- envliet, a glazier who kept a school of design. As often happens, the youth's style was influenced by his earliest surroundings. In his father's shop he became familiar with the ways and dress of people of distinction, Tis eye was fascinated in turn by the sheen of jewellery and stained glass; and, though he soon gave up the teaching of Torenvliet for that of Gerard Dow and Abraham van den Tempel, he acquired a manner which had more of the finish of the exquisites of the Dutch school than of the breadth of the disciples of Rembrandt. It should be borne in mind that he seldom chose panels of which the size exceeded 12 to 15 inches, and whenever his name is attached to a picture above that size

we may surcly assign it to his son Willem or to some other imitator. Unlike Gerard Dow when he first left Rembrandt, or Jan Stcen when he started on an independent career, he never ven- tured to design figures as large as life. Characteristic of his art in its minute proportions is a shiny brightness and metallic polish. The subjects which he treated best arc those in which he illustrated the habits or actions of the wealthier classes ; but he sometimes succceded in homely incidents and in portrait, and not unfrequently he ven- tured on allegory. He repeatedly painted the satin skirt which Terburg brought into fashion, and he often rivalled Terburg in the faithful rendering of rich and _highly- coloured woven tissues. But he remained below Terburg and Metzu, because he had not their delicate perception of harmony or their charming mellowness of touch and tint, and he fell behind Gerard Dow, because he was hard and had not his feeling for effect by concentrated light and shade. In the form of his composition, which sometimes represents the framework of a window enlivened with

4 Who, on reading this, does not think of such passages in the New Testament as Matt. xviii. 12, xxv. 21,and John x. 14?

greenery, and adorned with bas-reliefs within which figures are seen to the waist, his model is certainly Gerard Dow. It has been said that he possessed some of the humour of Jan Steen, who was his friend, but the only approach to humour in any of his works is the quaint attitude and look of a tinker ina picture at Dresden, who glances know- ingly at a worn copper kettle which a maid asks him to mend.

It is a question whether Houbraken has truly recorded this master's birthday. One of his best-known pieces, a party of ladies and gentlemen at an oyster luncheon in the hermitage at St Petersburg, bears the date of 1650. Celebrated alike for composition and finish, it would prove that Mieris had reached his prime at the age of fifteen. Another beautiful example, the Doctor Feeling a Lady's Pulse in the gallery of Vienna, is dated 1656 ; and Waagen, in one of his critical essays, justly observes that it is a remarkable production for a youth of twenty- one. In 1657 Mieris was married at Leyden in the pre- sence of Jan Potheuck, a painter, and this is the earliest written record of his existence on which we can implicitly rely.

Of the numerous panels known to the writer of these lines, twenty-nine at least are dated,—the latest being an allegory, long in the Ruhl collection at Cologne, illustrating the kindred vices of drinking, smoking, and dicing, in the year 1680.

Mieris had numerous and distinguished patrons. He received valuable commissions from Archduke Leopold, the elector-palatine, and Cosmo III, grand-duke of Tuscany. His practice was large and lucrative, but never engendered in him either carelessness or neglect. If there be a differ- ence between the painter's earlier and later work, it is that the former was clearer and more delicate in flesh, whilst the latter was often darker and more livid in the shadows. When he died his clients naturally went over to his son Willem, who in turn bequeathed his painting-room to his son Frans. But neither Willem nor Frans the younger equalled Frans the elder.

Il. Wintem van Mrmris (1662-1747), son of Frans. His works are extremely numerous, being partly imita- tions of the paternal subjects, or mythological episodes, which Frans habitually avoided. In no case did he come near the excellence of his sire.

III. Frans vAN Mreris the younger (1689-1763) also lived on the traditions of his grandfather's painting-room.

The pictures of all the generations of the Mieris family were suc- cessfully imitated by A. D. Snaphaan, who lived at Leipsic and was patronized by the court of Anhalt-Dessau. To those who would

study his deceptive form of art a visit to the collection of Worlitz near Dessau may afford instruction.

MIGNARD, Pierre (1610-1695), called—to distinguish him from his brother Nicholas—Le Romain, was the chief French portrait-painter of the 17th century. He was born at Troyes in 1610, and came of a family of painters. In 1630 he left the studio of Simon Vouet for Italy, where he spent twenty-two years, and made a reputation which brought him a summons to Paris. Successful with his portrait of the king, and in favour with the court, Mignard pitted himself against Le Brun, declined to enter the Academy of which he was the head, and made himself the centre of opposition to its

authority. The history of this struggle is most important, because it was identical, as long as it lasted, with that between the old guilds of France and the new body which Colbert, for political reasons, was determined to support. Shut out, in spite of the deserved success of his decorations of the cupola of Val de Grace (1664), from any great share in those public works the control of which was the attribute of the new Academy, Mignard was chiefly active in portraiture. Turenne, Bossuet, Maintenon (Louvre), La Valliére, Sévigné, Montespan, Descartes (Castle Howard), all the beauties

and celebrities of his day, sat to him. His readiness and skill, his happy instinct for grace of arrangement, atoned for want of originality and real power. With the death of Le Brun (1690) the situation changed; Mignard deserted his allies, and succeeded to all the posts held by his opponent. These late honours he did not long enjoy; in 1695 he died whilst about to commence work on the cupola of the Invalides. His best compositions have been en- graved by Audran, Edelinck, Masson, Poilly, and others.

MIGNONETTE, or MiGNoNNETTE (2.¢. "little dar- ling"), the name given to a popular garden flower, the Reseda odorata of botanists, a 'fragrant weed," as Cowper calls it, highly esteemed for its delicate but delicious perfume. The mignonette is generally regarded as being of annual duration, and is a plant of diffuse decumbent twiggy habit, scarcely reaching a foot in height, clothed with bluntish lanceolate entire or three-lobed leaves, and bearing longish spikes—technically racemes—of rather insignificant flowers at the ends of the numerous branches and branchlets. The plant thus naturally assumes the form of a low dense mass of soft green foliage studded over freely with the racemes of flowers, the latter unobtrusive and likely to be overlooked until their diffused fragrance compels attention. The native country of the original or typical mignonette has sometimes been considered doubtful, but according to the best and latest authorities it has been gathered wild on the North African coast near Algiers, in Egypt, and in Syria. As to its introduction, a MS. note in the library of Sir Joseph Banks records that it was sent to England from Paris in 1742; and ten years later it appears to have been sent from Leyden to Philip Miller at Chelsea. Though originally a slender and rather straggling plant, there are now

some improved garden varieties in which the growth is more compact and vigorous, and the inflorescence bolder, though the odour is perhaps less penetrating. The small six-petalled flowers are somewhat curious in structure: the two upper petals are larger, concave, and furnished at the back with a tuft of club-shaped filaments, which gives them the appearance of being deeply incised, while the two lowest petals are much smaller and undivided ; the most conspicuous part consists of the anthers, which are numerous and of a brownish red, giving the tone of colour to the inflorescence. In a new variety named Golden Queen the anthers have a decided tint of orange-yellow, which imparts a brighter golden hue to the plants when in blossom. A handsome proliferous or double-flowered variety has also been obtained, which is likely to be a very useful decorative plant, though only to be propagated by cuttings ; the double white flowers grow in large massive panicles (proliferous racemes), and are equally fragrant with those of the ordinary forms.

What is called tree mignonette in gardens is due to the skill of the cultivator. Though practically a British annual, as already noted, since it flowers abundantly the first season, and is utterly destroyed by the autumnal frosts, and though reeorded as being annual in its native habitat by Desfontaines in the Flora Atlantica, the mignonette, like many other plants treated in England as annuals, will continue to grow on if kept in a suitable temperature. Moreover, the life of certain plants of this semiannual character may be prolonged into a second season if their flowering and seeding are persistently prevented. In applying these facts to the pro- duction of tree mignonette, the gardener grows on the young plants under glass, and prevents their flowering by nipping off the blooming tips of the shoots, so that they continue their vegetative growth into the seeond season. The young plants are at first sup- ported in an ereet position, the laterals being removed so as to secure clean upright stems, and then at the height of one or two fect or more, as may be desired, a head of branches is encouraged to develop itself. In this way very large plants can be produced.

For ordinary purposes, however, other plans are adopted. In the open borders of the flower garden mignonette is usually sown in spring, and in great part takes care of itself ; but, being a favourite either for window or

baleony culture, and on account ofits fragranee a welcome inmate of town conservatories, it is also very exteusively

grown as a pot plant, and for market purposes with this object it is sown in pots in the autumn, and thinncd out to give the plants requisite space, since it does not transplant well, and it is thereafter

specially grown in pits protected from frosts, and marketed when just arriving at the blooming stage.

disposed of year by year. ; In classifying the odours given off by plants Rimmel ranks the mignonette in the class of which he makes the violet the type; and

Fée adopts the same view, referring it to his class of "iosmoids " along with the violet and wallflower.

The name is sometimes, but it would appear less correctly, written mignionette. estin, and useful species,—among them the Reseda Luteola, which is commonly called dyer's-weed and weld, and yiclds a valuable yellow dye.

MIGUEL, Maria Evarist (1802-1866), usually known as Don MiaveEt, whose name is chiefly associated with his pretensions to the throne of Portugal, was the third son of King John VI. of Portugal, and of Carlotta Joachima, one of the Spanish Bourbons; he was born at Lisbon on October 26, 1802. In 1807 he accompanied his parents in their flight to Brazil, where he was permitted to grow up a spoiled child and a worthless youth ; in 1821, on his return to Europe, it is said that he had not yet learned to read. In 1822 his father swore fidelity to the new Portuguese constitution which had been proclaimed in his absence; and this led Carlotta Joachima, who was an absolutist of the extremest Bourbon type, and otherwise hated her husband, to resolve to seek his dethronement in favour of Miguel her favourite son. The insurrections which ensued (see Portucat) resulted in her

relegation to the castle of Queluz and the exile of Miguel (1824), who spent a short time in Paris and afterwards lived in Vienna, where he came under the teaching of Metternich. On the sudden death of John VI. in May 1826, Pedro of Brazil, his eldest son, renounced the crown in favour of his daughter Maria da Gloria, on the understanding that she should become the wife of Miguel. The last-named accordingly swore allegiance to Pedro, to Maria, and to the constitution which Pedro had introduced, and on this footing was appointed regent in July 1827. He arrived in Lisbon in February 1828, and, regardless of his promises, dissolved the new Cortes in March; having called together the old Cortes, with the support of the reactionary party of which his mother was the ruling spirit, he got himself proclaimed sole legitimate king of Portugal in July. The power which he now enjoyed he wielded in the most tyrannical manner for: the repression of all liberalism, and his private life was characterized by the wildest excesses: The public opinion of Europe became more and more actively hostile to his reign, and after the occupation of Oporto by Don Pedro in 1832, the destruction of Miguel's fleet by Captain (afterwards Sir Charles) Napier off Cape St Vincent in 1833, and the victory of Saldanha at Santarem in 1834, Queen Christina of Spain recognized the legitimate sovereignty of Maria, and in this was followed by France and England. Don Miguel capitulated at Evora on May 29, 1834, renouncing all pretensions to the Portuguese throne, and solemnly promising never thenceforward to meddle in Peninsular affairs. He lived for some time at Rome, where he enjoyed papal recognition, but afterwards retired to Bronn- bach, in Baden, where he died on November 14, 1866.

MIGULINSKAYA, a Cossack village (stanitsa) of Russia, in the government of the Don Cossacks, and in the district of Ust-Medvyeditsa, 79 miles to the west of that town, on the left bank of the Don. It is one of the largest and wealthiest stanztsas of the government, and has 20,600 inhabitants, who are engaged in agriculture and stock- breeding, and in the export of agricultural produce.

MIKHAILOVSKAYA, a Cossack village (stanitsa) of Russia, in the government of the Don Cossacks, and in the

In this way hundreds of thousands, probably, of pots of blooming mignonette are raised and

The genus Reseda contains some other interesting

‘in 1881.

MIG—MIL

district of Khopersk, 14 miles to the north-west of Uryupino, on the low left bank of the Khoper, which is inundated when the river is full) It has an important fair, where Tartars from Astrakhan exchange furs and cottons for manufactured and grocery wares imported from central Russia; the inhabitants of the district also sell corn, cattle, and plain woollen stuffs. Population, 18,000.

MILAN (the Latin Mediolanum, Italian Milano, and German Marland), a city of Italy, situated near the middle of the Lombard plain, on the small river Olona, in 45° 27’ 35” N. lat. and 9° 5‘45” E. long. It is 390 feet above the sea-level, and lies 25 miles south of the Alps at Como, 30 miles north of the Apennines, 20 miles east of the Ticino, and 15 miles west of the Adda.

The plain around Milan is extremely fertile, owing at once to the richness of the alluvial soil deposited by the Po, Ticino, Olona, and Adda, and to the excellent system of irrigation. Seen from the top of the cathedral, the plain presents the appearance of a vast garden divided into square plots by rows of mulberry or poplar trees. To the east this plain stretches in an unbroken level, as far as the eye can follow it, towards Venice and the Adriatic ; on the southern side the line of the Apennines from Bologna to Genoa closes the view; to the west rise the Maritime, Cottian, and Graian Alps, with Monte Viso as their central point; while northward are the Pennine, Helvetic, and Rhetian Alps, of which Monte Rosa, the Saasgrat, and Monte Leone are the most conspicuous features. In the plain itself lie many small villages ; and here and there a larger town like Monza or Saronno, or a great building as the Certosa of Pavia, makes a white point upon the greenery.

The commune of Milan consists since 1873 of the city within the walls (area 1513 acres) and the so-called Corpi Santi! without the walls (area 15,415 acres). The popu- lation of the whole area increased from 134,528 in 1800 to 242,457 in 1861, 261,985 in 1871, and 321,839 in 1881,—the city within the walls contributing 110,884 in 1801, 196,109 in 1861, 199,009 in 1871, and 214,004 The climate is very variable ; there is a difference of 41° Fahr. between the extreme summer heat and winter cold. The average number of wet days is 72, and of snowy days 10 per annum.

Milan is built in a circle, the cathedral being the central point. The city is surrounded by a wall 7 miles in circumference, and immediately outside the wall a fine broad thoroughfare makes the circuit of the city. The streets inside are for the most part narrow and crooked ; the main streets are the Corso Vittorio Emanuele, the Strada S. Margherita, the Via Manzoni, the Corso Porta Ticinese, and the Corso Porta Romana. There are few piazzas of any size; the largest is the Piazza del Duomo, which has recently been extended, and the houses around it modernized. 'To the west of the city is the open space of the Foro Bonaparte and the Piazza d'Armi, with the square keep of the Visconti castle, flanked by two granite towers, between them. The castle was partly destroyed in 1447 by the Ambrosian republic, rebuilt by Francesco Sforza, enlarged by the Spanish governors, and taken by Napoleon in 1800, when the outer fortifications were razed to the ground, and the walls left as they now are. North of the Piazza d'Armi is the modern cemetery, with a special building and apparatus for cremation, erected in 1876.

Among the buildings of Milan the most important is the cathedral, begun under Gian Galeazzo Visconti, in 1386. It is built of brick cased in marble from the quarries which Visconti gave in perpetuity to the cathedral chapter. The

1 The name Corpi Santi (of doubtful origin) is also applied to the extra-mural portions of Cremona and Pavia,

name of the original architect is not known, but it is certain that many German master masons were called to Milan to assist the Italian builders.

After St Peter's at Rome and the cathedral of Seville the Duomo of Milan is the largest church in Europe. It is 477 feet in length and 183 in width; the nave is 155 feet high, the cupola 926 feet, and the tower 360 feet. The work was con- tinued through many centuries, and after the designs of many masters, notably of Amadeo, who carried out the octagon cupola, and of Tibaldi, who ornamented the doors and windows of the facade in the 16th century. The work was finished, under Napoleon, in 1805. The style

is Gothic, though its purity is destroyed by the introduc- tion of Romanesque windows and portals on the facade. The form of the church is that of a cross. are double aisles, and aisles in the transepts.

Inside there The roof is

Plan of Milan.

1. Diazza del Teatro. 9. Pal. Beccaria. (19, Marino. 2. Piazza dei Mercanti. 10. S. Fedele. 20. Hotel de la Ville. 8. S Angelo. 11. Teatro d. Cannobiana, | 21, Hotel Gran Bretagna. 4, Ospedale delle Fate-|12. Casa Uboldi. 22, Casa Origo. bene Sorelle. 13, Pal. della Ragione. 23. Galleria Vittorio 5. Ospedale dei Fate-bene | 14. Conserv. di Musica. Emanuele. Fratelli. 15. Teatro della Scala. 24. S. Eufemia. 6. Cusa Samovloff. 16. Casino dei Mercanti. | 25. Pal. Belgiojoso. 7. §. Maria de] Carmine. | 17. Hotel Reichmann. | 26, Museo Civico. 8. Pal. de Brera. 18. Grand Hotel Royal.. |27. Hotel de l'Europe.

supported by fifty-two columns, with canopied niches for statues instead of capitals. The windows of the tribune contain brilliant painted glass. To the right of the entrance is the tomb of Archbishop Heribert, the champion of Milanese liberty; next to that is the tomb of Otho Visconti, founder of that family as a reigning house, and in the right transept the monument of Giacomo dei Medici, the corsair of Como, brother of Pope Pius IV. and uncle to Saint Carlo Borromeo. Under the dome, in a crypt, lies the embalmed body of this cardinal saint (1538-84), canonized for his good deeds during the great famine and plague of 1576. The body is contained in a silver sarcophagus faced with rock-crystal. The roof of the cathedral is built of blocks of white marble; and the various levels are reached by

staircases carried up the buttresses ; it is ornamented with turrets, pinnacles, and two thousand statues.

There are four other churches of interest in Milan. 8. Ambrogio, the oldest, was founded by St Ambrose in the 4th century, on the ruins of a temple of Bacchus. It

is remarkable for its fine atrium, and inside for the mosaics in the tribune, dating from the 9th century, and for the "pala" or plating of the high altar, a curious and ancient specimen of goldsmith's work. S. Maria delle Grazie is a Dominican church of the 15th century. The cupola, with sixteen sides wrought in terra-cotta, is attri- buted to Bramante. §S. Gottardo is now built into the royal palace, and only the apse and the octagonal campanile remain. 'The latter, a beautiful example of early Lom- bard terra-cotta work, was built by Azzone Visconti in 1336, and was the scene of the murder of Giovanni Maria Visconti in 1412. The small church of San Satiro, founded in the 9th century, was rebuilt by Bramante in the 15th. ; the sacristy is one of that master's finest works.

The royal and archiepiscopal palaces are both worthy of note. The former stands on the site of Azzone Vis- conti's palace, and the present building was the viceregal lodge of the Austrian governors. It contains one fine hall with a gallery supported by caryatides. The Broletto, or town-hall, was built by Filippo Maria Visconti for his general Carmagnola, in 1415, who, however, never lived in it. The Great Hospital is a long building with a fine facade in terra-cotta from the designs of the Florentine Antonio Averlino; it dates from the reign of Francesco Sforza (1456), and can accommodate 2400 patients. Among the modern buildings the most remarkable are the Arco della Pace, which stands at the commencement of the Simplon road (begun in 1804 by Napoleon, finished in 1833 under the Austrians), and the great Galleria Vittorio Emanuele, connecting the Piazza del Duomo with the Piazza della Scala—a graceful glass-roofed structure 320 yards long, 16 yards wide, and 94 feet high, built in 1865-67 at a cost of 320,000 lire (£12,800). The Milanese are justly proud of this popular promenade, as the finest of its kind in Europe; and in the best of their four considerable theatres—the Scala, built in 177 8 on the site of a church raised by Beatrice

Scala, wife of Bernabd Visconti—they also possess the largest theatre in Europe, with the single exception of the S. Carlo at Naples.

Milan is rich in works of art. It has been the home of many excellent sculptors and architects, among others of Amadeo and of Agostino Busti, known as Bambaia,—whose work may be seen in the cathedrals of Como and Milan, in the Certosa of Pavia, and in the terra-cotta buildings of the Lombard towns. Later on, towards the close of the 15th century, the refined court of Lodovico Sforza attracted such celebrated artists as Bramante the architect, Gaffurio Franchino the founder of one of the earliest musical academies, and Leonardo da Vinci, from whose school came Luini, Boltraffio, Gaudenzio Ferrari, and Oggiono. Tn still more recent times Beccaria (1738-94) as a jurist, Monti (1754-1828) as a poet, and Manzoni (1785-1873) as a novelist, have won for the Milanese a high reputation in the field of letters.

The picture gallery of the Brera is one of the finest in Italy. It possesses Raphael's famous " Sposalizio," and contains many frescos by Luini, Gaudenzio Ferrari, and Bramantino. The Venetian school is particularly well represented by works of Paolo Veronese, Paris Bordone, Gentile Bellini, Crivelli, Cima da Conegliano, Bonifazio, Moroni, and Carpaccio. Luini may also be studied in the church of Monastero Maggiore, a large part of whose walls he painted in fresco. In the archeological museum, on the ground floor of the Brera, are preserved many interesting monuments, among others the tomb of Beatrice della Scala and the equestrian monument of her husband Bernabd Visconti, as well as the most exquisite sepulchral monument of Gaston de Foix, the work of Agostino Bust. The library of the Brera contains upwards of 200,000 volumes, including some important Venetian chronicles,

but it is not so rich in MSS. as the celebrated Ambrosian |. aud were soon masters of North Italy, and entered Milan the year

library, for which see Liprarizs, vol. xiv. p. 531.

Agriculture.—The district of Milan is renowned for its excellent agriculture. It may be divided into two regions, where different systems of farming are pursued and different crops produced. . The first region lies on the lower slopes of the Alps, where they sink into the plain. This is called the dry Milanese, for it is watered by torrents only, which have worn themselves too deep a bed to allow of irrigation, and the peasants are obliged to colleet the rain- water in large mud-lined tanks called " poppe." The soil is for the most part thin and light, and is frequently washed down the incline into the plain; in some parts it is only kept in its place by stone walls reared at great cost. The farms are smaller here than in the lower plain, and are let on a system which is a compromise between the mezzadria, which once obtained in the district, and regular leases. The tenant pays a money rent for the house; and for the land he either pays in kind or in a money equivalent, supplemented by labour given to the landlord. In cases where vines or fruit trecs are grown, the landlord supplies and maintains them till they come into fruit. The landlord carries out all improvements, and the tenant holds the farm at his pleasure. The rotation of cropping is for three years. The value of these farms varies greatly, ranging from 7 to 14 lire the pertica (1000 square yards). The district produces maize and wheat in abund- ance, a little flax and millet, apples, and wine. The second agricultural district is that which lies in the plain ; it is called the wet Milanese, from the elaborate system of irrigation which makes the ineadows yield a constant succession of crops. The plain is traversed by innumerable canals at various levels, crossing one another on bridges, or by siphons, so that the peasant can flood his fields at any moment. The system is as old as the 12th century; it was iinproved by Leonardo da Vinci, and is now the most perfect network of irrigation in Kurope. 'The farms vary in extent from 1500 to 4500 pertiche. They are let upon leases for nine, twelve, or fifteen years, at rents ranging from 8°50 to 12°50 lire the pertica, while those near a city may bring from 15 to 20 lire. The rotation of cropping is five-yearly. The meadows yield four crops of grass in the year ; the first three—the maggengo, the agostino, and the terzuolo—are cut, the fourth is grazed off. Where the ground is perfectly flat and water can stagnate, rice is grown ; this crop is continued for four years in succession, then the land is rested with cereals and grass. The other crops are inaize and wheat. But the chief oecupation is the supply of dairy

roduce. The cows are bonght in the Swiss cantons of Uri, Zug,

ucerne, and Schwyz, the last furnishing the best milkers. The cheese called Parrnesan comes from the Milanese; and the rich cheese, made of unskimmed milk, known as Stracchino, is made principally at the village of Gorgonzola, 12 miles east of Milan.

Industrics.—The industries of this district have increased very rapidly since the union of Italy, and the eity is now the chief commercial centre in North Italy. The principal industry of Milan and the Milanese is the production and manufacture of silk. For feeding the worms mulberry trees are largely cultivated on the plain; and the district counts upwards of 200 factories, where the silk thread is unwound from the cocoons, yielding 4,000,000 tb of raw silk in the year. Some of this is exported to France for manufacture, but the Milanese can now almost rival their neighbours in the production of silk stuffs, velvets, and brocades. Cotton is manufactured at Saronno and Legnano, fustian at Busto, linen at Cassano, combs at Burlando, and porcelain and carriages of very excellent workmanship in Milan itself.

History.—Bellovesus, king of the Celts, who crossed the Alps when Tarquinius Priscus was king in Rome, is the traditional founder of Milan. The city became the capital of the Insubrian Gauls, and was taken by the Romans in 222 B.c. As a Roman municipium it continued to increase in magnificence and import- ance ; and under Constantine it was the seat of the imperial vicar of the West. Under Theodosius, in the 4th eentury, Milan, to judge from Ausonius's deseription (Ordo Nob. Urbium, v.), must have been rich in temples and public buildings. Theodosius died at Milan after doing penance, at the bidding of St Ambrose, for his slaughter of the people of Thessalonica. Ambrose is still venerated in Milan as the founder of the Milanese chureh and the compiler of the Ambrosian rite, which is still in use throughout the diocese. After his death the period of invasions begins ; and Milan felt the power of the Huns under Attila (452), of the Heruli under Odoacer (476), and of the Goths under Theodoric (493). When Belisarius was sent by Justinian to recover Italy, Datius, the archbishop of Milan, joined him, and the Goths were expelled from the city. But Uraia, nephew of Vitigis the Gothic king, subsequently assaulted and retook the town, after a brave resistance. Uraia destroyed the whole of Milan in 589; and hence it is

that this city, once so important a centre of Roman civilization, possesses so few remains of antiquity. Narses, in his eampaigns against the Goths, had invited other barbarians, the Lombards, to his aid. They came in a body under Alboin, their king, in 568,

following. Alboin established his capital at Pavia, and Milan reniained the centre of Italian opposition to the foreign conquest.

The Lombards were Arians, and the archbishops of Milan from the days of Ambrose had been always orthodox. Though the struggle was unequal, their attitude of resolute opposition to the Lombards gained for them great weight among the people, who felt that their archbishop was a power around whom they might gather for the defence of their liberty and religion. All the innate hatred of the foreigner went to strengthen the hands of the archbishops, who slowly acquired, in addition to their spiritual authority, powers military, executive, and judicial. These powers they came to administer through their delegates, called viscounts. Wheu the Lombard kingdom fell before the Franks under Charles the Great in 774, the archbishops of Milan were still further strengthened by the close alliance between Charles and the church, which gave a sort of confirmation to their temporal authority, and also by Charles's policy of breaking up the great Lombard fiefs and dukedoms, for which he substituted the smaller counties. Under the confused government of Charles's immediate successors the archbishop was the only real power in Milan. But there were two classes of difficulties in the situation, ecclesiastical and political; and their presence had a marked effect on the development of the people and the growth of the commune, which was the next stage in the history of Milan, On the one hand the archbishop was obliged to contend against heretics or against fanatical reformers who found a following among the people; and on the other, since the archbishop was the real power in the city, the emperor, the nobles, and the people cach desired that he should be of their party ; and to whichever party he did belong he was certain to find himself violently opposed by the other two. From these causes it sometimes happened that there were two archbishops, and there- fore no central control, or no archbishop at all, or else an archbishop in exile. The chief result of these difficulties was that a spirit of independence and a capacity of judging and acting for themselves was developed in the people of Milan. The terror of

the Hunnish invasion, in 899, further assisted the people in their pro- gress towards freedom, for it compelled them to take arms and to fortify their city, rendering Milan more than ever independent of the feudal lords who lived in their castles in the country. The tyranny of these nobles drove the peasantry and smaller vassals to seek the protection for life and property, the equality of taxation and of justice, which could be found only inside the walled city and under the rule of the archbishop. Thus Milan grew populous, and learned to govern itself. Its inhabitants became for the first time Milanese, attached to the standard of St Ambrose,— no longer subjects of a foreign conqueror, but a distinet ee with a municipal life and prospects of their own. For the further growth of the commune, the action of the great archbishop Heri- bert, the establishment of the carroccio, the development of Milanese supremacy in Lombardy, the destruction of Lodi, Como, Pavia, and other neighbouring cities, the exhibition of free spirit and power in the Lombard league, and the battle of Legnano, see the article IrAty. See also LOMBARDs.

*After the battle of Legnano, in 1174, although the Lombard cities failed to reap the fruit of their united action, and fell to mutual jealousy once more, Milan internally began to grow in material prosperity. After the peace of Constance (1183) the city walls were extended ; the arts flourished, each in its own quartcr, under a syndic who watched the interests of the trade. The manufacture of armour was the most important industry. During the struggles with the emperor Barbarossa, when freedom seemed on the point of being destroyed, many Milanese vowed themselves, their goods, and their families to the Virgin should their city come safely out of her troubles. Hence arose the powerful fraternity of the **Umiliati," who established their headquarters at the Brera, and began to develop the wool trade, and subsequently gave the first impetus to the production of silk. From this period also date the irrigation works which render the Lombard plain a fertile garden. The government of the city consisted of (A) a parlamento or con- siglio grande, including all who possessed bread and wine of their own,—a council soon found to be unmanageable owing to its size, and reduced first to 2000, then to 1500, and finally to 800 mem- bers; (B) a credenza or committee of twelve members, elected in the grand council, for the despateh of urgent or secret business : (C) the consuls, the executive, elected for one year, and compelled to report to the great council at the*

term of their office. The way in whieh the burghers used their liberty and powers, secured by the peace of Constance, in attacking the fendal nobility ; how they compelled the nobles to eome into the city and to abandon their castles for a certain portion of the year ; how the war between the two classes was continued inside the city, resulting in the establish- ment of the podesta ; and the nature and limits of this office,—all this has been explained in the article Iraty.

This bitter and well-balanced rivalry between the nobles and the people, and the endless danger to which it exposed the city owing to the fuct that the nobles were always ready to claim the protec-

tion of their feudal chief, the emperor, brought to the front two noble families as protagonists of the contending factions, —the Torriani of Valsassina, and the Visconti, who derived their name from the office they had held under the archbishops. After the battle of Cortenova, in 1237, where Frederick II. defeated the Guclf army of the Milanese and captured their carroccio, Pagano della Torre rallied and saved the remnants of the Milancse. This act recom- mended hin to popular favour, and he was called to the government of the city,—but only for the distinct purpose of establishing the ‘“‘catasta,” a property tax which should fall with equal incidence on every citizen. This was a democratic measure which marked the party to which the Torriani belonged and rendered them hateful to the nobility. Pagano died in 1241. His nephew Martino fol- lowed as podest& in 1256, and in 1259 as signore of Milan,—the first time such a title was heard in Italy. The nobles, who had gathered round the Visconti, and who threatened to bring Ezzelino da Romano, the Ghibelline tyrant of Padua, into the city, were defeated by Martino, and nine huudred of their number were captured. Martino was followed by two other Torriani, Filippo his brother (1263-65) and Napoleone his cousin (1265-77), as lords of Milan. Napoleone obtained the title of imperial vicar from Rudolph of Hapsburg. But the nobles under the Visconti had been steadily gathering strength, and Napoleone was defeated at Desio in 1277. He ended his life in a wooden cage at Castel Baradeilo above Como.

Otho Visconti, archbishop of Milan (1262), the victor of Desio, became lord of Milan, and founded the house of Visconti, who ruled the city—except from 1302 to 1310—till 1447, giving twelve lords to Milan. Otho (1277-95), Matteo (1310-22), Galeazzo (1322-28), Azzo (1828-39), Lucchino (1389-49), and Giovanni (1349-54) fol- lowed in succession. Giovanni left the lordship to three nephews— Matteo, Galeazzo, and Bernabd. Matteo was killed (1355) by his brothers, who divided the Milanese, Bernabd reigning in Milan (1354-85) and Galeazzo in Pavia (1354-78). Galeazzo Sef a son, Gian Galeazzo, who became sole lord of Milan by seizing and im- prisoning his uncle Bernabd. For an account of this most powerful prince see Iraty. It was under him that the cathcdral of Milan and the Certosa of Pavia were begun. He was the first duke of Milan, having obtained that title from the emperor Wenceslaus. His sons Giovanni Maria, who reigned at Milan (1402-1412), and Filippo Maria, who reigned at Pavia (1402-1447), succeeded him. In 1412, on his brother's death, Filippo united the whole duchy under his sole rule, and attempted to carry out his father's policy of aggrandizement, but without success.

Filippo was the last male of the Visconti house. At his death a republic was proclaimed, which lasted only three years. In 1450 the general Francesco Sforza, who had married Filippo's only child Bianca Visconti, became duke of Milan by right of conquest if by any right. Under this duke the canal of the Martesana, which connects Milan with the Adda, and the Great Hospital were carried out. Francesco was followed by five of the Sforza family. His son Galeazzo Maria (1466-76) left a son, Gian Galeazzo, a minor, whose guardian and uncle Lodovico usurped the duchy (1479-1500). Lodo- vico was captured in 1500 by Louis XII]. of France, and Milan remained for twelve years under the French crown. In the partial settlement which followed the battle of Ravenna, Massimiliano Sforza, a protegé of the eniperor, was restored to the throne of Milan, and held it by the help of the Swiss till 1515, when Francis 1. of France reconquered the Milanese by the battle of Marignano, and Massimiliano resigned the sovereignty for a revenue from France. This arrangement did not continue. Charles V. succceded the emperor Maximilian, and at once disputed the possession of the Milanese with Francis. In 1522 the imperialists entered Milan and proclaimed Francesco Sforza (son of Lodovico). Francesco died in 1535, and with him ended the house of Sforza. From this date till the war of the

Spanish succession (1714) Milan was a dependency of the Spanish crown. At the close of that war it was handed over to Austria; and under Austria it remained till the Napoleonic cainpaign of 1796. For the results of that campaign, and for the history of Italian progress towards independence, in which Milan played a prominent part by opening the revolution of 1848, the reader is referred to the article Irauy. The Lombard campaign of 1859, with the battles of Solferino and Mageuta, finally made Milan a part of the kingdom of Italy.

Literature.—Pictro Verri, Storia di Milano; Corio, Storia di Milano; Cant,

Iliustrazione Grande del Lombardo Veneto; the Milancse chroniclers in Mura- tori's Rer. Ital. Scriptores; Sismondi, Italian Republics; Ferrari, Rivoluzione @'

Italia; Litta, Famiglie celebri, s.v.“ Torriani,” “Visconti,” “ Sforza,” and “Trivulzi;' |

Muratori, Annali d'Italia; Hallam, Mistory of the Middle Ages; and Mediolanum, 4 vols., 1881. Bonvicino da Riva gives a contemporary account of Milan in the 12th century. (H. F. B.)

MILAZZO, a city of Italy in the province of Messina in Sicily, 203 miles west of Messina, is built on the eastern shore of the Bay of Milazzo, partly on the isthmus of the promontory, Capo Milazzo, which divides it from the Bay of Olivieri. It consists of an old or uppertown protected by strong bastioned walls, and a lower or modern town

| as a prison.

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The fine old castle is now used Besides a certain amount of foreign com- merce (37 vessels with a burden of 6707 tons entering in 1881, 93 with 13,496 in 1863), Milazzo carries on a good coasting trade (194,366 tons in 1881, 40,138 in 1861), and is one of the seats of the tunny-fishery. The com- munal population increased from 10,493 in 1861 to 13,565 in 1881, and that of the city was 7427 in 1871.

Milazzo is the ancient Myle, a seaport and fortress founded by the Zancleans (Messaniaus), which gives its name to the battle of the Mylewan plain in which the Mamertines were defeated by Hiero in 270 B.c. In 1528 it was the scene of an unsuccessful conspiracy to transfer Sicily to the French. Captured by the Germaus in 1718, it was besieged by the Spaniards, but relieved by a Neapolitan and English force. In July 1860 the defeat of the Neapolitans in the vicinity, and the seizure of the fortress, formed almost the crown- ing act of Garibaldi's victorious campaign. The Bay of Milazzo has been the scene of the defeat of the Carthaginian navy by Duilius (260 B.c.), of Pompeius by Octavian's general Agrippa (36 B.c.), and of the French and Messinian galleys by the Pisans (1268).

MILDEW (explained as "meal-dew" or, with more probability, as "honey-dew") is a popular name given to various minute fungi from their appearance, and from the sudden, dew-like manner of their occurrence. Like many other popular names of plants, it is used to denote different species which possess very small botanical affinity. The term is applied, not only to species be- longing to various systematic groups, but also to such as follow different modes of life. The corn-mildew, the hop-mildew, and the vine-mildew are, for example, parasitic upon living plants, and the mildews of damp linen and of paper are saprophytes, that is, they subsist on matter which is already dead. It is generally possible to draw a distinct line between parasitic and saprophytic fungi; a species which attacks the living body of its host does not grow on dead matter, and vice versa. This is true so far as is known of perhaps all the higher fungi except Saprolegnia ferax (Gruith.), a parasite of freshwater fishes (especially of the salmon), which also grows freely on their dead bodies and on those of flies, &c. As regards mildews in general, the conditions of life and growth are mainly suitable nutrition and dampness accompanied by a high temperature. The life-history of the same species of mildew frequently covers two or more generations, and these are often passed on hosts of different kinds. In some cases again the same generation confines its attack to the same kind of host, while in others the same genera- tion grows on various hosts. For information regarding fungi generally see Funcus, vol. ix. p. 827.

The following examples are of common occurrence.

The Corn-Mildew (Puccinia graminis, Pers., Order Uredinex).—This disease of our grain crops and of many other grass plants is very widely distributed, like its hosts, over the earth, and is by far the most important to man of all mildews. Its life-history is passed in three generations —two of them on the grass plants and one on the barberry. In early spring the first generation is found on the dead leaves and leaf-sheaths of grass plants (in which thie disease has hibernated), presenting to the naked eye the appearance of thin black streaks. When examined with a microscope these streaks are seen to consist of a great number of minute two-celled and thick-walled teleutospores (reproductive bodies), each situated at the end of a stalk (see A in fig. 2, vol. ix. p. 831). These have burst through the epidermis of the plant from their origin on threads among the tissues beneath. When they have been in contact with excessive moisture for a few hours, each of the spore-cells germinates by emitting a fine tube called a promycelium, on which there are borne small round thin- walled sporidia (reproductive bodies). The sporidia are easily detached and carried from place to place by tbe wind, and on alighting on the leaves of a barberry plant

outside of the enceinte.

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soon germinate by pushing out a small tube which per- forates the epidermis and thus gains access to the interior of the leaf, where it branches copiously, and forms a mass of thread-like tissue called mycelium. The germ-tubes of sporidia are unable to enter the leaves, &c., of grass plants. In from six to ten days this mycelium gives rise to flask- shaped bodies called spermogonia (vol. ix. p. 831, fig. 2 B, sp), immediately under the surface of the leaf (usually the upper one), but breaking through it at the neck of the flask, out of which there protrudes a bunch of hairs. Within the flasks are formed at the end of stalks many exceedingly small oval bodies called spermatia, which escape through the neck. The function of these bodies has not yet been definitely made out, but that they bear a very strik- ing resemblance to the male sexual organs of other fungi there can beno doubt. In the same leaves and on the same mycelium there arise several days later numerous basin- shaped bodies containing erect stalks, bearing

at the apex a number of round ecidiospores (reproductive bodies) in vertical series (vol. ix. p. 831, fig. 2 B, a). These con- stitute the second generation. On their escape they germinate by emitting a tube which, if the host on which they fall be a grass plant, enters the leaf through one of the stomata in the epidermis, and there by branching forms a new mycelium. On this there soon appears, bursting through the epidermis, a new generation consisting of round or oval uredospores produced at the end of stalks (vol. ix. p. 831, fig. 2 C). The uredospores constantly reproduce this generation, and in such abundance that the grain crops are extensively ravaged by its attack. It is in this genera- tion that the term mildew is popularly given to the fungus. Later in autumn on the same mycelium the two-celled teleutospores appear, and these after hibernating renew in spring the life-history. This very remarkable cycle of generations was first traced by Professor de Bary.

The Hop-Mildew (Sphxrotheea Castagnei, Lev., Order LErysi- phex) isa parasitic disease of the hop, though it is often to be found on many other plants, such as Potentilla, Spirwa, Epilobium, balsams, cucumbers, dandelions, plantains, &c. 'The thread-like mycclium appears on the young shoots and leaves of the hop in white spots, which gradually extend and finally unite. This mycelium bears many miuute, round conceptacles (perithecia) which with their supporting threads are brown-coloured. Within each perithecium is found a somewhat oval body termed an ascus, con- taining eight ascospores (reproductive bodies).

The Vine-Mildew (Erysiphe Tuekeri, Berk., Order Erysiphex) is known only in one generation—called the oidium stage. Soon after the flowering of the vine the attack takes place on the young leaves, from which the thin white mycelium spreads rapidly to the older leaves and twigs, which it does not appear to affect so injuriously. The chief damage is done to the grapes while they are in a very immature condition. The mycelium which travels over the surface sends down at intervals into the tissues short irregular protuber- ances called haustoria, which perform for it the functions of roots. Above these rise from the mycelium short stalks bearing each a single oval spore at the apex. The disease spreads on the same plant not only by the extension of the mycelium but by the scattcring and gerinination of the spores. Here no perithecia are known.

The Paper-Mildew (Aseotricha chartarum, Berk., Order Erysiphex) grows on damp paper, and therefore is saprophytic in its mode of life. It consists at first of a branching filamentous mycelium on which minute globular spores occur. Finally a round brown peri- thecium is formed among the threads which appear as radiating from it. Within the peritliccium are numerous lincar asci contain- ing each a row of dark elliptic ascospores.

For the Lrysiphex generally see Funcus, vol. ix. p- 833.

MILETUS, an ancient city on the southern shore of the Latmic Gulf opposite the mouth of the Meander. Before the Ionic migration it was inhabited by the Carians (Thad ii. 876; Herod. i. 146); other authorities call the original people Leleges, who are always hard to distinguish from Carians. The Greek settlers from Pylus under Neleus massacred all the men in the city, and built for themselves a new city on the coast. It occupied a very favourable situation at the mouth of the rich valley of the Meander, and was the natural outlet for the trade

‘harbours, one of considerable size.

of southern Phrygia (Hipponax, /’r. 45); it had four Its power extended inland for some distance up the valley of the Meander, and along the coast to the south, where it founded the city of Iasus. The trade with the Black Sea, however, was the greatest source of wealth to the Ionian cities. Miletus like the rest turned its attention chiefly to the north, and after a time it succeeded in almost monopolizing the traffic. Along the Hellespont, the Propontis, and the Black Sea coasts it founded more than sixty cities—among them Abydus, Cyzicus, Sinope, Dioscurias, Panticapeeum, and Olbia. All these cities were founded before the middle of the 7th century ; and before 500 B.c. Miletus was decidedly the greatest Greek city. During the time when the enter- prise and energy of the seafaring population, the dewvadrar, raised Miletus to such power and wealth, nothing is known of its internal history. The analogy of all Greek cities, and some casual statements in later writers, suggest that the usual bloody struggles took place between the oligarchy and the democracy, and that tyrants sometimes raised themselves to supreme power in the city; but no details are known.

Miletus was equally distinguished at this early time as a seat of literature. The Ionian epic and lyric poetry indeed had its home farther north ; philosophy and history were more akin to the practical race of Miletus, and Thales, Anaximander, Anaximenes, Hecatzus, all belonged to this city. The three Ionian cities of Caria— Miletus, Myus, and Priene—spoke a peculiar dialect of Tonic.?

When the Mermnad kings raised Lydia to be a great military kingdom, Miletus was their strongest adversary. War was carried on for many years, till Alyattes concluded a peace with Thrasybulus, tyrant of Miletus ; the Milesians afterwards seem to have peaceably acknowledged the rule of Croesus. On the Persian conquest Miletus passed under a new master; it headed the revolt of 500 B.c., and was taken by storm after the battle of Lade. Darius treated it with peculiar severity, massacred most of the inhabitants, transported the rest to Ampe at the mouth of the Tigris, and gave up the city to the Carians. Henceforth the history of Miletus has no special interest ; it revived indeed when the Persians were expelled from the coast in 479 B.c., and was a town of commercial importance throughout the Graeco-Roman period, when it shared in the general fortunes of the Ionian cities under the rule of Athenians, Persians, Macedonians, Pergamenians, and Romans in succession. Its harbours, once protected by Lade and the other Tragusan islands, were gradually silted up by the Meander, and Lade is now a hill some miles from the coast. Ephesus took its place as the great Ionian harbour in the Hellenistic and Roman times. It was the seat of a Christian bishopric, but its decay was sure, and its site is now a marsh.

See Schroeder, Comment. de Reb. Miles.; Soldan, Rer. Miles. Comment. ; Rayet, Milet ect le Golfe Latmique; Head, 'Early Elec- truin Coins," in Numism. Chron., vol. xvi.

MILFORD, a seaport, market-town, and contributory parliamentary borough (one of the Pembroke district) of Pembrokeshire, South Wales, is finely situated on the north side of Milford Haven, about 8 miles west-north-west of Pembroke. The land-locked estuary of Milford Haven stretches about 10 miles inland, with a

1 The coinage of Miletus during this early period is an important subject on account of the wide commercial connexions of the city. The early electrum

eoinage belongs to the Pheenician or Graco-Asiatic standard, which was introduccd from Pheenicia and spread over many of the Ionian and Thracian cities through the influence of Milesiau trade. Very archaic coins of Miletus, Ephesus, Cyme, and Sardis are known of this standard, and at a somewhat later date of Chios, Samos, Clazomene, Lampsacus, Abydus, and Cyzicus. he lionis the regular Milesian type, often with a star beside or above him.

In most places it has a | abolish the military constitution of the frontier, but the

breadth of from 1 to 2 miles. depth of from 15 to 19 fathoms, and, as it is completely sheltered by hills, vessels can ride in it at anchor in all kinds of weather. The royal dockyard, founded at Milford in 1790, was removed in 1811, and from that time trade has been in a languishing condition. The town possesses irou-works. The shipping trade is confined chiefly to coasting vessels, but with the completion of new docks, capable of receiving vessels of the largest tonnage, it is supposed that a considerable trade may be carried on with America. The population of the urban sanitary dis- trict in 1871 was 3252, and in 1881 it was 3813.

MILFORD, a post-village of the United States, in Worcester county, Massachusetts, lies 34 miles south-west of Boston, at the junction of the Milford branch of the Boston and Albany Railroad with the Hopkinton, Milford, and Woonsocket Railroad. It is one of the principal seats of the boot manufacture in New England, and also pro- duces large quantities of straw goods. The population was 9310 in 1880.

MILICZ, or Mitrtscu, of Kremsier, Moravia, was the most influential among those preachers and writers in Moravia and Bohemia who during the 14th century paved the way for the reforming activity of Huss and through him for that of Luther. He was born about 1325, was already in holy orders in 1350, in 1360 was attached to

the court of the emperor Charles [V., whom he accompanied ,

into Germany in that year, and about the same time also held a canonry in the cathedral of Prague along with the dignity of archdeacon. About 1363 he resigned all his appointments that he might become a preacher pure and

simple ; he addressed scholars in Latin, and (an innovation) | the laity in their native Czech, or in German, which he | The success of his labours in | reclaiming the fallen made itself apparent in the reforma- |

acquired for the purpose.

tion of a whole quarter of the city of Prague. As he dwelt more and more on ecclesiastical abuses and the corruption of the clergy, and viewed them in the light of Scripture, the conviction grew in his mind that the "abomination of desolation" was now seen in the temple of God, and that antichrist had come, and in 1367 he went to Rome (where Urban V. was expected from Avignon) to expound these views. He affixed to the gate of St Peter's a placard announcing his sermon, but before he could deliver it was thrown into prison by the Inquisition. Urban, however, on his arrival ordered his release, whereupon he returned to Prague, and from 1369 to 1372 preached daily in the Teyn Church there. In the latter year the clergy of the diocese

complained of him to the papal court at Avignon, whither | he was summoned in Lent 1374, and where he died before |

his case was decided. He was the author of a Libellus de Antichristo, written in prison at Rome, a series of Postile and Lectiones Quadragesimales in Latin, and a similar series of Postls in Czech.

MILITARY FRONTIER (German, Militdrgrenze ; Slavonic, Granitza), a narrow strip of Austrian-Hungarian territory stretching along the borders of Turkey, which had for centuries a peculiar military organization, and from 1849 to 1873 constituted a crown-land. As a separate division of the monarchy it owed its existence to the necessity of maintaining during the 15th, 16th, and 17th centuries a strong line of defence against the invasions of the Turks, and may be said to have had its origin with the establishment of the captaincy of Zengg by Matthias Corvinus and the introduction of Uskoks (fugitives from Turkey) into the Warasdin district by the emperor

three frontier " generalates "—Carlstadt, Warasdin, and Petrinia (the last also called the Banal). After the defeat of the Turkish power by Prince Eugene it was proposed to

change was successfully resisted by the inhabitants of the district ; on the other hand, a new Slavonian frontier dis- trict was established in 1702, and Maria Theresa extended the organization to the march-lands of Transylvania (the Szekler frontier in 1764, the Wallachian in 1766).}

As a reward for the service it rendered the Government in the suppression of the Hungarian insurrection in 1848, the Military Frontier was erected in 1849 into a crown-land, with a total area of 15,182 square miles, and a population of 1,220,503. In 1851 the Transylvanian portion (1177 square miles) was incorporated with the rest of Transyl- vania ; and in 1871 effect was given to the imperial decree of 1869 by which the districts of the Warasdin regiments (St George and the Cross) and the towns of Zengg, Belovar, Ivanit, &c., were " provincialized" or incorporated with the Croatian-Slavonian crown-land. In 1872 the Banat regiments followed suit; and in 1873 the old military organization was abolished in all the rest of the frontier. Not till 1881, however, were the Croatian-Slavonian march-lands completely merged in the kingdoms to which they naturally belonged.

The social aspect of the military frontier régime is intcresting. A communal system of land tenure natural to the old Slavonians was artificially kept in existence. The mark or plot of ground assigned to the original family of settlers remaincd the property of the family as such, and could not be portioned out among the several members. In this way the house-community, all under the rule of the same house-father and house-mother (who were not neces- sarily man and wife, nor the oldest members of the community), and all living within the same palisade, sometimes came to num- ber two or three hundred persons. The "family" dined in a com- mon hall, and after dinner discussed and settled matters affecting the common weal. Every man posscssing real property in the country, and capable of bearing arms, was liable to military service from his twentieth year. The house-communities are now begin- ning to avail themselves of the permissive partition laws, and strangers are free to come and acquire

property in land. Watch- towers with wooden clappers and the beacons which flashed the alarm along the whole frontier in a few hours are still features in the landscape.

MILITARY LAW consists of the statutes, rules of pro- cedure, royal warrants, and orders and regulations which prescribe and enforce the public obligations of the officers, soldiers, and others made subject to its provisions. Its essential purpose is the maintenance of discipline; but it also includes the administrative government of the military forces of the state, more especially in the matters of enlist- ment, service, and billeting. The term "martial law" sometimes applied to it is, as regards modern times at least, a misnomer. For martial law as it is now understood applies not only to military persons but to the civil com- munity, and may be described generally as the abrogation of ordinary law and the substitution for it of military force uncontrolled save by what, in the discretion of the commanding general, may be considered the necessity of the case,

The military law of England in early times existed, like the forces to which it applied, in a period of war only.

1 By 1848 the following had come to be the division of the Military Frontier :—(1) The Carlstadt (Carlowitz), Warasdin, and Banal Generalate: the Licca Regiment (headquarters at Gospich), the Otto- chaz Regiment (Ottochaz), the Ogulin (Ogulin), the Sluin (Carlstadt), the Cross (Belovar), the St George's (Belovar), the Ist Banal (Glina), the 2d Banal (Petrinia). (2) The Slavonian Generalate: the Gradiska Regiment (Neu Gradiska), the Brood Regiment (Vinkoveze), the Peter- wardein (Mitrovicz), the Tchaikist Battalion (Titel). (3) The Banat Generalate: the German Banat Regiment (Pancsova), the Wallachian Banat (Karansebes), the Illyrian Banat (Weisskirchen). (4) The Tran- sylvanian Generalate: The Szekler Regiment No. 14 (Csik Szereda),

| the Szekler Regiment No. 15 (Keszdi Vasarhely), the Wallachian No. Ferdinand I. By the close of the 17th century there were |

*| as * military communities," had communal constitutions not unlike*

16 (Orlath), the Wallachian No. 17 (Naszod). Twelve towns, known

those of the free towns of Hungary—Carlopago, Zengg, Petrinia, Kostainicza, Belovar, Ivanit, Brood, Peterwardein, Carlowitz, Semlin, Pancsova, and Weisskirchen.

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Troops were raised for a particular service, and were dis- banded upon the cessation of hostilities. The crown, of its mere prerogative, made laws known as Articles of War, for the government and discipline of the troops while thus embodied and serving. Except for the punishment of desertion, which offence was made a felony by statute in the reign of Henry VI., these ordinances or Articles of War remained almost the sole authority for the enforce- ment of discipline until 1689, when the first Mutiny Act was passed and the military forces of the crown were brought under the direct control of parliament. Even the Parliamentary forces in the time of Charles I. and Cromwell were governed, not by an Act of the legislature, but by articles of war similar to those issued by the king and authorized by an ordinance of the Lords and Commons, exercising in that respect the sovereign prerogative. This power of law-making by prerogative was, however, held to be applicable during a state of actual war only, and attempts to exercise it in time of peace were ineffectual. Subject to this limitation it existed for considerably more than a century after the passing of the first Mutiny Act. From 1689 to 1803, although in peace time the Mutiny Act was occasionally suffered to expire, a statutory power was given to the crown to make Articles of War to operate in the colonies and elsewhere beyond the seas in the same manner as those made by prerogative operated in time of war. In 1715, in consequence of the rebellion, this power was created in respect of the forces in the kingdom. But these enactments were apart from and in no respect affected the principle acknowledged all this time that the crown of its mere prerogative could make laws for the government of the army in foreign countries in time of war. The Mutiny Act of 1803 effected a great constitutional change in this respect: the power of the crown to make any Articles of War became altogether statutory, and the pre- rogative merged in the Act of Parliament. So matters remained till the year 1879, when the last Mutiny Act was passed and the last Articles of War were promulgated. The Mutiny Act legislated for offences in respect of which death or penal servitude could be awarded, and the Articles of War, while

repeating those provisions of the Act, constituted the direct authority for dealing with offences for which imprisonment was the maximum punishment as well as with many matters relating to trial and procedure. The Act and the Articles were found not to harmonize in all respects. Their general arrangement was faulty, and their language sometimes obscure. In 1869 a royal commission recommended that both should be recast in a simple and intelligible shape. In 1878 a committee of the House of Commons endorsed this view and made certain recommendations as to the way in which the task should be performed. In 1879 the Government submitted to parliament and passed into law a measure consolidating in one Act both the Mutiny Act and the Articles of War, and amending their provisions in certain important respects. This measure was called the "Army Discipline and Regulation Act, 1879." After one or two years' experience of its working it also was found capable of improvement, and was in its turn superseded by the Army Act, 1881, which now forms the foundation and the main portion of the military law of England. It contains a Proviso saving the right of the crown to make Articles of War, but in such a manner as to render the power in effect a nullity ; for it enacts that no crime made punishable by the Act shall be otherwise punishable by such Articles, As the punishment of every conceivable offence is provided for by the Act, any Articles made thereunder can be no more than an empty formality having no practical effect, Thus the history of English military law up to 1879 may be divided into three periods, each having a distinct con-

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stitutional aspect :—(1) that prior to 1689, when the army, being regarded as so many personal retainers of the sovereign rather than servants of the state, was mainly governed by the will of the sovereign; (2) that between 1689 and 1803, when the army, being recognized as a per- manent force, was governed within .the realm by statute and without it by the prerogative of the crown; and (3) that from 1803 to 1879, when it was governed either directly by statute or by the sovereign under an authority derived from and defined and limited by statute. Although in 1879 the power of making Articles of War became in effect altogether inoperative, the sovereign was

empowered to make rules of procedure, having the force of law, which regulate the administration of the Act in many matters formerly dealt with by the Articles of War. These rules, however, must not be inconsistent with the provisions of the Army Act itself, and must be laid before parliament immediately after they are made. Thus in 1879 the government and discipline of the army became for the first time completely subject either to the direct action or the close supervision of parliament.

A further notable change took place at the same time. The Mutiny Act had been brought into force on each occasion for one year only, in compliance with the con- stitutional theory that the maintenance of a standing army in time of peace, unless with the consent of parliament, is against law. Each session therefore the text of the Act had to be passed through both Houses clause by clause and line by line. The Army Act, on the other hand, is a fixed permanent code. But constitutional traditions are fully respected by the insertion in it of a section providing that it shall come into force only by virtue of an annual Act of Parliament. This annual Act recites the illegality of a standing army in time of peace unless with the consent of parliament, and the necessity nevertheless of maintaining a certain number of land forces (exclusive of those serving in India) and a body of royal marine forces on shore, and of keeping them in exact discipline, and it brings into force the Army Act for one year.

Military law is thus chiefly to be found in the Army Act and the rules of procedure made thereunder, the Militia Act, 1882, the Reserve Forces Act, 1882, and the Volunteer Act, 1863, together with certain Acts relating to the yeomanry, and various royal warrants and regulations. The Army Act itself is, however, the chief authority. Although the complaint has been sometimes made, and not without a certain amount of reason, that it does not accom- plish much that it might in point of brevity, simplicity, and clearness of expression, it is a very comprehensive piece of legislation, and shows some distinct improvements upon the old Mutiny Acts and Articles of War.

The persons subject to military law are the officers on the active list and the soldiers of the regular forces (includ- ing the royal marines), the permanent staff of the auxiliary (.e., the militia, volunteer, and yeomanry) forces, and the officers of the militia. The above persons are amenable to its provisions

at all times except while embarked on board a commissioned ship of the royal navy, when they become subject to the Naval Discipline Act and certain orders in council made under its authority. Those who are subject to military law in certain circumstances only are—officers and men while serving in a force raised out of the United Kingdom and commanded by an officer of the regular forces ; pensioners when employed in military service under the command of a regular officer; the non-commis- sioned officers and men of the militia, during training, when attached to the regulars or when permanently embodied ; the officers of the yeomanry and the volunteers when in command of or attached to a body of men subject to military law, or when their corps is on actual military

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service, or when ordered on duty witli their own consent; | martial, usually convened by the general of the district,

the men of the yeomanry when they or their corps are being trained, when they are attached to or acting with the regular forces, when their corps is on actual military service, or when serving in aid of the civil power; the men of the volunteers when they are being trained with or are attached to any body of troops, or when their corps is on actual military service; the men of the army reserve and the militia reserve when called out for trainmg or on duty in aid of the civil power; any person who in an official capacity equivalent to that of an officer accompanies a body of troops on active service beyond the seas; any person accompanying a force on active service holding a pass from the general entitling him to be treated on the footing of an officer. In this last category would of course be included newspaper correspondents, also sutlers and followers. In one or two cases persons are subjected to military law to a limited extent and in respect only of certain offences. Thus a militiaman even when not out for training or not embodied is liable to a military trial and punishment for fraudulent enlistment or making a false answer on attestation. In the same manner an army reserve man may be tried and punished by court martial for neglect to appear at the place where he is bound periodically to report himself, or for insubordination to his superiors on these occasions, or for any fraud in connexion with the receipt

of his pay. A man of the army reserve or the militia reserve has the legal status of and in fact becomes a regular soldier when called out on occasions of national danger or emergency under the sovereign's pro- clamation.

When a person subject to military law commits an offence he is taken into military custody, which means either arrest in his own quarters or confinement. He must without unnecessary delay be brought before his commanding officer, who upon investigating the case may dismiss the charge if in his discretion he thinks it ought not to be proceeded with, or may take steps to bring the offender before a court martial. Where the offender is not an officer he may dispose of the case summarily, the limit of his power in this respect being seven days' imprison- ment with hard labour, fines not exceeding 10s. for drunkenness, certain deductions from pay, confinement to barracks for twenty-eight days, this involving severe extra drills, deprivations, and other minor punishments. Where the offence is absence without leave for a period exceeding seven days, the commanding officer may award a day's imprisonment in respect of each day of such absence up to twenty-one. It is only in the case of the imprisonment exceeding seven days that the evidence before the com- manding officer is taken on oath, and then only in the event of the accused so desiring it. The commanding officer is enjoined by regulation not to punish summarily the more serious kind of offences, but his legal jurisdiction in this respect is without limit as regards any soldier brought before him, and when he has dealt summarily with a case the accused is free from any other liability in respect of the offence thus disposed of. In any instance where the commanding officer has summarily awarded imprisonment, fine, or deduction from pay, the accused may claim a district court martial instead of submitting to the award.

Ordinary courts martial are of three kinds, viz.:—(1) a regimental court martial, usually convened and confirmed by the commanding officer of the regiment or detachment, presided over by an officer not under the rank of captain, composed of at least three officers of the regiment or detachment with not less than one year's service, and having a maximum power of punishment of forty-two days' imprisonment with hard labour; (2) a district court

consisting in the United Kingdom, India, Malta, and Gibraltar of not less than five and elsewhere of not less than three officers, each with two years' service or more, and having a maximum power of punishment of two years' imprisonment with hard labour ; (3) a general court martial, the only tribunal having authority to try a commissioned officer, and with a power of punishment extending to death or penal servitude, for offences for which these penalties are authorized by statute; it consists of not less than nine officers in the United Kingdom, India, Malta, and Gibraltar and of five elsewhere, each of whom must have over three years' service, five being not under the rank of captain. There is another kind of tribunal incidental to service in the field, or where, in the case of an offence against the person or property of an inhabitant, an ordinary court martial cannot be held, namely, a field general court martial. This court may consist of three officers only, and it has the power of sentencing to death. Another kind of court, called a summary court martial, may be held where an offence has been committed upon active service and an ordinary court cannot be conveniently assembled. In the event of three officers not being available it may consist of two. When thus constituted it can award only a "summary punishment" or imprisonment; where it consists of three officers, however, it can sentence to death. In the case of a field general or a summary court martial many forms and precautions prescribed in the case of ordinary courts are not necessarily observed, the whole proceeding being from the necessity of the case a somewhat rough and ready means of dealing promptly with crime.

The Army Act prescribes the maximum punishment which may be inflicted in respect of each offence. That of death is incurred by various acts of treachery or cowardice before the enemy, or by when on active service interfering with or impeding authority, leav- ing without orders a guard or post, or when sentry sleeping or being drunk on a post, plundering or committing an offence against the person or property of an inhabitant, intentionally causing false alarms, or deserting. Whether upon active service or not, a soldier also becomes liable to the punishment of death who mutinies or in- cites to or joins in or econuives at a mutiny, who uses or offers violenee to or defiantly disobeys the lawful command of his superior officer when in the execution of his office. Penal servitude is the maximum punishment for various acts and irregularities upon active service not

distinctly of a treacherous or wilfully injurious character, for using or offering violence or insubordinate language to a superior, or disobeying a lawful command when upon active service. The same punishment is applicable when not upon active service to a second offence of desertion or fraudulent enlistment (7.¢., enlistment by one who already belongs to the service), certain embezzlements of public property, wilfully releasing without authority a prisoner or wilfully permitting a prisoner to escape, enlisting when previously discharged from the service with disgrace without disclosing the circumstances of such discharge, or any other offence which by the ordinary eriininal law of England is punishable with penal ser- vitude. Imprisonment with hard labour for two years is the maximum punishment for minor forms and degrees of those offences which if committed upon active scrvice would involve death or penal servitude, such as using or offering violence or insubordinate language to a superior or disobeying a lawful command, and for the following offences:—resisting an escort, breaking out of barracks, neglect of orders, a first offence of desertion or attempted desertion or aiding or conniving at desertion, or of fraudulent enlistment, absence without leave, failure to appear at parade, going beyond prescribed bounds, absence from school, malingering or produc- ing disease or infirmity, maiming with intent to render asoldier unfit for service, an act of a fraudulent nature, disgraceful con- duct of a cruel, indecent, or unnatural kind, drunkenness, releasing a prisoner without proper authority or allowing him to escape, being eoncerned in the unreasonable detention of a person awaiting trial, escaping or attempting to eseape from lawful custody, conniving at exorbitant exactions, making away with, losing by ncglect, or wilfully injuring military clothing or equipments, ill-treating a horse used in the service, making false or fraudulent representations in public documents, making a wilfully false accusation against an officer or soldier, making a false confession of desei tion or fraudulent enlist- ment, or a false statement in respect of the prolongation of furlough, misconduct as a witness before a eourt martial or contempt of such court, giving false evidence on oath, any offence specified in relation

to billeting or the impressment of carriages, making a false answer to a question put upon attestation, being concerned in unlawful enlistment, using traitorous or disloyal words regarding the sovereign, disclosing any circumstance relating to the numbers, position, movements, or other circumstances of any part of her majesty's forces so as to produce effects injurious to her majesty's service, fighting or being concerned in or conniving at a duel, attempting suicide, obstructing the civil authorities in the apprehen- sion of any officer or soldicr accused of an offence, any conduct, disorder, or neglect to the prejudice of good order and military dis- cipline, any offence which if committed in England would be punish- able by the law of England. There is another offence which can be comnnitted by officers only, namely, 'scandalous conduct unbecom- ing the character of an officer and a gentleman." It necessitates cashiering, a punishment which in the case of an officer may be awarded as an alternative to imprisonment in several other instances. There is also an offence peculiar to officers aud non-commissioned officers, that of striking or ill-treating a soldier or unlawfully detaining his pay. A sentence of cashiering as distinguished from that of dismissal in the case of an officer involves an incapacity to serve the crown again. An officer may be also sentenced to forfeiture of seniority of rank and to reprimand or severe reprimand, A non-commissioned officer may be sentenced to be reduced to a lower grade or to the ranks, and where sentenced to penal servitude or imprisoninent is deemed to be reduced to the ranks. The com- mander-in-chief at home or the commander-in-chief in India or in either of the presidencies may also cause a non-commissioned officer to be reduced to a lower grade or to the ranks. An acting nou- comnuissioned officer may be ordered by his commanding officer for an offence or for inefficiency or otherwise to revert to his per- manent grade, —in other words, to forfeit his acting rank.

Tt will have been observed that persons subject to military law are liable to be tried by court martial for offences which if com- mitted in England would be punishable by the ordinary law, and to suffer either the punishment prescribed by the ordinary criminal law or that authorized for soldiers who commit offences to the prejudice of good order and military discipline. The effect of the latter alternative is that for many minor offeuces for which a civilian is liable to a short term of imprisonment, or perhaps

only to a fine, a soldier may be awarded two years' imprisonment with hard labour. A court martial, however, cannot take cognizance of the crimes of treason, murder, manslaughter, treason-felony, or rape if committed in the United Kingdom. If one of these offences be committed in any place within her majesty's dominions other than the United Kingdom or Gibraltar, a court martial can deal with it only if it be committed on active service or in a place more than 100 miles from a civil court having jurisdiction to try the offence. With regard to all civil offences the military law, it is to be understood, is subor- dinate to the ordinary law, and a civilian aggrieved by a soldier in respect of a criminal offence against his property or person i dl forfeit his right to prosccute the soldier as if he were a civilian.

The crimes for which soldiers are most usually tried are desertion, absence without leave, loss of necessaries, violence or insubordina- tion to superiors, drunkenness, and various forms of conduct to the prejudice of discipline. The punishments are generally speaking gauged as much with regard to the character and antecedents of the prisoner as to the particular offence. For a first offence of an ordinary kind a district eourt martial would give as a rule fifty-six days' imprisonment with hard labour, for a second or graver crime eighty-four days. There are not many instances in which the period of imprisonment excecds six months. Corporal punishment, which had been practically limited to offences committed upon active service, and in 1879 to crimes punishable with death, was finally abolished in 1881, and a summary punishment substituted. This summary punishment includes the liability for a term of three months to be kept in iron-fetters and handcuffs, and while so kept to be attached to a fixed object so that the offender may remain in a fixed position for a period not exceeding two hours in the day for not more than three out of any four consecutive days and for not niore than twenty-one days in the aggregate. The offender may also be subjected to the like labour and restraint, and may be dealt with in the same manner as if sentenced to hard-labour imprison- ment. But these summary punishments are to be inflicted so as not to cause injury to health or leave a permanent mark on the offender, The first instances in which this kind of punishment was inflicted occurred during the campaign of 1882 in Egypt. Estimated by the results, the abolition of flogging does not appear to have injuriously affected discipline, the conduct of the troops in Egypt Laving been exceptionally good. The

practice of marking a soldier with the letters "D" (deserter) or "BC" (bad character), in order to prevent his re-enlistment, was abolished about a dozen years ago in deference to public opinion, which erroneously adopted the idea that the "marking" was effected by red-hot irons or in some other manner involving torture. Military men for the most part regret its abolition, and maintain that if the practice were stil] in force the army would not be tainted by the presence of many bad

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characters wha find means of eluding the vigilance of the authorities and enlisting after previous discharge.

The course of procedure in military trials is as follows. When a soldier is remanded by his commanding officer for trial by a district or general court martial, a copy of the charge, together with the statements of the witnesses for the prosecution (called the sum- mary of evidence), is furnished to him, and he is given proper oppor- tunity of preparing his defence, of communicating with his witnesses or legal adviser, and of procnring the attendance of his witnesses. Further, if he desires it, a list of the officers appointed to form the court shall be given him. Any officer is disqualified to sit as a member who has convened the eourt, who is the prosecutor or a witness for the prosecution, who has made the preliminary inqury into the facts, who is the prisoner's commanding officer, or who has a personal interest in the case. The prisoncr may also object to any officer on the ground of bias or prejudice similarly as a civilian might challenge a juror. Except as regards the delay caused by the writing out of the evidence, the procedure at a court martial is'-very much the same as that at an ordinary criminal trial, —the examination and cross-examination of the witnesscs, addresses of the prosecutor and prisoner, and the rules governing the admission or rejection of evidence being nearly identical. At a general court martial, and sometimes at a district court, a judge advocate repre- senting the judge advocate general officiates, his functions being very much those of a legal assessor to the court. He advises upon all points of law, and sums up the evidence just as a judge charges a jury. When the prisoner pleads guilty the court finds a verdict accord- ingly, reads the summary of evidence, hears any statement in mitigation of punishment, and takes

evidence as to character before proceeding to pass sentence. The sentence is that of the majority of the court, except where death is awarded, when two-thirds of the members in the case of a general court martial and the whole iu that of a field general court martial must concur. When an acquittal upon all the charges takes place the verdict is announced in open court, and the prisoner is released without any further proceeding. When the finding is " guilty," evidence as to character is taken, and the court deliberates in private upon the sentence, but the result is not made known until the proceedings are confirmed and promulgated. No conviction or sentence has any effect until it is thus confirmed by the proper authority. The confirming authority in the case of a regimental court is the commanding officer, in that of a district court martial the general officer commanding the district, and in that of a general court, if held in the United Kingdom her majesty, and if abroad in most cases the general oflicer commanding. The confirming authority may order the reassembling of the court in order that any question or irregularity may be revised and corrected, but not for the purpose of increasing a sentence. He may, however, of his own discretion, and without further reference to the court, refuse confirmation to the whole or any portion of the finding or sentence, and he may mitigate, commute, or entirely remit the punishment. In the case of a general court martial the proceedings are sent to the judge advocate general, who submits to the queen his opinion as to the legality of the trial and sentence. If they are legal in all respects he sends the proceedings to the commander-in-chief, upon whom rests the duty of advising the queen regarding the exercise of clemency. In addition to confirmation, however, every general or district court martial held out of India has another ordeal to go through. Itis reviewed and examined in the office of the judge advocate general, and any illegality that may be disclosed is corrected and the prisoner is relieved of the con- sequences. To a certain extent a protection against illegality also exists in the case of regimental courts martial. A monthly return of those held in each regiinent is laid before the general command- ing the district or brigade, by whom any question that might appear to him doubtful would be referred to the adjutant general or the judge advocate general for decision. It is to be noted, however, that the judge advocate general, although fulfilling duties which are in their nature judicial, is only an adviser. He is not actually a judge in an executive sense, atid has no authority dircetly to interfere with or correct an illegal

conviction. In many cases the law thus pro- vides no remedy for an officer or soldier who may have been wronged by the finding or sentence of a court martial,—for instance, through a verdict not justified by the evidence or through a non- observance of the rules and practice prescribed for these tribunals. A person who has suffered injustice may appeal to the Queen's Bench division of the high court of justice. But, speaking generally, that tribunal would not interfere with a court martial exercising its jurisdiction within the law as regards the prisoner, the crime, and the sentence. In most cases, therefore, the virtual protector of an accused person against illegality is the judge advocate general, who personally advises the queen and the military authorities that the law shall be complied with. As a privy counciltor and member of the House of Commons that officer is responsible both to the queen and to parliameut for the right and due administration of military law; and, notwithstanding his want of direct executive authority, it is not to be contemplated that any military officer would hesitate to act upon advice given by him with reference to a

legal question connected with a court martial. The department of the judge advocate general consists of the judge advocate general, who is a lawyer, a privy councillor, and a member of parhament, of a permanent deputy judge advocate general who is alsoa lawyer, and of three military officers as deputy judge advocates having special experience in the working of military law.

The Army Act applies to European officers and soldiers serving in India in the same manner as to the rest of the army, but natives of India are governed by their own Articles of War, and in the case of civil offences they are dealt with according to the provisions of the Indian penal code. The department of the judge advocate general in India is distinct from and independent of that of the judge advocate general of the army, and courts martial held in that country are not subject to the supervision of a professional lawyer. Certain prominent irregularities led to the appointment of a barrister as judge advocate general in India in 1869, but after a few years that appointment again became filled by a milttary officer. The statf of the department is, however, far more numerous in India than clsewhere.

There are judge advocates general for each of the presidencies, and a deputy judge advocate at cach of the more important military centres.

Statistics of Crime in the Army.—Commissioned officers are rarely subjected to trial by court martial. Where an officer com- nits himself in a military sense, and his misconduct is too serious to be passed over merely with a mark of official displeasure, he is usually given and seldom fails to accept the alternative of resigning his commission. 1n some instances the crown is advised to exercise its prerogative and remove him from the army on the ground that her majesty has no further occasion for his services. In no circum- stances can an officer or soldier claim a court martial as a right. In the result, the annual number of trials of officers does not average more than four of late years. Among the non-commissioned officers and soldiers of the army, however, the trials and summary punish- ments by commanding officers are exceedingly numerous, as will presently be seen. In India this observation hardly holds good, for in that country desertion is physically almost impossible except at the two or three seaports where troops are stationed. Absence without leave is for a similar reason of rare occurrence, while the fact of the troops living in their own cantonments, and being free from many temptations of life existing in the large towns and garri- sons at home, places them outside the influence of certain prevalent causes of crime. For this reason mainly the proportion of courts martial held in 1881 was 107 per 1000 men at home as compared with 76 abroad. Similarly the proportion of minor punishments per 1000 was 1449 at home to 1042 abroad. It is also generally found that men engaged upon active service in the field commit less crime than those serving in ordinary circumstances. But the general criminal statistics of the army for 1881 show a formidable amount of crime and punishment. Upon an average strength of 181,186 non-commissioned officers and men there were 16,528 courts martial, of which 179 were general, 8549 district, and 7795 regi- mental courts. There were also 224,681 minor punishments by com- manding officers, including 44,108 fines for drunkenness. These figures generally show an increase of crime as compared with the two years immediately preceding, but these two exhibited a decrease upon previous years. Of the offences tried by court martial in 1881 the following were the principal:— mutiny 7, desertion 15$7, offences in relation to enlistment (fraudulently enlisting while already belonging to the service or making false answers

upon attestation) 1190, violence to and disobedience of superiors 1650, minor insubordination and neglect of orders 1472, quitting or sleep- ing on post 681, drunkenness on duty 2661, drunkenness (tried by court martial when the offence has been committed on a fifth occasion within twelve months) 2147, disgraceful conduct of various kinds 660, absence without leave not amounting to desertion 3298, making away with or losing by neglect equipment or necessarics 3768, and miscellaneous offences chiefly of an ordinary criminal character or to the prejudice of discipline 4181. Upon the 16,523 trials there were 349 findings of acquittal. Regarding the punish- ments awarded, it appears that no soldier was sentenced to death during the year, and the other awards were as follows :—penal servitude 104, imprisonment with or without hard labour (alinost invariably the former) 12,125, discharge with ignominy without other punishment 42, stoppages of pay without other punishment 65, flogging (before the abolition of that punishment by the Act of 1881) 15, and the new summary punishment (authorized as a sub- stitute for flogging) 3. Of the non-commissioned officcrs 3228 were punished by reduction to a lower grade or to the ranks, while 591 more suffered imprisonment in addition to loss of grade, the former number being in the proportion of about 12 and the latter of 2 pes cent. to strength. Of the men tried 305 were pardoned.

Military Law of other Countrics.—The administration of military law in other countries having large armies harmonizes in many important respects with that of England. In some indeed it is a question whether their systems are not superior and in advance. They have a considerable body.of " auditors" or military lawyers who expound the law and do much to secure a uniform and cxact

administration of justice. Thus in Austria there are about five hundred of these auditors, one being attached to each regiment. In the same country there are also courts of appeal from the courts of first instance, these latter consisting of eight persons including the auditor. Where the prisoner is a non-commissioned officer or a private, that rank is represented on the court. Here also the confirmation of superior authority is required. In the German army there are general and regimental courts. An auditor who is a

lawyer is attached to each division, and it is his duty to expound the law, collect the evidence, and read it to the court in the presence of the prisoner, who is asked if he has any thing to say. Thecourt consists of eleven inembers, of whom upon the trial of a private soldier or non-commissioned officer three are of the rank of the accused. The power of commanding officcrs in regard to disciplinary punishments is greater than in the British army, especially in relation to officers, who may be placed in arrest for fourteen days, The non-commissioned officers and privates are Hable to extra guards, drills, fatigues, and different degrees of arrest, some of a very severe character. Dismissal from the army, which is re- garded as a most severe punishment, involving civil disgrace, is often awarded. In Russia there are three kinds of military courts—- namely, the regimental court martial, the tribunals of military districts, and the supreme tribunal at St Petersburg. They are permanent courts, are attended by legal persons, and in certain instances have jurisdiction over the civil population as well as the army. There is a judge advocate general at St Petersburg, where the supreme tribunal consists of general officers and high war-office functionaries who have studied military law or possess a large experience of its working. In Italy there are permanent military tribunals for the trial of non-comunissioned officers and soldiers, while special tribunals are appointed to try officers. The court is the absolute judge of the facts, but regarding legal errors or irregularities an appeal lies to the supreme war tribunal, which con- sists of four civilian judges and three general officers. The French code corresponds in many respects with those of the other grcat Continental arinies, but it tends rather to give individual officers large powers of imprisonment graduated according to their rank. The chief distinctive feature of the French system is the institution of regiments of discipline for refractory characters. When the general officer's power of imprisonment (two months) is exhausted the offender may be sent before a court of discipline and by them drafted intoa compagnie de discipline; and cases of habitual miscon- duct are thus dealt with, the man being struck off the strength of his original corps and transferred to one in Algeria. The military law of the United States is founded upon and proceeds mnch upon the same lines as that of England. (J. C. O'D.)

MILITARY TACTICS. See War.

MILITIA. The militia of the United Kingdom consists of a number of officers and men maintained for the purpose of augmenting the military strength of the country in case of imminent national danger or great emergency. In such a contingency the whole or any part of the militia is liable, by proclamation of the sovereign, to be embodied,—that is to say, placed on active military service within the confines of the United Kingdom. The occasion for issuing the proclamation must be first com- municated by message to parliament if it be then in session ; if it be not sitting, parliament must be called together within ten days. For the purpose of keeping the force in a condition of military efficiency, the officers and men are subjected to one preliminary training for a period not exceeding six (usually about two) months, and further to an annual training not exceeding fifty-six (usually twenty- eight) days. The force is composed of corps of artillery, engineers, and infantry. Infantry militiamen are formed into battalions constituting part of the territorial regiment of the locality of which the regular forces are the senior battalions. The officers and men when called out are hable to duty with the regulars and in all respects as regular soldiers within the United Kingdom. Of late years the men have been raised exclusively by voluntary enlistment, but where a sufficient number for any county or place is not thus raised a ballot may be resorted to in order to complete the quota fixed by the queen in council for that county or place. Each man is enlisted as a militiaman for the county, to serve in the territorial regiment or corps of the district. The period of engagement is not to exceed six years, but during the last of these years a militiaman may be re- engaged for a further period also not exceeding six years.

Men who illegally absent themselves are liable, in addition to punishment for the offence, to make up for the time of their absence by a corresponding extension of their service. The officers are appointed and promoted by the crown, but first appointments are given to persons recommended by the lord Heutenant of the county who may be approved as fulfilling the prescribed conditions in respect of age, physical fitness, and educational qualifications. Since 1877 the officers have been permanently subject to military law. The general body of the non-commissioned officers and men

are so stibject only when called out for training or embodi- ment. At other periods they have simply the legal status of civilians, except as regards a liability to trial and punishment for offences in connexion with enlistment or for military offences committed while called out. Each militia regiment has a permanent staff, consisting of an adjutant and a small body of non-commissioned officers aud drummers, to conduct the recruiting drills and ordinary business of the corps; and the members of this permanent staff are always subject to military law. They mostly consist of non-commissioned officers who belong to or have served in the regular portion of the territorial regiment. Many of the militia corps have their head- quarters at the brigade depdt or local establishment of the territorial regiment, and all are under the general supervision of the (regular) colonel commanding the brigade depot. The area of service does not extend beyond the United Kingdom; but those who voluntarily offer to serve in the Channel Islands, the Isle of Man, Malta, or Gibraltar may be employed therein. The uniform of the officers and men of the militia is precisely the same as that of the regular corps with which they are associated, or rather of which they form part, except that in addition to the regimental distinguishing mark they bear the letter "M" upon their appointments, to denote that they belong to the militia portion of the corps.

As above stated, the ranks of the militia are usually filled by voluntary enlistment; but by a statute which, though temporarily suspended, can be put in force provi- sions are made for filling up any deficiency in the allotted quota in any county, city, or riding by ballot of the male inhabitants if within certain limits of age. The enactment provides as follows :—

The secretary of state is to declare the number of militiamen re- quired, whereupon the lord lieutenant is to cause meetings to be held of the lieutenancy for each subdivision. To these meetings the householders of each parish are to send in lists of all male persons between the ages of eightcen and thirty dwelling in their respective houses. Before the ballot, however, the parish may supply volun- teers to fill up the quota, every volunteer so provided and approved counting as if he were a balloted person. If a deficiency still exists, the persons on the lists shall be balloted for, and double the number of those required to supply the deficiency shall be drawn out. Any person whose name is so drawn may claim exemption or

object; and the deputy lieutenants scttle the question of his liability to serve. From the corrected list those who are of the requisite physique (the height is 5 feet 2) are enrolled in the order in which their names are numbered until the quota is completed. If the list

is not sufficient to fill the quota, another ballot in the same manner is to be taken. Any balloted man becoming liable to serve may,

however, provide a substitute who has the requisite physical qualifi- .

cations, and is not himself liable to serve.

Within the general body of the militia is contained another having an additional and important obligation in the matter of service. It is called the " militia reserve," and is formed of men who voluntarily undertake a liability to join the regular forces and serve in any place to which they may be ordered in case of the proclamation of a state of imminent national danger or great emergency. In this respect they are in fact upon the same footing as the army reserve, and on the occasion of the mobilization of 1878 more than 20,000 of these men became part of the regular army. The present strength of the militia reserve is a

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little under 29,000 men, and judging by past experience it

i may be computed that about 25,000 could be at once

added to the ranks of an army in the field in the event of national danger or emergency. It is to be observed, how- ever, that every man thus added to the regulars would be taken away from the effective strength of the militia.

There is no statutory provision for the number of men to be maintained, that number being what from time to time may be voted by parliament. The latest information available respecting the actual condition of the militia of Great Britain relates to the year 1881, and that of Ireland to 1880, the militia of the latter country for obvious political reasons not having been called out for training in 1881 or 1882. Taking the militia of the United

Kingdom in 1881, we find that the establishment provided for was 139,501, of whom 18,618 were artillery, 1317 engineers, and 119,566 infantry. Divided into ranks, this establish- ment was made up of 3534 sergeants and 1260 drummers of the permanent staff, and of the general body 3909 officers, 2520 sergeants, 5040 corporals, and 123,238 privates. The number actually enrolled was 127,868 of all ranks, leaving 11,633 wanting to complete. Of the number enrolled 84,864 belonged to English, 14,138 to Scotch, and 28,866 to Irish regiments, the numbers wanting to complete being for England 7420, for Scotland 162, and for Ireland 4051. As the Irish regiments were not called out, our information regarding the actual effective condition of the force as shown at the annual training does not include Ireland. With regard to the English regiments, 74,945 were present out of an enrolled strength of 84,864. Of the absentees 3144 were with and 6775 without leave. In the Scotch regiments, 12,401 appeared at the training, and of the absentees 616 were with leave and 1121 with- out. Of the total establishment (106,584) for Great Britain, 99,002 were enrolled, and of those enrolled 87,346 presented themselves and 3760 were absent with leave and 7896 actual defaulters. Of the English regiments five- sixths and of the Scotch regiments two-thirds were born in the county to which their regiments respectively belonged. Of 92,677 men (for Great Britain) whose occupations are disclosed, 17,665 were artisans, 22,221 mechanical labourers, 26,227 agricultural labourers, and 26,564 other trades. Speaking approximately, more than one-half of the men were between twenty and thirty years of age, about 4 per cent. between seventeen and eighteen, about 9 per cent. between eighteen and nineteen, and about 12 per cent. between nineteen and twenty, while some 20 per cent. were over thirty years of age. More than one-half ~ those inspected in 1881 were between 5 feet 5 inches and 5 feet 7 inches in height, about 20 per cent. were under 5 feet 5 inches, while only 585 out of a total of 92,677 were 6 feet and upwards. At the date of inspection there were 296 men in military confinement and 465 in the custody of the civil power. On the last occasion (1880) on which the Irish militia were called out, upon an establishment of 32,813 and an enrolled strength of 30,515 the number present at the training was 26,399, leaving 706 absent with and 2264 without leave. Regiments numbering in the aggregate 1146 men were not trained.

As distinguished from the regular forces or standing army, the militia has been described as the constitutional military force of the country ; and its history justifies the description, at least up to a recent period when it lost its distinctive character and became to a great extent merged in the regnlar army. It is the oldest force Britain possesses, and in fact represents the train bands of early English history. Its origin is to be found in the obligation of all freemen between certain ages to arm themselves for the preservation of the peace within their respective counties, and generally for the protection of the kingdom from invasion. This obligation, imposed in the first instance upon the individuals themselves, became shifted to the owners of land, who were compelled to keep up their propor- tion of horses and armour for the national defence. The forces were

placed under the lieutenant of the county, empowered in this respect by a commission from the crown. This prerogative of the sovereign, which had been in some instances a matter of controversy, was declared by statute shortly after the Restoration. By the same statute the militia of each county was placed under the lieutenant, who was vested with the appointment of officers, but with a reserva- tion to the crown in the way of commissioning and dismissal. The cost of the annual training—for fourteen days—fell upon the local authority. Offences against discipline were dealt with by the civil magistrates, but with a power to the officers of fining and of imprisoning in default. Upon this footing the militia of England remained for nearly a eentury, with the general approval of the cominunity. It was recognized as an instrument for defence and for the preservation of internal order, while it was especially popular from the circumstance that from its constitution and organization the crown could not use it as a means of violating the eonstitution or abridging the liberty of the subject. It was eon- trolled and regulated in the county ; it was officered by the land- owners‘an:] their relatives, its ranks were filled by men not depend- ing for their subsistence or advancement upon the favour of the crown; its numbers and maintenance were beyond tlie royal control; its government was by statute. While the supreme ecoinmand was distinctly vested in the crown, every practical security was thus taken against its use by the crown for any object not constitutional or legitimate. Itwas regarded as, and was, in fact, the

army of the state as distinguished from the standing army, which was very much the army of the king personally. The latter consisted of hired soldiers, and was more than once recruited by a conscription, con- fined, however, to persons of the vagrant class not having a lawful employment, while the former was mainly composed of those having a fixed abode and status. The militia thus enjoyed for many years as compared with the regular forces a social as well as a consti- tutional superiority. About the middle of the last century the militia was reconstituted, with certain modifications, not involving a sacrifice of the principle of its local government, but strengthening somewhat the supervising influence of the crown. Thus the king directly appointed the permanent staff, and was given a veto upon the appointment and promotion of the officers, who were to have a

property qualification. A quota was fixed for each county, to be raised by ballot of those between the ages of eighteen and forty-five, each parish having the option of supplying volunteers at its own cost, and each man balloted being permitted in lieu of serving to pay £10 to provide a substitute. When called out for service the pay was to be the same as that of the regulars, and while embodied or assembled for annual training the officers and men were placed under the Mutiny Act and Articles of War, with, however, a proviso that in time of training no punishment was to extend to "life or limb." The crown was given the power to call out the militia in case of apprehended invasion or of rebellion, and associate it with the regular army, but only upon the condition of previously in- forming parliament if then sitting, and if it were not sitting of calling parliament together for the purpose. A further and im- portant security was established to prevent an unconstitutional use of the militia by the crown: the estimate for its training was framed each year, not by an executive minister of the sovereign, but by the House of Commons itself. Upon the initiative of a committee of the House, an Act was passed providing for the pay and clothing of the militia for the year. Upon this footing substantially the

militia of England remained for many years, the Irish and Scotch militias beiug meantime brought under the same conditions by various enactments. The foree was embodied on several oceasions during the last and in the early years of the present century, and it contributed largely to the army engaged in the Peninsula. From 1803 to 1813 just 100,000 men, or two-

fifths of those raised for the army, came from the militia. In this way, however, it lost its distinctive character as a defensive force. During the peace which followed the final fall of Napoleon the militia was suffered to fall into decay; and up to 1852 it had only a nominal existence in the shape of an effete permanent staff with no duties to perform. In 1853 the militia was revived just in time to enable it to fulfil most valuable functions. In the war with Russia it was embodied aud did garrison duty not only in the United Kingdom but in the Mediterranean garrisons, thus enabling the authorities to send most of the available regular troops to the scene of hostilities. It further contributed many officers and some 30,000 men to the line. It still gives annually about 8000 recruits to the regulars. During the Indian mutiny it filled scarcely less useful functions when again called out. It has since then been regularly assembled for annual training; and when it is brigaded with the regular forees at Aldershot and other camps of instruction its military aptitude and proficiency have generally elicited the surprised admiration of pro- fessional soldiers. In 1871 an important constitutional change was made. It was part of the new army system inaugurated in that year that the control of the militia should be removed from the lord lieutenant of the county and vested wholly in the crown. It has now virtually ceased to exist as a distinct body, and isa part of the regular forces with a limitation as to the time aud area and |

d01 other conditions of service. There is no longer a regiment of militia. The body that would formerly be thus described is now a collection of militiamen of a regiment largely composed of regulars. The votes for the maintenance of the militia are now part of the army estimates. The officers of the militia and the line are eligible for duty with either force, and may sit upon courts martial indis- criminately. This practical amalgamation of the old constitutional force with the standing army may appear theoretically open to the objection that it is thereby placed under the direct control of the sovereign. But the day has passed when such an objection could have any value. The fact of the whole army being placed in all respects under the direct control of a minister responsible not only to the crown but to parliament is enough to dissipate any constitu- tional apprehensions under this head.

The only colonial militia that forms an effective force is that of Canada, which is organized as an efficient local army. 'The Goverument of the Dominion includes a minister of militia and defence. The foree is placed under the command of a general officer, assisted by an adjutant-general, belonging to the regular army and appointed by the queen. The training of the officers is a matter of special care, there being a military college at Kingston, several of the governing body and professors of which are officers of the Royal Artillery and Royal Engineers, as well as schools of gunnery and musketry. For military purposes the Dominion is mapped out in twelve districts. The militia is divided into the active and the reserve, and the male inhabitants between the ages of eighteen and sixty, with the usual exceptions, are liable to inilitary service, the extent of which varies with the age of each man, the larger amount of duty falling upon the younger. The active militia comprises 12 regiments of cavalry, 17 field and 31 garrison batteries of artillery besides a inountain battery, 4 com- panies of engineers, 2 mounted rifle corps, 97 battalions of from 5 to 10 companies each and 16 independent companies of infantry. The uniform is for the most part like that of the regular army, and the organization and general efficiency of the whole body have been very favourably reported upon. Although the obligations of the Canadiau militia are purely local, a large number on a late occasion offered themselves for general service; and, in the event of a war on a large scale, itis believed that the force would con- tribute a valuable addition to the fighting strength of the imperial army. (J. C. O'D.)

MILK is the fluid secreted by the mammary glands of the division of vertebrate animals called Mammalia. These glands are in a rudimentary form in the Monotremes. In

Ornithorhynchus there is no nipple, but the mouth and

| tongue are closely applied over the area on which the ducts

open, and the fluid is withdrawn by suction on the part of the young and compression of the gland by the mother. In Echidna the ducts of the gland open into a small pouch, foreshadowing the larger pouches of marsupials. In Marsupials the glands are more compact, and have a greater number of lobules. They are found behind the marsupial depressions or those of the

pouch; they are not fewer than | two on each side nor more than thirteen, six on eacli side and one midway. The ducts, long and slender during lactation, open on a nipple which is covered by a reflexion of the skin at the back of the pouch, thus forming a kind of hood or sheath. The nipple is protruded beyond the hood during lactation, and is much elongated. The number of these nipples bears a relation to the number of young at a birth; thus the kangaroo, with one at a birth, has four nipples (two, generally the anterior pair, being in use), whilst the Virginian opossum, which produces six or more at a birth, has thirteen nipples. Rodents show a corre- sponding provision for the nourishment of the young in the number of nipples. A seeming exception is the common guinea-pig, which frequently has eight, ten, or twelve young at intervals of two or three months, and yet the mother has only two teats to serve them, turn and turn about; the original stock of the domestic species breeds, however, only once annually, and has but one to two young, so the domestic variety is a curious anomaly due to the artificial circumstances of its life. In the porcupines there are two nipples, one midway between the fore and hind leg, and the other midway between this and the base of the fore leg. In the coypu, a creature often carrying its young on its back whilst it swims across rivers, the teats project from the flanks near the shoulders, and are of considerable length,

so that the young readily reach them. The Jnsectivora have, as a rule, more nipples than are found in any other order. Thus in the tenrec (Centetes) there are as many as twenty-two, and they are rarely fewer than fourteen, spread out in pairs from the pectoral to the inguinal regions. 'There are ten teats in the common hedgehog, six to eight in moles and shrews, two in sloths and armadillos. In Cetacea there are two long, narrow, flat glands lying between the dermal and abdominal muscles, with the sub- cutaneous blubber separating them from the skin. The peculiarity of the arrangement in these animals, where suckling is performed under water, is the large size of the central duct, which acts as a kind of reservoir, so that the young may obtain a considerable supply in a very short time. It would appear also that when suckling takes place the nose of the young is above the surface of the water. Among Ungulates, in the elephant the glands and teats are between the fore legs; in the rhinoceros they are inguinal ; in the mare and ass the

glands are two in number, and are found between the thighs, about 9 inches in front of the vulva; the tapir has two inguinal nipples, the peccary two ventral and two inguinal, the wild sow eight nipples, whilst in the domestic breeds there are at least ten, extend- ing from the pectoral to the inguinal regions, Ruminants have the glands aggregated into a round mass in the inguinal region, pendulous in full function, divisible into two glands, each of which has a large reservoir. When in use the teats, one pair or two pairs being the number, in connexion with the reservoirs become so large as to receive the special name of "udder." All the deer tribe, camels, the giraffe, and all kinds of cows have four teats; most antelopes and the gazelles have two teats, whilst a few antelopes have four. As to Carnivora, the felines have usually six nipples; the wolf, jackal, fox, dog have usually eight ; the seals and the walrus have four, the otters two, the weasels six, the bears six; and in the kinkajou (Cercoleptes) the number is reduced to two. Amongst Quadrumana, the aye-aye (Chiromys) has only one pair of nipples, about an inch and a half in front of the vulva; many lemurs have in addition to those a pectoral pair; in all the platyrhine and catarhine Quadrumana there is only one pair of glands, restricted to the pectoral region. Here the teats are between the fore legs, and the young clings to the mother's breast in human fashion, but there is no protru- sion of the breast as in the human being. (For further details see Owen's Anatomy of Vertebrates, vol. iii. p. 769.)

In the human race the glands are two in number, form- ing, along with the skin and fat, two rounded eminences, one on each side, on the front of the thorax. They extend from the third to the sixth or seventh rib, and from the side of the sternum to the axilla. In the centre projects a small conical body, the nipple. Around the nipple is a coloured circle, or areola, which is darker during pregnancy, and even in women who have borne children than in the virgin state. The surface of the nipple is wrinkled, and with a magnifying glass is seen to be covered with papille. It is perforated by numerous openings, the mouths of the milk ducts. The tissue of the nipple contains numerous minute blood-vessels, and it has at the base muscular fibres arranged in concentric circles and in radiating bands. It has much of the character of erectile tissue, as in the corpora cavernosa of the penis, becoming turgid, firm, and prominent from excitement. The base of the gland lies on the pectoral muscle, a thin layer of fascia intervening. The

surface is covered with fat, which gives it the smooth rounded outline. It is amply supplied with blood by the long thoracic artery, some other minute branches of the axillary artery, the internal intercostal artery, and the subjacent intercostals. The nerves come from the anterior and middle intercostal cutaneous branclies,

‘ globules.

LK

and the nipple is especially sensitive. The gland is com- posed of numerous lobes bound together by connective and adipose tissue, and each lobe is formed of smaller lobules. Each lobe has an excretory duct, and these ducts, from fifteen to twenty in number, converge towards the areola, beneath which they are dilated so as to form sinuses from 4th to }th of an inch in calibre. From these sinuses arise the ducts which open on the surface of the nipple. The

general structure will be understood by referring to the the description.

accompanying figures, along with

We

Fie, 1.—Half-diagrammatic view of a section through a lobule of the mammary gland, after Klein (At/as of Histology, plate xl. fig. 1), magnified 45 diameters. a, a duct dividing into two branches; 6, 6, 6, connective tissue surrounding and going between the ultimate pouches of the gland; c, c¢, ¢, the pouches or alvcolé of the gland, the dots representing the cells lining them.

Fre. 2.— A portion of the same gland, magnified about 400 diameters, showing one complete and two incomplete alveoli. , a, a, short, columnar, epithelial cells lining the alveolus, each having an oval or rounded nucleus: 0,6,6, epithelium cells, containing, next the interior of the alveolus, a milk globule; ¢, ¢,c,c, milk globules which have been set free from epithelial cells,

When a duct is traced into the gland, it is found to sub- divide into smaller ducts, and these into still smaller, until the smallest ductlet is reached, round the end of which are clustered several alveolt or pouches. ach alveolus has a wall, lined with epithelium cells. In the wall of the alveolus there are capillary blood-vessels which bring the blood near the cells. By this blood the cells are nourished. There is a minute cavity in the centre of each alveolus into which cells or their products can accumulate. There can be no doubt that the formation of the milk globule takes place in these cells. Whilst milk is not being formed the cells have a granular appearance, and the lumen or central cavity of the alveolus is small; but during secretion the cavity is enlarged and shows a few milk globules, whilst one or more milk globules can be seen in the interior of the cell. If the milk globule in the cell be very large, the nucleus of the cell is pressed outwards and the protoplasm of the cell is reduced to a thin covering, over the globule, at this stage presenting a striking resemblance to a fat cell containing an oil globule. Thus each milk globule is formed in the protoplasm of the epithelium cell, and even at an early stage each milk globule consists of a minute drop of fat or oil surrounded by a thin albuminous envelope. It has not been clearly ascertained whether epithelial cells, after having secreted milk globules, degenerate and fall off, or whether they have the power of ejecting the milk The fluid constituents of milk (water holding

salts in solution) may be separated from the blood by a kind of filtration under blood pressure, as is the case in other secretory processes. The origin of the sugar of milk and of the casein is unknown. (For a description of the minute structure of the milk gland, see Klein's Atlas of Histology, p. 300, and references.) At the beginning of lactation the milk is rich in largeirregularly- formed corpuscles (fig. 3, a, a, a) called colostrum corpuscles. These are a---- contractile bodies, slow- ly changing their form and squeezing out the oily particles, At first Fic. 3—A drop of milk magnified 300 diameters. they are the only bodies a, a, a, colostrum corpuscles. present, but they are soon replaced by the ordinary milk globules. Such globules have bright refractive edges, the surface is smooth, they vary in size from gp/y9th to

1_,th of an inch in diameter, and each consists of a drop of fatty matter surrounded by a layer of albumen (“Ascherson’s membrane ”). |

A secretion of milk takes place in newly-born children, from the fourth to the eighth day, and also in rare cases in men (Hermann’s Physiology, p. 158). During gestation in the human being the mammary glands increase in size ; immediately after the birth of the child active secretion commences; and usually it is on the stoppage of the secre- tion, ten months afterwards, that the process of menstrua- tion, which has been arrested by impregnation, again is re-established.

The secretion of milk is undoubtedly affected by the nervous system, as is shown by fear or mental distress arresting or injuring the quality of the secretion, and by the ‘“‘rush” or feeling of fulness in the breast experienced by the mother when the child’s mouth touches the nipple, or even when she sees her offspring. The nervous mechanism, however, is unknown, asit has been observed that secretion may continue even after section of all the nerves known to pass to the gland. The nature of the diet has a marked influence on the quality of the secretion. Thus the amount of casein and of fat is greater during an animal than during a vegetable diet. Fatty foods do not seem to increase the amount of fat or butter; an ample supply of carbo-hydrates (starches and sugars) increases the amount of sugar. These facts indicate that most if not all of the constituents of milk are formed from changes in the pro- toplasm of the epithelial cells. In some women the milk is deficient in fat and casein, and consequently is less nutritious. Prolonged lactation diminishes the amount of fat and sugar without materially affecting the amount of albuminous matter ; but the milk is less nutritious and is unfit for the child. The occurrence of menstruation during lactation also deteriorates the milk. (J. G. M.)

Milk as Food. The milk of various domesticated animals is more or less

used by man for food. The milk of the cow, which may .

be taken as typical of all others, and is indeed by far the most important and valuable of all, is, when newly drawn, an opaque white fluid, with a yellowish tinge, soft, bland, and sweetish to the taste, and possessed of a faintly animal odour. This odour, according to Schreiner, is due to the

presence of sulphuretted hydrogen, and disappears after a short exposure. The specific gravity of milk ordinarily ranges from 1°029 to 1:033, very seldom reaching 1:035 or falling so low as 1:027. Inchemical constitution it con-

| sists of an emulsion of fatty globules (cream) in a watery

alkaline solution of casein, and a variety of sugar, peculiar to milk, called lactose. The fat (which when separated we know as butter) and the lactose constitute the carbonaceous portion of the milk regarded as food. The casein, which forms the principal constituent of cheese, and a certain proportion of albumen which is present, form the nitro- genous, while the complex saline substances and water are the mineral constituents. These various substances are present in the proportions which render milk a perfect and typical food suitable to the wants of the young of the various animals for whom it is provided by nature. The milk of all animals, so far as is known, contains them, although they are present in somewhat different propor- tions. It is probable that the milk of ruminants possesses certain physical and physiological distinctions from that of non-ruminant animals, which will account for the virtues attributed to the milk of the ass and mare, The following table exhibits the chemical constitution of the kinds of milk most frequently used by man :—

Ewe.! | Mare.

Winter Blyth. Cameron. Cameron.

Water 86°87 ; : : 0°3 we. 3:50! 4:00| 6-11| 4°45| 1-055 Casein and ’ , P ; 4 nc 475} 410] 3-94] 516] 1-953 Sugar…..... 4-00! 4-28| 4:68) 5-73| 6-285 .. 0-70| 0°62| 0-79! 0-96| 0-369

In addition to these constituents milk contains small pro- portions of the gases carbonic acid, sulphuretted hydrogen, nitrogen, and oxygen, and minute quantities of other prin- ciples, the constant presence and essential conditions of which have not been determined. These consist of galactin and lactochrome, substances peculiar to milk, discovered by Winter Blyth,

with certain animal principles such as leucin, pepton, kreatin, tyrosin, &c. The salts in milk consist, according to the average of numerous analyses by Fleischmann, of the following constituents :—

Phosphoric acid…..... Ber): | PUMA cay oss sgapses cslepensyg 17°34 CHOTIMGL. 0.6. Secccrncceems OG 4 Mapnesie >... ci s.stc2 te dens 4°07 Bae Bt oh. khaatcewel 27°00\| Ferrie oxide cic s.28 oes 0°62 FSO GS ass arstemrensesienrcisnarel gaat 10°00

Milk thus is not to be regarded as a definite chemical compound nor even as a mixture of bodies in fixed and invariable proportions. Not only does the milk of different races and breeds of cows vary within comparatively wide limits ; the milk of the same animal is subject to extensive fluctuation. The principal causes of variation in the individual are age, period of lactation, nature and amount of food, state of health, and treatment, such as frequency of milking, &c. The following table indicates the range of normal variations :—

WY aihetas «durch See arreee ter «QR owed. 90°00 to 83°65 ae al 1 la a a Ae 2°80 ,, 4°50 CAseMP ATC APOUNMM) ctr. mis peaccnghre ace signa cece 3500) 4, 6:00 12 47. anh eoHenbutaNhd 1seoacie odes =aSacaeee anos Onnc 3°00 ,, 5°50 MST A. AT CIARA ALIAS Me 0:70 ,, 0°80

The average quantity of milk yielded by cows is also highly variable, both in individuals and breeds. As a rule the smaller breeds of cows yield a small amount of milk rich in cream (butter fat), while the yield of the larger breed is greater in quantity, but comparatively deficient in cream. A good milch cow should yield in a milk-giving period of from eight to nine months about

1 Bwe's milk is exceedingly variable, especially in its percentage of fat. The above analysis is one of nine by Dr Voelcker, in which the fat was found to range from about 2 to 12% per cent.

500 gallons of milk, from which nearly 500 tb of cheese or 200 tb of butter would be obtainable.

Dairy Treatment.—Cows are commonly milked by hand two or three timesa day. A milking machine of American origin, which was introduced about the year 1862, has been entirely abandoned. 'The milk should be drawn from the animals in as clean a condition as possible, but notwith- standing every precaution some amount of hair and epithelial and other animal débris invariably enters the milk-pail. It has therefore to be immediately strained through a sieve with fine wire-cloth or hair strainer. As milk is peculiarly susceptible of taint, and absorbs odours of all kinds with great avidity, it is of the utmost con- sequence that all vessels in which it is placed or kept should be so made as to be easily purified and that they should be kept scrupulously clean. In Switzerland inilk is strained with most beneficial effect through sprigs of washed fir tops, which inserted loosely and uprightly into the hole of a funnel arrest all hair, skin, clots, and slimy matter on the acicular leaves. The milk drains through in a clean condition with a fresh slightly aromatized flavour favourable to its keeping. A fresh sprig is used on each occasion of straining milk, so that there is freedom from the risk of taint which arises through the use of imperfectly cleaned wire gauze. The milk must be removed from the cow-house as quickly as possible ; and, if intended for use as new milk and for sale in the neighbourhood of the dairy, it may at once be put up for delivery. But if it has to travel a distance, or if it is to be kept for creaming or cheese-making, it should be rapidly cooled down, and kept in a cool airy milk-room if prac- ticable, surrounded with fresh cold water.

The ordinary method of separating cream either for direct use or for butter making is by allowing it to form on the surface and skimming it off with a broad flat spoon; but ingenious adaptations of centrifugal machines—of which Laval's separator is one of the best known—have been introduced for the purpose of effecting the rapid and complete separation of the cream. 'The centrifugal force of such machines throws the denser portions of the fluid towards the sides of a rapidly revolving cylinder, collecting the cream on an inner layer, which is carried off by one channel while the

impoverished milk escapes by another. The Laval separator gives very rich cream, as will be seen from the following analyses by Voelcker:—

{ f eit ;

Ordinary | Cream by ; Sele epee

ogee |e Seunettor, aa Wiatelet ca cscscaceses socal! 77 BO 66°12 90°82 89°25 IBS IEA ssn enoeansooone 15°45 27°69 0°31 IL, CASEIN sc ccccns Muara 3°40 2°69 3°31 3°69 IN GUD e RinEEMIE, coneappenoe 3°15 3°03 4°77 5°16 Mineral inatter…..... 0°70 0°47 0-79 0°78

After being kept some time, depending principally on the temperature at which it is maintained, milk begins to turn sour owing to the formation of lactic acid, by a process of fermentation, at the expense of the lactose or milk sugar. The acid so developed causes a coagulation of the casein, and the milk separates into a solid white curd, anda thin transparent yellow milk serum or whey. These changes can to a certain extent be artificially produced, hindered, and controlled. The following are the results of analyses by Fleischmann :—

Constituents of 100 Parts of Sweet Milk.

3°56 butter. A VROUMCHE AI tc ceric caitceie cvs vee oeeeeeeeans 16°30 buttermilk. 0:14 loss. 7°93 curd. 72-70 skimmedemilk…..... Benen 71°45 whey. 0°32 loss.

OsSOMlOSSmerrce so es acdc ereiec Hue oe 0°30 loss.

WMiLkK

Relative Composition of Milk and its Produets.

Milk

Water. Casein. | Albumin. Sugar.

Whole milk 87°60 4°30 Cream 77°30 Sls Skim-milk 90°34 4°63 Butter 14°89 0°28 Buttermilk 91:00 | 3°80 UT a. caie nena eee ee 59°30 5°01

Whey 94-00 4°55

The simplest and most advantageous form in which milk can be disposed of as a commercial product is by its sale as sweet or new milk, and it is in this manner that the greater proportion of the milk produced within the reach of large centres of population is disposed of. New milk, cream, and skimmed milk are the only primary forms in which milk is sent into the market. CHEESE and BurrEr have been dealt with in separate articles (q.v.). Whey, the yellow liquid remaining after the separation of the curd in cheese making, is a source of milk sugar, employed to a limited extent in pharmacy ; but it is prin- cipally used for feeding pigs. The buttermilk which re- mains after separating butter is a most wholesome and nutritious article of food.

Preservation of Milk.—The numerous methods which have been proposed for the preservation of milk in a condition fit for nse over a lengthened period resolve themselves into (1) chemical treatment with alkaline salts and antiseptic bodies, (2) physical treatment, such as cooling or icing, boiling, and aeration, and (3) condensation with or without the addition of a prescrvative agent. All systems of preservation, however, are subject to serious disadvantages either from their serving their purpose for too limited a time, or their interfering with the natural constitution and properties of the milk. Of all preservatives cold is the most efficient and least objectionable. It has been shown by Soxhlet (Dingler's Polytech. Journal, cexxili. 829) that milk cooled by ice-water remains sweet and unaltered for fourteen days, but after that time acquires a rancid taste. After twenty-eight days it coagulates on boiling owing to the presence of acids resulting from the oxidation of the cream, and in thirty-four days it coagulates even in the ice-water. It is also found that milk which has undergone aeration with atmospheric air has its keeping properties much improved. The acration is effected by allowing the milk to fall from sonie height in a state of fine division by passing it through the ineshes of a sieve. By another method air cooled by passing over ice is blown through the milk.

Milk keeps sweet for a longer time when boiled, but the smell, taste, and other properties are affected, partly owing to the escape of gases mixed with it when fresh. The unpleasant flavonr com- municated by boiling can be avoided if the action takes place in a closed vessel and the milk is

immediately cooled down in a refrigerator connected therewith. In the case of any suspicion of taint in milk either from disease in the cow, contamination from unhealthy persons, or the use of infected water in cleaning vessels, boiling is also strongly to be recommended, as it effectually destroys the germs of disease, in the carrying and spreading of which milk is a most active agent. It is with the utmost difficulty that boiled milk can be coagulated by means of rennet; but by treatment with acid it coagulates more rapidly and freely than if unboiled.

Of the various chemical compounds which have been suggested and more or less used for preserving inilk, the most successful hitherto has been salicylic acid, which has the advantage of being tasteless and inodorous. By briskly stirring in rather less than 2 grains to a pint of milk, it can be kept liquid and sweet in a tem- perature of from 65° to 68° Fahr. for twelve hours, and at 55° Fahr. fora whole day. If 4 grains be used to a pint, coagulation in the higher temperature is delayed from two or three days, and at the lower temperature the milk may be kept good from three to five days. Boracic acid and borax are also employed by dairymen, the former being known as glacialine salt. The presence of any chemical anti- septic in milk is, however, at best a matter of doubtful advantage.

Condensation. —Milk is now treated on a large scale by a process of concentration, the product of which comes into the market in two forms—as " plain condensed milk " and as " preserved milk." The credit of originating the industry is due to Mr Gail Borden of White Plains, New York, who began his experiments about 1849. In 1851 he introduced his plain condensed milk, which is simply milk from which between three-fourths and four-fifths of the water has been removed, and in 1861 he rendered important services to the army in the field by supplying preserved milk which was in

effect milk similarly concentrated, with a proportion of sugar added, and hermetically sealed in tin cans. The manufacture was transplanted to Switzerland in 1865, after which condensing factories were established in England, Ireland, Denmark, Bavaria, Norway, and elsewhere. With the introduction of the condensing trade there las also been associated the

factory system of dealing with dairy products, by which the milk of many dairies is carried to one centre and dealt with either for condensing or for cheese or butter making. The following epitome of the process of condensing milk is from a paper by Mr Willard of Uornell university, New York (Jour. Roy. Agric. Soc., 2d series, vol. viii., 1872). The milk when received at the factory is first passcd, he says, "through a strainer to the receiving vat; from this it is conducted off, going through another strainer into the heating cans, each holding about 20 gallons ; these cans are set in hot water, and the wilk is held in them till it reaches a temperature of 150° to 175° Fahr.; it then goes through another strainer into a large vat, at the bottom of which is a coil of copper pipe, through which steam is conducted, and here the milk is heated up to the boiling point. Then the best quality of white granulated sugar is added, in the proportion of 1} tb of sugar to the gallon of milk, when it is drawn into the vacuum-pan having a capacity of condensing 3000 quarts or more ata time. The milk remains in the vacuum-pan subjected to steam for about three hours, during which time about 75 per cent. of its bulk in water is removed, when it is drawn off into cans, holding 40 quarts each. The cans are only partially filled, and are then set in a large vat containing cold water, the water being of a height equal to that of the milk in the cans. Here it is stirred until the temperature of the condensed fluid is reduced to a little below 70°; it is then turned into large drawing-cans with faucets, in order to facilitate the filling of the small cans, ... holding 1 Ib each, which are immediately soldered to exclude the air.".

In the case of plain condensed milk the concentration is usually carried farther than is practised in preparing the preserved milk, it being evaporated down to between one-fourth and one-fifth of the original bulk. It is not put up in sealed tins, being intended for 'immediate use, and keeps sweet only for a few days, varying with the state of the weather, whereas the sugared milk in sealed cans keeps for years. The large amount, however, of cane sugar added to preserved milk seriously disturbs its balance of proportion as a perfect food, and renders it unfit to be used alone in a dilute state as a substitute for mother's milk by infants, a purpose for which it is largely employed. It should also be observed that the relative proportion of fat is small, the milk being partially skimmed before it is operated on, so that the statement that preserved milk diluted with a small proportion of water is equal to cream is not to be relied on. Preserved milk, rich in cream,

has always a more or less rancid oily taste, and cannot be obtained so sweet and even in flavour as that largely deprived of fat. According to a German patent of E. Klebs in Prague, plain condensed milk may be preserved by adding to every 100 litres of the original milk a solution of 50 grains of benzoate of magnesium in one litre of water.

Adulteration.—Practically the invariable mode of sophisticating milk for sale consists in the addition of water and in the subtrac- tion of cream,—in other words, passing off skimmed or partly skimmed as new milk. Now fied again there are found certain little refinements on these simple frauds, such as adding a quantity of sugar to correct the specific gravity, flour or starch to increase opacity, and a touch of colouring matter to cover the bluish tinge which would betray skimmed milk. In the United Kingdom no official standard of what constitutes pure milk has been promul- gated, but the so-called Somerset House standard has been generally recognized in law courts. According to this, new milk should contain as a minimum of solids not fat 8°6 per cent. and of fat 2°5 per cent., and of water a maximum of 88°9 per cent. The most satisfactory manner of discovering the probable genuineness of a sample of milk is by chemical analysis carried sufficiently far to determine the amount of fat and of other solids present. Numerous attempts have been made to place in the hands of dairy- men, dealers, and consumers of milk a trustworthy method of estimating the condition and value of the article by simple qnantitive tests for cream or fat—at once the most valuable con- stituent and one the presence of which in average proportion is indicative of the quality of the whole. The simplest but at the same time the least trustworthy and efficient method is by means of the so-called "creamometer," which consists merely of a graduated glass tube in which a measured amount of milk is placed and the amount of cream it throws up is read off by means of the scale. Specific gravity determinations have by themselves no significance, seeing milk deprived of its cream can by dilution with water be brought to correspond exactly with the original milk. But by a combination of two methods,—first taking the specific gravity, next observing the yield of cream by the " creamometer," and finally taking the specific gravity of the milk deprived of cream, regard being had to the temperature of the milk in these

observations, an approximately accurate idea of the value of a

sample may be obtained. Among so-called "lactoscopes," the operations of which are based on the fact that milk rich in cream is a much more opaque fluid than that from which cream has been taken or to which water is added, that invented by Professor Feser of Munich is one of the simplest and most useful. It con- sists of a glass tube open at the upper end and attenuated at its lower extremity. Into this narrower portion is fused a small cylindrical rod of opaque milk glass on which black lines are marked. These lines are invisible when the lower portion of the tube is filled with a measured quantity of milk, but on addition of water they become visible. When the black lines become by the gradual admixture of water perfectly distinct, the richness of the milk in cream globwes is indicated by the height to which the mixture of milk and water has risen in the wide portion of the tube, which has engraved on it a scale showing on one side the amount of water added and on the other the proportion of cream equivalent to the transparency resulting from such addition. Statistics.—In the year 1878 it was calculated by Mr J. C. Morton that the total yield of milk from the 2,250,000 cows and heifers in milk or in calf in England and Scotland amounted to about 1,000,000,000 gallons yearly. He assumed that about one-sixth of that quantity (167,000,000 gallons) went to feed calves, and that the daily consumption of the population was 1,000,000 gallons, being rather more than a quarter of a pint per head, which accounts for 365,000,000, still leaving 468,000,000 gallons to be used for butter and cheese making. Two-thirds of this quantity, or 312,000,000 gallons, Mr Morton assumes was used for cheese-making, yielding 2,800,000 ewts. of cheese (rather less than 1 fb per gallon of milk), and the remainder, 156,000,000 gallons, of milk devoted to butter-making would yield 530,000 Ib of butter, or 1 Tbh of butter for every 21 pints of milk. In these figures no account is taken of Ireland, whence at that period there were sent to England alone yearly 3,500,000 tb of salted butter. In June 1882 the number of cows and heifers in milk and in calf in Great Britain did not vary greatly from the number on which Mr Morton's estimate for 1878 was based, being 2,267,175, whilst in Ireland the number was 1,398,905, making the total for the United Kingdom 8,682,317. If we take approximately Mr Mortou's data as the basis of calcu- lation, the 8,682,317 milk cows and heifers in the United King- dom would yield, at 440 gallons per head, 1,620,219,480 gallons of milk. Further,

assuming that one-sixth of this is consumed by calves, one-third consumed by population, one-third used for cheese-making, and one-sixth used for butter-making, we have as the yield of cheese 4,846,600 cwts. and as the yield of butter 920,000 ewts. As Ireland is much more a butter-producing than a cheese-yielding country, the quantity of cheese made is probably overestimated in these figures, and the amount of butter made is correspondingly understated. 'To bring out the consumption of dairy products for the year the following imports must be added:—

| Cwts. Value. CE aie cares nsec Sees £4,742,368 Butter (including butterine).....s.seereceeeeeee 2,167,428 11,339,226

Thus we find the total supply of cheese to the United Kingdom in 1882 was 6,538,495 cwts., and of butter the supply was 3,087,428 ewts. Estimating the home produce of both articles at the same value as the imports, the cheese supply cost £18,320,000, and the butter £16,150,000. Adding to these the probable cost of the milk consumed as such (say 550,000,000 gallons at 1s. per gallon = £27,500,000), we have for the year 1882 in round numbers £62,000,000 expended on dairy produce within the United Kingdom.

The total number of milch cows at present (1888) in the United States is stated at 15,000,000, which, taking the 440 gallons basis, yield annually 6,600,000,000 gallons, or nearly 30,000,000 tons of inilk. In America the factory system of treating milk has attained much greater dimensions than in Europe, and that perfection of treatment, combined with the cheapness of raising and feeding stock, enables the American companies to enter the European markets with large quantities of cheese and other dairy products of uniformly good quality which find a ready and remunerative sale.

Koumiss.—Under this name is properly understood a fermented drink prepared from mare's milk by the Tartar tribes of the Russian empire and by all the nomad races of the northern parts of Asia. It is made by diluting mare's milk with about one-sixth part of its quantity of water, and adding as a ferment about one-eighth part of very sour milk or of old koumiss. This mixture is placed in a wooden vessel which is covered over with a thick cloth, and so left for about twenty-four hours in a moderately warm situation. During that time a thick 'coagulum rises to the surface, which is

thoroughly reincorporated by churning. After standing for another day, the whole mass is again thoroughly churned and mixed up, and in this state it forms new koumiss, having an agreeable subacid taste. The liquor is mostly stored and preserved by the Tartars in skin bottles, in which the fermentation continues developing its alcoholic qualities, and mellowing and improving its taste. Gcnuine Tartar koumiss has the following composition :—alcohol 3°21, lactic

acid 0°19, sugar 2°10, albuminoids 1:86, fat 1 78, salts 0°509, carbonic acid 0°177, and water 93°46. A distilled spirit is prepared from koumiss, which is drunk among the Tartars under the name of araca or arsa. Koumiss has of late years come into prominent notice as a remedial agent in cases of pulmonary cousumption, and generally as a nutritious form of food easily assimilated by delicate stomachs. It is probable that all its virtues reside in the original milk from which it is prepared, in which case the koumiss can only be regarded as valuable in so far that it is a convenient form under which the essential properties of the milk can be preserved for use. Under the name of koumiss a preparation of cow's milk is now very generally sold. It is made by adding to each quart of new milk about a tablespoonful of eommon sugar and brewcr's yeast, allowing the fermentation to proceed a sufficient length, then bottling and corking as in the ease of aerated waters. Such a preparation con- tains about the same proportion of alcohol as genuine koumiss, but a non-aleoholie variety can also be obtained, made by a process of natural fermentation, which continuing after bottling develops a large amount of carbonic acid and renders the liquor highly effervescent. (J. PA.)

MILL, James (1773-1836), historian and political and mental philosopher, was born 6th April 1773, in the little village called Northwater Bridge (Bridge of North Esk), in the parish of Logie-Pert, in the county of Forfar. His father, James Mill, was a shoemaker ; his mother, Isabel Fenton, belonged to a race of respectable farmers. The father was industrious, good-natured, and pious, but not known as specially intelligent. The mother was of a proud disposition, and resolved to educate James, her eldest son,

for a superior destiny. He began his education at the parish school, and went on to the Montrose Academy, where he remained till the unusual age of seventeen and a half, when he went to the college of Edinburgh (1790). According to the usage of the time and neighbourhood, he ought to have been sent about thirteen or fourteen to Marischal College, Aberdeen. His remaining so long at the Montrose Academy, and his going to Edinburgh for his university course, must be connected with his being taken up by Sir John and Lady Jane Stuart of Fettercairn, who engaged him to be tutor to their only daughter, known for having inspired the affection of Sir Walter Scott, and for being the mother of Principal James David Forbes. Sir John and Lady Jane Stuart contracted a warm attachment for Mill, which lasted throughout their hives. At Edinburgh University Mill was distinguished as a Greek scholar. But he received his greatest impulse from Dugald Stewart, for whom he always expressed unbounded admiration. In October 1798 he was licensed as a preacher, but seems to have preached very seldom. His years from 1790 to 1802, besides being occupied with incessant studies extending into history and moral and political philosophy, were devoted to various tutorships.

Failing to find a career to his mind in Scotland, in 1802 he went to London in company with Sir John Stuart, then member of parliament for Kincardineshire. He soon obtained literary occupation, to which he apphed himself with untiring energy. His first important venture was to start a periodical on a new plan, entitled The Literary Journal, which began to appear in January 1803, and continued under his editorship till the end of 1806. It was the most comprehensive in its aims of any periodical hitherto in existence, being a summary view of all the leading departments of human knowledge. Thomas Thomson, the chemist, took charge of science ; and many other men of 'ability co-operated. Mill himself wrote largely in biography, history, political philosophy, political economy, and also in theology, on which his views at the time were broad without being sceptical, The publisher of the journal was Baldwin, who was also the proprietor of the St James's Chronicle, a Conservative paper appear- ing three times a week. For two or three years, from 1805 onwards, Mill was editor, but at last gave it up, partly on conscientious grounds, although in conducting

it he never lent himself to the expression of any illiberal views, but often made it the vehicle of the opposite.

In 1804 the wrote a pamphlet on the Corn Trade, advocating the impolicy of a bounty on the exportation of grain. This was the beginning of his career as a political economist. In 1805 he published a translation of Villers's work on the Reformation, an unsparing exposure of the vices of the papal system. He added notes and quotations by way of confirmation of the author's views. On this subject also he continued to hold strong opinions all through life, and often recurred to it in his articles in the reviews. In 1805 he married Harriet Burrow, whose mother, a widow, kept an establishment for lunatics in Hoxton. He then took a house in Rodney Street, Pentonville, where his eldest son, John Stuart, was born in 1806. It was about the end of 1806 that he entered upon the composition of the History of India, which he expected to finish in three or four years. He was actually engaged upon it for twelve, giving, however, a considerable portion of his time to other writing for the support of his family. The strain upon his energies for those years was enormous.

He became acquainted with Jeremy Bentham in 1808, and was for many years Bentham's chief companion and ally. In 1810 Bentham, to have Mill nearer him, gave him Milton's house, which adjoined his own, and was his property. After a few months' trial Mill had to give up this house on account of his wife's health, and went to live in Newington Green; but in 1814 Bentham leased the house No. 1 Queen's Square, now 40 Queen Anne's Gate, close to his own garden, and gave it to Mill at a reduced rent; here he remained till 1831. The intimacy with Bentham was rendered still closer. For four years, from 1814 to 1817, Bentham was at Ford Abbey, near Chard, in Somersetshire, and there Mill and his family were domesticated with him nine or ten months each year,—in which retirement it is probable that Mill was able to accelerate the completion of his history.

In the twelve years between 1806 and 1818 he wrote a great many articles for various periodicals. Among these were the Anti-Jacobin Review, the British Review, and the Eclectic Review ; but there is no means of tracing his con- tributions. In 1808 he began to write for the Edinburgh feview, and contributed steadily till 1813, most of his articles being known. In the

Annual Review for 1808 two articles of his are traced—a "Review of Fox's History," and an article on "Benthain's Law Reforms," probably his first published notice of Bentham. The first known article in the Edinburgh was on "Money and Exchange " (October 1808). In 1809 (January and July) he wrote at great length on Spanish America and General Miranda, with whom he was on terms of intimate friendship. In the July number he also wrote on China. In 1810 (April) he made a severe attack on the East India Company. He also wrote on the liberty of the press and on the Church of England in connexion with the Lancasterian schools, He was an active member of the committee for promoting education on Lancaster's plan. In 1811 a periodical named the Philanthropist was started by William Allen, and published in quarterly numbers till 1817. Mill co-operated with Allen both in the writing and in the management, He contributed largely to every number,—his principal topics being education, freedoin of the press, and prison discipline (under which he expounded Bentham's " Panop- ticon"). He made powerful onslaughts on the church in connexion with the Bell and Lancaster controversy. In 1814 Macvey Napier engaged him to contribute to the supplement to the fifth edition of the Encyclopedia Britannica. Many of the articles became notable. The list included « Government," "J urisprudence," " Liberty of the Press," "Prisons and Prison Discipline," '" Colony,"

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"Law of Nations," "Education," '" Beggar," ' Benefit Societies," "Banks for Savings." In "Jurisprudence" and "Prisons" he was largely indebted to Bentham; in most of the others he was either altogethcr or in great part original. The article on "Government" will occupy a permanent position in English history.

In 1818 was published the History of India, which had a great and speedy success. It was the means of changing the author's future position. The year following he was appointed an official in the India House, in the important department of the examiner of Indian correspondence. He gradually rose in rank till he was appointed, in 1830, head of the office. He introduced his eldest son into the same department in 1823.

In 1824 Bentham projected the Westminster Review, and Mill was a principal writer for three years. Some of his most vigorous writings are included among those contribu- tions. The first was an elaborate criticism of the Ldunburgh Review as a whole ; it was followed by an onslaught on the Quarterly. Other articles dealt with English history and with ecclesiastical establishments, which he severely im- pugned. To a periodical of short duration, The Par- liamentary History and Review, he contributed an elaborate political retrospect of the parliament of 1820-26. In 1829 appeared the Analysis of the Ifuman Mind. From 1831 to 1833 he was largely occupied in the defence of the East India Company during the controversy attending the renewal of its charter, he being in virtue of his office the spokesman of the court of directors. In 1834 Sir William Molesworth projected the London Review, and Mill con- tributed to it during the last two years of his life. His most notable article was one entitled 'The Church and its Reform," which was much too sceptical for the time, and injured the Review. His last published book was the Fragment on Mackintosh, which appeared in 1835. He died on the 23d June 1836.

A eonsiderable space would be required to do justice to Mill's eharacter—intellectual and moral—as shown both in his writings and in his intenscly active and influential career. He was an ex- cellent scholar, in the sense of knowing the Greek and Roman elassics. His other accomplishments included general history, the philosophy of politics in the most eomprehensive acceptation, logic, ethics, and mental philosophy. The type of his intellect was logi- cal in the highest degree; he was, above all things, clear and pre- cise, an enemy of every form of looseness of reasoning, and a crushcr of prevailing fallacies. This is the most notable feature in his writings throughout. His was also an original mind. Except in a few subjects, which had been so well elaborated by Bentham that

he was content to be little more than an expounder of Bentham's |

views, he gave a fresh turn to whatever topic he took up. Ata time when social subjects were subjected almost exclusively to an empirical handling, he insisted on bringing first principles to bear at every point; in this lay both his strength and his weakness.

His greatest literary monument is the History of India. The materials for narrating the acquisition by England of its Indian empire were put into shape for the first time; a vast body of political theory was brought to bear on the delineation of the Hindu civiliza- tion; and the conduct of the actors in the successive stages of the conquest and administration of India was subjected to a severe criticism. The work itself, and the author's official connexion with India for the last seventeen years of his life, effected a complete ehange in the whole system of governing that eountry.

Mill played a great part as a politician and political philosopher in English affairs as well. He was, more than any other man, the founder of what was ealled philosophical radicalism. His writings on government and his personal influence among the Liberal poli- ticians of his time determined the change of view from the French Revolution theories of the rights of man and the absolute equality of men to the claiming of securities for good government through a great extension of the electoral suffrage. Under this banner it was that the Reform Bill was fought and won.

His work on Political Economy was intended as a text-book of the subject, and shows all the author's precision and lucidity. It followed up the views of Ricardo, with whom Mill was in habitual intimacy. It urged strongly the modern application of the prin- ciple of population, and started the doctrine of taxing land for the unearned increment of value.

By his Analysis of the Mind and his Fragment on Mackintosh

Mill acquired a position in the history of psychology and ethics. Attached to the a posteriori school, ie Piatt aid i elaims with conspicuous ability. He took up the problems of mind very much after the fashion of the Scotch school, as then represented by Reid

Stewart, and Brown, but made a new start, due in part to Hartley, and still more to hisown independent thinking. He carried out the principle of association into the analysis of the complex emotional states, as the affections, the esthetic emotions, and the moral sentiment, all which he endeavoured to resolve into pleasurable and painful sensations. But the

salient merit of the Analysis is the constant endeavour after precise definition of terms and clear state- ment of doctrines. The Fragment on Mackintosh is a severe ex- posure of the flimsiness and misrepresentations of Mackintosh's famous dissertation on ethical philosophy. It discusses, in a very thorough way, the foundations of ethics from the author's point of view of utility.

Mill's influence on the young men of his time by his conversation has been especially eelebrated. Among those that came under this influence were some of the greatest naines in the generation that succeeded him. He had himself a very high ideal of public virtue, which he carried out, at the risk of sacrificing all his chances of worldly advancement, and he impressed this ideal on those that surrounded him,—most of all on his own son, who has since eclipsed his father in fame, if not in genius.

See J. S. Mill's Autobiography, Bain's Life of James Mill, G. 8. Bower's Hartley and James Mill. (AB?)

_ MILL, Jonn (c. 1645-1707), editor of an historically important critical edition of the New Testament, was born about 1645 at Shap in Westmoreland, entered Queen's College, Oxford, as a servitor in 1661, and took his master's degree in 1669. Soon afterwards he was chosen fellow and tutor of his college; in 1676 he became chaplain to the bishop of Oxford, and in 1681 he obtained the rectory of Blechingdon, Oxfordshire, and was made chaplain to Charles II. From 1685 till his death he held the appoint- ment of principal of St Edmund's Hall; and in 1704 he was nominated by Queen Anne to a prebendal stall in Canterbury. He died on June 23, 1707, just a fortnight after the publication of his Greek Testament.

Mill's Novum Testamentum Greeum, cum, lectionibus variantibus MSS. Exemplarium, Versionum, Editionum SS. Patrum et Serip- torum LEcelesiasticorum, ct in.casdem notis (Oxford, fol. 1707), was undertaken by the advice and encouragement of Teil, his predecessor in the field of New Testament criticism ; it represents the labour of thirty years, and is admitted to mark a great advance on all that had previously been achieved. The text indeed is that of R. Stephanus (1550), but the notes, besides embodying all previously existing collections of various readings, add a vast number derived from his own examination of many new MSS. and Oriental versions

(the latter unfortunately he used only in the Latin translations). He was the first to notice, though only incidentally, the value of the concurrence of the Latin evidence with the Codex Alexandrinus, the only representative of an ancient non-Western Greck text then sufficiently known; this hint was not lost on Bentley (see Westcott and Hort, Introduction to New Testament). Mill's various readings, numbering about thirty thousand, were attacked by Whitby in his Exanven as destroying the validity of the text ; Antony Collins also argued in the same sense though with a different object. The latter called forth a reply from Bentley (Phileleutherus Ltpsiensis). 1n1710 Kuster reprinted Mill's Testament at Amsterdain with the readings of twelve additional MSS.

MILL, Jonn Stuart (1806-1873), son of James MILL (q.v.), was born in London on the 20th May 1806. His education was from first to last undertaken by his father, and is likely long to remain a standing subject for wonder and discussion. Much of the wonder is no doubt due to his father's monstrous inversion of custom, the boy being set almost as soon as he could speak to work at our time- honoured subjects of secondary and higher education. He was taught the Greek alphabet at the age of three, and one of his earliest recollections, as he has recorded in his auto- biography, was learning lists of common Greek words with their English meanings, written for him by his father on cards. By his eighth year he had gone through in the original a great many Greek books. "Of grammar," he says, "until some years later, I learnt no more than the inflexions of the nouns and verbs, but after a course of vocables proceeded at once to translation ; and I faintly

remember going through sop's Fables, the first Greek |

book which I read. The Anabasis, which I remember better, was the second. I learnt no Latin until my eighth year. At that time I had read under my father's tuition a number of Greek prose authors, among whom I remember the whole of Herodotus and of Xenophon's Cyropexdia and Memorials of Socrates, some of the lives of the philosophers by Diogenes Laertius, part of Lucian, and Isocrates Ad Demonicum and Ad Nicoclem. I also read, in 1813, the first six dialogues (in the common arrangement) of Plato, from the Huthyphron to the Thextetus inclusive." Besides all these Greek books,

he had read a great deal of history in English—Robertson's histories, Hume, Gibbon, Watson's Philip IF. and III, Hooke's Roman History, Rollin's Ancient History, Langhorne's Plutarch, Burnet's History of My Own Times, thirty volumes of the Annual Register, Millar's Historical View of the English Government, Mosheim's cclesiastical History, M'Crie's Knox, and two histories of the Quakers.

That Mill "knew Greek" and "read Plato" before he was eight years old is often repeated, sometimes as an instance of amazing precocity, sometimes as an awful example of injudicious parental forcing. The astonishment that a child should have done so much at such an age is probably as little grounded in reason as was Mill's own opinion that any child might have done the same. It is forgotten that many thousands of persons have known Greek before the age of eight without a knowledge of the technicalities of Greek grammar. In presence of the fact that Mill was never distinguished for great memory of detail or richness of historical or literary allusion, it is a fair conclusion that the matter of his reading at this age was of as little service to him in after life as if he had read the trashiest of boy's own books. This is not to say that for educational purposes his early years were wasted as in his own and his father's opinion they generally are. But undoubtedly the main factor in Mill's education was not the literature put into his hands, but his constant inter- course with the active richly stored mind and strenuous character of his father. If any should be tempted to imitate the method, they should bear in mind that this was the cardinal element of it. The tutor was of more importance than the books. The reading of Plato's dialogues would have been only an exercise in rough translation if the boy had not had a Socrates with him in living communion. The child was a constant inmate of his father's study, and trotted by his side in his walks, giving from jottings on slips of paper as'good an account as he could of what he had read. He thus learnt at an unusually early age by example, precept, and practice the habit of strenuous application to difficult work. The fact that Mill was taught thus early to take his chief pleasure in overcoming intellectual difficulties, and to realize the meaning of general terms, accounts for the singular and altogether unparalleled ease which he acquired in the treatment of political and social generalizations, not in barren abstract vagueness, but in close relation with facts. This on the intellectual side; and on the moral side the child was almost from the dawn

of consciousness instructed to regard himself as consecrated to a life of labour for the public good; his ambition was kindled to follow in the footsteps of the great men of all ages, and at the same time the utmost care was taken to purify that ambition from unworthy motives.

A contemporary record of Mill's studies from eight to thirteen is published in Dr Bain's sketch of his life. It shows that the Autobiography rather understates than overstates the amount of work done. At the age of eight he began Latin, Euclid, and algebra, and was appointed schoolmaster to the younger children of the family—a

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post, he hints, more serviceable to his intellect than to his manners. His main reading was still history, but he went through all the Latin and Greek authors commonly read in the schools and universities, besides several that are not commonly read by undergraduates. He was not taught to compose either in Latin or in Greek, and he was never an exact scholar in the academic sense ; it was for the subject- matter that he was required to read, and by the age of ten he could read Plato and Demosthenes with ease. His father's History of India was published in 1818 ; immedi- ately thereafter, about the age of twelve, John, under his energetic direction, began a thorough study of the scholastic logic, at the same time reading Aristotle's logical treatises in the original. In the following year he was introduced to political economy. And there, when the pupil was nearly fourteen, this remarkable education terminated. From that time he worked less immediately under his father's eye. It was an inevitable incident of such an education that Mill should acquire many of his father's speculative opinions, and his father's way of defending them. But his mind did not receive the impress passively and mechanically. "One of the grand objects of educa- tion," according to the elder Mill, "should be to generate a constant and anxious concern about evidence"; and he laboured with all the energy of his strong will against allowing his son to become a parrot of his own opinions and arguments. The duty of collecting and weighing evidence for himself was at every turn impressed upon the boy ; he was taught to accept no opinion upon authority ; he was soundly rated if he could not give a reason for his beliefs. John Stuart Mill was deliberately

educated as an apostle, but it was as an apostle of reasoned truth in human affairs, not as an apostle of any system of dogmatic tenets. It was purposely to prevent any falling off from this high moral standard till it should become part of his being that his father kept the boy so closely with himself. Much pity has been expressed over the dreary cheerless existence that the child must have led, cut off from all boyish amusements and companionship, working day after day on his father's treadmill; but a childhood and boyhood spent in the daily enlargement of knowledge, with the continual satisfaction of difficulties conquered, buoyed up by day-dreams of emulating the greatest of human benefactors, need not have been an unhappy childhood, and Mill expressly says that his was not unhappy. It – seems unhappy only when we compare it with the desires of childhood left more to itself, and when we decline to imagine its peculiar enjoyments and aspirations. Mill complains that his father often required more than could reasonably be expected of him, but his tasks were not so severe as to prevent him from growing up a healthy, hardy, and high-spirited boy, though he was not constitutionally robust, and his tastes and pursuits were so different from those of other boys of the same age.

Most of Mill's fifteenth year was spent in France in the family of Sir Samuel Bentham. Away from his father, he maintained his laborious habits; the discipline held. Copious extracts from a diary kept by him at this time are given by Dr Bain, and show how methodically and incessantly he read and wrote, studied botany, tackled advanced mathematical problems, made notes on the scenery and the people and customs of the country. On his return in 1821 he continued his old studies with the addition of some new ones. One of the new studies was Roman law, which he read with John Austin, his father having half decided on the bar as the best profession open to him. Another was psychology. In 1823, when he had just completed his seventeenth year, the notion of the bar as a livelihood was abandoned, and he entered as a clerk in the examiner's office of the India House, "with the under-

standing that he should be employed from the beginning in preparing drafts of despatches, and be thus trained up as a sucecssor to those who 'then

filled the highest depart- ments of the office."

Mill's work at the India House, which was henceforth his livelihood, did not come beforc the public, and those who have scouted his political writings as the work of an abstract philosopher, entirely unacquainted with affairs, lave ignored the nature of his duties. From the first he was more than a clerk, and after a short apprenticeship he was promoted, in 1828, to the responsible position of assistant-examiner. 'The duty of the so-called examiners was to examine the letters of the agents of the Company in India, and to draft instructions in reply. The character of the Company's government was almost entirely depend- ent upon their abilities as statesmen. For twenty years, from 1836 to 1856, Mill had charge of the Company's relations with the native states. In the hundreds of despatches that he wrote in this capacity, much, no doubt, was done in accordance with established routine, but few statesmen of his generation had a wider experience of the responsible application of principles of government to actual emergencies. That he said so little about this work in the Autobiography was probably because his main con- cern there was to expound the influences that affected his moral and mental development. A man of different temperament might have found abundance of dramatic interest in watching the personal and political changes in so many distinct states. But Mill makes no reminiscences of this kind, nor does he give any clue to the results of his own initiative.

To return to his extra-official activity, which received an immense impulse about the time of his entering the India House from what must strike a man of the world asa strange source. The reading of Dumont's exposition of Bentham's doctrines in the Jraité de Législation was an epoch in Mill's life. It awoke in him an ambition as enthusiastic and impassioned as a young man's first love. The language that he uses about it in his autobiography reveals a warmth of inner life that few people would suspect from the record of his dry studies. When he laid down the last volume, he says, he had become a different being. It gave unity to the detached and fragmentary component parts of his knowledge and beliefs. "I now had opinions— a creed, a doctrine, a philosophy—in one among the best senses of the word, a religion, the inculcation and diffusion of which could be made the principal outward purpose of a life. And I had a grand conception laid

before me of changes to be effected in the condition of mankind through that doctrine." He had been carefully bred to contemplate work for human welfare as the ruling motive of his life ; that motive had now received definite direction.

Many a youth has entered the world with ambition equally high, but few have felt as Mill felt the first shock of despair, and fewer still have rallied from that despair with such indomitable resolution. The main secret of the great "crisis" of his youthful life is probably to be found in the lofty ardour of the aspirations then conceived and shaped. For four years he worked with faith and hope in his mission, and these were years of incessant propagandist activity. The enthusiast of seventeen, burning to reorganize human affairs so as to secure the greatest happiness of the greatest number, set siege to the public mind through several approaches. He constituted a few of his youthful friends, imbued with the principles of his new creed, into a society which he called the " Utilitarian " Society, taking the word, as he tells us, from one of Galt's novels. Two newspapers were open to him—the 7'raveller, edited by a friend of Bentham's, and the Chronicle, edited by his father's friend Black. One of his first efforts was a solid

argument for freedom of discussion, in a series of letters to the Chromcle apropos of the prosecution of Richard Carlile. But he watched all public incidents with a vigilant eye, and seized every passing opportunity of exposing departures from sound principle in parliament and courts of justice. Another outlet was opened up for him in 1824 by the starting of the Westminster Review, and still another in the following year in the Parliamentary History and Review. This year also he. found a congenial occupation in editing Bentham's Rationale of Judicial Evidence. Into this he threw himself with zeal. And all the time, his mind full of public questions, he discussed and argued eagerly with the many men of promise and distinction who came to his father's house. He engaged in set discussions at a reading society formed at Grote's house in 1825, and in set debates at a Speculative Society formed in the same year.

"A very disquisitive youth," was Peacock's description of young Mill at this period, and this was probably how the enthusiast struck most of his outside

acquaintances. But the glow of a great ambition as well as the energy of a piercing intellect might have been felt in his writings. His mission was none the less arduous that he proposed to convert the world by reason. Only the fulness of unbroken hope could have supported his powers, if he had had a frame of iron, under the strain of such incessant labour. All of a sudden, a misgiving which he compares to the Methodist's "first conviction of sin" madc a rift in the wholeness of his faith in his mission. "It was in the autumn of 1826. I was in a dull state of nerves, such as everybody is occasionally liable to; unsusceptible to enjoyment or pleasurable excitement ; one of those moods when what is pleasure at other times becomes insipid or indifferent. .... In this frame of mind it occurred to me to put the question directly to myself, 'Suppose that all your objects in life were realized, that all the changes in institutions and opinions which you are now looking forward to could be completely effected at this very instant, would this be a great joy and happiness to you?' And an irrepressible self-consciousness distinctly answered, 'No!' At this my heart sank within me; the whole foundation on which my life was constructed fell down. All my happiness was to have been found in the continual pursuit of this end. The end had ceased to charm, and how could there ever again be any interest in the means? I seemed to have nothing left to live for."

The passage in his autobiography in which Mill gives an account of this prostrating disenchantment and his gradual release from its benumbing spell is one of the most interesting chapters in personal history. The first break in the gloom came, he tells us, from his reading in Marmontel's Mémoires "the passage which relates his father's death, the distressed position of the family, and the sudden inspiration by which he, then a mere boy, felt and made them feel that he would be everything to them—would supply the place of all that they had lost." Mill was moved to tears by the narrative, and his burden grew lighter at the thought that all feeling was not dead within him, that he was not a mere intellectual machine. This incident, and the delight that he now began to take im Wordsworth's "Poems founded on the Affections," gives a clue to one of the secrets of Mill's despondency. It was an unsatisfied longing for personal affection, for love and friendship, of which his life hitherto had been barren. His father seems to have been reserved, undemonstrative even to the pitch of chilling sternness in his intercourse with his family ; and ameng young Mill's comrades con- tempt

of feeling was almost a watchword, because it 1s so often associated with mischievous prejudice and wrong conduct. Himself absorbed in abstract questions and pro-

jects of general philanthropy, he had been careless of winning or keeping personal attachment.. But it was not till despair first seized him, as he looked back at the poverty of the results of his work as an apostle, that Mill began to feel the void in his affections and the need of human sympathy. We must remember how little when his ambition was formed he knew of the living world around him. He knew in terms that political and social change must be slow; he could whisper patience to him- self, and say to himself that his life must be happy because the attainment of his great object must occupy the whole of it; but without experience he could not have been prepared for the actual slowness of the reformer's work, or armed against its terribly oppressive influence. Inevitably he underrated the stolidity and strength of the forces arrayed against him. Four years seems a long time at that

age. In 1826 Mill could look back to four years of eager toil. What were the results? He had become convinced

that his comrades in the Utilitarian Society, who never numbered more than ten, had not the stuff in them for a world-shaking propaganda ; the society itself was dissolved ; the Parliamentary Review was a failure; the Westminster did not pay its expenses ; Bentham's Judicial Evidence produced little effect on the reviewers. His own reception at the Speculative Debating Society, where he first measured his strength in public conflict, was calculated to produce

self-distrust. He found himself looked upon with curiosity:

as a precocious phenomenon, a "made man," an intellectual machine set to grind certain tunes. The most clear and cogent reasoning failed to sway his audience. Great things had been expected of this society as a means of bringing together for close discussion the leading young men then in public life or looking forward to it. Its first session proved a fiasco. The leaders

that had been expected stayed away. With these repulses to his hopes along the whole line of his activity, Mill must also have suffered from the nervous exhaustion that only the hope and heat of the fight had kept him from feeling before. No wonder that he was disheartened, began to feel defects in his father's training, to question and analyse his own faith, to yearn for the solace of personal affection, and to reconstitute his scheme of life.

That in spite of this rude shock the foundations laid by his early training remained stable appears from the facts that all through the period of his gloom he continued working as before, and that he considered himself bound, once convinced that his old plan of life was insufficient, to build up a thoroughly reasoned new plan wherewith to give new heart and hope to his work. The new system was much less different from the old than might be sup- posed from what he says of the struggle that it cost him to reach it. Regard for the public good was still his religion, the ruling motive that gave unity to his conduct. But he now recognized that this was too vague and insub- stantial an object to be sufficient of itself for the satisfac- tion of a man's affections. Itis a proof of the dominating force of his father's character that it cost the younger Mill such an effort to shake off his stern ereed about poetry and personal emotion, Like Plato, the elder Mill would have put poets under ban as ministers of prejudice and enemies of truth. And he often insisted on the wisdom of restricting as much as possible the private affections, while expanding as much as possible the public affections. Landor's maxim of "few acquaintances, fewer friends, no familiarities" had his cordial approval. These doctrines the younger Mill at first took up with boyish enthusiasm and pedantry, but it was against this part of his father's crecd that he now felt himself forced in reason to revolt, He stood too much in awe of his father to make him the confidant of his difficulties, He wrestled with them in

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the gloomy solitude of his own mind. He was victorious ; he reached firm ground at last; but the struggle left him in several respects changed. He carried out of the struggle as the fruits of victory a more catholic view of the elements of human happiness, a delight in the poetry of nature and the affections as well as the poetry of heroic unselfish character and action, a

disposition to study more sympa- thetically the point of view of opponents, a more courteous style of polemic, a hatred of sectarianism, an ambition no less noble and disinterested but moderated to practical possibilities, ,

In the course of the next few years Mill wrote compara- tively little, but he "carried on," as he says, "'a quantity of thinking respecting a host of subjects." It was a period of search, deliberation, germination, and striking root. Coincident if not causally connected witli the relief from his spiritual crisis came his first consciousness of power as "an original and independent thinker." In the dia- lectic conversations with a small band of students at Grote's house, he regained the self-confidence that had been shaken in the larger and rougher arena of the Speculative Debating Society. The beginning of his works on logic and political economy may be traced back to those discus- sions, and he learnt from them, he tells us, the habit of "never accepting half solutions of difficulties as complete ; never abandoning a puzzle, but again and again returning to it until it was cleared up; never allowing obscure corners of a subject to remain unexplored, because they did not appear important; never thinking that he perfectly understood any part of a subject until he understood the whole." He learnt also an important moral lesson from the Speculative Society, besides learning the strong points of other political and social creeds and the weak points of Benthamism from defending it point by point against all comers. With all his despondency, he did not abandon the meetings of the society after the fiasco of the first session. He stood by it firmly, and in a short time had the triumph of seeing its debates famous enough to attract nien with whom it was profitable for him to interchange opinions, among others Maurice and Sterling. He ceased to attend the society in 1829, but he carried away from it the strengthening memory of failure overcome by per- severing effort, and the important doctrinal conviction that a true system of political philosophy was "something much more complex and many-sided than he had previously had any idea of, and that its office was to supply, not a set of model institutions, but principles from which the insti- tutions suitable to any given circumstances might be deduced."

The first sketch of Mill's political philosophy appeared in a series of contributions to the Hxaminer in the autumn of 1830 on " Prospects in France." He was in Paris soon after the July Revolution, made the

acquaintance of the leading spirits among the younger men; and in his discus- sion of what they were doing and what they should do in making a new constitution we find the germs of many thoughts afterwards more fully developed in his Represen- tative Government.

The division of a man's life into periods must always be a rough partition, but we may conveniently and with tolerable accuracy take these letters as marking the close of his period of meditative search, of radication, and his return to hopeful aspiring activity. It was characteristic of the nature of the man that he should be stirred to such delight by the Revolution in France, and should labour so earnestly to make his countrymen understand with what gravity and sobriety it had been effected. Their own Reform Bill came soon after, and it is again characteristic of Mill—at once of his enthusiasm and of his steady deter- nunation to do for humanity the work that nobody else

seemed able or willing to do—that we find him in the heat of the struggle in 1831 writing to the Hxaminer a series of letters on "The Spirit of the Age" which drew from Carlyle the exclamation, "' Here is a new mystic!" We can easily see now what it was in these remarkable essays that fascinated Carlyle; it was the pervading opinion that in every natural state of society power must be in the hands of the wisest. This was the condition of stability; when power and wisdom ceased to coincide, there was a disturbance of the equilibrium till this coincidence was again effected. But whether Carlyle was right in the epithet "mystic" may be judged from the fact that Mill's inductive logic was the direct result of his aspirations after political stability as determined by the dominion of the wisest. " Why is it," he asked, "' that the multitude accept implicitly the decisions of the wisest, of the specially skilled, in physical science?" Because in physical science there isall but complete agreement in opinion. ' And why this agreement?" Because all accept the same methods of investigation, the same tests of truth. Is it possible then to obtain unanimity as to the methods of arriving at conclusions in social and political matters, so as to secure similar agreement of opinion among the specially skilled, and similar general respect for their authority? The same thought appears in a review of

Herschel's Natural Philosophy, written about the same titne. Mill remarks that the uncertainty hanging over the very elements of moral and social philosophy proves that the means of arriving at the truth in those sciences are not yet properly understood. "And whither," he adds, "can mankind so advantageously turn, in order to learn the proper means, and to form their minds to the proper habits, as to that branch of knowledge in which by universal acknowledg- ment the greatest number of truths have been ascertained, and the greatest possible degree of certainty arrived at?"

By 1831 Mill's enthusiasm for humanity had been thoroughly reawakened, and had taken the definite shape of an aspiration to supply an unimpeachable method of search for conclusions in moral and social science. From the platform on which Carlyle and Mill inet in 1831 they travelled different roads,—the one to preach the duty of obedience to the wisest, the other to search for a means by which wisdom might be acquired such as would command respect and win the assent of free conviction. No mystic ever worked with warmer zeal than Mill. But his zeal encountered a check which baffled him for several years, and which left its mark in various inconsistencies and incoherences in his completed system. He had been bred by his father in a great veneration for the syllogistic logic as an antidote against confused thinking. He attributed to his early discipline in this logic an impatience of vague language which in all likelihood was really fostered in him by his study of the Platonic dialogues and of Bentham, for he always had in himself more of Plato's fertile ingenuity in canvassing the meaning of vague terms than the school- man's rigid consistency in the use of them. Be this as it may, enthusiastic as he was for a new logic that might give certainty to moral and social conclusions, Mill was no less resolute that the new logic should stand in no antagonism to the old. In his Westminster review of Whately's Logic in 1828 (invaluable to all students of the genesis of Mill's logic) he appears, curiously enough, as an ardent and brilliant champion of the syllogistic logic against highfliers such as the Scotch philosophers who talk of "superseding" it by "a supposed system of inductive logic." His inductive logic must "supplement and not supersede." It must be concatenated with the syllogistic logic, the two to be incorporated in one system. But for several years he searched in vain for the means of con- catenation.

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Meantime, while recurring again and again, as was his custom, to this cardinal difficulty, Mill worked indefatigably in other directions where he saw his way clear, expatiating over a wide range of political, social, economical, and philosophical questions. The working of the new order in France, and the personalities of the leading men, had a pro- found interest for him; he wrote on the subject in the Examiner. He had ceased to write for the Westminster in 1828; but during the years 1832 and 1833 he con- tributed many essays to 7Z'art's Magazine, the Jurist, and the Monthly Repository. In 1835 the London Review was started, with Mill as editor; it was amalgamated with the Westminster in 1836, and Mill continued editor till 1840. Much of what he wrote then was subsequently incorporated in his systematic works ; some of his essays were reprinted in his first two volumes of Dissertations and Discussions (1859). The essays on Bentham and Coleridge constituted the first manifesto of the new spirit which Mill sought to breathe into English Radicalism. But the reprinted papers give no just idea of the immense range of Mill's energy at this time. His position in the India Office, where alone he did work enough for most men, cut him off from entering parliament; but he laboured hard though ineffectually to influence the legislature from without by combating the disposition to rest and be thankful. In his Autolwography he admits that the attempt to forma Radical party in parliament at that time was chimerical.

It was in 1837, on reading Whewell's Znductive Sciences and re-reading Herschel, that Mill at last saw his way clear both to formulating the methods of scientific investi- gation and joining on the new logic as a supplement to the old. Epoch-making as his logic undoubtedly was, from the multitude of new views opened up, from the addition of a new wing to the rambling old building, and from the inspiring force with which every dusty chamber was searched into and illuminated, Mill did not escape all the innumerable pitfalls of language that beset the pioneer in such a subject. It is evident from a study of his purposes and the books from which he started that his worst perplexities were due to his determination to exhibit scientific method as the complement of schiolastic logic. In his defence of the syllogism he confounds the syllogistic forms with deductive reasoning. Every deductive reason- ing may be thrown into the form of a

syllogism, but not every syllogism is deductive. The reasoning in several of the syllogistic forms is not deductive at all in the sense of involving a movement from general to particular. Although he knew Aristotle in the original, Mill did not recognize the fact that the syllogistic machinery was primarily constructed for the reasoning together of terms. As regards the word induction, Mill uses it in different connexions to cover three or four distinguishable meanings —induction viewed as the establishment of predications about a general term, induction viewed as inference from the known to the unknown, induction viewed as verifica- tion by experiment, and induction viewed as the proof of propositions of causation. The form of his system was really governed by the scholastic notion of induction as a means of establishing general propositions ; the inductive part of his system is introduced after the deductive under this character ; while the greater portion of the substance of what he treats of under the name of induction, and especially the so-called experimental methods, have nothing whatever to do with the establishment of general proposi- tions, in the technical sense of general propositions.

But the permanent value and influence of Mill's inductive logic is not to be measured by technical inaccuracies and inconsistencies, to which an academic mind may easily attach undue importance. In the technical history of the science, Mill's Logic may be viewed as an attempt to fuse

the practical tests of truth set forth in Herschel's Discourse on Natural Philosophy with the theoretic views of induc- tion propounded in Whately's Logic. But in the history of thought the great importance of the work is due not so much to its endeavour to formulate the methods of science and lay bare the first principles on which they rest as to its systematic application of scientific method to what he called the moral sciences. Mill has often been criticized as if he had pretended to teach men how to conduct their investigations and how to make discoveries in the physical sciences. His work was rather to educe from the practice of men of science the principles on which they proceed in testing and proving their speculations concerning cause and effect in the physical world, and see whether the same principles could not be applied in testing and proving speculations concerning cause

and effect in the moral world. What is the effect upon human character and human happiness of given social and physical conditions— climate, institutions, customs, laws? How can conclusions upon such points be proved? These were the questions in which Mill was interested, and the striking novelty of his work was its endeavour to show that propositions of cause and effect in human affairs must be proved, if they admit of proof at all, absolute or approximate, on the same principles with propositions of cause and effect in the material world.

The Logic was published in 1843, In 1844 appeared his Essays on Some Unsettled Questions in Political Economy. These essays were worked out and written many years before, and show Mill in his first stage as a political economist. Four out of the five essays are elaborate and powerful solutions of perplexing technical problems—the distribution of the gains of international commerce, the influence of consumption on production, the definition of productive and unproductive labour, the pre- cise relations between profits and wages. Though Mill appears here purely as the disciple of Ricardo, striving after more precise statement, and reaching forward to further consequences, we can well understand in reading these essays, searching, luminous, large and bold in outline, firmly wrought in detail, how about the time when he first sketched them he began to be conscious of power as an original and independent thinker.

- That originality and independence became more con- spicuous when he reached his second stage as a political economist, struggling forward towards the standpoint from which his systematic work was written. It would seem that in his fits of despondency one of the thoughts that sat upon him like a nightmare and marred his dreams of human improvement was the apparently inexorable character of economic laws, condemning thousands of labourers to a cramped and miserable existence, and thousands more to semi-starvation. From this oppressive feeling he found relief in the thought set forth in the opening of the second book of his Political Lconomy—that, while the conditions of production have the necessity of physical laws, the distribution of what is produced among the various classes of producers is a matter of human arrangement, dependent upon alterable customs and institutions, There can be little doubt that this thought, whether or not in the clear shape that it afterwards assumed, was the germ of all that is most

distinctive in his system of political economy. It was as far as possible from the rigidity of his method of exposition to fall into the confusion of supposing that it was for political economy to discuss the equity of different modes of distribution, or the value of other objects of human endeavour conflicting with the production of wealth; but he put economic inquiries clearly in their proper place as leading to conclusions that were not always final and bind-

ing on the practical statesman, but had to be taken with other considerations as governing rational human action. Besides thus putting political economy in its just correla- tion with other parts of social science and conduct, Mill widened the scope of economic inquiries by discussing the economic consequences of various ideal social arrangements, and more especially different modes of distributing produce between landlord, capitalist, and labourer. Mill certainly redeemed political economy from the reproach of being a dry science. Nobody with any interest in human improve- ment can read his work with indifference. And he did this without in any way disturbing the original conception of political economy as the science of cause and effect in the production of wealth. One of his most eminent successors, the late Professor Cairnes, thus admirably summed up his work as a political economist :—' As he himself used to put it, Ricardo supplied the backbone of the science ; but it is not less certain that the limbs, the joints, the muscular developments—all that renders political economy a complete and organized body of knowledge—have been the work of Mill."

While his great systematic works were in progress, Mill wrote very little on events or books of the day. He turned aside for a few months from his Political Economy during the winter of the Irish famine (1846-47) to advocate the creation of peasant-proprietorships as a remedy for distress and disorder in Ireland. He found time also to write elaborate articles on French history and Greek history in the Edinburgh Review apropos of Michelet, Guizot, and Grote, besides some less elaborate essays.

The Political Hconomy was published in 1848. Mill could now feel that the main work he had proposed for himself was accomplished; but, though he

wrote compara- tively little for some years afterwards, he remained as much as ever on the alert for opportunities of useful influence, and pressed on with hardly diminished enthusiasm in his search for useful truth. Among other things, he made a more thorough study of socialist. writers, with the result that, though he was not converted to any of their schemes as being immediately practicable, he began to look upon some more equal distribution of the produce of labour as a practicability of the remote future, and to dwell upon the prospect of such changes in human character as might render a stable society possible without the institution of private property. This he has called his third stage as a political economist, and he says that he was helped towards it by the lady, Mrs Taylor, who became his wife in 1851, and with whom he had lived in intimate friendship for more than twenty years before. It is generally supposed that he writes with a lover's extrava- gance about this lady's powers when he conipares her with Shelley and Carlyle. But a little reflexion will show that he wrote with his usual accuracy and sobriety when he described her influence on him. He expressly says that he owed none of his technical doctrine to her, that she influenced only his ideals of life for the individual and for society; and his language about her is really only a measure of the importance that he attached to such ideals above any systems of reasoned truth. There is very little propositional difference between Mill and his father; but it is obvious from what he says that his inner life became very different after he threw off his father's authority. This new inner life was strengthened and enlarged by Mrs Taylor. We must remember also that Mill in his early years had been so strictly secluded from commonplace sentiment that what the general world would consider commonplace must have come to him with all the freshness of a special revelation.

During the seven years of his married life Mill published less than in any other period of his career, but four of his —

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most closely reasoned and characteristic works, the Laberty, the Utilitarianism, the Thoughts on Parliamentary Reform, and the Subjection of Women, besides his posthumously published essays on Vatwre and on the Utility of Religion, were thought out and partly written in collaboration

with his wife. In 1856 he became head of the examiner's office in the India House, and for two years, till the dissolution of the Company in 1858, his official work, never a light task, kept him fully occupied. It fell to him as head of the office to write the defence of the Company's government of India when the transfer of its powers was proposed. Mill was earnestly opposed to the transfer, and the documents in which he substantiated the proud boast for the Company that "few governments even under far more favourable circumstances have attempted so much for the good of their subjects or carried so many of their attempts to a beneficial issue," and exposed the defects of the proposed new government, are models of trenchant and dignified pleading. His prediction that the Indian Secretary's council would serve as a screen and not as a check was in the opinion of many amply verified a few years ago.

On the dissolution of the Company, Mill was offered a seat in the new council, but declined. His retirement from official work was followed almost immediately by his wife's death, and from this calamity he sought relief in active literary occupation. Politics, sociology, and psycho- logy divided as before the energies of his active mind. One of his first cares was to publish with a touching dedication to his wife the treatise on Liberty, which they had wrought out together, principle by principle and sentence by sentence. This pious duty discharged, he turned to current politics, and published, in view of the impending Reform Bill, a pamphlet on parliamentary reform. 'The chicf feature in this was an idea concerning which he and Mrs Mill often deliberated, the necessity of providing checks against uneducated democracy. His fanciful suggestion of a plurality of votes, proportioned to the elector's degree of education, was avowedly put forward only as an ideal; he admitted that no authentic test of education could for the present be found. An anonymous Conservative caught at the scheme in another pamphlet, proposing income as a test. Soon after, Mill supported in raser's, still with the same object, Mr Hare's scheme for the representation of minorities. In the autumn of the same year he turned to psychology, reviewing Mr Bain's works in the Hdinburgh Review.

In this way the indefatigable thinker worked on, throw- ing himself by turns into the various lines along which he saw prospects of fulfilling his mission as an apostle of pro- gress. In his Representative Government (1860) he

systema- tized opinions already put forward in many casual articles and essays. His Utilitarianism (published in Fraser's in 1861) was a closely reasoned systematic attempt to answer objections to his ethical theory and remove misconceptions of it. As the inventor of the term Utilitarianisin, he was entitled to define its meaning; and he was especially anxious to make it clear that hé included in utility the pleasures of the imagination and the gratification of the higher emotions, and to show how powerfully the good of mankind as a motive appealed to the imagination. His 'treatise on the Subjection of Women, in its ruling intention a protest against the abuse of power, was Mill's next work, though it was not published till 1869. His Hxamination of Hamilton's Philosophy, published in 1865, had engaged a large share of his time for three years before. When it first occurred to him that a criticism of the chief of our native intuitional psychologists would cause a wholesome stir and serve enlightenment, he thought only of an article such as he wrote about Austin's Jurisprudence or Grotc's

old Plato. But he soon found that the subject required a book, and a book appeared which certainly answered the purpose of rousing the sleepy realms of philosophy and theology.

While mainly occupied in those years with philosophical studies, Mill did not remit his interest in current politics. He made his voice heard on the contest in America in 1862, taking the side of the North—then very unpopular in London—and using all his strength to explain what has since been universally recognized as the issue really at stake in the struggle, the abolition of slavery. It was characteristic of the closeness with which he watched current events, and of his zeal in the cause of "lucidity," that, when the Reader, an organ of science and unpartisan opinion, fell into difficulties in 1865, Mill joined with some distinguished men of science and letters in an effort to keep it afloat. He supplied part of the money for carrying it on, contributed several articles, and assisted the editor, Mr Fraser Rae, with his advice. The effort was vain, though such men as Herbert Spencer, Huxley, Tyndall, Cairnes, Mark Pattison, F. Harrison, Sir Frederick Pollock, and Lockyer were among the contributors.

In 1865 a new channcl was opened to his influence. He was requested to stand for Westminster, and agreed on conditions strictly in accordance with

his principles of parliamentary election. He would not canvass, nor pay agents to canvass for him, nor would he engage to attend to the local business of the constituency. He was with difficulty persuaded even to address a meeting of the electors. The story of this remarkabie election has been told by Mr James Beal, one of the most active supporters of Mill's candidature. In parliament he adhered to his lifelong principle of doing only work that needed. to be done, and that nobody else seemed equally able or willing to do. It may have been a consciousness of this fact which prompted a remark made by the Speaker that Mill's presence in parliament elevated the tone of debate. The impression made by him in parliament is in some danger of being forgotten, because he was not instrumental in carrying any great measure that might serve as an abiding memorial. But, although in one of his first speeches against the suspension of the Habeas Corpus Act in Ireland he was very unfavourably received, Mill thoroughly succeeded in what is called "' gaining the ear of the House." The only speech made by him during his three years in parliament that was listened to with impaticnce was, curiously enough, his speech in favour of counteracting democracy by providing for the representation of minorities. Ifis attack on the conduct of General Eyre in Jamaica was listened to, but with repugnance by the majority, although his action in this matter in and out of parliament was far from being ineffectual. He took an active part in the debates on Mr Disraeli's Reform Bill, and helped to extort from the Government several useful modifications of the Bill for the Prevention of Corrupt Practices. 'The reform of land tenure in Ireland, the representation of women, the reduction of the national debt, the reform of London government, the abrogation of the declaration of Paris, were among the topics on which he spoke with marked effect. He took occasion more than once to enforce what he had often advocated in writing, England's duty to intervene in Continental politics in support of the cause of freedom. As a speaker Mill was somewhat hesitating, pausing occasionally as if to recover the thread of his argument, but he showed great readiness in extem-poraneous debate. Viewed as a candidate for ministerial office, he might be regarded as a failure in parliament, but there can be no doubt that his career there greatly extended his influence.

Mill's subscription to the election expenses of Mr Bradlaugh, and his attitude towards Governor Eyre, are XVI. — 40

generally regarded as the main causes of his defeat in the general election of 1868. But, as he suggests himself, his studied advocacy of unfamiliar projects of reform had made him unpopular with "moderate Liberals." When he was first elected on a sudden impulse of enthusiasm, extremely little was known about him by the bulk of the electorate; and his writing about checks against democracy had pre- pared many for a more conservative attitude on questions of practical politics. He retired with a sense of relief to his cottage and his literary life at Avignon. His parlia- mentary duties and the quantity of correspondence brought upon him by increased publicity had absorbed nearly the whole of his time. 'The scanty leisure of his first recess had been devoted to writing his St Andrews rectorial address on higher education and to answering attacks on his criticism of Hamilton ; of the second, to annotating, in conjunction with Mr Bain and Mr Findlater, his father's Analysis of the Mind. But now he could look forward to a literary life pure and simple, and his letters show how much he enjoyed the change. His little cottage was filled with books and newspapers; the beautiful country round it furnished him with a variety of walks; he read, wrote, discussed, waiked, botanized. His step-daughter, Miss Taylor, his constant companion after his wife's death, "architect and master-mason all in one," carried out various improvements in their quiet home for the philo- sopher's comfort. " Helen," he wrote to Mr Thornton, 'has carried out her long-cherished scheme (about which she tells me she consulted you) of a ' vibratory' for me, and has made a pleasant covered walk, some 3O feet long, where I can vibrate in cold or rainy weather. The terrace, you must know, as it goes round two sides of the house, has got itself dubbed the 'semi-circumgyratory.' In addition to this Helen has built me a herbarium, a little room fitted up with closets for my plants, shelves for my botanical books, and a great table whereon to manipulate them all. Thus, you see, with my herbarium, my vibratory, and my semi-circumgyratory, I am in clover ; and you may imagine with what scorn I think of the Ifouse of Commons, which, comfortable club as it is said to be, could offer me none of these comforts, or, more perfectly speaking, these necessaries of life." Mill was an enthusiastic botanist all his life long, and a frequent con- tributor of notes and short papers to the Phytologist. One of the things that he looked forward to during his last journey to Avignon was

seeing the spring flowers and completing a flora of the locality. His delight in scenery frequently appears in letters written to his friends during his summer and autumn tours.

No recluse ever had a more soothing retreat than Mill's Avignon cottage, but to the last he did not relax his laborious habits nor his ardent outlook on human affairs. The essays in the fourth volume of his Dissertattons—on endownients, on land, on labour, on metaphysical and psychological questions—were written for the Fortnightly Review at intervals after his short parliamentary career. One of his first tasks was to send his treatise on the Subjection of Women through the press. The essay on Theism was written soon after. The last public work in which he engaged was the starting of the Land Tenure Reform Association. The interception by the state of the unearned increment, and the promotion of co-operative agriculture, were the most striking features in his pro- gramme. He wrote in the Hxaminer and made a public speech in favour of the association a few months before his death. The secret of the ardour with which he took up this question probably was his conviction that a great struggle was impending in Europe between labour and capital. He regarded his project as a timely compromise.

Mill dicd at Avignon on the Sth of May 1873.

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Within the limits of this article it is impossible to attempt a criticism of Mill's conclusions in so many fields of researcl1; one must be content with trying to indicate the purpose and the spirit of his work. Perhaps we still stand too near to judge without bias; some years hence men will be better able to say whether he made sciolism less reckless or brought mankind appreciably nearer that dominion of the wisest which was the remote goal of his endeavour. It will be long before humanity finds a nobler example of the searcher after the best means of social improvement. He sought after clear ideas with the ardour of a mystic, the patience and laborious industry of a man of science; he encountered opponents with a generosity and a courtesy worthy of any preux chevalier of medieval romance, while he was not inferior to that ideal in the vigour of his blows against injustice. As regards his influence, it has been well said that "no calculus can integrate

the innumerable pulses of knowledge and of thought that he has made to vibrate in the minds of lis generation." He quickened thought upon every problem that he touched. Any estimate of Mill's service to political or philosophical thought at this moment is liable to be injuri- ously affected by the temporary discredit into whicli some of his doc- trines have fallen. He wasnot infallible; he made no claim to dog- matic authority. Butin criticism of detail, according to our present light, we may easily blind ourselves to the greatness of the work that Mill accomplished in the development of opinion. (W. M.)

MILLAU, or Mriwav, capital of an arrondissement in the department of Aveyron, France, is situated on the left bank of the Tarn, half a mile below the point at which that river is joined by the Dourbie, and 48 miles to the south-east of Rodez, on the Rodez and Montpellier line, Itself 1210 feet above the level of the sea, it is overlooked by hills covered with vineyards and fruit trees or by bare and scarped rocks. The streets of Millau are narrow, and soine of the houses of great antiquity, but the town is surrounded by spacious boulevards. On two sides the Place d'Armes is adorned by stone columns supporting galleries of wood ; the only buildings of special interest are the Romanesque church of Notre Dame, and the belfry of the old hétel de ville. 'The principal industry is the manufacture of gloves, but various branches of the leather manufacture are also carried on. 'The chief articles of commerce are wool (both raw and prepared), Roquefort cheese, wine, almonds, and live stock. The population in 1881 was 16,628.

The viscounts of Millau are mentioned as early as the 10th century; in the 16th it became one of thie leading strongholds of the Reformed 'party in the south of France. Its industry suffered severely by the revocation of the edict of Nantes.

MILLENNIUM. In the history of Christianity three main forces are found to have acted as auxiliaries of the gospel. They have elicited the ardent enthusiasm of many whom the bare preaching of the gospel would never have made decided converts. These are (1) a belief in the speedy return of Christ and in His glorious reign on earth; (2) mystical contemplation, which regards heavenly bless- ings as a possible possession in the present

life; and (3) faith in a divine predestination of some to salvation and others to perdition. Each of these forces has at particular times proved too strong for church authority and burst the embankments with which the church had at once narrowed and protected Christian life and thought. They have produced ecclesiastical, social, and political convulsions, where the elemental force of religious conviction has destroyed all organization, whether of church or of state. They have released from its fetters the free spirit of Christianity, though often enough they have associated with it a fanaticism more damaging to the gospel than the temporiz- ing policy of the hierarchy.

First in point of time came the faith in the nearness of Christ's second advent and the establishing of His reign of glory on the earth. Indeed it appears so early that it might be questioned whether it ought not to be regarded as an essential part of the Christian religion. That question, however, will scarcely be answered in the affirma- tive. The ideas of the Sermon on the Mount, or the pregnant thoughts of the Pauline theology, are independent of the expectation that the kingdom of glory will shortly

be established. On the other hand, it must be admitted that this expectation was a prominent feature in the earliest proclamation of the gospel, and materially contributed to its success. If the primitive churches had been under the necessity of framing a "Confession of Faith," it would certainly have embraced those pictures by means of which the near future was distinctly realized. But then these pictures and dreams and hopes were just the things that made systematized doctrine impossible ; it is possible to formulate the mythological ideas, but not the shifting imagery of the imagination.

In the anticipations of the future prevalent amongst the carly Christians (¢. 50-150) it is necessary to distinguish a fixed and a fluctuating element. (1) the notion that a last terrible battle with the enemies of God was impending ; (2) the faith in the speedy return of Christ; (3) the conviction that Christ will judge all men, and (4) will set up a kingdom of glory on earth. To the latter belong views of the Antichrist, of the heathen world-power, of the place, extent, and duration of the earthly kingdom of Christ, &c. These remained in a state of solution; they were modified from day to day, partly

because of the changing circumstances of the present by which forecasts of the future were regulated, partly because the indications—real or supposed —of the ancient prophets always admitted of new combinations and constructions. But even here certain positions were agreed on in large sections of Christendom. Amongst these was the expecta- tion that the future kingdom of Christ on earth should have a fixed duration,—according to the most prevalent opinion, a duration of one thousand years. From this fact the whole ancient Christian eschatology was known in later times as "chiliasm,"—a name which is not strictly accurate, since the doctrine of the millennium was only one feature in its scheme of the future.

1. This idea that the Messianic kingdom of the future on earth should have a definite duration has—like the whole eschatology of the primitive church—its roots in the Jewish apocalyptic literature, where it appears at a com- paratively late period. At first it was assumed that the Messianic kingdom in Palestine would last for ever (so tho prophets ; ¢f. Jerem, xxiv. 6; Ezek. xxxvil. 25; Joel iv. 20; Daniel vi. 27; Sibyll. iii. 49 sq., 766; Psalt. Salom. xvii. 4; Enoch Ixii. 14), and this seems always to have been the most widely accepted view (John xii. 34). But from a comparison of prophetic passages of the Old Testa- ment, learned apocalyptic writers came to the conclusion that a distinction must be drawn between the earthly appearance of the Messiah and the appearance of God Himself amongst His people and in the Gentile world for the final judgment. Asa necessary consequence, a limited period had to be assigned to the Messianic kingdom. It is not altogether improbable that the mysterious references to tho sufferings of the Messiah had also an influence on some minds. This, however, is doubtful. It is certain at all events that the whole conception marks the beginning of the dissolution of realistic and sensuous views of the future. The age was too advanced to regard the earthly Messianic kingdom as the end. There was an effort to find a place among the hopes of the. future for those more spiritual and universal anticipations, according to which eternal and heavenly blessedness will be the portion of the faithful, this earth and heaven will pass away, and God will be all in all. As to the period to be assigned to this earthly kingdom, no agreement was ever reached in Judaism, any more than in the detailed descriptions of its joys and pleasures. According to the Apocalypse of Baruch (xl. 3) this kingdom will last_"donec finiatur mundus

corruptionis." In the Book of Enoch (xci. 12) "a week" is specified, in the Apocalypse of Ezra (vii. 28 sq.) four

hundred years. hundred years of Egyptian bondage, occurs also in the

the Talmud has no fixed doctrine on the point. view most frequently expressed there (see Von Otto in Hilgenfeld's Zeitschrift, 1877, p. 527 sq.) is that the

two thousand) years. world, on the seventh He rested. But a day of God is equal to a thousand years (Ps. xc. 4). Hence the world will last for six thousand years of toil and labour; then will come one thousand years of Sabbath rest for the people of God in the kingdom of the Messiah."

The former includes | have already been very common in the first century beforo

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This figure, corresponding to the four Talmud (Sanhedrin 99a). But this is the only passage ; The

Messianic kingdom will last for one thousand (some said "In six days God created the

This idea must

Christ. The combination of Gen. i., Dan. ix., and Ps. xc. 4 was peculiarly fascinating.

2. Jesus Himself speaks of only one return of the Son of Man—His return to judgment. In speaking of it, and of the glorious kingdom He is to introduce, He makes uso of apocalyptic images (Matt. viii. 11, xxvi. 29; Luke xxii. 16; Matt. xix. 28); but nowhere in the discourses of Jesus is there a hint of a limited duration of the Messianic kingdom. The apostolic epistles are equally free from any trace of chiliasm (neither 1 Cor. xv. 23 sq. nor 1 Thess. iv. 16 sq. points in this direction). In the Apocalypse of John, however, it occurs in the following shape (chap. xx.). After Christ has

appeared from heaven in the guise of a warrior, and vanquished the antichristian world-power, the wisdom of the world, and the devil, those who havo remained steadfast in the time of the last catastrophe, and

have given up their lives for their faith, shall be raised up,

and shall reign with Christ on this earth as a royal priest- hood for one thousand years. At the end of this time Satan is to be let loose again for a short season ; he will prepare a new onslaught, but God will miraculously destroy him and his hosts. Then will follow the general resurrection of the dead, the last judgment, and the creation of new heavens and a new earth. That all believers will have a share in the first resurrection and in the Messianic kingdom is an idea of which John knows nothing. Tho earthly kingdom of Christ is reserved for those who have endured the most terrible tribulation, who have withstood the supreme effort of the world-power,—that is, for those who are actually members of the church of the last days. The Jewish expectation is thus considerably curtailed in the hands of John, as it is also shorn of its sensual attractions. 'Blessed and holy is he that hath part in the first resurrection ; on such the second death hath no power ; but they shall be priests of God and of Christ, and shall reign with Him a thousand years." More than this John does not say. But other ancient Christian authors wero not so cautious. Accepting the Jewish apocalypses as sacred books of venerable antiquity, they read them eagerly, and transferred their contents bodily to Christianity. Nay more, the Gentile Christians took possession of them, and just in proportion as they were neglected by tho Jews—who, after the war of Bar-Cochba, became indifferent to the Messianic hope and hardened themselves once more in devotion to the law—they were naturalized in the Christian communities. The result was that these books became "Christian " documents ; it is entirely to Christian, not to Jewish, tradition that we owe their preservation. The Jewish expectations are adopted, for example, by Papias, by the writer of the epistle of Barnabas, and by Justin. Papias actually confounds expressions of Jesus with verses from the Apocalypse of Baruch, referring to the amazing fertility of the days of the Messianic kingdom (Papias in Iren. v. 33). Barnabas (Ep., 15) gives us the Jewish theory (from Gen. i. and Ps. xc. 4) that the present condition of the world is to last six thousand years

from the ereation, that at the beginning of the Sabbath | (the seventh millennium) the Son of God appears, to put an end to the time of "the unjust one," to judge the ungodly and renew the earth. But he does not indulge, like Papias, in sensuous deseriptions of this seventh millennium; to Barnabas it is a time of rest, of sinlessness, and of a holy peace. It is not the end, however; it is followed by an eighth day of eternal duration,—"the beginning of another world." So that in the view of Barnabas the Messianic reign still belongs to ofros 6 aidv. Justin (Dial. 80) speaks of ehiliasm as a necessary part of complete orthodoxy, although he knows Christians who do not aecept it. He believes, with the Jews, in a restoration and extension of the city of Jerusalem; he assumes that this city will be the seat of the Messianie kingdom, and he takes it as a matter of eourse that there all believers (here he is at one with Barnabas) along with patriarchs and prophets will enjoy perfeet felicity for one thousand | years. In fact he reads this view into the Apocalypse of | John, which he understands to mean that before the general resurrection all believers are to rule for a time with Christ on earth. That a philosopher like Justin, with a bias towards an Hellenic eonstruetionof the Christian religion, should nevertheless have aeeepted its chiliastic elements is the strongest proof that these enthusiastic expectations were inseparably bound up with the Christian faith down to the middle of the 2d eentury. And another proof is found in the fact that even a speeulative Jewish Christian like Cerinthus not only did not renounee the chiliastic hope, but pictured the future kingdom of Christ as a kingdom of sensual pleasures, of eating and drinking and marriage festivities (Euseb., H. Z., ii. 28, vii. 25).

3. After the middle of the 2d eentury these ex- pectations were gradually thrust into the baekground. They would never have died out, however, had not cireumstanees altered, and a new mental attitude been taken up. The spirit of philosophical and theological – speculation and of ethical reflexion, whieh began to spread through the ehurches, did not know what to make of the old hopes of the future. To a new generation they seemed paltry, earthly, and fantastie, and far-seeing men had good reason to regard them as a source of political danger. But more than this, these wild dreams about the glorious king- dom of Christ began to disturb the organization

which the churehes had seen fit to introduce. In the interests of self-preservation against the world, the state, and the heretics, the Christian eommunities had formed themselves into compact societies with a definite ereed and eonstitu- tion, and they felt that their existence was threatened by the white heat of religious subjectivity. So early as the year 170, a church party in Asia Minor—the so-called Alogi—rejeeted the whole body of apocalyptic writings

| homologoumena of the eanon.

and denouneed the Apocalypse of John as a book of fables. All the more powerful was the reaetion. In the so-called Montanistie controversy (c. 160-220) one of the prineipal issues involved was the eontinuance of the chiliastie expeetations in the ehurches. The Montanists of Asia Minor defended them in their integrity, with one slight modifieation: they announeed that Pepuza, the eity of Montanus, would be the site of the New Jerusalem and the millennial kingdom. Modifications of this kind, which have often appeared in later times in connexion with the revival of millennarianism, area striking evidence of the tendency of every sect to regard its own little membership as the centre of the world and its fortunes as the kernel of universal history. After the Montanistic controversy, ehiliastic views were more and more diseredited in the Greek Church; they were, in fact, stigmatized as "Jewish" and consequently "heretical."

It was the Alexandrian theology that superseded them ; |

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that is to say, Neo-Platonie mysticism triumphed over the early Christian hope of the future, first among the "cultured," and then, when the theology of the "cultured" had taken the faith of the "uneultured" under its protec-tion, amongst the latter also. About the year 260 an Egyptian bishop, Nepos, in a treatise ealled ¢Aeyxos é\AnyopiorSv, endeavoured to overthrow the Origenistie theology and vindieate chiliasm by exegetical methods. Several congregations took his part; but ultimately Dionysius, bishop of Alexandria, sueceeded in healing the schism and asserting the allegorieal interpretation of

the prophets as the only legitimate exegesis. During this —

eontroversy Dionysius beeame eonvineed that the vietory of mystieal theology over "Jewish" ehiliasm would never be seeure so long as the Apoealypse of John passed for an apostolie writing and kept its place among the He aeeordingly raised the question of the apostolie origin of the Apocalypse; and by reviving old difficulties, with ingenious arguments of his own, he earried his point. At the time of Eusebius the Greek Church was saturated with prejudiee against the book and with doubts as to its canonicity. In the eourse of the 4th eentury it was removed from the Greek eanon, and thus the troublesome foundation on whieh ehiliasm might have eontinued to build was got rid of. The attempts of Methodius of Tyre at the beginning of the 4th eentury and Apollinarius of Laodicea about 360 to defend chiliasm and assail the theology of Origen -had no result. For many centuries the Greek Church kept the Johannine Apoealypse out of its canon, and eonsequently ehiliasm remained in its grave. It was considered a sufficient safeguard against the spiritualizing eschatology of Origen and his school to have rescued the main doctrines of the creed and the regula jidei (the visible advent of Christ; eternal misery and hell-fire for the wieked). Anything beyond this was held to be Jewish. It was only the chronologists and historians of the ehureh who, following Julius Afrieanus, made use of apocalyptic numbers in their caleulations, while court theologians like Eusebius entertained the imperial table with discussions as to whether the dining-hall of the emperor—the seeond David and Solomon, the beloved of God—might not be the New Jerusalem of John's Apocalypse. Eusebius was not the first who dabbled in sueh speculations. Dionysius of Alexandria had already referred a Messianie prediction of the Old Testament to the emperor Gallienus. But mysticism and politieal servility between them gave the death-blow to ehiliasm in the Greek Chureh. It never again obtained a footing there; for, although, late in the Middle Ages, the Book of Revelation —by what means we cannot tell—did reeover its authority, the ehureh was by that time so hopelessly trammelled by a magical eultus as to be ineapable of fresh developments. In the Semitic churehes of the East (the Syrian, Arabian, and Aithiopian), and in that of Armenia, the apoealyptie literature was preserved mueh longer than in the Greek Church. They were very conservative of ancient traditions in general, and henee ehiliasm survived amongst them to a later date than in Alexandria or

Constantinople. It is to these ehurehes that we are mainly indebted for the extensive remains of the old apoealyptie literature whieh we now possess. From remote cloisters of the East Europe has reeovered within the last forty years many works of this kind whieh onee enjoyed the highest repute throughout Christendom.

4, But the Western Chureh was also more conservative than the Greek. Her theologians had, to begin with, little turn for mystical speeulation ; their tendency was rather to reduee the gospel to a system of morals. Now for the moralists ehiliasm had a special signifieance as the one distinguishing feature of the gospel, and the only thing

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that gave a specifically Christian character to their system. This, however, holds good of the Western theologians only after the middle of the 3d century. The earlier fathers, Treneus, Hippolytus, Tertullian, believed in chiliasm simply because it was a part of the tradition of the church and because Marcion and the Gnostics would have nothing to dowithit. Irenzeus (v. 28, 29) has the same conception of the millennial kingdom as Barnabas and Papias, and appeals in support of it to the testimony of disciples of the apostles. Hippolytus, although an opponent of Montanism, was nevertheless a thorough-going millennarian (see his book De Antichristo). Tertullian (cf. especially Adv. Marcion., 3) aimed at a more spiritual conception of the millennial blessings than Papias had, but he still adhered, especially in his Montanistic period, to all the ancient anticipations. It is the same all through the 3d and 4th centuries with those Latin theologians who escaped the influence of Greek speculation. Commodian, Victorinus Pettavensis, Lactantius, and Sulpicius Severus were all pronounced millennarians, holding by the very details of the primitive Christian expectations. They still believe, as John did, in the return of Nero as the Antichrist ; they still expect that after the first resurrection Christ will reign with His saints "in the flesh" fora thousand years. Once, but only once (in the Gospel of Nicodemus), the time is reduced to five hundred years. Victorinus wrote a commentary on the Apocalypse of John; and all these theologians, especially Lactantius, were diligent students of the ancient Sibylline oracles

of Jewish and Christian origin, and treated them as divine revelations. As to the canonicity and apostolic authorship of the Johannine Apocalypse no doubts were ever entertained in the West ; indeed an Apocalypse of Peter was still retained in the canon in the 3d century. That of Ezra, in its Latin translation, must have been all but a canonical book,— the numbers of extant manuscripts of the so-called 4 Ezra being incredibly great, while several of them are found in copies of the Latin Bible at the beginning of the 16th century. The Apocalypse of Hermas was much read till far through the Middle Ages, and has also kept its place in some Bibles. The apocalyptic '"'Testamenta duodecim Patriarcharuni" was a favourite reading-book ; and Latin versions of ancient apocalypses are being continually brought to light from Western libraries (¢.g., the Assumptio Mosis, the Ascensio Jesaje, &c.). All these facts show how vigorously the early hopes of the future maintained themselves in the West. In the hands of moralistic theo- logians, like Lactantius, they certainly assume a somewhat grotesque form, but the fact that these men clung to them is the clcarest evidence that in the West millennarianism was still a point of "orthodoxy" in the 4th century.

This state of matters, however, gradually disappeared after the end of the 4th century. The change was brought about by two causes,—first, Greek theology, which reached the West chiefly through Jerome, Rufinus, and Ambrose, and, second, the new idea of the church wrought out by Augustine on the basis of the altered political situation of the church. Jerome, the pupil of the Greeks, fecls him- self already emancipated from "opiniones Judaice"; he ridicules the old anticipations ; and, though he does not venture to reject them, he and the other disciples of the Greeks did a great deal to rob them of their vitality. At the same time the influence of Greek theology was by no means so great in the West that this of itself could have suppressed chiliastic views. It was reserved for Augustine to give a direction to Western theology which carried it clear of millennarianism. He himself had at one timc belicved in it; he too had looked forward to the holy Sabbath which was to be celebrated by Christ and His people on carth. But the signs of the times pointed to a

O17 different prospect. Without any miraculous interposition of God, not only was Christianity victorious on earth, but the church had attained a position of supremacy. The old Roman empire was tottering to its fall; the

church stood fast, ready to step into its inheritance. It was not simply that the world-power, the enemy of Christ, had been vanquished; the fact was that it had gradually abdicated its political functions in favour of the church. Under these circuinstances Augustine was lcd, in his con- troversy with the Donatists and as an apologist, to idealize the political side of the catholic church,—to grasp and elaborate the idea that the church is the kingdom of Christ and the city of God. Others before him may have taken the same view, and he on the other hand never forgot that true blessedness belongs to the future ; but still he was the first who ventured to teach that the catholic church, in its empirical form, was the kingdom of Christ, that the millennial kingdom had commenced with the appcaring of Christ, and was therefore an accomplished fact. By this doctrine of Augustine's, the old millennarianism, though not completely extirpated, was at least banished from the realm of dogmatic. For the official theology of the church it very soon became a thing of the past; certain clements of it were even branded as heretical. It still lived on, how- ever, in the lower strata of Christian society; and in certain undercurrents of tradition it was transmitted from century to century. At various periods in the history of the Middle Ages we encountcr sudden outbreaks of millennarianism, sometimes as the tenet of a small sect, sometimes as a far-reaching movement. And, since it had been suppressed, not, as in the East, by mystical specula- tion, its mighticst antagonist, but by the political church of the hierarchy, we find that wherever chiliasm appears in the Middle Ages it makes common cause with all enemies of the secularized church. It strengthened the hands of church democracy ; it formed an alliance with the pure souls who held up to the church the ideal of apostolic poverty; it united itself for a time even with mysticism in a common opposition to the supremacy of the church ; nay, it lent the strength of its convictions to the support of states and princes in their efforts to break the political power of the church. It is sufficient to recall the well-known names of Joachim of Floris, of all the numerous Franciscan spiritualists, of the leading sectaries from the 13th to the 15th century who assailed the papacy and the sccularism of the church,—above all, the name of Occam. In these men the millennarianism of the ancient church came to life again; and in the revolutionary move- ments of the 15th and 16th centuries—especially in the Anabaptist movements—it appears with all its old uncom- promisirg energy. If the church, and not the state, was regarded as Babylon, and the pope declared to be the Antichrist, these

,were legitimate inferences from the ancient traditions and the actual position of the church. But, of course, the new chiliasm was not in every respect identical with the old. It could not hold its ground without admitting certain innovations. The "everlasting gospel" of Joachim of Floris was a different thing from the announcement of Christ's glorious return in the clouds of heaven; the "age of the spirit" which mystics and spiritualists expected contained traits which must be characterized as "modern"; and the "kingdom" of the Anabaptists in Miinster was a Satanic caricature of that kingdom in which the Christians of the 2d century looked for a peaceful Sabbath rest. Only we must not form our ideas of the great apocalyptic and chiliastic movement of the first decades of the 16th century from the rabble m Miinster. There were pure evangelical forces at work in it; and many Anabaptists need not shun comparison with the Christians of the apostolic and post-apostolic ages.

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The German and Swiss Reformers also believed that the end of the world was near, but they had different aims in view from those of the Anabaptists. It was not from poverty and apocalypticism that they hoped for a reformation of the church. In contrast to the fanatics, after a brief hesitation they threw millennarianism overboard, and along with it all other "opiniones J udaice." They took up the same ground in this respect which the Roman Catholic Church had occupied since the time of Augustine. How millennarianism nevertheless found its way, with the help of apocalyptic mysticism and Anabaptist influences, into the churches of the Reformation, chiefly among the Reformed sccts, but afterwards also in the Lutheran Church, how it became incorporated with Pietism, how in recent times an exceedingly mild type of "academic" chiliasm has been developed from a belief in the verbal inspiration of the Bible, how finally new sects are still springing up here and there with apocalyptic and chiliastic expectations,—these are matters which cannot be fully entered upon here. But one remark ought to be made in conclusion. A genuine and living revival of chiliastic hopes is always a sign that the church at large has become secularized to such a degree that tender consciences can no longer feel sure of their faith within her. In this sense all chiliastic phenomena in the history of the church demand respectful attention. But when attempts are made to find room for

millennarianism in a dogmatic system, it must always assume a form in which it would be utterly unrecognizable to the millennarians of the ancient church, who, just because they were millennarians, despised dogmatic, in the sense of philo-

sophical theology. The claims of chiliasm are sufficiently,

met by the acknowledgment that in former times it was associated—to all appearance inseparably associated— with the gospel itself. Those who try to remodel it, so as to conserve its "elements of truth," put contempt on it while they destroy it; for it was in its day the most uncompromising enemy of all remodelling, and it can only exist along with the unsophisticated faith of the early Christians.

Cf. Schiirer, Lehrbuch der Neutestamentlichen Zeitgeschichte, 1874, §§ 28, 29; Corrodi, Kritische Geschichte des Chiliasmus, 1781. A thorough history of chiliasm has not yet appeared. (A. HA.)

MILLER, Hue (1802-1856), eminent in science and literature, and one of the most remarkable among self- taught men of genius, was born at Cromarty, on the north- east coast of Scotland, on the 10th of October 1802. His father, a sagacious and strong-willed seaman, who earned a livelihood by sailing his own sloop, perished at sea when Hugh was five years old. His mother looked much, in the upbringing of her son, to her two brothers, James and Alexander Wright, the one a saddler, the other a carpenter. Scrupulous integrity, sincere religion, unflagging industry, and resolute contentment were the lessons which these men, not so much by precept as by example, impressed upon the boy. But young Miller had inherited from his father a strong individuality and obstinate force of will, and began ata very early age to take a line of his own. The enchantment of open air and freedom—the irresistible charm of mother nature on the hill and by the sea—made him at thirteen an incorrigible truant; and his schoolmaster thought it likely that he would prove adunce. Neverthe- less the truant schoolboy was alrcady giving indications of the destination of the man. At an age too early to date he had found in his pen a divining rod that led him to waters of inexhaustible delight. His mother summed up, in the singular dialect of the district, the impression derived from her son's boyhood and youth in the words, "he was aye vritin." But the writing from

the first, and increasingly as time went on, could be discriminated from the ordinary

productions of boyhood. A continuity of idea, an inde- finable grace and freshness, marked his performances. They were never bombastic or verbose. At no period of his life did he suffer from a flux of words. But, boy and man, he had a felicitous knack of fitting words into their right places and avoiding jerkiness and inequality. In verse he lacked the passionate intensity required for true rhythmic movement, but he had a fine sense of cadence and modulation in prose.

Tt is a curious fact that what determined Hugh Miller to apprentice himself to a stone-mason was his delight in literary composition. Unemployed during the winter frosts, the mason, he perceived, could enjoy for some months every year the ecstacy of writing. One result of his decision was that he never learned any language but English. Another was that fifteen years of the quarry and the hewing-shed, with stern experiences of over-work and privation, sowed in his frame the seeds of incurable disease. Meanwhile the advantages of his decision were indisputable. Under the discipline of labour the refractory schoolboy became a thoughtful, sober-minded man. Miller always looked back to his years of hand-labour with a satisfaction that has something in it of solemnity and pathos. " Noble, upright, self-relying toil," he exclaims ; "who that knows thy solid worth and value would be ashamed of thy hard hands, and thy soiled vestments, and thy obscure tasks,— thy humble cottage, and hard couch, and homely fare!"

Tt cannot be added that his fifteen years of close and constant intercourse with fellow-workmen inspired him with much respect for their class. He was most unfortunate in his comrades during the two seasons, 1824 and 1825, when he worked at Niddrie in the neighbourhood of Edinburgh. Swinish in their enjoyments, meanly selfish in their class ambitions, and fatuously subject to talking charlatans, that Niddrie squad of reprobates which he de-scribes in My Schools and Schoolmasters stamped on the mind of Hugh Miller an indelible conviction of the inca- pacity and degradation of the hand-workers.

Returning to Cromarty, he worked in happy patience as a stone-cutter year after year, sedulously prosecuting at the same time the grand object of his ambition, to write good English. He found time to invigorate and enrich his mind by careful reading, and was habitually and keenly observant both of man and of nature. His reading was not extensive but well chosen, and embraced Locke and Hume; Goldsmith and Addison were, more than any others, his masters in style. It was to get time to write that he had become a stone-mason ; another of the surprises of his career is that it was in advertising himself as a mason that he came before the world as a literary man. A stone- mason, figuring as a poetical contributor to the Lnverness Courier, might, he thought, be asked by some of the readers to engrave inscriptions on tombs. He therefore forwarded some of his verses to the editor. These seem to have been consigned to the waste-paper basket, which had been the fate of an '"'Ode on Greece" offered to the Scotsman when he was at Edinburgh. Piqued by his second failure, he now resolved, at all hazards, to see him- self in print. In 1829 appeared the small volume contain- ing Poems Written in the Leisure Hours of a Journeyman Mason. It procured its author the valuable friendship of Mr Robert Carruthers, and was favourably noticed by the press. Miller looked at his poems in print, and concluded, at once and irreversibly, that he would not succeed as a poet. It was a characteristic and very manly decision, proving that there was no fretting vanity in his disposition. Doubtless also it was right. His field was prose. But, though his poems yielded nothing in the way of fortune, they were a beginning of fame. The simple natives of Cromarty began to think him a wonder. Some very elo-

quent letters on the herring fishery extended his reputation. Good judges in Edinburgh detected in his work the mint- mark of genius, and Miller's first prose volume, Scenes and Legends of Cromarty, was published there in 1835, In the interval he had become the accepted lover of Miss Lydia Fraser, a young lady of great personal attractions, rare in- tellectual gifts, and glowing sympathy with all that was good and brave and bright. Her affection naturally steadied him in his resolution to emerge from the hand-working class; the mallet and chisel gradually dropped from his grasp; and when his prose venture appeared he was being initiated, in Linlithgow, into

the duties of a bank clerk. On his return to Cromarty he found employ- ment in the local branch of the Commercial Bank.

He was a married man, and his tent seemed stably fixed at Cromarty, when tlie agitation that preceded the Disrup- tion of 1843 made the air of Scotland vibrate. Miller loved his church, and deliberately esteemed her the most valuable institution possessed by the Scottish people. Fervently as he had sympathized with those who procured political representation for Scotland by the Reform Bill, he still more fervently took part with those who claimed that Scottish congregations should have no pastors thrust upon them. In the summer of 1839 he wrote his famous pamphlet-letter to Lord Brougham; Dr Candlish read it with "nothing short of rapture"; and the first days of 1840 saw Miller installed in the editorial chair of the IVztness newspaper, published twice a week m Edinburgh to advo- cate the cause of non-intrusion and spiritual independence. He continued to edit the Wétness till his death, which took place in the night between the 23d and 24th of December 1856. Unremitting brain work had overtaxed a system permanently injured by the hardships of his early mason life; reason at length gave way, and Miller died by a pistol shot fired by his own hand. A post-mortem examination, attested by four medical men of the highest character, evinced the presence of "diseased appearances" in the brain; and he left a few words indicating the form taken by the insane delusion which had mastered him.

During the three years preceding the Disruption, cham- pionship of the church by Miller did more, probably, than any other single agency to win for it the suffrage of the Scottish people. Months before the day of separation, the name 'Free Church" was prospectively assigned to the party proposing to sever connexion with the state ; and, whether Hugh Miller suggested the name or did not, le was one of the chief architects of the institution. Nor has the sequel shown that his labour was vain.

But long ere now an enthusiasm parallel in intensity with that which he felt for his country and his church, and to which even his old literary enthusiasm had become subservient, had taken possession of him. From infancy he had been a keenly interested observer of all natural facts and objects, and during his career as apprentice and journeyman mason he had

accumulated a vast store of the particular information belonging to the geologist. But it was not until later that he expressly undertook the study of geology. We still find him, when twenty-seven, laying down charts of study and production without a word about science. When, however, he had convinced himself that his road to the stars was not by poetry, and when the limited success of his prose tales and literary essays in the volume on Cromarty suggested a profound misgiving as to the adequacy of his purely literary materials to produce an important result, he bethought him of his hoard of scientific knowledge, and addressed himself with the con- centrated energy of mature manhood to geological reading and geological researches. These, in fact, were not new to him, and he was much impressed by the interest excited among scientific readers by a geological chapter in the

Scenes and Legends. His chief master was Lyell, whom he reverenced henceforward as one of the greatest of living men. 'The principal scene of his own investigations was the Cromarty district, where he ransacked every wrinkle of the hill-side, and traced every stratum sawn through by the watercourse, and where, on the beach at ebb, in indurated clay of bluish tint and great tenacity, belonging to the Old Red Sandstone formation, he discovered and dug out nodules which, when laid open by a skilful blow of the hammer, displayed certain organisms that had never been seen by a human eye. He had entered upon correspondence with Murchison and Agassiz; and "'fellows of the Geological Society and professors of colleges" had been brought by his descriptions "to explore the rocks of Cromarty." Along with the patriotic and religious enthusiasm, therefore, that burned within him when he went to champion his church in Edinburgh, there glowed, in the depths of his heart, not indeed a stronger but a more gentle and perhaps a dearer enthusiasm for that science in which, he felt per- suaded, he had something of his own to say, something to which the world of culture would be glad to listen. So early as September 1840 there began to appear in the Witness a series of articles entitled "'The Old Red Sand- stone." They attracted immediate and eager attention ; and the month was not at an end when, at the meeting of the British Association, Murchison brought them under the notice of the geological section,

presided over by Lyell. Agassiz, already familiar from Millcr's correspondence with the organisms described, contributed information respecting them, and proposed that one of the most remarkable of the fossils should be called Pterichthys Millert. Buckland joined warmly in the encomiums of Murchison and Agassiz, vowing that "he would give his left hand to possess such powers of description as this man." The articles which met with so enthusiastic a reception from the most eminent geologists in Europe formed the nucleus of a book soon after published, and entitled Zhe Old Red Sandstone. It established Miller's reputation not only as an original geologist but as a practical thinker of great sagacity, and as a lucid and fascinating writer. He had at last fairly found his hand ; it is impossible to turn from the Scenes and Legends to the new volume without feeling that the spirit of the author has become more exultant, his touch at once stronger and more free.

During his seventeen years of residence in Edinburgh he published a variety of books, all of them more or less geological, but claiming attention not on account of their geology aloue. His First Impres- sions of England and its People, the fruit of eight weeks' wandering arranged in the leisure hours of a hard-worked editor, will be best appreciated when we contrast its grace and gentleness, the classic moderation of its tonc, the quict vivacity and freshness of its observation, the sense and sentiment and justice of its criticism, with the smartness of the ordinary newspaper correspondent, or the vulgarity and the impudent omniscience of the conventional book of travels. Apart from its masterly descriptions, partly geological partly scenic, and that prose poem on the ubiquity of the occan which, though brief, will compare not unfavourably with seleet pages from Wilson or from Ruskin, its two passages on Westminster Abbey and Stratford-on-Avon would alone suffice to prove that the Cromarty stone-mason was a man of extraordinary genius. Of his autobiographical volume, My Schools and Schoolmasters, no opinion but one has ever been expressed. It ranks among the finest masterpieces of its kind in the English language. __

As a geologist his reputation is securely based upon his aetual discovery of important fossil organisms, one of which bears his name, and on his contributions, thoroughly servieeable at the time they were made, to our knowledge of the formation in which those organisms occur. His cye-to-eye

acquaintance with nature is attested on every page; and, if his enthusiasm does not often rise into spray and surge of rapture, it is a deep ground-swell per- ceptible in all he wrote. His powers of observation were singularly strong and aecurate, and were aeeompanied with the most eareful reflexion and a fine rich glow of imaginative vision. His diseern- ment of the true position of the ventral plate of Plerichthys, when

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the best ichthyologists unanimously insisted on its being dorsal, affords one of the nicest illustrations to be found of an obser- vational faeulty which reasons as wells as secs.

He was also, in his principal geological books, Whe Footsteps of the Creator and The Testimony of the Rocks, « polemical defender of theism and of revelation against some whom he regarded as_ their deadly assailants. It would have been safe and pleasant for Miller to waive all consideration of the religions question. He would thus have eseaped the dreaded sucer of the scientific expert. He would have escaped, also, the eold suspicion of many on his own side ; for the great mass of inedioere religionists like nothing so well as the simple ignoring of dilliculties and hushing up of objections. But he shrank instinctively from the moral cowardiee of reserve. The advance of seience has tended to compromise some of his controversial positions. When he occupied the chair of the Royal Pliysical Society of Edinburgh in 1852, he conld look the most eminent repre- sentatives of coutemporary geology in the face, and claim their assent to the possibility of drawing definite lines of demarcation between the Tertiary, Secondary, and Paleozoic strata. He could speak of 'the entire type of organic being" as altering between these periods. 'All on the one side of the gap," he could dare to affirm, 'belongs to one fashion, and all on the other to another and wholly different fashion." In the thirty intervening years every form of the cataclysmal scheme of geological progression has been discredited. It has become impossible to obtain anything like a consensus of opinion among scientific men as to the placing of those frontier lines between period and period which, however wide may be the margins of gradation assigned to "morning" and 'cvening," are indispensable to the maintenance of Miller's theory of the six-days' vision

of creation. “ Geographical provinces and zones,” says Professor Huxley, “may have been as distinctly marked in the Paleozoic epoch as at present, and those seemingly sudden appearances of new genera and speeies which we ascribe to new creation may be simple results of migration.” Such is now the received opinion of geologists, and we may be sure that Miller, who never shut his eyes to an established fact, would have accepted it. He has said in so many words that the Bible does not teach science.

In the long and memorable debate on the origin of species he strenuously engaged, maintaining, against the author of the Vestiges, the doctrine of specific creation. But when he did so he could feel that Buekland, Sedgwick, Murchison, and Lyell were on his side; nor is it a paradox to allege that he was an ally of Darwin himself. Ifthe author of the Vestiges was right, Darwin was wrong. In point of faet, the former was very nearly right ; but, precisely because Darwin supplies what is lacking in his argument, those who intelligently assent to the Origin of Speeies are bound not to assent to the Vestiges.

But it is ehicfly perhaps in eonnexion with the sweetness and classical animation of his style, and the lovely views he gives of nature’s facts, that we ought to praise Hugh Miller. In an age prodigal of genius, yet abounding also in extravagance, glarc, and bombast, the self-educated stone-mason wrote with the calmness and moderation of Addison. His powerful imagination was dis- ciplined to draw just those lines, and to lay on just those colours, whieh should reanimate the past. As his friend Carruthers, an admirable critic of style, observed, “the fossil remains seem, in his glowing pages, to live and flourish, to fly, swim, or gambol, or to shoot up in vegetative profusion and splendour, as in the primal dawn of ereation. Sueh power belongs to high genius.” Tens of thousands he has incited to the study of nature; tens of thousands he has taught to find in geology no mere catalogue of defunct organisms, no dreary sermon in fossi) stones, but a ‘science of landscape’ as well as an intelligent understanding of the rocky framework of the world.

In 1871 appeared The Life and Letters of Hugh Miller, by Peter Bayne (2vols., London). Miller’s works have cireulated on the European continent, and have been widely read in Ameriea. They have been issued in the United

States in an edition of twenty volumes, comprising the Life and Letters. (P. B.)

MILLER, Witi1am (1781-1849), the founder of an American religious sect holding peculiar millennarian views, was born at Pittsfield, Massachusetts,in 1781. He received a very imperfect education. In the war of 1812 he served as captain of volunteers on the Canadian frontier. While residing at Low Hampton, N.Y., he began in 1833 publicly to lecture on the subject of the millennium, asserting that the second coming of Christ would take place in about ten years. His doctrines awakened wide intercst among certain classes of the community. In 1840a semi-monthly journal, Zhe Signs of the Times, was started by one of his followers, and two years later the Advent Herald made its appearance. About 1843 the second coming of Christ was

Miller; and, although the disappointment of their hopes somewhat diminished their numbers, many continued their adherence to his tenets regarding the nature of the millen- nium. At present the number of Millerites or Adventists is estimated at from 15,000 to 20,000. Miller died at New Hampton, Washington county, N.Y., December 20, 1849.

MILLER, Witi1am (1796-1882), one of the greatest of modern line-engravers, was born in Edinburgh on the 28th of May 1796. After studying in London under George Cook, a pupil of Basire's, he returned to his native city, where he continued to practise his art during a long lifetime. He executed plates after Thomson of Duddingston, Macculloch, D. O. Hill, Sir George Harvey, and other Scottish landscapists, but his most admirable and most voluminous works were his transcripts from Turner. The first of these was the Clovelly (1824), of The Southern Coast, a publication undertaken by his master and his brother William B. Cook, to which Miller also con- tributed the Combe Martin and the Portsmouth. He was engaged on the illustrations of England and Wales, 1827-38 ; of The Rivers of France, 1833-35; of Roger's Poems, 1834; and very largely on those of Zhe Prose and Poetical Works of Sir Walter Scott, 1834. In The Pro- vincial Antiquities and Picturesque Scenery of Scotland, 1826, he executed a few excellent plates after Thomson and Turner. Among his larger engravings of

Turner's works may be mentioned The Grand Canal, Venice; The Rhine, Osterprey, and Feltzen ; The Bell Rock; The Tower of London; and The Shepherd. The art of William Miller was warmly appreciated by Turner himself, and Mr Ruskin has pronounced him to be on the whole the most successful translator into line of the paintings of the greatest English landscapist. His renderings of complex Turnerian sky- effects are especially delicate and masterly. Towards the end of his life Miller abandoned engraving and occupied his leisure in the production of water-colours, many of which were exhibited in the Royal Scottish Academy, of which he was an honorary member. He resumed his burin, however, to produce two final series of vignettes from drawings by Birket Foster illustrative of Hood's Poems, published by Moxon in 1871. Miller was a much respected member of the Society of Friends. He died while on a visit to Sheffield, on the 20th of January

1882.

MILLER'S THUMB (Cottus gobio), a well-known little fish, abundant in all rivers and lakes of northern and central Europe with clear water and gravelly bottom. The genus Cottus, to which the Miller's Thumb belongs, is easily recognized by its broad, flat head, rounded and scaleless body, large pectoral and narrow ventral fins, with two dorsal fins, the anterior shorter than the posterior ; the preoperculum is armed with a simple or branched spine. The species of the genus Cottus are rather numerous, and are confined to the north temperate zone of the globe, the majority being marine, and known by the name of "Bull- heads." The Miller's Thumb is confined to fresh water ; and only one other freshwater species is found in Europe, C. pecilopus, from rivers of Hungary, Galicia, and the Pyrenees ; some others occur in the fresh waters of northern Asia and North America. The Miller's Thumb is common in all suitable localities in Great Britain, but is extremely rare in Ireland; in the Alps it reaches to an altitude exceeding 7000 feet. Its usual length is from 3 to 5 inches. Generally hidden under a stone or in a hollow of the bank, it watches for its prey, which consists of small aquatic animals, and darts when disturbed with extra-ordinary rapidity to some other place of refuge. The female deposits her ova in a cavity under a stone, whilst the male watches and defends them until the young are

expected by as many as 50,000 believers in the doctrines of | hatched and able to shift for themselves.

MILLET

Italian, miglietto, diminutive | of Africa and Asia, particularly of India, is Sorghum vulgare

MILLET (French, mullet ; of miglio=Latin male, a thousand, in allusion to its fertility) is a name applied with little definiteness to a con- siderable number of often very variable species of cereals belonging to distinct genera and even subfamilies of Graminee. The true millet, however, is generally admitted to be Panicum (Setaria) miliaceum, L. (German Hirse, with which P. miliare, Lam., is reckoned by some botanists). It is indigenous to the East Indies and North Australia, but is mentioned by Hippocrates and Theo- phrastus as already cultivated in South Europe in their time. Some suppose it to be one of the earliest grains used in bread-making, and ascribe the origin of its name to panis, bread, rather than to the paniculate inflorescence. It is annual, requires rich but friable soil, grows to about 3 or 4 feet high, and is characterized by its bristly, much branched nodding panicles. One variety has black grains. It is largely cultivated in India, southern Europe, and northern Africa, and ripens as far north as southern Germany, in fact, wherever the climate admits of the production of wine. The grain, which is very nutritious, ig used in the form of groats, and makes excellent bread when mixed with wheaten flour. It is also largely used for feeding poultry and cage- birds, for which purpose mainly it is imported. P. ttalicum, L. (Setaria italica, Beauv.), is of similar origin and distribution, and is one of the ; most wholesome and palatable Indian § cereals. It is annual, grows 4 to 5 feet high, and requires dry light soil. German Millet (P. germanicum, Ger- man Kolbenhirse, Mohar) is probably merely a less valuable and dwarf variety of P. ctalicum, having an erect, compact, and shorter spike. The grains of both are very small, only one half as long as those of common millet, but are exceedingly prolific. Many stalks arise from a single root, and a single spike often yields 2 oz. of grain, the total yield being five times that of wheat. They are imported for poultry feeding like the former species, but are extensively used in soups, &c., on the Continent. Numerous other species belonging to this vast genus—the largest among

grasses, of which the following are among the most important—are also culti- vated in tropical or sub-tropical countries for their grain or as fodder grasses, or both, each variety of soil, from swamp to desert, having its characteristic forms. They are very readily acclimatized wherever the temperature is sufficient, e.g., in Australia, and seem destined to rise in agricultural importance.

Polish Millet is P. digitaria ; P. frumentaceum, Roxb., Shamalo, a Deccan grass, is probably a native of tropical Africa ; while the perennial P. sarmentosum, Roxb., also largely cultivated in tropical countries, is from Sumatra. P. decompositum is the Australian millet, its grains being made into cakes by the aborigines. iP maximum, Jacq., is the Guinea Grass ; it is perennial, grows 8 feet high, and yields abundance of highly nutritious grain. P. spec- tabile, Nees., is the Coapim of Angola, but has been acclimatized in Brazil and other tropical countries. Other gigantic species 6 or 7 fect high form the field crops on the banks of the Amazons. Of species

belonging to allied genera, Pennisetum thyphoideum, Rich. (Peni- cellaria spicata, Willd.), Bajree, sometimes also called Egyptian

Fic. 1.—Panicum italicum.

Millet, a Guinea corn, is largely cultivated in tropical Asia, Nubia,

and Egypt. P. distichwm grows south of the Sahara. Species of Paspalum, Eleusine, and Milium are also cultivated as millets.

But the most important dry grain of the tropical countries

Pers. (Holcus Sorghum, L., Andropogon Sorghum, Roxb. Durra, Great Millet, Indian Millet, Turkish Millet Guinea Corn (the French sorgho, German, Mohren- hirse or Kaffernkorn, 'Ta- mil Cholum, Bengalese Jowart). It ranges prob- ably as extensively as , wheat, being also largely

cultivated in southern Europe, the United States, and the West

Indies. In Asia Minor, Arabia, Italy, and Spain it may be said to replace oats and barley. It is annual, and may reach 12 feet in height; it is extremely prolific, even rivalling maize, of which it isa near congener. Its flour is very white, but does not easily make good bread ; it is largely used in cakes and puddings and for feeding cattle and poultry. The panicles are y used for brooms, and the iM roots for velvet-brushes. Fig. 2.—Sorghum vulgare.

S. bicolor, S. nigrum, S. rubrum, S. Kaffrorum (Kafire Corn), S. saccharatum, and other species or varieties are also of economic importance, the last-named (the " Chinese sugar-cane") being much cultivated in the United States as a source of molasses, the juice, which contains much glucose but comparatively little cane sugar, being simply expressed and concentrated by evaporation. S. vulgare is the grain referred to by Pliny as millet.

For systematic and economic purposes, see GRASSES ; Luerssen, Mced.~~Pharm. Botanik, Leipsic, 1880; Drury, Useful Plants of India, London, 1873; F. v. Miller, Select Plants for Naturaliza~~ tion in Victoria, Melbourne, 1876. For archeology, see Hehn's Kulturpflanzen, &c., Berlin, 1877. On Sorghwin cerunwm ("rice corn," &¢., of western Kansas) see Drummond's Report" in Parl. Papers, No. 2570 (1880).

MILLET, Jean Francors (1814-1875), was a painter of French peasant life, and it may be questioned whether France has produced in our day any greater or more original artist. He himself came of a peasant family, and was born on the 4th of October 1814 in the hamlet of Gruchy, near Gréville (La Manche), in the wild and picturesque district called La Hague. His boyhood was passed working in his father's fields, but the sight of the engravings in an old illustrated Bible set him drawing, and thenceforth, whilst the others slept, the daily hour of rest was spent by Millet in trying to render the familiar scenes around him. From the village priest the lad learnt to read the Bible and Virgil in Latin, and acquired an interest in one or two other works of a high class which accompanied him through life; he did not, however, attract attention so much by his acquirements as by the stamp of his mind. The whole family seems, indeed, to have worn a character of austerity and dignity, and when Millet's father finally decided to test the vocation of his son as an artist, it was with a gravity and

authority which recalls the patriarchal households of Calvinist France. 'Two drawings were pre- pared and placed before a painter at Cherbourg named Mouchel, who at once recognized the boy's gifts, and accepted him as a pupil; but shortly after (1835) Millet's father died, and the eldest son, with heroic devotion, took his place at home, nor did he return to his work until the

pressing calls from without were solemnly enforced by the

wishes of his own family. He accordingly went back to.

Cherbourg, but after a short time spent there with another master (Langlois) started with many misgivings for Paris. The council-general of the department had granted him a sum of 600 francs, and the town council promised an annual pension of 400, but in spite of friendly help and introductions Millet went through great difficulties. The system of the Ecole des Beaux Arts was hateful to him, and it was not until after much hesitation that he decided to enter an official studio—that of Delaroche. The master was certainly puzzled by his pupil; he saw his ability, and, when Millet in his poverty could not longer pay the monthly fees, arranged for his free admission to the studio, but he tried in vain to make him take the approved direc- tion, and lessons ended with " Eh, bien, allez & votre guise, vous étes si nouveau pour moi que je ne veux rien vous dire." At last, when the competition for the Grand Prix came on, Delaroche gave Millet to understand that he intended to secure the nomination of another, and there- upon Millet withdrew himself, and with his friend Marolle started in a little studio in the Rue de l'Est. He had renounced the beaten track, but he continued to study hard whilst he sought to procure bread by painting por- traits at 10 or 15 francs a piece and producing small "pastiches" of Watteau and Boucher. These works are classed as those of his "flowery manner," and Millet has been reproached—he whose whole life was an act of con- viction—with having sacrificed his convictions to curry favour with the public. It is true that he himself has recorded his aversion to both these masters. "In the Louvre," he said, "I received vivid impressions from

Mantegna, complete from Michelangelo ; after Michelangelo and Poussin I have remained faithful to the early masters." Boucher was for him an object of "repulsion," and in Watteau "I saw," he said, "a little theatrical world which oppressed me." Thus it was then that Millet naturally felt and saw, but the strongest genius knows moments of self-doubt. Later in life Millet was heard to say that were it not for the small group who believed in him he should have lost faith in himself. In earlier years, before he was certain of his own leading, he was naturally influ- enced by the advice of others whose arguments were enforced by the pressure of dire poverty. Even so from time to time the native vein showed strong. In 1840, as soon as he had despatched a portrait to the Salon, Millet went back to Gréville, where he painted Sailors Mending a Sail and a few other pictures—reminiscences of Cherbourg life. His first success was obtained in 1844 when his Milkwoman and Lesson in Riding (pastel) attracted notice at the Salon, and friendly artists presented themselves at his lodgings only to learn that his wife had just died, and that he him- self had disappeared. Millet was at Cherbourg; there he remarried, but having amassed a few hundred francs he went back to Paris and presented his St Jerome at the Salon of 1845. This picture was rejected and exists no longer, for Millet, short of canvas, painted over it Cédipus Unbound, a work which during the following year was the object of violent criticism. He was, however, no longer alone ; Diaz, Eugene Tourneux, Rousseau, and other men of note supported him by their confidence and friendship, and he had by his side the brave Catharine Lemaire, his second wife, a woman who bore poverty with dignity and gave courage to her husband through the cruel trials in which he penetrated by a terrible personal experience the bitter secrets of the very poor. To this date belong Millet's Golden Age, Bird Nesters, Young Girl and Lamb, and Bathers ; but to the Bathers (Louvre) succeeded The Mother Asking Alms, The Workman's Monday, and The Winnowcr. This last work, exhibited in 1848, obtained

conspicuous success, but did not sell till Ledru Rollin, informed of the painter's dire distress, gave him 500 francs for it, and accompanied the purchase with a conimission, the money for which enabled Millet to leave Paris for Barbizon, a village on the skirts of the forest of Fontaine- bleau.

There he settled in a three-roomed cottage for the rest of his life—twenty-seven years, in which he wrouglit out the perfect story of that peasant hfe of which he alone has given a "complete impression." Jules Breton has coloured the days of toil with sentiment; others, like Courbet, whose eccentric Funeral at Ornans attracted more notice at the Salon of 1850 than Millet's Sowers and Binders, have treated similar subjects as a vehicle for protest against social misery ; Millet alone, a peasant and a miserable one himself, saw true, neither softening nor exaggerating what he saw. Ina curious letter written to M. Sensier at this date (1850) Millet expressed his resolve to break once and for all with mythological and undraped subjects, and the names of the principal works painted subsequently will show how stedfastly this resolution was kept. In 1852 he produced Girls Sewing, Man Spreading Manure ; 1853, The Reapers; 1854, Church at Gréville (Luxembourg); 1855—the year of the International Exhibition, at which he received a medal of second class— Peasant Grafting a Tree; 1857, The Gleaners; 1859, The Angelus (Louvre, engraved Waltner), The Woodcutter and Death ; 1860, Sheep Shearing; 1861, Woman Shearing Sheep, Woman Feeding Child; 1862, Potato Planters, Winter and the Crows; 1863, Man with Hoe, Woman Carding ; 1864, Shepherds and Flock, Peasants Bringing Home a Calf Born in the Fields ; 1869, Knitting Lesson ; 1870, Buttermaking; 1871, November—recollection of Gruchy. Any one of these works will show how great an influence Millet's previous practice in the nude had upon his style. The dresses worn by his figures are not clothes, but drapery through which the forms and movements of the body are strongly felt, and their contour shows a grand breadth of line which strikes the eye at once. Something of the imposing unity of his work was also, no doubt, due to an extraordinary power of memory, which enabled Millet to paint (like Horace Vernet) without a model ; he could recall with precision the smallest details of attitudes or gestures which he proposed to represent. Thus he could count on presenting free from after thoughts the vivid impressions which he had first received, and Millet's nature was such that the impressions which he received were always of a serious and often of a noble order, to which the character of his execution responded so perfectly that even a Washerwoman at her Tub will show the grand action of a Medea. The drawing of this subject is repro- duced in Souvenirs de Barbizon, a pamphlet in which M. Piédagnel has recorded a visit paid to Millet in 1864. His circumstances were then less evil, after struggles as

severe as those endured in Paris. A contract by which he bound himself in 1860 to give up all his work for three years had placed him in possession of 1000 francs a month. His fame extended, and at the exhibition of 1867 he received a medal of the first class, and the ribbon of the Legion of Honour, but he was at the same moment deeply shaken by the death of his faithful friend Rousseau. Though he rallied for a time he never com- pletely recovered his health, and on the 20th January 1875 he died. He was buried by his friend's side in the churchyard of Chailly.

See A. Sensier, Vie e¢ fuvre de J. F. Millet, 1874 ; Piédagnel, Souvenirs de Barbizon, &c. (iE. ETS: Ba)

MILLVILLE, a city of the United States, in Cumberland county, New Jersey, at the head of navigation of Maurice river, 40 miles by rail from Philadelphia by the Cape May, Millville, and Vineland section of the West Jersey Railroad.

It is one of the chief seats of glass-making in the State, and also manufactures cotton, iron pipes for water and gas, turbines, &c. The population was 7660 in 1880. MILMAN, Henry Harr (1791-1868), dean of St Paul's, was born February 10, 1791, and was the third son of Sir Francis Milman, physician to George III. He was educated at Eton and at Brasenose College, Oxford ; his university career was brilliant, and among other dis- tinctions he gained the Newdigate prize with a poem on the Apollo Belvedere. In 1816 he was ordained, and was soon afterwards presented to the living of St Mary's, Reading. He had already made his appearance as a dramatic writer, his tragedy of Mazo, founded on a narra- tive in the Annual Register for 1795, having been brought on the stage without his knowledge under the title of The Italian Wofe. It was subsequently produced at Covent Garden, and obtained great success from the acting of Miss O'Neill as Bianca. The merit of the play consists chiefly in the powerful situation ; the diction is florid and ornate, The same criticism, by the author's own confes- sion, applies to his epic, Samor, the Lord of the Braght City (Gloucester), a poem written in early youth. The subject is taken from British legend, and Milman has failed to invest it with serious interest. He was more successful in his next attempts, where the

subjects were well adapted to an imagination easily kindled by the historical or the moral picturesque. The death struggle of an expiring nation in the Fall of Jerusalem (1820), the conflict of new truth and old order, of religious enthusiasm and earthly affection, in the Martyr of Antioch (1822), are depicted with great eloquence and real insight into human nature. Milman's characters, however, are personified tendencies rather than personages, and in poetical style he was unable to free himself from the influence of Byron. Belshazzar (1822) is in general a pale copy of Byron's Sardanapalus, but contains some fine lyrics. Milman's lyrics, indeed, especially his hymns, have frequently a fine. ring and sweep, though the thought is generally commonplace. His tragedy of Anne Boleyn (1826) is a poor performance. With the exception of admirable versions of the Sanskrit episode of Nala and Damayanti, and of the Ayamemnon and Bacche, this was Milman's last poetical work. He was elected professor of poetry at Oxford, and in 1827 delivered the Bampton lectures, selecting as his subject the conduct and character of the apostles as an evidence of Christianity. In 1830 his Hestory of the Jews appcared in the Family Library. The contracted limits of this series forbade any adequate treatment of the subject ; the work is nevertheless memorable as the first by an English clergyman which treated the Jews as an Oriental tribe, recognized sheikhs and emirs in the Old Testament, sifted and classified documentary evidence, and evaded or minimized the miraculous. Milman was violently attacked, especially by Dr Faussett and Bishop Mant, and the odium thus occasioned stopped the publication of the Family Library, and long impeded the preferment of the writer. In 1835, however, Sir Robert Peel made him rector of St Margaret's and canon of Westminster, and in 1849 he became dean of St Paul's. The unpopularity attaching to him had by this time nearly died away ; and now, generally revered and beloved, intimate with men of all pursuits, politics, and persuasions, counted among the chief ornaments of the most polished society of the metropolis, he occupied a singularly dignified and enviable position, which he constantly employed for the promotion of culture and enlightenment, and in particular for the relaxation of subscription to ecclesiastical formularies. His History of Christianity under the Empire had appeared in 1840, but had been as completely ignored as if, said Lord Melbourne, the clergy had taken a universal oath never to mention it

O23 to any one. Widely different was the reception of the continuation, his great History of Latin Christianity to the death of Pope Nicholas V., which appeared in 1855. He also edited Gibbon and Horace, and at his death in 1868 left behind him almost finished a delightful history of his own cathedral, which was completed and published by his son.

Milman possessed a large share of the imagination which cntcrs into and calls up the past, and of that which interprets actions and apprehends opinions by the power of sympathy. In creative imagination he was deficient, a defect which alone prevented him from attaining the first rank as an historian, His pages are crowded with splendid uames rather than with living personages ; the springs of action are disclosed with remarkable penetration, but the actor himself is rather heard than scen. There are, however, exceptions, such as his portrait of Sir Christopher Wren; and he possessed a peculiar power of investing mere intellectual tendencies with personality and life. His parallel of Latin and Teutonic Christianity, for example, is a piece of finished historical character painting. His power of sympathy rendered him in effect, as his natural equity and benignity made him in intcntion, a modcl of historical candour, only chargeable, perhaps, with toomuch gentleness. It will be long ere his great wok is superseded ; but he will perhaps be remembered even longer as an embodiment of all the qualities which the higher ecclesiastical preferment can be supposed capable of encouraging or rewarding among the clergy of a great historical church. (R. G.)

MILO, one of the most famous athletes of Greece, whose name became proverbial for personal strength. He lived about the end of the 6th century B.c., was six times crowned at the Olympic games and six times at the Pythian for wrestling, and was famous throughout the civilized world for his feats of strength, such as carrying an ox on his shoulders through the stadium at Olympia. In his native city of Crotona he was much honoured, and he commanded the army which defeatcd the people of Sybaris in 511 z.c, When Democedes, the physician of Darius, deserted the Persian service, he sent a boastful message to the king of Persia informing him of his marriage to the daughter of Milo. The traditional account of his death is often used to point a moral: le found a tree which some woodcutters had partially split with a wedge, and attempted to rend it asunder; but the

wedge fell out, and the tree closed on his hand, imprisoning hin till wolves came and devoured him.

MILO was the surname of T. Annius Papianus, one of the best-known of the partisan leaders and ruffians in the stormy times that preceded the dissolution of the Roman republic. His father was C. Papius Celsus, but he was adopted by his mother's father T. Annius Luscus. He joined the Pompeian party, and led the band of mercenaries and gladiators which was required to defend the cause and its chief supporters in the public streets. P. Clodius, the leader of the ruffians who professed the democratic cause, was his personal enemy, and their brawls in the streets and their mutual accusations in the law courts lasted for several years, beginning when Milo was tribune of the commons in 57 B.c. In 53 their quarrels came to a height when Milo was candidate for the consulship and Clodius for the pretorship ; and when the two leaders met by accident on the Appian Way at Bovills, Clodius was murdered (January 20, 52 B.c.). This act of violence strengthened the hands of Pompey, who was nominated sole consul, and proposed. several stringent laws to restore order in tlie city. Milo was impeached; his guilt was clear, and his enemies took every means of intimidating his supporters and his judges. Cicero was afraid to deliver the speech he had prepared Pro Milone, and the extant oration is an expanded form of the unspoken defence. Milo went into exile at Massilia, and his property was sold by auction. He joined the insurrection of M. Celius in 48 B.c., and was soon slain near Thurii in Lucania. His wife Fausta was daughter of the dictator Sulla.

MILTIADES. Sce Greece, vol. xi. p. 99.

MILTON, Joun (1608-1674), was born in Bread Street, Cheapside, London, on the 9th of December 1608. His father, known as Mr John Milton of Bread Street, scrivener, was himself an interesting man. He was a native of Oxfordshire, having been born there in or about 1563, the son of a Richard Milton, yeoman of Stanton-St-John's, of whom there are traces as one of the sturdiest adherents to the old Roman Catholic religion that had been left in his district. The son, however, had turned Protestant, and, having been cast off on that account, had come to London, apparently about the year 1586,

to push his fortune. Having received a good education, and having good abilities, especially in music, he may have lived for some time by musical teaching and practice. Not till 1595, at all events, when he was long past the usual age of apprenticeship, do we hear of his preparation for the profession of a scrivener ; and not till February 1599-1600, when he was about thirty- seven years of age, did he enter the profession as a qualified member of the Scriveners' Company. It was then that he set up his "house and shop" in Bread Street, and began, like other scriveners, his lawyerly business of drawing up wills, marriage-settlements, and the like, with such related business as that of receiving money from clients for invest- ment and lending it out to the best advantage. It was at the same time that he married. Till recently there has been the inost extraordinary uncertainty as to the maiden name of his wife, the mother of the poet. It has been now ascertained, however, that she was a Sarah Jeffrey, one of the two orphan daughters of a Paul Jeffrey, of St Swithin's, London, " citizen and merchant-taylor," originally from Essex, who had died before 1583. At the date of her marriage she was about twenty-eight years of age. Her widowed mother, Mrs Ellen Jeffrey, came to reside in the house in Bread Street, and died there in February 1610-11. Before this death of the maternal grandmother, three children had been born to the scrivener and his wife, of whom only two survived,—the future poet, and an elder sister, called Anne. Of three more children, born subse- quently, only one survived,—Christopher, the youngest of the family, born December 3, 1615.

The first sixteen years of Milton's life, coinciding exactly with the last sixteen of the reign of James I, associate themselves with the house in Bread Street, and with the surroundings of that housc in Old London. His father, while prospering in business, continued to be known as a man of "'ingeniose" tastes, and even acquired some dis- tinction in the London musical world of that time by his occasional contributions to important musical publications. Music was thus a part of the poet's domestic education from his infancy. Whatever else could be added was added without stint. Again and again Milton speaks with gratitude and affection of the ungrudging pains bestowed by his father on his early education. 'Both at the grammar school and also under other masters at home," is the statement in one passage, "he caused me to be instructed daily." This brings us to about the year 1619, when Milton was ten years of age. At that

time his domestic tutor was Thomas Young, a Scotsman from Perth- shire, and graduate of the university of St Andrews, after- wards a man of no small distinction among the English Puritan clergy, but then only curate or assistant to some parish clergyman in or near London, and eking out his livelihood by private teaching. Young's tutorship lasted till 1622, when he was drawn abroad by an offer of the pastorship or chaplaincy to the congregation of English merchants in Hamburg. Already, however, for a year or two, his tutorship had been only supplementary to the education which the boy was receiving by daily attendance at St Paul's public school, close to Bread Street. The hcadmaster of the school was Mr Alexander Gill, an elderly

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| Oxford divine, of high reputation for scholarship and teaching ability. Under him, as usher or second master, was his son, Alexander Gill the younger, also an Oxford graduate of scholarly reputation, but of blustering character. Milton's acquaintanceship with this younger Gill, begun at St Paul's school, led to subscquent friendship and corre- spondence. Far more affectionate and intimate was the friendship formed by Milton at St Paul's with a certain young Charles Diodati, his schoolfellow there, the son of a naturalized Italian physician, Dr Theodore Diodati, who | had settled in London in good medical practice, and was much respected, both on his own account, and as being the brother of the famous Protestant divine, Jean or Giovanni Diodati of Geneva. Young Diodati, who was destined for his father's profession, left the school for Oxford University early in 1623; but Milton remained till the end of 1624. A family incident of that ycar was the marriage of his elder sister, Anne, with Edward Phillips, a clerk in the Government office called the Crown Office in Chancery. Milton had then all but completed his sixteenth year, and was as scholarly, as accomplished, and as handsome a youth as St Paul's school had sent forth. We learn from himsclf that his exercises "in English or other tongue, prosing or versing, but chiefly this latter," had begun to attract attention even in his boyhood. This implies that he must have had a stock of attempts in English and Latin by him of earlier date than 1624. Of these the only specimens that now remain are his Paraphrase_on Psalm CXIV. and his Paraphrase on Psalm CXXX VI.

On February 12, 1624-25, Milton, at the age of sixteen years and two months, was entered as a student of Christ's College, Cambridge, in the grade of a " Lesser Pensioner." His matriculation entry in the books of the university is two months later, April 9, 1625. Between these two dates James I. had died, and had been succeeded by Charles I.

Cambridge University was then in the full flush of its prosperity on that old system of university education which combined Latin and Greek studies with plentiful drill and disputation in the scholastic logic and philosophy, but with little of physical science, and next to no mathe- matics. There were sixteen colleges in all, dividing among them a total of about 2900 members of the university. Christ's College, to which Milton belonged, ranked about third in the university in respect of numbers, counting about 265 members on its books. The master was Dr Thomas Bainbrigge ; and among the thirteen fellows were Mr Joseph Meade, still remembered as a commentator on the Apocalypse, and Mr William Chappell, afterwards an Irish bishop. It was under Chappell's tutorship that Milton was placed when he first entered the college. At least three students who entered Christ's after Milton, but during his residence, deserve mention. One was Edward King, a youth of Irish birth and high Irish connexions, who entered in 1626, at the age of fourteen; another was John Cleveland, afterwards known as royalist and satirist, who entered in 1627; and the third was Henry More, sub- sequently famous as the Cambridge Platonist, who entered in 1631, just before Milton left. Milton's own brother, Christopher, joined him in the college in February 1630- 31, at the age of fifteen.

Milton's academic course lasted seven years and five months, or from February 1624-25 to July 1632, bringing him from his seventeenth year to his twenty-fourth. The first four years were his time of undergraduateship. It was in the second of these, the year 1626, that there occurred that quarrel between him and his tutor, Mr Chappell, which Dr Johnson, making the most of a lax tradition from Aubrey, magnified into the supposition that Milton may have been one of the last students in either of the English universities that suffered the indignity of

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corporal punishment. The legend deserves no credit ; but it is certain that Milton, on account of some disagreement with Chappell, leading to the interference of Dr Bainbrigge, left college for a time, and that, when he did return, it was under an arrangement which, while securing that he should not lose a term by his absence, transferred him from the tutorship of Chappell to that of Mr Nathaniel Tovey, another of the fellows of Christ's. From a reference to the matter in the first of the Latin elegies one infers that the cause of the quarrel was some outbreak of self-assertion on Milton's part. We learn indeed, from words of his own elsewhere, that it was not only Chappell and Bainbrigge that he had offended by his independent demeanour, but that, for the first two or three years of his undergraduate-ship, he was generally unpopular, for the same reason, among the younger men of his college. They had nick- named him "The Lady," a nickname which the students of the other colleges took up, converting it into "The Lady of Christ's College" ; and, though the allusion was chiefly to the peculiar grace of his personal appearance, it con- veyed also a sneer at what the rougher men thought his uriusual prudishness, the haughty fastidiousness of his tastes and morals. Quite as distinct as the information that he was for a while unpopular with the majority of his fellow-students are the proofs that they all came round him at last with respect and deference. The change had cer- tainly occurred before January 1628-29, when, at the age of twenty, he took his B.A. degree. By that time his intel-lectual pre-eminence in his college, and indeed among his coevals in the whole university, had come to be acknow- ledged. His reputation for scholarship and literary genius, extraordinary even then, was more than confirmed during the remaining three years and a half of his residence in Cambridge.

Of Milton's skill at Cambridge in what Wood calls "the collegiate and academical exercises" specimens remain in his Prolusiones Quedam Oratoriz. They consist of seven rhetorical Latin essays, generally in a whimsical vein, delivered by him, in his undergraduateship or during his subsequent bachelorship in arts, either in the hall of Christ's College or in the public University School. Relics of Milton's Cambridge period are also four of his Latin Familiar Epistles; but more important are the poetical remains. These include the greater number of his preserved Latin poems—to wit, (1) the seven pieces which

compose his Elegiarum Liber, two of the most interesting of them addressed to his medical friend, Charles Diodati, and one to his former tutor Young in his exile at Ham- burg, (2) the five short Gunpowder Plot epigrams, now appended to the Elegies, and (3) the first five pieces of the Sylvarum Liber, the most important of which are the hexa- meter poem "In Quintum Novembris" and the piece entitled "Naturam non pati senium." Of the English – poems of the Cambridge period the following is a dated list: —On the Death of a Fair Infant, 1625-26, the subject being the death in that inclement winter of his infant niece, the first-born child of his sister Mrs Phillips; A¢ a Vacation Exercise in the College, 1628; the magnificent Christmas ode On the Morning of Christ's Natinty, 1629 ; the fragment called The Passion and the Song on May Morning, both probably belonging to 1630; the lines On Shakespeare, certainly belonging to that year; the two facetious pieces On the University Carrier, 1630-31; the Epitaph on the Marchioness of Winchester, 1631; the sonnet Z'o the Nightingale, probably of the same year; the sonnet On arriving at the Age of twenty-three, dating itself certainly in December 1631.

Just before Milton quitted Cambridge, his father, then verging on his seventieth year, had practically retired from his Bread Street business, leaving the active manage- ment of it to a partner, named Thomas Bower, a former apprentice of his, and had gone to spend his declining years at Horton in Buckinghamshire, a sinall village near Colnbrook, and not far from Windsor. Here, accordingly, in a house close to Horton church, Milton mainly resided for the next six years,—from July 1632 to April 1638.

Although, when he had gone to Cambridge, it had been with the intention of becoming a clergyman, that intention had been abandoned. His reasons were that "tyranny had invaded the church," and that, finding he could not honestly subscribe the oaths and obligations required, he "thought it better to preserve a blameless silence before the sacred office of speaking begun with servitude and forswearing." In other words, he was disgusted with the system of high prelacy which Laud, who had been bishop of London and minister paramount in ecclesiastical matters since 1628, was establishing and maintaining in the Church of England. '"Church-outed by the

prelates," as he emphatically expresses it, he seems to have thought for a time of the law. From that too he recoiled; and, leav- ing the legal profession for his brother Christopher, he had decided that the only life possible for himself was one of leisurely independence, dedicated wholly to scholarship and literature. His compunctions on this subject, expressed already in his sonnet on arriving at his twenty-third year, are expressed more at length in an English letter sent by him, shortly after the date of that sonnet, and with a copy of the sonnet included, to some friend who had been remonstrating with him on his "belatedness" and his persistence in a life of mere dream and study. There were gentle remonstrances also from his excellent father. Between such a father and such a son, however, the con- clusion was easy. What it was may be learnt from Milton's fine Latin poem Ad Patrem. There, in the midst of an enthusiastic recitation of all that his father had done for him hitherto, it is intimated that the agreement between them on their one little matter of difference was already complete, and that, as the son was bent on a private life of literature and poetry, it had been decided that he should have his own way, and should in fact, so long as he chose, be the master of his father's means and the chief person m the Horton household. For the six years from 1632 this, accordingly, was Milton's position. In perfect leisure, and in a pleasant rural retirement, with Windsor at the distance of an easy walk, and London only about 17 miles off, he

went through, he tells us, a systematic course of reading | testimony to her character is that she was a "a most

in the Greek and Latin classics, varied by mathematics, music, and the kind of physical science we should now call cosmography.

It is an interesting fact that Milton's very first public appearance in the world of English authorship was in so honourable a place as the second folio edition of Shakespeare in 1632. His enthusiastic eulogy on Shakespeare, written in 1630, was one of three anonymous pieces prefixed to that second folio, along with reprints of the commendatory verses that had appeared in the first folio, one of them Ben Jonson's immortal tribute to Shakespeare's memory. Among the poems actually written by Milton at

Horton the first, in all probability, after the Latin hexameters Ad Patrem, were the exquisite companion pieces DT Allegro and Il Penseroso. There followed, in or about 1633, the fragment called Arcades. It was part of a pastoral masque got up by the young people of the noble family of Egerton in honour of their vencrable relative the countess-dowager of Derby, and performed before that lady at her mansion of Harefield, near Uxbridge, about 10 miles from Horton. That Milton contributed the words for the entertainment was, almost certainly, owing to his friendship with Henry Lawes, one of the chief court musicians of that time, whose known connexion with the Egerton family points him out as the probable manager of the Harefield masque. Next in order among the compositions at Horton may be mentioned the three short pieces, At a Solemn Music, On Time, and Upon the Circumcision; after which comes Comus, the largest and most important of all Milton's minor poems. The name by which that beautiful drama is now universally known was not given to it by Milton himself. He entitled it, more simply and vaguely, "A Masque presented at Ludlow Castle, 1634, before the Earl of Bridgewater, Lord President of Wales." The existence of this poem is certainly due to Milton's intimacy with Lawes. The earl of Bridgewater, the head of the Egerton family, had been appointed to the high office of the presidency or viceroyalty of Wales, the official seat of which was Ludlow in Shropshire ; it had been determined that among the festivities on his assumption of the office there should be a great masque in the hall of Ludlow Castle, with Lawes for the stage manager and one of the actors; Milton had been applied to by Lawes for the poetry ; and, actually, on Michaelmas night, September 29, 1634, the drama furnished by Milton was performed in Ludlow Castle before a great assemblage of the nobility and gentry of the Welsh principality, Lawes taking the part of " the attendant spirit," while the parts of " first brother," "second brother," and " the lady " were taken by the earl's three youngest children, Viscount Brackley, Mr Thomas Egerton, and Lady Alice Egerton.—From September 1634 to the beginning of 1637 is a comparative blank in our records. Straggling incidents in this blank are a Latin letter of date December 4, 1634, to Alexander Gill the younger, a Greek Translation of Psalm CXIV., a visit to Oxford in 1635 for the purpose of incorporation in the degree of M.A. in that university, and the beginning in

and infirm father.—The lawsuit, which was instituted by a certain Sir Thomas Cotton, baronet, nephew and executor of a deceased John Cotton, Esq., accused the elder Milton and his partner Bower, or both, of having, in their capacity as scriveners, misappropriated divers large sums of money that had been entrusted to them by the deceased Cotton to be let out at interest. The lawsuit was still in progress when, on the 3d of April 1637, Milton's mother died, at the age of about sixty-five. A flat blue stone, with a brief inscription, visible on the chancel-pavement of Horton church, still marks the place of her burial. Milton's

' through the neighbourhood."

| for his journey. May 1636 of a troublesome lawsuit against his now aged |

excellent mother and particularly known for her charities The year 1637 was other- wise eventful in his biography. It was in that year that his Comus, after lying in manuscript for more than two

| years, was published by itself, in the form of a small quarto

of thirty-five pages. The author's name was withheld, and the entire responsibility of the publication was assumed by Henry Lawes. Milton seems to have been in London when the little volume appeared. He wasa good deal in London, at all events, during the summer and autumn months immediately following his mother's death. The plague, which had been on one of its periodical visits of ravage through England since early in the preceding year, was then especially severe in the Horton neighbourhood, while London was comparatively free. It was probably in London that Milton heard of the death of young Edward King of Christ's College, whom he had left as one of the most popular of the fellows of the college, and one of the clerical hopes of the university. King had sailed from Chester for a vacation visit to his relatives in Ireland, when, on the 10th of August, the ship, in perfectly calm water, struck on a rock and went down, he and nearly all the other passengers going down with her. There is no mention of the sad accident in two otherwise very in- teresting Latin Familiar Epistles of Milton, of September 1637, both addressed to his medical friend Charles Diodati, and both dated from London ; but how deeply the death of King had affected him appears from his occupation shortly afterwards. In

November 1637, and probably at Horton, whence the plague had by that time vanished, he wrote his matchless pastoral monody of Lycidas. It was his con- tribution toa collection of obituary verses, Greek, Latin, and English, which King's numerous friends, at Cambridge and elsewhere, were getting up in lamentation for his sad fate. The collection did not appear till early in 1638, when it was published in two parts, with black-bordered title-pages, from the Cambridge University press, one consisting of twenty-three Latin and Greek pieces, the other of thirteen English pieces, the last of which was Milton's monody, signed only with his initials "J.M." It was therefore early in 1638, when Milton was in his thirtieth year, that copies of his Lycidas may have been in circulation among those who had already become acquainted with his Comus.

Milton was then on the wing for a foreign tour. He had long set his heart on a visit to Italy, and circum- stances now favoured his wish. The vexatious Cotton lawsuit, after hanging on for nearly two years, was at an end, as far as the elder Milton was concerned, with the most absolute and honourable vindication of his character for probity, though with some continuation of the case against his partner, Bower. Moreover, Milton's younger brother, Christopher, though but twenty-two years of age, and just about to be called to the bar of the Inner Temple, had married a wife; and the young couple had gone to reside at Horton to keep the old man company. There being nothing then to detain Milton, all was arranged Before the end of April 1638 he was on his way across the Channel, taking one English man-servant with him. At the time of his departure the last great news in England was that of the National Scottish Covenant, or solemn oath and band of all ranks

_and classes of the Scottish people to stand by each other

to the death in resisting the ecclesiastical innovations which Laud and Charles had been forcing upon Scotland. To Charles the news of this "damnable Covenant," as he called it, was enraging beyond measure; but to the mass of the English Puritans it was far from unwelcome, promising, as it seemed to do, for England herself, the subversion at last of that system of "Thorough," or despotic

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government by the king and his ministers without parlia- ments, under which the country had been groaning since the contemptuous dissolution of Charles's third parliament ten years before.

Through Paris, where Milton made but a short stay, receiving polite attention from the English ambassador, Lord Scudamore, and having the honour of an introduction to the famous Hugo Grotius, then ambassador for Sweden at the French court, he moved on rapidly to Italy, by way of Nice. After visiting Genoa, Leghorn, and Pisa, he arrived at Florence, August 1638. Enchanted by the city and its society, he remained there two months, frequenting the chief academies or literary clubs, and even taking part in their proceedings. Among the Florentines with whom he became intimate were Jacopo Gaddi, young Carlo Dati, Pietro Frescobaldi, Agostino Coltellini, the grammarian Benedetto Buommattei, Valerio Chimentelli, and Antonio Francini. It was in the neighbourhood of Florence also that he "found and visited" the great Galileo, then old and blind, and still nominally a prisoner to the Inquisition for his astrohomical heresy. From Florence, by Siena, Milton went to Rome. He reached the Eternal City some time in October, and spent about another two months there, not only going about among the ruins and antiquities and visiting the galleries, but mixing also, as he had done in Florence, with the learned society of the academies. Among those with whom he formed acquaintance in Rome were the German scholar, Lucas Holstenius, librarian of the Vatican, and three native Italian scholars, named Cherubini, Salzilli, and Selvaggi. There is record of his having dined once, in company with several other English- men, at the hospitable table of the English Jesuit College. The most picturesque incident, however, of his stay in Rome was his presence at a great musical entertainment in the palace of Cardinal Francesco Barberini. Here he had not only the honour of a specially kind reception by the cardinal himself, but also, it would appear, the supreme pleasure of listening to the marvellous Leonora Baroni, the most renowned singer of her age. Late in November he left Rome for Naples. Here also he was fortunate. The great man of the place was the now very aged Giovanni Battista Manso, marquis of Villa, the friend and biographer of the great Tasso, and subsequently the friend and patron of the sweet Marini. By a happy accident Milton obtained an introduction to Manso, and nothing could exceed the courtesy of the attentions paid by the aged marquis to the young English stranger. He had

*hardly been in Naples a month, however, when there came news from England which not only stopped an intention he had formed of extending his tour to Sicily and thence into Greece, but urged*his immediate return home. 'The sad news of civil war in England," he says, "called me back; for I considered it base that, while my fellow-countrymen were fighting at home for liberty, I should be travelling abroad for intellectual culture." In December 1638, therefore, he set his face northwards again. His return journey, however, probably because he learnt that the news he had first received was exaggerated or premature, was broken into stages. He spent a second two months in Rome, ascertained to have been January and February 1638-39 ; during which two months, as he tells us, he was in some danger from the papal police, because the English Jesuits in Rome had taken offence at lis habit of free speech, wherever he went, on the subject of religion. Though he did not alter his demeanour in the least in this particular, nothing happened ; and from Rome he got safely to Florence, welcomed. back heartily by his Florentine friends, and renewing his meetings with them privately and in their academies. His second visit to Florence, including an excursion to Lucca, extended. over*

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two months; and not till April 1639 did he take his

leave, and proceed, by Bologna and Ferrara, to Venice.

About a month was given to Venice; and thence, having

shipped for England the books he had collected in Italy,

he went on, by Verona and Milan, over the Alps, to

Geneva. In this Protestant city he spent a week or two

in June, forming interesting acquaintanceships there too,

and having daily conversations with the great Protestant theologian Dr Jean Diodati, the uncle of his friend

Charles Diodati. From Geneva he returned to Paris, and

so to England. He was home again in August 1639,

having been absent in all fifteen or sixteen months.

Milton's Continental tour, and especially the Italian portion of it, remained one of the chief pleasures of his memory through all his subsequent life. Nor was it quite without fruits of a literary kind. Besides two of his Latin Epistole Familiares, one to the Florentine grammarian Buommattei, and the other to Lucas Holstenius, there have to be assigned to Milton's sixteen months on the Continent his three Latin epigrams Ad Leonoram Rome Canentem, his Latin scazons Ad Salsillum Poetam Romanum Avgrotantem, lis fine and valuable poem in Latin hexameters entitled Jfansus, and his Five Italian Sonnets, with a Canzone, celebrating the charms of some Italian lady he had met in his travels.

One sad and marring memory did mingle itself with all that was otherwise so delightful in his Italian reminiscences. His bosom friend and companion from boyhood, the half- Italian Charles Diodati, who had been to him as Jonathan to David, and into whose ear he had hoped to pour the whole narrative of what he had seen and done abroad, had died during his absence. He had died, in Blackfriars, London, in August 1638, not four months after Milton had gone away on his tour. The intelligence had not reached Milton till some months afterwards, probably not till his second stay in Florence; and, though he must have learnt some of the particulars from the youth's uncle in Geneva, he did not know them fully till his return to England. How profoundly they affected him appears from his Epitaphium Damonis, then written in memory of his dead friend. The importance of this poem in Milton's biography cannot be overrated. It is perhaps the noblest of all his Latin poems; and, though in the form of a pastoral, and even of a pastoral of the most artificial sort, it is unmistakably an outburst of the most passionate personal grief. In this respect Lycidas, artistically perfect though that poem is, cannot be compared with it ; and it is only the fact that Lyctdas is in English, while the Lpitaphium Damonis is in Latin, that has led to the notion that Edward King of Christ's College was peculiarly and pre-eminently the friend of Milton in his youth and early manhood.

That Milton, now in his thirty-first year, had been gird- ing himself for some greater achievement in poetry than any he had yet attempted, Comus not excepted, we should have known otherwise. What we should not have known, but for an incidental passage in the Lpitaphium Damonss, is that, at the time of his return from Italy, he had chosen a subject for such a high literary effort of a new Miltonic sort. The passage is one in which, after referring to the hopes of Diodati's medical career as so suddenly cut short by his death, Milton speaks of himself as the survivor and of his own projects in fis profession of literature. In translation, it may run thus:—

'J have a theme of the Trojans cruising onr southern headlands Shaping to song, and the realm of Imogen, daughter of Pandras, Brennus and Arvirach, dukes, and Bren's bold brother, Belinus ; Then the Armorican settlers under the laws of the Britons,

Ay, and the womb of Igraine fatally pregnant with Arthur,

Uther's son, whom he got disguised in Gorlois' likeness, All by Merlin's craft. O then, if life shall be spared me,

Thon shalt be hung, my pipe, far off on some dying old pine-tree,

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Much-forgotten of me; or else your Latian musie

Changed for the British war-sereech! What then ? do all things,

One to hope all things, fits not ! Prize sufficiently ample

Mine, and distinction great (unheard-of ever thereafter

Though I should be and inglorious all through the world of the stranger), ;

If but the yellow-haired Ouse shall read me, the drinker of Alan,

Humber, which whirls as it flows, and Trent's whole valley of orchards,

Thames, my own Thames, above all, and Tamar's western waters,

Tawny with ores, and where the white waves swinge the far Orkneys."

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Interpreted prosaically, this means that Milton was meditating an epic of which King Arthur was to be the central figure, but which should include somehow the whole cycle of British and Arthurian legend, and that not only was this epic to be in English, but he had resolved that all his poetry for the future should be in the same tongue.

Not long after Milton's return the house at Horton ceased to be the family home. Christopher Milton and is wife went to reside at Reading, taking the old gentleman with them, while Milton himself preferred London. He had first taken lodgings in St Bride's Churchyard, at the foot of Fleet Street ; but, after a while, probably early in 1640, he removed to a "pretty garden house" of his own, at the end of an entry, in the part of Aldersgate Street which lies immediately on the city side of what is now Maidenhead Court. His sister, whose first husband had died in 1631, had married a Mr Thomas Agar, his successor in the Crown Office; and it was arranged that her two sons by her first husband should be educated by their uncle. John Phillips, the younger of them, only nine years old, had boarded with him in the St Bride's Churchyard lodgings ; and, after the removal to Aldersgate Street, the other brother, Edward Phillips, only a year older, became his boarder also. Gradually a few other boys, the sons of well-to-do personal friends, joined the two Phillipses, whether as boarders or for daily lessons, so that the house in Aldersgate Street became a small private school. The drudgery of teaching seems always to have been liked by Milton. What meanwhile of the great Arthurian epic? That project, we find, had been given up, and Milton's mind was roving among many other subjects, and balancing their capabilities. How he wavered between Biblical subjects and heroic subjects from British history, and how many of each kind suggested themselves to him, one learns from a list in his own handwriting among the Milton MSS. at Cambridge. It contains jottings of no fewer than fifty-three subjects from the Old Testament, eight from the Gospels, thirty-three from British and English history before the Conquest, and five from Scottish history. It is curious that all or most of them are headed or described as subjects for "tragedies," as if the epic form had now been abandoned for the dramatic.

It is more interesting still to observe which of the subjects fascinated Milton most. Though several of them are sketched pretty fully, not one is sketched at such length and so particularly as Paradise Lost. It is the first subject on the list, and there are four separate drafts of a possible tragedy under that title, two of them merely enumerating the dramatis persone, but the last two indicating the plot and the division into acts. Thus, in 1640, twenty-seven years before Paradise Lost was given to the world, he had put down the name on paper, and had committed himself to the theme.

To these poetic dreamings and schemings there was to be a long interruption. The Scottish National Covenant had led to extraordinary results. Not only were Charles

and Laud checkmated in their design of converting the | Edmund Calamy, Thomas Young,

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'n Scotland into a high Laudian prelacy; but, in a General Assembly held at Glasgow in the end of 1638, Episcopacy had been utterly abolished in Scotland, and the old Presbyterian system of Knox and Melville revived. To avenge this, and restore the Scottish bishops, Charles had marched to the Border with an English army ; but, met there by the Covenanting army under General Alexander Leslie, he had not deemed it prudent to risk a battle, and had yielded to a negotiation conceding to the Scots all their demands. This "First Bishops' War," as it came to be called, was begun and concluded while Milton was abroad. About the time of his return, how-ever, Charles had again broken with the Scots. Milton

-had been watching the course of affairs since then with

close and eager interest. He had seen and partaken in the sympathetic stir in favour of the Scots which ran through the popular and Puritan mind of England. He had welcomed the practical proof of this sympathy given in that English parliament of April 1640, called " The Short Parliament," which Charles, in his straits for supplies against the Scots, had reluctantly summoned at last, but was obliged to dismiss as unmanageable. Charles had, never- theless, with money raised someliow, entered on the "Second

Bishops' War." This time the result was momentous indeed. The Scots, not waiting to be attacked in their own country, took the aggressive, and invaded England. In August 1640, after one small engagement with a portion of Charles's army, they were in possession of Newcastle and of all the northern English counties. The English then had their opportunity. A treaty with the Scots was begun, which the English Puritans, who regarded their presence in England as the very blessing they had been praying for, were in no haste to finish ; and, on the 3d of November 1640, there met that parliament which was to be famous in English history, and in the history of the world, as 'The Long Parliament."

Of the first proceedings of this parliament, including the trial and execution of Strafford, the impeachment and imprisonment of Laud and others, and the break-down of the system of Thorough by miscellaneous reforms and by guarantees for parliamentary liberty, Milton was only a spectator. It was when the church question emerged distinctly as the question paramount, and there had arisen divisions on that question among those who had been practically unanimous in matters of civil reform, that he plunged in as an active adviser. There were three parties on the church question. There was a high-church party, contending for Episcopacy by divine right, and for the maintenance of English Episcopacy very much as it was ; there was a middle party, defending Episcopacy on grounds of usage and expediency, but desiring to see the powers of bishops greatly curtailed, and a limited Episcopacy, with councils of presbyters round each bishop, substituted for the existing high Episcopacy ; and there was the root-and- branch party, as it called itself, desiring the entire abolition of Episcopacy and the reconstruction of the English Church on something like the Scottish Presbyterian model. Since the opening of the parliament there had been a storm of pamphlets crossing one another in the air from these three parties. The chief manifesto of the high-church party was a pamphlet by Joseph Hall, bishop of Exeter, entitled Humble Remonstrance to the High Court of Parliament. In answer to Hall, and in representation of the views of the root-and-branch party, there had stepped forth, in March 1640-41, five leading Puritan parish ministers, the initials of whose names, clubbed together on the title-page of their joint production, made the uncouth word "Smectymnuus." These were Stephen Marshall, Matthew Newcomen, —

mild Episcopal system which King James had established | and William Spurstow. The Thomas Young whose name

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comes in the middle was no other than the Scottish Thomas Young who had been Milton's domestic preceptor in Bread Strect. Having returned from Hamburg in 1628, he had been appointed to the vicarage of Stowmarket in Suffolk, in which living he had remained ever since, with the reputation of being one of the most solid and learned Puritans among the English parish clergy. The famous Smectymnuan pamphlet in reply to Hall was mainly Young's. What is more interesting is that his old pupil Milton was secretly in partnership with him and his brother-Smectymnuans, Milton's hand is discernible in a portion of the original Smectymnuan pamphlet; and he continued to aid the Smectymnuans in their subsequent rejoinders to Hall's defences of himself. It was more in Milton's way, however, to appear in print independently ; and in May 1641, while the controversy between Hall and the Smectymnuans was going on, he put forth a pamphlet of his own. It was entitled Of Reformation touching Church Discipline in England and the Causes that have hitherto hindered it, and consisted of a review of English ecclesiastical history, with an appeal to his countrymen to resume that course of reformation which he considered to have been prematurely stopped in the preceding century, and to sweep away the last relics of papacy and prelacy. Among all the root-and-branch pamphlets of the time it stood out, and stands out still, as the most thorough-going and tremendous. It was followed by four others in rapid succession,—to wit, Of Prelatical Episcopacy and whether it may be deduced from the Apostolical Times (June 1641), Animadversions upon the Remonstrant's Defence against Smectymnuus (July 1641), The Reason of Church Govern- ment urged against Prelaty (February 1641-42), Apology against a Pamphlet called a Modest Confutation of the Animadversions, &c. (March 1641-42). The first of these was directed chiefly against that middle party which advocated a limited Episcopacy, with especial reply to the arguments of Archbishop Ussher, as the chief exponent of the views of that party. Two of the others, as the titles imply, belong to the Smectymnuan series, and were castigations of Bishop Hall. The greatest of the four, and the most important of all Milton's anti-Episcopal pamphlets after the first, is that entitled The Reason of

Church Government. It is there that Milton takes his readers into his confidence, speaking at length of himself and his motives in becoming a controversialist. Poetry, he declares, was his real vocation; it was with reluctance that he had resolved to "leave a calm and pleasing solitariness, fed with cheerful and confident thoughts, to embark in a troubled sea of noises and hoarse disputes"; but duty had left him no option. The great poem or poems he had been meditat- ing could wait; and meanwhile, though in prose-polemics he had the use only of his "left hand," that hand should be used with all its might in the cause of his country and of liberty.

The parliament had advanced in the root-and-branch direction so far as to have passed a bill for the exclusion of bishops from the House of Lords, and compelled the king's assent to that bill, when, in August 1642, the further struggle between Charles and his subjects took the form of civil war. All England was then divided into the Royalists, supporting the king, and the Parliamentarians, adhering to that majority of the Commons, with a minority of the Lords, which sat on as the parliament. While the first battles of the civil war were being fought with varying success, this parliament, less impeded than when it had been full, moved on more and more rapidly in the root-and-branch direction, till, by midsummer 1643, the abolition of Episcopacy had been decreed, and the question of the future non-prelatic constitution of the Church of England referred to a synod of divines, to meet

at Westminster under parliamentary authority. Of Milton's life through those first months of the civil war little is known. He remained in his housc in Aldersgate Street, teaching his nephews and other pupils; and the only scrap that came from his pen was the semi-jocose sonnet bearing the title When the Assault was intended to the City. In the summer of 1643, however, there was a great change in the Aldersgate Street household. About the end of May, as his nephew Edward Phillips remembered, Milton went away ona country journey, without saying whither or for what purpose; and, when he returned, about a month afterwards, it was with a young wife, and with some of her sisters and other relatives in her company. He had, in fact, been in the very headquarters of the king and the Royalist army in and round Oxford; and the bride he

-brought back with him was a Mary Powell, the eldest

daughter of Richard Powell, Esq., of Forest Hill, near Oxford. She was the third of a family of eleven sons and daughters, of good standing, but in rather embarrassed circumstances, and was seventeen years and four months old, while Milton was in his thirty-fifth year. However the marriage came about, it was a most unfortunate event. The Powell family were strongly Royalist, and the girl herself seems to have been frivolous, unsuitable, and stupid. Hardly were the honeymoon festivities over in Aldersgate Street when, her sisters and other relatives having returned to Forest Hill and left her alone with her husband, she pined for home again and begged to be allowed to go back on a visit. Milton consented, on the understanding that the visit was to be a brief one. This seems to have been in July 1643. Soon, however, the intimation from Forest Hill was that he need not look ever to have his wife in his house again. The resolution seems to have been mainly the girl's own, abetted by her mother; but, as the king's cause was then prospering in the field, it is a fair conjecture that the whole of the Powell family had repented of their sudden connexion with so prominent a Parliamentarian and assailant of the Church of England as Milton, While his wife was away, his old father, who had been residing for three years with his younger and lawyer son at Reading, caine to take up his quarters in Aldersgate Street.

Milton's conduct under the insult of his wife's desertion was most characteristic. Always fearless and speculative, he converted his own case into a public protest against the existing law and theory of marriage. The Doctrine and Discipline of Divorce Restored, to the good of both Seaes, was the title of a pamphlet put forth by him in August 1643, without his name, but with no effort at concealment, declar- ing the notion of a sacramental sanctity in the marriage relation to be a clerically invented superstition, and arguing that inherent incompatibility of character, or contrariety of mind, between two married persons, is a perfectly just reason for divorce. 'There was no reference to his own case, except by implication; but the boldness of the speculation roused attention and sent a shock through London. It was a time when the authors of heresies of this sort, or of any sort, ran considerable risks. The famous Westminster Assembly of Divines, called by the Long Parliament, had met on the appointed day, July 1, 1643;

the Scots, in consenting to send an army into England to assist the parliament in their war with the king, had proposed, as one of the conditions, their Solemn League and Covenant, binding the two nations to endeavour after a uniformity of religion and of ecclesiastical discipline, with the extirpation of all "heresy, schism, and profane- ness," as well as popery and prelacy; the Solemn League and Covenant had been enthusiastically accepted in England, and was being sworn to universally by the Parliamentarians ; and one immediate cffect was that four eminent Scottish

divines and two Scottish lay commissioners were added to the Westminster Assembly and became leaders there. Whether Milton's divorce tract was formally discussed in the Assembly during the first months of its sitting is unknown; but it is certain that the London clergy, including not a few members of the Assembly, were then talking about it privately with anger and execration. That there might be no obstacle to a more public prosecu- tion, Milton threw off the anonymous in a second and much enlarged edition of the tract, in February 1643-44, dedicated openly to the parliament and the Assembly. Then, for a month or two, during which the gossip about him and his monstrous doctrine was spreading more and more, he turned his attention to other subjects. Among the questions in agitation in the general ferment of opinion brought about by the civil war was that of a reform of the national system of education and especially of the universities. To this question Milton made a contribution in June 1644, ina small Zract on Education, in the form of a letter to Mr Samuel Hartlib, a German then resident in London and interesting himself busily in all philanthropic projects and schemes of social reform. In the very next month, however, July 1644, he returned to the divorce subject in a pamphlet addressed specially to the clergy and entitled The Judgment of Martin Bucer concerning Divorce. The outcry against him then reached its height. Te was attacked in pamphlets; he was denounced in pulpits all through London, and more than once in sermons before the two Houses of Parliament by prominent divines of the Westminster Assembly ; strenuous efforts were made to bring him within definite parliamentary ccnsure. In the cabal formed against him for this purpose a leading part was played, at the instigation of the clergy, by the Stationers' Company of London. That company, represent- ing the publishers and booksellers of London, had a plea of their own against him, on the ground that his doctrine was not only immoral, but had been put forth in an illegal manner. His first divorce treatise, though published imme- diately after the "Printing Ordinance" of the parliament of June 14, 1643, requiring all publications to be licensed for press by-one of the official censors, and to be registered in the books of the Stationers' Company, had been issued without licence and without registration. Complaint to this effect was made against Milton, with some

others hable to the same charge of contempt of the printing ordinance, in a petition of the Stationers to the House of Commons in August 1644; and the matter came before comnuittee both in that House and in the Lords. It is to this circumstance that the world owes the most popular and eloquent, if not the greatest, of all Milton's prose-writings, his famous Areopagitica, a Speech of Mr John Milton for the Liberty of Unlicensed Printing to the Parliament of England. It appeared in the end of November 1644, deliberately unlicensed and unregistered, as was proper on such an occasion, and was a remonstrance addressed to the parliament, as if in an oration to them face to face, against their ordinance of June 1643 and the whole system of licensing and censorship of the press. Nobly eulogistic of the parliament in other respects, it denounced their printing ordinance as utterly unworthy of them, and of the new era of English liberties which they were initiating, and called for its repeal. Though that effect did not follow, the pamphlet virtually accomplished its purpose. The licensing system had received its death- blow; and, though the Stationers returned to the charge in another complaint to the House of Lords, Milton's offence against the press ordinance was condoned. He was still assailed in pamphlets, and found himself 'in a world of disesteem " ; but he lived on through the winter of 1644-45 undisturbed in lis house in Aldersgate Street.

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period there belong, in the shape of verse, only his sonnets ix. and x., the first to some anonymous lady, and the second "to the Lady Margaret Ley," with perhaps the Greck lines entitled Philosophus ad Regem Quendam. His divorce speculation, however, still occupied him ; and in March 1644-45 he published simultaneously his Tetrachordon, or Expositions upon the four chief places of Scripture which treat of Marriage, and his Colasterion, a Reply to a nameless Answer against the Doctrine and Discipline of Divorce. In these he replied to his chief recent assailants, lay and clerical, with merciless severity. It was not merely Milton's intellectual eminence that had saved him from prosecution for his divorce heresy. A new tendency of national opinion on the church question had operated in his favour, and in favour of all forms of free speculation. There had occurred in the

Westminster Assembly itself, and more largely throughout the general community, that split of English Puritanism into the two opposed varieties of Presbyterianism on the one hand and Independency or Congregationalism on the other which explains the whole subsequent history of the Puritan revo- lution. Out of this theoretical discussion as to the con- stitution of the church there had grown the all-important practical question of toleration. The Presbyterians insisted that the whole population of England should necessarily belong to the one national Presbyterian Church, be coni- pelled to attend its worship, and be subject to its discipline, while the Independents demanded that, if a Presbyterian Church should be set up as the national and state-paid church, there should at least be liberty of dissent from it, and toleration for those that chose to form themselves into separate congregations. Vehement within the West- minster Assembly itself, the controversy had attained wider dimensions out of doors, and had inwrought itself 'na most remarkable manner with the conduct of the war. Orthodox Presbyterian Calvinists were still the majority of the Puritan body ; but, in the new atmosphere of liberty, there had sprung up, from secret and long-suppressed seeds in the English mind, a wonderful variety of sects and denominations, mingling other elements with their Calvinism, or hardly Calvinistic at all,—most of them, it is true, fervidly Biblical and Christian after their different sorts, but not a few professing the most coolly inquisitive and sceptical spirit, and pushing their speculations to strange extremes of free-thinking. These sects, growing more and more numerous in the large towns, had become especially powerful in the English Parliamentary army. That army had, in fact, become a marching academy of advanced opinionists and theological debaters. Now, as all the new Puritan sects, differimg however much among themselves, saw their existence and the perpetuity of their tenets threatened by that system of ecclesiastical uniformity which the Presbyterians proposed to establish, they had, one and all, abjured Presbyterianism, and adopted the opposite principle of Independency, with its appended principle of toleration. Hence an extraordinary conflict of policies aniong those who seemed to be all Parliamen- tarians, all united in fighting against the king. The auxiliary Scottish army, which had come into England in January 1643-44, and had helped the English generals to beat the king in the great battle of Marston Moor in July 1644, thought that he had then been almost sufficiently beaten, and that the object of the Solemn League and Covenant

would be best attained by bringing him to such terms as should secure an immediate Presbyterian settle- ment and the suppression of the Independents and sectaries. In this the chief English commanders, such as Essex and Manchester, agreed substantially with the Scots. Cromwell, on the other hand, who was now the recognized head of the army Independents, did not think that the king had

been sufficiently beaten, even for the general purposes of the war, and was resolved that the war should be pushed on to a point at which a Presbyterian settlement should be impossible without guarantees for liberty of conscience and a toleration of non-Presbyterian sects. Through the latter part of 1644, accordingly, Milton had been saved from the penalties which his Presbyterian opponents would have inflicted on him by this general championship of liberty of opinion by Cromwell and the army Independents. Before the middle of 1645 he, with others who were on the black books of the Presbyterians as heretics, was safer still, 'Though the parliament had voted, in January 1644-45, that the future national church of England should be on the Presbyterian system, Cromwell and the Inde- pendents had taken care to have the question of tolera- tion left open; and, within the next month or two, by Cromwell's exertions, a completely new face was put upon the war by the removal of all the chief officers that had been in command hitherto, and the equipment of the New Model army, with Fairfax as its commander-in-chief and Cromwell himself as lieutenant-general. The Scots and the stricter English Presbyterians looked on malignantly while this army took the field, calling it an " Army of Sectaries," and almost hoping it would be beaten. On June 14, 1645, however, there was fought the great battle of Naseby, utterly ruining the king at last, and leaving only relics of his forces here and there. Milton's position then may be easily understood. Though his first tendency on the church question had been to some form of a Presbyterian constitution for the church, he had parted utterly now from the Scots and Presbyterians, and become a partisan of Independency, having no dread of "sects and schisms," but regarding them rather as healthy signs in the English body-politic. He was, indeed, himself one of the most noted sectaries of the time, for in the lists of sects drawn out by contemporary Presbyterian writers

special mention is made of one small sect who were known as Miltonists or Dworcers.

So far as Milton was concerned personally, his interest in the divorce speculation came to an end in July or August 1645, when, by friendly interference, a reconcilia- tion was effected between him and his wife. The ruin of the king's cause at Naseby had suggested to the Powells that it might be as well for their daughter to go back to her husband after their two years of separation. It was not, however, in the house in Aldersgate Street that she rejoined him, but in a larger house, which he had taken in the adjacent street called Barbican, for the accommodation of an increasing number of pupils.

The house in Barbican was tenanted by Milton from about August 1645 to September or October 1647. Among his first occupations there must have been the revision of the proof sheets of the first edition of his collected poems. It appeared as a tiny volume, copies of which are now very rare, with the title Poems of Mr John Milton, both English and Latin, composed at several times. The title-page gives the date 1645, but January 1645-46 seenis to have been the exact month of the publication. The appearance of the volume indicates that Milton may have been a little tired by this time of his notoriety as a prose-polemic, and desirous of being recognized once more in his original character of literary man and poet, But, whether because his pedagogic duties now engrossed him or for other reasons, very few new pieces were added in the Barbican to those that the little volume had thus made public. In English, there were only the four sonnets now numbered xi.—xiv., the first two entitled "'On the Detraction which followed upon my writing certain Treatises," the third "To Mr Henry Lawes on his Airs," and the fourth "To the Religious Memory of Mrs Catherine Thomson," together with the

powerful anti-Presbyterian invective or "tailed sonnet" entitled "On the New Forcers of Conscience under the Long Parliament"; and in Latin there were only the ode Ad Joannem fousium, the trifle called Apologus de Rustico et Hero, and one interesting Familiar Epistle addressed to his Florentine friend Carlo Dati. Some family incidents of importance,

however, appertain to this time of residence in Barbican. Oxford having surrendered to Fairfax in June 1646, the whole of the Powell family had to seek refuge in London, and most of them found shelter in Milton's house. His first child, a daughter named Anne, was born there on the 29th of July that year; on the Ist of January 1646-47 his father-in-law Mr Powell died there, leaving his affairs in confusion ; and in the following March his own father died there, at the age of eighty-four, and was buried in the adjacent church of St Giles, Cripplegate. For the rest, the two yearsin Barbican are nearly blank in Milton's biography. The great Revolution was still running its course. For a time Charles's surrender of himself, in May 1646, to the auxiliary Scottish army rather than to Fairfax and Cromwell, and his residence with that Scottish army at Newcastle in negotiation with the Scots, had given the Presbyterians the advantage ; but, after the Scots had evacuated England in January 1646-47, leaving Charles a captive with his English subjects, and especially after the English army had seized him at Holmby in June 1647 and undertaken the further management of the treaty with him, the advantage was all the other way. It was a satisfaction to Milton, and perhaps still a protection for him, that the ' Army of Independents and Sectaries" had come to be really the masters of England,

From Barbican Milton removed, in September or October 1647, to a smaller house in that part of High Holborn which adjoins Lincoln's Inn Fields. His Powell relatives had now left him, and he had reduced the number of his pupils, or perhaps kept only his twe nephews. But, though thus more at leisure, he did not yet resume his projected poem, but occupied himself rather with three works of scholarly labour which he had already for some time had on hand. One was the com- pilation in English of a complete history of England, or rather of Great Britain, from the earliest times; another was the preparation in Latin of a complete system of divinity, drawn directly from the Bible ; and the third was the collection of materials for a new Latin dictionary. Milton had always a fondness for such labours of scholar- ship and compilation. Of a poetical kind there is nothing to record, during his residence in High Holborn, but an experiment in psalm-translation, in the shape of Psalms Ixxx.-Ixxxviil. done into service-metre in April 1648, and the Sonnet to Fairfax, written in September of the same year.—This last connects him again with the course of public affairs. The king, having escaped from the custody of the army chiefs, and taken refuge

in the Isle of Wight, had been committed to closer custody there ; all negotia- tion between him and parliament had been declared at an end; and the result would probably have been his deposi- tion, but for the Consequences of a secret treaty he had contrived to make with the Scots. By this treaty the Scots engaged to invade England in the king's behalf, rescue him from the English parliament and army, and restore him to his full royalty, while he engaged in return to ratify the Covenant, the Presbyterian system of church government, and all the other conclusions of the West- minster Assembly, throughout England, and to put down Independency and the sects. Thus, in May 1648, began what is called the Second Civil War, consisting first of new risings of the Royalists in various parts of England, and then of a conjunction of these with a great invasion

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of England by a Royalist Scottish army, under the command of the duke of Hamilton. It was all over in August 1648, when the crushing defeat of the Scottish army by Cromwell in the three days' battle of Preston, and the simultaneous suppression of the English Royalist insur- rection in the south-east counties by Fairfax's siege and capture of Colchester, left Charles at the mercy of the victors.—Milton's Sonnet to Fairfax was a congratulation to that general-in-chief of the parliament on his success at Colchester, and attested the exultation of the writer over the triumph of the Parlamentary cause. His exultation continued through what followed. After one more dying effort of the parliament at negotiation with Charles, the army took the whole business on itself. The king was prought from the Isle of Wight ; the parliament, manipu- lated by the army officers, and purged of all members likely to impede the army's purpose, was converted into an instrument for that purpose; a court of high justice was set up for the trial of Charles; and on January 30, 1648-49, he was brought to the scaffold in front of Whitehall. By that act England became a republic, governed, without King or House of Lords, by the persever- ing residue or "Rump" of the recent House of Commons, in conjunction with an executive council of state, composed of forty-one members appointed annually by that House.

The first Englishman of mark out of parliament to attach himself openly to the new republic was John Milton, This he did by the publication of his

pamphlet entitled Tenure of Kings and Magistrates, proving that ut 1s lawful, and hath been held so in all ages, for any who have the power, to call to account a Tyrant or wicked King, and, after due conviction, to depose and put him to death, vf the ordinary Magistrate have neglected to do it. It was out within a fortnight after the king's death, and was Milton's last performance in the house in High Holborn. The chiefs of the new republic could not but perceive the importance of securing the services of a man who had so opportunely and so powerfully spoken out in favour of their tremendous act, and who was otherwise so distinguished. In March 1648-49, accordingly, Milton was offered, and accepted, the secretaryship for foreign tongues to the council of state of the new Commonwealth. The salary was to be £288 a year, worth about £1000 a year now. To be near his new duties in attendance on the council, which held its daily sittings for the first few weeks in Derby House, close to Whitehall, but afterwards regularly in Whitehall itself, he removed at once to temporary lodgings at Charing Cross. In the very first meetings of council which Milton attended he must have made personal acquaintance with President Bradshaw, Fairfax, Cromwell himself, Sir Henry Vane, Whitlocke, Henry Marten, Hasilrig, Sir Gilbert Pickering, and the other chiefs of the council and the Commonwealth, if indeed he had not known some of them before. After a little while, for his greater convenience, official apartments were assigned him in Whitehall itself.

At the date of Milton's appointment to the secretaryship he was forty years of age. His special duty was the drafting of such letters as were sent by the council of state, or sometimes by the Rump Parliament, to foreign states and princes, with the examination and translation of letters in reply, and with personal conferences, when necessary, with the agents of foreign powers in London, and with envoys and ambassadors. As Latin was the language employed in the written diplomatic documents, his post came to be known indifferently as the secretaryship for foreign tongues or the Latin secrctaryship. In that post, however, his duties, more particularly at first, were very light in comparison with those of his official colleague, Mr Walter Frost, the general secretary. Foreign powers held aloof from the English republic as much as they could ;

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and, while Mr Frost had to be present in every meeting of the council, keeping the minutes, and conducting all the gencral correspondence, Milton's presence was required only when some piece of foreign business did turn up. Hence, from the first, his employment in very miscel- lancous work. Especially, the council looked to him for everything in the nature of literary vigilance and literary help in the interests of the struggling Commonwealth. He was employed in the examination of suspected papers, and in interviews with their authors and printers; and he executed several great literary commissions expressly entrusted to him by the council. The first of these was his pamphlet entitled Observations on Ormond's Articles of Peace with the Irish Rebels. It was published in May 1649, and was in defence of the republic against a complication of Royalist intrigues and dangers in Ireland. A passage of remarkable interest in it is one of eloquent eulogy on Cromwell. More important still was the Eikonoklastes (which may be translated " Image-Smasher "), published by Milton in October 1649, by way of counterblast. to the famous ikon Basilike ("Royal Image"), which had been in circulation in thousands of copies since the king's death, and had become a kind of Bible in all Royalist households, on the supposition that it had been written by the royal martyr himself. A third piece of work was of a more laborious nature. In the end of 1649 there appeared abroad, under the title of Defensio Regia pro Carolo I., a Latin vindication of the memory of Charles, with an attack on the English Com- monwealth, intended for circulation on the Continent. 'As it had been written, at the instance of the exiled royal family, by Salmasius, or Claude de Saumaise, of Leyden, then of enormous celebrity over Europe as the greatest scholar of his age, it was regarded as a serious blow to the infant Commonwealth. To answer it was thought a task worthy of Milton, and he threw his whole strength into the performance through the year 1650, interrupting himself only by a new and enlarged edition of his Likonoklastes. Not till April 1651 did the result appear ; but then the suc- cess was prodigious. Milton's Latin Pro Populo Anglicans Defensio, as it was called, ran at once over the British Islands and the Continent, rousing acclamation everywhere, and received by scholars as an annihilation of the great Salmasius. Through the rest of 1651 the observation was that the two agencies which had co-operated most visibly in raising the reputation of the Commonwealth abroad were Milton's books and Cromwell's battles.—These battles of Cromwell, in the service of the Commonwealth he had founded,

had kept him absent from the council of state, of which he was still a member, since shortly after the beginning of Milton's secretaryship. or nearly a year he had been in Ireland, as lord lieutenant, reconquering that country after its long rebellion; and then, for another year, he had been in Scotland, crushing the Royalist commotion there round Charles IJ., and annexing Scotland to the English republic. The annexation was complete on the 3d of September 1651, when Cromwell, chasing Charles II. and his army out of Scotland, came up with them at Worcester and gained his crowning victory. The Commonwealth then consisted of England, Ireland, and Scotland, and Cromwell was its supreme chief—Through the eventful year 1651, it has been recently ascertained, Milton had added to the other duties of his secretaryship that of Government journalist. Through the whole of that year, if not from an earlier period, he acted as licenser and superintending editor of the Mercwrius Politicus, a news- paper issued twice a week, of which Mr Marchamont Needham was the working editor and proprietor. Milton's hand is discernible in some of the leading articles.

About the end of 1651 Milton left his official rooms in

Whitehall for a house he had taken on the edge of St James's Park, in what was then called Petty France, Westnuinster, but is now York Street. The house existed till the other day, but has been pulled down. In Milton's time it was a villa-looking residence, with a garden, in a neighbourhood of villas and gardens, He had now more to do in the special work of his office, in consequence of the increase of correspondence with foreign powers. But he had for some time been in ailing health; and a dimness of eyesight which had been growing upon him gradually for ten years had been settling rapidly, since his Jabour over the answer to Salmasius, into total blindness. Actually, before or about May 1652, when he was but in his forty-fourth year, his blindness was total, and he could go about only with some one to lead him. Hence a re- arrangement of his secretarial duties. Such of these duties as he could perform at home, or by occasional visits to the Council Office near, he continued to perform ; but much of the routine work was done for him by assistants, one of them a well-known German named Weckherlin, under the superintendence of Mr John Thurloe, who had

succeeded Mr Walter Frost in the general secretaryship. Precisely to this time of a lull in Milton's secretaryship on account of his ill-health and blindness we have to refer his two great companion sonnets Zo the Lord General Cromwell and Zo Sir Henry Vane the Younger. To about the same time, or more precisely to the interval between May and September 1652, though the exact date is uncertain, we have to refer the death of his only son, who had been born in his official Whitehall apartments in the March of the preceding year, and the death also of his wife, just after she had given birth to his third daughter, Deborah. With the three children thus left him,—Anne, but six years old, Mary, not four, and the infant Deborah,—the blind widower lived on in his house in Petty France in such desolation as can be imagined. He had recovered suffici- ently to resume his secretarial duties; and the total num- ber of his dictated state letters for the single year 1652 is equal to that of all the state letters of his preceding term of secretaryship put together. To the same year there belong also three of his Latin Yamiliar Epistles. In December 1652 there was published Joannis Philippr Angli Responsio ad Apologiam Anonymt Cujusdam Tene- brionis, being a reply by Milton's younger nephew, John Phillips, but touched up by Milton himself, to one of several pamphlets that had appeared against Milton for his slaughter of Salmasius. The ablest and most scurrilous of these, which had just appeared anonymously at the Hague, with the title Regi Sanguinis Clamor ad Colum adversus Parricidas Anglicanos ("Cry of the Royal Blood to Heaven against the English Parricides"), Milton was reserving for his own attention at his leisure.

On the 20th of April 1653 there was Cromwell's great act of armed interference by which he turned out the small remnant of the Rump Parliament, dismissed their council of state, and assumed the government of England, Ireland, and Scotland into his own hands. For several months, indeed, he acted only as interim dictator, governing by a council of his officers, and waiting for the conclusions of that select body of advisers which he had called together from all parts of the country, and which the Royalists nicknamed "The Barebones Parliament." In December 1653, however, his formal sovereignty began under the name of the Protectorate, passing gradually into more than kingship. This change from government by the Rump and its council. to government by a single military Lord Protector and his council was regarded by many as treason to the

republican cause, and divided those who had hitherto been the united Commonwealth's men into the " Pure Re- publicans," represented by such men as Bradshaw and Vane,

and the " Oliverians," adhering to the Protector. Milton, whose boundless admiration of Cromwell had shown itself already in his Irish tract of 1649 and in his recent sonnet, was recognized as one of the Oliverians. He remained in Oliver's service and was his Latin secretary through the whole of the Protectorate. For a while, indeed, his Latin letters to foreign states in Cromwell's name were but few,— Mr Thurloe, as general secretary, officiating as Oliver's right-hand man in everything, with a Mr Philip Meadows under him, at a salary of £200 a year, as deputy for the blind Mr Milton in foreign correspondence and translations. The reason for this temporary exemption of Milton from routine duty may have been that he was then engaged on an answer, by commission from the late Government, to the already-mentioned pamphlet from the Hague entitled Regit Sanguinis Clamor. Salmasius was now dead, and the Commonwealth was too stable to suffer from such attacks ; but no Royalist pamphlet had appeared so able or so venomous as this in continuation of the Salmasian controversy. All the rather because it was in the main a libel on Milton himself did a reply from his pen seem necessary, It came out in May 1654, with the title Joannis Miltont Angli pro Populo Anglicano Defensio Secunda ("Second Defence of John Milton, Englishman, for the People of England"). It is one of the most inter- esting of all Milton's writings. The author of the libel to which it replied was Dr Peter du Moulin the younger, a naturalized French Presbyterian minister, then moving about in English society, close to Milton ; but, as that was a profound secret, and the work was universally attributed on the Continent to an Alexander Morus, a French minister of Scottish descent, then of much oratorical celebrity in Holland,—who had certainly managed the printing in consultation with the now deceased Salmasius, and had contributed some portion of the matter,—Milton had made this Morus the responsible person and the one object of his castigations. They were frightful enough. If Salmasius had been slaughtered in the former Defensio, Morus was murdered and gashed in this. His moral character was blasted by exposure of his antecedents, and he was blazoned abroad in Europe as a

detected clerical blackguard. The terrific castigation of Morus, however, is but part of the Defensio Secunda. It contains passages of singular autobiographical and historical value, and includes laudatory sketches of such eminent Common- wealth's men as Bradshaw, Fairfax, Fleetwood, Lambert, and Overton, together with a long panegyric on Cromwell himself and his career, which remains to this day unap- proached for elaboration and grandeur by any estimate of Cromwell from any later pen. From about the date of the publication of the Defensio Secunda to the beginning of 1655 the only specially literary relics of Milton's life are his translations of Psalms i.—viii. in different metres, done in August 1654, his translation of Horace's Ode i. 5, done probably about the same time, and two of his Latin Familiar Epistles. The most active time of his secretary- ship for Oliver was from April 1655 onwards. In that month, in the course of a general revision of official salaries under the Protectorate, Milton's salary of £288 a year hitherto was reduced to £200 a year, with a kind of re- definition of his office, recognizing it, we may say, as a Latin secretaryship extraordinary. Mr Philip Meadows was to continue to do all the ordinary Foreign Office work, under Thurloe's inspection; but Milton was to be called in on special occasions. Hardly was the arrangement made when a, signal occasion did occur. In May 1655 all England was horrified by the news of the massacre of the Vaudois Protestants by the troops of Emanuele IL., duke of Savoy and prince of Piedmont, in consequence of their disobedience to an edict requiring them either to leave

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their native valleys or to conform to the Catholic religion. Cromwell and his council took the matter up with all their energy ; and the burst of indignant letters on the subject despatched in that month and the next to the duke of Savoy himself, Louis XIV. of France, Cardinal Mazarin, the Swiss cantons, the States-General of the United Provinces, and the kings of Sweden and Denmark, were all by Milton. His famous sonnet On the late Massacre in Piedmont was his more private expression of feeling on the same occasion. This sonnet was in circulation, and the case of the Vaudois Protestants was still occupying Cromwell, when, in August 1655, there appeared the last of Milton's great Latin pamphlets. It was his Pro Se Defensio, in answer to an elaborate self-defence which Morus had put forth on the Continent since

Milton's attack on his character, and it con- sisted mainly of a re-exposure of that unfortunate clergy- man. 'Thence, through the rest of Cromwell's Protectorate, Milton's life was of comparatively calm tenor. He was in much better health than usual, bearing his blindness with courage and cheerfulness ; he was steadily busy with such more important despatches to foreign powers as the Pro- tector, then in the height of his great foreign policy, and regarded with fear and deference by all European monarchs and states from Gibraltar to the Baltic, chose to confide to him ; and his house in Petty France seems to have been, more than at any previous time since the beginning of his blindness, a meeting-place for friends and visitors, and a scene of pleasant hospitalities. The four sonnets now numbered xix.—xxii., one of them to young Mr Lawrence, the son of the president of Cromwell's council, and two of the others to Cyriack Skinner, belong to this time of domestic

quiet, as do also no fewer than ten of his Latin Familiar |

Epistles. His second marriage belongs to the same years, and gleams even yet as the too brief consummation of this happiest time in the blind man's life. The name of his second wife was Katharine Woodcock. He married her on the 12th of November 1656; but, after only fifteen months, he was again a widower, by her death in childbirth in February 1657-58. The child dying with her, only the three daughters by the first marriage remained. The touching sonnet which closes the series of Milton's Sonnets is his sacred tribute to the memory on his second marriage and to the virtues of the wife he had so soon lost. Even after that loss we find him still busy for Cromwell. Mr Meadows having been sent off on diplomatic missions, Andrew Marvell had, in September 1657, been brought in, much to Milton's satisfaction, as his assistant or colleague in the Latin secretaryship; but this had by no means relieved him from duty. Some of his greatest despatches for Cromwell, including letters, of the highest importance, to Louis XIV., Mazarin, and Charles Gustavus of Sweden, belong to the year 1658.

One would like to know precisely in what personal relations Milton and Cromwell stood to each other. There is, unfortunately, no direct record to show what Cromwell thought of Milton; but there is ample record of what Milton thought of Cromwell. 'Our chief of men," he had called Cromwell in

his sonnet of May 1652; and the opinion remained unchanged. He thought Cromwell the greatest and best man of his generation, or of many generations ; and he regarded Cromwell's assumption of the supreme power, and his retention of that power with a sovereign title, as no real suppression of the republic, but as absolutely necessary for the preservation of the republic, and for the safeguard of the British Islands against a return of the Stuarts. Nevertheless, under this prodigious admiration of Cromwell, there were political doubts and reserves. Milton was so much of a modern radical of the extreme school in his own political views and sympathies that he cannot but have been vexed by the growing con-

servatism of Cromwell's policy through his Protectorate. To his grand panegyric on Oliver in the Defensio Secunda of 1654 he had ventured to append cautions against self-will, over-legislation, and over-policing ; and he cannot have thought that Oliver had been immaculate in these respects through the four subsequent years. The attempt to revive an aristocracy and a House of Lords, on which Cromwell was latterly bent, cannot have been to Milton's taste. Above all, Milton dissented in toto from Cromwell's church policy. It was Milton's fixed idea, almost his deepest idea, that there should be no such thing as an Established Church, or state-paid clergy, of any sort or denomination or mixture of denominations, in any nation, and that, as it had been the connexion between church and state, begun by Constantine, that had vitiated Christianity in the world, and kept it vitiated, so Christianity would never flourish as it ought till there had been universal disestablishment and disendowment of the clergy, and the propagation of the gospel were left to the zeal of voluntary pastors, self-sup- ported, or supported modestly by their flocks. He had at one time looked to Cromwell as the likeliest man to carry this great revolution in England. But Cromwell, after much meditation on the subject in 1652 and 1653, had come to the opposite conclusion. The conservation of the Established Church of England, in the form of a broad union of all evangelical denominations of Christians, whether Presbyterians, or Independents, or Baptists, or moderate Old Anglicans, that would accept state-pay with state- control, had been the fundamental notion of his Protec- torate, persevered in to the end. This must have been Milton's deepest disappointment with the Oliverian rule. Cromwell's death on the 3d of September 1658 left the Protectorship to his son Richard. Milton and Marvell continued in their

posts, and a number of the Foreign Office letters of the new Protectorate were of Milton's composition. Thinking the time fit, he also put forth, in October 1658, a new edition of his Defensio Prima, and, early in 1659, a new English pamphlet, entitled Treatise of Civil Power in Ecclesiastical Causes, ventilating those notions of his as to the separation of church and state which he had been obliged of late to keep to himself. To Richard's Protectorate also belongs one of Milton's Latin Familiar Epistles. Meanwhile, though all had seemed quiet round Richard at first, the jealousies of the army officers left about him by Oliver, and the conflict of political elements let loose by Oliver's death, were preparing his downfall. In May 1659 Richard's Protectorate was at an end. The country had returned with pleasure to what was called "the good old cause" of pure republicanism ; and the government was in the hands of "the Restored Rump," consisting of the reassembled remains of that Rump Parlia- ment which Cromwell had dissolved in 1653. To this change, as inevitable in the circumstances, or even promis- ing, Milton adjusted himself. The last of his known official performances in his Latin secretaryship are two letters in the name of William Lenthall, as the speaker of the restored Rump, one to the king of Sweden and one to the king of Denmark, both dated May 15, 1659. Under the restored Rump, if ever, he seemed to have a chance for his notion of church-disestablishment ; and, accordingly, in August 1659, he put forth, with a prefatory address to that body, a large pamphlet entitled Considerations touching the likeliest means to remove Hirelings. out of the Church. The restored Rump had no time to attend to such matters. They were in struggle for their own existence with the army chiefs; and the British Islands were in that state of hopeless confusion and anarchy which, after passing through a brief phase of attempted military government (October to December 1659), and a second revival of the purely republican or Rump government (December 1659 to

February 1659-60), issued in Monk's march from Scotland, assumption of the dictatorship in London, and recall of all the survivors of the original Long Parliament to enlarge the Rump to due dimensions and assist him in

further delibera- tions. Through all this anarchy the Royalist elements had been mustering themselves, and the drift tothe restoration of the Stuart dynasty, as the only possible or feasible con- clusion, had become apparent. To prevent that issue, to argue against it and fight against it to the last, was the work to which Milton had then set himself. His dis- establishment notion and all his other notions had been thrown aside ; the preservation of the republic in any form, and by any compromise of differences within itself, had become his one thought, and the study of practical means to this end his most anxious occupation. In a Letter toa Friend concerning the Ruptures of the Commonwealth, written in October 1659, he had propounded a scheme of a kind of dual government for reconciling the army chiefs with the Rump ; through the following winter, marked only by two of his Latin Familiar Epistles, his anxiety over the signs of the growing enthusiasm throughout the country for the recall of Charles IJ. had risen to a kind of agony ; and early in March 1659-60 his agony found vent in a pamphlet of the most passionate vehemence entitled The Ready and Easy Way to Establish a Free Commonwealth, and the Excellence thereof compared with the Inconventences and Dangers of readmitting Kingship in this Nation. An abridgment of the practical substance of this pamphlet was addressed by him to General Monk in a letter entitled Zhe Present Means and Brief Delineation of a Free Common- wealth. Milton's proposal was that the central governing apparatus of the British Islands for the future should con- sist of one indissoluble Grand Council or parliament, which should include all the political chiefs, while there should bea large number of provincial councils or assemblies sitting in the great towns for the management of local and county affairs. The scheme, so far as the public attended to it at all, was received with laughter; the Royalist demonstrations were now fervid and tumultuous; and it remained only for the new and full parliament of two Houses which had been sum- moned under Monk's auspices, and which is now known as the Convention Parliament, to give effect to Monk's secret determination and the universal popular desire. Not even then would Milton be silent. In Brief Notes on a late Sermon, published in April 1660, in reply to a Royalist dis- course by a Dr Griffith, he made another protest against the recall of the Stuarts, even hinting that it would be better that Monk should become king himself; and in the same month he sent forth a second edition of his Ready and Easy Way, more frantically earnest than even the first, and containing additional

passages of the most violent denunciation of the royal family, and of prophecy of the degradation and disaster they would bring back with them. This was the dying effort. On the 25th of April the Con- vention Parliament met; on the Ist of May they resolved unanimously that the government by King, Lords, and Com- mons should be restored ; and on the 29th of May Charles IL made his triumphal entry into London. The chief republicans had by that time scattered themselves, and Milton was in hiding in an obscure part of the city.

How Milton escaped the scaffold at the Restoration is a mystery now, and was a mystery at the time. Actually, in the terrible course through the two Houses of the Con- vention Parliament of that Bill of Indemnity by which the fates of the surviving regicides and of so many others of the chief republican culprits were determined, Milton was named for special punishment. It was voted by the Commons that he should be taken into custody by the sergeant-at-arms, for prosecution by the attorney- general on account of his Zzkonoklastes and Defensio

Bist) Prima, and that all copies of those books should be called in and burnt by the hangman. There was, however, some powerful combination of friendly influences in his favour, with Monk probably abetting. At all events, on the 29th of August 1660, when the Indemnity Bill did come out complete, with the king's assent, granting full pardon to all for their past offences,. with the exception of about a hundred persons named in the bill itself for various degrees of punishment, thirty-four of them for death and twenty- six for the highest penalty short of death, Milton did not appear as one of the exceptions on any ground or in any of the grades. From that moment, therefore, he could emerge from his hiding, and go about as a free man. Not that he was yet absolutely safe. During the next two or three months London was in excitement over the trials of such of the excepted regicides and others as had not succeeded in escaping abroad, and the hangings and quarterings of ten of them; there were several public burnings by the hangman at the same time of Milton's condemned pamphlets; and the appearance of the blind man himself in the streets, though he was legally free, would have caused him to be mobbed and assaulted. Nay, notwithstanding the Indemnity Bill, he was in some legal danger to as late as December 1660. Though the special prosecution ordered against him by

the Commons had been quashed by the subsequent Indemnity Bill, the sergeant-at- arms had taken him into custody. Entries in the Com- mons journals of December 17 and 19 show that Milton complained of the sergeant-at-arms for demanding exorbi- tant fees for his release, and that the House arranged the matter.

Milton did not return to Petty France. For the first months after he was free he lived as closely as possible in a house near what is now Red Lion Square, Holborn. Thence he removed, apparently early in 1661, to a house in Jewin Street, in his old Aldersgate-Street and Barbican neighbourhood,

In Jewin Street Milton remained for two or three years, or from 1661 to 1664. They were the time of his deepest degradation, that time of which he speaks when he tells us how, by the Divine help, he had been able to persevere undauntedly—

*'*thouch fallen on evil days, On evil days though fallen, and evil tongues,*

In darkness, and with dangers compassed round, And solitude."

The "evil days" were those of the Restoration in its first or Clarendonian stage, with its revenges and reactions, its return to high Episcopacy and suppression of every form of dissent and sectarianism, its new and shamcless royal court, its open proclamation and practice of anti-Puritanism in morals and in literature no less than in politics. For the main part of this world of the Restora- tion Milton was now nothing more than an infamous outcast, the detestable blind republican and regicide who had, by too great clemency, been left unhanged. The friends that adhered to him still, and came to see him in Jewin Street, were few in number, and chiefly from the ranks of those nonconforming denominations, Independ- ents, Baptists, or Quakers, who were themselves undcr similar obloquy. Besides his two nephews, the faithful Andrew Marvell, Cyriack Skinner, and some others of his former admirers, English or foreign, we hear chiefly of a Dr Nathan Paget, who was a physician in the Jewin- Street neighbourhood, and of several young men who would drop in upon him by turns, partly to act as his amanuenscs, and partly for the benefit of lessons from him,—one of them an interesting Quaker youth, named Thomas Ellwood. With all this

genuine attachment to him of a select few, Milton could truly enough describe his condition after

the Restoration as one of "solitude." Nor was this the worst. His three daughters, on whom he ought now to have been able principally to depend, were his most serious domestic trouble. The poor motherless girls, the eldest in her seventeenth year in 1662, the second in her fifteenth, and the youngest in her eleventh, had grown up, in their father's blindness and too great self-absorption, ill-looked- after and but poorly educated; and the result now appeared, They "made nothing of neglecting him # s they rebelled against the drudgery of reading to him or other- wise attending on him; they "did combine together and

counsel his maid-servant to cheat him in her marketings" ;

they actually "had made away some of his books, and would have sold the rest." It was to remedy this horrible state of things that Milton consented to a third mar- riage. The wife found for him was Elizabeth Minshull, of a good Cheshire family, and a relative of Dr Paget's. They were married on the 24th of February 1662-63, the wife being then only in her twenty-fifth year, while Milton was in his fifty-fifth. She proved an excellent wife ; and the Jewin Street household, though the daughters remained in it, must have been under better management from the time of her entry into it. From that date Milton's circum- stances must have been more comfortable, and his thoughts about himself less abject, than they had been through the two preceding years, though his feeling in the main must have been still that of his own Samson :— " Now blind, disheartened, shamed, dishonoured, quelled,

To what can I be useful ? wherein serve

My nation, and the work from heaven imposed ?

But to sit idle on the houschold hearth,

A burdenous drone, to visitants a gaze,

Or pitied object." That might be the appearance, but it was not the reality. All the while of his seeming degradation he had found some solace in renewed industry of various kinds among his books and tasks of scholarship, and all the while, more particularly, he had been building up his Paradise Lost. He had begun the poem in earnest, we are told, in his house in Petty France, in the last year of Cromwell's Protectorate, and then not in the dramatic form contem- plated eighteen years before, but deliberately in the epic form. He had made but little way when there came the interruption of the anarchy preceding the Restoration and of the Restoration itself; but the work had been resumed in Jewin Street and prosecuted there steadily, by dictations of twenty or thirty lines at a time to whatever friendly or hired amanuensis chanced to be at hand. Considerable progress had been made in this way before his third marriage; and after that the work proceeded apace, his nephew Edward Phillips, who was then out in the world on his own account, looking in when he could to revise the growing manuscript.

It was not in the house in Jewin Street, however, that

Paradise Lost was finished. Not very long after the third marriage, probably in 1664, there was a removal to another house, with a garden, not far from Jewin Street, but in a more private portion of the same suburb. This, which was to be the last of all Milton's London residences, was in the part of the present Bunhill Row which faces the houses that conceal the London artillery-ground and was then known as " Artillery Walk, leading to Bunhill Fields." Here the poem was certainly finished before July 1665; for, when, in that month, Milton and his family, to avoid the Great Plague of London, then beginning its fearful ravages, went into temporary country-quarters in a cottage in Chalfont St Giles, Buckinghamshire, about 23 miles from London, the finished manuscript was taken with him, in probably more than one copy. This we learn from his young Quaker friend, Thomas Ellwood, who had taken the cottage for him, and who was shown one of the

manuscript copies, and allowed to take it away with him for perusal, during Milton's stay at Chalfont. Why the poem was not published immediately after his return to his Bunhill house in London, on the cessation of the Great Plague, does not distinctly appear, but may be explained partly by the

fact that the official licenser hesitated before granting the necessary imprimatur to a book by a man of such notorious republican antecedents, and partly by the paralysis of all business in London by the Great Fire of Sep- tember 1666, It was not till the 27th of April 1667 that Milton concluded an agreement with a publisher for the printing of his epic. By the agreement of that date, still extant, Milton sold to Samuel Simmons, printer, of Alders- gate Street, London, for £5 down, the promise of another £5 after the sale of a first edition of thirteen hundred copies, and the further promise of two additional sums of £5 each after the sale of two more editions of the same size respec- tively, all his copyright and commercial interest in Paradise Lost for ever. It was as if an author now were to part with all his rights in a volume for £17, 10s. down, and a contingency of £52, 10s. more in three equal instalments. The poem was duly entered by Simmons as ready for publication in the Stationers' Registers on the 20th of the following August; and shortly after that date it was out in London as a neatly printed small quarto, with the title Paradise Lost: A Poem written in Ten Books: By John Milton. The publishing price was 3s., equal to about 10s. 6d. now. It is worth noting as an historical coincidence that the poem appeared just at the time of the fall and disgrace of Clarendon.

The effect of the publication of Paradise Lost upon Milton's reputation can only be described adequately, as indeed it was consciously described by himself in metaphor, by his own words on Samson's feat of triumph over the Philistines :—

But he, though blind of sight,

Despised, and thought extinguished quite, With inward eyes illuminated,

His fiery virtue roused.

From under ashes into sudden flame,

And as an evening dragon came,

Assailant on the perched roosts

And nests in order ranged

Of tame villatie fowl, but as an eagle

His cloudless thunder bolted on their heads."

As the poem circulated and found readers, whether in the first copies sent forth by Simmons, or in subsequent copies issued between 1667 and 1669, with varied title- pages, and the latest of them with a prefixed prose " Argument," the astonishment broke out every wliere. "This man cuts us all out, and the ancients too" is the saying attributed to Dryden on the occasion ; and it is the more remarkable because the one objection to the poem which at first, we are told, "stumbled many" must have " stumbled" Dryden mist of all, Except in the drama, rhyme was then thought essential in anything professing to be a poem ; blank verse was hardly regarded as verse at all; Dryden especially had been and was the champion of rhyme, contending for it even in the drama ; and yet here was an epic net only written in blank verse, but declaring itself on that account to be "an example set, the first in English, of ancient liberty recovered to heroic poem from the troublesome and modern bondage of riming." That, notwithstanding this obvious blow struck by the poem at Dryden's pet literary theory, he should have welcomed the poem so enthusiastically and proclaimed its merits so emphatically, says much at once for his critical perception and for the generosity of his temper. An opinion pro- claimed by the very chief of the Restoration literature could not but prevail among the contemporary scholars ; and, though execration of the blind and unhanged regicide

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had not ceased among the meaner critics, the general vote was that he had nobly redeemed himself. One conse- quence of his renewed celebrity was that visitors of all ranks again sought him out for the honour of his society and conversation. His obscure house in Artillery Walk, Bunhill, we are told, became an attraction now, 'much more than he did desire," for the learned notabilities of his time.

The year 1669, when the first edition of Paradise Lost had been completely sold out, and Milton had received his second £5 on account of it, may be taken as the time of the perfect recognition of his pre-eminence among the English poets of his generation. He was then sixty years of age; and it is to about that year that the accounts that have come down to us of his personal appearance and habits in his later life principally refer. They describe him as to be seen every other day led about in thie streets in the vicinity of his Bunhill residence, a slender figure, of middle stature or a little less, generally dressed in a grey cloak or overcoat, and wearing sometimes a small silver- hilted sword, evidently in feeble health, but still look- ing younger than he was, with his lightish hair, and his fair, rather than aged or pale, complexion. He would sit in his garden at the door of his house, in warm weatlier, in the same kind of grey overcoat, "and so, as well as in his room, received the visits of people of distinguished parts, as well as quality." Within doors he was usually dressed in neat black. He was a very early riser, and very regular in the distribution of his day, spending the first part, to his midday dinner, always in his own room, amid his books, with an amanuensis to read for him and write to his dictation. Music was always a chief part of his afternoon and evening relaxation, whether when he was by himself or when friends were with him. His manner with friends and visitors was extremely courteous and affable, with just a shade of stateliness. In free con- versation, either at the midday dinner, when a friend or two happened, by rare accident, to be present, or more habitually in the evening and at the light supper which concluded it, he was the life and soul of the company, from his "flow of subject" and his 'unaffected cheerful- ness and civility," though with a marked tendency to the satirical and sarcastic in his criticisms of men and things. This tendency to the sarcastic was connected by some of those who observed it with a peculiarity of his voice or pronunciation. 'He pronounced the letter r very hard," Aubrey tells us, adding Dryden's note on the subject: "Titera canina, the dog-letter, a certain sign of a satirical wit." He was extremely temperate in the use of wine or any strong liquors, at meals and at all other times; and when supper was over, about nine o'clock, "he smoked his pipe and drank a glass of water, and went to bed." He suffered much from gout, the effects of which had become apparent in a stiffening of his hands and finger-joints, and the recurring attacks of which in its acute form were very painful. His favourite poets among the Greeks were Homer and the Tragedians, especially

Euripides ; among the Latins, Virgil and Ovid; among the English, Spenser and Shakespeare. Among his English contemporaries, he thought most highly of Cowley. He had ceased to attend any church, belonged to no religious communion, and had no religious observances in his family. His reasons for this were a matter for curious surmise among his friends, because of the profoundly religious character of his own mind; but he does not seem ever to have furnished the explanation. The matter became of less interest perhaps after 1669, when his three daughters ceased to reside with him, having been sent out, at considerable expense, "to learn some curious and ingenious sorts of manufacture that are proper for women to learn, particularly embroideries

'in the preceding great epic.

Oot in gold or silver." After that the household in Bunhill consisted only of Milton, his wife, a single maid-servant, and the "man" or amanuensis who came in for the day.

The remaining years of Milton's life, extending through that part of the reign of Charles II. which figures in English history under the name of "The Cabal Administra- tion," were by no means unproductive. In 1669 he pub- lished, under the title of Accedence Commenced Grammar, a small English compendium of Latin grammar that had been lying among his papers. In 1670 there appeared, in a rather handsome form, and with a prefixed portrait of him by Faithorne, done from the life, and the best and most authentic that now exists, his //istory of Britain to the Norman Conquest, being all that he had been able to accomplish of his intended complete history of England. In 1671 there followed his Paradise Regained and Samson Agonistes, bound together in one small volume, and giving ample proof that his poetic genius had not exhausted itself His only publication in 1672 was a Latin digest of Ramist logic, entitled Artis Logice Plenior Institutio, of no great value, and doubtless from an old manuscript of his earlier days. In 1673, at a moment when the growing political discontent with the government of Charles II. and the conduct of his court had burst forth in the special form of a " No-Popery" agitation and outery, Milton ventured on the dangerous experiment of one more political pamphlet, in which, under the title Of True Religion, Heresy, Schism, Toleration, and

what best means may be used against the growth of Popery, he put forth, with a view to popular acceptance, as mild a version as possible of his former principles on the topics discussed. In the same year appeared the second edition of his Minor Poems. Thus we reach the year 1674, the last of Milton's life. One incident of that year was the publication of the second edition of Paradise Lost, with the poem rearranged as now into twelve books, instead of the original ten. Another was the publication of a small volume containing his Latin Epistole Familiares, together with the Prolusiones Oratorie of his student-days at Cambridge,—these last thrown in as a substitute for lis Latin state letters in his secretaryship for the Common- wealth and the Protectorate, the printing of which was stopped by order from the Foreign Office. A third publica- tion of the same year, and probably the very last thing dic- tated by Milton, was a translation of a Latin document from Poland relating to the recent election of the heroic John Sobieski to the throne of that kingdom, with the title A Declaration or Letters Patents of the Election of this present King of Poland, John the Third. It seems to have been out in London in August or September 1674. On the 8th of the following November, being a Sunday, Milton died, in his house in Bunhill, of " gout struck in," or gout-fever, at the age of sixty-five years and eleven months. He was buried, the next Thursday, in the church of St Giles, Cripplegate, beside his father, a considerable concourse attending the funeral. ,

Before the Restoration, Milton, what with his inheritance from his father, what with the official income of his Latin secretaryship, must have been a man of very good means indeed. Since then, however, various heavy losses, and the cessation of all official incomc, had greatly reduced his estate, so that he left hut £900 (worth about or over £2700 now), besides furniture and household goods. By a word-of-mouth will, made in presence of his brother Christopher, he had bequeathed the whole to his widow, on the ground that he had done enough already for his "' undutiful" daughters, and that there remained for them his interest in their mother's marriage portion of £1000, which had never been paid, but which their relatives, the Powells of Forest Hill, were legally bound for, and were now in circumstances to make good. The daughters, with the Powells probably abetting them, went to law with the widow to upset the will; and the decision of the court was that they should receive £100 each. With the £600

thus left, the widow, after some further stay in London, retired to Nantwich in her

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native Cheshire. There," respected as a pious member of a local

Baptist congregation, she' lived till 1727, having survived her hus-

band fifty-three years. By that time all the three daughters were

also dead. The eldest, Ann Milton, who was somewhat deformed,

had died not long after her father, having married "a master-

builder," but left no issue; the second, Mary Milton, had died,

unmarried, before 1694; and only the third, Deborah, survived as long as her step-mother. Having gone to Ireland, as companion to a lady, shortly before her father's death, she had married an Abraham Clarke, a silk-weaver in Dublin, with wliom she returned to London abont 1684, when they settled in the silk-weaving business in Spitalficlds, rather sinking than rising in the world,

though latterly some public attention was paid to Deborah, by Addison and others, on her father's account. One of her sons, Caleb Clarke, had gone out to Madras in 1708, and had diced there as ' parish-clerk of Fort George in 1719, leaving children, of whom*

there are some faint traces to as late as 1727, the year of Deborah's

death. Except for the possibility of further and untraced descent

from this Indian grandson of Milton, the direct descent from him came to an end in his granddaughter, Elizabeth Clarke, another of Deborah's children. Having married a Thomas Foster, a Spitalfields weaver, but afterwards set up a small chandler's shop,

Grst in Holloway and then in Shoreditch, she died at Islington in 1754, not long after she and her husband had received the proceeds of a performance of Comus got up by Dr Johnson for her benefit.

Alt her children had predeceased her, leaving no issue. —Milton's brother Christopher, who had always been on the opposite side in politics, rose to the questionable honour of a judgeship and. knight-

hood in the latter part of the reign of James Il. He had then become a Roman Catholic,—which religion he professed till-his death in retirement at Ipswich in 1692. Descendants from him

are traceable a good way into the 18th century.—Milton's two nephews and pupils, Edward and J ohn Phillips, both of them known as busy and clever hack-authors before their uncle's death, continued the career of hack authorship, most industriously and variously,

though not very prosperously, through the rest of their lives, Edward _ in a more reputable manner than John, and with more of enduring allegiance to the memory of his uncle. Edward died about 1695 ; John was alive till 1706. Their half-sister, Ann Agar, the only daughter of Milton's sister by her second husband, had married,

in 1673, a David Moore, of Sayes House, Chertsey ; and it has so happened that the most flourishing of all the lines of descent from the poet's father is in this Agar-Moore branch of the Miltons.

Of inasses of manuscript that had been left by Milton, some portions saw the light posthumously. Prevented, in the last year of his life, as has béen mentioned, from publishing his Latin State Letters in the same volume with his Latin Fwmiliar Epistles, he had com- initted the charge of the State Letters, prepared for the press, together with the completed manuscript of his Latin T'reatise of Christian Doetrine, to a young Cambridge scholar, Daniel Skinuer, who had been among the last of his amanuenses, and had, in fact, been employed by him specially in copying out and arranging those two important MSS. Negotiations were on foot, after Milton's death, between this Daniel Skinner and the Amsterdam printer, Daniel Elzevir, for the publication of both MSS., when the English Govern- ment interfered,

and the MSS. were sent back by Elzevir, and thrown aside, as dangerous rubbish, in a cupboard in the State

Paper Office. Meanwhile, in 1676, a London bookseller, named Pitt, who had somehow got into his possession a less perfect, but still tolerably complete, copy of the State Letters, had brought out a surreptitious edition of them, under the title Litere Pseudo- Senatus Anglieani, neenon Cromwelli, nomine et jussu conseripte. No other posthumous publication of Milton's appeared till 1681, when another bookseller put forth a slight tract entitled d/r John Milton's Charaeter of the Long Parliament and Assembly of Divines, consisting of a page or two, of rather dubious authen- ticity, said to have been withheld from his History of Britain in the edition of 1670. In 1682 appeared A Brief History of Moseovia and of other less-known Countries lying eastward of Russia as far as Cathay, undoubtedly Milton's, and a specimen of those prose compilations with which he sometimes occupied his leisure. Of the fate of his collections for a new Latin Dictionary, which had swelled to three folio volumes of MS., all that is known is that after having been used by Edward Phillips for some of his pedagogic books, they came into the hands of a committee of Cambridge scholars, and were used for that Latin dictionary of 1693, called The Cambridge Dietionary, on which Ainsworth's Dietionary and all subsequent Latin dictionaries of English manufacture have been based. In 1698 there was published in three folio volumes, under the editorship of John Toland, the first collective edition of Milton's prose works, professing to have been printed at Amsterdam, though really printed in London. A very interesting folio volume, pub- lished in 1743 by '"'John Nickolls, junior," under the title of Original Letters and Papers of State addressed to Oliver Cromwell, consists of a number of intimate Cromwellian documents that had

somehow come into Milton's possession immediately after Cromwell's death, and were left by him confidentially to the Quaker Ellwood. |

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a chance search in the London State Paper Office in 1823 parcel containing the MSS. of Mil- ton's Latin State Letters and his Latin Treatise of Christian Doctrine, as these had been sent back from Amsterdam a hundred and fifty years before, the Treatise on Christian Doetrine was, by the command of

George IV., edited and published in 1825 by the Rev. C. B. Sumner, keeper of the Royal Library, and afterwards bishop of Winchester, under the title of Juannis Miltont Angli De Doetrina Christiana Libri Duo Posthumi. An English translation, by the editor, was published in the same year.

Information, rather than criticism, has seemed proper in such an article as the present. What little of closing remark is necessary will best connect itself with the obvious fact of the division of Milton's literary life into three almost mechanically distinct periods, viz.:—(1) the time of his youth and minor poems, (2) his middle twenty years of prose polemics, and (3) the time of his later Muse and greater poems.

Had Milton died in 1640, when he was in his thirty-second year, and had his literary remains been then collected, he would have been remembered as one of the best Latinists of his generation and one of the most exquisite of minor English pocts. In the latter character, more particularly, he would have taken his place as one of that interesting group or series of English poets, coming in the next forty years alter Spenser, who, because they all acknowledged a filial relationship to Spenser, may be called collectively The Spenserians. In this group or series, counting in it such other true poets of the reigns of James I. and Charles I. as Phineas and Giles Fletcher, William Browne, and Drummond of Hawthornden, Milton would have been entitled, by the small collection of pieces he had left, and which would have included his Ode on the Nativity, his DP Allegro and Il Penseroso, his Comus, and his Lyeidas, to recogni- tion as indubitably the very highest and finest. There was in him that peculiar Spenserian something which might be regarded as the poetic faculty in its essence, with a closeness and perfectiou of verbal finish not to be found in the other Spenserians, or even in the master himself. A very discerning critic might have gone deeper, as we can now. Few as the pieces were, and owning discipleship to Spenser as the author did, he was a Spenserian with a differ- ence belonging to his own constitution, which prophesied, and. indeed already exhibited, the passage of English poetry out of the Spenserian into a kind that might be called the Miltonic. This Miltonic something, distinguishing the new poet from other Spenserians, was more than mere perfection of literary finish. It con- sisted in an avowed consciousness already of the os magna sonitw- rum, 'the mouth formed for great utterances," that consciousness resting on a

peculiar substratum of personal character that had occasioned a new theory of literature. “ He who would not be frustrate of his hope to write well hereafter on laudable things ought himself to be a true poem ” was Milton’s own memorable expression afterwards of the principle that had taken possession of him from his earliest days; and this principle of moral manliness as the true foundation of high literary effort, of the inextricable identity of all literary productions in kind, and their coequality in worth, with the personality in which they have their origin, might have been detected, in more or less definite shape, in all or most of the minor poems. It is a specific form of that general Platonic doctrine of the invincibility of virtue which runs through his Conus, and which is summed up in the Miltonic motto of the closing lines:—

“¢ Mortals that would follow me, Love Virtue : she alone is free. She ean teacli ye how to climb Higher than the sphery chime; – Or, if Virtue feeble were,

Heaven itself would stoop to her.”

That a youth and carly manhood of such poetical promise should have been succeeded by twenty years of all but iucessant prose polemics has been a matter of regret with many. Why should the author of Comus and Lyeidas, instead of keeping to the poetic craft, have employed himself for twenty years in the drudgery and turmoil of prose pamphleteering on questions of church and state, with nothing in verse to glitter across the long morass but a slight chain of biographical and historical sonnets? Surely this is a inost shallow and most unmasculine judgment. Is nothing due to Milton’s own explanation of the reasons that drew him, at the beginning of the English Revolution, out of his literary projects and dreamings, into active partisanship with the cause which his reason favoured? Hear what he says would have been the reproach of his own conscience to him, evening and morning, if he had abstained from such partisanship aud persisted in his poetic privacy. ‘‘ Kase and leisure was given thee for thy retired thoughts out of the sweat of other men. ‘Thou hadst the diligence, the parts, the language of a man, if a vain subject were to be adorned or beautified; but, when the cause of God and His churcli was to be pleaded, for which purpose that tongue was given thee which thou hast, God listened if He*

could hear thy voice among His zealous servants, but thou wert dumb as a beast : from henceforward be that which thine own brutish silence hath made thee." Or, if this should bein too high a strain for the ordinary modern apprehension, may not one ask, more

Finally, having discovered the long-lost

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simply, whether such controversial work as Milton did plunge into, and persevere in for twenty years, was unworthy, after all, of him or his powers? Do not hundreds of men, aecounted among the ablest in the world, spend their lives precisely in such work of controversy on contemporary qucstions; and are not some of the men of noblest reputation in the world's history remembered for nothing else? If Burke, whose whole public career consisted in a succession of speeches and pampliets, is looked back upon as one of the greatest men of his century on their account, why should there be such regret over the fact that Milton, after having been the author of Comus and Lycidas, became for a time the prose orator of his earlier and more tumultuous generation? The truth is that it is not his exchange of poetry for prose oratory that is objected to, so much as the nature of his prose oratory, the side he took, the opinions he advocated. English scholarship and English literary criticism have not yet sufficiently recovered from that inherited sycophancy to the Restoration which has covered with a cloud the preceding twenty ycars of the "Great Rebellion," voting that period of English history to be unrespectable, and all its phenomena of Presbyterianism, the Solemn League and Covenant, Independency, the sects, English republicanism, &c., to be matters of obsolete jargon, less worthy of attention than a Roman agrarian law or the names of Horace's mistresses. When this unscholarly state of temper has passed, there will be less disposition to distin- guish between Milton as the poet and Milton as the prose writer. While some may recognize, with the avidity of assent and partisan- ship, the fact that there are in Milton's prose writings notions of much value and consequence that have not yet been absorbed into the English political mind, there will be a general agreement at least as to the importauce of those pamphlets historically. It will be perceived that he was not only the greatest pamphleteer of his generation, head and shoulders

above the rest, but also that there is no life of that time, not even Cromwell's, in which the history of the great Revolution in its successive phases, so far as the deep underlying ideas and speculations were concerned, may be more intimately and instructively stndied than in Milton's. Then, on merely literary grounds, what an interest in those prose remains ! Not only of his Areopagitica, admired now so unreservedly because its main doctrine has become axiomatic, but of most of his other pamphlets, even those the doctrine of which is least popular, it may be said contidently that they answer to his own definition of "a good book," by containing somehow "the precious life-blood of a master-spirit." From the entire series there might be a collection of specimens, unequalled anywhere else, of the capabilities of that older, grander, and more elaborate English prose of which the Elizabethans and their immediate successors were not ashamed, though it has fallen into disrepnte now in comparison with the easier and nimbler prose which came in with Dryden. Nor will readers of Milton's pamphlets continue to accept the hackneycd observation that his genius was destitute of humonr. Though his prevailing mood was the severely carnest, there are pages in his prose writings, both English and Latin, of the most laughable irony, reaching sometimes to outrageous farce, and some of them as worthy of the name of humour as anything in Swift. Here, however, we touch on what is the worst feature in some of the prose pamphlets,—their measurcless ferocity, their boundless licence in personal seurrility. With all allowance for the old custom of those days, when controversy was far more of a life-and-death bnsiness than it is now, as well as for the intrinsic soundness of Milton's rule of always discerning the man behind the bvok, it is impossible for the most tolerant of modern readers to excuse Milton in this respect to the full extent of his delinquencies.

While it is wrong to regard Milton's middle twenty years of prose polemics as a degradation of his genius, and while the fairer contention might be that the youthful poet of Comus and Lycidas actually promoted himself, and became a inore powerful agency in the world and a more interesting object in it for ever, by consent- ing to lay aside his " singing robes" and spend a portion of his life in great prose oratory, who does not exult in the fact that such a life was rounded off so miraculously at the close by a final stage of compulsory calm, when the " singing robes" could be resumed, and Paradise Lost, Paradise Regained, and Samson Agonistes could issue in

succession from the blind man's chamber? Of these three le and what they reveal of Milton, no need here to spcak at

ength. Paradise Lost is one of the few monumental works of the world, with nothing in modern epic literature comparable to it except the great poem of Dante. This is best perceived by those who penetrate beneath the beauties of the merely terrestrial portion

of the story, and who recognize the coherence and the splendonr of | 2 i | immediately after death, but a miraculous revival of the whole man, –

that vast symbolic phantasmagory by which, through the wars in heaven and the subsequent revenge of the expelled archangel, it paints forth the connexion of the whole visible universe of human cognizance and history with the grander, pre-existing, and still environing world of the eternal and inconceivable. To this great epic Paradise Regained is a sequel, and it ought to be read as such. The legend that Milton preferred the shorter epic to the larger is quite incorrect. All that is anthentic on the subject is the state-

ment by Edward Phillips that, wnen it was reported to his uncle that the shorter epic was " generally censured to be much inferior to the other," he "'eould not hear with patience any such thing." The best critical judgment now confirms Milton's own, and pro- nounces Paradise Regained to ve not only, within the possibilities of its briefer theme, a worthy sequel to Paradise Lost, but also one of the most edifying and artistically perfect poems in any language, Finally, the poem in which Milton bade farewell to the Muse, and in which he reverted to the dramatic form, proves that to the very end his right hand had lost none of its power or cunning. Samson Agonistes is the most powerful drama in onr language after the severe Greek model, and it has the additional interest of being so contrived that, without strain at any one point, or in any one par- ticular, of the strictly objective incidents of the Biblical story which it enshrines, it is yet the poet's own epitaph and his con- densed autobiography. All in all, now that those three great poems of Milton's later life have drawn permanently into their company the beautiful and more simple performances of his youth and

early manhood, so that we have all his English poetry nnder view at once, the result has been that this man, who would have had to be remembered independently as the type of English magna- nimity and political courage, is laurelled also as the supreme poet of his nation, with the single exception of Shakespeare.

Much light is thrown upon Milton's mind in his later life, and even upon the poems of that period, by his posthumous Latin Treatise of Christian Doctrine. It differs from all his other prose writings of any importance in being cool, abstract, and didactic. Professing to be a system of divinity derived directly from the Bible, it is really an exposition of Milton's metaphysics and of his reasoned opinions on all questions of philosophy, ethics, and politics. The gencral effect is to show that, though he is rightly regarded as the very genius of English Puritanism, its representative poet and idealist, yet he was not a Puritan of what may be called the first wave, or that wave of Calvinistic orthodoxy which broke in upon the absolutism of Charles and Laud, and set the English Revolu- tion agoing. He belonged distinctly to that larger and more per- sistent wave of Pnritanism which, passing on throngh Inde- pendency, included at length an endless variety of sects, many of them rationalistic and free-thinking in the extreme, till, checked by the straits of the Restoration, it had to contract its volume for a while, and to reappear, so far as it could reappear at all, in the new and milder guise of what has ever since been known as English Liberalism. For example, the treatise shows that Milton in his later life was not an orthodox Trinitarian, but an anti-Trinitarian of that high Arian order, counting Sir Isaac Newton among its subsequent English adherents, which denied the coessentiality or coequality of Christ with absolute Deity, but regarded him as clothed with a certain derivative divinity of a high and unfathomable kind. It shows him also to have been Arminian, rather than Calvinistic, in his views of free will and predestination. It shows him to have been no Sabbatarian, like the Puritans of the first wave, but most strenuously anti-Sabbatarian. Indeed one of its doctrines is that the Decalogue is no longer tle standard of human morality, and that Christian liberty is not to be bounded by its prohibitious or by any sacerdotal code of ethics founded on these. Hence, in the treatise, not only a repetition of Milton's views on the iar- riage snbject and of other peculiar tenets of his that had been set forth in his pamphlets, but some curious and minute noveltics of opinion besides.

By far the most important revelation of the treatise, however, consists in the very definite statement it makes of Milton's metaphysical creed and of the connexion of that creed in his mind with the revealed theology of Christianity. Whilc, ontologically, he starts from a pure spiritualistic theism, or from the notion of one infinite and eternal Spirit as the self-subsisting God and author of all being, cosmologically his system is that of a pantheistic materialism, which conceives all the present uni- verse, all that we call creation, as consisting of diverse modifications, inanimate or animate, of one primal matter, which was originally nothing else than an efflux or emanation from the very substance of God. Angels and men, no less than the brute world and the things we call lifeless, are formations from this one original matter, only in higher degrees and endowed with soul and free will. Hence any radical distinction between matter and spirit, body and sonl, is, Milton holds, fallacious. The soul of man, he holds, is not something distinct from the body of man and capable of existing apart, but is actually bound up with the bodily organism. There- fore, when the body dies, the soul dies also, and the whole man ceases to exist. The immortality revealed in Scripture is, therefore, not a continued existence of the soul in an immaterial condition

soul and body together, at the resurrection, after an intermediate sleep. In such a resurrection, with a final jndgment, a reign of Christ, and a glorification of the saints in a new heaven and a new earth, Milton declares his absolute belief. But, indeed, throughout the treatise, with all its differences from the orthodox interpreta- tions of the Bible, nothing is more remarkable than the profound- ness of the reverence avowed for the Bible itself. The very initial

principle of the treatise is that, as God of things that man could not that the Bible says on any the plain sense of the words, and strange it may seem_to the natural human reason. those essentials of Christianity which consist : the fall of man, atonement by Christ, and restoration and sanctifica-

tion through Christ only, Milton is at one with the great body of Christians. Altogether, what the treatise makes clear is that, while Milton was a most fervid theist and a genuine Christian, believing In

all the other books in the the most intrepid of English

the Bible, and valuing the Bible over world, he was at the same time one of thinkers and theologians.

For further information reference may and History of his Time, Works (Cambridge edition in ; to Todd's variorum edition of the Poetical Works, Keightley's Life, Opinions, and Writings of Milton (1855),

6 vols. (1859-80),

prose and verse together, 1851); and St John's, in tion of the Treatise of Christian Doctrine, originally published in 1825. (D. MA.)

MILWAUKEE, the largest , city Wisconsin, United States, is situated on

York by rail, in 43° 3' W. of Washington). above the level of the sea.

N. lat., 87° 56'

The Milwaukee and Menomonee rivers unite in the centre of the business portion of the city, about half a mile from their entrance to Lake Michigan, where they are

joined by a third and smaller stream—the Kinnikinnic. A bay 6 miles from cape to cape, and 3 miles broad,

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Plan of Milwaukee.

stretches in front of the city, which commands a fine water view, the ground rising along the shore 80 feet above the level of the lake, then gradually

sloping westward to the Milwaukee river, and again rising on the west and north to a height of 125 feet. The ground also rises to a com- manding elevation south of the valley of the Menomonee. Few cities present so many natural attractions of site,

be made to Masson's Life of Miiton and to his editions of Milton's Poetical 3 vols., 1874, and smaller 3 vol. ed., 1882), as well as with Life (5th ed., 1852), to to Milton und Seine Zeit, by Alfred Stern (1877-79), and to Mr Mark Pattison's Milton in Mr Morley's series of " English Writers." Collective editions of the prose works since that of 1698 are—Symmons's (7 vols., 1806); Pickering's, with Life by Mitford (8 vols., Bohn's Standard Library (5 vols., 1848-53). This last includes a revised edition of Bishop Sumner's transla-

in the State of the west shore of Lake Michigan, 100 miles north of its southern end, 80 miles north of Chicago, and 1000 miles north-west of New W. long. (44 min. The shore of the lake is 600 feet

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the Bible is a revelation from have found out for himself, all matter is to be accepted implicitly, in without sophistication, however Hence, in all in the doctrines of

as indeed its Indian name indicates ("the beautiful hollow or bay"); and art has added to nature. In the residence parts of the city there are miles of avenues from 70 to 100 feet wide, lined on both sides with elms and maples, be- hind which stand handsome houses with spacious lawns, fountains, and evergreens, giving the appearance of a con- tinuous park. The material used for building is largely the cream-coloured brick made in the vicinity, from which Milwaukee is sometimes called the "Cream City." The climate, tempered by the great lake, is remarkably pleasant and healthy. The mean temperature, as shown by the records of twenty years, is 46°°7 Fahr. The coldest month is January (average 22°°37), the hottest July (70°-4).! During the last nine years the average death- rate has been but 20 per 1000, showing it to be one of the healthiest of American cities. Besides a full complement of the usual religious and charitable institutions, there is adjoining the city the national home for disabled United States volunteer

soldiers, consisting of several buildings situated in grounds of 400 acres extent, which serve the purpose of a city park. There are numerous lodges be- longing to the freemasons and other guilds; and the Turners' societies, which embrace a large membership and own some valuable buildings, have done much to create and keep up the practice of athletic exercises among the citizens. Two excellent musical societies are also established here. Before the year 1835 Milwaukee was known only as an Indian trading-post occupied by a Frenchman named Solomon Juneau, who is generally spoken of as the founder of the city. The total inhabitants in 1838 numbered only 700; in 1840 there were 1712; but in 1846 the popula- tion amounted to 9666, in 1850 to 20,061, in 1855 to 30,118, in 1860 to 45,246, in 1870 to 71,440, and in 1880 to 115,578 (57,475 males, 58,103 females). In 1882 the population was estimated at 130,000,——-more than one half of them of foreign parentage, a very large majority being Germans. Notwithstanding the multitude of nation- alities represented in the population, there are few cities more orderly and law-abiding, the number of police employed being less than one for every 1500 inhabitants. Another feature worthy of mention is the large proportion of families who own their own houses, and this is true not only as to the mercantile and professional classes, but especially as to the labouring population. Although the grain trade, formerly very large here, has now greatly diminished, the growth and prosperity of the city have not materially suffered, owing to the development of manu- facturing industries, for which the low rents, healthy climate, and advantageous location make it well adapted. Abouta sixth of the population are engaged in the manufacture of clothing, cigars, cooperage, leather, bricks, sashes, doors, and blinds, machinery, and flour (of which one million of barrels are annually made), and in meat-packing. Milwaukee has become famous for its "lager beer," of which there are one million of barrels annually produced, valued at $8,000,000. The lake commerce is very large. The tonnage entered and cleared in 1880 was 5,322,373 tons, being about as large as that of Baltimore, Boston, or Philadelphia. The Wisconsin Central, the Milwaukee and Lake Shore, the Milwaukee and Northern, and the Chicago, Milwaukee, and St Paul Railways have their head offices here, and the last-named, owning 4000 miles of lines, has immense workshops in the Menomonee valley near the city. Milwaukee is governed by a mayor and a common council of thirty-nine aldermen. The streets and public buildings are under the charge of the board of public works,

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1 The monthly averages for twenty years are:—January, Do, Ot February, 25°13; March, 33°°35; April, 43°°94; May, ba Os June, 64°°39; July, 70°04; August, 67°°89; September, 61°°68; October, 48°48; November, 36° °27 ; December, 25°°53.

composed of three commissioners and the city engineer, all subject to the common council. A bountiful supply of water is obtained from the lake, and the streets are well supplied with sewers. The value of property as assessed for taxation was $62,000,000 in 1882,—the city debt being $2,500,000, mostly for the water-works, which are city property.

There is an efficient system of public schools under a superintendent and board of school commissioners, the value of the buildings with their sites being estimated at $700,000. For the higher education there are a high school, a normal school, and three commercial colleges, while the Roman Catholics and Lutherans have several excellent denominational seminaries and colleges. A public library belonging to the city contained 20,000 volumes in 1882. (i)

MIMICRY is the name given in biology to the advan- tageous resemblance (usually protective) which one species of animal or plant often shows to another. The word was first applied in this metaphorical sense by Mr W. H. Bates, and it has since been accurately defined and limited, in its biological application, by Mr A. R. Wallace. Briefly put, the essence of the phenomenon of mimicry consists in the following relation. A certain species of plant or animal possesses some special means of defence from its enemies, such as a sting, a powerful and disagreeable odour, a nauseous taste, or a hard integument. Some other species inhabiting the same district or a part of it, and not itself provided with the same special means of defence, closely resembles the first species in all external points of form and colour, though often very different in structure and unrelated in the biological order. For example, a South- American family of butterflies, the Heliconide, are distin- guished by their very varied and beautiful colours, and their slow and ~~*weakly flight; they might easily be captured by*~~

~~insectivorous birds, but their remains are never found on the ground amongst the rejected wings of other butterflies which cover the soil in many places. They also possess a strong pungent odour, which clings to the fingers for many days; and this fact led Mr Wallace to suspect that they have a disagreeable taste, and would not there~~ fore be eaten by birds after a single trial. Mr Belt has since experimentally proved the truth of that belief. But among the totally distinct family of the Preridx, most of which are white, there is a genus of small butterflies, known as Leptalis, edible by birds, some species of which are white like their allies, while the greater number exactly resemble one or other of the Heliconide in the peculiar shape and colouring of their wings. As regards structure, the two families are widely different ; yet the resemblance of a species of one family to a species of the other is often so close that Mr Bates and Mr Wallace, experienced entomologists, frequently mistook them for one another at the time of capture, and only discovered their mistake upon nearer examination. Mr Bates observed several species or varieties of Leptalis in the Amazons valley, each of which more or less exactly copied one of the Heliconidz in itsown district. Accordingly, they seem to be mistaken by birds for the uneatable insects they mimic, and so to be benefited by their resemblance. This, which may perhaps be regarded as the most typical instance of true mimicry, is also the first to which the word was applied.

In considering the phenomena under review, it may be well to give first the chief observed facts, which are quite independent of any particular explanation, and then the theory which has been started to account for them by Mr Bates and Mr Wallace. Before doing so, however, true mimicry should be carefully discriminated from one or two superficially similar modes of resemblance among organic beings, whose real implications are very different.

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It must not be confused with mere accidental or adaptive resemblance, due either to simple chance or to similarity of external conditions. Asa case of the first sort, we may adduce the real or fancied resemblance between certain orchids and flies or spiders; as a case of the second sort, we may take certain African Huphorbiacex, which, growing in dry deserts, have

acquired a very close likeness to the cactuses that cover the equally dry deserts of Mexico; or again the sub-Antarctic gallinaceous bird, Chionis alba, which, living on the sea-shore, has acquired a coloration like that of the gulls, together with the legs of a wader. These resemblances, however, do not as such subserve any function. The species apparently mimicking and the species apparently mimicked either do not inhabit the same district or do not come into any definite relation with one another. The likeness is either accidental, or else it is due to similar adaptation to similar circumstances. In cases of true mimicry, on the other hand, the mimicking species derives a direct advantage from its likeness to the species mimicked ; the resemblance is deceptive ; and this is equally true whether we suppose the mimicry to be pro- duced by creative design or by natural selection. On either hypothesis, however it came by its likeness, the mimicking species escapes certain enemies or obtains certain sorts of food by virtue of its resemblance to some other kind.

It should also be added that the word mimicry, as applied to such cases, is used only in a metaphorical sense. It is not intended to imply any conscious or voluntary imitation by one species of the appearance or habits of another. All that is meant is the fact of an advantageous resemblance, a delusive similarity, which givesthe mimicking animal or plant some extra protection or some special means of acquiring food which it would not otherwise have pos- sessed but for its likeness to the creature mimicked.

Taking animals first, mimicry does not occur very frequently among the higher classes. In the vertebrates it is comparatively rare, and among mammals probably only one good case has yet been adduced. This is that of Cladobates, an insectivorous genus of the Malayan region, many species of which closely resemble squirrels in size, in colour, and in the bushiness and posture of the tail. It has been suggested by Mr Wallace (from whom most of the following examples have been borrowed) that Cladobates may thus be enabled to approach the insects and small birds which form its prey under the disguise of the harmless fruit-eating squirrel. In this case, as in some others, the resemblance is not protective, but is apparently useful to the animal in the quest for food.

Among birds, Mr Wallace has pointed out that the general likeness of the cuckoo, a weak and defenceless group, to the hawks and gallinaceous tribe makes some approach to real mimicry. But besides such vague resem- blances there are one or two very distinct cases of true mimicry in this class of vertebrates. In Australia and the Moluccas lives a genus of dull-hued honey-suckers, Tropidorhynchus, consisting of large, strong, active birds, with powerful claws and sharp beaks, They gather together in noisy flocks, and are very pugnacious, driving away crows and even hawks. In the same countries lives a group of orioles, forming the genus Mimeta; and these, which are much weaker birds, have not the usual brilliant colouring of their allies the golden orioles, but are usually olive-green or brown. In many cases species of Jimetu closely resemble the Tropidorhynchi inhabiting the same island. For example, on the island of Bouru are found the Tropidorhynchus bouruensis and Mimeta bouruensis, the latter of which mimics the former in the particu- lars thus noted by Mr Wallace :—" The upper and under surfaces of the two birds are exactly of the same tints of dark and light brown. The Tropidorhynchus has a large

bare black patch round the eyes; this is copied in the Mimeta by a patch of black feathers. The top of the head of the T'ropidorhynchus has a scaly appearance from the narrow scale-formed feathers, which are imitated by the broader feathers of the Mémeta having a dusky line down each. The Tropidorhynchus has a pale ruff formed of curious recurved feathers on the nape (which has given the whole genus the name of friar-birds) ; this is represented in the Mimeta by a pale band in the same position. Lastly, the bill of the Tropidorhynchus is raised into a protuberant keel at the base, and the Aimeta has the same character, although it is not a common one in the genus. The result is that on a superficial examination the birds are identical, although they have important structural differences, and cannot be placed near each other in any natural arrangement." Allied species of Tropidorhynchus in Ceram and Timor are similarly mimicked by the local Mimeta of each island. Mr Osbert Salvin has likewise noticed a case of mimicry among the birds of prey near Rio Janeiro. An insect-eating hawk, Harpagus diodon, is closely resembled by a bird-eating hawk, Accipiter pileatus. Here the advantage seems to be that the small birds have learned

not to fear the Harpagus, and the Accipiter is able to trade upon the resemblance by catching them unawares, both birds being reddish-brown when seen from beneath. But the Accépiter has the wider range of the two; and where the insect-eating species is not found it no longer resembles it, but varies in the under wing-coverts to white. Here again the resemblance, though advantage- ous, is not protective.

Among reptiles, Mr Wallace has instanced some curious cases where a venomous tropical American genus of snakes, Elaps, with brightly-banded colours, is closely mimicked by several genera of harmless snakes, having no affinity with it, but inhabiting the same region. Thus the poison- ous Elaps fulvus of Guatemala has black bands on a coral- red ground; the harmless Pliocerus xqualis of the same district is coloured and banded precisely like it. The likeness affords the unarmed snakes a great protection, because other animals probably will not touch them, mis- taking them for the venomous kinds.

It is among the invertebrates, however, and especially among insects, that cases of mimicry are most frequent and were first observed. In the order Lepidoptera, besides the classical instance of Leptalis and the Heliconide, a genus of another family, the Hrycinidz, also mimics the same group. The flocks of one species of Jthomia, an uneatable butterfly, often have flying with them a few individuals of three other widely different genera, quite indistinguishable from them when on the wing. In the tropics of the Old World, the Danaidz and Acrexidz possess a similar protec- tive odour, and are equally abundant in individuals ; they are closely mimicked by various species of Papilio and Diadema. Mr Trimen, in a paper on '" Mimetic Analogies among African Butterflies," gives a list of sixteen species or varieties of Diadema or its allies, and ten species of Papilio,

each of which mimics a Danais or Acrea of the same |

region in the minutest particulars of form and colour. The Danais tytia of India has semi-transparent bluish wings, and a border of reddish-brown ; this coloration is exactly reproduced in Papilio agestor and Diadema nama, all three insects frequently coming together in collections from Darjiling. In the Malay Archipelago the common and beautiful Huplea midamus is so exactly mimicked by two rare species of Papilio that Mr Wallace generally

mistook the latter at first for the ordinary insect. An immense number of other instances among the Lepidoptera have been quoted from other parts of the world. Occasionally species of Lepidoptera also imitate insects of other orders. Many of them take on the appearance of

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bees or wasps, which are of course protected by their stings. Thus the Sestide and Ageriide, two families of diurnal moths, have species so like hymenopterous insects that they are known by such names as apiformis, vespiforme, ichneumoniforme, sphegiforme, and so forth. The British sesia bombiliformis closely resembles the humble bee; the Sphecia craboniformis is coloured like a hornet, and carries its wings in the same fashion. Some Indian Lepidoptera have the hind legs broad and densely hairy, so as exactly to imitate the brush-legged, bees of the same country. Mr Belt mentions a Nicaraguan moth, Pionia lycoides, which closely mimics a distasteful coleopterous genus, Calopteron ; and Professor Westwood pointed out that the resemblance to the beetle is still further increased in the moth by raised lines of scales running lengthwise down the thorax. Among the Coleoptera, or beetles, and other orders, similar disguises are not uncommon. Mr Belt noticed species of Hemiptera and Coleoptera, as well as spiders, in Nicaragua, which exactly resemble stinging ants, and thus no doubt escape the attacks of birds. The genus Calopteron is mimicked by other beetles, as well as by the moth Pionia. Inthe same country, one of the Hemiptera, Spiniger luteicornis, has every part coloured like the hornet, Priocnemis, which it mimics; "in its vibrating coloured wing-cases it departs greatly from the normal character of the Hemiptera, and assumes that of the hornets." Mr Wallace mentions the longicorn beetle, Cyclopeplus batesn1, which "differs totally in outward appearance from every one of its allies, having taken upon itself the exact shape and colouring of a globular Corynomalus, a little stinking beetle, with clubbed antenne." Erythroplatis corallifer, another longicorn, almost exactly resembles Cephalodonta spinipes, one of the common South-American Hispide, which possesses a disagreeable secretion; and Mr Bates also found a totally different longicorn, Streptolabis hispoides, which resembles the- same insect with equal minuteness. Some of the large tropical weevils have the elytra so hard that they cannot be pierced by a bird's beak ; and

these are mimicked by many other comparatively soft and eatable insects. In southern Brazil, Acanthotritus dorsalis closely resembles a Curculio of the hard genus Heiliplus ; and Mr Bates found Gymnocerus cratosomoides, a longicorn, on the same tree with the hard weevil, Cratosomus, which it mimics. Other beetles resemble bees, wasps, and shielded bugs. Hairy caterpillars are well known to be distasteful to birds, and comparatively free from attack; and Mr Belt found a_longicorn, Desmiphora fasciculata, covered with long brown and black hairs, and exactly mimicking some of the short, thick, woolly caterpillars common on the bushes around. Amongst other orders, one of the most interesting cases is that of certain Diptera or two-winged flies which mimic wasps and bees. Sometimes this likeness only serves to protect the insect from attack, by inspiring fear of a sting. But there are also a number of parasitic flies whose larve feed upon the larve of bees, as in the British genus Volucella ; and these exactly mimic the bees, so that they can enter the nests or hives to deposit their eggs without being detected even by the bees themselves. In every country where such flies occur they resemble the native bees of the district. Similarly, Mr Bates found a species of Mantis on the Amazons which exactly mimicked the white ants on which it fed. On the other hand, the defenceless species itself may mimic its persecutor, as in the case of several crickets, Scaphura, that exactly resemble various sand-wasps, and so escape the depredations of those cricket-killing enemies. Another cricket from the Philippine Islands, Condylodera tricondyloides, so closely copies a tiger-beetle, Zricondyla, that even Professor Westwood long retained it among that group in his cabinet,

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and only slowly discovered his mistake. The cases here mentioned form but a small part of all those that have hitherto been observed and described in the insect world. They amount altogether to many hundreds.

Among plants, though included in the above definition for the sake of formal completeness, instances of true mimicry are rare or almost unknown. Perhaps the nearest approach to this phenomenon in the vegetal world is found in the resemblance borne by the dead-nettle, Lamium album, and a few other labiates, to the stinging nettle, Urtica dioica and U. urens. The

true nettles are strik- ingly protected from animal foes by their stinging hairs ; and the general appearance of the dead-nettle is sufficiently like them to prevent human beings from plucking it, and therefore probably to deter herbivorous mammals from eating it down. Mr Mansel Weale mentions another labiate, Ajuga ophrydis, of South Africa, which closely resembles an orchid, and may thus induce insects to fertilize its flowers. Mr Worthington Smith has found three rare British fungi, each accompanying common species which they closely resembled; and one of the common species possesses a bitter and nauseous taste; so that this would seem to be a case of true mimicry. Many diverse instances alleged by Mr A. W. Bennett, Dr Cooke, and others cannot be considered as genuine mimetic resem- blances in the sense here laid down. They are mere coincidences or similar adaptations to similar needs; and the word ought to be applied strictly to such likenesses alone as benefit the organism in which they occur by caus- ing it to be mistaken for another possessing some special advantage of its own.

The theoretical explanation of mimicry on evolutionary principles may best be considered in connexion with the general subject of protective coloration and variation in form, of which it is a very special case. There are two ways in which imitative colouring may benefit a species. It may help the members of the species to escape the notice of enemies, or it may help them to deceive prey. In the first case imitative hues enable the animal or plaut to avoid being itself devoured; in the second case they enable it to devour others more easily, and so to secure a larger amount of food than less deceptively coloured compeers. In the former instance we must suppose that such individuals as did not possess the deceptive colouring have been discovered and destroyed by enemies with highly developed sight, while those which possessed it have survived. In the latter instance we must suppose that the individuals which have no protective colouring have failed to secure sufficient prey, through too readily betraying their presence, and that only those which possessed such colouring have become the parents of future generations. It is difficult, however, to separate these two cases, and in many instances the same colouring may aid a species both in cscaping its peculiar enemies and in deceiving its peculiar prey. They may therefore most conveniently be considered together.

Colour is always liable to vary from individual to individual, as we see in the case of domesticated fowls, rabbits, dogs, and other animals, as well as in most cultivated flowers, wherever natural selection cannot act to keep the typieal speeific hues pure and true.

3ut in a wild state certain conspicuous colours are sure to prove disadvantageous by betraying the individual, and these will sooner or later get weeded out, under ccrtain circumstances, either through the action of enemies or by starvation resulting from the inability to escape the notice of prey. On the other hand, certain other

colours are sure to benefit the individual by harmonizing with the

tints of the environment and these will be spared by natural selection, so that the individuals possessing them will pair with one another, and will hand down their peculiarities to their dc- scendants. In this way many species will acquire and retain a eoloration that harmonizes with their environment as a whole or with some special part of it. The degree to which the protective coloration will be carried, however, niust depend upon the sharp- ness of the senses in those other organisms which it is desirable to deceive. Large dominant herbivorous or frugivorous mammals or birds, with relatively few enemies, would not be benefited by protective coloration, and so they seldom exhibit it. The grasses or fruits on which they feed cannot make any attempt to escape them. But carnivores generally require to deceive their prey, and therefore a large number of them exhibit marked deceptive colouring. Still more especially do small defenceless birds or mammals need to escape the notice of the carnivores, and they accordingly very generally possess dull colours, because any variation in the direction

of conspicuousness is certain to be promptly cut off. Above all among insects, which are so largely the prey of birds, of reptiles, and of other animals possessing highly developed vision, protective coloration in one form or other is almost universal, except whcre a nauseous taste, hairy skin, or hard external coverings afford a different kind of protection. In every case the weeding out of ill-protected forms must depend upou the relative keenness of visiou in the various enemies or of the prey, be they mammals,

birds, reptiles, insects, or spiders. Hence the existence of protective coloring and of mimicry incidentally affords us valuable hints as to the perceptive faculties of the various classes against which each organism is thus unconsciously guarded.

Where the general aspect of the environment is most uniform, and where little but a vague impression of colour without individual form ean be conveyed, the hues of animals are also usually uniform, to match their surroundings, and no special imitative adaptations of form occur. Thus, among the Arctic snows, a brown or black. animal would immediately be perceived, and if defenceless at once devoured, while if a carnivore it would seldom or never approach unperceived near enough to its prey to effect a capture. Hence all such variations are at once repressed, and almost all Arctic animals, like the American polar hare, are pure white. Elsewhere bears are black or brown ; in the polar region the native specics is nearly indistinguishable from the snow in which it lives. Where the environment undergoes a regular change from season to season the colour of the fauna varies with it. The Arctic fox, the ermine, the alpine hare, the ptarmigan and many other birds, are all more or less brown among the brown hill-sides of autumn, and snow-white among the winter snows. Almost eqnally general is the sandy colour of deserts, though this, instead of being uniform, is slightly varied from grain to grain; and nearly all the birds, reptiles, and insects of Sahara exactly copy the sandy grey line of the desert around them. Soles and other flat-fish (Plewronectidx) closely imitate the colour and speckled appearance of the sand on which they lie. 'The fishes and crustaceans which inhabit the sargasso weed arc colonred the same yellow as the masses of alge to whieh they cling. Aphides and many small leaf-eating caterpillars are bright green like the neighbouring foliage.

Where the environment is somewhat more diverse, the resemblance begins to show more specialized features. The lion, a large ground- cat of desert or rocky districts, is uniformly brown ; but the tiger and other jungle-cats have perpendicular stripes which harmonize with the bamboos and brown grass of their native haunts; while the leopards, jaguars, and other tree-cats have ocellated spots which conceal them among the mingled light and shade of the forests. Large marine animals have the back black, because the water looks dark when seen from above, but their bellies are white, so as to

harmonize with the colour of the surface when seen from below. Dr Weisniann has shown that most edible unprotected caterpillars imitate the stripes and shades of the leaves among which they feed. Those which live upon grasses arc longitudinally striped like the blades, those which live among small leaves are spotted and varied so as to resemble the distribution of light and shade in the bushes, and those which live upon large veined leaves with oblique ribs have oblique lines to harmonize with them. In some cases even the unripe berries are represented on the caterpillar by small reddish spots. A specialized form of this particular protcctive device is found in the chaineleon, the chameleon-shrimp, many flat-fish, and some amphibians, all of which can vary their coloration to suit that of the surface on which they rest. The action is reflex, and ceases if the animal is blinded.

Where the environment is very varied, as in tropical forests, we find the greatest variety of colouring as well as actual imitation of particular forms; and the protective resemblances become at once closer and more common. Birds, reptiles, spiders, monkeys, and other active predaceous creatures are constantly hunting for insects and similar small prey amongst the fallen sticks or leaves ; and among the most powerless classes of insects only those which very closely resemble specific objects in the environment can easily escape them. A gradual passage can be traced from the most general to the most special resemblances under sucl: circumstances. Many forestine birds have a ground-tone of green in their plumage, which occurs nowhere but in the tropics. Some tree-lizards are green like the leaves on which they sit, others are marbled to resemble the bark where they lie in wait for their prey. Arboreal snakes often hang like lianas or other ereepers. Insects which cling to the trunks of trees can seldom be distinguished from the bark. A Sumatran butterfly, Kallima paralecta, always settles on dry bushes among dead leaves, and cau then hardly be perceived ainong the brown foliage, which it imitates even in the apparent blotches and mildew with which its wings are covered. The family of Phasmidz, including the leaf and stick insects, carries such forms of imitation very far indeed. Most of them are large, soft, defenceless creatures; but some, like Phylliwm, closely resemble green leaves, so as to be almost indistinguishable while feeding ; and others exactly imitate short broken twigs of bamboo. Mr Wallace found one such insect, Ceroxylus laceratus, in Borneo,

apparently overgrown with a creeping moss or jungermannia ; and Mr Belt discovered a larval form in Nicaragna whose body was prolonged into thin green filaments, precisely like the moss In which it lurked. In other instances the insect probably uses its disguise rather to deceive its prey than to escape its enemies. Sir Joseph Hooker believes that an Indian Mantis deludes the little creatures which form its food by its singular likeness to a leaf ; while Sir Charles Dilke found one which had its head and fangs moulded into the deceptive appearance of an orchid, so that small flies were actually attracted in search of honey into its very Jaws. Outside the class of insects, similar phenomena sometimes occur. Thus, according to Mr Bates, many showy little tropical spiders double themselves up at the base of leaf stalks so as to resemble flower buds, and thus delude the flies on which they prey. Even among the vertebrates Mr Belt mentions a green Nicaraguan lizard looking like the herbage by which it is surrounded, and decked with leaf-like expansions, which hide its predaceous nature from passing beetles or butterflies.

These last instances are divided from true mimicry by a very narrow line. But they differ in the fact that some vague object only in the general environment is simulated, not a particular pro- tected species, as in genuiue mimetic resemblance. If we allow, however, that natural selection can produce the white colour of Arctic animals, and the sandy hue of the sole and the flounder, it is easy enough to extend the same principle to the leaf-insect and the stick-insect, or even to real mimicry, as in the case of the Leptalis and the Heliconidx. Certain Phasmide may at first have varied in the direction of green coloration, and these would naturally escape the eyes of birds more readily than their fellows. After the lapse of many generations, all the Phasmidz of that special group would have become green, and the birds which preyed upon them would have learned in many cases to penetrate the disguise ; for, as Mr Belt thas observed, each fresh deceptive resemblance in the prey is sure to be followed by increased keenness of discrimination in the enemies of the species. At this stage the ordinary green Phasmidex would often be killed, while only those which happened to approximate rudely in the venation of their wings to leaves would now escape the sharper and more experienced eyes of the birds.

‘Thus step by step the disguise would become more and more perfect, only the best-protected of each generation escaping on the average, while all the worse-protected would be dis- covered and devoured. Given the usual luxuriance of tropical life, it ig not difficult to understand how favourable variations might continu- ally occur, until at length we get such perfect deceptions as those of the leaf-insects, the stick-insects, and the moss-growu larve.

The phenomena of true mimicry may be explained by a parallel genesis. Suppose, to begin with, a group of large and brilliant butterflies like the South-American Heliconidx, protected by a nauseous taste and odour, and therefore never eaten by birds. To such insects slow flight and’ conspicuous hues are a positive protection, because they enable birds readily to discriminate them, and therefore prevent attacks, jnst as the banded body of the wasp and the hum of the bee prevent us from catching and killing them upon a window pane. Suppose, again, that in the same district there lives a widely different species of edible butterfly presenting some very slight and remote resemblance to the protected species. At first, no doubt, the resemblance will be merely an accidental one of general hue ; it may even be so slight as to deceive nobody except upon the most distant and casual glance. Now, suppose these edible butterflies to be devoured in large quantities by birds, then a few of them may happen to gain safety by associating with the flocks of inedible butterflies which the birds refuse. After a time, even if the habit of consortiug with the protected species becomes fixed in the race, the birds will begin to recognize the edible insects amongst the flocks, especially such as vary most in the opposite direction from the protected species. On the other hand, they will overlook such as vary most in the same direction as the inedible kind; and thus the least mimetic individuals will be destroyed, while the most mimetic will be left to pair with one another and to produce young, most of whom will present the like peculiarities. From generation to generation the birds will go on picking out every bad copy, and sparing all the best ones, till at last the two species become absolutely indistinguishable upon the wing. But the mimicry will never of course affect any but the most external and noticeable parts of the organism ; it will be to the last a mere matter of colour, shape of wing, visible appearance of legs or antenne, and so forth. The underlying

structural differences will remain as great as ever, though externally masked by the deceptive resemblance in form and hue.

In like manner we may explain the genesis of the mimetic resemblance borne by Volucella to the humble bee. Suppose an undisguised fly to enter the bees' nest, it would be at once attacked and killed. But if it presented some very slight resemblance to the bee it might manage to lay its eggs undisturbed, and its larve would then be able to feed quietly upon the larve of the bee. each new generation the more flimsy disguises would be more and nore readily detected, and only those flies which varied most in

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the direction of resembling the bees would survive or lay their eggs in peace. On the other hand, those which actually succeeded would possess great advantages over their neighbours, because their larvee would thus obtain a safe and certain supply of food, and be guaranteed the protection of the bees' nest. Iu this way the flies would at last, by constant survival of the best-adapted, come exactly to imitate the bees amongst which they lived.

The theory of the origin of mimetic forms thus briefly sketched out is due to Mr Bates and Mr Wallace, and it explains all the facts more fully thau any other. It shows us, first, why the mimicking organism always imitates a specially protected species ; secondly, why the two always inhabit the same district ; thirdly, why the mimicking species is always much rarer than the species mimicked ; fourthly, why the phenomenon is confined to a few groups only ; and fifthly, why several different mimicking species often imitate the same protected form. It also accounts for the absence of mimicry amongst large or dominant animals, and its comparative commonness amongst small and defenceless kinds. And by affiliating the whole of the phenomena upon the general principles of protective colouring it reduces a seemingly strange and marvellous fact to a particular case of a well-known law.

Whatever theory be adopted, however, the facts and most of their implications remain the same. For, whether we suppose these imitative

resemblances to be due to direct creative design or to survival of favourable variations, it is at least clear that the disguise subserves a function—that it is purposive and not accidental. Hence we may draw from the phenomena of mimicry certarn important psychological implications. On the hypothesis of evolution, it is obvious that the mimicry can never go further than the seuses of the creatures against whom the disguise is advantageous would naturally carry it; and even on the hypothesis of special design it is not likely that the imitation would be made more accurate than would be necessary for practical purposes of deception. here ig much evidence in favour of this view. Mr B. T. Lowne, for example, who has carefully measured the curvature of the facets in the compound eyes of insects, upon which depends the minimui size of apprehensible objects, finds that the mimicry in the case of the flies parasitic upon bees' nests has proceeded just so far as the structure of the bee's eye would lead us to expect, and nofurther. In other words, so far as measurements of angular distance subtended can guide us, such a fly seems to be absolutely indistinguishable by a bee from one of his own species, within the limits of ordinary vision. The pictures cast upon the sensorium by the fly and by a brother bee are simply identical. In many other cases it can be shown that the mimicry seems specially intended to deceive the eyes of a particular class of animals; while there is no case of mimicry where the only enemies or prey consist of plants or eyeless animals. Naturally there can be no mimicry without a creature to deceive ; the very conception implies an external nervous system to be acted upon, and to be acted upon deceptively. Thus mimicry in plants must have reference to the eyes of animals, in animals themselves to the eyes of one another. We may conclude, accord- ingly, that if a leaf-insect is green with faint violet-brown veins to the wings, exactly like a certain leaf, in order to deceive sundry tropical birds, then those birds are capable of perceiving the forms and colonrs imitated to that particular degree. So the presence of inimicry in any group may guide us to a rough idea of the perceptive powers of those creatures whom the mimicry serves to deceive. The exact imitation of sand and coloured pebbles in the flat-fish is a fairly safe indication that the predaceous fish by whose selection they have been developed (through the weeding out of ill-protected variations) can pretty accurately distinguish form and colour. Tho long green pipe fish which cling around green sea-weed have probably acquired their existing hues to deceive the eyes of small sharks ; the Phyllopteryx cques, a

hippocampus which looks pre- cisely like a piece of tangled and waving fucus (see figure, vol. Xl p- 852), has doubtless in the same way taken on its delusive like- ness to the alge among which it lives. So the cricket which resembles its foe the sand-wasp must have gained its present shape and hue by deceiving its enemy, and therefore it sug- gests the probability of highly developed vision on the part of the wasps. There seems every reason to believe that in many instances insects, spiders, and even lizards have developed mimetic or other deceptive resemblances in order to delude the eyes of in- sects; while in other cases the disguise has been unconsciously adopted to deceive fish, amphibians, reptiles, birds, and mammals. Moreover, we have some grounds for believing that the sense of colour is exceptionally strong in birds and in one or two insect orders ; and the mimicry of colour seems to have proceeded to the greatest length amongst animals which are most exposed to the attacks of these classes, or which would find it advantageous to deceive them. It may be added that these same classes have been most effective in producing the bright hues of flowers and fruits, on Mr Darwin's hypothesis, or are at least in any case most intimately correlated with such vegetable structures as fertilizers of blossoms and dispersers of seed. Mimicry is thus to some extent a rough gauge of the perceptive faculties of the species deceived by it.

MIM—MIN

The vocal mimicry which occurs among certain birds, such as the mocking-bird, starling, parrot, and bullfinch, must of course be placed in a wholly different category from these biological cases. It is a direct volitional result, and it is mimicry in a literal not in a figurative sense. The faculty seems to be due to the play-instinct alone, and not to subserve any directly useful function. (G. A.)

MIMNERMUS, a Greek elegiac poet, born at Smyrna, lived about 600 B.c. His life fell in the troubled time when the old Greek city of Smyrna was struggling to maintain itself against the rising power of the Lydian kings. One of the extant fragments of his poems refers to the struggle and contrasts the present effeminacy of his

countrymen with the bravery of those who had once |

defeated the Lydian king Gyges. The poet mentions in another fragment that he belonged to the stock of the Colophonians who had seized the Holic Smyrna. But his most important poems were a set of elegies addressed to a flute-player named Nanno; they were collected in two books called after her name. Hermesianax mentions his love for Nanno, and implies that it was unfortunate. Only a few fragments of these poems have been preserved; and their soft melancholy tone and delicate language give some idea of the poet's character. His ideal is the sweet soft luxurious Ionian life, and he would enjoy it free from sorrow and die as soon as he could no longer enjoy it. Yet there is apparent some of the old stronger strain of character which in early time raised the Ionian cities to greatness, pride in the glories of his race and scorn for those that are unworthy of their fathers' renown. His experience of life was evidently sad; he felt that his country was gradually yielding to the enemy it had once defeated, and he knew that his own hopes were disap- pointed. The sun himself has endless toils from rising to setting and again from setting to rising. The life of man is as transitory as the leaves of spring, he says, referring to a passage in the popular epic poetry of Ionia (Ziad, vi. 146). He wishes to die in his sixtieth year, a wish to which Solon replied bidding him reconsider and rather long to die when he was eighty years old. Mimnermus was the first to make the elegiac verse, which had pre- viously had more of the epic character, the vehicle for love- poetry, and to impart to it the colour of his own mind. He found the elegy devoted to objective themes ; he made it subjective. He set his own poems to the music of the flute, and the poet Hipponax says that he used the melan- choly véuos Kpadias. He bears the epithet Avyvaorddys, by which Solon addresses him. It is doubtful whether this epithet is peculiar to himself or whether it marks him as belonging to a musical and poetic family or school ; it is evidently akin to the epithet A'yecar Motcau.

MIMOSA. The Afimosex (so named from their mimicry of animal movements) form one of the three suborders of Leguminosx, and are characterized by their (usually small) regular flowers and valvate corolla. Their 28 genera and 1100 species are arranged by Baillon in four series, of which the acacias (see Acacta) and the true mimosas are the most important. They are distributed throughout almost all tropical and subtropical regions, the acacias preponderating in Australia and the true mimosas in America. The former are of considerable importance as sources

of timber, gum, and tannin, but the latter are of much less economic value, though a few, like the talh (IZ. ferruginea) of Arabia and Central Africa, are important trees. Most are herbs or undershrubs, but some South- American species are tall woody climbers. They are often prickly. The roots of some Brazilian species are poisonous, and that of WM. pudica, L., has irritating properties. J. sensitiva has been used in America in the treatment of fistula, &c., probably as an astringent. The mimosas, however, owe their interest and their extensive culti- vation, partly to the beauty of their usually bipinnate

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foliage, but still more to the remarkable development in some species of the sleep movements manifested to some extent by most of the pinnate Leguminose, as well as many other (especially seedling) plants. In the so-called "sensitive plants" these movements not only take place under the influence of light and darkness, but can be easily excited by mechanical and other stimuli. When stimu- lated, say at the axis of one of the secondary petioles, the leaflets move upwards on'each side until they meet, the movement being propagated centripetally. It may then be communicated to the leaflets of the other secondary petioles, which close (the petioles, too, converging), and thence to the main petiole, which sinks rapidly downwards towards the stem, the bending taking place at the pulvinus, or swollen base of the leafstalk. See Botany, vol. iv. p. 113, fig. 117. When shaken in any way, the leaves close and droop simultaneously, but if the agitation be continued, they reopen as if they had become accus- tomed to the shocks. The common sensitive plant of hot-houses is Af. pudica, L., a native of tropical America but now naturalized in corresponding latitudes of Asia and Africa ; but the hardly distinguishable J. sensitiva and others are also cultivated. The common wild sensitive plants of the United States are two species of the closely allied genus Schrankia.

MINDANAO, MINDORO. See Puitippine IsLanps,

MINDEN, the chief town of a district of the same name in Prussia, province of Westphalia, is situated about 22 miles to the west-south-west of Hanover, on the left bank of the Weser, which is spanned there by two bridges. The older parts of the town retain an old-fashioned appearance, with narrow

and crooked streets; the modern suburbs occupy the site of the former fortifications. The most interesting building is the Roman Catholic cathedral, the tower of which, dating from the 11th century, illustrates the first step in the growth of the Gothic spire in Germany. The nave was erected at the end of the 13th century, and the choir in 1377-79. Among the other chief edifices are the old church of St Martin; the town-house, with a Gothic facade ; the extensive court-house ; and the Govern- ment offices, constructed, like many of the other buildings, of a peculiar veined brown sandstone found in the district. Minden contains a gymnasium and several hospitals, besides other charitable institutions. Its industries include linen and cotton weaving, dyeing, calico printing, and the manufacture of tobacco, leather, lamps, chicory, and chemi- cals. There is also some activity in the building of small craft. In 1881 107 vessels of an aggregate burden of 12,569 tons entered and cleared the river-harbour of Minden. The population in 1880 was 17,869.

*Minden (Mindun, Mindo), apparently a trading place of some importance in the time of Charlemagne, was made the seat of a bishop by that monarch, and subsequently became a flonrishing member of the Hanseatic League. In the 18th century it was surrounded with a wall. Punished by military occupation and a fine for its reception of the Reformation in 1547, Minden underwent similar trials in the Thirty Years' War and the wars of the French occupa- tion. In 1648 the bishopric was converted into a secular principality under the elector of Brandenburg. From 1807 to 1814 Minden was included in the kingdom of Westphalia, and in the latter year it passed to Prussia. In 1816 the fortifications, which had been razed by Frederick the Great after the Seven Years' War, were restored and strengthened, and as a fortress of the second rank it remained the chief military place of Westphalia down to 1872, when the works were finally demolished. At Todtenhausen, 3 miles to the north of Minden, the allied English and German troops under the duke of Brunswick gained a decisive victory over the French in 1759. About 8 miles to the south of Minden is the so-called '*Porta Westfalica," a narrow and picturesque defile by which the Weser quits the mountains and reaches the plain.*

Minden is not to be confounded with the Hanoverian Miinden,

also sometimes written Minden (population 6355), at the confluence (Miindung) of the Werra and Fulda.

MINE. See Mininc. ey 1 ae

Definiti- tion of a mineral.

Amor- phous bodies.

Crystals.

ATURAL objects which are homogeneous in their mass, and in which no parts formed for special pur- poses can be distinguished, are termed " minerals"; and the branch of natural science which treats of these is termed mineralogy. Minerals differ from the structures treated of in botany and zoology in the three following par- ticulars. (1) They differ in the mode of their formation ; this has been accomplished, not by assimilation of matter, producing growth from within, but by augmentation of bulk through accretion of particles from without. (2) Minerals are not heterogeneous. While the objects treated of in the other departments of natural history consist of beings possessed of life, and having parts which, being mutually dependent, cannot be separated from one another without a more or less complete destruction of the individual, the objects treated of under the department of mineralogy have so uniformly consistent an individuality that they are not destroyed by any separation of parts,—each portion or fragment possessing the composition as the whole. And (3), while those beings which are possessed of life have their component elements grouped into complexes, for the most part capable of more or less freedom of motion and susceptible of change, minerals have a constitution resulting from chemical attrac- tions alone and an arrangement of their parts, under physical influences, which has resulted in rigidity and an absence of all tendency to change.

Form oF MINERALS—CRYSTALLOGRAPHY.

The most precise definition of a mineral would be—an inorganic body possessed of a definite chemical composition, and usually of a regular geometric form. Of these, the second is in one respect the direct outcome of the first ; while many of the most important physical properties pos- sessed by minerals are outcomes of the second.

"Both the geometric form and the composition of minerals are produced and modified under the influence of general laws.

Mineral bodies occur in the three physical conditions of solid, liquid, and gas. Those now found in the last two states are few in number, and are of altogether inferior interest to those which occur as solids; but there is reason to believe that the minerals we know as solids once existed in the liquid or gaseous state, and that their pre- sent structure was determined in the process of solidifica- tion. All bodies thus formed may be divided into two great classes :—

1. Amorphous bodies, or such as do not possess a de- finite and characteristic geometrical form. These (when transparent) refract light singly in every direction (except when under stress); they are equally easy or equally diffi- cult to break in all directions ; when broken they exhibit a conchoidal or an earthy fracture; they are equally hard throughout all their parts; they are equally elastic in all directions ; they conduct heat with equal rapidity and in equal amount in all directions.

2. Crystalline bodies, or such as occur in definite geo- metrical forms bounded by flat surfaces. These present greater facilities of separation of their particles, or " cleav- age," in certain directions lying in determinate planes than they do in others; most of them are neither equally hard nor equally elastic in all directions, conduct heat more rapidly in certain directions than they do in others, and, when transparent, refract light doubly except in certain directions.

and the same mineral body may occur in both the amorphous and the crystalline condition. This is seen in

has a sharply angular and a

same properties and the same | talline form.

over a yard in diameter to mere specks power have been obtained in America more than 4 feet in length by 24 crystals of apatite have rock crystal at Milan 3} feet long by 54 in circumference,

be ten or more times as great as the width

Mineral ‘bodies are found in both of the above classes ;

the piece of gold shown in fig. 1, where the upper portion

well-defined shape, while the lower presents curvilinear and rugged outlines, similar to one another in no part. Under favouring circumstances, it is possible that every substance whose composition is capable of being represented by a definite chemical formula— i.e, Which has an unvarying composition—may be capable of assuming a definite crys-

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Size and Form of Crystals.—They are of every size from Size of requiring a high crystals. of the microscope to reveal their existence. Beryls Equally large

in thickness, weighing 24 tons. There is a

been found in Canada.

weighing 870 ib. The highest perfection of form, and hence of other properties, is only found, however, in crystals of moderate or of small size.

Variety of Form, and Constancy of Form.—The same Variety mineral may be found in different localities, or sometimes of form. in thé same locality, exhibiting an almost endless variety © of forms. Calc-spar occurs at a Scottish locality in acicu- lar pyramidal crystals of which the length ‘Ge

fig. 2); in flat plates as thin as paper, in which the length is not the hundredth part of the width ; also in prisms, pyramids, and rhombohedra, which at first sight (as in figs. 3, 4) seem

Fig. 4.

destitute of any relationship to each other. This substance has elsewhere been noted in several hundred forms. The minerals fluorite, pyrite, and baryte have each been observed in over a hundred diverse forms. Nevertheless, however great the number, all the forms, in the case of

Fig. 2. each mineral, may be reduced or referred to a single type, Relation by the simple process of examining its internal structure to parent

or the mode of arrangement of its molecules. This is form-

Invaria- bility of angles.

Proper- ties and parts of crystals.

Tnterfer- ences.

Axes,

MoPrNsE RA-LOG Y

accomplished in two ways—(1) by finding the weak joints in that arrangement, through splitting the crystal, and (2) by measuring the angular inclination of. the outside surfaces which bound the form and, from these measure- ments, by simple mathematical laws, arriving at what has been termed its "primitive" or simplest form.

As regards the mere recognition of a substance, such measurement in itself suffices,—the angular inclination, if the same surfaces be measured, being unvarying in each species. It can, moreover, be shown that the possible range of external variety of form is governed by fixed mathematical laws, which determine precisely what crys- talline forms are or may be produced for each species. Comparatively few of these actually occur in nature; but crystallographic laws can point out the range of those which can possibly occur, can delineate them even before they are found, and can in all cases show the relationship which subsists between them and the simple or fundamental form from which or out of which they all originate. It must be

observed that in crystalline bodies the internal structure—that is, the arrangement of the molecules— is as regular in an outwardly shapeless mass as in the modelled crystal which presents itself as a perfect whole.

Definitions of Crystals, and their Members or Parts. —A crystal is a symmetrical solid, either opaque or transparent, contained within surfaces which theoretically are flat, and of a perfect polish, but which are actually frequently curved, striated, or pitted. These surfaces are called "planes," or "faces." The external planes of a crystal are called its "natural planes"; the flat surfaces obtained by splitting a crystal are called its "cleavage planes." The intersections of the bounding planes are called '" edges," and planes are said to be similar when their corresponding edges are proportional and their corresponding angles equal. Crystals bounded by equal and similar faces are termed "simple forms." The cube, bounded by six equal squares, the octahedron, bounded by eight equilateral triangles, and the rhombohedron, bounded by six equal rhombs, are thus simple forms. Crystals of which the faces are not all equal and similar are termed compound forms, or "combinations," being regarded as produced by the union or combination of two or more simple forms. Edges are termed rectangular, obtuse, or acute, according as the angle at which the faces which form the edge meet is equal to, or greater or less than, aright angle. Edges are similar when the planes by the intersection of which they are formed are respectively equal and equally inclined to one another ; otherwise they are unlike or dissimilar.

When a figure is bounded by only one set of planes, it is said to be "developed." When an edge is cut off by a new plane, it is said to be "replaced"; when cut off by a plane which forms an equal angle with each of the original faces which formed the edge, it is said to be "truncated." When an edge is cut off by two new faces equally inclined to the two original faces respectively, it is said to be "bevelled." When a solid angle is cut off by a new face which forms equal angles with all the faces which went to form the solid angle, it is said to be truncated.

In classifying crystals and studying their properties, it is found convenient to introduce certain imaginary lines called "axes." Axes are imaginary lines connecting points in the crystal which are diametrically opposite,—

such as the centres of opposite faces, the apices of opposite solid angles, the centres of opposite edges. Different sets of axes may thus be drawn through the same crystal; but there is always one set, usually of three, but in one special class of crystals of four, axes, by reference to which the geometrical and physical properties of a crystal can be most simply explained. These axes intersect one another, either at right angles, producing " orthometric" forms, or

at oblique angles, producing "clinometric" forms. The axes may be all equal, or only two equal, or all unequal.

There is a definite conventional position in which for purposes of description a crystal is always supposed to be held. With reference to this position one of the axes,— that which is erect or most erect,—is termed the " verti- cal," and the others the "lateral." The planes in which any two of the axes lie are called the "axial" or "diametral planes,"—sometimes "sections." By these the space around the centre is divided into "sectants." If there are, as is generally the case, only two lateral axes, the space is divided into eight sectants, or octants ; but, if there are three lateral axes, it is divided into twelve sectants.

Primitive Forms of Crystals.—If we attempt to arrive, through a study of the internal structure of crystals, as evidenced by directions of weakness of cohesion, at the total number of primitive or parent forms which can exist, we find that there are thirteen such forms and no more.

Nine of these may be regarded as prisms standing upon a base, three as octahedra standing upon a solid angle ; and there is one twelve-sided figure, or dodecahedron.

Prisms. —Of the prisms eight have a four-sided base

If the base is square and the prism stands erect—that is, if its sides or lateral planes, as they are called, are perpendicular to the base—the form is termed.a "right square prism" (fig. 6). In this the four lateral planes are rectangular and equal; they may be either oblong or square; in the latter

case the form is the “ cube ” (fig. 5). When the base is a rectangle instead of a square, the form is a “‘right rectangular prism” (fig. 7). In each of the

Bigs 5. Fig. 7.

above three forms the edges are twelve in number. In the cube all the edges are equal. In the square prism the lateral edges are all equal, but are different from the four equal edges of the base. In the rectangular prism, two at each base differ in length from the other two, while both differ from the lateral; hence there are here three sets of edges, four in each. In each of the three forms, however, the solid angles are eight in number, all equal, and each enclosed by three right angles.

When the base isa rhombus, and the prism stands erect, the form is a “right rhombic prism” (fig. 8). Two of the angles in the base being here acute andtwo . obtuse, two of the solid angles corresponding each with each must differ from the others. So also must two of the lateral angles be acute and two obtuse. The four lateral faces are equal.

When the base is a

Fig. 8. rhomboid, and the prism stands erect, it is only the opposite

Fig. 9.

lateral faces that can be equal. rhomboidal prism” (fig. 9).

When the base is a rhombus, but the prism stands obliquely on its base, the form is called an “ oblique rhombic prism” (fig. 10). Here the basal edges of the lateral planes are all equal in length, but on account of the inclination of the prism the angles which these edges form with the lateral edges of the lateral planes are two acute and two obtuse.

The form is called a “right

Fig 10. Fig. 12. If all the edges of an oblique rhombic prism are equal in length to the breadth of the base, and if the lateral planes are rhombi

equal in all respects to the basal, the form is called a“rhombo-

Big ii:

hedron ” (fig. 11). This is included within six equal planes, like

- *Pesi= tioning ”’ of crys- tals.*

Primi- tive forms.

Prisms.

above primary or simple forms. Thus the mineral fluorite occurs with much the greatest frequency in the form of the cube, and it might very consistently be held that its frequent occurrence in this form was a clear natural ‘ndication that the cube was the primary or simplest form of fluorite; but it splits up into an octahedron. Galena crystallizes frequently in the form of the octahedron ; yet to cleavage galena yields a cubic primary form. It might be conceived that there had been, in each case, some special tendency to assume the cubic form and the octa- hedral form; but one and the same piece of rock may bear on its surface cubic erystals of fluor and octahedral crystals of galena,—each of the minerals having here assumed the primitive cleavage form of the other in pre- ference to its own. ‘The mineral blende crystallizes not unfrequently in octahedra, which yield the dodecahedron on cleavage. Fluor crystallizes in dodecahedra, yet yields the octahedron to cleavage. Argyrite crystallizes in cubes and in octahedra, but yields the dodecahedron on cleavage. Pyrite crystallizes in cubes, octahedra, and dodecahedra, and yields both the cube and the octahedron on cleavage.

These are most embarrassing results, but they clearly indicate so intimate a relationship to subsist between three of the above simple forms that it is obvious that one alone would serve as a type form for representing the others. The selection of that one should be based upon grounds of most eminent simplicity, and this again is to be arrived at by a consideration of the smallness of number of parts, i.e., of faces, edges, and solid angles. Tn such a considera- tion we find that the dodecahedron, with its higher number of each of these, at once gives place. The cube has six faces, the

octahedron eight ; simplicity here is in favour of the cube. The cube has twelve edges, the octahedron has twelve; in this respect they are equal. The cube has eight solid angles, the octahedron six; here the greater simplicity is on the side of the octahedron. So that this method of adjudicating by simplicity fails, and we. are thrown back upon the relationships which may be unfolded through a consideration of the other elements of crystals,— their axes.

Systems of Crystals and Laws of Crystallization.

This consideration led, first, to the remarkable discovery Relation that several of the above primary forms are mere modifica- of faces tions of each other, and ultimately showed that all crystals t° 2€- found in nature may be referred to six systems, based on certain relations of their axes, and that every face which could occur upon a crystal bears a definite and simple relation, in position and in angular inclination, to these axes, A*

As regards mere geometric measurement, there are several direc- Axes di- tions in which axes may with nearly equal advantage be projected. rections For example, in the eube of domi- (fig. 19) they may be drawn nant ac- from the centres of opposite cretion. faces, as lettered O; or from opposite solid angles, as lettered C; or from the centres of opposite edges, as lettered D. There is abundance of evidence that

the cube, but these planes have oblique angles. The rhombo- hedron thus bears the same relation to the oblique rhombic prism which the cube does to the right square prism. Of the eight solid angles of a rhombohedron only two are contained by three equal plane angles, and these two "apices," as they may be called, are opposite one another. According as the apices are acute or obtuse, we have an acute or obtuse rhombohedron. :

When the base of an oblique prism is a rhomboid, the prism becomes an " oblique rhomboidal prism" (fig. 12). In this form, only diagonally opposite edges are similar, as regards equality of length and the value of the included angle. Only opposite solid angles are equal, as are also the opposite and parallel faces. —

A right prism may have an equilateral six-sided base ; it is then called an "hexagonal prism." This form may be developed in two positions relatively to each other, —one in which the transverse axes pass from the centres of opposite faces (fig. 13), the other in which they pass from the centres of opposite edges of the planes (fig. 14). The faces of the one set mutually truncate the edges of the other. If a rhombo- hedron be positioned so as to rest upon one of its apices, the faces of one hexagonal prism would truncate the lateral ; ; edges of the rhombohedron, Fig. 18. Fig. 14. while the faces of the other hexagonal prism would truncate its lateral solid angles. Hexagonal prisms may be longer or shorter than the width of their bases. The interfacial lateral angles are 120°. The angle between the lateral and terminal faces is 90°.

Octa- Octahedra.—The planes of these eight-faced solids are triangular,

hedra. and they may be regarded as made up of two four-sided pyramids applied to each other, base to base. They are always positioned so that they stand upon a solid angle with the '"basal plane "—that is, the plane which is the common base of the two pyramids—hori- zontal. In the primitive forms now under consideration the ver- tices of the two pyramids will in this position be vertically above and below the centre of the base. The upper and lower solid angles are then termed the "vertical solid angles," and the four lateral solid angles are called the basal solid angles.

There are three octahedrons. In the "regular" octahedron (fig. 15) the base is a square, and the eight faces are equilateral triangles of equal size. There are twelve edges, which are all equal. The faces incline to cach other at an angle of 109° 28' 16", and have the plane angles all 60°. 'There are six equal solid angles. When the base of the octahedron is square, but the other edges, although

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Fig. 15, Fig. 16. Fig. 17. equal to one another, are either longer or shorter than the edges of the base, the form is a “right square octahedron ” (fig. 16). In this the faces are isosceles triangles, the equal angles being at the basal edge of the planes. These basal edges are equal and similar, but differ in length and in angles from the eight equal pyramidal edges. When the. base of an octahedron is a rhombus, it is called a ‘right rhombic octahedron” (fig. 17).

Dodeca- Dodecahedron.—This (fig. 18) has each of its

hedron. twelve faces a rhombus. It is, like the cube and the octahedron, a solid which is symmetrical. The interfacial angles are all 120°, the plane angles are 109° 28’ 16" and 70° 31’ 44”. The cdges : are twenty-four, and similar. There are fourteen Fig. 18. solid angles, of which six are formed each by the meeting of four acute plane angles, and eight by the meeting of three obtuse plane

angles. each of these directions : c ke must be regarded as li Deter- Tt has been said that the above simple forms were arrived | of Somme siaiitian ak

molecules.

But the accretion may be not only dominant but overwhelmingly so in one only of these directions in aaardeat ee Fic. 19.—Position of three sets of axes. in certain others. In a specimen of native silver from Alva in Scotland (fig. 20), along O this is so much the case that the con- creting molecules have done little more than delineate the form of an octahedron, and this they have only been able to do by

mination at through a study of the internal structure of crystals, igs chiefly as disclosed by cleavage. Inasmuch, however, as – there are some minerals which cleave in only one direction,

and many which cannot be cleaved in any direction, this method of investigation fails. Its employment, moreover, frequently led to conflicting or embarrassing results. A conflicting result is when a substance has more than one

set of cleavages,—that is, splits up in directions which

would result in the production of more than one of the

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aggregating themselves in lines of minute crystals of the very shape of which they were projecting the skeleton form. More- over, a polar aggregation at the terminal ends of these octahedral

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found that they all here stand in a definite position one to the other; that definite position is the relation which they bear to one of the sets of axes, and this set may be assigned, not only to all

axes is here shown by the amount of concreting and crystallizing | the three crystals here combined, but also to all the crystals be-

longing to the same mineral, wherever occurring. This general applicability constitutes one of the respects in which one special set of axes is, in each of the systems, preferred to the others.

Fig. 24.

_ Another respect is the intensity with which the molecules cohere Coher- in the different parts of the crystal, as referred to these axes, and ence of

Fig. 25.

the resultant different hardness of certa It particles will be afterwards found that this obtains in a very limited not equal manner in the crystals which belong to the first of the follow- in all di- ing systems, on account of its regularity and sameness as a whole. rections.

in parts of crystals,

Fig. 20.

material being larger at the terminations of these axes than else- where. In the hollow-faced cube again (fig. 21), an aggregation of molecules in the direction of the lines D and C has filled the edges and solid angles, while none have been deposited along O.

Fig. 21.

Fig. 22.

This occurs in crystals of salt. In the hollow-faced octahedron, again (fig. 22), there has been no deposition of matter along the line C. Cuprite often shows this form; and it as frequently occurs in hollow-faced dodecahedra, wherein the vacuity is in the direc- tion of D.

In the specimen of pyrite from Elba (fig. 23), a deposition along D and C would ultimately have erected the scaffolding of a hollow cube, in twelve lines of minute combinations of the cube and

octahedron. Such directional LYITITYD) Pye arrangements may, moreover, (% re } LL] ne PT not ale be intermittent but NOXO\O\S\8\ 8 7

often alternate. The pyrite from Traversella (fig. 24) is an illustration of the first. A large pentagonal dodecahedron hav- ing been completed, a new ac- cession of material has been attached, not uniformly spread over the pre- existent crystal, to enlarge it, but locally ar- ranged, in equal amount, at : the poles of But here the Fig. 28.

special method of the arrangement has determined the formation of a number of small crystals of the same form as that originally projected.

Aun alternation, as it were, in plan is shown in such a crystal of calcite as that in fig. 25. Here a scalenohedron is seen in the centre of the figure; then a rhombohedron has been perched upon its summit, and lastly both have

been sheathed ina six-sided prism with trihedral summits. Different as these three forms are, it is

It may be laid down as a general rule that the edges of crystals are harder than the centres of their faces, and the solid angles harder than the edges. This is markedly the case in the diamond. But, apart from this, there is no distinctive hardness in ally one part, side, or end of the crystals of the first system. It is otherwise with the crystals which fall to be considered in all the other systems. So different is the hardness of the various portions of these, so diverse the appearance of their parts in lustre, colour, polish, &c., so varying the amount of the recoil of these when struck, so unequal their power of conducting heat, so dissimilar their power of re- sisting the agencies of decay, and so irreconcilable their action upon transmitted light, that we cannot but conclude that the molecules which build them up are packed with greater force, if not in greater number, in certain directions in preference to others. There thus remains no question that these nature-indicated sets of axes are those along which there has been a specially selective or '" polar" arrangement.

The six systems are founded upon the relationships of Systems of the axes in number, in length, and in angular inclination. crystals.

All crystals may be divided into "orthometric" or erect forms and "clinometric" or inclined forms; and in similar manner may the systems be, through a consideration of the relative lengths of their axes, divided into three classes. In the first, or most regular, of these the axes are all equal, that is, they are of one length ; in the second there is one axis which differs in length from the others, and therefore they are of two lengths; while in the third the axes are all unequal, and therefore they are of three lengths. Of the six systems one belongs to the first class, two to the second, and three to the third. Hence they are thus

classed :— Monometric. Dimetric. Trimetrie. Cubic. Tetragonal. Right Prismatic. Hexagonal. Oblique Prisnuatic.

Anorthic.

Though the grouping of the systems into three classes in virtue of axial dimensions is markedly borne out by optical and other properties, yet it is altogether insufficient for determining the relationships of the myriad forms in which bodies crystallize. Such knowledge is only attained by combining the consideration of axial length with axial inclination ; and it is through a due regard of both of these that the six systems are instituted.

The above table may be read in two different ways,— either across or consecutively up and down the page. The six systems may be treated of in either of these ways;

Unique axis made vertical.

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and there are certain advantages in considering them at least first by the former method.

We consider first, as the more essential, the relative lengths of the axes, and, secondly, the angular inclination of these.

1. In the cubic system the axes are all equal, and all intersect at right angles. Here is the most perfect sim- plicity, and the most perfect regularity.

9. In the tetragonal system two only of the axes are equal ; but all still intersect at right angles. Here is a departure from simplicity as regards the length of one axis, but no departure as regards the angular inclination.

3. In the right prismatic system none of the axes are equal, but all still intersect at right angles. Here is total loss of regularity in the first particular, but still none in the second.

4, In the oblique prismatic system none of equal, and only two intersect at right angles. is again a total loss of simplicity in the first particular, a certain amount of departure from it in the second.

5. In the anorthic system none of the axes are equal, and none of them intersect at right angles,—so that here, as expressed by the name, there is a

total departure from regularity in both particulars.

6. The hexagonal system is anomalous in relation to this mode of consideration. It is regarded as having four axes, three of which lie in one plane, parallel to the base, and intersect each other at equal angles

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(necessarily angles of 60°). The fourth axis intersects these at right angles, and may be longer, shorter, or equal to them. This system is generally considered after the tetragonal system, as having one axis which differs in length from the others, and only one which cuts the others at right angles. By some a rhombohedron is con- sidered as the primary of this system; it then comes to have three axes, all equal, but none intersecting at right angles.

In considering these sys- tems, or in describing the form of a crystal, the vertical or erect axis is named the principal axis of the figure, and that axis is chosen as the vertical which is the only one of its kind. In the cubic system there is no such axis, so that any one may be chosen as the vertical.

It will be convenient, before proceeding to the considera-

the axes are Here there and

Fig. 26.

Fig. 28.

Fig. 30.

of forms,—especially in view of the terminology that must be employed in illustrating those general aspects of the subject,—to give an outline of one of the six systems here. For this preliminary description the cubic system, as the simplest and most regular, naturally suggests itself as the most suitable.

L. The Cubic System.—Here the axes are all equal, and Cubic all intersect at right angles. The "cube" (fig. 26), "octa- system.

hedron" (fig. 30), and "rhombic dodecahedron" (fig. 33), which are here included, are alike in their perfect symmetry; the height, length, and breadth are equal; and their axes are equal, and are rectangular in their intersections.

In the cube (fig. 5) these axes connect the centres of opposite faces; in the octahedron (fig. 15) the apices of opposite solid angles; in the dodecahedron (fig. 18) the apices of opposite acute solid angles.

will be made manifest through a consideration of the transi- tion between the forms. If a cube be projected with the axes in the above position, or if a model of it in any sectile material be employed, and if the eight angles are sliced off evenly, keeping the planes thus formed equally inclined to the original faces, we first obtain the form in fig. 27, then that in fig. 28 and fig. 29, and finally a regular octahedron (fig. 30); and the last disappearing point of each face of the cube is the apex of each solid angle of the octahedron. Hence the axes of the former, being in no way displaced, necessarily connect the apices of the solid angles of the latter. By cutting off as evenly the twelve edges of another cube, the knife being equally inclined to the faces, we have the form in fig. 31, then fig. 32, and finally the rhombic dodecahedron (fig. 33), with the axes of the cube connecting the acute angles of the new form. These forms are thus mutually derivable. Moreover, they are often pre- sented by the same mineral species, as is exemplified in galena, pyrites, and the dia- mond.

The process may be re- versed, and the cube made from the octahedron, as will be readily understood from a comparison, in reverse order, of figs. 26 to 30. Or the cube may be similarly derived from the dodecahedron, as seen by inspecting figs. 33, 32, 31, 26. /

The octahedron also is ¢ changed to a rhombic dodeca- \ hedron by removing its twelve edges (figs. 34, 35), and con- tinuing the removal till the original faces are obliterated, thus producing the dodeca- hedron.

It will be observed that throughout all these changes the position of the axes, as determinants of dimensions, need not be altered,—that, in fact, one set of axes has served for all the forms. .

The relationships of the principal forms of this system being thus disclosed, the forms themselves have next to be

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Fig. 33.

tion of the laws of crystallography and the combinations | considered.

The relation of these Relations — forms to each other, and the correspondence in their axes, of simple

orms.

Parts of the cube.

Octa- ; : sidered form. The edges are twelve longer, corresponding hedron. triangles, has twelve equal edges with planes meeting at | with those of the inscribed octahedron, and twenty-four 109° 28’ 16”, and six tetragonal angles. The principal | shorter, three and three over each of the faces, The angles axes join the opposite solid angles. Examples: magnetite, | are eight trigonal and six ditetragonal (formed by eight gold, cuprite. : faces), the latter angles joined two and two by the principal Dodeca- | The rhombic dodecahedron (fig. 33) is bounded by twelve | axes. Examples: galena, diamond. hedron. equal and similar rhombi, has twenty-four equal edges of The icositetrahedrons (fig. 40) are bounded by twenty- qcosi- 120°, and has six tetragonal and eight trigonal angles. | four deltoids. This form varies from the octahedron to tetra- Each of the principal axes joins two opposite tetragonal | the cube, sometimes approaching the former and sometimes bedron. angles. Examples: garnet, cuprite, blende. the latter in general aspect. A four-sided pyramid rests Tetrakis- The tetrakishexahedrons (figs. 36, 37, 38, varieties of | on the angles of the faces of the cube. When increased hexa- icositetrahedron) are bounded by twenty-four isosceles | accretion takes place along the cubic axes, an octahedron hedron. triangles,

placed so as to form four-sided pyramids on the | results, When it is along lines joining the solid angles faces of the cube, arranged in of the cube, that form itself results. The edges are twenty- six groups of four each. They four longer and twenty-four shorter. The solid angles are have twelve longer edges, which six tetragonal joined by the principal axes, eight trigonal, correspond to those of the pri- and twelve rhombic or tetragonal with unequal angles. mitive or inscribed cube, and Examples: analcime, garnet. twenty-four shorter edges placed The hexakisoctahedrons (fig. 41), bounded by forty-eight Hexakis- over each of its faces. The scalene triangles, vary much in general aspect, approaching octa- angles are eight hexagonal and more or less to all the preceding forms, into all of which bed? six tetragonal, the latter joined they may pass; but most frequently they have the faces two and two by the principal arranged either in six groups axes. Examples: fluorite, gold. of eight on the faces of the This form varies much in general cube, or eight of six on the aspect. The four-sided pyra- faces of the octahedron, or mid which rests on the edges twelve of four on the faces of of each face of the cube may be the dodecahedron. There are so low as almost to fall into it twenty-four long edges, often (fig. 36) ; or it may rise so high corresponding to those of the that each side forms a level rhombic dodecahedron or bi- surface with that which is ad- secting the long diagonal of jacent to it upon the nearest the trapezohedron, twenty-four cubic face (fig. 38). In the intermediate edges lying in Wie ii latter case the form has become pairs over each edge of the staid the rhombic dodecahedron ; so inscribed octahedron, and twenty-four short edges in pairs that the more or less acute over the edges of the inscribed cube. There are six dite- varieties of the form are but tragonal angles joined by the principal axes, eight hexa- stages of a passage of the cube gonal, and twelve rhombic angles. Examples: diamond, into the latter figure, through fluorite. an increasing accretion of matter General Laws of Crystallography.—The seven forms of Laws of in the lines of the axes of the crystals now described are related to each other in the crystallo- cube. This is termed a " tran- most intimate manner. This will appear more distinctly 8™@P»Y- sition by increment." from the account which is to follow of the mode of deriva- Triakis- | The triakisoctahedrons, fig. 39 tion of the forms, with which is conjoined an explana- 7. (variety of icositetrahedron, tion of the crystallographic signs or symbols by which

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The cube (fig. 26) is bounded by six equal squares, has | the octahedron on one side to the rhombic dodecahedron

twelve edges formed by faces meeting at 90°, and eight solid trigonal angles. The axes are taken as joining the centres of each two opposite faces. Examples are hallite, galena, and fluor.

Fig. 34.

The octahedron (fig. 30), bounded by eight equilateral

fig. 40), are bounded by twenty- four isosceles triangles, in eight

Fig. 38.

on the other; while the increased accretion here is in the direction of lines joining the centres of the faces of the octahedron or the solid angles of the cube. The passage of the forms is similar to that illustrated: in the last-con-

they are designated. These symbols were introduced by Naumann, in the belief that they not only mark the forms

groups of three, arranged as pyramids on the edges of | in a greatly abbreviated manner, but also exhibit the

the faces of the octahedron. Like the previous form

they vary in general aspect, the variation here being from | words could hardly accomplish.

relations of the forms and combinations in a way which In order to follow out this

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derivation of forms, it is necessary to state briefly the following laws, which have been established in crystallo- graphy. It is to be remembered that these laws apply, not merely to the cubic system just described, but to all the systems. Invari- 1. The Law of the Invariability of the Angles of Crystals, ability of which was established by Romé de l'Isle, may be thus angles. stated :—the angles of inclination of the faces of a crystal are constant, however unequally the faces may be developed. The corresponding angles of different crystalline specimens of the same body do not, however, always absolutely agree, Differences have been found, amounting sometimes even to 10'.

9. The Law of Symmetry, discovered by Haiiy, may be thus expressed ;—(1) similar parts of erystals—faces, edges, angles, and consequently axes—are all modified in the same manner, and dissimilar parts are modified separately or differently; (2) the modifications produce the same effect on the faces or edges which form the modified part, when they are equal ; when they are not equal, they produce a different effect, That is, if an edge be truncated or bevelled, every similar edge will be similarly truncated or bevelled; if an angle be truncated or acuminated, every similar angle will be similarly truncated or acuminated ; and consequently every similar axis will be equally affected by the modifications. Thus the cube has eight similar angles and twelve similar edges. In the physical produc- tion of the cube, if one of the angles or edges be modified, all will be similarly modified. This, which is the most important law of crystallography, is, however, subject to an exception which was fully formulated by Weiss. The law was—all the similar parts of crystals, faces, edges, angles, and consequently axes, are modified at the same time and in the same manner; the forms resulting from this law are termed "holohedral." The exception is that half of them or one-fourth of them only may be similarly modified, When only half of the similar parts are modi- fied, we get the "hemihedral" forms ; when one-fourth only are modified, which occurs only rarely, we get "tetartohedral" forms.

Symme- try.

Parallele 3. The Law of the Parallelism of the Faces of a Crystal,

ism of discovered by Romé de l'Isle, may be expressed as

faces. follows :—every face of a crystal has a similar face parallel to it; or every figure is bounded by pairs of parallel faces (with the exception of certain hemihedral forms).

Zones. 4, The Law of Zones, first established by Weiss, may be thus enunciated :—the lines in which several faces of a crystal intersect each other (or would do so if they were produced until they met) frequently form a system of parallels, Such a series of faces is termed a " zone." Sometimes the zones are parallel to one of the symmetrical axes. Thus, in every prism, the faces of the prism con- stitute a zone which encircles the axis of the prism. Faces may be in a zone although they do not actually intersect on the form.

Ration. 5. The Law of the Rationality of the Parameters of the

oe a faces of crystalline series, first indicated by Malus, is that

—. – the position of planes may be assigned by numbers bearing

some simple ratio to the relative lengths of the axes of the crystal. This law was the outcome of investigations into the relationship of forms glanced at in commencing the consideration of the cubic system, and was arrived at through the study of the mode of derivation of forms. Deriva-

tion of forms.

The derivation of forms is that process by which, from one form chosen for the purpose, and considered as the type,—the funda- mental or primary form,—all the other forms of a system may be produced, according to fixed principles or general laws. In order to understand this process or method of derivation, it must be noted that the position of any plane is fixed when the position of any three points in it, not all in one straight line, is known. To deter- mine the position, therefore, of the face of a crystal, it is only

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necessary to know the distance of three points in it from the centre of the crystal, which is the point in which the axes intersect each other. As the

planes of all crystals are referred to their axes, the points in which the face (or its supposed extension) meets the three axes of the crystal are chosen, and the portions of the axes between these points and the centre are named parameters of the face ; and Para- the position of the face is sufficiently known when the relative meters. length or proportion of these parameters is ascertained. When the position of one face of a simple form is thus fixed or described, all the other faces of the form are in like manner fixed in accordance with law 2, since they are all equal and similar, and have equal parameters—that is, intersect the axis in the same proportions. Hence the expression which marks or describes one face marks and describes the whole figure, with all its faces. The octahedron is adopted as the primary or fundamental form of the cubic system, and distinguished by the first letter of the name, O. Its faces cut the half-axes at equal distances from the centre; so that these semiaxes, the parameters of the faces, have to each other the proportion 1:1:1. In order to derive the other forms from the octahedron, the following construction is employed. Suppose a plane to be laid down perpendicular to one axis, and Propor- consequently parallel to the two other axes (or to cut them at an in- tion of finite distance, expressed by ©, the sign of infinity); then the para- hexahedron or cube is produced, designated by the crystallographic meters sign oOco,—expressing the proportion of the parameters of its expressed faces, or 0: 1:0. Ifa plane is supposed placed on each edge, by parallel to one axis, and cutting the two other axes at equal dis- symbols. tances, the resulting figure is the rhombic dodecahedron, designated Notation by the sign 0, the proportion of the parameters of its faces being of Nau- co:1:1. The triakisoctahedron arises when, on each edge of the mann. octahedron, planes are placed cutting the axis not belonging to that edge at a distance from the centre m, which is a rational number greater than 1. The proportion of its parameters is therefore m:1: 1, and its sign mO; the most common varieties are $0, 20, and 30, secn in diamond and fluorite. When, on the other hand, from a similar distance m in each two semiaxes prolonged a plane isdrawn to the other semiaxis, or to each angle, an jcositetrahedron is formed ; the parameters of its faces have consequently the pro- portion m:m:1, and its sign is mOm ; the most common varieties are 202 and 303,—the former very frequent in leucite, analcime, and garnet, the latter in gold and amalgam. When, again, planes are drawn from each angle, or the end of one semiaxis of the octa- hedron, parallel to a second axis, and cutting the

third at a distance n, greater than 1, then the tetrakishexahedron is formed; the para- moter of itsfacesis o: 2:1; its sign is On; and the most com- mon varieties in nature are 00%, 002, and «03. Finally, if in each semiaxis of the octahedron two distances and 7 be taken, each greater than 1, and m also greater than , and planes be drawn from each angle.to these points, so that the two planes lying over each edge cut the second semiaxis belonging to that edge at the smaller distance m, and the third axis at the greater distance m, then the hexakisoctahedron is produced; the parameters are m:n: 1, its sign mOn, and the most common varieties 803, 402, and 508, scen in diamond and fluorite. It must be observed that the numbers in the above signs refer to the parameters of the faces, —not to the axes of the crystal, which are always equal. One parameter also has always been, in the above, assumed —1, and then, either one only of the two other para- meters, marked by the number before O, or both of them, marked by the numbers before and after O, have been changed. In the above consideration of the mode of derivation of these forms actually found in nature, which belong to the cubic system, it will be observed (though the illustrations were limited) that the value of m and n in these indicated, by the precision of the propor- tions 3, 2, or 3, a definite numerical relationship. This at once led up to the extended observations which established the law above stated of proportionality in the modification of crystals, or the rationality of the parameters, which gives a mathematical basis to the science, adding to symmetry of arrangement a numerical rela- tion in the position of the planes. To illustrate this in a general form (and not merely with special reference to the mode of notation or expression of Naumann, which is that adopted in the subsequent descriptions), let AOA', BOB', COC' (fig. 42) be the. three axes of a crystal, drawn in perspective, and cutting one anotherin the centreO. The semiaxes OA, OB, OC are three parameters. Now in the line OA take Oa,=4304A, and Oa,=30A,—making as many points as may be necessary be- tween OA, rational fractions of OA. Subdivide OB and OC ina similar manner. Further produce OA, OB, OC to Ao, Bo, Co, in each direction to an infinite distance, or to a supposed infinite distance, as expressed by the arrow-head ; and suppose these ex- tended axes to be divided in a manner similar to the subdivisions of the parameters, by rational multiples of OA, OB, and OC. All the planes of a crystal will be parallel to one or other of the planes which pass through three of the points thus determined. First, in order to apprehend the relationship of faces to

these axes, or to the half axes, —the parameters of the faces, —let us suppose one

Other

modes of have been glanced at.

notation.

Symme- try of —

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plane of a crystal to be so situated as to cut the three parameters OA, OB, OC at their extremities A, B, C, which it must be remem- bered are points equi- distant from the centre; or let it be supposed that a glass plate rests upon three intersect- ing wires at such points. It is evident that such a plane or plate will have a de- finite inclination or | slope. Suppose fur- ther a second plane or plate to exist, which cuts the three semiaxes in the points @e, ba, C, Which have been measured off (along with a, 2, ¢) as equidistant from O. Tt will be evident that such a plane, though sinaller, will be parallel to the first, seeing that, like it, it cuts the three parameters at equal distances from O.

A little consideration will show that, whatever the absolute dis- tances from the centre may be, so long as the supporting subdivi-

Fig. 42.

sions are equal, no new slope of the glass plates or planes is

possible ; planes so situated must be parallel and similar. Any sign which may be adopted to express the slope of one of such planes must be applicable to all. A plane, however, cutting the points M, 01, C, will have quite a different slope.

Let us now suppose a plane to cut a different set of the semiaxes, namely, OA', OB', OC', in the points -a,, ~~b,, —¢,. Such a plane would be parallel to one'cutting the points — da», — b,, — c,, and also to the set of planes first described, but on the opposite side of the centre of the crystal. If again, however, we had a plane cutting the semi~~ axes OA' and OB' in —q, —8,, but the semiaxis OC' in the point —€g, it is clear that the slope of this plane would be quite different from that of the planes just described, but it would be parallel to the plane cutting the points a, b,, ¢. This slope, like the other, evidently depends, not on the absolute lengths of the portions of OA', OB', OC' cut off, but upon their proportions or ratios; and such is the case with all the planes which are referred to the same axes.

As there are three axes, and each or all of them may be cut atany points and at any ratios, it is evident that the nuinber of planes which is possible is infinite ; and it must be also evident that the inclinations of all are fixed or determinate if we know the ratios. While, however, the possible number of planes is infinite, the actual number occurring among minerals is either small or moderate, in virtue of the fact that the ratios of subdivision of the axes are always simple, and not numerous.

Naumann's symbols for the notation or individualizing of planes A simpler method is that of employing as indices the denominators (if simple fractions) of the fractional parts of the axis cut. Thus 111 is used for any plane parallel to that cutting the axes in a, 64, c, ; 122 for those parallel to a, b,, ¢& 3 318 for ds, 0), c,; and so on.

When any of the points referred to have negative signs, the cor- responding indices have negative signs placed over them. Thus 122 is the index for a plane parallel to a',b,c,. 103 is the index of the plane a, bo, c's. oo here indicates infinity; that is, the plane never would cut the axis B however far it were extended; in other words, it is parallel toit. The necessity for elongating the axes is brought about by the occurrence of highly acuminating planes, which in many cases would not meet the axes at all unless these were prolonged.

If the axes are unequal, as in the trimetric forms, then the ratio is of the same character, except that the relative lengths of the axcs come into consideration ; but here, as in the regular system, irrational values cannot

occur, and in even the most complex crystals they seldom exceed seven, either as aliquot parts or multiples.

It will thus be seen that in crystals there is no haphazard scatter- ing of faces, but a complete subserviency to law, a law which may be said to be the linear equivalent to the law of multiple propor- tions by weight, and Gay Lussac's law of multiple proportions in combination by volume.

Tn abbreviation of all the systematic modes of notation, letters of the Latin and Greek alphabets are frequently employed in a more or less arbitrary manner, and with advantage in the case of highly complex forms.

6. The Law of Symmetry of Crystalline Combination is the consequence of the law of symmetry and the law of the rationality of the parameters, and has been partially

stated in enunciating these laws. It is thus expressed :— (1) a substance can only crystallize in forms, whether simple or compound, which have the same relative symmetry, that is, belong to the same crystalline system, and the parameters of the faces of which bear a simple relation to each other, thatis, belong to the same axis ; (2) a form cannot be modified by faces belonging to a different system, or a different series.

Certain exceptions to the first part of this law occur. Apparent

The element carbon occurs as the diamond, which is cubic, ¢xceP-

and as graphite, which is hexagonal. Sulphur occurs near voleanoes in needle crystals belonging to the oblique prismatic system, and also in caves (deposited apparently from solution) in crystals belonging to the right prismatic system. 'Titanic acid is tetragonal in rutile, and right prismatic in brookite. Carbonate of lime is hexagonal in calcite, and prismatic in aragonite. These are probably only apparent exceptions. The elementary substances

| which go to form them occur in different allotropic states,

with different amounts of specific heat; and it is probable that in these different states they go to form the above modifications, which are therefore, in every respect, except in their chemical composition, different mineral bodies. The physical differences between diamond and graphite may suffice as an illustration. The diamond is trans- parent, colourless, brittle, and extremely hard; graphite is opaque, black, tough, and so soft as to be utilized as a lubricant. ;

Spheres of Projection.—The foregoing scheme for the development of the relation which subsists between faces of crystals and their axes affords but slight aid in display- ing the position of the faces, or their mutual relationships. The delineation even of a considerable series of crystal forms does not indeed go far in effecting this,—on account, first, of very unequal development in the size of the faces of crystals, and, secondly, on account of the habit of development of these faces not only differing largely, but being special to certain localities,—as in the entire absence of some faces, and in the preponderance of others.

10ns.

Maps of the whole domain occupied by the forms of each Spheres mineral have been happily projected for such display. of pro-

The projection is laid down as on a globe, in accordance with stereographic projection, and admitting of calculation according to the laws of spherical trigonometry. These globe maps are called "spheres of projection." The centre O is the common centre of the crystal and of the sphere in which the axes intersect. The three axes will of course meet the circumference of the sphere in six points, called the "poles of the axes." From the centre radii are supposed to be drawn, meeting each plane perpendicularly. It is evident that such radii will have fixed inclinations to each other. the points in which when produced they meet the circum- ference of the sphere of projection are called the " poles" of the corresponding faces. A face and its pole thus call for only one symbol. The angle included by any two normals is the supplement of that included by the two corresponding faces.

It is thus easy to determine the angles of any two normals when that of the corresponding faces is known, or vice versa. Thus, if the angle between two

faces is 125°, that of the normals will be 55°. The spheres of projection are specially adapted to enable us to avail ourselves of the aid to calculation afforded by the forenoted fact that sets

They are called "normals" to the planes, and °

g jection.

of faces lie parallel to each other, forming zones ; for, when Zones.

projected on such a sphere, the normals of the parallel faces will all lie in one plane; and the poles, all cutting its surface in the direction of one line, may be connected, and so form a great circle on the sphere. This is called the "zone circle." A line drawn through the centre of the

ee 25

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zone plane, cutting it at right angles, is the "zone axis"; it is parallel to all the faces, and intersections of the faces (if they are extended enough to intersect), of the zone. A face may be common to two or more zones, its normals will then coincide with the intersections of the several zone planes. In the absence of actual spheres upon which to detail the facts which go to form the "sphere of projection " of each substance, the hemisphere is represented on a plane surface. This has of necessity the disadvantage, except as regards the circumferential zone, of introducing spherical distance- distortion—foreshortening of all parts lying near the circumference ; but the eye soon gets accustomed to this. Fig. 43 presents the principal zones of the cubic system, and

Fig. 43.

shows the position of the poles of the faces of the cube, the octahedron, and the rhombic dodecahedron. 0), %% 9% d&c., are the poles of the octahedral faces; a}, 42, 43, &c., those of the faces of the cube; and d,, d,, dz, &e., those of the rhombic dodecahedron. It will be observed that the

faces of the cube fall into the zone circles of the octahedron and dodecahedron, while those of the octahedron fall into those

007

070 440 130 250 120 430320 210 520 310 410

Fic, 44.—Principal Poles of Cubic System in Octant of Sphere.

of the rhombic dodecahedron. Considering this as a delineation of a globe, these zone circles come to represent latitude and longitude; and, as almost all the faces in this system fall into some zone circle, it is clear that the latitude and longitude of all normals may be readily laid down, and their relations at once determined by spherical trigonometry. Fig. 44 shows the arrangement of the poles of all the forms belonging to the cubic system noticed

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above, or referred to in the present article,—delineated on an octant of the sphere of projection. It displays the perfect regularity of the system.

second law (that of symmetry),

which go to form & holohedral crystal may be present. When but one-half of the faces present themselves, the form is termed hemi- hedral ; when only one-fourth, it is tetartohedral. These restrained developments have now to be considered. In hemihedral forms the development is restrained, but symmetry is not deranged ; half the similar parts are still alike, though unlike the other half.

There are two classes of hemihedral forms :—

*L Those forms in which half the similar angles or edges are modified indcpendently of the other half (‘*hemi-holohedral ”), producing—*

1. In the monometric and dimetric systems ‘tetrahedral ”. and ‘¢sphenoidal” forms, by the independent replacement of the alter- nate angles; their opposite faces are not parallel, and they are hence called

“inclined ” hemihedrons; as in chalcopyrite, boracite.! The replacement in the dimetric system of tivo opposite basal edges at one base and the other two at thc opposite base is of the same kind; as in edingtonite.

2. In the trimetric system ment of half the similar parts opposite of the other, unlike the

3. In the trimetric and hexagonal systems by independent replaccments at the opposite extremities crystal; as in topaz, calamine, tourmaline.

4. In the rhombohedral system, by the replacements of the alternate basal edges or angles of the rhombohedron, forms usually called ‘tetartohedral” or quarter forms, on the ground that mathematically the rhombohedron is a hemihedral form derived from the hexagonal prism, which is the type of the hexagonal system. Rock crystal is usually developed according to this law.

IL. Those forms in which all the similar angles or edges are modified, but by half the full or normal number of planes (‘ holo- hemihedral”), producing—*

1, In the monometric system “‘pyritohedral” forms, by a replace- ment of the edges or angles ; as in pyrites. Such forms have opposite faces parallel, and are often called parallel hemihedrons.

9. In the dimetric system “pyramidal” and “ scalenoidal” forms, by a replacement of the eight solid angles of the primary prism, according to two methods.

3. In the hexagonal’ system “pyramoidal » and ‘ gyroidal ” forms, by a replacement of prism, or of the six lateral angles of the rhombohedron, according to two methods; as in quartz and apatite.

*The above illustrations show that hemihedrism is not only divided into two classes, but is of various kinds, aud these have been systematized as follows:—“ holomorphic,” in which the occurring planes pertain equally to the upper and lower (or opposite) ranges of scctants, as in ordinary hemihedrons ; and (2) ** hemi- morphic,” in which each sct of planes pertains to either the upper or the lower range, but not to both. As to the*

relative position of the sectants which contain the planes, the forms may be vertically direct, as in baryte ; vertically alternate, as in the tetrahedron, the rhombohedron, and the plagihcdral faces of quartz ; and vertically oblique, as in many forms of chondrodite.

In hemimorphic forms symmetry is

“‘ monoclinic” forms, by the replace-

of one base and the diagonally other half; asin datholite, humite. “hemimorphic ” forms, of the

to distinct forms or modifications,—always, Rk 1 however, of the same system ; hence only the upper or the under half of each crystal can be regarded as complete, as regards the form there seen ; and so for each end it is half formed. Fig. 45 represents a crystal of tourmaline, which is bounded on the upper end by the planes of the rhombohedrons R(P) and ~~2R (0), and on the lower end by the basal pinacoid (k’). In fig. 46 of smith~~ sonite the upper extremity shows the base k, two brachydomes o and p,

~

Fig. 46.

Fig. 45. and two macrodomes m and J;

1 As the parts of either half are alternate, there still results a symme- trical solid. As either one or other half may be the one thus modified, there may result two such symmetric solids, which stand in an inverse position to one another. When the modifications affect the upper right- hand solid angle, the resulting form is called +; when the upper left- hand angle it is—.

Hemihedral and Tetartohedral Forms.—The exception to the Hemi- which was formulated by Weiss, hedral was to the effect that one-half or even one-fourth only of the faces forms.

the solid angles of the hexagonal

‘deranged ; the crystals are Hemi-

bounded at the opposite ends of their main axes by faces belonging nou orms.

3

Hemi- hedral forms.

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whilst on the lower end it is bounded by the faces P of the primary alone.

It has been found that all hemimorphic crystals become electri- cally polar when heated, that is, exhibit opposite kinds of electricity at opposite ends of the crystal. The subject will be more fully con- sidered under the electricity of minerals.

The hemihedral forms of the cubic system are the following :—

1. The tetrahedron (fig. 47), hemihedral of the octahedron, is bounded by four equilateral triangles. It has six equal edges with faces meeting at 70° 32', and four trigonal angles. The principal axes join the middle points of each two opposite edges. Examples: fahlore, boracite, and helvine.

Fig. 47. Fig. 48.

2. The trigonal dodecahcdrons (fig. 48), hemihedral of the icosi-tetrahedron, are bounded by twelve isosceles triangles, and vary in general form from the tetrahedron to the cube. There arc six longer edges corresponding to those of the inscribed tetrahedron, and twelve shorter, placed three and three over each of its faces, and four hexagonal and four trigonal angles. Example : tctrahedrite.

3. The deltoid dodecahedrons (fig. 49), hemihedral of the triakis-octahedron, are bounded by twelve deltoids, and vary in general form from the tetrahedron on the one hand to the rhombic dodecahedron on the other. They have twelve longer edges lying in pairs over the edges of the inscribed tetrahedron, and twelve shorter edges, three and three over each of its faces. There are six tetragonal (rhombic), four acute trigonal, and four

obtuse trigonal angles. The principal axes join, two and two, opposite rhombic angles. Example : tetrahedrite.

Fig. 49. Fig. 50.

4. The hexakistetrahedrons (fig. 50), hemihedral of the hexakis- octahedron, are bounded by twenty-four scalene triangles, and most commonly have their faces grouped in four systems of six each. The edges are twelve shorter and twelve longer, lying in groups of three over each face of the inscribed tetrahedron, and twelve in-

termediate in pairs over its edges. The angles are six rhombic, joined in pairs by the principal axes, and four acuter and four obtuser hexagonal angles. Example: diamond.

In these forms, often named " tetrahedral," the faces are oblique toeach other. Their derivation and signs areas follows. The tetra- hedron arises when four alternate faces of the octahedron, two opposite above and two intermediate below, are enlarged so as to

obliterate the other four; and its sign is hence C. But, as either

four faces may be thus enlarged or obliterated, two tetrahedrons can be formed, similar in all respects except in position, and together making up the octahedron. These are distinguished by the signs + and —, added to the above syntbol, but only the latter in general

expressed, thus ~~*. In all hemihedric systems. two forms simi*~~

larly related occur, which may thus be named complementary

forms. The trigonal dodecahedron is derived from the icositetra-

hedron by the expansion of the alternate trigonal groups of faces. mom F :

a? the most common variety being ae ie The

deltoid dodecahedron is in like manner the result of the increase of

the alternate trigonal groups of faces of the triakisoctahedron, and

Its sign is

its sign is Lastly, the hexakistetrahedron arises in the development of alternate hexagonal groups of faces in the hexa- mOn

kisoctahedron, and its sign is

&uL.06¢ ¥ 300

Two semitesseral forms with parallel faces occur. (1) The pentagonal dodecahedrons (fig. 51), bounded by twelve symmetrical pentagons, vary in general aspect between the cube and the rhombic dodecahedron. They have six regular (and in general longer) edges, lying over the faces of the inscribed cube, and twenty-

Fig. 51. Fig. 52.

four, generally shorter (seldom longer), edges, usually lying in pairs over its edges. The solid angles are eight of three equal interfacial angles, and twelve of three interfacial angles, of which only two are cqual. Each principal axis unites two opposite regular

edges. This form is derived from the tetrakishexahedron, and its

. ° co sign is »

It is found frequently in iron pyrites and cobaltine.

(2) The dyakisdodecahedron (fig. 52), bounded by twenty-four trapezoids with two sides equal, has twelve short, twelve long, and twenty-four intermediate edges. The angles are six cquiangular rhombic, united in pairs by the principal axes, eight trigonal, and twenty-four irregular tetragonal angles. It is derived from the mOn

used to distinguish it from the hexakistetrahedron, also derived from the same primary form. It occurs in iron pyrites and cobaltine. The two other semitesseral forms, the pentagonal

hexakisoctahedron, and its sign is

, the brackets being

Fig. 53.

dodecahedron (fig. 53), and the pentagonal icositetrahedron (fig. 54), both bounded by irregular pentagons, have not yet been observed in nature.

Fig. 54.

Combinations.—The above-mentioned forms of the tes- Combina- seral system (and this is true also of the five other systems tions.

of crystallization) not only occur singly, but often two, three, or more occur united in the same crystal, forming what are named combinations.

In this case it is evident that no one of the individual forms can be complete, because the faces of one form must interfere with, by diminishing, the faces of other forms. A combination therefore implies that the faces of one form shall appear symmetrically disposed between the faces of other forms, and consequently take the place of certain of their edges and angles. These edges and angles are thus, as it were, cut off, and a greater number of new ones produced in their place, which properly belong neither to the one form nor the other, but are angles of combina- tion. These new faces are hence termed modifications, and the original or primary or simple form is said to be modified. Usually one form predominates more than the others, or has more influence on the general aspect of the crystal, and hence is distinguished as the predominant form, the others being considered subordinate.

The sign of the combination consists of those of its constituent forms, written in the order of their influence or importance 1n the combination, with a point between each pair. ;

It will be readily seen that such combinations may be exceedingly numerous, or rather infinite ; and only a few of the more common

mid formed by the (6×4) faces of the latter. The faces of the octahedron truncate the threc-faced solid angles of the rhombic dodecahedron. Fig. 35 shows the first stage of this truncation, while fig. 34 shows an advanced amount. The faces of the icosi-

can be noticed. Many others more complicated will oceur in the descriptive part of this article. Among holohedral combinations, the cube, octahedron, and rhombic dodecahedron are the predomin- ant forms. In fig. 27 the cube has its angles replaced by the faeces of the octahedron, which truncate the angles, and the sign of this combination is «00, O.. In fig. 28 this process may be regarded as having proceeded still farther, so that the faces of the octahedron nearly equal those of the cube, while in fig. 29 they now predom- inate; the sign, still of the same two elements, but in reverse order, is O, Occ. It will thus be seen that, through an increase in the amount of the abstraction of the faces of the cube, the figure gradually passes over into that of the octahedron. This may occur in all cases, and is termed the passage of the cube into the octa- hedron (or vice versa), or a " transition by decrement."

In fig. 31 the cube has its edges replaced by the faces of the rhombic dodecahedron, which truncate the edges, the sign being «O02, 00; while in fig. 32 there is the same combination, but with the faces of the cube subordinate, and hence the sign is «0, oO, The former figure, it will be seen, has more the general aspect of the cube, the latter of the dodecahedron. Here the solid angles of the latter are truncated by the faces of the cube, and we have the passage of the cube into the dodecahedron by decrement. The same transition, through truncation or decrement, could be shown in all cases of combinations, and in both directions, the last stage of the passage into oue or other form always consisting of the replacement of its solid or interfacial angles by faces of the de- parting figure, more or less minute. A few illustrations of this may be given, in the three most important forms.

he relationship of the tetrakishexahedron to the cube has above been stated to be, that its faces form six low quadrilateral pyramids, which rest upon or spring from the edges of the cube. (From this the form derives its trivial name of four-faced cube.) Hence these faces bevel the edges of the cube. The first stage of such bevelling (or the last stage of the truneation of the tetrakis- hexahedron by the faces of the cube—whichever way it may be regarded) is secn in fig. 55. As the cubic face is here dominant, the sign is 00, 008. Fig. 56 shows a somewhat similar stage

Fig. 60. Fig. 61.

tetrahedron truncate the edges of the rhombic dodecahedron, as in fig. 60 ; while those of the latter truncate the unequal-angled tetra- gonal (or rhombic) angles of the former (fig. 61). The faces of the hexakisoctahedron bevel the edges of the rhombic dodecahedron.

While such transitions may appear indefinite, yet certain minerals have either in themselves a habit, or have at ecrtain localities a habit, of crystallizing so markedly. in @ certain stage of these transitions as to be absolutely capable of recognition thereby.

Combinations of hemihedral or, as they have been called, semi- Combina- tesseral forms are of three classes:—those with holohedral forms, tions of those in which the faces fall obliquely on one another, and those hemi- with parallel faces. Fig. 62 shows the coinbination of a right- hedral forms.

Fig. 62. Fig. 63.

handed tetrahedron with the cube, which truncates its edges, the tetrahedron here being dominant. Fig. 68, again, shows a com- bination of the cubo-dodeeahedron with a right-handed tetrahedron, the first or holohedral form being in this case markedly dominant. Fig. 64 is an illustration of the second class, combinations of

es: | ee “4 hY saphena ane Saea

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Fig. 55. Fig. 56.

in the modification produced through the combination of the icosi-tetrahedron with the cube. The trilateral pyramid which this form plaecs upon the faces of the cube rests upon its solid angles, instead of, asin the last case, upon its edges; hence it is these solid angles which, in the process of decrement, it replaces by faces which form a low three-sided pyramid. The triakisoctahedron,

—

Fig, 64. Fig. 65.

oblique-faced semitesseral forms with each other. In it a right- handed tetrahedron has its solid angles truncated by the faccs of

Si

va

a

1

i H a Ls

one which is left-handed ; and so its sign is > , — a . Fig. 65

shows a combination of a right-handed tetrahedron with a left-

Fig. 58.

again, modifies the solid angles of the cube, as shown in fig. 57, by a low three-sided pyramid, positioned at right angles to that considered in the last combination. As

the hexakisoctahedron is merely the <T-S

two-faced form of that last considered, the pyramid which modifies the solid angles is, in its combination with the cube, six-sided, as in fig. 58. /| AA» /\ As the faces of the rhombic dodeca- \ hedron truncate the edges of the octa- \ NY \/ hedron, fig. 34 represents the first stage such truncation or combination; while g. 85 may be taken as representing the last, the faces of the octahedron being Um there nearly totally removed. . Fic. 59 Fig. 59 shows the first stage of the oo passage of the octahedron into the icositetrahedron, in the trunca- tion of the solid angles of the former form by a four-sided pyra-

Fig. 66. Ge ea Orie

handed three-faced tetrahedron. Fig. 66 shows a combination of a right-handed hemihedron of the icositetrahedron with a right- handed tetrahedron.

Parallel-faced hemihedrons generally form combinations with holohedral forms ; and the amount of relative dominance is of all degrees. Fig. 67 shows a combination, in equal amount, of the cube

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with a vertical-faced pentagonal dodecahedron; while fig. 68 shows j placed erect, and named the chief axis ; its ends are poles, Dimetric

an increase in the amount of truncation effected by the latter. Fig. . 60 chiowe-the combination of the oubo with the dyakidodecuhedron, | 20% 'He edges connected with them polar edges, The and other axes are named subordinate or lateral axes, and the ™™e™<

plane that passes through them is the base. A plane forms. ar

through the chief and a lateral axis is a normal chief section. In these systems also occur the three forms of "pyramids," "prisms," and "pinacoids." (1) The pyra- mids have their faces triangles. Pyramids in crystallo- graphy are each composed of 'two geometric pyramids placed base to base, and named "closed forms," as the crystals are shut in by definite faces on every side. (2) he] The prisms are bounded by plane faces

parallel to one axis. Fig. 68. They are thus of unlimited extent in the direction of that the former being dominant. In fig. 70 an octahedron, in dominance, axis, and therefore named "open forms," but in solid crystals is combined with the vertical-faced pentagonal dodecahedron; in | are shut in by faces of other forms. (3) The pinacoids, or tables, have two faces intersecting one axis and parallel to the others, and thus are also open forms, or unlimited in the direction of these axes. Forms (2) and (3), when con- joimed, mutually shut in each other, or produce closed forms. I. Pyramidal or Tetragonal System.—This system has Pyra- three axes at right angles, two of them equal, and the chief ™idal axis longer or shorter. The name tetragonal is derived 5¥S™-

from the form of the base, which is usually quadrangular. There are eight tetragonal forms, of which five are closed. (1) Tetragonal pyramids (figs. 78, 79) are enclosed by eight isosceles triangles, with four middle edges all : : in one plane, and eight polar edges. Fig. 70. Fig. 71. There are three kinds of this form, fig. 71 the faces of these forms are of nearly equal size, while in fig. 72 the octahedral faces are nearly removed. 'The solid angles of

ah Fig. 78. SF al distinguished by the position of the lateral axes. In the first these axes Fic. 79 Fig. 72. Fig. 73. unite the opposite angles ; in the second it

the octahedron are modified in fig. 73 by the faces of the dyakis- they intersect the middle edges equally; and in the third they

; lie in an intermediate position, or divide these edges unequally, — dodecahedron. In fig. 68 a vertical-faced pentagonal dodeca- the last being hemihedral forms. These pyramids are also dis-

tinguished as obtuse (fig. 78) or acute (fig. 79), according as the vertical angle is greater or less than in the regular octahedron. (2) Ditetragonal pyra- mids (fig. 80) are bounded by sixteen scalene triangles, whose base- lines are all in one

Fig. 74. Fig. 75.

hedron is the prevailing form in combination with the cube; while in fig. 74 the faces of the octahedron are superadded. In fig. 75 its octahedral angles are modified by the faces of the icositetrahedron,

Fig. 80. Fig. 81. plane. This form rarely occurs except in combinations. (3) Tetra- gonal sphenoids (fig. 81), bounded by four isosceles triangles, are the hemihedral forms of the first variety of tetragonal pyramids. (4) The tetragonal scalenohedron (fig. 82), bounded by eight scalene triangles, whose bases rise and fall in a zigzag line, is the hemi- hedral form of the ditetragonal pyramid. Nos. (3) and (4) are rare. (5) The tetragonal trapezohedron is not found in minerals as a simple form. The three open forms are—(1) tetragonal prisms, bounded

Fig. 76. Fig. 77. by four planes parallel to the principal axis, which may be either and in fig. 76 by those of the octahedron in addition. In fig. | longer (fig. 83) or shorter (fig. 84) than bea lateral aXes ; @) be 77 they are modified by the faces of the dyakisdodecahedron. tragonal prisms, bounded by eight similar planes; and (3) the basa

2 Bs 3 i i isti ly of two parallel faces bounding the prisms In each of the five systems which follow there is this Be ie cose ania alter “ ss

difference from the cubic system that one axis is always The various series of tetragonal crystals are distinguished from unequal to (longer or shorter than) the others. This is | each other only by their relative dimensions. To determine these,

Primi- tive pyramid,

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one of the series must be chosen as the primary form, and for this purpose a tetragonal pyramid of the first variety, designated by P as its sign, is selected. The angle of one of its edges, especially the middle edge, found by measurement, determines its angular

_ dimensions, whilst the proportion of the principal axis @ to the

Derived.

pyra- mids.

Prism.

Pinaeoid.

Fig. 83.

| Fig. 84.

equal to 1, gives its linear dimensions. The of each faee of the fundamental form are

Fig. 82.

lateral axes, supposed parameters, therefore, Leda

Now if m be any (rational) number, either less or greater than unity, and if from any distance ma in the principal axis planes be drawn to the middle edge of P, then new tetragonal pyramids of the first order, but more or less acute or obtuse than P, are formed. The general sign of these pyramids is mP, and the most common varieties $P, 2P, and 3P,—with the ehief axis half, twice, or thrice that of P. If m becomes infinite, then the pyramid passes into a prism, indefinitely extended along the prineipal axis, and with the sign oP. If m=0, whieh is the case when the lateral axes are supposed infinite, then it becomes a pinacoid, consisting properly of two basal faces open towards the lateral axes, and designated by the sign OP. The ditetra- gonal pyramids are produced by taking in each lateral axis distances ” greater than 1, and drawing two lege = to these points from eaeh : ‘ of the intermediate sisi i tie polar edges. The parameters of these planes are therefore m : 1:2, and the general sign of the form mPn, the most eommon values of n being $, 2, 3, and oo. When n=, a tetragonal pyramid of the seeond order arises, designated generally by mPoo, the most eommon in the mineral kingdom being Po and2Po. The relation of these to pyramids of the first order is shown in fig. 85, where ABBBC is the first and ACCCX the second order of pyramid. In like manner, from the prism oP, the ditetragonal prisms oPn

Fig. 88.

Fig. 89.

are derived, and, finally, when n= the tetragonal prism of the second order, whose sign is o Poo.

The combinations of the tetragonal system are cither holohedral

or hemihedral; but the latter are rare. Prisms and pinacoids must always be terminated on the open sides by other forms. Thus in fig. 86 a square prism of the first order is terminated by the primary pyramid, and has its lateral angles again replaced by another more acute pyramid of the second order, so that its sign is cob, PB, 2P oo),

In fig. 87 a prism of the second order is first bounded by the fundamental pyramid, and then has its edges of combination replaced by a ditetragonal pyramid ; its sign is coPo, P, 3P3. In fig. 88 the polar edges of the pyramid are replaced by another pyramid, its sign being P, Po. In fig. 89a hemihedric form, very characteristie of chaleopyrite, is represented,—P and P' being the two sphenoids, @ the basal pinacoid, and 8, ¢ two ditetragonal pyramids. —

IIL The Hexagonal System.—The essential character of Hexas this system is that it has four axes,—three equal lateral gonal axes intersecting each other in one plane at 60°, and one lane principal axis at right angles to these. The plane through the lateral axes, or the base, from its hexagonal form, gives the name to the system. As in the last system, its forms are either closed or open. They are divided into holohedral, hemihedral, and tetartohedral,—the last, which are rare, having only a fourth part of the faces developed. Only a few of the more common forms require to be here described.

The hexagonal pyramids (figs. 90, 91) isosceles triangles, and are of three kinds, axes fall in the angles, in the middle of the lateral edges, or in another point of these edges, the last being hemihedral forms. They are also elassed as acute or obtuse, but with- out any precise limits. The trigonal

pyramid is bounded by six triangles, and may be viewed as the hemihedral form of the hexagonal. The dihexa- gonal pyramid is bounded by twenty-four scalene triangles, but has never been observed alone, and rarely even in combinations. The more common prisms are the hexagonal of six sides ; in these the vertical axis may be either longer than the lateral, as in fig. 92, or shorter, as in fig. 93. There are also dihexagonal, of twelve sides.

A particular pyramid P is chosen as the fundamental form of this system, and its dimensions deter- mined either from the proportion of the lateral to the principal axis (1: a) or from the measurement of its angles. From this form (mP) others are de- rived exactly as in the tetragonal system. Thus dihexagonal pyramids are produced with the general sign : mPn, the chief peculiarity being that, Fig. 91. whereas in the tetragonal system n might have any rational value from 1 to ©, in the hexagonal system it can only vary from 1 to 2, in consequence of the geometric character of the figure. When n=2, the dihexagonal changes into an hexagonal pyramid of the second order, whose signis mP2. When m=, various prisms arise from similar ehanges in the value of nm; and when m=0 the basal pinacoid is formed.

Few hexagonal min- eral species form per- fect holohedral eom- binations. Though quartz and.apatite ap- pear as sueh, yet pro- perly the former is a tetartohedral, the lat- ter a hemihedral spe- cies. In holohedral species the predomi- nant faces are usually ; those of the hexagonal Fig. 93. Fig. 94. prisms oP (fig. 92) and oP2, or of the pinacoid OP (fig. 93); whilst Prisms. the pyramids P and 2P2 are the most common subordinate forms. Fig. 94 represents the prism, bounded on the extremities by two pyramids,—one, P, forming the apex, the other, 2P2, the rliombic

are bounded by twelve Pyta- according as the lateral mids.

Fig. 90.

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faces on the angles, or oP, P, 2P2. Fig. 95 is a similar form, the upper part of the pyramid being replaced by the pinaeoid. In some erystals the lateral edges of the prism are replaced by the

Fig. 95. Fig. 96. Fig. 97.

second prism oP2 (fig. 96), producing an equiangular twelve-sided prism, which always represents the combination oP, wP2, and cannot occur asasimpleform. Figs. 97, 98 are combinations in this

Fig. 98. Fig. 99.

system seen in beryl. An example of a more complicated combina- tion is seen in fig. 99, of a crystal of apatite, whose sign with the corresponding letters is @P(Af), oP2(e), OP(P), $P®, P(x), 2P(z), P2(a), 2P2(s), 4P2(a).

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scalenohedron is properly the hemihedral form of the dihexagonal pyramid, but is more easily understood as derived from the inscribed rhombohedron mR. _ If the halves of the principal axis of this be multiplied by a definite number ; Al nm, and then planes be drawn from the extremities of this enlarged axis to the lateral edges of the rhombo- hedron, as in fig. 105, the scaleno- hedron is constructed. It is now designated by mRn (the » on the right here referring to the chief axis), and the dihexagonal prism in this series by oR» (for-

merly mR” and oR”), The combina-

tions of rhombo- hedral forms are very numerous, several hundreds having been de- scribed in cale-spar aloue. Among the most common is the prism in com- bination with a rhombohedron, as seen in the twin crystal of calc-spar (fig. 106), with the _ sign

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x

Fig. 105.

Fig. 104. oR, —4R, the lower half being the same form with the upper, but

turned round 180°. In fig. 107 the rhombohedron mR has its polar

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Rhombo- hedral forms.

Hexagonal minerals frequently crystallize in those series of hemi- hedral forms that are named “ rhombohedral,” from the prevalence

in them of rhombohedrons.- These (figs. 100, 101) are bounded by

4

G f ‘ ¢ #e ¢ – ee Ss . ‘ Sy s

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Fig. 100. Fig. 101. six rhombi, whose lateral edges do not lie in one plane, but rise and fall in a zigzag manner. The principal axis unites the two trigonal angles, formed by three equal plane angles; and in the most common variety the secondary axes join the middle points of two opposite edges. When the polar edges form an angle of more than 90°, the rhombohedrons are named obtuse; when of less than 90°, acute ; fig. 102 represents the first, fig. 103 the second. Hexagonal sealeno- hedrons (fig. 104) are bounded by twelve scalene triangles, whose lateral

ates

Fig. 102. Fig. 103.

edges do not lie in one plane. The principal axis joins the two hexagonal angles, and the secondary axis the middle points of two opposite lateral edges.

The rhombohedron is derived from the first order of hexagonal pyramid by the hemihedral development of its alternate faces. Its

general sign should therefore be oF but on several grounds it is

found better to designate it by R or mR, and its complementary figure by-— mR. When the prism or pinacoid arises as its limiting form, they are designated by oR and OR, though in no respect

changed from the limiting forms oP and OP of the pyramid. The.

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Y Fig. 106. Fig. 107.

edges replaced by another rhombohedron~4mR, and in fig. 108 its lateral edges bevelled by the scalenohedron mRn. A more complex combination of five forms is represented in the crystal of calc- spar fig. 109, its sign, with the letters on the faces, being R(y),*

Fig. 108. Rr), R(P), 4R(m), oR, Tetartohedral combinations are seen most distinctly in rock-crystal.

IV. Right Prismatic or Rhombie System.—This system is characterized by three unequal axes, all at right angles to each other. Any one of these may be assumed as the chief axis, when the others are named subordinate. The plane passing through the secondary axes, or the base, forms a rhombus, and from this one of its names is derived. As prismatic forms are most frequent (the prism standing vertically on the rhombic base), it is best defined as the right prismatic. This system comprises only a few varie- ties of forms that are essentially distinct, and its relations are consequently very simple.

Fig. 109.

Right prismatic system.

greater or less than 1, a series of pyramids arise, whose general sign Derived is mP, and their limits are the prism and pinacoid ; the whole series forms. being contained in thia- formula, OP « < «2 Ate tate heen mP… . oP,

—which is the fundamental series, the lateral axes always remaining unchanged. :

From each member a new series may, however, be developed in two directions, by increasing one or other of the lateral axes. When the macrodiagonal is thus multiplied by any number 7 greater than 1, and planes drawn from the distance ” to the polar edges, a new pyramid is produced, named a macropyramid,

Pyra- There are two closed forms. (1) The rhombic pyramids (figs. 110, mids, 111), bounded by eight scalene triangles, whose lateral edges lie in one

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Fig. 110.

plane, and form a rhom- bus. They have eight polar edges (four acute and four more obtuse) and fonr lateral edges. The angles are six rhom- bic, the most acute = the extremities of the : :

longest axis. (2) The — i rhombic sphenoids (figs. 112, 113) are bounded by four scalene

Sphen- triangles, with their lateral edges not in one plane, and are hemi-

oids. hedral forms of the rhombic pyramid. They are of very infrequent occurrence.

Prisms. Theopen forms, again, arerhombic prisms bounded by four planes parallel to one of the axes, which is indefinitely ex- tended, and may be longer than the _ lateral, as in fig. 114, or shorter as in fig. 115. They are divided into upright (as in the above figs.) and horizontal

. prisms, according as either the principal or one or other of the lateral axes is supposed to become infinite. For the latter form the name doma or dome has

Domes. been used; and two kinds, the macro- Fic. 114 dome (fig. 116) and the brachydome (fig. oe i

; __ 117), have been distinguished.

Pinacoids. Rhombic pinacoids also arise when a one axis becomes =0 and the two others as pee are indefinitely extended; and so we : have macropinacoids (fig. 118) and Fig. 115. brachypinacoids (fig. 119),—the qualifying term thus designat- ing the axis to which the faces of the dome or pinacoid are parallel.

In deriving these forms from a primary, a particular rhombic pyra- mid P is chosen, and its dimensions determined either from the

with the sign mPn, the mark over the P point- ing out the axis en- larged, When =o, a macrodome results,

with the sign mPo. If the shorter axis is multiplied, then brachy- pyramids and brachy- domes are produced,

with the signs mPn and

mPo. So also from the prism oP, on the one side, originate numerous

macroprisms Pn, with the limiting macro-

pinacoid «Po ; on the other, numerous brachy-

prisms coPn, with the Fig. 121,

limit form Po, or the brachypinacoid. . In figs. 120, 121 the two domes are shown in their relation to the primitive pyramid.

SPY RES

Fig 122. Fig. 128. Fig. 124.

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The pyramids seldom occur independent, or even as the pre- dominant forms in a combination; sulphur, however, is an excep- tion. Prisms or pinacoids usually give the general char- acter to the crystal, which then appears either in a columnar or tabular or even rectangular pyramidal form. The determination of the position of these crystals, as

Fig. 117. vertical or horizontal, de- Macro- angular measurement of two of its edges, or by the linear pro- pends on the choice of the and portion of its axes a:b: c, the greater lateral axis } being assumed chief axis of the fundamental

form. In the topaz crystal (fig. 122) the brachyprism and the pyramid are the predominant elements, asso-

brachy- equalto1. 'To the greater lateral axis the name macrodiagonal is diagonal. given, to the shorter that of

brachydiagonal; and the two principal sections are in like manner named macrodiagonal and brachydiagonal, according to the axis they intersect. The same terms are applied throughout all the derived forms. They conse- quently mark only the position of

the faces in respect to the axes – F

of the fundamental crystal, and — ig HG frequently of necessity without reference to the relative magnitude of the derived axes.

ciated with the prism, its sign and letters being P22), P(o), eP(dN). Fig. 123 of stilbite is another example, the macropinacoid

coPoo or M being combined with the pyramid P®, the

brachypinacoid oo Po (7),

Fig. 127.

and the basal pinacoid OP(P). Another instance is fig. 124 of a lievrite crystal, where the brachyprism and pyramid combine

By multiplying the principal axis by any rational number m,

Oblique prismatic system.

Hemi-

pyta- ‘midal character.

Prisms,

+and — pyramids.

MINERALOGY

with the macrodome, or oP2, P, Po. The above figures are very common forms of barytes,—figs. 125 and 126 being both composed of the pinacoid OP, a brachydome, anda macrodome, with sign

OP©, Poo (f), 4Po(d). The variation in aspect arises from the pre- dominance of different faces ; and fig. 127 consists of the macrodome 4Poo, the prism P(g), and the pinacoid OP.

V. The Oblique Prismatic System.—This system is char- acterized by three unequal axes, two of which intersect each other at an oblique angle, and are cut by the third at right angles. One of the oblique axes is chosen as the chief axis, and the other axes are then distinguished as the orthodiagonal (right-angled) and clinodiagonal (oblique- angled). The same terms are applied to the chief sections, and the name of the system refers to the fact that these two planes form with the base two right angles and one oblique angle C.

The forms of this system approach very near to those of the right prismatic serics, but the inclination of the axis, even when almost aright angle, gives them a peculiar character, by which they are always readily distinguished. Each pyrainid thus separates into two altogether independent forms or hemipyramids.

Three varieties of prism also occur—vertical, inclined, and nori- zontal—with faces parallel to the chief axis, the clinodiagonal, or the orthodiagonal. The horizontal prisms, like the pyramids, sepa- rate into two independent partial formsnamed hemiprismsor hemi- domes. The inclined prisms are often designated clinodomes, the term prism being restricted

to the vertical forms. Ortho- pinacoids and clinopinacoids are also distinguished, from

their position in relation to the axes. The monoclinic pyra- mids (fig. 128) are bounded by eight scalene triangles of two kinds, four and four only being similar. Their lateral edges lie all in one plane, and the similar /y triangles are placed in pairs on : the clinodiagonal polar Sigs ig, Ua:

The two pairs in the acute angle between the orthodiagonal and basal sections are designated the positive hemipyramid, whilst the two pairs in the obtuse angles of the same sections form together

‘the negative hemipyramid. But, as these hemipyramids are wholly

the rhombic series.

independent of each other, they are rarely observed combined. More frequently each occurs alone, and then forms a prism-like figure, with faces parallel to the polar edges, and open at the extremi- ties. Hence, like all prisms, they can only appear in combination with other forms. The vertical prisms are bounded by four equal faces parallel to the principal axis, and the cross section is a rhombus ; the clinodomes have a similar form and section; whilst the hori- zontal prisms or domes have unequal faces, and their section is a rhomboid.

The mode of derivation of these forms closely resembles that of A complete double pyramid is assumed as the fundamental form, and designated +P, in order to express the two portions of which it consists. Its dimensions are given when the

_ proportion of its axes @:b:c¢ and the angular inclination of the

oblique axes C, which is also the inclination of the orthodiagonal section to the base, are known.

The fundamental series of forms is OP ….+mP….2+P ....tmP…. oP, from each of whose members, by changing the dimensions of the other axes, new forms may be again derived. Thus from +mP, by multiplying the

*orthodiagonal by any number m, a series of orthopyramids +mP°n is produced, with the ortho. domes mP°o as limiting forms. The clinodiagonal produces a similar series of clinopyramids +mP‘n, with the limiting clinodome mP*co always completely formed, and therefore without the signs + attached. From oP arise orthoprisms »P°n and the ortho- pinacoid oP%o, and clinoprisms oP’ and the clinopinacoid coP’co. In these signs the o or c attached to the P indicates that the orthodiagonal (0) or clinodiagonal © axis has been multiplied. Formerly the latter forms were enclosed in brackets, thus (mPoo) == 9b 0).*

The combinations of this system may be easily understood from their resemblance to those of the right prismatic, the chicf difficulty being in the occurrence of partial forms, which, however, closely fesemble the hemihedral forms of the previous systems. A few examples only need tlierefore be given. ies

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*Hig: 129 represents a very common form of gypsum crystals, co Peo »(P), oP(f), P(Z). The most common form of augite is repre- sented in fig. 180, with the sign oP(M), 0 P%c ®, @P*co (2) , P(s).*

‘ prceetrnn4 ‘

Fig. 181. Fig. 132.

*Fig. 181 is a crystal of common felspar or orthoclase, composed of the clinopinacoid oP*o(M), the prism P(T), the basal pinacoid OP(P), and the hemidomes 2P%0(y); to which, in fig. 182 of the*

*same mineral, the hemipyramid P(o) and the clinodomie 2P*o (7m) are added.*

VI. Anorthic or Triclinie System.—This is the least Anorthic regular system, and departs the most widely, indeed almost system.

absolutely, from symmetry of form. The axes are all unequal, and inclined at angles none of which are right angles,—so that, to determine any crystal, or

series of forms,

the proportion of the axes a: b : ¢, and also their angles,

or those of the inclination of the chief sections, must be known. As in the previous systems, one axis is chosen as the principal axis, and the two others distinguished as the macrodiagonal and brachydiagonal axes. In consequence of the oblique position of the principal sections, this system consists entirely of partial forms wholly independent of each other, and each composed only of two parallel faces. The complete pyramid is thus broken up into four distinct quarter-pyramids, and the prism into two hemiprisms. Each of these partial forms is thus nothing more than a pair of parallel planes, and the various forms consequently mere individual faces. This circumstance renders many triclinic crystals very unsymmetrical in appearance.

Triclinie pyramids (fig. 183) are bounded by eight triangles whose lateral edges lie in one plane. They are equal and parallel two and two to each other, each pair forming, as just stated, a tetartopyramid or open form, only limited by combination with other forms, or, as we may sup- pose, by the chief sections. The prisms are again either vertical or inclined ; the latter are named domes, and their scction is alwaysrhomboidal. In deriv- ing the forms, the fundamental pyramid is placed upright with its brachydiagonal axis to the spectator, and the partial forms designated, the two upper by 'P and P', the two lower by ,P and P,, as in the figure. The further derivation now follows as in the right prismatic system, tions already mentioned.

Some combinations of this system, as the series exhibited by most of the felspars, approach very near to the oblique prismatic system; whilst others, as cyanose and axinite, show great incom-

XVI. — 46

Fig. 133. with the modifica-

Gonio- meters.

is then measured on a graduated are.

pleteness and want of symmetry. In the latter case the determina- tion of the forms is often difficult. In the albite crystal (figs. 134, 185) P is the basal pinacoid OP; Mf the brachydiagonal

pinacoid oP; s the upper right pyramid P'; 7 the right hemi-

prism oP'; 7 the left hemiprism o'P; and # the hemidome "Po. Figs. 186 and 187 are crystals of axinite, the former from Dauphiné,

Fig. 135,

Fig. 136. Fig. 137.

the latter from Cornwall, of whose faces the following is the de-

velopment :—r the macropinacoid oP ; P the left hemiprism oo'P; wthe left upper quarter-pyramid 'P; / the left upper quarter- pyramid 2'P; s the left upper partial form 'of the macropyramid

3'P3; and x the hemidome 2'P'c.

The Measurement of the Angles of Crystals.

The permanence of the angular dimensions of crystals shows the importance of some accurate method of measur- ing their angles,—that is, the inclination of two faces to each other. Instruments for this purpose are called gonio- meters.

Two have been specially used for this purpose—the common or contact goniometer, invented by Caringeau, and the reflecting goniometer of Wollaston. The former is simply two brass rulers turning on a common centre, between which the crystal is so placed that its faces coincide with the edges of the rulers, and the angle This instrument is suflici- ently accurate for many purposes and for large crystals, but for precise determination is far inferior to the reflecting goniometer. This requires smooth and even faces, but these may be very small, even the hundredth of

an inch; and, as small crystals are generally the most perfect, far greater accuracy can be attained.

The reflecting goniometer is represented in fig. 138. It con- sists essentially of a graduated circle mm, divided on its edge into twice 180°, or more frequently into half-degrees, the minutes being read off by the vernier hk. This circle turns on an axis connected with ¢, so that by turning this the circle is moved round, but it is stopped at 180°, when moving in one direction, by aspring at. The other part of the instrument is intended to attach and adjust the crystal to be measured. The first axis of mm is hollow, and a second axis, aa, passes through it from ss, so that this and all the connected parts from } to f can be turned withont inoving the circle mm. The axis d passes through a hole in be, so that 1t can turn the arm de into any required position; 7 is a similar axis turning the arm og, and pg a fourth axis, in like manner movable in g, and with a small knob at gq, to which the crystal to be measured is attached.

When about to be used, the instrument should be placed ona table, with its base horizontal (which is readily done by the screws in it), and opposite to a window at about 12 or 15 feet distance, so that its axis shall be parallel to the horizontal bars of the window. One of the upper bars of the window, and also the lower bar, or, instead of the latter, a white line on the floor or table parallel to the window, should then be chosen, in order to adjust the crystal. The observer places himself behind the instrument with the side a at his right hand. The crystal is then attached to q by a piece of wax, with the two faces to be measured upwards, and the

edge of union of the faces, including the angle to be measured, as nearly as possible in the line of aa. The eye being brought near to the first face of the crystal, the axes aa and p are turned till the image of the window is seen reflected in the face with the horizon- tal and vertical bars in their position. The axis d is then turned through a considerable angle (say 60°), and the image of the window again sought and brought into its proper place by turning the axis f, without movingp. When this is done that face is brought into its true position, normal to d, so that no motion of d@ can dis- arrange it. Hence the image of the window may now be sought in the second face,

and | brought into its true position, with the horizontal bars seen horizontal, by moving the axes d and a. When this is done the crystal is properly "adjusted." The angle is measured in the following manner. First bring the zero of the circle and vernier to coincide, and then turn the inner axis @ or ss, and move the eye till the image of the upper bar of the window re- flected from the more distant face of the crystal coincides with the lower bar or hori- zontal line seen directly. Keeping the eye in its place, turn the other axis ¢¢ till the reflected image of the upper bar in the other face in like manner coincides with the

Fig. 138. lower line; the angle of the two faces is then read off on the

divided circle. As the angle measured is not.directly that of the faces but of the rays of light reflected from them, or the differ- ence between the angle wanted and 180°, the circle has the degrees numbered in the reverse direction, so as to give the angle without the trouble of subtracting the one from the other.

The apparatus figured is for adjusting the crystal, and is an im- provement suggested by Naumann. In the original instrument the axis fo was made to push in or out in a sheath, and had a small brass plate, bent at right angles, inserted in a cleft at 0, to which the crystal was attached. The crystal was adjusted as formerly by moving the plate, or the axis fo, and by slight motion of the arm de, which should be at right angles nearly to be when used. A very marked improvement is to have a small mirror fixed on the stand below the crystal, with its face parallel to the axis aa, and inclined at 45° to the window, when the lower line can be dispensed with, and the instrument used for various other purposes of angular measurement. Many more perfect instruments have been intro- duced for the purpose of insuring greater accuracy ; but the simple instrument is sufficient for all purposes of determinative mineralogy, and the error from the instrument will, in most cases, be less than the actual variations in the angles of the crystals.

Departure from Geometric Simplicity and Loss of Regularity in Crystals.

Such departures may be regulated by law, or may result from an undue operation of the force of aceretion in certain directions.

1. Regular Departures from Simplicity.—There are three varieties of this :— parallel groupings, twin forms, hemitrope forms.

Parallel Groupings.—A plurality of individuals are here Crystal arranged either so that a line which joins their centres 8TOUPS

becomes a prolongation of one or other of their crystallo- graphic axes, or so that their axes are parallel.

Fig. 20 shows the first, where cohesion sufficient for stability requires that the minute octahedra must mutually penetrate some- what into each other. Fig. 189 shows the same in baryte. If we suppose octahedra united, the upper left-hand face of the one with the lower right-hand face of the other, there would be parallelism of their axes. Re-entering angles would, in such cases, prove a plurality of individuals, but if a number of cubes were superimposed in similar position, no such angles would occur, an elongated square prism resulting; and such arrangements, if

Duplex crystals.

Varieties of twins.'

MINERALOGY

repeated, are linear, or, with diminishing size in the individual, acicular.

Fig. 139. Fig. 140.

Twins and Hemitropes.—Though closely related, formed under the operation of very similar laws, and to a certain extent passing into one another, these are not the same. In the first case a plurality of individuals must be present ; in the second this is not necessary. In fig. 140 two individuals evidently intersect one another ; in figs. 141, 142 one individual may be supposed to have been bisected in a certain direction, and the two halves reattached, but in a position differing in some definite manner from their relative position before the separation.

Fig. 141.

Fig. 142.

There are four varieties of true twins: those of apposition, of intersection, of partial or completed interpenetration, and of in- corporation.

The first is exemplified by spinel, as in fig. 143; the second by

Fig. 145.

Fig. 146.

staurolite, as in fig. 144; the third by calcite, as in fig. 146, and by blende, as in fig. 145, where the two individuals of fig. 143 may

be supposed: to have been forced vertically into one another; and the last by quartz, as in fig. 147.

The following are the laws of union of twins.

a plane which does occur in the mineral twinned, or which can occur in accordance with the fifth law of symmetry.

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Fig. 147.

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Fig. 148.

union in twins is also a face of union in hemitropes of the samc 2. From the above it results that the axes of the united The

mineral. crystals are either parallel (fig. 148) or inclined (fig. 149). former generally occur among hemihedric forms; and the two erystals are combined in the exact tia in which they would be

erived from or would reproduce the primary holohedral form. The class with oblique axes occur both in holohedric and in hemihedric forms; and the two individuals are then placed in perfect symmetry, in accordance with law 1.

Twins are generally recognized by having re-entering angles (figs. 150, 151); but sometimes the crossed faces coincide in one plane, when the combination appears as a ; single individual (figs. 152, 153). Fic. 149 The line of union may then be im- at +i perceptible, or it may be disclosed by the intersection of two sets of strie (figs. 154,155), or by some physical diversity in the char- acters of the two faces.

The formation of twin crystals may be again, or many times, repeated,— forming groups of three, four, twenty-four, or more. When the faces of union are parallel to each other, the crystals form

Fig. 150. rows of indeterminate extent.

Fig. 151.

When they are not parallel, they may return into each other in circles, as in rutile; or form bouquet or rosette groups, as in chrysobery] (fig. 156) ; or stellate groups, as in calcite (fig. 157) and in cerussite (figs. 158, 159).

Fig, 152. Fig. 153.

When the crystals are of different size, greater complexity results; but a number of minute erystals are frequently arranged upon a larger at those

points where the angles of a single large crystal would protrude. Occasionally a simple form is twinned with a more complex one, as in chabasite (fig. 160).

; : 1. The face of Laws of union of twins, termed the ‘face of composition,” must be either twinning,

Hemi- tropes.

Laws of hemi- tropism.

Modes of

union.

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Hemitrope crystals we may imagine as having been formed from a single crystal, which has been cut into two halves in a particular direction, and one half turned round 180°, or 90°, or 60" “The line about which the revolution is supposed to take place is called the ‘axis of revolution.” From the amount of turn usually being 180°, Haiiy gave the name hemitrope. The position of the two

Fig. 157. Fig. 156.

halves in this case resembles that of an object and its image in a

mirror, whose surface then would represent the plane of reunion. The following are the laws of hemitropes. The axis of revolution is always a possible crystallographic line,—either an axis, a line parallel to an axis, or a normal to a possible crystalline plane. The plane normal to the axis of revolution is called the twin plane; it is either an occurring or a possible plane, and usually one of the more frequently re- curring planes, Both the axis and the twin plane

Vy,

Fig. 158. Fig. 159.

bear the same relation to both halves of the crystal in their re- versed positions; consequently the parts of hemitrope crystals are symmetrical with reference to the twin plane (except in triclinic forms and some hemihedral crystals). The face of composition very frequently coincides ‘

with the twin plane; when not coinciding, the twin plane and the face of com- position are generally at right angles to each other, so that the composition face is parallel to the axis of re- volution. But in twins of incorporation the surfaces of £ composition have exercised a disturbing influence on one another, so that the surface of union is exceedingly ir- regular. Still in these cases the axis and the plane of twinning retain a definite

Fig. 160. position ; but the face of composition, being no longer defined, is useless as a determinant.

There are three modes in which the composition may take place

in hemitropes. These may be explained by dividing a crystal into halves, with the plane of division vertical, and then turning one of the halves round.

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1. One of the halves may be inverted, as if by revolution through 180° on a horizontal axis at right angles to the plane of section, and the two faces again united by the surfaces which were separated. Here the surfaces of union are the original ones, but the base of one of the halves has taken the , place of its summit. Examples: selenite (fig. 161) and orthoclase.

2. One of the halves may be turned round through 180°, as if by revolution on a@ horizontal avis, parallel to the plane of seetion, and the face opposite and parallel to that of the plane of section—an originally external face—may then be applied to the other half. Here, not only has the base of one-half become a summit, but a lateral and external face of the original crystal has been thrust to its centre so as to become a face of

Fig. 161.

internal union. Example: labradorite (fig. 162).

“3. One of the halves may be turned round through 180°, as if by revolution on a vertical axts, parallel to the plane of section, the external face opposite and parallel to the plane of section becoming

Fig. 162.

a face of union. Here, however, both the original summits retain their position as summits. Example: orthoclase.

The first of these modes of composition may occur in each of the systems, but it is not always apparent until disclosed by optical properties. The second is rare, and the third still more so.

In hemitrope crystals (less frequently in true twins) the halves of the crystal are frequently reduced in thickness in the direction of the ordinary twin axis ; and when there is a parallel repetition of hemitropes, which frequently occurs, they are often

reduced to very thin plates, not the thickness of paper, giving to ~

the surface of the aggregate a striated structure and appearance. _ In the eubdic system the faces of composition, both of twinning and of hemitropic revolution, are those of the cube, the dodecahed- ron, and the octahedron. A

In the first case we have the axes of the two crystals necessarily in some cases parallel, or, more correctly, falling into one ; but, as in this system all the axes are alike, or all the cubic faces similar, composition may occur along or parallel to all alike, and double or triple twins occur. We have examples in twins of the pentagonal dodecahedron (fig. 163) made up by the interpenetration of a right

Vy?

IN Fig. 163.

and a left (+ and —), and of the tetrahedron, as seen in pyrite and fablerz respectively. In virtue of the position required by law 2, it will be scen that

the position of the solid: which is common to both intersecting crystals is in the twin of pyrite the four-faced cube, which is the holohedral form of the pentagonal dodecahedron, while in the case of the fahlerz twin (fig. 164), the common por- tion is an octahedron, the holohedral form of the tetrahedron.

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Fig. 165.

Twinning on an octahedral face is seen in the apposition twin of spinel (fig. 143), the tetrahedral twin of blende (fig. 165), the inter- penetrative octahedral twin of blende seen in fig. 166, and the inter- secting cubes of fluor (fig. 167).

This is also the usual twin face for hemitropes of the cubic system.

Fig. 166.

Twins of cubie system.

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It is seen in fig. 168 of blende, where the two parts of the rhombie dodceahedron are united by it. Magnetite, spinel, and diamond

Fig. 167. Fig, 168.

frequently oceur in oetahedral hemitropes of the same composition (fig. 169).

This is also the face of composition for tetartohedral hemitropes. Fig. 170 is that of the diamond. Here six of the faces of the six-

Fig. 169.

faced octahedron, with six faces diagonally opposite, form a low double six-sided pyramid (a portion of an oetahedral face truncating each) through an 180° revolution of one set of these. Garnet some- times shows both twins and hemitropes of the dodeeahedron, of dodeeahedral eomposition. In the tetragonal system, twin erystals are very uncommon, but hemitropes frequent. With parallel axes they very seldom oecur, ._ but are seen in ehaleopyrite. When the axes are inclined, the plane of union is usually one of the faces of the primary pyramid ; and, as these faees are all similar, composition may take place simultaneously parallel to all. Very eomplicated forms hence result, as geen in ehaleopyrite and in eassiterite (fig. 171)-

sw

Fig. 171 Fig. 172. In cassiterite the plane of union is frequently one of the faces of the pyramid Poo, sometimes one of those faees that replaee the polar edges of P (figs. 172 173). From the bend the latter form is termed genieulated.

Fig. 173.

Hausmannite occurs in hemitropes of the primary P; and on the

polar edges of this other twins are symmetrically repeated, a central individual appearing like a support to the others (figs. 174, 175).

Fig. 174,

In the hexagonal system twins are very eommon among the

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twins are generally formed by the interpenetration of two rhombo- hedrons, a + anda —, the vertical axis being the axis of eomposi- tion; as in chabasite (fig. 176), cinnabar, levyne, ealcite, &e. Soine- tines six or more erystals, united parallel to the prismatie planes,

Fig. 175. Fig. 176. form rosettes; as in ehabasite from Giant's Causeway. The almost endless stellate forms of crystals of snow are built up in this manner. Many of the most beautiful eombinations to be seen among crystals result from this mode of arrangement.

Parallel gronpings of hexagonal prisms also oeeur, as in apatite (fig. 177).

Rock erystal, in eonsequence of the tetartohedral character of its erystallization, exhibits twins in whieh the double hexagonal pyramid P may be said to be separated into two rhombohedrons P and 7; these, though geometrieally similar, are physi-

Fig. 177. Fig. 178.

cally distinct. In fig. 178 the two individuals have not entirely in- terpenetrated, and might be regarded as simply grown together with parallel axes; but in fig. 147 there is so eomplete an inter- et that the eomposite eharaeter of the erystal is only evi-

eneed through a differenee in the eharaeter of the surfaces of the two halves, whieh are most irregularly disposed.

The hemitropes of this system often form regular erystals, when the two halves have been united by a plane parallel to the base, so as to appear like a simple erystal, as in fig. 179. Here each end shows the forms oR,—4R, but the terminal faees appear in parallel instead of alternate posi- tion. Something of the same is seen in fig. 180, a hemitrope sealenohedron from Derbyshire. Heniitropes with the face of the primitive rhombohedron as the faee of composition are also com- mon; and they are sometimes joined by a faee of —4R, the two axes forming an angle of 127° 34'. Oeeasionally a third individual is interposed in a lamellar form, as in fig. 181, where the faces of the two outer portions become parallel. This is found in some pieces of Iceland spar. When the erystals unite in a face of the primary rhombohedron, they form an angle of 89° 8'; hemitropes on this law are easily reeognized by their differing so little from a right angle in the re-entering bend (figs. 182, 183).

The faees whieh in this species act as faeces of eomposition are

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omen Canam

Fig. 181.

exceedingly numerous ; other examples are figs. 142, 146, 148, and

149, ,

In the right prismatic system twin erystals with parallel axes are Right

thombohedral (the hemihedral) and the tetartohedral forms; while hemitropes prevail among the hexagonal or holohedral forms. The

tare, but with oblique axes eommon, the faees of union being one of prismatic

the faces of the prism oP. Twins of this kind oecur frequently in twins.

Oblique prismatie twins,

Twins of hemi- tropes.

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aragonite, cerussite, mispickel, and marcasite. In aragonite the crystals are partly interpenetrating, and partly merely in juxta- position, as in fig. 184, where the individuals are formed by the

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Fig. 182.

combination oP(Af), oP co (h), Poo(k). In fig. 185 several crystals of the same combination form a series with parallel planes of union, the inner members of which are often so shortened that they form

mere films, which appear as striz on the faces Poo and wPo of the twin.

In fig. 186 four crystals, each of the combination oP, 2P ao : having uuited in inclined planes, form a circular group, which returns into

Fig. 184. Cerussite occurs in similar groups, building up a composite

Fig. 185. itself. L hexagonal crystal. It also occurs in stellate twins of two or three individuals, as in figs. 158, 159. Similar stellate eombinations are also eomnion in chrysoberyl. In staurolite, individuals of the pris-

matic combination oP, oP, OP combine, either as in fig. 144 by a face of the brachydome, having their chief axes almost at right

angles, or as in fig. 140 by a face of the brachypyramid $P%, the chief axes and the braehypinacoids (0) of each A

of the crystals meeting at an angle of about

60°. This mineral, which is very frequently \ | twinned, also forms combinations with the axes

parallel (fig. 187).

In the oblique prismatic system, twins are by no means so frequent as hemitropes. Twins of interpenetration with parallel axes, but the one turned as regards the other round a vertical axis, are common iu orthoclase (figs. 188, 189). Such UN YY crystals are termed right-handed (fig. 188) and left-handed (fig. 189), according to the side of : the crystal whieh has been turned. In this Fig. 187. mineral hemitropes oecur around an axis normal to M, to P, and to n (fig. 529) ; double twins of the last two are common (fig. 530),

Harmotome and phil- ; lipsite form first hemi- tropes, and then twins of these, which are ar- ranged sometimes as crosses and sometimes. as double

crosses (fig. 190). In hemitropes of gypsum the two halves are united by a face ‘parallel to the ortho- diagonal seetion, as in fig. 161, where the two halves have united so regularly that the faces P’, P form only one : : plane. In a pees Fig. 188. Pig. 189.

manner the two halves of the augite crystal represented in fig.

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130 are in fig. 191 united so perfectly and symmetrically that the line of junetion cannot be observed on the clinopinacoid. The two hemipyramids P(s) (like — P (7) in the gypsum erystal) form at one end of the crystal a re-entering, at the other a salient angle,

Fig. 190. Fig. 191. Hornblende (fig. 192) and wolfram exhibit a similar appearance. This results in the imparting a pseudo-hemimorphism to certain oblique prismatic twins, which is well seen in the twins of sphene . (figs. 193 and 589), and in exalting the charac- teristic appearance of true hemimorphs, as seen in the twin of acmite (fig. 194). In other cases the individuals partially penetrate each other in the direction of the orthodiagonal. This mode of union is not uncommon in gypsum, and is very frequent in orthoclase. Two crystals

Fig. 192. Fig. 193.

of the latter of the combination (Po), oP, 0P, 2Po, as in fig. 131, are often pushed into each other, as shown in fig. 195.

In the anorthic system some twin formations are of great import- Anorthic | ance, é.g., as a means of distinguishing the triclinic from the mono- twins,

clinic species of felspar. In one variety the twin axis is the normal to .the braehydiagonal chief section. But in the anorthic felspars this section is not perpendicular to the base, and conse- quently the two bases form on one side a re-entering, on the other a salient angle; whereas in the oblique prismatic felspars (where the brachydiagonal chief section corresponds to the clinodiagonal) no twin crystals can be produced in conformity to this law, and the two bases fall in one plane.

Fig. 194. Fig. 195.

Albite and oligoclase very often exhibit such twins as in figs. 196, 197, where the very obtuse angles formed by the faces of OP, or P

and P' (as wellas those of 'P'o, or x and 2'), area very characteristic appearance, marking out this mineral at once as a triclinic species. Usually the twin formation is repeated, three or more crystals being combined, when those in the centre are reduced to mere plates. When very numerous, the surfaces P and x are covered with fine striz, often only perceptible with a microscope. A second law ob- served in triclinic felspars, particularly in albite and labradorite,

Twin growth,

is that the twin axis corresponds with that normal of the brachy- diagonal which is situated in the plane of the base. In pericline, a variety of albite, these twins appear as in fig. 198, where the two crystals are united by a face of the basal pinacoid P, whilst the faces of the two brachypinacoids (Jf

Fig. 198.

and JM') form edges with very obtuse angles (173° 22'), re-entering on the one side and salient on the other. These edges, or the line of junction between Jf and M', are also parallel to the edges formed by these faces and the base, or those between Af and P. In this case also the twins are occasionally several times repeated, when the faces appear covered by fine strie.

Cause of the Formation of Twins and Hemitropes.—It has been shown above that the relative position of the molecules of crystals is determined by a polarity in the molecules themselves. This polarity must exist along three lines which intersect in the centre of the molecules ; and unlike poles must attract each other. It has been supposed that compound crystals result from a reversion of the original polarity of the molecules of a crystal, after it has at- tained a certain size. Heat and electricity, resulting from move- ments in strata, might occasion such reversion during the forma- tion of a crystal, aud this would suffice for the explanation of hemitropes, though not directly of geniculated crystals, and still

*less of intersecting twins. Twins have accordingly been divided into '*paragenetic" and '*metagenetic." The first term is applicd to the ordinarily occurring twins, in which the compound structure is supposed to have had its beginning in a nucleal compound molecule, or to have been compound in its very origin. In metagenetic twins the crystal was at first simple, but afterwards, through some change in the material furnished for its increase or possibly induced in itself, it received new layers, or an extension in a reversed josition.*

Fig. 201.

Fig. 208.

Rutile occurs in crystals like fig. 178, but with a bend at both extremities, instead of one only. Here the middle portion of the crystal is supposed to have attained a length of half an inch, and then it became geniculated simultaneously at. both extremities ; – indeed, in this mineral such geniculations are frequently repeated until the ends are bent into one another, and produce short hexa-

gonal prisms with central depressions or even vacuities. The re- peated twinning which produces striation, as in calcite and the

felspars, and the peculiar rippled structure of amethyst, are ascribed to a similar operation, acting in an oscillatory manner.

; Certain intersecting twins in the cubic system may be explained simply through excessive or undue accretion of molecules along cer- tain lines. At page 351 it was shown how the three-faced octahe- dron (fig. 39) was formed through an accretion of molecules upon the faces of the octahedron along axes joining the centres of its faces (those which connect the solid angles of the cube). It was also shown that when through this accretion two faces of the triakis- octahedron (fig. 199), adjacent along the edge of the octahedron, rose into one plane the rhombic dodecahedron resulted. If now accretion still goes on along the same axes, so that the trihedral pyramid

rises above the level of the dodecahedral planes, fig. 200 results. This is the twin of the three-faced tetrahedron (fig. 201).

Fig. 208.

If the accretion is still along the same axes until the lateral edges of the adjacent pyramids fall into: the same line, fig. 202 results; and this is the twin of the simple tetrahedron (fig. 203). Here accretion upon the faces of a complex holohedral form has produced a twin of a simple hemihedral form.

Again, starting from the six-faced octahedron (fig. 204), there is produced by the same process first fig. 205, the twin of the six- faced tetrahedron (fig. 206), and ultimately fig. 207, the twin of the three-faced tetrahedron (fig. 208).

2. Departure from Regularity on Account of Undue Accre-

tion in certain Directions.—Distortion of Crystals.—The pistor- laws of crystallization should produce crystal forms of tions.

perfect symmetry ; these laws, however, are subject, not only to the influence of other laws, but also frequently to

| disturbing influences which are subject to no law. Abso-

lute symmetry, therefore, is very uncommon, crystals being generally so distorted and disguised through interference during their formation that either familiarity on the one hand or skill on the other is necessary for their recognition. As the magnitude of the angles may vary somewhat, even this guide may sometimes perplex. Hence it is necessary to be familiar with such departures from symmetry ; and some of the more common are here noticed.

In the cubic system a cube (fig. 26), le i along one axis, becomes a right square prism (fig. 209), and if elongated in the direction of two axes is changed to a rectangular prism (fig. 7). Cubes of pyrites, galena, fluor-spar, &c., are generally thus distorted. It is very unusual to find a cubic crystal

that is a truc symmetrical cube. ‘ In some species the cube or octa- hedron (or other monometric form) is lengthened into a capillary

lengthened or shortened Of cube.

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‘ crystal or needle, as happens in red copper and _pyrites. Crystals | result in the obliteration of these summit faces, and in the produc- of acicular pyrites occur at the Newton-Stewart lcad-mine. tion of a perfect double octagonal pyramid (fig. 219). The first An octahedron flattened parallel to two of its faces is reduced to | of these distortions is exceedingly common in analcime and not a tabular crystal (fig. 210). If lengthened in the same direction, it takes the form in fig. 211; or if it is still further lengthened, to the obliteration of two opposite octa- hedral faces, it becomes an acute rhombohedron (same figure). Of octa- When an octa- hedron. hedron is extend- ed inthedirection of a line between two opposite edges, it has the gencral form of a rectangular oetahedron ; and still further ex- tended, as in fig. 212, it is changed to a rhombic prism with dihe- dral summits.

Fig. 220.

uncommon in garnet; the latter rarely occurs in analcime. Length- ened along an octahedral axis it becomes fig. 220; shortened along the same it becomes fig. 221. Both are seen in analcime.

The figure repre- ; Fig. PAW ‘ Fig. 212. ; sents this prism lying on its acute edge (spinel, fluor, magnetite). Of do- The dodecahedron when lengthened in the direction of the up- deca- right axis becomes a square prism with pyramidal summits (fig. hedron, 213); and when shortened along the same axis it 1s reduced to a fe square octahedron with truncated basal angles (fig. 214). Both Fig. 223. Fig, 222.

hedral axis it assumes the form of fig. 222 ; still further elongated, kishexa- with obliteration of one half of its planes, it becomes a scalene do- hedron, decahedron. resembling the “dog tooth” form of calcite (fig. 223). Fig. 224 isa hemihedron of this form, produced by shortening along an octahedral axis, with obliteration of all the

planes which do uot touch the poles of that axis. Ly In the case of modi-

fied crystals of this

: : : Fie. 215. system the distortions me si . ; aay, Ses d sis' are more complex. these forms are modifications of the square prism; the first mode | Fig, 225 represents a |: of distortion is common in garnet, rendering it liable to be' con- | crystal of cinnamon- ; sidered zircon; the sccond is seen in aplome, when it might be taken | stone from Aberdcen-

IN shire; it is a combina-

OS When the tetrakishcxahedron is lengthened along a single octa- Of tetra-

tion of the dodecahe-

dron and the trapezo-

hedron. Only four

dodecahedral faces re-

main (d), and those Fig. 224. Fig. 225.

of the trapezohedron (n) are of unequal size. It may be best

understood by regarding it as fig. 218 with the four vertical fuces | of fig. 213; so that it combines the distortions of both of these

figures.

Crystals of diamond are very frequently distorted, though gene- rally through curvatures of their faces. :

Fig. 216. Fig. 217. for stannite. When the first of these forms is flattened, as in fig. 215 Imperfections in the Surfaces of Crystals. it resembles a form.of stilbite. , : When a dodecahedron again is lengthened along a diagonal Of these the most important are strie, caverns, and

curvatures.

1. Striated Surfaces.—The parallel furrows on the surfaces of Imperfec- |} crystals are called strie, and such surfaces are said to be striated. tion of Each ridge on a striated surface is enclosed by two narrow planes. surfaces. These planes often correspond in position to a secondary or to the primary planes of the crystal, and we may suppose these ridges to have been formed by repeated oscillation in the operation of those causes which give rise, when acting uninterruptedly, to larger planes. By this means the surfaces of a crystal are marked in parallel lines with a succession of narrow planes, meeting at angles alternately re-entering and salient, and constituting the ridges

between the obtuse solid angles, it becomes a six-sided prism with trihedral summits, as in fig. 216; and when shortened in the same direction, it becomes a rhombohedron which has its six acute angles truncated (fig. 217). In the first case, a crystal of green garnet or uwarowite would resemble dioptase ; in the latter, colourless garnct would resemble

oe os ee Ty referred to. This combination of different planes in the formation Sani oe ake i ae a \ of a surface has been termed an oscillation of faces, é nD

Cubes of pyrites are generally striated in such a way that the Striatiou. strie on adjacent faces are at right angles to one another. These . ne a earn to ely ees ew of the primary faces with the ynen : : : planes of the pentagonal dodecahedron, which is the most common direction of the upright _Fig. 218. ‘ Fig. 219, ; form of pyrites ; and they have evidently resulted from an oscilla- axis it becomes a double eight-sided pyramid with four-sided | tion between the primary and this secondary form. summits (fig. 218); a further elongation along the same axis would The rhombic dodecahedron is often striated parallel either with the

hedron, distortions which fre- quently disguise it much. When elongated in the

edges, or with the longer or the shorter diagonal of its faces. In the first case, seen in garnet (fig. 226), there is a passage into the six- faced octahedron ; the second results from an oscillatory combination of the dodecahedron with the regular octahedron, as in magnetite ; and the last with the cube, as in aplome.

Rhombohedrons of chabasite are often striated parallel to the

in the left-handed and right-handed crystals, the twist is to the right or left according as the crystal is right- or left-handed.

The surfaces of crystals are frequently far from flat, on account of fracture, with dislocation of the several fragments, occasioned by motion in the enclosing rock, the material of which igs forced; or it may be transfused, into the rents. The tourmalines and beryls (fig. Dislo- 234) which occur in granitic dykes are very subject to this, the frag- cated ments being often bent as well as displaced. A more or less simul- crystals.

terminal edges (fig. 227), indicating an oscillatory combination be- tween the primary faces and a secondary plane which bevels these edges.

Striation of faces is more frequent in the rhombohedral system than in any of the others. Horizontal strie are of almost invariable occurrence in the prismatic faces of quartz, whatever be the form of the crystal. The oscil- lation here has taken place between the pyramidal and the prismatic faces (figs. 228, 229, 230). During its growth there scems to have been a con- tinued effort to complete the erystal by the assumption of the terminal planes,—which effort was intermittently over-

Fig. 228. come by a preponderating one to continue the deposition of matter

Fig. 229. Fig. 230.

along its main axis. Quartz crystals, from these alternate efforts, often taper to a point, without having any regular pyramidal face. The lateral planes of

prisms of tourmaline are very frequently

taneous effort in the crystallization of two substances may produce a structure with the external form of one, the interior of which exhibits imbedded crystals of the other, more or less perfect in their development. In pegmatite or graphic granite, rude crystals of felspar contain skeleton forms of quartz, of which generally only one side of the prism and two of the pyramid occur, forming a rude lettering. Similar hollow quartz forms occur imbedded in garnet, radiating from its ceutre (fig. 235), and roughening its surface from protrusion, without distorting its form. 'Totally imbedded micro- scopic crystals, "microliths," are, as in the latter cases, chemi-

Fig. 233.

convex, owing to oscillation between several lateral faces. In all such cases the interfacial angles cannot be determined, as they are lost in the rounding. " The striations on the lateral faces of foliated mincrals are merely the edges of laminz. Examples: mica and gypsum. Cavern- 2. Cavernous Crystals. —Crystals not unfrequently occur with a ous faces, deep pyramidal depression occupying the place of each plane, as is often observed in common salt, galena (fig. 21), and sulphur. In Fig. 234, Fig. 236. the solution of crystals through atmospheric exposure, an approach nia: ' te a ae : to the same form is sometimes obtained, owing to the fact that the | Cally non-assimilable. These cabin he o. Whe pas Ee centres of the faces yield sooner than the edges and angles. Crystals | the including crystal, as in augite an i ogt: eS ans of redruthite are often thus cavernous, Sometimes octahedrons | & cettain amount of chemical pre ih . mai tg alee s occur with a triangular cavity, in place of each face (fig. 22). The | "efiniteness in the arrangement; and if the enclosed subs hich igi deinek with in dther forms. crystallizes in a system differing from that of the mineral which Curved 3. Curved Surfaces.—Curved surfaces sometimes result from the | !cludes it, the angles of the latter are more or less aed ae surfaces. oscillatory combination already noticed. Others result from a | 18 the case in "microcline," where the intrusion of a plagioclastic

curvature in the lamine constituting the crystal. Crystals of diamond have convex faces, and are sometimes almost spheres. This mode of curvature, in

which all the faces are equally convex, is less common than that in which a convex surface is opposite and parallel to a corresponding concave surface. Rhombohedrons of spathic iron and pearl spar are usually thus curved, as is shown in fig. 231. The saddle-shaped crystals of the same mincral (fig.

Fig. 231. Fig. 232.

232) are remarkable instances of several reversed curvatures in the same face. A singular curvature is shown in fig. 233, of calcite. The conical crystals of brown zine blende, and the lenticular and conical crystals of gypsum, are other examples. Crystals of quartz are sometimes curved and twisted. When this takes place

felspar causes some departure from the rectangularity of orthoclase. Foreign amorphous matter caught up or attaching itself to the surfaces of a crystal, during the process of its growth, causes lines of feeble cohesion,—as in the case of capped crystals of quartz. Here an occasional selectiveness in the sets of faces to which the foreign matter adheres seems to indicate that it has been to some extent under the influence of a polarity in its adhesion. Something of the same kind seems to have influenced the arrangement of the quartz grains caught up during the formation of the crystal of garnet shown in fig. 236. The perfect modelling of rock crystals is, however, but little interfered with by the almost numberless substances which they contain.

Aggregation of Crystals.

Crystalline aggregates which pass into amorphous masses may, in their more marked or perfect form, be assigned to an imperfect twinning.

Crystals are often grouped in linear series, as in native Regular copper and silver, and thus constitute long threads or re- @ggre-

ticulations. In clustered crystals those adjoining each other are generally parallel in position, and are united by a plane parallel to one of the principal sections, or to planes. of common occurrence. Senarmont mentions a union in galena,

parallel to the octahedral faces, as common ; and he also describes an instance where the union was parallel to the plane 33.

The positions of crystals on the supporting rock seem at first to be withont any regularity. But by closer inspection we detect even here the same law of harmony that governs the formation of the simple and compound crystal. The various positions assumed correspond generally with the more common kinds of composition in twin crystals. This regularity is not always manifest on account of the unevenness of the surface on which they rest. In general, however, on glancing over a surface covered with crystals, a reflexion from one face will be aceompanied with reflexions from the corresponding face in each of the other erystals, showing that the crystals are similarly positioned thronghout. :

This tendency to parallelism in the positions of associated crystals is apparent even in crystalline aggregates. In granite, for example, which is composed of felspar, quartz, and mica, the felspar crystallizations have usually a common position; that 1s, the corresponding extremities lie in the same direction, or nearly so. On this account granite is cleavable in one direction niore easily than in others, and this direction is that of the perfect cleavage plane of the felspar; the second less perfect cleavage of the felspar permits of fracture of the rock nearly at right angles to the first; but, as there is no such third cleavage in the felspar, the workman, in fashioning the blocks of granite for paving stones, is compelled to chip or dress them off in the third direction.

The dominant action of polarity may, moreover, give a parallel position to the main axes of different minerals belonging to the same system, when crystallizing in association, and even to those which belong to diffcrent systems. Fig. 237 is an illustration of the first of such cases, where a crystal of zircon, is implanted into a crystal of xenotime, and has its main axis identically in the same line. As illustrations of the latter—a parallel position of the axes of crystals of different systems—there are records of such association in crystals of cyanite and staurolite, of muscovite and

haughtonite, of albite and orthoclase. The same has been observed between crystals of rntile and specular iron,—the crystals of rutile in this case having the vertical axis in the direction of a lateral axis of the specular iron.

Parallel- ism in crystal growth.

Fig. 237.

Haidinger has observed pyroxene and horn- pblende crystals associated in parallel positions.

A prism of calcite terminating in the planes g (fig. 106) has been observed, in which each plane was covered with small crystals of quartz all lying symmetrically, with their pyramids pointing towards

the summit of the calcite crystal. When one mineral is changed into another, a polarity of accretion is still often seen to have domi- nated in the arrangement. In a crystal of calcite which had been changed into a number of minute crystals of aragonite, the main axes of the latter all lay in the direction of the main axis of the original crystal of calcite.

Irregular Aggregation of Crystals.—Besides the regular unions now described, crystals are often aggregated in peculiar ways, to which no fixed laws can be assigned.

‘Thus some crystals, apparently simple, are composed of concen- tric crusts or shells, which may be removed one after the other, always leaving a smaller crystal like a kernel, with smooth distinct faces. Some specimens of quartz from Becralston in Devonshire consist apparently of hollow hexagonal pyramids placed one within another. Other minerals, as fluor-spar, apatite, idocrase, heavy spar, and cale-spar, disclose a similar structnre by bands of dif- ferent colours. A growth rendered intermittent through the deposition of a thin layer of foreign matter is thus developed.

Many large crystals, again, appear like an aggregate of numerous small crystals, partly of the same partly of different forms. Thus some octahedrons of fiuor-spar from Schlageenwald are made up of small dark violet-blue

cubes, whose projecting angles give a drnsy character to the faces of the larger form. Such polysynthetic crystals, as they may be called, are very common in cale-spar.

Varieties Forms of Crystalline Aggregates.—Crystals have often of strac- been produced under conditions preventing the free de- ture in velopment of their forms; and, according to the direction age. of: the axis in which the development has been checked, . Se' they may be divided into "columnar" and "lamellar" arrangements.

The columnar structure is made up of a more or less fibrous

arrangement; and this may be supposed to have accrued from the simultaneous growth of a multitude of crystals from a single or

Trregular aggre-

gates.

from closely adjacent centres of support, so that, while the crystals were free to elongate themselves in the direction of their main axis, their increase was restrained laterally, by their impact upon one another. When the surfaces of support are level, or consist of the opposing sides of a vein, the columns or fibres, frequently exceedingly delicate, are parallel, and not unfrequently they then have a silky lustre. In the latter of the above circumstances the fibres are disposed transversely to the vein. Examples: gypsum, chrysotile, satin-spar. When the surface of support is rough, or has angular projections, the fibres radiate from certain of these in all directions, producing, in a thin vein, a starlike form, whence the arrangement is called "stellular." Example: wavellite. When this takes place in an open cavity, producing brush-like forms, they are – termed "radiant." Examples: antimonite, needlestone. When the points of divergent growth are so positioned that the radiating gronps interlace with one another, the structure is said to be "reticulated," from its resemblance to a net. Example: tremolite. When individual members of such fibrous structure project above the general surface with acuminated extremities, they are said

to be “ acicular”; when the protruding columns are of uniform thickness they are termed “bacillary,” or rod-like. Such terms as straight, curved, twisted-columnar, diverging, or confused-fibrous explain themselves. Such fibrous arrangements as the above may occur imbedded centrally in a rock mass, which had been the magma out of which they were formed; or they may line the inner surface ‘of cavities, filled originally either with water or aqueous vapour. These modes of occurrence have been distinguished by Mohs as crystal groups and druses. The former includes all unions of im- bedded crystals round a central nucleus; the latter those of crystals of simultaneous or regularly successive growth on a common support. In the first case, there may be spheroidal, ellipsoidal, cocks- comb, or other forms, frequently seen in marcasite, pyrite, and gypsum. In the second, spheroidal forms are less rare, but are seen in the case of several of the fibrous zeolites. In such cases surfaces more or less rough are coated, and diminished in angularity, through the hemispherical forms produced by the radiation of a multitude of bres. Certain imitative outlines thus result from the successive deposition of layers of these erystals. These forms or uniting masses are termed “globular” when nearly spherical, “botry- oidal”” when like bunches of grapes, “ reniform” or kidney-shaped when the spheres are larger, more confluent, and less distinct, and “mammillated” when the masses are nearertohemispheres. Mesolite occurs in globular forms; prehnite in botryoidal; hematite and chalcedony in reniform; and siderite and calamine in mammillated. In all the above cases the transverse fracture of such structures dis- closes the fibrous arrangement of the parts ; but, if the growth has been intermittent, lines of deposit, concentric with the central nucleus of each sphere, are evidenced by layers of distinct colours. Fracture or separation frequently takes place, also, along such lines. In such drusy cavities—termed “geodes” when they are circular— after a certain number of such lines of deposit, grouped arrange- ments which have somewhat more of free crystalline development may assume other imitative forms in which there is a certain dependence on the crystallographic character of the mineral con- cerned. There are thus produced coralloidal or coral-like groups, fruticose or cauliflower-like groups, capillary or hair-like, and fili- form or thread-like or wire-like forms. Often these groups expand in several directions, and produce arborescent, dendritic, plumose, mossy, dentiform, or other forms. Such are common among the native metals; as gold, silver, and copper. Mesolite is very frequently plumose. A

‘“‘drusy crust” is the term applied to a thin rough layer of crystals, which invests either a large crystal or the surface of some other body lodged in the interior of cavities.

In the lamellar structure a development along the main axis would appear to have been checked, and. the erystallographic force to have expended itself laterally; though this is not the invariable habit of a species under all circumstances, as exemplified by baryte. This structure consists of flat crystals, plates, or leaves. It is termed “tabular” when the plates are of uniform thickness, ‘Jenticular ” when they are thinner on the edges, “ wedge-shaped ” when sharp on one edge, “scaly” when the plates are thin and small, ‘ foliaceous” when larger and easily separable; “‘ micaceous” is also used to describe this kind of structure. It may also be curved lamellar and straight lamellar. Wollastonite, when fiat lamellar, is called tabular spar; gypsum. is frequently lenticular, tale scaly. Lamellar minerals when radiating from a centre often form fan- shaped, wheel-like, almond-shaped, comb-like, and other groups. In the granular structure, the force of crystallization has been exerting itself along all the axes; but, from the multiplicity of crystallizing centres, there has been such mutual interference that no single individuals have been able to assume perfect or even characteristic forms. The particles in a granular structure differ much in size. When coarse, the mineral is described as coarsely granular; when fine, finely granular; if not distinguishable by the naked eye, the structure is termed impalpable. Examples of the first may be observed in granular carbonate of lime, of the

Pseudo- morphs classi- fied.

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second in some varicties of specular iron, of the last in chalcedony, opal, and othier species.

The above terms are indefinite, but of necessity, as there is every degree of fineness of strncture in the mineral specics, from perfectly impalpable, through all possible shades, to the coarsest granular. The term phanero-crystalline has been used for varietics in whieh the grains are distinct, and crypto-crystalline for those in which they are not discernible without the aid

of a lens. Granular mincrals, when easily crumbled in the fingers, are said to be friable.

The minute or crypto-crystalline minerals form aggregates some- what similar to the above. When globular or oolitic, the minute crystals often appear to radiate from a centre, or form concentric crusts. These are often globular or nodular; asin dolomite. Some- what similar are the stalactites and stalagmites, in which the mineral (especially rock-salt, calc-spar, malachite, hsmatite, limonite) has been deposited from a fluid dropping slowly from some overhanging body, or some rent in the roof of a cave. In this case there is generally found a long pendent cylinder or cone, the principal axis of which, generally hollow, is vertical, whilst the marginal parts are arranged at right angles to it, except where they curve round the termination of the tube, when they become hemispherical.

By far the largest masses of the mineral kingdom have, however, been produced under conditions in which a free development of their forms was excluded, and are termed amorphous. This has been the case with the greater portion of the minerals composing rocks or filling veins and dykes. The structure of these masses on the large scale belongs to geology, but somie varicties of the textures, visible in hand specimens, may be noticed. The individual grains or masses have seldom any regular form, but appear round, long, or flat, according to circumstances, and as each has been more or less checked in the process of formation. Even then, however, a certain regularity in the position of the parts is often observable, as in graphic granite, where the axes of the skcleton crystals of quartz are parallel. ~~The rock is termed massive when the grains which form it are small, or granular when they are longer and more dis~~ tinct. Sometimes the rock becomes slaty, dividing into thin plates ; or concretionary, forming roundish masses ; at other times the interposition of some foreign substanee (gas or vapour) has rendered it porous, cellular, or vesicular, giving rise to drusy cavities. These cavities are often empty, but have occasionally been more or less filled by products of change in the rock. It is named amygdaloidal when the cavities so filled have the form of an almond.

Changes of Crystalline Structure.

“Pseudomorphs” are minerals which appear under a form of crystallization which does not belong to the species. They may be recognized either by their having no cleavage, which is most usual, or by their cleavage being altogether different in direction from that of the mineral imitated. Generally they have rounded angles, rough and dull surfaces, and when broken show-a granular structure. The faces of the crystal, moreover, are often covered with minute crystals of a form different from that of the mineral imitated, but which is that belonging to the substance now present. Occasionally the resemblance to real crystals is so perfect, from the perfect polish of the faces, that they are distinguished with difficulty. They may be frequently found still undergoing change.

Pseudomorphs have been classed under four heads :—

1. Pseudomorphs by Alteration.—Formed by a gradual cliange of composition in a species. Of these there are two varieties: they may be pseudomorphous by loss of an ingredient, or by addition of an ingredient ; change of augite to steatite is an example of the first, and of galena into anglesite is one of the second.

2. Pseudomorphs by Substitution. —Those formed by the replace- ment of a mineral which has been removed, or is gradnally under- going removal; e.g., galena takes the form of pyromorphite.

3. Pseudomorphs by Incrustation.—Those formed through the incrustation ofa crystal, which may be subsequently dissolved away. Often the cavity is afterwards filled by infiltration; ¢.g., change of fluor to quartz.

4, Pseudomorphs by Paramorphism.—Those formed when a mineral passes from one dimorphous state to another; ¢.g., change of aragonite to calcite.

These different kinds of change are not always distinguishable. In some cases a change may take place through alteration of the surface, and then, this process ceasing, the interior may be dis- solved out, leaving a pseudomorph like one of incrustation ; or a pseudomorph that appears to be a result of mere chemical altera- tion may be wholly due to substitution simply.

Again, changes of scapolite to a felspar, and of augite to uralite (hornblende), have been considered by Scheerer examples of paramorphism,—scapolite being considered dimorphous with some telspars, and augite with hornblende. But, while such paramorphic changes undoubtedly take place with aragonite, their occurrence in these silicates—which are common associates in the samc rock, and noe have been formed under like cireumstances—is hardly prob- able.

Where mineral bodics have taken the form of organisms, it is more a case of molecular replacement than of true pseudomorphism.

_ Pseudomorphism should be understood, however, to consist, not sunply in alteration of crystals, but in many instances of changes in beds of rock. Thus all serpentine, whether in mountain masses or in simple crystals, has been formed through a process of pseudo- morphism—or, in more general language, of metamorphism—of olivine and augite. The same is true of other magnesian rocks, as steatitic, taleose, and chlorite slates. The crystalline roeks often offer examples of a change similar innature. The graphite of these rocks is probably but a metamorph of some vegetable organism. Thus the subject of metamorphism, as it bears on all crystalline rocks, and that of pseudomorphism, are but branches of one system of phenomena; the chemistry of both is the same, and a knowledge of such changes is indispensable to a study of the older rock strata of the earth.

The common change of pyrites, forming the main ingredient of the upper part of metallic lodes, to earthy red or brown iron ore, thus producing the "'gossan" of miners, is one of many examples of these processes now in progress. Often the gossan contains dis- seminated silver or gold, derived from the decomposed ores. This is a case of pseudomorphism, as truly as when a simple crystal of pyrites becomes limonite; the mode of change and its laws are the same. Again, phosphates, vanadiates, and arseniates of lead, &c., as well as car- bonates and sulphates, are among the surface species, or those that occupy the upper patt of metallic lodes ; they are the results of altera- tion within those depths to which atmospheric agencies penetrate. :

Pseudomorphs are always records of past existences, in some cases they may be the only evidence we possess of such prior existence. Figs. 238, 239 are pseudomorphs of quartz or hornstone after datholite; the measured angles of these crystals show that the imitated crystal was datholite; but that mineral does not now occur in crystals of either of these forms.

The process of petrification of organic bodies is in reality a species of pseudomorphie formation, and has beeu pro- duced in all the above modes. External and internal casts of organic bodies are not uncom- mon. In other cases the original substance has been replaced by some mineral which has preserved, not merely the external form, but even the minutest detail of internal structure, —so that the different kinds of wood have been distinguished in their silici- fied trunks. The most common petrifying substances are silica and carbonate of lime. In encrinites, echinites, belemnites, and other fossils, the crystals of cale-spar often occur in very regular positions. In some varieties of petrified wood both the ligneous structure and the cleavage of the cale-spar are observable.

Different from the above are mineralized bodies, in which the original structure is still retained, but their chemical nature partially changed. In these a complete series may be often traced, as from wood or peat, through the varieties of brown coal, common coal, anthracite, and graphite.

Causes of Change—The causes of change are the Origin of

simplest and most universal operations about us :—(1) the process of gradual alteration to which some substances are liable on account of the presence of oxygen and carbonic acid in the atmosphere, and the reaction of substances thus formed on adjacent ingredients, aided or promoted by electrical currents or by heat; (2) the solvent power of ordinary waters, cold or hot, or of steam; (3) reactions, in accordance with chemical principles, of the ingredicnts

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dissolved in these waters, or in mineral or sea waters, heated or at the ordinary temperature ; (4) the action of gases ex- haling from the earth ; (5) changes referable to volcanic action.

Ordinary waters hold in solution, as is well known, more or less of mineral matter. When water containing carbonic acid is passed through a large number of ordinarily occurring minerals, it gives evidence of the presence of an alkali, or lime, or magnesia ; and some of these minerals give the tests even with the first drops. Pure water gives with many of them a similar result, but more slowly. Limestone in forty-eight hours yields soluble ingredients to the extent of 0°4 to 1 per cent. of the whole mass. The lime, magnesia, and alkalies appear in the condition of carbonates ; and the iron passes from the state of carbonate to that of peroxide during evaporation, The silicates of magnesia, lime, and man- ganese are especially ready in yielding to this action. Silica, however, is more soluble in ordinary than in carbonated water.

These facts illustrate two important points :—(1) that ordinary waters lying upon and filtering through the earth's crust are constantly active in dissolving and decomposing minerals and rocks, and that even species reputed indestrnctible are thus acted npon ; and (2) that the waters are thus furnishing themselves with agents capable of effecting other chemical changes. These waters penetrate all rocks, as well as percolate through soils. Hence the action is a universal one, everywhere going on ; and the results are universal. Bones, shells, corals, and animal remains generally are also sources of carbonate of lime, phosphates, and fluorides ; and plants may contribute also potash and soda, and sometimes silica.

Carbonic acid is a constant ingredient of the atmosphere, and is dissolved by the rains as they descend ; hence this active de- composing agent is present in all ordinary waters; but it is also a result of different mineral changes. Sulphate of iron along with vegetable matters gives oxygen to the carbon of the vegetable matter, and thus produces carbonic -acid and pyrites or sulphuret of iron; and the large quantities of pyrites in coal-beds show on how grand a scale this process has taken place. Sulphate of zine in a similar manner produces carbonic acid and blende or sulphuret of zinc. Bischof observes that the carbonic acid which has thus becn eliminated must have been sufficient in quantity to make an atmosphere of carbonic acid equal in height to our present atmo- sphere. Again, decomposition of sulphurets produces sulphuretted hydrogen ; this by the oxidating action of the atmosphere forms sulphuric acid, and the sulphuric acid aeting on

limestone produces gypstm, and liberates carbonic acid. Sulphurous acid is also generated in the neighbourhood of volcanoes, and rapidly becomes sulphuric acid, with the same result. Moreover, silica in waters, if aided by heat, will decompose limestone and liberate carbonic acid. Hence it is that this gas is exceedingly common in exhalations from mincral springs ; indeed it occurs more or less in all waters.

The dissolving and decomposing action of carbonated waters is therefore general. The sea also partakes of this character, and, in virtue of the numerous salts which it holds dissolved, is a powerful agent in carrying on the changes to which the process leads. Such changes and the various pseudomorphs to which they give rise have to be regarded as types and evidences of vast metamorphic transfor- mations,—processes either of decay or of reformation which have modified widespread rock-masses, and which are at the present time altering the structure of the crust of the earth. It is through a study of pseudomorphs, and of the processes which have gone to form them, that mineralogy is to become the germ from which alone the petrological department of geology can have its true development, and become a living instead of a merely speculative science.

PHysicaL PROPERTIES OF MINERALS. Characters Depending on Laght.

There are few more interesting departments of science than the relations of mineral bodies to light, and the modi- fications which it undergoes either when passing through them or when reflected from their surface. In this place, however, we only notice these phenomena so far as they point out distinctions in the internal constitution of minerals, or furnish characters for distinguishing one species from another.

Lustre of Lustre.—Though the varieties of lustre admit of no precise minerals. pr mathematical determination, they are of considerable value in mineralogy. One highly important distinction founded on them is that between minerals of metallic and non-mnetallic aspect or character. Transparency and opacity nearly coincide with this division,—the metallic minerals

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| oxides, or minute crystals (“ endomorphs ”’) of another mineral ; or

being almost constantly opaque, the non-metallic more or less transparent. Minerals which are perfectly opaque, and show the peculiar brilliancy and opacity of surface of polished metals, are named metallic ; those which possess these properties in an inferior degree are semi-metallic ; and those without these properties are non-metallic.

Lustre has reference to either the intensity or the quality of the reflected light, considered as distinct from colour. Several degrees in intensity have been named :—(1) splendent, when a mineral reflects light so perfectly as to be visible at a great distance, and lively and well-defined images are formed in its faces, as galena, specular iron, or cassiterite ; (2) shining, when the reflected light is weak, and only forms indistinct and cloudy images, as heavy spar or calcite ; (3) glistening, when the reflected light is so feeble as not to be observable at a greater distance than arm’s length, and no longer forms an image, as tale; (4) glimmering, when the mineral held near the eye in full clear daylight presents only a number of small shining points, as red heinatite and granular limestone. When, as in chalk or kaolin, the lustre is so feeble as to be indiscernible, the mineral is said to be dull.

In regard to the kind or quality of the lustre, the following varieties are distinguished :—(1) the metallic, seen in much per- fection in native metals and their compounds with sulphur, and imperfectly in glance coal ; (2) adamantine, found in beautiful per- fection in the diamond, and in some varieties of blende and cerussite ; a modification is metallic adamantine, as seen in wolfram and black cerussite ; (3) vitreous or glassy, scen in rock crystal, or common glass, or, inclining to adamantine, in flint glass; sub-vitreous is seen in broken calcite; (4) resinous, when the body appears as if smeared with oil, as in pitchstone, blende, and garnet ; (5) waxy, like beeswax, as seen in wax-opal and ozocerite ; (6) pearly, like mother-of-pearl, seen in gyrolite, tale, heulandite ; (7) silky, the glimmering lustre seen on fine fibrous aggregates like amianthus, tremolite, chrysotile, krokidolite.

These degrees and kinds of lustre are generally exhibited differ- ently by unlike faces of the same crystal, but always similarly by like faces. The

lateral faces of a right square prism may thus differ in lustre from that of a terminal face. Thus the lustre of the lateral faces of apophyllite is vitreous, while that of the terminal, at right angles thereto, is pearly ; chrysotile is silky when split along the fibres, dull when at right angles to them.

The surface of a cleavage plane, in foliated minerals, generally differs in lustre from the sides; and here again in some cases the latter are vitreous, while the former is pearly, as in heulandite.

As shown by Haidinger, only the vitreous, adamantine, and metallic lustres belong to faces perfectly smooth and pure. In the first, the index of refraction of the mineral is 1°3 to 1°8; in the second, 1°9 to 2°5; im the third, above 2°5. The pearly lustre is a result of reflexion from numberless lamelle, or cleavage planes, within a translucent mineral; and in hydrated minerals, as in the zeolites, itis the result of incipient change,—namely, a loss of water which ensues upon exposure to the atmosphere.

Colour.—This is a property which is of very inferior Colour. value. Minerals are so seldom, if ever, absolutely pure that very minute quantities of an intensely coloured impurity may impart colour to a substance inherently colourless, or overpower a feebler colour which may be its own.

Some few minerals have colour so strong, or have a constitution so little susceptible of intermixture, that they retain almost unim- paired the colour special to them. Such a substance is pyrite ; its brass-y ellow colour may be heightened to gold-yellow by intermixture with copper sulphide, or it may be slightly bleached by arsenic ; but the nature of its composition does not admit of the intrusion of ordi- nary colouring ingredients. The yellow of native gold, again, may be paled by impoverishment with the white of silver, down to the dull tint of electrum ; but no foreign colouring matter can intrude itsclf into a metallic mass. Such substances as these,—native metals, sulphides, and oxides,—have colours essential to them, dependent on their constitution, and to a great extent characteristic of the species.

A second class of minerals are colourless of themselves, and thus very subject to the influence of minute quantities of foreign tinc- torial impurity. These are absolutely transparent and devoid of colour when in crystals, but white and opaque when reduced to powder ; as ice and snow, calcite and

chalk, rock-crystal and sand. But such substances are generally coloured ; "muddied fil would be called in the first case, though it is equally so with the others. Such false colour may be imparted in several ways. It may be (1) from their holding dissolved some colouring matter ; (2) from mechanical mixture of colouring substances snch as metallic

Streak,

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(3) from ehemical replacement,—the substitution of a smaller or larger quantity of a coloured isomorphous ingredient.

As illustration of the first, silica, colourless in rock-crystal, has been found of almost every tint, duc frequently to volatile hydrocar- bons which are dissipated by heat. Fluorite also, found of almost every shade of every colour, may possibly be to a certain extent referred here.

Quartz, felspar, and caleite are often coloured accidentally by imbedded layers of foreign "inclusions," or by '"spangling endo- morphs." These are mechanically mixed, so far as regards their presence in a structure of different and non-assimilable chemical

composition, but erystallographically arranged. They cither mark | the lines of interrupted or intermittent growth; or, in the case of

endomorphs, the axial positions of the minute intruding foreign erystals lic in one plane, or in the same sets of planes.

As an instance of colours introduced through definite chemical replacement, calcite may be cited. Carbonate of lime is colourless ; if a portion of this be replaced by carbonate of magnesia there is a eertain amount of pearly opacity ; if by carbonate of manganese, of a pink tinge; if by carbonate of iron, of yellow, which may be increased through oxygen absorption and " weathering " to an ochre tint, and ultimately to a dark brown.

Sulphuret of zinc, chemieally white, and mineralogiecally trans- parent, may, through metallic substitution, be found of almost all tints of yellow, orange, brown, and black. Again, hornblende, augite, and garnet, — silieates, which in their purest states of tremo- lite, malacolite, and water garnet are colourless,—acquire green, brown, red, and black tints from the assimilation of other metallic silicates.

Henee it would appear that a very advanced practical know- ledge of the subject is necessary to enable us to avail ourselves of the information which is to be derived from this extcrnal feature.

The accidentally eoloured minerals sometimes present two or more colours or tints, even in a single erystal,—very remarkable exaniples occurring in fluor-spar, apatite, sapphire, amethyst, tour- maline, and cyanite. This is still more common in compound niinerals, on which the colours are variously arranged in points, streaks, clouds, veins, stripes, bands, or in brecciated and ruin-like forms. Some minerals again ehangce thcir colour from exposure to light, the air, or damp. Then either the surface alone is affected or "'tarnished," and appears eovered as with a thin film, producing in some minerals, as silver and arsenic, only one colour; in others, as chalcopyrite, haematite, bismuth, stibine, and anthracite, various or irideseent hues, when they are said to have a pavonine lustre. Or oecasionally the change pervades the whole mineral, the colour either becoming paler, or disappearing, as in chrysoprase and rosc-quartz, or becoming darker, as in brown spar, siderite, and rhodonite. In a few minerals a complete change of colour takes place, as in heterosite, and in the chlorophezite of the Western Isles of Scotland, whieh, on exposure for a few hours, passes from a transparent yellow-green to black. These mutations are generally connected with some chemical or physical change. The tarnished colours sometimes only appear on certain faces of a crystal belonging to a peculiar form. 'Thus a crystal of copper pyrites (like fig. 89) has one face P' free from tarnish ; the faces 5 and ¢, close to P', dark blue; the remainder of ¢, first violet, and then, close to P, gold-yellow.

Some crystalline minerals exhibit in certain directions a very lively play or change of colours from refleeted light. It is well seen in many various hues on the cleavage-planes of labradorite, and scems produced by a multitude

of very thin quadrangular pores, interposed in the mineral, like minute parallel lamin. On the cleavage-planes of hypersthene it appears copper-red, and is oceasioned by similar pores, or by numerous small brown or black lamine of some foreigu substance interposed in a parallel position between the planes of the hypersthene. The chatoyant or changing colours of the sun-stone arise from scales of hematite similarly inter- posed, and that of avanturine from scales of mica. The play of eolour in the noble opal seems to be produced very nearly in the same manner as that in the labradorite. A similar opalescence is secn in certain minerals when cut in particular forms. In the sapphire, cut hemispherically over the chief axis, it appears like a star with six rays; in garnet it shows four rays; in certain varieties of chryso- beryl and of adularia it has a bluish tint; and itis also very remark- able in the cat's-eye variety of quartz. Lridescence often arises from very fine fissures, produeing semicircular arches of prismatic tints, which, like the colours of thin plates in general, are referred to the interference of light.

Streak.—This name is applied to the appearance and the colour of the line or furrow produced in minerals by drawing the edge of a hard-tempered knife or file along their surface, or to the stain obtained by rubbing a soft mineral on such a substance as paper or porcelain. Taken along with the hardness, which may to a certain extent be

| it has no effect, as pyrite is harder than the knife.

determined by the same operation, it is one of the most valuable tests which we possess.

The furrow may be lustrous or it may be dull. Powder or splinters may lie along its course, or a still adherent ridge may have been merely rolled over. The furrow and the powder may each be possessed of colour, though such may not be distinguishable in the mincral, or may have a colour quite different from that of the mineral. Three illustrations of the usefulness of this test may suffice. Argentiferous gold, chaleopyritc, and pyrite, differing immensely in value, may readily be mistaken for each other. The knife, when drawn along the surface of the first, sticks in it, ruts up an adhering ridge,

and leaves a shining streak of the same colour as the specimen. When drawn along the second it ruts up

| a trench covered with a dusty powder, which when rubbed on paper

or in the hand -is greenish yellow. When drawn along the third Psilomelane, hematite, and limonite all oecur in black, glossy, stalactitic forms, and have all been termed "black hematite." "There is here also great difference in the value. The knife makes little impression on psilomelane, but leaves a blue lustrous line; it makes a blood-red line in hematite, and a rich ochre-yellow in limonite. Graphite and molybdenite both crystallize in hexagonal plates, both oecur in the same rocks, both have a grey-black colour and a brilliant metallic lustre, both stain the hands or paper; the streak of the

| first—best seen on paper—is black, tending to blue ; that of the last

is greenish. Rough porcelain is the best material for determining the streak of soft minerals.

Diaphaneity.—Minerals, and even different specimens of Trans- Some mission transmit so much light that small objects can be clearly of light.

the same species, vary much in this quality.

seen, or letters read, when placed behind them ; such are named transparent. They are semitransparent when the object is seen only dimly, as through a cloud, and translu- cent when the light that passes through is so broken that the form of the object can be no longer discerned ; some minerals are only thus translucent on the thinnest edges. Others transmit no light, and are named opaque.

Refraction.—It has already been mentioned that most Double erystals—all, in fact, except those of the cubical system— refrac-

exhibit the phenomena of double refraction. For a general explanation of these phenomena the reader is referred to Licut, vol. xv. p. 609 sq.

The direction in which there is no double refraction is named Optic the optic axis of the crystal, sometimes, less happily, the axis of axis.

double refraction. Now in certain mincrals it is found that there is only one direction with this property, whereas in others there are two such directions ; and they have in eonsequeuce been divided into uniaxal and binaxal. To the former belong all erystals of the tetragonal and hexagonal systems, to the latter all those of the other three systems. In the former the optic axis coincides with or is parallel to the crystallographic chief axis. In some uniaxal erystals the index of refraction for the extraordinary ray is greater than for the ordinary ray ; and in others it is smaller. According as it is greater or less they are said to have positive (attractive) or negative (repulsive) double refraction.

Quartz is an example of the former, the index of refraction, accord- ing to Malus, being for O=1°5484, for E=1°5582; cale-spar of tho latter, the index of O being =1°6543, that of E 1°4888. The index of E is in both cases taken at its maximum.

It should be observed that the optic axes are not single lines, but directions parallel to a line, passing through every part of the crystal. It is also important to remark that this property divides crystals into three precise groups :—the cubic, with single refrac- tion ; the tetragonal and hexagonal, with double refraction, and uniaxal; those of the other three systems, also double, but binaxal. These properties are therefore of the greatest use in determining the system to which a mineral belongs.

Polarization.—Intimately connected with this property Polariza- is that of the polarization of light, which affords an easier 402.

means of determining mineralogical characteristics than the direct study of double refraction. For the elements of this subject see Licut, vol. xv. p. 611 sq.

While a consideration of the optic axes enabled us

‘ merely to arrange the systems of crystallization in three

groups, the phenomena of polarization not only bear out a further subdivision of the whole into the above six systems, but disclose, in many cases, phenomena markedly special to individual species. The optical consideration of these phenomena enables us to fix three directions at

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Axes of right angles to one another—called the axes of optical

optical elasti- city.

Colour pheno- mena.

elasticity—such that the effect of the crystal on the luminous vibrations of the elastic ether is a maximum in one of these directions, a minimum in a second, and a maximum-minimum in the third. The length of these axes is chosen in terms of this action. In certain cases the direction of the axes of optical elasticity is different

for light of different colours.

The position of these axes in relation to the crystallographic axes, and the ratios of their lengths, enable us to class all crystals as follows :—

1. Crystals of the cubic system, Here the three axes of elasticity are all equal. The refraction is simple.

9, Crystals of the tetragonal and of the rhombohedral systems. Two of the axes of optical elasticity are equal in these systems; the third is greater or less according as the crystals are negative or positive. The two equal axes lie in a plane perpendicular to the principal crystallographic axes ; the third axis coincides with the principal axis. ‘ ; f

3. Crystals of the right prismatic system. ‘The direction of the three axes of optical elasticity coincides with the crystallographic axes, taken parallel to the diagonals of the base of the rhombo- hedron, and to the vertical edge of the prism (the primitive parallel- epiped of Levy).

*4. Crystals of the oblique prismatic system. Only one of the axes of optical elasticity coincides necessarily with the crystallo- graphical horizontal axis, or the diagonally horizontal axis of the *hombic base, the direction of the two others not having any evident relation, a priori, with the inclined or diagonally inclined axis of the base, and with the vertical axis (or vertical edge of the primitive parallelepiped). ;*

5. Crystals of the anorthic system. The three axes of optical elasticity have no relation that can be assigned a priori to the crystallographic axes, whatever position may be assigned to these in relation to the primitive solid.

In crystals belonging to the last three systems the three axes of elasticity are unequal.

The axes of elasticity are in gencral such that a ray passing through the crystal in the direction of any one of them is divided into two, which follow that direction with different velocities depending on the lengths of the other two axes. To any other direction there will in general also correspond two different velocities; but their ratio will now depend in a more complex manner on all three axes. In two directions (and only in two, if the axes are all unequal) the ratio becomes unity, or the ray is not divided. These directions are the optic axes.

The displacement of the axes of elasticity for light of different colours, already mentioned, takes place for two axes in crystals of the oblique prismatic system and for all three axes in the anorthic (i.c., doubly oblique) system. In the other systems it does not occur.

In order to follow the distinctive features of the different systems farther, it is necessary to consider the colour phenomena which they ~~*display, when examined in a beam of polarized light. Vari*~~ *ous instruments have been devised for this purpose, as, ¢.9., the polarizing apparatus of Norrenberg, fitted with a condensing lens below and above the crystal slice, or with a low- power (3-inch) eye-piece. The polariscope of Hoff- man of Paris is more efficient, but the appa- ratus of Descloizeaux (fig. 240), who has made this mode of investiga- tion a special study, has the widest scope of use- fulness. In this appa- ratus a blackened mirror is employed for polariz- ing*

the light, taking the place of a tourmaline plate, a Nicol's prism, or a bundle of thin glass. The mirror is inferior to the other two in completeness of polarizing power, and in not admitting of rotation ; while it shares this defect with the last. It is, however, superior to all in extent of field, while it does not, like the first, affect white light. A Nicol's prism is used for examining or analysing the light which passes.

The description of the many beautiful phenomena that may be observed with polarizing apparatus when applied to sections of erystals belongs to the subject of Oprics (PHYSICAL), to which

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heading also we must refer for the phenomena of circular polarization.

Double Refraction and Polarization of Composite Crystals.—In Optic all the crystallized bodies whose action upon light we have been proper- considering, the phenomena are identical in all parallel directions, ties of as the largest, composite In the mineral crystals,

the smallest fragment having the same property from whatever part of the crystal it is taken. world, however (and among the products of artificial crystaltiza- tion), there ocenr crystals which are composed of several individual crystals whose axes are not parallel. These crystals sometimes occur in such regular symmetrical forms that mincralogists have long regarded them as simple forms; and it is probable that they would have still been so viewed if they had not been exposed to the scrutiny of polarized light.

A composite structure has been ob- served in the case of Brazilian topaz, | sulphate of potash, and apophyllite. | Bipyramidal sulphate of potash, which Count Bournon supposed to be a simple] crystal, was found to be a tesselated MMH crystal, composed of three pairs of crystals Wf of the prismatic sulphate of potash com- bined so that cach pair had their principal axes parallel. When exposed to polarized light, cach pair gave the system of binaxal rings, and when held at a distance from the eye had the tcsselated appearance shown in fig. 241, each opposite pair of the triangles having the same tint.

The most remarkable of this class of minerals is the tesselated apophyllite. The examination of this body by polarized light is due to Brewster. For his results the reader is referred to his paper in the Edinburgh Transactions, vol. ix. p. 323.

Figs. 242, 248 are representations of the figure produced in polarized light by an internal slice of the barrel or cylindrical

Fig. 241.

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Fig. 242. Fig. 243.

apophyllite from Kudlisaet, in Disco Island. The figures are from different specimens. The shaded part of them has only one axis of double refraction, while the four sectors have two axcs. The mechanical structure of the cleav- age planes resembles the optical figure even after the planes are ground.

The minerals stilbite, heulan- dite, chabasite, and many others, are similarly complex in struc- ture. R Crystals with Planes of Double Refraction.—Analcime, a mineral ranked among the cubical crys- tals, was found by Brewster to be singular in its action upon light, and to exhibit the extraordinary property of many planes of double refraction, or planes to which the double-refracting structure was related in the same manner as it is to one or two axes in other minerals. It crystallizes most com- monly in the form of the icositetrahedron. If we suppose a com- plete crystal of it to be exposed to polarized light, it will give the remarkable figure shown in fig. 244, where the dark shaded lines represent planes in which there is neither double refraction nor polarization,—the double refraction and the tints commencing at these planes, and reaching their maximum § in the centre of the space enclosed by three of the dark lines. When light is trans- mitted through any pair of the four planes which are adjacent to any of the three axes of the solid, it is doubly refracted, the least refracted image being the extraordinary one, and consequently the double refraction nega- tive in relation to the axes to which the doubly-refracted ray is perpendicular, If we suppose the crystal to have the form of a

Pleo- chroism.

Summits of the blue masses are tipped with purple, and

cube, the planes of double refraction will be, as in fig, 245, a plane passing through the two diagonals of each face of the cube.

The tints vary as the square of the distance from the nearest plane of double refraction.

Pleochroism.—Closely connected with double refraction is that property of transparent minerals named pleochroism (of many colours), in consequence of which they exhibit dis- tinct colours when viewed by transmitted light in different directions. Crystals of the cubic system do not show this property, whilst in those of the other systems it appears in more or. less perfection,—in tetragonal and hexagonal minerals as dichroism (two colours), in the rhombic. and clinic systems as trichroism (three colours). In most cases these changes of colour are not very decided, and appear rather as different tints or shades than as distinct colours. The most remarkable of dichromatic minerals are the magnesian mica from Vesuvius, the tour- maline, and ripidolite ; of trichromatic, iolite, andalusite from Brazil, diaspore from Schemnitz, and axinite.

In a specimen of yellow Iceland spar the extraordinary image is of an orange-yellow colour, while the ordinary image is yellowish white. Along the axis of double refraction the colour of the two pencils is exactly the same, and the difference of colour increases with the inclination of the refracted ray to the axis. This is the invariable law of the phenomena in uniaxal crystals. Sir John Herschel found several tourmalines to have a blood-red colour along the axis, and at right angles to it to be yellow-green. There can be little doubt that this property will be found in every erystal of sufficient refraction. Even if the crystal is colourless, a slight inequality in the intensity of the two images may be observed; and when it is distinctly coloured the difference of intensity is very easily seen, even when the two colours are not of a different kind.

The phenomena of dichroism are best seen in crystals with two axes of double refraction, and are well exemplified in iolite, a mineral which crystallizes in six- or twelve-sided prisms. These prisms are of a deep blue eolour when seen along the axis, and of a yellowish brown colour when viewed in a direction perpendicular to it.

If abed (fig. 246) is a section of the prism of iolite ina plane parallel to the axis of the prism, the transmitted light will be blue through the faces ab and de, and yellowish brown through ad, bc, and in every direction perpendieu- ¢ lar to the axis of the prism. If we grind down the angles a, ¢, b, d, so as to replace them with ™" faces mn, m'n' and op, o'p', inclined 31° 41' to ad, or to the axis of the prism, then, if the plane- | abed passes through the optic axes, we shall ° observe, by transmitting polarized light through Pr % the crystal in the directions ac, bd, and subse- quently analysing it, a system of rings round each of these axes. The system will exhibit the individual rings very plainly if the crystal is thin; but if it is thick, we shall observe, when the plane abcd is perpendicular to the plane of primitive polarization, some branches of blue and white light diverging in the form of across from the eentre of the system of rings, or the poles of no polarization, as shown at p and p' (fig. 247), where the shaded branches The

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represent the blue ones.

are separated by whitish light in some specimens and yellow- ish light in others. The white light becomes more blue from p and p' to o, where it is quite blue, and more yellow from p and p' toc and d, where it is eompletely yellow. When the plane abcd is in the plane of primitive polarization, the

poles Dp, are marked by spots of white light, but everywhere else the light is a deep blue.

In the plane cadb (fig. 247) the mineral, when we look through it by common light, exhibits no other eolour but yellow, mixed with a small quantity of blue, polarized in an opposite plane. The ordinary image at cand dis yellowish brown, and the extraordinary image faint blue, the former receiving some blue rays and the latter some yellow ones from cand dto a and 6, where the difference of colour is still well-marked. The yellow image becomes fainter froma and 6 to p andy', tillit changes into blue, and the faint blue

Fig. 247.

image is strengthened by other blue rays, till the intensity of the two, blue images is nearly equal. As the incident ray advances from ¢

andd top and p', the faint blue image becomes more intense, and the

yellow one, receiving an accession of blue rays, becomes of a bluish

white eolour. The ordinary image is whitish from pand py' to 0,

and the extraordinary is deep blue; but the whiteness gradually

diminishes towards 0, when they are both almost equally blue.

The principal axis of double refraction in iolite is negative. The most refracted image is purplish blue, and the least refracted one yellowish brown.

Brewster found that the dichroism of several crystals is changed by heat, and that in some cases this property may be communi- eated to them. Babinet found that all negative crystals, such as calearеous spar, corundum (including ruby and sapphire), tour- maline, and emerald, absorb in a greater degree the ordinary ray, with the exception of beryl, apatite, and some apophyllites ; while positive crystals, such as zircon, smoky quartz,

sulphate of lime, and common apophyllite, absorb in a greater degree the extraordi- nary ray. Babinet found also that certain crystals, such as red tourmaline and ruby, transmit rays of their peculiar colour without being polarized, —in which eases the black eross of their system of rings 1s coloured, and this unpolarized light exists both in the ordinary and extraordinary ray.

Haidinger devised an instrument for showing and for testing the pleoehroism of minerals. In fig. 248, p is an oblong cleavage-thombohedron of Iceland spar which has two glass prisms w,w of

Fra, 248.—Section of Dichroiscope.

18° cemented to its ends with Canada balsam. This combination is placed in a metallic ease, which has a convex lens 7 at one end and a square hole o about the fifteenth of an inch in width at tho other. The lens is of a focal distanee which shows an object held about half an inch from the square hole.

On looking through the lens and prisms two images of the square hole are seen just touehing each other. The light of the one image is polarized in the plane which intersects the short diagonal of the prism ; that of the other is polarized in the plane of the longer diagonal. When a pleochroic crystal or fragment is held at focal distance and examined by transmitted light, then, on the turning of the instrument bringing the polarization of its planes into coincidence with those of the crystal, the two images of the square opening will show the colours of the oppositely polarized pencils of which the light transmitted by the crystal is composed; this constitutes its pleochroism. The dichroism is then seen by looking through the crystal in one direction only, and the contrast of the two colours is made more obvious.

Phosphorescence.—This is the property possessed by par- Phosphor- escence.

ticular minerals of emitting light in certain circumstances, without combustion or ignition.

Thus some minerals appear luminous when taken into the dark, after being for a time exposed to the sun's rays or even to the ordi- nary daylight. Many diamonds, and also calcined barytes, exhibit this property in a remarkable degree ; less so aragonite, cale-spar, and chalk. Many minerals, including the greater part of those thus rendered phosphorescent by the influence of the sun, also become so through heat. Thus some topazes, diamonds, and varie- ties of fluor-spar beeome luminous by the heat of the hand; other varieties of fluor-spar, and phosphorite, require a temperature near that of boiling water ; whilst calc-spar and many silicates are only phosphorescent at from 400° to 700° Fahr. : ;

Electricity produces phosphorescence in some minerals, as in green fluor-spar and calcined barytes. In others it is excited when they are struck, rubbed, split, or broken; as in many varieties of zine-blende and dolomite when scratched with a quill, pieces of quartz when rubbed on each other, and plates of mica or needles of pectolite when suddenly separated. ' ' . ;

The light emitted by phosphorescent minerals is of various tints. The variety of fluor called chlorophane emits, as its name expresses, a green light. The same particle may emit varying tints, as in the fluor from Aberdeenshire, which, as the heat falls, or the energy of the phosphorescence wanes, emits tints which pass from violet, through blue, green, and yellow, to dull purplish red. The yellow blende from the same place is vividly phosphorescent when heated. Fluor generally phosphoresces with a tint of its own colour.

Too high a heat destroys the phosphorescence, which may, how- ever, be restored by either exposure to sun's light or to electricity.

Fluor- escence.

Eleetric proper- ties of minerals.

Pyro- electri- city.

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The mineral phosphoresces vividly when the discharge passes

‘through it; it generally phosphoresces with a different colour after

it has been thus recharged.

Fluorescence is the property whereby rays of light of a refrangibility higher than those ordinarily seen by the human eye are rendered visible. The substance when placed in the violet end of the spectrum, and carried be- yond it into the invisible rays, becomes luminous, through “degrading ” the rays of extreme refrangibility. This property is well marked in those varieties of fluorite which

are pale green by transmitted light, and deep purple by reflected light. Ozocerite and some petroleums also ex- hibit the property.

Electric, Magnetic, and Thermic Properties.

Electricity.— Friction, pressure, and heat may all excite electricity in minerals. To observe this property delicate electroscopes are required, formed of a light needle termin- ating at both ends in small balls, and suspended horizon- tally on a steel pivot by an agate cup. Such an instrument, can be electrified negatively by touching it with a stick of sealing-wax excited by rubbing, or positively by merely bringing the wax so near as to attract the needle. When

the instrument is in this state, the mineral, if also rendered electric by heat or friction, will attract or repel the necdle according as it has acquired electricity of an opposite or of a similar kind; but if the mineral is not electric it will attract the needle in both conditions alike.

Most precious stones become electric from friction, and are either positive or negative aceording as their surface is smooth or rough. ‘Ail gems become positive when polished ; the diamond even when unpolished is positive. Pressure between the fingers will excite distinct positive electricity in pieces of transparent double-refracting eale-spar. Topaz, aragonite, fluor-spar, carbonate of lead, quartz, and other minerals show this property, but in a mueh smaller degree. Some bodies remain excited much longer than others, topaz for a very long time. Heat or ehange of temperature excites electrieity in many crystals; asin tourmaline, calamine, topaz, calc-

spar, beryl, barytes, fluor-spar, diamond, garnet, and others ; these are hence said to be thermo- or pyro-electric. Some acquire polar pyro-electricity, or the two electricities appear in opposite parts of the erystal, which are named its electric poles. Each pole is alter- nately positive and negative, the one when the mineral is heating, the other when it is cooling. Hankel's investigations of these phenomena are specially noteworthy.

As already noticed, many polar electric minerals are also remark- able for their hemimorphic crystal forms. Tourmaline, calamine, and boracite are among the species thus affeeted. The polarity eontinues so long as the temperature is increasing, aud becomes reversed when it commences to decline; and when the heat is stationary it disappears.

Rose and Reiss name one of the poles the analogue electrie pole, and the other the antilogue eleetric pole. The former beeomes positive while the crystal is heating, and negative while cooling ; the latter negative while heating, and_positive while eooling.

Beequerel found that in tourmaline at 30° C. electrieal polarity

was sensible; it continued unchanged to 150°, as long as the temperature eontinued to rise; if the temperature remained

Fig. 249.

stationary an instant, the polarity disappeared, but shortly mani- fested itself reversed, when the temperature commenced to deeline. If but one end of the crystal was heated the crystal was unpolarized, and when two sides were unequally heated each acquired an eleetri-

Fig. 250.

cal state independent of the other. In tourmaline the extremities of the prism are dissimilarly modified, and that end which presents the greater number of planes is the antilogue pole; or, if the

| name, and the opposite pole

number of planes is the same, the secondary rhombohedrons of the antilogue pole have (one or more of them) louger vertical-axes than those of the analogue pole. Fig. 249 (tourmaline) is the antilogue pole (negative under increasing heat), and fig. 250 the analogue pole. The pyramid of the analogue end is niore flattened by its

facets than that of the antilogue end; thus c and di of the anti- logue end are more aeumi- nating than e! and d? of the analogue end. The same is the ease with the other two crystals (figs. 251, 252). Pyro-electricity has been observed in the following substances : — tourmaline, topaz, axinite, boracite, seolezite, prehnite, electric calamine, sphene, rhodizite, heavy spar, rock-crystal. Pyro-eleetricity is of two kinds,—either terminally polar or. centrally polar. In the former the extre- mities are opposite poles. In the latter two sides of a prism are of the same

to each is intermediate be- Fig. 252. tween the two.

The examples of the first kind are tourmaline, calamine, and scolezite, which are uniaxal; axinite, binaxal; boraeite and rhodizite, with four axes. Calamine, like tourmaline, has the sharper extremity the antilogue end, and the more flattened the analogue. | Compound crystals from Altenberg have both ends analogue, and the portion whieh lies between the twins antilogue electrie; the pyro-electrie axis corresponds with the vertical axis of the prism, as in tourmaline.)\—/\ Boracite, which crystallizes in cubie forms, with the opposite solid angles differently modified, has four pyro-electrie axes, corre- sponding to the four oetahedral axes. In fig. 253 of this species,

the plane whieh has its angles modified by

ee v is the antilogue pole, and that with the ¥ Anal. h Ant. 4

Fig. 254.

unmodified angles the analogue pole ; and, generally, the antilogue pole has either more numerous OF larger facets. Rhodizite re- sembles boracite in its pyro-electricity.

The species in which pyro-electricity of the second kind has been observed are prehuite and topaz. If fig. 254 represent a tabular crystal of prehnite, the poles Will be situated as marked, the analogue being central, and the antilogue at either extremity of the shorter diagonal of the rhombic pris. Topaz has in a similar manner a central analogue pole, and an antilogue at either ex- tremity of the shorter diagonal. In some instances there is a separate set of similar poles near one or the other angle, as in fig. 255; this must be due to the erystals being of a composite nature.

Magnetism.—This property is very characteristic of the Magnet few minerals in which it occurs,—chiefly ores of iron or 8m.

nickel. Some magnetic iron ores possess polar magnetism, or are natural magnets; while the common varieties of magnetite, meteoric iron, magnetic pyrites, precious garnet, and other minerals, are simply magnetic. Most minerals are only attracted by the magnet, but do not themselves attract iron.

Minerals, as other substances, have also been divided into magnetic and diamagnetic. See MAGNETISM.

The ordinary mode of testing whether a mineral is magnetic or not is to bring it near a pole of a delicately suspended magnetic

Mag- netic polarity.

Heat conduc- tivity.

Senar- mont's investi- gations.

MINERALOGY

needle, and observe whether it causes it to vibrate. Another mode is to apply a strong magnet to the mineralin powder. These are sufficient for the mineralogist. Delesse has experimented exten- sively upon the magnetic force of minerals, and has determined the relative amount for numerous species. Calling this force for Styrian steel 100, the following are some of his results :—

eats OMB MER ENED ce == oi, oc sacceacces sausdet fousccussessuck ahah ceccse 2°173 to 3:047

BR Fea POL a cre merce ava angce ness sSs CUSTS ELITE LENG aS cee eee cane Mee een arr aon ae

0°136 to 0°0€5 Spinel (pleonaste), from Monzoni, Tyrol…..... 0°078

Titanic iron (rhombohedral), often magnetipolar…. ..... 5°764 Specular iron, sometimes magnetipolar. 0-14 to 2°35

Graphite…...<:... ace teneeoten ee coeuteac saantat ses. — 0°015 to 07040 Spathie iron (spherosiderite, the highest). 0-092 to 0°287 EWG DM a. ne tae dnicc = nv sdanemase oovcccsocexes – 07039 to 0°057 AAD 2 ag ee rele eee … 0°027 to 0°075 Columbite of Bodenmais and Haddam…..... 3-0-5

Hip GeO MEM eed ctanaceecasecwiesdeeeits

~~*RIGS) MEO TMALNGING). «c.nncensivoveiennsccescvcenseceveessooane f*~~

~~*Felspar, sometimes feebly magnetic.*~~

~~*Labradorite of an antique green porphyry ….....00.- 0°077*~~

~~*PREG PED OO er cece cecrnac cus on! Seen sclore steemett ote caceucesaceudsse<*~~

~~*Crystallomagnetic Action—The magnetic polarity thus far alluded to belongs to the mass, and has no relation to crystalline form. There is also a kind of polarity directly related to the crystalline or optic axes of minerals. A crystal of cyanite, suspended horizontally, points to the north, by the magnetic power of the earth only, and is a true compass needle, from which even the declination may be obtained ; and the line of direction is the line of the optic axes. Other crystals, which are called negative, take a transverse or equatorial position. 'The latter are diamagnetic crystals.*~~

~~*Conductivity for Heat.—Senarmont found that the con- ducting power of colloids and of crystals of the cubic system is equal in all directions, but. that it varies in different directions in crystals belonging to all the other systems, exhibiting characters analogous to those deduced from their double refraction, conformable with the optic axes of the crystal, and referable, as in the latter case, to axes of elasticity, or unequal compression of the molecules.*~~

~~*The fundamental fact is easily shown by taking two slices of rock-crystal, one cut transverse to the axis and one parallel to it. Through the centre of each plate a small hole is drilled for the reception of a bent wire, which by insertion into the hole sustains the plate. The other end of the wire is to be heated, and the rate of the conduction of the heat is rendered visible by the amount of a thin coating of beeswax, with which the plate has been pre- viously coated, which is melted round the central hole. It will be seen that in the transverse slice the wax is melted ina circular form, while in the longitudinal slice the form is elliptical (fig. 256). The conduction is equal in all directions, as regards the transverse axes of the hexagonal prism, but more rapid in one direction in the longitudinal slice, and that direction is the line of its optic axis. In the case of quartz the two diameters of the ellipse are as 1000 to 1312.*~~

~~*If the regular disposition of the molecules of amorphous bodies be interfered with by unequal tension or compression, the regularity of their power of conducting heat is destroyed, and they also show elliptical forms of melted wax ; and: the shorter axis of the ellipse is in the line of pressure or undue packing of the molecules. The heat thus does not travel so fast in this direction,—partly because it is spent in the heating up of the greater number of molecules. Hence we might conclude that along the main axis of quartz a smaller number of molecules are packed in an equal space than along the transverse. The following are the more important of Senarmont"s results.*~~

~~*1. Crystals of the tetragonal and rhombohedral systems have one axis of conductivity which is either greater or smaller than the others, and this axis coincides with the main crystallographic axis. The isothermal surfaces are*~~

~~*ellipses which lie in the line of this axis, and these ellipses may be either elongated or flattened in the direction of this line.*~~

~~*2. In crystals of the right prismatic system the isothermal surfaces have three unequal axes, which coincide with crystallo- graphic axes drawn parallel to the edges of the rectangular prism.*~~

~~*3. In crystals of the oblique rhombic system the 'isothermal*~~

~~*" properties.*~~

~~*Old*~~

~~*surfaces have three unequal axes, one of which coincides with the horizontal diagonal of the base, while the other two have directions which are not referable to any law.*~~

~~*4. In crystals of the anorthic system the isothermal surfaces*~~

~~*' have three unequal axes, all with indeterminable positions.*~~

~~*In crystals of a single axis there appears to exist no constant relation between the axis of optic elasticity, whether maximum or minimum, and the axis of the greatest or of the least calorific conductibility. Thus, of the minerals examined by Senarmont, quartz (), calcite (—), cassiterite (), rutile (), and calomel () have all their greatest axis of conductibility parallel to the principal axis; idocrase, beryl, tourmaline, and corundum, all optically negative, have on the contrary their smallest axis of conductibility parallel to the axis.*~~

~~*In crystals belonging to the oblique rhombic system there is rarely coincidence between the thermic axes and the axes of optic elasticity. In gypsum and in felspar these lie apart to a marked extent.*~~

~~*Dilatation by Heat.—In crystals of those systems in which Dilata-*~~

~~*the molecules are arranged unequally as regards their axes, the amount of their dilatation when heated is unequal in the direction of their axes. Our knowledge of this subject is chiefly due to Mitscherlich.*~~

~~*In crystals of cubic symmetry the expansion is equal in all directions. The dimetric systems—the pyramidal and hexagonal— are brought together as regards this quality, inasmuch as the axes of volumetric change are in these the same; for, while these in the pyramidal correspond with the crystallographic axes, in the hexagonal the three axes are the vertical, one lateral axis, and an axis lying intermediate to the other two and at right angles to the first lateral axis. The expansion along the principal axis may be either greater or less than along the others; and in some minerals there is even contraction along one axis.*~~

~~*In the right prismatic system the axes of dilatation correspond to those of form. In the oblique prismatic one axis corresponds with the orthodiagonal, but the others make angles not only with the other crystallographic axes but, strange to say, with the axes both of thermic conductivity and of optic elasticity. We are as yet ignorant of the properties of anorthic crystals in this respect.*~~

~~*As a consequence of this unequal expansion along different axes, the angles of crystals, other than those of the cubic system, are altered under the influence of heat. The alteration is extreme in the case of calcite, where, through elongation along the vertical axis, with some concomitant contraction of the transverse, the angle of the rhombohedric faces is, when the crystal is heated from 32° to 212° F., diminished from 105° 5' to 104° 56' 23",— the form thus approaching that of a cube, as the temperature is raised.*~~

~~*Dolomite, in the same range of temperature, diminishes 4' 46". In some rhombohedrons, as of calc-spar, the vertical axis is lengthened (and the lateral shortened), while in others, like quartz, the reverse is true. The variation is such, either way, that the double refrac- tion is diminished with the increase of heat ; for calc-spar possesses negative double refraction, and quartz positive. According to Fresnel the same is true of gypsum. The dilatation for calc-spar, according to experiment, is 0°001961. ly 4*~~

~~*Kopp has shown that in the carbonates of lime, magnesia, iron, manganese, and zinc, which are nearly the same in the angle of their crystals, the vertical axis is shorter the greater the atomic volume. And since heat diminishes the density, and therefore necessarily increases the volume, the*~~

~~*axis a should be lengthened by an increase of temperature, as is actually the case. He has determined by cal- culation that the change of angle from 32° to 212° should be 7’ 37”.*~~

~~*Although in the greater number of cases the variations are so sinall as to be scarcely measurable, yet they may be sufficient for establishing a difference between substances which have identical geometric form while belonging to different systems of crystalliza- tion. The angle of arhombohedron might at a certain temperature be 90°, and so coincide with a cube; but that angle would in a rhombohedron change whenever the temperature altered, while the angle of a true monometric cube is constant at all temperatures. The increase in volume and diminution in density which generally result from heating are always accompanied by a change in optical In trimetric crystals, where the principal indices alter unequally, the change affects the amount of divergence of the optic axes. The amount of alteration in gypsum, when the divergence is diminished, is extreme. At the ordinary temperature the angle of the divergence of the optic axes which lie in the plane of symmetry is about 90° for red light; when heated to 177° it is diminished to 0°, and for the moment the crystal appears to be uniaxal, When more highly heated, the axes. again diverge, but in a plane at right angles to the original one, and in cooling these changes take place in reverse order. In barytes and celestine again, the alteration in the angle of the optic axes is a divergence when*~~

~~*heated. ay. —-“4*~~

~~*Hardness.*~~

~~*Tenacity.*~~

~~*378*~~

~~*Characters depending on Cohesion:*~~

~~*five kinds : —(1) hardness, (2) (5) fracture. All may*~~

~~*These characters are of tenacity, (3) elasticity, (4) cleavage,*~~

~~*be considered as related to the power of resisting attempts |*~~

~~*to separate one part from another.*~~

~~*1. Hardness.—A harder body is distinguished from a softer, either by attempting to scratch the one with the other, or by trying each with a file. Each of these methods is used by the mineralogist in determining the hardness of the species, though the latter is in most cases to be preferred. Both methods should be employed when practicable.*~~

~~*Certain varieties of some minerals give a low hardness under the file, owing either to impurities or imperfect aggregation of the particles, while they scratch another mineral upon which a file would have no effect, showing that the particles of the first are hard, though loosely aggregated. Chiastolite, spincl, and sapphire are common examples of this, When the mineral is too hard to be impressed by a file, the peculiarity of the grating sound will suffice for the prac- tised ear.*~~

~~*Mohs introduced a scale of hardness, consisting of ten miuerals, which gradually increase in hardness from 1 to 10… The intervals between 2 and 3 and 5 and 6 are larger than the others. Breithaupt has therefore introduced another degree of hardness between each of the above, and thus his scale consists of twelve minerals.*~~

~~*The scale is as follows :—*~~

~~*1. Talc, common laminated light green variety.*~~

~~*Gypsum, a crystallized variety.*~~

~~*. Mica (muscovite). Calcite, transparent variety. Fluor-spar, crystalline variety. Apatite, transparent variety. '5, Scapolite, crystalline variety. Felspar (orthoclase), white cleavable variety. Quartz, transparent. Topaz, transparent. Sapphire, cleavable varieties. 10. Diamond.*~~

~~*If the file abrades the mineral under trial with the same ease as No. 4, and produces an equal depth of abrasion with the same force, its hardness is said to be 4; if with more facility than 4 but less than 5, the hardness may be*~~

~~43 or 43, written in decimals 4°25, 4°5. Several successive trials should be made to obtain certain results.~~

~~The use of the file is acquired with very little experience ; usually a single trial is sufficient. Care must be taken to apply the file to edges of equal obtuseness. That part also of the specimen should be selected which has not been altered by exposure, and has the~~

~~i On~~

~~f OO NES? OT OT 09 bo SO on .~~

~~highest degree of transparency and compactness of structure. The pressure for determination should be rather heavy, and the file should be passed three or four times over the specimen.~~

~~Where the scale of hardness is wanting, or a first rough deter- mination is sought, the following experiments may serve :—~~

~~Every mineral that is scratched by the finger-nail has H. =2°5 or |~~

~~less. Minerals that scratch copper have H.=3 or more. Polished white iron has H.=4°5. Window-glass has H.=5 to 5:5. Steel point or file has H.=6 to 7; hence every mineral that will cut or scratch with a good penknife has H. less than 6. Flint has H. =7, and only about a dozen minerals, including the precious stones or gems, are harder.~~

~~Many specimens present different degrees of hardness on dis- similar faces; as an example of which we mentjon cyanite and mica, This is confined to the inequilateral primary forms, and like the similar difference of colour, lustre, &c., finds a ready explana- tion in the theory of their formation; unlike faces are the result of the action of a polar force acting along unlike axes.~~

~~This difference in faces parallel to unlike axes may be perceived in nearly all cases, when the methods of trial are sufficiently delicate. Huygens observed long ago that the cleavage face of a crystal of calc-spar differed in hardness from the other faces ; and even in a monometric crystal it has~~

been found that the faces of the cube and octahedron are not exactly alike in this respect.

9. Tenacity.—Solid minerals are said to be brittle, sectile, malleable, flexible, or elastic :—

1. Brittle, when parts of a mineral separate in powder or grains on attempting to cut it ; as baryte, cale-spar.

2, Sectile, when pieces may be cut off with a knife without fall- ing to powder, but still the mineral pulverizes under a hammer; as brucite, gypsum.

3, Malleable, when slices may be cut off, and these slices flatten out under a hammer ; as native gold, native copper.

4. Flexible, when the mineral will bend and remain bent after the bending force is removed ; as gypsum, graphite, tale.

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5. Elastic, when after being bent it will spring back to its

| original position ; as mica.

A liquid is said to be viscous when, on pouring it, the drops lengthen and appear ropy ; as petroleum. P

3. Elasticity Investigations on this property have not to any extent been entered upon. The unequal elasticity of unlike faces of crystals has been shown by Savart in his acoustic investigations, and he was able to distinguish the rhombohedral from the other faces in the pyramid of quartz crystals ; he also showed that the figures formed upon vibrating plates of crystals were directly connected with their optic axes. Milne, by measuring the amount of recoil of a sphere of calcite when struck at different points by another of rock-crystal, found, that the elasticity, as thus measured, was greatest along the line of the optic axis, and least in directions at right angles to it. He also found that points which lay intermediate between the

~~*main and the transverse axes were most indented by the blows. This goes to show that, although there may be fewest molecules arranged along the lines of the transverse axes, yet cohesion operates with greater intensity along these than in intermediate directions. P*~~

~~*When the tenacity of a mineral is overcome by an over- whelming amount of traction, or its elasticity by a sudden shock, its parts are separated, either in flat and continuous surfaces, or in surfaces which are irregular in the extreme. The first of these modes is termed cleavage, the second fracture. In those substances in which cleavage exists it is found that the planes or directions along which it takes place lie in certain strictly definite positions to one another and to the axes of the crystal. They show not the smallest tendency to a transition or gradual passage into the other directions of greater coherence.*~~

~~*4. Cleavage—The number of these parallel cleavage- planes is altogether indefinite, so that the only limit that can be assigned to the divisibility of some minerals, as gypsum and mica, arises from the coarseness of our instru- ments, 'These minima of coherence, or cleavage-planes, are always parallel to some face of the crystal; and similar equal minima occur parallel to every other face of the same form. Hence they are always equal in number to the faces of the form, and the figures produced by cleavage agree in every point with true crystals, except that they are artificial. They are thus most simply and conveniently described by the same terms and signs as the faces of crystals.*~~

~~*Some minerals cleave in several directions parallel to the faces of different forms, but the cleavage is generally more easily obtained and more perfect in one direction than in the others. This com- plex cleavage is well seen in calc-spar and fluor-spar, and very remarkably in zinc blende, where it takes place in no less than six directions. As in each of these the division may be indefinitely continued, it is clear that no lamellar structure in any proper sense can be assigned to the mineral. All that can be affirmed is that contiguous atoms have less coherence along a direction normal to these planes than in other directions. When cleavage takes place in three directions, it.of course produces a perfect crystal form, from which the*~~

~~system of crystallization and angular dimensions of the species may be determined; it is thus often of very great im portance.~~

~~The common cleavage in the different systems is as follows, those of most frequent occurrence being in italics :—(1) In the cubic system, Octahedral, O, along the faces of the octahedron ; Hexahedral, c0oo, along those of the cube ; and Dodecahedral, #0. (2) In the tetragonal system, Pyramidal, P, or 2P ; Prismatic, P, or Po ; or Basal, OP. (8) In the hexagonal system with holohedral forms, Pyramidal, P, or P2; Prismatic, oP, or co Poo ; or Basal,OP; with rhombohedral forms, Rhombohedral, R; Prismatic, oR; or Basal, OR. (4) In the right prismatic system, Pyramidal, P; Prismatic, oP; Macrodomatic or Brachydomatic, Poo or Poo ; Basal, 0P;~~

~~Macrodiagonal, Poo ; or Brachydiagonal, oP, (5) In the oblique prismatic system,Hemipyramidal,P, or — P ; Prismatic, oP; Clinodomatic, P*co ; Hemidomatic, P°so or —P®0*; Basal, OP; Orthodiagonal, «P% ; or Clinodiagonal, wP*o. (6) In the~~

~~Elasticity.~~

~~Cleavage.~~

~~Pe Neh A OG Y~~

~~anorthic system, Hemiprismatic, oP', or oP ; Hemidomatic either | along the macrodome or the brachydome; Basal, 0P ; Macrodiagonal,~~

~~379~~

~~CHEMICAL PROPERTIES OF MINERALS.~~

~~Influence of Chemical Composition on the External Relation of | Characters of Minerals.—That the characters of a com-composi-~~

~~pound must to a certain extent depend on those of its tien to physical~~

~~oP; or Brachydiagonal, Poo. In some minerals, as mica and gypsum, the cleavage is readily procured ; these may be held in the hand and~~

~~*Fracture.*~~

~~*Odour.*~~

~~*Touch.*~~

~~*divided by a knife. difficulty ; these must be placed on a firm support resting on lead, folded paper, or cloth, and a sharp blow struck on a chisel applied in a proper direction. This may often be ascertained by examining the specimen in a strong light. Sometimes it is necessary to subject them to extreme com- pression in a vice. Some of the hardest substances have not only a perfect but a facile cleavage,—as euclase, topaz, and diamond; many of the softest species have none. The planes produced also vary much in their degree of perfection, being highly perfect in some, as mica and calc-spar, and imperfect in others, as garnet and quartz. Ina very few erystalline minerals cleavage-planes can hardly be said to exist. Cleavage must be carefully distinguished from the planes of union in twin crystals, and the division-planes of laminar minerals.*~~

~~*5. Fracture.—This is the irregular manner in which substances may be broken. Even minerals possessed of cleavage may be fractured in other directions; but in amorphous bodies fracture alone occurs. The following varieties of fracture occur, and are highly characteristic:—*~~

~~*1. Conchoidal, almost typical of amorphous bodies, but occas- sionally seen in crystals,—rounded cavities, more or less deep. The name is taken from the resemblance to the successive lines of interrupted growth in a bivalve shell. Seen in flint, obsidian, asphalt. In calcite the direction of this fracture is intermediate to the planes of the mineral's cleavage.*~~

~~*2. HIven, when the surface of fracture is smooth and free from inequalities.*~~

~~*kinds adopted for reference are as follows :— 1. Astringent, the taste of blue vitriol.*~~

~~*. Sweetish astringent, taste of alum.*~~

~~*. Saline, taste of common salt.*~~

~~. Alkaline, taste of soda.~~

~~. Cooling, taste of saltpetre.~~

~~. Bitter, taste of épsom salts.~~

~~. Sour, taste of sulphuric acid.~~

~~. Pungent, taste of sal-ammoniac.~~

~~. Metallic, taste of zinc sulphate.~~

~~Odour.—Excepting a few gaseous and soluble species,~~

~~minerals in the dry unchanged state do not give off odour.~~

~~9 CONT Od Cr CO DD~~

~~By friction, moistening with the breath, and the elimina-—~~

~~tion of some volatile ingredient by heat or acids, odours are sometimes obtained which are thus designated :—~~

~~1, Altiaecous, the odour of garlic. Friction of arsenical iron elicits this odour; it may also be obtained from any of the arsenical ores or salts by means of heat.~~

~~2. HIorse-radish odour, the odour of decaying horse-radish. odour is strongly perceived when the ores of selenium are heated.~~

~~3. Sulphurous. Friction will elicit this odour from pyrites, and heat from many sulphurets.~~

~~4, Bitwminous, the odour of bitumen.~~

~~5. Fcetid, the odour of sulphuretted hydrogen or rotten eggs. It is elicited by friction from some varieties of quartz and limestone.~~

~~6. Argillaceous, the odour of moistened clay. It is obtained from serpentine and some allied minerals after moistening them with the breath ; others, as pyrargillite, afford it when heated.~~

~~7. Empyrewmatie or ozonic. Quartz, when two portions strike one another.~~

~~Touch.—Some minerals are distinguished by a greasy feeling, as tale; others feel smooth, as celedonite ; others meagre, like clay; others cold. This last character distin- guishes true gems from their imitations in glass. Some, in virtue of their hygroscopic nature, adhere to the tongue.~~

~~Others only cleave with more or less'~~

~~This | ! col | these perfect identity is seldom observed, but only very~~

~~| component elements seems, as a general proposition, to~~

~~admit of no doubt. Hence it might be supposed possible from a knowledge of the composition of a mineral to draw conclusions in reference to its form and its other properties ; but practically this has not yet been effected.~~

~~The distinction between the mineralizing and mineralizable or the forming and formed elements lies at the foundation of all such inquiries. Certain elements in a compound apparently exert more than an equal share of influence in determining its physical pro- perties. Thus the more important non-metallic elements, as oxygen, sulphur, chlorine, fluorine, are remarkable for the influence they exert on the character of the compound. The sulphurets, for example, have more similarity among themselves than the various compounds of one and the same metal with the non-metallic bodies. Still more generally it would appear that the electro-negative element in the compound is the most influential, or exerts the greatest degree of active forming power. After the non-metallic elements the brittle, easily fusible metals rank next in power; then the ductile ignoble metals ; then the noble metals ; then the brittle, difficultly fusible ; and, last of all, the metals of the earths and alkalies,~~

~~Generally each chemical substance crystallizes only in one form or series of forms. Some substances, however, show dimorphism, or crystallize in two~~

~~forms, and thus may compose two or more minerals. Thus sulphur, which in nature usually crystallizes in the right prismatic system, when melted forms oblique prismatic crystals. Carbon in one form is the diamond, in another graphite; carbonate of lime appears as cale-spar and as aragonite ; the bisulphuret of iron as pyrite and as marcasite. An example of trimorphism occurs in titanic acid, forming the three distinct species anatase, rutile, and brookite. It is remarkable that of dimorphic minerals one form is almost always right prismatic; thus:—~~

~~Rhombic Form.~~

~~G@yalti Tet ANOGUMICew.2sceessceece.—osess0-.-2sass0s Sillimanite, Andalusite.~~

~~3. Rough, when the surface of fracture is rugged, with numerous Galera, WER G OMAN cece .a nse sene sec eseeeeses Aragonite. small elevations and depressions. aoe nae GS; pecceoneeeosocqancoseseconsoacnes pie a 4, Splintery, when covered with small wedge-shaped splinters. gee \ pyramidal… sestessssseeseserssseeeeseeee Brookite, 5. Hackly, when the elevations are sharp, slightly bent, or Pyrolusite, right prismatic…….ssce-e:s000— Polianite, _ jagged, as broken iron. Cuprite, CUBIC. ....+. apeedne cone catADHOSHNCESOLIoEsON Geen (@) 6. Earthy, when it shows only fine dust. ie a ee phe ee . ee Ome, Dena. oe * koma) Taste. Taste belongs only to soluble minerals. The different Freieslebenite, oblique prismatic. .... Diaphorite. Sulphur, do. sdk . Sulphur.~~

~~Even the temperature at which a substance crystallizes influences its forms, and so far its composition, as seen in aragonite, Glauber salt, natron, and borax.~~

~~Isomorphism.—Still more important is the doctrine of Tsomor-isomorphism, designating the fact that two or more simple or phism.~~

~~compound substances crystallize in one and the same form, or often in forms which, though not identical, yet approximate very closely. This similarity of form is generally combined witha similarity in other physical and in chemical properties. Among minerals that crystallize in the tesseral system, isomorphism is of course common and perfect, there being no~~

~~diversity in the dimensions of the primary form; but for this very reason it is generally of less interest. It is of more importance among crystals of the other systems, the~~

~~| various series of which are separated from each other by~~

~~differences in the proportions of the primary form. In~~

~~great similarity.~~

~~The more important isomorphic substances are either simple sub- stances, as (1) fiuorine and chlorine; (2) sulphur and selenium; (3) arsenic, antimony ; (4) cobalt, iron, nickel; (5) copper, silver, mercury, gold (?); or combinations with oxygen, as (6) lime, magnesia, and the protoxides of iron, manganese, zinc; (7) sesqui- oxides, as of iron, manganese, chromium, and alumina; (8) phosphoric acid, vanadic acid, arsenic acid; (9) sulphuric, selenic, chromic acids; or combinations with sulphur, as (10) sulphuret of~~

~~, ironand of zinc; (11) sulphuret of antimony and of arsenic; (12) sul-~~

~~phuret of lead, of copper, and of silver. These substances are named vicatious from the singular property that in chemical compounds they can mutually replace each other in definite proportions, and very often without producing any important change in the form or other physical properties. But there are numerous instances among the silicates where the mutual replacement of the isomorphie~~

~~Bi-valent elements.~~

~~'iron oxide and chrome oxide,~~

~~bodies, especially when the oxides of the heavy metals come in the room of the earths and alkalies, exerts a most essential influence ou the external aspect of the species, particularly in regard to colour, specifie gravity, and transparency. The varieties of hornblende, augite, garnet, epidote, and~~

~~*many other minerals are remarkable proofs of this influence. This intermixture of isomorphic elements confers many valuable properties on minerals, and to it this depart- ment of nature owes much of its variety and beanty. Without the occasional presence of the colouring substances, especially the oxides of iron and manganese, the non-metallic combinations would have exhibited a very monotonous aspect. It is also remarkable that in some silicates the substitution of a certain portion of the metallic oxides for the earthy bases seems to be almost a regular occurrence; whilst in others, as the felspars and zeolites, this rarely happens. This fact is also of great economic interest, as drawing attention to important elements often combined with others of less value. Thus sulphuret of copper and sulphuret of silver, nickel and cobalt, may be looked for in connexion. The*~~

~~*ALOGY*~~

~~*general chemical formule for such compounds is formed by writing R (=radical or basis) for the whole isomorphic elements; and in special instances their signs are placed one below the' other, con- nected by a bracket, or, as is more convenient, are enclosed in brackets onc after the other separated by a comma. Thus the gene-*~~

~~*becomes (Cag, Fe,, Mgs, Mng) Sig + (Al, Fe, Gr)Si; and this mineral forms many Varieties as the one or other element preponderates.*~~

~~*Of the forms special to similar groups of atoms the more notable are—the cubic system, special to metals proper, and binary compounds as protoxides and haloid salts; the tetragonal to binoxides ; the rhombohedral to carbonates; the hexagonal to sesquioxides and phosphates and their isomorphs; the prismatic to sulphates and their isomorphs.*~~

~~*The isomorphism of minerals goes as a whole to show that form depends on the number of molecules present, and is comparatively little influenced by the nature of the molecules themselves.*~~

~~*DESCRIPTION OF MINERAL SPECIES.*~~

~~*The arrangement adopted in the following description of mineral species is chemical. Simple substances are considered first, in the order of their*~~

~~quantivalence, then binary compounds, and lastly those of more complex structure. Our limits permit of the briefest notice of the less important, in order that more space may be avail- able for the delineation of the characteristic and transition forms of such as go to constitute the more important rock masses.~~

~~The following abbreviations are used:—H., hardness ; G., specific gravity (distilled water at 60° Fahr. and barometer 30 inches=1); cl., cleavage; sol., soluble ; s. [h. or n.] acid, sulphuric [hydrochloric or nitric] acid ; B.B., before blowpipe ; ox., oxidizing ; red., reducing ; ¢.c., chemical composition ; com., combination. ;~~

~~In the chemical formule, barred letters express tw equivalents, and the dots over the symbols indicate the combination with them of as many equivalents of oxygen as there are dots.~~

~~In the symbolic notation the several faces of crystals are separated by semicolons, and the constituent members of combinations by commas. The lettering on the faces of the figures is for the most part that adopted by Miller. In the enumeration of crystal forms, that which is typical of the mineral is placed first.~~

~~SIMPLE SUBSTANCES. 1. SuLrHuR, S. (a) Right prismatic. P (p) polar edges 106° 38', 84° 58', middle edge 143° 17'; oP 101° 58'; OP (ec); 4P(s); Po (n). Crystals~~

~~pyramidal, single or in druses; also stalactitic, disseminated, and pulverulent. Cl. basaland oP. H.=1°5 to a 2°5; G.=1°9 to 2°1. Fracture conchoidal or [afr splintery ; brittle, sectile. Lustre resinous, streak and colour sulphur-yellow, passing into red, brown,~~

~~or green. Sublimes in the closed tube. Fuses a~~

~~little above the temperature of boiling water. : Takes fire at 518° F., and burns with a pale blue~~

~~flame with odour of sulphurous acid. C.c.: pure~~

~~*sulphur, occasionally mixed with traces of selenium, Se*~~

~~*and when amorphous with clay or bitumen. Found Fi*~~

~~*chiefly in Tertiary strata. Localities: Girgenti in ee Sicily, with celestine ; Conil in Spain ; Bex in Switzerland ; Cracow in Poland ; deposited from hot springs in Solfatara near Naples ; from hot springs in Iceland; from sulphur springs in New York ; and in eavities of decomposing galena, cinnabar, and pyrites at several localities.*~~

~~*. (6) Oblique prismatic. The crystals of volcanic sulphur are of this form ; they occur in the neighbourhood both of extinct and of recent volcanoes. They are slender, needle-shaped, and interlacing and have generally more or less of a red-brown tinge. Oxhaveer and Cape Reykjanes in Iceland, Sicily, and the volcanoes of the Pacific, the Chilian Andes, and California yield this variety.*~~

~~*2. SELENSULPHUR, 8.Se.*~~

~~*Like sulphur, but reddish brown to orange-yellow. B.B. burns with fumes of selenious acid mixed with the sulphurous. Found > the crater of Volcano in the Lipari Islands, and Kilauea in Lawaili.*~~

~~*3. SELENIUM, Se.*~~

~~*H.=2; G.=4°3. Brownish black to lead-grey ; thin splinters translucent and red. — From Culebras in Mexico.*~~

~~*4, TELLURIUM, Te.*~~

~~*Rhombohedral ; R 86° 50'. In minute hexagonal prisms, with basal edges replaced ; usually massive and granular. Cl. lateral perfect, basal imperfect. H.=2to 25; G.=—6'1to6'3. Tin-white; sectile. C.c.: tellurium with a little gold and iron. Occurs at Facsebaya near Zalathna (Transylvania), and in several mines in*~~

~~*Boulder county, Colorado ; masses 25 Ib in weight have been obtained there.*~~

~~*5. ARSENIC, As.*~~

~~*Rhombohedral; R 85° 36' (fig. 258). investing masses composed of numberless layers. fine granular, rarely columnar. H. =3°5; G.=5°7 t05°93. Cl. basal. Colour black and dull, but when fresh broken very splendent and silver-white; fracture uneven.*~~

~~*When rubbed or heated gives out a garlic-like*~~

~~*odour. B.B. volatile, with formation of white fumes.*~~

~~*C.c.: arsenic, with some antimony, and traces of Fie, 258 iron, silver, and gold. Andreasberg in the Harz, or Annaberg, Schneeberg, Freiberg, Joachimsthal, Allemont (Dau- phiné), Kongsberg (Norway), the Altai, Chili, Pebble mine (Dum- friesshire), Tyndrum (Perthshire).*~~

~~*6. ANTIMONY, Sb.*~~

~~*Rhombohedral ; R 87° 35'; but rarely crystallized, generally in foliated or granular masses. Cl. basal. H.=3 ; G.=6°6 to 6°8. Tin- white, with slight yellow tarnish. Brittle and sectile. B.B. easily fusible; volatilizes, and on charcoal leaves a white deposit, burning with a pale flame. Found at Andreasberg, Przibram (Bohemia), Sala (Sweden), Allemont, Southham in East Canada, and Borneo.*~~

~~*7. ALLEMONTITE, SbAss.*~~

~~*Hexagonal, spherical, reniform, and investing. H.=3°5 ;G.=6'1 to 6°2. Lustre, when fresh, metallic. Tin-white to lead-grey, but with a blue or brown tarnish. B.B. strong odour of garlic, with residuum of oxide of antimony. C.c.: antimony 37°85, arsenic 62°15. Almost always in curved foliated lamine. Occurs at Allemont, Przibram, Schladming in Styria, Andreasberg.*~~

~~*8. BismMuTH, Bi.*~~

~~*Rhombohedral ; R 87° 40'. Crystals, R,OR, generally distorted ; also reticulated, spear-head twins, or arborescent ; also disseminated and*~~

~~granular. Cl. basal, perfect. H.=2°5; G.~·=9°6 to 9°8. Brittle and sectile. Reddish white, often tarnished grey, brown, or blue. B.B. easily fusible, even in candle flame. Volatilizes on charcoal, leaving a citron-yellow crust. Sol. in n. acid; solution pre- cipitated when thrown into water. Occurs in gneiss and clay slate in veins and disseminated, along with ores of cobalt, silver, lead, and zinc. Alva in Stirlingshire, Cumberland, Devonshire and Cornwall, Schneeberg, Marienberg, Joachimsthal, Bieber, Modum (Norway), Falun (Sweden), Bolivia.~~

~~9. TELLURIC BismuUTH, Bi,Te,.~~

~~Bismuth 52, tellarium 48, Virginia, Dahlonega in Georgia, Mon- tana.~~

~~10. TETRADYMITE, Bi,Te,S.~~

~~Rhombohedral ; 3R 68° 10', Almost always twins of 3R and OR, with the faces of OR at 93°. Cl. basal, perfect. Sectile, and thin lamin flexible. H.=1 to 2; G.=7°2to7°5. Steel-grey. B.B. fuses, yielding a grain of metal which ultimately volatilizes. Sol.~~

~~in n. acid. C.c.: 59°6 bismuth, 35°9 tellurium, and 4°5 sulphur. Schemnitz.~~

~~Usually in botryoidal Tri-valent}—> The structure is elements. |~~

~~MINERALOGY~~

~~11. WEIHRLITE, Bi(Te,S).~~

~~Hexagonal. Cl. basal. H.=1t02; G.=8-°44. High lustre. Steel- grey. C.c/: bismuth 61°15, tellurium 29°74, sulphur 2°38, silver 2°07. Deutsch-Pilsen in Hungary.~~

~~12. JosEITE, Bi,sTe,(SSe),.~~

~~Hexagonal. Cl. basal. G.=7-93. Colour grey-black to steel- grey. Brittle. C.c.: tellurium 15°93, sulphur 3°15, selenium 1°48, bismuth 79°15. San José (Brazil). A Cumberland variety yielded tellurium 6°73, sulphur 6°43, bismuth 84°33, corresponding to Bi,(TeS,).~~

~~13. Dramonn, C.~~

~~Var. 1. Crystallized.—Cubic; very frequently hemihedral. Crystals most generally with curved faces. Twins conmmon on the octahedral face; hemitropes also common (see figs. 170, 204, 205, 207). Crystals vary remarkably in appearance (see figs. 259 to 262). Cl. octahedral. H.=10;G.=3°5to3°6. Transparent, or translucent when of dark colour. Refracts light strongly. The back planes of diamonds reflect all the light which strikes them at an angle exceed- ing 24° 13', and thence comes their peculiar brilliancy. HIgh adamantine lustre. Colourless, but often tinged white, grey, and brown, —more rarely yellow, pink, blue, green, and black, those last named being the rarest. Disperses light highly, and hence emits brilliant flashes of all the colours of the spectrum. Becomes posi- tively electric by friction. B.B. infusible, but burns into carbonic~~

~~7~~

~~Fig. 259. acid in oxygen gas. When air is excluded is unchanged at the temperature of melting cast iron, but at that of melting malleable iron is changed into a black coke, or, it is said, into graphite. Insoluble in all acids and alkalies. C.c.: carbon, with traces of silica and earths. Geologic formation apparently a laminated flexible quartz rock called itacolumite, which occurs in Brazil, the Urals, Georgia, and North Carolina, in the vicinity of places where diamonds have been found. Minute crystals have been found in xanthophyllite, and in talc slate and serpentine, in the Schischim- skian hills, near Zlatoust (Russia). They have also been obtained in Brazil imbedded in a conglomerate composed of much-worn pebbles of quartz, chalcedony, and gold, cemented by limonite or~~

~~Fig. 261. ferruginous clay.~~

~~Fig. 262.~~

~~In South Africa they are imbedded in a steatitic clay. Diamonds were formerly obtained in India, at Panua, Raol-~~

~~conda, and Golconda. So few arenow obtained here that the mines are let for £1 a year. From these mines were obtained not only the Kohinoor, which~~

~~was possibly the same as the great diamond mentioned by Tavernier as having been seen by him in the pos- session of the Great Mogul, which weighed 280 carats, but the Regent, of 136 carats (which, not only from its size, but from the~~

~~erfection of its form, is very much the finest diamond known), the~~

~~izam, an uncut diamond of 340 carats, and the Carlow, rose- cut, 198 carats. More lately diamonds were found in great quantity in the neighbourhood of Rio Janeiro in Brazil ; they occur in two different deposits: the one called "gurgulho" consists of broken quartz covered by a bed of sand; the other, "cascalho," consists of rolled quartz pebbles united by ferruginous clay; both rest on talcose clays, which are the debris from talcose rocks. The first deposit affords the finest diamonds, and both contain gold, plati- num, magnetite, and rutile. A dodecahedral diamond of 257 carats was lately found at Bogagem in this district; this was~~

~~o8l~~

~~reduced by cutting to an oblong brilliant of 125 carats, and is the second most valuable diamond,—the Kohinoor, now reduced to an imperfectly circular brilliant of 102 carats, occupying the third place. The two coloured diamonds most worthy of note are a green diamond in the Dresden collection weighing 31 carats~~

~~which is a little deeper in tint than a beryl, and a blue diamond in the Hope collection, of 44 carats, as highly coloured as a sapphire, which it is by some considered to be. "Diamonds have lately been found in very large quantities, and some of great size, north of the Cape of Good Hope; these for the most part are of yellow colour and of very inferior value. While a Brazilian cut brilliant of one carat is worth from £20 to £25, the value of the finest brilliants from the Cape is only from £8 to £4, and that of the yellow diamonds is from £2 to £2, 10s. Apart from its employment as an ornamental stone, the diamond has an intrinsic value from its being utilized for cutting glass and for grinding and, polishing other gems. Of late years its usefulness has had a new application, it being employed for the drilling of rocks in tunnelling operations and in the boring of artesian wells. A singular observa- tion has resulted from these last methods of utilizing it,~~

~~namely, that the hardness of the African diamonds, as tested by the amount of their endurance, is markedly inferior to that of the Brazilian and Indian. So much is this recognized that, while the bort, or minute crystals, of the latter command a price of 15s. per carat, the African can be got for about 5s. The cleavage of certain of the African diamonds is so eminent that even the heat of the hand causes some of them to fallin pieces. Such diamonds, generally octahedra, may be recognized by a peculiar watery lustre ; they are called plate diamonds. The above facts give some ground for the supposition that there may be a slight difference in their composition, possibly that both may contain small, but different, quantities of hydrogen. The circumstances under which diamonds have been formed are altogether unknown. The fact of their being changed into a kind of coke at a very high temperature is an argument against their having been produced through the operation of heat, and it has long been known that an excess of carbon dissolved by molten cast iron crystallizes on cooling in the form of graphite ; yet the only attempts to form diamonds deserving of being mentioned as having been attended with any measure of success are those in which sugar charcoal was dissolved in niolten silver at the temperature only or melting steel. There were thus obtained a few minute black and also colourless octahedral and cubo-octahedral crystals with curved faces, mingled with a much larger amount of graphitoidal carbon.~~

~~Var. 2. Massive.—In black pebbles or masses called carbonado, sometimes 1000 carats in weight. H.=10; G.=3:012 to 3°42. C.c.: carbon except '27 to 2°07 per cent. of ash. Found in the mines of Baranco, &c., in Bahia.~~

~~Var. 3. Anthracitic.—Like anthracite, but scratches the diamond. In mammillar masses, partly in concentric layers, and globular. Brittle. G.=1°66. C.c.: carbon 97, hydrogen '5, oxygen 1°5. When cutand polished, refracts and disperses light, like the diamond. Supposed from Brazil.~~

~~14. GrapmiteE, C.~~

~~Hexagonal in flat crystals; p:p 85° 29'. Usually foliated, scaly, orcompact. Cl. basal. H.=0°5tol; G.=1°9to2°2. Lustre metallic. Colour and streak black to dark steel-grey ; flexible in thin lamine; very sectile; feels . greasy ; leaves a mark on paper of its own colour; conducts elec- tricity. B.B. burns with diffi- culty ; heated with nitre, de- flagrates. C.c.: carbon, with small~~

~~*quantities of volatile matter, and ash from 5 to 40 per cent. Strathfarrer (Inverness-shire), Mull, Craigman (Ayrshire), Borrowdale in Cumberland, Ural Mountains, Ceylon, Greenland. Used for making pencils.*~~

~~*15) Tos, Su:*~~

~~*Tetragonal in greyish white metallic grains. Reported as occur- ring with Siberian gold; with bismuthite from Guanajuato in Mexico.*~~

~~*16. Iron, Fe.*~~

~~*Cubic; in grains and plates or disseminated. 7 to 7°8. Steel-grey or iron-black. ve' magnetic. B.B. infusible. Sol. in h. acid. Two varieties are to be distinguished. (a) Telluric Jron, in grains and plates. Almost pure iron, or contains graphite, carbon, lead, or copper, but no nickel. At Chotzen in Bohemia in limestone ; in an argillaceous sandstone in the keuper at Miihlhausen ; in Thuringia along with fossils; in an ironstone conglomerate in Brazil, and: in lava in Auvergne ; in the mine of Hackenburg; at Bexley, in Liberia, Africa, along with quartz, a zeolite, and magnetite ; enclosed in magnetite in Unst (Shetland) and in Sutherlandshire ; in basalt in Antrim, Ireland; in the gold sands of Brazil, the Urals, and Olah- pian (Transylvania). (6) Meteoric tron, steel-grey to silver-white.*~~

~~*H. =4°5 4 ce = Native Fracture hackly, very metals.*~~

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~~*Almost always contains nickel, with cobalt, copper, and several minerals which are non-terrestrial. When polished and etched with nitric acid the surface is marked by lines of unaffected inter- lacing crystals called Widmannstitten's figures ; most of the nickel is contained in these. Occurs in masses which vary in size from the smallest microscopic dust as dredged from the depths of the ocean to upwards of 32,000 ib. Many of these masses have been seen to fall. Several (suspected, however, to_be terrestrial) have been found imbedded in a basaltic rock near Disco Bay in Green- land, one of which is 44,000 ib in weight. Several contain hydrogen in their pores, condensed to the extent of eight times the volume of the mass; and the pitted depressions frequently observable upon their surface give countenance to*~~

~~*the view that, if not dis- charged from a volcanic throat, they were set at liberty by some sudden disrupting gaseous explosion.*~~

~~*17. Zinc, Zn.*~~

~~*Rhombohedral. Said to be found in large hexagonal pyramids. Cl. basal, perfect. H.=2; G.=7. Lustre metallic. Colour and streak bluish white. Found in a geode in basalt near Melbourne, Australia, coated with smithsonite, erythrine, and aragonite. Also in the gold sands of the Mittamitta river.*~~

~~*18. CoprEr, Cu.*~~

~~*Cubic (figs. 28, 30, 26, 33, 37, 264). Twins, on an octahedral face. Crystals generally distorted. Often filiform and arborescent, or in plates and lamin. H. =2°5 to 3; G.=8°5 to 8°9. Lustre dull metallic. 'Colour and streak copper-red, with yellow or brown tarnish. B.B. easily = fusible, colouring the outer flame green.*~~

~~*Sol. inn. acid. Occurs in many rocks*~~

~~*(generally igneous), and frequently asso-*~~

~~*ciated with zeolites. In the Faroes, Unst*~~

~~*(Shetland), Cornwall, Chessy near Lyons,*~~

~~*the Banat (Hungary), Siberia, China,*~~

~~*Mexico, Brazil, Chili, and Australia.*~~

~~*Masses of great size are found, much the*~~

~~*largest being from the Ontanagon river,*~~

~~*on the south of Lake Superior. One Fig. 264.*~~

~~*mass found in February 1857 was 45 feet :*~~

~~*in length, 22 feet in width, and 8 feet in thickness; its weight was 420 tons. Another was found in 1869, 65 feet in length, 32 in width, and from 4 to 7 feet in thickness; this weighed upwards of 1000 tons, and had a value of 400,000 dollars.*~~

~~*19. Luap, Pb.*~~

~~*Cubic, but only in thin plates, capillary or filiform. Cl. none. H.=1°5; G.=11‘36 to 11°4. Ductile, malleable, and_sectile. Bluish grey, but with a blackish tarnish. Found in lava in Madeira, and at the mines near Cartagena in Spain; in amygdaloid near ‘Weissig ; in basaltic tufa at Rautenberg in Moravia ; with gold near Mount Alatau in the Altai, at Velika in Slavonia, and at Olahpian in Transylvania ; near Ekaterinburg in the Urals; in the district of Zomelahuacan in Vera Cruz, in foliated galena, in granular lime- stone; in the iron and manganese bed of Paisberg in Wermland (Sweden), with hematite, magnetite, and hausmannite; in white quartz, north-west, near the Dog Lake of the Kaministiquia, an affluent of Lake Superior; imbedded in hornstone in plates and grairis, in the mine of Bogoslovskoi in the Kirghiz steppes; in green- stone porphyry at Stiitzerbach in Thuringia ; with hematite in the islands of Nias on the west coast of Sumatra.*~~

~~*20. Mercury, Hg.*~~

~~*Cubic. Occurs in small liquid globules in its gangue, but may be solidified at — 39°, when it forms octahedral crystals. G. = 13596 when liquid, 15°612 when solid. Lustre brilliant metallic; tin white. B.B. volatile, sometimes leaving a little silver. Readily sol. inn. acid. Occurs generally in clay shales or schists of dif- ferent ages. The globules of mercury are usually found in rents in cinnabar, or accompanying calomel, at most of the localities for these minerals. Found at Idria in Carniola and Almaden in Spain. At Idria it is obtained by washing a soft clay slate. In Transylvania and Galicia springs issuing from the Carpathian sandstone bear along globules of mercury. At the Pioneer mine in California some of the quartz geodes contain several pounds of mercury. At Cividale in Lombardy it is found in an Eocene marl. It has also been observed occasionally in drift, and has even been stated to have been found in a peat bog.*~~

~~21. Sttver, Ag.~~

~~Cubic (figs. 26, 30, 33, 40, 37). Crystals generally small, also and most frequently filiform, arborescent, and in plates or crusts. These either project into cavities, coat their surfaces, or ramify in a reticu- lated manner throughout the mass of the rock. Twins of octahedral and trapezohedral composition. Nocl. H.=2°5 to 3; G.=101 toll'l. Lustre metallic. Colourand streak silver-white, but generally tarnished yellow, brown, or black. Malleable, ductile, and sectile, but less so than gold. B.B. easily fusible. Sol. in n. acid; the solution colours the skin black. C.e.: silver, with varying~~

~~proportions of gold, platinum, mercury, copper,~~

~~gol antimony, and~~

~~bismuth. The auriferous from Norway contains silver 72, gold 28 ; from quartz reefs in Sutherland, silver 71:4, gold 28°6. The cupriferous from Courcy near Caen contains 10 per cent. of copper. The antimonial from Bohemia contains 1 per cent. of antimony. The mercurial from Kongsberg in Norway has '4 of mercury, found chiefly in veins in gneiss, clay slate, and limestone. Localities : Alva and elsewhere in Scotland, Ballycorus in Ireland, and Cornwall in England; at Freiberg, Andreasberg, and Kongsberg; along with native copper at Lake Superior ; in Mexico, in Peru, and in the United States. The finest crystallized silver oecurs at Lake Superior, and at Kongsberg. At the last locality the crystals are an inch in diameter, and are disposed on large filiform brushes. Silver occurs in large masses ; three of 436, 560, 812 ib have been recorded from Kongsberg. A block which smelted 44,000 Ib was for some years used as a table by Duke Albert on his annual visits of inspection to the Schneeberg mine in Saxony. A Mexican specimen was found of 400 Tb; the mines of Huantaya in Peru have yielded masses of 444 and 960 fb. Britain produces annually about 760,000 oz. of silver, chiefly, however, from lead ores. The value of annual produce for the whole world from all sources is froni 8 to 10 millions of pounds sterling.~~

~~22. SCHNEIDERITE (Gold Amalgam), AugHg;. |~~

~~*Tetragonal four-sided prisms, easily crumbling, yellowish white to white ; sometimes in grains the size of a pea. C.e.: gold 41°63, mercury 58°37. Found at Mariposa in California. A variety (Au, Ag), Hg, is found along with platinum in Columbia ; this contains gold 38°39, silver 5, mercury 57°40. —*~~

~~*23, ARQUERITE, AggHg.*~~

~~*Cubic. In octahedra, also in grains and dendrites. G. =10°8. Like native silver, but softer. C.e.: silver 86‘5, mercury 13°5. From Arqueros in Coquimbo, Chili. Kongsbergite, AgjgHg, occurs at Kongsberg, with 95:1 of silver and 4°9 of mercury.*~~

~~*24, AMatcaM, Ag.Hg,, and AgHg;.*~~

~~*Cubic (fig. 33, in combination with 40, 30, 41, 38). Cl. dodeca-*~~

~~*hedral. H. =3to 3°5; G.=10°5to14. Colour and streak silver- white. Fracture conchoidal, brittle, grates when cut. — In closed tube yields mercury aud leaves silver. Sol. inn. acid. The first*~~

~~*variety (silver 34°8, mercury 65°2) oecurs at Moschellandsberg in the Palatinate, where the veins of mercury and silver intersect one another; the second (silver 26°25, mercury 73°75) there, and also at Allemont in Dauphiné, Almaden in Spain, in Hungary, and in Sweden. From Rosilla in Ataeama (Chili) Domeyko reports the following other compounds: Ag3Hg,, silver 46°8, mercury 53°2, white and silvery ; AgHg,; silver 55:1, mercury 44-9, granular and dull; Ag;Hgs, silver 64°2, mercury 35°8; of the last there is a mass weighing 22 Ib in the museum of Santiago.*~~

~~*25. Gop, Au.*~~

~~*Cubic (figs. 30, 26, 38, 40, 36) and more complex forms. Crystals generally smalland indistinct through elongation, assuming capillary and arborescent shapes. Also in thin plates. Twins rare; twin face octahedral. Frequently in rounded and apparently colloidal masses impacted in clay, or loose in small grains (pipettes) rolling in the bed of streams. Fig. 265 is of such a mass found in Sutherland. No cl. H.=2°5 to 3; G.=17 to 194. Lustre metallic, but*~~

~~*fre- quently dull and partly coated with a brown crust. Colour and streak yellow- ish white to bright gold- yellow. Malleable, ductile, and sectile; the purer varieties the more so and the softer. B.B. easily fusible. Sol. in aqua regia, generally with precipitation of chloride of silver. Solu- tion yellow, stains skin purple-red, with corrosion. ‘ C.c.: gold, with silver from °72 to 26 per cent. ; sometimes iron and copper under 1 per cent. Found in beds and veins generally of quartz in metamorphic rocks of a schistose nature, rarely in diorite and porphyry, and very rarely in granite. Its general associate is limonite, formed from decomposition of pyrite ; sometimes also hematite and magnetite. Occurs also in microscopic grains in quartz, from which it is extracted by crushing and amalgamation. The geologic range is from the Azoic to the Tertiary and Cretaceous, as in California ; but even in these more recent rocks the original source must have been at least Paleozoic. Of localities which yield gold the following may be noticed :— the Leadhills in Scotland, Wicklow in Ireland, Dolgelly in North Wales, Cornwall in England; Transylvania, HIungary, and Piedmont; the Urals, Ekaterinburg, and India; Kordofan, the coast opposite Madagas- car, and the Gold Coast (the fame of which has been recently re- vived); Minas Geraes in Brazil, Bolivia, North Carolina, and*~~

~~*Fig. 265.*~~

~~*MINERALOGY*~~

~~*California ; aud more recently New South Wales and Queensland in Australia, Tasmania, and New Zealand.*~~

~~*Some of the largest single masses of gold found in recent times are the following:—one of 22 0z. in Transylvania, of 28 16 in North Carolina, of 20 ib in California, one of 96 Tb troy near Miask in the Urals, and one of 184 tb 8 oz., which yielded £8376, 10s. 6d., at Ballarat, Australia.*~~

~~*The annual produce of gold from Australia is about 5 millions of pounds sterling, of the United States about 15 millions, and the whole earth about 23 millions.*~~

~~*The following sub-species may be noticed :—*~~

~~*1. Electrum. This name for the alloys of gold and silver was applied by Pliny, whenever the proportion of the latter metal was one-fifth. An alloy of 2 gold and 1 silver contains 21 per cent. of silver; this is found in Sutherland. One of 1 to 1 contains 36 per cent. of silver, this last being the most usual proportion. It occurs in Transylvania, in the Altai, and in Colombia. Its colour is brass-yellow to yellowish white. G.=12°5 to 15:5.*~~

~~*2. Porpezite, or Palladium Gold (ouro-poudré), from Porpez in*~~

~~*Brazil, contains 9°85 per cent. of palladium and 4°17 of silver. 3. Rhodium Grold, from Mexico (G. =15°5 to 16°8), contains from 34 to 43 per cent. of rhodium,*~~

~~*26. PLATINUM, Pt.*~~

~~*Cubic; rarely in small cubes or octahedrons, usually in minute scaly grains, sometimes cohering, and also in rounded lumps. No cl. H. =4 to 45; G.=17to 19. Lustre metallic. Colour and streak pale steel-grey. Malleable and ductile with difficulty, having a hackly fracture. When containing much iron, magnetipolar. B.B. in- fusible. Sol. in aqua regia, but only when heated ; solution red ; corrodes tlhe skin. C.c.: platinum, but never toa greater extent than 865 percent. The remainder consists ofiron, iridium, rhodium, palladium, osmium, gold, copper, and a mechanical mixture of irid- osmine. The iron exists in quantities varying from 4°3 per cent. to double that amount. Occurs in Brazil in syenite; near Popayan (Colombia) in alluvium, associated with chromite, iridium, palla- dium, gold, and copper; in the Urals in alluvium derived from crystalline rocks; and at Nijni-Tagilsk in serpentine along with chromite. It is also found in Borneo, California, and Carolina, and is said to have been found in the county of Wicklow in Ireland. The sands of many rivers yield it in small amount. Platinum does not occur in large masses. A mass in the Madrid Musenm: from Condoto weighs 264 oz. ; masses have been found in the Urals from 11 to 21 fb.*~~

~~*Iron Platina is a sub-species. This, which has a composition FePt,, and contains from 11 to 13 per cent. of iron, is found at Nijni-Tagilsk. G.=14-6 to 15°38; H.=6. It is magnetipolar, and attracts iron much more strongly than an ordinary magnet.*~~

~~27. PLATINIRIDIUM.~~

~~In minute silver-white grains. H.=6 to 7; G.=16‘94 to 22:8. Contains 55°44 platinum, 27°79 iridium, 6°86 rhodinm, 4:14 iron, 3‘3 copper, ‘49 palladium. Is found in Brazil.~~

~~28. Inip1uM, Ir.~~

~~Cubic (fig. 27). H. =6 to 7; G. =21°57 to 23°46. Cl. cubic, traces. Very slightly malleable. Silver-white to steel-grey. B.B. un- changed. Insoluble in all acids. C.c.: 76°8 iridium, 19°64 “platinum, 0°89 palladium, 1°78 copper. Found at Nijni-Tagilsk, generally in minute grains. Is the heaviest known substance.~~

~~Avaite, sub-species. From Ava in India. C.c.: 60 iridium, 20 platinum (according to Prinsep).~~

~~29. PALLADIUM, Pd.~~

~~Cubic ; in minute octahedrons, and ingrains. H. =4°5to5; G.= 11°3 to11°8. Malleable. Lightsteel-grey. B.B.infusible. Slowly dissolves in n. acid, forming a brown-red solution. C.c.: palla- dium, with a little platinum and iridium. From the gold sands of Brazil, often in small plumose crystalline lumps. Also from St Domingo, and the Urals. Does not tarnish with sulphurous fumes.~~

~~30. ALLOPALLADIUM, Pd,.~~

~~Hexagonal ; in small flat hexagons. bright silvery. Colour palé steel-grey. Harz, with gold.~~

~~31. NEWJANSKITE (Osmiridiwm), IrQs (iridium 49°78, osmium 50°22) and Ir,Os.~~

~~‘Hexagonal; P 124°. OP, P, oP. Generally in flat scales. Cl. basal perfect. H.=7; G.=18°8 to 19°47. Lustre metallic. Colour tin-white. B.B. unchanged. Insoluble —·— in all acids. The analyses of this mineral give a ar ae quantities of iridium varying from 44 to 77 per cent., and of osmium~~

~~*from 21 to 49. Ruthenium, ! rhodium, and platinum make up the 100 parts. Fic, 266 The largest quantity of ruthenium is 8°49, and Ne one variety from New Granada was found to contain no ruthenium, but 12°3 of rhodium, which is more than double its usual amount. Occurs with platinum in Choco (Colombia); at Newjansk and*~~

~~*Cl basal, perfect. Lustre From Tilkerode.in the*~~

~~*383*~~

~~*several localities in the Urals, in Australia, in northern California (somewhat abundantly in gold sands), also in Canada.*~~

~~*32. SISSERSKITE (Jridosmiwm), lrOs, (iridium 19°9, osmium 80:1) and IrOs, (iridium 24:8, osmium 75-2).*~~

~~*Rhombohedral ; R=84° 28'. H.=7:5; G.=21-12. Colour lead- grey to bluish. B.B. becomes black, with strong odour of osmic acid ; in flame of spirit-lamp shines strongly, and colours flame yellowish red. Occurs in small quantity with newjanskite at all its localities, and in proportionally larger quantity at Sissersk in the Urals. It is used for pointing gold pens, and in the United States sells at 50 dollars an ounce.*~~

~~*COMPOUNDS OF FLUORINE, CHLORINE, BROMINE, AND IODINE (HALOID SALTS).*~~

~~*33. FLuoRITE (Fluor-spar), CaF.*~~

~~*_ Cubic (figs. 267 to 270, also figs. 31, 33, 36, 55, 56, 57, 58); also divergent crystalline, granular, and compact. Cl. octahedral; fracture conchoidal ; brittle. H.=4; G.=3-1to 3-2. Transparent to pellucid. Lustre vitreous. Colourless, but generally coloured purple, blue, green, yellow, white, black, and pink. Sometimes two or three colours disposed in layers in one crystal. Frequently*~~

~~*Fig. 269.*~~

~~*Fig. 270.*~~

~~phosploresces with different tints of light, when heated. B.B. de- crepitates and fuses to an opaque bead. Sol. ins. acid with evolution of hydrofluoric acid. C.c.: 51°3 calcium, 48°7 fluorine. Common in veins, generally associated with metallic ores. Shetland, Suther- land, on the Avon, and Ballater in Scotland; Cumberland, Northumberland, Derbyshire, and Cornwall; Saxony, Bohemia, Freiberg. Used to be turned intovases and other ornaments (“ blue John ”) ; formerly employed as a flux, now for etching and obsenring glass. . :~~

~~34. YITROCERITE.~~

~~In crystalline crusts. H.=4t05; G.=3‘4to3°5. Translucent ; vitreous. Violet-blue to grey or white. B.B. infusible. Evolves fluorine when heated with sulphuric acid. C.c: fluorides of cerium, yttrium, and calcium. Finbo and Broddbo near Falun (Sweden), Massachusetts and New York.~~

~~35. FLUOCERITE, CeF + Ce,F3.~~

~~Hexagonal. H.=4 to 5; G.=4°7. Opaque or translucent on the edges. . Pale brick-red or yellowish ; streak yellowish white. B.B. infusible. In closed tube gives out hydrofluoric acid. C.c.: 82°64 peroxide of cerium, 1°12 yttria, 16°24 hydrofluoric acid. Finbo and Broddbo.~~

~~36. FLUOCERINE, Ce,F,(Ce,03 H,O).~~

~~Massive ; fracture conchoidal. H.=4°5 to 5. Opaque; resinous. Bright yellow to reddish brown ; streak brownish yellow. B.B. infusible, darkens with the heat; colour restored on cooling. C.c¢.: cerium 17°6, fluorine 10°9, sesquioxide of cerium 6674, water 5:1. From Finbo.~~

~~37. BASTNAESITE, Ce,F;Ce,03; 4H,0, and~~

~~38. HaMarrIrE, 2(LaO, CeO)3CO,+CeF;, are similar. The first is from Bastnaes in Sweden, the second from Pike’s Peak in Colorado.~~

~~39. FLUELLITE, Al,F3. Right prismatic. In acute rhombic octahedrons with truncated apex. Polar edges 109° 6' and 82° 12', middle 144°. H.=8. Lustre vitreous. Colour white; transparent. 40. OryvotiTE, 3NaF + ALF3.~~

~~Anorthic; but mostly in cleav- able masses. M:7 91°57'; P:T~~

~~Stenna-gwyn in Cornwall.~~

~~90° 2; P:M 90° 40'. Cl P perfect, Jf and 7 imperfect ; brittle. H.=2°5; G.=2°9 to 3°08.~~

~~Vitreous, somewhat pearly on P. Translucent; after immersion in water transparent. Colourless and . snow-white ; but when deep-seated brown to black. Melts even in flame of candle to a white enamel. In open tube traces of hydrofluoric acid. Sol. ins. acid. C.c.:alumi- nium 13, sodium 32°8, fluorine 54°2. Fic. 271 Arksutfiord, Greenland; Miask, a Siberia. Used for manufacture of a white glass, and extraction of aluminium. '~~

~~41, Arxsvuvits, (CaNa),F+AlLF;. Ca:Na=1:3.~~

~~Massive granular. H.=2'5; G.=8°03 to 3°18. Cl. one distinct. Vitreous; white; translucent. C.c.: aluminium 18°6, sodium 23°38, calcium 6°8, fluorine 51°38. Arksutfiord.~~

~~42. CHioLirE, 8NaF +2Al,F;.~~

~~Pyramidal, and twins (fig. 272). Middle edge 111° 14'. Mostly granu- lar. Cl. imperfect. H.=4; G.=2°84 to 2°9. Resinous; white. Fuses more easily than cryolite; evolves hydro- fluoric acid. C.e.: aluminium 18°6, sodium 23°4, fluorine 58. Ilmen Mts. near Miask.~~

~~43, CHODNEFFITE, 2NaF + Als.~~

~~G.=3. Other characters like chiolite, and from same locality.~~

~~44, PacuNoutrE, 3(CaNa)F+Al,F3;+2H,0. Ca: Na=38:2.~~

~~Oblique prismatic. oP 98° 34'; always twins. Vitreous; white ; semitransparent. C.c.:aluminium 12°3, calcium 16°1, sodium 12°4, fluorine~~

~~51°1, water 8°1. Evolves water with crackling, when heated ; other characters like cryolite, along with which it occurs in Greenland. :~~

~~45. Tuomsenouite, 2(CaNa)F+Al,F;+2H,0. Ca: Na=7: 3.~~

~~Oblique prismatic. Prismatic planes striated; oP 89° (fig. 273). Cl. basal, perfect. H. =2°5 to 4; G.=2°74 to 2°76. Vitreous; cleav- age face pearly. White with yellow crust; trauslu- cent. C.c.: aluminium 15, calcium 15-4, sodium 76, fluorine 52-2, water 9°8, B.B. fuses more easily than cryolite to clear glass, decrepitating violently. Along with cryolite in Greenland.~~

~~46, GEARKSUTITE, Cag + Al,F3+4H,0. RSS~~

~~Earthy. H.=2. White; dull; opaque. C.c.: KN aluminium 15°5, calcium 19°38, sodium 2°5, fluorine KXy=~~

~~41:2, water 20°3.. Along with cryolite.~~

~~47. EviaToxiTE, 2CaF,+ALF,+2H,0.~~

~~Crystalline. Soft; brittle ; like kaolin. calcium 22°39, aluminium . 16°23, fluorine 55°24, water 5°71. land.~~

~~48, PROSOPITE. Oblique prismatic. A hydrated silico-fiuoride of aluminium and calcium. H.=4; G.=2°89.~~

~~Colourless imbedded crystals. From the tin- mines of Altenberg.~~

~~49, CALOMEL, Hg,Cl.~~

~~Pyramidal ; P 135° 50' (fig. 274). H.=1to2; G.=6'4 to 65. Translucent; adamantine. Yel- lowish white to grey. Sublimes unchanged in closed tube; with soda yields mercury. Insol. in n. acid.~~

~~C.c.: mercury 85, chlorine 15. Moschellandsberg, Idria, Almaden.~~

~~50. SyLvitg, KCl.~~

~~*Cubic (figs. 26, 30); also massive. H.=2; G=1°9 to 2. White or colourless. .. ._ Vitreous; soluble; taste like common salt. Fig. 274 (sp. 49). C.c.: potassium 525, chlorine 47°5. B.B. fuses, and colours flame violet. Crater of Vesuvius, and salt beds of Stassfurt.*~~

~~*51. HALITE (Common Salt, Rock-salt), NaCl.*~~

~~*Cubic (fig.21) ; generally granular, sometimes fiorous. Cl. cubic.*~~

~~*(Cken sodium ‘43, Arksutfiord, Green-*~~

~~*Cl. cubic.*~~

~~*MINERALOGY*~~

~~*H.=2; G.=2‘1 to 2:2. Transparent to translucent ; vitreous. Colourless or white; but often coloured red, yellow, or blue. Taste saline. B.B. fuses and partly evaporates ; colours flame yellow. C.c.: sodium 39°3, chlorine 60°7. In great beds at Wieliczka, Salzburg, Bex, &c., on the Continent; Cheshire in England. As an efflorescence in Brazil, Abyssinia, the Caspian and ‘Aral Seas. As a sublimation among lavas at Vesuvius and other volcanoes.*~~

~~*52. Satmrac, NH,Cl.*~~

~~*Cubic (figs. 30, 40, and 41 with 26, 33, 40). Cl. octahedral ; also stalactitic, globular, and as an efflorescence. H. =1°‘5 to 2; G.=1‘5 to 1°6. Pellucid; vitreous. Colourless, but sometimes stained. Taste pungent. B.B, directly volatile ; in copper colours flame blue-green. C.c.: 32 ammonia, 66°4 chlorine. A sublimate on active volcanoes. Vesuvius, island of Volcano, Iceland. Near coal-seams which have taken fire, in Scotland and at Newcastle.*~~

~~*53. CHLoRo-CALcITE, CaCl+(KCl, NaCl). Cubic. Vesuvian bombs.*~~

~~*54. CERARGYRITE, AgCl.*~~

~~*Cubic (fig. 26). Twins on octahedral face. No cl. ; chiefly massive in crusts. H.=1 to 1°55; G.=5°5 to 5°6. Fracture con- choidal. Malleable. Translucent; adamantine to resinous. Grey, yellowish, and greenish. B.B.*~~

~~*fuses easily to a dark bead, reduced iu inner flame. Soluble in ammonia. C.c.: silver 75, chlorine 25. Johann-Georgenstadt, Mexico, Peru.*~~

~~*55. Empo.itr, 2AgBr + 3AgCl.*~~

~~*Cubic (fig. 29); also massive or concretionary. Boel todca; G.-=5°8. Adamantine to resinous. Green and yellowish green. C.c.; silver 67, chlorine 13, bromine 20. Chili, Mexicv, Honduras.*~~

~~*56. Bromite, AgBr.*~~

~~*Cubic (figs. 26, 80). H. =1to2; G.=5°8 to 6. Splendent. Yellow to olive-green ; streak siskin-green. B.B. fusible easily. C.c.: silver 57°5, bromine 42°5. San Onofre and Plateros (Mexico).*~~

~~*57. Iopirz, Agl.*~~

~~*Hexagonal. Cl. basal; also massive, and in crystalline plates some inches in width; these are flexible. H.=1 to 15; C= 55 to 5°7. Translucent; adamantine. Citron and sulphur-yellow ; streak yellow. B.B. fusible, colours the flame purple-red, and leaves button of silver. O.c.: silver 46, iodine 54. Zacatecas in Mexico, Algodones in Chili, Arizona, rarely in Spain.*~~

~~*58. CocciniTE, Hgl,.*~~

~~*In grains of an adamantine lustre, from Casas- Viejas in Mexico. Colour red to yellow ; in acute rhombic prisms. Also from Zimapan and Culebras.*~~

~~*59. TocoRNACLITE, Ag! + Hg,I .*~~

~~*Amorphous, yellow, soft. Chaiiarcillo in Chili.*~~

~~*60. CoruNNITE, PbCl.*~~

~~*Right prismatic. H.=2; G.—5°238. Transparent ; high ada-*~~

~~*mantine to pearly. White. C.c.: lead 74, chlorine 26. Crater of Vesuvius.*~~

~~*61. MotysiTE, Fe,Cls.*~~

~~*Incrusting. Brownish red and yellow. On lavas of Vesuvius.*~~

~~*C.c.: iron 34°5, chlorine 65°5. 62, CARNALLITE, KC1+2MgC1+12H,0.*~~

~~*Right prismatic. Nocl. Conchoidal fracture. H.=2 to 2°5; G.—1°6. Colourless, generally red from iron. C.c.: 342 chloride of magnesium, 26°9 chloride of potassium, 38°9 water. Stassfurt, Galicia, Persia.*~~

~~*63. TAcHHIYDRITE, CaCl+2MgCl+12H,0.*~~

~~*Massive. Yellow, translucent, very deliquescent. In anhydrite. C.c.: calcium 7°46, magnesium 9°51, chlorine 40°34, water 42°69. Stassfurt.*~~

~~*64. Kremersite, KCl+NH,Cl+ FeCl, +3H,0.*~~

~~*Cubic; in octahedra. Ruby-red. Soluble. Fumaroles of Vesuvius.*~~

~~*65. ERITHROSIDERITE, 2KCl+ Fe,Cl,+2H,0.*~~

~~*Right prismatic. Vesuvian lava.*~~

~~*66. MATLocKITE, PbCl+ PbO.*~~

~~*Pyramidal; P 136° 17'. Crystals tabular. Cl. basal ; fracture conchoidal. H.=2°5 ; G.=7°21. Translucent; adamantine. Yellowish white. B.B. fuses easily with decrepitation ; colours flame blue. C.c.: chloride of lead 55°5, oxide of lead 44°5.*~~

~~*| Cromford in Derbyshire.*~~

~~*67. MrnprpiTE, PbCl+2PbO.*~~

~~*Right prismatic; chiefly massive. Cl. oP perfect 102° 36'. H.=2°5 to 3; G.=7:to7'l. Fracture conchoidal. Translucent; adaman-*~~

~~*_ tine to pearly. Yellowish or greyish white. BB. decrepitates, fuses*~~

~~*MINERALOGY*~~

~~easily. Sol. in n. acid. C.c.: chloride of lead 40, protoxide of lead 60. Mendip Hills, and Brilon in Westphalia,~~

~~68. SCHWARTZEMBERGITE, PbI+2Pb0O.~~

~~Rhombohedral ; in thin crusts. H.=2to 2°5; G.=5°7 to 6°3. Adamantine. Honey-yellow. Desert. of Ata- cama.~~

~~69. ATACAMITE, CuCl+3Cu0,H,O.~~

~~Right prismatic ; oP (Jf) 112° 25', Po (P)~~

~~106° 10', oP so (h) (fig. 275); also reniform. Cl. h perfect. Semitransparent; vitreons. Emerald — green ; streak apple-~~

~~green. B.B. fuses, leaving cop- per. Easily soluble in acids. C.c.: copper protoxide 55°85,~~

~~copper 14°86, chlorine 16°61, water 12°68. Atacama, Chili; Tarapaca, Peru; Bolivia ; Burra- Burra, Australia; Serra de Bembe, Ambriz, Africa ; Vesu- vius and (?) Etna,~~

~~70. TALLINGITE, CuCl, H,O+4Cu0, H,O.~~

~~In crusts. H.=3; G.=3°5. Bright blue to greenish blue. Trauslucent; brittle. Botallack in Cornwall.~~

~~71. PERCYLITE, (PbCl+ PbO) + (CuCl1+CuO). Cubic (com. of figs. 26, 30, 38, 36). H.=2. Vitreous. Sky-blue. Sonora in Mexico. , 72. CONNELLITE. Bae oo lsp. 12), Hexagonal (fig. 276). 6:r 148° 10°; r:r 182° 50'. Crystals acicular. Vitreous; translucent. Vitriol-blue. A~~

~~chloride and sulphide of copper. Wheal Unity and Wheal Damsel (Cornwall).~~

~~sweet~~

~~Fig. 275 (sp. 69).~~

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OXIDES OF METALS.

1. SuBoxIDES AND PROTOXIDES. 73. CupRITE, Cu,0.

Cubic (figs. 22, 30, 38, 26, with 39, 40). Compact and granular. Cl. octahedral ; brittle. H.=3‘5to4; G.=5°7 to6. Transparent and opaque ; adamantine. When transparent, crimson; when opaque, cochineal or brick-red. Often tarnished grey. B.B. becomes black, fuses, and is reduced on charcoal. Soluble in acids and in ammonia. C.c.: 88°9 copper, 111 oxygen.

~~Cornwall, Siberia, Banat, Chessy near Lyons, Linares in Spain, Urals, South Africa, Burra-Burra. Valuable copper ore. Chalcotrichite consists of cubes elongated so as to become fibrous. Tile-ore is a ferruginous variety. Hepatic copper, liver ore, or pitchy copper ore seems to be a product of the decomposition of chalcopyrite. Delafossite, Cu,0 + Fe,0,, from Bohemia and Siberia.~~

~~74, Water, HO.~~

~~Hexagonal, when solid, in complex twins in snow crystals; thombohedric by cleavage, inice. H.=1°5; G.=-918. Hence 1000 of water—1089°5 of ice, or water expands #,th in freezing. Trans- parent ; vitreous. Colourless, but in bulk pale emerald-green. R 117° 23”. Cl. basal. Water when pure colourless, in mass bluish green. Occurs in centre of geodes of chalcedony in China; of druses of quartz in California and many other countries; in zeolitic cavities to the amount of several gallons in the Faroes, also in the Hebrides, &e. Water of the ocean, from holding saline matters in solution, has G. =1‘027 to 1:0285. Waters ofsaline lakes contain sometimes 26 per cent. of salts, and have G. 1°212. Besides its vast bulk in the ocean, water occurs in enormous amount in the solid form, often as water of crystallization in rocks and minerals, ¢.g., zeolites. Igneous rocks in some districts are converted largely into saponite, which contains 25 per cent. of water. Water is the standard for specific gravities of solids and liquids ; 1 cubic inch at 60° F. and 30 inches of the barometer weighs 252°458 grains ; 1 litre weighs 1000 grammes.~~

~~75. PericuasE, MgO. Cubic; in cubes and octahedrons.~~

~~3°75. Transparent; vitreous. Grey to dark green. B.B. infusible. Sol. in acids. C.c.: magnesia, with 6 to 8 of iron oxide. Somma.~~

~~76. Bunsenirg, NiO.~~

~~Cubic; in octahedrons. H. =5°5; G.=6°4. Vitreous. Pistachio- green. Johann-Georgenstadt.~~

~~77. ZINcITE, ZnO.~~

~~*Hexagonal and granular. Cl. basal. 5°5. Adamantine ; translucent. orange-yellow.*~~

~~*Cl. do. H.=6; G.=3°6 to*~~

~~*H. =4 to 4°55; G.=5°4 to Blood- or hyacinth-red ; streak B.B. infusible, but phosphorescces. O,c. : zine*~~

~~*385*~~

~~*80°26, oxygen 19°74; sometimes with manganese peroxide. Valuable ore of zinc. Franklin and Sterling in New J ersey.*~~

~~*- 78. Massicot, PbO.*~~

~~*Massive ; scaly crystalline. H.=2; G.=7°8 to 8. lemon-yellow ; often contains iron.*~~

~~*79. MELACONITE, CuO.*~~

~~*Cubic ; compact. H.=3 to 4; G.=6 to 6:3. infusible ; soluble in acids. Burra-Burra.*~~

~~*80. TENORITE, CuO.*~~

~~*Oblique prismatic ; occurs in thin scales of metallic lustre on lava of Vesuvius. Colour black and dark-red.*~~

~~*Sulphur- or Popocatepetl in Mexico.*~~

~~*Black. B.B. Cornwall, Leadhills, Lake Superior,*~~

~~*2. SESQUIOXIDES. 81. Corunpum, Al,0,.*~~

~~*Hexagonal ; R 86° 4’”.. Twins common. Cl. rhombohedral, and basal. Excessively tough, and difficultly frangible. H. =9; G.=3°9 to4°2. Transparent or translucent ; vitreous, but pearly to metallic on basal face. B.B. unchanged. As Corundwm, white, grey, and greenish, frequently with bronzy lustre on basal face. C.c.: alumina, with a little peroxide of iron.*~~

~~China, Ceylon, Bohemia, Malabar, Macon in North Carolina (one crystal 300 tb weight). Emery is coinpact, crystalline, granular; grey to indigo-blue. Asia Minor, Naxos, Spain, Greenland, America. Corundum is used when crushed for cutting and polishing gems in China and India, emery in powder for grinding. Alumina oc- curs also in a purer state in transparent crystals of vari- ous tints of colour. When red and of the colour of pigeon's blood they are termed Rubies; these come from Syriam in Pegu, Ava, Ceylon, Bohemia, and near Expailly. When 5 carats in weight a ruby is twice the value of a diamond of the same size, when 10 carats three times the value. When blue the crystal is the Sapphire, found chiefly in Ceylon and Pegu; when green it is the Oriental Emerald, when yellow the Oriental Topaz, when purple the Oriental Amethyst,—the adjective here distinguishing them from the true or occidental stones of the same name. Other tints of colour also occur, but with the excep- tion of the red and blue they are seldom pure or deep. The prism when cut with a hemispherical dome sometimes displays a six- rayed star, either of a bright gold or a silvery white colour, upon a greyish blue ground. These receive the name of Asteria Sapphires. The same crystal frequently shows portious of even three different tints. When perfectly devoid of colour, they are called Water Sapphtres; such are little inferior to the diamond in brilliancy, but do not disperse rays of light to the same extent.~~

~~82. HaMarTITE, Fe,O,.~~

~~Hexagonal and rhombohedral ; R 86°. Crystals rhombohedric, prismatic, and tabular. Twins with axes parallel. Cl. R, and basal; fracture conchoidal; brittle. H.=5°5 to 6°5; G.=5'1 to 5°38. Opaque, but in thin lamine transparent and blood-red. Brilliant metallic lustre, iron-black to steel-grey, often brilliantly tarnished of red, yellow, green, and blue tiuts ; streak cherry-red. B.B. in the inner flame becomes black and magnetic. Sol. in acids. C.c.: iron 70, oxygen 30. The following are varieties or subdivisions:—~~

~~Elba Tron Orc, highly modified rhombohedral crystals, often bril- liantly tarnished. Specular Iron Ore, in thin flat crystals, often from volcanoes, as on the island of Ascen- sion ; this variety includes Micaccous Iron, thin, lamellar, and curved, and Red Iron Froth, scaly. Red Hema- tite, in~~

~~*botryoidal and _ stalactitic forms, which are internally com- ‘ posed of radiating fibres, and often Fig. 280. have a concentric structure; the external surface has a dark red to a brownish red hue. Compact and Ochrey varieties, with more or less aluminous impurity, pass into Reddle or red chalk, and when still more earthy into jaspery and columnar ores. This ore is very commonly distributed :—micaceous iron at Pitfichie in Aberdeen and Birnam in Perthshire; red hematite at Leadhills and at*~~

~~*Fig. 278.*~~

~~*Ulverston in Lancashire ; specular iron at Tavistock in Devonshire and in Cumberland. Martite seems to be the same substance in pseudomorphs after magnetite; it occurs in octahedra in Bute, Framont (Vosges), New York, and Brazil.*~~

~~*83. ILMENITE, (Fe, Ti),03.*~~

~~*Rhombohedral; R 86°. Crystals rhombohedral and tabular, also intwins. Cl. basal; fracture conchoidal. H.=5 to6; G.=4°66 to 5, Opaque, semimetallic, iron-black to dark brown; streak black or reddish brown. Sometimes slightly magnetic. B.B. infusible, but with microcosmic salt forms a red glass. Slowly sol. in s. acid when pow- dered: C.c.: peroxide of iron, with from 8 to 58 per cent. oxide of titanium. Occurs in metamor- 3 phic rocks. Common in chloritic Fig. 281. gneiss in Scotland ; Menaccan (Cornwall), Ilmen Mountains, Salz- burg, Egersund (Norway), Arendal, Dauphiné (Crichtonite), Massa- chusetts (Washingtonite).*~~

~~*84. ISERINE.*~~

~~*Cubic; in octahedra. Strongly magnetic; in other respects similar to ilmenite, but occurs in igneous rocks. Common as black iron- sand in Scotland ; Iserweise in Bohemia, Auvergne, Canada, New Zealand.*~~

~~*3. COMPOUNDS OF SESQUIOXIDES WITH PROTOXIDEs (SPINELS).*~~

~~85. MAGNETITE, FeO, Fe,03.~~

~~Cubic (figs. 35, 30, 38, 29, 34, 37, with 40, 41, 36). Hemi- tropes common on octahedral face (fig. 169). Twins (fig. 261). Faces of «0 striated in long diagonal. Often compact and granular. Cl. octahedral; fracture conchoidal or uneven; brittle. H.=5°5 to 6°5;~~

~~G=4'9 to 5°2. Opaque; lustre metallic. Iron-black to brown ; streak black. Highly magnetic; often polar, forming natural magnets. B.B. becomes brown and non-magnetic, fusing with~~

~~difficulty. Powder sol. in h. acid. C.c, : 31 protoxide and 69 per- oxide of iron; or 72°4 iron, 27°6 oxygen; sometimes with titanic acid. In crystals in Shetland and Sutherland; also Cornwall and Antrim, Traversella (Piedmont), Tyrol, Styria. Massive at Dannemora and Taberg (Sweden), Norway, Urals, Harz, Saxony, Elba. This is the most important ore in Norway, Sweden, and Russia, and affords the finest iron.~~

~~86. MAGNESIO-FERRITE, MgO, Fe,O3.~~

~~Cubic (fig. 30). H.=6 to 65; G.=4°57 to 4°66. Other characters same as magnetite. C.c.: maguesia 20, peroxide of iron 87. Fumaroles of Vesuvius.~~

~~87. JAcoBsITE, (MnO, MgO), (Fe,03;, Mn,O3).~~

~~Cubic; O. Black; vitreous; streakred. Nordmark in Sweden.~~

~~88. FRANKLINITE, (FeO, ZnO, MnO), (Fe,0;, Mn,0O3).~~

~~Cubic (figs. 34, 64); also granular. Cl. octahedral; fracture conchoidal ; brittle. H.=5°5 to6°5; G.=5-07. Metallic lustre. Iron-black ; streak reddish brown. Opaque; slightly magnetic. B.B. infusible, but shines and throws ont sparks. On charcoal with soda a deposit of oxide of zinc. Sol. in h. chlorine. C.c.: about 67 iron oxide, 17 manganese peroxide, 16 zinc oxide, Franklin and Sterling (New Jersey).~~

~~89. CHROMITE, FeO, Cr,03.~~

~~*Cubic; in octahedra, generally granular-massive. G.=4‘4 to 4°5. Opaque ; semimetallic to resinous. Iron-black to dark brown ; Streak reddish brown. Fracture uneven ; sometimes magnetic. B,B. unchanged ; inred. flame becomes magnetic; with borax forms an emerald-green bead. Not soluble in acids. C.c.: 19 to 37 protoxide of iron, 0 to 15 magnesia, 36 to 64 peroxide of chromium, 9 to 21 alumina. Unst (Shetland), Towanrieff (Aber-deenshire), Silesia, Bohemia, Styria, Urals, Turkey, Baltimore Massachusetts, and Hoboken. The ore of chromium: used for dyes. rite is chromite mixed with iridosmium. ;*~~

~~*90. URANINITE (Piteh Blende), UO, U,0.*~~

~~*Cubic (fig. 30); usually massive and botryoidal. H.=5 to 6; G=6‘5to 8. Lustre pitch-like to submetallic. Colour pa ae brownish black, and grey. B.B. infusible. Not sol. in h. acid, we “— oe n. ie rs : oxides of uranium 80, witha mixture of other oxides. ohann-Georgenstadt, Annab Przi : ruth in Cornwall. The chief a of uranium. iece bie*~~

~~*91. GamniTE, ZnO, Al,O3.*~~

~~*Cubic (figs. 166, 30, 38, and with 39, 40). Hemi ik magnetite. Cl O; brittle, with conehoidal fracture. ais ee 8; G.=4°3 to 4°9. Opaque; vitreous to resinous. Dark leck-green to blue; streak grey. B.B. unchanged. Unaffected by acids or alkalies. _ C.c.: 44 oxide of zinc, 56 alumina. Falun, Broddbo Haddam in Connecticut, and Franklin in New Jersey. Dysluite contains 42 per cent. sesquioxide of iron; and Kreittonite contains 24 oxide of manganese.*~~

~~*E55 **~~

~~*MINERALOGY*~~

~~*3°95. Ronsberg in the BOhmerwald.*~~

~~*parent to opaque; vitreous. Black, red, blue, green ; streak white.*~~

~~*acid with evolution of*~~

~~92. Hercynitr, FeO, Al,Og.~~

~~Cubic ; generally granular massive. B.B. infusible. C.c. :~~

~~H.=7°5 to 8; G.=3°‘9 to oxide of iron 41°1, alumina 58°9.~~

~~93. SpENEL, MgO, Al,03. Cubic (figs. 30, 88, 40 with 26); hemitropesunited byface ofO. Cl. octahedral ; fracture conchoidal H.=8; G.=—3‘4 to 41. Trans-~~

~~B.B. infusible and unchanged. C.c.: 28 magnesia, 72' alumina; some with a little iron, and the red varieties some chromium. Varieties are—Spinel Ruby when scarlet, Balas Ruby when rose-red ; both often sold as the true ruby, but not nearly so valuable ; when of 4 carats valued at half the price ofa diamond the same size. These~~

~~Fig. 282.~~

~~come from Pegu (native name Balachan). The violet-coloured is the Alabandine ruby from Alabandin in Caria, (Asia Minor). The orange red isthe Rubicella. Theabove also occur at Ceylon, Ava, and Siam. Sapphirine is pale sapphire-blue to greenish or reddish blue; from Aker in Sweden, Greenland, and North America. Pleonaste, dark green or blue to black; from Candy in Ceylon. Chloro- spinel, grass-green with a yellowish white streak; from Zlatoust. Water-spinel colour- less; from Ceylon. Picotite is a dark blue chromiferous variety from serpentine.~~

~~94, CuRYSOBERYL, G10, Al,O3.~~

~~Right prismatic (fig. 284). Twins common, united by a face of Poo (fig. 285, also 156). Cl. brachydiagonal imperfect, macrodiagonal more so; fracture conchoidal. H.=8‘5; G.=3°68 to 3°8. Transparent or translucent; vitreous. Greenish white, leek-green, and dark emerald- green. B.B. infusible. Not affected by acids. C.c.: glucina 20, alumina 80. Brazil, Ceylon, India, the Urals, Haddam in Connecticut. A very valuable gem. It sometiines possesses an opalescent band, which when the stone is cut en cabochon appears as a streak of floating light ; whence it derives its name of Cymo-phane. It is then also called the chatoyant or Oriental chrysolite, and when~~

~~*fine is of extreme value. The emerald-green variety, or Alex- andrite, is columbine-red by transmitted light.*~~

~~*Fig. 288.*~~

~~*v*~~

~~*ps a ata a Gere dy*~~

~~*4, DEUTOXIDES, 95. Rutite, Tid,. Pyramidal ; prisms dominant. P84 40’; Poo 65° 35’ (figs. 286, 287). Hemitropes common, with axes of halves ies 26r GT,*~~

~~*o Pand Poo, perfect. H.=6 to 6°5; G.=4°2 to4°3. Trans- parent to opaque;*~~

~~*adamantine lustre.*~~

~~*Brown-red, red, pale ZK: Ss*~~

~~*yellow, and black; Al bee*~~

~~*streak yellowish brown. oJ > if B.B. unchanged ; with . borax in the ox. flame*~~

~~*forms a greenish, in . the red. flame a violet >*~~

~~*glass. Not affected by a 7*~~

~~*— rs titanic*~~

~~*acid, with some _per-*~~

~~*oxide of iron. aly:*~~

~~*cailleach and Ben-y-*~~

~~*Gloe (Perthshire), The ; Cobbler and Ben-Bheula Fig. 286. (Argyllshire), Alps, Limoges, Norway, Brazil. Large crystals at Titanium Mount (Lincoln county, Georgia). Used in porcelain painting, and for tinting artificial teeth.*~~

~~*When attenuated crystals are imbedded in rock-crystal they are called Venus' hair.*~~

~~*Fig. 287.*~~

~~*MINERALOGY*~~

~~*96. ANATASE, TiO,. Pyramidal ; pyramids dominant. P 136° 36' (fig. 288). basal, aud P, both perfect; brittle. H. =5'5 to 6; G.=3°8 to 3:93. Trans- parent to opaque ; lustre adamantine to*~~

~~*Cl.*~~

~~*metallie. Indigo-blue, yellow, brown, rarely colourless; streak white. B.B. infusible. Sol. in hot s. acid. C.e.:*~~

~~*titanic acid, with a little iron and rarely tin. Cornwall and Devonshire, the Alps, Dauphiné, Valais, the Urals, Minas Geraes (Brazil).*~~

~~*97. BrooxiTe, TiO,.*~~

~~*Right prismatie ; with polar edges 135° 37' and 101° 3' (fig. 289). Cl. maerodia- gonal. H.=5°5 to 6; G.=3°86 to 4:2. : Transparent to opaque; lustre metallie Fig. 288 (sp. 96). adamantine. Yellowish, reddish, and hair- brown; streak yellowish white to white. B.B. infusible; with mierocosmic salt, a brownish yellow glass. C.e.: titanic acid, with 1 to 4°5 per eent. peroxide of iron. Snowdon and Tremadoc (Wales), Chamouni, Bourg d'Oisans, Miask.*~~

~~*98. CASSITERITE, SnO,.*~~

~~*Pyramidal. P 87° 7'; Poo 67° 50' (figs. 290 to 292). Crystals oP, P; or oP (9), P (s), oP (2); or with Poo (P), (fig, 290); and also oP2 ®, and*~~

~~*: 3P3 (2), (fig. 291). Hemitropes ver Be oe ep 27), atin yaiieed by a face of Pe with theechief axes 112° 10' (figs. 293, 171, 172, 173); also fibrous (Wood Tin), or in rounded fragments and grains (Stream Tin). Cl. pris- matie along oP, andoPo, imperfeet; brittl. H.=6 to 7;*~~

~~*Fig. 290,*~~

~~*G.=6‘8 to 7. Translucent or opaque; adamantine or resinous. White, but usually grey, yellow, red, brown, and black; streak white, light grey, or brown. B.B. in the forceps infusible ; on*~~

~~*asa*~~

~~*ae*~~

~~*eharcoal, in the inner flame, reduced to tin. Not affected by aeids. C.e.: 78°6 tin and 21°4 oxygen, but often mixed with peroxide of iron, or manganese, or tantalie aeid. Cornwall, Bohemia, Saxony, also Silesia, Haute-Vienne in France, Greenland, Russia, North and South Ameriea, Malacea, Banea, and Queensland. Almost the only ore of tin.*~~

~~*99. HAusMANNITE, 2MnO, MnO,.*~~

~~*Pyramidal. P 116° 59’; Poo 98° 32’ (fig. 110). Twins common, and rosettes of twins (figs. 174,175). Cl. basal, perfect, less so P and Poo; fraetureuneven. H.=5‘5; G.=4°7 to 4°8. Opaque; metallic lustre. TIron-black; streak brown. B.B. infusible, but becomes*~~

~~*ee*~~

~~*Fig. 292.*~~

~~*Fig, 293.*~~

~~*387*~~

~~*brown. Sol. in h. aeid, with evolution of chlorine. Powder colours s. acid red. C.e.: 31 protoxide and 69 peroxide of manganese. Thlefeld and Ilmenau in the Harz, and Sweden.*~~

~~*100. BraunitTEz, MnO, MnO,.*~~

~~*Tetragonal. P108°39’. Cl. P; brittle. H.=6 to 6:5; G.=4°7 to 4°9. Metallie lustre. Colour and streak dark brownish black. C.e.: 70 manganese and 30*~~

~~oxygen, generally with about 8 per cent. of siliea. Ihlefeld and St Mareel. Mareeline has violet tarnish.~~

~~101. Pyro.usiTe, MnO,.~~

~~Right prismatic ; oP 93°40'; generally radiating fibrous, or compaet earthy. Cl. oP; friable. H.=2 to 2°5; G.=4'7 to 5. Opaque; lustre silky to semi-metallie. Dark steel-grey to black ; streak blaek. Soils. B.B. infusible, loses oxygen and becomes brown. Sol. inh. aeid, with evolution of chlorine. C.e.: manga- // | nese 63, oxygen 37. Arndilly (Banffshire), (6 ./ Cornwall and Devon, Ilmenau, Ihlefeld, Franee, Hungary, Brazil. Used for re-~~

~~moving the green iron tint from glass ; henee~~

~~its name and that of Savon de verrier, Also '~~

~~for obtaining oxygen and ehlorine. Var- = vicite is a variety with 5 per eent. of water, ;~~

~~from Warwickshire. Fig. 294.~~

~~102. CREDNERITE, 3CuO, 2(MnO,Mn0O,).~~

~~Oblique. H.=4'5; G=5. Metallie. Black; streak brown. Thuringia,~~

~~108. PLATINERITE, PbO,.~~

~~Hexagonal. oP120°. Cl. indistinct ; brittle.~~

~~metallie. Iron-black; streak brown. 13°8. Leadhills.~~

~~104. Mrxtum, 2PbO, PbO,.~~

~~Pulverulent. H.=2to 3; G.=4°6. Dull. Colour bright red ; streak orange-yellow. B.B. fuses easily and reduced. Sol. in h. aeid. C.e.: lead 90°7, oxygen 9°38. Leadhills, Weardale in York- shire, Anglesea, Badenweiler, Siberia.~~

~~G. =9'4. Opaque; C.e.: lead 86°2, oxygen~~

5. Hyprovus OxIpDEs, 105. SAssoLINE, B,O;, H,O.

Anorthie. OP: ol' 75° 30'. Scaly six-sided plates. Cl. basal. Flexible and sectile. H.=1; G.=1'4 to 1°5. Translucent; pearly; white; taste bitter; greasy. Sol. in hot water. C.e.: boraeie aeid 56°45, water 43°55. Hot springs of Sasso, near Siena, Tuseany; and with sulphur in the crater of Voleano, Lipari Islands.

106, TuRGITE, 2Fe,03+H,0.

Massive and fibrous, also earthy. H.=5 to 6; G.=3°54 to 4°68. Lustre satin-like, also dull. Colour reddish black to bright red. Botryoidal surfaces lustrous like limonite. Opaque. C.c.: iron sesquioxide 94°7, water 5'3. B.B. deerepitates violently and yields water. Kerrera (Hebrides), Bogoslovsk (Urals), and many limonite localities, Fre- quently taken for limonite.

107. Drasporr, Al,O,, H,0.

Right prismatic; oP 129° 47'; usually thin foliated. Cl. braehydiagonal, perfect ; brittle. H. =6; G.=3°3 to 3°4. Vitreous; pearly on eleavage-planes. ' oa At piboesly greenish, or violet. .B. infusible, decrepi- 2 " tates, 'Insoluble. C.c. : alumina 85, earat Hi SO. 107): 15. Sehemnitz, Broddbo, Switzerland, Naxos, Chester, Massa- chusetts. Fig. 295.

108. GdruiTE, Fe,0;, HO.

Right prismatie ; oP 94° 53'; > also eolumnar, fibrous, or sealy. Cl. brachydiagonal, perfeet ; brit- x

tle. H.=5 to 5°5; G.=3°8 to4-4.

Opaque; or fine erystals trans-

parent, and hyaeinth-red ; lustre

adamantine or silky. Colour

yellow, red, or dark brown ; streak

~~*brownish yellow. B.B. beeomes*~~

~~*magnetic, diffieultly fusible. Sol.*~~

~~*in h. aeid. C.e.: peroxide of iron 90, water 10. Hoy (Orkney),*~~

~~*Achavarasdale (Caithness), Salis-*~~

~~*bury Crags (Edinburgh), Lost-*~~

~~*withiel, Clifton, Bristol, Przibram, Ameriea.*~~

~~*Fig. 297.*~~

~~*Siegen, Saxony, Urals, North*~~

~~*109. MANGANITE, Mv,03, H,O.*~~

~~*Right prismatic, sometimes hemihedric; oP (Jf) 99°40. prismatic (figs. 298 to 300); vertically striated; also columnar or fibrous. Hemitropes com-mon. Cl. brachydiagonal, perfect; brittle. H.-3°5 to 4; G.=—4°3 to 4:4, Opaque; metallic lustre. Steel-grey to iron-black; streak brown. B.B. infusible. Sol. in warm*~~

~~*Crystals*~~

~~*h. acid. C.e.: peroxide of manganese 89°9, water 10°1. Grandholm (Aberdeenshire), Cork, Upton Pyne (Exeter), Churchhill*~~

~~*(Somerset), Warwickshire, Thlefeld, Thuringia, Norway, Sweden, Nova Scotia.*~~

~~*5 =*~~

~~*‘ 1 1 ‘ ‘ 1 1 1 ‘ ‘ ‘ 1 ! 1 1 1 1 1 1 4*~~

~~*Sp ee ween ne*~~

~~*Fig. 299 (sp. 109). 110. LimoniTE, 2Fe,03+3H,0. Fibrous, botryoidal, and stalactitic, some-*~~

~~*¥*~~

~~*.,*~~

~~*¥ ’*~~

~~*ex*~~

~~*YS times earthy. H.=4°5 to 5°5; G.=3”4 to id aks 3°95. Opaque; lustre silky, glimmering, or dull. Brown, yellow- ish and blackish brown, often black on surface; streak ochre- yellow. In closed tube yields water and becomes red. B.B. in inner flame becomes magnetic, fusing toa glass. C.c.: peroxide of iron 85°6, water 14°4. Sandlodge (Shetland), Hoy (Orkney), Clifton, Bristol, Cornwall, Harz, Thuringia, Nassau, Styria, Carin- thia, Siberia, United States.*~~

~~*111. XANTHOSIDERITE, Fe,0;, 2H,O.*~~

~~*Fibrous, stellate, also asan ochre. H.~2°5. Silky or greasy, pitch-like or earthy. In needles, golden-yellow or brown-red; as an ochre, yellow, red, or brown; streak ochre-yellow. B.B. like limonite. C.c.: peroxide of iron 81‘6, water 18°4. Hoy (Orkney), — ee Kilbride, Wicklow, Imenau, Goslar, and Elbingerode in the Harz.*~~

~~*112. Brauxire, (8A1,0,, FeO), 2H,O.*~~

~~*Oolitic, concretionary, disseminated ; also earthy and clay-like. G.=2°55. White, grey, ochre-yellow, brown, and red. C.c.: alumina 50-4, peroxide of iron 26°1, water 23°5. From Beaux (or Baux) near Arles, and elsewhere in France. In grains in compact limestone. Pure varieties used for manufacture of aluminium.*~~

~~*113. Exvrasitz, U,0,;+2H,0.*~~

~~*Amorphous masses; resin-like. H.=3°‘5 to 4:5; G.=4 to 5. Reddish brown to black ; streak wax-yellow to olive-green. C.c. + 68°5 per cent. sesquioxide*~~

~~*of uranium, 10 of water, with impurities. Elias mine (near Joachimsthal).*~~

~~*114. Brucitr, MgO,H,O.*~~

~~*Rhombohedral ; R 82° 22'; also foliated and botryoidal columnar. Cl. basal, perfect ; sectile; lamine flexible. H.=2;G.=2°3 to 2-4. Translucent, pearly. Colourless. B.B. infusible. Easily soluble in acids. C.c.: 69 magnesia, 31 water. Nemalite is afibrous variety with silky lustre. Swinaness and Quin Gio in Unst, Beresovsk in the Urals, Hoboken, New Jersey, Texas, Pennsylvania.*~~

~~*115. PyrocurolTE, MnO, H,0.*~~

~~*Foliated. H.=2°5. Pearly, white, but changing throwgh bronze to black. Flesh-red by transmitted light. i matrass becomes verdigris-green, finally black, yielding water. C.c. : protoxide of manganese 79°8, water 20°2. netite at Paisberg in Sweden.*~~

~~*116. GisBsITE (Hydrargillite), Al,O3;, 3H,O.*~~

~~*Hexagonal. C.c.: 65°5 alumina, 34°5 water. The crystals from Zlatoust in the Urals ; stalactites from Richmond in cee setts and Villa Rica in Brazil.*~~

~~*117. LimnitE, Fe,0;, 3H,O.*~~

~~*Massive in stalactites, also as a yellow ochre. Like limonitc, but*~~

~~*pitchy lustre. C.c.: peroxide of iron 74°8, water 25:2. dhill Botallack (Cornwall), Novgorod (Russia). ai ¥*~~

~~*118. Hyproratcitr, Al,O;, 3H,0+6Mg0, H,O+6H,0.*~~

~~*Hexagonal. Cl. basal, foliated, and somewhat fibrous. H.=2 ; G.=2°04. White, pearly. Greasy to the touch. Translucent. C.c.: alumina 16°8, magnesia 39°2, water 44. Zlatoust, Urals ; Snarum, Norway ; New York.*~~

~~*Sol. in h. acid. In veins in mag-*~~

~~*MINERALOGY*~~

~~119. PrroauRITE, Fe,03;, 3H,0+6Mg0, H,0 +6H,O.~~

~~Hexagonal ; tables and scaly coatings. Lustre pearly to sub- metallic. Colour white to gold-yellow. Translucent. BoB i fusible, yields water. Sol. in h. acid, C.c.: peroxide of iron 23°9, magnesia 35°8, water 40°3. HaafGrunay in Shetland, Lang- ban in Wermland. _~~

~~120. GumuiteE, U,03, 3H,0.~~

~~In rounded lumps, resembling gum. H.=2°5 to 3; G. =3°9 to 4-2, Lustre greasy. Reddish yellow to yellowish brown. C.c.: 72 per cent. sesquioxide of uranium water 14°75, with impurities. Johann-Georgenstadt.~~

~~121. PstLoMELANE, (BaO, MnO) MnO,+3H,0, MnO, +3H,0.~~

~~Massive and botryoidal ; fracture conchoidal. H.=5‘5 to 6; G. = 41 to4°3. Biluish black. B.B. infusible. About 80 per cent. of oxide of manganese, with baryta, potash, and water. Hoy (Orkney), Leadhills, Cornwall, Devon, Schneeberg, Hmenau, Vermont in France. Wad is similar, but sometimes soft and light. Lead- hills, Cornwall, Harz, France.~~

~~122. CHALCOPHANITE, MnOZnO+2Mn0O, + 2H,0.~~

~~Hexagonal. R:R 114° 30’. Cl. basal. H.=2°5; G. =3°91. Metallic lustre. Blue-black; streak brown, dull. Opaque; flexible. C.c.: manganese binoxide 59°94, protoxide 6°6, zinc oxide 2177, water 11°6. Sterling Hill (New Jersey).~~

~~OXIDES OF NON-METALS. 1. Oxrpes or ArsEnio-ANTIMONY FaMILy (TEROXIDES).~~

~~123. ARSENOLITE, AsO3.~~

~~Cubic; in octahedra; also botryoidal, stalactitic. 3-7, Lustre vitreous. White; streak pale yellow. Translucent. Sublimes in closed tube, condensing in brilliant octahedra. C.c.: arsenic 75°76, oxygen 24°24. Cornwall, Andreasberg, Joachimsthal, Kapnik (Hungary), Nevada, California.~~

~~124. SENARMONTITE, SbO3.~~

~~*Cubic; in octahedrons. Cl. octahedral, also massive granular. H. =2 to 2°5; G. =5‘22 to5°3. Transparent; adamantine. White or grey. B.B. ininner flame fuses and colours the flame greenish blue. Sol. in h. acid. C.c.: antimony 83°56, oxygen 16°44. Endellion in Cornwall, Constantine in Algeria, Malaczka in Hungary.*~~

~~*125. VALENTINEITE, SbO,.*~~

~~*Right prismatic; oP187°. Cl. oP, perfect. H. =2°5 to 8; G. =5°5 to5-6. Translucent; adamantine to pearly. Yellowish white, brown- grey; streak white. Other properties and composition like senar- montite. Glendinning (Dumfriesshire), Przibram, Braunsdorf (Saxony), Harz, Hungary, Allemont (Dauphiné), Siberia.*~~

~~*126. BrsmITE, BiO3.*~~

~~*Massive, earthy. G.=—4°36. Grey, yellow, green. C.c.: bismuth 89°65, oxygen 10°35. St Agnes (Cornwall), Schneeberg, Siberia.*~~

~~*127. MoryspitTE, MoO .*~~

~~*Right prismatic; oP 136° 48’, Incapillary crystals, also powdery. H.=1 to 2; G.=4°5. Straw-yellow to yellowish white. C.c.: molybdenum 65°71, oxygen 84°29. With molybdenite at many of its localities.*~~

~~*128. TunasTITE, WO;.*~~

~~*Earthy. Soft yellow or yellowish green. Sol. in alkalies. C.c.: tungsten 79°38, oxygen 20°7. Cumberland and Cornwall, Monroe in Connecticut.*~~

~~*129. CERVANTITE, SbO3+SbO;.*~~

~~*Right prismatic. Acicular, generallyearthy. H.=4 to 5; G.=4°1. Isabel-yellow, reddish white. B. B. on charcoal reduced; un- altered per se. Sol. inh. acid. Harehill, Ayrshire; Endellion, &c., Cornwall; Cervantes, Spain; Felsobanya, Hungary; Mexico ; Canada; California.*~~

~~*130. ST1BIconITE, SbO,, H,O.*~~

~~*Massive, powdery. H.=4 to 5°5; G.—5°28. Pale yellow. In closed tube yields water. C.c.: antimony 74:9, oxygen 19°6, water 5°5. Goldkronach (Bavaria).*~~

~~*131. VoteErirE, SbO,;, 5H,0.*~~

~~*Massive and powdery. White. ness. O.c.: antimony 58°9, oxygen 19°38, water 21°8. in Algeria.*~~

~~*132. ZUNDERERZ (Tinder Ore).*~~

~~*In soft, flexible, tinder-like masses. Colour dark cherry-red to blackish red; lustre glimmering. Two varieties :—one, from Klaus- thal, contains antimony oxide 33, iron oxide 40, lead 16, sulphur 4; the other, from Andreasberg and Klausthal, seems to be a mixture A reales (82°04 per cent.), mispickel (13°46), aud pyrargyrite*~~

~~*133. TELLURITE.*~~

~~*Yellowish or whitish. Radiated, spherical masses. Gives the reactions of tellurous acid. Facsebaya and Zalathna, Colorado.*~~

~~*HH =1576. =*~~

~~*In tube yields water, below red- Constantine*~~

~~*MINERALOGY*~~

~~*134. TANTALIC OCHRE. Powdery; brown; vitreous. Pennikoja in Finland. 2. OXIDES OF CARBON-SILICON FAMILY (BINOXIDES). 135. QuaRTZ, SiO,. Hexagonal ; the purest varieties tetartohedral. The primary pyramid P has the middle edge=103° 34', and the polar edges=*~~

~~*7 \//*~~

~~*Fig. 301. Fig. 302. Fig. 303. Fig. 304. Fig. 3065.*~~

~~*133° 44%, and is often perfect. Very frequently it appears as a rhombohedron R (or }P), with polar edges=94° 15'. Crystals often of oP, P*~~

~~*or oP, P, 4P, the forms oPand 4P being combined , in an oscillatory manner, producing striz on the face of the prism (figs. 303, 304, 305); also oP, P, $(2P2), the last face appearing as a rhomb replacing the alter- nate angles between the two other forms (figs. 307, 308). They are prismatic, or py- Fig. 306. Fig. 307. ramidal, or rhombohedral, wheu P is divided into R and —R; the latter very often wanting. Many faces plagihedral, as in figs. 302, 306, 309. ; Twins common, with parallel axes, and either merely in juxtaposition (see fig. 178) or interpene- trating. Orystals often distorted, as in figs. 310 to 313. The crystals occur either single, attached, or imbedded, or in groups and druses. Most fre- quently granular, massive, fibrous, or columnar; also in pseudomorphs, petrifactions, and other forms. Cl. rhombohedral along R, very imper- fect; prismatic along oP, still more imperfect ; fracture conchoidal, uneven, or splintery. H.=7; G.=2°5 to 2°8; 2°65 in the purest varieties. Colourless, but more often white, grey, yellow, brown, red, blue, green, or even black. Lustre vitreous, inclining to resinous; transparent or translucent ; when impure almost opaque. B.B. Fie. 309. infusible alone; with soda effervesces, and melts a into a clear glass. Insoluble in acids, except the hydrofluoric; when pulverized, slightly soluble in solution of potash. C.c.:*~~

~~*Fig. 310. Fig. 311. Fig. 312. Fig. 313.*~~

~~*48°05 silicon and 51°95 oxygen; but frequently a small amount of the oxides of iron or titanium, of lime, alumina, and other substances,*~~

~~*The following are varieties :—*~~

~~*Rock-crystal: highly transparent and colourless; Dauphiné, Switzerland, Tyrol, Hungary, Madagascar, and Ceylon.*~~

~~*Amethyst ; violet-blue (from iron peroxide or manganese), and often marked by zigzag or undulating lines, and the colour dis- posed in clouds; Siberia, Persia, India, Ceylon, Brazil (white or yellow, named false topaz), Hungary, Ireland (near Cork), and Aberdeenshire. Wine-yellow (Citrin and Gold Topaz); the brown or Smoky Quartz (coloured by a substance containing carbon and nitrogen); and the black or Morion, from Siberia, Bohemia, Pennsylvania, and other places. Cairngorm Stone, black, brown, or yellow,*~~

~~*from Aberdeenshire mountains. The above are valued as ornamental stones ; those which follow are less so.*~~

~~*Rose Quartz : red inclining to violet-blue; Clashnarce Hill (Aber- deen), and Rabenstein in Bavaria. Milk Quartz: milk-white, and slightly opalescent; Greenland. Prase: leek and other shades of*~~

~~green; Saxony and Cedar Mountain in South Africa. Cat's-eye, inclosing asbestos: greenish white or grey, olive-green, red, brown, or yellow; Ceylon and Malabar. Avanturine, enclosing mica: yellow, red, green, or brown; India, Spain, and Scotland. Siderite: indigo or Berlin blue ; Golling in Salzburg.~~

~~Common Quartz, crystallized or massive, white or grey, also red, brown, &c., is a frequent constituent in many rocks. Some impure varieties are properly rocks, as:—~~

~~(1) Ferruginous Quartz, or Iron Flint: red, yellow, or brown; often associated with iron ores.~~

~~(2) Jasper: red, yellow, brown, also green, grey, white, and black ; alone, or in spots, veins, and bands (Ribbon or Egyptian Jasper); Urals, Tuscan Apennines, Harz, and many parts of Scotland.~~

~~(3) Lydian Stone, or Flinty Slate: black, grey, or white; has a splintery or conchoidal fracture, breaks into irregular fragments, and passes by many transitions into clay-slate, of which it is often merely an altered portion, as in Scotland; used as a touchstone for gold, and at Elfdal (Sweden) manufactured into ornaments.~~

~~(4) Hornstone or Chert: compact, conchoidal, splintery fracture; translucent on the edges; dirty grey, red, yellow, green, or brown; passes into flinty slate or common quartz; conmon in the Mountain limestone, Oolite, and Greensand formations; and often contains petrifactions, as shells, corals, and wood.~~

~~Other siliceous minerals seem intimate mixtures of quartz and opal, as:—~~

~~Flint: greyish white, grey, or greyish black, also yellow, red, or brown; sometimes in clouds, spots, or stripes ; semitrans- parent; lustre dull; fracture flat conchoidal; occurs chiefly in the Chalk formation, as in England, Ireland, Aberdeenshire, France, Germany, and other countries;~~

~~*sometimes in beds or vertical veins, often in irregular lumps or concretions, inclosing petrifactions, as sponges, echinoids, shells, or siliceons Jnfusoria. The colour is partly derived from carbon, or organic matter. Used formerly for gun-fiints, and still for the manufacture of glass and pottery; and cut into cameos or other ornaments.*~~

~~*Chalcedony : semitransparent or translucent ; white, grey, blue, green, yellow, or brown; stalactitic, reniform, or botryoidal, and in pseudomorphs or petrifactions ; Iceland, Faroes, Trevascus in Cornwall, Scotland, Hungary, Bohemia, Oberstein. Carnelian: chiefly blood-red, but also yellow, brown, or almost black ; India, Arabia, Surinam, and Siberia; also Bohemia, Saxony, and Scotland (Fifeshire). Plasma: leek- or grass-green, and waxy lustre; Olym- pus, Black Forest, India, and China.*~~

~~*Chrysoprase: apple-green; Silesia, and Vermontin NorthAmeerica. Moss-Agate and Heliotrope: dark green and dendritic (called Blood- stone when sprinkled with deep red spots); India, Siberia, Bohemia, Fassa Valley, island of Rum and other parts of Scotland.*~~

~~*136. TRIpYMITE, Si0,.*~~

~~*Hexagonal ; P middle edge 124° 4', polar edges 127° 35'. Single crystals, very minute hexagonal tables of OP, oP, but with the edges replaced by P and oP2, are rare (fig. 314). Mostly twinned*~~

~~*Fig. 315. . in double or (oftener) triple combinations (figs. 315 to 317). Cl. basal, indistinct; fracture con- choidal. H.=7; G.=2°282 to 2°326. Colonrless and transparent; vitreous, pearly on the base. B.B. like quartz. C.c.: 96 silica, with some a. alumina, magnesia, and iron peroxide, probably from the matrix. Discovered by Von Rath in the trachyte of San Cristobal, near Pachnea, in Mexico; also in the trachyte of Mont-Dore (Puy-de- Dome), the Drachenfels, and Hungary. Many opals, treated with solution of potash, leave crystals, as those from Zimapan, Kaschau, Silesia, and the cacholong from Iceland. Where such co are abundant, the opal becomes opaque or snow-white. Jenzec regards these as still another variety of silica.*~~

~~*Ba a*~~

~~*Fig. 317.*~~

~~*390*~~

~~*137. OPAL, 9SiO,, H,O to 38i0,, H,0.*~~

~~*Amorphous; fracture conchoidal; very brittle. H.=5°5 to 6°5; G.—2 to 2°2, Transparent to opaque; vitreous, inclining to resinous. Colourless, but often white, yellow, red, brown, green, or grey, with a beautiful play of colours. B.B. decrepitates and becomes opaque, but is infusible; in the closed tube yields water; almost wholly soluble in solution of potash. C.c.: silica, with 5 to 13 per cent. water. Most opals are mixtures of various miuerals.*~~

~~*The following varieties may be noticed:—(1) Hyalite, Glassy Opal, or Miiller's Glass: transparent, colourless, very glassy; small botry- oidal, or incrusting; Kaiserstuhl in the Breisgau, Schemnitz, Silesia, Moravia, Mexico, and other places. (2) Fire Opal or Girasol: trans- parent; brilliant vitreous lustre ; bright hyacinth-red or yellow ; Zimapan in Mexico, and the Faroes. (3) Noble Opal, semi-trans- parent or translucent; resinous, inclining to vitreous; bluish or yellowish white, with brilliant prismatic colours; most show double *efraction and are binaxal; in irregular masses or veins near Eperies in Hungary; Australia. (4) Common Opal: semitransparent, vitreous; white, yellow, green, red, or brown; Hungary, also Faroes, Iceland, the Giant's Causeway, and the Western Isles of Scotland. (5) Semi-opal: duller and less pellucid; Wood Opal or Lithoxylon: with the form and texture of wood distinctly seen; Hungary, Bohemia, aud other countries. (6) Menilite: compact, reniform; opaque and brown or bluish grey; Menilmontant, near Paris. (7) Opal Jasper: blood-red, brown, or yellow. (8) Cacholong: opaque, dull, glimmer- ing, or pearly, and yellowish or rarely reddish white; in velns or reniform and incrusting ; Faroes, Iceland, the Giant's Causeway. One variety is named Hydrophane, from imbibing water, and becoming translucent. (9) Siliccous Sinter: deposited from the Geyser and other hot springs; and Pearl Sinter: incrusting voleanic tufa at Santa Fiora in Tuscany (Fiorite), and in Auvergne.*~~

~~*138. Zircon, ZrOs, SiO, .*~~

~~*Pyramidal; P 84° 20'. Crystals, oP, P; often with 3P3; also oPoo, P; or wPo (s), oP (2), P (P), 3P8 (x), Poo (t), 4P4 (y), 5P5 (2), (fig. 318, also 86, 87, 585). Chiefly prismatic or pyramidal, and in rounded grains. Trans- parent to opaque; vitreous, often ada- mantine. Rarely white, generally grey, yellow, green, or fre- £ quently red and brown. B.B. loses its colour, but is jn- fusible. Not affected by any acid except * concentrated s. acid, after long digestion. C.c.: 66°3 zirconia and 33°7 silica, with : q 0 to 2 iron peroxide Fig. 318. Fig. 319 (sp. 188). as colouring matter. Miask, Arendal, Sweden, Belgium (at Nil-St- Vincent), Carinthia, Tyrol, Ceylon, and North America; in Scot- land, Scalpay in Harris (fig. 819), Lewis (Hyacinth), Sutherland, Ross. The colourless varieties are sold for diamonds. The more brilliantly coloured are named hyacinths, and are valuable gems.*~~

~~*SULPHIDES, SELENIDES, TELLURIDES, &c, 139. Pyrite, FeS,. :*~~

~~*Cubic ; semitesseral dominant (figs. 8320 to 323, also 67 to 77, and 26 to 34). Pentagonal-dodecahedron in excess; or striz, produced by oscillation of it with faces of the cube, visible. Often distorted, as in the cubo- octahedral twin (fig. 323). Sometimes massive and in pseudomorphs. Cl. cubic or octahedral, difficult; brittle, H.=6*~~

~~*Fig. 320.*~~

~~*Fig. 321. Fig. 322.*~~

~~*to 6; G.=4°9 to 5:2. Brass-yellow, often somewhat gold- yellow; streak brownish black, Sek broken emits ooh gs sulphur. In closed tube sulphur sublimes. B.B. on charcoal burns with blue flame, and odour of sulphurous acid. In inner flame fuses to magnetic bead. Sol. in n. acid, with deposition of sulphur. C.c.: iron 46°7, sulphur 53°3; often contains gold in visible grains, when broken. Common to rocks of allages. Tomnadashin,*~~

~~*MINERALOGY*~~

~~*Birnam, Scotland; Cornwall, England; Elba and Traversella; Peru; Rossie, Middletown, and Schoharie in U.S. Auriferous pyrites, Berezoff (Siberia), Adelfors (Sweden), Mexico. Used to be cut in facets and set asan ornament,*~~
~~÷~~

~~under the name of marca- sites; also for striking fire in the old firelocks, whence the name of firestone; now used for manufacture of sulphuric acid.~~

~~140. MarcasiTE, Fe8,.~~

~~Right prismatic; oP (MM) 106°5'. Crystals tabular, thin — . prismatic, or pyramidal. Fig. 323 (sp. 189). Twins very frequent, also cockscomb-like groups, or spherical and stalactitic. Cl. oP; fracture uneven; brittle. G.— 4°65 to 4°9. Greyish bronze- yellow to greenish grey, often with brown crust; streak greenish grey or brownish black. B.B., &c., like pyrite. Very prone to decomposition, being changed into green vitriol, which may be detected by the tongue. ; Spear Pyrites are twins like Fig. 324. Fig. 325. fig. 825; Littmitz, Przibram. Hepatie Pyrites or Leberkies, liver- brown, generally decomposing; Harz, Saxony, Sweden. Cockscomb Pyrites;. Derbyshire and the Harz, Kyrosite contains arsenic.~~

~~141. MispickEL, FeS,+FeAs.~~

~~Right prismatic; oP (Jf) 111° 12' (fig. 326). Twins common; also massive or columnar. Cl. oP; fracture = uneven; brittle. H.=5°5 to 6; G.=6 to 62. Silver-white to steel-grey; streak black. In closed tube yields first a red then a brown sublimate, lastly metallic arsenic. B.B. on char- coal fuses to a black magnetic globule. Sol. in n. acid, with separation of arsenious acid and sulphur. C.c.: 34°3 iron, 46°1 arsenic, 19°6 sulphur; some- times silver or gold, or 5 to 9 of cobalt.~~

~~Fig. 326. Cornwall, Freiberg, Zinnwald, Sweden, Franconia, America.~~

~~142, LeucopynriTE, Feds.~~

~~Right prismatic ; oP (d)122°26'; Poo (0) 51°20'. Crystals like~~

~~fig. 327; generally massive or columnar. Cl. basal;~~

~~fracture uneven ; brittle. H.=5 to 55; G.=7 to~~

~~7°4, Silver-white with darker tarnish; streak greyish~~

~~*black. B.B. emits strong smell of arsenic, and fuses d to a black magnetic globule. C.c.: iron 27°2,*~~

~~*arsenic 72°8 ; sometimes iron 32°2 and arsenic 66°8 ; always some sulphur, and often nickel and cobalt.*~~

~~*Fossum in Norway, Andreasberg, Styria, and Silesia. Spathiopyrite, from Bieber in Hesse, seems a variety.*~~

~~*148. CoBALTITE, CoS,+CoAs.*~~

~~*Cubic and hemihedral ; sometimes massive (figs. 67, 74). Cl. cubic, perfect ; brittle. H.=5°5; G.—6 to 6°3. Brilliant lustre. Pinkish silver-white; tarnishes yellow or grey; streak greyish black. B.B. with borax blue glass; evolves smell of arsenic. C.c.: cobalt 35°9, arsenic 44°9, sulphur 19°2. St Just in Cornwall, Tunaberg in Sweden, Skutterud in Norway, Querbach in Silesia.*~~

~~*144. GLaucoporg, (Co, Fe)S,+(Co, Fe)As, ,*~~

~~*Right prismatic; oP 112° 36'. Cl. basal, perfect. H.=—5; G.= 6. Lustre metallic. Greyish white; streak black. C.c.: cobalt 24°7, iron 11:9, arsenic 43°2, sulphur 20°2. Huasco in Chili.*~~

~~*145. SMALTINE, (Co, Fe, Ni) Aso.*~~

~~*Cubic ; generally like fig. 27; also reticulated and granular com- pact, Cl. octahedral; fracture uneven; brittle. H.=5°5; G.= 6°4to7°3. Tin-white to steel-grey, with dark or iridescent tarnish ; streak greyish black, Evolves odour of arsenic, when broken ot heated. C.c.: 71°4 arsenic, 28°6 cobalt; sometimes 3 to 19 iron, and 1 to 12 nickel, or 4 bismuth. Dolcoath and Redruth in Cornwall, Schneeberg, Annaberg, Tunaberg, Allemont, Chatham in Connecticut.*~~

~~*146. CHLOANTITE (White Nickel), NiAs.*~~

~~*Cubic ; generally fine granular or compact; fracture uneven ; brittle. H.=5°5; G.=6'4 to6°6. Tin-white, rapidly tarnishing black. In the closed*~~

~~*tube yields a sublimate of arsenic, and becomes copper-red. Gives odour of arsenic when broken. B.B. fuses with much smoke, becomes coated with crystals of arsenious acid, and leaves a brittle grain of metal. C.c.: 28°2 nickel, 71°8*~~

~~*arsenic, but often with cobalt. Schneeberg, Riechelsdorf, Alle- mont, Chatham in Connecticut.*~~

~~*Fig. 327.*~~

~~*MINERALOGY*~~

~~*147, GersporFFiTL, NiS,+NiAs,.*~~

~~*Cubic (figs. 74, 30, 26). Cl. cubic, generally granular. H.=5‘5; G.=6°67. Lustre metallic. Silver-white to steel-grey, decrepitates in closed tube. B.B. fuses to a black slag; partially sol. in n. acid. C.c.: 85°2 nickel, 45°4 arsenic, and 19-4 sulphur ; sometimes with cobalt. Craignuir, near Loch Fyne, with 23 nickel and 6 cobalt. The Harz, Sweden, Spain, and Brazil.*~~

~~*148. ULLMANNITE, NiSb+NiS,.*~~

~~*Cubic (figs. 31, 29, 27); often tetrahedral, and in twins as in figs. 328, 8329. Cl. cubic, perfect; fracture uneven. H. =5 to 5‘5; G.=62 to 6°. Lead-grey to tin-white, often with iridescent*~~

~~*Fig. 329.*~~

~~*tarnish. B.B. fuses with dense fumes. Sol.inn. acid. C.c.: 27°4 nickel, 57°5 antimony, and 15°1 sulphur. Westerwald, Siegen, Harzgerode, Lolling (Carinthia), Lobenstein, and Bleiberg.*~~

~~*149. RAMMELSBERGITE, NiAs.*~~

~~*Right prismatic ; oP 123° to 124°. Chiefly massive, or in radiating and botryoidal aggregates) H.=5; G.=7‘2. Colour tin-white. Schneeberg, Reichelsdorf, and Wittichen in Baden.*~~

~~*150. HAveERiITE, Mn8,.*~~

~~*Cubic (figs. 30, 30-26, 30-33-37). Crystals single or in spherical groups. Cl. cubic, perfect ; H.=4; G.=8-46. Reddish brown to brownish black ; streak brownish red. In closed tube yields sul- phur, and leaves a green mass, which is sol. in h. acid. OC.c.: 46 manganese and 54 sulphur. Kalinka in Hungary.*~~

~~*151. PyRRHoTITE (Magnetic Pyrites), Fe,S,.*~~

~~*Hexagonal; P 126° 48'. Crystals rare, sometimes hemihedral on zh, commonly massive or granular. Cl. oP, imperfect; brittle. H.= 3°5 to 45; G.=4°5 to 4°6. Colour bronze-yellow with pinchbeck- brown tarnish ; streak greyish black. Morcorlessmagnetic. O.c.:*~~

~~*e ⊣*~~

~~*6*~~

~~*x*~~

~~*)*~~

~~*ONN re A : a. Fig. 330. Fig. 331.*~~

~~*63°65 iron and 36°35 sulphur ; sometimes with nickel. Common in ey limestones and diorites of Scotland. Crystallized in above orms at Askaig, on Loch Shin, Sutherland ; Carnarvon, Cornwall, Fahlun, Bodenmais, Andreasberg. Distinguished by its colour and its solubility in h. acid.*~~

~~*152. LINNZITE, 2(Co, Cu)S + CoS, .*~~

~~*Cubic (figs. 29, 30); often twinned ; twin face 0; also massive. Cl. cubic; brittle. H.=5-5; G.=4°9 to 5, Silver-white, with a yellow tarnish ; streak blackish grey. B.B. fuses to a grey mag- netie globule, which is bronze-yellow when broken. C.e.: cobalt 43°2, copper 14°4, iron 3°5, sulphur 38°5. Bastnaes (Sweden).*~~

~~*158. SIEGENITE, CoS + Ni,S, (2).*~~

~~_Onbic ; generally in crystals like fig. 29; also massive. Colour silver-white, inclining to pink. Other features like linneite. C.c.: cobalt 40°8, nickel 14°6, sulphur 43°1. Miisen near Siegen, Mary- land, and Missouri. The American mineral has 30°5 of nickel.~~

~~154. Potypymirs, Ni,S,.~~

~~Cubic ; in minute octahedral crystals and flattened twins. Cl. cubic. H.=4°5; G.=4°81. C.c.: 89°45 nickel, 40°55 sulphur, but generally with 4 of iron. Westphalia. Saynite or grunaaite seems~~

~~to be a bismuthic and cobaltic variety ; it is from Grunau in Sayn-Altenkirchen.~~

~~| metallic arsenic, otherwise like smaltine.~~

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~~155. Byricurire, 3NiS+2NiS,.~~

~~H.=3 to 35; G.=4°7. Ce: 54:23 nickel, 2°79 iron, 42°86 sulphur. From the Westerwald.~~

~~156. Horsacuire, 4Ye,S,+Ni,S,.~~

~~Crystalline masses. H.=4‘5; G.=4:43 to 4-7. Colour pinch- beck-brown ; streak black. (.c.: nickel 11°98, iron 41°96, sulphur 45°87. Horbach in the Black Forest.~~

~~157. SKUTTERUDITE, CoAsg.~~

~~Cubic (figs. 30, 26 with 33, 40) and granular. Cl. cubic; frac- ture conchoidal ; brittle. H.=6; G.=6-74 to 6°84. Tin-white to lead-grey. Lustre brilliant. In closed tube gives sublimate of C.c.: 79 arsenic, 21 cobalt. Skutterud, near Modum in N orway.~~

~~158. Ganena, PbS.~~

~~*Cubic ; crystals chiefly cube, octahedron, and rhombic dodeca- hedron ; rarely 20 and 202. Also massive and granular, compact, or laminar, and in pseudomorphs of pyromorphite and other minerals. Cl. cubic, very perfect; fracture scarcely observable; sectile. H.=2°5; G.=7‘2 to 7°6. Lead- grey, with darker or rarely iridescent tarnish; streak greyish black. B.B. decrepitates, fuses, and leaves a globule of lead. Sol. in un. acid, C.c.: 86°7 lead, and 13°3 sulphur ; but usually contains a little silver, | ranging from 1 to 8 or 5 parts in 10,000 ; rarely 1 per cent. or more. Some contain copper, zinc, or anti- mony, others selenium, and others (the “supersulphuret”’) probably free sulphur (2 to 8 per cent.). “Most common ore of lead in many countries. Leadhills, Pentland Hills, Linlithgow, Inverkeithing, Monaltrie, Tyndrum, Strontian, Islay, Orkney, Cornwall, Derbyshire (Castletown), Cumberland (Alston Moor), Durham (Allenhead), Wales, Isle of Man.*~~

~~*159. CUPROPLUMBITE, 2PbS+(Cu,S. Cubic. H.=2°5; G.=6‘4. Bluish grey. Chili. 160. BrxcrritE, 6PbS + Bi,S,.*~~

~~*Cubic. G.=7-27. Cl. cubic. Light to dark grey. Lustre brilliant. C.c.: sulphur 15, bismuth 20°6, lead 64:2, with copper 1°7. Grant (Park county, Colorado).*~~

~~*161. CLAUSTHALITE, PbSe.*~~

~~*Cubic; but massive granular. H.=2°5 to 3; G.=8‘2 to 8°8. Lead-grey ; streak grey. B.B. fuses, smells of selenium, colours the flame blue, stains the support red, yellow, and white, and volatilizes, except a small residue, withont fusing. C.c.: 72°7 lead, 27°3 selenium; but sometimes 11°7 of silver. Zorge, Lerbach, and Clausthal in the Harz. Tilkerodite, or Selen-Cobalt-Blei, containing 3 per cent. of cobalt, from Tilkerode, is a variety.*~~

~~*162. ZoRGITE.*~~

~~*Massive granular ; like clausthalite, but inclining to reddish, and often tarnished. There are four varieties. -(a) Selen-Blei-Kupfer : G.=7°4to7°5 ; 5PbSe+CuSe ; with 4 copper, 65 lead, 30 selenium. (0) The same, but with G.=5°6; 4Pb, 4Cu, 7Se ; with 15-8 copper, 48°4 lead, and 85 seleninm. (¢) Selen-Kupfer-Blet: with G.=7; 2PbSe + CuSe; with 8 copper, 57 lead, and 82 selenium. (d)2PbSe+ 9CuSe ; with 46-64 copper, 16°58 lead, and 36°59*~~

~~*selenium. : From Tilkerode and Zorge in the Harz, and near Gabel in Thuringia.*~~

~~*163. ALTAITE, PbTe.*~~

~~*Cubic and granular ; fracture uneven; sectile. H. =3 to 3°5; G. = 8*1to8-2. Tin-white to yellow, with yellow tarnish. B.B. colours the flame blue, fusing to a globule, which almost wholly volatilizes, C.c.: 61°9 lead and 38:1 tellurium. Zavodinski in the Altai, California, Colorado, and Chili.*~~

~~*164. Reprutuire (Copper Glance), Cu,S. Right prismatic. oP (0) 119° 35'; P (P) middle edge 125° 22'; ap (a) middle edge 65° 40'; 2P oo (d) middle edge 125° 40'; 2Pco (e)*~~

~~*Fig. 382.*~~

~~*middle edge 65° 48'. Crystals OP (s), oP (0), cPco (p) (figs. 388,*~~

~~*Fig. 333. Fig. 334. 334); with hexagonal aspect ; also twins; and massive. Cl. oP, imperfect ; fracture conchoidal or uneven; sectile. H.=2 to 3;*~~

~~*o92*~~

~~*G.=5°5 to 5°8. Rather dull; brighter on the streak. Blackish lead-grey, with a blue or other tarnish. B.B. colours the flame blue ; on charcoal in the oxygen flame spntters, and fuses easily ; in the red. flame becomes solid. With soda gives a grain of copper. Green solution in n. acid, leaving sulphur. C.c.: 79°8 copper, 20°2 sulphur. Fassnet Burn (Haddingtonshire), Ayrshire, Fair Island, near Redruth and Land's End in Cornwall, Saxony, Silesia, Nor- way, the Banat, Siberia, and the United States. Important copper ore.*~~

~~*165. STROMEYERITE, Cu,S+ Ags.*~~

~~*Right prismatic ; isomorphous with redruthite. Crystals rare ; usually massive ; fracture flat, very sectile. H. =2'5; G.=6'2 to 6°3. Bright. Blackish lead-grey. C.c.: 53:1 silver, 31°2 copper, and 15°7 sulphur, but*~~

~~*often indeterminate proportions of silver (3 to 53) and copper (80 to 75). Schlangenberg in Siberia, Rudelstadt in Silesia, and Catemo in Chili.*~~

~~*166. BERZELINITE, Cu,Se.*~~

~~*Crystalline, in thin dendritic crusts, and imbedded in calcite. Silyer-white with a black tarnish ; streak shining. In open tube gives a red sublimate of selenium, with white crystals of selenious acid. B.B. on charcoal fuses to a grey, slightly malleable bead, giving odour of selenious acid; with soda a grain of copper. C.c.: 61°5 copper and 88°5 selenium. Skrikerum in Smaland, Lerbach in the Harz.*~~

~~*167. CRooKESITE, (CuTI),Se.*~~

~~*In crystalline grains the size of peas. H.=2°5 to3; G.=6°9. Brittle. Lead-grey. Metallic. B.B. colours the flame intense green, C.c.: 45°76 copper, 3°71 silver, 17°25 thallium, 33°27 selenium. From Skrikerum.*~~

~~*168. EUKAIRITE, Cu,Se+ AgSe.*~~

~~*Massive and granular crystalline. Cuts with knife. Lead-grey ; streak shining. B.B. fuses to a brittle metallic grain. C.c.: 43°1 silver, 25°3 copper, and 31°6 selenium. Skrikerum, Atacama, Chili.*~~

~~*169. ARGENTITE, Ag,S.*~~

~~*Cubic. ©00; 0; 00; and 202 (figs. 29, 56). Crystals generally misshapen, with uneven or curved faces; in druses, or linear groups ; also arborescent, capillary, or in_crusts. Cl. indistinct ; fracture hackly ; malleable and flexible. H.=2 to 2°5; G.=7 to 7-4, Rarely brilliant, more so on the streak. Blackish lead-grey, often with a black, brown, or rarely iridescent tarnish. B.B. on charcoal fuses, intumescees greatly, and leaves a grain of silver. Sol. in con. n. acid. C.c.: 87 silver and 13 sulphur. Huel Duchy, Dolcoath, Herland, and near Callington in Cornwall ; Alvain Stirlingshire; Freiberg, Marienberg, Annaberg, Schneeberg, Johann-Georgenstadt, J oachimsthal, Schemnitz and Kremunitz, Kongsberg. Common ore at Guanajuato and Zacatecas in Mexico, in Peru, and at Blagodat in Siberia.*~~

~~170. AcANTHIITE, AgS.~~

~~Right prismatic. H.=2°5 ; G. =7°33. argentite, thus dimorphous. also at Copiapo.~~

~~171. Jatpaits, 8AgS+Cu,S.~~

~~Cubic; form 0. Cl. cubic; malleable. H.=2°5; G.=6°88. Dark- grey. Metallic lustre. C.c.: silver 71°78, copper 14°04, sulphur 14-2. Jalpa in Mexico.~~

~~172. LauTiTE (CuAg) Ass.~~

~~Granular. TIron-black. H.=3; G.=4°96. silver 12, arsenic 41°8, sulphur 17°86.~~

~~173. NAUMANNITE, AgSe.~~

~~In thin plates and granular. Cl. hexahedral, perfect. Malleable. H. =2°5; G.=8. Tron-black. Splendent. C.c.: 73 silver and 27 selenium, with 4°91 lead, Tilkerode.~~

~~174. HIussite, AgTe.~~

~~Cubic or anorthic (?); massiveand granular. Slightly malleable. H.=2‘5 to 3; G.=8‘1 to 8°45. Blackish pate to steel- grey. B.B. on charcoal fumes, fuses to a black grain with white spots, and leaves a brittle grain of silver. C.c.: 62°8 silver and 37°2 tellurium. Zavodinski (Altai), Nag- yag, Rezbanya, California, and Chili.~~

~~175. Prerzire, 2AgTe+AuTe.~~

~~Like hessite. Two varieties :— (a) with G. =8°72, containing 18 per cent. of gold, from Nagyag ; (0) with G. =9 to 9°4, and 24 to 26 of gold. Calaveras and Tuolumne in Cali- fornia, Colorado.~~

~~176. DiscrasITE, Ag,Sb; Ag,Sb; and Ag,gSb.~~

~~Right prismatic; P with polar edges 182° 42’ and 92°; oP 120°~~

~~*Iron-black. €.c. like Freiberg and Clausthal, on argentite;*~~

~~*C.c.: copper 28°3, Lauta, near Marienberg.*~~

~~*Fig. 335 (sp. 176). nearly (figs. 385, 336). Crystals short prismatic, or thick tabular,*~~

~~*MINERALOGY*~~

~~*and vertically striated (fig. 335) ; often in stellar groups (fig. 386); also massive or granular.*~~

~~*twins united by a face of oP; Cl,*~~

~~*basal and Po, distinct ; oP imperfect ; rather brittle, and slightly malleable. I= 3515 CG. =9°4 to 9°8. Silver-white to tin-white, with a yellow or blackish tarnish. B.B. fuses easily, fumes staining the charcoal white, and leaves a grain of silver. Sol. in n. acid. C.c.: 64 to 84 silver, and 36 to 16 antimony. Andreas- 3 berg, Allemont in Dauphiné, Spain, and Ar- Fig. 386. queras in Coquimbo (Chili). A valuable ore of silver. A variety from Chili contains 94°2 silver and 5°8 antimony, and is Ag,,Sb.*~~

~~*177. BueNDE, ZnS.*~~

~~*Cubic and tetrahedral (figs. 152, 158, 337). Twins remarkably common, united by a face of O, and several times repeated ; fre- quently massive and granular. Cl. 0, perfect; very brittle. H.= 3-5to 4; G.=3°9to4°2. Semitransparent to opaque ; adamantine and resinous. Brown or black, also red, yellow, and green, rarely colour- less or white. B.B. decrepitates, often violently, but only fuses on very thin edges. Sol. in con. n. acid, leaving sulphur. C.c.: 67 zinc and 33 sulphnr ; but generally in the darker varieties with 1 to 15 iron, 0 to 8 cadmium. Very abundant. Glen Gairn (bright yellow and highly phosphorescent), Leadhills, Tyndrum, Cornwall, Derby- shire, Cumberland, the Harz, Freiberg, ; Przibram, Schemnitz, Kapnik, North Fig. 387. America, Peru. Used for producing zinc vitriol and sulphur, and as an ore of zinc. Lithium, indium, thallium, and gallium have all been found in blende.*~~

~~*178. Wourrzire, 6ZnS+ Fes.*~~

~~*Hexagonal; oP, P, with well-marked horizontal strie. Cl. basal, and prismatic. H.=38°5 to 4; G.=3°9 to 4°1. Brownish black ; streak light brown. C.c. : like blende, which is thus dimor- phous. Oruro in Bolivia, and Przibram (radiated and cadmiferous).*~~

~~*179. GREENOCKITE, CdS.*~~

~~*Hexagonal, and generally hemimorphic. P 86°21'; 2P 123° 54'. Crystals 2P, OP, oP, P; or P, 2P, oP; attached singly. Cl. oP, imperfect; basal perfect. H.=8 to 3°5; G.=4°8 to 4°9. Trans- lucent; brilliant resinous, or adaman- tine. Honey- or orange-yellow, rarely brown; streak yellow. B.B. decrepitates, and becomes carmine- red, but again yellow when cold ; fused with soda forms a reddish brown coating on charcoal. Sol. in h. acid. C.c.: 77°6 cadmium, and 22°4 sulphur. Bishopton in Renfrewshire, Przibram, and Friedensville in Pennsylvania.*~~

~~*180. ALABANDINE, Mns.*~~

~~*Cubic; O and Oc ; usually massive and granular. Cl. hexa- hedral, perfect ; fracture uneven ; rather brittle. H.=3°5 to 4; G.=3°9 to 4. Opaque ; semi- metallic. Iron-black to dark steel- grey, brownish black tarnish ; streak dark green. B.B. fuses on thin edges to a brown slag. Sol. in'h. acid. C.c.: 638 manganese and 37 sulphur. Nagyag, Kapnik, Alabauda in Caria, Mexico, and Brazil.*~~

~~*181. Mruuerite, Nis.*~~

~~*Hexagonal rhombohedral; R 144° 8'; in fine acicular prisms of wP2, R. Brittle. H. =3°5; G.=4°6 (or 5°26 to 5°65). Brass- or bronze-yellow, with a grey or iridescent tarnish. B. B. fuses easily to a_blackish metallic globule, which boils and sputters. In nitro-hydrochloric acid forms a green solution. C.c.: 64°4 nickel and 35°6 sulphur. Morven (Argyllshire), Chapel (Fife), Ayrshire, near St Austell in Cornwall, at Merthyr-Tydvil, J ohann-Georgen- stadt, Joachimsthal, Przibram, Camsdorf, Riechelsdorf, Pennsyl- vania.*~~

~~*182, PENTLANDITE (Eisennickelkies), 2FeS+NiS.*~~

~~*Cubic; massive and granular ; fracture uneven ; brittle. H.= 3°5 to 4; G.=4°6. Light pinchbeck-brown, with darker streak. Not magnetic. B.B. acts in general like pyrrhotite ; the roasted powder forms with borax in the red. flame a black opaque glass. C.c.: 36 sulphur, 42 iron, and 22 nickel ; but mixed with pyrrhotite and chalcopyrite. Lillehammer in southern Norway. Inverarite, 5FeS + NiS, with 11 of nickel, from near Inveraray, is a variety.*~~

~~*183, NIcKELITE (Copper Nickel), NiAs.*~~

~~*Hexagonal ; P 86° 50'. Crystals oP, OP; rare. Arborescent, reniform, and massive ; fracture conchoidal and uneven ; brittle. H.=5°5;G.=7°5to7°7. Light copper-red, with a blackish tarnish. It forms no sublimate in the closed tube. B.B. fuses with strong*~~

~~*Fig. 338.*~~

~~*Mer LER AL OGY*~~

~~*fumes to a White, brittle, metallic globule. C.c.: 43°6 nickel and 56°4 arsenic. HIlderston in Linlithgow, Pibble in Kirkcudbright, Leadhills, Pengelly and Huel Chance in Cornwall, Freiberg, Schnee- berg, Joachimsthal, Sangerhausen, Andreasberg, Chatham in Con- necticut. Used as an ore of nickel.*~~

~~*184. BREITHAUPTITE (Antimonial Nickel), NiSb.*~~

~~*Hexagonal; P 86° 56'. Crystals, thin striated hexagonal tables of OP, oP. H.=5; G.=7'5to7°6. Brilliant. Light copper-red, generally with violet tarnish. B.B. fumes, but fuses with great difficulty. C.c.: 32°2 nickel and 67°8 antimony. Andreasberg.*~~

~~*185. STANNITE (Tin Pyrites), 20uS, SnS,+2(FeS, ZnS)+SnS,.*~~

~~*Cubic ; in cubes very rare, generally massive and granular. Cl. hexahedral, imperfect; fracture uneven or small conchoidal ; brittle. H.=4; G.=4°3 to 45. Steel-grey; streak black. C.c: 26 to 32 tin, 24 to 30 copper, 5 to 12 iron,*~~

~~2 to 10 zinc, and 30 sulphur. Huel Rock near St Agnes, St Michael's Mount, and Carn- brea in Cornwall; Zinnwald. Bell-metal ore.~~

~~186. STERNBERGITE, (AgS +2FeS)FeS,.~~

~~Right prismatic; P middle edge 118°. Crystals usually thin tabular; in twins, or in fan-like and spheroidal groups. Cl. basal, erfect ; sectile, and flexible in thin sth H.=1 to-1°5; G.=4°2 to 4°25. Dark pinchbeck-brown, often a violet-blue tarnish; streak black. C.c.: 34°2 silver, 35:4 iron, and 30°4 sulphur. Joachimsthal, Schneeberg, and Johann -Georgenstadt. Flexible~~

~~Fig. 339.~~

~~Sulphuret of Silver, from Hungary and Freiberg, is identical. Frie- | seite, Ag.Fe,S,, in twins (fig. 339), is a variety.~~

~~187. RITTINGERITE, AgAs.~~

~~Oblique prismatic. oP 126° 18'; oPo and OP. Cl. basal ; fracture conchoidal; brittle. H.=2°5to 3; G.=—5°63. C.c.: silver 57°7, the remainder being arsenic, with someselenium. Joachimsthal, Silesia, Felsébanya in Hungary.~~

~~188. CovELLINE, CuS.~~

~~Hexagonal. Crystals oP, OP; rare; usually reniform and granu- lar, Cl. basal; sectile. Thin lamine flexible. H.=1°5to2;G.= 3°8 to 4:6. Resinous. Indigo-blue; streak black. B.B. burns with blue flame. Sol. in n.acid. C.c¢.: 66°7 copper, 33°3 sulphur. Cairnbeg in Cornwall, Vesuvius, Leogang (Austria), Chili, Angola, New Zealand, and Victoria.~~

~~189. CHALCOPYRITE (Copper Pyrites), CuS+FeS.~~

~~Pyramidal ; and sphenoidal hemihedric ; $P (P) with polar edges 71° 20'; oP. Crystals generally small and deformed; twins very common, like fig. 340. Po(b) 89° 10', 2Po(e) 126° 11', OP (a), P (fig. 89). Most commonly compact and disseminated; also botryoidal and reniform. Cl. pyramidal 2P0 ; some- times rather distinct ; fracture conchoidal or uneven. H.=3°'5~~

~~*to 4; G.=4‘1 to 4:3. Brass-yellow, often with a gold-yellow or iridescent tarnish (peacoek copper ore) ; streak greenish black. B.B. on chareoal becomes darker or black, and on cooling red; fuses easily to a steel-grey globule, whieh at length becomes magnetic, brittle, and greyish red on the fractured surface ; with borax and soda yields a grain of copper; moistened with h. acid, colours the flame blue. C.c. essenti- ally 1 atom eopper, 1 atom iron, and 2 atoms sulphur; with 34°5 copper, 30°5 iron, and 35 sulphur. The most abundant ore of copper.*~~

~~*Fig. 340.*~~

~~*In Kirkeudbright- shire and Wigtownshire, Tyndrum in Perthshire, Inverness-shire, Lairg in Sutherland, Shetland, Anglesea (Parys mine), Derbyshire, Staffordshire, Cumberland, Gunnislake (Devonshire), St Austell (Cornwall), Wicklow, Falun, Roraas, Freiberg, Mansfeld, Goslar,*~~

~~*Lauterberg, Miisen, Siberia. It is distinguished from pyrite by yielding readily to the knife, by its tarnish, and by forminga green solution in n. acid.*~~

~~*190. BornitTE (Purple Copper), 3Cu,S, FeSs.*~~

~~*Cubic. Crystals o0c0,and oOo, O; but rare, and generally rough or uneven; also twins. Mostly massive. Cl. octahedral ; fracture conchoidal ; slightly brittle; sectile. H.=3; G.—4°9 to 5‘1. Colour between eopper-red and pinehbeck-brown, with tarnish at first red or brown, then violet or sky-blue ; streak greyish black. B.B. acts like chalcopyrite. Soluble in con. h. acid, leaving sulphur. C.c.: 55°6 copper, 16°4 iron, and 28 sulphur. Crystals near Redruth and St Day in Cornwall; massive at Killarney in Ireland ; also Norway, Sweden, Mansfeld, Silesia, Tuscany, and Chili. An ore of copper.*~~

~~*191. CuBan, CuS, Fe,8,. Cubic. H.=4; G.=4°1. Bronze-yellow; streak bronzc-yellow and black. Barracanao in Cuba, Tunaberg and Kafveltorp in Sweden.*~~

~~*393*~~

~~*192. DoMEYKITE, Cu,As.*~~

~~*Botryoidal or massive ; fracture uneven ; brittle. H.=3 to 3°53 G.=7 to 7°5. Tin- or silver-white, inclining to yellow, with an iridescent tarnish. Not affeeted by h. acid. C.c.: 71°63 copper and 28°37 arsenic. Calabazo in Coquimbo, and Copiapo in Chili. Con- durrite, massive, seems an impure variety ; from Condurrow mine and near Redruth (Cornwall). Algodonite from Lake Superior, Whit neyite from Mexico, and Darwinite (88 copper) are also identical or similar.*~~

~~*193. MELonirTE, Ni,Te,.*~~

~~*Hexagonal; minute tabular crystals, foliated and granular. Metallie lustre. Reddish white; streak dark grey. C.e.: nickel 21, silver 4°1, tellurium 73-4. Stanislaus and Calaveras (California).*~~

~~*194. SytvaniTE, AgTe,+AuTe,.*~~

~~*Oblique prismatic, C 55° 21'. oP 94° 26'; — P°a 19° 21'; P®co 62° 43'. Crystals small, short acicular, and oftentwinned and grouped in rows like letters; sectile, but friable. H.=1°5 to 2; G.=7°99 to*~~

~~*Fig. 341. 8°33. Steel-grey to silver-white, and pale bronze-yellow. C.c.: 59°6 tellurium, with 0°6 to 8°5 antimony, 26°5 gold (in some 30), and 13°9 silver, with 0°2 to 15 lead. Offenbanya (Graphic Tellurium), Nagyag (Yellow Tellurium), and California.*~~

~~*195. NacyaaiTe, Blaek Tellurium. Pyramidal. P 137° 52'; Poo 122° 50'; andOP (fi*~~

~~*Fig. 342.*~~

~~*tabular, rare; in general in thin plates or foli- ated. Cl. basal, perfect; sectile; thin lamine flexible. H.=1 to 1°5; G.=6°85 to 7°2. Splendent. Blackish lead-grey. C.c.: 51 to 63 lead, 6 to 9 gold, 1 eopper and silver, 13 to 32 tellurium, 3 to 12 sulphur, and 0 to 4°5 antimony. Nagyag and Offenbanya in Tran- sylvania.*~~

~~*196. MALDONITE, Au,Bi.*~~

~~*H.=15 to 2; G.=82 to 9°7. Colour _*‘ silver-white, with black tarnish. C.c.: gold Fig. 348 (sp. 195). 64°5, bismuth 35°5. Occurs in granite veins at Maldon in Victoria.*~~

~~*197. CHILENITE, Ag, Bi.*~~

~~*Minute plates of metallic lustre. Silver-white, but tarnished red or yellow. Silver 83°9, bismuth 1671. From the mine San Autonio near Copiapo in Chili,*~~

~~*198. CINNABAR, HgS.*~~

~~*Hexagonal and rhombohedral; R71° 48’. R(x), OR (0), oo R (m). 2R (<) (fig. 344). Crystals rhombohedral; also granular, compact, and earthy. Cl. oR, perfect; fracture uneven and _ splintery ; seetile. H.=2 to 2°5; G.8 to 8°2. Trans | parent, with circular polarization. Adaman- tine. Coclineal-red; streak searlet. C.e.: 86°2 mercury, 13°8 sulphur. Idria in Carniola, Almaden in Spain, Wolfstein in Bavaria, ae Saxony, Hungary, Tuscany, China, Cali- Pig. 344. fornia, Mexico, Peru. Chief ore of mercury. Also a pigment. Fepatie Cinnabar is a bituminous mixture.*~~

~~*199. TIEMANNITE, HgSe.*~~

~~*Fine granular ; brittle. H.=2°5; G.=7:1to7‘4. Brilliant. Dark lead-grey. C.c.: 75 merenry, 25 selenium. Clausthal and Zorge.*~~

~~*200. LERBACHITE, (PbHg)Se.*~~

~~*Granular and massive. G.=7°& to 7°88. Colour steel-grey to iron-black. Brittle. Lerbach, Tilkerode in the Harz.*~~

~~*201. GUANAJUATITE, Bi,Se;.*~~

~~*Massive; granular; foliated and fibrous. Ii.=2°5 to 3; G. =6525),*~~

~~*Blue-grey; streak grey and shining. Metallic; soft and malleable. C.c.: selenium 34:3, sulphur ‘7, bismuth 65. Santa Rosa (Guana-*~~

~~*juato, Mexico). XVI. — 50*~~

~~202. CotorapoiTE, HgTe. Massive and granular. H.=8; G.=8°63. Metallic. Tron-black. Conchoidal fracture. C.c.: 61 merenry, 39 tellurium. Colorado.~~

~~208. MoLyBpENITE, Mos.~~

~~Hexagonal (?). Crystals OP, «P; and OP, oP,P. Generally scaly. Cl. basal, perfect; sectile and flexible. Feels greasy. H. =1tol‘5; G.=4°6 to 4:9. Lead-grey with red tinge; grey streak on paper, greenish on porcelain. B.B. colours flame siskin-green; on charcoal yields sulphurous fumes, : and forms a white coating; in warm nitrochloric acid a greenish, and in boiling s. acid a blue pa C.c.: 59 molybdenum, 41 sulphur. i In ccopatitar" Uenewsores, and in Fig. 345. } granites in Sutherland, Ross, Aberdeen, Argyll, and Kirkcudbright; Shap in Westmorcland, Caldbeckfell in Cumberland, Arendal, Zinnwald, Mont Blanc, Maine, Connecticut, Yeain Victoria. Used~~

~~for preparing blue carmine, for colouring porcelain. 204. Laurits, (RuQs),83.~~

~~Cubic. Crystals O, 200; 003, 000. Ol. octahedral. H. = 75: G.=6°99. Metallic, bright. Dark iron-black. Powder grey. Brittle. O.c.: ruthenium 65°18, osmium 3°08, sulphur 31°79.~~

~~From platinum grains, in Borneo and Oregon.~~

~~205. ReaLcAR, Ass.~~

~~Oblique prismatic. oP (Af) 74° 26'; Pec (n) 182° 2', oo P92 (7) 113° 16'. Crystals (fig. 346) generally prismatic; sometimes massive. Cl. basal, also clino- diagonal; fracture splintery ; sectile. H.=1‘5 to 2; G.=3‘4 to 3°6. Trans- parent to opaque; resinous. Aurora-red ; streak orange-yellow. C.c.: arsenic 70, sulphur 30. Nagyag, Felsobanya, St Gotthard, Vesuvius.~~

~~206. ORPIMENT, AS,S3.~~

~~*Right prismatic. oP 117° 49'. Fre- quently foliated. Cl. brachydiagonal ; striated vertically ; sectile aud flexible. H.=1'5 to 2; G.=38'4 to 35. Semi-transparent; resinous to pearly. Citron- yellow and orange-yellow. C.c.: arsenic 61, sulphur 39. Kapnik, Andreasberg, Solfatara, Zimapan in Mexico.*~~

~~*207. DIMORPHITE, AS.S3.*~~

~~*Right prismatic. H.=1°5; G.=3°58. Orange-yellow. Solfatara.*~~

~~*208. STIBNITE, Sb,S3.*~~

~~*Right prismatic. P polar edges 109° 26' and 108° 21'; Crystals (fig. 347) generally prismatic. Cl. brachydiagonal, perfect ; sectile. H.=2 5 G.=4'6 to 4'7. Brilliant lead-grey, often tarnished. C.c.: antimony 71°8, sulphur 28°2. Maisley, Banffshire; Harehill, Ayrshire; Glendinning, Dumfriesshire ; Endellion and Padstow, Cornwall ; Wolfs- berg, Harz; Przibram, Schemnitz, Auvergne, Spain, America, Melbourne. Chief ore of antimony.*~~

~~*209. BisMUTHINE, Bi,S.*~~

~~*Right prismatic. oP 91° 30'. Crystals prismatic, striated; also granular and > foliated. Cl. brachydiagonal; sectile. Fi H. =2 to2'5; G.=6'4t06°6. Lead-grey. ig. 347 (sp. 208). C.c.: 81-2 bismuth, 18°8 sulphur. Caldbeckfell (Cumberland), Redruth (Cornwall), Riddarhyttan and Bastnaes (Sweden), Alten- berg, Haddam (Connecticut), Ballarat (Victoria), Bolivia.*~~

~~*210. FRENZELITE, Bi,Seg, or 2Bi,Se3 + Bi,S3.*~~

~~*Right prismatic; oP 90°. Needle crystals, and massive. Cl. brachydiagonal. H.=2°5 to 3; G.=6°25. Bluish grey; streak greyish black, shining. Lustre metallic. Malleable. C.c.: bismuth 67°38, selenium 24°13, sulphur 6°6. Guanajuato (Mexico).*~~

~~*Fig. 346 (sp. 205).*~~

~~*Servia,*~~

~~*oP 90° 54',*~~

~~*SULPHUR SALTS.*~~

~~*211. GUEJARITE, Cu,S + 2Sb,8;. Right prismatic. oP 101° 9%. G.=5‘03. Steel-green, with bluish streak. C.c.: copper 15°5, anti- mony 58°5, sulphur 25. Guejar in*~~

~~*Sierra Nevada. 212. Miareyrire, AgS+Sb8,. Oblique prismatic, C 81° 36’. P 90° 53’;-P 59° 59’. Crystals | pyramidal, or tabular (fig. 348); ~ massive; sectile. H.=2 to 2°5; G. =5‘2 to 5°3. Metallic adamantine.*~~

~~*Cl. brachydiagonal. H.=3‘5;*~~

~~*R*~~

~~*a*~~

~~*Fig. 348 (sp. 212). Blackish lead-grey to steel*~~

~~*MINERALOGY*~~

~~*grey; streak cherry-red. C.c.: 87 silver, 41 antimony, 22 sulphur. Freiberg, Przibram, Potosi.*~~

~~*213. MorococnireE (Silber- Wismuth Glanz), AgS + BiSs.*~~

~~*Massive. Colour grey; streak light green. G.=6°92. C.c.: silver 28-3, bismuth 54°7, sulphur 17. Morococha in Peru.*~~

~~*214. SARTORITE, PbS + As,S3.*~~

~~*Right prismatic. Crystals slender; oP 123°20’. Cl. OP. H.=3; G. =5°39. C.c.: lead 42°68, arsenic 30°93, sulphur 26°39. Binnen- thal in Switzerland.*~~

~~*215. ZINCKENITE, PbS+SbS3.*~~

~~*Right prismatic. oP (d) 120° 39; Poo (0) 150° 36’ (fig. 349). Crystals acicular; vertically striated, and twinned KO 3 or 6. Sectilee H.=38 to 85;*~~

~~*G.=5°3 to 5°35. Steel-grey to lead-grey ; with blue tarnish. C.c.: lead 359, antimony 42, sulphur 22°1. Wolfsberg.*~~

~~*216. EMPLECTITE, CuS + Bi,8,.*~~

~~*Right prismatic. Tin-white. Saxony, Wiirtemberg, yt and Copiapo. Fig.*~~

~~*217. WoLFSBERGITE, Cu,S +Sb,S3.*~~

~~*Right prismatic. oP 135° 12'; oP2 111° Crystals tabular ; also fine granular. Cl. brachydiagonal, perfect ; fracture conchoidal oruneven. H.=3°'5; G. =4°748, Lead-grey to iron-black, sometimes iridescent ; streak black, dull. C.c.; 25°4 copper, 49 antimony, and 25°6 sulphur. Wolfsberg.*~~

~~*218. BERTHIERITE, FeS, SbS3.*~~

~~*Massive ; columnar or fibrous, with indistinct cleavage. H.= 2°3; G.=4 to 4°38. Dark steel-grey, reddish. Tintagel and Padstow in Cornwall, Auvergne and Anglars (Creuse) in France, Braunsdorf in Saxony. In France used as an ore of antimony.*~~

~~*219. PLAGIONITE, Pb,Sb3.*~~

~~*Oblique prismatic, C 72° 28'.*~~

~~*(6)*~~

~~*P 184° 80' and 142° 3'; -2P*~~

~~*120° 49'. Crystals thick, tabu- lar (fig. 350), minute, and in o" druses. Cl. — 2P, perfect; brittle. H.=2°5; G.=5'4. Blackish lead-grey. C.c.: 41 lead, 38 antimony, and 21 sulphur. Wolfsberg. 220. KLaprorHITE, 3Cu,S + 2Bi,S,.*~~

~~*Right prismatic; long striated crystals; oP=107°. Wittichen, Fig. 350 (sp. 219). Bulach. Schirmerite, from Colorado, 3(Ag,Pb)S + 2Bi,S3, with G. =6'74, is similar.*~~

~~*221. BinniTE, 3CuS + 248,83.*~~

~~*Cubic. Typical forms 00, 202; 0, 00, 606; 404, 10010 303. H.=4:5; G.=4°48. Metallic. Black. Binnen.*~~

~~*222. JAMESONITE, 3PbS + 28b,S3.*~~

~~*Right prismatic; oP 101° 20'. Crystals oP, oP, long- prismatic, parallel or radiating. Cl. basal perfect, oP and brachy- diagonal imperfect; sectile. H.=2 to 25; G.=5'5 to57. Steel- grey to dark lead-grey. B.B. decrepitates, fuses easily, and wholly volatilizes except a small slag. Sol. in warm n. acid. C.c.: 44°5 lead, with 2 to 4 iron, 34°9 antimony, and 20°6 sulphur, Cornwall, Estremadura, Hungary, Siberia, and Brazil.*~~

~~*223. DuUFRENOYSITE, 2PbS + As,§3.*~~

~~*Right prismatic. oP 93° 39'. Generally in thick rectangular tables. H. =3; G.—5°56. Lead-grey. Brittle. Binnen, St Gotthard.*~~

~~*224. FRIESLEBENITE, 5(Pb, Ag,)S + 2Sb,83.*~~

~~*Oblique prismatic, C 87° 46'. ooP 119° 12'; P®co 31°41' (fig. 851)*~~

~~*| in prisms with curved reed-like faces, and*~~

~~*strong vertical strie. Twins intersecting ; also massive. Cl. oP, perfect; fracture con- choidal or uneven ; rather brittle. H.=2 to 25; C.=6'2to 64. Steel-grey to dark lead- grey. C.c.: 22°5 silver, 32°4 lead, 26°8 anti- mony, and18°3 sulphur, Freiberg (Saxony), a Hiendelaencina (Spain).*~~

~~*225. PYRARGYRITE, 8Ag,S+5Sb,S3.*~~

~~*Hexagonal rhombohedral; R (P) 108° 42'; —4R 187° 58'; OR; —2R ®; R8; oP2(s); and oR (/). Crystals prismatic (fig. 352); twins common, of various kinds; also massive, dendritic, oriuvesting. Cl. R, rather perfect; : fracture conchoidal to uneven and splintery; Fig. 351 (sp. 224). sectile. H.=2 to 2:5. Crimson-red to blackish lead-grey ; streak cochineal to cherry-red. Huel Brothers and Huel Duchy in Cornwall, Andreasberg, Freiberg, Johann-Georgenstadt, Annaberg,*~~

~~*MINERALOGY*~~

~~*Schneeberg, Marienberg, Przibram, Schemnitz and Kremnitz, Kongsberg, Mexico, Nevada, &c.*~~

~~*226. ProusTITE, 3Ag,S+ As,S,.*~~

~~*Rhombohedral, like pyrargyrite, except R 107° 50' (fig. 353). 008 tu Sila transparent to trans- lucent on the edges. Cochineal to crimson-red. C.c? 65°5 silver; 15°1 arsenic, and 19°4 sulphur. Streak aurora-red. B.B. arsenical odour, and difficultly reduced to metallic silver. At the same localities as pyrar- gyrite; both are valu- able ores of silver. Red orpiment has a_ lower specific gravity, and yellow streak; cinnabar volatilizes before the blowpipe.*~~

~~*227. BOULANGERITE, 3PbS+SbS,.*~~

~~*Fine granular, columnar, radiating, or fibrous ; slightly sectile. H.=3; G.=5'8 to 6. Silky, metallic. Blackish lead-grey, with darker streak. B.B. like jamesonite. C.c.: 59 lead, 22°8 antimony, and 18°2 sulphur. Moliéres in France, Oberlahr (Rhenish Prussia), Lapland, and Siberia. Plumbostib or Embrethite, from Nertchinsk, is only a variety.*~~

~~*228. KoBELLITE, 3PbS, Bi,S;+3PbS, Sb,S,.*~~

~~*Radiated columnar; soft. G.=6'2to 6°3. C.c.: 58 lead, 20 bis- muth, 10 antimony, and 17 sulphur. HIvena in Nerike (Sweden).*~~

~~*229. WITTICHENITE (Cupreous Bismuth), 3CuS + Bi,S,.*~~

~~*Right prismatic ; in tabular crystals like bournonite. Wittichen in the Black Forest.*~~

~~*230. BovRNonITE (3CuS + Sb,S,) + 2(3PbS + Sb,8,).*~~

~~*Right prismatic. oP (d) 93° 40'; Poo(n) 96° 13'; Boo (e) 92° 34'; OP ®; Poo (s); wPoo(k) (fig. 354). perfect ; fracture uneven to conchoidal; rather brittle. H.=2°5 to 3; G.=5°7 to 59. Lustre brilliant metallic. Steel- grey. C.c.: 42°4 lead, 13 copper, 25 antiniony, and 19°6 sulphur. Redruth and*~~

~~Beeralston; Harz (Neudorf), Brauns- dorf, Kapnik, Servoz; Alais and Pontgi- baud in France.~~

~~Wolchite from Wolch in Carinthia is only a variety.~~

~~231. AIKINITE (WNeedle-ore), + Bi,S;) +3(CuS + Bi,S,). . _ Right prismatic; long thin crystals d imbedded in quartz, often bent or broken; : vs rather brittle, H.=2°5; G.=6-7t06°8, Fig. 354 (sp. 230). Blackish lead-grey or steel-grey, with a brownish tarnish. C.c.: 36 lead, 11 copper, 36 bismuth, and 17 sulphur. Berezoff (Siberia), Georgia.~~

~~232. StyLoryp, 3(CuAgFe)S + Sb,§,.~~

~~a prismatic. OP 92° 30'. H.=3;G.=4'8. Black. Copiapo,~~

~~ili.~~

~~233. ANNIVITE, 4CuS +(As,S3, Sb.S5, Bi,S,).~~

~~Massive, similar to the foregoing. From Anniver in Valais. Studerite is similar, but with 15°5 of antimony.~~

~~234. JULIANITE, 3Cu,S+As,S3._~~

~~Cubic. G.=5°12. Metallic. Reddish grey. Silesia.~~

~~235. Menrcuinitr, 4PbS +Sb,9,.~~

~~Oblique prismatic, C 72° 8', oP 140° 24'; P®c 70°, small, acicular, chiefly of oP*o, fibrous. Saxony.~~

~~236. JoRDANITE, 4PbS + As,Sz. Right prismatic; oP 123° 29', Streak black. G.=6°38. 18°6. Binnen and Nagyag. 237. TETRAHEDRITE (Fahlerz), 4Cu,8 +Sb,85.~~

~~0 202~~

~~~o> oO, 7s (figs. Twins (figs. 164, 207); generall Cl. octahedral ; fracture conchoidal ; brittle. H. aend~~
~~~

~~*y*~~

~~*ee oe ee*~~

~~*Fig. 358 (sp. 226).*~~

~~*Fig. 352 (sp. 225).*~~

~~*Cl. brachydiagonal, im-*~~

~~*&*~~

~~*2(3PbS*~~

~~*Rudelstadt in*~~

~~*Crystals “2, coP%, oP; rare; mostly H. =3; G.=6‘4. Bottino in Tuscany, Schwarzenberg in*~~

~~*Cl. brachydiagonal, perfeet. C.c.: lead 68°9, arsenic 12°5, sulphur*~~

~~*Tesseral and tetrahedral. In crystals ss A*~~

~~*355 to 358, also 65, 66, 206). massive,*~~

~~*395*~~

~~*G.=4‘5 to 52. Steel-grey to iron-black; streak black (dark red when containing zinc). B.B. on charcoal boils slightly, and fuses to a steel-grey slag, usually magnetic, and with soda gives copper. C.c. essentially Cu,S in combination with Sb,8;. Airthrey near*~~

~~*Fig. 358.*~~

~~*Fig. 357.*~~

~~*Stirling, Sandlodge in Shetland, Tomnadashin on Loch Tay, Kirk-eudbright; Crinnis and other Cornish mines near St Austell; Harz, Miisen, Freiberg, Camsdorf, Alsace, Kremuitz, and Kapnik. Those with 17 to 31 silver are the Silver Fahlore (Freiberg). Ore of copper and silver.*~~

~~*238. TENNANTITE, (CuS, FeS) As,S,.*~~

~~*Cubic (like fig. 237). Cl. oO. Brittle. H.=4; G.=4°3 to 4:5. Tron-black ; streak dark red, grey. C.c.: 49 copper, 4 iron, 19 arsenic, and 28 sulphur. Redruth and St Day (Cornwall), and Skutterud. Copper-blende, with brownish red streak; G.=4°3; con- tains 8°9 zinc; Freiberg.*~~

~~*239. POLYTELITE (Weissgiltigerz), 4RS + Sb,S3.*~~

~~*Like tetrahedrite. H.=2°5;G.=5°4t05°7. C.c.: silver 6 to 22, lead 38 to 52, antimony 8°5 to 22, sulphur 13 to 22°5. Freiberg.*~~

~~*240. STEPHANITE, 5Ag,S+Sb,8,.*~~

~~*Right prismatic. oP (0) 115° 39'; P (P) middle edge 104° 20';*~~

~~*| 2Poo(d) middle edge 107° 48'; OP (s); «Pco(p) (figs. 333, 334).*~~

~~*Cl. d and p, both imperfect ; fracture conchoidal or uneven ; sectile. H. =2 to 2°5; G.=6-2 to 6°3. Iron-black to blackish lead-grey. C.c.: 68°5 silver, 15°3 antimony, and 16°2 sulphur. Cornwall, Freiberg, Schneeberg, Annaberg, Joachimsthal, Przibram, Schem- nitz, Mexico, Peru, and Siberia. Valuable ore of silver.*~~

~~*241. GrocroniTE, 5PbS+(Sb, As),Sz.*~~

~~*Right prismatic. Fracture conchoidal; sectile. H.=2to3; G.= 6°45 to 6°54. Pale lead-grey. C.c.: 67 lead, with 1 to 2 copper and iron, 16 antimony, with 4°7 arsenic, and 17 sulphur. Sala in Sweden, Meredo (Oviedo) in Spain, and near Pietrosanto in Tuscany.*~~

~~*242, KILBRICKENITE, 6PbS + Sb,S,. Massive ; granular or foliated. C.c.: 70°01 lead, 13°76 antimony, and 16°23 sulphur. County Clare in Ireland.*~~

~~243. PoLYBASITE, 9(Ag,, Cu,)S+(Sb, As),S3.~~

~~Hexagonal; P 117°. Crystals OP, oP; and OP, P, tabular. Cl. basal, imperfect ; sectile, and easily frangible. H.=2 to 2°5; G.=6 to 6:25. Iron-black, in very thin lamell, translucent, red. C.c.: 64 to 72 silver, 3 to 10 copper, 16 to 17 sulphur, 0°2 to 8 antimony, and 1 to 6 arsenic. Freiberg, Joachimsthal, Schem- nitz, Guanajuato, Nevada, and Idaho. Rich ore of silver.~~

~~244, PoLYARGYRITE, 12AgS+Sb,§3.~~

~~Cubic. Typical forn 0, o00, 00,mOm. Cl.cubic. H.=2°5; G.=6'97. Metallic, iron-black ; streak black. Malleable. C.c.: 78°2 silver, 7°4 antimony, 14°5 sulphur. Wolfach in Baden.~~

~~245. ENARGITE, 3Cu,S+As,S,.~~

~~Right prismatic. Cl. oP 97°53' perfect, brachydiagonal 100° 58'~~

~~Typical form oP, 0P, Po, oP. Iron-black. O.c.: 48°3 copper,~~

~~Morococha in Peru.~~

~~and macrodiagonal less so. Brittle, H.=3; G.=4°3 to 45: 19°1 arsenic, and 32°6 sulphur.~~

~~396~~

~~246. CLARITE, 8CuS+As8.~~

~~Oblique prismatic. Cl. clinodiagonal. Ordinary form of, oPto, OP, mP. H.=3°5; G.—4°46. Dark bluish grey. Kinzig- thal in Baden. Lwuzonite is similar.~~

~~247. FAMATINITE, 83CuS+SbsS.~~

~~Right prismatic. Typical form OP, oP, oPo, ooP3. Massive or reniform. H.= —3°5; G.=4°57. Copper-red to grey ; streak black. Famatina Mts. in the Argentine Republic, and Cerro de Pasco in Peru.~~

~~248. CHIVIATITE, 2PbS + 3Bi,§;.~~

~~Foliated, massive. G.=6°9. Metallic. Lead-grey. Chiviato in Peru.~~

~~249, EPIGENITE, 6RS + As,S;.~~

~~Right prismatic. oP 110° 50'. Steel-grey. H.=3°5. Witti- chen.~~

~~250. EP1BOULANGERITE, 3PbS+Sb,§;.~~

~~Right prismatic. G.=6°3. Metallic. in Silesia.~~

~~251. XanTHOcON, 2(3AgS + As,S,) + (8AgS + AsS;).~~

~~Hexagonal rhombohedral. R:0R 110° 30'. Crystals thin hex- agonal tables ; brittle, easily frangible. H. =2 to 2°5; G.=5 to 5-2, Translucent; adamantine. Orange-yellow or brown; streak darker. In the closed tube fuses easily, becomes lead-grey. C.c.:~~

~~63°4 silver, 14°7 arsenic, and 21°9 sulphur. Himmelsfurst mine at Freiberg.~~

~~Blue-black. Altenburg~~

~~952. PYROSTILPNITE (Fire-blende).~~

~~Oblique prismatic ; crystals like stilbite. OP 139° 12'. Twins on orthodiagonal. H.=2; G.=4°2. Lustre pearly, and adamantine. Colour hyacinth-red and bright-yellow. Sectile. C.c.: 62°3 silver, with sulphur and antimony. Freiberg, Andreasberg, Przibram.~~

~~OXYSULPHURETS.~~

~~253. KermusItE, SbO,+ 2Sb8;.~~

~~Oblique prismatic ; crystals oPo, OP, acicular and diverging ; sectile. H.=1 to 1°5;G.=4°5 to 4°6. Translucent ; adamantine. Cherry-red ; streak similar. Sol. in h. acid. In potash solution becomes yellow, and dissolves. C.c.: 75°3 antimony, 19°8 sulphur,~~

~~4°9 oxygen. Brdiunsdorf, Przibram, Pernek near Bosing (Hungary), Allemont, Southham (Canada).~~

~~254. Voitzine, ZnO+4ZnS8. Incrusting. H.=4°5; G.=3°7. Joachinisthal.~~

~~255. KARELINITE, 8Bi0+ BiS.~~

~~H. =2; G.—6°6, Metallic. Lead-grey. Zavodinski in the Altai. 256. BoxiviTE, Bi,O3+ Bi.S3.~~

~~Rhombohedral. From Bolivia.~~

~~Yellow. Pontgibaud and~~

~~SELENITES,~~

~~257. OHALCOMENITE, CuSe-+2H,[=Cu0, SeO, +2H,0}. Oblique prismatic, C 108° 20'. G.=3°76. Bright blue. Trans-~~

~~parent. C.c.: selenious acid 48-2, copper oxide 35-4, water 15°3. Cerro de Cacheuta (Mendoza, Argentine Republic).~~

~~NITRATES AND BORATES. 258. NirraTINE, Na,N.f=Na,0; N,O;}:~~

~~Rhombohedral ; R. 106° 30'. Tarapaca in Peru. Used in the arts as a substitute for nitre; but deliquesces in moist air.~~

~~259. Nirru (Saltpetre), K,N,[=K,0, N,O,]~~

~~Right prismatic. oP (If) 118° 49'; 2P~~

~~260. NirrocauciTr, CaN,+H,.~~

~~_Fibrous or pulverulent. White or grey. C.c.: 30°8 lime, 59:3 nitric acid, and 9°9 water. Limestone caves of Kentucky ; on old walls and limestone rocks.~~

~~261. NiTromacnesitE, MgN,+H,. Taste bitter. In the same places, and similar to nitrocalcite.~~

~~262. BoraciTE, 2Mg3B,+ MgCl.~~

~~Tesseral and hemihedral (figs. 68, 253, 359). perfect; fracture conchoidal ;__ brittle. H.=7; G.=2°9 to 3. Transparent or translucent; vitreous or adamantine. Colourless or white, often greyish, yellow- ish, or greenish. Becomes polar electric by heat. B.B. fuses with difficulty to a clear yellowish bead, which on cooling forms a white opaque mass of needle-like crystals ; at the same time colours the flame green. Sol. in h. acid. C.c.: 62°5 boracic acid, 26°9 magnesia, 7°9 chlorine, and 2°7 mag- nesium. Liineberg, Segeberg in Holstein, Stassfurt.~~

~~263. STASSFURTITE.~~

~~In very minute prismatic crystals. White. cite, and thus perhaps dimorphous. Stassfurt.~~

~~264. RuopiziTE, 2CagB, (?).~~

~~H.=8 and G.=3°3 to 3°42; agrees in most characters with boracite. Pyro-electric. Mursinsk in Siberia.~~

~~265. LupwiciTs, 2MgB+FeFe. Fibrous masses. From limestone at Morawitza in the Banat.~~

~~266. Borax (Tinkal), Na.2B+10H,.~~

~~Oblique prismatic, C 78° 25'. oP 87°; P 122° 34° (fig. 360). Almost isomorphous with augite; brittle. H.2 to 2°5; G.=1'7 to 1°8. Pellucid; resinous. Colour-less, or yellowish, greenish, and greyish white. Taste feebly alkaline and sweetish. C.c.: 16°4 soda, 36°5 boracic acid, and 47:1 water ; but often with 2 phosphoric acid or other impurities. Shores of salt lakes in Tibet and Nepal, in California, and near Potosi.~~

~~267. BorocaxcrTE, Ca2B+6H,.~~

~~Similar to ulexite (sp. 268); and from same locality.~~

~~*268. Unexite, Na,2B+2Ca2B+18H,.*~~

~~*Fibrous. H.=1; G.=1°6. White. Tasteless. Iquique and Nova Scotia.*~~

~~*269. SZAIBELYITE, 2Mg,2B+3H,.*~~

~~*H.=3'°5; G.=2°7, Werksthal in Hungary.*~~

~~*270. HypRoBoRAciTE, 2Ca8B,+2Mg3B, + 12H,.*~~

~~*Radiating and foliated. Caucasus. A similar mineral, with soda in place of magnesia, is found in Peru.*~~

~~*271. SussEXITE, (Mn, Mg).B+ Hy.*~~

~~*Fibrous, silky. White. H.=3; G.=3"4. county, New Jersey).*~~

~~*Cl. octahedral, im-*~~

~~*Fig. 359.*~~

~~*C.c. same as bora-*~~

~~*Fig. 360 (sp. 266).*~~

~~*Franklin (Sussex*~~

~~*ANHYDROUS CARBONATES.*~~

~~*272. CarcrtTx (Cale-spar, Calearcous Spar), CaC.*~~

~~*Hexagonal and rhombohedral; R 105° 5' (fig. 101). The forms and combinations exceed those of any other mineral. Among them are more than fifty rhnombohedrons, especially — 4R 135°; R; —2R 79°; and 4R 66°; with OR and oR as limiting forms. There are one hundred and fifty-five distinct scalenohedrons, as R38; R2; 1R3 ; and the second hexagonal prism oP2. Hexagonal pyramids are among the rarer forms. Some of the most usual combinations are oR, —48 (c, g, fig. 179); or — $8, oR, very frequent ; also oR, OR; likewise -2R, R (/, P, fig. 107); R38, oR, -2R; RS (y), R38 (r),*~~

~~*RB (P), 4R (mm), oR (e) (fig. 109); R, R8 (fig. 108). Several hundred distinct combinations are known.*~~

~~*Hemitropes and twins are not uncommon. These occur with the axes parallel (figs. 106, 146, 148, 180, 366, 367). Others*~~

~~*Cay*~~

~~*Fig. 361.*~~

~~*Fig. 362.*~~

~~*Fig. 363.*~~

~~*Fig. 364.*~~

~~*are conjoined by a face of R, the axes being almost at right angles, 89° 8' (figs. 188, 369) or by a face of —4R, in which the chief axes form an angle of 127$°; and usually many times repeated, so that the centre crystals appear in lamella not thicker than paper (fig. 181); at an obtuse angle, as figs. 149, 368, or an acute*~~

~~*MINERALOGY*~~

~~*angle, as figs, 364, 368. Also occurs granular, lamellar, parallel or radiated fibrous, compact and earthy. Cl. rhombohedral along R, very perfect and easily obtained, so that the couchoidal fracture is rarely observable; brittle. H.—3; G.=2°6 to 2°8; pure*~~

~~*transparent crystals=2°72. Pellucid in all AD F \ LEAP TS*~~

~~*degrees. Very distinct double refraction. Lustre vitreous, but several faces resinous, and*~~

~~*OR pearly. Most frequently colourless or*~~

~~*white, but often grey, blue, green, yellow,*~~

~~*red, brown, or black; streak greyish white. ae B.B. infnsible, but becomes caustic and emits ae*~~

~~*a bright light. Effervescees, and is entirely eu, sol. in h. orn. acid. The fine powder, ignited :*~~

~~*on platina-foil over the spirit-lamp, forms a Fig. 365. somewhat connected mass, and even adheres to the platina. C.c. of the purest varieties, carbonate of lime, with 44 carbonic acid and 56 lime, but usually contains magnesia and protoxide of iron or of manganese. Remarkable specimens of the crystallized variety or proper cale-spar are found at Alston Moor in Cumberland (fiat rhombic crystals) and in Derbyshire (pale yellow*~~

~~*Fig 366.*~~

~~*Fig. 367.*~~

~~*transparent pyramids), at Strontian, Elie in Fife (figs. 370, 371, 372), Andreasberg and other parts of the Harz (six-sided prisms), and at Freiberg, Tharand, and Maxen in Saxony.*~~

~~*Certain varieties are distinguished. Iceland Spar, remarkable*~~

~~*for its transparency and double re- fraction, occurs massive and in huge crystals in a trap rock in Iceland. Slate Spar, thin lamellar, often with a shining white pearly lustre aud greasy feel; Abergairn and Glen*~~

~~*JAI a*~~

~~*Fig. 368. Fig. 369.*~~

~~*Tilt in Scotland, Wicklow in Ireland, and Norway.*~~

~~*Fig. 370. Fig. 371.*~~

~~*of the ancients were impure limestones, as the Cipollino, zoned with green tale or chlorite, and Verde Antique, mixed with green*~~

serpentine. Ruin Marble shows irregular markings like ruins; Val d'Arno (Florentine niarble), and Bristol (Cotham marble). LIneullite from Egypt, and Anthraconite, from Campbelltown and Kilkenny, are black from carbon. Lwmachello, from Bleiberg in Carinthia, exhibits beautiful iridescent colours from fossil shells, sometimes deep red or orange (Fire Marble). Hislopite, from Poonah, is green, from celadonite.

Limestone occurs in all formations under varions names, as Oolite, egg-stone, orroe-stone,—round concretiouswithaconcentricstructure like the roe of a fish ; Pisolite, or peastone, similar structure; Chalk, soft earthy; Lnthographie Stone, yellowish and compact, from Solenhofen; and Marl, calcareous matter more or less mixed with clay. Calearcous Tufa, generally a recent deposit from calearcous springs, has often a loose friable texture, but at other times is hard and compact; and in the neighbourhood of Rome fornis the common building stone Travertino. The sandstone of Fontaine-bleau is carbonate of lime (3) mixed with quartz sand (§), and occasionally crystal- lizing in rhombohedrons.

This mineral is employed in many ways:—the coarser varieties, when burnt to drive off the carbonic acid, as lime, for mortar, manure, tanning; as a flux in melting iron and other ores, or in pre- paring glass, and for similar purposes; the finer, as marbles, for sculpture, architec-

Fig. 372.

ture, and ornamental stone-work; the chalk for writing, white- washing, or producing carbonic acid.

Plumbocalcite.—Cl. 104° 53'. White and pearly; softer than cale-spar ; but G.=2°824. Contains 2°3 to 7°8 carbonate of lead. Wanlockhead and Leadhills (Scotland).

273. DotomitR (Bitter-spar), Cab +MgG.

Hexagonal rhombohedral ; R 106° 15'-20'; most frequent form R. 'The rhombohedrons often curved and saddle-shaped ; also granular or compact, often cellular and porous. Cl. rhombohedral. H.=3°5 to 45; G.=2°85 to 2°95. 'Translucent; vitreous, but often pearly. Colourless or

~~*white, but frequently pale red, yellow, or green. B.B. infusible, but becomes caustic, and often shows traces of iron and manganese. Fragments effervesce very slightly or not at all in hydrochloric acid ; the powder is partially soluble, or wholly when heated. C.c.: 54:3 carbonate of lime and 45°7 carbonate of magnesia, but generally carbonate of lime with more than 20 per cent. carbonate of magnesia and less than 20 per cent. carbonate of iron.*~~

~~*Varieties are—Dolomite, massive-granular, easily divisible, white; Rhomb or Bitter-spar, larger grained, or distinctly crystallized and cleavable, often inclining to green ; and Brown-spar and Pearl-spar, in simple crystals generally curved (fig. 231), or in imitative forms, of colours inclining to red or brown, more distinct pearly lustre, and under 10 per cent. carbonate of iron. Leadhills and Charlestown in Scotland, Alston in Cumberland, in Derbyshire, Traversella in Piedmont, St Gotthard, Gap in France. Greenish, twinned ; Miemo in Tuscany (Aiemite), and Tharand in Saxony (Tharandite).*~~

~~*The massive and compact varieties are very common, and are valued as building stones (cathedral of Milan, York Minster, and the Houses of Parliament at Westminster). The Parian marble, and also the Sutherland and Iona marbles, belong to this species.*~~

~~*274. ANKERITE, CaC+(MgFe)G. R 106° 12'. Usually massive and granular. Otherwise like siderite. Unst (Shetland), Styria.*~~

~~*275. Macnesirz, MgC.*~~

~~*Rhombohedral ; 107° 10'-30'. Reniform or massive. H.=3'5; G.=2°85 to 2°95. Subtranslucent or opaque; streak shining. Snow-white, greyish or yellowish white, and pale yellow. Tyrol, Norway, North America.*~~

~~*276. BREUNNERITE (Giobertitc), MgC+(MnFe)C.*~~

~~*Hexagonal rhombohedral; R107°10'-30'.. Granular or columnar. Cl. R, very perfect. H.=4 to 4:5; G.=2°9 to 3:1. Transparent or translucent on the edges; highly vitreous. Colourless, but often yellowish brown or blackish grey. C.c. essentially carbonate of magnesia, with 51°7 carbonic acid and*~~

~~48°3 magnesia, but often nixed with 8 to 17 carbonate of iron or manganese. Unst, Tyrol (in Fassa Valley, &c.), St Gotthard, Harz.~~

~~277. SIDERITE (Sparry Iron, Chalybiic), FeC.~~

~~Hexagonal and rhombohedral ; R 107°. Chiefly R, often curved, saddle-shaped (fig. 232), or lenticular. Cl. rhombohedral along R, perfect; brittle. H.=3°5 to 4:5; G.=38°7 to 3°9. ; Translucent in various degrees, becoming opaque when weathered; vitreous or pearly. Rarely white, generally yellowish grey or yellowish brown, changiug~~

~~G.=2°'9 to 3°1.~~

~~to red or blackish brown on exposure. B.B. infusible, but becomes black and magnetic ; with borax and salt of phosphorus shows reaction for iron ; with soda often for manganese. In acids soluble with effervescence. C.c. carbonate of iron, with 62°1 protoxide of iron and 37°9 carbonic acid, but usually 0°5 to 10 or even 25 protoxide of manganese, 0°2 to 15 magnesia, and 0°1 to 2 lime. Unst, Kintyre. In beds or masses in Beeralston 11 Devonshire, Alston Moor in Cumberland, and in many of the tin-mines In Cornwall, in Styria, Carinthia, and Westphalia ; in veins 1n Anhalt and the Harz; also in the Pyrenees and the Basque, provinces of Spain, as near Bilboa; in crystals at Joachimsthal, Freiberg, Klausthal.~~

~~Clay Ironstone, grey, blue, brown, or black,—G. =2°8 to3°5, H. = 3°5 to 4°5, —is an impure variety.~~

~~278, DIALOGITE (Red Manganese), MnC.~~

~~Hexagonal rhombohedral ; R 106° 56'. Crystals often curved, lenticular, or saddle-shaped ; also spherical, reniform, and columnar or granular. Cl. R, periect. H. =3°5 to 4°5; G. =3°3 to 36. Trans- lucent; vitreous or pearly. _Rose-red to flesh-red ; streak white. C.c.: 62 manganese protoxide and 38 carbonic acid. Freiberg, Schemnitz, Kapnik, Nagyag, Elbingerode, and near Sargans.~~

~~279. CopatTsPaTH, CoCo. Rhombohedral and spheroidal. H.=4; G.=4 to 4°18. blossom-red ; but dark externally. Schneeberg.~~

~~280. SMITHSONITE (Calamine), ZnC.~~

~~Hexagonal rhombohedral ; R 107° 40'. Usually reniform, stal- actitic, and laminar or granular. Cl. R, perfect, but curved; fracture uneven, conchoidal ; brittle. H.=5; G.=4°1 to 4°5. Translucent or opaque ; pearly or vitreous. Colourless, but often pale greyish yellow, brown, or green. C.c.: 64°8 zinc oxide and 85°2 carbonic acid, Mendip in Somersetshire, Matlock in Derbyshire, compact at Alston Moor, Chessy near Lyons, Altenberg near Aix-la-Chapelle, Brilon in Westphalia, Tarnowitz in Silesia, Hungary, Siberia.~~

~~281. ARAGONITE, CaC.~~

~~Right prismatic. oP 116° 10'; Poo 108° 26'. The most common combinations are cobs (h), oF (Jf), Po (k, P) (fig. 275), generally long prismatic (like the separate crystals in fig. 184) ; oP, oP,~~

~~OP, generally short prismatic ; crystals of 6P4, oP, Po, 6Pxo (g) (fig. 378) acute pyramidal. But simple crystals are rare, from the great tendency to form twins, con- joined by a face of oP, and repeated either in linear arrangement (fig. 185) or in rosette group- ing (fig. 186). Also columnar, fibrous, and in crusts, stalactites, and other forms. Cl. brachy- diagonal, distinct ; fracture conchoidal or uneven. H. =3°5 to 4; G.=2°9 to 3 (massive 2°7). Trans- parent or translucent; vitreous. Colourless, but yellowish white to brick-red ; also light green, violet-blue, or grey. In the closed tube, before reaching a red heat, it swells, and falls down into a white coarse powder, evolving a little water. Unst and Leadhills; Valencia, Molina and else- where in Aragon ; Leogang in Salzburg, and Anti- paros, los-ferri, coralloid, in the iron-mines of Styria. Satin-spar, fine fibrous silky, at Dufton (Westmoreland). Stalactitic, coast of Galloway, Leadhills, Buckinghamshire, and Devonshire. Also deposited as tufa by the Carlsbad and other hot springs. 282, Wirneritz, BaC.~~

~~Right prismatic. oP (g) 118° 30'; 2Poo(P) 112°. Crystals not common like fig. 275, but generally with quite an hexagonal aspect from being twinned~~

~~like aragonite (fig. 374). Oftener spherical botryoidal, or reniform, with radiated-columnar structure. Cl. oP, distinct ; fracture uneven. H.=3 to 3°5; G.=—4‘2 to 4°3. Semitransparent or translucent; vitreous, or resinous on the fracture. Colourless, but generally yellowish or greyish. B.B. fuses easily to a transparent globule, opaque when cold ; on charcoal boils, becomes caustic and sinks into the support; soluble with effervescence in n. or h. acid. C.c.: 22°3 carbonic acid and 77°7 baryta. Alston Moor and Hexham in Northumberland, also in Styria, Salzburg, Hungary, Sicily, Siberia, and Chili.~~

~~288. AusTONITE, BaC+CaC.~~

~~Right prismatic. oP 118° 50’; 2Poo 111° 50’ ; usual combination P, 2Pc, oP, resembling an hexagonal pyramid (fig. 375). Cl. oP~~

~~Peach-~~

~~WO~~

~~eh.~~

~~Fig. 374.~~

~~ALOGY~~

~~and obo, rather distinct. H.=4 to 45; G.=3°65 to 3°76. 3°76. Translucent ; weak resinous. Colourless or greyish-white. C.c.: 66 carbonate of baryta and 34 carbonate of lime. Fallowfield near Hexham, and Alston Moor.~~

~~984, STRONTIANITE, SrC. Right prismatic. oP 117° 19’;~~

~~Poo 108° 12’. Crystals (fig. 376) and twins like aragonite; also broad columnar and fibrous, Cl. pris- matic along oP (Mf), H.=3°5; G.=8°6 to 3°8. Translucent or transparent; vitreous or resinous on fracture. Colourless, but often light asparagus- or apple-green, more rarely greyish, yellowish, or brown- ish. B.B. fuses in a strong heat only on very thin edges, intumesces~~

~~*in cauliflower-like forms, shines Fig. 375 (sp. 283). brightly, and colours the flame red ; easily soluble in acids, with effervescence. C.c.: 30 carbonic acid and 70 stroutia. but often — contains carbonate of lime (6 to 8). Strontian in Argyllshire, Suther- land, Leogang in Salzburg, Braéuns- dorf in Saxony, Hamm in West- phalia, the Harz; at Schoharie (N.Y.) and elsewhere in United States (Hmmonite). It is used to produce red fire in pyrotechnic exhibitions.*~~

~~*285. MANGANOCALCITE, (Mn, Ca, Fe) C.*~~

~~*Right prismatic ; in prisms like aragonite, and bears the same relation to dialogite that aragonite does to cale-spar. H.=4 to 5; G.=3°03. Red or reddish white. Vitreous. Schemnitz.*~~

~~*286. CerussitE (Lead Spar), PbC. Right prismatic; isomorphous with aragonite and nitre, oP*~~

~~*(Mf) 117° 14'; Peo 108° 16'; 2Poo (w) 69° 20'; also OP; P (4); 4Poo (s); «Poo (1); oP3 (e) (fig 377). wins common (figs. 158, 159, 378, 379). Also granular or earthy. Cl. oP and*~~

~~*QP oo, rather distinct; fracture conchoidal ; easily frangible. H.=38 to 3°5; G.=674 to 6°6, Transparent or translucent ; adamantine or resinous. Colourless and often white, but also grey, yellow, brown, black, rarely green, blue, or red ; streak white. B.B. decrepitates violently, but easily fused and reduced ; soluble with effervescence in n. acid. C.c. ; 83°5 protoxide of lead and 16°5 carbonic acid. Very common. _ Leadhills, Wanlockhead,: Keswick, Alston Moor, Beeralston in Devon- shire, St Minver in Cornwall; Przibram, Mies, and Bleistadt ;*~~

~~*eee eee 7 er*~~

~~‘~~

~~*Fig. 378.*~~

~~*| Tarnowitz, J ohann-Georgenstadt, Zellerfeld, Klausthal, and many other places.*~~

~~287. BAryTo-CaterTE, Ba + Cad.~~

~~h~~

~~—7~~

~~Fig. 380.~~

~~Oblique prismatic, C 69° 30'.~~

~~Fig. 381. ooP (m) 84° 52', P (s) 106° 54',~~

~~MINER~~

~~ALOG YY 399~~

~~P%o (h) 61° (figs. 380, 381); also columnar and granular. Cl. P | Thuringia, Moldawa in the Banat, in North America, Africa, and~~

~~perfect, Pec less perfect. H.=4; G.=3°6 to 3°7. or translucent ; vitreous, inclining to resinous. C.c.: like alstonite. Alston Moor.~~

~~288. BISMUTO-SPHIZRITE, Bi,C.~~

~~Small fibrous brown concretions from Neustadtel, near Schnee- berg. »~~

~~Transparent~~

~~HYDROUS CARBONATES. 289. THIERMONATRITE, Na,C+H,. Right prismatic. oP2 (d) 107° 50'; (P) in rectangular tables (fig. 382). brachydiagonal, perfect. H.=1°5; G. =1°5 to 1°6. Colourless. B.B. like natron, but does not melt. C.c.: 50'lsoda, 35°4 earbonic acid, and 14°5 water. Natron lakes of Lagunilla in Veneznela, of Lower Egypt, and of the steppes between Urals and Altai.~~

~~290. Natron, Na,G+10H,. Oblique prismatic, C 57° 40'. Crystals artificial; with oP 79° 41'; P 76° 28'.~~

~~Poo (0) 83° 50'; with ooPco Cl.~~

~~Cl. orthodiagonal, distinct. H.=1t01°5; G.=14 to 1°5. Pellucid; vitreous. : ; Colourless or greyish white. 'B.B. melts 'Fig. 382 (sp. 289).~~

~~easily, colouring the flame yellow. C.c.: 22 soda, 15 carbonic acid, and 63 water ; but mixed with chloride of sodium and other salts. Only as an efflorescence on the ground or rocks (lava of Vesuvius and Etna) in various countries (Hungary, Egypt, Tartary), and in mineral springs and lakes. Used in the manufacture of soap, in dyeing, and in bleaching.~~

~~291. Trona, Urao, Na,C,+4H,.~~

~~Obliqne prisinatic. Crystals 0P (7), @P%«% (A), P (n). 103° 15' (fig. 383). Cl. orthodiagonal, perfect. H.=2°5 to 3; G.=2'1 to 2°2. Transparent to translucent. Colourless. Does not decompose in the air. Taste alkaline. C.c:: 38 soda, 40 car- bonic acid, and 22 water. Fezzan and Barbary (Trona), Lagunilla (Urao).~~

~~292. GavussirE, Na,(CaG 5H,.~~

~~Oblique prismatic, C 78° 27'. Cl. oP, imperfect; fracture conchoidal. H.=2°5; G.=1°9 to 1°95. "ransparent; vitreous. Colourless. C.c.: 34°5 carbonate of soda, 83°6 carbonate of lime, 30°4 water, with 1°5 clay. Lagunilla.~~

~~2938. HyproMAGyesiTx, Mg,C,+4H,.~~

~~Oblique prismatic. oP 88° nearly. Crystals small, rare ; also massive. H.= —1°5 to 3; G.=2°14 to 2°18. Vitreous or silky. White. C.c.: 36°2 carbonic acid, 44 magnesia, and 19°8 water. Unst (Shetland), Moravia, Kumi in Negropont, Hoboken in New~~

~~Jersey, and Texas in Pennsylvania.~~

~~294. AzuRITE (Blue Copper), CugO,+ H,.~~

~~Oblique prismatic, C 87° 39'. oP (M) 99° 32';-— P(x') 106° 14'. Crystals OP, oP, oP%o,P (or h, M, s,k', in fig. 384, but in another position) ; also radiated and earthy. Cl. clinodomatic (P) 59° 14', rather perfect; frac ture~~

~~*conchoidal or splintery. H.=3°5 to 4‘2; G.=3°7 to 3°8. Translucent or opaque; vitre- ous. Azure-blue, the earthy varieties (and streak) smalt-*~~

~~*lue. B.B. on charcoal fuses and yields a grain of copper ; soluble with effervescence in acids, and also in ammonia. C.c.: 69°1 protoxide of copper, 25°7 carbonic acid, and 5°2 water.*~~

~~*T:M*~~

~~*ery*~~

~~*Fig. 383.*~~

~~*Fig. 384.*~~

~~*Crystals at Redruth, Alston Moor, Chessy near Lyons, in Siberia, Moldawa in the Banat, Burra-*~~

~~*Burra (Australia). Valued as an ore of copper.*~~

~~*295. MaLacuirr, Cu,C+H,.*~~

~~*Oblique prismatic, C 61° 50’. oP 104° 20’. Crystals oP (Jf), coP%co (s), OP (P), in hemitropes (fig. 885). In general acicular, scaly, or reniform, stalactitic, and radiated fibrous. Cl. basal and clinodiagonal, very perfect. H.=3°5 to 4; G.=3°6 to 4. Transparent or translucent on the edges; adamiantine, vitreous, silky, or dull. Emerald and other shades of green; streak apple- ad green. B.B. and with acids like azurite. C.c.:*~~

~~*71°8 copper protoxide (=57°5 copper), 20 carbonic ee a acid, and 8:2 water. Crystalline at Rheinbreiten- ; z bach on the Rhine and Zellerfeld in the Harz; fibrous Fig. 385.*~~

~~*and compact at Sandlodge in Shetland, Leadhills, Cornwall, Wales,*~~

~~*and Ireland, at Chessy in France, Siberia, the Urals, Saalfeld in | H.=2°5; G.—6°26 to 6°44.*~~

~~*Yellowish white. .*~~

~~*Australia, Frequently pseudomorphous after copper and its ores, also after calcite and cerussite. Valuable ore of copper ; the finer varieties are prized for ornamental purposes.*~~

~~*296. Hyprozincirs, ZnO+2ZnH,.*~~

~~*Massive. C.c.: zinc oxide 75°38, carbonic acid 13°6, water 11°1. Spain, Westphalia, Bavaria, Persia, United States. Valuable ore.*~~

~~*297. AUBICHALCITE, 2CuC+3ZnH,.*~~

~~*Acicular. H.=2. Translucent, pearly, and verdigris-green. C.c. : 29°2 copper protoxide, 44°7 zinc oxide, 16°2 carbonic acid, and 9°9 water. Leadhills, Matlock, Loktevski in the Altai.*~~

~~*298. EMeraLp-NIckEt (Zaratite), NiC+6H,.*~~

~~*Amorphous, reniform, and incrusting. H.=3; G.=2°6 to 2°7. Translucent ; vitreous. Emerald-green. C.c.: 59°3 nickel pro- toxide, 11°7 carbonic acid, and 29 water. On chromite at Hagdale in Unst, Texas in Pennsylvania; also Cape Ortegal in Spain, Tyrol, and Ekaterinburg in the Urals.*~~

~~*299. Linpaxerits, U,0+2CaC+10H,.*~~

~~*In small siskin-green crystalline aggregates. H.=2°5 to 3. From Elias mine near Joachimstlal, implanted on pitch-bleude.*~~

~~*300. Voeuite, 4UC + 76a +3CuG + 24H,.*~~

~~*Rhomboidal. Emerald-green scales with pearly lustre. Elias mine, Joachimsthal.*~~

~~*301. Lizsierre, U,C+CaG+20H,.*~~

~~*Mammillary concretions. H.=2to2°5. Apple-green. Adrian-*~~

~~*ople, Joachimsthal, and Johann-Georgenstadt.*~~

~~*302. Bismutuire, Bi,C,+4H,.*~~

~~*Disseminated, investing or acicular ; fracture conchoidal or un- even ; very brittle. H.=—4 to4°5;G.=6°8 to 6°91. Opaque; dull vitreous. Grey, yellow, or green. C.c.: 90°1 bismuth oxide, 6°4 carbonic acid, and 3°5 water. Ullersreuth (Reuss), Sclineebery, Johann-Georgenstadt ; also Chesterfield in South Carolina.*~~

~~*303. LANTHANITE, LaC+3H,.*~~

~~*Right prismatic. oP 92° 46'. Small tabular crystals; usually granular or earthy. Cl. basal. H.=2; G.=2°7. Dull or pearly. White or yellowish. C.c.: 21 carbonic acid, 55 lanthanum oxide, and 24 water. Bastnaes in Sweden, Lehigh in Pennsylvania.*~~

~~*CARBONATES WITH HALOID SALTS, &c.*~~

~~*304. PHosGENITE, PbC1+PbC.*~~

~~*Pyramidal. P 118° 56'. Crystals short-prismatic or sharp- pyramidal. Cl. oP, rather perfect ; fracture conchoidal. . Hi=2-5 to' 35 G.=6 to-6°2. Transparent or translucent ; resinous adaman- tine. White, yellow, green, or grey. C.c.: 51 chloride and 49 carbonate of lead. Very rare. Stottfield near Elgin in Scotland, Matlock and Cromford in Derbyshire, Tar- nowitz.*~~

~~*305. PARISITE, 8CeC+CaF.*~~

~~*Hexagonal. P 164° 58'. Cl. basal, perfect. H.=4°5; G.=4°35. Vitre- / ous; on cleavage-plane pearly. — Brownish yellow, inclining to red. C.c.: 23°5 carbonic acid, 42°5 prot- : t oxide of cerium, 8°2 lanthanum*~~

~~*Big SSF Gap. SDP oxide, 9°6 didymium oxide, 2°8 lime, 10°1 fluoride of calcium, and 2°2 fluoride of cerium. Emerald mines of the Muzo Valley in Colombia, Urals.*~~

~~*306. LEADHILLITE (Jfawzite), PbgCy8,0,, + 5H,. Right prismatic. P middle edge 137°; oP 120° 20/; 2Poo 43°12'.*~~

~~*Fig. 389.*~~

~~*v Fig. 388. . Mostly tabular ; also twins. Cl. basal, perfect ; slightly brittle.*~~

~~*Transparent or translucent ; resinous*~~

~~*or adamantine, pearly on OP. Yellowish white, inclining to grey, green, yellow, or brown. C.c.: 81°98 oxide of lead, 8°03 car- bonic acid, 8°12 sulphuric acid, 1°8 water. Lead- hills, Taunton, Nertchinsk, Granada. Jfawxite from Sar- dinia.*~~

~~*307. SUSANNITE, 38PbC +Pbs.*~~

~~*Rhombohedral; R 72° 29'. Cl. basal, perfect. H. =2°5; G.=6°55. White, green, yellow, brownish. Resinous to adamantine ;*~~

~~*pearly on the cleavage faces. Powder white. C.c.: 72°5 carbonate and 27°5 sulphate of lead.*~~

~~*From the Susanna mine at ,,. fe Leadhills, but very rare; Fig. 390 (sp. 307). also in large dark crystals from the Banat.*~~

~~*Fig. 391 (sp. 307).*~~

~~*ANHYDROUS SULPHATES.*~~

~~*808. ARCANITE (Glaserite), KS. Right prismatic. Acute pyramids, with oP 120° 24'; dimorphous and also rhombohedral, with R 88° 14'. Mostly in crusts, or pul- verulent. Cl. basal, imperfect. H.=2'5to3; G.=2°7. Pellucid; vitreous or resinous. Colourless or white. C.c. : 54 potash and 46 sulphuric acid. Lavas of Vesuvius and other volcanoes.*~~

~~*309. MascacninE, (NH,)S.*~~

~~*Right prismatic. ooP 121° 8'; but chiefly in crusts and stalac- tites. Cl. perfect; sectile. H.=2 to 25; G.=1'7 tol. Pel- lucid ; vitreous. Colourless, white, or yellowish. Taste pungent and bitter. C.c.: 25°9 ammonia, 60°5 sulphuric acid, and 13°6 water. Near volcanoes, as Etna, Vesuvius, the Solfatara, the Lipari Islands, in the marshes near Siena, and in ignited coal-beds, as at Bradley in Staffordshire.*~~

~~310. THENARDITE, Na,S. *~~

~~Right prismatic. Acute pyramids P, with 0P and oP, in crusts and druses. Cl. basal, perfect ; fracture uneven. H.=2°5; G.= 2°6 to 2°7. Pellucid; vitreous. White. C.c.: 43°82 soda and~~

~~56°18 sulphuric acid. In salt deposits near Aranjuez (Spain) and at Tarapaca (Peru).~~

~~311. GLAUBERITE (Brongniartine), Na,S+CaS. Oblique prismatic, C 68° 16'. OP,—P, or with oP (P, f, M, fig. 392). Cl. basal, perfect; along oP traces. H.=2°5 to 3; G.=2°75 to 2°85. Translucent; vitreous to resinous. Colourless. C.c.: 51 sulphate of soda, and 49 sulphate of lime. Villarnbia in Spain, Vic, Berchtesgaden, near Brugg in Aargau, Aussee and £ Ischl in Anstria; Tarapaca in Peru, with 1 to 5 boracic acid.~~

~~312. ANHyDRITE (Karstenite), CaS.~~

~~Right prismatic. oP 90° 4'. Chiefly granular, or almost com- pact or columnar. Twins: rare. Cl. macrodiagonal and brachy- diagonal, both perfect; basal perfect. H.=3 to 3°5; G.=2°8 to~~

~~3. 'Transparent or translucent; vitreous; on oPoo pearly. Colourless or white, but often blne, red, or grey; streak greyish white. (C.c.: 58°75 sulphuric acid and 41°25 lime.~~

~~; The crystalline, or /uriaette, occurs in the salt-mines of Bex, Halt in Tyrol, and Aussce in Styria, also at Sulz, Stassfurt, and Bleiberg. Compact at Ischl iu Austria, Berchtesgaden, Eisleben, and the Harz. Grauniar, or Vulpinite, near Bergamo. The contorted, or Gekrosstein, chiefly at Wieliczka and Bochnia. ;~~

~~313. BARYTE (Heavy Spar), BaS.~~

~~Right prismatic. Poo (g) 78° 20'; Boo (f) 105° 22'; wP2 (d) 77° 44'; also ooPoo © (figs. 125, 126, 127, but in a different position, d, d@ being placed vertical). The crystals show very many forms~~

~~*and combinations, and are tabular or columnar, often in drnses or groups; also foliated, fibrous, granular, or compact. Cl. brachy-*~~

~~*diagonal perfect, along Poo less perfect ; basal, traces. H.=3 to 3°5; G.=4°3 to 4:7. Transparent to translucent; vitreous or resinous. Colourless and white, but generally reddish white or flesh-red, yellow, grey, bluish, greenish, or brown. B. B. decrepitates violently, and fuses very difficultly, or only on the edges, colouring the flame yellowish green ; not soluble in acids. C.e.: 34°38 sulphuric acid and 65°7 baryta, but occasionally with 1 to 15 sulphate of strontia. Very common, chiefly in veins, either alone or accompanying ores. Crystals at Arran, Strontian, Elic, Sutherland ; Duftou, Bohemia, Felsobanya and Kremnitz in*~~

~~*M Fig. 392.*~~

~~*MINERALOGY*~~

~~*Hungary, Auvergne, and United States. Columnar at Freiberg. The radiated from near Bologna, or the Bolognese Stone, plios- phorescces in the dark. Massive, or Cawk, from Derbyshire and Staffordshire, Leadhills, and Arran.*~~

~~*Lime Barytes, from Derbyshire, Strontian, Freiberg, seems a mixture with sulphate of lime; crystals tabular, in rosettes and other groups; G.=4 to 4°3. Hepatite, dark grey, from carbona- ceous matter; Kongsberg. Allomorphite, scaly, white, and pearly, near Rudolstadt, agrees essentially with barytes.*~~

~~*314. BarytTo-CELESTINE, 2SrS+BaS.*~~

~~*Radiated and foliated. Bluish white. Brittle and friable. H. = 2°5;G.=— 3°92. Difficultly fusible. Lake Erie, Upper Canada, and Biunenthal.*~~

~~*315. CELESTINE, SrS. . Right prismatic ; forins like barytes and anglesite. Poo (0) 104°*~~

~~*8”; Poo (Mf) 75° 58’. Usual combinations Po, Po, co Poo ; or this with oP2 (d); also columnar and foliated; or fibrous, fine*~~

~~*granular, or compact. Cl. macrodiagonal, perfect ; along Poo less perfect. H.=3 to3°5; G.=3°9 to 4. Transparent or translucent ; vitreous or resinous. Colourless, but usually bluish white to indigo-blue, and rarely reddish or yellowish. B.B. decrepitates and fuses easily to a milk-white globule; colours the flame carmine-red. Distinguished from barytes by a splinter, after ignition in the inner flame, on being moistened with h. acid, and held in the blue border of the flame of a candle, colouring this of a lively purple-red. Scarcely affected by acids. C.c.: 43°6 sulphuric acid and 56°4 strontia, but often some baryta or lime. Tantallon Castle, Calton Hill, Clachnaharry; near Bristol and Knares- borough ; sulphur-mines of Girgenti and other parts of Sicily, Herrengrund in Hungary, Bex, Salzburg, Monte Viale near Verona, and Meudon and Montmartre near Paris. Used for producing a red_ light in pyrotechnic mixtures.*~~

~~*316. ANGLESITE, PbS.*~~

~~*Right prismatic. oP 108° 48'; Poo' 75° 35'. The crystals, of many forms and combinations, are short prismatic, pyramidal, or tabular. Cl. prismatic along oP, and basal; fracture conchoidal; very brittle. H.=8; G.=6'2 to 6°35. Transparent or translucent; adamantine or _ resinous. Colourless and white, but occasionally yellow, grey, brown, or blue; streak white. De-crepitates in candle ; B.B. on charcoal fuses in the oxygen flame to a milk-white bead ; very difficultly soluble in acids, wholly in solution of potash. C.c.: 73°7 lead protoxide and 26°3 sulphuric*~~

~~*Fig. 394. Fig. 395. acid. Leadhills (fig. 397), St Ives in Cornwall, Derbyshire,*~~

~~*Parys mine in Anglesea, Zellerfeld, Klausthal, Baden-*~~

~~*Fig. 396. | weiler, Siegen, Silesia, Linares, Pheenixville in Pennsylvania. 317. LANARKITE, PbS+Pb.*~~

~~*Oblique prismatic. oP 49°50'. Cl. basal, perfect ; sectile; thin laminez flexible. H.=2 to 2°5; G.=6°3 to 67. Transparent ;*~~

~~*eeoserr*~~

~~*aon Se Bess s+ amasensensie ns ys===**~~

~~*Fig. 398.*~~

~~*resinous or adamantine; on OP pearly. Greenish or yellowish white, inclining to grey ; streak white. B.B. on charcoal fuses to a white globule containing metallic lead ; partially suluble in n.*~~

~~*MINERALOGY*~~

~~*acid with effervescence.*~~

~~*C.c.: sulphate of lead 57°6, oxide of lead 42°4, Leadhills; rare.*~~

~~*HYDROUS SULPHATES.*~~

~~*318. MIRABILITE (Glauber Salt), NagS+10H,.*~~

~~*Oblique prismatic, C 72° 15'. Cl. orthodiagonal; fracture conchoidal. H.=1°5to 2; G.=1°4 to 1°5. Pellucid and colour- less. C.c.: 19°2 soda, 24°8 sulphuric acid, and 56 water. As an efflorescence in quarries, on old walls, or on the ground; in the waters of lakes and springs in Russia and Egypt, and on Vesuvius on lava. :*~~

~~*319. Gypsum, CaS+2H,.*~~

~~*Oblique prismatic, C 80° 57'. The most common forms are oP 111°30'; P 138° 40'; —P 143° 30'; and oP*0. Twocommon combinations are oP(f), oP*%o (p),—P (1) (fig. 129), and this with P. Lenticular crystals often occur ; hemitropes frequent (figs. 161, 150, 151); also granular, compact, fibrous, scaly, or pulverulent. Cl. elinodiagonal perfect, along P much less perfect ; sectile ; thin plates flexible. . H.=1°5 to 2 (lowest on P); G.=2°2 to 274. Transparent or translucent ; vitreous, on cleavage pearly or silky. Colourless, and snow-white, but often red, grey, yellow, brown, and more rarely greenish or bluish. ' In the closed tube yields water. B.B. becomes opaque and white; soluble in 400 to 500 parts of water, scarcely more so in acids. C.c.: 46°5 sulphuric acid, 32°6 lime, and 20°9 water. ' Transparent crystals, or Selenite, occur in the salt-mines of Bex in Switzerland, of the*~~

~~Tyrol, Salzburg, and Bohemia, in the sulphur- mines of Sicily, at Lockport in New York, in porphyry at Gourock, in the clay of Shotover Hill near Oxford, at Chatley near Bath, and many other localities. Fibrous gypsum at Campsie, Matlock in Derbyshire, and at Ilfeld in the Harz. Compact gypsum in whole beds in many parts of England, Germany, France, and Italy, at Volterra in Tuscany (Alabaster) often with rock-salt. The finer qualities (or alabaster) are cut into various ornamental articles.~~

~~320. KiEsERITE, MgS+H,.~~

~~Rhombic, but chiefly massive. G.=2°52. white. C.c.: magnesia 29, sulphuric acid 58, water 13. Stassfurt.~~

~~321. EpsoMITE (Zpsom Salt), MgS+7H,.~~

~~Right prismatic. P mostly hemihedric; oP 90°38'. oP (dN, coPoo (0), P (2) (fig. 399). Granular, fibrous, or earthy. Cl. brachydiagonal, perfect. H.=2 to 2°5; G.=1°'75. Pellucid; vitreous; and white. Taste bitter. C.c.: 16°32 magnesia, 32°53 sulphuric acid, and 51'15 water. Efflorescence on various rocks, as at Hurlet near Paisley, Idria, Montmartre, and Freiberg; on the ground in Spain and the Russian steppes ; in mineral waters, as at Epsom in Surrey, Saidschitz and Seidlitz in Bohemia. Used in medicine,~~

~~322, GostaniTe (White Vitriol), ZnS So Right prismatic.~~

~~Pellucid:; greyish In beds at~~

~~oP 90° 42'; isomor-~~

~~phous with epsomite. oP, oPo, P (M, 0, : 1) (fig. 399). P Mostly granular or stalactitic; Fig. 999 (sp. 821).~~

~~reniform and incrusting. Cl. brachydiagonal, perfect. H.=2 to 2°5; G.=2to 2:1. Pellucid; vitreous. White, inclining to grey, yellow, green, or red. Taste nauseous-astringent. C.c.: 28°2 zinc oxide, 27°9 sulphuric acid, and 43°9 water. Holywell in Flintshire, Cornwall, Ram- melsberg near Goslar in the Harz, Falun, Schemnitz. Used in dyeing and medicine.~~

~~823. Morenositz, NiS+7H,.~~

~~Acicular, fibrous, and as an efflorescence. H. =2 to .2°25; G.=2. Lustre vitreous. Apple-green; streak white. Soluble. Mor- veru in Argyllshire, Cape Ortegal (Spain), Lake Huron, Pennsylvania.~~

~~324, MELANTERITE (Green Vitriol, Cop- peras), FeS+7H,.~~

~~Oblique prismatic, C 75° 45'. oP (f) 82° 22; —P (P) 101° 34'; P*0(0) 67° 30' (fig. 400); chiefly stalactitic, reniform, or in~~

~~Fig. 400 (sp. 324).~~

~~crusts. Cl. basal, perfect; prismatic less so. H.=2; G. =1'8 to 1°9. Translucent, rarely transparent ; vitreous. Leek- ormountain-green, often with a yellowish coating; streak white. C.c.: 26 protoxide of~~

~~Hurlet near Paisley,~~

~~iron, 29 sulphuric acid, and 45 water. Used in~~

~~Bodenmais, Rammelsberg, Falun, Schemnitz, Bilin.~~

~~401~~

~~dyeing, and in manufacturing ink, Prussian blue, and sulphuric acid.~~

~~325, Smixire, Mn,S+H,. Stalactitic aggregates. Rose to white. Felsébanya (Hungary). 326. MALLARDITE, MnS+7H,.~~

~~Crystalline foliated masses ; apparently oblique prismatic. Lucky Bay mine in Utah.~~

~~827. BIEBERITE (Cobalt Vitriol), CoS +7H,.~~

~~Oblique prismatic ; usually stalactitic, or an efflorescence. Pale~~

~~rose-red, C.c.: 20 cobalt oxide, 4 magnesia, 29 sulphuric acid, and 47 water. Bieber near Hanau, and Leogang.~~

~~828. ALUNOGENE (Hair-Salt), Al,8’+18H,.~~

~~Capillary or acicular, in crusts or reniform masses. H.=1°5 to 2; G.=1°6 to1‘7. Silky. White, inclining to green or yellow. C.c.: 36 sulphuric acid, 15°4 alumina, 48°6 water. Volcanoes of South America, in coal and lignite in Germany, and on old walls.~~

~~329, ALUMINITE (Websterite), Al,S+9H.~~

~~Reniform, and very fine scaly, or fibrous. Fracture earthy ; sectile or friable. H.=1; G.=1°7. Opaque ; dull or glimmering ; snow-white or yellowish white. C.c.: 29°8 alumina, 23°2 sulphuric acid, and 47 water. Newhaven in Sussex ; Epernay, Auteuil, and Lunel Vieil in France; Halle and Morl in Prussia, Felsébanyite, from Hungary, in rhombic tubes, is similar, but has 10 per cent. of water.~~

~~330. Coquimaire, Fe,38+9H,.~~

~~Hexagonal. P 58°. Crystals OP; with «P and P; usually granular, Cl. oP, imperfect. H.=2 to 2°5; G.=2 to 2°1. White, also brown, yellow, red, and blue. C.c.: 28°5 iron peroxide, 42°6 sulphuric acid, and 28-9 water. Copiapo in Chili, and Calama in Bolivia,~~

~~381. CoprapiTe, 2Fe,58+13H,.~~

~~Six-sided tables, but system uncertain ; also granular. Cl. per- fect. Translucent; pearly. Yellow. C.c.: 34 iron peroxide, 42 sulphuric acid, and 24 water. Copiapo in Chili. Also radiated- fibrous masses, dirty greenish yellow, incrusting the former, with 32 sulphuric acid and 37 water. Both probably mixtures.~~

~~Fibroferrite, also from Chili, and Yellow Iron Ore, from the brown coal at Kolosoruk in Bohemia and Modum in Norway, are both reniform, or compact and earthy. H.=2°5 to3; G.=2°7 to 2°9. Colour ochre-yellow. Apatelite, reniform-earthy, yellow, from Auteuil near Paris, is similar; also Vitriol Ochre from Falun. Misy, from Rammelsberg in the Harz, containing sulphates of iron, copper, zinc, and other metals, is a product of decomposition.~~

~~332. PissopHanr, (Al,!e,),8+15Hy.~~

~~Stalactitic ; fracture conchoidal ; very easily frangible. H.=2; G.=1°9 to 2. Transparent or translucent; vitreous. Olive-green to liver-brown ; streak greenish white to pale yellow. C.c.: 7 to 35 alumina, 10 to 40 iron peroxide, 12 sulphuric acid, and 41 water. Saalfeld and Reichenbach in Saxony.~~

~~Carphosiderite, reniform, opaque, resinous, and straw-yellow, with a greasy feel, is related. H.=4°5; G.= 2°5. Consists of hydrous sulphate of g iron. Labrador. Ww~~

~~338, CHaLcaNnTuTe, CuS+5H,.~~

~~Anorthic. oPo(n): cP ® 79°* iP Qs oP (7) 127° Oe. Pin 120° 50': P:¢ 108" 37", @P* (7): oo'P (Af) 128° 10' (fig. 401). Generally incrusting. €]. T and MM, im- perfect. H.= 25; G.=2°2, Blue. C.c.: 32 protoxide of copper, 382 sulphuric Cornwall, Wicklow,~~

~~Fig. 401 (sp. 333).~~

~~acid, 36~~

~~Hungary,~~

~~Falun, and on lava of Vesuvius. 334. BRocHANTITE, CuS+8CuH,.~~

~~oP 104° 32'; Po~~

~~hi2* 3 3. and. cP; also reniform. Cl.~~

~~water. Tyrol,~~

~~Right prismatic.~~

~~brachydiagonal, perfect, H.=3'5 to 4;~~

~~G.=3°75 to 39. Transparent or trans-~~

~~lucent; vitreous. Emerald or blackish~~

~ green; streak bright green. C.c.: 70

Fig. 402 (sp. 334). copper protoxide, 18 sulphuric acid,

and 12 water. Sandlodge (Unst), Roughton Gill in Cumber- XVI — 51

402

land, Rezbanya, (Krisuvigite). 335. Lanirs, CuS+3CuH,+2H,. Right prismatic. oP 123° 44'. Crystals long-tabular, mostly

Ekaterinburg; also Krisuvig in Ieeland

Also in fibro-lamellar and concretionary crusts, with

in twins. ' earthy surface. Cl. basal and brachydiagonal. H.=2°5; G. =3°5. Vitreous. Greenish blue. C.c.: 65°1 copper protoxide, 16°4 sul-

Cornwall.

phuric acid, and 18°5 water. "UP also Konigince from Siberia.

Warringtonite is similar ;

336. JomANNITE (Uran-vitriol).

Oblique prismatic, C 85° 40'. oP 69°. ; trona (No. 291, fig. 383), but minute ; arranged in concretionary and reniform masses. H.=2t02°5; G.=3'19. Semitransparent; vitreous. Soluble. Taste bitter. Bright grass-green. C.c.: oxides of uranium 67°72, oxide of copper 5°99, sulphuric acid 20°02, water 5°59. Joachimsthal (Bohemia), J ohann-Georgenstadt.

337. Biupite (Astrakanite), (MgNae)S + 2H,.

Oblique prismatic, C 100° 43'. cP°2 112° 55'; eP (m), eP®oo (0), oo P°2 (n), ao P® oo (2), -P(p), P*co (d), OP (ec) (fig. 403). In prismatic crystals, or efflorescent. H.=3°5; G. =2°2, Transparent. White or red. C.c.: 47°9 sulphuric acid, 8°5 soda, 12 magnesia, and 21°5 water. Salt lakes on the

~~*Volga near Astrakhan, Ischl, Stassfurt, and near Mendoza in South America.*~~

~~*Reussine from Seidlitz is similar, but a mixture.*~~

~~*338. LoWEITE, 2(Na.S + MgS)+5Hg.*~~

~~*Pyramidal, but only compact. CL. basal, distinct; also octahedral, with angles 110° 44' and 105° 2.) H.=2% ; to 3; G.=2°376. Vitreous. Yellow-*~~
~~*Fig. 403 (sp. 387). ish white to flesh-red. C.c.: 20 soda, 18 magnesia, 52 sulphuric acid, and 15 water. Ischl.*~~

~~*339. Syncrnite, K,S+CaS+ Hy.*~~

~~*Oblique prismatic, C 76°. oP 73° 55'. coP%co (5), OP (2), oP (p), oP°2 (p"), oP (p'"), 2P°2 (e'), P (0), 2P (0), Peo (q)— Po (7), Pe (1'), 2P%co (r"), —3P°co (9). Cl. oP, perfect; fracture conchoidal. H. =2°5; G. =2°25. Colour- less to milk-white. C.c.: lime 16°88, potash 28°55, sulphuric acid 48°45, water 5°47, Soluble in 400 parts of*~~

~~*Crystals similar to*~~

~~*Crystals «P°c (a),*~~

~~*\ ay a*~~

~~*er i ae z*~~

~~*water. In cavities iu halite at Kalusz (Galicia).*~~

~~*340. Potyuatirs, 20aS+MgS+K,8 UP + ele:*~~

~~*Right prismatic. oP 115°. Mostly fibrous,' Hi<=8'5% (Gee 277 (00 0238.*~~

~~*Translucent; resinous. Colourless, gene- rally brick-red. C.c.: sulphate of lime*~~

~~*Fig. 404 (sp. 389). 45, of inagnesia 20°5, of potash 29, water 5:5. Berchtesgaden.*~~

~~Ischl, Aussee, and~~

~~_ Cubie. O, sometimes with oO and Ow. Generally efflorescent in fibrous erusts. Cl. octahedral; fracture conchoidal. H.=2 to 2°5;G.=1°75to1‘9. Translucent. White. Taste sweetish-astrin- gent. Soluble. B.B. evolves sulphurous fumes. (a) Potash Alum: RO=K,0; 33°7 sulphuric acid, 10°9 alumina, 9°9 potash, and 45°5 water. In the coal formation at Hurlet and Campsie in Scotland ; the Tertiary brown coals of Hesse and the Rhine; the Lias neat Whitby ; Silurian alum slates of Scotland, Norway, and Sweden; the volcanic formations of the Lipari Islands, Sicily, and the Azores. (6) Ammonia Alum: RO=(NH,O),; about 4 per cent. oxide of ammonium and 48 water. In closed tube forms a sublimate of sul- phate of amnionia. Tschermig in Bohemia. (c) Soda Alum: RO=Na,0; with 7 of soda and 48 water. Mendoza in South America, Solfatara near Naples, and Milo. (d) Magnesia Alum: RO=MgoO. Translucent and silky. South Africa, Iquique in Peru (Pickeringite). (e) Iron Alum (Feather Alum): RO=FeO. Hurlet near Paisley, Morsfeld in Bavaria, Krisuvig in Iceland. ganese Alum: RO=MnO. From Delagoa Bay in South Africa, An alum with 3°7 oxide of zine occurs at Felsobanya, and has been termed Dietrichite.~~

~~Cubic, O; 0c; Oc, Black, brown, or green. H.=8; G.=~~

~~(f) Man-.~~

~~MINERALOGY~~

~~2°79. Solfatara near Naples, Goslar in the Harz, and Krem- mites~~

~~earthy. Cl. basal. G. —2°6 to 2°8. Translucent ; vitre- ous, pearly on O. Colorless, but often stained. Hungary, Tolfa (near Civita Vecchia), Lipari Islands, Auvergne, and Milo.~~

~~344, JARoSITE, K,S+Fe,3S+ 2(Fe,3H,) .~~

~~Rhombohedral ; R 88° 58’. Cl. basal; also fibrous in nodules or incrusting. H.=2°5 to 35; G.— 3°24. Spain, Saxony, and Mexico.~~

~~Fig. 405 (sp. 343). Colour ochre-yellow.~~

~~*345, GELBEISENERZ, K,S+4¥e,S+9H,. Foliated and massive. H.=2°5 to 3; G.=277 to 2°9. Bohemia, Norway, and Tcheleken Island in the Caspian Sea.*~~

~~*347. BorryoGENnr (Red Vitriol), Fe,S,+3(Fe,28)+36Hy.*~~

~~*Oblique prismatic, C 62°26'. oP 119° 56'. Commonly botry- oidal. H.=2 to 2°5; G.=—2. Translucent; vitreous. Hyacinth- red and orange-yellow. Falun in Sweden.*~~

~~*348. HERRENGRUNDITE.*~~

~~*Oblique prismatic, C 88° 50'. Dark emerald-green crystals. H. =2°5; G.=3°18. C.e.: 57°22 oxide of copper, 23°04 sulphuric oxide, 19°44 water, sometimes with lime. Herrengrund (Hungary).*~~

~~*349, Lixanire, (PbS+H,Pb)+(CuS+H,Cu).*~~

~~*Oblique prisinatic, C 77°22'. oP (M) 61° 41'; 2Pew (a) 52° 31'. Crystals cP®co (a), OP ©, and the above forms generally. Hemi- tropes united by «P% (a). Cl. orthodiagonal, perfect ; fracture*~~

†

~~*Fig. 406. H.=2°5 to 3; G. =5°2 to 5°45. Translucent ; adamant-*~~

~~*conchoidal. inc. Azure-blue to dark blue; streak pale blue. C.e,: oxide, of lead 55°69, oxide of copper 19°83, sulphuric acid 19°98, water 4°5. Leadhills, Red Gill and Roughton Gill (Cumberland), Linares in Spain, and Nertchinsk.*~~

~~*350. CALEDONITE, 5PbS+2(H,Pb)+3(H,Cu). Right prismatic. ooP'(m) 95°; Poo (2) 70° 57'; 2Poo (x) 36° 10'.*~~

~~*Crystals frequently as in fig. 407, but gene- aN rally hemihedral. C1. brachydiagonal, @ dis- Jn) tinct; m, cimperfect. H.=2'5 to3; G. =6'4. Gi Transparent; resinous. Verdigris-green and*~~

~~*mountain-green ; streak greenish white. C.Gst 68°42 oxide of lead, 10°17 oxide of copper, 17°3 sulphuric acid, 4°05 water. Leadhills, ; Red Gill in Cumberland, Rezbanya in Tran- sylvania.*~~

~~*2*~~

~~*351. Lerrsomire, 30u,9 + 2(Al,3H,) + \ € 15H,.*~~

~~*Right prismatic; but in tufts of eapillary WV crystals with velvet-like appearance. Colour 6 smalt-blue to sky-blue. C.c.: 49 oxide of Fig. 407 (sp. 350).*~~

~~*1°41 oxide of iron, 12°1 sulphuric*~~

~~*eopper, 2°97 lime, 11°21 alumina, Woodwardite is*~~

~~*acid, 22°5 water. Moldawa in the Banat. probably an aluminous variety of the above. Turquoise-blue to greenish blue. Cornwall.*~~

~~*352. Karnitz, MgS + KCl + 3H. Obliqne prismatic, C 85° 5'*~~

~~*(fig. 408). G.=2°13. Cl. ortho- diagonal. White to reddish.*~~

~~*Fig. 408 (sp. 352). C.c.: 16°1 magnesia, 15°7 potash, 32°2 sulphuric acid, 14°3 chlorine,*~~

~~*21°7 water. Stassfurt.*~~

~~*MINERALOGY*~~

~~*TELLURATES AND CHROMATES.*~~

~~*353. Montanirer, Bi,Te+2H,. Incrusting, carthy. Lustre waxy. Yellowish. Opaque. bismuth 66°8, tellurium 26°8, water 5-9.*~~

~~*C.c. Highland in Montana.*~~

~~*354. Macnouite, HgTe. ' White acicular crystals from Keystone mine in Colorado. –*~~

~~855. CROcOISITE, PbCr. Oblique prismatic, C 77° 27'. oP 98° 42' (AN, — P 119° 12' (2), oo P°2 (7) 56°10', coP%oo (g), (fig. 409). Cl. of, distinct; seetile. H.=2°5 to 8; G.=5'9 to6°1. Translucent ; ada- mantine. Hyacinth- or anrora-red ; streak orange-yellow. C.c.: 31 chromic acid, and 69 lead protoxide. Berezoff, Mursinsk, and Nijni-Tagilsk in the Urals, Congonhas do Campo in Brazil, 'Rezbanya, Moldawa, and Tarnowitz. Used as a pigment, but not permanent. 356. PHa@nico-CHROITE,2PbCr + Pb. Right prismatic; dimensions un- known. He=s tos hs Go br7b: Translucent on the edges; resinous or adainantine. Cochineal- to hya-~~

~~Fig. 409 (sp. 355). einth-red ; streak brick-red. C.c.: 23 chromic acid, and 77 prot- oxide of lead. Berezoff.~~

~~Oblique prismatic, C 67° 15'. Crystals 0P,-—P,—P®oo (or P, f, h), always twinned (fig. 410), the faces of OP reniform. H,=2°5 to3; G.=5°'5 to 5°8. Semi 05> translucent or opaque; resinous. Blackish or lead protoxide, 11 copper protoxide, 28 chromic acid. Leadhills, Berezoff, Congonhas do Campo (Brazil). 358. WuLFenrtTE, PbMo. Pyramidal. P131°48'. OP(a),4P (5), P, oP (m), oP2 ® (figs. fracture uneven, or con- choidal. H.=8; G.=6°3 to adamantine. Orange- yellow, honey-yellow, and of lead 61°5, inolybdic acid 88°5; red varietics have entyre in Kirkcudbright (fig. 412), Bleiberg, Rez- eatecas. 2PbOMoO,; + CaOMo0,, with 6°88 of~~

~~357. VAUQUELINITE, 2(2PbCr + Pb) + (2CuCr + Cu). forming an angle of, 134° 30'; also botryoidal or dark olive-green ; streak siskin-green. C.c.: 61 Hig, £10. MOLYBDATES AND TUNGSTATES. 411-414), Cl P; brittle; to 6°9. Pellucid; resinous eolourless. C.c.; protoxide some chromic acid. Lack- banya, Pennsylvania, Za- lime, occurs in Chili.~~

~~Fig. 413 (sp. 858). °~~

~~359, EosirTE. : Pyramidal. OP © : p'117°10' ; p' : p 125° 40' (fig. 415). H.=3 to4. Colonr deep aurora-red. Streak orange-~~

~~yellow. A vanadio-molybdate of lead. Lead- hills.~~

~~360. MrcasasiTE, Mg,Ws3.~~

~~*Oblique prismatic; similar to wolframite. In fine needles. H.=3°5 to 4; G.=6°45 to 6°97. Vitreous to adamantine. Yellowish brown to brownish red, translucent hyacinth- red; streak ochre-yellow. C.c.: protoxide of manganese 23°1, protoxide of iron 5:4, tungstic acid 71°5. Schlaggenwald, Sadis- dorf, Morococha in Peru.*~~

~~*361. ScHEELITE, CaW. Pyramidal; with many of the modifying planes hemihedric. P. 113° 32', Cl. 2Poo (nm) 180° 33', perfect; Pand OP less so. Frac- ture conchoidal. H.=4 to 4°5; G.=—5°9 to 6°2. Translucent ; resinous to adamantine. Colourless, and grey, yellow, or brown; streak white. C.c.: 19°4lime, 80°6 tungsticacid. Caldbeckfell near*~~

~~*Fig. 414 (sp. 358).*~~

~~*Fig. 415 (sp. 359).*~~

~~*403*~~

~~*Keswick, Pengelly in Cornwall, Zinnwald, Schlageenwald, Salz- burg, Chili, Si- beria, Connecti- eut. Employed for the extrac- tion of yellow tungstic acid, a fine pigment.*~~

~~*3862. Srouz- ITE, PbW. Fig. 416 (sp. 361).*~~

~~*Pyramidal; generally hemihedric. P. 131° 25'. Crystals sometimes spindle-shaped. Cl.P, imperfeet. H.=3; G.= 7°9to8-1. Translucent; resinous. Grey, yellow, brown. C.c.; 48°4 protoxide of lead, 51°6 tungstic acid. Keswick, Zinn- wald, Coquimbo (Brazil).*~~

~~*363. REINITE, FeW.*~~

~~*Pyramidal. P 103° 32'; basal angle 122° 8'. Cl. oP. H.=4; G.=6°64. C.c.: protoxide of iron 23°4, tungstic aeid 75°45. Kimbosan in Japan.*~~

~~*364. WoLFRAMITE, (Fc, Mn) W. Oblique prismatie, C 89° 22', G1" 54", Pte (wu) 98° 69, Po (), 42P¢2 (s), Twinscommon. Also laminar. Cl. clinodiagonal, perfect; fracture un- even; H.=6 to 6; G.=7-1. to. 7°65. Opaque; resinous, metallic adamantine on the cleavage. Brownish black ;*~~

~~*streak black (varieties with most iron) to reddish brown (most manganese). C.c.: 76 tungstic acid, 9°5 to 20 protoxide of iron, and 4 to 15 protoxide of manganese, in some with 1:1 niobic acid. East Pool, Carnbrae, and mines near Redruth; Godolphin's Ball in Cumberland ; Alten- berg, Geyer, Ehrenfriedersdorf, Schlag- genwald, Zinnwald, the WHarz; also Urals, Ceylon, and North America. Fi*~~

~~*Ferberite, with 26 protoxide of iren ig. 418.*~~

~~*and 2FeW + Fe (H. =4 to4'5; G.=6°7 to 6°8), from Spain, may bo different.*~~

~~*365. Hipnuritz, MnW. |*~~

~~*Right prismatic. oP (Af). M:M105°. Cl. Poo, perfect ; usually foliated or columnar. H.=4°5; G.=7°14. Adamantine on cleavage; elsewhere greasy. Brown-red; streak yellow-brown, C.c.: protoxide of manganese 28°4, tungstic acid 76°6., Mammoth district in Nevada.*~~

~~*Fig. 417 (sp. 361).*~~

~~*oP (M) 100° 37',-4P%0 (P) coP°2 (b),-P*~~

~~*(@),*~~

~~*ANHYDROUS PHOSPHATES, ARSENIATES, AND VANADIATES.*~~

~~*366. XENOTIME, Y3P.*~~

~~*Pyramidal. P 82° 22' middle angle; polar angle 124° 30'. Crystals: P; oP; aoPo. Cl. oP. H. =4°5; G.=4'6 to 4°55. Translucent in thin splinters; resinous. Yellowish and flesh-red.. C.c.: 62 yttria, and 38 phosphoric acid ; but some with 8 to 11 eerium protoxide. Lindesnaes and Hit- teré in Norway, Ytterby (Sweden), Georgia, and (Wiserine) St Gotthard.*~~

~~*867. CRYPTOLITE, Ce3P,.*~~

~~*Aecicular crystals, embedded in apatite. ' G.=4°6. Transparent. Pale wine-yellow. Powder sol. in con. s. acid. Wohler found 73°70 cerium protoxide,*~~

~~27°37 phosphoric acid, and 1°51 iron protoxide. Occurs in the apatites of granite in Scotland, but not in those of limestones. Also at Arendal.~~

~~Fig. 419 (sp. 366).~~

~~368. Monazite, (Ce, La, Th)3P2.~~

~~Oblique prismatic, C 76° 14'. oP 93° , 23'; erystals (fig. 420) generally thick or tabular. Cl. basal, perfect; translucent on edges. Flesh-red and reddish brown. C.c.: 28 phosphoric acid, 37 to 46 cerium prot- arse oxide, 24 to 27 lanthanum oxide; that from Fig. 420 (sp. 368). Zlatoust from 18 to 32°5 of thoria. Notero ' Ayn in Norway, Miask, Norwich in Connecticut, and the Rio Chico in Colombia. Turnerite, from Dauphiné, in complex transparent honey-yellow crystals, is monazite.~~

~~ee~~

~~Noa ae a~~

~~404~~

~~369. TRIPHYLITE, (2Fe + Li,)P..~~

~~Right prismatic. ooP 133°; chiefly granular, H.=5; G.=3°6. Resinous. Greenish grey with blue spots. C.c.: iron protoxide 40, manganese protoxide 5°5, lithia 7'5, phosphoric acid 45. Boden- inais in Bavaria, Norwich in Massachusetts. Lithiophilite, from Fairfield (Connecticut), is a manganesian triphylite.~~

~~370. BERZELIITe (Kuhnite), (CaMg)zAsy ; Massive. H.=5 to 6; G.=252. C.c.: lime 23, magnesia By arsenic acid 60. Sol. inn. acid. Langban (Sweden).~~

~~371, ARSENIATE oF Nickel, Ni, As). Amorphous. H.=4; G.=4°98. Sulphur-yellow. C.c.: nickel 48°2, arsenic acid 50°5. J ohann-Georgeustadt.~~

~~379, Nickruerz, NisAs,+2Ni. Crystalline massive. G. 4°84. Dark grass-green ; streak lighter. C.c.: oxide of nickel 6271, arsenic acid 36°6. Johann-Georgeustadt.~~

~~373. DECHENITE, (PbZn)V9.~~

~~Botryoidal and stalactitic. H.=3 to 4; G =5°82. Lustre resinous to greasy. Yellowish red, deep red ; streak orange to pale yellow. C.c.: 57°7 oxide of lead, 15°8 oxide of zinc, 24°2 of vanadic acid. Wanlockhead, Freiburg (in Baden), Lauter Valley.~~

~~374, PSITTACINITE, 3(Pb,V,)+Cu3V.+6CuHy,.~~

~~Mammillated and incrusting. Siskin- to olive-green. C.c.: vanadic acid 19°3, lead oxide 53°2, copper oxide 18°95, water 8°58. Silver Star (Montana).~~

~~375. PucHERITE, Bi,Vo.~~

~~Right prismatic. oP 123°55'". H.=4; G.= 6°25. Cl. basal, per- fect; vitreous. Red or reddish brown; streak yellow. Easily soluble inacids, C.c.: bismuth oxide 71°7, vanadic acid 28°3. Schneeberg.~~

~~376. AvropitE, Ca,Sb,.~~

~~Cubic (figs. 30 with 26 and 33). H.=5:5 to 6; G.=5. Lustre greasy; yellow to resin-browa. 'Translucent. C.c.: antimonic acid 73°2, lime 17°5, iron protoxide 2°7, magnesia 1°5, soda 4°38. Lang- ban (Wermland).~~

~~HYDROUS PHOSPHATES, &c.~~

~~377. BRUSHITE, (30a +2H,),P> + 4H.~~

~~Oblique prismatic, C 62° 45'. Needle crystals. H.—2 to 2s G. =2°21. Vitreous. C.c.: lime 32°6, phosphoric acid 41°3, water 26'4. Aves Islands and Sombrero (Antilles).~~

~~378. NewberviTE, Mg,H,, P.+6H,.~~

~~Right prismatic. Cl. brachydiagonal. C.c,: phosphoricacid 41°25, magnesia 23, water 35°7. From guano, Skipton Caves, Victoria.~~

~~379. HaIpINceritE. CayAs,+3Hby.~~

~~*Right prismatic. oP 100° Cl. perfect; sectile, flexible. H. =2 to 2°5; G.=2°8 to 2°9. Otherwise like pharmacolite (sp. 381). C.c.: 85°68 arseuiate of lime, and 14°32 water. Joachimsthal.*~~

~~*380. RosrtitE, R,As,+2H,.*~~

~~*Anorthic, Cl. macrodiagonal. Rose-red; streak white. H.= 3°5; G.=—3°46. C.c.: 25°5 lime, 10°3 cobalt oxide, 3°6 magnesia, 52°4 arsenic acid, 8°2 water. Schneeberg.*~~

~~*381. PHARMACOLITE, 2CaAs,+6Hy.*~~

~~*Oblique prismatic, C 65° 4' (fig. 421), 139° 17',- P (n) 141° 8', 4P®c0 (0) 88° 14', oP°3 (g) 157° 5'. Crystals generally acicular and radiated. Cl. clinodiagonal, perfect; sectile and flexible. H.=2 to 2°55; G.=2°6 to 2°8. Translucent; vitreous. Pearly white. Yields water in the closed tube. C.c.: arsenic acid 51, lime 25, é water 24. _Andreasberg, Bieber, Mar- Fig, 421. kirchen, Wittichen. Generally mixed with erythrite or annabergite.*~~

~~*382, WaprLerity, 2CaAs+8H,,*~~

~~*Anorthic; «P' (m), «'P (I), oP'2 (n), o'P.2 (WN), Pro (d), "Po (D), 3 Po (t), 3'P,co (1), 2P'2 (p), 323 (9), 3'P3 (@), 4,P4 (w), 2,P2 (mw), Poo (b) (fig. 422); also incrusting and globular. Cl. clinodiagonal. H.=2 t02'5; G.= 2°48. Colourless. Vitreous. C.c.: lime 15°6, magnesia 7°4, arsenic acid 47°5, water 29°5. Joachimsthal.*~~

~~*383. Hornesire, Mg,As,-+8Hp.*~~

~~*Oblique prismatic. oP 107°. H.*~~

~~*=5 tol; G.=2°47. White. Translucent; pearly. C.c.: 24°83 magnesia, 29°14 water, 46°56 arsenic acid. Probably from Hungary.*~~

~~*oxide of*~~

~~*oP (f) 117° 24', -P (2)*~~

~~*Fig. 422 (sp. 882).*~~

~~384. VIVIANITE, 3FeP,+ 8H.~~

~~Oblique prismatic, C 75°34', ooP (m) 108° 2'; P (vw) 120° 26', Peco (w) 54° 40'. wing prismatic (figs. 423, 424) ; also fibrous. or earthy. Cl. clino- n Sigganal, pated, thin <—JSiN lamine flexible. H. =2; oe G.=2°6 to 2°77. Trans- lucent or transparent ; vitreous, or bright pearly on cleavage. Indigo- blue to blackish green ; streak bluish white, but soon becomes blue on exposure. Cee 331 iron protoxide, 12°2 iron peroxide, 29 phosphoric acid, and 25°7 water.~~

~~Transparent indigo-~~

~~coloured crystals at St ; Agnes in Cornwall, and Fig. 428. Fig. 424. Allentown and Imleytown in New Jersey ; earthy in Cornwall, Styria, North America, Greenland, and New Zealand ; and in peat mosses in northern Germany, Sweden, Norway, and Shetland.~~

~~385. SyMPLESITE, Fe,As,+ 8H.~~

~~Oblique prismatic; in minute acicular crystals. Cl clino- diagonal H.=2'5; G.=2°96. Vitreous. Cleavage face pearly. Celadon-green to pale indigo; streak bluish white. Lobenstein in Reuss, and Lélling in Carinthia.~~

~~386. EryTuRitTE, CosAs,+ 8H.~~

~~Oblique prismatic, C 55° 9'. coP*co (P), ep a (1), Peo (ah) 5 also oP8 (k), and P (J) 118° 28' (fig. 425). Cl. clinodiagonal (P), perfect'; sectile; thin lamine flexible H.=1°5 to.25; G.=2°9 to 8. Translucent; vitreous, pearly on the cleavage. Crimson or peachblossom-red. C.c.: 38-2 arsenic acid, 37°8 cobalt protoxide, 24 water, but often with nickel 9. Cornwall, Alston in Cumberland, Alva in Stirlingshire, Schneeberg, Saalfeld, Allemont, Riechelsdorf, the Pyrenees, and Modum in Norway. Kobaltbeschlag or Earthy Incrusting Cobalt, reniform, is a mixture of erythrine with arseni- ous acid. Lavendulan, thin reniform lavender- blue crusts, translucent, resinous, or .vitreous ; (H. =2°5 to 8; G.=2°95 to 3:1), consisting of Fig.~~

~~*425. arsenic acid, protoxides of cobalt, nickel, and copper, with water ; from Annaberg.*~~

~~*387. Kérricite, (Zn, Co, Ni)sAs,+ 8H.*~~

~~*Oblique prismatic ; massive or in crusts, with crystalline surface and fibrous structure. Cl. clinodiagoual, perfect. H.=2°5 to 3; G.=3°1. Lustre of fracture silky. Colour light carmine and peach- blossom-red, of different shades ; streak reddish white. Translucent to subtranslucent. C.c.: 30°52 zine oxide, 6°91 cobalt oxide, 2 nickel oxide, with arsenic acid. Schneeberg.*~~

~~*_ 388. ANNABERGITE (Nickel Ochre), Ni,As + 8H.*~~

~~*Oblique prismatic ; in capillary crystals, also earthy ; sectile. H.=2 to 25; G.=8 to 31. Dull or glistening. Apple-green or greenish white; streak greenish white and shining. C.c.: 38°7 arsenic acid, 37°3 nickel protoxide, and 24 water, but with a little cobalt or iron. Leadhills, Pibble in Kirkeudbright, Andreasberg, Saalfeld, Riechelsdorf.*~~

~~*339. Luptamrre, Fe,2h)+9H,. Oblique prismatic, C 79° 27'.*~~

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~~oP 131° 23'; OP; P 111° 29°~~

~~(fig. 426). Cl. OP, perfect. H.=386; G=312. Ge. 53°05 oxide of iron, 29°88~~

~~phosphoric acid, 17°0 water. Cornwall.~~

~~390. FittowiTE, 3(RP,)+He.~~

~~Oblique prismatic, C 89° 51'; P; -2P8; OP. Cl. basal. H.=4°5; G. =3°43. Resinous to greasy. Wax-yellow to red-brown, or colourless; streak white; translucent. C.c.: phosphoric acid 40°2, iron protoxide 6:8, manganese protoxide 40:2, linc 5°2, soda 5°8, water 1°7, Branchville (Connecticut).~~

~~391. HurEavuirs, 5(Mn, Fe)2P,+5H,.~~

~~Oblique prismatic, C 89° 27'. oP 61°. H.=8'°5; G.=8°2. Translucent ; resinous.~~

~~Fig. 426 (sp. 389).~~

~~pseudo-rhombohedral.~~

~~Fracture conchoidal. Reddish yellow or~~

~~'brown. B.B. fuses easily to a black metallic globule. Soluble in~~

~~acids. -C.c. : 39 phosphoric acid, 8 iron protoxide, 42 mangancse protoxide, and 12 water. Hurcaux near Limoges.~~

~~METNERALOG Y~~

~~Heterozite. .H.=5; G.=3°5. Opaque; vitreons or resinous. Dark violet or blue to greenish grey ; streak violet-blue or erim- son-red, Contains more iron and less manganese than the above, Hureaux.~~

~~392. DickINsoniTE, 4(R;P,)+3H,.~~

~~Oblique prismatic, C 60° 30'. Crystals tabular. Cl. basal, per- fect. H.=3°5 to 4; G.=3°34. Vitreous; pearly on cleavage. Olive- to oil-green, and grass-~~

~~green; streak white. Transparent; brittle. C.c.: phosphoric acid 40, iron protoxide 12°7, manganese protoxide 25, lime 11°8, soda 6°6, water 38. Brancliville (Con- necticut).~~

~~393. TrrpLorpire, (Mn, Fe);P,+H,(Mn, Fe),.~~

~~Oblique prismatic, C 51° 56'. Generally fibrous; transparent ; resinous toadamantine. H.=4°5 to 5; G.=3°7.° Yellowish-brown. C.e.: 48°45 oxide of manganese, 14°88 protoxide of iron, 32°1 phos- phoric acid, 4°1 water. Fairfield (Connecticut).~~

~~394. Farrrievpire, R,P,+2H,.~~

~~Anorthic; usually foliaceous. H.=3°5; G.=3°15. White to straw-yellow ; streak white. Pearly to brilliant-adamantine on eleavage. Transparent; brittle. C.c.: phosphoric acid 38:4, iron protoxide 5°6, manganese protoxide 15°6, lime 30, soda -7, water 10. Fairfield (Conneeticut).~~

~~395. CHonprarsEnire, Mn, As, +H. In small grains. H.=3. Yellow to reddish-yellow. Trans-~~

~~lucent; brittle; fracture conchoidal. Paisberg mines (Werm- land). 396. ReppinciTE, Mn,P,+3H,.~~

~~Right prismatic. P; P2; oPo. H.=8 to 3°5; G.=3°1. Vitreous; rose-pink to yellowish white. Tyranslneent; fracture uneven; brittle. C.c.: phosphoric acid 34°5, iron protoxide 5:43, manganese protoxide 46°83, lime '8, water 18°1. Branchville.~~

~~397. ScoropiTE, Fe,As,+4H,. Right prismatic. P with polar edges 102° 52' and 114° 40'. Crystals P (p), wPo (a), and oP (6); also OP, $P (7), oP (n),~~

~~2P2 (s), oP2 (d) 120° 10', and 2Pa (m) 132° (fig. 427); also columnar and fibrous. Cl. imperfect; brittle. H.=3°5 to 4; G.=3'1 to 8°2. Translucent ; vitreous. Leek-green to greenish black, also indigo- blue, red, and brown. B.B. fuses easily, with arsenical odour, to a grey magnetic slag. Sol. in h. acid, to a brown solution. C.c.: 49°8 arsenic acid, 34°6 iron peroxide, and~~

~~15°6 water. St Austell in Cornwall, near Limoges in France, Schwarzenberg, Lolling in Carinthia, Brazil, and Siberia.~~

~~Right prismatic. 101° 38’ and . 115° 36’, mid- dle edge 111° 30’. oP2 (d)~~

~~and Po (7), P (P), OP (h),~~

~~2Pc (m) 48° (fig. 428). Cry- stals generally PP as Tf do- minant. Cl.r. H.=3 to 4; G.=2°87. Cherry-red. ‘Translucent. C.c.: prot- oxide of iron 48°18, phosphorie acid 37°42, water 19-4. Rock Bridge (Vir- ginia).~~

~~Fig. 427 (sp. 397).~~

~~Fig. 428 (sp. 398). 399. DuFrenivTe (Kraurite), 2¥e,P,+3H, .~~

~~Right prismatic. oP about 123°. Spherical or reniform. Cl. brachydiagonal ; brittle. H.=3 to 3°5; G.=3°3 to 3°4. Trans- lucent on the edges, or opaque; shining or dull. Dirty leek-green or blackish green; streak siskin-green. C.c.: 68 iron peroxide, 28 phosphoric acid, and 9 water. Westerwald, Hirschberg, and Limoges,~~

~~400 Brraunire, 5Fe,3P,+14H,.~~

~~Occurs in small foliated and columnar aggregates. Cl, plane metallic pearly. H.=2; G.=2°878. Colour hyacinth-red to reddish brown ; streak dirty-yellow. C.c. : 54°5 peroxide of iron, 28°65 phosphoric acid, and 16°55 water. Bohemia, Scheibenberg in Saxony.~~

~~405~~

~~401. Exgoyonire, 3fe,2P, + 8H, .~~

~~Oblique prismatic, C 48° 33’. Twin face the orthopinacoid. Cl, oP%. H.=8 to 4. Dark hyacinth-réd ; streak yellow. Vitreous to pearly. C.e. : 51°94 peroxide of iron, 31-88 phosphoric aeid, 16°37 water. Eleonore mine near Bieber,~~

~~402. CacoxENE, 2Fe,P,+12H,.~~

~~Radiated tufts, of a brownish-yellow colour. H.=3 to 4 : G.=3°38. Sol. in h.acid. From the Hrbeck mine near Zbirow in Bohemia.~~

~~403. PHARMACOSIDERITE (Cube Ore), 4¥e,3As, +15H,. Cubic and tetrahedral ; usually Ow, with 4 or oO. Brittle.~~

~~H.=2°5; G.=2‘9 to3. Cl. oOo. Semitransparent to translu- cent ; adamantine or resinous. Olive- to emerald-green, honey- yellow, and brown ; streak straw-yellow. Pyro-electric. C.c.: 43 arsenic acid, 40 iron peroxide, and 17 water. Carharrack in Corn- wall, Burdle Gill in Cumberland, Lobenstein in Reuss, Schwarzen- berg in Saxony, North America, and the gold quartz of Australia.~~

~~405. WAVELLITE (Lastonite),3’Ai,2P, +12H,. oP 126° 25 ; Poo 106° 46’. Crystals ooPoo~~

~~(P), oP (d), Poo (0) (fig. 429); but generally small, acicular, and in radiated-hemispherical and stellate-fibrous masses. Cl. along oP and Poo, perfect. H.=3°5 to4; G.=—2°3 to 2°5. Translucent ; vitreous. Colourless, but generally yellowish or greyish,~~

~~sometimes green or blue.. C.c.: 38 alumina, 35°3 phos- Id~~

~~Right prismatic.~~

~~phoric acid, and 26°7 water; but generally traces of fluoric acid (2 per cent.), Shiant Islands and Glencoe in Scotland, Barnstaple, St Austell, near Clonmel and Portrush, Beraun in Bohemia, Amberg in Bavaria ; also~~

~~in New Hampshire and Tennessee. Ceruleolactin, from Fi8- 429. Nassau, has two equivalents less of water.~~

~~406. Vanisrte, Al, P,+4H,.~~

~~Right prismatic; reniform ; conchoidal fracture. H.=4 to 5;~~

~~G. =2°34 to 2°38. Apple- and emerald-green ; streak white. 32°4 alumina, 44°85 phosphoric acid, 22°74 water. Reuss, Montgomery county in Arkansas.~~

~~*Zepharovichite from Bohemia contains one equivalent more water; Evansite from Hungary two equivalents more.*~~

~~*407. FISCHERITE, 2Al,P,+8H,.*~~

~~*Right prismatic. oP 118° 32'; generally in crystalline crusts. H.=5; G.=2°46. Grass- and olive-green. Vitreouslustre. C.c.; alumina 42, phosphoric acid 29, water 29. Nijni-Tagilsk.*~~

~~*408. PEGANITE, 2Al,P,+6H,.*~~

~~*Right prismatic. oP 127°. In thin reniform crusts, of fibrous structure. H.= —3 to 4; G.=2°49 to 2°54. Grass- aud emerald- green. Vitreous or greasy lustre. C.c.: alumina 45, phosphoric acid 31°3, water 23°7. Striegis in Saxony.*~~

~~*409. Hoprrre, Zn,P+4H,.*~~

~~*Right prismatic. oP2 82° 20'; P with polar edges 106° 36' and 140°. Cl. macrodiagonal, perfect. H.=—2°5to3 ; G.=2°76 to 2°85.*~~

~~*Vitreous or pearly. Greyish white. C.c.: oxide of zinc 35°21; phosphoric acid 31°1, water 15°38. Altenberg.*~~

~~*410. ApAmITE, 4ZnAs,+ Hy.*~~

~~*Right prismatic. oP 91° 52'. Cl. macrodomic. H.=3°'5; G.=4°34. Lustre vitreous. Colonr honey- yellow to violet; streak white. Trans- parent. C.c.: oxide of zinc 56°6, arsenic acid 40°2, water 3°2. Cape Garonne in France, Chafiarcillo in Chili.*~~

~~*(Oo Messbach in*~~

~~*411, Lrserenire 40uP;+ 6H.*~~

~~*Right prismatic. oP (w) 92° 20', Poo (0) 109° 52', and P (fig. 430). H.=4; G. =8°6 to 3°8. Translucent on the edges; resinous. Leek-, olive-, or blackish-green; streak olive-green. C.c. : 66 copper prot- oxide, 80 phosphoric acid, and 4 water.*~~

~~*Fig. 480 (sp. 411). Gunnislake (Devon), Libethen (Hungary), Nijni-Tagilsk.*~~

~~*- 20°5.*~~

~~*406*~~

~~*412, Ourventre, 40u (As,P,)+ Hy.*~~

~~*Right prismatic. o(P) (r) 92° 30', Poo(Z) 110° 50', Peo (2) (fig. 481); also spherical and reniform, and eolumuar or fibrous. Cl. (r) and (/), im- perfect. H.=—3; G.=4'1 to 4°6. Pellucid in all degrees; vitreous, resinous, or silly. Leek-, olive-, or blackish-green, also yellow or brown; streak olive-green or brown. B.B. in the forceps fuses easily to a dark brown adamantiue bead, covered with radiating crystals; on charcoal detonates, emits arsenical vapours, and is reduced. Sol. in acids and ammonia. C.c.: 56°5 eopper protoxide, 39°5 arsenic acid, and 4 water; but also 1 to 6 phosphoric acid. Carharrack, Tin Croft, Gwennap, and St Day in Cornwall; Alston Moor, Thuringia, Tyrol, Siberia, Chili. oe*~~

~~*413. VuszeLyire, 9Cu, 6Zn, P,, Asp+18H.*~~

~~*Oblique prismatic, C 108° 50'. H. =3'5 to 4; G. = 3°53. Green- ish blue. C.c.: copper 37°34, 25°20 zine oxide, 10°41 arsenic acid, 9°01 phosphoric acid, 17°05 water. Moravicza (Banat).*~~

~~*Fig. 431.*~~

~~*414, DEscLoIziTE, 2PbV,.+ He.*~~

~~*Right prismatic. oP 116° 25'. H.=3'5; G.=5'86 to 6:1. Olive-brown to black. C.c. : 56°48 oxide of lead, 16°6 oxide of zine, 1°16 oxide of manganese, 22°74 vanaiic acid, Sierra de Cordoba in the Argentine Republic.*~~

~~*415. Votportulre, 4(Cu, Ca) Vo+Hp.*~~

~~*Hexagonal; small tabular crystals, OP, oP, single or in groups. Generally massive H.=3; G.=—3°45 to 3°89. Olive-green ; streak almost yellow. B.B. on charcoal fuses easily aud forms a graphite-like slag, containing grains*~~

~~of copper. Sol. in n. acid, and with water gives a brick-red precipitate. C.¢. : 37 to 88 vanadic acid, 39°4 to 46 copper oxide, 18°5 to 13 lime, 3°6 to 5 water. Sissersk (Urals), Nijui-Tagilsk, and Friedrichroda in Thuringia.~~

~~416. TacitirE, 4CuP,+3H,.~~

~~Oblique prismatic; but botryoidal and radiating-fibrous, or earthy. H.=—3; G.=4. Emerald-green. C.c.: 61°8 copper prot- oxide, 27°7 phosphoric acid, aud 10°5 water. Nijui-Tagilsk, and near HIrschberg.~~

~~417. Eveurorrs, 4CuAs,+7H).~~

~~Right prismatic. oP (Af) 117° 20', Poo(m) 80° 52', with wP2 (2) and OP (P) (fig. 432). Brittle. H.=3°5 ; to4; G.=—3°35 to 3°45. Translucent ; vitre- ous. Emerald- or leek-green; streak ver- digris-green. B.B. in forceps fuses to a | greenish brown crystallized mass. Easily | sol. in n. acid. C.c.: 47 copper protoxide, | 34 arsenic acid, and 19 water. Libethen in | Hungary. 418, Errntre, 5CuAs,+2Hy. Reniform and foliated; conchoidal fracture.~~

~~H.=4'5 to 5; G.=4 to4'l. Translucent on the edges; dull resinous.~~

~~Fig. 432 (sp. 417).~~

~~Emerald- or grass-green ; streak similar. — C.c.: 59°9 copper protoxide, 34'7 arseuic acid, and 5°4 water.~~

~~Cornwall. Cornwallite has 3 or.5 of water.~~

~~419. Duryrirz, 5CuP,+2H,.~~

~~G.=4'4. Oxide of copper 69, phosphoric acid 24°7, water 6°25. Rheinbreitenbach and Nijni-Tagilsk.~~

~~420, Morrramire, 5(Cu, Pb)V,+2Eh. | Black crystalline crusts; streak yellow. H.=3; G.=5°9.~~

~~C.c.: oxide of copper 20°4, oxide of lead 7°2, vanadic acid 18°7, water 3°7. Mottram.in Cheshire.~~

~~421, Enuits 50uP,+3Hp.~~

~~Right prismatic ; botryoidal, radiating, foliated. H.=1°5 to 2; G. =3°8 to 4°27. Translucent on the edges ; pearly on the cleavage. Verdigris-green ; streak paler. C.c.: 67 copper protoxide, 24~~

~~os acid, and 9 water. 'ity on the Rhine, Nijni-Tagilsk,~~

~~492, Tyrouire, 5CuA's, +9H,.~~

~~Right prismatic. Cl. basal, perfect; reniform. Radiate-folia- ceous. H.=1°5 to 2; G.=3. Lustre pearly on cleavage face. Colour apple-green and verdigris-green to sky-blue; streak paler. Sub- translucent. C.c.: oxide of copper 50°3, arsenic acid 29°2, water Tyrol, Hesse, Thuringia.~~

~~423, PHOSPHOROCHALCITE (Lunnite), 6Cul',+3H,. Oblique prismatic. Crystals oP¢2 (f) 38° 56', P(P) 117° 49',~~

~~MINERALOGY~~

~~with OP (a) and coP%o (¢) (fig. 433) ; nsually small and indistinct; more common in spherical or reniform and b radiated-fibrous masses. H.=5;, G.=4'1 to 4°3. Translucent throughout or on the edges; adamantine to resinous. Blackish-, emerald-, or verdigris-green. C.c.: 70°8 copper protoxide, 21°2 phosphoric acid, and 8 water. Cornwall, Rheinbreitenbach, Nijni-Tagilsk.~~

~~424, CLINOCLASE, 6CuAs,+3H,.~~

~~Obliqne prismatic, C 80° 30°. OP (P), co P (m) 56°, $P°c0o (a) 99° 30', (7) 128° 48' (figs. 484, 485) ; and hemispherical. Cl. basal, perfect. H.=2°5 to3; G.=4°2 to 4°4.~~

~~ous; pearly on cl. Dark =~~

~~Fig. 483 (sp. 428). Translucent ; vitre-~~

~~verdigris-green to sky-blue ; streak blue. C.c: 62°6 copper protoxide, 30°3 ar- senic acid, 7*1 water. Corn- wall, Tavistock, Erzgebirge. 425. MixXITE.~~

~~*Oblique prismatic or an- orthic (%). Radiating, cen- trally granular, oP 125°. H. =3 to 4;G. =2°66. Eme- rald-green to blue-green ; ; streak paler. C.c.: 48°21 ,. A saigpel Peide, 13°1 bismuth Fig 434 (sp. 424). Fig. 486 (sp. 424). oxide, 30°45 arsenic acid, 11°1 water.*~~

~~*- Geistergang, Joachimsthal. 426, Ruacirs, 51,243, +8H,.*~~

~~*Grape-like groups of minute crystals. streak white. Lustre wax-like ; brittle.*~~

~~*Colour yellowish green ; H.=5; G.=6°82. C.c.:*~~

~~*bismuth oxide 79°5, arsenic acid 15°6, water 4°9. Neustiidtel near Schuceberg.*~~

~~*497, Trocenite, 3U As, +12H,.*~~

~~*Oblique prismatic, C 80°. Crystals thin tabular. Cl. clino-*~~

~~*diagonal, perfect. Lustre pearly. G.=3°3. Lemon-yellow. C.c.: 65°95 oxide of uranium, 17°56 arsenic acid, 16°49 water. In closed tube gives off water, and becomes golden brown, but again yellow on cooling. Neustidtel.*~~

~~*428. SrruvitE, (NH, 2Mg) P,+12H,.*~~

~~*Right prismatic. Poo (a) 68° 7', Poo © 95°, 4Poo (b) 30° 32', wPoo (2), #Pco (m) 128°, OP (0) (fig. 436). Cl. brachydiagonal, perfect. H. =1°5 to 2; G.=1°66 to 1°75. Trans- parent or opaque ; vitreous. Colonrless, but yellow or brown. C.c.: 29°9 plios- phoric acid, 16°3 magnesia, 10°6 am- nionia, and 44 water. Under St Nicholas church at Hamburg, and in guano from South America.*~~

~~*Spherical and fibrous , friable. H.=—1°2; G.=3°52 to 3°88. Opaque; silky. Golden yellowish brown; streak yellowish brown. C.c.: peroxide of iron 39°4, lime 13°8, arsenic acid 37°9, water 8°9. Romanéche uear Macon.*~~

~~*430. CHALCOSIDERITE. Anorthic. Light green erystais. G.=3°1l, C.c.:*~~

~~*oxide of iron, 8°1 oxide of eopper, 4°45 alumina, 30°54 phosphoric acid, 15 water. Cornwall. 431, Lazuuirs, Al,P +(Mg, Fe);P,+2H,. . Oblique*~~

~~prismatic, C 88° 2'. oP 91° 30', P (e) 99° 40',P (p) 100° 20'. Crystals often tabular through distortion; twins on OP, and wP%«; also massive ; fracture splint~~

~~ery. Cl. @P. Ho=5 to 2. : 6) G28 to 31. 'Trans. Fig: 437 (sp. 431). Fig, 488 (sp. 481). Incent; vitreous. Indigo- and smalt-blue to greenish ; streak white. In closed tube yields water, and loses colour. Soluble in acids after ignition. C.c.: 31°7 alumina, 10 magnesia, 6 prot- oxide of iron, 44 phosphoric acid, and 6 water. Salzburg, Styria,~~

~~42°8 per-~~

~~| Brazil, Georgia, Lincoln in North Carolina.~~

~~MINERALOGY~~

~~432, CHILDRENITE, 2(Fe, Mn), AlP 15H. P=P,,H=H,,&e. Right prismatic. Polar edges 101° 43', 130° 10', middle 98° 44';~~

~~usual form P, 2P0, «Po (e, a, P, fig. 439). ie~~

~~H.=4'5 to 5; G.=3'18 to 3°3, Translucent; SS~~

~~vitreous. Yellowish white to winc- or ochre-yellow,~~

~~brown, or almost black. C.c.: 30°7 iron protoxide,~~

~~9 manganese protoxide, 14°5 alumina, 29 phos-~~

~~phoric acid, and 17 water. Tavistock, Crinnis —~~

~~and Callington (Cornwall). Fig. 459.~~

~~433. EHOSsPHORITE (Ie, Mn),7], P+4H.~~

~~Right prismatic. P (p) 183° 32' and 118° 56'; oP (2) 104° 19'; a@Poo (a), oPoo (b), oP2(g), PE (¢), 2P2 (s) (polar edges 130° 26' and 98° 42') (fig. 440). Cl. macro- diagonal. H.=5; G.=3°13. Pale red. Vitreous. C.c.: 22~~

~~alumina, | 7°4 protoxide of iron, 23°5 oxide of manganese, 31°5 phosphoric acid, 15°6 water. Fairfield (Connecticut).~~

~~434, LrroconirE, Cu,As+Al¢~~

~~+24%.~~

~~Oblique prismatic, C 88° 33'. oP (d) 61° 31', P%oo (0) 74° 21' (fig. 349). He 2 te 2:5; G)=2°8 to 3.. Trans- lucent ; vitreous or resinous. Azure- blue to verdigris-green; streak paler. ; :~~

~~C.c.: 86°6 protoxide of copper, 11°9 Fig. 440 (sp. 433).~~

~~alumina, 26°6 arsenic acid, 24'9 water. Redruth, Herrengrund in Hungary. — he 435, CHALCOPHYLLITE, Cu,As +124.~~

~~Hexagonal rhombohedral ; R 69° 48' (fig. 441). Cl. basal, perfect ;~~

~~Reale, He—=2 5 G.—24 to 26. ' : Transparent; vitreous to adamantine. — 7 Pearly on OR (0). Enerald- to grass- =. * and verdigris-green; streak pale green. 3~~

~~Soluble in acids and ammonia. C.c.: Fig. 441.~~

~~protoxide of copper 49°6, arsenic acid 18, water 32°4. Redruth~~

~~in Cornwall, Saida in Saxony, Moldawa in the Banat.~~

~~436, URANITE, (Ca, U,) P+8H.~~

~~Right prismatic. oP 90° 48'; P middle edge 127° 32'. OP:P 116°14; OP : 2P<0 109° 6'; OP : 2Poo 109° 197 (figs. 442, 443). _ Crys- tals flat. Cl. basal, perfect; sectile H.=1 to 2; G.=8 to 3:2. Translucent; pearly on OP. Sulphur-yellow to siskin-green; streak yellow. C.c.: 15°5 phosphoric acid, 62°6 uranium peroxide, 6°1 lime, and 15:8 water.~~

~~Fig. 443.~~

~~Cornwall, Autun and Limoges in France, Johann-Georgenstadt and Eibenstock in Saxony, Chesterfield in Massachusetts.~~

~~Right prismatic; quadrangular, scale-like crystals. Cl. basal, perfect. H.=2°3; G.=3°45. Siskin-green. C.c.: lime 5°47, sesqui-~~

~~oxide of uranium 59°18, arsenic acid 19°37, water 16°29. Neu- stadtel. 438. Uranocrrcire, (Ba, §,)P +8.~~

~~Yellowish green crystals, isomorphous with 4387. Cl. basal.~~

~~G. =3°53. C.c.; sesquioxide of uranium 56°86, baryta 14°57, phos- phoric acid 15-1, water 14. Falkenstcin in Voigtland.~~

~~439. CHALCOLITE, (Cu, U,) P+ 8H.~~

~~Pyramidal, [P middle edge 142° 8'; Poo 128° 14'. Crystals OP, P, wPo, Po. Cl. basal, perfect; pearly lustre; brittle. H.=2 to 2°5; G.=8°5 to 3°6. Grass- to emerald- or verdigris- green; streak apple-green. C.c.: 15°2 phosphoric acid, 61 uranium peroxide, 8°5 copper protoxide, and 15°38 water. Red- ruth and St Austell, Johann-Georgenstadt, Eibenstock, Schneeberg Bodenmais, Baltimore.~~

~~Pyramidal. P middle edge 142° 6'. OP:P 109° 57'. Crystals tabular. Cl. basal. H.=2°5; G.=3°58. Grass-green. Lustre pearly. C.c.:7°7 oxide of copper, 55°95 sesquioxide of uranium, 14 water. Huel Gorland in Cornwall, Nenstidtel, Joachimsthal, Zinnwald, Wittichen.~~

~~407~~

~~Anorthic; in scaly crystals. Wax-yellow to pomegranate-red Adamantine to greasy. H.=3°5; G.=5°76. C. ty henioxias, of bismuth 60°4, sesquioxide of uranium 20°4, arsenic acid 138, water 4°5. Neustédtel. :~~

~~442. Puomecommer, Pb, + 6AlF.~~

~~Reniform or stalactitie ; fracture conchoidal and splintery. H.= 4 to 4°5; G.=6°3 to6'4. Translucent; resinous. Yellowish or greenish white to reddish brown. C.c.: 88 protoxide of lead, 35 alumina, 8 phosphoric acid, and 19~~

~~water; but with 2 chloride of lead. Poullauouen, Nuissiére (near Beaujeu), Georgia.~~

~~ComMPOUNDS oF PHospHATrs, VANADIATES, AND ARSENIATES witH HAtorp SAtts.~~

~~443. Apatite, 3CaF+(Ca(Cl, F).~~

~~Hexagonal and pyramidal-hemihedric. P 80° 26'. The most common forms are oP (M); oP2(n); OP (m); P(x); the base OP seldom wanting (figs. 92, 95, 96, 97, 98). The crystals are short- prismatic or thick-tabular; also granular, fibrous, or com- pact; fracture conchoidal or splintery; brittle. H. —5: G. =3°1 to 3:25. Transparent to opaque; vitreous to resinous. Colourless and white, but generally light green, grey, blue violet, or red. C.c.: phosphate of lime (89 to 92°3), with chloride (to 11) or fluoride (to 7°7) of calcium, or both. Dissemi- nated in granite, gneiss, mica and hornblende slates, primary limestones, and trap rocks; also in beds and veins. Sutherland Ross, and Aberdeen, in granite and limestone ; Cumberland, Devonshire, and Cornwall; in tin-mines in Saxony; Bohemia, St Gotthard, Tyrol; Krageré in Norway, New York, Canada.~~

~~444, PyromMorpHITE, 3Pb,P + PbCl.~~

~~Hexagonal; P 80°44'. Crystals oP, OP, with »P2, or P CLAP hey fig. 444), occasionally thicker in the middle, or spindle-shaped ; also reniform or botryoidal; fracture conchoidal or un- ; even. H.=3°'5 to 4; G.=6°9 to 7. Translucent; resin- ous or vitreous. Colourless, but generally grass-, pis- tachio-, olive-, or siskin-green, and clove- or hair-brown, and scarlet (Leadhills). C.c.: 89°7 phosphate and 10°3 chloride of lead, but with 0 to 9 arseniate of lead, 0 to 11 phosphate of lime, and 0 to 1 fluoride of calcium. Elgin, Wanlockhead, also Cornwall, Derby- shire, Yorkshire, Durham, Cumberland, Wicklow; Przibram, Mies, and Bleistadt in Bohemia ; Berezoff, Phenixville in Pennsylvania, and Mexico.~~

~~445, VANADINITE, 3Pb;¥+PbCl.~~

~~Hexagonal; P 78° 46'. Forms oP, OP (0), P(z), 2P,4P(b4), oP, oP, 2P2 (fig. 445). Transparent to opaque; resinous. Honey-yellow to greyish brown;~~

~~*streak white. H.=3; G. =6°8to7 '2. C.c.: oxide oflead 70°88, S vanadic acid 19°35, lead 7-2, chlorine Saaceniteek — EE 2°62. Wanlockhead, Windischkappel : tN*~~

~~*in Carinthia, Haldenwirthshaus in the Black Forest, Bolet in West-Gotland, Berezovsk, Zimapan in Mexico,*~~

~~*Cordoba in the Argentine Republie.*~~

~~*446. MIMETESITE, 3Pbs74s + PbCI.*~~

~~*Hexagonal ; P-S1° 48'. Crystals -4_ }— b.----0.g0 Soop. oP, OP, P (figs. 91, 444), or P, OP. Yes Se 7 y Cl. P; fracture conchoidal or uneven.*~~

~~*H.=3°5 to 4; G.=7719 to 7°25. Be*~~

~~*Translucent. Colourless, but usually F*~~

~~*honey- or wax-yellow, yellowish green :*~~

~~*or grey. O.c.3_ 90°7 sieaniaia and ae Fae eee BA*~~

~~*9°38 chloride of lead; but part of the arsenic oecasionally replaced Ly phosphoric acid. Leadhills, Huel Alfred and Huel Unity in Corn- wall, Roughten Gill and Dry Gill in Cumberland, Beeralston in Devonshire, Johann-Georgenstadt, Zinnwald, Badenweiler, St Prix in France, Nertchinsk, and Zacatecas in Mexico.*~~

~~*447. WAGNERITE, Mg,P+MeF.*~~

~~*Obliqne prismatic, C 68°25'. oP 57°35'. Cl. prismatie, and orthodiagonal imperfect ; fracture conchoidal or splintery. H.=5 to 5°5; G.=8 to 3:2. Translucent or transparent; resinous. Wine- yellow and white. C.c.: 43°3 phosphoric acid, 11°4 fluorine, 37°6 magnesia, and 7°7 magnesium; but with 8 to 4°5 iron protoxide and 1to4lime. Werfen in Salzburg.*~~

~~*448, TrIPLiITE, (Fe, Mu),P+RF. ; 7*~~

~~*Oblique prismatic; only granular. Cl. in two directions at right angles ; fracture conchoidal. H.=—5 to 5°5; G.=3°6 to 3°8. Translucent or opaque; resinous. Chestnut- or blackish-brown ; streak yellowish grey. C.c.: iron and manganese protoxides, with 38 phosphoric acid, and 7 or 8 fluorine. Limoges, Schlaggenwald.*~~

~~*408*~~

~~*449, ZwIEsELITE, (Ie, Mn) + FeF.*~~

~~*Right prismatic ; but only massive. Cl. basal, perfect. H.=4°5 to 5; G.=3‘95 to 4. Brown; streak yellow. C.c.: like triplite. Zwiesel in Bavaria.*~~

~~*Montebrasite has no soda.*~~

~~*451. DuRANGITE, (Re) As+2NaF.*~~

~~*Oblique prismatic; crystals like keilhauite (sp. 669). oP110°10’; P112°10’. Cl. prismatic. H.=5; G. =3‘95 to 4. Bright orange-red;*~~

~~*streak cream-yellow. Vitreous. C.c.: alumina 17°2, iron protoxide*~~

~~*9-2, arsenic acid 53, soda 13°1, fluorine 7°7. Durango (Mexico). 452. HERDERITE,*~~

~~*P polar edges 77° 20’ and 141° 16’; »P 115°*~~

~~*53’. Fracture conchoidal. H.=5; G.=2°9 to 8. Translucent;*~~

~~*vitreous, inclining to resinous. Yellowish or greenish white.*~~

~~*Ehrenfriedersdorf in Saxony. An anhydrous phosphate of alumina with lime and fluorine.*~~

~~*Right prismatic.*~~

~~*PHOSPHATES WITH SULPHATES AND BORATES.*~~

~~*453. SVANBERGITE.*~~

~~*Rhombohedral; R 90° 35'. H.=4°5; G.=2°57. Vitreous to adamantine. Honey-yellow, reddish brown, and rose-red ; streak reddish. Subtransparent. C.c.: 87°8 alumina, 6 lime, 17°83 sul- phuric acid, 12°8 soda, 17°8 phosphoric acid, 6°8 water. Horr- sjoberg in Wermland.*~~

~~*Reniform and stalactitic; fracture conchoidal. H.=3; G.=1°9 to 2. Resinous; vitreous. Yellow or yellowish brown; streak white. (C.c.: 36°7 iron protoxide, 14°8 phosphoric acid, 15°2 sulphuric acid, 'and 80°38 water. Grafenthal and Saalfeld.*~~

~~*Reniform and stalactitic ; brittle ; fracture conchoidal. H. =2°3; G. =2°3 to 2°5. Translucent throughout, or on the edges; resinous to vitreous. Yellowish, reddish, or blackish brown, sometimes in spots or stripes; streak light yellow or white. C.c.: 35 iron per- oxide, 26 arsenic acid, 14 sulphuric acid, and 24 water. In many old mines, as Freiberg and Schneeberg.*~~

~~*456. BEUDANTITE.*~~

~~*Rhombohedral ; R 91°18'. H.=3°5; G.=4. Vitreous. Olive- green; streak greenish yellow. C.c.: oxide of iron 40°69, oxide of lead 24°05, sulphuric acid 13°76, phosphoric acid 8°97, water 9°77. Dernbach in Nassau, Cork in Ireland.*~~

~~*457, Lunepurerre (2Mg, #) P+ MgB+7H.*~~

~~*Concretions of fibrous structure.*~~

~~*C.c.: 25°2 magnesia, 29°8*~~

~~*phosphoric acid, 14°74 boracic acid, 30°23 water. Liineburg. ARSENITES. 458. Ecprmirs, Pb,As,+2PbCl,. Pyramidal. Cl. OP. H.=2°5 to 83; G.=7:14. Pale green.*~~

~~*Vitreous on cleavage ; resinous on fracture. C.c.: oxide of lead 59°67, lead 22°2, arsenious acid 10°59, chlorine 7°58. Langban in Wermland. 459. TrippKerre, Cuds. Pyramidal; P 111° 56'. Blue-green. Lustrous. Copiapo in Chili.*~~

~~*SILICATES. ANDALUSITE Group.*~~

~~*460. ANDALUsSITE, AISi. Right prismatic. ooP (2m) 90°50', Poo ® 109° 4', Poo (s) 109° 51'.*~~

~~*Fig. 446.*~~

~~*Fig. 447. Also columnar. Cl. m; fracture splintery. H. =7 to 7°5; G. =3'1 to*~~

~~*3°2. Pellucid; vitreous. Grey, green, red, or blue. B.B. infusible.*~~

~~*MINERALOGY*~~

~~*Not affected by acids. C.c.: alumina 6371, silica 36°9. Clashnaree (figs. 446 to 449) and Clova in Aberdeenshire, Marnoch and Botriph-*~~

~~*Fig. 448. nie in Banffshire, Killiney Bay in Wicklow, Andalusia, Tyrol, Penig, Massachusetts, Litchfield in Connecticut.*~~

~~*Chiastolite. H.=5to5'5; G.=3. Pale grey, yellow, green, and red. A compound structure, formed of four double wedge-shaped crystals, arranged in contact with the angles of a square conoidal crystal placed in their*~~

~~*Fig. 449.*~~

~~*centre, and imbedded in a paste of clay slate. The section of the compound structure forms a tesselated | cross, the appearance of which varies with the portion Fic, 430 of the crystal which is cut. Portsoy (fig. 450) and ae Sa Boharm in Banffshire, Wicklow, Keswick and Skiddaw, Brittany, Pyrenees, Maine, New Hampshire, Nova Scotia, Canada.*~~

~~*461. CYANITE (Disthene), X1Si.*~~

~~*Anorthic ; generally broad-prismatie lengthened crystals, formed*~~

~~*by two faces (m, ¢). m:t 106° 15'; m:% 145° 41'; p:m98° 15' (fig. 451). Hemitropes common, united by m. Also radiated. Cl. m, perfect; brittle. H. =7, on cl. planes 5; G.=3°5 to 3°7. Pellucid; vitreous. Cl. pearly.*~~

~~Colourless, and red, yellow, green, grey, and blue. 8B.B. infusible. Not affected by acids. C.c. same as andalusite. Hillswick in Shetland, Mount Battock, Tarfside (fig. 451), Botriphnie (Banffshire), Tyrol, St Gotthard, Bohemia, Pontivy in France.~~

~~462. SILLIMANITE, AlISi.~~

~~Right prismatic; oP 111°. Crystals fibrous, columnar, and radi- ating. Cl. macrodiagonal. H.=7; G.=3°2 to 3°26. Translucent; resinous ; oncl. vitreous. Greyish, greenish, clove, or hair-brown. C.c. and chemical characters like cyanite. 'Tvedestrand, Norway; Chester and Norwich, Connecticut. Al,O,SiO, is thus trimorphous.~~

~~Monrolite, Xenolite, Bucholzite, Fibrolite, and Bamlite are varieties.~~

~~463. Topaz, 5A1Si+ AIF, +SiF). Right prismatic. ooP (Jf) 124° 17', 2Boo (nm) 92° 42', oP2 (1) 98°~~

~~Fig. 451.~~

~~14', P(o). Crystals always prismatic (fig. 122), often hemimorphie.~~

~~Cl. basal, perfect ; fracture conchoidal. Transparent ; vitreous. Colourless, honey-yellow, amber, pink, asparagus-green, blue. Becomes electric by heat or friction, and the yellow colours become pink. B.B. infusible. Not affected by h. acid; by digestion in s. acid gives traces of fluorine. The formula requires 33°2 silica, 56°7 alumina, 17°5 fluorine. Part of the oxygen must be replaced by fluorine, as the total of the above is 107°4. Ben-a-bourd and Arran, Scotland ; Mourne Mountains, Ireland; St Michael's Mount, Cornwall; Siberia, Saxony, Bohemia, Connecticut, Australia, Ceylon, Brazil, Peru. The finest topazes are the blue from Scotland and Siberia, the pink, the yellow from Brazil, and the colourless from Pern. The last-named when cut may be distinguished at once from diamond by their elec- tricity. Pyrophysalite isa massive opaque cleavable variety from Falun. Pyenite is a columnar straw-yellow to reddish white variety from Zinnwald in Saxony and Durango in Mexico.~~

~~H=5: G34 t 0%,~~

~~Mg) Si.~~

~~Right prismatic. ooP (m) 128° 42', Poo ® 70° 46', cP (0), OF (p) (fig. 452). Twins common, as figs. 140, 144, 187, 453. Cl. brachydiagonal, perfect ; fracture conchoidal to splin- _° : tery. HH. =7; G. =3°5 to 3°8. Trans- Fig. 452. (Sp. 464.) Fig. 453. parent to opaque; vitreous to resinous. Reddish brown; streak white. B.B. infusible. Not affected by h. acid, partially by s. acid.~~

~~. long prismatic, and striated (fig. 45, and 249 to 252).~~

~~MINERALOGY~~

~~C.c.:; silica 30, alumina 48'5, with 5°5 iron peroxide, 12°5 iron protoxide, 3°5 magnesia; often impure. Shetland, Boharm and Marnoch in Banffshire, St Gotthard, Greiner in Tyrol, Finistére, Urals, and North America. Xantholite is a yellow variety from Urquhart (Inverness).~~

~~465. SAppHiriTe, 4Mg, 541, 28i.,~~

~~Oblique prismatic; granular. H.=7 to 8; G.=3'4 to 3°5. Vitreous; pale blue or green; translucent; dichroic. C.c.: alumina 63°2, magnesia 19°3, silica 14°9. Fiskenaes in Greenland.~~

~~ToURMALINE GROUP.~~

~~466. ToURMALINE, R,Si+ Ri. Rhombohedral ; R 133 10'. Crystals of OR (%'),-42; usually Generally hemimorphic; also radiating and fibrous; fracture conchoidal to uneven. H.=6'5to 75; G.=3 to 3°3. Black varieties opaque, others transparent; vitreous. Generally black ; but colourless, yellow, brown, blue, green, and rose-red; streak white. Different colours often disposed in layers parallel to the axis; and portions of one crystal differing also in colour along the axis. By friction acquires positive electricity; and becomes elec- trically polar when heated. Powder insol. in h. acid ; imperfectly in s. acid. C.c. complex, but all with water and fluorine, some with boracie acid. Coarse black columuar varieties, called Schori, very common in granite and gneiss. Black occur at Portsoy in Banff, Clova, Cabrach, and Rubislaw in Aberdeenshire, Bovey in Devon- shire, St~~

~~*Just in Cornwall, in Greenland, Arendal, Tyrol, and North America ; blue or Jndicolite at Uté in Sweden ; green at Glen Skiag in Cromarty. Crystals ruby-red within, surrounded by green or red at one extremity and green at the other, also blue and pink, at Albany, Paris, and Hebron in Maine. Currant-red or Rubellite in India and Ceylon, also in Siberia and Brazil.*~~

~~*467. DATHOLITE, CaB+ CaSi, +H.*~~

~~*Oblique prismatic, C 89°51'. &P (g) 115° 22', wP°2(f) 76° 38', P (P) 120°, —P%co (a) 45° 8', cP%o (s), 2Peoo (0) (fig. 454); or rhombic with 6: 90°, 6:4 185°, b:c 141° 9', and. f:g 160° 39'. Fracture uneven, or conchoidal. H.=5 to 55; G.= 2°9 to 3. Transparent or translucent ; © vitreous. Colourless and tinted green- ish, yellowish, or pink. In closed tube yields water. B.B. intumescees and melts easily to a clear glass, colouring the flame green; the powder gelatinizes in h. acid. C.c.: 38°1 silica, 21°6 boracic acid, 34°7 lime, and 5°6 water. Bishopton in Renfrew, Glen Farg in Perthshire (fig. 455), Salisbury Crags and Corstor- phine Hill near Edinburgh, Arendal, Uté, Andreasberg, Seisser Alp, Connecticut, and New Jersey. Figs. 238, 239 are pseudomorphs of quartz after datholite termed Haytorite.*~~

~~*468. EucLAsE, AME.*~~

~~*Oblique prismatic, C 79° 44', coP®2 (s) 115°; 8P°3 (/) — . 105° 49'. Crystals specially of oP°2, o Peo (7), 3P°3. Cl. clino- diagonal, perfect; very brittle and fragile; fracture conchoidal.*~~

~~*Fig. 404,*~~

~~*2G18i +*~~

~~*Fig. 455 (sp. 467).*~~

~~*Fig. 457. H.=7°5; G.=8 to 31. Transparent; splendent; vitreous.*~~

~~*Bixeter Voe and Unst in.*~~

~~*fusion soluble with gela-*~~

~~_Chemical and physical characters like~~

~~Cle.; 27-4 alumima, 8°5~~

~~Mountain-green, passing into blue, yellow, or colourless. B.B. intumesces, becomes white, and melts in thin splinters to a white enamel. Not affected by acids. C.c.: 42 silica, 35 alumina, 18~~

~~glucina, 6 water. Peru and Brazil, and Southern Urals. Cannot be used as 'a gem on aecount of its brittleness ; whence its name.~~

~~469. HoMILirE.~~

~~Oblique prismatic, C 89° 21'. H.=5°5; G.=3'28. Black and brownish black. Vitreous. C.c.: 27°28 lime, 16°25 protoxide of iron, 31°87 silica, 18°1 boracic acid. Stoké and Brevig (Norway).~~

~~470, BorrYo.ire.~~

~~Fine fibrous, botryoidal, or reniform. Snow-white to hair-brown.~~

~~datholite, but 10°64 of water,—being 2 equivalents. Arendal.~~

~~471, Gapo.tnire, (Y, Ce, Fe),Si.~~

~~Oblique prismatic, C 89° 28'. o! 116°; P_ 120° 56' (fig. 458). Fracture conchoidal, or splintery. H.=6°5 to 7; G.=4 to 4:4. Translucent on the edges; vitreous to resinous. Black; streak greenish grey. B.B. the con-choidal (vitreous) varieties incandesce; ; gelatinizes in h. acid. OC.c.: 36 to 51 Fig. 458 (sp. 471). yttria, 10 to 15 iron protoxide, 5 to 17 protoxide of cerium with lanthanum, 0 to 12 glucina, and 25 to 29 silica. HIitteré in Norway, Ytterby, Broddbo and Finbo near Falun.~~

~~EpipoTe Grovp.~~

~~472, Zoisits, 4Ca, 341, 681+.~~

~~Right prismatic. oP 116° 26'; oP2 145° 24'; wP3 156° 40'; Po 122° 4'; 2Poo 111 6' (fig. 459). Cl. brachydiag- onal, perfect. H. =6; G. =3'2to3°4.~~

~~*White, brownish grey, and dark green. B.B. intu- mesces, and forms a white or yellow porous mass; and on the edges fuses to a clear glass. C.c.: 29°8 alumina, 24°35 lime, 2°8 oxide of iron, 40°83 silica, and 2°1 water. Glen Urquhart, Dalnain, and Allt Gonolan, In- verness; Sterzing in Tyrol, the Sau Alp in Carinthia, the Urals, and Connecticut. Thulite, peachblossom-red, from Souland in Thelemark (Norway), is similar.*~~

~~*473. Eprpore, 4Ca, 841, 6Si+#.*~~

~~*Oblique prismatic, C 89° 27'. oP°«o (J), ooP 2 (0) 68° 1', P®c0(T) 64° 36', —P (x) 70° 25', — Poo ® 63° 42', P (z) 70°. Crystals complex, with many partial forms. Hemitropes united by 7'; also columnar and granu- lar. Cl. M, perfect; also 7', forming 115° 24'; fracture conchoidal to splintery. H.=6 to7; G.=3'2to03'5. Pellucid ; vitreous. Green to yellowish grey. B.B. fuses and swells to a dark brown slag; after*~~

~~*Fig. 459 (sp. 472).*~~

~~*tinization in. h. acid. iron peroxide, 23°9 lime, 88°3 silica, 1:9" water. Shetland,GlenelginInver- ness, Tilquilly in Aber- : hops deen, in pr in amyg-*~~
~~*Fig. 460. Fig. ace daloid in Mull and Skye ; in granite at Cassencary in Kirkeud- bright; Arendal, Dauphiné, Greenland, the Urals, North America. Withamite from Glencoe is a red, strongly dichroic variety. Pied- montite or Manganese Epidote, brownish violet, from St Marcel, has 20 per cent. of manganese peroxide.*~~

~~*474, ALLANITE (Orthite, Cerine), RySi, + RSI.*~~

~~*Fig. 463. Oblique prismatic, C 65°. oP (z) 70° 48', P (x) 71° 27', —P (d)*~~
~~*XVI — 52*~~

~~*Fig. 462.*~~

~~*410 MINER*~~

~~*96° 40', OP (MD, Po (7), ePo (7). Mf: 7 115°, T:n 111° 21, 7: &130°18'. Often massive or granular; fracture conchoidal. H. =6; G.=8'4 to 3°8. Translucent on edges; vitreous to resinous. Black to brown or greenish;*~~

~~*streak brownish grey. B.B. froths and melts toa brown glass, Gelatinous with h. acid. C.c.: 12 to 18 alumina with peroxide of iron, 13 to 26 oxide of eerium and lanthanum, 2 to 12 yttria, 4 to 20 protoxide of iron, 30 of silica. Small crystals eommon in the syenitic granites of Scotland 3 as at Lairg, Boat of Garten (fig. 468), Aboyne, and Criffel. In lime- stone at Urquhart (fig. 462), Greenland, Hittero and Snarum, Thuringia, Pennsylvania, New Jersey. Orthite (massive) at Finbo, Krageré, and Falun. Cerine (granular) at Riddarhyttan. "Pyr- orthite has carbonaceous matter. Bodenite is a variety.*~~

~~*475. Ipocrass, 3(Ca, Mg),Si+ 2AISi.*~~

~~*Pyramidal ; P © 74° 27' (figs. 464 to 466). Crystals «PD (d),*~~

~~*Fig. 464.*~~

~~*Fig. 465.*~~

~~*oP (J), P (ec), OP (p), Po (0) 56° 29', wP2 (f). Prismatic, striated ; also granular; fracture uneven. H.=6°5; ig G. =3°35 to 4. Pellucid ; vitreous to resinous. Brown, green, yellow; streak white. B.B. fuses easily, with intumescence, to a green or brown glass. Partially gol. in h. acid; after ignition totally, gelatinizing. C.c.: alumina 16, peroxide of iron 7, lime 34, silica*~~

~~*38. Glen Gairn and Crathie, Aberdeenshire, in lime- stone; Broadford, Skye; Wicklow and Donegal, Ire- land; Egg, Norway; Mussa, Piedmont; Vesuvius; Fig. 466.*~~

~~*Wilui river, near Lake Baikal (fig. 463). Cyprine from Thele- mark is azure-blue, from copper. ;*~~

~~*OLIVINE Group. 476. ForsTerity, Mg, Si. Right prismatic. Like olivine (sp. 478). 3°3. Vitreous ; transparent. White, wax- yellow, greenish; streak white. C.c.: magnesia 57°1, silica 42°86. Vesuvius.. Boltonite, red, is from Massachusetts.*~~

~~*477, FAYALITE, Fe,Si.*~~

~~Right prismatic ; 2 »n' 49° 36' (fig. 467). Massive. Cl. rectangular. Black, green- ish, or brownish. Metallic to resinous ; fracture conchoidal; magnetic. H.=6°'5; G.=4 to 41. C.c.: protoxide of iron 70°5, silica 29°5. Mourne Mountains, Treland ; Fayal, Azores.~~

~~H.=6to7; G.=3°'2 to~~

~~478. CHRYSOLITE (Olivine, Peridote), (Fe, Mg),Si . ge al Right prismatic. P (e) 85° 16'-and 'Fis: 467 (sp. 477).~~

~~139° 54'; middle 108° 30'. (k) 80° 53', wPo (MM) (fig. 468). Also diagonal, perfect; fracture conchoidal. H=65 to 73 GC. =33 to 85. 'Wrans: parent; vitreous. Olive-green, yellow, brown, and colourless. B.b. intusible. Soluble, with gelatinizing, in acids. C.c.: 47 magnesia, 12 protoxide of iron, 40 || silica. Talisker in Skye, Haalival in | Rum, Elie in Fife, Unkel on the Rhine, Vesuvius, Esneh in Egypt, Brazil. Hya- losiderite, brown and yellow, with metallic lustre and 380 per cent. protoxide of iron, is from the Kaiserstuhl in the Breisgau.~~

~~479, TEPHROITE, Mn,Si. Fig. 468 (sp. 478). Right prismatic ; granular, with rectangular cleavages. Ash- grey, rose-red. Adamantine; translucent. H.=5%5 to6; G.=4~~

~~to 4:1. C.c.: protoxide of manganese 70°2, silica 29°8. Franklin and Sparta in New Jersey.~~

~~oP (n) 130° 2', Poo (d) 76° 54', 2P oo Cl. brachy-~~

~~massive.~~

~~ALOG Y~~

~~| 480, KNEBELLITE, le,Si+Mn,Si. Massive. Grey, brown, green, black. Glistening ; brittle.~~

~~H.=6'5; G.=3°71. C.e.: protoxide of iron 35:5, protoxide of~~

~~manganese 35, silica 29°5. Ilmenau, Dannemora in Sweden.~~

~~481. Montice.ute, Ca,Si+Mg,Si. Right prismatic. P (/) 110° 43’ and 97° 55’, oP (s) 98° 7’, wP2 (x) 188°6’, Boo (Ke) 81° 57’, kPoo (hk) 120° 8’, P2 © 141° 47’ and 82°,~~

~~wD (b) (fig. 469). Vitreous. Grey, yellowish and greenish, and white ; we~~

~~streak white. Translucent. H.=5 } 1~~

-

~~Se ra~~

~~magnesia 21°9, protoxide of iron 5°6, silica 37°5. Sol. in h. acid, gelatiniz-ing. Somma (Milan).~~

~~482. CHONDRODITE (Humitie), Mg,Sia.~~

~~Right prismatic. P middle edge 156° 38’, polar edges 131° 34’ and 54° 28’ (figs. 470 to 472). Crystals monoclinic in habit, often grauular-~~

~~to 5°5; G. =3 to 3°25. C.c.: lime 35, i] Ea, Wa~~

~~a,~~

~~silicate of magnesia, with 2 to 3of fluorine. From limestone on Loch Ness (?); Pargas, Finland; Gallsj6 and Aker, Sweden; New~~

~~York ; Sparta, New Jersey. Hwmite, from Somnia. 483. Lirvrits, 3(Fe, Ca),Si+FeSi+H. tight prismatic. P (0) polar edges 139° 30’ and 117° 27’; oP~~

~~112° 38’, Poo (d) 112° 49’, oP2 (s) 106° 15’. Crystals (fig. 124) are long-prismatic and vertically striated ; also radiated, columnar, or fibrous; brittle. H.=5°5to6; G.=3‘9to4‘2. Opaque ; resinous or imperfect metallic. Brownish or greenish black ; streak black. B.B. fuses easily to a black magnetic globule. Sol. in h. acid, forming a yellow jelly. C.c.: 29°83 silica, 19°6 iron peroxide, 35°2 iron protoxide, 13°7 lime, and 2°2 water. Rio in Elba, Fossum, | Kupferberg, Rhode Island, and Greenland.~~

~~484, CERITE (Ce, R),Si+H.~~

~~Hexagonal ; 0P; oP; in low six-sided prisms. Generally fiue- | granular ; fracture uneven, splintery ; brittle. H.=675; G.=4°9 to 5. Translucent on the edges; dull, adamantine, or resinous. Clove-brown, cherry-red, or pearl-grey. Sol. in h. acid, leaving gelatinous silica. C.c.: 20°5 silica, 73°5 protoxide of cerium (with didymium and lanthanum), and 6 water. Bastnaes near Riddar- hyttan.~~

~~485. Gates, Zn,Si+H. Right prismatic, and hemimorphic ; 2P2 (P) with polar edges 101° 35' and 132° 26', oP (d) 108° 50', Poo (0) 117° 14', Poo (J)~~

~~128° 55' (fig. 46); common form «Po (s), oP, Po. Also columnar, fibrous, granular, and earthy. Cl. prismatic along oP,~~

~~very perfect; along Po perfect. H.=5; G.=3°'3 to 3°5. Trans- parent to translucent ; vitreous and pearly. — Colourless or white, | but often light grey, also yellow, green, brown, and blue; becomes electric by heat. B.B. decrepitates slightly, but is infusible ; with cobalt solution blue and partly green ; readily soluble in acids, and gelatinizes. C.c.: 25 silica, 67°5 zinc oxide, and 7°5 water. Wau- lockhead, Mendip Hills, Matlock, Raibl and Bleiberg in Carinthia, Aix-la-Chapelle, Iserlohn, Nertchinsk, Pennsylvania, Virginia. Used as an ore of zinc.~~

~~WILLEMITE GROUP. | 486, Wittemirs, Zn,Si. __ Rhombohedral; R 116° 1'. Cl. basal, and prismatie, of; _ brittle. H.-5°5; G.=—39 to £°2. White, yellow, brown, and red. Vitreous lustre. C.c.: oxide of zinc 73, silica 27. Altenberg, | Liége, Greenland, New Jersey.~~

~~MINER~~

~~487, TroostiTE, ZnSi+MnSi. |~~

~~Rhombohedral ; R 116°. Cl. prismatic, oP2; brittle H.=5°5 ; G.=4°1. Asparagus-green, grey, and reddish brown. Vitreous. C.e.: oxide of zinc 58, oxide cf manganese 13, siliva 28. New Jersey. |~~

~~488, CENTROLITE (PbMn) Si.~~

~~Right prismatic; oP 115° 18'. G.=6°2. Red-brown. Chili.~~

~~489, PHENACITE, GI,Si.~~

~~Hexagonal and tetartohedral; R (p) 116° 36' (fig. 473). Crystals Kk, oP2, 2P2. Twins with +~~

~~parallel axes, and intersecting. CL R, and oP2; fracture con- choidal H.=7°5 to 8; G.=~~

~~Form «oP, P, wPo. H.=5; Cl. prismatic; splendent on P. Southern~~

~~| wine to purplish red.~~

~~2°97. Transparent or trans- lucent ; vitreous. Colourless, and wine-yellow or brown when fresh, but colour soon lost on exposure. B.B. infusible; not | affected by acids. C.c.: glucina |; 45°8, silica 54°2. Framont in Alsace, Takovaya in Urals, Miask, Durango in Mexico. 490. DioprasE, CuSi+#. Hexagonal and rhombohe- dral; R 125° 54', —2R ® 95° 28', oP2, -2Ri(s) (fig. 474). Cl. R, perfect; brittle H.=5; G.=3°2 to 3:3. Transparent or translucent; vitreous. Emerald-green, rarely verdigris-green or blackish green; streak green. C.c.: 38°7~~

~~Fig. 473 (sp. 489).~~

~~silica, 50 copper protoxide, and 11°3 water. Altyn-Tiibeh in the Kirghiz Steppe, Murosh- naya, Copiapo.~~

~~491. CHRyYsocoLLA, CuSi+2H.~~

~~Botryoidal or investing ; brittle; fracture econchoidal. H.=2to3; G.=2to2°3. Trans- lucent; resinous. Verdigris- to emerald-green or azure-blue ; streak greenish white. C.c.: | 34°83 silica, 44°94 copper protoxide, and 20°23 water. Leadhills, Lackentyre in Kirkeud- | bright, Cornwall, Saxony, Hungary, Spain, Urals, Australia, Chili. |~~

~~492. BoGoOSLOVSKITE (Kupferblau).~~

~~*Massive; fracture conchoidal; brittle. H. = 4to5; G.=2°56. Sky-to ultramarine-bluc ; streak smalt-blue,and shining. A silicate of copper, with 45°5 per cent. copper oxide. Schapbach Valley in Raden, Bogoslovsk in the Urals. Demidowite may be the same.*~~

~~*Fig. 474 (sp. 490).*~~

~~*GARNET GRovur.*~~

~~*493. GARNET, R,Si,+ BSi.*~~

~~*Cubic ; most common forms «0 and 202 (figs. 33, 40, 60, 475). | Also granular. Cl. dodecahedral; fracture conchoidal, or splintery. — H.=6‘5 to 7°5; G.=8‘5 to 4°3. Pellucid ; vitreous or resinous. Rarely colourless or white ; generally red, brown, black, green, or yellow. B.B. in general fuses to a glass, black or grey in those containing much iron, green or brown in the others, and often magnetic; imperfectly soluble in h. acid. C.c. ex-ceedingly variable, but generally forming two series, according as R,O, is chiefly alumina or 2 chiefly iron peroxide; and these are again Fig. 475. divided according as RO. is more especially lime, iron pro- | toxide, magnesia, or a similar base. The more important varieties are—*~~

~~*(1) Lime-Alumina Garnet, Ca,Si,+AlSi, with 40 silica, 23 alumina, and 87 lime. To this subdivision belong—*~~

~~*(a) Water Garnet.—Colourless to white. Craig Mohr, Aberdeen; Thelemark in Norway.*~~

~~*(b) Grossular.—Olive- to gooseberry-green. Craig Mohr; Wilui river ; America.*~~

~~*(c) Cinnamon Stone.—Hyacinth-red to’ orange-yellow. Glen | Gairn (Aberdeen), Allt Gonolan and Ord Ban (Inverness), Ceylon, | Wernland. Romanzowite, from Kimito (Finland), is the same. | This variety when polished is often sold as Hyacinth.*~~

~~*(d) Common Lime Garnet.—Here one half of the alumina is replaced by iron peroxide. Colours red, brown, yellow. Piedmont, Vesuvius, the Urals.*~~

~~*(2) Magnesia-Alumina Garnet ; RO chiefly magnesia.*~~

™~

~

~~*Arendal.* |~~

~~*| bedded or attached.*~~

~~*I to 6; G.=—3°43.*~~

~~*| to 5; G.=5°9 to 671.*~~

~~*ALOGY 411*~~

~~*(3) Manganese-Alumina Garnet; RO=MnO; reddish-brown. Spessart (Bavaria), Sweden. ,*~~

~~*(4) Magnesia-Iron-Lime-Alumina Garnet, Pyrope.—-Colour port- Elie in Fife, Zoblitz in Saxony, Bohemia.*~~

~~*(5) Lron-Alumina Garnet, Almandine, Noble Garnet. —Colum- bine-red, inclining to violet, blood-red, and reddish brown. Common in mica-slate, gneiss, and granite. Shetland, Ross, Inverness, Aberdeen, Falun, Arendal, Tyrol, the Urals, North America, Pegu, and Ceylon.*~~

~~*(6) Lime-Chrome-Alumina Garnet, Ca,8i, + (6r, ADSi, Uwaro- wite, Emerald-green; with 22 per cent. chrome oxide. .Bissersk and Kyshtimsk in the Urals, India, and California.*~~

~~*(7) Lime and Iron Garnet, Ca,8i,+¥Fe, Si. This includes—*~~

~~*(a) Common Lron-Garnet, Rothofite, Allochroite.—Subtranslucent or opaque. Green, brown, yellow, or black; with white, grey, or yellow streak. Sweden and Arendal.*~~

~~*(6) Melanite.—Black ; opaque; in thin splinters translucent ; streak grey ; slightly magnetic. Albano near Frascati, Vesuvius, France, Lappmark.*~~

~~(e) Colophonite.—Yellowish-brown to pitch-black, also yellow or red; resinous ; streak white. G.=3°48. Arendal.~~

~~The red varieties, when cut en cabochon, are termed Carbuncles.~~

~~Anorthic. Crystals unsymmetrical. w: P 185° 81'; w:7 115° 38', P:r 184° 45' (figs. 186, 187). Cl. distinct along planes trun- cating the sharp edges between P and wv andP and r, H.=6°5 to7; G.=8'2 to3°3. Pellucid; vitreous. Clove-brown, inclining to smoke-grey or plum-blue; but often cinnamon-brown in one direc- tion, dark violet-blue in a second, and pale olive-green in a third (triechroism). B.B. colours flame green; intumescces, and fuses easily~~

~~| toa dark green glass, becoming black in the ox. flame ; not sol. inh.~~

~~acid till after ignition, when it gelatinizes. C.c.: 45°9 silica, 5'9~~

~~| boracic acid, 17°5 alumina, 9°3 iron (with manganese) protoxide,~~

~~and 21°4 lime. Botallack and other mines in Cornwall, Bourg~~

~~_ d'Oisans in Dauphiné, Kongsberg, Arendal, Nordmark in Sweden,~~

~~Pyrenees, St Gotthard, Tyrol, Thum in Saxony, Urals, and North America.~~

~~495. DANBURITE (Ca, B) 28i. Right prismatic. oP (Z) 122° 52', owP2 (¢) 94° 52', Peo (d) 97° 7', 4Poo (w) 54° 58', OP ©, P (0), 2P2 (1), cPoo (a), old (n).~~

~~Fig. 477. Fig. 479.~~

~~Fig. 476. Fig. 478. Cl. basal; fracture uneven to subconchoidal ; vitreous to greasy lustre. H.=7to7°5; G.=2°986 to 3°021. Pale yellow to reddish brown. Translucent; brittle. C.c.: 22°76 lime, 28°46 boracic acid, 48°76 silica. Danbury in Connecticut, Russell in New York.~~

~~HELVINE Grovr.~~

~~496. HELvINE, Mn$+3R,Si.~~

~~*Cubic and tetrahedral. 5 or 7-3 (fig. 64 and with 66), Im-*~~

~~*Cl. octahedral. H.=6 to 6°5; G.=3‘1 to Translucent on the edges; resinous. Wax-yellow, siskin- B.B. in the red. flame fuses with in- tumescence to a yellow obscure pearl; sol. in h. acid, evolving sulphuretted hydrogen, and gelatinizes. C.c.: 34 silica, 10 glucina, 8 iron protoxide, 43 manganese protoxide, and 5 sulphur. Schwarz- enberg in Saxony, and near Modum in Norway.*~~

~~*497. DANALITE, 8R.Si+Zns.*~~

~~*Cubic. In octahedra, with striated dodecahedral planes. H.=5°5 Vitreous to resinous. Flesh-red to grey ; streak lighter. Translucent; brittle. C.c.: protoxide of -iron 29, of manganese 6°5, of zinc 19, silica 31°5, sulphur 5°5. Rockport in Massachusetts.*~~

~~*3°3. green, or yellowish brown.*~~

~~*498, EULYTINE, Bi,Si;.*~~

~~*202*~~

~~*2*~~

~~*Cubic and tetrahedral. — and — ==*~~

~~*The crystals (fig. 66) small, and often with curved faces ; fracture conchoidal. H.=4°5 Transparent and translucent ; adamantine. streak white or grey. C.c¢.: Schneeberg and Brauns-*~~

~~*Clove-brown, yellow, grey, or white; 16°2 silica and 83°8 bismuth peroxide. dorf near Freiberg.*~~

~~*412*~~

~~*SCAPOLITE GROUP. 499, SancoxiTE, 8Ca, 341, Na, 9Si. Pyramidal. P 102° 54; wPo; OP; P, and other facesas in fig. 480, many of the faces being alternately hemihedral. H.=5‘5 to 6; G.—2°93. Vitreous. Grey to rose-red. Translucent ; very*~~

~~*brittle. B.B. fuses to a white enamel; gelatinizes with acids,*~~

~~*C.c: alumina 21°5, lime 32°4, soda 3°38, silica 40°5. Somma.*~~

~~*| Crystals imbedded, or in druses ; also | massive-granular; fracture conchoidal,*~~

~~*Fig. 480 (sp. 499).*~~

~~*Fig. 481 (sp. 500).*~~

~~*500. Mrronrrs, 6(Ca, Na), 441, 98i.*~~

~~*P (0) 68° 42'; Poo (é); oP (a); oP (b) (fig. 481). H.=5'6 to 6; G.=2°6*~~

~~*Pyramidal. Cl.. maerodiagonal.*~~

~~*to 2°74. Vitreous. Colourless or white.*~~

~~*Transparent. Much eracked. C.e.: 31°9*~~

~~*alumina, 26'2 lime, 41°9 silica. Gelatinizes*~~

~~*in acids, Somma. A*~~

~~*4*~~

~~*501. MizzontTE, 6(Ca, Na), 4A], 158i. Pyramidal ; P 64° 4' (fig. 482). Similar to*~~

~~*meionite.- C.c.: alumina 23°8, lime 8°8, soda 9°8, silica 54°7. Insoluble in h. acid. Somma.*~~

~~*502, ScapouiTs, 3(Ca, Na)Si+ALSi,. Fig. 482 (sp. 501).*~~

~~*Pyramidal. P 63° 42'; «Po; P; oP; also massive. Cl. oPoo, perfect; and oP. H.=5 to 55; G.=2°6 to 28. Trans- parent or translucent ; vitreous, pearly, or resinous. Colourless, but also pale grey, green, yellow, or red. B.B. melts with effervescence to a vesicular glass; in the closed tube may show traces*~~

~~*of fluorine; with solution of cobalt becomes blue. Sol. in hi. acid. C.c.: 49 silica, 28 alumina (with iron peroxide), and 28 lime (with soda). Tiree (Scotland), Arendal, Tunaberg, Pargas, Massachusetts, and | New York. Known by its rectangular cleavage, resinous lustre on fractured surfaces, and action B.B. Dipyre, P 64° 4', is a variety.*~~

~~*508. MELLILITE (HIwmboldtilite), 2(Ca, Mg)Si,+ (Al, Fe)Si.*~~

~~*Pyramidal. P 65°30'; OP; oPo. Cl. basal, perfect. H.=5 to 5°5; G.=2°91 to 2°95. Translucent on edges ; vitreous to resin- ous. Houey-yellow, orange-brown, and yellowish white. C.e.:*~~

~~*32 lime, 7 magnesia, 9 alumina, 7 iron peroxide, 40 silica. Capo di Bove, and Vesuvius. :*~~

~~*Pyramidal. P. 59°; 0P; wPoo; oP38; 2P. Cl. basal H.=5'5 to 6; G.=2°9 to 3°1. Translucent on edges. Dull resinous. Mountain-, leek-, or olive-green, and liver-brown. C.e,: 22 alumina, 5 iron peroxide, 35 lime, 4 magnesia, 31°4 silica. Mon- zoni in the Fassa Valley.*~~

~~*NEPUELINE GRovp. 505, Leucire, Al, Si,+KSi. Pyramidal. Combination of the ditetragonal pyramid (7) with the tetragonal pyramid 'o), and 2P (u)with oP(m). Hemitropes united |*~~

~~=~~

~~*Fig. 483.*~~

~~*by (wu). Fracture conchoidal. H.=5'5to6; G.=2°4to2°5. Trans- parent to translucent on the edges; vitreous, inclining to, resinous.*~~

~~*B.B. infusible ; with cobalt solution becomes blue. Sol. in h.*~~

~~*Colourless, but greyish, yellowish, or reddish white; streak white. |*~~

~~*| to 2°58.*~~

~~*| soda, 4'7 sodium, and 7°3 ehlo-*~~

~~; acid, without gelatinizing.~~

~~C.c.: 54°9 silica, 28°6 alumina, and 21°5 potash. Abundant in the lavas of Vesuvius, the tufas near Rome, and the peperino of Albano; also at the Kaiserstuhl, and near Lake Laach. Readily distinguished from analcime by its in- fusibility, and by never showing faces of the cube.~~

~~506, NePuELINE (Eleolite), AlSi+4(Na, K)Si.~~

~~Hexagonal. P 88° 10'. oP, OP, P common ; also fig. 485.~~

~~or uneven. H.=5'5 to 6; G.=2°58 to 2°64. Transparent or translucent ; vitreous and resinous. Colourless or white (nepheline); or opaque, dull resinous, and green, red, or brown (eleolite). B.B. melts diffieultly (nepheline), or easily with slight effer- veseence (elxolite), into a vesicular glass. Sol. and gelatinizes in h. acid. C.e.: 41°2 silica, 35°3 alumina, 17 soda, 6°5 potash. Nepheline at Monte Somma, Capo di Bove, Katzenbuekel in the Odenwald, Aussig, and Lusatia. Eleolite in the zireon syenite at Laur- Fic. 485 vig, Fredriksvirn, Brevig, and Miask. Massie~~

~~Davine, with 4P 51° 46', seems only a variety; as also Canert- nite, bright blue, and with some earbonate of lime.~~

~~Hexagonal. oP; 0P; oP2; oP§. Cl. oP. H.=6; G.=2°42 Colourless to yellow; lustre silky. Sommaand Vesuvius.~~

~~Cubic; 0, and fig. 486 ; generally distorted ; also massive and~~

~~granular. Cl. 0; fracture eonehoidal or uneven. H.= 5°5; G.=2°13 to 2°29. Trans-~~

~~lucent; vitreous. White, grey, and rarely green or blue. C.e.: 87 silica, 31°8 alumina, 19°2~~

~~rine. Greenland, Vesuvius, Ilmen Hills, Fredriksvirn, and Litchfield in Maine.~~

~~*509. NosEAN, 3(AlSi+ Nasi) + WNas.*~~

~~*Cubic ; and granular. H.= 55; G.=2°28 to 2°40. Trans- lucent; vitreous to resinous. Ash or yellowish grey, sometimes blue, brown, or black. C.c.: 36 silica, 81 alumina, 25 soda, and 8 sulphuric acid. Lake Laach, and Rieden near Andernach, on the Rhine. Occurs in phonolites, in minute crystals.*~~

~~*Fig. 486 (sp. 508).*~~

~~*Cubie; chiefly «0; also fig. 487; but more common in grains. Cl. ©0. H.=5 to 5°5; G.=2‘4 to 2°5. Semitransparent or trans- lucent; vitreous or resinous. Azure- or ; sky-blue; streak bluish white. C.c.: 34°2 silica, 28°5 alumina, 11°5 soda, 4°3 potash, 10°4 lime, and 11°1 sulphuric acid. Vesu- vius, Mount Vultur near Melfi, the Cam- pagna of Rome, and Niedermendig near Andernach.*~~

~~*511. Lapis-Lazv.i.*~~

~~*Cubic ; Oo; generally massive, granu- e lar, H.=5‘5; G.=2‘38 to 2°42. Trans- Fig. 487 (sp. 510). lucent on edges; dull resinous or vitreous. Ultramarine, or azure-blue; streak light blue. B.B. fuses readily to a white porous glass. In h, acid the powder is dissolved and gelatinizes, evolving sulphuretted hydrogen. C.c.: 45°50 silica, 5°89 sul- phuric acid, 31°76 alumina, 9°09 soda, 3°52 lime, 0°86 iron, 0°42 chlorine, 0°95 sulphur, 0°12 water. Near Lake Baikal, China, Tibet, Tartary, Monte Somma, and Chili. It is used for ornamen- tal purposes, and in the preparation of ultramarine. The colour both in it and hauyne seems due to some compound of sulphur with sodium and iron.*~~

~~*Mica Group.*~~

~~*Oblique prismatic, C 89° 59'. OP ©, 98° 41' P (m),-4P (0),*~~

~~*o Peco (b), Bao ®, — $P°8 (2). Cl. basal, perfect; sectile; thin plates elastic. H.=2°5 to 3; G. =2°85 to2:9. Transparent, but often only*~~

~~*MINERALOGY*~~

~~*in very thin plates. Generally uniaxal, sometimes with diver- gence=56°. Metallic, pearly. Usually dark green, brown, or black; streak greenish grey or white. B.B. difficultly fusible to a grey or black glass. Completely sol. in concentrated s. acid, leaving white*~~

~~*+ !*~~

~~*i*~~

~~*1 1 ! '*~~

~~*how m*~~

~~*,*~~

~~*Fig. 488. Fig. 489.*~~

~~*pearly plates of silica. C.c.: 39 silica, 17 alumina, 10 iron protoxide, 20 magnesia, 9 potash. Hillswick, Shetland, in gneiss; Sutherland, Ross, Inverness, in limestone; Skye and Fife in trap; Pargas, Boden- mais, Greenland, New York. Rubellan is a decomposed variety.*~~

~~*Oblique prismatic. Cl. basal, perfect. H.=3; G.=3:1. Vitreous to adamantine. Chocolate-brown to black. Weathers pale green and ochry. Difficultly soluble in acids. B.B. fused with difficulty toa highly magnetic bead. C.c.: silica 36, alumina 18, ferric oxide 4°5, ferrous oxide 18, magnesia 9, potash 8, water 3. Common in the granites of Scotland. Black Forest, Harzburg, Tyrberger.*~~

~~*Oblique prismatic. Cl. basal, perfect ; brittle. H. =3; G. =2°97. Vitreous; transparent to opaque. Rich brown to raven-black. B.B. fuses easily to a*~~

~~*black feebly-magnetic bead. Sol. in h. acid, leaving pearly scales of silica. C.c.: 37 silica, 17 alumina, 24 iron peroxide, 3 protoxide of iron, 8 potash, 10 magnesia, 4 water.*~~

~~*Rarely in gneiss, Scotland ; common in granite, Ireland ; and Pers-*~~

~~*berg, Sweden.*~~

~~*515. ANoMITE, 12Mg, 3A1, 2K, H, 125i,*~~

~~*Oblique prismatic. c¢:m 98° 42'. Form e¢, m, 0, b (sec fig. 488); divergence of optic axes 12°to 16°. Monroe(New York), Lake Baikal.*~~

~~*Oblique prismatic. OP ©, P(m),—$P (0), «Poo (5). ¢:m98° 30' to 99°. Cl. basal, perfect. H.=2°5 to 3; G.=2°75 to 2°97. Pearly to submetallic. Yellowish brown with copper-like reflexion; also green, white, and colourless. Transparent. Divergence of optic axes 3° to 20°. C.e.: 14 alumina, 2 protoxide of iron, 28 mag- nesia, 8°6 potash, 2°57 fluorine, 41 silica. B.B. whitens, and fuses on edges. Decomposed by s. acid, leaving the silica in scales. Pargas (Finland), Fassa Valley, New York, Canada, Ceylon. Char- acteristic of serpentine and of dolomitic limestones.*~~

~~*517. ZINNWALDITE.*~~

~~*Oblique prismatic. Forms as in figs. 490, 491; also 2P0o (H) and 3P°3 (x). m:¢ 98° to 99°. Divergence of optie axes 65°. G.= 2°82 to 3°2. C.c. similar to muscovite (sp. 519), but with 4 to*~~

~~*Fig. 490. 8 fluorine, 2 to 5 lithia, and traces of rubidium, cesium, and thal- lium. Altenberg and Zinnwald, St Just and Trewavas in Cornwall. Cryophyllite from Cape Anu in Massachusetts is similar.*~~

~~*518. LEPIDOLITE. Oblique prismatic. Forms like muscovite. Divergence of optic*~~

~~*axes 50° to 77°. Cl. basal, perfect. H.=2°5 to 4; G.=2°84 to 3. Often massive; scaly granular, coarse or fine. Lustre pearly. Colour rose-red, violet, lilac, yellow, greyish white. Contains 5 to 6 per cent. lithia, with*~~

~~rubidium, cesium, and thallium, also fluorine. B.B. colours flame red. Mourne Mountains, Rozena (Moravia), Uté (Sweden), Ekaterinburg, Maine.~~

~~519. MuscovitTE (Afuscovy-Glass), 3A1Si+ Si.~~

~~Right prismatic, with monoclinic habit. OP ©; oP (AN; oP%o (0); P (m); 2P%co (y). ooP nearly 120°. Twin-face c. Cl. basal, perfect ; elastic. Angle of optie di- vergence from 44° to 77°. Metallic, pearly. Colourless, and tinged of various shades to black. B.B. fuses to an opaque enamel. Not affected by acids. C.c.: 36°6 alumina, 11°8 pot- ash, 45-1 silica, 4°5 water, with traces of fluorine. Shetland, Loch Glass (crystals 15 inches in length) and Struay Bridge in Ross, Aber-~~

~~Fig. 492." in Sutherland, Glen Skiag | side, Bute, and Jnra in Scotland. Cornwall, Cumberland, Wales, Fassa Valley, Urals, America.~~

~~deen, Cornwall, St Gotthard, Norway, Sweden, Siberia. Crystals over a yard in diameter in China, where it is used for windows. Fuchite, bright green, has 6 per cent. of chrome oxide. Margaro- dite contains 4 to 6 water. ilbertite, Cornwall, may be different.~~

~~Massive; foliated. Lustre pearly. H.=2°5 to 8; G.=2°78 to2°9,~~

~~| Yellowish, greyish, and greenish. C.c.: 40°1 alumina, 6°1 soda,~~

~~47°75 silica, 4°6 water.. Monte Campione, St Gotthard. 521. SANDBERGERITE (Baryta-Mica).~~

~~_ White minute scaled aggregates. G.=2°894. C.c.: 30-2 alumina, 4'9 magnesia, 5°9 baryta, 7°6 potash, 42°6 silica, 4°48 water, Pfitsch Valley in Tyrol, and the Swiss Alps.~~

~~522. MARGARITE (Lime-Mica).~~

~~Right prismatic. Cl. basal perfect. H.=3°5 to 4-5; G. =2°99 to 3°1. Lustre of cl. pearly. Lateral planes, vitreous. Snow-white, reddish white, and pearl-grey. Lamine brittle. Optic axial angle 109° to 129°. C.c.: 51°2 alumina,~~

~~11°6 lime, 2°6 soda, 30°1 silica, and 4-5 water. Greiner in Tyrol, Naxos, Asia Minor, Greece, Pennsylvania, North Carolina. D¢phavnite is similar.~~

~~Like muscovite, but laminz not easily separable. H.=3°5 to 4°5; G.=2°83 to 3. Lustre of cl. pearly to adamantine. White to colourless. Transparent to opaque. Lamine brittle. Optic axial angle 714°. C.c.: alumina 42°3, lime 1°5, potash 8:2, soda 5°9, silica 41°6, water 5°5. Unionville in Pennsylvania. —~~

~~524. CLINTONITE, (2R,2A1),Si }4E.~~

~~Oblique prismatic; in hexagonal tables, or massive foliated. basal, perfect. H.=5 to 5°5; G.=3°15. Translucent ; pearly to metallic on the cleavage. Angle of the optic axes 3° to 18°. Reddish brown to yellow. C.c.: 39°7 alumina, 21:1 magnesia, 13°1 lime, 19°2 silica, 2 protoxide of iron, 4°9 water. Amity and War- wick in New York. Brandisite is similar.~~

~~525. XANTHOPHYLLITE.~~

~~Oblique prismatic, C about 90°. Crystalline aggregates. Radiate lamellar. H.=4°5to6; G.=3-1. Lustre pearly. Colour yellowish to copper-red. Angle of optic axes 0° to 20°. C.c.: alumina 43°6, lime 13, magnesia 17°5, silica 16°9, water 5°1. Zlatoust.~~

~~526. CHLoRIToID, FeSi+Ali#t.~~

~~Right prismatic; in foliated crystals; brittle. Cl. basal. Lustre greasy to pearly. H.=5°5 to6; G.=3°52 to 3°56. Dark green ; streak greenish white. C.c.: 40 alumina, 27 protoxide of iron, 25 silica, 7 water. B.B. infusible, but becomes magnetic. Decomposed by s. acid. MHillswick in Shetland, Pregratten in Tyrol, Ekaterinburg, Canada.~~

~~527. MASONITE.~~

~~_ Broad plates. H.=6°5; G.—3°53. Grey-green. Streak grey. Pearly to vitreous. C.c.: 26°4 alumina, 19 peroxide of iron, 16°7 protoxide of iron, 32°68 silica, 4°5 Water. Middletown in Rhode Island. –~~

~~528. OTTRELITS, Al,Sig+3(Fe, Mn)Si+ 3H.~~

~~Thin hexagonal tables. Cl. parallel to the prismatic faces. H. = 5°5; G.=4°4. Translucent; vitreous. Greenish or blackish grey. C.c.: 24°3 alumina, 16°8 protoxide of iron, 11°1 protoxide of manganese, 43°4 silica, 5°65 water. Ottrez in the Ardennes (Luxemburg), Aste in the Pyrenees, Ebnat in Bavaria, Newport (Rhode Island), Vardhos (Greece).~~

~~529. PyrosMALITE, 7RSi+ RCI, + 5H. .~~

~~Hexagonal. P101° 34'; crystals oP, OP; tabular; also granular. Cl. basal, perfect ; brittle. H.=4 to 4:5; G.=3to3'2.. Trans- lucent to opaque; resinous, or metallic-pearly. Liver-brown to olive-green. OC.c.: 35°5 silica, 27°5 iron protoxide, 21°5 manganese protoxide, 8 chloride of iron or manganese, and 7°5 water. Nord- mark in Sweden.~~

~~530. ASTROPHYLLITE, (Rg, B)ySig. . Right prismatic, with oblique habit. and in stellate groups. Cl. basal, perfect. H.=3°5; G.=3°33. Submetallic to pearly. Tombac-brown to gold-yellow. Pellucid. Axial divergence 118° to 124°. C.c.: peroxide of iron 9°3, protoxide 23°6, protoxide of manganese 10, soda 3°9, potash 5:9, titanic acid 7°90, silica 39°2. Brevig, El Paso in Colorado.~~

~~Cl.~~

~~In long tabular prisins,~~

~~' CuLoritre GROUP.~~

~~581. Cuorire, 2RSi+R,Al+ 3H. Hexagonal. P 106° 50'; crystals tabular of OP, »P or OP, P (fig. 493); often in comb-like or other groups ; generally foliated and scaly. H.=1to 15; G.=2°78 > to 2°96. lLeck-green to blackish green; streak greenish grey. C.c.: 21 alumina, 20 protoxide 55, gos. of iron, magnesia 18, silica 24, water 11. Tarf- =~~

~~414~~

~~532. PENNINE, 4MgSi+ Mg,Al1+ 5.~~

~~*Hexagonal, rhombohedral ; R 65°.28'. rhombohedrons, with or without the base. Lustre resinous. H 2 to 3; G.=2°6 to 2°77. Streak greenish white. B.B. exfoliates, becomes white, and fuses on the edges to a white enamel, Com- pletely sol. in warm s. acid. C.c.: 83°6 silica, 14°4 alumina, 39°4 magnesia, and 12°6 water; but with 5 to 6 iron protoxide re- placing magnesia. Scalpa in Harris, Glen Lochy in Perthshire, Zermatt in Valais, Tyrol, Ala di Stura in Piedmont, Mauleon in the Pyrenees. Lewehtenbergite is the same. Kammererite, with 5 to 8 chromium sesquioxide, is violet-blue or green ; Unst, Siberia, Pennsylvania. Rhodochrome and Tabergite are also varieties.*~~

~~*533, CLINOCHLORE (Ripidolite), 3MgSi+ Mg,Al+ 4H.*~~

~~*Oblique prismatic, C. 76° 4'. oP i9i°°93. "OP*~~

~~*Sy'; OP: oP 192°8'.. Crystals —2P, P, 4P%o0, OP (n, m, t, P, fig. 494). Twins common; lustre vitreous or resiuous. H.=2 to-3; G.=2°6 to 2°8. B.B. becomes white, and fuses on thin edges to a greyish yellow enamel. C.c.: 30°3 silica, 17°3 alumina, 40°3 magnesia, and' 12°1 water. Edentian and Blair Athole in Scotland, Traversellain Piedmont, Akhmatovsk in Urals, West Chester in Pennsylvania. Corwndophyllite, Epi- chlorite, and Kotschubeyite are varieties.*~~

~~*534. PYROSCLERITE, (3K, $8),Si3+ 3H. _ Right prismatic. sectile. H.=3; G.—2°7 to 2°8. Pearly; translucent. Apple-, emerald-, and grey-green. C.c.: alumina 13-4, chrome oxide 174, protoxide of iron 3°5, magnesia 31°6, silica 37, water 11. Porto- Ferraio in Elba, China. !*~~

~~*MINER*~~

~~*Crystals chiefly very acute*~~

~~*Fig. 494. Cl. basal, perfect ; fracture uneven ; brittle,*~~

~~*535, CHONICRITE.*~~

~~*Massive; crystalline-granular and globular-radiated. H.=2'5 to 3;G.=2°91. Weak silky. White, with yellowish spots ; greenish blue. C.c.: 17°1 alumina, 22°6 magnesia, 12°6 lime, 35°7 silica, 9 water. B.B. fuses easily, with*~~

~~*intumescence, to a grey glass. composed by h. acid, with separation of silica. Colmonell (Ayrshire), Porto-Ferraio.*~~

~~*586. PycNoTROP. ;*~~

~~*Large grained aggregates. Cl. along two rectangular faces ; frac- ture hackly, splintery. Greyish white to brown-red. Vitreous to greasy. H.=2 to 2°3; G.=2°6 to2°7. C.c.: alumina 29°3, mag- nesia 12°6, potash 474, silica 45, water 7°8. Waldheim in Saxony.*~~

~~*537. Tuvrincite, ($R, Ff, +4(Al, #e)),Si, + 4H.*~~

~~*Massive ; scaly. H.=2to25;G.=3°2. Pearly. Olive-green to pistachio-green ; streak paler. Very tough. Powder greasy. C.c.: alumina 16, peroxide of iron 14, protoxide of iron 33, silica 23, water 11. Schmiedefeld in Thuringia, Harper's Ferry on the Potomac, Hot Springs in Arkansas.*~~

~~*538. Deuessite, (Fe}, Mg3),Si,+ (Alyy, Feg,)Si+ 34+ 2MgH.*~~

~~*Massive ; scaly. H.=2 to 2°5; G.=2°6 to 2°89. Olive-green to |*~~

~~*dark green, passing to dark brick-red ; streak light greeu. C.c.: alumina 16°3, protoxide of iron 12°6, magnesia 21, silica 31°5, water 15°8. Common in igneous rocks of Old Red Sandstone and Coal- measure age in Scotland. Oberstein, Zwickau, Lagréve near Mielin.*~~

~~*589. CronsTEDTITE, FeSi+(Fe, Mg), Si+ 3H.*~~

~~*Rhombohedral; radiated columnar. In _. : tapering hexagons, and hemihedral (figs. Fig.495. (Sp.589.) Fig.496. 495, 496). Cl. basal, perfect; elastic. H.=2°5; G33 to 2-5. Vitreous, Coal-black and brownish black; streak dark olive-green.*~~

~~*C.c.: protoxide of iron 39, peroxide of iron 29, silica 22, water 11. Huel Maudlin in Cornwall, Przibram, Brazil (Siderosehisolite).*~~

~~*TALC AND SERPENTINE GROUP.*~~

~~*540. Tato, Mg,Si,+7k.*~~

~~*Right prismatic (%) ; rarely found in six-sided or rhombic tables ; generally massive, granular, or scaly. Rarely fibrous. Cl. basal perfect ; soft, sectile, and flexible in thin plates. H.=1; G. =2°6 to 2°8. Transparent in thin plates, and optically binaxal; pearly orresinous. Colourless, but generally greenish or yellowish white to apple- or olive-green. Feels very greasy. B.B. emits a bright light, exfoliates, and hardens (H. =6), but is infusible ; with cobalt solution becomes red. Not sol. in h. or s. acid before or after igni- tion. C.c.: 63°5 silica, 31°7 magnesia, and 4°8 water. Unst in Shetland, green; Cairnie in Aberdeenshire, brown; Greiner in Tyrol, Sala and Falun, the Pyrenees. Used as crayons, also for forming crucibles and for porcelain.*~~

~~*Steatite.—Massive. Grey, red, yellow, or green. Shetland,*~~

~~*De- |*~~

~~*| H.=3 to3°5; G.=2°5 to 2°7. Translucent to opaque ; | ous.*~~

~~*ALOG Y.*~~

~~*Sutherland, Portsoy, and near Kirkcaldy, Scotland; the Lizard Poiut, Cornwall ; Briangon, Wunsiedel. Savage nations cut the steatite into culinary utensils.*~~

~~*Potstone is a mixture of talc, chlorite, and other minerals.*~~

~~*541. PICROPHYLL, 3RSi+2H.*~~

~~*Right prismatic. H.=2°5; G.=3°75. Dark green. Foliated, shining. C.c.: magnesia 3071, protoxide of iron 6°9, silica 49°8, water 9°8. Sala in Sweden.*~~

~~*542. PicrosMINE, 2MgSi+ Hf.*~~

~~*Right prismatic, but massive. Cl. coPco perfect, less so in other directions ; sectilee H.=2°5 to3;G.=2°5 to 2°7. Translucent or*~~

~~*opaque ; vitreous, but pearly on oP, Greenish white, grey, or blackish green ; streak colourless. Yields a bitter odour when breathed on ; hencethe name.*~~

~~C.c.: 55°8 silica, 36°1 magnesia, and 8‘1 water. Presnitz in Bohemia, and Greiner in Tyrol. a~~

~~543. Monravire, 4(3Mg, #Fe)Si+H.~~

~~Massive, foliated, translucent, and yellowish-grey. H.—6;G.= 3°27. O.c.: silica 55°2, magnesia 31°9, protoxide of iron 8°8, water 4-1. B.B. infusible. Bergen in Norway.~~

~~544, MEERSCHAUM, 2\Ig,Si, + 41.~~

~~Fracture earthy ; sectilee H.=2 to 25; G.=0°8 to 1 (when moist nearly 2). Opaque, dull. Yellowish and greyish white; streak slightly shining. Feels rather greasy, and adheres strongly to the tongue. C.c.: 54°2 silica, 24°7 magnesia, and from 9 to 21°7 water. es ae Anatolia, near Madrid and Toledo, Moravia, Werm- land. ;~~

~~545. ApHRODITE, 4MgSi+H. Soft and earthy. G.=2°21. silica, 35°3 magnesia, 11°9 water. 546. SpapAITE, Mg,Si,+ 444. Massive ; fracture splintery ; sectile. H.=2°5. Translucent ;~~

~~resinous. Red, with white streak. C.c.: 57 silica, 31°6 magnesia, 11°4 water. _Capo di Bove near Rome.~~

~~547, GYMNITE.~~

~~Massive. H.=2to 3; G.=1‘9 to 2°2. Translucent ; resinous. Dull orange-yellow. C.c.: 41 silica, 37 magnesia, 22 water. Tyrol, Passau, Texas, Barehills uear Baltimore. Nickel Gymnite has 29 of nickel oxide, replacing the water. Unst, Texas, Pennsylvania.~~

~~548. SAPONITE, (FeCaMg)gSig + (Alg¥e)Si+ 13H.~~

~~Massive; sectile, and very soft. H.=1°5; G.=2°2 to 2°3. White, orange-yellow, pale green, and reddish brown. Feels greasy; does not adhere to the tongue; falls to pieces in water. C.c.: silica 40°8, alumina 7°5, ferric oxide 3°9, magnesia 20°6, water 22°7. Occurs in all the above colours in the later~~

~~*igneous rocks of Scotland, com- monly. Lizard Point and St Clear in Cornwall, and Dalecarlia in Sweden. Pimelite has 2°8 oxide of nickel.*~~

~~*549. SERPENTINE, 2MgSi+ Mgt.*~~

~~*Crystallization uncertain ; pseudomorphic after olivine, &c. ; generally massive, and granular or fibrous; fracture flat-cou- choidal, uneven, or splintery; sectile, and slightly _ brittle. dull resin- Green, grey, yellow, red, or brown; often in spots, stripes, or veins ; streak white, shining. Feels greasy, and does uot adhere to the tongue. In the closed tube yields water, and becomes black. C.c.: 43°5 silica, 43°5 magnesia, and 13 water ; but with 1 to 8 iron protoxide, and also carbonic acid, bitumen, and chrome oxide.*~~

~~*Varieties are—(1) Noble Serpentine, brighter coloured, 16H,0, and more translucent; (2) Picrolite, or fibrous (H.=3°5 to 4°B); (3) Common, or compact; (4) Chrysotile (Baltimorite, Metasite), in fine asbestiform fibres, easily separated, with a metallic or silky lustre (G. =2°219).*~~

~~*Common in Shetland, Urquhart, Portsoy, Ballantrae ; Lizard Point in Cornwall ; Norway, Sweden, North America. Chrysotile at Colafirth and Fetlar, Shetland, Portsoy, Towanreiff, in Scot- land; Reichenstein in Silesia, the Vosges Mountains, and North America. Serpentine is often a product of decomposition, or pseudo- morph of various minerals, as augite, hornblende, olivine, spinel, enstatite, garnet, &c. It forms whole rocks and mountains, and is manufactured into yarious ornamental articles.*~~

~~*550. Marmonire, 3MgSi+2iIgH,.*~~

~~*Oblique prismatic ; often foliated. H.=2°5 to 3; G. =2‘41 to 2°47, Lustre peatly. Greenish white, bluish white, and asparagus- green. C.c.: silica 42°1, magnesia 38°5, water 17°5. In veins in serpentine of Urquhart and Portsoy (Scotland) Cornwall, Fin- land, Hoboken. :*~~

~~*- 551. ANTIGORITE.*~~

~~*Thin flat lamine. H.=2°5;G.=2°6. Translucent. Green with brown spots ; streak white. C.c.: silica 40°8, magnesia 36°3, prot- oxide of iron 5:8, water*~~

~~12°4. Antigorio in Piedmont.~~

~~Milk-white; opaque. C.c.: 52°9 Langban (Sweden), Elba.~~

—

~~MINERALOGY~~

~~- 552. Hypropuirs, (Mg, Fe),8i,+ 4H.~~

~~Massive and fibrous. H.=3 to 4; G.=2°65. Mountain-green to blue-black ; streak paler. C.c.: silica 36‘2, magnesia 21°1, protoxide of iron 22°7, water 16. Taberg in Sweden, New York.~~

~~553. VILLARSITE, 2Mg,Si+3. ba~~

~~Right prismatic ; erystals P, OP, meeting at 136° 32’, often twins in triple combination; also grannlar. H.=3;G.=2‘9 to 3. Trans- lucent. Greenish to greyish yellow. C.c.: siliea 39°6, magnesia 47°4, protoxide of iron 3°6, water 5°8. Totaig, Ross-shire ; Traver- sella, Piedmont; Forez, France.~~

~~554. PYRALLOLITE.~~

~~Oblique prismatic, C 72° 56’; columnar and granular. Cl. basic and_hemidomatie, meeting at 94° 36’; fracture splintery ; brittle. H.=3°5 to 4; G.=2°6. Translucent on edges ; resinous. Greenish to yellow-grey. C.c.: silicate of magnesia and water. Storgard in Finland.~~

~~555. DERMATINE, (Mg, Fe) Si+2H. Reniform ; stalactitie; fracture econehoidal ; brittle. H.=2°‘5; G.=2‘1. Resinous. Blackish green; streak yellow. Does not~~

~~adhere to tongue. C.c.: silica 38, maguesia 22, protoxide of iron 12, water 23. . Waldheim in Saxony.~~

~~Massive, rarely reniform. Coating or filling up geodes in amyg- daloidal cavities. H.=1°5; G.=2°02to2°3. Seetile; fracture con- choidal. On first exposure transparent and olive-green to orange- yellow, but soon changes to black and opaque, splitting in so doing. Vitreous to shining. B.B. melts to~~

~~*a black glass. C.e.: silica 86°2, alumina 8°9, peroxide of iron 18°8, protoxide of iron 2°4, lime 3°8, magnesia 10, water 24:8. -Rum and Canna in the Hebrides, Giant's Causeway. The original mineral from Rum has 22°8 iron peroxide and no alumina.*~~

~~*557. ForcHaAMMERITE, FeSi+6H.*~~

~~*Granular massive. Subresinous to dull. Dark green. H.=2; G.=1'8. C.e.: silica 32°8, protoxide of iron 21°6, maguesia 3°4, water 42°2. Faroes.*~~

~~*558. KIRWANITE.*~~

~~*Fills druses in amygdaloids with divergent sheaf-like crystals. H. =2; G.=2°9. Opaque. Olive-green to dark green. C.e.: siliea 40°5, alumina 11°1, protoxide of iron 23:9, lime 19°8, water 4°4. Loeh Baa in Mull; Mourne Mountains in Ireland.*~~

~~*559. GLAUCONITE,*~~

~~*Round grains. Dull resinous. Light green. C.e.: silicate of protoxide of iron and potash. Ashgrove near Elgin; greensand of England, Franee, Germany, and America.*~~

~~*Massive, forming crusts, as of agates. Earthy, sectile. H.=1 to 2; G.=—2°6 to 2°8. Opaque, shining. Bright green. Feels greasy. C.e.: silica 54, alumina 3°8, ferric oxide 11°9, ferrous oxide 5'4, magnesia 6°8, potash 7°9, water 10. Orkney, Rum, and Fifeshire in Seotland. Giant's Causeway, Verona, Faroes, Iceland, Cyprus, Bohemia.*~~

~~*Massive or radiating-foliated. One el. perfect; brittle. H.=3 to 4;G.=3to3'4. Opaque; vitreous topearly. Greenish black. C.e.: 45°3 silica, 6°9 alumina, 38°3 iron protoxide (with 2 to 3 magnesia), and 9°5 water. Zuekmantel in Silesia and Weilburg in Nassau.*~~

~~*562. CHAMOISITE.*~~

~~*Oolitic and massive. H.=3; G.=3 to 3°4. Greenish grey to black; streak paler. C.c.: siliea 14°3, alumina 7°8, protoxide of iron 60°5, water 17'4.*~~

~~Chamoison (or Chamoson) in Valais, the~~

~~Vosges. Berthierine has 75 protoxide of iron and 5 of water; Moselle.~~

~~AUGITE AND HoRNBLENDE Grovp.!~~

~~Hornblende and augite rather represent gronps of minera] snb- stanees than single species. They are best distinguished when imperfectly formed, by the cleavage and angles of the prisms.~~

~~563. ENSTATITE (Chladnite), MgSi.~~

~~1 Hornblende and angite agree so closely in crystalline forms and chemical com- position that it has sometimes been proposed to unite them in one species. They, however, differ too widely to justify their union. Hornblende is more fusible, and ranges lower in specific gravity (hornblende from 2°931 to 3°445, augite 3195 to 3°525), Though both possess a cleavage parallel to their vertical prisms, yet these differ in angular dimensions :—hornblende 124° 12', augite 87° 6'. They also occur in distinct geognostic positions :—hornblende in rocks con- taining quartz or free silica, and mostly with minerals that are neutral compounds of silica, as orthoclase and albite; augite in rocks that do not contain free silica, and mostly with minerals that are not neutral silicates, as labradorite, olivine, and leucite. Hence there are two distinct series of massive or igneous rocks :—the hornblende series, including granite, syenite, diorite, diorite-porphyry, and red porphyry ; and the augite series or hypersthene rock, gabbro, dolerite, nepheline rock, augite-porphyry, and leucite-porphyry-~~

~~415~~

~~Right prismatic. oP 92° to 93°; crystals Poo (a), clo (6), @P (m), $Peo (k), $Poo (9), &Poo (¥), $P (7) (fig. 497). Usually imbedded, or indis- tinet granular masses. Cl. macrodiagonal very perfect, prismatic oP distinet, brachy- diagonal imperfect. H. =5-5; G.=3'1 to 3°3. Translucent throughout, or only on the edges; vitreous or pearly on the more perfeet .cleavage- planes. Colourless, greyish or greenish white, yellowish, or brown. Not affeeted by acids. B.B. almost infusible. Fig. 497.~~

~~*C.c.: 60 silica and 40 magnesia, but with 6 to 8 iron protoxide, 1 to 2 alumina, and‘1 or 2 water. In olivine and serpentine roeks in Moravia, the Harz (Baste), and the Pyrenees.*~~

~~*564. BronziTE (Schiller Spar, Bastite), (Mg, Fe)Si.*~~

~~*Right prismatic. oP 94°; only granular and foliated. (1. brachydiagonal perfeet, prismatic less so ; fracture uneven, splin- tery, H.=4 to 5; G.=3 to 35. Translucent on thin edges; metallic pearly. Green, inelining to yellow or brown. Imper- fectly sol. in h. acid, wholly in s. acid. B.B. becomes magnetic, and fuses in very thin splinters. C.e.: 43 silica, 26 magnesia, 2°7 lime, 7°4 iron protoxide, 33 iron peroxide, 2‘4 chrome oxide, 1°7 alumina, and 12-4 water. Bastite is possibly altered enstatite. Belhelvic and Black Dog in Aberdeenshire, Baste, Tyrol, Baireuth, . Styria.*~~

~~*565. PAULITE (Hypersthene), (Fe, Mg)Si.*~~

~~*Right prismatic. oP (m) 98° 30’, P2 (ec), 2P2 (i), 3P3 (w),*~~

~~*coP2 (x), 2Po (h), wPo (a), aPo (b), 4Poo (k), 2Poo (d). Granular or disseminated. Cl. brachydiagonal very perfeet, prismatie ooP distinet, macrodiagonal very imperfect. H.=6; G.=3°3 to 3°4. Opaque or translucent on thin edges ; vitreous or resinous, but metallie pearly on the cleavage planes, of which one is copper-coloured to violet or silvery. Pitch-black and greyish black; streak greenish grey or pinehbeek-brown, inclining to copper-red. Not affected by acids. B.B. melts more or*~~

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Fig. 498. Fig. 499.

less easily to a greenish black glass, often magnetic. C.c.: gene- rally 46 to 58 siliea, 0 to,4 alumina, 11 to 26 magnesia, 1 to 5 lime, 13 to 34 iron protoxide, 0 to 6 manganese protoxide. Portsoy and Craig Buroch in Banffshire, Barra Hill in Aberdeenshire, Paul’s Island, Labrador, and Greenland. Crystals oceur in sanadine bombs at Lake Laach (Amblystegiée), and in meteorites of Breiten- bach. Hypersthene rock in Norway, Elfdal in Sweden, Cornwall

(2), the Harz, and Canada. Chemically enstatite and paulite pass

into one another; the essential difference is that the axial dispersion is uniformly p

~~566. WoLLAsTONITE (Tabular Spar), CaSi.~~

~~Oblique prismatic, C 84° 30'. oP 87° 18', OP (w or h'), coPoo (ce orp), oP (z) 110° 7', Pe? (x or e') 51°, — Poo (v) 44°~~

~~27', 4Poo (a) 69° 56' (fig. 500). Rarely crystallized, mostly broad prismatic or laminar. Frequently fibrous. Cl. along OP and oP%o perfect, but planes uneven or rough ; meet ab 95° 232" -Hi=45. to 5; G. =2°8 to 2'°9. Translucent ; vitreons or pearly on cleavage. ; White, inclining to grey, yellow, red, or brown ; streak white.~~

~~Fig. 500.~~

~~416~~

~~Phosphoresces with heat or friction; gelatinizes — h. acid. B,B. .e.8~~

~~difficultly fusible to a semitransparent glass. 51°7 silica and 48°3 lime, but with 0 to 2 magnesia and 0 to 2 iron protoxide. Glen Gairn, Crathie, &c., in Aberdeen- shire, Urquhart in_ Inver- ness, Skye, Banat, Finland, Sweden, Vesuvius (fig. 501), North America, Ceylon, Capo di Bove.~~

~~567. AUGITE (Pyroxene), RSi=(Ca, Mg, Fe)Si.~~

~~Oblique prismatic, C 74°11'. oP 87° 6"; P(s:s) 120° 48'; Fig. 501 (sp. 566). —P (ut) 181° 30'; 2P (0) 95° 48'; OP; 8P; Peo. In fig. 180 oP (Mf), wP% (7), wP oo (2), P(s); also various twins and hemitropes of same form (figs.~~

~~191, 502, 503).~~

~~also granular, columnar, and scaly. Cl. prismatic along oP (with~~

~~Fig. 602. angles of 87° 6' and 92° 54'), generally rather imperfect ; ortho- diagonal and clinodiagonal imperfect. H.=5 to 6; G.=38 to 3°5. Pellucid in all degrees; vitreous; in some pearly on oP®o,- Colour-~~

~~less, and white, but usually grey, green, or black. B.B. generally fusible; imperfectly soluble in acids. C.c. generally as follows :—~~

~~| Silica. ‘Lime. Magnesia. | Iron. | (a) Magnesia augite……. 56°22 | 25°54; 18°24 | -... | (0) Magnesia-iron augite 52°72 | 23°81 8°50 =|: 14°97 (c) Tron augite w…sessecceees ..| 49°06 | 22°29 se | 28°65~~

~~Analysis gives 47 to 56 silica, 20 to 25 lime, 5 to 15 magnesia, 1 to 20 iron protoxide, with 0 to 3 manganese protoxide and 0 to 8 alumina. The alumina, chiefly found in very dark green or black augites, may in some replace either silica or part of the silicate. The more important varieties are — Diopside, —Greyish or greenish white, to pearl-grey or leek-green; streak white. Crystallized or broad columnar, or concentric~~

~~lamellar. Transparent to translucent on the edges. Not affected by acids. B.B. fuses to a-whitish semitransparent glass. C.c.: generally lime 26 and magnesia 18°5, with 55°5 silica. Mussa Alp~~

~~(Mussite) and Ala (Aladlite) in Piedmont, Schwarzenstein in Tyrol, Scandinavia, Finland, Urals, and North America.~~

~~Malacolite, Sahlite.—White, green, rarely yellow, brown, or red; streak white. Translucent, or only on the edges ; vitreous, inclining to pearly. Seldom crystallized, mostly columnar~~

~~Fig. 504. B.B. melts to a dark-~~

~~or lamellar. coloured glass. Malacolite common in primary limestones in Scotland, as at Shinness, Ledbeg (fig. 505), and Glen~~

~~Fig. 506. Tilt. Fassa Valley (Fassaite), Piedmont, Arendal, Philipstadt in~~

~~Almost always prismatic, imbedded, or attached ; |~~

~~MINERALOGY~~

~~Sweden; Lake Baikal (Batkalite); near Lake Lherz in the Pyrenees (Lherzolite) ; Sala (or Sahla) in Sweden (Sahlite) ; Shinness (figs. 504, 506), Glenelg, Tiree, in Scotland ; Tyrol ; North America. Coccolite is a granular sahlite or augite.~~

~~*Augite.—Leek-green, greenish black, or velvet-black, rarely brown ; streak greenish grey. Vitreous to resinous; translucent or qpaque. Only slightly affected by acids. B.B. fuses to a black, often magnetic glass. An essential component of many rocks, as basalt, dolerite, clinkstone, and augite porphyry ; Germany, Auvergne, Vesuvius ; St Kilda, Rum, Tiree, Dalnain, and Urquhart in Scotland. Augite crystals in basalt often contain very many mi- croscopic crystals and glasses ; also pores with fluid carbonic acid.*~~

~~*Hudsonite.—Cleavable lamellar, and jet-black, with green streak and bronzy tarnish, from the Hudson river ; the most highly ferru- ginous variety.*~~

~~*Amianthus.—Some asbestiform minerals are augite, but the greater number hornblende.*~~

~~*Breislackite.—Fine yellowish or brown woolly crystals.. Vesuvius, and Capo di Bove near Rome.*~~

~~*568. DraLuace, (Ca, Mg, Fe) Si.*~~

~~*Like angite, and only a variety with very perfect cleavage in the clinodiagonal, which forms with a second cleavage an angle of 87°. Lustre metallic pearly; colour grey or pinchbeck-brown. i.=4; G.=3°23. B.B. melts easily to a greyish or greenish enamel. C.c.: 50 to 58 silica, 1 to 5 alumina, 15 to 23 magnesia, 11 to 20 lime, and 5 to 20 manganese protoxide. Constituent of*~~

~~*_ the augite rock of the Cuchullins in Skye and of the gabbro of Unst _ and Ayrshire.*~~

~~*Baste in the Harz, Silesia, the Alps, Apennines,*~~

~~*and Urals. Vanadine-Bronzite, containing soda and vanadie acid,*~~

~~*_issimilar. At Craig Buroch (Banffshire) diallage passes in paulite.*~~

~~*569. JEFFERSONITE. |*~~

~~*Oblique prismatic. Cl. prismatic oP 87° 30’, and orthodiagonal. H.=4°‘5; G.=3°3 to 3°5. Dark clive-green, brown to black. Lustre greasy. A manganese and zinc augite, with 10°2 protoxide of manganese, and 10°15 oxide of zinc. Sparta in New Jersey.*~~

~~*570. ACMITE, 2FeSi,+3RSi.*~~

~~*Oblique prismatic. Crystals long often acute-pointed prisins. oP 87°15’, wPo ®, P(s), 6P (0), — 6P°3(z) (figs. 507, 508). Cl.*~~

~~*like augitec. H.=6 to 6°5; G.=34 to. 3°6. ‘(Nearly LAN opaque; vitreous. Brownish fo*~~

~~*or greenish black; streak greenish grey. Imperfectly soluble in acids. B.B. fuses easily to a black magnetic glass. C.c.: 52 silica, 30 iron |:|! peroxide, 5 iron protoxide, [*: and 18 soda, but with 1 to 3 manganese peroxide, and alsq 3to4titanicacid. Eger and Porsgrund in Norway.*~~

~~*571. Active, R,Si;+ RSi +2NaSi.*~~

~~*Oblique prismatic; striated Fig. 507. (Sp. 570.) Fig. 508. or reed-like prisms of 86° 30’ to 87° 45’. Cl. orthodiagonal per- fect, less distinct clinodiagonal, and prismatic. H.=5°5 to 6; G.=3‘4 to 3°5 or 3°6. Vitreous; translucent on edges, or opaque. Greenish black. B.B. fuses easily, colouring the flame yellow. Searcely affected by acids. C.c.: 49 silica, 31°7 iron peroxide, 6°6 iron (and manganese) protoxide, and 12°7 soda, with a little magnesia and potash. HIas the same relation to augite as arfved- sonite to hornblende. Near Brevig and Barkevig in Norway.*~~

~~*572. SpopumEN#, 4A]Si,+3(hi, Na, K)Si.-*~~

~~*Oblique prismatic, C 69° 40’. oP 87° (fig.509). Cl. prismatic oP and orthodiagonal, perfect; chiefly massive or foliated. H.=6°5 to 7; G.=8‘1 to 3°2, Translucent; vitreous or pearly. Pale greenish grey or white to apple- green; streak white. B.B. intumesces slightly, tinging the flame momentarily purplish red, and fuses easily to a colour- less glass. Not affected by acids. C.c.: 65 silica, 28°7 alumina, and 6°3 lithia. Killiney near Dublin, Uté in*~~

~~*Sweden, Tyrol. Killinite (sp. 651), from Killiney, seems to be decomposed spodumene.*~~

~~*Che*~~

~~*Na)Si,. Oblique prismatic. Castor has C 67° 34° and oP 86° 20', in irregular rect-*~~

~~*angular prisms, petalite being massive and coarse granular.*~~

~~*Fig. 509 (sp. 572). Cl. basal, distinct; in a second direction*~~

~~*MINERALOGY*~~

~~*(meeting at 1414°) less so. H.=6°5; G.=2'4 to 2:5. Greenish, greyish, or reddish white to pale red. Translucent; vitreous or pearly. B.B. melts easily into a porous obscure glass, colouring the flame red. Notaffeeted by acids. C.c.: 78°3 siliea, 17°4 alu mina, 3°2 lithia, and 1°1 soda. Uté, Bolton in Massachusetts, York in Canada. Castor in Elba. Milarite, valley of Milar, Switzerland.*~~

~~*574. RHoDONITE (Afanganese-Spar),-MnSi.*~~

~~*Anorthie. oPco(a); oPco (b); OP ©; oP' (uw); P'co (k); Poo(s); 'P'co (0) ; m'P'oo (t). a:b 111°9'; c: @ 98° 28'; n: a 106° 19'; but chiefly massive or granular. Cl. oPo and OP, meeting at 87° 38', perfect ; brittle. . H.=5 to 5°5; G.=3°5 to 3°7. Translucent; vitreous or partly pearly. Dark rose-red, bluish red, or red- dish brown. Not affeeted by acids. — B.B.. fusible. C.c.: 45°8 silica and 54:2 manganese protoxide, with 3 to 5 lime and 0 to 6 iron protoxide. St Marcel, Langban: Ekaterinburg, the Harz, and New Jersey. Bustamite, pale greenish or reddish grey, with 14 lime, Mexico; Fowlerite, New Jersey, With 7 to 11 iron protoxide; and Paisbergite, Sweden, are varieties. Hydropite, Photicite, Allagite, and Horn-Manganese are mere mixtures.*~~

~~*575. BaBINGTONITE, 9(Ca, Fe, Mn)Si+ FeSi,.*~~

~~*Anorthic. Crystals very low eight-sided prisms, small, attached. gue. 90° 24°. ee 87° 27" pa: b.1I2" eS bie 81 8's ved). 150" 10° (fig: 511). Cl. basal ©, very perfect; also along 6. H.=5°5 to 6; G.=3°3 to 3°4, Thin lamine translucent. Splen- dent vitreous ; black. Notaffected by acids. B.B. fuses easily with efferves- cence to a black magnetic bead. C.c.: 50°7 silica, 11 iron peroxide, 10°3 iron protoxide, 7°7 manganese protoxide, aud 20°3 lime, in the Arendal speci- mens; one from Nassau gave about 17 of peroxide, with protoxides only 11. Tongue (Sutherland), Portsoy (Banffshire), Arendal, Nassau, and Gouverneur (New York).*~~

~~*Fig. 511.*~~

~~*Anorthic. ooP'(2); 00'P (m) 88° 40'; ola (5); Poo (a); P'(p); —!P (0); 2'P.co (y); 2P'oo (x) (fig. 512). H.= 5; G.=3°'5. Brownish red to reddish yellow. Pleochroic.*~~

~~*C.c.: silica 52°4, per-*~~

~~*oxide of iron 44°7, lime 3°1. Slightly sol. in s. acid, more so in h. acid. Calvario on Kitna, Mont Dore. el @*~~

~~*577. ANTHOPHYLLITE, 3MgSi+ FeSi.*~~

~~*Right prismatic. oP 124° 30'. Cl. macrodiagonal, perfect. Clove-brown to purplish brown and leek-green. Trans- lucent; radiating and foliated. Pearly on el. plane. H.=5°5; G.=8°2. C.c.: silica 55:9, protoxide of iron 16°7, magnesia 27°8. B.B. very difficultly fusible. Hillswick, Shetland ; Kongsberg and Modum, Norway ; Greenland, and the United States.*~~

~~*578. HoRNBLENDE.*~~

~~*Fig. 512 (sp. 576).*~~

~~*Oblique prismatic (figs. 513 to 517; see also fig. 192). Distinct*~~

~~*cleavage in several directions. ~H.=4 to 6, but generally 5 (will seratch with knife); G.=2°5 to 4:0, but mostly high. Mostly coloured. Lustre vitreous, in some silky or metallic pearly. Sol., but not very readily, in acids;*~~

~~more or less easily fusible. C.e.: anhydrous silicates and aluminates of lime, magnesia, iron pro- toxide; more sparingly of soda, yttria, and manganese protoxide. on chief species form by their decomposition highly fertile soils.~~

~~Amphibole.—Oblique prismatic, C 75° 10'. oP 124° 307.8 148° 30'. The erystals short and thick, or long and thin prismatic ; formed especially by oP (2m), oP*o (x), and bounded on the ends chiefly by OP(p) and P ®. Twins eommon, with the chief axis the twin axis. Very often radiated, fibrous, or columnar, or granular. Cl. prismatic along oP 1244°, very perfect; orthodiagonal and clinodiagonal very imperfect. H.=5 to 6; Gl=e"9 to 3°4. Pellueid in all degrees ; vitreous, but sometimes pearly or silky. Colourless or white, but usually some shade of grey, yellow, green, brown, or black. B.B. fuses, generally intumeseing and boiling, to a grey, green, or black glass. Those containing~~

~~most iron are most fusible, and are also partially sol. in h. acid whieh scarcely affeets the others. C.e. very variable ; the silica is partly replaced by alumina, specially in the green or black varieties; RO is chiefly MgO, CaO, and FeO. Lime is the most~~

~~Fig. 513, Fig. 514~~

~~constant element, in most from 10 to 12; magnesia and iron protoxide replace each other, the one inereasing as the other diminishes.~~

~~With 48i and R=2Mg+1Ca+1Fe, the average composition is 53°6 silica, 17°8 magnesia, 12°5 lime, and 16°1 iron protoxide ; but~~

~~Fig. 516,~~

~~Fig. 515.~~

~~analyses give 40 to 60 silica, 0 to 17 alumina, 0 to 30 magnesia, 10 to 15 lime, 0 to 36 iron protoxide (or peroxide), and 0 to 4 manganese protoxide, 0 to 8 soda, 0 to 8 potash, and 0 to 1°5 fluorine with a little water.~~

~~*The more iniportant varieties are—*~~

~~*Amianthus, Asbestos, and Byssolite, 2MzSi + CaSi. Fine fibrous.*~~

~~*Fig. 517.*~~

~~*White, grey, or green. The fibres often easily separable, elastie, and flexible. Unst, Shinness, Portsoy, Savoy, Tyrol, Corsica.*~~

~~*Tremolite, Grammatite, 3MgSi + CaSi, with 58°35 siliea, 28°39 magnesia, and 13°26 lime. White, grey, green; in long prismatic erystals, often striated longitudinally. Pearly or silky; semi- transparent or translueent. B.B. fuses readily to 2 white or nearly colourless glass. Loch Shin (Sutherland), Glen Tilt, Glenelg, Tiree, Cornwall, Cumberland, Sweden, the Alps, Pyrenees, Silesia, Siberia, North America.*~~

~~*Nephrite, or Jade, isa tough, compaet, fine-grained tremolite, with H.=6 to 65; G.=2‘9 to 3°1. Fracture close splintery. Very tenacious. Translucent ; dull to resinous. Leek-green to blackish green. Feels slightly greasy. Formerly made into ring-stones, amulets, idols, and war axes. New Zealand, China, Mexico, Peru, Balta (Shetland).*~~

~~*Actinolite, Actinote, or Strahlstein (Ca, Mg, Fe) Si. Colour green, inclining to black, grey, or brown. Translueent through- out, or only on the edges. Long prismatic crystals, or radiated- columnar masses. B.B. melts to a greenish or blaekish enamel. Fethaland and Colafirth and Hillswiek (Shetland), Oronsay, Ord Ban (Inverness), Sweden, Tyrol, North America.*~~

~~*Hornblende.—6RSi + 8,Si3. Green or blaek, seldomer brown or grey. G.=3’l to 3°3. B.B. fuses rather easily to a yellow, greenish, or black enamel. Three varieties are distinguished. (a) The noble or Pargasite, pale celadon- or olive-green, and strong pearly or vitreous lustre; at Pargas in Finland, Tyrie in Seotland. (6) Common hornblende, dark leek- or blaekish-green; opaque ; streak greenish grey. A constituent of many rocks, as in Norway, the Alps, and Scottish Highlands (Ballater, Ben Arihaar, Glen- bucket, Colafirth). (c) Basaltic, foliated, with bright even cleavage, opaque, velvet-black; streak grey or brown. Generally contains alumina (9 to 15) and*~~

~~much (5 to 11) iron peroxide. In basalt and volcanic rocks. Etna, Vesuvius, Rhineland, Bohemia.~~

~~AVI — 53~~

~~418~~

~~579. ARFVEDSONITE, RSi + Fei, .~~

~~Oblique prismatic. oP; oP «o; P; 2P%« 120° 24'; OP. Cl. oP 124° 29', perfect; also OP. Massive. Black; opaque. | Vitreous. H.=6; G.=3'44. C.c.: silica 43, alumina 4°5, peroxide of iron 3°8, protoxide 34, lime 577, soda 8°5. Streak dark blue-grey. Fusible in fine splinters in the flame of a candle. B.B. intu- mesces atid melts easily to a black magnetic globule. Not sol. in acids. Kangerdluarsuk in Greenland, Frederiksvirn, Arendal, El Paso in Colorado.~~

~~MINER~~

~~Felted or matted fibres more or less dense. Cream yellow to buff. Dull; extremely tough; absorbs water like a sponge. H. =1 to 2°5; G.=°68 to1:34. Structure varies considerably, and has given rise to trivial names, as mountain paper, mountain leather, mountain flesh, rock cork, &c. Mountain Paper occurs 1n thin sheets at Boyne Castle near Banff ; Mountain Leather, Burn of the Cairn (Cabrach), Tod Head (Kineardineshire), Leadhills, Strontian ; Rock Cork, Portsoy and Boyne Castle, Saxony, and Sweden. C.c.: silica 51°6, alumina 8°6, ferrous oxide 2°88, magnesia 10°2, water 23°38.~~

~~581. KroxKIpouiTE, 3FeSi + (Na, Mg)Si,+ 2H.~~

~~Delicate, easily separable, but tough fibres ; elastic. H.=— 4; G. =3°2to3°3. Trauslucent ; silky. Indigo-blue ; streak lavender. B.B. fuses easily to a black magnetic glass. C.c.: silica 50°8, iron protoxide 85, magnesia 2°2, soda 6°7, water 5°8. Stavern in Norway, Greenland. A fibrous yellow mineral from Orange river, South Africa, has been referred here ; its fibres are not separable, and its hardness is 7. Abriachanite, a very similar mineral, of blue colour, occurs near Inverness.~~

~~582. GLAUCOPHANE, 9R3i + 2AISi,. Oblique prismatic. Cl. prismatie, perfect ; fracture conchoidal. H.=5‘5; G.=3°1. Translucent; vitreous to pearly. Indigo-~~

~~blue, grey, bluish black. B.B. becomes brown, fusing easily to~~

~~olive-green glass. C.c.: silica 56°5, alumina 12°2, protoxide of iron 10°9, magnesia 8, soda 9°3. Island of Syra.~~

~~588. HERMANNITE, MnSi.~~

~~Granular and arborescent. Rose-red. G.=3”4. of manganese 46°7, silica 48°9, lime 2, magnesia 2°4. in Massachusetts.~~

~~584. GRuNERITE, FeSi.~~

~~Asbestiform. G.=3°7, Brown; silky lustre. C.c.: protoxide of iron 51°55, silica 45°45. Mt. des Maures (Var).~~

~~585. IoniTE (Cordicrite, Dichroite), A,Si,+2(Mg, Fe)Si.~~

~~Right prismatic. oP (P) 119° 10’, middle edge of P 95° 36’. Form oP (7), Po (J), OP (m); and this with oP (k), ol3 (d), Po (n),.and $P (s), (fig, 518); short, prismatic. Cl.~~

~~«Pc distinct, traces along Poo ; fraeture conchoidal or uneven. = 7% t0/,/75.4G.—2°5. to 257, dllwams= parent or translucent; vitreous, inclining to resinous. Colourless, but chiefly dark blue, or violet, green, brown, yellow, and grey. Often with distinct trichroism; on~~

~~OP blue, on oP grey, and on Po yel- Towish. B.B. fuses diffieultly to a clear glass; slightly affeeted by acids. C.c.: 48 to 51 siliea, 29 to 33 alumina, 8 to 13 mag- nesia, 1 to 12 iron protoxide. Cabo de Gata in Spain, Bodenmais (Peliom), Orijerfvi in Finland (Steinheilite), Norway, Sweden, Greenland, North America, and Siberia. Small rolled masses of an intense blue colour and transparent, found in Ceylon, are the Sapphire d’ Eau or Luehssapphir of the jewellers.~~

~~*The following have been considered cordierite altered, or with 2 to 6 atoms water :—(a) Bongdorjite, Hydrous Iolite, greenish brown or dark olive-green ; near Abo. (b) Esmarkite, Chlorophyllite, large prisms or foliated, green or brownish ; near Cabrach (Aberdeen) Brevig in Norway, Unity in Maine, and Haddam in Connecticut, (c) Fahlunite, Trielasite, compact, greenish brown or black, foliated ; H. =2°5 to 3; G.=2°5 to 2°38; Falun. (d@) Huronite, granular ; pearly, yellowish-green ; H=3°3; G.=2°86; infusible and insol- uble; Lake Huron. (¢) Weissite, kidney-shaped and ash-grey or brown; Falun and Lower Canada. (f/f) Pyrargillite, indistinct imbedded crystals, black passing into brown or red, dull resinous lustre; H.=3‘5; G.=2°5; Helsingfors. (g) Pinite, crystallized, or massive and laminar, with imperfeet cleavage; H.=2 to 8; G.=2°7 to 2°9, semitranslucent or opaque, dull or resinous, and dirty grey, green, or brown; B.B. fuses toa glass, sometimes clear, at other times dark-coloured ; Auvergne, Schneeberg, Penig in Saxony, the Harz, Cornwall, Cabrach and Torry (Aberdeenshire),*~~

~~*C.c.: protoxide Cummington*~~

~~&~~

~~*)o<--------‘*~~

~~*1*~~

~~*4*~~

~~*(a, p, ¢, 8, fig. 519) are prismatic, generally with vertical strie, Cl.*~~

~~*PPS at SAN basal, rather perfect; oP im- Lai: Bema ne WS perfect. H.=7°5 to 8; G.=2°6 Vg ORY \ to 2:8. Transparent or trans- (*~~

~~*lucent ; vitreous.*~~

~~*times very brilliant; also yellow*~~

~~*to 3°5 chrome oxide in the rich A ed ‘green emerald. Emerald, bright 1 VSL*~~

~~*| acids.*~~

~~*ALOGY*~~

~~*the United States, aud Greenland (Giescekite, sp. 650). Oosite from Geroldsau in Baden, snow-white, opaque, fragile, is similar. () Gigantolite ; H.=3°5 ; G.=2°8 to 2°9; opaque, dull resinous, and greenish grey or brown ; B.B. intumescces slightly, and fuses easily to a greenish slag ; Tammela in Finland. and green; Brevig in Norway.*~~

~~*(¢) Prascolite, lamellar*~~

~~*586. EMERALD (Beryl), AlSi, + 3G18i. Hexagonal; P 59°53'. Crystals of oP, OP, and oP, wP2, OP, P*~~

~~*Colourless or white, but generally green, some-*~~

†

~~*and smalt-blue. B.B. melts with difficulty on the edges to an obscure vesicular glass. Not affected by acids. C.c.: 67°5 silica, 18°7 alumina, and 13°8 glucina, with 0°3 to 38 iron peroxide, and 0°3*~~

~~*green ; G. =2°710 to 2°759; occurs : in Muso Valley uear Bogota, also Fig. 519.*~~

~~*in Salzburg and the Urals. Bery', or Aquamarine, colourless, or less brilliant; G.=2°677 to 2°725 ; near Mursinsk and Nertehinsk in Siberia, Salzburg, and Brazil; in the United States, where at Grafton, between the Connecticut and Merrimack, crystals 4 to 6 feet long, aud weighing 2000 to 3000 Ib, occur ; Mourne Moun- tains in Ireland; Mount Battock and Cairngorm in Scotland (fig. 98). Common Beryl at Falun in Sweden, Fossum in Norway, Limoges in France, Rabenstein in Bavaria, Nigg Bay and Pitfodels and Rubislaw near Aberdeen (Davidsonite), Struay Bridge (Ross). Emerald and beryl are much valued as precious stones. Known from quartz by face py. Forms shown in figs. 92, 95, 96, 97, 98, 276.*~~

~~*587. Levcopuaneg, 6CaSi+3GISi+2NaF.*~~

~~*Right prismatic. oP 91°. CL basal perfect. H.=3°5 to 4; G.=2°97. _ Pellucid. | Wine-yellow to olive-green. Vitreous. B.B. fuses to pale violet-blue bead. C.c.: silica 47, lime 23°4, glucina 10°7, soda 11°3, fluorine 6°6. Lamé in Norway.*~~

~~*588. Mr.inopHane, 7(R,S8i,)+6NaF.*~~

~~*Pyramidal. P 122° 23'. Mostly lamellar. H.=5; G.=3. Honey-yellow to citron-yellow. Brevig and Frederiksvarn.*~~

~~*FELSPAR GROUP.*~~

~~*Crystallization oblique prismatic or anorthic; very similar both in aspect and in angles. Cl. very distinct, especially the basal P; less so the elino- or brachydiagonal M. G.=2°4 to 3°2, but mostly 2°5 to 2°8; H.=6 ora little more. Slightly or not at all soluble in B.B. fusible, but often with difficulty. Translucent; pure varieties transparent. Colourless, white, or shades of red ; less commonly of green or yellow. C.c.: anhydrous silicates of alumina, and of an alkali or alkaline earth.*~~

~~*The felspars are very important constituents of the earth's crust, occurring in nearly all the igneous rocks, and in many of the stratified crystalline schists. In true strata they are found chiefly as fragments or decomposed, and in the latter state form a large part of wet soils and clays. By the older mineralogists and in popular language many species are conjoined under the common name of felspar which are now considered as distinct, each of them having not only its peculiar physical and chemical characters, but also geognostic position and associated groups of minerals. Thus orthoclase, and the other more siliceous felspars with potash, abound in granite and the plutonic rocks ; the less siliceous, with soda and lime, characterize the volcanic rocks,—e.g., labradorite the basaltic group, glassy felspar the trachytic. Orthoclase is associated with quartz, hornblende, and mica; glassy felspar either with hornblende and -a black mica or with augite; labradorite with augite, very rarely with quartz or hornblende.*~~

~~*The felspars are best known from similar minerals by their hard- ness (they scarce scratch with a good knife), difficult fusibility, and unequal cleavages.*~~

~~*The following marks may aid'the student in distinguishing the more common species. In orthoclase the basal eleavage plane forms a right angle with the clinodiagonal cleavage planes Jf on both hands; in the triclinic or plagioclase felspars the angles are unequal. Orthoclase, albite, andesine, and oligoclase*~~

~~*are insoluble in acids; labradorite and anorthite are more or less –*~~

~~*soluble. In granite, when decomposing, orthoelase often becomes reddish or dark-red ; oligoclase dull green, and at length white. Walterhausen considers that the felspars are mixtures of three true species, forming a series with the oxygen of the silica, alumina, and KO in the proportions x :8:1, — « ranging from 24 to 4. Tcher-*~~

~~*MINERALOGY*~~

~~*mak and most mineralogists now take a similar view, regarding orthoclase, albite, and anorthite alone as true species, of which the others are mixtures. Those consisting essentially of potash and soda only are mechanical mixtures of orthoclase and albite, the distinct lamelle being visible by the microscope; those again that contain essentially lime and soda together are, sometimes at least, chemical, being isomorphous compounds of albite and anorthite in various proportions, and with corresponding transitions in erystallographic and physical properties. Notwithstanding this, these intermediates must be regarded as independent mineral species, inasmuch as they are severally typical of certain rocks, and have characteristic forms differing from each other in angular inclination.*~~

~~*589. OrTHOoLASE, AlNi; + KSi,.*~~

~~*Oblique prismatic, C=63° 57. oP (7 and J} 118° 47' ; P°co (zx) 65° 46'; 2P%oo (z) 90° 71'; 2Poo (y) 35°45'. The commonest and simplest forms are oP, OP, Poo, and oP (M), oP, OP (P), 2P%o (figs. 520 to 527). When oP predominates the crystals*~~

~~*eo*~~

~~*Fig. 523.*~~

~~are short rhombic prisms ; when oP*%o predominates they are tabular; when oP and mP*%o predomi- nate they are short hexa- gonal prismatic, when OP and oP*co they are rect- angular prismatic, often much lengthened. Twins are very frequent, and oceur according primarily : . to four laws. First, Fig. 526. Fig. 527.~~

~~through revolution of one half or of a whole crystal, then forming interpenetrating twins round a vertical axis (fig. 195). In the case of this hemitropic revolution one of the external faces becomes a face of union. erystal) is conceived to be that which has been revolved the crystals are termed right and left, as in figs. 188, 189. Second, by revolution of one half around an axis normal to ¥; in such twins the com- position is not evidenced externally except by sutures. Third,~~

~~Fig. 528.~~

~~Fig, 529.~~

~~through revolution round an axis normal to P, forming orthorhombic prisms which show a herring-bone lineation, through the meeting of striz commonly present upon the face M parallel to the intersection of its edge with the face 7' (fig. 528). Fourth, by revolution round an axis normal to 2P%co (") ; this also forms a prism the section of which is nearly square (fig. 529). Compound twins on this last type are formed of 8 to 4 and 8 crystals (fig. 530).~~

~~Uccurs also massive, and coarse or fine granular. Cl. basal (P), very perfect ; clinodiagonal (df), perfect (P : M=90°) ; fracture conchoidal or splintery. H.=6; G.=2°53.to 2°58. Transparent to translucent on the edges ; vitreous but pearly on cl.; and also opalescent, with bluish or changing colours. Occasionally colour- less but generally red, yellow, grey, or green. B.B. fuses with~~

~~According as the right or the left half (or whole.~~

~~419~~

~~- difficulty to an opaque vesicular glass. Not affected by acids. C.c.:~~

~~64°6 silica, 18°5 alumina, and 16°9 potash, but generally 10 to 14 potash, 1 to 4 soda, 0 to 1°3 lime, 0 to 2 iron peroxide. Varieties are—~~

~~(1) Adularia and Jee-spar, transparent or translucent, splendent, and almost colourless. Some with bluish opalescence are named Moonstone ; St Gotthard, Mont Blanc, Dauphiné, Arendal, Green- laud, and Ceylon.~~

~~(2) Common Felspar, generally white or red, especially flesh-red, is a common constituent of many rocks. Crystals at Baveno on Lago Maggiore, Lomnitz in Silesia, Mourne Mountains and Wick- low in Ireland, Aberdeenshire (at Rubislaw 6 or 8 inches long) in Scotland, and at Carlsbad and Elnbogen in Bohemia. Amazon . Stone, verdigris-green, from Sutherland, Lake Ilmen, and Colorado, and Murchisonite, golden or greyish yellow, from Arran and Dawlish, are varieties,~~

~~(3) The Glassy Felspar or Sanidine (C 64° 1', @P 119° 16') con- tains 3 to 12 potash and 3 to 10 soda. Crystals imbedded ; vitreous, translucent, and often much cracked; Arran, Figg, and other parts of Scotland, Drachenfels, Auvergne, and other countries.~~

~~Orthoclase occurs in granite, gneiss, and porphyry in many countries. It is commonly associated with quartz; sometimes, as~~

~~'in the Graphic Granite of Sutherland, Harris, and Portsoy, in~~

~~letter-like combinations of the latter. It is very liable to decom- position, when it is converted especially into kaolin, used for manufacturing porcelain and stoneware. The adularia or moon- stone and the green amazon stone are cut as ornamental stones. Leelite, from Biddean nam Bian in Argyllshire and Grythyttan in Sweden, is a somewhat siliceous horny- lustred flesh-coloured com- pact variety. Petwntze and Hornstone are similar but more impure. Mieroeline is a variety with angle distorted by interstitial penetra- tion, by oligoclase (Sutherland), and by albite (Frederiksvirn, &c.).~~

~~590. Axsire, AlSi, + NaSi,. Anorthic. OP (P):0Pco (M) 86° 24'; cP" (J) : oP (7) 122° 15';~~

~~but angles variable. Crystals, generally like those of orthoclase, are tabular or prismatic (fig, 197). Hemitropes common, especially~~

~~united by a face of oPco (figs. 581, 582) the re-entering angle he-~~

~~ee N~~

~~:~~

~~n------ye~~

~~+ 1 ‘ ‘ 1 ‘ 1 ‘ !~~

~~n~~

~~7 /~~

~~N\A~~

~~¢~~

~~Fig. 531.~~

~~tween the faces of OP (P and P’) 172° 48’ being very characteristic. Fig. 198 is another common hemitrope. Also massive, and in radiat- ing plates. Cl. basal and brachydiagonal, almost equally perfect ; fracture conchoidal or uneven. H.=6 to 65; G.=2°6 to 2°67. Rarely transparent ; vitreous, pearly on the cl. Colourless, but generally white, grey, green, red, or yellow; streak white. B.B. difficultly fusible, ~~

~~tinging the flame yellow, to a white semiopaque glass. Not affected by acids. C.c.: 68°6 silica, 19 ‘6alumina with 01 to 1 iron peroxide, and 11‘8 soda, with 0°3 to 4~~

~~:~~

~~Fig. 533. lime, 0 to 2°5 potash. Hence albite and orthoclase both contain~~

~~soda and potash, only in different proportions. Albite is most easily recognized by its frequent re-entering angles, its readier fusibility, and the obliquity (93° 36') of its cl. planes, often marked with strie. Pericline is a variety of which fig. 533 is a typical form.~~

~~Albite is a constituent of many " greenstones," as at Corstorphine (Edinburgh), and of granite, syenite, gneiss, porphyry, and trachyte. Crystallized at Murdoch's Cairn, Aberdeenshire, being the colourless felspar of the red granites of Scotland. Dauphiné, St Gotthard, Tyrol, Salzburg, and Arendal. : ;~~

~~" Adinole is a compact variety similar in appearance to Leelite.~~

~~591. Anorrurre, AlSi+CaSi.~~

~~Anorthic. OP (P): Poo (AN) 85° 50'; oP' (1): 'P(T) 120° 30'. Hemitropes common on both M and P. Angle between P and P' 180° 24'. Cl. basal and brachydiagonal, perfect. H.=6 ;~~

~~420~~

~~G.=2°7 to2°78. Transparent ortranslucent; vitreous. Colourless or white. B.B. fuses toa clear glass ; soluble without gelatinizing in con. h. acid. C.c.: 48 silica, 36°9 alumina, 20°1 lime. sometimes~~

~~Fig. 535.~~

~~with magnesia and soda. Fetlar in Shetland ; Lendalfoot in Ayr- shire, in gabbro; Monte Somina, Iceland, Java. Lepolite and Am- phodelite are varieties. In Latrobite the greater part of the lime is replaced by potash. Glen Gairn and Labrador. At both rose-red.~~

~~592. OLIGOCLASE, 2A1Si, + (Na, Ca),Si.~~

~~Anorthic. OP : wPo 86°10'; oP': w'P 120° 42'. Hemitropes face m, with p: p' 178° 4'; 2:1 120° 20'; y:y179° 9; 2:2 175° 59'. Cl. basal, perfect; brachydiagonal, lessso. H.=6; G. =2°62 to 2°84. Vitreous, resinous on the cl. White, with a tinge of green, grey, orred. B.B. inelts easier than~~

~~orthoclase or albite to a clear glass ; not affected by acids. C.c.: 68 silica, 23°4 alumina, 8°4 soda, and 42 lime; thus nearly=8 albite and 1 anorthite. Distinguished from orthoclase by the marked strie on the faces ; less readily from albite, but more fusible and G. higher. The common associate of~~

~~orthoclase in the Scotch grey granites, especially in vein granite, as at Rispond and Ben Loyal (figs. 586, 587) in Sutherland, and at~~

~~Fig. 534.~~

~~Fig. 536.~~

~~Fig. 537.~~

~~Rubislaw ; Scandinavia, Urals, Harz, and North America. The Sunstone, from Foinaven in Sutherland, Norway, Lake Baikal, and~~

~~Ceylon, with a play of colour due to imbedded crystals of rubin-~~

~~glimmer (gidthite), belongs to this species.~~

~~593. LaBraporite, AlSi,+ (Ca, Na)Si.~~

~~Anorthic. OP: Poo 86° 40'; OP: o'P 111°; OP: oP' 113° 34'; oo': o'P 121° 37'; cPoo ; @P' 120°58'; oPco : w''P 117° 30'. Hemitropes of three types : —(1) according to the first law of orthoclase as in fig. 588; that is, vertical revolution and face of~~

~~union cPoo ; (2) revolution of onc half with reunion on the face wPa,~~

~~ch a4 VA WA~~

~~Fig. 539. Fig. 540,~~

~~as in fig. 589; (8) with twin face P, as in fig. 540. Hemitropes of the last form also occur in which the lower half consists of a hemi- trope formed according to the second method. Crystals imbedded~~

~~MINERALOGY~~

~~*in rocks consist generally of repeated twins affording an angle of 178° 20'. Cl. basal, perfect; brachydiagonal, less so; both usually striated on account of the above twinning. H.=6; G. =2°68 to 2°74. Translucent; vitreous, on the cl. resinous. Grey, passing into white,*~~

~~*green, yellow, or red. The faces of oPco often exhibit very beauti- ful changing colours—blue, green, yellow, red, or brown—some- times bands intersecting at certain angles. B.B. fuses more readily than orthoclase to a compact colourless glass. Sol. inh. acid. C.c.: 52°9 silica, 30°38 alumina, 12°3 lime, and 4°5 soda. It is thus=1 albite and 3 anorthite. Common constituent of dolerite, gabbro, and hypersthene. rocks. , In Scotland, Labrador, Finland, Harz, Tyrol; also at Etna and Vesuvius.*~~

~~*Anorthic. Crystals similar to albite and anorthite. Twin face M. Crystals generally formed of repeated plates. G.=2°67 to 2°7. Physical properties like albite; more easily fusible to a porous white glass; h. acid sometimes dissolves out alternate lamine of crystals. C.e.: 59°7 silica, 25°6 alumina, 7°7 soda, and 7 lime, and thus nearly 1 of albite and 1 anorthite. Typical of the primary limestones and a granitic belt therein in Scotland, as at Shinness, Urquhart, Dalnain, &c. In the Andes, the Vosges, and Iceland.*~~

~~*Oblique prismatic; resembles orthoclase; crystals and angles nearly the same. Cl. OP, perfect. H.=6 to 6°5 ; G.=2°8 to 2°9. Transparent. Lustre vitreous. Colourless, white, and flesli-red. C.c.: silica 52°7, alumina 21, baryta 15°1, potash 7°8, soda 2°1. B.B. difficultly fusible to a blebby glass, not acted upon by acids. Binnen in Valais, Jacobsberg in Sweden.*~~

~~*596. BarsoviTr, AlSi + CaSi.*~~

~~*Right prismatic, or oblique prismatic. H.=5°5 to 6; G.=2°58. Snow-white ; translucent. Fracturegrannlar. Pearly. C.c.: silica 42°2, alumina 36°4, lime 19°8. Gelatinizes in h. acid, difficultly fusible. A dimorphic form of anorthite. Barsovskoi in the Urals.*~~

~~*597. SAUSSURITE.*~~

~~*A massive, granular, translucent, white or pale green felspathic mineral of the nature of anorthite mixed with labradorite. H.=6 to 7; G.=3°26 to 3°4.*~~

~~*Probably a mixture. Occurs in loose blocks near Geneva, and in Corsica. In China and in India is carved under the namie of Oriental jade (nephrite). Seems to be confounded also with zoizite, and perhaps with yu (prehnite). Jadcite is similar.*~~

~~*ZEOLITE GROUP.*~~

~~*These crystallize in all the systems except the anorthic, and them- selves present great variety of development. Mostly hyaline and white; rarely red, grey, or yellow. Cl. generally distinct. All yield water in closed tube ; all: fusible B.B. most easily, and often intumescing ; all sol. in acids, and mostly gelatinize or deposit silica. They are hydrated silicates of alkalies, or alkaline earths, mostly with silicates of alumina, but rarely. contain magnesia. Some mineralogists regard the water as basic, in union with silica, and Kenngott gives the formula in that form, thus :—*~~

~~*Analcime, (NaAl) 2Si + 2(FF, Si),*~~

~~*Natrolite, (NasAl) 28i + 2(H, Si),*~~

~~*Stilbite, Ca, Al + 6(4, Si), aud the others similar. They are generally found in amygdaloidal cavities or fissures of trap or plutonic rocks, apparently as deposits from water percolating into them, and are thus. probably products of decomposing uepheline or felspars, or hydrated felspars them- selves. They never form constituents of rocks. WNatrolite, scolezite, thomsonite, and the connected varieties are marked by their needle-like radiating forms ; stilbite and heulandite by their broad, foliated, pearly cleavage.*~~

~~*598. Preerouits, 4CaSi + NaSi, + H .*~~

~~*Oblique prismatic, C 84° 37'. Peo ©; OP (uw) 95° 23'. Cl. c and w. Twin- face c; chiefly spher- oidal and radiating fibrous. H.—5; Se . G.=2°74 to 2°88. Translucent ; Wo Fa crystals pearly ; fibressilky. Pale SS*~~

~~*green to yellowish white. Sol. in h. acid, leaving silica. C.c.: 51:2 : silica, 83°7 lime, 9°4 soda, and Fig. 541*~~

~~2°7 water. Ratho, Corstorphine, Castle Rock, and Arthur's Seat, Edinburgh; Kilsyth, Stirling ; Knockdolian and Lendalfoot, Ayr- shire; Skye; Montebaldo; Monzoni Valley in Tyrol.~~

~~599. Waxerite, 4Ca8i + MgSi + NaSi, + 2H.~~

~~Like pectolite, but columnar. H. =4°5; G.=2°7. Flesh-coloured. Lustre pearly to greasy. C.c.: silica 58°7, lime 28°6, magnesia 5'1, soda 7°9, water 4°6. Corstorphine Hill, Burntisland.~~

~~600. Xonotuits, 4CaSi + #.~~

~~Massive. H.=6; G.=2°6 to2°7. Pink, white, and grey. Tough;~~

~~MINERALOGY~~

~~fracture conehoidal and splintery. — C.c.: siliea 49°8, lime 4375, protoxide of manganese 2°3, protoxide of iron 2°9, water 3°7. _ Kilfinichen and Torosay (Mull), Xonotla (Mexico).~~

~~' 601. ToBERMORITE, 3(Ca,, Hf)Si, + 25H.~~

~~Massive, fine granular; translucent ; fracture haekly. H.=5; G.=2'4. Pale pink. C.c.: siliea 49°8, lime 37°2, water 12°9. Tobermory (Mull), Dunvegan (Skye).~~

~~602. OKENITE, CaHfSi, + H.~~

~~Right prisinatic. oP 122° 19'. Usually fine fibrous; radiating. H.=5; G, =2°28 to 2°36. Pellucid; slightly pearly. Yellowish to bluish white. In powder easily sol. in h. acid, leaving gelatinous flakes after ignition. C.e.: 56°6 silica, 28°4 lime, and 17 water; an apophyllite without the fluorine. Disco Island, Faroes, and Iceland. ;~~

~~603. APOPHYLLITE, 8(CaSi + 2H) + KF.~~

~~Pyramidal. P 120° 56'. P, wPo (m), _ Rarely lamellar. Cl]. 0, perfect. Brittle. G.=2°3 to 3:4. Transparent ; vitreous. thalmite). Colourless, rarely pink, green, red, brown, and yellow. B.B. exfoliates, intumesces, aud melts~~

~~*to white enamel. Sol. in h. acid, leaving silica. C.c.: silica 50°38, lime 24°7, water 15:9,*~~

~~*OR) @), oP2i (x): He deb to bb;*~~

~~*P r*~~

1.

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~~*Ne*~~

~~*Ld*~~

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~~’ *n*~~

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~~*Fig. 542. Fig. 543. Fig. 544. potassium 4°3, fluorine 21. Dunvegan and Storr, Skye (fig. 544); Chapel, Fife ; Corstorphine (fig. 542) and Ratho, near Edinburgh ; Kilsyth, Bowling, Kilpatrick ; Port Rush, Ireland. In the form P (fig. 79), grass-green at Oxhaveer, Jeeland (Oxhaveerite) ; Ut, Sweden; Andreasberg and Faroes (pink); Faroes, and Poonah in India (green). Internal structure tesselated, being built up of wedge and lenticular forms with varying refractive indices, hence exhibit- ing a beautiful structure with polarized light.*~~

~~604. GyROLITE, (?Ca+7H)Si+H.~~

~~Lamellar, radiate, spherical, and investing. H.=3to4. Pearly. Bluish white to cream-coloured. 'Transparent, rapidly becoming opaque. C.c.: silica 53°3, lime 382°9, water 13°8. Quiraing, Lyndale, and Storr, Skye; Loch Screden and Carsaig, Mull; Canna; Karartut, Niakornak, and Disco ; Faroes ; Nova Scotia.~~

~~605. ANALCIME, AISi,+NaSi+2H.~~

~~Cubie. oOc;202. Fractureuneven. H.=5°5; G. =2°1 to 2°28. Colourless, white, flesh-red, sear- let. Vitreous; transparent. B.B. melts without frothing to a clear vesicular glass. Decomposable with gelatinization in h. acid. C.e.: 54°5 silica, 23°3 alumina, 14°1 soda, 8°2 water. Walls, Orkney; Talisker, Skye; Sanda, and Hebrides generally. 'Trans- parent at Eigse, and Elie, Fife scarlet at Bowdens, Kincardine ; opaque white at Glen Farg, Salisbury Crags, and Dumbarton; Giant's Causeway, Seisser Alp in~~

~~Fig. 545. Tyrol, Cyclopean Islands (fig. 545), Faroes, Iceland, and Nova~~

~~Scotia. Hudnophite is a variety. Pecto- lite (sp. 598) occurs pseudomorphous after analcime, in large crystals of a, 7, at Ratho, Edinburghshire.~~

~~606. Ponnux, 3(AlSi;+(€s2, Nad)$i) +~~

~~oOo; 202 (fig. 546). Also massive. Gum-like externally. Brittle,~~

~~with traces of cleavage. Fracture con-~~

~~choidal. H.=5°5 to 65; G.=2°86 to SQ~~

~~2°9. Colourless. Vitreous. Sol. in n. " :~~

~~acid. C.e.: silica 44, alumina 16, oxide cia GP 606); : of cesium 34; soda 2°5, water 2°4. Elba. The only mineral which contains cesium in quantity. :~~

~~On o pearly (Lehthyoph- |~~

~~421~~

~~607. Fausasitz, 2418i, + (CaNa),Sig + 18HE.~~

~~Cubic ; in octahedrons with the icositetrahedron $0%. Fracture uneven ; brittle H.=7; G.=1°92. Transparent; vitreous to adamantine. White to brown. Sol. inh. acid. C.c.: 46°8 silica 16 alumina, 4-4 lime, 4°8 soda, 28 water. Kaiserstuhl in Baden, Annerod near Giessen, Eisenach, Marburg.~~

~~Rhombohedral ; R 94° 46.' 48R4;— 4R ®;-2R (ce); wP2 (a). Twins very common (generally interse*ting), on faces oP and~~

~~)~~

~~Fig. 547. Fig. 548, Poo. Primary rhombohedron is sometimes twinned with a crystal with faces r, e,s. Cl. r perfect. H.=4 to 45; G.=2 to 2°92. Transparent or translucent; vitreous. Colourless, and brownish,~~

~~Fig. 549. Fig. 550.~~

~~yellowish, brick-, and flesh-red. Sol. in h. aeid, leaving silica. C.c.: silica 47°8, alumina 20°8, lime 10°7, water 21°3. Lyndale (figs. 547, 548, 549), Talisker (figs. 176, 550, sometimes flesh~~

~~eS~~

~~Fig. 551. Fig. 552.~~

~~colour), and Storr, Skye (figs. 547, 548); Port Glasgow and Kil- malcolm (pink and brown); Giant's Causeway and Magee Island (red), Faroes, Iceland, Aussig, Andreasberg (fig. 551). Haydenite in twinned rhombohedra, with p:p 95° to 97° and p:@ 170° reentering (fig. 552), from Fassa and ¢ Maryland, is similar. Phaeolite is chabasite in twins of 2P2, oP2, R, -4R at the Giant's Causeway (fig. 154). At — Richmond in Victoria~~

~~they occur as in fig~~

~~Fig. 553. 553, -2R (n), — 3R ®, $P2 (0), OP ©; polar edge, 3P2 145°. In this, half of the lime is replaced by soda. < 609. GMELINITE (Soda-~~

~~Chabasite), ANSi, + NaSi + 6H « Hexagonal. R 112° 26'; P 79° 54'. Combination P, OP, oP~~

~~(figs. 554, 556). Faces of P striated parallel to the polar edge, those of the prism horizontally (fig. 555). Cl. ooP distinct. Gelatinizes~~

~~"as CY~~

~~Fig. 556.~~

~~iy with h. acid. C.c.: 47°6 silica, gre 19°7 alumina, 12 soda, 20°7 water.~~

~~Fig. 555. Certain crystals seem to indicate twinning. Talisker in Skye (twins of fig. 555), Glenarm in Antrim (fig. 555), Vicenza, Pyrgo in Cyprus, Cape Blomidon in Nova Scotia.~~

~~610. Levyne, AlSi, + CaSi + H5. :~~

~~Rhombohedral; R (s) 79° 29'; ~·—4R ® 106° 3'; OR (0). Forms intersecting twins as in fig. 557. H.=4; G. =2°1 to 2:2, Colourless and white. C.c.: silica 43°8, alumina 23°8, lime 9°7, water 21. Storr in Skye (0, s), Ireland (at Glenarm, Island Magee, London-~~

~~derry, &c.), Iceland, Dalsnypen, and Naalso in the Faroes.~~

~~611. Hersceneuirs,~~

~~Hexagonal prisms (¢) surinounted by two trihedral pyramids of a7 and one of a3) (fig. 558). a,: ¢ 122°8';~~

~~a :¢ 107° 26'; e striated hori- zontally. Cl. e; fracture con- choidal; transparent; vitreous. € White or colourless) H.=5'5; . G.=2°06. Cc: silica 47, alu- Fig. bho et) mina 21°2, lime 5°2, soda 4°8, potash 2, water 17°86. Aci- Castello and Palagonia in Sicily, Yarra in Australia. 612, LAUMONTITE (Leonhardite), AlSi, + CaSi + 4H. Oblique prismatic, C 80° 42', oP (m) 86°16', oP:— oP (ce)~~

~~118°30' ; Poo (a,):— oP 111° 14'; ¢: @125° 41'; a:090°; ¢:2149° 15'. Twin facea. Cl. m, perfect ; very brittle. H.=3 to 35; G,=2°2 to 2°38.~~

~~*Pellucid when fresh ; vitreous ; pearly on cl. White, cream-coloured, brick-red. De- composes rapidly through loss of water. B.B. intumesces, and melts first to a white enamel, ultimately to a clear glass. Gelatinizes in h. acid. C.c: silica 50°9, alumina 21°8, lime 11°9, water 16°3. Rapidly loses 1 equivalent or 3°86 per cent. of water, and becomes fri- able (Hypostilbite). Kilfinichen, Mull (jig. 559); Storr and Quiraing, Skye (hypostil- bite); Tod Head, Snizort, Glen Farg (red) ; Bowling, Dumbarton (twins of m, e); Huel- ; goat. in Brittany; Prague, Falun, Iceland, Fig. 559.*~~

~~*Faroes, Nova Scotia. Caporcianite from Tuscany has only 3*~~

~~*water. 613. EPpImsTILBITE (Reisstte), AISi, + CaSi, + 574.*~~

~~*Oblique prismatic, C 54° 53'. coP (m) 135° 10'; Poo (¢) 109° 46'; $P(s) 147° 40'(fig. 560). Henni- tropes united by m, with twins of the same united by the brachy- diagonal (a). Cl. brachydiagonal, perfect. H.=3°5 to 4; G.=2°3 to 2°4, Pellucid ; vitreous; pearly on cl. Colourless. Sol. without gelatinizing. C.c.: silica 59, alum- ina 17°5, lime 9, soda 1°5, water 14°5. Talisker in Skye (m, ¢, a);*~~

~~*Fig. 560.*~~

~~*Hartlepool (in twins), Iceland, Faroes, Silesia, Viesch in Valais, Nova Scotia, and New Jersey.*~~

~~*MINERALOGY*~~

~~*614. HrvtanpirTe, ASi, + Cadi, + 5H. — Oblique prismatie, C 63° 40'. Pc' (p) 50° 20'; 2P (z) ; $P (w) 5*~~

~~*2P%co (7); SPeoo (s); Poo; oP®; OP. 2:2 186°4'; w: wu 146° 52'. Crystals elongated along each of the axes pre- sent very varying forms, but generally tabular Cl. clinodiagonal, per- fect; pearly on this, vitreous on others; brittle. H.=3°5 to 4; G.=2°1 #0 2°2, "Drans- parent to translucent ; colourless, white, brick- red, rose, green, hair- brown. B.B. melts with exfoliation and _ intu- mescence to a white enamel. . Sol. in h. acid, leaving _ silica. Storr and Talisker, Skye (fig. 562); Sanda; Kilmalcolm; Catterline, Kincardine (fig. 563); Kilpatrick Hills (p, mm, N, %, U,7,8)and Kintyre .*~~

~~—— (red); Iceland, Tass. Fig. 564. Fig. 565. Fassa Valley, Nova Scotia, Baltimore (Beawmontite) (fig. 565) (p, m, 2, 2, t); Vindhya Mountains in India (fig. 564).~~

~~615. BrewsreriTe, AlSi,RSi, 57. R=(¢Sr + ?Ba + }Ca).~~

~~Oblique prismatic, C 86° 56'. cP%s0 (a); coPto (b); OP (0); nPoo (€); oP (m); wPe2 ©; oP% (Z). e:e 178° 10' (fig. 566). Cl. clinodiagonal, perfect ; pearly on do., vitreous on others; pellucid. H.=5 to 5°5; G.=2°5 to 2°45. Colourless, yellow, or brown. Sol. with gelatinization in h. acid. C.e.: 54°83 silica, 15 alumina, 9 strontia, 6°6 baryta, 1°3 lime, 13°5 water. Strontian, Freiburg in the Breisgau, Pyrenees.~~

~~Fig. 562. Fig. 563.~~

~~Oblique prismatic, C 55° 1'. oP (m);| cP (b); OP (¢). Polar edges 120° 42' and 119° 18'. Faces b and m striated parallel to the intersections. ase always twinned; \ |.~~

~~enerally these duplicated by intersection on |.~~

~~ee b ai fade € (figs. 567, 568), and frequently Fig. 566 (sp. 615). arranged so that three of the above double twins intersect at right angles to one another, forming the cruciform fig. 569.~~

~~;~~

~~Fig. 569. . When the prismatic faces of these are short, the faces m of the~~

~~Fig. 570.~~

~~MINERALOGY~~

~~intersecting individuals fall nearly into one plane, presenting the form fig. 570; when long, fig. 190. Brittle; fracture uneven. H. =4'5; G.=2°15 to 2°2. Gelatinizes in h. acid. C.e.: silica 48°6, alumina 20°2, lime 7°3, potash 6°2, water 17°7. Giant's Causeway, Giessen, Marburg, Cassel, Capo di Bove, Vesuvius, Iceland.~~

~~*Physical properties like phillipsite, but G.=2°3 to 2°5, and fuses*~~

~~*SESS 7)*~~

~~*ane *~~

~~*Fig. 573. with difficulty. Difficultly sol. in h. acid. C.c.: 46°5 silica, 15°9*~~

~~*Fig. 574.*~~

~~*alumina, 23°7 baryta, and 13°9 water. Stroutian, transparent (Morvenite, fig. 572) and opaque (figs. 571, 573); Glen Arbuck (fig. 574) and Bowling in Dumbarton; Corstorphine near Edinburgh ; Andreasberg, Kongsberg, Oberstein.*~~

~~*618, Srinpire, AISi, + CaSi, + 6FF. Oblique prismatic, but with right prismatic habit; C 50° 49'.*~~

~~*aPo (a); wPo(b); P®; oP2 (m); OP (p). Cl. a, perfect. Ho=3'> to.4; G.—2Tto22. Transparent ; vitre- ous. Pearly on a. Colourless, white, yellow, pale brown, brick-red. Decomposed by h. acid, leaving silica. C.c.: silica 57°5, alumina 16°4, lime 8'9 water 17°2. Storr and Talisker in Skye (a, 6, p) (fig. 575), and in Hebrides (colourless); Arran and Kilmalecolm (pale brown); Long Craig (Dumbarton) and Kinneff (Kincardine) (brick-red); Iceland, i Faroes, Andreasberg, Vindhya Mountains, Wellington Mountains (Australia), Nova Scotia. i*~~

~~*619. PurrLeriTE, AlSi, + Ca,Si,+ SFE*~~

~~*Fibrous globular concretions, with vitreous surface. H.=4; G.=2-21. Greyish white. 'Transparent. C.c.: silica 52°8, alumina 16°3, lime 11°2, water 17°2. Pufflatsch in the Seisser Alp.*~~

~~*620. Epincronire, 4A]Si,3BaSi 12H.*~~

~~*Pyramidal ; hemihedral with inclined faces. 129° 8'; oP (a); polar edges P 92° 51' (fig. 576). Cl. a, per- fect ; fracture uneven. H.=4 e425: Gl—2-7 to. 2°71. Trans- lucent ; vitreous. Colourless. C.c.: silica 37°3, alumina 23°75, baryta 26°52, water 12°46. Kil- patrick Hills in Dumbarton- shire,*~~

~~*P 87° 19'; 4P (n)*~~

~~*ene calc ign*~~

~~*621. Foresite, 2AINi, _ + (Na, Ca,)Si, + 6H. Fig. 576 (sp. 620). Right prismatic. Pc; oPo;0P. Cl. perfect ; lustre thereon pearly. G.=—2°4. White.*~~

~~*50, alumina 27°4, lime 5°5, soda 1°4, water 15:1. in Elba, .*~~

~~*622. Narrouire, AlSi, + NaSi + 2H. Right prismatic. ooP(m) 91°; P (0); polar edges 148° 20' and 144° 40', middle edge 58° 20'; «Pa (b); Pc (a). Radiating*~~

~~*brachydiagoual, C.c. > silica San Piero*~~

~~*| 55; G.=2°2 to 2°3.*~~

~~*423*~~

~~*acicular crystals, often fibrous. Cl. oP, perfect. H.=5 to 55; G. =2°17 to 2°26.. Pellucid; vitreous. Colourless, ochre-yellow, reddish. Is not pyro-electric. B.B. melts quietly to a clear glass, colouring flame yellow. Sol. in oxalic acid. C.c.: 47°2 silica.*~~

~~*Fig. 577. Fig. 578. 27 alumina, 16°3 soda, 9°4 water. Glen Farg (fig. 577), (colourless and reddish), Tantallon Castle (fig. 578), Dumbarton, Bowling (green), Campsie, Bishopton, Glenarm and Port Rush (Ireland), Auvergne, Hesse, Hohentwiel in Swabia, Norway. Crocalite is red, fibrous, and investing ; Kintyre, Forfarshire, Wemyss Bay, and the Urals.*~~

~~*623. Sconecire, AISi, CaSi 3H.*~~

~~*Oblique prismatic, C 89° 6'. oP (m) 91° 35'; P (0) 144° 20;-P. Prismatic and acicular crystals. Twins common, on face coP*co , one face with feathered stria, Cl. oP, perfect. H.=5 to Pellucid ; vitreous ; pyro-electric. White to reddish white. B.B. twists in a vermicular manner; melting readily to a porous glass. Only par- tially sol. in oxalic acid. C.c.: silica 45°8, alumina 26°2, lime 14°3, water 13°7. Staffa; Loch Screden, Mull; i] Talisker, Skye; Berufiord, Iceland \ if (fig. 579); Faroes ; Vindhyas, India.*~~

~~Ni} Natrolite and scolecite pass into one ‘i another. There are two definite in- termediates—Fargite, consisting of two equivalents of natrolite and one of scolecite, aud Mesolite, consisting of one of the former and two of the latter. The first of these occurs at Glen Farg and at Bishopton (Galactite) ; the second is the ordi- nary radiated zeolite of the amygda- Fig. 579. loids of the Tertiary igneous rocks of the Hebrides and the Farces. It there occurs in matted crystals of extreme tenuity (Cotton- stone), also in delicate feathery tufts ; in Renfrewshire in spheres with an internally radiated structure, and also in needle form and in downy tufts.~~

~~Pyramidal. P (6) 92° 30’; polar angie 118° 34’; owPo (fig. 580). Cl. P. H.=5, on edges and angles 5 to 6; G.=2°26. Translucent ; vitreous. JBluish white to pale red. C.c.: silica 35°9, alumina 27°3, lime 1371, potash 2°8, water 21°l. Island Magee and Larne, Ireland; Vesu- vius, Aci-Castello, and Capo di Bove; Schiffenberg near Giessen; Schlauroth near Gorlitz.~~

~~Si 4 atk. Fig. 580.~~

~~Right prismatic. P polar angle 120° 37’ and 121° 44’; middle angle 89° 13’. Crystals like fig. 419. H.=5, on edges and angles 7; G.=2°2. Transparent; vitreous. Colourless, white, or bluish. C.c.: silica 44, alumina 23°38, lime 5°3, potash 11°1, water 15°3. Capo di Bove.~~

~~Right prismatic. oP (m) 90° 26’; oPco (a); coBco (b); sPeo (y); Poo ®; debo (2), aie 177° 34’ 20”, Cl. macrodiagonal and_brachy- diagonal, both perfect. H.=5 to 5°56; G.=2°35 to 2°38, Translucent; vitreous ; pearly on mac- rodiagonal. Colourless. B.B. difficultly fusible with intumescence to a white enamel. Sol. with pic, 581 (sp. 626). gelatinization in h. acid. C.c.: silica 3877, ; alumina 30°8, lime 13°4, soda 4°4, water 13°1. Lochwinnoch, Renfrew ; Kilpatrick (fig. 58°. > Quiraing and Talisker (sometimes~~

~~massive-granular) ; Rathlin and Magee Island, Ireland; Faroes,~~

~~Vesuvius (fig. 581), Sicily, Bohemia, Tyrol,~~

~~Nova Scotia. A..* aA Faroelite is a variety with 42°5 of silica.~~

~~*It replaces thomsonite generally in Tertiary*~~

~~*igneous rocks, occurring at Storr and else-*~~

~~*where in the Hebrides, Faroes, Iceland,*~~

~~*and Nova Scotia. The angle of the vertical*~~

~~*prism is within 8' of that of thomsonite. It*~~

~~*contains an equivalent more silica.*~~

~~*627. Prennitr, AlSi + 2CaSi + H.*~~

~~*Right prismatic. oP (m) 99° 58'; OP ©) 3Poo (e) 33° 26'; $Poo (v) 90° 32'; «Poo (a); cPoo (b); P(s). Crystals either tabular of ¢, or prismatic along both the vertical and the brachydiagonal axes, hence varying much in form. Also in fan-shaped and botryoidal aggregations. Cl. ¢, perfect; pearly thereon, vitreous else-*~~

~~*where. H.=6 to 7; G.=2°8 to 3. Transparent to translucent. Colour-*~~

~~*Fig. 583.*~~

~~*Fig. 582 (sp. 626).*~~

~~*Fig. 584.*~~

~~*less, but generally green of bright but pale tints, also lemon-yellow. Becomes electrically polar by heat. B.B. intumesces greatly, melting to a porous enaniel. Decomposed by h. acid. C.c.: silica 43°6, alumina 24°9, lime 2771, water 4°4. Glen Gairn, Aber- deen (fig. 588); Skye and Mull; Corstorphine Hill (green and pink), Castle Rock (white), and Salisbury Crags (yellow), Edin- burgh; Frisky Hall, Dumbartonshire (fig. 584); Hartfield Moss, Renfrew (botryoidal); Cornwall; Dauphiné; Tyrol: Cape of Good Hope; China (Yu).*~~

~~*628. FRIEDELITE, Mn,Si,; + 2H.*~~

~~*Rhombohedral ; R 128° 42'. OR; oR. Tabular habit, and in granular aggregates. Cl. basal,perfect. H.=4 to 5; G.=3°1. Rose-*~~

~~*red, with paler streak. C.c.: silica 36, protoxide of manganese 53, lime 2°96, water 7°9. Adervielle on the Neste de Louron (Pyrenees).*~~

~~*Hyprovs SilIcaATEs oF ALUMINA.*~~

~~*These are probably for the most part products of decomposition of felspars under atmospheric exposure.*~~

~~*629. Kaottn (Porcelain Earth), A\Si,+ 24.*~~

~~*Massive ; in beds and veins. Fracture uneven ; fine earthy, very soft, sectile, and friable. H.=1; G.=2'2. Opaque, dull. White or grey, inclining to blue, green, yellow, or red. Feels meagre, not greasy when dry, and plastic when wet. 3B.B. infusible. Not affected by h. acid, but decomposed by warm s. acid, leaving silica. C.c. very variable, but approximates to 46 silica, 40 alumina, and 14 water. Chiefly a product of the decomposition of orthoclase, or of granite, porphyry, and other rocks containing that mineral. Cornwall and Devonshire in England are the chief European locali- ties for the kaolin used in manufacturing porcelain.*~~

~~*Clays are merely varieties of kaolin, mixed with quartz-sand, car- bonate of lime, magnesia, and the oxyliydrates of iron. Often 40 to 50 silica, 30 alumina, 13 to 20 water, and 4 iron peroxide, with lime and potash. In the fire they are infusible, burning hard. Generally they are compact and friable, of white, yellow, red, blue, grey, or brown colours, Their specific gravity varies from 1°8 to 27. The following are varieties. Pipe-clay, greyish or yellowish white, with a greasy feel, adheres strongly to the tongue, when wet is very plastic and tenacious, and in the fire burns white. Abundant in Devonshire, and in the Trough of Poole in Dorsetshire; in France, Belgium, and Germany. "Used for manufacturing tobacco-pipes and similar articles. Potter's Clay, red, yellow, green, or blue, becoming yellow or red when burnt; more easily fused than the former, and often effervesces with acids. That used in the potteries in England comes chiefly from Devonshire. Loam, coarser and more impure, with more sand, and consequently less plastic. Shale or Slate Clay, greyish black, and much mixed with bituminous or*~~

~~carbonaceous matter. Bituminous Shale, known by its shining resinous streak. Black Chalk, with more carbon, leaves a black mark on paper. Jron~~

~~MINERALOGY~~

~~Clay contains much peroxide of iron, is reddish-brown, and forms the basis of many amygdaloids and porphyries. °~~

~~630. NacriTE, AlSi,+ 2H.~~

~~Right prismatic; minute six-sided tables in fan-like group ; and scaly. H.=0°5 to1; G.=2°35 to2°6. Glimmering to pearly, snow- white or yellowish white. C.c.: silica 46°83, alumina 39°8, water 13°9. Acrystalline form of kaolin. Fins in Allier, Mons, Freiberg, Pennsylvania, and coal formation commonly;~~

~~631. LiTHOMARGE. Kaolinie substances, compact, earthy, and pseudomorphous. H.=2‘5to3; G. =2°4to 2°6. White, yellow, orred. Greasy, adheres~~

~~to tongue. Klausthal, Harz, &c. Similar are Carnat, Myelin, Melopsite.~~

~~632. Hattoysirs, AlSi+ 47.~~

~~Massive and reniform. H.=1°5to 2°5; G.=1°‘9to 2-1. Trans- lucent wheu moist. Bluish white, green, or yellow. C.c.:.41°5 silica, 34°4 alumina, 24°1 water. Hospital Quarry near Elgin, on the Tweed, Liége, Tarnowitz, Eifel (Lenzinite). Fuller’s Earth may be an impure ferruginous variety. Maxton in Scotland, Reigate aud Maidstone in England, Saxony, Bohemia, &c.~~

~~633. GLAGERITE, z1,Si3+ 61.~~

~~H.=1; G.=2°35. Bergnersreuth. Jfalthazite, from Steindérfel near Bautzen, has less alumina.~~

~~H.=1 to 2; G.=2. Also similar. Schemnitz, Pyrenees, and Saxony. Scarbroite from Scarborough has 10H,0.~~

~~635. MILOSCHIN.~~

~~*Conchoidal or earthy. . H.=2; G.=2°1. green ; has 2 to 4 chrome oxide.*~~

~~*Indigo-blue to celadon+ Ruduik in Servia.*~~

~~*636. MONTMORILLONITE, Al,Si,+ 2H.*~~

~~*Massive. Rose-red. Montmorillon and elsewhere in France, Poduruoj in Transylvania.*~~

~~*From Carinthia. Chrome Ochre, with 2 to 10 per cent. of chrome oxide, from Waldenburg in Silesia and Creusot in France, is similar.*~~

~~*638. CrmoniTE, Al,Si,+ 67.*~~

~~*Pseudomorphous after augite. Argeutiera and Milo.*~~

~~*639. ALLOPHANE, AlSi+ 53H.*~~

~~*Botryoidal and reniform. Fracture conchoidal; brittle. H.=38 ; G.=1°8 to 2. Pellucid; vitreous. Pale blue, white, green, or brown. Colour duc to copper. Charlton, Woolwich, Baden, and Bonn.*~~

~~*640. PYRoPHYLLITE, AISI,+ HH.*~~

~~*Right prismatic, but radiated, foliated. Cl. perfect ; flexible, sectile. H.=— 1; G.=2°8to2°9. Translucent, pearly. Light verdi- gris-green to yellowish white. B.B. swells up with many twistings to a white infusible mass. C.c.: 67 silica, 28 alumina, and 5 water. Urals, Spa, Morbihan, Westana in Sweden, Carolina, and Brazil. Talcosite, from Heathcote in Victoria, has silica and alumina about equal.*~~

~~*641. AnauxiTE, AlSi,+3H.*~~

~~*Granular. H.=2 to 3; G.=2°2 to2°4. Translucent, pearly. Greenish white. C.c.: 60°5 silica, 26 alumina, and 13°5 water. Bilin in Bohemia.*~~

~~*Bilin, Limburg, Kaiserstulil,*~~

~~*Hyprovs SILIcATES OF ZIRCONIA, THORIA, &c.*~~

~~642. MALAcCONE, 3ZrSi + Hf.~~

~~Pyramidal. P 83°30'. Typical form Po, P, oP. H. =6; G.=3°9 to 4°1. Conchoidal fracture. Lustre vitreous. C.c. same as zircon, but with 3 of water in the Hitteré variety and over 9 in that from Finland. Has a surface opalesceuce, and may be altered zircon. Hitterd, Chanteloube (near Limoges), near Dresden, Rosen- dal, Finland, Miask.~~

~~643. EUCRASITE.~~

~~Right prismatic (?). H.=4'5 to5; G.=4°39. Lustre greasy. Blackish brown; streak brown. Translucent on edges. Fracture uneven; brittle. C.c. very complex: silica 16, thoria 86, cerium protoxide 5:5, peroxide 6, lanthania 2°4, yttria 4°3, erbia 1°6,~~

~~titanic acid 1°3, ferric oxide 4°25, alumina 1°8, water 9. Barkevig near Brevig.~~

~~644, Tuorire, ThSi + 2H .~~

~~Pyramidal. oP: P 133° 30'. Generally massive. H.=4°5 to5. G.=5to5'4. Lustre brilliant vitreous; when weathered resinous. Fracture conchoidal when fresh, splintery when~~

~~weathered. Brownish black to clove-brown. C.c. complex, but essentially 18 silica, 73 thoria, 9 water. In syenite at Lochan~~

~~MINERALOGY~~

~~Hacon, and in a boulder on Ben Bhreck in Sutherland, in crystals (fig. 585); L6éwo6 near Brevig, Nor- way. Uranothorite, from Arendal, has 50 per cent. thoria and 10 uranous oxide ; found also at Hitter and at Champlain (U. 8.)~~

~~645. ORANGITE, 8ThSi + 2H.~~

~~Massive. Orange-yellow to cinua- mon-red. Other characters like tho- mite, ©.e.: 7 silica, 75 thoria, 7 water. Ben Bhreck, Langesund near Brevig. The~~

~~*mineral from Ben Bhreck passes gradually into thorite, which | thus would appear to be altered orangite.*~~

~~*646. TRITOMITE, B,Si,+ 4H.*~~

~~*Cubic. In tetrahedra. H.=5‘5; G.=3°9 to 4°66. Lustre vitreous. Dull brown; streak yellowish grey. Subtranslucent. C.c. complex: silica*~~

~~*Fig. 585 (sp. 644). 21, alumina 2°5, ceria 40, lanthania 15, yttria 4°6, lime 4, water 8. Lam6 near Brevig.*~~

~~*MAGNESIAN SILICATES.*~~

~~*647. AGALMATOLITE (Figure Stone), 4A]Si, + KSi, + 342.*~~

~~*Massive or slaty. Fracture splintery, rather sectile. H.=2 to 3; G. =2°8to2°9. Translucent; glimmering. Green, grey, red, and yellow. Feels somewhat greasy, but does not adhere to the tongue. Sol. ins. acid. C.e.: 55 silica, 33 alumina, 7°6 potash, and 5 water; but in many localities magnesian. Calligaig in Sutherland ; China, where it is cut into various works of art; also Nagyag in Hungary, and Saxony.*~~

~~*648. OncosINn, 2AISi, + (K,Mg)Si,+ 2H.*~~

~~*Fracture uneven or splintery; sectile. lucent; slightly resinous. Apple-green or brown. Sol. ins. notin h. acid. Salzburg.*~~

~~*649. LIEBENERITE.*~~

~~*Hexagonal. oP; 0P. Cl. prismatic, perfect ; fracture hackly.*~~

~~*®@H.=3‘5; G.=2°8. Oil-green, bluish green, and greenish grey. Greasy lustre. C.c.: silica 44°7, alumina 36°5, potash 9°9, water 5°5. Monte Viesena near Forno, Predazzo in Tyrol.*~~

~~*650. GIESECKITE.*~~

~~*Hexagonal. oP; OP. Fracture splintery. H.=3 to 35; G.=2°7 to2°9. Kangerdluarsuk in Greenland, Diana in New York.*~~

~~*Crystalline, foliated. Cl. along a prism of 135° 44'. G.=2°65. Greenish grey, yellow, or brownish green. C.c.: 48 silica, 31 alumina, 2°3 protoxide of iron, 6°5 potash, 10 water. Killincy near Dublin.*~~

~~*652. HYGROPHILITE.*~~

~~*Sealy. H.=—2to 2°5; G.=2°7.*~~

~~*Sol in h. acid.*~~

~~*potash 5°7, water 9. Halle on the Saale.*~~

~~*__ Aggregates of thin plates. H: =1to2; G.=2°6. C.c.: silica 51:4, alumina 18°9, peroxide of iron 4, magnesia 3°3, potash 6°5, water 18°3. Noyant in Allier.*~~

~~*654. PINITOID.*~~

~~*Massive. Leek- and oil-green. H.=2°5; G.=2°8. C.c.: silica 48°5, alumina 28, protoxide of iron 8, potash 5°8, water 4°5. Frei- berg and Chemnitz in Saxony.*~~

~~*655. BoLe.*~~

~~*Earthy, in nests and veins.*~~

~~*_ 25.*~~

~~*Conchoidal. H.=1 to 2; G.=2°2 to Opaque ; dull resinous; streak shining. Brown, yellow, or 'red. Feels greasy; some adhere strougly to the tongue, others not atall. In water crackles and falls to pieces. C.c. hydrous silicates of alumina and iron peroxide, in various proportions. Scotland, lreland, Dransfeld, Clermont in Auvergne. Stolpenite, Rock Soap, Plinthite, Yellow Earth or Felinite, Fetbol, and Ochran are varieties.*~~

~~*Right prismatic. P111°27'. Radiating stellated. H.=5 to 5°5; G. =2°9. Translucent; silky; straw- to wax-yellow. B.B. intumesces and fuses to an opaque brown glass. C.c.: silica 38, alunina 29°4, protoxide of iron 2°9,*~~

~~*peroxide of iron 4, protoxide of manganese 11°8, water 10°8. ebtnceon wall Wippra in the Harz, Meuville in the Ardennes.*~~

~~*657. NonTRonitTE, FeSi,+ 5H.*~~

~~*Massive; fracture uneven. H.=2 to 3; G.=2 to 2°3. Opaque; dull or glimmering; streak resinous. Straw-yellow or siskin-green. B.B. decrepitates, becomes black and magnetic, but without fusing;*~~

~~*| and 21 water, with 3°5 alumina and 2 magnesia. France, Harz, and Bavaria.*~~

~~*| yellow-brown.*~~

~~*_=2: G.=2°8. Trans- | He = 2s G 8. Trans- 19, ferric oxide 10, water 21.*~~

~~*| Crystals honey-yellow ; when massive leek-green.*~~

~~*Greenish grey. Lustre and feel / greasy. C.c.: silica 48°4, alumina 32°1, protoxide of iron 3°3, |*~~

~~*425*~~

~~*sol. and gelatinizes in warm acids. C.c,: 48 silica, 36 iron peroxide, Nontron in Chloropal is similar. B.B. brown. Unghvar in Hungary, and Passau.*~~

~~*658. PINGUITE.*~~

~~*Massive; fracture splintery; sectile. H.=1; G.=2°3. Light to dark green. Lustre vitreous. Feels greasy. C.c.: silica 36°9, per- oxide of iron 29°5, protoxide of iron 6°1, water 25:1. Wolkenstein,*~~

~~*| Suhl.*~~

~~*659. HisincErive, Ye,Si, + 2FeSi+ 9H.*~~

~~*Reniform, andin crusts. H.=3‘5 to4; G.=2°6 to 3. Opaque, resinous. Brownish or bluish black; streak liver-brown or yellowish brown. C.c.:*~~

~~*various, but 32°5 silica, 83°5 iron peroxide, 15°1 iron protoxide, and 19 water, in the Thrauwlite from Bodenmais. Also Gilling and Riddarhyttan in Sweden, and Breitenbrunn (Polyhydrite).*~~

~~*660. BERGHOLZ.*~~

~~*Fine fibrous; glimmering lustre. Wood-brown to green. G. =2°4, C.c.: silica 55°5, peroxide of iron 19°5, magnesia 15, water 10°38.*~~

~~*| Sterzing in Tyrol.. Xylite, probably from the Urals, is similar.*~~

~~*661. UMBER.*~~

~~*Massive; fracture conchoidal. H.=1°5; G.=2°2. Liver-brown; streak shining. Mixtures of peroxide of iron, oxide of manganese, and alumina with water. Cyprus. Hypoxanthite and Siderosili- cite are similar.*~~

~~*662. KuipsTEINITE, (Rg, #,),Si, + Rely.*~~

~~*Compact. H.=5 to 5‘5; G.=3°5. Liver-brown to black ; streak C.c.: silica 25, peroxide of iron 4, sesquioxide of manganese 57, water 9. Klapperud in Dalecarlia, Herborn near*~~

~~*| Dillenburg.*~~

~~*663. WOLKONSKOITE.*~~

~~*Amorphous. Horny; bluish green to grass-green. Fracture con- choidal ; brittle. C.c.: silica 36, alumina 3, sesquioxide of chromium Okhansk in Siberia.*~~

~~*664. RUrrisiTE, 3NiSi+ 4H.*~~

~~*Amorphous and reniform. Apple-green toemerald-green. H. =2 to 2°5; G.=2°35 to 2°37. C.c.: silica 43°7, nickel oxide 35°9, water 11°2. Réottis near Reichenbach in Saxony. Konvarit is similar.*~~

~~*Right prismatic. oP 146°; cPco; Po; with polar angle 90°. H. =2°5; G= 2°6 to 2°8. C.c.: silica 17, alumina 6°1, oxide of uranium §3°3, lime 5°1, water*~~

~~15°1. Kupferberg in Silesia.~~

~~666. URANOTILE, CaSi+%,Si, + 91.~~

~~Right prismatic. oP 164. Instellate groups. Lemon-yellow. G.=3°96. C.c.: silica 18°8, oxide of uranium 66°75, lime 5°27,~~

~~| water 12°67. Wolsendorf in Bavaria, Joachimsthal, Mitchel county~~

~~in North Carolina.~~

~~667. BISMUTOFERRITE, Bi, Sig, + 2¥e,Si.~~

~~Crypto-crystalline ; oblique prismatic. Siskin- to olive-green. H. =3‘5; G. =4°48. C.c.: silica 24, oxide of bismuth 42°8, peroxide of iron 38°1. Schneeberg in Saxony. Hypochlorite is a variety containing 18 of bismuth. In a third variety, from Briunsdorf, antimony replaces bismuth. ,~~

~~SILICATES WITH TITANATES, NIOBATES, &c. 668. SPHENE, CaSi, + CaTi,.~~

~~Oblique prismatic, C 85° 22’. oP (i) 133°2’; $P°c0(x) 55°~~

~~| 21’; Peco (y) 34°21’; wP* (g): 0P (Porc) 90°; oP3 (1 76°7’ ;~~

~~Peco ® 118° 30’; 3P°2 (m) 136° 12’; 4P%4 (s) 67° 57’. vary extremely in form, being generally appar- ently oblique-tabular, from predominance of nm, which are hemidomes in alternate position on opposite ends; also,~~

~~but more rarely, pris- matic, with dominance of 2 and M@. Twins frequent. Twin face ¢, and formed by revolution either (a) on an axis nor- mal to ¢ or (J) ona vertical axis; the former very commonand usually producing thin tables with a re-entering angle along one side, and sometimes elongated. Occasionally in double twins. Some-~~

~~Crystals~~

~~Fig. 586. Fig. 587.~~

~~*times granular or foliated. Cl. in some (/), in others ®.*~~

~~*H.=5 Semitransparent ; adamantine or resinous.*~~

~~*to 55; G.=3°‘4 to 3°6. XVI. — 54*~~

~~*426 MINER*~~

~~*Yellow, brown, and green. B.B. fuses with micro-salt in the red. flame, gives reaction for titanicacid. C.c.: silica 30°6, titanic acid 40°8, lime 28°6. In Scotland, typical of syenites and primary lime- stones. In minute hair-brown crystals in the first ; as at Lairg (Sutherland), Achavarasdale (Caithness), and Criffel (Kirkeud-*~~

~~*Fig. 588. Fig. 589.*~~

~~*bright) (figs. 586 to 588). In the latter often in highly complex twins, yellow to brown, at Shinness (figs. 193, 589), Urquhart, Dalnain, Torbane, &c., also with ilmenite and allanite in exfiltra- tion veins of grey granite. Dauphiné, Mont Blanc, St Gotthard, Tyrol, Arendal, America. (reenovite, flesh-red from Glen Gairn in Aberdeenshire (like 194), and St Marcel in Piedmont; contains manganese at the latter locality.*~~

~~*Oblique prismatic, C 58°. oP 114. Cl — 2P, 138°. H.=6 to 7; G.=3°5 to3°7. Blackish brown; streak greyish yellow. B.B. with borax forms blood-red glass in the red. flame; other features like sphene. C.c.: 29°7 silica, 28°7 titanic acid, 21°1 lime, 10°8 yttria, 6°2 alumina, and 6°5 iron peroxide. Near Arendal.*~~

~~*670. ScuoRLoMITE (Ferrotitanite), Ca,Si+¥e,Si, + CaTig.*~~

~~*Cubic ; oO and 202; generally massive ; fracture conchoidal. H. =7 to 7°5;G.=3°8. Black; streak grey-black; vitreous. C.c.: silica 26, titanic acid 23°3, peroxide of iron 20, lime 29°4. Arkansas, Kaiserstuhl, Ivaara in Finland. Perhaps a titaniferous garnet.*~~

~~*671. TsCHEWKINITE.*~~

~~*Massive ; fracture flat conchoidal. H.=5 to 5°56; G.=4°5. Opaque, vitreous, splendent. Velvet-black; streak dark brown. B.B. intumesces greatly, becomes porous, and often incandesces ; in white heat fuses to black glass ; gelatinizes with h. acid. C.c.: 21 silica, 20 titanic acid, 11 iron protoxide, 45 peroxides of cerium metals with perhaps thoria, lime 4. Miask, Coromandel.*~~

~~*672. MOSANDRITE.*~~

~~*Oblique prismatic, C 71° 243'. oP (¢) 88° 36'; cP (n); Po (a); —P (e) 124° 1'; — P°co (gq); wP*co. £: a 134° 18; m: a 152° 52'; g:a@ 138° 2'. Twin face the orthopinacoid. Generally massive. Fracture uneven. H.=4; G.=2°93 to 3. Yellowish or reddish brown ; streak pale green. Vitreous to resinous lustre. C.c.: silica 29°9, titanic acid 9°9, oxide of cerium metals 26°5, lime 19, water 8°9. Brevig and Langesundfiord.*~~

~~*673. EUDIALITE (Zukolite), 6RSi,+RZr.*~~

~~*Rhombohedral ; R 73°10'. BR (p), OR (a,), wP2 (d,), 1R (ao); also oR, &R, ~4R, —2R, —3R, Te Pe (1) ity) $B Sas (fig. 591). Generally massive, granular. Cl. a, and a; fracture uneven. H.=5 to5°5; G.=2°84t02°95. Peachblossom- red to brownish red ; streak white. Trans- lucent; vitreous. B.B. fuses easily to a light-green opaque glass; gelatinizes in h. acid. C.c.: silica 50, zirconia 16°9, penne of iron 7, lime 11, soda 12.*~~

~~*angerdluarsuk in Greenland, Sedlova- toi Island in White Sea, Brevig (Zuko- lite), Magnet Cove in Arkansas.*~~

~~*674. CATAPLEITE, 2(Na,Ca)(SiZr), + OF.*~~

~~*Hexagonal. P 114° 43'. OP, oP, P, also with 2P, and 4P. In lamellar agere- gates. Cl. prismatic and P; fracture uneven. yellow, lustrous. 9. Brevig.*~~

~~*Fig. 590 (sp. 672).*~~

~~*Fig. 591 (sp. 673). H.=6; G.=2°8. Yellowish brown to pale green ; streak*~~

~~*C.c.: silica 46°7, zirconia 29°6, soda 10°8, water*~~

~~675. CERSTEDITE.~~

~~Pyramidal. P 84° 25'. P,aP,aoPo, Like zircon. G. =3°63. Lustre adamantine. Reddish brown. titanate of zirconia 68°96, water 5°6. Arendal.~~

~~Hi ==‘b5 5 C.e.: silica 19°7,~~

~~| stuhl, Brevig, and Frederiksvarn.~~

~~ALOGY~~

~~676. WOuLERITE, 9RSi + 3RZr + RNb.~~

~~Oblique prismatic, C 70° 45'. oP 90°14'; —P%0 438° 18'. OP: wP°~ 109° 15; —P°m: wP®% 136° 42'; OP : wP 103° 31'. Crystals tabu- lar and prismatic. Cl. clinodia- gonal; fracture conchoidal. H.=5 to 6; G.=3°4. Light yellow, honey- yellow to brownish grey; streak yellowish white. C.c.: silica 28, zirconia 19, niobic acid 13°9, lime 27°8, soda 8°38, protoxide of iron 3. B.B. fuses to yellowish glass. Sol. in h.. acid. Langesundfiord, Brevig.~~

~~677. ARDENNITE.~~

~~Right prismatic. oP 131°2'; Poo 112°24'; P38; wP3; wP2; oP; wPo. Crystals like ilvanite. Cl. brachydiagonal, and oP, H.=6 to7; G.=3°62. Yellow to yellow-brown. Dichroic; brittle. C.c.: silica 27°8, alumina 24, protoxide of manganese 26°7, lime 2°2, magnesia 4'3, vanadic acid 3°2, arsenic acid 6°38, water 5. Ottrez in the Ardennes (Luxemburg).~~

~~678. RoscoELITE.~~

~~Foliated masses, sometimes stellated. H.=1; G.=2°3 to 2:9. Dark green to greenish blue. Pearly lustre. C.c.: silica 47:7,~~

~~vanadic acid 22, alumina 14°1, magnesia 2, potash 7°6, water 5. Eldorado in California.~~

~~ca POT 27" 47;~~

~~TITANATES WITH NIOBATES. 679. TrITANoMoRPHITE, CaTi,. Oblique prismatic. Like sphene. 2p°2. C.c.: titanic acid 74°3, lime 25°3. Weistritz. 680. PERovskITE, CaTi. Right prismatic. In complicated twins, often distorted, pseudo-~~

~~oP, OP, $P%co ' P%o , Lampersdorf in Silesia,~~

~~cubic. H. =5°5; G. =4to4'1. Lustre metallic- adamantine. Pale yellow, reddish brown to f_—*} iron-black ; streak grey. C.c.: 58°8 titanic 5 4) acid, 41:2 lime. B.B. with micro-salt in onter es SES flame gives a bead greenish while hot, colour- less on cooling; in inner flame grey-green when hot, violet-blue when cold. Decomposed~~

~~by boiling s. acid. Zlatoust, Schelingen, Zer-~~

~~matt, Malenco Valley near Sondrio, Pfitsch :~~

~~in Tyrol, Magnet Cove in Arkansas. iS~~

~~681. Koprirs, R,Nb,. Fig. 598.~~

~~Cubic; 00. G.=4'45 to 4°56. Brown. Transparent. C.c.: niobic acid 62°46, oxide of cerium 6°7, oxide of lanthanum 3. Schelingen on the Kaiserstuhl in Baden.~~

~~682. ANNERUDITE, 2R,Nb+5H :~~

~~Right prismatic. H=6. G 5'7. Metallic to greasy. Black. Streak black, brown, greenish grey. 'Translucent in splinters; brittle. C.c.: 48 niobic acid, with zirconia, thoria, ceria, yttria, and uranium oxide. Annerdd near Moss (Norway).~~

~~683. DysANALYTE, 6RTi+ RNb.~~

~~Cubic; «O00. Cl. cubic. G.=4°13. Black. C.c.: titanic acid 41°5, niobic acid 23°2, cerium oxide 5°7, lime 19°8; protoxide of iron 5°8, soda 3°6. Vogtsburg on the Kaiserstuhl.~~

~~684. PyrocHLORE, 5RNb+4R(TiTh),+4NaF.~~

~~*Cubic (fig. 594). Cl. octahedral ; brittle ; fracture conchoidal. H.=5; G.=4°2to4°4. Resinous, opaque. Red-brownto black, ruby- red and transparent rarely; streak pale brown. C.c.: niobic acid 53°2, titanic acid 10°5, thoria 7°6, cerium oxide 7, lime 14:2, soda 5, fluorine 3°1. Miask, Kaiser-*~~

~~*Microlite, from Chesterfield in Massachnsetts, has tantalic acid 68°4, niobic acid 7°75, 11°7 lime and 7°7 protoxide of manganese. Pyrrhite from Mursinsk in the Urals, San Piero in Elba, and the Azores may be the same; at the last locality it is in orange-red octahedra, and is a niobate of zirconia.*~~

~~*685. Bromsrranpirs, (Ga,Fe), Ti+UNb, +. Massive. H=5°5.. G.=4‘17 to 4°25 Vitreous, black. Streak*~~

~~*MINERALOGY*~~

~~*brown. Translucent in splinters. C.c.: niobic acid 49°8, titanic acid 10°7, uranium oxide 23°7, protoxide of iron 3°3, lime 3°5, water 7°9. Nohl (Sweden).*~~

~~*686. Potyorase, 4R’Ti+RNb. Right prismatic (fig. 595). oP, oP*~~

~~*(140°), P, 2Poo (56°). Fracture conchoidal. H.=5 to 6; G.=5’l. Black; streak grey- brown. 8B.B. decrepitates violently, incan- descing, but does not fuse. Sol. in s. acid. C.c.: titanic acid 26°6, niobic acid 20-4, yttria 23°83, erbia 7°5, oxide of uranium 7°7, water 4, Hitterd (Norway), Slettakra in Jonkdp- ing (Sweden).*~~

~~*687. Evxenirs, IRTi+RNb+H. Right prismatic (fig. 596). oP (m) 140°;*~~

~~*oP (b); 2Poo (d) 52°; P (p) 102° 58’, p:b 108° 6’. Fracture conchoidal. Opaque ; nietallic to vitreous. Black and brownish black; streak red-brown. B.B. infusible. Not acted on by acids. C.c.: niobic acid 32, titanic acid 19°2, uranium oxide 19-5, yttria 18°2, cerium oxide 2°8, but variable. Jolster, Tromé, Alvé, &c., in Norway ; also Hitters and Cape Lindesnaes.*~~

~~*Fig. 595.*~~

~~S~~

~~688. AISCHYNITE. Fig. 596. Right prismatic. oP (Mf) 128° 34'; 2Pco (y) 73° 16'; P (0 : 0) 137° 14'; P83. 69° 23'; Poo; OP. Crystals long prismatic (fig. 597). Cl. traces; fracture imperfect conchoidal. | H. =5 to 5°5 ; G.=4°9 to 5°1. Opaque ; submetallic or resinous. Iron-black or brown; streak yellow- ish brown. B.B. swells and becomes yellow or brown, but is infusible. Not sol. in h. acid, partially in s. acid. C.c.: niobic and tantalic acids 28°8, titanic acid 22°6, thorium oxide 15°7, cerium || x protoxide 18°5, lanthanum oxide and didymium oxide 5°6. Miask, Hitters. :~~

~~689. PoLYMIGNITE.~~

~~Right prismatic. P (py) polar 136° 28' and 116° ff 22'; oP 109° 46'; wPo; WZ oo Poo (fig. 598). Cl. macro- Fig. 597 and brachydiagonal, imper- ees 883) fect; fracture conchoidal. H.=6°5; G.=~~

~~4°7 to 4°8. Opaque; semimetallic. lron- black ; streak dark brown. B.B. infusible. Sol. inh. acid. C.e.: titanic acid 46°3, zir- conia 14°1, yttria 11-5, lime 4°1, iron peroxide 12°2, cerium ox- ide 5. Frederiks- varn. ee 690. Mencirx, ; (Fe, Zr) Ti.~~

~~Fig. 598 (sp. 689). Righb priswia- tic. P(e) polar angle 151° 27' and 101° 10'; oP 186° 20'; P83; cP (fig. 599). Fracture uneven. H.=5 to 5°5; 5°48. Opaque; semimetallic. black ; streak chestnut-brown. B.B. : infusible, but becomes magnetic. Sol. Pig 09 (yp 600), ins. acid. Miask, Groix island in Morbihan.~~

~~691. TANTALITE, Fe (La, Nb).~~

~~7, =~~

~~Iron-~~

~~Right prismatic. P (p) with polar edges 126° and 112° 30', |~~

~~middle 91° 42'. oP2® 122° 53 — aPo (s); cP (t); Poo (m) 118° 48; 8Pa (q) 54° 10'; .3Poo (nm) 167° 36; P (v); 2P2 (0). Fracture conchoidal or~~

~~uneven. H.=6 to 65; G.=6‘1 to 8. Opaque; semimetallic, – adamantine, or resinous. Iron-black; streak cinnamon- or coffee-brown. B.B. infusible ; scarcely affected by acids. C.c.: 76 to 50 tan- talic acid, 7°5 to 29 niobic acid, 9 to 16 iron protoxide, and 1 to 6 manganese protoxide; some with 1 to 10 tin oxide (Cassiterotantalite); also in union with iron (mauganese) protoxide, Kimito and Tammela in Finland, Broddbo and Finbo near Falun, and Chanteloube near Limoges ; always in granite.~~

~~692. TapiouTE, 4a + Feb. Pyramidal. P middle angle 84° 52’, summit 123°1’.. 1.=6; G.=~~

~~Fig. 600.~~

~~427~~

~~C.c.: tantalic acid 73°9, niobic acid Tammela in Finland.~~

~~698. CoLumBITE, m¥eNb+nFe#a.~~

~~Right prismatic, P (a) polar angles 104° 10’ and 151°, middle~~

~~| angle 83° 8’; OP ©; coPco (b); Poo (a); oP (y) 135° 40’;~~

~~oPco (m) 101° 26’; 2P (s); 3P3 (0); 31% (x); AP oo (2) 161°;~~

~~Poo (&) 148°; 2Poo (h) 112° 26’; Poo (4) 101° 12’; 2Poo (e) 62° 40’.~~

~~Hemitropes, face ¢; vertical axes forming an angle of 62° 40’; also~~

~~on faces 2P2 (n), and rarely b. Also granular and foliated. Cl.~~

~~brachydiagonal, perfect, also macrodiagonal. H.=6 ;°G.=5‘4 to 6°4. Metallic, adamantine. Iron-black to brownish ; streak black~~

~~5~~

~~PR]~~

~~72 to 7°5. . Black. Lustrous. 11°2, protoxide of iron 15.~~

~~*Fig. 601.*~~

~~*Fig. 602. B.B. infusible; not affected by acids.*~~

~~*Cre: isomorphic mixtures of niobic and tantalic acids with protoxide of*~~

~~*or reddish brown.*~~

~~*iron (or manganese). Pure coluinbite would give 78°8 niobic acid, 'pure tantalite 86 tantalic acid. The niobic acid generally prevails, and the crystals are better formed the more this is the case. Rabenstein, Bodenmais, Chanteloube, Finland, Imen Hills, Evigtok in Greenland, Haddam and Middletown in Connecticut, Acworth in New Hampshire, Pike's Peak in Colorado.*~~

~~*In two varieties. (@) Black. Right prismatic; in short pris-*~~

~~*matic or tabular crystals. oPco ; ooP (m) 121° 48'. OP : 2Pa 108° 26'; Poo: OP 181° 26'; 7: ¢ 149° 42! (fig. 604); also in grains and lamellae. << Cl. brachydiagonal, indistinct; fracture (" ; conchoidal or uneven. Opaque, or in thin splinters translucent. Velvet-black, semi- metallic lustre, and greenish grey streak. H.=5°5; G.=5°4 to 5°7. (0) Yellow. Amorphous, yellowish brown, or yellow, often striped or spotted ; resinous or vitre- ous; streak white. G.=5'46 to 5°88. Both varieties B.B. infusible, but become Fic. 604 brown or yellow. Not affected by acids. Se ee C.c.: 57 to 60 tantalic acid, 1 to 8 tungstic acid, 0 to 20 niobic acid, 20 to 88 yttria, 0°5 to 6 lime, 0°5 to 6 uranium peroxide, and 0°5 to 3°5 iron peroxide. Ytterby, and near Falun.*~~

~~*695. FERGUSONITE, (Y, Er, Ce),(Nb, Fa). Pyramidal and hemihedric ; P (s) 128° 28'. Usual form (4) 3P8 (z), P, 4oP% (g), OP © (fig. 605). s:s 100 54' s:¢ 115° 16', 2: r 169° 17. Cl. traces along P; fracture imperfect conchoidal ; brittle. H.=5°'5 to 6; G.=5°6 to 5°9. Translucent in thin splinters; semimetallic. Brownish black ; streak pale brown. B.B. infusible. C.c.: chiefly niobic acid and yttria, with erbia, also a little cerium protoxide, tin oxide, ura- | nium oxide, and iron protoxide. Cape Fare- well in Greenland, Ytterby, Ricsengebirge, Rockport in Massachusetts. Tyrite, from Helle near Arendal, is similar.*~~

~~696. HJELMITE.~~

~~Massive, with granular fracture and traces of crystals; H.=5; G.=5°€2. black. Lustre metallic. 2 i 4-9, protoxide of iron 8°1, yttria 5-2. B.B. infusible. In closed tube decrepitates and yields water. — Kararfvet near Falun.~~

~~697. SAMARSKITE (Uranotantalite), (Rg, 8, R2),(Nb£Fa); — '~~

~~oP 122° 46'; wP2 95°; Po 93°; P; Po; oPco ; 8P3; also in grains. Fracture conchoidal ; brittle. H.= 5°56; G.=5°6 to 5°76. Opaque; strong semimetallic. Velvet- black ; streak dark reddish brown. B.B. fuses on the edges to a black glass. In the closed tube decrepitates, yields water, incan- desces, and becomes brown. Sol. in h. acid to a greenish finid.~~

~~Fig. 605.~~

~~Velvet-black ; streak greyish C.e.: tantalic acid 62°4, tin 6°6, uranium~~

~~Right prismatic.~~

~~428 MINER~~

~~C.e.: 37°2 niobie acid, 18°6 tantalic acid, 12 iron protoxide, 14 to 20 uranium oxide, 6 thorium oxide, 4 zirconia, and 16 yttria with lime and magnesia. Miask, Mitchell county in North Carolina. The Yittrotlmenite of Hermann.~~

~~698. NoHLiTE, R,Nb.~~

~~Massive. H=4'5 to 5; Brittle. Opaque ; vitreous. ; zirconia 3, ferrous oxide 8, yttria 14°4, lime 4°7, water 4°6. near Kongelf (Sweden).~~

~~699. HarcHETTOLITE.~~

~~Cubic; O, "O00. Yellowish brown. Resinous lustre. Frac- ture conchoidal. H.=—5; G.=—4°8 to 4°9. C.e.: miobie acid 34°3, tantalic acid 29-8, uranium oxide 15°5, lime 8°9, water 4°5. North Carolina.~~

~~G.=5°04. Black-brown. Splintery. Niobic acid 50°4, uranium oxide 14°4,~~

~~ANTIMONIATES.~~

~~700. Romerre, Ca,8b8b.~~

~~Pyramidal; P110°50'. Scratches glass. G.=4'7. Honey-yellow or hyacinth-red. B.B. fuses to a blackish slag. Sol. in acids. C.c.: 41°3 antimonic acid, 37°3 antimony oxide, and 21°4 lime, but with 2 to 3 manganesc and iron protoxide. St Marcel in Piedmont.~~

~~Schneebergite, from Tyrol, may be an impure variety.~~

~~701. BuginierE, Pb(Sb, 8b) + H.~~

~~Reniform and massive. H.=4; G.=8°9 to 4:8. Translucent; resinous to earthy. Colourless, yellow, brown, and grey. B.B.~~

~~reduced on charcoal. C.c.: oxide of lead 41 to 62, antimonious acid 32 to 47, water 6 to 12. Lostwithiel, Horhausen, Nertchinsk.~~

~~702. Naporirr, PbSb + PbCh.~~

~~Right prismatic; oP 132° 51'. Crystals tabular. Cl. macro- diagonal, H.=3; G.=7. Yellowish or greyish brown. Resinous to adamantine; translucent. C.c.: lead 52°2, antimony 30°8, oxygen 8, chlorine 9. Constantine (Algeria).~~

~~703. RIVOTITE.~~

~~Massive. Yellowish to greyish green. Opaque; fracture un- even ; brittle. H.=3°5 to 4; G.=3°6. C.c.: oxide of copper 39°5, oxide of silver 1°2, antimonic acid 42, carbonic acid 21. Sierra del Cadi in the province of Lerida. Thrombolite from Rez-~~

~~banya, Hungary, may be a hydrated variety. 704. Mute, Al(C,,0,) + 18F.~~

~~Pyramidal ; P 93° 5'. OP; Poo; and wPoo. eonchoidal; brittle. H.=2 to 2°5; G.=1°5 to 1:6. Transparent; doubly refractive ; vitre- ous. Honey-~~

~~*yellow or reddish; streak white. In closed tube yields water. B.B. chars with- out odour. Burns white and acts like alumina, Sol. in n. acid or potash. C.c.: alumina 14°4, mellic acid 40°3, water 45°3. In lignite at Fig. 606. Artern in Thuringia and Luschitz in Bohemia; Walchow in Moravia (cretaceous); in coal at Malovka in Tula.*~~

~~*705. OxALiITE, 2Fe6,+3H.*~~

~~*Capillary crystals, also botryoidal or compact; fracture uneven ; sectile. H.=2;G.=22. Opaque; resinous todull. Straw-yellow. B.B. turns blaek, then red. Sol. to yellow solution in acids. C.c.: 42°1 iron protoxide, 42°1 oxalic acid, 15°8 water. In lignite at Kolosoruk near Bilin, Duisburg, and Gross Almerode in Hesse.*~~

~~*706. WHEWELLITE, CaO +H.*~~

~~*Oblique prismatic, C 72° 41'. oP 100° 36'.*~~

~~*Cl. P ; fracture*~~

~~*Cl. basal, perfect ;*~~

~~*brittle. H.=2°5 to 28; G.—1°838. Transparent to opaque ; vitreous. Colourless. O.c.: 49°31 oxalic acid, 38°36 lime, 12°33 water. Hungary.*~~

~~*THE MINERAL RESINS.*~~

~~*Many of these are only vegetable resins slightly altered. Naphtha is fluid ; the others solid, with H.=1 to 2 or 2°5. Most are amor- phous, a few crystalline and monoclinie. G.=0°6 to1°6. Mostly resinous ; colourless, or eoloured brown, yellow, or red, with paler streak. Sol. in acids, aleohol, ether, and oils. Melt readily, and burn with flame and smoke.*~~

~~*707. NarutHa, Prrroteum, CH.*~~

~~*Liquid. Colonrless, yellow, or brown. Transparent or translu- eent. G.=0°7 to 0°9. Volatilizes in the atmosphere with an aromatic bituminous odour. C.c.: 84 to 88 carbon, and 12 to 16 hydrogen. Varieties are—*~~

~~*Naphtha.—Very finid, transparent, and light yellow. Tegern Lake in Bavaria, Amiano near Parma, Salies in the Pyrevees, Rangoon, Baku on the Caspian Sea, China, Persia, and North America. Used for burning, and in preparing varnishes.*~~

~~*Petroleum.—Darker yellow or blackish brown; less fluid or volatile. Ormskirk in Lancashire ; Coalbrookdale, Pitchford, and*~~

~~*Nohl |*~~

~~*ALOGY*~~

~~*Madeley in Shropshire ; St Catherine's Well, south of Edinburgh ; Mainland of Orkney ; and many other parts of Europe.*~~

~~*708, ELATERITE (Elastic Bitumen, Mineral Caoutchoue), CH, .*~~

~~*Compact ; reniform or fungoid ; elastic and flexible like caont- choue, very soft. G.=0°8 to 1:23. Resinous. Blackish, reddish, or yellowish brown. Strong bituminous odour. C.c.: 84 to 86 carbon, 12 to 14 hydrogen, and a little oxygen. Derbyshire, Montrelais near Nantes, and Woodbury in Connectieut.*~~

~~*709. AsPHALTUM, BITUMEN.*~~

~~*Compact and disseminated ; fracture conchoidal, sometimes vesieular; sectilee H.=2; G.=1°1 to 1°2. Opaque, resinous, and pitch-black; strong bituminons odour, especially when rubbed. Takes fire easily, and burns with a bright flame and thick smoke. Sol. in ether, except a small remainder, which is lissolved in oil of turpentine. C.c.: 76 to 88 carbon, 2 to 10 oxygen, 6 to 10 hydrogen, and 1 to 3 nitrogen. Limmer near Hanover, Seyssel on the Rhone, Val Travers in Neufchatel, Lobsann in Alsace, in the Harz, Dead Sea, Persia, and Trinidad ; Cornwall, Haughmond Hill (Shropshire), East and West Lothians, Elie and Burntisland (Fife).*~~

~~*710. ALBERTITE.*~~

~~*Massive. Velvet-black. carbon 86, hydrogen 9, nitrogen 2°9, oxygen 2. Strathpeffer, Ross ; Hillsborough, New Brunswick.*~~

~~*711. Pravuzire.*~~

~~*Massive ; imperfect couchoidal, sectile. H.=1°5; G. =1°22. Dimly translucent on very thin edges ; resinous. Blackish brown ; streak yellowish brown. Fuses at 600° Fahr., and burns with an aromatic odour, lively fame, and dense smoke. Sol. in ether and caustic potash. Piauze near Rudolfswerth in Carniola.*~~

~~*712. IXOLYTE.*~~

~~*Massive ; conchoidal fracture. H.=7; G.=1°008. Resinons. Hyacinth-red ; streak ochre-yellow. Rubbed between the fingers it' emits an aromatic odour; becomes soft at 119°, but is still viscid at 212°. Oberhart near Gloggnitz in Austria.*~~

~~*713. AMBER (Succinite), Cy)H,0.*~~

~~*Round irregular lumps, grains, or drops. Fracture perfect con- choidal ; slightly brittle. H.=2to 25; G.=1to1'l. Transparent to translucent or almost opaque ; resinous. Honey-yellow, hyacinth- red, brown, yellowish white ; also streaked or spotted. When rubbed emits an agreeable odour, and becomes negatively electric. It melts at 550°, emitting water, an empyreumatic oil, and succinic acid ; it burns with a bright flame and pleasant odour, leaving a carbonaceous remainder; only a small part is soluble in alcohol. C.c.: 79 carbon, 10°5 hydrogen, and 10°5 oxygen. Derived chiefly from an extinct coniferous tree (Pinites succinifer), and found in the Tertiary and diluvial formations of many countries, especially northern Germany and shores of the Baltic, Sicily, Spain, and northern Italy, rarely in Britain (on the shores of Fife, Norfolk, Suffolk, and Essex, and at Kensington, near London). Used for ornamental purposes, and for preparing succinic acid and var- nishes. Krantzite, from Nienburg, is essentially the same.*~~

~~*714. RerinrvE (Retinasphalt).*~~

~~*Roundish or irregular lumps ; fracture uneven or conchoidal ; very easily frangible. H.=1‘5 to 2; G.=1°05 to 1:15. Trans- lucent or opaque; resinous or glistening. Yellow or brown. Melts at a low heat, and burns with an aromatic or bituminous odour. C.c.: in general carbon, hydrogen, and oxygen, in very un- certain amount. Bovey, Halle, Cape Sable, and Osnabriick. Pyroretinite from Aussig in Bohemia is similar.*~~

~~*715. Wa.cHowiTE, C),.H,0.*~~

~~*Rounded pieces, with a conchoidal fracture. H.=1°5 to 2; G. =1°085 to 1:069. Translucent, resinous. Yellow with brown stripes, and a yellowish white streak. It fuses at 482°, and burns readily. Soluble partially (7°5 per cent.)in ether ; in s. acid forms a dark-brown solution. C.c.: 80°4 carbon, 10°7 hydrogen, and 8-9 oxygen. Walchow in Moravia.*~~

~~*716. CopaLine (Fossil Copal, Highgate Resin), CypH,,O-*~~

~~*Irregularfragments. H.=1°5; G.=1°046. Translucent, resinous; burns with light yellow flame and much smoke; alcohol dissolves little of it ; becomes black in sulphuric acid. C.c.: 85°54 carbon, 11°63 hydrogen, 2°76 oxygen. Highgate near London. A similar resin from Settling-Stones mine in Northumberland, found in flat drops or crusts on cale-spar, is infusible at 500° Fahr.; G. =1°16 to 1°54; it contains 85°13 carbon, 10°85 hydrogen, and 3°26 ashes.*~~

~~*717. BERENGELITE, Cj)H¢.0,.*~~

~~*Amorphous; conchoidal fracture. Dark brown, inclining to green; yellow streak. Resinous; unpleasant odour, and bitter taste. Fuses below 212°, and continues soft afterwards at ordinary temperatures; easily soluble in alcohol. C.c.: 72°40 carbon, 9°28 hydrogen, 18°31 oxygen. San Juan de Berengela in Peru.*~~

~~*718. GUAYAQUILLITE, Cy9H,,03.*~~

~~*Amorphous ; yielding easily to the knife, and very friable. G.*~~

~~*Adamantine lustre; brittle. C.c.: Hoy, Orkney ;*~~

~~*Ce cal*~~

~~*Sa*~~

~~*MINER*~~

~~*=1:092. Pale yellow. Slightly resinous. Fluid at 212°, viscid when cold; slightly soluble in water, and largely in alcohol, forming a yellow fiuid with a bitter taste. C.c.: 77°01 carbon, 8°18 hydro- gen, and 14°80 oxygen. Guayaquil in South America.*~~

~~*Bogbutter, from the Irish peat mosses, is similar; it melts at 124°, is easily soluble in alcohol, and contains 73°70 carbon, 12°50 hydrogen, and 13°72 oxygen. ;*~~

~~*719. HaRTINE, Co)H)+H.*~~

~~*Round masses or thin layers. Brittle, but easily cut with a knife. G.=1°6. Resinous. Reddish brown by reflected and deep red by transmitted light; streak light brown. Becomes black on exposure. OC.c.: 86°43 carbon, 8°01 hydrogen, 5°56 oxygen. In the main coal seam at Middleton near Leeds, and at Newcastle.*~~

~~*720. OzocERITE (Native Parafin), CH.*~~

~~*Amorphous, sometimes fibrous. fashioned with the fingers. G.—0°94 to 0°97. Glimmering or glistening; semitranslucent. Yellowish brown or hyacinth-red_by transmitted, dark leek-green by reflected light. Strong paraffin or aromatic odour; fuses easily to a clear oily fluid; at higher temperature burns with a clear flame, seldom leaving any ashes ; readily soluble in oil of turpentine, with great difficulty in alcohol or ether. O.c.: 85°7 carbon, and 14°38 hydrogen. Binny (Linhth- gow), and Edinburgh ; Slanik and Zietriska in Moldavia, near Garning in Austria, and Baku; also at Urpeth coal-mine near Newcastle-on-Tyne. Pyropissite may be a variety.*~~

~~*721, HATCHETTINE (Mineral Tallow).*~~

~~*Flaky, like spermaceti; or subgranular, like beeswax; soft and flexible. G.=0°6. Translucent; weak pearly. Yellowish white, wax-yellow, or greenish yellow. Greasy inodorous ; readily soluble in ether. C.c.: 85°91 carbon, 14°62 hydrogen, or similar to ozocerite. Loch Fyne (fusible at 115°), Merthyr-Tydvil, Schaumburg.*~~

~~*722, FICHTELITE, C,H3.*~~

~~*Crystalline (oblique prismatic) lamelle, which swim in water, but sink in alcohol. White and pearly. Fuse at 114°, but agaiu become crystalline on cooling. Very easily soluble in ether, and pre- cipitated by alcohol. C.c.: 88°9 carbon and 111 hydrogen. In pine wood in a peat-moss near Redwitz in Bavaria.*~~

~~*723. Hantite, C,H;.*~~

~~*Anorthic; but mostly like spermaceti or white wax, and lamellar. Sectile, but not flexible H.=1; G.=1°046. Translucent; dull resinous. White. Melts at 165°, and burns with much smoke. Very soluble in ether, much less so in alcohol. C.c.: 87°8 carbon, aud 12‘2 hydrogen. Oberhart in Austria.*~~

~~*724, KONLITE, C,H.*~~

~~*Crystalline folia and grains. Soft. resinous. White, without smell. Fuses at 120° to WBE n. acid; precipitated by water in a white crystalline mass. 92°3 carbon, 7°7 hydrogen. Uzuach near St Gall, Redwitz.*~~

~~*725. ScuEERERITE, CH,.*~~

~~*Oblique prismatic ; tabular or acicular. Soft and rather brittle. G.=1 to 1‘2. Translucent; resinous or adamantine. White, in- clining to yellow or green. Feels greasy, has no taste, and when cold no smell, but when heated a weak aromatic odour. Insoluble in water; readily sol. in alcohol, ether, and n. and s. acids. C.c.: 75 carbon, 25 hydrogen. Uznach. Branchite, white, translucent, fusing at 167°, is similar; Montevaso in Tuscany.*~~

~~*‘ 726. IpRIALITE, C3H,.*~~

~~*Massive; fracture uneven or slaty; sectile. H.=—1 to ihe G.=1‘4 to 1°6 (1:7 to 3°2). Opaque; resinous. Greyish or brownish black ; streak blackish brown, inclining to red. F eels greasy. Burns with a thick smoky flame, giving out sulphurous acid, and leaving some reddish brown ashes. C.c.: 77 idrialine (=94°7 carbon and 5°83 hydrogen) and 18 cinnabar, with a little silica, alumina, pyrite, and lime. The idrialine may be extracted by warm olive oil or oil of turpentine as a pearly shining mass, difficultly fusible. Idria.*~~

~~*G.=0°88. Translucent ; Sol. in Cres:*~~

~~*Very soft, pliable, and easily.*~~

~~*abo Ge 429*~~

~~*727. ‘TORBANITE.*~~

~~*Massive ; fracture subconchoidal. Yellow, brown-grey, and light brown. H.=1°5 to 2; G.=1‘28. C.c.: 60 to 65 carbon, 9 hydrogen, 4 to 5 oxygen, 10 to 20 silicate of alumina. When distilled below redness yields a burning fluid holding paraffin in solution ; above redness a large quantity of highly illuminating gas. Shown by the microscope to consist of granules of a yellow bituminoid wax, with interstitial shaly matter. Torbanehill in Scotland, Pilsen in Bohemia, Kurakina and Murayevna in Russia.*~~

~~*728. DopPLERITE.*~~

~~*Jelly-like elastic masses. Brownish black; streak brown. Greasy lustre. Hl. =0°5; G.=1°‘1. After drying H.=2‘5; G.=1°5. Insol- uble in alcohol and ether. An acid substance related to humic acid. From peat beds, Aussee (Styria) and Switzerland.*~~

~~*THE COALS.*~~

~~*729. ANTHRACITE (Glance Coal).*~~

~~*Massive and disseminated; rarelycolumnar. Fracture conchoidal ; brittle. H.=2 to 2°5; G.=1‘4 to1‘7. Opaque; brilliant metallic. Iron-black; streak*~~

~~*unaltered. Perfect conductor of electricity. Burns difficultly with a very weak or no flame, and does not cake ; in the closed tube yields a little moisture, but no empyreumatic*~~

~~*oil; detonates with nitre. C.c.: carbon above 90 per cent., with 1 to 8 oxygen, 1 to 4 hydrogen, and 0 to 3 nitrogen; and ashes chiefly of silica, alumina, lime, and peroxide of iron. Common in some parts of all coal-fields; and especially in the United States, as in Rhode Island, Massachusetts, and above all in Pennsylvania. Used chiefly for manufacturing metals.*~~

~~*730. Common Coal (Black Coal, Stone or Mineral Coal, Bitu minous Coal).*~~

~~*Compact, slaty, or confusedly fibrous; often dividing into rhom- boidal, columnar, or cubical fragments. Fracture conchoidal, un- even, or fibrous; rather brittle or sectile. H.=2 to 2°5; G.=1‘2 to 1°5. Vitreous, resinous, or silky in the fibrous variety. Blackish brown, pitch-black, or velvet-black. Burns easily, emitting flame aud smoke, with a bituntinous odour ; heated in the closed tube yields much oil. C.c.: 74 to 90 carbon, with 0°6 to 8 or 15 oxygen, 3 to 6 hydrogen, 0 to 1 to 2 nitrogen, 0°1 to 8 sulphur, and 1 to 11 earthy matters or ash, in 100 parts.*~~

~~*Slate Coal or Splint hasa thick slaty structure, and an uneven fracture. Cherry Coal is the name applied to the brittle highly lus- _ trous variety common in the English coal-fields. Caking Coal is a*~~

~~*more bituminous variety which undergoes semifusion when ignited, caking oragglutinating during combustion. Cannel Coal hasa resin- ous, glimmering lustre, and a flat-conchoidal fracture, breaks into irregular cubical fragments, but is more solid and takes a higher polish than other varieties. This burns with a bright flame, and yields much gas. Abundant in many lands, as in England, Scot- land, and Ireland, in Belgium and France, in Germany and southern Russia. British America and the United States possess immense fields, especially in the valley of the Mississippi. Also found in China, Japan, Hindustan, Australia, Borneo, and several of the Indian islands.*~~

~~*731. Lienits (Jet, Brown Coal).*~~

~~*Distinctly vegetable in origin, the external form, and very often the internal woody structure, being preserved. The texture is com- pact, woody, or earthy. Fracture conchoidal, woody, or uneven ; soft and often friable. G.=0°5 to 1°5. Lustre sometimes resin- ous, mostly glimmering or dull. Brown, black, or rarely grey. Burns easily with an unpleasant odour; colours solution of potash deep brown. C.c.: 47 to 78 carbon, 2°5 to 7°5 hydrogen, 8 to 33 oxygen (with nitrogen), and 1 to 15 ashes. Jet is pitch-black, with conchoidal fracture and resinous lustre. Brown coal occurs at Bovey-Tracy in Devonshire; also in Germany, Hungary, France, Italy, and Greece. The Surturbrand of Iceland seems a variety.*~~

~~*Used as fuel, but much inferior to common coal. The Oolitic coals of Yorkshire, Antrim, Brora, Mull, and Skye are intermedi- ate varieties.*~~

~~*TnpEX OF MINERAL SPECIES.*~~

~~*Abriachanite, 581. | Albite, 590. Alunogene, 328. Andesine, 594.*~~

~~*Babingtonite, 575. Baikalite, 567. Barsovite, 596.*~~

~~*Bergholz, 660. Berthierine, 562. Berthierite, 218,*~~

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~~*Adamite, 410. Adinole, 590. Adularia, 589. 'Egerine, 571. 4Eschynite, 688.*~~

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~~*| Astrakanite, 337. | Astrophyllite, 530. Atacamite, 69. Atopite, 376. Augite, 567. Aurichalcite, 297. Avaite, 28. Avanturine, 135. Axinite, 494.*~~

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~~But there are few countries in which~~

~~tion can be drawn between ordinary and mineral waters. There is usually in the latter an excess of mineral con- stituents or of temperature, but some drinking waters contain more mineral constituents than others that are called mineral waters, and many very pure waters, both cold and warm, have been regarded for ages as mineral springs.~~

~~As to the origin of mineral waters, there is much in what the elder Pliny said, that waters are such as the soil through which tliey flow. Thus in limestone and chalk districts an excess of lime is usually present; and the waters of a particular district have much resemblance to each other—as in the Eifel, in Auvergne, and in the Pyrenees. But this is only a partial explanation, for waters are by no means necessarily uniform throughout a particular geological formation. We do not know with any certainty the depth from which various mineral waters proceed, nor the various distances from the surface at which they take up their different mineral constituents.~~

~~The source of the temperature of thermal waters remains a subject of much uncertainty. Among the assigned causes are the internal heat of the globe, or the development of heat by chemical or electrical agencies in the strata through which they arise.~~

~~Their occasional intermittence is doubtless often depend- ent on the periodical generation of steam, as in the case of the Geysers. A few geological facts are certain, which bear on the origin of mineral waters.~~

~~*Such springs are most abundant in volcanic districts, where many salts of soda and much carbonic acid are present. They occur most frequently at meetings of stratified with unstratified rocks, in saddles, and at points where there has been dislocation of strata,*~~

~~*The diffusion of mineral waters is very extended. Pliny was quite correct in observing that they are to be found on alpine heights and arising from the bottom of the ocean. 'They are found at the snow in the Himalayas and they rise from the sea at Baise and Ischia. They are to be found in all quarters of the globe, but more particularly in volcanic regions, as in. the Eifel and Auvergne, in the Bay of Naples, and parts of Greece, in Iceland, New*~~

~~*they are not to be found, except in very flat ones and in deltas of rivers,—for instance, in the north of France, where they are very few, and in Holland, from which they are ab- sent, France, Germany, Italy, and Spain, as wellas Greece, Asia Minor, and the Caucasus, are all rich in mineral waters. The British Isles have a fair though not very large pro- portion of them. There are a few in Sweden and Norway. They are abundant in the United States, less so in Canada. They are found in the Azores and in the West India Islands. Of their occurrence in the interior of Africa or of Australia we know little ; and the same is true of South America. But they are met with in Algiers, in Egypt, and in the Holy Land. The vast Indian peninsula has for its size a comparatively small supply.*~~

~~*As the effects of mineral waters on the bodily system have been found to be different from those of drinking waters, an explanation of this has been naturally sought for. It has been imagined that there is something special in the nature of mineral waters, that their heat is not ordinary heat, that their condition is a peculiar electric one. Some French modern writers even say that they have a certain life in them, that their constitution is analogous to that of the serum of the blood. But we must pass by these speculations, and be guided as far as possible by ascer- tained facts, respecting the action on the system of water, of heat and cold, and of the mineral constituents present.*~~

~~*Mineral waters, when analysed, are found to contain a great many substances, although some of them occur only in very minute quantities:—soda, magnesia, calcium, potash, alumina, iron, boron, iodine, bromine,*~~

~~arsenic, lithium, cesium, rubidium, fluorine, barium, copper, zinc, manganese, strontium, silica, phosphorus, besides extractive matters, and various organic deposits known under the name of glairin or baregin. Of gases, there have been found carbonic acid, hydrosulphuric acid, nitrogen, hydro- gen, oxygen, and ammonia. Of all these by far the most important in a therapeutic point of view are sodium, magnesia, and iron, carbonic acid, sulphur, and perhaps hydrosulphuric acid. These substances, detected separately by chemists, are in their analyses combined by them into various salts, if not with absolute certainty, undoubtedly~~

~~with a close approximation to it. Those combinations are very numerous, and some waters contain ten to twenty of them; but there are always soime predominating ones, which mark their character, while many of them, such as cesium, rubidium, or fluorine, occur in mere traces, and can not be assumed to be of any real importance. Mineral waters therefore resolve themselves into weaker or stronger solutions of salts and gases in water of higher or lower temperature. For medical purposes they are used either externally or internally, for bathing or for drinking. As the quantity of salts present commonly bears but a very small proportion to that of the fluid containing them, water becomes a very influential agent in mineral-water treatment, about which it is therefore necessary to say something.~~

~~For the action of hot and cold baths the reader is referred to the article Barus. But it may be observed here that, according to the most generally received opinion, the cuta- neous surface does not absorb any portion of the salts in a mineral-water bath, although it may absorb a little gas (an alkaline water, for instance, at most acting as a shight detergent on the skin), and that neither salts nor gases have any action on the system, except as stimulants of the skin, with partial action on the respiratory organs.~~

~~It seems to be ascertained that drinking considerable amounts of cold water reduces the temperature of the body, diminishes the frequency of the pulse, and increases the blood pressure temporarily. Water when introduced into the stomach, especially if it be empty, is quickly absorbed ; but, although much of the water passes into the veins, there is no proof that it ever produces in them, as is sometimes supposed, a state of fluidity or~~

~~*wateriness. Therapeutically, the imbibition of large quantities of water leads to a sort of general washing out of the organs. This produces a temporary increase of certain excretions, augmented diuresis, and a quantitative increase of urea, of chloride of sodium, and of phosphoric and sulphuric acids in the urine. Both the sensible and the insensible perspirations are augmented. A draught of cold water undoubtedly stimulates the peristaltic action of the intestines. On the whole water slightly warm is best borne by the stomach, and is more easily absorbed by it than cold water; and warm waters are more useful than cold ones when there is much gastric irritability.*~~

~~*In addition to the therapeutic action of mineral waters, there are certain very important subsidiary considerations which must not be overlooked. An individual who goes from home to drink them finds himself in a different climate, with possibly a considerable change in altitude. HIs diet is necessarily altered, and his usual home drinks are given up. There is change in the hours of going to bed and of rising. HIe is relieved from the routine of usual duties, and thrown into new and probably cheerful society. HIe takes more exercise than when at home, and is more in the open air, and this probably at the best season of the year. So important has this matter of season and climate been found that it is an established axiom that waters can be used to the greatest advantage during the summer months and in fine weather, and during the periods most convenient for relaxation from business. Summer is therefore the bath*~~

~~*season, but of late years provision has been made in many:*~~

~~*places, .with the aid of specially constructed rooms and passages, for carrying out cures satisfactorily during the winter season, ¢.g., at Aix-la-Chapelle, Wiesbaden, Baden Baden, Baden in Switzerland, Dax, Vichy, and Bath. The ordinary bath season extends from the 15th of May to the 20th or 30th September. The season for baths situated at considerable elevations commences a nionth later and terminates some ten days earlier. Mineral waters may be employed at home, but patients seldom so use them; and*~~

~~*MINE RAW WATE RE*~~

~~*this necessarily limits the time of their use. It is common to declare that the treatment should last for such or such a period. But the length of time for which any remedy is to be used must depend on its effect, and on the nature of the particular case. It is found, however, that the con- tinued use of mineral waters leads to certain disturbances of the system, which have been called crises, such as sleep- lessness, colics, and diarrhœa, and to skin eruptions known as la poussée. This cause, and also certain peculiarities of the female constitution, have led to the period of three weeks to a month being considered the usual period for treatment. A certain after-treatment is often prescribed — such as persistence in a particular diet, visiting springs or climates of a different and usually of a tonic character,*~~

~~*or continuing for a certain time to drink the waters at .*~~

~~*home. It may be added that the advantage of having recourse to mineral waters is often felt more after than during treatment.*~~

~~*Since improved methods of bottling have been discovered, and the advantage of an additional supply of carbonic acid has been appreciated, the export of waters from their sources has increased enormously, and most of the principal waters can now be advantageously used at home. It may be added that many of the artificial imitations of them are excellent.*~~

~~*The history of the use of mineral waters can only just be alluded to. They have been employed from the earliest periods, and traces of Roman work have been found at most of the European baths which are now in favour, — at almost all the thermal ones. Occasionally new springs are discovered in old countries, but the great majority of them have been long known. They have varied in popularity, and the modes of applying them have also varied, but less so than has been the case with most of the ordinary medicines. Warm waters, and those containing small quantities of mineral constituents, appear to have remained more steadily in favour than any other class within the appropriate sphere of mineral waters, which is limited to the treatment of chronic disease.*~~

~~*The attempt has been made to range mineral waters according to their therapeutic action, according to their internal or external use, but most generally according to their chemical constituents so far as they have been*~~

~~from time to time understood; and a judicious classification undoubtedly is a help towards their rational employment. But their constituents are so varied, and the gradations between different waters are so finely shaded off, that it has been found impossible to propose any one definite scientific classification that is not open to numberless objections. Thus a great many of the sulphur waters are practically earthy or saline ones. Yet because they con- tain very minute amounts of such a gas as hydrosulphuric acid, an ingredient so palpable as always to attract attention, it is considered necessary to class them under the head of sulphur. The general rule is to attempt to class a water under the head of its predominant element ; but if the amount of that be extremely small, this leads to such waters as those of Mont Dore being classified as alkaline or arseniated, because they contain a very little soda and arsenic. The classification in the following table, which is that usually adopted in Germany, has the merit of comparative simplicity, and of freedom from theoretical considerations which in this matter influence the French much more than the German writers. The more important constituents only are given. The amount of solid constitu- ents is the nuniber of parts to one thousand parts of the water ; the temperature of thermal springs is added. The waters are classified as indifferent, earthy, salt, sulphuretted, iron, alkaline, alkaline saline—with subvarieties of table waters and purging waters.~~

~~TABLE I.—Typical Mineral Waters.~~

~~indifferent.| Earthy. Salt. Salt. ee ee Kissingen. | Sea-Water. Solids, Bicarbonate of soda. ..... a potash. ... , magnesia.| *0017 ‘013 017 “45 ay ealeium…| °0195 012 1°06 2°38 Sulphate of soda.…..... 0208 050 5 potashr…..... 0135 038 – magnesia….. 308 588 2°96 + caleiom:..... 1°520 *389 °25 Sulphide of sodium.…..... Chloride of sodiuim.…..... 0428 5°52 25°21 potash. ....:. – magnesia….. Carbonate of iron.…..... 0005 023 RSINICTGHACIO, ..ccsesceesece soe “0496 036 Gases.~~

~~Carbonic acid Hydrosulphuric acid~~

~~*In addition to their solid constituents, gas is present in many waters in considerable quantity. There is a little oxygen and a good deal of nitrogen in some of them; the quantity of hydrosulphuric acid, even in strong sulphuric waters, is wonderfully small; but the volume of carbonic acid present is often very large,—for instance, in the case of Kissingen, Schwalbach, and Selters. Carbonic acid is so generally diffused that it is practically a very important agent in the therapeutics of mineral waters. Springs that contain it are far the most agreeable to the taste, and consequently most popular with patients. The immediate effect of the carbonic acid which they contain is that of pleasant stimulation to the stomach and system, although it can scarcely be said to approach, as some have thought, the slighter forms of stimulation from alcoholic drinks. Extremely little appears to be known of its actual operation on the system: a part of what is swallowed is returned by eructation, and a part passes on to the intestines ; whether any appreciable quantity reaches the blood is doubtful. There is no question that carbonic acid increases diuresis. Practically it is found to aid digestion, helping the functions of the stomach, and in a slight degree the peristaltic action of the intestines. The increased flow of urine may be caused by its favouring the absorption of water by the stomach. In some baths carbonic acid is so abundant that precautions have to be taken to prevent its tendency to accumulate on account of its heavy specific gravity. Car- bonic acid gas, used as a bath, proves stimulating to the skin and to the general system; but its employment has not answered the expectations formed of it. _.*~~

~~*Indifferent Waters scarcely vary in chemical qualities from ordi- nary drinking water ; but they are usually of higher temperature. Their therapeutic action, which is mainly exercised through baths, has been explained on the theory of peculiarities of their electric or thermal condition, about which we know nothing definite, and ou the presence in some of them of a large quantity of nitrogen. It has also been ascribed to the various organic substances in some of them, such as glairin, which when collected is sometimes useful as*~~

~~*a cataplasm. These waters are not often much drunk, but any efficiency they may have in dyspepsia and perhaps in neuralgic*~~

~~diarrheeas must be attributed to the favourable action of hot water |~~

~~on the digestion. The waters of this class, especially the hotter ones in the form of baths, are extremely useful in resolving the effects of inflammation, in thickenings of the joints, and in clironic rheumatism and gout. They also are often effective, especially the cooler ones, in neuralgia and in some hysterieal affections. They are sometimes prescribed in urinary affections, in which case they probably assist by dilution. The effects of many of these waters are aided by the baths often being situated at considerable elevations and in out-of-the-way spots, whence the Germans called them Wildbéder. They are very widely diffused, being found in all quarters of the globe, especially in volcanic districts. There are many in New Zealand ; in America the hottest are in the West and in California.~~

~~Purging~~

~~Sulphur. Tron. Alkaline,| A ae Beas aline, -Water, Water. Alx-la-Chapelle i : di ig do" ©) Sehwalbach, vie ip ae Sclters. oe 6449 0206 4°883 1°92 ey~~

~~352~~

~~"0506 "DAD? 303 18 "157 ALS} "434 4298 *2831 "0079 "292 Dey 15°9 "1527 '0037 "16 46 16°0~~

~~0136~~

~~2616 534 1°03 Aa ss~~

~~Locality, a Fale. For what prescribed. Evian, Lake of Geneva! 1,100 , { Nervous cases, dyspepsia, urinary affections. — padenmellere Raden 1.425 For mild rheumatie treatment; a 2 | ae health resort. Buxton, England….. 980 82 { Gout a rheumatism (nitrogen aor present). Schlangenbad, Nassau.| 800 | 80-87 =. cases, female disorders, skin. le — hceumatism, gout, cutaneous affec- Sacedon, Spain……. 1,500 85 fone 4 x Wildbad, Wiirtemberg.| 1,320 | 90-101 ei ieee neuralgia, Pfctfers, Switzerland…| 2,115 | 99 Do. "do. do. Ragatz, do. «| 1,570 95 Do. do. do. f e Do. (nitrogen present); special action Panticosa, S. Pyrenees.) 5,110 | 85-95 in phthisis. Teplitz, Bohemia 648 |101-120 { Gout, rheumatism, old injuries, joints~~

~~SARS 2 ae eS. | Gastein, Austria…….. 3,315 | 95-118 | Do. do.; soothes nervous system.~~

~~Earthy Waters.—These differ chiefly from the indifferent waters in containing an appreciable quantity of salts, among which sulphate or carbonate of lime or of magnesia predominates. The great majority of them are of high temperature. They produce the same effects as the indifferent waters, but are perhaps less efficacious in neuralgic affections, while they are more employed in some of the chronic scaly eruptions. There was formerly a tendeney to consider these waters useful in urinary affections; but at the present day it is only the colder ones that have come into repute for the expulsion of gravel and biliary calculi and in the treat- ment of affections of the bladder generally. Some of them have also of late years been considered to exercise a favourable influence on scrofula, and to.be useful in the early stages of pulmonary phthisis. This has been attributed to the salts of lime present in them, although it is known that most of its salts pass through the system unaltered. Many of these baths, such as Leuk and Bormio, enjoy the advantages of great elevation, but Bath, otherwise one of the best of them, lies low.~~

~~TasLe IIJ].—Zarthy Waters.~~

~~: Height; Temp. 2 : Locality. feet irate Therapeutic Action, (r q Special action in calculous Contrexeville, Vosges…….. 1,050 { Le canes — : Supposed to be useful in Lippe Springe, N. Germany phthisis. 5 ; Special use in urinary com- es} ; P' uy & Wildungen, do. | plaints; contains iron. 2 Resorted to for pulmonar. Weissenberg, Switzerland…| 2,600 ane hicke: Pp y Dyspepsia, diabetes, hepatic Pougues, FYance….cseeseeeeeee 600 50 arianeint ary con BR . Baden, Switzerland…….. + + 1,180 | 117-122 apa ny || Leis GIQ® —_ Seasnoseenoc 4,400 | 93-123 | Do., some female complaints. = | Bormio, North ltaly…….. 4,400 | 86-104 | Do. do. ; old sprains. an eg eee … {108-122 Do. do. do. i= Lucca, ltaly …cccc-ceeree = | Bath, England……..-sseeeeeseee| aes 108-122 | Do. do. 0. Dax, south of France……..- 1,400 139 | Do. do. ; B. de Bigorres, Pyrenees…..| 1,800 64-123 | Do.; chlorosis, neuralgia.~~

~~f i ion is gi t-known~~

~~! In this and the following tables a selection is given of some of the bes n mineral waters in various European countries that possess establishments. Bed chief peculiaritics of elevation, of temperature, and constituents are briefly pa . The curative effects, necessarily alluded to very generally, are those usually~~

~~attributed to them. XVI — 55~~

~~Salt Waters are so called from containing a predominant amount of chloride of sodium. They also generally contain chlorides of magnesia and of lime, and occasionally small amounts of lithium, bromine, and iodine. They further often contain a little iron, which is an important addition. The great majority of the drinking wells have a large supply of carbonic acid. There are cold and hot salt springs. Sometimes bathing; and the double use of them is often resorted to. ;~~

~~The normal quantity of common salt consumed daily by man 1s usually set down at about 300 grains, The maximum quantity likely to be taken at any well may be 225 grains, but commonly not inore than half of that amount is taken. The increase to the usual daily amount is therefore probably not much more than one-third. Still it may be presumed that the action of a solution of salt on an empty stomach is different from that of the same amount of salt taken with food. Salt introduced into the stomach excites the secretion of gastric juice, and favours the peristaltic actions, and when taken in considerable quantity is distinctly aperient. We thus see how itis useful in dyspepsia, in atony of the stomach and intestines, and sometimes in chronic intestinal catarrh. Salt when absorbed by the stomach appears again in the urine, of which it in- creases the amount both of fluid and of solid constitueuts, especially ofthe urea. It seems therefore to be pretty certain that considerable quantities of salt taken into the circulation increase the excretion of nitrogenous products through the urine, and on the whole accelerate the transformation of tissue. Salt is thus useful in scrofula by stimulating the system, and also in anemia, especially when iron is also present. In some German stations, as at Soden, carbonated salt waters are considered to be useful in chronic laryngitis or granular pharyngitis. :~~

~~*Baths of salt water, as usually given, rarely contain more than 3 per cent. of chloride of sodium, some of the strongest perhaps from 8 to 10 per cent. Their primary action is as a stimulant to the skin, in which action it is probable that the other chlorides, especially that of calcium, and still more the carbonic acid often present, co-operate. In this way, and when aided by various pro- cesses of what may be termed water poultices and packing, they are often useful in removing exudations, in chronic metritis and in some tumours of the uterus, and generally in scrofula and rachitis, and occasionally in some chronic skin affections.*~~

~~*The French accord high praise to some of their thermal salt waters in paralysis, and some German ones are used in a similar way in spinal affections. that they must be diluted for bathing. In other cases concen- trated solutions of salt are added to make them sufficiently strong. These waters are widely diffused, but on the whole Germany is richest in them, especially in such as are highly charged with salt. The Kissingen springs may be-considered as typical of the drinking wells, and sea-water of bathing waters. The air of salt- works and pulverization of the water are employed in German baths as remedial agents.*~~

~~*Salt springs are found in many quarters of the world, but the chief carbonated groups for drinking purposes occur in Germany, and at Saratoga in America, where very remarkable wells indeed are to be found. France and England have no springs of this class. The stronger wells, used chiefly for bathing, occur where*~~

~~*TasiE 1V.—Salt Springs.*~~

~~*Locality. oe Therapeutie Action. "Soden, near Fiankfort……..0- { Dyspeeea, ane Pinar aks orm nee gieia i eae net dae special for throat and phthisis. | Homunre ay : { Dyspepsia, slighter hepatic} |e , : Fe affections, chlorosis, gout. = j Kissingen, Bavaria. antes 1n all essentials the same. © | Pyrmont, North Germany…….. { Better known for its iron; has | a good salt drinking spring. . , Asalt well without carbonic acid Kreuznach, near Bingen……. used in scrofula and anemia; bathing more important. Wiesbaden, Nassau…..ee.eeeeeee 155 Used in dyspepsia and gout; the (bathing is most important. UON-BAGOW: ; csi, sec eessecccesee see ss 156 cr alld 7 uses similar ; ut. Bourbonne, Hante-Marne…….. 114-149 { ba ranean*~~

~~neuralgia, effects | ria. Balaruc, South Francce…….00 116°6 { Do.; special for treatment of | = Metal a q | Salins, Moutiers, Savoy (1480 ft. { Sere eis eee lb emeeromer E a a y¢ i Y. sexual disorders. a = | Brides, Savoy (1700 ft.).-e-ceesesae- | 4 Act ones smaidigearecicanal; eS ’ y ( ) og : used for obesity. Aequi, North Italy..c..ceessssseeeeee- | 469 { Rheumatism; special treatment | with the bath deposit. pn ds: eee 185 ed as baths; nud of bath Caldas de Momb) Rhe sae toe e uy, near 2 eumati sciati in- Barcelona….s.sse0e rt fi Ue { ‘ juries. ee ae { Cestona, Guipuzcoa, Spain…….. 88-94 { ET ela indigestion, bron-~~

~~Almost all the above stations have several springs of various strengths: the cold may be said to vary from 14 to 5°8 per cent. of chloride cf sodium ; the warm are generally weaker, perhaps varying from 6°8 to 1°6.~~

~~they are used for drinking, sometimes for —~~

~~The salt waters are sometimes so strong —~~

~~WATERS~~

~~there are salt-bearing strata, as in Germany, Galicia, Italy, Switzer- land, France, and England. Very powerful waters of this class are those of St Catherines in Canada.~~

~~The presence of minute: portions of dodine or bromine in salt waters is by no means infrequent, and they appear in considerable quantity in some few. It is, however, extremely doubtful whether any known spring contains a sufficient quantity of iodine, still more of bromine, to act specially on the system, even if that action were not necessarily superseded by the presence of the large quautity of other salts with which they are associated. Some of the best known springs of the kind are :—Challes, Wildegg, Castrocaro, Hall, Adel- heid’s Quelle, Krankenheil, Kreuznach, Woodhall Spa.~~

~~Tron or Chalybeate Waters.—Ivon usually exists in waters in the state of protoxide or its carbonate, less frequently as sulphate or crenate, and very rarely if at all as chloride. The quantity present is usually extremely small. It may be said to vary from °12 to ‘03 in the 1000 parts of water. Some wells considered distinct chaly- beates contain less than ‘03. Many wells,~~

~~*especially in Germany, have a rich supply of carbonic acid, which is unfortunately wanting in French and English ones.*~~

~~*It has long been the prevalent idea that want of iron in the blood is the main cause of chlorosis and of other anemic conditions, and that these conditions are best relieved by a supply of that metal. Since the detection of it in hemoglobuline this view has been still more popular. It is pretty certain that the blood contains 37 to 47 grains and the whole system 70 to 74 grains of iron; and it has been calculated that in normal conditions of the system some- what more than one grain of iron is taken daily in articles of food, and that the same amount is passed in the feces; for although the stomach takes the iron up it is excreted by the alimentary canal mainly, if being doubtful whether any is excreted in the urine. It is possible by drinking several glasses to take in more thana grain of carbonate of iron in the day, equivalent to half that amount of metalliciron. It has further been ingeniously reckoned from practice that 10 to 15 grains of metallic iron suffice to supply the deficiency in the system in a case of chlorosis. It is thought probable that a portion of the iron taken up in water is in certain pathological states not excreted, but retained in the system, and goes towards making up the want of that metal. But, whether this or any other explanation be satisfactory, there is no question as to the excellent effects often produced by drinking chalybeate waters (especially when they are carbonated), and by bathing in those which are rich in carbonic acid after they have been artificially heated. As regards the drinking cure we must not, however, forget that carbonate and chloride of sodium, and also the sulphate, are often present and must be ascribed a share inthe cure. Thus chloride of sodium isa power-*~~

~~*TaBLE V.—Stronger Salt Waters.*~~

~~*Chloride of Sodium in*~~

~~*Locality. 1000 parts Therapeutic Application. of Water. (Serofula, effects of inflamma- | tion, chronic exudations, Rheinfeld, Aargau, Switzerland ….. 311 4 some elironic exanthe- | inas, rheumatism, uterine | infiltrations, Salzungen, North Germany…..+ + .. 256 Do. do Isehl, Austria (1440 ft.)....00 oe eens Do. do Wall, Tyrol (1700 ft.) .....cccceeseeeeeeeseee 255 Do. do Reichenhall, near Salzburg (1800 ft.) ae Do. do Bex, Rhone Valley (1400*~~

~~ft.)..... 156 Do. do Castrocaro, TUSCANY.....0+60.+0- 36 Do. do Droitwich, near Worcester…... 233°6 Do. do. Sea Water ….....00.- sesescccccessesecces cae 30°4 — ‘ on © 5 3 a mo- Rehme, Westphalia (92° F.).....0..| 24-85 re i bccdiawes he 29 Do. do.~~

~~Nauheim, Wetterau (80°-103° F.)....~~

~~TABLE VI.—Jron Waters.~~

~~ee~~

~~Locality ba pee Therapeutic Use. Rippoldsau, Black Forest…...| 1,886 “12 | For anemic cor ditions; laxative. Homburg, near Frankfort…) ... 10 Do. do. co. Wister (Saxon yoeseceeress-=—s [lg 08 Do. do. do. Liebenstein, North Germany| 911 08 Sehwalbach, Nassau..... 900 08 Do.; much of a ladies’ path. Bocklet, near Kissingen…... 600 08 Do.~~

~~Gricsbach, Black Forest…... 1,614 07 Do.; laxative; a ladies’ bath. Franzensbad, Bohemia……..| 1,293 07 Do, do. do. Pyrmont, Germany …….-.| «+. 07 Do, Spa, Belgium. ....0+..<-2e---.../e0UG 06 Do. Petersthal, Black Forest…... 1,353 “04 Do.; laxative. Se oe, Ee: 5,464 03 Do.; sought for its air. Forges-les-Eaux, France….. aes 06 Do. La Malou, Hérault, 0 :~~

~~France (temp. 8S°)..... aoe e L& Recoaro, North Italy…….| 1,463 04 Do. Tunbridge Wells, England…| ... 06 Dos deficientin carbonicacid Muspratt Spring, Harro- :~~

~~gater(chloride) 222-2-..<. i Le |~~

~~MINERALIWATERS~~

~~ful adjuvant in the strong Stahl Quelle of Homburg and in the Putnam Well at Saratoga. A whole category of female complaints is treated successfully with these waters. Indeed anemia from any source, as after fever or through loss of blood, and enlargements of the spleen, are benefited by them. The stimulating action of the copious supply of carbonic acid in steel baths is a very important adjuvant; no one now believes in direct absorption of iron~~

~~*from the bath. Iron waters are scarcely ever thermal. They are extremely common in all countries,—frequently along with sulphurctted hydrogeu in bogs, and near coal-measures. But such springs and non-carbonated wells generally are weak, and not now held in much esteem.*~~

~~*It may be added that some of the strongest known iron wells are sulphated or aluminated. They are styptic aud astringent, and can only be used diluted. They are sometimes useful as an application to ulcersand sores. Such springs have oftcn been brought into notice, but never retain their popularity. They are known in the Isle of Wight, in Wales, in Scotland, as well as in Elba, &c.; and of late years the Bedford Alum and Oak Orchard Springs, U.S., have been brought into notice, the latter containing 10 grains of free sulphuric acid in the pint. All such springs have been considered useful in scrofula, anemia, and chronic diarrheeas.*~~

~~*Sulphur Springs.—Waters having the odour of hydrosulphuric acid, however slightly, are usually called sulphur ones. They owe their smell sometimes to the presence of the free acid, sometimes to sulphides of sodium, calcium, or niagnesia, and sometimes to both. Hydrosulphuric acid is absorbed more freely by cold than by hot water, and is therefore most abundant in cold springs. The sulphides decompose and give off the gas. Most of these springs occur near coal or shale measures, or strata containing fossils, or in moors and in places generally where organic matter is present in the soil or strata. Many of them contain so little mineral impreg- natiou that they might as well be classed among the indifferent or earthy waters. One group cotains a considerable amount of chloride of sodium, another of sulphate of lime, while a third has little mineral impregnation, but contains sulphides.*~~

~~*Hydrosulphuric acid is a strong poison, and its action on the system has been pretty well ascertainced. It has been assumed that the gas in mineral waters acts similarly, though in a modified deeree; but there is next to nothing absolutely known of the action of the small quantities of the gas that are present in mineral waters, and which certainly have no toxic effect. It has been assumed that this gas has some special action on the portal system and so on the liver. On the connexion of metallic poisoning with the liver has been founded the idea that sulphur waters are useful in metallic*~~

~~*intoxication. Drinking large quantities of these waters, especially of such as contain sulphates or chlorides of sodium or magnesia, combined with hot baths and exercise, may help to break up albuminates, but there is no proof of the action of the sulphur.)*~~

~~*For similar reasons, and primarily to counteract mercurial poison, sulphur waters have been considered useful in syphilis. But it may be well to remember that at most baths mercury is used along with them, No doubt they are frequently, like other warm waters, nseful in bringing out old eruptions, acting in this way as a test for syphilitic poison, and in indicating the treatment that may be*~~

~~*Taste VII.—Cold Sulphur Springs.*~~

~~*Hydrosul- . ‘ phuric Acid | Sulphide Locality. absorbed in | coginm Water. ‘ USNS CHAMMDUTSALAPNE.....—.00---eac-esecceseesnesncoee 42°3 as MleiMbengy Lippe-WEtMOld..,.....-0s0ccccevseccccccesesesesvessees 23°71 “008 Gurnigel, Switzerland (8600 ft.).....00+ 1571 eda Leuk, OMEN (SDOSHE Serre cscee. os eos.0e0 44°5 = NEB PES ARONA (OUOHU2) xcen-erecacses-<avesesenesacens ae “478 Enghien, near Paris..... ae 106 Uriage, Istre, France (1509 f 7°34 ood Harrogate, England..... se0 *207 Strathpetfer, Scotland..... “026 isdanivains, Clare, Ireland…-....- s.s02c-ccossesereenneses see TABLE VIII.—Warm Sulphur Springs. | Hydrosul- . Height! Temp. | Sulphide | phuric Acid eeety in eel. ° Fahr. | of Sodium. | absorbed in Water. Aix-la-Chapelle, Germany.....+ 534 | 131-140 01 3 Baden, near Vienna.....ccccccccccces or 95-115 “052 25 Schinznach, Switzerland .....c00000 1,060 80-92 aoe 37°38 MEANEYAeLHONC VELICY.....c2-.2reeee

~~required, Sulphur waters, both hot and cold, are used in gout and rheumatism, in dyspepsia, in hepatic and cutaneous affections ; and of late years inhalation of them has been popular in phthisis and in laryngeal affections. They have long been popular remedies in cutaneous affections. While so much doubt has been cast on the action of the sulphur of these waters, it may be admitted that the~~

~~- sulphides are probably decomposed in the stomach and hydrosul-~~

~~phuric acid generated. That gas is probably a slight stimulant to the intestine. What hydrosulphuric acid reaches the blood is eliminated by the lungs. There seems to be no doubt that the gas is absorbed in smal] quantities by the skin.~~

~~It is in sulphur waters chiefly that glairin and baregin occur. This peculiar organic substance has been found both in-American and in European spriugs. Cold sulphur springs are very widely diffused throughout the world. Thermal ones are not so common. Per- haps the largest though not the strongest group of the latter is to be found in the Pyrenees. We may remark again how very little hydrosulphuric acid there is in many of the most favourite sulphur springs, including the very popular White Sulphur ones of Virginia. There seems to be something peculiarly unsatisfactory in the analysis of sulphur waters, and there has been difficulty in construct- ing the following imperfect tables.~~

~~Some of the most powerful cold wells are those of Challes (with its very peculiar water), Leuk, and Harrogate. Uriage has a very large amount of chloride of sodium in its springs. Cold sulphur waters are on the whole more used in liver and indigestion than warm ones. The general effects of warm sulphur waters differ so little at the various baths as to make it difficult to mention anything special to particular localities. Schinznach has a reputation in skin complaints, Cauterets, Eaux Bonnes, and Challes in laryngeal affections, the two Aixes, Luchon, and Archena in syphilis.~~

~~Alkaline Waters are such as contain carbonate (chiefly bicarbon- ate) of soda, along with an excess of carbonic acid. Of the action of those carbonates it is known that when taken into the stomach they are neutralized by the gastric juice, and converted into chloride of sodium. On~~

~~their introduction into the stomach they produce an increased flow of gastric juice. If given during or immediately after meals in any quantity, they impede digestion. They slightly increase peristaltic action, but only feebly, unless assisted by other salts. They act slightly as diuretics. Of the connexion between the biliary system and alkalies, which undoubtedly exists, not much is known with certainty. The alkalization of the blood by them is It is very doubtful whether they reduce the quantity of fibrine in the blood, and thus induce a~~

~~TABLE LX.—4lkaline Waters.~~

~~Cuass I1.—Simple Alkaline.~~

~~Locality. cae Therapeutic Uses. Catarrh of stomach, gout, renal and iValS, SOUL) ELANCEs. ...cc+02.5-s<0sce fel biliary calculi, liver complaints, diabetes. Bilin; Bobemia:.....--... 4:2 Do. do. do. Vichy, France (105° F.).....-0 51 Do. do. do. — Neucnahr, Rhineland (92°-97° F.).| 1:0 Mucous catarrh; diabetes specially. 5 Do.; sedative effect on nervous La Malou, France (97° F.).....00-. i. system. ae Do., gout, urinary affections —'' The Vidago, Portugal:.....<-.....-. Portuguese Viehy."~~

~~Ciass Il.—With Chloride of Sodium varying from 4°3 to 1 in amount.~~

~~Height) Temp. | Carb. in Feet.| ° Fahr. | Soda.~~

~~a : Springs rich bothincarb. — a ; soda and chl. sodium. {Light antacid tonic to~~

~~Locality. Therapeutic Uses.~~

~~Luhatsehowitz, Moravia.....~~

~~Toénnistcin, Rhine Valley…| ... soe 2°5 Venta ee. Special in female com-ETS NRSSA I toe ecesssrcecces soe. 85-115 | 2°0 plaints and mucous s : membrane, : : P Specially rheumatism iRs@hiias sMtaliye.cccseeccesestcneecse uptol70| 2-0 6 dfernlile complaints. Do. and some skin|. Royat, AUVergne ……..eeeee 1,400 | 80-95 1°3 {~~

~~*RifCCHIGTIS! Asthma, chronic laryn- Mont Dore, do. .....------| 3,800 | 100-114] ... ae y a Scrofula, rachitis, cuta- Bown boule; iO: *~~

~~*Crass III.— With Sulphate of Soda varying from 5°2 to 2 in amount, and _ Carbonate of Soda varying from 3°85 to °51 in amount.*~~

~~*ight :*~~

~~*Locality. fe ea Therapeutic Uses. i sbdominal organs 1,460 | {Action on abdominal organs,*~~

~~*BISber, SAXONY .....00c.seerecvece eee -= {. female complaints.*~~

~~*es*~~

~~*Marienbad, Bolicmia.. good) Joe es Do.; special nse in obesity.*~~

~~*R cee ree} Do.; specially a ladies' bath. eg ae . ' Powerful action on abdominal Tarasp, Lower Engadine.....| 4,000 Piscorat a :*~~

~~*Gout, liver affections, biliary an Carlsbad, Bohemia (121°-164° F.)..| 1,200 { Sree ailboses.*~~

~~*ee eee eee EE ES*~~

~~*436 MINERAL*~~

~~*lowered state of the system, or whether they have any direct tend- ency to combine with fat and carry off a portion of. superfluous adipose tissue. Their excess of carbonic acid, through its action on the stomach, favours the operation of alkaline waters. They have been classed as follows:—(I.) simple alkalines, where carbonate of soda is the main agent ; (II.) waters containing in addition some chloride of sodium ; (III.) waters containing sulphates of soda or of magnesia. All these classes may be said to be used in gout, lithi- asis, affections of the liver, catarrh, and obstructions of the gall ducts, in dyspepsia, chronic catarrh of the stomach, and diarrhea, in obesity, and in diabetes. Some of the waters of the second class are supposed to influence bronchial catarrhs and incipient phthisis, while the more powerful sulphated waters of the third class are especially useful in*~~

~~*catarrh of the stomach, and in affections of the biliary organs; of these only one of importance (Carlsbad) is ther- mal. ' The rival cold waters of Tarasp contain twice as much car- ponate of soda. The cold ones are chiefly used internally, the thermal ones both internally and externally. — The latter, besides acting as warm water, slightly stimulate the skin when the car- bonic acid is abundant, and the carbonate of soda has some slight detergent effect on the cutaneous surface like soap. These waters are unknown in England. 'They are most abundant in countries of extinct volcanoes.*~~

~~*Classes I. and II. of alkaline waters may be said to have a sub- variety in acidulated springs or carbonated waters, in which the quantity of salts is very small, that of carbonic acid large. These table waters are readily drunk at meals. They have of late years been so widely exported as to be within the reach almost of every one. Their practical importance in aiding digestion is in reality much greater than one could expect from their scanty mineraliza- tion. 'They are drunk by the country people, and also largely ex- ported and imitated. They are very abundant on the Continent, and, although some of the best-known ones enumerated below are German and French, they are common in Italy and elsewhere :— Heppingen, Roisdorf, Landskro, Apollinaris, Selters, Briickenau, Gieshiibel, all German ; St Galmier, Pougues, Chateldon, French.*~~

~~*Associated with Class III. is that of the strongly swlphated waters known in Germany as bitter or purging waters, which have of late deservedly come into use as purgative agents. They are almost wanting in France and in America, and there are no very good ones in England. The chief supply is from Bohemia and Hungary. The numerous waters of Ofen are the best- known, and some of them are stronger than the Hunyadi, of which an analysis has been given in Table I. They are easily imitated. Some of the best-known are Ofen, Piillna, Saidschiitz, Friedrichshall, Birmerstoff, Kissingen.*~~

~~*Two other classes of waters demand a few words of notice. The French have much faith in the presence of minute quantities of arsenic in some of their springs, and trace arsenical effects in those who drink them, and some French authors have established a class of arsenical waters. Bourboule in Auvergne is the strongest of them, and is said to contain ⁺ ,th of a grain of*~~

~~arseniate of soda in 7 ounces of water. Baden-Baden, according to Bunsen's latest analysis, has a right to be considered an arsenical water. It is, however, extremely doubtful whether the small amounts of ar- seniate of soda which have been detected, accompanied as they are by preponderating amounts of other salts, have any actual opera- tion on the system. The following are among the most noted springs :—Bourboule, Mont Dore, Royat, Salies (Bigorres), Plom- biéres, Baden-Baden.~~

~~Of late years lithiwm has been discovered in the waters of Baden-~~

~~Baden; and various other places boast of the amount of that sub-~~

~~stance in their springs. Indeed a new bath has been established at Assmannshausen on the Rhine in consequence of the discovery of a weak alkaline spring containing some Vehinih. Not very much is known of the action of lithium in ordinary medicine, and it un- doubtedly does not exist in medicinal doses even in the strongest springs. Among these springs are those of Baden-Baden, Assmanns- hausen, Elster, Royat, Ballston Spa, and Saratoga (U.S.).~~

~~AMERICAN MINERAL WATERS.—The number of springs in the United States and Canada to which public attention has been called on account of their supposed therapeutic virtues is very large, amounting in all to more than three hundred. Of this number comparatively few are in Canada, and of these not more than six (St Catharines, Caledonia, Plantagenet, Caxton, Charlottesville, and Sandwich) have attained general celebrity. The first three belong to the saline class, the Caxton is alkaline-saline, and the last two are sulphur waters. The St Catherines is remarkable for the very large amounts of sodium, calcium, and magnesium chlorides which it contains, its total salts (450 grains in the pint) being more than three times the quantity contained' in the brine-baths of Kreuz- nach in Prussia. The Charlottesville and Sandwich springs likewise surpass the noted sulphur-waters of Europe in their excessive per- centages of sulphuretted hydrogen, the former containing more than 3 and the latter 4°72 cubic inches of this gas in the pint.~~

~~The mineral springs in the United States are very unequally dis- tributed, by far the larger number of those which are in high medical repute occurring~~

~~*along the Appalachian chain of mountains,*~~

~~*WATERS*~~

~~*and more especially on or near this chain where it passes through the*~~

~~*States of Virginia, West Virginia, and New York. The Devonian*~~

~~*and Silurian formations which overlie the Eozoic rocks along the*~~

~~*course of the Appalachian chain have been greatly fissured—the*~~

~~*faulting of the strata being in some places of enormous magnitude*~~

~~*—by the series of upheavals which gave rise to the many parallel*~~

~~*mountain ridges of the Appalachians. In many places the springs*~~

~~*occur directly along the lines of fault. The various classes of mineral waters are likewise very unequally represented, the alkaline*~~

~~*springs, and those containing Glauber and Epsom salts, being much*~~

~~*inferior to their European representatives. On the other hand, the*~~

~~*very numerous and abundant springs of Saratoga compare very*~~

~~*favourably with the Selters and similar saline waters, and among*~~

~~*the many American chalybeate springs the subclass represented*~~

~~*by the Rockbridge Alum is unequalled in regard to the very large*~~

~~*percentages of alumina and sulphuric acid which it contains.*~~

~~*Besides its greater amount of mineral constituents (185 grains per*~~

~~*pint), the Ballston spring surpasses the similar saline waters of Homburg, Kissingen, Wiesbaden, and Selters in its percentage of carbonic acid (53*~~

~~*cubic inches). It is also remarkable for the very*~~

~~*large proportion of carbonate of lithia, amounting to 0°701 grains.*~~

~~*Thermal springs are specially numerous in the territories west of the Mississippi and in California. Those in the east mostly occur*~~

~~*in Virginia along the southern portion of the Appalachian chain ;*~~

~~*in the middle and New England States Lebanon is the only im-*~~

~~*portant thermal spring. Subjoined is a list of thirty American*~~

~~*springs, the design being to represent as many of the more noted*~~

~~*spas as possible, while at the same time enumerating the best repre-*~~

~~*sentatives of the classes and subclasses into which mineral waters*~~

~~*are divided according to the German method of classification.*~~

~~*Designation aud Loeality. Therapeutic Application*~~

~~*Lebanon, Columbia Co., N.Y. (73° F.)..*~~

~~*Serofulous ulcers and ophthal-*~~

~~*. = mia,ozzena,chronie diarrheea*~~

~~*Healing; Bath Coz, Va: @8" F.)sa:....|) gaa' deuettery,. scéaualite (and tertiary syphilis.*~~

~~*een, and subacute rheuma-*~~

~~*Warm, Bath Co., Va. (98° F.).....000+ tism, gout, neuralgia, neph-*~~

~~*ritie and caleulous diseases. Chronie rheumatism, gout, diseases of liver, neuralgia,*~~

~~*contractions of joints.*~~

~~*4*~~

~~*Hot, Bath Co., Va. (110° F.) .....eeeeeeee*~~

~~*Paso Robles, San Luis, Obispo Co.,) | GAGS 5); a een tees*~~

~~*Indifferent (Thermal).*~~

~~*functional diseases of uterus. ehronic mercurial and lead poisoning. Calculus, gravel, catarrh of 4 stomach or bladder,dyspepsia. Gravel, dyspepsia (diuretic, diaphoretic). Neuralgia (restorative). Purgutive, diuretic. | amma mellitus, gravel, in-*~~

~~*Hot, Garland Co., Ark. (93°-150° F.)....*~~

~~*— diseases of skin,*~~

~~*Gettysburg, Adams Co., Penn.……0+*~~

~~*Sweet, Monroe Co., W. Va. (74° F.)...-*~~

~~*Berkeley, Morgan Co., W. Va. (74° F.). Alleghany, Moutgomery Co., Va.…...-*~~

~~*Calcareous and Earthy.*~~

~~*Bethesda, Waukesha Co., Wis….. fiammation of bladder,dropsy, albuminuria (diuretic). Aperient and alterative.*~~

~~*do.*~~

~~*Lower Blue Liek, Nicholas Co., Ky…..*~~

~~*5 Sharon, Sehoharie Co., N. Y……..0200+ + Do. a j Dartrous skin diseases, dis- = White Sulphur, Greenbrier Co., Va. .... } eases of the bladder, jaun- Rn diee, dyspepsia. 2 Salt Sulphur, Monroe Co., W. Va.…..— Do.; serofula and syphilis. a} Bedford Aaland Go, Pétthesereene Ansmia, gravel, ealculus*~~

~~<3)~~

~~g St Catherines, Ontario, Canada…….. en" gout, serofula, Ea Caledonia, Ontario, Canada……..+...008 Rheumatism, gout. Dyspepsia, jaundiee, abdomi- n yspep J € 0 2 Hathorne, Saratoga, N.Y…....csesseseers nal pl Sano 2~~

~~Ballston, Saratoga Co., N.Y. ...+sse000| Do. do. do. Uleers, diseases of the skin, passive hemorrhages, atonic~~

~~Qak-Orchard Acid, Genesee Co., N.Y… diarrhcea(has 10 grainsof free~~

~~: | sulphuric acid in the pint). S E 5 Chlorosis and anemia gene-~~

~~/~~

~~= Rawley, Rockingham Co., Va……..+ { rally; tonie. | Sweet Chalybeate, Alleghany Co.. Va.| Do. do. do. ; Roekbridge Alum, Rockbridge Co., Va.| Serofula, ehronic diarrhoea. ~ ; ' Aneniia, ehlorosis, ehronic a | cooper s Well, Hinds Co., Miss…….. diarrhea, dropsy.. >. 3 (Crab Orehard, fineoln Co., Ky…….. SA (Midland, Midland Co., Mieh…..... S _ (Bladon, Choetaw Co., Ala. (earbon- a ated alkaline). ……..+. soocnmanseenane a 4 Congress, Santa Clara Co., Cal.? 2 (saline alkaline). …….000—sesesssses id~~

~~and subacute rheumatism.~~

~~St Louis, Gratiot Co., Mieh. praiie:~~

~~Dyspepsia, neuralgia, ehronic alkaline)~~

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~~*MINERVA (i.e., menes-va, endowed with mind) was the Roman goddess who presided over all handicrafts, inven- tions, arts, and sciences. She was probably an Etruscan deity, but her character was modified on Roman soil through her identification with the Greek Pallas Athena (see Arnena). No legend of her birth is recorded ; the Roman deities were abstractions, not distinct persons with an individual history. Her chief worship in Rome was in the temple built by Tarquin on the Capitol, where she was worshipped side by side with Jupiter and Juno, This foundation may be assigned to Etruscan influence. She had also an old temple on the Aventine, which was a regular meeting-place for dramatic poets and actors. The dedi- cation day of the temple and birthday of the goddess was March 19, and this day was*~~

~~*the great festival of Minerva, called quinquatrus because it fell on the fifth day after the Ides. The number five was sacred to the goddess, All the schools had holidays at this time, and the pupils on reassembling brought a fee (minerval) to the teachers. In every house also the quinquatrus was a holiday, for Minerva was patron of the women's weaving and spinning and the workmen's craft. At a later time the festival was extended over five days, and games were celebrated. This feature is evidently due to the Grecizing conception of Minerva as the goddess of war. To this same Grecizing tendency we must attribute the dectesternium to Minerva and Neptune conjointly after the battle of the Trasimene Lake. The 23d had always been the day of the tubilustrium, or purification of the trumpets, so that the ceremony came to be on the last day of Minerva's festival. Trumpets were used in many religious ceremonies; and it is very doubtful whether the twbelustrewm was really con- nected with Minerva. There was another temple of Minerva on the Celian Hill, and a festival called the lesser quin-quatrus was celebrated there on June 13-15, chiefly by the flute-players.*~~

~~*Minerva of the Celian temple was called Capta; June 19 was the foundation day of this temple and the birthday of the goddess. The palladiwm, an archaic image of Pallas, was brought from Troy to Lavinium, and thence to Rome by the family of the Nautii; it was preserved in the temple of Vesta as a pledge of the safety of the city. There are some traces of an iepiilientiion of Minerva with the Italian goddess Nerio, wife of Mars; it is probable that March 19 was originally a feast of Mars.*~~

~~*Besides Preller, Rém. Myth., and Hartung, Relig. d. Rémer, &c., see Jordan, a Epigraph., i. 238; Mommsen, C. J. L., i. 3888; Usener, Rhein. Mus., Xxx.*~~

~~*MINGRELIA, a former principality of Transcaucasia, which became subject to Russia in 1804, and since 1867 has constituted three circles of the government of Kutais—Letchgum, Senakh, and Zugdidi. The country corresponds to the ancient Colchis; and Izgaur or Iskuriah on the Black Sea coast, which was the capital during the period of Mingrelian independence under the Dadian dynasty, is to be identified with the ancient Dioscurias, a colony of Miletus. The Mingrelians (still almost exclusively confined to the Mingrelian territory, and numbering 197,000) are closely akin to the Georgians. See Caucasus, vol. v. p. 257, and GEORGIA.*~~

~~MINIATURE is a term which by common usage has come to be applied to two different branches of painting.~~

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~~Derived from the Latin word miniwm, the red pigment used in the primitive decoration of MSS., in the first place it is the technical word employed to describe a painting in a MS. ; and, from the fact of such pictures being executed on a reduced scale, it has its secondary and modern signifi- cation of a small, or miniature, portrait. In the latter sense it belongs to the general subject of painting. Here it is proposed to trace the development of the miniature in MSS. of the different schools of Europe.~~

~~'The rise of the art of InLumryarioy, in which the miniature plays so important a part, has been described under that heading ; and something has been said in that place about the earliest extant specimens of miniature painting. Unfortunately we cannot with any certainty reach farther back than the 4th century for the most ancient of them ; and all remaining examples between that period and the 7th century in Greek and Latin MSS. can be counted on the fingers. The two famous codices of Virgil in the Vatican Library stand pre-eminent as the most ancient Latin MSS. decorated with paintings. The miniatures in the first of them, the Codex Romanus, are large and roughly yet boldly executed paintings, which have no pretension to beauty, and are simply illustra- tions ; but they are as old as the 4th century, and are of the highest value in enabling us to appreciate the debased style to which classical art had descended, and which no doubt was more largely employed than we might think. The second MS., the Schedx Vaticane, which may also be assigned to the 4th century, is far more artistic and retains a good deal of the grace of classic art. Of the same kind, but of rather later date, are the fragments of the Ziad in the Ambrosian Library at Milan, the miniatures of which are generally of excellent design. Next comes the Dioscorides of the Imperial Library at Vienna, with its semiclassical portrait-miniatures executed at the beginning of the 6th century. Of a rather later period are the paintings which illustrate the Greek MS. of Genesis in the same library. A far finer and older MS. of the same book of the Pentateuch once existed in the Cottonian Library, but was almost totally destroyed by fire. The few fragments of the miniatures which~~

~~once filled this volume, and which were of the 5th century, are sufficient to show what excellent work could be done in tlie capital of the eastern empire, from whence the MSS. most probably came. The late interesting discovery of an illus- trated MS. of the Gospels in Greek, of the latter part of the 6th century, at Rossano in southern Italy, adds another number to our scanty list of early volumes of this class, which is closed by the Latin Pentateuch in the library of the earl of Ashburnham. This last MS., however, is not older than the 7th century. It was executed in Italy, and is adorned with many large miniatures, not of high artistic merit, but of great interest for the history of painting and of costume.~~

~~Coeval with the MSS. which have just been enumerated are the beautiful mosaics and wall-paintings which are seen at Rome, Ravenna, and in other parts of Italy, serving as standards of comparison'and carrying on the history of art where MSS. fail us. The strong and ever-increasing Byzantine element which appears in these works prepares us to find the predominance of the same influence when we again pick up the broken thread of the history of miniature painting. We may then, at this point, turn for a moment to the east of Europe and state briefly what remains of Greek art in MSS. Of Greek miniatures there are still many fine examples extant, but, excepting those which have been noticed above, there are few which are earlier than the 11th century. At this period the miniature appears in the set form which it retained for the next two or three hundred years; and the connexion between 1ts~~

~~*style and that of the mosaics is too evident for us to be at | of earlier ages. But, apart from ornamentation, the Irish*~~

~~*a loss to explain the course of development. The figure drawing is delicate, but rather exaggerated in length; the colours are brilliant; and the whole effect is heightened by glittering backgrounds of gold. In some few instances, however, the Greek artist breaks away from conventionalism, and, especially when pourtraying the divine features of the Saviour or some subject which deeply stirs his feelings, he surprises us with the noble dignity with which he invests his figures. Minuteness also caught the fancy of these Byzantine miniaturists ; and there still remain MSS., such as Psalters and saints' lives, adorned throughout with delicate little drawings of great symmetry and beauty. The ornamentation which was employed in Greek MSS. in the period of which we are speaking, either as frames for miniatures or as borders or head-pieces, is designed evidently after Eastern types, and has more than an accidental likeness to the patterns which are seen in the tapestries and prayer-carpets of Persia. After the 13th century decadence sets in, and we need not follow the course of Byzantine art in MSS. farther than to notice that immediately from it sprang such national styles as those of Russia, Bulgaria, and modern Greece.*~~

~~*Meanwhile, in the West, under the fostering care of Charlemagne, arose a great school of decoration in MSS., which at the close of the 8th and beginning of the 9th century were multiplied and enriched with all the splendour that colours and gilding could give to them. But the books thus ornamented were almost always copies of the Gospels, or Bibles, or church service books, which afforded little scope for invention. Hence among the miniatures of this period we have an endless repetition of portraits of the evangelists, drawn, for the most part, in a lifeless way after Byzantine traditions, and degenerating, as time passes, into positive ugliness. The few miniatures of other descrip- tions, such as Biblical illustrations, show no great merit, and a half-barbaric splendour was generally preferred to artistic effect, But an exception must be made in regard to the style of drawing found in the MS. known, on account of its present resting-place, as the Utrecht Psalter. This volume is filled from beginning to end with delicately drawn pen illustrations, designed and executed with a facility*~~

~~*which, compared with the mechanical and clumsy drawing of other Continental MSS. of the period, is astonish- ing. And these drawings are of particular interest for us, as they are of the style which was adopted in England and which gives to Anglo-Saxon art its distinctive aspect. Executed about the year 800 or early in the 9th century, and probably in the north of France, the volume was soon brought to England, where, however, MSS. of the same kind, it may be assumed, had long before been intro- duced. The light " fluttering" outlines of the drapery and other details of the drawings seem to suggest that the original models were derived directly from Roman life, and perhaps partly copied from sculpture; but those models inust have gone through many modifications before passing into the style of the drawings of the Psalter, That the MS. was copied from an older one there can be scarcely a doubt ; and it is not impossible that the original archetype may date back some centuries earlier. May not MSS. which St Augustine and his successors brought from Rome have contained drawings of the same kind? This style of drawing was, at all events, adopted and became nationalized in England ; but it had there a rival in the Irish school of ornamentation, introduced from the north of the island. The early civilization of Ireland placed her in the van of art development in these islands. The wonderfully intricate interlaced designs which render Irish MSS. of the 7th and 8th centuries such marvels of exact workmanship derive their origin, in all probability, from the metal-work*~~

~~*miniatures of saints and evangelists are extraordinary and grotesque instances of purely mechanical drawing, which cause us to wonder how the same eyes and hands which assisted in the creation of such beautiful specimens of pure ornament could tolerate such caricatures of the human shape. The explanation is perhaps to be found in super- stitious regard for tradition. This style of art was carried by the monks to Jona and thence to Lindisfarne, where was founded the school which produced, in the 8th and 9th centuries, the richly ornamented codices of Durham. While, then, Byzantine models were copied on the Continent, the free drawing introduced from the south and the intricate ornamentation brought in from the north were practised in England ; but the free drawing, with its accompanying decoration copied from foliage, and gradually developing into beautiful borders harmoniously coloured, gained the day, and lasted down to the time of the Norman Conquest. The one great fault of this latter*~~

~~*style of drawing strikes' the eye at the first glance. This is the inordinate length of limb with which the human figures are endowed. But this blemish is forgotten when one comes to appreciate the many points of merit in the designs.*~~

~~*In Italy, aftera long period of inactivity, two very different styles of decoration of MSS. sprang into existence. The first of these was that of the Lombardic school, which is distinguished by intricate patterns and bright colouring. The large initial letters which are found in the MSS. of the 11th and 12th centuries, the best period of this style, are often a perfect maze of interlaced bands and animal forms, and are extremely handsome and effective. Figure drawing, however, seems to have been but little practised by the Lombardic artists, but such as there is appears on a broad scale and well executed. In the collections of Monte Cassino are some of the best examples of this school. In the second style which developed in Italy the Byzantine influence is at first most marked. Indeed, among its early specimens of the 13th century are some which might pass for the work of Greek artists. But the genius of the Italians soon assimilated the foreign element, and produced a national school which spread throughout the peninsula and afterwards extended its influence to southern France and Spain. It is, however, remarkable that in a country which produced such fine pictures and wall-paintings at an early date there is com- paratively little miniature painting in contemporary MSS. A curious and early instance of this kind of art occurs in a MS. in the British Museum, written and orna- mented with a series of miniatures at Winchester, in the 12th century, in which are two paintings which are purely Italian and of more than ordinary excellence.*~~

~~*In the majority of the extant Italian miniatures of the 14th century the influence of the great artists of the Florentine school is manifest. The peculiar treatment of flesh tints, painted in body colour over a foundation of olive-green, and the peculiar vermilion and other colours which need be but once seen to be ever afterwards recog- nized as belonging to this school, are constantly present. The figures are generally rather shortened and the drapery carried in straight folds, very different characteristics from the swaying figures and flowing drapery of the English and French artists of the same period. The ornamentafion which accompanied this style of*~~

~~miniature generally consists of heavy scrolls and foliated or feather-like pendants from the initial letters, with spots of gold set here and there in the border. There are also extant some examples of a most beautiful kind of ornamentation which appears to have originated in central Italy, and which seems to partake of the qualities of both the styles of Italian art of which we have been speaking, combining~~

~~the drawing of the Florentine school with a lighter colour- ing which may have been suggested by the Lombardic.~~

~~Of native Spanish miniature art little can be said. In the Visigothic MSS. of the early Middle Ages there is no ornament beyond roughly coloured initial letters and some barbaric figure drawing. A little later, however, we get some indication of national peculiarities in the MSS. of the 10th, 11th, and 12th centuries. Here there appear miniatures, stiff and rude in their drawing, but exhibiting the unmistakable Spanish predilection for sombre colours, —dusky reds and yellows and even black entering largely into the compositions.~~

~~The materials at our disposal of the 10th, 11th, and 12th centuries show the gradual development in France and western Germany of a fine free-hand drawing which was encouraged by the proportionately increasing size of books. Both in outline and colour the fully de- veloped miniatures of the 12th century are on a grand scale ; and initial letters formed of scrolls and interlacings assume the same proportions. The figure drawing of this time is frequently of great excellence, the limbs being well- proportioned ; care is also bestowed upon the arrangement of the drapery, which is made to follow the shape and, as it were, to cling to the body.~~

~~But the great revulsion from the broad effects and bold grandeur of the 12th century to the exact details and careful finish of the 13th century is nowhere more striking than in miniature painting in MSS. With the opening of the new period we enter on a new world of ideas. Large books generally disappear to give place to smaller ones; minute writing supersedes the large hand ; and miniatures appear in circumscribed spaces in the interior of initial letters. The combination of the miniature with the initial brings it~~

~~into close connexion with the ornamental border, which develops pari passu with the growth of the minia- ture and by degrees assumes the same national and distinctive characteristics. Burnished gold was now also freely used, tending to give the miniature a more decorative character than formerly. In England, northern France, and the Netherlands the style of miniature painting of this period was much the same in character; and it is often difficult to decide from which of these countries a MS. is derived. English work, however, may be often distinguished by its lighter colouring, while deeper and more brilliant hues and a peculiar reddish or copper tinge in the gold marks French origin. The drawing of the Flemish artists was scarcely so good, the outlines being frequently heavy and the colours rather dull. Of the Rhenish or Cologne school examples are more scarce ; but they generally show greater contrasts in the colours, which, though brilliant, are not so pleasing. As the century advanced, and particularly at its close, national distinctions became more defined. English artists paid more attention to graceful drawing and depended less upon colour. In some of their best productions they are satisfied with slightly tinting the figures, finding room in the backgrounds for display of brilliant colours and gilding. In France the drawing, though exact, is hardly so graceful, and colour plays a more important part. From the 13th to the middle of the 15th century great decorative effect is obtained by the introduction of diapered or other highly ornamented backgrounds. Of landscape, properly so called, there is but little, a conventional hill or tree being often taken as sufficient indication. Borders begin in the 13th century in the form of simple pendants from the initial letters, terminating in simple buds or cusps. But once arrived fairly in the 14th century, a rapid development in all parts of the decoration of MSS. takes place. There is greater freedom in the drawing; the borders begin to throw out branches and the bud expands into leaf. This is the best~~

~~period of English miniature painting, many of the fine MSS. of this century which are preserved in the public libraries bearing witness to the skill and delicate touch of native artists. In France the decoration of MSS. received a great impetus from the patronage of King John and Charles Ve; of whose famous libraries many handsome volumes are still to be seen; and later in the century the duke of Berri carried on the same good work,~~

~~*With regard to miniature art in Germany there are so*~~

~~*few examples to guide us that little can be said. Most of them are rough in both drawing and colouring ; and in the few remaining specimens of really good work foreign influence is distinctly seen. In the west the art of France and Flanders, and in the south that of Italy, are pre- dominant. Perhaps the finest MS. of this southern style to be seen in England is a Psalter belonging to Lord Ashburnham, which was probably executed in the 14th century at Prague, and is full of miniatures which in drawing and colouring follow the Italian school. _ When we enter the 15th century we find great changes in both. the great English and French schools. In England the graceful drawing of the previous century has disappeared, At first, however, some beautiful examples of purely native work were produced, and still remain to excite our admiration. Probably the most perfect of these MSS. are the Sherborne Missal belonging to the duke of North- umberland, and a very beautiful volume, a Book of Hours, in the library of Lord Ashburnham. The care bestowed upon the modelling of the features is particularly noticeable in English work of this period. In decoration the border of the 14th century had by this time grown to a solid frame surrounding the page ; but now another form of most effec- tive ornament was also used, consisting of twisted feather- like scrolls brightly coloured and gilt. As the century advanced native English work died out, and French and then Flemish influence stepped in.*~~

~~*In France immense activity was shown all through the 15th century in the illumination and illustration of books of all kinds, sacred and profane; and it is in the MSS. of that country, and, a little later, in those of the Low*~~

~~*Countries, that we can most exactly watch the transition*~~

~~*from medizeval to modern painting. Early in the century there were executed in France some of the most famous MSS. which have descended to us. In these the colouring is most brilliant, the figure drawing fairly exact; and the landscape begins to develop. The border has grown from the branching pendant to a framework of golden sprays.or of conventional and realistic leafage and flowers. Towards the middle of the century the diaper disappears for ever, and the landscape is a recognized part of the miniature ; but perspective is still at fault, and the mystery of the horizon is not solved*~~

~~until the century is well advanced. And now Flemish art, which had long lain dormant, sprang into rivalry with its French sister, under the stimulus given to it by the Van Eycks, and the struggle was carried on, but unequally, through the rest of the century. French art gradually deteriorates ; the miniatures become flat and hard; nor are these defects compensated for by the meretricious practice of heightening the colours by pro- fusely touching them with gold. The Flemish artists, on the other hand, went on improving in depth and softness of colouring, and brought miniature painting to rare perfec- tion. The borders also which they introduced gave scope for the study of natural objects. Flowers, insects, birds, and jewels were painted in detached groups on a solid framework of colour surrounding the page. But if, as the 15th century drew to its close, the Flemings had outstripped their French rivals, they had now more powerful antagonists to contend with. The Italians had been advancing with rapid strides towards the glories of~~

~~the Renaissance. Early in the century there arose a taste for older models. As, for their writing and afterwards for their printing, they went back to the 11th and 12th centuries for their standards, so they adopted again the interlacing designs of the Lombardic school for their orna- ment, and produced beautiful borders of twining patterns relieved by colour; or they took natural objects for their models, and painted borders of delicate flowers made still more brilliant with clustering stars of gold. Later, they drew from the ancient classical designs inspiration for the wonderful borders of arabesques, medallions, griffins, human forms, antique objects, &c., which they brought to such perfection early in the next century. heir miniatures rose to the rank of exquisitely finished pictures, and were executed by some of the best artists working under the patronage of such great houses as those of Sforza and Medici.~~

~~Here then, having advanced to the threshold of the domain of modern painting, we leave these two great schools of miniaturists in possession of the west of Europe. The Flemings had the wider field; they were wanderers~~

~~from home; and their works are scattered through many lands, from England in the north to Spain in the south. But Italian art had greater inherent strength, and will always hold the first rank. To instance a few of the more famous MSS. of this closing period of miniature painting : the Breviary of Isabella the Catholic, in the British Museum, is a masterpiece of Flemish art produced in Spain; the Grimani Breviary at Venice is another fine example of the same school. Some beautiful Italian miniatures (executed for Leo X. and others) were in the collection lately sold by the duke of Hamilton. 'The earl of Ashburnham possesses a most delicately illuminated Book of Hours written for Lorenzo dei Medici by the famous scribe Sinibaldo in 1485, as well as a MS. to which Perugino and his contemporaries contributed paintings. And in one MS8., a Book of Hours belonging to Mr Malcolm of Poltalloch, are gathered some of the best miniatures of both schools, viz., a series of exquisite paintings by Milanese artists supplemented by later ones of the finest Flemish type. (. ac)~~
~~MINIMS. See Francis (St) or Paowa, vol. ix. p. 695.~~

~~MINING~~

~~IIE art of mining consists of those processes by which useful minerals are obtained from the earth's crust.~~

~~This definition is wider than what is popularly known as mining, for it includes not only underground excavations but also open workings ; at the same time it excludes under- ground workings which are simply used for passages, such as railway tunnels and sewers, and galleries for military purposes. We must remark also that the word " mine," or its equivalent in other languages, varies in signification in different countries on account of legal enactments or decisions which define it. Thus, in France and Belgium, the workings for mineral are classified by the law of 1810, according to the nature of the substance wrought, into mines, miniéres, et carriéres. In the United Kingdom, on the contrary, it is the nature of the excavation which decides the question for certain legislative purposes, and~~

~~the term mine is restricted to workings which are carried |~~

~~on underground by artificial light. The consequence is that what is merely an underground stone quarry in France becomes a true mine in England,~~

~~*whilst the open workings for iron ore, such as exist in Northampton- shire, would be true mines under the French law. It is necessary, therefore, in an article on mining, to go beyond the English legal definition of a mine, and include the methods of working minerals in excavations open to day- light as well as in those which are purely subterranean: Furthermore, as it is customary for the miner to cleanse his ore to a greater or less extent before selling it to the smelter, we shall treat, under the head of mining, those processes which are commonly known as the dressing or mechanical preparation of ores ; and, finally, a few remarks will be made concerning legislation affecting mines in the United Kingdom, accidents in mines, and the production of the useful minerals in various parts of the globe.*~~

~~*The subject therefore will be dealt with as follows :—*~~

~~*1. Manner in which the useful minerals occur in the earth's crust, viz., tabular deposits and masses ; faults or dislocations.*~~

~~*2. Prospecting, or search for mineral.*~~

~~*3. Boring with rods and ropes; diamond drill.*~~

~~*4, Breaking ground ; tools employed ; blasting by vari- ous methods ; machine drills ; driving levels and sinking shafts.*~~

~~*5. Principles of employment of mining labour.*~~

~~*7. Exploitation, or the working away of strata or veins.*~~

~~*8. Carriage or transport of minerals through under- ground roads.*~~

~~*9. Winding, or raising in the shafts, with the machinery and apparatus required.*~~

~~*10. Drainage of mines, adit-levels, pumps, pumping engines,*~~

~~*11. Ventilation and lighting of mines.*~~

~~*12. Means of descending into and ascending from mines.*~~

~~13. Dressing or mechanical preparation of minerals.~~

~~14. Recent legislation affecting mines in the United Kingdom.~~

~~15. Accidents in mines.~~

~~16. Useful minerals produced in various parts of the globe.~~

~~1. Manner in which the Useful Minerals Occur.—The repositories of the useful minerals may be classified accord- ing to their shape as (A) tabular deposits, and (B) masses.~~

~~A. Tabular Deposits—These are deposits which have a more or less flattened or sheet-like form. They may be divided, according to their origin, into (1) beds or strata, and (2) mineral veins or lodes.~~

~~(1) Beds.—Geology teaches us that a large proportion Stratifiel] of the rocks met with at the surface of the earth consist deposits))«~~

~~of substances arranged in distinct layers, owing to the fact that these rocks have been formed at the bottom of seas, lakes, or rivers by the gradual deposition of sediment, by precipitation from solutions, and by the growth or accumu- lation of animal and vegetable organisms. If any one of these layers consists of a useful mineral, or contains enough to make it valuable, we say that we have a deposit in the form of a bed, stratum, or seam. Of course the most important of all bedded or stratified deposits is coal, but, in addition, we have beds of anthracite, lignite, iron ore, especially in the Oolitic rocks, cupriferous shale, lead- bearing sandstone, silver-bearing sandstone, diamond., gold-, and tin-bearing gravels, to say nothing of sulphur, rock-salt, clays, various kinds of stone, such as limestone and gypsum, oil-shale, alum-shale, and slate.~~

~~The characteristic feature of a bed is that it is a member of a series of stratified rocks; the layer above it is called~~

~~'the roof of the deposit, and the one below it is the jloor.~~

~~Its thickness is the distance from the roof to the floor at~~

~~6. Means of securing excavations by timber or masonry. | right angles to the planes of stratification ; its dip is the~~

~~inclination downwards measured from the horizontal ; its strike is the direction of a horizontal line drawn in the middle plane.~~

~~The thickness of beds that are worked varies within very wide limits. Whilst the thickness of certain workable beds of coal is only 1 foot, and that of the Mansfeld cupriferous shale only 10 to 20 inches, we find on the other hand one of the beds of lead-bearing sandstone at Mechernich no less than 85 feet thick, and beds of slate far exceeding that thickness. It must not be supposed, however, that the thickness of a bed necessarily remains uniform. Occasionally this is the case over a very large area; but frequently the thickness varies, and the bed may dwindle away gradually, or in- : ne crease in size, or become divided DEST test into two owing to the appearance = Suaue of a parting of valueless rock, 2s 32==s= Sree non Om Fig. 1 shows beds of shale, ine. == stone, iron ore, and sandstone. =e rte Any one of these beds may be = valuable enough to be worked. Fig. 1.~~

~~(2) Mineral Veins or Lodes.—Veins or lodes are tabular or sheet-like deposits of mineral which have been formed since the rocks by which they are surrounded ; they differ, therefore, by their subsequent origin from beds, which, as just stated, are of contemporaneous origin with the enclos- ing rocks (although of course cases occur in which the deposit is lying unconformably upon very much older strata, or is covered unconformably by very much younger strata). Itis necessary to explain that the term " vein" in this definition is used in a more restricted sense than is sometimes customary among miners, who speak of veins of coal, clay-ironstone, and slate, which geologically are true beds, They see a band of valuable mineral or rock, and, careless of its origin, call it metaphorically a vein or seam. On the other hand, the definition is broader than that which prevails among some geologists, who would confine the term vein to deposits occupying spaces formed by fissures.~~

~~The term " lode" was defined in 1877 by Mr Justice Field in the celebrated Eureka v. Richmond case asfollows:—" We are of opinion, therefore, that~~

~~*the term, as used in the Acts of Congress, is applic- able to any zone or belt of mineralized rock lying within bound- aries clearly separating it from the neighbouring rocks." This interpretation seems suitable for the peculiar mining tenure of the United States, where the discoverer of a vein or lode can obtain*~~

~~*"a inining claim of 500 yards in length along the lode. It protects the prospector, whose object is to obtain a secure title, the mode of origin of the deposit being a matter of small importance to him so long as it is worth working. In many cases also it would be impossible to decide upon the mode of origin until workings had progressed considerably, and even then there would be room for disputes.*~~

~~*No doubt a very large number of mineral veins are simply the contents of fissures; others are bands of rock impregnated with ore adjacent to fissures or planes of separation ; others, again, have been formed by the more or less complete replacement of the constituents of the original rock by particles of ore.*~~

~~*Veins may occur in igneous or in sedimentary rocks,*~~

~~*and in the latter they frequently cut across the planes of stratification. _ Like a bed, a vein has its dip and strike; but, as the dip of veins is generally great, the inclination is usually measured from the vertical, and is then spoken of as the wnderlie or hade. The bounding planes of a vein are called the walls or cheeks, and they are frequently smooth and striated, showing that one side must have slid against the other. The upper wall is known as the hanging wall, the lower one as the foot wall. The width of a vein is measured at right angles to the walls.*~~

~~*A typical example of a fissure-vein is shown in fig. 2, repre- senting a lead lode in slate at Wheal Mary Aun mine! in Cornwall.*~~

~~*1 0. Le Neve Foster, " Remarks on the Lode at Wheal Mary Ann, Menheniot," Trans, Roy. Geol. Soc. Cornwall, vol. ix. p. 153.*~~

~~*It is evident that a fissure in the surrounding slate has here been a up by the successive deposition of bands of mineral on both es.*~~

~~*A large proportion of the contents of a lode may consist of fragments of the walls that have fallen into these are often tightly cemented ——W together by minerals that have == been introduced subsequently. The = horizontal section of part of the = Comstock lode? (Plate IV.) shows much "country" rock enclosed = within the walls. ——— _ Where a lode consists of rock impregnated with ore, the nineral- ized part may fade away gradually into the surrounding rock (country) without there being any distinct*~~

~~*DINDDITIVIID — TIVM\ ONIDNY*~~

~~*Fig. 2. wall, as shown in fig. 3, which is an illustration taken from the Great Flat Lode? near Redruth in Cornwall.*~~

~~*The celebrated Ruby Hill deposit in the Eureka district, Nevada,*~~

~~*is a mineralized zone of dolo- mitic limestone varying in width from a few inches to 450 feet, and having a mean width of 250 feet. It con- tains numerous irregular ore- bodies, which consist mainly of highly ferruginons car- bonate of lead, rich in silver aud gold. This mineralized limestone band, long called , Fig. 3.*~~

~~*a lode by miners, has been determined by the decision just men- tioned to be a lode in the eyes of the law.*~~

~~*Veins often continue for a great distance along their strike. The Van lode in Montgomeryshire is known for a length of 9 miles, whilst the Great Quartz Vein in California has been traced for a distance of no less than 80 miles. Veins are of less uniform pro- ductiveness than beds, and are rarely worth working throughout. Rich portions alternate with poor or worthless portions. The rich parts have received various names according to the forms they assunie: fig. 4 represents a gyeeace une longitudinal section along the ——·__——··__———_ &_ strike (cowrse) of a lode, and — 42=+#*=* & = tts the stippled parts are ore- bodies ; B, B, Bare bunches; A is a large bunch or course of ove; when an ore-body forms a sort of*~~

~~*continuous column we have a shoot, and ore- bodies which on being ex-*~~
~~*Fic. ¢*~~

~~*: 5 g. 4. cavated leave chimney-like openings are called pipes (fig. 4, C). In the United States the Spanish word bonanza, literally meaning 'fair weather" or " pro- sperity," is frequently used for a rich body of ore.*~~

~~*The richness of veins is dependent in many cases upon the nature of the adjacent rock (cowntry), upon the underlie, and upon the strike, variations in any one of these three elements being often sufficient to cause a decided change of productiveness.*~~

~~*Various theories have been formed concerning the origin of mineral veins. Some geologists suppose that the minerals now constituting the veins have been dissolved out of the adjacent rocks and re-deposited in the vein cavity ; others, on the contrary, believe that the ores have been brought up from great depths by mineral springs. In all probability both theories are correct, some lodes having been formed by the former process and some by the latter ; and, furthermore, other lodes appear to owe their origin to a gradual substitution of valuable mincrals in the place of some of the con- stituents of a worthless rock. One of the most important con- tributions to the science of ore-deposits of late years has been the discovery by Professor F, Sandberger of small quantities of silver, lead, copper, nickel, cobalt, bismuth, arsenic, antimony, and tin in silicates, such as olivine, augite, hornblende, and mica, which are constituents of igneous rocks. He therefore regards these rocks as the sources from which lodes have derived their riches.*~~

~~*B. Masses.—These are deposits of mineral, often of*~~

~~*irregular shapes, which cannot be distinctly recognized as beds or veins. Such, for instance, are the red hematite*~~

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~~*GRANITE. °*~~

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~~2B 60 FATHOMS LEVEL pine Bs sie 2 ——————EET—TE——————~~

~~2 James D. Hague, in United States Geological Exploration of the Fortieth Parallel, vol. iii., “ Mining Industry,” Washington, 1870, Atlas, plate 11.~~

~~3 C. Le Neve Foster, ruth and Camborne, and on the Alteration of Granite,” Quart.~~

~~644.~~

~~‘On the Great Flat Lode south of Red- some other Tin Deposits formed by Jour. Geol. Soc., vol. XXXIV. P.~~

~~XVI. — 56~~

~~Masses.~~

~~Faults.~~

~~442~~

~~= ORDNANCE DATUM~~

~~50 FATHOMS LEVEL~~

~~60 FATHOMS LEVEL~~

~~Fig. 5.—Vertical Section, Roanhead Mine. A, Mountain Limestone ; B, red hematite ; C, sand and clay; D, gravel. Scale ga'yo-~~

~~occupy irregular cavities in the Mountain Limestone. These may have been formed by the percolation of water bring- ing down iron in solution from overlying Triassic rocks.~~

~~Other examples of masses Z\ ee :~~

~~are the calamine deposits of Sates Altenberg? (fig. 6), Sardinia, Yi), he: qq |~~

~~and Lombardy, the iron ore 7% ' 4 deposits in Missouri, such Yj = J as Iron Mountain and Pilot 7 A\\ —=\7 tj; Knob, the huge upright Fic. 6.—Vertical Section, Alten- "necks" or "pipes" of dia- berg. B, slate; d, dolomite ; mantiferous rock in- South ©, calamine ; L, clay.~~

~~Africa, and the granite decomposed im situ worked for china clay in Cornwall.~~

~~Under this head also are included by most authors the so-called "stockworks" or "reticulated masses," names applied to masses of sedimentary or igneous rock which are penetrated by so many little mineral veins as to make the whole worth excavating.~~

~~It must be understood that we cannot expect nature to make distinct lines of demarcation between the different kinds of deposits. Though we may be able to see clearly that a seam of coal is contemporaneous with the enclosing rocks, and that a vein intersecting beds of shale and sandstone was formed subsequently, cases frequently occur where the origin of the mineral is uncertain. For example, we have the lead-bearing sandstone of Mechernich and the silver-bearing sandstone of Utah. The grains of sand are of sedimentary origin ; but opinions differ as to whether the lead and silver respectively were deposited with the sand or were introduced subsequently by solutions percolating through the beds. In the case of the well-known bed of Cleveland ironstone, Dr Sorby considers that the iron was "derived partly from mechanical deposition and partly from subsequent chemical~~

~~*replacement of the originally deposited carbonate of lime.”? Furthermore, a bed may be so folded and contracted as to lose its original sheet-like form in places and assume the shape of an itregular mass. This may happen even with a coal seam.**~~

~~*All kinds of deposits are subject not only to irregularities of origin dependent upon their mode of formation but also to dislo- cations or shiftings known as faults, heaves, or throws.*~~

~~*We will take the case of a bed (fig. 7). AB is a seam which ends off suddenly at B, whilst the continuation is found at a lower level at CD. The bed was evidently once continuous ; buta fracture took place along the line XY followed by a displacement. “As a rule*~~

~~*Fig. 7.*~~

~~*the portion of rock on the hanging-wall side of a fault appears to have slid downwards, but occasionally this is not so, and we havea*~~

~~*Fig. 8.*~~

~~*reversed fault (fig. 8). It is very evident, in some cases, that the motion took place, not along the line of greatest dip, but in a dia-*~~

~~*1 Fr. Moritz Wolff, “ Beschreibung der Rotheisenerzlagerstitten von West Cumberland und North Laneashire,” Stahl und Eisen, 2 Jahrgang, No. 12, plate vi. ‘*~~

~~*2M. Braun, Zetischr. d. d. geol. Gesellsch., 1857, vol. ix.; and A. von Groddeck, Die Lehre von den Lagerstitten der Erze, Leipsic 1879, p. 242. :*~~

~~*3 Quart. Jour, Geol. Soc., vol. xxxv. (1879), p. 85, Anniversary Address of the President.*~~

~~*4 J. Callon, Lectures on Mining, vol. i. p. 63, and Atlas, plate vill. fig. 44.*~~

~~*MINING*~~

~~*[PROSPECTING.*~~

~~gonal direction, causing a displacement sideways as well as down- wards. Nevertheless, where beds or veins are not horizontal, a mere shift along the line of dip is sufficient to cause an apparent heave sideways. This will be understood from fig. 9. Let AB and CD represent two portions of a lode dislo- A cated by the fault EF. The point B' corresponded originally with B, and the dislocation was caused by a simple sliding of B' along the line of dip BB'. An instance of the complication caused by a succession of faults is shown in fists L029~~

~~2. Prospecting, or Search for Mineral.—The object of the pro-~~

~~Fig. 9. spector is to discover valuable deposits of mineral.~~

~~This~~

~~search is beset with many difficulties: the outcrops of~~

~~LIVHS Inton»z~~

~~Fia. 10.—Vertical Section, Penhalls Mine, Cornwall. G, G, G, small veins called gossans in the St Agnes district.~~

~~mineral deposits are frequently hidden by soil; the nature of the deposit itself is generally entirely changed near the surface; and, in addition to this, the explorer may have to pursue his work in trackless forests far away from any settlements.~~

~~The prospector seeks for natural sections of the rocks, such as occur in cliffs or in river valleys and their tributary gullies and gorges; he examines the materials constituting the river-beds, often digging up and washing portions in a pan, in order to ascertain whether they contain traces of the heavy ores or metals. If, while prospecting in a valley, he discovers stones that have the appearance of having once belonged to veins, he endeavours to trace them to their source, and is perhaps rewarded by finding similar frag- ments, but less water-worn, as he goes up the stream ; further on he may come upon large blocks of veinstuff lying about, and finally find the vein itself laid bare in a gorge, or at the bottom of a brook, or possibly projecting above the soil in the form of huge crags of quartz. Thus at the~~

~~*Great Western quicksilver mine in California the outcrop of the vein appears as a dike over 100 feet wide, and having precipitous sides in places 75 feet high.® Loose pieces of veinstuff found lying about are known in Cornwall as shoad-stones, and shoading is the term given to the process of tracking them to the parent lode.*~~

~~*The upper portion of a deposit is frequently much altered by atmospheric agencies, and bears little resemblance to the undecom- posed bed or vein which will eventually be met with ata greater or lesser depth. The principal difference consists in the change of sulphides into oxides or oxidized compounds, Thus iron pyrites, which is such a common constituent of mineral veins, is converted into hydrated oxide of iron, and a vein originally consisting largely of iron pyrites and quartz now becomes a cindery mixture of quartz and ochre, known in Cornwall as gossan. This gossan, or tron hat, may often furnish important indications concerning the nature of the lode itself, because such minerals as pyromorphite or cerus- site point to the existence of galena, whilst melaconite, cuprite, malachite, and azurite are the forerunners of chalcopyrite or copper glance. The gossan itself may contain a sufficient quantity of valu- able ores to be worth working.*~~

~~*The seams containing native sulphur in Sicily often show no trace*~~

~~*of that element immediately at the surface, as the sulphur-bear- ing limestone weathers into a soft white granular or pulverulent*~~

~~*5 J. W. Pike, " On some remarkable heaves or throws in Penhalls Mine," Quart. Jour. Geol. Soc., vol. xxii. p. 537.*~~

~~*. Luther Wagoner, " The Geology of the Quicksilver Mines of Cali- fornia," Engineering and Mining Journal, vol. xxxiv. p. 334.*~~

~~*BORING. |*~~

~~*variety of gypsum, called briscale by the miners, and considered by them as affording important indications concerning the bed itself.1*~~

~~*Other signs of mineral deposits are given by springs and by certain plants dependent upon the deposit or its associated minerals for part of their nourishment. The appearance of the so-called*~~

~~*lode-lights may be explained by the production of phosphoretted |*~~

~~*hydrogen from the action of organic matter and water upon phos- phates, which are so common in the upper parts of mineral veins; and one hears also of differences in the appearance of the vegetation along the line of the deposit, of places where snow will not lie in winter, and of vapours hanging over the ground. Though some writers refuse to put any value upon these indications, they should not be entirely overlooked, because the outcrop ofa lode, of different nature and texture to the surrounding rocks, and which is generally a channel for water, may readily cause the phenomena just mentioned. Where the surface is cultivated and the natural springs are tapped by adit-levels or other mine-workings, these appearances cannot be looked for to any great extent. With one special mineral, magnetic iron, the position of the deposit may be traced out with some degree of accuracy with a dipping needle; this is used in Sweden.*~~

~~*After having acquired an idea of the position of a vein or seam by some of the surface indications just mentioned, it is necessary, before attacking it by shafts or levels, to obtain more certain data concerning it. In the case of mineral veins, trenches are dug at right angles to the supposed strike; and, when the upper part of the deposit*~~

~~*has been cut in several places, its general course and dip | can be determined sufficiently for the purpose of arranging —*~~

~~*the future workings. These trenches are called ‘“ costean pits”; in some cases, instead of a trench, a pit is sunk a short distance and a little tunnel driven out.*~~

~~*Where the mineral to be wrought occurs as a bed or*~~

~~*mass, the process of boring is resorted to, and indeed this | method is also applied in the case of veins, especially in» Boring is a work of such importance |*~~

~~the United States. that it deserves to be treated under a separate heading.~~

~~3. Boring with Rods and Ropes—Diamond Drills.—The object of boring is to reach a deposit by a small hole and ascertain its nature, its depth from the surface, thickness, dip, and strike. water, brine, and petroleum, which either rise to the surface or have to be pumped up from a certain depth, and finally for tapping water-in old workings or for effecting ventilation, follows :—(1) boring with the rod; (2) boring with the rope; (3) boring with the diamond drill.~~

~~In the first method tools for cutting and removing the~~

~~rock are fixed to rods, which are lengthened as the hole > increases in depth, and which are worked by hand or by | Where the ground is soft, such †~~

~~machinery at the surface. as sand or clay, tools like augers can be employed; but in harder ground it becomes necessary to have recourse to percussion ; various forms of chisel are used, the simplest being made of the shape shown in fig. 11.2 The rods generally consist of bars of square iron, from 1 inch to 2 inches on the side. The length of each rod de- pends upon the height of the tower, derrick, or shears erected above the bore-hole, which should be an exact multiple of the individual parts. These are made in lengths of 15 to 30 or rarely 40 feet, and with a suitable tower it is possible to de- tach or attach two or three lengths at a time, instead of having to make or unmake every joint. nexion usually preferred is by a screw joint as shown in fig. 12; care is taken to have all the joints exactly alike, so that any two bars can be screwed together. In order to~~

~~1 Lorenzo Parodi, Sull' Estrazione dello Solfo in Sicilia, 1873, pp. 7 and 24, ® Serlo, Leitfaden zur Bergbaukunde, Berlin, 1878, p. 59.~~

~~MINING~~

~~Bore-holes are also used for obtaining |~~

~~The methods of boring may be classified as _~~

~~*Fia. 11.—Chisels. Fig. 12.*~~

~~*The mode of con- |*~~

~~*| diminish the weight of the rods, which becomes consider able in deep holes, wood has sometimes been employed. The rods are connected by male and female screws attached to the rods by sockets of sheet iron, or by a fork-like _arrangement. At the surface a head is screwed to the uppermost rod by which the rods can be lifted, and they are turned by means of cross-bars called tillers.*~~

~~*When the depth is small the rods are lifted by hand and then allowed to drop, being turned slightly at each lift so that the cutting chisel may strike a new place each time. For greater depths a lever has to be employed, the rods being suspended at one end, whilst the other end can be pressed down by men using their hands or feet. The spring pole is another arrangement, in which the elasticity of a long pole is made use of for lifting the rod at each | Stroke. The length of the stroke can be maintained the same while the bore-hole is deepened by means of a screw ina swivel-head at the top of the rod.*~~

~~*With deep holes, and especially those of large diameter, steam machinery has to be employed for working the rod; the engine may be direct-acting and stand immediately above the bore-hole, but a commoner arrangement is to employ a single-acting cylinder working a beam. Occasionally also the beam is actuated by a connecting-rod worked by a crank.*~~

~~*The actual boring machinery has now been described, and the mere boring appears to be a very simple matter, consisting only in lifting the rod a little and allowing it to drop, the rod being turned slightly before each stroke. Nevertheless the process of putting | down a bore-hole is not so simple as it seems, for there are numer- ous indispensable accessory operations which take up much time. In the first place the débris have to be removed, and in order to effect this the rods must be drawn up, the swivel-head is discon- nected and a capscrewed on. A length of rods is now drawn up by | a hand or steam windlass and disconnected. It is well to have as many caps as*~~

~~there are lengths to be drawn up, and then each length can be suspended in the house. Sometimes a grip which catches the rod at the bulging joint is used instead of acap. The next operation consists in lowering by means of a rope the shell-pwmp or sludger, which is a hollow cylinder with a clack or a ball- f valve (fig. 13). Itis worked up and down a little tillitis filled, and it is then drawn up and emptied at the surface. §) The operation is repeated, if necessary, and the boring is #) resumed with the rod. :~~

~~Occasionally a bore-hole has to be widened slightly with a tool called a reamer. Soft beds may have to be bored through with a wimbdle; and, unless the rocks are hard and Vix firm, the hole has to be lined with a tube, generally of sheet- _. iron. Accidents may occur, causing an immense amount Fig. 18- of trouble, such as the breaking of rods or chisel, and many in- genious implements have been devised for seizing the broken rod or the fragments of tools which prevent further progress , | with the work.~~

~~In boring at considerable depths, the weight of the rod becomes so great that much vibration ensues when / the mass is suddenly arrested by the chisel striking 7 against the bottom of the hole. Various devices have 7 been contrived for overcoming this difficulty and pro- 7 ducing a tool which will act independently of the rod. | One of the best-known arrangements is the free-falling /~~

~~tool invented by Kind (fig. 14). The head of the actual /~~

~~boring-rod is held by a click or grapple; when the main / ‘ rod descends, the resistance of the water in the hole / slightly stops the sliding disk D, the jaws J, J open, the / head is disengaged, and the boring part falls and strikes the bottom without any injurious vibrations being com- municated to the main rod. When this descends farther the head is caught again by the click. Special tools also are used for cutting an annular groove at the bottom of a bore-hole and breaking off the core, which is then brought up, with certain precautions, so as to show the nature and dip of the strata traversed.~~

~~In order to obviate the great loss of time which ensues from connecting and disconnecting long | lengths of rods, recourse may be had to boring 7~~

~~*In this method, known as the 4 _ a*~~

~~*| Ohinese method, the chisel is worked by a rope in Fis. 14.*~~

~~*the same manner as the sludger already described. Messrs*~~

~~*Mather and Platt of Manchester have long used with suc-*~~

~~*cess, in many parts of England and various other countries, a system of boring by means of a flat hempen rope. |*~~

~~*The most important modification of late years 1n the*~~

~~*x. fig. 52.*~~

~~*SSS*~~

~~*SSS SSH SSSA*~~

~~*SSS*~~

~~*| with the rope.*~~

~~*| J. Callon, Lectures on Mining, vol. i., Atlas, plate i*~~

~~*, Boring Z with*~~

~~*rope.*~~

~~*444*~~

~~*Diamond process of making bore-holes is the introduction of the*~~

~~*drill.*~~

~~*diamond drill. The working part of the drill consists of the so-called crown, which is a short piece of tube made of cast steel, at one end of which a number of black diamonds are fastened into small cavities (fig. 15). The crown is screwed on to wrought-*~~

~~LZ Za Za |~~

~~which, breaking off from time to time, 2 is caught by a little shoulder, and brought up to the surface with the rod. In places where it is not necessary to make any verification of the rocks tra- versed, the crown is arranged with diamonds in the centre also. The débris, in either case, are washed away by a stream of water, which is forced down the tube and flows up the sides of the hole. With this system a bore-hole can be deepened continuously at a speed altogether unattainable by the other methods, which require stoppages for cleaning out. Tt has the further advantage of making it possible to drill holes in any direction; and prospecting diamond drills are constantly used with much success inside many metal mines, especially in the United States.~~

~~Fig. 16! shows the Little Champion Rock-Drill,which is largely em- ployed in the Lake Superior district for prospecting. It can be used above or below ground. Two inclined cylinders drive a horizontal crank shaft, which works bevel gear, causing the drill to revolve. At the same time a countershaft is likewise set in motion, and this effects the advance of the drill by gearing driving the feed-screw; as there are three kinds of gearing, the speed can be varied at pleasure. The feed-screw and its connexions are carried by a swivel-head, and this can be tumed so as to drill holes at an angle. The drum shown above the cylinders is used for hoisting out the drill-rods by a rope.~~

~~The rods are lap-welded iron tubes 1§ inches in diameter, fitted with.~~

~~a bayonet joint. Another light portable prospecting drill for underground work is~~

~~Fic. 16.—Little Champion Rock-Drill.~~

~~represented in fig. 17.2 It is intended for drilling holes 1} inches in diameter to a depth of 150 feet. The cores which it yields are % inch in diameter. It has double oscillating cylinders 34 inches in diameter with 34 inches stroke, which are run up to a speed of 800 revolutions. The drill can be set to bore in any direction by turning the swivel-head on which it is carried.~~

~~*The larger rock-drill used by the American Diamond Rock Boring Company for putting down holes to a depth of 2000 feet consists of a 20 horse-power boiler with two oscillating 6-inch cylinders and the necessary gearing for working the drill, all*~~

~~*1 Engineering and Mining Jour., vol. xxxiii. p. 119. 2 Tbid., vol. xxxiii. p. 273.*~~

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~~*[BREAKING GROUND.*~~

~~*mounted upon a carriage, so that the whole machine is readily moved from place to place. The feed is effected by gearing or by hydraulic pressure; a 23-inch crown is employed, leaving a 2-inch core. Each separate drill-rod is 10 feet long. The total weight of the machine is about 4 tons.*~~

~~*4, Breaking Ground — Tools Employed — Blasting by Various Methods—Machine Drills—Drwing Levels and Sinking Shafts—The kind of ground in which mining ex- cavations have to be carried on varies within the widest limits, from loose quicksands to rocks which are so hard that the best steel tools will scarcely touch them.*~~

~~*Loose ground can be removed with the shovel; but in Tools. |*~~

~~*the special case of peat sharp spades are employed, which cut through the fibres and furnish lumps or sods of con- venient form for drying and subsequent use as fuel. What*~~

~~*-is called fair, soft, or easy ground, such as clay, shale,*~~

~~*θ*~~

~~*decomposed clay-slate, and chalk, requires the use of the pick and the shovel. The pick is a tool of very variable form, accord- ing to the material operated on. Thus there are the navvy's. pick, the single-pomt- ed pick with a striking head at the other end called the poll-*~~

~~*pick (fig. 18), and numerous varieties*~~

~~*of the double-pointed pick (fig. 19), the*~~

~~*special tool of the collier, but also*~~

~~*largely used in metal mining. When*~~

~~*the ground, though harder, is neverthe-*~~

~~*less "jointy," or traversed by many*~~

~~*natural fissures, the wedge comes into Fre. 19.—Double- play. The Cornish tool known as a gad _ pointed Pick.*~~

~~*is a pointed wedge (fig. 20). The so-called "pick and gad" work consists in breaking away the easy ground with the point of the pick, wedging off pieces with the gad driven in by a sledge or the poll of the pick, or prizing them*~~

~~*Fic, 18.—-Poll-pick.*~~

~~*SS*~~

~~*off with the pick after they have been loosened by _ iS the gad. The Saxon gad is held on a little handle,*~~

~~*and is struck with a hammer. It is used for wedg-*~~

~~*ing off pieces of jointy ground, and in former days*~~

~~*even hard rocks were excavated by its aid. The ¥—-' process consisted in chipping out a series of parallel —*~~

~~*grooves and then chipping away the ridges left between the grooves. Asa method of working this process is obsolete; but it is useful on a small scale for cutting recesses (hitches) for timber, for dressing the sides of levels*~~

~~*_ or shafts before putting m dams, and for doing work*~~

~~*in places where blasting might injure pumps or other machinery.*~~

~~We now come to hard ground ; and in this class we have a large proportion of the rocks met with by the miner, such as slate of various kinds, hard grits and sandstone, limestone, the metamorphic schists, granite, and the contents of many mineral veins. Rocks of this kind are attacked by boring and blasting. The tools employed are the jumper, the borer or drill, the hammer, the sledge (mallet, Cornwall), the scraper and charger, the tamping bar or stemmer, in some places the pricker or needle, the claying bar, the crowbar, and finally the shovel for clearing away the broken rock.~~

~~The jumper (fig. 21) is merely a long bar of iron terminating in two chisel-like edges made of steel; Fig, 21. generally there is a swelling in the middle, and sometimes the jumper tapers all the way from the middle to the edge or bit. The jumper is most commonly used when it is necessary to bore holes downwards, and is~~

~~largely employed in quarries; occasionally it is used in boring holes horizontally, as for instance in the salt mines of~~

~~Cheshire. The jumper is held in the desired direc- tion, lifted up, and thrust down; it is turned a little after each stroke.~~

~~However, the miner's tool is generally the borer proper, or drill (fig. 22), which is a bar of round or octagonal steel, usually from { inch to-14 inches in diameter, with one end forged into a chisel-shaped edge, the exact shape and degree of sharpness varying according to the hardness of the rock. | The hole is bored by striking the drill with a hammer or sledge and turning it after each blow. etic Boring is said to be single-handed if the miner * holds the drill in one hand and strikes with the hammer in the other, whilst it is called double-handed when one Iman turns and an- 2 other strikes. The hammers for single- Wh… handed boring usu- cam ally vary in weight © from 2 to 6 or 7 bb. Fic. 23.—Sledge-Hammer. The double-handed boring hammer, or sledge (fig. 23), weighs from 6 to 10 ib or more. If a hole is directed downwards, the miner pours in a little water and bores the hole wet. From time to time he draws out the sludge with the scraper, a little disk~~

~~*at the end of a metal rod, and he takes a fresh borer when the tool he is using has become blunt. The depth bored varies with the rock and the nature of the excavation; but in driving levels in the ordinary way the depth is commonly from 18 inches to 3 feet.*~~

~~*Holes for blasting are sometimes bored by tools like carpenters' augers. One of the simplest, which is used in some French slate-mines, is very like a brace and bit, and the tool is kept pressed against the rock by means of a screw fixed in a frame resting on the ground.*~~

~~*The pricker, or needle, is a slender tapering rod of copper or bronze, with a ring at the large end. It is used for maintaining a hole in the tamping through which the charge can be fired. The use of needles made of iron is prohibited in many countries, on account of the danger of their striking sparks which might fire the charge. The tamping bar, or stemmer, is a rod of iron, copper, or bronze, or iron shod with copper, and it is used for ramming in dried clay, slate pounded up, or other fine material, upon the powder, and so creating a resistance sufficient to make the gases generated by the explosion of the charge rend the rock in the manner required. The claying bar is used for lining wet holes with clay, and so rendering them temporarily watertight.*~~

~~*Shovels vary much in different districts. In the south- west of England the long-handled shovel is preferred to the common one with a short handle; in Germany the ore or rubbish is frequently scraped into a tray with a sort of hoe.*~~

~~*In addition to these tools the miner requires an ex- plosive, and a means of firing the charge at the bottom of the hole which will give him time to escape. Twenty years ago gunpowder was the only explosive in common use in mines, but at the present day its place has been taken to a very large extent by mixtures containing nitro-glycerin or gun-cotton. The powder used for blasting in mines usually contains less saltpetre than that which is employed for sporting or military purposes. The following is an analysis of mining powder by Captain Noble and Sir F. Abel :1—*~~

~~*SSG PEULG ..ccccceseer eso ec GHRGGE INOMV EEN. . 5. occ. ..002. o.55 2°23*~~

Potassium sulphate…... @ 13 |) ASE Sineenennbeoceeeeespeorec 0°59 5 chloride…... ODMR Watelser,corseedenes dete: sae 1°61

PEPORMED one 22. -sy een 0evene 15°06

(Cia On) socencee ee eee 17°98 100-00

IN CN@ 350) GenpepeePeernEEee 0°66

1 "Qn Fired Gunpowder," Phil. Trans., 1880, p. 225,

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Gunpowder compressed into cylinders of diameters suitable for bore-holes, and provided with a central hole for the insertion of the fuse, has lately been brought forward with some success.

Nitro-glycerin or glyceryl nitrate is a light-yellow oily liquid which is very sensitive to shocks; under the action of a fulminating cap it explodes with great violence. Its chemical composition is expressed by the formula C;H; (NO,),0, or (C3H;)3NO,; its specific gravity is 16. It has been found so dangerous that its use by itself has been given up; but on the other hand the mix- ture of nitro-glycerin and infusorial earth (Kieselguhr) called dynamite or giant powder is now one of the commonest explosives met with. It has the advantage over powder that it is far more powerful, that it may be used in wet holes or under water, that it is very effective even in ground full of "'vughs" or cavities, and that it requires no hard tamping, which is always a source of danger. Its plasticity too enables it to fill the space at the bottom of a bore-hole, which is rarely a true cylinder, more completely than any solid cartridge can do. One disadvantage is that it has to be thawed in cold weather, and there is also the fact that occasionally the whole of a charge of dyna- mite fails to go off, and unnoticed remnants have exploded and caused serious and even fatal accidents when struck with the pick or borer. The danger is enhanced when the remnants have been left in contact with water, which causes a separation of the sensitive nitro-glycerin, so that even a blow upon the adjacent rock may lead to an accident if any of the

~~*explosive oil has leaked into cracks. The strongest dynamite contains about 75 per cent. of nitro- glycerin, the rest being kieselguhr. A newer explosive is blasting gelatin; it is made by mixing nitro-cotton with nitro-glycerin, until enough nitro-cotton has been dissolved to convert the nitro-glycerin into a jelly-like mass. The blasting gelatin in ordinary use contains no less than 93 per cent. of nitro-glycerin, with 7 per cent. of nitro-cotton, and its strength is very great.*~~

~~*Gun-cotton per se is not much in favour in ordinary mining; but mixed with some nitrate or mixture of nitrates, such as the nitrates of barium and potassium, and known as cotton powder, tonite, and potentite, it is employed extensively. Though not quite so powerful as dynamite, nitrated gun-cotton possesses the important advantage of not requiring to be thawed in cold weather. As in the case of dynamite, accidents have been caused by remnants of charges ; and with both explosives it is neces- sary to examine carefully the bottoms of all holes after blasting, and to destroy any possible remnants by firing off a detonator in any bottom or "socket" which cannot with certainty be pronounced free from danger.*~~

~~*The commonest method of firing a. charge is by means Safety- of the safety-fuse, a cord containing a core of gunpowder fuse.*~~

~~*introduced during the process of manufacture ; it may be rendered waterproof by tar or gutta-percha.*~~

~~*In blasting in the ordinary way the charge of gunpowder is put in either loose or enclosed in a paper bag, aud it is pressed down to the bottom of the hole with a wooden stick, whilst a piece of fuse also is inserted extending from the charge well beyond the hole. If the powder is loose the miner carefully wipes down the sides of the hole with a wet swab stick (a wooden rod with the fibres frayed at one end), or with a wisp of hay twisted round the scraper, in order to remove any loose grains adhering to the fuse or the sides of the hole, and then presses in a wad of hay or paper. A little fine tamping, often the dust from boring a dry hole, is now thrown in and rammed down with the wooden charging stick, and the same process is repeated, and when harder tamping is required the nietal bar is brought into operation, until the hole is completely filled.*~~

~~*As the safety-fuse burns slowly, at the rate of about 2 or 3 feet a minute, the miner can secure ample time for retreat by taking a sufficient length. It is usual to ignite the fuse by a _candle-end fixed under it by a piece of clay, and it takes a little time for the candle to burn through the fuse. — ;*~~

~~*The old plan of firing a charge, which is still in use In many*~~

~~*Blasting by elec- tricity.*~~

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~~*places, consists in inserting the needle into the charge and then tamping up the hole. Care is taken to draw out the needle a little as the tamping proceeds, so as to prevent too much foree being re- quired for its final withdrawal. The small hole left in this way serves for the insertion of a straw, rush, or series of small quills, filled with fine powder, which like the fuse reaches from the charge to the outside. A short squib which shoots a stream of sparks down the needle hole is also used occasionally. The straw or squib is lighted by some kind of slow match, made either by dipping a cotton strand in melted sulphur or soaking a picce of paper or a lucifer in the tallow of a candle; touch-paper also is used. Dynamite, blasting gelatin, gun-cotton, and cotton-powder are fired by the detonation of a fulminating cap. A long copper cap containing fulminate of mercury is fastened into the safety-fuse by squeezing with a pair of nippers, and is then inserted into a small cartridge of the explosive (primer), and placed above the rest of the charge. Fig. 24 shows a hole charged with two dynamite cartridges, a primer with cap, and filled up with water as*~~

~~*tamping. Sometimes gun-cotton is fired : — by a small charge of powder above it. a r Several substitutes for explosives es have been tried with the object of pe getting rid of the flame, which is Be. dangerous in collieries giving off fire- Bae*~~

~~*damp. Among these may be men- tioned plugs of dry wood which swell when wetted, wedges worked by hydraulic pressure, cartridges con- taining compressed air at extremely*~~

~~*high pressures, and lastly cartridges of compressed lime which ex- pands when water is brought into it.*~~

~~*For the purpose of firing several holes simultaneously, Messrs Bickford, Smith, & Co., the original inventors and makers of the safety-fuse, have brought out a new fuse (fig. 25), the action of which will be easily understood from the figure. An ordi- nary fuse is fixed into a metal case called the igniter, from which a number of instantaneous fuses convey fire to as many separate holes. It is found in practice that this fuse answers very well.*~~

~~*Charges may be readily fired singly or simultaneously with the aid of electricity, either of high tension obtained from a_ frictional, magneto-electric, or dynamo-electric machine, or of low tension from a galvanic battery. The former is preferred.*~~

~~*Fig. 26 shows a section of one of Brain's high-tension fuses. A is a cylindrical wooden case containing a paper cartridge B,*~~

~~*with an electric igniting composition C at the bottom. copper wires D, D enclosed in gutta-percha E, E reach down to*~~

~~*Two*~~

~~*the composition, where they are about jy inch apart. A copper cap or detonator G is fixed on to the small end of the wooden case. The insulated wires D, D are long enough toreach beyond the bore- hole. The ends of the wires are scraped bare, and one wire of the first hole is twisted together with a wire of the next hole, and so on, and finally the two odd wires of the first and last hole are connected to the two wires of a single cable, or to two separate cables, extending to some place of safety to which the men can retreat. Here the two cable wires are connected by binding screws to a frictional electrical machine or dynamo exploder.*~~

~~*One great advantage of electric firing is that the miner can retire to a perfectly safe place before attempting to explode the charge. This is important in sinking shafts,*~~

where the means of escape are less easy than in levels. | in diameter, the length of the stroke 4 inches, and the maximum

A second advantage is that there is no danger of a "' hang

"a.

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[BLASTING.

fire," an occasional source of accidents with the ordinary safety-fuse.

One of the greatest improvements in the art of mining Machine during the last few years has been the introduction of drills. —

machinery for boring holes for blasting; most of the machines imitate percussive boring by hand, but a few rotary machines are also in use. A percussive drill or perforator consists of a cylinder with a piston to which the drill is fastened. Compressed air is made to act alternately on each side of the piston, and in this manner the drill receives its reciprocating motion. Various arrangements have been adopted for securing the automatic rotation of the drill. In some cases also the advance forward of the machine, as the hole is deepened, is also effected automatically ; but im many of the best drills this work is left to the man in charge. It is impossible within the limits of this article to describe the various drills now in use, or even to make a complete enumeration of them.

The following, in alphabetical order, are the names of some of the best-known drills:—Barrow, Beaumont, Burleigh, Champion, Cornish, Cranston, Darlington, Desideratum, Dering, Dubois and Frangois, Dynamic, Eclipse, Excelsior, Ferroux, Frohlich, Inger- soll, Laxey, Mackean, Osterkampf, Rand, Roanhead, Sandycroft, Schram. An account of two of the simplest, the Barrow and the Darlington drills, will be sufficient to give a general idea of the construction of these machines.

"The Barrow drill (fig. 27) consists essentially of a gun-metal Barrow

~~D~~

~~cylinder C about 2 feet in length and 4 inches in diameter, in which works a cast-steel piston-rod D, fitted with two pistons G, about 12 inches apart, mid-way between which is the tappet, or boss, G'. Ina valve-box on the top of the cylinder is placed the oscillating slide-valve H (shown separately), hinged at M, which is worked by the reciprocation of the tappet G' coming in con- tact with its lower edges, which for this purpose are formed with two slopes at each end, as shown. It has ports corresponding with openings in the slide-valve face for admitting the fresh steam or compressed air from the inlet pipe I (fig. 28) to the~~

~~ports j at each end of the cylinder, and for letting the spent or~~

~~exhaust air or steam escape by the exhaust pipe J. This simple~~

~~arrangement constitutes the whole valve gear of the machine. '~~

~~piston rod, and is fixed therein by means of a screw. Its rotation is effected by hand, by means of the handle D", turning a spindle D', which is so fitted by means of the cotter d, made fast in the piston DG, and fitting in a slot in the spindle D', that the latter can slide in the piston DG, but when turned by the handle causes the piston to turn with it. The spindle D' has a pinion E gearing into the pinion F, on the adjusting and feeding screw C', so that when the piston D is turned by means of the handle D" the cylinder C is simultaneously pushed along the bed-plate A. These pinions can be easily disconnected by loosening the nut /f, and thus the piston and the adjusting screw can be turned independently of one another when required.~~

~~"The borers used are respectively 1} inches, 1} inches, and 1 inch~~

~~number of blows about three hundred per minute. The air is~~

~~MACHINE DRILLS. |~~

~~brought down about 400 fathoms from surface, at a pressure of 50 to 55 Ib to the square inch, in wrought-iron pipes 2 inches in diameter in the shaft, and 14 inches in the level, and admitted through a flexible tube into the~~

~~*inlet I on the left-hand side of the eylinder. The cost of the pipes is rather under 7d. a foot, or about 3s. 3d. per fathom.*~~

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~~*machine drills. The gross weight of the machine, including the bed-plate and gudgeon, is about 115 tb." * The method of fixing the machine for work is as follows :—" The bed-plate A of the machine is formed with a gudgeon A' which fits into, and can be adjusted to any position in, a socket formed in or*~~

~~*The air is compressed at the surface by a 14-inch compressor, worked | on a clamp B', which can be fixed on any part of the wrought-iron by a 12-inch horizontal engine, capable, however, of working two | bar or column B, thus forming a universal joint. This bar or column*~~

~~=~~

~~—~~

~~=~~

~~= =. ——— ora =~~

~~*Scule, figs. 29, 30.*~~

~~*ia Lt ee es a ee Pe J*~~

~~‘~~

~~*Inches 12 9 6 3 0*~~

~~*i x 2 Feet.*~~

~~*Fig. 29.—Side Elevation of Darlington's Rock-Drill.—Scale ~;4.*~~

~~can be placed in position either horizontally or vertically, as may be most convenient, but is generally placed across the level, against the sides of which it is secured by means of the clamp L, and~~

~~adjusting screw M, and claws N and N'. If necessary, wooden~~

~~wedges QO, O' are driven in between the claws and the wall to make it still firmer. The weight of the bar is about 120 ib.""?~~

~~——— ee — ee eee~~

~~Fia. 30.—Horizontal Section of Darlington's Rock-Drill.—Scale 7's.~~

~~Air-compressing plant of greater size has now been erected at Dolcoath mine, to which the above description refers. At Snail- beach mine in Shropshire they have two air-compressors of 18 inches~~

~~x NS SS~~

~~diameter and 5 feet stroke ; the air-main is at first 9 inches in dia- meter, then 6 inches, whilst 2-inch gas-pipe is used in the levels. A rock-drill which has done, and is doing, exeellent work is that~~

~~of Mr John Darlington. Its construction will be understood by referring to figs. 29, 30, and 31; a is the cylinder, d the piston rod, ce the borer; d, d are two openings for bringing in compressed. air, either of which may be used according to the position of the drill; eis the inlet hose with a stopcock, fdrill-holder, g stretcher bar, h piston, j rifled bar for turning piston and drill, & ratchet wheel attaehed to rifled bar, 7 rifled nut fixed in the piston head, m wood for lessening weight of piston rod and blocking space, » portway for allowing the eompressed air to pass to the top of the piston and give the blow, o exhaust portway. The action of the drill is as follows. The compressed air is always acting on the underside of the piston, and when the upper side of the piston communicates with the outer atmosphere the piston moves rapidly backwards and uncovers the portway 2. The eompressed air rushes through and presses against the upper side of the piston, which has a greater area than the lower side, the difference being equal to the area of the piston rod. The piston is driven rapidly downwards~~

and the drill strikes its blow. At the same time it uncovers the exhaust port o and then the con- stant pressure on the annular area on the underside of the piston produces the return stroke. The number of blows per minute is, from six hundred to eight hundred. The rotation of the drill is effected by the rifled bar. On the down-stroke of the piston the bar with its ratchet wheel is free to turn under a couple of pawls, and eonsequently the piston moves straight whilst the bar and ratchet wheel turn. When the up-stroke is being made the ratchet wheel's held by the pawls and the piston is forced to make part of a revolution. "As the hole is deepened the cylinder is advanced

forwards by turning the handle »; this works an endless screw ¢

1 Proc. Mining Institute of Cornwall, vol. i., 1877, p. 12,

Darling- ton drill.

Rotating drills.

Driving levels.

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passing through a nut attached to the cylinder; 7 is the cradle carrying the feed-screw and supporting the cylinder. It is centred on the clamp s. As this clamp can be fixed in any position on the bar, and as the cradle can be turned on the clamp, it is evident that holes can be bored in any direction.

In driving a level with the Darlington drill it is usual to fix the stretcher bar horizontally across the level so as to command the upper .part of the face; holes can then be bored with the cradle above the bar or below it. The bar is then shifted low enough to bore the bottom holes. It is found that all the necessary holes can be bored from two positions of the bar. The bar therefore has simply to be fixed twice; the alterations in position for boring holes in various directions are managed by shifting the clamp on the bar and turning the cradle on the clamp. Fig. 31 shows the stretcher bar fixed in a vertical position, which is sometimes convenient.

~~*In order to clear out the sludge from holes that are 'looking downwards," a jet of water, supplied from a hose attached toa half- inch gas-pipe leading from a cistern at a higher level, is made to play Into the holes during the process of boring.*~~

~~*For sinking shafts Mr Darlington has the drill fixed in a cylin-*~~

~~*drical case with a large external thread which works in a nut on the °*~~

~~*clamp. The drill is fed forwards by turning a hand-wheel attached to the case.*~~

~~*Rotating machine drills are also used in mines as well as those with percussive action. Stapff pointed out some years ago that, if a rock may be chipped off by power com- municated by a blow, it may also be chipped off by a similar amount of power communicated by pressure. Brandt's rotatory boring-machine consists of a hollow borer which has a steel crown with cutting edges screwed on. The tool is kept tight against the rock by the pressure of a column of water, and is at the same time made to rotate by two little water-pressure engines, whilst a stream of water passing down through the borer washes away the débris and keeps the cutting edges cool. In principle, therefore, this drill resembles the original diamond boring machine of De la Roche-Tolay and Perret, save that the crown is made of steel and not of diamonds. During the last few years it has been tried with success in railway tunnels and in mines. Jarolimek's drill! acts also by rotation, but the borer is fed forwards and pressed against the rock by a differential screw arrangement. The machine can be worked by hand, or by a little water-pressure or compressed-air engine or an electro-motor. In working certain minerals occurring in seams the undercutting may be performed by machines similar to those used in coal mines (see vol. vi. p. 68).*~~

~~*We now come to the application of the tools and machine drills to the purpose of breaking ground for driving levels and sinking shafts,*~~

~~*A level or drift is a more or less horizontal passage or tunnel, whilst a shaft is a pit either vertical or inclined. In driving a level by hand labour in hard ground, the first thing the miner has to do is to take out a cut, z.e., blast out*~~

~~a preliminary opening in the "end" or " forebreast." The position of this cut is determined by the joints, which the miner studies carefully so as to obtain the greatest advantage from these natural planes of division. Thus fig. 32 shows a case in which, owing to joints, it was dD~~

~~advisable to begin with a hole No. 1, and then bore and blast 2, 3, and 4 one after the other. The miner as a rule does not plan the position of any hole until the previous~~

~~1 Oesterreichische Zeitschrift fir Berg- und Wiittenwesen, 1881.~~

~~[FORMATION OF EXCAVATIONS.~~

~~one has done its work; in fact he regulates the position and depth of each hole by the particular circumstances of the case. Though a vein andits walls may be hard, there is occasionally a soft layer of clay (DD, DD, fig. 33) along one wall (dig, Cornwall; gouge, United States). The miner then works this away with the pick, and, having excavated a groove as deep as possible, he can now blast down the lode by side holes and so push the level forward.~~

~~In sinking a shaft a similar method of proceeding is Sinking observed. A little pit (sink) is blasted out in the most shalts. convenient part, and the excavation is widened to the full size by a succession of blasts, each hole being planned according to circumstances. This series of operations is repeated, and the shaft is thus gradually deepened.~~

~~Where boring machinery is employed, less attention, and sometimes no attention, is paid to natural joints, because when once the drill is in its place it is very little trouble to bore a few more holes, and the work can then be carried on according to a system which is certain of effecting the desired result.~~

~~A common method of procedure for hard ground is Driving shown in figs. 34 and 35. Four centre holes are bored levels about a foot apart — pies at first, but con- Zz verging till at a depth of 3 feet they are within 6 inches, or~~

~~less, of each other. Other holes are = then bored around ~~~ : them until the Hig BE. end is pierced by twenty or thirty holes in all. The four centre holes are then charged and fired simultaneously, either by electricity or by Bickford's instantaneous fuse, and the result is the removal of a large core of rock. The holes round the opening are then charged and fired, generally in volleys of several holes at a time, and the level is thus carried forward for a distance of 3 feet. If the ground is more favourable fewer holes are required, and they may be bored deeper,—in fact as much as 6 feet in some instances. Occasionally the four centre holes are directed so that they meet at the apex of an acute pyramid, and then, after all have been charged with blasting gelatin, only one of them receives a primer and cap ; the shock of the explosion of one charge fires the other three adjacent charges simultaneously. The preliminary opening is not necessarily made in the centre of a level, and sometimes it is blasted out in the bottom or one side.~~

~~In sinking shafts by boring machinery operations are conducted Sinking much in the same way as in levels, save of course that the holes shafts are directed downwards. Figs. 36 and 37 are a section and plan of with a shaft which is machine now being sunk at yz, Wills. the Foxdale mines arr LAL in the Isle of Man. ' oe About forty-five holes are bored in the bottom of the shaft before the drills are removed ; two of the holes A, B, and occasionally four, are bored only 4 feet deep, and are blasted with ordinary fuse. They serve simply to smash up and weaken the core; then the six holes nearest the centre, which are 8 feet deep, are blasted all together with Bickford's instantaneous fuse, and the result is the removal of a large core leaving a deep sink. The remaining holes are fired in volleys of four at a time in the ordinary way. In this manner the shaft, which is in hard granite, is being deepened atthe rate of 34 or 4 fathoms a month. Tonite is the explosive used.~~

~~'Sundry machines have been invented and used for driving levels without blasting. Some cut up the face into small chips which can~~

-

~~machine drills.~~

~~Fig. 87.~~

~~|| Modes of~~

~~| paying) miners.~~

~~PAYMENT OF MINERS. |~~

~~easily be removed, but they have not made their way at present into ordinary mining. The Bosseyeuse of MM. Dubois and Frangois acts on a different principle. It is a strong machine worked by compressed air. It first of all drills holes 4 inches in diameter by percussion ; a striking head is then substituted for the drill, and wedges, ou the principle of the plug and feathers, are inserted into the holes; and powerful blows with the striking head wedge off the rockin lumps. This machine is being used with success in Belgium for driving levels and crosscuts in fiery mines.~~

~~Some comparative experiments betweeu hand-labour, a percussive drill, and a rotatory drill have lately been made in one of the Freiberg mines,! and the results are of much interest and import- anee. The actual figures are as follows, the eost ineludiug, in the case of the machines, interest, depreciation, and cost of repairs, and cost of steam-power, supposing water-power not available :—~~

~~Hand- | Schram's Brandt's |~~

~~boring. | Drill. Drill. Distance driven per week (in metres) .....-| 0°95 4°5 5°0 A 120to | 77°4t Cost in marks per Metre Ariven.....seeeeeeeseeeses (123-5 tis 74°34 Wages realized by the miners, in marks, per 8) | 1°85 to | 3°48 to 3°76 PREBLE co eis eo 5: wanes Sessa nen seeaseus,s i 205 3°66~~

~~The advantages of machine work are very marked indeed both as regards rate and cost of driving, and wages earned by the men. Brandt's rotatory drill did its work cheaper and faster than Sehram's machine; but nothing is said in the original notice of the advantage of a machine driven by compressed air for ventilating workings such as advanced headings in which these drills are employed.~~

~~Brandt's machine was worked with water at a pressure of 834 atmospheres, of which 56°6 atmospheres were obtained by pressure pumps provided with~~

~~an accumulator, and 26°9 atmospheres by natural fall, owing to the working level being 277 metres below the pumps. The water was conveyed to the machine in iron pipes of 14 inches diameter inside. The diameter of the holes bated was 22 inches, and they could be bored in gneiss at the rate of 14 inches per minute. The stretcher bar on which the machine is carried is hollow, and has a piston which can be forced out by hydraulic pressure so as to fix the bar firmly. A similar bar is sometimes used with percussive drills."~~

~~As a method of breaking ground the ancient process of fire-setting requires to be mentioned. Before blasting was known it was largely employed, but its use is now confined to a few places on the Con- tinent where the rocks are exeeedingly hard and where wood is abundant and cheap. Piles of wood are heaped up against the face of the workings and set on fire. On returning to the working place two or three days afterwards, when the rocks have cooled a little, it is found that the ground has split and flaked off, and that much has been loosened which can be removed by the pick and wedge.~~

~~We finally come to water as an agent for removing rocks. Streams of water were formerly used in South Wales for working beds of clay ironstone at the outcrop. The water washed away the clay and shale and left the clean nodules of ironstone. The china clay of Cornwall is also worked by water: a stream of water is turned on to the soft mass, and the workman loosens the ground with a pick; the water carries off the particles of decomposed rock in suspension to regular settling pits. Water under pressure has rendered vast services to the miner in working auriferous alluvia. The system is described and figured at p. 746 of vol. x., so it is unnecessary here to enter into details. In the special case of salt-mines recourse may be had to the solvent aetion of water, directed by suitable jets, for making excavations.~~

~~5. Principles of Employment of Mining Labour.—As a large proportion of the expenditure in mining is for actual manual labour, it is very important that means should be taken to prevent any waste in this department. Three principles are in vogue—payment by time, by work done either measured or weighed, and by the value of the ore extracted.~~

~~The overseers, called captains in many metal mines, are naturally paid by the month, and where strict supervision can be exercised, such as is~~

~~possible at the surface, on the dressing-floors for instance, the same principle may be adopted; but when men are working underground, and often in small gangs of only two or three persons at some distance apart, piecework of some kind is more economical and satisfactory in every way.~~

~~In driving levels and sinking shafts it is usual for the~~

~~1 Jahrbuch fiir das Berg- und Hiittenwesen im Konigreiche Sachsen auf das Jahr 1882, p. 18, and abstraet in Proc, Inst. Civ, Eng., vol. lxix., 1881-82, part iii. p. 51.~~

- ~~Annales des Mines, ser, 8, ii., pl. 1, fig. 6, 1882.~~

~~men to work at a certain price per running yard or fathom. The agents have to see that the excavation, whether shaft or level, is maintained of the full dimensions agreed upon, and preserved in the proper direction. At the end of a certain time, generally a month, the work is measured by the agent. From the gross amount obtained by multiply- ing the price by the number of fathoms driven or sunk it is necessary to deduct the cost of the materials supplied to the men by the mining company, such as explosives, steel, candles, &c., and the remainder is divided among the persons who took the contract. When the useful mineral is being obtained the men may be paid at so much per cubic yard or fathom excavated, or at so much per ton of mineral extracted; the overseer of course has to see, in this latter case, that worthless rock is not sent to the surface. Payment by the number of inches bored is a method in use in some countries, where the men are not experienced or enterprising enough to undertake the work in any other way. A foreman points out to the men the position and direction in which the holes must be bored, measures them when completed, and subsequently charges and fires them.~~

~~The third method is that which is known as the tribute system. The miner working on tribute is allowed to speculate upon the value of the ore in a certain working area assigned to him and called his pitch. He gives the~~

~~mining company all the ore he extracts at a certain pro- portion of its value, after he has paid all the cost of break- ing it, hoisting it to the surface, and dressing it. Thus, supposing he takes a pitch at 5s. in the £, and produces marketable copper ore of the value of £50, his share will be 50× 5s.= £12, 10s., less the cost of the materials he has been supplied with, and all expenses for winding, dressing, sampling, &c.~~

~~6. Means of Securing Excavations by Timber, Iron, and Timber- Masonry.—The following kinds of timber are those most !8-~~

~~frequently employed for securing excavations underground : oak, larch, pitch pine, spruce fir, and acacia. In many mines the timber is attacked by dry rot, which gradually renders it useless, and when the timber has often to be. renewed the expense may be very considerable. Various methods of preventing dry rot have been tried with more or less success, such as letting water trickle over the timber in the mine or treating it with preservative solutions beforehand. Brine, creosote, and solutions of chloride of zinc, sulphate of zinc, sulphate of copper, and sulphate of iron increase the duration of timber. It was found by experiments carried on at Commentry during a long series of years that one of the best plans was to soak the timber for twenty-four hours in a strong solution of sulphate of iron. The total cost was only 4d. per yard of prop, whilst the timber lasted eleven times as long as when this simple treatment was omitted.~~

~~Timber is used in various forms—either whole and merely sawn into lengths, or squared up, or sawn in half, or sawn into planks of various thicknesses. tes~~

~~Where the roof of a bed is weak it may be kept up by simple props; but in some coal- mines and clay-minesa better > support is obtained by logs (chocks) laid two by two crosswise (fig. 38).~~

~~Though a level is an ex- cavation of a very simple nature, the methods of tim- bering it vary considerably, = beeause the parts requiring support may either be the : roof alone, or the roof and one or two sides, or the roof, sides, bottom.~~

If the roof only is weak, as is the case with a soft lode between two hard walls, a cap with a few boards resting on it (fig. 39) is sufficient to prevent falls. If one side is weak the cap must be

XVI. — 57

and

450 MINING

supported by a side prop or leg (fig. 40), and very often by two logs. The forms of joint between the cap and leg are numerous

[s ECURING EXCAVATIONS.

Figs. 48 and 49 show methods of sccuring a drift by arches when a lode has been removed.

Tron supports.

Masonry.

Qe SF EA ee ey | 3 = ss Pe = ee Fig. 39. Fig. 40. a. uf ac (fig. 41), depending to a great extent upon the nature of the pres- ek =

sure, whether coming upon the top or sides. the top of the leg is sometimes hollowed as shown in fig. 42 A, but occasionally the joint is flat and | a thick nail, or nog, is put in (fig. 42 B)

B e ae

wal

Fig. 41. Fig. 42.

to prevent the effects of side pressure, or, better, a piece of thick Where the floor of a level

plank is nailed under the cap (fig. 43). is soft and weak, a sole-piece or stil be- comes necessary, and, if the sides or roof are likely to fall in, a lining of poles or planks is used (fig. 43). In some very heavy ground in the Com- ¢ stock lode a_ special system of timbering is adopted (fig. 44).

(YEASTS ER Ay

y

Ey Ey

Fig. 43.

If the ground is loose, so that the roof or sides, or both, will run in unless immediately supported, the method of working called It consists in supporting the weak

spilling or poling is pursued. parts by boards or poles kept in advance of the last frame set up. The poles or boards (Jaths) are driven forward by blows from a sledge, and the ground is then worked away with the pick; as soon as a sufficient advance has been made a new frame is set up to support the ends of the poles or boards and the process is re- peated (figs. 45 and ; 46). In running ground it is necessary to have the laths fitting closely together, and the working face also must be supported by breast-boards kept in place by little struts resting against the frame. These are removed and advanced one by one after the laths in the roof and side have been driven beyond them.

On account of the high price of' timber, iron is sometimes em- ployed in its place. One method in use in the Harz consists in bending a rail into the form shown in fig. 47 and making it support other rails laid longi- tudinally, against which flattish stones are placed; the vacant spaces are then filled with rubbish.

Masonry has long been used for supporting the sides of mining excavations. The materials necessary are stone, ordinary bricks, or slag-bricks, and they may be built up alone (dry Fic. 47 walling) or with the aid of oe mortar or hydraulic cement. The bottom of a level is occasionally lined with conerete

~~*to carry a large stream of water, which other- wise might run into lower workings through cracks and crevices. Dry walling is not uncommon, and it may be combined with the use of timber (or iron) as shown in fig. 69, in which a level is maintained between two walls keeping back a mass of rubbish.*~~

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~~*shy Uf is 3*~~

~~*4)*~~

~~*oe) wa te (| oes \ J A*~~

~~*With round timber A*~~

~~*The timbering required for shafts varies according to the nature Timber.*~~

~~*¥ J*~~

~~*SY*~~

~~*of the ground and the size of the excavation. of planks set on their edges (fig. 50) suffices corner pieces being nailed to keep the successive frames together. In some of the salt-mines of Cheshire the shafts are lined with 4-inch planks united by mortice and tenon joints.*~~

~~*The usual method of securing shafts is by sets or frames. Each set consists of four pieces, Fig. 50. two longer ones called wall-plates and two shorter ones called end- pieces. They are joined by simply halving the timber as shown in*~~

~~*A mere lining for small shafts,*~~

~~*Z Fig. 51. Fig. 52. fig. 51. A more complicated joint (fig. 52) is often preferred. The separate frames are kept apart by corner pieces (studdles, Cornwall ; jogs, Flintshire), and loose ground is prevented from falling in by boards or poles outside the frames,*~~

~~*As shafts are frequently used for the several purposes of pumping, hoisting, and affording means of ingress and egress by ladders, it becomes necessary in such cases to divide them into compartments. Pieces of timber parallel to the end-pieces (buntons or dividings) are fixed across the shaft, and serve to stay the wall-plates and carry the guides as well as to support planks (easing boards) which are nailed to them so as to form a continuous partition or brattice. The magnificent timbering of some of the shafts on the*~~

~~*Comstock lode is described by Mr James D. Hague as follows :'— 'The timbering consists of framed sets or cribs of square timber, placed horizontally, 4 feet apart, and separated by uprights or posts introduced between them. Cross-timbers for the partitions between compartments form a part of every set.*~~

~~*the*~~

~~*wz*~~

~~*The whole is covered*~~

~~*HOISTING COMPARTMENT.*~~

~~*HOISTING COMPARTMENT.*~~

~~*HOISTING COMPARTMENT,*~~

~~*Fig. 54. on the outside by a lagging of 3-inch plank placed vertically." Figs. 53, 54, and 55, copied from Mr Hague's plates, illustrate this method*~~

~~*. 1 United States Geological Exploration of the Fortieth Parallel, vol. iii., 'Mining Industry," p. 103.*~~

~~*Fig. 55.*~~

~~*Masonry for shafts.*~~

~~*Exploi- tation,*~~

~~*EXPLOITATION. |*~~

~~*of timbering. Fig. 538 is a plan of the shaft: "S, S are the lougi- tudinal or sill-timbers,.T, T the transverse end-timbers, P partitiou- timbers, 7 guide-rods between which the cage moves, g gains cut in the sill-timbers, to receive the ends of the posts. The sheathing or lagging is seen enclosing the whole frame." Fig. 54 is a trans- verse section through the partition P of fig. 53, " between the pumping compartment and the adjoining hoisting compartment, looking towards the latter. In this figure, G, G are the posts, S the sill-timbers, P the partition-timbers, the ends of which are framed with short tenons that are received in gains cut in the sill- timbers and the ends of the posts, r guide-rod, 7 lagging or sheathing." Fig. 55 is an end view of the frame shown in fig. 53. "The single picce T forms the end, while the double pieces P forming the partitions are seen beyond." "The outer timbers of each set, that is, the two sides aud ends of the main frame, are 14 inches square; the posts, ten in number, four at the corners and two at each end of the three partitions, are of the same size. The dividing timbers, forming the partitions, are 12 inches square,"*~~

~~*When ground is loose or running, recourse must be had to a spilling process like that described for levels. Strong balks of timber are fixed at the surface or in solid ground, and then the first frame is hung from these bearers, and each successive frame from the one above it. Iron bars with cotters may be used for suspend- ing the sets; but on the Comstock lode each bolt is made in two parts with a tightening screw in the middle, and the sets can thus be kept very firmly together. The laths arc driven in advance, in the manner explained in the case of levels, and a new frame is put in as soon as the excavation has been sufficiently deepened within the protecting sheath of boards. In very unstable ground it may be necessary to put in the frames touching each other, so that the shaft becomes encased in a solid box of timber, occasionally 14 inches thick.*~~

~~*Like levels, shafts may be lined with masonry or brickwork, and these have the advautage of being far more permanent than timber, and of requiring fewer repairs. This kind of shaft-lining is especially desirable in the loose ground near the surface; because, if the working is discontinued temporarily, the shaft still remains secure aud available for use at any future time, whereas if timber is put in it often decays, the top of the shaft collapses, and much ex- peuse is incurred in the process of reopening it.*~~

~~The section of the shafts that are walled is generally circular as affording the best resistance to pressure; but elliptical walling is also met with. Another shape is like a rectangle, save that the sides, instead of being straight, form curves of large radius. The walling may be dry or with mortar, according to circumstances.~~

~~the shaft, and on this is placed a crib or curb AB (fig. 56)! con- sisting of segments of timber which form qaEgE ES a ring. This serves for a foundation for Vee the brickwork, which is built up to the =¥ surface; the temporary timbering is re- © moved, and the space filled up with earth % or concrete. Sinking is then resumed ‘ below the curb, and for a certain distance < J" jj of a smaller diameter, so as to leave a “UH bracket, or ledge, to support the first curb. ~· On arriving, after a certain depth of sink- owing to the nature of the ground, it ~· is impossible at first to find a firm seat SS SS for the curbs, it becomes necessary to hang Fig. 56. them by iron bolts from a strong bearing frame at the surface. When shafts pass through very watery strata, it is most desirable to stop all influx into the mine for the purpose of saving the heavy expense of pumping. The manner in which this is effected by a watertight lining, known as tubbing, is described in the article COAL, vol. vi. p. 62, where will also be found an account of Triger’s plan of sinking shafts with compressed air, and the very successful method of boring shafts through water-bearing ground invented by Messrs Kind & Chaudron.~~

~~1. Exploitation, or Working Away of Veins, Beds, and Masses.—We have described how shafts are sunk and levels~~

~~driven, and we now come to the processes employed in removing the mineral.~~

~~Taam~~

~~1 J. Callon, Lectures on Mining, vol. i., Atlas, plate xxviii.~~

~~*The deposit must first of all be reached by a shaft, or, where the contour of the country permits it, by a level. In the case of a vein an exploratory shaft is often sunk on the course of the lode for 20 or 30 fathoms, and, if the indications found in a level driven out from this shaft warrant further prosecution of the mine, a first working shaft is sunk to intersect the lode at a depth of 100. fathoms or more from gouts. the surface. Crosscuts are then driven out at intervals of 10,15, or 20 ~· fathoms to reach the lode, ~· \ as shown in fig. 57, which represents a section at — right angles to the line of strike. Sometimes the main shafts are carried (~· down all the way along , \~* the dip of the deposit, *~~

~~*NORTH.*~~

~~*Bsnaccow ADIT*~~

~~*though perpendicular ~~· y shafts have the advan- < ni tages of quicker and 'SY a cheaper winding and 7*~~

~~*cheaper pumping, to say Fig. 57.*~~

~~*nothing of the possibility of utilizing the cages for the rapid descent and ascent of the miners. If an inclined shaft appears to be advisable, great care should be taken to sink it in a straight line. In either case levels are driven out along the strike of the lode as shown in the longitudinal section fig. 58, in the hopes of meeting with valuable ore-*~~

~~*Lope*~~

~~*Swart on m > w "I*~~

~~'~~

~~*Suattow_Aoir*~~

~~*Shart on UNOERLE OF Looe*~~

~~*Fig. 58. bodies such as are represented by the stippled portions of*~~

~~*the figure. For the purpose of affording ventilation, and still further exploring the ground and working it, inter- mediate shafts, called winzes (Cornwall) or swmps (North Wales), are sunk in the lode.*~~

~~*The actual mode of removing the lode itself depends a good deal upon circumstances, viz., its width, the nature of its contents, and the walls that enclose it; but the methods of working may generally be brought under one of two heads, viz., underhand stoping or overhand stoping. The word stope is equivalent to step, and the term stoping means working away any deposit in a series of steps. Underhand or bottom stopes are workings arranged like the steps of a staircase seen from above, whilst overhand or back stopes are like similar steps a from underneath. Both methods have their advantages anc disadvantages, and both are largely MULL used.*~~

~~*We will first take underhand stop- ing, as this is the older method. In the old days the miner began in the floor of the level (fig. 59), and sank down a few feet, removing the part 1; he followed with 2, 3, 4, &c.,*~~

~~*hand stoping.*~~

~~*Fig. 59. until the excavation finally presented the appearance shown in*~~

~~*fig. 60. Any valueless rock or mineral was deposited upon plat- forms of timber (stud/s), and the ore was drawn up into the level*~~

~~*452*~~

~~*by a windlass. ore and water have to be drawn up some distance by hand labour ; much timberis required, yyy py)*~~

~~*for the stulls if there YY yy MU) is a large quantity of worthless stuff in the vein, or if the sides are 7 weak. The advantages are that ore can be worked away as soon as the level is driven, that the men are always bor- ing downwards, and, lastly, that the ore can be carefully picked after it is broken, particles being lost.*~~

~~*A more economical method of working by underhand stopes, and one largely employed in Cornwall at the present day, consists in reserving any*~~

~~attack upon : the ore-ground until a lower level has been driven. An intermediate shaft (winze) between the two levels is then made, either by sinking froin the upper level or rising from the lower one. The work of stoping is com- menced at the two upper ends of the winze, and the lode is removed in a suc-~~

~~4,~~

~~without fear of any valuable ||~~

~~ae as Fig. 61. cession of steps, the workings assuming the appearance exhibited in~~

~~#~~

~~fig. 61. The steps are generally made steep, so that the ore may readily roll into the winze, and so that the bore-holes may do better execution; but these steep stopes are dangerous if a man happens to slip and fall. The huge open chasms left by the removal of a large lode in this way are also a source of danger ; for there is always a risk of falls of rock, and from places which cannot easily be examined. Figs. 62 and 63, kindly supplied by Captain Josiah Thomas,' explain the general arrangement of the workings of the largest tin mine in Cornwall. The lode after producing copper ores to a considerable depth changed its character and became rich in tin. The workings for tin ore are confined almost entirely to the~~

~~WEST~~

~~=~~

~~MINING~~

~~granite. The section fig. 62 shows that the main shaft of the mine is at first vertical and then carried down on the dip of the lode.~~

~~[EXPLOITATION.~~

~~SOUTH wa NORTH~~

~~*WX AZZ ZEN*~~

~~*< Scale.*~~

~~*Cha Wee LP oat MOTD*~~

~~*Fathoms 100 50 0 100 Fathoms. Fic. 62.—Transverse Section, Dolcoath Mine, Cornwall.*~~

~~*The process of overhand stoping is precisely the reverse of that*~~

~~*EAST*~~

~~*Nhe*~~

~~*— _2 Sa ee ee nee SS = Ca SS Ee Zee Le*~~

~~*Ce)*~~

~~*°o {See oe eee ee ae ¢j es os ae =*~~

~~*(26 4 Sal aes*~~

~~*CROSS COURSE*~~

~~*Es ILS*~~

~~*meme ef ee Gb ne ee pe ee ee ewe nee SS SS R ASSS EG. BSS S GRANITE BSI WK KCCI a SS S IN LIX W)\W TSS KW*~~

~~*1298 |*~~

~~*pepe ess |*~~

~~*GREAT*~~

~~*IWS*~~

~~*IW WT SS ACY "AGS*~~

~~SSN~~

~~~ SRG ou. Fa~~

~~Ed AW K.KKC AKFCF~~

~~PW Pa~~

~~CoPPER WORKINGS Copper ano Tin mixeo — Eeesed Tin) WORKINGS NGG "pl ed oat Mis We a Fathoms 100 50 0 100~~

~~Scale.~~

~~200~~

~~300 400 Fathoms.~~

~~Fre. 63.—Longitudinal Section, Main Lode, Dolcoath Mine, Cornwall.~~

~~Over- which has been just described ; the work is commenced from a rise~~

~~hand 1 See Report of Miners' Association of Devon and Corntcail for 1882, and R. J. stoping. Freecheville, Trans. Roy. Geol. Soc, Cornwall, vol. x. part v.~~

~~(fig. 64 A), or better from the two bottom ends of a winze (fig. 64 B). As soon as the men have excavated a sufficient height of the roof of the level, they put in strong pieces of timber from wall to wall, and~~

~~Working When very wide lodes~~

~~wide lodes.~~

~~Van mine.~~

~~EXPLOITATION. |~~

~~In the midst of the rubbish chimney-like openings~~
~~~

~~Ae~~

~~WELLL Fig. 64.~~

~~closed at the bottom with shoots provided with doors. The ore is thrown into these passes, which are tapped when necessary; the ore falls into the tram-waggon placed ready to receive it.~~

~~Fig. 65 gives a transverse section showing the rubbish resting on the stull. This is what may be called the typical method of stop- ing, when the lode affords rubbish enough for the men to stand on and to keep them close to the rock they are attacking. Very often such is not the case, and the whole of the lode has to be sent to the surface for treatment. If the walls are firm, the lode is sometimes stoped away, a stull putin, and a sufficient heap of broken ore is left upon the stull to give the men good standing ground ; the excess is thrown over the ends of the stull, or the great heap is tapped by cutting a hole in the . icc vexing, and al- \ a Ss ORAS BS lowing a quantity to — . run down into the level.~~

~~Another method con- sists in putting in temporary stages upon Bee which the men stand to SE awe do their work, whilst the excavation is left as = N ae an open space (fig. 66). Fig. 66.~~

~~This mode of working is incompatible with weak walls. Ifa lode does not afford rubbish enough for completely filling up the exca- vated space, or if it is too narrow £~~

~~for men to do their work comfort- ably, one of the walls may be eut = into and blasted down (fig. 67), so that the men always stand upon a firm bed of rubbish while at work, and there is no fear of a collapse of the mine. In certain special 2 cases rubbish is sent down from the surface to fill up the excavations.~~

~~The advantages of overhand < stoping are—that the miner is – assisted by gravity in his work, that no ore or rock has to be drawn up by hand labour, and that less timber is required. On the other = hand, the miner is always menaeed by falls, but as he is elose by he can constantly test the solidity of the roof and sides by sounding them with his sledge ; there is the further~~

~~disadvantage that particles of ore may be lost in the rubbish, but this loss is often prevented by laying down boards or sheets of = iron while the lode is being broken down.~~

~~NS~~

~~come to be worked, recourse is often had to special methods. The great lode at the famous Van mine, in Montgomeryshire, is some- times 40 feet in width, and the hanging wall is weak. The lode is stoped away overhand, and the cavities packed with rubbish, part of which is derived from the lode itself, whilst the greater portion is supplied from a special quarry at the surface. Fig. 68! explains the details of the case. A is the original cross-~~

~~MINING~~

~~cover these eross-pieces (stempels, stull-pieces) with boards or poles, and throw down the rubbish upon the platform (stwll, bunning) thus formed. (mills, passes) are reserved, lined with boards or dry-walling, and~~

~~WEE)~~

~~; 7~~

~~453~~

~~eut (not in the line of section) by which the lode was reached B is the flucan, C the bastard lode, generally worthless, E. the main lode, H permanent levels, and K ore-pass reserved amidst the rubbish (deads) D, I pass down which rubbish is shot, N erosscut connect- ing the level H with P the permanent level in the country.~~

~~If the lode is not firm enough to allow of the stopes being carried for its full width, the crosscut method is adopted ; the workings in this case, instead of proceeding along the strike, are carried across the deposit from one wall to another.~~

~~The lode is removed in successive horizontal slices A,B, C,D,E, and for each slice a level (L, fig. 69) is driven, either in the lode,~~

~~*I a a a a w w > = wu – a 3 u z 4 is z 4 c oO*~~

~~*Fig. 70.*~~

~~*or partly or entirely in the country; from this level crosscuts are put out 6 or 8 feet wide, as shown in the plan (fig. 70). These are regularly timbered according to the necessities of the case, and, when No. 1 is completed, No. 2 is begun, and the rubbish from No. 2 thrown into the empty space of No. 1 crosscut. If the quantity is insufficient, deads are brought in from the surface or from exploratory workings in worthless rock in the neighbourhood. Sometimes the crosscuts are not driven side by side, but 1 and 5 would be driven first, leaving 2, 3, and 4 as a solid pillar; then 3 would be worked away, and finally 2 and 4 between the timber and rubbish on each side. The greater part of the timber can be re- covered when the next slice above is taken off, as the props are put in with the small ends downwards, and can be drawn up with levers. M (fig. 69) is a level reserved in the deads for traffic and ventilation. This method of working is applicable not only to lodes but also to irregular masses.*~~

~~*In working away the soft " bonanzas" or ore-bodies of the great Comstock Comstock lode, which are from 10 to 80 or even 40 or 50 feet wide, lode.*~~

~~*and which are enclosed in very un- stable ground, a special method of timbering is employed (figs. 71 and 72).2 '"Iteonsists in framing timbers together in rectangular sets, each set being eomposed of a square base placed horizontally, formed of four timbers, sills, and eross-pieces, 4 to 6 feet long, framed 'together, sur- mounted by four posts 6 to 7 feet high, at each corner, and capped by | a frame-work, similar to that of the base. These cap-pieces, forming the top of any set, are at the same time the sills or base of the next set above, the posts, as the sets rise one above the other in the stope, being gene- rally placed in position directly over . those below." "The timbers are ; usually of 12-inch stuff square-hewn ; or sawn." Each post has a tenon 9 inches long at the upper end, and a tenon of 2 inches at the lower end, which fit into mortices in the cap and sill respeetively ; and "the sills and eaps have short tenons on each end and shoulders cnt to receive the ends of the post and the horizontal cross-*~~

~~pieces." The walls of the excavation are sus- tained by a lagging of 3-inch or 4-inch plank. The whole width of the ore-body is stoped away at once, = its en supplied by timbering, an Snails the Ror space is filled | IL | | IIU with waste rock derived from dead work in the mine or from special excavations, — under- a " ground quarries in fact,— in barren ground. The stoping 1s earried on overhand, starting from an intermediate shaft or winze, and fig. 73 will explain how the different frames are built up one above the other. k p : Another method of working a' wide lode is to attack it in slices~~

~~'C. Le Neve Foster, "Notes on the Van Mine," Trans. Roy. Geol. Soc. Corn- wall, vol. x. p. 41.~~

~~< BK. coe ia es Vy a / s we are 1 bee : F 5 ¥ 4 ' ey : Yo \ S \S : te Z Ze , b— SE Z : 5 \\ Zednes) 7 \ NSS 5 ws .~~

~~2 James D. Hague, United Staies Geological Exploraiton of the Fortieth Parallel, yol. iii. " Mining Industry," p. 112.~~

~~Working We now come to beds or scams. , of beds, mode of working the most important beds —~~

~~Cleve- land ironstone work- ings.~~

~~Gypsum quarries.~~

~~Slate quarries.~~

~~454~~

~~parallel to the dip, working away each slice separately as if it were a lode of ordinary dimensions, and filling up with rubbish (fig. 74).~~

~~The~~

~~that occur in the earth's crust, viz., coal Z seams, has already been described in the 2 article CoaL (vol. vi. p. 64 sq.), and ; details have been given concerning the Z removal of the mineral by pillar working <7 and long-wall working. Both these 2 methods are applicable in the case of~~

~~seams of other minerals. Such for ~· instance are the beds of fire-clay and ~·· © clay-ironstone which are wrought by both the processes just mentioned, and often in connexion with coal.~~

~~Next in importance to coal is ironstone, and a brief account of the workings in the Cleveland district will explain the manner il which more than one-third of the iron ore raised in the British Isles is obtained by mining. It resembles the "bord and pillar" system used for working coal in Durham.~~

~~The Cleveland ore occurs in the form of a bed from 6 to 16 feet thick in the Middle Lias, lying pretty level. A mainway (fig. 75) is driven about 12 feet wide for a considerable distance, and at right angles to it bords are driven 5 yards wide fora length of 30 yards, and then at right angles a wall 7 or 8 feet wide and 20 yards long. By driv- ages of this kind the bed is cut up into pillars or blocks 30 yards long by 20 yards wide. The pillars are subsequently removed in the following way.~~

~~Fig. 76 represents in section and plan the chambers and pillars of the underground gypsum quarries ee which supply the well-known plaster of Paris to all the world! The principal bed is from 50 to 60 feet in thickness; pillars are left 10 feet square at the base, and the stadls between them are 16 feet wide. The workings are slightly arched, and are = = not carried up to the roof, for the —=== purpose of better maintaining the security of the chambers, because~~

~~mes ee ey~~

~~heavy damages would have to be \ eee — "caved in" and ren- \ dered the surface useless. A simi- \ lar layer left for the floor prevents U creep (see CoAL, vol. vi. p. 64), and Fig. 76.~~

~~enables the underground roads to be kept in good repair. Underground slate quarries afford examples of very various methods of removing thick beds of mineral of comparatively little intrinsic value. At Angers in France, where the beds dip at a high angle, the underground workings are carried on like an open quarry~~

~~*Fig. 79. —A,A, pillars of slate; B, B, rubbish ; C, C, slate cham- bers. Scaleggyz-*~~

~~*Fig. 77.*~~

~~*under a strong roof of slate ; the floor is continually being worked*~~

~~*Fig. 78.*~~

~~*away in steps, and an immense open chamber is left. In the*~~

~~*1Callon, Lectures on Mining, vol. ii. plate xi.*~~

~~*MINING*~~

~~*[EXPLOITATION.*~~

~~*Festiniog district in North Wales the principal bed, or vein as it is called, is more than 100 feet thick in places, and the method of working consists in making alternate pillars and chambers each 30 feet to 50 feet wide along the strike (cross-section and plan, figs. 77 and 78). The pillars follow lines of natural cross-rending PP', which commonly make an angle of 25° to 35° with the direction of the dip. The excavations are arranged in regular lines, and form continuous chambers extending very often from the surface to the very lowest workings. A,B,C, D are the original working levels. The slate of the supporting pillars is entirely lost, as these cannot be removed with safety. This method of working requires a strong roof. In the Ardennes, on the contrary, the pillars are carried along indefinitely along the strike (fig. 79, cross-section). The slate in each longi- tudinal chamber is removed in slices parallel to the bedding, and the men stand upon the rubbish, which finally fills up the chambers*~~

~~*(MARLSTONE-.. — WITH*~~

~~*SSS ees &OCK-SALT ——*~~

~~*Fig. 80. Fig. 81.*~~

~~*are advanced by making in the upper part an excavation 5 feet 9 inches high, called the roofing (a, fig. 81); and then the lower two-thirds of the part worked are removed by blasting slanting holes. Many of the old salt mines have collapsed from weakness of the roof or insufficiency of the pillars, and have become inundated; the brine is then extracted by pumping and evaporated for salt.*~~

~~*In some countries, especially when the beds of salt are impure or much mixed with clay or shale, the formation of brine is conducted regularly by making a network of drivages within a rectangular, elliptical, or circular area in thick beds of saliferous marl, and then introducing fresh water by pipes, so as to form underground ponds which gradually dissolve the roof and sides. The brine is drawn off and either pumped up or conveyed by adits to the surface.*~~

~~*A few words remain to be said about open workings. Some minerals are always obtained in this way; others are worked open before regular underground mining begins; and, thirdly, it often happens that underground and surface work are both carried on simultaneously on the same deposit. Among deposits worked open- cast are peat, numerous kinds of stone, iron ore, cupreous pyrites, lead ore, gold- and tin-bearing alluvia, and diamantiferous rock.*~~

~~*Owing to its soft, spongy, and fibrous texture, and the fact of its often lying below the water-level, peat has to be worked in a special manner. Trenches are dug about a foot deep with a sharp spade, which cuts out sods of convenient size for drying and burning. When one layer has been removed in this way, another is taken off, and so on. If water is reached the working can still be pursued by using the long spade (grand louchet, France) with a handle of 16 or 20 feet. It cuts ont a sod 8 or 4 feet long at each thrust.*~~

~~*When a deposit is more or less solid the workings are frequently arranged in steps, the height and breadth of each depending upon the firmness of the rock.*~~

~~*In many cases the first work consists in removing worthless rock at the surface (overburden), and where the underlying deposit is thick or very valuable it will pay to remove a very great thickness of overburden, on*~~

~~*account of the advantages of working a deposit open. These advantages are — entire removal of the deposit without loss in pillars, no expense for timbering or for packing with rubbish or for ventilating or lighting the workings, better ventilation, easier supervision, longer working hours, less danger.*~~

~~*As an example of a large open working may be mentioned the great Penrhyn slate quarry near Ban- gor, employing about 3000 hands, and worked by a succession of terraces on an average 60 feet high by 30 feet wide (fig. 82). Reference has already been made to the thick lead-bearing sandstone of Mechernich, which is in part worked as an open quarry. Mokta-el- Hadid, near Bona in Algeria, and the Rio Tinto mines in Spain, afford instances of extensive combined open and mnder- ground workings for iron ore and cupriferous pyrites respectively.*~~

~~*Local laws regulating the size of the working areas, or claims,*~~

~~*? Joseph Dickinson, " Report on the Salt Districts," Reports of the Inspectors of Mines for the year 1881, p. 66.*~~

~~*Diamond mines.*~~

~~*Evils at- tending hy- draulic mining.*~~

~~*Under- ground trans- port.*~~

~~*Carriage*~~

~~*by workers.*~~

~~*Sledges.*~~

~~*'| Wheel carriages.*~~

~~*CARRIAGE. |*~~

~~*owned by separate individuals or companies, considerably affect the methods of working. This is especially the case with the diamond deposits of South Africa. The diamantiferous rock at the cclebrated Kimberley mine*~~

~~*(formerly called Colesberg Kopje) occurs in the shape of an elliptical upright mass, the greatest length being about 330 yards and the greatest breadth about 200 yards. The super- ficial area is about 9 acres; the mass extendsdownwards within almost perpendicular walls of shale, and is worked in places to a depth of about 400 feet. The claims are only 31 feet square, and are more than four hundred in number, and these have in some instances been subdivided into portions as small as the sixteenth of a claim; but, as at the present time one company may own very many claims, the number of individual holdings is less numerous than formerly when the limit was two claims. The working is carried on vertically downwards, and, as the claims are not all worked at the same rate, those that progress most rapidly are surrounded by perpendicular walls of neighbouring claims. The shale, or reef, enclosing the deposit is constantly falling into the huge open pit, and has to be cut away to a slope, the expense of this work being charged to the claim-holders generally by the mining board. The diamanti- ferous rock is extracted by innumerable wire-rope inclines.*~~

~~*We have already referred to the method of working gold-bearing alluvia by the hydraulic process, which has rendered such services in the United States (GOLD, vol. x. p. 746). At the same time one must not be blind to the evils of this method of working, which have at last necessitated legislative interference. Some idea of the extent of the mischievous results of hydraulic mining will be gathered from the statement that one working alone, the Gold Run Ditch and Mining Company, for the last eight years has been discharging 4000 to 5000 cubic yards of sand, gravel, and boulders daily, for a period of five months each year, into a tributary of the Sacramento. Asa natural consequence deposits are formed lower down the river, ob- structing the navigable channels, rendering overflows more frequent and destructive, and causing valuable land to be destroyed by de- posits ofsand. The superior court of Sacramento county, California, has recently decided that the hydraulic mining companies must build dams to impound the coarse and heavy débris, or take other efficacious means to prevent their being washed down the rivers.*~~

~~*8. Carriage or Transport of Minerals along the Under- ground Roads.—After the mineral has been broken down in a deposit it is necessary to pick out any barren rock and then convey to the surface all that is of value.*~~

~~*The simplest and oldest method of transport along underground roads is carriage on the back, and this method may still be seen at the present day even in countries where the art of mining is generally highly advanced. Thus, for instance, in the little slate mines near Cochem on the Moselle men and lads carry up all the blocks of slate upon their backs, walking upon steps cut in the rock ; they come up with their hands upon the ground bent almost double under the weight of the block, which rests upon a thick pad. Again, the blocks of slate are still carried on the back from the actual working place to the nearest tram-road, in the slate mines of the Ardennes. In the Sicilian sulphur mines the same method is common, and it is found also in parts of Spain and China, where baskets are used, whilst bags are employed in Mexico and also in Japan. Even in England the system still survives in the Forest of Dean, where boys carry iron ore in wooden trays from the very irregular ore-producing cavities either to the surface or to the nearest shaft.*~~

~~*Sledges, or sleds, enable greater loads to be transported ; but they are not available unless the conveyance is along roads sloping downwards. They have been largely employed in coal mines, and are still resorted to in some collieries for conveying the coal from the working place to the nearest tram-road.*~~

~~*We next come to wheeled carriages. The simplest is the wheelbarrow. The barrow used in Cornwall at the present day is not unlike that figured more than three centuries ago by Agricola. The navvy's barrow is more advantageous, but it requires a wider and higher level. The barrow runs upon the natural floor of the level, upon boards, or upon thin strips of iron. Carts drawn by horses may be used in large underground quarries. Excepting in special cases it is advisable to replace barrows by waggons running upon rails. The oldest form is the German Hund.*~~

~~*It consists of a rectangular wooden body, with four wheels, resting upon two boards as rails, and it is kept on the track by a pin which runs between the boards.*~~

~~*Cast-iron tram-plates were introduced in the last century, and were finally succeeded by iron rails, which are now in general use, though steel threatens to displace iron in this as in other departments of mining. Various forms of rail are employed. The simplest is a bar of iron set on its edge in transverse sleepers, or flat iron nailed to longitudinal sleepers. Small T-headed and bridge rails are not uncommon. In the Harz the rails sometimes lie on stone sleepers ; a hole is bored in the stone, plugged with wood, and the rail is nailed on. The gauge varies from 14 inches to 3 feet or more ; 20 inches to 22 inches is a common gauge in metal mines. Arrangements of course have to be made for passing from one line to another by points; but the transference is frequently best effected by putting down flat plates of cast iron, upon the smooth surface of which the waggons can be handled with ease and turned in any direc- tion ; raised ledges guide the wheels into any particular track.*~~

~~*The form and size of the waggons running upon the rails necessarily vary according to the size of the underground roads and the manner in which the mineral is raised in the shaft. In some mines the practice exists of loading the mineral in the level into an iron bucket (kibble) standing upon a trolley, which is merely a small platform upon wheels. This trolley is pushed (¢rammed) to the shaft; the full kibble is hooked on to the winding-rope and drawn up, whilst an empty kibble is placed upon the trolley and trammed back along the level, where it is again loaded from a shoot (mel, pass) or by the shovel. The usual plan, however, is to have a waggon, which is tipped on coming to an enlargement of the shaft (plat, lodge) where the level joins it. These waggons may be made of wood or sheet- iron, and of late years sheet-steel for the body and cast- steel for the wheels have been coming into favour.*~~

~~*The most modern system in metal mines is to imitate collieries, and use waggons which are drawn up in cages. Fig. 83 represents the plain but strong waggon of the Van mines, consisting of arectangular) = === body of sheet-iron resting on an oak frame, and provided with cast-steel wheels. The wheels are loose upon the axles, which them. selves run loose in the pedestals. The waggon is emptied by being*~~

~~*Fig. 83, run on to a "tippler," which enables it to be completely over-*~~

~~*turned with great ease. A commoner plan is to construct the waggon with a hinged door at one end, and the contents are discharged by opening this door and raising the body.*~~

~~*The motive power for tramming waggons along the levels of metal mines is generally supplied by men or boys, though, where large quantities have to be extracted, and where the roads are favourable, recourse may be had to ponies and horses and the various kinds of mechanical haulage described in Coat, vol. vi. p. 69.*~~

~~*Trains of cars are sometimes drawn along underground railways by locomotives; they have the great disadvantage of polluting the air with the products of combustion, and consequently they are not available unless the ventilation is very good. Asmall locomotive of 2 horse-power nominal is used on an 18-inch track in the adit-level of the Great Laxcy mine (Isle of Man), now approaching a mile in length, and full-sized locomotives ply along the adit of the Rio Tinto mines. Locomotives worked by compressed air improve the ventilation instead of injuring it, and are not a source of danger in cases where fire-damp may be present ; but, except in special cases, they cannot be worked so cheaply as engines fired with coal. Conveyance by electric railroads underground has hardly gone beyond the experimental stage, but the results obtained at the Zaukeroda colliery in Saxony! show that electricity can be applied with profit in this department of mining.*~~

~~*A few instances of transport by boats may still be met with. Boats.*~~

~~*The boats used in the underground canal at Klausthal are 31 feet*~~

~~*1 Jahrbuch fir das Berg- und Hiittenwesen im Kénigreiche Sachsen auf das Jahr 1883, p. 50.*~~

~~*Winding.*~~

~~*Buckets.*~~

~~*long by 4 feet 6 inches wide, and 2 feet 11 inches deep. Each boat earries 5 or 6 tons. .*~~

~~*Where roads have a strong gradient, inclined planes are employed, either self-acting if the mineral has to be lowered, or worked by stationary engines if the mineral has to be raised (see CoAL, vol. vi. p. 69).* |~~

~~*9. Winding, or Raising in the Shafts, with the Machinery and Apparatus required.—In speaking of the transport by underground roads, we mentioned that the mineral is occa- sionally brought to the surface on the backs of men or boys. In other cases daylight is reached by adit-levels provided with railroads ; but in by far the greater number of mines it is necessary to hoist the mineral, and often much rubbish, up vertical or inclined pits generally known as shafts.*~~

~~*In beginning to sink a shaft from the surface, or in sinking a winze, hand-power applied by a windlass is sufficient. The broken rock at the bottom of the shaft is shovelled into a wooden or iron bucket (Azbble), which is drawn up by a rope passing round the barrel of the wind- lass. When a depth of 20 or 30 yards has been reached it is more advantageous to introduce horse-power, and the usual machine by which this power is applied, called a gin or horse-whim, is a common sight in many metalliferous districts. It consists of a vertical axis carrying a barrel or drum 8 to 12 feet in diameter, round which is coiled the rope, which after passing over a pulley hangs down the shaft. 'The axis carries an iron pin at each end, the lower one working in a stone and the upper one in a socket in the span-beam or cross-bar of the supporting frame. Under the barrel is a long driving beam to which a horse is harnessed, and, as will be readily understood, the kibble is drawn up or lowered down as the horse walks round. Tt is most economical to have two kibbles, for then they balance each other.*~~

~~*Where steam and water-power are not available, a large number of horses or mules are sometimes harnessed to whims, and ore raised from depths of 200 fathoms. These, however, are exceptional cases; and, especially since the introduction of portable engines, the use of steam-power even for comparatively small depths, such as 100 yards, is daily increasing. In hilly districts water-power is generally at hand, and huge reservoirs are frequently constructed for storing the rainfall, and so affording an adequate*~~

~~and con- stant supply. It may be utilized by water-wheels, turbines, and water-pressure engines.~~

~~There are three systems of winding by steam or water- power which are in regular use :—(1) by buckets (kzbbles), baskets, or bags swinging loose in the shafts ; (2) by boxes working between guides (skips, Cornwall); (3) by cages carrying one or More waggons.~~

~~The buckets are made of wood, sheet-iron, or sheet-steel. Their shape varies ; it may be round or elliptical, straight in the side or bulging in the middle. Fig. 84 represents-a kibble made of sheet-iron. When the shaft is inclined, the side upon which the kibble slides is carefully lined with boards (bed-planks) resting upon cross sleepers. Planks of hard wood like beech last longer and require fewer repairs than $A' deal boards. In the Harz, poles fixed lengthwise | take the place of boards, which are customary in | Great Britain. Even where shafts are perpen- dieular a lining of planks is often put in round the winding compartment, unless the space is considerable, and the kibble then glides up smoothly, and there is less risk of accidents. A inore modern system is to use wire-rope guides for the kibble, which is thus kept from swinging about. Another advantage of this plan is that a light cage ean easily be substituted for the kibble and used for the aseent and descent of the men. Mr Galloway has patented a method of sinking shafts with wire-rope guides, the upper ends of which are coiled upon drums at the surface. By adopting this expedient the guides ean be lengthened as the shaft is deepened.~~

~~A word must be said about the actual loading and emptying of the kibble. Sometimes, as already mentioned, the kibble is filled at the working place or from a shoot (pass, Cornwall) carried down~~

~~into the level, and then conveyed on a trolley to the shaft, where.~~

~~it is hooked on to the rope and drawn up. More frequently the filler standing in the plat loads the kibble with a shovel; and in order to save time two~~

kibbles are often provided, one being filled while the other is making the journey to and from the surface. In this case it is necessary to have some kind of elevis, which will enable the kibble to be readily detached from the winding-rope, and quickly and securely fastened on again. On its arriving at the surface the lander seizes an eye or ring at the bottom of the kibble by a pair of tongs suspended by a chain, and the rope is now lowered. The kibble is thus turned over and the contents fall into a tram-waggon.

The inconveniences of this method of winding are considerable, especially in inclined shafts where the direction and amount of the inclination are not constant. There is great wear and tear of the bed-plank and easing-boards; and, unless constant attention is paid to repairs, places are worn out where the kibble catches, causing the rope-to break. The fall of a kibble and its contents not only does much damage to the shaft, but also is a source of danger to the men. The introduction of boxes (skips) working between guides or conductors was therefore a decided step in advance, for the system allows the winding to be carried on with less friction and with greater rapidity and safety. The guides are

often made of pieces of timber (like 7, fig. 58) bolted to the end-

pieces and dividings. It is only in perpendicular shafts that guides made of wire-rope or iron rods can be applied. The skip isa box of rectangular section made of sheet-iron or sheet-steel, with a sloping bottom, and provided with a hinged door closed by a bolt for discharging its contents. Fig. 851 shows how the skip runs upon

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the guides by means of four cast-iron or (better) cast-steel wheels. In an inclined shaft the guides sometimes have iron rails laid on them so as to diminish the wear. Some of the skips in Cornwall are made to hold as much as a ton and a half of tin-bearing rock. The skip is filled with a shovel by a man standing in the plat, but a better plan is to arrange shoots leading from large hoppers, so that the ore can be made to run in without any shovelling. The skip is sometimes tilted completely over instead of being emptied by a

~~*hinged door; this arrangement is in use in some of the German mines, where the skip is made of wood, and is guided on each side by two pins or rollers running between two conductors. When the skip has reached the surface two catches are made to support the lower rollers, whilst the upper ones pass through openings in the front guides, and the skip, turning mpon the lower ones, is tipped over and so emptied.*~~

~~*Skips,*~~

~~*The most satisfactory system of winding is by eages ; there is Cage.*~~

~~*less handling of the mineral, and the hoisting proceeds at far greater speed. This system, which is almost universal in collieries, is employed also for working deposits of other minerals, and, though*~~

~~*OO*~~

~~*1 Moissenet, Annales des Mines, ser. 6, vol. ti., 1862, plate vii.*~~

~~*Koepe system,*~~

~~*Blan- chet's method.*~~

~~*DRAINAGE.* |~~

~~*managers are beginning to recognize the advantages of the cage and equip their mines with more modern appliances than have hitherto been customary. The cages used in the mines on the Comstock lode are very light and simple in construction, as will be seen from fig. 86. The cage in fact is a mere timber platform, 5 feet by 4,*~~

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~~*iyi ities Lend Fic. 86.—Cage used in Comstock Lode.*~~

~~*resting on iron bars y, and supported by iron rods on each side. It is provided with a sheet-iron bonnet to protect the men if they are inside, and also with safety catches ¢, t, which come into play if the rope breaks. The hand levers &, & at the ends of the cage raise up blocks which keep the car in its place during the aseent or descent ; g, g are guides for the end of the crossbar 6; c, bar working teeth t,t by levers; f, “ear” or “shoe” embracing the guide-rod in shaft; 7, lifting bar; s, strong spring.*~~

~~*The most important details concerning the use of cages, ropes, and other hoisting appliances such as pulleys, pulley-fraimes, detaching hooks, and winding engines, have already been set forth in the article Coal, vol. vi. p. 74; and it is therefore needless to repeat these particulars, especially as the art of winding mineral cheaply, speedily, and safely has been carried to a far greater pitch of perfection in collieries than in the majority of metal mines. It is often convenient to fix winding engines underground for the purpose of sinking shafts and winzes, and drive them by com- pressed air brought down in pipes from the surface.*~~

~~*The Koepe system of winding, which appears to be viewed with favour on the Continent, consists in having what is practically an endless rope with one large sheave over the shaft, in the place of the two drums. There are two cages, and the rope below them acts as a counterbalance, so that the load is uniform throughout.*~~

The most novel hoisting apparatus is that of M. Blanchet (Coat, vol. vi. p. 76), which has now been regularly at work in the Hot- tinguer shaft at Epinac in France for the last six years. M. Blanchet's method consists in fixing in the shaft a large pipe in which is arranged a piston; from this is suspended a cage carrying waggons. By exhausting the air above the piston the load is eotely forced up: by the atmospheric pressure below it. The

ottinguer shaft is 660 yards deep, and the pipe is 5 feet 3 inches in diameter, made up of a succession of cylinders of sheet-iron about 38, inch thick and 4 feet 4 inches high, joined by flanges and bolts. The 485 rings composing the long pipe weigh altogether 418 statute tons. The cage has nine decks, and arrangements are made for unloading three at a time; each waggon holds half a ton, so that the total useful load is 44 tons. The speed of hoisting is 20 feet per second. If two hoisting pipes are connected the dead weights may be made to balance each other, and the power required is simply that which is necessary to overcome the weight of the useful load. All the men prefer the pneumatic hoist to the ordinary cage for descending and ascending the mine, and are regularly lowered and raised by it. The advantages claimed by M. Blanchet for this system are—(1) the possibility of hoisting from depths at which rope-winding would no longer be practicable ; (2) getting rid of the costly ropes and dangers connected with rope- winding ; (3) better utilization of the engine power ; (4) improve- ment of the ventilation and diminution of the amount of fire-damp.

10. Drainage.—The mineral having been raised to the surface, the task of the miner might appear to be at an

in vein-mining the skip and kibble still prevail in England, the

end; but this is not the case, for it is further necessary that he should keep his mine free from water and foul air. These two indispensable operations of draining and ventilating frequently require special appliances which add considerably to the general cost of mining,

~~*In all cases where it is possible, endeavours should be made to keep the water out of a mine, so as to save the expense of pumping it; and the method of putting in a watertight lining (¢ubbing) in a shaft has been already described (Cot, vol. vi. p. 62). When large streams of water happen to be intersected by underground work- ings, and threaten to overpower the available pumping machinery, or when it is advisable to save the expense of draining abandoned workings, the entry of this water into the mine may often be prevented by stoppings, called dams, constructed of timber or brickwork.*~~

~~*In spite of all precautions, the miner generally has to contend with water which percolates into the workings. Four methods of getting rid of this water are available, viz., adits, siphons, winding machinery, and pumps.*~~

~~*An adit, day-level, or sough is a nearly horizontal tunnel with one end opening at_the surface, allowing the water to drain away naturally. In hilly countries mines are often worked entirely by adits, and even whena mine is deepened below the drainage level the utility of the adit is still threefold :— it lessens the quantity of water which tends to percolate into the lower workings ; it lessens the depths to which the water has to be pumped; and, by furnishing a certain amount of fall, it enables water to be applied as power. On account of these important advantages some very long and costly adits have been driven for the purpose of aiding the miners in certain metalliferous districts.*~~

~~*Thus in the Harz the Ernest Augustus adit (“‘Ernst August Stolln”) has been driven a distance of nearly 64 miles into the Klaus- thal district. The total length of the adit, including the branches, is no less than 14 miles. It intersects many of the lodes at a depth of upwards of 400 yards from the surface. ‘The total cost of this adit is estimated at £85,500.*~~

~~*Another long adit is the celebrated ‘“‘Rothschonberger Stolln,” which unwaters some of the most important mines at Freiberg in Saxony. The length of the main or trunk adit is more than 84 miles; the gradient of the greater part of it is only 1°18 inch in 100 yards. The branches of this adit among the mines are more than 16 miles in length, so that the total length of the main adit with its branches amounts to nearly 25 miles. Many of the mines are now drained naturally to a depth of 250 to 300 yards. The cost of*~~

~~*the main tunnel was £359,334, or nearly £24 per yard, but this includes the cost of eight shafts, heavy expeuses for pumping from these shafts, the walling of the adit for } mile, and all general expenses. The length of time occupied in driving this adit was thirty-three years. The " Kaiser Josef II. Erbstolln" in Hungary is another remarkable mining tunnel, which was commenced in 1782, and com- pleted in 1878 at a total cost of 4,599,000 florins. It is 10} miles in length, extending from the valley of the river Gran to the town of Schemnitz, where it intersects the lodes at depths varying from 300 to 600 yards according to the contour of the surface.*~~

~~*In Cornwall the Great County adit was driven for the purpose of relieving the Gwennap mines of their water, and it was pushed on nearly to Redruth. This adit differs from the great works under- taken in Germany by the fact that it commences in the mining district, and, though the length of all the drivages amounts to more than 30 miles, the water from the most distant mine does not run more than abont 6 miles before reaching daylight. The average depth is only 70 or 80 yards from the surface. In fact this great adit, though a work of great utility when the Gwennap district was in a flourishing condition, is merely a network of comparatively shallow drivages, often along the lodes themselves, among the mines, and therefore for boldness of execution cannot for one moment be compared to the great Schemnitz, Freiberg, and Klausthal drainage tunnels which have just been mentioned. The Blackett Level in Northumberland is an adit which has been driven a distance of about 4% miles, and it will have to be extended about 2 miles further before reaching Allenheads. Its depth from the surface at this place will be about 200 yards. or .*~~

~~*The main part of the Halkyn tunnel in Flintshire is 2 miles 1256 yards in length, and the branch driven out to Rhosesmor mine intersected the, vein at a distance of 809 yards, making a total of about 3 miles. The greatest depth from the surface is 230 yards, and the average depth in Halkyn Mountain about*~~

~~*Siphons.*~~

~~*Winding*~~

~~*machin- ery.*~~

~~*Pumps.*~~

~~*MIN*~~

~~*215 yards. The length and depth of this adit are not remarkable; but the great quantity of water discharged is a point of considerable interest and importance. It is estimated that this adit is now discharging 15 million gallons or 66,000 tons of water in twenty- four hours, although the outflow is purely natural, for no mines are pumping water into it. It is now easy to understand that the Rhosesmor mine, though provided with powerful pumping machinery, was unable to cope with the springs it encountered. —*~~

~~*In the United States the famous Sutro tunnel is an adit of which the main branch, 4 miles in length, reaches the great Comstock lode in Nevada at a depth of 1700 feet. The total cost of this tunnel, which was completed in nine years, is estimated to have been $7,000,000. The quantity of water running out daily in 1879 was 12,000 tons, at a temperature of 123° Fahr. at the mouth of the tunnel. All this water must otherwise have been pumped to the surface at a cost estimated at $3000 a day. The obstacles to progress were very great: not only was the heat extreme, but swelling ground was encountered which snapped the strongest timber. Thanks, however, to the untiring energy of Mr Adolph Sutro, the difficulties were at last successfully overcome, and this great work will long remain as a mouument to his foresight, skill, and patient pertinacity.*~~

~~*The Atlantic-Pacific tunnel,!*~~

~~*458*~~

~~*which was commenced in 1880, will pierce the heart of the Rocky Mountains under Grey's Peak, Colorado. It is being driven from both sides of the watershed, and will have a total length of 42 miles from end to end.*~~

~~*Siphons have been used for unwatering workings in special cases ; but of course they will not act unless the barrier over which the water is raised is very decidedly less than 33 feet.*~~

~~*When workings cannot be drained by tunnels or siphons it is necessary to raise the water mechanically, elther to the surface or at all events to an adit through which it can flow away naturally. If the amount of water is not too considerable, it is often convenient to use the winding machinery and draw up the water in special buckets (water- barrels) or tanks. The bucket may be tilted over on reach- ing the surface, or it may be emptied by a valve at the bottom. This means of raising water is often adopted while sinking shafts, when it may be desirable to wait till the whole or a portion of the shaft is completed before putting in the final pumping machinery.*~~

~~*The varieties of pumps used in mines are numerous. In small sinkings hand-pumps, either direct-acting or rotary, may be applied; steam-jet pumps on the principle of the Giffard injectors are also used; and pulsometers, though requiring a large expenditure of steam, have the advantages of being quickly fixed, of occupying little space, and. of working with sandy or muddy water. They are capable, therefore, of rendering great services in special cases. When we come to the definitive machinery erected in large mines of considerable depth, we find that the pre- vailing types of pumps arefew. They may be classified as follows :—(A) lifting and force pumps worked by rods in the shaft actuated by wind, water, or steam power ; (B) force-pumps at the bottom of the shaft worked by steam, compressed air, or hydraulic pressure.*~~

~~*A. In describing the first method we have to consider the motive power, the rods, and the actual pumps themselves.*~~

~~*Windmills have the disadvantage, which is often fatal, that the power is not constant. By erecting an auxiliary steam-engine, which can be set to work if wind fails, this evil is overcome ; and at the Mona mines in Anglesea a windmill pumps up water from a depth of 80 fathoms at the rate of upwards of 90 gallons per*~~

~~*minute. As the site of the mine is breezy, there is wind enough to work the mill about one-half of the time.*~~

~~_ Water-power was for a long period the principal agent employed in draining mines, and it is still of the greatest utility in many districts, reservoirs being constructed to collect and store the rainfall. Some idea of the scale upon which these works are conducted will be gathered from the following figures relating to the Harz mines. In 1868 there were "sixty-seven reservoirs covering an area of 604 acres, and having a storage capacity of 336,000,000 cubic feet."2 The total length of the various leats,~~

~~ee 1 Mining and Scientific Press, San Francisco, 1882, vol. xlv. p. 241. 2 ¢ Notes on the new Deep Adit in the Upper Harz Mines," by H. Bauerman, Report of the Miners' Association of Cornwall and Devon- shire, 1868, p. 21,~~

~~ING races, and other water-courses, including the six principal adits, is about170 statute miles. The net power extracted is reckoned at 1870 horse-power, but less than one-fourth of this is used for pumping.~~

~~Water-power is applied to pumping machinery by water-wheels, turbines, and rotary or non-rotary water-pressure engines. Hxcept- ing the case of the latter, the rotary motion has to be converted into a reciprocating motion by a crank ; and furthermore with turbines the speed must be reduced very considerably by intermediate gearing.~~

~~Overshot wheels are the commonest prime movers when pumps are worked by water-power ; water-wheels are frequently constructed 40 or 50 feet in diameter, and at the Great Laxey mine, in the Isle of Man, one of the wheels is no less than 72 feet 6 inches in diameter and 6 feet in the breast. The power is conveyed from the water- wheel by a connecting rod toa bell-crank (600) laced over the shaft ; and when, owing to the contour of the ground, the wheel has to be placed at a distance, it is connected to the bob by the so-called flat rods, made of wood, bars of iron, or wire-rope, travelling backwards and forwards, and supported by pulleys or oscillating upright beams.~~

~~Water-pressure engines have the advantage of being able at once to utilize any amount of fall, and those which are direct-acting can be applied immediately to the main rod of the pumps.~~

~~*Steam, however, is the power used par excellence in draining mines ; indeed the first applications of steam-power were made for this purpose, and Watt's great inventions owed their birth to the necessities of mines which could no longer be drained by the water- power at their command.*~~

~~*The principal type of engine is that known as the Cornish engine, which is a single-acting condensing beam engine working ex- pansively. Its mode of action may be briefly described as follows. The steam is let in at the top of the cylinder and presses down the piston, which is connected with one end of a large beam, whilst the main rod of the pumps is attached to the other. When the piston has completed its course the equilibrium valve is opened by a cataract, and, the pressure on both sides of the piston being now equal, the weight of the punip rods, or rather the excess of their weight over that of the counterbalances, causes them to drop and force up the water from the mine by means of the plungers, which will be described immediately. Double-acting rotary engines working the pumps by cranks may also be met with.*~~

~~*The rod in the shaft, known as the main rod or spear rod, is usually made of strong balks of timber butted together and con- nected by strapping plates fastened by bolts. It serves to work either lifting-pumps or force-pumps, or both.*~~

~~*¥*~~

~~*[DRAINAGE.*~~

~~*AWN*~~

~~*Y y Ze Yy Z*~~

~~*GY, 4 Yi ty AA y aa BZ Ki GLP EE 3g Ze a Se YY A Z 4 =] ¥ WY ZS lo Zz Vp. = o*~~

~~*Z an Gy, tyes Y; ,*~~

~~*NS*~~

~~N~~

~~SSX Ss~~

~~S&S~~

~~Aa BZ Hy i, Uf Y LY~~

~~WN~~

~~ANH~~

~~SS Ss~~

~~~~

~~aS SS~~

~~2 PONS Wi Fig. 87. Fig. 88. The lifting-pump, or drawing lift (fig. 87),? consists of the wind- bore, the clack-piece, the clack-seat piece, the working barrel~~

~~piece Banicelaleiaahiat oui: nian aia eS 8 Michell and Letcher on 'Cornish Mine Drainage," Forty-Third~~

~~Annual Report of the Royal Cornwall Polytechnic Society, p. 211.~~

~~Cornish engine,~~

~~VENTILATION. |~~

~~surmounted by pumps, and the bucket with its rod. The whole works like any ordinary pump, and needs no special explanation.~~

~~The force-pump used in mines, known as the plunger-pump, eonsists of a solid piston (plunger) (fig. 88)! working through a stuffing-box in a pump standing on the H-piece. This has a valve which communicates with the windbore resting in the cistern. Above the H-piece comes the door-piece with another valve, and then a series of pipes, generally of east iron, but~~
~~~~

~~*occasionally of wrought iron, constituting the eolunin. The upward motion of the plunger, which is attached to the main rod, causes an inflow of water, which is foreed into the eolumn when the plunger descends. It is usual to fix a drawing lift at the bottom of the shaft, which raises the water into a first eistern, and thence a plunger forces it into a second cistern some 60 yards higher up; and it is continually forced up from cistern to cistern until it reaches the adit or the surface.*~~

~~*There are numerous important matters which require special attention, such as the valves, eatches, balance-bobs, guiding arrangements for the rod in inclined shafts, the V-bobs, tend-off bobs, and running loops, which have to be used when there are bends in the shaft; but space will not permit of more than mere mention of these details.*~~

~~*Such then is the standard arrangement worked by steam or water power for pumping from mines. The great advantage of the system consists in the employment of the plunger, because it is simply necessary for the machine to raise a weight slightly greater than that of the water, which is forced up afterwards by the down- stroke of the rods. Leaks are readily discovered, and the stuffing- box can be easily screwed up as the packing wears; this is one great reason of the superiority of the plunger compared with a piston working in a barrel.*~~

~~*The modifications of this system relate more to the engines em- ployed than to the actual pumps themselves,*~~

~~*The cylinder of the Cornish engine is sometimes reversed and stands over the shaft, the main rod being attached directly to the piston. This type of engine, known as the Bull engine in Corn- wall, dispenses with the ponderous beam, but it has the great disadvantage of obstructing the mouth of the shaft. The use of two cylinders combined, as invented by Woolf, eauses less strain upon the main rod and pumps (pit-work) and machinery generally, as the initial velocity of the piston is smaller and the engine starts with less jerk. 'he cylinders are placed side by side or one above the other.*~~

~~*Kley, of Bonn, has constructed engines on the Woolf system with steam acting on both sides of the pistons. He makes the excess of the weight of the*~~

~~rod over that of the counterbalances sufficient to raise only half the weight of the water and to overcome the friction; and then in the descending stroke the steam aets on the top of the piston and so makes up for the insufficiency in force of the rods. As the steam acts on both sides of the piston the same amount is eon- sumed, it is true, but a smaller cylinder will do the work, and the original cost of the engine is lessened. The same engineer of late years has put up several pumping engines in Belgium, Germany, and France of 30 to 460 horse-power, with a fly-wheel which serves simply to regulate the stroke of the pistou, so that the crank always stops before or after the dead point till the cataract starts another stroke. The engines are double-acting, with two cylinders and beam. The advantage of working with the fly-wheel is that the main rod and pumps are set in motion without the injurious jerk unavoidable with a Cornish engine worked at a high rate of expansion.~~

~~M. Guinotte, the well-known Belgian engineer, also adopts a fly-wheel, and the engines he has erected at Mariemont and else- where are single-acting rotary engines with one cylinder. The peculiarity of the fly-wheel is that he ean weight it in any way he pleases ; and he so overcomes the difficulty, which occurs in other rotary machines, of its being impossible to work them below a certain speed. His object has been to make the speed slow at the beginning and end of a stroke, so as to avoid the injurious shocks to the valves and machinery generally from sudden starts and stoppages. In order to make the main rod aet by traction only aud not compression, which may be advisable with iron rods, the plungers are sometimes reversed ; whilst Kraft of Seraing has introduced the Rittinger pump, which consists ofa hollow moviug plunger with a valve inside, and a plunger case above it working over a hollow fixed plunger. By this arrangement both the up and the down stroke of the engine cause Water to be forced up; and this pump is used with a double-acting rotary engine.~~

~~B. We must now speak of the second class of pumps, viz., force- pumps worked by steam, water-power, or eompressed air at the bottom of the shaft.~~

~~The steam pumps are of very various descriptions,? but they mostly-consist of one or two plungers, or rams, set in motion by a rotary or a non-rotary engine, which may or may not work with~~

~~1 Michell and Letcher on "Cornish Mine Drainage," Forty-Third Annual Report of the Royal Cornwall Polytechnic Society, p. 211. 2 Stephen Michell, Mine Drainage, London, 1881.~~

~~expansion and condensation. The plunger or ram is generally fixed directly on to the piston, and works in the same line, con- sequently the power is transmitted to the plunger with the least possible loss. The water is forced up the shaft in one long column. Engines and pumps of this kind are easily kept in order; all the parts are readily accessible. The miner is able to dispense with the heavy beam, the massive engine-house, the long main rod and its connexions and bobs, the various cisterns and plungers, and instead he has a compact and easily supervised machine and a simple line of pipes taking up but little space in the shaft; the pump can therefore be erected and set to work very quickly, and this is a matter of the utmost importance in emergencies. It is true that these direct-acting steam-pumps, even when worked by a compound engine, cause a greater consumption of coal than the Cornish engine ; but, as a set off, there is the economy in first cost, erection, and repairs which has led to their adoption more especially in collieries. The steam is generated by boilers underground, or is conveyed from the surface in well-jacketed pipes.~~

~~If natural water-power is available water-pressure engines working the plunger directly are often employed, and indeed such water-power may be created artificially for use in workings where steam-power is objectionable on account of the heat. 'There are other reasons too for employing water for transmitting power; where the length of the rods is very great, and they have to be worked quickly, there is a great liability to breakages; in order to overcome these difficulties at the mines on the Comstock lode, Mr Joseph Moore? uses a steam- engine at the surface to work an hydraulic accumulator, and then by pipes couveys the water under pressure to hydraulic engines working plungers. These are fixed at 2400 feet from the surface, and force the water in one column, 813 feet high, to the level of the Sutro tunnel. The exhaust water is returned to the surface in pipes and used over again. The pumps are now raising 1600 to 1700 gallons per minute.~~

~~*Where compressed air is being supplied to a mine for drilling and winding purposes, it is often convenient to employ it, by means of direct-acting pumps, such as are generally used with steam, for the drainage of small temporary sinkings ; and occasion- ally large pumps raising considerable quantities of water are worked in this way.*~~

~~*ll. Ventilation and Lighting.—The composition of the air of the atmosphere is about one-fifth by volume of oxygen and four-fifths of nitrogen, with a little carbonic acid gas; more exactly, the standard amount of oxygen may be taken at 20°9 per cent., and that of the carbonic acid gas at 0°03 per cent. The atmosphere of mines is subject to various deteriorating influences: not only do noxious gases escape from the rocks into the underground excavations, but also the very agents employed in the execution of the work itself pollute the air considerably.*~~

~~*The dangerous emanations of fire-damp in collieries have Deleteri- been already described (Coat, vol. vi. p. 72); and with ous gases.*~~

~~*reference to this gas it is simply necessary to say that its presence is not entirely confined to coal mines. Large quantities have been observed in Silver Islet mine,* Lake Superior, where several explosions have occurred, whilst small quantities are met with in the stratified ironstone of Cleveland, and also in the Cheshire salt mines ; jets of the gas may be seen constantly burning in the salt mine at Bex in Switzerland ; a little has been noticed also in lead mines in Wales and Derbyshire. In the Sicilian mines the amount given off by the black carbonaceous shales inter- stratified with the sulphur beds is sufficient to cause dangerous explosions. It has been pointed out (vol. vi. p. 72) that carbonic acid gas exudes from coal ;° it escapes also from some mineral veins. At the lead mines of Pontgibaud in central France it is so abundant that special fans have to be provided for getting rid of it ; very distinct issues of this gas may be observed at the Foxdale mines in the Isle of Man, and in the Alston Moor district it is not*~~

~~*3 Trans. Inst. Engineers and Shipbuilders in Scotland, 1882.*~~

~~*4 Engineering and Mining Journal, vol. xxxiv. p. 322. ;*~~

~~5 A, Schondorff, “ Untersuchung der ausziehenden Wetterstrome in den Steinkohlenbergwerken des Saarbeckens,” Zeitschrift fir das Berg-, Hiitten-, und Salinen-Wesen im Preussischen Staate, vol. XXIV. Dp. 133 and Cl. Winkler, “ Die chemische Untersuchung der bei verschiedenen Steinkohlengruben Sachsens ausziehenden Wetterstrome und ihre Ergebnisse,” Jahrbuch fir das Berg- und Hitienwesen vm Kénigreiche Sachsen auf das Jahr 1882, p. 65.~~

~~oxide and carbonic oxide, and the analyses of MM. Sarrau and Vieille confirm the practical experience of miners, who complain greatly of noxious fumes when, owing perhaps to a bad detonator, a charge of dynamite or tonite fails to explode properly.~~

~~The air of mines is finally deteriorated by organic matter con- tained in the exhalations of the men and animals employed and in the products of decaying timber, by dust, and by the solid par- ticles constituting the smoke of explosives. It must be recollected also that the injury to the air is not confined to the addition of the~~

 ~~uncommon. This gas is likewise given off in the Sicilian sulphur mines, where also the highly poisonous sulphuretted hydrogen is of frequent occurrence, the water in the work- ings being often saturated with it. Small quantities of mercurial vapour occur in quicksilver mines.~~

~~Products Such then are the principal gases which naturally pollute~~

~~of respi- the atmosphere of mines, and have to be swept out by~~

~~ration, Ventilation. In addition to these we have the products | gases and substances just mentioned ; but the proportion of oxygen “digas of the respiration of the men and animals in the pit, and | is diminished by the combustion of candles, by respiration, the e.~~

~~decay of timber, and decomposition of some minerals such as iron pytites. Dr Angus Smith‘ sums up the results of his analyses of the air of British~~

~~metal-mines as follows :—~~

~~those due to the combustion of candles or lamps, and the explosion of gunpowder, dynamite, &c.~~

~~Dr Angus Smith?~~

~~reckons that two men working eight hours, Percentage by volume, 20°26~~

~~and using 4 tb of candles and 12 oz. of gun owder, produce 25°392 Oxygen, average of 339 specimens 0 cubic feet of earbonic acid feonbpiitley a Te F., —viz., 10°32 by » pag h or aie breathing, 12°276 by candles, and 2°796 by gunpowder. "in currents.… tee The products of the explosion of gunpowder have been carefully » 4n Bri SAR Seceyae wee vooeee 2OTF studied by Captain Noble and Sir Frederick Abel, and the follow- eae ing figures, showing proportions by weight, are copied from the tibial ch Sa cl oo oes~~

~~valuable paper? containiug the results of some of their researches: —~~

~~He considers air with 20°9 per cent. oxygen as normal, and air with proportions between that and 20°6 as impure; and where the per- centage of oxygen descends below 20°6 he calls the air exceedingly~~

~~Curtis & Harvey's | Mining No. 6 Gunpowder. | Powder.~~

~~Total Solid products.…..ccccsssssrsssseersesees ssestentse ons 57°74 47°04 bad. According to these standards, only 10°67 per cent. of the Total gaseous products 41:09 51°35 samples showed the air to be normal or nearly so; 24°69 per cent. WAteD.. ..ccsosceeccensesecceerectenseeseressensee scorer sescsceenes Pat 1°61 were decidedly impure ; whilst 64°63 per cent. or nearly two-thirds~~

~~190-00 Joo-00 | | of the samples were exceedingly bad. The amount of oxygen in~~

~~one specimen was as low as 18°52 per cent., whilst the carbonic~~

—

~~The solid residue of the mining powder consisted mainly of potassium carbonate, potassium monosulphide, and sulphur. The pereentage composition by volume of the gas produced was :—~~

~~Carbonic anhydride Carbonic oxide.. ONIErO COM... .050----c-~~

~~acid often exceeded 1 per cent. and in several instances 2 per cent. It is evident that twenty years ago the ventilation of British metal mines was anything but satisfactory, and even now there is room for improvement.~~

~~Having explained the reasons why the air of mines must be constantly renewed, we must now point out how this desirable end is effected.~~

~~Sulphuretted hydrogen Marsh QAS...ccccccecoeeesees Fy rOGeD.……cccccccccesceccceneeccccccecoeteessesersarecccces~~

~~Two systems are employed,—natural ventilation and Systems artificial ventilation; but, as both systems have been of venti- described (Coat, vol. vi. p. 70), little remains to be said stem~~

~~The volume (calculated for a temperature of 0° C. and barometer 760 mm. of mereury) of permanent gases generated by the explosion of 1 gramme of dry powder is—~~

~~Curtis & Harvey, No. 6…....c0.-ecccccescreee0 Mining~~

~~seooeee 241°0 eurdic centimetres. 3603 yy ”~~

~~MM. Sarrau and Vieille have communicated to the Academy of Seiences? the results of their researches concerning the decomposi- tion of certain explosives, and more particularly gun-cotton and nitrated gun-cotton. The following table shows, in litres, the volume (at 0° C, and 760 mm. of mercury) of each of the gases per kilogramme of the substance exploded in a closed vessel: —~~

~~PPrrererrerre ree reer~~

~~Kind of Explosive. CO.| CO>.| H.| N.|0./C2Hy.| HS.| Total. es = aie ie | aca a Pure gun-e0tton…….ccce. eee 234 | 234 | 166] 107)... 741 Gun-cotton~~

~~*and nitrate of | potash (50 per cent. ott 171 109 | 45 825 GROM) <: <.oeetele ccavoneacnceenc i Gun-cotton (40 per cent.) and nitrate of ammonia 184 211) 6 401 (60) ner Gent.) 2... ..esresres | NIEPO-QIY CEPI... ceccese seceevess] ove 295 || >.. |d47 25 Ses 467 Ordinary blasting powder…... 64) 150 4) 6G…) 24 ipa 304*~~

~~*_ If, however, the explosive is decomposed at a pressure approach- ing that of the atmosphere, the volumes (again at 0° C. and 760 mm. of mercury) are very different, as shown below:—*~~

~~*Kind of Explosive.*~~

~~*Pure gun-cotton…….. Sctvomcsniee 139 | 237; 104 | 45 | 33 a 565 Gun-cotton and nitrate of ral potash (50 per cent. of each) 56] 57) 3 iJ 196*~~

~~*nitrate of ammonia (60 per*~~

~~*Gun-cotton (40 per cent.) and*~~

~~*122*~~

~~*cent.) —*~~

~~*218*~~

~~*When explosives are decomposed in this way they liberate nitrie*~~

~~*1 Report of the Commissioners Appointed to Inquire into the Condt- tion of all Mines in Great Britain to which the Provisions of the Act 23 & 24 Vict. c. 151 do not apply, Appendix B., p. 224.*~~

~~*2 "On Fired Gunpowder," Captain Noble and Mr F. A. Abel Phil. Trans., 1880, p. 278.*~~

~~*Bree Recherches expérimentales sur la décomposition de quelques explosifs en vase clos ; composition des gaz formes,' Comptes Rendus, 1880, pp.1058 and 1112.*~~

~~*| air-way may be constructed*~~

~~here, especially as the ventilating machines in metalliferous~~

~~| mines generally cannot for one moment be compared with~~

~~the powerful appliances employed in collieries. In vein- mining there are generally many more shafts than in collieries, and natural currents are set up which are often considered sufficient for ventilating the mines; never-theless, the advanced workings, such as the ends, rises, and winzes,—in fact all workings in the form of a cul-de- sac,—are likely to require special means of ventilation as soon as they proceed a little distance from the main air-current.~~

~~The means of ventilating a drift or heading are various. Tf a natural or artificial draught exists at the mouth of the drift, it may be diverted by an up- right partition (Jrattice), or an Y~~

~~along the roof or floor by a horizontal partition of planks (air-sollar) (fig. 89). In this~~

~~Fig. 89.~~

~~way a sufficient supply is~~

~~secured at the end or fore-breast. The water-blast is another simple~~

~~appliance ; it is pre- cisely the same as the well-known tromp, and it blows a current of air through square pipes made of boards, or better through cylindri- 7/7//7//// cal pipes of sheet zine. The fall of water may be applied by Williams's water-jet, shown in fig. 90. The jet of water acts like an injector, and creates a powerful current.~~

~~Small fans driven by boys, or better by small water- wheels or other machinery, are frequently applied, and the~~

~~4 Op. cit, p: B22.~~

~~LIGHTING.|~~

~~*Harz blower (duck machine, Cornwall) (fig. uncommon. 'This is merely an air-pump of construction which is worked by the main rod of the pumps, and can be arranged so as to exhaust the foul air or force in fresh air.*~~

~~*In working in blasting ground, boring-machines driven by com- pressed air are becoming more and more largely used every day, and the exhaust air escaping from the machines is invaluable for ventilation. At the same time, on account of volley firing, the quantities of dele- terious gases generated in a short space of time are very considerable ; and, in order to get rid of them speedily, the compressed air may be*~~

~~*91) is not very simple*~~

~~*Fig. 91. . utilized for working a Korting aspirator or the somewhat*~~

~~*similar ventilator of Mr Teague, a jet of compressed air turned into a ventilating pipe, which creates an exhaust*~~

~~*(fig. 921). Naturally this MAM nee ee ly*~~

~~*ventilator is merely*~~

~~*brought into play at the 7 G*~~

~~*time of blasting, and I while the boring ma- GH Sacaaiasiantaniaineate . chinery is out of use. MM La*~~

~~*When compressed air is Fig. 92.*~~

~~*being supplied on a large scale to a mine for boring and winding machinery, it is often convenient to convey it by a small gas-pipe to working places in which the ventilation is inadequate. Of course, in one sense, it is very unecono- mical to compress air to a pressure of 60 or 70 ib to the square inch for ventilating purposes only; but, where com- pressing machinery is always at work on the mine, it may be better to be a little wasteful of cheap power at the sur- face than to go to the greater expense of having a man or boy to work a fan underground.*~~

~~*Mines are lighted by lamps, torches, candles, and electricity. The subject of safety lamps for fiery mines has already been discussed (see Coat, vol. vi. p. 72), and consequently the question of illuminating mines may be treated in a very summary manner.*~~

~~*Lamps vary very much in shapeand size. The Sicilian miner has a mere shallow cup of unglazed pottery ; the Saxon a small tin or brass lamp in a wooden box lined with tinplate and open in front. In the Harz the miner prefers a heavy flat iron lamp with a hook by which it is stuck into the timber or any crack in the rocks ; in France, northern Italy, and parts of Spain, the iron lamp is lenticular in shape and also suspended by a hook. In Scotland, and parts of Germany and the United States, a small tin lamp of the shape shown in fig. 98 is very common ; the hook Fin 03 enables it to be carried on the hat while climbing ig. 93. ladders, and to be fixed up underground. Olive oil and rape oil are burnt in these lamps ; petroleum lamps are employed occasionally.*~~

~~*The miners of England and Wales still cling to the tallow candle; and when surrounded by a lump of clay it can easily and quickly be fixed in the working place or carried upon the hat when climbing. Gas brought down from the surface answers for Uluminating large excavations, such as on-setting places and engine-rooms.*~~

~~*Up to the present time the electric light has been but little used underground on account of its want of portability, and the small- hess of the spaces requiring illumination. Very often a few men only are employed in each working place, and consequently the expense incurred in fixing and shifting the lamps and maintaining them alight would be out of proportion to the value of the work executed. However, an incandescent electric lamp has been invented weighing only 10 tb, which gives the light of three candles for six hours, and it may be reasonably expected that improvements will be made which will render the electric light more available for underground purposes than it is at present. When the area requir- ing illumination is large, an arc-lamp may be used with advantage.*~~

~~*1 Trans. Roy. Geol. Soc. Cornwall, vol. x. p. 142.*~~

~~Among the first successful applications of electric lighting to underground excavations may be mentioned that of M. Blavier at the Angers slate quarries.2 In the year 1879 he fixed two Serrin lamps in one of the large underground chambers with an area of 2400 square yards, and he found that they gave light enough for all the men at work. The total cost, reckoning everything, viz., coal, carbons, repairs, labour, depreciation of plant, and interest oncapital, is 50 francs per day ; the gas formerly in use cost 54 francs a day and gave much less light. It is evident, however, that the arc lights can only be applied with advantage in special cases where a large number of men are concentrated in one working area which can be illuminated from one or two points.~~

~~The large chambers in the salt mine of Maros-Ujvar in Hungary have been regularly lighted up by electricity since 1880. The cost is somewhat greater than that of the tallow, oil, or petroleum formerly in use ; but, on the other hand, the illumination is better, the men can do more work and are more easily supervised, whilst the air of the mine is not deteriorated by the products of combustion of the lamps.? ~~

~~12. Means of Descending into and Ascending from Means of~~

~~Mines.—Where mines are worked by adit-levels the men naturally walk in along the ordinary roadways; such mines, however, are exceptional, and the men generally have to climb down and up by ladders, or are raised and lowered by machinery. The means of access to and from workings may be classified as follows:—(1) steps and slides ; (2) ladders ; (3) cages ; (4) man-engines.~~

~~If a lode or seam is inclined at an angle or 40° or 50° from the horizon, steps may be cut in the floors of the deposit if it is firm enough, or wooden stairs may be put in with a hand-rail. Even with higher dips steps may be arranged by directing them in a line intermediate between the dip and the strike. In speaking of con- veyance underground, reference has already been made to the practice of carrying sulphur ore in Sicily and slate in Germany up to the surface by steps; and steps may be found in other foreign mines and occasionally in Great Britain. They are much less fatiguing than~~

~~ladders placed so flat that part of the weight of the body rests upon the arms. In some of the Austrian salt mines the men descend by wooden slides inclined at angles varying from 30° to 50°, flattening at the bottom to destroy the velocity gradually; the ascent is effected by steps.~~

~~Ladders are very largely used in metal mines all over the world, but they vary a good deal in different countries. The ladder consists of two sides and a series of rungs (staves, Cornwall). The sides are usually made of wood, and the rungs of wood or iron. The distance between the rungs is important; 10 inches from centre to centre is sufficient, for climbing upon ladders with the rungs 12 inches apart is decidedly more fatiguing. On the Continent wooden rungs are commoner than iron ones, and oak is preferred. Sometimes the wooden staves, instead of being round, are flat, so as to stand more wear, and iron sides may be seen in places where dry rot is very bad. Platforms should be fixed at short intervals, not exceeding 3 or 4 fathoms in perpendicular shafts, so~~

~~: gg as to prevent falls from having fatal Z i y |~~

~~consequences. Z In many cases sufficient attention is not paid to the angle of inclination of the ladders. A ladder is climbed with the least fatigue when the person uses his arms simply to steady hin- self, and is not compelled to pull himself up by them, as on a vertical _ ladder, or to support much of the © weight of his body by them, as happens with a very flat one. The best angle is about 20° from the xen vertical, and in Belgium the autho- Fig. 94. rities have very wisely decreed that no ladder shall be inclined at an angle of less that 10° from the vertical. Furthermore, of the two arrangements shown in fig. 94~~

~~SS~~

~~WES ASS~~

~~S~~

~~EWE SSG~~

~~*2M. Blavier, "L' Eclairage électrique aux Ardoisiéres d' Angers," Annales des Mines, ser. 7, vol. xvii., 1880, p. 5. — 3 Oesterreichische Zeitschrift sir Berg- und Hiilienwesen, 1882, No.*~~

~~*25, p. 296,*~~

~~*access.*~~

~~*Steps.*~~

~~*Slides.*~~

~~*Ladders.*~~

~~*Cages,*~~

~~*Man- engines,*~~

~~*462*~~

~~*A is better than B, because it not only affords a greater inclination for the ladders, but also renders it less likely that a man will drop through the opening (manhole) in the platform (sollar) if he loses his hold and falls. These may seem trifling matters; but, leaving aside the question of safety, the economy derived from fixing the ladders at the best inclination is by no means small. To make this apparent we must recollect the depths to and from which men have to climb, viz., 300, 400, and even 500 yards. It is important, therefore, to save every unnecessary expenditure of energy, which, though trifling for one ladder, becomes considerable when repeated a great number of times. When a mine has reached a depth of 200 yards, and a fortiori when it exceeds it, mechanical appliances should be introduced for raising and lowering the men, because time and strength are wasted by climbing. Medical men also are agreed that excessive ladder-climbing is injurious to the health of the miner. Therefore, both upon hygienic and financial grounds, one of the first thoughts in working a mine should be the conveyance of the men up and down the shafts by machinery with the least possible fatigue.*~~

~~*In collieries and other mines worked by perpendicular shafts, it has long been customary to raise and lower the men by the ordinary winding machinery already described. In the United Kingdom it is necessary that guides should be used if the shaft exceeds 50 yards in depth; safety- catches and disengaging hooks (Coat, vol. vi. p. 75) are frequently applied for the purpose of preventing accidents. The simplicity of this method of ingress and egress naturally renders it popular, and statistics prove that, where proper precautions are used, it is exceedingly safe.*~~

~~*The first man-engine was put up in the Harz in 1833, and nine years later a similar machine was fixed in Tresavean mine in Cornwall. Since that time this very useful means of conveying workmen up and down shafts has been resorted*~~

~~*_ to in other mining districts, and especially in Belgium and*~~

~~*Westphalia.*~~

~~*Two kinds of man-engine are in use, the double-rod machine and the single-rod machine. The double-rod or original man-engine consists of two reciprocating rods like the main rods of pumps, earry- ing small platforms upon which the men stand. 'The stroke is froin 4 to 16 feet, and the little platforms are so arranged that they are always opposite each other at the beginning and end of each stroke.*~~

~~*Figs. 95 and 96 represent the rods in the two final positions. A man who wishes to descend steps upon platform 6 (fig. 95); the rod B goes down, and A goes up, so that 6 (fig. 96) is brought opposite c. The man steps across from 6 to ¢, and then the rod A makes a down-stroke, B an up-stroke. Platforin ¢ is now oppo- w site d (fig. 95), and the man again steps across ; and 77 thus, by constantly stepping from the rod as it com- yy) pletes its down-stroke, the man is A gradually eonveyed to the bottom of*~~

~~*Ze SAAS AAs*~~

~~*the shaft. By reversing the process, or, in other words, by stepping off | B on to the opposite platform as soon as the rod has completed its up- 5 2 stroke, the man is raised to the sur- {ZF faee, without any fatigue beyond that | V7*~~

of the very slight effort of stepping sideways. If each rod makes four d 7, up and down strokes of 10 feet each Yj per minute, the rate of aseent or VE deseent will be 80 feet per minute. 1 Vy

The single-rod man-engine has one YY rod carrying steps, whilst fixed plat- Z

yj

forms are arranged in the shaft so as to correspond exactly with them (fig. 97). If a man wants to go down, he steps on to A when the up stroke is eompleted ; the rod goes Fj :

down and A is brought down oppo- eo HE

Fig. 97. site to the fixed platform }, on to which he steps off. He then

waits on 6 until the rod has finished its up-stroke. B is brought opposite 6; he steps on to B, the rod goes down and he is brought opposite ¢, where he steps off again and waits. By reversing the operation he is gradually lifted to the top of the shaft. The single-

rod engine may be used by men going up while others are going '

MINING

[MEANS. OF ACCESS.

down, provided that there is sufficient room upon the fixed plat- forms (sollars). The best plan is to have sollars right and left, as shown in the figure, and then the aseending men step off to the left, for instance, while the descending men take the right-hand sollars. The ascending man steps on to the man-engine as soon as the deseending man steps off, and so the rod may be always carrying men up or down. The usual stroke in Cornwall is 12 feet, and there are from three to five or six strokes a minute. With five strokes the men descend 10 fathoms a minute, or in other words a descent or ascent of 300 fathoms oeeupies half an hour. The reciprocating motion is best obtained from a crank, because in this ease the speed is diminished

~~gradually at the dead points, and the danger of an accident in stepping off and on is thereby dimin- ished; man-engines, however, are sometimes driven by direct-acting engines.~~

~~Man-engine rods are constructed of wood or iron; and at An- dreasberg in the Harz each rod is replaced by two wire ropes. Like a pun.p rod the man-engine rod requires proper balance bobs and catches, and for the safety of the men a handle is provided at a convenient height above each step.~~

~~The man-engine has one great advantage over the cage, which consists in the fact that it can be safely applied in inclined and even crooked shafts ; and it is for this reason that man-engines have been adopted in many metal mines unprovided with vertical shafts.~~

~~Careful comparisons as regards safety of travelling have been made in Prussia between ladders, man-engines, and cages. The average accidental death-rate is shown by the accompanying table, which gives averages for a period of ten years, 1871 to 1880:—~~

~~Ladders. | Man-engines. | Cages.~~

~~Average annual number of men travelling. 73,942 7,191 64,071 Total number of persons killed……. 75 41 74 Average annual death-rate per 1000…..... 0°101 0°570 0-115~~

~~a nnn nnn LEE EEE EE EEE!~~

~~The table shows that the cage is nearly as safe as ladders. In reality, if the actual distance travelled were taken into account, the cage would appear to be safer, because we may fairly assume that the mines in which men are hoisted by cages are on the whole very much deeper than those in which men ascend and descend by ladders. The man-engine appears to be decidedly more dangerous than either the cage or ladders. Here again a distinction requires to be made between the single-rod and the double-rod machines, and the Prussian statistics include many of the latter. It will be readily understood that a fall in a naked shaft with few fixed platforms is much more likely to be fatal than a fall in the shaft of a single-rod man-engine which is closed with the exception of the manhole at intervals of 12~~

~~feet. The Belgian warocquéres are rendered safer than the Harz or Saxon man-engines by having a railing round the pack of each platform on the rod. Some of the double-rod machines are made with large platforms so that two persons can stand on them, one going up and the other going down, or both travelling in the same direction. The use of double-rod man-engines has been entirely abandoned in the United Kingdom. The death-rate from accidents on man-engines in Cornwall and Devon during the nine years 1878 to 1881 was 0°17 per 1000 persons using them, whilst the annual death-rate per 1000 persons using ladders was slightly higher, viz., 0°19. If the actual distance travelled were taken into account, the scale would turn more decidedly in favour of the man-engine.~~

~~The cost of raising and lowering men by the man-engine is not great. At Dolcoath, a tin mine in Cornwall approaching 400 fathoms in depth (see figs. 62, 63), it is reckoned that 14d. per man per day covers all expenses, including interest upon the capital expended and depreciation of plant.~~

~~13. Dressing or Mechanical Preparation of Ores.—In a Dressing js large number of cases the mineral, as it is raised from the of ores. |~~

~~niine, is not ready for sale. It usually requires to be sub- jected to mechanical processes whereby the good ore is entirely or partly freed from valueless veinstone. These processes, which in a few special instances are aided by calcination in furnaces, are known as the dressing or mechanical preparation of the ores. Asa rule the valuable ore is specifically heavier than the veinstone, and most of the separating processes are based upon the fact that the heavy particles of ore will fall in water more quickly than the light particles of veinstone.~~

~~The processes of mechanical preparation may be classified as follows :—(1) washing and hand-sorting ; (2) disintegra- tion, or reduction in size; (3) classification by size or by equivalence ; (4) concentration.~~

~~(1) Sometimes the ore coming from the mine requires Washing),~~

~~simply to be freed from adhering particles of clay in order~~

~~DRESSING. |~~

~~*to be rendered fit for sale, at other times the washing is necessary as a preliminary process previous to sorting by hand. 'The operation is performed either by raking the ore backwards and forwards upon a grating under a stream of water, or in a box containing water, or, thirdly, by means of an inclined revolving iron drum worked by hand or any other motive power. The machines used for this purpose, known as washing trommels, are revolving cylinders or truncated cones of sheet-iron provided with teeth inside. The ore is fed in at one end, is subjected to the action of a stream of water, and is discharged at the other end.*~~

~~*The stuff, z.¢., the mixed ore, veinstone, and country rock, having been cleansed, it is now possible to make a separation by hand. Women and children are generally employed for this work, as their labour is cheaper and their sight sharper than that of men. The stuff is spread out ona table, and various classes are picked out according to the nature of the products furnished by the mine. Thus in a lead mine we may have—(a) clean galena, (6) mixed ore, 7.¢., pieces consisting partly of galena and partly of barren veinstone, (c) barren veinstone and country rock. This is a most simple case; very frequently we have to deal with a vein producing ores of two metals, especially in the case of lead and zinc, and then the classification into various qualities becomes more com- plicated.*~~

~~*(2) Reduction in size is necessary for two reasons. Even when an ore is sufficiently clean for the smelter, the large lumps are often crushed by the miner for the sake of obtaining a fair sample of the whole, or supplying a product which is at once fit for the furnace. The chief reason, however, for disintegration lies in the fact that the particles of ore are generally found enclosed in or adhering to particles of barren veinstone.*~~

~~*The disintegration is effected by hand or by machinery. Large blocks of ore and veinstone are broken by men with large sledge hammers, and the reduction in size is continued very often by women with smaller hammers. Sometimes the blow of the hammer is directed so as to separate the good from the poorer parts, and hand-picking accompanies this process, called cobbing. Ore may be crushed fine by a flat-headed hammer (bucking iron) on an iron plate.*~~

~~*The machines used for reducing ores to smaller sizes are very numerous ; here it is impossible to do more than briefly call attention to those most commonly used. These are stone-breakers, stamps, rolls, mills, and centrifugal pulverizers.*~~

~~*The stone-breaker, or rock-breaker, is a machine with two jaws, one of which is made to approach the other, and*~~

~~*Fig. 98.—Blake's Stonebreaker, improved by Marsden. so crack any stone which lies between them. The best- known stone-breaker is the machine invented by Blake, which has rendered inestimable services to the miner for*~~

~~*the last twenty years, and the introduction of which con- stituted a most important step in advance in the art of ore-dressing. Its mode of action is very simple. When the shaft A (fig. 98) revolves, an excentric raises the "'pitman" B, and this, by means of the toggle-plates C, C, causes the movable jaw D to approach the fixed jaw E by about 2 inch at the bottom. When the pitman descends the jaw is drawn back by an india-rubber spring. The jaws are usually fluted, the ridges of one jaw being opposite the grooves of the other, and they are so con- structed that the wearing parts are quickly and easily replaced.*~~

~~*Mr Marsden of Leeds has lately introduced a pulverizer, constructed on the principle of the stone-breaker, which will reduce large stones to the finest powder in one opera- tion. The moving jaw has an up-and-down as well as the old backwards-and-forwards motion, and the stones are first cracked and then ground by the double action.*~~

~~*Stamps are pestles and mortars worked by machinery. gtamps.*~~

~~*The construction of the modern California stamp mill with revolving heads is explained in Gop, vol. x. p. 747, and the description need not be repeated. In Cornwall the older form with rectangular heads still prevails.*~~

~~*It is impossible to give any correct average figures representing the work done by a stamping mill, because this varies with the hardness of the stuff treated and the fineness to which it must be reduced. However, it is usual in Cornwall to reckon | ton of tinstuff and in California 1 to 1) ton of gold quartz stamped per horse-power in twenty-four hours.*~~

~~*Stamps are principally used in dressing the ores of gold, silver, and tin, but are occasionally employed for those of copper and lead. The stamps described at vol. x. p. 747 act simply by gravity. Another form, which has met with favour in the Lake Superior district, is the direct- acting or Ball stamp, which works like a steam hammer, the blow of the head being assisted by the pressure of steam. At the Calumet and Hecla Mill, Lake Superior, each Ball stamp is capable of crushing 130 tons in twenty- four hours. Ina third kind of stamps, the heads are lifted by a crank and the power of the up-stroke compresses a cushion of air (pneumatic stamps) or a spring, storing up power which makes the down-stroke strike a heavier blow.*~~

~~*Revolving rolls were introduced in the west of England Rolls.*~~

~~*in the early part of the present century to replace bucking by hand. The machine, now often known as the Cornish crusher, consists of two cast-iron or steel cylinders which revolve towards each other, whilst at the same time they are kept pressed together by levers or springs. The cylinders or rolls are generally from 18 inches to 2 feet or 2 feet 8 inches in diameter and 12 to 22 inches wide.*~~

~~*Stone mills constructed like flour mills are employed in Mills.*~~

~~*some countries for reducing ores to powder; and the arrastra, which consists of heavy stones dragged round upon a stone bed, has rendered good service in grinding and amalgamating gold and silver ores, in spite of its being slow and cumbersome. Edge-runners (Chilian mills) also deserve mention.*~~

~~*Tron mills, known as pans, with grinding surfaces made of chilled cast-iron and arranged so that they can be quickly and easily replaced when worn out, are greatly in vogue in the United States for the treatment of ores of*~~

~~gold and silver ; the ore delivered to them is already finely divided, and they are intended, not only still further to reduce the size of the particles, but also and more especially to effect the amalgamation of the precious metals with quicksilver. The pulverizers used in Cornwall for grinding grains of tin ore with a little waste still adhering to them are also iron mills. ;~~

~~The centrifugal pulverizers are machines by which the~~

~~Centri- fugal pulver- izers,~~

~~Classifi-~~

~~464~~

~~pieces of ore are thrown with great velocity against bars or arms, or against each other, and so reduced to powder ; in other machines iron balls or iron rollers are whirled by centrifugal force against an iron casing and grind any mineral contained inside it. These pulverizers are much less used than stone-breakers, stamps, and rolls for the dis- integration of metallic ores. ;~~

~~(3) Classification of a crushed ore into sizes is absolutely~~

~~cation of necessary in some cases and advisable in others, because~~

~~ores.~~

~~Coneen- tration.~~

~~Jiggers.~~

~~the subsequent concentration is dependent upon the fall of the particles in water, as will be presently explained. Classification by size is effected by sieves. Hand sieves and flat sieves placed one above the other have been super- seded at most dressing establishments by cylindrical or conical revolving screens known as trommels. These screens are made of wire web or of perforated sheets of metal, and they are often arranged so as to discharge one into the other, so that the ore from a crusher can quickly be separated into classes of various sizes.~~

~~*With sizes of less than 1 millimetre (1; inch) trommels are no longer employed, and recourse is had to the so-called separators or classifiers. These are boxes in the shape of inverted cones or pyramids into which the finely crushed ore is brought by means of a current of water; a jet of clean water is often made to rise up in the bottom; the larger and the specifically heavier particles fall and are discharged with a stream of water at or near the bottom, whilst the smaller and specifically lighter particles flow away at the top. The separators do not effect a true classi- fication by size ; they merely cause a division by equevalence, a term which will be explained immediately.*~~

~~*(4) We now have to deal with the enriching of the ore, or the concentration of the valuable particles into as small a bulk as iseconomically advantageous. The concentration is generally brought about by the fall of the particles in water. Occasionally the fall in air is utilized; mercury is employed as a collecting agent in the case of gold and silver, and in a few instances magnetism can be applied.*~~

~~*The concentration in water depends upon the difference in specific gravity of the valuable ore and the waste vein- stone or rock. A piece of galena with a specific gravity of 7-5 sinks to the bottom more quickly than a similar piece of quartz, the density of which is only 2°6. Nevertheless a large piece of quartz may fall to the bottom as quickly as a small piece of galena. Particles which have equal velocities of fall, though differing in size and specific gravity, are said to be equal-falling, or equivalent. P. von Rittinger shows that a sphere of quartz of 4 inch in diameter would sink in water exactly as quickly asa sphere of galena of ;', inch in diameter, and these two particles are therefore equal-falling. Consequently, before we can separate properly by water it is necessary to classify the particles by size, so that equivalence shall not prevent a separation or lessen its sharpness. Jt is nevertheless true that in the early part of the fall of equivalent grains the influence of the specific gravity preponderates, and the denser particles take the lead; therefore, by a frequent repetition of very small falls, particles which have not been closely sized may still be separated.*~~

~~*The principal machine for concentrating particles of sizes ranging between 1 inch and #5 inch is the jig or jigger. The hand jigger is merely a round*~~

~~sieve which is charged with the crushed ore and then moved up and down ina tub full of water. The particles gradually arrange them- selves in layers, the heaviest on the bottom and the lightest at the top. On lifting out the sieve the light waste can be skimmed off with a scraper, leaving the concentrated pro- duct below ready for the smelter or for further treatment. Similar sieves worked by machinery were for a long time employed in dressing establishments, but the introduction~~

~~of the improved continuous jiggers has led to their The con-~~

~~abandonment in all works of any importance. tinuous jigger is one of the =~~

~~most useful dressing ma- chines of the present day. It consists of a box or hutch divided by a partial partition into two compartments ; in one is fixed a flat sieve s (fig. 99), which carries the ore, and in the other a piston p is made to work up and down by means of an ex- centric. The hutch being full of water, the movement of the piston causes the water to rise up and fall down through the ore, lifting it and letting it fall repeatedly. The effect of these frequent lifts and fallsistocauseasepa- ration of the previously sized ore into layers of rich mineral at the bottom, light waste at the top, and particles of ore mixed with waste in the middle.~~

~~The great value of these jiggers is the continuous discharge of the products without stoppages for their removal. Several methods are in vogue, viz., the end discharge, the central discharge, and the discharge through the meshes of the sieve. With the first, the enriched product lying at the bottom of the sieve passes out through openings at the end of the jigger, and the amount escaping is governed by an adjustable cap or shutter, by which the size of the openings can be increased or diminished at pleasure; the middle product can be discharged by openings placed a little higher up, whilst the waste is washed over the top of the end of the jigger at each ae Very often a first sieve simply separates a concen- trated product and discharges the poorer product into a second sieve, where a similar separation is effected. With the central discharge, a pipe is brought up through the bottom of the~~

~~*sieve, and the size of the opening for the escape of the concentrated ore is regulated by a cylindrical cap which can be raised or lowered by ascrew. The discharge through the sieve is especially adapted for the finer products from the crusher, though it is also used in some cases for grains up to $ inch in diameter. The mesh of the sieve is ehosen so that the par- ticles under treatment will just pass through, but above the sieve a layer of clean ore is} placed which prevents * {2 anything but the heavier particles from being dis- charged. The pulsations of the water, as before, cause a separation into layers, and the heavy rieh particles find their way through the bed and drop into the hutch, whence they can be drawn off through a hole at pleasure. The poorer part passes over a simple sill at the end of the sieve, or to a second sieve if necessary. Three or four sieves are occasionally arranged in a row in one machine. Y'*~~

~~*Fig. 100 is a section through the two sieves of a Harz sand jig. The pistons act in the manner explained by fig. 99.*~~

~~*pr WATER TROUGH. | — =3*~~

~~*TELE Ee IKE*~~

~~*The smaller sizes are concentrated by a variety of machines. The action of many of them is based upon the behaviour of particles carried down an inclined plane by a thin stream of water. If the gradient of the plane and the strength of the thin current are properly arranged, the denser particles will be deposited and the specifically ighter ones washed away, although they may be equal-falling if allowed to settle in deep water.*~~

~~*Frue vanner,*~~

~~*Buddles,*~~

~~*MIN*~~

~~*The principal machines for concentrating fine sands and slimes are the frame, rotating frame, percussion frame, side-blow percussion frame, revolving belt and Frue vanner, the hand buddle, the round buddle, and the keeve.*~~

~~*The frame is simply an inclined wooden table upon which a thin deposit is formed by the sheet of ore-and-waste-bearing water which is made to flow over it gently. The stream is then stopped and the deposit washed off by hand or automatically, aud collected in pits for subsequent retreatment by similar appliances if necessary.*~~

~~*The rotating frame is a round table with a very flat convex conical surface; the ore for suspension flows on at one part of the centre and forms a thin deposit which is richest at the top and poorest at the bottom, and this deposit is washed off so as to form two classes by means of jets of water, under which the table passes as it turns round. Concave rotating tables, fed at the circumfer- ence, are also employed.*~~

~~*The percussion frame, the Stossheerd of the Germans, is a table suspended by four chains which receives a succession of blows from a cam in the direction of the stream flowing over it; after each blow it bumps against a piece of timber before receiving the next blow. These bumps cause the ore to settle, and after a thick deposit is formed it is dug off with the shovel, the upper end being richer than the middle or the tail.*~~

~~*Rittinger's side-blow percussion frame is a suspended rectangular table ABCD (fig. 101), receiving blows and bumps on the side and*~~

~~*not on theend. A stream of orey ae we ow Rutt*~~

~~*DRESSING.*~~ |

~~*clean water W is supplied by the other head-boards H, H, H; and the table is pushed out by cams in the direction of the arrow, and is driven back by a spring so that the cross-piece E strikes against a bumping-block K. The light par- ticles travel down the table much faster than the heavy ones, and take a comparatively straight course; whereas the heavy and richer particles remain on the table, subject to the influence of the side-blows, for a much longer time, and travelling alongacurved path reach the bottomat F. The iniddle class is discharged at G aud the poor waste at K. The exact degree of richness of the products can be regulated by alter- : ing the pihctanny atrios of wood Fig. 101. which can be turned so as to divide the stream of ore and waste where thought most desirable. The great advantage*~~

~~*of this machine over the old percussion frame is its continuous action. The Frue vanner (fig. 102) may be looked upon as an improved form of Brunton's simple revolving belt. It is an endless band of india- rubber cloth, flanged on each side, which revolves slowly in QS the direction of the arrows, whilst at the same time it is shaken sideways by a crank motion. The orey water is fed on at A, clean water at B. The natural path of the particles is*~~

~~*water S is fed on at the corner A;*~~

~~*LAUNDER*~~

~~*Fig. 102.*~~

~~*down the inclined belt, but the specifically heavier ones settle upon*~~

~~*it and are carried upwards. Those that can resist the action of the stream of clean water at B go over the end and are washed off as the belt passes through the tank. The poor stuff falls into the waste launder. The degree of concentration can be regulated by the slope and speed of the belt and the strength of the streams of ore and water. The Frue vanner has the disadvantage that it makes ouly two classes, rich and poor, without any intermediate product.*~~

~~*The hand buddle isa rectangular wooden box with a sloping bottom. A stream of fine ore and waste suspended in water is fed in at the upper end and gradually forms a deposit on the bed of the buddle. A boy with a broom keeps the top of the sediment smooth, so as to ensure regularity of action. After a thick deposit has accumulated, it is << out in sections which decrease in richness from the upper end (head) to the lower end (fail).*~~

~~*Round buddles, like rotating frames, are of two kinds, convex and concave. The convex round buddle (figs. 103! and 104) is a circular pit with a truncated cone, or head, of varying size in the centre, and a bottom sloping towards the circumference. The orey stream A falling over this head runs down gently, depositing the heaviest particles near the top, the lighter ones further down, whilst the*~~

~~1 Henry T. Ferguson, "On the Mechanical Appliances Used for Dressing Tin and Copper Ores in Cornwall," Proc. Inst. Mech. Eng., 1878, pl. 41.~~

~~ING~~

~~lightest of all flow away at C. even by revolving brushes D.~~

~~465~~

~~The surface of the sediment is kept This machine may be compared to~~

~~20FEEr~~

~~Scale.~~

~~a number of hand buddles arranged radially round a centre. The deposit that is formed is dug out in rings of varying richness.~~

~~Fig. 104. The concave buddle is a circular pit with the bottom sloping to-~~

~~wards the centre. The stream of ore is fed all round the circum- ference, and runs inwards to the middle, where the lightest particles escape. The rich head is of course near the circumference.~~

~~The keeve is a large tub in which the fine stuff is stirred with Keeve. water and then is allowed to settle from a state of suspension while blows are being struck on the side of the tub. The deposit is afterwards scraped out in layers which increase in richness as they approach the bottom.~~

~~The series of processes employed in dressing an ore varies, Dressing not only according to the nature of the particular mineral different to be concentrated, but also according to the size of its ores. particles and the nature of the other minerals with which it is associated.~~

~~With gold the reduction in size is usually effected by Gold. stone-breakers and stamps, and much of the metal is then caught by mercury ; what escapes is concentrated with its accompanying pyrites by inclined tables covered with blankets, or by buddles, and the concentrate is treated by amalgamation or chlorination. See Goxp, vol. x. p. 746.~~

~~*In the case of silver the ore is frequently pulverized by Silver. stamps, and the resulting pulp amalgamated in pans or barrels. The ore may also be concentrated by any of the various machines described, and delivered to the smelter. Many of the ores of silver are sent to the smelting works without any concentration by water, as this would cause a serious loss.*~~

~~*Lead ore is generally crushed by rolls, often after a pre- Lead. liminary reduction in size by the stone-breaker. The crushed ore is classified by revolving screens down to the size of 1 mm., and the resulting grains concentrated by jigging ; dredge, or grains of ore and matrix, must be recrushed, sized, and jigged. The finer sizes are classified by pyramidal boxes and concentrated by frames, rotating tables, and buddles.*~~

~~*Zinc ore is dressed in the same way as lead ore ; and, as Zinc. galena and zinc-blende are frequently intimately associated together, it is necessary to separate them by the use of the jig, buddle, and frame.*~~

~~*XVI. — 59*~~

~~*Tin.*~~

~~*Copper.*~~

~~*Loss in dressing,*~~

~~*Separa- tion by magnet- ism.*~~

~~*Recent*~~

~~*improve-*~~

~~*ments,*~~

~~*466*~~

~~*Tin-bearing rock is crushed by the stone breaker and then stamped fine. The resulting sand and slime may be concentrated by the repeated use of the round buddle, with the keeve for a final cleaning; but often the sand only is enriched by the buddle, whilst the very finest particles, constituting an*~~

~~*almost impalpable mud (slime) when mixed with water, are treated by frames. When much pyrites is present it is necessary to make a preliminary concentra- tion and roast the enriched product (witts) in a furnace. The calcination converts the heavy iron and arsenical pyrites into a light oxide which can be got rid of with the rest of the waste by buddling and framing. The final product from the keeve is clean enough to approach pure cassiterite in the percentage of metal. Alluvial tin ore is concentrated in sluice-boxes, and sometimes by jiggers, after a preliminary treatment in a puddling-machine (GOLD, vol. x. p. 745) if there are balls of clay which have to be broken up. When the alluvial ore occurs as a hard con- glomerate (cement), it has to be stamped.*~~

~~*Copper ores are treated by crushing by rolls and some- times stamps, sizing by trommels, and then jigging and buddling ; but, as some of the ores are very friable and easily carried away by water, hand-picking is employed to a greater extent than with lead and tin ore, and the enrichment by water is not carried so far on account of the inevitable loss that would ensue. The amount of concentration depends upon the distance from the smelting works, and the mine-owner has to calculate whether it is best to get a low price for a large quantity of ore, after paying the carriage, or a higher price for a smaller lot (parcel) when due allowance has been made for the cost of dressing and loss sustained in that process. Thus, for instance, in Cornwall, the ore containing copper pyrites is dressed so as to contain only from 5 to 8 or 9 per cent. of metal, because it can easily be conveyed to Swansea by sea, and because further reduction in bulk would cause greater loss in value than the saving of freight.*~~

~~*The loss in dressing is very considerable. P. von Rittinger estimates it at from 30 to 50 per cent., and stubborn facts bear out his conclusions. Heaps of refuse from dressing floors are frequently worked over again with profit; and in the year 1881 no less than 909 tons of "black tin" (i.e, concentrated tin ore fit for the smelter), worth £35,283, were extracted from the muddy water allowed to flow away from the dressing floors of some of the principal Cornish tin mines.*~~

~~*The fall in air has been employed instead of the fall in water for concentrating purposes, and several ingenious air-jigs have been*~~

~~constructed and worked upon this principle.~~

~~In exceptional cases magnetic attraction may be utilized. Mag- netic iron can be separated in this way, and the magnetic process 1s applied for treating mixed blende and chalybite, the specific gravities of which are too close to render concentration by water practicable. The mixed ore is calcined, and the chalybite is thus converted into~~

~~magnetic iron, which can be extracted by a magnetic separator, leaving saleable blende.~~

~~Before concluding this part of the subject we will briefly~~

~~enumerate the principal improvements that have been |~~

~~made in metal-mining during the last quarter of a century. They are as follows :—diamond-drill for prospecting ; machine drills for driving, sinking, and stoping; use of compressed air for winding underground ; stronger explo- sives, especially the nitro-glycerin compounds dynamite~~

~~and blasting gelatin; increased use of steel for various | purposes ; Blake's stone-breaker and continuous jiggers ;~~

~~extended application of hydraulic mining ; larger employ- ment of electricity both for blasting purposes and for signalling by telegraph and telephone. It may be reason-~~

~~ably hoped that ere long electricity will render increased |~~

~~services to the miner for lighting the workings and for the transmission of power.~~

~~MINING~~

~~14. Recent Legislation affecting Mines in the United King- Recent~~

~~}~~

~~[LEGISLATION.~~

~~*dom.!—In England the person owning the surface of a free- hold is prima facie entitled to all the minerals underneath, excepting in the case of mines of gold and silver, which be- long to the crown. The crown, however, does not claim gold and silver extracted from the ores of the baser metals. The ownership of the minerals can be, and often is, severed from that of the surface, the latter being sold whilst the mineral rights are reserved by the original owner. Local customs, now regulated by Acts of Parliament, are still in force in Derbyshire (High Peak Mining Customs and Mineral Courts Act, 1851, 14 & 15 Vict. c. 94, and the Derbyshire Mining Customs and Mineral Courts Act, 1852, 15 & 16 Vict. c. 43) and in the Forest of Dean (1 & 2 Vict. c. 43, and 24 & 25 Vict. c. 40). The Stannaries Act (32 & 33 Vict. c. 19) regulates the commercial dealings of mining companies in Cornwall and Devon, and provides for their liquidation.*~~

~~*The working of mines in the United Kingdom is con- trolled by five Acts of Parliament, viz., "The Coal Mines Regulation Act, 1872" (35 & 36 Vict. c. 76), "The Metalliferous Mines Regulation Acts, 1872 and 1877" (35 & 36 Vict. c. 77, and 38 & 39 Vict c. 39), "The Stratified Ironstone Mines (Gunpowder) Act, 1881" (44 & 45 Vict. c. 26), and "The Slate Mines (Gunpowder) Act, 1882" (45 Vict. c. 3). The last three Acts simply refer to the annual returns, and exemptions from certain restrictions concerning the use of gunpowder.*~~

~~*The Coal Mines Regulation Act applies to mines of coal, stratified ironstone, shale, and fire-clay. The Metalliferous Mines Regulation Act applies to all mines uot included under the Coal Mines Act, and therefore controls not only workings for lead, tin, copper, and iron, commonly known as mines, but also the salt-mines, and under- ground quarries worked for stone, slate, or other earthy minerals. The principal provisions of the Coal Mines Regulation Act have been set forth at vol. vi. p. 78; those of the Metalliferous Mines Regulation Act are similar, but less strict owing to the almost complete absence of fire-damp. One important difference is that the manager of a mine under the Metalliferous Act need not hold any certificate of competency or service.*~~

~~*Other Acts of Parliament are the "Explosives Act, 1875" (88 Vict. c. 17), regulating the manner in which explosives are stored the 'Elementary*~~

~~*Education Acts, 1876 and 1880" (38 & 39 Vict. c. 79, and 43 & 44 Vict. c. 23), regulating the employment of children ; the '"' Factory and Workshop Act, 1878" (41 Vict. c. 16), which applies to the dressing floors of mines under the Metalliferous Mines Regulation Act.*~~

~~*The statute of Elizabeth (48 Eliz. c. 2) which was passed for raising money for the relief of the poor mentions coal mines, but omits other mines; these have been made subject to poor- rates by "The Rating Act, 1874" (37 & 38 Vict. c. 54). The "Employers' Liability Act, 1880" (43 & 44 Vict. c. 42), extends and regulates the liability of employers to make compensation for personal injuries suffered by workmen in their service. Finally, if, as sometimes happens, works are put up at a mine for roasting copper ores with comnion salt in order to extract the metal by the wet way, the provisions of the "Alkali, &c., Works Regulation Act, 1881" (44 & 45 Vict. c. 37), must be attended to.*~~

~~*It is thus very evident that the laws affecting mines have received most important additious during the last few years.*~~

~~*15. Accidents in Mines.—Mining is one of the occupa- Accident)*~~

~~*tions that may decidedly be called hazardous. This fact has been thoroughly impressed upon the public mind by explosions of fire-damp in collieries ; but, though accidents of this kind are appalling, owing to the number of victims who perish at one time, fire-damp is by no means the worst enemy with which the miner has to contend. Falls of roof and sides both in collieries and metal mines are far more fatal in their results. With the risks attending the collier's calling we need not deal, as statistics upon*~~

~~*1 For information concerning the laws relating to mines in the United. Kingdom, see W. Bainbridge, A Treatise on the Law of Mines and Minerals, 1878, and Arundel Rogers, The Law relating to Mines, Minerals, and Quarries in Great Britain and Ireland, with a Sum-*~~

~~*| mary of the Laws of Foreign States, 1876.*~~

~~this subject have been already given (see Coat, vol. vi. | mines prove that the occupation of the metal miner is p. 79); but the figures below relating to metalliferous | very little less dangerous.~~

~~Mines classed under the Metalliferous Mines Regulation Act in Great Britain and Ireland.~~

~~Number of Deaths from Accidents.~~

~~Death-rate from Accidents per~~

~~Persons Employed. 1000 persons employed.~~

~~Under Ground.~~

~~hl La aoe Genera] Falls of In Miscel- round, Under | Above | Under Ground Under Ground. | Above Ground. Total. Ground.| Shafts. feces. Total. pee abe ia | a | '| Above Ground. 1874 34,036 22,325 40 34 15 89 14 103 1°82 1875 34,905 23,168 32 35 | 33 | 100 19 119 2-36 | O89 2-05 1876 34,109 23,388 25 16 23 64 6 70 7: ales Aca 1877 34,095 23,300 41 21 24 86 11 97 2°52 0°47 1°69 1878 30,624 20,834 27 19 23 69 8 77 3235 | 0-38 149 1879 28,265 18,795 24 16 16 56 8 64 1-98 | 0-42 i-n6 1880 32,045 20,863 52,908 31 ili 18) 7a 13 84 PFI | 0°62 1°59 1881 33,291 21,651 54,942 | . 36 22 32 90 9 99 270 | O41 1:80 1882 33,814 21,692 55,506 30 27 17 74 18 92 218 | 083 1°65 Total and averages = oe ; 295,184 196,016 491,200 =~~

~~This table! shows that the average accidental mortality of the | ——- ————__-~~

~~persons employed wrderground in metalliferous mines is 2°37 per Minerals. ————__|__ Quantities, Values. 1000. During the ten years 1873-1882 the corresponding mor- Tate, E ae | tality at mines under the Coal Mines Act was 2°57, showing a (CO bonnenconosoooconnenoeeeeeeeneeoeeed | LEC GT 65,528,327 10 0 difference of only 0°20 per 1000 in favour of the metal miner ; and | | [TOM OTC .sssssessseeseseeeeseeeeteeeeees Be 6,201,068 6 6 when we take the well-kuown metalliferous distriet of Cornwall a 52. ee 1 ee ; é aud Devon we find a death-rate for the ten years mentioned of | |~~

~~Lead ore… eeeeeseessessencessssens 64,702 5 656,725 0 0 2°63 per 1000, which therefore exeeeds that of coal mines. . serie 35,527 7 110,048 10 8 Referenee to the table shows that more than one-third of the | | Gog Py CSsrrrrrrreetesteestecceeeneees ad BA ee aoe deaths were eaused by falls of ground. The actual pereentages of S 5 19° 358 7 0 the deaths are as follows:—falls of ground 35°5, in shafts 26-2, ie and nickel ore .. 63 14 309 12 8 miscellaneous 25°1, on surface 13°1. The aecidents in shafts are | | M@nganese….. — 2,884 0 6441 5 0 ; : PY Ol fiemtnae seers 2. « oeSeeceareereresesesn 54 7 5644 1 9 due to falls from ladders, cages, and man-engines, ropes and chains | | Ochre and UMbeT. seseeeeeeeeeeeee, 7,996 9 12,986 7 0 breaking, overwinding, and other eauses, whilst the miscellaneous | | Arsenic…...sssssseseessenseeeseene 6,156 8 45,070 7 6 aecidents include numerous fatalities in connexion with blasting | | (UOT SPar, GC…..seeeesesees 372 14 253 10 0 F : oe) 2,401,421 0 1,200,210 0 0 operations. The surfaee accidents are mostly eaused by persons se om eal 2998290 0 149,110 0 0 beeoming entangled in maehinery, and there have been several fatal | | Barytes……..eeeeesssssseeesesesseeeeees 21,313 11 23,894 3 10 boiler explosions, Sundry minerals, including In spite, however, of all the dangers to which miners are exposed, ere expan, calapa = eae 2) they are less likely to be the vietims of accident than railway ser- vants, among whom the rate of fatal aecidents varies from 2°5 per The total value of minerals produeed in 1881 was £76,201,695, 2s., 1000 on passenger traffie lines to 3°5 per 1000 on lines possessing | exelusive of slate, building-stone, limestone, and other stones worked a heavy goods traffie.? ; by mines and quarries. Statisties coneerning aeeidents in mines are published by many The quantity of eoal raised in 1882 was 156,499,977 tons. foreign countries; the most minute are those prepared by the The metals obtained from the ores produeed in the United~~

~~Government mining engineers in Prussia. The average annual | Kingdom in 1881 were— death-rates per 1000 persons employed below ground and above ground from aeeeidents in mines in Prussia during the fifteen years~~

~~Metals. Quantities. Values.~~

~~1867 to 1881 have been:— -coal mines 2°952, lignite mines 2°474, £~~

~~metal inines 1°446, other mines 1°693, all the mines together 2°476. || Gold… scsssessssetsscerseeseesetenseeeeeee 18 In making any comparison between these figures and those we have Silver, ae oS geen a { 67,140 given for Great Britain, it is necessary to recollect that the mines ‘oi 20,361,122 under the Coal Mines Act inelude some workings whieh in Prussia 839,680~~

~~would be classed as metalliferous, and that British mines under the Metalliferons Aet inelude underground stone-quarries.~~

~~Before coneluding the subject of aeeidents, it is neeessary to point out that sueeessful efforts have been made of late years to mitigate their results. In the first place, persons equipped with~~

~~£22,514,508~~

~~the Fleuss breathing apparatus ean now enter mines after explosions, The total valne of minerals and metals obtained from the mines in spite of the noxious and irrespirable gases, and save lives whieh and other mineral workings of the United Kingdom in 1881 was— would otherwise be saerifieed.? Secondly, by means of the instrue- £~~

~~tion afforded by classes established by the St John Ainbulance | Coal… ssessesssessessesessessessesesesesssnssoenseseeesesanessssteaeenees 65,528,327~~

~~Metals, as above.. — 22,514,508~~

~~Association, miners are learning how best to render first aid to the maneaiosiret red mee iI a aa 2,817,652~~

~~injured before the arrival of a medieal man, and there is no doubt that many valuable lives have been lost in times past for want of £90,860,487~~

~~this knowledge. Thirdly, a vast amount of good has been done From these tables it is evident that coal and iron are by far the by the establishment of Miners’ Permanent Relief Societies in | most important mineral productions of the United Kingdom, as 94 different districts, which afford aid to persons~~

~~disabled by accidents | per cent. of the total value is due to these two snbstanecs.~~

~~and to the dependent relatives of those who have unfortunately Franee.— The mineral productions of Franee® for the year 1880 are lost their lives by any mining fatality. set forth in the following table:—~~

~~16. Useful Mincrals produced in Various Parts of the Globc.~~

~~Values.~~

~~Quantities.~~

~~Great Britain and Ireland.—The mineral produce of the United Metric Tons. Francs. Kingdom for the year 1881 is summed by Mr Robert Hunt* as 19,362,000 | 246,687,000 foll 243,000 2,755,000 ne 144/000 1.023,000~~

~~2,874,000 peal~~

~~'1 y 133,000 114,~~

~~Frota Reports of H.M. Inspectors of Mines for the year 1882, ea 4690.00 p. Xxxvi. : , : 333,000 11,814,000~~

~~2 The Rate of Fatal and Non-Fatal Accidents in and about Mines 367,000: 6,719,000 aw ailways, with the Cost of Insurance against sueh Accidents —~~

~~ee, Ut u a ' Genera. totalsseesssessesssees ee 23,514,000 | 290,711,000~~

~~by Franeis G. P. Neison, London, 1880.~~

~~3 Reports of H.M. Inspectors of Mines for the year 1881, Mr ; 7 Bell's Peon ¢. 463. f ' 5 Statistique de Industrie Minérale et des A 'ppareils & Vapeur en~~

~~4 Mineral Statistics of the United Kingdom for 1881, p. ix. France et en Alyéric, Année 1880, Paris, 1882, p. 45.~~

The quantities of metal produced in Frauce from native and foreign ores in 18801 were—

Pig iron… 1,725,000 metrie tons. Nickel…....ccssees 30 metric tons. Lead…....0s0 ‘ 6,500 ,, “9 0) il Eyeeeereo scot 31 kilogrammes COpper. ...- ceeeeeee 3,400, “5 Silver…sseseeeeeee 40,400 –

ZINE. ..cccerceeseees 16,200, Aluminium…... . 1,150 3

Germany.—The mining industry of the German empire is of

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high importance. The output of the mines in 1881 is shown by the following table,—taken from the Stat. Jahrb. Siir das Deutsche Reich, Berlin, 1888, p. 27. The production of common salt, potassium ehloride, and other salts from brine is also considerable. The total quantity for the German empire in 1881 was 698,000 metrie tons, worth 38,567,000 marks, including 113,200 tons of potassium elloride valued at 14,090,000 marks.

[MINERAL PRODUCE OF

Silver | Iron Pyrites Total Value

Other Pe Rock- | Potash and and other ae of all the Coal. Lignite. | ‘gai. | ‘Salts, | Ho” OF Gold | Vitriol and cane Mining Ore. | Alum Ores. *| Products. Uae | Unte | Unit | Unis | Unit Unit | Unit Unit 1000 1000 1000 | 1000 | 1000)) } 1000 1000 1000 aan Metrie Metrie Metrie | Metric | Metrie Mctrie | Metrie | Metrie | Metrie Metrie Secs Tons. Tons. Tons. | Tons. Tous. Tons. | Tons. Tons. Tons. Tons. ss [= a3780°5. | o4l2-2 | 2078 | 545-4 | 39063 0-1 142-0 33-2 326,423 Poe ccececers 519°8 18-1 0°9 200 756 ese eA! 15 6,124 : 3707°8 609°7 eh . 23°8 26-7 0-1 1-2 33,057 wee aco 84-2 19°3 oes 0-1 m0 752 94 650 oot ose eee 5 0-0 3 110 mon Soncesaéocenane . 30°7 Bee 133°8 =o . 06 1,115 Meeklenburg….s.sseseeeees ner 12°3 oe ae oot 2 46 Thuringia we cocete 0°9 735°3 284 0-4 1-4 1,626 Brunswick. oc 273°7 oe or 96°4 × 18-0 1,578

~~oon 766°1 19°0 360°5 21 6,344 108-9 eae eee ese =e 965 con Bec 32°3 003 170 560°9 3-2 1096-0 97 German OMpire…….seccecccccres 48688 2 12852°3 311°9 905°9 54119 164°8 523°7 26°8 146°1 67°7 384,000 LUXCMDULE ....—ecccccccccseccccce tee oe =09 ose 2161-9 eee eee tee see see 4,994 Together ……ccccesecccccccccsereeeee 48688°2 12852°3 | 311°9 905°9 7573°8 523°7 26°8 14671 677 388,994~~

~~Austria-Hungary. Hungarian empire may : Transylvania for gold and silver ; Styria produces much of the iron ; quicksilver is yielded by the mines of Idria in Carniola, lead and silver by those of Przibrain_ in Bohemia ; salt is obtained in the Austrian Alps and in Galicia, which also produces petroleum and ozokerite.~~

~~The production of minerals and metals in Austria year 1881 was as follows :—~~

~~—Among the famous mines of the Austria-~~

~~5 during the~~

~~Gold OFe……..seceee 784 metric tons—Metallic gold……. 18°6 kilogrammes.~~

~~Silver Ore …...2+0. 12,383 ,, os silver…... 31,359 53~~

~~Quicksilver ore….. 48,20 a5 » — oo mereury.. 398 metric tons,~~

~~Copper Ore…...-+. 4445, » — » copper… 481 ,, *~~

~~Tron ore…....-----.. 618,963 4, so 4 ae a + “ eS § i» Gid……. 6385 ,, 3~~

~~Lead ore…... 13,542, » “—\ Lisdeege «me 2‘996 3 .~~

~~ZANCIOLE ....200-0-s-=- Dss9) » —letallie zinc ……. 4,819 ,, op~~

~~Manganese orc….. Oe109) 39~~

~~Graphite……..0-. TSO) Tse “a~~

~~*Petroleum … ase 1.249 |; 5*~~

~~*Lignite…..... ⁺. 8.961,498 4, fy*~~

~~*Comes cccseeresersens . 6,343,315 ,, a*~~

~~*Exclusive of salt, the value of the produce of the Austrian mines in 1881 was 44,693,692 florins. The total output of salt in 1881 was 267,279 metric tons, valued according to the monopoly prices at 23,000,498 florins.*~~

~~*Hungary in 1879 ® produced*~~

~~*1,593 kilogrammes. 18,660 ac 1,035 metric tons,*~~

~~*33 ” 3?*~~

~~*Belgiwm.—Belgium is rich in coal, the output in 1881 being no less than 16,873,951 metric tons, valued at 163,704,242 francs. Though it produces iron ores, it is largely dependent upon other countries, and especially the grand-duchy of Luxemburg, for supplies for its blast furnaces. The principal lead mine is that of Bleiberg, and the calamine deposits in the neutral territory of Moresnet have long been worked with success by the eelebrated Vieille Montagne Company, which also owns zinc mines in Belgium, Germany, Sweden, Sardinia, and Algeria.*~~

~~*Russia.—In a vast empire like Russia it is not surprising that there should be valuable deposits of a great variety of minerals.*~~

~~*Mercury*~~

~~*Among the most important are the auriferous alluvia of the Ural |*~~

~~*mountains and Siberia, which in 1880 yielded 115,940 troy tb of gold, worth more than 5 millions sterling. Platinum is found associ- ated with the gold-bearing sands of the Urals; the output in 1880 was 7895 troy tb. Zinc ore is largely worked in Poland. Import-*~~

~~*1 Statistique de U Industrie Minerale et des Appareils & Vapeur er Algérie, Année 1830, Paris, 1882, pp. 59 and 72.7 e Fear ee*~~

~~2 Detailed statistics eoucerning the mineral produee of Prussia are given every year in the Zeitschrift fir das Berg-, Hiitien-, und Salinen-Wesen im Preussischen Staate (Berlin).~~

~~3 Quantity less than 50 tons.~~

~~4 Detailed statistics of the mineral produee of Saxony are given yearly in the Jahrbuch fir das Berg- und Iftittenwesen tm Kénigreiche Sachsen (Freiberg).~~

~~5 Stat. Jahrb, des k. k. Ackerbau- Ministeriums fiir 1881, Weft iii., Lief. 1 Vienna, 1882. :~~

~~6 " Der Bergwerkshetrieb Ungarns im Jahre 1879," Oesterreichische Zatschrift fiir Berg- und Hiittenwesen, 1881, p. 271.~~

~~be mentioned those of Hungary and |~~

~~| extracted from the burnt ore by Claudet's process,~~

~~ant supplies of chromic iron ore are derived from the Urals, amount- ing in 1880 to more than 8000 tons. The metallic copper produced in 1880 was about 3100 tons, and the oil wells of Baku yielded in that year 346,000 tons of petroleum. Russia also possesses mines of iron ore, manganese, lead, silver, coal, and lignite. A little tin ore is furnished by Finland.~~

~~Italy.—The most important mineral in Italy? is sulphur, 359,540 tons (metric), worth 36,448, 453 lire, having been obtained in 1880,~~

~~| and mainly from seams containing the native element in the~~

~~Miocene rocks of Sicily and Romagna.~~

~~The celebrated iron mines of the island of Elba have been worked from very early times, and furnish a valuable ore ; and the deposits of calamine, lead ore, and silver ore in Sardinia form no small pro- portion of the mineral wealth of the Italian kingdom. The gold mines in and near the Val Anzasca (Piedmont) are producing more than 7000 ounces of metal yearly.~~

~~*Spain.—Spain is justly celebrated for its mineral wealth. It produces more cupreous pyrites than any other country in the world, and very large amounts of lead ore and quicksilver; and its iron ores are abundant and of excellent quality. The principal lead mines are in the provinees of Jaen (Andalusia) and Murcia, and the total amount of metallic lead produced in Spain or from Spanish ores is estimated to be 120,000 tons yearly.*~~

~~*Cinnabar, the heavy red ore of mercury, naturally attracted atten- tion at a very early date, and the world-renowned Almaden inine has been worked from time immemorial. The output in 1880 was 13874 tons (metric) of quicksilver.®*~~

~~*The cupreous pyrites, often known as sulphur ore, is obtained from the province of Huelva, where vast deposits occur over a belt of country nearly 100 miles long by 20 miles wide. The Rio Tinto mines are the largest in the district, and are worked on a gigantic scale. The company employs upwards of 10,000 hands, or more persons than are engaged in all the Cleveland iron mines, and the output is upwards of a million tons per anntum. About one-quarter*~~

~~*| of this, containing 3} per cent. of copper, is exported, mainly for the*~~

~~*manufacture of sulphuric acid and subsequent treatment for copper and silver, whilst theremaining three-quarters, with 25 to 24 per cent. of copper, are treated on the spot. 'T'he ore contains rather less than 1 oz. of silver to the ton, anda few grains of gold. These are profitably and some idea of the importance of the copper and silver will be gained by reference to the following figures. During the year 1881 there were obtained from cupreous pyrites imported into the United Kingdom in 1881, mainly from Spain and Portugal, 14,000 tons of copper, 258,468 oz. of silver, and 1490 oz. of gold. The total value of the silver and gold was £64,195,*~~

~~*The total output of iron ore in 1880 was 3,565,338 metric tons,!® more than two-thirds, viz., 2,683,627 tons, being obtained from the celebrated mines near Bilbao in the province of Biscay. England, France, Belgium, and Germany are all glad to draw supplies of*~~

~~*ee*~~

~~*7 Notizie statistiche sulla Industria Mineraria in Italia dal 1860 al 1880, Rome, 1881, p. 406.*~~

~~*5 : pay Minera de Espaita, correspondiente al aiio de 1880, Madrid, 1882, 9 Hunt, Mineral Statistics, &c., p. 45. 10 Estadistica Minera, &c., ut supra, p. 15.*~~

~~*DIFFERENT COUNTRIES. |*~~

~~*excellent red and brown hematite from the Bilbao mines. Murcia comes next in importance to Biscay, with a production of 589,328 tons.*~~

~~*Portugal.—The great mineral belt of Huelva extends into Portugal, and deposits of cupreous pyrites almost identical with that of Rio Tinto have been wrought from very early ages. The principal mine, San Domingos, is close to the Spanish frontier. It is estimated that the workings had yielded up to the year 1877 no less than 3,578,745 English tons of cupreous pyrites, by far the greater part of this having been extracted in recent times. The quantity of ore raised from the mine in 1882 was 405,029 tons.*~~

~~*Portngal possesses notable manganese mines, but produces com- patatively small quantities of iron, lead, and copper.*~~

~~*Norway.—The mines at Kongsberg are famous for the large quantities of native silver they produce, and enormous masses are sometimes inet with. The annual output is from 10,000 to 12,000 troy ounces. Copper ore and cupreous pyrites are also mined in Norway, and there are important workings for nickel and eobalt and for apatite. Allnvia) gravels have been washed for gold in Norwegian Finland.*~~

~~*Sweden.—Yhe most important mineral obtained in Sweden is iron ore, much being in the form of magnetite ; red hematite also is mined, and brown hematite is dredged up from some of the lakes. The principal iron-producing districts are those of Norberg, Danne- mora, Nora, and Perseberg. The output of the Swedish mines in 1880 was—*~~

~~*775,205 tons, 43,452 tons.*~~

~~12988 ,, 29,380 ,,~~

~~Greece. —One of the most interesting undertakings of modern times has been the re-working of the Laurium mines, whicli are situated in the southern extremity of Attiea ; and an account of them written by Cordella furnishes many curious details concerning the inethods of mining, washing, and smelting employed by the ancients. The workings for lead and silver appear to have been carried on with the greatest vigour between 600 3.c. and the Peloponnesian War, and were finally abandoned in the 1st century of the Christian era. Huge piles of slag which had accumulated from the old smelting works were found to be well worth being re-worked for silver and lead, and operations were commenced in 1864. Five years later the old heaps of mine refuse began to be treated, and at last in 1875 a French company resumed working the mine. A Greek company employing some 3000 persons is now producing annually from the old mine heaps no less than 8000 to 9000 tons of pig lead, yielding 45 oz. of silver to the ton, whilst the mines of the Compagnie francaise des mines du Lawriwm made an output in 1881 of 36,664 tons (metric) of roasted calamine, with 40 to 60 per cent. of zinc, in addition to lead ore and mixed ores. Cordella calculates that during the three hundred years the Lanrium mines were worked by the ancients the total amount of lead produced was 2,100,000 tons, with 224 million troy fbof silver. Besides this the ancients left behind two million tons of lead slags containing on an average 10°67 per cent. of lead, 109 million tons of mine refuse with 14 to 18 per cent. of lead, and exeavations to the extent of 51 million enbie yards with lead ore still in sight. They did not touch the calamine deposits.!_ Next in importance to lead, silver, and zinc comes bay-salt, and after that emery. The island of Naxos furnished 3300 metric tons of emery in 1877, valued at £28,000.~~

~~Africa.—Algeria is rich in iron, and three-fourths of the value of its total mineral output are due to ores of this metal. In 1880 the iron mines produced 614,000 metric tons of ore, Mokta- el-hadid mine, near Bona, alone yielding about 300,000 tons. Algeria also possesses mines of copper, lead, zinc, and antimony.~~

~~The name “ Gold Coast” applied to part of the shores of Africa, denotes its productiveness of the precious metal, and it is probable that very important~~

~~supplies of gold will one day be derived from various districts of the Dark Continent.~~

~~Cape Colony possesses rich copper mines in the Namaqualand division, which in 1882 produced ore and metal worth £331,546; however, the most valuable and remarkable mineral deposits of Africa at the present time are the diamond mines, The first diamonds were obtained from recent gravel in the bed of the Vaal river, and it was afterwards discovered that the precious stones could be obtained from the so-called dry diggings. The most im. portant of these, the Colesberg Kopje, now known as the Kimberley mine, produced in 1881 diamonds weighing 900,000 earats, worth £1,575,000. Three other neighbouring mines are Old De Beer's, which yielded 300,000 earats in 1881, worth £600,000, Du Toit's Pan, and Bulfontein. The value of the diamonds raised in South Africa since 1870 amounts to forty millions sterling ;? indeed the Kimberley mine alone was estimated in 1877 to have already pro- duced ten million pounds worth of diamonds, extracted from 4 million tons of diaiantiferous roek.~~

~~1 A. Cordella, " Mineralogisch-geologische Reiseskizzen aus Griechenland," Berg- und hiittenmdnnische Zeitung, vol. xlii., 1883, p. 21.~~

~~2-A, J. Macdonald. "The Value of the Cape as a Dependency of Great Britain," The Times, 3d May 1883.~~

~~| Asia.—For many centuries India was regarded as possessing fabulous inineral wealth, and a strong basis for this idea may be found in the existence of traces of mining on a very extensive seale. No doubt in early days India did supply what then appeared to be very large quantities of metals, and a country that produces gold and precious stones is apt to be endowed by the popular mind with boundless riches. The actual amounts of mineral raised in India at the present day are comparatively small. Gold exists over con- siderable areas, but it remains to be proved that the gold mines of the Wynaad and Mysore can be profitably worked by British com- panies. Diamonds occur and are worked in alluvial diggings aud in a~~

~~*conglomerate belonging to the Vindhyan formation. Sapphires and rubies are obtained from Upper Burmah, Ceylon® produced in 1880 no less than 10,286 tons of graphite or plumbago, valued at £192,879. Petroleum is abundant in Upper Burmah, and oil from wells has been utilized for upwards of twenty centuries. The total output in 1878 was estimated to be about 10,000 tons yearly. Tinore oecurs and is worked in Tenasserim. Passing into Siam and the Malay Peninsula we find deposits of alluvial tin ore, producing what is known in commerce as Straits tin. A little to the east are the islands of Banca and Billiton, which for many years have been a source of wealth to the Dutch Government. The sales of Banca tin in 1881 amounted to 4339 tons, and those of Billiton tin to 4735 tons, whilst 11,475 tons of Straits tin were exported from Penang and Singapore.* Stanniferous alluvia are also worked in Karimon, Singkep, and Sumatra, whilst the latter island possesses also valuable seams of coal.*~~

~~*Borneo furnishes coal, antimony ore, and some cinnabar; and river-gravels are washed for diamonds, gold, and platinum.*~~

~~*There is no doubt that the mineral wealth of China is enormons. In addition to important coal-fields it possesses numerous metallic mines. The province of Yunnan in the south of the empire seems to be specially favoured with regard to metalliferous wealth, for mines of gold, silver, copper, lead, tin, and iron are worked there, whilst jade and precious stones are found in the beds of rivers.*~~

~~*Japan produces more than 3000 tons of copper yearly, or about as much as the British Isles. The output of lead and tin is insignifi- cant, but the quantity of silver, exeeeding 300,000 oz. yearly, is worthy of notice. Gold, iron, and petroleum are other products of Japan.*~~

~~*The gold of Siberia has been mentioned in speaking of Russia.*~~

~~*Canada.—The Dominion of Canada is rich in minerals. Gold- bearing quartz veins are worked in Nova Scotia, whilst in British Columbia alluvial deposits are the main source of the supply. Silver oecurs on Lake Superior, the most important mine being that of Silver Islet, which from 1869 to the spring of 1877 yielded 24 million ounces of silver, and gave a profit of £200,000.*~~

~~*Rocks resembling the copper-bearing strata of the United States territory are mined in Miehipoten island in Lake Superior. Iron ores, in the form of magnetite, red hematite, limonite, and ilmenite, are worked in various parts of Canada.*~~

~~*Petroleuin is derived from oil wells in Western Ontario, and the quantity refined in 1875 was about 210,000 barrels, each of 40 gallons. It isin Ontario also that the veims of apatite exist from which a large amount of that useful mineral has been raised.*~~

~~*United States.—The mineral wealth of the United States is admirably summed up by Mr Richard P. Rothwell in his address*~~

~~*to the American Institute of Mining Engineers.®*~~

~~*“ Production of Coal, Metal, and Petroleum in 1881.6*~~

~~*Anthraeite…….. SREB ET GOEnIceDAnacOcGHO 30,261,940 tons (of 2240 tb). Bituminous coal 42,417,764 ,, (of 2000 tb).*~~

~~*Pig i7OM……..c-esecoseeeeeseeerseee 4,144,000 ,, (of 2240 Ib).*~~

~~*ia camer cecesens sissies <*~~

~~*‘The statisties of other useful minerals and metals show an equally marvellous advance during the past thirty years. The production of pig iron, which in 1852 was 541,000 net tons, in 1861 was 653,000 tons, and in 1871 was 1,708,000 tons. Ten years later, in 1831, we produced 1o less than 4,141,000 tons, an inerease in thirty years of nearly 800 per cent. ; ;*~~

~~*« Lead, which appears at 14,400 tons in 1852, varied but little from that figure until the construction of railroads into the argentiferous lead-mining districts of the west about 1870. Eureka, Nevada, Utah, and more recently Colorado, with its Leadville bonanzas. rapidly raised the production from 18,000 tons in 1871 to 47,000 tons in 18738, 75,000 tons in 1877, and 105,000 tons in 1881.*~~

~~*‘Our production of copper steadily increased from 1000 tons in 1852 to 31,000 tons in 1881,—the enormous output of that unrivalled mine Calumet and Heela steadying the production and neutralizing the fluctuations of the lesser mines.*~~

- ~~*Quicksilver has shown wide fluctuations, due more to trade combinations than to the condition of the mines. In 1852 the output amounted to 20,000 flasks;*~~

~~*3 Statistical Abstract for the Several Colonial and other Possessions of the United Kingdom tn each year from 1860 to 1880, London, 1882, p. 39.*~~

~~*4 Hunt, Min. Stat. for 1881, p. 9. ;*~~

~~*5 Engineering and Mining Journal, vol. XxXxiv. DP.*~~

~~*6 The total production of coal in the United States 86,862,614 tons of 2240 tb (Colliery Guardian for 1883, p. 731).*~~

~~*es in 1882 amounted fo The quantities of*~~

~~*ss tons of*~~

~~*metals produced in 1882 are estimated to be—pig iron 4,623,323 gro he ed*~~

~~*: B s (The fron, 2240 ib each, lead 123,000 gross tons, copper 40,000 gross tons (T Tron, Allied Trades in 1882, p. 188; Eng. and Min. Jour., yol. xxxyv. p. 27).*~~

~~*Plate IV.*~~

~~*470*~~

~~*but it went as low as 10,000 flasks in 1860, and rose to 53,000 flasks five years later; from this it declined to 15,000 flasks in 1875, though in the following year it grew to 75,000 flasks. Last year we produced 59,000 flasks.*~~

~~" Gold is the only metal in which our production has been declining. In 1852 it amounted to $60,000,000; but, with some fluctuations, it has now declined to less than $32,000,000 annually. t~~

~~"The production of silver, on the contrary, has largely increased. Commencing in 1859 with $100,000, it has now attained $45,000,000, In 1877 only were these figures exceeded, and then only by about $1,000,000. ;~~

~~"The production of petroleum, that great American industry, has grown with wonderful rapidity. In 1859 it commenced with only 3000 barrels, and, after an almost uniform increase, it attained last year the enormous figures of 27,000,000 barrels. Scientific investigation has recently raised a note of warning in this industry, asserting the limited area of oil-producing territory and its approaching exhaustion."~~

~~Some valuable statistics concerning the production of the precious metals in the United States are coutained in a report issued by the Censns Bureau.! The output for the year ended 31st May 1880 is suinmed up as follows :—~~

~~Silver.~~

~~1,033,974 |$21,374,152 580,767 | 12,005,511~~

~~33,379,663~~

~~31,717,297 80,177~~

~~$41,007,296 | $62,381,448~~

~~Deep mines…. 103,661 | 12,109,172~~

~~Placers~~

~~41,110,957 | 74,490,620~~

~~31,797,474~~

~~All mines.~~

~~1,614,741~~

~~The State producing the greatest value is Colorado, viz., $19,249,172, or gold 180,607 oz. and silver 12,800,119 oz. ; Cali- fornia comes next, having produced $18,301,828 of bullion, and then Nevada, with $17,318,909 of bullion. :~~

~~The greatest gold producer among the States and Territories is California, with 829,676 oz. of gold, half from deep mines and half from placers. Next follows Nevada, with 236,468 oz. of gold, of which only about 1 per cent. came from placer mines ; then Dakota, 159,920 oz. of gold, nearly entirely produced by deep mines ; and in the fourth rank Colorado, 180,607 oz., with a placer production of less than 5000 oz.~~

~~The greatest silver producer is Colorado, with 12,800,119 oz.; then Nevada, 9,614,561 oz.; then Utah, 3,668,365 oz.; Montana, 2,246,938 oz. ; and fifthly Arizona, 1,798,920 oz. '~~

~~It is useless within the limits of this article to attempt to convey an adequate idea of the enormous mineral resources of the United States. We can merely very briefly allude to some of the principal deposits, which are of commercial value on account of their magni- tude, of scientific interest owing to their mode of occurrence, and of technical importance as having led to the introduction of consider- able improvements in the arts of mining, milling, and dressing.~~

~~Among these may be mentioned the coal and anthracite mines and oil wells of Pennsylvania, the gold and quicksilver mines of California, the silver mines of Nevada, the lead and silver mines of Colorado, and the copper mines of Lake Superior. The articles CoaL (vol. vi. p. 60) and GoLp (vol. x. p. 743) may be referred to for information concerning the occurrence of these minerals and the method of extracting gold by hydraulic mining and improved stamping machinery.~~

~~Quicksilver in the form of native mercury and cinnabar occurs in considerable abundance in California, and much of it is found in connexion with serpentine, either in the serpentine itself or in sand- stone near its junction with serpentine. The inost important mines are those of New~~

~~*Almaden in the southern part of the State near San Jose. The deposit at Sulphur Bank in Lake County is of much geological interest. It consists of native sulphur, gypsum, and cinnabar in a decomposed andesitic lava close to an extinct geyser from which boiling water still issues. The top of the bank was worked open-cast for sulphur, and then for sulphur and cinnabar, and now underground mining is carried on in stratified sandstone and shale impregnated with cinnabar and underlying the lava.*~~

~~*Some of the most marvellous silver mines in the world are those upon the Comstock lode in Nevada. A horizontal section of part of this great vein is shown on Plate IV., copied from the excellent and well-known report of Mr J. D. Hague.? The strike is nearly north and south, and the dip about 43° to the east. " The vein matter of the Comstock consists of crushed and decomposed country rock, clay, and quartz." "Up to January 1, 1880, the Comstock had yielded in twenty years about $325,000,000 worth of bullion. The total length of shafts and galleries is about 250 miles. The number of men employed in the mines in January 1880 was 2800, earning average wages of $4a day. At the same date 340 men were at work in the amalgamating mills." The heat of the Comstock lode is remarkable, On the 2700 feet level of the Yellow Jacket mine Mr Becker found the temperature of the water to be 158°, that of the air 126° ; whilst the water in the Yellow Jacket shaft at a depth of 3065 feet has a temperature of 170° Fahr.4*~~

~~*1 Clarence King, special agent of the Census, Statistics of the Producti Precious Metals in the United States, Washington, 1881, p. 69. cael 2 United States Geological Exploration of the Fortieth Parallel, vol. iii., Mining indus, Atlas, plate 11. Clarence King, First Annual Report of the U.S. Geological Surve 3 _ 4 Op. cét., pp. 44, 45. Z De ae*~~

~~*MINING*~~

~~*[MINERAL PRODUCE OF*~~

~~*During the last few years the Comstock lode has been falling off in productiveness. In 1876 the total yield of the Comstock lode was $38,572,984 (gold, $18,002,906; silver, $20,570,078). During the census year ending May 31, 1880, the product of the whole Comstock district, including outlying veins, was $6,922,330 (gold, $3,109,156; silver,*~~

~~*$3,818,174), showing a decline of $31,650, 654, or 82°06 per cent., since 1876.° ;*~~

~~*Though the extraction of silver from its ores may be regarded as the business of the metallurgist rather than of tle miner, we must not forget to mention that it is to the necessities of the treat- ment of the Nevada ores that we owe the system of pan amalgama- tion first developed in that State and practised since in Colorado.*~~

~~*Another district in Nevada which cannot be passed over in silence is that which contains the Eureka and Richmond mines, which are celebrated, not only for the silver they have produced, but also for the important trial in which the issue hinged upon the defini- tion of the term vein or lode (p. 441). The bullion produced in the Eureka district from ore raised and treated during the census year ended May 31, 1880, was—gold, 62,893 oz.; and silver, 2,037,666 oz.; worth altogether $3,934, 621.§*~~

~~*The history of Leadville in Colorado seems like a romance when we read of the rapid development of the mines, the creation of a large and important town, the erection of smelting works and the building of railways, under very adverse conditions, in the heart of the Rocky Mountains, all within the space of four or five years. It affords additional proof that the miner is the true pioneer of civilization. The main facts concerning the Leadville deposits are admirably summed up by Mr S. F. Emmons, from whose report? we borrow, not only the following facts, but also the geological section across the district (Plate IV.).*~~

~~*The principal deposits of the region are found at or near the junction of the porphyry with the Blue limestone, which is the lowest member of the Carboniferous formation. This bed is about 150 or 200 feet thick, and consists of dark blue dolomitic limestone. At the top there are concretions of black chert. The porphyry occurs in intrusive sheets which generally follow the bedding, and almost invariably a white porphyry is found overlying the Blue limestone. This porphyry is of Secondary age ; it isa white homo- geneous-looking rock, composed of quartz and felspar of even granular texture, in which the porphyritic ingredients, which are accidental rather than essential, are small rectangular crystals of white felspar, occasional double pyramids of quartz, and fresh hexa- gonal plates of biotite or black*~~

~~*mica. Along the plane of contact with the porphyry the limestone has been transformed, by a process of gradual replacement, into a vein consisting of argentiferous galena, cerussite, and cerargyrite mixed with the hydrous oxides of iron and manganese, chert, granular cavernous quartz, clay, heavy spar, and "Chinese tale," a silicate and sulphate of alumina. The vein seems to have been formed by aqueous solutions, which took up their contents from the neighbouring eruptive rocks and brought about the alteration of the limestone as they percolated downwards through it. In Carbonate Hill, a gradual passage may be observed from dolomite into earthy oxides of iron and manganese. The masses of workable ore are extremely irregular in shape, size, and distribu- tion. They are often 30 to 40 feet thick vertically, and occasionally 80 feet, but only over asmallarea. The rich ore bodies are common- est in the upper part of the ore-bearing stratum. At Fryer Hill the Blue limestone is almost entirely replaced by vein material.*~~

~~*In the census year ended May 31, 1880, Lake County, Colorado, which includes the Leadville district, produced 28,226 gross tous of lead, with 3830 oz. of gold and 8,853,946 oz. of silver, of a total value of $13,032,464.8*~~

~~*The most important copper mines of the United States are those on Lake Superior, where the native metal occurs "in veins, in large masses, or scattered more or less uniformly in certain beds which are either amygdaloid or conglomerates." ®*~~

~~*The copper-producing districts are those of Ontonagon, Keweenaw County, and Portage Lake. The last-named contains the famous Calumet and Hecla mine, which alone produced 15,887 tons of copper in 1880, or about half the entire output of the United States. The deposit from whence this vast amount of copper was obtained is a bed of conglomerate, generally called a vein, dipping about 38° north- west. It has been worked for a depth of 2250 feet on the incline. In 1875 the stuff stamped yielded 44 per cent. of copper.*~~

~~*In conclusion, we will point out that the value of the mining industry in the United States exceeds that of any other country in the world, Mr Porter estimating it for 1879-1880 at 360 million dollars, and that of Great Britain at 325 millions.° Germany holds*~~

~~5 Clarence King, Statistics of the Production of the Precious Metals in the United States, Washington, 1881, p. 19.~~

~~8 Opctt., Da2l.~~

~~7 Abstract of a Report upon the Geology and Mining Industry of Leadville, Colorado, Washington, 1882.~~

~~8 Clarence King, op. cit., p. 47.~~

~~9 Charles E, Wright, commissioner, Annual Report oy the Commissioner of Mineral Statistics for the State of Michigan for 1880, Lensing, Michigan, 1881.~~

~~es "ew P. Porter, The West from the Census of 1880, Chicago and London, Depelge~~

~~MIN the third rank, followed by France and Russia. The United States produce 38 per cent.' of the gold yield of the whole world, 50 per cent. of the silver, 22 per cent. of the pig iron,? 29 per cent. of the steel, and about 25 per cent. of the lead.~~

~~Mexico has been renowned for its gold and silver mines ever since the Spaniards first took possession of it, and its production is still very considerable. Indeed, after the United States, it still produces far more silver than any other country in the world. The average annual output of silver during the twenty-five years 1851 to 1875 is estimated by Dr Adolf Soetbeer at 501,520 kilogrammes, or 16,124,235 oz. ;? whilst the average annual output of gold during the same period was 1785 kilogramimes, or 57,389 oz. Tin ore occurs in considerable quantities in Mexico, and is likely to be worked on a large scale as soon as the tin district is opened up by a railway.~~

~~Central America possesses numerous gold mines.~~

~~South America.—Venezuela produces gold, copper, and a little lead. The copper is found at Aroa near the north coast, and the gold in the province of Guiana, which is now producing upwards of 100,000 oz. annually. It is~~

~~highly probable that the existence of this gold was known to the Indians, who reported it to Sir Walter Raleigh, and so led him to undertake his unfortunate expedition in search of "E] Dorado." French Guiana contains workable deposits of gold, and yielded 72,168 oz. in 1880.~~

~~The chain of the Andes forms a long belt of mineral-producing country. Beginning with the United States of Colombia we have a country rich in gold,—the State of Antiquoia being especially favoured in this respect. The annual yield of all the states is about 200,000 oz. Colombia has mines of rock salt, yielding 19,000 tons a year, and the emerald mine at Muzo has long been famous. Peru is renowned for its silver mines; the best-known are those of Cerro de Pasco, situated at an elevation of 14,000 feet above the sea-level. Passing into Bolivia, we must notice the silver mines of Potosi, the wealth of which is proverbial. Chili is best known as the principal copper- producing country of South America ; but its silver mines are not unimportant, and beds of nitrate of soda are largely wrought.~~

~~The most remarkable gold mines of Brazil lie in the province of Minas Geraes, whilst diamonds are obtained in that of Matto Grosso. In the Argentine Republic gold, silver, and copper mines are worked, especially in the provinces on the eastern flanks of the Andes.~~

~~The total annual output of the precious metal in South America is estimated to be upwards of 300,000 oz. of gold, and 2,000,000 oz. of silver. In 1877 Chili exported 35,128 metric tons of metallic copper, in addition to ore and regulus.~~

~~Australia,—Australia is remarkably rich in minerals, especially gold (see Gorn, vol. x. p. 744), tin, and copper, and its coal deposits are likely to be largely utilized in the future.~~

~~Queensland, though a young colony, has already made itself famous for gold and tin, and it also possesses vast resources of coal and copper, in addition to the ores of other metals. The quantity of gold sent by escort from the different gold fields was 204,388 oz. in 1880, in addition to what was carried by private hands. Tin ore was first worked in 1872 near the border of the colony with New South Wales, and large quantities of stream tin have~~

~~been obtained from very shallow alluvial diggings near Stanthorpe. Like gold,~~

~~Leap, about 50 ft. deep,~~

~~'DIFFERENT COUNTRIES. |~~

~~. not rich. 7A PEO UM, B SURFACE vies v4 aD) . — SRR TE eS hfs fo pe 7 eee —— ceiiig ois PAILS AERA EPS 5 ee (y PTAA ONY 4 fig pet aif hE ko ge aa K a \/< />~~ '

~~3 ,~~

~~Deep Leap, about 150 ft. deep; tin wash from 2 ft.~~

~~to 15 ft. thick.~~

~~E 4 GV ag ees : Peete a~~

~~=i fer AX ak vy Se cl cu gy |~~

~~ALA ANINY EY Zoe~~

~~fey ee 1 Skip fy a py "M4 a OK Ze, |S i hep has ie hes Yi Vege lerey dalek]: |·~~

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~~ING 471~~

~~the tin ore is not confined to one district ; it occurs and is worked at the North Palmer diggings; a little to the south is Great Western, rich in tin ore,~~

~~*and so is Herberton to the north-east on the other side of the Dividing range.*~~

~~*In 1881 New South Wales# produced minerals and metals worth £2,373,191, viz., 149,627 oz. of gold, 1,775,224 tons of coal, 8200 tous of tin, 5493 tons of copper, 6560 tons of iron, besides silver, oil-shale, and antimony. In addition to the facts concerning the oceurrence of gold already inentioned (Joc, cit.), it is interesting to note that auriferous conglomerates containing the precious metal in payable quantities have been discovered and worked in this colony in rocks of the age of the Coal Measures.> The most important tin district is that of Vegetable Creek in New England, which from 1872 to 1880 produced 20,988 tons of tin ore. The accompanying map (fig. 105%) shows the recent alluvium which has hitherto been*~~

~~*PY : if al idl, P, | ll lj iy Hy, nF hn mt : ; “ Nags » E>, Man os | gee.*~~

~~*Wy, My “yy*~~

~~*I) verity: Ss i ee | iw*~~

~~*Uy*~~

~~*M1 4 ime Moin,*~~

~~*Ve*~~

~~*FEET DEEP*~~

~~*Scale. —_.. 1. i 2 Miles, Fig. 105.—Sketch Map of Part of Vegetable Creek, New South Wales, showing recent and ancient tin deposits. The stippled part re- presents tin-bearing alluvium. The shaded part AB denotes basalt which has covered the lower portions of the ancient tin- bearing alluvia (deep leads), as explained in fig. 106. The rest is granite.*~~

~~*the main source of the supply, and the deep leads which, as far as explored at present, promise still greater riches. The section (fig. 106°) shows that these deep leads, like those of the gold fields*~~

~~LEAD, about 60 ft. deep, and very rich,~~

~~: SURFACE~~

~~Se SSS SSS SSS SRE — ..BASALT~:~ Se sean cK M4~~

~~5~~

~~os 5 ENGST IN SOE LS. "s/l See SIX fx] SRW L A SPAL AIS 4.)/% AED OE Rede Po 4 AM LSA Toe]! KH ULeL Y xh y AUER SINSIN OU < yald ah oph LiL, , aR > =f Bt ARs <1 "~~

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~~eee~~

~~Fig. 106.—Enularged Section (on AB of fig. 105) across Deep Leads in Vegetable Creek, New South Wales.~~

~~(GoD, vol. x. p. 748), are old alluvia preserved under a capping of basaltic lava. There are also numerous tin lodes which are begin- ning to be worked.~~

~~_ Victoria heads the list of gold-producing British colonies, having yielded in 18827 as much as 864,610 oz., of which 352,078 oz. were derived from alluvial deposits, and 512,532 oz. from quartz mines. 1077 tons of tin ore were raised and 375 tons of antimony ore,~~

~~South Australia is the great copper-producing province, though the yield is not so great as it was ten years ago. The principal~~

~~1 Clarence King, op. cit., p. 93.~~

~~2 James M. Swank, Statistics of the Iron and Steel Productions of the United States, Washington, 1881, p. 179. 3 Dr Adolf Soetbeer, Edelmetall-Produktion, Gotha, 1879, p. 60.~~

4 Annual Report of the Department of Mines New South Wales, for the 1881, Melbourne, 1882, 7 3 ‘ ~ vid

5 Annual Report of the Department of Mines, New South Wales, for the year 1876, Sydney, 1877, p. 173. , oa . 6 Furnished by Mr W. H. Wesley.

7 Mineral Statistics of Victoria for the year 1882, Melbourne, 1883, p. 7.

mines now at work are on Yorke’s Peninsula. In 18818 South Australia produced 3824 tons of copper, worth £263,370, and 21,638 tons of copper ore, worth £154,926.

In 1881 Western Australia exported 1400 tons of lead ore, valued at £11,204.

Tasmania, like some parts of Australia, is rich in tin ore, which is now obtained principally from an alluvial deposit at Mount Bischoff. The ore is now almost entirely smelted in the colony, and in 1880 the exports were 3951 tons of metal and 8 tons of ore, worth altogether £341,736.

New Zealand furnishes a considerable amount of gold from quartz reefs and alluvial diggings. The annual exports during the ten years 1862 to 1872 were often 600,000 and even 700,000 oz. Of late years the yield has gradually diminished, and in 1880 only 303,215 oz., valued at £1,220, 263, were exported. Silver is exported to the

§ Statistical Register of the Province of South Australia for the year 1881, Adelaide, 1882,

extent of 20,000 to 30,000 oz. annually ; it is mainly derived from the gold obtained in the Thames district, which contains about 30 per ceut. of the less valuable metal. Coal is worked in several places, but the total output is at present comparatively small.

New Caledonia.—The discovery of nickel ore in this island by M. Garnier in 1867 was one of great mineralogical interest, and it has since borne

~~*fruits of considerable commercial importance. The New Caledonia ores are hydrous silicates of nickel and magnesium, which occur in veins in serpentine, and contain from 7 to 18 per cent. of metal. The mineral is found on the Mont d'Or not far from Noumea. Most of the ore is sent to France to be treated.*~~

~~*MINISTRY. Ever since the introduction of monarchical institutions into England the sovereign has always been surrounded by a select body of confidential advisers to assist the crown in the government of the country. At no period could a king of England act, according to law, without advice in the public concerns of the kingdom ; the institution of the crown of England and the insti- tution of the privy council are coeval. At the era of the Norman Conquest the king's council, or as it is now called the privy council, was composed of certain select members of the aristocracy and great officers of state, specially summoned by the crown, with whom the sove- reign usually advised in matters of state and government. In the earlier stages of English constitutional history the king's councillors, as confidential servants of the monarch, were present at every meeting of parliament in order to advise upon matters judicial in the House of Lords; but in the reign of Richard II. the privy coun- cil dissolved its judicial connexion with the peers and assumed an independent jurisdiction of its own. It was in the reign of Henry VI. that the king's council first assumed the name of privy council, and it was also during the minority of this sovereign that a select council was gradually emerging from out of the larger body of the privy council, which ultimately resulted in the institution of the modern cabinet. Since the Revolution of 1688, and the development of the system of parliamentary govern- ment, the privy council has dwindled into comparative insignificance when contrasted with its original authorita- tive position. The power once swayed by the privy council is now exercised by that unrecognized select committee of the council which we call the cabinet. The practice of consulting a few confidential advisers instead of the whole privy council had been resorted to by English mronarchs from a very early period ; but the first mention of the term cabinet council in contradistinction to privy council occurs in the reign of Charles I., when the burden of state affairs was intrusted to the committee of state which Clarendon says was enviously called the "cabinet council." At first government by cabinet was as unpopular as it was irregular. Until the*~~

~~*formation of the first parliamentary ministry by William III. the ministers of the king occupied no recognized position in the House of Commons; it was indeed a moot point whether they were entitled to sit at all in the lower chamber, and they were seldom of one mind in the administration of matters of importance. Before the Revolution of 1688 there were ministers, but no ministry in the modern sense of the word ; colleague schemed against colleague in the council chamber, and it was no uncommon thing to see ministers opposing one another in parliament upon measures that ought to have been supported by a united cabinet. As the exchange from government by prerogative to government by parlia- ment, consequent upon the Revolution of 1688, developed, and the House of Commons became more and more the centre and force of the state, the advantage of having ministers in the legislature to explain and defend the measures and policy of the executive Government began*~~

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~~*MIN*~~

~~*To the list of works on mining mentioned in the article Coat (vol. vi. p. 81) the following may be added :—Callon, Cours d'erplottation des Mines, Paris; 1874, and English translation by C. Le Neve Foster and W. Galloway; Serlo; Leitfaden zur Bergbaukunde, Berlin, 1878; Zoppetti, Arte mineraria, Milan, 1882; A. yon Groddeck, Die Lehre von den Lagerstdtten der Erze, Leipsic, 1879 ; P. von Rittinger, Lehrbuch der Aufbereitungskunde, Berlin, 1867 ; Jahrbuch fir das Berg- und Huttenwesen im Kénigreiche Sachsen, Freiberg, annually; Annual Reports of H.M. Inspectors of Mines; Preliminary Report of Her Majesty's Commissioners Appointed to Inquire into Accidents in Mines, London, 1881; Annales des Mines, Paris, 6 parts published yearly; The Engineering and Mining Journal, New York, published weekly ; Transactions of the American Institute of Mining Engineers, Philadelphia ; Die berg- und hiittenmdnnische Zeitung, Leipsie,*~~

~~*weekly; Oesterreichische Zeitschrift fir Berg- und Htttenwesen, Vienna, weekly. (C, L. N. F.)*~~

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~~*gradually to be appreciated. The public authority of the crown being only exercised in acts of administration, or, in other words, through the medium of ministers, it became absolutely necessary that the advisers of the sovereign, who were responsible for every public act of the crown as well as for the general policy they had been called upon to administer, should have seats in both Houses of Parliament. The presence of ministers in the legislature was the natural consequence of the substitution of government by parlia- ment for the order of things that had existed before 1688. Still nearly a century had to elapse before political unanimity in the cabinet was recognized as a political maxim. From the first parliamentary ministry of William IIL. until the rise of the second Pitt divisions in the cabinet were constantly occurring, and a prime minister had more to fear from the intrigues of his own colleagues than from the tactics of the opposition. In 1812 an attempt was made to form a ministry consisting of men of opposite political principles, who were invited to accept office, not avowedly as a coalition Government, but with an offer to the Whig leaders that their friends should be allowed a majority of one in the cabinet. This offer was declined on the plea that to construct a cabinet on "a system of counteraction was inconsistent with the prosecution of any uniform and beneficial course of policy." From that date 't has been an established principle that all cabinets are to be formed on some basis of political union agreed upon by the members composing the same when they accept office together. It is now also distinctly understood that the members of a cabinet are jointly and severally responsible for each other's acts, and that any attempt to separate between a particular minister and his colleagues in such matters is unfair and unconstitutional.*~~

~~*The leading members of an administration constitute the Castner (q.v.). The members of an administration who are sworn of the council, but who are not cabinet minis- ters, are the lord-lieutenant of Treland, the vice-president of the council for education, the judge advocate general, and the chief officers of the royal household. The sub- ordinate members of an administration who are never in the cabinet, and who are seldom raised to the distinction of privy councillors, are the junior lords of the treasury, the joint-secretaries to the treasury, the paymaster-general, the junior lords of the admiralty, the parliamentary under- secretaries of state, and the law officers of the crown.*~~

~~During the present century the power of ministers has been greatly extended, and their duties more distinctly marked out. Owing to the development of the system of parliamentary government, much of the authority which formerly belonged to English sovereigns has been delegated to the hands of responsible ministers. As now interpreted, the leading principles of the British constitution are the personal irresponsibility of the sovereign, the responsibility of ministers, and the inquisitorial power of parliament. At the head of affairs is the prime minister, and the difference between theory and practice is curiously exemplified by the post he fills. The office is full of anomalies. Like the cabinet council the prime minister is unknown to the law~~

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~~and the constitution, for legally and according to the fictions of the constitution no one privy councillor has as such any superiority over another, yet practically the premier is the pivot on which the whole administration turns. He is the medium of intercourse between the cabinet and the sovereign; he has to be cognizant of all matters of real importance that take place in the different departments so as to exercise a controlling influence in the cabinet; he is virtually responsible for the disposal of the entire patronage of the crown; he selects his colleagues, and by his resignation of office dissolves the ministry. Yet, though entrusted with this power, and wielding an almost absolute authority, he is in theory but the equal of the colleagues he appoints and whose opposition he can silence by the threat of dissolu- tion. The prime minister is nominated by the sovereign. "1 offered," said Sir Robert Peel on his resignation of office, "no opinion as to the choice of a successor. That is almost the only act which is the personal act of the sovereign ; it is for the sovereign to determine in whom her confidence shall be placed." Yet this selection by the crown is practically limited. No prime minister could carry on the government of the country for any length of time who did not possess the confidence of the Honse of Commons ; and royal favour, if it were ever invidiously exercised, would ultimately have to yield to a regard for the public interests. As a general rule the prime minister holds the office of first lord of the treasury, either alone or in connexion with that of chancellor of the exchequer. Before 1806 the premiership was occasionally held in~~

~~*connexion with different other offices,—a secretaryship of state, the privy seal, and the like,—but it is now almost invariably associated with the post of first lord of the treasury. With the exception of the premier, whose duties are more general than departmental, the work of the other members of the administration is exemplified by the title of the offices to which they are called. The lord chancellor, in addition to the jurisdiction which he exercises in his judicial capacity, is prolocutor of the House of Lords by prescription, the keeper of the sovereign's conscience, the general guardian of all infants, idiots, and lunatics, and to him belongs the appointment of all the justices of the peace throughout the kingdom. In former times the lord chancellor was frequently prime minister; the earl of Clarendon in the reign of Charles IT., however, was the last who occupied that position. The lord president of the council, who is always a member of the Upper House, presides over the department of the privy council, exercises a general superintendence over the education department, and has to frame minutes of council upon subjects which do not belong to any other department of state. Sub- ordinate to his department are separate establishments in relation to public health, the cattle plague, and quarantine. The post of lord privy seal is one of great trust, though its duties are not very onerous, since they simply consist in applying the privy seal once or twice a week to a number of patents. Ever since the days of Henry VIII. the privy seal has been the warrant of the legality of grants from the crown and the authority of the lord chancellor for affixing the great seal. is always a member of the cabinet. As his official duties are light he is at liberty to afford assistance to the administration in other ways, and he has often to attend to matters which require the investigation of a member of the Government.*~~

~~*The secretaries of state are among the most important members of the ministry, and within the present century their number has been increased and their duties more specially consolidated. The ancient English monarchs were always attended by a learned ecclesi-*~~

~~*astic, known at first as their clerk, and afterwards as secretary, who conducted the royal correspondence ; but it was not until the*~~

~~*end of the reign of Queen Elizabeth that these functionaries were called secretaries of state. Upon the direction of public affairs passing from the privy council to the cabinet after 1688, the secre- taries of state began to assume those high duties which now render their office one of the most influential of an administration. Until the reign of Henry VIII. there was generally only one secretary of state, but at the end of his reign a second principal secretary was appointed. Owing to the increase of business consequent upon the union of Scotland, a third secretary, in 1708, was created, but a vacancy occurring in this office in 1746 the third secretaryship was dispensed with until 1768, when it was again instituted to take charge of the increasing colonial business. However, in 1782 the office was again abolished, and the charge of the colonies trans- ferred to the home secretary; but owing to the war with France in 1794 a third secretary was once more appointed to superintend the business of the war department, and seven years later the colonial business was attached to his department. In 1854 a fourth secre- tary of state for the exclusive charge of the war department and in 1858 a fifth secretaryship for India were created. 'There are there- fore now five principal secretaries of state, four of whom, with their political under-secretaries, occupy seats in the House of Commons. One of these secretaries of state is always a member of the House of Lords. The secretaries of state are the only authorized channels through which the royal pleasure is signified to any part of the body politic, and the counter-signature of one of thein is necessary to give validity to the sign manual; thus, while the personal immunity of the sovereign is secured, a responsible adviser for every act is provided who has to answer for whatever course the crown has pursued. The secretaries of state constitute but one office, and are coordinate in rank and equal in authority. Each is competent in general to execute any part of the duties of the secretary of state, the division of duties being a mere matter of arrangement. These duties are of the deepest importance to the welfare of the nation. The home secretary controls all matters relating to the internal affairs of the country: he is responsible for the preservation of the public peace and for the security of life and property throughout the kingdom ; he exercises extensive powers over the civil and military authorities of the country, and has a direct controlling power over the administration of justice and police in the municipal boroughs, over the police in and around London, and over the county constabulary ; and he is especially responsible for the exer- cise of*~~

~~*the royal prerogative in the reprieve or pardon of convicted offenders or the commutation of their sentences. The foreign secre- tary, as his name implies, is the official organ of the crown in all communications between Great Britain and foreign powers: he negotiates all treaties or alliances with foreign states, protects British subjects residing abroad, and demands satisfaction for any injuries they may sustain at the hands of foreigners. The secretary of state for the colonies has to superintend the government of the various colonial possessions of the British crown: he appoints the governors over the different dependencies of the crown, and sanc- tions or disallows the enactments of the colonial legislatures. This latter power has of late years been much curtailed owing to the establishment of responsible government in imost of the colonies ; still it is the duty of the secretary of the colonies to correspond with the colonial governors and to offer such suggestions as may be expedient to assist the deliberations of the colonial councils and to promote the welfare of colonial subjects. Until the year 1854 the direction of military affairs was practically divided between the commander-in-chief at the horse guards, the board of ordnance, the secretary at war, and the secretary of state for war and the colonies. Upon the declaration of hostilities, however, against Russia in 1854, the duties of war minister were separated from those of colonial secretary, and a secretary of state for war appointed, in whose hands the supreme and responsible authority over the whole military business of the country formerly transacted by the various depart- ments was placed. The actions of the commander-in-chief are sub- ject to the approval of the secretary of state for war. The duties of the commander-in-chief embrace the discipline and patronage of the army and the direct superintendence of the personnel of the army ; with the exception of those duties, everything connected with the management of the army in peace or war (its matériel and civil administration, &c.) remains in the hands of the war minister. The subordinate position of the commander-in-chief is the result of the British system of parliamentary government. The secretary of state for war is the minister of the crown and not of parliament ; although he is responsible to parliament for the advice he may give to the sovereign, yet it is in the execution of the royal authority and prerogative that he is superior to the officer commanding in chief. 'The principle of the constitutional army 1s that command, prefer- ment, and honour come to it from the crown; but the general prin- ciple is equally undisputed that for all pecuniary*~~

remuneration it is made to depend on parliament. By the constitution the crown exercises its authority only through responsible advisers, and hence it follows that the secretary of state for war is supreme over any authority in the army, including the officer commanding in chief. From 1784 to 1858 the territories belonging . the British crown in

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the East Indies were governed by a department of state called the board of control in conjunction with the court of directors of the East India Company. In 1858 this double goverument was abolished, and the entire administration of the British empire in India was assumed by the crown, and all the powers formerly exer- cised by the East India Company and the board of control were transferred to a fifth principal secretary of state. The secretary for India is responsible for everything connected with the Indian Government at home and abroad ; the whole of the Indian revenues are at his disposal, and the governor-general of India is subject to his control. Yo assist him in his labours, and to act asa check upon the exercise of his otherwise arbitrary administrative powers, this secretary has the aid of a council of state for India, consisting of fifteen persons, of which, however, he is the president. The members of the council for India cannot sit in the House of Commons.

The duties of the other members of the ministry can be briefly disinissed. The chancellor of the exchequer at present exercises all the powers which formerly devolved upon the treasury board ; he has the entire control of all matters relating to the receipt and expenditure of public money; he frames the annual estimates of the sums required to defray the expenditure of government in every branch of the public service ; and it is his duty to lay before the country the annual statement of the estimated expenses of govern- ment and of the ways and means by which it is proposed to defray those charges, including the imposition or remission of taxes. The first lord of the admiralty (since the abolition of the office of lord high admiral), with the aid of the junior lords who are called the lords of the admiralty, conducts the administration of the entire naval force of the empire both at home and abroad, and is respon- sible to parliament for all his political

~~*proceedings ; as the admiralty is but an executive board, it is, however, subject on certain matters — the number of men required for the naval service, the distribution of the fleet, the strength of foreign squadrons, &c. — to the control of the cabinet. The president of the board of trade takes cognizance of all matters relating to trade and commerce, and has to protect the mercantile interests of the United Kingdom ; until 1864 it was not necessary for the president to have a seat in the cabinet, but since that date he has always been a cabinet minister in order to insure for his advice on commercial matters a due consideration ; in*~~

~~*1867 the office of vice-president of the board was abolished. The |*~~

~~*chancellor of the duchy of Lancaster exercises jurisdiction over all matters of equity relating to lands held of the crown in right of the duchy of Lancaster; the office is, however, practically a sinecure, and is usually filled by a leading statesman whose time is at the service of the Government for the consideration of such important questions as do not come within the province of other departments. In 1832 the public works and buildings of Great Britain were for the first time placed under the control of a responsible minister of the crown, and were assigned to the charge of the commissioners of woods and forests ; but in 1851 the department of public works was separated from the woods and forests and erected into a board under the name of the office of her majesty's works and public buildings. The first commissioner of works is the head of the board, and in his hands is placed the custody of the royal palaces and parks and ofall public buildings not specially assigned to the care of other depart- ments. Since the establishment of his office the first commissioner has frequently had a seat in the cabinet. The duties of the post- master-general, of the president of the local government board, and of the minor members of the administration are so obvious from the titles of the offices they hold as not to call for any special mention.*~~

~~*The prime minister is responsible for the distribution of the chief offices of government between the two Houses of Parliament. Owing to the development of the House of Commons within the present century it is now considered advisable that a larger propor- tion of cabinet ininisters should have seats in that chamber than was formerly the case. In the first cabinet*~~

~~of George III. only one of its members was in the House of Commons and thirteen in the House of Lords. In 1783 Mr Pitt was the sole cabinet minister in the Commons. In 1801 four cabinet ministers were in the Commons and fivein the Lords. In 1804 Mr Pitt and Lord Castlereagh were out of a cabinet of twelve, the only ministers in the Commons. Iu the Grenville ministry (“ All the Talents’), of a cabinet of eleven seven were in the Lords and four in the Commons. In 1809, of Mr Perceval’s cabinet, six were peers and four commoners. In 1812 of Lord Liverpool’s cabinet, ten were peers and only two commoners. In 1818, ont of a cabinet of fourteen, six were commoners; and in 1822, out of a cabinet of fifteen, nine were peers. Since the Reform Act of 1832, however, the leading members of Government have been more equally apportioned between the two Houses.~~

~~See May, Constitutional Iistory of England; Cox, Institutions of the English Government; Alpheus Todd, On Parliamentary Government ; oie Hitorjiof Party. (A. C. E.)~~

~~MINK. The genus Putorius, belonging to the family Mustelide or Weasel-like animals (see Mammatta, vol. xv. p. 440), contains a few species called Minks, distin- guished from the rest by slight structural modifications, and~~

~~especially by semiaquatic habits. They form the subgenus Lutreola of Wagner, the genus Vison of Gray. As in other members of the genus, the dental formula is 7 3, ¢ ↑, p . m4; total 34. They are distinguished from the Polecats, Stoats, and Weasels, which constitute the remainder of the group, by the facial part of the skull being. narrower and. more approaching in form that of the Martens, by the pre- molar teeth (especially the first of the upper jaw) being larger, by the toes being partially webbed, and by the absence of hair in the intervals between the naked pads of the soles of the feet. The two best-known species, so much alike in size, form, colour, and habits that although they are widely separated geographically some zoologists question their specific distinction, are P. lutreola, the Nore or Sumpf- otter (Marsh-Otter) of eastern Europe, and P. wson, the Mink of North America. The former inhabits Finland, Poland, and the greater part of Russia, though not found east of the Ural mountains. Formerly it extended west- ward into central Germany, but it is now very rare, if not~~

~~*extinct, in that country. The latter is found in places which suit its habits throughout the whole of North America. Another form, P. scbéricus, from eastern Asia, of which much less is known, appears to connect the true Minks with the Polecats.*~~

~~*The name may have originated in the Swedish maenk applied to the European animal. Captain John Smith, in his History of Virginia (1626), at p. 27, speaks of ‘ Martins, Powlecats, Weesels, and Minkes,” showing that the animal must at that time have been distinguished by a vernacular appellation from its congeners. By later authors, as Lawson (1709) and Pennant (1784), it is ofteu written “Minx.” For the following description, chiefly taken from the American form (though almost equally applicable to that of Europe) we are mainly indebted to Elliott Coues’s Mur-bearing Animals of North America, 1877.*~~

~~*In size it much resembles the English Polecat, —the length of the head and body being usually from 15 to 18 inches, that of the tail to the end of the hair about 9 inches. The female is considerably smaller than the male. The tail is bushy, but tapering at the end. The ears are small, low, rounded, and scarcely project beyond the adjacent fur. The pelage consists of a dense, soft, matted under fur, mixed with long, stiff, lustrous hairs on all parts of the body and tail. The gloss is greatest on the upper parts; on the tule bristly hairs predominate. Northern specimens have the finest and most glistening pelage ; in those from southern regions there is less difference between the under and over fur, and the whole pelage is coarser and harsher. In colour, differeut specimens present a con- siderable range of variation, but the animal is ordinarily of a rich dark brown, scarcely or not paler below than on the general upper parts; but the back is nsually the darkest, and the tail is nearly black. The under jaw, from the chin about as far back as the angle of the mouth, is generally white. In the European Mink the upper lip is also white, but, as this occasionally occurs in American specimens, it fails as an absolutely distinguishing character. Besides the white on the chin, there are often other irregular white patches on the under parts of the body. In very rare instances the tail is tipped with white. The fur, like that of most of the animals of the group to which it belongs, is an important article of commerce.*~~

~~*The principal characteristic of the Mink in comiparison with its congeners is its amphibious mode of life. It is to the water what the other Weasels are to the land, or Martens to the trees, being as essentially aquatic in its habits as the Otter, Beaver, or Musk-rat, and spending perhaps more of its time in the water than it does on land. It swims with most of the body submerged, and dives with perfect ease, remaining long without coming to the surface to breathe. It makes its nest in burrows in the banks of streams, breeding once a year about the month of April, and producing five or six young atabirth. Its food consists of frogs, fish, freshwater molluscs and crustaceans, as well as mice, rats, musk-rats, rabbits, and small birds. In common with the other animals of the genus, it has a very peculiar and disagreeable effluvium, which, according to Coues, is more powerful, penetrating, and lasting than that of any animal of the country except the Skunk. It also possesses the courage, ferocity, and tenacity of life of its*~~

~~allies. When takeu young, however, it can be readily tamed, and lately Minks have been extensively bred in captivity in America both for the sake of their fur and forthe purpose of using them in like manner as Ferrets in England, to clear buildings of rats. (W. H. Ba~~

~~MINNEAPOLIS, the county seat of Hennepin county, Minnesota, United States, and in 1880 the first city of the State as regards population, lies on both banks of the~~

~~Mississippi, at the fails of St Anthony, 14 miles by river | St Lawrence system sends its waters towards the Atlantic,~~

~~above St Paul. The east side was first settled, under the name of St Anthony, which was incorporated as a city in 1860. The west side settlement, named Minneapolis, was incorporated as a city in 1867, and soon surpassed St Anthony in population. In 1872 the two cities were united under the name of Minneapolis. The chief in- dustries are the manufacture of flour and of lumber, for which the falls supply abundant water-power. The Missis- sippi here flows over a limestone bed resting upon a friable white sandstone; hence erosion is rapid, and the river banks show that the falls have receded from a position at the mouth of the Minnesota river. In 1851 90 feet of the limestone gave way at once; and, as the rock bed extends but 1200 feet above the present site of the falls, the destruction of the water-power was threatened. This has been averted by the construction of an apron, or inclined plane, of timber, with heavy cribwork at the bottom, and the building of a concrete wall in the bed of sandstone behind the falls and underneath the channel of the river. Yor this work the United States Government appropriated $550,000 and the citizens of Minneapolis contributed $334,500. The city has twenty-seven flour-mills, which can produce 29,272 barrels a day. The total product for the year ended September 1, 1882, was 2,301,667 barrels. The shipments of lumber for 1880 were 164,620,000 feet. The population in 1870 was 18,079; and in 1880, 46,887.~~

MINNESANGER. See Germany, vol. x. p. 525.

MINNESOTA, one of the north-western States of the American Union, extending from 43° 30’ N. lat. to the British Possessions (about 49° N. lat.), and from Wisconsin and Lake Superior on the east to Dakota on the west, between the meridians of 89° 39’ and 97° 5’ W. long. Its area, including half of the lakes, straits, and rivers along its boundaries, except Rainy Lake and Lake of the Woods, amounts to 83,365 square miles.

The surface of Minnesota is diversified by few elevations of any great height. In general it is an undulating plain, breaking in some sections into rolling prairie, and traversed by belts of timber. It has an average elevation above sea-level of about 1000 feet. The watershed of the north (which determines the course of the three great continental river systems) and that of the west are not ridges or hills, but elevations whose inclination is almost insensible. The southern and central portions of the State are chiefly rolling prairie, the upper part of which is crossed from N.W. to §.E. by the forest belt known as the Big Woods,— a stretch of deciduous forest trees with an area of about 5000 square miles. North of the 47th parallel, the great Minnesota pine belt reaches from Lake Superior to the confines of the Red River valley, including the region of the headwaters of the Mississippi and its upper tributaries, as well as those of the Superior streams. North of the pine region there is but a stunted growth of tamarack and dwarf pine. In the north-east are found the rugged ele- vations of the granite uplift of the shores of Lake Superior, rising to a considerable height; while in the north-west the surface slopes away to the level prairie reaches of the Red River valley. The surface elevation of the State varies from 800 to 2000 feet above sea-level. A short line of hills in the north-east reaches the latter altitude, while only the valleys of the Red River, the Mississippi, and the Minnesota fall below the former.

Geology and Soil.—The geology has not yet been mapped out with the precision attained in other States. The great central zone, from Lake Superior to the south- western extremity of the State, is occupied by granitic and metamorphic rocks, succeeded, in the south-east, by nar- rower bands of later formation. Within the great Azoic area lies the central watershed of the continent, from which the

~~*the Mississippi towards the Gulf of Mexico, and the Red River of the North to Hudson's Bay. These primordial rocks carry back the geologic history of Minnesota to pre- Silurian times. They form in the north-east, in the neighbourhood of Lake Superior, an extremely rough and hilly country, but as they reach the central and south- western portions of the State they for the most part disappear beneath the surface drift. This central belt is succeeded, on the south and east, by a stretch of sandstone, partially the true red Potsdam and partially a similar but lighter-coloured stratum, which some have proposed to designate the St Croix Sandstone. Isolated beds of sand- stone are found in various parts of the State. The north-western corner, stretching east from the Red River valley, is believed to be Cretaceous; but the great depth of drift and alluvium, disturbed by no large rivers, prevents a positive conclusion. The Lower Magnesian limestone underlies the extreme south-eastern portion of the State, and extends along the west side of the Mississippi to a point a little below St Paul; thence it takes a course almost semicircular, and finally passes out of the State at the south-western boundary. The Trenton limestone occupies a large field in the south and south-east; it comes to the surface in long irregular bands, and an island of it underlies the cities of Minneapolis and St Paul with the adjacent districts. The Galena limestone, the Masquoketa shales, the Niagara limestone, and the rocks of the Devonian age in turn prevail in the other counties of the south and east ; while the existence of the St Peter sandstone would scarcely be known but for its outcropping along the bluffs of the Mississippi, and at the famous waterfall of Minnehaha. From these various formations numerous kinds of stone valuable for building purposes are obtained. The grey granite of St Cloud is extremely hard and enduring. The Lower Magnesian furnishes two especially handsome building stones, —the pink limestone known as Kasota stone, and the cream-coloured stone of Red Wing, both easily worked, and hardening by exposure to atmospheric changes. . Naturally, from its location underneath the principal cities of the State, the Trenton limestone is the most widely used. Sand suitable for glass-making, and argillaceous deposits abound. The clays which make up so large a portion of the sur- face drift of the State are almost wholly of glacial origin. Overlying the deposits of sand, gravel, boulders, and clay is, in most portions of the State, a sandy loam, very finely divided, rich in organic matter, deep brown or black in colour, and of the greatest fertility. It is this soil which has given to the State its reputation for productiveness. Its*~~

~~depth varies from 2 to 5 feet in various parts of the State, and it has been described by Dr Owen as "excellent in quality, rich as well in organic matter as in those mineral salts which give rapidity to the growth of plants, while it has that durability which enables it to sustain a long succession of crops."~~

~~Rivers and Lakes.—The State holds a unique place with reference to the great water systems of the continent. The Mississippi takes its rise in Lake Itasca, north of the centre of the State. Before it leaves the State limits it becomes a great river, half a mile wide, and from 5 to 20 feet deep. It drains with its tributaries all the southern and central portions and a large area of the northern part of the State. It is navigable as far as St Paul, and at Minneapolis the falls of St Anthony afford unrivalled facilities for manufacturing. Of the many affluents of the Mis- sissippi the most important is the Minnesota, which after a course of about 440 miles flows into the main stream at Fort Snelling, 3 miles above St Paul. The source of the Minnesota is but 1 mile from Lake Traverse, the origin of the Red River of the North, and it is navigable during the high-water season for about 238 miles. Its principal tributaries are the Blue Earth, Chippewa, Redwood, Lac qui Parle, and Pomme de Terre. The Red River system drains the north-western part of the State, and its waters~~

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~~finally pass into Hudson's Bay, as also do those from the country drained by streams flowing to the Rainy Lake river and the lakes along the northern boundary line. East of this lies the region tributary to Lake Superior and the St: Lawrence system. This comprises an area within the State estimated at 9000 square miles. Its principal river is the St Louis. There are altogether about 2796 miles of navigable water in Minnesota.~~

~~The number of lakes isestimated at seven thousand. They are of all sizes, and are found chiefly in the northern two-thirds of the State. They have been classified geologieally into glacial or drift lakes, fluviatile or river lakes, oceupying basins on river courses, and lakes having rock basins either seooped. out by the action of glaciers or formed by the relative position of different geological formations. By far the greater number give evidence of glacial action in their origin. They abound over the region most deeply~~

~~*covered by the surfaee drift, and are especially prevalent in morainie districts, forming the southern fringe of the laeustrine area of North Ameriea. With the melting of the iee-sheet which onee overspread Minnesota its innumerable lakes eame into existenee ; and the gentle aeelivity of its slopes, precluding rapid erosive aetion, has tended to give permanence to the depressions constituting their basins. The census returns give 4160 square miles of water surfaee within the State. Most of the lakes are exceedingly picturesque in their sur- roundings. Forests skirt their shores, whieh are seldom marshy ; and their waters, abounding in various kinds of fish, are elear and eool. Besides the sanitary advantages afforded by the lakes, as supplying places for reereation and delightful summer resorts, they affect. the elimate to some extent, tempering the extremes com- monly experienced in northern latitudes. The faet that many of the lakes are gradually drying up must be explained by agricul- tural operations. The largest lakes, exclusive of Superior, lying wholly or in part in Minnesota are as follows :—Lake of the Woods, 612 square miles ; Red, 342; Mille Laes, 198; Leeeh, 194; Rainy, 146; Winnibigoshish, 78, and Vermilion, 63.*~~

~~*Flora and Fauna.—The flora and fauna present no marked differences from those of other States in the same latitude. Ina partial list of the birds of Minnesota, two hundred and eighty-one species are enumerated. Of wiuter birds fifty-two speeies have been elassified, twenty-three of them being permanent residents.*~~

~~*Climate. —The State lies so far north as to have a low mean annual temperature, and so far inland as to have the charaeteristie continental elimate. Its elevation above sea-level gives an agree- able rarefaction to the atmosphere, and makes the prevalence of fogs and damp weather unknown. Between June and January there is an annual variation from the summer heat of southern Ohio to the winter cold of Montreal. The winter, usually eom- ineneing in November, and eontinuing till near the end of March, is not a period of intense continued eold, but is subject to consider- able variations. Asa rule, the comparative dryness of the atmo- sphere neutralizes the severest effeet of exeessive cold. The snowfall is extremely light during most of the winter, but as spring approaches preeipitation beeomes greater, and there are frequently heavy snowfalls in February and March. The ehange from winter to summer is rapid, vegetation sometimes*~~

seeming to leap into full and active growth within the space of a few weeks. The summer months bring days of intense heat, but, with comparatively rare exceptions, the nights are deliciously cool. Hot days and eool nights make the ideal weather for a good wheat erop ; and the foreing heats of summer produce in luxuriant growth the vegetable life which belongs to the middle States. The Smithsonian chart assigus to Minnesota an average temperature for the hottest week in summer of from 85° to 90°, and for the eoldest week in winter from 10° to 20° below zero. The mean annual average, for all below 47° of latitude, it gives as 40°. Observations at St Paul, extending over a period of more than thirty-five years, show thie following mean temperatures:—spring, 45°°6; summer, 70°°6 ; autumn, 40°'9 ; winter, 16°°1; average, 44°°6. The average annual rainfall is about 25°5 inches. While this is not large, it is so distributed as best to subserve the purposes of vegetable growth. No moisture is lost in superfluous spring and autumn rains, or in the cold and non-producing part of the year, the precipitation, which jn winter is less than 2 inches, inereasing to about 12 for the sum- mer, To the season of vegetable growth belong 70 per eent. of the yearly measures of heat, 76 per cent. of the rainfall, and 76 per cent. of the atmospheric humidity. The prevailing winds are from the south or south-east. In 1880 rain or snow fell on 150 days, and in 1881 0n 167. Itisevident that the eauses which mitigate the actual severity of the climate as felt, which produce so large a nuniber of clear days, and which forbid the continued presence of a large amount of moisture in the atmosphere, are those which render a elimate healthful in the highest degree. Minnesota has been for many years a favourite resort for invalids. The curative properties of its elimate are especially marked in the ease of pulmonary complaints.

Agriculture.—The leading industry of the State is agriculture, The charaeter of the surface soil varies in different parts of the State with the charaeter of the underlying strata. The fertile land comprises about three-fourths of the entire area of the State. The

drift soil proper of the south and eentre, including the Minnesota valley and the greater part of that of the Mississippi, contains silica and calcareous matter, and is interspersed with alluvial river bottoms. The limestone soil,

~~*in which there is a large calcareous element, lies chiefly on the western slope of the Mississippi. The Red River valley consists of an argillaceous mould, rich in organic deposits. Around Lake Superior, wherever arable land is to be found, it is marked by a rich trap soil. North of the central fertile area, and in the neighbourhood of the sources of the Mississippi, is much swampy land, susceptible of easy drainage, with a large tract of sand and other drift detritus, unfavourable to production. Maize and potatoes flourish, and the uplands, which support hardwood ridges, are suited to general agriculture. To the extreme north the surface, while indicating mineral wealth, is utterly unfit, except in occasional isolated areas, for purposes of tillage.*~~

~~*Wheat has hitherto been the staple product of the State. Soil and climate are such as to ensure a large average yield, while the superior quality of the grain has given it a wide reputation. The other cereals are also cultivated with success. The tendency to diversify agriculture, especially in the southern part of the State, has been stimulated by several partial failures of the wheat crop, the locust invasions, and the competition of the farther north-west.*~~

~~*The area of the State includes 89,791,265 acres surveyed, 10,968,575 acres not surveyed, and 2,700,000 acres of lake surface. The total sales of public and railroad lands in 1879 and 1880 were not far from 4,000,000 acres. It is estimated that the aggregate of lands yet undisposed of, three-fourths of which may be profitably cultivated, is nearly 20,000,000 acres, exclusive of the lands belong- ing to the State. White Earth Indian reservation has thirty-six townships of prairie and timber land; and Red Lake reservation contains 3,200,000 acres.*~~

~~*Forestry.—A special census bulletin estimates the amount of merchantable white pine standing, May 31, 1880, as amounting in all to 6,100,000,000 feet. The entire cut for the census year 1880 was 540,997,000 feet. Of hardwood forest 3,840,000 acres remain, capable of yielding 57,600,000 cords of wood.*~~

~~*Every encouragement is afforded, both by the railway corpora- tions and the State, to tree-planting on the prairies. A quarter section is given to any one who will plant and keep in good condi- tion 40 acres of timber for eight*~~

~~*years. In 1880 there were planted 25,331 acres of trees, exclusive of those bordering highways and the windbreaks along the railroad lines.*~~

~~*Manufactures.—The manufactures of Minnesota are yet in their*~~

~~*infancy. The abundant water-power of the State, its proximity to*~~

~~*the coal-fields of Iowa, its superior transportation facilities, and the large demand for manufactured commodities are, however, rapidly developing this brane ofindustry. The most important industries are the manufacture of flour and that of lumber. The former natu- rally established itself in aState of immense wheat yield andabundant water-power. It received its greatest stimulus from the invention and adoption of the middlings purifying process, which produces the highest grade of flour, and to which the hard spring wheat of Minnesota is especially adapted. Among other manufacturing industries actively prosecuted are the making of brick, pottery, stoneware, and agricultural implements, and also meat-packing.*~~

~~*Commerce.—The geographical position of Minnesota gives it ex- tensive commercial interests. Two continental waterways terminate within the State. The Mississippi affords continuous navigation to European ports during eight months of the year. From Duluth numerous lines of vessels traverse the chain of great lakes, and transport the products of the west to the eastern seaboard. Three great transcontinental railway lines are connected more or less directly with the railroad system of the State. Twelve lines of rail- way from every part of Minnesota converge at the contiguous cities of St Paul and Minneapolis, and three great trunk lines from these centres to Chicago secure the advantages of a lively competition.*~~

~~*Education.—The common school system is supported by land grants, a local tax, and a State tax. The superintendent of in- struction is appointed by the governor. County superintendents are chosen by popular vote. Common school districts have boards of three trustees each. Six directors are appointed for independent districts. The permanent fund in 1881 was $4,850,000, and the current fund $260,835. The State university, located at Minnea- polis, is governed by a board of regents, consisting of the governor of the State, the superintendent of public instruction, the president of the university, and six others; both sexes are admitted, and tuition is free. The*~~

~~*State supports three normal schools. Forty- two aeademies and six colleges are sustained by denominational or private enterprise.*~~

~~*Administration.—The departments of Government are, as in all the States, the legislative, the executive, and the judicial. The State contains seventy-eight counties, of which some are still subject to change of boundary. From these are elected by districts forty-seven senators and one hundred and three members of the House of Representatives. The State officers arc a governor, lieutenant-governor, seeretary of state, treasurer, and attorney-general, all elected by the people. The term of oflice is two years.*~~

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~~*The governor has power to veto separate items of a money bill. judieiary is elective, and the termi of office seven years. requirements for citizenship are residence in the United States one year, in the State four months, and in the election district ten days preceding an election. _. Women arc allowed to vote for school officers aud upon questions relating to the management of schools, and are also eligible to sueh offices. No coumty can eon- tain more than 400 square miles. Extra sessions may be called, but no session can exceed sixty days in length. Under the last apportionment the State is entitled to five representatives in the national Congress.*~~

~~*The annual valuation of property for 1882, as equalized by the State board, gives the personal property as $79,219,445, the real estate $242,938,170. from $750,000, 000.*~~

~~*While Minnesota was still a Territory, but after it had adopted a State constitution, an amendment was added to the constitution authorizing the issue of a large ainount of bonds in aid of railway construction. Shortly afterwards, the companies having failed to fulfil their contracts and defaulted payment, the State foreclosed its mortgage on the lands, franchises, &c., of the roads, and turned them over to other companies. By another amendment to the constitution, the payment of the bonds was made contingent upon the result of a popular vote. Several proposals having failed to receive this sanetion, the necessity for it was removed in 1881 by a decision of the supreme court, declaring the aniendment uncon- stitutional. The legislature immediately met, accepted a plan of settlement proposed by*~~

~~*the bondholders themselves, and over $4,000,000 worth of new bonds were issued in exchange for the old. For the payment of the principal and interest of these the people have voted (November 1882) to set aside as a sinking fund the proceeds of 500,000 acres of land belonging to the State internal improvement fund, the deficit to be paid out of the tax on railroad earnings. These bonds include all the State debt except about $200,000.*~~

~~*Population. The population of the State was 6077 at the census of 1850, 172,023 in 1860, 439,706 in 1870, and 780,778 (419,149 males and 361,624 females) in 1880. According to the last census 299,800 whites had been born in the State; and of the 267,676 foreign-born inhabitants of the State 107,770 came from Seandina- vian countries and 68,277 from the United Kingdom and the British colonies, while 77,505 acknowledge the German as their native tongue. The increase of population in the State for the last decade of years alone was 75 per eent. The most important cities are St Paul, the capital, and Minneapolis, with 41,473 and 46,887 inhabit- ants respectively in 1880; Winona had 10,208 and Stillwater 9055.*~~

~~*History.—Missionary efforts and the trading spirit first induced white men to venture as far into the unexplored north-west as the boundaries of what is now the State of Minnesota. The earliest accounts of its natural features and native tribes appear in the Jesuit writings. The "Relations" of 1670-71 allude to the Sioux or Dakotas. In 1678 a company was formed for trading with this tribe. Du Luth was leader of this expedition, and later on went from Lake Superior to the Mississippi by canoe. But the first pub- lished account is that of Louis Hennepin, a Recollect monk, who, in 1680, visited the falls of St Anthony, and gave them their name, from that of his patron saint. For a eentury the only visitants of the wild region were a few missionaries, and a number cf fur traders who found the profit of the journey to more than couuter- balance its perils and hardships. To the latter class belong Perrot, who reached the Mississippi by way of the Fox and Wiseonsin in 1684, aud founded at Lake Pepin the first trading post in the State, aud Le Sueur, a Canadian, who ascended the great river from its mouth, and established another post above Lake Pepin. Captain John Carver, the explorer of the country of the upper Mississippi, visited the falls of St Anthony in 1766, being the first British tra- veller who reached the spot. On March 20, 1804, Upper Louisiana was organized, eonsisting of*~~

~~*Arkansas, Missouri, Iowa, and a large portion of Minnesota. From this time onwards the progress of explo- ration was rapid, and settlement followed in its train. The first really extensive exploration of any large part of what is now Minnesota was made between 1817 and 1823, by Major S. H. Long, of the United States engineer corps, in command of a Government expedition. About the same time the Red River received its first visitant. Thomas Douglas, earl of Selkirk, an Englishman of eccentric character, went, in 1817, to what is now Winnipeg, by way of York river. Having been struck with the agricultural possibilities of the region about the Red River of the North, he induced a colony of Swiss farmers to settle there. These were dis- appointed in the country, and unused to the severity of the climate, so that they finally removed to the vieinity of St Paul and_con- tributed to the earliest development of the agrieultural in- dustry of the State. In 1821 Colonel Snelling built, at the junction of the Minnesota and Mississippi rivers, a stronghold which he named Fort St Anthony. The name was changed to Fort*~~

~~*The*~~

~~*The legislature meets biennially. |*~~

~~*AUT*~~

~~*The State | Snelling in his honour, in 1824, and the fort is still an important*~~

~~*post as a base of supplies for the newer north-west. The first steamboat made its appearance at the head of navigation in 1823. The settlement of St Paul, one of the oldest towns as well as the capital, iscommonly dated from 1846, at which time there were a few shanties on its site. Population now began to arrive in constantly increasing numbers, and on Mareh 3, 1849, a bill passed Congress for organizing the Territory. It was proposed at one time to name it Itasca, but the name Minnesota, meaning, "sky-tinted water," and originally applied to the river bearing that title, was finally retained. The western boundary of the territory was fixed at the Missouri river, The population was but 4057, the largest town*~~

~~*: | had but a few hundred inhabit and ¢ i Te Geel valicor not tar | undred inhabitants, and a large part of the soil of*~~

~~*the State still belonged to the Indians. But progress now began in earnest. A constitution was adopted in 1857, and on May 11, 1858, Minnesota was admitted as a State, with a population, according to the last Territorial eensus, of 150,037.*~~

~~*One of the first acts of the new State was the issue of the rail- road bonds noticed above. Soon after eame the civil war. Within two months of Lineoln's first call for troops the first Minnesota regiment, over one thousand strong, was mustered into serviee. By August of 1862 ten regiments had been called for andfurnished. In all, the Statesupplied to the armies of the Union 25,052 nen, or about one-seventh of its entire population at the outbreak of the war.*~~

~~*In the meantime there occurred, in 1862, the horrible outbreak known as the Sioux massacre. Settlements were cut off, isolated settlers murdered, and even a strong post like Fort Ridgely was attacked. The outbreak spread over a large portion of the State; several severe engagements were fought; and it was not until the State had a thoroughly equipped military force ready for the cam- paign that the Indians begun to flee or to give themselves up. By this time over 700 persons had been niurdered, 200, chiefly women, taken eaptive ; eighteen counties were ravaged, and 30,000 people were homeless. The property loss was not less than $3,000,000.*~~

~~*During these loeal and national disturbanees the material pro- sperity of the State was unabated. Notwithstanding the heavy cost of the civil war and the Sioux massacre, the eensus of 1865 showed a population of 250,099. Railroad construction began to be ener- getically carried forward; in 1870 329 miles were made and 1096 miles were in operation; a road to Lake Superior was completed, and the Northern Pacifie was fairly under way. In 1878-76, and to some extent in 1877, successive visitations of locusts destroyed the crops of the south-western counties. The sufferers were relieved by the State, and no repetition of the scourge has sinee been experienced. (Gis is 12)*~~

~~*MINNOW (Leuciscus phoxinus or Phosxinus levis) is the smallest British Cyprinoid, readily distinguished by its very small scales. It is abundant in rivers, brooks, and lakes, always swimming in schools, and shifting its ground in search of food, which consists of every kind of vegetable and*~~

~~*animal substance. It ranges from southern Europe to Scandinavia, and from Ireland into north-eastern Asia ; in the Alps it attains to a higher altitude than any other Cyprinoid, viz., to nearly 8000 feet. Its usual size varies between 2 and 3 inches; but insuitable localities, especially in Germany, it is known to reach a length of from 4 to 5 inches. The colours vary with age and season ; a series of dark spots or cross-bands along the sides is always present, but the males assume in summer a nuptial dress of scarlet or purple on the lower parts of the head and body. The minnow is used as bait; it can also be introduced with facility and with great advantage into ponds in which there is otherwise a scarcity of food for more valuable fishes, such as trout, perch, and pike.*~~

~~*MINO DI GIOVANNI (1431-1486), called pa Fresoze, was born at Poppi in the Casentino in 1431. He had property at Fiesole, whence his usual name. Vasari's account of him is very inaccurate and full of contradictions. Mino was a friend and fellow-worker both with D. da Settignano and Matteo Civitale, all three being about the same age. 'There is considerable similarity in their works, showing mutual influence. Mino's sculpture is remarkable for its gem-like finish and extreme delicacy of detail, as well as for its spirituality and strong devotional feeling. No other sculptor portrayed the virginal purity of the Madonna or the soft infant beauty of the Divine Child with greater tenderness and refinement. _ Of Mino's earlier works, the finest are in the duomo of Fiesole, the altarpiece*~~

~~*and tomb of Bishop Salutati, executed about 1464. In the Badia of Florence are some of Mino's most important sculptures—an altarpiece, and the tombs of Bernardo Giugni, 1466, and the Margrave Hugo, 1481—all sculptured in white marble, with beautiful life-sized recumbent effigies and attendant angels. The pulpit in Prato cathedral, finished in 1473, is very delicately sculptured, with bas-reliefs of great minuteness, but somewhat weakly designed. Soon after the completion of this work Mino paid a visit of some years to Rome, where he executed several fine pieces of sculpture, such as the tomb of Pope Paul II. (now in the crypt of St Peter's), the tomb of Francesco Tornabuoni in 8. Maria Sopra Minerva, and a beautiful little marble tabernacle for the holy oils in S. Maria in Trastevere. There can be*~~

~~little doubt that he was also the sculptor of several of the very lovely monu-ments in §. Maria del Popolo, especially those in the sacristy of Bishop Gomiel and Archbishop Rocca, 1482, and the marble reredos, also in the sacristy, given by Pope Alexander YI. Some of Mino's portrait busts and delicate profile bas-reliefs are preserved in the Bargello at Florence ; they are full of life and expression, though without the extreme realism of Verrocchio and other sculptors of his time. He died in 1486.~~

~~See Vasari, Milanesi's cd., 1878-82; Perkins, Italian Sculptors ; Winckelmann and D'Agincourt, Storia della Scultura, 1818.~~

~~MINOR. See INFANT.~~

~~MINORCA. See Batraric IsLanps.~~

~~MINORITES. See Franciscans.~~

~~MINOS, a legendary king of Crete, in whom both historical and religious elements are united. The historical element lies in the fact that an early civilization and mari- time power had its seat in Crete. The Phcenician inter- course played a great part in developing this island state, and Minos issometimescalleda Phcenician. The name Minoa is often found where Phcenician influence was strongest, e.g., at Megara. The laws and constitution which existed from a very early time in Crete were attributed to Minos, to whom they were revealed by Zeus. After his death he became the judge of the dead; he is one of the forms assumed by the old conception of the first man, who is after death king and god among the dead. It is therefore highly probable that the name Minos is the Greek form of the original Manva, 2.e., "endowed with thinking," which is seen in the Hindn Manu and the Germanic Mann. As in all other heroized forms of the god of the dead, there is both a terrible and a wise and beneficent side in the character of Minos. Cretan legends described him as the wild huntsman of the forests and mountains, the lover of the nymphs, though his love means death to them. His death is localized in the far west, in the land of sunset ; his grave was shown at Camicus near Agrigentum, attached toa temple of Aphrodite. He pursued Dedalus thither, and the daughters of Cocalus, the king of Agrigentum, killed him by pouring boiling water over him in the bath, an obvious myth of the sun dying in the sea. Minos, the god of the~~

~~dead, is, according to the usual rule, the sun-god, who goes to illumine the dead when he dies on the earth. His wife is Pasiphae, the moon-goddess, who had an oracle by dreams at Thalame in Laconia. The union of the sun and the moon, the bull and the cow, gave rise to many quaint and ugly legends: Pasiphae loved the bull of Minos, was aided by the stratagem of Deedalus, and gave birth to the Minotaur, half bull and half man. The Minotaur is one of those monstrous forms which were suggested to the Greek fancy by the quaint aniinals common in Oriental art. It was shut up in the LaByRINTH (q.v.), which was constructed by the skilled artist Dedalus. Now a son of Minos nained Androgeus had been killed by the Athenians, and Minos as a punishment required that seven Athenian~~

~~youths and seven maidens should be sent every ninth year and given up to the Minotaur to be devoured. When this sacrifice took place for the third time Theseus came as one of the hostages, and slew the Minotaur with the help of Ariadne. Throughout these legends we see the close relation of Minos to the Phoenician sun-god Melkarth, and perceive the way in which different places where Pheenician influence can be traced, Athens, Sicily, &c., are brought together in religious myths.~~

~~MINOTAUR. See Minos.~~

~~MINSK, a western government of Russia, is bounded by Vilna, Vitebsk, and Moghileff on the N. and E., and by Tchernigoff, Kieff, Volhynia, and Grodno on the 8. and W., and has an area of 35,175 square miles. The surface is undulating and hilly in the north-west, where a narrow plateau and a range of hills of the Tertiary forma- tion runs to the north-east, separating the basin of the Niemen, which flows into the Baltic, from that of the Dnieper, which sends its waters into the Black Sea. The range, which averages from 800 to 1000 feet, culminates in Lysaya Gora (1129 feet). The remainder of the province is flat, 450 to 650 feet above the sea-level, covered with sands and clays of the glacial and post-glacial periods. Two broad shallow depressions, drained by the Berezina and the Pripet, cross the province from north to south and from west to east; and these, as well as the triangular space between them, are covered with immense marshes (often occupying 200 to 600 square miles), numberless ponds and small lakes,~~

~~*peat-bogs, downs, and moving sands, as well as with dense forests. This country, and especially its south-western part, is usually known under the name of Polyesie ("The Woods"). Altogether, marshes take up 15 per cent. and marshy forests no less than 55 per cent. of the entire area of the province (60 to 71 per cent. in several districts). The forests, however, consist of full- grown trees in the higher districts of the north-west only, those which occupy the marshy ground consisting of small and stunted pine, birch, and aspen. The climate of the Polyesie is harsh and extremely unhealthy; malarias and an endemic disease of the bulbs of the hair (oltun, plica Polonica) are the plagues of these tracts, the evil being intensified by the dreadful poverty of the popula- tion. Communication is very difficult. The railway from Poland to Moscow has, so far as Minsk is concerned, taken advantage of the plateau above mentioned ; but still it has to cross the broad marshy depression of the Berezina. A successful attempt was recently made to drain the marshes of the Polyesie by a system of canals, and more than 4,500,000 acres have thus been rendered suitable for pasture and agriculture. Two great tributaries of the Dnieper, the Berezina and the Pripet, both navigable, with numberless subtributaries, many of which are also navigable, are the natural outlets for the marshes of the province. The Dnieper flows along its south-eastern border for 160 miles, and the Niemen on the north-western for 130 miles. The affluents of the Baltic, the Duna (Dwina), and the Vistula are connected by three canals with tributaries of the Dnieper. The population of the province (1,183,200 in 1873) may be estimated at about 1,350,000, mostly White Russians (67 per cent.); there are also Poles (about 11 per cent.), especially in the western districts, Jews (more than 10 per cent.), Little Russians (5 per cent.), and Russians (2 per cent.). About 70,000 are considered to be Lithuanians ; there are also 4000 Tartars, whose presence can be traced to the raids of their ancestors on Lithuania in the 13th century, and about 2000 German agriculturists who settled in last century*~~

~~*The chief occupation of the inhabitants is agriculture, which is, however, very unproductive in the lowlands; in the Polyesie the peasants rarely have pure bread to eat. Only 23°8 per cent. of the*~~

~~*area is under crops, the average yield being 1,600,000 quarters of corn and 1,170,000 quarters of potatoes. Cattle-breeding is very imperfectly developed, the meadows being marshy throughout the lowlands. Hunting and bee-keeping are sources of income in the Polyesie, and fishing gives occupation to about twenty thousand persons. The chief source of income for the inhabitants of the low- lands is the tiinber trade. Timber is floated down the rivers, and tar, pitch, various products of bark, potash, charcoal, and numerous sorts of timber-ware (wooden dishes, &¢.)are manufactured in villages toa great extent ; and shipbuilding is carried on along the Dnieper, Pripet, and Niemen. Shipping is also an important source of income, owing to the traffic on the canals and rivers of the province. In 1877 560 boats and 1120 rafts with 170,000 cwts. of cargo left the banks of the Berezina and Pripet ; and the traffic on the Dnieper and Niemen was nearly as great. The industrial arts are almost entirely undeveloped. There are, however, several distilleries and tanneries ; aud woollen-stuffs, candles, tobacco, and sugar are manu- factured to a limited extent. Corn is exported from the western districts, but imported to the same amount into the southern parts ; the chief export trade is in produce of forest industries. The pro- vince is crossed by two important railways, one of which connects Poland with Moscow, and the other Libau and Vilna with the srovinees of Little Russia; the great highway from Warsaw to loscow crosses the province in the south, and its passage through the Berezina is protected by the first-class fortress of Bobruisk. Minsk is divided into nine districts, of which the capitals are— Minsk (43,500 inhabitants), Bobruisk (26,850), Borisotf (5650), close by the place where Napoleon I. crossed the Berezina on his retreat from Moscow, Igumen. (2200), Mozyr (4200), Novogrodek (9000), Pinsk (18,000), Ryechitsa (4300), and Shutsk (17,200). The pro- vinee is well provided with secondary schools, but primary edu- cation, especially in the Polyesie, is in a very backward state.*~~

~~*The country now occupied by the province of Minsk was, as far as historical records extend, an abode of Slavonians. That portion of it which was occupied by the Krivichi became part of the Polotsk principality and so of " White Russia" ; the other portion, ocen- pied by the Dregovichi and Drevlans, became part of the " Black*~~

~~*tussia ”; whilst the south-western portion of it was occupied by Yatvyags or Lithuanians. During the 12th, 13th, and 14th cen- turies it was divided among several principalities, which were in- corporated with the great principality of Lithuania, and later were annexed to Poland. Russia took possession of this country in 1793. In 1812 it was invaded by the army of Napoleon I.*~~

~~*Minsk, the capital of the above province, is situated on the Svisloch, a tributary of the Berezina, at the junction of the Moscow and Warsaw and the Libau and Kharkoff railways, 465 miles by rail west from Moscow. It has 43,500 inhabitants, of whom one-third are Jews of the poorest class; the others are White Russians, Poles, and Tartars (about 700). The manufac- tures are few and insignificant. Since the introduction of railways the commercial importance of the place, which formerly was slight, has begun to increase.*~~

~~*Minsk is mentioned in Russian annals in the 11th century under the name of Myen’sk or Menesk. In 1066 and 1096 it was devas- tated, first by Izyaslav and afterwards by Vladimir. It changed rulers many times until the 13th century, when it became a Lithu- anian fief. Jn the 15th century it became partof Poland, but as late as 1505 it was ravaged by Tartars, andin 1508 by Russians. In the 18th century it was taken several times by Swedes and Russians. Russia annexed it in 1793. Napoleon I. took it in 1812.*~~

~~*MINSTREL. The “minstrels,” according to Bishop Percy, “were an order of men in the Middle Ages who united the arts of poetry and music, and sang verses to the harp of their own composing, who appear to have accom- panied their songs with mimicry and action, and to have practised such various means of diverting as were much admired in those rude times, and supplied the want of more refined entertainments.” This conception of the ‘minstrel ” has been generally accepted in England ever since Percy published his Reliques of Ancient Poetry, which he gave to the world as the products of the genius of these anonymous popular poets and harpers. The name has been fixed in the language by the usage of romantic poets and novelists ; Scott’s “last minstrel” and Moore’s “minstrel boy ” were*~~

~~*minstrels in Percy’s sense of the word. The imagination |*~~

~~was fascinated by this romantic figure, and the laborious and soured antiquary Ritson argued in vain that nobody before Bishop Percy had ever applied the word minstrel to such an order of men, that no such order of men ever did~~

~~| his own composing.~~

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~~exist in medizval England, and that the historical English "minstrels," so-called, were a much less gifted and respect- able class, being really instrumental musicians, either retainers or strollers.~~

~~The dispute between Ritson and Percy was partly a dis- pute about a word, and partly a dispute about historical facts; and there can be little doubt that Ritson was substan- tially right in both respects. The romantic bishop trans- ferred to the medizeval English minstrel the social status and brilliant gifts of the Anglo-Saxon gleoman or scép, and the French troubadour in the flourishing period of Provencal poetry. Thatthegleemen sang tothe harp verses of their own composing, that some of them travelled from court to court as honoured guests, while others were important attached court officials, and all received costly presents, is a well attested historical fact. The household bard at Heorot in the poem of Beowulf, a man who bore many things in mind and found skilfully linked words to express them, was one of King Hrothgar's thanes; the gleeman of the 7'raveller's Song had visited all the tribal chiefs of Europe, and received many precious gifts, rings and bracelets of gold. The incidents in these poems may not be historic, but they furnish indubitable testimony to the social position of the gleeman in those days; a successful gleeman was as much honoured as a modern poet-laureate, and as richly rewarded as a fashionable prima donna. Further, the strolling glee- man of a humbler class seems to have been respected as a nou-combatant ; this much we may infer from the stories about Alfred and Anlaff having penetrated an enenty's camp in the disguise of gleemen, whether these stories are true or not, for otherwise they would not have been invented. The position of pocts and singers in Provence from the 11th to the 13th century is still clearer. The classification of them by King Alphonso of Castile in 1273, by which time honourable designations were getting mixed, may help to determine the exact position~~

~~of the English "minstrel." There was first the lowest class, the ba/os, who strolled among the common people, singing ribald songs, playing on instruments, showing feats of skill and strength, exhibiting learned dogs and goats, and so forth ; then the joglars or joculatores, who played, sang, recited, conjured, men of versatile powers of entertainment, who performed at the houses of the nobility, and were liberally remunerated ; then the trobadors, or inventores, whose dis- tinction it was to compose verses, whether or not they had sufficient executive faculty to sing or recite them.~~

~~If we compare these distinctions with Percy's definition of the minstrel, we see that his minstrel would have corre- sponded with the jog/ar, who also wrote his own songs and recitations. Now in the palmy days of Provencal song there were many professional joglars, such as Arnaut Daniel or Perdigo, who stood high among the most brilliant troubadours, and visited on terms of social equality with nobles and princes. But long before English became the court language the fashion had disappeared, and a new division of functions had been developed. In Chaucer's time the poet of society no longer sang his verses to harp or fiddle, or amused his patrons with feats of legerdemain ; the king's gestour (teller of gestes) discharged the profes- sional duty of amusing with witty stories; and the social position of the joglar had very much sunk. Ritson was perfectly right in saying that no English poet of any social position was a professional reciter to the harp of verses of The Provengal joglar, travelling from court to court, combined our modern functions of poet, society journalist, entertainer, and musician. But about the time when the word "minstrel" came to be applicd to him the English joglar was rapidly sinking or had already sunk to the social position of the modern strolling mounte- bank, travelling showman, or music-hall singer. And the.~~

~~word minstrel had had a separate history before it became synonymous (as in the Catholicon Anglicum of 1483) with gesticulator, histrio, joculator, and other names for strolling entertainers. Derived from the Low Latin ministralis, it was originally applied to those retainers whose business it was to play upon musical instruments for the entertainment of their lords. In Chaucer's Syuire's Tale, the " minstralles " play before King Cambuscan~~

~~*as he dines in state " biforn him at the bord deliciously," and the '"loude minstralcye " precedes him when he rises and withdraws to the orna-mented chamber, Ther as they sownen diverse instrumentz, That it is lyk an heuen for to here.*~~

~~*But even in Chaucer's time there were less respectable musicians than those of the king's household—strolling musicians, players on trumpets, clarions, taborets, lutes, rebecks, fiddles, and other instruments. These also were known by the generic name of minstrels, whether because many of them had learnt their art in noble households before they took to a vagabond life, or because the more respectable of them affected to be in the service or under the patronage of powerful nobles, as later on companies of strolling players figured as the "servants" of distinguished patrons. All the allusions to minstrels in literature from Langland's time to Spenser's point to them as strolling musicians. Some of them may have sung to the harp verses of their own composing, and some of them may have composed some of the ballads that now charm us with their fresh and simple art ; but the profession of the "' minstrel," properly so-called, was much less romantic than Bishop Percy painted it. It was not merely "the bigots of the iron time" that "called their harmless art a crime"; in a repressive Act passed by Henry IV. they appear with "westours, rymours, et autres vacabondes" among the turbulent elements of the community.*~~

~~*In a passage in Malory's Morte Darthur, the word minstrel is applied to a personage who comes much nearer the ideal of the Provengal joglar. When Sir Dinadan wished to infuriate King Mark, he composed a satirical song, and gave it to Elyot a harper to sing through the country, Tristram guaranteeing him against the conse- quences. When King Mark took him to task for this, the harper's answer was, ' Wit you well Iam a minstrel, and I must do as Iam commanded of these lords that I bear the arms of." And because he was a minstrel King Mark allowed him to go unharmed. The service done by Elyot the harper in the old romance is a good illustration of the political function of the itinerant medieval joculator; but even he did not sing verses of his own composing, and he was not a "minstrel" in the sense in which the word was used by romantic poets after the publication of Percy's Reliques. (w. M.)*~~

~~*MINT. The mint is the place where the coinage of a country is manufactured, and whence it is issued by sovereign authority, under special conditions and regulations. The privilege of coining has in all ages and countries belonged to the sovereign, and has, in England at least, been rarely delegated to any subject, and in any case in a restricted form, the crown always reserving the right of determining the standard, denomination, and design of the coins.*~~

~~*At a very early stage of civilization it was found necessary to have some definite medium of exchange, in order to avoid the great inconvenience arising from the system of payment in kind, which was the primitive and natural method. It was not long before metal came to be used as such a medium, probably from its durability and portability, and in the case of gold and silver on account of their intrinsic value. The less liable the value of a metal is to change the better is it suited for a standard of value.*~~

~~*Though historians assure us that metals were found in*~~

~~*Britain at a very early period, there does not appear to be any evidence that the mines were worked until consider- ably later than the time at which the use of metal as a medium of exchange was introduced. It 1s probable there- fore that the metals for exchange were imported into Britain long before the native mines were developed.*~~

~~*The metals chiefly used were silver and brass, which were at first simply exchanged by weight for commodities of all kinds. As commercial transactions became more numerous and more complicated, this system of payment grew troublesome, and it was found convenient to divide the mass of metal into small parts, which soon took the form of rough coins. But the principle of payment by weight was retained through many centuries, and is per- petuated, though in name only, in the word " pound."*~~

~~*Records of attempts to organize the coinage of England are found as far back as the Anglo-Saxon period, and it is known that on the dissolution of the Heptarchy the mints were regulated by laws framed in the witenagemot. The first monarch who appears to have dealt successfully with the*~~

~~*organization of the coinage was Athelstan, who framed laws for the regulation of the mints, and appointed officers whose titles and duties are then first recorded. The only officers connected with the coinage of whom mention is found before this time are the "moneyers," who appear to have been alone responsible for the manufacture of the coin ; but it is probable that even then there existed some officer who had authority over them. In early Saxon and Norman times the number of moneyers was considerable, mints being established in almost every important town, as might be expected at a period when communication between distant places was extremely difficult. They appear to have been the officers who actually performed the work of making the coin, the mint master in later times contracting with them, ata high rate, for the work. They were respon- sible for the purity and perfection of the coins produced, as appears from the fact that it was they who were punished (as traitors) in the case of any deficiency in weight or fineness. They had prescriptive rights in the coinage, and in modern times (even so lateas 1850) claimed to have corporate privileges; but it is clear, on the authority of Ruding, that they never were a "corporation" separate from other officers of the mint.1 The number of mints was greatly reduced after the Norman Conquest, but continued to be considerable until the reign of Richard L, when the work of coining for the whole kingdom was con- centrated in the mint in the Tower of London. Only one provincial mint (Winchester) remained till a later date.*~~

~~*An important reorganization of the coinage took place in 1325 under Edward II., the regulations then framed for the manufacture and issue of the coins forming the basis of those still in force. The principal officers under these regulations were—master, warden, comptroller, king's assay master, king's clerks, and cuneator. The office of cuneator was one of great importance at a time when there existed a multiplicity of mints, since he had the sole charge of all the dies used not only at the mint in the Tower of London but also in the provinces. He chose the engravers and presented them to the barons of the exchequer in order that they might take the oath of fidelity ; he superintended their work, and was generally answerable for the perfection of the dies before they were issued for use in the various mints of the country. The office, which was hereditary, ceased to exist when the provincial mints were suppressed. In its place was instituted the office of clerk of the irons,*~~

~~*1 Among the special privileges which they undoubtedly enjoyed was exemption from local taxation, as appears in a writ of Henry III., which commands the mayor of London not to disturb them "by exacting tallages contrary to their privileges." Sometimes also houses were allowed to them rent free.*~~

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~~*whose functions were more limited, and were not hereditary. This office was only recently abolished.*~~

~~*In the Middle Ages an important duty devolving on the officers of the mint was the collection of the seigniorage which was levied on the coining of money, not only for the purpose of covering the expenses of minting, but also as a source of revenue to the crown which the sovereign claimed by virtue of his prerogative. In former times the collection of the seigniorage was entrusted to the warden, who also superintended the manufacture of the coins, so far as to ensure the proper relations between the moneyers on the one hand and the state on the other. He does not appear, however, to have had any responsibility with regard to the fineness and weight of the coins.*~~

~~*The king's assay master was specially charged with all matters relating to the accuracy of the standard. The officer next in rank to him was the comptroller, who presented annually to the barons of the exchequer a report of all the gold and silver money struck in the kingdom during the year. These reports, which were always written upon parchment, constitute the chief mint records. The king's clerk exercised a general superintendence and kept an account of all the mint transactions. As the work of the mint became more extensive and more complicated, other officers were added such as the surveyor of the meltings, surveyor of the money presses, and many others.*~~

~~*The present arrangements with regard to the officers of the mint were made in 1870, when several important changes took place in the mint establishment. Up to that time there had been two controlling officers,—the master, who in some instances was selected on account of distinguished scientific attainments (as in the cases of Sir John Herschel and Professor Graham), and the deputy master and comp- troller. A careful inquiry,*~~

~~*however, having led to the conclusion that the control of the mint might with advantage be concentrated in the hands of asingle officer of experience in the conduct of public business, it was decided, on the death of Professor Graham, to entrust the actual administra- tion of the department to the deputy master,—the office and title of master of the mint being held by the chancellor of the exchequer for the time being, without salary. At the same time the services of a scientific officer were secured, by the appointment of a chemist of the mint. The coining and die department and the melting depart- ment were united under the name of the operative depart- ment, and placed under a single superintendent. The first deputy master appointed under the new regulations was the Hon. C. W. Fremantle, C.B., to whom the public are indebted for a series of Annual Reports which have given a new and increased interest to the subject of the coinage, and may be said to constitute in themselves a mint literature.*~~

~~*The actual operations of coining in early times were few in number and simple in character. The metals forming the alloy were melted together in the proportion necessary to bring them to the required standard, and the alloy thus obtained was cast into bars, which were reduced by hammering to the requisite thickness. They were then cut with shears into pieces more or less regular in size and form, roughly annealed, and finally impressed with the prescribed device by a blow with a hammer.*~~

~~*The last-named appears to have been the only part of the process which was performed with any great amount of care. The blank piece was placed by the hand upon a die fixed into a block of wood having a large heavy base to resist the oscillation caused by the blow ; the die on which was engraved the device for the reverse of the com was then placed upon the upper side of the blank and held by means of a holder, round which was placed a roll of lead to protect the hand of the operator while heavy blows were struck with a hammer by an assistant workman. One of the*~~

~~*earliest improvements in coining was the introduction of a tool in shape resembling a pair of tongs, the two dies being placed one at the extremity of each leg. This avoided the necessity of readjusting the dies between successive strokes of the hammer, and ensured greater accuracy in the*~~

~~*impres- sion. It was long before the system of coining by hand was superseded by the coining press, or mill, which, even after its first introduction, was only very slowly adopted. Several attempts were made to introduce machinery for coining before it was brought into active use, the objection to it being its great expense. The mill and screw were finally introduced into the mint under Charles II., when many improvements were also made in the preliminary operations. Steam-power was first applied in 1810, when the vacuum screw-press was introduced. In 1839 Uhlhorn invented the lever-press, which still remains in use.*~~

~~*The subject of the design on coins, besides being inter- esting both from an artistic and an historical point of view, becomes very important when it is remembered that it is the impression of the coin with the authorized device which makes it legally current. The artistic merits of the design of the early Greek coins are well known, and prove that the dies from which the coins were struck must have been engraved with much skill and care. The form of the coins before being stamped was at first merely that of*~~

~~*| natural rounded nuggets of gold, or of the silver-gold alloy*~~

~~*known as electrum. Such coined nuggets of gold are still to be found among the hill tribes of India. Simple nuggets were afterwards replaced by roughly-fashioned masses like half bullets, a form which rendered it easy to impart high relief to the obverse and comparatively low relief to the reverse of the coins. The early British coins! had for their prototype the gold "'stater" of Philip of Macedon, but the design of this beautifully finished coin was so roughly imitated by a succession of British copyists that ultimately the wreath round the head of the monarch alone survived, and that in a scarcely recognizable form. It is not only in the early British coins that the influence of classical art may be seen, for it is very evident in some of the present day, the most notable instances being the reverse of the bronze coinage, and the beautiful design of St George and the dragon by Pistrucci, which is still used as an alternative design for the sovereign. It has been ascertained that the impressions on the reverse of very early Greek coins were produced by the rough surface of the anvil or the nail head on which they were placed, while the obverse was struck with the die. A little later the device on the reverse of the coins was obtained by placing*~~

~~*the blank piece on small points of metal arranged in geometrical forms which caused corresponding indenta- tions on the coins when struck with the hammer. The beauty and accuracy of design on coins gradually increased as art and manual skill developed, and probably culminated at the period of the Renaissance.*~~

~~*Although it has been the custom since the time of the Saxons to stamp coins with the head of the reigning monarch, it does not appear that any attempt at actual por- traiture was made in England until the reign of Henry VII, who, "about the eighteenth or nineteenth year of his reign, did make a great alteration in the form of his coin, upon which his head was now represented in profile, and with a good resemblance of his other pictures."? Since then much care seems to have been taken to stamp the coins with a true likeness of the monarch. In most cases the heads bear a striking resemblance to the portraits drawn by the great artists of the respective periods, and were, indeed, generally designed by artists of eminence. Some of the Milan coinage of Louis XII. is said to have been*~~

~~*1 See Evans, Coins of the Ancient Britons. 2 See Martin Folkes, Tables of English se A*~~

~~*d Gold Coins.*~~

~~*== Of*~~

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~~*designed by Leonardo da Vinci, and similar work is attri- buted to Benvenuto Cellini.*~~

~~*In very early times the silver coins were equal in weight and in tale, each penny weighing 24 grains or | penny- weight. The amount now denominated a pound was a pound weight of standard or sterling silver. This principle was in fact, however, not strictly adhered to, the coins frequently falling below the standard of weight. This deviation may possibly have arisen from the imperfection of the methods of manufacture, but Ruding (Annals of the Coinage) considers it to have occurred from design, as the deficiency in weight was sometimes made a source of profit. The deviation from the*~~

~~*standard weight permitted by law, now called the "remedy," and anciently called the " shere," was taken advantage of to a large extent, so that the coins suffered considerable diminution, particularly when, as frequently happened, they were also "clipped" as soon as they were issued. When these coins were called in they were taken by weight and not by tale, so that the posses- sors suffered considerable loss. In later times the great improvements in the method of manufacture made it easy to attain far greater accuracy both of weight and fineness ; consequently the remedy permitted by law has been con- siderably reduced, and the possibility of making a large amount of profit by this means proportionally diminished.?*~~

~~*The seigniorage levied on the coining of money was not a fixed rate, but varied considerably at different times, and accrued from a deduction made from the bullion coined. It was abolished by an Act of Charles II., which provided that whoever brought sterling silver or standard gold to the mint should receive in exchange an equal weight of current coin, the expenses of coining being defrayed by means of duties levied upon certain commodities of common use. The seigniorage on silver was revived in the reign of George IIL, when that part of the Act of Charles II. which related to the coining of silver without charge was repealed, and another Act was passed, requiring every pound of silver to be coined into sixty-six shillings instead of sixty-two,—the four shillings realized on each pound of silver by this depreciation of its value being handed over to the master of the mint to defray the expenses of assay- ing, loss, and manufacture. An Act of William IV. required the seigniorage on the silver coinage to be paid to the credit of the Consolidated Fund, and the charges of the mint to be brought annually before parliament. Against the profit derived by the state from this source must be placed the expense of maintaining the silver coinage in a condition fit for circulation by frequently withdrawing, recoining, and reissuing the silver coins. A vote of £15,000 is annually taken in the mint estimates for the loss on the recoinage of silver.*~~

~~*In former times the work of the mint was performed by contract, the mint master undertaking the manufacture of the coinage at a stated price, and paying the moneyers and other officers and workmen under him at a fixed tariff. The agreement made between the crown and the mint master, called the 'master's indenture," was sometimes purposely kept secret. This system*~~

~~appears to have pre- vailed from the reign of Edward I, when an agreement was entered into between the king and the first master of the mint (appointed about 1279). Under this agreement~~

~~1 Two notable instanees are recorded of the use that has been made at various times of the shere, or remedy, as a means of profit, one being in the reign of Queen Elizabeth, when Lonison, then master of the mint, finding the allowanee made him under his contract was in- sufficient to eover the expenses of eoining, availed himself of the remedy on the silver coiuage, amounting to 63d. in the pound troy. The other ocenrred at the time of the great reeoinage of silver in the reign of William III., when the profit of the shere amounted to 3d. per pound weight, or rather more than 8s, in every hundred pounds of money.~~

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~~an allowance was secured to the master to cover all the ex- penses of coinage. Although the master of the mint ceased to be a contractor, the arrangement with the managers con- tinued in force up to 1851.~~

~~The work of coinage was transferred in 1810 from the Tower of London, where it had been carried on for many centuries, to the present Mint on Tower Hill, not far from the Bank of England. The head of the department, as has already been stated, is the chancellor of the exchequer for the time being, who is ex officio master of the mint,—the practical direction of the work being placed in the hands of a permanent officer, the deputy master, who is responsible for its due performance. From the English mint is supplied the coinage for the whole of the British empire, including the colonies, with the exception of Australia; the latter and the East Indies are supplied from branch mints estab- lished at Sydney and Melbourne, and the mints of Calcutta and Bombay. In addition to the gold, silver, and bronze coins current in the United Kingdom, the English mint strikes gold coins of the value of two dollars for New- foundland ; silver coins of the value of fifty, twenty-five, twenty, ten, and five cents respectively for Newfoundland and Canada; bronze pence and halfpence of special design for Jersey, and nickel pence, halfpence, and farthings for the West Indies. The number of coins of each separate denomination issued varies considerably in different~~

~~years, the demand for special denominations of coin naturally determining the supply.~~

~~The following table (from official sources) shows the value of the~~

~~gold and silver coins issued during the ten years 1871-81. The total value of the bronze coin issued in the same period is £112,890.~~

~~Gold Coinage.? Silver Coinage. Date. ; :~~

~~Sovereigns. |Half-Sovereigns.| Total Value.| Half-Crowns.| Florins.~~

~~£ £ £ £ £ 1872 13,643,885 1,617,556 | 15,261,441 ae 692,010 1873 2,382,835 1,001,733 3,384,568 bz 596,574~~

~~1874 519,629 941,936 1,461,565 278,240 180,774~~

~~1875 ace 243,264 243,264 138,996 114,246~~

~~1376 3,294,705 1,401,943 4,696,648 79,200 60,786~~

~~1877 a ; 981,468 55,836 68,706 1878 | 1,106,289 1,158,780 2,265,069 183,150 178,596 1879 | 17,525 | 17,525 35,050 112,662 135,432 1880 3,645,853 | 504,199 4,150,052 168,102 | 232,254 1881 es > Es me 280,170 256,806~~

~~24,610,721 7,868,408 32,479,129 1,291,356 2,516,184~~

~~Silver Coinage.3~~

~~Date. 5 ae Six- Four- Three- Two- Shillings. pences. | pences. pences. pences. Bees. Totals. £ £ £ £ 8. Leis £ "g~~

~~1872 | 443,322 94,446 69 6 13,916 2 39 12 33 1,243,836 1873 | $24,324 | 109,890; 69 6j 50,744 2 39 12 33 | 1,081,674 1874 | 275,022 | 105,732} 69 6 | 55,694 2 39 12 33 890,604 1875 | 217,800 81,878 | 69 6 | 41,488 2 389 12 33 594,000 1876 38,412 20,988} 69 6] 22,826 2 39 12 33 222,354 1877 | 163,350 | 101,772; 69 G| 31,142 2 39 12 33 420,948 1878 156,222 65,538 | 69 6 | 30,350 2 39 12 33 618,998~~

1879 180,576 83,160; 69 6) 37,082 2 39 12 33 549,054

1880 | 242,154 96,426| 69 6 | 22,480 2 39 12 33 761,508 1881 262,548 | 156,816| 69 6 | 40,646 2 39 12 33 997,128 |

{ |— - — | — ee

| 2,308,730 916,146 | 693 0 | 346,269 0 | 396 0 330 | 7,875,104

ee ee | Cee De a eee

The British sovereign or twenty-shilling piece was first issued by proclamation dated 1st July 1817, superseding the guinea or twenty-one-shilling piece. Crown pieces of the nominal value of five shillings were first struck in the reign of Henry VIII, six- pences and threepenny-pieces are first mentioned in the reign of Edward V1., while the groat or fourpenny-piece was coined as early as the reign of Edward J.; the florin or two-shilling-piece was introduced in 1849. Copper money was first coined by Charles I. in 1665, but does not appear to have been issued until 1672. Copper was replaced by bronze in 1860.

The weight and fineness of the various denominations of coin struck at the Royal Mint is shown in the first schedule of the Coin- age Act (38 Vict. c. 10), 1870 :— a

2 In these gold returns fractions of pounds sterling are omitted.

3 The numbers and weights of the fourpenees, twopences, and pence, being Maundy eoins, are the same for each of the years :—4518 four- pences, 4752 twopenees, and 7920 pence.

MIN T 483

Standard Weight. Least Current Weight. Remedy Allowanee. Denomination of Coin. Imperial Metrie Imperi 'i . Weight per Pi) perial Metrie Sta y é eight per Liece. Weight. Weight. Weight. Weight. ndard Fineness. |__| itiesimal Grains. Grammes. Grains. Grammes. Imperial | Metric | Fineness. Grains. | Grammes. Gold— Five POUNG

~~.....cccs..ceseeeseescccnsnsescnseccscsecsees 616°37239 39°94028 612°50000 39°68935 l fi : ne gold, 4! 1°00000 0064 Two pound cepueres ae 246°54895 15°97611 24500000 15°87574 i aS ee feiles (0°40000 ee Sovereign «sss… s veee| 128°27447 798805 122°50000 7°98787 simal fineness 0-20000 | 0-01296 0°002 ‘ la 6163723 | 3:99402 61°12500 3-96083 916-66, t 0°10000 | 0:00648 4 — } | COISEWELTL eneosnnnc cnc ChOce pO EEDEECCCOCEDE SOE LCS DBO CSTE ribed 436°36363 28°27590) Fo 6 er “u] 21stsis1 | 1413795 (| egens | one Florin… cece ccc cevcccceseccccces “pag 174°54545 (1131036 a8 fine silver, i 0°72727 0°04712 | Shilling …. 5 87°27272 565518 $y alloy; or 0°36363 0-02356 || 2 ee Sana eens — A 43 °63636 2°82759 millesimal ~ | 0:18181 0-01178 0-004 MEMIMOIPNOMT DOMGECs.c.20cccncecccneccccansssscesese=s 29-09090 1:88506 fineness 0°12121 0:00785 | aga (i 21:81818 141379 | : 925. | 0-09090 | 0-00589 ence en OtCOSCECECCE EDR CEATOOLDOEEEO DGS eee 0°94253 Bs 0-06060 0°00392 | HS acco no Sage SeCERIRRON OO SADOR IDET OCH SUCH SOCHEODE 7°27272 047126 | : | o- 2 Ree. ‘ | 0:03030 0°00196 |) Oo Ws 145-83333 944984 ee = Mixed metal:— (2°91666 | 0°18899 Halfpenny… 87°50000 5°66990 | woe oct copper, tin, and 1-75000 | 0°11339 None. nso secon cance derece eo atcannnsen sna 43°75000 283495 – a zine, _ 0°87500 | 0°05669 ee~~

~~*The weight and fineness of the coins specified in this schedule are according to what is provided by the Act 56 Geo. III. c. 68, that the gold coin of the United Kingdom of Great Britain and Ireland should hold such weight and fineness as were prescribed in the then existing mint indenture, that is to say, that there should be nine hundred and thirty-four sovereigns and one ten-shilling piece contained in 20 fb weight troy of standard gold, of the fine- ness, at the trial of the same, of 22 carats fine gold and 2 carats of alloy in the pound weight troy, and further, as regards silver coin, that there should be sixty-six shillings in every pound troy of standard silver of the fineness of 11 ounces 2 pennyweights of fine silver and 18 pennyweights of alloy in every pound weight troy.*~~

~~*The present standard of fineness for gold, 22 parts fine or pure gold and 2 parts of alloyed metal, was finally adopted in the reign of Charles II., and has remained unchanged up to the present time. Before the passing of the Act determining this standard considerable changes had been made from*~~

~~time to time, the highest degree of fineness having been reached in the reign of Henry Ill, when the first gold coins were struck of the standard of 24 carats pure gold. The standard of fineness for gold at some different periods may be seen from the following table, which shows the composition of some of the ancient gold trial plates, of which portions are preserved in the Mint : —~~

~~rT~~

~~Standard preseribed . Remedy or by Baw: Standard Permitted Variation | Date. 3 hell in Carats and in In Carats Deeimal Assay Tho aa mits and Grains. | Equivalent. | uss — 1349 a6 eon noe 3 earat, or 13°9 1477 23 3h 994:8 Gold 993°5 eee 15.2 1527 22 0 916°6 » gas5 ey OO 1543 (2) 23 «0 958°4 » «©9544 Ae 5. yn Gs? 1553 3 8y 994°8 yy» 990°3 ih i ee. Ot) 1560 220 916°6 glbez a eGo 1560 23 3h 994°8 » 994°3 i Geer. es 1593 22 0 916°6 a) cy ye orn. ee) 1605 23° 3h 994°8 ae ues ee 3) gan Ose 1649 22 0 9166 » 913-0 Me 6:9 1660 23 32 994:8 » ©9909 eS ty Ee 1660 22 0 916°6 » ©9129 1g G9 1688 22 0 916°6 4» 914°6 ee CN 1707 22, 0 916°6 Poe ial | iy po 1728 D2 0 916°6 » 916'1 ee G29 1829 22 0 916°6 = 9153 sie Sy py AB 1873 22 0 916°6 Do Loco) g 2-0 1873 Supplementary plate. | Pure gold. AG~~

~~The earliest trial plate of which there is any record was made in the seventeenth year of Edward IV. Before that time it would seem that the coins were compared with others known to be of standard fineness, since among the Cotton MSS. is preserved the account of the trial of the pyx of gold nobles in 1349, when the coins wgre compared with an ounce of florins of Florence kept in the Treasury as standards, The first gold coins were 24 carats fine or pure gold. Edward III. caused coins to be struck of 23 carats 34 grains fine in 1345, but no trial plate of this standard was made until 1477. Henry VIII. lowered the standard to 22 carats, but caused coins to be struck both of that and the former standards. The greatest debasement of the standard ever reached in England was in 1546, when it sunk as low as 20 carats. It reached a low point in the early part of Edward VI.'s reign, but was raised towards the end of it to 22 carats; and it was still further raised to 2 carats 84 grains by Elizabeth, who, however, caused gold coins of 22 carats also to be struck. Charles IT. on his accession rejected the trial~~

~~plates of the standard of 22 carats which had been made under the Commonwealth, and caused others to be made of the standard of 28 carats 34 grains. No coins, however, appear to have been struck of this standard. The same monarch~~

~~afterwards fixed the standard at 22 carats; and no variation in the legal standard has occurred since that time. The last new trial plates, made in 1878, were alloyed with copper only, in order that they might correspond with the composition of the British gold coins, former plates having been alloyed with silver and copper. At the same time supplementary plates of pure gold and silver were prepared in order that the greatest possible accuracy might be secured.~~

~~The present standard of fineness of silver for coinage was fixed at a very early period, but has been subject to considerable varia- tion since the reign of Edward I., the first English monarch who debased the silver coinage. In the reign of Henry VIII. it was once reduced as low as 4 ounces of silver to 8 of alloying metal, | and Edward VI. reduced it even lower. It was restored by Elizabeth to the original standard. i~~

~~The following table shows the composition of some of the ancient eee trial plates of which portions have been preserved in the~~

~~int :—~~

~~Standard preseribed s Remedy or Date py ta. a. Permitted Variation Ps . y in Dwts. and in In ozs. Deeimal Assay. THOUeATdEl and dwts. | Equivalent. Weis Hela No date. BOS ne0 Silver 757°4 406 | 1477 eZ 925°0 » ©9235 2 dwts, | 1527 (2) AAD 506 3 885°5 aes 1542 ; 8 € 7759 » 163°6 3 dwts. (?), or 12°5 1553 ; il 2 925°0 » 9270 | 2dwts, or 8-4 1560 ll 2 9250 » 930°2 i) Es wae 1600 3 0 250°0 » 252°0 Bec 5, 125 1601 im 2 925°0 5 as DB bs » 84 1604 nig ae 925-0 tend 2 dwts. 1649 in 2 925°0 » 9287 Dx 1660 ijl 9§25-0 me za 2 dwts., or 8°4 1688 2 925°0 ae 922:0 2 Sy yee 1707 iit 2) 925:0 92270 Do iy RS 1728 ll 2 925°0 3 928°9 2 dwts. 1829 iW 2 925°0 oy, MEAD 1 dwt., or 42 1873 el) 925°9 », 924°96 4:0 1873 Supplementary plate. Pure silver.~~

~~ee ee~~

~~*The alloy used for the bronze coinage is composed of 95 per cent. of copper, 4 of tin, and 1 of zinc. The bronze coinage superseded the old copper coinage in 1860, the latter having been in use since the reign of Charles II. The vicissitudes of the copper coinage were even greater than those of the superior coinages, coins for Ireland having been issued at one time of pewter and of other alloys in which scarcely any copper was contained.*~~

~~*The annual testing of the standard of gold and _ silver coins, called the trial of the pyx, from the " pyx" or chest in which the coins to be examined are kept, is a ceremony of very ancient institution. It arose from the circumstance that the mint master was originally a contractor, under the crown, for the manufacture of the coinage, and it was therefore necessary that periodical examinations of the coins should be held in order to ascertain that the terms of his contract had been complied with. At the present day, when the mint master is no longer a contractor, but an officer of the crown, the trial of the pyx has a somewhat different object; but it would appear from the description of these periodical examinations in some of the earliest mint records that but little change has taken place in the manner of conducting them. 'The finished coins are delivered | to the mint master in weights called " journey weights,*~~

~~*484*~~

~~*supposed to be the weight of coin which could be manu- factured in a day when the operations of coining were performed by the hand. The journey weight of gold is 15 ib troy, coined into 701 sovereigns or 1402 half-sovereigns. The journey weight of silver is 60 tb troy. From each journey weight a coin is taken and deposited in the "pyx" or chest for the annual trial. This is made by the freemen of the goldsmiths' company under the direction of the crown in the presence of the queen's*~~

~~*remembrancer, who administers the oath to the jury and |*~~

~~*presides over the proceedings. The coins selected for trial are compared with pieces cut from trial plates of standard fineness, which are in the keeping of the warden of the standards, these pieces being assayed against the coins under examination. If the coins are found to be of the standard*~~

~~*fineness and weight, within certain limits, a verdict to that effect is drawn up by the jurors and presented to the Treasury.*~~

~~*In consequence of the impossibility of ensuring an abso- lutely exact admixture of metals in coining, it has been found necessary at all times to allow to the mint master a certain margin, or "remedy," within which coins may vary in weight and fineness from the fixed standard and still be considered of the current standard. The remedy of fineness for English gold coin is now fixed at 2 parts per 1000. The great importance of maintaining the standard of fineness for gold will be evident when it is stated that the variation of ;J, of a millieme (or thousandth part) above or below the standard causes a gain or loss of £100 in every million sterling. Gold coins would be within the remedy of fineness permitted by law if the amount of precious metal contained in them varied from 914°6 to 918°6 parts in 1000; and, although this remedy cannot be considered to be more than would meet occasional and unavoidable deviation from the exact standard, still, in the case of gold, but a very small part of the remedy of fineness is actually used, the coins seldom falling below 916-3 parts of gold in 1000, or rising above 917:0, while the mean composition of many millions of coins issued from the mint is often of the precise legal standard, 916°66, The remedy of fineness for silver coin, which appears to have been always greater than that for gold coin, is 4 parts per 1000. The remedy of weight*~~

~~*for gold is 16 per 1000 parts, that for silver 4°17, and |*~~

~~*that for bronze 20. Extreme care is taken to prevent the issue from the mint of any coins that exceed these permitted variations in weight and standard, each coin being weighed separately, and all those found to be above or below the standard being returned to the melting-house.*~~

~~*Since the real value of the gold coinage is the same as its nominal value, it is of the first importance that gold coins which are below the standard weight should not be allowed to circulate, otherwise holders of large quantities of gold coin are liable to considerable loss. After a certain amount of wear a gold coin in passing from hand to hand loses weight and becomes legally uncurrent. By the Comage Act it is made compulsory for every person to "cut, break, or deface" any coin tendered to him in payment which is below the current weight, the person tendering it bearing*~~

~~*the loss; but, as no penalty is imposed for disregard of this obligation, the law is practically without effect. The withdrawal of light coin from circulation was formerly accomplished solely by the Bank of England, the mint regulations making provision for the receipt of gold tendered for coinage only in the form of bars. The bank undertook to purchase the light gold from the public at the rate of £3, 17s, 64d. an ounce, a price which, as compared with the mint value of £3, 17s. 104d., entailed a loss of no less than 4d. an ounce on the seller. This loss was occasioned chiefly by the circumstance that the bank, being obliged*~~

~~*MINT*~~

~~*before sending the light gold to the mint for recomage to melt, assay, and cast it into bars, found it necessary to deduct the sum of 24d. an ounce from the rate of £3, 17s. 9d. an ounce at which it was allowed by statute to purchase gold for coinage, in order to cover the expense of these operations and the loss incident to them. The heavy loss in price, added to that from deficient weight, occasioned constant disregard of the law requiring all light coin to be cut or defaced, and consequently a large amount of light gold continued to be circulated. After the passing of the Coinage Act in 1870, accordingly, fresh regulations were made, by which the mint authorities undertook to receive light gold coin for recoinage, returning to the importer the full mint value of £3, 17s. 104d. an ounce, thus reducing the loss to that arising from deficiency of weight only. As the Bank of England was enabled py these regulations to raise ~ its price for light gold to the rate of £3, 17s. 9d., the same rate at which it is bound to purchase ingots of standard gold, greater inducements were offered to the public to send in. light gold for recoinage, and its withdrawal from circulation was in consequence greatly facilitated. It is*~~

~~*| evident, however, that, as the deficiency in weight must*~~

~~*entail some loss on the holders of light gold coin, they will be disposed to keep it in circulation as long as_ possible ; consequently only a small proportion of the light gold received by bankers finds its way to the Bank of England and thence to the mint for recoinage. The result of some careful experiments made by the late Mr Stanley Jevons, and published by him in the Journal of the Statistical Society (vol. xxxi. p. 426), showed that a*~~

~~*sovereign becomes so light as to be legally uncurrent at the end of eighteen years. The last state measure taken for the withdrawal of light gold coin from circulation was the issue of a royal pro- clamation in 1842 calling attention to the laws and regulations relating to light gold coin, and instructing those persons whose duty it was to enforce them to see that they were carried out. From the beginning of July 1842 to the end of March 1845 £14,000,000 in light gold coin was withdrawn from circulation and recoined. This amount was estimated to represent 95 per cent. of the whole of the light gold then in circulation. In order to facilitate this withdrawal the Treasury had in June 1842 entered into arrangements with the Bank of England by which the bank was enabled to purchase light gold on behalf of the Government, at the full mint value of £3, 17s. 103d. an ounce. Light coin, however, continued to be sent into the bank for some time after it had reverted to its original rate of payment for light gold, z.¢., £3, 17s. 64d. an ounce. The expense to the state of this withdrawal, including the expenses of recoinage, was £67,816. As no important withdrawal of worn gold coin has occurred since that time, it is evident that a large amount of light gold must be at the present time in circulation, and that the loss in weight must be considerably greater than that of the coins withdrawn in 1842, the oldest of which were not more than twenty-five years old, the first issue having taken ylace in 1817. It has been proved by experiment that the average loss of weight in worn sovereigns and half-sovereigns now in circulation is about 3d. in each sovereign, and that the deficiency in fineness of a large proportion of the coin amounts to about £400 per million. This deficiency arises from the trial plate of 1829, which determined the standard of a portion of the coins still in circulation, being itself below the legal standard. Taking the gold circulation at £100,000,000, of which about 50 per cent. is light, it is estimated that the amount to be recoined cannot be less*~~

~~*than £50,000,000, on which the loss from deficiency of*~~

~~*gold, both in weight and fineness, must be reckoned at about £650,000, independent of the expenses of recoinage. In the case of the silver coinage, the loss consequent on the*~~

~~*MINT*~~

~~*withdrawal and recoinage of silver money is now covered by the seigniorage arising from the difference between the real and the nominal value of the coins. Before the adop- tion of gold as the sole standard of value, the conditions attending the withdrawal and recoinage of silver were much the same as those for gold. In the period between the reign of Charles IJ. and the accession of William III. the condition of the silver coinage became so unsatisfactory as to demand the attention of parliament. A recommendation made at the suggestion of Sir Isaac Newton for a recoinage of silver was at first strenuously opposed, but was finally adopted. In the course of the discussion the question of raising the standard of weight and fineness arose, and this important change would probably have been made but for the representations of Locke, who warmly took up the question and convinced the Government of the desirability of preserving the established standard. In the great recoinage of silver, the loss arising from clipped and defaced coin was borne by the public, the money being raised by means of a special tax on glass windows. The silver reissued at this time amounted to £7,000,000, and the tax raised to cover loss and the expenses of coinage to £1,200,000. The work of this recoinage was so great that the resources of the mint in London were found to be unequal to the pressure put upon them, and therefore mints were either revived or established for the first time in a few of the large provincial towns. In addition to this ten furnaces were erected behind the Treasury at Whitehall to melt down the old pieces. By these means the renovation of the silver coinage was completed within the year. The new silver coins then issued were the first which had milled edges, the milling having been introduced in order to prevent clipping.*~~

~~*The mode in which the silver currency is distributed throughout the kingdom is explained by the late Mr George Forbes, caslucr of the Bank of England, as follows :—*~~

~~*Every banker in the kingdom has a banker wlio is his agent in London. Every London banker has an account with the Bank of England. In the Bank of England there is a department devoted to the issue and receipt of silver coin. If in a district there is a deficiency of silver currency, the bankers of the district are the first to find it out. They at once write to their London agents, who draw on their account with the Bank of England, and obtain*~~

~~what silver is required, which they send to the country banker. On the other hand, if there is a surplus of silver in a district it accumulates in the coffers of the local bankers, who send it up to their London agents, and they send it into the Bank of England. If there isa general demand for silver currency, the stock which the Bank of England endeavours to keep on hand becomes unduly diminished, and immediate notice of the fact is conveyed to the mint authorities, who proceed with all convenient speed to coin a supply of florins, shillings, sixpences, or of all of these coins, as the nature of the demand may require.~~

~~Gold bullion for coinage is supplied to the mint almost entirely by the Bank of England, the bank being bound by law to purchase at the rate of £3, 17s. 9d. an ounce any gold bullion of the legal standard which the public may bring for sale. Private individuals are permitted to bring bullion to the mint, and to receive back the full amount (at £3, 17s. 104d. an ounce) converted into coin, free of any charge for loss or manufacture ; but, as they are subject to considerable delay, all "importations" of bullion being converted into coin in the order in which they are brought to the mint, the public practically prefer to sell their bullion to the bank, and receive its value without delay. In order to be accepted by the bank, the bullion must be cast into ingots and assayed, a guarantee being | given by certain recognized assayers that the gold is of a certain standard fineness. This is known as the "trade assay." When the bank requires gold to be struck, due- notice is sent to the deputy master, and on a fixed day the bullion is conveyed to the mint and delivered into his~~

~~about 200 ounces, the aggregate value of each importa- tion being about £144,000. When the ingots arrive at the mint a small sample is taken from each and assayed,} the result being sent to the authorities of the bank in order that it may be compared with that of the trade assay. Ifthe bank authorities find that the two assays agree, within certain limits, as to weight~~

~~*and fineness, the ingots are immediately sent to the operative department of the mint to be converted into coin. The mint assay affords the basis for calculating the amount of copper, the alloying metal, that must be melted with the gold in order to produce the standard prescribed by law. 'The case of silver is somewhat different, the bullion being purchased by the department at its market value, which varies from year to year. During the ten years ending 1881 the average price of silver bullion sank gradually from 607;d. to 51432d. The silver bullion arrives at the mint in the form of ingots, each of which weighs about 1000 ounces, the value of each set of ingots varying considerably. The ingots, both of gold and silver, are weighed on a balance capable of turn- ing with 1 grain when loaded with 1200 ounces.*~~

~~*The operations of coining have undergone some slight changes with the introduction of new machinery and the increased extent of the Royal Mint, since the reconstruc- tion of the operative department in 1881.2 The plan (fig. 1) shows the present arrangement of the operative department.*~~

~~*The operations employed in the manufacture of gold and silver coin are as follows (incidental operations being printed in smaller type) :—*~~

~~*I. Assaying the bullion.*~~

~~*II. Melting the metal.*~~

~~*(w) Addition of the amount of copper necessary to form the prescribed alloy; (b) pouring the metal into moulds so as to form bars; (c) dressing these bars to remove rough edges and hollow ends ; (d) recovery of precious metals from crucibles and "sweep."*~~

~~*III. Assaying portions of metal cut from certain bars, to ascertain whether sufficient accuracy has been attained in the standard fineness.*~~

~~*IV. Rolling the bars into strips or " fillets."*~~

~~*Aunealing the fillcts (in some cases).*~~

~~*V. Adjusting the fillets by a final rolling, and in some cases by the use of the drawbench.*~~

~~*Testing the fillets to ascertain whether they arc of suffi- cient accuracy as regards thiekness.*~~

~~*VI. Cutting out disks or blanks from the fillets.*~~

~~*Adjusting the blanks in weight (in some mints).*~~

~~*VII. Edge-rolling the blanks to produce a raised rim,*~~

~~*Annealing the blanks and (in some cases) “ blanching” or ‘* piekling” them in dilute acid.*~~

~~*VIII. Coining, or stamping the device on the blanks, by means of engraved steel dies.*~~

~~*Milling the edges of the blanks or (in some cases) im- pressing a device, inscription, or ornament upon them.*~~

~~*IX. Weighing each coin, usually by the aid of automatic machinery.*~~

~~*X. Assaying and weighing pieces taken from the finished coin before it is issued to the public.*~~

~~*The foregoing list will make it clear that the operations of minting consist, not simply in the mechanical production of accurately adjusted disks of metal the purity alone of*~~

~~*1 The assays are conducted in the manner already described in the articles ASSAYING and GOLD.*~~

~~*2 Tn order to provide a stock of silver coin during the temporary suspension of the work of the mint, a large coinage of silver was issued, and BO tons of bronze coins were manufactured by contract in the autumn of 1881. The governor of the Bank of England had previously reported that the stock of gold coin held by the bank was abnormally large, and that no*~~

~~inconvenience would arise "af the mint were to fo coining sovereigns and half-sovereigns for a period of six mouths or a~~

~~custody. It arrives in the form of ingots, each weighing | year or even more." ui 8 |~~

~~486 MI~~

~~which has to be guaranteed, but in the formation of an | alloy composed of precious and base metals in definite pro- portions. The accuracy of the "standard fineness" of the | alloy after melting must be absolutely ascertained ; the | alloy must be protected during manufacture against a change of standard, and finally its correctness must be verified after it has been converted into coin.~~

~~The precious metals are weighed on entering the mint, as well as during various stages in the manufacture of coin. The finished coins are also weighed in bulk before they are issued to the public.~~

~~The operations incidental to the coinage of bronze and | silver differ from those described in relation to gold in some — unimportant details only; and the weight and composition | of the bronze coins are not so carefully guarded as is the case with gold and silver.~~

~~Nt Subjoined are the details of the operations involved in the conversion of bullion into coin at the British mint.~~

~~After being assayed and weighed in the manner already described Melting the bullion is taken to the melting-house, where the dctails of treat- the (The sub-.metal.~~

~~ment for silver and gold respectively differ somewhat. sequent operations are nearly identical for both metals.) The silver melting-house (see fig. 1) contains eight furnaces, of the kind shown at A fig. 2, the part of the furnace containing the crucibles being below the lids B, B. Crucibles of cast iron were formerly employed, but these were replaced in 1853 by wrought iron pots, which have since 1870 been in turn abandoned in favour of crucibles made of a mixture of clay and graphite, each crucible being capable of~~

containing about 3000 oz. Such crucibles are very generally adopted throughout the Indian and Continental mints, but the form and dimensions given to them vary. The fuel employed in England is coke, about 75 tb of which are re- quired to melt 3000 oz. of standard silver. Sufficient draught is

afforded by the flue C and by a chimney about 35 feet high which communicates with it.

The silver and copper are melted together ;

BRONZE STORE

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| SHOP

SILVER

MELTING i

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R20 H PeNGiNeEgD BOILERS 3

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~~MAIN BUILDING ~ \~~

~~=~~

~~f STORES~~

~~7~~

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~~PACKING ROOM~~

~~ANNEALING FURNACE~~

~~ROLLING~~

~~ROOM~~

~~COPPER Be OFFICE~~

~~ANNEALING BB ee~~

~~“STRONG” “HOLD,~~

~~= = =~~

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~~/~~

~~&o) . A ‘eV MINT OFFICE~~

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~~0 20 40 80 100 120 Foot.~~

~~—>———~~

~~FINISHED~~

~~BULLION COIN~~

~~Fic. 1.—Royal Mint, Tower Hill, London. Plan showing the Operative Department as rearranged in 1881-82.~~

~~and before the metal is poured into moulds it is stirred with an iron rod having a flattenedend. The surface of the molten metal is | covered with a layer of charcoal to prevent oxidation of the copper. | ' The crucible with its contents is then removed from the furnace | by the aid of a crane and tongs W, and is placed in a cradle M, which can be tilted by means of a handle D. By the interven- tion of toothed wheels E, F, G, H, and K acting on a rack the handle turns the crucible on the fulerum formed by a spindle, so that the contents of the crucible may be poured into the moulds N mounted on a carriage OP, running on rails Q, Q. The moulds now in use in London are of such dimensions as to enable bars to be cast 12 inches long and inch thick. The width of the bars varies, according to the coin to be produced, from 1 to 28 inches. | When the metal has solidified in the moulds it is removed, and | the bars are trimmed by the aid of a revolving circular file, their | ends being cut off and returned to the melting pot. Portions of metal are then cut from certain of the bars, and sent to the assay department. The bars are weighed before they pass to the subse-~~

~~quent operations of coinage, in order that the amount of inctal re- |~~

~~tained by the crucibles or carried into the flues may be ascertained. Gold bullion is melted in a similar way, but the crucibles are~~

~~| grasped being supporte~~

~~*and contain only 1200 oz. Their contents are poured by hand into moulds, one end of the tongs by which the erncible is d by a chain and suspended from the roof.? mints it is very generally the practice to metals in the furnace, the aid of small ladles*~~

~~*smaller,*~~

~~*In many Continental leave the crucible containing the precious and to pour the contents into the moulds by of wrought iron lined with clay. ;*~~

~~*It has been pointed out in Gop (vol. x. p. 751) that minute quantities of certain metals render standard gold extremely brittle and unfit for coinage. If either the gold bullion or the copper used as an alloying metal should be impure, brittle bars will be the result. Should this prove to be the case, the bars are re-*~~

~~*1 A new form of furnace devised by M. 'A. Piat of Paris has recently been introduced. In these furnaces the portion which contains the crucible may be detached from the flue, so as to admit of the molten metal being poured into moulds without removing the crucible from the incandescent fuel. Four of such furnaces have been fitted up in the gold melting-house, but have not as yet been used for gold melt- | ing ; in the melting of silver and bronze, however, they are known to | effect considerable economy in labour, fuel, and crucibles.*~~

~~*Rolling.*~~

~~*MINT*~~

~~*melted and chlorine gas is passed through the molten mass in the manner described in GoLD, vol. x. p. 750.*~~

~~*The engine-room (shown in fig. 1) contains three 60-horse- power vertical condensing engines, which are provided with Corlis valves, and are specially devised for meeting the constantly vary- ing strain to which they are subjected by the machinery, the whole of which they are capable of driving. The central éngine acts directly on either or both of the rolling rooms placed on each side of the engine-house. There is, however, an*~~

~~additional 20-horse- power compound beam engine usually employed, in connexion with the pumps of a deep artesian well.~~

~~Into one or other of these rooms the bars which have been cast~~

~~487~~

~~in the melting-house are brought, and are rolled into strips the thickness of which depends on the kind of coins to be produced. Gold is rolled in one room and silver or bronze in the other. The details of manipulation involved in the conversion of gold, silver, or bronze bars into coin, however, do not differ materially, and the coinage of sovereigns will therefore be taken as typical.~~

~~Each room contains six pairs of rolls, the diameter of the rolls varying from 10 to 14 inches. Smaller diameters are employed in most European mints, but on the other hand the use of very narrow rolls of far larger diameter has often been suggested, and there appears to be good ground for the belief that the rigidity of such rolls would enable strips or fillets of more uniform thickness to be~~

~~Fic. 2.—Furnace Apparatus.~~

~~produced than is the case at present. The iron frame CC (fig. 3) is | and, as it rises with the screws, it can thus be readily adjusted in a~~

~~firmly bolted to the stone D, which rests on a solid foundation KE. This frame supports the two rolls A, B, the lower of which B revolves, but is not, like the upper, capable of adjustment in a ver-~~

~~L~~

~~= =~~

~~Fig. 8.—Rolls. tical plane. The upper roll is centred in bearings, and may be raised | first room, In some of the six pairs the bottom rolls revolve and drive the upper~~

or lowered by means of screws connected with toothed wheels F, F, which are turned by a handle G, both wheels being moved simulta- neously by worms on the rod If.

|| i

/ minute.

line exactly parallel with the lower roll, at a sufficient distance from it to admit the bar which is to be reduced to a strip or fillet. The rolls are turned by the shaft NN, the main wheel M, and the gearing K, L, O, P. The sockets r by which the upper roll is conuected with the gearing by the shaft I are not rigid, as is the case with the shaft Q of the lower roll, but admit of the adjust- ment of the roll. The portion of the roll used is determined by a

| guide a little wider than the bar.1 The rolls throughout this

department are driven at the rate of about 32 revolutions in a The iron frame CC is braced by rods a, s; and blocks bearing the driving shafts are shown at k, k, p, p.

The initial thickness of a sovereign bar is 3ths of aninch. The bars

' are weighed out to the workmen in batches of about sixty bars,

i

[| | same conditions of adjustment.

†

†

an entire batch being passed through the rolls under precisely the The bars are only slightly reduced in width by repeated passages through the rolls, but are successively reduced in thickness in the first stages of the rolling by #yth of an

$$._ —€—0 0€0¢0 050 0

~~1 In the second rolling room, shown in the plan on the right of the engine-~~

~~| house, the frames and gearing of the rolls are of newer pattern than those in the~~

~~| which the fillets are first treated,—the upper roll is stationary, | alone revolving.~~

~~The bearings of the upper roll are |~~

~~In the pair of “ breaking-down”’ rolls in this room,—that is, the roll by the Jower ro} “pite” is given to the fillet, when its end is a ratchet-wheel and~~

~~ones,~~

~~The necessary introdueed, by slightly turning the upper roll by means of~~

~~connected by vertical rods with weights below the level of the floor ; | lever.~~

~~488~~

~~inch, while in the later stages the reduction in thickness at eacli passage through the rolls is less than +4,th of an inch, and finally one or two “spring pinches” are given to the bars by simply pass- ing them through the rolls without altering the adjustment. The testing of the fillets, to ascertain whether they are of the accurate thickness, is effected by the aid of the gauge plate (fig. 4), which |uo, consists of two steel bars sct at a low angle in relation as ne other and graduate to rassth gee inch. Fie. 4.—Gauge Plate.~~

~~It will be evident that the weight of the finished coin depends upon the thickness of the fillets ; and to show how accurately the rolling must be performed it may be pointed out that, in the ease of the half-sovereign, a variation of gy$yth of an inch above or below the accurate thickness (or a range of r}yath of an inch) throws the coin out of “ remedy.”~~

~~IHh | HN A hin~~

~~AWN , NS ll~~

~~*MINT*~~

~~*The repeated passage through the rolls is attended by a consider- able increase of hardness in the metal, and it is therefore in some cases necessary to anneal the fillets repeatedly during the rolling. In the case of fillets for sovereigns the annealing may be entirely dispensed with if the initial thickness of the bars does not exeeed ths of aninch. Fillets for half-sovereigns have only to be annealed onc2, In some European mints the fillets are annealed frequently ; in one mint the operation is performed after each passage through the rolls. The furnace used for the purpose is generally so arranged as to permit the flame to play over the fillets, which are sometimes freely exposed to its action, but are more often enclosed in cases or tubes. Muffle furnaces are frequently used. The furnace used in the Royal Mint is a simple form of reverberatory furnace. The final rolling is given by a pair of finishing rolls capable of more accurate adjustment than the " breaking-down" rolls.*~~

~~*The fillets of gold or silver are in some eases, though not always, Drag submitted to an appliance known as the drag bench, show in bench,*~~

~~*figs. 5, 6, 7. drawing them between steel cylinders.*~~

~~*Its object is to equalize the thickness of the fillets by The ends of the fillets are*~~

~~¥~~

~~*i*~~

~~*Mit*~~

~~*Fries. 5, 6, 7.—Drag Bench.*~~

~~*first flattened in a little appliance, which need not be described. | fillet is released, the pins 7, 7 and the weight / loosen the jaws and*~~

~~*The essential feature of the machine now used in the mint consists of two small steel cylinders A, A, which : do not revolve, aud are via*~~

~~*held in position in the > (; Ni ig Z UT say |*~~

~~*plates D, D by clamp pieces _ Lt >*~~

~~*F, F serewed against them. The portions of metal may be adjusted by the aid of a wheel and screw II (figs. 6, 7), and by small ad- justing screws f, f. The part of the machine con- taining the steel cylinders is fixed at the end of a long bench, and gearing at the other end of this bench drives an endless chain BB (fig. 6), one link or other of F which eatches the carriage, * shown in plan in fig. 5, and drags it along as soon as its end f is depressed by the handler. The carriage runs on the wheels d, d. The drawing of the fillet C is conducted as follows. Its flattened end is intro- duced between the steel eylinders, and is grasped — by the jaws a. The jaws — turn on the pin ¢, and while the fillet is being dragged through the cylinders the === SS = axle of the wheels d, d tends : :*~~

~~*to inerease the grip ed the Fie, 8.—Cutting Machine.*~~

~~*jaws by acting on their inclined ends. Directly the strain on the*~~

~~*at the same time raise the end of the earriage so as to arrest its further progress along the bench. 'The carriage is then moved forward by the handle s until the jaws enter the hollowed portion N and grasp another fillet.*~~

~~*Formerly—when fillets were rolled from thick bars—this appliance played a more important part in coining operations than at present. It is now only used for fillets from which sovereigns and half- sovereigns are to be produced. Before fillets are passed on to the next operation—that of cutting from them the disks or blanks destined to form the coin—they are carefully tested by a skilful workman*~~

~~*called the "tryer," who cuts one or two blanks from the sides of Trying.*~~

~~*each fillet by the aid of a cutter worked by hand. These blanks are weighed on a delicate balance against a standard weight, and the experience of the operator enables him to determine whether the*~~

~~*| variation from the exact weight will justify his sending the fillets for- | ward to the cutting room. 'two or more classes for a reason that will be explained presently. The cutters employed in the mint until quite recently were of Cutting complicated construction, but these have been replaced by a simple blanks.*~~

~~*In any case he divides the fillets into*~~

~~*machine (fig. 8) which, by the revolution of an excentric A, causes two short steel cylinders, mounted on a block of iron B suitably guided, to enter two holes firmly fixed in a plate on the bed of the*~~

~~*machine. When the fillet FF is interposed between the short eylin- ¢ OO O O ole ders and the holes, the former force OC) C) C) C) C) 'S*~~

~~*disks of metal through the holes, Fic. 9 the fillet being advanced at each ie stroke of the machine by small gripping rolls C, C', C" actuated by a ratchet-wheel E, driven from the shaft which bears the excentric A. The disks pass down the tube G to a receptacle placed on the floor.*~~

~~*'In the ease of very large silver coins, only one disk is cut in the*~~

~~*width of the fillet; and in some few mints disks for gold coin are also eut in this way, but it is far more usual to cut two disks in the width of the fillet, the position of the cutters being so arranged as to remove blanks in the*~~

~~*manner shown in fig. 9. In cutting disks for bronze coin extreme precision is not necessary, and it has ney been found possible to obtain five at each stroke of the machine.*~~

~~*ML NT*~~

~~*Tt will be evident that the rough classification of the fillets according to their thickness, to which reference has already been made, renders it easy to compensate for slight irregularities in thick- ness caused by rolling, by employing cutters of a slightly larger diameter than the standard size for fillets which are too thin.*~~

~~*The fillets after the removal of the disks present the perforated appearance shown in fig. 9. The residual metal, called " scissel," which amounts to from 25 to 30 percent. of the metal operated upon, is returned to the melting-house in bundles weighing 180 oz. 1t may be mentioned here that all attempts to cut disks or blanks for coinage from the ends of rods or cylinders, and thus to avoid the production of scissel, have hitherto failed. —*~~

~~*The next operation to which the blanks are submitted varies in different mints. In some, each blank is weighed by hand or by automatic machinery, and each blank that is too heavy is adjusted either to an exact weight or to within the remedy prescribed by law. On the Continent it is very generally the practice to adjust blanks by the aid of a file, or by a machine that removes a fine shaving of metal from the surface of the blank. In mints where mechanical adjustment isadopted there isa tendency to produce '*~~

~~*Fig. 10.*~~

~~*between two planes, one of which is fixed and bears the device, while the other has a reciprocating motion imparted to it, or the edge of the blank receives the impression, which may be either raised*~~

~~*:—*~~

~~*1 A description of a machine used for the adjustment of blanks will be found in Dingler's Polytechnisches Journal (1882, ccxlv. 61, pl. 6); und some years ago Mr J. M. Napier devised for the Indian mints a beautiful machine*~~

~~*which first ascertains how much it is necessary to cut from each blank in order to reduce it tothe standard weight, and then removes the necessary amount of metal and no more. The initial eost of such machinery, however, is considerable. In 1849 M. Diereek, director of the mint in Paris, endeavoured to substitute a chemical for a mechanical treatment by submitting the heavy gold blanks to aqua regia, which it was anticipated would bring them within the prescribed limits of accuracy. The results were not satisfactory, and the attempt was abandoned. In 1870 the present chemist of the mint, Professor W. Chandler Roberts, showed that gold alloyed with copper might be removed from heavy blanks with singular regularity by means of a suitable solvent aided by a battery. The blanks are arranged in a frame of wood and submitted to the action of a solution of eyanide of potassium, the heavy blanks forming the dissolving pole of the battery. The process was not used in the London mint, as it became evident that it could not profitably replace the present system, under which finished coins alone are weighed and the manufacture of good coin only is paid for. It was, however, introduced into the Bombay mint in 1870 by the late Mr L. G. Hines, who extended its usefulness by transferring the metal dissolved from the heavy blanks to blanks which are too light, the latter being by this means raised to the prescribed weight. The process has now fairly taken its plaee as an ordinary operation of coining, and its importance to the mints where it is used may be gathered from the fact that in the Indian mints no less than 1300 tons of silver were converted into coin in one year (1879), so that the saving effected by its introduction must be considerable.*~~

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~~*In the London mint finished coin alone is weighed, so that the blanks after leaving the cutting room pass directly to an edge-rolling machine, which thickens the edge of each blank so as to form arim intended to protect the impression on the finished coin. The operation of edge-rolling is called "marking," and the method of conducting it varies considerably in different mints.*~~

~~*_In the Royal Mint the blanks are made to pass in quick succes- sion, at the rate of six hundred a minute, between a circular groove in the face of a revolving steel disk and a groove in a fixed block placed parallel to the face*~~

~~*of the revolving disk. The groove in the block exactly corresponds to that on the disk; and, as the distance between the' block and the disk is slightly less than the diameter of the blank submitted to the operation, the result is that before the blank escapes from the machine its edge has been thickened. The operation may be varied by admitting the blanks between a groove in the periphery of a revolving wheel and a groove in a segmented block, placed at a distance from the wheel rather less than the diameter of the blank. The wheel and block may be either vertical or horizontal.*~~

~~*In some cases the edges of the blanks, at the same time that they are thickened, receive the impression of a legend, or inscription, or an ornamental device. When this is the case the blank is rolled*~~

~~*W.J WELCH. SE*~~

~~*Pigs,*~~

~~*| or sunk, from a collar surrounding the blank in the coining press, as*~~

~~*will be afterwards explained.*~~

~~*Before passing to the coining press the blanks either of gold or Anneal- In many mints the object of the heating is ing the not only to soften the blanks before they receive the impression, but blanks.*~~

~~*silver are annealed.*~~

~~*also to produce a film of oxide of copper on their surface. This is attained in various ways. In England gold blanks are placed in cylindrical crucibles of plumbago and covered with a layer of char- coal, heated in a reverberatory furnace, and when the blanks reach cherry-redness they are cooled by plunging them in water. The thin film of oxide of copper thus formed on the surface of the gold or silver blanks is readily soluble in dilute sulphuric acid, and the removal of a small portion of the alloying metal in this way con- stitutes "blanching" or "pickling" the coin. The method of conducting the operation varies somewhat in different mints, mainly, however, in the strength of the acid used, which varies from 3° to 5° of the hydrometer of Baumé. The solution is sometimes heated to 96° to 98° C., while in other*~~

~~*cases the blanks are intro- duced into the solution while at a red heat. The latter method is, however, objectionable, as a dense layer of pure metal is found at the surface of the blank which is apt to protect the underlying oxide of copper from the action of the acid. The planks are afterwards washed in pure water and dried either in sawdust or in copper vessels heated by steam jackets. The — _ the — is to . — 62*~~

~~*Coining press.*~~

~~*Auto- matic balance.*~~

~~*490*~~

~~*improve the appearance of the finished coin by removing all traces of impurity from the surface of the blank. It has, however, been abandoned in the British mint except in the case of some of the smaller silver coins, mainly because the soft superficial layer of metal wears away with undue rapidity. Certain precautions suggested in 1869 by Mr Hill, the superintendent of the operative department, for avoiding oxidation or tarnishing of the metal during coinage rendered the abolition of the process possible.*~~

~~*The blauks receive the impression which constitutes them coins from engraved dies. Each is placed in the lower of two dies, and the upper die is brought forcibly down upon it. The lateral escape of the metal is prevented by a collar which surrounds the blank while it is being struck. This collar may be either plain or engraved, and if the latter is the case any device or ornament it may bear will be imparted to the edge of the blank. } ;*~~

~~*The coining presses used in various mints may be divided into three types : —(1) the screw press worked by atmospheric pressure, (2) the excentric press, and (3) the lever press. The first of these (see Ency. Brit., 8th ed., vol. vii. p. 92) has now been abandoned. In the excentric press the power is applied to a shaft bearing an excentric which acts by means of a connecting rod upon a verti- cal slide holding the die which is brought down on the blank. This form of press is used in the mint at Constantinople, where the atmo- spheric screw press is also still retained. Of the third type, the lever press, there are two modifications, devised respectively by Thonnelier and*~~

~~*by Uhlhorn. The details of the Uhlhorn press have been improved by Messrs R. Heaton & Sons of Birmingham ; and, their superiority to the old vacunm screw press having been demou- strated by careful experiments, they have been finally adopted in the newly arranged mint, which contains fourteen of them. This press is shown in figs. 10 and 11. It is driven from below the floor of the press-room by bands which pass over fast and loose pulleys on the same shaft that bears the fly-wheel. The loose pulley, however, is only used when it is necessary to stop the machine entirely, as the fly-wheel is permitted to revolve without imparting motion to the shaft so long asa lever M, worked from the front of the machine, does not cause the fly-wheel to be con- nected with the driving wheel by means of two pins. The dies are placed in the front part of the machine (fig. 10). The lower one is firmly fixed to the bed, while the upper is held at A by the upper of two jaws F and A', or levers, the fulera of which are so close together as almost to coincide, the lower jaw A' bearing the collar which encircles the blank while it is being converted into a coin; the Ly jaw F, A, governed by the weighted lever H shown below the bed of the machine, has a tendency to rise a sufficient distance to admit the blank between the upper and lower die. A crank B on the shaft bearing the fly-wheel is connected by a rod C with the bent lever D, and this bent lever, acting through the toggle joint and a piece of metal E connected with the jaw that bears the*~~

~~*Fig. 12. upper die, forces it down, and thus squeezes the blank between the*~~

~~*upper and lower dies. A cam on the crank shaft acting on the lower of the two levers G shown below the bed of the machine causes the lower jaw A' bearing the collar which surrounded the blank to be depressed sufficiently to leave the finished coin freely resting on the lower dic, from whence it is driven down the shoot N by the next blank in succession. Coins are produced at rates varying from 60 to 120 a minute, 90 a minute giving the best results. The blanks to be converted into coins are placed on the slide J, and the advance of each blank in succession is regulated by the rod called the "layer on" K, the backward and forward movement of which is also regulated by an excentric on the crank shaft. The details of this part of the machine are shown in plan, fig. 12.*~~

~~*The last operation before the finished coin is returned to the mint office for issue to the public is the weighing each gold or silver piece separately. This is effected in the American and in most Contiuental*~~

~~*MINT*~~

~~*mints by hand, but in England automatic balances of beautiful construction are employed. They were originally devised for separating worn pieces from those of current weight, but they are now employed to distinguish between "light," "heavy," and " good" pieces, the latter alone being permitted to pass into circulation. In the newly arranged department thirty such machines are provided. Each is driven from overhead shafting by means of gut linex The driving pulleys derive their motion from a small atmospheric engine, which is found to give more satisfactory results than would be the case if the steam-engine were employed directly. Each balance is worked by a cone pulley A (fig. 13) by a gut line passing round it from the loose pulleys B, the necessary ten- sion being imparted to the line by means of a spring C. The tension of the line is, however, but slight, for if the action of the balance is arrested by accident the cord slides over the cone pulley A without turning it. It will be obvious that the use of the cone pulley enables the machine to be driven with varying degrees of speed. The toothed wheel D is mounted on the spindle which bears the driving pulley A, but it acts only through the intervention of a friction cheek, which is so lightly screwed against the driving wheel – that it would cease to act if the machine should be accidentally deranged. The wheel D sets in motion the wheels E, E', E'. The cam F, acting on the curved extremity of the rocking frame G, causes the slide H to bring forward one of a series of coins (arranged in the hopper I) until it rests on the plate J of the balance beam, of which beam a portion is shown in an enlarged drawing above the balance, while the plate that receives the coin is also shown in a separate drawing to the left ofthe machine. Another cam K then comes into play, and enables the forceps, shown at L, to release the rod M to which the balance plate J is attached. The forceps L serves to keep the rod steady while the coin is being placed on the plate J. A rod shown at N is then raised by the cam O, the lower extremity of the rod being kept steady by a pin sliding in a hole in the bottom plate of the balance, and its upper end by a pin which works into the central support of the balance beam. At the base of this rod N, and at right*~~

~~*angles to it, there is a metallic bar QQ, the ends of which pass through stirrups in the pendants M and P from the opposite ends of the beam. The elevation of this horizon- tal rod by the cam O simultaneously releases both ends of the beam, aud the coin placed on the beam plate has then, for the first time, a direct influence on the beam. If the coin is "too light" the counterpoise R in the cage at the end of the rod P will raise the coin, and the revolution of the machine then causes part of the cam K to permit a spring to close the forceps L and to hold the pendant M firm. An indicating finger T then falls, and by means of a horizontal lever UU', which fits into one of three inverted steps on the bottom of the shoot V, determines over which of three orifices W,W',W" in the bottom plate of the balance this shoot shall stand. In the meantime the advance of the slide H brings the next piece forward, and displaces the coin which has hitherto occupied the beam plate J, forcing the coin down the shoot V, and thence through the orifice W into a receptacle, external to the balance, destined for the reception of ""'light coin." If this next piece should be "too heavy" it will not only raise the counterpoise R but will also elevate a little wire S, which would otherwise remain undisturbed ona support. This little wire represents the "working remedy" for the particular denomination of coin in question, which, for safety, is less by 35th of a grain than the remedy permitted by law. The undue weight of the " heavy coin" will depress the right end of the balance beam and its pendant M to the lowest possible point, and the indicating finger T will, in this case, determine that the rod UU' shall occupy the lowest step of the shoot V, which will conse- quently stand over the orifice W" in the bottom plate of the balance which communicates with the receptaele for the ""' heavy" coins, and the heavy coin on the beam plate will be driven down the shoot by the next coin in succession. If the coin which is next brought forward by the slide H should be a "good" one, that is, if it is within the working "remedy," its action will be as follows. It may be slightly heavier than the counterpoise, but not sufficiently heavy to lift both the counterpoise and the remedy wire. The balance beam consequently remains approximately horizontal, and the indicating finger T will cause the rod UU' to strike the centre step of the shoot V, which will then stand over the central orifice W' in the bed plate which communicates with a receptacle for " good" coins, into which the coin will find its way, as soon as it is driven from the beam plate by the next coin of the series. It will*~~

~~*be evident that this excelient appliance both weighs and classifies the coins. About twenty-three coins are passed through it in a minute.*~~

~~*In order to show the importance of extreme accuracy in weighing, it may be pointed out that, although by the Coinage Act of 1870 the 'remedy ," or allowed variation above or below the standard weight of a sovereign is only)th of a grain, yet in a million sterling of sovereigns the difference between the least and the greatest weight the law allows would be no less than £3244.*~~

~~*The manufacture of coin is not the only work which is performed in the Royal Mint. All medals issued to the*~~

~~*MINT*~~

~~*army and navy, as well as those given by the Royal Society and the university of London and some others, are struck in the mint, and their preparation forms a considerable part of the work of the die department. Since 1874 the clasps and bars for the medals have also been manufactured in the mint, whence they have been issued completely mounted. Another operation, not con- nected with the coinage, which is performed in the mint*~~

~~*CO)*~~

~~*f*~~

~~*491*~~

~~*is the assay of the "diet" or metal scraped from the gold and silver plate manufactured at Sheffield and Birmingham under the direction of the warden of the standard of wrought plate for those towns. By Act of Parliament it is directed that this shall be brought once in each year to the mint to be assayed by the "king's assay master," under the supervision of an officer appointed by the lords of the Treasury.*~~

~~*cic ESS:*~~

~~*A! ' | (\ — EEE*~~

~~*The gold coin in circulation in Great Britain is esti- mated at £100,000,000. It may be well to add the following table, which gives the value of the gold and silver coinages of four of the most important foreign countries, in two recent years :—*~~

~~*1880, 1881.*~~

~~*Gold. Silver. Gold. Silver.*~~

~~*United States £12,461,655, £5, 481,941 £19,370,178 £5,587,840 Germany ….. 1,332,430 ae 326,837 dr MISE es. . 493,605, 1,674,712 485,999) 1,805,734 Francee)s….. ˈ.- sid 83,646 259,910*~~

~~*£14, 287,690 £7,156,653 £20, 266, 660) £7,653, 484*~~

†

~~*The value of the gold coinage of the American mints during the fiscal year ending June 1882 amounted to*~~

~~*$89,413,447°50,—being greater than that of any previous |*~~

~~*year in their history. (W. CG. RR. A. H.) MINT, botanically Mentha, a genus of labiate plants, comprising about twenty species of perennial herbs, widely distributed throughout the temperate and sub-tropical portions of the globe. All the species are furnished with square stems, opposite, aromatic leaves, and creeping roots. The flowers are arranged in axillary cymes, which either form separate whorls or are crowded together into a terminal spike. The corolla is usually small, and of a pale purple or*~~

†

~~*Gos*~~

~~*Fic. 13.—Automatic Balance.*~~

~~*pinkish colour ; it has four nearly equal lobes, and encloses two long and two short stamens. Great difficulty is experienced by botanists in discriminating the species of this genus by reason of the occurrence of a*~~

~~large number of intermediate forms, nearly three hundred of which have been named and described. Many of these varieties are permanent in consequence of being propagated by stolons.~~

~~In Britain nine of the recognized species are indigen- ous. Mentha viridis, L., or Spearmint, grows in marshy meadows, and is the species commonly used for culinary purposes ; it is distinguished by its smooth, sessile leaves and lax tapering flower-spikes. Mentha sylvestris, L., or Horsemint, chiefly differs from the above in its coarser habit and hairy leaves, which are silky beneath, and in its denser flower-spikes. This plant is supposed to be the mint of Scripture, as it is extensively cultivated in the East, and is much used in cookery; it was one of the bitter herbs with which the paschal lamb was eaten. M. rotundifolia~~

~~| resembles the last in size and habit, but is readily distin- _ guished by its rounded wrinkled leaves, which are shaggy~~

†

†

~~beneath, and by its lanceolate bracts. The last two species usually grow on damp waste ground near roadsides. MM, aquatica, or Capitate Mint, grows in ditches and by the side of streams, and is easily recognized by its rounded flower-spikes and stalked hairy leaves. /. Piperita, or Peppermint, has stalked smooth leaves and an oblong obtuse terminal spike of flowers ; it is extensively culti-~~

~~492~~

~~vated for its volatile oil. JL pratensis belongs to a group of mints which, unlike the foregoing, have the flowers arranged in axillary whorls and never in terminal spikes ; it otherwise bears some reserblance in foliage and habit to M. viridis. M. sativa, the Whorled Hairy Mint, grows by damp roadsides, and M. arvensis in cornfields ; they are distinguished from J. pratensis by their hairy stalked leaves, which in Jf arvensis are all equally large, but in M. sativa are much smaller towards the apex of the stem. M. Pulegium, commonly known as Pennyroyal, more rarely as Flea-mint, has~~

~~*small oval obtuse leaves and flowers in axillary whorls, and is remarkable for its creeping habit and peculiar odour. It differs from all the mints above described in the throat of the calyx being closed with hairs. It is met with in damp places on grassy conmmons, and forms a well-known domestic remedy for female disorders.*~~

~~*All the plants of the genus Mentha abound in a volatile oil, which is contained in small receptacles having the appearance of resinous dots in the leaves and stems. The odour of the oil is similar in several species, but is not dis- tinctive, the same odour occurring in varieties of distinct species, while plants which cannot be distinguished by any botanical character possess the same odour. Thus the peppermint flavour is found in J. Piperita, in A. incant, and in Chinese and Japanese varieties of M.arvensis. Other forms of the last-named species growing in Ceylon and Java have the flavour of the common garden mint, Jf. viridis, and the same odour is found to a greater or less degree in M. sylvestris, M. rotundifolia, and MM. canadensis, A bergamot scent is met with in a variety of M. aquatica and in forms of other species. Most of the mints may be found in blossom in August.*~~

~~*The name mint is also applied to plants of other genera, Monarda punctata being called Horsemint, Pyenanthemum linifolium, Mountain Mint, and Nepeta Cataria, Catmint.*~~

~~*MINTO, Sir Gitzert Extiot, First Hart or (1751- 1814), was descended from an old border family, the Elliots of Minto, and was born at Edinburgh, April 23, 1751. His father, Sir Gilbert Elliot, was a member of the administration of Pitt and Grenville, and is spoken of by Horace Walpole as "one of the ablest men in the House of Commons." Young Elliot was educated by a private tutor, with whom at the age of twelve he went to Paris, where David Hume, who was then secretary of the embassy, undertook, from friendship to his father, the special charge of superintending his studies. After spending the winters of 1766 and 1767 at Edinburgh University, Elliot entered Oxford. On quitting the university he became a member of Lincoln's Inn, and was in 1774 called to the bar. He entered parliament in 1776, the year of his father's death. Although he gave a general support to Lord North's administration, he from the beginning occupied an inde- pendent*~~

~~*position, and in 1782 supported the address of the Commons against an offensive war with America. From this time he became a declared follower of Fox and Burke, with the latter of whom he gradually came to be on terms of great intimacy. He was created Baron Minto in 1797, and after filling several diplomatic posts with great success became in 1807 governor-general of India. The character and events of his rule in India are described in vol. xii. p. 805. He was created Earl of Minto and Viscount Melgund in 1813. He returned to England in 1814, and died on June 21st of that year.*~~

~~*See Life and Letters of Sir Gilbert Elliot, first Earl of Minto, from 1751 to 1806, 1874; and Lzfe and Letters, 1807-14, 1880. See also MIRABEAU.*~~

~~*MINUCIUS FELIX, Mazcus, one of the earliest, if not the earliest, of the Latin apologists for Christianity. Of his personal history nothing is known, and even the date at which he wrote can be only approximately ascertained.*~~

~~*MIN—Mih*~~

~~*Jerome (De Vir. Iil., 58) speaks of him as "Rome insignis causidicus," but in this he is probably only improving on the expression of Lactantius (Inst. Dw., v. 1) who speaks of him as "non ignobilis inter causidicos loci." He is now exclusively known by his Octavius, a dialogue on Christianity between the pagan Czcilius Natalis! and the Christian Octavius Januarius, a provincial solicitor, the friend and fellow-student of the author. The scene is pleasantly and graphically laid on the beach at Ostia on a holiday afternoon, and the discussion is represented as arising out of the homage paid by Ceecilius, in passing, to the image of Serapis. His arguments for paganism, which proceed partly upon agnostic grounds, partly upon the inexpediency of disturbing long-established religious beliefs, partly upon the known want of culture in Christians, the alleged indecency of their worship, and the inherent absurdity of their doctrines, are taken up seriatim by Octavius, with the result that the assailant is convinced, postponing, however, the discussion of some things neces- sary for perfect instruction to a future occasion, The form of the dialogue, modelled on the De Natura Deorwm and De Divinatione of Cicero, shows much care and ability, and its style is on the whole both vigorous and elegant if at times not exempt from something of the affectations of the age If the doctrines of the Divine unity, the resurrection, and future rewards and punishments be left out of*~~

~~*account, the work has less the character of an exposition of Christianity than of a philosophical and ethical polemic against the absurdities of crass polytheism. Christology and the other metaphysics of distinctively Christian theology are entirely passed over, and the canonical Scriptures are not quoted, hardly even alluded to.*~~

~~*The Octavius is admittedly earlier than Cyprian's De Idolorum Vanitate, which borrows from it ; how much earlier can be deter- mined only by settling the relation in which it stands to Tertullian's Apologeticum. The argument for the priority of Minucius has been most exhaustively set forth by Ebert ("Tertullians Verlalt- niss zu Minucius Felix," in vol. v. of the philologico-historical series in Abhandl. d. Kénig. Stehs. Gesellsch. der IVi issonschaften, 1868), who has been followed by Teuffel (Rém. Lit., sec. 368), Keir (Celsus' Wahres Wort, 1873), Kuhn, and other scholars. The opposite view is ably maintained by Professor Salmon (" Minucius Felix" in Smith's Dict. Christ. Biogr., 1882). The Octavius was first printed (Rome, 1543) as the eighth book of Arnobius Adv. Gentes ; Balduinus (Heidelberg, 1560) first assigned it to its propow author. There have been numerous subsequent editions, the best being that of Halm in the Corp. Scriptor. Eccl. Lat. (Vienna, 1867). See Kuhn's monograph, Der Octavius des Minucius Feliz (1882), MINUET (Fr. Menuet, from [pas] menus), a very grace- ful kind of dance, consisting of a coupee, a high step, and a balance. Its invention is universally ascribed to the inhabitants of Poitou. The melody begins with the down beat, and contains three crotchets ina bar. The music is made up of two strains, which, from being repeated, are called reprises, each consisting of eight or more bars, but very rarely of an odd number. Walther speaks of a minuet in Lully's opera of Roland, each strain of which contains ten bars, the sectional number being five,—a circumstance which renders it very difficult to be danced ; but Lully's system of phrasing was remarkably irregular. Modern instrumental composers have introduced into their sym- phonies and quartetts, &c., minuets of rapid movement and fanciful character, followed by supplementary strains (called trios) in a different style. Some of these composi- tions bear but very slight resemblance to the older forms ; and many of them begin with the third beat in the bar. The finest minuets we possess are those in Handel's Samson and Mozart's Don Giovanni.*~~

~~*MIRABEAU, HonortGasrieLt RiquetiI, CoMTE DE, (1749-1791), one of the greatest statesmen and orators*~~

~~*1 This name occurs in six inscriptions of the years 211-217 found at Constantine (Cirta), North Africa (C. Z. Z., vol. viii.).*~~

~~*MIRABE AWG 492*~~

~~*France has ever produced, was born at Bignon, near Nemours, on March 9, 1749. M. de Loménie has shown that the family of Riquet or Riqueti came originally from the little town of Digne, that they won wealth and municipal honours as merchants at Marseilles, and that in 1570 Jean Riqueti bought the chateau and estate of Mirabeau, which had up to that time belonged to the great Provengal family of Barras, and took the title of esquire a few years later. In 1685 Honoré Riqueti obtained the title of Marquis de Mirabeau, and his son Jean Antoine brought honour to it. He served with distinction through all the later campaigns of the reign of Louis X1V., and especially distinguished himself in 1705 at the battle of Cassano, where he was so severely wounded in the neck that he had ever after to wear a silver stock ; yet he never rose above the rank of colonel, owing to his eccentric habit of speaking unpleasant truths to his superiors. On retiring from the service he married Frangoise de Castellane, a remarkable woman, who long survived him, and he left at his death, in 1737, three sons —Victor, Marquis de Mirabeau (see next article), Jean Antoine, Bailli de Mirabeau, and Comte Louis Alexandre de Mirabeau. The great Mirabeau was the elder surviving son of the marquis. When but three years old he had a virulent attack of confluent small-pox which left his face for ever disfigured, and contributed not a little to nourish his father's dislike to him. His early education was conducted by Lachabeaussitre, father of the better known man of letters, after which, being like his father and grandfather destined for the army, then the only profession open to young men of family, he was entered at a pension militaire at Paris, kept by an Abbé Choquart. Of this school, which had Lagrange for its professor of mathematics, we have an amusing account in the life of Gilbert Elliot, first earl of Minto, who with his brother Hugh, afterwards British minister at Berlin, there made the acquaintance of Mirabeau, an acquaintance which soon ripened into friendship, and to which Mirabeau in later life owed his introduction into*~~

~~*good English society. On leaving this school in 1767 he received a commission in the cavalry regiment of the Marquis de Lambert, which his grandfather had commanded years before. He at once began love making, and in spite of his ugliness succeeded in winning the heart of the lady to whom his colonel was attached, which led to such scandal that his father obtained a lettre de cachet, and the young scapegrace was imprisoned in the isle of Rhé. The love affairs of Mirabeau form quite a history by themselves, and a well-known history, owing to the celebrity of the letters to Sophie; and the behaviour of the marquis in perpetually imprisoning his son is equally well known, and as widely blamed. Yet it may be asserted that until the more durable and more reputable connexion with Madame de Nehra these love episodes were the most disgraceful blemishes in a life otherwise of a far higher moral character than has been commonly supposed. As to the marquis, his use of lettres de cachet is perfectly defensible on the theory of the exist- ence of lettres de cachet at all. They were meant to be used (see Lurrres DE CacueEt) by heads of families for the correction of their families, and Mirabeau, if any son, surely deserved such correction. Further, they did have the effect of sobering the culprit, and the more creditable part of his life did not begin till he left Vincennes. Mirabeau, it may be remarked at once, was not a states- man of the Alcibiades type, and he did not develop his great qualities of mind and character until his youthful excesses were over. These will be passed over as rapidly as possible, for it was not till 1781 that the qualities which inade him great began to appear.*~~

~~*On being released from his first imprisonment, the young count, who had always intended to continue his military*~~

~~*career, obtained leave to accompany as a volunteer the French expedition which was to effect the reduction of Corsica. The cunquest was one of sheer numerical strength, for the whole population was on the side of Paoli, and Mirabeau, perceiving the value of public opinion, is said to have written a treatise on the oppression the Genoese had formerly exercised over the island, which the Government was ready to publish had not the Marquis de Mirabeau thought fit to destroy it because of its divergence from his own philosophical and economical views. For his services in Corsica Mirabeau was made a captain of dragoons, though not in any particular regiment,*~~

~~*and on his return his father endeavoured to make use of the literary ability he had shown for the advancement of his own economical theories. He tried to keep on good terms with his father, though he could not advocate all his ideas, and even went so far in 1772 as to marry a rich heiress, a daughter of the Marquis de Marignane, whose alliance his father had procured for him. He did not live happily with her, and in 1774 was ordered into semi-exile in the country, at his father's request, where he wrote his earliest extant work, the Essai sur le Despotisme. His violent dis- position now led him to quarrel with a country gentleman who had insulted his sister, and his semi-exile was changed by lettre de cachet into imprisonment in the Chateau d'Il. In 1775 he was removed to the castle of Joux, to which, however, he was not very closely confined, having full leave to visit in the town of Pontarlier. Here he met Marie Therése de Monnier, his Sophie as he called her, a married woman, for whom he conceived a violent passion. Of his behaviour nothing too strong can be said: he was introduced into the house as a friend, and betrayed his trust by inducing Madame de Monnier to fall in love with him, and all his excuses about overwhelming passion only make his conduct more despicable. The affair ended by his escaping to Switzerland, where Sophie joined him ; they then went to Holland, where he lived by hack-work for the booksellers ; meanwhile Mirabeau had been condemned to death at Pontarlier for rapt et vol, of which he was certainly not guilty, as Sophie had followed him of her own accord, and in May 1777 he was seized by the French police, and imprisoned by a lettre de cachet in the castle of Vincennes. There he remained three years and a half, and with his release ends the first and most disgraceful period of his life. During his imprisonment he seems to have learnt to control his passions from their very exhaustion, for the early part of his confinement is marked by the indecent letters to Sophie (first published in 1793), and the obscene Erotica Biblion and Ma Conversion, while to the later months belongs his first political work of any value, the Lettres de Cachet. The Essai sur le Despotisme was an ordinary but at times eloquent declamation, showing in its illustra- tions a wide miscellaneous knowledge of history, but the Lettres de Cachet exhibits a more accurate knowledge of French constitutional history skilfully applied to an*~~

~~*attempt to show that an existing actual grievance was not*~~

~~only philosophically unjust but constitutionally illegal. It shows, though still in rather a diffuse and declamatory form, that application of wide historical knowledge, keen philosophical perception, and genuine eloquence to a practical purpose which was the great characteristic of Mirabeau, both as a political thinker and as a statesman. With his release from Vincennes begins the second pericd of Mirabeaw's life. He found that his Sophie was an ideal- ized version of a rather common and ill-educated woman, and she speedily consoled herself with the affection. of a young officer, after whose death she committed suicide. Mirabeau first set to work to get the sentence of death still hanging over him reversed, and by his eloquence not only succeeded but got M. de Monnier condemned in the costs of~~

~~the whole law proceedings. From Pontarlier he went to Aix, where he claimed the court's order that his wife should return to him. She naturally objected, but his eloquence would have won his case, even against Portalis, the leader of the Aix bar, had he not in his excitement accused his wife of infidelity, on which the court pronounced a decree of separation. He then with his usual impetuosity inter- vened in the suit pending between his father and mother before the parlement of Paris, and so violently attacked the ruling powers that he had to leave France and again go to Holland, and try to live by literary work. About this time began his connexion with Madame de Nehra, which sweetened the ensuing years of toil and brought out the better points of his character. She was the daughter of Zwier van Haren, a Dutch statesman and political writer, and was a woman of a far higher type than Sophie, more educated, more refined, and more capable of appreciating Mirabeaw's good points and helping him to control his passions. With her the lion became a lamb, and his life was strengthened by the love of his petite horde, Madame de Nehra, her baby son, afterwards Lucas de Montigny, and his little dog Chico. After a period of work in Holland he betook himself to England, where his treatise on Lettres de Cachet had been much admired, and where he was soon admitted into the best Whig literary and political society of London, through his old schoolfellow Gilbert Elliot, who had now inherited his father's baronetcy and estates, and become a leading Whig member of parliament. Sir Gilbert introduced him freely, but ofall his English friends none seem to have been~~

~~*so intimate with him as Lord Lans- downe, and Mr (afterwards Sir Samuel) Romilly. The latter became particularly attached to him, and really understood his character ; and it is strange that his remarks upon Mirabeau in the fragment of autobiography which he left, and Mirabeau's letters to him, should have been neglected by French writers. Romilly was introduced to Mirabeau by D'Ivernois, and readily undertook to translate the Considerations on the Order of Cincinnatus. Romilly writes thus of him in his autobiography :—*~~

~~*"The count was difficult enough to please; he was sufficiently impressed with the beauties of the original. He went over every part of the translation with me, observed on every passage in which justice was not done to the thought or the force of the expression lost, and made many useful criticisms. During this occupation we had occasion to see one another often, and became very inti- mate; and, as he had read much, had seen a great deal of the world, was acquainted with all the most distinguished persons who at that time adorned either the royal court or the republic of letters in France, had a great knowledge of French and Italian literature, and possessed very good taste, his conversation was extremely interest- ing and not a little instructive. I had such frequent opportunities of seeing him at this time, and afterwards at a much more import- ant period of his life, that I think his character was well known tome. I doubt whether it has been so well known to the world, and I am convinced that great injustice has been done him. This, indeed, is not surprising, when one considers that, from the first moment of his entering upon the career of an author, he had been altogether indifferent how numerous or how powerful might be the enemies he should provoke. His vanity was certainly excessive ; but I have no doubt that, in his public conduct as well as in his writings, he was desirous of doing good, that his ambition was of the noblest kind, and that he proposed to himself the noblest ends. He was, however, like many of his countrymen, who were active in the calamitous Revolution which afterwards took place, not suffi- ciently scrupulous about the means by which those ends were to be accomplished. He indeed to some degree professed this; and more than once I have heard him say that there were occasions upon which 'la petite morale était ennemie de la grande.' It is not sur- prising that with such maxims as these in his mouth, unguarded in his expressions, and careless of his reputation, he should have afforded room for the circulation of many*~~

~~*stories to his disadvan- tage. Violent, impetuous, conscious of the superiority of his talents, and the declared enemy and denouncer of every species of tyranny and oppression, he could not fail to shock the prejudices, to oppose the interests, to excite the jealousy, and to wound the pride of many descriptions of persons.*~~

~~*Witha PEW*~~

~~*him asa nmionster of vice and profligacy. A scandal once set on foot is strengthened and propagated by many, who have no malice against the object of it. They delight to talk of what is extraordi- nary ; and what more extraordinary than a person so admirable for his talents and so conteinptible for his conduct, professing in his writings principles so excellent and in all the offices of public and private life putting in practice those which are so detestable? I indeed possessed demonstrative evidence of the falsehood of sonie of the anecdotes which by men of high character were related to his prejudice. "—Life of Sir S. Romilly, vol. i. p. 58.*~~

~~*This luminous judgment, the best that is extant on the character of Mirabeau, deserved to be quoted at length ; it must be noted that it was written by a man of acknow- ledged purity of life, who admired Mirabeau in early life, not when he was a statesman, but when he was only a struggling literary man. This close association with Romilly, and his friends Baynes, Trail, and Wilson, does credit to Mirabeau, and must have helped that moral revolution against his passions which was passing within him. He was a warm friend, and first made Romilly acquainted with Lord Lansdowne, and tried to get him a seat in parliament. Lord Lansdowne was himself an extraordinary man, and the first of the new Whigs might well feel sympathy with the statesman of the French Revolution. The Considérations sur ordre de Cincinnatus which Romilly translated was the only important work Mirabeau wrote in the year 1785, and it is a good speci- men of his method. He had read a pamphlet published in America attacking the proposed order, which was to form a bond of association between the officers who had fought in the American War of Independence against England ; the arguments struck him as true and valuable, so he rearranged them in his own fashion, and rewrote them in his own oratorical style. He soon found such work not sufficiently remunerative to keep his 'petite*~~

~~*horde" in comfort, and then turned his thoughts to employment from the French foreign office either in writing or in diplomacy. He first sent Madame de Nelira to Paris to make his peace with the authorities, in which she was completely successful, and then returned himself, hoping to get employment through an old literary collaborateur of his, Durival, who was at this time director of the finances of the department of foreign affairs. One of the functions of this official was to subsidize political pamphleteers, and Mirabeau had hoped to be so employed, but he ruined his chances by a series of financial works. On his return to Paris he had become acquainted with Claviéres, a Genevese exile, who was minister of finance during the Revolution, and who now introduced him to a banker named Panchaud. From them he heard plenty of abuse of stock-jobbing, and seizing their ideas he began to regard stock-jobbing, or agiotage, as the source of all evil, and to attack in his usual vehement style the Banque de St Charles and the Compagnie des Faux. This was at least disinterested on his part, for, while his supporters were poor, the bankers he attacked were rich, and would gladly have bought his silence ; but Mirabeau, though ever ready to take money for what he wrote, never sold his opinions, or wrote what he did not really believe. The very eloquence of his style rests upon the enthusiastic conviction that he himself was right, and those who differed from him were stupidly and wilfully wrong. This last pamphlet brought him into a contro- versy with Beaumarchais, who certainly did not get the best of it, but it lost him any chance of literary employ- ment fron Government. However, his ability was too great to be neglected by a great minister such as M. de Vergennes undoubtedly was, and after a preliminary tour in the early spring of 1786 he was despatched in June 1786 on a secret mission to the court of Prussia, from which he returned in January 1787, and of which he gave*~~

~~*| a full account in his Hstorre Secréte de la Cour de Berlin.*~~

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~~*The months he spent at Berlin were important ones in the] the majority of the representatives of the country; and he*~~

~~*history of Prussia, for in them Frederick the Great died. The letters just mentioned show clearly what Mirabeau did and what he saw, and equally clearly how unfit he was to be a diplomatist ; for, with all his knowledge of men and his influence over them, he thought (and showed he thought) too much of himself ever to be able to surprise their secret thoughts and intentions. He certainly failed to conciliate the new king Frederick William; and thus ended Mirabeau's one attempt at diplomacy. During his journey he had made the acquaintance of a Major Mauvillon, whom he found possessed of a great number of facts and statistics with regard to Prussia; these he made use of in a great work on Prussia published in 1788, as Romilly says, to show that he could write more than a fugitive pamphlet. But, though his Monarchie Prussienne gave hin a general reputation for historical learning, he had in this same year lost a chance of political employment. He had offered himself as a candidate for the office of secretary to the Assembly of Notables which the king had just con- vened, and to bring his name before the public published another financial work, the Denonciation de l'Aguotage, dedicated to the king and notables, which abounded in such violent diatribes that he not only lost his election, but was obliged to retire to Tongres ; and he further injured his prospects by publishing the reports he had sent in during his secret mission at Berlin. But 1789 was at hand ; the states-general was summoned ; Mirabeau's period of pro- bation was over, and he was at last to have that oppor- tunity of showing his great qualities both as statesman and orator on a worthy arena.*~~

~~*On hearing of the king's determination to summon the states-general, Mirabeau started for Provence, and offered to assist at the preliminary conference of the noblesse of his district. They rejected him; he appealed to the ters état, and was returned both for Aix and for Marseilles. He elected to sit for the former city, and was present at the opening of the states-general on May 4, 1789. From this time the record of Mirabeau's life forms the best history of the first two years of the Constituent Assembly, for at every important crisis his voice is to be heard, though his advice was not always followed. It is impossible here to detail minutely the history of these two eventful years; it will be rather advisable to try and analyse the manner in which Mirabeau regarded passing events, and then show how his policy justifies our analysis.*~~

~~*Mirabeau possessed at the same time great logical acuteness and most passionate enthusiasm; he was there- fore both a statesman and an orator, and the interest of the last two years of his life lies mainly in the gradual but decided victory of the statesmanlike and practical over the impulsive and oratorical qualities. From the beginning Mirabeau recognized that government exists in order that the bulk of the population may pursue their daily work in peace and quiet, and that for a Government to be successful it must be strong. In this practical view of the need of a strong executive lies one of Mirabeau's greatest titles to the name of statesman. At the same time he thoroughly com- prehended that for a Government to be strong it must be in harmony with the wishes of the majority of the people, and that the political system of Louis XIV. was now fall- ing for lack of this. He had carefully studied the English constitution in England under the guidance of such men as Lord Lansdowne, Sir Gilbert Elliot, and Romilly, and appreciated it with the wise approval of its powers of ex- pansion which characterized the new Whigs, and not with the blind admiration of Burke. He understood the key- notes of the practical success of the English constitution to be the irresponsibility of the king, the solidarity of the ministers, and the selection of the executive from aniong*~~

~~*hoped to establish in France a system similar in principle, but without any slavish imitation of the details of the English constitution.*~~

~~*In the first stage of the history of the states-general Mirabeau's part was very great. He was soon recognized as a leader, to the chagrin of Mounier, because he always knew his own mind, and was prompt at emergencies. To him is to be attributed the successful consolidation of the National Assembly, its continuance in spite of De Brezé and the carpenters, and the address to the king for the with- drawal of the troops assembled by De Broglie. When the taking of the Bastille had assured the success of the Revolution, he was the one man who warned the Assembly of the futility of passing fine-sounding decrees and the necessity for acting. He declared that the famous night of August 4 was but an orgy, giving the people an immense theoretical liberty while not assisting them to practical freedom, and overthrowing the old régime before a new one could be constituted. Still more did he show his foresight when he attacked the dilatory behaviour of the Assembly, which led to the catastrophes of the 5th and 6th October. He*~~

~~*implored the Assembly to strike while the iron was hot, and at once solve in a practical manner the difficult problems presented by the abolition of feudalism. But the Assembly consisted of men inexperi- enced in practical politics, who dreamed of drawing up an ideal constitution preluded by a declaration of rights in imitation of the Americans; and for two months the Assembly discussed in what words the declaration should be expressed, while the country was in a state of anarchy, declaring old laws and customs abolished and having no new ones to obey or follow, disowning the old adminis- trative system and having no new one yet instituted, while Paris was starving and turbulent, and the queen and her friends planning a counter-revolution. The result of these two months' theorizing was the march of the women to Versailles, and the transfer of the king to Paris. Mirabeau now saw clearly that his eloquence would not enable him to guide the Assembly by himself, and that he must there- fore try to get some support. He wished to establish a strong ministry, which should be responsible like an English ministry, but to an assembly chosen to represent the people of France better than the English House of Commons then represented England. He first thought of becoming a minister at a very early date, if we may believe a story contained in the Mémoires of the Duchesse d'Abrantes, to the effect that in May 1789 the queen tried to bribe him, but that he refused to be bribed to silence, and expressed his wish to be a minister. The indignation with which the queen repelled the idea may have been the cause of his thinking of the Duc d'Orleans asa possible constitutional king, because his title would of necessity be parliamentary. But the weakness of Orleans was too palpable, and in a famous remark Mirabeau expressed his utter contempt for him. He also attempted to form an alliance with Lafayette, but the general was as vain and as obstinate as Mirabeau himself, and had his own theories about a new French constitution. Mirabeau tried for a time, too, to act with Necker, and obtained the sanction of the Assembly to Necker's financial scheme, not because it was good, but because, as he said, "no other plan was before them, and something niust be done."*~~

~~*Hitherto weight has been laid on the practical side of Mirabeau's political genius ; his ideas with regard to the Revolution after the 5th and 6th October must now be examined, and this can be done at length, thanks to the publication of Mirabeau's correspondence with La Marck, a study of*~~

~~which is indispensable for any correct knowledge of the history of the Revolution between 1789 and 1791.~~

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~~The Comte de la Marck was a Flemish lord of the house of Aremberg, who had been proprietary colonel of a regiment in the service of France; he was a close friend of the queen, and had been elected a member of the states-general. His acquaintance with Mirabeau, commenced in 1788, ripened during the following year into a friendship, which La Marck hoped to turn to the advantage of the court. After the events of the 5th and 6th of October he consulted Mirabeau as to what measures the king ouglit to take, and Mirabeau, delighted at the opportunity, drew up an admirable state-paper, which was presented to the king by Monsieur, afterwards Louis XVIII. The whole of this Mémoire should be read to get an adequate idea of Mirabeau's genius for politics; here it must be merely sum- marized.~~

~~The main position is that the king is not free in Paris ; he must therefore leave Paris and appeal to France. " Paris n'en veut que argent; les provinces demandent des lois." But where must the king go? 'Se retirer & Metz ou sur toute autre frontiére serait déclarer la guerre 4 la nation et abdiquer le tréne. Unroi qui est la seule sauvegarde de son peuple ne fuit point devant son peuple ; il le prend pour juge de sa conduite et de ses principes." Ho must then go towards the interior of France to a provincial capital, best of all to Rouen, and there he must appeal to the people and summon a great convention. It would be ruin to appeal to the noblesse, as the queen advised: "un corps de noblesse n'est point une armée, qui puisse combattre." When this great convention met, the king must show himself ready to recognize that great changes have taken place, that fendalism and absolutism have for ever disappeared, and that a new relation between king and people has arisen, which must be loyally observed on both sides for the future. "Il est certain, d'ailleurs, qu'il faut une grande révolution pour sativer le royaume, que la nation a des droits, qu'elle est en chemin de les recouvrer tous, et qu'il faut non seulement les rétablir, mais les consolider." To establish this new constitutional position between king and people would not be difficult, because "]'indivisibilité du monarque et du~~

~~*peuple est dans le cour de tous les Frangais ; il faut qu'elle existe dans l'action et le pouvoir."*~~

~~*Such was Mirabeau's programme, which he never diverged from, but which was far too statesmanlike to be understood by the poor king, and far too positive as to the altered condition of the monarchy to be palatable to the queen. Mirabeau followed up his Afémoire by a scheme of a great ministry to contain all men of mark,—Necker as prime minister, "'to render him as powerless as he is incapable, and yet preserve his popularity for the king," the archbishop of Bordeaux, the Duc de Liancourt, the Duc de la Rochefoucauld, La Marck, Talleyrand bishop of Autun at the finances, Mirabeau without portfolio, Target mayor of Paris, Lafayette generalissimo to reform the army, Segur (foreign affairs), Mounier, and Chapelier. This 'scheme got noised abroad, and was ruined by a decree of the Assembly of November 7, 1789, that no member of the Assembly could become a minister; this decree destroyed any chance of that necessary harmony between the ministry and the majority of the representatives of the nation exist- ing in England, and so at once overthrew Mirabeaw's present hopes and any chance of the permanence of the constitution then being devised. The queen utterly refused to take Mirabeau's counsel, and La Marck left Paris. However, in April 1790 he was suddenly recalled by the Comte de Mercy-Argenteau, the Austrian ambassador at Paris, and the queen's most trusted political adviser, and from this time to Mirabeau's death he became the medium of almost daily communications between the latter and the queen. Mirabeau at first attempted again to make an alliance with Lafayette by a letter in which he says, "Les Barnave, les Duport, les Lameth ne vous fatiguent plus de leur active inaction ; on singe longtemps l'adresse, non pas la force." But it was useless to appeal to Lafayette; he was not a strong man himself, and did not appreciate "la force" in others. From the month of May 1790 to his death in April 1791 Mirabeau remained in close and suspected but*~~

~~*MIRABEAU*~~

~~*up many admirable state-papers for it. In return the court paid his debts; but it ought'never to be said that he was. bribed, for the gold of the court never made him swerve from his political principles—never, for instance,*~~

~~*made him a royalist. He regarded himself as a minister, though an unavowed one, and believed himself worthy of his hire. Undoubtedly his character would have been more admirable if he had acted without court assistance, but it must be remembered that his services deserved some reward, and that by remaining at Paris as a politician he had been unable to realize his paternal inheritance. Before his in- fluence on foreign policy is discussed, his behaviour on several important points must be noticed. On the great question of the veto he took a practical view, and seeing that the royal power was already sufficiently weakened, declared for the king's absolute veto, and against the compromise of the suspensive veto. He knew from his English experiences that such a veto would be hardly ever used unless the king felt the people were on his side, in which case it would be a useful check on the representatives of the people, and also that if it was used unjustifiably the power of the purse possessed by the representatives and the very constitutional organization of the people would, as in England in 1688, bring about a bloodless revolution, and a change in the person entrusted with the royal dignity. He saw also that much of the inefficiency of the Assembly arose from the inexperience of the members, and their incurable verbosity ; so, to establish some system of rules, he got his friend Romilly to draw up a detailed account of the rules and customs of the English House of Commons, which he translated into French, but which the Assembly, puffed up by a belief in its own merits, refused touse. On the great subject of peace and war he supported the king's authority, and with some success. What was the good of an executive which had no power? Let it be responsible to the representatives of the nation by all means ; but if the representatives absorbed all executive power by perpetual interference, there would be six hundred kings of France instead of one, which would hardly be a change for the better. Again Mirabeau almost alone of the Assembly understood the position of the army under a limited monarchy. Contrary to the theorists, he held that the soldier ceased to be a citizen when he became a soldier ; he must submit to be deprived of his liberty to think and act, and must recognize that a soldier's first duty is obedience. With such sentiments, it is no wonder that he approved of Bouillé's vigorous conduct at Nancy, which was the more to his credit as Bouillé was the one hope of the court influences opposed tohim. Lastly, in matters of finance he showed his wisdom: he attacked Necker's "caisse d'escompte," which was to have the whole control of the taxes, as absorbing the Assembly's power of*~~

~~*the purse ; and he heartily approved of the system of assignats, but with the important reservation that they should not be issued to the extent of more than one-half the value of the lands to be sold. This restriction was not observed, and it was solely the enormous over-issue of assignats that caused their great depreciation in value.*~~

~~*Of Mirabeau's attitude with regard to foreign affairs it is necessary to speak in more detail. He held it to be just that the French people should conduct their Revolution as they would, and that no foreign nation had any right to interfere with them, so long as they kept themselves strictly to their own affairs. But he knew also that neighbouring nations looked with unquiet eyes on the progress of affairs in France, that they feared the influence of the Revolution on their own peoples, and that foreign monarchs were being prayed by the French emigrés to interfere on behalf of the French monarchy. To prevent this interference, or*~~

~~*not actually proved connexion with the court, and drew | rather to give no pretext for it, was his guiding thought as*~~

~~*MPT hos BE AU*~~

~~*to foreign policy. He had been elected a member of the comité diplomatique of the Assembly in July 1790, and became its reporter at once, and in this capacity he was able to prevent the Assembly from doing much harm in regard to foreign affairs. He had long known Montmorin, the foreign secretary, and, as matters became more strained from the complications with the princes and counts of the empire, he entered into daily communication with the minister, advised him on every point, and, while dictating his policy, defended it inthe Assembly. Thus in this parti- cular instance of the foreign office, for the few months before Mirabeau's death, a harmony was established between the minister and the Assembly through Mirabeau, which checked for a time the threatened approach of foreign intervention, and maintained the honour of France abroad. Mirabeau's exertions in this respect are not his smallest title to the name of statesman; and how great a work he did is best proved by the confusion which ensued in this department of affairs upon his death.*~~

~~*For indeed in the beginning of 1791 his death was very near; and he knew it to be so. The wild excesses of his youth and their terrible punishment had weakened his strong constitution, and his parliamentary labours completed the work. So surely did he feel its approach that some time before the end he sent all his papers over to his old English friend and schoolfellow Sir Gilbert Elliot, who kept them under seal until claimed by Mirabeau's executors. In March his illness was evidently gaining on him, to his great grief, because he knew how much depended on his life, and felt that he alone could yet save France from the distrust of her monarch and the present reforms, and from the foreign interference, which would assuredly bring about catastrophes unparalleled in the history of the world. On his life hung the future course of the Revolution. Every care that science could afford was given by his friend and physician, the famous chemist Cabanis, to whose brochure on his last illness and death the reader may refer. The people, whose faith in him revived in spite of all suspicions, when they heard that he was on his death-bed, kept the street in which he lay quiet; but medical care, the loving solicitude of friends, and the respect of all the people could not save his life. His vanity appears in its most gigantic proportions in his last utterances during his illness; but many of them have something grand in their sound, as his last reported expression, when he looked upon the sun—'"'If he is not God, he is at least His cousin-german." When he could speak no more he wrote with a feeble hand the one word "dormir," and on April 2, 1791, he died.*~~

~~*With Mirabeau died, it has been said, the last hope of the mon- archy; but, with Marie Autoinette supremeatcourt, canit be saidthat there could ever have been any real hope for the monarchy? Had she been but less like her imperious mother, Louis would have made a coustitutional monarch, but her will was as strong as Mirabeau's own, and the Bourbon monarchy had to meet its fate. The subse- quent events of the Revolution justified Mirabeau's prognostications in his first mémoire of October 15, 1789. The royal family fled towards the German frontier, and from that moment there sunk deep into the hearts of the people not only of Paris, but of the provinces, a conviction that the king and queen were traitors to France, which led inevitably to their execution. The noblesse and the foreign aid on which the queen relied proved but a source of weakness. The noblesse, Mirabeau had said, was no army which could fight; and truly the army of*~~

~~*the emigrés could do nothing against revolutionary France in arms. The intervention of foreign aid only sealed the king's fate, and forwarded the progress of the Revolution, not in a course of natural development, but to the terrible resource of the Reign of Terror. With regard to the Assembly too, and its consti- tution, Mirabeau had shown his foresight. The constitution of 1791, excellent as it was on paper, and well adapted to an ideal state, did not deal adequately with the great problems of the time in France, and by its ridiculous weakening of the executive was unsuited to a modern state. Surely if events ever proved a man's political sagacity, the history of the French Revolution proved Mirabeau's.*~~

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~~*_A few words must be added on Mirabeau's manner of work and his character.*~~

~~*No man ever so thoroughly used other men's work, and yet made it all seem his own, " Je prends mon bien ou je le trouve" 1s as true of him as of Moliére. His first literary work, except the bombastic but eloquent Essai sur le Despotisme, was a transla- tion of Watson's Philip IJ., accomplished in Holland with the help of Durival ; his Considérations sur Vordre de Cincinnatus was based on an American pamphlet, and the notes to it were con- tributed by Target ; while his financial writings were all suggested by the Genevese exile Claviéres. During the Revolution he received yet more help; men were proud to labour for him, and did not murmur because he absorbed all the credit and fame. Dumont, Claviéres, Duroveray, Pellenc, Lamourette, and Reybaz were but a few of the most distinguished of his collaborators. Dumont was a Genevese exile, and an old friend of Romilly's, who willingly prepared for him those famous addresses which Mirabeau used to make the Assembly pass by sudden bursts of eloquent declamation ; Claviéres and Duroveray helped him in finance, and not only worked out his figures, but even wrote his financial discourses. Pellenc was his secretary, and wrote the speeches on the goods of the clergy and the right of making peace, and even the Abbé Lamourette wrote the speeches on the civil constitution of the clergy. Reybaz, whose per- sonality has only been revealed within these last ten years, not only wrote for him his famous speeches on the assignats, the organization of the national guard, &c.,*~~

~~*which Mirabeau read word for word at the tribune, but even the posthumous speech on succession to estates of intestates, which Talleyrand read in the Assembly as the last work of his dead friend. Yet neither the gold of the court nor another man's conviction would make Mirabeau say what he did not himself believe, or do what he did not himself think right. He took other men's labour as his due, and impressed their words, of which he had suggested the underlying ideas, with the stamp of his own individuality ; his collaborators themselves did not com- plain,—they were but too glad to be of help in the great work of controlling and forwarding the French Revolution through its greatest thinker and orator. True is that remark of Goethe's to Eckermann, after reading Dumont's Souvenirs: "At last the wonderful Mirabeau becomes natural to us, while at the same time the hero loses nothing of his greatness. Some French journalists think differently… .. The French look upon Mirabeau as their Hercules, and they are perfectly right. But they forget that even the Colossus consists of individual parts, and that the Hercules of antiquity is a collective being—a gigantic personification of deeds done by himself and by others."*~~

~~*There was something gigantic about all Mirabeau's thoughts and deeds. The excesses of his youth were beyond all bounds, and severely were they punished ; his vanity was immense, but never spoilt his judgment; his talents were enormous, but could yet make use of those of others. As a statesman his wisdom is indubit- able, but by no means universally recognized in his own country. Lovers of the ancien régime abuse its most formidable and logical opponent; believers in the Constituent Assembly cannot be expected to care for the most redoubtable adversary of their favourite theorists, while admirers of the republic of every description agree in calling him from his connexion with the court the traitor Mirabeau. As an orator more justice has been done him: his eloquence has been likened to that of both Bossuet and Vergniaud, but it had neither the polish of the old 17th-century bishop nor the flashes of genius of the young Girondin. It was rather parliamentary oratory in which he excelled, and his true compeers are rather Burke and Fox than any French speakers. Personally he had that which is the truest mark of nobility of mind, a power of attracting love, and winning faithful friends. "I always loved him," writes Sir Gilbert Elliot to his brother Hugh; and Romilly, who was not given to lavish praise, says, "I have no doubt that in his public conduct, as in his writings, he was desirous*~~

~~of doing good, that his ambition was of the noblest kind, and that he proposed to himself the noblest ends." What more favourable judgment could be passed on an ambitious man! What finer epitaph could a states-man desire !~~

~~The best edition of Mirabeau's works is that published by Blanchard in 1822, fn 10 vols., of which two contain his uvres Oratoires; from this collection, how- ever, many of his less important works, and the Monarchie Prussienne, In 4 vols., 1788, are omitted. For his life consult Mirabeau: Mémoires sur sa vive littéraire et privée, 4 vols., 1824, and, what is of most iinportance, Mémoires biographiques, littéraires, et politiques de Mirabeau écriis par lui-méme, par son pere, son oncle, et son fils adoptif, which was issued by M. Lucas de Montigny in 8 vols., Paris, 1834, See also Dumont, Souvenirs sur Mirabeau, 1832 ; Duval, Souvenirs sur Mirabeau, 1832; Victor Hugo, Etude sur Mirabeau, 1834 ; Mirabeau's Jugendleben, Breslau, 1832: Schneidewin, Mirabeau und seine Zeit, Leipsic, 1831; Afirabeau, Life His- tory, London, 1848. The publication of the Correspondance entre Mirabeau et le Comte de la Marck, by Ad. Bacow't, 2 vols., 1851, marks an epoch in our exact~~

~~Mirabeau et la Constituante, 1873. On his eloquence and the sate eS collabora- tors had in his specches, see Aulard, L' Assemblée Cogs ene, ae death see the curious brochure of his physician Cabanis, Journal ae~~

~~i is, 17 II, M.S.) et de la mort de Mirabeau, Paris, 1791. . (IIA. Vas cole ae~~

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~~MIRABEAU, Vicror RiqveT, Marquis pz (1715- 1789), himself a distinguished author and political econo- mist, but more famous as the father of the great Mirabeau, was born at Pertuis near the old chateau de Mirabeau on October 4, 1715. He was brought up very sternly by his father, and in 1729 joined the army. He took keenly to cam- paigning, but never rose above the rank of captain, owing to his being unable to get leave at court to buy a regiment. In 1737 he came into the family property on his father's death, and spent some pleasant years till 1743 in literary~~

~~*companionship with his dear friends Vauvenargues and Lefranc de Pompignan, which might have continued had he not suddenly determined to marry—not for money, but for landed estates. The lady whose property he fancied was Marie Genevieve, daughter of a M. de Vassan, a brigadier in the army, and widow of the Marquis de Saulveboeuf, whom he married without previously seeing her on April 21, 1743. While in garrison at Bordeaux, Mirabeau had made the acquaintance of Montesquieu, which may have made him turn his thoughts to political speculations ; anyhow it was while at leisure after retiring from the army that he wrote his first work, his Testament Politique (1747), which demanded for the prosperity of France a return of the French noblesse to their old position in the Middle Ages. This work, written under the influence of the feudal ideas impressed upon him by his father, was followed in 1750*~~

~~*by a book on the Utilité des Etats Provenciauc, full of |*~~

~~*really wise considerations for local self-government, which was published anonymously, and had the honour of being attributed to Montesquieu himself. In 1756 Mirabeau made his first appearance as a political economist by the publication of his Ami des Hommes ow traité de la population. This work has been often attributed to the influence, and in part even to the pen, of Quesnay, the founder of the economical school of the physiocrats, but was really written before the marquis had made the acquaintance of the physician of Madame de Pompadour. In 1760 he published his Théorie de [Impét, in which he attacked with all the vehemence of his son the farmers- general of the taxes, who got him imprisoned for eight days at Vincennes, and then exiled to his country estate at Bignon. At Bignon the school of the physiocrats was really established, and the marquis surrounded himself with devotees, and eventually in 1765 bought the Journal de Pagriculture, du commerce, et des finances, which became the organ of the school. He was distinctly recog- nized as a leader of political thinkers by Prince Leopold of Tuscany, afterwards emperor, and by Gustavus ITI. of Sweden, who in 1772 sent him the grand cross of the order of Vasa. But the period of his happy literary life was over; and his name was to be mixed up in a long scandalous lawsuit. Naturally his marriage had not been happy; he had separated from his wife by mutual consent in 1762, and had, he believed, secured her safely in the provinces*~~

~~*by a lettre de cachet, when in 1772 she suddenly appeared in Paris, and soon after commenced proceedings for a separation. The poor marquis did not know what to do; his sons were a great trouble to him, and it was one of his own daughters who had encouraged his wife to take this step. Yet he was determined to keep the case quiet if possible for the sake of Madame de Pailly, a Swiss lady whom he had loved since 1756. But his wife would not let him rest; her plea was rejected in 1777, but she renewed her suit, and, though the great Mirabeau had pleaded his father's case, was suc- cessful in 1781, when a decree of separation was pro- nounced. This trial had quite broken the health of the marquis, as well as his fortune; he sold his estate at Bignon, and hired a house at Argenteuil, where he lived quietly till his death on July 11, 1789.*~~

~~*MIR—MIR*~~

~~*For the whole family of Mirabeau, the one book to refer to is Louis de Loménie's Les Mirabeau, 2 vols., 1878, and it is greatly to be regretted that the talented author did not live to treat the lives of the great Mirabeau and his brother. See also Lucas de Mon- tigny's Mémoires de Mirabeau, and, for the marquis's economical views, De la Vergne's Economistes frangais du 18™ siécle,*~~

~~*MIRAGE. See Lieut, vol. xiv. p. 600.*~~ |

~~*MIRAMON, Micuet, a Mexican soldier of French extraction, was born in the city of Mexico, September 29, 1832, and shot along with the emperor Maximilian at Queretaro, June 19, 1867. While still a student he helped to defend the military academy at Chapultepec against the forces of the United States; and, entering the army in 1852, he rapidly came to the front during the civil wars that dis- turbed the country. It was largely due to Miranion's support of the ecclesiastical party against Alvarez and Comonfort that Zuloaga was raised to the presidency; and in 1859 he was called to succeed him in that office. Decisively beaten, however, by the Liberals, he fled the country in 1860, and spent some time in Europe earnestly advocating foreign intervention in Mexican affairs; and when he returned it was as a partisan of Maximilian. His ability as a soldier was best shown by his double defence of Puebla in 1856.*~~

~~*MIRANDA, Francesco (1754-1816), was born at Santa Fé in New Granada in 1754. He entered the army,*~~

~~*'and served against the English in the American War of*~~

~~*Independence. The success of that war inspired him with a hope of being the Washington of his own country, and a belief that the independence of Spanish America would increase its material prosperity. With these views he began to scheme a revolution, but his schemes were dis- covered and he had only just time to escape to the United States. Thence he went to England, where he was intro- duced to Pitt, but chiefly lived with the. leading members of the opposition—Fox, Sheridan, and Romilly. Finding no help in his revolutionary schemes, he travelled over the greater part of Europe, notably through Austria and Turkey, till he arrived at the court of Russia, where he was warmly received, but from which he was dismissed, though with rich presents, at the demand of the Spanish ambassador, backed up by the envoy of France. The news of the dispute between England and Spain about Nootka Sound in 1790 recalled him to England, where he saw a good deal of Pitt, who had determined to make use of him to "insurge" the Spanish colonies, but the peaceful arrangement of the dispute again destroyed his hopes. In April 1792 he went to Paris, with introductions to Pétion aud the leading Girondists, hoping that men who were work- ing so hard for their own freedom might help his country- men in South America. France had too much to do in fighting for its own freedom to help others ; but Miranda's friends sent him to the front with the rank of general of brigade. He distinguished himself under Dumouriez, was intrusted in February 1793 with the conduct of the siege of Maestricht, and commanded the left wing of the French army at the disastrous battle of Neerwinden. Although he had given notice of Dumouriez's projected treachery, he was put on his trial for treason on May 12. He was unanimously acquitted, but was soon again thrown into prison, and not released till after the 9th Thermidor. He again mingled in politics, and was sentenced to be deported after the struggle of Vendémiaire. Yet he escaped, and continued in Paris till the coup @état of Fructidor caused him finally to take refuge in England. He now found Pitt and Dundas once more ready to listen to him, and the latter sent a special minute to Colonel Picton, the governor of Trinidad, to assist General Miranda's schemes in every possible way: but, as neither of*~~

~~them would or could give him substantial help, he went to the United States, where President Adams gave him fair words but nothing more. Once more he returned to. England,~~

~~MIR—MIR~~

~~where Addington might have done something for him but for the signature of the peace of Amiens in 1802. At the peace, though in no way amnestied, he returned to Paris, but was promptly expelled by the First Consul, who was then eager to be on good terms with the court of Spain. Disappointed in further efforts to get assistance from England and the United States, he decided to make an attempt on his own responsibility and at his own expense. Aided by two American citizens, Colonel Smith and Mr Ogden, he equipped a small ship, the "Leander," in 1806, and with the help of the English admiral Sir A. Cochrane made a landing near Caracas, and proclaimed the Colombian republic. He had some success, and would have had more~~

~~had not a false report of peace between France and | England caused the English admiral to withdraw his |~~

~~support. At last in 1810 came his opportunity; the events in Spain which brought about the Peninsular War had divided the authorities in Spanish America, some of whom declared for Joseph Bonaparte, others for Ferdinand VII., while others again held to Charles IV. At this moment Miranda again landed, and had no difficulty in getting a large party together who declared a republic both in Venezuela and New Granada or Colombia. Miranda's desire that all the South American colonies should rise, and a federal republic be formed, awoke the selfish- ness and pride of individual provincial administrations, and thus weakened the cause, which further was believed to be hateful to heaven owing to a great earthquake on March 26, 1812. The count of Monte Verde, the Bourbon governor, had little difficulty in defeating the dispirited forces of Miranda, and on July 26 the general capitulated on condition that he should be deported to the United States. The condition was not observed; Miranda was moved from dungeon to dungeon, and died in 1816 at Cadiz.~~

~~There are allusions to Miranda's early life in nearly all memoirs of the time, but they are not generally very accurate. For his trial see Buchez et Roux, Histoire Parlementaire, xxvii. 26-70. Yor his~~

~~later life see Biggs, History of Miranda's Attempt in South America, London, 1809 ; and Veggasi, Revolucion de la Columbia.~~

~~MIRANDOLA. See Pico.~~

~~MIRKHOND (1433-1498). Mohammed bin Khawand- shah bin Mahmud, commonly called Mirkhwand or Mirk- hawand, more familiar to Europeans under the name of Mirkhond, was born in 1433, the son of a very pious and learned man who, although belonging to an old Bokhara family of Sayyids or direct descendants of the Prophet, lived and died in Balkh. From his early youth he applied himself to historical studies and literature in general. In~~

~~(born 1440), who served his old school-fellow the reigning sultan Husain (who as the last of the Timurides in Persia ascended the throne of Herat in 1468), first as keeper of the seal, afterwards as governor of Jurjin. At the request of this distinguished statesman and writer! Mirkhond began about 1474, in the quiet convent of Khilastyah, which his patron had founded in Herat as a house of retreat for literary men of merit, his great work on universal history, the largest ever written in Persian, and to the present day an inexhaustible mine of information both to Eastern and Western scholars. It is named Rauzat-ussafé fi strat-ulanbid walmulik walkhulafé or Garden of Purity on the Biography of Prophets, Kings, and Caliphs. That the author has made no attempt at a critical examination of historical traditions can scarcely be called a peculiar fault of his, since almost all Oriental writers are equally deficient in sound criticism ; more censurable is his~~

~~1 Mir 'Alishir not only excelled as poet both in Chaghatai, in which his epopees gained him the foremost rank among the classic writers in that language, and in Persian, but composed an excellent tadhkirah or biography of contemporary Persian poets.~~

~~But |~~

flowery and often bombastic style, but in spite of this draw- back, and although, in our own age, the discovery of older works on Asiatic history has diminished to some extent the value of Mirkhond's Razgat, it still maintains its high position as one of the most marvellous achievements in literature from the pen of one man, and often elucidates, by valuable text-corrections, various readings, and important additions, those sources which have lately come to light. It comprises seven large volumes and a geographical ap- pendix ; but internal evidence proves beyond doubt that the seventh volume, the history of the sultan Husain (1438- 1505), together with a short account of some later events down to 1523, cannot have been written by Mirkhond himself, who died in 1498. He may have compiled the preface, but the main portion of this volume is probably

_ the work of his grandson, the equally renowned historian

Khwandamir (1475-1534), to whom also a part of the appendix must be ascribed.

The following is a summary of the contents of the other six volumes. Well, ah : Preface on the usefulness of historical studies, history of the creation, the patriarchs, prophets, and rulers of Israel down to Christ, and the Persian kings from the mythical times of the Peshdadians to the Arab conquest and the death of the last Sasdnian Yazdajird III. in 30 a.u. (651 A.p.). Vol. ii.: Mohammed, Abubekr, 'Omar, 'Othman, and 'AH. Vol. iii.: The twelve imams and the Omayyad and 'Abbasid ealiphs down to 656 A.H. (1258 A.D.). Vol. iv.: The minor dynasties contemporary with and subsequent to the 'Abbasids, down to 778 a.H. (1376 A.v.), the date of the over- throw of the Kurdsby Timur. Vol. v.: The Moghuls down to Timur's time. Vol. vi.: Timur and his sueeessors down to Sultan Husain's aceession in 873 A.u. (1468 A.p.). The best accounts of Mirkhond's life are De Saey's " Notice sur Mirkhond" in his Mémoires sur diverses antiquités de la Perse, Paris, 1793 ; Jourdain's " Notiee de Vhistoire universelle de Mirkhond" in the Notices et Extraits, vol. ix., Paris, 1812 (together with a translation of the preface, the history of the Ismailians, the conclusion of the sixth volume, and a portion of the appendix) ; Elliot, History of India, vol. iv. p. 127 sq. ; Morley, Descriptive Catalogue, London, 1854, p. 30 sg. ;

~~*Rieu, Cat. of Persian MSS. of the Brit. Mus., vol. i., London, 1879, p. 87 sq. Mirkhond's patron, Mir 'Alishir, to whom the Rauzat is dedicated, died three years after him (1501),*~~

~~*Besides the lithographed editions of the whole work in folio, Bombay, 1853, and Teheran, 1852-56, and a Turkish version, Constantinople, 1842, the following portions of Mirkhond's history have been published by European Orientalists: Eariy Kings of Persia, by D. Shea, London, 1832 (Oriental Translation Fund); L fistoire dela dynastie des Sassanides, by S. de Saey (in the above-mentioned Mémoires); Histoire des Sassanides (texte Persan), by Jaubert, Paris, 1843; His- toria priorum regunt Persarum, Pers. and Lat., by Jenish, Vienna, 1782; Mirchondt historia Taheridarum, Pers. and Lat., by Mitscherlik, G6ttingen, 1814, 2d ed., Berlin, 1819; Zfstoria Samanidarum, Pers. and Lat., by Wilken, Géttingen, 1808 ; Histoire des Samanides, translated by Defrémery, Paris, 1845; Historia Ghaznevidarum, Pers. and Lat., by Wilken, Berlin, 1832; Geschichte der Sultane aus dem Geschlechte Bujeh, Pers. and German, by Wilken, Berlin, 1835; followed by Erdmann's Lrlduterung und Ergdnzung, Kazan, 1836; Historia Seldschuckidarum,*~~

~~*| ed. Vullers, Giessen, 1837, and a German translation by the same, Histoire des*~~

~~*Sultans du Kharezm, in Persian, by Defrémery, Paris, 1842; Histery of the Atabeks of Syria and Persia, in Persian, by W. Morley, London, 1848; Historta*~~

~~*tie . | Ghuridarum, Pers. and Lat., by Mitseherlik, Frankfort, 1818; Histotredes Sultans Herat, where he spent the greater part of his life, he gained |*~~

~~*the favour of that famous patron of letters, Mir 'Alishir |*~~

~~*Ghurides, translated into French by Defrémery, Paris, 1844, Vie de Djinghiz-Khan, in Persian, by Jaubert, Paris, 1841 (see also extracts from the same 5th volume in French translation by Langlés in vol. vi. of Notices et Extraits, Paris, 1799, p. 192 sg., and by Hammer in Sur les origines Russes, St Petersburg, 1825, p. 52 sg.); "Timtr's Expedition against*~~

~~*Tuktamish Khdn," Persian and French, by Charmoy, in Mémoires de I' Acad. Impér. de St Pétersbourg, 1836, pp. 270-321 and 441-471. (CH, E.)*~~

~~*MIROPOLIE, a town of Russia, situated in the govern- ment of Kursk, district of Suja, 83 miles south-west of Kursk and 25 miles from the Sumy railway station. It is supposed to have been founded in the 17th century, when it was fortified against the raids of Tartars. The fertility of the soil Iced to the settlement of large villages close by the fort, and the 10,800 inhabitants of this town are still engaged mostly in agriculture. There is also an extensive manufacture of boots.*~~

~~*MIRROR. It is only since the early part of the 16th century that mirrors have become articles of household furniture and decoration. Previous to that time—from the 12th to the end of the 15th century—pocket mirrors or small hand mirrors carried at the girdle were indispensable adjuncts to ladies' toilets. The pocket mirrors consisted of small circular plaques of polished metal fixed in a shallow circular box, covered with a lid. Mirror cases were chiefly made of ivory, carved with relief representations of love*~~

~~*or domestic scenes, hunting, and games, and sometimes illustrations of popular poetry or romance. Gold and silver, enamels, ebony, and other costly materials were likewise used for mirror cases, on which were lavished the highest decorative efforts of art workmanship and costly jewelling. The mirrors worn at the girdle had no cover, but were furnished with a short handle. In 625 Pope Boniface IV. sent Queen Ethelberga of Northumbria a present of a silver mirror; and there is ample evidence that in early Anglo-Saxon times mirrors were well known in England. It is a remarkable fact that on many of the sculptured stones of Scotland, belonging probably to the 7th, 8th, or 9th century, representations of mirrors, mirror cases, and combs occur.*~~

~~*The method of backing glass with thin sheets of metal for mirrors was well known in the Middle Ages at a time when steel and silver mirrors were alimost exclusively employed, Vincent de Beauvais, writing about 1250, says that the mirror of glass and lead is the best of all "quia vitrum propter transparentiam melius recipit radios." It is known that small convex*~~

~~*mirrors were commonly made in southern Germany before the beginning of the 16th century, and these continued to be in demand under the name of bull's-eyes (Ochsen-Augen) till comparatively modern times. They were made by blowing small globes of glass into which while still hot was passed through the pipe a mixture of tin, antimony, and resin or tar. When the globe was entirely coated with the metallic com- pound and cooled it was cut into convex lenses, which of course formed small but well-defined images. It appears that attention was drawn to this method of making mirrors in Venice as early as 1317, in which year a " Magister de Alemania," who knew how to work glass for mirrors, broke an agreement he had made to instruct three Venetians, leaving in their hands a large quantity of mixed alum and soot for which they could find no use.*~~

~~*It was, however, in Venice that the making of glass mirrors .on a commercial scale was first developed; and that enterprising republic enjoyed a rich and much-prized monopoly of the manufacture for about a century and a half. In 1507 two inhabitants of Murano, representing that they possessed the secret of making perfect mirrors of glass, a knowledge hitherto confined to one German glass- house, obtained an exclusive privilege of manufacturing mirrors for a period of twenty years. In 1564 the mirror- makers of Venice, who enjoyed peculiar privileges, formed themselves into a corporation. The products of the Murano glass-houses quickly supplanted the mirrors of polished metal, and a large and lucrative trade in Venetian glass mirrors sprang up. They were made from blown cylinders of glass which were slit, flattened on a stone, carefully polished, the edges frequently bevelled, and thie backs "silvered" by an amalgam. The glass was remarkably pure and uniform, the "silvering" bright, and the sheets sometimes of considerable dimensions. In the inventory of his effects made on the death of the great French minister Colbert is enumerated a Venetian mirror 46 by 26 inches, in a silver frame, valued at 8016 livres, while a picture by Raphael is put down at 3000 livres.*~~

~~*The manufacture of glass mirrors, with the aid of Italian workmen, was practised in England by Sir Robert Mansel early in the 17th century, and about 1670 the duke of Buckingham was concerned in a glass-work at Lambeth where flint glass was made for looking-glasses. These old English mirrors, with bevelled edges in the Venetian fashion, are still well known.*~~

~~*The Venetians guarded with the utmost jealousy the secrets of their varied manufactures, and gave most excep- tional privileges to those engaged in such industries. By their statutes any glassmaker carrying his art into a*~~

~~*foreign state was ordered to return on the pain of imprisonment of his nearest relatives, and should he disobey the command emissaries were delegated to slay the contumacious subject. In face of such a statute Colbert attempted in 1664, through the French ambassador in Venice, to get Venetian artists transported to France to develop the two great industries of mirror-making and point-lace working. The ambassador, the bishop of Béziers, pointed out that to attempt to send the required artists was to court the risk of being thrown into the Adriatic, and he further showed that Venice was selling to France mirrors to the value of 100,000 crowns and lace to three or four times that value. Notwithstanding these circumstances, however, twenty Venetian glass-mirror makers were sent to France in 1665, and the manufacture was begun under the fostering care of Colbert in the Faubourg St Antoine, Paris. But previous to this the art of blowing glass for mirrors had been actually practised at Tour-la-Ville, near Cherbourg, by Richard Lucas, Sieur de Nehou, in 1653; and by the subsequent combination of skill of both establishments French mirrors soon excelled in quality those of Venice. The art received a new impulse in France on the introduction of the making of plate glass, which was discovered in 1691. The St Gobain Glass Company attribute the discovery to Louis Lucas of Nehou, and over the door of the chapel of St Gobain they have placed an inscription in memory of " Louis Lucas qui in- venta in 1691 le methode de couler les glaces et installa la*~~

~~*manufacture en 1695 dans le chateau de Saint Gobain."*~~

~~*Manufacture.—The term "silvering," as applied to the forma- tion of a metallic coating on glass for giving it the properties of a mirror, was till quite recently a misnomer, seeing that till about 1840 no silver was used in the process. Now, however, a large proportion of mirrors are made by depositing on the glassa coating of pure silver, and the old amalgamation process is comparatively little used.*~~

~~*The process of amalgamation consists in applying a thin amalgam | of tin and mercury to the surface of glass, which is done on a perfectly flat and horizontal slab of stone bedded in a heavy, iron- bound wooden frame, with a gutter running round the outer edge. On the surface of this table, which must be perfectly smooth and level, is spread a sheet of thin tin-foil, somewhat larger than the glass to be operated on, and after all folds and creases have been coni- pletely removed, by means of stroking and beating with a covered wooden rubber, the process of " quickening" the foil is commenced. A small quantity of mercury is rubbed lightly and quickly over the whole surface, and the scum of dust, impure tin, and mercury is taken off. Mercury is then poured upon the quickened foil, until there is a body of it sufficient to float the glass to be silvered (about } inch deep), and, the edge at one of the sides having been cleared of the scum peculiar to mercury, the glass (scrupulously cleaned simultaneously with the above operations) is slid from that side over the surface of the mercury. Weights are placed over the surface until the greater part of the amalgamated mercury is pressed out, the table is then tilted diagonally, by means of dumb-screws, and all superfluous mercury finds its way to the gutter. The glass is left twenty-four hours under weights; it is then turned over silvered side up, and removed to a drainer with inclining shelves, where by slow degrees, as it dries and hardens, it is brought toa vertical position, which in the case of large sheets may not be arrived at in less than a month. This process yields excellent results, producing a brilliant silver-white metallic lustre which is only subject to alteration by exposure to high temperatures, or by contact with damp surfaces; but the mercurial vapours to which the workmen are exposed give rise to the most distressing and fatal affections. 7*~~

~~*In 1835 Baron Liebig observed that, on heating aldehyde with an ammoniacal solution of nitrate of silver, in a'glass vessel, a brilliant deposit of metallic silver was formed on the surface of the glass. To this observation is due the modern process of silvering glass. In practice the process was introduced about 1840; and it is now carried on, with several modifications, in two distinct ways, called the hot and the cold process respectively. In the former method there is employed a horizontal double-bottomed_ metallic table, which is heated with steam to from 35° to 40°C. The glass to be silvered is cleaned thoroughly with wet whiting, then washed with distilled water, and prepared for the silver with a sensitizing*~~

~~solution of tin, which is well rinsed off immediately before its removal to the silvering table. The table being raised to the proper temperature, the glass is laid, and the silvering solution at~~

~~MIRROR~~

~~once poured over it, before the heat of the table has time to dry any part of the surface of the glass. The solution used is prepared as follows:—in half a litre of distilled water 100 grammes of nitrate of silver are dissolved; to this there is added of liquid ammonia (sp. gr. 0°880) 62 grammes; the mixture is filtered, and made up to 8 litres with distilled water, and 7°5 grammes of tartaric acid dissolved in 30 grammes of water are nixed with the solution. About 2°5 litres are poured over the glass for each superficial metre to be silvered. The metal immediately begins to deposit on the glass, which is maintained at about 40°C. (104° F.), and in little more than half an hour a continuous coating of silver is formed. The silvered surface is then cleaned by very cautiously wiping with a very soft chamois rubber, and treated a second time with a solution like the first, but containing a double quantity of tartaric aeid. This solution is applied in two portions, and thereafter the glass is once more carefully cleared of all unattached silver and refuse and removed to a side room for backing up. i~~

~~In silvering by the cold process advantage is taken of the power of inverted sugar to reduce the nitrate of silver. This process has been adopted for the silvering of mirrors for astronomical telescopes, notably for Leverrier's great telescope in the Paris Observatory. For ordinary mirror silvering the following is the process recommended by H. E. Benrath. Two solutions are prepared, the first of which contains the silver salt, and the second the sugar preparation. For the silver solution 800 grammes of nitrate of silver and 1200 grammes of nitrate of ammonium are dissolved in 10 litres of water, and 1°3 kilos of pure caustic soda in 10 litres of water, and of each of these solutions 1 litre is added to 8 litres of water, which is allowed to rest till the sediment forms and then decanted. The second solu- tion—inverted sugar—is prepared by dissolving 150 grammes of loaf sugar with 15 grammes of vinegar in 0°5 litre of water, and boiling the solution for halfan hour. After cooling it is made up with water to 4200 cubic centimetres. The silvering is done on horizontal tables in a well-lighted and moderately~~

~~heated apartment, and the glass is cleaned with scrupulous care. For each square centimetre of glass operated on 15 cubic centimetres of the silver solution above described are measured ont, and from 7 to 10 per cent. of the solution of inverted sugar is added, both being quickly stirred to- gether and poured rapidly and evenly over the glass. The reduction immediately begins, and the solution exhibits tints passing througli rose, violet, and black, till in about seven minutes it again becomes transparent and the deposit of metalis complete. This first deposit is extremely thin, and allows the transmission of bluish rays. The exhausted solution with floating and unattached dust-like granules of silver is carcfully wiped off, the silvered surface washed with distilled water and again treated with the mixed solutions to the extent of half the quantity used in the first application. The finished surface is wiped and washed in the most thorough manuer,—for the least trace of caustic soda left would destroy the mirror. The further processes are the same in both methods of silvering.~~

~~The deposit of silver on glass is not so adherent and unalter- able under the influence of sunlight and sulphurous fumes as the tin-mereury amalgam, and moreover real silvered glass has a slightly yellowish tinge. These defects have been overcome by a process introduced by M. Lenoir, which consists of brushing over the silvered surface with a dilute solution of cyanide of mercury, which instantaneously forming a kind of amalgam renders the deposit at once much whiter and more firmly adherent than before. To protect the thin metallic film from mechanical injury and the chemical action of gases and vapours, it is coated with shellac or copal varnish, over which when dry are applied two coatings of red-lead paint.~~

~~Platinum Mirrors.—A cheap process of preparing mirror glass is to some extent prosecuted in France, whereby a thin but very adherent deposit of platinum is formed on the glass. A solution of chloride of platinum with a proportion of litharge and borate of lead dissolved in essential oil of spike is applied with a brush to well-cleaned glass, which is then placed on edge in a mufile furnace, and the platinum is thus burned in, forming an exceedingly thin~~

~~but brilliant metallic backing having a somewhat grey lustre. It.~~

~~is used only for the lids of cheap boxes, toys, ornamental letters, &c.~~

Magic Mirrors.—Hand mirrors of metal are still in common use in Oriental countries, and especially in Japan and China they con- tinue to be the prevalent form of looking-glass. In the former country indeed bronze mirrors are articles of the greatest importance in the generally meagre furnishing of houses, and besides possess a religious significance. They have been known and used from the most remote period, mention of them being found in Chinese literature of the 9th century. The (reputed) first made Japanese mirror, preserved at Is¢, is an object of the highest veneration in Japan, and an ancient mirror, connected with which is a tradition to the effect that is was given by the sun-goddess at the foundation of the empire, is a principal article of the Japanese regalia. The mirrors of Japan vary in form and size, but in general they con- sist of thin disks, from 3 to 12 inches in diameter, of speculum metal with handles cast in one piece. The polished face of the mirror is slightly convex in form, so that a reflected image is seen

proportionately reduced in size; the back of the disk is occupied with characteristic Japanese ornamentation and inscriptions in bold relief, and its rim is also raised to the back. Much attention has been attracted to these mirrors by a singular physical peculi- arity which in a few cases they are found to possess, These are known as magic mirrors from the fact that when a strong beam of light is reflected from their smooth and polished surface, and thrown on a white screen, an image of the raised ornaments and characters on the back of the mirror is formed with more or less distinctness in the disk of light on thescreen. This peculiarity has at no time been specially observed by the Japanese, but in China it attracted attention as early as the 11th century, and mirrors possessed of this property sell among the Chinese at ten or even twenty times the price sought for the ordinary non-sensitive examples. The true explanation of the magic mirror was first

"suggested by the French physicist Person, who observed that

the reflecting surface of the mirrors was not uniformly convex, the portions opposite relief surfaces being plane. There- fore, as he says, "the rays reflected from the convex portion diverge and give but a feebly illuminated

~~*image, while, on the contrary, the rays reflected from the plane portions of the mirror preserve their parallelism, and appear on the screen as an image by reason of their contrast with the feebler illumination of the rest of the disk." That such differences of plane in the mirror surface arise is an accidental circumstance due to the manner in which it is prepared, a process explained by Professors Ayrton and Perry, by whom ample details of the history, process of manu- facture, and composition of Oriental mirrors have been published. A preliminary operation in polishing the surface consists of scoring the cast disk in every direction with a sharp tool. The thicker portions with relief ornament offer more resistanee to the pressure of the tool than the thin flat portions, which tend to yield and form at first a concave surface, but this by the reaction of its elastieity rises afterwards and forms a slightly convex surface while the more rigid thick portions are comparatively little affected. This irregu- larity of surface is inconspicuous in ordinary light, and does not visibly distort images ; but when the mirror reflects a bright light on a screen the unequal radiation renders the minute differences of surface obvious. The ingenious theory of Person has been estab- lished by experiments cominunicated by M. Govi to the academy of Turin in 1864-65, and more recently by investigations of MM. Bertin and Dubosq. See Annales de Chimie et de Physique (5th ser., vol, xx.). . (J. PA.)*~~

~~*Ancient Mirrors.*~~

~~*The mirror of classical antiquity (kdromzpoy, speculum) was a thin disk of bronze slightly convex on one side and polished, usually provided with a handle, sometimes mounted on a stand in the form of a female figure (see CosruME, vol. vi. p. 453, fig. 1), sometimes fixed inside a circular bronze case. The common size is that of an ordinary hand mirror. Examples large enough to take in the whole figure appear to have been rare. Mirrors of glass are mentioned, and though none of them have been found their existence need not be questioned altogether, since the process of silvering occasionally employed on bronze mirrors suggests that an analogous process may have been applied to glass. But the very large number of mirrors still existing from antiquity shows that bronze was the regular material employed. The alloy known as speculum, producing a very hard*~~

~~metal with great reflecting power, is comparatively seldom met with. Silver mirrors are men- tioned, but none have as yet been found.~~

~~The principal feature of ancient mirrors, especially those of Etruria, is the design incised on the back (see Erruria, vol. viii. p. 648). While twelve incised specimens are all that are as yet known from Greece, the number found in Etruria must be nearly a thousand. As a rule the subjects incised are taken from Greek mythology and legend, the names of the persons represented being frequently added in Ktruscan letters and orthography. In most cases the style of drawing, the types of the figures, and the manner of composing the groups are true to the characteristics of Greek art. Some may have been im- ported from Greece ; but the greater number appear to have been more or less faithfully imitated from such designs as oecurred on the almost innumerable printed Greek vases which the Etruscans obtained from Greece. Even where distinctly Etruscan figures are introduced, such as the heroes Allius and Celius Vibenna on a mirror in the British Museum, Greek models are followed. The characteristics of Greek art here referred to date from a little before 400 B.c., and last for some time after. In this period would fall the majority of the Etruscan mirrors, and to this period also belong the Greek ineised mirrors, among which may be mentioned for their beauty one representing Leucas and Corinthus, inscribed with their names (engraved, Monuments Grecs, 1873, pl. 8, published by the Association pour l'encouragement des Etudes Grecques), and another in the British Musenm (Gazette Arch., ii. pl. 27), ou the back of which is a figure of Eros which has been silvered over. With this last-mentioned mirror was found the bronze case used to contain it,~~

~~502~~

~~on the back of which is a group of Aphrodite and Eros in repoussée. |~~

~~It was found in Crete. But most-of the Greek mirrors and mirror- cases having artistic designs are from Corinth. One bears the name of the artist, AwoAAas emote: (engraved, Arch. Zeitung, 1862, pl. 166, fig. 1). :~~

~~Archaic art (about 500 B.C.) is represented by a mirror in the British Museum from Sunium in Attica. The mirror itself is quite plain, but the stand is composed of a draped female figure, above whose head float two~~

~~*cupids. From Etruria there is a comparatively small number with archaic incised designs. It may be concluded that the luxury of mirrors enriched with incised designs was not freely in- dulged before 400 B.o. in Etruria and never to any extent in Greece. A special centre of incised mirrors was the Latian town of Preneste (Palestrina), and it is of interest in regard to some of the mirrors found there that they have inscriptions in early Latin. Artistically they have a purely Greek character. Plain mirrors are found wherever Greek and Roman civilization spread, and it may be seen from a specimen found in Cornwall, now in the British Museum, that the Celtic population of England had adopted the form and substance of the mirror from their conquerors. This specimen is enriched with a Celtic pattern incised. The shape of the handle testifies to native originality. Mirrors were used in Greece, perhaps rarely, for divination, as appears, for example, from Pausanias (vil. 21, 5), the method being to let the inirror down into a well by means of a string till it reached close to the surface of the water. When it was pulled up after a little it was expected to show the face of the sick person on whose behalf the ceremony was performed. This was at Patras.*~~

~~*The principal publications on ancient mirrors are Gerhard, Etruskische Spiegel, Berlin, 1843-67, 4 vols., containing 430 plates; for the Greek mirrors, Mylonas, 'EAAnvixd kaéromrpa, Athens, 1876, and Dumont, Bullet. de Corresp. Hellén.. 1877,*~~

~~*. 108; see also Friederichs, K/einere Kunst und Industrie im Alterthum, Diissel- dorf, 1871, p. 18 sg; and Marquardt and Mommsen, Handbuch der rémischen Alterthiimer, vii. pt. 2, p. 670. (A. S. M.)*~~

~~*MIRZAPUR, a district in the North-Western Provinces of India, lying between 23° 51' 30" and 25° 31' N. lat.,*~~

~~*on the N. by Jaunpur and Benares, on the E. by Shahdbad and Lohardaga, on the S. by Sarguja state, and on the W. by Allahébad and Rewah state, and has an area of 5217 square miles. It is crossed from east to west by the Vindhya and Kaimur ranges. A central jungly plateau connects these, and separates the valley of the Ganges from that of the Son.*~~

~~*The population in 1872 was 1,015,203 (males, 520,496; females, 494,707), of whom 949,644 were Hindus, 64,809 Mohammedans, and 750 Christians. The non-Asiatic population numbered 623. Only three towns had a population exceeding 5000 :—Mirzapur, 67,274; Chanar, 10,154; and Ahraura, 9091. Out of a Govern- ment-assessed area of 3048 square miles, 1313 are cultivated, 497 cultivable waste, and 1238 uncultivable. The part of Mirzapur which lies north of the Vindhydas is very highly cultivated and thickly peopled, but the rest of the district consists largely of ravines and forests, with a very sparse population. Local manu- factures comprise carpets of a superior description, brass ware, and shellac. The East Indian Railway traverses the district, along the right bank of the Ganges, for a distance of 32 miles. The climate is slightly warmer and damper than that of districts farther north and east. The mean annual rainfall is 42°7 inches.*~~

~~*MirzAror, chief town and administrative headquarters*~~

~~*of the Ganges, 56 miles below Allahabad (25° 9’ 43” N. lat., 82° 38’ 10” E. long.). The population in 1872 was 67,274, of whom 55,917 were HIndus and 11,053 Mo- hammedans. Up to quite recent years Mirzapur was the largest mart in upper India for grain and cotton; but of late its commercial importance has rapidly decreased, owing to the establishment of through railway communica- tion with Bombay wa Jabalpur, and the rise of Cawnpore to the position of a mercantile centre. The river front, lined with stone ghdis or flights of stairs, and exhibiting numerous mosques, HIndu temples, and dwelling-houses of the wealthier merchants, with highly decorated facades and richly carved balconies and door-frames, is handsome ; but the interior of the town is mainly composed of mud huts. The manufacture of shellac gives employment to about four thousand persons ; brass ware and carpets are also made, The imports consist of grain, sugar, cloth, metals, fruit, spices, tobacco, lac, salt, and cotton ; the same articles, with manufactured lac-dye, shellac, and ghi, are exported.*~~

~~*th t” (Stephen’s Digest, art. 22). and between 82° 9’ 15” and 83° 0’ 36” E. long., is bounded | e court” (Stephen’s Digest, art. 22)*~~

~~*MIR—MIS*~~

~~*MISDEMEANOUR. "The word mnisdemeanour," says Russell (On Crimes, vol. i. chap. iv.), "is applied to all those crimes and offences for which the law has not provided a particular name." Stephen, in his Digest of the Criminal Law, adopts the following mode of distinguishing between misdemeanour and other crimes. '"' Every crime is either treason, felony, or misdemeanour. Every crime which amounts to treason or felony is so denominated in the defini- tions of crimes hereinafter contained. All crimes not so denominated are misdemeanours." It is customary to speak of misdemeanour as implying a less degree of crime than felony (see Fetony). " Misdemeanours," observes Russell in the passage already cited, 'have been sometimes termed misprisions ; indeed the word misprision, in its larger sense, is used to signify every considerable misdemeanour which has not a certain name given to it in the law, and it is said that a misprision is contained in every felony whatsoever, so that the offender may be prosecuted for misprision at the option of the crown." Misprision, -in a more restricted sense (or negative misprision), is the concealment of an offence. Positive misprisions are contempts or misdemeanours of a public character, ¢.7., mal-administration of high officials, contempt of the sovereign or magistrates, &c. The rule as to punishment, when no express provision has been made by law, is that "every person convicted of a misdemeanour is liable to fine and imprisonment without hard labour (both or either), and to be put under recognizances to keep the peace and be of good behaviour at the discretion of By 28 & 29 Vict. c. 67 prisoners convicted of misdemeanour and sentenced to hard labour shall be divided into two divisions, one of which shall be called tlie first division, and when a person convicted of misdemeanour is sentenced to imprisonment without hard labour the court may order him to be treated as a first-class misdemeanant, who shall not be deemed a "criminal prisoner" within the meaning of that Act. The Prison Act, 1877 (S$ 40, 41), requires prisoners con- victed of sedition or seditious libel, or attached for contempt of court, to be treated as misdemeanants of the first class.*~~

~~*In New York and some other States of the American Union the legislature has defined felony as any crime which is or may be punishable with death or imprisonment in a State prison, all other crimes being misdemeanours.*~~

~~MISHNAH. The Mishnah, in the most familiar appli- cation of the name, is the great collection of legal decisions by the ancient rabbis which forms in each Talmud the text on which the Gemara rests, and so is the fundamental document of the oral law of the Jews. The question What is Mishnah? was asked, however, as early as the~~

~~| latter part of the Ist cr the early part of the 2d century, of the above district, is situated on the south bank |~~

~~though in a somewhat different sense and for a somewhat different purpose.! It will be answered in the course of this article in all its bearings.~~

~~1. Name.—Rabbinic tradition has fixed the pointing Mishnah (}¢‘2) by giving its status constructus as Mishnath. Although the word Mishnah is not found in the Bible, it is no doubt a classical Hebrew term, signi- fying something closely akin to Mfshneh (which term occurs more than once there), as may be seen on comparing Mikvah with Mikveh, Miknah with Mikneh, Ma‘alah with Ma‘aleh, and Mar’ah with MMar’eh, each two of which are, however they may vary in practical application, un- questionably synonymous terms. The practical signifi- cations of Mishnah are seven in number :—(1) repeti- tion, i.e, tradition :2 as such it is the equivalent of the i ee ee Re~~

~~1 See T. B., Kiddushin, 49a.~~

~~2The root Shanoh (73), from which Mishnah is immediately de- rived, is not merely, as is often thought, to learn, to teach, but to~~

~~repeat ; and it is in reality this last meaning which underlies the two former.~~

~~Sevrepdoeis of Epiphanius,! the traditiones et devrepdcas | given by God to Moses, and in uninterrupted succession~~

~~of Jerome,? the devrépwors of Justinian,? and the may~~

~~sand ("the second to the law") of the Arukh*; (2) re-_ citation from memory, in contradistinction to reading from | a book ;° (3) study: as such it is the equivalent of |~~

~~Midrash in the former part of its third signification ; (4) instruction ; as such it is the equivalent of Midrash in the latter part of its third signification ;° (5) system, style, view, line of study and instruction: as such it is~~

~~identical with the Talmudical Shitiah ;* (6) a paragraph | of the Mishnah: it is invariably employed in this sense in | the Babylonian Talmud, and is identical with the word |~~

~~alakhah, used for the same purpose, in the Palestinian Talmud ; and (7) the collection of the decisions of the whole "oral law," @.e., the J¢shnah in the concrete sense.~~

~~The word Mishnah has three different plurals :—(1) the | traditional Mishnayoth for signification (7), formed on the analogy of JMikvaoth (not, as some think, on that of |~~

~~Mikraoth or Midrashoth) ; (2) the correct, though ques- tioned, Mishniyyoth for signification (6), formed on the analogy of Parshiyyoth from Parashah (or Parshah), not to speak of that of Ja'asiyyoth from Ma'aseh ; (3), the~~

~~somewhat inelegant, but correct, Mishnoth,® which also |~~

~~serves for signification (6). Significations (1), (2), (3),~~

~~(4), and (5) have, however inconsistent it may appear | when one takes into consideration their respective equi-~~

~~valents, no plural whatever. Mishnah. later.~~

~~2. Contents and Nature.—The Mishnah consists chiefly~~

~~So much for the Hebrew | The Aramaic JJathnitho will be spoken of |~~

~~of IIIalakhah;9 there is, comparatively speaking, little |~~

~~Agadah® to be found in it. It is not, however, as many think, either a commentary on the Halakhic portions of the Pentateuch, or on the ordinances of the Sopherim, or on both together. It rather presupposes the knowledge of, and respect for, both the Mosaic and the Sopheric laws, and it only discusses, and finally decides on, the best mode and manner of executing these. The discussions and eventual decisions to be found in the Jishnah owe their existence principally to deep meditation on these two kinds of laws, notably on the former, by the rabbis of various ages, but chiefly by those who lived fifty years before and one hundred and fifty years after the rise of Christianity, the names of whom it faithfully gives, along with their respective discussions and decisions. 'There are but few cases to be found in the Mishnah which would critically come under the denomination of an //alakhah le- Mosheh mis-Sinai, i.e.,an explanation (of a law) as directly~~

~~1 Heores., xv. (xaT& ypaypatéwv), in fine. Epiphanius was a native of Palestine, even if he was not, as some think, of Jewish parentage. Asa Palestinian writer on Jewish and semi-Jewish matters he must have had a more than superficial knowledge of the Jewish traditions (the Mishnah, &c.). And indeed, to judge from the account he gives of the various Jewish traditions (althongh the text of this account is extremely corrupt in every way), he was pretty well informed, For he tells us that the Jews have four kinds of traditions :—such as are ascribed to Moses (by which he no doubt means the Zalakhah le- Mosheh mis-Sinai) ; such as are ascribed to the sons of Asmoneus (by which he means the Tekanoth, &c., of the Beth Dino shel Hash- monat; see T. B., 'Abodah Zarah, 36b); such as are ascribed to R. 'Akibah (the great teacher and martyr) ; and such as are ascribed to R. Andan, &c, (Rabbi Yehudah Hannasi).~~

~~2 In Isaiam, cap. viii. 11-15.~~

~~8 Nov. exlvi. (Tlep) 'EBpatwv) cep. d, in medio.~~

~~4 Article 13W'D (first definition).~~

~~5 Contrast Shanoh (3¥) with Karo (SY).~~

~~6 See article MIDRASH, p. 285.~~

~~7 See Schiller-Szinessy, Catalogue of Hebrew MSS. in the Cambridge University Library, ii. p. 94.~~

~~8 See MS. Add. 464 (University Library, Cambridge), leaf 2835.~~

~~9 This word, derived from the root Halokh (FO), to go, is synony-~~

~~mous with Minhag (custom, practice) and Mishpat (rule), &c. 10 For the meaning of this term and the Agadic parts which are to be found in the Mishnah, see MIDRASH.~~

~~received from him by the rabbis. Several cases given under this name in the JMZishnah are not bona fide cases ; for the test of such an Halakhah is that it must never have been contested by any one.?2~~

~~3. Method.—A Mishnah, if genuine, never begins with a passage of the Pentateuch, and even comparatively seldom brings direct proof from or gives reference to it. When there is any exception to this rule it will be found, on close examination, either that such a paragraph belongs to a very early age (that of the Sopherim), or that it is to be found in another work of the "oral law," and is simply copied in the Mishnah, or, what is more likely, that, if independent, it belongs to a very late age, or, finally, that~~

~~_ the proof or the reference thus given is only a later addi-~~

~~tion. One example of the true method of the Wishnah will, perhaps, better illustrate the foregoing statement than a sheet full of theorizing on the subject; and this one example will the more surely suffice because of its mixed (Mosaic and Sopheric) character. It is the very first paragraph of the whole Mishnah, and runs thus: 'From what time (of the day) does (may, should) one read the Shema' ('the taking upon oneself the yoke of the heavenly kingdom') in the evening?" The JZishnah does not begin: One is in duty bound to read the Shema in the evening, because it is written (Deut. vi. 7), "'And when thou liest down." For, in the first place, the law to read the Shema evening and morning is not unquestionably Mosaic, as the words, "And thou shalt talk of them, &c.," do not refer to this passage of~~

~~*the law particularly, but rather to the words of the Pentateuch in general ;!° and, secondly, it is needless to say that one is in duty bound to recite the Shema twice a day, since every Jew readily acknowledges this duty and executes it, although it isnot Mosaic. This duty of reading the Shema, the grounds on which this duty rests, and how it is best fulfilled, are fully and ably discussed, developed, and finally settled in that part of the Talmud called Gemara,—the business of which it is to discuss the words of the Jlishnah and to show the sources of the tradition, and eventually the passage in the Pentateuch (if on such the case rest) from which the respective disputants had derived their views, &c.*~~

~~*4. Purpose.—Although it is a book containing Halakhic decisions, the Mishnah was never intended, as many think, to enable the reader thereof to decide from it immediately. This mistake is old}5 and widely spread,—but a mistake nevertheless. The purpose of the Meshnah was and is simply to exhibit the development of the "oral law" and the view taken of this development by the rabbis of various times. For this reason one finds side by side with the opinions of the majority those also of the minority, which latter are very carefully given. But why, since these opinions of the minority can have no decisional effect? The Mishnah itself ("Hduyyoth,' i. 5)*~~

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~~*11 See R. Asher b. Yehiel (Harosh), Hilekhoth Mikvaoth (coming close after this Rabbi's commentary on Viddah, in the printed editions of the Bab. Talmud), i. 1.*~~

~~*12 There are, however, at least sixteen such dona side cases to be found in the works of the "oral law."*~~

~~*13 See T. B., Berakhoth, on Deut. xi. 19.*~~

~~*14 Gemara, or Gemoro, signifies concretely discussion on and final settlement of the contents of the Mishnah, from gemar (124); to study deeply, to come to a final result ; which last signification is, to some extent, to be found also in the Hebrew root gamor (1193). Compare*~~

~~*T. B., Bobo Metsi'o, 33a, and Rashi, tn loco.*~~

~~15 See T. B., Sotah, 22a. —~~

~~16 'The word MY} is variously pointed :— Aduyoth, Ediyoth, and, as in the text, 'Edwyyoth, which last, if the name come from M3TY, because of the testimony of the witnesses on which this Massekheth chiefly rests, would be the only correct one. But it ought to be remarked that the Babylonian teachers must have spelled it Idiyyoth (best things), since its equivalent is given by them as Behirto (or Behirotho). See T. B., Berakhoth, 27a aud elsewhere.~~

~~answers this question: it is that the teacher or the judge | Mzshnah is untrue, because the thing is impossible. For~~

~~of later ages may be thus enabled, if he have good grounds for taking a view different from that of the majority as given hundreds of years before, to reverse the old decision, by forming, on the strength of the example before him, with others who agree with him (or without them, if only one vote was wanted to reverse the majority) a fresh majority. Thus the Jewish "oral law" can never become ossified like the laws of the Medes and Persians.~~

~~5. Language.—The Mishnah is, on the whole, written in almost pure Hebrew; and even the originally non- Hebrew words (Aramaic, Greek, Latin, &c.) are so skil- fully Hebraized that they are a most creditable testimony to the linguistic powers both of many of the disputants mentioned in it, whose very words are in most cases given, and of the editor! or editors who revised them.~~

~~6. Age and Authorship.—R. Yehudah Hannasi (the Prince), the reputed author (in reality only the principal and best among the editors) of the Mishnah, was born before the year 140 of the Christian era. in full Yehudah b. Shime'on b. Gamliel b. Shime'on b. Gamliel? b. Shime'on b. Hillel. On account of his holy living he was surnamed Rabbenu Hakkadosh, and on account of his great learning and authority he was called simply "Rabbi" (" 'My Teacher" par excellence). Rabbi and his time, however, are no~~

~~terminus a quo for the composi- tion of the Mishnah. For, not to speak of many isolated Mishniyyoth which can be brought home to R. Meir, to R. 'Akibah, to Hillel,? to Yose b. Yo'ezer,* and to others, even to the earlier Sopherim,® we find that R. Yose b. Halaphta of the Ist century already quotes the beginning and end- ing of a whole Mishnic treatise (elim ®), and that in the same century (or very early in the 2d) another treatise consisting of early testimonies ("Hduyyoth") was put into order. Moreover, although the phrases Mishnath R. Eliezer b. Ya'akob' and Mishnath R. "Akibah® do simply signify the systems, styles, and views of these two eminent teachers, there can be little doubt that they and others besides them, presided over colleges in which the whole Halakhic matter was systematically treated and regularly gone through. Nor are Rabbi and his time for the composition of the Mishnah a terminus ad quem, for the Mishnah was not brought to a close till a very long time afterwards. Not only did R. Hiyya Rabbah, R. Hosha'yah Rabbah, and Shime'on bar Kappara redact Mishnayoth,'° but in the Mishnah before us notices are actually found which reach to the end of the 3d century, if not even later. The statement that Rabbi was the first to write down the~~

~~1 The Hebrew spoken in the house of the principal editor of the Mishnah was so correct that rabbis actually learnt the meaning of uncommon words of the Bible from the handmaidens of this house. See T. B., Rosh Hasshanah, 266. As for Rabbi himself, he was not merely a fine Hebrew scholar, but a fine Greek scholar also. He was also a purist ; for in T. B., Sotah, 49}, he is reported to have exclaimed, "Why should any one speak in Palestine 'Sursi'? Let him speak either Hebrew or Greek!" In using the word " Sursi"' for '* Surith" (Syriac), he no doubt makes a punning allusion to the mixed (cut-up)~~

~~character of the language, corrupted from Hebrew, Chaldee, Persian, Greek, and Latin.~~

~~2 This was the teacher of St Paul.~~

~~3 In addition to such well-known Agadic Mishniyyoth as those which are distinctly ascribed in Aboth to Hillel, see Mishnah Kiddushin, iv. 1; and contrast it with the language and style of the Afishnah in general, and that of Massekhto Kiddushin in particular.~~

~~*4 Mishnah ‘Eduyyoth, viii. 4.*~~

~~*5 See Mishnah Ma’aser Sheni, v. 7; Sotah, v.1, 2; Nega‘im, xii. 5, 6, 7, &c.; though it cannot be said that these passages preserve the teaching of the Sopherim in their original purity.*~~

~~*6 See Mishnah Kelim, in fine.*~~

~~*7 See T. B., Berakhoth, 28a: ‘It is handed down orally (3M) that Eduyyoth was on that day (when R. EYazar b. ‘Azaryah was installed as president) gone through,” 7.¢., redacted.*~~

~~*87. B., Yebamoth, 490.*~~

~~*9 Mishnah Synhedrin, iii. 4.*~~

~~*10 See Koheleth Rabbah on ii, 8 in medio.*~~

~~*the two Talmuds, of which that of Babylonia was not finished before the 6th century (if then), know, certainly, nothing of the writing down of the Mishnah. On the contrary, their language throughout presupposes the Mish- nah in their time to have been what its name indicates, a repetition, ¢.¢., a thing acquired by continual recitation, because, like the other works of the “oral law” (Torah shebbéal peh), it was to be, and was, handed down orally.U As for the difficulty of keepmg in memory such a stu- pendous and vast work as the J/ishnah, it is sometimes forgotten in this controversy that memory was aided by a great variety of mnemotechnic means, such as numbers and names of teachers, and by the existence of other works of the “oral law,” which, although they also were not written down, could be easily kept in memory because they rested on letters, words, and verses of the written Pentateuch. Anyhow, there is ample evidence, both nega-*~~

~~*| tive and positive, that the J/tshnah as we now have it HIs name was |*~~

~~*was not committed to writing in the times of Rabbi or for long afterwards. But it certainly does not follow that no merit is due to Rabbi in connexion with the Mishnah. Wis merit in connexion with it is great in every way. For (1) Rabbi was himself a link in the chain of tradition, since he had*~~

~~*"received" from his own father and so on up to his ancestor HIllel and even higher; (2) he gave in the Mishnah his own decisions, in most cases in accordance with those of the famous R. Meir, which are thus in a great part secured to us; (3) in giving his own decisions he preserved to us also a good many decisions of the teachers of the 2d century ; (4) in collecting all these decisions he anxiously ascertained the genuine formulas of the older Mishniyyoth ; (5) he did not merely reproduce the formulas which he esteemed the best, but discussed them anew in his own college, which was composed of men of the highest eminence, as is well known; (6) although he gave on the whole the very language of the teachers who preceded him, he gauged it, guarding it against the barbarisms which are so plentiful in the other works of the "oral law" ; and (7) he scattered the Mishnah broadcast (thougli only by word of mouth) over all Palestine and Babylonia by means of the disciples who flocked to him from all parts of those countries. If the I/ishnah, as it now exists, is not entirely his, it certainly belongs to him in a great measure and in more than one sense.*~~

~~*7. Value and Appreciation—Whatever can be said in favour of the Agadah applies with equal if not greater force to the Mishnah, as the latter is a canonical and therefore more reliable work of the "oral law." The Mishnah is one of the richest mines of archeeology which the world possesses. But it waits yet for the master touch to break the spell which holds it bound. Great, however, as the value of the Mishnah is, its popu- larity has never been steady, but has been continually fluctuating, and that for various reasons. Even Rabbi in his time had to appeal for due attention to it. Whilst it was neglected in troublous times by the masses, who ran after the Agadah,!8 which, besides being consoling, — needed no particular study, it was, in prosperous times, neglected by the rabbis themselves through the study of the Bible and the Talmud.!4 And much more was this*~~

~~*1 See particularly T. B., Bobo Metsi'o, 33a and 6; and compare also Rashi, in loco.*~~

~~*22 See T. Y., Ma''aser Shent, v. 1; and compare the preceding note.*~~

~~*13 See MipRasH, p. 285, note 14.*~~

~~*14 R. Yohanan said, This Mishnah (Boraitho), that no study can ex- cel that of Gemara, was taught in the time of (and by) Rabbi himself. Then the people went after Gemara and neglected the study of the A/ish- nah, Whereupon he again bade them ever run more after Mishnah than after Gemara. TT. B., Bobo Metsi'o, 336, and Rashi, in loco.*~~

~~*MISHNAH*~~

~~*the case when the Talmud had developed from a mere studious activity to two concrete works of large size.*~~

~~*8. The Ultimate Writing Down of the Mishnah.—The troubles of the unhappy Jews had multiplied everywhere. The masses, as already stated, preferred, in consequence of these troubles, the Agadah. But the number of the learned also diminished through these troubles day by day ; and the comparatively few that remained preferred more and more the Talmud (in Palestine the Palestinian and in Babylonia the Babylonian), which was a better field for the exercise of their ingenuity. The fate of the Mishnah would have been sealed had it not been ultimately written down. But the writing down of Halakhah en masse had been prohibited in early times. Two considera- tions, however, ultimately removed all scruples. (1) It was a time to do something for God, even if by such doings His law was apparently destroyed.!_ Let one (and a minor) law be disregarded, so that many (and higher) laws be preserved. The Halakhoth of the Mishnah were numerous and the students few; the power of tyranny increased and that of the memory decreased by reason of the persecution.*~~

~~*2) The language of the Mishnah, although pure, and in- deed purer than the language of several books of the Bible, was so concise and terse that it could not be understood without a commentary; and, therefore, even after being written down, it would virtually retain its oral character.*~~

~~*9. Recensions—The Mishnah has three principal recen- sions :—(1) the Mishnah as presented in the work standing by itself; (2) that on which the Palestinian Talmud rests ; and (3) that of the Babylonian Talmud. The first-named and the last-named Mishnayoth have always been known as complete; the second, however, was supposed for several hundred years to*~~

~~be imperfect, lacking four Perakim in Shabbath, two entire Massekhtoth in the Seder Nezikin, the whole of the Seder Kodoshim, and by far the~~

~~greater part of the Seder Tohoroth.? But since 1869 this |~~

~~recension also has been known to have been always comi- plete ; and it is to be found in its entirety in a MS. pur- chased in that year for the University Library of Cam- bridge (Add. 470. 1). Besides these three there are many minor recensions, touching, however, only isolated read- ings. These last are to be attributed chiefly to copyists. The origin of the difference between the principal recen- sions is to be sought in the following two facts :—(1) Rabbi had himself gone twice through the Mzshnah and had himself considerably altered the wording of the text;® and (2) his successors in early and late times had wilfully altered and corrected the original text.~~

~~10. Divisions and Detailed Contents of the Mishnah.—The Mish- nah in all recensions is divided into six Sedarim (orders), each of which contains a number of Massekhtoth * (treatises), which stand in connexion with one another. These are subdivided into Perakim (chapters), and these again into Halakhoth or Mishniyyoth (para- graphs called Mishnoth).° The number of the Sedarim is six, that of the Massekhtoth sixty,® and that of the Perakim 528, or,~~

~~1 This is a somewhat inexact application of Ps. cxix. 126, but it has been more than once acted upon both in ancient and modern times by the Jews. Compare the explanation given in T. B., Berakhoth, 63a, and Menahoth, 99a.~~

~~2 Niddah is the only Massekheth of this Seder of which three entire Perakim are to be found in the printed editions. Compare Schiller- Szinessy, Occasional Notices, &c., i. (Cambridge, 1878, 8vo) p. 8.~~

~~3 See T. B., Bobo Metsi‘o, 44a, and elsewhere. :~~

~~4 Whether the word Massekheth comes from Masokh (WDD, to pour into, to mix, &c.), or from Nasokh (D2, to pour, to mix, to weave, &c.), it signifies in either case here a mould, a form, a frame. Dfas- sekheth has three~~

~~*several plurals :—(1) the common Massekhtoth (not Massikhtoth) ; (2) the less common Massekhoth (see MS. Add. 470. 1, belonging to the University Library of Cambridge, leaf 69a and else- where) ; and (3) Massekhtiyyoth (MNYNSDD), see Midrash Rabbah on Canticles vi. 8, 9. The Aramaic Massekhto (not Massikhto) has in the plural Massekhotho, the use of which is, however, very uncommon. ~*~~

~~*5 Compare above, p. 503. 6 Compare Midrash Rabbah on Canticles vi. 8, 9.*~~

~~*| Gate, in ten chapters ;*~~

~~*505*~~

~~*| with a fourth Perek to Bikkurim, 524.7 The following is a scheme of the whole Mishnah.®*~~

~~*I, Zera'tm (on Agriculture, preceded by the Treatise on Thanks- givings®). (1) Berakhoth (blessings), in nine chapters; (2) Peah (Lev. xix. 9, &c.), in eight chapters; (3) Demai (fruit, grain, &c., doubtful if tithed), in seven chapters ; (4) Kilayim (mixtures of plants, animals, and garments respectively), in nine chapters ; (5) Shebi'ith (year of release), in ten chapters ; (6) Terumoth (gifts to the priests), in eleven chapters ; (7) Ma'aser Sheni? (Deut. xiv. 22-27), in five chapters ; (8) Ma'aser Rishon, otherwise Ma aseroth (Levitical tithes), in five chapters ; (9) Hallah (Num. xv. 19-21), in four chapters ; (10) 'Orlah (Lev. xix. 28), in three chapters; and (11) Bikkwrim (Deut. xxvi. 1-10), in three (commonly four) chapters.*~~

~~*Il, Moxrp (on Festival Times). (1) Shabbath (Sabbath), in twenty-four chapters ; (2) 'Erubin (mixtures, i.¢e., ideal union of divided spaces), in ten chapters ; (3) Pesah (commonly Pesahim, 1.60, Passover), in ten chapters ; (4) Kippurim (commonly Yoma, i.e., "the day" [of atonement]), in eight chapters ; (5) Shekalim (Exod. xxx. 12-15), in eight chapters; (6) Sukkah (Lev. xxiii. 34-43), in five chapters ; (7) Betsah ("an egg," so called from the beginning of the treatise; also Yom Tob, i.e., on work prohibited, or permitted, on festivals), in five chapters ; (8) Rosh Hasshanah (on the various kinds of new year, as religious or civil, the king's accession and coronation, &c.), in four chapters; (9) Ta aniyyoth (fast-days), in four chapters ; (10) Alegillah (reading of the book of Esther, other readings,*~~

~~*&c.), in four chapters; (11) HagigaH (festival-offerings), in three chapters; (12) MashkiN (so called from the begiuning of the treatise, but commonly Moed Katau, on work prohibited, or permitted, on the middle holidays of Passover and Tabernacles), in three chapters.*~~

~~*III]. NasHim (Women). (1) Nashim (so called from the first distinctive word of the treatise, but commonly Yebamoth, on sisters-in-law, the levirate, &c.), in sixteen chapters; (2) Kethuboth (marriage-pacts, settlements, &c.), in thirteen chapters; (38) Nedarim,*~~

~~| (vows), in eleven chapters; (4) Nazir (Num. vi. 2-21), in nine | chapters ; (5) Gittin (bills of divorcement and other bills), in nine~~

~~chapters; (6) Kiddushin (betrothal and marriage), in four chapters; (7) Sota (mostly Sotah, Num. v. 12-31), in nine chapters.~~

~~IV. NEziKIM, commonly Nezikin (Damages, &c.; see Exod. xxi, xxii., &c.). (1) Nezikin (commonly Bobo Kammo, the Former Bobo Metsi'o, the Middle Gate, in ten chapters; and Bobo Bathro, the Last Gate, in ten chapters!!), in thirty chapters ; (2) Synhedrin (courts of justice, &c.), in eleven chapters; (3) Makkoth ("forty stripes save one," &c.), in three chapters ; (4) Shebwoth (oaths, &c.), in eight chapters ; (5) HduyyoTh (testinionies) or 'Jdiyyoth (chiefest or best things »), in eight chap- ters; (6) 'Abodah Zarah (idolatry), in five chapters ; (7) Aboth (see MiprasH, p. 286), in five chapters; (8) HorayoTh (judicial errors, teachings, and decisions), in three chapters.~~

~~V. Koposuim (HoTy Things). (1) Zebahim™ (sacrifices), in fourteen chapters; (2) Menahoth (meat-offerings), in thirteen chapters ; (3) Shehitath HuTlin (slaying animals for common food ; commonly HuTlin, or common food), in twelve chapters ; (4) Be- khoroth (the first-born of beast and man), in nine chapters ; (5) 'Arakhim, commonly Erachin (on valuations ; see Lev. xxvii. 2-33), in nine chapters ; (6) Temurah (Lev. ix. 10, 33), in seven chapters; (7) Karethoth, not Kerithoth (sins the punishment of which is excision), in six chapters; (8) Mé¢ilah (Num. v. 6, 7), in stx chap- ters; (9) Middoth (description of the temple and its measurements ; see MIDRASH, p. 286), in five chapters ; (10) Tamid (perpetual or daily sacrifice), in six (commonly arrauged in seven) chapters ; (11) Kinnim (sacrifices of birds), in three chapters.~~

~~VIL. Tonororu (Purifications). (1) Kelim (impurities of vessels), in thirty chapters ; (2) Oholoth (Num. xix. 14-16, &c.), in eighteen chapters; (3) Nega'im (plague of leprosy in man, house, and garment), in fourteen chapters; (4) Parah (Num. xix. 1-19), in twelve chapters ; (5) Tohoroth (euphemism for impurities), in ten chapters; (6) Alikvaoth (religious baths), in ten chapters; (7) Niddah (Lev. xv. 19-33), in ten chapters ; (8) Makhshirim (liquids~~

~~7 Others include, instead of a fourth Perek of Bikkurim, the Perek Rabbi Meir, i.e., the treatise 'On the Acquisition of the Law." The original Mishnah, however, had neither of these two Perakim.~~

~~®In this scheme the Cambridge MS. of the Afshnah is taken as the groundwork, while the variations in title, &c., are given from the common texts.~~

~~9 Compare St Paul's words, Eph. v. dep TaVTOV. ' ;~~

~~10 On the apparent anomaly of Me'aser Sheni preceding Ala aser Rishon, see Schiller-Szinessy's Catalogue of Hebrew MSS. in the Cambridge University Library, vol, ii, p. 1, note 4. Pi~~

~~11 In the Cambridge MS. Add. 470. 1, Alassekhto Nezikin is given correctly as one, containing thirty chapters. Compare T. B., Bobo Kammo, leaf 102a, 'Abodah Zarah, 7a, and Midrash Shemuel, V.~~

~~12 See p. 503, note 16. | 33 Also known under Shehitath Kodoshim.~~

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~~predisposing for the contraction of impurities, Lev. xi. 34), in six chapters ; (9) Zabim (Lev. xv. 2-33), in five chapters; (10) Zebul Yom (Num. xix. 19), in four chapters ; (11) Yadayim (purification of the hands), in four chapters ; (12) 'Okotsin (stalks, peel, &c., of fruit), in three chapters.~~

~~11. Editions. — The editions of the Mishnah, whether as a book by itself or as contained in the Babylonian Talmud, are too numerous to be mentioned here. The editio princeps of the Mishnah, as a separate book, appeared (with Maimonides's com- mentary) at Naples in 1492 (see MarMonrDEs), and that as contained in the Babylonian Talmud at Venice in 1520-23, both in folio. As part of the Palestinian Talmud the Mishnah came out also at~~

~~*Venice, in 1523-24, folio. This Talmud, however, being defective, its Mishnah naturally is incomplete too (see p- 505); and it is, moreover, '* corrected "' by the scribe of 1288-89 (see Schiller-Szinessy, Occasional Notices, &c., i. pp. 8, 11). The syndics of the University Press of Cambridge have therefore laid the learned public under considerable obligations by publishing for the first time the complete original Mishnah on which the Palestinian Talinud rests, from the unique MS. preserved in the University Library.*~~

~~*12. Translations.—There exist translations of the Mishnah in Latin, German, and English. (1) There is a Latin translation by the brothers Abendana (R. Ya'akob and R. Yitshak). The former was Haham (Hakham, %.e., chief rabbi) of the Sepharadim in England, and the latter was teacher of Hebrew and Rabbinic at Cambridge and Oxford successively. Both brothers, correspond- ents in 1660 of Buxtorf, were fine Hebrew and Latin scholars (see Schiller-Szinessy, "The Abendanas," in Jewish World of December 5, 1879). This translation is preserved in the Cambridge Univer- sity Library MS. Mm. 1. 4-8.2 (2) The Abendanas' version was before Surenhusius when he compiled, from old and new mate- rials, his Latin translation, which appeared (with the text of the Mishnah and the translation also of the commentaries of Mai- monides and ' Bertinoro"') at Amsterdam in 1698-1703, folio. The great indebtedness of Surenhusius to the Abendanas is a fact either unknown to or ignored by the bibliographers.? (3) A German translation by Rabe came out in German letters at Onolzbach in 1760-63, 4to. (4) The version last-named was in the possession of the anonymous author of the translation, printed in Rabbinic letters, in the Vienna edition of the Mishnah with the commentary Kaph Nahath, 1817-35, 8vo. This author (or editor) silently "used" the work of his predecessor. (5) Both these translations were surpassed in German diction, as well as in correctness of rendering, by that which came out in Hebrew square letters at Berlin in 1832-34, 4to, and which, no doubt, belongs to J. M. Jost the historian. (6) The English translation which came out at London in 1843, 8vo, by De Sola and Rapliael, extends only over eighteen treatises.*~~

~~*13. Commentaries.—The commentaries on the Afishnah are almost as numerous as the editions, and cannot therefore be speci- ally enumerated*~~

~~*here. The principal and the oldest, however, are the following. (1) The two Talmuds themselves, of which, at present,4 the Babylonian is the only {and that but compara- tively) perfect one, or at all events the more extensive of the two. It ought, however, to be stated, first, that the Palestinian Talmud has Gemara on the whole order Zeraim, whilst the Babylonian has it on the first " treatise" only of that order (Berakhoth), and, secondly, that the Gemurath Shekalim in the Babylonian Talmud is only borrowed from the Palestinian Talmud. (2) The commentaries on Zeradim, Tohoroth, &., by Rabbenu Hai Gaon, who was the last, most learned, and in every way noblest of the Geonim.® He flourished in the 10th and 11th centuries. Part of the commentaries (viz., that on Tohoroth) has appeared in the collection*~~

~~*1See Mr W. H. Lowe's able edition of this grand work (The oo on which the Palestinian Talmud rests, Cambridge, 1883,*~~

~~*vo).*~~

~~*? According to Picciotto (Sketehes of Anglo-Jewish History, London, 1875, 8vo, p. 55), R. Yitshak Abendana translated the Mishnah and its commentaries (Maimonides and " Bertinoro "?) also into Spanish.*~~

~~*3 Surenhusius was also aided in his grand work by the books and notes of Guisius (in Berakhoth, Peah, Demai, [Kil'ayim, Shebiith Terumoth, and Ma aseroth, i.—iii. 3), Schmid (in Shabbath and 'Erubin), Houting (Mosh Hasshanah), Lund (Ta'anith), Otho (Shekalim) Wagenseil (Sotah), Cocceius (Makkoth), Fagius (Aboth), Arnoldi (Tamid), L'Empereur (Mfiddoth), and Ulmann (Zebahim and Kare- thoth). But without the Abendanas Surenhusius could never have commenced, much less executed, the great task he had before him.*~~

~~*4For the probability that the missing parts of the Palestinian Talmud will one day come to light somewhere in the Hast, see Schiller- Szinessy in the Academy, February 23, 1878 ; [fe-Chaluz, xi. ; and Steinschneider, Mlandschriften-Verzeichnisse der kiniglichen Bibliothek zu Berlin, ii., &c. (1878, 4to), p. 65, where a passage of Palestinian Gemara of 'Okotsin is actually quoted.*~~

~~*5 He was also a poet of no mean standing.*~~

~~*See his Musar Hashel (or Hassekhel), ed. princ. Fano, 1505 (%), 4to.*~~

~~*Ma 4S Ta a Al*~~

~~*Kobets Ma'ase Yede Geonim, &c. (Berlin, 1856, 8vo). (3) The commentary on various treatises of the B. Talmud, and indirectly on the Mishnah, by Rabbenu Gershom Meor Haggolah (the " Light of the Diaspora," flourished in the 10th and 11th centuries). Frag- ments of this commentary are incorporated in the ordinary Talmud editions (¢.g., Nedarim, 22b, &c.), but the greater part lies as yet in manuscript in various libraries. (4) The commentary of Rabbenu Hananeel, who lived at Kairawan (in Africa) in the 10th and 11th centuries. His commentary on the Talmud, and thus indirectly on the Mishnah, is now being published in the Vilna edition of the Babylonian Talmud." (5) The commentary of Rashi (0d. 1105) in all those parts of the B. Talmud on which that " prince of commentators'"'? wrote. Here ought to be mentioned also the separate editio princeps of this commentary as far as the Mishnah is con- cerned, which appeared at Leghorn in 1653-54, 8vo. (6) The supplements and additions to the commentary of Rashi by his son- in-law Rabbenu Yehudah b. Nathan (¢.g., T. B., Mukkoth, 196, &c.), and by his grandsons Rabbenu Shemuel b. Meir (vulgo Rashbam; see Pesahim, 99b, and Bobo Bathro, 29a, &c.) and Rabbenu Shema'yah b. Simhah of Vitri,8 who interpreted the Mas- sekheth Middoth before Rashi, his grandfather (see Schiller-Szinessy, Catalogue of the Hebrew MSS. preserved in the University Library of Cambridge, ii. p. 89). (7) The commentary on the whole Mishnah by MatMonIDES (q.v.). (8) The commentary by R. Abraham b. David of Posquiéres (vulgo Rabad) on 'Eduyyoth (see editions of the B. Talmud), Kinnim (with two other commentaries by Rabbenu Zerahyah Hallevi and R. Asher b. Yehiel, Constantinople, 1751, folio), and on many other Mishniyyoth of the orders Zeradim and Tohoroth (in his " strictures " on Maimonides, Mishneh Torah, books Zerdim and Tohorah). (9) The commentary of R. Shimshon of Sens (who, like the foregoing, was a contemporary and opponent of Mainionides) on the orders of Zera'im (with supple- ments taken from the works of the somewhat older R. Yitshak b. Malkitsedek) and Tohoroth.® (10) The commentary by R. Meir of Rothenburg (the celebrated captive of Rudolph of Hapsburg); see under (13) below. (11) The commentary by R. Asher b. Yehiel (a disciple of the foregoing, who died at Toledo in 1327) on*~~

~~twenty- oue treatises of the orders i. and vi. (12) The commentary on the whole Mishnah, by Rabbenu 'Obadyah di Bertinoro (flourished in the 15th and 16th centuries), the editions of which are very numerous. (13) The commentary on the whole MJishnah, by R. Yomtob Lip- mann Heller (flourished in 16th and 17th centuries). This famous teacher, rabbi in some of the greatest congregations of the Jews (Prague, Vladimir, and Cracow), incorporated much of the com- mentary of R. Meir of Rothenburg ; compare under (10).~~

~~14. Works Subsidiary and Auailiary to the Mishnah.—These Math- may be summed up under the word Mathnitho. Mathnitho is uitho. ostensibly the Aramaic equivalent of the Hebrew Mishnah ; in reality, however, it signifies and comprises, not merely every- thing which is understood under that name, but also Boraitho (in full, Mathnitho Borattho), i.e., four other works of the oral law, and many literary notices of Mishnic and pre-Mishnic times besides, which are scattered throughout the Talmuds and other early Rabbinic works. :~~

~~The first of these is Tosephto. As its name indicates, Tosephto Tosephto. is " Addition," 7.¢., to the canonical Mishnah. All Mishnah teachers from time immemorial, notably R. 'Akibah and R. Yehudah Hannasi, left out, when they taught Mishnah, a large mass of kindred and explanatory matter, which they only occasionally and supplementarily mentioned, ¢.¢., when absolutely wanted. The chief collection of this additional matter, not incor- porated in the system of the canonical Mishnah, is called Tosepheth in Hebrew and Tosephto (or Tosiphta as some less correctly write it) in Aramaic. The Aramaic singular and the Hebrew plural occur already in the Talmuds and Jfidrashim. Tosephto shares with the Mishnah, which it enlarges and explains, the number of orders and treatises, but not that of chapters, of which it has only 452. The oldest collection of Tosephtic matter, even as the oldest collection of Mishnic matter, is due to R. 'Akibah. But, whilst~~

~~6 In the synod called together by Rabbenu Gershom, among several " ordinances" was also one that no Jew is allowed to marry more than one wife.~~

~~7 His commentary on Pesahim appeared at Paris in 1868, and that ou Makkoth at Leipsic in 1876, both in 8vo.~~

~~8 These writers (together with Rabbenu Meir another son-in-law and Rabbenu Ya'akob another grandson of Rashi) are the first of the so- called Tosaphists, whose activity continued down to the early part of the 14th century. :~~

~~® Whether the commentary on Yamid printed under his name, together with that of R. Asher b. Yehiel on the same treatise (Prague, 1725, 4to), is really his is still matter of dispute.~~

~~10 See T. Y., Shabbath, viii. 1, &c.; T. B., Synhedrin, 86a and else- where ; Midrash Rabbah on Ecclesiastes v. 8, &c. There can be little doubt that in some places the word NNDDIN ought to be transliterated Tosephotho (i.e., as plural).~~

~~Mekhilto.~~

~~mis HN AE~~

~~the Mishnah, as a work, was first sifted by his disciple R. Meir, Tosephto, as a work, was first sifted by another disciple R. Nehemyah ; and just as R. Meir's Mishnah was sifted again by Habbi and others after him, and was not written down before the 6th century, so Tosephto was sifted again by R. Hiyya, R. Hosha'yah, and others, aud was not written down in its entirety before the 6th century. It is no wonder, then, that it now contains matter of a considerably later age. T'osephto is not merely of great help for understanding the Mishnah, which is, in a certain sense, incomplete without it, but for the precise and exact knowledge of Jewish archeology and other sciences, and in its Agadic parts, of which there are many, for the Greek Scriptures also. Here ought also to be mentioned Aloth de-Rabbi Nathan, which is, no doubt, Tosephto to the Mishnah of Aboth. Tosephto used to be printed till within the last forty years ? as an appendix to the Riph, i.e., the Hilekhoth Rab Alphes (a compendium of the Talmud by R. Yitshak b. Ya'akob Al-Phesi, or Al-Phasi, i.e, of Fez, ob. 1103), which appeared first with this appendix at Venice, 1521-22, folio. Here, however, it was not edited critically or printed with even ordinary care. But in the Vienna~~

~~*edition of the Babylonian Talmud (1860-72) it came out, for the first time, worthily after a MS. till then uncollated which is preserved in the Court Library. Dr Zuckermandel has since published it from the Erfurt and Vienna MSS., with collations.? A Latin translation of Tosephto (with the Hebrew text) is to be found, under the name of Tosaphta, in Blasins Ugolinus's Zhesaurus Antiquitatum Sacrarum (xvii.-xx.). It comprises, however, only the orders Zera'im, Mo'ed, and Kodoshim, and came out at Venice in the years 1755-57, folio.*~~

~~*The second of these pieces of literature is Mekhilto. This word*~~

~~*is the Aramaic equivalent of the Hebrew Middah (measure), and'*~~

~~*hence signifies mould, form, 7.¢., of Scriptural exegesis, notably of part or parts of the Pentateuch. As such it might, of course, stand for any kind of commentary on any book of the Pentateuch, and have been composed by any one. And we find, indeed, that Mekhiito signified at one time a commentary on the books Exodus, Leviticus, Numbers, and Deuteronomy, either by R. Yishmael or by R. 'Akibah,? at another time a commentary on Exodus, by R. Shime'on b, Yohai,* and at another time again a commentary on the last four books of Moses, by (Shime'on) Ben 'Azzai.® Mekhilto now, however, means a commentary on the greater part of Exodus, ascribed to R. Yishma''el emaaned in the 1st century) ; although, in reality, this teacher cannot have been the author of the book, seeing that his name is more than seventy times mentioned in it. The reason why the ancients called the book by his name is, no doubt, because the first words of the real work are Amar Rabbi Vishma'el. Like the other works of the 'oral law," Alekhilto was not written down before the 6th century, a fact which accounts also, in part at least, for the loss of several portions of this com- mentary, which, at present, only extends from xii. 1 to xxv. 3, with several gaps between. That Mekhilto was once fuller than it is now we know, not only from a statement made by Maimonides and others, but from a MS. (Add. 394. 1, in the University Library of Cambridge, leaf 400), where an extract is given by a Franco- German author of the 12th or 18th century. The Talmud knows the name Mekhilto, and actually quotes Boraithoth (non-canonical Mishniyyoth) which are to be found in our book; and yet the existing Mekhilto can scarcely have been known to the teachers of the Talmnd.*~~

~~*Mekhilto is by some called Midrash and by others Mishnah; both names are in a certain sense correct. It is Mid- rash in substance, inasmuch as it contains exegesis, and in form, inasmuch as it is subdivided into Parshiyyoth and follows the order of the Scriptural verses. But it is Aishnah in substance, inas- much as it not only deals with the groundwork of the Afishnah, but consists of Boraithoth (non-canonical MMishniyyoth), and in form, inasmuch as it is, like the canonical Mishnah, divided into Massekhtoth. These latter are nine in number, and are called re- spectively (1) Dephisha (with 18 Parshiyyoth and 1 Pethihto or introduction), (2) Beshallah (with 6 Parshiyyoth and 1 Pethihto), (3) Deshiretha (with 10 Parshiyyoth), (4) Vayyassa' (with 6 Par- shiyyoth), (5)'Amalek (with 2 Parshiyyoth), (6) Yithro (with 2 Parshiyyoth), (7) Bahodesh (with 11 Parshiyyoth), (8) Nezikin and Kaspo (with 20 Parshiyyoth), and (9) Shabbetho (with 2 Par- shiyyoth—1 in the pericope Ai thissa and 1 in that of Vayyakhel). Mekhilto was published first at Constantinople in 1515, under the name of Sepher Hammekhilto, and in 1545 at Venice as Mid- rash Hammekhilto. In 1712 it appeared at Amsterdam with a commentary. In 1744 it appeared again at Venice with a Latin translation by Blasius Ugolinus (Thes. Antig. Sacr., xiv.). – In 1801 it appeared at Leghorn with a different commentary. In 1844 it*~~

~~*1That on the order Zeraim came out at Vilma in 1799, 4to; but in its entirety it came only out between 1837, 1841, and 1871, folio.*~~

~~*2 Tssued at Pasewalk and Treves from 1877 to 1882, 8vo.*~~

~~*2 See Maimonides's preface to the Mishneh Torah.*~~

~~*4 See Nahmanides's commentary on the Pentateuch (on Gen. xlix. 31).*~~

~~*5 See Yuhasin Hasshalem (ed. Filipowski, London and Edinburgh, 1857, 8vo), p. 30, col. 2.*~~

~~*came out at Vilna with a newcommentary. All these are in folio. The best and cheapest editions with commentaries are those by ewe (1865) and Friedmann (1870), both printed at Vienna, and in 8vo.*~~

~~_ The third of these pieces of literature is Siphro. itself, because it is the most difficult of all Mosaic books, and the oldest Rabbinic commentary on it, because it is the most difficult of all commentaries on the Scriptures, have been from time immemorial known under the name of Siphro (i.e., the Book).® This book and this commentary are also called Zorath Kohanim, and the former is spoken of in the Talmud already as Szphro debe Rub." This latter expression has led many great meu (among others Maimonides) 8 to ascribe the authorship of this commentary to Rab (Abba Arikho, a nephew and disciple of R. HIyya). But such a view is erroneous in the extreme, as the book is, so far as form and substance go, both older and later than Rab, paradoxical as this statement may appear. It is older in its origin and in its matter, for not merely do all the anonymous Boraithoth which are to be found in it belong to R. Yehudah b. II'ai, a teacher of the lst century, but one of the sons of Rabbi (of the 2d century) had actually taught another rabbi two-thirds of a third, i.e., two-ninths, of this work.® It is later than Rab, for in it are found one " authority" and several "results" of much later date than that of this great Babylonian teacher.!° The fact is, the word Rab in the phrase Siphro debe Rab is not a proper name at all, but simply stands for "teacher," and debe Rad thus signifies "' of a school," a terin used for any teacher and any school of any time. Although most of the Boraithoth which it contains are as old as the 1st century, this book as such cannot have been written down earlier than the 6th, in accordance with the treatment, in this respect, of all the other HIalakhic works of the "oral law." Stphro, although it bears on the pericopes and verses of Leviticus, and is on account of this fact by many called a Midrash, is in reality Mishnah,4u—a name borne out by the nature of its contents, which are mostly Mishnic, and sometimes represent actual canonical Mishniyyoth. Siphro exhibits a curious conglomeration of matter. It opens with the "Rules of the Interpretation of Scripture," ascribed to R. Yishma'el,—a Boraitho which, although important in itself, is not more important for this than for any other com- mentary on the Pentateuch. And this conglomerate nature shows itself even more strikingly in form; for Siphro contains as forms of division Dibburim, Mekhilto, Parshiyyoth (some of which mean pericopes, whilst others mean chapters), Perakim, and Piskoth. All this points, of course, to various divisions of the book made at various times. Whilst none of these divisions can be later than the 12th century,?2 the earliest is at least as old as the 2d, and belongs perhaps to the ist.8 Siphro is chiefly of importance~~

~~*for the under- standing of the Wishnah of the orders Kodoshim and Tohoroth (which were, no doubt, the earliest Mishniyyoth put into 'Sordens) but, whilst it is a sure help for the Mishnah, the Mishnah is no sure help for it: Siphro is a genuine specimen of the "' oral law," inasmuch as it cannot be mastered without ateacher. Owing to the difficulty of understanding it, Siphro has not been often studied, and conse- quently not often printed. The editio princeps is of 1545; the second edition with the commentary Korban Aharon is of 1609-11, both at Venice. The third edition with the just-named commen- tary is of 1702, and came out at Dessau. The fourth edition, with a Latin translation, is to be found in Blasius Ugolinus's Thesawrus Antiquitatum Sacrarum, &c., Venice, 1744 (vol. xiv.). All these are in folio. The fifth edition, with the commentary 'Azarath Kohanim (vol. i.), appeared at Vilna, 1845, 4to. The sixth edition, with the commentary 'Asirith Haephah, appeared at Lemberg, 1848, folio. The seventh edition, with the commentary Hattorah Veham-Mitsvah, appeared at Bucharest, 1860, 4to. The eighth edition, with the commentary of R. Abraham b. David of Pos- quiéres, &., appeared at Vienna, 1862; and the ninth edition, with the commentary by R. Shimshon of Sens, appeared at War- saw, 1866, both in folio. .*~~

~~*The fourth of these pieces of literature is Siphere. Siphere debe Rab, which in_ earlier times certainly included the oldest Rabbinic commentaries on Exodus, Numbers, and Deu- teronomy (and perhaps also that on Leviticus), means now the oldest Rabbinic commentary on the last two books of Moses only. ee*~~

~~*6 See T. B., Berakhoth, 186, and Rashi, in loco. The Siphro said here to have been studied by Benaiah the son of Jehoiada may well have been our Leviticus, though of course it cannot have been the Siphro with which we are here concerned,*~~

~~*7 Ibid.*~~

~~*8 Preface to Mishneh Torch.*~~

~~*9 See T. B., Kiddushin, 33a.*~~

~~*10 See the pericope Kedoshim, vi. :*~~

~~11 Its original founder (R. Yehudah b. Il'ai) identifies Mishnah and Midrash, T. B., Kiddushin, 49a.~~

~~12 They were known to R. Abraham b. David (Rabad).~~

~~B37, B., Kiddushin, 33a.~~

~~Both Leviticus Siphro.~~

~~Siphere, or Siphere.~~

~~Boraitho.~~

~~008~~

~~Both books are divided into Piskoth (paragraphs), of which Siphere on Nuinbers has 161, whilst that on Deuteronomy has 357. The ancient division into Boraithoth cannot now be accurately traced. The work eommeuces now at Numbers v. 1, and goes to the end of Deuteronomy. The passages anonymously given in Siphere are ascribed by the Babylonian 'Talmud! to R. Shime'on b. Yohai, the favourite disciple of R. 'Akibah, and the reputed author of the Zohar. But although he is no doubt the virtual author of Siphere, seeing that most Boraithoth which are to be found therein are his, he cannot be, technically speaking, itsauthor. For, in the first place, he is not only repeatedly named in the book, but several times actually contradicted by others; and, secondly, there are several passages, anonymously given, in the book, which can only be the result of "Talmudic" study, and must be consequently pos- terior to the composition of the Talmud. The fact is that Siphere, like the other works of the "oral law," was not written down before the 6th century. It ought to be mentioned here that the rabbis of the 11th, 12th, and 18th centuries, and even somewhat later, speak also of another Siphere which they variously designate as Siphere Panim Sheni, Siphere shel Panim Sheni, Siphere Bemid- bar Sinai, Siphere Zutta, and Siphere simply. To judge from the extracts which have coine down to us, that work must not only lave been of much later date, but also of far less value than the work in our hands. Siphere appeared for the first time in 1545, and with a Latin translation by Blasius Ugolinus, in his Thesaurus, &c. (vol. xv.), in 1744,—both at Venice, and in folio. The third~~

~~*edition appeared at Hamburg in 1789, and the fourth at Sulzbach in 1802, both in 4to. The fifth edition, with the commentary Zera Abraham, appeared in two volumes, of which the first was printed at Dyhernfurt in 1811 and the second at Radawell in 1820, both in folio. The sixth and best edition is that of Friedmann (Vienna, 1864), and the seventh is that of Lemberg, 1866, both in 8vo. There is also a fifth piece of Mishnic literature known specially by the name Boraitho. Besides the Boraithoth constituting Tosephto, Mekhilto, Siphro, and Siphere, there are hundreds of other Boraithoth to be found scattered about in both Talmuds. These are, however, mere fragments of the vast Mishnayoth (entire Mishnic works?) composed by Bar Kappara, Rabbi Hiyya, and hundreds of other teachers, which in course of time must have perished. There is, however, enough left of the Mishnah, canonical and non-canonical, to prove the correctness of the cabbalistic remark that Mishnah is the equivalent of Neshamah (soul). This is no mere trifling based on the fact that the two words (FAWN, mows) accidentally consist of the same letters; it is rather an enunciation of an intrinsic truth: what the soul (Neshamah) is to the body, the Mishnah is to Mosaism. The soul gives life to the body, aud the Afishnah gives life to the Pentateuch. For the letter killeth, but the spirit giveth life! (S. M. 8.-S.)*~~

~~*MISKOLCZ, capital of the Cis-Tisian county of Borsod, Hungary (48° 6' N. lat., 20° 49' E. long.), is picturesquely situated in a valley watered by the Szinva, 90 miles north- east from Budapest, with which, as also with Debreczen and Kassa (Kaschau), it is directly connected by railway. Miskolez is one of the most thriving provincial towns in the kingdom, and has many fine buildings, including Roman Catholic, Greek Catholic, Lutheran, and Calvinist churches and schools, a Minorite convent, synagogue, Hungarian theatre, hospital, royal and circuit courts of law, salt and tax offices, and the administrative bureaus for the county. There are manufactories of snuff, porcelain, boots and shoes, and prepared leather, and both steam and water mills. The trade is chiefly in grain, wheaten flour, wine, fruit, cattle, hides, honey, wax, and the agricultural products of the neighbourhood. The great fairs, held five times a year, are much resorted to by strangers from a distance. Not far from the town are stone quarries and iron mines. At the end of 1880 the (civil) population amounted to 24,343, of whom the majority were Magyars by nationality.*~~

~~During the 16th and 17th centuries Miskolez suffered much from the desolating hordes of Ottomans who then ravaged the country, as also from the troops of various Transylvanian princes and leaders, especially those of George Rakéczy and Emerie Tokélyi. In 1781, 1843, and 1847 it was devastated by fire, and on the 30th August~~

~~1878 a great portion of the town was laid in ruins by a terrific storm. (See Huncary, vol. xii. p. 374.)~~

~~MISREPRESENTATION,. See Fravp.~~

~~1 Synhedrin, 86a. 2 According to T. B., Hagigah, 14a, there existed at one time no less than six or seven hundred ALishnah orders.~~

†

~~MIS—MIS~~

~~MISSAL,? the book containing the liturgy, or office of the mass, of the Latin Church. This name (e.g., Missale Gothicum, Francorum, Gallicanum Vetus) began to super- sede the older word Sacramentary (Sacramentarium, Liber Sacramentorum) from about the middle of the 8th century. At that period the books so designated contained merely the fixed canon of the mass or consecration prayer (actionem, precem canonicam, canonem actionis), and the variable collects, secretze or orationes super oblata, prefaces, and post-communions for each fast, vigil, festival, or feria, of the ecclesiastical year; for a due celebration of the Eucharist they required accordingly to be supplemented by other books, such as the Antiphonarium, afterwards called the Graduale, containing the proper antiphons (introits), responsories (graduals), tracts, sequences, offertories, com- munions, and other portions of the communion service designed to be sung by the schola or choir, and the Lection- arium (or Epistolarvum and Evangelistarvum) with the proper lessons. Afterwards missals began to be prepared contain- ing more or less fully the antiphons and lessons as well as the prayers proper to the various days, and these were called missalia plenaria. All modern missals are of this last de- scription. The Mfssale Romanum ex decreto SS. Concilii Tridentini restitutum, now in almost exclusive use through- out all the churches of the Latin obedience, owes its present form to the council of~~

~~*Trent, which among its other tasks undertook the preparation of a correct and uniform liturgy, and entrusted the work toa committee of itsmembers. This committee had not completed its labours when the council rose, but the pope was instructed to receive its report when ready and to act upon it. The "reformed missal" accordingly was promulgated by Pius V. on July 14, 1570, and its universal use enjoined on all branches of the Catholic Church, the only exceptions allowed being in the case of churches having local and independent liturgies which had been kept in unbroken use for at least two centuries.* It has subsequently undergone slight revisions under Clement VIII. (1604) and Urban VIII. (1634); and various new masses, both obligatory and permissive, universal and local, have been added by the competent authority. Although the Roman is very much larger in bulk than any other liturgy, it need hardly be explained that the com- munion office to which it relates is not in itself inordinately long. By much the greater part of it is contained in the "ordinary" and "canon" of the mass, usually placed about the middle of the missal, and occupies, though in large type, only a few pages in any printed copy. The work owes its bulk and complexity to two circumstances. On the one hand, in the celebration of the sacrifice of the mass practically nothing is left to the impulse or discretion of the officiating priest ; everything—what he is to say, the tone and gestures with which he is to say it, the cut and colour of the robe he is to wear—is carefully prescribed either in the general rubrics prefixed to the text, or in the running rubrics which accompany it. On the other hand, the Roman, like all the Western liturgies, is distinguished*~~

~~*3 Missalis (se., liber), Missale, from Missa ; see vol. viii. p. 652.*~~

- ~~*The English missal consequently continued to be used by English Catholics until towards the end of the 17th century, when it was superseded by the Roman through Jesuit influence. The Gallican liturgy held its ground until much more recently, but has now succumbed under the Ultramontanism of the bishops.*~~

~~*> In all the older liturgies the comparative absenee of rubrics is conspicuous and sometimes perplexing. It is very noticeable in the Roman Sacramentaries, but the want is to some extent supplied by the very detailed directions for a high pontifical mass in the various texts of the Ordo*~~

~~*Romanus mentioned below. That there was no absolutely fixed set of rubrics in use in France during the 8th century is shown by the fact that each priest was required to write out an account of his own practice ("libellum ordinis") and present it for approbation to the bishop in Lent (see Baluze, Cap. Reg. Frane., i.*~~

~~*| 824, quoted in Smith's Diet. of Chr. Antiq., ii. 1521).*~~

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~~*from those of the Eastern Church by its flexibility. Partly by conscious effort, no doubt, but partly also by happy accident, a well-marked distinctive character has been given in one or all of the above-mentioned respects to the office for each ecclesiastical season, for each fast or festival of the year, almost for each day of the week ; and provision has also been made of a suitable communion ser- vice for many of the special and extraordinary occasions both of public and of private life. This richness of variety is seen not only in the collects but also in the lessons and antiphonal parts of the service, passages of Scripture in the selection and collocation of which an exquisite delicacy of religious and esthetic instinct has been for the most part strikingly shown.*~~

~~*The different parts of the Roman communion office are not all of the same antiquity. Its essential and character- istic features are most easily caught, and their rationale best understood, by reference to the earliest Sacramentaries (particularly the Gregorian, which was avowedly the basis of the labours of the Tridentine committee), to. the Gregorian Antiphonary, and to the oldest redaction of the Ordo Romanus.1 The account of the mass (qualiter Missa Romana celebratur) as given by the Sacramentarium Gregorianum is to the effect that there is in the first place '"'the Jntroit according to the time, whether for a festival or for a common day; thereafter Ayrie Lleison. (In addition to this Gloria in Excelsis Deo is said if a bishop be [the celebrant], though only on Sundays and festivals ; but a priest is by no means to say it, except only at Eastertide. When there is a litany (quando letania agitur) neither Gloria in Hxcelsis nor Alleluia is sung.) After- wards the Oratio is said, whereupon follows the Apostolus, also the Gradual and Alleluia. Afterwards the Gospel is read. Then comes the Ofertorium,? and the Oratio super oblata is said." Then follow the*~~

~~*Sursum Corda, the Pre- face, Canon, Lord's Prayer and "embolism" (éuBddocpa or insertion, Labera nos, Domine), given at full length precisely as they still occur in the Roman missal.*~~

~~*In every liturgy of all the five groups a passage similar to this occurs, beginning with Surswm Corda, followed by a Preface and the recitation of the Sanctus or Angelic Hymn. The "canon" or consecration prayer, which in all of them comes immediately after, invariably contains our Lord's words of institution, and (except in the Nestorian liturgy) concludes with the Lord's Prayer and '"'embolism." But within this framework there are certain differences of arrangement, furnishing marks by which the various groups of liturgies can be classified (see vol. xiv. p. 709 sq.). Thus it is distinctive of the liturgy of Jerusalem that the " great intercession" for the quick and the dead follows the words of institution and an Epiklesis (érixAnots TOU Tvevparos dyiov) or petition for the descent of the Holy Spirit upon the gifts ; in the Alexandrian the "'oreat intercession" has its place in the Preface; in the East Syrian it comes between the words of restitution and the Epiklesis ; in the Ephesine it comes before the Preface ; while in the Roman it is divided into two, the commemora- tion of the living being before, and that of the dead after, the words of institution. Other distinctive features of the Roman liturgy are (1) the position of the " Pax" after the consecration, and not as in all the other liturgies at a very early stage of the service, before the Preface even; and (2) the absence of the Epiklesis common to all the others.?*~~

~~*1 For the genealogical relationships of the Roman with other liturgies, the reader is referred to the article Lirurey (vol. xiv. 706 sq.), where some account is also given of the three Sacramentaries. For the doctrines involved in the " sacrifice of the mass," see HucHARIST, vol. viii. p. 650 sq.*~~

~~*2 Some editions do not mention the Offertory here.*~~

~~*3 This was one of the points discussed at the council of Florence, and Cardinal Bessarion for a time succeeded in persuading the Greeks to give up the Epiklesis.*~~

~~*-(precem quam scholasticus composuerat).*~~

~~The words of its 'canonical prayer" are of unknown antiquity ; they are found in the extant manuscripts of the Sacramentarium C'elasianum, and were already old and of forgotten authorship in the time of Gregory the Great, who, in a letter to John, bishop of Syracuse (Registr. HIpist., vii. 64), speaks of it as " the prayer composed by a 'scholastic' "). The same letter is interesting as containing Gregory's defence, on the ground of ancient use, of certain parts of the Roman ritual to which the bishop of Syracuse had taken exception as merely borrowed from Constantinople. Thus we learn that, while at Constantinople the Kyrie HIleison was said by all simultaneously, it was the Roman custom for the clergy to repeat the words first and for the people to respond, Christe Eleison being also repeated an equal number of times. Again, the Lord's Prayer was said immediately after the consecration aloud by all the people among the Greeks, but at Rome by the priest alone.~~

~~The somewhat meagre and imperfect liturgical details furnished by the Sacramentarium Gregorianum are supple- mented in a very full and interesting manner by the succes- sive texts of the Ordo Romanus, the first of which dates from about the year 730. The ritual they enjoin is that for a pontifical high mass in Rome itself ; but the differences to be observed by a priest "quando in statione facit missas" are comparatively slight. Subjoined is a précis of Ordo Romanus I.~~

~~It is first of all explained that Rome has seven ecclesiastical regious, each with its proper deacons, subdeacons, and acolytes. Each region has its own day of the week for high ecclesiastical functions, which are celebrated by each in rotation. [This accounts for the Statio ad 8. Mariam Majorem, ad S. Crucem in Jerusalem, ad S. Petrum, &c., prefixed to most of the masses in the Gregorian Sacramentary, and still retained in the " Proprium de Tempore" of the Roman missal.] The regulations for the assembling and marshalling of the procession by which the pontiff is met and then escorted to the appointed station are minutely given, as well as for the adjustment of his vestments "ut bene sedeant," when the sacristy has been reached. HIe does not leave the sacristy until the Introit has been begun by the choir in the church. Before the~~

~~*Gloria he takes his stand at the altar, and after the Kyrie Elcison has been sung (the number of times is left to his discretion) he*~~

~~*. begins the Gloria in Excelsis, which is taken up by the choir. Dur-*~~

~~*ing the singing he faces eastward; at its close he turns round for a moment to say " Pax vobis," and forthwith proceeds to the Oratio.4 This finished, all seat themselves in order while the subdeacon ascends the ambo and reads [the /pistle]. After he has done, the cantor with his book (cantatorio) ascends and gives out the response (Responsum) with the Alleluia and TJ'ractus in addition if the season calls for either. The deacon then silently kisses the feet of the pontiff and receives his blessing in the words " Dominus sit in corde tuo et in labiis tuis." Preceded by acolytes with lighted candles aud subdeacons burning incense, he ascends the ainbo, where he reads the Gospel. At the close, with the words " Pax tibi" and '*Dominus vobiscum," the pontiff,® after another Oratio, descends to the " senatorium " accompanied by certain of the inferior clergy, and receives in order the oblations of the rulers (oblationes princi- pum), the archdeacon who follows taking their "amulas" of wine and pouring them into a larger vessel; similar offerings are received from the other ranks and classes present, including the women. This concluded, the pontiff and archdeacon wash their hands, the offerings being meanwhile arranged by the subdeacons on the altar, and water, supplied by the leader of the choir (archiparaphonista), being mingled with the wine. During this ceremony the schola have been engaged in singing the Ofertorium; when all is ready the pontiff signs to thein to stop, and enters upon the Preface, the sub- deacons giving the responses. At the Angelic Hymn (Sanctus) all kneel and continue kneeling, except the pontiff, who rises alone and begins the Canon. At the words " per quem hec omnia" the archdeacon lifts the cup with the oblates, and at " Pax Doinini sit semper vobiscum " he gives the peace to the clergy in their order, and to the laity. The pontiff then breaks off a particle from the consecrated bread and lays it upon the altar; the rest he places on the paten held by the deacon. It is then distributed while Agnus Dei is sung. The pontiff in communicating puts the particle into the cup, saying, " Fiat commixtio et consecratio corporis et sanguinis Domini nostri Jesu Christi accipientibus nobis in vitam eterna." Those present communicate in their order under this species also.*~~

~~*4 Quam collectam dicunt, Ord. Rom. IJ, 5 After singing " Credo in unum Deum," Ord. Rom. IT.*~~

~~*510*~~

~~*As the pontiff descends into the senatorium to give the communion, the schola begins the communion Antiphon, and continues singing the Psalm until, all the people having communicated, they receive the sign to begin the Gloria, after which, the verse having been again repeated, they stop. 'The celebrant, then, facing eastward, offers the Oratio ad Complendum, which being finished the arch- deacon says to the people,* **' Ite, missa est," they responding with '** *Deo gratias.""*~~

~~*To complete our idea of the Roman communion office as it was prior to the end of the 8th century we must now turn to the Gregorian Antiphonarius sive Gradualis Liber ordinatus per circulum anni, which as its name implies contains those variable portions of the mass which were intended to be sung by the schola or choir. It gives for each day for which a proper mass is provided—(1) the Antiphona (Anti- phona ad Introitum) and Psalmus ; (2) the Responsorium and Versus, with its Allelwia and Versus; (3) the Offertorium and Versus; (4) the Communio and Psalmus. Some explanation of each of these terms is necessary. (1) The word Antiphon (dvzipuvov, Old English Antefn, English Anthem) in its ecclesiastical use has reference to the very ancient practice of relieving the voices of the singers by dividing the work between alternate choirs. In one of its most usual meanings it has the special significa- tion of a sentence (usually scriptural) constantly sung by one choir between the verses of a psalm or hymn sung by another. According to the Roman liturgiologists it was Pope Celestine who enjoined that the Psalms of David should be sung (in rotation, one presumes) antiphonally before mass; in process of time the antiphon came to be sung at the beginning and end only, and the psalm itself was reduced to a single verse. In the days of Gregory the Great the introit appears to have been sung precisely as at present,—that is to say, after the antiphon (proper and par excellence), the Psalmus with its Gloria, then the antiphon again. (2) The Responsorium, like the Greek antiphon, derives its name from the responsive manner of singing. As introduced between the epistle and gospel it was probably at first a comparatively long passage, usually an entire*~~

~~*psalm or canticle, originally given out by the cantor from the steps from which the epistle had been read (hence the later name G'raduale), the response being taken up by the whole choir. (3) The Ofertoriwm and Communio correspond to the "hymn from the book of Psalms" mentioned by early authorities (see, for example, Augustine, Retr., ii. 11; Ap. Const., vill. 13) as sung before the oblation and also while that which had been offered was being distributed to the people. A very intimate connexion between these four parts of the choral service can generally be observed ; thus, taking the first Sunday in the ecclesiastical year, we find both in the Antiphonary and in the modern Missal that the antiphon is Ps. xxv. 1-3, the psalmus Ps. xxv. 4, the responsorium (graduale) and versus Ps. xxv. 3 and xxv. 4, the offertorium and versus Ps. xxv. 1-3 and Ps. xxv. 5. The communio is Ps. Ixxxv. 12, one of the verses of the responsorium being Ps. lxxxv. 7. In the selection of the introits there are also traces of a certain rotation of the psalms in the Psalter having been observed.*~~

~~*The first pages of the modern Roman missal are occupied with the Calendar and a variety of explanations relating to the year and its parts, and the manner of determin- ing the movable feasts. The general rubrics (Rubrice Generales Missalis) follow, explaining what are the various kinds of mass which may be celebrated, prescribing the hours of celebration, the kind and colour of vestments to be used, and the ritual to be followed (ritus celebrandi missam), and giving directions as to what is to be done in case of various defects or imperfections which may arise. The Preparatio ad Missam, which comes next, is a short*~~

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~~*to be used as opportunity may occur before and after celebration. Next comes the proper of the season (Proprium Missarum de Tempore), occupying more than half of the entire volume. It contains the proper introit, collect (one or more), epistle, gradual (tract or sequence), gospel, offertory, secreta (one or more), communion, and post-communion for every Sunday of the year, and also for the festivals and ferias connected with the ecclesiastical seasons, aS well as the offices peculiar to the ember days, Holy Week, Easter, and Whitsuntide. Between the office for Holy Saturday and that for Easter Sunday the ordinary of the mass (Ordo Missx), with the*~~

~~*solemn and proper pre- faces for the year, and the canon of the mass are inserted. The proper of the season is followed by the proper of the saints (Proprium Sanctorum), containing what is special to each saint's day in the order of the calendar, and by the Commune Sanctorum, containing such offices as the com- mon of one martyr and bishop, the common of one martyr not a bishop, the common of many martyrs in paschal time, the common of many martyrs out of paschal time, and the like. A variety of masses to be used at the feast of the dedication of a church, of masses for the dead, and of votive masses (as for thesick, for persons journeying, for bridegroom and bride) follow, and also certain benedictions. Most missals have an appendix also containing certain local masses of saints to be celebrated "ex indulto apostolico."*~~

~~*Masses fall into two great subdivisions :—(1) ordinary or regular (secundum ordinem officii), celebrated according to the regular rotation of fast and feast, vigil and feria, in the calendar ; (2) extraordinary or occasional (extra ordinem officii), being either "votive" or "for the dead," and from the nature of the case having no definite time prescribed for them. Festival masses are either double, half-double, or simple, an ordinary Sunday mass being a half-double. The difference depends on the number of collects and secrete ; on a double only one of each is offered, on a half-double there are two or three, and on a simple there may be as many as five, or even seven, of each. Any mass may be either high (missa solennis) or low (missa privata). The distinction depends upon the number of officiating clergy, certain differences of practice as to what is pro- nounced aloud and what inaudibly, the use or absence of incense, certain gestures, and the like. Solitary masses are forbidden; there must be at least an acolyte to give the responses. The vestments prescribed for the priest are the amice, alb, cingulum or girdle, maniple, stole, and chasuble (planeta) ; see Costums, vol. vi. p. 462. There are certain distinctions of course for a bishop or abbot. The colour of the vestments and of the drapery of the altar varies according to the day, being either white, red, green, violet, or black. This last custom does not go much further back than Innocent III., who explains the symbolism intended.*~~

~~*Subjoined is an account of the manner of celebrating high mass according to the rite at present in force.*~~

~~1. The priest who is to celebrate, having previously confessed (if necessary) and having finished matins and lauds, is to seek leisure for private prayer (fasting) and to use as he has opportunity the "* prayers before mass" already referred to. How the robing in the sacristy is next to be gone about is minutely prescribed, and prayers are given to be used as each article is put on. The sacramental elements having previously been placed on the altar or on a credence table, the celebrant enters the church and takes his stand before the lowest step of the altar, having the deacon on his right and the subdeacon on his left. After invoking the Trinity (In nomine Patris, &c.) he repeats alternately with those who are with him the psalm " Judica me, Deus," which is preceded in the usual way by an~~

~~antiphon (Introibo ad altare Dei), and followed also by the Gloria and Antiphon.! The versicle " Adjutorium nostrum," with its~~

~~u This antiphon is not to be confounded with the Antiphona ad Introitum further on. This use of the 43d Psalm goes as far back at least as the end of the 11th century, being mentioned by Micrologus~~

~~manual of devotion containing psalms, hymns, and prayers | (1080). It is omitted in masses for the dead and during Holy Week.~~

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~~response "Qui fecit," is followed by the "' Confiteor,"? said alter- nately by the priest and by the attendants, who in turn respond with the prayer for divine forgiveness, " Misereatur." The priest then gives the absolution (" Indulgentiam "), and after the versicles and responses beginning " Deus, tu conversus" he audibly says, "Oremus," and ascending to the altar silently offers two short prayers, one asking for forgiveness and liberty of access through Christ, and another indulgence for himself 'through the merits of thy saints whose relics are here." Receiving the thurible from the deacon he incenses the altar, and is thereafter hiniself incensed by the deacon. He then reads the Introit, which is also sung by the choir ; the "' Kyrie Eleison" is then said, after which the words "Gloria in Excelsis "? are sung by the celebrant and the rest of the hymn completed by the choir.~~

~~2. Kissing the altar, and turning to the people with the formula '¢ Dominus vobiscum," the celebrant proceeds with the collect or col- lects proper to the season or day, which are read secretly. The epistle for the day is then read by the subdeacon, and is followed by the gradual, tract, alleluia, or sequence, according to the time.? This finished, the deacon places the book of the gospels on the altar, and the celebrant blesses the incense. The deacon kneels before the altar and offers the prayer '"' Munda cor meum," after- wards takes the book from the altar, and kneeling before the celebrant asks his blessing, which he receives with the words 'Dominus sit in corde tuo." Having kissed the hand of the priest, he goes accompanied by acolytes with incense and lighted candles to the pulpit, and with a " Dominus vobiscum " and minutely pre- scribed crossings and incensings gives out and reads the gospel for the day, at the close of which " Laus tibi, Christe" is said, and the book is brought to the celebrant and kissed with the words " Per evan- gelica dicta deleantur nostra delicta." Thecelebrant then standing at the middle of the altar sings the words " Credo in unum Deum," and the rest of the Nicene creed is sung by tlie choir.4~~

~~3. With " Dominus vobiscum" aud " Oremus" the celebrant proceeds to read the Offertory, which is also sung by the choir. This finished he receives the paten with the host from the deacon, and after offering the host with the prayer beginning " Suscipe, Sancte Pater" places it upon the corporal. The deacon then ministers wine and the snbdeacon water, and before the celebrant mixes the water with the wine he blesses it in the prayer " Deus qui humane." He then takes the chalice, and having offered it (" Offerimus tibi, Domine ") places it upon the corporal and covers it with the pall. Slightly bowing over the altar, he then offers the prayer "In spiritu humilitatis," and, lifting up his eyes and stretching out his hands, proceeds with " Veni sanctificator." After blessing the incense (" Per intercessionem beati Michaelis archangeli") he takes the thurible from the deacon and incenses the bread and wine and altar, and is afterwards himself incensed as well as the others in their order. Next going to the epistle side of the altar he washes his fingers as he recites the verses of the 26th Psalm beginning "Lavabo." Returning and bowing before the middle of the altar, with joined hands he says, "Suscipe, sancta Trinitas," then turning himself towards the people he raises his voice a little and says, "Orate, fratres" ("that my sacrifice and yours may be acceptable to God the Father Almighty"), the~~

~~*response to which is ‘“Suscipiat Dominus sacrificium de manibus tuis,” &c. He then recites the secret prayer or prayers, and at the end says, with an audible voice, “ Per omnia secula seculorum ” (R. “Amen”).*~~

~~*4, Again saluting with a “‘ Dominus vobiscum,” he lifts up his hands and goes on to the “Sursum Corda” and the rest of the Pre- face. A different intonation is given for each of the prefaces.® At the Sanctus the handbell is rung. If there is a choir the Sanctus is sung while the celebrant goes on with the Canon.* After the words of consecration of the wafer, which are said “secretly, dis- tinctly, and attentively,” the celebrant kneels and adores the host, rising elevates it, and replacing it on the corporal again*~~

~~*1 A form very similar to the present is given by Micrologus, and it is foreshadowed even in liturgical literature of the 8th century.*~~

~~*2 During Lent and Advent, and in masses for the dead, this is omitted. In low masses it is of course said, not sung (if it is to be said). It may be added that this early position of the Gloria in Excelsis is one of the features distinguishing Roman from Ephesine use.*~~

~~*3 The tract is peculiar to certain occasions, especially of a mournful nature, and is sung by a single voice. By a sequence is understood a more or less metrical composition, not in the words of Scripture, having a special bearing on the festival of the day. See, for example, the sequence, “ Lauda Sion Salvatorem,” on Corpus Christi day.*~~

~~*4 On certain days the Credo is omitted.*~~

~~*5 Now eleven; they were at one time niuch more numerous.*~~

~~*6 The approved usage appears to be in that case that it is sung as far as “ Hosanna in Excelsis”’ before the elevation, and “ Benedictus qui venit”’ is reserved till afterwards. In France it was a very com- mon custom, made general for a time at the request of Louis XII., to sing ‘GO salutaris hostia”’ at the elevation.*~~

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~~adores it (the bell meanwhile being rung).? The same rite is observed when the chalice is consecrated. Immediately before the Lord's Prayer, at the words " per ipsum et cum ipso et in ipso," the sign of the cross is made three times over the chalice with the host, and towards the close of the "' embolism" the fraction of the host takes place. After the words " Pax Domini sit semper vobis- cum" the emission of the particle into the cup takes place with the words " Hac commixtio et consecratio," &c. The celebrant then says the Agnus Dei three tines.~~

~~5. While the choir sings the Agnus Dei and the Communion, the celebraut proceeds, still ' secrete," with the remainder of the office, which though printed as part of the canon is more conveniently called the Communion and Post-communion. After the prayer for the peace and unity of the church ("Domine Jesu Christe, qui dixisti") he salutes the deacon with the kiss of peace, saying, " Pax tecum"; the subdeacon is saluted in like manner, and then conveys the '" pax" to the rest of the clergy who may be assisting. The cele- brant then communicates under both species with suitable prayers and actions, and afterwards adniinisters the sacrament to the other communicants if there be any. Then while the wine is poured into the cup for the first ablution he says, " Quod ore sumpsimus" ; having taken it he says, " Corpus tuum, Domine." After the second ablution he goes to the book and reads the Communion. Then turn- ing to the people with " Dominus vobiscum" he reads the Post- communion (one or more); turning once more to the congregation he uses the old dismissal formula " Dominus vobiscum" (#. Et cum spiritu tuo), and "Ite, missa est" [or " Benedicamus Domino," in those masses from which " Gloria in Excelsis" has been omitted] (R.-Deo Gratias). Bowing down before the altar he offers the prayer "¢Placeat tibi, sancta Trinitas," then turning round he makes the sign of the cross over the congregation with the words of thc benediction (" Benedicat").§ He then reads the passage from the gospel of John beginning with "In principio erat Verbuin," or else the proper gospel of the day.® (J. S. BL.)~~

~~MISSIONS. The history of Christian missions may, for practical purposes, be best divided into three chief periods—(1) the primitive, (2) the medieval, and (3) the modern. None of these periods can be neglected, for they have an intimate connexion with each other, and illustrate the activity~~

~~*respectively of individuals, of the church in her corporate capacity, and of societies.*~~

~~*1. The Primitive Period.*~~

~~*Christian missions had their origin in the example and the command of our Lord Himself (Matt. xxviii. 19); and the unparalleled boldness on the part of the Founder of Christianity, which dared to anticipate for the Christian faith a succession of efforts which should never cease to cause its propagation to be undertaken as "a distinct and direct work," has been justified by the voice of history.!° Whereas other religions have spread from country to country as component parts of popular opinion, have travelled with migration or conquest, have passed in the train of things and by the usual channels of communica- tion, the first foundations of the church had hardly been laid before individual missionary activity marked the life of each one of the circle of the apostles.*~~

~~*Of the actual details of their labours we have been per- mitted to know but little. Three only of the immediate followers of the Saviour have any conspicuous place in the apostolic records, and the most illustrious in the whole domain of missionary activity, St Paul, did not belong to the original twelve. His activity took the form of journeys and voyages, chiefly to large towns, where his message found a point of contact either with the Jewish synagogue or the aspirations of the Gentile world. The result of his labours and of those of his successors*~~

~~*7' The history of the practice of elevating the host is somewhat obscure. It seems to have arisen out of the custom of holding up the oblations, as mentioned in the Ordo Romanus (see above). The elevation of the host, as at present practised, was first enjoined by Pope Honorius III. The use of the handbell at the elevation is still later, and was first made general by Gregory XI.*~~

~~*8 The benediction is omitted in masses for the dead.*~~

~~*®8 The reading of the passage from John on days which had not a proper gospel was first enjoined by Pins V.*~~

~~10 Davison, On Prophecy, p. 278.~~

~~was that towards the middle of the 2d century the church had gradually extended its conquests through Asia Minor, Greece, Italy, southern Gaul, and northern Africa.! Ecclesiastical history can tell but little of the church's earliest teachers, and the infancy of many of the primitive congregations is wrapped in hopeless darkness. Whatever was effected was due to the evangelizing labours of individual bishops and clergy, who occupied themselves "in season and out of season," and toiled zealously and effectively in the spread of the church, though leaving no record of their devotion. representatives of this individual activity in the 4th and 5th centuries may be mentioned Ulfila, the " apostle of the Goths," about 325; Frumentius, a bishop of Abyssinia, about 327; Chrysostom, who founded at Constantinople in 404 A.D. an institution in which Goths might be trained to preach the gospel to their own people ;? Valentinus, the "apostle of Noricum," about 440; and Honoratus, who from his monastic home in the islet of Lerins, about 410, sent forth numerous labourers to southern and western Gaul, to become the leading missionaries of their day among the masses of heathendom in the neighbourhood of Arles, Lyons, Troyes, Metz, and Nice.~~

~~2. The Medizval Period.~~

~~With the 5th century the church found a very different element proposed to her missionary energies and zeal. Her outposts of civilization had scarcely been planted when she was confronted with numberless hordes which had long been gathering afar off in their native wilds, and which were now precipitated over the entire face of Europe. Having for some time ceased to plead for toleration, and learnt: to be aggressive, she not only stood the shock of change but girded herself for the difficult work of calming the agitated elements of society, of teaching the nations a higher faith than a savage form of nature worship, of purifying and refining their recklessness, independence, and uncontrollable love of liberty, and fitting them to become members of an enlightened Christendom.~~

~~*(a) The Celtic Missionaries.—The first pioneers who went forth to engage in this difficult enterprise came from the secluded Celtic churches of Ireland and the Scottish Highlands, which, though almost forgotten amidst the desolating contest which was breaking up the Roman world, were no sooner founded than they sent forth "armies of Scots" to pour back upon the Continent the gifts of civilization and the gospel. Of many who deserve mention in connexion with this period, the most prominent were—Columba, the founder of the famous monastery of Iona, and the evangelizer of the Albanian Scots and northern Picts; Aidan, the apostle of Northumbria ; Columbanus, the apostle of the Burgundians of the Vosges ; Callich or Gallus, the evangelizer of north-eastern Switzer- land and Alemannia; Kilian, the apostle of Thuringia ; and Trudpert, the martyr of the Black Forest. The zeal of these singular men at the head of ardent disciples seemed to take the world by storm. Travelling generally in companies, and carrying a simple outfit, these Celtic pioneers flung themselves on the Continent of Europe, and, not content with reproducing at Annegray or Luxeuil the willow or brushwood huts, the chapel and the round tower which they had left behind in Derry or in the island of Hy, they braved the dangers of the northern seas, and pene- trated as far as the Faroes and even far distant Iceland.?*~~

~~*(b) The English Missionaries—Thus they laid the foundations, awing the heathen tribes by their indomitable spirit of self-sacrifice and the sternness of their rule of life.*~~

~~*1 Justin, Dial. c. 117; Tertull., Apol., 37; Id., Adv. Jud., 7. 2 Theodoret, H.#., v. 30. 2 See A. W. Haddan, "Scots on the Continent," Remains, p. 256.*~~

~~*Amongst the most distinguished |*~~

~~*MLSs 1 NS*~~

~~*But, marvellous as it was, their work lacked the element of permanence ; and it became clear that if Europe was to be carried through the dissolution of the old society, and missionary operations consolidated, a more practical system must be devised and carried out. The men for this work were now ready. Restored to the commonwealth of nations by the labours of the followers of Augustine of Canterbury and the Celtic missionaries from Iona,*~~

~~*the sons of the newly evangelized English churches were ready to go forth to the help of their Teutonic brothers in the German forests. The energy which warriors were accustomed to put forth in their efforts to conquer was now "exhibited in the enterprise of conversion and teaching" * by Wilfrid on the coast of Friesland,® by Willibrord in the neighbourhood of Utrecht, by the martyr-brothers Ewald or Hewald amongst the "old" or continental Saxons,' by Swidbert the apostle of the tribes between the Ems and the Yssel, by Adelbert, a prince of the royal house of Northumbria, in the regions north of Holland, by Wursing, a native of Friesland, and one of the disciples of Willibrord, in the same region, and last, not least, by the famous Winfrid or Boniface, the "apostle of Germany," who went forth first to assist Willibrord at Utrecht, then to labour in Thuringia and Upper Hessia, then, with the aid of his kinsmen Wunibald and Willibald, their sister Walpurga, and her thirty companions, to consolidate the work of earlier missionaries, and finally to die a martyr on the shore of the Zuyder Zee.*~~

~~*(c) Scandinavian Missions.—Devoted, however, as were the labours of Boniface and his disciples, the battle was not yet nearly won. All that he and they and the emperor Charlemagne after them achieved for the fierce untutored world of the 8th century seemed to have been done in vain when, in the 9th, "on the north and north-west the pagan Scandinavians were hanging about every coast, and pouring in at every inlet; when on the east the pagan Hungarians were swarming like locusts and devastating Europe from the Baltic to the Alps; when on the south and south-east the Saracens were pressing on and on with their victorious hosts. It seemed then as if every pore of life were choked, and Christendom must be stifled and smothered in the fatal embrace."® But it was even now that one of the most intrepid of missionary enterprises was undertaken, and the devoted Anskar went forth and proved himself a true apostle of Denmark and Sweden, sought out the Scandinavian viking in his native home and icy fiords, and, after persevering in the face of apparently insurmountable difficulties and hardships, handed on the torch of self-denying zeal to others, who "casting their bread on the waters" saw, after the lapse of many years, the close of the monotonous tale of burning churches and pillaged monasteries, and taught the fierce Northman to lay aside his old habits of piracy, and gradually learn respect for civilized institutions,*~~

~~*(d) Slavonic Missions.—Thus the "gospel of the kingdom" was successively proclaimed to the Roman, the Celtic, the Teutonic, and the Scandinavian world. A contest still more stubborn remained with the Slavonic tribes, with their triple and many-headed divinities, their powers of good and powers of evil, who could be approached only with fear and horror, and propitiated only with human sacrifices. Mission work commenced in Bulgaria during the latter part of the 9th century; thence it extended to Moravia, where two Greek missionaries—Cyril and Methodius—provided for the people a Slavonic Bible*~~

~~*4 Church, Gifts of Civilization, p. 330. 5 Bede, H.H., v. 19*~~

~~*6 ** Annal. Xantenses," Pertz, Mon. Germ., ii. 220. 7 Bede, H.E., v. 10.*~~

~~*8 See Lightfoot, Ancient and Modern Missions.*~~

~~*mission sd*~~

~~*and a Slavonic Liturgy; thence to Bohemia, and so onwards to the Scythian wilds and level steppes, where arose the Russian kingdom of Ruric the Northman, and where about the close of the 10th century the Eastern Church "silently and almost unconsciously bore into the world her mightiest offspring." But, though the baptism of Vladimir and the flinging of the triple and many-headed idols into the waters of the Dnieper was a heavy blow to Slavonic idolatry, mission work was carried on with but partial success ; and it taxed all the energies of Albrecht, bishop of Bremen, of Vicilin, bishop of Oldenburg, of Bishop Otto of Bamberg the apostle of the Pomeranians, of Adalbert the martyr-apostle of Prussia, to spread the word in that country, in Lithuania, and in the territory of the Wends. It was not till 1168 that the gigantic four- headed image of Swantevit was destroyed at Arcona, the capital of the island of Riigen, and this Mona of Slavonic superstition was included in the advancing circle of Christian civilization. As late as 1230 human sacrifices were still being offered up in Prussia and Lithuania, and, in spite of all the efforts of the Teutonic Knights to expel by force the last remains of heathenism from the face of Europe, idolatrous practices still lingered amongst the people, while in the districts inhabited by the Lapps, though successful missions had _ been inaugurated*~~

~~*as early as 1335, Christianity cannot be said to have become the dominant religion till at least two centuries later.*~~

~~*(ee) Moslem Missions—The mention of the order of the Teutonic Knights reminds us how the crusading spirit had affected Christendom, and exchanged the patience of a Boniface or an Anskar for the fiery zeal of the warrior of the cross. Still it is refreshing to notice how even now there was found the famous Raymond Lully to protest against propagandism by the sword, to urge on pope after pope the necessity of missions amongst the Moslems, and to seal his testimony with his blood outside the gates of Bugiah in northern Africa (June 30, 1315). Out of the crusades, however, arose other efforts to bear the banner of the cross into the lands of the East, and to develop the work which Nestorian missionaries from Baghdad, Edessa, and Nisibis had already inaugurated along the Malabar coast, in the island of Ceylon, and in the neighbourhood of the Caspian Sea. In 1245 the Roman pontiff sent two embassies, one to charge the Mongol warriors to desist from their desolating inroads into Europe, the other to attempt to win them over to the Christian faith.. The first, a party of four Dominicans, sought the commander-in-chief of the Mongol forces in Persia ; the second, consisting of Franciscans, made their way into Tartary, and sought to convert the successor of Oktai-Khan. Their exertions were seconded in 1253 by the labours of another Franciscan whom Louis IX. of France sent forth from Cyprus,? while in 1274 the celebrated traveller Marco Polo, accompanied by two learned Dominicans, visited the court of Kublai-Khan, and at the commencement of the 14th century two Franciscans penetrated as far as Peking, and kept alive a flickering spark of Christianity in the Tartar kingdom, even translating the New Testament and the Psalter into the Tartar language, and training youths for a native ministry.?*~~

~~*(f) Missions to India and the New World.—These ten- tative missions in the East were now to be supplemented by others on a larger scale. In 1486 the Cape of Good Hope was rounded by Dias, and in 1508 the foundations of the*~~

~~*1Stanley, Hastern Church, p. 294.*~~

~~*2 Neander, vii. 69; Hakluyt, 171; Hue, i. 207.*~~

~~*3 Neander, vii. 79; Gieseler, iv. 259, 260; Hardwick, Middle Ages,*~~

~~*235-337,*~~

~~*513*~~

~~*Portuguese Indian empire were laid by Albuquerque. Columbus also in 1492 had landed on San Salvador, and the voyages of the Venetian Cabot along the coast of North America opened up a new world to missionary enterprise. These bold discoverers had secured the countenance of the pope on the condition that wherever they might plant a flag they should be also zealous in promoting the extension of the Christian faith, Thus a grand opportunity was given to the churches of Portugal and Spain. But the zeal of the Portuguese, even when not choked by the rising lust of wealth and territorial power, took too often a one-sided direction, repressing the Syrian Christians on the Malabar coast, and interfering with the Abyssinian Church,* while the fanatic temper of the Spaniard, maddened by his prolonged conflict with the infidel at home, betrayed him into methods of propagating his faith which we cannot contemplate without a shudder, consigning, in Mexico and Peru, multitudes who would not renounce their heathen errors to indiscriminate massacre or abject slavery. Their only defender for many years was the famous Las Casas, who, having sojourned amongst them till 1516, has drawn a terrible picture of the oppression he strove in vain to prevent.© Some steps indeed were taken for disseminating Christian principles, and the pope in granting territory to the crowns of Spain and Portugal had specially urged this duty, and had been instrumental in inducing a band of missionaries, chiefly of the mendicant orders, to go forth to this new mission field? But the results were scanty. Only five bishoprics had been established by 1520, and the number of genuine con- verts was small. In settling, however, his realm the conqueror of Mexico evinced no little solicitude for the spiritual welfare of his charge; and the labours of the devoted men whom he begged the emperor to send out were successful in banishing every vestige of the Aztec worship from the Spanish settlements.®*~~

~~*(g) The Jesuit Missions.—It was during the period at which we have now arrived that the great organization of the Jesuits came into existence, and one of the first of Loyola's associates, Francis Xavier, was also one of the*~~

~~*greatest and most zealous missionaries of his or any other era. Encouraged by the joint co-operation of the pope and of John III. of Portugal, and strongly tinged like Loyola with ideas of chivalry and self-devotion, he disem- barked at Goa on the 6th of May 1542, and before his death on the Isle of St John (Hiang-Shang), December 2, 1552, he had roused the European Christians of Goa to a new life, laboured with singular success amongst the Para- vars, a fisher caste near Cape Comorin, gathered many converts in the kingdom of Travancore, visited the island of Malacca, made his way to and founded a mission in Japan, thence revisited Goa, and impelled by the quenchless desire to unfurl the banner of the cross in China, had set out thither to fall a victim to malignant fever at the early age of forty-six, within sight of that vast empire whose conversion had been the object of his holy ambition.*~~

~~*The immediate successor of Xavier, Antonio Criminalis, was regarded by the Jesuits as the first martyr of their society (1562). Mattheo Ricci, an Italian by birth, was also an indefatigable missionary in China for twenty-seven years, while the peculiar methods of unholy compromise with Brahmanism in India followed by Robert de' Nobili drew down the condemnatory briefs of pope after pope, and were fatal to the vitality of his own and other missions.*~~

~~*4 Geddes, History of the Church of Malabar, p. 4; Neale, Lastern Church, ii, 343. : 5 Prescott, Conquest of Mexico, i. 318, iii, 218. 6 Relacion de la Destruycion de las Indias. 7 Prescott, Afexico, iii, 218 n 8 Prescott, iii. 219. Vive OF*~~

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~~*Other representatives of the same order worked with success in evangelizing the Spanish settlement of Paraguay in 1582, while their defeated foes the Huguenots sent forth under a French knight of Malta a body of devoted men to attempt the formation of a Christian colony at Rio Janeiro. By the close of the 16th century the unflag- ging zeal of the Jesuits led to a more complete development and organization of the missionary system of the Roman Church. To give unity and solidity to the work of missions, a committee of cardinals was appointed under the name of the "Congregatio de propaganda fide," and to it was entrusted the entire*~~

~~*management of the mission, conducted under the superintendence of the pope. The scheme origin- ated with Gregory XIII, but was not fully organized till forty years afterwards, when Gregory XV. gave it plenary authority by a bull dated June 2, 1622. Gregory's suc- cessor, Urban VIIL, supplemented the establishment of the congregation by founding in connexion with it a great missionary college, where Europeans might be trained for foreign labours, and natives might be educated to undertake mission work wherever new colonies were settled. At this college is the missionary printing-press of the Roman Church, and its library contains an unrivalled collection of literary treasures bearing on the particular work. From its walls have gone forth numbers of devoted men, who have proved themselves able to promote in a singular degree the enlargement of the boundaries of the church by means of material as well as spiritual forces.*~~

~~*38. The Modern Period.*~~

~~*This last period of missionary activity is distinguished in a special degree by the exertions of societies for the development of mission work.*~~

~~*As contrasted with the colossal display of power on the part of the Church of Rome, it must be allowed that the churches which in the 16th century broke off from their allegiance to the Latin centre at first presented a great lack of anxiety for the extension of the gospel and the salvation of the heathen. The causes of this, however, are not far to seek. The isolation of the Teutonic churches from the vast system with which they had been bound up, the conflicts and troubles among themselves, the necessity of fixing their own principles and defining their own rights, concentrated their attention upon themselves and their own home work, to the neglect of work abroad.*~~

~~*Still the development of the maritime power of England, which the Portuguese and Spanish monarchies noted with fear and jealousy, was distinguished by a singular anxiety for the spread of the Christian faith. Edward VI. in his instructions to the navigators in Willoughby's fleet, Cabot in those for the direction of the intended voyage to Cathay, good old Hakluyt, who promoted many voyages of dis-*~~

~~*covery in addition to writing their history, agree with.*~~

~~*Sir Humphrey Gilbert's chronicler that "the sowing of Christianity must be the chief intent of such as shall make any attempt at foreign discovery, or else whatever is builded upon other foundation shall never obtain happy success or continuance." When on the last day of the year 1600 Queen Elizabeth granted a charter to George, earl of Cumberland, and other "adventurers," to be a body- corporate by the name of "The Governor and Company of Merchants of London trading with the East Indies," the expressed recognition of higher duties than those of com- merce may by some be deemed a mere matter of form and, to use the words of Bacon, "what was first in God's providence was but second in man's appetite and intention." Yet a keen sense of missionary duty marks many of the chronicles of English mariners. Notably was this the case with the establishment of the first English colony in America, that of Virginia, by Sir Walter Raleigh. The*~~

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~~*philosopher Heriot, one of his colleagues, laboured for the conversion of the natives, amongst whom the first baptism is recorded to have taken place on August 13, 1587.1 Raleigh himself presented as a parting gift to the Virginian Company the sum of £100 "for the propagation of the Christian religion" in that settlement.2, When James I. granted letters patent for the occupation of Virginia it was directed that the "word and service of God be preached, planted, and used as well in the said colonies as also as much as might be among the savages bordering among them"; and the honoured names of Nicolas Ferrar, John Ferrar, Dr Donne, and Sir John Sandys, a pupil of Hooker, are all found on the council by which the home management of the colony was conducted.*~~

~~*In the year 1618 was published Zhe True Honour of Navigation and Navigators, by John Wood, D.D., dedicated to Sir Thomas Smith, governor to the East India Company, and much about the same time appeared the well-known treatise of the famous Grotius, De Veritate Religionis Christiane, written for the express use of settlers in distant lands. The wants, moreover, of the North American colonies did not escape the attention of Archbishop Laud during his official connexion with them as bishop of London, and he was developing a plan for promoting a local*~~

~~*episcopate there when his troubles began and his scheme was interrupted. During the Protectorate, in 1649, an ordinance was passed for "the promoting and propagating of the gospel of Jesus Christ in New England" by the erection of a corporation, to be called by the name of the President and Society for the Propagation of the Gospel in New England, to receive and dispose of moneys for the purpose, and a general collection was ordered to be made in all the parishes of England and Wales; and Cromwell himself desired a scheme for setting up a council for the Protestant religion, which should rival the Roman Propaganda, and consist of seven councillors and four secretaries for different provinces. On the restoration of the monarchy, through the influence of Richard Baxter with Lord Chancellor Hyde, the charter already granted by Cromwell was renewed, and its powers were enlarged. For now the corporation was styled "The Propagation of the Gospel in New England and the parts adjacent in America," and its object was defined to be "not only to seek the outward welfare and prosperity of those colonies, but more especially to endeavour the good and salvation of their immortal souls, and the publishing the most glorious gospel of Christ among them." On the list of the corporation the first name is the earl of Clarendon, while the Hon. Robert Boyle was appointed president. Amongst the most eminent of its missionaries was the celebrated John Eliot, who, encouraged by Boyle, and assisted by him with considerable sums of money, brought out the Bible in the Indian language in 1661-64, having revealed at the end of the Indian grammar which he had composed the secret of his success: "prayer and pains, through faith in Jesus Christ, will do anything." Boyle displayed in other ways his zeal for the cause of missions. He contributed to the expense of printing and publishing at Oxford the four Gospels and the Acts of the Apostles in the Malay language, and at his death left £5400 for the propagation of the gospel in heathen lands.*~~

~~*The needs of the colonial church soon excited the attention of others also, and great efforts were made by Bishop Beveridge, Archbishop Wake, Archbishop Sharpe, Bishop Gibson, and afterwards by the philosophic Bishop Berkeley, and Bishop Butler, the famous author of the Analogy, to*~~

~~*1 Hakluyt, Voyages, iif. 345.*~~

~~2 Oldy, Life of Raleigh, p. 118.~~

~~° Neale, History of New England, i. p. 260; Burnet, History of his own Times, i. p. 182.~~

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~~develop the colonial church and provide for the wants of the Indian tribes. In 1696 Dr Bray, at the request of the gover- nor and assembly of Maryland, was selected by the bishop of London as ecclesiastical commissary ; and, having sold his effects, and raised money on credit, he sailed for Maryland in 1699, where he promoted, in various ways, the interests of the church. Returning to England in 1700-1, and supported by all the weight of Archbishop Tenison and Bishop Compton, he was graciously received by William IIT., and received letters patent under the great seal of England for creating a corporation by the name of the "Society for the Propagation of the Gospel in Foreign Parts" on the 16th of June 1701.~~

~~With the establishment of this corporation the era of the activity of societies for carrying out mission work may be said to commence, though the opening of the 18th century saw other movements set on foot for the same object. Thus in 1705 Frederick IV. of Denmark founded a mission on the Coromandel coast, and inaugurated the labours of Ziegenbalg, Schultze, and Schwartz, whose devotion and success told with such remarkable reflex influence on the church at home. Again in 1731 the Moravians illustrated in a signal degree the growing consciousness of obligation towards the heathen. Driven by persecution from Moravia, hunted into mountain-caves and forests, they had scarcely secured a place of refuge in Saxony before, "though a mere handful in nunibers, yet with the spirit of men banded for daring and righteous deeds, they formed the heroic design, and vowed the execution of it before God, of bearing the gospel to the savage and perishing tribes of Greenland and the West Indies, of whose condition report had brought a mournful rumour to their ears." And so, literally with "neither bread nor scrip," they went forth on their pilgrimage, and, incredible as it sounds, within ten years they had established missions in the islands of the West Indies, in South America, Surinam, Greenland, among~~

~~*the North American tribes, in Lapland, Tartary, Algiers, Guinea, the Cape of Good Hope, and Ceylon.!*~~

~~*Such were the preparations for the more general move- ments during the last hundred years, and the manifesta- tion of missionary zeal on a scale to which it would be diffi- cult to find a parallel in Western Christianity.*~~

~~*The progress that has been made may be best judged of from consideration of the following details :—*~~

~~*(a) At the close of the last century there were only seven missionary societies in existence, properly so called. Of these three only, the Society for the Propagation of the Gospel in Foreign Parts, the Halle-Danish Society, and the Moravians, had been at work for the greater part of the century, whilst four, the Church Missionary Society, the Baptist Missionary Society, the London Missionary Society, and the Dutch Society at Rotterdam, began their work only in its tenth decade. To-day these seven have, in Europe and America alone, increased to upwards of seventy, and to these must be added, not only several independent societies in the colonies, but numerous missionary associations on a smaller scale, the offspring of English and American societies.*~~

~~*(b) The following chronological lists illustrate the growth of missionary societies in Britain and the United States :—*~~

~~*Great Britain and Ireland.*~~

~~*Christian Faith Society for the West Indies.*~~

~~*Society for Promoting Christian Knowledge.*~~

~~*Society for the Propagation of the Gospel in Foreign Parts. Moravian (Episcopal) Missions of the United Brethren, Baptist Missionary Society.*~~

~~*London Missionary Society.*~~

~~*Scottish Missionary Society.*~~

~~*Church Missionary Society.*~~

~~*Religious Tract Society.*~~

~~*British and Foreign Bible Society.*~~

~~*London Society for Promoting Christianity among the Jews. Wesleyan Missionary Society.*~~

~~*General Baptist Missionary Society.*~~

~~*Colonial and Continental Church Society.*~~

~~*Church of Scotland Mission Boards.*~~

~~*National Bible Soeicty of Scotland.*~~

~~*1691, _1698. 1701. 1732, 1792. 1795, 1796, 1799. _1799. 1804, 1808, 1813. 1817, 1823, 1829,*~~

~~*d15*~~

~~*| eg Trinitarlan Bible Soelety.*~~

~~*32. Wesleyan Ladies' Auxiliary for Female Edueation in Foreign Countries. 1854, Society for Promoting Female Education in the East. 1835. United Seeession (now United Presbyterian) Foreign Missions. 1836. Colonial Missionary Society. 1840. Foreign Aid Suciety. Coral Missionary Fund. 1840, Welsh Calvinistic Methodist Missionary Society. 1841. Colonial Bishoprics Fund. 1841. Edinburgh Medical Missionary Society. Waldensian Missions Aid Fund. 1843. British Society for the Propagation of the Gospel among the Jews. 1843. Free Church of Scotland Missions. 1843. Primitive Methodist African and Colonial Missions. Methodist New Connexion in England Foreign Missions. 1844, South American Missionary Society. 1849. Evangelical Continental Society. 1852. Indian Female Normal School Society. 1853. Lebanon Schools, 1855. Presbyterian Church in England Foreign Missions. 1856. Turkish Missions Aid Society. 1856. United Methodist Free Churches Foreign Missions. 1858. Christian Vernacular Education Society for India. 1860, Central African Mission of the English Universities. 1860. British Syrian Schools. Melanesian Mission. 1865.*~~

~~*Ladies' Association for Promoting Female Education among the Heathen, 1866, China Inland Mission. 1867. Delhi Female Medical Mission. 1867. '* Friends" Foreign Mission Association. 1868. Cape Town Aid Association. 1869, " Friends" Mission in Syria and Palestine. Irish Presbyterian Missions. 1876. Spanish and Portuguese Church Aid Society. Columbia Mission. Original Secession Church Indian Mission. 1877, Cambridge Mission to DeJhi. 1880. Church of England Zenana Missionary Society.*~~

~~*United States of America.*~~

~~*1733, Corporation for the Propagation of the Gospel in New England. 1787. Society for Propagating the Gospel among the Indians at Boston. 1800. New York Missionary Society. Connecticut Missionary Society for Indians, 1808. United States Mission to the Cherokees. 1806, Western Missionary Society for Indians. 1810. Board of Commissioners for Foreign Missions. 1814, Baptist Missionary Union. 1833, Free-will Baptist Foreign Missionary Society in India. 1835. Foreign Missions of the Protestant Episcopal Church. 1837. Board of Foreign Missions of the Presbyterian Church, 1837, Evangelical Lutheran Foreign Missionary Society. 1839. Methodist Episcopal Church Missionary Society. 1842. Seventh Day Baptist Missionary Society. Strict Baptist Missionary Society. 1843. Baptist Free Missionary Society. 1845. Methodist Episcopal Church, South. 1845. Southern Baptist Convention. 1846. American Missionary Association. 1857, Board of Foreign Missions of (Dutch) Reformed Church. 1859. Board of Foreign Missions of United Presbyterian Ciurch. American United Brethren, Moravian. United States German Evangelical Missionary Society. American Mexican Association. : Indian Home Missionary Association: Indian Missionary Association. Local Baptist Missionary Society. Women's Union Zenana Missionary Society.*~~

~~*(c) At the beginning of the present century the total sum con- tributed for Protestant missions can hardly be said to have amounted to £50,000; in 1882 the amount raised by British con- tributions alone to foreign missions amounted to upwards of £1,090,000,? thus divided :—*~~

~~*Church of England Missions…….. sieateceeccertantesenceczsencre soseee £460,935 Joint Societies of Churchmen and Nonconforimists……..*~~

~~153,320 Nonconformist Societies, English and Welsh,.....++-++++00+~~
~~313,177 Scottish and Irlsh Societies.....see- Saredep ses 5~~

~~Roman Catholic Societies.....sccesesesecsereeeeccrecsserserereneseres~~

~~(d) At the same date it is calculated that there were about 5000 heathen converts under instruction, not counting those belonging to the Roman Catholic missions. At the present day the converts from heathenism may be estimated certainly at no less than 1,800,000, a single year (1878) showing an increase of about 60,000.~~

~~(c) When the Society for the Propagation of the Gospel was founded in 1701, there were probably not twenty clergymen of the Church of England in foreign parts. The spiritual condition of the settlers in Ameriea and elsewhere was terrible in the extreme, and no effort was then made by the church to win over the heathen to Christ. But now the position which the church holds in the British colonies and dependencies and many parts of heathendom is recognized by all. In those regions where the society labours, aud which before it commenced its work were spiritually the 'waste places" of the earth, there are, ineluding the American Church (the first fruits of the society's efforts), 138 bishops, more than 5000 clergy, and upwards of 2,000,000 members of the communion.~~

~~The above tables sufficiently indicate how varied are the missionary agencies now at work, covering the heathen~~

~~1 Holmes, /ist. Sketches of the Missions of the United Brethren, p. 3; Grant, Bampton Lectures, p. 190.~~

~~2 See Seott Robertson, Analysis of British Contributions to Foreign~~

~~| Iissions, 1888.~~

~~world with a network of mission outposts, which within the last century have won nearly two millions of converts to the Christian faith.~~

~~*The continuity of missionary enthusiasm maintained through the primitive, the medieval, and the modern periods of the church's history, operating at every critical epoch, and surviving after periods of stagnation and depression, is a very significant fact. It is true that other religions have been called missionary religions, and that one of them occupies the first place in the religious census of mankind.? But the missionary activity of Buddhism is a thing of the past, and no characteristic rite distinguishing it has found its way into a second continent; while, as for Mohammedanism, the character of its teaching is too exact a reflexion of the race, time, place, and climate in which it arose to admit of its becoming universal.2. These and other religions of the far East may still maintain their hold over millions, but it must be admitted that their prospect of endurance in the presence of advancing Christianity is very small, and it is difficult to trace the slightest probability of their harmonizing with the intellectual, socia], and moral progress of the modern world. With all its deficiencies, the Christian church has gained the "nations of the future," and whereas in the 3d century the proportion of Christians to the whole human race was only that of one in a hundred and fifty, this has now been exchanged for one in five,' and it is indisputable that the progress of the human race at this moment is entirely identified with the spread of the influence of the nations of Christendom.*~~

~~*Side by side with this continuity of missionary zeal, a noticeable feature is the immense influence of individual energy and the subduing force of personal character. Around individuals penetrated with Christian zeal and self- denial has centred not merely the life, but the very existence, of primitive, mediaeval, and modern missions. What Ulfila was to the Gothic tribes, what Columba and his disciples were to the early Celtic missions, what Augustine or Aidan was to the British Isles, what Boni- face was to the churches of Germany and Anskar to those of Denmark and Sweden, that, on the discovery of a new world of missionary enterprise, was Xavier to India, Hans Egede to Greenland, Eliot to the Red Indians, Martyn to the church of Cawnpore, Marsden to the Maoris, Carey and Marshman to Burmah, Heber, Wilson, Milman, and Duff to India, Gray, Livingstone, Mackenzie, Steere, Callaway to Africa, Broughton to Australia, Patteson to Melanesia, Mountain and Feild to Newfoundland, Crowther to the Niger Territory, Brett to Guiana. At the most critical epochs such men have ever been raised up, and the reflex influence of their lives and self-denial has told upon the*~~

~~*church at home, while apart from their influence the entire history of important portions of the world's surface would have been altered.*~~

~~*If from the agents themselves we turn to the work that has been accomplished it will not be disputed that the success of missions has been marked amongst rude and aboriginal tribes. What was true in the early missions has been found true in these latter times. The rude and barbarous northern peoples seemed to fall like "full ripe fruit before the first breath of the gospel." The Goths and the Vandals who poured down upon the Roman empire were evangelized so silently and rapidly that only a fact here and there relating to their conversion has been preserved. Now this is exactly analogous to modern experience in the South Seas, America, and Africa, We must here content ourselves with a cursory survey*~~

~~*1 Max Miiller, Chips, iv. p. 265.*~~

~~*2 Newman, Grammar of Assent, p. 424.*~~

~~*3 Lightfoot, Comparative Progress of Ancient and Modern Missions, Das*~~

~~*of what missionary enterprise has accomplished in those regions and among the more civilized nations of Eastern Asia.*~~

~~*The South Seas.—That missions have done much in these regions in suppressing cannibalism, human sacrifices, and infanticide, humanizing the laws of war, and elevating the social condition of women, is a fact confirmed by the researches of Meinicke, Waitz, Gerland, Oberlander, and even of Darwin.4*~~

~~*In Australia work among the aborigines, wherever it has been zealously conducted, has been blessed with signal success. Amongst the Papuans the Moravian stations of Ebenezer in the district of Wimmera, and Ramahyuck in that of Gippsland, can point to their little villages of 125 native Christian inhabitants, their cleanly houses, and their well-ordered churches. In the district of South Adelaide, at Point Macleay, the Scottish Presbyterian Mission has been similarly successful, while in New Zealand the native*~~

~~*population was converted almost within a single generation. In the islands north and north-west of Australia the Dutch missionaries have been especially successful in the Minahassa (see CELEBES), of whose 114,000 inhabitants more than 80,000 have been won over to the Christian faith, forming 195 communities with 125 schools; and in southern Borneo, the Rhenish Mission in the south and the Society for the Propagation of the Gospel in the north have been enabled to establish themselves firmly, while the former society has also done a great work among the Battaks in Sumatra. Amongst the dark-coloured races of Polynesia missionary work has made great advances through the labours of the London Missionary Society, the Wesleyans, and the American Board. Making Tahiti its basis of operations, the first-named society has carried on missionary operations in the islands of Australasia, Hervey, Sarnoa, Tokelau, and Ellice, while the American Board has witnessed equally favourable results in the Sandwich Islands, and in Micronesia (Caroline, Marshall, and Gilbert Islands) the agents of the Hawaiian Association are actively at work under the direction of American missionaries. In Melanesia the Soeicty for the Propagation of the Gospel, the Wesleyans, the London Missionary Society, and the Presbyterians are all actively engaged. The Fiji group stands out as one of the most promising centres of Christian eivilization, and the governor, Sir A. Gordon, was enabled to report in 1879 that, out of a population of about 120,000, 102,000 are now regular worshippers in the churches, which number 800, while over 42,000 children are in attendance in 1534 Christian day schools. The Loyalty Islands have been occupied partly by Roman Catholic missions and partly by the London Missionary Society, while in the New Hebrides the missionaries of the Free Church of Scotland and of the Presby- terian churches of Canada, New Zealand, and Australia, in spite of many obstacles, the unhealthiness of the climate, and the variety of the dialects spoken, have upwards of 3000 natives receiving Christian teaching, 800 communicants, and 100 native teachers. On the islands of Banks, Santa Cruz, and Solomon, the English Episcopal Church is achieving no little success, sending native youths for months at atime to Norfolk Island to receive instruction, whence they return again-in order to spread the knowledge of truth at home. These islands will ever be famous in connexion with the martyr-death of the noble Bishop Patteson.*~~

~~*The Uncivtlized Peoples of America.—The quiet humble labours of the Moravians have accomplished much in Greenland and Labrador, whilst among the Indiaus of Canada and the people of Hudson's Bay the Society for the Propagation of the Gospel has not laboured in vain, nor the Church Missionary Society in the dioceses of Rupertsland, Red River, Saskatchewan, and Moosonec. At Columbia, on the coast of the Pacific, a practical missionary genius named William Duncan has succeeded in civilizing a body of Indians degraded by cannibalism, and at his Metlakahtla mission stands at the head of a community of some thousand persons, which has a larger church than is to be found between there and San Francisco. Testimony to the value of the results achieved was borne in 1876 by Lord Dufferin, then governor-general of Canada, who declared that he could hardly find words to express his astonishment at what he witnessed. Amongst the Indian tribes of the United States work is carried on by the Moravians, the American Board of Missions, the Presbyterians of the Northand South, the Baptists, the Epis- copal Methodists, and the American Missionary Society ; and the result is that 27,000 Indians, divided amongst tlie 171 communities of different denominations (including the Roman Catholic) arein full menibership with the church, and have 219 places of worship, besides 366 schools attended by about 12,222 Indian children. The Cherokees, the Choctaws, the Creeks, the Chiekasaws, have their own eliurches, schools, and academies, and may compare favourably both intellectually and morally with their white neighbours in Missouri, Arkansas, and Texas.> Amongst the negroes in the United States more than 1000 places of worship have been built since the last war, while the American Missionary Association alone has erected 26 academies with about 6000 students, for the purpose of*~~

~~*4 See Christlieb, Foreign Missions, p. 88. Swibid., pose, Yes*~~

~~*Miss rows*~~

~~*preparing freed slaves to be teachers and missionaries. Amongst the Indians on the Essequibo and Berbice in British Guiana, the missions of the Society for the Propagation of the Gospel have been rapidly extended, and now upwards of half the Indian population are members of Christian churches. In the British West Indies, through the united labours of various*~~

~~*missionary societies, out of 1,000,000 inhabitants upwards of 248,000 are returned as regular members of the churches, 85,000 as communicants, while 78,600 children receive instruction in 1123 day schools, of which number about 45,000 belong to Jamaica.*~~

~~*Passing to the southern promontory of South America, we find that the self-denying labours of Allen Gardiner are beginning to justify the devotion that prompted them. The London South American Missionary Society not only carries on its operations in the Falkland Islands, where youths from Tierra del Fuego receive instruction, but has founded stations in Tierra del Fuego itself, has roused the natives of Patagonia from their spiritual deadness, and lias extended its labours even to the Indians in Brazil.*~~

~~*Africa.—Here there are three great regions of missionary activity,—on the west coast, in the south, and in some parts of the east.*~~

~~*The largest and most fruitful mission field in West Africa is that of Sierta Leone, where at least seven-eighths of the people are now Christians, though the first mission does not date further back than the present century; and important results have also been obtained in Senegambia (on the Pongas), in Old Calabar, and in the republic of Liberia. On the Gold and Slave Coasts the labours of English Wesleyan missionaries and of the North German missionary societies have been crowned with no small success, while the Basel Society, which celebrated its jubilee in 1878, has extended its sphere of activity to Ashantee, translating the Scriptures into the native languages, and changing primeval marshes into bright- looking Christian villages. In the Yoruba lands the Church Missionary Society has 11 stations, 5994 Christians, and 1657 scholars, while on the Niger we are confronted with the interesting spectacle of negro preachers and teachers labouring under the coloured Bishop Crowther, carrying on a work which within the last few years was consecrated by the blood of martyrs.*~~

~~*Sonth Africa has for some time been a centre of missionary activity. Here thirteen British and Continental associations have proved that all the South African races, Hottentots and Kaffres, Fingoes and Bechuanas, Basutos and Zulus, are capable of attaining a considerable degree of Christian civilization, and can not only be instructed in handicraft and agriculture, but trained as ministers and teachers. A single instance of this is afforded in*~~

~~*British Kaffraria by the Lovedale Institute of the Free Church of Scotland, where youths from all the above-mentioned tribes are taught along with Europeans, and every Sunday sixty students proclaim the gospel in the neighbouring villages. In the cause of mission work here few ever laboured more zealously than the late Bishop Gray, whose diocese, when first constituted, included the whole colony of the Cape, but whose successor has now for his suffragans the bishops of Grahamstown, Maritzburg, St Helena, Bloemfontein, Zululand, St John's, and Pretoria.*~~

~~*Fast and East Central Africa, so long neglected, is now being rapidly occupied by missionary enterprise. Here the island of Madagascar has been in great part evangelized, while on the island of Mauritius the Anglican Mission has developed pre-eminent results. On the mainland, the coast of Zanzibar calls for special notice. Here the little island of the same name has long been the seat of the Universities Mission to Central Africa, and the heroic Bishop Steere has not only erected a cathedral on the site of the former slave-market, but translated the New Testament into Sawahili, a language which can be understood by the tribes around the lakes, and even in Uganda.*~~

~~*China.—"O mighty fortress! when shall these impenetrable brazen gates of thine be, broken through?" was the mournful exclamation of Valignani, the successor of Xavier, as he gazed in sadness at the mountains of China. The words well express the incredible difficulties which this largest and most thickly peopled heathen land in the world, with its petrified constitution and culture of three thousand years, presents in the way of missionary effort. The country itself, the people, their speech, their manners, their religion, their policy, seemed to unite in opposing an insuper- able barrier, but history has to record how efforts have been made by many bodies, and at many times, to break it down. An early Nestorian Church established itself in the empire, but was either uprooted, or died out in course of time. In the 16th century the Jesuits undertook the task, and in spite of the persecutions which they have undergone the missions of the Roman Church, with their numerous foreign clergy and their hosts of natives of different ecclesiastical degrees, have attained no small measure of success. Before the country was really opened to foreigners by the treaty of Tientsiu, pioneers proceeded*~~

thither from America, and from the London Missionary Society. The labours of Dr Legze in translating and reducing to system the Chinese classics are

1 See Lightfoot, Anctent and Modern Missions, p. 10.

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well known. At the present day it is estimated that there are upwards of 29 societies at work in the country, with about 250 ordained missionaries and 63 female teachers, aud the number is constantly increasing. These societies, of which the largest pro- portion belong to England, and the next largest to America, support, it is estimated, 20 theological schools, 30 higher boarding schools for boys with 611 scholars, 38 for girls with 777 scholars, 177 day sehools for boys with 4000 to 5000 pupils in attendance, 82 for girls with 1307, while 16 missionary hospitals and 24 dispensaries are under the direction of medical missionaries, whose work in China has been recognized almost from the first as the source of the greatest blessing. The mission centres stud the east coast from Hong Kong and Canton to the frontiers of Manchuria in the north ; thence they advance little by little every year into the interior, while as yet the western provinces are scarcely touched by missionary effort. The literary labours of the various societies have been carried on with the utmost perseverance; and on the foundations laid by a Morrison and a Milne later toilers have been enabled to raise a superstructure of translations of various portions of the Bible, as well as various Christian books and religious and general periodicals which constitute a means of vast importance towards gradually gaining over this land of culture. At Peking a Russian mission has been labouring for more than one hundred and fifty years. The Society for the Propagation of the Gospel and the Church Missionary Society have lately opened up new centres in this almost limitless country.?

Japan.—Of the missions in Japan it is as yet too early to fore- cast the future. The signing of the commercial treaties of 1854 and 1858 with America and England was followed in 1859 by efforts on the part of the American churches to extend a knowledge of Christianity, and in these Bishop Williams, an accomplished Japanese scholar, proved himself a valuable leader and guide. Soon afterwards other societies found their way into the country, and in March 1872 the first Japanese congregation, of 11

~~converts, was constituted in Yokohama. Within the last eight years these 11 have increased to 1200, while the American missious have been supplemented by those of the Church Missionary Society and the Society for the Propagation of the Gospel. Nearly every mission has what may be called a high school for girls, and these institu- tions are very popular. Thousands of copies also of the Gospels have been circulated in Japanese, and representatives of nearly all the missions are engaged in translating the entire New Testament, while a Russo-Greek mission has established itself in the north, and is advancing steadily, having already madé about 3000 converts.3 Thus, when it is considered that in the beginning of the 17th century the Japanese Government drove out the Portuguese and massacred the native Catholic converts, and prohibited all Christians under pain of death from ever setting foot in the country, and when it is borne in mind that many of these old laws against Christianity have not yet been repealed and that the old distrust of strangers is still plainly discernible among the governing classes, it is clear that, while there is much ground for hope, effectual results can only be the work of time.~~

~~India.—What is true of China and Japan applies with tenfold force to India. Here the results achieved resemble those which were attained in the conflict between Christianity and the religion of old pagau Rome, with its mass of time-honoured customs interwoven with the literature, institutions, and history of the empire. Against the influence of prestige and settled prejudice the wave of the gospel beat for centuries in vain. Slowly and gradually it was undermining the fabric, but no striking results were immediately visible. So also in India with the Hindu proper Christianity has hitherto made inappreciable progress, while among the rude aboriginal or non-Aryan tribes its success has been remarkable. Independently of Roman Catholic missions upwards of twenty-eight societies are earnestly engaged in the English mission field, and the following figures will give some idea of the progress that has been made during the last twenty or thirty years. In British India, including Burmah and Ceylon, it is estimated that in 1852 there were 22,400 comniunicants and 128,000 native Christians young and old; in 1862 these had increased to 49,681 communicants and 213,182 native Christians; in 1872 there had been a further in- crease to 78,494 communicants and 318,363 native Christians, while in 1878 the latter figures rose to 460,000. When we look at the share that each of the societies~~

has had in this inercase, we find that the Society for the Propagation of the Gospel and the Church Missionary Society together have since 1850 increased in member- ship from 61,442 to upwards of 164,000; the London Missionary Society from 20,000 to npwards of 48,000; the Presbyterian missions of Scotland, England, Ireland, and America from 800 to 10,000 ; the Basel mission in India from 1000 to 6805 ; the Baptist missionary societies (including the American as well as the English) from 30,000 to 90,000; the five Lutheran societies from 3316 to about 42,000. In some places the progress made has been excep-

2 The Roman Catholic Mission had 404,530 converts in China in 1876, with a yearly increase of about 2000. 3 Christlieb, Foreign Missions, p. 222.

tionally rapid. In Cuddapah, ¢.g., in the Telugu territory, the Society for the Propagation of the Gospel and the London Mission- ary Society laboured side by side for upwards of thirty years without winning over more than 200 converts. Then on a sudden there sprang up a revival among the non-caste population, and the 200 became nearly 11,000. Among the Kols, after five years' waiting, the Gossuer missionaries baptized their first converts in 1850; now in the German and English stations together these amount to about 40,000. Since the famine, however, in 1878-79, the increase of new converts has been still more rapid, and the practical experience of the superiority of Christian pity to heathen selfishness and of the helplessness of their heathen deities, united with the effect produced by persistent missionary labour in past years, brought thousands into the fold of the church. Thus in the Tinnevelly district, where the Church Missionary Society carries on its operations, upwards of 11,000 heathens applied in 1878 to Bishop Sargent and his native clergy for instruction preparatory to baptism.! In the same district, in connexion with the Society for the Propagation of the Gospel, between July 1877 aud the end of June 1878 upwards of 23,564 persons betook themselves to Bishop Caldwell and his fellow- labourers for Christian teaching. Thus the English Church mis- sions in Tinnevelly and Ramnad received in little more than a year and a half an increase of 35,000 souls,?and the Propagation Society is now

~~proclaiming the gospel in nearly six hundred and fifty villages in the Tinnevelly district, amongst not merely food-seeking ‘~~

~~ringing about results analogous to that to which Sir James Mack- intosh referred in a conversation with Henry Martyn, when the~~

~~! Abstract of Church Missionary Society’s Report for 1879, p. 18. 2 Report of the Propagation Society for 1879, p. 31 sq.~~

~~Oriental world was made Greek by the successors of Alexander in order to make way for the religion of Christ. But when to these indirect influences we add the effects of direct missionary instruc- tion, of training schools like those of the Free Church of Scotland in Madras, of Bishop Sargent in Tinnevelly, of Bishop Cotton in the North-West Provinces, of Zenana missions now carried on on an extensive scale amongst the female population, of the numerous missionary presses at work circulating thousands of copies of the Holy Scriptures and of Christian books, it is obvious that, small and insignificant as these agencies may seem compared with the magnitude of the work required to be done, there has been a great advance made during recent years. The present century of missions may: favourably compare with the primitive and medieval ages of the church, and the continuity of the missionary spirit operating, as we have seen, after long periods of stagnation and depression is the best guarantee of its ultimate and more com- plete success at the close of the present epoch, during which, to use Karl Ritter’s expression, “‘ almost all the rivers of the earth have begun to run in double currents, and nearly all the seas and rivers have become the seas and rivers of civilization.” (G. F. M.)~~

~~MISSISSIPPI. The territory drained by the Missis- sippi river and its tributaries includes the greater part of the United States of America lying between the Alle- ghany Mountains on the east and the Rocky Mountains on the west, and has an area (1,244,000 square miles) con- siderably larger than all central Europe. The central artery through which the drainage of this region passes is called the Mississippi river for about 1300 miles above its mouth. The name is then usurped by a tributary, while the main~~

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~~The Mississippi and its Tributaries.~~

~~stream becomes known as the Missouri. From its remote sources in the Rocky Mountains to the Gulf of Mexico the total length of the river is about 4200 miles. The other principal tributaries are the Ohio, the Arkansas, and the Red River, but the Yazoo and the St Francis often make dangerous contributions in seasons of flood.~~

~~The tables given below exhibit the hydraulic features of the Mississippi and its principal tributaries.~~

~~Below the influx of the Ohio the Mississippi traverses alluvial bottom lands liable to overflow in flood seasons. The soil is of inexhaustible fertility, producing large crops of corn in the northern portion, cotton in the middle dis- trict, and sugar, rice, and orange groves near the mouth. These bottom lands, averaging about 40 miles in width, extend from north to south for a distance of 500 miles, having a general southern slope of 8 inches to the mile. The river winds through them in a devious course for 1100 miles, occasionally on the east side washing bluffs from 100 to 300 feet in height, but usually confined by banks of its own creation, which, as with all sediment-bearing rivers of like character, are highest near the stream itself. The general lateral slope towards the foot hills is about 6 inches~~

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~~in 5000 feet, but the normal fall in the first mile is about 7 feet. Thus apparently following a low ridge through the bottom lands, the tawny sea sweeps onward with great velocity, eroding its banks in the bends and~~

~~*rebuilding them on the points, now forming islands by its deposits, and now removing them as the direction of the flow is modified by the never-ending changes in progress. Chief among such changes is the formation of cut-offs. Two eroding bends gradually approach each other until the water forces a passage across the narrow neck. As the channel distance between these bends may be many miles, a cascade perhaps 5 or 6 feet in height is formed, and the torrent rushes through with a roar audible for miles, The banks dissolve like sugar. In a single day the course of the river is changed, and steamboats pass where a few hours before the plough had been at work. The checking of the current*~~

~~*at the upper and lower mouths of the abandoned channel soon obstructs them by deposit, and forms in a few years one of the characteristic crescent lakes which are so marked a feature on the maps.*~~

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~~*The total area of the bottom lands is about 32,000 square miles, of which only a narrow strip along the immediate banks of the main river and of its principal bayous and tributaries has even yet been brought under cultivation. A proper system of protection against overflow would throw open 2,500,000 acres of rich sugar land, 7,000,000 acres of the best cotton land in the world, and 1,000,000 acres of corn land of unsurpassed fertility.*~~

~~*The work of embankment began in 1717, when the engineer De la Tour erected a dyke or levee 1 mile long to protect the infant city of New Orleans from overflow. Progress at first was slow. In 1770 the settlements extended only 30 miles above and 20 miles below New Orleans ; but by 1828 the levees, although quite insufficient in dimensions, had become continuous nearly to the mouth of Red River. In 1850 a great impulse was given to systematic embankment by the U.S. Government, which gave over to the several States all unsold swamp and over- flowed lands within their limits to provide a fund for re- claiming the districts liable to inundation. The action*~~

~~*Tributaries of the Lower Mississippi.*~~

~~Distance Width Range River from | Elevation | petween | between Mouth. | above Sea. | Banks, High and Low Water. Missouri— Miles, Feet. Feet. Feet. IKONS co aogunoEAbEesoc 2, 908 6,800? Three Forks……. 2,824 4,319 ig abe Fort Benton ……. 2,644 2,845 1,500 6 Fort Union'……. 1,894 2,188 1,500 ae Siow Citys… 2a. 842 1,065 2,500 dns Stwlosephiy…... ae. 484 756 3,000 20 Mouth ……..ceccecees 0 381 38,000 35~~

~~OUNCE fie… cc ees ceccnnen 1,330 1,680 ann Swan River:……. 998 1,290 120 ae StaPaulee sc: ss cases 658 670 1,200 20 Rock Island 310 505 5,000 16 OEM Reise vss ces.crs 381 5,000 35 Ohio— Coudersport……. 1,265 1,649 age nad Bittaberg.. centeo...- 975 699 1,200 45 Cinfeiniiaitis)……..-. <. 515 432 ge 42 IVIGMIEN 555s ccsw esses 0 275 3,000 51 Arkansas— ISOUNCEM Aer. ...csene: «ot 1,514 | 10,000 150 aon Bontyseh ons. ve... 1,289 3,672 5,000 6 Great Bend……. 992 1,658 5,000 oe Port Smith……. 522 418 1,500 25 Inttle Rock:……2... 250 252 1,500 35 WIG. saorngeirnccanreee: 0 162 1,500 45 Red River— Near source. . 1,200 2,450 2,900 8 IBTESUOM ass cceices esses. 820 641 2,000 aa DMTEVEPOTt…..0.. ⁺. 330 180 800 25 MIO cesses ers es 0 4 800 45~~

~~High Water Cross Section.~~

~~Square Feet.~~

~~Remarks.~~

~~Area of basin, 518,000 square miles ; rainfall, 20°9 inches ; annual discharge, 37455 ' pillions lase-,~~

~~3,780,000, 000,000] cubic acl ratio between~~

~~drainage and rainfall, 7455 ; mean discharge per~~

~~75,000 second, 120,000 cubic feet. 75,000 | } Area of basin, 169,000 square miles; rainfall, 35:2 100.000 \ inches ; annual discharge, 3435 billions 'oubie 100.000 feet; ratio between drainage and rainfall, 5%; 100.000 | mean discharge per second, 105,000 enbic feet. ? i \ Area of basin, 214,000 square miles; rainfall, 41°5 50,000 \ inches ; annual "discharge, 5 billions cubic. feet ; hs ratio between drainage and rainfall, 3%°;; mean 150,000 }~~

~~discharge per second, 158,000 cubic feet. 80,000 | Area of basin, 189,000 square miles; rainfall, 29°3 Be inelies; annual discharge, 2 billions cubic feet; 70,000 ratio between drainage and rainfall, ~y%; mean 70,000 | discharge per second, 63,000 cubic feet.~~

~~70,000~~

~~inches ; annual discharge, 135 billions ee feet; ratio between drainage and" tain fall, vyo «Mean~~

~~40,000~~

~~discharge per second, 57,000 cubic feet.~~

~~J 12,000 {ina of basin, 97,000 square | miles; rainfall, 39 40,000 J~~

~~The Lower Mississippi.~~

~~Miles. Feet. Feet. Mouth: of Missouri.....0¢ 1,286 ee~~

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~~High idth Least Low Range ae Water Fall per — Water Depth| between — . Cross — ry a Elevation Mile, Banke upon the High and High We ie CH SESS Mouth. | above Sea. ; Bars. Low Water. eS AEE~~

~~Feet.~~

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~~*Square Feet.*~~

~~*area, square*~~

~~*miles: rainfall, 30°4 | inches; annual dis- | charge (including*~~

~~*three outlet bay- ous), 213%; billions 1 ap el*~~

~~*2-0*~~

~~*Drainage*~~

~~*1,244,000*~~

~~*of cubic feet ; ratio between drainage and rainfall, 3%; mean discharge per*~~

~~*675,000*~~

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~~*second, cubic feet.*~~

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~~*resulting from this caused alarm in Louisiana, for the great bottom lands above were believed to act as reservoirs to receive the highest flood wave ; and it was imagined that if they were closed by levees the lower country would be overwhelmed whenever the river in flood rose above its natural banks. The aid of the Government was in- voked, and Congress immediately ordered the necessary investigations and surveys. This work was placed in charge of Captain (now General) HIumphreys, and an elaborate report covering the results of ten years of investi- gation was published just after the outbreak of the civil war in 1861. The second of the tables given above, and indeed most of the physical facts respecting the river, are quoted from this standard authority.*~~

~~*To understand the figures of the table it should be noted*~~

~~*that at the mouth of Red River, 316 miles above the passes, | the water surface at the lowest stage is only 555 feet above |*~~

~~*the level of the Gulf, where the mean tidal oscillation is about 1,2; feet. The river channel in this section is there- fore a freshwater lake, nearly without islands, 2600 feet wide and 100 feet deep along the deepest line. At the flood stage the surface rises 50 feet at the mouth of Red River, but of course retains its level at the Gulf, thus giving the head necessary to force forward the increased volume of discharge. Above the mouth of Red River the case is essentially different. The width increases and the depth decreases ; islands become numerous; the oscillation be- tween high and low water varies but little from 50 feet until the mouth of the Ohio is reached—a distance of about 800 miles. Hence the general slope in long distances is here nearly the same at all stages, and the discharge is regulated by the varying resistances of cross section, and by local changes in slope due to the passage of flood waves contributed by the different tributaries. The effect of these different physical conditions appears in the compara- tive volumes which pass through the channel. At New Orleans the maximum discharge hardly reaches 1,200,000 cubic feet per second, and a rising river at high stages carries only about 100,000 cubic feet per second more than when falling at the same absolute level ; while just below the mouth of the Ohio the maximum flood volume reaches 1,400,000 cubic feet per second, and at some stages a rising river may carry one-third more water than when falling at the same absolute level.*~~

~~*The percentage of sedimentary matter carried in suspen- sion by the water varies greatly at different times, but is certainly not dependent upon the stage above low water. It is chiefly determined by the tributary whence the water proceeds, but is also influenced by the caving of the banks, which is always excessive when the river is rapidly falling after the spring flood. In long periods the sedimentary matter is to the water by weight nearly as 1 to 1500, and by bulk as 1 to 2900. The amount held in suspension and annually contributed to the Gulf constitutes a prism 1 mile square and 263 feet high. In addition to this amount a large volume, estimated at 1 mile*~~

~~*square and 27 feet high annually, is pushed by the current along the bottom and thus transported to the Gulf.*~~

~~*The mean annual succession of stages for long periods is quite uniform, but so many exceptions are noted that no definite prediction can safely be made for any particular epoch. The river is usually lowest in October. It rises rapidly until checked by the freezing of the northern tributaries. It begins to rise again in February, and attains its highest point about the lst of April. After falling a few feet it again rises until, early in June, it attains nearly the same level as before. After this it rapidly recedes to low- water mark. As a rule the river is above mid-stage from January to August inclusive, and below that level for the remainder of the year.*~~

~~*Missi esrerda*~~

~~*Tt has been established by measurement and observation that the great bottom lands above Red River before the con- struction of their levees did not serve as reservoirs to diminish the maximum wave which passed through Louisiana in great flood seasons. They had already become filled by local rains and by water escaping into them from the Mississippi through numerous bayous, so that at the date of highest water the discharge into the river near their southern borders was fully equal to the volume which the wave had lost in passing along their fronts.*~~

~~*In fine, the investigations between 1850 and 1860 estab- lished that no diversion of tributaries was possible ; that no reservoirs artificially constructed could keep back the spring freshets which caused the floods; that the making of cut- offs, which had sometimes been advocated as a measure of relief, so far from being beneficial, was in the highest degree injurious ; that, while outlets within proper limits were theoretically advantageous, they were impracticable from the lack of suitable sites ; and, finally, that levees properly constructed and judiciously placed would afford protection*~~

~~*'to the entire alluvial region.*~~

~~*During the civil war (1861-65) the artificial embankments were neglected ; but after its close large sums were expended by the States directly interested*~~

~~*in repairing them. The work was done without concert upon defective plans, and a great flood early in 1874 inundated the country, causing terrible suffering and loss. Congress, then in session, passed an Act creating a commission of five engineers to determine and report on the best system for the permanent reclamation of the entire alluvial region. Their report, rendered in 1875, endorsed the conclusions of that of 1861, and advocated a general levee system on each bank. This system comprised—(1) a main embankment raised to specified heights sufficient to restrain the floods; and (2), where reasonable security against caving required considerable areas near the river to be thrown out, exterior levees of such a height as to exclude ordinary high waters but to allow free passage to great floods, which as a rule only occur at intervals of five or six years. The back country would thus be securely protected, and a safe refuge would be pro- vided for the inhabitants and domestic animals living upon the portion subject to occasional overflow. An engineering organiza- tion was proposed for constructing and maintaining these levees, and a detailed topographical survey was recommended to determine their precise location. Congress promptly approved and ordered the survey ; but strong opposition on constitutional grounds was raised to the construction of the levees by the Government.*~~

~~*In the meantime complaints began to be heard respecting the low-water navigation of the river below the mouth of the Ohio. Forty-three places above the mouth of Red River afforded depths of less than 10 feet, and thirteen places depths less than 5 feet, the aggregate length of such places being about 150 miles. A board of five army engineers, appointed in 1878 to consider a plan of relief, reported that 10 feet could probably be secured by narrow- ing the wide places to about 3500 feet with hurdle work, brush ropes, or brush dykes designed to cause a deposit of sediment, and by protecting caving banks, when necessary, by such light and cheap mattresses as experience should show to be best suited to the work. Experiments in these methods were soon begun upon the river above Cairo, and have since proved of decided benefit.*~~

~~*In June 1879 Congress created a commission of seven members to mature plans to correct, permanently determine, and deepen the channel, to protect the banks of the river, to improve and give safety to navigation, to prevent destructive floods, and to promote and facilitate commerce. Up to 1882 appropriations amounting to £1,285,000 were made to execute the plans of this commission, but with provisos that none of the funds were to be expended in repairing or building levees for the protection of land against overflow, although such levees might be constructed if necessary to deepen the channel and improve navigation. Acting under this authority, the conmmission have allotted considerable sums to repair existing breaks in the levees ; but their chief dependence is upon contracting the channel at low water by promoting lateral deposits, and upon protecting the high-water banks against caving by mats of brush, wire, &c., ballasted where necessary with stone,—substan- tially the plaus proposed by the army board of 1878.*~~

~~*The bars at the efflux of the passes at the mouth of the Mississippi have long been recognized as serious impediments to commerce. The river naturally discharges through three principal branches, the south-west pass, the south pass, and the north-east pass, the latter through two channels, the most northern of which is called Pass & POutre. The ruling depth on the several bars varies with the discharge over them, which in turn is controlled by the successive advances of the passes. In the natural condition the greatest*~~

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~~*depth does not exceed 12 or 13 feet. The first appropriation by | "the north-western corner of Washington county on the*~~

~~*Congress to secure increased depth was made in 1837, and was ex- pended in an elaborate survey and in a system of dredging by buckets, but the plan of a ship canal was also discussed. At the next appropriation, made in 1852, a board of officers, appointed by the war department, recommended trying in succession—(1) stirring up the bottom by suitable machinery, (2) dredging by buckets, (3) constructing parallel jetties 5 miles long at the south-west pass, to be extended as found necessary, (4) closing lateral outlets, and (5) constructing a ship canal. A depth of 18 feet was secured by the first plan, and was maintained until the available funds were exhausted. Under the next appropriation (1856) an abortive attempt was made to apply the plan of jetties to the south-west pass. 'his failed from defects in execution by the contractors, but a depth of 18 feet was finally secured by dredg- ing and scraping. The report of 1861 discussed the subject of bar formation at length. Although it approved the plan of jetties and closure of outlets as correct in theory, the stirring up of the bottom by scrapers during the flood stages of the river (six months annually) was recommended by it as the most economical and least objection- able. After the war this recommendation was carried into effect for several years with improved machinery, giving at a moderate annual cost a depth at times reaching 20 feet at extreme low water, but experience indicated that not much more than 18 feet could be steadily maintained. This depth, entirely satisfactory at first, soon*~~

~~*became insufficient to meet the growing demands of commerce, and |*~~

~~*in 1878 Major Howell, the engineer in charge, revived the pro- ject of a ship canal. The subject was discussed carefully by a board of army engineers, the majority approving a ship canal. In 1874 Congress constituted a special board which, after visiting Europe and examining similar works of improvement there, reported in favour of constructing jetties at the south pass, substantially upon the plan used by Mr Caland at*~~

~~*the mouth of the Meuse ; and in March 1875 Captain J. B. Eads and associates were authorized by Congress to open by contract a broad and deep channel through the south pass upon the general plan proposed by this board. This contract called for " the maintenance of a channel of 30 feet in depth and 350 feet in width for twenty years" by ""the construction of thoroughly substantial and permanent works by which said channel may be maintained for all time after their completion." The jetties were to be not less than 700 feet apart. The sum of £1,080,000 was to be paid for obtaining this channel, and £412,000 for maintaining it for twenty years. In addition, the contractors were authorized to use any materials on the public lands suitable for and needed in the work.. The south pass was 12,°, miles long. It had an average width of 730 feet and a minimum interior channel depth of 29 feet. The distance from the 30-foot curve inside the pass across the bar to the 30-foot curve outside was 11,900 feet. The minimum depth at average flood tide on the bar was about 8 feet. The discharge at the mouth was about 57,000 cubic feet of water per second, trans- porting annually about 22 million cubic yards of sediment in sus- pension to the Gulf. A small island and shoal existed at the head of the pass, the channel there having a minimum depth of 17 feet. The work was begun on June 2, 1875, and has been so far success- ful that during the year ending June 30, 1882, a channel was main- tained having a least depth of 30 feet between the jetties and extend- ing through the bar. Its least width was 20 feet, the average being 105 feet. The 26-foot channel had a least width of 200 feet, except for a few days. In the pass itself the 26-foot channel had a least width of 50 feet. A very powerful dredge-boat was at work between and beyond the jetties 87 days, of which 51 were devoted to the channel in the Gulf. A deepening of 6 feet has occurred in Pass 3 l'Outre near its head since 1875. Up to the present time the work has proved of great benefit to the commerce of New Orleans.*~~

~~*For further details, see RIVER ENGINEERING.*~~

~~*MISSISSIPPI, one of the Southern States of the American Union, derives its name from the river which for more than 500 miles forms its western boundary between the 35th and 31st parallels of north latitude, separating it from Arkansas and Louisiana. The boundary with the latter State is continued along the 31st parallel, for 110 miles, to the Pearl river, and then*~~

~~*down the Pearl to its mouth. The Gulf of Mexico, eastward from the mouth of Pearl river, completes the southern boundary. On the north the 35th parallel, from the Mississippi river to the Tennessee, separates the State from Tennessee, and the boundary then follows the latter river to the mouth of Bear Creek, in 34° 53' N. lat. and 88° 15' W. long. The eastern boundary of the State, separating it from Alabama, follows a line drawn from the mouth of Bear Creek about seven degrees west of south to what was*~~

~~*(H. L. A.)*~~

~~*Tombigbee," and thence due south to the Gulf of Mexico. Ship, Horn, Cat, and Petit Bois Islands, and those nearer the shore, form a part of Mississippi. The extreme length of the State, north and south, is 330 miles, and its maximum breadth is 188 miles. Under the United States surveys, begun in 1803, the State has been divided into townships and sections, except such parts as were at the first owned by individuals. The area of the State is given in the census reports for 1880 as 46,340 square miles. Topography.—There are no mountains in Mississippi, but a considerable difference of level exists between the continuously low, flat, alluvial region lying along and between the Mississippi and Yazoo rivers, called "the Bottom," and nearly all the remainder of the State, which is classed as upland. The latter part, comprising five- sixths of the whole, is an undulating plateau whose general elevation above the water of the Gulf of Mexico increases to 150 feet within a few miles of the coast, and varies elsewhere from 150 to 500 or 600 feet. Some exceptional ridges are probably 800 feet high. The streams of this region flow in valleys varying in width from a few hundred yards to several miles. The fall of each river is not great, and is quite uniform. Usually a considerable part of the valley of each larger stream is several feet above its present high water mark, and forms the "hommock," or "second bottom" lands. On some of the rivers the lowest part of the valley, subject to overflow, is several miles in width,*~~

~~*and bears a resemblance to the Mississippi Bottom.*~~

~~*Ridges or plateaus everywhere in the upland region divide the contiguous basins of creeks and rivers, descending more or less abruptly to their valleys. In the north-eastern part of the State, almost level prairies cover large areas overlying a Cretaceous formation called Rotten Limestone.*~~

~~*A line of abrupt bluffs, extending southward from the north-west corner of the State, divides the upland region from the Bottom, where the general surface lies below the high-water level of the Mississippi river. A few low ridges, running north and south, and embracing about 200,000 acres, are barely above high water. The culti- vated lands in the Bottom lie on these, and on the borders of the rivers and the numerous lakes and bayous, where the surface is slightly elevated. Low swamps or marshes, in which flourish large cypress trees (Taxodium distichum), lie between the streams, and frequently receive the surface drainage from their banks. Large forest trees and dense cane-brakes (Arundinaria gigantea) occupy the drier ground. The Mississippi river is prevented from flooding the Bottom during high water by a system of levees or embankments built by a fund derived partly from taxation on the land and partly from the proceeds of the sale of public lands in the State classed as "swamp lands," which were given over for this purpose by Congress. The only com- pensation for the injury done when breaks in the levees ('crevasses ") occur is the deposit of alluvial matter left by the overflow, which adds to the productiveness of the already wonderfully fertile soil. 'The present levee system usually protects about one-fourth of the 4,000,000 acres in the Bottom. Many crescent-shaped lakes ("cut-offs") occur in the Bottom. Similar phenomena present them- selves in the channels of the other rivers having wide bottoms.*~~

~~*The volume of water in the streams varies greatly during the year, and is usually largest between the months of January and April. During high water all the larger streams are navigable by steamboats. These ply upon the Mississippi, Tennessee, and Yazoo rivers throughout the whole year. The rivers flowing into the Gulf are much obstructed by sand-bars, and are chiefly used for floating*~~

~~*logs to the saw-mills on the coast. XVI. — 66*~~

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~~*The best and only deep harbour on the coast is the well- protected roadstead inside of Ship Island. It has a depth of 27 feet, a firm clay bottom, and is readily accessible to lighters from the shallower harbours along the coast.*~~

~~*Climate.—Near the waters of the Gulf of Mexico the climate is much milder than in the northern parts of the State. On the southern borders the temperature rarely falls to 32° Fahr., or exceeds 95°, the annual mean being about 68°. The orange, lemon, almond, banana, and olive can be grown without protection. In the latitude of Vicksburg the temperature ranges from 98° to 20°, very rarely lower; the annual mean is 65°. The range in the northern part of the State is from 98° to 15°, or rarely 10°, and the annual mean is 61°. The first and last hoar-frosts occur, in the central parts of the State, usually in the latter parts of October and March. The ground is seldom frozen to the depth of 3 inches, and only for a few days at a time. The rainfall on the coast is 60 to 65 inches per annum, and at the northern boundary 50 inches. While about two-thirds of this precipitation occurs in winter and spring, a month seldoin passes without several inches of rainfall.*~~

~~*Land and sea breezes in the south, and variable winds elsewhere, make the heat of summer tolerable. In healthfulness Mississippi compares favourably with other States. The average death-rate of thirteen States, variously situated, as given in the census of 1880, is 1°38 per cent. ; that of Mississippi is 1°19 per cent. Where the surface is flat and poorly drained malarial fevers are prevalent during the warm season. Yellow fever has become epidemic after importa- tion, but strict quarantine has been successful in preventing it.*~~

~~*Geology.—In accordance with an Act of the legislature passed in 1850, an agricultural and geological survey of the State was begun, which continued, with interruptions, until 1871. Two reports have been published, one in 1854 and another in 1860.*~~

~~*The geological structure of the State is comparatively simple, and closely related to that of the adjacent States,*~~

~~*period, which will described last. In the extreme north- eastern portion are found the oldest rocks in the State,—an ex- tension of the Subcarboniferous formation which underlies the Warrior coal-fields of Alabama, The strata here show some traces of the upheaval which formed the Appalachian mountain chain, whose south-west termination is found in Alabama. When this chain formed the Atlantic mountain-border of the continent, except- ing*~~

~~*this north-east corner, Mississippi had not emerged from the waters of the ancient Gulf of Mexico. As the shore-line of the Gulf slowly receded southward and westward, the sediment at its bottom gradually came to the surface, and constituted the Cretaceous and Tertiary formations of this and adjacent States. Wherever stratification is observed in these formations in Mississippi, it shows a dip west and south of 20 or 80 feet to the mile. The Cretaceous region includes, with the exception of the Subcarboni- ferous, all that part of the State eastward of a line cutting the Tennessee boundary in 89° 3' W. long., and drawn southward and eastward through the towns of Ripley, Pontotoc, and Stark- ville, crossing into Alabama in latitude 32° 45'. Four groups of Cretaceous strata have been determined in Mississippi, defined by lines having the same general direction as the one just described. The oldest, bordering the Subcarboniferous, is the Eutaw or Coffee group, characterized by bluish-black or reddish laminated clays, and yellow or grey sands, containing lignite and fossil resin, Westward and southward to the city of Columbus is the Tombigbee sand group, consisting chiefly of fine-grained micaceous sands of a greenish tint, with many marine fossils. Next in order, westward and southward, is the Rotten Limestone group, made up of a material of great uniformity,—a soft chalky rock, white or pale blue, composed chiefly of tenacious clay, and white carbonate of lime in minute crystals, Borings show the total thickness of this group to be about 1000 feet. Fossils are abundant, but species are few. The latest Cretaceous is the Ripley group, lying west of the northern part of the last-named group, and characterized by hard crystalline white limestones, and dark- coloured, micaceous, glauconitic marls, whose marine fossils are admirably preserved. One hundred and eighty species have been described. The total thickness of the Cretaceous is about 2000 feet. Deposits of the Tertiary period form the basis of more than half the State, extending from the border of the Cretaceous west- ward nearly or quite to the Yazoo and Mississippi Bottom, and southward to within a few miles of the Gulf coast. Seven groups of the Tertiary strata have been distinguished. Beginning nearest the Cretaceous, the Flatwoods group is characterized by grey or white clays, and a soil which responds poorly to tillage. "The Lagrange group, lying to the west of the last, is marked by grey clays and sands, fossil plants, and beds of lignite or brown coal*~~

~~*sometimes 8 feet in thickness. The Buhrstone group, lying south- westward from the last, is characterized by beds of white siliceous clays, and of silicified shells, and sandy strata containing glauconite in valuable quantities. The Claiborne group lies south of the last, and is slightly developed in Mississippi, but well-marked in*~~

~~*The older | formations are i all overlaid by deposits of the Quaternary | e*~~

~~*MEiSSiIisS62@? Pa*~~

~~*Alabama. The Jackson group, south-west of the last two, is made up chiefly of soft yellowish limestones or marls, containing much clay, and sandy strata with glauconite. Zeuglodon bones and other marine fossils are abundant. The Vicksburg group lies next in order south-westward, and is characterized by crystalline limestones and blue and white marls. Marine fossils are very abundant. More than one hundred and thirty species have been determined. The Grand Gulf group, showing a few fossil plants and no marine fossils, extends southward from the last to within a few miles of the coast.*~~

~~*The oldest formation of the Quaternary period is the " orange sand" or "stratified drift," which immediately overlies all the Cretaceous groups except the prairies of the Rotten Limestone, and all the Tertiary except the Flatwoods and Vicksburg groups and parts of the Jackson. Its depth varies from a few feet to over 200 feet, and it forms the body of most of the hills in the State. Its materials are pebbles, clays, and sands of various colours from white to deep red, tinged with peroxide of iron, which sometimes cements the pebbles and sands into compact rocks. The shapes of*~~

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~~*GULF or MEXICO Geological Map of Mississippi State.*~~

~~*these ferruginous sandstones are very fantastic, —tubes, hollow spheres, plates, &c., being common. The name stratified drift is used by the geologist of Alabama to indicate its connexion with the northern drift. The fossils are few, and in some cases probably derived from the underlying formations. Well-worn pebbles of amorphous quartz, agate, chalcedony, jasper, &c., are found in the stratified drift along the western side of the Tertiary region of the State, and from Columbus northward. “While this forma- tion is not well understood, it seems tolerably well established that the melting of the great glaciers of the north furnished the water which brought with it fragments of the rocks over which it passed, and flowed into the Gulf with a current which was most rapid where the pebbles were dropped, but overspread the remainder of the State with a gentler flow, leaving sands and clays” (EK. A. Smith). The second Quaternary formation is the Port Hudson, occurring within 20 miles of the Gulf coast, and prob- ably outcropping occasionally in the Mississippi Bottom. Clays, gravel, and*~~
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~~*sands, containing cypress stumps, drift-wood, and mastodon bones, are characteristic. The loess or bluff formation lies along the bluffs bordering the Bottom, nearly continuously through the State. Its fine-grained, unstratified silt contains the remains of many terrestrial animals, including fifteen mammals.*~~

~~*Pro ers st iP Pi*~~

~~*The surface and subsoil of nearly all the upland region of Mississippi, the southern part being the exception, is composed of yellow loain or brick-clay containing no fossils, and showing no stratification. The soil of the Rotten Limestone region is similar in its general make up, but is black, aud contains more lime and clay. Both are regarded as an independent aqueous deposit, pos- terior to the stratified drift and bluff formations, and anterior to the alluvium of the present epoch. The 'second, bottoms," probably, are later than the yellow loam, and belong to the " terrace epoch." The latest formation, alluvium, is strongly marked, and covers a large area in the Yazoo and Mississippi Bottom, and along other streams.*~~

~~*The following are the equivalents of the Mississippi groups in Dana's Geology :—*~~

~~*(DOE NOMI oconsr.vcoes crecenevrscese 2 20c Loam and loess wee Quaternary…..----. "*~~*) 99% Port Hudson… is DANTE JOYS RRS Becocnoccoecneenetnnonrec 3 Grand Gulf. UPPer vesseerseves { Vicksburg. TOWN iissin es. csncssvoaees 19a Eocene… Middle ……. ns ; Buhrstone, Lagrange. Lower….. O coco Flatw aden : Ripley. on SOL esece ere Upper… seve peesceneias { Putten Liniwstoné. COUSccccvvccccsvee Tombigbee 18a….00+. LOWE! ..- are Coiice ; SubcarboniferOus …….cesescccccve. cere Been ssessescaccarecorenee Keokuk.*~~

~~*Minerals.—Metallic ores are not found in Mississippi in paying quantities. The only valuable minerals are sandstones and lime- stones, marls, sands, lignite or brown coal, and fire-clays. Nonc of these have been extensively brought into market. Potable water is found almost everywhere. Artesian wells furnish it in the Rotten Limestone region, when bored into the underlying Coffee strata.*~~

~~*Fauna.—Mississippi affords ere no species which are nov found in the neighbouring States. 'There are thirty or forty species of Mammalia, the most remarkable being the American opossum, still quite abundant. The deer (Cervus virginianus), black bear (Ursus americanus), wolves (Canis lupus and Lupus americanus), catamount (Felis concolor), and wild-cat (Lyncus rufus) have much decreased in number, and may, like the buffalo and elk, shortly become extinct. About one dmared and fifty species of birds are found during at least part of the year. Many are seen only in transitu, and about twenty species from the north spend the winter here. The mocking bird (Minus polyglottus), the most remarkable songster, is very abundant. The wild turkey (Meleagris gallipavo) survives by virtue of its wary and watchful character. Over fifty species of Reptilia have been found, prominent among which is the alligator (4. mississippiensis), which attains a length of 12 or 15 feet, and is common in the southern river bottoms. The rattlesnake, moccasin, and copperhead, venomous serpents, are occasionally found. About half of the sixty-three species of fish abounding in the fresh and salt waters of the State are valuable for food. The edible oysters and crustaceans of the coast are remarkably fine.*~~

~~*Flora.—Originally uearly the entire State was covered with a growth of forest trees of large size, mostly deciduous. The under- growth was kept down by annual burnings by the natives, and the ground became carpeted with grasses and herbs. Over 120 species of forest trees are found ; miany valuable ones are abundant, and their tiniber constitutes a large item in the resources of the State. Of the 15 species of oak the most valuable are the live-oak (Q. virens), found near the coast, and the white-oak (Q. alba), widely distributed. The cypress (Taxodiwm distichwm) is very abundant in the bottoms. Various species of hickory, the chest- nut, black walnut, sweet gum, cucumber tree, cottonwood (Populus deltoides), red cedar, elms, holly, maguolias, maples, ash, persim- mon, sycamore, tupelo, and many others valuable for their timber, are abundant and of large size. The long-leaved pine (P. australis) forms the principal forest growth south of lat. 32°15'. 1t attains a diameter of 2 or 3 feet, has a tall and shapely trunk, and its timber is unsurpassed in the variety of its uses. The census reports estimate the merchantable timber of this species now standing in the State at 18,200,000,000 feet, board measure. The amount cut in 1880 was 108,000,000 feet. The short-leaved pine (P. nvitis), almost as valuable, is*~~

~~found in various parts, the quantity now standing being estimated at 6,775,000,000 feet. The total value of the pine timber of the State is about $250,000,000.~~

~~Agriculture is the leading industry in Mississippi. Over 300,000 of the population are directly engaged in the cultivation of 4,895,000 acres of land. The character of the soil is varied, and all is productive, except that in the Flatwoods region and in the district covered with long-leaved pine, where only the valleys are fertile. At least half the State is exceptionally fertile. Not more than one-fourth of the arable land has been brought into culti- vation, and two millions of acres of the best lands in the State, lying in the Bottom, might be made arable by proper drainage.~~

~~Cotton is the chief agricultural product; in 1880 Mississippi~~

~~ranked first among the States in the amount raised. The crop of | New~~

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~~1879-80 amounted to 955,808 bales, worth $43,000,009. There were produced also of cotton seed 28,000,000 bushels, worth $3,000,000; of Indian corn, 21,340,800 bushels ; of oats, 1,959,620 bushels ; of wheat, 218,890 bushels ; of rice, 1,718,950 Ib. Small quantities of rye, barley, molasses, and tobacco, and abundant crops of potatoes, yams, pease, and all garden vegetables, are annually produced.~~

~~Fruits of various kinds flourish in many parts of the State, and, with early vegetables, are largely shipped to the northern markets in spring and early summer. The value of the cotton crop is about three times as great as that of all the other products of the soil, which are sometimes insufficient for home consumption. Economically this specialization of agriculture is to be regretted ; but successful efforts are being made to diversify it by growing other crops to which the soil and climate are equally well suited.~~

~~Manufactwres.—The principal articles manufactured are lumber, oe and woollen goods, cotton seed oil, and agricultural imple- ments.~~

Population.—The number of inhabitants according to the different census returns from 1850 is given in the following table :—

a

: , Density per Census. Total. White. Coloured. Sq. Mile. 1850 606,526 295,718 310,808 13°09 1860 791,314 353,910 437,404 17°07

1870 829,609 384,549 445,060 17:9

1880 1,131,592 479,371 652,221 24°42

Of the coloured population, mostly freedimen and their descend- auts, 1738 were Indians or half-breeds in 1880, and abont 60,000 mulattoes. The whites own nearly all the farms and other real property. The total property valuation in the State decreased trom $607,324,911 in 1860 to $209,197,345 in 1870, on account of the losses in war and the liberation of the slaves. There has been, however, a rapid increase in the last decade. The towns in the State have small populations: in 1880 Vicksburg had 11,814 in- habitants, Natehez 7058, and Jackson, the State capital, 5204.

Administration.—The three departments, legislative, executive, and judiciary, are similar to those of other States. The governor and other executive officers are elected for four years. The legis- lature, which meets biennially, is composed of forty senators, serving four years, and one hundred and twenty representatives, serving two years. These are apportioned to the seventy-four counties according to population, aud eleeted by the people. The judiciary officers, consisting of three justices of the supreme court, twelve circuit judges, and twelve chancellors, are appointed by the governor with the consent of the senate. One attorney-general and twelve district attorneys are elected by the people. 'The State maintains a public school system, with separate schools for the two races, costing in 1880 $830,704, besides a State university and other schools of high grade for each of the races.

History.—Mississippi was first visited by Europeans in 1540, when the adventurous expedition of De Soto reached its northern parts. After the disastrous termination of this expedition no other Europeans visited this

~~*region until 1673, when Joliet and Pere Marquette descended the Mississippi to lat. 33°. In 1682 La Salle and Tonty descended to the mouth of the river, and claimed the whole region drained by it for the king of France, giving it the name Louisiana. In 1699 the first colonists reached the coast of Mississippi, sent from France under Iberville. Settlements were made on Ship Island and Cat Island, and upon the mainland on the eastern side of Biloxi Bay, at Bay St Louis, and at Mobile. The colony did not prosper, and in 1712 Anthony Crozat obtained by charter from the king all the commercial privileges of the lower Mississippi valley. Under his management the colony languished, and in 1717 the king accepted the surrender of his charter, and granted another with more extended privileges to the '¢ Western Company," or " Mississippi Scheme," with John Law as director-general, and Bienville as governor of the colony. Under this management the rich alluvial lands on the Mississippi river began to be occupied ; tobacco, rice, and indigo were culti- vated, and African slaves were introduced. Settlements were made near the present city of Natchez in 1720. wo years later, Law's company becoming bankrupt, much embarrassment in the colony followed, and troubles also began with the natives. On November 28, 1729, the Natchez Indians surprised and murdered about 200 of the white male residents, and made captives of about 500 women and cbildren and negroes. A war followed, resulting in the destruction of the Natehez tribe. The representatives of the '* Western Company " returned their franchises to the king in 1782, the number of colonists and slaves being then about 7000. _ After two unsuccessful eampaigns against the Chickasaw Indiaus in the northern part of what is now Mississippi, Bienville was superseded by the Marquis de Vaudreuil in 1740. ;*~~

~~*By the treaty of Paris, in 1763, France ceded all her possessions east of the Mississippi river to England, excepting the island of Orleans, ceded to Spain. The British province of West*~~

~~*Plate VII.*~~

~~*524*~~

~~*Florida at first extended eastward from the Mississippi river along the Gulf coasts, with its northern limit at the 31st parallel of north latitude. Soon*~~

~~*afterwards the northern boundary was fixed at a line drawn eastward from the point where the Yazoo river unites with the Mississippi.*~~

~~*Under British rule the Natchez country, which had been deserted since the massacre of 1729, and the southern part of the present State of Mississippi, rapidly filled with settlers, many of them emigrants from the Atlantic colonies. Cotton, indigo, and sugar were cultivated, and negro slaves continued to be freely introduced. During the revolutionary war of the Atlantic colonies, West Florida, being far removed, remained undisturbed until 1779. Spain and England being then at war, Galvez, the governor of New Orleans, aided by sympathizers with the revolutionary colonists, took possession of the whole of West Florida for the king of Spain. At the peace of 1783 England acknowledged the 31st parallel as the southern boundary of the United States, and ceded West Florida to Spain. The district between the 31st parallel and the parallel through the mouth of the Yazoo was therefore claimed by the United States and by Spain, the latter being in possession. After tedious negotiations the latter power relinquished the district in March 1798, and Congress at once formed it into " the Mississippi Territory," which extended from the Mississippi river eastward between the two above-mentioned parallels of latitude to the Chattahoochee river.*~~

~~*The State of Georgia claimed as a part of its domain all of the district east of the Mississippi river, and between the 31st and 35th parallels. In 1802 it ceded its claims to the Federal Government for certain considerations, and in 1804 Congress extended the limits of the Mississippi Territory northward to the 35th parallel. Nearly all of the Territory was then owned by the native Indians. The Choctaws occupied the southern part, and the Chickasaws the northern part of what is uow the State of Mississippi. In 1812 the United States troops occupied Spanish West Florida, and the district east of Pearl river and south of lat. 31° was added to the Mississippi Territory. The Territory was divided by the present line between Alabama and Mississippi, and the State of Mississippi admitted into the Union in 1817. In 1830-32 the native tribes exchanged their lands for others west of the Mississippi river and were nearly all removed, and a rapid influx of settlers followed. In January 1861 the State seceded from the Federal Union, and, joining the Southern Confederacy, furnished a large*~~

~~*number of troops during the civil war. It was the field of many important campaigns, and suffered great losses. Exhausted by the conflict, and harassed by processes of political reconstruction, the State was in a deplorable condition for several years. But within the last decade an era of laa or commenced, marked by a large increase in population and great activity in agricultural and other pursuits.*~~

~~*Literature.—Gayarré, History of Louisiana; Monette, History of the Valley o7 the Mississippi, New York, 1846; Claiborne, Mississippi as a Province, Territory, and State, Jackson, 1880; Wailes, Agriculture and Geology of Mississippi, Jackson, 1854; Uilgard, Agriculture and Geology of Mississippi, Jackson, 1860; Smith,*~~

~~*Outline of the Geology of Alabama, Montgomery, 1880; Wall, Handbook of Mis- Sissippi, Jackson, 1882. (R. B. F.)*~~

~~*MISSOLONGHI, or Mesotoneut (MeooAoyyiov), a city of Greece, the chief town of the nomarchy of Acarnania and Autolia, situated on the north side of the Gulf of Patras, about 7 miles from the coast, in the midst of a shallow lagoon, with a population of 6324 in 1879, is notable for the siege of two months which Mavrocordatos with a handful of men sustained in 1821 against a Turkish army 11,000 strong, and for the more famous defence of 1825-26 (see vol. xi. p. 125). Byron died there in 1824, and is commemorated by a cenotaph.*~~

~~*MISSOURI, a Central State of the American Union, lying almost midway between the Atlantic and the Rocky Mountains, British America and the Gulf of Mexico. Its eastern boundary is the Mississippi, separating it from Tllinois, Kentucky, and Tennessee. North and south its boundaries with Iowa and Arkansas respectively are mainly coincident with the parallels of 40° 30' and 36° 30' N. lat.; but a small peninsula between the Mississippi and St Francois rivers stretches 34 miles farther south between Arkansas and Tennessee. The western border with Nebraska, Kansas, and the Indian Territory, is nearly coincident with the course of the Missouri to the junction of that stream with the Kansas, and then follows the meridian of 17° 40' W. of Washington (94° 43' W. of Greenwich). The area of the State is 65,350 square miles, the extreme length from north to south 282 miles, the extreme width 348 miles. Missouri is divided into*~~

~~*a northern and southern portion by the Missouri river, flowing 400 miles in a generally easterly direction from its junction with the Kansas to the point 12 miles above St Louis where it unites with the Mississippi. Northern Missouri has a surface broken and hilly, but not moun- tainous. It is mainly prairie land, well watered by streams, and fit for agriculture ; but there is a good deal of timber in the eastern parts, especially along the bold bluffs of the two great rivers. Southern Missouri is almost equally divided between timber land in the east and prairie in the west. In its south-western portion rises the table-land of the Ozark hills (highest point 1600 feet above the sea). The Osage, the Gasconade, and other streams flow north- ward and eastward into the Missouri. The south-eastern lowlands form an undulating country, readily drained after rain, with fertile ridges generally running north and south, occasional abrupt isolated hills, forests of oak, hickory, elm, maple, ash, locust, willow, persimmon, pecan, chestnut, and cherry trees, and in the lowest parts swamps and morasses. High rocky bluffs extend along the banks of the Mississippi from the mouth of the Meramec river to Ste Genevieve, rising sometimes precipitously to the height of 350 feet above the water, and low bottom lands with many lakes and lagoons extend from Ste Genevieve to the Arkansas border. The south-east corner of the State is 275 feet above the sea, the north-east corner 445 feet, and the north-west corner 1000 feet.*~~

~~*Climate.—The climate of Missouri, lying as it does far from the ocean and unprotected by mountain ranges, is one of extremes in heat and cold, moisture and drought. The Ozark range is high enough to influence the climate locally, but not to affect that of the whole State. The mean summer temperature for the ten years 1870-80 ranged from 75° in the north-west of the State to 78°°5 in the south-east; but the thermometer has been known to rise to 104°. The winter temperature averaged 33°:87 for the whole State, varying from 28°°5 in the north-west to 39°°5 in the south-east. In some winters the temperature hardly falls to zero; in others 20° below zero have been registered. The Mississippi at St Louis freezes over once in four or five years; but this is partly caused by the accumulations of floating ice coming down from the north. The river has closed as early as the first week in December, and, again, has remained open until the last week in February. It*~~

~~*is in cold seasons sometimes passable for the heaviest teams. The Missouri river is often closed during the whole winter. The mean annual temperature of the State varies from 53°-to 58°. The climate is, on the whole, dry ; for, in spite of the abundant rains, especi- ally in the spring, evaporation is so rapid that the atmo- sphere is rarely overloaded with moisture. April is the driest month. The greatest amount of rain falls in the south-eastern part of the State. An unusual amount of fair weather, prevailing clearness of sky, general salubrity of soil and climate, are chief among the natural advantages of this great State.*~~

~~*Geology.—The stratified rocks of Missouri belong to the following divisions :—Quaternary, Tertiary, Carboniferous, Devonian, Silurian, and Archean. The Quaternary system comprises the drift, 155 feet thick ; the bluff, 200 feet above the drift; then the bottom prairie, 35 feet thick ; and on the surface the alluvium, 30 feet in thickness. Clays with strata of sands, marls, and humus form the alluvial bottoms of the two great rivers of the State, and make up a soil deep, light, and incomparably rich. Beneath the alluvium is found the bottom prairie, made up also of sands, clays, and vege- table moulds. This formation is found only in the bottom lands of the Missouri and Mississippi rivers, and more abundantly in those of the former. Numerous and well- preserved organic remains are found in the bottom prairie,*~~

~~*mee Ss © UR I*~~

~~*including the shells found in great quantities in the bluff and remains of the mastodon and many trees and plants. Below this formation, resting upon the drift, is the bluff. This rests upon the ridges and river bluffs, and thus is topographically higher, although geologically lower, than the bottom prairie. It is composed chiefly of a grey siliceous marl, coloured sometimes to a deep brown or red by the stains of oxide of iron. This formation extends along the bluffs of the Missouri from Fort Union to its mouth, and is found capping those of the Mississippi from Dubuque to the mouth of the Ohio. It is sometimes 200 feet thick ; at St Joseph it is 140, at Booneville 100, at St Louis 50, in Marion county only 30 feet. This forma- tion has interesting fossils (Zlephas primigenius, &c.). The drift, the lowest of the Quaternary system, appears in the altered drift, the boulder formation, made up largely*~~

~~of the igneousandmetamorphicrocks, with rocks from the Paleozoic strata upon which the others rest. Large boulders, five or six feet in diameter, are found, usually of granite or meta- morphic sandstone; no fossils except a few logs in the altered drift have been found in this formation. The Tertiary formation in Missouri is composed of clays, shales, iron ores, sandstone, and sand, and extends along the bluffs and bottoms of the south-east part of the State. Iron ore is found in this formation in great abundance ; sand of the best quality for glass-making and clays for pottery and stoneware also abound. Below the Tertiary bed are found rocks which strongly resemble Cretaceous beds found in other places in the United States. These strata are in such a state of irregularity and disturbance as to indicate the occurrence of some great movements after their deposition and before the formation of the Tertiary strata. The Upper~~

~~Carboniferous system, or coal measures, made up of sand- |~~

~~stone, limestone, marl, coal, and iron ores, covers an area of more than 23,000 square miles in Missouri, occupying the western and northern portions of the State. The supply of bituminous and cannel coals found here would seem to be well-nigh inexhaustible. In the Lower Carboniferous rock are found many varieties of limestone and sandstone. Among these are the Upper Archimedes Limestone, 200 feet; Ferruginous Sandstone, 195 feet ; Middle Archimedes Limestone, 50 feet; St Louis Limestone, 250 feet. The Devonian system is represented by limestone in Marion, Ralls, Pike, Callaway, Saline, and Ste Genevieve counties,~~

~~among which occur the Chouteau Limestone, 85 feet;~~

~~Lithographic Limestone, 125 feet ; Onondaga Limestone, 100 feet. Of the Upper Silurian series are the following formations :—Lower Helderberg, 350 feet; Niagara Group, 200 feet ; Cape Girardeau Limestone, 60 feet. Prominent among the Lower Silurian formations are the Trenton Limestone, 360 feet; the Black River and Bird's Eye Limestone ; and the Magnesian series. The last-named series is valuable both in a scientific and an economic sense. It covers much of the southern and south-eastern portions of the State, and in it are found vast deposits of lead, zinc, copper, cobalt, iron ores, and marble. The Archean rocks occur below the Silurian deposits,~~

~~*and contain siliceous and other slates in which no fossils are found. The porphyry rocks of this formation also contain iron ores.*~~

~~*Coal.—The exposed coal in Missouri includes upper, middle, and lower measures. In the first are about 4 feet of coal, and the area of exposure is about 8400 square miles. The middle coal measures contain about 7 feet of coal, and cover an exposed area of about 2000 square miles. The lower measures have five workable seams, varying from 18 inches in thickness to 43 feet, and also some thin seams of only a few inches. In 1880 556,304 bushels of bitu- minous coal were raised in thirty-five counties of Missouri, the value at the pit mouth being $1,060,225. $642,772 were paid in wages to 2599 persons. The Missouri coal mines are easily worked.*~~

~~*Jvon.—The iron ores are red hematite, red oxide, specular iron,*~~

~~*brown hematite or limonite, and clay ironstone. Manganiferousand |*~~

~~*siliceous specular ores occur in the porphyries of the Archean rocks,*~~

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~~*and in the granites. The greatest exposure of specular iron yet dis- covered is Iron Mountain, the purest mass or body of iron ore known. Analysis shows it to contain from 65 to 69 per cent. of metallic iron. The ore of Shepherd Mountain is not so rich as that of Iron Moun- tain, but is uniform in character, free from sulphur and phosphoric acid and on the whole superior to any other yet developed in Missouri. Pilot Knob ore gives 53 to 60 per cent. metallic iron, and has few deleterious substances. It is fine-grained, light bluish grey in colour. The ore of the Scotia iron banks and Iron Ridge are much alike in appearance and character, being specular boulders imbedded in soft red hematite. In some of these boulders are cavities in which the ore has taken botryoidal form, and upon these peroxide of iron crystallizations are so formed that a gorgeous show of prismatic colours is presented. The above are the chief deposits of iron ores, but limonites are found mostly in the southern parts of the State. The counties of Ste Genevieve, Madison, St Francois, Cape Girar- deau, Bollinger, Wayne, Stoddard, Washington, Reynolds, Shan- non, Carter, and*~~

~~*Ripley have the greatest exposures of these orcs, although they are found in many others. The supply of iron ores is, indeed, practically inexhaustible.*~~

~~*Lead.—Second only to iron among the metals of Missouri is the vast deposit of lead found in the southern parts of the State. The great disseminated lead region occupies about one-half of the north- ern portion of Madison, and about as much of St Frangois county. It isin the magnesian limestone that the largest quantities have been found. In Franklin county galena is found in abundance in ferruginous clay and coarse gravel. In the great mammoth mine in Washington county is a succession of caves in which millions of pounds of lead were found adhering to the sides and roofs, The central lead district of the State compvises the counties of Cole, Cooper, Moniteau, Morgan, Miller, Benton, Maries, Camden, and Osage ; the southern lead region the counties of Pulaski, Laclede, Texas, Wright, Webster, Douglass, Ozark, and Christian. The western lead district includes the counties of Hickory, Dallas, Polk, St Clair, Cedar, and Dade; the south-western the counties of Jasper, Newton, Lawrence, Stone, Barry, and M'Donald. The two couuties Jasper and Newton produce fully one-half of the pig lead of Missouri. The lead mines of Granby are among the best- known in the State, and millions of pounds of lead have been taken from these lands.*~~

~~*Copper deposits have been found in several counties, chiefly in the south-western part of the State. Zinc is found, in the shape of sulphuret and also silicate of zinc, in nearly all the lead mines in south-western Missouri. It has often occurred in such masses as seriously to hinder mining operations, and until very recent years, when railroad facilities have given this ore a market, it was thrown aside as worthless. It is now an important and profitable adjunct of the lead mines of Missouri. Cobalt and niekel are found at Mine La Motte and in a few otherplaces. Silver is found in small quan- tities in lead nines in Madison county, combined with the lead.*~~

~~*Clays for the manufacture of ordinary brick for building purposes and for fire-brick exist in quantities beyond computation, and kaolin has been found in a few places. Marble of various shades and qualities abounds in Missouri, and is an important item in its mineral wealth. Limestones and sandstones suitable for building purposes are found in many parts of the State.*~~

~~*Agricultwre.—Indian corn, wheat, oats, and tobacco are the staple products ; but cotton, hemp, and flax are also raised to some extent in the southern counties. The average yield of wheat to the acre is 30 bushels, and that return is often far exceeded. No flour is of a higher quality or more in demand in foreign as well as home markets than that made from Missouri wheat. Indian corn is especially used in fattening live stock. Blue grass, timothy, red-top, and red and white clover grow luxuriantly, and favour stock-raising. In some parts of the State pasturage can be had all the year round, and the cheapness of corn makes the raising of pork, in particular, a very profitable business. All varieties of fruit can be very suc- cessfully cultivated. The more tender fruits, such as apricots, nec- tarines, figs, and many choice kinds of grapes, grow here as well as the more northern fruits —the apple, the pear, the pluin, and the cherry. Apples and peaches do well in all parts of the State. Six native varieties of grapes are found in luxuriant growth, and many cultivated varieties have been successfully introduced. No State, not even California, can hope ultimately to rival Missouri in the production of both red and white wines. Sheep-raising has proved remunerative in the southern counties chiefly, where the mild cli- mate, the fine grasses, and the abundance of good water are especially favourable to this branch of agricultural industry. There are in Missouri, in round numbers, 10,000,000 acres of improved and 13,000,000 of unimproved land, including 9,000,000 acres of wood- land. 'The cash value of the farms is estimated at $90,000,000. In 1880 there were on the farms in the State 667,776 horses, 192,027 mules and asses, 9020 oxen, 661,405 cows, 1,410,507 other cattle, 1,411,298 sheep, and 4,553,123 swine. Missouri is the fourth maize-producing State of the Union; it supplies more wine than any State except California, and is a rival of Kentucky, Virginia, Tennessee, and Maryland in the culture of tobacco, which is a*~~

~~*staple in the rich counties in the northern central part of the State, bordering upon the Missouri river. No State raises so many mules, asses, and hogs. The production of cereals in 1880 was——corn, 202,485,723 bushels ; wheat, 24,966,627 bushels ; rye, 535,426 bushels ; oats, 20,670,958 bushels ; barley, 123,031 bushels ; buckwheat, 57,640 bushels. The production of tobacco for the same year was 12,015,657 tb from 15,521*~~

~~*acres, valued at $600,256, Three-fourths of this amount was raised in Chariton, Marion, Randolph, Howard, Callaway, and Saline counties.*~~

~~*Wild Animals.—Red-deer are found in every part of the State, especially in the thinly-settled and mountainous districts. Venison, indeed, in its season, is as cheap as good beef in the markets of St Louis. Wild turkeys are numerous in the swampy and mountainous districts, and are found in all parts of the State. Prairie chickens, or pinnated grouse, are found in the prairie portion of Missouri, and are shipped in great numbers to Eastern markets. In all parts of Missouri are found the quail or Virginia partridge, thousands of barrels of which are shipped from the State each season. The rabbit, a species of hare, is so common as to be considered a pest. The grey squirrel and the red fox-squirrel are also found in large numbers all over the State. Black bass, perch, catfish, buffalo fish, suckers, and pike are the leading varieties of native fish.*~~

~~*Manufactures.—In 1880 Missouri had about 20,000 manufactur- ing establishments, in which a capital of about $125,000,000 was employed. The products of these establishments were valued at upwards of $300,000,000. The leading manufacturing counties outside of the city of St Louis are Jackson, Buchanan, St Charles, Marion, Franklin, Greene, Cape Girardeau, Platte, Boone, and Lafayette; but more than three-fourths of the manufactures are produced at St Louis, which is the fourth manufacturing city of the Union. The chief manufacture is that of flour, which employs about 900 mills, and is rapidly increasing. Twenty-four mills made in St Louis, in 1880, 2,142,949 barrels of flour, having a daily out- put of more than 11,000 barrels. St Louis millers and dealers sent in 1880 to Europe and South America 619,108 barrels of flour ; and at the world's fairs at Paris, Vienna, and Philadelphia, Missouri flour received the first award. The iron industry, which stands second in importance, is yet only in its infancy, and St Louis seems destined to be one of the great centres of iron and steel manufacture. The amount of iron made in Missouri in 1880, in twenty-two establish- ments employing 3189 hands, was 125,758 tons. St Louis made the same year 102,664 tons of pig-iron, steel, and rolled iron and blooms. The yearly values of a number of other industries are estimated as follows :—meat packing, $20,000,000 ; lumber, $10,000,000 ; bags and bagging, $7,000,000; saddlery, $7,000,000 ; oi}, $6,000,000 ; printing and*~~

~~publishing, $5,500,000 ; furniture, $5,000,000 ; car- riages and waggons, $4,500,000 ; marble and stone, $4,000,000 ; tin, copper, and sheet-iron, $4,000,000 ; agricultural implements, $2,000,000. The manufacture of glass and glass-ware is carried on to a considerable extent, especially in St Louis. At Crystal City, on the Mississippi, 80 miles below St Louis, is a very large deposit of sand suitable for the manufacture of plate-glass, and a company has been organized and is now in successful operation, with a capital of $1,000,000.~~

~~Commerce.—The extensive commerce of Missouri centres at St Louis, between which city and the ports on the Mississippi and Missouri rivers steamboats are constantly plying. Railroad _traus- portation has, in recent years, furnished superior and cheaper facilities for much of the trade which formerly depended upon the rivers. The trade in cotton especially has been greatly increased in Missouri since 1870 by the use of railroad transportation, which has made St Louis one of the great cotton centres of the United States. Extensive cotton presses were built in St Louis in that year, and the receipts of cotton from the more southern States has increased rapidly—from 12,264 bales in 1869-70 to 457,568 bales in 1879-80. Railroad connexions have made the interior portions of Arkansas and Texas more accessible to St Louis than to the southern ports of shipment, and the trade with the south-west, with the Indians, and with Mexico is constantly increasing. In 1870 St Louis was made by Act of Congress a port of entry to which foreign merchandise could be brought in bond. The value of the direct imports for the year ending 30th June 1882 was $1,934,342.~~

~~Population.—Missouri is divided into 114 counties. The following table gives the number of inhabitants since 1850 :— .~~

~~Males. Females. Total. Density per ‘ square mile. 357,882 | 324,212 682,044 14°37 622,201 | 559,811 | 1,182,012 18-08 896,347 824,948 1,721,295 26°34 1880 1,127,187 | 1,041,193 | 2,168,380 31°55~~

~~In 1880 the foreign-born residents numbered 211,578, or 9°7 per cent., of whom 109,974 were Germans and Scandinavians ; there were also 145,046 of African descent. The early settlers of the State~~

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~~were French, and their descendants are still found in St Louis and Ste Genevieve and a few other smaller towns. Many Germans have recently settled in all parts of the State, while English, Irish, Scotch, and Swedes have also made Missouri their home in considerable numbers. The native American population is mostly descended from immigrants from the States of Kentucky, Tennessee, N orth Carolina, and Virginia. During recent years there has been a large accession to the population from the eastern and north-western States.~~

~~St Louis, the chief city of the Mississippi valley, situated upon the Mississippi river about 12 miles below the mouth of the Missouri, has a population of 850,518; Kansas City, a thriving town on the western border, situated on the banks of the Missouri, has 55,785 ; St Joseph, in the north-west, has 32,431 ; Hannibal, in the north-east, has 11,074 ; and Jefferson City (the State capital), in the centre, has 5271.~~

~~Education.—Missouri has a public school system of education first adopted in 1839. There are district schools, elementary and ungraded ; city schools, graded, with high school courses; four normal schools, and a State university. Free public schools for white and coloured children between the ages of six and twenty years are required by law for every district in the State. Besides these public institutions supported by the State there are many private schools and colleges for both sexes. Chief among these are the St Louis University, an institution managed by the Jesuits ; the College of Christian Brothers, also under the control of the Roman Catholics ; and Washington University, a non-sectarian en- dowed school, which has property estimated at $1,000,000, and more than 1300 students. The Baptists have a college at Liberty called William Jewell College ; the Congregationalists one at Spring- field called Drury College ; and the Methodists and Presbyterians several colleges and seminaries.~~

~~Religion.—The early settlers of Missouri were Roman Catholics, and in the river towns may be found to-day a large number of that faith. The Baptists have 88,999 members, with 1885 churches ; the Methodists, 96,270 members and 918 churches ; the Protestant Episcopal Church, 25,000 members and 65 church buildings ; the Presbyterians, with their various branches, 84,628 members and 706 churches.~~

~~*Administration.—The legislative power is vested in a body con- sisting of a senate and a house of representatives, which meets once in every two years, on the Wednesday after the first day of January next after the election of the members thereof. Members of the legislature are paid a sum not to exceed $5 a day for the first seventy days of the session, and after that not to exceed $1 a day for the remainder of the session. They are also allowed mile- age. The executive department consists of a governor, a lieu- tenant-governor, a secretary of state, a State auditor, State treasurer, an attorney-general, and a superintendent of public instruction ; these are all elected by the people. The supreme executive power is vested in the governor, who is chosen for four years, as also are the other members of this department. The governor has a qualified veto upon the acts of the legislature, and such other powers as are common to that officer in the several States. The judicial power of the State is lodged in a supreme court, the St Louis court of appeals, circuit courts, criminal courts, probate courts, and municipal courts. All judicial officers are elected by the people. Judges of the supreme court are elected for ten years, those of the St Louis court of appeals for twelve years, those of the circuit courts for six years. Executive and judicial officers are liable to impeachment by the house of repre- sentatives. All impeachment cases are tried by the senate.*~~

~~*Every male citizen of the United States, and every male person of foreign birth who may have declared his intention to become a citizen of the United States, according to law, not less than one year nor more than five years before he offers to vote, who is over the age of twenty-one years, is entitled to vote at all elections by the people, if he has resided in the State one year immediately preceding the election at which he offers to vote, and has resided in the county, city, or town where he shall offer to vote at least sixty days immediately preceding the election.*~~

~~*History.—On the 9th April 1682, the French voyager and dis- coverer La Salle took possession of the country of Louisiana in the name of the king of France. Its limits were quite indefinite, and in- cluded the present territory of Missouri (see LovistAna). The first settlements of Missouri were made in Ste Genevieve and at New Bourbon, but uncertainty exists as to the exact date. By some the year is fixed at 1768; by others, and by many traditions, as early as 1735. St Louis was settled by Pierre Laclede Liguest, a native of*~~

~~France. The site was chosen in 1768, and in February 1764 Auguste Chouteau went at the order of Liguest to the spot previously selected, and built a small village. For a long time the settlements were confined to the neighbourhood of the river. On the 31st of October 1808 the Congress of the United States passed an Act by which the president was authorized to take possession of the territory according to the treaty of Paris, and the formal transfer of Lower Louisiana was made on 20th December~~

~~1803. In 1804 Congress divided the territory into two portions. The northern part, commonly called Upper Louisiana, was taken possession of in March 1804. In June 1812 Missouri was organ- ized as a Territory, with a governor and general assembly. The first governor (1813-1820) was William Clarke. In 1818 Missouri applied for admission to the Union as a State. Two years of bitter controversy followed, which convulsed the country and threatened the dissolution of the Union. This controversy followed a resolution introduced into Congress which had in view an anti-slavery restriction upon the admission of Missouri to the Union. This was at last settled by the adoption of the " Missouri compromise," which forbade slavery in all that portion of the Louisi- ana purchase lying north of 36° 30' except in Missouri, and on 19th July 1820 Missouri was admitted to the Union. A conven- tion to frame a constitution had already been called, and the constitution then adopted remained without material change until~~

~~1865.~~

~~St Louis in September 1820, and Alexander M'Nair was chosen governor in August. The seat of government was fixed at St Charles in 1820, and removed to Jefferson City, the present State capital, in 1826. The first census of the State was taken in 1821, when the number of inhabitants was found to be 70,647, of whom 11,254 were slaves. In the Black Hawk war in 1832, the Florida war in 1837, and the Mexican war in 1846 Missouri volunteer troops did their share of the work. In the troubles in Kansas, and the bitter discussion upon the question of slavery, Missouri was deeply involved. A strong feeling in favour of secession showed itself in many parts of the State. Governor Jackson, in his inaugural address on the 4th of January 1861, said that Missouri must stand by the slaveholding States,~~

~~*whatever might be their course. The election of a majority of Union men, however, as delegates to a convention ealled to eonsider the aifairs of the nation, showed that public sentiment was hostile to secession, and the convention adjourned without committing the State to the seeession party. United States troops were soon gathered at St Louis, and forees were also sent to Jefferson City, and to Rolla. Governor Jaekson fled from the eapital, and summoned all the State troops to meet him at Booneville. General Lyon defeated these troops, 17th June 1861, and soon most of the State was under the eontrol of the United States forees. tion was reassembled. This body deelared vacant the offices of governor, lieutenant-governor, and secretary of state, and filled them by appointment. The seats of the members of the legislature were also declared vaeant.*~~

~~*The first general assembly under the constitution met in* |~~

~~*The State conven-* |~~

~~*Governor Jackson soon issued a pro-* |~~

~~*clamation deelaring the State out of the Union, and Confederate | forees were assembled in large numbers in the south-western part* |~~

~~*of the State. Creek near Springfield, and General Fremont, commanding the department of the west, deereed martial law throughout the State. For a year matters were favourable to the Confederates, and at the opening of 1862 their troops held nearly half the State ; but in*~~

~~*General Lyon was killed at the battle of Wilson's* |~~

~~*February a Federal foree under General Curtis drove General Price* |~~

~~*into Arkansas. He returned in 1864, and overran a large part of the State, but was finally foreed to retreat, and but little further trouble arose in Missouri during the war. the United States army during the war 108,773 troops. a new eonstitution was adopted by the people. In 1869 the XV. Amendment to the United States constitution was adopted by a large majority. by a convention called for that purpose, and ratified by the people, and is now the fundamental law of the State. (M. S. S.)*~~

~~*MISTLETOE! (Viscum album, L.), a species of Viscum, of the family Loranthacex. The whole genus is parasitical, and seventy-six species have been described ; but only the mistletoe proper is a native of Europe. It forms an ever- green bush, about 4 feet in length, thickly crowded with (falsely) dichotomous branches and opposite leaves. The leaves are about 2 inches long, obovate-lanceolate, yellowish green ; the dicecious flowers, which are small and nearly of the same colour but yellower, appear in February and March ; the fruit, which when ripe is filled with a viscous semitransparent pulp (whence birdlime is derived), is almost always white, but there is said to be a variety with red fruit. evergreen trees and shrubs, and "it would be difficult to*~~

~~*1 Greek itfa or ités, hence Latin viscum, Italian vischio or visco, and French gui. The English word is the Anglo-Saxon misteltan, Icelandic mistelteinn, in which tan or tetnn means a twig, and mistel may be associated either with mist in the sense of fog, gloom, beeause of the prominence of mistletoe in the dark season of the year, or with the same root in the sense of dung (from the character of the berries or the supposed mode of propagation).*~~

~~*Missouri furnished to | In 1865 |*~~

~~*In 1875 still another State constitution was drawn up |*~~

~~*The mistletoe is parasitic both on deciduous and |*~~

~~*O27*~~

~~*say on what dicotyledonous trees it does not grow" (Loudon). In England it is most abundant on the apple tree, but rarely found on the oak. 'The fruit is eaten by most frugivorous birds, and through their agency, particu- larly that of the thrush (hence missel-thrush or mistle- thrush), the plant is propagated. (The Latin proverb has it that "Turdus malum sibi cacat"; but the sowing is really effected by the bird wiping its beak, to which the seeds adhere, against the bark of the tree on which it has alighted.) The growth of the plant is slow, and its dura- bility proportionately great, its death being determined generally by that of the tree on which it has established itself. See Loudon, Arboretum et Fruticetum Britannicum, vol. ii. p. 1021 (1838).*~~

~~*The mistletoe so extensively used in England at Christmas tide is largely derived from the*~~

~~*apple orchards of Normandy.*~~

~~*Pliny (H. V., xvi. 92-95; xxiv. 6) has a good deal to tell about the viscwm, a deadly parasite, though slower in its aetion than ivy. He distinguishes three " genera." "On the fir and lareh grows what is called stelés in Euboa and hyphear in Arcadia." Viscum, called dryos hyphear, is most plentiful on the esculent oak (quereus), but oeenrs also on the robur, Prunus sylvestris, and terebinth. Hyphear is useful for fattening cattle if they are hardy enough to withstand the purgative effeet it produces at first ; viseum is medicinally of value as an emollient, and in eases of tumour, uleers, and the like; and he also notes it "coneeptum foeminarum adjuvare si omnino secum habeant." Pliny is also our authority for the reverence in whieh the mistletoe when found growing on the robur was held by the Druids. The robur, he says, is their saered tree, and whatever is. found growing upon it they regard as sent from heaven and as the mark of a tree chosen by God. Sueh eases of parasitism are rare, and when they oeeur attract much attention (est autem id rarum admodum inventu et repertum magna religione petitur), partieularly on ,the sixth (day of the) moon, with which their months and years and, after the lapse of thirty years, their "ages" begin. Calling it in their own language "all heal" (omnia sanantem), after their sacrifices and banquets have been duly prepared under the tree, they bring near two white bulls whose horns are then for the first time bound. The priest clothed with a white robe ascends the tree, euts [the mistletoe] with a golden hook; it is caught in a white mantle. They then slay the vietims, praying God to prosper His gift to them unto whom He has given it. Prepared as adranght, it is used as a eure for sterility and a remedy for poisons. The mistletoe figures also in Seandinavian legend as having furnished the material of the arrow with whieh Baldur (the sun-god) was slain by the blind god Héder. Most probably this story had its origin in a partieular theory as to the meaning of the word mistletoe.*~~

~~*MITAU (the Lettish Jelgava), a town of Russia, capital of the government of Courland. It is situated 27 miles by rail to the south-west of Riga, on the right bank of the river Aa, in a fertile plain which rises only 12 feet above*~~

~~sea-level, and which probably has given its name to the town (Mitte in der Aue). At high water the plain and sometimes~~

~~also the town are inundated. Mitau is surrounded by a~~

~~canal occupying the place of former fortifications. Another canal was dug through the town to provide it with water; but this now receives the sewage, and water is brought in cars from a distance of 3 miles. Though so near Riga, Mitau has quite a different character. It has regular broad streets, bordered with the low pretty mansions of the German nobility who reside at the capital of Courland either to enjoy the social amusements for which Mitau is renowned or to provide education to theirchildren. Mitau is well provided with educational institutions. A gym- nasium occupies a former palace of the dukes of Courland, and has a rich library; and there are about forty other schools. The town is also the seat of a society of art and literature, of a natural history society, which has a good local museum, and of the Lettish Literary Society. The old castle of the dukes of Courland, which has witnessed so many conflicts, was destroyed by the Duke Biron, who erected in its place a spacious palace, now occupied by the governor and the courts. Mitau has 22,200 inhabitants, mainly Germans, but including also Jews (about 6000), Letts (5000), and Russians. Manufactures are few, those~~

~~of wrought-iron ware and of white-lead being the most im- portant. The river Aa brings Mitau in connexion with the trade of Riga, small vessels carrying goods to the amount of about £150,000 a year.~~

~~Mitau is supposed to have been founded in 1266 by the grand- master Conrad Mandern. It has often changed its rulers. In 1345, when it was plundered by Lithuanians, it was already an important town, In 1561 it became the residence of the dukes of Courland. During the 17th century it was thrice taken by the Swedes, Russia annexed it with Courland in 1795. At the be-~~

~~ginning of this century it was the residence of the count of~~

~~*Provence (afterwards Louis XVIII.). Napoleon I.*~~

~~*MITCHEL, Ormssy M'Kyicurt (1810-1862), American general and writer on astronomy, was born in Union county, Kentucky, August 28, 1810. He began life as a clerk, but, obtaining an appointment to a cadetship at West Point in 1825, he graduated there in 1829, and became assistant professor of mathematics in 1831. Subsequently he was called to the bar, but forsook law to become professor of mathematics and natural philosophy at Cincinnati college. There he established an observatory, of which he became director. From 1859 to 1861 he was director of the Dudley observatory at Albany. He took part in the war as brigadier-general of volunteers, and for his skill and rapidity in seizing certain important strategic points was on April 11, 1862, made major-general. He died of yellow fever at Beaufort, South Carolina, October 30, 1862. Besides making important improvements on several astrono- mical instruments, Mitchel was the author of several works on astronomy, the principal of which are The Planetary and Stellar Worlds (1848) and The Orbs of Heaven (1851). See Memoir by Headley (1865).*~~

~~*MITCHELL, Sir THomas Livinestone (1792-1855), Australian explorer, was a son of Mitchell of Craigend, Stirlingshire, where he was born, June 16, 1792. From 1808 to the end of the Peninsular War he served in Wellington's army, and for his services received the medal and five clasps, and was raised to the rank of major. He was appointed to survey the battlefields of the Peninsula, and his map of the Lower Pyrenees is still admired. In 1827 he was appointed deputy surveyor-general, and after- wards surveyor-general, of New South Wales. He devoted himself to the exploration of Australia, making four expeditions for that purpose between 1831 and 1846. During these expeditions he discovered the Peel, the Namoi, the Gwyder, and other rivers, traced the course of the Darling and Glenelg, and was the first to pene- trate into that portion of the country which he named Australia Felix. His last expedition was mainly devoted to the discovery of a route between Sydney and the Gulf of Carpentaria, and during the journey he explored the Fitzroy Downs, and discovered the Balonne, Victoria, Warrego, and other streams. In 1838, while in England, Mitchell published the narrative of his first three journeys, Three Expeditions into the Interior of East Australia (2 vols.). In 1839 he was knighted and made a D.C.L. of*~~

~~*Oxford. During this visit he took with him some of the first specimens of gold and the first diamond found in the country. In 1848 the narrative of his second expedition was published in London, Journal of an Expedition into the Interior of Tropical Australia. In 1851 he was sent to report on the Bathurst gold-fields, and in 1853 he again visited England and patented his boomerang propeller for steamers. He died at his residence at Darling Poirt, Sydney, October 5, 1855.*~~

~~*Besides the above works, Mitchell wrote a book on Geographical*~~

~~*and Military Surveying (1827), an Australian Geography, and a translation of the Lusiad of Camoens.*~~

~~*In 1812 it was taken by*~~

~~*MITE. Mites (Acarina) are minute creatures which form a large division of the Arachnida, distinguished by*~~

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~~*the absence of any constriction between the cephalothorax and abdomen. Linneeus included all in the single genus Acarus. They are now divided into several families (mostly containing numerous genera), viz., Trombidiide (harvest mites), usually scarlet specks seen running on stones, grass, &c., in hot weather; Z'etra- nychi, which, although not bright red, are the red spider of our green-houses, and are distinguished by feet with knobbed hairs; Bdellide, long-snouted mites with an- tenniform palpi; Cheyletide (fig. 1), the so-called book mites,—ferocious, predatory . little "beings, 'quite "wtncon- 7% 1—Ceeptete flabellifer.*~~

~~*nected with books; Hydrachnide, freshwater mites with swimming legs, mostly beautiful creatures of brillant colours; Limnocaridz, crawling freshwater or mud mites ; Halicaridz, chiefly marine ; Gamasidz, hard-skinned brown mites often parasitic on insects, and best known by the females, and young of both sexes, found on the common dung beetle (Geotrupes stercorarius) ; Txodide, the true ticks, not to be confounded with the sheep-tick, d&c., which*~~

~~*Fic. 2.—Letosoma palmicinetum ; nymph.*~~

~~*are wingless flies ; Oribatide, beetle mites, so called from their resemblance to minute beetles (these are never parasitic; they undergo transformations almost as strange as those of insects, many of the immature forms being quaint and beautiful, see fig. 2); Myobiada, bizarre para- sites of the mouse, &c., with peculiar holding claws ; Tyroglyphidx, the cheese mites; Analgide, found on the feathers of birds ; Sarcoptide, the itch mites ; Arctesconide, the water bears; Demodicidz, found in the sebaceous follicles of the human nose, &c.; and Phytoptidx, the gall mites, which attack the leaves of plants, making tiny gall- like excrescences.*~~

~~*The sexes are distinct individuals; the reproduction is oviparous; the larva is almost always hexapod, though the later stages have eight legs; that answering to the pupa of insects is active, and is called the nymph. The breathing in the first-named eleven families is tracheal, the position of the stigmata varying greatly; in the last-named six families it is by the general body surface. No heart or circulation of the blood is known to exist; the alimentary canal is usually somewhat on the insect type, but with cecal prolongations to the stomach, the reproductive organs often more on the crustacean type. There is generally a single very large nerve-ganglion above the cesophagus, sending nerve-branches to the various parts. The legs have ordinarily five to*~~

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~~*seven joints, rarely three; the feet are usually terminated by claws or suckets, or both, sometimes by bristles. The mandibles are generally large, oftenest chelate (like a lobster's claw), sometimes style-like piercing organs, and of other forms. The maxille vary much: they may be piercing or crushing organs, or may coalesce to form a maxillary lip; there is usually one pair of maxillary palpi, no others. Sometimes there is a lingua, and in the Gamasidex a galea. Antenne are not found.*~~

~~*Mites are distributed all over the known world. They have been found in Franz-Josef's Land and Spitzbergen and in the hottest tropical regions, as well as the temperate zones. Often very similar species come from all parts. They are numerous in amber of the Tertiary epoch.*~~

~~*The best-known species are probably those which injure man or his works, viz., the itch mite, the cheese mite, the so-called harvest-bug, and the red spider. The dog-tick is also well known.*~~

~~*The itch mite (Sarcoptes scabiet, fig. 3) is a minute, almost circular, flattened, colourless creature, with skin covered with wavy wrinkles, and a number of triangular points arising from that of the back; legs short, the two front pairs and the fourth pair in the male terminated by suckers on long stalks, the two hind pairs in the female and third pair in the male having long bristles instead. It is parasitic on human beings: the males and young remain chiefly on the surface of the skin, but are difficult to find; the female burrows under the scarf-skin, causing the intense itching of scabies by the action of her chelate mandibles as she eats her way. A small watery pustule is raised near where the acarus has entered the skin, and others arise; the creature is not found in the pustule, but at the further end of a short tunnel which may be half aninch long. The eggs are laid in the tunnel after the acarus has passed ; they hatch and multiply rapidly. The disease can be certainly cured ; the usual mode is to rub the whole body with sulphur ointment, which is best done after a warm bath, allow it. to remain on all night, and wash off in the morning. This treatment should be repeated once or twice at intervals of a day ortwo. Other applications of sulphur, as sulphurous acid, sulphur vapour baths, d&c., are efficacious. All clothes which have touched the skin must be disinfected by heat. The disease is highly contagious. Most mammals have their peculiar varieties of itch mite.*~~

~~*The cheese mite (Z'yroglyphus siro) is an elliptical, fat- bodied, colourless acarus with smooth skin and very long hairs. It breeds in thousands in old cheese, flour, grain, é&c., and does much damage. There are numerous allied species; some belonging to the genus Glyciphagus are elegantly ornamented with plumes or leaf-like hairs.*~~

~~*The red-spider (Zetranychus telarius) attacks the leaves of plants or trees, and is a great pest in green-houses. It spins a slight web on the surface of the leaves, and lives in companies on the web; it is of a rusty red or brown.*~~

~~*The harvest bugs, thought by some writers to be a species, and by them called Leptus autwmnalis, are simply the larvee of several species of Z'rombidium. They are predatory, but will attach themselves temporarily to*~~

~~*the human skin, and produce the violent itching felt on the lower parts of the legs after walking through dry grass in autumn. On inspection with a glass the creature may be seen as a*~~

~~*Fra. 3.—The Itch Mite (Sareoptes seabiei) ; female. After Meguin.*~~

~~*O29 minute scarlet point. A drop of benzine will probably get rid of the intruder.*~~

~~*The dog tick, like the harvest-bug, is not really parasitic on mammals, though it attaches itself temporarily; its ordinary food may probably be vegetable. (A. D. M.*~~

~~*MITFORD, Mary Russett (1786-1855), born at Alres- ford, Hampshire, on the 16th of December 1786, retains an honourable place in English literature as the authoress of Our Village, a series of sketches of village scenes and characters unsurpassed in their kind, and after half a century of imitations as fresh as if they had been written yesterday. Washington Irving was Miss Mitford's literary model, but her work is thoroughly original and spontaneous, the free outflow ofa singularly charming character. The shortest account of her life would be incomplete without a reference to the scapegrace father who was the centre of her affections, and the "only begetter" of all that is most delightful and characteristic in her writing. Dr Mitford first spent his wife's fortune in a few years; then he spent also in a few years the greater part of £20,000 which his daughter drew (in 1797, at the age of ten) as a prize in a lottery ; then he lived, for most years of his life, on a small remnant of his fortune and the proceeds of his daughter's literary industry. In the little village of Three Mile Cross, near Reading, in a small cottage which Miss Mitford says was "a fine lesson in condensation," the doctor was the stay, support, and admiration of all the loafers in the neighbourhood, while his daughter, who had called herself his mamma, and treated him as her little boy from the time when she was herself a little girl, found an unfailing charm in his "friskings," and was the loving slave of all his good-humoured exactions. The father kept fresh in his daughter the keen delight in incongruities, the lively sympathy with self-willed vigorous individuality, and the womanly tolerance of its excess which inspire so many of her sketches of character. The woman who lived in close attendance on such an "awful dad," refused all holiday invitations because*~~

~~*he could not live without her, and worked incessantly for him, except when she broke off her work to read him the sporting newspapers, evidently wrote from the heart in her bright portraits of such characters as the Talking Lady, the Talking Gentleman, Joel Brent, Jack Rapley, Tom Cordery, Lizzy, Lucy, and Harriet. Her writing has all the charm of perfectly unaffected spontaneous humour, combined with quick wit and exquisite literary skill, She died January 10, 1855.*~~

~~*Miss Mitford's youthful ambition was to be " the greatest English poetess," and her first publications were poems in the manner of Coleridge and Seott (Miscellaneous Verses, 1810, of sufficient mark to be reviewed by Scott in the Quarterly ; Christine, a metrical tale, 1811; Blanche, 1818). Later on she essayed writing plays (Julian, 1823; The Foscari, 1826; Dramatie Seenes, 1827 ; Rienzi, 1828 ; Charles the First, 1828). But the prose to which she was driven by domestic necessities has rarer qualities than her verse. The first series of Our Village sketehes appeared in 1824, a second in 1826, a third in 1828, a fourth in 1830, a fifth in 1882, and Belford Regis, a novel in whieh the neighbourhood and soeiety of Reading were idealized, in 1835. Her Recollections of a Literary Life (1858) is a series of ewuseries about her favourite books. Five volumes of her Life and Letters were published in 1870 and 1872, showing her to have been a delightful letter-writer ; two volumes of letters to her appeared in 1882.*~~

~~*MITHRADATES, or, as it is often wrongly spelt, MirHRipAtEs (2.¢., "given by the god Mithras"), was a favourite name of the Pontic kings in the third and second centuries B.c., and was also common in Persia and the neighbouring countries. The dynasty of Pontus was a Persian family, claiming descent from the Achemenide, and the earliest of them known in history was satrap under the Persian empire. When that empire was destroyed Mithradates II. made himself king of Pontus; and he and his successors gradually spread their power over a great*~~

~~*part of Cappadocia and Paphlagonia. Several of them intermarried with the Seleucid and other Greek royal families, and something of the Hellenic*~~

~~*civilization was engrafted on the native non-Hellenic character of the kingdom. The names Mithradates, Pharnaces, and Ariobar- zanes, all non-Hellenic, alternate in the family. The pro- vince of Phrygia was sold in the most scandalous way by the Roman consul Aquillius to Mithradates V., who died probably in 120 s.c. He was succeeded by his son Mithradates Eupator, sixth of the name, one of those remarkable conquerors that arise from time to time in the East. He was a boy when his father died, and for seven years lived the wandering life of a hunter pursued by assassins. His courage, his wonderful bodily strength and size, his skill in the use of weapons, in riding, and in the chase, his speed of foot, his capacity for eating and drink- ing, and at the same time his quick and penetrating intellect, his wonderful mastery of twenty-two languages,— all these qualities are celebrated by the ancients to a degree which is almost incredible. With a surface gloss of Greek education, he united the subtlety, the superstition, and the obstinate endurance of an Oriental. He was a virtuoso, and collected curiosities and works of art; he assembled Greek men of letters round him; he gave prizes to the greatest poets and the best eaters. He spent much of his time in practising magic arts, the interpretation of dreams, and other superstitious ceremonies; and it was believed that he had so saturated his body with poisons that none could injure him. He trusted no one; he murdered his nearest relations, his mother, his sons, the sister whom he had married ; to prevent his harem from falling a trophy to his enemies he murdered all his concubines, and his most faithful followers were never safe. He once dis- appeared from his palace, no one knew whither, and returned after some months, having wandered over all Asia Minor in disguise. Except in the pages of romance or the tales of the Thousand and One Nights it would be difficult to find anything to rival the account given of Mithradates by the gravest of historians. These qualities fitted him to be the opponent of Roman arms in Asia Minor, to be the champion of the East in its struggle against the destroying and yet civilizing power of the West. He resisted the Romans for eighteen years, yet we can hardly credit him with much real generalship or organizing power. He could collect masses of men and hurl them against the Roman legions; everything that boundless energy and boundless hatred could do he did; but the strength of his opposition to the Romans lay in the fact that all the dislike inspired by Rome in the worst and most cruel time of her rule was arrayed on his side.*~~

~~No direct collision took place between the Romans and Mithradates for thirty-two years, though the republic took away Phrygia from him in 120 B.c., and several times thwarted his designs in Paphlagonia and Cappadocia. The rupture came about the time of the Social War. Mithradates, prompted, it is said, by envoys from the Italian allies, took advantage of the intestine struggles in Italy. War broke out in 88, on the ostensible cause of disputes about the kingdom of Bithynia; Mithradates rapidly overran Galatia, Phrygia, and Asia, defeated the Roman armies, and made a general massacre of the Romans resident in Asia. He also sent large armies into European Greece, and his generals occupied Athens. But Sulla in Greece and Fimbria in Asia defeated his armies in several battles ; the Greek cities were disgusted by his severity, and in 84 B.c. he concluded peace, abandoning all his con- quests, surrendering seventy ships, and paying a fine of 2000 talents. Murena invaded Pontus without any good reason in 83, but was defeated in 82. Difficulties con- stantly arose between the two adversaries, and in 74 a~~

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~~general war broke out. Mithradates defeated Cotta, one of the Roman consuls, at Chalcedon ; but Lucullus worsted him in several engagements, and drove him finally in 72 B.c. to take refuge in Armenia with his son-in-law Tigranes. After two great victories in 69 and 68, Lucullus was dis-concerted by mutiny among his troops and the defeat of his lieutenant Fabius (see vol. xv. p. 56). In 66 he was superseded by Pompey, who completely defeated both Mithradates and Tigranes. The former established him- self in 64 at Panticapeum, and was planning new campaigns against the Romans when his own troops revolted, and, after vainly trying to poison himself, he ordered a Gallic mercenary to kill him. So perished the greatest enemy that the Romans had to encounter in Asia Minor. His body was sent to Pompey, who buried it in the royal sepulchre at Sinope.~~

~~MITHRAS was a Persian god whose worship spread over the Roman world during the 2d and 3d centuries after Christ. His name is found in the oldest records of the East Aryan races. In the Rig-Veda, Mitra, ze, the friend, and Varuna, 2.e., Odpavos, are a pair of gods regularly associated : they denote~~

~~*the heaven of day and the heaven of night. Mithras is therefore by origin the god of the bright heaven and of day, closely related in conception to, and yet expressly distinguished from, the sun. In the developed Old Persian religion of Zoroaster Mithras retained a place; he was not one of the greatest gods, but was first of a triad which, while less pure embodiments of the divine nature, were more easy for men to comprehend and to worship. The seventh month, which bears his name, and the sixteenth day of every month were sacred to Mithras; prayers were offered to him at sunrise, at mid-day, and at sunset. When the Persians conquered Assyria and Babylonia their religion was much affected by the worship of these more educated races. The worship of foreign deities was introduced, that of Persian deities was changed in character ; and the gods were represented by images. The cultus of Mithras now became far more prominent, he was identified with the sun, and an elaborate ritual with the non-Aryan accompaniment of mysteries was established. This revolution had begun before Herodotus (i. 131) could identify Mithras with the Assyrian goddess Mylitta, and it became more thorough during the 4th century B.c.*~~

~~*It is in this most developed form that we know the cultus of Mithras. The god of light becomes by a ready transition, which is made in the very oldest Aryan records, the god of purity, of moral goodness, of knowledge. There goes on in the world as a whole, and in the life of each man, a continual struggle between the power of good and the power of evil; Mithras is always engaged in this con- test, and his religion teaches all, men and women alike, to aid in the battle. Victory in this battle can be gained only by sacrifice and probation, and Mithras is conceived as always performing the mystic sacrifice through which the good will triumph. The human soul, which has been separated from the divine nature and has descended to earth, can reascend and attain union with God through a process of fasting and penance which is taught in the mysteries ; the sacrifice which is being always offered by Mithras makes this ascent and union possible. Those who were initiated in the mysteries of Mithras had to pass through a long probation, with scourging, fasting, and ordeal by water, and were then admitted as soldiers fighting on behalf of Mithras. This was the lowest terrestrial grade, but there were still two others to attain, the Bull and the Lion, each involving further probation, before the soul could rise above the earth. It then ascended by the grades of Vulture, Ostrich, and Crow through*~~

~~*the region of ether ; and then it strove to become pure fire through the grades of Gryphon, of Perses, and of the Sun. Finally*~~

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~~*the soul attained complete union with the divine nature through the grades of Father Eagle, of Father Falcon, and of Father of Fathers. A holy cave on a hill was the central point in the worship; and the mystic rites involved watching and fasting all night till sunrise brought the triumph of light.*~~

~~*The worship of Mithras became known to the Romans through the Cilician pirates captured by Pompey about 70 B.c. It gained a footing in Rome under Domitian, was regularly established by Trajan about 100 a.D., and by Commodus about 190. Finally the mysteries were pro- hibited and the holy cave destroyed in 378. Dedicatory inscriptions to Deo Soli Invicto Mithre, and votive reliefs of Roman work, are very common. The usual representa- tion shows Mithras in the mystic cave performing the mystic sacrifice; a young man in Oriental costume kneels with one knee on a prostrate bull, grasping the head and pulling it back with the left hand, while with the right he plunges his sword into its neck. A dog, a snake, and a scorpion drink the blood that flows from the bull; a crow sits on the rock behind Mithras; the figures of the sun and of the moon occupy the two sides of the relief.*~~

~~*See Lajarde, Recherches sur le Culte de Mithras.*~~

~~*MITRE. See Costumg, vol. vi. p. 463 ; and HERALDRY, yok a.p. 711.*~~

~~*MITSCHERLICH, Eruarpt (1794-1863), was born January 7, 1794, at Neuende near Jever, in the grand- duchy of Oldenburg, where his father was pastor. He was educated at the gymnasium of Jever under the historian Schlosser. In 1811 he went to Heidelberg, where he devoted himself to philology, giving special attention to the Persian language. In 1813 he went to Paris, partly for study, partly with the view of obtaining permission to join a French embassy to Persia. The political events of 1814 put an end to this scheme, and Mitscherlich returned to Germany. He then set to work on a history of the Ghurides and Kara-Chitayens, manuscript materials for which he found in the university library of Gottingen, and a portion of*~~

~~*which he published in 1815. Still anxious to visit Persia, he resolved to study medicine in order that he might enjoy that freedom of travel usually allowed in the East to physicians. He began at Géttingen with the study of chemistry, and this so completely arrested his attention that he gave up the idea of the journey to Persia and the medical profession. In 1818 he went to Berlin, where he worked in the laboratory of Professor Link. He made analyses of phosphates and phosphites, arseniates and arsenites, confirming the observations of Berzelius as to their composition. In the course of these investigations he observed that corresponding phosphates and arseniates crystallized in the same form.*~~

~~*This was the germ from which grew the theory of isomorphism. In order to follow out his discovery Mitscherlich set to work to learn crystallography. His teacher was a fellow student, Gustav Rose, to whose penetrating mind and profound knowledge of mineralogy have been due some of the most interesting developments and illustrations of the theory of isomorphism. Having measured the inclinations of the faces of a vast number of natural and artificial crystals, he established the principles of isomorphism very much as we now hold them.*~~

~~*It is right that we should remember that Mitscherlich was not the first to notice the fact that two different sub- stances might have the same crystalline form, or that one element could partially replace another without great change of form. Romé de l'Isle in 1772 mentions mixed vitriols containing variable proportions of iron and copper, and Leblanc in 1802 showed that the crystalline form remains the same although the proportions vary both in the case of these mixed vitriols and in that of mixed*~~

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~~*alums. Vauquelin had already, in 1797, proved that alum might contain variable quantities of ammonia without any corresponding variation of crystalline form.*~~

~~*The authority of Haiiy, who laid down as one of his principles that each compound has its own crystalline form, for a time kept these observations in the background. Further cases were, however, observed. Wollaston (1812)*~~

~~*accurately measured the angles of the rhombohedral carbonates, and proved that the forms of these minerals, although nearly the same, are not absolutely identical. He showed that a similar close approximation to identity exists in the case of the vitriols. Fuchs in 1815 brought forward his theory of "vicarious constituents." Gay- Lussac proved that a crystal of common alum continues to grow when placed in a solution of ammonia alum, and cases of crystallized mixtures were pointed out by the French mineralogist Beudant. But notwithstanding these foreshadowings, of which we know, on the evidence of Gustav Rose, that Mitscherlich was wholly ignorant, there was at the time of which we are now speaking no trace of a theory, but merely isolated observations. The theory of isomorphism is the work of Mitscherlich. It was com- municated to the Berlin Academy on December 9, 1819.*~~

~~*In that year Berzelius paid a visit to Berlin, and was so struck with Mitscherlich's ability that he suggested him to the minister Altenstein as the most fitting successor to Klaproth in the chair of chemistry in that university. It is not surprising that this idea was not carried out. It was only four years since Mitscherlich had begun to study chemistry ; he had never lectured, nor had he published anything on the subject.*~~

~~*Although Altenstein did not at that time carry out the proposal of Berzelius, he was so far impressed by it that he obtained for Mitscherlich a Government grant to enable him to continue his studies under Berzelius.*~~

~~*In 1820 he went to Stockholm, where he worked for a year in Berzelius's laboratory. In 1822 he was appointed extraordinary and in 1825 ordinary professor in Berlin. In the course of an investigation into the slight differences discovered by Wollaston in the angles of the rhombohedra of the carbonates isomorphous with calc-spar, Mitscherlich observed that the angle in the case of calc-spar varied with the temperature. On extending his inquiry to other non- isotropic crystals he observed a similar variation, and was thus led, in 1825, to the discovery that non-isotropic crystals, when heated, expand unequally'in the direction of dissimilar axes. In the following year he discovered the change, produced by change of temperature, in the direction of the optic axes of selenite. The discovery (also in 1826) that sulphur can be obtained in two absolutely distinct*~~

~~*crystalline forms threw much light on the fact that the two minerals calc-spar and aragonite have the same composition but perfectly different forms. Other cases of this property, to which Mitscherlich gave the name of dimorphism, were arrived at not long after.*~~

~~*In 1833 he made a series of careful determinations of the vapour densities of a large number of volatile substances, and proved that Gay-Lussac's law as to the proportions by volume in which oxygen, nitrogen, hydrogen, and chlorine unite with one another holds generally for volatile elements, and that the simplicity of the relation of the volume of the compound to that of the component gases is also general,*~~

~~*In pure chemistry Mitscherlich's discoveries were mainly connected with isomorphism, Thus he obtained selenic acid in 1827, and showed the isomorphism of its salts with the sulphates, and examined with great care the manganates and permanganates, showing their isomorphism with the sulphates and with the perchlorates respectively. But he did much important work unconnected with this special*~~

~~*subject. We may in particular refer to his discovery of the relation of benzene to benzoic acid, of nitro-benzene, and of a considerable number of the derivatives of benzene.*~~

~~*In 1833 he published his Lehrbuch der Chemie, a student's text-book of chemistry of the most thoroughly practical and yet rigidly scientific kind, from the study of which teachers of chemistry may still derive many a valuable hint. His interest in mineralogy led him to the study of the geology of volcanic regions, and he made frequent visits to the Eifel with a view to the discovery of a theory of volcanic action. He did not, however, publish any papers on the subject, but since his death his notes have been arranged and published by Dr Roth in the Memoirs of the Berlin Academy (1866). In December 1861 symptoms of 'heart disease made their appearance, but he was able to carry on his academical work till December 1862. He died at Schéneberg near Berlin on 28th August 1863.*~~

~~*Mitscherlich's published papers are chiefly to be found in the Abhandlungen of the Berlin Academy, in Poggendorf's Annalen, and in the Annales de Chimie et de Physique. The fourth edition of the Lehrbuch der Chemie was published in 1844; a fifth was begun in 1855, but was not completed. (ACS Bs)*~~

~~*MITYLENE, or Mytitenr. See LEsBos.*~~

~~*MIZPAH (F531) and Mizprn (7BY!)) are Hebrew words for a "place of prospect," or high commanding point. The cities of Palestine generally occupied such positions ; and so in the Old Testament we find several places bearing the name of "The Mizpah" (Mizpeh). Sometimes a determining genitive is added; 'The Mizpeh of Gilead" (Judg. xi. 29), "The Mizpeh of Moab" (1 Sam. xxii. 3).*~~

~~*(1) The most famous of these places is that in Gilead, a noted sanctuary (J udg. xi. 11; Hosea v. 1), claiming consecration from the sacrifice of Jacob (Gen. xxxi. 54) and the masseba or sacred stone erected by him (ver. 45). The narrative of Gen. xxxi. 45 sq. is somewhat obscure, and not all from one hand. We gather, however, from it that another name of '"'The Mizpah" was Galeed, i.e, Gilead. Thus Mizpah, Mizpeh Gilead, Gilead (Hos. vi. 8), Ramath Mizpeh (ic., the height of Mizpeh, Josh. xiii. 26), and Ramoth Gilead (the heights of Gilead), or simply The Ramah (2 Kings viii. 28, 29), are almost universally taken to be one place. With this it agrees that Ramoth Gilead was a city of refuge, which points to an early sanctity. The place is prominent throughout the history. It was the seat of Jephthah (Judg. xi.), the mourning for whose daughter probably gives us a glimpse into the ancient rites of a provincial sanctuary, the residence of one of Solomon's officers (1 Kings iv. 18), and a hotly disputed frontier city in the wars between Syria and the house of Omri, before which Ahab fell (1 Kings xxii.), and in which the military revolt of Jehu was organized (2 Kings ix.). Maspha was still a strong place in the Greek period, and was taken by Judas Maccabeus (1 Mac. v. 35). Eusebius knows Ramoth as a place 15 miles west of Philadelphia or Rabbah of Ammon. It is therefore commonly identified with El-Salt, the modern capital of the Belk&; but this cannot be said to be made out. (2) The Benjamite Mizpah or Mizpeh, also a sanctuary, is often named in the history of Samuel. It was a border fortress of King Asa (1 Kings xv.*~~

~~22), and the residence of Gedaliah as governor of Judea after the fall of Jerusalem (Jer. xl.). Its old sanctity was still remembered in the Maccabee times, and from 1 Mac. iii. 46 we conclude that it commanded a view of Jerusalem. The most prob- able identification is with the prominent hill-top of Neby Samwil. There was (3) another Mizpeh in the low country of Judah (Josh. xv. 38), and (4) a land or valley of Mizpeh (Josh. xi. 3, 8) under Mount Hermon.~~

~~MNEMONICS, or artificial helps to the memory, have been employed in a more or less systematic form from a very early period. Mnemonics (76 pynpovirdy, sc. Texvnpa or wapdayyeApa) were much cultivated by Greek sophists and philosophers, and are repeatedly referred to by Plato and Aristotle. In later times the invention was ascribed to the poet Simonides,! perhaps for no other reason than that the strength of his memory was famous. Cicero, who attaches considerable importance to the art, but more to~~

~~the principle of order as the best help to memory, speaks~~

~~1 Pliny, 7. N., vii. 24. Cicero, De Or., ii, 86, mentions this belief without committing himself to it.~~

~~MIT—MNE~~

~~of Carneades (or perhaps Charmades) of Athens and Metro- dorus of Scepsis as distinguished examples of the use of well-ordered images to aid the memory. The latter is said by Pliny to have carried the art so far wt nihil non tisdem verbis redderet auditum. The Romans valued such helps as giving facility in public speaking. The method used is described by the author of Rhet. ad Heren., iti. 16- 24; see also Quintilian (Znst. Or., x. 1, 2), whose account is, however, somewhat incomplete and obscure. In his time the art had almost ceased to be practised. The Greek and Roman system of mnemonics was founded on the use of mental places and signs or pictures. The thing to be re- membered was localized in the imagination, and associated with a symbol which concretely represented what it was desired to retain in the memory, special care being taken that the symbols should be as vivid, pleasing, and impres- sive as possible. The most usual method was to choose a large house, of which the apartments, walls, windows,~~

~~*statues, furniture, &c., were severally associated with cer-*~~

~~*tain names, phrases, events, or ideas, by means of symbolic pictures ; and to recall these it was only necessary to search over the apartments of the house, till the particular place was discovered where they had been deposited by the ima- gination. As the things to be remembered increased, new houses could be built, each set apart to a certain class of ideas or events, and these houses were again constructed into a mnemonic town. In accordance with this system, if it were desired to fix an historic date in the memory, it was localized in an imaginary town divided into a certain number of districts, each with ten houses, each house with ten rooms, and each room with a hundred quadrates or memory-places, partly on the floor, partly on the four walls, partly on the roof. Thus, if it were desired to fix in the memory the date of the invention of printing (1436), an imaginary book, or some other symbol of printing, would be placed in the thirty-sixth quadrate or memory-place of the fourth room of the first house of the historic district of the town. The success of the method depended largely on the power of the imagination to give the different houses, rooms, &c., characteristic varieties of aspect, and we may suppose that it was the effort to frame suitable images and places, giving an adventitious interest to dry details, that constituted the real advantage of the system. Except that the rules of mnemonics are referred to by Martianus Capella, nothing further is known regarding the practice of the art until the 13th century, when the system of the Romans was revived and a good many treatises were published on the subject. Among the voluminous writ- ings of Roger Bacon is a tractate De Arte Memoratwwa, which exists in MS. at Oxford. Raymond Lully devoted special attention to mnemonics in connexion with his ars generalis, The first important modification of the method of the Romans was that invented by Conrad Celtes, a German poet, who, in his HIpitoma in utramque Ciceronis rhetoricam cum arte memorativa nova (1492), instead of places made use of the letters of the alphabet. About the end of the 15th century Petrus de Ravenna awakened such astonishment in Italy by his mnemonic feats that he was believed by many to be a necromancer. HIs Phenix Artis Memoriz, published at Venice in 1491 in four volumes, went through as many as nine editions, the seventh appear- ing at Cologne in 1608. An impression equally great was produced about the end of the 16th century by Lambert Schenkel, who taught mnemonics in France, Italy, and*~~

~~*Germany, and, although he was denounced as a sorcerer by the university of Louvain, published in 1593 his tractate De Memoria at Douai with the sanction of that celebrated theological faculty. The most complete account of his sys- tem is given in two works by his pupil Martin Sommer, published at Venice in 1619. Giordano Bruno, in connexion*~~

~~*with his exposition of the ars generalis of Lully, included a memoria technica in his treatise De Umbris Idearwm.*~~

~~*About the middle of the 17th century Winckelmann made known what he called the "most fertile secret" in mne- monics, namely the use of letters with figures so as to express numbers by words ; and the philosopher Leibnitz adopted an alphabet very similar to that of Winckelmann in connexion with his scheme for a form of writing common to all languages. Winckelmann's method was modified and sup- plemented in regard to many details by Richard Grey, who published a Memoria Technica in 1730. The principal part of Grey's method is briefly this: "To remember any- thing in history, chronology, geography, &c., a word is formed, the beginning whereof being the first syllable or syllables of the thing sought, does, by frequent repetition, of course draw after it the latter part, which is so contrived as to give the answer. Thus, in history, the Deluge happened in the year before Christ two thousand three hundred forty-eight ; this is signified by the word Deletok, Del standing for Deluge and etok for 2348." To assist in retaining the mnemonical words in the memory they were formed into memorial lines. The vowel or consonant which Grey connected with a particular figure was chosen arbitrarily ; but in 1806 Feinaigle, a monk from Salem near Constance, began in Paris to expound a system of mnemonics, one feature of which was to represent the numerical figures by letters chosen on account of some similarity to the figure to be represented or some accidental connexion with it. This alphabet was supplemented by a complicated system of localities and signs, with the aim of expressing, by a more vivid and impressive symbol, ideas which for want of this are apt to pass from the memory, and of establishing between ideas of the same group an intimate relation, so that the mention of the one would sug- gest the other. Feinaigle, who published a Wotice sur la mnémonique at Paris in*~~

~~1806, came to England in 1811, and in the following year published Zhe New Art of Memory. A simplified form of Feinaigle's method was published in 1823 by Aimé Paris, and the use of symbolic pictures was revived in connexion with the latter by a Pole, Jazwinsky, of whose system an account was pub- lished by J. Bem, under the title Haposé Général de la Méthode Mnémonique Polonaise, perfectionnée & Paris, Paris, 1839. Various other modifications of the systems of Feinaigle and Aimé Paris were advocated by subsequent mnemonists, among them being the Phrenotyping or Brain-Printing method of Beniowsky, the Phreno-Mnemo- techny of Gouraud, and the Mnemotechnik of Carl Otto, a Dane. The more complicated mnemonic systems have fallen almost into complete disuse ; but methods founded chiefly on the laws of association have been taught with some success in Germany by, among others, Kothe, who is the author of Lehrbuch der Mnemonik, and Katechismus der Gedéchtnisskunst, both' of which have gone through several editions; and in England by Dr. Edward Pick, whose Memory and the Rational Means of Improving i has also obtained a wide circulation. In certain cases mnemonical devices may be found of considerable service ; but all systems which have aimed at completeness have been found rather to puzzle than aid the memory. The fullest history of mnemonics is that given by J. C. F. von Aretin in his Systematische Anleitung zur Theorie und Praxis der Mnemonik, 1810.~~

~~MOA. See DInorNis.~~

~~MOAB. Moab and Ammon (children of Lot) consti- tute along with Edom and Israel (children of Isaac) that group of four Hebrew peoples which in early antiquity had issued from the Syro-Arabian wilderness, and settled on the border of the cultivated country eastward of the great depression which extends from the Gulf of Elath to the~~

~~Dead Sea, and up the valley of the Jordan. According to the book of Genesis, they had come out of Mesopotamia, and so were precursors of the larger wave which followed from the same quarter, forming the most southern outpost of the Aramzan immigration into the lands of Canaan and Heth. Whether the Hebrews were originally Ara- means is questionable, but it is certain that, like the Arameans, they were distinct from the Canaanites,~~

~~*whose conquerors they were. Such was the relation of the old and new inhabitants, not only in Western Palestine after the Israelite occupation, but also, and from a much earlier period, in Eastern Palestine, where the aborigines were Amorites—that is, Canaanites—and where the Bne Ammon and Moab and the Bne Isaac successively settled in their lands. The old population did not disappear before the conquerors, but continued to subsist among them. In a considerable district—namely, in Gilead—the Amorites even remained unsubdued, and thus formed a gap, only imperfectly filled up by the Bne Ammon, between the Hebrew line of immigration on the south and the Ara- mezean line more to the north,—a gap which did not begin to close until the historical period. From this district they even endeavoured, and with some success, as will be afterwards seen, to recover the territory which had been taken from them in the south. But where they were the subjects of the Hebrews they constituted the basis of the population, the mainstock of the working and trading classes. The extent of their influence over the conquerors may be judged from the fact that it was their speech which gained the upper hand. The Moabites, and doubt- less also the Ammonites and Edomites, spoke the language of Canaan as well as the Israelites. They must have learned it from the Canaanites in the land eastward of Jordan, prior to the period at which Jacob immigrated to and returned from Egypt. Our knowledge is extremely imperfect as regards other departments of the Canaanite influence; but in religion it has left a noticeable trace in the cultus of Baal-Peor, which was carried on in Moabite territory, but was certainly of Canaanite origin.*~~

~~*The assumption that the change of language was first brought about by the Israelites in the land which is called by preference that of Canaan, is rendered untenable by the fact that the Moabites also spoke Canaanitish. It is vain to urge against the identity of Hebrew and Canaanitish the distinction between Phcenician and Hebrew ; for doubtless similar distinctions existed between the dialect of the Pheenician coast towns and that of the Hivites, Amorites, and Canaanites generally, whose language the Hebrews borrowed. 'That the Aramzans of Damascus, who also were com- pelled to mingle with the Hethites in the country of which they had taken possession, nevertheless retained their original tongue is to be explained by the circumstance that they continued to maintain direct relations with the*~~

~~*mother-country of Mesopotamia, and more- over had greater internal cohesion. The designation Aimorites, usually given in the Old Testament to the original inhabitants of Eastern Palestine, is substantially synonymous with that of Canaanites, although not quite so comprehensive. The Palestine of the Pre-Israelitic period, which in the Pentateuch is called the Land of Canaan, figures in Amos as the Land of the Amorites. While, however, the former name is bestowed chiefly upon that portion of the earlier population which had remained unconquered, the latter is given to the portion against which the Israelites first directed their attack and in whose territory they settled. This took place in the mountain district, first to the east and afterwards to the west of Jordan. For this reason the Amorites, as contrasted with the Canaanites of the cities of the level country, are a highland race, like the Hebrews themselves, but belong exclusively to the past. In the time of the Biblical narrators, the Canaanites are still living here and there in the land, but the Amorites have once lived where the Israelites now are. This explains the fact that, while in ordinary peaceful circumstances the Canaanites are named as the old inhabitants, the Amorites are immediately substituted for them wherever war and conquest are spoken of. Sihon and Og, with whom Moses does battle, are kings of the Amorites ; in like manner it is with the twelve kings of the Amorites that Joshua has to deal westward of the Jordan. The Amorites as an extinct race of course assume a half-mythical character, and are represented as giants, tall as cedars and strong as oaks.*~~

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~~*Just as Israel was the people of Jehovah, and Ammon the people of Milcom, Moab was the people of Chemosh (wD2, Num. xxi. 29). The kingship of Chemosh was regarded as thoroughly national and political in its character, but did not on that account exclude the institution of a human king, which existed in Moab much earlier than in Israel; in the time of Moses the Moabites had a king, and the institution was even then an old one. The capitals of the kingdom were Ar-Moab and Kir-Moab, south from the Arnon ; these were not, however, the constant residences of the kings, who continued to live in their native places, as, for example, Mesha in Dibon. Doubtless there were changes of dynasty, and traces exist of a powerful aristocracy (Ariele Moab ; 2 Sam. xxiii. 20).*~~

~~*The land of the Moabites, the Balk4, is bounded north- ward and southward by Mount Gilead and Wadi 'l-Ahsé, westward and eastward by the Dead Sea and the Wilder- ness; it is divided into two portions by the deep bed of the Arnon, that to the north being the more level (Mishér), and that to the south being more broken up, and consti- tuting the proper stronghold of the nation. The soil is peculiarly adapted for sheep-farming (2 Kings iii.) and the culture of the vine (Isa. xvi.).}*~~

~~*The historical importance of the Moabites lies wholly in their contact with Israel, and we have no knowledge of them apart from this. After the Israelites had quitted Egypt and passed a nomadic life for about a generation in the neighbourhood of Kadesh, they migrated thence, still under the leadership of Moses, into northern Moab, dis- possessing the Amorites, who had made themselves masters of that district. The interval from Kadesh to the Arnon could be passed only by a good 'understanding with Edom, Moab, and Ammon,—a proof that the ethnical relationships, which at a later period were expressed only in legend, were at that time still living and practical. In all probability the Moabites called the Israelites to their aid; they were not as yet aware that this little pastoral people was des- tined one day to become to them a greater danger than the Canaanites by whom they were threatened at the moment.?*~~

~~*As the story of Balaam indicates, the Moabites would willingly have been rid of their cousins after their service had been rendered, but were unable to prevent them from settling in the land of Sihon. The migration of the tribes of Israel into Western Palestine, however, and the dissolu- tion of their warlike confederation soon afterwards made a restoration of the old frontiers possible. If King Eglon took tribute of Benjamin at Jericho, the territory between Arnon and Jordan must also have been subject to him, and*~~

~~*1 There does not seem to have been any difference in this respect between the northern and southern portions; instead of Heshbon, Sibmah, and Jaezer (Isa. xvi.), the poet Hatim of Tayyi, a little before Mohanimed, names Maab and Zoar as the chief wine centres (Yakut, iv. 377, 19). '*~~

~~*2 The facts as a whole are indubitable; it cannot be an invention that the Israelites settled first in Kadesh, then in northern Moab, and thence passed*~~

~~*into Palestine proper. The only doubtful point is whether the song in Num. xxi. 27 sqg. is contemporary evidence of these events. It is certainly not a forgery, but it is a ques- tion whether it really refers to the destruction of the kingdom of the Amorites at Heshbon. This reference rests entirely upon the words*~~

~~*PD WON bn, which might very well be omitted as a mere gloss, in which case the song would naturally be understood as directed against the Moabites themselves ; it is in this last sense that it is taken by the author of Jer. xlviii. (Comp. E. Meyer in Stade's Zeitschr. f. A Tliche Wissensch., 1881, p. 129 sqg.) As Israel got the better of the Amorites on the plain of Moab, so did Hadad king-of the Edomites vanquish the Midianites on the ' field" of Moab (Gen. xxxvi. 35); this took place in Gideon's time, as is borne out by the fact that between Hadad and the downfall of the ancient Edomite monarchy, 7.e. to the period of David, there were four reigning princes. Confused recollections of a former settlement of the Midianites in northern Moab are seen in Num. xxii. 4, 7; xxv. 18.*~~

~~*MOAB*~~

~~*Reuben must even then have lost his land, or at least his liberty. It would appear that the Moabites next extended their attacks to Mount Gilead, giving their support to the Ammonites, who, during the period of the judges, were its leading assailants. So close was the connexion between Moab and Ammon that the boundary between them vanishes for the narrators (Judges xi.).*~~

~~*Gilead was delivered from the Ammonites by Saul, who at the same time waged a successful war against Moab ; the fact is lightly touched upon in | Sam. xiv. 47, as if this were a matter of course. The establishment of the mon- archy necessarily involved Israel in feuds with its neighbours and kin. The Moabites being the enemies of the Israelite kingdom, David naturally sent his people for shelter thither when he had broken with Saul; the incident is precisely analogous to what happened when he himself at a later period took refuge from Saul's persecution in Philistine territory, and needs no explanation from the book of Ruth. As soon as he ceased to be the king's enemy by himself becoming king, his relations with Moab became precisely those of his predecessor. The war in which apparently casual circumstances*~~

~~*involved him with Hanun ben Nahash of Ammon really arose out of larger causes, and thus spread to Moab and Edom as well. The end of it was that all the three Hebrew nationalities were incorporated with the kingdom of Israel; the youngest brother eclipsed and sub- dued his seniors, as Balaam had foreseen. Through the work of Saul and David the political system of Palestine was altogether changed: the smaller peoples were no longer a match for Israel, which established a decisive preponder- ance, and transformed what had hitherto been jealousy on the part of Moab and Ammon as well as of Edom into bitter hatred ; this hatred did not cease even after nothing but a religious shadow remained of what had once been the political supremacy of the people of Jehovah.*~~

~~*The struggle with Ammon which David began ultimately assumed larger dimensions, and brought the Arameans also into the field against him. He was successful, indeed, against them also, and destroyed their most powerful kingdom ; but after his death they recovered themselves, and pressed steadily on from the borders of the wilderness towards the sea; at their head were those kings of Damascus who had established themselves on the ruins of Zoba. In presence of these enemies the already fading distinction between the ruling and the subject nationality within the kingdom of Israel now completely disappeared ; and even towards the Canaanites outside the relations of the kings became friendly. It is in one instance expressly stated that the common danger threatening from the East had to do with this (2 Sam. viii. 9 sqq.). But, conversely, it was natural that Ammon and Moab should make common cause with the Aramzans; such an attitude was suggested by geographical position and old connexions, but above all by their helpless fury against Israel. Both nationalities must have succeeded in emancipating themselves very soon after David's death, and only now and then was some strong king of Israel able again to impose the yoke for a time, not upon the Ammonites indeed, but upon Moab. The first to do so was Omri, who garrisoned a number of their towns and compelled the king to acknowledge Israel's suzerainty by a yearly tribute of sheep,—a state of matters which con- tinued until the death of Ahab ben Omri. But when that brave king fell in battle with the Aramzans at Ramoth Gilead (about 850 B.c.), Mesha of Dibon, then the ruler of Moab, seized the favourable opportunity to make him- self and his people independent. In his famous inscription he tells how, through the wrath of Chemosh, the land*~~

~~*had fallen into the enemy's power and endured forty years of slavery, and how by the grace of Chemosh the yoke is now broken and the Israelites ignominiously driven off. In*~~

~~*MO A EB*~~

~~*the Bible we find only the curt statement that Moab rebelled against Israel after the death of Ahab (2 Kingsi.); on the other hand, there isa full narrative of a later attempt on the part of Joram ben Ahab to bring Mesha again into subjection—an attempt which promised very well at first, but ultimately failed completely. Joram's invasion took place not from the north but (probably very unex- pectedly to the enemy) from the frontier of Edom over the Wadi 'l-Ahs4; he marched through Judah and Edom, and the kings of those countries served as auxiliaries. He defeated a Moabite army on the frontier, penetrated into the country and laid it waste; he laid siege to the fortress of Kir-Moab so closely as to reduce it to great straits. But these straits seem to have filled the besieged with a desperate courage, for the fortunes of war suddenly changed. The Israelites were compelled to retire home- ward, a great wrath (of Jehovah) having come upon them, that is, a severe disaster having befallen them, which is not described, but, from the nature of the case, must have been a sudden surprise and defeat by the enemy.*~~

~~*As the Moabites owed their liberation from Israelite supremacy to the battle of Ramah—that is, to the Aramzans—we accordingly find them (as well as the Ammonites) afterwards always seconding the Arameans in continual border warfare against Gilead, in which they took cruel revenge on the Israelites. With what bitterness the latter in consequence were wont to speak of their hostile kinsfolk can be gathered from Gen. xix. 30 sqg.— the one trace of open malice in the story of the patriarchs, and all the more striking as it occurs in a narrative of which Lot is the hero and saint, which therefore in its present form is of Moabite origin, although perhaps it has a still older Canaanite nucleus. Of these border wars we learn but little, although from casual notices it can be seen (2 Kings xiii, 20; Amos i. 13; comp. 2 Kings v. 2) that they were long kept up, although not quite uninterruptedly. But when at length the danger from the Aramzans was removed for Israel by the inter- vention of the Assyrians, the hour of Moab's*~~

~~subjection also came ; Jeroboam II. extended his frontier over the eastern territory, as far as to the brook of the willows (Wadi 'l-Ahs4). (Perhaps the song of Num. xxi. 27 sqq. has reference to these events.) A vivid picture of the confusion and anguish then prevalent in Moab has been preserved to us in the ancient prophecy of Isa. xv., xvi. which indeed would have greater historical value if we were able to tell precisely what in it depicts the present, and what is prediction of the future.?~~

~~This utterance of an older prophet was repeated some~~

~~1 The narrative of Mesha in his inscription has, strange to say, not unfrequently been regarded as parallel with 2 Kings iii., and the conclusion been drawn that the Biblical narrative completely inverts the true state of the case,—it is difficult to see for what motives, for there is no braggadocio in 2 Kings iii, But it is perfectly clear that the narrative of 2 Kings iii. presupposes the revolt of Mesha as an old affair; while, on the other hand, Mesha's story on the stele in the Louvre is a narrative of this very revolt and its immediate consequences ; it is accordingly to be regarded as parallel with 2 Kings i. 1. Elisha's miracle in Wadi 'Ahsd (2 Kings iii. 16) is explained by the locality ; Alis& means a sandy ground with moist subsoil, where, by digging trenches, water is always obtainable. The (probably compulsory) par ticipation of the king of Edom in Joram's expedition against Moab may perhaps be brought into connexion with the fact that the Moabites burned to lime the bones of a king of Edom (Amos ii. 1).~~

~~2 In Isa. xv. xvi. it is presupposed that the attack upon Moab has been made from the north, at a time when Judah is a comparatively powerful kingdom, exercising sovereignty over Edom also, and in a position to afford shelter to the fugitive Moabites, thus not being itself at war with them. These marks taken together can only apply to the period of Jeroboam II. and Uzziah. Hitzig will have it that Jonah ben Amittai wrote Isa. xv. xvi. ; but according to 2 Kings xiv. 25 that prophet preached prosperity to Jeroboam, and not disaster to the Moabites,~~

~~*decennia later by the prophet Isaiah, with the addition of a clause adapting it to his time, to the effect that the Assyrians would carry out in all its fulness the hitherto imperfectly-executed threat. The Assyrians actually sub-jugated the Moabites, as well as the other small peoples of that region ; but the blow was apparently not so grave as Isaiah had predicted. They lay more out of the way than their western neighbours, and perhaps their resistance to the scourge of God was not so obstinate as to demand the sharpest measures. What made it all the easier for them to reconcile themselves to the new situation was the fact that the Israelites suffered much more severely than they. From these their deadly enemies they were henceforth for ever free. They did not on that account, however, give up their old hatred, but merely transferred it from Israel to Judah. The political annihilation of the nation only inten- sified in Jerusalem the belief in its religious prerogative, and against this belief the hostility of neighbours was aroused more keenly than ever. The deepest offence at the reli- gious exclusiveness of the people of Juda, which then first began to manifest itself, was, as is easily understood, taken by their nearest relatives, Edom and Moab. They gave terrible expression to their feelings when the Chal-deans urged them on like uncaged beasts of prey against the rebellious Jews ; and they joined loudly in the general chorus of malignant joy which was raised over the burning of the temple and tle ruin of the holy city.®*~~

~~*"Because Moab saith: Behold the house of Judah is like all the other nations, therefore do I open his land to the Bne Kedem," says the prophet Ezekiel (xxv. 8 sqq.). HIs threat against the Moabites as well as against the Edomites and Ammonites is that they shall fall before the approach of the desert tribes. Probably in his day the tide of Arabian invasion was already slowly rising, and of course it had first to overtake the lands situated on the desert border. At all events the Arab immigration into this quarter began at an earlier date than is usually supposed ; it continued for centuries, and was so gradual that the previously-introduced Aramezizing process could quietly go on alongside of it. The Edomites gave way before the pressure of the land-hungry nomads, and settled in the desolate country of Judah; the children of Lot, on the other hand, appear to have amalgamated with them, —the Ammonites maintaining their individuality longer than the Moabites, who soon entirely disappeared.*~~

~~*Israel and Moab had a common origin, and their early history was similar. The people of Jehovah on the one hand, the people of Chemosh on the other, had the same idea of the Godhead as head of the nation, and a like patriotism derived from religious belief,—a patriotism capable of extraordinary efforts, and which has had no parallel in the West either in ancient or in modern times. The mechanism of the theocracy also had much that was common to both nations; in both the king figures as the deity's .representative, priests and prophets as the organs through whom he makes his communications. But, with all this similarity, how different were the ultimate fates of the two! The history of the one loses itself obscurely and fruitlessly in the sand; that of the other issues in eternity. One reason for the difference (which, strangely enough, seems to have been felt not by the Israelites alone but by the Moabites also) is obvious. Israel received no gentle treatment at the hands of the world; it had to carry on a continual conflict with foreign influences and hostile*~~

~~*3 Zeph. ii. 8 sq. ; 2 Kings xxiv. 2, and Jer. xii. 9 sqg.; Ezek. xxv. 8 sqg. It need hardly be said that the Moabites shared the fate of all the Palestinian peoples when supremacy passed from the Assyrians to the Chaldeans, and that, notwithstanding their hatred of the Jews, they had no difficulty in seeking alliances with them, when occasions arose on which they could be made useful (Jer. xxvii. 3).*~~

~~*was not profitless, although the external catastrophe was inevitable. Moab meantime remained settled on his lees, and was not emptied from vessel to vessel (Jer. xlviii. 11), and corruption and decay were the result. This explana-*~~

~~*tion, however, does not carry us far, for other peoples with*~~

~~*fortunes as rude as those of Israel have yet failed to attain historical importance, but have simply disappeared.*~~

~~*The service the prophets rendered at a critical time, by raising the faith of Israel from the temporal to the eternal*~~

~~sphere, has already been spoken of in the article ISRAEL.~~

~~Sources.—The Old Testament (Ruth and Chronicles, however, being of no historical worth in this connexion), and the inscription of Mesha, on the stone of Dibon, discovered in 1868, and now in the Louvre. The Berlin Moabditica are valueless,—Schlottmann himself, the unshaken champion of their genuineness, conceding that they are mere scribbling, and do not even form words, much less sentences. The literature of the subject is to be found in the commentaries on the Old Testament books, and in those on the inscription of Mesha. (J. WE.)~~

~~MO'ALLAKAT. Al-Mo'allakdt is the title of a group of seven longish Arabic poems, which have come down to us from the time before Islam. The name signifies "the suspended" (pl.), the traditional explanation being that these poems were hung up by the Arabs on or in the Katba at Mecca. 'The oldest passage known to the writer where this is stated oceurs in the '/kd of the Spanish Arab, Ibn 'Abd-Rabbih (a.p. 861-940), Buldk ed. vol. iti. p. 116 sg. We read there: "The Arabs had such an interest in poetry, and valued it so highly, that they took seven long pieces selected from the ancient poetry, wrote them in gold on rolls (1) of Coptic cloth, and hung them up ('allakat) on the curtains which covered the Ka'ba. Hence we speak of 'the golden poem of Amraalkais,' 'the golden poem of Yohair" The number of the golden poems is seven ; they are also called 'the suspended' (al-Mo'allakdt)." Similar statements are frequent in later Arabic works. But against this we have the testimony of a contemporary of Ibn "Abd- Rabbih, the grammarian Nahhas (0b. a.p. 949), who says in his commentary on the Mo'allakat: "As for the assertion that they were hung up in [sic] the Ka'ba, it is not known to any of those who have handed down ancient poems." 4 This cautious scholar is unquestionably right in rejecting a story so utterly unauthenticated. The customs of the Arabs before Mohammed are pretty accurately known to us ; we have also a mass of information about the affairs of Mecca at the time when the Prophet arose; but no trace of this or anything like it is found in really good and ancient authorities. We hear, indeed, of a Meccan hanging up a spoil of battle on the Ka'ba (Ibn HIsham, ed. Wiis- tenfeld, p. 431). Less credible is the story of an important document being deposited in that sanctuary, for this looks like an instance of later usages being transferred to pre- Islamic times. But at all events this~~

~~*is quite a different thing from the hanging up of poetical manuscripts. To account for the disappearance of the Mo'allakat from the Ka'ba we are told, in a passage of late origin (De Sacy, Chrestom., ii. 480), that they were taken down at the cap- ture of Mecca by the Prophet. But in that case we should*~~

~~*expect some hint of the occurrence in the circumstantial '*~~

~~*biographies of the Prophet, and in the works on the history of Mecca; and we find no such thing. That long poems were written at all at that remote period is improbable in the extreme. All that we know of the diffusion of Arabic poetry, even up to a time when the art of writing had become far more general than it was before the spread of Islam, points exclusively to oral tradition. Moreover, it is quite inconceivable that there should have been either a guild or a private individual of such acknowledged taste,*~~

~~*1 Ernst Frenkel, An-Nahhas' Commentar zur Mu'allaga des Imruul- Qais (Halle, 1876), p. viii.*~~

~~*MO'ALLAKAT*~~

~~*powers ; and this perpetual struggle with gods and men*~~

~~*or of such influence, as to bring about a consensus of opinion in favour of certain poems. Think of the mortal offence which the canonization of one poet must have given to his rivals and their tribes! It was quite another thing for an individual to give his own private estimate of the respective merits of two poets who had appealed to him as umpire ; or for a number of poets to appear at large gather- ings, such as the fair of 'Okaz, as candidates for the place of honour in the estimation of the throng which listened to their recitations. In short, this legend, so often retailed by later Arabs, and still more frequently by Europeans, must be entirely rejected.2. The story is a pure fabrication based on the name "'suspended." The word was taken in its literal sense; and as these poems were undoubtedly prized above all others in after times, the same opinion was attributed to "the [ancient] Arabs," who were sup- posed to have given effect to their verdict in the way already described. A somewhat simpler version, also given by Nahhds in the passage already cited, is as follows : " Most of the Arabs*~~

~~were accustomed to meet at 'Okaz and recite verses ; then if the king was pleased with any poem, he said, 'Hang it up, and preserve it among my treasures.'" But, not to mention other difficulties, there was no king of all the Arabs; and it is hardly probable that any Arabian king attended the fair at 'Okaz. The story that the poems were written in gold has evidently originated m the name "the golden poems" (literally "the gilded"), a figurative ex- pression for excellence. We must interpret the designation "suspended" on the same principle. In all probability it means those (poems) which have been raised, on account of their value, to a specially honourable position. Another derivative of the same root is 'wk, "precious thing."~~

~~The selection of these seven poems can scarcely have been the work of the ancient Arabs at all. It is much more likely that we owe it to some connoisseur of a later date. Now Nahhas says expressly in the same passage : "The true view of the matter is this: when Hammad arrawiya (Hammad the Rhapsodist) saw how little men cared for poetry, he collected these seven pieces, urged people to study them, and said to them: 'These are the [poems] of renown.'" And this agrees with all our other information. Hammad (who lived in the first three quar- ters of the 8th century A.D.) was perhaps of all men the one who knew most Arabic poetry by heart. The recita- tion of poems was his profession, To such a rhapsodist the task of selection is in every way appropriate ; and it may be assumed that he is responsible also for the some- what fantastic title of "the suspended."~~

~~The collection of Hammad appears to have consisted of the same seven poems which are found in our modern editions, composed respectively by Amraalkais, Tarafa, Zohair, Labid, 'Antara, 'Amr ibn Kolthtim, and Harith ibn Hilliza. These are enumerated both by Ibn "Abd- Rabbih, and, on the authority of the older philologists, by Nahhas ; and all subsequent commentators seem to follow them. We have, however, evidence of the existence, at a very early period, of a slightly different arrangement. Two of the foremost authorities in Arabic poetry are Abu 'Obaida and Mofaddal,—men who for care and accuracy in preserving the genuine text were far ahead of their much older contemporary Hammad. Both of these inserted a poem by Nabigha and one by A'shé in place of those of 'Antara and Harith ;3 and, if our informant has expressed~~

~~2 Doubts had already been expressed by various scholars, when Hengstenberg — rigid conservative as he was in theology — openly challenged it; and since then it has been controverted at length in Noldeke's Beitrage zur Kenntniss der Poesie der alten Araber (Han- over, 1864), p. xvii. sqq. Our highest authority on Arabic poetry, Professor Ahlwardt, concurs in this conclusion ; see his Bemerkungen~~

~~tuber die Aechthett der alten arabischen Gedichte (1872), p. 25 sg. 3 The passage is cited by Noldeke, Bettrége, p. xx. sq.~~

~~MOALLAKAT~~

~~himself correctly, they also called this modified collection Mo'allakat. Mofaddal employs, besides, the names "the seven long [poems]" and "the necklaces." This last be- came afterwards a common title for the seven poems. The comparison of songs to strings of pearls is a very apt one, from the nature of the Arabic poem, composed as it is of separate loosely-connected parts. Hence it became so popular that even in ordinary prose to speak in rhyth- mical form is called simply nazm, "to string pearls." Mofaddal expressly opposes the view of those who did not acknowledge the pre-eminence of the seven poets selected by him. This appears to be an attack on Hammad for including in his collection the works of two men who for poetic fame could certainly never enter the hsts with Nabigha and A'shé. It is prima facie more likely that a later writer should have replaced the less famous poets by those who were universally placed in the first rank, than vice versa. Perhaps another fact is of some importance here. Hammad, a Persian by descent, was a client of the Arab tribe, Bakr ibn Wail. In the heathen period this tribe was much at war with the closely-related tribe Taghlib. Now of all Arabic poems none was more famous than that in which 'Amr ibn Kolthim celebrates in glowing terms the praises of his tribe Taghlib. If, therefore, Hammad's collection embraced this poem, it was very natural for him to gratify his patrons the Bakrites by placing alongside of it that of Harith—a Bakrite and contemporary of 'Amr—where he extols his own tribe and assails the Taghlibites with bitter scorn. Such considera- tions did not affect Abu "Obaida and Mofaddal.~~

~~The authority of these men has so far prevailed that the poems of their favourites Nabigha and A'sha often appear in the manuscripts, not indeed~~

~~*instead of those of ‘Antara and Harith, but after the other seven. Thus we sometimes read of nine Mo‘allakét. The first author in whom the writer has observed this is the great philosophic historian Ibn Khaldun (4.p. 1332-1406); he mentions instead of Harith the far more celebrated ‘Alkama ; whether relying on ancient authority, or by an oversight, we cannot tell. In an excellent collection of forty-nine long poems by Abt Zaid al-Korashi (date unknown) Mofaddal’s seven poets appear in the first class, “the necklaces;” but Ndabigha and A‘sha are each represented by a different piece from that usually reckoned among the Mo‘allakat. By this editor the name “golden poems,” which, as we have seen, sometimes occurs as a synonym of “Mo‘allakat,” is applied to seven quite distinct songs.) This uncertainty as to the selection and the titles may serve as an additional proof that the “suspension,” on the Ka‘ba or anywhere else, is a fable.*~~

~~*The lives of these seven (or nine) poets were spread over a period of more than a hundred years. The earliest of them, according to the common and probably correct opinion, was AMRAALKAIS (pronounced also Imroolkais, Imraalkais, &c.), regarded by many as the most illustrious of Arabian poets. His exact date cannot be determined ; but probably the best part of his career fell within the first half of the 6th century. He was a scion of the royal house of the tribe Kinda, which lost all its power at the death of King Harith ibn ‘Amr in the year 529.2 The poet’s royal father, Hojr, by some accounts a son of this Harith, was killed by Bedouins. The son led an adven- turous life as a refugee, now with one tribe, now with another, and appears to have died young. The anecdotes related of him—which, however, are very untrustworthy in detail—as well as his poems, imply that the glorious*~~

~~*1 See Noéldeke, Bettrdge, p. xxi., and the catalogue of the Arabic codd. in the British Museum, p. 480 sqq.*~~

~~*2 See Tabari’s Geschichte der Perser und Araber . . Th. Nildeke (Leyden, 1879), p. 171.*~~

~~*. ubersetzt von*~~

~~*5ae*~~

~~*memory of his house and the hatred it inspired were still comparatively fresh, and therefore recent.*~~

~~*The Mo'allaka of 'Amr hurls defiance against the king of HIra, 'Amr son of Mundhir, who reigned from the summer of 554 till 568 or 569, and was afterwards slain by our poet.? This prince is also addressed by HArrru in his Mo'allaka. Of Tarara, who is said to have attained no great age, a few satirical verses have been preserved, directed against this same king. This agrees with the fact that a grandson of the Kais ibn Khalid, mentioned as a rich and influential man in Tarafa's Mo'allaka (v. 80 or 81), figured at the time of the battle of Dhu Kar, in which the tribe Bakr routed a Persian army. This battle falls between A.D. 604 and 610 (Néldeke's Z'abari, p. 311).*~~

~~*The Mo'allaka of 'Anrara and that of Zowarr contain allusions to the feuds of the kindred tribes 'Abs and Dhobyadn. Famous as these contests were, their time cannot beascertained. But the date of the two poets can be approxi- mately determined from other data. Ka'b, son of Zohair, composed first a satire, and then, in the year 630, a eulogy on the Prophet; another son, Bojair, had begun, some- what sooner, to celebrate Mohammed. 'Antara killed the grandfather of the Ahnaf ibn Kais who died at an advanced age in A.D. 686 or 687 ; he outlived 'Abdallah ibn Simma, whose brother Doraid was a very old man when he fell in battle against the Prophet (early in a.p. 630); and he had communications with Ward, whose son, the poet 'Orwa, may perhaps have survived the flight of Mohammed to Medina. From all these indications we may place the productive period of both poets in the end of the 6th century.* The historical background of 'Antara's Mo'allaka seems to lie somewhat earlier than that of Zohair's.*~~

~~*To the same period appears to belong the poem of 'ALKAMA, which, as we have seen, Ibn Khaldtin reckons amongst the Mo'allakat. This too is certainly the date of NAsicHA, who was one of the most distinguished of Arabic poets. For in the poem often reckoned as a Mo"'allaka, as in many others, he addresses himself to the above-named No'man, king of HIra, who reigned in the two last decades of the 6th century. The same king is mentioned as a contemporary in one of 'Alkama's poems.*~~

~~*The poem of A‘sH4, which Mofaddal placed among the Mo‘allakat, contains an allusion to the battle of Dhu Kar (under the name “ Battle of Hinw,” v. 62). This poet, not less famous than Nabigha, lived to compose a poem in honour of Mohammed, and died not long before a.p.*~~

~~*630.*~~

~~*Lasip is the only one of these poets who embraced Islam. His Mo‘allaka, however, like almost all his other poetical works, belongs to the pagan period. He is said to have lived till 661 or even later; certainly it is true of him, what is asserted with less likelihood of several others of these poets, that he lived to a ripe old age.*~~

~~*We have already mentioned that the old Arabic poetry was transmitted not by manuscripts but simply through oral tradition. Many pieces, especially the shorter ones, may have owed their preservation to their hold on the popular memory. But, fortunately, there was a class of men who made it their special business to learn by rote, and repeat, the works either of a single poet or of several. The poets themselves used the services of such rhapso dists (rdéwis). The last representative of this class is Hammad, the man who formed the collection of Mo‘alla- kat ; but he, at the same time, marks the transition from*~~

~~*3 See Noldeke’s Tabari, pp. 170, 172.*~~

~~*4 This evidence might be supplemented from a poem in Zohair’s name, whose author describes himself as a man of ninety years, and in which the downfall of King No‘man of Hira (a.p. 601, see Tahari, p- 847) is spoken of as a not very recent event. But the genuineness*~~

~~*of this poem is more than doubtful (see Ahlwardt, op. cit. p. 64, and C, J. Lyall in the Academy, March 18, 1880, p. 192).*~~

~~*XVi — 68*~~

~~*538*~~

~~*the rhapsodist to the critic and scholar. Now, when we*~~

~~*consider that more than a century—in some cases two*~~

~~*centuries—elapsed before the poems were fixed by literary*~~

~~*men, we must be prepared to find that they have not*~~

~~*retained their original form unaltered. The most favour-*~~

~~*able opinion of the rhapsodists would require us to make*~~

~~*allowance for occasional mistakes; expressions would be*~~

~~*interchanged, the order of verses disarranged, passages omitted, and probably portions of different poems pieced together. The loose structure of the ancient poems ren- dered them peculiarly liable to corruptions of this kind. But the fact is that Hammad in particular dealt in the*~~

~~*most arbitrary fashion with the enormous quantity of poetry which he professed to know thoroughly. He is even charged with falsifications of all sorts in this depart- ment. Of others, again—and notably of the great philolo- gist Khalaf, "the Red"—it is credibly reported that they used their intimate knowledge of the style and language of the ancients to pass off whole poems of their own making as the productions of earlier authors. The worst anticipations are only too completely confirmed by an examination of such pieces as are still preserved, as is*~~

~~*shown most conclusively in Ahlwardt's Bemerkungen, already*~~

~~*cited. The seven Mo'allakat are indeed free from the sus-*~~

~~*picion of forgery, but even in them verses are frequently*~~

~~*transposed ; in all there are lacune; and probably all*~~

~~*contain verses which do not belong to them. Some of them have more than one introduction. This is the case even with the poem of 'Amr, although, as the finest pane- gyric of his very powerful tribe, it must have had a wide circulation. 'The true introduction begins at v. 9; before that we find another which certainly does not belong to this poem, and can hardly be the*~~

~~*work of the same poet. 'Amr lived in the desert regions near the lower Euphrates, under the Persian dominion; whereas the author of v. 8 boasts of his carousals in several parts of Roman Syria, and in v. 1 he speaks of drinking wine from a place in Northern Syria. It is evident that all attempts to restore the original order, to fill up blanks, or to remove interpola- tions, can only be carried to a certain degree of probability at the best; there must always be a large subjective ele- ment in judgments on points of the kind. Still less can we hope to discover and rectify the minor changes, in single expressions or grammatical forms, which the text may have undergone before it was fixed in writing. It may be re- marked in this connexion that where any ancient song has been transmitted through two different grammatical schools it generally appears in two considerably divergent forms, each having been taken down from the lips of a separate rawi. Of secondary importance are the errors due to later copyists. Considerable as these often are, we are, at least in many cases, better able to correct them.*~~

~~*Even the masters of old Arabian poetry do not exhibit such characteristic differences in their general manner and style as to leave in the mind a clear idea of their indivi- duality. A few distinct poetic types emerge, but the great majority of these poets present a somewhat monotonous aspect to the Western scholar, who indeed can at best have but a very imperfect feeling for nwances of style in this field. But if we are thus unable to isolate the various constituent parts of this poetical literature, and pass a critical opinion on each, we do get from this literature, as a whole, what is of far greater importance than an esthetic estimate of this or that particular poet, viz. a poetic picture of the whole life and activity of that remarkable people which, amid the endless agitation and endless sameness of its existence, and in an extremely inhospitable region, was preparing one of the mightiest revolutions in the history of the world. This collective impression is hardly impaired by the involuntary alterations made by the rawis; nor is*~~

~~*it greatly distorted by the forgers of the 2d century of Islam, who were thoroughly familiar with the spirit and style of antiquity, and seldom did violence to them.*~~

~~*The critics of the 2d and 3d centuries a.H. unani- mously ranked the poets of the heathen period above those of Islam ; and in that verdict we must concur. The older Moslem poets were for the most part mere Epigoni, content, for better or worse, to borrow the style of their pagan predecessors. It is only natural, therefore, that the seven best poems should have been selected from the pro- ductions of heathenism. But how these particular seven came to be fixed upon, it is difficult to decide. It is remarkable that people who knew thousands of such poems should have agreed as to the superiority of five, and only differed about two. No doubt the selection was greatly influenced by the widely-established reputation of certain poets, like Amraalkais, Zohair, and Tarafa ; while in other cases single poems, such as that of 'Amr, stood in high repute for special reasons. Still, even we, with a much narrower range of selection, should hardly pick out these seven as the finest. In all probability our choice would not light on a single one of them. The truth is, our sesthetic ideal is essentially different from that of those old litterateurs. And, while we may certainly consider our own taste, formed on the model of the Greeks and the best of the moderns, to be on the whole purer than theirs, we must not forget that they had the advantage of perfect knowledge of the language and the subject-matter, and could thus perceive a multitude of beautiful and delicate touches, which we either miss entirely or realize with labo- rious effort. The world of the old Arabian poet lay at an infinite remove from ours. HIs mental horizon was narrow, but within that horizon every minute detail was seized and designated with precision. Among the nomads, for example, the smallest point of the horse or camel that the eye can see has its importance ; the language has pre- cise and generally understood words for them all, where ours has only technical terms. It is the same with all the physical properties of the animal—its paces, ete. Thus, when a poet faithfully described the exterior and the deportment of his camel, that was to his hearers—and the same is true of later critics—a genuine pleasure, because the deccription conveyed to them a definite pictorial im- pression. But we do not understand the details of the picture; or, when at best with all the resources of tradition and natural history we have gained some tolerable compre- hension of them, the whole still leaves us indifferent. A camel to us is simply not a poetical object ; and even a horse ceases to be esthetically interesting —except perhaps to a sportsman—when one is asked to go over his points in detail. For this reason we are apt to find a great part of Tarafa's*~~

~~*Mo'allaka, and many parts of the poems of Amraalkais, viewed as poetry, distasteful rather than interesting. More attractive are the descriptions of the life and habits of wild animals in the desert, such as the wild ass and some species of antelope, which the poets are fond of introducing (see, ¢g., the Mo'allaka of Labid). There are also many vivid sketches from nature to be met with,—nature, of course, as seen in the very monotonous Arabian landscape. Monotony, indeed, is a predominant characteristic of this poetry. When one first reads poems where the bard begins by shedding tears over the scarcely perceptible traces of the dwelling of his beloved in years gone by, one's sympathy is aroused. But when poem after poem is found to commence with the same scene, and pos- sibly with almost the same words, the emotion is somewhat damped. No doubt such occurrences must really have been very common in the nomad life; nevertheless the suspicion becomes at last irresistible that for the most part all this is pure fiction. Nor can we be sure that the*~~

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~~*poets are always to be taken aw sériewx when they describe those carousals, and other adventures in peace and war, of which they love to boast. They are probably more serious in the narratives of their love experiences: these are often very highly coloured, and yet are always pervaded by a certain natural refinement, which is too often wanting in the later erotic poetry of the Moslems. But there, too, our enjoy- ment is frequently marred by minute and even prosy de- scriptions of the physical charms of the object of affection.*~~

~~*The lyrical and even the more rhetorical passages of the poems make in general a deeper impression upon us than the descriptive portions, to which they owe their distinctive character, and which are often intimately blended with the former. When those old Arabs are really moved by love, or rage, or grief, when personal or tribal vanity vents itself in immoderate boasting, invective, or banter, then they strike chords that thrill our breasts. In those passages where genuine human feeling is stirred, they also display far greater individuality than in the more conventional descriptions. Especially affecting are the numerous pass- ages or complete poems which mourn over the beloved and venerated dead. Their sober practical philosophy too, as it*~~

~~*is presented in the Mo'allaka of Zohair and in many of Labid's poems, is really impressive.*~~

~~*The Mo'allakat are highly characteristic specimens of this poetry. They exhibit nearly all its merits as well as most of its defects. Amongst its merits we ought, perhaps, to include the unfailing regularity of the verse. That a people living under such extremely simple conditions should have cultivated a purely quantitative metre, so euphonious and so rigorously adhered to, is a fact worthy of our highest admiration. It is one evidence of that sense of measure and fixed form which is, in other directions also, a marked feature in the life and speech of the Arabs. The mere fact that in their verses they give so much attention to elegance of expression deserves commendation. Amongst the defects of this poetry we must emphasize the loose connexion between the separate parts. We require a poem, like any other work of art, to be a compact unity; the Arabs and many other Orientals lay all the stress on the details. In the Mo'allaka of Tarafa, for instance, after the poet has spoken long enough about his beloved, he starts off in this fashion: " But I banish care when it comes near with a"— she-camel of such and such qualities, and then proceeds to give a description of his riding-camel. Equally abrupt transitions occur in almost all these poems, generally more than once in the same poem. In many cases a sort of unity is preserved by making the different sections represent so many scenes from the life of the poet or from the common life of the Bedouins; but even then there is something unsatisfactory in the want of real connexion. It does not mend matters much when the poet keeps up a merely mechanical transition ; as, for example, when he speaks first of his camel, then with the words "it is as swift as a wild ass which," &c., passes to a description of that animal, and again proceeds, "or as swift as an ostrich which," &c., in order to introduce the ostrich.*~~

~~*This loose structure of the poems explains the fact that from a very early period particular pieces were culled from larger works and recited by themselves. For the town- Arabs of later times this procedure was especially convenient. For them the wild ass or oryx-antelope had little attraction ; and on the camel they bestowed about as much notice as we do on our dray-horses and waggons. But the love and hate, the pride and scorn, the fierce lust of revenge and the wailing grief, the bravery and the gaiety, which breathed through the old Bedouin songs, had an intense fascination for them. We see that their attitude towards that poetry had in some degree*~~

~~*approximated to our own. Hence it is that some anthologies from the old poetry, made by men*~~

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~~*of learning and ability, with an eye to contemporary tastes, are on the whole much more pleasing to us than the com- plete poems themselves. This is eminently true of the excellent collection edited by Abii Tammam, himself a con- siderable poet (first half of the 9th century), under the title "Hamdsa" (Valour). This collection, which, however, embraces many pieces of the Moslem period, is certainly fitted to give a European a rather too favourable idea of ancient Arabic poetry. Whoever wishes really to know that poetry—and without this knowledge it is impossible to understand the Arabs themselves or their language—must betake himself to those which, like the Mo'allakat and others, have been preserved more or less in their integrity.*~~

~~*The Mo'allakat have been repeatedly printed, separately and collectively, both in the West and the ee generally with an Arabic commentary. A good commentary by a competent European is a real desideratum. A work of this kind would do more for the understanding of the poems than any poetical translation, which must always fail in rendering these definite concrete expressions of the Arabs for which we possess neither the idea nor the image. A*~~

~~*translation must either be a mere paraphrase or else substitute some- thing utterly vague. (CEN)*~~

~~*MOBILE, a city and port of entry of the United States, the capital of Mobile county, and, though not the capital, the largest city of Alabama, lies 140 miles east of New Orleans, on a sandy plain on the west bank of Mobile river, one of the arms of the Alabama. The municipal boundary includes an area about 6 miles long by 2 or 3 in breadth; but, excluding the suburban villas scattered about the nearer hills, the portion occupied by the buildings of the city proper is not more than a mile square. In the matter of paving and shade the streets are generally good, and Government Street especially, with its fine oak trees and gardens, forms an attractive promenade. Besides the spacious granite building erected in 1859 to accommodate the Custom-*~~

~~*House, the Post Office, and the United States courts, the principal edifices are the Roman Catholic cathedral of the Immaculate Conception (1833), Christ Church (Episcopal) (1837), the City Hos- pital (1830), the United States Marine Hospital (1836), the Providence Infirmary, the conjoint market-house and municipal buildings, Barton Academy (occupied by the high schools), and the Alabama Medical College (founded in 1859). About 6 miles out, at Spring Hill, is the Jesuit College of St Joseph, established by Bishop Portier in 1832. Asa commercial centre Mobile is in some re- spects very favourably situated. It is the only port of Alabama ; the estuary on which it stands is the outlet for several navigable rivers; and it is the seaward terminus of the Mobile and Ohio railroad, the Mobile and Mont- gomery, and the Grand Trunk. But, on the other hand, it lies 25 miles from the coast; the lagoon-like bay cut off from the Gulf of Mexico by the narrow isthmus of Mobile Point is extremely shallow ; and in 1879 no vessel drawing more than 13 feet could load and unload in the harbour with safety. Since 1827, it is true, various works have been undertaken to improve the approaches: the Choctaw Pass and the Dog River Bar, which had formerly a depth of little more than 5 and 8 feet respectively, were deepened to 17 feet by 1882; but Mobile will not take rank as a satisfactory ocean port till the scheme (now in operation) for constructing a wide channel more than 20 feet deep right through the bay has been fully carried out. The cost of the necessary works being beyond the power both of the city and State, Con- gress has granted $270,000 for the purpose of widening the channel to 200 feet, and deepening it to 23 feet. A private company, established in 1876, has built a break- water in the bay, and greatly increased the safety of the harbour. For the years between 1855 and 1859 the average value of exports and imports was respectively*~~

~~*$93,419,266 and $711,420; the following figures for recent years show a considerable decline on the total :—*~~

~~*Years ending in*~~

~~*ane Exports. Imports.*~~

~~1877 $12,784,171 $648,404 1878 9,493,306 1,148,442 1879 6,219,818 544,628 1880 7,188,740 425,519 1881 6,595,140 671,252 1882 3, 258,605 396,573~~

~~po In cotton, which forms the staple export, the falling off is par- ticularly noticeable, 632,308 bales being the average for 1855 to 1859, and 365,945, 392,319, and 265,040 bales the quantities for 1879, 1880, and 1881, A great deal of what comes to the Mobile inarket is sent to New Orleans for shipment, partly that it may obtain a higher price as ‘ Orleans” cotton. Lumber shingles, turpentine and rosin, fish and oysters, and coal, are also important items, but do not make in the aggregate so much as half the value of the cotton. Among the local industrial establishments arc several spinuing-mills, breweries, cooperages, shipbuilding yards, foundries, and sash and door works. The market gardeners of the outskirts produce a large quantity of cabbages, potatoes, water- melons, tomatoes, &c., to supply the cities of the western and northern States (value in 1879, $112,520; 1880, $174,483; 1881, $159,706; 1882, $867,194; 1883, estimated $700,000). Though in 1820 it had no more than 2672 inhabitants, Mobile had 31,255 in 1880; the figures for the intermediate decades being 3194 (1830), 12,672 (1840), 20,515 (1850), 29,258 (1860), and 32,034 (1870). Founded as a fort by Lemoyne d’Iberville (de Bienville) in 1702, Mobile continued to be the capital of the colony of Louisiana till 1723, when this rank was transferred to New Orleans. The site selected by Lemoyne was probably about 20 miles above the pre- sent position, which was first occupied after the floods of 1711. By the Treaty of Paris, 1763, Mobile and part of Louisiana were ceded to Britain; but in 1780 the fort (now Fort Charlotte) was captured by the Spanish general Galvez, and in 1783 it was recog- nized as Spanish along with other British possessions on the Gulf of Mexico. General Wilkinson, ex-governor of Louisiana, recovered the town for Louisiana in 1813, and in 1819, though its population did not exceed 2500, it was incorporated as a city. In 1864-65 Mobile and the neighbourhood was the scene of important military and naval engagements. The Confederates had surrounded the city by three lines of defensive works, but the defeat of their fleet by Admiral Farragut, and the capture of Fort Morgan, Spanish Fort, and Fort Blakelly, led to its immediate evacuation. Asa municipal corporation, Mobile had got into such financial difficulties~~

~~*by 1879 that its city charter was repealed, and a board of commissioners established for the liquidation of its debt of $2,497,856.*~~

~~*MOBIUS, Avcust Ferprnanp (1790-1868), astronomer and mathematician, was born at Schulpforta, November 17, 1790. At Leipsic, Gottingen, and Halle he studied for four years, ultimately devoting himself to mathematics and astronomy. In 1815 he settled at Leipsic as privat- docent, and the next year became extraordinary professor of astronomy in connexion with the university. Later he was chosen director of the university observatory, which was erected (1818-21) under his superintendence. In 1844 he was elected ordinary professor of higher mechanics and astronomy, a position which he held till his death, September 26, 1868. His doctor's dissertation, De computandis occultationibus jfixarum per planetas (Leipsic, 1815), established his reputation as a theoretical astronomer. Die Hauptsdtze der Astronomie (1836), Die Elemente der Mechanik des Himmels (1843), may be noted amongst his other purely astronomical publications. Of more general interest, however, are his labours in pure mathematics, which appear for the most part in Crelle's Journal from 1828 to 1858. These papers are chiefly geometrical, many of them being developments and appli- cations of the methods laid down in his great work, Der Barycentrische Calcul (Leipsic, 1827), which, as the name implies, is based upon the properties of the mean point or centre of mass. Any point in a plane (or in space) can be represented as the mean point of three (or four) fixed points by giving to these proper weights or coefficients, — an obvious principle which leads in the hands of Mobius to what no doubt is the chief novel feature of the work, a*~~

~~*system of homogeneous coordinates. Besides this, how- ever, the work abounds in suggestions and foreshadowings of some of the most striking discoveries in more recent times—such, for example, as are contained in Grassmann's Ausdehnungslehre and Hamilton's Quaternions. He must be regarded as one of the leaders in the introduction of the powerful methods of modern geometry that have been developed so extensively of late by Von Standt, Cremona, and others.*~~

~~*MOCHA, a town of Yemen on the coast of the Red Sea, in E. long. 43° 20', N. lat. 13° 19'. The point of the coast where Mocha lies appears to have owed early import- ance to its good anchorage, for the Muza of the Periplus (Geog. Gr. Min., i. 273 sqq.), a great seat of the Red Sea trade in antiquity, seems to be identical with the modern Muza' (Yakut, iv. 680; Niebuhr, Desc. de ? Arahve, p. 195), a few miles inland from Mochdé. Moché itself is a modern town, which rose with the coffee trade into short-lived pros- perity. The French expedition of 1709 found it a place of some 10,000 inhabitants, and its importance had increased half a century later, when Niebuhr visited it. The chief _ trade was then with British India. Lord Valencia in 1806 still found the town to present an imposing aspect, with its two castles, minarets, and lofty buildings ; but the popula- tion had sunk to 5000. The internal disorders of Arabia and the efforts of Mohammed Ali to make the coffee trade again pass through India accelerated its fall, and the place is now a mere village. Mochd never produced coffee, and lies indeed in a quite sterile plain; the European name of Mocha coffee is derived from the shipment of coffee there. The patron saint, Sheikh Shadali, was, according to legend, the founder of the city and father of the coffee trade.*~~

~~*MOCKING-BIRD, or Mock-Birp (as Charleton, Ray, and Catesby wrote its name), the Mimus polyglottus of modern ornithologists, and the well-known representative of an American group of birds usually placed among the TurusHES (q.v.), Turdidx, though often regarded as forming a distinct section of that Family, differing by having the tarsus scutellate in front, while the typical Thrushes have it covered by a single horny plate. The Mocking-bird inhabits the greater part of the United States, being in the north only a summer-visitant ; but, though breeding yearly in New England, is not common there, and migrates to the south in winter, passing that season in the Gulf States and Mexico. It appears to be less numerous on the western side of the Alleghanies, though found in suitable localities across the continent to the Pacific coast, but not farther northward than Wisconsin, and it is said to be common in Kansas. Audubon states that the Mocking-birds which are resident all the year round in Louisiana attack their travelled brethren on the return of the latter from the north in autumn. The names of the species, both English and scientific, have been bestowed from its capacity of successfully imitating the cry of many other birds, to say nothing of other sounds, in addition to uttering notes of its own which*~~

~~*possess a varied range and liquid fulness of tone that are unequalled, according to its admirers, even by those of the NicHTINGALE (¢.v.). This opinion may perhaps be correct; but, from the nature of the case, a satisfactory judgment can scarcely be pro- nounced, since a comparison of the voice of the two songsters can only be made from memory, and that is of course affected by associations of ideas which would pre- clude a fair estimate. To hear either bird at its best it must be at liberty ; and the bringing together of captive examples, unless it could be done with so many of each species as to ensure an honest trial, would be of little avail. Plain in plumage, being greyish-brown above and dull white below, while its quills are dingy black, variegated with white, there is little about the Mocking-bird's appear-*~~

~~*ance beyond its graceful form to recommend it; but the lively gesticulations it exhibits are very attractive, and therein its European rival in melody is far surpassed, for the cock-bird mounts aloft in rapid circling flight, and, alighting on a conspicuous perch, pours forth his ever- changing song to the delight of all listeners; while his actions in attendance on his mate are playfully demonstra- tive and equally interest the observer. The Mocking-bird is moreover of familiar habits, haunting the neighbourhood of houses, and is therefore a general favourite. The nest is placed with little regard to concealment, and is not dis- tinguished by much care in its construction. The eggs, from three to six in number, are of a pale bluish-green, blotched and spotted with light yellowish-brown. They, as well as the young, are much sought after by snakes, but the parents are often successful in repelling these deadly enemies, and are always ready to wage war against any intruder on their precincts, be it man, cat, or hawk. Their food is various, consisting of berries, seeds, and insects.*~~

~~*Some twelve or fourteen other species of Mimus have been recog- nized, mostly from South America; but Jf, orpheus seems to be common to some of the Greater Antilles, and Jf, Aillz is peculiar to Jamaica, while the Bahamas have a local race in M. bahamensis. The so-called Mountain Mocking-bird (Orcoscoptes montanus) is a form not very distant from Mimus ; but, according to Mr. Ridgway, it inhabits exclusively the plains overgrown with*~~

~~*Artemisia of the interior tableland of North America, and is not at all imitative in its notes, so that it is an instance of a misnomer. Of the various other genera allied to Mimus, those known in the United States as Threshers, and belonging to the genus Harporhynchus—of which six or eight species are found in North America, and are very Thrush-like in their habits—must be mentioned ; but there is only room here to dwell on the Cat-bird (Galcoscoptes carolinensis), which is nearly as accomplished an imitator of sounds as its more cele- brated relative, with at the same time peculiar notes of its own, from one of which it has gained its popular name. The sooty-grey colour that, deepening into blackish-brown on the crown and quills, pervades the whole of its plumage—the lower tail-coverts, which are of a deep chestnut, excepted—renders it a conspicuous object ; and though, for some reason or other, far from being a favourite, it is always willing when undisturbed to become intimate with men's abodes. It has a much wider range on the American continent than the Mocking-bird, and is one of the few species that are resident in Bermuda, while on more than one occasion it is said to have appeared in Europe.*~~

~~*The name Mocking-bird, or more frequently Mock-Nightingale, is in England occasionally given to some of the WARBLERS (q.v.), especially the Blackcap (Sylvia atricapilla), and the Sedge-bird (Acrocephalus schenobenus). In India and Australia the same name is sometimes applied to other species. (A. N.)*~~

~~*MODENA, one of the principal cities of Northern Italy, formerly the capital of a duchy, and still the chief town of a province and the seat of an archbishop, is situated in the open country in the south side of the valley of the Po, between the Secchia to the west and the Panaro to the east. By rail it is 31 miles E.S.E. of Parma, 24 W.N.W. of Bologna, and 37 S. of Mantua. The observatory stands 135 feet above the level of the sea, in 44° 38' 52" N. late and 10° 55' 42" E. long. Dismantled since 1816, and now largely converted into promenades, the fortifications still give the city an irregular pentagonal contour, modified at the north-west corner by the addition of a citadel also penta- gonal. Within this circuit there are various open areas—the spacious Piazza d'Armi in front of the citadel, the public gardens in the north-east of the city, the Piazza Grande in front of the cathedral, and the Piazza Reale to the south of the palace. The Aumilian Way crosses obliquely*~~

~~*right through the heart of the city, from the Bologna Gate in the east to that of Sant'? Agostino in the west. Commenced by the countess Matilda in 1099, after the designs of Lanfranc, and consecrated in 1184, the cathedral (St Geminian's) is a low but handsome building, with a lofty crypt, three eastern apses, and a facade still preserving some curious sculptures of the 12th and 15th centuries. The bell-tower, named La Ghirlandina from the bronze garland surrounding the weathercock, is lined with white marble,*~~

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~~*and is 315 feet high; in the basement may be seen the wooden bucket captured by the Modenese from the Bo- lognese in the affray at Zappolino (1325), and rendered famous by Tassoni's Secchia Rapita. Of the other churches in Modena, San Pietro has terra-cottas by the local artist Begarelli, and 8. Agostino (now §. Michele) contains the tomb of Sigonius and the tombstone of Muratori. The old ducal palace, begun by Duke Francis I. in 1635 from the designs of Avanzini, and finished by Francis Ferdinand V., is an extensive marble building, and now contains the library (Bib. Palatina, see vol. xiv. p. 530), picture-gallery, and museum. Many of the best pictures in the ducal collection were sold in the 18th century, and found their way to Dresden. The valuable Museo Lapidario in a building near Porta Sant' Agostino is well known to the*~~

~~*Scale of ¥z English Mile*~~

~~*Plan of Modena.*~~

~~*4, 8. Domenico.*~~

~~*5. Royal Palace.*~~

~~*6. Archbishop's Palace. 10. 8. Pietro.*~~

~~*7. Cathedral. 8. Campanile Ghirlandina. 9. University.*~~

~~*1. Museo Lapidario. 2. 8. Agostino. 8. Academy of Fine Arts.*~~

classical antiquary through Cavedoni's Dichzarazione degli anticht marmi Modenesi (1828), and the supplements in the Memoirs of the Academy, vol. ix., &c. The university of Modena, originally founded in 1683 by Francis IL, is mainly a medical and legal school, but has also a faculty of physical and mathematical science. It has about twenty-five professors, and from 200 to 250 students; a library of 20,000 volumes, an observatory, botanical gardens, an ethnographical museum, &c. The old academy of the Dzssonanti, dating from 1684, was restored by Francis in 1814, and now forms the flourishing Royal Academy of Science and Art (Memoirs since 1833) ; and there are besides in the city an Italian Society of Science founded by Anton Mario Lorgna, an academy of fine arts, a military college (1859), an important agricultural college, and a lyceum and gymnasium, both named after Muratori. In industrial enterprise the Modenese show but little activity, silk and linen goods and iron-wares being almost the only products of any note. Commerce is stimulated by a good position in the railway system, and by a canal which opens a water-way by the Panaro and the Po to the Adriatic. The population of the city was 32,248 in 1861, and 30,854 in 1871; that of the com- mune 55,512 in 1861, and 58,058 in 1881.

The Ducuy or MoprEna, an independent sovereign state

(1452 to 1859), ultimately extended from the Po to the Mediterranean, and was bounded N. by Lombardy and the Papal States, E. by the Papal States and Tuscany, 8. by Tuscany, Sardinia, and the Mediterranean, and W. by Sardinia and the duchy of Parma. Its greatest length, from Porto-Vecchio, on its northern frontier towards Man- tua, to the outlet of the Parmignola torrent, on the Sardinian frontier, was 844 miles; and its greatest width, from the pass of Calama, on the Papal and Tuscan frontier, to the right bank of the Enza, on the frontier of Parma, was 37 miles. The area was 2371 square miles, of which three- {ths were mountainous. In 1855 the population was 606,159. The duchy had six provinces—Modena, Reggio, Guastalla, Frignano, Garfagnana, Massa-Carrara. .

Modena is the ancient Mutina, which was annexed by the Romans along with the rest of the territory of the Boii. In 183 3.c. Mutina becaine the seat of a Roman colony. During the civil wars Marcus Brutns held out within its

~~*walls against Pompeins in 78 B.c., and in 44 Bc. the place was defended by D. Brutus against M. Antony. The 4th century found Mntina in a state of decay; the ravages of Attila and the troubles of the Lombard period left it a ruined city in a wasted land. In the 8th century its exiles founded, at a distance of 4 miles to the north-west, a new city, Citta Geminiana (still represented by the village of Cittanova) ; but about the close of the 9th century Modcna was restored and refortified by its bishop, Laedoinus. When it began to build its cathedral (1099 a.p.) the city was part of the possessions of tle countess Matilda of Tuscany ; but when, in 1184, the edifice was consecrated by Lucius IIL, it was a free community. In tho wars between Frederick II. and Gregory IX. it sided with the emperor, though ultimately the papal party was strong enough to introduce confusion into its policy. In 1288 Obizzo d'Este was recognized as lord of the city; after the death of his successor, Azzo VIII. (1308), it resumed its communal independence ; but by 1836 the Este family was again in power. Constituted a duchy in 1452 in favour of Borso d'Este, and enlarged and strengthened by Hegcules II., it became the ducal residence on the incorporation of Ferrara with the States of the Church (1598). Francis I. (1629-1658) erected the citadel and commenced the palace, which was largely embellished by Francis IL Rinaldo (ob. 1737) was twice driven Loin his city by French invasion. To Francis III. (1698-1780) the city was indebted for many of its public buildings. Hercules III. (1727-1803) saw his states transformed by the French into the Cispadine Republic, and, having refused the principality of Breisgau and Ortenau, offered him in compensation by the treaty of Campo Formio, died an exile at Treviso. His only daughter, Maria Beatrice, married Ferdinand of Austria (son of Maria Theresa), and in 1814 theireldest son, Ferdinand, received back the Stati Estensi. His rule was subservient to Austria, reactionary, and despotic. On the outbreak of the French Revolution of 1830, Francis [V.seemed for a time disposed to encourage the corresponding movement in Modena; but no sooner had the Austrian army put an end to the insurrection in Central Italy than he returned to fis previous policy. Francis Ferdinand V., who succeeded in 1846, followed in the main his father's example. Obliged to leave the city in 1848, he was restored by the Austrians in 1849; ten years later, on 20th August 1859, the representatives of the Modenese, under the direction of Carlo Farini, declared their territory part of the kingdom of Italy, and their decision was confirmed by the plebiscite of 1860.*~~

~~*Natives of Modena are Fallopius the anatomist, Tarquinia Molza, Sadoletius, Sigonius, Tassoni, and Cavedoni the archeologist ; the names of Zaccaria, Tiraboschi, and Muratori are associated with its library. Tiraboschi's Bibliotheca Modenensis, 6 vols., contains an account of all the literary personages of the duchy.*~~

~~*See Vedriani, Storia di Modena, 1666; Tiraboschi, Mem storiche modenest, 1793; Scharfenberg, Gesch. des Herzogth. Modena, 1859; Oreste Raggi, Modena descritta, 1860; Baraldi, Storia di Modena; Valdrighi, Diz. Storico, &c., delle*~~

~~*contrade di Modena, 1879-80 ; Crespellani, Guida di Modena, 1879 ; Galvani, Mem. stor. tntorno la vita di Francesco IV., 4 vols.*~~

~~*MODICA, a city of Italy, in the province of Syracuse in Sicily, 8 miles from the south coast, on the line of rail- way decreed in 1879 between Syracuse and Licata. It has increased its communal population from 30,547 in 1861 to 41,231 in 1881, and is a well-built and flourishing place. Of note among the public buildings are the old castle on the rock, the medizeval convent of the Franciscans, and the churches of 8. Maria del Carmine (1150) and 8. Maria di Betlem—this last containing ruins of the ancient temple destroyed by the earthquake of 1693. Modicais the point from which the remarkable prehistoric tomb and dwelling- eaves of Val d'Ispica are usually visited. An early de- pendency of Syracuse, Motyca or Mutyca was in Cicero's*~~

~~*days a fairly important municipiuin. In modern times it was held as a countship by the dukes of Alba. Placido Caraffa has written a prolix history of the city, which may be found in Greevius, Zhes. Ant. e¢ Hist. [tal., vol. xii.*~~

~~*MOE, Jérceen Encrpretsen (1813-1882), Norwegian poet and comparative mythologist, was born at Hole in Sigdal, Ringerike, Norway, on 22d April 1813, and entered the university of. Christiania as a theological student at the age of seventeen. After leaving the university in 1839 he acted as tutor in various schools and families, and in 1845 was appointed professor of theology in the Military School of Norway, which post he held until 1853,*~~

~~*when he became resident chaplain in his native parish of Sigdal. In 1863 he received the living of Bragernees, Drammen ; in 1870 that of Vest Aker, near Christiania ; and in 1875 the bishopric of Christiansand, where he died on 27th March 1882.*~~

~~*Moe's first publication was a volume of Norse 'songs, ballads, and staves," which appeared in 1840; it was followed in 1841 by the Norske Folke-eventyr (Norwegian Popular Tales), which he had collected along with lis schoolfellow Asbjérnsen, 'The work excited such interest as a contribution to the study of comparative mythology that in 1847 he was sent by the Government through Thelemark and Setersdal to increase his collection of stories. The second (enlarged) edition, with a preface by Moe, appeared in 1852. In 1851 his I Brénden og i Tyernet (In the Well and in the Tarn), a delightful collection of prose stories for children, appeared, and it was followed in 1859 by a volume of poems entitled En liden Julegave (A Little Christmas Present). In 1877 he prepared a collected edition of his works in two volumes, the stories he had published along with Asbjérnsen being excluded. Many of the Volke-eventyr (Popular Tales from the Norse) were translated by Sir George Dasent in 1859.*~~

~~*MCBSIA (in Greek Mysia, or, to distinguish it from the country of the same name in Asia, Mysia in Europe), in ancient geography the territory immediately to the south of the Danube corresponding in the main to Servia and Bul- garia, It became a Roman province between 27 B.c, and 6 A.D., probably about 16 B.c.! In the time of Tiberius and Caius the province was under the same governor with Macedonia and Achaia. It was divided by Domitian into two provinces, Mesia Superior (Servia) and Mosia Inferior (Bulgaria) ; and the same emperor completed the great military road along the line of the Danube, increased the strength of the Roman forces in the country, and, by the conquest of Dacia, saved it from the inroads by which it had been harassed from the time of Tiberius. The Goths invaded Meesia in 250 a.D., and at last, in 395, a number of them, afterwards known as Mcesogoths, obtained per- mission to settle in the province. The Slavonians and Bulgarians appear in the 7th century.*~~

~~*The boundary between Upper and Lower Mcesia was not marked, as Ptolemy (iii. 9, 10) states, by the river Cebrus or Ciabrus (Cibritza or*~~

~~Zibru), but, as may be inferred from an inscription (6125, C. Inser. Lat., vol. iii. 2, additamenta), lay between Almus (Lom) and Ratiaria (Artcher). Upper Mesia, or, as it was often called, Meesia Prima, contained — Singidunum (Belgrade), headquarters of Legio IV. Flavia, and in the 3d century a colonia; Viminacium (Kostolatz), headquarters of Leg. VII. Claud., and designated some- times municipium Ailium, but more usually colonia (a rank bestowed on it by Gordianus); Bononia (Widin); Ratiaria, which, on the loss of Dacia, became the headquarters of Leg. XIII. gemina, and remained a large town till it was destroyed by Attila ; Remesiana (Mustapha Pasha Palanka), which has furnished inscriptions belong- ing to the unidentified Ulpiana ; and Naissus (Nissa or Nish), the birthplace of Constantine the Great. Lower Meesia (Mcesia Secunda) contained—Oescus (Colonia Ulpia, mod. Gigen), headquarters, after loss of Dacia, of Leg. V. Maced. ; Nove (Sistova), at a late date a camp of Leg. I. Ital., and afterwards chief seat of Theodoric king of the Goths ; Nicopolis ad Istrum (Nikup), really on the Iatrus or Yantra, a memorial of Trajan's victory over the Dacians ; Pristra (Rustchuk), Asamus (Nicopoli on the Osma), Darostorum (Silistria), Odessus (Varna), Tomi (Kustendjc), Troesmis (Iglitza).~~

~~See Roesler, Romanische Studien, 1871; Pfitaner, Gesch. der Rom. Kaiser-~~

~~legionen, 1881, pp. 152-161; Hahn, in Dkschr. K, Ak. der Wiss., Ph. H. Cl., Vienna, 1861, p. 228.~~

~~_ MOFFAT, a health resort of some note in Scotland, is situated in Upper Annandale, Dumfriesshire, occupying an~~

~~1 See A. W. Zumpt, Commentat. Epigraph., ii. 253 sqq.~~

~~agreeable position at the base of the Gallow Hill, 63 miles.~~

~~from Edinburgh, and 42 miles from Carlisle by railway. The Spa, which is 14 miles above the town (525 feet above sea-level), is sulphureous with' some saline ingre- dients, and is used in gout, rheumatism, and dyspepsia. Population (1881) 2161 ; in the season about 4000.~~

~~*MOFFAT, Ropsrt, D.D. (1795-1883), African mission- ary, was born at Ormiston, Haddingtonshire, Scotland, on 21st December 1795, of humble parentage. Moffat learned the craft of gardening, but in 1814 offered himself to the London Missionary Society, who, in 1816, sent him out to South Africa. After spending a year in Namaqua Land, with the powerful and dreaded chief Africaner, whom he converted, Moffat returned to Cape Town in 1819, and married Miss Mary Smith, a remarkable woman and most helpful wife. In 1820 Moffat and his wife left the Cape and proceeded to Griqua Town, and ultimately settled at Kuruman, among the Bechuana tribes lying to the west of the Vaal river. Here he worked as a missionary till 1870, when he reluctantly returned finally to his native land. He made frequent journeys into the neighbouring regions, as far north as the Matabele country, to the south of the Zambesi. The results of these journeys he communicated to the Royal Geographical Society (Jour. R. G. S., xxv. XXvili., and Proc. ii.), and when in England in 1842 he published his well-known Missionary Labours and Scenes in South Africa. Single-handed he translated the whole of the Bible into Bechuana. While solicitous to turn the people to Christian belief and practice, Moffat was perhaps the first to take a broad view of the missionary function, and to realize the importance of inducing the savage to adopt the arts of civilization. He himself was builder, carpenter, smith, gardener, farmer, all in one, and by pre- cept and example he succeeded in turning a horde of bloodthirsty savages into a "people appreciating and cultivating the arts and habits of civilized life, with a written language of their own." Now we find more or less Christianized communities extending from Kuruman to near the Zambesi. Moffat met with incredible discourage- ment and dangers at first, which he overcame by lis strong faith, determination, and genial humour. It was largely due to him that the work of Livingstone, his son-in-law, took the direction which it did. On his return to England, Moffat received a testimonial of about £6000. He died at Leigh, near Tunbridge Wells, 9th Aug. 1883.*~~

~~*See Scenes and Services in South Africa, the Story of Moffat's Missionary Labours, London, 1876 ; and publications of the London Missionary and the B. and F. Bible Societies.*~~

~~*MOGADOR, or SurraH (Berber Zasurt), the most southern seaport town on the Atlantic coast of Morocco, and the capital of the province of Haha,*~~

~~*stands from 10 to 20 feet above high water on a projecting ridge of cal- careous sandstone in 31° 30' N. lat. and 10° 44' W. long. In certain states of wind and sea it is turned almost into an island, and a sea-wall protects the road to Saffi. The streets are regular and, for a Moorish town, broad and clean. Within the walls there are three distinct divisions: the citadels old and new with the government buildings; to the north-west the outer town with its spacious markets in the centre; and at the north-west corner the Mellah, or Jews' quarter. In the citadels the houses are fairly good, and considerable attention is paid to sanitary matters. Water is brought from the Kseb, about 14 miles to the south, by an aqueduct. The prosperity of Mogador is due to its commerce; only a few gardens break the barren- ness of the immediate vicinity. The harbour or roadstead, though apparently protected by the island and quarantine 'station of Mogador, is extremely dangerous during west and south-west winds. 'Trade is carried on mainly with Marseilles, London, Gibraltar, and the Canaries,—the prin-*~~

~~*cipal exports being almonds, goat-skins, gums, olive oil, and ostrich feathers, and the principal imports cotton goods (half of the total) and tea. The average value of the ex- ports for the five years 1877-1881 was about £210,000, the imports rather less. Attention has been frequently directed to the value of Mogador as a health resort, especially for consumptive patients. The climate is remarkably steady : mean temperature of the hottest month 71-06, of coldest month 58°69. The annual rainfall is only 10 or 12 inches, and the rainy days of winter and spring about 28. The sirocco is but rarely felt. The population is about 15,000 (7000 Jews, about 150 foreigners). Jews, Protestants, and Roman Catholics have religious edifices in the town.*~~

~~*A place called Mogador is marked in the 1351 Portulan of the Lau- rentian Library, and the map in Hondius's Aélas Minor shows the island of: Mogador I. Domegador ; but the origin of the present town is much more recent. Mogador was founded by Sultan Mohammed, and completed in 1770. The town received from the Moors the name of Suerah (little picture), while the Portuguese called it after the shrine of Sidi Mogadul, which lies*~~

~~towards the south half-way to the village of Diabat, and forms a striking landmark for seamen. In 1844 the citadel was bombarded by the French.~~

~~MOGHILEFFY, a north-western government or province of the Russian empire, situated on the upper Dnieper, between the provinces of Vitebsk and Smolensk on the north and east, Tchernigoff and Minsk on the south and west. In the north it is occupied by the watershed which separates the basins of the Dwina and the Dnieper, an undulating tract from 650 to 900 feet above the sea-level, and covered nearly everywhere with forests. .This water- shed slopes gently to the south, that is, to the valley of the Dnieper, which enters the province from the north- east and flows west and afterwards due south. The southern part of the province is flat and has much in com- mon with the Polyesie of the province of Minsk; it is, however, more habitable, the marshes being less extensive.~~

~~The province is covered by the Tertiary formation ; Devonian sandstone appears in the north, and Carboniferous limestones in the east. The soil is mostly sand, clay (brick-clay and potter's-clay are not uncommon), and peat-bogs, with a few patches of "black- earth." The climate is rude and wet, the average yearly tempera- ture at the Gorki meteorological observatory being 40°°4 Fahr. (14°-2 in January, and 63°°8 in July); cold nights in summer are often the cause of bad crops. The province has about 1,140,000 inhabitants (947,625 in 1870), mostly White-Russians (78 per cent.), belonging to the Greek Church ; Jews are numerous (16 per cent.) ; Poles, belonging mostly to the nobility, make only 3 per cent. of the population. Agriculture is the chief occupation ; nearly one half (46 per cent.) of the surface of the province is under crop ; but, except after unusually good harvests, corn is imported, chiefly by the navigable channels of the Dnieper and Sozh. There are many distilleries on the estates of landowners, and wine-spirit is exported. The hemp culture is important; hemp and hemp- seed oil are exported to Riga. The province has one large paper- mill, a few iron and copper works, and minor manufactures.~~

~~The province of Moghileff is divided into eleven districts, with the chief towns: Moghileff (40,500 inhabitants), Chausy (4200), Tcherikoff (3900), Gomel (13,030), Gorki, formerly the seat of an agricultural institute (5050), Klimovichi (4000), Mstislav! (6700), Orsha (5350), Rogacheff (7750),~~

~~*Staryi Bykhoff (5200), and Syenno (2550). Of about 80 other municipal towns, we name Shkloff (13,000 inhabitants), Dubrovka (7000), Kricheff (4000).*~~

~~*This province was inhabited in the 10th century by the Krivichi and Radimichi. In the 14th century it became part of Lithuania and afterwards of Poland. Russia annexed it in 1772. '*~~

~~*MoGHILEFF ON THE DNIEPER, a town of Russia, capital of the province of same name. It is situated on both banks of the Dnieper, 40.miles south of the Orsha station of the railway between Moscow and Warsaw. A railway along the Dnieper will soon bring Moghileff into railway*~~

~~*communication with these capitals.*~~

~~*Moghileff is mentioned for the first time in the 14th century as a dependency of the Vitebsk, or of the Mstislavl principality. At the beginning of the 15th century it became the personal property of the Polish kings. But it was continually plundered — either by Russians, who attacked it six times during the 16th century, or by Cossacks, who plundered it three times. In the 17th century its inhabitants who belonged to the Greek Church suffered much from the persecutions of the Union, In 1654*~~

~~*it surrendered to Russia, but in 1661 the Russian garrison was massacred by the inhabitants. In the 18th century it was taken several times by Russians and by Swedes, and in 1708 Peter I. ordered it to be destroyed by fire. It was annexed to Russia in 1772. Of 40,500 inhabitants two-thirds are Jews and the remainder White-Russians, with a few Poles (2500). Its manufactures are without importance ; but one branch of trade, namely, the prepa- ration of skins, has maintained itself for many centuries. The commerce is mostly in the hands of Jews: corn, salt, sugar, and fish are brought from the south, whilst skins and manufactured ware imported from Germany (partly by smugglers) are sent to the southern provinces.*~~

~~*MOGHILEFF on tue Dntsster (Mohilov), adistrict town of Russia, situated in the province of Podolia, on the left bank of the Dniester, 87 miles east-*~~

~~south-east of Kamenets- Podolsk, and 43 miles from the Zhmerinka railway junc- tion. It has 18,200 inhabitants, nearly one-half of whom are Jews; the remainder are Little Russians, Poles (1500), and afew Armenians. The Little-Russian inhabitants of Moghileff carry on agriculture, gardening, wine, and mul- berry culture. The Jews and Armenians are engaged in a brisk trade with Odessa, to which they send corn, wine, spirits, and timber, floated down from Galicia, as well as with the interior, to which they send manufactured wares imported from Austria.~~

~~Moghileff, named in honour of the Moldavian hospodar Mohila, was founded by Count Potocki about the end of the 16th century. Owing to its situation on the highway from Moldavia to the Ukraine, at the passage across the Dnieper, it developed rapidly. For more than 150 years it was disputed by the Cossacks, the Poles, and the~~

~~Turks. It remained in the hands of the Poles, and was annexed to Russia in'1795. The Crown purchased it from Count Potocki in 1806.~~

~~MOGILAS, Perrus (c. 1600-1647), metropolitan of Kieff from 1632, belonged to a noble Wallachian family, and was born about the year 1600. He studied for some time at the university of Paris, and first became a monk in 1625. He was the author of a Catechism (Kieff, 1645) and other minor works, but is principally celebrated for the Orthodox Confession, drawn up at his instance by the abbot Kosslowski of Kieff, approved at a provincial synod in 1640, and accepted by the patriarchs of Constantinople, Jerusalem, Alexandria, and Antioch in 1642-3, and by the synod of Jerusalem in 1672. See GrezK CHURCH, vol. xi. p. 158.~~

~~There are numerous editions of the Confession in Russian ; it has been edited in Greek and Latin by Panagiotes (Amsterdam, 1662), by Hofmann (Leipsic, 1695), and by Kimmel (Jena, 1843), and there is a German translation by Frisch (Frankfort, 1727).~~

~~MOGUL, or MucHAL, |}xe, the Arabic and Persian form of the word Mongol, usually applied to the Mongol empire in India. See Iyp1a, vol. xii. p. 793 sqq.~~

~~*MOHACS, a market town in the Trans-Danubian county of Baranya, Hungary, stands on the right bank of the west arm of the Danube, 25 miles east-south-east of Pécs (Fiinf- kirchen), with which it is connected by railway, 45° 58' N. lat., 18° 37' E. long. At Mohdcs there are several churches and schools belonging both to the Roman Catholics and the Calvinists, also the summer palace of the bishop of Pécs, a monastery, an old castle, and a station for steamers plying on the Danube, by which means a considerable commerce in wine and the agricultural produce of the neighbourhood is carried on with Budapest and Vienna. Not far from Mohacs are coal mines, and the town is an important coal depot of the Danubian Steam Navigation Company. The population in 1880 was 12,047 (Magyars, Serbs, and Germans).*~~

~~*Two great. battles fought in the vicinity of the town mark the commencement and close of the Turkish dominion in Hungary. In the first, 29th August 1526, the Hungarian army under Louis IJ. was annihilated by the Ottoman forees led by Soliman the Magnifieent (see vol. xii. p. 369). In the second, 12th August 1687, the Austrians under Charles of Lorraine gained a great and decisive victory over the Turks, whose power was afterwards still further broken by Prince Eugene of Savoy.*~~

~~*MOG—MOH*~~

~~*MOHAIR is the woolly hair of a variety of the common or domestic goat inhabiting the regions of Asiatic Turkey, of which Angora is the centre, whence the animal is known as the Angora Goat (see Goat, vol. x. p. 708). Goat's hair has been known and used as a textile material in the East from the most remote periods; but neither the Angora goat nor its wool was known in Western Europe till, in 1655, the animal was described by the naturalist Tourne- fort. That textures of mohair were in use in England early in the 18th century is obvious from Pope's allusion :—*~~

~~*'* And, when she sees her friend in deep despair,*~~

~~*Observes how much a chintz exeeeds mohair." Owing, however, to the jealous restrictions of the Turkish power, it was not till 1820 that mohair became a regular article of import into the United Kingdom. In that year a few bales came into the market; but so little was the material appreciated*~~

~~that it only realized 10d. per ib. In 1870 average mohair fleece was selling at five times that price. From the small beginning of 1820 the imports gradually waxed, and the trade received a very consider- able impetus through the introduction in 1836, by Titus Salt, of the analogous fibre alpaca. The increasing demand for and value of mohair early stimulated endeavours to acclimatize the Angora goat in other regions; but all European attempts have failed, owing to humid and un- genial climates. In 1849 a flock was taken by Dr J. P. Davis to the United States of America, and since that time many fresh drafts have been obtained and distributed to Virginia and various Southern States, and to California and Oregon in the west. In these high and dry regions the goats thrive; and the flocks in the Western States now number many thousands. The Angora goat has also been introduced into the Cape of Good Hope with much success. The first importation of mohair from the Cape, made in 1862, amounted to 1036 tb; and now about one- tenth of the total British supply is received from that source. Mohair has also been received in England from goats reared successfully in Fiji, where they were first in- troduced in 1874, and there are also thriving flocks in Australia.~~

~~The trade in mohair between Asia Minor and western Europe is controlled in Constantinople. There upwards of twenty varieties of fleeces are distinguished according to the localities of their pro- duction, the richest and most lustrous qualities being produced in hilly and forest regions, while the fleeces from the Tale plains are comparatively kempy, coarse, and cottony. From the Lake Van district on the eastern borders of Asiatic Turkey a distinct and inferior variety of wool is obtained. It is known in commerce as Van mohair, and consists, to the extent of about 70 per cent., of white wool slightly streaked with black, with 30 per cent. of coloured red and black wool. At Konieh in the south, also, an inferior mohair known as Pelotons is produced, 80 per cent. of which is black and red, and the remainder white. The average weight of an Angora goat fleece is from 5 to 6 Ib. The finest quality of wool is obtained from the first clip, which is made in the second year of the animal. She-goats yield the best wool, after which come wethers, while the rams give the coarsest fleeces. Angora mohair is a brilliant white lustrous fibre, elastic and wiry in character, and devoid of felting properties. It attains the length of four or five inches, but the long fibre is mixed with an undergrowth of shorter wool, which in the spinning~~

~~*process is combed out as "noils" for separate use. It is a material of enormous durability, and, owing to its remarkable elasticity, it is especially fitted for working into long piled fabrics, such as plush and imitation furs, or for use in braids and bindings, and in boot and other laces. It is largely used for making Utrecht velvet or furniture plush for the upholstering of railway carriages, &c., a trade centred at Amiens. In the making of imitation seal- skins, and imitation beaver, otter, chinchilla, and other furs, and for earriage rugs generally, mohair is extensively employed. Many dress fabrics of mixed mohair and alpaca, eotton, or silk are also manufactured ; but with changes in fashion such materials are con- stantly ehanging in style, composition, and name. Mohair is also used for making certain qualities of lace, and an imitation of ostrich feathers for use as trimming has been made from the fibre. The imports of mohair into the United Kingdom during 1882 amounted*~~

~~*to 16,859,771 ib, valued at £1,433,584, a quantity largely in exeess of the imports of any previous year.*~~

~~*Plate NADU*~~

~~*the birth of Mo- hanimed.*~~

~~*Arabia at*~~

~~*545*~~

~~*MOHAMMEDANISM*~~

~~*Unver this head is given the history of Mohammed and his successors to the fall of the Eastern Caliphate, with a sketch of the institutions and civilization of the Moslem empire and an account of the Koran. The later history*~~

~~*PART IL—MOHAMMED AND*~~

~~*OHAMMED! or MAHOMET, the founder of Islam, first appears in the full light of history with his Flight to Medina (The Hijra), a.p. 622; and this date, not that of his birth, has been fittingly chosen as the epoch of the*~~

~~*Moslem Era, The best-attested tradition? places his first appearance as a prophet in Mecca some twelve years earlier (circa 610). He was then forty years old: the forty must be taken as a round number, but as such is doubtless trustworthy. Thus the birth of Moham- med falls about 570 a.D.: it is said to have fallen in the year when Abrah4, the Abyssinian viceroy of Yemen, made the expedition against Mecca, mentioned in the Koran, when the Arabs first saw the elephant and first suffered from smallpox.?*~~

~~*At the time of Mohammed's birth and youth nothing seemed less likely than that the Arabs should presently make their triumphal entrance into the history of the world as victors over the Greeks and Persians. Nowhere in the Peninsula was there an independent state of any considerable power and importance. At the beginning of the 6th century indeed the princes of Kinda had attempted to form a national kingdom, uniting in particular the tribes of central Arabia; but this kingdom was nothing more than an epic prelude to the true history of the Arabs, which begins with Islam. After the fall of the Kindite dynasty, the old anarchy reigned again among the nomads of the Nejd and the Hij4z; in all other quarters Greek or Persian influence predominated, extending from the frontier deep into the interior by the aid of two vassal states—the kingdom of the Ghassanids in the Haurdn under Greek suzerainty, and that of the Lakhmids in Hira and Anbar under the Persian empire. The antagonism between-By- zantium and Ctesiphon was reflected in the feuds of these Arab lordships; but indeed the rivalry of Greek and Persian exercised its influence even on the distant South of the Peninsula. Urged on by the Greeks, the Abyssinians had overthrown the Christian-hating realm of the Himyarites, the sunken remnant of the ancient might of the Sabans (a.D. 526), the Persians had helped a native prince again to expel the Christians (civca 570), and since then the Persians had retained a footing in the land. Toward the close of the 6th century, their direct and indirect influence*~~

~~*ne*~~

~~*1 'The name Mohammad means in Arabic "the praised," and it has been supposed that this epithet was conferred on the Prophet after his mission to mark him out as the promised Paraclete. This, however, is incorrect (Noldeke, Gesch. d. Qorans [Gott 1860], p. 6, note 2; Sprenger, Leben und*~~

~~*Lehre des M., i. 155 sq.) The name is found, although it was not common, among the heathen Arabs. Renan has shown it to occur on a Greek inscription of the early part of the 2d century of the Christian era (Boeckh, C. J. @., 4500), and Mohammed ibn Maslama of Medina, a contemporary of the Prophet, bore it as his original name, as appears from the fact that his brother was called Mahmud, it being a favourite practice to give to brothers variations of the same name, as Anas and Minis, Sahl and Sohail, Monabbih and Nobaih (Sprenger, i. 158, note 2). That Mohammed calls himself Ahmad, in sur. 1xi. 6, in order to adapt his name to a supposed prophecy, proves nothing ; on the other hand, the men of Mecca, on occa- sion of a treaty with the Moslems, demanded that the Prophet should not call himself messenger of God, but Mohammed ibn 'Abdallah, using his old familiar name; see J. Wellhausen, Vakidi's Kitab al- Maghazi in verkirzter deutscher Wiedergabe (Berl. 1882), p. 257.*~~

~~*2 Nildeke, wt supra, p. 54 sq.*~~

~~*3 Noldeke, Gesch. d. Perser und Araber zur Zeit der Sasaniden aus… Tabari iibersetzt (Leyden, 1879), pp. 205, 218.*~~

~~*must be sought under the names of individual countries and dynasties. What falls to be said of the social and religious aspects of Islam in modern times will be given under the two great divisions of SUNNITESs and SHf'ITESs,*~~

~~*THE FIRST FOUR CALIPHS.*~~

~~*in Arabia greatly surpassed that of the Greeks; and since the Kindites had fallen before the kings of Hira, it extended right through the Nejd into Yemen.**~~

~~*In the Hij4z and western Nejd, the district from which Islam and the Arab empire took their beginning, Greeks and Persians, Ghassanids and Lakhmids, had not much influence ; the nomad tribes, and the few urban common- wealths that existed there, lived free from foreign interfer- ence, after the manner of their fathers. Mohammed's city*~~

~~*was Mecca, where the Banu Kindna had formed a settle- Mecca.*~~

~~*ment round the Ka'ba, the sanctuary of a number of con- federate tribes (Ahabish) belonging to that district. The feast annually observed in the days before the full moon of the month Dht'l-Hijja at Mecca and at 'Arafa and Kozah in the vicinity, presented strong attractions for all inhabitants of the Hij4z, and grew into a great fair, at which the Meccans sold to the Bedouins the goods they imported from Syria. Feast and fair gave the city the prosperity which it shared with other cities which, like Mecca, had the advantage of lying near the meeting-place of the two*~~

~~*great natural roads to Yemen—that from the north-west along the Red Sea coast, and that from the north-east fol- lowing the line of the mountains that traverse the Nejd.®*~~

~~*By their trading journeys the Koraish® had acquired a knowledge of the world, especially of the Greeco-Syrian world: the relative superiority of their culture raised them not only above the Bedouins, but above the agricultural population of such a city as Medina; the art of reading and writing was pretty widely diffused among them. The Koraish within the city were the Bani Ka'b ibn Loay, those in the surrounding country Banu 'Amir ibn Loay ; the townsmen proper were again subdivided into Motayya- bin and Ahl4f—the latter were the new citizens, who were distinguished from the old settlers by the same name in other Arabian towns, as in Téif and Hira. The community was a mere confederation of neighbouring septs, each occupying its own quarter; there was no magistracy, the town as such had no authority. All political action centred in the several septs and their heads ; if they held together against outsiders, this was due to interest and a sense of honour, a voluntary union strengthened by the presence of public opinion. In the time of Mohammed, the most numerous and wealthy sept was that of the Bani Makhzim ; but that of the Banu 'Abdshams was the most distinguished. The Bani Omayya were the most powerful house of 'Abd- shams ; their head, Abu Sofy4n ibn Harb, exercised a de- cisive influence in the concerns of the whole community. Mohammed himself was of the Banu Hashim; it is affirmed that these had formerly enjoyed and claimed of right the position actually enjoyed by the Bani Omayya, but this assertion seems to have had its origin in the claims to the Caliphate which the Hashimites (the house of 'Alf and the 'Abbdsids) subsequently set up against the Omayyads."*~~

~~*4 On the state of Arabia before Islam see Caussin de Perceval, HIssat sur Uhistoire des Arabes, vol. ii.; Muir, Life of Mah., vol. i.*~~

~~*5 Marr al-Zahran, near Mecca, is accordingly said to have been the point at which the great emigration of tribes from Yemen parted into two streams, moving north-west and north-east respectively.*~~

~~*6 The Koraish were the branch of Kindna settled in and about Mecca. They are called also Ghalib and Fihr, but the last name ig particularly applied to those of the Koraish who did not live within the town. 7 Sprenger, vol. ill. p. cxx. sg.*~~

~~*XVI.— 69*~~

~~*Youth of L I the Pro- not live to see the son's birth, and his mother*~~

~~*phet.*~~

~~*Arabian religion,*~~

~~*546*~~

~~*Mohammed's father, 'Abdallah b. 'Abdalmottalib, did mina died while he was still a child. Mohammed was then cared for first by his grandfather, 'Abdalmottalib, and after his death by his oldest paternal uncle, Abu Talib b. 'Abdalmottalib. HIe was kindly treated, but shared the hardships of a numerous and very poor family; he herded sheep and gathered wild berries in the desert. This is all that we know of his youth (sur. xciii. 6), all else is legend, containing at most an occasional fragment of truth.*~~

~~*It was, we are told, in his twenty-fifth year that Mohammed, on the recommendation of his uncle, entered the house and business of a wealthy widow named Khadija. For her he made commercial journeys, thus learning to know part of Palestine and Syria, and perhaps receiving impressions which fructified in his soul? By and by he married the widow, who was much his senior; he was a shrewd man, with prepossessing countenance, fair of skin, and black-haired. The marriage was happy, and blessed with several children. The two sons, however, died young; from the*~~

~~*elder the father received the surname Abu ’1- Kasim. The most famous of the daughters was Fatima, who married her father’s cousin, ‘Ali b. Abi Talib.*~~

~~*During his married life with Khadija, Mohammed came in contact with a religious movement which had laid hold on some thoughtful minds in Medina, Mecca, and Taif. In Mecca, as elsewhere, Arabian heathenism was a traditional form of worship, chiefly concentrated in great feasts at the holy places; it was clung to because it had come down from the fathers. The gods were many; their importance was not due to the attributes ascribed to them, but to their connection with special circles in which they were worshipped. They were the patrons of septs * and tribes, and symbolized, so to speak, the holy unity which united the present and past members of these. Above them all stood Allah, the highest and universal God. By him the holiest oaths were sworn; in his name (Bismika Alldhummd) treaties and covenants were sealed; the lower gods were not fit to be invoked in such cases, as they belonged to one party instead of standing over both. The enemy was re- minded of All4h to deter him from inhuman outrage ; enemy of All4h (‘aduw Allah, Geoorvy7s) was the name of opprobrium for a villain. But, since Allah ruled over all*~~

~~*1 The tradition relates that as an infant Mohammed was entrusted to a Bedouin foster-mother, Halima, who brought him up among her people, the Banu Sa‘d b. Laith. Sprenger (i. 162 sq.) will have it that this precise statement is also a fiction ; but he is probably wrong. It can hardly be disputed that Bedonin women were accustomed to suckle the children of townsfolk for wages, and Mohammed’s “ milk-kinship ” with the Banu Sa‘d b. Laith is confirmed by what happened at and after the battle of Honain. A nephew of Mohammed was also brought up among the Sa‘d. Comp. Vakidi, ut supra, pp. 364, 377 sq., 431, note 1. ;*~~

~~*2 He saw the mute witnesses of divine judgment, the rock-dwellings of Hijr and the Dead Sea; perhaps, too, he was impressed by the figure of some venerable mouk (Bahira legends), Comp. Ibn Hisham, p. 115 sq.; Sprenger, i. p. 178 sqq.*~~

~~*3 Vakidi, p. 850: Idols were fouud in every house, and homage was paid to them when men went out or in to gain their blessing. Abu Bajrat made and*~~

sold them ; there was a lively trade in idols with the Bedouins.

4 The particular gods are said to have been regarded as children of Alléh (oondy 893). From sur. iii, 21, xxvii, 149, it appears that the Meccaus called their goddesses daughters of All4h; perhaps it was their disputes with Mohammed that forced them to this view. At first, certainly, al-Lat and al-'Ozz4 were names of the wife of the supreme god ; sexual dualism dominated in the oldest Arab idea of the godhead. It was Mohammed who first reduced the gods to Jinns—1.e. to subordinate demons and kobolds—as he did not deny their existence, but only stripped off their divinity. To say that the oldest Arabs worshipped Jinns is as unreasonable as to say that they worshipped the devil; for Islam degraded the gods to Shaitans as well as to Jinns. Superstition certainly played its part among the Arabs, but superstition is not religion.

MOHAMMEDANISM

[MOHAMMED.

and imposed duties on all, it was not thought that one could enter into special relations with him. In worship he had the last place, those gods being preferred who represented the interests of a specific circle, and fulfilled the private desires of their worshippers.° Neither the fear of Allah, however, nor reverence for the gods had much influence. The chief practical consequence of the great feasts was the observance of a truce in the holy months, and this in course of time had become mainly an affair of pure practical convenience. In general, the disposition of the heathen Arabs, if it is at all truly reflected in their poetry, was profane in an unusual degree. Wine, the chase, gaming, and love on the one side ; vengeance, feuds, robbery, and glory on the other, occupy all the thoughts of the old poets. Their motives to noble deeds are honour and family feeling; they hardly name the gods, much less feel any need of them. The man sets all his trust on himself : he rides alone through the desert, his sword helps him in danger, no God stands by him, he commends his soul to no saint. HIs reckless egoism may expand to noble self-sacrifice for the family and the tribe; but in this heroism religious impulses have no part, there is nothing mystical in these hard, clear, and yet so passionate natures. The only vein of what can in any sense be called religious feeling appears when the volcano

~~*has burned itself out and the storm of life is over; then, it may be, a wail is heard over the vanity of all the restless activity that is now spent.® It is very possible that religion meant more to the sedentary Arabs than to the nomads, to whom almost all the ancient poetry belongs; but the difference cannot have been great. The ancient inhabitants of Mecca practised piety essentially as a trade, just as they do now; their trade depended on the feast, and its fair on the inviolability of the Haram and on the truce of the holy months.'*~~

~~*The religion of the Arabs before Mohammed was de- The crepit and effete.8 Many anecdotes and verses prove that Hanifs.*~~

~~*indifference and scoffing neglect of the gods was nothing uncommon. The need for a substitute for the lost religion was not very widely felt. But there were individuals who were not content with a negation, and sought a better re- ligion, Such were Omayya b. Abi '1-Salt in Taif, Zaid b. 'Amr in Mecca, Abt Kais b. Abi Anas, and Abt 'Amir in Medina.® They were called Hanifs, probably meaning*~~

~~*5 Vakidi, pp. 368, note 1, 370, note 1 ; Sprenger, iii. 457 sqg., 512. Whether the feast at Mecca was celebrated in honour of Allah before Mohammed, is very doubtful. It would seem that Hobal was wor- shipped in the Ka'ba (Ibn Hisham, p. 97 sq.), and Kozah in Mozdalifa (Vakidi, p. 428); it is possible, however, that Allah stood to Hobal among the Arabs as El to Jahwé among the Hebrews, Ritual sacri- fices were generally presented to a god who had a proper name; but the trace of a religious rite which still survived in the ordinary killing of beasts for food, possibly consisted even before Mohammed in the invocation of the name of Allah (Sprenger, ii. 478, note 1; but comp. Vakidi, p. 160, note 1, p. 158).*~~

~~*6 'We hasten towards an unknown goal, and forget it in eating and drinking. We are sparrows and flies and worms, but more dariug than famishing wolves. . . . My roots reach dowu to the depths of the earth; but this Death spoils me of my youth, and of my soul he spoils me and of my body, and right soon he lays me in the dust. I have urged my camel through every desert, wide-stretching and shimmering with mirage ; and I have ridden in the devouring host, reaching after the honours of greedy perils, and I joined in the fray under every sky till I longed for the home-coming instead of*~~

~~*booty. But can I, after Harith's death, and after the death of Hojr, the noble host—can I hope for a softer lot from the change of time, which does not forget the hard mountains? I know that I must soon be transfixed by his talon and tooth as befell my father and my grandsire, not to forget him that was slain at Kolab."—-Amraalkais, ed. Slane, No. 10, p. 33; ed. Ahlwardt, No. 5.*~~

~~*7 See, on Arabian heathenism, Pococke, Specimen hist. Arabum ; Krehl, Religion der vorislamischen Araber (Leip. 1863); Sprenger, i, 241 sq. 8 Vakidi, p. 298, note 1.*~~

~~*® See, for Omayya, Kitéb al-Aghdnit (Bulak ed.), iii, 186 sg.; for Zaid, Ibn Hisham, p. 148 sg. ; for Abt Kais, 7d. 348 sq., 39 sq.; and for Abu 'Amir, Vakidi, pp. 108, 161, 190, 410.*~~

~~*ifs, |*~~

~~*Jewish and Christian influence,*~~

~~*MOHAMMED. |*~~

~~*"nenitents", men who strive to free themselves from sin.) They did not constitute a regular sect, and had in fact no fixed and organized views. They had, no doubt, inter- course with one another, but were not a close society; they thought more of their own souls than of propaganda ; only in Medina they seem to have been more numerous. They rejected polytheism and acknowledged Allah, but not so much on intellectual grounds as on grounds of conscience. Faith in the one God was with them identical with pious resignation (Js/dém) to his will; their monotheism was most closely allied to the sense of responsibility and of a coming judgment ; it stood opposed to the worldly ideas of the idolaters, and was an impulse to upright and sin-avoiding walk. They were not theorists, but ascetics. It was the primitive ideas of Law and Gospel ("the religion of Abra- ham") that lived again in them. They felt on the whole less attracted towards the developed forms of the religion of revelation ; they rather sought after some new form ; few of them attached themselves to existing religious communities. Mohammed, it would appear, came into connexion with these Hanifs through a cousin of his wife, Waraka b. Naufal, who was one of them, Their doctrines found a*~~

~~fruitful soil in his heart ; he was seized with a profound sense of dependence on the omnipresent and omnipotent Lord, and of responsibility towards him. Following the example of old Zaid b. 'Amr, he now frequently withdrew for considerable periods to the solitude of the bare and desolate Mount Hird, and meditated there with prayer and ascetic exercises. For years, perlaps, he went on in these purely individual exercises, without anything to dis- tinguish him essentially from the others who held similar views. But in him the Hanifite ideas lodged themselves in a natural temperament which had a sickly tendency to excitement and vision, and so produced a fermentation that ended in an explosion.2 Thus he became a prophet ; he felt himself constrained to leave the silent circle of ascetics and make a propaganda for the truth. In this resolve he was unquestionably influenced by what he knew of the example of the Biblical prophets, perhaps also by the cir- cumstance that a longing after a new founder of religion was diffused among the Hanifs, and found support in some dim acquaintance with the Messianic hopes of the Jews. That Mohammed did not independently produce his own ideas is indisputable ; nor is it to be doubted that he de- rived them from the Hanifs. But what was the ultimate source of these first motions towards Islam? In general they are ascribed to a Jewish source. Jews were very numerous in Hij4z and Yemen, and had perfectly free intercourse with the Arabs, to whom they undoubtedly imparted a quantity of Biblical and religious material. Mohammed in particular was indebted to the Jews for almost all the stories and a great part of the laws of the Koran (laws of marriage, purity, etc.), and the theological language of Islam is full of Jewish words. But the ori- ginal and productive forces of Islam did not spring from Judaism, least of all the ideas of the Judgment and of the inexorable demands set before the creature by his Creator,~~

~~_ ia er 1 Sprenger (p. 38 sg.) connects Hanif with 42M, and expounds it~~

~~per antiphrasin as Jucus a non lucendo, on the ingenious fashion of A. Geiger. As tahannuth = tahannu/f is the technical name of such solitary ascetic practices as Mohammed himself engaged in before his call, Hanif may be taken to mean a mutahannif by profession. The connexion between hanif and tahannuf is certain, and it seems equally certain that tahannuf as an equivalent of tahannuth comes not from hanif but from hinth (for hinf),~~

~~*and means not to play the Hanif but to concern oneself with one's sin, to purge oneself of it.*~~

~~*2 It is disputed whether Mohammed was epileptic, cataleptic, hys- teric, or what not; Sprenger seems to think that the answer to this medical question is the key to the whole problem of Islam. It is certain that he had a tendency to see visions, and suffered from fits which threw him for a time into a swoon, without loss of inner con- sciousness.*~~

~~*which are so dominant in the older stras. A distinction must be drawn between the primitive impulses and the material added later; Mohammed did not get his leaven from the Jews, they only supplied him afterwards with meal. Neither in truth can Christianity be viewed as the proper source of Islam—Christianity, that is, in any of its great historical developments. The Arabs knew Greek, Syrian, and Abyssinian-Himyaritic churches ; manifold in- fluences from these doubtless reached Islam, but in none of them did the idea of Judgment still stand as the central point of religion ; the living sense of divine reality ruling over the life was half extinguished by the developments of theology. But in the Syro-Babylonian desert, off the line of the church's main advance, primitive forms of Chris- tianity, perhaps also of Essenism, still survived, which the course of church history had left untouched. To these belong on the one hand the Sabians (" Baptists," from pay), on the other the nunierous anchorets of these regions. The con- nection of Islam with the Sabians appears from the fact that in Mecca and Taif its adherents were simply known as Sabians.? From them, however, were derived, it would seem, for the most part only externals, though the import- ance of these must on no account be undervalued. The deepest influence exercised on the Hanifs, and through them on the Prophet, appears to have come from the an- chorite ascetics. How popular they were with the Arabs, appears from the Bedouin poetry ; what power they exer- cised over the minds even of the heathen, is proved by various episodes in the history of Ghassin and Hira; how well the Arabs knew the difference between them and the shaven clergy, is seen in the instructions of Abubekr to the commanders in the Syrian campaigns. It was not their doctrine that*~~

~~*proved impressive, but the genuine earnest- ness of their consecrated life, spent in preparation for the life to come, for the day of judgment, and forming the sharp- est contrast to the profanity of heathenism. Ascesis and meditation were the chief points with the Hanffs also, and they are sometimes called by the same name with the Christian monks. It can hardly be wrong to conclude that these nameless witnesses of the Gospel, unmentioned in church history, scattered the seed from which sprang the germ of Islan.*~~

~~*The tradition gives a telling story of the way in which Mohammed at length came to proclaim openly what had long been living and working within him ; in other words, how he became a propket. Once, in the month of Rama- dan, while he repeated his pious exercises and meditations on Mount Hird, the angel Gabriel came to him by night as he slept, held a silken scroll before him and compelled him, though he could not read, to recite what stood written on it.5 This was the first descent of a passage of the heavenly book, the source of revelation from which Moses and Jesus and all prophets had drawn ; and so Mohammed was called to be a prophet. The words with which Gabriel had summoned him to read, remained graven on his heart. They were the beginning of sur. xevi.—*~~

~~*3 Ibn Hisham (p. 835) relates that the Bani Jadhima announced their conversion to Islam to Khalid in the words, " We are become Sabians." Renan, Ktudes d'histoire rel. (1863), p. 257, misunderstands this utterance.*~~
~~:~~

~~*4 Abi 'Amir is as often called Rahib as Hanif. All the accounts indicate that the Hanifs stood nearer to Christianity than to Judaism, not only in Tif but elsewhere. Interesting in the highest degree is a verse ascribed to Sakhr al- Ghay in the Hodhailian Poems, ed. Kose- garten 18,11. A thundercloud is there described, the centre of which is an impenetrable mass ; only on the onter fringe a restless motion is discernible. "Its fringes on the mountain- ridge (al-Mala) are like Christians celebrating a banquet when they have found a Hanif (and so run to and fro in the restlessness of glad excitement)."" ;*~~

~~*5 Of course any one can read ina vision, The question discussed even by Moslems, as to whether the Prophet could read or not, has at least no place*~~

~~*in this connexion.*~~

~~*Moham-*~~

~~*med's*~~

~~*first vision.*~~

~~*The fatra.*~~

~~*548*~~

~~*"Read! in the name of thy Lord, who created, created man from a drop. Read! for thy Lord is the Most High who hath taught by the pen, hath taught to man what he knew not. Nay truly man walketh in delusion, when he deems that he suffices for him- self; to thy Lord they must all return."*~~

~~*What is here recorded is the commencement, not of Mohammed's knowledge, but of his prophesying. That the latter was due to a vision experienced by him on a night of the month Ramadan (sur. xcvii. 1, il. 181) is certain, and it is at least very possible that the form of the vision was governed by the traditional conception of revelation and prophecy which Mohammed had learned to accept.! It is, of course, uncertain whether the words in which the angel called the Prophet are really contained in sur. xcvi. Certainly this stira is very early, and its con- tents are, indeed, the best expression of the original ideas of Islam. Man lives on content with himself, but he must one day return to his Creator and Lord, and give account to him. This is ina sense the material principle of the oldest faith of Islam ; the formal principle is the very pro- minent doctrine of revelation in writing copied from the heavenly book.*~~

~~*When the angel left him—so the tradition runs on—Mohammed came to Khadija and recounted the occurrence to her in much distress ; he thought that he was possessed. She however comforted him, and confirmed him in the belief that he had received a revelation and was called as a mes- senger of God. Yet his doubts returned, when there ensued a break in the revelation, and they reached a distressing height. He was often on the point of seeking death by casting himself down from Mount Hird. It is usually*~~

~~assumed that this state of anguish lasted from two to three years. Then the angel is said to have suddenly appeared a second time; he came to Khadija in great excitement and said: "Wrap me up! wrap me up!" This, it must be explained, was done when he fell into one of his swoons ; and on this occasion, as often thereafter, the revelation came during an attack. Then was sent down sutra lxxiv. beginning with the address—'O thou enveloped one!" Henceforth there was no interruption and no doubt; the~~

~~revelations followed without break, and the Prophet was~~

~~assured of his vocation.~~

~~That Mohammed did pass through many doubts and much distress before he reached this assurance, may well be believed (sur. xciii. 3); but the systematic development of the doctrine of the fatra, or interval of from two to three years between the first and second revelation, belongs to a later stage of tradition. It appears that it was de- vised to dispose of the controversy whether Mohammed lived as a prophet in Mecca for ten or for twelve years ; perhaps, too, it was desired to solve another difiiculty— viz., whether sur. xevi. or sur. lxxiv. was the beginning of the revelation—in a sense that should do some justice to the rival claims of each.? The tradition may also have been influenced by the circumstance that Mohammed, in the first three years of his mission, did not appear as a public preacher,' but only sought recruits for his own cause and the cause of Allah in private circles. First, he gained the inmates of his own house,—his wife Khadfja, his freed-~~

~~1H. Dodwell, **De Tabulis cceli," in Fabricius, Cod. pseud. V. T., 2d ed , ii, 551 sg. Compare, in the Koran, especially sur. lxxxvii. 6, "We will cause thee so to read that thou mayest forget nothing save what God will." The following progress is noteworthy :—TIsaiah's lips are touched to purge them of sin (Isa. vi. 7); Jeremiah's are touched by the Lord to put His word in his mouth (Jer. i. 9) ; Ezekiel receives the revelation as a roll of a book which he has to swallow (Ezek. iii. 2).~~

~~2 See Sprenger in 7.D.M.G., 1859, p. 173 sq.; Néldeke, op. cit., 67 sz. Ewald thinks that the vocatives at the beginning of sur. Lxxiv. aud lxxiii, mean simply—O long sleeper! This view is worthy of consideration. The~~

~~*Moslem exegetes thoroughly understand the art of giving to general expressions of the Koran specific reference to historical events which they have themselves invented to facilitate exegesis, 3 Ibn HIsham, p. 166.*~~

~~*MOHAMMEDANISM*~~

~~*man Zaid b. Haritha, his cousin 'Ali (of whose nurture he First had relieved Abu Talib, a poor man with many children), converts.*~~

~~*[MOHAMMED.*~~

~~*and finally his dearest friend Abtbekr b. Abt Kohafa. The last named won for him several other adherents: 'Othman b. 'Affan, Zobair b. al'Awwdm, "Abd al-Rahmén b. 'Auf, Sa'd b. Abt Wakkas, Talha b. 'Obaid All4h, all names of note in the subsequent history of Islam. Soon there was a little community formed, whose members united in common exercises of prayer.*~~

~~*To the HIanffs, especially to the family of Zaid b. "Amr, their relation was friendly ; they had the name of Moslem in common, and there was hardly any difference of prin- ciple to separate them. The personality of the prophet had given an altogether new impulse to a movement already in existence; that was all. To found a new religion was in no sense Mohammed's intention ; what he sought was to secure among his people the recognition of the old and the true. HIe preached it to the Arabs as Moses had before him preached to the Jews, and Jesus to Christians ; it was all one and the same religion as written in the heavenly book. The differences between the several religions of the book were not perceived by him till a much later period.*~~

~~*It is not difficult to understand why Mohammed should in the first instance have turned to those who were most readily accessible to him; but the nature of his mission did not suffer him to rest content with this; it compelled him to make public proclamation of the truth. One of his dependents, Arkam b. Abi Arkam, offered for this purpose his house, which stood close by the sanctuary, and thus the Moslems obtained a convenient meeting-place within the . town, instead of, as hitherto, being compelled to resort to ravines and solitary places. HIere Mohammed preached, and here too it was that he received some converts to Islam. But he did not obtain*~~

~~any great results among the Meccans. What he had to say was already in substance familiar to them; all that was new was the enthusiasm with which he proclaimed old truth. But this enthusiasm failed to make any impression on them; they set him aside as a visionary, or as a poet, or simply as one possessed. In their eyes it was a fatal flaw that his supporters were drawn from the slave-class and the lower orders, and the ranks of the young; it would have been quite another matter if one of the rulers or elders had believed in him. This circumstance was a source of annoyance to the pro-_ phet himself; in sur. lxxx. we find him rebuked by God for having repulsed in an unkind way a blind beggar who had interrupted him as he was endeavouring to win over a man of influence—an endeavour which proved of no avail.~~

~~This indifference of the Meccans embittered the mes- senger of God, and led him to give to his preaching a polemical character which it had not hitherto possessed. Tn the oldest stiras we have monotheism in its positive and practical form.5 God is the all-powerful Lord and all-know- ing Judge of man; he demands loyal self-surrender and unconditional obedience; the service he requires is a serious life, characterized in particular by prayer, almsgiving, and temperance. That the worship of other gods beside Allah is excluded by these views, goes without saying ; still it 1s~~

~~4 It does not appear that Arkam's house was of the nature of an asylum to which Mohammed betook himself for refuge from the ill- treatment to which he was subjected in his own home, nor is there any evidence that he ever lived in it. It was simply the meeting- house of the oldest Islam. Prayer continued to be offered within it until the conversion of 'Omar, who was bold enough to choose the Ka'ba itself, the centre of heathenism, as the Moslem place of prayer. Comp. Muir, ii. p. 117 ; Sprenger, i. p. 434.~~

~~5 What is meant by practical monotheism is most easily understood by reference to Matt. vi. 24 sqg., x. 28 sgg., and to Luther's exposi- tion of the first commandment in the catechisms ; itis the essence of religion. We do not, of course, mean that this practical monotheism a aoe in the Koran with as much purity and depth as in the~~

~~ospel.~~

~~*Hostility pressly to add the morals.*~~

~~*MOHAMMED.*~~ |

~~*noteworthy that the sharp negations of monotheism ac- quired prominence only by degrees. It was in his indig- nation against the cold mockery with which he was met that Mohammed first assumed an attitude of hostility towards the worship of polytheism, while at the same time he gave much greater prominence to his own mission, just because it was not acknowledged. He now began to threaten the infidels with the judgment of God for their contempt of His message and His messenger ; he related to them the terrible punishments that in other cases had fallen on those who refused to hear the voice of their pro- phet, applying the old legends to the circumstances of the present with such directness that it was superfluous ex- This could not fail to irritate the Meccans, especially as after all the new religion gained*~~

~~*Meccans. oround. What Mohammed attacked as ungodly and abom-*~~

~~*inable were their holy things ; they were jealous for their gods and their fathers. Their attachment to the tradi- tional worship was the greater that the prosperity of their town rested upon it ; for they had not yet learned that the Ka'ba was no institution of heathenism. They found, how- ever, no other way to remove the public scandal than to approach Abt Talib, the Prophet's uncle and the head of his family, asking him to impose silence on the offender, or else to withdraw from him his protection. Abu Talib was not personally convinced of Mohammed's mission, but he did not choose to impose conditions on the enjoyment of his protection. At length, however, when the Meccans adopted a threatening tone and said that he must either restrain his nephew from his injurious attacks, or openly take side for Mohammed and against them, he sent for his nephew, told him how things stood, and urged him not to involve them both in ruin. Mohammed was deeply moved ; he thought his uncle wished to get rid of him ; yet he could not and would not withdraw from the divinely- imposed necessity which impelled him to preach his con- victions. 'Though they gave me the sun in my right hand," he said, "and the moon in my left, to bring me back from my undertaking, yet will I not pause till the Lord carry my cause to victory, or till I die for it." With this he burst into tears, and turned to go away. But*~~

~~*Abt Talib called him back and said : “ ‘Go in peace, son of my brother, and say what thou wilt, for, by God, I will on -no condition abandon thee.”*~~

~~*The protection of his uncle did not relieve Mohammed from all manner of petty insults which he had to endure from his enemies from day to day; but no one ventured to do him serious harm, for the family feud which this would necessarily have produced was not to be lightly incurred. Less fortunate than the Prophet, however, were such of his followers as occupied dependent positions, and had no family support; especially the converted bondmen and bondwomen, who found no consideration, and were often treated with actual cruelty. For some of these Abtbekr purchased freedom. There seem to have been no martyrs, but the situation of many Moslems became so intolerable that they fled to Abyssinia. The Abyssinian Christians were quite looked upon as their religious kinsmen.*~~

~~*A breach with one’s people is for the Arab a breach with*~~

~~*“What think ye of al-Lat and al-‘Ozzd, and of Manat the third with them?” the devil put words in his mouth which he had long wished to have by revelation from God—viz. “These are the sublime Cranes,? whose intercession may be hoped for.” The auditors were surprised and delighted by this recognition of their goddesses, and when Mohammed closed the stra with the words, “So prostrate yourselves before Allah and do service to him,” they all with one accord complied. They then professed their satisfaction with his admissions, and declared themselves ready to recognize him. But the messenger of God went home dis- quieted. In the evening Gabriel came to him, and Mo- hammed repeated to him the stra; whereupon the angel said: ‘ What hast thou done? thou hast spoken in the ears of the people words that I never gave to thee.” Mohammed now fell into deep distress, fearing to be cast out from the sight of God. But the Lord took him back to His grace and raised him up again. He erased the diabolical verse and revealed the true reading, so that the words now ran— “What think ye of al-Lat and al-‘Ozz4, and of Manat the third with them? The male [offspring] for you and the female for God? That were an unjust*~~

~~*division!" When the new version reached the ears of the Meccans they compared it with the old, and saw that the Prophet had broken the peace again. So their enmity broke out again with fresh violence.*~~

~~*It is generally and justly suspected that this compromise did not rest on a momentary inspiration of Satan, but was the result of negotiations and protracted consideration. Nor was the breach so instantaneous as is represented ; the peace lasted more than one day. There is no doubt as to the fact itself. Every religion must make compro- mises to gain the masses. But for Mohammed the moment for this had not yet arrived ; later on he used the method of compromise with great effect.*~~

~~*The news of: the peace between Mohammed and the Meccans had recalled the fugitive Moslems from Abyssinia ;3 on their return the actual state of affairs proved very different indeed from what they had been led to expect, and it was not long before a second emigration took place. By degrees as many as a hundred and one Moslems, mostly of the younger men, in little groups, had again migrated to Abyssinia, where they once more met with a friendly reception. Among them were Ja'far, the brother of 'Alf, and the Prophet's daughter Rokayya, along with her hus- band 'Othman b. 'Affan.**~~

~~*Mohammed's position was very considerably altered for the worse, both subjectively and in other respects, by his precipitate withdrawal from the compromise almost as soon as it had been made. He himself indeed, although long and salutarily humbled by the remembrance of his fall (sur. xvii. 75 sqg.), never abandoned faith in his vocation ; his followers also did not permit themselves to be led*~~

~~*tradition ignores the fact itself, but knows its result, the return of the Abyssinian fugitives. : 2 « Al.ghardnik al-'olé," fine-sounding but perhaps meaningless words— "Herrlich, etwas dunkel zwar, Doch es klingt recht wunderbar."*~~

~~*Comp. Néldeke, op. cit., p. 80. Hobal, though the chief god of the*~~

~~*= God and the world ; he feels it like a living death. Mo- Meccans, is not mentioned in the Koran either here or elsewhere. ics, °® hammed, who*~~

~~*remained in Mecca, naturally made every | Perhaps as God of the Ka'ba he was already identified with Allah by*~~

~~*the Meccans, or was so identified by Mohammed.*~~

~~*3 The date assigned is the month Rajab of the fifth year of the Call, corresponding to the eighth year before the Flight (a.D. 614-615). The compromise must have been made in the interval. The chronology of this period is of course in the highest degree uncertain, and the order of the events hard to ascertain. Thus it can scarcely be deter- mined whether the above-mentioned scene with Abu Talib ought to be placed before or after the compromise.*~~

~~*4 'Othm4n and Rokayya, however, members of the noble house of Omayya, soon returned, along with many others. The rest reniained in exile until the seventh year of the Flight.*~~

~~*effort to heal the breach with his townsmen, and, as natur- ally, the latter met him half-way. He even went so far as to take the edge from his monotheism. Once, when the heads of the Koraish were assembled at the Ka''ba, Mohammed, we are told, came to them and began to recite before them sur. liii! When he came to the passage,*~~

~~*1 The authorities for this are Ibn Sa'd, the secretary of Wakidi, to*~~

~~*whom we owe the preservation of Wakidi's materials for the Meccan period, and especially Tabari; comp. Muir, ii. 150 sgg. The comnion*~~

~~*Hamza and 'Omar.*~~

~~*550*~~

~~*was nothing but a manifest imposture.*~~

~~*passionate assurances. — Fortunately for the Moslems, precisely at this juncture,*~~

~~*when matters were assuming so gloomy an aspect for their little company, two conversions took place, which were well Mohammed's uncle, Hamza b,*~~

~~*‘Abdalmottalib, felt his family pride wounded by the injurious treatment which the former had received from Abu Jahl, head of the great and wealthy family of the Bani Makhzim, and in order to become publicly his champion, he adopted Islam. Of much more importance still was the conversion in the same year (the sixth of the Call) of ‘Omar b. al-Khatt4b. ‘Omar was then only twenty- six years of age, and neither rich nor noble ; but his im- posing figure and his unbending strength of will gave him*~~

~~*fitted to revive their courage.*~~

~~*a personal influence, which immediately made itself felt in*~~

~~*a very marked manner in favour of Islam. Until now its*~~

~~*religious gatherings had taken place privately, especially in the house of Arkam ; but ‘Omar offered his prayers at the Ka‘tba as publicly as possible, and his example was followed by the other Moslems. Their religious exercises were no longer gone about in secret, but ostentatiously and before the eyes of all.*~~

~~*So far as can be gathered, it was at this time that the opposition between Mohammed and his townsmen reached its highest pitch. The feeling that he had somewhat committed himself embittered him ; he was determined to atone for his previous concessions to polytheism by un- compromising polemic against it. A personal element, which had lurked from the first in the war of principles, became by degrees increasingly dominant. The idols were less displeasing to Alldh than the idolaters; his own wor- ship was a matter of less concern to him than the recogni- tion of his messenger. With ever-increasing distinctness the prophetic utterances came to be mere words of threaten- ing and rebuke against the Meccans; it was impossible not to recognize in Noah and Moses or Abraham the pro- phet himself. The coming judgment upon Mecca, and the hour of it, were either in plain words or veiled allusion the continual theme of the ‘“admonisher ;” but the oftener and the more urgently it was repeated, the less was the impression it produced. The Meccans did not, on the whole, suffer themselves to be much disturbed by the pro- spect of the terrible overthrow which was portrayed before them in vivid colours. They were even profane enough to express a desire to see the long-threatened catastrophe arrive at last, and their*~~

~~*audacity went so far as to complain of the revelations with which Mohammed sought to stir their feelings as being tedious! They did not in the least believe that the Biblical narratives, which he related with special pride, were known to him by revelation; on the contrary, they pretended to know perfectly well the human source from which he had derived them (sur. xvi. 105; xxv. 5; xliv. 13). It is very interesting to find Mohammed in presence of their unbelief referring to the recognition and approval with which he met among the children of Israel (sur. vi. 114; x. 94; xiii. 36 sgg., xvii. 108; xxviii. 52 sq.; xxxiv. 6), and particularly to find him appealing to the testimony of a certain Jew, whom he does not name (sur. xlvi. 9 sgg.) Manifestly he had relations with Jews at this period, and was under their influence ; and from them, of course, it was that the material of his Old Testa- ment and Haggadistic narratives was derived. At the*~~

~~*1 Ibn Hisham, pp. 191, 235 sq.*~~

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~~*away. But the Meccans, from the way in which he had at first given out a verse as God's word and afterwards withdrawn it as a suggestion of Satan, did not hesitate to draw the inference that the whole of his boasted revelation To their cold and unfeeling logic the Prophet had nothing to oppose save*~~

~~*[MoHAMMED.*~~

~~*same time it is clear that he himself must have believed these to have come directly to him in a second revelation from above, otherwise he would hardly have taken his stand in the presence of his opponents upon the testimony of the Jews. Such a self-deception seems indeed hardly credible to us, but it is impossible to impute to the Arab prophet too complete an absence of the critical faculty.*~~

~~*The Koraish at last lost all patience. Their heads The in-*~~

~~*entered into a solemn compact to break off all intercourse terdict. with the Hashimids, as they declined to separate them- selves from Mohammed. The Hashimids submitted to the interdict for the sake of their relative, although*~~

~~*for the most part they were not believers on him. Along with the Bant ’l-Mottalib they withdrew into the separate quarter of their chief, into the so-called Shi‘b Abt Talib ; one only of their number, Abu Lahab, separated himself from them, and made common cause with the Meccans. All buying and selling with the excommunicated persons being forbidden, these found themselves reduced occasion- ally to outward distress, as well as excluded from all fellowship. This treatment, although apparently never carried out with absolute strictness, did not fail of its effect. The Prophet’s more remotely attached adherents fell away from him, and his efforts for the spread of Islam were crippled. All he could do was to encourage those who remained faithful, and to set himself to seek the con- version of his relations.*~~

~~*This state of matters, after continuing for from two to three years, at last became intolerable to the Meccans themselves, who had a variety of relations with the ex- communicated family. In the tenth year of the Call (a.p. 619-620) five of the leading citizens paid a visit to the Shitb Abi Talib and induced the Bani Hashim and al- Mottalib to come out of their retirement and again appear among their fellow-citizens. The rest of the Koraish were taken by surprise, and did not venture, by setting them- selves against the fait accompli, to run the risk of what might have become a dangerous breach. The story goes that a lucky accident released them from the solemn oath under which they had laid themselves with reference to the Bani’ Hashim—the mice had destroyed the document, hung up in the Ka‘ba, on which it was recorded.*~~

~~*Mohammed was now free once more; but he no longer The Pro- |, thought of carrying on his polemic against the Meccans or phet’s of seeking to influence them at all. In his relations to oy them three stadia can be distinguished, although it is easier penn to determine their character than their chronology. In the first instance, his endeavour was to propitiate them and win them over to his side ; when other methods failed, he even went so far as to make complimentary mention of their goddesses in one of his revelations, and thus to set up a compromise with heathenism. When this compromise failed, he forthwith commenced an embittered assault upon the idolaters, which ended in the outlawry of himself and of his family. And now, the ban having been removed, he gave the Meccans up, abandoning*~~

~~them to their hard- ness of heart. It had become clear to him that in his native town Islam was to make no progress, and that his position was untenable. HIs feeling of separation was in- creased all the more with the death of his faithful Khadija about this time, followed soon afterwards by that of Abu Talib, his noble protector. HIe accordingly came to the determination to take his chance in the neighbouring Taif, Visit to and set out thither alone. On his arrival he asked the Tait heads of the town whether they would be willing to receive him and protect the free proclamation of his doctrines. HIe was answered in the negative ; the mob drove him out of the town, and pursued him until he found refuge in a vineyard, the property of two noble Meccans. In the deepest despondency he again took the homeward road.~~

~~The men of Me- dina.~~

~~First Homage on the "Akaba.~~

~~MOHAMMED. |~~

~~Tradition has it that he found comfort in the fact that at least the Jinns listened to him as by the way he chanted the Koran in the sacred grove of Nakhla.! In the present circumstances it was now impossible for him to return into the town, after having openly announced his intention of breaking with it and joining another community. HIe did not venture to do so until, after lengthened negotiations, he had assured himself of the protection of a leading citizen, Mot'im b. 'Adi. Notwithstanding all that had happened, he resolved, two months after the death of Khadija, to enter upon a second marriage with Sauda bint Zam'a, the widow of an Abyssinian emigrant.~~

~~Chance soon afterwards brought to pass what fore- thought (on his journey to Taif) had failed to accomplish. After having given up the Meccans, Mohammed was wont to seek interviews with the Arabs who came to Mecca, Majanna, Dhu '1-Majaz, and 'Okaz, for the purpose of taking part in the feasts and fairs, and to preach to them.? On one such occasion, in the third year before the Flight (A.D. 619-620), he fell in with a small company of citizens of Medina, who to his delight did not ridicule him, as was usually the case, but showed both aptness to understand and willingness to receive his doctrines. For this they had been previously prepared, alike by their~~

~~*daily inter- course with the numerous Jews who lived in confederation with them in their town and neighbourhood, and by the connections which they had with the Nabateans and Christian Arabs of the north. Hanifitism was remarkably widely diffused among them, and at the same time there were movements of expectation of a new religion, perhaps even of an Arabian Messiah, who should found it. Medina was the proper soil for Mohammed's activity. It is singular that he owed such a discovery to accident. He entered into closer relations with the pilgrims who had come from thence, and asked them to try to find out whether there was any likelihood of his being received in their town. They promised to do so, and to let him hear from them in the following year.*~~

~~*At the pilgrim feast of next year, accordingly, twelve citizens of Medina had a meeting with Mohammed,' and gave him their pledge to have no god but Allah, to with- hold their hands from what was not their own, to flee for- nication, not to kill new-born infants, to shun slander, and to obey God's messenger as far as was fairly to be asked.* This is the so-called First Homage on the 'Akaba.> The twelve men now returned, as propagandists of Islam, to their homes with the injunction to let their master hear of the success of their efforts at the same place on the following year. One of the Meccan Moslems, Mos'ab b. 'Omair, was sent along with or after them, in order to teach the people of Medina to read the Koran, and instruct them in the doctrines and practices of Islam.*~~

~~*Islam spread very quickly on the new soil. It is easy to understand how his joy strengthened the Prophet's spirit to try a higher flight. As asymptom of his exalted frame we might well regard his famous night-journey to Jerusalem (sur. xvii. 1; vi. 2), if we could be sure that it*~~

~~*1 Sur, xlvi. 28; lxxii. 1. On the impossibility of historically fixing the date of this occurrence see Noldeke, op. cit., p. 101.*~~

~~*2 Muir (ii. 181 sq.) assumes, with good reason, that he had already done so during the time when he was living in the Shi'b Abi Talib, and assigns to this period the story that Abi Lahab followed him in this in order to counteract his preaching, and sow tares among the wheat.*~~

~~*3 Sprenger (ii. 526) identifies this meeting with the first, which tra- dition distinguishes from it and places a year earlier. He is probably right.*~~

~~*4 Afterwards this was called the women's oath. It is a noteworthy summary of the features by which Islam is distinguished from heathenism.*~~

~~*5 On the 'Akaba compare Vakidi, pp. 417, 427, 429. station between 'Arafa and Mind.*~~

~~*It was a*~~

~~*belonged to this period.6 The prophecy also of the final triumph of the Romans over the Persians (contained in sur. xxx. 1 sgg.) might very well pass for an expression of his own assurance of victory, as at that time he still hada feeling of solidarity with the Christians. But the prophecy (the only one contained in the Koran) belongs, it would appear, to a much earlier date."*~~

~~*At the Meccan festival of the last year before the Flight (in March 622) there presented themselves among the pil- grims from Medina seventy-three men and two women who had been converted toIslam. In the night after the day of the sacrifice they again had an interview with the Prophet on the 'Akaba ; Al-'Abbas, his uncle, who after Abt Talib's*~~

~~*death had become head of the Bani Hashim, was also Second This is the so-called Second Homage on the Homage.*~~

~~*present. 'Akaba, at which Mohammed's emigration to Medina was definitely settled. Al-'Abb4s solemnly transferred his nephew from under his own protection to that of the men from Medina, after these had promised a faithful discharge of the duties this involved. They swore to the Prophet to guard him against all that they guarded their wives and children from. He, on the other hand, promised thence- forward to consider himself wholly as*~~

~~one of themselves, and to adhere to their society. According to the tradition this remarkable scene was brought to a close by a sudden noise,~~

~~The Meccans soon got wind of the affair, notwithstand- ing the secrecy with which it had been gone about, but Ibn Obay, the leader of the Medina pilgrim caravan, whom they questioned next morning, was able with good con- science to declare that he knew nothing at all about it, as, being still a heathen, he had not been taken into the con- fidence of his Moslem comrades, and he had not observed their absence over night. The Meccans did not gain certainty as to what had occurred, until the men of Medina had left. They set out after them, but by this they gained nothing. They next tried, it is said, violently to prevent their own Moslems from migrating. After a considerable pause, they renewed the persecution of the adherents of the Prophet, compelling some to apostasy, and shutting up others in prison. But the measures they adopted were in no case effective, and at best served only to precipitate the crisis. A few days after the homage on the 'Akaba, Mohammed issued to his followers the formal command to emigrate.~~

~~months some 150 persons had reached Medina. from slaves, only a few were kept behind in Mecca. Mohammed himself remained to the last in Mecca, in the company of Abubekr and 'Ali. HIs reason for doing so is as obscure as the cause of his sudden flight. The explana- tion offered of the latter isa plan laid by the Meccans for his assassination, in consequence of which he secretly withdrew along with Abibekr. For two or three days the two friends hid themselves in a cave of Mount Thaur, south from Mecca, till the pursuit should have passed over (sur. ix. 40). They then took the northward road and arrived safely in Medina on the 12th of Rabf of the first year of the Flight. Meanwhile, 'Ali remained three~~

~~Apart~~

~~6 See Muir, ii, 219 sqg. ; Sprenger, ii. 527 sg. ; and on the other side, Noldeke, Koran, p. 102. The masra& was afterwards called mi'raj (ascension), and, originally represented as a vision, came to be regarded as an objective though instantaneous occurrence.~~

~~7 See on the one hand Muir (ii. 228 sqq.) and Sprenger (ii. 527 s9q.), and on the other Noéldeke (Qoran, p. 102; Tabari, p. 298). The manner in which Sprenger seeks to make the prophecy a vaticinium ex eventu is unfair.~~

~~8 Ibn Hisham, pp. 315 sq., 319 sq.~~

~~9 The 12th of Rabi‘ is, according to tradition, the Prophet's birth- day, the day of his arrival in Medina, and the day of his death. It is certain that he died at mid-day on Monday the 12th of Rabi', but~~

~~In the first month of the first year of the The emi- Flight (April 622) the emigration began; within two gration.~~

~~Moham- mel in Medina.~~

~~Medina.~~

~~days longer in Mecca, for the purpose, it is alleged, of restoring to its owners all the property which had been entrusted for safe keeping to the Prophet. The Koraish left him entirely unmolested, and threw no obstacle in the way when at last he also took his departure.~~

~~With the Flight to Medina a new period in the life of the Prophet begins; seldom does so great a revolution occur in the circumstances of any man. Had he remained *n Mecca he would in the best event have died for his doctrine, and its triumph would not have come until after his death. The Flight brought it about that he, the founder of a new religion, lived also to see its complete victory,—that in his case was united all that in Christen- dom is separated by the enormous interval between Christ and Constantine. He knew how to utilize Islam as the means of founding the Arabian commonwealth ; hence the rapidity of its success, That this was of no advantage for the religion is easily understood. It soon lost the ideality of its beginnings, for almost from the first it became mixed up with the dross of practical considerations. In reaching its goal so soon its capability of development was checked for all time to come; in every essential feature it received from Mohammed the shape which it has ever since retained. It~~

~~*ought not, however, to be overlooked that the want of ideality and spiritual fruitfulness was partly due to its Arabian origin.*~~

~~*Mohammed in the first instance took up his quarters in the outlying village of Koba, where several of his most zealous adherents had their homes, and had already built a mosque. It was not until after some days had passed, and he had made himself sure of the best reception, that he removed to the city itself, which at that time bore the name of Yathrib. All were anxious to have him; in order that none might feel themselves slighted, he left the decision to the camel (al-Kaswa) on which he rode. It knelt down in an open space in the quarter of the Banu Najjar, which he accordingly selected as the site of the mosque and of his own house. At first he took quarters for seven months in the house of Abi Ayyub; within this interval the mosque was finished, which was to serve at once as the place of religious gatherings and as the com- mon hall. Close to it was the Prophet's private dwelling, consisting of the huts of his wives, in one or other of which he lived. At that time he had only one wife, the Sauda already mentioned ; but soon he married, in addi- tion, the youthful 'Aisha, the daughter of his friend Abubekr, who acquired great influence over him. Some of the leading emigrants built houses in the same neigh- bourhood, while the rest continued to be quartered with the people of Medina.*~~

~~*Medina is situated on a westward spur of the Arabian tableland, on the Wadi Kandt. It is an oasis amongst barren rocks, mostly of volcanic origin. The inhabitants supported themselves by their date palms and by the field and garden fruits that grew under their shadow ; they had their homes partly in the town itself and partly in the suburbs and outlying villages. At one time the oasis had belonged to the Jews, as the similar oases to the north still did—Wadi 'l-Kordé, Khaibar, Fadak, Taima. But some centuries before Mohammed's time, Arabs of Yemen, the Bani Kaila, had immigrated and partially driven the Jews away. Many Jews, however, still continued to live there, partly scattered among the Arab tribes and under their protection, partly also in independent communities such as the Kainokd, the Nadir, and the Koraiza. For them it was a great advantage that the Arabs were not agreed among themselves. The Banu Kaila were divided*~~

~~*the other statements are all the more suspicious because they also speak of Monday and mid-day. Comp. Noldeke, Qoran, p. 59 sq.*~~

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~~*into two branches, the Aus and the Khazraj, who were Aus and constantly at daggers drawn. The mutual hate which Khazraj.*~~

~~*burned within them, from time to time manifested itself in murder and assassination, if by any chance one of the Aus had wandered into a Khazrajite quarter, or vice versd. Shortly before the arrival of Mohammed, the battle of Bo'dth had taken place within the liberties of Medina, in which the Aus, with the help of their Jewish allies, had vanquished the Khazraj and broken their preponderance. The Khazraj were the more numerous and powerful, and seem to have been on the point of making their leading man, Ibn Obay, the king of Medina; by the battle of Bo'éth the balance of parties —and anarchy—was pre- served in the interests of a third, who came in at the right moment to settle these feeble and exhausting feuds and restore order.*~~

~~*The circumstances were singularly fitted to change the Moham- religious influence which Mohammed brought along with meds in:*~~

~~*him into another of a political character, and from being as prophet to make him the founder of a commonwealth. The Arabs had hitherto been accustomed to lay before their Kéhins, or priestly seers, at the sanctuaries, for decision in God's name, all sorts of disputes and hard questions which ordinary means were inadequate to decide. The religious prestige which Mohammed enjoyed led directly to his being frequently called in as adviser and judge. In Medina quarrels and complications were abundant, and an authority to stand over both parties was much needed. Mohammed met this need in the manner which was most acceptable to the Arabs; the authority he exercised did not rest upon force, but upon such a voluntary recognition of the judgment of God as no one had any need to be ashamed of.!_ In principle, it was the same kind of judicial and public influence as had been possessed by the old Kahins, but its strength was much greater. This arose*~~

not only from the peculiarly favourable circumstances, but above all from Mohammed's own personality. It is im- possible to understand the history until one has mastered the fact of his immense spiritual ascendency over the Arabs. The expedient of giving oneself out for the mes- senger of God, and one's speech as the speech of God, is of no avail to one who finds no credence ; and credence such as Mohammed received is not given for any length of time either to an impostor or a dupe. Even the respect in which he was held as a prophet would have helped him little if his decisions had been foolish and perverse. But they were in accordance with truth and sound understand- ing; he saw into things and was able to solve their riddle ; he was no mere enthusiast, but a thoroughly practical nature as well.

It was not long before he was able to demand as of right that which, in the first instance, had been a voluntary tri- bute. "Every dispute which ye have one with another ye shall bring before God and Mohammed ;" so runs the text in the original constitution for Medina, set up in the first years after the F'light?; and in the Koran a rebuke is given to those who continue to seek the administration of justice at the hands of the false gods, tc. of their priests and seers.2 With incredible rapidity the Prophet as a veritable "hakim biamr Alléh" had come to be the most powerful man in all Medina.

1 Very significant is it that the Moslems were ready to submit even to punishment with stripes, if awarded by God.

2 Ibn Hisham, 342, 17.

3 Ibn Hishdm, 360, 8 sqqg. Jolas b. Sowaid and other hypocrites were summoned before Mohammed by their believing relatives on ac- count of some dispute ; but they in their turn summoned the plaintiffs before the K4hins, who in the days of heathenism had been their judges. It was with reference to this that sur. iv. 63 was revealed——— '¢ Hast thou not taken note of those who profess to be believers, yet wish to carry on their suit before the false gods ?"

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~~Law. Mohammed thus laid the foundations of his position in | afterwards became the basis of the Moslem fiscal aystem, a manner precisely similar to that which Moses (Exod. | and so at the same time the material foundation of the xvill.) is said to have followed ; and just asthe Torah grew | Moslem state. Religion received so practical a develop- out of the decisions of Moses, so did the Sunna out of those | ment that of alms nothing but the name remained, and of Mohammed. It was perhaps in judicial and regulative | the convenient fiction that the taxes had to be paid to God. activity, which he continued quietly to carry on to the Just in proportion to the closeness of the union into In- very end of his life, that his vocation chiefly lay. At all | which Islam brought its followers did its exclusiveness creased events his work in this direction was extremely beneficial, | towards them that were without increase. If in Mecca °*°!"" if only because he was the creator of law and justice where | Mohammed in his relations to the other monotheistic reli.» previously there had been nothing but violence, self-help, | gions had observed the principle, "he that is not against or at best voluntary arrangement. But the contents of | me is for me," in Medina his rule was "he that is not for his legislation also (if it can be called by such a name) | me is against me." As circumstances were, he had to ad- The marked a distinct advance upon what had been the previ- | just matters chiefly with the Jews. Without any intention slowest ous use and wont in Arabia. In particular, he made it | on their part, they had helped to prepare the ground for his special care to set a fence round the rights of property, | him in Medina; he had great hopes from them, and at first~~

~~~ and to protect and raise the place of woman in marriage. | treated them on no different footing from that of the Arab~~

~~Blood revenge he retained indeed, but completely altered | families which recognized him. But as his relations with its character by reserving to himself the right of permitting | the Aus and Khazraj consolidated, those which he had it; in other words, the right of capital sentence. It need | with the Jews became less close. The conjunction of reli- not be said that in many ways he availed himself of that | gious with political authority, the development of civil which already existed, whether in the form of Arab~~
~~~

~~usage | polity out of religion, of the kingship from the prophetic or of Jewish law; he followed the latter, in particular, in | function, was precisely what they objected to.2 On the his laws relating to marriage. other hand, while the old polity of Medina, broken up and~~

~~Religion. The new situation of affairs inevitably brought it about | disorganized as it was, had no difficulty in tolerating~~

~~that religion was made a mere servant in the work of forming a commonwealth. Never has this service been better performed ; never has it been utilized with greater adroitness as a means towards this end. In Mecca, Islam had originally been nothing more than the individual con- viction of Mohammed ; it was only after severe struggles that he went so far as to preach it, and even his preaching had no other aim than to create individual conviction in others. What he said was of the simplest description— that people ought to believe in God and in judgment to come, that men ought to live their lives seriously and not waste them in follies, that one ought not to be high-minded or covetous, and so on. A community arose, it is true, even in Mecca, and was confirmed by the persecutions, There also religious meetings were held and social prayers. But everything was still in a very fluid and rudimentary stage ; religion retained its inward character. It was not until the first two years after the Flight that it gradually~~

~~'lost this, and became, if not exclusively, yet to a very large~~

~~extent, a mere drill system for the community.! No god but the one God (14 ilah illa ll4h) was the entire sum of their dogmatic, and less inportance was attached to belief in it than to profession of it. It was the watchword and battle-cry. The prayers? took the form of military exer- cises ; they were imitated with the greatest precision by the congregation, after the example of the Im4m. The mosque was, in fact, the great exercising ground of Islam ; it was there that the Moslems acquired the esprit de corps and rigid discipline which distinguished their armies. Next to the monotheistic confession (tauhid) and to prayer (saldt) came almsgiving (zakat, sadaka) as a third important means by which Mohammed awakened and brought into action among hisfollowers the feeling of fellow- ship. The alms by and by grew to be a sort of tithe, which~~

~~*1 This is to be understood as applying to the system as a whole. Of course, there are always individuals who break through system ; but the historical power of Islam rests upon the system. To the system also belongs the spiritual jargon which Mohammed introduced. Tt was no longer perntissible to say " Good morning !' ('im sabahan), the phrase now ran, '* Peace be with thee!" and on every occasion pious forms of speech were demanded. Characteristic of the puritan- ism of the system is the prohibition of wine and of gaming, first issued in the years immediately following the Flight, and the contempt for poetry.*~~

~~*2 They were five in number—at sunrise, noon, afternoon, sunset, and late evening. Each prayer consisted originally of two, afterwards of four, prostrations. The chief weekly public service (jom'a), with ser- mon, was held on Friday at mid-day.*~~

~~*foreign elements within its limits, the new political system created by Islam changed the situation, and rendered it necessary that these should be either assimilated or ex- pelled.*~~

~~*Mohammed's hostility to the Jews found expression, in the first instance, theoretically more than practically,* and especially in the care with which he now differentiated certain important religious usages which he had taken over from Judaism, so that they became distinguishing marks between Islam and Mosaism. Thus, for example, he altered the direction of prayer (Kibla), which formerly used to be towards Jerusalem, so that it now was towards Mecca; and for the fast on the 10th of Tisri ("Ashtra) he sub- stituted that of the month of Ramadan.® In appointing Friday as the principal day of public worship, he may also possibly have had some polemical reference to the Jewish Sabbath. Of these alterations the greatest in positive importance is the transference of the Kibla to Mecca. It symbolizes the completion of the Arabizing process which went on step by step with the change Islam underwent from being an individual to being a political religion. In substituting the Meccan Ka'ba for the sanctuary at Jeru- salem, Mohammed did not merely bid farewell to Judaism and assert his independence of it ; what he chiefly did was to make a concession to heathenism, and bring about a nationalization of Islam, for the purpose of welding together the Arab tribes (Kabdil) into one community. Of similar*~~

~~*significance was the institution of the feast of sacrifice (‘{d al-doha) on the day of the Meccan festival. The Moslems were to observe the latter as much as possible, even if they could not be actually present on the spot.*~~

~~*Thus we have the five chief precepts of Islam—(1) Con- Precepts fession of the unity of God; (2) stated prayer ; (3) alms- of Islam.*~~

~~*giving; (4) the fast of Ramadan; (5) observance of the festival of Mecca. Capable of having deeper meanings*~~

~~*3 While Islam had the effect of uniting the Arabs politically, uni- formity of religion in the case of the Jews had no such effect ; on the contrary, the mutual feuds and hatreds in which they indulged con- duced greatly to the advantage of the Moslems. The Jews, of conrse, recognised Mohammed’s supremacy as a fact, but they denied any legal title thereto as arising from his prophetic office. ‘*~~

~~*4 Compare the well-known second sura, in which a long attack is made on Judaism. :*~~

~~*5 A connection with the Christian fasts is usually alleged. It is possible that Christian influence may have to do with the long duration of the fasts, but it cannot have anything to do with the selection of Ramadan ; for in the first years after the Flight, Ramadan fell not in Spring but in December.*~~

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~~*attached to them, but meritorious also, even in a merely external observance, they were an excellent instrumentality for producing that esprit de corps, that obedience to Allah and his messenger, which constituted the strength of the Moslem system. Up till that time blood-relationship had been the foundation of all political and social relations in Arabia; upon such a foundation it was impossible to raise any enduring edifice, for blood dissociates as much as it unites. But now, religion entered upon the scene as a much more energetic agent in building the social structure ; it ruthlessly*~~

~~*broke up the old associations, in order to cement the thus disintegrated elements into a new and*~~

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~~*chaos of existing relations, must have exercised a mighty power both of attraction and repulsion is obvious. More than one naive expression bears witness to the astonish- ment with which the Arabs regarded the strange spirit which animated the community of the Moslems—the firm- ness with which they held together, the absolute and will- ing obedience which they gave to their leaders, the reck- lessness with which they disregarded everything that before Islam, or outside of it, was looked upon as holy. Some natures felt themselves attracted by these peculiarities, especially if on other grounds they felt little difficulty in severing themselves from their old connexions ; but, on the*~~

~~*much more stable system. The very hearts of men were changed ; the sanctity of the old relationships faded away in the presence of Allah ; brother would have slain brother,*~~

~~*whole, feelings of antipathy prevailed. Even in Medina The itself this antipathy was widespread. The so-called hypo-hypo- crites (mondfikin) were either only half-attached to the cues*~~

~~*had Mohammed willed it. The best Moslem was he who was the most remorseless in separating from the old and attaching himself to the new ; Mohammed gave preference to active natures, even if they occasionally kicked over the traces; contemplative piety received from him only the praise of words. Over the anarchical rule of a multi- tude of families the sole sovereignty of God came forth triumphant ; its subjects were united by the firmest of all bonds. Every Moslem was every Moslem's brother, and, as matter of course, took his part as against every non- Moslem. Outside of Islam there was neither law nor safety; Alléh alone was powerful, and he protected those only who acknowledged his sole sovereignty.*~~

~~*Prophet or in their inmost hearts unfavourably disposed ; they were kept from overt action partly by the absence of a decided opinion, partly by the terrorism which the con- vinced Moslems exercised. The reproach of hypocrisy brought against them means chiefly that they did not manifest a full acceptance of the new political relations. They could not reconcile themselves to the position of having never a word to say in their own town, and of being compelled to obey the Prophet from Mecca and those who had come with him. For a time the danger was imminent that all Medina (the Emigrants of course ex- cepted) might be infected with hypocrisy, if one may call it hypocrisy when for a moment nature and blood asserted*~~

~~*Emi- The Emigrants (Mohdjira), who along with the Prophet | themselves against religious discipline and burst its bonds. grants had fled from Mecca, were the kernel and the cement of | The younger portion of the community, however, was on emg the community. It was made all the easier for them to | the whole enthusiastic for Mohammed ; the hypocrites*~~

~~*give effect to the fundamental principle, that citizenship in Medina depended not on family but on faith, because the natives themselves (Ansar, "the Defenders"), consisting of Aus and Khazraj, neutralized one another by their mutual enmity. Mohammed seems at first to have cherished the design not only of entirely disowning relationship with non-Moslems, but also of obliterating as much as possible, within Islam, the distinctions of blood, by means of the common faith. He established between emigrants and individual citizens of Medina relationships of brotherhood, which also involved heirship. But he soon abandoned this line, and expressly recognized the validity and sacredness, within Islam, of the old rights of family and inheritance (sur. viii. 76). Thus he refrained from carrying out to its full logical consequence the theoretical principle of equalization, but on practical grounds permitted the old order of society to continue. At a subsequent period, he even conceded to relationship and the ties of blood far larger rights than were compatible with Islam, and thus himself laid the foundations of the violent quarrel which rent the community, more particularly in the time of the Omayyads. Similarly it might be said that communism was originally involved in the principles of Islam; but it is characteristic that from the first the alms were less em- ployed for the equalization of society, than for strengthening the hands of the ruling*~~

~~*power. It frequently happens that a religious revolution finds expression also in the region of social polity ; but it is remarkable to observe how Islam utilized the religious leaven from the first for a positive re-organization of society, and neutralized the destructive tendency which that leaven is wont to show in political affairs, It did not indeed succeed in totally destroying the radical tendency, as the history of the caliphate shows. But, on the whole, the equality before God which Islam teaches interfered hardly at all with the subordination of men to their human leaders; both were demanded by religion, both were taken sincerely, and each was found, in practice, reconcilable with the other.*~~

~~*That this new and drastic principle, thrown into the*~~

~~*were for the most part older men, especially heads of families, who found it difficult to put up with the loss of political influence which they were suffering. As chief of their number Ibn Obay is always named, the foremost man of Medina, whom the Khazraj had thought of crown- ing as king, before matters were so fundamentally changed by Islam. Mohammed's attitude towards him and the hypocrites in general was that of connivance, —thoroughly appropriate here, where political rather than religious affairs were involved, and the question was one less of principle than of power.*~~

~~*The founding of the state upon the feeling of fellowship generated by religion, was without question the Prophet's greatest achievement: the community of Medina was the tool, its heroic faith the force, by means of which Islam attained the results which figure so largely in the history of the world.1 Moslem tradition, however, does not stop to inquire what it was that constituted the inward strength of Islam, but goes on at once to relate what were its outward manifestations. Its information on the subject of the period of Mohammed's sojourn in Medina is given under the title of "the campaigns (maghazt) of the apostle of God." With a few of the smaller tribes in the neighbourhood of Medina (Johaina, Mozaina, Ghifdr, Aslam), and with the Khoza'a, Mohammed maintained relations of peace and amity ; benevolent neutrality gradually grew into alliance, and finally union with the commonwealth of Medina. But towards all the rest of Arabia his very principles placed him in an attitude of war. Ever since Islam from being a religion had become a kingdom, he was compelled to vindicate, by means of*~~

~~*war against unbelievers, its claims to supremacy ; the conflict of principles had to be settled by the sword, the sole sovereignty of All4h demonstrated*~~

~~*1 The credit of being the founder of the Moslem state cannot be transferred to 'Omar, but must be left with Mohammed. It was not 'Omar who created that feeling of oneness which enabled him, for ex- ample, suddenly to recall a general like Khalid from his career of victory*~~

~~*without eliciting a murmur. The miracle is the "primitive cell" of*~~

~~*Medina, not the fact that in course of time success gave it the force of an avalanche,*~~

~~*The holy*~~

~~*war.*~~

~~*Battle of*~~

~~*Bedr.*~~

~~*MOHAMMED. |*~~

~~*by force to the rebels who showed unwillingness to accept it. More literally than Christ could Mohammed say of himself that he was come not to bring peace but a sword. Islam was a standing declaration of war against idolaters.*~~

~~*The nearest object against which to direct the holy war (jihad) was presented by the Meccans. Against them first did Mohammed bring into operation the new principle, that it is faith and not blood that separates and unites. Ac- cording to Arab notions it was a kind of high treason on his part to leave his native town in order to join a foreign society ; on the part of the people of Medina it was an act of hostility to Mecca to receive him among them. The Meccans would have been fully justified on their side in taking arms against the Moslems, but they refrained, being too much at their ease, and shrinking besides from fratricidal war. It was the Moslems who took the initia- tive; aggressiveness was in their blood. Mohammed began with*~~

~~*utilizing the favourable position of Medina, on a mountain spur near the great highway from Yemen to Syria, to intercept the Meccan caravans. Originally he sent forth only the Emigrants to take part in the expedi- tions, as the people of Medina had pledged themselves to defend him only in the event of his being attacked ; soon, however, they also joined him. What first induced them to do so was the prospect of booty ; afterwards it was im- possible to separate themselves, so great was the fusion of elements which had been quietly going on within the crucible of Islam.*~~

~~*The first plunder was taken in the month Rajab, a.H. 2 (Autumn 623), in which circumstance was at once seen the advantage arising from the change of conscience brought about by the new religion ; for in Rajab feuds and plun- dering raids were held to be unlawful. Relying upon the sacredness of this month a caravan of Koraish was return- ing from Tdif laden with leather, wine, and raisins. But this did not prevent Mohammed from sending out a band of Emigrants to surprise the caravan at Nakhla, between Taif and Mecca; his orders to this effect were given in a document which was not to be unsealed until two days after the departure of the expedition. The plan was carried out, and the surprise was all the more successful, because the robbers gave themselves the outward semblance of pilgrims; one Meccan was killed in the struggle. But the perfidy with which in this instance Mohammed's ad- vanced religious views enabled him to utilize for his own advantage the pious custom of the heathen roused in Medina itself such a storm of disapproval, that he found himself compelled to disavow his own tools. In Moham- medan tradition, the contents of the unambiguous document in which he ordered the surprise are usually falsified.*~~

~~*The Koraish still remained quiet ; another outrage had yet to come. In Ramadan a.n. 2 (December 623), the return of their great Syrian caravan was expected, and Mohammed resolved to lie in wait for it at Bedr, a favour- ite watering-place and camping-ground, northward from Medina. For this purpose he set out thither in person along with 308 men; but the leader of the caravan, the Omayyad Abu Sofydn, got word of the plan and sent a messenger to Mecca with a request for speedy help. Con- cern about their money and goods at last drove the Koraish to arms; a very short interval found them, 900 strong, on the road to Bedr. By the way they*~~

~~received intelligence that the caravan had made a circuit to the west of Bedr, and was already in safety. Nevertheless they resolved, at the instance of the Makhzumit Abu Jahl, for the sake of their honour, to continue their march. When the Moslems first got touch of them at Bedr, they took them for the caravan ; their surprise on discovering the truth may be imagined. But, kept firm by the courage of their leader, they resolved to face the superior numbers of the enemy.~~

~~On the morning of Friday, the 17th of Ramadan, the encounter took place. A number of duels were fought in the front, which were mostly decided in favour of the Moslems. The Meccans at last gave up the fight, strictly speaking for no other cause than that they did not see any reason for carrying it on. They were reluctant to shed the blood of their kinsmen ; they were awestruck in pre- sence of the gloomy determination of their adversaries, who did know what they were fighting for, and were absolutely reckless of consequences. After a number of the noblest and oldest of the Koraish, including at last Abt Jahl, had fallen, those who remained took to flight. The number of the dead is said to have been as great as that of the prisoners. Two of the latter, whom he per- sonally hated, Mohammed caused to be put to death— 'Okba b. Abi Mo'ait and al-Nadr b. al-Harith. When the last named had perceived, from the Prophet's malignant glance, the danger in which he stood, he implored an old friend of his among the Moslems for his intercession. This request being refused, al-Nadr said: '"'Had the Koraish taken thee prisoner, thou hadst not been put to death as long as I had lived ;" to which the apologetic reply was : "TY do not doubt it, but I am differently placed from thee, for Islam has made an end of the old relations." To the remaining prisoners life was spared on payment by their kinsmen of a heavy ransom; but Mohammed is said to have afterwards reproached himself for having allowed considerations of earthly gain to keep him back from send- ing them all to hell as they deserved.~~

~~The battle of Bedr is not only the most celebrated of Effect battles in the memory of Moslems; it was really also of of the~~

~~great historical importance. It helped immensely to strengthen Mohammed's position. Thenceforward open opposition to him in Medina was impossible; families which had hitherto withdrawn themselves from his influ- ence were so thoroughly cowed by some atrocious murders carried out in obedience to his orders, that they went over to Islam. He was now in a position to proceed to break up the autonomy of the Jews. In the first instance, he addressed himself to the weak Bani Kainoka, demanding their acceptance of Islam; on their refusal, he took the earliest opportunity that offered itself to declare war against them. After a short siege they were compelled to surren- der; and they might congratulate themselves that their old ally, Ibn Obay, was able to concuss the Prophet into sparing their lives, and contenting himself with their banishment from Medina. Soon afterwards other blows were struck, in the shape of assassinations, by means of which Moham- med put out of the way several of the Jews whom he hated most, such as Ka'b b. al-Ashraf and Ibn Sonaina.! The state of fear to which the rest were reduced may readily be imagined ; they came to the Prophet and begged him to be propitious. If in other days their dislike had found somewhat public expression in all sorts of witticisms and scornful sayings, they were now at least modest and quiet, and kept their hatred to themselves.~~

~~The Meccans also were very deeply impressed by the defeat inflicted on them by the Moslems. They saw clearly that the blow must be avenged, and they took comprehen- sive measures for their campaign. After a year's delay, their preparations being now complete, and their allies~~

~~1 The murderer of Ibn Sonaina was Mohayyisa b. Mas'ud, of whose elder brother, Howaisa, he had been a sworn ally. Howaigsa struck the murderer in consequence, and reproached him with his treacherous ingratitude, saying that much of the fat in his body had come from the estate of the Jew. Mohayyisa's reply was: "If he who bade me kill him were also to bid me kill thee, I should obey." The brother, amazed, asked him if he was serious, and when the other assured hin that he was, Howaisa exclaimed : " By God, a religion which brings it to this is a stupendous one," and forthwith became a convert. The story (Vakidi, p. 98) is too characteristic to be passed over.~~

~~Battle of changed their minds.~~

~~Ohod.,~~

~~Banu Nadir expelled.~~

~~556~~

~~(Ahabish) assembled, they set out under the command of~~

~~Abtt Sofyan, and without any check reached Medina, where they pitched their camp to the north-east of the city, in the green corn-fields by Mount Ohod. In Medina the elders were for awaiting the attack on the town and de-~~

~~fending themselves within it, but the young men hurried~~

~~the Prophet into the determination to meet the enemy~~

~~without the gates; this resolution once come to he per- severed in, even after those who had urged him to it had On the morning of Saturday, the 7th of Shawwal, au. 3 (Jan. Feb. 625), the armies met. At first the battle seemed to be going once more in favour of the Moslems; one after another the standard-bearers and champions of the enemy fell, the whole host wavered, and even the camp was gained. But here their lust for plunder did them an evil turn. Mohammed had covered his left flank against the Meccan horsemen by a number of bowmen, whom he had ordered on no account to leave their post. But as soon as they saw that the enemy's camp was taken, they threw off all discipline, and determined to have their share of what was going. It thus became possible for the Meccan cavalry to fall upon the Moslem rear, and snatch back the victory that had already been won. In the confusion which now ensued Mohammed himself was wounded in the face, and for some time lay for dead on the ground. Among the slain was found his uncle, Hamza b. 'Abdalmottalib, "the lion of God ;" his liver was cut out and carried to Abt Sofyan's wife, Hind bint 'Otba, whose father had been killed by Hamza at Bedr. But the Meccans did not know how to follow up their triumph. Instead of at once attacking Medina—where, to be sure, a second struggle with Ibn Obay, who with his following had not taken part in the battle at Ohod, would have been necessary—they con- tented themselves with the honour of their victory, and took the road home, after having~~

~~*summoned the Moslems to a repetition in the following year of the duel at Bedr. Mohammed even pursued them for a short distance on the following day (as far as to Hamré al-Asad), of course only for the sake of appearances, that the Arabs might not suppose him to have been daunted by his defeat.*~~

~~*Nothing came of the proposed meeting at Bedr, the Meccans failing to put in an appearance. 'The principal event of a.H. 4 was the expulsion of the Banu Nadir, the most distinguished and powerful Jewish family in Medina (Summer 625). Mohammed, under some pretext, suddenly broke with them and ordered their departure within ten days, on pain of death. Relying upon the support of Ibn Obay, they resolved to resist, and sus- tained a siege within their walls; but the ally they had counted on proved a broken reed,! and they were soon compelled to surrender. They were permitted to with- draw, taking along with them all their movable property except their arms. With music and roll of drum, the women in gala dress, they marched through the streets of Medina, on their way to Khaibar, where they had pro- perty. Their land the Prophet appropriated to himself (sur. lix. 7); the income derived from it could be em- ployed to meet the numerous claims that were made upon him. He seems also to have handed over some of it to the Emigrants, who until then had acquired no property in land in Medina.*~~

~~*Meanwhile, the Bantu Nadir were not idle in Khaibar, but left no stone unturned to annihilate their mortal enemy. They succeeded in bringing about an alliance of the Koraish and the great Bedouin tribes of Solaim and Ghatafan, for the suppression of Islam. In the month*~~

~~*1 The sympathy shown by many scholars for Ibn Obay, whose weak- ness degenerated into faithlessness, is unjustified.*~~

~~*MOHAMMEDANISM*~~

~~*[MOHAMMED.*~~

~~*Dhu 'l-ka'da, a.H. 5 (March 627), the three armies set out, 10,000 strong, under the command of Abu Sofyan. Mohammed received word of this through the Khoza'a, who secretly played into his hands, and on this occasion he resolved, not as formerly to offer battle on the open field, but to*~~

~~*make preparation for a siege. For the most part the houses of the town were built so close to one another as to make a continuous wall; at the north-west corner only was there a wide open space, through which an enemy could easily effect an entrance. Here Mohammed, with the advice and direction of the Persian freedman Salman, drew a ditch, behind which he entrenched him- self with the Moslems, the hill of Sal'? protecting their rear. 'This fosse, which has become famous, and has even given its name to the entire campaign (the War of the War of Fosse), fully served its purpose. 'The enemy with their the cavalry perseveringly directed their attack on this spot, iat but were constantly repelled by the vigilant and courageous defence of the fosse. They at last gave up all hope of reaching their end in this way, unless a simultaneous attack were to succeed in another quarter. To assist them in this, they endeavoured to stir up the Koraiza, the*~~

~~*last autonomous family of Jews still remaining in Medina, having their settlements in the south-east of the town.*~~

~~*The Nadirite Hoyay b. Akhtab, the most zealous promoter*~~

~~*of the alliance against Mohammed, undertook charge of*~~

~~*the negotiations, and succeeded at last in persuading their prince, Ka'b b. Asad, to break his pact of neutrality with*~~

~~*the Moslems. But nothing came of it. The Jews doubted*~~

~~*the perseverance of the Koraish and their allies—they had their fears lest, if the struggle proved a protracted one, the besiegers might withdraw and leave them to their fate. They accordingly demanded hostages in security against such an event, being otherwise determined not to break*~~

~~*up all hope of reconciliation with Mohammed by entering*~~

~~*the contest. This attitude, in turn, aroused suspicion on*~~

~~*the part of the besiegers, whom it was not difficult to con- vince that the Jews were demanding hostages of them for*~~

~~*the purpose of handing them over to Mohammed, and so making their peace with him. All this crippled their activi-*~~

~~*ties still more than did the failure of their own attacks upon*~~

~~*the fosse. The season also was against them; the weather*~~

~~*was windy, the nights extremely cold, and, worst of all, the fields yielded nothing. From this cause the chief sufferers were the Bedouins, who had brought no forage for their camels and horses. Mohammed, who appears to have been*~~

~~*kept well informed of their mood, judged it expedient to open negotiations with them. These were soon broken off indeed, but the mere fact that the Ghatafan had ever entered upon them was enough to create mutual suspicion amongst the allies. One stormy night the Meccans suddenly raised the siege, after it had lasted fourteen days, and returned home; they were followed by the Ghatafan and Solaim. It was with no small joy that the Moslems on the following morning discovered the de- parture of the enemy ; it would have been impossible for them to have held out much longer, exhausted as they were, not less by cold and hunger, than by the fatigues of constantly mounting guard. As soon as Mohammed had given them permission to leave the camp beside the hill*~~

~~*of Sal', they dispersed with the greatest alacrity to their homes.*~~

~~*Mohammed, however, did not allow them much time to Attack recruit. Hardly had they reached their abodes, when he °? the again called them to arms against the treacherous Koraiza, The unlucky Jews had been given over to the sword by the withdrawal of the allies; a siege of fourteen days compelled them to surrender unconditionally. The men*~~

- ~~*Now the citadel, it would seem.*~~

~~*MOHAMMED. |*~~

~~*were driven in chains to the house of Osdma b. Zaid, whence on the following morning Mohammed caused them to be brought one by one to the*~~

~~*market-place of Medina, and there executed. This continued till late in the even- ing. They were six or seven hundred in number, and among them was the Nadirite Hoyay b. Akhtab, the author of the War of the Fosse, who had left the Meccans to join his fortunes with those of the Koraiza. By accepting Islam these men could have saved their lives, but they preferred death. No more magnificent martyrdom is known to history. The women and children were sold into slavery ; one young woman only, Banana, suffered the penalty of death for having broken the head of a Moslem "with a millstone during the siege. Withjoyous heart and smiling face she went to meet her death, never forgotten by 'Aisha, with whom she was when her name was called. The Prophet selected for himself the fair Raihana, and married her, after having caused her to become a convert to Islam.*~~

~~*The War of the Fosse was the last attack made by the Koraish upon Medina ; Mohammed now began to take the offensive towards Mecca. This he at first set about with extreme diplomacy, utilizing the festival, and the truce of God subsisting at the time of the festival, for the purpose of paying a visit to his native town. Although unsuccess- ful in winning to his side the neighbouring tribes of Bedouins, it was nevertheless with a considerable following (1500 men) that in Dhw '1-ka'da a.H. 6 (March 628),! he set out on his journey. In a dream he had had the key of the Ka'ba delivered to him; on the strength of this his followers believed firmly in the success of the expedition. But the Koraish were determined that the pretext of pil- grimage should not avail their adversary ; they summoned their allies and formed a camp to the north of their town for the purpose of preventing the entrance of the Moslems. Mohammed was forced to halt at Hodaibiya on the borders of the sacred territory, and it was in vain that by fair speeches he sought to obtain permission to make the circuit of the Ka'ba. He felt himself too weak to force his way, and accordingly preferred to treat. While the envoys were passing to and fro, there suddenly arose an alarm in the Moslem camp; they apprehended a sudden act of treachery on the part of the Meccans. It was on this occasion that the famous Homage under the Tree took place, when Mohammed pledged his followers by striking hands that they would stand by him and go to death for his sake. Some of the Koraish agents witnessed the scene, and were immensely impressed by it ; such an enthusiastic obedience as Mohammed received, such an ascendency over the minds of men as he exercised, they had never before*~~

~~*conceived to be possible, and on their return they urged their people in the strongest way not to permit matters to come to extremities. The Koraish accordingly judged it best to offer a bargain with Mohammed, the terms being that for this year he was to withdraw, so that the Arabs might not say that he had forced an entrance, but that on the following year he was to return and be permitted to remain three days within the sacred territory for the purpose of sacrifice. After some discussion Mohammed accepted this proposal, although zealous Moslems detected a discreditable shortcoming in matters of faith, in so far as it involved turning back within sight of the Ka'ba without being allowed to accomplish the sacred circuit. When the agreement was to be committed to writing, Mohammed dictated the words: "In the name of Allah, the merciful Rahman" ;? but the Meccan plenipotentiary, Sohail b. 'Amr, declared that he knew nothing about Rahman, and*~~

~~*1 Noldeke, Tabari, p. 308, note 1; Vakidi, p. 18.*~~

~~*? Rahman is a name of God which Mohammed had taken from the Jews and used with special preference.*~~

~~*Sey*~~

~~*insisted upon the customary formula—'" In thy name, Alla- homma!" The Moslems murmured, but Mohammed yielded. He then went on to dictate: "' This is the treaty of peace between the apostle of God." . . . Sohail anew protested ; to acknowledge Mohainmed as the apostle of God, would be to declare himself his follower; the de- signation ought to besimply Mohammed b. 'Abdallah. The Moslems murmured louder than before, and refused to consent to the change. The heads of the two tribes of Medina, Osaid b. Hodair and Sa'd b. 'Obdda, held the hand of the scribe and declared that " Mohammed the apostle of God" must be written, or the sword must de- cide. The Meccan representatives whispered to one another words of amazement at the spirit displayed by these men. But Mohammed made a sign to the zealots to hold their peace, and again gave way (sur. xvii. 110). The writing which now took shape ran as follows :—*~~

~~*In thy name, O God! This is the treaty of peace concluded by Mohammed b. 'Abdallah and Sohail b. 'Amr. They have agreed to allow their arms to rest for ten years. During this time each party shall be secure, and neither shall injure the other ; no secret damage shall be inflicted, but uprightness and honour prevail be- twixt us. Whosoever wishes to enter into treaty and covenant with Mohammed can do so, and whosoever wishes to enter into treaty and covenant with the Koraish can do so. But if a Koraishite comes without permission of his guardian (Wali) to Mohammed, he shall be delivered up; but if, on the other hand, one of Mohammed's people comes to the Koraish he shall not be delivered up. This year Mohammed with his companions must withdraw from us,? but next year he may come amongst us and remain for three days, yet without other weapons than those of a traveller, the swords remaining in their sheaths."~~

~~The first result of the treaty was that the Khozd'a de- clared for alliance with Mohammed; while, on the other hand, the Bekr b. Kindna joined themselves to the Koraish.~~

~~The treaty.~~

~~To compensate his followers for the apparent resultless- War with~~

~~ness of this expedition, Mohammed immediately after their return led them out against the rich Jews of Khaibar (northwards from Medina), whither the Banu Nadir had migrated, and from which place they had unceasingly stirred up opposition against the Prophet. Hitherto he had contented himself with putting out of the way, by means of assassination, some of their leading men who seemed to him to be particularly dangerous, such as Abu Réfit and Yosair b. Razim,* but now he resorted to whole- sale measures. In Moharram, a.H. 7 (May 628), he made his appearance before Khaibar with a powerful army ; in the plunder only those who had taken part in the expedi- tion of Hodaibiya were to share, but many others besides accompanied them. The Jews, although aware of the hostility of Mohammed's intentions, were nevertheless taken completely by surprise when one morning they saw him and his troops encamp before their strongholds. One of their leaders had given them the excellent advice not to shut themselves up by families in their quarters, but to construct a common camp in the fields, otherwise they were likely to share the fate of their~~

~~coreligionists in Medina. But they replied that their strongholds were of a different sort, perched on impregnable summits, and they remained shut up within them. They had neither discipline nor order, courage nor devotion. As they were wanting in community of feeling, so also were they lacking in leaders. Their best man, Sal4m b. Mishkam, lay on a sick-bed , his place was by no means supplied by Kinana b. b. Abi 'l-Hokafk. When they suddenly became aware that they had been completely abandoned by their Arab allies, the Ghatafan, their heart utterly failed them. When besieged in any of their citadels, they hardly ever waited~~

~~8 The "us" is remarkable, and sounds as if the treaty had been~~

~~dictated by the Meccans. 4 Vakidi, pp. 170, 239.~~

~~Khaibar.~~

~~Ruin of the Moslems; treachery, which had something to do with | divers of his missionaries who were sent to teach them the Jews. the surrender, was well-nigh superfluous. From Al-Natat the faith.2 We can hardly believe that a new spirit now the Jews were driven to Al-Shikk, and at last nothing was | suddenly possessed them. Their change of attitude was left to them but Al-Katiba (with Al-Watih and Soldlim).! | merely due to the imposing effect of the rising might of There they remained shut up and filled with fear, without | Islam. They began to respect the Moslems, who, in spite even risking, as formerly, single combats and skirmishes | of their small numbers, could defy a whole world, because before their citadels. After some time they asked for | they were of one mind, and did not ask what the world peace, and obtained it on the footing that, they retained | thought. They saw that, in the great conflict between. their lives, wives and children, and one garment each, but | Mecca and Medina, in which as actors or as spectators gave up all their property, the penalty of concealing any- | they had all participated, the victory inclined more and thing being death. Kinana b. b. Abf 'l-Hokaik was cruelly | more to the side of Medina, that force could accomplish tortured, and at last put to death because he had buried | nothing against faith. The prestige of Mecca was shaken the renowned jewels of his family ; thus at the same time | by the War of the Fosse, and was not restored by the treaty his handsome wife Safiya bint Hoyay was left free for | of Hodaibiya, in which the Koraish waved Mohammed off Mohammed. with the open~~

~~hand, and at the same time permitted him His marriage with "the daughter of the king" wound | to return next year. Islam had "stretched out its neck" up the prosperous campaign. Saffya felt no repulsion—had consolidated itself into indestructible existence— towards the man who had caused the death of her father | it now fought for victory. There was, moreover, another Hoyay, and of her husband Kindna; she gracefully accom- | argument in favour of the new religion, to which the Arabs modated herself to the situation. More worthy was the | were very sensible—the rich booty, to wit, which the demeanour of another Jewess, Zainab, who made the | Moslems acquired by their continual forays. There is no attempt to poison the executioner of her people, and | question that the material success of Islam was the chief atoned for this offence by her death. The attempt was | force that attracted new adherents. unsuccessful, but Mohammed believed that even in his The treaty of Hodaibiya gave a breathing space to the Results last illness he could trace the effects of the poison. two combatants, and of this the prophet reaped the whole of the Simultaneously with Khaibar, Fadak also fell into his | advantage. The truce, which lasted for almost two years, =i hands, and shortly afterwards Wadi 'l-Kord4, where also | brought to the Meccans an almost unbroken series of Mecca. there were settlements of Jews. The plunder was very | humiliations and losses. Contrary to all expectation, the considerable. So far as it consisted of movables, it was | provision made in their favour, by which Mohammed gathered together into a heap, and put up to auction ; the | bound himself to send back such of their sons as deserted proceeds were then divided. Mohammed insisted very | to him before their majority, turned to their hurt, so that strictly that no one should be permitted to plunder for | they had to ask Mohammed to have it changed.? Still his own hand. The property in land, palm plantations, | more serious for them was the desertion of three eminent vegetable gardens, were allowed for the time being to | men, Khalid b. al-Walid, 'Amr b. al-"As, and 'Othman b. remain at a rent in the hands of the Jews; half of the | Talha, whom the Prophet received with open arms. Next produce had to be paid to the new owners. The lion's | year they looked on with shame and concealed indignation share of the spoil fell to the lot of God, z.e. of the Prophet | when the Prophet, availing himself of his stipulated right, —a fifth of the movables, of the real estate a larger pro- | entered the city with 2000 men, and performed the sacred portion. He consequently had at his command consider- | ceremonies ('Omrat al-Kadé,~~

~~March 629). Still they were able material resources, and he well knew how to employ | afraid to break with him again, and did not even venture to them, not only for the enrichment of his family, but also | rid themselves of his spies, the Khoza‘a, who lived in their for gaining over to his side such individuals as were | midst. “ When they put one foot forward they draw the more accessible to payment than to principles. other back; they are convinced that Mohammed will The peace of Hodaibiya, with the subsequent conquest | win ”—such was the impression the Koraish made on the of Khaibar, closes the first period of Mohammed’s life at | Bedouins, who have a very keen instinct in matters of Medina ; strictly speaking, indeed, it merely confirmed the | this sort. They had lost confidence in themselves ; they status which in point of fact the War of the Fosse had | knew that the fight was not fought out, but they dared already given him. If at first it seemed as if Mohammed | not seek to bring it to a decision. had shamefully given way, it soon became apparent, never- Against their will the decision came. The Banu Bekr theless, that the advantage lay with him. “No victory of | fell upon Mohammed’s friends, the Khozd‘a, and_were Islam,” Abtbekr was wont to say, “has more importance | supported by some of their Koraishite allies. The Khoza- than the treaty of Hodaibiya; men are always for hurry- ing things on, but God lets them ripen.” ‘Previously | 2 gee vahidi, pp. 153-157 (Bir Ma’tma and al-Raji’), andthe general there had subsisted a wall of partition between the | view of these feuds, ébid. p. 29 sqq. Moslems and the rest of men; they never spoke to each 3 Abu Basir had fied to Mohammed to Medina; the Meccans de- other ; wherever they met, they began to fight. Sub- — = eer He was given se i cl his Enetonae “7° °. remonstrances, to e two messengers sent to letc im. on ·— oe, cn oe iu So ae i road he fell on one of them and slew him with his own sword; the (1 los eR: [alee toined dine SBiche. + : fe hastened back to Medina in horror, Abu Basir feuewed, ‘en g joined 1t; in the twenty-two | thinking Mohammed had now done enough to satisfy the Meccans.~~

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~~to be stormed, but after one or two sorties evacuated it and withdrew to another, where the same story was re- peated. Thus citadel after citadel fell into the hands of~~

~~*months during which the truce subsisted, the number of conversions was greater than throughout the whole of the previous period ; the faith diffused itself in all directions among the Arabs."*~~

~~*As a religion Islam did not attract the Arabs; they had*~~

~~*1 Such were the names of the three separate quarters of Khaibar, each one made up of a complex of houses and citadels.*~~

~~*MOHAMMEDANISM*~~

~~*[MOHAMMED.*~~

~~*no inclination to pray, read the Koran, and give alms. Of this they had given sufficient evidence by their per- ennial feuds with Mohammed, and by the murder of*~~

~~*Only, however, when the messenger refused the charge of so dangerous a prisoner, did Mohammed permit the latter to go off where he pleased, refusing to allow him to stay with the Moslems. Accordingly Abu Basir made for the coast-road of the Syrian caravans, and became the leader of other Moslem fugitives from Mecca, who quickly gathered round him. They intercepted all caravans, divided the prey, and slew the men. Abt Basir's robberies at length induced the Meccans to ask Mohammed by letter to allow him to join his community, and as _put an end to the mischief— Vakidi, p. 261; Ibn Hisham, p. 7 sqq.*~~

~~*The war is renewed.*~~

~~*MOHAMMED. |*~~

~~*ites complained to the Prophet, who eagerly seized the pretext for war. In vain did the Meccans send Abu Sofy4n to Medina to renew the truce; they could not move the Prophet from his purpose. In Ramadan, a.u. 8 (January 630), he moved against Mecca with an army of 10,000 men. With the Emigrants and the Defenders were mustered the Aslam, Ghifdr, Mozaina, Johaina, and Ashja'; the Solaim and the Khoza'a joined them on the way.*~~

~~*‘The Bedouins were drawn by the hope of booty ; the Fazarite ‘Oyaina was sorely vexed that he had left his*~~

~~*-Ghatafan at home, not knowing what was in view, for*~~

~~*Mohammed at first kept the aim of his expedition a secret. Some of the Meccan nobles must, however, have known it; Makhrama b. Naufal, for example, and the Prophet’s uncle, ‘Abbas, did not await the capture of their city, but deserted to the enemy while he was still distant. Abu Sofy4n, in particular, must have been in the secret; it appears that at Medina he received the promise that the holy city should be spared if it yielded pacifically, and that he pledged himself to do his best to play into the hands of the Prophet.1 But before the populace it was necessary to keep up the appearance of a sudden surprise, an inevitable submission to an unforeseen display of force. The same comedy was repeated afterwards at Taif; the headmen treated with the Prophet without consulting the Thakafites, and then contrived that the result of their policy should appear to be forced by the course of events. The Moslems were on the border of the holy land before the Meccans suspected their approach ; then suddenly one night 10,000 fires were seen rising to heaven to the north- west of the holy city. In well-feigned surprise Abu Sofydén*~~

~~*Conquest hastened to the hostile camp; he returned with the news*~~

~~*of Mecca.*~~

~~*that the Moslems were at the gates, that an improvised resistance could effect nothing against their force ; the only wise course was a surrender— Mohammed had promised security to those who remained in their houses or threw away their weapons. The terrified Meccans had hardly any other course open to them than to follow this advice. And now the Moslems entered the city from several sides at once, meeting only at one point with an easily quelled resistance. Mohammed insisted that there should be no violence ; he pledged the captains to avoid all bloodshed. Ten persons only were put to the ban, and of these one half were subsequently pardoned. HIe took all pains to preserve the sanctity of Mecca unimpaired, confirmed the rights and privileges therewith connected, and made it plain that the old cultus should not be less flourishing under Islam. The ceremonies were*~~

retained, save only that he abolished all idols, both the domestic gods found in every house and the images in and round the Ka'ba. But every sanctuary outside of Mecca was destroyed, except such as had a part in the celebration of the Feast, and so stood in connexion with the Ka'ba itself. Thus the Meccan worship gained a new and unique importance. Mohammed's reform did for Mecca what Josiah's did for Jerusalem?

The last step towards that identification of the Ka'ba with Islam, which made it the religious centre of the Moslem world, was not taken till the following year, when the famous Renunciation (Bard'a) of sur. ix. forbade the heathen to share in the Feast, which was henceforth to be a strictly Moslem ordinance, and at the same time abro- gated the peace of the holy months. A year later (Dht'l- Hijja, A.w. 10, March 632) he himself celebrated the Feast for the first time in the orthodox fashion, introducing certain modifications on. the traditional practice and

*1 The tradition indeed is silent, but Muir (iv. 120) is justified in drawing this inference from the course of events. * Snouck-Hurgronje, Het Mekkaansche Feest, Leyden, 1880.*

reducing certain varieties of use to uniform rule. In all this he professed to re-establish the true ancient use, purged of heretical deviations from the example of Abraham. At the same time he remodelled the Calendar, forbidding the occasional interpolation of a month as an arbitrary and human invention, and establishing the true lunar year of twelve lunations.

We return to the capture of Mecca. The submission of the Koraish was followed by that of their nomad brethren and allies. But the neighbouring Hawazin, to whom belonged also the Thakafite inhabitants of Taif, assembled for battle with the Moslems. They camped in Autds between Taif and Mecca. Mohammed advanced against them, and battle was joined in the valley of Honain. The Moslems were broken by the first charge of the foe; for a moment the Prophet himself was in danger, till the Khazraj rallied round him, checked the onset of the Hawazin, and at length turned them to

flight. A vast booty rewarded the victors ; for the Hawazin had brought all their herds and non-combatants with them and placed them in the rear, that they might feel what they were fighting for.® Mohammed caused the prey to be conveyed to the glen of Ji'rana, outside the north-west border of the Haram, a little way off the great valley that descends from Taif; he him- self pressed on to Taif itself. Here, however, he failed in his object ; in a dream he saw a cock peck a hole in a bowl of cream that was set before him, so that the con- tents ran out. After fourteen days he gave up the siege and marched to Ji'rdna to deal with the booty. He had deferred this task in the hope that the Hawazin would be tempted to embrace Islam in order to recover their families and cattle. But as they still sent no ambassadors, he had to yield to the pressure of the Bedouins and divide the spoil. When it was too late, the messengers of the Hawazin appeared to announce their conversion; they had now to give up their herds, and content themselves that their wives and children were restored to them, through the mediation of the Prophet with their new masters. The Bedouins received compensation for what they gave up; the Emigrants and Defenders gave up their captives freely. Altogether the men of Medina fared worst in the distribution of booty, though they had borne the brunt of the conflict ; those who fared best were the nobles of Mecca, who had no share in the fight, but whom Mohammed desired to conciliate by gifts (sur. ix. 60).

The fall of Mecca reacted powerfully on the future development of Islam. Again the saying came true: victa victores cepit ; the victory of the Moslems over the Koraish shaped itself into a domination of the Koraish over the Moslems. For this the Prophet himself was to blame. In making Mecca the Jerusalem of Islam, he was ostensibly moved by religious motives; but in reality Mohammed's religion had nothing to do with the heathenish usages at the Ka'ba and the Great Feast. To represent Abraham as the founder of the ritual was merely a pious fraud. What Mohammed actually sought, was to recommend Islam to Arabic prejudices by incorporating this fragment of heathenism, and at the same time he was influenced by his local patriotism. Henceforth these local feelings became quite the mainspring of his conduct ; his attitude to the Koraish was determined entirely by the spirit of clannishness. Hence the extraordinary value he set on the conciliation of their chiefs; one gains the impression that he cared more for this than for the con- version of all the rest of the world. He left to them all that they

~~already had ; he gave them in addition whatever they asked, if only they would be his good friends. Abt Sofy4n was a great man already, but Mohammed hastened~~

~~3 Among them were relatives of the Prophet's foster-mother, Halima.~~

~~War with the Ha- wazin.~~

~~Aggran- dizement of the~~

~~Koraish.~~

~~The Khari- jites.~~

~~Conver- sion of Arabia,~~

~~560~~

~~to raise his power by giving him rule over a broad tract southward from Mecca. He used every means to make their conversion easy to the Koraish, and to convince them that they were losing little and gaining much, They had the sense to understand this and act accordingly; they were soon the best of Moslems, and that for the best practical reasons.~~

~~The men of Medina, as was natural, felt themselves slighted in a special degree by this petting of the Koraish. They had done all and sacrificed all for the Prophet; were others now to reap the fruit of their labours? Had they by years of struggle made Mohammed Lord of Mecca, only that they might surrender in favour of Mecca the place they had hitherto held? Did he indeed esteem kin- ship so much more than tried service to the Faith? The Defenders had good ground for discontent, but Mohammed appeased them easily enough. He reminded them of their fellowship together in the great days of the past, of all that he had done for them, and they for him; he promised that their town should still be his residence, and so the political capital of Islam (Madinat al-Islim). Then all the men wept till their beards were wet, and said: "'O apostle of God, we are content with our share and lot!"~~

~~*The Defenders murmured at the preference shown to the Koraish, because they desired preference for them- selves. But already there were movements of an opposi- tion from principle which deemed it a falling away from Islam to give any heed to kinship instead of to faith. It is related that the beginnings of the Khérijites (Dissenters) go back to the distribution of booty in W. Ji'rdna.' Certain it is that a worldly bias, which had indeed been introduced into Islam long before, then first became visible to every eye. Certain it is that Mohammed then sowed the seeds of the deep dissensions that rent his following after his death—of the struggle between religious democracy, such as Islam demanded, and the national aristocracy, which alone was really fit to hold rule in Arabia. It was Mohammed who placed the helm in the hands of the Koraish and opened the way to sovereignty for Abu Sofydén and his house, the Omayyads. If the Khérijite Dhu 'l-khowaisira spoke out against the Prophet himself at Jitrana, the feeling that moved him was quite sound.*~~

~~*The last years of the Prophet were like the ingathering of a harvest laboriously reaped. The conquest of Mecca, so great was the impression it produced, was called "the Conquest," as if it contained in itself all others. From every side, in the next two years, the sheikhs streamed to Medina to open negotiations for the acceptance of Islam by their tribes; if they did not come spontaneously, Mohammed sent to them. A change of heart on the part of the Arabs had no more share in these than in former conversions. It cost them no struggle to cast away their idols ; the images and the sanctuaries fell quietly enough. Heathenism was a dead thing; superstitions could be transplanted into Islam. The unique sovereignty of Allah was clearly evidenced in the fact that no might could withstand his. It is safe to affirm that the acces- sions to Islam were due to political more than religious impulses, and meant adherence to the state of Medina rather than to monotheism. The power to which that city had grown, acted as a force of attraction upon the Arabs ; and their subjection was not the mere effect of fear, but expressed also that sense of the necessity for peace and order, which had led to the founding of states in the two previous centuries. Thus it becomes intelligible that from every side, by a sort of natural necessity, the*~~

~~*1 Vakidi, p. 877. Tbn Hisham, p. 884.*~~

~~*MOHA™"WEDANGS HS*~~

~~*[MOHAMMED*~~,

~~*masses of Arabian society were drawn towards the centre of attraction at Medina, and that the Prophet received the homage of distant tribes which he could not have influenced directly. The Christian tribes were not behind the rest, they were Arabs first and Christians after. Only the Christians of Najran remained true to their faith ; so did the Jews in all parts, and the Magians in the province of Bahrain.? The last named, as idolaters, ought not in strictness to have been tolerated in the Moslem state ; but practical considerations broke through theory, and the men of system had to accept the incon- sistency with the best grace they could.*~~

~~*The signs of submission were—(1) the performance of the five daily prayers, or at least the proclamation of the times of prayer by the Muedhdhin ; (2) the payment of the alms-tax ;3 (3) the acceptance of the Moslem Law, which was introduced by qualified delegates from Medina. Otherwise things remained as they were ; Mohammed was careful not to meddle with tribal affairs, and strengthened the existing aristocracies wherever he could do so. The change of faith was effected by treaty; the populace was not consulted, and the whole negotiations were directed by the Elders and Chiefs. For, in fact, purely political interests were involved.*~~

~~*A single case, about which our information is exception- Téif.*~~

~~*ally full, will suffice in illustration, The Hawazin had joined Mohammed after the battle of Honain, and now preached the duty of holy warfare against their kinsmen, the Thakafites of Taif, who were still heathens. They made raids on the cattle pastured without the city, and made captives of those who ventured abroad. The Thaka- fites were exposed, alone and helpless, to the advances of Islam ; they dared not stir a foot beyond their walls. The heads of the city found the situation untenable, and resolved to do homage to the Prophet for the sake of peace. Ten ambassadors proceeded to Medina, and nego- tiations began as to the conditions of the conversion of the Thakif. The envoys desired that fornication, usury, and wine-drinking should be permitted to them ; this Moham- med refused (sur. xvii, 234; ii. 278; v. 92); and they consented to yield the point when it was*~~

~~*explained that, indispensable as these three practices might seem, the other Moslems had learned to give them up. There was more difficulty about the Rabba or Goddess of Taif (al- Lat). The ambassadors begged that, as a concession to the foolish multitude, they might retain her for three years. When they found Mohammed resolute, they came down successively to two years, one year, and a month. Even this was refused ; Mohammed's sole concession was that they should not be obliged to destroy their goddess with their own hands. The deputation returned, and had nearly reached Taif, when 'Abdyalil counselled the others to make as if they had broken off the negotiation, and not to con- fess the conclusion of the pact till the Thakif showed no stomach for battle with Mohammed. With faces covered, like men who have no good news, they rode into the town, and first paid the customary visit to the temple of the Rabba. Then they told their tribesmen the conditions of treaty, declared them intolerable, and reviled Mohammed as a hard and arrogant man. 'And so," they concluded, "prepare for war, lay in provisions for two years ; Mohammed will surely not maintain the siege longer ; dig a fosse to protect your stronghold, and lose no time." The Thakafites at first agreed to this; but in a few days they lost courage, and bade the negotiators return and accept the conditions. These then confessed the truth,*~~

~~*2 Non-Moslem subjects were made to pay an arbitrary capitation or income tax.*~~

~~*3 The expenditure of this tax was regulated in the case of some tribes by special treaty.*~~

~~*MOHAMMED.* |~~

~~*and added that Mohammed's emissaries would presently appear to destroy the Rabba. The destruction took place accordingly, to the terror of the women and children, but without a single man raising his hand.*~~

~~*The pilgrimage undertaken by Mohammed in the year 10 (March 632) was like a very triumph. All Arabia, apart from the vassals of Persia and Greece, lay at his feet. The greatest success of his life had been effected by sheer moral force without a stroke of the sword. But Arabia*~~

~~religion was the soul of the community. The founding of a religion and the forming of a state were not connected in so merely external a way as is usually supposed ; on the contrary, the one was the natural and necessary consequence of the other. This must certainly be conceded, that, if we are to make any distinctions at all, Islam was far less rich in religious meaning than in social forces. The Koran is Mohammed's weakest performance; the 'weight of his historical importance lies in his work at Medina and not~~

~~no longer sufficed him ; he had wider aims. In his last | in that at Mecca. And it is a fact that the politician in War years he began to extend the holy war against the Greeks. | him outgrew the prophet more and more, and that in many with the Even on his return from Hodaibiya, he began to direct | cases where he assigned spiritual motives he merely did so Greeks. envoys to several foreign potentates, with letters demand- | to give a fair appearance to acts that emanated from secular ing their adhesion to Islam. One of these envoys was | regards. In this respect it appears to us particularly seized and beheaded in the Belk& (the ancient Moab). | objectionable that he gave out as revelations of God and Hence sprang the first campaign against the Greeks, 2.e. | placed in the Koran all sorts of regulations and orders of the Arabs who were subject to the Greek empire. The | the day, which proceeded simply from his own deliberations army directed against them was, however, entirely defeated | or even in part were suggested to him by advisers from at Mu'ta (Autumn 629); Khalid succeeded with difficulty | outside. At the same time the element of self-deception in rallying and leading back the broken remnant of the | is not excluded even here; he took for a message sent host. Next summer the Nabatzans who visited the mar- | down from heaven everything which in his cataleptic fits ket of Medina spread a rumour that the Emperor Heraclius | passed through his mind, however close might be its agree- was collecting a vast force to attack the Moslems; and | ment with his own previously cherished thoughts. It was Mohammed set forth to meet him at the head of 30,000 | pardonable that he went on with the idea after le had men, but got no farther than Tabuk, on the southern | once grasped it, that he blew upon~~

~~*the coals when the flame borders of ancient Edom, when the rumour was found to | threatened to die out. It is less easy to free him from the be false. The expedition, however, was not altogether | reproach of perfidy and cruel vindictiveness, The surprise fruitless, as it led to the submission of several small Jewish | of Nakhla in the month Rajab (ordered by him, though he and Christian communities in the north of the Peninsula. | afterwards repudiated it), the numerous assassinations Mohammed equipped a new expedition against the Greeks | which he instigated, the execution of the 600 Jews at the on his return from his "farewell pilgrimage," and it was | close of the War of the Fosse, burden the Prophet heavily, Death just ready to start when he died, on Monday, 8th June | and sufficiently explain the widespread antipathy in which a 632. he is held. Yet even in this respect it is well not to forget*~~

~~*In forming an estimate of one who has exercised so unexampled an influence on the history of the world, we shall do well to bear in mind the hint of Gibbon, that "some reverence is surely due to the fame of heroes and the religion of nations." The grounds on which Mohammed may be condemned are partly found in his private life. Although on the whole, even after he had become ruler of all Arabia, he maintained the original povertyand simplicity of his establishment, never set store by money and estate, eating and drinking and soft clothing, strictly continued to fast and watch and pray after his first fashion, and that, too, plainly out of a heartfelt need and without any osten- tation, he nevertheless in one point at least used his supreme authority as prophet to make provision for the flesh. He*~~

~~*the instance, already cited, of Charlemagne. It is precisely the man of vast aims who finds it most difficult to keep the beaten path.*~~

~~*After the death of Mohammed arose the question who was to be his "representative" (Khalifa, Caliph). The choice lay with the community of Medina; so much was understood ; but whom were they to choose? The natives of Medina believed themselves to be now once more masters in their own house, and wished to promote one of themselves. But the Emigrants asserted their opposing claims, and with success, having brought into the town a considerable number of outside Moslems,! so as to terrorize the men*~~

~~*of Medina, who besides were still divided into two parties. The Emigrants' leading spirit was 'Omar; he did not,*~~

~~*claimed to be personally exempt from those restrictions in regard to the female sex which lay upon all other Moslems, and, as is well known, he made very extensive application of this fundamental principle. This fact is quite rightly urged against him as a reproach ; even pious Moslems have*~~

~~*however, cause homage to be paid to himself but to Abubekr Abubekr, the friend and father-in-law of the Prophet. Calpe. The affair would not have gone on so smoothly, had not Revolt the opportune defection of the Arabians put a stop to the of the inward schism which threatened. Islam suddenly found 4'™>**~~

~~*been scandalised by it. At the same time, it is unnecessary to judge him on this account more harshly than we do Charlemagne, the most Christian king of the Franks; in any case we must not apply the standards of the present day to the circumstances of old Arabia. Of much weightier and indeed of crushing character is the accusation, that he did not really believe himself to be a prophet, but merely of set purpose played the part of one. For the first years of his activity indeed this charge is not now any longer maintained ; it is universally granted that at that period his enthusiasm was genuine and real. But in Medina, we are told, he used his prophetic character simply as a pretext for the establishment of his power. It seems to the present writer that into this opinion there enter modern notions as to the separation between religion and the civil magistracy, which ought to be carefully kept out of sight. By any other instrumentality than that of a prophet it would hardly have been possible to found the state of Medina ;*~~

~~*itself once more limited to the community of Medina ; only Mecca and Taif remained true. The Bedouins were willing enough to pray, indeed, but less willing to pay taxes ; their defection, as might have been expected, was a political movement.? None the less was it a revolt from Islam, for here the political society and the religious are identical. A peculiar compliment to Mohammed was involved in the fact that the leaders of the rebellion in the various districts did not pose as princes and kings, but as prophets ; in this the secret of Islam's success appeared to lie.*~~

~~*Abtbekr proved himself quite equal to the perilous situation. In the first place, he allowed the expedition against the Greeks, already arranged by Mohammed, quietly to set out, limiting himself for the time to the defence of Medina. On. the return of the army he proceeded to*~~

~~*1 Compare Muir, iv. 263.*~~

~~*2 See Noldeke, Betérige zur Kenntniss der (1864), p. 89 sq.*~~

~~*Poesie der alten Araber*~~

~~*xXVI.—71*~~

~~*Defeat of the rebels.*~~

~~*Khalia in Syria.*~~

~~*Battle of Ka- distya,*~~

~~*'Amr in Egypt.*~~

~~*562*~~

~~*attack the rebels. The holy spirit of Islam kept the men of Medina together, and inflamed them to a death-defying zeal for the faith ; while, on the other side, the Arabs as a whole had no other bond of union and no better source of inspiration than universal egoism. As was to be expected, they were worsted; eleven small flying columns of the Moslems, sent out in various directions, sufficed to quell the revolt. Those who submitted were forthwith received back into favour ; those who persevered in rebellion were punished with death. The majority accordingly converted, the obstinate were extirpated. In Yamama only was there a severe struggle; the Banu Hanifa under their prophet Mosailima fought bravely, but here also Islam triumphed.*~~

~~*The internal consolidation of Islam in Arabia was, strange to say, brought about by its diffusion abroad, The holy war against the border countries which Mohammed had already inaugurated, was the best means for making the new religion popular among the Arabs ; for, in spread- ing by means of*~~

~~*the sword the worship of Alléh, oppor- tunity was at the same time afforded for gaining rich booty. This vast movement was organized by Islam, but the masses were induced to join it by quite other than religious motives. Nor was this by any means the first occasion on which the Arabian caldron had overflowed ; once and again in former times emigrant swarms of Bedouins had settled on the borders of the wilderness. This had last happened in consequence of the events which destroyed the prosperity of the old Sabzan king- dom. At that time the small Arabian kingdoms of Ghassan and Hira had arisen in the western and eastern borderlands of cultivation ; these now presented to Moslem conquest its nearest and natural goal. But inasmuch as Hira was subject to the Persians, and Eastern Palestine to the Greeks, the annexation of the Arabians involved the extension of the war beyond the limits of Arabia to a struggle with the two great powers.*~~

~~*After the subjugation of Middle and North-Eastern Arabia, Khalid b. al-Walfd proceeded by order of the Caliph to the conquest of the districts on the lower Euphrates. Thence he was summoned to Syria, where hostilities had also broken out. Damascus fell late in the summer of 635, and on 20th August 636 the great decisive battle on the Hieromax (Yarmuk) was fought, which caused the Emperor Heraclius finally to abandon Syria.1_ Left to themselves, the Christians henceforward defended them- selves only in isolated cases in the fortified cities ; for the most part they witnessed the disappearance of the Byzan- tine power without regret. Meanwhile the war was also carried on against the Persians in 'Irék, unsuccessfully at first, until the tide turned at the battle of Kadisiya (end of 637). In consequence of the defeat which they here sustained, the Persians were forced to abandon the western portion of their empire and limit themselves to Eran proper. 'The Moslems made themselves masters of Ctesi- phon (Madain), the residence of the Sasanides on the Tigris, and conquered in the immediately following years the country of the two rivers. In 639 the armies of Syria and 'Irak were face to face in Mesopotamia. Ina short time they had taken from the Aryans all the prin- cipal old Semitic lands,—Palestine, Syria, Mesopotamia, Assyria, and Babylonia. To these was soon added Egypt, which 'Amr b. al-'As, aided by the national and confessional antipathies of the Copts towards the Greeks, overran with little trouble in 641.2. This completed the circle of the lands bordering on the wilderness of Arabia; within*~~

~~1 De Goeje, Afémoires d' Hist. et de Géog. Orient., No. 3. 1864; Noldeke, D. Af. Z., 1875, p. 76 sqq.; Beladhori, 137.~~

~~2 See H. Zotenberg in Journ. as., 1879 (xiii. 291-386). Gott. Gel. Anz. 1881, p. 587 sqq.~~

~~Leyden,~~

~~Comp.~~

~~MOHAMMEDANIS®M™~~

~~[THE FIRST~~

~~these limits annexation was practicable and natural, a repetition indeed of what had often previously occurred. The kingdoms of Ghass4n and Hira, advanced posts hitherto, now became the headquarters of the Arabs; the new empire had its centres on the one hand at Damascus, on the other hand at Cufa and Basra, the two newly- founded cities in the region of old Babylonia. The capital of Islam continued indeed for a while to be Medina, but soon the Hijéz and the whole of Arabia proper lay quite on the outskirt of affairs.~~

~~It is striking to notice how easily the native populations of the conquered districts, exclusively or prevailingly Christian, adapted themselves to the new rule. Their nationality had been broken long ago, but intrinsically it was more closely allied to the Arabian than to the Greek or Persian. Their religious sympathy with the West was seriously impaired by dogmatic controversies ;° from Islam they might at any rate hope for toleration, even though their views were not in accordance with the theology of the Emperor of the day. The lapse of the masses from Christendom to Islam, however, which took place during the first century after the conquest, is only to be accounted for by the fact that in reality they had no inward relation to the gospel at all, They changed their creed in order to acquire the rights and privileges of Moslem citizens. In no case were they compelled to do so; on the contrary, the Omayyad Caliphs saw with dis- pleasure the diminishing proceeds of the poll-tax derived from their Christian subjects.~~

~~*It would have been a great advantage for the solidity of the Arabian empire if it had confined itself within the limits of those old Semitic lands, with perhaps the addition of Egypt.*~~

~~*Moslems had subjugated the whole of the Sasanid empire. The most important event in the protracted war which led to the conquest of Eran, was the battle of Nehawend in 641 ;3 the most obstinate resistance was offered by Persis proper, and especially by the capital, Istakhr (Persepolis). In the end, all the numerous and somewhat autonomous provinces of the Sasanid empire fell, one after the other, into the hands of the Moslems, and the young Shahanshah, Yezdegerd, was compelled to retire to the farthest corner of his realm, where he came to a miserable end. But in more than one case the work of conquest had to be done over again : it was long before the Eranians learned to accept the situation. Unlike the Christians of Western Asia, they had a vigorous feeling of national pride, based upon glorious memories and especially upon a church having a connexion of the closest kind with the state. Internal disturbances of a religious and political character and external disasters had long ago shattered the empire of the Sasanids indeed, but the Eranians had not yet lost their patriotism. They were fighting, in fact, against the despised and hated Arabs, in defence of their holiest pos- sessions, their nationality, and their faith, They were subjugated, but their subjection was only outward. The commonwealth of Islam never succeeded in assimilating them as the Syrian Christians were assimilated. Even when in process of time they did accept the religion of the Prophet, they leavened it thoroughly with their own peculiar leaven, and, especially, deprived it of the practical political and national character which it had assumed after the Flight to Medina. To the Arabian state they were always a thorn in the flesh, it was they who helped most largely to break up its internal order, and it was from them also that it at last received its outward deathblow.*~~

~~*3 The accounts differ; see Beladhori, 305. The chronology of the*~~

~~*conquests, as is well known, is in many points uncertain. + Beladh., 315 sg.; Tabari, i. 1068.*~~

~~*But the Persians were not so ready as the Conquest Greeks to give up the contest ; they did not rest until the of Bran.*~~

~~*'Omar Caliph.*~~

~~*CALIPHS.*~~ |

~~*The fall of the Omayyads was their work, and with the Omayyads fell the Arabian empire. The course of Islam's political history during its first' centuries is denoted by the removal of the capital from Damascus to Cufa, and from Cufa to Baghdad, the latter occupying, approximately, the site of the ancient Ctesiphon.*~~

~~*But we must return to the period of Abtbekr, He died after a short reign, on 22d August 634, and as matter of course was succeeded by 'Omar. To 'Omar's ten years' Caliphate belong for the most part the great conquests. He hiniself did not take the field, but remained in Medina ; he never, however, suffered the reins to slip from his grasp, so powerful was the influence of his personality and the Moslem community of feeling. His political insight is shown by the circumstance that he endeavoured to limit the indefinite extension of Moslem conquest, and to main-*~~

~~*'tain and strengthen the national Arabian character of the*~~

~~*'Othman Caliph.*~~

~~*commonwealth of Islam ;! also by his making it his fore- most task to promote law and order in its internal affairs. The saying with which he began his reign will never grow antiquated: " By God, he that is weakest among you shall be in my sight the strongest, until I have vindicated for him his rights; but him that is strongest will I treat as the weakest, until he complies with the laws." It would be impossible to give a better general definition of the function of the State. After the administration of justice he directed his organizing activity, as the circumstances demanded, chiefly towards financial questions—the incidence of taxation in the conquered territories,? and the applica- tion of the vast resources which poured into the treasury at Medina. It must not be brought against him as a personal reproach, that in dealing with these he acted on the principle that the Moslems were the chartered plun- derers of all the rest of the world. But he had to atone by his death for the fault of his system ; a workman at Cufa,*~~

driven to desperation by absurd fiscal oppressions, stabbed him in the mosque at Medina. He died in the beginning of November 644.

Before his death 'Omar had nominated six of the leading Emigrants who should choose the Caliph from among them- selves—Othman, 'Ali, Zobair, Talha, Sa'd b. Abf Wakkas, and 'Abd al-Rahmaan b.'Auf. Thelast named declined to be candidate, and decided the election in favour of 'Othman b. 'Affan. Under this weak sovereign the government of Islam fell entirely into the hands of the Koraish nobility. We have already seen that Mohammed himself prepared the way for this transference ; Abubekr and 'Omar likewise helped it; the Emigrants were unanimous among themselves in thinking that the precedence and leadership belonged to them as of right. Thanks to the energy of Omar, they were successful in appropriating to themselves the succes- sion to the Prophet. They indeed rested the claims they put forward in the undeniable priority of their services to the faith, but they also appealed to their blood relationship with the Prophet, as a legitimation of their right to the inheritance ; and the ties of blood connected them with the Koraish in general. In point of fact they felt a greater solidarity with these than, for example, with the natives of Medina; nature had not been expelled by faith. The supremacy of the Emigrants naturally fur- nished the means of transition to the supremacy of the

1 He songht to make the whole nation a great host of God; the Arabs were to be soldiers and nothing else. They were forbidden to acquire landed estates in the conquered countries ; all land was either made state property or was restored to the old owners subject to a perpetual tribute which provided pay on a splendid scale for the army.

2 Noldeke, Tabari, 246. To 'Omar also is due the establishment of the Era of the Flight.

3 Even in the list of the slain at the battle of Honain the Emigrants are enumerated along with the Meccans and Koraish, and distinguished from the men of Medina,

~~*Meccan aristocracy. ‘Othman did all in his power to press forward this development of affairs. He belonged to the foremost family of Mecca, the Omayyads, and that he should favour his relations and the Koraish as a whole, In every possible way, seemed to him a matter of course. Every position of influence and emolument was assigned to them ; they themselves boastingly called the important province of ‘Irak the garden of Koraish. In truth, the entire empire had become that garden. Nor was it unreasonable that from the secularization of Islam the chief advantage should be reaped by those who best knew the world. Such were beyond all doubt the patricians of Mecca, and after them those of T4if, people like Khalid b. al-Walid, ‘Amr b. al-‘As, ‘Abdallah b, Abt Sarh, Moghira b. Sho‘ba, and, above all, old Abi Sofydn with his son Mo‘awiya, the governor of Syria.*~~

~~*Against the rising tide of worldliness an opposition, however, now began to appear. It was led by what may be called the spiritual noblesse of Islam, which, as dis- tinguished from the hereditary nobility of Mecca, might also be designated as the nobility of merit, consisting of the ‘ Defenders,” and especially of the Emigrants who had lent themselves to the elevation of the Koraish, but by no means with the intention of allowing themselves to be thereby effaced. The opposition was headed by ‘Ali, Zobair, ‘Talha, both as leading men among the Emigrants and as disappointed candidates for the Caliphate, who therefore were jealous of “Othman. Their motives were purely selfish; not God’s cause but their own, not religion but power and preferment, were what they souglit.* Their party was a mixed one. To it belonged the men of real piety, who saw with displeasure the promotion to the first places in the commonwealth of the great lords who had actually done nothing for Islam, and had joined themselves to it only at the twelfth hour, while those who had borne the burden and heat of the day were passed by. But the majority were merely a band of men without views, whose aim was not a change of system but of persons, that they themselves might fatten in the vacant places. Everywhere in the provinces there was agitation against the Caliph and his governors, except in Syria, where ‘“Othman’s cousin, Mo‘Awiya b. Abi Sofydn, carried on a wise and strong administration. The movement was most energetic in ‘Lrak and in Egypt. Its ultimate aim was the deposition of ‘Othman in favour of ‘Alf, whose own services as well as his close relationship to the Prophet seemed to give him*~~

~~*the best claim to the Caliphate. Even then there were enthusiasts who held him to be a sort of Messiah.*~~

~~*The malcontents sought to gain their end by force. In bands they came from the provinces to Medina to concuss 'Othman into concession of their demands. From the Indus and Oxus to the Atlantic the world was trembling before the armies of the Caliph, but in Medina he had no troops at hand. He propitiated the mutineers by concessions, but as soon as they had gone, he let matters resume their old course. Thus things went on from worse to worse. In the following year (656) the leaders of the rebels came once more from Egypt and 'Irak to Medina with a more numerous following ; and the Caliph again tried his former plan of making promises which he did not intend to keep. But the rebels caught him ina flagrant breach of his word, and now demanded his abdi- cation, besieging him in his own house, where he was 4 Tt was the same opposition of the spiritual to the secular nobility that afterwards showed itself in the revolt of the sacred cities against the Omayyads. The movement triumphed with the elevation of the 'Abbasids to the throne. But, that the spiritual nobility was fighting not for principle but for personal advantage was as apparent in 'Alf's hostilities against Zobair and Talha as in that of the 'Abbasids against the followers of "Ali.*~~

~~*Move- ment against 'Othman.*~~

~~*'Ali Caliph.*~~

~~*Mo'd- wiya.*~~

~~*564*~~

~~*defended by a few faithful subjects. As he would not yield, they at last took the building by storm and put him to death, an old man of eighty. His death in the act of maintaining his rights was of the greatest service to his house and of corresponding disadvantage to the enemy.*~~

~~*Controversy now arose among the leaders of the oppo- sition as to the inheritance. The mass of the mutineers summoned 'Alf to the Caliphate, and compelled even Talha and Zobair to do him homage. But soon these two, along with 'Aisha, the mother of the faithful, who had an old grudge against*~~

~~*'Ali, succeeded in making their escape to 'Trak, where at Basra they raised the standard of rebellion. 'Alt in point of fact had no real right to the succession, and moreover was actuated not by piety but by ambition and the desire of power, so that men of penetration, even although they condemned 'Othmin's method of govern- ment, yet refused to recognize his successor. The new Caliph, however, found means of disposing of their opposi- tion, and at the battle of the Camel, fought at Basra in November 656, Talha and Zobair were slain, and 'Aisha was taken prisoner.*~~

~~*But even so 'Alf had not secured peace. With the murder of 'Othman the dynastic principle gained the twofold advantage of a legitimate cry—that of vengeance for the blood of the gray-haired Caliph, and of a distin- guished champion, the Syrian governor Mo'awiya. Mo'dwiya was not inclined to recognize 'Ali, and the latter did not venture to depose him. 'To have done so would have been useless, for Mo'Awiya's position in Syria was impregnable. The kernel of his subjects consisted of genuine Arabs, not only recent immigrants along with Islam, but also old settlers who, through contact with the Roman empire and the Christian church, had taken on a measure of civilization. Through the Ghassdnids these latter had become habituated to monarchical government and loyal obedience, and for a long time much better order had prevailed amongst them than elsewhere in Arabia. Syria was the proper soil for the rise of an Arabian kingdom, and Mo'éwiya was just the man to make use of the situation. He exhibited 'Othman's blood-stained garment in the mosque at Damascus, and incited his Syrians to vengeance.*~~

~~*'Als position in Cufa was much less advantageous. The population of 'Irak was already mixed up with Persian elements; it fluctuated greatly, and was largely composed of fresh immigrants. Islam had its head- quarters here; Cufa and Basra were the home of the pious and of the adventurer, the centres of religious and political movement. This movement it was that had raised 'Ali to the Caliphate, but yet it did not really take any personal interest in him. Religion proved for him a much less trustworthy and more dangerous support than did the conservative and secular feeling of Syria for the Omayyads. Mo'dwiya could either act or refrain from acting as he chose, secure in either case of the obedience of his subjects. 'Alf, on the other hand, was unable to convert enthusiasm for the principle inscribed on*~~

~~_ his banner into enthusiasm for his person. It was necessary that he should accommodate himself to the wishes of his supporters, and at the same time it was impossible, for these wishes were inconsistent. They compelled him suddenly to break off the battle of Sifffn, which he was on the point of gaining over Mo'awiya, because the Syrians fastened copies of the Koran to their lances to denote that not the sword but the word of God should decide the contest (end of July 657). But in yielding to the will of the majority he excited the displeasure of the minority, the genuine zealots, who in Mo'Awiya were opposing the enemy of Islam, and who regarded 'AIt(''s entering into negotiations with him as a denial of the~~

~~faith. When the negotiations failed and war was resumed, the Kharijites refused to follow 'Alf's army, and he had to turn his arms in the first instance against them. He succeeded in disposing of them without diffi- culty, but in his success he lost the soul of his following. For they were the true champions of the theocratic principle ; through their elimination it became clear that the struggle had in no sense anything to do with the cause of God. 'Al's defeat was a foregone conclusion, once religious enthusiasm had failed him; the secular resources at the disposal of his adversaries were far superior. Fortunately for him he was murdered (end of January 661), thereby posthumously attaining au importance in the eyes of a large part of the Mohammedan world (Shi'a) which he had never possessed during his life. His son Hasan made peace with Mo'awiya.~~

~~The Kharijites are the most interesting feature of the The~~

~~then phase of Islam. In the name of religion they raised their protest against allowing the whole great spiritual movement to issue in a secular and political result, in the establishment within the conquered territories of an Arabian kingdom, a kingdom which diametrically contra- dicted the theocratic ideal. Islam was then on the point of making its peace with the world, not without a certain apostasy from its original principles, for which Mohammed himself had paved the way. Life was no more dominated by religion, but came to terms with it and parted com- pany. This development~~

~~was favoured by the govern- ment, which desired before all things to have peace. Orthodoxy arose, and thereby religion was tamed and divested of every dangerous element ; strictly speaking, it became a compromise, according to which the letter of the precept was correctly followed, in order that, in everything besides, a man might obey his own inclinations. The con- ditions under which any one might make sure of heaven were—on the one hand, the performance of " good works," a.e. of such opera operanda as had a special churchly merit assigned to them; on the other hand, faith in the absolute sovereignty of God even over the wills of men. About morals God showed little concern—the usual view of orthodox shamanism. This was by no means the original standpoint of Islam, although the transition to it was made at an early stage, and by the Prophet himself. Originally Islam—.e. religious resignation—was only the complement of pious effort; a man set himself about even the hardest and apparently purposeless tasks, because he believed the issue to lie entirely in the hand of God. But now all this was reversed; a man acted according to his humour, because his destiny had nothing to do with his inherent qualities, but was dependent entirely on Allah's caprice. The Kharijites protested not merely against the dynastic principle and the rule of the Omay- yads, but also against orthodoxy ; they disputed the doc- trine of predestination and the proposition that a great sinner could yet be a good Moslem, because they did not understand how to divorce religion from practice. To some degree they call to mind the Montanists, but their opposition was much more energetic in its expression.~~

~~Sources.—For the history of Mohammed these are—(1) the Sources.~~

~~Koran ; (2) the theologico-historical tradition or Hadith. The latter is chronologically arranged in the biographies, of which those of Ibn Ishak and of Wakidi are the oldest and most import- ant. Ibn Ishak's work in its complete form is now to be found only in Ibn Hishdm's revision (ed. Wiistenfeld), bunt large and numerous fragments of the original are given by Tabari (ed. De Jong). Of Wakidi the Kitdb al-Maghdzi, t.e. the history of Mohammed in Medina, is still extant (abridged German translation by Wellhausen, 1882); his collections for the earlier period are known to us through the work of Ibn Sa'd his secretary (Tabakdt,~~

~~*1 On the further development of Islam compare Houtsma, De Strid over het Dogma, Leyden, 1875.*~~

~~*The Omay- yads,*~~

~~*CALIPHATE. |*~~

~~*unedited). The Hadith is set forth more systematically, according to subjects, in the great collections of tradition by Malik b. Anas, Bokhari, Moslim, etc. (Bulak editions). A subsidiary authority is the humanistic tradition of the Odaba, with which the poetry may be reckoned. The principal collections of this class are the Kitab al-Aghéni (Bulak edition) and the Kémil (ed. Wright). For the period after Mohammed the most important work is the Chronicle of Tabari (Leyden edition); the history of the conquest is treated briefly after the best authorities by Beladhori (ed. De Goeje, 1866).*~~

~~*Literatwre.—The genuine tradition of the Arabs with reference to their prophet was first introduced into Europe by the French, beginning with Gagnier and ending with the valuable work of Caussin de Perceval. Weil and, after him, Noldeke especially, have*~~

~~*PART IIL—THE EASTERN*~~

~~*Sect, I.—THE OMAYYADS.*~~

~~*1. In commencing the history of the Omayyad dynasty we must first recur to the causes which brought about the triumph of this family, and which led its chief to substitute Damascus for Medina as the seat of the Caliphate; an event which led to profound changes in the Moslem empire, and exercised a considerable influence on its development. In the same way, at a later date, the transfer of the Cali- phate from Damascus to Baghd4d marked the accession of a new family to the supreme power, and gave Islam a new direction.*~~

~~*In the time of Mohammed, the Arabs were divided into an infinite number of tribes, some settled, others nomadic, which were constantly at war with each other. The Prophet united them into one body, but he could not entirely*~~

~~eradicate the hatred which had existed for ages between tribe and tribe. Thus the people of Mecca and those of Medina hated each other, because the former were a branch of the race of Ma'add, the great ancestor of the tribes of the North ;! while the latter belonged to the Yemenite race, or that of the South. The conquest of Mecca by Mohammed and his allies of Medina only exas- perated this hatred, and the nobles of the Koraish swore to take revenge on the Yemenites, as soon as they should be able to do so. One of the most violent opponents of the Prophet had been, as we have seen, the father of that very Mo'Awiya who founded the Omayyad dynasty, Abu Sofyan, grandson of Omayya, the leader of the Meccans in the battle at Ohod ; and it is related that his wife Hind, having found Hamza, Mohammed's uncle, among the dead, cut open his body, and tore out and devoured his liver. We have also seen how Abt Sofydén ultimately made his submission and embraced Islam, but only under compulsion. His son Mo'Awiya became, it is true, one of Mohammed's secretaries ; but we know that his faith was never very strong, and that he always made his religion subordinate to the interests of his family. Even in his youth, he had conceived the project of recovering the supreme power for his own race, and it has been related above how the inner conflicts of Islam under the Caliphates of 'Othman and 'Alf carried him forwards towards this goal.~~

~~Mo'Awiya might, no doubt, have marched to the help of 'Othman with an army of Syrians; but the preserva- tion of the Caliph, his relative, would not have served the purposes of his burning ambition, and we may say with- out hesitation that it was with secret joy that the prefect of Damascus heard of the fatal result of the plot against 'Othman, The Syrians were entirely devoted to Mo- 'awiya. Polite, amiable, and generous, he had gained the goodwill of all the Arabs of Syria, for whom Islam had remained a dead letter, and who, continuing Bedouins at heart, shared the feelings of their chief against the new~~

~~1 The Ma'addites are also often called Modarites and Kaisites, after their ancestors Modar and Kais.~~

~~*the merit of having shown how to use the Koran in conjunction with the Arab tradition asa main source. Of modern biographies the most important are those of Muir and Sprenger ; research has not yet got beyond them, although there is room for this. For the history of the Caliphs, the standard book is still the well-known work of Weil, although since it was published considerable addi- tions have been made to our knowledge of the sources, thanks specially to the labours of Dozy, De Goeje, and other Dutchmen. Hitherto the main object has been to bring together the materials in this department of research, and a comprehensive treatment of the entire subject has not as yet been accomplished ; still reference may be made in this connection to Dozy (Histoire de l'Islamisme), and A. von Kremer (Gesch. der herrschenden Ideen d. Islam, and Kulturgeschichte d. Orients unter den Khalifen). (J. WE.)*~~

~~*CALIPHATE.*~~

~~*aristocracy of Medina. Consequently, when 'Ali, 'Oth- man's successor, summoned Mo'dwiya for the last time to acknowledge him, and when Mo'dwiya, assembling his partisans in the mosque of Damascus, asked their advice, they replied that it was his part to command, and theirs to obey and to act. The enthusiasm of the Syrians was great; and Mo'dwiya having ordered a levy en masse, within three days every able-bodied man had joined his standard. Syria alone supplied Mo'dwiya with more troops than all the rest of the provinces put together furnished to 'Ali, who is said to have addressed his soldiers with these bitter words: "I would gladly exchange ten of you for one of Mo'Awiya's soldiers." Then he added—in allusion to the savage action of Hind, Mo'Awiya's mother, on the field of battle at Ohod—'" By God! he will gain the victory, this son of the liver-eater ! "*~~

~~*'Al's gloomy anticipations were fulfilled ; but it was by stratagem that Mo'Awiya gained his victory. The battle of Siffin, the abortive negotiations that followed, and the withdrawal of the Khérijites, have been already spoken of. The negotiations ended in the conference of Dumat al-*~~

~~*Jandal, a small place situated between Syria and 'Irdk,*~~

~~about seven days' journey from Damascus and thirteen from Medina. Here in Ramadan, a.H. 37 (a.D. 657-658), Abu Musé4 and 'Amr b. al-'Ags (the famous conqueror of Egypt) appeared as arbitrators for 'Alf and Mo'Awiya respectively, and the cunning of the latter induced Abu Musé to pronounce both pretendants deprived of whatever rights either might have to the Caliphate, and to say that it now rested with the Moslems to make a new choice. 'Amr, who was only waiting for this declaration, rose in his turn, and said to the Arabs who were crowding round the platform: "O people, ye hear what Abu Mus4 says. He himself renounces the claims of his master. I also agree to~~

~~the deprivation of 'Alf, but I proclaim my master Mo'awiya Mo'd- Abt Mus cried out against this treachery, but Viv !.~~

~~Caliph." no one would listen to him, and he fled for refuge to Mecca, where he ultimately recognised the claims of Mo'awiya, even in 'Ali's lifetime. This event marks the commencement of the Omayyad dynasty. 'Amr went in triumph to Damascus, where the Syrians took the oath of fidelity to Mo'Awiya.~~

~~In 'Trék, on the other hand, with the exception of the Kharijites, all the people remained faithful to the cause of 'Ali, who, mounting the pulpit at Cufa, summoned his army to the field, and fixed their rendezvous at Nokhaila, a small place not far from the city. The Kharijites had taken refuge at Nahrowdn, and 'Alf found it necessary to attack them there, before marching against the Syrians. At his arrival most of the rebels dispersed, except from fifteen to eighteen hundred fanatics, who remained at ~ their post and allowed themselves to be slaughtered to the last man. Thus rid of the Kharijites, "Alf meant to direct his march towards Syria, but his soldiers refused to move, and declared their intention of first taking some~~

~~Assassi- the mosque.~~

~~nation of alone fell.~~

~~1.~~

~~*rest at Cufa. Compelled to inaction, 'Alf returned to Cufa, while Mo'Awiya gave his attention to securing the ossession of the provinces. At the beginning of a.H. 38 (A.D. 658-659), Egypt was lost to 'Alf. 'Amr b. al-"As was sent thither by Mo'Awiya, and marched without delay, at the head of five thousand men, against 'Alt's vicegerent, Mohammed, son of the late Caliph, Abubekr. The brave general Ashtar, whom 'Ali sent to the help of Mohammed, was poisoned at Kolzom by the prefect of that place, acting under secret orders from Mo'éwiya, and 'Alt's troops retraced their steps. Meanwhile, in Egypt itself, a partisan of the Omayyads, Mo'Awiya b. Hodaij, who was at the head of six thousand fighting men, had declared against Mohammed, and driven him from Fostat. On his arrival in Egypt, 'Amr effected a junction with Mo'awiya b. Hodaij, and the unfortunate Mohammed, beaten by his adversaries, fell into the hands of Ibn Hodaij, who put him to death.*~~

~~*While Egypt was thus being lost to 'All, commotions were excited at Basra itself by a partisan of the Omayyads. These were, however, put down by the governor of that city, ZiyAd. This man was Mo'dwiya's own brother, but illegitimate, and not having been acknowledged by his father, Abu Sofyan, he had revenged himself by embracing the party of 'Alf. Ziydd was renowned among the Arabs for his eloquence, his resolution, and his courage. At a later period, Mo'awiya gained him over to his cause by publicly acknowledging him as his brother. At the time we speak of, he was a faithful servant of 'Alf, and as soon as the revolt of Basra was put down, he marched into Farsistan, where he maintained peace and kept the inhabitants in their allegiance. Meanwhile, however, the other provinces were falling one after the other under the power of Mo'awiya. His generals penetrated into the heart of Chaldea; and even in Arabia, where 'Alt's generals had at first gained some advantages, Bosr? b. Artah obtained possession of Medina a.u. 40 (A.D. 660-661), and compelled its inhabitants to acknowledge Mo'Awiya. After this he marched upon Mecca, expelled Kotham, 'Ali's governor, and there also exacted an oath of obedience to his master. Following up his successes, Bosr did not hesitate to press southward, and soon gained possession of Yemen. 'AL{ was now no longer master of anything but 'Irak and a part of Persia, and even of these provinces the former was menaced by the Syrians, as we have seen. Taking advantage of some partial successes gained by his forces in Arabia and in*~~

~~*Syria, ‘Ali made overtures for peace, but they were rejected. Mo‘dwiya believed himself too sure of ultimate success to be willing to share the empire.*~~

~~*It was then that three men of the Kharijites conceived the project of delivering Islam from those who were desolating it with fire and blood. ‘Abd al-Rahman b. Moljam, Boraik b. ‘Abdallah, and “Amr b. Bekr agreed that on the very same day the first should kill ‘Alf at Cufa, the second Mo‘Awiya at Damascus, and the third “Amr b. al-‘As at Fostat. They fixed on Friday the 15thof Ramadan, a.H. 40, when they were sure of finding their victims at The plot was put in execution, but ‘Alf On the appointed day, Boraik made his way into the mosque of Damascus, and stabbed Mo‘Awiya in the back with his sword. Before he could repeat the blow he was seized, and Mo‘éwiya recovered from his wound. As for ‘Amr, he had been kept at home by illness; his place at the mosque was taken by Kharija, the chief of his guards; and it was he who fell beneath the blows of ‘Amr b. Bekr. ‘Abd al-Rahman was more*~~

~~*1 Not Bishr, as some historians call him.*~~

~~*Bosr gave his name to a fortress near Kairawan.*~~

~~*Beladhori calls him Bosr b, Abi Artah.*~~

~~*MOHAMMEDANISM*~~

~~*[oMAYYADS.*~~

~~*successful. As ‘Ali was entering the mosque, he dealt him a blow on the head with his sword, and stretched him on the ground mortally wounded. Two days later “Alf died, and the assassin was put to death with horrible torments.*~~

~~*‘Alf left two sons, Hasan and Hosain. The people of ‘Trak chose Hasan Caliph. But he, not having his father’s energy, recoiled before the prospect of a war with Mo‘Awiya. Though he had an army of forty thousand men at his disposal, he preferred to renounce the Caliphate. Besides, one of his generals, Kais b. Sa‘d, who had urged him to continue the struggle, and*~~

~~had himself tried the chance of arms, had just been beaten by the Syrians. In consequence of this defeat, a mutiny had broken out in Hasan's army. He abdicated, and only demanded, in exchange for the power which he resigned, pardon for his relatives and a yearly pension of five millions of dirhems,? together with the revenues of the Persian city of Darab- gird. A treaty to this effect was concluded between Mo'Awiya and Hasan, in spite of the opposition of Hosain, who exhorted his brother to continue the struggle; and Mo'éwiya entered Cufa at the head of his army, accord- ing to some authorities towards the end of the month of Rabi L, a.n. 41 (July, a.pv. 661), according to others a month or two later. Hasan retired to Medina, where he died eight or nine years afterwards, poisoned, it is said, by order of the Caliph.~~

~~Mo'Awiya, who now remained sole master of the Moslem empire, was, however, not yet universally acknowledged. Five thousand Kharijites made head against him in the province of Ahwaz, the ancient Susiana, and a revolt broke out at Basra. Ziydd himself, Mo'dwiya's brother, refused to take the oath to him, and fortified himself at Istakhr, the ancient Persepolis. The revolt at Basra was put down by Bosr b. Artah, and Moghira b. Sho'ba, whom Mo'awiya had named prefect of Cufa, accepted the task of bringing about a reconciliation with Ziyad. Ziyad refused to take the oath of allegiance only because he feared being called to account for certain sums of money which were missing from the public treasury of Persia. Mo'dwiya promised to shut his eyes to these irregularities ; and Ziyéd came to Damascus and was very well received by the Caliph, who hastened to adopt the bastard as his brother, to the great scandal of all pious Moslems.? After acknowledging Ziyad, who thus became Ziy4d son of Abu Sofyan, Mo'awiya entrusted him with the government of Basra and of Persia, and afterwards with that of Cufa, when Moghira b. Sho'ba died. Ziydd governed 'Irak with the greatest vigour, to the full satisfaction of Mo'Awiya, who further placed the whole of Arabia under his authority; but in that same year, A.H. 53 (A.D. 672-673), Ziyad died. It seems that Mo'Awiya had thought of him as his successor in the Caliphate. After Ziyad's death, the Caliph wished to secure the throne for his own son Yazid. This was a new violation of the customary rights of Islam ; for Mohammed, whose actions served as a rule, had not in his lifetime appointed any one as his successor. Mo'dwiya, who was a statesman above everything, and who held religion~~

~~very cheap when it interfered with his objects, did not hesitate to create a precedent. He met, however, at first with vigorous opposition, and it was not till some years later that he ventured to have his intentions publicly announced from the pulpit. In Syria the people took the oath of allegiance to Yazid; in Arabia and 'Irak public opinion declared itself against the step which Mo'dwiya had taken.~~

- ~~The dirhem is a silver coin worth about a franc.~~

~~3 At a later period, the 'Abbasid Caliph Mahdi thought it right to have the names of Ziy4d and his descendants struck off the rolls of the Koraish ; but, after his death, the persons concerned gained over the chief of the rolls-office, and got their names replaced on the lists. See Tabari, iii. 479.~~

~~Mo'a- wiya sole Caliph.~~

~~OMAYYADS. |~~

~~The Caliph was not moved; threats prevailed over the obstinacy of the people of "Irak, and Mo'Awiya repaired to Arabia in person, at the head of an army, to intimidate the inhabitants of Mecca and Medina. As may be supposed, the principal fomenters of the resistance in Arabia were the sons of the first Caliphs, "Abd al-Rahman the son of Abtbekr, 'Abdallah the son of "Omar, and Hosain the son of 'Ali; for, by submitting, they would have renounced all hope of being themselves chosen by the people. Another 'Abdallah, son of that Zobair who had been among the six candidates nominated at the death of 'Omar for the choice of the Moslems, was also one of the warmest opponents of the pretensions of Mo'Awiya. All the efforts of the Caliph to win over these personages to his side having proved vain, he ordered them to be brought into the mosque at Mecca, each between two soldiers ; then, having mounted the pulpit, he called on the bystanders to take the oath of allegiance to his son; adding that 'Abd al-Rahman, Hosain, and the two 'Abdallahs would raise no objection. They, in their terror, did not utter a word, and the assembly took the oath. Then Mo'Awiya, without con- cerning himself further about the malcontents, returned to Damascus.~~

~~*While thus occupied at home, Mo‘dwiya did not neglect foreign affairs. ‘Amr b. al-‘As, governor of Egypt, died A.H. 43 (A.D. 663-664), and was followed by several prefects in succession, under one of whom the general Mo‘Awiya b. Hodaij undertook several expeditions into the province of Africa. In the year 50 (a.p. 670) he advanced as far as Camunia, now Stsa, near which city he laid the foundations of the celebrated Kairawd4n, and even went on to Sabaratha, a town situated near the seashore, and opposite to the island of C’rina. The emperor, Constantine IV., had sent thither thirty thousand Greeks, who were beaten and compelled to re-embark in haste. Mo‘awiyab. Hodaij returned to Egypt after his victory, and the Caliph now considered the position of the Moslems in Africa so strong, that he separated that province from Egypt, and appointed as governor of Africa “Okba b. Nafi, who per- manently established Kairawan, in a plain situated at a little distance from the first encampment of Mo‘Awiya b. Hodaij. According to some historians, the new city was completed a.H. 55 (A.D. 674-675).*~~

~~*In the East the successes of the Moslems were still more brilliant. Ziydd, brother of Mo‘Awiya, as soon as he was appointed governor of ‘Irdk and Persia, sent an army into Khords4n. It advanced as far as the Oxus, crossed that river, and returned loaded with booty taken from the wandering Turkish tribes of Transoxiana. Bokhdrd was occupied by a son of Ziydd, and Sa‘d, son of the Caliph ‘Othman, whom Mo‘Awiya had made governor of Khordsdn, marched against Samarkand, a.H. 56 (a.p. 675-676). Other generals penetrated as far as the Indus, and over- ran and conquered Multén, Kabulistén, Mokrdn, and Sijistan.*~~

~~*In the North the Moslems were not less fortunate in their attacks on the Byzantine empire. Mo‘Awiya, while still only governor of Syria, had gained possession of Armenia, and had sent a fleet against Cyprus, which, in conjunction with that of the governor of Egypt, had effected the conquest of that island. Encouraged by the result of this expedition, he gave the order for new incur- sions in the Mediterranean. HIs fleet of twelve hundred vessels invested the islands of Cos, Crete, and Rhodes. The famous Colossus of Rhodes was broken to pieces, and it is said that the bronze of which it was made was bought by a Jew of Emesa, and formed a load for nine hundred and eighty camels. The Arabs even dared to threaten*~~

~~Constantinople, which owed its safety only to the Greek fire. Yazid, the son of Mo'dwiya, took part in these~~

~~expeditions, but with no great ardour, and in the year 58 (A.D. 677-678) Mo'Awiya concluded a thirty years' peace with Constantine IV. Two years later, he died at Damas- cus, after a reign of nearly twenty years. He had been governor of Syria for the same length of time. Before his death, he sent for his son Yazid, and having pointed out how he had smoothed down all difficulties for him, he advised him to spare no effort to preserve the attachment of the Syrians. He urged him also to keep a close watch on the actions of Hosain b. 'Ali, and of the other pre- tenders who had refused to take the oath of allegiance to him ; but he added that, should they rebel, Yazid ought to treat them with clemency, and not to forget their illus- trious origin. By failing to act upon this wise advice, Yazid rendered irreconcilable that formidable schism which, even at the present day, still divides the Moslem world, and which, at all periods, has been a source of calamity to Islam.~~

~~2. Yazid had not his father's genius. fond of pleasure, and careless about religion, he bestowed more care on turning a pretty couplet than on consoli- dating the strength of his empire. During his short reign he committed three actions for which Moslems never pardoned his memory: the murder of Hosain, son of 'Ali and grandson of the Prophet; the pillage of Medina; and the taking of the Ka'ba, the venerated temple of Mecca ; crimes which were not redeemed in the eyes of the people by a few fortunate expeditions on the part of his generals.~~

~~Immediately on ascending the throne, in the month Rajab a.u. 60 (April, a.p. 680), Yazid sent a circular to all his prefects, with an official announcement of his father's death, and an order to administer the oath of allegiance to their respective subjects. In particular, he charged the new prefect whom he appointed to Medina, his own cousin Walid b. 'Otba, to strike off the heads of Hosain son of 'Ali, 'Abd al-Rahman son of Abtbekr, 'Abdall4h son of 'Omar, and 'Abdalldh son of Zobair, if they again refused~~

~~*to acknowledge him. Terrified at such a commission, Walid did not dare to act with rigour against Hosain and 'Abdallah b. Zobair, both of whom refused to take the oath, but allowed them to escape to Mecca. Yazid immediately deprived him of his office, and appointed in his place "Amr b, Sa'id, already governor of Mecca. Once in the Holy City, 'Abdallih b. Zobair thought himself in such perfect safety that he began to intrigue with the Meccans to have himself proclaimed Caliph in Arabia. At Cufa the news of the flight of Hosain produced great agitation among the partisans of the family of 'Ali, who were numerous there, and they sent several addresses to the grandson of the Prophet, inviting him to take refuge with them, and promising to have him proclaimed Caliph in 'Irak. Hosain, who knew the fickleness of the people of 'Irak, hesitated to yield to their entreaties; but Ibn Zobair, who was desirous to get rid at all costs of so formidable a rival, persuaded him that he ought to go and put himself at the head of the people of 'Irak, and enter on an open struggle with Yazid. Hosain began by sending his cousin Moslim b. 'Akil to Cufa, and from him he learned that many of the inhabitants of that city appeared really decided to support him. The prefect of Cufa, No'man b. Bashir, though apprised of these proceedings, did not choose to make them known to Yazid, as he was reluctant to act with severity against a descend- ant of the Prophet. Information, however, reached the Caliph, who deprived No'man of his office, and ordered*~~

~~*1 Salam b. Ziyad invaded Sogdiana, and brought back immense booty to Merv. In Africa 'Okba b. Nafi' invaded the whole coast of the Mediterranean as far as Morocco. On his return, however, he fell into an ambuscade laid by the Berbers, who killed him and took Kairawan.*~~

~~*Passionately Yazid I.*~~

~~*Kerbela.*~~

~~*568*~~

~~*of Basra, to give up his post there to his brother "Othman,*~~

~~*and to repair in person to Cufa, in order to watch the*~~

~~*partisans of ‘Ali in that city. ‘Obaid Allah obeyed,*~~

~~*entered Cufa, and, ascending the pulpit the very day after his arrival, publicly announced his firm intention of putting Moslim b. ‘Akil was*~~

~~*to death any one who should rebel. given up by a traitor and executed. Meanwhile Hosain,*~~

~~*on receiving his cousin’s despatches, had already set out from Mecca with all his family, and had reached Kadistya*~~

~~*(a place situated only fifteen parasangs! from Cufa, and noted for the defeat sustained there by the Persians during the Caliphate of ‘Omar), news of these vexatious occurrences.*~~

~~*dissuaded him from doing so, crying out for revenge, and representing to him that doubtless he had only to show himself under the walls of Cufa to be received with enthusiasm by its inhabitants. sued his journey towards Cufa. But ‘Obaid Allah, who was watching all his movements, sent four thousand horsemen, devoted to the Omayyad cause, to meet him, with orders to bring Hosain before him either alive or dead. The commander of these horsemen was ‘Omar b. Sa‘d,? to whom ‘Obaid Allah had promised the govern- ment of Media as a reward, if his expedition should succeed. The Omayyads met Hosain in the plain of Kerbela, opposite to Cufa, before he had reached the Euphrates, and surrounded him. ‘Omar b. Sa‘d himself sought out Hosain and summoned him to surrender. Hosain declared himself ready to renounce his pretensions, provided he were allowed to return to Mecca with his followers, or were even sent to Damascus. When ‘Obaid All4h was informed of this proposal, he simply repeated his former order to bring Hosain to Cufa, dead or alive ; and, fearing the defection of ‘Omar b. Sa‘d, he sent out another troop of horsemen under the orders of a certain Shimr. On the 9th of Moharram in the year 61 (9th October A.D. 680), Shimr reached Kerbeld, and summoned Hosain afresh to surrender at discretion. Hosain pre- ferred to die sword in hand, and on the following day, after a desperate struggle, he was cut down with all his followers. His head was cut off and carried to Cufa, and then sent to Damascus. His body was not buried till the following day. Only the women of his family were spared, and one of his sons ; these were taken by Yazid’s order to Medina,*~~

where the sight of their mourning and the tale of their sufferings caused a profound sensation. The horror and grief of the partisans of "All's family were great. Hence the names of Yazid, 'Obaid Allah, and Shimr, have been held accursed ever since by the Shfites. They observe the 10th of Moharram as a day of public mourning. Among the Persians, stages are erected in public places on that day, and plays are acted, represent- ing the misfortunes of the family of 'Ali* The Omayyads themselves were loud in their reprobation of this impious massacre, and all Moslems, without distinction of party, considered it a monstrous act.*

At Mecca the news was received with a degree of indignation of which 'Abdallah b. Zobair took advantage to assume the title of Caliph. As early as a.H. 60, the new prefect of Medina had tried to secure his person. He had sent against him a force of two thousand men, at whose

1 The parasang is nearly equivalent to an English mile.

2 Son of the famous Sa'd b. Abi Wakkas, conqueror of Persia under 'Omar, and founder of Cufa.

3 Shi'ites comes from Shi'a, a word which in Arabic signifies "sec- tary." It is the name given to the partisans of the family of 'Ali, who acknowledge no legitimate Caliphate outside of that family. Shi'ism is the religion of Persia.

4 See Chodzko, Thédtre persan. Paris, 1878.

'Obaid All4h, son of the famous Ziydd, and then governor

when he received the He wished to retrace his steps immediately, but the friends of Moslim

Hosain accordingly pur-.

gates of the city is called the Gate of Harra.

~~*head was placed a brother of the pseudo-Caliph himself, called 'Amr, who, having been accused by 'Abdallah of maintaining a guilty intercourse with one of his wives, had become his bitter enemy. 'Abdallah collected an army, and placed it under the orders of 'Abdallah b. Safwan, who completely defeated the Omayyad troops. The brother of the pseudo-Caliph was taken and put to death. At the news of this defeat, Yazid swore that Tbn Zobair should never appear before him but as a prisoner in chains. He dismissed the new prefect of Medina, and reinstated Walid b. 'Otba, who, in the year 61, went to Mecca to try to seize 'Abdallah b. Zobair. The latter, in derision, wrote to Yazid: "Walid is a mad- man, who will ruin everything by his folly; send in his place another governor to repair the wrongs he has done." Yazid thought that 'Abdall4h meant these words as a step towards reconciliation ; hastened to deprive Walid of his office ; appointed 'Othman b. Mohammed in his place ; and even sent envoys to Ibn Zobair. He, however, would not listen to them; he thought he could reckon upon the devotion of the people of Mecca, and further hoped that Medina itself would declare against Yazid. This, in fact, took place in the year 63 (A.D. 682-683). The people of Medina, stirred up by a certain 'Abdallah b. Hanzala, who had had a near view of Yazid at the court of Damas- cus, and had been scandalized by the profligacy of his life, revolted, drove the governor and all the Omayyads out of Medina, and proclaimed the dethronement of Yazid. The Caliphate was even offered by sonie to 'Ali, that one of the sons of Hosain who had escaped the massacre of Kerbela ; but 'AH wisely refused it, At the news of this revolt, Yazid first sent an ambassador to Medina. This step proving fruitless, he next collected an army of from ten to twelve thousand Syrians, and entrusted their command to Moslim b. 'Okba, who passed, and with good reason, for a man who would recoil from nothing. This general, though weighed down by age and sickness, marched against Medina, took it, aftera battle known as the day of Harra 5 (26th Dhu '1-Hijja 63, 26th August 683), and gave Capture up the city for three days to massacre and pillage. 'Tor- and pil- rents of blood flowed, and hence Moslim b. 'Okba received a the surname of Mosrif (the Prodigal). On the fourth ad day, Moslim repaired to the mosque, and received the oath of allegiance from all those of the citizens of Medina who had not been able to make their escape. The news reached Mecca a few days later, and fell like a thunder- stroke on Ibn Zobair and his adherents, who prepared for war, expecting from day to day to see Moslim appear before the walls of their*~~

~~*city. He had, in fact, started for Mecca immediately after the conquest of Medina ; but he died on the road, and the command was taken by Hosain b. Nomair. The Omayyad army arrived before Mecca a month after the capture of Medina, and found Ibn Zobair ready to defend it. A number of the citizens of Medina had come to the aid of the Holy City, as well as many Kharijites and Shiites, at the head of whom was a certain Mokhtar b. Abi 'Obaid, who subsequently played a very important part in 'Trak. In spite of the sorties of the Meccans, the Syrian army invested the city. Siege of Hosain b. Nomair had caused balistas to be placed on Mecca. the neighbouring heights; and these, under the manage-*~~

~~*ment of an Abyssinian soldier, hurled against the Ka'ba*~~

~~*enormous stones and vessels full of blazing bitumen, with*~~

~~*such effect that the temple took fire and was consumed.*~~

~~*After a siege of two months, Ibn Zobair was beginning*~~

~~*to despair, when he received, through an Arab of the*~~

~~*desert, news of the death of Yazid. The Caliph had in*~~

~~*fact died on the 15th of Rabi' I. (11th November 683).*~~

~~*5 Harra is the volcanic district outside of Medina. One of the*~~

~~*Ibn Zo-*~~

~~*bair pro-*~~

~~*claimed*~~

~~*Prince of*~~

~~*the Be- lievers.*~~

~~*Mo'dwi- ya II,*~~

~~*Merwan I.*~~

~~*OMAYYADS.*~~ |

~~*Hosain b. Nomair immediately offered the Caliphate to Ibn Zobair, on condition that he should grant a complete amnesty to all those who had taken part in the battle of Harra and in the siege of Mecca. 'Abdallah had the folly to refuse, and Hosain then returned to Damascus.*~~

~~*Thus rid of his enemy, 'Abdallah caused the title of Prince of the True Believers (Amir al-mo'minin) to be conferred on him—a title which 'Omar had already received, and which was afterwards adopted by all the Caliphs. He sent one of his brothers, 'Obaid Allah, to Medina, and chose as governor of Egypt 'Abd al-Rahmaén b. Jahdam, who repaired to that province, and caused the authority of Ibn Zobair to be acknowledged there. At Basra and at Cufa, many of the inhabitants did not hesitate to acknowledge him, and received a Zobairite governor, while the Kharijites and the Shf'ites rose in revolt—the former at Basra under the leadership of Nafi' b. Azrak, the latter at Cufa under that of Solaiman b. Sorad—and expelled the Omayyad governor, 'Obaid Allah b. Ziydd, who took refuge at Damascus. Mesopo- tamia soon followed the example of 'Irak. Even in Syria, the population seemed disposed to forsake the cause of the Omayyads. The Kharijites and Mokhtar b. Abi "Obaid, who had supported Ibn Zobair, now repented of having laboured for the elevation of this pretender, and quitted Mecca. The son of Zobair, remaining thenceforth sole master of Mecca, occupied himself tranquilly in rebuilding the Ka'ba, which he restored on its ancient foundations.*~~

~~*3. It was in the midst of this break-up of his party that, immediately after the death of Yazid, his eldest son, Mo'awiya II., was elected Caliph at Damascus at the age of only seventeen or twenty. He was a young man of weak character, and imbued, it is said, with Shi'ite opinions. He felt himself incapable of ruling, and was contemplating abdication, when he died, after a reign of but forty days, by poison, as some say; of the plague, as others assert. The Caliphate was immediately offered to 'Othman b. 'Otba b. Abi Sofydn, cousin of Mo'Awiya IT. ; for Khalid, the second son of Yazid, was only sixteen years old. "Othman b. 'Otba, however, having made it a condition of his election that he should not be compelled to enter on any*~~

~~*war, or to condemn any one to death, the choice fell at Damascus on Merw4n b. al-Hakam, a descendant of Omayya through his grandfather Abu 'l-'As, but on con- dition that he should marry Maistn, the widow of Yazid, and should appoint Khalid, her son, as his successor.*~~

~~*4, Merwan b. al-Hakam had been secretary to the Caliph 'Othman, and governor of Medina under Mo'Awiya I. Yazid, on his accession to power, had dismissed him and put Walid b. 'Otba in his place; but Merwd4n had continued to live at Medina, and had been driven from it during the revolt of the year 63, and again in the following year, when "Obaid Allah b. Zobair had taken possession of that city in the name of his brother. It might have been thought that Merwdn would cherish a deep hatred of "Abdallah Ibn Zobair ; but he was an old man of sixty- two at the time of his election, and, dreading an unequal struggle, he was on the point of making his submission to the Meccan Caliph. The drooping courage of Merwdén was revived by his son 'Abd al-Melik and by 'Obaid Allah b. Ziyad, and he resolved to try the chances of war.*~~

~~*Dahhak b. Kais, governor of Damascus, had declared himself on the side of Ibn Zobair, and had raised an army, principally from among the tribe of Kais. This tribe had taken offence because Mo'dwiya I. and Yazid had chosen their wives from the Yemenite tribe of Kalb, and, con- tinuing to resent their conduct, now refused to acknowledge Khalid as the heir-presumptive of Merwdn. It was there- fore on the Yemenites that Merwan had to depend for the suppression of Dahhdk's rebellion. The latter had an*~~

~~*army of nearly sixty thousand horsemen, while Merwdn could bring together only thirteen thousand infantry. The two armies met at Marj Rahit, a few miles from Damascus, and, after a series of combats which lasted for twenty days, Merwan's troops gained a complete victory, and Dahhak was among the killed. The Syrian provinces hastened to acknowledge the conqueror, and Merwdn was able to turn his attention to Egypt, which, as will be remembered, had submitted to the Meccan. 'Abd al- 'Aziz, a son of Merwén, had already marched to Aila on the Red Sea, and was preparing to*~~

~~*enter Egypt ; Merwan joined him, and the Zobairite governor of Egypt, beaten by their united forces, was obliged to seek safety in flight. Merwdén made ‘Abd al-‘Aziz governor of the province. At the beginning of the year 65 (a.p. 684-685) Merwan returned in haste to Syria; for, during his absence, a brother of Ibn Zobair, named Mos‘ab, had invaded that province. Merwan triumphed over Mos‘ab; but an army of four thousand men, which he had sent to the Hijaz, and in which was Hajj4j b. Yusuf— then quite a young man, but who afterwards played so important a.part under ‘Abd al-Melik — was cut to pieces. This defeat was redeemed by a victory gained by his generals, ‘Obaid Allah b. Ziyéd and Hosain b. Nomair, at ‘Ain al-Warda over a small army of Shiites led by Solaimdn b. Sorad. But while the battle was being fought in Ramadan 65 (April-May 685), Merwan died ; suffocated, it is said, by his wife Maistin, because he had insulted her son Khalid, and had broken his word by nominating his own son ‘Abd al-Melik as his successor. The accession of ‘Abd al- Melik was attended with no difficulty, as he was acknow- ledged by the whole of Syria and Egypt. The Kaisites naturally rallied round him, because he had not a drop of Yemenite blood in his veins.*~~

~~*5. When ‘Abd al-Melik ascended the throne, there still remained much to be done before the unity of the empire could be re-established. Ibn Zobair was still master of Arabia and of ‘Irak, though in the latter province his authority was very much shaken by the permanent rebel- lion of the Shf‘ites at Cufa, and of the Kharijites at Basra. The Zobairite general Mohallab had, it is true, succeeded in forcing back the Kharijites into Susiana and Persia ; but at Cufa the Shiites, at the instigation of Mokhtar, continued their agitation. Mokhtar, as we have seen, had withdrawn from Mecca after the raising of the siege by Hosain b. Nomair. He returned to Cufa, and there fomented serious disturbances. Many of the inhabitants of that city repented bitterly of having allowed Hosain, the grandson of the Prophet, to be massacred. Amid the general disorder of the Moslem empire, Mokhtar hoped to make his own authority acknowledged in ‘Irak and Mesopotamia. He put himself forward as the avenger of the family of ‘Ali, and pretended to have been commissioned by a son of ‘Ali, Mohammed b. Hanafiya,! who was living at Medina, to give effect to his rights to the Caliphate. Many Shi‘ites believed him, and, detesting their chief Solaimén b. Sorad, joined Mokhtdér. On learning these intrigues, the Zobairite governor threw him*~~

into prison. Soon after the defeat of Solaiman at ‘Ain al-Warda, at the request of Mokhtar’s brother-in-law, who was no other than ‘Abdallah the son of ‘Omar, the governor consented to set him at liberty, on his swearing to make no further attempts against him. As Solaim4n had fallen on the

1 That is to say, the son of the Hanafite woman. The mother of Mohammed was of the tribe of Hanifa, Even before Mokhtar, Mo- hammed had partisans who looked on him as destined to be Caliph. These sectaries received the name of Kaisanites, from a freedman of ‘All, called Kaisdn, who was the most ardent advocate of Mohammed’s pretensions. After Mokhtar had declared in favour of Mohammed, his supporters received the name of Mokhtarites.

field of battle at ‘Ain al-Warda, all the Shi‘ites now acknowledged Mokhtar as their chief. He, however, con- sidering himself bound by his oath, remained inactive until the governor who had imposed it was replaced by ‘Abdallah b. Moti. The new Zobairite governor, suspect- ing with reason that Mokhtar was about to recommence his intrigues, thought it advisable to invite him to his house, with the intention of having him arrested. Mokh- tar called his partisans together, and plotted with them to take Ibn Moti by surprise. As, however, Sa‘d, one of the Shiite chiefs, asked for a delay of a week, for the purpose of collecting troops, Mokhtar was obliged to feign illness in order to evade the governor’s invitation, and took care to surround himself with a numerous body of guards. Meanwhile Sa‘d, who had only demanded this delay in order to ascertain the real wishes of Mohammed b, Hana- fiya, sent off four confidential messengers to Medina, to ask Mohammed whether he had really confided the care of his interests to Mokhtar. Mohammed contented himself with replying vaguely that it was the bounden duty of every good Moslem to take part with the family of the Prophet. These words were interpreted in favour of Mokhtar, and thenceforward all the Shi‘ites followed him blindly as their chief, Mokhtar fixed the middle of the month Rabi L, a.u. 66, for the commencement of*

~~*hostilities. During the night of the 13th to the 14th, the conspira- tors intended to gain possession of the city by a coup de main, but the governor was on his guard, and*~~

~~*Revolt of Mokhtar and his Shiites took the course of leaving Cufa.*~~

~~*Mokhtér 'They numbered sixteen thousand resolute men. All the*~~

~~*at Cufa. o»mies which 'Abdallah b. Moti' sent against them were successively beaten, and Mokhtar soon re-entered Cufa in triumph, compelling the Zobairite governor to flee to Basra. Once master of Cufa, Mokhtar thought himself already in possession of the empire. He sent emissaries to Medina, to Mosul, to Madain, and even into Azerbaijan, with orders to induce the people to take the oath of allegiance to him. He then sent his generals, Yazid b. Anas and Zofar, against the Omayyad army, which had entered Mesopotamia after the battle of 'Ain al-Warda, and these prevented the advance of the Syrians into 'Irak. Another of Mokhtar's generals, Ibrahim b. Malik, inflicted a serious defeat on the Syrians near Mosul, and "Obaid Allah b. Ziyad, who commanded them, fell in the battle. Tbrahim was rewarded by Mokhtar with the government of Mosul. Mokhtar himself next took the title of "lieutenant of the Mahdi") and inserted in the Khotba, on Friday's preaching, a prayer on behalf of Mohammed b. Hanaffya ; which was equivalent to declaring him Caliph. After this, urged on by his adherents, he caused all those who had taken part in the massacre of Hosain, the grandson of the Prophet, like 'Omar b. Sa'd and Shimr, to be sought out and put to death.*~~

~~*While these events were. occurring, the Caliph at Damascus, 'Abd al-Melik, sent an army of observation to the frontiers of Arabia. Mokhtar, having been informed of this, feigned an intention to help Ibn Zobair, and de-spatched a body of three thousand men from Cufa, under the command of a certain Shardhil. His real object was to concentrate forces at Medina, with a view to attacking Ibn Zobair. But the latter penetrated his design, and two thousand Meccans marched by his orders to meet Sharahil, who was defeated.*~~

~~*In the same year (A.H. 66) Mohammed b. Hanafiya had gone to Mecca to perform the ceremonies of the pilgrimage.*~~

~~*1 Mahdi, or "the well-guided," is the name given by the Shi'ites to that member of the family of 'Alf who, according to their belief, is one*~~

~~*day to gain possession of the whole world, and set up the reign of*~~

~~*righteousness in it. In Mokhtar's time, Mohammed b. Hanafiya was looked upon as the Mahdi.*~~

~~*MOHAMMEDANISM™M*~~

~~*[OMAYYADs.*~~

~~*Ibn Zobair took advantage of this to seize his person, and confined him in a small house adjoining the well of Zamzam, within the precincts of the Ka'ba. Mohammed succeeded in conveying intelligence of his detention to Mokhtar ; and he, delighted to find his aid implored by the very man whose follower he called himself, swore to effect his rescue. He despatched a thousand chosen horsemen, who managed to conceal their march so well, that they were under the walls of Mecca before the son of Zobair had been able to make the slightest preparations for defence. They made their way into the Holy City; but, being unwilling to draw the sword on that sacred ground, they armed them- selves with sticks, broke in the doors of the house in which Mohammed b. Hanafiya was imprisoned, rescued him, and escorted him out of the city. A son of Mohammed, called 'Al, who had also been thrown into prison, likewise suc- ceeded in escaping, and rejoined his father at some distance from Mecca.*~~

~~*In the following year, Ibn Zobair, who was determined to get rid, at all costs, of so dangerous an adversary as Mokhtar, ordered his brother Mos'ab to effect a junction with Mohallab, the conqueror of the Kharijites, and to march against Cufa. Mos'ab and Mohallab invested that city, and Mokhtar, making a sortie against them, was beaten, taken prisoner, and beheaded. 'Irak thus, for Death of the second time, fell under the rule of Ibn Zobair. Mokhtar. Ibrahim b. MAlik, who held Mosul in the name of Mokhtar, submitted to the conquerors, on condition of retaining his government; but Mos'ab deprived him of his office, and put Mohallab in his place. He himself was appointed governor of 'Irak by his brother, and, having installed himself at Basra, placed Cufa under the orders of his lieutenant*~~

~~*Harith. The year after, the Kharijites of Susiana raised a fresh' insurrection, and invaded 'Irak. Mohallab had to be recalled from Mosul, and during his absence it was Ibrahim b. Malik whom Mos'ab chose to supply his place. The period of the pilgrimage caused a momentary truce to all these struggles, and in that year was seen the curious spectacle of four different standards planted near Mecca, belonging respec- tively to four party chiefs, each of whom was a pretender to the empire: the standard of 'Abdallah b. Zobair, Caliph of Mecca; that of the Caliph of Damascus, 'Abd al-Melik ; that of the son of 'Ali, Mohammed b. Hanaftya ; and that of the Khdarijites, who were at that time under the command of Najda b. 'Amir. Such, however, was the respect inspired by the holy places, that no disorders resulted from the presence of so many inveterate rivals.*~~

~~*The Omayyad Caliph, whose troops had been beaten in Mesopotamia, and who had been hitherto content to watch the frontiers of Arabia, was again prevented from pushing on military operations more actively by the breaking out of troubles in Syria. At the beginning of AH. 69 (A.D. 688-689), 'Abd al-Melik having left Damascus at the head of a numerous army, with the purpose of marching against 'Irdk, the Omayyad 'Amr b. 'Amr b, Sa'id, whom he had appointed governor of Damascus, took Sa'id. advantage of his absence to lay claim to the supreme power, and to have himself proclaimed Caliph by his partisans.*~~

~~*'Abd al-Melik was obliged to retrace his steps, and to lay siege to his own capital. The garrison of Damascus took fright, and deserted their posts; so that "Amr b. Said, abandoned by his followers, was compelled to surrender at discretion. 'Abd al-Melik at first meant to spare him, but he afterwards changed his mind, and struck off his head with his own hand. Scarcely had he suppressed this revolt, when the Emperor of Constantinople, Justinian I1., in viola- tion of the thirty years' truce formerly concluded between Mo'Awiya I. and Constantine IV., sent a Greek army to invade Syria. 'Abd al-Melik was obliged to buy peace*~~

~~*MOHAMM™MEDANIS™*~~

~~*for the time, for he required all his forces to dispute the empire with the son of Zobair. He consented, it is asserted, to pay the Greeks an indemnity of one thousand pieces of gold weekly. He then gave his attention to the*~~

~~*renewal of the projected expedition against 'Irak. Mos'ab the Zobairite had rendered himself odious to the inhabit- ants of Basra and Cufa by his exactions, and a party*~~

~~*OMAYYADS. | 5/4 the Ka'ba, passed the night there in prayer. At daybreak of the 14th of Jomadi I. in the year 73 (1st October 692), the Omayyad troops made their way into the mosque. 'Abdallah attacked them furiously, notwithstanding his advanced age, but at last fell, overwhelmed by numbers. Death His head was cut off, carried to Hajjaj, and sent by the of Ibn victorious general to Damascus.! agpett:*~~

~~*favourable to "Abd al-Melik was already forming in those cities. The Omayyad Caliph marched forth at the head of an army composed of Syrians and Egyptians, and encamped three parasangs from the plain of Dair al-Jathalik, not far from the site of Baghdad, where Mos'ab had established his army. Before joining battle, 'Abd al- Melik had written secretly to all the chiefs of Mos'ab's army, making them the most seductive promises if they would agree to desert the cause of Mos'ab. This step was crowned with success, and on the eve of the battle, which took place on the 13th Jomadi IL, aw. 71 (23d Nov- ember 690), several of these generals passed into the*~~

~~*With Ibn Zobair perished the influence which the early companions of Mohammed had hithertoexercised over Islam. Medina and Mecca, though they continued to be the Holy Cities, had no longer the political importance which had enabled them to maintain a struggle with Damascus. Temporal interests, represented by Damascus, will hence- forth have precedence over those of religion ; policy will outweigh fanaticism ;? and the centre of Islam, now per- manently removed beyond the limits of Arabia, will be more easily affected by foreign influences, and assimilate more readily their civilizing elements. Damascus, Cufa, and Basra will attract the flower of all the Moslem*~~

~~*Defeat camp of "Abd al-Melik with arms and baggage. Mos'ab | provinces; and thus that great intellectual, literary, and and nevertheless attacked his enemy, but during the battle he | scientific movement which is to reach its apogee under the = found himself deserted by his troops, and, not choosing | 'Abbdsid Caliphs at Baghdad, will become daily more * to survive his defeat, he caused himself to be slain. This | marked. victory opened the*~~

~~gates of Cufa to ‘Abd al-Melik, and all By the death of the son of Zobair, ‘Abd al-Melik ‘Abd al- ‘Irak received him with acclamations. He remained forty | remained sole Caliph; for Mohammed b. Hanafiya Melik days at Cufa, and then, having given the government to | reckoned for nothing since the death of Mokhtar, whose his brother Bishr, while Khalid b. “Abdallah received that | creature he had been. The only remaining danger was of Basra, he returned in triumph to Damascus. Soon | from the Kharijites, who, though incessantly repulsed, as after, the Omayyad arms having sustained a check from | incessantly returned to the charge. Hajjaj had remained the Kharijites in Farsistin, the Caliph gave Khalid orders | after his victory at Mecca, where he was occupied in to march against those sectaries with the support of | rebuilding the Ka‘ba, ruined for the second time by his Mohallab, who was their terror, and of the governor of | engines of war. In the year 75, ‘Abd al-Melik, alarmed Rey. Khalid succeeded completely in this expedition, | at the news which reached him from Persia and ‘Irak, and drove the Kharijites out of Ahwaz, Farsistén, and | named Hajjaj governor of that province, and gave him the Kirman. On his side, the Omayyad Caliph stirred up a | most extensive powers for the re-establishment of order. revolt in Khorasan, a province which still remained faithful | The troops of ‘Irak, who accompanied Mohallab in an to the Zobairite cause. Its governor was treacherously | expedition against the Kharijites, had abandoned their assassinated by his lieutenant Bokair, who received, as the | general and dispersed to their homes, and nothing could price of this service, the governorship of the province. induce them to return to their duty. Hajjaj, arriving Hajj4jin Only Arabia now remained to Ibn Zobair. In a.H. 72 | unexpectedly at Cufa, ascended the pulpit at the moment ‘Irak. ‘Abd al-Melik made preparations for depriving him of it. | when the people were assembled for morning prayers, and Second Accordingly he raised an army; but when his generals | delivered an energetic address to them, which depicts his ae found that another siege of Mecca was in contemplation, | character so well, that some passages from it may be~~

~~not one of them was willing to accept such a mission. An obscure officer, Hajjaj b. Yusuf, boldly offered to lead the expedition. ‘Abd al-Melik had little confidence in him, and therefore at first placed only two or three thousand horsemen under his command. Hajjaj set out, traversed the Hijaz~~

~~without resistance, and pitched his camp at Taif, not far from Mecca. Ibn Zobair tried to dislodge him ; but in the frequent encounters between his troops and those of Hajjaj, the latter always had the advantage. 'Abd al-Melik then decided on sending him a reinforcement of five thousand men, on receiving which Hajjaj invested Mecca. The blockade lasted several months, during which the city was a prey to all the horrors of siege and famine. Hajj4j had set up balistas on the neighbouring heights, and poured a hail of stones on the city and the Ka''ba. Famine at length triumphed over the last adherents of the son of Zobair. Ten thousand fighting men, and even several of the sons of the pretender, left the city and surrendered. Mecca being thus left without defenders, Hajjaj took possession of it and invested the Ka'ba. Then the son of Zobair, seeing that ruin was inevitable, went to his mother Asma, who had reached the age of a hundred, and asked her counsel. She answered that he must die sword in hand; and when, in embracing him for the last time, she felt the cuirass which he wore, she exclaimed that such a precaution was unworthy of a man resolved to perish. 'Abdalldéh took off his cuirass, and taking refuge in~~

~~cited :—~~

~~'*Men of Cufa, I see before me heads ripe for the harvest, aud the reaper—I am he! I seem to myself already to see blood between turbans and shoulders. I am not one of those who can be frightened by an inflated bag of skin, nor need any one think to squeeze me like dried figs. 1 have been chosen on good grounds ; and it is because I have been seen at work that I have been picked out from among others. The Prince of the Believers has spread before him the arrows of his quiver, and has tried every one of them by biting its wood. It is my wood that he has found the hardest and the bitterest, and I am the arrow which he shoots against you."~~

~~Thereupon Hajj4j ordered that every man capable of bearing arms should immediately join Mohallab in Susiana, and swore that all who made any delay should have their heads struck off. This threat produced its effect, and Hajjaj proceeded to Basra, where his presence was followed by the same result. Mohallab, reinforced by the army of 'Irak, at last succeeded, after a struggle of eighteen months, in subjugating the Kharijites, and was able, at~~

~~*the beginning of a.u. 78, to return to Hajjaj at Basra. The latter loaded him with honours and niade him*~~

~~*1 On these events, see Quatremére, Mémoire historique sur la vie @ Abd-Allah b. Zobair. Paris, 1832.*~~

~~*2 It is said that the Caliph 'Abd al-Melik affected great piety before his elevation. At the moment when he was first saluted with the title of Caliph, he closed a copy of the Koran which was in his hands, say- ing: "' We must now part."*~~

~~*Ibn al- Ash'ath,*~~

~~*OTe governor of Khordsdn,! whence he directed several expedi- tions against Transoxiana.*~~

~~*While Mohallab was fighting against the Kharijites in Persia, Hajjaj himself had had to struggle against rebel- lion. Three Khéarijites, Salih, Shabfb, and Motarrif, had succeeded in creating a party in Mesopotamia and 'Irak. The second had even pushed his audacity so far as to march upon Cufa, and for a moment had occupied that city. Hajjaj overcame the rebels; and through his vigilance, Katari b. al-Foja'a, another Kharijite chief, after being pursued as far as Tabaristan, on the Caspian Sea, was taken and killed by two Omayyad generals.*~~

~~*When he gave the government of Khorasan to Mohallab, Hajjaj had committed that of Sijistin to 'Obaid Allah b. Abi Bakra. At the beginning of a.u. 79, 'Obaid Allah's troops were beaten by the king of Kabul. Hajjaj thought it advisable to remove 'Obaid All4h and to replace him by the captain of his guards, 'Abd al-Rahman b. al-Ash'ath, This was a bad choice, for Ibn al-Ash'ath had often given proofs of an insubordinate temper, and Hajj4j soon had occasion to repent of it. In fact, soon after his arrival in Sijistan, 'Abd al-Rahman, whose army was composed of contingents from Cufa and Basra, always ready for revolt, conceived the design of an insurrection against the authority of Hajj4j. Popular movements often go beyond the object first proposed; and not only did the troops welcome joyfully the idea of marching against the hated governor of 'Irak, but they even proclaimed the dethrone- ment of 'Abd al-Melik, and*~~

~~*saluted Ibn al-Ash‘ath as Caliph. The new pretender entered Farsistin and Ahwaz, and it was in this last province, near Shuster, that Hajjaj came up with him, after receiving from Syria the reinforcements which he had demanded in all haste from the Caliph. Hajj4j was beaten and obliged to retreat. Ibn al-Ash‘ath pursued him as far as Basra, which opened its gates to him; but fortune soon changed, and he was again driven out by his adversary. Ibn al-Ash‘ath then turned his arms against Cufa, and with aid from within, obtained possession of it; thus cutting the com- munications of Hajjaj with Syria. The latter, thus com- pelled to leave Basra, took the field, and pitched his camp at Dair al-Jamdjim, two days’ journey from Basra. Tbn al-Ash‘ath marched against him at the head of his army. The condition of ‘Irak caused the greatest uneasi- ness at Damascus, and ‘Abd al-Melik hoped to stifle the revolt by proposing to the insurgents the dismissal of Hajjaj from his post. The insurgents rejected this offer, and hostilities recommenced. At the end of three months, in Jomddi IL, aa. 83 (July 702), a decisive action took place. Victory declared for Hajj4j. Ibn al-Ash‘ath fled to Basra, where he managed to collect fresh troops ; but, having been again beaten, he took refuge in Susiana, from which he was driven by a son of Hajjaj. The rebel then retired into Sijistan, and afterwards sought an asylum with the king of Kabul. As soon as his partisans had rejoined him, he penetrated into Khorasdin, in order to raise an insurrection there. The governor of this province was at that time Yazid, son of the celebrated Mohallab, who had died in the year 82. Yazid marched against Ibn al-Ash‘ath, and cut his army to pieces. From that time the pretender disappeared ; and it is thought that, having again taken refuge with the king of Kabul, he was betrayed by him and put to death.? It was during*~~

~~*1 In a.u. 78, ‘Abd al-Melik had made Khorasan and Sijistan depend- ent on the governor of ‘Irak, so that Hajjaj had the right of directly nominating the governors of those provinces.*~~

~~*2 This king of Kibul is called Ratbil or Rotbil by some historians, and Zenbil by others. See Weil, Geschichte der Chalifen, i. 449; Tabari, transl. by Zotenberg, iv. 127 ; and Mas‘udi, transl. by Barbier de Meynard, index, s. v. Rotbil. According to Abulfeda’s Geography,*~~

~~this long struggle that, in the year 83, Hajjaj laid the foundations of the city of Wasit (the Intermediate) ; so called because it is situated midway between Cufa and Basra. Some time after the suppression of this revolt, in the year 84, Hajjaj deprived Yazid b. Mohallab of the government of Khorasan, accusing him of partiality towards the rebels, and appointed in his stead first his brother Mofaddal b. Mohallab, and nine months after Kotaiba b. Moslim, who was destined at a later period to extend the sway of the Moslems in the East as far as China.~~

~~While these events were taking place, 'Abd al-Melik was engaged in the West in a struggle against the Greeks. We have seen that in the year 69 the Caliph, compelled as he then was to direct all his efforts towards 'Irak and Arabia, had concluded a disgraceful peace with Justinian IL It was not till aH. 73 (a.v. 692-693) that he resumed hostilities in Armenia, Asia Minor, and Africa. The operations in Asia Minor and in Armenia were entrusted to Mohammed b. Merwan, brother of the Caliph, and to 'Othman b. Walid. They beat the Greeks at first; but, in consequence of subsequent reverses, the Moslems were compelled to accept peace, which was broken anew by the Greeks about the year 75 or 76, the Caliph in one of his letters to Justinian II. having used expressions which displeased the Christian monarch. In retaliation, Justinian threatened to have legends offensive to Islam struck on his coins. As, up to that time, the Moslems had no special coinage of their own, and princi- pally used Byzantine and Persian money, this menace led 'Abd al-Melik to institute a purely Arabic coinage. It was a Jew of Taimd, named Somair, who commenced its fabrication. Justinian IT. refused to receive these coins in payment of the tribute, and declared the treaty at an end. The incensed Moslems fought valiantly, and suc- ceeded in extending their frontiers to Mar'ash, on the side of Asia Minor, and to Amid, on the side of Armenia. From this time forth the Moslems made yearly expedi- tions against the Greeks; but they were only razzias, for which the Greeks often avenged themselves by incursions into the territory of Islam.~~

~~*In Africa we have seen that 'Okba b. Nafi' had been slain by the Berbers, who had taken Kairawin. In the year 73 'Abd al-Melik sent Hassan b. No'man into Africa, at the head of a numerous army. He retook Kairawdn, swept the coast as far as Carthage, expelling the Greek garrisons from all the fortified places, and then, turning his arms against the Berbers, beat them so completely that they submitted for a long time to the tribute and the conscription. But when Hassan left Africa, the Greeks, under the successor of Justinian, retook the coast-line. Hassdn prepared to return to Africa, but he previously demanded from the governor of Egypt, "Abd al-'Aziz, the recall of a freedman, whom he had appointed governor of a part of the province of Africa. 'Abd al- 'Aziz refused, and Hassan went to Damascus to complain to the Caliph. Soon after his arrival at the capital he died, and the governor of Egypt placed Musd b. Nosair at the head of the expedition. This general reconquered the seaboard as far as Carthage, and drove the Greeks permanently from it. The daring Mus4 continued his triumphant march, and took possession of the whole of the coast to Tlemcen. One of his lieutenants, in the year 82, carried a reconnaissance by sea as far as Sicily. The Moslem fleet having been destroyed by a storm, Mus4 equipped another, and entrusted its command to his brother 'Abdallah, who returned to Sicily and effected a*~~

~~*848, Ibn al-Ash'ath was killed in the province of Arrokhaj (Arra-*~~

~~*chosia), and his head was sent to Damascus and Egypt.*~~

~~*Progress of the Moslem arms,*~~

~~*First Arabic coinage.*~~

~~*Walid I.*~~

~~*Con- quest of Spain.*~~

~~*Mm Ons M M*~~

~~*razzia there. Merwdan, the father of 'Abd al-Melik, had designated as successor to the latter his other son, 'Abd al-"Aziz, governor of Egypt. 'Abd al-'Aziz having died in the year 84, 'Abd al-Melik chose as heirs of the*~~

~~*empire, first his son Walid, and after him his second son Solaiman.? He himself survived 'Abd al-"Aziz only two years, and died 14th Shawwal 86 (8th October 705), at the age of about sixty. His reign was one of the most unquiet in the annals of Islam, but also one of the most glorious. 'Abd al-Melik not only brought triumph to the cause of the Omayyads, but extended and strengthened the Moslem power externally. Amid so many grave anxieties, he yet found time for his pleasures. He was passionately fond of poetry, and his court was crowded with poets, whom he loaded with favours, even if they were Christians, like Akhtal. In his reign flourished also the two celebrated rivals of Akhtal, Jarir and Farazdak.?*~~

~~*6. Immediately on his accession Walid confirmed Hajj4j in the government of 'Irak, and appointed as governor of Medina his cousin 'Omar b. 'Abd al-'Aziz, who was received there with joy, his piety and gentle character being well known. Under his government important works were undertaken at Medina and Mecca by order of Walid, who, having no rivals to struggle against, was able to give his attention to pacific occupations. The mosque of Medina was enlarged, wells were sunk, the streets widened, and hospitals established. At Mecca many improvements were introduced. The reputation of 'Omar attracted to the two Holy Cities a great number of the inhabitants of 'Irak, who were groaning under the iron hand of Hajjij. The latter, who was not a man to let his prey escape from his grasp, was so urgent with Walid that he obtained the dismissal of 'Omar b. 'Abd al-'Aziz in the year 93, and the appointment of 'Othman b. Hayyan at Medina, and of Khalid b. 'Abdall4h at Mecca. These two prefects compelled the refugees at Mecca and Medina to return to 'Irak, where many of them were cruelly treated and even put to death by Hajjdj. It was probably his cruelty which drove so many men of 'Irak to enlist in the armies of the East and the South; and this may in some degree account for the unheard-of successes of Kotaiba b. Moslim in Transoxiana, and of Mohammed b. Kasim in India. They may also be explained by the ambition of Hajj4j, who, it is said, cherished the project of creating a vast empire for himself to the east and south of the Moslem realm, and had secretly promised the government of China to the first of his generals who should reach that country. Be this as it may, in the course of a very few years Kotaiba conquered the whole of Bokharia, Kharizm, and Transoxiana or M4 ward-annahr, as far as the frontiers of China.. Meanwhile Mohammed b. Kasim invaded Mokran, Sind, and*~~

~~Multan, carried off an immense booty, and reduced the women and children to slavery. In Armenia and Asia Minor, Maslama, brother of the Caliph Walid, and his lieutenants, also obtained numerous suc- cesses against the Greeks. In Armenia, Maslama even advanced as far as the Caucasus.~~

~~The most important achievement, however, of Walid's reign was the conquest of Spain. The narrative of this conquest belongs specially to the history of Spain ; and we shall therefore only touch briefly on it here. We have seen that, even in the Caliphate of 'Abd al-Melik, Musd b. Nosair had penetrated as far as Tlemcen in Africa. Under Walid, Mus4, who had been appointed governor of Africa, entered Morocco, occupied Fez and Tangier, and then~~

~~OMAYYADS. |~~

~~1 'Abd al-Melik had several other sons, two of whom, Yazid and Hisham, also reigned.~~

~~2 See Caussin de Perceval, Journal asiatique, 2¢ série, vols. xiii. and xiv.~~

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~~returned to Kairawan, having made his lieutenant Tarik governor of Tangier and of all the West of Africa. The town of Ceuta still held out under its governor Julian, who held it in the name of Witiza, King of Spain. Witiza having been dethroned by Roderic, Julian thought he might find the Arabs useful allies in the struggle which he proposed to carry on against the usurper? and entered into negotiations with Tarik. The latter, foreseeing the possibility of conquering for the advantage of the Arabs a country which had been represented to him as a paradise, requested instructions from Musa, who referred the matter to the Caliph. Walid gave Musd carte blanche, and Tarik hastened to make alliance with Julian. He first, however, sent four ships, with five hundred men under the command of Tarif, to reconnoitre the country. This expedition was successful, and Tarik, now certain of meeting no serious opposition to his landing, passed into Spain himself, at the head of twelve thousand men, in the year 92 (a.p. 710-711), and landed at the spot which thence received the name of Jabal-Tarik, or 'Mountain of Tarik," a name which was afterwards corrupted by the~~

~~*Westerns into Gibraltar. At the news of this invasion, Roderic led a numerous army against the Arabs, but was completely routed near Cadiz, and perished in the conflict. Musa, jealous of the success of his lieutenant, hastened to Spain with eighteen thousand men, and his first step on arriving was to send Tarik orders to suspend his march. But Tarik, far from obeying, divided his little army into three corps, and obtained possession successively of Ecija, Malaga, Elvira, Cordova, and Toledo. Musd, hopeless of arresting the victorious march of Tarik, determined to play the part of a conqueror himself, and took Seville, Carmona, and Merida. On rejoining Tarik at Toledo, the first step he took was to throw him into prison. The Caliph, how- ever, gave orders that he should be set at liberty and restored to his command. The two conquerors then shared the country between them, and, in less than three years, all Spain was subdued, to the very foot of the Pyrenees. Meanwhile Walid, fearing to see Musd declare his independence, recalled him to Damascus. He obeyed after appointing his son 'Abd al-'Aziz governor of Spain, and assigning Seville as his residence. Musa left Spain in the month of Safar, a.n. 95 (October-November 713), in company with Tarik, bringing an immense booty to Damascus, and leading in his train a great number of prisoners. His journey from Ceuta to Damascus was one long triumph. He reached Egypt in the month of Rabi' I. in the following year (Nov.-Dec. 714), and then moved on by short marches towards Damascus, where he did not arrive till two months and a half later, at the very moment when Walid had just breathed his last, and his brother Solaim4n had been saluted as Caliph. The renowned Hajj4j had preceded his sovereign, and had expired five days before the end of Ramadan, a.H. 99. Mus4 did not receive the reward due to his distinguished services. Accused of peculation by the new Caliph, he was beaten with rods, and condemned to a fine of 100,000 pieces of gold; and all his goods were confiscated. Solaim4n did not stop here: he caused "Abd al-'Aziz, the son of Musd, to be put to death in Spain, and carried his cruelty so far as to show his severed head to Musa, asking him whether he recognised it. He replied that it was the head of a man a thousand times superior to him who had ordered his death. Mus4 died soon after. As for Tarik, there is no further mention of him after the beginning of the reign of Solaim4n, and we must therefore suppose that he retired into private life.*~~

~~8 According to Eastern chronicles, Julian's hatred of Roderic arose from the latter's having dishonoured his daughter.~~

~~Solai- 7. Solaiman had nearly missed the throne. Walid, in~~

~~m4n. the very year of his death, wished to have his son 'Abd al-'Aziz b. Walid chosen as his successor, and had offered Solaimdn a great sum of money to induce him to surrender his rights to the Caliphate; but Solaiman obstinately refused to do so. Walid went still further, and sent letters to the governors of all the provinces, calling on them to make the people take the oath of allegiance to his son. None except Hajjij and Kotaiba b. Moslim consented thus to set at nought the order of succession established by 'Abd al-Melik; and Solaimdn succeeded without difficulty at the death of his brother. We can easily conceive the hatred felt by Solaiman for Hajjaj, and for all that belonged to him, far or near. Hajjaj himself escaped by death; but Solaiman poured out his wrath on his family, and strove to undo all that he had done. First of all, Mohammed b. Kasim, the conqueror of India, who was cousin to Hajj4j, was dismissed from his post and outlawed. Hajj4j had deprived Yazid b. Mohallab of the government of Khorasin; Solaiman conferred on him that of 'Irak. Kotaiba b. Moslim, on learning the accession of Solaiman, knew that his own ruin was certain, and therefore anticipated the Caliph by a revolt. But Solaiman induced Kotaiba's troops to desert by authorising them to return to their homes; and when the illustrious general sought to carry his army with him, a conspiracy was formed against him which ended in his murder. Yazid b. Mohallab, who preferred Khorasan to 'Irak, obtained permission to exchange. Immediately on his return to Khords4n he set on foot a series of new expeditions against Jorjan and Tabaristin. But the inhabitants of Khordésén, which he governed oppressively, made complaints against him to the Caliph, accusing him of practising extortions in order to obtain such a sum of money as would enable him to rebel against his sovereign. From that day Solaiman determined to get rid of Yazid. As, however, he was then dreaming of the conquest of Constantinople, he thought it prudent to dissemble his dissatisfaction for some time.~~

~~*The Byzantine empire was disturbed by internal troubles during the years a.p. 715-717. Solaiman resolved to take advantage of these in order to rid hiniself for ever of the hereditary enemy of Islam, and prepared a formidable expedition. A fleet of eighteen hundred vessels, equipped at Alexandria, sailed to the coasts of Asia Minor, took on board the Moslem army, commanded by Maslama, and transported it to Europe. This army appeared under the walls of Constantinople, 15th August 717, five months after Leo III., the Isaurian, had ascended the throne. Once more the Greek fire prevailed against the Moslems. Their fleet was destroyed by this terrible engine of war; the army could obtain no fresh supply of provisions, and suffered all the horrors of famine. Mean- while the Caliph, who desired to be present in person at the taking of Constantinople, had set out to join the army. He fell ill at Dabik, not far from Aleppo, and died there on the 22d of September in the same year, after having nominated as his own successor his cousin, 'Omar b. 'Abd al-"Aziz, and as successor to the latter, Yazid b. 'Abd al-Melik, his own brother. In vain did the new Caliph despatch from Egypt a fleet of four hundred ships to carry arms and provisions to the army before Constanti- nople; this fleet also was destroyed by the Greeks, and the Moslem army was decimated by famine, and soon by the plague as well, A hundred thousand men perished miserably under the walls of Constantinople, and Maslama brought back to Asia Minor a mere handful of soldiers, and that with great difficulty.*~~

~~*Omar II. 8. 'Omar b. 'Abd al-'Aziz, incensed at this disaster, took his revenge on the Christians of his own states by*~~

~~*excluding them from all public employments, in spite of the great services they rendered there, and by loading them with imposts to such an extent that one public functionary wrote thus to the Caliph: "If things continue to go on in Egypt as at present, all the Christians will become Moslems to escape taxation, and the State will lose its revenue." To this the pious 'Omar replied: "TI should look on the conversion of all the Christians as a great piece of good-fortune ; for God sent his prophet to act the part of an apostle, and not of a tax-gatherer." By his religious intolerance, by the simplicity of his life, and by his vigour in observing the precepts of his religion and enforcing their observance, 'Omar has acquired in Moslem history the reputation of a saint. But the sanctity of a prince does not ensure*~~

~~*the greatness of a State; and the reign of ‘Omar, as we shall see, was injurious rather than advantageous to Islam. He alienated the provincial governors by his severity ; and the family of “Abbas took advantage of the general discontent to stir up the people secretly, and thus to prepare the way for the fall of the dynasty.*~~

~~*It will be remembered that Solaiman died before carry- ing out his purpose of deposing Yazid b. Mohallab, the governor of Khordsin. ‘Omar II. took it on himself to fulfil this design. He summoned Yazid to his presence, and on his arrival at Damascus, threw him into prison, and demanded the restitution of the money which he believed him to have misappropriated. As Yazid alleged that he could render no account of it, the Caliph banished him to Dahlak, a small island in the Red Sea, but soon brought him back, and placed him in close confinement. It was not till au. 101, when ‘Omar IJ. was dying, that Yazid succeeded in escaping and took refuge in ‘Irak. Mokhallad, the son of Yazid, whom his father, on quit- ting Khordsan, had left there as his lieutenant, was also summoned to Damascus, and the Caliph at first appointed Jarrah b. ‘Abdall4h governor of that province, but soon after, on receiving complaints against him, replaced him by ‘Abd al-Rahman al-Koshairi, whom he desired to use every effort for the conversion of the unbelievers, rather than to think of extending the Moslem power by force of arms. With so pacific a disposition, it is easy to understand that the Caliph did not signalize his reign by any conquest ; except a revolt of the Khdarijites in ‘Irak, which was suppressed by Maslama, his caliphate was not distinguished by any warlike event. Its most noticeable occurrence, as we have said above, was the commencement of the ‘Abbasid movement.*~~

~~*The ‘Abbasid family derived its name from ‘Abbas, who ‘Abbasid was Mohammed’s uncle on the father’s side, and who, ™0ve during the Prophet’s life, had enjoyed universal considera- sae” tion among the Moslems. It was he who, at the death of the Prophet, had the charge of washing the corpse. The first Caliphs, Abttbekr, ‘Omar, ‘Othman, and ‘Ali, showed the utmost deference to ‘Abbas; and his eldest son ‘Abdallah had been united in the closest friendship with Hosain, the unfortunate son of ‘Ali. After the assassina- tion of ‘Ali, and the slaughter of Hosain, ‘Abdallah had retired to Mecca, and there brought up his numerous family in hatred of the Omayyads. It was from his youngest son ‘Alf, born a.H. 40,*~~

~~that the "Abbasid dynasty sprung. Under the Caliph 'Abd al-Melik, this "Ali was living at Damascus; but, on his marrying Labbaba, the divorced wife of 'Abd al-Melik, the Caliph conceived a great aversion for 'Ali. Walid, the son and successor of 'Abd al-Melik, inherited his father's prejudices, subjected 'Ali to every kind of insult, and drove him from his court. Walid's successor, Solaiman, gave him leave to return to Damascus, but 'AH, instead of availing himself of this permission, preferred to retire to Homaima, a town situ-~~

~~ated in the south of Syria, on the confines of Arabia. It was in this retirement that his son Mohammed conceived the design of supplanting the Omayyad dynasty. We have said that the first 'Abbasids were closely united with the family of 'Alf, Mohammed b. 'Ali, the 'Abbasid, saw clearly that it was only among the followers of 'Ali that he was likely to be able to form a party. To attain this object, he formed the plan of making it believed that a descendant of the Prophet's son-in-law had transmitted to him his rights to the Caliphate. It will be remembered that Mohammed b. Hanaffya had come forward as a pre- tender to the throne at the troublous period when Ibn Zobair and 'Abd al-Melik were disputing the Caliphate. According to the story of the 'Abbasids, Abi Hashim "Abdallah, the son of Ibn Hanafifya, had gone to Homaima, to the house of Mohammed b. 'Alf, and had made on his deathbed a legal transfer of his rights to Mohammed, by appointing him his heir. Whatever may be the truth respecting this transfer,! Mohammed the 'Abbasid spread abroad the report of it, and chose especially for its pro-pagation the provinces in which the family of 'Ali had the greatest number of adherents, 'Irak and Khordsdn. Emissaries sent by him into these two provinces, under the caliphate of "Omar IJ., began to stir up the people in secret against the reigning house. 'Omar was probably acquainted with these intrigues, but he had not time to repress them, for he died on the 20th or 25th of Rajab, AH. 101 (5th or 10th February 720), after a reign of about two years and a half.~~

~~9. Yazid, the son of 'Abd al-Melik, ascended the throne without resistance. His first care was to pursue Yazid b. Mohallab, who had escaped from his~~

~~prison and taken refuge in 'Irdk. Besides reasons of state, Yazid II. had personal reasons for ill-will to Yazfd b. Mohallab. One of the wives of the new Caliph, the same who gave birth to that son of Yazid IJ. who afterwards reigned under the name of Walid II., was niece to the celebrated Hajj4j, who, as it will be remembered, had hated and per- secuted Yazid b. Mohallab. Aware of the alliance of the new Caliph with the family of Hajjaj, the son of Mohallab had made every effort to escape as soon as he was informed of the illness of 'Omar II. ; for he well knew that Yazid II. would spare neither him nor his family. In fact, the Caliph sent express orders to the prefect of 'Irak to arrest all the brothers and other members of the family of Mohallab who were to be found at Basra; and this order was immediately carried out. But Yazifd b. Mohallab had many partisans in 'Irak. He collected a small army, and fought with such valour that in a short time he succeeded in making himself master of Basra, where he had himself proclaimed Caliph. The public treasury fell into his hands, and he employed it in paying his troops and in raising fresh ones, whom he sent on expeditions into Khiuzistan or Ahwaz, Farsist4n, Mokrdn, and Sind. As this revolt threatened to spread far and wide, Yazid II. was obliged to have recourse for its suppression to the celebrated Maslama. Early in a.n. 102, this illustrious general took the field, and completely defeated Ibn Mohallab near Basra. Yazid fell in the battle, and his brothers fled beyond the Indus, but were pursued and slain by the lieutenants of Maslama.~~

~~This revolt suppressed, Yazid II. was able to give his thoughts to the extension of the empire, an object which had been so much neglected by his predecessor. Several expeditions were directed against Fargh4na in Transoxiana, against the Khazars in Armenia, and against the Greeks~~

~~in Asia Minor, but without any very decided results. In~~

~~1 The 'Abbdsid Caliph Ma'miin certainly did not believe in it, for he thought it his duty to restore the Caliphate to the family of 'Ali, by appointing as his successor 'Ali Rida, a descendant of the Caliph 'All.~~

~~*Africa, serious troubles had been caused by the appoint- ment as governor of a certain Yazid b. Abi Moslim, who had been secretary to Hajj4j, and who followed the example of his master's implacable harshness. The Ber- bers rose in insurrection, slaughtered the unfortunate governor, and chose in his place Mohammed b. Aus. The Caliph at first ratified this choice, but soon after dismissed Mohammed from his post, and replaced him by Bishr b. Safwan, who sent out an expedition against Sicily.*~~

~~*In Europe, the Arabs obtained at first some degree of success. Under the orders of Samah, then governor of Spain, they crossed the Pyrenees, and took possession of Narbonne ; but, having been beaten at Toulouse, they had to retrace their steps. It was the celebrated Abderame ('Abd al-Rahmén) who effected their retreat.*~~

~~*Yazid II. died three years later of a lingering illness, caused, it is said, by his grief for the death of a favourite slave-girl. At his accession, Yazid had designated as his successors, in the first place his son Hishdm, and in the second his son Walid. Hishdm ascended the throne without opposition.*~~

~~*10. Hisham was a pious prince and an enemy of Hishdm.*~~

~~*luxury; as rigid in his religion as 'Omar II. To this severity may in part be attributed the disturbances which broke out in the provinces during his reign. The governors were accustomed to remain loyal to the Caliphs only when the latter did not exact from them too rigorous an account. Hishdm was, besides, very avaricious, a fault highly calculated to make him odious to those about him. Lastly, he favoured the Yemenites, and this alienated from him the powerful party of the Kaisites. All these circumstances emboldened the 'Abbasids to carry on actively their propaganda in 'Irak and Khordsdn, and it succeeded beyond their hopes. The Kaisite tribes, offended at seeing the Caliph bestow the best posts on Yemenites, were ready to espouse with enthusiasm the cause of any one whose aim was the overthrow of the Omayyads. Rebellion had been smouldering in the provinces for thirteen years; it broke out at last at Cufa and in the whole of 'Irak, under chiefs called Moghira and Bahlul ; and when these insurgents had been chastised, others sprung up in their place, 'Amr al-Yashkori, Al-'Anazi, and Al-Sakhtayéni. The prefect of 'Irak, Khalid b. 'Abdallah, was accused of favouring this revolt, was degraded, and replaced by Yusuf b.*~~

~~*'Omar, who threw him into prison, where he remained for eighteen months. This measure increased the discontent of the people of 'Ir4k, and a member of the family of 'Alf, Zaid b. 'Alf, collected round him a small body of partisans, and had himself proclaimed Caliph, aH. 122 (a.v. 739-740).*~~

~~*Unfortunately for Zaid, he had to do with the same Cufans Zaid b. whose fickleness had already been fatal to his family. In Al!*~~

~~*the moment of danger he was deserted by his troops, slain in an unequal conflict, and his head sent to Damascus. In Khorasan also there were very serious disturbances. In the year 106 (a.p. 724-725) there had already been a revolt at Balkh, excited by the emissaries of the 'Abbasids. The following years brought with them fresh troubles, which led to the dismissal of the governor of Khorasan, Asad, the brother of Khalid b. 'Abdall4h, who had been prefect of 'Irak. Under the successors of Asad, who were successively Ashras b. 'Abdallah, Jonaid b. 'Abd al-Rahman, and 'Asim b. 'Abdallah, seditions broke out in Transoxiana, which were repressed with great difficulty ; and it was not until the year 120 that, by the appointment of the brave and prudent Nasr b. Sayyar as governor of Khordsdn, peace was for a time restored to that region. The 'Abbasid emissaries, nevertheless, secretly continued their propaganda.*~~

~~*In India, several provinces which had been converted*~~

~~*Walid II,*~~

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~~*to Islam under the Caliphate of 'Omar II. declared them- selves independent; and this led to the founding of several strong cities for the purpose of controlling those provinces. It was thus that the cities of Mahfuza and Mansura had their origin.*~~

~~*In the north and north-west of the empire there were no internal disorders, but the Moslems had much to do to maintain themselves there against the Alans, the Turko- mans, and the Khazars. The illustrious Maslama lost his life in battle, and Merwdn b. Mohammed, afterwards Caliph, took his place as prefect of Armenia and Azer- baijan. He succeeded in imposing peace on*~~

~~*the petty princes of the Eastern Caucasus, and in consolidating the Arab power in that quarter. The war against the Byzan- tines lasted during the whole of Hishém's reign, In Asia Minor, the Moslems reoccupied Czesarea, and laid siege to Nicxa, Arab writers even declare that Constantine, after- wards Emperor of Constantinople, was made prisoner in the year 114 (a.v. 732-733), but the Byzantine authori- ties make no mention of this fact. On the other hand, they notice an important defeat of the Moslem arms in A.D. 739. This defeat, which is acknowledged by the Arab writers, cost the life of their general, 'Abdallah, surnamed al-Battél—' the hero "—whose prowess still lives in the memory of the people of Asia Minor.*~~

~~*In Africa, several successive prefects were fully occupied in repressing the constant insurrections of the Berbers. In Spain, the attention of the Moslems was principally turned to avenging their defeats beyond the Pyrenees. As early as the second year of the reign of Hish4m, 'Anbasa, governor of Spain, crossed the Pyrenees, and pushed on military operations vigorously. Carcassonne and Nimes were taken. The death of 'Anbasa, in A.H. 107 (aD. 725-726), put a stop to hostilities; but they recommenced still more vigorously six years later. 'Abd al-Rahman (Abderame), the same who, under Yazid IL, had led back to Spain the remnants of the Moslem army, crossed the mountains anew, and penetrated into Gascony by the passage of Roncevaux. The Moslems beat the Duke Eudes, gained possession of Bordeaux, and overran the whole of Southern Gaul as far as the Loire. But in a.H. 114 (a.v. 732) Charles Martel, whose aid the Duke of Aquitaine had implored, succeeded in inflicting on "Abd al-Rahm4n so severe a defeat, near Poitiers, that the Moslems were obliged to effect a hasty retreat, and to return to Spain. Two years later the new governor of Spain, 'Okba b. al-Hajjaj, re-entered Gaul, and pushed forward expeditions as far as Burgundy and Dauphiné. Charles Martel, with the help of the Lombards, again drove back the Arabs as far as Narbonne. Thenceforth the continual revolts of the Berbers in Africa on the one side, and on the other the internal troubles which disturbed Spain, and which led at a later period to its independence, offered insurmountable obstacles to the ambition of the Moslems, and prevented their resuming the offensive.*~~

~~*Such was the state of the empire when Hish4m died on the 6th of Rabi Il aw. 125 (6th Feb. a.p. 743), after a reign of twenty years. He had not been*~~

~~wanting in energy and ability. Yet under his reign the Moslem power declined rather than advanced, and signs of the decay of the Omayyad dynasty began to show themselves. The history of his four successors, Walid IL, Yazid III., Ibrahim, and Merwan IL., is but the history of the fall of the Omayyads.~~

~~11. Walid IL, the son of Yazid II., ascended the throne without opposition at the death of Hisham ; but he soon made himself so much hated and despised by his debauch- eries and his irreligion that even the sons of Hisham and of Walid I. plotted with the enemies of the Omayyads. Yazid, one of the sons of Walid L, went so far as to take~~

~~openly the title of Caliph, and to march against Damascus, which Walfd II. had quitted for fear of a pestilence which was then raging there. This step was fatal to the Caliph. The inhabitants of Damascus opened their gates to Yazid, who took possession of the arsenals, and used the arms they contained to equip new troops. Walid IL, on his side, collected his adherents and marched against his rival. The two armies met at a place called Bakhra, on the confines of Syria and Arabia. Yazid had no difficulty in overcoming his opponent, who was abandoned by his own soldiers. Walid II. died fighting, having reigned little more than a year, and his head was taken to Damascus, and carried about the city at the end of a spear. (Jomadi IL, a.u. 126, March-April 744.)~~

~~12. The death of Walid IL, far from appeasing the Yazid troubles of the State, put its unity in greater jeopardy than III.~~

~~ever, The distant provinces escaped from the power of the new Caliph. In Africa, 'Abd al-Rahman b. Habfb declared himself independent. In Spain, every emir aspired to free himself from a suzerainty which appeared to him only nominal. In Khorasan the 'Abbasid emissaries were more and more busy, acting in the name of Ibrahim b. Mohammed, who had become the head of the family by the death of his father, Mohammed b. 'Ali. Even in Syria Yazid III. saw his authority disputed. Himself belong- ing to the sect~~

~~*of Mo'tazilites, who rejected the doctrine of predestination—a sect to which we shall have occasion to recur in treating of the religious history of Islam — he aroused all the orthodox against him. Besides this, many of the Syrians, from a sudden change of feeling, now desired to avenge the death of Walid Il. The inhabitants of Emesa revolted, and marched against Damascus. They were beaten at a place called Thantfyat al-'Okab, or The Eagle's Pass, twelve miles from the capital. Palestine rose in its turn, and chose as its Caliph another Yazid, cousin of the reigning prince. This revolt also was suppressed. But a greater danger menaced Yazid III. The Omayyad Merwén b. Mohammed, who was, as we have said, governor of Armenia and of Azer- baijan, also prepared to dispute the supreme power with the Caliph of Damascus, and invaded Mesopotamia. Yazid IIL., in his alarm, offered him the government of this last province as the price of peace. Merwdn accepted these conditions, but he would probably not have left his rival long at rest, had not the latter died after a reign of only six months.*~~

~~*13. Yazid III. left his brother Ibrahim as his successor. Ibréhim.*~~

~~*At the news of Yazid's death, Merwan collected a power- ful army and entered Syria. Having beaten Ibrahim's generals one after the other and taken Emesa, he advanced rapidly towards Damascus. Solaimdn b. Hishdm tried to oppose his march, but he was defeated at 'Ain al-Jarr, between Baalbec and Damascus, and the Caliph Ibrahim took flight ; while Solaim4n, the son of Hisham, laid hands on the public treasure, and then fled in turn, Merwdn entered Damascus, and caused himself to be proclaimed Caliph. The reign of Ibrahim had lasted only two months. Ibrahim himself soon acknowledged the new Caliph, and submitted to his authority.*~~

~~*14. Merwdn IL was a man of energy, and might have Merwan*~~

~~*revived the strength of his dynasty, if the ferment in the ll. east of the empire had been less strong. Unfortunately for him, the 'Abbasid movement had never ceased to gain ground in Khorasan, and the chief adherent of the family of 'Abbas, Abi Moslim, was in no degree inferior to the Caliph in energy and ability. This Abi Moslim, whose origin is obscure and disputed, had been distinguished by the 'Abbasid Mohammed b. 'Alf, the same who*~~

~~alleged that he had been appointed heir to the claims of the family of ‘Alf to the supreme power. If we may believe the legend,~~

~~Al-Saffah~~

~~assumes 4~~

~~the title of Caliph.~~

~~OMAYYADS. |~~

~~Mohammed had even foretold that the accession of his family would take place in the year of the ass,! through the efforts of Abt Moslim, and that one of his three sons would ascend the throne. These three sons were: Ibra- him, “Abdallah, called Abu ’l-“Abbas, and ‘Abdallah, called Abt Ja‘far. Whatever we may think of this prediction, it is certain that under Merwan II. Abu Moslim was the principal emissary of the “Abbasid Ibrahim, and had been able to form a vast conspiracy in Khorasan, which broke out in A.H. 128, at the very moment when it had been dis- covered by Nasr b. Sayyar, the Omayyad governor of the province. Even before this, Merwan II. had had to repress disorders which had broken out in Syria, Palestine, and ‘Trak ; and the Caliph could now rely so little on Syria that he had thought it necessary to quit Damascus, and to fix his abode at Harran, in Mesopotamia. On learning the revolt of Abu Moslim, Merwadn II. wrote to Nasr b. Sayyar, directing him to act with vigour against the fomenters of sedition. It was easier to give such an order than to execute it, for Abu Moslim was at the head of a numerous army, absolutely devoted to the ‘Abbasids. Merwan II. thought it necessary at the same time to secure the person of the ‘Abbasid pretender Ibrahim, who was still living at Homaima. Ibrahim was therefore arrested, conveyed to Harran, and thrown into prison. He found means, however, of communicating with his lieutenant Abu Moslim, and the latter, who had received the most extensive powers from his chief, marched direct upon Merv, the capital of Khorasan, and drove out the governor Nasr. At the news of this the Caliph, no longer able to restrain his anger, had his captive Ibrahim put to death ; an execution which, at a later period, brought upon the Omayyads the most terrible reprisals. The brother of Ibrahim, Abu ’l‘Abbds, surnamed Saffah, “The Sanguinary,” on account of his cruelties, having by Ibrahim’s death become chief of the ‘Abbasids,~~

immediately quitted Homaima with all the members of his family, and took refuge in Khordsdn, that his pre- sence there might sanction and encourage the insurrection. Abt Moslim, now master of Khorasén by the capture of Merv, had meanwhile sent an army against 'Irdk, under the orders of Kahtaba b. Shab{b, who had beaten the Omayyad army, commanded by Yazfd b. Hobaira, governor of that province. In a.H. 132 Abt 'l'Abbas arrived at Merv. After remaining there some time, waiting for a favourable moment, he decided on openly assuming the title of Caliph. He installed himself n the governor's palace, and thence went in state to the mosque, where he mounted the pulpit, and officiated

in the capacity of successor of the Prophet. All those present took the oath of allegiance to him, and Abt 'Abbas returned to the palace, over which the black flag was flying, black being the distinctive colour of the 'Abbdsids.2 But he did not remain long at Merv. Committing the government of that city to his uncle Dawid, he went to review his army, and divided it into several corps, which he directed against different points. After this he went to Chaldea, and there estab- lished himself in a spot not far from Cufa, to which he gave the name of Hashimfya, or the city of Hashim, the ancestor of his own family and of that of the Prophet. Another of his uncles, 'Abdallah b. 'Ali, whom he had sent on an expedition against the city of Shahrozur, took pos- session of that place, and leaving Abt 'Aun 'Abd al-Melik b. Yazid there as governor, rejoined his nephew and sovereign at Hashimfya. Meanwhile the Omayyad Caliph had marched against Shahroztir. Abu 'Aun went out to meet him, and was joined by a strong reinforcement of cavalry under "Abdallah b. 'Ali. The 'Abbasids only numbered forty-five thousand soldiers, but these were experienced and resolute warriors. The Omayyad army, though much more numerous, was ill commanded and devoid of spirit. A battle ensued, and fortune favoured the rebels. In vain did Merwdn show himself everywhere; his soldiers gave way and repassed the Zab in disorder, hurrying away

in their flight the unfortunate Merwan. (Jomadi IT. 11, a.n. Triumph 132, 25th January 750.) This victory cost the Omayyads of the

~~*their empire. Merwdn attempted at first to take refuge at Mosul; but the inhabitants of that city having declared for the enemy, the prince went to his capital Harrdn, whence he was soon driven by the army of 'Abdallah b. 'Ali. From Harrin Merwdn fled successively to Emesa, to Damascus, to Palestine, and finally to Egypt. He was pursued without intermission by Salih, brother of 'Abd- allah b. 'Ali, who at last came up with him at Bustr, on the frontiers of the Delta. Merwdn took refuge ina Coptic church ; but the 'Abbasids pursued him into the building, and slew him at the foot of the altar. His head was cut off and sent to Cufa, where the new Caliph then was.*~~

~~*Thus perished in the East the dynasty of the house of Omayya, which, having been founded by usurpation, had only maintained itself by shedding torrents of blood, and was destined to perish in blood. We now enter upon the history of the new dynasty, whose origin we have described, and under which the power and glory of Islam reached their highest point.*~~

~~*Here we give the*~~

~~*GENEALOGICAL TABLE OF THE OMAYYADS. Omayya. |*~~

~~*| a Abu '1-'As. | Hakam.*~~

~~*| 4, en le*~~

~~*| hai 14, Merwan II.*~~

~~*| | | 6. ee I. 7, SOLAIMAN. 9. Yazip II.*~~

~~*| | 11. Wain II. 12, WOReA aD) NUL 13. IprAuim.*~~

~~*1 To understand this allusion we must know that Merwdn II. had received the nickname of Himér, "the ass," on account of his temper- ance and the strength of his constitution.*~~

~~*? Historians are divided as to the date at which black became the 'Abbasid colour. According to some, the first 'Abbasids wore a robe*~~

~~*| 5. 'ABD AL-MELIK.*~~

~~*Harb. Abt Abia. 1. Mo'Awrya I. 2. Yazip I.*~~

~~*| a ze a i | Abd al-'Aziz 3. Mo'Awiya IL.*~~

~~*| 8. 'Omar II.*~~

~~*| 10. HisHAM.*~~

~~*of black silk as early as at the battle called that of the Camel. According to others, it was only after the murder of Tbrahim by Mer- wan that the 'Abb4sids adopted black as a sign of mourning. See Quatremére, Mémoires historiques sur la dynastie des khalifes Abbas- sides. Paris, 1837.*~~

~~*XVI.—73*~~

~~*'Abba-*~~

~~*sids.*~~

~~*578 MOHAMMEDANISM ['appAstps. 2p submit. Lastly, Abt Moslim quieted the rising in coor eee Khorasan. Mosul also attempted an insurrection, but*~~

~~*Abi 1. From the death of Merwa4n may be reckoned the .'Abbas real accession of the 'Abbasid dynasty to the Caliphate, al-Saffdh. which thus returned to the hands of the grand-nephews*~~

~~*Yahya, a brother of the Caliph, quenched the revolt in streams of blood. All the provinces being thus reduced to peace, the new Caliph distributed them among the*~~

~~*of the Prophet. Abt 'l"Abbas, whose proper name was 'Abdall4h, and who afterwards received the surname of Saffah, was, as has been said above, a man of energetic will, who hesitated at nothing to ensure the triumph of his dynasty. When he caused himself to be proclaimed Caliph at Cufa, one of his partisans, Abu Salama, who had till then believed that Abu 'l'Abbas was working to restore the posterity of 'Ali to the throne, and not to gain posses- sion of the empire for himself, hesitated to take the oath of obedience to the new Caliph. Abt 'l'Abbaés immedi- ately resolved on his destruction, but*~~

~~fearing that Abu Salama might have a secret understanding with the con-queror of Khorasin, he began by sending his own brother Abt Ja'far into' that province to sound Abt Moslim. The latter loudly disclaimed any alliance with Abu Salama, and, that no suspicion might rest upon him, he sent a confidential agent to Cufa, and had Abt Salama assas- sinated. Still further to prove his zeal for the house of 'Abbas, Abi Moslim also got rid of Solaiman b. Kathir, another 'Abbasid emissary, whom he suspected of partiality towards the family of 'Ali. On his side, Abt 'l—Abbas caused 'Abdallah b. Mo'dwiya, an adherent of 'Alt's family, to be treacherously slain, though he had distinguished himself in the wars against Merwan. As for the Omayyads, they were systematically followed up and put to death.~~

~~principal members of his family and his best generals. To his brother Abti Ja'far he gave a part of Mesopotamia, Azerbaijan, and Armenia; to his uncle 'Abdallah b. "All, Syria; to his uncle Dawid, Arabia, Hijaiz, Yamdma, and Yemen; to his cousin '{sA b. Musa, the province of Cufa. Abt Moslim continued in possession of the govern- ment of Khorasan, Transoxiana, and a part of Farsistan. Egypt was entrusted to Abt 'Aun. Another uncle of the Caliph, Solaiman b. 'Ali, received the government of Basra, with Bahrain and 'Oman. Lastly, the province of Mosul was taken from the cruel Yahya, and granted to one of the uncles of Abt 'l'Abbas, Isma'il b. 'Alf, who received besides the government of Ahwaz. In Sind, the Omayyad governor had succeeded in maintaining himself, but was defeated by an army sent against him under Musa b. Ka'b, and the black standard of the 'Abbasids was raised over the city of Manstra. If we omit Africa and Spain in describing this division of the provinces of the empire, it is because the 'Abbasids never gained any real footing in Spain, while Africa remained in only nominal subjection to the new dynasty.~~

~~Abt 'l'Abbas, after having definitively established his power, left the town of Hashimfya and fixed his residence at Anbar, where he died on the 13th of Dhu '1-Hijja, a.H. 136 (9th June 754).~~

~~The new Caliph desired to exterminate that family, not only for the sake of revenge, but also that he might deprive~~

~~2. Abi 'l-'Abbds had designated as his successors, first Abi Ja- Abu Ja'far, and after him his cousin 'fsA b. Muisd. At 'far al-~~

~~*the Syrians of any pretext for fresh insurrections. In fact, hardly had Abu ’l-‘Abbas been proclaimed Caliph at Cufa, when the Omayyad governor of Kinnesrin, Abt Ward b. Kauthar, notwithstanding that he had taken the oath to the new sovereign, gave the signal for revolt in the name of the Omayyads. Abt ’l‘Abbas immediately ordered his uncle ‘Abdallah b. ‘Ali, who had been made governor of Palestine, to act with the utmost rigour against all members of the Omayyad family on whom he could. lay his hands. That he might let none of them escape, ‘Abdall4h pretended to grant an amnesty to all Omayyads who should come in and acknowledge the new Caliph, and even promised them the restitution of all their property. Ninety members of that unfortunate family allowed themselves to be entrapped by these specious promises, and ‘Abdallah, on pretence of sealing the reconciliation of the two parties, invited them to a banquet. But when they were all collected, a body of executioners rushed into the hall, and slew the Omayyads with blows from whips and rods. A grandson of Hish4m, ‘Abd al-Rahmdn b. Mo‘awiya, who had taken refuge in Africa, alone escaped this massacre. It was he who, at a later date, founded in Spain the Omayyad dynasty of Cordova. The cruelty of the ‘Abbasids excited a feeling of horror in the whole of Syria, and the revolt soon became general. Abu ’1Ward b. Kauthar found himself at the head of forty thousand men, and pitched his camp at Marj al-Akhram, a plain near Kinnesrin. The revolt spread even to Mesopotamia and ‘Irak. One of Merwan’s former generals, Ishak b. Moslim, laid siege to Harran, while Yazid b. Hobaira, formerly governor of ‘Irak, raised an insurrection at Wasit. In Khorasan also, as many as thirty thousand malcontents took up arms against Abu Moslim. Notwithstanding this formidable display of force, the ‘Abbasids remained conquerors. In Syria, ‘Abdallah b. ‘Ali beat Abu ’1Ward at Marj al- Akhram. Abt Ja‘far, brother of the Caliph, compelled Ishak b. Moslim and Yazid b. Hobaira in succession to*~~

~~*the moment of the death of Abu ’‘Abbés, Abu Ja‘far, Mansur.*~~

~~*who then assumed the title of Al-Manstr, “the Victo- rious,” was not in ‘Irak. He had undertaken the leader- ship of the pilgrims who had started on the journey to Mecca, and among whom figured the celebrated Abu Moslim. ‘Abdalléh b. ‘Ali, uncle of Abti ’l‘Abbas, dis- satisfied at having been excluded from the succession, took advantage of this absence to revolt.*~~

~~*Having raised an army and proclaimed himself Caliph, he marched against Harrdn and laid siege to it. On receiving this news, Abt Ja'far hastened to return to Anbar in company with Abi Moslim, whom he placed at the head of his troops, and sent against the rebel. At the approach of Abi Moslim, 'Abdallah, who had among his troops a body of seventeen thousand men of Khordsin, fearing that they might declare for Abi Moslim, had them all slaughtered, as the historians assert, by his Syrians, and then hastened to meet his enemy. The two armies met at Nisibis, and, after a number of skirmishes, a decisive engagement took place on the 7th of Jomadi IL, a.a, 137 (28th November 754). 'Abdallah was defeated and com- pelled to submit to Al-Manstr, who spared his life. The new and brilliant service thus rendered by Abt Moslim to his sovereign ought to have placed him even higher in the favour of Mansur than he already stood. On the contrary, it was the cause of his ruin. The Caliph wished to com- mit the task of maintaining order in Syria to Abu Moslim; but the latter refused to give up his government of Khorasdn, where he enjoyed an extraordinary reputation, and possessed numerous adherents, and, instead of obeying the order of the Caliph, directed his march towards the East. Thenceforth Manstr looked on him only as a dangerous rebel, and sought for means of getting rid of him. On pretence of conferring with him on business of state, he induced him to come to Maddin (the ancient Ctesiphon), caused him to be put to death by his guards, and ordered his body to be thrown into the Tigris. Thus miserably perished the real founder of the 'Abbasid*~~

~~*dynasty, after having accomplished his work, which, as the historians assert, cost the lives of more than 600,000 men, Notwithstanding the defeat of 'Abdallah b. 'Alf and the murder of Abu Moslim, the spirit of rebellion was not yet broken. Risings took place in Mesopotamia and to a still greater extent in Khorasan; and the Caliph's troops were repeatedly beaten by the rebels; but order was at last re-established by Manstir's generals, by Khazim b. Khozaima in Mesopotamia, and by Mohammed b. al- Ash'ath in Khorasan. About the same time Africa and Spain escaped from the dominion of the Eastern Caliphate; the former for a season, the latter permanently. The cause of the revolt of Africa was as follows: As soon as Mansur ascended the throne, he wrote to 'Abd al-Rahmdn, announcing the*~~

~~*death of Abu ’l-“Abbds, and requiring him to take the oath of allegiance. ‘Abd al-Rahmaan sent in his adhesion to the new Caliph, and added a few presents of little value. The Caliph was so much dissatisfied that he replied by a threatening letter which excited the anger of ‘Abd al- Rahman. He called the people together at the hour of prayer, mounted the pulpit, publicly cursed Mansur, and then declared his deposition from the Caliphate. He next caused a circular letter to be written, commanding all Maghrebins to refuse obedience to the Caliph; and this letter was circulated and read from the pulpit throughout the whole extent of the Maghrib (the West). A brother of ‘Abd al-Rahman, Ily4s, saw in this revolt an opportunity of obtaining the government of Africa for himself. Seconded by many of the inhabitants of Kairaw4n, who had remained faithful to the cause of the ‘Abbasids, he attacked his brother, slew him, and proclaimed himself governor in his stead. This revolution in favour of the ‘Abbasids was, however, of no long duration. Habib, the eldest son of ‘Abd al-Rahman, had fled on the night of his father’s murder, and Ily4s caused him to be pursued, with the object of transporting him to Andalusia. Habib was captured, but the vessel which was to convey him to Spain having been detained in port by stress of weather, the partisans of independence took arms, rescued Habib, and prepared to resist Ilyds, who was marching against them at the head of an army. Under these circumstances a fortunate idea occurred to Habib. He challenged his uncle Ily4s to single combat. Ilyds hesitated, but his own soldiers compelled him to accept the challenge. He measured arms with Habib, and was laid prostrate by him with a thrust of his lance. The party of independ- ence thus triumphed, and several years elapsed before the The Agh- Abbasid general, Al-Aghlab, was able to enter Kairawan, \| labites in and regain possession of Africa in the name of the Eastern \| Africa. Caliph. From this time forward, it must be added, Africa only nominally belonged to the ‘Abbasids; for, under the Caliphate of Harun al-Rashid, Ibrdhim, the son of Al- Aghlab, who was invested with the government of Africa, founded in that province a distinct dynasty, that of the Aghlabites. Spanish Coincidently with the revolt in Africa, the independent Caliph- Caliphate of the Western Omayyads was founded in Spain. , “The long dissensions which had preceded the fall of that dynasty in the East, had already prepared the way for the independence of a province so distant from the centre of the empire. Every petty emir there tried to seize sovereign power for himself, and the people groaned under the consequent anarchy.*~~

~~*Weary of these commotions, the Arabs of Spain at last came to an understanding among themselves for the election of a Caliph, and their choice fell upon the last survivor of the Omayyads, 'Abd al-Rahman b. Mo'dwiya, grandson of the Caliph Hisham. This prince was wandering in the deserts of Africa, pursued by his implacable enemies, but everywhere protected and*~~

~~*concealed by the desert tribes, who pitied his misfortunes and respected his illustrious origin. A deputation from Andalusia sought him out in Africa, and offered him the Caliphate of Spain, which he accepted with joy. On 25th September, a.p. 755, 'Abd al-Rahman landed in the Iberian Peninsula, where he was universally welcomed, and speedily founded at Cordova the Western Omayyad Caliph- ate, with which this history has no further concern.*~~

~~*While Mansur was thus losing Africa and Spain, he was trying to take from the Greeks the city of Malatiya, which, from the importance of its situation, was looked on as the key of Asia Minor. In a.u. 139-140 (a.p. 756- 757), 2 Moslem army of 70,000 men invested the place, and, after a vigorous siege, Malatiya was taken by assault. After this success the Moslems marched through Cilicia, entered Pamphylia, and cut to pieces a Greek army on the banks of the Melas. The Greeks asked and obtained a seven years' truce, which Mansur was the more disposed to grant because new and very serious troubles had been stirred up in his empire by certain sectaries of Khordsin, called Rawandis, These RAwandis, like many other Persian sectaries, admitted a number of dogmas completely foreign to Islam, such as the trans- migration of souls and the incarnation of the Deity as a man. 'They believed, for instance, as historians assure us, that divine honours ought to be paid to the Caliph Manstr, They had their name from Rawand, a city near Isfahan, where the sect originated. A great number of these sectaries had repaired to Hashimfya, the residence of the Caliph, and there persisted in marching in pro- cession round his palace, as if it had been the Ka'ba. Mansur, refusing to receive this impious homage, caused the principal chiefs of the sect to be seized and thrown into prison, The*~~

~~*Rdwandis imniediately rose in revolt, broke open the prison doors, rescued their chiefs, and pushed their audacity so far as to besiege the Caliph in his own palace. Very fortunately for Mansur, the populace declared against the Rawandis and massacred them ; but from that time forward he took a dislike to the city of Hashimfya, and resolved to choose another residence. He had at first thought of fixing his place of abode at Cufa; but he remembered the fickle character of the inhabitants, and decided on founding an entirely new city on the banks of the Tigris. His choice fell upon a spot near the ancient Ctesiphon, the capital of the Founda- Sassanids, called Baghdad. There he himself laid the tion of first stone of the city which was to be the centre of the Baghdad. civilised world as long as the Caliphate lasted. A revolt, however, of some importance soon called Mansur's atten- tion from the building of Baghdad. The descendants of 'Ali, who had had reason to think that the 'Abbasids were labouring for their advancement, were now cruelly un- deceived. In a.H. 145 (A.D. 762-763), Mohammed Mahdi, great-grandson of Hosain, and surnamed Al-Nafs al-Zakiya ("the pure soul"), collected a large number of adherents at Medina, and had himself proclaimed Caliph. The governor of Cufa, 'fs4 b. Musd, received orders to march against him, and entered Arabia. The partisans of 'Ali were defeated, and Mohammed Mahdi fell in battle. But meanwhile his brother Ibrahim had gone to Basra, and had there succeeded in exciting a revolt, in presence of which the 'Abbdsid governor had been obliged to capitu- late. The adherents of 'Ali, emboldened by this success, spread themselves over 'Irak, and obtained possession of several places, among which was the city of Wasit. Ibrahim was already advancing towards Cufa, at the head of a strong army, when '[s4 b. Mus4, who had been hastily recalled from Arabia, threw himself in his way. A terrible conflict took place. At last Ibrahim fell, pierced by an arrow, and, in spite of the desperate efforts*~~

~~*Mahdi.*~~

~~*580*~~

~~*of his followers, his body remained in the hands of the enemy. The partisans of 'Ali then dispersed, and never again ventured to have recourse to arms.*~~

~~The Caliph was highly delighted when he heard of the decisive victory gained by 'Isa, but, far from rewarding his valiant cousin, he tried to compel him to renounce his right of succession to the Caliphate, with the view of substituting as heir-presumptive his own son Mohammed. '{s4 at first energetically refused to abandon his rights ; but Mansur did not hesitate at a shameless deception, and produced false witnesses, who swore that 'Is4 had waived his claim in favour of Mohammed b. Manstir. However unwillingly, 'fs4 was obliged to yield his priority to Mohammed, but it was understood that, in case of the death of the latter, the succession should return to 'fsa. One of the false witnesses was, it is asserted, Khalid b. Barmak, the head of that celebrated Persian family the Barmecides, which played so important a part in the reign of Harun al-Rashid. To this Khalid, Manstr had entrusted the elevated post of minister of finance.~~

~~In a.H. 158 (s.D. 774-775), Mansur, feeling the decline of his powers, resolved to undertake for the last time the pilgrimage to Mecca. At the last station on the route he had a fall from his horse, and died at the gate of the Holy City. He was nearly seventy years of age, and had reigned for twenty-two years. He was buried at Mecca.~~

~~3. Mohammed b. Manstr was at Baghddd when he received the news of his father's death, and hastened to have himself proclaimed Caliph. He then took the title of Mahdi ("the well-directed"). To make his accession welcome to his subjects, he began by granting an amnesty to a great number of persons wlio had incurred the anger of Manstr, and had been thrown into prison. Among these was a certain Dawtd b. Ya'kub, whom Mahdi after- wards made his prime minister. But, on the other hand, Mahdi did not choose to confirm in their posts the pro- vincial governors in whom his father had placed confidence ; he supplied their places by creatures of his own. These changes displeased the people of Khordsdn, who revolted under the leadership of a certain Yusuf b. Ibrahim, sur- named Al-Barm. Mahdi sent against him his general Yazid b. Mazyad, who, after a desperate struggle, defeated Yusuf, took him prisoner, and brought him in triumph to Baghdad, where he was put to the torture and crucified. Mahdi had been scarcely a year on the throne, when he resolved to accomplish the pilgrimage to Mecca, and at the same time to visit the tomb of his father. Leaving his eldest son Mus& as governor of Baghdad, he set off,~~

~~*accompanied by his second son Hartin and a numerous suite. The chroniclers relate that the Caliph had ordered a great number of camels to be laden with snow, and that he reached Mecca without having exhausted this store. Immediately on his arrival in the Holy City, he applied himself, at the request of the inhabitants, to the renewal of the veils which covered the exterior walls of the Ka'ba. For a very long time these veils had been placed one over another, no care having been taken to remove the old covering when a new one was put on; so that the accumu- lated weight caused uneasiness respecting the stability of the walls. Mahdi caused the temple to be entirely stripped, and covered the walls again with a single veil of great richness. On this occasion he distributed considerable largesses among the Meccans. From Mecca, Mahdi went to Medina, where he caused the mosque to be enlarged. During his stay in that city he formed himself a guard of honour, composed of five hundred descendants of the Ansar,! to whom he assigned lands in 'Irak to be held in*~~

~~*1 The first citizens of Medina who embraced Islam were called Ansar; see above, p. 554, ;*~~

~~*MOHAMMEDANISM*~~

~~*[“ABBASIDS.*~~

~~*fief. Struck by the difficulties of every kind which had to be encountered by poor pilgrims who desired to repair to Mecca from Baghdad and its neighbourhood, he resolved to come to their help. His first care was to have the road from Baghdad to Mecca laid out, and its divisions.marked by milestones. He next ordered the construction at every stage of a kind of inn, where the poorer travellers might find shelter and food. He also saw to having new wells dug and cisterns built along the whole route.*~~

~~*Whilst he was devoting himself to these pious labours, he was menaced by a dangerous revolt in Khorasan. Its leader was a sectary called Hakim, surnamed Al-Mokanna' or the Veiled One, because he never appeared in public without having his face covered with a mask. Al- Mokanna' hoped to gather a great number of adherents around him, and to govern the province as absolutely as Abt Moslim had formerly done. His religious teaching consisted in the assertion that God had several times become incarnate*~~

~~among men, and that his last incarna- tion was Mokanna‘ himself. Many Persians were seduced by his words, and still more by the hope of plundering the property of the Moslems, which Mokanna’ promised to give up to them. The governor of Khordsdn and several other generals who marched against these sectaries were defeated; but at last the Caliph charged a skilful captain, Sa‘{d al-Harashi, with the direction of operations, and Sa‘id, having compelled the impostor to throw him- self into the city of Kash, soon reduced him to a choice between ‘surrender and death. Mokanna*‘ preferred the latter alternative, and took poison.~~

~~These disturbances did not suffice to turn Mahdi’s thoughts from the hereditary enemy of the Caliphate. Every summer he sent expeditions into Asia Minor against the Greeks; but these were not successful, and the Caliph decided on leading his army in person. Having levied in Khords4n a large number of those mountaineers who had always distinguished themselves by their valour, he assembled his army in the plains of Baraddn, on the banks of the Tigris, and commenced his march .u. 163, taking with him his second son Hart, and leaving his eldest son Musd4 as governor of Baghd4d. The latter was also designated as his successor in the Caliphate, ‘fs4 b. Mus4 having definitively renounced the throne. Mahdi traversed Mesopotamia and Syria, entered Cilicia, and established himself on the banks of the Jaihan (Pyramus). Thence he despatched an expeditionary force, at the head of which his son Hartin was nominally placed. In reality, that prince being too young to direct military operations, the chief command was exercised by his tutor, the Barmecide Yahya b. Khalid. Harun took the fortress of Samali after a siege of thirty-eight days. In consequence of this feat of arms, Mahdi made Harun governor of Azerbaijan and Armenia. Two years later war broke out afresh between the Moslems and the Greeks. Leo IV., Emperor of Constantinople, had recently died, leaving the crown to Constantine Porphyrogenitus. This prince was then only ten years old, and would have been incap- able of governing. His mother Irene took the regency on herself. By her orders an army of 90,000 men, under the command of Michael Lachonodracon, entered Asia Minor. The Moslems, on their side, invaded Cilicia under the orders of ‘Abd al-Kabir, but were defeated by the Greeks. Mahdi then recalled his son Hartn, and enjoined on him to avenge the failure of the arms of Islam. Hartin assembled an army of nearly 100,000 men, and conceived the project of~~

~~carrying the war to the very gates of Constantinople. The patrician Nicetas, who sought to oppose his march, was defeated by Hartn's general, Yazid b. Mazyad, and forced to take refuge at Nicomedia. Hartin marched through Asia Minor, and~~

~~Hadi.~~

~~'ABBASIDS. |~~

~~pitched his camp on the shores of the Bosphorus, Irene took alarm, sued for peace, and obtained it, but on humiliating conditions. This brilliant success increased Mahdi's affection for Harun to such an extent that he resolved, a few years later, to declare him his successor instead of Musé. It was necessary first to obtain from Miusé a renunciation of his rights; and for this purpose his father recalled him from Jorjan, where he was then engaged on an expedition against the rebels of Tabaristan. Musa, who had had information of his father's intentions, refused to obey this order. Mahdi determined to march in person against his rebellious son (a.H. 169), and set out, accompanied by Harun. But, after his arrival at MaAsabadhan, a place in Persian 'Irak or Jabal, the Caliph died suddenly, at the age of only forty-three. There are two versions of the cause of his death: some attribute it to an accident met with in hunting; others believe him to have been poisoned. If this was really the case, although we have no proofs against Mus4, we may reasonably sus- pect him of having been privy to the sudden death of his father.~~

~~4, Mahdi having died before he could carry out his plan for assuring the throne to Harun, the succession natur- ally fell to Musa, and he was proclaimed Caliph at Baghdad in the year of his father's death. He took the title of Hadi (He who directs). Harun made no opposition to the accession of his brother, and the army which had accom- panied Mahdi returned peacefully from Jabal to Baghdad.~~

~~The accession of a new Caliph doubtless appeared to the partisans of the house of 'Alf a favourable opportunity for arising. Hosain b. 'Ali, a descendant of that Hasan who had formerly renounced his pretensions to the Caliphate through fear of Mo'dwiya I., raised an insurrection at Medina with the support of numerous adherents, and had himself proclaimed~~

~~*Caliph. But having unfortunately conceived the idea of going on pilgrimage to Mecca, he was attacked at Fakh by a party of 'Abbasids, and perished in the combat. His cousin Idris b. 'Abdallah succeeded in escaping and fled to Egypt, whence he passed into Morocco; and there, at a later period, his son founded the Idrisite dynasty.*~~

~~*Hadi, as may be supposed, had never been able to forget that he had narrowly escaped being supplanted by his brother. He formed a plan for excluding Hartn from the Caliphate, and transmitting the succession to his own son Ja'far. He neglected no possible means of attaining this object, and obtained the assent of his ministers, and of the principal chiefs of his army, who took the oath of allegiance to Ja'far. Only Yahya b. Khalid the Barmecide, Hartn's former tutor, absolutely refused to betray the interests of his pupil. In a discussion which took place between him and the Caliph on this subject, Yahy4 showed such firm- ness and boldness that Haddi resolved on his death, and Harthama b. A'yan, one of the bravest generals of the empire, had already received the order to go and take his head, when the Caliph died suddenly. One of those terrible domestic dramas had been acted of which so many were afterwards seen in the palace of the Caliphs. The mother of Hadi and Hartin was Khaizordn, a haughty and intriguing woman, whose aim it was to get the direction of affairs into her own hands, leaving Hadi only the shadow of power. Her influence over all matters of government was so well understood that her door was beset all day by a crowd of petitioners, who neglected the Caliph and preferred to address their requests to her. Hadi soon became indignant at the subordinate part which his mother wished him to play, and after a dispute on the matter, he attempted to poison her. Khaizoran, hoping to find a more submissive instrument of her will in her second son, and wishing to protect herself against fresh*~~

~~*attempts at murder, caused Hadi to be taken unawares and smothered with cushions by two young slaves whom she had presented to him. (Rabf' IL, a.H. 170, Sept. A.D. 786.)*~~

~~*5. We have now reached the most celebrated name Hérin among the Arabian Caliphs, celebrated not only in the l-Ra- East, but in the West as well, where the stories of the 4*~~

~~*Thousand and One Nights have made us familiar with that world which the narrators have been pleased to represent to us in such brilliant colours.*~~

~~*On the unexpected death of Hadi, the generals and ministers who had declared against Harin, perceiving that popular favour did not incline to the son of the late Caliph, hastened to rally round the son of Khaizordn ; and Harin, surnamed Al-Rashid (The Upright), ascended the throne without opposition. His first act was to choose as prime minister his former tutor, the faithful Yahya b. Khalid, and to confide important posts to the two sons of Yahya, Fadl and Ja'far, the former of whom was also his own foster-brother. The Barmecide family were endued in the highest degree with those qualities of generosity and liberality which the Arabs prized so highly. Thus the chroniclers are never wearied in their praises of the Barmecides. Loaded with all the burdens of government, Yahya brought the most distinguished abilities to the exercise of his office. He put the frontiers in a state of defence, and supplied all that was wanting for their security. He filled the public treasury, and carried the splendour of the throne to the highest point. The following anecdote will show what an amount of earnest affection the Barmecide family succeeded in winning :—*~~

~~*After Hartn, as we shall relate farther on, had ruined the Barmecides of whose influence he was jealous, he forbade the poets to compose elegies on the disgrace of the family, and commanded that all who disobeyed this order should be punished. One day, as one of the soldiers of the Caliph's guard was passing near a ruined building, he perceived a man holding a paper in his hand, and reciting aloud, and with many tears, a lament over the ruin of the palace of the Barmecides. 'The soldier arrested the man and led him to the palace of the Caliph, who ordered the culprit to be brought before him, and asked him why he had infringed his orders. " Prince," replied the man, "let me relate my history to thee ; when thou hast heard it, do with me as thou wilt. I was an inferior clerk under Yahya b. Khalid. He said to me one day: 'Thou must invite me to thy house.' 'My lord,' I replied, 'I am quite unworthy of such an honour, and my house is not fit to receive*~~

~~*thee.' 'No,' said Yahya, 'thou must absolutely do what I require of thee.' 'In that case,' answered I, 'grant me some little delay that I may make suitable arrangements.' Yahya granted me some months. As soon as I informed him that I was ready, he repaired to my abode, accompanied by his two sons, Fadl and Ja'far, and by some of his most intimate friends. Scarcely had he dismounted from his horse when he begged me to give him some- thing to eat. I offered him some roasted chickens. When he had eaten his fill, he went over the whole of my house, and having seen it all, he asked me to show him the buildings attached to it. 'My lord,' said I, 'thou hast seen everything.' 'No,' said he, 'thou hast another house.' In vain I assured him that I had but one; he persisted in his assertion, and, sending for a mason, ordered him to make an opening in the wall. 'My lord,' said J, 'may I venture thus to make my way into my neighbour's house?' 'It matters not,' replied he. When a doorway had been opened, he passed through it, followed by his two sons, and I went after him. We entered a delightful garden, well planted and watered by fountains. In this garden stood a beautiful house with pavilions ~ adorned with furniture and carpets, and filled with slaves of both sexes, all of perfect beauty. ' All this is thine,' said Yahya to me. I kissed his hands and poured out my thanks to him ; and then I learned that on the very day when he had spoken to me of inviting him he had bought the land adjoining to my house, and had had it laid out for me without my ever suspecting it. I had certainly noticed that building was going on, but I was far from imagining that all this was intended for me. Yahyd next addressed himself to Ja'far and said: 'Here are certainly a house and servants, but who will provide for their support?' 'I,' replied Ja'far, 'will give him a farm and its dependencies, and will send him the deed of gift.' 'Very well,' continued Yahya; 'but how is he to live until he shall receive the revenue of his property?' 'I owe hima thousand pieces of gold,' said Fadl, 'and I will send them to his*~~

~~*582*~~

~~*house.' Thanks to these magnificent gifts, I afterwards gained great wealth, —wealth which I still enjoy. Since that day, I have never lost any opportunity of singing the praises of that noble family. And now, Prince, slay me if thou wilt; I am ready to die." Hardin, affected by this talc, let the*~~

~~*man depart, and in future forbade no man to weep for the tragical end of the sons of Barmak. (£l-Fachri, ed. Ahlwardt, p. 287.)*~~

~~*Although the administration of Hartn's states was com- mitted to skilful hands, yet the first years of his long reign were not free from troubles. Towards the year 176 (A.D. 792-793), a member of the house of 'Ali, named Yahya b. 'Abdallah, who had taken refuge at Dailam on the shores of the Caspian Sea, succeeded in forming a powerful party, and publicly announced his pretensions to the Caliphate. Hdrin immediately sent an army of 50,000 men against the rebel, under the command of Fadl. Reluctant, however, to fight against a descendant of the Prophet, Fadl first attempted to induce him to sub- mit, by promising him safety for his life and a brilliant position at the court of Baghd4d. Yahya accepted these conditions, but he required that the Caliph should send him letters of pardon countersigned by the highest legal authorities and the principal personages of the empire. Harin consented to do so, and Yahya, furnished with the Caliph's safe-conduct, repaired to Baghdad, where he met with a splendid reception. At the end of some months, however, he was calumniously accused of conspiracy, and the Caliph, seizing this opportunity of ridding himself of a rival who might prove dangerous, threw him into prison, where he was soon after put to death. Dreading fresh insurrections, Harin thought it well to secure the person of another descendant of 'Ali, Mus4 b. Ja'far, who was resident at Medina, where he enjoyed the highest consider- ation. The unfortunate man was sent to Baghdad, and there died by poison.*~~

~~*Meanwhile Harun did not forget the hereditary enemy against whom he had already fought. Under his reign all the strong places of Syria were formed into a special province, which received the name of "Awdsim. The charge of fortifying the city of Tarsus was committed to Faraj, the chief of the Turkish soldiers, whom the Caliphs were beginning to employ, and who were at a later period to become their masters. The ancient Anazarbus was rebuilt, and garrisoned with a military colony from Khordsén. Thanks to these measures, the Moslem armies were able to advance boldly into Asia Minor, Ishak b. Solaimdn entered Phrygia and defeated the Greek gover- nor of that province. A Moslem fleet destroyed that of the Greeks in the Gulf of Satalia. Harin in person invaded Asia Minor in the year 181 (a.D. 797-*~~

~~798), and during the following years his generals gained continual victories over the Byzantines, so that Irene was compelled to sue for peace. An attack by the Khazars called the Caliph's attention from his successes in Asia Minor. That people had made an irruption into Armenia, and their attack had been so sudden that the Moslems were unable to defend themselves, and a hundred thousand of them had been reduced to captivity. Two valiant generals, Khozaima b. Khazim and Yazid b. Mazyad, marched against the Khazars and drove them out of Armenia.~~

~~In the midst of the cares of war, Harun did not forget his religious duties, and few years passed without his making the pilgrimage. In one of these pilgrimages, A.H. 186 (A.D. 802), he was accompanied by his two eldest sons, Mohammed and 'Abdallah, and having determined to fix the order of succession in so formal a manner as to take away all pretext for future contentions, he executed a deed by which he appointed Mohammed his immediate heir; after him 'Abdall4h, and after 'Abdallih a third of his sons, named Kasim. Mohammed received the surname of Al-Amin (The Sure), "Abdallah that of Al-Ma'mun (He~~

~~['ABBASIDS.~~

~~in whom men trust), and Kasim that of Mo'tamin billéh (He who trusts in God). Harin further stipulated that Ma'min should have as his share, during the lifetime of his brother, the government of the eastern part of the empire. Each of the parties concerned swore to observe faithfully every part of this deed, which the Caliph caused to be hung up in the Ka''ba, imagining that it would be thus guaranteed against all violation on the part of men. These precautions were to be rendered vain by the perfidy of Amin. We shall see hereafter how he kept his oath, and how he expiated his treachery by death.~~

~~It was in the following year, at the very moment when the Barmecides thought their position most secure, that Hartin brought sudden ruin upon them. 'The causes of their disgrace have been differently stated by the annalists. Some relate that the Caliph, preferring to all other society that of his sister 'Abbdsa and of Ja'far b. Yahyd, resolved to unite them in~~

~~*marriage, in order to be able to bring them together in his presence without a breach of etiquette. He meant, however, that Ja'far should continue to be only the nominal husband of his sister. Ja'far accepted this condition, but it was not long before he forgot it, and the Caliph learned that his sister had given birth toa son. This, it is said, was the cause of Ja'far's disgrace, which involved his father and his brother. This story may be true; but the principal cause of the fall of the Barmecides appears to have consisted in the abuses of power of which they had been guilty, and in the sovereign influence which they exercised on those around them. The Barmecides lived in a magnificent palace opposite to that of the Caliph. Seeing one day an extraordinary crowd around the dwelling of his first minister, Harin was moved to say: "Verily Yahy4 has taken all business into his own hands; he it is who really exercises supreme power ; as for me, I am Caliph only in name." This secret dis- satisfaction was increased by a new act of disobedience on the part of Ja'far. Harun had ordered him to put to death secretly a member of the house of 'Ali, whose intrigues he dreaded. Ja'far allowed the victim to escape, and afterwards swore to the Caliph that his orders had been executed. Soon after, however, information against him was given to Hartn, who, after compelling Ja'far to acknowledge the truth, had his head struck off and brought tohim by Masrur, the chief of his eunuchs. On the very next day Yahyd, his son Fadl, and all the other Barme- cides, were arrested and imprisoned; all their property was confiscated ; and Hartn chose as his prime minister Fadl b. Rabi', who had been his chamberlain.*~~

~~*In the same year, a revolution broke out at Constan- tinople, which overthrew the Empress Irene, and raised Nicephorus to power. The new emperor had _ scarcely ascended the throne, when he thought himself strong enough to refuse the payment of tribute, and wrote an insulting letter to Harin, who contented himself with replying: 'Thou shalt not hear, but see, my answer." He then assembled an army, entered Asia Minor, and took Heraclea, plundering and burning along his whole line of march, till Nicephorus, in his alarm, sued for peace. Scarcely had the Caliph returned into winter quarters, when Nicephorus broke the treaty. Notwith- standing the rigour of the season, Harun retraced his steps, and this time Nicephorus was compelled to observe his engagements. The year after, aH. 189 (a.D. 804- 805), disturbances arose in Khordsin. They were caused by the*~~

~~*malversations of the governor of that province, 'Alt b. 'fs4, and the Caliph went in person to Merv to judge of the reality of the complaints which had reached him. 'Ali b. 'fs4 hastened to meet the Caliph on his arrival at Ray. He brought with him a great quantity of presents, which he distributed with such profusion*~~

~~*Amin.*~~

~~*ABBASIDS.*~~ |

~~*among the courtiers that every one found a thousand reasons for excusing his conduct. HA4rtn confirmed him in his post and returned to Baghdad, through which, how- ever, he only passed, and went on to Rakka on the Euphrates, a city which became his habitual residence. He did not long enjoy the repose which he went there to seek, for Nicephorus again broke the treaty of peace, and the Caliph was obliged to take the field anew. Once more Nicephorus was beaten, and so completely that he was obliged to submit to the very harsh conditions which the victor imposed on him.*~~

~~*Two years later, new disturbances broke out in Khora- san, where a certain Rafi b. Laith had revolted. Harin set out again for that province, accompanied by his son Ma'mun. It was to be his last journey. He was attacked by a tumour in the abdomen, and struggled in vain against this malady, which carried him off a year after his depart- ure, A.H. 193 (A.D. 808-809), just on his arrival at the city of Tus, the birthplace of the great epic poet of Persia, Firdausi. Hartin was only forty-seven years of age.*~~

~~*6. On the death of Harun, his minister Fadl b. Rabi' hastened to call together all the troops of the late Caliph, and to lead them back to Baghdad, in order to place them in the hands of the new sovereign, Amin. He even led back the corps which was intended to occupy Khorasan, and which ought to have fallen to the share of Ma'mun, according to the testament of Hérin. Fadl b. Rabi' thus committed a serious violation of the rights of Ma'mun ; but he cared little for this, being chiefly desirous of winning the confidence of the new Caliph. He was quite aware, however, that in thus acting he was making Ma'mun his irreconcilable enemy; and he therefore purposed to use every endeavour to arouse against him the enmity of his brother Amin. He advised him to exclude Ma'mun from the*~~

~~*succession, and the Caliph was weak enough to listen to him. Receiving the order to resign his government of Khordsan and to repair to Baghdd4d, Ma'miun was greatly perplexed ; but his tutor and vizier, Fadl b. Sahl, reani- mated his courage, and pointed out to him that, if he obeyed the orders of the Caliph, certain death awaited him at Baghdad. Ma'miun resolved to hold out against Amin, and found pretexts for eluding the orders of his brother and remaining in Khorasan. Amin, in his anger, caused the testament of his father, which, as we have seen, was preserved in the Ka*'ba, to be destroyed, declared, on his own authority, the rights of Ma'mun to the Caliphate to be forfeited, and caused the army to swear allegiance to his own son Musé, a child five years of age, on whom he bestowed the title of Natik bil-Hakk, '""He who speaks according to truth" (a.H. 194, a.p. 809-810). On hearing the news, Ma'miun, strong in the rightfulness of his claim, retaliated by suppressing the Caliph's name in all public acts. Amin immediately despatched to Khordsén an army of fifty thousand men, under the command of 'Alt b. 'fsa. Ma'min, on his side, raised troops among his faithful people of Khorasdn, and entrusted their command to Tahir b. Hosain, who displayed remarkable abilities in the war that ensued. In the following year, the two armies met under the walls of Ray, and victory declared for Téhir. Ma'miun now no longer hesitated to take the title of Caliph. The year after, Amin placed in the field two new armies, commanded respectively by Ahmed b. Mazyad and 'Abd- allah b. Homaid b. Kahtaba. The skilful Tahir b. Hosain succeeded in creating divisions among the troops of his adversaries, and obtained possession, without striking a blow, of the city of Holwdn, an advantage which placed him at the very gates of Baghdad. Ma'min immediately sent Tahir reinforcements under the orders of Harthama b. A'yan, which enabled him to maintain a firm hold on all the conquered territory, and to continue his victorious*~~

~~*march to the capital. Reverses naturally lead to fresh reverses. One after the other the provinces fell away from Amin, and he soon found himself in possession of Baghdad alone, which was speedily invested by the troops of*~~

~~Tahir and Harthama. That unfortunate capital, though blockaded on every side, made a desperate defence for two years. Ultimately the eastern part of the city fell into the hands of Tahir, and Amin, deserted by his followers, was compelled to surrender. He resolved to treat with Harthama, as he hated Tahir; but this step caused his ruin. 'Tahir learned by his spies that Harthama was to receive the Caliph in person, and gave orders to a body of horsemen to arrest Amin as he issued from Baghdad under cover of the night. On the banks of the Tigris, Harthama awaited Amin with a boat, but scarcely had the Caliph set foot in it, when the agents of Tahir poured on it a storm of arrows and stones. The boat sank, and the Caliph had to make his escape by swimming. But he was closely followed up, and had scarcely left the river when he fell into the hands of his enemies, who shut him up ina hut and went to inform Tahir of the capture. The victorious general immediately ordered him to be put to death, and the order was carried out. The head of the unfortunate Amin was cut off and sent to Ma'mun, a.u. 198. It was presented to him by his vizier, Fadl b. Sahl, surnamed Dhu 'l-Riydsatain, or "the man with two governments," because his master had committed to him both the ministry of war and the general administration. Ma'mun, on see- ing the head, hid his joy beneath a feigned display of sorrow.~~

~~7. On the day following that on which Amin had Ma'mtn.~~

~~perished so miserably, Tahir caused Ma'min to be pro- claimed at Baghdad. The accession of this prince appeared likely to put an end to the evils of civil war, and to restore to the empire the order necessary for its prosperity. It was not so, however. 'The reign of Ma'min—that reign on which art, science, and letters, under the patron- age of the Caliph, threw so brilliant a lustre—had a very stormy beginning. Ma'mtn was in no haste to remove to Baghdad, but continued to make Merv his temporary residence. In his gratitude to the two men to whom he owed his throne, he conferred on Tahir the government of Mesopotamia and Syria, and chose as prime minister of the empire Fadl b. Sahl, who had been already his vizier in the government of Khords4n. The adherents of 'Ali seized on the elevation of Ma'mun to power as a pretext for fresh revolts at Mecca, at Medina, and in 'Irak. At Cufa a certain Ibn Tabdtabé also broke out into open rebellion, and placed an army in the field under one of his partisans, Abu 'l-Sar4y4. Hasan b.~~

~~*Sahl, brother of Ma'miun's prime minister, who had been made governor of all the provinces conquered by Tahir, immediately sent troops against Cufa. They were defeated, and Abu 'l- Saraya, encouraged by this first success, and no longer finding a secondary part sufficient for his ambition, poisoned his chief Ibn TabdAtabé, and put in his place another of the family of 'Alf, Mohammed b. Mohammed, whom, on account of his extreme youth, he hoped to govern at his will. Fresh troops sent against Abu '71- Saraya fared no better than the first, and several cities of 'Irak, as Basra, Wasit, and Madain, fell into the hands of the rebels. Abu 'l-Sar4y4 was already marching against Baghdad, when Hasan b. Sahl, in great alarm, hastily recalled Harthama b. A'yan, one of the heroes of the civil war, who was already on his way back to Merv. As soon as this general had returned from Khorasan, the face of affairs changed. The adherents of 'Ali were everywhere driven back, and the whole of 'Irak fell again into the hands of the 'Abbasids. Cufa was taken by assault, and both Abt 'l-Sar4y4 and Mohammed b. Mohammed were*~~

~~*made prisoners. The former had his head struck off ; the latter was sent to Khords4n. The revolt in Arabia was also quickly stifled, and it might have been supposed that peace was about to be re-established. This, however, was by no means the case. The civil war had caused a swarm of vagabonds to spring, as it were, from underground at Baghdad. They proceeded to treat the capital as a con- quered city; and such was their audacity that they plundered houses and carried off women and children at mid-day. It became necessary for all good citizens to organize themselves into a regular militia, in order to master these ruffians. Meanwhile, at Merv, Ma'mtn was adopting a decision which fell like a thunderbolt on the 'Abbasids. In a.u. 201 (a.p. 816-817), under pretence of putting an end to the continual revolts of the partisans of 'Alf, and acting on the advice of his prime minister, Fadl, he publicly designated as his successor in the Caliphate 'AH b. Musa, a direct descendant of Hosain the son of 'Alf, and proscribed black, the colour of the 'Abbasids, in favour of that of the house of 'Ali, green. This step was well calculated to delight the followers of 'Ali, but it naturally could not fail to exasperate the 'Abbasids and their partisans. The people of Baghdad refused to take the oath to 'Alf b. Mus4 as heir-presumptive,*~~

~~*declared Ibrahim Ma'mun deposed, and elected his uncle Ibrahim, son of i of Mahdt, to the Caliphate! The news reached the Caliph 'loctedat ONLY indirectly, for his minister Fadl, desiring to leave Baghdad. Ma'mtin only the shadow of power, kept all important events carefully from his knowledge. The eyes of the Caliph were opened, and he now perceived that Fadl had been treating him as a puppet. His anger knew no bounds. Fadl was one day found murdered, and 'Ali b. Musé died suddenly. The historians bring no open accu- sation against Ma'mtn of having got rid of these two personages ; but it seems clear that it was not chance that did him such a seasonable service. Ma'mun of course affected the profoundest grief, and, in order to disarm suspicion, appointed as his prime minister the brother of Fadl, Hasan b. Sahl, whose daughter Buran he also after- wards married. But on the other hand, in order to quiet the people of Baghdad, he wrote to them: "The cause of your dissatisfaction in the business of 'Ali b. Mus& no longer exists ; since he who was the object of your resent- ment has just died." From that moment the pseudo- caliph Ibrahim found himself deserted, and was obliged to seek safety in concealment. His precarious reign had, however, lasted nearly two years. Ma'mun now decided on making a public entry into Baghdad, but to show that he came as a master, he still displayed for several days the green flag of the house of 'Ali, though at last, at the entreaty of his courtiers, he consented to resume the black. From this time the real reign of Ma'mun began, freed as he now was from the guardianship of Fadl. His general Tahir alone continued to excite his suspicions. Under the pretence that he could no longer endure the sight of the murderer of his brother, he removed Tahir to a dis- tance by appointing him governor of Khorasan. Like most of the great Moslem generals, Tahir, it is said, conceived the project of creating an independent kingdom for himself. His death, a.H. 207, prevented its realization ; but as his descendants succeeded him one after the other in the post of governor, he may be said to have really founded a dynasty in Khorasin. When, two years later, the impostor Babak set up a communistic sect in Armenia and Azer- baijan, it was a son of Tahir, "Abdallah, who was commis- sioned by Ma'mtin to put him down. Notwithstanding his ability, 'Abdallah could not accomplish the task, and it*~~

~~*1 On this event, see a remarkable essay by Barbier de Meynard, in the Journal asiatique for March-April, 1869.*~~

~~*[“ABBASIDS.*~~

~~*was only under Ma’mtn’s successor that Babak was taken*~~

~~*and put to death.*~~

~~*Ever since Ma’miun’s entry into Baghdad, the pseudo- caliph Ibra4him had led a wandering life. He was arrested one night in Baghdad, under the disguise of a woman, and brought before Ma’muin. The latter gener- ously pardoned him, and also granted an amnesty to the former minister of Amin, Fadl b. Rabi‘, although he had been the chief promoter of the terrible civil war which had so lately shaken the empire. After that time, Ibrahim the son of Mahdi lived peacefully at the court, cultivating the arts of singing and music, in which he excelled.*~~

~~*Tranquillity being now everywhere re-established, Ma’- min gave himself up, without hindrance, to his scientific and literary tastes. He caused works on mathematics, astronomy, medicine, and philosophy, to be translated from the Greek. It was also by his orders that two learned mathematicians undertook the measurement of a degree of the earth’s circumference. Ma’mun interested himself, too, in questions of religious dogma. Shocked at the opinion which had spread among the Moslem doctors, that the Koran was the uncreated word of God, he published an edict commanding them to renounce this error, Several distinguished doctors, and, among others, the celebrated Ibn Hanbal, founder of one of the four orthodox Moslem sects, were obliged to appear before an inquisitorial tribunal; and as they persisted in their belief respecting the Koran, they were thrown into prison. Meanwhile, war having broken out between the Greeks and the Moslems, Ma’mtn set out for Asia Minor, to put himself at the head of hisarmy. On his arrival at Tarsus, he received from the governor of Baghdad the report of the tribunal of inquisition, and ordered that the culprits should be sent off to him. Happily for these unfortunate doctors, they had scarcely started on the road to the frontiers, when news of the Caliph’s death reached Baghd4d. Ma’mtn having bathed in the Podendon, a burning fever was the result, which brought him to the grave in A.H. 218 (a.D. 833), Before his death, he*~~

~~*designated as his successor his brother Mo‘tasim billah, (He who seeks defence in God), whom he had for a long time preferred to Mo’tamin.*~~

~~*8. The accession of the new Caliph Mo’tasim met at Mo’tasim first with active opposition in the army, where a powerful billab. party had been formed in favour of ‘Abbas, the son of Ma’mtn. Thanks, however, to the disinterested conduct of that prince, civil war was averted. ‘Abbas publicly renounced all pretension to the Caliphate, and took the oath of allegiance to his uncle. Mo’tamin, the son of Harun, imitated the conduct of ‘Abbas, and the whole army accepted Mo’tasim, who made his public entry into Baghdad in the month of Ramadan 218.*~~

~~*The new Caliph, far from putting a stop to the persecu- tion which had been directed against the orthodox doctors, took up and carried out the views of Ma’mtn. The doctor Ibn Hanbal was beaten with rods and thrown into prison, together with several of his companions, and was not restored to liberty till the Caliphate of Motawakkil. This persecution had already prejudiced the people against Mo‘tasim, and their discontent became more marked when the Caliph created a new body of troops, specially intended to watch over his person. This new guard was composed of Turks, an unbridled and undisciplined body of soldiery, who, moreover, held in open contempt the religious pre- cepts of Islam. Tired of the excesses of every kind com- mitted by the Turks, the people of Baghdad rose in insurrection, and Mo‘tasim, not daring to act with severity either against his guard or the citizens, took the course of quitting the city. Leaving the government of the capital in the hands of his son Wathik bill4h (He who trusts in*~~

~~*Wathik.*~~

~~*“ABBASIDS. |*~~

~~*God), he established himself with his guard at Samarra, a small place situated a few leagues above Baghdad, and changed its name to Sorra- man-ra’a (He rejoices who sees it). This resolution of Mo‘tasim was destined to prove fatal to his dynasty ; for it placed the Caliphs at the mercy of their Pretorians. In fact, from the time of Mo’tasim, the Caliphate became the plaything of the Turkish guard, and its decline was continuous. Some glorious feats of arms, however, were still performed under Mo‘tasim. The*~~

~~*sectary Babak was at last taken by Afshin, a Turkish general of the Caliph, in the year 223 (A.D. 837-838). Babak was carried to Baghddd, led through the city on the back of an elephant, and then delivered to the executioners, who cut off his arms and his legs. Afshin, however, was very ill rewarded for his services, for shortly afterwards the Caliph had him put to death on a charge of heresy.*~~

~~*The death of Ma'mun had for the moment suspended hostilities with Constantinople ; under Mo'tasim the war was rekindled. A valiant Greek general, Manuel, who had incurred the displeasure of the Emperor Theophilus, took refuge with the Caliph, who eagerly welcomed him and gave him a command. Manuel began by reducing Khoras4n, which had risen in revolt, and Mo'tasim was so well satisfied with him that he thought of employing him against his own countrymen. This was precisely what Theophilus dreaded, and he took measures accordingly to bring back the banished general to his side. He sent an ambassador to Mo'tasim, under pretence of ransoming some Greek prisoners ; but the real object of his mission, which he contrived to communicate to Manuel, was the recall of that general. Manuel, feigning great animosity against his country, himself asked to be allowed to lead a Moslem army into Cappadocia. The Caliph granted his request, and sent with him his own son WaAthik bill4h. But, as soon as they reached the frontiers of Cappadocia, Manuel confessed to the young prince that his intention was to return to Constantinople, and quitted the army. Theophilus, taking advantage of the confusion into which the departure of Manuel had thrown the Moslems, made an incursion into Syria, laid waste that province as far as Zabatra, and returned loaded with booty. At the news of this disaster, Mo'tasim assembled a formidable army, estimated at more than two hundred thousand men, penetrated into Asia Minor, beat the Greeks, and took the city of Amorium, which he ordered to be razed to the ground, A revolt which broke out at Baghdad in favour of his nephew 'Abbas, the son of Ma'mtn, compelled the Caliph to turn back. Mo'tasim had the unfortunate "Abbas arrested, and he was soon after found dead in his prison. Mo'tasim survived him only four years. He died at Sorra-man-ra'a, in A.H. 227 (a.p. 841-842).*~~

~~*9. His son Wathik, who succeeded him, showed himself no less intolerant on the doctrinal question of the un- created Koran. He carried his zeal to such*~~

~~a point that, on the occasion of an exchange of Greek against Moslem prisoners, in the year 231 (a.p. 845-846), he ordered that all the Moslem captives who would not declare their belief that the Koran was a human work, should be left in the hands of the enemy. The reign of Wathik billah was not otherwise marked by any very striking events. He died in 232 (A.p. 846-847), after a reign of five years, As he had appointed no successor before his death, the principal personages of the state at first cast their eyes on his son Mohammed ; but they had scarcely saluted him with the title of Caliph, when they changed their purpose, and offered the supreme power to Motawakkil 'ala 'll4h (He who trusts to God), brother of Wathik. This prince was therefore elected in the same year in which Wathik died.~~

~~10. The first act of Motawakkil was an atrocious Mota- cruelty. He seized Mohammed b. 'Abd al-Melik, his wakkil. brother's vizier, who had always been his enemy, and ordered him to be placed in a furnace bristling within with iron points, which was then raised to a red heat. The Caliph looked on at the agonies of his victim, incessantly repeating: "Pity is a weakness." This had been the favourite maxim of the unfortunate vizier. An umpostor named Mohammed b. Faraj had set himself up as a prophet, giving out that he was Moses risen from the dead. By means of this gross fabrication, he had con- trived to attract twenty-seven followers. The Caliph had him seized, and condemned him to perpetual imprison- ment; but first he compelled each of the followers of Mohammed to give the pretended prophet ten blows on the head with his fist ; and the poor wretch expired under the hands of his own disciples. (A.H. 235, A.D. 849-850.)~~

~~In the year of his elevation to the Caliphate, Mota- wakkil had regulated the succession to the empire in his own family, by designating as future Caliphs his three sons, Montasir billah (He who seeks help in God), Mo'tazz billah (Strong through God), and Mowayyad bill4h (Assisted by God). In acting thus, his object was to protest against the tendency of his predecessors to favour the house of 'Ali, and to guard against the attainment of the Caliphate by any member of that house. Motawakkil displayed the most extreme hatred for the descendants of the Prophet. He even went so far as to~~

~~*destroy the chapel erected over the tomb of Hosain at Kerbela, and forbade the Shi'ites to visit the spot. Not content with attacking the liberty and the property of the descendants of 'Alf, he insulted their belief, by taking buffoons into his pay, whose business it was to turn the person of 'Al{ into mockery. He also persecuted the Christians and the Jews ; excluding them from all public employments, and obliging them to send their children to Moslem schools. In the year 237, a revolt broke out in Armenia. The Caliph sent the Turk Bugha against the rebels; but they met him with a vigorous resistance, and it was four years before peace was restored to the province. During that time the Greeks effected a descent on Egypt, and Damietta was taken and burned. Motawakkil caused Damietta to be fortified, and transferred his own residence to Damascus, doubtless that he might be able to keep a closer watch on the proceedings of the Byzantines. He soon thought himself strong enough to take the offensive, and poured his Turkish soldiery into Asia Minor, where they encountered the same Manuel who had been formerly received at the court of Mo'tasim. After an alternation of successes and reverses, both Moslems and Greeks retired from the conflict. Motawakkil then returned to his residence at Sorra-man-ra'a, and there caused a magni- ficent quarter to be built, which he called Ja'fariyya.1 There he gave himself up to debaucheries; till at last, during one of his orgies, he was murdered by a Turkish soldier named Wasif, who had been bribed to the deed by his own son Montasir billah (a.n. 247, a.v. 861-862).*~~

~~*11. On the very night of his father's assassination Mon- Montasir had himself proclaimed Caliph. The conspirators tasir. among the Turkish soldiery compelled him to deprive his two brothers, Mo'tazz and Mowayyad, who were not agree- able to them, of their rights of succession. Montasir did not long enjoy the fruits of his crime. He died five months after, by poison, it is said.*~~

~~*12. The Turkish soldiery, which now arrogated to itself Mosta'in. the mastery over the Caliphate, chose in succession to Montasir his cousin Ahmed, who took the title of Mosta'in*~~

~~*1 That is, " City of Ja'far." Ja'far was Motawakkil's own proper*~~

~~*name.*~~

~~XVI.— 74~~

~~Mo’‘tazz.~~

~~Mohtadi.~~

~~Mo’ta- mid.~~

~~586~~

~~the Moslems in Asia Minor. the city of Sorra-man-ra’a.~~

~~the Eastern Caliphate of those provinces. time, insurrections sprang up in every part of the empire. Next, the chiefs of the Turkish soldiery, in their mutual jealousies, began to tear each other to pieces. The infatu- ated Caliph fled from Sorra-man-ra’a, and took refuge at Baghdad. The Turks now resolved on his destruction, and forgetting that they themselves had deprived Mo‘tazz billah, brother of Montasir, of his legitimate rights, chose him as their Caliph. They next placed at their head a brother of Mo‘tazz, named Mowaffak billih, and besieged Mostatin at Baghdad. At the end of one month (a.H. 252, a.p. 866), Mosta‘in surrendered, and was put to death.~~

~~13. Mo‘tazz bill4h, thus called to the throne by the very men who had previously sought to exclude him from it, resolved to free himself from the yoke of the formidable Turkish soldiery which thus made and unmade Caliphs. But to maintain a struggle against such terrible adversaries, the new sovereign would have needed an ability and energy which he did not possess. HIe made, indeed, a very impolitic beginning in getting rid of his brothers Moway- yad and Mowaffak, of whom he put the former to death, and drove the latter into exile. Some time after, it is true, he had the satisfaction of seeing Wasif, one of the chiefs of the Turkish soldiery, lose his life in a mutiny of his own troops; and that of defeating in person another chief, Bugha, whom he afterwards caused to be beheaded. But in the following year (4.H. 254), the Turks chose as their leaders the sons of Wasif and Bugha, Salih and Mohammed, who avenged their fathers by plundering the palace of the prime minister and besieging that of the~~

~~*Caliph, whom they seized and threw into close confine- ment, where he died of hunger and thirst, a.H. 255.*~~

~~*14, Immediately after the fall of Mo'tazz, the Turks brought from Baghdad one of the sons of Wathik billih, and proclaimed him Caliph, with the title of Mohtadi billah (Guided by God). Mohtadi, a man of noble and generous spirit, exerted himself, but in vain, to release his prede- cessor from prison. Having failed in this, he kept the precarious measure of power which his masters left him, and applied it to the regeneration of Moslem society, the decay of which appeared to him imminent. He forbade wine and games of chance; he devoted himself to the administration of justice; he examined in person every sentence passed by the judges, and gave public audience to the people twice a week for the redress of their grievances. The farmers of the revenue were subjected to strict control, and the taxes were considerably lightened. It seemed as if these reforms were likely to re-establish order and prosperity in the empire. But Mohtadi came too late, and the Turks did not leave him time to finish his work. Salih, one of the chiefs of the Turkish soldiery, having been assassinated by a rival, Mohtadi punished the guilty person with rigour. The Turks, in their rage, beset the palace and slaughtered the unfortunate Caliph (a.H. 256, a.p. 870).*~~

~~*15. Whether from weariness, or from repentance, the Turkish soldiery discontinued for a time their hateful excesses. A son of Motawakkil was brought out of prison to succeed his cousin, and reigned for twenty-two years under the name of Mo'tamid 'ala 'Il4h (He whose support is God). During his reign two great events took place,*~~

~~*pill4h (He who looks for help to God). Under the reign of this feeble prince, the Greeks inflicted serious losses on The Turkish soldiery, instead of attempting to repair these losses, revolted against the Caliph whom they had themselves chosen, and plundered Taking advantage of these disorders, a descendant of 'Ali, named Hasan, gained pos- session of Tabaristan and Jorjan, and permanently deprived At the same*~~

~~*tokens and precursors of the dissolution of the Caliphate. Eastern Persia and Egypt separated themselves by force from the empire, and two new dynasties established themselves in these countries, those respectively of the Saffarids and the Tulinids, The founder of the former, Ya'kub b. Laith, was the son of a coppersmith (Saffar). At the head of a band of resolute men, he invaded success- ively Khorasan, Kirman, and Sijistan, and at last the Caliph Mo'tamid, powerless to arrest his progress, was obliged to give an official recognition to accomplished facts. But Ya'kub was not satisfied with this; he soon possessed himself of Tabaristan, Farsistan, and Ahwdz, and thence marched against Baghdad. Fortune, however, deserted him; he was beaten in the neighbourhood of Wasit (4.H. 262), and compelled to return to Persia in order to levy a new army there. In 265 he resumed his march against Baghdad, but was obliged by sickness to halt at Jondis- bur, where he died ; not, however, till he had obtained from the Caliph a formal investiture of all the provinces he had conquered. He was succeeded by his brother 'Amr. On the other side, a certain Ahmed b. Tultn, the son of a freedman, who had obtained from the Caliph the post of governor of Egypt, planned the creation for himself of an independent kingdom. Under Mo'tamid he even invaded Syria, and perhaps would have pushed his con- quests still farther, had not death overtaken him in 4.x. 270 (a.p. 883-884). His son Khomartya succeeded him in Egypt, and though, at a later period, he submitted to pay tribute to Mo'tadid, nevertheless a dynasty had been founded in that country which lasted for twenty-one years longer. Mo'tamid died eight years after Ahmed b, Tulun.*~~

~~*16. The reign of Mo'tadid bill4h (He who seeks his Mo'ta- support in God), who succeeded his uncle Mo"tamid, is did. principally remarkable for the rise of the celebrated sect of the Carmathians (Kardmita), who for two centuries laid waste the Moslem empire, and for the extinction of the Saffarid dynasty in Persia, where it was replaced by that of the SAmanids. Some details respecting the origin and the creed of the Carmathians will be found in the third section of this article. We shall content ourselves here with stating the fact that these sectaries, who were numerous in 'Irak, Syria, and Eastern Arabia, kept in check all the armies which were sent against them. Under the reign of Mo'tadid they invaded Mecca and committed great ravages there. In a.H. 281, Mo'tadid repaired the disasters which they had*~~

~~caused there, and raised important works about the Ka'ba. Mo"tadid died in 289 (a.p. 902), leaving the throne to his son Moktaff billih.~~

~~17. Moktafi billéh (He who sufficeth himself in God) Moktafi. — reigned for six years, during which he had constantly to J struggle against the Carmathians. One of his generals, indeed, gained a signal victory over these sectaries ; but, to avenge their defeat, they lay in wait for a caravan which was on its return from Mecca, and massacred twenty thousand pilgrims. This horrible crime raised the whole of Arabia against them. The Carmathians were beaten again, and Dhikriya, one of their ablest generals, was taken and put to death. The sectaries remained quiet for some time, and the Caliph took advantage of this respite to take Egypt from the house of Tulin, and to confer its government on the Ikhshidites. Moktaf{ died a.H. 295 (a.p. 907-908). His activity and energy revived for a moment the prestige of the Caliphate; but this fleeting renewal of its greatness was soon to disappear, and decay resumed its course.~~

~~18. The new Caliph, Moktadir bill4h (Powerful through Mokta- God), was only thirteen years of age when he ascended dir. the throne. His extreme youth prejudiced the people of Baghdad against him ; they rebelled, and swore allegiance to 'Abdallah, son of the former Caliph Mo'tazz; but the~~

~~The Fa- timites.~~

~~| The last | 'Abbé-~~

~~| sids.~~

~~| Kahir.~~

~~RAdi.~~

~~'ABBASIDS. |~~

~~party of Moktadir prevailed, and his rival was put to death. Moktadir, however, was too young to exercise any real power ; he was governed by his eunuchs. He was, besides, a man of feeble character, and looked on help-lessly at the death-struggle of the empire, upon which calamities of every~~

~~kind now poured in. The Greeks invaded Mesopotamia. A truce was concluded with them; but the Carmathians then recommenced their disorders in Syria. The indolence of the Caliph, and his inaction in the face of this danger, alienated all hearts from him ; and the eunuch Munis, the principal chief of his party, took the lead in deposing him and proclaiming in his stead his brother Kahir bill4h (Victorious through God), in the year 317 (a.p. 929-930). Kahir, however, having refused to distribute a donative to the army on the occasion of his accession, a counter-revolution took place, and Moktadir, who had been imprisoned, was taken from his dungeon and replaced on the throne, only three days after his de- position, Favoured by these disturbances, the governor of Mosul, Nasir al-Daula, declared himself independent, and founded definitively the dynasty of the Hamdanites ; thus causing an additional dismemberment of the empire. The Carmathians in their turn, under the guidance of a newchief, Abt Tdhir, obtained possession of Mecca, and carried off the celebrated black stone of the Ka'ba, which they did not restore till very long afterwards. Meanwhile the eunuch Minis had been disgraced. He withdrew at first to Mosul, to the court of Nasir al-Daula; but it was to raise an army and march upon Baghdad, where the Caliph had again fixed his abode. The object of Munis was not to~~

~~attack the Caliph, but only to take vengeance on his.~~

~~personal enemies. Moktadir was induced by evil coun- sellors to make a sally against Munis. His troops were put to the rout, and he himself fell on the field of battle, in the year 320 (a.D. 932).~~

~~With the reign of Moktadir is connected one of the greatest events in the history of the Caliphate, the founda- tion of the Fatimite dynasty, which reigned, first in the Maghrib and then in Egypt, for nearly three centuries. The first of this family who put forward any pretensions to the Caliphate was "Obaid Allah, surnamed the Mahdi, or Messiah of the followers of 'Alf, who gave himself out as a direct descendant of 'Alf, through his wife Fatima, the daughter of Mohammed, whence the name of Fatimite. It seems to be proved that "Obaid All4h was really descended from a certain 'Abdall4h b. Maimtn el-Kadddh, the founder of the Ismailian sect, of which the Carmathians were only a branch. This 'Obaid Allah had himself~~

~~*become pontiff of the Ismailians. As early as the Caliphate of Moktafi, one of 'Obaid Allah's missionaries, named Abu 'Abdallah, had succeeded in gaining numerous parti- sans in the province of Africa, then subject to the Aghlabites, and the victories of this missionary had wrested Eastern Africa from the family of Aghlab when Moktadir ascended the throne. 'Obaid Allah then repaired to his new realm (4.H. 303), and founded the city of Mahdfya, which he made his capital. He tried also, but without success, to seize Egypt; the conquest of that country was reserved for one of his successors, Mo'izz li-din-ill4h, 'Obaid Allah died two years after Moktadir, leaving to his son Kaéim an empire already sufficiently powerful to cause uneasiness to the 'Abbasids, to the Omayyads of Spain, and to all the Christian princes whose states bordered on the Mediterranean.*~~

~~*19. Kéhir billah, on being raised anew to the throne after the death of his brother Moktadir, still bore ill-will to his patrons, and tried to free himself from their guardianship. The emirs of his court dethroned him a second time and put out his eyes. One of his nephews was then proclaimed Caliph under the name of Radi*~~

~~*billh (Content through God). This prince, who was entirely governed by those about his person, created, in favour of a certain Abibekr Mohammed b. Raik, the office of Amir al-Omara, or Emir of the Emirs, which nearly corresponds to that of Mayor of the Palace among the Franks! The Amir al-Omard was charged with the administration of civil and military affairs. He also acted as the Caliph's deputy in sacerdotal functions, and was named next after him in the public prayers. Thenceforth the Caliphate was no longer anything but an empty shadow. During the reigns of Kahir and Radi, the Car- mathians became more audacious than ever. The Amir al-Omara was obliged to purchase from them the freedom of pilgrimage to Mecca at the price of a disgraceful treaty. Thus the Caliphate found itself almost reduced to the pro- vince of Baghdad. Khordsdn, Transoxiana, Kirman, and Persia were in the hands of independent sovereigns, the S4- manids, the Buyids, and a prince named Washimgir. The Hamdanites possessed Mesopotamia ; the Sdjites, Armenia; Egypt was under the rule of the*~~

~~*Ikhshidites; Arabia was held by the Carmathians; Africa, as we have seen, had become the prey of the Fatimites. The single transient success obtained by Radi was the capture of Mosul in a.u. 328 (A.D. 939-40) ; and even this success he owed to the Turk Bejkem, who had succeeded Mohammed b. Raik as Amir al-Omara.*~~

~~*Radi died in the following year, and was succeeded by Mottaki.*~~

~~*Mottaki lill4h (He who fears God). From his very accession, this prince saw himself exposed to the attacks of a certain Al-Barfdi, who had carved out for himself a principality in Chaldzea, and who now laid siege to Baghdad. Nasir al-Daula, prince of Mosul, who had been reinstated in his government, offered an asylum to Mottak{; put his troops at his disposal, and succeeded in repelling Al- Baridi. In return he obtained the office of Amir al-Omara. But there were other competitors for that post. Turun, a former lieutenant of Bejkem, protested sword in hand against the choice of the Caliph, and threatened Bagh- dad. Ikhshid, sovereign of Egypt, offered Mottaki a refuge in his states; but Turun, fearing to see the Caliph obtain such powerful support, found means to entice him to his tent, and had his eyes put out, a.H. 333 (a.D. 944-945),*~~

~~*As successor to Mottaki, Turun chose Mostakfi billdh (He Mostakfi.*~~

~~*who places his whole trust in God). This prince, like his predecessors, was a mere puppet in the hands of his min- isters. A new Amir al-Omara, Zirak b. Shirzad, made himself so hateful to the people of Baghdad by his deeds of violence and rapacity that they besought the help of the Buyids. Ahmed, the third prince of that dynasty, entered Baghdad, overthrew Zirak, and took his place under the title of Mo'izz al-Daula. Mostakf{ soon had enough of this new master, and ventured to conspire against him. The plot was discovered, and Mo'lzz al-Daula had the eyes of the Caliph put out. There were now at Baghdad three Caliphs who had been dethroned and blinded—Kéhir, Mottaki, and Mostakff. Mo'izz al-Daula thought for a moment of restoring the illusory title of Caliph to the descendants of 'Ali. He feared, however, lest this should lead to the recovery by the Caliphs of their former supremacy, and his choice fell on a son of*~~

~~*Moktadir under the name of Moti' lilla4h (He who obeys Mott'.*~~

~~God). Reserving to himself all the powers and revenues of the Caliph, he allowed Moti‘ merely a secretary and a moderate pension. The prince of Mosul, who began to think his possessions threatened by the neighbourhood of Mo‘izz, entered on a struggle with him and tried to wrest Baghdad from him; but he failed, and was obliged to~~

~~1 See Defrémery, Afémotre sur les Emirs al-Oméra, Paris, 1848,~~

~~Tai”.~~

~~Kaim.~~

~~Moktadf.~~

~~588~~

~~submit to the payment of tribute. We have said above that Mo‘izz al-Daula professed a great veneration for the house of ‘Ali. HIs preference showed itself in public acts. He caused the most terrible imprecations against the Omayyads to be posted up at the doors of the mosques. This step irritated men’s minds; and a general insurrec- tion was imminent at Baghd4d, when Mo‘izz died (a.u. 356), leaving his power to his son ‘Izz al-Daula.~~

~~While the ‘Abbasid family was thus dying out in shame and degradation, the Fatimites, in the person of Mo‘izz li-din-illah, were reaching the highest degree of power and glory (see Eeypr, vol. vii. p. 750 sqg.) Jauhar, a general of Mo‘izz li-din-ill4h, conquered Egypt for his master, and Arabia acknowledged the sovereignty of the Fatimites. The Carmathians, who had so long contended against the ‘Abbasids, now came to better terms with Moti‘, and their general made the Caliph the offer of driving back the Fatimites, on condition of his granting him the government of Egypt. Moti‘ preferred to stand neutral in the struggle ; and the Carmathian general, who with the support of Moti‘ might perhaps have triumphed over Mo‘izz, was beaten by his powerful rival. Mott’, having been struck by paralysis, was obliged to abdicate in the year 363 (a.D. 973-974), and left the empty title of Caliph to his son Tai‘ li-amr-ill4h (Obedient to the command of God). The new Caliph lived at first in peace, for it was now the office of Amir al-Omara which provoked ill-will, Under the reign of Tai‘ the Buyid~~

~~*princes contended furiously with one another for the office of Emir, and one of them, 'Adod al-Daula, having con- quered 'Izz al-Daula, took the title, never before employed, of Shahinshah, or king of kings. On his death he trans- mitted his office to his three sons, who held it successively, under the names of Shams al-Daula, Sharaf al-Daula, and Baha al-Daula. The last, who was as avaricious as he was ambitious, took offence at the Caliph Tai' for having disposed of certain sums of money, of which he wished to reserve the management to himself, compelled him to abdicate in A.H. 381, and replaced him by a grandson of Moktadir, who took the name of Kadir bill4h (Powerful through God), and reigned forty one years under the tutelage of the Buyids. Meanwhile events were pre- paring the fall of the Buyids. In Persia, Mahmud of Ghazni was founding the powerful empire of the Ghaz- nevids, which extended to the Indus, and the Seljuk Turks were already invading Khordsin. It was under the successor of Kadir billah that that sanguinary revolu- tion took place, which was to give over the government of Baghdad to the Seljuks.*~~

~~*Kadir bill4h died in a.nH. 422 (a.v. 1030-31), and was succeeded by Kaéim bi-amr-illah (He who is charged with the business of God). The new Caliph, groaning under the iron hand of his Amir al-Omard, called to his aid the Seljuk Toghril Beg, who entered Baghdad in the month of Ramadan in the year 447 (a.p. 1055- 1056), overthrew the Buyids, and took their place. Some years later, Toghril married the daughter of the Caliph. At his death, Toghril left to his nephew Alp Arslan the title of Sultan, a flourishing empire, and uncon- trolled power. As for Kdim, he enjoyed the Caliphate in peace under the tutelage of Alp Arslan and of his successor Malik Shah, till his death in a.w. 467. His grandson, Moktadi bi-amr-ill4h (He who obeys the orders of God), who succeeded him, owed to the power of Malik Shah the honour of recovering his supremacy in Arabia. At Medina and Mecca his name was substituted in the public prayers for those of the Fatimite Caliphs. This was, after all, a mere gratification to his vanity, for Malik Sh4h was the real sovereign, and the Caliph thought himself highly honoured in marrying the daughter of his*~~

~~*MOHAM™MMWEDANIS®*~~

~~*['ABBASIDS.*~~

~~*powerful patron. This union, however, far from drawing closer the bonds of friendship between Malik Shah and Moktadi, became on the contrary a cause of strife. The Caliph having put away his wife, who had wearied him by her peevish humours, was compelled by Malik Shah to appoint the child whom he had had by her as his successor, to the prejudice of his eldest son. Malik Shah also exiled his son-in-law to Basra. Just, however, as this order was about to be carried out, Malik Shah died. Moktadi survived him only a few months. It was during the reign of his successor Mostazhir billah (a.H. 487-512) that the first crusade took place. We need not here enter into the details of those wars. It is sufficient to say that from the date of the first crusade Baghdad ceases, so to speak, to have any special history. The successors of Mostazhir billah (He who seeks to triumph through God) were —Mostarshid billah (He who asks guidance from God), A.u. 512-529; Rashid bill4h (Just through God), a.H. 529- 530; Moktafi li-amr-ill4h (He who follows the orders of God), a.H. 530-555; Mostanjid billah (He who invokes help from God), a.H. 555-566 ; and Mostad?' bi-amr-illah (He who seeks enlightenment in the orders of God), A.H. 566-575. Under this last, the Fatimite dynasty was at length destroyed, and Egypt fell again under the spiritual authority of the Caliphs of Baghdad. It was one of the generals of the Emir Nur al-din, the celebrated Salah al- din (Saladin), who made this important conquest in A.H. 567 (A.D. 1171-1172). He maintained himself in Egypt as Sultan, founded a new dynasty, that of the Ayyubites, and in some sort compelled Nasir li-din-ill4h (He who helps the religion of God), the successor of Mostadi' (a.H. 575-622), to acknowledge his title and to ratify his usurpation.*~~

~~*A still more formidable danger was now threatening Baghdad. 'The terrible Jinghiz Khan was issuing from the depths of Asia at the head of his Mongols, and was beginning to invade Transoxiana. Under Nasir li-din-ill4h's successors, Zahir billdh (Victorious through God), A.B. 622-623, and Mostansir bill4h (He who asks help from God), a.H. 623-640, the Mongol invasion advanced with immense strides; and when, after them, Mosta'sim billah (He who seeks his defence in God) was named Caliph in the year 640 (a.p. 1242-1243), the last days of the Caliphate had arrived. Huldgu, who was then sove- reign of the Mongols, determined to make himself master of the whole of Western Asia. He placed himself at the head of his immense hordes, swept everything before him on his march, and arrived under the*~~

~~*walls of Baghdad. In vain did Mosta'sim sue for peace. The siege was actively pursued, and on the 29th of Moharram 656 (5th February 1258), the Mongols forced their way into Baghd4d and planted the standard of Huldégu on the highest of its towers. The city was given up to fire and slaughter ; Mosta'sim was thrown into prison, and died there a few days after; and with him expired the Eastern Caliphate, which had lasted 626 years, from the death of Mohammed.*~~

~~*In vain, three years later, did a scion of the race of the 'Abbasids, who had taken refuge in Egypt, make an effort to restore a dynasty which was now for ever extinct. At the head of a few followers, he marched against Baghdad, but was repulsed by the governor of that city, and died fighting. At a later period, another descendant of the 'Abbasids also sought an asylum in Egypt. The Sultan Baibars, after a judicial investigation of his origin, pro- claimed him Caliph under the name of Hakim bi-amr-illah. His sons inherited this empty title, but, like their father, remained in Egypt, without power or influence. This shadow of sovereignty continued to exist till the conquest of Egypt by the Turks.*~~

~~*Mostaz- hir and the last Caliphs.*~~

~~*The Mongols,*~~

~~*MOHAMMEDANISM 589*~~

~~*GENEALOGICAL TABLE OF THE 'ABBASID CALIPHS DOWN TO THE | study of philosophy led to the use of translations from the FALL OF BaGupAD. Greek, The institutions of Islam were developed, no "A DWEE, doubt, as new wants made themselves felt, in proportion ane to the extension of the empire ; but they were nevertheless eee founded on the first arrangements made by the Prophet, 'Alt. and handed down by him in the Koran. ee aes a _ Under the first four Caliphs these institutions continued Political —_ in a rudimentary state. The Caliph (Khalifa, substitute 2>4 i or successor) was elected by the Moslem community ; ee*~~

~~*and, after receiving from all its members the oath of tions,*~~

~~*INSTITUTIONS. |*~~

~~| | ie ton: 1, Abu ’l-‘Abbds. 2. Mansur.~~

~~| 8. Mahdi. |~~

~~| | 4, Hadi. 5. Harun al-Rashid. |~~

~~] | 6, Amin. 7 Ma’min. 8 Mo’tasim. |~~

~~] | 9. ae 10. Motawakkil. 14, Mohtadi. |~~

~~| 15. Mo‘tamid.~~

~~Mohammed,~~

~~12 Mosta’in, nine ube Sieaean 13. utaee, 16. Mo’tagi~~

~~| 18. Moktadir. 17. Moktafi.~~

~~| | 22. Mostakfi. | 23. Moti’.~~

~~| 19. Kéhir.~~

~~|] Ishak. | 21. Mottaki. 20. hsai, 24, Tai’. 25. Kadir.~~

~~| 26. Kaim. Mohammed Dhakhirat al-Din.~~

~~| 27. Moktadi.~~

~~| 28. Mostazhir. |~~

~~| 29, meerembic. 80. Rashid.~~

~~31. Moktaf, 32. Mostanjid. 33. Mostadi’. 34, Nisin,~~

~~35. Zahir,~~

~~36. vedetacie. 37. toaiisimn:~~

~~Sect, III.—Sxketon or tux INstrrurions anp CIVILIza-~~

~~*TION OF THE EASTERN CALIPHATE.*~~

~~*Mohammed had begun to bestow political unity on Arabia; but he had done still more: he had given her the Koran, as the starting-point and base of the future civilization of Islam. It was for the preservation and the better under- standing of the sacred text that the first believers were led to create grammar and lexicography, and to make col- lections of the poems of their own and former times, those "'witnesses of the meaning of words," as the Arabs call them. To elucidate questions of dogma they created theology. Jurisprudence, in like manner, issued from the Koran, and the historical sciences at first gathered around it. As early as the first century of the Flight, schools were founded in 'Trak, at Basra and at Cufa, in which all the questions to which the study of the Koran gave rise were stated, and answered in different ways. Natural science and mathematics were less directly concerned with the sacred book, and were consequently neglected during the whole period of the Omayyad dynasty. They only began to be cultivated when, under the 'Abbasids, the*~~

~~*fidelity (Bai'a) which they were bound to take, united the temporal and spiritual powers in his own hands. He was at the same time high priest, ruler, and judge. He was compelled, however, by the very extent of the empire to delegate his powers to those agents ('Amil, plural 'Ommal) whom he commissioned to represent him in the provinces, The State revenues, which entered the public treasury (Bait al-mdl), were composed—(1) of the tithe, or tax for the poor (Zakdt), which every Moslem was bound to pay ; (2) of the fifth, raised on all booty taken in war, the rest being divided among the warriors; (3) of the poll-tax (Jizya) and the land-tax (Khardj), which only affected non- Moslem subjects. The Caliph administered the revenues of the State at his own pleasure, applying them to the neces- sities of war, to public works, to the payment of officials, to the support of the poor, and to the distribution of the annual pensions, in which every Moslem had originally a right toshare. The State could possess landed property. Under 'Omar I. we find that the pasture land belonging to the State supported not less than forty thousand camels and horses. To 'Omar I. was due the regulation of the poll-tax by a fixed scale. The rich, whether Christians or Jews, paid four dinars (about thirty-two shillings) yearly ; people of the middle class, two dindrs; the poor, one dinar. Besides this*~~

~~*payment in money, the subject-races had to make contributions in kind, intended for the support of the troops. The land-tax consisted of a general rent in proportion to the extent, character, and fertility of the lands possessed by the conquered.*~~

~~*As the sums produced by these different imposts were The often very considerable, it became necessary, as early ag Diwan.*~~

~~*the Caliphate of 'Omar I, to create a special office, charged with the accounts of their expenditure. Its organization was borrowed by 'Omar from the Persians, and it retained its Persian name of Diwan, a term afterwards applied to all government offices. The Arabs at that time being too illiterate for such employment, the task of keeping the registers of the Diwan was entrusted to Greeks, Copts, and Persians. 'Omar also gave his attention to the apportionment of the individual pensions of the Faithful. Every one received a larger or smaller sum according to the greater or less nearness of his con- nexion with the family, or the tribe, of the Prophet. Thus 'Aisha, who had been the favourite wife of Mohammed, received a yearly pension of twelve thousand dirhems ;1 the other widows of the Prophet only received ten thousand. The Hashimites and Mottalibites, that is, the members of the Prophet's family, also received ten thousand dirhems. The Emigrants and the Defenders, or those citizens of Mecca and Medina who had been the first to embrace Islam, had five thousand dirhems; and that was the sum which 'Omar I. allotted to himself.? For every other Moslem of full age, the pension varied from 4000 to 300 dirhems. We can easily understand what an influence the hope of this pension must have exerted on the conquered races, and how much it must*~~

~~*1 The dirhem was equivalent to one franc.*~~

~~*2 His moderation was not imitated by his successor 'Othman, who made it his principal object to enrich all the members of his own family at the expense of the rest of the Moslems,*~~

~~*Military institu- tions.*~~

~~*Ceremo- nial.*~~

~~*Heredi- tary suc- cession.*~~

~~*Pro- vinces.*~~

~~*Prefects.*~~

~~*590*~~

~~*have contributed to their conversion. On accepting Islam they acquired a right to the pension, besides ceasing to pay the land-tax and the poll-tax.*~~

~~*Even in the earliest days of Islam the Arabs were not entirely devoid of military skill. Many of their tribes had been brought into relations with the Greeks and Persians, and had acquired from them some ideas of the art of war. Thus, in the time of Mohammed, the division of an army into a centre, right and left wings, vanguard and rearguard, was understood, and the art of defend- ing a camp or a city by entrenchments was also known. The Arabs fought on foot, on horseback, and mounted on camels. The arms of the infantry consisted of a spear, a sword, and a shield, and sometimes also of a bow and arrows. The horsemen fought chiefly with the lance. For defensive arms, besides the shield, the Arabs were acquainted with the helmet, the coat of mail, and the cuirass of leather covered with plates of iron, It was not till the period of the Omayyads that they began to employ military engines, such as the balista. The army was divided by tribes; and each tribe had its flag, which consisted of a piece of cloth fastened to a lance. As regards the recruitment of their armies, every man able to carry arms was originally bound to render military service. 'Omar I., to whom Islam owes so many of its institutions, was the first to divide his armies into distinct corps, and to assign to each corps a fixed station. These stations were the province of Cufa, that of Basra, and afterwards the provinces of Emesa, of the Jordan, and of Palestine. These provinces afterwards became military colonies, all the inhabitants of which were bound to render military service, as distinguished from the other provinces, where service was optional, or at all events regulated by the necessities of the moment.*~~

~~*With the accession of Mo'Awiya I. to the supreme power, the mechanism of the State was modified and became more complicated. Mo'swiya endeavoured to copy the cere- monial of foreign courts. He built himself a*~~

~~*palace at Damascus, and set up a throne in the audience-chamber, the door of which was kept by a chamberlain (Héjzb). When he attended the service at the mosque, he occupied a close pew with a grating in front (Makstira). When he left his palace, he was surrounded by a bodyguard (Shorta), commanded bya provost (Sdhib al-Shorta). Lastly, in his own lifetime, he caused his son Yazid to be acknow- ledged as his heir-presumptive, and thus established the principle of hereditary succession, which was opposed to the spirit of Islam, and was the source of every kind of calamity. As regards the administration of the State, Mo'Awiya acted at his own will and pleasure. Thus, in order to secure the services of 'Amr b. al-'As, the conqueror of Egypt, he gave up to him the revenues of that province, a part of which ought to have gone to the State. He also took an important step with regard to the annual pensions of the Faithful, which he reduced by about two and a half per cent. The administration of the public funds in the different provinces was left to their Prefects, who were expected to pay into the public treasury only the surplus of their respective revenues. The empire had been at first divided into ten provinces—1. Syria (subdivided into four Jond, or military districts); 2. Cufa, with Arabian 'Irak and Persian 'Trak; 3. Basra, with Persia, Sijistan, Khorasan, Bahrain, and 'Oman; 4. Armenia; 5. Mecca; 6. Medina; 7. The Indian Marches ; 8. Africa; 9. Egypt; 10. Yemen. Mo'awiya, however, subsequently thought proper to make Khords4n a separate province. Under his successors, and according to the necessities of the moment, it was some- times reunited to the government of 'Irak. In 'Trak itself, Mo'Awiya joined Basra and its dependencies to Cufa.*~~

~~*Under Mo'déwiya the Prefects had the most extensive*~~

~~*civil and military powers. They had even the right of the direct appointment of their Sub-Prefects. Mo'awiya, not- withstanding, thought it advisable to disconnect from their powers the offices of Judge (Addi) and of Religious Official (Imam), which were entrusted to special function- aries named directly by the Caliph. The Caliph was, however, always at liberty to modify these arrangements at his own pleasure. Under the successors of Mo'dwiya,*~~

~~*we find certain Prefects invested at the same time with the dignities of Cadi and Imam.*~~

~~*It was also to Mo'Awiya that the State owed the creation Chan- of a Chancery (Diwan al-akhtam, or Seals-office), in which ecery.*~~

~~*all decrees proceeding from the Caliph were registered ; so that, when once issued, these decrees could not be falsified.*~~

~~*Mo'dwiya also exerted himself to ensure rapidity of com- Posts.*~~

~~*munication throughout the empire, by instituting the courier-post (Barid), in imitation of the post of the Persians and Byzantines.*~~

~~*After Mo'dwiya we must come down to the time of 'Abd al-Melik to meet with any important innovations in Moslem institutions. Before the reign of that Caliph the books of the public offices were kept by Christians and Persians, and drawn up in Greek and Persian. 'Abd al-Melik ordered the exclusive employment of the Arabic language, and substituted Moslems for all the Christian and Persian clerks in the government offices. It was this same Caliph who founded the monetary system of Islam, and who was the first to strike dinars (pieces of gold worth about ten francs), and dirhems (pieces. of silver worth about a franc), with legends in Arabic. The postal system was also very much improved and developed under this prince. 'Abd al-Melik was powerfully seconded by the famous Hajj4j, who was able to re-establish in 'Irak the disputed principle of obligatory military service, and who also succeeded, by skilful management, in raising the condition of agriculture in that province. Walid, the successor of 'Abd al-Melik, especially distinguished himself*~~

~~*Money.*~~

~~*by the foundation of religious institutions. In his reign Religious the mosque of Damascus, half of which had hitherto founda- remained in the hands of the Christians, was appropriated tions.*~~

~~*exclusively to the Moslems, and considerably embellished. Hospitals were also established for lepers, the poor, the blind, and the sick. The pious*~~

~~*'Omar II. devoted all his efforts to the embellishment of the mosque of Damascus. An edict of 'Omar I. had forbidden Moslems to acquire landed property, agriculture being considered an occupa- tion unworthy of a free man. 'This law had fallen into disuse ; but 'Omar II. put it in force again, and declared null and void every purchase of land made by a Moslem subsequently to A.H. 100. The effects of this law might have been fatal to the empire; but it again became obsolete under the Caliphate of Hisham.*~~

~~*At the accession of the 'Abbasids the centre of the Institu- empire was displaced. Damascus fell from the rank of tions*~~

~~*its capital to that of a provincial town ; while Baghdad,*~~

~~*under the "Abba-*~~

~~*a small and unknown village, became the mistress of the gids,'*~~

~~*world. Under the first 'Abbasid the empire—not includ- ing the province of Baghd4d—was divided as follows :— 1. The province of Cufa ; 2. The province of Basra, with the district of the Tigris, Bahrain and 'Oman; 3. Hijaéz and Yamama; 4. Yemen; 5. Ahwaz; 6. Farsistan; 7. Khorasan; 8. The province of Mosul; 9. Mesopotamia, with Armenia and Azerbaijan; 10. Syria; 11. Egypt and the province of Africa (Spain being a dependency of Africa) ; 12. Sind. Al-Safféh afterwards made Palestine a distinct province, and separated Armenia and Azerbaijan from Mesopotamia. Still later, Hartin al-Rashid created a new province to the north of Syria, which received the name of "Awasim. Each newly-conquered province was always united to that one of the older provinces to which it was nearest.*~~

~~*Prime Minister.*~~

~~*Adininis- trative services.*~~

~~*Organi- zation of the State.*~~

~~*Caliph.*~~

~~*INSTITUTIONS. |*~~

~~*Simultaneously with the accession of the 'Abbasids, Persian influence began to preponderate. The Persian, Khalid b. Barmak, was entrusted with the administration of the finances (Diwan al-Khardj) by As-Saffih, who was also the first Caliph who transferred the burden of public affairs from himself to a Prime Minister (Wazir, whence, in European languages, the term Vizier). The title of Wazir was unknown to the Omayyads. The office of Prime Minister was of Persian origin. It existed till the time of the Caliph Radi, when that of Amir al-Omara was substituted for it. When the Caliphs had fallen under the tutelage of the Buyids, it was the latter who chose Viziers, leaving to the Caliphs only Secretaries (Rayis al-Ruwasd). Under the Seljuk Sultans the Caliphs were again permitted to choose their own Viziers.*~~

~~*The institution of the office of Vizier was not the least among the causes of the decadence of the Eastern Caliphate. The 'Abbasids gradually became unaccustomed to the exercise of power and the management of affairs, and thus lost all direct influence over their subjects. Besides the Minister of Finance and the Vizier, the 'Abbasids created another important office, that of Postmaster-General (Sahib al-Barid), whose duty it was to collect at a central office all the information which arrived from the provinces, and to transmit it to the Prime Minister. Thus the adminis- trative services were greatly extended under the 'Abbasids. They were subdivided as follows:— 1l. Diwdn al-Khardj, or Ministry of Finance; 2. Diwan al-Diyd, or Bureau of State property; 3. Déiwdn al-Zimdm, Registry Office or Exchequer Office ; 4. Déiwdn al-Jond, or Ministry of War ; 5. Nazar al-Mazdlim, or Court of Appeal; 6. Déwén al- Mawiélt wal-Ghilmdn, or Bureau of the freedmen and slaves of the Caliphs; 7. Diwdn Zimdm al-Nafakdt, or Office of Expenditure ; 8. Diwdn al-Barid, or Office of the Posts ; 9. Diwén al-Rasdil, or Office of Correspondence; 10. Diwin al-Taukt, or Office of the Imperial Seal, and of the registration of official documents. There were also offices for the despatch and reception of official documents, and for the inspection of weights and measures.*~~

~~*We cannot better conclude this brief summary of the institutions of the Caliphate than by giving a sketch of the organization of the State, according to the Moslem authors themselves.*~~

~~*The supreme chief received the title of Caliph, or of Commander of the Faithful (Amir al-Mo'minin). He united in his own person all the powers of the State; his Ministers and all public functionaries acted only by virtue*~~

~~*of a commission from him. They, like all other Moslems,*~~

~~*Minis- ters.*~~

~~*were at the mercy of the Caliph, who had power of life and death over them. As spiritual chief, the Caliph was also the supreme judge in questions of dogma. In theory he held his powers by the free choice of the majority of Moslems ; but, when he had once received their oath of allegiance, he became their absolute master. The first condition of eligibility to the Caliphate was to belong to the tribe of Koraish. In Moslem belief, the subjects of the Caliph owed him obedience and aid so long as he should fulfil his duties with exactness. These consisted in maintaining the principles of religion, in administering justice scrupulously, in defending the territory and assur- ing its safety, in carrying on war for the subjugation of the infidels, and in spending the public revenue in conformity to the law. If the Caliph failed in the performance of his duty, rebellion against him became lawful.*~~

~~*The Ministers might be absolute or dependent. If dependent, they simply executed the orders of their sovereign. If absolute, they took his place, and exercised all the powers of a Caliph except that they could not, at least in theory, designate any successor to the reigning*~~

~~*MOHAMM™MEDANISM*~~

~~*before the Cadi.*~~

~~Caliph. It was only to the Caliph himself that they were responsible for their actions.~~

~~The Prefects, when once appointed, whether by the Prefects.~~

~~Caliph or the Vizier, became so many petty sovereigns, and, legally, owed an account of their actions only to the Caliph, or to his Prime Minister, when the latter was absolute.~~

~~The Generals were appointed either by the Caliph or by Gene- the Vizier, or lastly by the Prefect, when only a local war Tals.~~

~~was in question. They were sometimes invested with very extensive powers, such as those of concluding treaties of peace, of administering justice, and of dividing the booty. The General, in his turn, appointed the officers (Nakibs) and under-officers ('Aréfs). It was a general order that infidels, before hostilities against them were opened, should be summoned to embrace the faith, or to submit by capitulation. The conversion of infidels was valid, even when effected sword in hand, on the field of battle, and the new convert became inviolable in person and property. On the other hand, every infidel taken prisoner was sold as a slave, with his wife and children. He might even be put to death. Apostates were never to be spared; they were put to death, and their property confiscated.~~

~~Justice was administered by Cadis, appointed either by Cadis.~~

~~the Caliph, by the Vizier, or by the Prefect. To be eligible as a Cadi (Kadi), it was requisite that a man should be—l. A male and of respectable age; 2. In full pos- session of his mental and physical faculties; 3. A free man; 4. A Moslem; 5. Of good moral character ; 6. Acquainted with the principles of the law and their application. The duties of the Cadi were to examine into the disputes and lawsuits brought before him ; to enforce the execution of his judgments; to name judicial councils for the administration of the goods of minors, madmen, etc.; to administer the mortmain property of mosques and schools (wakf, plural wokdf) ; to watch over the execution of wills; to~~

~~*inflict due legal penalties on those guilty of crimes or misdemeanours ;! and to inspect the highways and public buildings. When any locality possessed no Imam, or public officiator at the mosque, it was the Cadi who performed this duty. The assistants of the Cadi were Notaries (Shohid), Secretaries (Omand), and Deputies (Ndyibin). If the Cadi died, his subordinates lost their offices aso facto. On the other hand, the death of a Caliph did not nullify the powers of the Cadi; but it was necessary that he should be confirmed by the new sove- reign.*~~

~~*The Court of Appeal (Nazar al-Mazdlim) was instituted Court of to take cognizance of those causes in which the parties Appeal.*~~

~~*concerned appealed from the judgment of the Cadi. The sittings of this court were presided over by the Caliph in person. It was established by the Omayyad 'Abd al-Melik. The last Caliph who sat in public to examine appeal cases was Mohtadi. After him a special judge was appointed to the function of president of the Court of Appeal.*~~

~~*Besides the Judges there were Inspectors (Afohtaszb), Inspec- charged with the police of the markets and the care of tors.*~~

~~*morals. The Mohtasib's duty was to take care that weights and measures were not falsified, and that buyers were not deceived as to the quality of the goods sold. He had the power of inflicting summary punishment on delin- quents, but only in the case of flagrant offences. If the person charged denied the facts, he was to be brought As regards morals, the Mohtasib took care that widows and divorced women should not remarry before the expiration of the legal period prescribed by the*~~

~~*1 The principal offences were—apostasy, neglect of religious duties,*~~

~~*refusal to pay taxes, theft, adultery, outrages, and murder. The penalties were imprisonment, fines, corporal punishment, and death.*~~

~~*Koran. Slaves and beasts of burden were placed under | free-will in man. The Koran speaks only of paradise and*~~

~~his guardianship, and he protected them from ill-treatment | hell; Wasil admitted a purgatory. The sect founded by~~

~~on the part of their masters. The Mohtasib was also | Wasil received the name of Mo'tazilite (dissident), or Mo'tazi-~~

~~commissioned to prevent public scandals, such as the sale | Kadarite, that is to say, which recognizes in man a power lites.~~

~~of wine; to forbid Christians and Jews from building | (Kadar) over his own actions. Another sect, that of the~~

~~houses higher than those of the Faithful ; and to enforce | Jabarites (Partisans of constraint) agreed with the Mo'tazi- Jaba-~~

~~their wearing on their dress a distinctive mark (Ghiydr). | lites on the question of the attributes, but were diametri- rites. Besides the offices already described, there existed three | cally opposed to them on that of free-will, The Jabarites~~

~~others which require mention—those of the Marshals of the Nobility (Wekdbat al-Ashraf), of the Imams, and of the Emirs of the Pilgrimage.~~

~~Marshal The Marshals of the Nobility were appointed in the~~

~~ofthe different provinces either by the Caliph, by his represent-~~

~~Nobility. stives, or by the Grand Marshal. Their functions were to superintend the descendants of the family of the Prophet, who formed the nobility of Islam, and to keep a register of all the births and deaths which occurred in the families of the members of this nobility. In every pro- vince there were two Marshals, one for the family of 'Alf, the other for the 'Abbasids.~~

~~Imam. The duty of the Im4m was to recite the public prayers in the mosque. He was appointed by the Caliph or his representatives, and chose in his turn his Mo'edhdhans, who called the Faithful to prayer from the tops of~~

~~*the minarets. In the Friday prayers it was the duty of the Imam to invoke publicly the blessings of Heaven on the reigning Caliph.*~~

~~*Leaderof The leadership of the yearly pilgrimage to the temple*~~

~~*the Hajj. of Mecca was considered a great honour. It was almost always the Caliph himself or one of his near relatives who assumed the function of Amir al-Hajj. The duties of this leader of the pilgrimage were—1. To escort the pilgrims in safety on their journeys to Mecca and back ; 2. To direct the religious ceremonies during the sojourn of the pilgrims at the Holy City.*~~

~~*Such, briefly stated, was the organization of the Moslem State. Let us now say a few words on its religion.*~~

~~*Religion. We need not now recur to the subject of the doctrines of Mohammed, which are treated of in their own place ; but it is important to show what they became after the time of the Prophet, and what movements they aroused in Islam. The diversity of the conquered races was of itself sufficient to introduce, in the course of ages, serious modifications of the earlier religion.*~~

~~*But, from the very first, the Koran contained within itself the germs of discord. As long as men were content to adopt its teachings without discussion, orthodoxy might boast of maintaining itself unbroken. But as soon as they sought to examine deeply into its meaning, difficulties arose, which necessarily led the strongest minds into doubt and uncertainty. In particular, the conception of God, predestination, and free-will, as presented by the Koran, could not bear examination. As early as the first century of the Flight a theological school was founded at Basra, the most renowned master of which, Hasan al-*~~

~~*Critical Basrf, introduced the critical study of dogmas. His dis-*~~

~~*study of ciples, who were for the most part Persians, could not fail*~~

~~*dogma. soon to discover that the Koran often contradicted itself, and especially that it left many dogmatic difficulties unre- solved. One of the disciples of Hasan, Wasil b. 'Ata, set forth his scruples publicly, departing*~~

~~*on three points from the orthodox doctrine. The Koran affirms the attributes of God; Wasil b. "Ata denied them ; because, he says, if the attributes of God are eternal, they constitute in some sort so many deities. We ought not therefore to affirm the existence of an attribute—that of justice, for example—but simply to affirm that God is essentially just. The Koran admits the doctrine of predestination; Wasil rejected it, as incompatible with the theory of rewards and punishments in another life, which presumes absolute*~~

~~*denied to man the slightest share in his own actions, and believed the very smallest actions of men to be the effect of predestination. The Koran, not concerning itself with the contradiction involved, admits at the same time the responsibility of man and the absolute predestination of his actions. The Jabarites rejected all responsibility, and believed that man is predestined from all eternity to para- dise or to hell, for no other reason than that God has so*~~

~~*willed it. A third sect, that of the Sifatites (Partisans of Sifatites.*~~

~~*the Attributes), contended energetically against the two former. Keeping to the text of the sacred book, they alleged, for example, that when it is said in the Koran that God is seated on his throne, the expression must be taken literally. They thus fell into the grossest anthropo- morphism, a doctrine which was very far from the ideas of Mohammed. In the face of these heterodox sects, the orthodox made but a poor figure. Rejecting, in their commentaries on the Koran, the explanations alike of the Mo''tazilites, of the Jabarites, and of the Sifatites, but acknowledging their inability to refute them systemati- cally, they merely opposed to them a declaration that the Koran was neither to be explained allegorically nor always taken literally ; and they concluded that, where two con- tradictory expressions could not be reconciled, a mystery must be admitted to exist, which it would be vain to attempt to fathom. But they did not always keep within the limits of discussion. Under the reign of 'Abd al- Melik they succeeded in bringing about a persecution of the sectaries.*~~

~~*The Mo'tazilites, the Jabarites, and the Sifatites were dangerous only to the Church. Other sects arose, which put the State itself in peril. It will be remembered that, at the time of the dispute between "Ali and Mo'dwiya, twelve thousand of the partisans of the former deserted*~~

~~*him. ‘These revolters, or Kharijites, originated one of the Khari- most formidable sects which ever existed in Islam. The Jites.*~~

~~*Kharijites rejected in principle the Caliphate and the Imamate. At all events, they did not acknowledge the exclusive right of the Koraish to the Caliphate, but declared that, if it was absolutely necessary to elect a Caliph, his origin was of little consequence, provided he fulfilled his duties conscientiously and exactly. We have seen for what a length of time they kept the Omayyads in check, When they had been put down in Asia, they passed into Africa, and there made numerous proselytes among the Berbers, disposed as these were, by their independent character, to adopt with enthusiasm the principle of anarchy. The most terrible, however, of the militant sects which were formed in the bosom of Islam*~~

~~*was that of the Shf‘ites. Originally the Shf‘ites were Shi’ites.*~~

~~*simply the partisans of ‘Alf and of his descendants. In the course of time, when the whole of Persia had adopted the cause of the family of ‘Alf, Shf{‘ism became the recep- tacle of all the religious ideas of the Persians, and Dualism, Gnosticism, and Manicheism, were to be seen reflected in it. Even in the lifetime of ‘Alf, a converted Jew, named ‘Abdallah b. Sabd, had striven to introduce foreign elements into Islam. Thus, he alleged that ‘Alf was to be adored as an incarnation of the Deity. These ideas, though rejected with horror by ‘Alf himself, and by the greater part of the first Shi‘ites, gradually made way ; and all the direct descendants of ‘Alf became veritable deities in*~~

~~*SECTS.*~~ |

~~*the eyes of their respective partisans. interpretation.*~~

~~*Ismailian sect.*~~

~~*Under the ‘Abbasids it seemed for a moment that the*~~

~~*Shfite doctrines were about to triumph. We know, in*~~

~~*fact, that the founder of that dynasty gave himself out as*~~

~~*the heir of the house of ‘Ali. But reasons of State prevailed, and the ‘Abbasids, false to their first professions, on the whole supported orthodoxy. Under their reign were established the four orthodox sects — Malikite, Hanafite, Shafiite, and Hanbalite, which even at this day divide between them the whole Moslem world. They are named after their founders — Malik, Abu Hanifa, Shafi, and Ibn Hanbal. These sects only differ from each other on a few points of civil and religious jurisprudence. They agree on questions of dogma. It was not, however, without difficulty that orthodoxy succeeded in obtaining the victory. Under Ma’mun and other Caliphs several doctors, as we have seen, were persecuted for believing that the Koran was. the uncreated word of God. From the time of Motawakkil, however, orthodoxy regained the upper hand. Still, this reaction would not have lasted long, in face of the advance in science which marked the accession of Ma’mtn to power, if the orthodox had had no other defensive weapons than material force and the assent of the majority. As philosophy made its way in Islam, thanks to the translations from Greek authors, which were made principally during the Caliphate of Ma’mun, it called forth in men’s minds a movement of scientific curiosity which might have been fatal to orthodoxy. In the tenth century of our era a society of encyclopedists was formed at Basra, who, under the name of Ikhwan al-Safa, or Brothers of Purity, put forth a number of very curious treatises, in which all sorts of physical and metaphysical questions were discussed and resolved in a scientific manner.!_ There is no doubt that these lucid and attractive writings would have led to a great religious revolution, if the orthodox had not understood the danger of their position, and applied themselves also to the study of philosophy, for the pur- pose of employing it in the service of the faith. It was thus that, towards the middle of the tenth century, a certain Abu ’l-Hasan al-Ash‘arf, a descendant of that Abi Mus4 al-Ash‘arf who had formerly acted the part of arbitrator in the dispute between Mo‘awiya and ‘Alf, struck out a system in which religion appeared to be reconciled with philosophy; a system which was natur- ally sure to attract all commonplace minds—that is to say, the greater number. Ash‘arism, or philosophic theology (Kalam), was adopted with enthusiasm by the triumphant orthodox doctors, and thenceforth pure philosophy and the heterodox sects ceased to extend their influence.2*~~

~~*The creation, however, of this philosophical theology had not done away with all dangers for orthodoxy. We have seen above that the Shi'a were divided into several sects, each holding for one of the direct descendants of 'Alf, and paying him the reverence due to adeity. One of these sects, called the Ismailian, because it acknowledged Isma'il, the seventh Im4m or Pontiff of the posterity of 'Alf, as its chief, was the source of the greatest disorders in the Moslem empire, and was not far from being triumphant in Asia, as it was for a long time in Egypt.*~~

~~*ili- The Ismailians, like all the other Shitites, believed in the*~~

~~*1 The most important have been translated into German by Prof. Dieterici.*~~

- ~~*See Houtsma, De Strijd over het dogma in den Islém tot op el- Ash'art ; and Spitta, Zur Geschichte Abu 'l- Hasan al-ASs'arvs.*~~

~~*MOHAMMEDANISM*~~

~~*A further distinc- tion between the Shfites and other sects is, that they introduced the practice of giving the Koran an allegorical This system permitted them to see in the sacred book whatever meaning they chose, and was carried out at a later date, as we shall see, by the founder of the*~~

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~~*coming of a Messiah, whom they called the Mahdi, and who, according to them, was one day to appear on earth, in order to establish the reign of justice and equity, and to take vengeance on the oppressors of the family of 'All. They also believed in a God of far more elevated character than the God of the Koran, one who was unapproachable by human reason, and who had created the universe, not directly, but by the intermediate action of a sublime being, the Universal Reason, produced by an act of God's will. The Universal Reason, in its turn, had produced the Universal Soul, which, on its part, had given birth to primitive Matter, to Space, and to Time. These five principles were the causes of the universe. Man, emanating from them, had a tendency to reascend towards his source. The chief end of his being was to attain to perfect union with the Universal Reason.3 But, left to himself, man would have been powerless to attain this end. The Universal*~~

~~*Reason and the Universal Soul therefore became incarnate among men, in order to guide them towards the light. These incarnations were no other than the prophets in all ages, and, in the last period, the Iméms of the posterity of 'Alf, In the second half of the ninth century, a Persian, born in Susiana and named 'Abdall4h b. Maimun al-Kaddah, nourished the dream of destroying Islam, and thought these doctrines, suitably modified, likely to be highly useful in carrying out his purpose. He devised a system at once religious, philosophical, political, and social, in which, as he thought, all beliefs were to meet and mingle, but—and in this consisted its originality—a system so graduated to suit different degrees of intelligence, that the whole world should become one vast Masonic association. The chief of the Ismailians, the Imam Isma'il, having died, 'Abdallah asserted that his son Mohammed b. Isma'il was to succeed him as the founder of this new religion, which it was 'Abdallah's mission to announce to the world. Since the creation of the world, as 'Abdallah asserted, there had been six religious periods, each marked by an incarnation of the Universal Reason in the person of a prophet. Adam, Noah, Abraham, Moses, Jesus, and Mohammed had been the prophets of these periods. Their mission had been to invite men to accept more and more perfect forms of religion. The seventh and last religion, and the most perfect of all, was that of Mohammed b. Isma'il, the true Messiah. The Ismailians, as may be imagined, readily embraced the theories of 'Abdallah. In addressing other sects and religions, "Abdallih used special arguments with each. With the philosophers he dwelt on the philosophical principles of his doctrine. The conversion of Christians, Moslems, or Jews, was a more difficult task. 'Abdallah had established several degrees of initia- tion, and it was only by slow degrees, and with the most minute precautions, that he gained a mastery over the mind of the future proselyte. His curiosity was first aroused by allegorical interpretations of the Old Testament, the Gospels, and the Koran, and by proposing to him reli- gious problems which could not be solved by any of the existing religions. The solution of these problems was not to be given to him till he should have signed a compact, and sworn never to reveal the mysteries with which he was made acquainted. If he took this pledge, he thence- forward belonged, body and soul, to the sect ; and woe to him if he made any attempt to withdraw himself from the authority of his chiefs! The compact signed, the newly- initiated disciple had to make a*~~

~~certain payment, which went to swell the treasury of the sect. The secret society~~

~~3 It need hardly be said that all these doctrines were borrowed from Gnosticism and from Neo-Platonism. See on the Ismailian sect Guyard, Fragments relatifs a la doctrine des Ismaéliens, and Un grand- maitre des Assassins au temps de Saladin.~~

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~~founded by 'Abdallah soon had a great number of mem- bers, and its missionaries spread themselves over the Moslem world. Towards 887 a.p. an Ismailian, Hamdan, surnamed Karmat, founded the branch sect of the Carma- thians, whose exploits have been recorded above. The Ismailian preachers also made numerous proselytes in Africa and in Egypt; and in a.p. 909, 'Obaid Allah, a descendant of the founder of the sect, but who passed as a member of the family of 'Ali, founded the Fatimite dynasty.~~

~~MOHAMMEDANISM~~

~~[LAW.~~

~~astically embraced by those who wished to give themselves up undisturbed to philosophical speculation. Thus, under the colour of Sufism, opinions entirely subversive of the faith of Islam were professed. In its first form Sufism was quite compatible with Moslem dogma. It was satis- fied to profess a contempt for life, and an exclusive love of God, and to extol ascetic practices, as the fittest means of procuring those states of ecstasy during which the soul was supposed to contemplate the Supreme Being face to face.~~

~~réti: Under the Fatimite Caliph Hakim, a new religion sprang | But by degrees, thanks to the adepts whom it drew from mites. out of Ismailism, that of the Druses, so called from its | the ranks of heterodoxy, Sufism departed from its original inventor, a certain Darazi or Dorzi. This religion differs | purpose, and entered on discussions respecting the Divine little~~

~~*from Ismailism, except that it introduces the dogma of | nature, which in some cases finally led to Pantheism. the incarnation of God himself on earth, under the form of | The principal argument of these Pantheistic Sufis was that the Caliph Hakim. This heresy did not survive the reign of | God being one, the creation must make a part of his Hakim in Egypt. When the Fatimite Caliph Mostansir | being; since otherwise it would exist externally to him, ascended the throne, he re-established the Ismailian belief ; | and would form a principle distinct from him; which and the Druses, driven from Egypt, took refuge in the | would be equivalent to looking on the universe as a deity Lebanon, where they still exist. As for the Egyptian | opposed to God. In the reign of Moktadir, a Persian Sufi Ismailians, they disappeared at the time of the conquest | named Hallaj, who taught publicly that every man is God, of that province by the pious and orthodox Ayyubite | was tortured and put to death. After this the Suffs showed Saladin. This, however, was not a final deliverance of | more caution, and veiled their teachings under oratorical Islam from that formidable heresy. A hundred years | phrases. Moreover, it was not all the Sufis who pushed before the return of Egypt to orthodoxy, a Persian named | logical results so far as to assert that man is God. They Hasan Sabbah, who had been initiated into Ismailism maintained that God is all, but not that all is God. Sufism at Cairo, in the household of the Caliph Mostansgir, had | exists in Persia even in our own day. founded at Alamut, on the southern shores of the Caspian It has been explained that, under the 'Abbasids, four Law. Sea, that Persian branch of the Ismailians known to all | orthodox sects were established, and that these sects Assas- the world under the name of the Assassins,! who held in | differed among themselves principally with regard to juris- sins. check the most powerful princes of Islam, till they were | prudence. The law of Islam is one of its most original destroyed by the Mongol invasion. From Persia, Hasan | creations, and can only be compared in history with the Sabbah succeeded in filling Syria with his Assassins, and | development of Roman law. The laws laid down by every one knows the part they played during the Crusades. Mohammed in the Koran might suffice for the Arabs as The Assassins of Syria have never entirely disappeared. | long as they were confined within the bounds of their Even at this day some are to be found in the Lebanon. | peninsula, When their empire was extended beyond these There are also some representatives of the sect in Persia, | limits, it was inevitable that this first code should*~~

~~*become in India, and even in Zanzibar ; but since the 13th century | insufficient for their wants. As early as the time of the they have become completely inoffensive. first four Caliphs it was necessary, in giving judgment To conclude this sketch of the development of religious | on the new cases which presented themselves, to have re- beliefs, it remains to say a few words on one of the most | course to analogy, and to draw inspiration from decisions remarkable manifestations of Islam—its mysticism, or | given by Mohammed, but not recorded in the Koran. The Stifism. Sufism. In principle, mysticism is rather a mode of | first fountains, therefore, of law were, besides the sacred*~~

~~*practising religion than a distinct religion ; it depends on the character of the believer's mind, and adapts itself to all dogmas.? It is the especial tendency of tender and dreamy spirits. Thus among the Moslems it is a woman who is considered to have founded mysticism. This woman, named Rabi'a, lived in the first century of the Hijra, and was buried at Jerusalem. Her doctrine was simply the theory of Divine love. She taught that God must be loved above all things, because he alone is worthy of love ; and that everything here below must be sacrificed in the hope of one day attaining to union with God. These views were too similar to the Neo-Platonic ideas respecting the union of the human intellect with the Universal Reason not to have an attraction for the Gnostics, who abounded in the Shf'ite sects. Mysticism therefore made great pro- gress in Persia, and assumed the character of a sect towards the year 200 of the Flight. A certain Abu Sa'id b. Abi'l- Khair was the first who advised his disciples to forsake the world and embrace a monastic life, in order to devote themselves exclusively to meditation and contemplation ; a practice which may very probably have been borrowed from India. The disciples of Abu Sa'id wore a garment of wool (Sif), whence they received the name of Sufis. Sufism spread more and more in Persia, and was enthusi-*~~

~~*book, the traditions of Mohammed, or Hadith, the collective The | body of which constitutes the Swnna, or custom. These Hada traditions were for a long time preserved only in the memory of the companions of Mohammed, and of those to whom they had been orally communicated. But at the beginning of the second century of the Flight the need*~~

~~was felt of fixing tradition in writing; and it was at Medina that the first collection of them was made, It~~

~~was due to the jurisconsult Malik b. Anas. He rejected Malik from his collection with the greatest care all traditions ™4 fe which appeared doubtful, and only preserved about seven- ae teen hundred, which he arranged in the order of their subjects. To this collection he gave the name of J/owatta,~~

~~or Beaten Path.? After him came the celebrated Bokhart, the compiler of the Sahth,* in which he brought together about seven thousand traditions, carefully chosen. The Sahih has continued to be the standard work on the subject~~

~~of tradition.~~

~~The traditions did not always supply the means of deciding difficult causes, The first four Caliphs were often obliged to have recourse to their own judgment in the administration of justice. Their decisions (‘Athdr) The were also collected at Medina, and helped to swell the Athir store of juridical matter. 1 From Hashishin, or eaters of [Zashish—that is, Cannabis Indica. 2 See Guyard, “‘Abd ar-Razzak et son traité de la prédestination et~~

~~du libre arbitre,” Journ. asiat., Feb.-Mar, 1873 ; Dozy, Het Islamisme, 2d ed. 1880.~~

~~3 Published at Tunis, in India, and at Cairo, a.H. 1280, with the commentary of Zarkani. 4 Krehl’s edition (Leyden) is still unfinished.~~

~~An edition, fully vocalised, in 8 vols., appeared at Bulak, a.H. 1296.~~

~~School of ‘Trak.~~

~~LITERATURE. |~~

~~In ‘Trak another school of law was formed, which is distinguished from that of Medina by a greater degree of independence. While the lawyers of Medina held strictly to the Koran, the traditions of the Prophet, and the~~

~~*'Athar, those of 'Irak admitted, in addition to these, the deductive or analogical method (Kiyds), according to which it was lawful to create precedents, provided there was no departure from the spirit of the sacred book, from the traditions of the Prophet, or from the corresponding decisions of the first four Oaliphs. Ibn Abf Laila, who filled the office of judge in 'Ir4k under the caliphate of Mansur, was one of the first to apply this system. His renown, however, was eclipsed by that of his con- temporary Abi Hanifa, who worked out a complete system of jurisprudence, with which his name has continued to be connected (Hanifite law). Fifty years after the death of Abt Hanffa, Shafi, a pupil of Malik, appeared at Baghdad, and founded in his turn an intermediate system, in which he endeavoured to hold an equal balance be- tween the purely traditional and the deductive methods. The fourth system reputed orthodox is that of Ibn Hanbal, a pupil of Shafi'i, Ibn Hanbal strove above all things to bring back religious observances to their primitive purity. His doctrine was a kind of puritanism. As may be sup- posed, each of these systems has been subsequently deve- loped and commented on in a multitude of works, even the names of which it is impossible to enumerate. In order, however, to give some idea of what a Moslem treatise on jurisprudence is, we shall point out the principal subjects contained in it. It treats successively—Il. Of Purification (ablutions commanded by the law, purification of women, circumcision, etc.) ; 2. Of Prayer as commanded by the law; 3. Of Funerals; 4. Of Tithe and Almsgiving ; 5. Of the legal Fast; 6. Of the Pilgrimage to Mecca ak Of Commercial and other transactions ; 8. Of Inheritance p 9. Of Marriage and Divorce; 10. Of the Faith; 11. Of Crimes and Misdemeanours; 12. Of Justice ; 13. Of the Imdmate or spiritual power, and of the Caliphate or tem- poral power. It is thus a complete code, religious, civil, penal, and governmental, that Moslem treatises on juris- prudence set before us ; a code which embraces and foresees all the circumstances both of public and private life.*~~

~~*The development of science and literature runs parallel with the development of law. Before the time of Mohammed the Arabs had been distinguished only by a rare poetical talent. Islam was the signal for the springing up of all the sciences and of literature. While the study of the dogmas and ordinances of the Koran was producing theology and jurisprudence, the necessity of preserving the exact text of the sacred book,*~~

~~*and of teaching the new converts the language of the Prophet, was giving birth to grammar and lexicography. The first school of grammar was established at Basra. The first attempts at grammar are generally attributed to a certain Abt ’l-Aswad al-Do’ali, who was tutor to the children of Ziyad, the brother of Mo‘dwiya. According, however, to some authors, the honour of having discovered the first elements of grammar ought to be attributed to a Persian, named ‘Abd al-Rahmdn b. Hormiuz. Be this as it may, a foreign influence must be recognized at the very commencement of this science. The vowel marks, for instance, were imitated from those of the Syriac. The division of the parts of speech into nouns, verbs, and particles was indirectly borrowed from Greek grammar. Yet the Moslems, once in possession of the principles of grammar, knew how to develop and apply them in an admirable manner. A_ perfect galaxy of grammarians arose in the track of Abt ’l-Aswad ; a rival school to that of Basra was established at Cufa, and grammar attained its highest degree of perfection under the first ‘Abbasids Z*~~

~~*as is shown by the voluminous treatise of Stbawaihi, known under the name of Xitdb,) or the Book par excellence.*~~

~~*In lexicography, the Arabs were at first content to ex- Lexico- plain the rarer words of the Koran, of the traditions, and staphy.*~~

~~*of the ancient poems ; and to collect lists of terms applying to the same object, as the camel, the horse, the sword, etc. Thus small collections were formed, which served afterwards for the composition of dictionaries. The first dictionary properly so called, composed in Arabic, appears to have been the Kttdb al-Ain of Khalil b. Ahmed al-Fardhidi, a contemporary of Harin al-Rashid. After him came J auhari, whose Sahdh may still be consulted with profit. The cele- brated Zamakhshari composed a dictionary of metaphors under the title of Asds al-Baldgha. Lastly, Tha*‘alibi, in the 11th century of our era, drew up his Likh al-Logha,? a work specially devoted to synonyms. The accessory branches of philology gave occasion to some important works, The ancient poems and proverbs were collected and*~~

~~commented on. Thus Abii Tammém formed his Antho- logy, called Hamdsa (q.v.), and Maidani his collection of proverbs (Kitdb amthdl al-'Arab). with special regard to its~~

~~the conception of prosody. He wrote the first treatise on that science, which served as a model to all subsequent writers on metre.* Pure literature remained confined to poetry. It was not that the Arabs were without any conception of the romance, the tale, or the novel. The adventures of Antar, the romances of Dhi 'l-Himma and of Saff al-Yazan, the Thousand and one N ights, and various collections of stories and novels, such as the Faraj ba'da "l-Shidda and the compilation of Bika', well known by the extracts which Kosegarten has given in his Chres- tomathy ;—all these show clearly that the Arabs were not devoid of imagination, at least if, as we believe, these tales and romances were not pure and simple imitations from the Persian. It must be acknowledged, however, that these few productions do not, any more than the Makdmdt of Hamadhant and of Hariri, constitute a very important literature. The drama, the epic, the romance of character, were absolutely unknown to the Arabs, Poetry, on the other hand, an endowment of the ancient Arabs, continued to live and flourish as long as the Eastern Caliphate lasted. We may count poets by the hundred, eminent in every department of that art: in descriptive, erotic, martial, and philosophic poetry; in odes, in satires, etc. The great collection entitled Kitdb al-Aghdni,> compiled by Isfahani, contains a choice of the finest poems, accompanied by very instructive notices of the poets, and of the circumstances under which they composed such and such pieces. Besides this, many Diwans, or complete editions of the works of poets, have come down to us. They bear the celebrated names of Nabigha, of 'Antara, of Tarafa, of Zohair, of 'Alkama, of Amraalkais, of Shanfara, of Labfd, in the pre- Islamic period (see Mo'arnaKdr); of Jarfr, Akhtal, and Farazdak,° in the Omayyad period ; and of Abi NowAs,? Abu '1-'Atéhiya, Moslim,? MoranaBsr' (q.v.), and Abt '1- 'Ala,® in the period of the 'Abbasids. And this list con- tains only the most illustrious names.~~

~~The first part of which has just been published by H. Derenbourg (Paris, 1882). 2 Published by Roshaid Dahdah.~~

~~3 Translated by Freytag (Bonn, 1838-43), with the Arabic text of the proverbs. 4 See Freytag, Arabische Verskunst.~~

~~° Published at Bulak, a.w. 1285 (20 vols.) See also Kosegarten, Ali Ispahanensis liber cantilenarum, tom. i. Greifswald, 1840.~~

~~8 See Caussin de Perceval in the Journal astatique, 2d ser., vols. X11. X1lv.~~

~~7 See Ahlwardt, Die Weingedichte des Abu Nuwas (Greifswald, 1861), and, for a Cairo edition, Z. D. M. G., xxi. 674.~~

~~8 Edited by De Goeje.~~

~~9 See Rieu, De Abul-Ale vita et carminibus, and Kremer in Z. D, M, G., xxix., xxx., xxxi.~~

~~The study of poetry, Poetry rhythm, led Khal{l b. Ahmed, and ro- already mentioned as a grammiarian and lexicographer, to ™#2°*~~

~~Transla- tions from the Greek.~~

~~History and geo- graphy.~~

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~~With the accession of the 'Abbasids to power, Moslem culture entered on a path fruitful im scientific progress. The second Caliph of that family, Mansur, was surrounded by Syrian Christians of great learning, and equally well acquainted with the Greek, Syriac, and Arabic languages, and took advantage of their abilities to have a number of foreign books translated into Arabic. Thanks to him, the writings of Aristotle, Ptolemy, and Euclid spread a taste for science among the Moslems. The Caliph Ma'mun was one of those who most encouraged translations from the Greek. In this way the Moslems became acquainted with the most important productions of the ancient world. Plato, the works of the Alexandrian school, those of Hip- pocrates, Dioscorides, and Galen, were familiar to them. Through the Persians many Indian writings also became accessible to them, such as the fables of Bidpai,! and certain treatises on astronomy and~~

~~algebra. The study of philo- sophy in all its branches was at one time in fashion, and, to appreciate the success with which it was cultivated in Islam, we need only recall the great names of Al-Kindi, AlL-Farabi, Ibn Sind (Avicenna), Ibn Bajé (Avempace), and Ibn Roshd (Averroes), whose scientific teaching swayed the Middle Ages, and led to the revival of learning in the West.~~

~~In history and geography the Moslems distinguished themselves. The taste for history had been developed among them. by the necessity of collecting all traditions relating to the Prophet, and by that of preserving their own genealogies. The study of geography was a result of their conquests. One of their most ancient historical productions was the biography of Mohammed, composed by Mohammed b. Ishak under the caliphate of Mansur. Wakidt, another author of the 8th century of our era, compiled a history of the first Moslem conquests. At a later period, Baladhori wrote on the same subject his Kitdb Lotdh al-Boldén.? General history also soon became a subject of study, and, in the 9th century after Christ, Ibn Kotaiba compiled his Kitdb al-Ma'drif,3 a treatise on universal history. In the 10th century two great historians flourished, Tabari and Mas'udi, by the first of whom we have a very extensive chronicle,t and by the second a general history, entitled Morij al-Dhahab (see Mas'Upi). After them came a perfect galaxy of well-known historians and biographers, such as Hamza of Isfahan, Ibn al-Tiktaka, Nowairi, Makrizi, Abu '|-Fidd, Abu 'l-Faraj, Al-Makin, Ibn al-Athir, Soyuti, and Ibn Khaldun,5 not to speak of many others who compiled local chronicles and histories, such as those of Mecca, Medina, Damascus, and Baghdad. As biographers, Nawawi and Ibn Khallikan © are celebrated. The history of physicians and philosophers, by Ibn Abi Osaibiya, deserves to be placed in the first rank, side by side with the history of religions and sects by Shahrastani.'~~

~~The Moslems were not less active in the study of geo- graphy. In the 9th century, Ya'kubi wrote his Kuitdb al-Boldén, or Book of Countries, in which he described the principal cities of the Moslem empire. After him, Ibn Khordadhbeh composed his Avtdb al-Masdlik wal-~~

~~1 Translated from the Arabic by Knatchbull.~~

~~2 Edited by De Goeje (Leyden, 1866).~~

~~3 Edited by Wiistenfeld (Gottingen, 1850).~~

~~4 In course of publication at Leyden, edited by De Goeje, with the assistance of J. Barth, Th. Noldeke, P. de Jong, E. Prym, H. Thorbecke, 8. Frenkel, I. Guidi, D. H. Miiller, M. Th. Houtsma, 8. Guyard, and V. Rosen.~~

~~5 Most of these have been published by Gottwaldt, Ahlwardt, Reiske, Pocock, Erpenius, Tornberg.~~

~~6 The former has been edited by Wiistenfeld (G6ttingen, 1842-47), the latter translated into English by Mac Guckin de Slane (Lond.~~

~~1843-71).~~

~~7 Published by Cureton (Lond, 1842-46), and translated into German by Haarbriicker (Halle, 1850-51).~~

~~8 Edited by A. W. Th. Juynboll and De Goeje (Leyden, 1860-61).~~

~~Mamdlik, or Book of Roads and Provinces, in which his principal object is to point out the different routes, and to give an account of the revenues derived from every province.? His contemporary Kod4ma soon after published his treatise on the work of clerks, in which, after a notice of the various government offices, he gives a description of the provinces of the empire with an account of the post-routes, their stages and distances, and of the revenues of each province. Ahmed b. Abi Ya'kub al-Ya'kubi wrote a description of Asia Minor and Ifrikiya. Several of the writings of the historian Mas'udi also afford highly valuable information on geography. To Yakut we owe a great geographical dictionary under the title of Moyam al-Boldén. Lastly, Istakhri, Ibn Haukal, Mokaddast, Bértni, Bakri, Zamakhsharf, Edrisi, and Abu ')-Fida have left us important treatises, narratives of travels, and geographical dictionaries.1! Among the literature of voyages and travels we must also mention the curious Chain of Histories~~

~~associated with the name of the merchant Solaiman and the narratives of Nasiri Khosru,!? of Ibn Jobair,!? and of Inn Batura (q.v.).~~

~~The sciences connected with geography, such as astro- Astro- nomy and cosmography, were also cultivated by the nomy~~

~~Moslems. As early as the reign of Mansur, the Sanscrit **~~

~~treatise on astronomy entitled Siddhanta had been trans- graphy,~~

~~lated into Arabic. Under Ma'mun, two observatories were founded, one at Baghdad, the other at Damascus, and two degrees of the terrestrial meridian were measured by order of that Caliph. Al-Kharizmi, librarian to Ma'mutn, composed his Rasm al-Ard, or configuration of the earth, in which the name of every place was accompanied by its latitude and longitude. Astronomical tables were drawn up by Yahya, Habash, Abu Ma'shar (Abumazar), and Al-Battanf (Albategni), Treatises on astronomy were composed by Al- Farghani and Al-Kind{. Al-Battini, of whom we have just spoken, was the author of important works on the obliquity of the ecliptic and on the precession of the equi- noxes. We may mention in the last place the curious writings of Dimashk{ and Kazwint on general cosmography, embracing several physical sciences.1*~~

~~The study of mathematics was carried very far.~~

~~nometry, and algebra from the Greeks and Hindus, but themselves gave a further development to those sciences. The works of Al-Kharizm{ served as guides to those learned men in Europe who first turned their attention to algebra in the 16th century.~~

~~The sciences of physics and chemistry, on the other Physical hand, remained in their infancy. In physical science we §1en%®~~

~~can only mention a few works on Optics. As for Music, its study was limited to the practical, and though we may name the important treatise of Al-Farabi on the theory of Music—a treatise itself drawn entirely from Greek sources—we must acknowledge that Acoustics, properly so called, are not at all taken into consideration by him. Chemistry, considered as an exact~~

~~*science, continued unknown to the Moslems; yet they cultivated Alchemy with eagerness, in their search after the transmutation of metals, and Alchemy is the mother of Chemistry. Medicine, in the hands of the Arabs, remained such as they had borrowed it from the Greeks, As their religion forbade dissection, the Moslems were never able to rise above a rude empiri- cism. They contented themselves with adding to their*~~

~~*® Published and translated by Barbier de Meynard.*~~

~~*10 Edited by Wiistenfeld (Leipzig, 1866-70).*~~

~~*11 Published, and some translated, by De Goeje, Sachau, Wiistenfeld, De Grave, Jaubert, Dozy, Amari and Schiaparelli, Reinaud, and De Slane. The last volume of Abu '1-Fida's Geography is now in the press.*~~

~~*12 Published and translated by Schefer (Paris, 1881).*~~

~~*13 Bdited by W. Wright (Leyden, 1852).*~~

~~*14 Published and translated by Mehren, Wiistenfeld, and Ethé.*~~

~~*The Mathe- Moslems not only received arithmetic, geometry, trigo- matics.*~~

~~*Com- merce.*~~

~~*COMMERCE.*~~ |

~~*own prescriptions, which they pretended to have received from the Prophet, those of the Greek physicians. The works of Avicenna prove this ; and Ibn al-Baitar's treatise on the pharmacopceia also shows how smalla part observa- tion played in Arabian medicine! Zoology, botany, and mineralogy made no greater progress; but they were at least among the subjects which attracted the attention of learned Moslems. The great treatise by Damiri, entitled Hayat al-Hawwén, or Life of Animals, is of interest mainly from the legends it contains ;2 and the treatise on miner- alogy by Taifashi interests us principally by the details it gives on the origin of precious stones and the art of cutting them. It would be unjust to conclude this sketch without adding that the Moslems possess also a great number of technical treatises*~~

~~*on the art of war, on military engines, and the Greek fire, on falconry and hunting, and on certain industries, such as those of glass, pottery, and metals, They have also written on magic, on the inter- pretation of dreams, and on sleight of hand. These works have as yet been very little investigated. We shall no doubt find in them interesting revelations on the history of the industrial arts, and on the history of superstitions. With an empire so vast as that of the Moslems, we may easily conceive how extensive their commerce and industry must have been. Commerce had at all times been held in honour by the Arabs. Long before the days of Mohammed, the Koraish annually sent caravans, laden with all the products of Yemen, into Syria. Maritime commerce also was already flourishing in Chaldea in the 5th century of our era. 'The city of Hira was frequented by ships coming from the Red Sea, from India, and even from China. Obolla 'was the emporium for the merchandise of India. It was principally thither that teakwood was brought, which served for the construction of ships and houses. Thus the Arabs, when they conquered Chaldea, found maritime commerce in full activity there, and took advan- tage of it. Under the 'Abbasids, Basra supplanted Hira and Obolla, and became the principal port. The history*~~

~~*of Sindibaéd (Sinbad the Sailor) shows how active foreign.*~~

~~*commerce was under the 'Abbasids, and with what courage the Arab sailors confronted danger. Moslem colonies were established all along the coasts of Persia and India, and Moslem voyagers did not fear to venture as far as the China Seas, On the West, the commercial movement was not less active. Caravans laden with the products of Spain left Tangier, traversed the whole of Northern Africa, and reached Syria, Arabia, and Mesopotamia. Others passed through Asia Minor, Armenia, Persia, Khordsdn, and Turkestan, as far as the frontiers of China, while the route of others again was along the eastern coast of Africa, whence they brought back ivory and black slaves. Thus the silks of China, and the spices, camphor, steel, and*~~

~~*precious woods of India, were poured into the empire, while the Moslems exported their glass, their dates, their cotton stuffs, their refined sugar, and their wrought tools, to those countries.*~~

~~*was celebrated, and we know that flint-glass and enamels were also made at Baghdad. Dates were cultivated prin- cipally in the neighbourhood of Basra, and also in Persia and Khuzistén. Refined sugar also came from the coast of Persia. As regards steel, the manufacture of armour and weapons was the speciality of the people of 'Irak, of Bahrain, of 'Oman, and of Yemen, The Syrians had the credit of forging excellent sword-blades. In Syria too were made mirrors of polished steel. The weaving of various stuffs formed an important branch of industry. The striped stuffs of Yemen, and the tissues of Baghdad, Herat, Tawwaj, and Fas4, enjoyed a high repute. Damas- cus was renowned for the silk fabrics which have taken their name from that city. The silks of Yemen, of Egypt, and of Cufa, had also a high reputation. Tunis produced gauze, and muslin figured with gold. Egypt manufactured brocade, Armenia supplied satin. The carpet manufacture under the Caliphs had already reached the excellence which it has maintained to our own days. At that time the carpets most valued came from Farsistan and Tabaris- tan. Jewellery and trinkets found numerous outlets, as may be supposed. This traffic was principally carried on in the East by the Jews.*~~

~~*We know that the religion of the Prophet forbade any Art.*~~

~~*representation of the human figure. This prohibition does not appear to have been long observed, for we find that the walls of palaces and of the houses of the rich were covered with paintings. There was a school of painting at Basra, and a historian gives us the names of two painters of high celebrity in their art—Ibn 'Aziz and Kosair.*~~

~~*The manufacture of paper was carried on very extensively, a fact which is easily explained when we think of the liter- ary activity of the Moslems. The Arabs originally used parchment. For this, after the conquest of Egypt, they substituted papyrus, which was itself supplanted by paper, when the Arabs had opened communications with China. Paper mills were established in several of the provinces, and at Baghdad itself. Simultaneously with the appear- ance of this precious substance, the art of binding became one of*~~

~~*the most flourishing industries, as did also the trades of the shoemaker, the saddler, and the dyer, etc. etc. Retail commerce, lastly, undertook the distribution of the products of agriculture and industry. In almost all the cities of the empire markets were held, where the fruiterer and grocer (Bakkdl), the butcher (Jazér), the armourer (Satkal), the bookseller (Warrdk), and the druggist and perfumer ('Affdr), offered their wares for sale. (st. c.)*~~

~~*PART IIL—THE KORAN.*~~

~~*Tur Koran (Ko'rdn) is the foundation of Islam. It is the sacred book of more than a hundred millions of men, some of them nations of immemorial civilization, by all whom it is regarded as the immediate word of God. And since the use of the Koran in public worship, in schools and other- wise, is much more extensive than, for example, the reading of the Bible in most Christian countries, it has been truly described as the most widely-read book in existence. This circumstance alone is sufficient to give it an urgent claim on our attention, whether it suit our taste and fall in with our religious and philosophical views or not. Besides, it is the work of Mohammed, and as such is fitted to afford eee eee eS ee*~~

~~*1 The treatise has been translated into French by Dr. Leclerc. ? Printed at Bulak, a.H. 1292.*~~

~~*a clue to the spiritual development of that most successful of all prophets and religious personalities. It must be owned that the first perusal leaves on a European an im- pression of chaotic confusion,—not that the book is so very extensive, for it is not quite so large as the New Testament. This impression can in some degree be modified only by the application of a critical analysis with the assistance of Arabian tradition.*~~

~~*To the faith of the Moslems, as has been said, the Koran is the word of God, and such also is the claim which the book itself advances. For except in sur. ii—which is*~~

~~*3 For further information on Moslem civilization, see Kremer's important work, Culturgeschichte des Orients unter den Chalifen, Vienna, 1875-77.*~~

~~t The manufacture of glass was an Manu- industry of old standing among them. The glass of Syria factures.~~

~~598~~

~~a prayer for men—and some few passages where Moham- med (vi. 104, 114; xxvii. 93; xlii, 8), or the angels (xix. 65; xxxvii. 164 sqq.), speak in the first person without the intervention of the usual imperative "say" (sing. or pl.), the speaker throughout is God, either in the first person singular, or more commonly the plural of majesty 'Cwe." The same mode of address is familiar to us from the prophets of the Old Testament ; the human personality disappears, in the moment of inspiration, behind the God by whom it is filled. But all the greatest of the Hebrew prophets fall back speedily upon the unassuming human "J"; while in the Koran the divine "I" is the stereotyped~~

~~MOHAMMEDANISM~~

~~[KORAN.~~

~~sutras have to be severed out as originally independent ; even in the short ones parts are often found which cannot have been there at first. At the same time we must beware of carrying this sifting operation too far,—as Néldeke now believes himself to have done in his earlier works, and as Sprenger also sometimes seems to do. That some stiras were of considerable length from the first is seen, for example, from xii, which contains a short introduction, then the history of Joseph, and then a few concluding observations, and is therefore per- fectly homogeneous. In like manner, xx., which is mainly occupied with the history of Moses, forms a complete~~

~~Moham- form of address. Mohammed, however, really felt him- | whole. The same is true of xviii., which at first sight~~

~~med's self to be the instrument of God; this consciousness was | seems to fall into several pieces ; the history of the seven~~

~~*view of no doubt brighter at his first appearance than it afterwards | sleepers, the grotesque narrative about Moses, and that*~~

~~*— became, but it never entirely forsook him. We might | about Alexander “the Horned,” are all connected together,*~~

~~*therefore readily pardon him for giving out, not only the | and the same rhyme runs through the whole stra, Even*~~

~~*results of imaginative and emotional excitement, but also | in the separate narrations we may observe how readily the*~~

~~*many expositions or decrees which were the outcome of | Koran passes from one subject to another, how little care*~~

~~*cool calculation, as the word of God, if he had only | is taken to express all the transitions of thought, and how*~~

~~*attained the pure moral altitude which in an Isaiah or a | frequently clauses are omitted, which are almost indispens-*~~

~~*Jeremiah fills us with admiration after the lapse of ages. | able. Weare not at liberty, therefore, in every case where*~~

~~*The rationale of revelation is explained in the Koran itself | the connection in the Koran is obscure, to say that it is*~~

~~*as follows :—In heaven is the original text (“the mother | really broken, and set it down as the clumsy patchwork of*~~

~~*of the book,” xliii. 3; “a concealed book,” lv. 77 ; “a well- | a later hand. Even in the old Arabic poetry such abrupt*~~

~~*guarded tablet,” lxxxv. 22). By a process of “sending transitions are of very frequent occurrence. It is not*~~

~~*down” (tanzil), one piece after another was communicated | uncommon for the Koran, after a new subject has been*~~

~~to the Prophet. The mediator was an angel, who is called | entered on, to return gradually or suddenly to the former~~

~~sometimes the "Spirit" (xxvi. 193), sometimes the "holy | theme,—a proof that there at least separation is not to be~~

~~Spirit " (xvi. 104), and at a later time "Gabriel" (ii. 91). | thought of. In short, however imperfectly the Koran may~~

~~This angel dictates the revelation to the Prophet, who | have been redacted, in the majority of cases the present repeats it after him, and afterwards proclaims it to the | stiras are identical with the originals.~~

~~world (Ixxxvii. 6,etc.). Itis plain thatwe have here a some- How these revelations actually arose in Mohammed's~~

~~what crude attempt of the Prophet to represent to himself | mind is a question which it is almost as idle to discuss as~~

~~the more or less unconscious process by which his ideas | it would be to analyse the workings of the mind of a poet.~~

~~arose and gradually took shape in his mind. It is no | In his early career, sometimes perhaps in its later stages~~

~~wonder if in such confused imagery the details are not | also, many revelations must have burst from him in uncon-~~

~~always self-consistent. When, for example, this heavenly | trollable excitement, so that he could not possibly regard~~

~~archetype is said to be in the hands of an exalted "scribe" | them otherwise than as divine inspirations. We must~~

~~(Ixxx. 13 sqq.), this seems a transition to a quite different | bear in mind that he was no cold systematic thinker, but~~

~~set of ideas, namely, the books of fate, or the record of all | an Oriental visionary, brought up in crass superstition,~~

~~*human actions—conceptions which are actually found in | and without intellectual discipline ; a man whose nervous*~~

~~*the Koran. It is to be observed, at all events, that | temperament had been powerfully worked on by ascetic*~~

~~*Mohammed's transcendental idea of God, as a Being exalted | austerities, and who was all the more irritated by the*~~

~~*altogether above the world, excludes the thought of direct | opposition he encountered, because he had little of the*~~

~~*intercourse between the Prophet and God. heroic in his nature. Filled with his religious ideas and*~~

~~*Compon- It is an explicit statement of the Koran that the sacred | visions, he might well fancy he heard the angel bidding*~~

~~*ent parts book was revealed ("sent down") by God, not all at once, | him recite what was said to him. There may have been*~~

~~*youd but piecemeal and gradually (xxv. 34). This is evident | many a revelation of this kind which no one ever heard*~~

~~*from the actual composition of the book, and is confirmed by Moslem tradition. That is to say, Mohammed issued his revelations in fly-leaves of greater or less extent. A single piece of this kind was called either, like the entire collection, ko'rdn, 7.e. "recitation" or "reading;" or kitaéb, "writing ;" or stéra, which is the late-Hebrew shia, and means literally "series." The last became, in the lifetime of Mohammed, the regular designation of the individual sections as distinguished from the whole col- lection ; and accordingly it is the name given to the sepa- rate chapters of the existing Koran. These chapters are of very unequal length. Since many of the shorter ones are undoubtedly complete in themselves, it is natural to assume that the longer, which are sometimes very compre-*~~

~~*but himself, as he repeated it to himself in the silence of the night (lxxiii. 4). Indeed the Koran itself admits that he forgot some revelations (lxxxvii. 7).*~~

~~*But by far the greatest part of the book is undoubtedly the result of deli- beration, touched more or less with emotion, and animated by a certain rhetorical rather than poetical glow. Many passages are based upon purely intellectual reflection. It is said that Mohammed occasionally uttered such a passage im- mediately after one of those epileptic fits which not only his followers, but (for a time at least) he himself also, regarded as tokens of intercourse with the higher powers. If that is the case, it is impossible to say whether the trick was in the utterance of the revelation or in the fit itself.*~~

~~*How the various pieces of the Koran took literary form The*~~

~~*is uncertain. Mohammed himself, so far as we can dis- Koran cover, never wrote down anything. The question whether Witten. he could read and write has been much debated among Moslems, unfortunately more with dogmatic arguments*~~

~~*and spurious traditions than authentic proofs. At present,*~~

~~*one is inclined to say that he was not altogether ignorant*~~

~~*of these arts, but that from want of practice he found it*~~

~~*hensive, have arisen from the amalgamation of various originally distinct revelations. This supposition is favoured by the numerous traditions which give us the circumstances under which this or that short piece, now incorporated in a larger section, was revealed; and also by the fact that the connection of thought in the present stras often seems to be interrupted. And in reality many pieces of the long*~~

~~*convenient to employ some one else whenever he had any- thing to write. After the flight to Medina (a.p. 622) we are told that short pieces—chiefly legal decisions—were taken down-immediately after they were revealed, by an adherent whom he summoned for the purpose; so that nothing stood in the way of their publication. Hence it is probable that in Mecca, where the art of writing was commoner than in Medina, he had already begun to have his oracles committed to writing. That even long portions of the Koran*~~

~~*existed in written form from an early date may be pretty safely inferred from various indications ; especially from the fact that in Mecca the Prophet had caused insertions to be made, and pieces to be erased in his previous revelations. For we cannot suppose that he knew the longer stras by heart so perfectly that he was able after a time to lay his finger upon any particular passage. In some instances, indeed, he may have relied too much on his memory. For example, he seems to have occasionally dictated the same stra to different persons in slightly different terms. In such cases, no doubt, he may have partly intended to introduce improvements ; and so long as the difference was merely in expression, without affecting the sense, it could occasion no perplexity to his followers. None of them had literary pedantry enough*~~

~~*Moslems when it pleases him. Thus, for example, the Koran contains very different directions, suited to varying circumstances, as to the treatment which idolaters are to receive at the hands of believers. But Mohammed showed no anxiety to have these superseded enactments destroyed. Believers could be in no uncertainty as to which of two con- tradictory passages remained in force; and they might still find edification in that which had become obsolete. That later generations might not so easily distinguish the "abrogated" from the "abrogating" did not occur to Mohammed, whose vision, naturally enough, seldom ex- tended to the future of his religious community. Current events were invariably kept in view in the revelations. In Medina it called forth the admiration of the Faithful to observe how often God gave them the answer to a question whose settlement was urgently required at the moment. The same naiveté appears in a remark of the Caliph 'Othman about a doubtful case: "If the Apostle of God were still alive, methinks there had been a Koran passage revealed on this point." Not unfrequently the divine word was found to coincide with the advice which Mohammed had received from his most intimate disciples, "Omar was many a time of a certain Opinion," says one tradition, "and the Koran was then revealed accordingly."*~~

~~*to question the consistency of the divine revelation on that ground. In particular instances, however, the differ- ence of reading was too important to be overlooked.*~~

~~*The contents of the different parts of the Koran are Contents extremely varied. Many passages consist of theological or of the moral reflections. We are reminded of the greatness, the Kora.*~~

~~*Thus the Koran itself confesses that the unbelievers cast it up as a reproach to the Prophet that God sometimes substituted one verse for another (xvi. 103). On one occasion, when a dispute arose between two of his own followers as to the true reading of a passage which both had received from the Prophet himself, Mohammed is said to have explained that the Koran was revealed in seven forms. In this apparently genuine dictum seven stands, of course, as in many other cases, for an indefinite but limited number. But one may imagine what a world of trouble it has cost the Moslem theologians to explain the saying in accordance with their dogmatic beliefs. A great num- ber of explanations are current, some of which claim the authority of the Prophet himself; as, indeed, fictitious utterances of Mohammed play throughout a conspicuous part in the exegesis of the Koran. One very favourite, but utterly untenable interpretation is that the "seven forms" are seven different Arabic dialects.*~~

~~*When such discrepancies came to the cognisance of Mohammed it was doubtless his desire that only one of ' the conflicting texts should be considered authentic; only he never gave himself much trouble to have his wish carried into effect. Although in theory he was an up- holder of verbal inspiration, he did not push the doctrine to its extreme consequences ; his practical good sense did not take these things so strictly as the theologians of later centuries. Sometimes, however, he did suppress whole sections or verses, enjoining his followers to efface or forget them, and declaring them to be "abrogated." A very remarkable case is that of the two verses in liii,, when he had recognised three heathen goddesses as exalted beings, possessing influence with God. (Supra, p.549*~~

~~*3 much for abrogated readings ; the case is somewhat different when we come to the abrogation of laws and directions to the Moslems, which often occurs in the Koran. There is nothing in this at variance with Mohammed's*~~

~~*idea of God. God is to him an absolute despot, who declares a thing right or wrong from no inherent necessity but by his arbitrary fiat. This God varies his commands at pleasure, prescribes one law for the Christians, another for the Jews, and a third for the Moslems ; nay, he even changes his instructions to the*~~

~~*goodness, the righteousness of God as manifested in N ature, in history, and in revelation through the prophets, especially through Mohammed. God is magnified as the One, the All-powerful. Idolatry and all deification of created beings, such as the worship of Christ as the Son of God, are un-sparingly condemned. The joys of heaven and the pains of hell are depicted in vivid sensuous imagery, as is also the terror of the whole creation at the advent of the last day and the judgment of the world. Believers receive general moral instruction, as well as directions for special circumstances. The lukewarm are rebuked, the enemies threatened with terrible punishment, both temporal and eternal. To the sceptical the truth of Islam is held forth; and a certain, not very cogent, method of demonstration predominates. In many passages the sacred book falls into a diffuse preaching style, others seem more like proclama- tions or general orders. A great number contain ceremonial or civil laws, or even special commands to individuals down to such matters as the regulation of Mohammed's harem. In not a few, definite questions are answered which had actually been propounded to the Prophet by believers or infidels. Mohammed himself, too, repeatedly receives direct injunctions, and does not escape an occasional rebuke. One sura (i.) is a prayer, two (cxiii., cxiv.) are magical formulas. Many sutras treat of a single topic, others embrace several.*~~

~~*From the mass of material comprised in the Koran—and Narra- the account we have given is far from exhaustive—we tives.*~~

~~*should select the histories of the ancient prophets and saints as possessing a peculiar interest. The purpose of Mohammed is to show from these histories how God in former times had rewarded the righteous and punished their enemies. For the most part the old prophets only serve to introduce a little variety in point of form, for they are almost in every case facsimiles of Mohammed himself. They preach exactly like him, they have to bring the very same charges against their opponents, who on their part behave*~~

~~*exactly as the unbelieving inhabitants of Mecca. The Koran even goes so far as to make Noah contend against the worship of certain false gods, mentioned by name, who were worshipped by the Arabs of Mohammed's time. In an address which is put in the mouth of Abra- ham (xxvi. 75 sgq.) the reader quite forgets that it is Abraham, and not Mohammed (or God himself) who is*~~

~~*Relation to the Old and New Tes- taments.*~~

~~*Style.*~~

~~*600*~~

~~*speaking. Other narratives are intended rather for amuse- ment, although they are always well seasoned with edifying phrases. It is no wonder that the godless Koraishites thought these stories of the Koran not nearly so entertain- ing as those of Rostam and Ispandiar related by Nadr the son of Harith, who had learned on the Euphrates the heroic mythology of the Persians. But the Prophet was so exasperated by this rivalry that when Nadr fell into his power after the battle of Badr, he caused him to be executed ; although in all other cases he readily pardoned his fellow-countrymen.*~~

~~*These histories are chiefly about Scripture characters, especially those of the Old Testament. But the deviations from the Biblical narratives are very marked. Many of the alterations are found in the legendary anecdotes of the Jewish Haggada and the New Testament Apocrypha; but many more are due to misconceptions such as only a listener (not the reader of a book) could fall into. The most igno- rant Jew could never have mistaken Haman (the minister of Ahasuerus) for the minister of Pharaoh, or identified Miriam the sister of Moses with Mary (= Miriam) the mother of Christ. In addition to such misconceptions there are sundry capricious alterations, some of them very grotesque, due to Mohammed himself. For instance, in his ignorance of everything out of Arabia, he makes the fertility of Egypt—where rain is almost never seen and never missed—depend on rain instead of the inundations of the Nile (xii. 49). It was through the Jews also that he borrowed his account of Alexander "the Horned"; an epithet which is to be explained, after old Hottinger, from the great multitude of coins where*~~

~~*Alexander is represented with the ram's-horn of Ammon. Besides Jewish and Christian histories there are a few about old Arabian prophets. In these he seems to have handled his materials even more freely than in the others.*~~

~~*The opinion has already been expressed that Mohammed did not make use of written sources. Coincidences and divergences alike can always be accounted for by oral com- munications from Jews who knew a little and Christians who knew next to nothing. Even in the rare passages where we can trace direct resemblances to the text of the Old Testament (comp. xxi. 105 with Ps. xxxvii. 29; i. 5 with Ps, xxvii. 11) or the New (comp. vii. 48 with Luke xvi. 24 ; xlvi. 19 with Luke xvi. 25), there is nothing more than might readily have been picked up in conversation with any Jew or Christian. In Medina, where he had the opportunity of becoming acquainted with Jews of some culture, he learned some things out of the Mishna, e.g. v. 35 corresponds almost word for word with Mishna Sanh. iv. 5; compare also 11. 183 with Mishna Ber.i. 2. That these are only cases of oral communication will be admitted by any one with the slightest knowledge of the circum- stances. Otherwise we might even conclude that Moham- med had studied the Talmud; eg. the regulation as to ablution by rubbing with sand, where water cannot be obtained (iv. 46), corresponds to a talmudic ordinance (Ber. 15 a). Of Christianity he can have been able to learn very little even in Medina ; as may be seen from the absurd travesty of the institution of the Eucharist in v. 112 sgq. For the rest, it is highly improbable that before the Koran any real literary production—anything that could be strictly called a book—existed in the Arabic language.*~~

~~*In point of style and artistic effect, the different parts of the Koran are of very unequal value. An unprejudiced and critical reader will certainly find very few passages where his esthetic susceptibilities are thoroughly satisfied. But he will often be struck, especially in the older pieces, by a wild force of passion, and a vigorous, if not rich, imagination. Descriptions of heaven and hell, and allu- sions to God's working in Nature, not unfrequently show*~~

~~*a certain amount of poetic power. In other places also the style is sometimes lively and impressive ; though it is rarely indeed that we come across such strains of touching simplicity as in the middle of xciii. The greater part of the Koran is decidedly prosaic; much of it indeed is stiff in style. Of course, with such a variety of material, we cannot expect every part to be equally vivacious, or imaginative, or poetic. A decree about the right of inheritance, or a point of ritual, must necessarily be expressed in prose, if it is to be intelligible. No one complains of the civil laws in Exodus or the sacrificial ritual in Leviticus, because they want the fire of Isaiah or the tenderness of Deuter- onomy. But Mohammed's mistake consists in persistent and slavish adherence to the semi-poetic form which he had at first adopted in accordance with his own taste and that of his hearers. For instance, he employs rhyme in dealing with the most prosaic subjects, and thus produces the disagreeable effect of incongruity between style and matter. It has to be considered, however, that many of those sermonizing pieces which are so tedious to us, especi- ally when we read two or three in succession (perhaps in a very inadequate translation), must have had a quite different effect when recited under the burning sky and on the barren soil of Mecca. There, thoughts about God's greatness and man's duty, which are familiar to us from childhood, were all new to the hearers—it is hearers we have to think of in the first instance, not readers—to whom, at the same time, every allusion had a meaning which often escapes our notice. When Mohammed spoke of the goodness of the Lord in creating the clouds, and bringing them across the cheerless desert, and pouring them out on the earth to restore its rich vegetation, that must have been a picture of thrilling interest to the Arabs, who are accustomed to see from three to five years elapse before a copious shower comes to clothe the wilderness once more with luxuriant pastures. It requires an effort for us, under our clouded skies, to realize in some degree the intensity of that impression.*~~

~~*The fact that scraps of poetical phraseology are spe- cially numerous in the earlier stras, enables us to under- stand why the prosaic mercantile community of Mecca regarded their eccentric townsman as a "poet," or even a "possessed poet." Mohammed himself had to disclaim such titles, because he felt himself to be a divinely-inspired prophet ; but we too, from our standpoint, shall fully acquit him of poetic genius. Like many other predomi- nantly religious characters, he had no appreciation of poetic*~~

~~*beauty ; and if we may believe one anecdote related of him, at a time when every one made verses he affected ignorance of the most elementary rules of prosody. Hence the style of the Koran is not poetical but rhetorical ; and the powerful effect which some portions produce on us is gained by rhetorical means. Accordingly the sacred book has not even the artistic form of poetry ; which, among the Arabs, includes a stringent metre, as well as rhyme. The Koran is never metrical, and only a few exceptionally eloquent portions fall into a sort of spontaneous rhythm. On theother hand, the rhyme is regularly maintained ; although, especially in the later pieces, after a very slovenly fashion. Rhymed prose was a favourite form of composition among the Arabs of that day, and Mohammed adopted it; but if it imparts a certain sprightliness to some passages, it proves on the whole a burdensome yoke. The Moslems themselves have observed that the tyranny of the rhyme often makes itself apparent in derangement of the order of words, and in the choice of verbal forms which would not otherwise have been employed; e.g. an imperfect instead of a perfect. In one place, to save the rhyme, he calls Mount Sinai Sinin (xcv. 2) instead of Sind (xxiii. 20); in another Elijah is called /lydsin (xxxvii. 130) instead of*~~

~~*Rhetori- cal form and*~~

~~*rhyme,*~~

~~*Stylistic weak- nesses,*~~

~~*Dogma of the stylistic perfec- tion of the Koran.*~~

~~*KORAN. |*~~

~~*Ilyds (vi. 85; xxxvii. 123). The substance even is modi- fied to suit exigencies of rhyme. Thus the Prophet would scarcely have fixed on the unusual number of evght angels round the throne of God (Ixix. 17) if the word thamdniyah, "eight," had not happened to fall in so well with the rhyme. And when lv. speaks of two heavenly gardens, each with two fountains and two kinds of fruit, and again of two similar gardens, all this is simply because the dual termination (dn) corresponds to the syllable that controls the rhyme in that whole stra. In the later pieces, Mohammed often inserts edifying remarks, entirely out of keeping with the context, merely to*~~

~~*complete his rhyme. In Arabic it is such an easy thing to accumulate masses of words with the same termination, that the gross negli- gence of the rhyme in the Koran is doubly remarkable. One may say that this is another mark of the Prophet's want of mental training, and incapacity for introspective criticism.*~~

~~*On the whole, while many parts of the Koran un- doubtedly have considerable rhetorical power, even over an unbelieving reader, the book, esthetically considered, is by no means a first-rate performance. To begin with what we are most competent to criticize, let us look at some of the more extended narratives. It has already been noticed how vehement and abrupt they are where they ought to be characterized by epic repose. Indispens- able links, both in expression and in the sequence of events, are often omitted, so that to understand these histories is sometimes far easier for us than for those who heard them first, because we know most of them from better sources. Along with this, there is a great deal of superfluous verbiage ; and nowhere do we find a steady advance in the narration. Contrast in these respects the history of Joseph (xii.) and its glaring improprieties, with the admirably-conceived and admirably-executed story in Genesis. Similar faults are found in the non-narrative portions of the Koran. The connexion of ideas is extremely loose, and even the syntax betrays great awk- wardness. Anacolutha are of frequent occurrence, and cannot be explained as conscious literary devices. Many sentences begin with a "when" or "on the day when" which seems to hover in the air, so that the commentators are driven to supply a "think of this" or some such ellipsis, Again, there is no great literary skill evinced in the frequent and needless harping on the same words and phrases ; in xviii, for example, "till that" (hatté idhd) occurs no fewer than eight times. Mohammed, in short, is not in any sense a master of style. This opinion will be endorsed by any European who reads through the book with an impartial spirit and some knowledge of the language, without taking into account the tiresome effect of its endless iterations. But in the ears of every pious Moslem such a judgment will sound almost as shocking as downright atheism or polytheism. Among the Moslems, the Koran has always been looked on as the most perfect model of style and language. This feature of it ig in their dogmatic the greatest of all miracles, the incontest- able proof of its divine origin. Such a view on the part of men who knew Arabic infinitely better than the most*~~

accomplished European Arabist will ever do, may well startle us. In fact, the Koran boldly challenged its opponents to produce ten suras, or even a single one, like those of the sacred book, and they never did so. That, to be sure, on calm reflexion, is not so very surprising. Revelations of the kind which Mohammed uttered, no unbeliever could produce without making himself a laugh- ing-stock. However little real originality there is in Mohammed's doctrines, as against his own countrymen he was thoroughly original, even in the form of his oracles. To compose such revelations at will was beyond the power

of the most expert literary artist ; it would have required either a prophet, or a shameless impostor. And if such a character appeared after Mohammed, still he could never be anything but an imitator, like the false prophets who arose about the time of his death and afterwards. That the adversaries should produce any sample whatsoever of poetry or rhetoric equal to the Koran is not at all what the Prophet demands. In that case he would have been put to shame, even in the eyes of many of his own followers, by the first poem that came to hand. Never- theless, it is on a false interpretation of this challenge that the dogma of the incomparable excellence of the style and diction of the Koran is based. The rest has been accom- plished by dogmatic prejudice, which is quite capable of working other miracles besides turning a defective literary production into an unrivalled masterpiece in the eyes of believers. This view once accepted, the next step was to find everywhere evidence of the perfection of the style and language. And if here and there, as one can scarcely doubt, there was among the old Moslems a lover of poetry who had his difficulties about this dogma, he had to beware of uttering an opinion which might have cost him his head. We know of at least one rationalistic theologian who defined the dogma in such a way that we can see he did not believe it (Shahrastani, p. 39). The truth is, it would have been a miracle indeed if the style of the Koran had been perfect. For although there was at that time a recognized poetical style, already degenerating to mannerism, a prose style did not exist. All beginnings are difficult; and it can never be esteemed a serious

~~*charge against Mohammed that his book, the first prose work of a high order in the language, testifies to the awk- wardness of the beginner. And further, we must always remember that entertainment and esthetic effect were at most subsidiary objects. The great aim was persuasion and conversion ; and, say what we will, that aim has been realized on the most imposing scale.*~~

~~*Mohammed repeatedly calls attention to the fact that the Foreign Koran is not written, like other sacred books, in a strange words.*~~

~~*language, but in Arabic, and therefore is intelligible to all. At that time, along with foreign ideas, many foreign words had crept into the language ; especially Aramaic terms for religious conceptions of Jewish or Christian origin. Some of these had already passed into general use, while others were confined to a more limited circle. Mohammed, who could not fully express his new ideas in the common language of his countrymen, but had frequently to find out new terms for himself, made free use of such Jewish and Christian words, as was done, though perhaps to a smaller extent, by certain thinkers and poets of that age who had more or less risen above the level of heathenism. In Mohammed's case this is the less wonderful, because he was indebted to the instruction of Jews and Christians whose Arabic—as the Koran pretty clearly intimates with regard to one of them—was very defective. Nor is it very surprising to find that his use of these words is some- times as much at fault as his comprehension of the histories which he learned from the same people—that he applies Aramaic expressions as incorrectly as many unedu- cated persons now employ words derived from the French. Thus, forkdn means really "redemption," but Mohammed*~~

~~*(misled by the Arabic meaning of the root 5,5 "sever,"*~~

~~*decide") uses it for "revelation." Mella is properly "Word," but in the Koran "religion." dliyiin (Ixxxiii. 18, 19) is apparently the Hebrew name of God, Llyén, "the Most High" ; Mohammed uses it of a heavenly book (see 8. Fraenkel, De vocabulis in antiquis Arabum carmur tbus et in Corano peregrinis, Leyden, 1880, p. 23). So again the word mathdni is, as Geiger has conjectured, the XVI. — 76*~~

~~*MOHAMMEDANISM*~~

~~*earlier Meccan stras. We have in this list no genuine tradition, but rather the lucubrations of an undoubtedly conscientious Moslem critic, who may have lived about a century after the Flight.*~~

~~*Among the revelations put forth in Mecca there is a The considerable number of (for the most part) short suras, Meccan which strike every attentive reader as being the oldest. S"**~~

~~*602 [KORAN. regular plural of the Aramaic mathnithd, which is the same as the Hebrew Jishna, and denotes, in Jewish usage, a legal decision of some of the ancient Rabbins. But in the Koran "the seven Mathdni" (xv. 87) are probably the seven verses of stra i., so that Mohammed appears to*~~

~~*have understood it in the sense of '"'saying," or "sen*~~

~~*Date of the seve- ral parts.*~~

~~*tence" (comp. xxxix. 24). Words of Christian origin are less frequent in the Koran. It is an interesting fact that of these a few have come over from the Abyssinian ; such as hawdriyin, "apostles," mdida, "table," and two or three others; these all make their first appearance in suras of the Medina period. The word shaitdn, "Satan," which was likewise borrowed, at least in the first instance, from the Abyssinian, had probably been already introduced into the language. Sprenger has rightly observed that Mohammed makes a certain parade of these foreign terms, as of other peculiarly constructed expressions ; in this he followed a favourite practice of contemporary poets. It is the tendency of the imperfectly educated to delight in out-of-the-way expressions, and on such minds they readily produce a remarkably solemn and mysterious impression, This was exactly the kind of effect that Mohammed desired, and to secure it he seems even to have invented a few odd vocables, as ghislin (Ixix. 36), sijjin (Ixxxiii. 7, 8), tasnim (Ixxxiii. 27), and salsabil (Ixxvi. 18). But, of course, the necessity of enabling his hearers to understand ideas which they must have found sufficiently novel in themselves, imposed tolerably narrow limits on such eccentricities.*~~

~~*The constituents of our present Koran belong partly to the Mecca period (before 622 a.D.), partly to the period commencing with the flight to*~~

~~*Medina (from the autumn of 622 to 8th June 632). Mohammed's position in Medina was entirely different from that which he had occupied in his native town. In the former he was from the first the leader of a powerful party, and gradually became the autocratic ruler of Arabia; in the latter he was only the despised preacher of a small congregation. This difference, as was to be expected, appears in the Koran. The Medina pieces, whether entire stiras or isolated passages interpo- lated in Meccan stras, are accordingly pretty broadly dis- tinct, as to their contents, from those issued in Mecca. In the great majority of cases there can be no doubt what- ever whether a piece first saw the light in Mecca or in Medina; and for the most part the internal evidence is borne out by Moslem tradition. And since the revelations given in Medina frequently take notice of events about which we have pretty accurate information, and whose dates are at least approximately known, we are often in a position to fix their date with at any rate considerable certainty ; here again tradition renders valuable assistance. Even with regard to the Medina passages, however, a great deal remains uncertain, partly because the allusions to historical events and circumstances are generally rather obscure, partly because traditions about the occasion of the revelation of the various pieces are often fluctuating, and often rest on misunderstanding or arbitrary conjecture. But at all events it is far easier to arrange in some sort of chronological order the Medina suras than those composed in Mecca. 'There is, indeed, one tradition which professes to furnish a chronological list of all the stras. But not to mention that it occurs in several divergent forms, and that it takes no account of the fact that our present suras are partly composed of pieces of different dates, it contains so many suspicious or undoubtedly false statements, that it is impossible to attach any great importance to it. Besides, it is a priort unlikely that a contemporary of Mohammed should have drawn up such a list; and if any one had made the attempt, he would have found it almost impos- sible to obtain reliable information as to the order of the*~~

~~*They are in an altogether different strain from many others, and in their whole composition they show least resemblance to the Medina pieces. It is no doubt conceivable—as Sprenger supposes—that Mohammed might have returned at intervals to his earlier manner; but since this group possesses a remarkable similarity of style, and since the gradual formation of a different style is on the whole an unmistakable fact, the assumption has little*~~

~~*probability ; and we shall therefore abide by the opinion that these form a distinct group. At the opposite extreme from them stands another cluster, showing quite obvious affinities with the style of the Medina stras, which must therefore be assigned to the later part of the Prophet's work in Mecca. Between these two groups stand a number of other Meccan sutras, which in every respect mark the transition from the first period to the third. It need hardly be said that the three periods—which were first distinguished by Professor Weil—are not separated by sharp lines of division. With regard to some stras, it may be doubtful whether they ought to be reckoned amongst the middle group, or with one or other of the extremes. And it is altogether impossible, within these groups, to establish even a probable chronological arrangement of the individual revelations. In default of clear allusions to well-known events, or events whose date can be deter- mined, we might indeed endeavour to trace the psycholo- gical development of the Prophet by means of the Koran, and arrange its parts accordingly. But in such an under- taking one is always apt to take subjective assumptions or mere fancies for established data. Good traditions about the origin of the Meccan revelations are not very numerous. In fact the whole history of Mohammed previous to the Flight is so imperfectly related that we are not even sure in what year he appeared as a propliet. Probably it was in A.D. 610; it may have been somewhat earlier, but scarcely later. If, as one tradition says, xxx. 1 sg. ("The Romans are overcome in the nearest neigh- bouring land") refers to the defeat of the Byzantines by the Persians, not far from Damascus, about the spring of 614, it would follow that the third group, to which this passage belongs, covers the greater part of the Meccan period. And it is not in itself unlikely that the passionate vehemence which characterizes the first group was of short duration. Nor is the assumption contradicted by the tolerably well-attested, though far from incontestable state- ment, that when 'Omar was converted (a.D. 615 or 616), xx., which belongs to the second group, already existed in writing. But the reference of xxx. 1 sg. to this particu- lar battle is by no means so certain that positive conclu- sions can be drawn from it. It is the same with other allusions in the Meccan stiras to occurrences whose chrono- logy can be partially ascertained. It is better, therefore, to rest satisfied with a merely relative determination of the order of even the three great clusters of Meccan revelations.*~~

~~*In the pieces of the first period the convulsive excite- Oldest*~~

~~*ment of the Prophet often expresses itself with the utmost Meccan t suras.*~~

~~*vehemence. He is so carried away by his emotion tha he cannot choose his words; they seem rather to burst from him. Many of these pieces remind us of the oracles of the old heathen soothsayers, whose style is known to us from imitations, although we have perhaps not a single genuine specimen. Like those other oracles, the stras of this period, which are never very long, are composed of*~~

~~*The Fatiha.*~~

~~*KORAN. |*~~

~~*short sentences with tolerably pure but rapidly-changing rhymes. The oaths, too, with which many of them begin, were largely used by the soothsayers. Some of these oaths are very uncouth and hard to understand, some of them perhaps were not meant to be understood, for indeed all sorts of strange things are met with in these chapters. Here and there Mohammed speaks of visions, and appears even to see angels before him in bodily form. There are some intensely vivid descriptions of the resurrection and the last day which must have exercised a demonic power over men who were quite unfamiliar with such pictures. Other pieces paint in glowing colours the joys of heaven and the pains of hell. However, the suras of this period are not all so wild as these ; and those which are conceived in a calmer mood appear to be the oldest. Yet, one must repeat, it is exceedingly difficult to make out any strict chronological sequence. For instance, it is by no means certain whether the beginning of xcvi. is really, what a widely-circulated tradition calls it, the oldest part of the whole Koran. That tradition goes back to the Prophet's favourite wife 'Aisha; but as she was not born at the time when the revelation is said to have been made, it can only contain at the best what Mohammed told her years afterwards, from his own not very clear recollection, with or without fictitious additions. And, moreover, there are other pieces mentioned by others as the oldest. In any case xcvi. 1 sqqq. is certainly very early. Accord- ing to the traditional view, which appears to be correct, it treats of a vision in which the Prophet receives an injunction to recite a revelation conveyed to him by the angel. It is interesting to*~~

~~*observe that here already two things are brought forward as proofs of the omnipotence and care of God: one is the creation of man out of a seminal drop—an idea to which Mohammed often recurs ; the other is the then recently introduced art of writing, which the Prophet instinctively seizes on as a means of propagating his doctrines. It was only after Mohammed encountered obstinate resistance that the tone of the reve- lations became thoroughly passionate. In such cases he was not slow to utter terrible threats against those who ridiculed the preaching of the unity of God, of the resur- rection, and of the judgment. HIs own uncle Abu Lahab had rudely repelled him, and in a brief special sura (cxi.) he and his wife are consigned to hell. The stras of this period form almost exclusively the concluding portions of the present text. One is disposed to assume, however, that they were at one time more numerous, and that many of them were lost at an early period.*~~

~~*Since Mohammed's strength lay in his enthusiastic and fiery imagination rather than in the wealth of ideas and clearness of abstract thought on which exact reasoning depends, it follows that the older stras, in which the former qualities have free scope, must be more attractive to us than the later. In the suras of the second period the imaginative glow perceptibly diminishes ; there is still fire and animation, but the tone becomes gradually more prosaic. As the feverish restlessness subsides, the periods are drawn out, and the revelations as a whole become longer. The truth of the new doctrine is proved by accu- mulated instances of God's working in nature and in history ; the objections of opponents, whether advanced in good faith or in jest, are controverted by arguments ; but the demonstration is often confused or even weak. The histories of the earlier prophets, which had occasion- ally been briefly touched on in the first period, are now related, sometimes at great length. On the whole, the charm of the style is passing away.*~~

~~*There is one piece of the Koran, belonging to the begin- ning of this period, if not to the close of the former, which claims particular notice. This is i., the Lord's Prayer of*~~

~~*the Moslems, and beyond dispute the gem of the Koran. The words of this stra, which is known as al-fdtiha ("the opening one") are as follows :—*~~

~~*(1) In the name of God, the compassionate compassioner. (2) Praise be [literally "is"] to God, the Lord of the worlds, (3) the compassionate compassioner, (4) the Sovereign of the day of Judgment. (5) Thee do we worship and of Thee do we beg assist- ance. (6) Direct us in the right way ; (7) in the way of those to whom Thou hast been gracious, on whom there is no wrath, and who go not astray.*~~

~~*The thoughts are so simple as to need no explanation ; and yet the prayer is full of meaning. It is true that there is not a single original idea of Mohammed's in it. Several words and turns of expression are borrowed directly from the Jews, in particular the designation of God as the "'Compassioner," Lahmdn. Rahménd, which was a favourite name for God in the Talmudic period. Mohammed seems for a while to have entertained the thought of adopting al-Rahmdn as a proper name of God, in place of Ad/dh, which was already used by the heathens.1 This purpose he ultimately relinquished, but it is just in the sutras of the second period that the use of Rahmdn is specially frequent. It was probably in the first stra also that Mohammed first introduced the formula, "In the name of God," etc. It is to be regretted that this prayer must lose its effect through too frequent use, for every Moslem who says his five prayers regularly—as the most of them do—repeats it not less than twenty times a day.*~~

~~*The stras of the third Meccan period, which form a Latest pretty large part of our present Koran, are almost entirely Meccan*~~

~~*prosaic. Some of the revelations are of considerable extent, and the single verses also are much longer than in the older sutras. Only now and then a gleam of poetic power flashes out. A sermonizing tone predominates. The suras are very edifying for one who is already recon- ciled to their import, but to us at least they do not seem very well fitted to carry conviction to the minds of unbe- lievers. That impression, however, is not correct, for in reality the demonstrations of these longer Meccan suras appear to have been peculiarly influential for the propaga- tion of Islam. Mohammed's mission was not to Europeans, but to a people who, though quick-witted*~~

~~*and receptive, were not accustomed to logical thinking, while they had out-grown their ancient religion.*~~

~~*When we reach the Medina period it becomes, as has Medinan been indicated, much easier to understand the revelations suras.*~~

~~*in their historical relations, since our knowledge of the history of Mohammed in Medina is tolerably complete. In many cases the historical occasion is perfectly clear, in others we can at least recognize the general situation from which they arose, and thus approximately fix their time. There still remains, however, a remnant, of which we can only say that it belongs to Medina.*~~

~~*The style of this period bears a pretty close resemblance to that of the latest Meccan period. It is for the most part pure prose, enriched by occasional rhetorical embellish- ments. Yet even here there are many bright and impres- sive passages, especially in those sections which may be regarded as proclamations to the army of the faithful. For the Moslems, Mohammed has many different messages. At one time it is a summons to do battle for the faith; at another, a series of reflexions on recently experienced success or misfortune, or a rebuke for their weak faith ; or an ex- hortation to virtue, and soon. IIe often addresses himself +0 the "doubters," some of whom vacillate between faith and unbelief, others make a pretence of faith, while others*~~

~~*1 Since in Arabic also the root »>), signifies 'to have pity," the Arabs must have at once perceived the force of the new name.*~~

~~*This is simply the Jewish Rahman.*~~

~~*Mysteri- ous letters.*~~

~~*604*~~

~~*scarcely take the trouble even to do that. They are no consolidated party, but to Mohammed they are all equally vexatious, because, as soon as danger has to be encountered, or a contribution is levied, they all alike fallaway. There are frequent outbursts, ever increasing in bitterness, against*~~

~~*the Jews, who were very numerous in Medina and its neighbourhood when Mohammed arrived. He has much less to say against the Christians, with whom he never came closely in contact ; and as for the idolaters, there was little occasion in Medina to have many words with them. A part of the Medina pieces consists of formal laws belong- ing to the ceremonial, civil, and criminal codes ; or directions about certain temporary complications. The most objec- tionable parts of the whole Koran are those which treat of Mohammed's relations with women. The laws and regula- tions were generally very concise revelations, but most of them have been amalgamated with other pieces of similar or dissimilar import, and are now found in very long stras.*~~

~~*Such is an imperfect sketch of the composition and the internal history of the Koran, but it is probably sufficient to show that the book is a very heterogeneous collection. If only those passages had been preserved which had a permanent value for the theology, the ethics, or the juris- prudence of the Moslems, a few fragments would have been amply sufficient. Fortunately for knowledge, respect for the sacredness of the letter has led to the collection of all the revelations that could possibly be collected,—the "abro- gating" along with the "abrogated," passages referring to passing circumstances as well as those of lasting importance. Every one who takes up the book in the proper religious frame of mind, like most of the Moslems, reads pieces directed against long-obsolete absurd ctistoms of Mecca just as devoutly as the weightiest moral precepts,—perhaps even more devoutly, because he does not understand them so well,*~~

~~*At the head of twenty-nine of the stras stand certain initial letters, from which no clear sense can be obtained. Thus, before ii, iii, xxxi. xxxii. we find J) (Alif Lém Mim), before xl.-xlvi.*~~

~~*> (Hi Mim). Noldeke at one time suggested that these initials*~~

~~*did not belong to Mohammed's text, but might be the monograms of possessors of codices, which, through negligence on the part of the editors, were incorporated in the final form of the Koran ; he now deems it more probable that they are to be traced to the Prophet himself, as Sprenger, Loth, and others suppose. One can- not indeed admit the truth of Loth's statement that in the proper nage words of these suras we may generally*~~

~~find an allusion to the accompanying initials ; but it can scarcely be accidental that the first verse of the great majority of them (in iii. it is the second verse) contains the word " book," " revelation," or some equivalent. They usually begin with: "This is the book," or " Revelation ('down sending') of the book," or something similar. Of suras which commence in this way only a few (xviil. xxiv. xxv. xxxix.) want the initials, while only xxix. and xxx. have the initials and begin differently. These few exceptions may easily have proceeded from ancient corruptions ; at all events they cannot neutralize the evidence of the greater number. Mohammed seems to have meant these letters for a mystic reference to the archetypal text in heaven. Toa man who regarded the art of writing, of which at the best he had but a slight knowledge, as something supernatural, and who lived amongst illiterate people, an A B C may well have seemed more sig- nificant than to us who have been initiated into the mysteries of this art from our childhood. The Prophet himself can hardly have attached any particular meaning to these symbols : they served their purpose if they conveyed an impression of solemnity and enigmatical obscurity. In fact, the Koran admits that it contains many things which neither can be, nor were intended to be, understood (iii. 5). To regard these letters as ciphers is a precarious hypothesis, for the simple reason that cryptography is not to be looked for in the very infancy of Arabic writing. Ifthey are actually ciphers, the multipli- city of possible explanations at once precludes the hope of a plausible interpretation. None of the efforts in this direction, whether by Moslem scholars or by Europeans, have led to convincing results."~~

~~This remark applies even to the ingenious conjecture of Sprenger, that the letters jag (Kaf Hé Yé' Ain Sad) before xix. (which treats of John and Jesus, and, according to tradition, was sent to the Christian king of Abyssinia) stand for Jesus Nazarenus~~

~~MOHAMM™MEDANISM~~

~~[KORAN,~~

~~Rex Judzorum. Sprenger arrives at this explanation by a very artificial method ; and besides, Mohammed was not so simple as the Moslem~~

~~*traditionalists, who imagined that the Abyssinians could read a piece of the Arabic Koran. It need hardly be said that the Moslems have from of old applied themselves with great assiduity to the decipherment of these initials, and have sometimes found the deepest mysteries in them. Generally, however, they are content with the prudent conclusion, that God alone knows the meaning of these letters.*~~

~~*When Mohammed died, the separate pieces of the Koran, Trans- notwithstanding their theoretical sacredness, existed only mission in scattered copies ; they were consequently in great danger of the*~~

~~*of being partially or entirely destroyed. Many Moslems knew large portions by heart, but certainly no one knew the whole ; and a merely oral propagation would have left the door open to all kinds of deliberate and inadvertent alterations. Mohammed himself had never thought of an authentic collection of his revelations; he was usually concerned only with the object of the moment, and the idea that the revelations would be destroyed unless he made pro- vision for their safe preservation, did not enter his mind. A man destitute of literary culture has some difficulty in anticipating the fate of intellectual products. But now, after the death of the Prophet, most of the Arabs revolted against his successor, and had to be reduced to submission by force. Especially sanguinary was the contest against the prophet Maslama (Mubarrad, Kdmil 443, 5), an imi- tator of Mohammed, commonly known by the derisive diminutive Mosailima, At that time (4.p. 633) many of the most devoted Moslems fell, the very men who knew most Koran pieces by heart. 'Omar then began to fear that the Koran might be entirely forgotten, and he induced the Caliph Abubekr to undertake the collection of all its parts. Thabit, a native of Medina, then about twenty-two years of # age, who had often acted as amanuensis to the Prophet, in whose service he is even said to have learned the Jewish letters. The account of this collection of the Koran has reached us in several substantially identical forms, and goes back to Zaid himself. According to it, he collected the revelations from copies written on flat stones, pieces of leather, ribs of palm-leaves (not palm-leaves themselves), and such-like material, but chiefly "from the breasts of men," ze. from their memory. From these he wrote a fair copy, which he gave to Abtbekr, from whom it came to his successor 'Omar, who again bequeathed it to his daughter*~~

~~*Hafsa, one of the widows of the Prophet. This redaction, commonly called al-sohof ("the leaves"), had from the first no canonical authority ; and its internal arrangement can only be conjectured.*~~

~~*The Moslems were as far as ever from possessing a uni- form text of the Koran. The bravest of their warriors sometimes knewdeplorably little about it; distinction on that field they cheerfully accorded to pious men like Ibn Mas'ud. It was inevitable, however, that discrepancies should emerge between the texts of professed scholars, and as these men in their several localities were authorities on the reading of the Koran, quarrels began to break out between the levies from different districts about the true form of the sacred book. During a campaign in a.H. 30 (4.D. 650-1), Ho- dhaifa, the victor in the great and decisive battle of Neha- wand—which was to the empire of the Sdsdnids what Gaugamela was to that of the Achemenidee—perceived that such disputes might become dangerous, and therefore urged*~~

~~*Koran.*~~

~~*The Caliph laid the duty on Zaid, the son of Zaid's*~~

~~*Tr*~~

~~*st oran.*~~

~~*on the Caliph 'Othman the necessity for a universally bind- 'oth.*~~

~~*ing text.*~~

~~*The matter was entrusted to Zaid, who had made man's*~~

~~*the former collection, with three leading Koraishites, or"*~~

~~*These brought together as many copies as they could lay their hands on, and prepared an edition which was to be canonical for all Moslems. To prevent any further dis- putes, they burned all the other codices except that of*~~

~~*KORAN. |*~~

~~*Merwin, the governor of Medina. 'The destruction of the earlier codices was an irreparable loss to criticism ; but, for the essentially political object of putting an end to con- troversies by admitting only one form of the common book of religion and of law, this measure was necessary.*~~

~~*The result of these labours is in our hands; as to how they were conducted we have no trustworthy information, tradition being here too much under the influence of dog- matic presuppositions. The critical methods of a modern scientific commission will not be expected of an age when the highest literary education for an Arab consisted in ability to read and write. It now seems to me highly probable that this second redaction took this simple form: Zaid read off from the codex which he had previously written, and his associates, simultaneously or successively, wrote one copy each to his dictation. It certainly cannot have been by chance that, according to sure tradition, they wrote exactly four copies. Be that as it may, it is impos- sible now to distinguish in the present form of the book what belongs to the first redaction from what is due to the second.*~~

~~*In the arrangement of the separate sections, a classifica- tion according to contents was impracticable because of the variety of subjects often dealt with in one stra. A chrono- logical arrangement was out of the question, because the chronology of the older pieces must have been imperfectly known, and because in some cases passages of different dates had been joined together. Indeed, systematic prin- ciples of this kind were altogether disregarded at that period, The pieces were accordingly arranged in indiscri- minate order, the only rule observed being to place the long stras first and the shorter towards the end, and even that was far from strictly adhered to. The short opening stira is so placed on account of its superiority to the rest, and two magical formule are kept for a sort of protection at the end; these are the only special traces of design, The combination of pieces of different origin may proceed partly from the possessors of the codices from which Zaid compiled his first complete copy, partly from Zaid himself. The individual stras are separated simply by the super- scription—"Tn the name of God, the compassionate Com- passioner," which is wanting only in the ninth. The additional headings found in our texts (the name of the sura, the number of verses, etc.) were not in the original codices, and form no integral part of the Koran.*~~

~~*It is said that 'Othman directed Zaid and his associates, in cases of disagreement, to follow the Koraish dialect ; but, though well attested, this account can scarcely be correct. The extremely primitive writing of those days was quite incapable of rendering such minute differences as can have existed between the pronunciation of Mecca and that of Medina,*~~

~~*'Othman's Koran was not complete. Some passages are evidently fragmentary ; and a few detached pieces are still extant which were originally parts of the Koran, although they have been omitted by Zaid. Amongst these are some which there is no reason to suppose Mohammed desired to suppress, Zaid may easily have overlooked a few stray fragments, but that he purposely omitted anything which he believed to belong to the Koran is very unlikely. It has been conjectured that in deference to his superiors he kept out of the book the names of Mohammed's enemies, if they or their families came afterwards to be respected. But it must be remembered that it was never Mohammed's practice to refer explicitly to contemporary persons and affairs in the Koran. Only a single friend, his adopted son Zaid (xxxiii. 37), and a single enemy, his uncle Abi Lahab (cxi.) —and these for very special reasons—are men- tioned by name ; and the namie of the latter has been left*~~

~~*Hafsa, which, however, was soon afterwards destroyed by*~~

~~*in the Koran with a fearful curse annexed to it, although his son had embraced Islam before the death of Mohammed, So, on the other hand, there is no single verse or clause which can be plausibly made out to be an interpolation by Zaid at the instance of Abubekr, 'Omar, or 'Othman. Slight clerical errors there may have been, but the Koran of 'Othman contains none but genuine elements, —though sometimes in very strange order,*~~

~~*Of the four exemplars of 'Othman's Koran, one was kept in Medina, and one was sent to each of the three metro- politan cities, Cufa, Basra, and Damascus. It can still be pretty clearly shown in detail that these four codices deviated from one another in points of orthography, in the insertion*~~

~~*or omission of a wa ("and"), and such-like minutie ; but these variations nowhere affect the sense. All later manuscripts are derived from these four originals.*~~

~~*At the same time, the other forms of the Koran did Other not at once become extinct. In particular we have editions, some information about the codex of Obay. If the list which gives the order of its stras is correct, it must have contained substantially the same materials as our text : in that case Obay must have used the original collection of Zaid. The same is true of the codex of Tbn Mas'ud, of which we have also a catalogue. It appears that the principle of putting the longer stras before the shorter was more consistently carried out by him than by Zaid. He*~~

~~*omits i, and the magical formule of exiii, exiv. Obay, on the other hand, had embodied two additional short prayers, which we may regard as Mohammed's. One*~~

~~*can easily understand that differences of opinion may have existed as to whether and how far formularies of this kind belonged to the Koran. Some of the divergent readings of both these texts have been preserved, as well as a con- siderable number of other ancient variants. Most of them are decidedly inferior to the received readings, but some are quite as good, and a few deserve preference.*~~

~~*The only man who appears to have seriously opposed Ibn the general introduction of 'Othman's text is Tbn Mas'ud, Mas'td. He was one of the oldest disciples of the Prophet, and had often rendered him personal service ; but he was a man of contracted views, although he is one of the pillars of Mos- lem theology. His opposition had no effect. Now when we consider that at that time there were many Moslems who had heard the Koran from the mouth of the Prophet, that other measures of the imbecile 'Othmd4n met with the most vehement resistance on the part of the bigoted champions of the faith, that these were still further incited against him by some of his ambitious old comrades until at last they murdered him, and finally that in the civil wars after his death the several parties were glad of any pretext for branding their opponents as infidels ;—when we consider all this, we must regard it as a strong testi- mony in favour of 'Othman's Koran that no party, not even that of 'All, found fault with his conduct in this matter, or*~~

~~*repudiated the text formed by Zaid, who was one of the most devoted adherents of 'Othman and his family.*~~

~~*But this redaction is not the close of the textual history of the Later Koran. The ancient Arabic alphabet was very imperfect ; it not history only wanted marks for the short, and in part even for the long of the vowels, but it often expressed several consonants by the same sign. text. Hence there were many words which could be read in very different ways. This variety of possible readings was at first very great, and many readers seem to have actually made it their object to discover pronunciations which were new, provided they were at all appro- priate to the ambiguous text. There was also a dialectic license in grammatical forms, which had uot as yet been greatly restricted.*~~

~~*An effort was made by many to establish a more refined pronuncia- tion for the Koran than was usual in common life or in secular literature. The various schools of " readers" differed very widely from one another ; although for the most part there was no im- portant divergence as to the sense of words. A few of them gradu-*~~

~~*Manu- scripts.*~~

~~*Commen- tators.*~~

~~*606*~~

~~*ally rose to special authority, and the rest disappeared. Seven readers are generally reckoned chief authorities, but for practical purposes this number was continually reduced in process of time ; so that at present only two "reading-styles" are 1n actual nse,— the common style of Hafs, and that of Nafi', which prevails in Africa to the west of Egypt. There is, however, a very comprehen- sive massoretic literature in which a number of other styles are indi- cated. The invention of vowel-signs, of diacritic points to dis- tinguish similarly formed consonants, and of other orthographic*~~

~~*signs, soon put a stop to arbitrary conjectures on the part of the readers. Many zealots objected to the introduction of these inno- vations in the sacred text, but theological consisteucy had to yield to practical necessity. In accurate codices, indeed, all such addi- tions, as well as the titles of the sura, etc., are written in coloured ink, while the black characters profess to*~~

~~*represent exactly the original of 'Othman. But there is probably no copy quite faithful in this respect. '*~~

~~*In European libraries, besides innumerable modern manuscripts of the Koran, there are also codices, or fragments, of high anti- quity, some of them probably dating from the Ist century of the Flight. For the restoration of the text, however, the works of ancient scholars on its readings and modes of writing are more important than the manuscripts ; which, however elegantly they may be written and ornamented, proceed from irresponsible copyists. The original, written by 'Othman himself, has indeed been exhibited in various parts of the Mohammedan world. The library of the India Office contains one such manuscript, bearing the subscription : 'Written by 'Othman the son of 'Affan." These, of course, are barefaced forgeries, although of very ancient date ; so are those which profess to be from the hand of 'Ali, one of which is preserved in the same library. In recent times the Koran has been often printed and lithographed, both in the East and the West.*~~

~~*Shortly after Mohammed's death certain individuals applied themselves to the exposition of the Koran. Much of it was obscure from the beginning, other sections were unintelligible apart from a knowledge of the circumstances of their origin. Unfortunately, those who took possession of this field were not very honourable. Ibn 'Abbas, a cousin of Mohammed's, and the chief source of the traditional exegesis of the Koran, has, on theological and other grounds, given currency to a number of falsehoods ; and at least some of his pupils have emulated his example. These earliest expositions dealt more with the sense and connexion of whole verses than with the separate words. Afterwards, as the know- ledge of the old language declined, and the study of philolog arose, more attention began to be paid to the explanation of vocables. A good many fragments of this older theological and philological exegesis have survived from the first two centuries of the Flight, although we have no complete commentary of this period. Most of the expository material will perhaps be found in the very large commentary of the celebrated Tabari (A.D. 839-923), of which an almost complete copy is in the Viceregal library at Cairo. Another very famous commentary is that of Zamakhshari (a.p. 1075-1144), edited by*~~

~~*Nassau-Lees, Calcutta, 1859; but this scholar, with his great insight and still greater subtlety, is too*~~

~~*MOHAMMEDANISM*~~

~~*[KORAN.*~~

~~*apt to read his own scholastic ideas into the Koran, The favourite commentary of Baiddwi (ob. A.D. 1286), edited by Fleischer, Leipsic, 1846-1848, is little more than an abridgment of Zamakh- shari's. Thousands of commentaries on the Koran, some of them of prodigious size, have been written by Moslems ; and even the number of those still extant in manuscript is byno meanssmall. Although these works all contain much that is useless or false, yet they are invaluable aids to our understanding of the sacred book. An un- biassed European can, no doubt, see many things at a glance more clearly than a good Moslem who is under the influence of religious prejudice ; but we should still be helpless without the exegetical literature of the Mohammedans. Nevertheless, a great deal remains to be accomplished by European scholarship for the correct inter- pretation of the Koran. We want, for example, an exhaustive classification and discussion of all the Jewish elements in the Koran; a praiseworthy beginning has already been made in Geiger's youthful essay: Was hat Mahomet aus dem Judenthum aufgenommen? (Bonn, 1833). We want especially a thorough commentary, executed with the methods and resources of modern*~~

~~*science. No European language, it would seem, can even boast Trans- of a translation which completely satisfies modern requirements. lations.*~~

~~*The best are in English; where we have the extremely para- phrastic, but for its time admirable translation of Sale (repeatedly printed), that of Rodwell (1861), which seeks to give the pieces in chronological order, and that of Palmer (1880), who wisely follows the traditional arrangements. The introduction which accompanies Palmer's translation is not in all respects abreast of the most recent scholarship. Considerable extracts from the Koran are well trans- lated in E. W. Lane's Selections from the Kur-an.*~~

~~Besides commentaries on the whole Koran, or on special parts and topics, the Moslems possess a whole literature bearing on their sacred book. There are works on the spelling and right pronun- ciation of the Koran, works on the beauty of its language, on the number of its verses, words and letters, etc. ; nay, there are even works which would nowadays be called "historical and critical introductions." Moreover, the origin of Arabic philology is intimately connected with the recitation and exegesis of the Koran. To exhibit the importance of the sacred book for the whole mental life of the Moslems would be simply to write the history of that life itself; for there is no department in which its all-pervading, but unfortunately not always salutary inflnence has not been felt.~~

~~The unbounded reverence of the Moslems for the Koran reaches Eternity its climax in the dogma that this book, as the divine word, 7.e. of the thought, is immanent in God, and consequently eternal and wn- Koran.~~

~~ercated. That dogma has been accepted by almost all Mohammedans since the beginning of the 3d century. Some theologians did indeed protest against it with great energy ; it was in fact too pre-~~

~~osterous to declare that a book composed of unstable words and etters, and full of variants, was absolutely divine. But what were the distinctions and sophisms of the theologians for, if they could not remove such contradictions, and convict their opponents of heresy ?~~

~~The following works may be specially consulted : Weil, Einleitwng in den Kordn, 2d ed., 1878; Th. Noldeke, Geschichte des Qordn's (Gottingen, 1860); and the Lives of Mohammed by Muir and Sprenger. (TH. N.)~~

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~~*: Note.—Arabic has ouly three short vowels, ranging between the short sounds of a and e, e and i, o and w respectively. In the transcription adopted these are given by a or e, i and o respectively. The corresponding long vowels are 4, 4,%. The latter two have the sound of English ee and 00, and are so written by some*~~

~~*English scholars. equivalent ;*~~

~~*In the transcription of consonants th is as the th in thin, dh the th in the; dots are put under hard letters which have no exact English*~~

~~*kh (often written ch) is nearly the Scottish or German ch; 'isa deep breathing, seldom pronounced by Europeans ; gh a guttural something like*~~

~~*niodern Greek y or the Northumberland burr. In a few names the conventional spelling is used. In proper names 0. stands for ibn, "son of."*~~

~~*MOH—MOH*~~

~~*MOHL, Juxes (1800-1876), Orientalist, was born at Stuttgart 25th October 1800, and educated for the Lutheran Church at Tiibingen ; but his inclinations carried him from theology through Hebrew to Oriental studies, and in 1823 he betook himself to Paris, at that time under De Sacy the great European school of Eastern letters. He soon ac- quired reputation, and from 1826 to 1833 was nominally professor at Titibingen, with permission to continue his studies in France, but he never entered on the duties of this office, Paris having become his second home. In 1826 he was charged by the French Government with the preparation of an edition of the Skdk Ndmeh, the first volume of which appeared in 1838, while the seventh and last was left unfinished at his death; in 1844 he was nominated to the Institut, and in 1847 he became pro- fessor of Persian at the Collége de France. But his know- ledge and interest extended to all departments of Oriental learning, and this catholicity of taste, united to a singular impartiality of judgment and breadth of view, gave him a quite remarkable personal influence on the course of East- ern learning in France. The chief sphere of this influence was the Société Asiatique, which he served for many years as secretary-adjunct, as secretary, and finally as president. His annual reports on Oriental science, presented to the society from 1840 to 1867, and tollected after his death (4th January 1876, at Paris) under the title Vingt-sept Ans des Etudes Orientales (Paris, 1879), are an admirable history of the progress of Eastern learning during these years, and justify the high esteem in which he was held by scholars.*~~

~~*MOHLER, Jonann Apam (1796-1838), Roman Catholic theologian, was born at the village of Igersheim in Wiir- temberg on 6th May 1796, and, after studying philosophy and theology in the Lyceum at Ellwangen, entered*~~

~~*the Wilhelmstift in the university of Tiibingen in 1817. Ordained to the priesthood in 1819, he was appointed to a curacy at Riedlingen, but speedily returned as "repetent" to Tiibingen, where he became privat-docent in 1822, ex- traordinary professor of theology in 1826, and ordinary in 1828. The controversies excited by his Symbolik (1832) proved so unpleasant that in 1835 he accepted a call to the university of Munich. In 1838 he was appointed to the deanery of Wiirzburg, but died shortly afterwards*~~

~~*(12th April 1838).*~~

~~*Mohler wrote Die Einheit in der Kirche (Tiibingen, 1825) ; Athanasius der Grosse u. d. Kirche seiner Zeit im Kampfe m. d. Arianismus (2 vols., Mainz, 1827) ; Symbolik, oder Darstellung der dogmatisehen Gegensitze der Katholiken u. Protestanten naeh thren éffentlichen Bekenntnisssehr iften (Mainz, 1832; 8th ed., 1871-72; Eng. transl. by J. B. Robertson, 1843) ; and Neue Untersuehungen der Lehrgegensitze zwischen den Katholiken uw. Protestanten (1834). HIs Gesdmmelte Sehriften u. Aufsitze were edited by Déllinger in 1839 ; his Patrologie by Reithmayr, also in 1839 ; and a Biographie by Worner was published at Ratisbon in 1866. It is with the Symbolik that his name is chiefly associated ; the interest excited by it in Protestant circles is shown by the fact that within two years of its appearance it had elicited three replies of considerable importance, those namely of Baur, Marheineke, and Nitzsch. But, although characterized by abundant learning and acuteness, as well as by considerable breadth of spiritual sympathy, and thus a stimula- tive and suggestive work, it cannot be said to have been accepted by Catholics themselves as embodying an accurate objective view of the actual doctrine of their church. The liberal school of thought of which Mohler was a prominent exponent was dis-couraged in official circles, while Protestants, on the other hand, complain that the author has failed to grasp the vast significance of the Reformation as a great movement in the spiritual history of mankind, while expending needless pains on an exposition of the doctrinal shortcomings, inconsistencies, and contradictions of the individuals who were its leaders.*~~

~~*MOHR, Karu Friepricu (1806-1879), a philosopher whose greatest claims to scientific distinction are as yet, though indubitable, only partially*~~

~~admitted, was the son of a well-to-do druggist in Coblentz, and was born 4th November 1806. Being a delicate child, he received much~~

~~of his early education at home, in great part in his father's~~

~~laboratory. To this may be traced much of the skill he showed in devising instruments and methods of analysis which are still in common use in chemical and pharmaceu- tical laboratories. At the age of 21 he studied chemistry under Gmelin, and, after five years spent in Heidelberg, Berlin, and Bonn, returned with the degree of Ph.D. to join his father's establishment. On the death of his father in 1840 he succeeded to the business, retiring from it for scien- tific leisure in 1857. Serious pecuniary losses led him at the age of 57 to become a privat-docent in Bonn, where he . was soon after appointed, by the direct influence of the emperor, extraordinary professor of pharmacy. In pri- vate and domestic life he was a man of singularly winning manners, intensely fond of music and poetry, for the latter of which he showed wonderful memory. But his uncom- promising spirit—perhaps we might even in some cases say his wrongheadedness—in matters of scientific and theo- logical authority had raised such a host of enemies that even royal influence could not secure his further advance- ment. Although he stood at the very head of the scien- tific pharmacists of Germany, his name was deliberately omitted from the list of the commission entrusted with the preparation of the Pharmacopawia Germanica. Yet in that work many of his ideas and processes were incor- porated by the very men who had previously denounced them. He died in October 1879.~~

~~Mohr's best-known work is his Lehrbuch der chemiseh-analytisehen Titrirmethode (1855), which has already run through inany editions, and which was specially commended by Liebig. His improvements in methods of chemical analysis occupy a long series of papers extending over some fifty years. He also published a number of physical papers on subjects such as Hail, St. Elmo's Fire, Ground-ice, &e., and a curious notice of the carliest mention of Ozone. He shows that Homer, on four different occasions, mentions the sul- phurous smell produced by lightning, and employs the very word from which the name of Ozone was long afterwards coined. In~~

~~*1866 appeared his Geschichte der Erde, eine Geologie auf neuer Grundlage, which has obtained a wide circulation.*~~

~~*But he will be remembered in future times mainly on account of a paper, Ueber die Natur der Warme, published in 1837, which unfortunately has not yet appeared in full in an English translation. The history of this paper is remarkable. It was refused admission into Poggendorf's Annalen, and was then sent to Baumgartner of Vienna, in whose Zeitschrift fiir Physik, &c.,it was at once published. As no proof-sheets reached Mohr, he concluded that his paper had been lost or rejected, and contented himself with publishing a short analysis in the Annalen der Pharmacie, of which he was an editor. This analysis, it is only fair to say, though probably prepared by the author himself, gives a very inadequate idea of the scope and merit of the paper. In 1864 Dr. Akin unearthed the paper from the forgotten pages of the Zeitschrift, and the author was enabled to reprint it, with notes, while the recent discussions as to the history of Conservation of Energy were still being carried on. Along with it he issued a number of other papers of greatly inferior merit.*~~

~~*Unless some still earlier author should be discovered, there can be no doubt that Mohr is to be recognized as the first to enunciate in its generality what we now call "conservation of energy." The thesis of his paper must be stated in his own words,—" Besides the 54 known chemical elements, there is in the physical world one agent only, and this is called Kraft (energy).! It may appear, according to circumstances, as motion, chemical affinity, cohesion, electricity, light, and magnetism; and from any one of these forms it can be transformed into any of the others." Even now, after nearly half a century of rapid advance in science, it would be difficult to improve this statement except by inserting, as regards transformation of energy, some such guarding expression as "in whole or in part." But if Mohr had inserted this, he might have had claims tothe 'dissipation of energy" also. Mohr's starting-point appears to have been the discovery (by Forbes) of the polarization of radiant heat. He goes through the whole of the then range of physics, pointing out the explanation of each experimental result as a transformation of energy, mentioning even the electric currents produced by electro-magnetic induction as a transformation of the energy required to draw the coil from the magnet—one of the earlier methods used by Joule*~~

~~*for quantitative determinations. His nu- merical results, based on data quoted from various books, are, it is*~~

~~*1 Tt is to be remembered that even the most accurate authorities in Germany—as, for instance, Von Helmholtz in his Essay of 1847—used till quite recently the word Kraft in the sense of Energy.*~~

~~*true, very inaccurate ; the correct experimental determinations we owe to Joule. But it must be remembered that these speculations, daring as they were and accurate (on the whole) as they have been found to be, required the confirmation which they received from the experimental work of Colding and Joule, or from the Essay of Von Helmholtz, whose basis also is wholly experimental, being the fact that 'perpetual motion" is recognized as unattainable.*~~

~~*MOIR, Davi Maczetu (1798-1851), the "Delta" of Blackwood's Magazine, one of its most popular contributors in its early days, was born at Musselburgh 5th January 1798, and was a physician in active practice there from his manhood to his death (6th July 1851). He seems to have been a man of winning manners and noble integrity of character, and the intrinsic value of his poetry has been in consequence somewhat over-estimated by critics of repute who enjoyed his personal acquaintance. He had no inde- pendent vein as a writer of serious verse, and his technical qualities as a poet do not bear examination. But his verses were undoubtedly popular with the readers of the magazine at the time. A collection of them was edited by Thomas Aird in 1852. Asa kindly humourist "Delta" had a more original turn. His Autobiography of Mansie Wauch, pub- lished separately in 1828, is a Scotch classic. And some of his satirical squibs on passing events were written with great freshness and spirit. His Outlines of the Ancient History of Medicine (1831) evidence his industry and ver- satility of talent. His Sketch of the poetical literature of the past Half Century (1851) is more remarkable for the grace of its rhetorical ornaments than for depth or fresh- ness of insight.*~~

~~*MOIR, Grorce (1800-1870), author of the treatises on "Poetry" and "Romance" in the seventh edition of the Encyclopedia Britannica, and born*~~

~~at Aberdeen in 1800, was an Edinburgh lawyer of very varied accomplishments. He was appointed professor of rhetoric in 1835, professor of Scots law in 1864; he had a considerable success at the Scottish Bar, was successively sheriff of Ross and sheriff of Stirling, and was a frequent contributor to Blackwood's Magazne. tions of Edinburgh law. He was a man of very wide reading, catholic sympathy, and fastidious taste, alive to very various degrees and kinds of excellence in literature, but too critical and hard to please to do justice to his own wealth of ideas. He died in 1870.~~

~~MOISSAC, chief town of an arrondissement in the department of Tarn-et-Garonne, France, is situated on the right bank of the Tarn, and on the railway line from Bor- deaux to Cette, 17 miles west-north-west of Montauban. The church of St Peter, belonging to the 15th century, has a doorway of the 12th century, remarkable for its elaborate and beautiful sculpture, representing Scriptural scenes. Connected with the choir of the church is a cloister dating from the beginning of the 12th century, and one of the finest specimens of this kind of building in France ; the pointed arches are supported by small columns with sculptured capitals. The town has a large trade in corn and flour, and the mills afford employment to a considerable number of persons. The population in 1881 was 9202.~~

~~The town owes its origin to an abbey founded between 630 and 640 by St Amand, the friend of Dagobert. After being devastated by the Saracens, the abbey was restored by Louis of Aquitaine, son of Charlemagne. Subsequently it was made de- pendent on Cluny, but in 1618 it was secularized by Pope Paul Y., and replaced by a house of Augustinian monks, which was suppressed at the Revolution. The town, which was erected into~~

~~a commune in the 15th century, was taken by Richard Cceur-de Lion, and by Simon de Montfort.~~

~~MOKADDAS!. Shams al-Din Abt Abdallah Moham- med ibn Ahmad al-Mokaddasf, 7.¢., of Jerusalem, also called al-Bashshari, was the author of a famous description of the lands of Islam, which much surpasses the earlier works of the same kind. His paternal grandfather was an architect of eminence, who constructed many public works in Pales-~~

~~*Moir honourably maintained the literary tradi- |*~~

~~*MOI—MOL*~~

~~*tine, and his mother's family was opulent. He was himself a well-educated and talented man, with an exorbitant idea of his own qualities, and some curious affectations, such as that of imitating for each region the dialect of its inhabit- ants. His descriptions rest on very extensive travels continued through a long series of years. His first pilgrim- age was made at the age of twenty, but his book was not published till a.u. 375 (985-6 a.D.), when he was forty years old. The two MSS. (at Berlin and Constantinople) represent a later recension (A.H. 378). The book became known in Europe through the copy brought from India by Sprenger, and was edited by De Goeje in 1877 as the third part of his Biblioth. Geographorum Arabicorum.*~~

~~*MOKANNA (Al-Mokanna', "the veiled") was, as explained above, p. 580, the surname given to Hakim, or 'Até, a man of unknown parentage, originally a fuller in Merv, who posed as an incarnation of Deity, and headed a revolt in Khorasan against the caliph Mahdi. Much is related of his magical arts, especially of a moonlike light visible for an enormous distance which he made to rise from a pit near Nakhshab. He died by poison in a.H. 163 (779-80 A.D.).*~~

~~*MOKSHAN, a town of Russia, situated in the govern- ment of Penza, 27 miles to the north-west of the capital of the province, and 18 miles from the Ranzay railway station. It has 14,500 inhabitants, who are engaged in agriculture, or work in flour-mills, oil-works, tanneries, and potash- works. A few merchants export corn and flour. Mokshan, which was built in 1535 as a fort to protect the country from the raids of the Tatars and Kalmuks, is supposed to occupy the site of the town of Mescheryaks, Murundza, mentioned as early as the 9th century. It has begun rapidly to increase since the railway between Moscow and Penza was made.*~~

~~*MOLA, or Mota pi Bazi, a seaport town of Italy, in the province of Bari, 13 miles from Bari on the railway to Brindisi. It is an old-fashioned place with irregular streets, but outside of the walls several new districts have grown up. The foreign, and to some extent also the coasting, trade has considerably declined since 1863, and the com- munal population has*~~

~~decreased from 12,574 in 1861 to 12,435 in 1881. Little is known about the early history of Mola ; it was sold by Alphonso I. to Landolfo Maramoldo in 1436, and ten years afterwards to Niccolo Tovaldo.~~

~~MOLASSES. See Sucar.~~

~~MOLAY, JAcQUES DE, a native of Burgundy, became grand-master of the order of the Temple in 1298, and was the last who held that dignity. HIe was burned at the stake in 1314. See TEMPLARS.~~

~~MOLDAVIA. See Roumania.~~

~~MOLE (contracted form of mould-warp, 7.¢., mould- caster), a term restricted in England to the common mole (Talpa europea), a small, soft-furred, burrowing mammal, with minute eyes, and broad fossorial fore feet, belonging to the order Jnsectivora and family Z'alpidz, but generally applied elsewhere to any underground burrowing animal of the class Mammalia. Thus, in North America we find, representing the same family, the star-nosed moles (Con- dylura), and the shrew moles (Scalops and Scapanus) ; in South Africa, the golden moles of the far-removed family Chrysochloride ; and in South-East Europe, Asia, and South Africa, the rhizophagous rodent moles of the order Rodentia and families Spalacide and Muride (see Mam- MALIA, vol. xv. pp. 405, 419, figs. 64 and 96).~~

~~Talpa europea, the Common Mole, type of the genus Talpa,) is about six inches in length, of which the tail measures somewhat more than an inch; the body is long~~

~~1 Eight species may be recognized, and arranged, according to their dentition, as follows :—~~

~~MOLE~~

~~and cylindrical, and, owing to the very anterior position of the forelimbs, the head appears to rest between the shoulders ; the muzzle is long and obtusely pointed, ter- minated by the nostrils, which are close together in front ; the minute eye is almost hidden by the fur; the ear is without a conch, opening on a level with the surrounding integument ; the forelimbs~~

~~*are rather short and very mus- cular, terminating in broad, naked, shovel-shaped feet, the palms normally directed outwards, each with five subequal digits armed with strong flattened claws; the hind-feet, on the contrary, are long and narrow, and the toes are provided with slender claws. The body is densely covered with soft, erect, velvety fur,—the hairs uniform in length and thickness, except on the muzzle and short tail, the former having some straight vibrisse on its sides, whilst the latter is clothed with longer and coarser hairs. The fur is generally black, with a more or less greyish tinge, or brownish-black, but various paler shades up to pure white have been observed.*~~

~~*The food of the mole consists chiefly of the common earth-worm, in pursuit of which it forms its well-known underground excavations. Its habits, so difficult to observe, were many years ago most patiently studied and described by M. Henri le Court. Like many other mammals the mole has a lair or fortress to which it may retire for security. This is constructed with much ingenuity. It consists of a central nest formed under a hillock which is placed in some protected situation, as under a bank, or between the roots of trees. The nest, which is lined with dried grass or leaves, communicates with the main-run by four passages, one of which only joins it directly, leading downwards for a short distance and then ascending again ; the other three are directed upwards and communicate at regular intervals with a circular gallery constructed in the upper part of the hillock, which in turn communicates by five passages leading downwards and outwards with another much larger gallery placed lower down on a level with the central nest, from which passages proceed outwards in different directions, one only communicating directly with the main-run, while the others, curving round, soon join, or end in culs-de-sac. The main-run is somewhat wider than the animal's body, its walls are smooth, and formed of closely compressed earth, its depth varying according to the nature of the soil, but ordinarily from four to six inches. Along this tunnel the animal passes backwards and forwards several times daily, and here traps are laid by mole-catchers for its capture. From the main-run numerous passages are formed on each side, along which the animal hunts its prey, throwing out the soil in the form of mole- hills, The mole is the most voracious of mammals, and, if deprived of food, is said to succumb in from ten to twelve hours. Almost any kind of flesh is eagerly devoured by captive moles, which*~~

~~*have been seen by various observers, as if maddened by hunger, to attack animals nearly as large as themselves, such as birds, lizards, frogs, and even snakes ; toads, however, they will not touch, and no form of vegetable food attracts their notice. If two moles be confined together without food, the weaker is invariably devoured by the stronger. They take readily to the water—in this respect, as well as in external form, resembling their*~~

~~*(A.) i. $, c. 4, prm. 4, m. 3 × 2 (7. wogura). (B.) i. 3, c. 4, prm. $, m. 3 × 2 (7. europea, cxea, longirostris, micrurn).*~~

~~*(C.) i. 3, c. 4, prm. 3, m. 3 × 2 (7. leucrura, leptura). (D.) i. 3, c. 4, prm. 3, m. 3 × 2 (7. moschata).*~~

~~*Except in 7. europwa, the eyes are covered by a membrane. In T. micrura the short tail is concealed by the fur. 7. ewropwa ex- tends from England to Japan. 7. caca is found south of the Alps, the remaining species are all Asiatic, and of them two only—T7. micrura and 7. leucrwra—occur south of the Himalayas, (See Dobson, Mono- graph of the Insectivora, Part ii., 1883.)*~~

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~~*representatives on the North American continent. Bruce, writing in 1793, remarks that he saw a mole paddling towards a small island in the Loch of Clunie, 180 yards from land, on which he noticed molehills,*~~

~~*The sexes come together about the second week in March, and the young—generally from four to six in number—which are brought forth in about six weeks, quickly attain their full size.*~~

~~*The mole exhibits in its whole organization the most perfect adaptation to its peculiar mode of life. In the structure of the skeleton very striking departures from the typical mammalian forms are noticeable. The first sternal bone is so much produced anteriorly as to extend forward as far as a vertical line let down from the second cervi- eal vertebra, carrying with it the very short almost quadrate cla- vicles, which are arti- culated with its an- terior extremity and distally with the hu- meri, being also con- nected ligamentously withthe scapula. The forelimbs are thus brought opposite the*~~

~~*sides of the neck, and from this position a threefold advantage is derived :— in the first place, as this is the narrowest part of the body, they add but little to the general width, which, if in- creased, would lessen the power of move- ment in a confined space ; secondly, this position allows of a longer forelimb than would otherwise be possible, and so in— creases its lever power; and, thirdly, although the entire limb is rela- tively very short, its anterior position en- ables the animal, when burrowing, to thrust the claws so far for- ward as to be in a line with the end of the*~~

~~*Skeleton of Mole x % (lower jaw removed to show base of skull).*~~

~~*c, ealcaneum ; c¢.h., clavicular articulation of the humerus; cl., clavicle ; e.c, external condyle of hu- merus; j., femur; /0, fibula; fc, falciform bone (radial sesamoid); h, humerus; i.c, internal condyle of humerus; il, left iliac bone; i.p, — of te*~~

~~*; ilium and pubis ; is., ischium ; /.d, ridge of insertion muzzle, theimportance of latissimus dorsi 'muscle ; Lt, lesser trochanter ; of which is evident. m, manubrium sterni; 0, fourth hypapophysial se- Posteriorly, we find the pen omsale perio ; Py im bone mudely*~~

~~*i i imilarly Separa rom that of the opposite side ; pa., patella ; ee es aa ».m., ridge for insertion of pectoralis major muscle ;*~~

~~*P 3 pt., pectineal eminence; 1, radius; 78, first rib; s, way by approximation plantar sesamoid ossicle corresponding to the radial of the hip = joints to sesamoid (os falciform) in the manus; sc., scapula; the centre line of the s.h., scapular articulation of the humerus; ¢, tibia;*~~

~~*body. This is effected var*~~

~~*by inward curvature of the innominate bones at the acetabula to such an extent that they almost meet in the centre, while the pubic bones are widely separated behind.? The shortness of the*~~

~~*1 It is most interesting to observe how, in the golden moles (Chrysochloridz) of South Africa, the necessary modifications of the corresponding parts of the body and limbs fitting them for fossorial action and underground*~~

~~*progression have been brought about in a totally different manner. In them the manubrium sterni is. not anteriorly elongated, neither are the clavicles shortened ; but this is made up for by a deep hollowing out of the antero-lateral walls of the thorax, the ribs in these parts and the sternum being convex inwards, the long clavicles have their distal extremities pushed forward, and the concavities on the sides and inferior surface of the thorax lodge the thick muscular arms. ; / f*~~

~~*2 In Jacobs's Talpx# Europes Anatome (Jena, 1816) this part of the pelvic wall (marked pt in the fig.) was identified with the symphysis*~~

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~~*forelimb is due to the humerus, which, like, the clavicle, is so much reduced in length as to present the appearance of a flattened X-shaped bone, with prominent ridges and deep depres- sions for the attachments and origins of the powerful muscles connected with it. Its proximal extremity presents two rounded prominences: the smaller, the true head of the bone, articulates as usual with the scapule ; the larger, which is really the external tuberosity rounded eff, forms a separate synovial joint with the end of the clavicle. This double articulation gives to a naturally loose joint the rigidity necessary to support the great lateral pressure sustained by the forelimb in excavating. The forearm bones are normal, but those of the forefeet are much flattened and laterally expanded. The great width of the forefoot is also partly due to | the presence of a peculiar falciform bone, lying on the inner side of the palm and articulating by its proximal extremity with the wrist. Into the radial side and under surface of this bone is inserted a tendon derived from that of the palmaris longus muscle, which, acting upon it as an abductor, separates it from the side of the palm, and so increases the width of the latter, at the same time rendering the palmar integument tense.*~~

~~*The muscles acting on these remarkably modified limbs are all homologous with those of the cursorial insectivora, differing only in their relative development. The tendon of the biceps traverses a long osseous tunnel, formed by the great expansion of the margin of the bicipital groove for the*~~

~~*insertion of the large pectoralis major muscle; the anterior division of the latter muscle is unconnected with the sternum, extending across as a muscular band between the humeri, and co-ordinating the motions of the forelimbs. The teres major and latissimus dorsi muscles are of immense size, probably relatively larger than in any other mammal, and are inserted to- gether into the prominent ridge below the pectoral attachment ; they are the principal agents in the excavating action of the limb. The cervical muscles connecting the slender scapule, and through them the forelimbs, with the centre line of the neck and with the occiput are large, and the ligamentum nuche between them is ossified (as in all true moles); the latter condition appears to be*~~

~~*MOLE*~~

~~*N the conception of the atomic as opposed to the con- | tinuous and infinitely divisible constitution of matter, it is supposed that portions of matter called atoms exist, which are separated, or are capable of being separated, from each other by empty space. (See ATom). It may be the ease that each atom has unchangeable shape and volume as well as unchangeable mass, but such a conception of | an atom is not essential to the hypothesis. It is not even necessary, as explained in the article Atom (vol. iii., pp. 37, 38), to maintain that no part of space can be in two atoms at the same time. But one attribute of the atom upon which its permanence, or, so to speak, its personal identity, depends, is its constituent mass, and this remains the same, unchanged and unchangeable, through all time. Boscovich, indeed, goes so far as to regard the atom as a mere centre of force, the result of whose existence is that no two atoms or centres can approach each other within a certain distance, while other physicists regard the atomic volume as a distinct portion of space occupied by that atom to the exclusion of every other, and comprising | within it matter ideally infinitely divisible, but the parts of which in fact never have been, and never can be, separated from each other. In this latter mode of viewing the subject, all the conclusions of mechanics which are based on the conception of the continuity and infinite divi- sibility of matter may be applied to the equilibrium or motion of each individual atom, the atomic theory merely introducing the additional hypothesis that, in fact, these per- sistent entities called atoms do exist, and that out of them all substances which affect our*~~

~~*senses are constructed. The theory of universal gravitation requires us to believe in the existence of forces or actions between every portion*~~

~~*pubis, whereas the true pubic bones are widely separated (as shown at). In this mistake he has been followed by most comparative anato- mists ; and hence the mole is generally believed to present the unique peculiarity that the outlets of the urinary, generative, and digestive organs do not pass through the arch of the pelvis.*~~

~~*MO L—*~~

~~*MOL*~~

~~*due to the prolongation forwards of the sternum (described above), preventing all flexion of the head downwards; and, accordingly, the normal oftice of the ligament being lost, it ossifies, and so alfords a more fixed point for the origins of the superficial cervical muscles. The skull is long, with slender zygomatic arches ; the nasal bones are strong and early become united, and in front of them the nostrils are continued forwards in tubes formed of thick cartilage, the sep- tum between which becomes partially or wholly ossified beneath. There are 7 cervical, 138 dorsal, 6 luinbar, 6 sacral, and 10-12 caudal vertebre ; of the dorsal and lumbar there may be one vertebra more or less. The sacral vertebre are united by their greatly ex- panded and laterally compressed spinous processes, and all the others, with the exception of the cervical, are very closely and solidly articulated together, so as to support the powerful propulsive and fossorial actions of the Jimbs. Dentition : i. , c. 4, prm. 4, m. 3, x 2= 44 teeth. The upper incisors are simple chisel-edged teeth ;*~~

~~*| the canine is long and two-rooted; then follow three subequal*~~

~~*conical premolars, and a fourth, much larger, and like a canine; these are succeeded by three molars with W-shaped cusps. In the lower jaw the three incisors on each side are slightly smaller, and slant more forwards ; close behind them, is a tooth which, though quite like them, must, from its position in front of the upper canines when the jaws are closed, be considered as the canine ; behind it, but separated by an interval, is a large double-rooted conical tooth, the first premolar ; the three following*~~

~~*premolars are like the corre- sponding teeth above, but smaller, and are succeeded, as above, by three molars.*~~

~~*The geographical distribution of the common mole may be said to exceed that of all the other known species of the genus to which it belongs taken together. It extends from England to Japan, and from the Dovre-Fjeld Mountains in Scandinavia and the Middle Dwina region in Russia to southern Europe and the southern slopes of the Himalayas, where it occurs at an elevation of 10,000 feet. In Great Britain it is found as far north as Caithness, but in Ireland and in the Western Isles of Scotland (except Mull) it is altogether unknown. (G. E. D.)*~~

~~*CULE*~~

~~*of matter and every other portion, determinate in magni- tude and direction, and such that, when on the infinitely divisible hypothesis the volumes of these portions are indefinitely diminished, these mutual forces are inversely proportional to the square of the distance between the por- tions (the distance between any two points, one in the volume of each portion, being in this case taken as the distance between the portions), and directly proportional to the products of the masses, or quantities of the two portions of matter,—such forces being regarded provision- ally as ultimate facts, while inviting further analysis and explanation. Chemical and chemico-physical investigations indicate the existence of other actions between portions of matter, following other and for the most part unknown laws, and rapidly becoming inappreciable as the distance between the reacting portions is increased. All these hypotheses are to be retained on the hypothesis of discrete atoms as above enunciated, the mutual actions between atoms being the resultant of the actions between the various portions of their constituent matter. The volumes of the*~~

~~*_atoms are so small that, for any sensible distances apart,*~~

~~*the line of the resultant mutual action between them may be taken as coincident with the line joining any point in the volume of one to any point in the volume of the other, but, for distances or parts comparable with the linear dimensions of the atoms, the size and shape of their bound- ing surfaces must be taken into consideration, and perhaps also the law of*~~

~~*distribution of their constituent matter within that surface. In all respects, unless we accept the Boscovichian hypothesis, we simply regard the atom as made up, so to speak, of infinitely divisible matter, while substances, as we know them, are built up of indestructible and unchangeable atoms.*~~

~~*With this conception of an atom, as thus explained, we might be content to rest, confessing our total ignorance of the mode in which such atoms are built up into actual substances, being satisfied to regard such substances as*~~

~~*MOLECULE*~~

~~*composed of these distinct portions of matter separated, or capable of being separated, by empty space from other portions. But the molecular hypothesis of the constitution of different kinds of substances aims at analysing this process by which such substances are built up out of their constituent atoms. The molecule of any substance is, by some chemists, defined as being the smallest portion of that substance to which can be attributed all the chemical pro- perties of the substance ; by others, as the smallest portion which, so long as the substance is chemically unchanged, keeps together without complete separation of its parts. In the language of Clausius's theorem, if the parts.of the molecule have internal motion, the kinetic energy of such internal motion is equal to the virial of the mutual attrac- tive forces of the parts. Thus the formation of the mole- cule of each particular substance is viewed as an essential step in the process of building up that substance out of its constituent atoms. The molecule is first built up out of atoms arranged in its formation according to a definite type, and then the substance itself is constituted of these molecules. Of course molecules may be, and in fact in many particular substances are, supposed to be mon- atomic; that is to say, the intermediate step of building up the molecule out of the atoms has, in these particular substances, been omitted, the atoms and molecules becom- ing then identical. The particular arrangement of the formed molecules in the building up of the substance de- termines the physical state of that substance,—that is, its fluid, solid, gaseous, crystalline, or amorphous state ;*~~

~~*but the chemical properties of the substance depend upon | As the investigations |*~~

~~*the constitution of the molecule. and theories of chemistry appear to indicate irresistibly the existence of permanent atoms, so do they also lead almost as necessarily to the conception of the molecule as an entity which bears the same relation to special substances that the atoms bear to matter generally. So long as the molecule endures, the substance of which it is the molecule retains its chemical properties; with the dissolution of the molecule, the substance, as that special substance, perishes ; the atoms alone continue, and are free to enter into other combinations, The permanence of the molecule is relative, that of the atom absolute. This con- ception of the molecular constitution of substances sug- gests physical questions of great interest, such as the shape, volume, and mass of the constituent molecules, and the relative motions of which their parts are susceptible ; and the answers to these questions cannot fail to. be of great value in chemical and chemico-physical investigations, as well as in the theories of light and electricity. :*~~

~~*Now, whatever differences may exist between the proper- ties of different substances in the solid and liquid states, there are certain properties which, in the gaseous state, manifest themselves with no variation whatever in all sub- stances alike. Hence the explanation of these common properties—or gaseous laws, as they are called—has long possessed a peculiar fascination for physicists. The tend- ency to expand or fill all accessible space, manifested by all gases, proves that on the molecular hypothesis their compound atoms or molecules must be continually tending to fly apart. We must conceive gases as constituted of mole- cules, not only separable but actually separated by space void of the matter of which these gases consist ; and it may be most reasonably expected, therefore, that any general laws to which substances in this state conform may afford us a valuable insight into the constitution of these separate molecules.*~~

~~*Now the general laws to which all gases conform are: (1) Boyle's law—that, in a given mass of any gas kept at constant temperature, the pressure per unit of area upon the containing surface increases in the same proportion as*~~

~~*the volume occupied by the gas is diminished, or at least with very slight deviation from exact proportionality ; (2) Charles's law—that, if the temperature be varied while the pressure upon the gas remains the same, the gas increases by ztsd of its volume at zero centigrade for every degree of centigrade added to the temperature, pr, which in com- bination with Boyle's law is the same thing, that if the density be constant, the pressure is directly proportional to the temperature measured from the point — 273° centigrade, this point being called the zero of absolute temperature ; (3) Avogadro's law—which asserts that all gases at the same temperature and pressure contain the same number of molecules in the same volume ; and (4) Dalton's law—that in a mixture of different gases, when there is equilibrium, each gas behaves as a vacuum to all the rest.*~~

~~*It was at one time considered that these phenomena might be explained on the hypothesis of mutual repulsive forces between the parts of which the gas is composed, whether they were regarded as constituted of molecules or of infinitely divisible continuous matter,! but it has been shown in the article Arom (vol. iii, p. 39 sq.) that there are at least two absolutely conclusive reasons why this ex- planation cannot be accepted. These objections, together with the experimental fact proved by Joule that gases, or at any rate atmospheric air, expand into vacuum with scarcely any appreciable change of temperature, must be considered fatal to any mutual-force theory of gaseous action, and, accordingly, physicists have been driven to seek for other methods of explaining these laws. The explanation which has been more developed than any other is that known as the kinetic theory of gases, which regards the intrinsic energy of a gaseous mass as residing, not in the potential energy of intermolecular forces, but mainly in the kinetic energy of the molecules themselves, which are assumed to be in a state of continual relative velocity, admitting at the same time a possible small intermolecular potential energy, and it may be also an interatomic energy, between the atoms of the individual molecules. That some such persistent relative motion does exist in every gaseous mass is evident from the rapidity with which odours penetrate the stillest air where no breath of wind—that is, of absolute motion of translation of the mass as a whole or any portion of finite size—is perceptible. It becomes an interesting question whether the laws of mechanics admit of a mass thus constituted ever arriving at a state of permanence ; that is to say, whether, consistently with the hypothesis of*~~

~~*infinite irregularities in the directions and magnitudes of velocities of individual molecules, there may be found any properties of the mass in the aggregate which remain*~~

~~*1 An argument in favour of the molecular constitution of gases, to which attention was first called by Professor Osborne Reynolds (Memoir "On some Dimensional Properties of Matter in the Gaseous State," Phil. Trans., 1879), is derived from certain phenomena observed in highly-rarefied gases, and in the transpiration of gases through porous plates. If, according to this argument, we had in a gas to do with a continuous plenum, such that every portion must possess the same properties, then these properties must exist inde- pendently of the amount of gas contained in any space, although their sensible effects might be increased or diminished by a variation in that amount. If, then, we can find properties of a gas depending on the size of the space in which it is enclosed, and on the quantity of gas enclosed in this space, we have proof that gas is not continuous—in other words, possesses dimensional structure. Such properties we do find in highly-rarefied gases, as, for instance, in the pheno- mena of Crooke's radiometer. The motion of the vanes when one side is heated by incident rays appears to depend on the distance between the vane and the containing walls of the vessel bearing some not very high ratio to the distance between the particles or molecules of the gas. At least no satisfactory explanation of the phenomena consistent with the gas being continuous has yet been suggested.*~~

~~*Again, Professor 0. Reynolds, from his experiments on the trans- piration of gases through a porous plate, finds a relation between the gas and the coarseness or fineness of the plate, which would not exist were the gas continuous.*~~

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~~*constant, and in agreement with the accepted laws common to all gases. Now the physical theory of heat compels us to regard the intrinsic energy of any gaseous mass as de- pendent entirely or almost entirely upon the temperature. If, therefore, this intrinsic energy is to be sought for in the kinetic energy of the moving molecules, it follows that the average value of the kinetic energy of the mole- cules taken throughout the mass must be also a function of the temperature.*~~

~~*We will proceed to investigate the condition of per- manence of a number of molecules moving about irregu- larly in any bounded space ; and, for simplicity's sake, we shall first of all restrict ourselves to the case of monatomic molecules.*~~

~~*We know nothing of the size or shape of these atoms, except that the volume of each one must be incomparably smaller than that of the containing region. In shape we shall, as the simplest hypothesis, regard them as spherical. We shall suppose that there are no intermolecular forces between any two such atoms, except of such a nature as to be practically insensible when the atoms are not geo- metrically in contact, and similarly as regards the forces between the atoms and the material bounding surface, such forces being of the nature called "conservative." So that in point of fact we are investigating the mechanical properties of an infinitely large number of infinitely small and perfectly elastic spheres moving about in a given region and subject to frequent collisions.*~~

~~*ProsLeM. —A very large number of smooth elastic spheres, equal in every respect, are in motion within a region of space of given volume, and therefore occasionally impinge upon each other with various degrees of relative velocity and in various relative directions ; re- quired to find the law of distribution of velocities in order that such distribution may be permanent.*~~

~~*Let WV be the total number of spheres, and let*~~

~~*x (u, v, w) du dv dw*~~

~~*be the number of spheres whose component velocities, parallel to the axes, are intermediate between wu and u + du, v and v + dv, wand w + dw respectively.*~~

~~*If c be the resultant velocity of any of these last-mentioned spheres, and if @ be the inclination of c to the axis of z, and ¢ that of the plane cz to the plane xz, the last-mentioned expression will become, by changes of the independent variables from , y, 2 to 6, ~, and c,*~~

~~*x (uw, v, w) c sind dé d¢ de,*~~

~~*Let a spherical surface of radius unity be described about any origin as centre, and let do be written for the element sin 0 d0 dd on this surface, then the last-written expression becomes*~~

~~*x (wu, v, w) c? de do. _ Since for the same magnitude of the resultant velocities all direc- tions of motion must be equally probable, it follows that the co- efficient of de do in the last-written expression must be a function*~~

~~*of c only, and therefore the number of spheres having component*~~

~~*velocities between w and wu + du, v and v + dv, w and w + dw, must be*~~

~~*w © du dv dw.*~~

~~*It is required to find the form of y in order that the value of this expression may be unaffected by collisions. The solution is, that the number of spheres with component velocities between the limits wand w + du, v and v + dv, w and w + dw must be*~~

~~*Ae“? dy dv dw; or Ae~h? & de de,*~~

~~*employing the notation already used. Integrating with respect to do from 0 to 47, we find for the number of spheres with velocities between c and c + de the expression*~~

~~*dn Ae” do,*~~

~~*Again, since the number with component velocities between w and u + du, vand v + dv, w and w + dw is j*~~

~~*Ac hut + + ©) da dv dw, or (5) Ae ds). (F/ide 8° dv) (/Ac~™ dw),*~~

~~*it follows that the number of spheres having velocities intermediate between w and w + duw parallel to the x axis is*~~

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~~*eo ao Ae~ me? auf eke al e~ hw dy ; co oO that is, 54 eW ? dy,*~~

~~*where A is to be determined by the equations*~~

~~*or A ee Ns hi Nhi therefore A= 7 3 us*~~

~~*that is to say, the number of spheres having velocities between c and c+ dcis*~~

~~*3*~~

~~*~ Ne-* de, T Multiplying this expression by c, and integrating the product with regard to c from 0 to ©, and dividing by N, the mean velocity for all the spheres becomes*~~

~~*se te*~~

~~*Vath' and multiplying by ¢? instead of by ¢, we find the mean square of all the velocities to be*~~

~~*3*~~

~~*on In the preceding investigation no account has been taken of*~~

~~*collisions between the spheres and the enclosing boundary of the region in which they are contained, because in every such collision the magnitude of the velocity of each sphere is unaltered and its direction is changed according to the ordinary law of reflexion, whence it is evident that the distribution is unaffected by such*~~

~~*. collisions. Also, the investigation has been confined to the cases*~~

~~*of spheres colliding in pairs, but since there need be no limit to the smallness of the interval between any pair of collisions the result really embraces the cases of simultaneous collisions between three or more spheres ; for if a sphere 4 collides with another B, and immediately afterwards with a third C, the resultant velocity of 4 after this second collision must be the same as if it had col- lided with B and C simultaneously.*~~

~~*The foregoing investigation has been given in some detail because the principles upon which it proceeds are essentially the same as those by which all questions of the distribution of energy among a great number of moving bodies are determined, although it may be found, as well as the detailed investigations of the results imme- diately following, in published memoirs and systematic treatises ou the kinetic theory of gases.*~~

~~*If the spheres be not all of equal mass, but if there be within the region V spheres of mass m, NV' of mass m', and so on, then it may be proved, by reasoning exactly similar to the foregoing, that when the permanent or stable state of motion has been attained the number of spheres of the WV set with component velocities between uand u + du, vand v + dv, wand w + dw is*~~

~~*_ hime? Ae 2 dudvdwu, and the number of the WV' set having component velocities between wu' and w' + duw', v and v' + dv, w' and w' + dw', is _hm'c'2 Ae 2 dw dv dw, where 2=w?+v?+w?, c2=u2+v2+w", hk is a constant the same for both sets, and*~~

~~*N (mht N' (mh FO bos ae et by x CT sl rt 2 and so on if there be any other sets.*~~

~~*The mean velocity and mean square velocity of each sphere of the NV set are*~~

~~*2 2*~~

~~*Pt — and — respectively, and the mean kinetic energy of each of such spheres is*~~

~~=~~

~~*2h'*~~

~~*the last result being common to all the sets.*~~

~~*If the spheres in the given region be acted on by any given forces tending to fixed centres, and functions of the distances of the centres of the spheres from the centres of force, we may not in such case assume, @ priori, that*~~

~~the chances of velocities in all directions are the same ; but we may assume that the number of spheres of any set (NV) with coordinates of their centres intermediate between~~

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~~wand x + dzx, yand y + dy, z and z + dz, and component velocities intermediate between wu and w + du, vand v + dv, w and w + du, is W (a, Y, 2, U, v, w) dx dy dz du dv dw.~~

~~In the state of permanence the form of y must be independent of the time (¢), so long as the sphere is moving free from collisions with any other.~~

~~From the last-mentioned condition it must follow that, if ¢,=a,, $o=%, &c., be any equations among the variables determining the position and motion of any sphere obtained by the elimination of ¢~~

~~rom the equations of motion of that sphere, then y must be of the form y (¢,, $2, &c.). With the assumption, then, that the number of spheres of the given set with variables between the above-mentioned~~

~~limits is y (dy, $o-.-) dx…dw, we find for the form of y, by reasoning like the foregoing,~~

~~me2 wer" (x + 55) , where x is the potential energy of the sphere in the position x, y, z, and ?=u? + v? + w?, and h is a constant, the same for all the sets.~~

~~me?~~

~~If we integrate the expression Ae ' (x + 2) dx dy dz du dv dw for all values of x, y, 2 within the given region, we find for the number of spheres of any set with component velocities between wand w + du, v and v + dv, wand w + du,~~

~~hme2~~

~~Be 2 du dv dw,~~

~~*whence we easily see that the chances of velocities in all directions are the same, and that the mean velocity and mean square velocity*~~

~~*of any sphere of this set are z ss Vimh kinetic energy of any such sphere is = and therefore the same for*~~

~~*all the sets. Furthermore, if we integrate the expression*~~

~~*ooh (xt)*~~

~~*and = respectively, andthe mean*~~

~~*A dz dy dz du dv dw*~~

~~*for all values of w, v, and w from — © to + © respectively, we obtain a result of the form Ce~"'X dx dy dz, and therefore the number of spheres of the set in question with centres within the elementary volume dx dy dz, or, what is the same thing with the exception of a constant factor, the chance of the centre of any sphere of that set being within that elementary volume, is Ce-"'X dx dy dz, so that the density of the WV set of matter in the neighbourhood of the point x, ¥, zis mCe~*X,*~~

~~*We are now in a position to compare the physical properties of a medium composed of monatomic molecules in motion, and free from any intermolecular or interatomic forces with those of ordinary gases, so long at least as the atoms are spherical.*~~

~~*Consider two contiguous portions of such a medium separated by any plane parallel to that of yz, and, since the distribution and motion of each set of spheres is independent of all the other sets, let us confine our attention to the spheres of the WV set. Suppose that there are V such spheres per unit volume in the neighbour- hood of the point x, y, z, whose component velocities parallel to the axis of x are between uw and u+du. The number of these spheres which cross the elementary area dy dz in time dé will be*~~

~~*the same as the number of the dN spheres whose centres are.*~~

~~*situated within the elementary parallelepiped dx dy dz, in which da is equal to wdt, and this number is*~~

~~*Nu dy dz dt.*~~

~~*Each of these spheres carries across with it a momentum parallel to x equal to mw; the total momentum parallel to x transferred across dy dz in time dt is therefore*~~

~~*mNu* dy dz dt.*~~

~~*If u be positive, this is positive momentum transferred from the negative to the positive side of the plane yz; and if ~ be negative, this is negative momentum similarly transferred from the positive to the negative side of that plane. In either case it follows that by the mere motion of these spheres across the area dy dz the positive momentum parallel to the axis of x is diminished by the quantity mNu? dy dz dt on the negative side of the plane y z, and increased by the same quantity on the positive side of that plane in the time dé; m being, as before, the mass of each sphere. Hence, on the whole, there isa transference of positive x momentum*~~

~~*in the time dé across the area dy dz equal to mdy dz dt = * ON ; that is, equal to a dy dz dt pu?, where p is the density of the NV matter at the point x, y, z, and 2? is the mean square of the x velocities. But either by integration or general reasoning it is easily seen*~~

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~~*aR 2 ah oo that u?= 7, where v? is the mean square of the resultant yelo-*~~

~~*CULE*~~

~~*cities of the NV spheres, and is equal, as we have proved, to*~~

~~*se*~~

~~*mh Therefore, there is a transference of positive momentum from the negative to the positive side of the plane y z across the area dy dz in time dt equal to*~~

~~p dy dz dt mh~~

~~Each separate sphere whose component velocities are wv, v, and w carrics across the same area y and z momenta equal to mv and mw respectively, so that in the time dé there are carried across the area dy dzy and z momenta equal to Zmuv dy dz dt and Xmuw dy dz dt, respectively. By symmetry it is clear that Zmauv and Xmww are separately zero. Therefore, the resultant mutual actions of the two portions of the medium under consideration in the time df is the transference across the elementary area dy dz of a quantity of x~~

~~2~~

~~momentum equal to pdy dz dt + from the negative to the positive~~

~~side of the bounding plane. If this mutual action, or, as it is gener- ally called, " pressure" when referred to unit of surface, be denoted by the symbol p, we get the equation~~

~~a p dy dz dt=p dy dz dt,~~

~~or p=) = ee~~

~~Since the momenta parallel to y and z remain unaltered, it follows that the mutual action or pressure between contiguous por- tions of the medium in the neighbourhood of any point is normal to the bounding surface at that point. Since also the expression~~

~~for p or = is independent of the direction of the x axis, it fol-~~

~~mM. lows that the pressure at any point of the medium is the same in all directions,~~

~~If the contiguous portions of the medium be separated by a material instead of an ideal plane, it will be necessary for the main- tenance of equilibrium that there should be an action between this plane and the adjacent medium, equivalent to the transference of momentum estimated above; but action measured by the rate per unit of time at which momentum is generated~~

~~constitutes moving force or statical pressure. Hence the force or pressure between the plane and medium is normal to the plane, independent of the direction of the plane through the point, and equal to the value of~~

~~p mh~~

~~When several sets of spheres are present together in the region under consideration, the distribution of the centres and of the velocities of each set is, as we have seen, independent of the co- existence of the other sets. If therefore p,, pp, &c., be the densities of the matter of the different sets in the neighbourhood of the point x, y, % and if p,, p,, &c., be the pressures at that point defined as above, and if m,, m., &c., be the masses of the spheres of each of the sets, and p the total pressure, we get~~

~~P=P, + po + &c.~~

~~oo EE. eee a mh Mah~~

~~at the point.~~

~~Hence we arrive at the following conclusions :—(1) there is one physical quantity having the same value for every set of spheres—~~

~~3 .~~

~~oh? let this~~

~~quantity be called + ; (2) the distribution of the positions and velocities of the spheres of each set is independent of the coexist- euce of the remaining sets, and is in all respects the same as if that particular sct existed alone in the region considered ; (3) the pressure at any point referred to unit of surface at any point of~~

~~namely, the mean kinetic energy of each sphere, or~~

~~‘ . 2 the medium arising from the action of any one of the sets is yf?~~

~~where p is the density of that particular set at the point in question, and 7 is the physical quantity above referred to as common to all the sets.~~

~~This third inference may be expanded into the following three laws :—(a) if + be kept constant, then the pressure arising from each set varies as the density of that set; (8) if p be kept constant, then the pressure from each set varies as 7; (y) if the pressures~~

~~for all the sets be the same, then £ is also the same, or the num-~~

~~ber of spheres per unit volume is the same. ;~~

~~Now suppose there is a mixture of any number of gases in auy region ; when there is equilibrium there is one physical quantity, namely, temperature, which is the same for all; the intrinsic~~

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~~energy of this mixtwre depends, as we know, upon its temperature, and the energy of these moving spheres is entirely kinetie, and may be conceived, therefore, to be a function of the mean vis viva. Let us then assume that in this medium of moving spheres we have a representation of a mass of gases, and that what is called the temperature of the gaseous mass is nothing else than the 7 or mean kinetic energy of each moving sphere. Then, with this assumption, the three parts (a, 8, y) of inference (8) above correspond to the gaseous laws connected with the names of Boyle, Charles, and Avogadro respectively, and inference (2) corresponds with the law of Dalton coneerning gaseous mixtures. We may also deduce the ordinary hydrostatical equations of equilibrium from the formule which we have obtained. For, since these equations give us pa and p=mBe·· wea we get , F F ya dx _ pa pX, and dn mX, and similarly~~

~~where X, Y, and Z are the component impressed forces, or the negatives of the space variations of x along the coordinate axes.~~

~~So far, therefore, the physical properties of a perfect gas or mixture of such gases correspond, in all respects, with the physical properties of a medium consisting of a set of elastic spheres, or of a mixture of sets of such spheres, with the sole assumption that the physical property termed temperature, in the case of the gas, corresponds to, or is represented by, the mean kinetic~~

~~energy of each of the spheres, and that each sphere represents the chemical atom.~~

~~There are, however, physical properties of gases which this theory fails to explain. The most important of these is the ratio of the specific heats at constant volume and constant temperature respect- ively. The specific heat of gas expanding while being heated under a constant pressure is greater than that of gas heated with a con- stant volume, as when it is contained in a rigid vessel, for the obvious physical reason that in the former case a portion of the heat is converted into mechanical work, namely, that performed by the expansion under the constant pressure. This ratio of the specific heat of gas under constant pressure to the specific heat with con- stant volume has been determined for many gases with great ac- curacy, chiefly from observations of the velocity of sound in such gases, in which velocity the value of this ratio bears a very im- portant part.~~

~~Now, on the assumption of the gas being constituted of a number of elastic spheres in rapid but irregular motion among each other, and the phemaal property of temperature being represented or measured by the mean vis viva of each sphere, the ratio of these specific heats must be exactly 14. ~ For, if v be the volume occupied by a unit of mass of this movin Fe medium, and 7 the number of spheres to the unit mass, an if p be the density, it follows that~~

~~rm=pv=1,~~

~~Also we know that p, the pressure referred to unit surface, is given by the equation~~

~~:~~

~~py= = 17;~~

~~where 7 is the mean wis viva. If now 7 increase from 7 to 7+ 67, while v remains constant, the increase of intrinsic energy must be, from definition, r57. Also if there be a similar change 1n 7 without the restriction of v being constant, but supposing p to be constant, there is external mechanical work performed equal to pév, where év is the increase of volume. Also~~

~~: 2~~

~~pov = = ror ; and therefore the whole energy required to be supplied from without must be in this case ror + 2 ror.~~

~~Or the ratio of the energies to be supplied from without, in order that the mean vis viva of the moving sphere medium should be increased by the same amount in the two cases respectively, becomes~~

~~2~~

~~T + " 8 , or 1%,~~

~~If therefore the gaseous mass be adequately represented by the moving sphere medium, the ratio of the specific heats must be 13.~~

~~Mercury vapour is the only gas for which the ratio has so large a value as this. Several of the more permanent gases have the ratio equal to 1°408, while in others it falls as low as 1°26. The value for mercury vapour, as determined by Kundt and Warburg~~

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~~(Poggendorff, clvii. 353), is between 1'695 and 1°631, the mean of all the observations being somewhat under 1°6. If any value above 1°6 be insisted on it will be impossible to retain the theory as above enunciated. In point of fact we may say, in anticipation of what has yet to come, that there is no modification of the kinetie theory as hitherto treated which could give a higher value for the ratio in question than 14.~~

~~It follows from what has been proved that either all known gases and vapours, except the vapour of mercury, and perhaps cadmium, must be polyatomic, or else that the attempts to explain the consti- tution of gases by the kinetic theory must be abandoned. We must therefore proceed further to investigate the physical pro- perties of a medium consisting of compound atoms or molecules built up of atoms in any definite arrangement, such molecules being in a condition of irregular motion among themselves, such~~

~~*as we have supposed in the cases of the spherical atoms hitherto con- sidered.*~~

~~*It will be observed, on reference to the cases of the spheres hitherto — investigated, that, whether there be forces to fixed centres in action on the medium or not, the chance of any sphere having the coordi- nates of its centre and its component velocities between x and # + dz, yand y + dy, z and z + dz, u and u + du, v and v + dv, wand w + du,*~~

~~*is proportional to e~ # dedydzdu dvdw,where £ is the total energy, kinetic and potential, of the sphere in the state of position and motion defined by 2, y, 2, %, ¥, W.*~~

~~*We may generalize this proposition, and prove that when the sphere is replaced by a molecule of any shape and constitution, so as to be defined as to position aud motion by r generalized coordi- nates ,...¢, With their corresponding monienta 7…p,, the chances of the molecule having its defining variables between the limits q, and 1 + 4Qq,..p, and p, + dp,, or, What is the same thing, the number of such molecules at any time with variables thus limited, whether there be forces to fixed centres or not, and whether interatomic forces or intermolecular forces are or are not in action on the mole cular aggregate, is proportional to*~~

~~*oT MEr dqy.. dps*~~

~~*where # is a constant, the same for all molecules, and £, is the total energy, kinetic and potential, of the molecule in the free state as to position and motion, the potential energy being that of the fixed centre forces on the molecule, together with that of its inter- atomic forces, in the given position.*~~

~~*The problem before us may be stated thus :—*~~

~~*A number of similar molecules possessing in the whole n degrees of freedom, where x is very large, are in motion in a region of space bounded by a material envelope, under the action either of forces to fixed centres (called external forces) or of forces between different molecules and different parts of the same molecule, as well as by forces between the fixed boundary and the contained molecules, all of them conservative, so that the*~~

~~total energy, kinetic and potential, of the aggregate remains always the same; it is required to find the chance of a group of any one or more molecules possessing in the whole v degrees of freedom, defined by the coordinates q,...9, and momenta p,..-~,, Where r is small compared with n, having its variables between the limits g, and 9,+4dq…p, and p,+dp,.~~

~~We might start with the assumption made above in the case of the spheres under central forces, that this chance must be of the~~

~~form Y (Py Pe &c.) dqy…dpys~~

~~where ¢,=%, ¢: =, &c., are obtained by the elimination of t between the equations of motion of the r group under the fixed centre and boundary forces and those between its component atoms, because there is nothing in the conception of a molecule beyond that of a system with a number of mi of freedom, and under | internal forces ; and in this case, considering the generality of the assumption as to the external forces, it would be impossible to con- ceive the existence of any general equation, independent of the time, between the variables, except that of the conservation of energy, so that the chance in question becomes~~

~~p (Z,) dqy..-Dyp~~

~~where £, is above defined, and it remains to determine the form of y.~~

~~If we considered a second group of one or more molecules con- taining s degrees of freedom (where s may or may not be equal to r, but, like 7, is much smaller than 7), and defined by the coordinates and momenta @,41. —9,to Prti—Ppt» then the two groups together contain r+s degrees of freedom defined by the variables 9)...2,+y and since r+s is small compared with », the chance of this group having its variables between g, and ¢,+q)...p,4, and p,1,4p,,~~

~~must be Y (E,+,) dqy.—OpPyty~~

~~But this chance must be equal to the chance of the r group being fixed in the state q, ¢,+4).—Py ~,+4p,, multiplied by the chance of the remaining s~~

~~group being in the state q,4), %+1+4¢,11: Privo Prts+ P,+, Where the r group are so fixed.~~

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~~Now to find this latter chance we observe that it is the chance of~~

~~the s group being in their required limits of position and motion,~~

~~when the internal forces between the 7 and s group become forces~~

~~between the s group and fixed centres. If the total kinetic energy of the r group in their given state be~~

~~T,, and that of the r+s group be 7,.,, the total kinetic energy of~~

~~the s group must be 7, — 7,.~~

~~Also if the total potential energy of the r+s group under the influence of all forces be x,4, this is made up of—~~

~~(1) x,, the potential energy of the r group to fixed centres, and of~~

~~its internal forces ; (2) x, similarly taken for the s group; and (3) .xX» the potential energy of the r and s group forces. And when the 7 group is fixed the potential energy of the s group is reduced to (2) and (3), or is X,1,-X« Therefore the chance of the s group having its variables.within the required limits when the r group is fixed must be~~

~~Y (Zit, — Z,) Uppy. CPt y Therefore~~

~~Y(L,) y C4 2,) dqy…dp,.. = y (£45) AQ. AD pty or y L,) y (Hay = 2) = v (E,+0): Therefore W (x)=c = c~h* suppose.~~

~~And the chances of the r group having its variables between the limits q and g,+dq)...p, and p,+dp, must, in the state of per- manent or stable motion, be proportional to~~

~~eT si dq. : OP, which was to be proved.~~

~~Supposing now that the aggregate of molecules under considera- tion consists of a number of sets of similar molecules, the number of molecules in one of these sets being NV, where V is very large, and suppose that each of these NV molecules possesses o degrees of freedom defined by the coordinates g,...¢, with the momenta P}---Po, and that its mass ism. Three of these coordinates may be taken as the rectangular coordinates of its centre of mass, in which case the corresponding momenta will be mu, mv, mw, where u, v, and w are the component velocities of translation of that centre of mass. Then in this case, if 94-+-Yo, P4:.Pg be the remaining coordinates and momenta of the molecule, the chance of the mole- cule's variables being within the limits x and e+dz…p, and Po + dp, will be proportional to~~

~~ht) — ht (u2-+v2-+22)~~

~~dx dy dz dq,...dp, ¢ du dv dw…(1), where 7, the kinetic energy of the molecule, is equal to~~

~~m a (w+ +0) +7,~~

~~where fis a quadratic function of the p's, having as coefficients known functions of the q's. If we integrate the expression (I) for all possible values of fh Onc {4:+-Io, P4-»-Pg, We obtain an expression of the form m~~

~~oe i , (II),~~

~~where B is independent of w, v, and w, and @=u2+e2+w?, From the form of (II) it follows, exactly as in the casesof the elastic spheres, that the chances of all directions of the velocity of translation of a molecule are equal, that the mean velocity and mean square velocity of translation of each molecule are~~

~~oe V7 and per Vinh mh,~~

~~respectively, and that the mean kinetic energy of translation is — ,~~

~~and the same for a molecule of any set. Again, if 7 be the mean total kinetic energy of the molecule, then~~

~~*pal lL. Pe OF? de…ddg © || .e-* OED dee,..dpg*~~

~~*and if we evaluate this expression, paying attention to the form of T as a quadratic function of the p's mentioned above, we shall find*~~

~~*for (III) the expression oR*~~

~~*It follows from this result that each additional degree of freedom of the molecule increases the mean total kinetic energy of the mole-*~~

~~*cule by the quantity iy, which is the mean kinetic energy of trans-*~~

~~*2h lation parallel to any one of the axes, and that the total kinetic energy is proportional to the number of such degrees of freedom. f, again, we integrate the expression (I) for all values of the momenta, we obtain an expression of the form Ce-"X dx dy dz Oe « SOQ Pe as ee de See (IV),*~~

~~*where x is the potential energy of the molecule due to fixed centre*~~

~~*615*~~

~~*and to interatomic forces in the position defined by x, y, =, Y4-+-Io. The dimensions of the molecule are so small that we may regard forces from each fixed centre on different parts of the molecule as parallel and equal and functions of the distance of the centre of mass from that fixed centre, so that, if the part of x arising from these fixed centre forees be called Xa X; Will be a function of 2, y, 2, and of these variables only, the remaining part of x (arising from interatomie forces), which may be ealled x2, will be a function of the o — 8 variables Ga. Ge*~~

~~*If in (IV) we write x, +X, for x, and then integrate for all values of 94… ¢g,we obtain an expression of the form*~~

~~*De Gade… secs cases ccc (V),*~~

~~*where D is independent of x, y, z, and therefore p the density of the NV molecule matter in the neighbourhood of the point 2, y, 2, is*~~

~~mDe~· "Xi, From these results all the propositions proved above with reference to the aggregate of elastic spheres or monatomic molecules, as to the correspondence of the physical properties of such an aggregate with those of gases as indicated by the gaseous laws, may be deduced also for this aggregate of polyatomic molecules. So that if 7 be equal to ay? ot the mean kinetic energy of agitation of any one of the aggregate of moving molecules, if v be the volume occupied by unit of mass, 7 the number of molecules in unit of volume, and i the mass of each molecule, we have, exactly as in the case referred to, mr=1, py=1,~~

~~and p= = rT'. We also get the ordinary hydrostatical equations~~

~~aP _ ox~~

~~dp dp~~

~~=e — L=pV. yy~~

~~from this expression for p combined with the equation p=mDe- hx,~~

~~remembering that ax — mX, 9a. — mY, aX, mdZ, : dy dz whence the coincidence of the physical properties of this ageregate of polyatomic moving molecules with those of a gas, on the assump tion that the temperature represents the mean kinetic energy of agitation, is at once apparent.~~

~~It can be shown also that the aggregate of moving molecules, such as we conceive a gas to be, possesses another very important physical property which, by its analogy to the second law of thermo- dynamics, affords additional evidence of the relation between the Eats of heat and those of aggregates in some kind of motion, — the property in question being that, if in any ageregate of moving molecules the mean kinetic energy of any one of them be called 7, and if 6Q be an increment of energy imparted to the ageregate~~

~~from without, then ag is a perfect differential. ZF~~

~~If to this aggregate we apply a certain small quantity 6Q of heat or energy from without, and if 67 be the increase of the mean kinetic energy of agitation when the volume is unaltered, then this constancy of volume prevents any of the energy 6Q from being absorbed in doing external work ; but it is conceivable that the increase of + may cause such a change in the average state of the molecule as to produce a variation dy in the mean potential energy of the molecule, 5x being proportional to 67.~~

~~Therefore s05; { aT an ax. }. Sr. dr dr Dis i Bs therefore sg=r { sel 5 erefor Wasp) pitas if~~

~~If the volume vary by 5», the pressure being coustant, then we must add external work, or pév, to the energy absorbed, so that ifthe whole external energy now applied be 8'Q, and the increase of tempera- ture dr be the same in both cases, we have~~

~~o , ax~~

~~— + -") dr + piv ae dee) ee. 6G o , ax~~

~~r(atZ) a~~

~~6Q But if p be constant, then as before~~

~~piv=2 s or,~~

~~616~~

~~and therefore the ratio of 6'Q to 6Q, or of the two specific heats at~~

~~constant pressure and constant volume respectively, becomes~~

~~te is unknown in all respects except that it must be positive ; also ar we know that o must be integral and not less than 3; if we denote~~

~~3 x by e we have for the ratio te~~

~~o+2+e~~

~~*or 1+*~~

~~*which, with the necessary limitations of o and e, cannot be greater*~~

~~*than 1% or 1°6, and in this limiting case the gas must be mon- atomic. ;*~~

~~*If, therefore, any value above 1°6 of the ratio for mercury vapour be insisted upon, the theory must be abandoned so far as present investigations are concerned. If, however, the difference between 16 and any higher value given by the observations be regarded as within reasonable limits of experimental error, this value for mercury vapour, a gas which on chemical grounds is regarded as monatomic, may be viewed as confirming the theory, at least pro tanto.*~~

~~*If two spherical atoms were united by a rigid rod to form a mole- cule, such a molecule would have five degrees of freedom and the specific heat ratio would in this case be 13, for ¢ would then be zero. This value has a plausible approximation to the observed value 1°408 of the ratio in a great number of two-atom gases, such as hydrogen, nitrogen, oxygen, and others, but all observations agree so completely in the ratio 1°408, or from 1°405 to 1°408, that it hardly seems reasonable to regard the difference 008 as within the limits of experimental error, unless, indeed, we had grounds for suspecting a tendency to excess in all the methods employed for the determination of the ratio. But there are other difficulties more formidable still, arising from the spectroscopic properties of heated gases. 'The light emitted by such gases, so long as they are of no great density, never presents a continuous spectrum, but a spectrum consisting of bright lines with intervening dark spaces. Thus the spectrum of hydrogen gives thirty-two bright lines, that of mercury vapour six lines, that of nitrogen eighteen, and so on. So long as light is regarded as an energy intercommunicable with heat, and light of definite refrangibility is referred to vibrations of given period, we must regard these discontinuous spectra as con- nected with, and arising from, vibrations of determinate periods in the molecule of the heated gas. And if a gas such as hydrogen or nitrogen be constituted, as we are supposing, of an indefinite repe- tition of similar molecules, it must follow that such molecules must be capable, at any rate when not too closely packed together, of as many independent vibrations as there are bright lines in the spec- trum ; that is to say, in addition to the three degrees*~~

~~*of freedom arising from motion of translation in solid space, each molecule must possess as many additional degrees of freedom or possible relative motion of its parts as are indicated by the number of spec- trum lines. The degrees of freedom corresponding to motion of translation cannot well contribute anything to these luminous vibrations owing to their assumed irregularity and independence of any law ; but it is otherwise with the internal or relative degrees of freedom of each molecule, for, unless the gas be very dense, we may easily conceive a sufficient interval of time between one encounter and the next of any molecule with another for very many vibra- tions, each according to its own law, to take place in the relative positions of different parts of the molecule. At each encounter the whole molecule would be roughly shaken, and when the encounters increased in frequency the vibrations would become irregular and the spectrum would degenerate into a general diffused light of no definite refrangibility, just as music degenerates into ordinary noise. And this is exactly what occurs in the spectra of dense gases.*~~

~~*To bring the theory, therefore, into agreement with observed phenomena, we require very many more degrees of freedom in each molecule than could possibly be assigned to it in accordance with the observed value of the ratios of the specific heats,—mercury vapour, for example, admitting with difficulty the minimum number of three such degrees, as we have just now seen, while its spectrum would require at least nine. And the difficulty increases as we pass to hydrogen and other gases.*~~

~~*We might perhaps conceive, with the view of possibly explaining this difficulty, that there were in all gases a number of composite molecules with many degrees of freedom mixed up with the other molecules with three or five such degrees, but in so small a propor- tion to these molecules that their presence produces no appreciable effect upon the specific heats ; or, since we have no experimental de- termination of the specific heats of gases at light-giving temperature,*~~

~~*MOLECULE*~~

~~*we might, at least until such experimental determination has been arrived at, conceive that our atoms may change their constitution under increased temperature, and become themselves capable of vibration. There is nothing*~~

~~*in the conception of an atom as we are considering it which is really inconsistent with such an hypothesis.*~~

~~*Certain observed phenomena accompanying dissociation and com- bination give rise to other difficulties in the way of the acceptance of the kinetic theory in addition to those arising from the equal distribution of mean kinetic energy just now discussed. For when nitrogen and hydrogen, for example, are mixed in proportion to form ammonia it is observed (1) that at ordinary temperatures they do not exhibit the slightest tendency to combine directly with each other, while, on the other hand, (2)ammonia at ordinary temperatures does not exhibit the slightest tendency to decompose into nitrogen or hydrogen. But ammonia when subjected to certain very high temperatures becomes partially decomposed—that is, becomes a mixture of so many parts of ammonia and of so many other parts of nitrogen and hydrogen in the proportions to form ammonia ; and if the temperature be high enough the decomposition may be com- plete. But, in accordance with the kinetic theory, the conditions, whatever they may be, which at high temperature cause the ammonia to decompose, must sometimes occur to individnal molecules at ordinary temperature, because temperature, as we understand it, merely indicates a certain quantity ot kinetic energy, and therefore in a gas, however cold, there will be always some molecules in a state for dissociation ; and this dissociation having taken place can by (1) never be compensated by recombination ; therefore dissocia- tion should be going on in ammonia at all temperatures, and this result is contrary to the observed phenomena (2). Itmight ossibly be conceived, as a way of meeting this last-mentioned difficulty, that the dissociation attendant upon high temperature—that is, upon an average large molecular velocity of translation—requires that there should be a fairly rapid repetition of encounters among molecules moving with dissociation velocity to ensure the production of dis- sociation, and that in the case of a gas at low temperature, or small average velocity, the chance of two molecules encountering one another at high velocities is small, and the chance of any molecule meeting with any rapid succession of such encounters is practically insensible, and therefore that the dissociation spoken of really never takes place.*~~

~~*'As above stated, we conceive that in any gas at ordinary pressure and temperature the intermolecular forces are very small in the aggregate—that is, in Clausius's language, have a very small virial,— by which is understood, not that the forces themselves, where acting, are small, but that, considering the whole aggregate of molecules at any instant, there are very few pairs near enough to each other to exert any appreciable force on each other. Or, if we could watch any individual molecule for any time, we should find that during by far the greater portion of the time it was sensibly free from any action by surrounding molecules. The distance traversed by the type molecule between the instant when it passes out of the sphere of action of one molecule and the instant when it passes into the sphere of action of the next—that is, from one encounter to another—is called its free path.*~~

~~*We may find the chance that a molecule starting from any point with velocity w in a uniform gas shall have free path between x and « + dz from that point.*~~

~~*If a be the chance for such a molecule of free path at least unity, then a? is the chance of a free path at least 2. Hence the chance of free path at least 2 must be of the form a.*~~

~~*Following the method employed by O. E. Meyer,! let us write this in the form*~~

~~*x e 0 where therefore ie i ~· log a' then the chance of free path x+dz is*~~
~~*_a+du e L*~~

~~*The chance that such a molecule shall have its first encounter between a and x+dma is the difference of these two expressions ; that is, oe*~~

~~*pamee l This is the chance of a free path between x and x+ dx. The mean free path for such a molecule must then be*~~

~~*ee) x ie) x 1 | oT tae | e T—de=l. 0 U 0*~~

~~*Hi*~~

~~*é*~~

~~This is the meaning of the constant 7 in e t, Bntifwe denote by B the number of encounters which a molecule moving through space with velocity w experiences on the average per unit of time,~~

~~ee~~

~~1 Kinetische Theorie der Gase, Breslau, 1877.~~

~~mol ECU LE~~

~~Hence the chance for such a molecule of free path between x and « + dz is~~

~~with the above definition of B. The chance of a molecule whose velocity is w having free path # is of course the same as the chance of its free path having the~~

~~duration". If¢ =", the chance of duration between ¢ and ¢ + dé Ww Ww~~

~~is thus B i, e~· Bt wdt: or Be~Bt de,~~

~~Meyer determines the value of B, if the molecules be spheres, in the form~~

~~. i ai oe he wiVersee le = ee 47,2 * Te "io s.5°" * capella 1 Rea 4 ee ae = [ew tat' ie 1~~

~~2~~

~~where Q= a? and s is the sum of the radii of two molecules. TT~~

~~It will be observed that the series converges very rapidly if wh is less than unity, the successive coefficients being~~

~~a; @ 2 a Fl~~

~~B"° 80° 2" Toig' " isd'~~

~~Having found B for the number of encounters experienced per unit of time bya molecule having velocity w, we have for the average number of~~

~~*encounters experienced by any molecule per unit of time, which we denote by C,*~~

~~*&c.*~~

~~*ro) gw 2 Pd,*~~

~~*θ*~~

~~*= OV2, Nrs*. Hence the mean value of the free path for all molecules, irrespec-*~~

~~*: ae Q 1 tive of velocity, is L O/B'*~~

~~*Thus the kinetic theory of gases presents to us the conception of apparently perfect rest, as the result of motion irregular in detail but permanent and stable on the average. Whatever difficulty may be felt at first sight in the acceptance of this theory in the case of a medium at rest is greatly enhanced when we pass to the contemplation of a disturbed medium like a mass of gas throngh which a wave of sound is passing. In our ordinary investigations of such a disturbance the gas is treated as a continuous body, sub- jected to small relative motions of its parts, accompanied by corre- sponding variations of internal pressure. When a disturbance or a local condensation or rarefaction is set up in any portion of this gas we calculate the resulting effects by the well-known equations of sound motion. But on this kinetic theory the medium is supposed to consist of a number of discrete masses—elastic spheres or the like—which preserve the physical properties of the medium merely by the recurrence of their mutual collisions, such collisions obeying no law in individual cases, but preserving a certain average uni- formity in the motion of the whole aggregate ; and we need some further investigation to assure ourselves of the applicability of the ordinary treatment of wave motion to such a medium.*~~

~~*Now we observe that the physical properties of our medium, so far as the relation between pressure, density, and temperature is concerned, merely require that the temperature be measured by the mean total kinetic energy of translation, and that the mean kinetic energy of translation parallel to any fixed line be equal to one-third of the mean total energy of translation.*~~

~~If the molecules constitut- ing any portion of this medium were animated by a common velocity or acceleration, the physical properties of this portion would be similarly determined by the velocities and kinetic energies relative to the common motion. When the distribution of such relative velo- cities is stable or permanent, the average relative kinetic energy in any fixed direction is one-third of the average relative total kinetic energy, such property constituting normal distribution.~~

~~Suppose that in any portion of a medium, consisting of equal elastic spheres, this distribution has been disturbed—that is, Smu2, 2mv, and Bmw? are unequal. If V were the relative velo- city of any pair of spheres after such disturbance and before they collide, and @ the angle between V and the common normal at the point of impact, then the normal and tangential relative velocities~~

~~617~~

~~before impact are Vcos~~ ~~and Vsin 6, and after impact they become ~ Vcos 6 and Vsin~~ ~~respectively. The relative velocity after im- pact, resolved in the direction of relative velocity before impact, is therefore — PV cos? 6+ V sin? 6, or — V'cos 20; and the chance of~~ ~~being between and 0+d6 is sin 20 dd, Therefore the average square relative velocity resolved in the~~

~~original direction becomes after impact T~~

~~= Hees V2 Ve i cos? 26 sin 26 dé, or = ;~~

~~θ~~

~~The relative velocity after impact in the plane of V, and the normal perpendicular to the direction of V before impact is V sin~~ ~~cos 0+ V sin cos @, or V sin 26. And, if fixed line be taken in the plane perpendicular to V, the~~

~~average value of the square of the relative velocity after impact, resolved parallel to this line, is~~

~~y2 20 us ee m V2 ah [sin' 26 cos? ¢ dé dd, or 5 as before.~~

~~_Hence we conclude that, in whatever manner the distribution is disturbed in any portion of the medium at any instant, it will, for all those pairs of spheres which within any given interval encounter each other, have assumed the normal distribution after that in terval.~~

~~If r denote the average time between two collisions for any given sphere, the chance that this sphere shall continue for any time ¢ t free from collisions is, as we have seen, e 7. If, therefore, D be the number of spheres within any region whose total relative velocity is between w and w + dw, but so distributed that the mean square of their relative velocities along any fixed~~

~~. . 2~~

~~line is not > then after a time ¢ considerably greater than 7, say~~

~~ten times 7, the number of the D spheres which have escaped col- lision will be utterly inconsiderable, and the distribution will have become normal throughout the region. Suppose, for instance, that a sound wave is passing along a tube filled with air, C jaa 6 R~~

~~0)~~

~~the air in the tube is, at any instant, ina state of alternate com- pression and rarefaction, as at C, R, C, R above.~~

~~If the note sounded be (say) 500 vibrations per second, the length of the wave CR is about ¥%,°,° feet, and the time taken by the wave in traversing that distance is about 545th of a second.~~

~~The air in any section of the tube near P has alternately a small positive inomentum and an equal small negative momentum, the reversal taking place in every ;45th of a second; also the same cause which produces the average momentum in either case disturbs the distribution of energy among the 2, y, and z directions, i¢., it is always producing an excess or defect in mu? above or below that of mv" and mw*, By what has been proved above, this abnormal distribution of energy becomes inappreciable, owing to molecular collisions in a time considerably less than ;;/55th of a second—in fact, in about gsaaoooath of a second, when the value of 7 for atmospheric~~

~~*air is considered. It is therefore legitimate, in calcu- lating the velocity of sound in air (at least on the elastic sphere hypothesis), to regard the distribution as always normal in any section of the tube, the air in that section or in any elementary portion of it possessing, as a whole, any given velocity or accelera- tion, estimated as if we were dealing with a continuous mass.*~~

~~*DIFFUSION oF GASES.*~~

~~*If any further light is to be thrown on the physical nature of a molecule from investigations, experimental or analytical, concerning gases, it will most probably be by means of experiments on the diffusion of gases, or else on the internal friction or viscosity of gases, and the com- parison of these results with those obtained analytically by the methods of the kinetic theory. Such investiga- tions have been undertaken experimentally by Graham, Loschmidt, Maxwell, O. E. Meyer, and others. An ac- count of them will be found in O. E. Meyer's work above referred to. The same problems have also been discussed analytically by Maxwell,! and by Stefan, O. E. Meyer, and Boltzmann in the treatises referred to below. We pro- ceed to give a short account of Meyer's results.*~~

~~*1 Phil. Mag., July 1860, and Feb. and March 1868. XVI. — 78*~~

~~*The term "diffusion" has sometimes been applied to the process by which a gas passes through a porous diaphragm. This, however, is now generally denominated transpiration. Tt has also been applied to the expansion of a gas into vacuum, as on the removal of a diaphragm separating the gas from an exhausted receiver. This is now generally denominated free expansion. We shall understand, as is now usual, by the term diffusion the process by which, when two or more gases are mixed throughout any space in different proportions at different points; but so that if all molecules were of the same gas the whole would be in equilibrium, the different gases pass through each other and tend to equalize the proportions at all points in the space.*~~

~~*Suppose, for instance, a tube containing a mixture of two gases, 4 and B, at constant temperature and constant pressure of the com- bined gases*~~

~~throughout the tube and subject to no forces, but the density of gas A increasing and that of B diminishing from one end of the tube to the other. Let the axis of the tube be taken for the axis of x. If NM, be the number of molecules of gas A, and NV, the number of molecules of gas B in unit volume, we have, owing to the constant pressure and temperature at all points of the tube, N,+N,=4N, a constant. But at a given instant V, and , at any point are severally functions of x It will be found that under these circumstances more molecules of gas A pass through any sec- tion of the tube, which may be in the plane of yz, in one direction, say from left to right, than in the opposite direction. On the other hand, more molecules of gas B pass from right to left than from left to right. And this will go on till the mixture becomes uniform throughout the tube.~~

~~The investigation of the rate at which the unequal distribution tends to equalize itself in this simple case—that is, the excess of the number of molecules of gas A which cross a section of the tube from left to right over the number crossing in the same time from right~~

~~to left—is the problem of diffusion. We give the results obtained by—~~

~~O. E. Meyer as follows :—if the molecules of the two gases had the same mass and dimensions (to put an ideal case), then the excess of molecules of either gas passing through the section in one direction—~~

~~Va that is, the stream velocity—would be-3 ae wl, where J denotes~~

~~the mean free path for a molecule having velocity w, and wl is the average value of that function for all molecules of the gas.~~

~~When we come to deal with two gases, the molecules of one not being of the same size and dimensions with those of the other, we shall find that, in the absence of any common velocity of the two gases at the plane of yz, more, or fewer, molecules of gas A would cross the plane per unit of time from left to right than of gas B from right to left, hecause, assuming constant pressure and tem- perature of the mixture at every point in the tube, the number of molecules of the two gases combined must be the same at every~~

~~point—that is, V,+N,=WN, where Vis constant. HIence = — aN, daz dx"~~

~~Now the excess of molecules of gas A coming from left to right per unit of time is ~· ane wl,, and similarly the excess of mole-~~

~~cules of gas B crossing from right to left per unit of time is 1 aN, ~·—7 . . . = de 4% if we now distinguish by suffixes a and 4 quantities~~

~~relating to the two gases respectively. Here J, and J, are mean free paths for velocity w of the two kinds of molecules through the mixed gases, and wi, is not generally equal to wi, Hence the total number of molecules crossing the plane from left to right ex- : é Wey ceeds the number coming from right to left by ist ace (wl, — wl).~~

~~Meyer here assumes that the combined gases have a common~~

~~i The GUO a velocity — 3 oe (wl, —l,), and that such common velocity~~

~~will not affect the relative motion of the molecules. On that hypo- thesis the rate of diffusion can be calculated as follows. The pro- portion of the stream of the combined gases which consists of mole- cules of gas A is~~

~~Hence the total surplus number of molecules of gas A passing through unit area of the plane per unit of time is~~

~~De, UN Ne ~· 8 de \V,+N, ome ole }~~

~~ee oe ae = = SUG) de" {M, wl, + N, ol, } »~~

~~MOLECULE~~

~~or GUN go Pri aN dn (Mo ela N, whe) The expression 1 a — ay (No ela t Na why)~~

~~is defined to be the " coefficient of diffusion" of gas A into gas B, It is evidently the same as that of gas B into gas A.~~

~~The Relation of the Coefficient of Diffusion to Density.—It can be shown that J, the mean free path for a molecule having velo-~~

~~*city w, is for any single gas inversely proportional to the density, and for any mixture of gases inversely proportional to , the ag- gregate volume occupied by matter in unit space. Hence, in the*~~

~~*ee 6 Se ; ; expression —> wl re wl is inversely proportional to the density,*~~

~~*or to A, as the case may be. 1g*~~

~~*Sean wl.*~~

~~*Hence, given the absolute increase of density of a gas per unit of d*~~

~~*az' versely as the density of the combined gases.*~~

~~*Now the rate of diffusion on this theory depends upon*~~

~~*length, that is, given the rate of diffusion ought to vary in-*~~

~~*On the other hand, given the proportional increase of the density, or ¥ | the rate of diffusion ought to be independent of the density, because in that case*~~

~~*an ae qq Varies directly, and wl inversely, as V. The analytical result,*~~

~~*that at given temperatures, and given the absolute value of the rate of diffusion is inversely proportional to the density of the gases agrees with the experimental results obtained by Loschmidt for carbonic acid gas and air, carbonic acid gas and hydrogen, hydrogen and oxygen.}*~~

~~*Relation of the Coefficient of Diffusion to Temperature. —The coefficient of diffusion varies directly as the square root of the abso- lute temperature, for*~~

~~*— ww wWl=F and ~ woVh Baan Ne (eee due#\ 2 Vh wh J 9*~~

~~*or, if wVA=y, paone N® { e /h*~~

~~*Hence*~~

~~*where y denotes a certain function, and Pra) Py is 4 (a) icc Al dw —*~~

~~1~~

~~ra) yt 1 1 oe) ch dy e-¥ =e ar dy e~¥* ary oc ——, [, ht B a/. na) a/h~~

~~This analytical result also agrees fairly with Loschmidt's experi- ments above referred to.~~

~~FRICTION OR Viscosity oF GASES.~~

~~Suppose two layers of gas separated by an imaginary plane, similar in all respects except that the molecules of one have a small common momentum in a certain direction parallel to the plane. We may take the imaginary plane for that of yz, and the average direction of motion of the molecules on one side of the plane, ¢.g., the left-hand side, for the axis of y, the molecules on the right-hand side of the plane having no average momentum. Then the mole- cules crossing from the left to the right side carry with them an average momentum in the direction y, and so tend to impress the right-hand stratum of gas with that mo- mentum. On the other hand, the molecules of the right- hand stratum crossing the plane into the left-hand one have, relatively to the molecules in the latter, an average momentum in the opposite direction, and therefore tend to diminish the average momentum of the left-hand stratum.~~

~~1 Sitzungsberichte, 1870, Bd. 1xi. 8. 380. 2 See Meyer's Kin. Theorie, p. 295.~~

~~nor Cw bf i~~

~~Hence, if we attempt to cause one stratum of gas to pass over another in parallel planes, we experience a resistance due to the interchange of molecules between the portions of gas separated by the plane. This is in some respects analogous to sliding friction between solid bodies, and is called by German writers the "friction" (Reibung), by Max- well and others the "viscosity," of the gas, Meyer ! investi- gates this effect of friction in a manner somewhat similar to that employed in case of diffusion, and obtains for the~~

~~coefficient of viscosity + mol. Relation of the Coefficient of Viscosity to Density and Tempera- twre.—The viscosity of a gas is independent of the density, being,~~

~~according to O. E. Meyer, mx wl. Now, for any one gas, l,, is, as~~

~~we have seen, inversely proportional to the density, and therefore wt is inversely proportional to the density. On the other hand, V is directly proportional to the density. Hence the viscosity is in- dependent of the density. This agrees with the result obtained by Maxwell from the kinetic theory in 1860, and with the results of experiments by Maxwell? and O. E. Meyer.? Also, experiments by O. E. Meyer and Springmiihl 4 on the ¢ranspiration of gases show that the times in which two different gases under similar circum- stances flow through a tube maintain the same constant ratio to~~

~~one another. As in the case of the coefficient of diffusion, w/ is inversely proportional to the square root of the absolute temperature. As both the coefficient of diffusion and that of viscosity depend~~

~~on the same function w/, it should be possible from experiments on viscosity to determine the rate of diffusion. Experiments with this object have been conducted by Stefan with very satisfactory results, his calculated values for the coellicient of diffusion agreeing very closely with those determined by Loschmidt's direct experiment. §~~

~~We have given the above results for the coefficients of diffusion and viscosity from O. E. Meyer's work, because his method has met with very general acceptance. It has been shown, however, by Boltzmann,' that the method is incomplete. Meyer's results can only be obtained on the assumption that the molecules of a gas undergoing diffusion or internal friction, which have any given velo- city, as7, are moving with that velocity in all directions indifferently. We may calculate the number of molecules having velocity w that pass through a given plane during a short time dé, starting from encounters at any given distance from the plane. If we assume that thé molecules, issuing from such encounters with velocity w, move indifferently in all directions, we obtain Meyer's result. This assumption is true only of a gas at rest—that is, having no velocity of translation—so that~~

~~*our result so obtained would express, in case of diffusion, the rate at which two gases begin to diffuse, if given at any instant both at rest—that is, with no stream velocity—but mixed in unequal proportions in different parts of space. In any actual case of diffusion, either of the two diffusing gases acquires a small velocity of translation. If we take this velocity into account in calculating the number of molecules of the gas ag: through a plane, according to Meyer's method, we shall*~~

~~*nd that it introduces two new terms, one of which, when the motion becomes steady, is equal and opposite to the result obtained by Meyer. This is proved by Boltzmann in the case of viscosity in the treatise above referred to. The same proof is easily applied in the case of diffusion.*~~

~~*Stefan's Method.—Stefan® regards the two diffusing gascs as having small velocities of translation, or stream velocities, w, and Mo, in opposite directions, so that the molecules of one gas, of mass ™,, have an average momentum m,1, in direction from left to right, and those of the other gas, of mass m,., an average mo- mentum m,t. from right to left. By virtue of encounters between the two sets of molecules, each gas is always imparting to the other a portion of its own average momentum, and receiving from the other a corresponding momentum in the opposite direc- tion. The momentum so transferred or interchanged is what Stefan calls the resistance which one gas offers to the other's diffusion. In this investigation Stefan assumes that all classes of molecules of one gas, whatever their molecular velocity in space, have the same average velocity in the direction of diffusion—that is, the same stream velocity—so that the motion of the molecules of a diffusing gas would be exactly represented by considering the molecules of a gas at rest—that is, with only its molecular velocity—at the same*~~

~~*1 See pp. 311-325 of the work above referred to.*~~

~~*2 Proceedings of the Royal Society, 8th' February 1866.*~~

~~*3 Poggendorf's Annalen, 1871, cxliii. 14.*~~

~~*4 Pogg. Aun., 1873, exlviii. 1 and 526.*~~

~~5 Sitzwngsber. d. k.-k. Akad., 1872, Ixv. 328.~~

~~6 For a full account of these and other experiments on diffusion and vis- cosity, see O. E. Meyer, Kinetische Theorie d. Gase, under the heads " Reibung" and " Diffusion."~~

~~7 " Zur Gas-Reibung," in the Sitzwngsber. d. k.-k. Akad., 1881.~~

~~8 Oia "On the Dynamical Theory of Diffusion" (Sitzwngsber. a. k.-k. Akad., lxv.~~

~~619~~

~~temperature and pressure, and then giving to each molecule the additional common velocity w in the direction of diffusion. Boltz- mann, however, shows that, in order correctly to represent the motion of the diffusing gas, we must impart to molecules having different molecular velocities independent of direction different. common velocities in the direction of diffusion. And it will be found that the resistance of the gases is sensibly modified by this property.?~~

~~_ The complete solution of the problem,—that is, the determina- tion of w as a function of w, on the hypothesis that the molecules are clastic spheres,—is difficult.~~

~~If we assume molecules to be centres of force varying inversely as~~

~~the nth power of the distance, so that the force at distance r is =.~~

~~where u is constant, we obtain the following result. We assume the molecules of gas 4 whose absolute velocities are between wand w + dw to have an average stream velocity w in direction of the tube, where w is a function of 2. Then, if the terminal con- dition at the ends of the tube be maintained constant, we obtain an equation of the form~~

~~pdNy_4n-8/, _mym, ___ NN; N dz 8n-3~· * m + m, unit volume~~

~~pace eee by the average value for all molecules of N-~~

~~gas A of~~

~~wV™-1 whereV is the relative velocity of two molecules, one taken from each gas, and Cis a constant, and M, M, the masses of the molecules of gas 4 and gas B respectively.~~

~~By making infinite we obtain the result for elastic spheres: in n—5~~

~~a case V”-1— 1, and the problem is to find the average valuc of wv.~~

~~Since p varies as the absolute temperature, and the average value of V varies as the square root of the absolute temperature, we may infer that the average value of w—that is, the stream velocity—will vary approximately as the square root of the temperature, as it appears to do from experimental evidence. If, on the other hand,~~

~~, 4n— ‘ n=5, V disappears, and gongs. In this case th analytical de- termination of « presents no difficulty ; but in the result the stream velocity varies as the absolute temperature, which accords less satis- factorily with experiments.~~

~~On Motecutar DIMENSIONS.~~

~~Many attempts have been made in recent years to form an estimate or conjecture, more or less accurate, of the numerical value of the dimensions of a molecule and the absolute force between molecules.”~~

~~In accordance with the view of the subject considered in this article, we are here concerned with such specula- tions only in so far as they are founded upon the kinetic theory of gases, or supported by it. The phenomena of diffusion and viscosity especially have afforded grounds for estimates of molecular dimensions,~~

~~It is first necessary to define what is meant by the dimensions of a molecule. Regarded as an elastic sphere, it has dimensions with the conception of which we are familiar. It is not, of course, seriously contended by any physicists that the molecules of a gas are actually hard elastic spheres, exerting no force on each other at any dis- tance greater than that of actual~~

~~contact, and then an infinite force. It is necessary to conceive the forces as finite, although they may diminish so rapidly with the dis- tance as that the motions of molecules in the aggregate differ little from what they would be if the molecules were ideal elastic spheres. Nevertheless, they must be finite forces ; and, that being the case, it is difficult, if not im- possible, to frame a definition of the boundary of a mole- cule, except as a certain surface at which the forces acting between the molecule in question and other molecules~~

~~attain a certain value. If, for instance, we were to regard a molecule as a centre of force,~~

~~® For Boltzmann's own treatment, of the subject we cannot, within the limits of this article, do more than refer tle reader to the memoir above mentioned, "Zur Gas-Reibung," and another as yet unfinished nemoir "On Diffusion," in the Sitzwngsber. d. k.-k. Akad., 1882. ; ;~~

~~10 An account of these will be found in O. E. Meyer's Kin. Theorie d. Gase, in Professor Tait's Recent Advances in Physical Science, lect. xii., and in the following memoirs :—Phil. Mag., July 1879, " On the Size of Molecules," by N. . D. C. Hodges; Phil. Mag., March 1880, "On the Mean Free Path of Molecules, by the same author. See also, lecture delivered by Sir W. Thomson at the Royal Institution, 2d Feb. 1883.~~

;

~~: : be , : no Gaia exerting an attractive force (4 aud a repulsive force 7, we might~~

;

~~: a define the molecule to be a sphere of radius a, such that (7=77.~~

~~In like manner, regarding a molecule as a centre of force, repelling according to the law of the inverse fifth power of the distance, we might define the magnitude of a molecule as a sphere of radius equal to the least~~

~~*distance to which two molecules, whose relative velocity is equal to the mean velocity of the centres of force, approach each other in a direct encounter.*~~

~~*If on any hypothesis concerning the nature of a molecule, or the law of force which acts during encounters, we can calculate the co- efficient of viscosity or diffusion analytically, a comparison of the analytical result with results obtained by experiment may afford the means of determining the absolute numerical value of the con- stants used in the analysis. For example, if we consider the mole- cules as elastic spheres, and if we consider for a moment Meyer's results as correct, or approximately correct, the awe of*~~

~~*i—*~~

~~*viscosity for any single gas can be put in the form —9~ oly,*~~

~~*where WV is the number of molecules in unit of volume, m the mass of a molecule. Now, for every value of wi,,, the mean free path*~~

~~*a . of a molecule with that velocity is equal to \/h aa, where s is*~~

~~*twice the radius of a molecule multiplied by a numerical factor which can be determined to any required degree of accuracy. Also at given temperature and pressure the numerical value of /h is known. It follows that we can calculate the numerical value of the coefficient of viscosity by analytical methods in terms of N7s**~~

~~*F ¢ P to any required degree of accuracy. Let it be Nast If by experi-*~~

~~*ments on viscosity we can determine the numerical value of the same coefficient in the form C,, when C, is a mere numerical quan-*~~

~~*, f : ; C (Of tity, we have immediately the equation C)}= Naw oF Nr? = a:*~~

~~*This gives in absolute numerical measure the value of WV7s?, or four times the sum of the great circle areas of all the molecules in unit of volume, supposing them to be spherical. If we attempt to use the coefficient of*~~

~~*diffusion instead of viscosity in this method, we are met by the difficulty that the analytical result contains now two unknown quantities instead of one—namely, the radii of the respective molecules of the two gases in question. If this difficulty be got over by a comparison of results obtained in different ex- periments, the greater certainty attending the observations on dif- fusion might perhaps compensate for the additional mathematical difficulty, and render diffusion at least equally trustworthy with viscosity as a method for estimating molecular dimensions. Again, on the hypothesis of repulsion between molecules according to the law of the inverse fifth power of the distance, we can calculate analytically the rate of diffusion between two reservoirs connected by a tube as above described, the result containing only one unknown constant, viz., #4, the constant of absolute force. Com- paring the analytical result with the results of experiments on diffusion through such a tube as above described, if we find them capable of being harmonized by attributing any numerical value to #, we should have good reason for concluding that the law of force assumed is toa certain extent at least the true law, and that the particular value of » is that which harmonizes the analytical with the experimental results. And the determination of u, the absolute force, corresponds to, or indeed 7s, the determination of the size of the molecule,*~~

~~*Until all the mathematical hypotheses have been fully developed, no very great reliance can be placed on the results of such com- parisons, even assuming that the experimental results themselves are to be depended upon. However valuable the experiments may be for other purposes, they are not valuable for the purpose of determining molecular dimensions until our mathematical analysis is sufficiently advanced to enable us to interpret the experiment. At present it is perhaps impossible to deduce from the experiments any other result bearing on this question than that the coefficients of diffusion and viscosity increase with increasing temperature, and probably contain an important term proportional to the square root of the absolute temperature. If, indeed, it can be shown that that is the only term, and if it can be also shown that the density of one of two diffusing gases in a tube through which steady diffusion is going on tends to vary in geometrical progression, then the analysis will lead us to the conclusion that molecules of gases behave in their physical relations to each other as if they were elastic spheres,*~~

~~The following method has also been suggested for estimating the magnitude of molecules of mercury. Mercury is regarded by most chemists as monatomic. Let us assume that its molecules are con- ducting spheres; on that assumption we may calculate the specific~~

~~bes wale capacity of mercury vapour on Faraday's hynothesis to be + Sena: ; Y—x> Where A is the ratio which the aggregate volume of all the~~

~~CULE~~

~~spherical molecules in unit volume bears to unit volume. If now K, the specific inductive capacity of mercury vapour, can be deter-~~

~~: 1+2A mined experimentally, the equation A= 7) affords a ground~~

~~for estimating the value of A,—that is, the aggregate volume of the molecules.~~

~~Another method, originally proposed by Van der Waals, is founded on the small deviations from Boyle's law observed in all gases. Suppose a vessel of volume V containing a number J, of elastic spheres, each of mass m, moving with a certain average kinetic energy. Let », be the pressure. Let a second class of elastic spheres, in number N,, each of the same mass m as the former class and having the same average kinetic energy, be introduced into the vessel. If the second class of spheres could freely penetrate the first, and vice versa, so that there should be no restrictions on a sphere of the first class and a sphere of the second being in the same place at the same time, then the pressure on the walls of the N, +N,~~

~~vessel would be increased in the exact proportion . Boyle's~~

~~law would be exactly fulfilled. But if the spheres cannot pene- trate each other, the volume occupied by the second class of spheres~~

~~4~~

~~is not V, but V- 3 Myr, if » be the radius of a sphere of the~~

~~*first class. Consequently, the pressure due to the second class of spheres is rather greater than it should be, and there is a small deviation from Boyle's law. Van der Waals treats the pressure as proportional to the number of encounters, and therefore inversely Se ee to the mean free path, which is evidently diminished*~~

~~*y any increase in the magnitude of the spheres, and diminished more than in proportion by any increase in the number.*~~

~~*(H. W. W.—S8. H. B.)*~~

~~*CHEMICAL ASPECT.*~~

~~*The word Molecule is used by chemists to express the unit of a pure substance, that quantity of it which its formula ought to represent. What this quantity is, in any particular case, must be ascertained by studying the chemical actions by which the substance is produced and the chemical changes which it undergoes. We may give one or two illustrations to show how this can be done, as well as to indicate the limits within which these methods can be applied.*~~

~~*The formula usually assigned to acetic acid is C,H,O,. This agrees with almost all the chemical actions in which it takes part. Thus, one quarter of the hydrogen is replaceable by other metals, as in C,H,KO,, &c.; and one, two, or three quarters of the hydrogen can be replaced by chlorine. There must, therefore, be four (or a multiple of four) atoms of hydrogen in the molecule. Similarly, half of the oxygen can be replaced by sulphur, and one-half of the oxygen along with one-quarter of the hydrogen can be replaced by chlorine. There must, therefore, be two (or a multiple of two) atoms of oxygen in the molecule. Again, the formation of marsh gas and carbonate of soda, when acetate of soda is heated with caustic soda, and the formation of aceto-nitrile from cyanide of potassium and iodide of methyl, show that the carbon in acetic acid is divisible by two, or that the molecule contains two (or a multiple of two) atoms of carbon. O,H,O, is the simplest formula which fulfils these conditions, but the existence of an acid acetate of potash and an acid acetate of ammonia, the formule of which are usually written C,H,KO,, C,H,0, and C,H,(NH,)O,, C,H,O,, as if these were com- pounds derived from two molecules of acetic acid, might lead us to C,H,O, as this shows that the hydrogen is divisible by eight. In the same way, we can easily satisfy ourselves that C,H,,O;, or some multiple of it, is the formula of starch ; that C,H;NO, or some multiple of 1, is the formula of indigo blue, and so on. But it is not easy to determine by purely chemical methods whether these formule themselves, or multiples of them, really represent the molecule. A simple formula may suffice for a great many of the reactions of a substance, and may enable us to represent a great many of its derivatives, and yet reactions and derivatives may be discovered which require a multiple of that simple formula. This has already been indicated in reference to acetic acid, and a very striking*~~

~~*Ou ns CU Ls*~~

~~*illustration is supplied by mellitic acid. For a long time the formula C,H,O, was used for this acid, and by means of it all the then known derivatives were repre- sented. But later investigations by Baeyer proved that this formula must be multiplied by three, the new deriva- tives obtained by him not being capable of representation with any formula simpler than C,,H,O,.. Very many ex- amples of the same kind might be adduced, but those given*~~

~~*may serve to show the nature of the difficulty of settling the formula and with it the molecular weight of a sub- stance. It need scarcely be said that the multiple formula represents everything which the simple formula represents and something more, and that chemists as a rule take the simplest formula which will answer the purpose. These chemical methods of determining the formula and mole- cular weight apply equally to all pure substances, but they do not give us absolute values, only numbers to which the molecular weights are proportional. And for purely chemical purposes these are all that we require. Thus, when a chemist speaks of acting on a molecule of suc- cinic acid with two molecules of pentachloride of phos- phorus, he means that he mixes them in the proportion of 118 parts of the former to 2× 177-5 of the latter. For the sake of precision we sometimes speak of a mole- cule of water (or other substance) in grammes, or even of a gramme-molecule, agrain-molecule, &c. Thus, in the case just mentioned a gramme-molecule of succinic acid means 118 grammes of succinic acid, &c.*~~

~~*But, while for practical purposes these proportional numbers are quite sufficient, we cannot leave out of view their relation to the actual constitution of matter. There is good reason to believe that matter consists of discrete particles, and that every pure substance is made up of small portions of matter, all alike, so that one of them, if we could examine it, would give us a complete idea of the chemical composition, constitution, and character of the substance. These small portions, of which the smallest quantity of the substance which we can examine contains many millions, we may call molecules. From the character which we have supposed this molecule to possess—viz., that it fully represents all the chemical properties of the sub- stance—it will be seen that these real, ultimate molecules must be proportional to the molecular weights ascertained by chemical means ; so that, while for practical laboratory or manufacturing purposes we use the gramme, the pound, or the ton as our unit, and speak of 18 grammes, pounds, or tons, as the case may be, of water, as a molecule (or gramme- molecule, ton-molecule, &c.), in dealing with the actual constitution of matter we should use as our unit the mass of a single atom of hydrogen, and our gramme- molecule would then be a definite, very large, but not yet accurately ascertained, number of real molecules.*~~

~~*It has been already shown above that, on the kinetic theory of gas, a gas consists of a number of particles moving about in straight lines in all directions, and that in a homogeneous gas which follows Boyle's and Charles's laws these particles are all alike. The masses of the particles of different gases are therefore to one another in the same proportion as the densities of the gases, tempera- ture and pressure being the same. Thus, in gases, the in- dependently moving particles of the kinetic theory are the molecules of which the chemist is in search, and it becomes important that we should compare our chemically found molecular weights with the densities. Theoretically accu- rate results could be obtained only in the case of a perfect gas; but small deviations from Boyle's and Charles's laws do not interfere with the application of this method. Chemical methods, as we have already seen, lead us to a particular number, or a multiple of zt, so that our choice is as a rule limited to two or three numbers widely differing*~~

~~*from one another. We find that if we do not exceed the limits of chemical stability a gas approaches the state of a perfect gas as the temperature increases, or as the pres- sure diminishes. Now if one of the numbers rendered probable by chemical evidence nearly coincides with that given by comparison of gas densities, under conditions where the substance sensibly deviates from Boyle's and Charles's laws, we find that by diminishing the pressure or increasing the temperature within the limits of chemical stability, and thus bringing the substance nearer the state of a perfect gas, the correspondence between these two numbers becomes closer. This has already been pointed out and illustrated in the article CuEmisTRY, vol. v. p. 469.*~~

~~*We can now compare the results, in the case of gases, of the chemical and of the physical determination of molecular weight, by giving some examples, placing side by side the formula and molecular weight adopted by chemists, and the mass, in grammes, of the gas occupying the volume of 22°33 × 760/p x (273 + 1)/273 litres. This volume is that which one gramme of an ideal gas having the molecular weight 1, and perfectly following Boyle's and Charles's laws, would occupy at pressure p millimetres of mercury and temperature ¢° C. If, then, w be the mole- cular weight of any gas, «*~~

~~grammes of it should occupy this volume, and slight deviation from this would indicate slight deviation from Boyle's and Charles's laws. In the annexed table wis the molecular weight and m the mass contained in 22°33 × 760/p x (273 + t)/273 litres. Where the temperature is not specially stated, the determinations were made under the usual atmospheric conditions.~~

~~Name. Formula. W. Me Sulphuretted hydrogen …) H,S 34 | 34°04 Nittomgioxide ……100…+. NO 44 | 44:08 2005)110) 0 he NH, il ile:~~

~~Carbonic acid ……..1…0..5 co, 44 44°14 BYBAS oe.eee sss eee een aes CH, 16 16°13 QloGaat Gas ……..ee000s C,H, 28 | 28°44 TMOG eea esss.0asaveeene labs Z 2 ODN eseas yes -01etisee sarees 0, 32 32 CIMGTIG Pe… iaseasesoesaes Cl, 71 71°27) at 100° C. PROGBWORRSW... 6.00 eidseeeee P, 124 | 125°9 500° C UR PMAI Ce cis 4 gives 0s SUR 0s As, 300 | 294°5 860° C S 192 | 194 |°° 500°C Sulphur pleiplsieihisin'nieis ajevaisleveveiacereibrete | (S) 64 63°5 ,1000° C Bromide of aluminium …| Al,Brg | 584 | 537°5 | ,, 440°C Henmeichiloridems…e.e.s.0.03 Fe,Cl, 325 | 328°8),, 440°C Sal-AaMMOnae ….00…0.000s NH,Cl | 53°5 | 29°6 | at 350° C. Onlfor Wael. eds eee ors H,SO, 98 50°24 |,, 440°C Pentachloride of phos- . 140 |,, 200°C TOMOVNER eeontannoceneeenrs PCl, ees) 105°4 300° C | Sulphide of ammonium …|(NH,),S| 68 PETS | 5 KO?~~

~~A comparison of the values of w and m leads to the following conclusions : —'~~

~~(1) In the case of a very great number of substances, of which only a few specimens are given in the table, the two determinations agree, the slight differences often observed being evidently due to deviation of the sub-stance from the state of a perfect gas. (2) In a consider- able number of substances, physical evidence leads to a multiple of the simplest number satisfying the chemical conditions. This cannot be looked upon as a disagreement between the methods, because, if a particular formula satis-fies the chemical conditions, any multiple of it will neces- sarily do so; and indeed, in many of the cases we are now considering, it is possible from chemical considerations to justify the higher molecular weight after it has been sug- gested, although such chemical considerations might not in all~~

~~cases have warranted its adoption without external support. Thus, we are not without chemical evidence in~~

~~favour of the formule H_2, Cl_2, O_2, or even Al, Br, and Fe_2Cl_6, although chemists would probably have contented them- selves with H, Cl, O, $AlBr_3$, and $FeCl_3$, had it not been for the evidence of gas and vapour-density, and certainly with- out the latter no one would have thought of P_4, As_4, or S_8.1 (3) There are a number of substances in the case of which there is an apparent disagreement between thie results of the two ways of determining molecular weight. Such substances are said to have an anomalous gas or vapour-density. The expression anomalous vapour-density is sometimes applied to the case of such substances as phosphorus and arsenic, but not very accurately. It would be better to say that these substances have an unexpected vapour-density, because their complex molecular formule, while not clearly indicated by their chemical character, are not at variance with any established law.~~

~~We shall therefore reserve the term "anomalous vapour-density" for those substances the molecular weight of which as given by their vapour-density is not reconcilable with any formula which is chemically admissible. In the case of some substances, such as the oxides of chlorine, it has been shown that the discrepancy was due to errors of observation, impure specimens having been used in the experiments; but there still remain many substances having, in the sense above indicated, an anomalous vapour-density. These substances have therefore been examined with special care, with the result of completely vindicating the kinetic theory, and of disclosing a very interesting and theoretically important kind of chemical change. We shall take, as instances of such anomalous vapour-densities, the substances in the last division of the table, and show how the anomaly has in these cases been explained.~~

~~Sal-ammoniac has the composition represented by the formula NH_4Cl. This formula agrees with all the chemical actions of the substance and of all the substances in any way related to it, but it does not agree with the results of vapour-density determinations. When sal-ammoniac is heated it is converted into vapour or gas, and this vapour or gas is reconverted into~~

~~solid sal-ammoniac when it is cooled. This looks exactly like the process of sublimation, and it was universally supposed that the vapour given off when sal-ammoniac is heated was 'really sal-ammoniac vapour. But its vapour density corresponds, not to the for- mula NH,Cl and the molecular weight 53°5, but to the half of this. Now this formula does not admit of divi- sion, and the explanation at once suggests itself, that the vapour examined was not really the vapour of sal- ammoniac, but of hydrochloric acid and ammonia gases, the products of the decomposition of sal-ammoniac.~~

~~This would of course completely explain the apparent anomaly ; each molecule NH,Cl dividing into two mole- cules NH, and HCl, the gas from a given weight of sal- ammoniac would of course contain twice as many molecules and occupy twice the space which it would do if no such decomposition had occurred. On this supposition the mixed gases would remain uncombined as long as the temperature was above the decomposing point of sal- ammoniac ; if the temperature fell below this point they~~

~~1 It is important as a matter of scientific history to note that this agreement of gas density and chemical molecular weight was first indicated by Gay-Lussae, who showed that the ratio of the densities of two gases stood in a very simple arithmetical relation to the ratio of their chemical equivalents. Avogadro in 1811 brought forward his famous hypothesis, that the number of molecules in a given volume of gas is independent of the nature of the gas, or that the densities of gases (temperature and pressure being the same) are to one another as the masses of their molecules. This hypothesis is now shown to be in accordance with the kinetic theory of gas, and is known as " Avogadro's law.' See Atom, vol. iii. p. 40, where a slight con- fusion has been caused by using the word " equivalent" instead of "molecule," and by not sufficiently distinguishing between the discovery of Gay-Lussae and the hypothesis of Avogadro.~~

~~MOLE Cw~~

~~would unite and reproduce sal-anmmoniac. It was neces- sary, however, to prove that this decomposition occurs.~~

~~As has been shown above (p. 618), the rate of diffusion of a gas depends upon its density. In this case the two gases into which the substance may be~~

~~supposed to break up at the moment of volatilization differ considerably in density ; we ought, therefore, to be able to effect partial separation by means of diffusion, and it has been shown that such partial separation actually does occur. Thus, if we have hydrogen gas on one side of a porous dia- phragm and volatilized sal-ammoniac on the other side, we find after a time that, mixed with the hydrogen on the one side, we have what we may for shortness call sal- ammoniac vapour—that is, a vapour which when cooled forms solid sal-ammoniac—vwith an excess of ammonia, which, being less dense than hydrochloric acid gas, has diffused faster ; while on the other side, also mixed with hydrogen which has diffused through the diaphragm, we have sal-ammoniac vapour with excess of hydrochloric acid, the denser and more slowly diffusing gas. This of course proves that the decomposition has occurred, but it does not prove that the vapour of sal-ammoniac consists entirely of hydrochloric acid and ammonia mixed with one another. That this in fact is not the case has been shown by an ingenious experiment. The two gases were separately raised to a temperature higher than that at which sal-am- moniac volatilizes, and were then allowed to mix ina vessel kept at the same temperature as the two gases. In this vessel a delicate thermometer was placed, and it was found that the mixing of the two gases was accompanied by a small but very decided evolution of heat. This proves that some chemical combination takes place, and that the mixed gases must contain some vapour of NH,Cl. More- over, careful determinations of the vapour density of sal- ammoniac prove that it is a little more than the mean of the densities of ammonia and hydrochloric acid (as compared with air at the same temperature and pres- sure, 1‘01 instead of 0°9255 at 350°C.); and this increase of density on mixing the hot gases is easily explained by supposing that a small proportion is in the condition of NH,Cl, while the most of the gas consists of separate NH, and HCl molecules.~~

~~In a similar way it has been shown that the vapour of oil of vitriol is a mixture of two vapours,—that of water, H,O, and that of sulphuric anhydride, SO,; and that sulphide of ammonium when volatilized breaks up into two volumes of ammonia and one of sulphuretted hy- drogen, (NH,),S =2NH,+H,S. We find, therefore, that in the former case, as in that of sal-ammoniac, w= 2m, and in the latter, w= 3m.~~

~~This peculiar kind of decomposition is now known by the name "' dissociation." (See vol. v. pp. 475, 476.) In the cases we have mentioned the substances undergo nearly complete dissociation at the temperature at which they volatilize, and recombination takes place when they are cooled and again assume the solid, or, as in the case of oil of vitriol, the liquid state. These substances are therefore not suited for the illustration of the whole course of dissociation. This has been carefully studied in the case of some compounds, in which the dissociation is far from complete, at the boiling point of the substance, with the result that, if 4B be the compound dissociating into the separate molecules 4 and B, we may represent the amount of dissociation as the ratio of the num- ber of pairs of separate 4 and B molecules to the total number of pairs of 4 and B, both separate and conibined. This ratio we may call R, so that when dissociation is complete R=1.~~

~~(1) R increases as the temperature rises. (2) dR/dt (where ¢ is temperature) isa maximum when R=4. (8) The presence of excess of either A or B diminishes the value of &. For instance, PCI, is nearly completely dissociated into PCl, and Cl, at 300° C.; butifa large excess of PCl, is mixed with the vapour.it is found to contain scarcely any Cl,, so that dissociation is greatly diminished by the presence of excess of PCl,. These experimental results are capable of explanation on the kinetic theory of gas, if we adopt Pfaundler's hypothesis. This is, that for each case of dissociation there is a~~

~~MOL—MOL~~

~~limiting value for the internal kinetic energy} of a molecule of AB, If a molecule of AB, by encounters with other molecules or with the wall of the vessel containing the gas, acquires a greater amount of internal kinetic energy than this limit, it at once breaks up into A-and JS, so that in the gaseous mixture there are no molecules of AB having more internal kinetic energy than the limit. Further, if two molecules, one of 4 and one of B, meet one another with such a velocity and with such an amount of internal kinetic energy that together the internal kinetic energy is less than the limit, they will unite to form a molecule of 4B. Thus the molecules with great internal kinetic energy will be separate molecules of A and £8; those with~~

small internal kinetic energy will mostly be united as AB, This hypothesis has been to a considerable extent worked out and applied by Pfaundler and by Naumann, and the deductions from it agree fairly well with the results of experiment ; but in some points the theory has not been fully developed, and in some it does not seem altogether to accord with observed facts. Some of these difficulties have been mentioned above. We know enough of the nature of dissociation to see that it belongs to the class of balanced chemical actions, in which a chemical change is reversible, and equili- brium is kept up, with constant external conditions, by the two opposite chemical changes taking place to an equal extent in a given time. We can see that all such cases are explicable by the statistical method, but we cannot apply this method mathematically until we know more of the intimate nature of the molecules and of the way in which they act upon one another. In this discussion of dissocia- tion we have looked specially at the cases in which 4, B, and AB are all gaseous, because it was the question of anomalous vapour densities which led us to treat of the subject. Dissociation also occurs where one or two of the substances are solid or quid.

We now see with what restrictions the method of vapour density is applicable to the determination of molecular weight, and we can understand more fully the example given in the article CHEMIsTRY, vol. v. p. 469. It is there shown that acetic acid vapour does not conform to the laws of Boyle and Charles until the temperature is raised to about 250°, at the ordinary barometric pressure. At and above that temperature the vapour density corresponds to the formula C,H,0. At lower temperatures the density corresponds to a higher molecular weight. Now Playfair and Wanklyn determined the vapour density at much lower temperatures than the ordinary boil- ing point of acetic acid, by greatly diminishing the pressure of the

MOLESKIN is a stout heavy cotton fabric of leathery consistence woven as a satin twill on a strong warp. It is finished generally either as a bleached white or as a slaty drab colour, but occasionally it is printed in imitation of tweed patterns. Being an exceedingly durable and econo- mical texture, it was formerly much more worn by working- men, especially outdoor labourers, than is now the case. It is also used for gun-cases, carriage-

~~*covers, and several pur- poses in which a fabric capable of resisting rough usage is desirable.*~~

~~*MOLESWORTH, Sir WitttaM (1810-1855), the eighth baronet, was. born in London, 23d May 1810, and succeeded to the extensive family estates in Devon and Cornwall in 1823. On the passing of the Reform Act of 1832 he was re- turned to parliament, though only twenty-two years old, for the eastern division of the county of Cornwall, to support the ministry of Lord Grey. For some time he took little part in the debates of the House of Commons; but in April 1835 he founded, in conjunction with Mr. Roebuck, the London Review, as an organ of the politicians known to the world as "Philosophic Radicals." After the publication of two volumes he purchased the Westminster Review, and for some time the united magazines were edited by him and J. S. Mill. From 1837 to 1841 Sir William Molesworth sat for the borough of Leeds, and during those years acquired con- siderable influence in the House of Commons by his speeches and by his tact in presiding over the select committee on Transportation. From 1841 to 1845 he remained in private life, occupying his leisure time in editing the works in Latin and English of Thomas Hobbes of Malmesbury, a recreation which cost him no less than £6000. In the latter year he*~~

~~*1 By internal kinetic energy is meant the kinetic energy of motion of the parts of the molecule relatively to one another, in contradis- tinction to the kinetic energy of motion of the molecule as a whole.*~~

~~*acetic acid vapour. This they accomplished by mixing it with a large quantity of hydrogen, so that the pressure due to acetic acid vapour formed only a small fraction of the total pressure. The vapour density of acetic acid at the low temperatures at which they worked was found to correspond very nearly with the formula C4H,0,, and, by comparing this result with what has been said (p. 620) of the chemical evidence as to the molecular weight of acetic acid, we may reasonably conclude that the molecule of acetic acid at low temperatures is C,H,O,, and that as the temperature is raised it undergoes dissociation, each molecule dividing into two of C.H,0, This is then a case where A'and B are equal, and 4.4 divides into4+A, Another instance of the same kind is probably to be found in peroxide of nitrogen*~~

~~(CHEMISTRY, p. 518), where N,0, divides into NO, + NO,. Similarly, sulphur vapour has, at temperatures below 500° C., a density corresponding to the formula Se. This dissociates as the temperature rises until, about 1000° C the density corresponds to the formula S, (CHEMISTRY, p. 498). We have now seen that chemistry receives great assistance in the determination of molecular weight from physics, but this assistance is almost entirely confined to the case of gases, or of substances which can be volatilized. The phenomena of the diffusion of liquids show us that there also there are independently moving particles ;~~

~~Ss)~~

~~| but the laws of liquid-diffusion have not been sufficiently gener-~~

~~alized to give us much help in the determination of the relative masses of these particles. In liquids it is probable that the par- ticles are very near each other, and that their shape and their mutual action, as well as their mass and the temperature, detcr- mine their rate of motion.~~

~~In solids we have no independently travelling particles, and it is perhaps scarcely correct to speak of a molecular structure of solids at all. Solids are no doubt composed of atoms, and those atoms are evidently arranged in what may be called a tactical order. When the solid is fused or dissolved or volatilized, it breaks into molecules, each repetition of the pattern, if we may use the expres- sion, being ready to become an independent thing under favourable circumstances. But, while these potential molecules of solids can- not perhaps be properly called molecules in a physical sense,? for chemical purposes we may call them so, for they are the smallest portions of the substance which fully represent it chemically, and, as we have seen, this is the chemical molecule, the quantity which should be represented by the formula. (A. CoiBa)~~

~~was returned for the borough of Southwark, and retained that seat until his death. On his return to parliament he devoted special attention to the condition of the colonies, and delivered many speeches in favour of a reduction in colonial expenditure and on their better administration. His arguments on these questions changed the opinions of the members of the House of Commons; and the criticisms of the daily press, aided by the~~

~~*printing of his speeches, led to the gradual acceptance of his views by the electors at large. It was not, however, until many years afterwards that he was allowed full opportunity for working out the difficult problems connected with the government of Great Britain. Office was conferred upon him in December 1852 by Lord Aberdeen, but it was the minor post of directing the public improvements and crown lands of his own country, and the chief work by which his name was brought into prominence at this time was the construction of the new Westminster Bridge. At last, in July 1855, he was called to preside over the Colonial Office, but unfortunately its duties were no sooner entrusted to his care than he was cut off by death (22d October 1855), to the universal regret of his countrymen, for he had lived down the animosities of his youth, and had attracted to himself the sympathies of all thoughtful men. The influence which his views had acquired, and still retain, may be judged from the fact that in 1878 the delegates of the Transvaal Government put forward, as the chief argument for the withdrawal of the English from the Transvaal, the substance of his speech on the abandonment of the Orange River Territory in 1854. A full pedigree of the Molesworth family is printed in Sir John Maclean's Trigg Minor, vol. i.; the titles of his speeches and works*~~

~~*2 It may be urged that the cleavage of crystals indicates that they possess a molecular structure, but a tactical or pattern-like arrangement of atoms may easily be supposed to present planes of easier separation, without the assumption of really independent molecules.*~~

~~*may be found in the Bibl. Cornubiensis, vols. i. and iii. The name of Sir William Molesworth is frequently mentioned in the biographies of Mill, Cobden, Carlyle, Grote, and Panizzi.*~~

~~*MOLFETTA, a city and seaport of Italy, in the province of Bari, 16 miles by rail north-north-west of Bari. From the sea it presents a fine appearance with its white stone houses and the remains of its turreted walls; and there are several buildings of considerable pretensions. The castle was in the 14th century the prison of Otho, duke of Brunswick. The cathedral is dedicated to St Conrad. Molfetta has well-frequented markets, a small foreign trade (6000 tons in 1881), and such industries as cotton and net*~~

~~*weaving, soap-boiling, and rope-spinning. The population was 26,516 in 1871.*~~

~~*Molfetta (Melficta or Malfitum) was given by Charles V. to the duke of Termoli in 1522, and during his lordship it was grievously sacked by the French under Lautrec. In 1631 Cesare Gonzaga took the title of duke of Gnastalla and prince of Molfetta ; but in 1640 the fief was sold to the Spinola family, and in 1798 incorporated with the royal domain. The bishopric holds directly of the papal see.*~~

~~*MOLIERE (1622-1673), to give Jean Baptiste Poquelin the stage name which he chose, for some undiscovered reason, to assume, was born in Paris, probably in January 1622. The baptismal certificate which is usually, and almost with absolute certainty, accepted as his is dated 15th January 1622, but it is not possible to infer that he was born on the day of his christening. The exact place of his birth is also disputed, but it seems tolerably certain that he saw the light in a house of the Rue St Honoré. His father was Jean Poquelin, an upholsterer, who, in 1631, succeeded his own uncle as "valet tapissier de chambre du roi." The family of Poquelin came from Beauvais, where for some centuries they had been prosperous tradesmen. The legend of their Scotch descent seems to have been finally disproved by the researches of M. E. Révérend du Mesnil. The mother of Moliére was Marie Cressé; and on his father's side he was connected with the family of Mazuel, musicians attached to the court of France. In 1632 Moliére lost his mother ; his father married again in 1633. The father possessed certain shops in the covered Halle de la Foire, Saint Germain des Prés, and the biographers have imagined that Moliére might have received his first bent towards the stage from the spectacles offered to the holi- day people at the fair. Of his early education little is known ; but it is certain that his mother possessed a Bible and Plutarch's Lives, books which an intelligent child would not fail to study. In spite of a persistent tradition, there is no reason to believe that the later education of Moliére was neglected. 'Il fit ses humanitez au Collége de Clermont," says the brief life of the comedian published by his friend and fellow-actor, La Grange, in the edition of his works printed in 1682. La Grange adds that Moliére "eut l'advantage de suivre M. le Prince de Conti dans toutes ses classes." As Conti was seven years younger than Moliére, it is not easy to understand*~~

~~how Moliere came to be the school contemporary of the prince. Among more serious studies the Jesuit fathers encouraged their pupils to take part in ballets, and in later life Moliére was a distinguished master of this sort of enter- tainment. According to Grimarest, the first writer who published a life of Moliére in any detail (1705), he not only acquired "his humanities," but finished his " philo- sophy " in five years. He left the Collége de Clermont in 1641, the year when Gassendi, a great contemner of Aris- totle, arrived in Paris. The Logic and Lthics of Aristotle, with his Physics and Metaphysics, were the chief philoso- phical text-books at the Collége de Clermont. But when he became the pupil of Gassendi (in company with Cyrano de Bergerac, Chapelle, and Hesnaut), Moliére was taught to appreciate the atomic philosophy as taught by Lucretius. There seems no doubt that Moliére began, and almost or~~

~~quite finished, a translation of the De Natura Rerum. According to a manuscript note of Trallage, published by M. Paul Lacroix, the manuscript was sold by Moliére's widow to a bookseller. His philosophic studies left a deep mark on the genius of Moliére. In the Jugement de Pluton sur les deux Parties des Nouveaux Dialogues des Morts (1684), the verdict is "que Moliére ne parleroit point de Philosophie." To "talk philosophy" was a favourite exer- cise of his during his life, and his ideas are indicated with sufficient clearness in several of his plays. There seems no connexion between them and the opinions of '" Moliére le Critique" in a dialogue of that name, published in Hol- land in 1709. From his 'study of philosophy, too, he gained his knowledge of the ways of contemporary pedants, —of Pancrace the Aristotelian, of Marphorius the Carte- sian, of Trissotin, "qui s'attache pour lordre au Péripa- tétisme ", of Philaminte, who loves Platonism, of Belise, who relishes "les petits corps," and Armande, who loves "les tourbillons." Grimarest has an amusing anecdote of a controversy in which Moliére, defending Descartes, chose a lay-brother of a begging order for umpire, while Chapelle appealed to the same expert in favour of Gassendi. His college education over, Moliére studied law, and there is even evidence—that of tradition in Grimarest, and of Le Boulanger de Chalussay, the libellous author of a play called Elomire Hypochondre—to prove that he was actually called to the bar. More trustworthy is the pass-~~

~~*ing remark in La Grange's short biography (1682), "au sortir des écoles de droit, il choisit la profession de comé- dien." Before joining a troop of half-amateur comedians, however, Moliére had some experience in his father's busi- ness. In 1637 his father had obtained for him the right to succeed to his own office as "valet tapissier de chambre du roi." The document is mentioned in the inventory of Moliére's effects, taken after his death. When the king travelled the valet tapissier accompanied him to arrange the furniture of the royal quarters. There is very good reason to believe (Loiseleur, Points Obscurs, p. 94) that Moliére accompanied Louis XIII. as his valet tapissier to Provence in 1642. It is even not impossible that Moliére was the young valet de chambre who concealed Cinq Mars just before his arrest at Narbonne, 13th June 1642. But this is part of the romance rather than of the history of Moliére. Our next glimpse of the comedian we get in a document of 6th January 1643. Moliére acknowledges the receipt of money due to him from his deceased mother's estate, and gives up his claim to succeed his father as 'valet de chambre du roi." On 28th December of the same year we learn, again from documentary evidence, that Jean Baptiste Poquelin, with Joseph Béjard, Madeleine Béjard, Geneviéve Béjard, and others, have hired a tennis-court, and fitted it up as a stage for dramatic performances. The company called themselves L'Illustre Théatre, //ustre being then almost a slang word, very freely employed by the writers of the period.*~~

~~*We now reach a very important point in the private history of Moliére, which it is necessary to discuss at some length in defence of the much maligned character of a great writer and a good man. Moliére's connection with the family of Béjard brought him much unhappiness. The father of this family, Joseph Béjard the elder, was a needy man with eleven children at least. His wife's name was Marie Hervé. The most noted of his children, com- panions of Moliére, were Joseph, Madeleine, Genevieve, and Armande. Of these, Madeleine was a woman of great talent as an actress, and Moliére's friend, or perhaps mis- tress, through all the years of his wanderings. Now, on ° 14th February 1662 (for we must here leave the chrono- logical order of events), Moliére married Armande Claire Elisabeth Grésinde Béjard. His enemies at that time,*~~

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~~*and a number of his biographers in our own day, have attempted to prove that Armande Béjard was not the sister, but the daughter of Madeleine, and even that Moliére's wife may have been his own daughter by Madeleine Béjard. The arguments of M. Arsene Houssaye in sup- port of this abominable theory are based on reckless and ignorant confusions, and do not deserve criticism. But the system of M. Loiseleur is more serious, and he goes no further than the idea that Madeleine was the mother of Armande. This, certainly, was the opinion of tradition, an opinion based on the slanders of Montfleury, a rival of Moliére's, on the authority of the spiteful and anonymous author of La Fameuse Comédienne (1688), and on the no less libellous play, Llomire Hypochondre. In 1821 tradition received a shock, for Beffara then discovered Moliére's "'acte de mariage," in which Armande, the bride,*~~

~~*is spoken of as the sister of Madeleine Béjard, by the same'*~~

~~*father and mother. The old scandal, or part of it, was revived by M. Fournier and M. Bazin, but received another blow in 1863, M. Soulié then discovered a legal document of 10th March 1643, in which the widow of Joseph Béjard renounced, in the name of herself and her children, his inheritance, chiefly a collection of unpaid bills. Now in this document all the children are described as minors, and among them is "une petite non encore baptisée." This little girl, still not christened in March 1643, is universally recognized as the Armande Béjard afterwards married by Moliere. We reach this point, then, that when Armande was an infant she was acknowledged as the sister, not as the daughter, of Madeleine Béjard. M. Loiseleur refuses, how- ever, to accept this evidence. already become the mother, in 1638, of a daughter by Esprit Raymond de Moirmoron, comte de Modéne, and chamberlain of Gaston duc d'Orléans, brother of Louis XII. In 1642 Modéne, who had been exiled for political reasons, "was certain to return, for Richelieu had just died, and Louis XIII. was likely to follow him." Now Madeleine was again—this is M. Loiseleur's hypothesis— about to become a mother, and if Modéne returned, and learned this fact, he would not continue the liaison, still less would he marry her,—which, by the way, he could not do, as his wife was still alive. Madeleine, therefore, induced her mother to acknowledge the little girl as her own child. In the first place, all this is pure unsupported hypothesis. In the second place, it*~~

~~*has always been denied that Béjard's wife could have been a mother in 1643, owing to her advanced age, probably fifty-three. But M. Loise- leur himself says that Marie Hervé was young enough to make the story "sufficiently probable." If it was probable, much more was it possible. M. Loiseleur supports his contention by pointing out that two of the other children, described as legally minors, were over twenty-five, and that their age was understated to make the account of Armande's birth more probable. Nothing is less likely than that Modéne would have consulted this document to ascertain the truth about the parentage of Armande, yet M. Loise leur's whole theory rests on that extreme improbability. It must also be observed that the date of the birth of Joseph Béjard is unknown, and he may have been, and according to M. Jal (Dictionnaire Critique, p. 178) must have been, a minor when he was so described in the docu- ment of 10th March 1643, while Madeleine had only passed her twenty-fifth birthday, her legal majority, by two months. This view of Joseph's age is supported by Bouquet (Afoliére & Rouen, p. 77). M. Loiseleur's only other proof is that Marie Hervé gave Armande a respectable dowry, and that, as we do not know whence the money came, it must have come from Madeleine. 'The tradition in Grimarest, which makes Madeleine behave en femme furteuse, when she heard of the marriage, is based on a juster appreciation of the*~~

~~*Madeleine, says he, had |*~~

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~~*character of women. It will be' admitted, probably, that the reasons for supposing that Moliére espoused the daughter of a woman who had been his mistress (if she had been his mistress) are flimsy and inadequate. The affair of the dowry is insisted on by M. Livet (La Fameuse Comédienne, reprint of 1877, p. 143). But M. Livet explains the dowry by the hypothesis that Armande was the daughter of Madeleine and the comte de Modéne, which exactly con- tradicts the theory of M. Loiseleur, and is itself contra- dicted by dates, at least as understood by M. Loiseleur. Such are the conjectures by which the foul calumnies of Moliére's enemies are supported in the essays of modern French critics,*~~

~~*To return to the order of events, Moliére passed the year 1643 in playing with, and helping to manage, the Théatre lustre. The company acted in various tennis- courts, with very little success. Molitre was actually arrested by the tradesman who supplied candles, and the company had to borrow money from one Aubrey to release their leader from the Grand Chatelet (13th August 1645). The process of turning a tennis-court into a theatre was somewhat expensive, even though no seats were provided in the pit. The troupe was for a short time under the protection of the duc d'Orléans, but his favours were not lucrative. The duc de Guise, according to some verses printed in 1646, made Moliére a present of his cast-off wardrobe. But costume was not enough to draw the public to the tennis-court theatre of the Croix Noire, and empty houses at last obliged the Théatre Ilustre to leave Paris at the end of 1646.*~~

~~*"Nul animal vivant n'entra dans nétre salle," says the author of the scurrilous play on Moliére, Llomire Hypo- chondre. But at that time some dozen travelling companies found means to exist in the provinces, and Moliére deter- mined to play among the rural towns. 'The career of a strolling player is much the same at all times and in all countries. The Roman Comique of Scarron gives a vivid picture of the adventures and misadventures, the difficulty of transport, the queer cavalcade of horses, mules, and lumbering carts that drag the wardrobe and properties, the sudden metamorphosis of the tennis-court, where the balls have just been rattling, into a stage, the quarrels with local squires, the disturbed nights in crowded country inns, all the loves and wars of a troupe on the march. Perrault tells us what the arrangements of the theatre were in Moliére's early time. Tapestries were hung round the stage, and entrances and exits were made by struggling through the heavy curtains, which often knocked off the hat of the comedian, or gave a strange cock to the helmet of a warrior or a god. The lights were candles stuck in tin sconces at the back and sides, but luxury sometimes went so far that a chandelier of four candles was suspended from the roof. At intervals the candles were let down by a rope and pulley, and any one within easy reach snuffed them with his fingers. A flute and tambour, or two fiddlers, supplied the music. The highest prices were paid for seats in the dedans (cost of admission fivepence) ; for the privilege of standing up in the pit twopence-halfpenny*~~

~~*was the charge. The doors were opened at one o'clock, the curtain rose at two.*~~

~~*The nominal director of the Théatre Illustre in the provinces was Du Fresne; the most noted actors were Moliére, the Béjards, and Du Parc, called Gros René. It is extremely difficult to follow exactly the line of march of the company. They played at Bordeaux, for example, but the date of this performance, when Moliére (according to Montesquieu) failed in tragedy and was pelted, is variously given as 1644-45 (Trallage), 1647 (Loiseleur), 1648-58 (Lacroix). Perhaps the theatre prospered' better else- where than in Paris, where the streets were barricaded in*~~

~~*SOWIE esac)*~~

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~~*these early days of the war of the Fronde. We find Moliére at Nantes in 1648, at Fontenay-le-Compte, and in the spring of 1649 at Agen, Toulouse, and probably at Angouléme and Limoges. In January 1650 they played at Narbonne, and between 1650 and 1653 Lyons was the headquarters of the troupe. In January 1653, or perhaps 1655, Moliére gave L'Ztourdi at Lyons, the first of his finished pieces, as contrasted with the slight farces with which he generally diverted a country audience. It would be interesting to have the precise date of this piece, but La Grange (1682) says that "in 1653 Moliére went to Lyons, where he gave his first comedy, L'Etourdi," while in his Registre La Grange enters the year as 1655. At Lyons De Brie and his wife, the famous Mlle. de Brie, entered the troupe, and Du Parc married marquise de Gorla, better known as Mlle. du Parc. The libellous author of La Fameuse Comédienne reports that Moliére's heart was the shuttlecock of the beautiful Du Pare and De Brie, and the tradition has a persistent life. Moliére's own opinion of the ladies and men of his company may be read be- tween the lines of his Impromptu de Versailles. In 1653 Prince de Conti, after many political adventures, was residing at La Grange, near Pézénas, in Languedoc, and chance brought him into relations with his old school-fellow Moliére. Conti had for first gentleman of his bed- chamber the abbé Daniel de Cosnac, whose memoirs now throw light for a moment on the fortunes of the wander- ing troupe. Cosnac engaged the company " of Moliére and of La Béjart;" but another company, that of Cormier, nearly*~~

~~*intercepted the favour of the prince. Thanks to the resolu- tion of Cosnac, Moliére was given one chance of appearing on the private theatre of La Grange. The excellence of his acting, the splendour of the costumes, and the insist- ence of Cosnac, and of Sarrasin, Conti's secretary, gained the day for Moliére, and a pension was assigned to his company (Cosnac, Afémoires, i. 128, Paris, 1852), As Cosnac proposed to pay Moliére a thousand crowns of his own money to recompense him in case he was supplanted by Cormier, it is obvious that his profession had become sufficiently lucrative. In 1654, during the session of the estates of Languedoc, Moliére and his company played at Montpellier, Here Moliére danced in a ballet (Le Ballet des Incompatibles) in which a uumber of men of rank took part, according to the fashion of the time. Moliére's own voles were those of the Poet and the Fishwife. The sport of the little piece is to introduce opposite characters, dancing and singing together. Silence dances with six women, Truth with four courtiers, Money with a poet, and so forth. Whether the ballet, or any parts of it, are by Moliere, is still disputed (Za Jeunesse de Moliére, suivie du Ballet des Incompatibles, P. L. Jacob, Paris, 1858). In April 1655 it is certain that the troupe was at Lyons, where they met and hospitably entertained a profligate butfoon, Charles d'Assoucy, who informs the ages that Moliére kept open house, and "ane table bien garnie." November 1655 found Moliere at Pézénas, where the estates of Languedoc were convened, and where local tradition points out the barber's chair in which the poet used to sit and study character. The longest of Moliére's extant autographs is a receipt, dated at Pézénas, 4th Feb- ruary 1656, for 6000 livres, granted by the estates of Languedoc. This year was notable for the earliest repre- sentation, at Béziers, of Moliére's second finished comedy, the Dépit Amoureux. Conti now withdrew to Paris, and began to "make his soul," as the Irish say. Almost his first act of penitence was to discard Moliére's troupe (1657), which consequently found that the liberality of the estates of Languedoc was dried up for ever. Conti's relations with Moliére must have definitively closed long before 1666, when the now pious prince wrote a treatise against the*~~

~~*stage, and especially charged his old schoolfellow with keeping a new school, a school of atheism (Traité de la Comédie, p. 24, Paris, 1666).*~~

~~*Moliere was now (1657) independent of princes and their favour. He went ona new circuit to Nismes, Orange, and Avignon, where he met another old class-mate, Chapelle, and also encountered the friend of his later life, the painter Mignard. After a later stay at Lyons, ending with a piece given for the benefit of the poor on 27th February 1658, Moliére passed to Grenoble, returned to Lyons, and is next found in Rouen, where, we should have said, the Théatre Illustre had played in 1643 (F. Bouquet, La Troupe de Moliére & Rouen, p. 90, Paris, 1880). At Rouen Moliére must have made or renewed the acquaintance of Pierre and Thomas Cor- neille. His company had played pieces by Corneille at Lyons and elsewhere. The real business of the comedian in Rouen was to prepare his return to Paris. 'After several secret journeys thither he was fortunate enough to secure the patronage of Monsieur, the king's only brother, who granted him his protection, and permitted the company to take his name, presenting them as his servants to the king and the queen-mother" (Preface to La Grange's edition of 1682). The troupe appeared for the first time before Louis XIV. in a theatre arranged in the old Louvre (24th October 1658).*~~

~~*Moliére was now thirty-six years ofage. He had gained all the experience that fifteen years of practice could give. He had seen men and cities, and noted all the humours of rural and civic France. He was at the head of a company which, as La Grange, his friend and comrade, says, "sin- cerely loved him." He had the unlucrative patronage of a great prince to back him, and the jealousy of all play- wrights, and of the old theatres of the Hétel de Bourgogne . and the Marais, to contend against. In this struggle we can follow him by aid of the Registre of La Grange (a brief diary of receipts and payments), and by the help of notices in the rhymed chronicles of Loret.*~~

~~*The first appearance of Moliére before the king was all but a failure. Nicoméde, by the elder Corneille, was the piece, and we may believe that the actors of the Hotel de Bourgogne, who were present, found much to criticize. When the play was over, Moliére came forward and asked the king's permission to act "one of the little pieces with which he had been used to regale the provinces." The Docteur Amoureux, one of several slight comedies admitting of much "gag," was then performed, and 'diverted as much as it surprised the audience." The king commanded that the troupe*~~

~~*should establish itself in Paris (Preface, ed. 1682). The theatre assigned to the company was a salle in the Petit Bourbon, in a line with the present Rue du Louvre. Some Italian players already occupied the house on Tuesdays, Fridays, and Sundays; the company of Moliére played on the other days. The first piece played in the new house (3d Nov. 1658) was L'Etowrd:. La Grange says the comedy had a great success, producing seventy pistoles for each actor. The success is admitted even by the spiteful author of Llomire Hypochondre (Paris, BN ee Je jouai l'Etourdi, qui fat une merveille."*~~

~~*The success, however, is attributed to the farcical element in the play and the acting—the cuckoo cry of Moliére's detractors. The original of Z'Ltourd: is the Italian comedy (1629) L'Inavvertito, by Nicold Barbieri detto Beltrame ; Moliére pushed rather far his right to "take his own wherever he found it." Had he written nothing more original, the contemporary critic of the Irestin de Pierre might have said, not untruly, that he only excelled im stealing pieces from the Italians. The piece is conventional : the stock characters of the prodigal son, the impudent valet, the old father occupy the stage. But the dialogue*~~

~~*MOLT ER E 627*~~

~~*has amazing rapidity, and the vivacity of M. Coquelin in Mascarille still makes Z'HItourdi a favourite on the stage, though it cannot be read with very much pleasure. The next piece, new in Paris, though not in the provinces, was the Dépit Amoureux (first acted at Béziers, 1656). The play was not less successful than L'Etourdi. It has two parts, one an Italian imbroglio; the other, which alone keeps the stage, is the original work of Moliére, though, of course, the idea of amantium ire is as old as literature. 'Nothing so good," says Mr. Saintsbury, "had yet been seen on the French stage, as the quarrels and reconciliations of the quartette of master, mistress, valet, and soubrette." Even the hostile Le Boulanger de Chalussay (Zlomire Hypochondre) admits that the audience was much of this opinion — ** Et de tous les cdtés chacun cria tout haut, 'Cest la faire et jouer les piéces comme il faut.' "*~~

~~*The same praise was given, perhaps even more deservedly, to Les Précieuses eidicules(18th November 1659). Doubtshave been raised as to whether this famous piece, the first true comic satire of contemporary*~~

~~*foibles on the French stage, was a new play. La Grange calls it piéce nouvelle in his Registre, but, as he enters it as the third piece nowvelle, he may only mean that, like L'Ltourdi, it was new to Paris. The short life of 1682, produced under La Grange's care, and probably written by Marcel the actor, says the Précieuses was "made" in 1659. There is another contro- versy as to whether the ladies of the Hétel Rambouillet, or merely their bowrgeoises and rustic imitators, were laughed at. Ménage, in later years at least, professed to recognize an attack on the over-refinement and affectation of the original and, in most ways, honourable précieuses of the Hotel Ram- . bouillet. But Chapelle and Bachaumont had discovered provincial précceuses, hyper-esthetic literary ladies, at Mont- pellier before Moliére's return to Paris; and Furetiére, in the Roman Bourgeois (1666), found Paris full of middle- class précteuses, who had survived, or, like their modern counterparts, had thriven on ridicule. Another question is—Did Molitre copy from the earlier Précieuses of the abbé de Pure? This charge of plagiarism is brought by Somaize, in the preface to his Véritables Précieuses. De Pure's work was a novel (1656), from which the Italian actors had put together an acting piece in their manner, that is, a thing of "gag," and improvized speeches. The reproach is interesting only because it proves how early Moliére found enemies who, like Thomas Corneille in 1659, accused him of being skilled only in farce, or, like Somaizc, charged him with literary larceny. These were the stock criticisms of Moliére's opponents as long as he lived. The success of the Précieuses Ridicules was immense; on one famous occasion the king was a spectator, leaning against the great chair of the dying Cardinal Mazarin. The play can never cease to please while literary affectation exists, and it has a comic force of deathless energy. Yet a modern reader may spare some sympathy for the poor heroines, who do not wish, in courtship, to "begin with marriage," but prefer first to have some less formidable acquaintance with their wooers. Moliére's next piece was less important, and more purely farcical, Sganarelle ; ou le Cocu Imagin- aire (28th May 1660). The public taste preferred a work of this light nature, and Sganarelle was played every year as long as Moliére lived. The play was pirated by a man who pretended to have retained all the words in his memory. The counterfeit copy was published by Ribou, a double injury to Moliére, as, once printed, any company might act the play. With his habitual good-nature, Moliére not*~~

~~*only allowed Ribou to publish later works of his, but actually lent money to that knave (Soulié, Mecherches, p. 287).*~~

~~*On llth October 1660 the Théatre du Petit Bourbon was demolished by the superintendent of works, without*~~

~~*notice given to the company. The king gave Moliére the Salle du Palais Royal, but the machinery of the old theatre was maliciously destroyed. Meanwhile the older companies of the Marais and the Hotel de Bourgogne attempted to lure away Moliére's troupe, but, as La Grange declares (Registre, p. 26), "all the actors loved their chief, who united to extraordinary genius an honourable character and charming manner, which compelled them all to protest that they would never leave him, but always share his for- tunes." While the new theatre was being put-in order, the company played in the houses of the great, and before the king at the Louvre. In their new house (originally built by Richelieu) Moliére began to play on 20th J anuary 1661. Moliére now gratified his rivals by a failure. Don Garcie de Navarre, a heavy tragi-comedy, which had long lain among his papers, was first represented on 4th February 1661. Either Moliére was a poor actor outside comedy, or his manner was not sufficiently "stagy," and, as he says, "'demoniac," for the taste of the day. His opponents were determined that he could not act in tragi-comedy, and he, in turn, burlesqued their pretentious and exaggerated manner in a later piece. In the Préciewses (sc. ix.) Molidre had already rallied "les grands comédiens" of the Hotel Bourgogne. "Les autres," he makes Mascarille say about his own troupe, "sont des ignorants qui récitent comme l'on parle, ils ne savent pas faire ronfler les vers." All this was likely to irritate the grands comédiens, and their friends, who avenged themselves on that unfortunate jealous prince, Don Garcic de Navarre. The subject of this unsuccessful drama is one of many examples which show how Moliére's mind was engaged with the serious or comic aspects of jealousy, a passion which he had soon cause to know most intimately. Meantime the everyday life of the stage went on, and the doorkeeper of the Théatre St. Germain was wounded by some revellers who tried to force their way into the house (La Grange, Registre). A year later, an Italian actor was stabbed in front of Moliére's house, where he had sought to take shelter (Campardon, Vouwvelles Piéces, p. 20). To these dangers actors were peculiarly subject : Mohire himself*~~

~~was frequently threatened by the marquises and others whose class he ridiculed on the stage, and there seems even reason to believe that there is some truth in the story of the angry marquis who rubbed the poet's head against his buttons, thereby cutting his face severely. The story comes late (1725) into his biography, but is supported by a passage in the contemporary play, Zélinde (Paris, 1663, scene viiil.). Before Easter, Moliére asked for two shares in the profits of his company, one for himself, and one for his wife, if he married. That fatal step was already contemplated (La Grange). On 24th June he brought out for the first time L' Ecole des Maris. The general idea of the piece is as old as Menander, and Molitre was promptly accused of pilfering from the Adelphi of Terence. One of the jficelles of the comedy is borrowed from a story as old, at least, as Boccaccio, and still amusing in a novel by Charles de Bernard. It is significant of Moliére's talent that the grotesque and baffled paternal wooer, Sganarelle, like several other butts in Moliére's comedy, does to a certain extent win our sympathy and pity as well as our laughter. The next new piece was Les Mascheux, a comédie- ballet, the Comedy of Bores, played before the king at Fouquet's house at Vaux le Vicomte (August 15-20, 1661). The comedians, without knowing it, were perhaps the real "fascheux" on this occasion, for Fouquet was absorbed in the schemes of his insatiable ambition (Quo non ascendam ? says his motto), and the king was organizing the arrest and fall of Fouquet, his rival in the affections of La Vallitre. The author of the prologue to Les Fascheus, Pellisson, a friend of Fouquet's, was arrested along with the superintendent of finance. Pellisson's prologue and~~

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~~name were retained in later editions. In the dedication to the king Moliére says that Louis suggested one scene (that of the Sportsman), and in another place he mentions that the piece was written, rehearsed, and played in a fortnight. The fundamental idea of the play, the inter- ruptions by bores, is suggested by a satire of Régnier's, and that by a satire of Horace. Perhaps it may have been the acknowledged suggestions of the king which made gossips declare that Moliére habitually worked up hints and mémotres given him by persons of quality (ouvelles Nouvelles, 1663).~~

~~*In February 1662 Moliére married Armande Béjard. The date is given thus in the Registre of La Grange: "Mardy 14, Les Visionnaires, L'Ecol des M.*~~

~~*Part. Visite chez M* d'Equeuilly."*~~

~~*And on the margin he has painted a blue circle, his way of recording a happy event, with the words, "mariage de M. de Moliére au sortir de la Visite." M. Loiseleur gives the date in one passage as 29th February, in another as 20th February. But La Grange elsewhere mentions the date as "Shrove Tuesday," which was, it seems, 14th February. Elsewhere M. Loiseleur makes the date of the marriage a vague day "in January." The truth is that the marriage contract is dated 23d January 1662 (Soulié, Documents, p. 203). Where it is so difficult to establish the date of the marriage, a simple fact, it must be infinitely harder to dis- cover the truth as to the conduct of Madame Moliere. The abominable assertions of the anonymous libel, Les Intragues de Moliére et celles de sa Femme; ou la Fameuse Comédienne (1688), have found their way into tradition, and are accepted by many biographers. But M. Livet and M. Bazin have proved that the alleged lovers of Madame Moliere were actually absent from France, or from the court, at the time when they are reported, in the libel, to have conquered her heart. A conversation between Chapelle and Moliére, in which the comedian is made to tell the story of his wrongs, is plainly a mere fiction, and is answered in Grimarest byanother dialogue between Moliére and Rohault, in which Moliére only complains of a jealousy which he knows to be unfounded. It is noticed, too, that the con- temporary assailants of Moliére counted him among jealous, but not among deceived, husbands. The hideous accusation brought by the actor Montfleury, that Moliére had married his own daughter, Louis XIV. answered by becoming the godfather of Moliére's child. The king, indeed, was a firm friend of the actor, and, when Moliére was accused of impiety on the production of Don Juan (1665), Louis gave him a pension. We need not try to make Madame Moliere a vertu, as French ladies of the theatre say, but it is certain that the charges against her are unsubstantiated. It is generally thought that Moliére drew her portrait in Le Bourgeois Gentilhomme, acte iii. sc. ix., "elle est capri- cieuse, mais on souffre tout des Belles."*~~

~~*From 1662 onwards Moliére suffered the increasing hatred of his rival actors. La Grange mentions the visit of Floridor and Montfleury to the queen-mother, and their attempt to obtain equal favour, "la troupe de Moliére leur donnant beaucoup de jalouzie" (12th August 1662). On 26th December was played for the first time the admirable Hcole des Femmes, which provoked a literary war, and caused a shower of "paper bullets of the brain." The innocence of Agnes was called indecency ; the sermon of Arnolphe was a deliberate attack on Christian mysteries. We have not the space to discuss the religious ideas of Moliére ; but both in Z'Ecole des Femmes and in Don Juan he does display a bold contempt for the creed of " boiling chaldrons" and of a physical hell. A brief list of the plays and pamphlets provoked by L'Zcole des Femmes is all we can offer in this place.*~~

~~*December 26, 1662,—Ecole des Femmes.*~~

~~*MOLIERE*~~

~~*February 9, 1663.—Nowvelles Nowvelles, by De Vise. Moliere is*~~

~~*accused of pilfering from Straparola.*~~

~~*June 1, 1663.—Moliere's own piece, Critique de V Ecole des Femmes. In this play Moliere retorts on the critics, and especially on his favourite butt, the critical marquis.*~~

~~*August 1663.—Zélinde, a play by De Visé, is printed. The scene is in the shop of a seller of lace, where persons of quality meet, and attack the reputation of "Hlomire," that is, Moliére. He steals from the Italian, the Spanish, from Fureti¢re's Franeion, 'il lit tous les vieux bouquins," he insults the nodlesse, he insults Christianity, and so forth.*~~

~~*November 17, 1663.—Portrait du Peintre is printed,—an attack on Moliére by Boursault. This piece is a detailed eritieism, by several persons, of L'Eeole des Femmes. It is pronouneed dull, vulgar, farcical, obscene, and (what chiefly vexed Moliére, who knew the danger of the accusation) impious. Perhaps the only biograph- ieal matter we gain from Boursault's play is the interesting faet that Moliére was a tennis-player. On 4th November 1663 Moliere replied with Z'Impromptu de Versailles, a witty*~~

~~*and merciless attack on his critics, in which Boursault was mentioned by name. The actors of the Hétel de Bourgogne were parodied on the stage, and their art was ridiculed.*~~

~~*The next scenes in this comedy of comedians were :—*~~

~~*November 30.—The Panégyrique del' Ecole des Femmes, by Robinet.*~~

~~*December 7.—Réponse & Impromptu; ow la Vengeance des Mar- quis, by De Visé.*~~

~~*January 19, 1664.—L' Impromptu de 0 H6tel de Condé. reply by a son of Montfleury. 6*~~

~~*March 17, 1664.—La Guerre Comigue ; ow Défense de ' Ecole des Femmes.*~~

~~*1664.—Lettre sur les Affaires du Thédtre, published in Diversités Galantes, by the author of Zélinde.*~~

~~*In all those quarrels the influence of Corneille was opposed to Moliére, while his cause was espoused by Boileau, a useful ally, when "les comédiens et les auteurs, depuis le cédre [Corneille ?] jusqu'a Vhysope, sont diable- ment animés contre lui" (Impromptu de Versailles, scéne v.).*~~

~~*Moliére's next piece was Le Mariage Forcé (15th Feb- ruary 1664), a farce with a ballet. The comic character of the reluctant bridegroom excites contemptuous pity, as well as laughter. From the end of April till 22d May the troupe was at Versailles, acting among the picturesque pleasures of that great festival of the king's. The Princesse ad' Elide was acted for the first time, and the three first acts of Z'artujfe were given. Moliére's natural hatred of hypocrisy had not been diminished by the charges of blas- phemy which were showered on him after the "cole des Femmes. Tartuffe made enemies everywhere. Jansenists and Jesuits, like the two marquises in L'Impromptu de Versailles, each thought the others were aimed at. Five years passed before Moliére got permission to play the whole piece in public. In the interval it was acted before Madame, Condé, the legate, and was frequently read by Moliére in private houses. The Gazette of 17th May*~~

~~1664 (a paper hostile to Molitre) says that the king thought the piece inimical to religion. Louis was not at that time on good terms with the dévots, whom his amours scandal- ized; but, not impossibly, the queen-mother (then suffering from her fatal malady) disliked the play. A most violent attack on Moliére, 'that demon clad in human flesh," was written by one Pierre Roullé (Le Roy Glorieux au Monde, Paris, 1664). This fierce pamphlet was suppressed, but the king's own copy, in red morocco with the royal arms, remains to testify to the bigotry of the author, who was curé of Saint Barthélemy. According to Roullé, Moliére deserved to be sent through earthly to eternal fires. The play was prohibited, as we have seen, but in August 1665 the king adopted Moliére's troupe as his servants, and gave them the title of "'troupe duroy." This, however, did not cause Moliére to relax his efforts to obtain permission for Tartuffe (or Tartufe, or Tartufle, as it was variously spelled), and his perseverance was at length successful. That his thoughts were busy with contemporary hypocrisy is proved by certain scenes in one of his greatest pieces, the Mestun de Pierre, or Don Juan (15th February 1665). The legend of Don Juan was familiar already on the Spanish, Italian,~~

~~It is a~~

~~and French stages. Moliére made it a new thing: terrible | got the king's promise that he would reconsider the matter~~

~~and roniantic in its portrait of wn grand seigneur mauwvais homme, modern in its suggested substitution of la humanité for religion, comic, even among his comedies, by the mirth- ful character of Sganarelle. The piece filled the theatre, but was stopped, probably by authority, after Easter. It was not printed by Moliére, and even in 1682 the publi- cation of the full text was not permitted. Happily the copy of De la Regnie, the chief of the police, escaped obliterations, and gave us the full scene of Don Juan and the Beggar. The piece provoked a virulent criticism (Observations sur le Festin de Pierre, 1665). It is allowed that Moliére has some farcical talent, and is not unskilled as a plagiarist, but he "attacks the interests of~~

~~*Heaven," "keeps a school of infidelity," "insults the king," "cor- rupts virtue," 'offends the queen-mother," and so forth. Two replies were published, one of which is by some critics believed to show traces of the hand of Moliére. The king's reply, as has been shown, was to adopt Moliére's company as his servants, and to pension them. JL'Amour Médecin, a light comedy, appeared 22d September 1665. In this piece Moliére, for the second time, attacked physicians. In December there was a quarrel with Racine about his play of Alexandre, which he treacherously transferred to the Hétel de Bourgogne. June 4, 1666 saw the first repre- sentation of that famous play, Le Misanthrope (ou L'Atra- biliavre Amoureur, as the original second title ran). This piece, perhaps the masterpiece of Moliére, was more suc- cessful with the critics, with the court, and with posterity than with the public. The rival comedians called it "a new style of comedy," and so it was. The eternal passions and sentiments of human nature, modified by the influence of the utmost refinement of civilization, were the matter of the piece. The school for scandal kept by Céliméne, with its hasty judgments on all characters, gave the artist a wide canvas. The perpetual strife between the sensible optimism of a kindly man of the world (Philinte) and the seva rndignatio of a noble nature soured (Alceste) sup- plies the intellectual action. The humours of the joyously severe Céliméne and of her court, especially of that death- less minor poet Oronte, supply the lighter comedy. Boileau, Lessing, Goethe have combined to give this piece the highest rank even among the comedies of Moliére. As to the "keys" to the characters, and the guesses about the original from whom Alceste was drawn, they are as value- less as other contemporary tattle.*~~

~~*A briefer summary must be given of the remaining years of the life of Moliére. The attractions of Le Misanthrope were reinforced (6th August) by those of the Médecin Malgré Lui, an amusing farce founded on an old fabliau. In December the court and the comedians went to Saint Germain, where, among other diversions, the pieces called Meélwerte, La Pastorale Comique (of which Moliére is said to have destroyed the MS.), and the charming little piece Le Sicilien, were performed. A cold and fatigue seem to have injured the health of Moliere, and we now hear of the consumptive tendency which was cruelly ridiculed in Elomire Hypochondre. Moliére was doubtless obliged to see too much of the distracted or pedantic physicians*~~

~~*of an age when medicine was the battlefield of tradition, super- stition, and nascent chemical science. On 17th April 1667 Robinet, the rhyming gazetteer, says that the life of Moliére was thought to be in danger. On the 10th of June, however, he played in Le Stcilien before the town. In the earlier months of 1667 Louis XIV. was with the army in Flanders. There were embassies sent from the comedy to the camp, and on 5th August it was apparent that Molitre had overcome the royal scruples. Tartuffe was played, but Lamoignon stopped it after the first night. La Grange and La Torilliere hastened to the camp, and*~~

~~*on his return. Moliére's next piece (13th January 1668) was Amphitryon, a free—a very free—adaptation from Plautus, who then seems to have engaged his attention, for not long afterwards he again borrowed from the ancient writer in Z'Avare. There is a controversy as to whether Amphitryon was meant to ridicule M. de Montespan, the husband of the new mistress of Louis XIV. Michelet has a kind of romance based on this probably groundless hypo- thesis. The king still saw the piece occasionally, after he had purged himself and forsworn sack under Madame de Maintenon, and probably neither he nor that devout lady detected any personal references in the coarse and witty comedy, As usual, Moliére was accused of plagiarizing, this time from Rotrou, who had also imitated Plautus. The next play was the immortal George Dandin (10th July), first played at a festival at Versailles. Probably the piece was a rapid palimpsest on the ground of one of his old farces, but the addition of these typical members of a county family, the De Sotenville, raises the work from farce to satiric comedy. The story is borrowed from Boccaccio, but is of unknown age, and always new, —Adolphus Crosbie in The Small House at Allington being a kind of modern George Dandin. Though the sad fortunes of this peasant with social ambition do not fail to make us pity him some- what, it is being too refined to regard George Dandin as a comedy with a concealed tragic intention. Moliére must have been at work on L'Avare before George Dandin appeared, for the new comedy after Plautus was first acted on 9th September. There is a tradition that the piece almost failed ; but, if unpopular in the first year of its pro- duction, it certainly gained favour before the death of its author. Jf. de Pourceaugnac (17th September 1669) was first acted at Chambord, for the amusement of the king. It is a rattling farce. The physicians, as usual, bore the brunt of Moliére's raillery, some of*~~

~~which is still applicable. Earlier in 1669 (5th February) Zartuffe was played at last, with extraordinary success. Les Amants Magnifiques, a comedy-ballet, was acted first at Saint Germain (10th February 1670). The king might have been expected to dance in the ballet, but from Racine's Britannicus (138th December 1669) the majestical monarch learned that Nero was blamed for exhibitions of this kind, and he did not wish to out-Nero Nero. Astrology this time took the place of medicine as a butt, but the satire has become obsolete, except, perhaps, in Turkey, where astrology is still a power. The Bourgeois Gentilhomme, too familiar to require analysis, was first played on 23d October 1770. The lively Fourberies de Scapin 'saw the footlights" (if footlights there were) on 24th May 1671, and on 7th May we read in La Grange, "'les Repetitions de Spsyche ont commancé." La Grange says the theatre was newly decorated and fitted with machines. A "concert of twelve violins" was also provided, the company being resolute to have everything handsome about them. New singers were introduced, who did not refuse to sing un- masked on the stage. Quinault composed the words for the music, which was by Lulli; Moliére and Pierre Corneille collaborated in the dialogue of this magnificent opera, the name of which (Psyche) La Grange eventually learned how to spell. The Comtesse d'Escarbagnas (2d February 1672) was another piece for the amusement of the court, and made part of an entertainment called Le Ballet des Ballets. In this play, a study of provincial manners, Moliére attacked the financiers of the time in the person of M. Harpin. The comedy has little importance compared with Les Femmes Savantes (11th February), a severer Pré-cieuses, in which are satirized the vanity and affectation of sciolists, pedants, and the women who admire them. The satire is never out of date, and finds its modern form in~~

~~Le Monde o% Von s'ennuie, by M. Pailleron. On the 17th February Madeleine Béjard died, and was buried at St Paul. She did not go long before her old friend or lover, Moliére. His Jfariage Forcé, founded, perhaps, on a famous anecdote of De Gramont, was played on 8th July. On 7th August La Grange notes that Moliére was indisposed, and there was no comedy. Moliére's son died on the 11th October. On 22d November the preparations for the Malade Imaginaire were begun. On 10th Feb- ruary~~

~~*1673 the piece was acted for the first time. What occurred on 17th February we translate from the Registre of La Grange :—*~~

~~*"This same day, about ten o'clock at night, after the comedy, Monsieur de Moliére died in his house, Rue de Richelieu. He had played the part of the said Malade, suffering much from cold and inflammation, which caused a violent cough. In the violence of the cough he burst a vessel in his body, and did not live more than half an hour or three-quarters after the bursting of the vessel. His body is buried at St Joseph's, parish of St Eustache. There is a gravestone raised about a foot above the ground."*~~

~~*Moliére's funeral is thus described in a letter, said to be by an eye-witness, discovered by M. Benjamin Fillon :—*~~

~~*"Tuesday, 21st February, about nine in the evening, was buried Jean Baptiste Poquelin Moliere, tapissier valet du chambre, and a famous actor. There was no procession, except three ecclesiastics ; four priests bore the body in a wooden bier covered with a pall, six children in blue carried candles in silver holders, and there were lackeys with burning torches of wax. The body… was taken to St Joseph's churchyard, and buried at the foot of the cross. There was a great crowd, and some twelve hundred livres were distributed among the poor. The archbishop had given orders that Moliere should be interred without any ceremony, and had even forbidden the clergy of the diocese to do any service for him. Nevertheless a number of masses were commanded to be said for the deceased."*~~

~~*When an attempt was made to exhume the body of Moliére in 1792, the wrong tomb appears to have been opened. Unknown is the grave of Moliére.*~~

~~*Moliére, according to Mlle. Poisson, who had seen him in her extreme youth, was "neither too stout nor too thin, tall rather than short ; he had a noble carriage, a good leg, walked slowly, and had a very serious expression. His nose was thick, his mouth large with thick lips, his complexion brown, his eyebrows black and strongly marked, and it was his way of moving these that gave him his comic expression on the stage." " His eyes seemed to search the deeps of men's hearts," says the author of Zélinde. The inventories printed by M. Soulié prove that Moliére was fond*~~

~~of rich dress, splendid furniture, and old books. The charm of his conversation is attested by the names of his friends, who were all the wits of the age, and the greater their genius the greater their love of Molitre. As an actor, friends and enemies agreed in recognizing him as most successful in comedy. HIs ideas of tragic declamation were in advance of his time, for he set his face against the prevalent habit of ranting. HIs private character was remarkable for gentleness, probity, generosity, and delicacy, qualities attested not only by anecdotes but by the evidence of documents. HIe is probably (as Menander is lost) the greatest of all comic writers within the limits of social and refined as distinguished from romantic comedy, like that of Shakespeare, and of political comedy, like that of Aristo- phanes. HIe has the humour which is but a sense of the true value of life, and now takes the form of the most vivacious wit and the keenest observation, now of melan- choly, and pity, and wonder at the fortunes of mortal men. In the literature of France his is the greatest name, and in the literature of the modern drama the greatest after that of Shakespeare. Besides his contemplative genius he possessed an unerring knowledge of the theatre, the knowledge of a great actor and a great manager, and hence his plays can never cease to hold the stage, and to~~

~~charm, if possible, even more in the performance than in the reading.~~

~~There is no biography of Moliére on a level with the latest re- searches into his lite. The best is probably that of M. Taschereau, prefixed to an edition of his works (wvres Complétes, Paris, 1868). To this may be added Jules Loiseleur's Les Points Obseurs de la Vie de Moliére, Paris, 1877. We have seen that M. Loiseleur is not always accurate, but he is laborious. For other books it is enough to recominend the excellent Bibliographic Moliéresque ot M. Paul Lacroix (1875), which is an all but faultless guide. The best edition of Moliere's works for the purposes of the student is that published in Les Grands Eerivains de la Franee (HIachette, Paris, 1874-1882). The edition is still incomplete. It contains reprints of many contemporary tracts, and, with the Registre of La Grange, . and the Collection Moliéresque of M. Lacroix, is the chief source of the facts stated in this notice, in cases where the rarity of docu- ments has prevented the writer from studying them in the original~~

~~texts. Another valuable authority is the Zecherches sur Moliére et sur sa Famille of Ed. Soulié (1863). Lotheisen's Moliére, sein Leben und seine Werke (Frankfurt, 1880), is a respectable Ger- man compilation. Le Moliériste (Tresse, Paris, edited by M. Georges Monval) is a monthly serial, containing notes on Moliére and his plays, by a numberof contributors. The essays, biographies, plays, and poems on Moliére are extremely numerous. 'The best guide to these is the indispensable Bibliographie of M. Lacroix. The English biographies arc few and as a rule absolutely untrustworthy. (A. L.)~~

~~MOLINA, Luis (1535-1600), a Spanish Jesuit, whom Pascal's Lettres d'un Provincial have rendered immortal, was born at Cuenca in 1535, Having at the age of eighteen become a member of the Company of Jesus, he studied theology at Coimbra, and afterwards became professor in the university of Evora, Portugal. From this post he was called, at the end of twenty years, to the chair of moral theology in Madrid, where he died on 12th October 1600. Besides other works he wrote Libert arbitrit cum gratiz donis, divina prescientia, providentia, preedestinatione et reprobatione, concordia (4to, Lisbon, 1588); a com- mentary on the first part of the Swmma of Thomas Aquinas (2 vols., fol., Cuenca, 1593); and a treatise De Justitia et Jure (6 vols., 1593-1609). It is to the first of these that his fame is principally due. Jt was an attempt to reconcile, in words at least, the Augustinian doctrines of predestina- tion and grace with the Semipelagianism which, as shown by the recent condemnation of Basus (q.v.), had become prevalent in the Roman Catholic Church. Assuming that man is free to perform or not to perform any act whatever, Molina maintains that this circumstance renders the grace of God neither unnecessary nor impossible :—not impossible, for God never fails to bestow grace upon those who ask it with sincerity ; and not unnecessary, for grace, although not an efficient, is still a sufficient cause of salvation. Nor, in Molina's view, does his doctrine of free-will exclude predestination. The omniscient God, by means of His "scientia media" (the phrase is Molina's invention, though the idea is also to be found in his older contemporary Fonseca), or power of knowing future contingent events, foresees how we shall employ our own free-will and treat His proffered grace, and upon this foreknowledge He can found His predestinating decrees. These doctrines, although in harmony with the prevailing feeling of the Roman Catholic Church of the period, and further~~

~~recommended by their marked opposition to the teachings of Luther and Calvin, excited violent controversy in some quarters, especially on the part of the Dominicans, and at last rendered it necessary for the pope (Clement VIII.) to interfere. At first (1594) he simply enjoined silence on both parties so far as Spain was concerned ; but ultimately, in 1598, he appointed the "Congregatio de Auxiltis Gratize" for the settlement of the dispute, which became more and more a party one. After holding very numerous sessions, the "congregation" was able to decide nothing, and in 1607 its meetings were suspended by Paul V., who announced his intention of himself pronouncing judgment in due time. He contented himself, however, in 1611,~~

~~with prohibiting all further discussion of the question "de auxiliis," and studious efforts were made to control the publication even of commentaries on Aquinas. The Molinist subsequently passed into the Jansenist controversy, and it is as a champion of Jansenism that Pascal in the Provincial Letters attacks Molina and the scientia media (see JANSENISM).~~

~~MOLINE, a city of the United States, in Rock Island county, Illinois, is situated in a picturesque district on the left bank of the Mississippi, opposite the upper end of Rock Island. First settled in 1832, the town was organized as a city in 1872. It is noted for its water-power, developed and maintained by the Government, and for the number and importance of its manufacturing establishments. By means of a dam nearlya mile in length, from the Illinois shore to the island, an almost uniform head of 7 feet of water is obtained, which is used in driving the machinery of the Government arsenal on the island, and in supplying power to several factories. Beds of bituminous coal are mined in the neighbourhood, and three lines of railway pass through the city, affording with the river ample means of communi- cation. The most prominent manufactures are agricultural implements and machinery generally, waggons, organs, paper, and stoves. Moline has nine churches, a complete system of graded free schools, including a high school, and a free library. The population increased from 4066 in 1870 to 7805 in 1880, and with the suburbs the number is now estimated at 12,000.~~

~~*MOLINOS, Micuen pz (1627-c. 1696), a Spanish priest whose name is intimately associated with that type of religion known in Italy and Spain during the latter half of the 17th century as Quietism, was born of good family in the diocese of Saragossa, on 21st December 1627. Having entered the priesthood, he settled about his fortieth year in Rome, where he speedily rose to high repute as a father confessor, and gained many distinguished friends, among whom were several cardinals, including Odescalchi (afterwards Innocent XI., 1676). In 1675 he published at Rome a small duodecimo volume entitled Guida spirituale che disinvolge Vanima e la conduce per Vinterior camino all' acquisto della perfetta contemplazione e del ricco tesoro della pace interiore, which was soon afterwards followed by the Breve trattato della cottidiana communione, usually bound up with it in later editions. The work, which breathes a spirit of simple and earnest piety, is designed to show how inward peace may be found by what may be called con- templative or passive prayer, by obedience, by frequent communion, and by inward mortification ; it was widely circulated, and greatly increased the popularity of its author, whom Innocent XI. after his elevation provided with rooms in the Vatican, and is said to have also taken as his spiritual director. Its doctrine of the passivity of the highest contemplation and purest prayer does not appear to have raised the slightest discussion until after the publication, in 1681, of the Concordia tra la fatica e la quiete nell oratione, by the Jesuit preacher, Paolo Segneri. Although scrupulously refraining from any mention of the name of Molinos, and indeed displaying considerable moderation as a controversialist, Segneri by this tract and by another with which he followed it up brought upon himself much unpopularity ; and so great did the excitement become that a committee was at last appointed by the Inquisition to investigate his own views as well as to examine the writings of Molinos and of his friend Petrucci (author of La contemplazione mastica acquistata), The report (1682) was entirely favourable to the doctrines of the Guida Spirituale, the writings of Segneri being censured as scandalous and heretical; but in 1685, in consequence of representations made to the pope by Louis XIV., under the Jesuit influence of Pere La Chaise, both Petrucci and*~~

~~*Molinos were laid under arrest, and the papers of the latter, including a voluminous correspondence, seized. Petrucci was soon afterwards liberated, and relieved from further persecution by the gift of a cardinal's hat; but, after Molinos had languished in confinement for two years, suddenly 200 persons, many of them of high rank, were also apprehended by order of the Inquisition for what were then for the first time called "Quietist" opinions. In 1687 the pope signi- fied his approval of the condemnation pronounced by the Inquisition on sixty-eight doctrines imputed to Molinos. The "heretic" forthwith "abjured " these, and thus escaped the flames indeed, but did not regain his liberty. Of his later years nothing is known ; according to the most prob-*~~

~~*able accounts he languished in imprisonment until 28th December 1696.*~~

~~*The evidence on which certain charges of immorality against Molinos were based is unknown, and the degree of his responsibility for certain of the condemned propositions is obscure; but a perusal of the Guida Spirituale at least does not disclose to the candid reader any reason wherefore Molinos should not have been tolerated within a church which has canonized St Theresa. The explanation of the treatment to which he was subjected is most probably to be sought rather in the negative than in the positive aspects of his teaching, and still more in the passing exigencies of party politics, As Tholuck remarks, it was hardly to be expected that the Society of Jesus should regard as otherwise than highly dangerous a man who "declared confession and outward mortification to be work only for beginners, who himself abstained from confessing for twelve years on end, by whose advice countless monks and nuns had thrown aside chaplets, images, and reliques, that they might worship God in the spirit, and who, moreover, stood well with the fashionable world and with the pope himself." The Guida Spirituale was published in Spanish at Madrid in 1676, and fre- quently afterwards ; it was also translated into Latin (Manuductio Sptritualis, Leipsic, 1687) by A. H. Francke, the well-known German pietist and philanthropist, and an English version (The spiritual guide, which disentangles the soul and brings it by the inward way to the getting of perfeet contemplation and the rich treasure of eternal peace: with a brief treatise coneerning daily communion) appeared in 1688. The materials for a history of the Quietist controversy are very fully given in the third volume*~~

~~of Gottfried Arnold's Kirchen-wnd Ketzerhistorie. See also Heppe, Geschiehte der quietistisehen Mystik in der Katholischen Kirehe (Berlin, 1875); Tholuck's article on "Molinos" in Herzog's itealeneyklopddie ; and Bigelow, Molinos the Quietist, New York,~~

~~1882.~~

~~MOLISE, now Camposasso, a province of Italy, stretch- ing twenty miles along the coast of the Adriatic, and bounded by the Abruzzi (Chieti and Aquila), Terra di Lavoro (Caserta), Benevento, and Capitanata (Foggia). Most of it lies on the north-eastern side of the Apennines, and is watered by the Biferno, the Forlone, and the Trigno ; but it also includes the country on the other side which contains the head streams of the Volturno. About five-sixths of the surface may be described as mountainous or hilly, the loftiest range being the Matese on the borders towards Benevento, with its highest point in Monte Miletto, 6750 feet. The population, which increased from 346,007 in 1861 to 365,434 in 1881, is mainly dependent on pastoral and agricultural pursuits, neither manufactures nor trade being highly developed. According to the census of 1871, there were six places with more than 5000 inhabit- ants—Campobasso, 12,890; Riccia, 8123; Isernia, 7715 ; Agnone, 7147 ; Cascalende, 6217 ; and Larino, 5357 ; accord- ing to the census of 1881, 21 of the 133 communes had a population exceeding 4000.~~

~~The Molise territory was in ancient times part of the country of the Sabines and Samnites. Under the Lombards it was included in the duchy of Benevento; but the districts of Sepino, Boiano, and Isernia were cut off to form a domain for the Bulgarians who had come to assist King Grimoald. About two centuries later this became the countship of Boiano, and the name was soon after changed to countship of Molise, probably because the lordship was held by Ugone di Molisio, or Molise. Attached under Frederick II. to the Terra di Lavoro, and at a later date incorporated with Capitanata, the district did not again become an independent province till 1811. In 1861 it surrendered fifteen communes to Benevento, and received thirteen from Terra di Lavoro,~~

~~*HE Mollusca form one of the great "phyla," or sub- kingdoms of the Animal Pedigree or Kingdom.*~~

~~*Literary Ilstory of the Group.—The shell-bearing forms belonging to this group which were known to Linnzeus were placed by him (in 1748) in the third order of his class Vermes under the name "Testacea," whilst the Echino- derms, Hydroids, and Annelids, with the naked Molluscs, formed his second order, termed "Zoophyta." Ten years later he replaced the name "Zoophyta" by "Mollusca," which was thus in the first instance applied, not to the Mollusca at present so termed, but to a group consisting chiefly of other organisms. Gradually, however, the term Mollusca became used to include those Mollusca formerly placed among the "Testacea," as well as the naked Mollusca.*~~

~~*It is important to observe that the term paAdxva, of which Mollusca is merely a Latinized form, was used by Aristotle to indicate a group consisting of the Cuttle-fishes only.*~~

~~*The definite erection of the Mollusca into the position of one of the great primary groups of the animal kingdom is due to George Cuvier (1788-1800), who largely occupied himself with the dissection of representatives of this type (1). An independent anatomical investigation of the Mollusca had been carried on by the remarkable Neapolitan natur- alist Poli (1791), whose researches (2) were not published until after his death (1817), and were followed by the beautiful works of another Neapolitan zoologist, the illus- trious Delle Chiaje (8).*~~

~~*The "embranchement" or sub-kingdom Mollusca, as de- fined by Cuvier, included the following classes of shell-fish :— 1, the cuttles or poulps, under the name CEPHALOPODA; 2, the snails, whelks, and slugs, both terrestrial and marine, under the name GastTRopopa; 3, the sea-butterflies or winged-snails, under the name Prrropopa; 4, the clams, mussels, and oysters, under the name AcEPHALA; 5, the lamp-shells, under the name Bracuiopopa; 6, the sea- squirts or ascidians, under the name Nupa; and 7, the barnacles and sea-acorns, under the name CIRRHOPODA.*~~

~~*The main limitations of the sub-kingdom or phylum Mollusca, as laid down by Cuvier, and the chief divisions thus recognized within its limits by him,*~~

~~*hold good to the present day. At the same time, three of the classes con- sidered by him as Mollusca have been one by one removed from that association in consequence of improved know- ledge, and one additional class, incorporated since his day with the Mollusca with general approval, has, after more than forty years, been again detached and assigned an independent position owing to newly-acquired knowledge.*~~

~~*The first of Cuvier's classes to be removed from the Mol- lusca was that of the Cirrhopoda, Their affinities with the lower Crustacea were recognized by Cuvier and his contem- poraries, but it was one of the brilliant discoveries of that remarkable and too-little-honoured naturalist, J. Vaughan Thompson of Cork, which decided their position as Crus- tacea. The metamorphoses of the Cirrhopoda were described and figured by him in 1830 in a very complete manner, and the legitimate conclusion as to their affinities was for- mulated by him (4). Thus it is to Thompson (1830), and not to Burmeister (1834), as erroneously stated by Kefer- stein, that the merit of this discovery belongs. The next class to be removed from Cuvier's Mollusca was that of the Nuda, better known as Tunicata. In 1866 the Russian embryologist Kowalewsky startled the zoological world with a minute account of the developmental changes of Ascidia, one of the Tunicata (5), and it became evident that the*~~

~~*Fa figures refer to the bibliography at the end of the article, Daogas*~~

~~*affinities of that class were with the Vertebrata,whilst their structural agreements with Mollusca were only superficial. The last class which has been removed from the Cuvierian Mollusca is that of the Lamp-shells or Brachiopoda. The history of its dissociation is connected with that of the class, viz., the Polyzoa or Bryozoa, which has been both added to and again removed from the Mollusca between Cuvier's date and the present day. The name of J. Vaughan Thompson is again that which is primarily con- nected with the history of a Molluscan class. In 1830 he pointed out that among the numerous kinds of " polyps" at that time associated by naturalists with the Hydroids, there were many which had a peculiar and more elaborate type of organization, and for these he proposed the name Polyzoa (6). Subsequently (7) they were termed Bryozoa by Ehrenberg (1831).*~~

~~*Henri Milne-Edwards in 1844 demonstrated (8) the affi- nities of the Polyzoa with the Molluscan class Brachiopoda, and proposed to associate the three classes Brachiopoda, Polyzoa, and Tunicata in a large group "Molluscoidea," coordinate with the remaining classes of Cuvier's Mollusca, which formed a group retaining the name Mollusca. By subsequent writers the Polyzoa have in some cases been kept apart from the Mollusca and classed with the "'Vermes;" whilst by others (including the present writer) they have, together with the Brachiopoda, been regarded as true Mol- lusca. The recent investigation by Mr. Caldwell (1882) of the developmental history of Phoronis (9), together with other increase of knowledge, has now, however, estab- lished the conclusion that the agreement of structure supposed to obtain between Polyzoa and true Mollusca is delusive; and accordingly they, together with the Brachi- opoda, have to be removed from the Molluscan phylum. Further details in regard to this, the last revolution in Mol- luscan classification, will be found in the article Potyzoa.*~~

~~*As thus finally purified by successive advances of em- bryological research, the Mollusca are reduced to the Cuvierian classes of Cephalopoda, Pteropoda, Gastropoda, and Acephala. Certain modifications in the disposition of these classes are naturally enough rendered necessary by the vast accumulation of knowledge as to the anatomy and embryology of the forms comprised in them during fifty years. Foremost amongst those who have within that period laboured in this group are the French zoologists Henri Milne-Edwards (20) and Lacaze Duthiers (21), to the latter of whom we owe the most accurate dissections and beautiful illustrations of a number of different types. To Kolliker (22), Gegenbaur (23), and more recently Spengel (24), amongst German anatomists, we are indebted for epoch-making researches of the same kind. In England, Owen's anatomy of the Pearly Nautilus (10), Huxley's dis- cussion of the general morphology of the Mollusca (11), and Lankester's embryological investigations (12), have aided in advancing our knowledge of the group. Two remarkable works of a systematic character dealing with the Mollusca deserve mention here—the Jfanual of the Mollusca by the late Dr. 8. P. Woodward, a model of clear systematic exposition, and the exhaustive treatise on the Malacozoa or Weichthiere by the late Professor Keferstein of Gottingen, published as part of Bronn's Classen und Ordnungen des Thier-Reichs. The latter work is the most completely illustrated and most exhaustive survey of exist- ing*~~

~~*knowledge of a large division of the animal kingdom which has ever been produced, and, whilst forming a monu- ment to its lamented author, places the student of Mol- luscan morphology in a peculiarly favourable position,*~~

~~*wonLuSsS eA*~~

~~*Classes of the Mollusca.—The classes of the Mollusca which we recognize are as follows :—*~~

~~*Phylum Mortusca. Brancu A.—Glossophora. Brancu B.—Lipocephala (=Acephala, Cuvier). Class 1.—LAMELLIBRANCHTA (Syn. Conchifera). Examples—Oyster, Mussel, Clam, Cockle.*~~

~~*Class 1.—GASTROPODA, Br. a.—Tsoplewra. Examples —- Chiton, menia. Br. b.— Anisopleura. Examples—Limpet, Whelk, Snail, Slug. Class 2.—ScAPHOPODA. Example—Tooth-shell.*~~

~~*Class 3.—CEPHALOPODA. Br. a.—Pteropoda. Examples—Hyalea, Pneu- modermon. Br. 6.—Siphonopoda. Examples — Nautilus, Cut- tles, Poulp.*~~

~~*General Characters of the Mollusca.—The forms com- prised in the above groups, whilst exhibiting an extreme range of variety in shape, as may be seen on comparing an Oyster, a Cuttle-fish, and a Sea-slug such as Doris; whilst adapted, some to life on dry land, others to the depths of the sea, others to rushing streams ; whilst capable, some of swimming, others of burrowing, crawling, or jump- ing, some, on the other hand, fixed and immobile; some amongst the most formidable of carnivores, others feed- ing on vegetable mud, or on the minutest of microscopic organisms—yet all agree in possessing in common a very considerable number of structural details which are not possessed in common by any other animals.*~~

~~*The structural features which the Mollusca do possess in common with other animals belonging to other great phyla of the animal kingdom are those 'characteristic of the Coelomata, one of the two great grades (the other and lower being that of the Celentera) into which the higher animals, or Enterozoa as distinguished from the Protozoa, are divided (18). The Enterozoa all commence their indivi- dual existence as a single cell or plastid, which multiplies itself by transverse division. Unlike the cells of the*~~

~~*Proto- zoa,these embryonic cells of the Enterozoa do not remaineach like its neighbour and capable of independent life, but pro- ceed to arrange themselves in two layers, taking the form of a sac. The cavity of the two-cell-layered sac or Diblas- tula thus formed is the primitive gut or ARCH-ENTERON. In the Coelentera, whatever subsequent changes of shape the little sac may undergo as it grows up to be Polyp or Jelly-fish, the original arch-enteron remains as the one cavity pervading all regions of the body. In the Coelomata the arch-enteron becomes in the course of development divided into two totally distinct cavities shut off from one another—an axial cavity, the MET-ENTERON, which retains the function of a digestive gut; and a peri-axial cavity, the c@tom or body-cavity, which is essentially the blood- space, and receives the nutritive products of digestion and the waste products of tissue-change by osmosis. The Mollusca agree in being Coelomate with the phyla Verte- brata, Platyhelmia (Flat-worms), Echinoderma, Appendicu- lata (Insects, Ringed-worms, &c.), and others,—in fact, with all the Enterozoa except the Sponges, Corals, Polyps, and Medusz.*~~

~~*In common with all other Cclomata, the Mollusca are at one period of life possessed of a PROSTOMIUM or region in front of the mouth, which is the essential portion of the "head," and is connected with the property of forward locomotion in a definite direction and the steady carriage of the body (as opposed to rotation of the body on its long axis). As a result, the Coelomata, and with them the Mollusca, present (in the first instance) the general*~~

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~~*condition of body known as BILATERAL SYMMETRY; the dorsal is differentiated from the ventral surface, whilst a right and a left side similar to, or rather the complements of, one another are permanently established. In common with all other Ccelomata, the Mollusca have the mouth and first part of the alimentary canal which leads into the met-enteron formed by a special invagination of the outer layer of the primitive body-wall, not to be confounded with that which often, but not always, accompanies the ante-cedent formation of the arch-enteron ; this invagination is termed the*~~

~~*sromop zum. Similarly, an anal aperture is formed in connexion with a special invagination which meets the hinder part of the met-enteron, and is termed the PROocTODAUM.*~~

~~*In common with many (if not all) Coelomata, the Mol- lusca are provided with at least one pair of tube-like organs, which open each by one end into the coelom or body cavity, and by the other end to the exterior, usually in the neigh- bourhood of the anus. These are the NEPHRIDIA.*~~

~~*Like all other Coelomata, the Mollusca are also provided with special groups of éells forming usually paired or median growths upon the walls of the ccelomic cavity, the cells being specially possessed of reproductive power, and _dif- ferentiated as egg-cells and sperm-cells. These are the Gonaps. As in other Ceelomata, the cells of the gonads may escape to the exterior in one of two ways—either through the nephridia, or, on the other hand, by special apertures.*~~

~~*As in all other Calomata, the cells, which build up respectively the primary outer layer of the body, the lining layer of the met-enteron, and the lining layer of the ceelom, are multiplied and differentiated in a variety of ways in the course of growth from the early embryonic condition, TissuxEs are formed by the adhesion of a num- ber of similarly modified cells in definite tracts. As in all Ceelomata, there is a considerable variety of tissues char- acterized by, and differentiated in relation to, particular physiological activities of the organism. Not only the Celomata but also many Ccelentera show, in addition to the EPITHELIA (the name given to tissue which bounds a free surface, whether it be that of the outer body-wall, of the gut, or of a blood-space), also deeper lying tissues, of which the first to appear is MUSCULAR tissue, and the second NERVOUS tissue,*~~

~~*The epithelia are active in throwing off their constituent cells (blood- corpuscles from the wall of the ceelom), or in producing secretions (glands of body-wall and of gut), or in forming horny or calcareous plates, spines, and pro- cesses, known as CUTICULAR PRODUCTS (shells and bristles of the body-wall, teeth of the tongue, gizzard, dvc.).*~~

~~*In the Mollusca, as in all other Coelomata, in correspond- ence with the primary bilateral symmetry and in relation to the special mechanical*~~

~~conditions of the prostomium, the nervous.tissue which is in Ccelentera, and even in Flat- worms, diffused over the whole body in networks, tends to concentrate in paired lateral tracts, having a special enlargement in the prostomium. The earlier plexiform arrangement is retained in the nervous tissue of the walls of the alimentary canal of many Ccelomata, whilst a con- centration to form large nerve-masses (GANGLIA), to which numerous afferent and efferent fibres are attached, affects the nervous tissue of the body-wall.~~

~~In all Coelomata, including Mollusca, muscular tissue is developed in two chief layers, one subjacent to the deric or outer epithelium (SoMATIC MUSCULATURE), and a second sur- rounding the alimentary canal (sPLANCHINIC MUSCULATURE). Thus, primarily, in Coelomata the body has the character of two muscular sacs or tubes, placed one within the other and separated from one another by the ccelomic space. The somatic musculature is the more copious and develops~~

~~very generally an outer circular layer (.e., a layer in which the muscular fibres run in a direction transverse to the long axis of the body) and a deeper longitudinal layer ; to these oblique and radiating fibres may be added. The splanchnic musculature, though more delicate, exhibits a circular layer nearer the enteric epithelium, and a longi- tudinal layer nearer the coelomic surface.~~

~~In Coelomata and in many Ccelentera there are found distributed between the tracts of muscular tissue, bounding them and giving strength and consistency also to the walls of the body, of the alimentary canal, of the ccelom, and of the various organs and tissue-masses (such as nerve-centres, gonads, &c.) connected with these, tracts of tissue the function of which is skeletal. The SKELETAL TISSUE of Mollusca, in common with that of other Coelomata, exhibits a wide range of minute structure, and is of differing density in various parts ; it may be fibrous, membranous, or carti- laginous. The Mollusca, in common with the other Coelo- mata, exhibit a remarkable kind of association between the various forms of skeletal tissue and the~~

~~*epithelium which lines the coelomic cavity. The ccelomic cavity contains a liquid which is albuminous in chemical composition (BLooD- LYMPH or HAMOLYMPH), and into this liquid cells are shed from the ccelomic epithelium. They float therein and are known as BLOOD CORPUSCLES or LYMPH CORPUSCLES. The coelomic space with its contained hemolymph is not usually in Coelomata, and is not in Mollusca, a simple even-walled cavity, but is broken up into numerous passages and re- cesses by the outgrowths, both of the alimentary canal and of its own walls. By the adhesion of its opposite walls, and by an irregularity in the process of increase of its area during growth, the ccelom becomes to a very large extent a spongy system of intercommunicating LACUN or irregular spaces, filled with the coelomic fluid. At the same time, the coelomic space has a tendency to push its way in the form of narrow canalsand sinuses between the layers of skeletal tissue, and thus to permeate together with the skeletal tissue in the form of a spongy, or it may be a tubular, network all the apparently solid portions of the animal body. This association of the nutritive and skeletal functions is accom- panied by a complete identity of the tissues concerned in these functions. Not only is there complete gradation from one variety of skeletal tissue to another (¢.g., from membranous to fibrous, and from fibrous to cartilaginous) even in respect of the form of the cells and their intercellular substance, but the ccelomic epithelium, and consequently the hemolymph with its floating corpuscles derived from that epithelium, is brought into the same continuity. The skeletal and blood-containing and -producing tissues in fact form one widely-varying but continuous whole, which may be called the SKELETO-TROPHIC SYSTEM OF TISSUES.*~~

~~*In many Ccelomata not only do the skeletal tissues allow the coelomic space with its fluid and corpuscles to penetrate between their layers, but a special mode of extension of that space is found, which consists in the hollowing out of the solid substance of elongated cells having the form of fibres, which thus become tubular, and, admitting the nutritive fluid, serve as channels for its distribution. These are "capillary vessels," and it has yet to be shown that such are formed in the Mollusca, Larger vessels, however, concerned in guiding the move- ment of the coelomic fluid in special directions are very usually developed in the Mollusca, as in other Ccelomata, by the growth of skeletal tissue around what are at first ill-*~~

~~defined extensions of the coelomic space. In this way a portion of the coelomic space becomes converted into vessels, whilst a large part remains with irregular walls extending in every direction between the skeletal tissues and freely communicating with the system of vessels. As in many other Coelomata, muscular tissue grows around~~

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~~[SCHEMATIC MOLLUSC.~~

~~the largest vessel formed from the primitive ccelom, which thus becomes a contractile organ for propelling the blood- lymph fluid. This "HEART" has in Mollusca, as in most other Coelomata in which it is developed, a dorsal position. A communication of the blood-lymph space with the exterior by means of a pore situated in the foot or else- where has been very generally asserted to be characteristic of Mollusca. It has been maintained that water is intro- duced by such a pore into the blood, or admitted into a special series of water-vessels. It has also been asserted that the blood-fiuid is expelled by the Mollusca from these same pores. Recent investigation (14) has, however, made it probable that the pores are the pores of secreting glands, and do not lead into the vascular system. There is, it there- fore appears, no admission or expulsion of water through such pores in connexion with the blood, although in some other Coelomata it is established that water is taken into the coelomic space through a pore (Echinoderms), whilst in some others there is no doubt that the coelomic hemolymph is occasionally discharged in quantity through pores of defi- nite size and character (Earthworm, éc.).~~

~~We have thus seen that the Mollusca possess, in common with the other Coelomata—1, a body composed of a vast number of cells or plastids, arranged so as to form a sac- like body-wall, and within that a second sac, the met-enteron, the wall of which is separated from the first by a calom or blood-lymph space; 2, a stomodxum and a proctodxum ; 3, a prostomium, together with a differentiated dorsal and ventral surface, and consequently right and left sides, 1.¢., bilateral symmetry; 4, a pair of nephridia; 5, gonads developed on the wall of the ccelom ; 6, dere epithelium (producing horny and calcareous deposits on its surface), enteric epithelium, and calomic epithelium; 7, laterally paired masses of nerve-tissue, especially~~

~~*large in the pro- stomial region (nerve-centres or ganglia); 8, muscular tissue, forming a somatic tunic and a splanchnic tunic; 9, skeleto-trophic tissues, consisting of membranous, fibrous, and cartilaginous supporting tissues, and of blood-vessels and the walls of blood-spaces, the caelomic epithelium, and the liquid tissue known as hemolymph (commonly blood).*~~

~~*Schematic Mollusc.—Starting from this basis of structural features common to them and the rest of the Cœlomata, we may now point out what are the peculiar developments of structure which characterize the Mollusca and lead to the inference that they are members of one peculiar branch or phylum of the animal pedigree. In attempting thus to set forth the dominating structural attributes of a great group of organisms it is not possible to make use of arbi- trary definitions. Of Mollusca, as of other great phyla, it is not possible categorically to enunciate a series of struc- tural peculiarities which will be found to be true in refer- ence to every member of the group. We have to remember that the process of adaptation in the course of long ages of development has removed in some cases one, in other cases another, of the original features characteristic of the ancestors from which the whole group may be supposed to have taken origin, and that it is possible (and actually is realized in fact) that some organisms may have lost all the primary characteristics of Molluscan organization, and yet be beyond all doubt definitely stamped as Mollusca by the retention of some secondary characteristic which is so peculiar as to prove their relationship with other Mollusca. An example in point is found in the curious fish-hke form Phyllirhoé (fig. 58), which has none of the primary char- acteristics of a Mollusc, and yet is indisputably proved to belong to the Molluscan phylum by possessing the peculiar and elaborate lingual apparatus present in one branch of the phylum, the Glossophora.*~~

~~*In order to exhibit concisely the peculiarities of organi- zation which characterize the Mollusca, we find it most*~~

~~convenient to construct a schematic Mollusc, which shall | Mollusc the representation of the actual Molluscan ancestor~~

~~possess in an unexaggerated form the various structural arrangements which are more or less specialized, exagger- ated, or even suppressed in particular members of the group. Such a schematic Mollusc is not to be regarded as an arche-~~

~~Fic, 1.—Schematie Mollusc. heart, pericardium, gonads,~~

~~A. Dorsal aspect. and nephridia shown in position. D. The nervous system; the reader is requested to note that the cord passing backwards from g.pe lies beneath, and does not in any way unite with the cord which~~

~~B. Ventral aspect. C. The~~

~~passes from g.ab to g.pl. E. Diagram in which the body-wall is represented as cut in the median antero-posterior plane, so as to show organs in position, —the shell-sac is seen in section, but the shell is omitted. f Letters in all the figures as follows :—a, cephalic tentacle ; b, head ; c, edge of the mantle-skirt or limbus pallialis; d, dotted line indicating the line of origin of the free mantle-skirt from the sides of the visceral hump; ¢, outline of the foot seen through the mantle-skirt in A, which is supposed to be trans-parent, allowing the position of this and of the various parts h, 1, k, l, m, to be seen through its substance; /, edge of the shell-follicle ; g, the shell; h, the osphradium, paired (Spengel's olfactory organ); t, the ctenidium, paired (gill-plume) ; &, aperture of the gonad, paired ; 1, aperture of one of the two nephridia ; m, anus; n, posterior region of the foot reaching farther back than the mass of viscera (dorsal hump) which it carries ; 0, mouth ; p, plantar surface of the foot; g, cut edge of the body-wall of the dorsal region ; vi ccelomnic space (blood-lymph space or body-cavity), mostly occupied by liver, but to some extent retained as blood-channels and lacune ; 8, pericardial cavity ; t, gonad (ovary or spermary), paired ; u, nephridium, paired ; v, ven- tricle of the heart receiving the right and the left auricles at its sides, and sending off anteriorly a large vessel, posteriorly a small one; w, the cephalic eye, paired ; x, dotted ring to show the position occupied by the cesophagus in relation to the nerve ganglia and cords; y, the otocyst, paired ; z.l, the digestive gland (so-called "'liver") of the left side; z.g, duct~~

~~*of the digestive gland of the right side; g.c, cerebral ganglion united by the cerebral com- missure to its fellow; g.pl, pleural ganglion united by the cerebro-pleural connective to the cerebral ganglion, and by the pleuro-pedal connective to the pedal ganglion ; g.pe, the pedal ganglion united to its fellow by the pedal commissure—the two sending off posteriorly the long ladder-like pair of pedal nerves ; g.v, the visceral ganglion (of the left side) united by the visceral loop or commissure to the similar ganglion on the right side, and by the viscero-pleural connective to the pleural ganglion ; g.ab, abdominal ganglion developed on the course of the visceral loop ; g.olf, olfactory ganglion placed near the osphradium on a nerve taking its origin froin the visceral ganglion.*~~

~~*type, in the sense which has been attributed to that word, nor as the embodiment of an idea present to a creating mind, nor even as an epitome of developmental laws. Were know- ledge sufficient, we should wish to make this schematic*~~

~~*from which the various living forms have sprung. To defi- nitely claim for our schematic form any such significance in the present state of knowledge would be premature, but it may be taken as more or less coinciding with what we are justified, under present conditions, in picturing to ourselves as the original Mollusc or archi-Mollusc (more correctly Archimalakion). After describing this schematic form, we shall proceed to show how far it is realized or justified in each class and order of Mollusca successively.*~~

~~*The schematic Molluse (fig. 1, A to E) is oblong in shape, bilaterally symmetrical, with strongly differentiated dorsal and ventral surface, and has a well-marked HEAD, consisting of the prostomium (b) and the region imme- diately behind the mouth. Upon the head we place a pair of short CEPHALIC TENTACLES (a), The mouth is placed in the median line anteriorly, and is overhung by the prostomium (B, 0); the anus is placed in the median line posteriorly, well raised on the dorsal surface (A, m). The apertures of a pair of NEPHIRIDIA are seen in the neighbourhood of the anus right and left (A, 1). Near the nephridial apertures, and in front of them, right and left, are the pair of apertures (&) appropriate to the ducts of the GonaDs (generative pores).*~~

~~*The most permanent and distinctive Molluscan organ is the roor (Podium). This is formed by an excessive development of the somatic musculature along the ventral surface, distinctly ceasing at the region of the head, below which it suddenly projects as a powerful muscular mass (B, p; E, p). It may be compared, and is probably genetic- ally identical, with the muscular ventral surface of the Planarians and with the suckers of Trematoda, but is more extensively developed than are those corresponding struc- tures. The muscular tissue of the foot, and of all other parts of the body of all Mollusca, is cellular and unstriated, as distinguished from the composite muscular fibre (con- sisting of cell-fusions instead of separable cells) which occurs in Arthropoda and in Vertebrata, and which has the further distinction of being composed of alternating bands of substance of differing refractive power (hence "striated"). The appearance of cross striation seen in the muscular cells of some Molluscs (odontophore of Haliotis, Patella, &c.) requires further investigation. It is by no means altogether the same thing as the mark- ing characteristic of striated muscular fibre.*~~

~~*Contrasting with the ventral foot is the thin-walled dorsal region of the body, which may be termed the anti- podial region. This thin-walled region is formed by soft viscera covered in by the comparatively delicate and non-muscular body-wall (fig. 1, E). As the ventral foot is clearly separate from the projecting head, so is this dorsal region, and it is conveniently spoken of as the VISCERAL HUMP or "dome" (cupola). Protecting the visceral dome is a SHELL (conchylium) consisting of a horny basis impreg- nated with carbonate of lime,! and secreted by the deric epithelium of this region of the body (g). The shell in our schematic Mollusc is single, cap-shaped, and sym- metrical. It does not lie entirely naked upon the surface of the visceral dome, but is embedded all round its margin, to a large extent in the body-wall. In fact, the integu- ment of the visceral dome forms an open flattened sac in which the shell lies. This is the PRIMARY SHELL- SAC, or FOLLICLE (A and E, f). The wall of the body pro- jects all round the visceral dome in the form of a flap or skirt, so as to overhang and conceal to some extent the head and the sides of the foot. This skirt, really an out-*~~

~~*1 As to the minute structure of the shell in various classes, see Carpenter's article " Shell" in the Cyclop. of Anat. and Physiol. The limits of our space do not permit us to deal with this or other histo- logical topics.*~~

growth of the dorsal body-wall, is called the MANTLE-FLAP (limbus pallialis), or more shortly the MANTLE or PALLIUM (c). The space between the overhanging mantle-flap and the sides and neck of the animal which it overhangs is called the SUB-PALLIAL SPACE or CHAMBER. Posteriorly in this space are placed the anus and the pair of nephridial aper- tures (see fig. 1, E),

The development of the mantle-skirt and its sub-pallial space appears to have a causal relation, in the way of pro- tection, to a pair of processes of the body-wall which spring, one on the right and one on the left, from the sides of the body, nearer the anus than the mouth, and are concealed by the mantle-flap to some extent (A, B, 7). These processes have an axis in which are two blood-vessels, and are beset with two rows of flattened filaments, like the teeth of a comb in double series. These are the CTENIDIA or gill-combs. Usually, as will be seen in the sequel, they play the part of gills, but since in many Molluscs (Lamelli- branchs) their function is not mainly respiratory, and since also other completely-formed gills are developed as special organs in some Molluscs to the exclusion of these pro- cesses, it is well not to speak of them simply as "gills" or "branchie," but to give them a non-physiological name such as that here proposed. Near the base of the stem of each ctenidium is a patch of the epithelium of the body- wall, peculiarly modified and supplied with a special nerve and ganglion. This is Spengel's olfactory organ, which tests the respiratory fluid, and is persistent in its position and nerve-supply throughout the group Mollusca. We propose to call it the oSsPHRADIUM.

Passing now to the internal organs, our schematic Mollusc is found to possess an ALIMENTARY CANAL, which passes from mouth to anus in the middle line, leaving between it and the muscular body-wall a more or less spongy, in parts a spacious, ceLom. The stomodxum is large and muscular, the proctodzum short; the bulk of the alimentary canal is therefore developed from the met- enteron or remnant of the arch-enteron after the ccelom has been pinched off from it. A paired outgrowth of the met-enteron forms the glandular diverticulum known as the digestive gland or (commonly) liver (E, 2g, /).

~~*Dorsally to the alimentary tract the ccelom is spacious. The space (C, E,~s) is termed the PERICARDIUM, since it is traversed by a vessel running fore and aft in the median line, which has contractile muscular walls and serves as a heart to propel the ccelomic blood-fluid. This pericardial space, although apparently derived from the original ccelom, is not in communication with the other spaces and blood- vessels derived from the ccelom ; it never (or perhaps in a very few instances) coritains in the adult the Molluscan blood or hemolymph, and is always in free communication with the exterior through the tubes called nephridia (renal organs). The HEART receives symmetrically on each side, right and left, a dilated vessel bringing aerated blood from the ctenidia. These dilated vessels are termed the auricles of the heart, whilst the median portion itself, at the point where these vessels join it, is termed the ventricle of the heart (C, v). The vessel passing fore and aft from the ventricle gives off a few trunks which open into spaces of the ccelom, the so-called lacunz ; these are excavated in every direction between the viscera and the various bundles of fibrous and muscular tissue, and may assume more or less the character of tube-like vessels with definite walls. Right and left opening into the pericardial ccelom is a coiled tube, the farther extremity of which opens to the exterior by the side of the anus. These two tubes (C, ~) are the symmetrically disposed NEPHIRIDIA (renal organs).*~~

~~*The GoNADs (ovaries or spermaries) are placed in the mid-dorsal region of the ccelom (C, ¢), and have their own apertures in the immediate neighbourhood of those of the*~~

~~*MOLLUS A*~~

~~*[SCHEMATIC MOLLUSC.*~~

~~*nephridia. The apertures are paired right and left, and so are the ducts into which they lead; but at present we have no ground for determining whether the gonad itself was primarily in Molluses a paired organ or a median organ, nor have we any well-founded conception as to the nature of the ducts when present, and their original relationship*~~

~~*Fia. 2,—Ctenidia of various Mollusca (original). A. Of Chiton; /t., fibrous tissue; a.b.v., afferent blood-vessel ; ¢.b.v., efferent blood-vessel ; g.l., later-*~~

~~ally paired lamelle. B. Of Sepia; lettersasin A. C. Of Fissurella; letters asin A. D. Of Nucula; d, position of axis with blood-vessels; a, inner; band ¢, outer row of lamellz. E. Of Paludina ; i, intestine running parallel with the axis of the ctenidium and ending in the anus a; br, rows of elongate processes corresponding to the two series of lamelle of the upper figures.~~

~~to the gonads. The genital ducts of some organisms are modified nephridia, but the nature of those of Mollusca, of Arthropoda, of Echinoderma, of Nematoidea, and of some Vertebrata has yet to be elucidated.~~

~~The disposition of the nerve-centres is highly character- istic. There are four long cords composed of both nerve- fibres and nerve-cells which are disposed in pairs, two right and left of the pedal area or foot, two more dorsally and tending to a deeper position than that occupied by the pedal cords, so as to lie freely within the coelomic space unattached to the body-wall. These are respectively the PEDAL NERVE-CORDS and the VISCERAL NERVE-CoRDS. The latter meet and join one another posteriorly. A right and left (D, g.v), and a median abdominal (g.ab) ganglion are placed on these cords, and from them are given off the osphradial nerves which have special ganglia (g.0/f). In the region of the prostomium the pedal nerve-cords are enlarged behind the mouth, forming the pedal ganglia (g.pe), and are united by nerve-fibres to one another. From this spot they are continued forward into the prostomium, where they enlarge to form the right and left cerebral ganglia (9.c), which are united to one another by nerve-fibres in front of~~

~~SCHEMATIC MOLLUSC.]~~

~~the mouth, just as the pedal ganglia are behind it. On their way forwards from the pedal ganglia to the cerebral ganglia the right and left pedal nerve-cords are joined by the right and left visceral cords respectively, the point of union being marked on either side by a swelling (9.p/) known as the pleural ganglion. Transverse fibres connect the right and left pleural ganglia behind the mouth. The visceral nerve-cord can be traced up on each side beyond the pleural ganglion to the cerebral ganglion. Thus we have a complete double nerve-ring formed around the ceso- phagus by the two pairs of nerve-cords which are in this region drawn, as it were, towards each other and away from their lateral position both behind and before the~~

~~*stomodzal invagination. Whilst the swollen parts of the nerve-tracts are termed ganglia, the connecting cords are conveniently distinguished either as connectives or as commissures. Com- missures connect two ganglia of the same pair. We have a cerebral commissure, a pedal commissure, a pleural com- missure, and a visceral commissure.. Connectives connect ganglia of dissimilar pairs, and we speak accordingly of the cerebro-pedal connective, the cerebro-pleural connective, the pleuro-pedal connective, and the viscero-pleural con- nective.*~~

~~*An ENTERIC NERVOUS sysTEM forming a plexus on the walls of the alimentary canal exists, but does not exhibit cords and ganglia visible to the naked eye except in the large Dibranchiate Cephalopods.*~~

~~*Our schematic Mollusc is provided with certain oRGANS OF SPECIAL SENSE. Tactile organs occur on the head in the form of short CEPHALIC TENTACLES (a). Deeply placed are*~~

~~*Kia. 8.—Development of the Pond-Snail, Limneus stagnalis (after Lankester, 15). dc, directive corpuscles (preseminal outcast cells); ch, egg-envelope or chorion ; or, oral end of the blastopore; 7, anal end of the blastopore. A. Formation of the Diblastula by the invagination of larger cells into the area of smaller cells (optical section). B. View of the same specimen from the surface of invagination ; the smaller cells are seen at the periphery ; by division they will multiply and extend themselves over the four larger cells. C. Fully-formed Diblastula, surface view to show the elongated form of the orifice of invagination or blastopore ; its middle portion closes up and coin- cides with the region of the foot; the extremity, or, coincides with the mouth and stomodum, the opposite extremity, r, with the anus. D. Optical section of an embryo a little older than A. E. Surface view of the same embryo.*~~

~~*a pair of closed vesicles containing each a calcareous con- cretion and acting as auditory organs ; these are known as ocrocysts (D, y). They are situated behind the mouth in the foremost portion of the foot. At the base of each cephalic tentacle is a pigmented eye-spot—the CEPHALIC EYE (D, w). The ospHRapIUM (h), or peculiar patch of olfactory epithelium at the base of the ctenidium, has already been mentioned.*~~

~~*To the scheme thus exhibited of the possible organization of the ancestral Mollusc we shall now add a sketch of the mode in which this form of body and series of internal organs are developed from the egg.*~~

~~*The egg-cell of Mollusca is either free from food material a simple protoplasmic corpuscle—or charged with food*~~

~~*material to a greater or less extent. Those cases which appear to be most typical—that is to say, which adhere to a*~~

~~*= \ * Y vs LA yy jj ae YY Pel' \ ae ey? * is ae eae*~~

~~*Fic. 4.—Development of the Pond-Snail, Limneus stagnalis (after Lankester, 15). 7, directive corpuscle; bl, blastopore; en, endoderm or enteric cell- layer ; ec, ectoderm or deric cell-layer ; v, velum; m, mouth; f, foot; ¢, ten- tacles ; fp, pore in the foot (belonging to the pedal gland ?); m/f, the mantile- flap or limbus pallialis ; sh, the shell; /, the bui>pelital space, here destined*~~

~~*A. First four cells resulting from the cleavage of the*~~

~~*original egg-cell. B. Side viewof the same. ©. Diblastula stage (see fig. 3),*~~

~~*showing the two cell-layers and the blastopore. D, E, F. Trochosphere*~~

~~*stage, D older than EorF. G. Three-quarter view of a Diblastula, to show the orifice of invagination of the endoderm or blastopore, bl. H, I. Veliger*~~

~~*stage later than D. (Compare fig. 70 and fig. 72***),*~~

~~*procedure which was probably common at one time to all then existing Mollusca, and which has been departed from*~~

~~*to become the lung.*~~

~~eS Se~~

~~*Fic. 5.—Early stages of division of the fertilized egg-cell in Nassa mutahilis (from Balfour, after Bobretzky). A. The egg-cell has divided into two spheres, of which the lower contains more food-material, whilst the upper is again incompletely divided into two smaller spheres. Resting on the dividing upper sphere are the eight-shaped "directive corpuscles," better called "preeseminal outcast cells or apoblasts," since they are the result of a cell-division which affects the egg-cell before it is impregnated, and are mere refuse, destined to disappear. B. One of the two smaller spheres is reuuited to the larger sphere. C. The single small sphere has divided into two, and the reunited mass has divided into two, of which one is oblong and practically double, asin B. D. Each of the four segment-cells gives rise by division to a sniall pellucid cell. E. The cap of small cells has increased in number by repeated formation of pellucid cells in the same way, and by division of those first formed. The cap will spread over and euclose the four segment-cells, as in fig. 3, A, B.*~~

~~*only in later and special lines of descent—show approxi-*~~

~~*638*~~

~~*mately the following history. By division of the egg-cell (fig. 3, A, B; fig. 4, A, B; and fig. 5) a mulberry-mass of embryonic-cells is formed (Morula), which dilates, forming a one-cell-layered sac (Blastula). By invagination one*~~

~~*Fig. 6.—Development of the Oyster, Ostrea edulis (modified from Horst, 16). A. Blastula stage (one-cell-layered sac), with commencing invagination of the wall of the sac at bl, the blastopore. B. Optical section of a somewhat later stage, in which a second invagination has commenced—namely, that of the shell-gland sk; bl, blastopore; en, invaginated endoderm (wall of the future arch-enteron); ec, ectoderm. C. Similar optical section at a little later stage. The invagination connected with the blastopore is now more contracted, d; and cells, me, forming the mesoblast from which the ecelom and muscular and skeleto-trophic tissues develop, are separated. D. Similar section of a later stage. The blastopore, bl, has closed; the anus will subsequently perforate the corresponding area. A new aperture, m, the mouth,*~~

~~*has eaten its way into the invaginated endodermal sac, and the cells pushed in with it constitute the stomodeum. The shell-gland, sk, is flattened out, and a delicate shell, s, appears on its surface. The ciliated velar ring is cut in the section, as shown by the two projecting cilia on the upper part of the figure. The embryo isnowa Trochosphere. E. Surface view of an embryo at a period aliost identical with that of D. F. Later embryo seen as a transparent object. m, mouth; ft, foot; a, anus; e, intestine ; st, stomach ; tp, velar area of the prostomium. The extent of the shell and commencing agers of the mantle-skirt is indicated by a line forming a curve from a*~~

~~*θ*~~

~~*N.B.—In this development, as in that of Pisidium (figs. 150, 151), no part of the blastopore persists either as mouth or as anus, but the aperture closes, — the pedicle of invagination, or narrow neck of the invaginated arch-enteron, becoming the intestine. The mouth and the anus are formed as independent in-pushings, the mouth with stomodzeum first, and the short anal proctodzeum much later. This interpretation of the appearances is contrary to that of Horst (16), from whom our drawings of the oyster's development are taken, The account given by the American naturalist Brooks (19) differs greatly as to se of fact from that of Horst, and appears to be erroneous in some respects.*~~

~~*portion of this sphere becomes tucked into the other—as in the preparation of a woven night-cap for the head (fig. 6, B; fig. 7, A). The orifice of invagination (blastopore) narrows, and we now have a two-cell-layered sac, —the Diblastula. The invaginated layer is the enteric cell-layer or endoderm ; the outer cell-layer is the deric cell-layer or ectoderm. The cavity communicating with the blastopore and lined by the endoderm is the arch-enteron. The blas- topore, together with the whole embryo, now elongates. The blastopore then closes along the middle portion of its extent, which corresponds with the later developed foot. At the same time the stomodeum or oral invagination forms around the anterior remnant of the blastopore, and the proctodeum or anal invagination forms around the posterior remnant of the blastopore. There are, however,*~~

~~*MOLLUSCA*~~

~~[SCHEMATIC MOLLUSC.~~

~~variations in regard to the relation of the blastopore to the mouth and to the anus which are probably modifications of the original process described above. An examination of figs. 3, 4, 5, 6, 7, and of others illustrative of the embryo- logy of particular forms which occur later in this article, is now recommended to the reader. The explanation of the figures has been made very full so as to avoid the~~

~~Fic. 7.—Development of the River-Snail, Paludina vivipara (after Lankester, 17). dc, directive corpuscle (outcast cell); ae, arch-enteron or cavity lined by the enteric cell-layer or endoderm; 0, blastopore; vr, velum or circlet of ciliated cells; dv, velar area or cephalic dome; sm, site of the as yet un- formed mouth ; f, foot; mes, rudiments of the skeleto-trophic tissues ; pi, the pedicle of invagination, the future rectum ; shgl, the primitive shell-sac or shell-gland ; m, mouth; an, anus. A. Diblastula phase (optical section). B. The Diblastula has become a Trochosphere by the development of the ciliated ring wr (optical section). C. Side view of the Trochosphere with commencing formation of the foot. D. Further advanced Trochosphere (optical section). E, The Trochosphere passing to the Veliger stage, dorsal view showing the formation of the primitive shell-sac. F. Side view of the same, showing foot, shell-sac (shgl), velum (vr), mouth, and anus.~~

~~N.B.—In this development the blastopore is not elongated ; it persists as the anus. The mouth and stomodeum form independently of the blastopore.~~

~~necessity of special descriptions in the text. Internally, by the nipping off of a pair of lateral outgrowths (forming part of the indefinable ‘“ mesoblast ”) from the enteric cell- layer the foundations of the coelomic cavity are laid. In some Coelomata these outgrowths are hollow and of large size. In Mollusca they are not hollow and large, which is probably the archaic condition, but they consist at first of a few cells only, adherent to one another ; these cells then diverge, applying themselves to the body-wall and to the gut-wall so as to form the lining layer of the ccelomic cavity. Muscular tissue develops from deep-lying cells, and the rudiments of the paired nerve-tracts from thickenings of the deric-cell layer or ectoderm.~~

~~The external form meanwhile passes through highly char-~~

~~*acteristic changes, which are on the whole fairly constant*~~

~~*throughout the Mollusca. A circlet of cilia forms when the embryo is still nearly spherical (fig. 4, F; fig. 6, E; fig. 7,*~~

~~*CLASSES AND ORDERS.*~~ |

~~*B), in an equatorial position. As growth proceeds, one hemisphere remains relatively small, the other elongates and enlarges. Both mouth and anus are placed in the larger area ; the smaller area is the prostomium simply ; the cili- ated band is therefore in front of the mouth. The larval form thus produced is known as the Trochosphere. It exactly agrees with the larval form of many Chetopod worms and other Ccelomata. Most remarkable is its agreement with the adult form of the Wheel animalcules or Rotifera, which retain the pre-oral ciliated band as their chief organ of locomotion and prehension throughout life. So far the young Mollusc has not reached a definitely Molluscan stage of development, being only in a condition common to it and other Coelomata. It now passes to the veliger phase, a definitely Molluscan form, in which the disproportion between the area in front of the ciliated circlet and that behind it is very greatly increased, so that the former is now simply an emarginated region of the head fringed with cilia (fig. 8; fig. 6, F; fig. 7, F; and fig. 60, A). It is termed the "velum," and is fre- quently drawn out into lobes and processes. As in the Rotifera, it serves the veliger larva as an organ of loco-*~~

~~*Fia. 8.—"Veliger" embryonic form of Mollusca (from Gegenbaur). v, velum; ¢, visceral dome with dependent mantile-skirt ; p, foot ; t, cephalic tentacles ; op, operculum.*~~

~~*motion. In a very few Molluscs, but notably in the Com-*~~

~~*mon Pond-Snail, the emarginated bilobed velum is re-*~~

~~*tained in full proportions in adult life (fig. 70), having lost its marginal fringe of specially long cilia and its locomotor function. The body of the Veliger is char- acterized by the development of the visceral hump on one surface, and by that of the foot on the other. Growth is greater in the vertical dorso-ventral axis than in the longitudinal oro-anal axis ;*~~

~~consequently the foot is rela- tively small and projects as a blunt process between mouth and anus, which are not widely distant from one another, whilst the antipedal area projects in the form of a great hump or dome. In the centre of this antipedal area there has appeared (often at a very early period) a gland-like~~

~~depression or follicle of the integument (fig. 6, C, sk; fig. 7,~~

~~E, F, shgl; fig. 60, B; fig. 68, sks; fig. 72***, ss). This is~~

~~the primitive shell-sac discovered by Lankester (18) in 1871,~~

~~and shown by him to precede the development of the perma-~~

~~nent shell in a variety of Molluscan types. The cavity of this small sac becomes filled by a horny substance, and then it very usually disappears, whilst a delicate shell, commenc-~~

~~aoOLL USC «z~~

~~639~~

~~ing from this spot as a centre, forms and spreads upon the surface of the visceral dome.~~

~~The embryonic shell-sac or shell-gland represents in a transient form, in the individual development of most Mollusca, that condition of the shell-forming area which we have sketched above in the schematic Mollusc, In very few instances (in Chiton, and probably in Limax), as we shall see below, the primitive shell-sac is retained and enlarged as the permanent shell-forming area. It is sup- planted in other Molluscs by a secondary shell-forming area, namely, that afforded by the free surface of the visceral hump, the shell-forming activity of which extends even to the surface of the depending mantle-skirt. Accord- ingly, in most Mollusca the primitive shell is represented only by the horny plug of the primitive shell-sac. The permanent shell is a new formation on a new area, and should be distinguished as a secondary shell.~~

~~*The ctenidia, it will be observed, have not yet been mentioned, and they are indeed the last of the charac- teristic Molluscan organs to make their appearance. Their possible relation to the pra-oral and post-oral ciliated bands of embryos similar to the Trochosphere will be discussed in the final section of this article dealing with the Polyzoa and Brachiopoda. The Veliger, as soon as its shell begins to assume definite shape, is no longer of a form common to various classes of Mollusca, but acquires characters peculiar to its class. At this point, therefore, we shall for the present leave it.*~~

~~*SysTEMATIC REVIEW OF THE CLASSES AND ORDERS oF Mo.uusca,*~~

~~*We are now in a position to pass systematically in review the various groups of Mollusca, showing in what way they conform to the organization of our schematic Mollusc, and in what special ways they have modified or even suppressed parts present in it, or phases in the repre- sentative embryonic history which has just been sketched. It will be found that the foot, the shell, the mantle-skirt, and the ctenidia, undergo the most remarkable changes of form and proportionate development in the various classes—changes which are correlated with extreme changes and elaboration in the respective functions of those parts.*~~

~~*Division of the Phylum into two Branches.—The Mollusca are sharply divided into two great lines of descent or branches, according as the prostomial region is atrophied on the one hand, or largely developed on the other.*~~

~~*The probabilities are in favour of any ancestral form— the hypothetical archi-Mollusc which connected the Mol- lusca with their non-Molluscan forefathers—having pos- sessed, as do all the more primitive forms of Ccelomata, a well-marked prostomium, and consequently a head. The one series of Mollusca descended from the primitive head- bearing Molluscs have acquired an organization in which the Molluscan characteristics have become modified in definite relation to a sessile inactive life. As the most prominent result of the adaptation to such sessile life they exhibit an atrophy of the cephalic region. They form the branch LIpocEPHALA—the mussels, oysters, cockles, and clams. The other series have retained an active, in many cases a highly aggressive, mode of life; they have, corre-*~~

spondingly, not only retained a well-developed head, but have developed a special aggressive organ in connexion with the mouth, which, on account of its remarkable nature and the peculiarities of the details of its mechanism, serves to indicate a very close genetic connexion between all such animals as possess it. This remarkable organ is the odon- tophore, consisting of a lingual ribbon, rasp, or radula, with its cushion and muscles. On account of the pos- session of this organ this great branch of the Molluscan phylum may be best designated GLossopHora. Any term

which merely points to the possession of a head is objec- | rasp (y). Anteriorly the ventral wall of the diverticulum

tionable, since this is common to them and the hypotheti- cal archi-Mollusca from which they descend. The term Odontophora, which has been applied to them, is also un- suitable, since the organ which characterizes them is not a tooth, but a tongue.

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Fia. 9.—Odontophore of Glossophorous Mollusca.

A. Diagram showing mouth, cesophagus, and lingual apparatus of a Gastro- pod in section. au, upper lip; al, lower lip; b, calcareo-corneous jaw of left side ; c, outer surface of the snout; d, esophagus; e, fold in the wall of the cesophagus behind the radular sac (n); f, anterior tennina- tion of the radula and fts bed, the point at which it wears away ; g, base of the radular sac or recess of the pharynx ; h, cartilaginous piece developed in the floor of the pharynx beneath the radula, and serving for the attachment of numerous muscles, and for the support of the radula; i, anterior muscles ; k, posterior muscles attached to the carti- lage; J, muscle acting as a

~~*retractor of the buccal mass; m, muscle attached to the lower lip; n, posterior extremity of the radular sac o, the bed of the radula or layer of cells by which its lower surface is formed ; p, the horny radula or lingnal ribbon ; g, opening of the radular sac into the pharynx or buccal cavity; r, cells at the extreme end of the inner surface of the radular sac which produce as a "cuticular secretion" the rows of teeth of the upper surface of the radula.*~~

~~*B. Radula or lingual ribbon of Paludina vivipara, stripped from its bed,—a horny, cuticular product.*~~

~~*C. A single row of teeth from the radula of Trochus cinerarius. glossate ; formula, x.5.1.5.x.*~~

~~*D. Asingle row of teeth from the radula of Faultima fragilis. formula, x.0.x.*~~

~~*E. A single row of teeth from the radula of Chiton cinereus. for formulation.*~~

~~*F. Asingle row of teeth from the radula of Patella vulgata. Formula, 3.1.4.1.3.*~~

~~*G. A single row of teeth from the radula of Cyprea helvola. Tenioglossate ; formula, 3.1.3. '*~~

~~*H. A single row of teeth from the radula of Nassa annalata. formula, 1.1.1. The Common Whelk is similar to this.*~~

~~*Rhipido- Ptenoglossate ;*~~

~~*Too elaborate*~~

~~*Rachiglossate ;*~~

~~*The general structure of the odontophore (= tooth- bearer, in allusion to the rasp-like ribbon) of the glosso- phorous Mollusca may be conveniently described at once. Essentially it is a tube-like outgrowth—the radular sac (fig. 9, A, g, n)—in the median line of the ventral floor of the stomodeeum, upon the inner surface of which is formed a chitinous band (the radula) beset with minute teeth like a*~~

~~*is converted into cartilage (h), to which protractor and re- tractor muscles are attached (4, 2), so that by the action of the former the cartilage, with the anterior end of the ribbon resting firmly upon it, may be brought forward into the space between the lips of the oral aperture (au, al), and made to exert there a backward and forward rasping action by the alternate contraction of retractor and protractor muscles attached to the cartilage. But in many Glosso- phora (e.g., the Whelk) the apparatus is complicated by the fact that the diverticulum itself, with its contained radula, rests but loosely on the cartilage, and has special muscles attached to each end of it, arising from the body wall; these muscles pull the whole diverticulum or radular sac alternately backwards and forwards over the surface of the cartilage. This action, which is quite distinct from the movement of the cartilage itself, may be witnessed in a Whelk if the pharynx be opened whilst it is alive. It has also been seen in living transparent Gastropods. The chi- tinous ribbon is continuously growing forward from the tube-like diverticulum as a finger-nail does on its bed, and thus the wearing away of the part which rests on the car- tilage and is brought into active use, is made up for by the advance of the ribbon in the same way as the wearing down of the finger-nail is counterbalanced by its own for- ward: growth. And, just as the new substance of the finger-nail is formed in the concealed part, sunk posteriorly below a fold of skin, and yet is continually carried forward with the forward movement of the bed on which it rests, and which forms its undermost layers, so is the new sub- stance of the radula formed in the compressed extremity of the radular sac (n), and carried forward by the forward movement of the bed (0) on which it rests, and by which is formed its undermost layer. This forward-moving bed is not merely the ventral wall of the radular diverticulum, but includes also that portion of the floor of the oral cavity to which the radula adheres (as far forward as the point f in fig. 9, A). At the spot where the radula ceases, the for- ward growth-movement of the floor also ceases, just as in the case of the finger-nail the similar growth-movement ceases at the line where the nail becomes free.*~~

~~*The radula or cuticular product of the slowly-moving bed can be stripped off, and is then found to consist of a ribbon-like area, upon which are set numerous tooth-like processes of various form in transverse rows, which follow one another closely, and exactly resemble one another in the form of*~~

~~their teeth (fig. 9, B). The tooth-like processes in a single transverse row are of very different shape and num- ber in different members of the Glossophora, and it is pos- sible to use a formula for their description. Thus, when in each row there is a single median tooth with three teeth on each side of it more or less closely resembling one another, as in fig. 9, G, we write the formula 3.1.3. When there are additional lateral pieces of a different shape to those immediately adjoining the central tooth, we indi- cate them by the figure 0, repeated to represent their number, thus 0000.1.1.1.0000 is the formula for the lingual teeth of Chiton Stellerx. A single median tooth, an admedian series, and a lateral series may be thus dis- tinguished. In some Glossophora only median teeth are present, or large median teeth with a single small ad- median tooth on each side of it (fig. 9, H); these are termed Rachiglossa (formula, —.1.— or 1.1.1). In a large number of Glossophora we have three admedian on each side and one' median, no lateral pieces (fig. 9, G); these are termed Tzenioglossa (formula, 3.1.3). Those with nume- rous lateral pieces, four to six or more admedian pieces, and a median piece or tooth (fig. 9, C) are termed Rhipi doglossa (formula, x.6.1.6.x, where x stands for an inde- finite number of lateral pieces). The Toxoglossa have~~

~~MOLL~~

~~1.0.1, the central tooth being absent and the lateral teeth. peculiarly long and connected with muscles. The term Ptenoglossa (fig. 9, D) is applied to those Glossophora in which the radula presents no median tooth, but an indefinite and large number of admedian teeth, giving the formula x.0.x. When the admedian teeth are inde- finite (forty to fifty), and a median tooth is present, the term Myriaglossa is applied (formula, x.1.x). It must be understood that the pieces or teeth thus formulated may themselves vary much in form, being either flat plates, or denticulated, hooked, or spine-like bodies. We shall revert to the terms thus explained in the systematic descriptions of the groups of Glossophora.~~

~~The muscular development in connexion with the whole buccal mass, and with each part of the radular apparatus, is exceedingly complicated,—as many as twenty distinct muscles having been enumerated in connexion with this organ. In addition to the radula, and correlated with its development,~~

~~*we find almost universally present in the Glossophora a pair of horny jaws (usually calcified) de- veloped as cuticular productions upon the epidermis of the lips (fig. 9, A, 6). The radula and the shelly jaws of the Glossophora enable their possessors not only to voraciously attack vegetable food, but the radula is used in some in- stances for boring the shells of other Mollusca, and the jaws for crushing the shells of Crustacea, and for wound- ing even Vertebrata.*~~

~~*Puytum MOLLUSCA.*~~

~~*Brancw A.—GLOSSOPHORA.*~~

~~*Characters.—Mollusca with head-region more or less prominently developed ; always provided with a peculiar rasping-tongue—the odontophore—rising from the floor of the buccal cavity.*~~

~~*The Glossophora comprise three classes, chiefly distin- guished from one another by the modifications of the foot.*~~

~~*ISOPLEUROUS GASTROPODS.*~~ |

~~*Class L.—GASTROPODA.*~~

~~*Characters.—Glossophora in which (with special excep- tion of swimming forms) the Foot is simple, median in position, and flattened so as to form a broad sole-like sur- face, by the contractions of which the animal crawls, often divided into three successive regions—the pro-, meso-, and meta-podium—by lateral constrictions.*~~

~~*The Gastropoda exhibit two divergent lines of descent indicated by the term sub-class (see p. 649).*~~

~~*Sub-class 1.—GASTROPODA ISOPLEURA.*~~

~~*Characters.—Gastropoda in which not only the head and foot but also the visceral dome with its contents and the mantle retain the primitive BILATERAL SYMMETRY of the archi-Mollusc. The anus retains its position in the median line at the posterior end of the body. The whole visceral mass*~~

~~*together with the foot is elongated, so that the axis joining mouth and anus is relatively long, whilst the dorso-pedal axis at right angles to it is short. The CTENIDIA, the NEPHRIDIA, GENITAL DUCTS, and CIRCULA-TORY ORGANS are paired and bilaterally symmetrical. The pedal and visceral NERVE-coRDs are straight, parallel with one another, and all extend the whole length of the body ; the ganglionic enlargements are feebly or not at all deve- loped. The Isopleura comprise three orders.*~~

~~*Order 1.—Polyplacophora (the Chitons).*~~

~~*Characters.—Gastropoda Isopleura with a metameric re- petition of the shell to the number of eight. The shells of the primitive type are partially or wholly concealed in shell- sacs comparable to the single embryonic shell-sac of other Mollusca. On the surface of the mantle-flap numerous*~~

~~*Usgt¢ & 641*~~

~~*calcified spines and knobs are frequently developed. The ctenidia are of the typical form, small in size and meta- merically repeated along the sides of the body to the*~~

~~*SS*~~

~~*Lv zy iA, Z*~~

~~*4*~~

~~*Y*~~

~~*4*~~

~~*Z ZB Ky A,*~~

~~*Fig. 10.—Three views of Chiton. Midd., showing the eight shells.*~~

~~*A. Dorsal view of Chiton Wosnessenksii, h (After Middendorf.) B. View from the pedal surface of a species of Chiton from the Indian Ocean. p, foot; o, inouth (at the other end of the foot is seen the anus raised on a papilla); kr, oral fringe ; br, the numerous ctenidia (branchial plumes); spreading*~~

~~beyond these, and all round the animal, is the mantle-skirt. (After Cuvier.) C. The same species of Chiton, with the shells removed and the dorsal integument . reflected. 6, buccal mass; m, retractor muscles of the buccal MASS ; Ov, ovary; od, oviduct; i, coils of intestines; ao, aorta; ¢, left auricle; c, ventricle. number of sixteen or more; an osphradium or area of "olfactory epithelium" (Spengel) is found at the base of each ctenidium. The other organs are not subject to metameric repetition. The odontophore is highly devel- oped; the teeth of the lingual ribbon are varied in form,—several in each transverse row (fig. 9, E). Paired genital ducts distinct from the paired nephridia are present. The order Polyplacophora contains but one family, the Chitomde, with the genera: Chiton, Lin. (figs. 10, 15, &c.); Cryptochiton, Midd., 1847 ; and Cryptoplax (= Chitonellus),~~

~~Blainv., 1818. Order 2.—Neomeniz.~~

~~Characters.— Gastropoda Isopleura devoid of. a shell, which is replaced by innumerable microscopic calcified plates or spicules set in the dorsal epidermis; mantle-flap not lateral, but reduced to a small collar surrounding the~~

~~Fic. 11.—Neomenia carinata, Tullberg (after Tullberg). A. Lateral view. B. Ventral view. C. Dorsal view. D. Ventral view of a more extended speci- men. 4a, anterior; b, posterior extremity; c, furrow, in which the narrow foot is concealed.~~

~~anus; ctenidia represented by a symmetrical group of bran- chial filaments on either side of the anus; foot very narrow, sunk in a groove; odontophore feebly developed, but the radula many-toothed ; gonads placed in the pericardium discharging by the nephridia ; no special generative ducts.~~

~~The order Neomeniz contains the two genera Veomenia, Tullberg (Solenopus, Sars) (fig. 11); and Proneomenia, Hubrecht.~~

~~Order 3.—Cheztoderma.~~

~~Characters.— Gastropoda Isopleura devoid of a shell, which is replaced by numerous minute calcareous spines~~

~~*Fic. 12.—Chetoderma nitidulum, Loven (after Graff). The cephalic enlarge- ment is to the left, the anal chamber (reduced pallial chamber, containing the concealed pair of ctenidia) to the right.*~~

~~*standing up like hairs on the surface of the body; body XVI. — 81*~~

~~*642*~~

~~*much elongated so as to be vermiform; mantle-flap as in Neomeniz ; ctenidia in the form of a pair of branchial plumes, one on each side of the anus; foot aborted, its position being indicated by a longitudinal furrow ; odonto- phore greatly reduced, the radula only represented by a single tooth ; gonads and nephridia as in Neomenia.*~~

~~*The order Cheetoderma contains the single genus Che- toderma. (fig. 12).*~~

~~*MOLLUsocan&*~~

~~*[1SOPLEUROUS GASTROPODS.*~~

~~*cecum in Chetoderma. Salivary glands are present in Chiton and in Proneomenia. The radula is highly devel- oped in Chiton, and, though present in Proneomenia, has not been described in Neomenia. A single tooth in Che- toderma appears to represent the radula in a reduced state. The circulatory organs of Chiton alone are known with any degree of detail (fig. 10, C). There is a median dorsal blood-vessel—the aorta—which is enlarged to form a ventricle in the posterior region of the body. On either*~~

~~*Further remarks on the Isopleurous Gastropods.—The | side the ventricle is connected to a well-developed auricle,*~~

~~*union of the Chitons with the remarkable worm-like forms Neomenia and Chztoderma was rendered necessary by Hubrecht's discovery (25) in 1881 of a definitely consti- tuted radula and odontophore in his new genus Proneo- menia, founded on two specimens brought from the arctic regions by the Barents Dutch expedition.*~~

By some writers—e.g., Keferstein—the Chitons have been too intimately associated with the other Gastropoda, whilst, on the other hand, Gegenbaur seems to have gone a great deal too far in separating them altogether from the other Mollusca as a primary subdivision of that phylum, inas- much as they are inti- mately bound to the other Glossophora by the possession of a

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thoroughly typical and_ well – developed odontophore. They undoubtedly — stand

_.j nearer to the archi- Mollusca than any other Glossophora in having retained acom- plete bilateral sym- metry and the primi- tive shell-sac, though the metameric repe- tition of this organ and of the ctenidia is a complication of, and departure from, the primitive character. It is not improbable that in the calcareous spines and plates of the dorsal integument of Neomenia and Che- toderma, which occur

f Fic. 13.—Diagrams of the alimentary canal of also on the part o

Isopleura (from Hubrecht). 0, mouth; a, the dorsum uncovered

anus ; d, alimentary canal; 1, liver (digestive 4 A gland). 'he Neomenia and Proncomenia. B. by shell in Chiton, we have the retention of

Cheetoderma. ©. Chiton.

a condition preceding the development of the solid Mol- luscan shell, or a reversion to it. The minute calcareous bodies may have the same relation to a compact shell which the shagreen denticles of the sharks have to a continuous dermal bone.

The anatomy of the Gastropoda Isopleura has been largely elucidated within the past year by the researches of Hubrecht and of Sedgwick, who have been the first to apply the method of sections to the study of this group.

The leading points in the modifications of mantle-flap, foot, and ctenidia are set forth in the preceding summaries, and in the accompanying

~~*references to the figures. With regard to other organs, we have to note the form of the alimentary canal (fig. 13), which is simplest in Chetoderma, symmetrically sacculated in Neomenia, and wound upon itself, forming a few coils, in Chiton. The latter has a compact liver with arborescent duct, which is represented by the sacculi in Neomenia and by a single*~~

~~*which pours into it the aerated blood from the gills (ctenidia). The extent to which vascular trunks are developed has not been determined, but vessels to and from the ctenidia, and in the mid-line of the foot, are known. As in other Mollusca, the vessels do not extend far, but lead into lacune between the organs and tissues. Dorsal and ventral vessels have been detected in Neomenia and Chetoderma, but no specialized heart.*~~

~~*Fia. 14.—Diagrams of the excretory and reproductive organs of Isopleura (after Hubrecht). 0, ovary ; P, pericardium ; N, nephridium ; w, external aperture of nephridiuin ; g, external aperture of the genital duct of Chiton ; r, rectum ; Cl, cloacal or pallial chamber of Neomeniz and Chetoderma; Br, ctenidia —— plumes). A. Chetoderma. B. Neomenia. C. Proneomenia. D.*~~

~~*The heart of Chiton lies in a space which is to be regarded as a specialized part of the cœlom, and, as in other Molluscs, is termed the pericardium. In front of this space in Chiton lies the ovary (fig. 14, D). In the other Isopleura the genital bodies (gonads) lie in the peri- cardium, which has a longer form and extends dorsally above the intestine. Opening into the pericardium equally in all the Isopleura (fig. 14) is a pair of bent tubes which lead to the exterior. These are the nephridia, which in*~~

~~*Chiton are essentially renal in function. Their disposition*~~

~~*has been determined by Sedgwick (26), who has shown that*~~

~~*each nephridium is much bent on itself, so that, as in the*~~

~~*nephridia of Conchifera (organ of Bojanus), the internal | menia (seen also in Fissurella (fig. 36) and some other aperture lies near the external. From the folded stem of | Gastropods) are comparable to the transverse connexions the nephridium very numerous secreting cæca are given off,*~~

~~*—omitted in the dia- gram (fig. 14, D), but accurately drawn in fig. 15. The sexes in Chiton are distinct, and the ovary or testis, as the case may be, though lying in and filling a chamber of the original cœlom, does not discharge into the pericardium, but has its own ducts, which pass to the ex- terior just in front of those of the nephridia (fig. 14, D, g, and fig. 16). In this respect Chiton is less primi- tive than the other Iso- pleura, and even than some other Gastropods (the | Zygobranchia), and some Conchifera (Spondylus, &c.), which have no special genital apertures, but make use of the nephridia for*~~

~~*this purpose. In Chiton Fic. 15.—Dissection of the renal organs (neph-*~~

~~*discrepans, in which there are sixteen pairs of ctenidia, the orifices of the nephridia are coincident with the six- teenth pair of ctenidia, those of the genital*~~

~~*ridia) of Chiton siculus, after Haller (Arbeiten, Zool. Instit., Vienna, 1882). F, foot; L, edge of the mantle not removed in the front part of the specimen ; s.0., oesophagus ; af, anus; gg, genital duct; go, external opening of the same ; eg, stem of the nephridium leading to no, its external aperture ; nk, reflected portion of the nephridial stem; ng, fine czeca of the nephri- dium, which are seen ramifying transversely over the whole inner surface of the pedal mus- cular mass.*~~

~~*ducts with a point between the thirteenth and fourteenth*~~

~~*ctenidia.*~~

~~*In the Neomeniz and Chetoderma the nephridia are*~~

~~*short and wide (JW in fig. 14, A, B, C), and function as excretory ducts for the genital products, the gonads being lodged in the long pericardium. Their separate or united apertures open near the anus into the small*~~

~~*chamber formed by the restriction of the mantle-skirt to the immediate neighbourhood of the anus.*~~

~~*The nervous system of the Gas- tropoda Isopleura is represented in the diagram fig. 17. In all it is important to observe that nerve- ganglion cells are by no means limited to special swellings—the ganglia—but are abundant along the whole course of the four great longitudinal trunks. This is a pri- mitive character comparable to that*~~

~~*of the ventral nerve- cords of Chetopod worms and Arthro- pods. In the abund- ance of the nervous network connected with its longitudinal nerve-tracts, Chiton appears to retain some- thing of the early con- dition of the Ccelo- mate nervous system when it had the form of a sub-epidermic net-work or nerve-tunic (seen more clearly in Planarians and some Nemertines), and when the concentration into definitely compacted cords had not set in. Ganglia are, how- ever, distinguishable upon the nervous cords of Chiton (fig. 18). The cerebral ganglia are not distinguishable as such, but a pair of buccal ganglia (B in fig. 18) are developed on two connectives which pass forward from the cerebral re- gion to the great mus-cular mass of the mouth. These buccal ganglia are special de- velopments connected with the special mus- cularity of the lips and odontophore, and are found in all Glosso- phora, but not in the Lipocephala.*~~

~~*B*~~

~~*AAA*~~

~~*pe Fic. 17.—Diagrams of the nervous system of Isopleura (after Hubrecht, loc. cit.). , cere- bral ganglia; s, sublingual ganglia; v, pedal (ventral) nerve-cord ; 1, visceral (lateral) nerve- cord; pc, post-anal junction of the visceral nerve-cords. A. Proneomenia. B. Neomenia. C. Chetoderma. D. Chiton.*~~

~~*Such special ganglia related to special*~~

~~*organs (and not introduced in our schematic Mollusc, fig.*~~

~~*V*~~

~~1) we find in connexion with the siphons of the Lipoce- phala, and in various posi- tions upon the visceral nerve- cords of other Mollusca, both Glossophora and. Lipocephala. A pair of pedal ganglia but little developed (yp in fig. 18), and a special group of sub- lingual ganglia are present in Chiton. On the whole, the nervous system of the Iso- . pleura is exceedingly simple and archaic, whilst it does not well serve as a type with which to compare that of~~

~~Fio, 16.—Ovary and oviducts presented by the nerve-cords of Ne- of Chiton siculus (after Hal- 7 ‘ ley, lor. at) #b, Ab, anterior MOTUBE Worms, and of the Arthro iy posterior viene | of pod Peripatus. Higher differen-~~

~~e ovary; U, uterus (en- 4:, 4: : larged part of’ oviduct); a, tiation im other Mollusca leads to eeaner: predominance if not an exclusive presence of nerve-fibres in the cords, and of nerve-ganglion cells in the specialized ganglia. ‘The numerous transverse connexions of the pedal nerve-cords in Chiton and Neo-~~

~~Fie. 18.—Anterior part of the nervous system of Chiton cinereus, in more de- other Mollusca on account of tail(from Gegenbaur, Elements ofComp. f Anatomy). B, buccal ganglia ec. the small amount of concen- cerned with the odontophore); C. ; 7 i (ail boa 2 eal tration of its nerve ganglion glion and commencement of pedal cells into ganglia, such as we nerve-cord ; pl, visceral nerve-cord. :~~

~~The sublingual ganglia are not let- find well developed in other tered. forms.~~

~~The development of Neomenia and Chetoderma from~~

~~the egg is entirely unknown, that of Chiton only par- tially. Impregnation is effected when the eggs have been discharged and are lying beneath the mantle-skirt. A trochosphere larva is developed from the Diblastula of Chiton (Loven). .~~

~~*The Chitons are found in the littoral zone in all parts of the world, and are exclusively marine. Neomenia, Proneo- menia, and Cheetoderma have hitherto been dredged from considerable depths (100 fathoms and upwards) in the North Sea, Proneomenia also in the Mediterranean (Marion).*~~

~~*Sub-class 2—GASTROPODA ANISOPLEURA.*~~

~~*Characters.—Gastropoda in which, whilst the head and foot retain the bilateral symmetry of the archi-Mollusca, the visceral dome, including the mantle-flap dependent from it, and the region on which are placed the ctenidia, anus, generative and nephridial apertures, have been subjected to a ROTATION tending to bring the anus from its posterior median position, by a movement along the right side, forwards to a position above the right side of the animal's neck, or even to the middle line above the neck. This torsion is connected mechanically with the excessive vertical growth of the visceral hump and the development upon its surface of a heavy shell. The sHELL is not a plate en- closed in a shell-sac, but the primitive shell-sac appears and disappears in the course of embryonic development, and a relatively large nautiloid shell (with rare exceptions) develops over the whole surface of the visceral hump and mantle-skirt. Whilst such a shell might retain its median position in a swimming animal, it and the visceral hump necessarily fall to one side in a creeping animal which carries them uppermost.*~~

~~*The shell and visceral hump in the Anisopleura incline*~~

~~*fl a*~~

~~*Fa. 19.—Diagram to show the effect of torsion or rotation of the visceral hump in Gastropoda, when the visceral nerve commissure passes above the intestine ; 4, unrotated ancestral condition; B, quarter-rotation ; C, com- plete semi-rotation (the limit) ; L, left, R, right side of the animal; an, anus ; ln, rn, primarily left nephridium and primarily right nephridium ; lg, primarily left (subsequently the sub-intestinal) visceral ganglion eae primarily right (subsequently the sub-intestinal) visceral ganglion. The dotted circle indicates the basal area of the visceral hump which undergoes rotation,*~~

~~*normally to the right side of the animal. As mechanical*~~

~~*results, there arise a one-sided pressure and a one-sided*~~

~~*strain, together with a one-sided development of the muscular masses which are related to the shell and foot.*~~

~~*Both the TORSION THROUGH A SEMICIRCLE of the base of the*~~

~~*visceral dome and the continued leiotropic spiral growth*~~

~~*of the visceral dome itself, which is very usual in the*~~

~~*Anisopleura, appear to be traceable to these mechanical*~~

~~*conditions. ATRopHY of the representatives on one side*~~

~~*of the body of paired organs is very usual. Those placed priumitively on the left side of the rectum, which in virtue of the torsion becomes the right side, are the set which suffer*~~

~~*(see fig. 19). Some Anisopleura, after having thus acquired*~~

~~*a strongly-marked inequilateral character in regard to such*~~

~~*organs as the ctenidia, nephridia, genital ducts, heart, and*~~

~~*rectum, appear by further change of conditions of growth to have acquired a superficial bilateral symmetry, the second-*~~

~~*Ube &*~~

~~*[ANISOPLEUROUS GASTROPODS.*~~

~~*ary nature of which is revealed by anatomical examination (Opisthobranchia, Natantia).*~~

~~*In all groups of Anisopleura examples are numerous in which the shell is greatly developed, forming a "house" into which the whole animal can be*~~

~~*with- drawn, the entrance being often closed by a second shelly piece carried upon the foot (the operculum). The power of rapidly extending and of again contract- ing large regions of the body to an*~~

~~*Fic.20.—Nervous system*~~

~~*of Aplysia, as a type of ©*~~

~~*the long- looped Euthy- neurous condition. The*~~

~~*enormous degree is usual, as in the Li- pocephalous Mol- lusca. In spite of the theories which have been held on this matter, it ap- pears highly prob- able that no fluid from without is in- troduced into the blood, nor is any ex- pelled during these changes of form. A large mucous gland with a med- ian pore is usually developed on the ventral surface of the foot, compar- able to the similar gland and pore in Lipocephala, and in*~~

~~*Fic. 21.—Nervous system of Paludina as a type of the Streptoneurous con- dition. B, buccal (sub- cesophageal) ganglion ; C, cerebral ganglion; Co, pleural ganglion ; P, pe- dal ganglion with otocyst attached ; p, pedal nerve; A, abdominal ganglion at the extremity of the twisted visceral "loop" ;*~~

~~*sp, supra-intestinal visce- ral ganglion on the course of the right visceral cord ; sb, sub-intestinal ganglion on the course of the left visceral cord. (From Ge- genbaur, after Jhering.)*~~

~~*untwisted visceral loop SOMe Cases (6.9 ms ia*~~

~~*is lightly shaded. ce, ryla fig. 37, B) this*~~

~~*cerebral ganglion ; pl, ' :*~~

~~*pleural ganglion; pe, has been mistaken*~~

~~*pedal ganglion ; ab. sp, e*~~

~~*abdominal ganglion, for a water P Ore. 3*~~

~~*which represents also The leiotropic*~~

~~*ganglion. of "Strepts. torsion of the visceral dome has had*~~

~~*neura and gives off the Jess deep-seated effect in one series of*~~

~~*nerve to the osphra- 5 .*~~

~~*dium (olfactory organ) Anisopleura than in another. Accord-*~~

~~*o, and another toan un- :*~~

~~*lettered so-called "ge. gly, as the loop formed by the two*~~

~~*Tata)" ganglion. The VISCERAL NERVES (fig. 19) is or is not*~~

~~*buccal nerves and gan- : . h :*~~

~~*glia are omitted. (After caught, as it were, in the twist, we are*~~

~~*pongel.) able to distinguish one branch or line of descent with straight visceral nerves—the EUTHYNEURA*~~

~~*a]*~~

~~*Fig. 22.—Nervous system of the Pond-Snail, Limnaus stagnalis, as a type of the short-looped Euthyneurous condition. The short visceral "loop" with its three ganglia is lightly-shaded. ce, cerebral ganglion ; pe, pedal ganglion ; pl, pleural ganglion ; ab, abdominal ganglion; sp, visceral ganglion of the left side; opposite to it is the visceral ganglion of the right side, which gives off the long nerve to the olfactory ganglion and osphradium o. In Planorbis and in Auricula (Pulmonata, allied to Limneus) the olfactory organ is on the left side and receives its nerve from the left visceral ganglion. (After Spengel.)*~~

~~*(fig. 20)—from a second branch with the visceral nerves*~~

~~*ZYGOBRANCHIA.|*~~

~~*twisted into a figure-of-eight—the Srrepronrura (fig. 21), Probably the Euthyneura and the Streptoneura have de- veloped independently from the ancestral bilaterally sym- metrical Gastropods.- The escape of the visceral nerve-loop from the torsion depends on its having acquired a somewhat deeper position and shorter extent, previously to the com- mencement of the phenomenon of torsion, in the ancestors of the Euthyneura than in those of the Streptoneura. The junction of the two halves of the visceral loop in the Euthyneura is below the anus, and the loop is therefore not caught by the intestine. In the Streptoneura the junction is (as in the Isopleura) above the anus.*~~

~~*Branch a.—STREPTONEURA (Spengel, 1881).*~~

~~*Characters.—Gastropoda Anisopleura in which the visceral "loop" (the conterminous visceral nerves) em- braces the intestine and therefore shares in the torsion of the visceral hump, the right cord crossing above the left so as to form a figure-of-eight (see fig. 19).*~~

~~*The Streptoneura comprise two orders — the Zygo branchia and the Azygobranchia.*~~

~~*Order 1.—Zygobranchia.*~~

~~*Characters.—Streptoneura in which, whilst the visceral torsion is very complete so as to bring the anus into the middle line anteriorly or nearly so, the atrophy of the primitively left-side organs is not carried out. The right and left ctenidia, which have now become left and right respectively, are of equal size, and are placed symmetrically on either side of the neck in the pallial space. Related to them is a simple pair of osphradial patches. Both right*~~

~~*Fig. 23.—Haliotis tuberculata. d, foot; i, tentacular processes of the mantle. (From Owen, after Cuvier.)*~~

~~*and left nephridia are present, the actual right one being much larger than the left. Two auricles may be present right and left of a median ventricle (Haliotis), or only one (Patella). The Zygobranchia are further very definitely characterized by the archaic character of absence of special*~~

~~genital ducts. The generative products escape by the larger nephridium. The sexes are distinct, and there is no copulatory or other accessory generative apparatus. The teeth of the lingual ribbon are highly differentiated (Rhipidoglossate). The visceral dome lies close upon the oval sucker-like foot, and is coextensive with its prolonga- tion in the aboral direction.~~

~~The Zygobranchia comprise three families, arranged in two sub- orders.~~

~~Sub-order 1. Ctenidiobranchia.~~

~~Character.—Large paired ctenidia acting as gills. Family 1.—Haliotidez. : Genera: Haliotis (Ear-Shell, Ormer in Guernsey); mostly tropical ; Teinotis. Family 2.—Fissurellidx. , Genera: Fisswrella (Key-hole Limpet) (figs. 24, 36), Hmarginula, Parmophorus (fig. 25) ; mostly tropical.~~

~~Sub-order 2, Phyllidiobranchia. Characters. —Ctenidia reduced to wart-like papille; special sub-~~

~~pallial lamelle, similar to those of the Opisthobranch Pleuro- phyllidia, perform the function of gills, Family 3.—Patellide.~~

~~a: Patella (Limpet, figs. 26, &c.), Nacella (Bonnet-Limpet), ottia.~~

~~_ Further Remarks on Zygobranchia.—The Common Limpet 1s a specially interesting and abundant example of the remarkable order Zygobranchia. A complete and accurate account of its anatomy has yet to be written, Here we have only space for a brief outline. The foot of the Limpet is a nearly circular disc of muscular tissue 3 in front, projecting from and raised above it, are the head and neck (figs. 26, 30). The visceral hump forms a low conical dome above the sub- circular foot, and standing out all round the base of this dome so as to completely overlap the head and foot, is the circular mantle-skirt. The depth of free mantle-skirt is greatest in front, where the head and neck are covered in by it. Upon the surface of the visceral dome, and extending to the edge of the free mantle-skirt, is the~~

~~conical shell. When the shell is taken away (best effected by immersion in hot water) the surface of the vis- ceral dome is found to be covered by a black-coloured epithelium, which may be re- t moved, enabling the observer giniz' ger arene left) nephri- to note the position of some @rchaic right) aperture of nephri- organs lying below the trans- “”™”) ? snout (Original.) parent integument (fig. 27). The muscular columns © attaching the foot to the shell form a ring incomplete in or _— front, external to which is the free mantle-skirt. The limits of the large area formed by the flap over the head and neck (ecr) can be traced, and we note the anal papilla show- ing through and opening on the right shoulder, so to speak, of the animal into the large anterior region of the sub-pallial space. Close to this the small renal organ (7, mediad) and the larger renal organ (4, to the right and posteriorly) are seen; also the pericardium (2) and a coil of the in- testine (nt) embedded in the com- pact liver. On cutting away the anterior part of the mantle-skirt so as to expose the sub-pallial chamber in the region of the neck, we find the right and : left renal papillee (discovered by Lan- Miron the pedal surface… Kester (27) in 1867) on either side~~

~~Paty pty eA ten: the anal papilla (fig. 28), but no gills.~~

~~symmetrical gills placedon If a similar examination be made~~

~~theneck. (Original.) of the allied genus Fissurella (fig. 24, d), we find right and left of the two renal apertures a right and left gill-plume or ctenidium, which by their presence here and in Haliotis furnish the distinctive char- acter to which the name Zygobranchia refers. In Patella no such plumes exist, but right and left of the neck are seen a pair of minute oblong yellow bodies (fig. 28, a), which were originally described by Lankester as orifices possibly connected with the evacuation of the generative~~

~~ROD~~

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~~N \~~

~~ee. SSS~~

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~~KS Sz~~

~~SX~~

~~Fic. 24.—Dorsal aspect of a specimen of Fissurella from which the shell has been removed, whilst the ante- rior area of the mantle-skirt has been longitudinally slit and its sides reflected. a, cephalic tentacle; b, foot; d, left (archaic right) gill- plume ; ¢, reflected mantle-flap ; fi, the fissure or hole in the mantle-flap traversed by the longitudinal inci-~~

~~N~~

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~~products. On account of their position they were termed by him the "'capito-pedal orifices," being placed near the junction of head and foot. Spengel (24) has, however, in a most ingenious way shown that these bodies are the repre- sentatives of the typical pair of ctenidia, here reduced to a mere rudiment. Neartoeach rudimentary ctenidium Spengel~~

~~Fro, 26.—The Common Limpet (Patella vulgata)in its shell, seen from the pedal surface, a, y, the median antero-posterior axis; a, cephalic tentacle; b, plantar surface of the foot; ¢, free edge of the shell; d, the branchial effe- rent vessel carrying aerated blood to the auricle, and here interrupting the circlet of gill lamelle; e, margin of the mantle-skirt; f gill lamelle (not ctenidia, but special pallial growths, comparable to those of Pleurophyllidia); g, the branchial efferent vessel ; h, factor of the branchial advehent vessel ; 1, interspaces between the muscular bundles of the root of the foot, causing the separate arcs seen in fig. 27, «, (Original.)~~

~~*has discovered an olfactory patch or osphradium (consisting of modified epithelium) and an olfactory nerve-ganglion (fig. 32). It will be remembered that, according to Spengel, the osphra- dium of Mollusca is definitely and inti- mately related to the gill- plume or cteni- dium, being always placed near the base of that organ; further, Spengel has shown that the nerve-supply of this olfactory organ is always derived from the visceral loop. Ac- cordingly, the nerve- supply affords a means of testing the conclu- sion that we have in*~~

~~*Lankester's capito- Fio. 27.—Dorsal surface of the Limpet removed*~~

~~*3-4 from its shell and deprived of its black pig-*~~

~~*pedal bodies the rudi- rene epithelium ; the internal orice aes*~~

~~*ala seen through the transparent body-wall. c.*~~

~~*nientary ctenidia. The muscular bundles forming the root of the foot, accompanying dia- grams (figs. 34, 35) of*~~

~~*and adherent to the shell; e, free mantle-*~~

~~*skirt; em, tentaculiferous margin of the same ;*~~

~~*i, smaller (left) nephridium ; k, larger (right)*~~

~~*the nervous systems of nephridium ; 1, pericardium ; lx, fibrous septum, 'Patel ek Waliot; behind the pericardium; n, liver; int, intes- atella and 0 a lotis, tine; ecr, anterior area of the mantle-skirt over- as determined by Spen- hanging the head (cephalic hood), (Original.) gel, show the identity in the origin of the nerves passing from the visceral loop to Spengel's olfactory ganglion of the Limpet, and that of the nerves which pass from the visceral loop of Haliotis to the olfactory patch or osphra- dium, which lies in immediate relation on the right and on the left side to the right and the left gill-plumes (ctenidia) respectively. The same diagrams serve to de-*~~

~~*MOLLUSCA*~~

~~*[ZYGOBRANCHIA.*~~

~~*monstrate the Streptoneurous condition of the visceral loop in Zygobranchia.*~~

~~*Thus, then, we find that the Limpet possesses a sym- metrically-disposed pair of ctenidia in a rudimentary con- dition, and justifies its position among Zygobranchia, At the same time it pos- sesses a totally dis- tinct series of func- tional gills, which are not derived from the modification of the typical Mollus- can ctenidium. These gills are in*~~

~~*the form of delicate Fic. 28.—Anterior portion of the same Limpet, with*~~

~~*he overhanging cephalic hood removed. a, ce- lamellze (fig. 26, f » phalic tentacle; , foot; ¢, muscular substance which form a series forming the root of the foot; d, the capito-pedal extending com-*~~

~~*organs of Lankester (=rudimentary ctenidia); e, mantle-skirt ; f, papilla of the larger nephridium ; pletely round the inner face of the*~~

~~*g, anus; h, papilla of the smaller nephridium; i, depending mantle-*~~

~~*smaller nephridium ; k, "vs nephridium ; J peri- cardium; m, cut edge of the mantle-skirt; n,*~~

~~*liver; p, snout. (Original.) skirt. This circlet of gill-lamelle led Cuvier to class the Limpets as Cyclobranchiata, and, by erroneous identifica- . tion of them with the series of meta- merically repeated ctenidia of Chiton, to associate the latter Molluse with the former. The gill-lamelle of Patella are processes of the mantle compar- able to the plait- like folds often*~~

~~*Fio. 29.—The mee Se et AEP a observed on the front, so as to show the sub- anal tract (ff) 0 e larger nephridium, by which it communicates with roof of the bran- the pericardium. 0, mouth; other letters asin fig. 28. ehial chamber in*~~

~~*other Gastropoda (e.g., Buccinum and Haliotis), They are termed pallial gills. The only other Molluscs in which they are exactly represented Tao*~~

are the curious Opistho- branchs Phyllidia and Pleurophyllidia (fig. 57). In these, as in Patella, the typical ctenidia are aborted, and the branchial function is assumed by close-set lamelliform processes ar- ranged in a series beneath the mantle-skirt on either side of the foot. In fig. 26, d the large branchial vein of Patella bringing blood from

ksi the gill-series to the heart Fi¢- 30.—Diagram of the two renal organs

(nephridia), to show their relation to the rectum and to the pericardium. jf, pa- pilla of the larger nephridium; g, anal papilla with rectum leading from it; h, papilla of the smaller nephridium, which is only represented by dotted outlines ; 1, pericardium indicated by a dotted out- line,—at its right side are seen the two reno-pericardial pores; jf, the sub-anal tract of the large nephridium given off near its papilla and seen through the unshaded smaller nephridium; ks.a, an- terior superior lobe of the large ne- phridium ; ks./, left lobe of same; ks.p, posterior lobe of same; ks.i, inferior sub-visceral lobe of sane, (Original.)

is seen; where it crosses the series of lamelle there is a short interval devoid of lamellz.

The heart in Patella con- sists of a single auricle (not two as in Haliotis and Fis- surella) and a ventricle; the former receives the blood from the branchial vein, the latter distributes it through a large aorta which soon leads into irregular blood-lacune.

ZYGOBRANCHEA.

The existence of two renal organs in Patella, and their relation to the pericardium (a portion of the ccelom), is

Fic. 31.—Diagram of a vertical antero-postero median section of a Limpet. Letters as in figs. 28, 29, with following additions: g, intestine in transverse section ; r, lingual sac (radular sac); rd, radula; s, lamellated stomach ; ¢, salivary gland ; u, duct of same; v, buccal cavity; w, gonad ; br.a, branchial advehent vessel (artery); br.v, branchial efferent vessel (vein); bv, blood-

~~vessel; odm, muscles and cartilage of the odontophore ; cor, heart within the pericardium. (Original.)~~

~~important. Each renal organ is a sac lined with glandular epithelium (ciliated cells with concretions) communicating~~

~~Fic. 82.—A. Section in a plane vertical to the surface of the neck of Patella through a, the rudimentary ctenidium (Lankester's organ), and }, the olfactory epithelium (osphradium); c, the olfactory (osphradial) ganglion. (After Spengel.) B. Surface view of a rudimentary ctenidium of Patella, excised and viewed as a transparent object. (Original.)~~

~~with the exterior by its papilla, and by a narrow passage with the pericardium. The connexion with the pericar-~~

~~Fic. 33,—Vertical section in a plane running right and left throngh the anterior part of the visceral hump of Patella, to show the two renal organs and their openings into the pericardium. a, large or external or right renal organ ; ab, narrow process of the same running below the intestine and lead- ing by k into the pericardium; 6, small or median renal organ; ¢, pericardium ; d, rectum ; e, liver; f, manyplies; g, epithelium of the dorsal surface ; h, renal epithelinm lining the renal sacs; 4, aperture connecting the small sac with the pericardium; k, aperture connecting the large sac with the pericardium. (From an original drawing by Mr J. T. Cunningham, Fellow of University College, Oxford.)~~

~~dium of the smaller of the two renal organs was demon- strated by Lankester in 1867, at a time when the fact~~

~~BAOoLLvUsca~~

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~~that the renal organ of the Mollusca, as a rule, opens into the pericardium, and is therefore a typical nephridium,~~

~~was not known. Subsequent investigations (27) carried on under. the direction of the same~~

~~naturalist have shown that the larger as well as the smaller renal sac is in communication with the pericardium. The walls of the renal sacs are deeply plaited and thrown into ridges. Below the surface these walls are excavated with blood-vessels, so that the sac \ is practically a series of blood-ves- sels covered with renal epithelium, and forming a mesh-work within a space communicating with the exterior. The larger renal sac (re- markably enough, that which is aborted in other Anisopleura) ex- tends between the liver and the integument of the visceral dome Fre. 34.—Nervous system of Pa- very widely. It also bends round [fentiy Te aesera gor, is the liver as shown in fig. 30, and ganglia are omitted. ce, cere- forms a large sac on half of the~~

~~/~~

~~ce~~

~~pe~~

~~bral ganglia; c'e,cerebral com- missure ; pl, pleural ganglion ; upper surface of the muscular mass % Pedal ganglion ; p's, pedal E — nerve ; s, s', nerves (right and~~

~~of the foot. Here it lies close left) to the mantle ; 0, olfac- : ory ganglion, connected b~~

~~upon the genital body (ovary or nerve to the Streptoneurons testis), and in such intimate rela- visceral loop. (After Spengel.) tionship with it that, when ripe, the gonad bursts into the renal sac, and its products are carried to the exterior by the papilla on the right side of the anus (Robin, Dall). This fact led Cuvier erroneously to the belief that a duct existed leading from the gonad to this papilla. The position of the gonad, best seen in the diagrammatic~~

~~Fic, 35.—Nervous system of Haliotis; the visceral loop is Ughtly shaded ; the buccal ganglia are omitted. ce, cerebral ganglion ; pl.pe, the fused pleural and pedal ganglia; pe, the right pedal nerve ; ce.pl, the cerebro- pleural con- nective; ce.pe, the cerebro-pedal connective; s, s', right and left mantle nerves ; ab, abdominal ganglion or site of same ; 0, 0, right and~~

~~*left olfactory ganglia and osphradia receiving nerve from visceral loop. (After Spengel.)*~~

~~*section (fig. 31), is, as in other Zygobranchia, devoid of*~~

~~*a special duct communicating with the exterior. This*~~

~~*condition, probably an archaic one, distinguishes the Zygo-*~~

~~*branchia among all Glossophorous Mollusca. The digestive tract of Patella offers some interesting features. The odontophore is powerfully developed ; the*~~

~~*radular sac is extraordinarily long, lying coiled in a space*~~

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~~*between the mass of the liver and the muscular foot. The radula has 160 rows of teeth with twelve teeth in each row. Two pairs of salivary ducts, each leading from a salivary gland, open into the buccal chamber. The cesophagus leads into a remarkable stomach, plaited like the manyplies of a sheep, and after this the intestine takes a very large num- ber of turns embedded in the yellow liver, until at last it passes between the two renal sacs to the anal papilla. A curious ridge (spiral? valve) which secretes a slimy cord is found upon the inner wall of the intestine. The general structure of the Molluscan intestine has not been suffi- ciently investigated to render any comparison of this struc- ture of Patella with that of other Mollusca possible. The eyes of the Limpet (28) deserve mention as examples of the most primitive kind of eye in the Molluscan series. They are found one on each cephalic tentacle, and are simply minute open pits or depressions of the ¢@ epidermis, the epidermic Ss cells lining them being \|i pigmented and connected with nerves (compare fig.*~~

~~*118).*~~

~~*The Limpet breeds upon the southern Eng- lish coast in the early part of April, but its de- velopment has not been followed. It has simply been traced as far as the formation of a Diblastula which acquires a ciliated band, and*~~

~~*becomes a nearly spherical Trocho- sphere. It is probable that the Limpet takes several years to attain full growth, and during that period it frequents the same spot, which becomes gradually sunk below the surrounding 5.4 96. surface, especially if the rock be carbonate of lime. At low tide the Limpet (being a strictly inter- tidal organism) is ex- posed to the air, and is to be found upon its spot of fixation ; but when the water again covers it, it (according to trustworthy observers) quits its attachment and walks away in search of food (minute encrusting algze), and then once more as the tide falls returns to the identical spot, not an inch in diameter, which belongs, as it were, to it. Several million Limpets—twelve million in Berwickshire alone—are annually used on the east coast of Britain as bait.*~~

~~*—Nervous system of Fissurella. pl, pallial nerve; p, pedal nerve; A, abdomi- nal ganglia in the Streptoneurous visceral commissure, with supra- and sub-intestine ganglion on each side; B, buccal ganglia ; C, C, cerebral ganglia ; es, cerebral commis- sure; 0, otocysts attached to the cerebro-pedal connectives. (From Gegenbaur, after Jhering.)*~~

~~*Order 2.—Azygobranchia.*~~

~~*Characters.—Streptoneura which, as a sequel to the torsion of the visceral hump, have lost by atrophy the originally left ctenidium and the originally left nephridium, retaining the right ctenidium as a comb-like gill-plume to the actual left of the rectum, and the right nephridium (that which is the smaller in the Zygobranchia) also to the actual left of the rectum, between it and the gill-plume. The right olfactory organ only is retained, and may assume the form of a comb-like ridge to the actual left of the ctenidium or branchial plume. It has been erroneously described as the second gill, and is known as the para- branchia, The rectum itself lies on the animal's right*~~

~~*shoulder. The presence of glandular plication of the surface of the mantle-flap (fig. 46, x) and an adrectal gland (purple- gland, fig. 47, gp) are frequently observed. The sexes are always distinct; a special genital duct (oviduct or sperm duct) unpaired is present, opening either by the side of*~~

~~*the anus or, in the males, on the right side of the neck in con- nexion with a large penis. The shell is usually large and spiral; often an operculum is developed on the upper sur- face of the hinder part of the foot. The dentition of the lingual ribbon is very varied. In most cases the visceral hump and the foot increase along axes at right angles to one another, so that the foot is extended far behind the visceral hump in the ab-oral direction, whilst the visceral hump is lofty and spirally twisted.*~~

~~*This is a very large group, and is conveniently divided into two sections, the Reptantia and the Natantia. The former, containing the immense majority of the group, breaks up into three sub-orders, the Holochlamyda, Pneu- monochlamyda, and Siphonochlamyda, characterized by the presence or absence of a trough-like prolongation of the margin of the mantle-flap, which conducts water to the respiratory chamber (sub-pallial space where the gill, anus, &c., are placed), and notches the mouth of the shell by its presence, or again by adaptation to aerial respira- tion. The sub-orders are divided into groups according to the characters of the lingual dentition. In some Azygo- branchia the mouth is placed at the end of a more or less elongated snout or rostrum which is not capable of intro- version (Rostrifera); in the others (Proboscidifera) the rostrum is partly invaginated and is often of great length. It is only everted when the animal is feeding, and is with- drawn (introverted) by the action of special muscles; the over-worked term "proboscis" is applied to the retractile form of snout. The term "introversible snout," or simply "introvert," would be preferable. The presence or absence of this arrangement does not seem to furnish so natural a division of the Reptant Azygobranchia as that afforded by the characters of the mantle-skirt.*~~

~~*Section a.—REPTANTIA,*~~

~~*Characters.—Azygobranchia adapted to a creeping life; foot either wholly or only the mesopodium in the form of a creeping disc.*~~

~~*Sub-order 1.—Holochlamyda.*~~

~~*Characters.—Reptant Azygobranchia with a simple margin to the mantle-skirt, and, accordingly, the lip of the shell unnotched ; mostly Rostrifera*~~

~~(7.c., with a non-introversible snout), and vege- tarian ; marine, brackish, fresh-water, terrestrial.~~

~~a. Rhipidoglossa (x.4 to 7.1.4 to 7.x).~~

~~Family 1.—Trochide. Genera: Turbo, Lin.; Phasianella, Lam.; Imperator, Monttf.; Trochus, Lin.; Rotella, Lam.; Euomphalus, Low. Family 2.—WNeritide. Genera: Nerita, L.; Neritina, Lam.; Pileolus, Low ; Navicella, Lam. Family 3.—Plewrotomaride. Genera: Pleurotomaria, Defr.; Anatomus, Montf.; Stomatia, Helbing. ; B. Ptenoglossa (x.0.x). Family 4.—Scalaride. Genus: Sealaria, Lam. Family 5.—Janthinide. Genera: Janthina, Lam. (fig. 44); Reeluzia, Petit.~~

~~y- Texnioglossa (3.1.3). Family 6.—Cerithide. Genera: Cerithium, Brug.; Potamides, Brong.; Nerinwa, Defr. Family 7.—Melanide. Genera: Melania, Lam.; Melanopsis, Fér.; Ancylotus, Lay. Family 8.—Pyramidellide. Genera: Pyramidella, Lam.; Stylina, Flem.; Aclis, Loveu. Family 9.—Turritellide. Genera: Turritella, Lam.; Cecwm, Flem.; Ve ermetus, Adans.; Siliquaria, Brug. Family 10.—Xenophoride. Genus: Phorus, Montf. (fig. 39).~~

~~AZYGOBRANCHIA. |~~

~~TABULAR VIEW OF THE SUBDIVISIONS OF THE CLASS~~

~~MCLLUSCA~~

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~~GASTROPODA, ARRANGED sO AS TO SHOW THEIR SUPPOSED GENETIC~~

~~RELATIONSHIPS.~~

~~Class.—-GASTROPODA. (Archisopleurum.)~~

~~Sub-class 1.—ISOPLEURA.~~

~~Brauch a.—STREPTONEURA. (Archizygobranchium.)~~

~~Sub-class 2, —ANISOPLEURA. (Archieuthyneurwm.)~~

~~Brauch 6.—EUTHYNEURA. (Archiopisthobranchiwim.)~~

~~——— 2 9 > Order 1.—ZYGOBRANCHIA. Order 2. —AZYGOBRANCHIA. Order 1.—OPpiIsTHOBRANCHIA. Order 2.—PULMONATA. a ze e (Archiholochlamydum.) (Archipalliatum.) (Archibasommatum.) ce tf By en eo 4 5 | | | m 8 & Sect. a. Sect. 0. Sect. a. Sect. 0. g : 4 ial a i Non-Palliata. a og & | e B 8 ——— —_—”— ——— _~ ——— —_” a ps e ‘ z 5 e g ¢ eg oe. Ga ee . o ¢ >) Jae ke ae 7 a. eu = a om au iS} 8 g g a 5 moo Poe coat ot o> — ean T= moor “a aa i la ae [ie tel | | Ra yy ce fe @Ffe #88 S 3 seo 8 § e § 7 2 = > = & = = os = = ans 2. 3 S Ss Ss 3 3 = 2. a =e S) 8 eS FE ie. = = eee = iy =~~

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~~Family 11.—Naticide. Genera: Natica, Lam.; Sigarctus, Lam.; Nerttopsis, Gratel. Family 12.—LHntoconchide.~~

~~The single genus and species Entoconcha mirabilis, discovered by Joh. Miiller in 1851, parasitic in Synapta digitata. The adult form is not known.~~

~~Family 13.—Marsenide. Genera: Marscnia, Leach ; Onchidiopsis, Family 14.—Acmexide. Genera: Aemea, Eschsch.; Lottia, Gr.; (probably these will be _ found to belong to the Zygobranchia). Family 15.—Capulide. ;~~

~~Genera: Capulus, Montf.; Calyptrea, Lam. (fig. 40); Zvochita,~~

~~Schum. Family 16.—Littorinide.~~

~~Genera: Littorina (the Periwinkles, fig. 46) ; Modulus, Gray ; Lacuna, Turt.; Rissoa, Frem.; Hydrobia, Hartm.; Assiminia, Leach.~~

~~Family 17.—Paludinide. ; Genera: Paludina (River-Snail) (figs. 7, 21); Bithynia, Gray ; Tanalia, Gray. Family 18.—Valvatidex. Genus: Valvata (fig. 45), fresh-water. Family 19.—Ampullaride.~~

~~*Genus: Ampullaria (can breathe air by means of the walls of the pallial chamber as well as water by the gill ; fresh-waters of tropical America, Africa, and East Indies).*~~

~~*Beck.*~~

~~*Sub-order 2.—Pnewmonochlamyda.*~~

~~*Characters.—Pallial chamber a lung-sac ; no gill; mouth ona rostrum, uot a retractile proboscis ; terrestrial habit.*~~

~~*Family 20.—Cyclostomide. ‘ Genera: Cyclostoma, Lam. ; Cyclophorus, Montf.; Ferussina, Gratel.; Pupina, Vignard. ; Family 21.—Helicinide (radula rhipidoglossate rather than teenio- glossate). Genera: Stoastoma, Adams ; Lam.; Proserpina, Guild. Family 22.—Aciculide. Genera: Acicula, Hartm.; Geomelania, Vesta,*~~

~~*Trochatella, Swains.; Helicina,*~~

~~*Sub-order 3.—Siphonochlamyda. Characters.—Reptant Azygobranchia with the margin of the mantle drawn out to form a trough-like siphon which notches the lip of the shell; shell always spiral ; usually an operculum, horny or lamelliform ; either a rostrum or a retractile proboscis ; exclusively marine ; mostly carnivorous.*~~

- ~~*Tenioglossa (3.1.3). Family 1.—Strombide. Genera: Strombus, L.; Pteroceras, (fig. 438). Family 2.—*~~

- ~~*Toxiglossa (1.0.1).*~~

~~*Lam.; Rostellaria, Lam.*~~

~~*Lam.; Fiewla,*~~

~~*Family 7.—Conide. Genus: Conus, L.*~~

~~*Family 8.—Terebride. Genus: Zerebra, Adans.*~~

~~*| Family 9.—Plewrotomide.*~~

~~*Genus: Plewrotoma, Lam. Family 10.—Cancellaridez. Genus: Cancellaria, Lam. * Rachiglossa (1.1.1 or .1.). Family 11.—Muricide. Genera: Murex, L.; Trophon, Montf. ; Fusus, Lam. (fig. 38); Turbinella, Lam. Family 12.—Buccinide. Genera: Buccinwm, L.; Nassa, Lam. (fig. 5); Purpura, Brug. (fig. 47); Concholepas, Lam.; Magilus, Montf. Family 13.—dMitride. Genus: Mitra, Lam.*~~

~~*Brug. ; Pyrula,*~~

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~~*Family 14.—Olivide. Genera: Oliva, Brug.; Ancilla, Lam.; Harpa, Lam. Family 15.—Volutide. Genera: Voluta, L.; Cymbiuwm, Montf.; Marginella, Lam.; Volvaria Lam.*~~

~~*Further Remarks on the Reptant Azygobranchia.—The very large assemblage of forms coming under this order comprise the most highly developed predaccous sea-snails, numerous — vegetarian species, a considerable number of*~~

~~*Fia. 87.—A. Triton variegatum, to show the proboscis or buccal introvert (e) in astate of eversion. a, siphonal notch of the shell occupied by the siphonal fold of the mantle-skirt (Siphonochlamyda) ; b, edge of the mantle-skirt rest- ing on the shell; ¢, cephalic eye; d, cephalic tentacle; e, everted buccal introvert (proboscis); jf, foot; g, operculum; h, penis; i, under surface of the mantle-skirt forming the roof of the sub-pallial chamber, B. Sole of the foot of Pyrula tuba, to show a, the pore usually said to be "aquiferous" but probably the orifice of a gland ; 6, median line of foot.*~~

~~*fresh-water, and some terrestrial forms. The partial dis- section of a male specimen of the Common Periwinkle,*~~

~~*Littorina littoralis, drawn in fig. 46, will serve to exhibit the disposition of viscera which prevails in the group.*~~

~~*Fic, 88,—Animal and shell of Pyrula laevigata.*~~

~~*The branchial chamber formed by the mantle-skirt over- hanging the head has been exposed by cutting along a line extending backward from the letters vd to the base of the coluniella muscle mc, and the whole roof of the chamber thus detached from the right side of the animal's neck has been thrown over to the left, showing the organs which lie upon the roof. No opening into the body-cavity has been made; the organs which lie in the coiled visceral hump show through its transparent walls. The head is seen in front resting on the foot and carrying a median non-retractile snout or rostrum, and a pair of cephalic tentacles at the base of each of which is an eye. In many Gastropoda the eyes are not thus sessile but raised upon special eye-tentacles (figs..43, 69). To the right of the head is seen the muscular penis p close to the termination of the vas deferens (sper- matic duct) vd. The testis ¢ occupies a median position in the coiled visceral mass. Behind the penis on the same side is the hooklike columella muscle, a development of the*~~

~~*MOLLUSCA*~~

~~*a, siphon ; }, head-tentacles ; C, head, the letter placed near the right eye; d, the foot, expanded as in crawling; h, the mantle-skirt reflected over the sides of the shell,*~~

~~*| AZYGOBRANCHIA.*~~

~~*retractor muscle of the foot, which clings to the spiral column or columella of the shell (see fig. 42). This col- umella niuscle is the same thing as the muscular surface marked c in the figures of Patella, marked & in fig. 91 of Nautilus, and the posterior adductor of Lamellibranchs (fig. 131).*~~

~~*The surface of the neck is covered by integument forming the floor of the branchial cavity. It has not been cut into.*~~

~~*Fre. 89,—Animal and shell of Phorus erutus, a, snout (not introversible); 4, cephalic tentacles; ¢, right eye; d, pro- and meso-podium,—to the right of this is seen the metapodium bearing the sculptured operculum,*~~

~~*Of the organs lying on the reflected mantle-skirt, that which*~~

~~*in the natural state lay nearest to the vas deferens on the*~~

~~*right side of the median line of the roof of the branchial chamber is the rectum ¢', ending in the anus a. Itcan be traced back to the intestine 2 near the surface of the visceral hump, and it is found that the apex of the coil formed by the hump is occupied by the liver # and the stomach v. Pha- rynx and cesophagus are con- cealed in the head. The enlarged glandular structure of the walls of the rectum is frequent in the*~~

~~*Azygobranchia, as is also though*~~

~~*not universally the gland marked*~~

~~*y, next to the rectum. It is the*~~

~~*adrectal gland, and in the genera*~~

~~*Murex and Purpura secretes a*~~

~~*colourless liquid which turns*~~

~~*purple upon exposure to the at-*~~

~~*(From Owen, mosphere, and was used by the*~~

~~*ancients as a dye.*~~

~~*Near this, and less*~~

~~*advanced into the*~~

~~*branchial chamber, is the single renal organ or nephri- dium 7 with its opening to the ex- terior 7'. Internally this glandular sac presents a second slit or aperture which leads into the pericardium (as is now found to be the case in all Mol- lusea). The heart c lying in the pericardium is seen in close proximity to*~~

~~*Fis. 40.—Shell of Calyptreea, seen from below so as to show the inner whorl }, concealed by the cap- like outer whorl a. .*~~

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~~*the renal organ, and consists of a single auricle receiving blood from the gill, and of a single ventricle which pumps it through the body by an anterior and posterior aorta (see fig. 105). The surface « of the mantle between the rectum and the gill- plume is thrown into folds which in many sea-snails (Whelks, &c.) are very strongly deve- Ee oe f loped. The whole Pe,thaicer a foots h mantle-skirt, which is nati*~~

~~*rally carried in a reflected condition so as to cover in the sides of the shell.*~~

~~*of this surface ap- pears to be active in the secretion of a mucous-like substance. The single gill-plume br lies to the left of the median line in natural position. It corresponds to the right of the two primitive cten- idia in the untwisted archaic condition of the Molluscan body, and does not project freely into the branchial cavity, but its axis is attached (by concres- cence) to the mantle-skirt (roof of the branchial chamber). It is rare for the gill-plume of an Anisopleurous Gastropod to stand out freely as a plume, but occasionally this more ar- chaic condition is exhibited, as in Valvata (fig. 45). Next be- yond (to the left of) the gill- plume we find the so-called para-branchia, which is here simple, but sometimes lamellated as in Purpura (fig. 47). This organ has, without reason, been sup- posed to represent the second ctenidium of thetypical Molluse, which it cannot do on account of its position. It should be to the right of the anus were this the case. Recently Spengel has shown that the parabran- chia of Gastropods is the typical olfactory organ or osphradium Owen.)*~~

~~*in a highly-developed condition The minute structure of the epithelium which clothes it, as well as the origin of*~~

~~*See: 1 +,*~~

~~*Fic, 42,—Section of the shell of Tritoniui, Cuv. a, apex; a, Si phonal notch of the mouth of the shell ; ac to pe, mouth of the shell; w, w, whorls of the shell; s, s, su- tures. Occupying the axis, and exposed by the section, is seen the "eolumella" or spiral pillar. The upper whorls of the shell are seen to be divided into separate cham- bers by the formation of succes- sively formed "septa." (From*~~

~~*Fic. 43,—Animal and shell of Rostellaria rectirostris, a, snout or rostrum ; b, cephalic tentacle ; ¢, eye ; d, propodium and mesopodium ; e, metapodiuin ; f, operculum; h', prolonged siphonal notch of the shell occupied by the siphon, or trough-like process of the mantle-skirt. (From Owen.)*~~

~~*the nerve which is distributed to the parabranchia, proves it to be the same organ which is found universally in Mol-*~~

~~*MOLLUS CA*~~

~~*| gobranchia and Isopleura).*~~

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~~*luses at the base of each gill-plume, and tests the indrawn current of water by the sense of smell. The nerve to this*~~

~~*Fic, 44,—Female Janthina, with egg-float (a) attached to the foot; b, egg: capsules ; c, ctenidium (gill-plume); d, cephalic tentacles.*~~

~~*organ is given off from the superior (original right, see fig. 19) visceral ganglion.*~~

~~*The figures which are here given of various Azygo- branchia are in most cases suffi- ciently explained by the refer- ences attached to them. As an excellent general type of the nervous system, attention may be directed to that of Paludina drawn in fig. 21. On the whole, the ganglia are strongly indivi- dualized in the Azygobranchia, nerve-cell tissue being concen- trated-in the ganglia and absent yo, 45.—Vatvata cristata, MUll. from the cords (contrast with Zy- % mouth; op, operculum ; br,*~~

~~*etenidium (branchial plume); 2, : .) At filiform appenda; e(? rudiment- the same time, the junction of abies os erties hen the visceral loop above the in- not having its axis fused to the testine prevents in all Strepto- {ne er Ge neura the shortening of the vis- 5s. ceral loop, and it is rare to find a fusion of the visceral ganglia with either pleural, pedal, or cerebral—a fusion which can and does take place where the visceral loop is not above but*~~

below the intestine, eg., in the Euthyneura (fig. 67), Cephalopoda(fig.112), and Lamellibranchia (fig. 144). As con- ;' trasted with the Zygo- ° branchia and the Iso- pleura, we find that in the Azygobranchia the pedal nerves are dis- tinctly nerves given off from the pedal ganglia, rather than cord-like nerve-tracts contain- ing both nerve-cells or ganglionic elements and nerve-fibres. Yet in some Azygobran-

chia (Paludina) a lad- Fic. 46.—Male of Littorina littoralis, Lin., re- a lik moved from its shell; the mantle-skirt cut along

er-like arrangement its right line of attachment and thrown over of the two pedal to the left side of the animal so as to expose the nervesand their lateral

organs on its inner face, a, anus ; i, intestine 5 r, nephridium (kidney); 7', aperture of the branches has been de- tected (30). The his-

nephridium; c, heart; br, ctenidium (gill- plume); por, parabranchia (=the osphradium tology of the nervous system of Mollusca

or olfactory patch); 2, glandular lamelle of the inner face of the mantle-skirt ; y, adrectal has yet to be seri- ously inquired into.

(purpuriparous) gland; , testis; vd,.vas de- ferens; p,penis; mc,columella muscle(muscular process grasping the shell), ; stomach ; h, liver. N.B. Note the simple snout or rostrum not in-

The alimentary canal of the Azygobranchia presents little diversity of character, except in so far as the buccal region is concerned. Salivary glands are present, and in some carnivorous forms (Dolium) these secrete free sul-

troverted as a " proboscis."

~~*phuric acid (as much as two per cent is present in the secretion), which assists the animal in boring holes by means of its rasping tongue through the shells of other Molluscs upon which it preys. A crop-like dilatation of the gut and a recurved intestine, embedded in the com- pact yellowish-brown liver, the ducts of which open into it, form the rest of the digestive tract and occupy a large bulk of the visceral hump. The buccal region presents a pair of shelly jaws placed laterally upon the lips, and a wide range of variation in the form of the denticles of the lingual ribbon or radula, the nature of which will be un- derstood by a reference to fig. 9, whilst the systematic list of families given above shows the particular form of den- tition characteristic of each division of the order.*~~

~~*The modification in the form of the snout upon which the mouth is placed, leading to the distinction of '" proboscidiferous " and " rostriferous" Gastropods, re- quires further notice. The condi- tion usually spoken of as a " pro- boscis " appears to be derived from the condition of a simple rostrum (having the mouth at its extrem- ity) by the process of incomplete introversion of that simple rostrum. There is no reason in the actual significance of the word why the term "proboscis" should be applied to an alternately introversible and eversible tube connected with an animal's body, and yet such is a very customary use of the term. The introversible tube may be completely closed, as in the " pro- boscis" of Nemertean worms, or it may have a passage in it leading into a non-eversible cesophagus, as in the present case, and in the case of the eversible pharynx of the predatory Chetopod worms. The diagrams here introduced (fig. 48) are intended to show certain important distinctions which obtain amongst the various 'introverts," or intro- and e-versible tubes so fre- quently met with in animal bodies. Supposing the tube to be completely introverted and to commence its ever- sion, we then find that eversion may take place, either by a forward movement of the side of the tube near its attached base, as in the proboscis of the Nemertine worms, the pharynx of Cheetopods, and the eye-tentacle of Gastro- pods, or, by a forward movement of the inverted apex of the tube, as in the proboscis of the Rhabdoccel Planar- ians, and in that of Gastropods here under consideration. The former case we call '"pleurecbolic" (fig. 48, A, B, C, H, I, K), the latter "acrecbolic" tubes or introverts (fig. 48, D, E, F, G). It is clear that, if we start from the*~~

~~condition of full eversion of the tube and watch the pro- cess of introversion, we shall find that the pleurecbolic variety is introverted by the apex of the tube sinking in- wards ; it may be called acrembolic, whilst conversely the acrecbolic tubes are pleurembolic. Further, it is obvious enough that the process either of introversion or of eversion of the tube may be arrested at any point, by the develop- ment of fibres connecting the wall of the introverted tube with the wall of the body, or with an axial structure such as the cesophagus ; on the other hand, the range of move- ment of the tubular introvert may be unlimited or complete. The acrembolic proboscis or frontal introvert of the Nemer- tine worms has a complete range. So has the acrembolic pharynx of Cheetopods, if we consider the organ as ter- minating at that point where the jaws are placed and the cesophagus commences. So too the acrembolic eye-tentacle of the snail has a complete range of movement, and also the~~

~~Fic. 47.—Female of Purpura la- pillus removed from its shell; the mantle-skirt cut along its left line of attachment and thrown over to the right side of the animal so as to expose the organs on its inner face, a, auus ; vg, vagina; gp, adrec- tal purpuriparous gland; 7', aperture of the nephridium (kid- ney); br, ctenidium (branchial plume); br', parabranchia (=the comb-like osphradium or olfac- tory organ).~~

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~~[AZYGOBRANCHIA.~~

~~pleurembolic proboscis of the Rhabdoccel prostoma. The introverted rostrum of the Azygobranch Gastropods pre- sents in contrast to these a limited range of movement. The "introvert" in these Gastropods is not the pharynx as in the Chetopod worms, but a pree-oral structure, its apical limit being formed by the true lips and jaws, whilst the apical limit of the Cheetopod's introvert is formed by the jaws placed at the junction of pharynx and cesophagus, so that the Cheetopod's introvert is part of the stomodzeum or fore-gut, whilst that of the Gastropod is external to the alimentary canal altogether, being in front of the mouth, not behind it, as is the Chzetopod's. Further, the Gastro- pod's introvert is pleurembolic (and therefore acrecbolic), and is limited both in eversion and in introversion ; it can-~~

~~*c. a*~~

~~*we: pd*~~

~~*d b € . "Ht Fig, 48.—Diagrams explanatory of the nature of so-called proboscides or "intro-*~~

~~*verts." A. Simple introvert completely introverted. B, The same, partially*~~

~~*everted by eversion of the sides, as in the Nemertine proboscis and Gastropod eye-tentacle=pleurecbolic. C. The same, fully everted, D, E. A similar simple introvert in course of eversion by the forward movement, not of its sides, but of its apex, as in the proboscidean Rhabdocoels=acrecbolic, F. Acrecbolic (= pleurembolic) introvert, formed by the snout of the proboscidi- ferous Gastropod. al, alimentary canal; d, the true mouth, The introvert is not a simple one with complete range both in eversion and introversion, but is arrested in introversion by the fibrous bands at c, and similarly in eversion by the fibrous bands at 6. G. The acrecbolic snout of a probos- cidiferous Gastropod, arrested short of complete eversion by the fibrous band bv. H. The acrembolic (=pleurecbolic) pharynx of a Cheetopod fully iutro verted. al, alimentary canal; at d, the jaws; at a, the mouth; therefore a to @ is stomodeum, whereas in the Gastropod (F) a to d is inverted body- surface. I. Partial eversion of H, K. Complete eversion of H. (Original.)*~~

~~*not be completely everted owing to the muscular bands (fig. 48, G), nor can it be fully introverted owing to the bands (fig. 48, I') which tie the axial pharynx to the adjacent wall of the apical part of the introvert. As in all such intro- and e-versible organs, eversion of the Gastropod proboscis is effected by pressure communicated by the muscular body-wall to the liquid contents (blood) of the body-space, accompanied by the relaxation of the muscles which directly pull upon either the sides or the apex of the tubular organ. The inversion of the proboscis is effected directly by the contraction of these muscles. In various members of the Azygobranchia the mouth-bearing cylinder is introversible (.¢., is a proboscis)—with rare exceptions these forms have a siphonate mantle-skirt. On the other hand, many which have a siphonate mantle-skirt are not provided with an introversible mouth-*~~

~~*bearing cylinder, but have a simple non-introversible rostrum, as it has been*~~

~~*AZYGOBRANCHIIA.* |~~

~~*termed, which is also the condition presented by the mouth- bearing recion in nearly all other Gastropoda. One of the best examples of the introversible mouth-cylinder or pro- boseis which can be found is that of the Common Whelk and its immediate allies, In fig. 37 the proboscis is seen in an everted state; it is only so carried when feeding, being withdrawn when the animal is at rest. Probably "ts use is to enable the animal to introduce its rasping and licking apparatus into very narrow apertures for the purpose of feeding, ¢.y., into a small hole bored in the shell of another Mollusc.*~~

~~*The foot of the Azygobranchia, unlike the simple mus- cular disc of the Isopleura and Zygobranchia, is very often divided into lobes, a fore, middle, and hind lobe (pro-, meso-, and meta-podium, see figs. 39 and 43). Very usually, but not universally, the meta-podium carries an operculum. The division of the foot into lobes is a simple case of that much greater elaboration or breaking up into processes and regions which it undergoes in the class Cephalopoda. Even among some Gastropoda (viz., the Opisthobranchia), we find the lobation of the foot still further carried out by the development of lateral lobes, the epipodia, whilst there are many Azygobranchia, on the other hand, in which the foot has a simple oblong form without any trace of lobes.*~~

~~*The development of the Azygobranchia from the egg has been followed in several examples, ¢.g., Paludina, Purpura, Nassa, Vermetus, Neritina. As in other Molluscan groups, we find a wide variation in the early process of the forma- tion of the first embryonic cells, and their arrangement as a Diblastula dependent on the greater or less amount of food-yelk which is present in the egg-cell when it com- mences its embryonic changes. In fig. 7, the early stages of Paludina vivipara are represented. There is but very little food-material in the egg of this Azygobranch, and consequently the Diblastula forms by invagination ; the blastopore or orifice of invagination coincides with the anus, and never closes entirely. A well-marked Trocho- sphere is formed by the development of an equatorial ciliated band; and*~~

~~*subsequently, by the disproportionate growth of the lower hemisphere, the Trochosphere becomes a Veliger. The primitive shell-sac or shell-gland is well marked at this stage, and the pharynx is seen as a new ingrowth (the stomodum), about to fuse with and open into the primitively invaginated arch-enteron (fig. 7, F).*~~

~~*In other Azygobranchs (and such variations are repre- sentative for all Mollusca, and not characteristic only of Azygobranchia), we find that there is a very unequal division of the egg-cell at the commencement of embryonic development, as in Nassa (fig. 5). Consequently there is strictly speaking no invagination (emboly), but an over- growth (epiboly) of the smaller cells to enclose the larger. The general features of this process and of the relation of the blastopore to mouth and anus have been explained above in treating of the development of Mollusca generally. In such cases the blastopore may entirely close, and both mouth and anus develop as new ingrowths (stomodzeum and proctodeum), whilst, according to the observations of Bobretzky, the closed blastopore may coincide in position with the mouth in some instances (Nassa, &c.), instead of with the anus. But in these epibolic forms, just as in the embolic Paludina, the embryo proceeds to develop its cili- ated band and shell-gland, passing through the earlier con- dition of a Trochosphere to that of the Veliger. In the veliger stage many Azygobranchia (Purpura, Nassa, &c.) exhibit, in the dorsal region behind the head, a contractile area of the body-wall. This acts as a larval heart, but ceases to pulsate after a time. Similar rhythmically con- tractile areas are found on the foot of the embryo Pulmo- nate Limax and on the yelk-sac (distended foot-surface) of the Cephalopod Loligo (see fig. ea),*~~

~~*The history of the shell in the development of Azygo- branchia (and other Gastropods) is important. Just as the primitive shell-sac aborts and gives place to a cap-like or boat-like shell, so in some cases (Marsenia, Krohn) has this first shell been observed to be shed, and a second shell of different shape is formed beneath it.*~~

~~*A detailed treatment of what is known of the histo- genesis in relation to the cell-layers in these Mollusca would take us far beyond the limits of this article, which aims at exposing only the well-ascertained characteristic features of the Mollusca and the various subordinate groups. There is still a great deficiency in our knowledge of the develop- ment of the Gastropoda, as indeed of all classes of animals. The development of the gill (ctenidium) as well as of the renal organ, and details as to the process of torsion of the visceral hump, are still quite insufficiently known.*~~

~~*One further feature of the development of the Azygobran- chia deserves special mention. Many Gastropoda deposit their eggs, after fertilization, enclosed in capsules; others, as Paludina, are viviparous; others, again, as the Zy gobranchia, agree with the Lamellibranch Conchifera (the Bivalves) in having simple exits for the ova without glandular walls, and therefore discharge their eggs unenclosed in capsules freely into the sea-water; such unencapsuled eggs are merely enclosed each in its own delicate chorion. When egg-capsules are formed they are often of large size, have tough walls, and in each capsule are several eggs floating in a viscid fluid. In some cases all the eggs in a capsule develop ; in other cases one egg only in a capsule (Neri- tina), or a small proportion (Purpura, Buccinum), advance in development ; the rest are arrested either after the first process of cell-division (cleavage) or before that process. The arrested embryos or eggs are then swallowed and digested by those in the same capsule which have advanced in development. The details of this history require renewed study, our present knowledge of it being derived from the works of Koren and Danielssen, Carpenter and Claparede. In any case it is clearly the same process in essence as that of the formation of a vitellogenous gland from part of the primitive ovary, or of the feeding of an ovarian egg by the absorption of neighbouring potential eggs; but here the period at which the sacrifice of one egg to another takes place is somewhat late. What it is that determines the arrest of some eggs and the progressive development of others in the same capsule is at present unknown.*~~

~~*Section b (of the Azygobranchia).—V.A TANTIA.*~~

~~*Characters.—Azygobranchiate Streptoneura which have the form and texture of the body adapted to a free-swimming pelagic habit. They appear*~~

~~*to be derived from holochlamydic forms of Reptant Azygobranchia. The foot takes the form of a swimming organ. The nervous system and sense-organs (eyes, otocysts, and osphradium) are highly developed. 'The odontophore also ig\ Te- markably developed, its admedian teeth being mobile, and it serves as an efficient organ for attacking other pelagic forms upon which the Natantia prey. The sexes are distinct as in all Streptoneura ; and genital ducts and accessory glands and pouches are present as in all Azygobranchia. The Natantia exhibit a series of modifica- tions of the form and proportions of the visceral mass and foot, leading from a condition readily comparable with that of a typical Azygobranch such as Rostellaria, with the three regions of the foot (pro-, meso-, and meta- podium) strongly marked, and a coiled visceral hump of the usual proportions, up toa condition in which the whole body is of a tapering cylindrical shape, the foot a plate- like vertical fin, and the visceral hump almost completely atrophied. Three steps of this modification may be distinguished as three sub- orders, the Atlantacea, the Carinariacea, and the Pterotracheacea.*~~

~~*Sub-order 1.—Atlaniacea.*~~

~~*Characters.—Natantia with a large spirally-wound visceral hump, covered by a hyaline spiral shell ; mantle-skirt large, overhanging a well-developed sub-pallial branchial chamber asin Azygobranchia, to the wall of which is attached the branchial ctenidium ; foot well developed, divisible into a mobile propodium, a mesopodium on which is formed a sucker, and a metapodium which, when the animal is expanded, extends backwards beyond the shell and visceral*~~

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~~*hump; upon the upper surface of the metapodium is developed an*~~

~~*operculum. Genera: Atlanta, Oxygurus. fossils Bellerophon.*~~

~~*Sub-order 2.*~~

~~*Characters.—Visceral hump shell small, cap-like, hyaline ; ctenidium (branchial plume) projecting from the small sub- pallial chamber; body cylin- drical; of the foot-lobes only the mesopodium is prominent, provided*~~

~~with a sucker, and compressed laterally so as to form a vertical plate-like fin projecting from the ventral surface; the propodium forms simply the ventral surface of the anterior region of the cy- lindrical body whilst the me- tapodium forms its posterior region.~~

~~Genera: Carinaria, Cardio- poda.~~

~~Sub-order 3.—Pterotracheacea. * Characters.— Visceral hump still further reduced, forming a mere oval sac embedded in the posterior dorsal] region of the cylindrical body; no shell ; foot as in Carinariacea, except that the sucker is absent from the mesopodium in the females.~~

~~Genera: Pterotrachea, Firu- loides.~~

~~Further Remarks on the~~

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~~| AZYGOBRANCHIA.~~

~~the visceral loop of the Natantia is Streptoneurous. Special~~

~~to the Natantia is the high elaboration of the lingual ribbon, and, as an agreement with some of the Opistho- branchiate Euthyneura but. as a difference from the Azygo- branchia, we find the otocysts closely attached to the cerebral ganglia.~~

~~Probably here belong the Paleozoic~~

~~—Carinariacea.~~

~~greatly reduced in relative size ; This is, however, less of a difference than it was~~

~~Fic. 50.—Carinaria mediterranea. A. The animal. B. The slicll removed. C, D. Two views of the shell of Cardiopoda. a, mouth and odontophore ; b, cephalic tentacles; ¢, eye; d, the fin-like mesopodium ; d', its sucker; e, metapodium ; f, salivary glands; h, border of the mantle-flap; i, ctenidium (gill-plume); m, stomach ; n, intestine; 0, anus; p, liver ; t, aorta, springing~~

~~*from the ventricle; u, cerebral ganglion ; v, pleural and pedal ganglion ; w, testis ; 7, visceral ganglion ;*~~

~~*a : ‘ y, vesicula seminalis ; z. penis, Natantia Azygobranchia.—*~~

~~*Logically the Natantia should stand as we have placed them, viz., as a special branch or section of the Azygobranchia, related to them somewhat as are the Birds to the Reptiles. They are true Azygobranchia which have taken to a pelagic life, and the peculiarities of structure which they exhibit*~~

~~*Fia. 49.—Atlanta (Oxygura) Keraudrenit (magnified 20 diameters). «a, mouth and odontophore ; 6, cephalic tentacles ; c, eye; d, propodium (B) and meso- odium ; ¢, metapodium; f, operculum; h, mantle-chamber ; i, ctenidium gill-plume) ; k, retractor muscle of foot; J, optic teritacle ; m, stomach; n, dorsal surface overhung by the mantle-skirt, the letter is close to the salivary gland; 0, rectum and anus; 9, liver; g, renal organ (nephridium)}; s, ven- tricle ; uv, the otocyst attached to the cerebral ganglion ; w, testis; x, auricle “of the heart ; y, vesicle on genital duct; z, penis. (From Owen.) are strictly adaptations of the structure common to them and the Azygobranchia consequent upon their changed mode of life. Such adaptations are the transparency and colourlessness of the tissues, and the modifications of the foot, which still shows in Atlanta the form common in Azygobranchia (compare fig. 49 and fig. 39). The cylindrical body of Pterotracheacea is paralleled by*~~

~~*the slug-like forms of Euthyneura. Spengel has shown that*~~

~~*_ corresponding position.*~~

~~*(From Owen.)*~~

~~*at one time supposed to be, for it has been shown by Lacaze Duthiers, and also by Leydig, that the otocysts of Azygo- branchia even when lying close upon the pedal ganglion (as in fig. 21) yet receive their special nerve (which can sometimes be readily isolated) from the cerebral ganglion (see fig. 36). Accordingly the difference is one of position of the otocyst and not of its nerve-supply. The Natantia are further remarkable for the high development of their cephalic eyes, and for the typical character of their*~~

osphradium (Spengel's olfactory organ). This is a groove, the edges of which are raised and ciliated, lying near the branchial plume in

_ the genera which possess that organ, whilst in Firuloides,

which has no branchial plume, the osphradium occupies a Beneath the ciliated groove is

Fia. 51.—Pterotrachea mutica. seen from the right side. a, pouch for reception of the snout when retracted ; c, pericardium ; ph, pharynx; oc, cephalic eye ; g, cerebral ganglion; g', pleuro-pedal ganglion; pr, foot (mesopodium) ; », stomach ; 7, intestine ; , so-called nucleus ; br, branchial plume (ctenidium) ; = osphradium ; mt, foot (metapodium); z, caudal appendage. (After Kefer- stein.)

placed an elongated ganglion (olfactory ganglion) connected by a nerve to the supra-intestinal (therefore the primitively dextral) ganglion of the long visceral nerve-loop, the strands of which cross one another,—this being characteristic of Streptoneura (Spengel).

The Natantia belong to the "pelagic fauna" occurring near the surface in the Mediterranean and great oceans in company with the Pteropoda, the Siphonophorous Hydrozoa, Salpee, Leptocephali, and other specially-modified trans- parent swimming representatives of various groups of the animal kingdom. In development they pass through the typical trochosphere and veliger stages provided with boat- like shell.

OPISTHOBRANCHIA. |

Branch).—HUTHYNEURA (Spengel, 1881).

Characters. — Gastropoda Anisopleura in which the visecral loop (the conterminous visceral nerves) does not share in the torsion of the visceral hump, but, being placed entirely below the intestine, remains straight and untwisted, the junction of the visceral cords being below, and not

*is · *

~~*Tia. 52.—Bulla verillum (Chemnitz), as seen crawling. 4d, oral hood (compare with Tethys, fig. 62, B), possibly a continuation of the epipodia ; 6, b', cephalic tentacles, (From Owen.)*~~

~~*above, the intestine as it is in Streptoneura. Although*~~

~~*the anus is not brought so far forward by the visceral*~~

~~*torsion as in the Streptoneura, and may even by secondary growth assume a posterior median position, yet, as fully developed, an asymmetry has resulted as in the Azygo- branchia, only the original right renal organ, right cteni- dium (if any), right osphradium, right side of the heart, and right genital ducts being retained. All the Euthy- neura are hermaphrodite. The lingual ribbon has very usually numerous fine denticles undifferentiated into series in each row. The shell is light and little calcified ; often it is not developed in the adult, though present in the embryo.*~~

~~*An operculum, often found in*~~

~~*the embryo, is never present in*~~

~~*the adult (except in Tornatella,*~~

~~*fig. 53). Many Euthyneura show a tendency to, or a*~~

~~*complete accomplishment of, the suppression of the mantle-*~~

~~*skirt as well as of the shell, also of the ctenidium, and ac- quire at the same time a more or less cylindrical (slug-like) form of body.*~~

~~*The Euthyneura comprise two orders, the Opistho- branchia and the Pulmonata.*~~

~~*Fic, 53.—Tornatella. h, shell; 2, oral hood; d, foot; f, operculum.*~~

~~*Order 1.—Opisthobranchia.*~~

~~*Marine Euthyneura the more archaic forms of which have a relatively large foot and a small visceral hump, from the base of which projects on the right*~~

~~*side a short mantle-skirt. The anus is placed in such forms far back*~~

~~*Fic, 54.—Umbrella mediterranea. a, mouth; b, cephalie tentaele; h, gill (ctenidium). The free edge of the mantle is seen just below the margin of the shell (compare with Aplysia, fig. 63). (From Owen.)*~~

~~*beyond the mantle-skirt. In front of the anus, and only*~~

~~*partially covered by the mantle-skirt, is the ctenidium with*~~

~~*its free end turned backwards. The heart lies in front of, instead of to the side of, the attachment of the ctenidium,*~~

~~*—hence Opisthobranchia as opposed to " Prosobranchia,"*~~

~~*which correspond to the Streptoneura. A shell is possessed in the adult state by but few Opisthobranchia, but all pass through a veliger larval stage with a nautiloid shell (fig. 60). Many Opisthobranchia have by a process of atrophy lost the typical ctenidium and the mantle-skirt, and have deve- &§ loped other organs in their [B@ place. As in some Azygo- branchia, the free margin of the mantle-skirt is frequently reflected over the shell when Pes a shell exists; and, as in some & Azygobranchia, broad lateral outgrowths of the foot (epi- \ podia) are often developed, which, asdoes not occur in Azy- gobranchia, may be thrown over the shell or naked dorsal surface of the body.*~~

~~*The variety of special deve- lopments of structure accom- panying the atrophy of typical organs in the Opisthobranchia and general degeneration of organization is very great, and renders their classification difficult. Two sections of the order may be distinguished, according as the typical Molluscan mantle-skirt (limbus pallialis) is or is not atro- phied, and within each section certain sub-orders.*~~

~~*Section a.—PALLIATA (= Teetibranchiata, Woodward)—the typical Molluscan mantle-skirt or pallium retained. Sub-order 1.—Ctenidiobranchia.*~~

~~*Characters.—Palliata in which the ctenidium is retained as the branchial organ ; with rare exceptions a delicate shell, which may be very small or completely enclosed by the reflected margin of the mantle; epipodia (lateral outgrowths of the foot) frequently present. Family 1.—Tornatellide.*~~

~~*Genera: Tornatella, Lam. (fig. 58); Cinwlia, Gray, &c.*~~

~~*Family 2.—Bullide.*~~

~~*Genera: Bulla, Lam. (fig. 52); Acera, Miiller ; Scaphander, Montf.; Bulla, Lam. ; Doridiwm, Meckel; Gastropteron, Meckel, &c.*~~

~~*Family 3.—Aplysiide.*~~

~~*Genera: Aplysia, Gmelin (the Sea-Hare)*~~

~~*Dolobella, Lam.; Lobiger, Krohn, &c. Family 4.—Plewrobranchide.*~~

~~*Genera: Pleurobranchus, Cuvier; Umbrella,*~~

~~*55); Runeina, Forbes, &c. Sub-order 2.—Phyllidiobranchia.*~~

~~*Characters.—Palliata in which the ctenidia have atrophied ; much as in Patellide among the Zygobranchiate Streptoneura their place is taken by laterally-placed lamelle, developed from the inner surface of the bilaterally-disposed mantle-skirt in two lateral rows.*~~

~~*Family 5.—Phyllidiade. Genera: Phyllidia, Cuiver ; Plewrophyllidia, Meck. (fig. 57).*~~

~~*Section b.—NON-PALLIATA.*~~

~~*Characters.—'The typical Molluscan mantle-skirt is atrophied in the adult. No shell is present in the adult, though the dorsal integument may be strengthened by calcareous spicules (Doris). The otocysts are not sessile on*~~

~~*the pedal ganglia as in other Gastropods, but, asin the Natantia Azygobranchia, lie close to the cerebral ganglia. In one sub-order (Pygobranchia) the typical ctenidium appears to be retained in a modified form ; in the others special developments of the body-wall take its place, or no special respiratory processes exist at all. The general form of the body is slug-like, the foot and visceral hump being coextensive, and a secondary bilateral symmetry is asserted by the usually median (sometimes right-sided) dorsal position of the anus on the hinder part of the body.*~~

~~*Sub-order 1.—Pygobranchia. Characters. —The ctenidium assumes the form of acirclet of pinnate processes surrounding the median dorsal anus ; a strongly-marked epipodial fold may occur all round the foot and simulate a mantle- skirt (see fig. 62, C, Doris); papille or "cerata" of the dorsal integu- ment may occur as well as the true ctenidium (fig. 61). Family 6.—Doridide. ; Genera: Doris, L.; Goniodoris, Forbes; Triopa, Johnst.; Agirus Loven ; Theeacera, Fleming ; Polyeera, Cuvier ; Idalia, Leuck- art ; Anecula, Loven; Ceratosoma, Adams; Onchidoris, Blainv.*~~

~~*Fia. 55,—Umbrella mediterranea, seen from above. h, mouth; i, cephalic tentaeles; k, penis-sheath. (After Keferstein.)*~~

~~*(figs. 20, 56, &c.);*~~

~~*Chemnitz (figs. 54,*~~

~~*656 MOLL*~~

~~*Sub-order 2.— Ceratonota.*~~

~~*Characters.—The typical Molluscan ctenidium is not developed ; upon the dorsal area is developed a more or less numerous series of eylindrieal or branched processes (the eerata) into each of which the intestine usually sends a process ; anus dorsal, median, or right-sided. Family 7.—T7ritoniade.*~~

~~*Genera: 7'ritonia, Cuvier; Scyllea, L.; Tethys, L. (fig. 62, B);*~~

~~*Dendronotus, A. and H.; Doto, Oken. Family 8.—Lolidx. Genera: Eolis, Cuvier (fig. 62, A); Glaweus, Forster ; Fiona, A. and H. (fig. 67); Embletonia, A. and H.; Proctonotus, A. and H.; Antiopa, A. and H.; Hermea, Loven; Alderia, Allman.*~~

~~*Sub-order 3.—Haplomorpha.*~~

~~*Characters.—No ctenidia, cerata, mantle-skirt, or other processes of the body-wall ; degenerate forms of small size. Family 9.—Phyllirhoide.*~~

~~*Genera: Phyllirhoé, Peron and Lesucur (fig. 58); Acura, Adams. Family 10.—Hlysiada.*~~

~~*Genera: Elysia, Risso (fig. 62, D, E); Acteonia, Quatref.; Cenia,*~~

~~*A. and H.; Limapontia, Johnston; Rhodope, Koll.*~~

~~*Further Remarks on the Opisthobranchia.—The Opis- thobranchia present the same wide range of superficial appearance as do the Azygobranchiate Streptoneura, forms*~~

~~*Fig. 56.—Three views of Aplysia sp., in various conditions of expansion and retraction. ¢, anterior cephalic tentacles ; £2, posterior cephalic tentacles ; e, eyes ; f, metapodium ; ep, epipodium ; g, gill-plume (ctenidium) ; m, mantle- flap reflected over the thin oval shell; os, s, orifice formed by the unclosed border of the reflected mantle-skirt, allowing the shell to show; pe, the sper- matic groove. (After Cuvier.)*~~

~~*carrying well-developed spiral shells and large mantle-*~~

~~*skirts being included in the group, together with flattened*~~

~~*or cylindrical slug- like forms. But in respect of the substi- tution of other parts for the mantle-skirt and for the gill which the more degenerate*~~

~~*Opisthobranchia ex-*~~

~~*hibit, this Order*~~

~~*stands alone. Some*~~

~~*Opisthobranchia are*~~

~~*striking examples of*~~

~~*degeneration (some*~~

~~*Haplomorpha), hav-*~~

~~*ing none of those re-*~~

~~*gions or processes of the body developed which distinguish the archaic Mollusca from such flat-worms as the Dendroccel Planarians. Indeed, were it not for their retention of the characteristic odontophore we should have little or no indication that such forms as Phyllirhoé and*~~

~~*Fia. 57.—Dorsal and ventral view of Plewrophylli- dia lineata (Otto), one of the Phyllidiobranchiate Palliate Opisthobranchs. 6, the mouth; J, the lamelliform sub-pallial gills, which (as in Patella) replace the typical Molluscan ctenidium. (After Keferstein.)*~~

~~*USCA*~~

~~*Limapontia really belong to the Mollusca at all.*~~

~~*[OPISTHOBRANCHIA.*~~

~~*The inter-*~~

~~*esting little Rhodope Veranyuw, which has no odontophore, has been associated by systematists both with these simpli- fied Opisthobranchs and with Rhabdoccel Planarians (29).*~~

~~*In many respects the Sea-Hare (Aply- sia) of which several species are known (some occurring on the English coast), serves aS a conven- ient example of the fullest development of the organization characteristic of*~~

~~iF Fig. 58.—Phyllirhoé bucephala, twice the natural size, a transparent pena hey pelagic Opistho-~~

~~branch. The internal organs are shown as seen by transmitted light. a, mouth; b, radular sac ; c, esophagus ; d, stomach ; c', intestine; /", anus ;~~

~~: : g, 9, 9', g", the four lobes of the liver; h, the Opisthobranc hia. heart (auricle and ventricle) ; 1, the renal sac (ne- The woodeut (fig. 56) phridium) ; /', the ciliated communication of the~~

~~. 3 renal sac with the pericardium ; m, the external givesa faithful repre- openy of the renal sac ; n, the cerebral ganglion ; : o, the cephalic tentacles; jf, the genital pore, sentation of the gr eat ¥, the ovo-testes ; w, the parasitic hydromedusa~~

~~mobility of the vari- — be tsk pre prmee attached in this position by fi . f in.~~

~~ous par ts of the bo dy. he aboral pole of its umbrella. (After Keferstein.)~~

~~The head is well marked and joined to the body by a some- what constricted neck. It carries two pairs of cephalic tentacles and a pair of sessile eyes. The visceral hump is low and not drawn out into a spire. The foot is long, carrying the oblong visceral mass upon it, and projecting (as metapodium) a little beyond it (f). Laterally the foot gives rise to a pair of mobile fleshy lobes, the epipodia (ep), which can be thrown up so as to cover in the dorsal~~

~~Fra. 59.——Acera bullata, A single row of teeth of the radula. (Formula, x.1.x.)~~

~~surface of the animal. Such epipodia are common, though by no means universal, among Opisthobranchia. The torsion of the visceral hump is not carried out very fully,~~

~~2 =~~

~~{ (5,0) 5 a c J)~~

~~oy~~

~~*Fig. 60.—A. Veliger-larva of an Opisthobranch (Polycera). f, foot ; op, oper- culum; mn, anal papilla; ry, dry, two portions of ,unabsorbed nutritive yelk on either side the intestine. The right otocyst is seen at the root of the foot. B. Trochosphere of an Opisthobranch (Pleurobranchidium) show- ing: shgr, the shell-gland or primitive shell-sac ; ¥, the cilia of the velum ; ph, the commencing stomodeum or oral invagination ; of, the left otocyst ; pg, red-coloured pigment spot. C., Diblastula of an Opisthobranch (Poly- cera) with elongated blastopore ot. (All from Lankester.)*~~

~~*the consequence being that the anus has a posterior posi- tion a little to the right of the median line above the metapodium, whilst the branchial chamber formed by the overhanging mantle-skirt faces the right side of the body instead of lying well to the front as in Streptoneura and. as in Pulmonate Euthyneura. 'The gill-plume which in Aplysia is the typical Molluscan ctenidium is seen in fig.*~~

~~*63 projecting from the branchial sub-pallial space.*~~

~~*The*~~

~~*relation of the delicate shell to the mantle is peculiar, since it occupies an oval area upon the visceral hump,*~~

~~*the extent of which is indicated in fig. 56, O, but may be better understood by a glance at the figures of the allied genus Umbrella (figs. 54, 55), in which the margin of the mantle-skirt coin- cides, just as it does in the Limpet, with the margin of the shell. But in Aplysia the mantle is reflected over the edge of the shell, and grows over its upper surface so as to completely enclose it, excepting at the small cen- tral area s where the naked shell is exposed. This enclosure of the shell is a permanent development of the arrangement seen in many Strepto- neura (e.g. Pyrula, Ovulum, see figs. 38 and 41), where the border of the mantle can be, and usually is, drawn over the shell, though it is withdrawn*~~

~~(as it cannot be in Aplysia) when they pro, 61 —Potycera cristata,~~

~~are irritated. From the fact that Aplysia commences its life as a free-swimming Veliger with a nautiloid shell not enclosed in any way by the border of the mantle, it is clear that the enclosure of the shell in the adult is a secondary process. Accordingly, the shell of Aplysia must not be con-founded with a primitive shell in its shell-sac, such as we find realized in the shells of Chiton and in the plugs which form in the remarkable tran-~~

~~one of the Pygobranchi- ate Opisthobranchs (dor- sal view). a, anus; dr, the ctenidium peculiarly modified so as to encircle theanus; t, cephalic ten-tacles. External to the branchial ctenidium are seen ten club-like pro-cesses of the dorsal wall, these are the "cerata" which are characteristic-~~

~~_ ally developed in another~~

~~sub-order of Opistho- pbranchs, the Ceratonota (see fig. 62, A). (From Gegenbaur, after Alder and Hancock.)~~

~~sitory "shell-sac" or "shell-gland" of Molluscan embryos~~

~~657~~

~~develops a primitive shell-sac in its trochosphere stage of development (fig. 68), which disappears and is succeeded This forms the nucleus of~~

~~by a nautiloid shell (fig. 60).~~

~~the adult shell, and, as the ani- mal grows, be- comes enclosed by a reflexion of the mantle-skirt. In reference to the possible com- parison of the enclosed shell of Aplysia and_ its allies with those of some Slugs and of Cuttle-fishes, the reader is re- ferred tothe para- graphs dealing especially with those Molluscs. When the shell of an Aplysia enclosed in its mantle is pushed well to the left, the sub-pallial space is fully ex- posed as in fig. 63, and the vari- ous apertures of the body are seen. Posteriorly we~~

~~Fic. 638.—A plysia leporina (camelus, Cuv.), with epipodia~~

~~*and mantle reflected away from the mid-line. a, an- terior cephalic tentacle; b, posterior do.; between a and 6, the eyes; ¢, right epipodium; d, left epipo- dium ; e, hinder part of visceral hump ; fp, posterior extremity of the foot; fa, anterior part of the foot underlying the head; g, the ctenidium (branchial plume); ', the mantle-skirt tightly spread over the horny shell and pushed with it towards the left side ; i, the spermatic groove; k, the common genital pore (male and female) ; 1, orifice of the grape-shaped (sup- posed poisonous) gland; m, the osphradium (olfac- tory organ of Spengel); n, outline of part of the renal sac (nephridium) below the surface ; 0, external aper- ture of the nephridium ; p, anus, (Original.)*~~

~~*have the anus, in front of this the lobate gill-plume, be- tween the two (hence corresponding in position to that of the Azygobranchia) we have the aperture of the renal*~~

~~*organ.*~~

~~*In front, near the anterior attachment of the gill-*~~

~~*plume, is the osphradium (olfactory organ) discovered by*~~

~~*Fia. 62.*~~

~~*A. Eolis papillosa (Lin.), dorsal view. tentacles ; B. Tethys leporina, dorsal view. c, neck; d, genital pore ;*~~

~~*c, the dorsal "cerata" (hence Ceratobranchia),*~~

~~*h, margin of the foot.*~~

~~*C. Doris (Actinocyclus) tuberculatus mouth: 6, margin of the head; Jf,*~~

~~*epipodium.*~~

~~*growths.*~~

~~*(After Keferstein.)*~~

~~*a, b, posterior and anterior cephalic*~~

~~*a, the cephalic hood ; 6, cephalic tentacles ; e, anus; f, large cerata; g, smaller cerata ;*~~

~~*(Cuy.), seen from the pedal surface. m, sole of the foot ; sp, the mantle-like*~~

~~*D, E. Dorsal and lateral view of Elysia (Actewon) viridis. ep, epipodial out-*~~

~~*(see figs. 7, 68, and 72***), Aplysia, like other Mollusca,*~~

~~*Spengel, yellowish in colour, in the typical position, and overly- ing an olfactory ganglion with typical nerve-connexion (see fig. 20). To the right of Spengel's osphradium is the opening of a peculiar gland which has, when dissected out, the form of a bunch of grapes ; its secretion is said to be poisonous. On the under side of the free edge of the mantle are situated the numerous small cu- taneous glands which, in the large Aplysia camelus (not in other species), form the purple secretion which was known to the ancients. In front of the osphradium is the single genital pore, the aperture of the common or hermaphrodite duct. From this point there stretches forward to the right side of the head a groove—the spermatic groove—down which the spermatic fluid passes. In other Euthyneura this groove may close up and form a canal. At*~~

~~*Fic. 64.—Gonad, and accessory glands and ducts of Aplysia. i, ovo-testis ; h, hermaphrodite duct ; g, albuminiparous gland ; f, vesicula seminalis ; k, open- ing of the albuminiparous gland into the hermaphrodite duct; e, hermaphrodite duct (uterine portion); b, vaginal portion of the uterine duct; c, sperma- theca; d, its duct; a, genital pore, (Original.)*~~

~~*its termination by the side of the head is the muscular*~~

~~*introverted penis.*~~

~~*In the hinder part of the foot (not*~~

~~*shown in any of the diagrams) is the opening of a large*~~

~~*mucous-forming gland very often foot.*~~

~~*found in the Molluscan*~~

~~With regard to internal organization we may commence with the disposition of the renal organ (nephridium), the external opening of which has already been noted. The position of this opening and other features of the renal organ have been determined recently by Mr. J. T. Cunning- ham, Fellow of University College, Oxford, who writes as follows from Naples, February 1883 :—~~

~~'There is considerable uncertainty with respect to the names of the species of Aplysia. There are two forms which are very common in the Gulf of Naples, and which I have used in studying the ana- tomy of the renal organ in the genus. One is quite black in colour, and measures when outstretched eight or nine inches in length. The other is light brown and somewhat smaller, its length usually not exceeding seven inches. The first is flaccid and sluggish in its movements, and has not much power of contraction ; its epipodial lobes are enormously developed and extend far forward along the body ; it gives out when handled an abundance of urple liquid, which is derived from cutaneous glands situated on the under side of the free edge of the mantle. In the Zoological Station this form is known as Ap. leporina ; but according to Blochmann it is iden- tical with 4. Camelus of Cuvier. The other species is 4. depilans ; it is firm to the touch, and contracts forcibly when irritated ; the secretion of the mantle-glands is not abundant, and is milky white in appearance. The kidney has similar relations in both genera, and is identical with the organ spoken of by many authors as the triangular gland. Its superficial extent is seen when the folds covering the shell are cut away and the shell removed ; the external surface forms a triangle with its base bordering the pericardium and its apex directed posteriorly and reaching to the left-hand posterior corner of the shell-chamber. The dorsal surface of the kidney extends to the left beyond the shell-chamber beneath the skin in the space between the shell-chamber and the left epipodium.~~

~~" When the animal is turned on its left-hand side and the mantle- chamber widely opened, the gill being turned over to the left, a part of the kidney is seen beneath the skin between the attachment of the gill and the right epipodium (fig. 63). On examination this is found to be the under surface of~~

~~*the posterior limb of the a the upper surface of which has just been described as lying*~~

~~*eneath the shell. In the posterior third of this portion, close to that edge which is adjacent to the base of the gill, is the external opening (fig. 63, 0).*~~
~~÷~~

~~*"When the pericardium is cut open from above in an animal otherwise entire, the anterior face of the kidney is seen forming the posterior wall of the pericardial chamber ; on the deep edge of this face, a little to the left of the attachment of the auricle to the floor of the pericardium, is seen a depression ; this depression con- tains the opening from the pericardium into the kidney.*~~

~~*"To complete the account of the relations of the organ : the right anterior corner can be seen superficially in the wall of the mantle- chamber above the gill. Thus the base of the gill passes in a slant- ing direction across the right-hand side of the kidney, the posterior end being dorsal to the apex of the gland, and the anterior end ventral to the right-hand corner.*~~

- ~~*As so great a part of the whole surface of the kidney lies adjacent to external surfaces of the body, the remaining part which faces the internal organs is small ; it consists of the left part of the under surface ; it is level with the floor of the pericardium, and lies over the globular mass formed by the liver and convoluted intestine.*~~

~~*'Mere dissection does not give sufficient evidence concerning such communications as these of the kidney in Aplysia. I studied the external opening by taking a series of sections through the sur- rounding region of the gland ; to demonstrate the internal aperture injected a solution of Berlin blue into the pericardium ; it did not fill the whole kidney easily, but ran down into the part adjacent to the base of the gill."*~~

~~*Thus the renal organ of Aplysia is shown to conform to the Molluscan type. The heart lying within the adjacent pericardium has the usual form, a single auricle and ven- tricle. The vascular system is not extensive, the arteries soon ending in the well-marked spongy tissue which builds up the muscular foot, epipodia, and dorsal body-wall.*~~

~~*The alimentary canal commences with the usual buccal mass ; the lips are cartilaginous, but not armed with horny jaws, though these are common in other Opisthobranchs ; the lingual ribbon is multidenticulate, and a pair of salivary glands pour in their secretion. The cesophagus expands into a curious gizzard, which is armed internally with large horny processes, some broad and thick, others spinous, fitted to act as crushing instruments. From this we pass to a stomach and a coil of intestine embedded in the lobes of a voluminous liver; a cecum of large size is given off near*~~

~~*MOLLUSCA*~~

~~*"the commencement of the intestine.*~~

~~*[OPISTHOBRANCHIA.*~~

~~*The liver opens by two ducts into the digestive tract.*~~

~~*The generative organs lie close to the coil of intestine and liver, a little to the left side. When dissected out they appear as represented in fig. 64. The essential reproductive*~~

~~*Fic, 65,—Follicles of the hermaphrodite gonads of Euthyneurous Anisopleura.—A, of Helix; B, of Eolidia. «a, ova; 6, developing spermatozoids ; c, com- mon efferent duct.*~~

~~*organ or gonad consists of both ovarian and testicular cells (see fig. 65). It is an ovo-testis. From it passes a common or hermaphrodite duct, which very soon becomes entwined in the spire of a gland—the albuminiparous gland. The latter opens into the common duct at the point #, and here also is a small diverticulum of the duct y. Passing on, we find not far from the genital pore a glandular spherical body (the spermatheca a) opening by means of a longish duct into the common duct, and then we reach the pore (fig. 63, k). Here the female apparatus terminates. But when the male secretion of the ovo-testis is active, the seminal fluid passes from the genital pore along the spermatic groove (fig. 63,) to the penis, and is by the aid of that eversible muscular organ introduced into the genital pore of a second Aplysia, whence it passes into the spermatheca, there to await the activity of the fe- male element of the ovo-testis of this second Aplysia. After an*~~

~~interval of some days—possibly weeks—the ova of the second Aplysia commence to descend the hermaphrodite duct; they become enclosed in a viscid secre- Fic. 66. ~ Enteric canal of Holidia tion at the point where the al- Pith Bre ae uctages buminiparous gland opens into *; all of which are not a te the duct intertwined with it; Gegeuiens, after Alder and Han- and on reaching the point where °°)~~

~~the spermathecal duct debouches they are impregnated by~~

~~the spermatozoa which escape now from the spermatheca~~

~~and meet the ova.~~

~~The development of Aplysia from the egg presents many~~

~~points of interest from the point of view of comparative~~

~~embryology, but in relation to the morphology of the~~

~~Opisthobranchia it is sufficient to point to the occurrence~~

~~of a trochosphere and a veliger stage (fig. 60), and of a~~

~~shell-gland or primitive shell-sac (fig. 68, sks), which is suc-~~

~~ceeded by a nautiloid shell.~~

~~The nervous system of Aplysia will be found on com- parison of fig. 20, which represents it, with our schematic Mollusc (fig. 1, D) to present but little modification. It 1s in fact a nervous system in which the great ganglion-pairs are well developed and distinct. The Euthyneurous visceral loop is long, and presents only one ganglion (in Aplysia camelus, but two distinct ganglia joined to one another in~~

~~Aplysia hybrida of the English coast), placed at its extreme limit, representing both the right and left visceral ganglia and the third or abdominal ganglion, which are so often separately present. The diagram~~

~~*(fig. 20) shows the nerve connecting this abdomino- visceral ganglion with the olfactory ganglion of Spen- gel. It is also seen to be connected with a more re- mote ganglion—the genital. Such special irregularities in the development of gan- glia upon the visceral loop, and on one or more of the main nerves connected with it, are, as the figures of Molluscan nervous systems given in this article show, very frequent. Our figure of the nervous system of Aplysia does not give the small pair of buccal ganglia which are, as in all Glosso- phorous Molluscs, present upon the nerves passing from the cerebral region to the odontophore.*~~

~~*For a comparison of various Opisthobranchs, Aplysia will be found to present a convenient starting-point. It is one of the more typical Opisthobranchs, that is to say, it belongs to the section Palliata, but other members of the Palliata, namely, Bulla and Tornatella (figs. 52 and 53), are less abnormal than Aplysia in regard to their shells and the form of the visceral hump. They have naked spirally- twisted shells which may be concealed from view in the living animal by the expansion and reflexion of the epipodia,*~~

~~*Fic. 67,—Central nervous system of Fiona (one of the Ceratonotous Opistho- branchs), showing a tendency to fusion of the great ganglia. A, cerebral, pleu- ral, and visceral ganglia united; B, pe- dal ganglion; C, buccal ganglion; D, cesophageal ganglion connected with the puccal; a, nerve to superior cephalic tentacle ; b, nerves to inferior cephalic tentacles; c, nerve to generative organs; d, pedal nerve ; e, pedal commissure ; e', visceral loop or commissure (?). (From Gegenbaur, after Bergh.)*~~

~~*Fic. 68.—Young veliger larva of an Opisthobranch (Pleuro-branchidium). m, mouth; 2, ciliated band marking off the velum; 1g, cerebral ganglion de- veloping from epiblast, within the velar area; ot, otocyst also developing from epiblast ; f, foot; i, intestine; ry, residual nutritive yelk; shs, primi- tive shell-sac or shell-gland. (From Lankester.)*~~

~~*but are not enclosed by the mantle, whilst Tornatella is*~~

~~*remarkable amongst all Euthyneura for possessing an oper-*~~

~~*culum like that of so many Streptoneura.*~~

~~*The great development of the epipodia seen in Aplysia is usual in Palliate Opisthobranchs; it occurs also in Elysia (fig. 62, D) among Non-Palliata ; in Doris it seems prob- able that the mantle-like fold overhanging the foot is to be interpreted as epipodium, the mantle-skirt being alto- gether absent, as shown by the naked position of the gills and anus on the dorsal surface (figs. 61 and 62,C). The whole surface of the body becomes greatly modified in those Non-Palliate forms which have lost, not only the*~~

~~*mantle-skirt and the shell, but also the ctenidium. Many*~~

~~*of these (Ceratonota) have peculiar processes developed on the dorsal surface (fig. 62, A, B), or retain purely*~~

~~*negative characters (fig. 62, D). The chief modification of internal organization presented by these forms, as compared with Aplysia, is found in the condition of the alimentary canal. The liver is no longer a compact organ opening by a pair of ducts into the median digestive tract, but we find very numerous hepatic diverticula on a shortened axial tract (fig. 66). These diverticula extend usually one into each of the dorsal papill or "cerata" when these are present. They are not merely digestive glands, but are sufficiently wide to act as receptacles of food, and in them the digestion of food proceeds just as in the axial portion of the canal. A precisely similar modification of the liver or great digestive gland is found in the Scorpions, where the axial portion of the digestive canal is short and straight, and the lateral ducts sufficiently wide to admit food into the ramifications of the gland there to be digested ; whilst in the Spiders the gland is reduced to a series of simple ceca.*~~

~~*The typical character is retained by the heart, peri- cardium, and the communicating nephridium or renal organ in all Opisthobranchs. An interesting example of this is furnished by the fish-like transparent Phyllirhoé (fig. 58), in which it is possible. most satisfactorily to study in the living animal, by means of the microscope, the course of the blood-stream, and also the reno-pericardial communi- cation. With reference to*~~

~~*the existence of pores placing the vascular system in open communication with the surrounding water, see the paragraph as to Mollusca gener- ally. In a form closely allied to Aplysia (Pleurobranchus) such a pore leading outwards from the branchial vein has been precisely described by Lacaze Duthiers. No such pore has been detected in Aplysia. In many of the Non-Palliate Opisthobranchs the nervous system presents a concentra- tion of the ganglia (fig. 67), contrasting greatly with what we have seen in Aplysia. Not only are the pleural ganglia fused to the cerebral, but also the visceral to these (see in further illustration the condition attained by the Pulmonate Limneeus, fig. 22), and the visceral loop is astonishingly short and insignificant (fig. 67, e'). That the parts are rightly thus identified is probable from Spengel's observation of the os- phradium and its nerve-supply in these forms ; the nerve to that organ, which isplaced somewhat anteriorly—on the dor- sal surface—being given off from the hinder part (visceral) of the right compound ganglion—the fellow to that marked A in fig. 67. The Ceratonotous Opisthobranchs, amongst other specialities of structure, are stated to possess (in some.cases at any rate) apertures at the apices of the "'cerata" or dorsal papillz, which lead from the exterior into the hepatic ceca. This requires confirmation. Some amongst them (Tergipes, Eolis) are also remarkable for possessing peculiarly modified epidermic cells placed in sacs at the apices of these same papilla, which resemble the "thread- cells" of the Planarian Flatworms and of the Ccelentera. The existence of these thread-cells is sufficiently remark- able, seeing that the Non-Palliate Opisthobranchs resemble in general form and habit the Planarian worms, many of which also possess thread-cells. But it is not conceivable that their presence is an indication of genetic affinity between the two groups, rather they are instances of homoplasy. The development of many Opisthobranchia has been examined—e.g., Aplysia, Pleurobranchidium, Elysia, Poly- cera, Doris, Tergipes. All pass through trochosphere and veliger stages, and in alla nautiloid or boat-like shell is developed, preceded by a well-marked "shell-gland" (see figs. 60 and 68). The transition from the free-swimming veliger larva with its nautiloid shell (fig. 60) to the adult form has not been properly observed, and many interesting points as to the true nature of folds (whether epipodia or mantle or velum) have yet to be cleared up by a knowledge of such development in forms like Tethys, Doris, Phyllidia, ce.*~~

~~[PULMONATA.~~

~~As in other Molluscan groups, we find even in closely- | Pulmonata, into a lung, and the ctenidium or branchial allied genera (for instance, in Aplysia and Pleurobran- | plume aborted. The Pneumonochlamyda (represented in~~

~~chidium, greatest differences as to the amount of food-material by which the egg-shell is encumbered. Some form their Diblastula by emboly (fig. 7), others by epiboly (fig. 5) ; and in the later history of the further development of the enclosed cells (arch-enteron) very marked variations occur in closely-allied forms, due to the influence of a greater or less abundance of food-material mixed with the protoplasm of the egg.~~

~~Order 2 (of the Euthyneura).—Pulmonata.~~

~~Characters.—Euthyneurous Anisopleurous Gastropoda, probably derived from ancestral forms similar to the Palliate Opisthobranchia by adaptation to a terrestrial life. The ctenidium is atrophied, and the edge of the mantle-skirt is fused to the dorsal integument by concrescence, except at one point which forms the aperture of the mantle-chamber, thus converted into a nearly closed sac. Air is admitted to this sac for respiratory and hydrostatic purposes, and it thus becomes a lung. An operculum is never present; a contrast being thus afforded with the operculate Pulmonate Streptoneura (Cyclostoma, &c.), which differ in other essential features of structure from the Pulmonata. The Pulmonata are, like the other Euthyneura, hermaphrodite, with elaborately-developed copulatory organs and accessory glands. Like other Euthyneura, they have very numerous small denticles on the lingual ribbon. The ancestral Pulmonata appear to have retained both the right and the left osphradia (Spengel's olfactory organs), since in some (Planorbis, Auricularia) we find the single osphradium to be that of the original left side, whilst in others (Limnzus) it is that of the original right side.~~

~~*In some Pulmonata (Snails) the foot is extended at right angles to the visceral hump, which rises from it in the form of a coil as in Streptoneura ; in others the visceral hump is not elevated, but is extended with the foot, and the shell is small or absent (Slugs).*~~

~~*The Pulmonata are divided into two sub-orders according to the position of the cephalic eyes.*~~

~~*Sub-order 1.—Basommatophora.*~~

~~*Characters.—Eyes placed mediad of the cephalic tentacles at their base ; the embryonic velar area retained in adult life as a pair of cephalic lobes (fig. 70, v); male and female generative apertures separate, placed (as is typical in Anisopleura) on the right side of the neck; visceral hump well developed, with a well-developed shell; aquatic in habit.*~~

~~*Family 1.—Limnwidea. Genera: Limnaus, Lam. (figs. 3, 4, &c.); Chilinia, Gray; Physa, Draparn. ; Ancylus, Geoft. ; Planorbis, Miill., &c. Family 2.—Auriculide.*~~

~~*&c. Sub-order 2.— - Stylommatophora.*~~

~~*Characters.—Eyes placed on the summit of two hollow tentacles ; visceral hump well or not at all developed; shell large and coiled, or minute or absent ; almost exclusively terrestrial.*~~

~~*Family 1.—Helicide.*~~

~~*Genera: Helix, L. (figs. 69, A; 72”); Vitrina, Draparn. ; Suc- cinea, Draparn. ; Bulimus, Scopoli; Achatina, Lam. ; Pupa, Lam. ; Clausilia, Draparn., &c.*~~

~~*Family 2.—Limacide (Slugs).*~~

~~*Genera: Limaz, L.; Incilaria, Benson; Arion, Ferussac (fig.*~~

~~*69, D); Parmacella, Cuvier; Testacella, Cuvier (fig. 69, C), &c. Family 3.—Oncidiade.*~~

~~*Genera: Oncidiwm, Buchanan; Peronia, Blainv. (fig. 72) ;*~~

~~*Vaginulus, Ferussac, &c.*~~

~~*Further Remarks on Pulmonata.—The land-snails and slugs forming the group Pulmonata are widely distinguished from a small set of terrestrial Azygobranchia, the Pneumo- nochlamyda (see above), at one time associated with them on account of their mantle-chamber being converted, as in*~~

~~*Genera: Auricula, Lam. ; Conovulus, Lam. ; Pitharella, Wood.*~~

~~*and other genera observed by Lankester) the | England by the common genus Cyclostoma) have a twisted*~~

~~*Fic. 69.—A series of Stylommatophorous Pulmonata, showing transitional forms*~~

~~*between snail and slug,*~~

~~*A. Helix pomatia (from Keferstein).*~~

~~*B. Helicophanta brevipes (from Keferstein, after Pfeiffer).*~~

~~*C. Testacella haliotidea (from Keferstein),*~~

~~*D. Arion ater, the great Black Slug (from Keferstein). a, Shell in A, B, C, shell-sac (closed) in D; }, orifice leading into the*~~

~~*subpallial chamber (lung).*~~

~~*visceral nerve-loop, an operculum on the foot, a complex rhipidoglossate or tenioglossate radula, and are of distinct sexes; they are, in fact, Azygobranchiate Streptoneura. The Pulmonata have a straight visceral nerve-loop, never an operculum (even in the embryo), and a multidenticulate*~~

~~*) ni ria : f Fic. 70.—A, B, C. Three views of Limnzus stagnalis, in order to show the persistence of the larval velar area v, as the circum-oral lobes of*~~

~~*the adult, m, mouth; f, foot; v, velar area, the margin » corresponding with the ciliated band which demarcates the velar area or velum of the embryo Gas- tropod (see fig. 4, D, E, F, H, I, v). (Original.) radula, the teeth being equi-formal ; and they are hermaphro- dite. Some Pulmonata (Limnezus, &c.) live in fresh-waters although breathing air. The remarkable discovery has been made that in deep lakes such Limnzi do not breathe air, but admit water to the lung-sac and live at the bottom. The lung-sac serves undoubtedly as a hydrostatic apparatus in the aquatic Pulmonata, as well as assisting respiration.*~~

~~*'It is not improbable that here, and in other air-breathing*~~

~~*animals, the hydrostatic function was the primary one, and the respiratory a later development.*~~

~~*PULMONATA. |*~~

~~*The same general range of body-form is shown in Pul- monata as in the Natant Azygobranchia and in the Opis- thobranchia; at one extreme we have Snails with coiled visceral hump, at the other cylindrical or flattened Slugs (see fig. 69). Limpet-like forms are also an found (fig. 71, Ancylus). The foot is al- WS ways simple, with its flat crawling surface | WS extending from end to end, but in the KS embryo Limneus (fig. 4, H) it shows a "r5> bilobed character, which leads on to the ¥ condition characteristic of Pteropoda. et eer The adaptation of the Pulmonata to ter- form aquatic Pul- restrial life has entailed little modification scm) of the internal organization. The vascular system appears to be more complete in them than in other Gastropoda, fine vessels and even capillaries being present in place of lacune, in which arteries and veins find their meeting- point. The subject has not, however, been investigated by the proper methods of recent histology, and our know-*~~

~~*Fia, 72.—Peronia Tonga, a littoral Pulmonate, found on the shores of the Indian and Pacific Oceans (Mauritius, Japan).*~~

~~*ledge of it, as of the vascular system of Molluscs generally, ig most unsatisfactory. In one genus (Planorbis) the plasma of the blood is coloured red by hemoglobin, this being the only instance of the pre- sence of this*~~

~~*body in the blood of Glossophorous Mollusca, though it occurs in corpuscles in the blood of the bivalves Arca and Solen (Lankester, 31).*~~

~~*The generative apparatus of the Snail (Helix) may serve as an ex- ample of the hermaphrodite appa- ratus common to the Pulmonata and Opisthobranchia (fig. 72*). From the ovo-testis, which lies near the apex of the visceral coil, a common hermaphrodite duct v.¢ proceeds, which receives the duct of the compact white albumini- parous gland #.d., and then be- comes much enlarged, the addi- tional. width being due to the development of glandular folds, which are regarded as forming a uterus u. Where these folds cease the common duct splits into two portions, a male and a female. Fia.72*,—Hermaphroditerepro- tha anske deck vd becomes leaky te ere ee mils and muscular near its termination evo-testis; 7.2, hermaphro-*~~

~~*° : dite duct; E.d., albuminipar- at the genital pore, forming the ous gland; a, uterine dilata- penis p. Attached to it is a diver- ee ae ticulum jt. in which the sperma- glands on the female duct; tozoa which have descended from %3¢ page ne re ae one the ovo-testis are stored and mo- ne nid Ca apeed delled into sperm ropes or sperma- ing into the female duct; v.d, tophores. 'The female portion of the duct is more complex. Soon after quitting the uterus it is joined by a long duct leading from a glandular sac, the spermatheca (#,f). In this duct and sac the spermatophores received in copulation from*~~

~~*male duct (vas deferens); 7, penis; fi., flagellum, another snail are lodged. In Helix hortensis the sperma-*~~

~~*theca is simple. In other species of Helix a second duct (as large in Helix aspersa as the chief one) is given off from the spermathecal duct, and in the natural state is closely adherent to the wall of the uterus. This second duct has normally no spermathecal gland at its termination, which is simple and blunt. But in rare cases in Helix aspersa a second spermatheca is found at the end of this second duct. Tracing the widening female duct onwards we*~~

~~*now come to the openings of the digitate accessory glands d, d, which probably assist in the formation of the egg-capsule. Close to them is the remarkable dart-sac ps, a thick-walled sac, in the lumen of which a crystalline four-fluted rod or dart consisting of carbonate of lime is found. It is supposed to act in some way as a stimulant in copulation, but pos- sibly has to do with the calcareous covering of the egg- capsule. Other Pulmonata exhibit variations of secondary importance in the details of this hermaphrodite apparatus.*~~

~~*- The nervous system of Helix is not favourable as an example on account of the fusion of the ganglia to form an almost uniform ring of nervous matter around the cesophagus. 'The Pond-Snail (Limnzeus) furnishes, on the other hand, a very beautiful case of distinct ganglia and connecting cords (fig. 22). The demonstration which it affords of the extreme shortening of the Euthyneurous vis- ceral nerve-loop is most instructive and valuable for com- parison with and explanation of the condition of the nervous centres in Cephalopoda, as also of some Opisthobranchia. The figure (fig. 22) is sufficiently described in the letter- press attached to it; the pair of buccal ganglia joined by the connectives to the cerebrals are, as in most of our figures, omitted. Here we need only further draw attention to the osphradium, discovered by Lacaze Duthiers (82), and shown by Spengel to agree in its innervation with that organ in all other Gastropoda. On account of the shortness of the visceral loop and the proximity of the right visceral ganglion to the cesophageal nerve-ring, the nerve to the osphradium and olfactory ganglion is very long. The posi- tion of the osphradium corresponds more or less closely with that of the vanished right ctenidium, with which it is normally associated. In Helix and Limax the osphradium has not been described, and possibly its discovery might clear up the doubts which have been raised as to the nature of the mantle-chamber of those genera. In Planorbis, which is dexiotropic (as are a few other genera or exceptional varieties of various Anisopleurous Gastropods) instead of being leiotropic, the osphradium is on the left side, and receives its nerve from the left visceral ganglion, the whole series of unilateral organs being reversed. This is, as might be expected, what is found to be the case in all " reversed " Gastropods. It is also the case in the Pulmonate Auricula, which is leiotropic.*~~

~~*The shell of the Pulmonata, though always light and delicate, is in many cases a well-developed spiral "house," into which the creature can withdraw itself ; and, although the foot possesses no operculum, yet in Helix the aperture of the shell is closed in the winter by a complete lid, the "hybernaculum," more or Jess calcareous in nature, which is secreted by the foot. In Clausilia a peculiar modifica tion of this lid exists permanently in the adult, attached by an elastic stalk to the mouth of the shell, and known as the "clausilium." In Limnezus the permanent shell is preceded in the embryo by a well-marked shell-gland or primitive shell-sac (fig. 72***), at one time supposed to be the developing anus, but shown by Lankester to be identical with the "sliell-gland" discovered by him in other Mol- lusca (Pisidium, Pleurobranchidium, Neritina, &c.). As in other Gastropoda Anisopleura, this shell-sac may abnorm- ally develop a plug of chitonous matter, but normally it flattens out and disappears, whilst the cap-like rudiment of the permanent shell is shed out from the dome-like surface*~~

~~*of the visceral hump, in the centre of which the shell-sac existed for a brief period.*~~

~~*In Clausilia, according to the observations of Gegenbaur, the primitive shell-sac does not flatten out and disappear, but takes the form of a flattened closed sac. Within this closed sac a plate of calcareous matter is developed, and after a time the upper wall of the sac disappears, and the calcareous plate continues to grow as the nucleus of the permanent shell. In the slug Testacella (fig. 69, C) the shell-plate never attains a large size, though naked. In other slugs, namely, Limax and Arion, the shell-sac remains permanently closed over the shell-plate, which in the latter*~~

~~*genus consists of a granular mass of carbonate of lime. |*~~

~~*The permanence of the primitive shell-sac in these slugs is a point of considerable interest. It is clear enough that the sac is of a different origin from that of Aplysia (described in the section treating of Opisthobranchia), being primitive instead of secondary. It seems probable that it is identical with one of the open sacs in which each shell-plate of a Chiton is formed, and the series of plate-like imbrications which are placed behind the single*~~

~~*shell-sac on the dorsum of the curious slug, Plectrophorus, suggest the possibility of the formation of a series of shell-sacs on the back of that animal similar to those which we find in Chiton. Whether the closed primitive shell-sac of the slugs (and with it the transient embryonic shell-gland of all other Mollusca) is precisely the same thing as the closed sac in which the calcareous pen or shell of the Cephalopod Sepia*~~

~~*Fic, 72**,—Comparative diagrams of an embryo Slug, Limax (left), and an embryo Cuttle-fish, Loligo (right). sh, internal shell; pk, embryonic renal organ (Stiebel's canal) in Limax ; mt, edge of the mantle-flap in Loligo ; op, cephalic eye; t, cephalic tentacle; m, position of the mouth; Ft, the foot, Fu, the hinder part of the foot drawn out to form the funnel of Loligo ; con, the contractile yelk-sac or hernia-like protrusion of the mid-region of the foot, corresponding to the line of closure of the blastopore in Limneus. N.B.—The blastopore in the embryo of Loligo, which, like that of a bird, is much distorted by excess of food-yelk, does close at the extremity of the yelk-sac con. (Original.)*~~

~~*and its allies is formed, is a further question, which we*~~

~~*shall consider when dealing with the Cephalopoda. It*~~

~~*is important here to note that Clausilia furnishes, us with an exceptional instance of the continuity of the shell or secreted product of the primitive shell-sac with the adult shell. In most other Mollusca (Anisopleurous Gastropods, Pteropods, and Conchifera) there is a want of such continuity; the primitive shell-sac contributes no factor to the permanent shell, or only a very minute knob- like particle (Neritina and Paludina). It flattens out and disappears before the work of forming the permanent shell commences. And just as there is a break at this stage, so (as observed by Krohn in Marsenia = Echinospira) there may be a break at a later stage, the nautiloid shell formed on the larva being cast, and a new shell of a different form being formed afresh on the surface of the visceral hump. It is, then, in this sense that we may speak of primary, secondary, and tertiary shells in Mollusca, recognizing the fact that they may be merely phases fused by continuity of growth so as to form but one shell, or that in other cases they may be presented to us as separate individual things, in virtue of the non-development of the later phases,*~~

~~*MOLLUSCA*~~

~~*[PULMONATA.*~~

~~*or in virtue of sudden changes in the activity of the mantle- surface causing the shedding or disappearance of one phase of shell-formation before a later one is entered upon.*~~

~~*The development of the aquatic Pulmonata from the egg offers considerable facilities for study, and that of Limnzeus has been elucidated by Lankester, whilst Rabl has with remarkable skill applied the method of sections to the study of the minute embryos of Planorbis. The chief features in the development of Limnezus are exhibited in the woodeuts (figs. 8, 4, and 72***), There is not a very large amount of food-material present in the egg of this snail, and accordingly the cells resulting from division are not so unequal as in many other cases. The four cells first formed are of equal size, and then four smaller cells are formed by division of these four so as to lie at one end of the first four (the pole corresponding to that at which the "directive corpuscles" de are extruded and remain). The smaller cells now divide and spread over the four larger cells (fig. 3) ; at the same time a space*~~

~~*Fig, 72***,—Embryo of Limneus stagnalis, at a stage when the Trochosphere is developing foot and shell-gland and becoming a Veliger, seen as a transparent object under slight pressure. ph, pharynx (stomodeal invagination); ¥, v, the ciliated band marking out the velum; ng, cerebral nerve-ganglion ; re,*~~

~~*_ Stiebel's canal (left side), probably an evanescent embryonic nephridium ; sh,*~~

~~*the primitive shell-sac or shell-gland ; pi, the rectal peduncle or pedicle of invagination, its attachment to the ectoderm is coincident with the hindmost extremity of the elongated blastopore of fig. 8, C; tge, mesoblastic (skeleto-trophic and muscular) cells investing gs, the bilobed arch-enteron or lateral vesicles of invaginated endoderm, which will develop into liver ; J, the foot (Original.) —the cleavage cavity or blastoccel—forms in the centre of the mulberry-like mass. Then the large cells recom- mence the process of*~~

~~division and sink into the hollow of the sphere, leaving an elongated groove, the blastopore, on the surface (fig. 3, C, and fig, 4, G). The invaginated cells (derived from the division of the four big cells) form the endoderm or arch-enteron ; the outer cells are the ecto- derm. 'The blastopore now closes along the middle part of its course, which coincides in position with the future "foot." One end of the blastopore becomes nearly closed, and an ingrowth of ectoderm takes place around it to form the stomodzeum or fore-gut and mouth. The other extreme end closes, but the invaginated endoderm cells remain in continuity with this extremity of the blastopore, and form the "rectal peduncle" or "pedicle of invagination" of Lankester (see also the account and figures (fig. 151, A) of the development of the bivalve Pisidium), although the endoderm cells retain no contact with the middle region of the now closed-up blastopore. The anal opening forms at a late period by a very short ingrowth or proctodeum coinciding with the blind termination of the rectal peduncle (fig. 72***, mi). The body-cavity and the muscular, fibrous, and vascular tissues are traced partly to two symmetrically-disposed~~

~~" "mesoblasts," which bud off from the invaginated arch- enteron, partly to cells derived from the ectoderm, which at a very early stage is connected by long processes with the invaginated endoderm, as shown in fig. 3, D. The ex- ternal form of the embryo goes through the same changes as in other Gastropods, and is not, as was held previously to Lankester's observations, exceptional, When the middle and hinder regions of the blastopore are closing in, an equatorial ridge of ciliated cells is formed, converting the embryo into a typical "Trochosphere" (fig. 4, E, F).~~

~~The foot now protrudes below the mouth (fig. 4), and the post-oral hemisphere of the Trochosphere grows more rapidly than the anterior or velar area. The young foot shows a bilobed form (fig. 4, D, 7). Within the velar area the eyes and the cephalic tentacles commence to rise up (fig. 4, D, ¢), and on the surface of the post-oral region is formed a cap- like shell and an encircling ridge, which gradually increases in prominence and becomes the freely depending mantle- skirt. The outline of the velar area becomes strongly emarginated and can be traced through the more mature~~

~~*embryos to the cephalic lobes or labial processes of the adult Limnzus (fig. 70).*~~

~~*This permanence of the distinction of the part known as the velar area through embryonic life to the adult state is exceptional among Mollusca, and is therefore a point of especial interest in Limneus. None of the figures of adult Limneeus in recent works on Zoology show properly the form of the head and these velar lobes, and accordingly the figures here given have been specially sketched for the present article. The increase of the visceral dome, its spiral twisting, and the gradual closure of the space over- hung by the mantle-skirt so as to convert it into a lung-sac with a small contractile aperture, belong to stages in the development later than any represented in our figures.*~~

~~*We may now revert briefly to the internal organization at a period when the Trochosphere is beginning to show a prominent foot growing out from the area where the mid- region of the elongated blastopore was situated, and having therefore at one end of it the mouth and at the other the anus. Fig. 72*** represents such an embryo under slight compression as seen by transmitted light. The ciliated band of the left side of the velar area is indicated by a line extending from v to v; the foot f is seen between the pharynx ph and the pedicle of invagination pz. The mass of the arch-enteron or invaginated endodermal sac has taken on a bilobed form (compare Pisidium, fig. 151), and its cells are swollen (gs and tge). This bilobed sac becomes entirely the liver in the adult ; the intestine and stomach are formed from the pedicle of invagination, whilst the pharynx, cesophagus, and crop form from the stomodzal invagination ph. To the right (in the figure) of the rectal peduncle is seen the deeply invaginated shell-gland ss, with a secretion sh protruding from it. The shell-gland is destined in Limneeus to become very rapidly stretched out, and to disappear. Farther up, within the velar area, the rudiments of the cerebral nerve-ganglion ng are seen separating from the ectoderm. A remarkable cord of cells having a position just below the integument occurs on each side of the head. In the figure the cord of the left side is seen, marked ve. This paired organ consists of a string of cells which are perforated by a duct. The opening of the duct at either end is not known. Such cannulated cells are characteristic of the nephridia of many worms, and it is held that the organs thus formed in the*~~

~~*embryo Limnzus are embryonic nephridia. 'The most important fact about them is that they disappear, and are in no way connected with the typical nephridium of the adult. In reference to their first observer they are conveniently called "Stiebel's canals." Other Pulmonata possess, when embryos, Stiebel's canals in a more fully-developed state, for instance, the*~~

~~*common slug Limax (fig. 72**, pk). Here too they disap- pear during embryonic life. Further knowledge concern- ing them is greatly needed. It is not clear whether there is anything equivalent to them in the embryos of marine Gastropoda or other Mollusca, the ectodermal cells called " embryonic renal organs" in some Gastropod embryos hav- ing only a remote resemblance to them. The three pairs of transient embryonic nephridia of the medicinal leech, the ciliated cephalic pits of Nemertines, and the anterior nephridia of Géphyreans, all suggest themselves for com- parison with these enigmatical canals.*~~

~~*Marine Pulmonata.—Whilst the Pulmonata are essen- tially a terrestrial and fresh-water group, there is one genus of slug-like Pulmonates which frequent the sea- coast (Peronia, fig. 72), whilst their immediate congeners (Onchidium) are found in marshes of brackish water. Sem- per (33) has shown that these slugs have, in addition to the usual pair of cephalic eyes, a number of eyes developed upon the dorsal integument. These dorsal eyes are very perfect in elaboration, possessing lens, retinal nerve-end cells, retinal pigment, and optic nerve. Curiously enough, however, they differ from the cephalic Molluscan eye (for an account of which see fig. 118) in the fact that, as in the vertebrate eye, the filaments of the optic nerve pene- trate the retina, and are connected with the surfaces of the nerve-end cells nearer the lens instead of with the opposite end, The significance of this arrangement is not known, but it is important to note, as shown by Hensen, Hickson, and others, that in the bivalves Pecten and Spondylus, which also have eyes upon the mantle quite distinct from typical cephalic eyes, there is the same relationship as in Onchidiadz of the optic nerve to the retinal cells (fig. 145). In both Onchidiade and Pecten the pallial eyes have prob- ably been developed by the modification of tentacles, such as coexist in an unmodified form with the eyes. The Onchidiadze are, according to Semper, pursued as food by the leaping fish Periophthalmus, and the dorsal eyes are of especial value to them in aiding them to escape from this enemy.*~~

~~*Class II.—SCAPHOPODA.*~~

~~*Characters.—Mollusca Glossophora with the roor adapted to a BURROWING life in sand (figs. 73; 74, f). The body,*~~

~~*Fic 73—Dentalium vulgare, Da C. (after Lacaze Duthiers), A. Ventral view of the animal removed from its shell. B. Dorsal view of the same. C. Lateral view of the same. D, The shell in section. I, Surface view of the shell with gill-tentacles exserted as in life, a, mantle; a', longitudinal muscle ; a", fringe surrounding the anterior opening of the mantle-chamber ; a", the posterior appendix of the mantle; b, anterior circular muscle of the mantle ; b', posterior do. ; ¢, ¢', longitudinal muscle of mantle; ¢, liver; Jf, gonad ; k, buccal mass (showing through the mantle); ¢, left nephridium; s', club-shaped extremity of the foot; w, w', longitudinal blood-sinus of the mantle.*~~

~~*and to a much greater extent the mantle-skirt and the foot, are elongated along the primitive antero-posterlor (oro-anal)*~~

~~*664*~~

~~*axis, and retain, both externally and in the disposition of internal organs, the archi-Molluscan BILATERAL SYMMETRY. The margins of the mantle-skirt of opposite sides (right and left) meet below the foot and fuse by concrescence ; only a small extent in front and a small extent behind of the mantle-margin is left unfused. Thus a CYLINDRICAL FORM is attained by the mantle, and on its surface a TUBU- LAR shell (incomplete along the ventral line in the youngest stages) is secreted (fig. 73, D). The roor is greatly elon- gated, and can be protruded from the anterior mantle-aperture. It has a characteristic clavate form (fig. 74, /).*~~

~~*The pair of typical cTENIDIA are symmetrically deve- loped in the form of numerous gill-filaments (fig. 74, A, 7)*~~

~~*Fic. 74.—Diagrams of the anatomy of Dentalium. A. The anterior portion of the tubular mantle is slit open along the median dorsal line, and its cut margins (a) reflected so as to expose the foot, snout, and gills. 3B. Lateral view with organs showing as though by transparency. ©. Similar lateral view to show the number and position of the nerve-ganglia and cords. a, the*~~

~~*mantle-skirt ; 6, anterior free margin of the same; ¢, hinder extension of the mantle-skirt ; d, the appendix of the mantle-skirt separated by a valve from the peri-anal portion of the sub-pallial chamber, h; e, the snout or oral process; f, the foot; g, the ctenidial filaments ; h, the peri-anal part of the sub-pallial chamber ; 7, the peri-oral yea of the same chamber; k, the anus; l, the left nephridium ; m, the mouth surrounded by pinnate tentacles; n, the buccal mass and odontophore; 0, cesophagus; p, the left lobe of the liver; g.p, pedal ganglion-pair; g.e, cerebral ganglion-pair; g.pl, pleural ganglion-pair; g.v, visceral ganglion-pair. Possibly further research will show that g.pl is the typical visceral ganglion-pair, and that g.v is a pair of olfactory ganglia placed on the visceral loop as in the Lipocephala according to Spengel.*~~

~~*placed at the base of the cylindrical cephalic prominence or snout (fig. 74, ¢). A pair of NEPHRiDtA (fig. 74, J) are present, opening near the anus (fig. 74, %). The, right serves as a genital duct, the left is apparently renal in function. The LIVER (p) is large and bilobed, the lobes divided into parallel lobules. The NERVE-GANGLIA are present (fig. 74, C) as well-marked cerebral, pleural, pedal, and visceral pairs the typical pleural pair being closely joined to the cerebral. The visceral loop or commissure is untwisted, that is to say, the Scaphopoda are EUTHYNEUR- ous. Hearr and distinct vEssELs are not developed; a colourless blood is contained in the sinuses and networks formed by the body-cavity. The Gonaps are either male or female, the sexes being distinct.*~~

~~*The embyro is remarkable for developing five ciliated rings posterior to the ciliated ring and tuft characteristic of the trochosphere larval condition of Molluscs generally. These rings are comparable to those of the larva of Pneu- modermon (fig. 84), and like them disappear.*~~

~~*The class Scaphopoda is not divisible into orders or families. It contains only three genera: Dentalium, L. (figs. 73, 74); Siphonodentalium, Sars.; and Entalium, Dfr.*~~

~~*MOLLUSCA*~~

~~*[CEPHALOPODA.*~~

~~They inhabit exclusively the sand on the sea-coast in depths of from 10 to 100 fathoms.~~

~~It is worthy of remark that the Scaphopoda constitute among the Glossophora a parallel to the sand-boring forms so common among the Lipocephala (such as Solen and Mya). This parallelism is seen in the special mode of elongation of the body, in the form of the foot, and in the tubular form of the mantle brought about by the concrescence of its ventral margins, as in the Lipocephala mentioned. The cylindrical shell of Dentalium is also comparable to the two semi-cylindrical valves of the shell of Solen ; or, better, to the tubular shell of Aspergillum and Teredo. Nevertheless, it is necessary to consider the Scaphopoda as standing far apart from the Lipocephala, and as having no special genetic but only a homoplastic relationship to them, in consequence of their possessing a well-developed odonto- phore, the characteristic organ of the Glossophora never possessed by any Lipocephala.~~

~~Class IJI.—CEPHALOPODA.~~

~~Characters.—Mollusca Glossophora with the roor prim- arily adapted to a FREE-SWIMMING mode of life. The archi-Molluscan BILATERAL SYMMETRY predominates both in the external and internal organs generally, though in many cases (especially the smaller forms) a one-sided dis- placement of primitively median organs and a suppression of one of the primitively paired organs is to be noted.~~

~~An ANTERIOR, MEDIAN, and POSTERIOR region of the FooT can be distinguished (fig. 75, (4), (5), (6)), corre- sponding to but probably not derived from the pro-, meso-,~~

~~Fic. 75.—Diagrams of a series of Molluscs to show the form of the foot and its regions, and the relation of the visceral hump to the antero-posterior and dorso-ventralaxes. (1) A Chiton. (2) A Lamellibranch. (3) An Anisopleur- ous Gastropod. (4) A Thecosomatous Pteropod. (5) A Gymnosomatous Pteropod. (6) A Siphonopod (Cuttle). A, P, antero-posterior horizontal axis; D, V, dorso-ventral vertical axis at right angles to A, P; 0, mouth; a, anus; ms, edge of the mantle-skirt or flap; sp, sub-pallial chamber or space ; ff,~~

~~*fore-foot; m/f, mid-foot ; hf, hind-foot; ¢, cephalic eyes ; ed, centro- dorsal point (in 6 only).*~~

~~*and meta-podium of Gastropoda. The fore-foot invariably has the HEAD MERGED into it, and grows up on each side (right and left) of that part so as to surround the mouth, the two upgrowths of the fore-foot meeting on the dorsal aspect of the snout,—whence the name Cephalopoda. In the more typical forms of both branches of the class, the peri-oral portion of the foot is drawn out into paired arm-*~~

~~*PTEROPODA. |*~~

~~*like processes, either very short and conical (Clio, Eurybia), or lengthy (Pneumodermon, Octopus) ; these may be beset with suckers or hooks, or both. The mid-foot (fig. 75, m/) is expanded into a pair of muscular lobes right and left, which either are used for striking the water like the wings of a butterfly (Pteropoda), or are bent round towards one another so that their free margins meet and constitute a short tube,—the siphon or funnel (Siphonopoda). The hind foot is either very small or absent.*~~

~~*A distinctive feature of the Cephalopoda is the ABSENCE of anything like the ToRston of the visceral mass seen in the Anisopleurous Gastropoda, although as an exception this torsion occurs in one family (the Limacinide).*~~

~~*The anus, although it may be a little displaced from the median line, is (except in Limacinidx) approximately median and posterior. The MANTLE-SKIRT may be aborted (Gymnosomatous Pteropoda) ; when present it is deeply produced posteriorly, forming a large sub-pallial chamber around the anus. As in our schematic Mollusc, by the side of the anus are placed the single or paired apertures of the NEPHRIDIA, the GENITAL APERTURES (paired only in Nau- tilus, in female Octopoda, female Ommastrephes, and male Eledone), and the paired crENrD1A (absent in all Pteropoda). The VISCERAL HUMP or dome is elevated, and may be very much elongated (see fig. 75, (4), (5), (6)) in a direction almost at right angles to the primary horizontal axis (A, P in fig. 75) of the foot.*~~

~~*A SHELL is frequently, but not invariably, secreted on the visceral hump and mantle-skirt of Cephalopoda ; but there are both Pteropoda and*~~

~~*Siphonopoda devoid of any shell, The shell is usually light in substance or lightened by air-chambers in correlation with the free-swimming habits of the Cephalopoda. It may be external, when it is box-like or boat-like, or internal, when it is plate-like. Very numerous minute pigmented sacs capable of expansion and contraction, and: known as CHROMATOPHORES, are usually present in the integument in both branches of the class. The GoNADs of both sexes are developed in one individual in some Cephalopoda (Pteropoda), in others the sexes are separate:*~~

~~*SENSE-ORGANS, especially the cephalic eyes and the oto- cysts, are very highly developed in the higher Cephalopoda. The osphradia have the typical form and position in the lower forms, but appear to be more or less completely replaced by other olfactory organs in the higher. The normal NERVE-GANGLIA are present, but the connectives are shortened, and the ganglia concentrated and fused in the cephalic region. Large special ganglia (optic, stellate, and aaa are developed in the higher forms (Siphono- poda).*~~

~~*The Cephalopoda exhibit a greater range from low to high organization than any other Molluscan class, and hence they are difficult to characterize in regard to several groups of organs; but they are definitely held together by the existence in all of the encroachment of the fore-foot so as*~~

~~*Dp*~~

~~*Fig. 77.*~~

~~*Fig, 76. Fic. 76.—Spirialis bulimoides, Soul., one of the Limacinide enlarged (from Owen), C€ C, pteropodial lobes of the mid-foot ; f, operculum carried on the hind-foot; g, spiral shell. Fic. 77. —Operculum of Spirialis enlarged.*~~

~~*to surround the head, and by the functionally important BILOBATION OF THE MID-FOOT.*~~

~~*MOLLUSCA*~~

~~Two very distinct branches of the Cephalopoda are to be recognized: the one, the Pteropoda, more archaic in~~

~~the condition of its bi- lobed mid-foot, including a number of minute, and in all probability degen- erate, oceanic forms of simplified and obscure organization ; the other, the Siphonopoda, con- taining the Pearly Nautilus and the Cuttles, which have for ages (as their fossil remains show) dominated among the in- habitants of the sea, be- ing more highly gifted in special sense, more varied in movement, more powerful in pro-~~

~~portion to size, and more Fia,~~

~~heavily equipped with owen).~~

~~"7a,—Cymbulia Peronii, Cuvier (from C, C, the expanded pteropodial~~

~~destructive weapons of lobes or wing-like fins of the mid-foot, offence than any other marine organisms. Branch a.—PTEROPODA.~~

~~Characters.—Cephalopoda in which the mid-region of the foot is (as compared with the Siphonopoda) in its more~~

~~primitive condition, being relatively largely developed and drawn out into a pair of wing-like muscular lobes (identical with the two halves of the siphon of the Siphon- opoda) which are used as paddles (see figs. 76-86). The hind-region of the foot is often aborted, but may carry an operculum (figs. 76, 77). The fore-region of the foot (that embracing the head) is also often rudimentary, but may be drawn out into one or more pairs of tentacles, simulating cephalic tentacles, and provided with suckers (figs. 84, 85).~~

~~Though the visceral hump is not twisted except in the Limacinide (fig. 76), there is a very general tendency to one-sided development of the viscera, and of their external apertures (as contrasted with Siphonopoda). The ctenidia are aborted, with the possible exception of the processes (fig. 85, c) at the end of the body of Pneumodermon. The vas- cular system resembles that of the Gastropoda. The ne- phridium is a single tubular body~~

corresponding to the right nephridium of the typi- cal pair of the archi- Mollusc. The anal aperture is usually placed a little to the left of to the right.

h

Fic. 78.—Styliola acicula, Rang. sp. en-

larged (from Owen). C, C, the wing- like lobes of the mid-foot; d, median fold of same; e¢, copulatory organ ; h,

ointed extremity of the shell; 4, an- itor margin of the shell; 1, stomach; 0, liver; u, hermaphrodite gonad.

the median line, more rarely

In the Limacinide it has an exceptional

position, owing to the torsion of the visceral mass, as In

Anisopleurous Gastropoda.

XVI.—84

666

Jaws and a lingual ribbon are present as in typical Glossophora, the dentition of the ribbon and the number of jaw-pieces presenting a certain range of variation. Sense-

Fig. 79. Fig. 80.

Fia. 79.—Cavolinia tridentata, Forsk. from the Mediterranean, magnified two diameters (from Owen), a, mouth; b, pair of cephalic tentacles; C, C, ptero- podial lobes of the mid-foot; d, median web connecting these ; é, e, processes of the mantle-skirt reflected over the surface of the shell; g, the shell en- closing the visceral hump; h, the median spine of the shell.

~~*Fig, 80.—Shell of Cavolinia tridentata, seen from the side. /f, postero-dorsal surface; g, antero-ventral surface; h, median dorsal spine ; 7, mouth of the shell.*~~

~~*organs are present in the form of cephalic eyes in very few forms (Cavolinia, Clione, and in an undescribed form dis- covered by Suhm during the "Challenger" Expedition) ; oto- cysts are universally present. The osphradia are present in typical form, although the ctenidia are aborted ; only one osphradium (the right of the typical pair) is present (fig. 87). The gonads are both male and female in the same individual. The genital aperture is single. Copulatory or- gans, often of consider- able size, are present (fig. 86, 2).*~~

~~*The mantle-skirt is present in one divi- sion of the Pteropoda (Thecosomata), and in these an extensive sub- pallial chamber is de- veloped, the walls of which in the absence of ctenidia have a branchial function. In asecond division (Gym- Fro, 81,—Embryo of Cavolinia tridentata (from nosomata), which com- Balouy afte 1), onus medion poysn prises forms highly de-*~~

~~*h, heart; 7, intestine ; ot, otocyst; q, shell; 7, veloped in regar d to nephridium ; s, cesophagus ; o, sac containing the processes of the*~~

~~*nutritive yelk; mb, mantle-skirt; me, sub-*~~

~~*pallial chamber; Kn, contractile sinus. fore-foot, the mantle-skirt is aborted. A shell is developed on the surface of the visceral hump and mantle-skirt of the Thecosomata, whilst in the Gymnosomata, which have no mantle-skirt, there is in the adult animal no shell. The embryo passes through a trochosphere and a veliger stage (fig. 81), provided with boat-like shell, except in some Gymnosomata in which the Trochosphere with its single velar ciliated band becomes metamorphosed into a larva which has three additional ciliated bands but no velum (resembling the larva of the Scaphopod Dentalium) ; this banded larva does not form a larval shell (fig. 84),*~~

~~*The Pteropoda are divided into two orders,*~~

~~*Order 1.—Thecosomata.*~~

~~*Characters.— Pteropoda provided with a mantle-skirt,*~~

~~*MOLLUSCA*~~

~~*[SIPHONOPODA.*~~

~~*and with a delicate hyaline shell developed on the surface of the visceral hump and mantle-skirt ; visceral hump, and consequently the shell, spirally twisted in one family, the Limacinide ; shell often with con- tracted mouth and di- lated body, its walls sometimes drawn out into spine-like processes, which are covered by reflexions of the free margin of the mantle (Cavolinia, figs. 79, 80). Family 1.—Cymbuliide. Genera: Tiedemannia, Chj.; Halopsyche, The- ceurybia (figs. 82, 83), Cymbulia, P. and L. (fig. 77a). Family 2. — Conulartidz (fossil). Genus: Conularia, Mill. Family 3.— Tentaculitide*~~

~~*(fossil). =~ seg oe Let so*~~

~~*: ; om Owen). Much enlarged ; the body-wa es | 7 Poutacutanes, removed. a, the mouth; c, the pteropodial Schlth. ; Cornulites, jobes of the foot; f, the centrally-placed Schlth. ; Coleoprion, hind-foot; d, l, e, three pairs of tentacle-like Sandb. processes placed at the sides of the mouth,*~~

~~*and developed (in all probability) from the fore-foot; 0', anus; y, genital pore ; /, retractor muscles ; 0 and p, the liver ; u, ¥, w, genitalia.*~~

~~*Family 4.—Hyalcidex.*~~

~~*' Genera: Triptera, Q. and G.; Styliola, Les. (fig. 78); Balantium, Leh. ; Vaginella, Dand. ; Cleodora, P. and L.; Diacria, Gr.; Pleuwropus, Esch.; Cavolinia, Gioni. (figs.*~~

~~*79, 80, 81).*~~

~~*Family 5.—Thecide.*~~

~~*Genera: Theca, Low ; Pterotheca, Salt.*~~

~~*Family 6.—Limacinide.*~~

~~*Genera: Eccyliomphalus, Porti.; Heterofusus, Fg. ; Spirialis, E. 8. (fig. 76); Limacina, Cuv.*~~

~~*Order 2.—Gymnosomata.*~~

~~*Characters.—Pteropoda devoid of mantle- | skirt and shell; tentacular processes of the | forefoot well developed and provided with suckers,*~~

~~*Family 1.—Pterocymodoceidz.*~~

~~*Genus: Pterocymodoce, Kef. Fic. 83.—Shell*~~

~~*Family 2.—Clionide. Mi porns Genera: Cliodita, Q. and G.; Clionopsis, Trosch.; ensis; 'the*~~

~~*Clione, Pall. (fig. 86). Family 3.—Pnewmodermide. Genera: J'richocyclus, Esch. ; Spongobranchia, d'Orb.; Pnewmodermopsis, Kef.; Pneumodermon, Cuv. (fig. 85).*~~

~~*lower figure shows the na- tural size.*~~

~~*Branch 6.—STPHONOPODA.*~~

~~*Cephalopoda in which the two primarily divergent right | and left lobes of the mid-region of the foot have their free borders recurved towards the middle line, where they are either held in apposition (Tetrabranchiata), or fused with one another to form a complete cylinder open at each end (Dibranchiata). This fissured or completely closed tube is the siphon (fig. 75, (6), mf) characteristic of the Siphono- poda, and is used to guide the stream of water expelled by the contractions of the walls of the branchial chamber. The pallial skirt is accordingly well developed and muscular, subserving by its contractions not only respiration but locomotion. The visceral hump is never twisted, and ac- cordingly the main development of the pallial skirt and chamber is posterior, the excretory apertures, anus, and gills having a posterior position, as in the archi-Mollusc. At the same time the visceral hump is usually much elon- gated in a direction corresponding*~~

~~*to an oblique line be- tween the vertical dorso-ventral and the horizontal antero- posterior axes (see fig. 75, (6)).*~~

~~*SIPHONOPODA. | MOLLUSCA 667*~~

~~*The fore-part of the foot which surrounds the mouth, as in all Cephalopoda, is drawn out into four or five pairs of lobes, sometimes short, but usually elongated and even fili-*~~

~~*or through the nephridia. It has no connexion with the vascular system. The nephridia are always paired sacs, the walls of which invest the branchial advehent vessels (figs. 104, 108). They open each by a pore into the viscero-*~~

~~*mL HIN ¢ }*~~

~~*Fig. 84 Fig. 85.*~~

~~*Fic. 84.—Larve of Pneumodermon (from Balfour, after Gegenbaur). The pre-oral ciliated band of the trochosphere stage (velum) has atrophied. In A three post-oral circlets of cilia are present. The otocysts are seen, and the rudiments of a pair of processes growing from the head. In B the fore- most ciliated ring has disappeared ; the cephalic region is greatly developed, and, as compared with the adult (fig. 85), is large and free 5 the pair of hook- bearing processes on each side of the mouth are retractile, probably part of the fore-foot. At the base of the cephalic snout are seen the pair of arm- like processes (fore-foot) provided with suckers, and behind these the broad pteropodial lobes or wing-like fins of the mid-foot.*~~

~~*Fig, 85.—Pneumodermon violaceum, d'Orb, ; magnified five diameters. a, the sucker-bearing arms; 8, the fins of the mid-foot (in the middle line, between these, is seen the sucker-like median portion of the foot, by means of which the animal can crawl as a Gastropod); c, the four branchial processes. (After Keferstein.)*~~

~~*form. These lobes either carry peculiar sheathed tentacles (Nautilus), or, on the other hand, acetabuliform suckers, which may be associated with claw-like hooks (Dibranchiata). The hind-foot is probably represented by the valve which depends from the inner wall of the siphon in*~~

many cases. hu MYyYy? A shell (figs. 89, 100) AN EONS is very generally present WY WW wah affording protection to GINS. ct bev 7 the visceral mass and 7 Y YN & \ \ \ i ,

attachment for muscles. It may be external or en-

closed in dorsal upgrow- sa Brot, ee i magnified two ‘ iameters,—postero-ventral aspect. a, the ing folds of the mantle, cephalic region carrying a ikeee pairs of

which (except in Spirula) cephalic cones provided each with very nu-merous minute sucker-like processes, and

close up at anearlyperiod surrounded by a hood-like upgrowth,—

and b, the more elongated tentacles (the of. development, so as to retractile eye-tentacles are not seen, being

form a shut sac in which placed dorsally); ¢, the pteropodial fins ; the shell is secreted. The hus’ grthe vagina; s the penis. Crom ctenidia are well deve- Owen, after Eschricht.) loped as paired gill-plumes, serving as the efficient bran- chial organs (figs. 101, 103, and fig. 2, B).

The vascular system is very highly developed ; the heart consists of a pair of auricles and a ventricle (figs. 104, 105). Branchial hearts are formed on the advehent vessels of the branchie. It is not known to what extent Vs. the minute subdivision of the arteries extends, or ® osp. whether there is a_ true

: Fic. 87..—Enlarged diagram of the nerve capillary system. centres of sete agi (from Spen- : 7 \ _ gel, after Souleyet). CeR, right cere-

The pericardium mse bral ganglion; Pl.R, right pleural tended so as to form a very apg T. right weds pension; : is. R., right visceral ganglion ; Vis.L.*

large ’ sac passing among left visceral ganglion ; cpe, right cere- the viscera dorsal wards and __ bro-pedal connective ; cpl, right cere- . as bro-

~~*pleural connective ; Osp., osphra- sometimes containing the ium connected by a nerve with the*~~

~~*ovary or testis—the viscero- "ht visceral ganglion. pericardial sac—which opens to the exterior either directly*~~

~~*go oe URE lk*~~

~~*Fic, 88.—Male (upper) and female (lower) specimens of Nautilus pompilius as seen in the expanded condition, the observer looking down on to the buccal cone e; one-third the natural size linear. The drawings have been made from actual specimens by A. G. Bourne, B.Sc., and serve to show the natural disposition of the tentaculiferous lobes and tentacles of the circum-oral portion of the foot in the living state, as well as the great differences between the two sexes, a, theshell; 6, the owter ring-like expansion (annular lobe) of the circum-oral muscular mass of the fore-foot, carrying nineteen tentacles on each side—posteriorly this is enlarged to form the "hood" (marked v in fig. 89 and m. in figs. 90 and 91), giving off the pair of tentacles marked g in the present figure; c, the right and left inner lobes of the fore- foot, each carrying twelve tentacles in the female, in the male subdivided into p, the "'spadix" or hectocotylus on the left side, and q, the "anti-spadix," a group of four tentacles on the right side,—it is thus seen that the subdivided right and left inner lobes of the male correspond to the undivided right and left inner lobes of the female; d, the inner inferior lobe of the fore-foot, a bilateral structure in the female carrying two groups, each of fourteen tenta- cles, separated from one another by a lamellated organ , supposed to be olfactory in function—in the male the inner inferior lobe of the fore-foot is very much reduced, and has the form of a paired group of lamelle (d in the upper figure); e, the buccal cone, rising from the centre of the three inner lobes, and fringing the protruded calcareous beaks or jaws with a series of minute papille ; f, the tentacles of the outer circum-oral lobe or annular lobe of the fore-foot projecting from their sheaths ; g, the two most posterior tentacles of this series belonging to that part of the annular lobe which forms the hood (m. in figs. 90 and 91); i, superior ophthalinic tentacle; k, inferior ophthalmic tentacle; 1, eye; ™, aired laminated organ on each side of the pase of the inner inferior lobe Cd of the female, probably olfactory in func- tion; n, olfactory lamelle upon the inner*~~

inferior lobe (in the female); 0, the siphon (mid-foot) ; p, the spadix (in the male), the hectocotylized portion of the left inner lobe of the fore-foot representing four moditied tentacles, eight being left unmodified; q, the anti-spadix (in the male), being four of the twelve tentacles of the right inner lobe of the fore-foot isolated from the remaining eight, and representing on the right side the differentiated spadix of the left side. The four tentacles of the anti-spadix are set, three on one base and one on a separate base. ;

There are thus in the female, where they are most numerous, ninety-four tentacles, thirty-eight on the outer annular lobe, four ophthalmic (a pair to each eye), twelve on each of the right and left inner lobes, and twenty-eight on the inner inferior lobe.

pericardial sac except in Nautilus. The anal aperture is median and raised ona papilla. Jaws (fig. 88, e) and a lin- gual ribbon (fig. 107) are well developed. The jaws have the form of a pair of powerful beaks, either horny or calcified (Nautilus), and are capable of inflicting severe wounds.

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Sense-organs are highly developed ; the eye exhibits a very special elaboration of structure in the Dibranchiata, and a remarkable archaic form in the Nautilus. Otocysts are present in all, The typical osphradium is not present,

Fic. 89.—Lateral view of the female Pearly Nautilus, contracted by spirit and lying in its shell,

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[SIPHONOPODA,

term hectocotylization is applied to this modification (see figs. 88, 95, 96). Elaborate spermatophores or sperm-ropes are formed by all Siphonopoda, and very usually the female possesses special capsule-forming and nidamental glands for providing envelopes to the eggs (fig. 101, g.n.). The egg of all Siphonopoda is large, and the development is much modified by

~~*the presence of an excessive amount of food-material diffused in the protoplasm of the egg-cell. Trochosphere and veliger stages of development are conse- quently not recognizable.*~~

~~*The Siphonopoda are divisible into two orders, the names of which (due to Owen) de- scribe the number of gill-plumes present ; but in fact there are several characters of as great importance as those derived from the gills by which the members of these two orders are separated from one another.*~~

~~*Order 1.—Tetrabranchiata (= Schizosiphona, Tentaculifera).*~~

~~*Characters. — Siphonopodous Cephalopods in which the inrolled lateral margins of the inid-foot are not fused, but form a siphon by apposition (fig. 101). The circum-oral lobes of the fore-foot carry numerous sheathed ten- tacles (not suckers) (fig. 88). There are two pairs of ctenidial gills (hence Tetrabranchiata), and two pairs of nephridia, consequently four nephridial apertures (fig. 101). 'The viscero-*~~

~~*tle right half of which is cut away (from Gegenbaur, after Owen). a, visceral hump ; 6, por- pericardial chamber opens by two independent tion of the free edge of the mantle-skirt reflected on to the shell,—the edge of the mantie-skirt apertures to the exterior and not into the*~~

~~*can be traced downwards and forwards around the base of the mid-foot or siphon 7;.1, J, super- fae ficial origin of the retractor muscle of the mid-foot (siphon), more or less firmly attached to the nephridial sacs.*~~

~~*There are two oviducts*~~

~~*shell, of which a small piece (s) is seen between the letters 1,1; s (farther back) points to the /,, : . siphuncular pedicle, which is broken off short and not continued, as in the perfect state, through (right and left) in the female and two sperm*~~

~~*the whole length of the siphuncle of the shell, also marked s and s'; 0 points to the right eye; d t is placed near the extremities of the contracted tentacles of the outer or annular lobe of the*~~

ucts in the male, the left duct in both

fore-foot,—the jointed tentacles are seen protruding a little from their long cylindrical sheaths ; v, SCX€S being rudimentary.

the dorsal "hood" formed by an enlargement in this region of the annular lobe of the fore- foot (m. in figs, 90, 91); V, a swelling of the mantle-skirt, indicating the position on its inner .

face of the nidamental] gland (sce fig. 101, g.7.).

A large external shell either coiled or straight is present, and is not enclosed by reflexions of

except in Nautilus, but other organs are present in the | the mantle-skirt, except such narrow-mouthed shells as

Fic, 90.—Spirit specimen of female Pearly Nautilus, removed from its shell, and seen from the antero-dorsal aspect (drawn from nature by A. G. Bourne). m., the dorsal "hood" formed by the enlargement of the outer or annular lobe of the fore-foot, and corresponding to the sheaths of two tentacles (g, g in fig. 88); ., tentacular sheaths of Jateral portion of the annular lobe; u., the left cye; b., the nuchal plate, continuous at its right and left posterior angles with the root of the mid-foot, and corresponding to the nuchal cartilage of Sepia; c., visceral hump; d., the free margin of the mantle-skirt, the middle letter d. points to that portion of the mantle-skirt which is reflected over a part of the shell as seen in fig. 89, 0; the cup-like fossa to which 0. and d. point in the present figure is occupied by the coil of the shell; g.a. points to the lateral continuation of the nuchal plate b. to join the root of the mid-foot or siphon.

cephalic region, to which an olfactory function is ascribed both in Nautilus and in the other Siphonopoda.

The gonads are always separated in male and female individuals. The genital aperture and duct is sometimes single, when it is the left; sometimes the typical pair is developed right and left of the anus. The males of nearly all Siphonopoda have been shown to be characterized by a peculiar

~~modification of the arm-like processes or lobes of the fore-foot, connected with the copulative function. The~~

~~that of Gomphoceras, which were probably enclosed by the a~~

~~Fic. 91.—Lateral view of the saine specimen as that drawn in fig. 90. Letters as in that figure with the following additions—e points to the concave margin of the mantile-skirt leading into the sub-pallial chamber ; 9, the mid-foot or siphon ; k, the superficial origin of its retractor muscles closely applied to the shell and serving to hold the animal in its place; J, the siphuncular pedicle of the visceral hump broken off short ; v, v, the superior and inferior ophtha}- mic tentacles.~~

~~mantle as in the Dibranch Spirula. The shell consists of a series of chambers, the last formed of which is occupied by the body of the animal, the hinder ones (successively deserted) containing gas (fig. 89).~~

~~The pair of cephalic eyes are hollow chambers (fig. 118, A) opening to the exterior by minute orifices (pinhole camera), and devoid of refractive structures. A pair of osphradia are present at the base of the gills (fig. 101, olf). Salivary glands are wanting. An ink-sac is not present. Branchial hearts are not developed on the branchial adve- hent vessels.~~

~~SIPHONOPODA. |~~

~~Family 1.—Nautilide.~~

~~Genera: [Orthoceras], Breyn.; [Cyrtoceras], Goldfuss ; [Gompho- ceras], Miinster ; [Phragmoceras], Brod. ; [Gyroceras], Meyer ; { Ascoceras], Barraude ; [Oncoceras], Hall ; [Litwites], Breyn.; {Trochoceras], Barraude ; Nazwtilus, L. (figs. 88, 89, 90, &c.) ; [Clymenia], Miinst. ; [Nothoceras], Barraude.~~

~~Family 2.—Ammonitidez.~~

~~Genera: [Bactrites], Sanderg.; [Goniatites], de Haan ; [Rhabdo- ceras], Hauer; {Clydonites], Hauer; [Cochloceras], Hamer ; [Baculina], d'Orb.; [Ceratites], de Haan ; [Baculites], Lam. ; [Toxoceras|, d'Orb.;~~

~~*[Crioceras], Leveillé ; [Ptychoceras],d'Orb. ; [HIamites], Parkinson; [Ancyloceras], d'Orb.; [Scaphites], Parkinson ; [Ammonites], Breyn.; [Twrrilites], Lam. ; [HIelio- ceras], d'Orb.; [HIeteroceras], d'Orb.*~~

~~*N.B.—The names in brackets are those of extinct genera.*~~

~~*Order 2.—Dibranchiata (= HIolosiphona, Acetabulifera).*~~

~~*Characters.—Siphonopodous Cephalopods in which the inflected lateral margins of the mid-foot are fused so as to form a complete tubular siphon (fig. 96, 7). The circum- oral lobes of the fore-foot carry suckers disposed upon them in rows (as in the Pteropod Pneumodermon), xot tentacles (see figs. 92, 95, 96). There is a single pair of typical ctenidia (fig. 103) acting as gills (hence Dibranchiata), and*~~

~~*Fig. 92.—Sepia officinalis, L., half the natural size, as seen when dead, the long prehensile arms being withdrawn from the pouches at the side of the head, in which they are carried during life when not actually in use. a, neck; b, lateral fin of the mantle-sac ; c, the eight shorter arms of the fore-foot; d, the two long prehensile arms ; ¢, the eyes.*~~

~~*a single pair of nephridia opening by apertures right and left of the median anus (fig. 103, r), and by similar internal pores into the pericardial chamber, which consequently does not open directly to the surface as in Nautilus. The ovi- ducts are sometimes paired right and left (Octopoda), sometimes that of one side only is developed (Decapoda, except Ommastrephes). The sperm-duct is always single except, according to Keferstein, in HIedone moschata.*~~

~~*A plate-like shell is developed in a closed sac formed by the mantle (figs. 98, 99), except in the Octopoda, which have none, and in Spirula (fig. 100, D) and the extinct Belemni- tide, which have a small chambered shell resembling that*~~

~~*of Nautilus with or without the addition of plate-like and cylindrical accessory developments (fig. 100, C).*~~

~~*The pair of cephalic eyes are highly-developed vesicles with a refractive lens (fig. 120), cornea, and lid-folds,—the vesicle being in the embryo an open sac like that of Nautilus (fig. 119). Osphradia are not present, but cephalic olfac- tory organs are recognized. One or two pairs of large salivary glands with long ducts are present. An ink-sac formed as a diverticulum of the rectum and opening near the anus is present in all Dibranchiata (fig. 103, ¢), and has been detected even in the fossil Belemnitide. Branchial hearts are developed on the two branchial advehent blood- vessels (fig. 104, vc', w).*~~

~~*The Dibranchiata are divisible into two sub-orders, accord- ing to the number and character of the arm-like sucker- bearing processes of the fore-foot.*~~

~~*Fic. 93.—Decapodous Siphonopods; one-fourth the natural size linear. A. Cheiroteuthis Veranyi, d'Orb. (from the Mediterranean). B. Thysanoteuthis rhombus, Troschel (from Messina). C. Loligopsis cyclura, Fér. and d'Orb. (from the Atlantic Ocean). Sub-order 1.—Decapoda. Characters.—Dibranchiata with the fore-foot drawn out into eight shorter and two longer arms (prehensile arms), the latter being placed right and left between the third and fourth shorter arms. The suckers are stalked and strengthened by a horny ne 3 The eyes are large and have a horizontal in place of a sphincter-like lid. The body is elongated and provided with lateral fins (lamelliform expansions of the mantle). The month has a buccal membrane. The mantle-margin is locked to the base of the siphon by a specially-developed cartilaginous apparatus. Numerous water-pores are pre- sent in the head and anterior region of the body, leading into re- cesses of the integument of unknown significance. The oviduct is single ; large nidamental glands are present. 'The viscero-pericar- dial space is large, and lodges the ovary (Sepia). There is always a shell present which is enclosed by the upgrowth of the mantle, so as to become " internal." Section a.—Decapoda Calciphora. Character.—Internal shell calcareous. Family 1.—Spirulide. Genus: Spirula, Lam. (fig. 100, D). Family 2.—Belemnitide.*~~

~~*Genera: [Spirulirostra], d'Orb. (fig. 100, C); [Beloptera], Desh. ; [Belemnosis], Edw. ; [Conoteuthis], d'Orb. (fig. 100, A); Acan thoteuthis], R. Wag.; [Belemnites], Lister, 1678 ; [Belemnitella], d'Orb.; [Xiphoteuthis], Huxley.*~~

~~*Family 3.—Sepiadz. , Genera: Sepia, L. (figs. 92, 98, &c.); [Belosepia], Voltz ; Cocco- teuthis, Owen. J*~~

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~~*Section b.—Decapoda Chondrophora.*~~

~~*Character.—Internal shell horny.*~~

~~*Sub-section a.—Myopside (d'Orb.). Eye with closed cornea, so that the surrounding water does not touch the lens; mostly frequenters of the coast. Family 1.—Loligidz. .*~~

~~*Genera: Loligo, Schneid. (figs. 99, &c.); Loliolus, Steenstrup ; Sepioteuthis, Blv.; [T'cuthopsis], Desl. ; [Leptoteuthis], Meyer ; [Belemnosepia], Ag. ; [Beloteuthis], Mist.*~~

~~*Family 2.—Scpiolide. Genera: Scpiola, Schneid. ; Rossia, Owen.*~~

~~*Sub-section 8.—Oigopsidex (d'Orb.).*~~

~~*Eye with open cornea, so that the surrounding water bathes the anterior surface of the lens ; mostly pelagic animals. Family 3.—Cranchiade.*~~

~~*Genus: Cranchia, Leach (fig. 94, C). Family 4.—Loligopsidx.*~~

~~*Genus: Loligopsis, Lam. (fig. 93, C). Family 5.—Chetrotewthide, _*~~

~~*Genera: Chetrotewthis, d'Orb. (fig. 93, A); Histiotewthis, d'Orb. Family 6.—Thysanoteuthide.*~~

~~*Genus: Thysanoteuthis, Troschel (fig. 93, B). Family 7.—Onychoteuthide.*~~

~~*Genera: Gonatus, Gray; Onychoteuthis, Lichtenst. (fig. 97); Ouy- chia, Lesueur ; Enoploteuthis, d'Orb., Veranya, Krohn ; [Plesio- teuthis], A. Wag. ; [Celeno], Miinst. ; Dosidicus, Steenstrup ; Ommastrephes, a' Orb.*~~

~~*Sub-order 2.—Octopoda.*~~

~~*Characters.—Dibranchiata with the fore-foot drawn out into eight arms only; suckers sessile, devoid of horny ring; eyes small, the*~~

~~*Fic. 94.—Octopodous Siphonopods; one-fourth the natural size linear, A. Pinnoctopus cordiformis, Quoy and Gain (from New Zealand). B. Tremoc- topus violaceus, Ver. (from the Mediterranean). C. Cranchia scabra, Owen (from the Atlantic Ocean; one of the Decapoda). D. Cirrhoteuthis Miilleri, Esch. (from the Greenland coast).*~~

~~*outer skin can be closed over them by a sphincter-like movement. The body is short and rounded; the mantle has no cartilaginous locking apparatus, and is always fused to the head dorsally by a broad nuchal band. No buccal membrane surrounds the mouth. The siphon is devoid of valves. The oviducts are paired; there are no nidamental glands. The viscero- pericardial space is reduced to two narrow canals, passing from the nephridia to the capsule of the genital gland. There is no shell on or in the visceral hump. Family 1.—Cirrhoteuthidz.*~~

~~*Genus: Cirrhoteuthis, Esch. (Sciadephorus, Reinh.) (fig. 94, D). Family 2. —Octopodidex.*~~

~~*Genera: Pinnoctopus, d'Orb. (fig. 94, A); Octopus, Lam. (fig. 95) ;*~~

~~*Sceurgus, Trosch.; Eledone, Leach ; Bolitena, Steenstrup.*~~

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~~*Family 3.—Philonexide.*~~

~~*Genera: Tremoctopus, Delle Chiaje (Philonexis, d'Orb.) (fig. 94, B); Parasira, Steenstrup (Octopus catenulatus, Fer., is the female, and Octopus*~~

~~*carena, Ver., is the male of the one species of this genus according to Steenstrup (fig. 96)) ; Argonauta, L. (the shell of this genus is formed only in the female by the expanded ends of the two large "arms"' of the fore-foot).*~~

~~*Fig. 95.—A. Male specimen of Octopus granlandicus, with the third arm of the right — hectocotylized. B. The extremity of the hectocotylized arm magnified.*~~

~~*Further Remarks on the Cephalopoda.—tin order to give a more precise conception of the organization of the Cephalo- poda in a concrete form we select the Pearly Nautilus fo further description, and in pass- * , ing its structure in review we \ shall take the opportunity of comparing here and there the peculiarities presented by that animal with those obtaining in allied forms. In the last edition of this work the Pearly Nautilus was made the subject of a de- tailed exposition by Professor | Owen, and it has seemed accord- | ingly appropriate that it should } be somewhat fully treated on / the present occasion also. The figures which illustrate the pre- sent description are (excepting fig. 89) original, and prepared from dissections (made under the direction of the writer) of a male and female Nautilus pompilius, lately purchased for the Museum of University College, London.*~~

~~*Visceral Hump and Shell.— The visceral hump of Nautilus (if we exclude from considera- tion the fine siphuncular pedicle Fie. 96.—Male of Parasira catenu- which it trails, as it were, behind emigre Sipe nm ter it) is very little, if at all, affected arm. a, 2, 4, 4, the first, second, by the coiled form of the shell {te aA ne bush: & Wee which it carries, since the animal penis ee ee dar always slips forward in the shell ylizec as it grows, and inhabits a cham- ™ent Wren ont Sig aie tog ber which is practically cylindri- 4, the siphon. (From Gegenbaur.) of being accumulated behind the inhabited chamber as a coiled series of air-chambers, we should have a more correct indication in the shell of the extent and form of the animal's*~~

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~~hectocotylized arm; y, the fila- cal (fig. 89). Were the deserted chambers thrown off instead~~

~~CEPHALOPODA. |~~

~~body. Amongst Gastropods it is not very unusual to find the animal slipping forward in its shell as growth advances and leaving an unoccupied chamber in the apex of the shell. This may indeed become shut off from the occupied cavity by a transverse septum, and a series of such septa may be formed (fig. 42), but in no Gastropod are these apical chambers known to contain a ae~~

~~gas during the life of the aL animal in whose shell they occur. A further peculiarity of the Nautilus shell and of that of the allied extinct Am- monites, Scaphites, Orthoceras, &c., and of the living Spirula, is that the series of deserted air-chambers are traversed by a cord-like pedicle extending from the centro-dorsal area of the visceral hump to the small- est and first-formed chamber of the series. No structure com- parable to this siphuncular pedicle is known in any other Mollusca. Its closest repre-~~

~~sentative is found in the so- called "contractile cord" of the remarkable form Rhabdo- pleura, referred according to present knowledge to the Poly- zoa. There appears to be no doubt that the deserted cham- bers of the Nautilus shell con- tain in the healthy living animal a gas which serves to lessen the specific gravity of the whole organism. The gas is said to be of the same com- position as the atmosphere, with a larger proportion of nitrogen. With regard to its origin we have only conjec- tures. Each septum shutting off an air-containing chamber is formed during a period of quiescence, probably after the reproductive act, when the vis- ceral mass of the Nautilus may be slightly shrunk, and gas is secreted from the dorsal inte- gument so as to fill up the space previously occupied by the animal, A certain stage is reached in the growth of the animal when no new cham- bers are formed. The whole process of the loosening of the animal in its chamber and of its slipping forward when a new septum is formed, as well as the mode in which the air-chambers may be used as a hydrostatic apparatus, and the relation to this use, if any, of the siphuncular pedicle, is involved in obscurity, and is the subject of much in- genious speculation. In connexion with the secretion of gas by the animal, besides the parallel cases ranging from the Protozoon Arcella to the Physoclistic Fishes, from the Hydroid Siphonophora to the insect-larva Corethra, we have the identical phenomenon observed in the closely- allied Sepia when recently hatched. Here, in the pores of the internal rudimentary shell, gas is observable, which has necessarily been liberated by the tissues which secrete~~

~~Fic. 97.Head and circum-oral pro- cesses of the fore-foot of Onycho- teuthis (from Owen), a, neck; }, eye; c, the eight short arms; d, long prehensile arms, the clavate extre- mities of which are provided with suckers at e, and with a double row of hooks beyond at f. The tempo- rary conjunction of the arms by means of the suckers enables them to act in combination.~~

~~the shell, and not derived from any external source~~

~~(Huxley).~~

The coiled shell of Nautilus, and by analogy that of the Ammonites, is peculiar in its relation to the body of the animal, inasmuch as the curvature of the coil proceeding

:

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Fig. 98. Fig. 99.

Fic. 98.—The calcareous internal shell of Sepia officinalis, the so-called cuttle- bone. a, lateral expansion; b, anterior cancellated region; ¢, laminated region, the lamine enclosing air.

Fig. 99.—The horny internal shell or gladius or pen of Loligo.

from the centro-dorsal area is towards the head or forward, instead of away from the head and backwards as in other discoid coiled shells such as Planorbis; the coil is in fact absolutely reversed in the two cases. Amongst the extinct allies of the Nauti-

lus (Tetrabranch- iata) we find shells of a variety of

shapes, open coils such as Scaphites, leading on to per-

— SES

fectly cylindrical GY shells with chaniber We

: YG succeeding cham- We ber in a_ straight ' line (Orthoceras),

~~*whence again we may pass to the cork-screw spires formed by the shell*~~

~~*of Turrilites.*~~

~~*Fic. 100.—Internal shells of Cephalopoda Siphono-*~~

~~*oda. A. Shell of Conoteuthis dupiniana, d'Orb. Whilst the Tetra- (from the Heocoudan s peace : al -|*~~

~~*: Sepia orbigniana, Fér. (Mediterranean). ©. she branchiata, so far as of Spirulirostra 'Bellardii, d'Orb. (from the Mio- we can recognize cene of Turin). The specimen is cut so as to show*~~

~~*jn section the chambered shell and the laminated*~~

~~*their remains, are "guard" deposited upon its surface. D. Shell of*~~

~~*characterized by Spirula levis, Gray (New Zealand).*~~

~~*these large chambered shells, which, as in Nautilus, were with the exception of some narrow-mouthed forms such as Gomphoceras but very partially covered by reflexions of the mantle-skirt (fig. 89, 5), the Dibranchiata present an interesting series of gradations, in which we trace— a) the diminution in relative size of the chambered shell; (6) its complete investiture by reflected folds of the mantle (Spirula, fig. 100, D); (c) the concrescence*~~

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~~*of the folds of the mantle to form a definitely-closed shell-sac; (d) the secretion by these mantle-folds or walls of the shell-sac of additional laminz of calcareous shell- substance, which invest the original shell and completely alter its appearance (Spirulirostra, fig. 100, C; Belemnites) ; (c) the gradual dwindling and total disappearance of the original chambered shell, and survival alone of the calcare- ous laminz deposited by the inner walls of the sac (Sepia, fig. 100, B); (f) the disappearance of all calcareous sub- stance from the pen or plate which now represents the contents of the shell-sac, and its persistence as a horny body simply (Loligo, fig. 99); (g)*~~

~~*the total disappearance of the shell-sac itself, and consequently of its pen or plate, nevertheless the rudiments of the shell-sac appearing in the embryo and then evanescing (Octopus). The early appearance of the sac of the mantle in which the shell is enclosed, in Dibranchiata, has led to an erroneous identifi- cation of this sac with the primitive shell-sac of the archi- Molluse (fig. 1), of Chiton (fig. 10, A), of Arion (fig. 69, D, a), and of the normally-developing Molluscan embryo (figs. 68 and 72***, sh). The first appearance of the shell- sac of Dibranchiata is seen in figs. 121 and 122, its forma- tion as an open upgrowth of the centro-dorsal area of the embryo having been demonstrated by Lankester (34) in 1873, who subsequently showed (85) that the same shell-sac appears and disappears without closing up in Argonauta and Octopus, and pointed out the distinctness of this sac and the primitive shell-gland. The shell of the female Argonauta is not formed by the visceral hump, but by the enlarged arms of the foot, which are in life always closely applied to it.*~~

~~*The shell of such Pteropoda as have shells (the Thecoso- mata) is excessively light, and fits close to the animal, no air-chambers being formed. It is important to note that in this division of the Cephalopoda there is the same tend- ency, which is carried so far in the Dibranchiate Siphono- pods, for the mantle-skirt to be reflected over and closely applied to the shell (¢.g., Cavolinia, figs. 79 and 80). But in Pteropoda there is no complete formation of a closed sac by the reflected mantle, no thickening of the enclosed shell, no dwindling of the original shell and substitution for it of a laminated plate. The variety of form of the glass-like shells of Pteropoda is a peculiarity of that*~~

~~*roup.*~~

~~*: eo, Foot, Mantle-skirt, and Sub-pallial Chamber.—In the Pearly Nautilus the ovoid visceral hump is completely encircled by the free flap of integument known as mantle- skirt (fig. 91, d, e). In the antero-dorsal region this flap is enlarged so as to be reflected a little over the coil of the shell which rests on it. In the postero-ventral region the flap is deepest, forming an extensive sub-pallial chamber, at the entrance of which e is placed in fig. 91. A view of the interior of the sub-pallial chamber, as seen when the mantle-skirt is retroverted and the observer faces in the direction indicated*~~

~~*by the reference line passing from e in fig. 91, is given in fig. 101. With this should be com- pared the similar view of the sub-pallial chamber of the Dibranchiate Sepia (fig. 103). It should be noted as a difference between Nautilus and the Dibranchiates that in the former the nidamental gland (in the female) lies on that surface of the pallial chamber formed by the dependent mantle-flap (figs. 101, g.n.; 89,7), whilst in the latter it lies on the surface formed by the body-wall; in fact in the former the base of the fold forming the mantle-skirt com- prises in its area a part of what is unreflected visceral hump in the latter.*~~

~~*The apertures of the two pairs of nephridia, of the vis- cero-pericardial sac, of the genital ducts, and of the anus are shown in position on the body-wall of the pallial cham- ber of Nautilus in figs. 101, 102. There are nine apertures*~~

~~*USCA*~~

~~*in all, one median (the anus), and four paired. Besides these apertures we notice two pairs of gill-plumes which*~~

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~~*are undoubtedly typical ctenidia, and a short papilla (the*~~

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~~*Fra. 101.—View of the postero-ventral surface of a female Pearly Nautilus, the mantle-skirt © being completely reflected so as to show the inner wall of the sub-pallial chamber (drawn from nature by A. G. Bourne). a, muscu- lar*~~

~~band passing from the mid-foot to the integument; b, the valve on the surface of the funnel-like mid-foot, partially concealed by the inrolled lateral margin of the latter; c, the mantle-skirt retroverted ; an, the median anus ; x, post-anal papilla of unknown significance ; g.n., nidamental gland ; 7.0v., aperture of the right oviduct; l.ov., aperture of the rudimentary left oviduct (pyriform sac of Owen); neph.a., aperture of the left anterior nephridium ; neph.p, aperture of the left posterior nephridium ; visceper., left aperture of the viscero-pericardial sac; olf, the left osphradium placed near the base of the anterior gill-plume. The four gill-plumes (ctenidia) are not lettered,~~

~~osphradium) between each anterior and posterior gill-plume (see figs. 101, 102, and explanation). As compared with this in a Dibranchiate, we find (fig. 103) only four aper-~~

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~~G Hy i 7 // | / \ ; \ " [/ ue | ee | 'Y Y \ ) ;] Si ae Pal : nye rag ~V aa 3 te ey SN Mick) ~ == Zam SS ES Be : Ce et S2> . CZ E , \ neph.p- an. x ViSCPR~~

~~Fic. 102.—View of the postero-yentral surface of a male Pearly Nautilus, the mantle-skirt © being completely reflected so as to show the inner wall of the sub-pallial chamber, and the four ctenidia and the foot cut short (drawn from nature by A. G. Bourne). pe., penis, being the enlarged termination of the right spermatic duct; L.sp., aperture of the rudimentary left spermatic duct (pyriform sac of Owen). Other letters as in fig. 101.~~

~~tures, viz., the median anus with adjacent orifice of the ink-sac, the single pair of nephridial apertures, and one asymmetrical genital aperture (on the left side), except in female Octopoda and a few others where the genital ducts and their apertures are paired. No viscero-peri- cardial pores are present on the surface of the pallial chamber, since in the Dibranchiata the viscero-pericardial~~

~~sac opens by a pore into each nephridium instead of directly to the surface. A single pair of ctenidia (gill- plumes) is present instead of the two pairs in~~

~~*Nautilus. The existence of two pairs of ctenidia and of two pairs of nephridia in Nautilus, placed one behind the other, is highly remarkable. The interest of this arrangement is in relation to the general morphology of the Mollusca, for it is impossible to view this repetition of organs in a linear series as anything else than an instance of metameric seg- mentation, comparable to the segmentation of the ringed worms and Arthropods. The only other example which we have of this metamerism in the Mollusca is presented by the Chitons. There we find not two pairs of ctenidia merely, but sixteen pairs (in some species more) accom-*~~

~~*Fig. 103.—View of the postero-ventral surface of a male Sepia, obtained by cutting longitudinally the firm mantile-skirt and drawing the divided halves apart. This figure is strictly comparable with fig. 101. C, the head ; J, the mid-foot or siphon, which has been cut open so as to display the valve i; R, the glandular tissue of the left nephridium or renal-sac, which has been cut open (see fig. 108); P, P, the lateral fins of the mantile-skirt ; Br, the single pair of branchie (ctenidia); a, the anus,—immediately below it is the open- ing of the ink-bag ; ¢, cartilaginous socket in the siphon to receive c', the cartilaginous knob of the mantle-skirt,— the two constituting the "pallial hinge apparatus" characteristic of Decapoda, not found in Octopoda ; g, the azygos genital papilla and aperture ; 44, valve of the siphon (possibly the rudi- mentary hind-foot); m, muscular band connected with the fore-foot and mid-foot (siphon) and identical with the muscular mass k in fig. 915 7, renal*~~

~~*apille, carrying the apertures of the nephridia; v.br, branchial efferent i odoeel : v.07', bulbous enlargements of the branchial blood- vessels (see figs. 104, 108); ¢, ink-bag. (From Gegenbaur.)*~~

~~*panied by a similar metamerism of the dorsal integument, which carries eight shells. In Chiton the nephridia are not affected by the metamerism as they are in Nautilus. It is impossible on the present occasion to discuss in the way which their importance demands the significance of these two instances among Mollusca of incomplete or partial metamerism ; but it would be wrong to pass them by with- out insisting upon the great importance which the occur- rence of these isolated instances of metameric segmentation in a group of otherwise unsegmented organisms possesses,*~~

~~*and the light which they may be made to throw upon the nature of metameric segmentation in general.*~~

~~*The foot and head of Nautilus are in the adult inex- tricably grown together, the eye being the only part belong- ing primarily to the head which projects from the all- embracing foot. The fore-foot or front portion of the foot*~~

~~*in Nautilus has the form of a number of lobes carrying tentacles and completely surrounding the mouth (figs. 88, 89,91). The mid-foot is a broad median muscular process which exhibits in the most interesting manner a curling in of its margins so as to form an incomplete siphon (fig. 101), a condition which is completed and rendered per- manent in the tubular funnel, which is the form presented by the corresponding part of Dibranchiata (fig. 96). The hind-foot possibly is represented by the valvular fold on the surface of the siphon-like mid-foot. In the Pteropoda the wing-like swimming lobes (epipodia or pteropodia) corre- spond to the two halves of the siphon, and are much the largest element of the foot. The forefoot surrounding the head is often quite small, but in Clione and Pneumo- dermon carries lobes and suckers. A hind-foot is in Ptero- poda often distinctly present; it is open to doubt as to whether the corresponding region of the foot in Siphono- poda is developed at all. .*~~

~~*The lobes of the fore-foot of Nautilus and of the other Siphonopoda require further description. It has been doubted whether these lobes were rightly referred (by Huxley) to the fore-foot, and it has been maintained by some zoologists (Grenacher, Jhering) that they are truly processes of the head. It appears to the present writer to be im- possible to doubt that the lobes in question are the fore- portion of the foot when their development is examined (see fig. 121, and especially fig. 72**), further, when the fact is considered that they are innervated by the pedal ganglion, and, lastly, when the comparison of such a Siphonopod as Sepia is made with such a Pteropod as Pneumodermon in its larval (fig. 84) aswell as in its adult condition (fig. 85). The*~~

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~~Fic. 104.—Circulatory and excretory organs of Sepia (from Gegenbaur, after John Hunter). br, branchie (ctenidia); ¢, ventricle of the heart; a, anterior artery (aorta); a', posterior artery; v, the right and left auricles (enlarge- ments of the efferent branchial veins); v', efferent branchial vein on the free face of the gill-plume; v.c, vena cava ; vi, ve', advehent branchial vessels (branches of the vena cava, see fig. 108) ; ve', abdominal veins ; 2, branchial hearts and appendages; re, e, glandular substance of the nephridia developed on the wall of the great veins on their way to the gills. The arrows indicate the direction of the blood-current.~~

~~larval Pneumodermon shows clearly that the sucker-bearing~~

~~processes of that Mollusc are originally far removed from~~

~~the head and close in position to the pteropodial lobes of the foot. By differential growth they gradually embrace and obliterate the head, as do the similar sucker-bearing processes of Sepia. In both cases the sucker-bearing pro- cesses are "fore-foot." The fore-foot of Nautilus completely surrounds the buccal cone (fig. 88, ¢), so as to present an appearance with its expanded tentacles similar to that of the dise of a sea-anemone (Actinia). No figure has hitherto been published exhibiting this cireum-oral disc with its tentacles in natural position as when the animal 1s alive and swimming, the small figure of Valenciennes being deficient in detail. All the published figures represent the actual appearance of the contracted spirit-specimens. Mr A. G. XVI.—85~~

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~~Bourne, B.Sc., of University College, has prepared from actual specimens the drawings of this part in the male and female Nautilus reproduced in fig.~~

~~88, and has restored the parts to their natural form when expanded. The drawings show very strikingly the difference between male and female. In the female (lower figure), we observe in the centre of the disc the buccal cone e carrying the beak-like pair of jaws which project from the finely papillate buccalmembrane. Three tentaculiferous lobes of the fore-foot are in immediate contact with this buccal cone; they are the right and left (c, c) inner lobes, as we propose to call them, and the in- ferior inner lobe (d),—called inferior because it really lies ventralwards of the mouth. This inner inferior lobe is clearly a double one, representing a right and left inner inferior lobe fused into one. A lamellated organ on its sur- face, probably olfactory in function (n),marks the separation of the constituent halves of this double lobe. Each half carries a group of fourteen tentacles. The right and the left inner lobes (c, c) each carry twelve tentacles. Hx-~~

~~{ B Ct D a E eee ee dee ee ba. A ae Dee Z al '2 a x ae v Ea ae v ee YS Fe ¥ i ¦~~

~~Fic. 105.—Diagram to show the relations of the heart in the Mollusca (from Gegenbaur). A. Part of the dorsal vascular trunk and transverse trunks of awormn, 2. Ventricle and auricles of Nautilus. C. Of a Lamellibranch, of Chiton, or of Loligo. D. Of Octopus. EH, Of a Gastropod. a, auricle; »v, ventricle ; ac, arteria cephalica (aorta); ai, arteria abdominalis, The arrows show the direction of the blood-current.~~

~~ternal to these three lobes the muscular substance of the mouth-embracing foot is raised into a wide ring, which becomes especially thick and large in the dorsal region where it is notably modified in form, offering a concavity into which the coil of the shell is received, and furnish- ing a protective roof to the retracted mass of tentacles. This part of the external annular lobe of the fore-foot is called the "hood" (figs. 90, 91, m.). The median antero-posterior line traversing this hood exactly corresponds to the line of concrescence of the two halves of the fore-foot, which primitively grew forward one on each side of the head, and finally fused together along this line in front of the mouth. The tentacles carried by the great annular lobe are nineteen on each side, thirty-eight in all. They are somewhat larger than the tentacles carried on the three inner lobes. The dorsalmost pair of tentacles (marked g in fig. 88) are the only ones which actually belong to~~

~~that part of the disc which forms the great dorsal hood m. The hood is, in fact, to a large extent formed by the enlarged sheaths of these two tentacles. In the Ammonites (fossil Tetrabranchiata allied to Nautilus) the dorsal surface of the hood secreted a shelly plate in two pieces, known to palzontologists as Trigonellites and Aptychus. Possibly, however, this double plate was carried on the surface of the bilobed nidamental gland with the form and sculptur- ing of which, in Nautilus, it closely agrees. All the ten- tacles of the circum-oral disc are set in remarkable tubular sheaths, into which they can be drawn. The sheaths of some of those belonging to the external or annular lobe are seen in fig. 91, marked ». The sheaths are muscular as well as the tentacles, and are simply tubes from the base of which the solid tentacle grows. The functional signifi- cance of this sheathing arrangement is as obscure as its morphological origin. With reference to the latter, it appears highly probable that the tubular sheath represents~~

~~the cup of a sucker such as is found on the fore-foot of the | variations in for~~

~~MOLD 8. 4~~

~~{CEPHALOPODA.~~

~~Dibranchiata. In any case, it seems to the writer impos- sible to doubt that each tentacle, and its sheath on a lobe of the circum-oral disc of Nautilus, corresponds to a sucker on such a lobe of a Dibranchiate. Keferstein follows Owen in strongly opposing this identification, and in regarding such tentacle as the equivalent of a whole lobe or arm of a Decapod or Octopod Dibranch. We find in the details of these structures, especially in the facts concerning the hectocotylus and spadix, the most conclusive reasons for dissenting from Owen's view. We have so far enumer- ated in the female Nautilus ninety tentacles. Four more remain which have a very peculiar position, and almost lead to the suggestion that the eye itself is a modified tentacle. These remaining tentacles are placed one above (before) and one below (behind) each eye, and bring up the total to ninety-four (fig. 91, v, v). They must be con- sidered as also belonging to the fore-foot which thus sur- rounds the eye.~~

~~*In the adult male Nautilus we find the following im- portant differences in the tentaculiferous disc as compared with the female (see upper drawing in fig. 88). The inner inferior lobe is rudimentary, and carries no tentacles. It is represented by three groups of lamellz (d), which are not fully exposed in the drawing. The right and left inner lobes are subdivided each into two portions, The right shows a larger portion carrying eight tentacles, and smaller detached groups (q) of four tentacles, of which three have their sheaths united whilst one stands alone. These four tentacles may be called the ‘“‘anti-spadix.” The left inner lobe shows a similar larger portion carrying eight tentacles, and a curious conical body in front of it corresponding to the anti-spadix. This is the “spadix” of Van der Hoeven (36). It carries no tentacles, but is terminated by imbri- cated lamelle. These lamelle appear to represent the four tentacles of the anti-spadix of the right internal lobe, and are generally regarded as corresponding to that modification of the sucker-bearing arms of male Dibranchiate Siphono- pods to which the name “hectocotylus” is applied. The spadix is in fact the hectocotylized portion of the fore- foot of the male Nautilus. The hectocotylized arm or lobe of male Dibranchiata is connected with the process of copu- lation, and in the male Nautilus the spadix has probably a similar significance, though it is not possible to suggest how it acts in this relation. It is important to observe that the modification of the fore-foot in the male as com- pared with the female Nautilus is not confined to the existence of the spadix. The anti-spadix and the reduction of the inner inferior lobe are also male peculiarities. The external annular lobe in the male does not differ from that of the female ; it carries nineteen tentacles on each side. The four ophthalmic tentacles are also present. Thus in the male Nautilus we find altogether sixty-two tentacles, the thirty-two additional tentacles of the female being repre- sented by lamelliform structures.*~~

~~*If we now compare the fore-foot of the Dibranchiata with that of Nautilus, we find in the first place a more simple arrangement of its lobes, which are either four or five pairs of tapering processes (called “ arms”) arranged in a series around the buccal cone, and a substitution of suckers for tentacles on the surface of these lobes (figs. 92, 95, 96). The most dorsally-placed pair of arms, corresponding to the two sides of the hood of Nautilus, are in reality the most anterior (see fig. 75, (6)), and are termed the first pair. In the Octopoda there are four pairs of these arms (figs. 94, 95), in the*~~

~~*Decapoda five pairs, of which the fourth is greatly elongated (figs. 92, 93). In Sepia and other Deca- poda (not all) each of these long arms is withdrawn into a pouch beside the head, and is only ejected for the purpose of prehension. The figures referred to show some of the m which these arms may assume. In the*~~

~~*Octopoda they are not unfrequently connected by a web, and form an efficient swimming-bell. The suckers are placed on the ad-oral surface of the arms, and may be in one, two, or four rows, and very numerous. In place of suckers in some genera we find on certain arms or parts of the arms horny hooks ; in other cases a hook rises from the centre of each sucker. The hooks on the long arms of Onychoteuthis are drawn in fig. 97. The fore-foot, with its apparatus of suckers and hooks, is in the Dibranchiata essentially a prehensile apparatus, though the whole series of arms in the Octopoda serve as swimming organs, and in many (eg., the Common Octopus or Poulp) the sucker- bearing surface is used as a crawling organ.*~~

~~*In the males of the Dibranchiata one of the arms is more or less modified in connexion with the reproductive function, and is called the "hectocotylized arm." This name is derived from the condition assumed by the arm in those cases in which its modification is carried out to the greatest extent. These cases are those of the Octo- pods Argonauta argo and Parasira catenulata (fig. 96). In the males of these the third arm (on the left side in Argonauta, on the right side in Parasira) is found before the breeding season to be represented by a globular sac of integument. This sac bursts, and from it issues an arm larger than its neighbours, having a small sac at its extremity in Parasira (fig. 96, #), from which subsequently a long filament issues. Before copulation the male charges this arm with the spermatophores or packets of spermatozoa removed from its generative orifice beneath the mantle-skirt, and during coitus the arm becomes detached and is left adhering to the female by means of its suckers. A new arm is formed at the cicatrix before the next breeding season. The female, being much larger than the male, swims away with the detached arm lodged beneath her mantle-skirt. There, in a way which is not understood, the fertilization of the*~~

eggs is effected. Specimens of the female Parasira with the detached arm adherent were examined by Cuvier, who mistook the arm for a parasitic worm and gave to it the name Hectocotylus. Accordingly, the correspondingly modified arms of other Siphonopoda are said to be hecto-cotylized. Steenstrup has determined the hectocotylized condition of one or other of the arms in a number of male Dibranchs as follows :—in all, excepting Argonauta and Parasira, the modification of the arm is slight, consisting in a small enlargement of part or the whole of the arm, and the obliteration of some of its suckers, as shown in fig. 95, A, B; in Octopus and Eledone the third right arm is hectocotylized; in Rossia the first left arm is hectocotylized along its whole length, and the first right arm also in the middle only ; in Sepiola only the first left arm along its whole length; in Sepia it is the fourth left arm which is modified, and at its base only ; in Sepioteuthis, the same at its apex ; in Loligo, the same also at its apex; in Loliolus, the same along its whole length; in Ommastrephes, Onychoteuthis, and Loligopsis no hectocotylized arm has hitherto been observed.

In the females of several Dibranchs (Sepia, &c.) the packets of spermatozoa or spermatophores received from the male have been observed adhering to the smaller arms. How they are passed in this case by the female to the ova in order to fertilize them is unknown.

Musculature, Fins, and Cartilaginous Skeleton.—W ithout 'entering into a detailed account of the musculature of Nautilus, we may point out that the great muscular masses of the fore-foot and of the mid-foot (siphon) are ultimately traceable to a large transverse mass of muscular tissue, the ends of which are visible through the integument on the right and left surfaces of the body dorsal of the free flap of the mantle-skirt (fig. 89, J, /, and fig. 91, &). These muscular ares have a certain adhesion to the shell,

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and serve both to hold the animal in its shell and as the

fixed supports for the various movements of the tentaculi-

ferous lobes and the siphon. They are to be identified with the ring-like area of adhesion by which the foot-muscle of the Limpet is attached to the shell of that animal (see fig. 27). Inthe Dibranchs a similar origin of the muscular masses of the fore-foot and mid-foot from the sides of the shell—modified, as this is, in position and relations—can be traced.

In Nautilus there are no fin-like expansions of the integu- ment, whereas such occur in the Decapod Dibranchs along the sides of the visceral hump (figs. 92, 93). As an excep- tion among Octopoda lateral fins occur in Pinnoctopus (fig. 94, A), and in Cirrhoteuthis (fig. 94, D). In the Ptero-podous division of the Cephalopoda such fin-like expansions of the dorsal integument do not occur, which is to be con- nected with the fact that another region, the mid-foot, which in Siphonopods is converted into a siphon, is in them expanded as a pair of fins.

In Nautilus there is a curious plate-like expansion of integument in the mid-dorsal region just behind the hood, lying between that structure and the portion of mantle- skirt which is reflected over the shell. This is shown in fig. 90, 6. If we trace out the margin of this plate we find that it becomes continuous on each side with the sides of the siphon or mid-foot. In Sepia and other Deca- pods (not in Octopods) a closely similar plate exists in an exactly corresponding position (see 6 in figs. 110,111). In Sepia a cartilaginous development occurs here immediately below the integument forming the so-called "nuchal plate," drawn in fig. 116, D. The morphological significance of this nuchal lamella, as seen both in Nautilus and in Sepia, is not obvious. Cartilage having the structure shown in fig. 117 occurs in various regions of the body of Siphono- poda. Inall Glossophorous Mollusca the lingual apparatus is supported by internal skeletal pieces, having the char- acter of cartilage ; but in the Siphonopodous Cephalopoda such cartilage has a wider range.

In Nautilus a large H-shaped piece of cartilage is found forming the axis of the mid-foot or siphon (fig. 116, A, B). Its hinder part extends up into the head and supports the peri-cesophageal nerve-mass (a), whilst its two anterior rami extend into the tongue-like siphon. In Sepia, and Dibranchs generally, the cartilage takes a different form, as shown in fig. 116, C. The processes of this cartilage cannot be identified in any way with those of the

~~capito- pedal cartilage of Nautilus. The lower larger portion of this cartilage in Sepia is called the cephalic cartilage, and forms a complete ring round the cesophagus ; it completely invests also the ganglionic nerve-collar, so that all the nerves from the latter have to pass through foramina in the cartilage. The outer angles of this cartilage spread out on each side so as to form a cup-like receptacle for the eyes. The two processes springing right and left from this large cartilage in the median line (fig. 116, C) are the " pree-orbital cartilages ;" in front of these, again, there is seen a piece like an inverted T, which forms a support to the base of the "arms" of the fore-foot, and is the " basi- brachial" cartilage. The Decapod Dibranchs have, further, the "nuchal cartilage" already mentioned, and in Sepia, a thin plate-like "sub-ostracal " or (so-called) dorsal cartilage, the anterior end of which rests on and fits into the concave nuchal cartilage. In Octopoda there is no nuchal cartilage, but two band-like "dorsal cartilages." In Decapods there are also two cartilaginous sockets on the sides of the funnel—"siphon-hinge cartilages ""—into which fleshy knobs of the mantle-skirt are loosely fitted. In Sepia, along the whole base-line of each lateral fin of the mantle (fig. 92), is a "basi-pterygial cartilage." It is worthy of remark that we have, thus developed, in Dibranch Siphonopods a more~~

~~complete internal cartilaginous skeleton than is to be found in some of the lower Vertebrates. There are other instances of cartilaginous endo-skeleton in groups other than the Vertebrata. Thus in some capito-branchiate Chzetopods cartilage forms a skeletal support for the gill-plumes, whilst in the Arachnids (Mygale, Scorpio) and in Limulus a large internal cartilaginous plate—the ento-sternité—is devel- oped as a support for a large series of muscles. ;~~

~~Alimentary Tract.—The buccal cone of Nautilus is ter- minated by a villous margin (buccal membrane) surround- ing the pair of beak-like jaws. These are very strong and dense in Nautilus, being calcified. Fossilized beaks of Tetra- branchiata are known under the name of Rhyncholites. In Dibranchs the beaks are horny, but similar in shape to those of Nautilus. They resemble in general those of a parrot, the lower beak being the , larger, and~~

~~*overlapping the upper or dorsal beak. The lingual ribbon and odontophoral apparatus has the struc- ture which is typical for Glosso- phorous Mollusca. In fig. 107, A is represented a single row of teeth from the lingual ribbon of Nautilus, and in fig. 107, B, C, of other Si- phonopoda.*~~

~~*In Nautilus a long and wide crop or dilated cesophagus (cr, fig. 110) passes from the muscular buccal mass, and at the apex of the visceral hump passes into a highly muscular stom- ach, resembling the gizzard of a bird (gizz, fig. 110). A nearly straight intestine passes from the muscular stomach to the anus, near which it develops a small cecum. In other ue Siphonopods the cesophagus is usually ric, 106,—Alimentary canal narrower (fig. 106, oe), and the mus- : Sek Wie ee cular stomach more capacious (fig. is omitted. oe, esophagus; 106, v); whilst a very important PP epee ag ng ri feature in the alimentary tract is through the gv ¢, formed by the cecum. In all but cum; ¢, its spiral portion ; Nautilus the cxcum lies near the stomach, and may be very capacious —much larger than the stomach in*~~

~~*i, intestine ; a, ink-bag; b, its opening into the rectum, elongated into a spiral coil, as in fig.*~~

~~*A*~~

~~*Loligo vulgaris —or 106, e.*~~

~~*The simple*~~

~~*Fic. 107.—Lingual dentition of Siphonopoda. A. A single row of lingual teeth*~~

~~of Nautilus pompilius (after Keferstein). B. Two rows of li 1 teeth~~

~~yd —" (after Troschel). C. Lingual teeth of Slisdone atbvdoon fatter~~

~~oven). U-shaped flexure of the alimentary tract as seen in fig. 106, and in fig. 110, is the only important one which it exhibits in the Cephalopoda,— the Pteropoda (except the~~

~~Limacinida) agreeing with the Siphonopoda in this sim-~~

~~plicity in consequence of their visceral hump being un- twisted. The acini of the large liver of Nautilus are compacted into a solid reddish-brown mass by a firm membrane, as also is the case in the Dibranchiata. The liver has four paired lobes in Nautilus, which open by two bile-ducts into the alimentary canal at the com- mencement of the intestine. The bile-ducts unite before entering the intestine. In Dibranchiata the two large lobes of the liver are placed antero-dorsally (beneath the shell in Decapoda), and the bile-ducts open into the cecum. Upon the bile-ducts in Dibranchiata are deve- loped yellowish glandular diverticula, which are known as " pancreas," though neither physiologically nor morpho- logically is there any ground for considering either the so- called liver or the so-called pancreas as strictly equivalent to the glands so denominated in the Vertebrata. In Nauti- lus the equivalents of the pancreatic diverticula of the Dibranchs can be traced upon the relatively shorter bile- ducts.~~

~~Salivary Glands are not developed in Nautilus unless a pair of glandular masses lying on the buccal cavity are to be considered as such. In the Dibranchs, on the contrary, one (Sepia, Loligo) or two pairs of large salivary glands are present, an anterior and a posterior (Octopus, Eledone, Onychoteuthis). Each pair of salivary glands has its~~

~~paired ducts united to form a single duct, which runs forward from the glands and opens into the buccal cavity~~

~~*n ip*~~

~~*Fic. 108.—Diagram of the nephridial sacs, and the veins which run through them, in Sepia officinalis (after Vigelius), The nephridial sacs are supposed to have their upper walls removed. v.c, vena cava; 7.d.v.c, right descending branch of the same; r.s.v.c, left descending branch of the same; v.b.a., vein from the ink-bag; v.m, mesenteric vein; v.g, genital vein; v.a.d, right abdominal vein ; v.a.s, left abdominal vein; v.p.d, right pallial vein ; v.p.s, left pallial vein ; c.b, branchial heart ; 2, appendage of the same; c.v, capsule of the branchial heart ; np, external aperture of the right nephridial sac; y, reno-pericardial orifice placing the left renal sac or nephridium in communi- cation with the viscero-pericardial sac, the course of which below the nephri- dial sac is indicated by dotted lines; y', the similar orifice of the right side ; a.r, glandular renal outgrowths; w.k, viscero-pericardial sac (dotted outline).*~~

~~*near the radula. The anterior pair of glands when present lie in the head near the buccal mass, the posterior pair lie much farther back beneath the liver, at the sides of the cesophagus. It is the posterior pair which alone are pre- sent in Sepia and Loligo. The ink-bag is to be considered as an appendage of the rectum. It is not developed in Nautilus, nor in the Pteropoda; in all Dibranchiata (even in the fossil Belemnites) it is present (fig. 106, a; fig. 103, 2), and has been observed to develop as a diverticulum of the rectum, with spirally plaited walls which very early secrete ablack pigment. The spiral plaitings of the walls diminish*~~

~~*in relative size as the volume of the sac increases. Its outer surface acquires a metallic iridescence similar to that of the integuments of many fishes. The opening of the ink-sac is in the adult sometimes distinct from but near to*~~

~~*vent*~~

~~*Fia. 109.—Diagram to show the relations of the four nephridial sacs, the viscero- pericardial sac, and the heart and large vessels in Nautilus (drawn by A. G. Bourne). neph, neph, on the right side point to the two nephridia of that side (the two of the opposite side are not lettered),—each is seen to*~~

have an independent aperture ; x is the viscero-pericardial sac, the dotted line indicat- ing its backward extension ; vise.per.apert marks an arrow introduced into the right aperture of the viscero-pericardial sac; 7.¢., r.e., point to the glandular enlarged walls of the advehent branchial vessels,— two small glandular bodies of the kind are seen to project into each nephridial sac, whilst a larger body of the same kind depends from each of the four branchial advehent vessels into the viscero-pericardial sac; v.c., vena cava; vent, ventricle of the heart; ao., cephalic aorta (the small abdominal aorta not drawn); a.b.v, advehent branchial vessel ; ¢.v.6., efferent branchial vessel.

the anus (Sepia) ; in other cases it opens into the rectum near the anus. The ink-bag of Dibranch Siphonopoda is possibly to be identified with the adrectal (purpuriparous) gland of some Gastropoda.

Colom, Blood-vascular System, and Excretory Organs.— Nautilus and the other Siphonopoda conform to the

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Fic. 110.—Djagram representing a vertical approximately median antero posterior section of Nautilus pompilius (from a drawing by A. G. Bourne). The parts which are quite black are the cut muscular surfaces of the foot and buccal mass. a, the shell; 6, the nuchal plate identical with the nuchal cartilage of Sepia (see fig. 90, b); ¢, the integument covering the visceral hump; d, the mantle flap or skirt in the dorsal region where it rests against the coil of the shell ; e, the inferior margin of the mantle-skirt resting on the lip of the shell represented by the dotted line; f the pallial chamber with two of the four gills; g, the vertically cut median pcrtion of the mid-foot (siphon); h, the capito-pedal cartilage (see fig. 116); 4, the valve of the siphon ; J, the siphuncular pedicle (cut short); m, the hood or dorsal enlarge- ment of the annular lobe of the fore-foot ; n, tentacles of the annular lobe; py, tentacles of the inner inferior lobe; g, buccal membrane; 7, upper jaw or beak ; s, lower jaw or beak ; #, lingual ribbon ; x, the viscero-pericardial sac ; n.c, nerve-collar ; oe, esophagus ; cr, crop; gizz, gizzard; int, intestine; an, anus; ni, nidamental gland; nept, aperture of a

nephridial sac; 7.e, renal glandular masses on the walls of the afferent branchial veins (see fig. 109); a.b.v., afferent branchial vessel ; ¢.b.v, efferent branchial vessel ; vt, ventricle of the heart.

general Molluscan characters in regard to these organs. Whilst the general body-cavity or ccelom forms a lacunar

blood-system or series of narrow spaces, connected with the trunks of a well-developed vascular system, that part of the original ccelom surrounding the heart and known as the Molluscan pericardium becomes shut off from this general blood-lymph system, and communicates, directly in Nautilus, in the rest through the nephridia, with the exte- rior. In the Siphonopoda this specialized pericardial cavity is particularly large, and has been recognized as distinct from the blood-carrying spaces, even by anatomists who have not considered the pericardial space of other Mollusca to be thus isolated. The enlarged pericardium, which may even take the form of a pair of sacs, has been variously named, but is best known as the viscero-pericardial sac or chamber. In Nautilus this sac occupies the whole of the postero-dorsal surface and a part of the antero-dorsal (see fig. 110,), investing the genital and other viscera which lie below it, and having the ventricle of the heart sus- pended in it. Certain membranes forming incomplete septa, and a curious muscular band—the pallio-cardiac band—traverse the sac. The four branchial advehent veins, which in traversing the walls of the four nephridial sacs give off, as it were, glandular diverticula into those sacs, also give off at the same points four much larger glandular

Fia, 111.—Diagrain representing a vertical approximately median antero-posterior section of Sepia officinalis (from a drawing by A. G. Bourne), The lettering corresponds with that of fig. 110, with which this drawing is intended to be compared. a, shell (here enclosed by a growth of the mantle); b, the nuchal plate (here a cartilage); ¢ (the reference line should be continued through the black area representing the shell to the outline below it), the integument covering the visceral hump; d, the reflected portion of the mantle-skirt forming the sac which encloses the shell; ¢, the inferior

margin of the mantle-skirt (mouth of the pallial chamber); jf, the pallial chainber ; g, the vertically cut median portion of the mid-foot (siphon); 7, the valve of the siphon ; m, the two upper lobes of the fore-foot; n, the long prehensile arms of the sane; 0, the fifth or lowermost lobe of the fore-foot ; p, the third lobe of the fore-foot ; g, the buccal membrane; v, the upper beak or jaw; s, the lower beak or jaw ; t, the lingual ribbon; x, the viscero-pericardial sac ; n.¢c, the nerve-collar ; er., the crop; gizz., the gizzard ; an, the anus; c.t., the left ctenidium or gill-plume; vent, ventricle of the heart; a.b.v., afferent branchial vessel ; e.b.v, efferent branchial vessel; re, renal glandular mass ; n.n.a, left nephridial aperture ; visc.per.apert., viscero-pericardial aperture ~ fig. 108); 6r.b., branchial heart; app., appendage of the same; 1.s., ink-

8.

masses, which hang freely into the viscero-pericardial chamber (fig. 109, r.e). In Nautilus the viscero-pericardial sac opens to the exterior directly by a pair of apertures, one placed close to the right and one close to the left posterior nephridial aperture (fig. 101, wsceper.). This direct opening of the pericardial sac to the exterior is an exception to what occurs in all other Mollusca. In all other Molluscs the pericardial sac opens into the nephridia, and through them or the one nephridium to the exterior. In Nautilus there is no opening from the viscero-pericardial sac into the nephridia. Therefore the external pore of the viscero-peri- cardial sac may possibly be regarded as a shifting of the reno-pericardial orifice from the actual wall of the nephridial sac to a position alongside of its orifice. Parallel cases of such shifting are seen in the varying position of the orifice of the ink-bag in Dibranchiata, and in the orifice of the genital ducts of Mollusca, which in some few cases

(e.g., Spondylus) open into the nephridia, whilst in other

cases they open close by the side of the nephridia on the

surface of the body. The viscero-pericardial sac of the

~~*Dibranchs is very large also, and extends into the dorsal region. It varies in shape—that is to say, in the extensions of its area right and left between the various viscera—in different genera, but in the Decapods is largest. In an ex- tension of this chamber is placed the ovary of Sepia, whilst the ventricle of the heart and the branchial hearts and their appendages also lie in it. It is probable that water is drawn into this chamber through the nephridia, since sand and other foreign matters are found in it. In all it opens into the pair of nephridial sacs by an orifice on the wall of each, not far from the external orifice (fig. 108, y, 7'). There does not seem any room for doubting that each orifice corresponds to the reno-pericardial orifice which we have seen in the Gastropoda, and shall find again in the Lamelli- pranchia. The single tubelike nephridium and the peri- cardium of the Pteropoda also communicate by an aperture.*~~

~~*The circulatory organs, blood-vessels, and blood of Nauti- lus do not differ greatly from those of Gastropoda. The ventricle of the heart is a four-cornered body, receiving a dilated branchial efferent vessel (auricle) at each corner (fig. 109). It gives off a cephalic aorta anteriorly, and a smaller abdominal aorta posteriorly. The diagram, fig. 105, serves to show how this simple form of heart is related to the dorsal vessel of a worm or of an Arthropod, and how by a simple flexure of the ventricle (D) and a subsequent suppression of one auricle, following on the suppression of one branchia, one may obtain the form of heart charac- teristic of the Anisopleurous Gastropoda (excepting the Zygobranchia). The flexed condition of the heart is seen in Octopus, and is to some extent approached by Nautilus, the median vessels not presenting that perfect parallelism which is shown in the figure (B). The most remarkable feature presented by the heart of Nautilus is the possession of four instead of two auricles, a feature which is simply related to the metamerism of the branchie. By the left side of the heart of Nautilus, attached to it by a membrane, and hanging loosely in the viscero-pericardial chamber, is the pyriform sac of Owen. This has recently been shown to be the rudimentary left oviduct or sperm-duct, as the case may be (Lankester and Bourne, 37), the functional right ovi-sac and its duct being attached by a membrane to the opposite side of the heart.*~~

~~*The cephalic and abdominal aortz of Nautilus appear, after running to the anterior and posterior extremes of the animal respectively, to open into sinus-like spaces surround- ing the viscera, muscular masses, &c. These spaces are not large, but confined and shallow. Capillaries are stated to occur in the integument. In the Dibranchs the arterial system is very much more complete; it appears in some cases to end in irregular lacune or sinuses, in other cases in true capillaries which lead on into veins, An investiga- tion of these capillaries in the light of modern histological knowledge is much needed. From the sinuses and capil- laries the veins take origin, collecting into a large median trunk (the vena cava), which in the Dibranchs as well as in Nautilus has a ventral (postero-ventral) position, and runs parallel to the long axis of the animal. In Nautilus this vena cava gives off at the level of the gills four branchial advehent veins (fig. 109, v.c.), which pass into the four gills without dilating. In the Dibranchs at a similar posi- tion the vena cava gives off a right and a left branchial advehent vein (fig. 108, 7.s.v.c, r.d.v.c), each of which, traversing the wall of the corresponding nephridial sac and receiving additional factors (fig. 108, v.9, v.p.d, v.a.d, v.b.a), dilates at the base of the corresponding branchial plume, forming there a pulsating sac—the branchial heart (fig.104, x; and fig 108, c.b). Attached to each branchial heart is a curious glandular body, which may possibly be related to the larger masses (r.e in fig. 109) which depend into the viscero-pericardial cavity from the branchial advehent veins*~~

~~*MOLLUS «A*~~

~~*[CEPHALOPODA.*~~

~~*of Nautilus. From the dilated branchial heart the bran- chial advehent vessel proceeds, running up the ad-pallial face of the gill-plume (v7, 2c', fig. 104). From each gill- plume the blood passes by the branchial efferent vessels (v', fig. 104) to the heart, the two auricles being formed by the dilatation of these vessels (v, v in fig. 104).*~~

~~*The blood of Siphonopoda contains theusual amceboid cor- puscles, and a diffused colouring matter—the hemocyanin of Fredericque—which has been found also in the blood of Helix, and in that of the Arthropods*~~

~~*Homarus and Limulus. It is colourless in the oxidized, blue in the deoxidized state, and contains copper as a chemical constituent.*~~

~~*The nephridial sacs and renal glandular tissue are closely connected with the branchial advehent vessels in Nautilus and in the other Siphonopoda. The arrangement is such as to render the typical relations and form of a nephridium difficult to trace. In accordance with the metamerism of Nautilus already noticed, there are two pairs of nephridia. Each nephridium assumes the form of a sac opening by a pore to the exterior. As is usual in nephridia, a glandular and a non-glandular portion are distinguished in each sac ; these portions, however, are not successive parts of a tube, as happens in other cases, but theyare localized ares of the wall of the sac. The glandular renal tissue is, in fact, confined to a tract extending along that part of the sac's wall which immediately invests the great branchial advehent vein. The vein in this region gives off directly from its wall a complete herbage of little venules, which branch and ana- stomose with one another, and are clothed by the glandular epithelium of the nephridial sac. The secretion is accumu- lated in the sac and passed by its aperture to the exterior. Probably the nitrogenous excretory product is very rapidly discharged ; in Nautilus a pink-coloured powder is found accumulated in the nephridial sacs, consisting of calcium phosphate. The presence of this y phosphatic calculus by no means \ proves that such was the sole ex- cretion of the renal glandular tis- sue. In Nautilus a glandular 7, yy growth like that rising from the \\ wall of the branchial vessel into its corresponding nepliridial sac, but larger in size, depends from each branchial advehent vessel into the viscero-pericardial sac,—prob- ably identical with the 'append- age" of the branchial hearts of Dibranchs.*~~

~~*The chief difference, other than that of number between the ne- phridia of the Dibranchs and those of Nautilus, is the absence of the accessory growths depending into the viscero-pericardial space just mentioned, and, of more import- ance, the presence in the former of a pore leading from the nephridial sac into the viscero-pericardial sac (y, y' in fig. 108). The external orifices of the nephridia are also more prominent in Dibranchs than in Nautilus, being raised on papillee (np in fig. 108; 7 in fig. 103). In Sepia, according to Vigelius (38), the two nephridia give off each a diverticulum dorsalwards, which unites with its fellows and forms a great*~~

~~*median renal chamber, lying between the ventral portions of the nephridia and the viscero-pericardial chamber. In Loligo the fusion*~~

~~*f Vi IIf*~~

~~*Fic. 112.—Nervous system of Nautilus pompilius (from Ge- genbaur, after Owen). ft, 4, ganglion-like enlargements on nerves passing from the pedal ganglion to the inner series of tentacles; ¢', nerves to the ten- tacles of the outer or annular lobe; b, pedal ganglion-pair ; a, cerebral ganglion-pair); ¢, pleuro — visceral _ ganglionic band (fused pleural and visce- ral ganglion-pairs); d, genital ganglion placed on the course of the large visceral nerve, just before it gives off its branchial and its osphradial branches ; m, nerves from the pleural ganglion to the mantle-skirt.*~~

~~*of the two nephridia to form one sac is still more obvious, since the ventral portions are united. In Octopus the nephridia are quite separate.*~~

~~*Tegumental pores have not been described in Nautilus, but exist in Dibranchiata, and have been (probably erroneously, but further investigation is needed) supposed to introduce water into the vascular system. A pair of*~~

~~*Fig. 114.*~~

~~*Fics, 113, 114.—Nerve-centres of Octopus. Figure 118 gives a view from the dorsal aspect, figure 114 one from the ventral aspect. 6uc, the buccal mass ; ped, pedal ganglion ; opt, optic ganglion ; cer, cerebral ganglion ; pl, pleural ganglion ; visc, visceral ganglion ; ws, cesophagus; f, foramen in the nerve- rosea se by pedal, pleural, and visceral ganglion-pairs, traversed by a*~~

~~*ood-vessel.*~~

~~*such pores leading into sub-tegumental spaces of consider- able area, the nature of which is imperfectly known, exist on the back of the head in Philonexis, Tremoctopus, and Argonauta. At the base of the arms and mouth*~~

~~*four such pores are found in Histioteuthis and Ommastrephes, six in Sepia, Loligo, Onychoteuthis. Lastly, a pair of such pores are found in the Decapoda at the base of the long arms, lead- ing into an extensive sub-tegumental pouch on each side of the head into which the long arms can be, and usually are, withdrawn. In Sepia, Sepiola, and Ros- sia the whole arm is coiled up in these sacs ; in Loligo only a part of it is so; in Histio- teuthis, Ommastrephes, and Onychoteuthis, the sacs are quite small and do not admit the*~~

~~*a*~~

~~*arms. GANG, wtell. | Nervous System. — yi*~~

~~*Nautilus, like the other Ag*~~

~~*Cephalopoda (e.g., Pneu-*~~

~~*modermon, fig. 87;*~~

~~*Octopus, fig. 113), ex- hibits a great concentra- tion of the typical Mol- luscan ganglia, as shown in fig. 112. The gan- glia take on a band-like form, and are but little differentiated from their commissures and con- nectives,—-an archaic condition reminding us of Chiton. The special optic out- growth of the cerebral ganglion, the optic ganglion (fig. 112, 0), is characteristic of the big-eyed Siphonopoda. The cerebral ganglion-pair (a) lying above the cesophagus*~~

~~*Fic. 115.—Lateral view of the nervous centres and nerves of the right side of Octopus vul- garis (from a drawing by A. G. Bourne). bg, buccal ganglion; cer., cerebral ganglion; ped., pedal ganglion; pl., pleural, and visc., visceral region of the pleuro-visceral ganglion; gang. stell., the right stellate ganglion of the mantle connected by a nerve to the pleural portion; n.visc., the right visceral nerve; nolf., its (probably) olfactory branches; n.br., its branchial branches,*~~

~~*BOLLUBS CA*~~

~~*is connected with two sub-cesophageal ganglion-pairs of band-like form. The anterior of these is the pedal 8, 6, and supplies the fore-foot with nerves 7', t, as also the mid-foot (siphon). The hinder band is the visceral and pleural pair fused (compare fig. 112 with fig. 87, and especially with the typical Euthyneurous nervous system of Limnzeus, fig. 22) ; from its pleural portion nerves pass to the mantle, from its visceral portion nerves to the branchie and genital ganglion (d in fig. 112), and in immediate connexion with the latter is a nerve to the osphradium or olfactory papilla. No buccal ganglia have been observed in Nautilus, nor has an enteric nervous system been described in this animal, though both attain a special development in the Dibranchiata. The figures (114 and 115) representing the nerve-centres of Octopus serve to exhibit the disposition of these parts in the Dibranchiata. The ganglia are more distinctly swollen than in Nautilus. In Octopus an infra-buccal ganglion-pair are present cor- responding to the buccal ganglion-pair of Gastropoda. In Decapoda a supra-buccal ganglion-pair connected with these are also developed. Instead of the numerous radi- ating pallial nerves of Nautilus, we have in the Dibran- chiata on each side (right and left) a large pleural erve passing from the pleural portion of the pleuro- visceral ganglion to the mantle, where it enlarges to form the stellate ganglion. From each stellate ganglion nerves radiate to supply the powerful muscles of the mantle-skirt. The nerves from the visceral portion of the pleuro-visceral ganglion have the same course as in Nautilus, but no osphradial papilla is present. An enteric nervous system is richly developed in the Dibranchiata, connected with the somatic nervous centres through the buccal ganglia, as in the Arthropoda through the stomato-gastric ganglia, and anastomosing with deep branches of the vis- ceral nerves of the viscero-pleural ganglion-pair. It has been especially described by Hancock (39) in Omma- strephes. Upon the stomach it forms a single large and readily-detected gastric ganglion. It is questionable as to how far this and the "caval ganglion" formed in some Decapoda by branches of the visceral nerves which accom- pany the vena cava are to be considered as the equivalents of the 'abdominal ganglion," which in a typical Gastropod nervous system lies in the middle of the visceral nerve-loop or commissure, having the right and left visceral ganglia on either side of it, separated by a greater or less length of visceral nerve-cord (see figs. 20, 21, 22). There can be little doubt that the enteric nervous system is much more developed in the Dibranchiata than in other Mollusca, and that*~~

~~*it effects a fusion with the typical "visceral" cords more extensive than obtains even in Gastropoda, where such a fusion no doubt must also be admitted.*~~

~~*Special Sense-Organs.—Nautilus possesses a pair of osphradial papillz (fig. 101, off) corresponding in position and innervation to Spengel's organ placed at the base of the ctenidia (branchiz) in all classes of Mollusca. This organ has not been detected in other Siphonopoda. In Ptero- poda it is well developed as a single ciliated pit, although the ctenidia are in that group aborted (fig. 87, Osp.). Nautilus possesses other olfactory organs in the region of the head. Just below the eye is a small triangular process (not seen in our figures), having the structure of a shortened and highly-modified tentacle and sheath. By Valenciennes, who is followed by Keferstein, this is regarded as an olfactory organ. The large nerve which runs to this organ originates from the point of juncture of the pedal with the optic ganglion. The lamelliform organ upon the inner inferior tentacular lobe of Nautilus is possibly also olfactory in function. In Dibranchs behind the eye is a pit or open canal supplied by a nerve corresponding in origin to the olfactory nerve of Nautilus above mentioned.*~~

~~*Possibly the sense of taste resides in certain processes within the mouth of Nautilus and other Siphonopoda.*~~

~~*Fria. 116,—Cartilaginous skeleton of Siphonopoda (after Keferstein). A. Capito- pedal cartilage of Nautilus pompilius; a points to the ridge which supports the pedal portion of the nerve-centre. B. Lateral view of the same, —the large anterior processes are sunk in the muscular substance of the siphon. C. Cephalic cartilages of Sepia officinalis. D, Nuchal cartilage of Sepia offci- nalis,*~~

~~*The otocysts of Nautilus were discovered by Macdonald (40). Each lies at the side of the head, ventral of the eye, resting on the capito-pedal cartilage, and supported by the large auditory nerve which arises from the pedal gan- glion. It has the form of a small sac, 1 to 2 mm. in dia- meter, and contains whetstone—shaped crystals, such as are known to form the*~~

~~otoliths of other Mol- lusca. The otocysts of Dibranchiata are larger and deeply sunk in the cephalic~~

~~cartilage. It has ric. 117,—Minute Si Sa of — rine of~~

~~-. Loligo (from Gegenbaur, after Furbringer). a been shown by Lan simple, 6, dividing, cells; c, canaliculi; d, an kester that they de- empty cartilage capsule with its pores ; e, canali- velop as open pits~~

~~culi in section. (fig. 121, (5), (6), 0), which gradually close up, the com- munication with the exterior becoming narrowed into a fine canal, which is reflected over one end of the sac, and finally has its external opening obliterated. A single otolith only is found in all Dibranchiata.~~

~~The eye of Nautilus is among the most interesting struc- tures of that remarkable animal. No other animal which has the same bulk and general elaboration of organization has so simple an eye as that of Nautilus. When looked at from the surface no metallic lustre, no transparent coverings, are presented by it. It is simply a slightly pro- jecting hemispherical box like a kettle-drum, half an inch in diameter, its surface looking like that of the surrounding integument, whilst in the middle of the drum-membrane is a minute hole (fig. 91, ~). Owen very naturally thought that some membrane had covered this hole in life, and had been ruptured in the specimen studied by him. It, how- ever, appears from the researches of HIensen (41) that the hole is a normal aperture leading into the globe of the eye, which is accordingly filled by sea-water during life. There is no dioptric apparatus in Nautilus, and in place of refract- ing lens and cornea we have actually here an arrangement for forming an image on the principle of "the pin-hole camera." There is no other eye known in the whole animal kingdom which is so constructed. The wall of the eye-~~

~~globe is tough, and the cavity is lined solely by the naked retina, which is bathed by sea-water on one surface and receives the fibres of the optic nerve on the other (see fig. 118, A). As in other Siphonopods (eg., fig. 120,~~

~~*Au, Re, p), the retina consists of two layers of cells separated by a layer of dark pigment. The most interesting consideration connected with this eye of Nautilus is found when the further facts are noted—(1) that the elaborate lens-bearing eyes of Dibranchiata pass through a stage of development in which they have the same structure as the eye of Nautilus—namely, are open sacs (fig. 119); and (2), that amongst other Mollusca examples of cephalic eyes can be found which in the adult condition are, like the eye of Nautilus and the developing eye of Dibranchs, simple pits of the integument, the cells of which are surrounded by pigment and connected with the filaments of an optic nerve. Such is the structure*~~

~~*Np Fic. 118.—Diagrams of sections of the eyes of Mollusca. A. Nautilus (and Patella). B. Gastropod (Limax or Helix). C, Dibranchiate Siphonopod (Oigopsid). Pal, eyelid (outermost fold); Co, cornea (second fold); Ir, iris (third fold); Intl, 2, 3, 4, different parts of the integument; 1, deep portion of the lens; J, outer portion of the lens; Co.ep, ciliary body; R, retina ; N.op, optic nerve; G.op, optic ganglion; 2, inner layer of the retina; N.S, nervous stratum of the retina. (From Balfour, after Grenacher.) of the eye of the Limpet (Patella); and in such a simple eye we obtain the clearest demonstration of the fact that the retina of the Molluscan cephalic eye, like that of the Arthropod cephalic eye and unlike that of the Vertebrate myelonic eye, is essentially a modified area of the general epiderm, and that the sensitiveness of its cells to the action of light and their relation to nerve-filaments is only a specialization and intensifying of a property common to the whole epiderm of the surface of the body. What, however, strikes us as especially remarkable is that the simple form of a pit, which in Patella serves to accumulate a secretion which acts as a refractive body, should in Nautilus be glorified and raised to the dignity of an efficient optical apparatus. Natural selection has had an altogether excep- tional opportunity in the ancestors of Nautilus. In all other Mollusca, starting as we may suppose from the follicular or pit-like condition, the eye has proceeded to acquire the form of a closed sac, the cavity of the closed vesicle being then filled partially or completely by a refractive body (lens) secreted by its walls (fig. 118, B). This is the condition attained in most Gastropoda. It presents a striking contrast to the simple Arthropod eye, where, in consequence of the existence of a dense exterior cuticle, the eye does not form a vesicle, and the lens is always part of that cuticle.*~~

~~*In the Dibranchiate division of the Siphonopoda the greatest elaboration of the dioptric apparatus of the eye is attained, so that we have in one sub-class the extremes of the two lines of development of the Molluscan eye, those two lines being the punctigerous and the lentigerous. The structure of the Dibranchiate's eye is shown in section in fig. 118, C, and in fig. 120, and its development in fig. 119 and fig. 123. The open sac which forms the retina of the young Dibranchiate closes up, and constitutes the posterior chamber of the eye, or primitive optic vesicle (fig. 123, A, poc). The*~~

~~*_ lens forms as a structureless growth, projecting inwards from the front wall of this vesicle (fig. 123, B, 7). The integument around the primitive optic vesicle which has sunk below*~~

~~*Fic. 119,—Diagrams of sections showing the early stage of development of the eye of Loligo when it is, like the permanent eye of Nautilus and of Patella, an open sac, A. First appearance of the eye as a ring-like upgrowth. B. Ingrowth of the ring-like wall so as to form a sac, the primitive optic vesicle of Loligo. (From Lankester.)*~~

~~*the surface now rises up and forms firstly nearest the axis of the eye the iridian folds (7f in B, fig. 123 ; kin fig. 120; Zr in fig. 118), and then secondly an outer circular fold grows up like a wall and completely closes over the iridian folds and the axis of the primitive vesicle (fig. 120, C). This covering is transparent, and is the cornea. In the oceanic Decapoda the cornea does not completely close, but leaves a central aperture traversed by the optic axis. These forms are termed Oigopside by d'Orbigny (42), whilst the Decapoda with closed cornea are termed Myopside. In the Octopoda the cornea is closed, and there is yet another fold thrown over the eye. The skin surrounding the cornea presents a free circular margin, and can be drawn over the surface of the cornea by a sphincter muscle. It thus acts as an adjustable diaphragm, exactly similar in*~~

~~*Ws*~~

~~*Wy* \~~

~~t ‘~~

~~wn AW~~

~~WY AW~~

~~Re~~

~~SS~~

~~JY)~~

~~G/U CG~~

~~re~~

~~*Fia, 120,—Horizontal section of the eye of Sepia (Myopsid). KK, cephalic cartilages (see fig. 116); C, cornea (closed); L, lens; ci, ciliary body; Ri, internal layer of the retina; Re, external layer of the retina; p, pigment between these ; 0, optic nerve ; go, optic ganglion ; kand k’, capsular cartilage ; ik, cartilage of the iris; w, white body; ae, argentine integument. (From Gegenbaur, after Hensen.)*~~

~~*movement to the iris of Vertebrates. Sepia and allied Deca-*~~

~~*pods have a horizontal lower eyelid, that is to say, only*~~

~~*one-half of the sphincter-like fold of integument is movable.*~~

~~*The exact history of the later growth of the lens in the*~~

~~*Dibranchs’ eye is not clear. Asseen in fig. 120, it appears,*~~

~~*after attaining a certain size, to push through the front*~~

~~*wall of the primitive optic vesicle at the point correspond- ing to its centre of closure, and to project a little into the anterior chamber formed by the cornea. The wall of the*~~

~~*primitive optic vesicle adjacent to the embedded lens (L) now becomes modified, forming a so-called "ciliary body," in which muscular tissue is present, serving to regulate the focus of the lens (ci in fig. 120). Bobretzky (48) differs from Lankester, whose view is above given, in assigning a distinct origin to the protruding anterior segment of the lens (/1 in fig. 118), The optic ganglion, as well as the other large ganglia of the Dibranchiata, originate in the mesoblast of the embryo. The connexion between the cells of the retina and the nerve-fibres proceeding from the optic ganglion must therefore be a secondary one.*~~

~~*Chromatophores.—In Nautilus these remarkable struc- tures, which we mention here as being intimately asso- ciated with the nervous system, appear to be absent. In Dibranchiata they play an important part in the economy, enabling their possessor, in conjunction with the discharge of the contents of the ink-bag, to elude the observation of either prey or foe. They consist of large vesicular cells (true nucleated cells converted into vesicles), arranged in a layer immediately below the epidermis. Each chroma- tophore-cell has from six to ten muscular bands attached to its walls, radiating from it star-wise. The contraction of these fibres causes the chromatophore-cell to widen out; it returns to its spherical resting state by its own elasticity. In the spherical resting state such a cell may measure '01 mm., whilst when fully stretched by its radiat- ing muscles it covers an area of '5 mm. The substance of the chromatophore-cells is intensely coloured with one of the following colours—scarlet, yellow, blue, brown— which are usually of the greatest purity and brilliance. The action of the chromatophores may be watched most readily in young Loligo, either under the microscope or with the naked eye. The chromatophores are suddenly expanded, and more slowly retracted with rapidly-recurring alter- nation. All the blue, or all the red, or all the yellow may be expanded and the other colours left quiescent. Thus the animal can assume any particular hue, and change its appearance in a dazzling way with extraordinary rapidity. There is a definite adaptation of the colour assumed in the case of Sepia and others to the colour of the surrounding rock and bottom.*~~

~~*Gonads and Genital Ducts.—In Nautilus it has recently been shown by Lankester and Bourne (37) that the genital ducts of both sexes are paired right and left, the left duct being rudimentary and forming the "pyriform appendage," described by Owen as adhering by membranous attach- ment to the ventricle of the heart, and shown by Kefer- stein to communicate by a pore with the exterior. Thus the Cephalopoda agree with our archi-Mollusc in having bilaterally symmetrical genital ducts in the case of the most archaic member of the class. The ovary (female gonad) or the testis (male gonad) lies in Nautilus as in the Dibranchs in a distinct cavity walled off from the other viscera, near the centro-dorsal region. This chamber is formed by the ccelomic or peritoneal wall; the space enclosed is originally part of the ccelom, and in Sepia and Loligo is, in the adult, part of the viscero-pericardial chamber. In Octopus it is this genital chamber which communicates by a right and a left canal with the nephrid- ium, and is the only representative of pericardium. The ovary or testis is itself a growth from the inner wall of this chamber, which it only partly fills. In Nautilus the right genital duct, which is functional, is a simple continuation to the pore on the postero-dorsal surface of the membran- ous walls of the capsule in which lies the ovary or the testis, as the case may be. The gonad itself appears to represent a single median or bilateral organ.*~~

~~*The true morphological nature of the genital ducts of the Cephalopoda and of other Mollusca is a subject which invites*~~

~~*speculation and inquiry. In all the cases in which such ° XVI. — 86*~~

~~*ducts continuous with the tunic of the gonad itself occur— viz., in Nematoid worms, in Arthropoda, and in Teleostean fishes, besides Mollusca—there is an absence of definite knowledge as to the mode of development of the duct. Tt seems, however, from such facts as have been ascer- tained that the gonad lies at first freely in the ccelom, and that the duct develops in connexion with the genital pore, and attaches itself to the embryonic gonad, or to the capsule which grows around it. The question then arises as to the nature of the pore. In other groups of animals we find that the pore, and funnel or tube connected with it by which the genital products are conveyed to the exterior, is a modified nephridium (usually a pair, one right and one*~~

~~*left). Is it possible that this is also the case where the duct very early becomes united to the gonad, and even gives rise to the appearance of a tubular ovary or testis? Probably this is the case in Teleostean fishes (see Huxley's observations on the oviducts of the smelt, 44); but it seems to be a tenable position that in other cases, including the Mollusca, the genital pore is a simple opening in the body-wall leading into the body-cavity or ccelom, such as we find on the dorsal surface of the earth-worm, which has become specialized for the extrusion of the genital products. Possibly, as in Nemertine and Cheetopod worms, the condition preceding the development of these definite genital pores was one in which a temporary rupture of the body-wall occurred at the breeding season, and this temporary aperture has gradually become perma- nent. The absence of genital pores in Patella, and some Lamellibranchs which make use of the nephridia for the extrusion of their genital products, suggests that the very earliest Mollusca or their forefathers were devoid of genital ducts and pores. In no Mollusca, however, is the nephrid- ium used in the same way as a genital duct as it is in the Cheetopoda, the Gephyrza, and the Vertebrata; for the open mouth of the nephridium in Mollusca leads into the pericardial space, and it is not through this space and this mouth that the genital products of any Mollusca enter the nephridium (except perhaps in Neomenia), although it is by this mouth that the genital products enter the nephridium in the former classes above named. Hence the arrangement in Patella, d&c., is to be looked upon as a special development from the simpler condition when the Mollusca brought forth by rupture (= schizodinic, from @dés, travail), and not as derived from the common arrangement of adaptation of a nephridium to the genital efferent func- tion (=nephrodinic).1*~~

~~*The functional oviduct of Nautilus forms an albumini- parous gland as a diverticulum, which appears to corre- spond to a dilatation in the male duct, which succeeds the testis itself, and is called the "accessory gland." The male duct has a second dilatation (Needham's sac), and then is produced in the form of a large papilla. In Dibranchs the genital ducts are but little more elaborated. They are ciliated internally. In female Octopoda, in Ommastrephes, and in one male Octopod (Hledone moschata) the genital ducts are paired, opening right and left of the anus. But in all other Dibranchs a single genital duct only is deve- loped, viz., that of the left side, and leads from the genital capsule or chamber of the gonad to an*~~

~~asymmetrically-placed pore. In the male Dibranchs the genital duct is coiled and provided with a series of glandular dilatations and~~

~~1 Celomate animals are, according to this nomenclature, either Schizodinic or Porodinic. The Porodinic group is divisible into Ne- phrodinic and Idiodinic, in the former the nephridium serving as a pore, in the latter a special (?6:os) pore being developed. In each of these latter groups the pore may be—(1) devoid of a duct, (2) provided with a duct which is unattached to the gonad and opens into the body- cavity, (3) provided with a duct which fuses with the gonad. The genital ducts of Idiodinic forms may be called Idiogonaducts, as dis- tinguished from the Nephrogonaducts of nephrodinic forms.~~

~~MOLL Ss ce~~

~~[| CEPHALOPODA.,~~

~~receptacles. These are connected with the formation of the spermatophores. In the Siphonopoda the spermatic fluid does not flow as a liquid from the genital pore, but the spermatozoa are made up into little packets before extrusion. In other Mollusca (Pulmonata) and in other animals (Cheetopoda) this formation of '" sperm-ropes" is known, but in the Siphonopoda it attains its highest development. Exceedingly complicated structures of a cylindrical form (sometimes an inch in length) are formed in the male genital duct by a secretion which embeds and cements together the spermatozoa. They are formed in Nautilus as well as in Dibranchs, the actual manner in which their complicated structure is produced being not easily con- jectured. Accessory glands not forming part of the oviduct, but furnishing the material for enclosing the eggs inan elastic envelope, are found as paired structures, opening some way behind the anus in Nautilus (101, g.n.) and in the Di- branchs. They are known as the nidamental glands. In the female Sepia they are particularly large and prominent, and are accompanied by a second smaller pair. Reproduction and Development. —The details of sexual congress and of the actual fertilization of the egg are quite unknown in Nautilus, and imperfectly in the Dibranchs and the Pteropoda. Allusion has already been made to the subject in connexion with the hectocotylized arm. The mature eggs of Nautilus are unknown, as well as the appear- ance which they present when deposited. In the Dibranchs~~

~~*the eggs are always very large; in some cases the amount of food-yelk infused into the original egg-cell is so great as to give it the size of a large pea. This results in that mode of development which is only known outside this class among the Vertebrata ; it is discoblastic. The proto- plasm of the fertilized egg-cell segregates to one pole of the egg, and there undergoes cell-division, resulting in the formation of a disc of cleavage cells (fig. 121, (1)) resem- bling the cicatricula of the hen's egg, which subsequently spreads over and invests the whole egg (fig. 121, (2)). For details of this process we must refer the reader to other works (45, 46); but it may here be noted that in addition to the layer of cleavage cells, which consists of more than one stratum of cells in the future embryonic area as opposed to the yelk-sac area, additional cells are formed in the mass of residual yelk apparently by an independent process of segregation, each cell having a separate origin, whence they are termed "autoplasts." The autoplasts eventually form a layer of fusiform cells (fig. 121, (7), 2; fig. 122, m; and fig. 123, ps),—the "'yelk-membrane" which everywhere rests upon and encloses the residual yelk. The cleavage cells form a single layer on the yelk-sac area and two layers on the embryonic area, an outer layer one cell deep (fig. 122, ep), and an inner—the middle layer of the three—which is often thick and many cells deep (fig. 122, m). There is great difficulty here in identifying the layers with the three typical layers of other animal embryos, except in regard to the outermost, which corresponds with the epiblast of Vertebrates in many respects. The middle layer, however, gives rise to the nerve-ganglia as well as to the muscles, ccelom, and skeleto- trophic tissues, and to the mid-portion of the alimentary canal with its hepatic diverticula, the liver (see fig. 121, (7) and explanation, where the origin of the mid-gut as a vesicle r isseen). It is clearly, therefore, something more than the mesoblast of the Vertebrate, giving rise, as it does, to important organs formed both by epiblast and hypoblast in other animals, Tastly, the yelk- membrane, though corresponding to the Vertebrate hypo- blast in position and structure, furnishes no part of the alimentary tract, but disappears when the yelk is com- pletely absorbed. In fact, the developmental phenomena in Sepia, Loligo, and Octopus are profoundly perturbed by the excessive proportion of food-yelk. Balfour has shown*~~

~~that in the chick the orifice of closure of the overspreading | a structure corresponding to the primitive streak of the~~

~~blastoderm does not represent the whole of the blastopore,~~

~~Fic. 121.—Development of Loligo. (1) View of the cleavage of the egg during the first formation of embryonic cells. (2) Lateral view of the egg ata little later stage. a, limit to which the layer of cleavage-cells has spread over the egg; b,portion of the egg (shaded) as yet uncovered by cleavage-cells; ap, the autoplasts ; kp, cleavage-pole where first cells were formed. (3) Later stage, the limit @ now extended so as to leave but little of the egg-surface ae unen- closed. The eyes (d), mouth (e), and mantle-sac (vw) have appeared. (4) Later stage, anterior surface, the embryo is becoming nipped off from the yelk sac (g). (5) View of an embryo similar to (3) from the cleavage-pole or centro-dorsal area. (6) Later stage, posterior surface. (7) Section in a median dorso-ventral and antero-posterior plane of an embryo of the same age as (4). (8) View of the anterior face of anolder embryo. (9) View of the posterior face of an embryo of the same age as (8). Letters in (3) to (9):—«, lateral fins of the mantle; 6, mantle-skirt; c, supra-ocular invagination to form the " white body" ; d, the eye; e, the mouth ; /1, 2, 3, 4, 5, the five paired processes of the fore-foot; g, rhythmically contractile area of the yelk-sac, which is itself a hernia-like protrusion of the median portion of the fore-foot (see fig. 72**); h, dotted line showing internal area occupied by yelk (food- material of the egg); k, first rudiment of the mid-foot (paired ridges which unite to form the siphon or funnel); J, sac of the radula or lingual ribbon ; m, stomach ; n, rudiments of the gills (paired ctenidia); 0, the otocysts,—a pair of invaginations of the surface of the mid-foot; p, the optic ganglion ; a the distal portion of the ridges which form the siphon or mid-foot, & being~~

~~he basal portion of the same structure; 1, the vesicle-like rudiment of the in-testine formed independently of the parts connected with the mouth, s, k, m, and without invagination ; s, rudiment of the salivary glands; ¢ in (7), the Shell-sac at an earlier stage open (see fig. 122), now closed up; u, the open~~

~~*shell-sac formed by an uprising ring-like growth of the centro-dorsal area; w in (5), the mantle-skirt commencing to be raised up around the area of the shell-sac. In (7) mes points to the middle cell-layer of the embryo, ep to the outer layer, and h to the deep layer of fusiform cells which separates every- where the embryo from the yelk or food-material lying within it. (Original.)*~~

~~*but that this is in part to be sought in the widely-separated primitive streak. The present writer has little doubt that*~~

~~*chick, and lying near the klastic pole, will be found in Sepia and Loligo, and the strange vesicular origin of the mid-gut will be traced to and explained by it.*~~

~~*Leaving this difficult question of the cell-layers of the embryo, we would draw the reader's attention to the series of sketches representing the semi-transparent embryo of Loligo, drawn in fig. 121. When the cleavage cells have nearly enclosed the yelk, the upper or embryonic area shows the rudiments of the centro-dorsal mantle-sac or pen-sac, the mouth, the paired optic pits, and the paired*~~

~~*Fic, 122.—Section through the stil] open shell-sac occupying the centro-dorsal area of an embryo of Loligo; the position is inverted as compared with fig.*~~

~~*121 (3) and (7). ep, outer cell-layer; m, middle cell-layer; m', deep cell-layer of fusiform cells; y, the granular yelk or food-material of the egg; shs, the still open shell-sac. (From Lankester.)*~~

~~*otic pits (fig. 121, (3), (5)). The eye-pits close up (fig. 119), the orifice of the mantle-sac narrows, and its margin becomes raised and freely produced as mantle-skirt ; at the same time an hour-glass-like pinching in of the whole embryo commences, separating the embryo proper from the so-called yelk-sac (fig. 121, (4)). Around the "waist" of constriction, pair by pair, ten lobes arise (fig. 121, (8)),—the arms of the fore-foot. It now becomes obvious that the yelk-sac is but the median surface of the fore-foot bulged out inordinately by food-yelk, just as the hind region of the foot is in the embryo slug (see fig. 72**, and explanation). Just as in the slug, this dilated*~~

~~*yelk- holding foot is rhythmically contractile, and pulsates steadily over the area g in fig. 121, (4). At this stage, and long subsequently, the mouth of the young Cephalopod is in no way surrounded by the fore-foot, but lies well above its nascent lobes (e in fig. 121). Subsequently it sinks, as it were, between the right and left most anterior pair of the series, which grow towards one another and fuse above it, and leave no trace of their original position and relations. Fig. 121, (6) gives a view of the postero- dorsal surface of an embryo, in which the important fact is seen of the formation of the funnel or siphon by the union of two pieces (¢), which grow up each independently, one right and one left, like the sides of the siphon of Nautilus or the swimming lobes of a Pteropod, and subse- quently come together, as shown in (9), where the same letter g indicates the same part. The explanations of figs. 121 and 123 are given very full, and here, therefore, we shall only allude to two additional points. A curious mass of tissue of unknown significance occurs in the orbit of Dibranchs, known as the white body (w in fig. 120). A strongly-marked invagination just above the orbit is a very prominent feature in the embryo of: Loligo, Sepia, and Octopus, and appears to give rise to this so-called white body. This invaginated portion of the outer cell-layer is seen in fig. 121, (8) and (9), lettered c; in fig. 123, A and B, it is lettered wb. Lastly, in fig. 123, A, the origin of the optic nerve-ganglion ng from the cells of the middle layer should be especially noticed. In some other Molluscs the nerve- ganglia have been definitely traced to the outer cell-layer,*~~

~~*684*~~

~~*whilst in some Gastropods, according to Bobretzky, they originate, as here shown, for Loligo. ,*~~

~~*The egg-coverings of the Dibranchiate are very complete. Argonauta and Octopus deposit each egg in a firm oval case, thin and transparent, which has a long stalk by which (in Octopus) the egg is fixed in company with two or three hundred others to some foreign object. Sepia encloses each egg in a thick envelope of many layers resembling india-rubber. Loligo encloses many rows of eggs in a copious tough jelly, and affixes a dozen or twenty such egg-strings to one spot. Sepia and Loligo desert their eggs when laid. The female Octopus most jealously*~~

~~He TPN eV Cy V7~~

~~7~~

~~Ma: eoGoonoDeood~~

~~laa ita) a) abana te) ’ ~· ‘a yy~~

~~Fic. 123.—Right and left sections through embryos of Loligo. A. Same stage as fig. 121). B. Same stage as fig. 121 (8); only the left side of the sections is drawn, and the food-material which occupies the space internal to the membrane ym is omitted. al, rectum; is, ink-sac; ep, outer cell-layer; mes, middle cell-layer; ym, deep cell-layer of fusiforin cells (yelk-membrane); 7g, optic nerve-ganglion ; ot, otocyst ; wb, the “ white body” of the adult ocular capsule forming as an invagination of the outer cell-layer; mtf, mantle-skirt ; g, gill; ys, pen-sac or shell-sac, now closed ; dg, dorsal groove ; poc, primitive optic vesicle, now closed (see fig. 119); 7, lens; 7, retina; soc, second or anterior optic chamber still open ; if, iridean folds. C, The primitive invagination to form one of the otocysts, as seen in fig, 121 (5) and (6). (After Lankester.)~~

~~guards them, building a nest of stones and incubating.~~

~~Argonauta carries hers with her in a special brood-holding~~

~~shell.~~

~~The development of the Pteropoda, so far as is known, presents no points of contact with that of the Siphonopoda rather than with that of the Gastropoda, owing to the fact that in them the egg has not an excess of food-yelk. Con- sequently, we find typical trochosphere and veliger larvee among the Thecosomata (fig. 8, C, and fig. 81), whilst the isolated observation of Gegenbaur has made known very remarkable larve referable to the Gymnosomata, and with little doubt to Pneumodermon (fig. 84). The former set of larvee are sufficient to demolish once for all the view which has been entertained by some zoologists, viz., that the velar disc of the veliger larva is the same thing as the ptero- podial lobes of the mid-foot of Pteropoda. The latter larvee are of importance in showing that, as in~~

~~*embryo Siphonopods so in embryo Pteropods, the sucker-bearing lobes of the fore-foot are truly podial structures, and only embrace the head and surround the mouth as the result of late embryonic growth.*~~

~~*Branou B.—LIPOCEPHALA.*~~

~~*Characters.—Mollusca with the head region undeveloped. No cephalic eyes are present ; the buccal cavity is devoid*~~

~~*MOLLUSCA*~~

~~*| LAMELLIBRANCHIA.*~~

~~*of biting, rasping, or prehensile organs. The animal is sessile, or endowed with very feeble locomotive powers. The Lipocephala comprise but one class, the Lamelli- branchia, also known as Elatobranchia and Conchifera.*~~

~~*Class LAMELLIBRANCHITA.*~~

~~*Characters.—Lipocephala in which the archaic BILA- TERAL SYMMETRY of the Mollusca is usually fully retained, and raised to a dominant feature of the organization by the lateral compression of the body and the development of the shell as two bilaterally symmetrical plates or valves cover- ing each one side of the animal. The Foor is commonly a simple cylindrical or ploughshare-shaped organ, used for boring in sand and mud, and more rarely presents a crawl- ing disc similar to that of Gastropoda ; in some forms it is aborted. The paired cTENIDIA are very greatly developed right and left of the elongated body, and form the most prominent organ of the group. Their function is chiefly not respiratory but nutritive, since it is by the currents produced by their ciliated surface that food-particles are brought to the feebly-developed mouth and buccal cavity.*~~

~~*The Lamellibranchia present as a whole a somewhat uniform structure, so that, although they are very numerous, it is not possible to divide them into well-marked sub-classes or sections, and orders. The chief points in which they vary are—(1) in the structure of the ctenidia or branchial plates ; (2) in the presence of one or of two chief muscles, the fibres of which run across the animal's body from one valve of the shell to the other (adductors) ; (3)*~~

~~*in the greater or less elaboration of the posterior portion of the mantle-skirt so as to form a pair of tubes, by one of which water is introduced into the sub-pallial chamber, whilst by the other it is expelled ; (4) in the perfect or deficient symmetry of the two valves of the shell and the connected soft parts, as compared with one another ; (5) in the development of the foot asa disc-like crawling organ (Arca, Nucula, Pectun- culus, Trigonia, Lepton, Galeomma), as a simple plough- like or tongue-shaped organ (Unionacea, &c.), as a re-curved saltatory organ (Cardium, &c.), as a long burrowing cylin- der (Solenacea, &c.), or its partial (Mytilacea) or even com- plete abortion (Ostracea).*~~

~~*The essential Molluscan organs are, with these excep- tions, uniformly well developed. The MANTLE-SKIRT is always long, and hides the rest of the animal from view, its dependent margins meeting in the middle line below the ventral surface when the animal is retracted; it is, as it were, slit in the median line before and behind so as to form two flaps, a right and a left; on these the right and the left calcareous valves of the shell are borne respectively, connected by an uncalcified part of the shell called the ligament. In many embryo Lamellibranchs a centro-dorsal PRIMITIVE SHELL-GLAND or follicle has been detected (figs. 8and 151). The mouru lies in the median line anteriorly, the ANUS in the median line posteriorly.*~~

~~*Both crenrpia right and left are invariably present, the axis of each taking origin from the side of the body as in the schematic archi-Molluse (see fig. 1 and fig. 131). A pair of NEPHIRIDIA opening right and left, rather far forward on the sides of the body, are always present. Each opens by its internal extremity into the pericardium. A pair of GENITAL APERTURES, connected by genital ducts with the paired gonads, are found right and left near the nephridial pores, except in a few cases where the genital duct joins that of the nephridium (Spondylus). The sexes are often, but not always, distinct. No accessory glands or copulatory organs are ever present in Lamellibranchs. The ctenidia often act as brood-pouches.*~~

~~*A dorsal contractile HEART, with symmetrical right and left auricles (fig. 143, A) receiving aerated blood from the ctenidia and mantle-skirt, is present, being unequally de-*~~

~~*LAMELLIBRANCHIA.*~~ |

veloped only in those few forms which are inequivalve. The typical PERICARDIUM is well developed. It appears, as in other Mollusca, not to be a blood-space although developed from the cœlom, and it communicates with the exterior by the pair of nephridia. As in Cephalopoda (and possibly other Mollusca) water can be introduced through the nephridia into this space. The ALIMENTARY CANAL keeps very nearly to the median vertical plane whilst ex- hibiting a number of flexures and loopings in this plane. A pair of large glandular outgrowths, the so-called "liver" or great digestive gland, exists as in other Molluscs. A pair of pedal orocysts, and a pair of OSPHIRADIA at the base of the gills, appear to be always present. A typical NERVOUS SYSTEM is present (fig. 144), consisting of a cerebro-pleuro-visceral ganglion-pair, united by connectives to a pedal ganglion-pair and an osphradial ganglion-pair (parieto-splanchnic).

A special czeccum connected with the pharynx is some- times found, containing a tough flexible cylinder of trans- parent cartilaginous appearance and unknown significance, called the "crystalline style" (Mactra), which possibly represents the radular sac of Glossophora. In many Lamelli- branchs a gland is found on the hinder surface of the foot in the mid line, which secretes a substance which sets into the form of threads —the so-called " byssus "—by means of which the animal can fix itself. Sometimes this gland is found in the young and not in the adult (Anodon, Unio, Cyclas). In some Lamellibranchs (Pecten, Spondylus, Pholas, Mactra, Tellina, Pectunculus, Galeomma, &c.), although cephalic eyes are always absent, special eyes are developed on the free margin of the mantle-skirt, apparently by the modification of tentacles which are commonly found there (fig. 145). The existence of pores in the foot and elsewhere in Lamellibranchia by which liquid can pass into and out of the vascular system, although asserted as in the case of other Mollusca, appears to be improbable. It has yet to be shown by satisfactory micro- scopic sections that the supposed pores are anything but epidermal glands.

The Lamellibranchia live chiefly in the sea, some in fresh waters. A very few have the power of swimming by opening and shutting the valves of the shell (Pecten, Lima) ; most can slowly crawl or rapidly burrow; others are, when adult, permanently fixed to stones or rocks either by the shell or the byssus. In development some Lamellibranchia pass through a free-

~~swimming trochosphere stage with pre- oral ciliated band ; other fresh-water forms which carry the young in brood-pouches formed by the ctenidia have sup- pressed this larval phase.~~

~~The following classification and enumeration of genera are based primarily upon the characters of the adductor muscles. The Heteromya and Monomya must be conceived of as derived from forms resembling such Gastropodous Isomya as Nucula and Trigonia, which undoubtedly are the nearest living representatives of the ancestral Lipo- cephala, and bring us nearest to the other branch of the Mollusca, the Glossophora.~~

~~Order 1.—Isomya.~~

~~Character.—Anterior and posterior adductor muscles of approxi- mately equal size.~~

~~Sub-order 1.—Jntegripallia.~~

~~Characters.—Marginal attachment of the mantle to the shell not inflected to form a sinus; siphons not developed in some, present in most.~~

~~Family 1.—Arcacea.~~

~~Genera: Area, L. (fig. 132); Cucullwa, Lam. ; Peetuneulus, Lam. ; Limopsis, Sassi; Nueula, Lam. (fig. 134) ; Zsoarea, Miinster ; Leda, Schu.; Yoldia, Moll. ; Solenella, Sowerby, &c.~~

~~Family 2.—Trigoniacea. Genera: Trigonia, Brug. ; Axinus, Sow. ; Iyrodesma, Conrad.~~

~~Family 3.—Unionacea.~~

~~Genera: Unio, Retz. ; Castalia, Lam. ; Anodon, Ouv. (figs. 124,~~

~~&c.) ; Iridina, Lam. ; Myeetopus, d'Orb., &c. Family 4.—Lueinacea.~~

~~*Genera : Lucina, Brug. ; Corbis, Cuv.; Diplodonta, Brown ; Kellia, Turton ; Montaeuta, Turton ; Lepton, Turton ; Gaic- omma, Turton ; Astarte, Sow. ; Crassatella, Lam. ; Cardinia, Ag. ; Cardita, Brug., &c.*~~

~~*Family 5.—Cyprinacea.*~~

~~*Genera : Tridaena, Da C. ; Chama, L. ; Dimya, Ron. ; Diceras, Lk. ; Isocardia, Lam. ; Hippopodium, Sow. ; Cardium, L. ; Corbicula, Meg.; Cyrena, Lk.; Cyclas, Brug. (fig. 146) ; Pisid- tum, Pfr. (figs. 148-158) ; Cyprina, Lam., &c.*~~

~~*Sub-order 2.—Stnupallia.*~~

~~*Characters.—Marginal attachment of the mantle to the shell in- flected so as to form a sinus into which the pallial siphons can be withdrawn ; siphons always present, and large.*~~

~~*Family 6.—Veneracea.*~~

~~*Genera: Cyprieardia, Lam. ; Tapes, Megl. ; Cyelina, Desh. ; Cytherea, Lain. (figs. 125, &c.); Chione, Megl.; Venus, L. ; Lucinopsis, ¥F. H. ; Sanguinolaria, Lam. ; Psammobia, Lam. (fig. 130); Tellina, L.; Donax, L.; Serobicularia, Schu. ; Cumingia, Sow. ; Rangia, Dsml. ; Maetra, L. (fig. 140); Lrigo- nella, Da C. ; Vaganella, Gr. ; Lntraria, Lam.*~~

~~*Family 7.—Myaeea.*~~

~~*Genera: Myochama, Stb. ; Chamostrea, Rois; Pandora, Sol. ; Dhracia, Leach ; Thetis, Sow. ; Pholadomya, Sow. ; Corbulu, Brug. ; Mya, Lam. ; Saxicava, Fleur; Panopewa, Ad. ; Glyei- meris, Lam. ; Siliqua, Mhif., &c. ; Solen, L.*~~

~~*Family 8.—Pholadacea.*~~

~~*Genera: Clavagella, Lam. ; Aspergillum, Lam. (figs. 128, 129) ; Humphreyia, Gr. ; Pholas, L. ; Pholadidea, Turt.; Teredo, L. ; Teredina, Lam. ; Furcella, Oken, &c.*~~

~~*Order 2.—Heteromya.*~~

~~*Characters.—Anterior adductor (pallial adductor) much smaller than the posterior adductor (pedal adductor) ; siphons rarely present. Family 1.—Jytilacea.*~~

~~*Genera: Mytilus, L. (fig. 188); Modiola, Lam.; Crenella, Brown ; Lithodomus, Cuv.; Dreissena, Ben. (fig. 1386); Modiolarea, Gr., &c.*~~

~~*Family 2,—Mulleriacea. Genera: Aetheria, Lam. ; Maulleria, Fer. Order 3.—Monomya. Characters,—Anterior adductor absent in the adult; siphons never developed. Family 1.—Aviewlacea, Genera: Cardiola, Brdp. ; Aviewla, Kl.; Matlews, Lam. ; Jno- ceramus, Sow. ; Crenatula, Lam. ; Perna, Brug., &c. Family 2.—Ostracea.*~~

~~*Genera: Ostrea, L. (fig. 6); Anomia, L.; Spondylus, L.; Plicatula, Lam. ; Vuilsella, Lam. ; Lima, Brug. ; Pecten, L. ; Hiwnites, Dir, &c.*~~

~~*Further Remarks on the Lamellibranchia.—The Lamelli- branchia are the only members of the Lipocephalous branch of Mollusca existing at the present day; and we must suppose that, whilst on the one hand the earliest Glosso- phorous forms were developing from the archi-Mollusca by the elaboration of the buccal apparatus, the bivalved sessile Lamellibranchs were developing in another direction from univalve cephalophorous ancestors. The large bilobed mantle-flap with its pair of shells covering in the whole animal, the current-producing largely-expanded ctenidia, and the reduced cephalic region are characters which go hand in hand, and were simultaneously acquired, each being related to the development of the others. Unless the "crystalline style" of Lamellibranchs is to be considered as the rudiment of the "radular sac" of Glossophora, as suggested by Balfour, there is no indication whatever that the ancestors of the Lamellibranchia had acquired a repre- sentative of the buccal apparatus—so highly developed in Glossophora—before diverging from the archi-Mollusca ; that is to say, the common ancestors of the two great branches of Mollusca presented the distinctive character of neither branch—they had not an aborted cephalic region, and they had not a lingual ribbon.*~~

~~*As an example of the organization of a Lamellibranch, we shall review the structure of the Common Pond-Mussel (Anodonta cygnea), comparing its structure with those of*~~

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other Lamellibranchia. The Swan Mussel has superficially a perfectly-developed bilateral symmetry. The left side of the animal is seen as when removed from its shell in fig. 124 (1). The valves of the shell have been removed by severing their adhesions to the muscular arez h, 2, k, 1, m, w.

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and so to form a more or less completely closed bag, as in the Scaphopoda (Dentalium). In this way the notches d, e of the hinder part of the mantle-skirt of Anodon are in the Siphonate forms converted into two separate holes, the edges of the mantle being elsewhere fused together along this hinder margin. Further than this, the part of the mantle-skirt bounding the two holes is frequently drawn out go as to form a pair of tubes which project from the shell (figs. 130, 141). In such Lamellibranchs as the oysters, scallops, and many others which have the edges of the mantle-skirt quite free, there are numerous tentacles upon those edges. In Anodon these pallial tentacles are confined to a small area surrounding the inferior siphonal notch (fig. 124, (3), ¢).

The centro-dorsal point a of the animal of Anodonta (fig. 124, (1)) is called the umbonal area ; the great anterior muscular surface A is that of the anterior adductor muscle, the posterior similar surface 7 is that of the posterior adductor muscle; the long line of attachment uw is the simple "pallial muscle,"—a thickened ridge which is seen to run parallel to the margin of the mantle-skirt in this Lamellibranch. In some of the Siphonate Isomya, which are hence termed "Sinupallia," the pallial muscle is not simple but deeply incurved at the posterior region so as to allow of the large pallial siphons being retracted within the shell or expanded at will (fig. 127, and figs. 140, 141).

It is the approximate equality in the size of the anterior and posterior adductor muscles which has led to the name Isoyma for the group to which Anodon be- longs. The hinder adductor muscle may be considered as re-presenting morphologically the transverse fibres of the root of the foot of

~~*Nautilus by which it adheres to its shell (fig. 91, £), the annular muscular area of Patella (fig.27,c), and the columella muscle of the Gastropods generally. It is always large in Lamellibranchs, but the anterior adductor may be very small (Heteromya), or Fig, 225*~~

~~*Fic, 124.—Diagrams of the external form and anatomy of Anodonta cygnea, the Pond-Mussel; in all the figures the animal is seen from the left side, the centro-dorsal region uppermost, as in the drawings of fig. 75, which compare. (1) Animal removed from its shell, a probe g passed into the sub-pallial chamber through the excurrent siphonal notch. (2) View from the ventral surface of an Anodon with its foot expanded and issuing from between the gaping shells. (3) The left mantle-flap reflected upwards so as to expose the sides of the body. (4) Diagrammatic section of Anodon to show the course of the alimentary canal. (5) The two gill-plates ofthe left side reflected upwards so as to expose the fissure between foot and gill where the probe g passes. (6) Diagram to show the positions of the nerve-ganglia, heart, and nephridia.*~~

~~*Letters in all the figures as follows :—a, centro-dorsal area; b, margin of the left mantle-flap ; c, margin of the right mantle-flap ; d, excurrent siphonal notch of the mantle margin; e, incurrent siphonal notch of the mantle margin; f, foot; g, probe passed into the superior division of the sub-pallial chamber through the excurrent siphonal notch, and issuing by the side of the foot into the inferior division of the sub-pallial chamber; h, anterior (pallial) adductor muscle of the shells; i, anterior retractor muscle of the foot; k, protractor muscle of the foot; 1, posterior (pedal) adductor muscle of the shells; m, posterior retractor muscle of the foot; », anterior labial tentacle; 0, posterior labial tentacle ; p, base-line of origin of the reflected mantle-flap from the side of the body; g, left external gill-plate; r, left in- ternal gill-plate; rr, inner lamella of the right inner gill-plate ; rg, right outer gill-plate ; s, line of concrescence of the outer lamella of the left outer gill- plate with the left mantile-flap ; t, pallial tentacles ; u, the thickened mus- cular pallial margin which adheres to the shell and forms the pallial line of the left side; v, that of the right side; w, the mouth; 2, aperture of the left organ of Bojanus (nephridium) exposed by cutting the attachment of the inner lamella of the inner gill-plate ; y, aperture of the genital duct; z, fissure between the free edge of the inner lamella of the*~~

~~*inner gill-plate and the side of the foot, through which the probe g passes into the upper division of the sub-pallial space; aa, line of concrescence of the inner lamella of the right inner gill-plate with the inner lamella of the left inner gill-plate; ab, ac, ad, three pit-like depressions in the median line of the foot supposed by some writers to be pores admitting water into the vascular system ; ae, left shell valve ; af, space occupied by liver ; ag, space occupied by gonad ; ah, muscular substance of the foot; ai, duct of the liver on the wail of the stomach ; ak, stomach ; al, rectum traversing the ventricle of the heart; am, pericardium ; i an, glandular portion of the left nephridium ; ap, ventricle of the heart ; aq, Pe aperture by which the left auricle joined the ventricle; ar, non-glandular por- tion of the left nephridium ; as, anus; at, pore leading from the pericardium into the glandular sac of the left nephridium ; au, pore leading from the glandular into the non-glandular portion of the left nephridium ; av, internal pore lead- ing from the non-glandular portion of the left nephridium to the external pore ; aw, left cerebro-pleuro-visceral ganglion ; ax, left pedal ganglion ; ay, left otocyst; az, left olfactory ganglion (parieto-splanchnic) ; bb, floor of*~~

~~*the pericardium separating that space from the non-glandular portion of the nephridia.*~~

~~*The free edge of the left half of the mantle-skirt b is repre-*~~

~~*O07 ety,*~~

~~*sof*~~

~~*Wan onqses enmwens? 5 i tral orinfervor bo*~~

~~*sented as a little contracted in order to show the exactly simi- lar free edge of the right half of the mantle-skirtc. These edges are not attached to, although they touch, one another 5 each flap (right or left) can be freely thrown back in the way which has been carried out in fig. 124, (3) for that of the left side. This is not always the case with Lamellibranchs; there is in the group a tendency for the corresponding edges of the mantle-skirt to fuse together by concrescence,*~~

~~*Fic. 126.—Right valve of the same shell from the outer face.*~~

~~*in Heteromya and Isomya. Amongst those Lamelli- branchs which have only a posterior adductor (Monomya), it is remarkable that the oyster has been found (by Huxley) to possess, when the young shells and muscles first develop, a well-marked anterior adductor as well as a posterior one. Accordingly there is ground for supposing*~~

~~*that the Monomya have been developed from Isomya- like ancestors, and have lost by atrophy their anterior adductor. The single adductor muscle of the Monomya is separated by a difference of fibre into two portions, but neither of these can be regarded as possibly represent*~~

~~*ligamen! f i. _1umbo*~~

~~*ing the anterior adductor of the other Lamelli- branchs. One of*~~

~~*these portions is more ligamentous, and serves to keep the two shells con- stantly attached to one another, whilst Fic. 127.—Left valve of the same shell from the inner the more fleshy por- face. (Figs. 125, 126, 127 from Owen.) tion serves to close the shell rapidly when it has been gaping. In removing the valves of the shell from an Anodon, it is necessary not only to cut through the muscular attach- ments of the body-wall to the shell but to sever also a strong elastic ligament, or spring resembling india-rubber, joining the two shells about the umbonal area. The shell of Anodon does not present these parts in the most strongly marked condition, and accordingly our figures (figs. 125, 126, 127) represent the valves of the Sinupalliate genus Cytherea. The corresponding parts are recognizable in Anodon. Referring to the figures (125, 126) for an ex- planation of terms applicable to the parts of the valve and the markings on its inner surface—corresponding to the muscular area which we have already noted on the surface of the animal's body—we must specially note here the posi- tion of that denticulated thickening of the dorsal margin of the valve which is called the hinge (fig. 127). By this hinge one valve is closely fitted to the other. Below this hinge each shell becomes concave, above it each shell rises a little to form the umbo, and it is into this ridge-likeupgrowth of each*~~

~~*valve that the elastic ligament or spring is fixed (fig. 127). As shown in the diagram (fig. h 127*) representing a transverse sec- tion of the two valves of a Lamelli- branch, the two shells form a double lever, of which the toothed-hinged is the fulcrum. The adductor muscles placed in the concavity of the shells act upon the long arms of the lever at a mechanical advantage ; their con- traction keeps the shells shut, and stretches the ligament or spring A. On the other hand, the ligament 2 acts upon the short arm formed by the umbonal ridge of the shells; when- ever the adductors relax, the elastic substance of the ligament contracts, and the shells gape. It is on this account that the valves of a dead La-*~~

~~*A*~~

~~*Fia.127*.—Diagram of asec- tion of a Lamellibranch's shells, ligament, and ad-*~~

~~*mellibranch always gape; the elastic ligament is no longer counteracted by the effort of the adductors. The state of closure of the valves of the shell is not, therefore, one of rest ; when it is*~~

~~*ductor muscle. a, b, right and left valves of the shell; c, d, the umbones or short arms of the lever ; e, f, the long arms of the lever; g, the hinge; h, the ligament ; 7, the adductor*~~

~~*at rest—that is, when there is no muscle.*~~

~~*muscular effort—the valves of a Lamellibranch are slightly gaping, and are closed by the action of the adductors when the animal is disturbed. The ligament is simple in Anodon ; in many Lamellibranchs it is separated into two layers, an outer and an inner (thicker and denser). That the condition*~~

~~*of gaping of the shell-valves is essential to the life of the Lamellibranch appears from the fact that food to nourish it, water to aerate its blood, and spermatozoa to fertilize its eggs, are all introduced into this gaping*~~

~~*chamber by currents of water, which are set going by the highly- developed ctenidia. The current of water enters into the sub-pallial space at the spot marked ¢ in fig. 124, (1), and, after passing as far forward as the mouth w in fig. 124, (5), takes an outward course and leaves the sub-pallial space by the upper notch d. These notches are known in Anodon as the afferent and efferent siphonal notches respectively, and correspond to the long tube-like afferent inferior and efferent superior "siphons" formed by the mantle in many other Lamellibranchs (fig. 130).*~~

~~*Whilst the valves of the shell are equal in Anodon we find in many Lamellibranchs (Ostreea, Chama, Corbula, é&c.) one valve larger, and the other smaller and sometimes flat, whilst the larger shell may be fixed to rock or to stones (Ostreea, &c.). A further variation consists in the develop- ment of additional shelly plates upon the dorsal line be- tween the two large valves (Pholadide). In Pholas dactylus we find a pair of umbonal plates, a dors-umbonal plate and a dorsal plate. It is to be remembered that the whole of the cuticular hard product produced on the dorsal surface and on the mantle-flaps is to be regarded as the "shell," of which a median band-like area, the ligament, usually remains uncalcified, so as to result in the production of two valves united by the elastic ligament. But the shelly substance does not always in boring forms adhere to this form after its first growth. In Aspergillum the whole of the tubular mantle area secretes a continuous shelly tube, although in the young condition two valves were present. These are seen (fig. fi. 129) set in the firm substance of the adult*~~

~~*? tubular shell, which has even replaced the ligament, so that the tube is complete. In Teredo a similar tube is formed as the animal elongates (boring in wood), the original shell- valves not adhering to it but remaining mov- able and provided with a special muscular apparatus in place of a ligament.*~~

~~*Let us now examine the organs which lie beneath the mantle-skirt of Anodon, and are bathed by the current of water which cir-*~~

~~*Fig. 128. Fig. 129.* «~~

~~*Fic, 128.—Shell of Aspergillum vaginiferum (from Owen). Fra, 129.—Shell of Aspergillum vaginiferum to show the original valves a, now embedded in*~~

~~*a continuous calcification of tubular form (from Owen).*~~

~~*culates through it. This can be done by lifting up and throwing back the left half of the mantle-skirt as is re- presented in fig. 124, (3). We thus expose the plough- like foot (7), the two left labial tentacles, and the two left gill-plates or left ctenidium. In fig. 124, (5), one of the labial tentacles x is also thrown back so as to show*~~

~~*the mouth w, and the two left gill-plates are reflected so as to show the gill-plates of the right side (77, 77) pro- jecting behind the foot, the inner or median plate of each side being united by concrescence to its fellow of the opposite side along a continuous line (aa). The left inner gill-plate is also snipped so as to show the subjacent orifices of the left nephridium «, and of the genital gland (testis or ovary) y. 'The foot thus exposed in Anodon is a simple muscular tongue-like organ. It can be protruded between the flaps of the mantle (fig. 124, (1), (2)) so as to issue from the shell, and by its action the Anodon can slowly crawl, or burrow in soft mud or sand. It has been sup- posed that water is taken into the blood-vessels of the Anodon through pores in the foot, and in spite of opposi- tion this view is still maintained (Griesbach, 47). In fig. 124, (2) the letters ab, ac, ad, point to three pit-like depres- sions, supposed by Griesbach to be pores leading into the blood-system. According to Carriére (48) these pits are nothing but irregularities of the surface; in some cases they are the entrances to ramified glands. Other Lamelli- branchs may have a larger foot relatively than has Anodon. In Arca it has a sole-like surface. In Arca too and many others it carries a byssus-forming gland and a byssus- cementing gland. In the Cockles, in Cardium, and in Trigonia, it is capable of a sudden stroke, which causes*~~

~~*the animal to jump when out of the water, in the latter*~~

~~*<9! — iit a y, *~~

~~*and the posterior a continuation of the inner gill-plate. There is no embryological evidence to support this sug- gested connexion, and, as will*~~

~~appear immediately, the history of the gill-plates in various forms of Lamelli- branchs does not directly favour it. Yet it is very prob- able that the labial tentacles and gill-plates are modi- fications of a double horseshoe-shaped area of ciliated filamentous processes which existed in ancestral Mollusca much as in Phoronis and the Polyzoa, and is to be com- pared with the continuous pre- and post-oral ciliated band of the Echinid larva Pluteus and of Tornaria (49).~~

~~The gill-plates have a structure very different from that of the labial tentacles, and one which in Anodon is singu- larly complicated as compared with the condition presented by these organs in some other Lamellibranchs, and with what must have been their original condition in the ances- tors of the whole series of living Lamellibranchia. The phenomenon of "concrescence" which we have already had to note as showing itself so importantly in regard to the free edges of the mantle-skirt and the formation of the siphons, is what, above all things, has complicated the structure of the Lamellibranch ctenidium. Our present knowledge of the interesting series of modifications through which the Lamellibranch gill-plates have developed to their most complicated form is due to R. Holman Peck (50) and to Mitsukuri (51). The Molluscan ctenidium is typi- cally, as shown in fig. 2, a plume-like struc- ture, consisting of a vascular axis, on each side of which is set a row of numerous la- melliform or filamentous processes. These processes are hollow, and receive the venous blood from, and return it again aerated into, the hollow axis, in which an afferent and an efferent blood-vessel may be differentiated. In the genus Nucula (fig. 134), one of the~~

~~é Fra. 130.—Psammobdia florida, right side, showing expanded foot e, and g incurrent and g' excurrent Arcacee, we have an example of a Lamelli-~~

~~siphons (from Owen).~~

~~genus to a height of four feet. In Mytilus the foot is reduced to little more than a tubercle carrying the aper- tures of these glands. In the Oyster it is absent alto- gether.~~

~~The labial tentacles of Anodon (n, 0 in fig. 124, (3), (5)) are highly vascular I flat processes richly q I c supplied with nerves. 4 oan The left~~

~~anterior ten- a: tacle (seen in the figure) is joined at i= its base in front of He oe. | the mouth (w) to the $4 : right anterior ten- tacle, and similarly the left (0) and right posterior tentacles are joined behind the~~

~~mouth. Those of p.4. 131 Diagram of a view from the left side of Sam & : _ m of a view from the i Arca (4, kin fig. 132) the animal of Anodonta cygnea, from Waid ths show this relation to mantle-skirt, the labial tentacles, and the gill- filaments have been entirely removed so as to the mouth (a). These — ute Fepeens of oe ~~ of = gill-plumes r ctenidia g, h. a, centro-dorsal area; 6, ante- organs are character- rior adductor muscle ; ¢, posterior adductor istic of all Lamelli- ton'ot the axis of left ctenlatam; >, axis of : i e ctenidium; h, axis o: branchs 5 they do not oy oe ae portion of the axis of the var x * s eft ctenidium which is fused with the base of ary except IM SIZ, the foot, the two dotted lines indicating the b eling some times epee 9 ag pbs of gill-filaments ; m, line 3 of origin o e anterior labial tentacle; — drawn ; out : to phridial aperture; 0, genital eneclns tiie late streamer-like dimen- of 69 of the posterior labial tentacle, (Ori-~~

~~s i ginal.~~

~~sions. Their appear-~~

~~ance and position suggest that they are in some way related morphologically to the gill-plates, the anterior labial tentacle being a continuation of the outer gill-plate,~~

~~e~~

~~nr~~

~~branch retaining this plume-like form of gill. In other Arcacez (e.g., Arca and Pectunculus) the lateral processes which are set on the axis of the ctenidium are not lamellz, but are slightly-flattened, very long tubes or hol- low filaments. These fila- ments are so fine and are set so closely together that they appear to form a continuous membrane until examined with a lens. The microscope shows that the neighbour- ing filaments are held to- gether by patches of cilia, called "ciliated junc- tions," which interlock with one another just as two brushes may be made to do. In fig. 133, A a~~

~~*portion of four filaments of a ctenidium of the Sea- Mussel (Mytilus) is repre- sented, having precisely Fia. 132.—View from the ventral (pedal) as-*~~

~~*the same structure as __pectofthe animal of Arca Now, the mantle-*~~

~~*flapand gill-filaments having been cut away.*~~

~~*those of Arca. ‘< The fila- a, mouth; b, anus; ¢, free spirally turned ments of the gill (cteni- extremity of the gill-axis or ctenidial axis di fi of the right side; d, do. of the left side; ium) of Mytilus and e, f, anterior portions of —_ a — Ar by concrescence to the wall of the y; ca thus form two g, anterior adductor muscle; h, posterior closely set rows which adductor; i, anterior labial Oat bi D osterior labial tentacle ; 1, base line of the*~~

~~*depend from the axis of oot; m, sole of the foot; 7, callosity.*~~

~~*the gill like two paralle] (Original.)*~~

~~*plates. Further, their structure is profoundly modified by the curious condition of the free ends of the depending filaments. These are actually reflected at a sharp angle—*~~

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~~*doubled on themselves in fact—and thus form an additional | in the trellis-work formed by the united gill-filaments*~~

~~*row of filaments (see fig. 133, B). Consequently, each primi- | (fig. 138, A, B).*~~

~~*tive filament has a descending and an ascending ramus, and instead of each row forming a simple plate, the plate is double, consisting of a descending and an ascending lamella. As the axis of the ctenidium lies by the side of the body, and is very frequently connate with the body, as so often happens in Gastropods also, we find it convenient to speak of the two plate-like*~~

~~structures formed on each ctenidial axis as the outer and the inner gill-plate ; each of these is~~

~~Base~~

~~Fia. 183.—Filaments of the ctenidium of Mytilus edulis (after HIolman Peck). A. Part of four filaments seen from the outer face in order to show the ciliated junctions ¢j. B. Diagram of the posterior face of a single complete filament with descending ramus and ascending ramus ending in a hook-like process. ep., ep., the ciliated junctions ; il.j., inter-lamellar junction. C. Transverse section of a filament taken so as to cut neither a ciliated junction nor an inter-lamellar junction. fe., frontal epithelium ; l.fie'., l.fe'., the two rows of latero-frontal epithelial cells with long cilia ; ch, chitonous tubular lining of the filament ; lac., blood lacuna traversed by a few processes of connective tissue cells; b.c., blood-corpuscle.~~

~~composed of two lamella, an outer (the reflected) and an~~

~~adaxial in the case of the outer gill-plate, and an adaxial and~~

~~an inner (the reflected) in the case of the inner gill-plate.~~

~~This is the condition seen in Arca and Mytilus, the so-~~

~~called plates dividing upon the slightest touch into their~~

~~constituent filaments, which are but loosely conjoined by their "ciliated junctions." Complications follow upon this in other forms. Even in Mytilus and Arca a con- nexion is here and there formed between the ascending and descending rami of a filament by hollow extensible outgrowths called "interlamellar junctions" (2,7 in B, fig.~~

~~133). Nevertheless the filament is a complete tube formed~~

~~of chitonous substance and clothed externally by ciliated~~

~~epithelium, internally by endothelium and lacunar tissue—~~

~~a form of connective tissue—as shown in fig. 133, C.~~

~~*Now let us suppose, as happens in the genus Dreissena—*~~

~~*a genus not far removed from Mytilus—that the ciliated*~~

~~*inter-filamentar junctions (fig. 136) give place to solid*~~

~~*permanent inter-filamentar junctions, so that the filaments are converted, as it were, into a trellis-work. Then let us suppose that the inter-lamellar junctions which we have already noted in Mytilus become very numerous, large, and irregular; by them the two trellis-works of filaments would be united so as to leave only a sponge-like set of spaces between them. Within the trabecule of the sponge-work blood circulates, and between the trabeculze the water passes, having entered by the apertures left*~~

~~*The larger the intra-lamellar spongy*~~

~~*tj,*~~

~~*Fic. 134.—Structnre of the ctenidia of Nucula (after Mitsukuri); see also fig. 2. A. Section across the axis of a ctenidinin with a pair of plates—flattened and shortened filaments—attached. 4, j, k, g are placed on or near the membrane which attaches the axis of the ctenidium to the side of the body; a, b, free extremities of the plates (filaments); d, mid-line of the inferior border; e, surface of the plate; ¢, its upper border; h, chitonous lining of the plate; r, dilated blood-space ; u, fibrous tract; 0, upper blood-vessel of the axis ; , lower blood-vessel of the axis; s, chitonous framework of the axis ; ep, canal in the same; A, B, line along which the cross-section C of the plate is taken. B. Animal of a male Nucula proxvima, Say, as seen when the left valve of the shell and the left half of the mantle-skirt are re-moved. «.a., anterior adductor muscle; p.a., posterior adductor muscle; v.m, visceral mass; f, foot; g, gill; J, labial tentacle; J.a., filamentous appendage of the labial tentacle; Jb, hood-like appendage of the labial ten-tacle ; m, membrane suspending the gill and attached to the body along the line 2, y, 2, w; p, posterior end of the gill (ctenidium), C. Section across one of the gill-plates (A, B, in A) comparable with fig. 133, C. i.a., outer border; d.a., axial border; U.f,, latero-frontal epithelium ; e, epithelium of general surface ; 7, dilated blood-space ; h, chitonous lining (compare A),*~~

~~*growth becomes, the more do the original gill-filaments*~~

~~*lose the character of blood-holding tubes and tend to become dense elastic rods for the simple purpose of sup- porting the spongy growth. This is seen both in the section of Dreissena gill (fig. 136) and in those of Anodon*~~

~~*(fig. 137, A, B, C). In the drawing of Dreissena the*~~

~~*individual filaments /, f, f are cut across in one lamella at*~~

~~*the horizon of an inter-filamentar junction, in the other*~~

~~*(lower in the figure) at a point where they are free. The*~~

~~*chitonous substance ch is observed to be greatly thickened*~~

~~*as compared with what it is in fig. 133, C, tending in fact to obliterate altogether the lumen of the filament.*~~

~~*And in Anodon (fig. 137, C) this obliteration is effected. In*~~

~~*Anodon, besides being thickened, the skeletal substance of*~~

~~*the filament develops a specially dense rod-like body on*~~

~~*each side of each filament. Although the structure of the ctenidium is thus highly complicated in Anodon, it is yet more so in some of the Siphonate genera of Lamellibranchs.*~~

~~*The filaments take on a secondary grouping, the surface of*~~

~~*the lamella being thrown into a series of half-cylindrical*~~

~~*ridges, each consisting of ten or twenty filaments; a filament XVI. — 87*~~

~~*690*~~

~~*of much greater strength and thickness than the others may be placed between each pair of groups. In Anodon, as In*~~

jr

w

Fic. 135.—Diagrams of transverse sections of a Lamellibranch to show the adhesion, by concrescence, of the gill-lamellz to the mantle-flaps, to the foot,

and to one another. A shows two conditions with free gill-axis; B, condition at foremost region in Anodon; C, hind region of foot in Anodon; D, region altogether posterior to the foot in Anodon. a, visceral mass ; }, foot ; c, mantle flap; d, axis of gill or ctenidium ; c¢, adaxial lamella of outer gill-plate; er, reflected lamella of outer gill-plate; f, adaxial lamella of inner gill-plate ; fr, reflected lamella of inner gill-plate ; g, line of concrescence of the reflected lamella of the two inner gill-plates ; h, rectum ; 7, supra-branchial space of the sub-pallial chamber. (Original.)

many other Lamellibranchs, the ova and hatched embryos are carried for a time in the ctenidia or gill apparatus, and in this particular case the space between the two lamell

f ie Be Hy «stiles Wc dy, J 3 say JDJ é YY WIN) SW YING AR SUA i Y e) NOX NV ‘ 6) IN es Yl [eles / (Ve ‘sie Sie & AV Ayes \ Fa dal | ‘\SE Cal | 3 GC \ 4 4 ie fo” Roam H > MeV mel AS mm UN A Se aie Sue BU Sills (ome) ame Nc ay oe NC

aS,

d la 3 4 = oa\ 2 if ic Se 2 ies) [ar 3 \e ie) ia): ia) a) es i ass). We)

Fia. 186.—Transverse section of the outer gill-plate of Dreissena polymorpha (after Holman Peck). /, constituent gill-filaments ; ff, fibrous pes ae fin tissue ; ch, chitonous substance of the filaments; nch, cells related to the chitonous substance; lac, lacunar tissue; pig, pigment-cells; be, blood- corpuscles ; Se, frontal epithelium ; lfe’, Life’, two rows of latero-frontal epi- thelial cells with long cilia; Uf, fibrous, possibly muscular, substance of the inter-filamenter junctions.

~~*of the outer gill-plate is that which serves to receive the ova (fig. 137, A). The young are nourished bya substance*~~

~~*MOLLUSCGA*~~

~~*[LAMELLIBRANCHIA.*~~

~~*formed by the cells which cover the spongy inter-lamellar outgrowths.*~~

~~*There are certain other points in the modification of the typical ctenidium which must be noted in order to under- stand the ctenidium of Anodon. The axis of each ctenid- ium, right and left, starts from a point well forward near the labial tentacles, but it is at first only a ridge, and does not project as a free cylindrical axis until the back part of*~~

~~*ch chr*~~

~~*Fic. 137.—Transverse sections of gill-plates of Anodon (after Peck). A. Outer late. B. Inner gill-plate. C. A portion of B more highly magnified.*~~

~~*ill-p aL outer lamella; i.J, inner lamella; v, blood-vessel ; /, constituent fila-*~~

~~*ments; lac, lacunar tissue; ch, chitonous substance of the filament; chr, chitonous rod embedded in the softer substance ch.*~~

~~*the foot is reached. This is difficult to see at all in Ano- don, but if the mantle-skirt be entirely cleared away, and if the dependent lamelle which spring from the ctenidial axis be carefully cropped away so as to leave the axis itself intact, we obtain the form shown in fig. 131, where g and h are respectively the left and the right ctenidial axes pro- jecting freely beyond the body. In Arca this can be seen with far less trouble, for the filaments are more easily re- moved than are the consolidated lamellae' formed by the filaments of Anodon, and in Arca the free axes of the ctenidia are large and firm in texture (fig. 132, ¢, d).*~~

~~*If we were to make a vertical section across the long axis of a Lamellibranch which had the axis of its ctenidium free from its origin onwards, we should find such relations as are shown in the diagram fig. 135, A. The gill axis d is seen lying in the sub-pallial chamber between the foot 6 and the mantle c. From it depend the gill-filaments or lamellee—formed by united filaments—drawn as black lines f. On the left side these lamellz are represented as hav- ing only a small reflected growth, on the right side the reflected ramus or lamella is complete (fr and er). The actual condition in Anodon at the region where the gills commence anteriorly is shown in fig. 135, B. The axis of the ctenidium is seen to be adherent to, or fused by con- crescence with, the body-wall, and moreover on each side the outer lamella of the outer gill-plate is fused to the mantle, whilst the inner lamella of the inner gill-plate is fused to the foot. If we pass a little backwards and take another section nearer the hinder margin of the foot, we*~~

~~*LAMELLIBRANCHIA. |*~~

~~*get the arrangement shown diagrammatically in fig. 135, C, and. more correctly i in fig. 142. In this region the inner lamellee of the inner gill-plates are no longer affixed to the foot. Passing still further back behind the foot, we find*~~

~~*i af 4*~~

~~*'i q*~~

~~*Fig, 138,—Gill-lamelle of Anodon (after Peck). A. Fragment of the outer lamella of an inner gill-plate torn from the connected inner lamella, the sub- filamentar tissue also partly cut away round the edges so as to expose the filaments, their transverse junctions tr, and the " windows" left in the lattice- work ; aft, internal surface of the lamella; v, vessel. B. Diagram of a block cut from the outer lamella of the outer gill- plate and seen from the inter- lamellar surface coe Peck). /, constituent filaments; tr/, fibrous tissue of the transverse inter-filamentar junctions ; v, blood-vessel ;*~~

~~*ally by the transverse inter-filamentar junctions.*~~

~~*in Anodon the condition shown in the section D, fig. 135. The axes 7 are now free; the outer lamelle of the outer gill-plates (e7) still adhere by concrescence to the mantle- skirt, whilst the inner lamelle of the inner gill-plates meet one another and B*~~

~~*fuse by concres- cence at g. In the lateral view of én, the animal with reflected mantle- skirt and gill- plates, the line of concrescence of the inner lamelle of the inner gill- plates is readily seen; it is marked aa in fig. 124, (5). In the same figure the free part of the inner lamella of the inner gill-plate resting on the foot is marked 2, whilst the attached part—the most anterior—has been snipped with scissors so as to show the genital and nephnidial apertures and y. The concrescence, then, of the free edge of the reflected lamelle of the gill-plates of Anodon is very extensive. It is important, because such a concrescence is by no means universal, and does not occur, for example, in Mytilus or in Arca; further, because*~~

~~*br…*~~

~~*8*~~

~~*Fig. 130.—Transverse sections of A, a Lamellibranch, and B, an Isopleurous Gastropod (Chiton), to show the relations of p, the foot; br, the branchie; and m, the mantle. (From Gegenbaur.)*~~

~~*BOVLLELUSCA*~~

when its occurrence is once appreciated, the reduction of the gill-plates of Anodon to the plume-type of the simplest ctenidium presents no difficulty; and, lastly, it has import- ance in reference to its physio- logical significance. The me- chanical result of the concres- ,, cence of the outer lamellz to the mantle-flap, and of the inner lamelle to one another as shown in section D, fig. 135, is that the sub-pallial space is divided into two

_ Spaces by a horizontal Sep- Fic. 140.—Lateral view of a Mactra,

the right valve of the shell and right mantle-flap removed, and the si- phons retracted. br, br', outer and inner gill-plates ; ¢, labial tentacle ; ta, tr, upper and lower siphons ; ms, siphonal muscle of the mantle-flap 3 ma, anterior adductor muscle ; mp, posterior adductor muscle ; p, foot ; c,umbo, (From Gegenbaur.)

tum. The upper space (7) communicates with the outer world by the excurrent or su- perior siphonal notch of the mantle (fig. 124, d); the lower space communicates by the lower siphonal notch (e in fig. 124). The only communica- tion between the two spaces, excepting through the trellis-work of the gill-plates, is by the slit (z in fig. 124, (5)) left by the non-concrescence of a part of the inner lamella of the inner gill-plate with the foot. A probe (g) is introduced through this slit-like passage, and it is seen to pass out by the excurrent siphonal notch. It is through this passage, or indirectly through the pores of the gill-plates, that the water introduced into the lower sub-pallial space must pass on its way to the excurrent siphonal notch. Such a subdivision of the pallial chamber, and direction of the

Fia. 141. —The same animal as fig. 140, with its foot and siphons expanded. Letters asin fig. 140, (From Gegenbaur.)

currents set up within it do not exist in a number of Lamellibranchs which have the gill-lamellee comparatively free (Mytilus, Arca, Trigonia, &c.), and it is in these forms that there is least modification by concrescence of the pri- mary filamentous elements of the lamella. Probably the gill-structure of Lamellibranchs will ultimately furnish some classificatory

~~characters of value when they have been thoroughly investigated throughout the class.~~

~~The alimentary canal of Anodon is shown in fig. 124, (4). The mouth is placed between the anterior adductor and the foot ; the anus opens on a median papilla overlying the posterior adductor, and discharges into the superior pallial chamber along which the excurrent stream passes. The coil of the intestine in Anodon is similar to that of other Lamellibranchs, but the crystalline style and its diverticulum are not present here. The rectum traverses the pericardium, and has the ventricle of the heart wrapped, as it were, around it. This is not an unusual arrangement in Lamellibranchs, and a similar disposition occurs in some Gastropoda (Haliotis). A pair of ducts (az) lead from the first enlargement of the alimentary tract called stomach into a pair of large digestive glands, the so-called liver, the branches of which are closely packed in this region (af). The food of the Anodon, as of other Lamellibranchs, consists of microscopic animal and vegetable organisms, which are brought to the mouth by the stream which sets into the sub-pallial chamber at the lower siphonal notch (ein fig. 124). Probably a straining of water from solid~~

~~particles is effected by the lattice-work of the ctenidia or gill-plates. :~~

~~_ The heart of Anodon consists of a median ventricle em- bracing the rectum (fig. 143, A), and giving off an anterior and a posterior artery, and of two auricles which open into the ventricle by orifices protected by valves.~~

~~The blood is colourless, and has colourless amœboid corpuscles floating in it. In two Lamellibranchs, Solen (Ceratisolen) legumen and Arca Nox, the blood is crimson, owing to the presence of corpuscles impregnated with hemoglobin (Lankester, 31). In Anodon the blood is driven by the ventricle through the arteries into vessel- like spaces, which soon become irregular lacunze surround- ing the viscera, but in parts—e.g., the labial tentacles and walls of the gut—very fine vessels with endothelial cell- lining are found. The blood makes its way by large veins to a venous sinus which lies in the middle line be- low the heart, having the paired renal organs (nephridia) placed between it and that organ. Hence it passes through the~~

vessels of the glandular walls of the nephridia right and left into the gill-lamelle, whence it returns through many openings into the widely-stretched auricles. A great deal more pre- cision has been given to accounts of the structure of arteries, veins, and capillaries in Anodon than the facts warrant. The course of the blood- streain can only be some- what vaguely inferred ex- cept in its largest out- lines. Distinct arterial and venous channels can- not be distinguished in the gill-lamellz, in spite of what Langer (52) has written on the subject, though it is highly prob- able that there is some kind of circulation in the gills. In the filaments of the gill of Mytilus the tubular cavity is divided by a more or less complete fibrous septum into two channels, presumably for an ascending and a descend- ing blood-current. The ventricle and auricles of Anodon lie in a pericardium which is clothed with a pave- ment endothelium (d, fig. 143). Veins are said by Keber and others to open anteriorly into it, but this appears to be an error. It does not contain blood or communicate directly with the blood-system ; this isolation of the peri- cardium we have noted already in Gastropods and Cephalo- pods. A good case for the examination of the question as to whether blood enters the pericardium of Lamellibranchs, or escapes from the foot, or by the renal organs when the animal suddenly contracts, is furnished by the Solen legu- men, which has red blood-corpuscles. According to ob- servations made by Penrose (58) on an uninjured Solen legumen, no red corpuscles are to be seen in the pericardial space, although the heart is filled with them, and no such corpuscles are ever discharged by the animal when it is irritated.

The pair of nephridia of Anodon, called in Lamelli- branchs the organ of Bojanus, lie below the membranous floor of the pericardium, and open into it by two well- marked apertures (e and f in fig. 143). Each nephridium, after being bent upon itself as shown in fig. 143, ©, D, opens to the exterior by a pore placed at the point marked win fig. 124, (5), (6). It is no doubt possible, as in the

Fig. 142.—Vertical section through an Ano- donta, about the mid-region of the foot. m, mantle-flap; br, outer, b'r', inner gill-plate —each composed of two lamelle ; f, foot; v, ventricle of the heart; a, auricle; p, 7', pericardial cavity ; 4, intestine.

~~USCA~~

~~Gastropoda and Cephalopoda, for water to enter from the exterior by the nephridia into' the pericardium, but that it ever does so is as yet not proved. — What is certain from the set of the ciliary currents is that liquid generally~~

~~[LAMELLIBRANCHIA.~~

~~∀~~

~~Fic. 143.—Diagrams showing the relations of pericardium and nephridiain a Lamellibranch such as Anodon. A. Pericardium opened dorsally so as to expose the heart and the floor of the pericardial chamber d. 3B. HIeart removed and floor of the pericardium cut away on the left side so as to open the non-glandular sac of the nephridium, exposing the glandular sac 0, which is also cut into so as to show the get jf. ©. Ideal pericardium and nephridium viewed laterally. D. Lateral view showing the actual relation of the glandular and non-glandular sacs of the nephridium. The arrows indicate the course of fluid from the pericardium outwards. a, ventricle of the heart; b, auricle; bb, cut remnant of the auricle; c, dorsal wall of the pericardium cut and reflected; ¢, reno-pericardial orifice; f, probe introduced into the left reno-pericardial orifice ; g, non-glandular sa¢ of the left nephridium ; h, glandular sac of the left nephridium ; 4, pore leading from the glandular into the non-glandular sac of the left nephridium; k, pore leading from the non-glandular sac to the exterior ; ac, anterior, ab, posterior, cut remnants of the intestine and ventricle.~~

~~passes out of the pericardium by the nephridia. One half~~

~~of each nephridium is of a dark-green colour and glandular~~

~~(A in fig. 143). This opens into the reflected portion which~~

~~overlies it as shown in the diagram fig. 143, D,7; the latter~~

~~has non-glandular walls, and opens by the pore & to the exterior. The nephridia may be more ramified in other~~

~~*Lamellibranchs than they are in Anodon. In some they*~~

~~*are difficult to discover. That of the common oyster*~~

~~*has recently (1882) been detected by Hoek (54). Hach nephridium in the oyster is a pyriform sac, which commu- nicates by a narrow canal with the urino-genital groove*~~

~~*placed to the front of the great adductor muscle; by a*~~

~~*second narrow canal it communicates with the pericardium.*~~

~~*From all parts of the pyriform sac narrow stalk-like tubes*~~

~~*are given off, ending in abundant widely-spread branching*~~

~~*glandular cæca, which form the essential renal secreting apparatus. The genital duct opens by a pore into the urino-genital groove of the oyster (the same arrangement being repeated on each side of the body) close to but distinct from the aperture of the nephridial canal. Hence, except for the formation of a urino-genital groove, the apertures are placed as they are in Anodon, Previously to Hoek's discovery a brown-coloured investment of the auricles of the heart of the oyster had been supposed to represent the nephridia in a rudimentary state. This investment, which occurs also in Mytilus but not in Anodon, may pos- sibly consist of secreting cells, and may be comparable to the pericardial accessory glandular growths of Cephalopoda.*~~

~~*Nervous System and Sense-organs.—In Anodon there are three well-developed pairs of nerve-ganglia (fig. 144, B and fig. 124, (6)). An anterior pair, lying one on each side of the*~~

~~*mouth (fig. 144, B, a) and connected in front of it by a commissure, are the representatives of the cerebral, pleural, and visceral ganglia of the typical Mollusc, which are not here differentiated as they are in Gastropods (compare, however, fig. 67). A pair placed close together in the foot (fig.*~~

~~144, B, 6, and fig. C B A 124, (6), ax) are the typ- ical A am: nes 'ey are joined to the cerebro- = a pleuro- visceral ganglia ¢@ @ by connectives.~~

~~Posteriorly beneath the posterior adductors, and covered only by a thin layer of elongated epidermal cells, are the olfactory ganglia, their epidermal clothing con- stituting the pair of os- phradia, which are thus seen in Lamellibranchs to occupy their typical position and to have the A~~

~~typical innervation,—the 1a. 144,—Nerve-ganglia and cords of three~~

~~F nerve to each osphrad- Lamellibranchs (from Gegenbaur): 4, of ium being given off by Teredo; B, of Anodonta; C, of Pecten. a,~~

~~° 6 cerebral ganglion-pair (=cerebro-pleuro- the visceral ganglion — visceral); 6, pedal ganglion-pair; c, olfac-~~

~~that is to say, by the tory (osphradial) ganglion-pair.~~

~~undifferentiated cerebro-pleuro-visceral ganglion of its proper side. This identification of the posterior ganglion- Other~~

~~pair of Lamellibranchs is due to Spengel (11).~~

~~Fic. 145.—Pallial eye of Spondylus (from Hickson). a, pree-corneal epithe- lium ; 0b, cellular lens; c, retinal body; d, tapetum; ¢, pigment; f, retinal nerve; g, complementary nerve; h, epithelial cells filled with pigment; k, tentacle <~~

~~anatomists have considered this ganglion-pair as corre-~~

~~sponding to either the pleural or the visceral of Gastropoda,~~

~~or to both, and very usually it is termed "the parieto- splanchnic " (Huxley).~~

~~The sense-organs of Anodon other than the osphradia consist of a pair of otocysts attached to the pedal ganglia (fig. 124, (6), ay). The otocysts of Cyclas are peculiarly favourable for study on account of the transparency of the small foot in which they lie, and may be taken as typical of those of~~

~~*Lamellibranchs generally. The structure of one is exhibited in fig. 146. A single otolith is present as in the veliger embryos of Opisthobranchia. In adult Gastropoda there are frequently a large number of rod-like otoliths instead of one.*~~

~~*Anodon has no eyes of any sort, and the tentacles on the mantle edge are limited to its posterior border. This deficiency is very usual in the class; at the same time, many Lamellibranchs have tentacles on the edge of the mantle supplied by a pair of large well-developed nerves, which are given off from the cerebro-pleuro-visceral ganglion-pair,*~~

~~*and very frequently some of these tentacles have undergone a special metamorphosis converting them into highly- organized eyes. Such eyes on the mantle-edge are found in Pecten, Spondylus, Lima, Ostrea (1), Pinna, Pectunculus, Modiola, Mytilus (?), Cardium, : Tellina, ¢ | Mactra, Venus, Solen, Pholas, and Ga*~~

~~*leomma. They are totally distinct from the cephalic eyes of typical Mollusca, and have a different structure and historical de- velopment. They have not originated as pits but as tentacles. They agree with the dorsal eyes of Onchidium (Pulmonata) in the curious fact that the optic nerve pene- trates the capsule of the eye and passes in front of the retinal body (fig. 145), so that its fibres join the anterior faces of the nerve-end cells as in Vertebrates, instead of their posterior faces as in the cephalic eyes of Mollusca and Arthropoda; moreover, the lens is not a cuticular product but a cellular structure, which, again, is a feature of agreement with the Vertebrate eye. It must, however, be distinctly borne in mind that there is a fundamental difference between the eye of Verte- brates and of all other groups in the fact that in the Vertebrata the retinal body is itself a part of the central nervous system, and not a separate modification of the epidermis—myelonic as opposed to epidermic. The struc- ture of the reputed eyes of several of the above-named genera has not been carefully examined. In Pecten and Spondylus, however, they have been fully studied (see fig. 145, and explanation).*~~

~~The gonads of Anodon are placed in distinct male and female individuals. In some Lamellibranchs—for instance, the European Oyster and the Pisidium pusillum—the sexes are united in the same individual; but here, as in most hermaphrodite animals, the two sexual elements are not ripe in the same individual at the same moment. It has been conclusively shown that the Ostrea edulis does not fertilize itself. The American Oyster (0. virginiana) and the Portuguese Oyster (O. angulata) have the sexes separate, and fertilization is effected in the open water after the discharge of the ova and the spermatozoa from the females and males respectively. In the Ostrea edulis fertil- ization of the eggs is effected at the moment of their escape from the uro-genital groove, or even before, by means of spermatozoa drawn into the sub-pallial chamber by the in- current ciliary stream, and the embryos pass through the early stages of development whilst entangled between the gill-lamellee of the female parent (fig. 6). In Anodon the eggs pass into the space between the two lamelle of the outer gill-plate, and are there fertilized, and advance whilst~~

~~Fic. 146.—Otocyst of Cyclas (from Gegenbaur). C, capsule; e,ciliated cells lining the same ; 0, otolith.~~

~~Fie. 147.—Two stages in the development of Anodonta (from Balfour). Both figures represent the glochidium stage. A, when free swimming, shows the two dentigerous valves widely open. B, a later stage, after fixture to the fin ofafish. sh, shell; ad, adductor muscle; s, teeth of the shell; by, byssus ; a.ad, anterior adductor ; p.ad, posterior adductor ; mt, mantle-flap ; J, foot ; br, branchial filaments ; au.v, otocyst; al, alimentary canal.~~

~~still in this position to the glochidium phase of develop- ment (fig. 147). They may be found here in thousands in the summer and autumn months. The gonads them-~~

~~selves are extremely simple arborescent glands which open to the exterior by two simple ducts, one right and one~~

~~left. continuous with the wall of the tubular branches of the gland (fig. 124, (5), (6); 9). In no Lamellibranch is there a divergence from this structure,~~

~~*excepting that in some (Ostrea) the contiguous nephridial and the genital aperture are sunk in a urino-genital groove, which in other cases (Spondylus?) may partially close up so as to con- stitute a single pore for the nephridial and genital ducts. No accessory genital glands are present. The development of Anodon is remarkable for the curious*~~

~~*larval form knownasGlochidium (fig. 147). The Glochidium*~~

~~*<> Wy 6 De o's SO-p Oxo + eto dt*~~

~~*Fig. 148.—Embryos of Pisidium pusillum (after Lankester). A. Only four embryonic cells are present, still enclosed in the egg envelope. B. The cells have multiplied and commenced to invaginate, forming a blastopore or orifice of invagination, bl.*~~

~~*quits the gill-pouch of its parent and swims by alternate opening and shutting of the valves of its shell, as do adult Pecten and Lima, trailing at the same time a long*~~

~~*Fia. 149.—Embryo of Pisidiwm pusillum in the diblastula stage, surface view (after Lankester). The embryo has increased in size by accumulation of moa between the outer and the invaginated cells. The blastopore has closed.*~~

~~*Fic. 150.—B. Same embryo as fig. 149, in optical median section, showing the invaginated cells hy which form the arch-enteron, and the mesoblastic cells me which are budded off from the surface of the mass hy, and apply them- selves to the inner surface of the deric or epiblastic cell-layer ep. C. The same embryo focused so as to show the mesoblastic cells which immediately underlie the outer cell-layer.*~~

~~*byssus thread. By this it is brought into contact with the fin of a fish, such as Perch, Stickleback, or others, and effects*~~

~~*MOLLUSCA*~~

~~*a hold thereon by means of the toothed edge of its shells. HIere it becomes encysted, and is nourished by the exuda- tions of the fish. organs has been*~~

~~*traced by the late Professor Balfour, but no one has followed it to the moment at which it drops from the fish's fin and assumes the form of shell characteristic of the parent. sphere larva which becomes a Veliger, differing only from the Gastropod's and Pteropod's Veliger in having bilateral shell-calcifications instead of a single central one; or, like Anodon, they may develop within the gill-plates of the mother, though without presenting such a specialized larva as the Glochidium. An example of the former is seen in the*~~

~~*| LAMELLIBRANCHIA.*~~

~~*A distinct development of its internal*~~

~~*Other Lamellibranchs exhibit either a trocho-*~~

~~*T Fic. 151.—Further stages in the development of Pisidiwm pusillum (after Lankester). A. Optical section of an embryo in which the foot has begun to develop. B. The same embryo focused to its surface plane to show the mouth o. C. Later embryo, showing the shell-gland sh. D. Lateral view of the same embryo. E. Later stage, with rudiments of the mantle-flap, lateral view. F. Still later stage, with shell-valves and branchial filaments. ep, epiblast ; me, mesoblast ; al, met-enteron ; rp, rectal peduncle or pedicle of*~~

~~*invagination connecting the met-enteron with the cicatrix of the blastopore ; o, mouth; ph, pharynx; sh, shell-gland; mn, mantle-flap; br, branchial filaments ; y, granular cells of doub significance ; v, vesicular structure of unknown significance. development of the European Oyster, to the figure of which and its explanation the reader is specially referred (fig. 6). An example of the latter is seen in a common little fresh-water bivalve, the Pisidiwm pusillum, which has been studied by Lankester (12). The successive stages of the development of this Lamellibranch are illustrated in the woodcuts figs. 148 to 153 inclusive. These should be compared with the figures of Gastropod development (figs. 3, 4, 5, 7, and 72***), Fig, 148 shows the cleavage of the egg-cell into four (A), and at a later stage the tucking in of some of the cells to form an invaginated series (B).*~~

~~*MOL—MOL*~~

~~The embryonic cells continue to divide, and form an oval vesicle containing liquid (fig. 149); within this, at one pole, is seen the mass of invaginated cells (fig. 150, hy). These invaginated cells are the arch-enteron ; they proliferate and give off branching cells, which apply themselves (fig. 150, C) to the inner face of the vesicle, thus forming the meso-~~

~~Fic. 152.—Diagram of embryo of Pisidium in the same stage as E in fig. 151. m, mouth; jf, foot; ph, pharynx; gs, met-enteron; pi, rectal peduncle or pedicle of invagination ; shs, shell-gland. (From Lankester.)~~

~~blast or coelomic outgrowths. The outer single layer of cells which constitutes the surface of the vesicle (fig. 147) is the ectoderm or epiblast or deric cell-layer. The little mass of hypoblast or enteric cell-mass now en- larges, but remains con- nected with the cicatrix of the blastopore or orifice of invagination by a stalk, the rectal peduncle (fig. 151, A, rp). The enteron itself be- comes bilobed and is joined by a new invagination, that of the mouth and stomo- deum, ph. Fig. 151, B® shows the origin of the mouth o, being a deeper view of the same specimen Fic. 153.—Diagram of embryo of Pisidium, in the same position which ister)' n snouth ; % anus; foot; br, is drawn in fig. 151, A. banchlal haments: mn, nigrpin of he The mesoblast multiplies phridium). The unshaded area gives its cells, which become the position of the shell-valve.~~

~~partly muscular and partly skeleto-trophic. Centro-dor- sally now appears the embryonic shell-gland (fig. 151, ©, sh). The pharynx or stomodeum is still small, the foot not yet prominent. A later stage is seen in fig. 152, where the pharynx is widely open and the foot pro- minent. No ciliated velum or pre-oral (cephalic) lobe ever develops. The shell-gland disappears, the mantle- skirt is raised as a ridge (fig. 151, E, mn), the paired shell-valves are secreted, the anus opens by a proctodeal ingrowth into the rectal peduncle, and the rudiments of the gills (6r) and of the nephridia (B) appear (figs. 151, F, and 153, dorsal and lateral views of same stage), and thus the chief organs and general form of the adult are~~

~~acquired. Later changes, not drawn here, consist in the growth of the shell-valves over the whole area of the mantle-flaps, and in the multiplication of~~

~~*the gill-fila- ments and their consolidation to form gill-plates. It is important to note that the gill-filaments are formed one by one posteriorly. The labial tentacles are formed late. In the allied genus Cyclas, a byssus gland is formed in the foot and subsequently disappears, but no such gland occurs in Pisidium. The nerve-ganglia and the otocysts probably form from thickenings of the epiblast, but detailed observation on this and other points of histogenesis in the Lamellibranchia is still wanting.*~~

~~*List of Memoirs, &c., referred to by numbers in the preceding article.—{1) G. Cuvier, Mémoires pour servir a U'histoire et & Vanatomie des Mollusques, Paris, 1816. | (2) J. Poli, Testacea utriusque Siciliz, eorumque historia et anatome, tabulis aeneis 49 illustrata, vols. i.-iii., fol., Parma, 1791-1795 and 1826-1827. (3) St delle Chiaje, Memorie sulla storia e notomia degli animali senza vertebre del regno di Napoli, Naples, 1823-1829; new edit. with 172 plates, fol., 1843. (4) J. Vaughan Thompson, Zoological Researches, Cork, 1830; memoir iv., "On the Cirripedes or Barnacles, demonstrating their deceptive character." (5) A. Kowalewsky, "Entwickelungsgeschichte der einfachen Ascidien," in Mém. de UAcad. des Sciences de St Pétersbourg, 1866, and 'Entwickelungsgeschichte des Anphioxus lanceolatus," ibid., 1867. (6) J. Vaughan Thompson, Zoological Researches, Cork, 1830; memoir v., "Polyzoa, a new animal discovered as an inhabitant of some Zoophytes." (7) C. G. Ehrenberg, Die Korallenthiere des Rothen Meeres, Berlin, 1834 (Abhand. d. k. Akad. d. Wissenschaften in Berlin, 1832). (8) H. Milne-Edwards, Recherches anatomiques physiologiques et zoolo- giques sur les Polypiers de France, Paris, 1841-1844. (9) W. H. Caldwell, 'On the development of Phoronis," Proc. Roy. Soc., 1882. (10) Richard Owen, Memoir on the Pearly Nautilus, London, 1832. (11) T. H. Huxley, "On the morphology of the cephalous Mollusca," Phil. Trans., 1858. (12) E. Ray Lankester, "Con- tributions to the developmental history of the Mollusca," Phil. Trans., 1875. (13) E. Ray Lankester, "Notes on Embryology and Classification," Quart. Journ. Microsc. Sc., 1877. (14) J. Carriére,"Das Wassergefass-System d. Lamelli-branchiaten u. Gastropoden," Zoolog. Anzeiger, 1881, No. 90. (15) E. Ray Lankester, " Development of the Pond-Snail," Quart. Journ. Microsc. Sc., 1874, and "Shell-gland of Cyclas and Planula of Limneus," ibid., 1876. (16) R. Horst, "Development of the European Oyster," Quart. Journ. Microsc. Sc., 1882, p. 341. (17) E. Ray Lankester, "Coincidence of the*~~

~~*blastopore and anus in Paludina," Quart. Journ. Microsc. Sc., 1876. (18) Id., " Zoological Observations made at Naples," Annals and Mag. Nat. Hist., February, 1873. (19) W. K. Brooks, "Development of the American Oyster," Report of the Commissioners of Fisheries of Maryland, 1880. (20) Henri Milne-Edwards, Papers in the Annales des Sciences Natwrelles, 1841-1860. (21) H. de Lacaze Duthiers, Papers in the Annales des Sciences Natwrelles, e.g., '*' Anomia" (1854), ** Mytilus" (1856), " Dentalium " (1856, 1857), " Purpura " (1859), " Haliotis " (1859), " Vermetus" (1860). (22) A. Kolliker, Entwickelungsgeschichte der Cephalopoden, Zurich, 1844. (23) C. Gegenbaur, Untersuchungen viber Pteropoden und Hetero- poden, Leipsic, 1855. (24) J. W. Spengel, " Dic Geruchsorgane und das Nerven-system der Mollusken," Zeitschr. f. wiss. Zool., 1881. (25) A. A. W. Hubrecht, "On Proneomenia Shuteri nov. gen. et sp., with remarks upon the anatomy and histology of the Amphineura," Niederldndisches Archiv fiir Zoologie, supple- ment volume, 1881. (26) Adam Sedgwick, "On certain points in the anatomy of Chiton," Proc. Roy. Soc. Lond., 1881. (27) E. Ray Lankester, "On some undescribed points in the anatomy of the Limpet," Annals and Mag. Nat. History, 1867; J. T. Cunningham, "The Renal Organs of Patella," Quart. Journ. Microsc. Sc., 1888. (28) P. Fraisse, " Veber Molluskenaugen mit embryonalem Typus," Zettschr. f. wiss. Zool., 1881. (29) L. v. Graff, " Veber Rhodope Veranti, KOll.," Morpholog. Jahrb., vol. viii. (80) H. Simroth, " Das Fussnervensystem der Paludina vivipara," Zeitschr. f. wiss. Zool., 1881. (81) E. Ray Lankester, '*A contribution to the knowledge of Hemoglobin," Proc. Roy. Soc. Lond., 1873. (32) H. de Lacaze Duthiers, "Du systeme nerveux des Mollusques Gasteropodes Pulmonés aquatiques et d'un nouvel organe d'innervation," Arch. de Zoologie expérimentale, vol. i. (33) C. Semper, Animal Life (for eye of Onchidium, 'p. 371), International Scientific series, 1881. (34) Same as number 18. (85) E. Ray Lankester, "' Observations on the development of the Cephalo- poda," Quart. Jowrn. Microsc. Sc., 1875. (36) J. van der Hoeven, " Bijdrage tot de outleedkundige kennis aangaaende Nautilus pompilius," Verhandl. d. K. Akad. v. Wet. Naturk., Amsterdam, 1856. (87) E. Ray Lankester and A. G. Bourne, "On the existence of Spengel's olfactory organ and of paired genital ducts in the Pearly Nautilus," Quart. Journ. Microsc. Sc., 1883. (88) J. W. Vigelius, "Ueber das Excretions-System der Cephalopoden," Niederldndisches Archiv fiir Zoologie, bd. v., 1880. (89) Albany Hancock, "On the nervous system of Ommastrephes todarus," Annals and Mag. Nat.*~~

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~~*MOLLUSCOIDS. See Bracuiopops and PoLyzoa. MOLOCH, or Moteen—in Hebrew, with the doubtful*~~

~~*exception of 1 Kings xi. 7, always 70 with the article— is the name or title of the divinity which the men of Judah*~~

~~*in the last ages of the kingdom were wont to propitiate by the sacrifice of their own children. The phrase employed in speaking of these sacrifices is "to make one's son or daughter pass through fire to the Moloch" (2 Kings xxiii.*~~

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~~*10; Jer. xxxii. 35, and so without the words "through fire" Lev. xviii. 21); but it appears from Ezek. xvi. 20, 21 that this phrase denotes a human holocaust,' and not, as sometimes has been thought, a mere consecration to Moloch by passing through or between fires, as in the Roman Palilia and*~~

~~similar rites elsewhere. HIuman sacrificcs were com- mon in Semitic heathenism, and at least the idea of such sacrifices was not unknown to Israel in early times (Isaac, Jephthah's daughter), though in the sunny days of the nation, when religion was a joyous thing, there is no reason to think that they were actually practised.? It was otherwise in the neighbouring nations, and in par- ticular we learn from 2 Kings iii. 27 that the piacular sacrifice of his son and heir was the last offering which the king of Moab made to deliver his country. Even the HIebrew historian ascribes to this act the effect of rousing divine indignation against the invading host of Israel ; it is not, therefore, surprising that under the miseries brought on Palestine by the westward march of the Assyrian power, when the old gladness of Israel's faith was swallowed up in a crushing sense of divine anger, the idea of the sacrifice of one's own son, as the most powerful of atoning rites, should have taken hold of those kings of Judah (Ahaz and Manasseh, 2 Kings xvi. 3, xxi. 6) who were otherwise prone, in their hopelessness of help from the old religion (Isa. vii. 12), to seek to strange peoples and their rites. Ahaz's sacrifice of his son (which indeed rests on a somewhat late authority) must have been an isolated act of despair; human sacrifices are not among the corruptions of the popular religion spoken of by Isaiah and Micah. But in the 7th century, when the old worship had sustained rude shocks, and all religion was transformed into servile fear (Micah vi. 1 sg. belongs to this period; see Mrcan), the example of Manasseh spread to his people ; and Jeremiah and Ezekiel make frequent and indignant reference to the "high places" for the sacrifice of children by their parents which rose beneath the very walls of the temple from the gloomy ravine of HInnom or Tophet*® (Jer. vii. 31, xix., xxxii. 35; Ezek. xvi. 20, xxiii, 37). It is with these sacrifices that the name of "the Moloch" is always connected; sometimes "the Baal" (lord) appears as a synonym. At the same time, the horrid ritual was so closely associated with Jehovah worship (Ezek. xxiii. 39) that Jeremiah more than once finds it necessary to protest that it is not of Jehovah's institution (vii. 31, xix. 5). So too it is the idea of sacrificing the firstborn to Jehovah that is discussed and rejected in Micah vi. It is indeed plain that such a sacrifice—for we have here to do, not with human victims in general, but with the sacrifice of the dearest earthly thing—could only be paid to the supreme deity; and Manasseh and his people never ceased to acknowledge Jehovah as the God of Israel, though they sought to make~~

~~their worship more efficacious by the adoption of foreign rites. Thus the way in which Jeremiah, and after him~~

~~1 Tn 2 Chron. xxviii. 3 (parallel to 2 Kings xvi. 3) a single letter is transposed in thephrase, changing the sense from "caused to pass through the fire" to " caused to burn with fire." Geiger (Urschrift und Ueber-setzung, p. 805) very unnecessarily supposes that this is everywhere the original reading, and has been changed to soften the enormity ascribed to the ancient Hebrews. The phrase "to give one's seed to Moloch," Lev. xx. 2 sg., and the fact that these victims were (like other sacrifices) regarded as food for the deity (Ezek. xvi. 20) explain and justify the common reading.~~

~~2 In Hosea xiii. 2 the interpretation "they that sacrifice men" ig improbable, and 2 Kings xvii. 17 and Lev. xviii., xx. are of too late date to prove the immolation of children to Moloch in old Israel. The "ban » (BIN), which was a religious execution of criminals or enemies, was common to Israel with its heathen neighbours (stone of Mesha), but lacked the distinctive character of a sacrifice in which the pos is the food of the deity, conveyed to him through fire.~~

~~The etymology of the word Tophet is obscure; its meaning appears from tophteh, "pyre," Isa, xxx. 33.~~

~~MOL—MOL~~

~~the legislation of Leviticus and the author of Kings, seem to mark out the Moloch or Baal as a false god, distinct from Jehovah, is precisely parallel to the way in which Hosea speaks of the golden calves or Baalim. In each case the people thought themselves to be worshipping Jehovah under the title of Moloch or Baal; but the prophet refuses to admit that this is so, because the worship itself is of heathenish origin and character. "The Moloch," in fact, like 'the Baal," is not the proper name of a deity, but a honorific title, as appears from the use of the article with it. According to the Hebrew consonants, it might simply be read "the king," which is a common appellation for the supreme deity of a Semitic state or tribe. And so the LXX., except in 2 Kings xxiii. 10, and perhaps Jer. xxxii. 35, actually treat the name as an appellative ("ruler," "rulers"). The traditional pronuncia- tion, which goes back as far as the LXX. version of Kings~~

~~(Mod6x), appears to mean "the kingship"—an unsuitable sense, which lends probability to the conjecture that the old form was simply "the king," and that the later Jews gave it the vowels of NWa, the contemptuous name for Baal (G. Hoffman in 7. f. AT.W., 1883, p. 124).~~

~~From these arguments it would appear that the rise of Moloch worship does not imply the introduction into the religion of Judah of an altogether new deity, but only a heathenish development of Jehovah worship, in the familiar fashion of religious syncretism, and under that sense of the inadequacy of the old popular ritual to divert the wrath of the Godhead which was inspired by the calamities of the nation in the 7th century B.c., and led to more than one new development of atoning ritual. The key to the phenomenon is to be found in Micah vi., not in any vein of mythological speculation as to the forces of nature, such as is supposed in Movers's theory that Moloch represents the fiery destructive power of the sun. Moloch, in fact, in the Old Testament has no more to do with fire than any other deity. The children offered to him were not burned alive ; they were slain and burned like any other holocaust (Ezek. ut supra; Isa. lvii. 5); their blood was shed at the sanctuary (Jer. xix. 4; Ps. cvi. 38). Thus the late Rabbinical picture of the calf-headed brazen image of Moloch within which children were burned alive is pure fable, and with it falls the favourite comparison between Moloch and the Carthaginian idol from whose brazen arms children were rolled into an abyss of fire, and whom Diodorus (xix. 14) naturally identifies with the child-eater Kronos, thus leading many moderns to make Moloch the planet Saturn. On the other hand, the Massoretic text of 1 Kings xi. 7 makes Moloch (without the article) the name of the god of the Ammonites, elsewhere called Milcom or Malecam. But in this place the LXX. translators certainly found the longer form orb in their MSS. (as the Hebrew still reads in verse 33), while it is plain from 2 Kings xxiii. 10, 13 that the worship of Milcom at the shrine set up by Solomon was distinct from the much later Moloch worship of Tophet. In the usual printed text of the LXX., indeed, this distinction is not made in 2 Kings xxiii.; but this is an error of the Roman edition, the Vatican MS. really reading MOAXOA in verse 13.~~

~~(Ww. RB. 8.)~~

~~*MOLUCCAS, Motuwecos, or Spice Isutanps, THE, com- prise, in the wider use of the term, all the islands of the East Indian Archipelago between Celebes on the west, the Papuan Islands and New Guinea on the east, Timor on the south, and the open Pacific on the north. They are*~~

~~*4 Compare the Tyrian Melkart (king of the city) and the two names compounded with melek, "king," in 2 Kings xvii. 31. These latter cases are specially instructive, because Adrammelech and Anna- melech were also worshipped by the sacrifice of children.*~~

~~*thus distributed over an area measuring about 450 miles from east to west, and about 800 from north to south, and include—(1) the Moluccas proper or Ternate group, of which Jilolo is the largest and Ternate the capital; (2) the Bat- chian, Obi, and Sula groups ; (3) the Ambon or Amboyna group, of which Ceram (Serang) and Buru are the largest ; (4) the Banda Islands (the spice or nutmeg islands par excellence), of which Lantoir or Great Banda is the largest, and Neira politically the most important; (5) the south- eastern islands, comprising Tenimber or Timor-Laut, Larat, &c.; (6) the Kei Islands and the Aru Islands, of which the former are sometimes attached to the south- eastern group; and (7) the south-western islands or the Babber, Sermatta, Letti, Wetter, Roma, and Damme groups. At the close of the 16th century this part of the archi- pélago was divided among four rulers settled at Ternate, Tidore, Jilolo, and Batchian. The northern portion be- longs to the Dutch residentship of Ternate, the southern portion to that of Amboyna.*~~

~~*The name Moluccas seems to be probably derived from the Arabic for "king." Argensola (1609) uses the forms aslas Malucas, Maluco, and el Maluco; Coronel (1623), islas del Moluco; and Camoens, Afaluco.*~~

~~*Compare the articles on INDIAN ARCHIPELAGO, Aru IsLANDs, JILOLO, TERNATE, &c., and J. J. de Hollander, Handleiding bij de Beoefening der Land- en Volkenkunde von Ned. Oost. Indié, Breda, 1877 and 1882.*~~

~~*MOLYBDENUM, one of the rarer metallic elements (symbol for atomic weight, Mo=96; H=1), occurs in nature chiefly in the two forms of Yellow Lead Ore (PbOMoO,) and Molybdenite (MoS,). The latter mineral is very*~~

~~similar in appearance and in mechanical properties to graphite or black lead, and, in fact, was long confounded with it chemically, until Scheele in 1778 and 1779 proved their difference by showing that only the mineral now called molybdenite yields a white earth on oxidation. The metallic radical of the earth, after its discovery by HIjelm, was called molybdenum, from pdAvfdos, lead.~~

~~By heating molybdenite in a combustion tube in a current of air, we obtain the trioxide MoO, (molybdic acid) as a white crystalline sublimate. This substance, when heated to redness in close vessels, fuses without much volatilization into a yellow liquid, which, on cooling, freezes into a crystalline radiated mass of 4°39 specific gravity. It dissolves in 500 parts of cold, and in 960 of hot water. It dissolves readily in aqueous ammonia or alkalies, form- ing molybdates. Like silica, it combines with bases in a great variety of proportions. Of these many salts, an ammonia salt of the composition 3(NH,),0.7Mo0,+4H,O (known in laboratory parlance simply as molybdate of ammonia) is the most important, affording, as it does, the most delicate, characteristic, and widely applicable precipitant for ortho-phosphoric acid. To detect phos- phoric acid in any substance soluble in water or nitric acid, add first toa solution of molybdate of ammonia an excess of nitric acid, and then (not too much) of the nitric solution of the phosphate, and keep the mixture at 40° C.; the whole of the phosphoric acid gradually separates out in the shape of a canary-yellow crystalline precipitate of "phospho-molybdate of ammonia," of the composition~~

~~24MoO,. P,O,. 8(NH,),0 BAO. P,0.. ONTO. oj e~~

~~(according to Gibbs), which is insoluble in the reagent, even in the presence of dilute nitric acid, but soluble in excess of phosphoric acid. By treatment of this complex ammonia salt with aqua regia we can eliminate its acid 24MoO,. P,O;.3H.O as a substance soluble in water and crystallizing from this solution with 59 molecules of water,~~

~~This phospho-molybdic acid plays a great part in chemical toxi- cology, being a generically characteristic precipitant for all (organic) alkaloids, which combine with it, pretty much as ammonia does, into precipitates insoluble in dilute mineral acids. A solution of the acid sufficient for this purpose may be obtained by saturating carbonate of soda solution with~~

~~molybdic acid, adding phosphate of soda, one part for every five of MoO;, evaporating to dryness, fusing, dissolving in water, filtering, and adding nitric acid until the liquid becomes yellow.~~

~~Metallic molybdenum is obtained by reduction of the trioxide in hydrogen gas at very high temperatures. It is thus obtained in small crystalline granules which are infusible even in the oxy- hydrogen flame. An alloy of the metal with four or five per cent.~~

~~of carbon (formerly accepted as molybdenum) fuses in the oxy- hydrogen flame into a silver-white metal, of 8°6 specific gravity, which is harder than topaz (Debray).~~

~~Analysis.—Molybdenum in all its forms is readily converted into molybdic acid by oxidizing agents, such as nitric acid ; or if in non- volatile forms into alkaline molybdate by fusion with carbonate of alkali and nitre. Alkaline molybdate is soluble in water; the solution, on a gradual addition of hydrochloric acid, gives first a white precipitate, which then dissolves in the excess of acid. When a piece of zinc is added to such a solution, the latter, through gradual reduction of its MoO, to lower oxides, assumes first a blue, then a green, and lastly a deep blackish-brown colour. Molybdic acid colours the blowpipe flame yellowish green. It dissolves in fused borax, forming a head which in the oxidizing flame becomes yellow in the heat, but almost colourless on cooling ; the reducing flame colours it dark brown, and may cause the separation of brown flakes of MoO,. Compare Cuumisrky, vol. v. pp. 541, 542.~~

~~MOMBASA, or less correctly Momsas, the Jwita of the Sawahili, a town on the east coast of Africa, in 4° 4' S. lat., with the best harbour on all the Zanzibar mainland. The coralline island of which it occupies the eastern portion is 3 miles long by 23 broad, and lies in the middle of adouble inlet of the sea stretching northward into Port Tudor (so called after the English officer who surveyed it) and westward into Port Reitz (after the English resident who died while exploring the Pangani river in 1823). Except at the western end, the coast of the island consists of cliffs from 40 to 60 feet high. In the vicinity of the town palms, mangoes, guavas, baobabs, and~~

~~*cinnamon-trees flourish abundantly, and farther to the west are stretches of virgin forest, the haunt of monkeys, wild hogs, and hyenas. The citadel, originally constructed by Xeixas and Cabrera in 1635, still remains in good condition, "a picturesque yellow pile with long buttressed curtains," but has preserved little of its Portuguese architecture. Of the twenty Portuguese churches which Mombasa once contained, only two or three can be identified. A few of the houses are built of stone, but most of them are mere thatched huts. The population in 1844 was, according to Dr Krapf, from 8000 to 10,000, mostly Wasawahili, but with a considerable number of Arabs and some thirty or forty Banyans. In 1857 Burton estimated the inhabitants at 8000 to 9000, and in 1883 they numbered about 20,000. The Arabs, the Wamwita, and the Wakilindini (the two divisions of the Wasawahili residents, of which the former is the original stock) have each their own chief. In 1875-76 the Church Missionary Society, which made Mombasa one of its stations in 1844, established a settlement for liberated slaves at Freretown (Kisauni) on the mainland, opposite Mombasa. By 1881 it consisted of about 450 persons, of whom about one-fourth were children attending school. The pupils are taught to read both English and Sawahili (Ch. Miss. Intelligencer, 1875-76 and 1881), A branch station at Rabbai numbers 600 inhabitants.*~~

~~*Mombasa takes its name from. Mombasa in Oman. It is men- tioned by Ibn Battta in 1331 as a large place, and at the time of Vasco da Gaina's visit it was the residence of Calicut Banyans and Christians of St Thomas, and the seat of considerable commerce. The "king" of the city, however, tried to entrap Da Gama, and with this began a series of troubles which give full force to the native name JJwita (war). The principal incidents are the capture and burning of the place by Almeyda (1505), Nuno da Cunha (1529), and Duarte de Menezes (1587)—this last as a revenge for its submission to the sultan of Constantinople—the building of the Portuguese fort (1594), the revolt of Yusuf ibn Ahmed (1631), the erection of the Portuguese citadel (1635), the five years' siege by the imani of Oman (1660-65), and the final expulsion of the Portuguese (1698). In 1823 the Mazara family, who had ruled in Mombasa from the early part of the 18th century, placed the city under British protection ; but Britain soon withdrew, and left the place to be bombarded and captured by Sayyid Said*~~

~~of Zanzibar, who was obliged to make repeated attacks between 1829 and 1833, and only got possession in 1834 by treachery. A revolt against Zanzi-~~

~~bar in 1875 was put down by British assistance.~~

~~See Capt. W. F. W. Owen, Narrative, &c. (1833); Capt. Thomas Boteler, Narrative, &c. (1835); Guillain, Voyage, (Paris, 1856); Krapf, Travels, (1860) ; Burton, Zanzibar, (1872).~~

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~~HE word Monachism, or Monasticism, primarily mean- ing the act of "dwelling alone" (povaxds, povagery, pévos), has come, by an easy and natural transition, to denote the corporate life of religious communities living a life of poverty, celibacy, and obedience, under a fixed rule of discipline. The root-idea of monachism, in all its varieties of age, creed, and country, is the same— namely, retirement from society in search of some ideal of life which society cannot supply, but which is thought attainable by abnegation of self and withdrawal from the world. 'This definition applies to all the forms of monachism which have left their mark on history, whether amongst Brahmans, Buddhists, Jews, Christians, Moslems, or the communistic societies of the present day, even when theoretically anti-theological.~~

~~This broad general conception of monachism is differ- enced in the following ways :—It may take the form of absolute separation, so far as practicable, from all human intercourse, so as to give the whole life to solitary con- templation—the anchoretic type ; or, contrariwise, it may seek fellowship with kindred spirits in a new association for the same common end—the ccenobitic type; it may abandon society as incurably corrupt, as a City of De struction out of which the fugitive must flee absolutely— the Oriental view, for the most part; or it may consider itself as having a mission to influence and regenerate society—which has been, on the whole, and with minor exceptions, the Western theory of the monastic life.~~

~~*The question has been warmly debated whether mona- chism be an evil or a good,—whether a natural, perhaps a necessary, part of Christianity (as being, indeed, the strict logical issue of the triple vow of baptism, literally construed), or a foreign element introduced into it with unfortunate results, and rather an excrescence on its system than an orderly and healthy development. Unlike many other institutions which have needed the lapse of centuries and the gradual approach of decay and degeneracy to show their weak places, monachism in its Christian form displays some of its most unlovely features while yet almost in its cradle, whereas not a few of its best achieve- ments belong to a late period in its history; and it has throughout displayed a singular elasticity and power of taking a fresh departure, after seeming to have exhausted its energies. Its champions and its opponents have thus always had ample materials for their briefs, and there is little probability of the controversy ever coming to an end. But the most philosophical mode of viewing its relation to Christianity is to recognize that monachism has made a part of every creed which has attained a certain stage of ethical and theosophical development ; that there is a class of minds for which it has always had a powerful attrac- tion, and which can otherwise find no satisfaction ; and consequently that Christianity, if it is to make good its claim to be a universal religion, must provide expression for a principle which is as deeply seated in human nature as domesticity itself, albeit limited to a much smaller sec- tion of mankind.*~~

~~*Three main factors combined to produce the phenomenon of monachism in early Christianity, each of them set in motion by the general dissolution of morals in the pagan society of the time, of which we get a sufficient glimpse from the Christian standpoint in the first chapter of the Epistle to the Romans, and from the pagan standpoint in the sixth Satire of Juvenal. These three factors were—(1) the Oriental tendency towards retirement, contemplation, and asceticism, influencing the infant Christian church through the agency of those Jewish ascetics, the Essenes*~~

~~*and Therapeute, who had begun long before the gospel times both the solitary and the common life in Palestine and Egypt, and who probably contributed many converts to Christianity, and became practically merged therein, as they disappear from history in the first century of the Christian era; (2) the Hellenic teaching of the Alexandrine Neo-Platonists on the*~~

~~*purification of the intellect by absten- tion from physical indulgence ; and (3), perhaps a more powerful influence than either, that old Roman spirit of austerity and discipline which, while looking back regret- fully to the memories of the simpler habits of republican times, could find nothing amidst the social luxury and administrative weakness of the decaying empire which pre- sented its ideal, save the monastic system with its rigid proscription of luxury, and even of comfort, in every form. The first-named of these three factors was, however, neces- sarily the earliest to operate. The Scriptures attest clearly the existence of a body of ascetics in the persons of the Nazarites, leading always for a certain period, and sometimes for life, a stricter existence than the ordinary Jew; Elijah and John the Baptist furnished examples of the solitary hermit type; the Schools of the Prophets at least seem to have been celibate and ccenobitic communities, living by a fixed ascetic rule ; and it is familiar to all that such was the actual discipline of the Essenes (see EssENES). The sect of the Therapeuts, known to us only from the book De Vita Contemplativa (ascribed to Philo), and described as chiefly, though not exclusively, established in Egypt, bore much resemblance to the Essenes, differing from them for the most part by greater austerity in the matter of food, and by their preference for the solitary life over the common fellowship of the Essenes ; for their custom was that each member confined himself to his lonely dwelling (called by the afterwards famous name of povacriptov) throughout the week, while all assembled on the Sabbath for joint worship, and for instruction from the senior of the society. So closely does this polity resemble that of several of the earliest Christian societies of the kind that Eusebius de- votes a chapter of his Ecclesiastical HIstory (ii. 17) to as- serting their identity, holding that Philo could have been speaking of none save Christian ascetics, a view in which he is followed by Sozomen and Cassian in ancient times, as also by many moderns. This view has been rendered much more probable by recent inquirers, who seem to have made out that the De Vit. Cont. is spurious, and was written about 300 a.p.;! for there isa general agreement amongst the fathers that the monastic life did not begin till nearly two hundred years after Philo lived ; and Ter- tullian (160-240 a.p.) declares explicitly that Christians in his time did not withdraw from society,—" We are not Indian Brahmans or Gymnosophists, dwellers in woods, and exiles from life; ... we sojourn with you in the world" (Apol., xlii.). Yet there is no reason to doubt that the leaven of*~~

~~*Essenism was at work in the church from the earliest time, and helped to form the temper which issued in monachism. Still, the process was slow and gradual, passing through very much the same stages as can be traced by careful inquiry in the case of the Essenes. That is to say, the new converts to Christianity, being for the most part dwellers in cities, were in necessary and daily contact with the heathen society around, whose relaxation was such as to induce an even greater recoil from habits of self-indulgence than the stricter morality of their new creed enjoined, so that a body known by the name of ' Ascetics " sprang up very soon within the church, and*~~

~~*1 See especially Lucius, Die Therapeuten, 1879.*~~

~~*were urged on to still greater severity of life when the rapid progress of Christianity brought large numbers of merely nominal converts in, whose practice fell too conspicuously below their profession.. The desire of protest against such a state of things led to the gradual separation of the devotees into a kind of order within the main body, and to their actual withdrawal from habitual intercourse with their less strict fellows, which led in turn to their departure from the towns into more secluded places, even before any formal conception of the monastic life had shaped itself in their minds. But the first glimpse obtainable of the "common life," and that only an indistinct one, is in the New Testament, and applies to women alone. There is mention in the pastoral epistles (1 Tim. v. 9-12) of a class of widows, apparently not as mere recipients of relief, but as constituting an ecclesiastical grade; while in Acts ix. 39 it appears as if a number of women belonging to this order were united in some kind of community under the headship of Dorcas, for the narrative rather implies that they were her assistants in making clothing for the poor than themselves the objects of her bounty. This conjecture receives some confirmation from the mention of "the virgins who are called widows" (ras rapOevous Tas Aeyoménvas yfpas) in the shorter recension of the Ignatian Epistle to the Smyrneans, and from the statement of Athanasius, that Anthony, when himself about to begin the solitary life which he is regarded as having instituted, first placed his sister in a convent of virgins (7ap0evova),—facts*~~

~~*which prove the organization of women at an earlier date in com- munity life than of men, and lend some probability to the notion that it may have begun very soon indeed, especially when the prominence given to the virgins as a separate and seemingly long-established order in the church by such early writers as Tertullian and Cyprian is borne in mind.*~~

~~*Two other causes must be taken into account as tend- ing to stimulate monachism when once it began. First is the theological opinion, early formulated, and never since without many advocates, that two distinct standards of life and holiness are set forth in the gospel: that of pre- cept, and that of "counsels of perfection,'"—the former binding all Christians without exception, the latter being voluntary, and merely offered for acceptance to such as aim at especial sanctity. The second, and even more powerful, agent was Gnosticism, not only in its earlier forms and in the kindred spirit of Montanism, but still more in its Manichzean development, when its dualism led to exaggeration of the antagonism between flesh and spirit, and the human body was regarded no longer as a servant to be trained, but as an enemy to be crushed and beaten down with unrelenting hostility. But in every age of monachism, from the earliest to the latest, social disorders and insecurity have proved the chief feeders of the cloister, never widely popular in times of healthy and orderly national life, but eagerly resorted to as a place of shelter from social turbulence.*~~

~~*There are five main classes of monastic institutions, each of which approximately marks a new departure in the history of Western monachism (for the East has never had more than the first), as they succeed one another in chrono- logical order, without in any instance involving the aban- donmentof the previous foundations. They are—(1) Monks; (2) Canons Regular ; (3) Military Orders ; (4) Friars ; (5) Clerks Regular. All of these have communities of women, either actually affiliated to them, or formed on similar lines. .*~~

~~*There is no doubt as to the time and the person, when, and by whom, the first decisive step was taken which left a marked interval for all time between those ascetics who continued to live in family life, if not really part of it, or who at least dwelt close to some ordinary church, to which they*~~

~~resorted habitually, and the seekers after some more retired and separate mode of life, whether singly or in communities. During the stress of the Decian persecution (249-250 A.D.) Paul, a native of the Lower Thebaid, born of wealthy parents about 228, was denounced by his brother-in-law to the authorities as a Christian, and fled for safety in- to the desert, where he established himself in a cavern, shaded by a palm-tree, and with a spring of water close by. There he remained till extreme old age, dying, if we may accept Jerome's chronology, in his hundred and thirteenth year, about 342. Although he did not collect any band of disciples around him, nor even, so far as is re- corded, attract any casual visitors, except his more famous successor, Anthony, who is alleged, in a narrative con- taining many legendary details, to have had an interview with him when himself a very old man, the day before Paul's death ; yet there seems reason to believe that the fame of his example spread sufficiently to induce imitation of it, and that anchoretic cells began to be set up sparsely in the deserts even before Anthony adopted that mode of life. Anthony's career differed in various respects from that of his precursor. In the first place, it was voluntary choice, not fear of persecution, which sent him into solitude. He was born. about 250 at Coma in Upper Egypt, of wealthy Christian parents, and was left at eighteen years of age in possession of a large fortune and of the guardian- ship of a younger sister. He had received what was prob- ably a fair vernacular education, but distaste for study, or perhaps more probably that difficulty which contempla- tive intellects experience in the acquisition of languages, left him unacquainted with Greek or Latin; yet the intimate knowledge of Scripture which he afterwards displayed cannot be satisfactorily accounted for in any other way than as the result of attentive perusal, since no mere listening to the lections in church would suffice to con- vey it; and we must therefore take Athanasius's statement of his ignorance of letters to denote the absence of culture, not as implying actual illiteracy. Oneday, hearing the gospel read, "'Go and sell that thou hast, and give tothe poor… and come, and follow Me," he took it as a direct address to himself, and at once returned home, distributed his pro- perty amongst his neighbours, reserving only a small sum for the support of his sister whom he placed in charge of some Christian virgins, and then betook himself to a solitary life, first visiting the most eminent ascetics and anchorets he could find, in order that he might learn the peculiar merit of each, and imitate it. He fixed his dwell- ing first in a tomb, then in a ruined~~

~~fort near the Nile, where he remained for twenty years, leaving it but once, in 311, to encourage the Christians of Alexandria during the persecution of Maximin ; and lastly ina small grove of date-palms, a few miles west of the western coast of the Red Sea, near the base of Mount Kolzim, where he made an enclosure and planted it as a garden. He quitted this retirement but once in his remaining life, when he again visited Alexandria in 335, at the request of Athan- asius, to preach against the Arians. Yet his fame drew not only frequent visitors to his cell, but numerous disciples and imitators around him, attracted not alone by his pious austerities, but by his cheerful and courteous manners and shrewd practical judgment. He made the solitary life honourable and popular, fully justifying Jerome's plirase in comparing him with Paul, " Hujus vite auctor Paulus, illustrator etiam Antonius." When Anthony died in 365, aged one hundred and five, the desert was already studded with hermitages in every direction, and the second great step in the development of monachism had been long taken by Pachomius, who stands out in history at once as the founder of the ccenobitic life amongst Christians and as the author of the first formal monastic rule. Born about 292,~~

~~and converted to Christianity in early manhood while serving in the army, he was baptized on obtaining his dis- charge, and at once adopted the ascetic life under the direction of the hermit Palemon, with whom he retired to Tabenne, an island in the Nile, between Farshoot and Dendarah. Here he began his new institute, whose dis- tinguishing features were as follows. The monks were distributed into cells, each of which contained three inmates, known in this relation as syncelli (the usual number in other Egyptian foundations was two in each cell, while in Syria the tenant had no partner). A large number of such cells clustered near each other formed a laura, and each such laura had but one common place for meals and other assemblies. Work and food were apportioned to each inmate according to his physical strength, and such as were permitted exceptional strictness in fasting were not to undertake the heavier tasks of bodily labour. Their dress was to be a close linen tunic, with a white goatskin by way of upper garment, which they were not to lay aside at meals or in bed, but only when they assembled for the eucharist, when they wore their hoods only in~~

~~*addition to the tunic. 'They were divided into twenty-four groups or classes numbered according to the letters of the Greek alphabet, into which they were distributed according to their intellectual and spiritual proficiency, the least intelli- gent being placed in class 4, the letter of simplest form, and the ablest in class é, the most complicated. Each group was subdivided into bands of ten and a hundred under decurions and centurions, and all subject to the Abbot, who was himself in turn, when the institution spread and ramified, subject to the Superior (or Archi- mandrite) of the mother-house ; while the finance of each house was managed by a steward (oikovdpos), who was simi- larly accountable to the treasurer or steward at 'Tabenne. Their usual food was bread and water ; their luxuries, oil, salt, and a few occasional fruits or vegetables, chiefly pulse ; frugal meals which they ate in strict silence— sometimes broken by the voice of a reader, appointed to recite lections from the Bible—each man so wearing his hood or cowl as to hide his face from his companions. They assembled twice daily for common prayer, and met further for communion on Saturdays and Sundays. A strict probation of three years was imposed on postulants for admission, during which they were confined to simple tasks of labour, and were not permitted to enter upon actual study till they had satisfactorily passed through this term. Their work was tillage for their own immediate wants, and weaving mats or baskets for sale, to procure such necessaries as their direct labour was insufficient to provide; and, as time went on, other handicrafts were practised in the cloisters, such as those of smiths, tailors, boat-builders, tanners, and so forth. Pachomius induced his sister to found a convent of nuns governed by very similar rules,.and subject to the authority of a visitor appointed by himself, as superior of the whole institute. Such was the success of the Pachomian rule that before the founder died (between 348 and 360) he had no fewer than fourteen hundred monks in his own coenobium, and seven thousand altogether under his authority. Nor was its influence confined to Tabennz and its dependencies. Ammon carried the rule into the Nitrian desert, where five thousand monks were soon collected ; Hilarion bore it into Syria and Palestine, Eustathius of Sebaste into Armenia, Ephraem Syrus into Mesopotamia, Basil the Great into Cappadocia and Pontus (though a rule of his own framing supplanted it later) ; and, above all, it was brought by Athanasius himself into Italy, whence it spread over the West till modified in various ways by subsequent*~~

~~*legis- lation, and finally displaced by the Benedictine institute. And such was its popularity, meeting as it did a need of*~~

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~~*the time, that its votaries in Egypt alone amounted by the 5th century to more than a hundred thousand, of whom three-fourths were men. This rule has come down to us in two very different forms: an earlier and probably ari- ginal. one, preserved for us in the HIstoria Lausiaca of Palladius, bishop of Helenopolis (367-480)—a great store- house of details on Egyptian monachism, which is 'very brief, and has been summarized above —and a much longer recension, extending to 194 heads or chapters, pre- served in a translation by Jerome, in whose time the monks governed by it had increased to fifty thousand. It had not, however, a complete monopoly, for there were also similar rules in local use, going by the names of famous ascetics such as Paphnutius, Macarius, and Serapion; nor was it uncommon to find communities wherein two or three different rules were followed simultaneously by the various inmates. The rule of Basil, however, proved to the East what that of Benedict did to the West, in that it practically absorbed or supplanted all its predecessors, while, unlike the great Western reform, it has had no sub- sequent competitors, and remains to this day the single monastic code of the Oriental Church. This rule is embodied in the Ascetic Sermons of Basil, and also in two recensions, a longer and a shorter one, of the actual provisions of his code, which are marked with not a little of the shrewd practical sense, as well as lofty piety, which characterized the founder,—being especially noticeable for their discouragement of the solitary mode of life, and for their recommendation of labour. The development of Orien- tal monachism thus ceases with the Basilian rule, and there are only two seeming exceptions to this fact: the institu- tion of the Accemcti (dxotynrot), or 'sleepless" monks in the 5th century, for the purpose of keeping up unbroken prayer day and night—a system copied much later in the West by the communities founded for " perpetual adora- tion ;" and the erection, for these very monks, of the great monastery of the Studium at Constantinople (named from Studius, its founder), which was the Cluny of its time and country, as a centre of the more intellectual monastic life, and as the model of stateliness in ecclesiastical ceremonial. Greek monachism, as an institute, has no history*~~

~~*later than the 5th century. The monks indeed constantly appear as factors in the controversies of the centuries which followed, at once the polemical and the political disputes showing them equally fierce and eager partisans (notably in the TIconoclastic controversy, which found them the most ardent champions of images); but they cannot be said to have exerted much influence upon society till a very late period of their history, when they were instrumental in keeping the national spirit and the national religion alive in Russia when suffering under the Tatar yoke, and they performed a like service for Greece during the centuries of Turkish oppression. It may further be added that, however low the intellectual life of Eastern monasteries may appear when judged by a Western standard, the clergy who are trained in them, technically known as the " Black clergy," stand much higher in character, acquirements, and general influence than the secular or "White clergy" of the parishes, whether in Greece or in Russia.*~~

~~*It has been already mentioned that the bad side of Irregular*~~

~~*monachism appears almost as early as its good side.*~~

~~*1 This great abbey, at the height of its prosperity, contained more than a thousand monks, and the following list of its staff of office- bearers, due to Theodore the Studite, may be usefully compared with the Western monastic hierarchy :—'Hyotpevos (abbot), tmoraxrixés (prior), olkovéuos (treasnrer), émeornwovdpxys (ceremoniarius), émir7- pnts (inspector), eavovdpxns (precentor), ragidpxns (seneschal), Ked- hapirns (cellarer), dpisrntdpros (refectioner), Beoridpios (sacrist), dduruaris (evigilator), vocoxduos (infirmarer). One or two of the offices do not quite correspond in East and West, but the general reseniblance is close.*~~

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~~*While the system won the admiration of all the most emi- nent Christian teachers of the age which saw its birth and early growth, and while we are met by a still more remark- able fact that from the time when monachism was fairly established till we enter on the Middle Ages there are but two or three names of distinction amongst the clergy, whether as writers or administrators, to be found outside the ranks of monachism, amongst whom the most famous are Ambrose and Leo the Great, nevertheless, there is a*~~

~~heavy account on the other side. Not only did the institute speedily find itself caricatured by the Messalians, Euchites, Gyrovagi, Sarabaites or Remoboth, Circumcel- liones, and other companies of professed ascetics, wild in doctrine, vagrant in habits, and turbulent in conduct, but the more genuine societies had scarcely fewer faults in too many cases. Lay in their origin, and for the greater part of their earlier history having but rarely ecclesiastics amongst them (a single priest ordained for each monastery to minister to its inmates being the utmost allowed for a considerable time), they were not subject to the saine strict inspection and discipline as the clergy, in case a whole community chose to disregard its rule ; though of course it was easy to deal with an offender who had the tone of his monastery against him. The clergy were subject to the direct control of the bishops, and many disciplinary canons of councils laid down rules for their conduct ; but this was not the case with the monks for a considerable time—nor indeed ever effectively in the East—and their lay character gave them practical independence of any authority external to their abbot. And, although the stringency of the mon- astic rule itself, which, even before actual vows began to be introduced (probably on the recommendation of Basil), always involved during compliance with it the three engagements to the observance of poverty, chastity, and obedience, which make up the staple of the monastic principle, and though pains were taken to exclude unfit applicants (such as criminals, slaves who had fled for rea- sons other than ill-treatment, or persons who had kindred dependent on them), while a long probation was exacted from all who were accepted, yet it was impossible that more than a small proportion of the many thousands who flocked in during the first enthusiasm for the new move- ment should have had any real sympathy with the re- straints and aspirations of such a mode of life. Severe asceticism operates differently on different natures, and while there are some whom it does but discipline and refine there are more whom it tends to coarsen and to brutalize, even apart from the many whom it is apt to affect with morbidness, if not actual insanity. And it is unquestionable that vast numbers of those who entered on the monastic life came from the poorer classes, in search of some less toilsome mode of existence than they had previously led, preferring the contemplative societies, wherein almost no labour, certainly none of a severe and trying cast, was practised, to those where agriculture and other active employments, requiring more energy than mat and basket weaving, were enjoined. Such men, unedu- cated and~~

~~*undisciplined, were liable to be thrown entirely out of gear by the complete revolution in their mode of life,—especially when the community they joined was not*~~

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~~*less and nearly naked, as Sozomen and Evagrius tell us, in the mountains and deserts, grovelling on the earth, and browsing like cattle on the herbs they casually found ; and to those fierce bands of Nitrian and Syrian ascetics who, reared in the narrowest of schools, treated any divergence from their own standard of opinion as a crime which they were entitled to punish in their own riotous fashion, two instances of which have left an indelible brand on their history—the murder of Hypatia in Alexandria, and that of the patriarch Flavian at the Robber Synod of Ephesus. An equally singular, but more sporadic and temporary, form of asceticism was that of the Stylites or Pillar-hermits (orvAirat, 'ktovitar), who followed a fashion first set by Simeon, a Syrian monk who spent almost half of the 5th century on the summit of a column 60 feet in height. This unwonted kind of austerity at first gave rise to strong objections, even from hermits themselves, and a messenger was sent to Simeon, bidding him in the name of a synod of bishops to descend from his pillar, but with instruc- tions to permit him to remain if he showed himself ready tocomply. Such proved to be the case; and, having thus assured themselves that he was not influenced by spiritual pride, they left him to follow his own devices. And we have the direct personal testimony of the wise and tem- perate Theodoret that he exercised a strong and salutary influence over the nomadic Saracen tribes, converting many hundreds and even thousands to Christianity, besides being the shrewd and trusted adviser, not only of the peasants who flocked to him for counsel, but of Arab princes, Per- sian kings, and even Roman emperors. He cannot be judged, therefore, by ordinary standards, and it is more than likely that a less extraordinary mode of life would have given him less power for good; but he is the only eminent figure in the class to which he belongs, and the fashion he set may be said to have died out with his name- sake, the younger Simeon, a century later. Even when the healthier side of monachism as it appeared in Egypt and Syria is dwelt upon, and the fullest weight is allowed to the contemporary pictures drawn by great Christian writers of the monasteries as schools of a philosophy truer and purer than*~~

~~*that of the Porch or the Academy, as places where the equality and brotherhood, merely dreamed of as unrealizable fancies in the outer world, could be seen in living action—where children, deserted by their parents or otherwise orphaned, were carefully reared—where the sick were lovingly tended—where calmness, piety, and self-for- getfulness were the rule of all, —it must be confessed that the complaint of the Government, embodied in the hostile legislation of the emperor Valens in 3738, subjecting monks to the conscription (which drew forth an indignant protest from Chrysostom), that monachism was injurious to society and to the healthy condition of civil life by draining off so large a fraction of the population into the backwater of the cloister, was perfectly well founded. And no small part of the overthrow of Christianity in Egypt and Syria by Islam is due to the practical with- drawal of all the devout from family and public life, leaving no spiritual energy to cope with the Koran in the towns and villages whither the conquering Arabs came to settle and proselytize.*~~

~~*The history of monachism in the West is far more varied, Propaga-*~~

~~*only contemplative, but situated in some place where the Tops chequered, and interesting than in the East. It takes Hon ™*~~

~~*ungrateful soil made tillage nearly impracticable, and the the West.*~~

~~*vast numbers crowded together were far too numerous for any tasks which could be assigned them. From the bosom of such societies came not only single examples of exagger- ated spiritual pride, bitter fanaticism, avaricious greed of the scanty articles whose usufruct was permitted, fierce sensuality, and wild religious delusions, but they gave birth to companies like the Bocxoé, or " grazing monks," of Mesopotamia and Palestine, who roved about, shelter-*~~

~~*its beginning from the visit of Athanasius to Rome in 340, during his second term of exile, when he brought with him his Life of St Anthony, and pressed his example on the Roman Christians who mourned as patriots, not less than as devotees, over the lax and enervated habits of society. The popular imagination was caught at once, and not only was the basis of monachism successfully laid in Rome itself, but Eusebius of Vercelli introduced it*~~

~~by the illustrious Ambrose at Milan.~~

~~contemplation or severe self-torture, such as is equally common to many of the Egyptian or Syrian ascetics and to the Yogis of Hindustan. Hard work, with due inter- vals for food and recreation, occupied all that part of a Western monk's time which was not devoted to prayer or study, and a careful apportionment of his duties through- out the day gave each hour its appointed task to be ful- filled, leaving very few loose ends of time to be wasted. Tt is true that the Basilian rule aimed at this same end, and that a very minute time-table forms a part of other early Eastern codes; but, as already remarked, the work was neither hard enough nor abundant enough to provide really healthy labour, or to occupy the mind sufficiently to keep it from vague speculation or morbid brooding dur- ing the hours of so-called toil. From this fundamental unlikeness springs the broad distinction between the two types of the monastic life, in that the West did not merely provide shelter for such as felt unable to endure the storms of the world, leaving secular society to take care of itself as best it could, but, contrariwise, employed the cloister far more as a training-school for the strong, as the stand- point whence to work the lever which moved a world. Even the more remotely secluded monasteries of the West, instead of serving as refuges wherein the inmates might effectually cut themselves off from all intercourse from without, were rather military outposts and frontier forts of civilization, which taught the arts of peace, the pro- cesses of agriculture, and at least the rudiments of social morality, to the rude and almost nomadic hunters and forayers, of whom many of the wilder tribes in outlying districts consisted. And if such was the case even where the conditions seemed least favourable, it may readily be understood what an ample field for exertion the more settled regions provided.~~

~~It would seem that it was some modification of the Pachomian rule which first made its way into Europe, but the interest excited by the movement led to variety of choice on the part of the teachers who aimed at spreading its influence in Italy. Thus, Urseus, abbot of Pinetum (probably near Ravenna), translated the Basilian rule into Latin, and it soon took root in southern Italy, where it continued to hold its ground for a considerable time. But a~~

~~*far more important part in the propagation of the monastic Institute in the West was taken by Jerome, who, 'after spending a considerable time, beginning in 374, first as a hermit in the desert of Chalcis, and later at Constantinople, returned to Rome in 382, where he was secretary to Pope Damasus. He acquired much influence over a distinguished group of Roman ladies of high social position, the most celebrated of whom are Paula, and her daughters Blesilla and Eustochium, and employed that influence in urging the adoption of the monastic life upon them. Blesilla died early, it was said and believed in consequence of austerities pressed upon her which her constitution was unable to bear; and the unpopularity which this report brought upon Jerome, co-operating with the death of his patron Damasus and other causes, drove him back to the East, whither Paula and Eustochium also betook themselves, finally settling down in Bethlehem, where the elder lady built three con- vents, of one of which she was superior, while Jerome, who similarly erected a monastery for monks in the immediate vicinity, acted as chaplain and director to the community.*~~

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~~*into northern Italy, where it was fostered a little later From the very beginning a marked difference shows itself in the spirit of Western monachism as compared with the parent institute inthe East. Partly from dissimilarity of climate, but still more from that of racial and national temperament, there has always been less tendency in the West to either abstract*~~

~~*As the taste for pilgrimages had already become deeply rooted, the convent at Bethlehem was ere long a favourite resort of pilgrims, and exerted considerable influence in prompting the erection of similar foundations in the West. Quite another impulse was given to the further- ance of monachism by Augustine. While, amongst the many documents which have been ascribed to him, the only one which is of the nature of a monastic code is his 109th Epistle, addressed in terms of severe reproval to the nuns of a convent he had himself founded at Hippo, but which had fallen away from discipline, his personal example gave rise to a new type of the common life, in that he formed a sort of college of priests, who shared the episcopal house with him, ate at a common table, and copied in other particulars the*~~

~~*observances of monasteries, but with- out losing their secular character. This was the origin of the institute afterwards famous as the Austin Canons, a foundation of the 11th century. It is true that Eusebius of Vercelli had anticipated Augustine by collecting the clergy of his cathedral: (and, as it would seem, the remain- ing ecclesiastics of the city) into a common dwelling, but the difference in his case was that he obliged them to adopt the habit and style of monks, and thus was in no sense the originator of a new institute. Another important contri- bution of Augustine's to the history of the common life is his treatise De Opere Monachorum, wherein he sets forth the imperative need of making hard work an invariable factor of the monastic profession, notably on the ground that most of the monks in Africa came from the lower ranks of society, such as freedmen, farm-labourers, and artisans, who were spiritually injured by being raised into a grade viewed with more general respect than that from which they had sprung, while they were actually subject to fewer privations and lighter employment than they had been accustomed to. And he adds that amongst other evil consequences of this idleness was that they were found tramping the country selling sham relics, which they palmed off on the unwary, extorting money in other fashions also, and bringing discredit on their profession by their hypocrisy and vices—a picture only too faith- fully repeated by the Mendicants a thousand years after the date of this treatise. The 5th century was one of rapid progress in the spread of monachism in the West. Chief amongst those who helped to popularize it stands the name of John Cassian (350-433), a monk of Bethlehem, who made a long and careful study of the Egyptian forms of monachism, of which he has bequeathed us valu- able details in his De Institutione Cenobiorum and Col- lationes Patrum, the former of which is a treatise on the monastic life, and indeed virtually a rule, though a some- what prolix one, mainly derived from Macarius, while the latter is a record of the teachings of some hermits of the desert of Scete. Both of these works exercised a powerful influence in their own day, and the second retained its repute much longer, having been warmly approved and recommended for study by Benedict, Bruno, Dominic, and Ignatius Loyola, all four founders of celebrated orders. Cassian fixed himself at Marseilles, where he founded a famous monastery of which he was probably abbot, and which was the centre whence monachism, uniting the peculiarities of East and West, was propagated in southern Gaul, and notably planted in the island of Lerins, which became the seat of one of the most eminent*~~

~~*monasteries of the early Middle Ages. Northern Gaul had received the institute earlier through the agency of Martin, bishop of Tours (316-397), who founded monasteries near Poitiers and in his own diocese, which were soon thronged, so that his funeral was attended by two thousand monks. Spain was even earlier in the field than Gaul, but there is some obscurity as to the history*~~

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~~*of the introduction of monachism there, all that is certain being that it had made its footing good before 380, the date of a council of Saragossa (Casaraugusta) which for- bade priests to assume the monkish habit. Still more obscurity hangs over the first establishment of monachism in Britain, as to which no trustworthy records have come down to us, though all probability points to its importation from Gaul in some variety of the Pachomian rule ; while Germany did not receive the institute till the following century.*~~

~~*It must not be supposed, however, that the principle of monachism met with no opposition in the course of its progress. Apart from the opposition of those who disliked it precisely for its merits, for its protest against the dissolute morals and enervated habits of a luxurious and rotting society, and for the manner in which it won to itself many of the noblest and most promising of the young and ardent of both sexes, and without taking into account the more reasonable objections of statesmen, there were not lacking warnings of the dangers attending exaggerations of the principle of monachism, uttered by some of its most eminent upholders. Augustine's sharp censures have been already mentioned, and to them may be added the decrees of the council of Gangra in 363, or thereabouts, which anathematize those who adopt a celibate life on the ground that marriage is evil, who wear a peculiar dress as a mark of holiness, condemning such as use ordinary clothing, or who desert their parents or children dependent on them under the plea of desiring to lead an ascetic life. So, too, the great Chrysostom, him- self a warm advocate of monachism, found himself obliged to teach his flock the sanctity of Christian family life, and the truth that there was often as much selfishness as piety in retirement to a hermitage from the cares and duties of society. These arguments and*~~

~~decisions were, however, aimed only at abuses and exaggerations of the monastic idea. Itremained for Jovinian and Vigilantius to assail the actual principle. Their writings have not survived, and we can judge of their arguments only from the account given of them by their chief opponent Jerome, whose eminent gifts, however, did not include either moderation or controversial fairness, so that it is not safe to assume that we have all their case before us. As regards Vigilantius, he accurately represents the Puritan type of mind protesting against the external part of the popular religion of his day, often with good reason, but also show- ing equal intolerance for harmless, if not useful, practices ; so that his condemnation of monachism is only part of his general objection to the temper of his time. But Jovinian's objections seem to have gone deeper. He had been him- self a monk (and indeed never resumed secular life), but he disputed absolutely the thesis that any merit lay in monachism, celibacy, fasting, and asceticism considered in themselves, save in so far as they contributed to foster the Christian temper and life, which might and did flourish equally, he urged, under quite different conditions, while it was by no means unfrequent for spiritual pride, if not Manichean error, to lay hold of those who devoted them- selves to the ascetic profession. This was, in fact, going very little further than Chrysostom had done, or than Nilus did a short time later. But Jovinian's divergence from the standard of his day was not confined to practical questions ; it extended to theological doctrines also, and accordingly his strictures on monachism, probably more incisive and less qualified than those of its other critics, were involved in his condemnation as a heretic by synods at Rome and Milan in 390. The reaction, of which he may be regarded as the mouthpiece rather than as the sole representative, was thus effectually crushed, and that for centuries. And though Jovinian is undoubtedly niore~~

~~in accord than his opponents with the modern temper on the subject of monachism, and while it may be allowed that his teaching might have been a useful corrective in Eastern Christendom, where family life was all but over- borne by asceticism, yet the impartial historian must admit that his success would have been an irreparable misfortune for civilization in the West. Such a dispas- sionate estimate of asceticism as his, if widely~~

~~*entertained, would have been fatal to the spread of monachism, and thus one of the most important conservative and statical forces in the preservation of the older culture, one of the most powerful dynamical forces in reducing the chaotic materials of early medieval society to order and coherence, would have been lost to Europe; nor is it easy to conjecture what effectual substitute could have taken its place. As it was, the movement was not checked for a moment by this partial reaction; and not only did the older com- munities thrive and spread during the 5th and early 6th centuries, but new ones were established,—chief among which stand those of Cesarius of Arles and of Donatus of Besangon in southern Gaul, that of Isidore of Seville in Spain, and the early Celtic code, of which only tradi- tional fragments survive, but which seems in Britain to have been strongly affected by tribal influences, so that a monastery was often recruited from a single clan, and the abbacy became hereditary in the family of the chief- tain, a fact which is noticeable even in the succession of the abbots of Iona, who for ten elections after Columba were of his family in the tribe of Conall Gulban.!*~~

~~*But, swiftly as monachism spread in Europe during the breaking-up of the Western empire, some of the causes which hastened its progress also tended to its rapid de- cay. The disturbed state of society, and, in particular, the prevalence of petty warfare, drove many thousands of persons to seek a quiet refuge in the cloister without any more directly religious motive. When once there, they found in every place some rule in force which was either imported directly from Egypt or Syria, or else, like that of Ceesarius, modelled on Eastern lines, and therefore ill suited to the severer climate of Europe and the more active habits of the people. The austerities were thus too oppressive for general observance, and the result was a widespread neglect of rules which continued nominally in force, while at the same time the very monks who had ceased to keep them laid claim to special sanctity on the pretence of their strict way of life. The time was ripe for a reform, or rather for a wholly new departure in the shape of a rule devised to meet Western needs, and not merely adapted more or less clumsily from Oriental asceticism. The fitting man to accomplish this difficult task appeared in the person of Benedict of Nursia, author of the most famous of all monastic codes. Born of a respectable family about 480, he adopted the ascetic life at fourteen in a cave near Subiaco, not far from Rome, where he remained for*~~

~~*three years, at the expiration of which he was chosen abbot of a neighbouring con- vent, then in a very relaxed state. His rule proved too stern for his new subjects, who attempted to poison him, whereupon he resigned his office.and returned to Subiaco, around which he soon erected twelve monas- teries, each peopled by an abbot and twelve monks. Fresh attempts on his life and on the discipline of his society drove him out again in the year 528, when he fixed his dwelling at Monte Cassino, the place where his cele- brated rule was drafted in the following year, and which has ever since prided itself on its rank as the cradle of the Benedictine Order and the premier abbey of Western Christendom. The famous institute which he devised*~~

~~*1 Adamnan, Vit. Colwmb., ed. Reeves.*~~

~~*Rule of Bene- dict.*~~

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~~*has a great surface likeness to the rule of Basil, which alone has rivalled it in permanence, though far below it in diffusion and, it may be added, in services to humanity. Superior in flexibility and in the power of adapting itself in new conditions of circumstance and society to any rule which preceded it (and indeed to most of those devised later), the effect it produced in its own immediate day and for several centuries afterwards is almost incalculable. Obedience, silence, humility ; worship, study, and work; such are the ideas and employments with which this code of seventy- three chapters is occupied. It opens with a sermonet or hortatory preface, and then proceeds to define the existing classes of monks, as divided into Ccenobites, Anchorets, Sarabaites, living by twos and threes together without any fixed rule or lawful superior, and Gyrovagi, vagrant tramps who, even at that time, as more than a century earlier, continued to bring discredit on the monastic profession. it was one great aim of the Benedictine reform to extirpate these two latter classes, and the method adopted was the addition of a fourth vow, that of stability," to the three usual pledges. This fourth vow bound the monk to continuance in his profession, and even to residence for life at the monastery in which he was professed, unless temporary absence or permanent transfer were permitted by the authorities, and thus struck directly against the temper of restless- ness and desire for*~~

~~*change which were such powerful factors in generating the irregular and wandering classes just named, Chapter ii. describes the qualities of an abbot, and also decrees that no dis- tinctions of worldly rank or station are to be recognized amongst the inmates of the monastery. Chapter iii. is one of those which best enable us to estimate the foresight and good sense of Bene- dict. It enacts that the abbot is to call the entire body of the brethren together to deliberate on any weighty matter, and not to decide it till he has heard the counsel of even the very youngest ; while in matters of less moment consultation with the elder members suffices. Chapter iv. enumerates the instruments of good works, summed up in seventy-two pithy maxims, mainly Scriptural in letter or spirit. Chapter v. is on the obedience of disciples. Chapter vi. is on silence, recommending spareness and wholesomeness of speech, but not laying down any hard-and-fast rules such as those of the Trappists of a later day. Chapter vii. treats of humility, including injunctions to the monk to confess his secret faults and thoughts to the abbot, to do nothing but what the common rule or the example of his seniors teaches, and to exhibit lowliness and meekness in out- ward bearing as well as in the inward spirit. Chapters ix.-xx. are occupied with directions about the performance of Divine service, so far as relates to the recitation of the Canonical Hours, seven of the day and one of the night. Chapter xxi. provides for the appointment of deans (officers over ten monks) in large monasteries, to be chosen by merit, and not by mere seniority. Chapter xxii. prescribes rules for the dormitory, each monk to have a separate bed with suitable coverings, and to sleep in his habit, and girded, so as to be ready to rise at a moment's notice, and a light is to be kept burning in the dormitory till morning. Eight chapters (xxiii. – xxx.) then deal with offenders, a graduated scale of penalties being provided: first, private admonition; next, separation from the brethren at meals and recreation ; then scourging; and, finally, ex- pulsion in the case of hardened offenders, but not until the abbot has used every means to soften and reclaim them. ven in this last event, the outcast may be received again, and that thrice, on the condition of forfeiting his seniority and descending to the lowest place. After the third expulsion, return was finally barred. Chapter xxx. is on the character and duties of the cellarer, an important officer in monasteries ; who was steward, and had the charge of all the stores, and the responsibility of serving them out as needed ; while the next chapter provides for the appointment of inferior officers to take charge of the tools, clothes, and other goods belong- ing to*~~

~~*the monastery. Chapter xxxiii. prohibits any monk to give, receive, or keep aught as his own without leave of the abbot, who is, however, bound to supply him with all necessaries. Murmuring at anything in the manner of distribution is censured in the next chapter as a very grave offence. Chapter xxxv. ordains that the brethren are to serve in the kitchen by turns, unless excused by reason of sickness or some more important occupation, and that who- ever is on duty on Saturday is to clean up for the week, and to deliver all the cloths and utensils to the cellarer in good condition for his successor in office. Chapter xxxvi., while warning the sick not to be impatient or exacting, gives careful directions for their comfort. They are to be placed in an infirmary and to be com- mitted to the care of a competent attendant, are to be allowed baths as often as is expedient, and a flesh diet to promote their recovery though against the rule for those in health. Old men and children are also to be dispensed from the rigour of the rule, and they may have their meals before the usual hours, instead of waiting for the others. Chapter xxxviii. directs that reading aloud during meals is to be practised, and that no conversation, even about the subject of the reading, is to be carried on by the brethren, who are to keep*~~

~~*silence, using signs if they need anything. The reader is to be appointed for a week, and to enter upon his dutieson Sunday. He*~~

~~*is to be allowed a little food before beginning his task, lest he should become faint, and is to finish his meal afterwards along with the kitcheners and waiters. And the readers are not to take turns of duty in order, but only such persons are to be appointed as can dis-*~~

~~*charge the office satisfactorily. Chapters xxxix. and xl. prescribe the*~~

~~*daily rations of food and drink, Two meals are allowed, consisting of two cooked dishes (pulmentaria), to permit a choice of food, lest one or other dish should be unsuitable to any one, and a third dish' of fruit or young vegetables is granted as an occasional addition.*~~

~~*A pound of bread is to be served out daily for each, though the abbot is empowered to increase the rations of such as had extra hard work to do;*~~

~~*while the rations of children are to be proportionably diminished, and flesh-meat is forbidden to all except the sick and weak, but there is no prohibition of any flesh save that of four-footed beasts, thus leaving the use of poultry, eggs, and fish optional.*~~

~~*One pint of wine daily is allowed to each monk, but the hesitation with which this is conceded is noteworthy ; and, while the prior is empowered to increase the allowance if he judge it well, the brethren*~~

~~*are told that voluntary abstinence is the best course, and that where a house is too poor to provide wine those debarred from it are not tomurmur. Chapter xli. prescribes the hours for meals at different seasons of the year, care being taken that both meals shall be taken by daylight, without need oflamps. Chapter xlii. directs the monks to assemble in the evening for a reading, preferably of the Collations of Cassian, followed by compline, after which silence is to be strictly observed, save for some necessary cause. Chapters xliii.xlvi. im pose penalties for minor breaches of rule, such as coming late to prayers or meals, Chapter xlvii. gives some further directions as to Divine service, throwing on the abbot or his deputy the responsi- bility of notifying the hour for it, and provides that no incompetent person shall be set to chant or read. Chapter xlviii., although brief, is one of the most important and characteristic in the rule.*~~

~~*It is on daily manual labour, and begins with the pithy axiom,*~~

~~*'"Tdleness is an enemy of the soul" (Otiositas inimica est anime).*~~

~~*It proceeds to enjoin that the brethren are to distribute the time not already taken up with prayer, meals, and sleep, into periods of manual labour or devout reading. From Easter till the 1st October they are to work from prime till the fourth hour. From the fourth till nearly the sixth hour they are to read. On rising from meal- time after the sixth hour they are to rest in silence on their beds— the familiar siesta of warm countries—but those who prefer to read may do so, provided they disturb no one. Nones are to be said about the middle of the eighth hour (2.30 p.m.), and then work is to be resumed till evening. From the 1st October till the beginning of Lent they are to read till the second hour, then to say terce,*~~

~~*after which to work till the ninth hour. At the ninth hour they are to leave off work, and after their meal to read spiritual books or the Psalms. In Lent they are to read from the morning till the third hour, then to work till the end of the tenth hour. And every one is to have a book given out to him from the library at the be- ginning of Lent, which he is to read through ; while two senior brethren are to go the rounds during reading hours to see that the monks are actually reading, and neither lounging nor gossiping.*~~

~~*On Sundays all are to read throughout the day, except such as have special duties to discharge ; and if there be any who either cannot or will not read or meditate, some task to keep them from idling is to be assigned them. Sickly and delicate brethren are to be given light work, suitable to their health. Chapter xlix. suggests, with- out commanding, the adoption of some voluntary self-denial during Lent, to be undertaken with the abbot's approval only,—austerities without such sanction being denounced as vainglorious. Chapter l. directs that brethren who work at a distance, so as to be unable to attend common prayer, are to recite the office where they may happen to be. Chapter li. preseribes that monks sent on an errand, and expecting to return the same day, are not to eat while out,*~~

~~*unless they have special leave from the abbot. Chapter lii. gives a few directions as to behaviour in the oratory. Chapter liii. contains rules for the entertainment of guests. The most noteworthy pro- visions are that the abbot is licensed to break his fast with the guests, unless on a church fast-day, in order to bear them company at meal-times ; that the kitchen for the abbot and guests is to be separate from the general kitchen, and served by the same two brethren for a year, to insure that no additional labour may fall on the ordinary kitcheners through the unexpected arrivals of strangers needing to be fed; that the guest-room be entrusted to a brother (the hospitaller), and that no monk shall speak to or mix with the guests unless by special appointment—a very salutary regulation,*~~

~~*in view of the miscellaneous rout of visitors likely to apply for food and shelter. Chapter liv. forbids monks to receive letters, tokens, or gifts, even from their nearest kin, without the abbot's permis- sion, or to give any such things to another; and the abbot is em- powered to transfer presents to some person other than him for whom they were intended. Chapter lv.*~~

~~*prescribes the dress, and, with Benedict's usual good sense, leaves it wholly in the abbot's dis- cretion to provide clothing suitable to the climate and locality;*~~

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~~*merely ruling that in temperate places a cowl and tunic, thick in winter and thin in summer, with a scapular (a sleeveless woollen garment passed over the head, and falling down over the breast and back) for work hours, as also shoes and stockings, all of the ordinary country make and cheapest kind, shall suffice. Each monk is to have a change of these garments, to allow of washing, and yet another for use when sent on a journey, to be of rather better materials, and to be kept in the general wardrobe when not in actual wear. The old clothes are to be given up when new ones are served out, and are to be laid by in the wardrobe for the poor. A straw mattress, blanket, quilt, and pillow are to be furnished for each bed ; and in addition the abbot is to give every monk a knife, a pen, a needle, a handkerchief, and tablets. Chapter lvi. rules that the abbot is to take lis meals with the guests and strangers, with the privilege, if guests be few, of inviting any of the brethren he eliooses, so long as some seuiors are left in charge. Chapter lvii. prescribes that craftsmen amongst the brethren are to work with the abbot's permission, and if their work is to be for sale, those who are entrusted with making the bargains are to deal honestly with pur- chasers, and to sell rather below the current trade price. Chapter lviii. lays down the rules for the admission of new members. It is not to be made too easy. The postulant is to be allowed to knock for entrance in vain for four or five days, then to be brought into the guest-room for a few days more, and so be transferred to the novice-house, where he is to remain under the charge of a senior monk for two months. If he persevere at the end of this time, the rule is to be read over to him, and the option of departing or remain- ing is to be offered. If he persevere, he is returned to the novice- house for six months' further probation, after which the rule is again read to him as before, and yet a third time after a further term of four months. Not till he has surmounted this final ordeal can he be admitted into the community, and before that is done he must divest himself of his property, either giving it to the poor, or mak- ing a deed of gift to the monastery. Then he is allowed to sign the act of profession, including the vow of stability, which he is to lay*~~

~~*with his own hand on the altar. Chapter lix. provides for the dedication of young children, noble or poor, by their parents to the monastic life, and requires a promise from the latter never to endow the oblate with any property, directly or in trust, though they may give to the monastery if they please and reserve the life-income to themselves, Chapter lx. regulates the position of priests who desire to live in the monastery. They are to enjoy no relaxations or priority in virtue of their ecclesiastical rank, though the abbot may assign clerical functions to them ; and a somewhat like rule is laid down for clerks in minor orders. Chapter lxi. provides for the reception of strange monks as guests, and for their admission if desir- ing to join the community. The abbot is enjoined to listen to any criticisms such a guest may offer, and is empowered to give him, if accepted as a new member, higher standing than that of his entrance, but is forbidden so to admit a monk of any known monastery with- out the consent or letters commendatory of its abbot. Chapter lxii. rules that the abbot may choose a monk for ordination as priest or deacon ; but the ordinee is to rank in the house from the date of his admission, except when officiating, or if the community and the abbot single him out for promotion by merit. If he misbehave, he is to be reported to the bishop, and if continuing to misconduct himself, shall be expelled,—only, however, in case of obstinate dis- obedience to therule. Chapter lxiii. lays down rules for the gradation of rank in the community, and warns the abbot against arbitrary government. Chapter lxiv. allows the abbot to be chosen either by the common consent of the whole community, or by a select electoral committee ; and the lowest in standing may be chosen, if fit. In the event of a bad choice, the bishop of the diocese, the neighbour- ing abbots, or even the neighbouring laity, if having reason to think the election made for the purpose of keeping up abuses, may annul it and appoint another superior. Chapter lxv. speaks of the mis- chief occasioned in many monasteries by the rivalry of the provost or prior with the abbot, and advises that no such officer be appointed ; yet, if the circumstances of the place need one, the abbot may name a brother to the post, but he is to be as entirely subject to the abbot as any other monk, and may be admonished, deposed, or expelled for misconduct. Chapter xvi. directs the appointment of a porter to answer at the gate, and further recommends that every house shall have its own well, mill, garden, bakery, and handicraftsmen, to avoid the need of intercourse with the outer world. Chapter lxvii. directs that no monk shall quit the cloister without leave of*~~

~~the abbot, and that, on the return of any from a journey, they are to beg the prayers of the community for any faults they have committed during their absence, and are forbidden to speak of what they have~~

~~be subject to discipline from all the monks; but any who shall chastise those above fifteen without the abbot's leave, or be unduly severe towards the younger, shall be himself punishable by rule. Chapter lxxi. lays down that the prineiple of obedience is to prevail throughout the community, not only towards the abbot, or his officers, but from the juniors towards their seniors. Chapter lxxii. is a brief exhortation to zeal ; and chapter Lxxiii. a note to the effect that the Benedictine rule is not offered as an ideal of perfection, or even as equal to the teachings of Cassian and Basil, but for mere be- ginners in the spiritual life, who may thence proceed further.~~

~~It has been necessary to make this detailed analysis of the rule, because no mere summary of its general scope conveys an adequate notion of it; and it plays so import- ant a part in the history of European civilization that it is expedient to obtain a clear idea of its details as well as of its main outlines. The first peculiarity in it meriting attention is the absence of any severe austerities. Plain and bare as the food and lodging appear if tested by modern notions, yet it is to be remembered that what is called "comfort" is a wholly recent idea, and even still scarcely fantiliar, it may almost be said, out of Great Britain and its colonies. The scale of living appointed by the rule secures a greater abundance of the necessaries of life, not only than was at all common amongst the Italian poor of the 6th century, but than is to be found amongst the humbler peasantry of any European country at the present day ; while even the excluded superfluities entered but little into the habits of any save the very wealthy. Next, high thinking—the highest thought of the time—was united with this plain living, as the considerable stress laid upon reading attests. To this part of the code is due the great service performed by the Benedictines, both in the erection of schools, and in the preservation of almost all the remains of ancient Latin literature which have come down to us. It made it not only possible but easy for them to become a learned order, and it is a very imperfect estimate of the stride forward in this provision which Milman makes, when he views the~~

~~*injunctions as to reading in the mere light of expedients to fill up time somehow. If it were so, the hours for reading would have been fewer, shorter, and more occasional, merely rounding off the intervals between times of labour; but they are just' as prominent and nearly as long as these. It is true that Benedict, whose own education had been abruptly broken off by his early retreat from Rome, did not speci- fically enjoin the pursuit of learning on his monks; but they borrowed the idea at once from his contemporary, the celebrated Cassiodorus, the real founder of monastic learning, of which his monastery of Viviers in Bruttium is the first known school. But the most valuable feature of the rule is the position of dignity which it assigns to work. It is scarcely possible to realize at the present day the dishonour into which toil of all kinds had sunk in the days of Benedict. Not only had the institution of slavery degraded many kinds of occupation, but the gradual disappearance from Italy of the yeoman class, ruined and exiled by the concentration of great estates (latifundia), or slain in the ceaseless battles of competitors for empire or of barbarian invaders, left few save serfs and bondsmen to till the soil, while the military habits of the invading tribes led them to contemn any life except that of a warrior. It is the special glory of Benedict that he taught the men of his day that work, sanctified by prayer, is the best thing which man can do, and the lesson has never been wholly lost sight of since.*~~

~~*The new institute spread with even more astonishing Spread rapidity than the earlier monachism which it practically ae —s é : : * fluence of supplanted in the West, and its history thenceforward 15, ine Rene with one important exception, that of Western conventual dictine life for some centuries. Moreover, besides marking the order. close of the first or tentative era of monachism, when all*~~

~~*kinds of crude essays and experiments were being made, XVI. — 89*~~

~~*heard or seen outside. Chapter lxviii. bids a monk who has received a hard or impossible command to undertake it patiently and obedi- ently. If he find it beyond his powers, he may mention the cause quietly to his superior ; and, if the command is still persisted in, he must obey as best he can. Chapter lxix. forbids monks to uphold or defend one another in the monastery, even their nearest of kin. Chapter lxx. forbids striking or*~~

~~*excommunicating another, without the abbot's authority, and provides that children, until fifteen, shall*~~

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~~*and being itself the beginning of a new and settled order, ‹t has the distinction of giving greater dignity and weight to the female side of monachism than had been the rule previously. Numerous and crowded as convents for women were in the early church, there is little evidence of their exercising any powerful influence as a factor in the practical religious life of the time, and though a few 'ndividual women of eminence, a Euphrosyne or a Macrina, illustrate the annals of the common life in the East, yet as a class the Basilian nuns do not play at all so important a part in ecclesiastical history as the spiritual descendants of Scholastica, sister of Benedict; for the same flexibility and comparative gentleness of his rule which made it healthier for men than its precursors were still more effective when dealing with the more sensitive organization of women. Accordingly, the Benedictine nuns offer a far greater variety of type than their Eastern sisters, and exerted a much more visible influence upon society, even before those newer forms of the organization of women's work in the church were devised which have given it much additional importance. Further, whereas the most serious and well-founded objection alleged against mona- chism is that by parting large companies of men and women irrevocably from each other, and treating this severance as an indispensable condition of the highest kind of life, it has tended to throw discredit on marriage and the family, and so to weaken society, which is based on family life alone, a strong counter-plea can be put in for the Benedictines. Not merely are they free, as already remarked, from the anti-social tendencies of Oriental monachism, which actually did disintegrate society in Egypt, but their institute was the one corrective in the early Middle Ages of those habits and ideas which tended to degrade the position of women. The cloister was not alone the single secure shelter for women who had no strong arm to rely on; but it provided the only alternative profession to marriage, and that one recognized by public opinion as of even higher distinction, and opening to women positions of substantial rank and authority, less precarious than the possession of temporal estates, which might only serve to attract cupidity, and so invite attack. The abbess of a great Benedictine house was more than*~~

~~*the equal of the wife of any save a very great noble ; and, as single women were thus not obliged to look to wedlock as the only path to safety and consequence, they were enabled to mate on more equal terms, and were less likely to be viewed as the mere toys or servants of the stronger Sex,*~~

~~*But the special eminence of the Benedictines, in which they were without even the semblance of rivalry till the Jesuits arose, is that they were a missionary, civilizing, and educational body. It is true that the first successful efforts to convert the barbarian conquerors of the empire somewhat precede their entrance on that field of labour, and Ulfila amongst the Mceso-Goths, Valentinus in Bavaria, and Sever- inus in Austria had achieved much even before Benedict was born; but their work needed to be taken up on a larger scale, and by a permanent organization not liable to be imperilled by the death of any one missionary or group of missionaries. And the task of laying the very foundations of civilized society, apart from the question of religious conversion, was as yet quite unessayed. It was as teachers of what for those times was scientific agriculture, as drainers of fens and morasses, as clearers of forests, as makers of roads, as tillers of the reclaimed soil, as archi- tects of durable and even stately buildings, as exhibiting a visible type of orderly government, as establishing the superiority of peace over war as the normal condition of life, as students in the library which the rule set up in every monastery, as the masters in schools open not*~~

~~*uicrely to their own postulants but to the children of secular families also, that they won their high place in history as benefactors of mankind. No doubt there was another side to this picture, even before the order began to deteriorate collectively ; but the good actually effected far exceeded the evils which may have accompanied it. The Benedictine institute was carried to Sicily by Placidus in 534; to France by Maurus, Simplicius, and their companions in 543; to Spain at a somewhat later and uncertain date; but did not touch any of the Teutonic countries till the very end of the century. That work was chiefly accomplished by another agency, that of the Celtic monks, themselves disciples of a Christianity presumably carried to Ireland from Gaul, and following a rule seemingly adapted from that of Pachomius.*~~

~~*The early history and constitution of Irish and Scottish monachism are too obscure to be set down with any con- fidence, but it is at least clear that it was mainly tribal in organization, and even less subject to episcopal authority than the Eastern and Italian forms. The same holds good of the Welsh communities which survived the Saxon invasions of Britain. Legend is abundant, trustworthy record is scanty, and only a few facts can be rescued from oblivion. Amongst them may be included the introduc- tion into Scotland of a species of monachism resembling that of Augustine, by Ninian, first missionary of the southern Picts, who borrowed his institute from Martin of Tours, 'and set up a cathedral, a house of canons, and a school of learning at Whithorn (Candida Casa) in Galloway before the close of the 4th century, himself dying, it is thought, about 432 (Ailred, Vit. Vin.). The foundation of the second model of Welsh monachism (the first has gone below the horizon of history) is ascribed to the bishops Germanus of Auxerre and Lupus of Troyes, who visited Britain in 429 to combat the prevalent Pelagianism, itself a form of opinion due to a British monk. They are alleged to have been, directly or through their disciples, founders of great monasteries and schools at Hentland on the Wye, at Llantwit, Llancarvan, Docwinni, Bangor, Whitland, &c. ; while among the more famous names connected with these and similar houses may be mentioned Asaph, David, Illtut, Dubric, Cadoc, Gildas the Wise, and Kentigern, the last-named being a zealous missionary. But Ireland was the true stronghold of Celtic monachism, and before the close of the 5th century was already thickly planted with religious houses. Armagh, Clonard, Aran, Lismore, Cluain-ednech, Clonfert, and, above all, Benchor or Bangor, the famous abbey of Comgall, on the coast of Down, near the entrance of Belfast Lough, are some of the more conspicuous founda- tions; and there are numberless stories recorded of the learning, the austerities, and the miracles of their inmates. The chief interest they have for the student of ecclesiastical history lies rather, however, in the colonies they sent forth than in their home operations, and it is to the great foundation of Columba (521-597) at Iona, the hive of missions and home of Western learning, more than to any Irish monastery, except Bangor, that the Celtic raid on heathenism is mainly due. The rule of Columba! resembles the Benedictine in prescribing three kinds of employment—prayer, work, and reading ; while under the last-named head not only Scripture but all attainable secular learning was included, and it is also certain that the work of*~~

~~copying MSS. in a careful and beautiful fashion, which became so important a part of monastic occupation, reached maturity first at Iona. It remains only to say in this connexion that the discipline of Iona, apparently borrowed from Irish use, made the abbot supreme, not~~

~~u Published by Dean Reeves in Colton's Visitation of Derry, p. 109, and in another form by Haddan and Stubbs, Councils, &c., ii. p. 119.~~

~~The Cel- tic move-~~

~~ment.~~

~~MONACH IS@~~

~~merely over his monks, as in other rules, but over bishops also, whose office was simply that of ordaining such as were to be promoted to holy orders;! they had no territorial jurisdiction as rulers, because the monastery,~~

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~~and the 8th century was a time of deterioration amongst both the seculars and the regulars. To amend the former, Monastic Chrodegang, bishop of Metz, instituted in 760 an order reform-~~

~~of Canons Regular, living by a rule carefully based on and ° 8th century.~~

~~not the diocese, was the primary local unit in Celtic Chris- tianity, and thus a great founder or abbot was of more account and power than a bishop. Another famous pupil of Irish monachism, Columbanus, trained at Benchor along with his companion Gallus, exercised a powerful influence on the religious life of his time (543-615), not only as the founder of important monasteries at Luxeuil, Fontenay, and Bobbio, and as scholar and missionary, but also as the author of a rule, more severe both in its pro- visions and in its penalties than the Benedictine, with which it disputed for a considerable time the first place, and which it might very probably have displaced, had not the Benedictine institute, as of Italian origin, found that favour at Rome which a Celtic code, bearing more than one trace of divergence from Latin usages, could scarcely expect. With the mention of~~

~~another prominent name in the list of distinguished Celtic reformers and mission- aries, that of Fursey, abbot of Lagny near Paris (c. 650), we close this sketch of the Celtic movement in the 6th and 7th centuries, merely adding that its extent and influence may be partly estimated from the number of monasteries founded in England and various parts of the Continent by Irish monks, and the list of Celtic saints recoverable from the different martyrologies and similar records. The former amount to more than one hundred ; the latter to nearly three hundred.~~

~~Returning to the Benedictines, the most important event in their history after the consolidation of their institute was the favour they received from Gregory the Great, himself once a monk, who set himself to reform monastic discipline, then at a very low ebb save where the new foundation was at work. He enacted several regulations for the better government of monasteries, such as pro- hibiting the admission of any persons under eighteen, exacting two years' novitiate, enforcing inclosure, visiting relinquishment of monachism with imprisonment for life, and finally, in the Lateran synod of 601, exempting monasteries in all cases from the jurisdiction of bishops (a measure due, it appears, to episcopal misconduct and oppression rather than to monastic ambition), thereby abolishing the measure of control which the eighth canon of Chalcedon and the legislation of Justinian I. in 535 had left in the hands of the diocesan, and leaving only the still surviving check, that the bishop's consent was required for the erection of any new monastery. The mission of the monk Augustine to England in 596 was, however, destined to produce more immediate and for- tunate results than this piece of legislation. It brought Latin monachism into a part of Britain whence Welsh monachism had been long extirpated, and though little success attended the original foundation at Canterbury, yet two other houses were destined to be the cradles of great things. Jarrow-on-Tyne, founded by Benedict Biscop, trained the illustrious Bede, to whom is due the monastic school of York, which in its turn sent out Alcuin to recon- stitute European learning under the fostering hand of Charlemagne; Nutcell in Hampshire reared Boniface to be the apostle of Germany, and founder of one of the most celebrated and powerful monasteries of the Middle Ages, that of Fulda. Nevertheless, decline set in very soon,~~

~~*1 So Bede tells us: '*'Habere autem solet ipsa insula rectorem semper abbatem presbyterum, cujus juri et omnis provincia et ipsi etiam episcopi, ordine inusitato, debeant esse subjecti, juxta exemplum primi doctoris illius, qui non episcopus sed presbyter extitit et mona- chus" (list. Eccl., iii. 4); though, after all, the principle is precisely that of the Benedictine rule as applied to priests.*~~

~~*adapted from the Benedictine, with the bishop as abbot, the archdeacon as prior, and with a general likeness in all the details of community life, except that there was no obligation to poverty, and the canons were allowed to enjoy any private property and such fees as they might receive for the performance of religious rites. This rule became extremely popular, was sanctioned by the coun- cil of Aix-la-Chapelle in 816, and was adopted in most cathedrals of France, Germany, and Italy within fifty years after, besides making some way in England also. It prevailed till the institute of the Austin Canons was substituted for it. And, as regards the laxity amongst regulars at this time, there is extant a very interesting letter from Bede addressed to Ecgberht, archbishop of York, calling his attention to the excessive number of monasteries in northern England which were conducted without a rule, and were often merely fictitious institutions, founded by laymen with the object of obtaining charters of privilege which would exempt them from civil and military burdens,—such laymen then assuming, without warrant, the title and powers of abbots, and filling their houses either with monks expelled from their own societies, or with lay retainers induced to receive the tonsure and promise obedience. Bede calls on the archbishop to con- vene a synod and institute a visitation for the correction of these abuses. The cause of the decline of the monasteries is to be sought in their popularity, which brought them great estates and other kinds of wealth, leading to the relaxation of the vow of poverty, which was interpreted as merely forbidding individual property; in the growth of pluralities ; and in yet another cause which at first does not seem to lead in the same direction—the growing custom of ordaining monks, hitherto laymen, to fit them better for missionary work. But this led, not only to much more intercourse with the society of a lax and turbulent age than suited with claustral rules, but to ambition, as it became customary to fill several sees with monks from certain abbeys. The declension, notably in the habits of the superiors of wealthy houses, had become very marked, when a*~~

~~reformer arose in the person of a second Benedict, of Aniane in the modern department of the Hérault (750-821), who, in gratitude for an escape from drowning in the Ticino in 774, adopted the mon- astic life, and changed his name Witiza to that of the great Nursian monk. But he accounted the Benedictine rule too easy, and adopted instead the severest practices of Eastern monachism. He quitted the house of Seine, where he had been professed, and betook himself with a couple of companions to Aniane, where by 782 he had built a monastery for a thousand monks, with depend- ent cells, and collected a considerable library, paying special attention to the acquisition of the rules of the different monastic bodies both of East and West. He was transferred by his warm patron, the emperor Louis the Pious, to an abbey built for him near Aix-la-Chapelle, whence he acted as in some sense a superior-general and inspector of all the Benedictine houses, and drew up a harmony of all the rules he had collected to aid him in the task of reform. What he actually effected was the practical abolition of most of the competing codes, so as to leave the Benedictine in nearly sole possession, and to procure the enactment of a large body of canons in the council of Aix-la-Chapelle before mentioned, which laid down detailed provisions for the government of monasteries, whose very minuteness made them vexatious and ulti- mately intolerable, so that the reform lasted scarcely two~~

~~generations from its inception. Parallel with the time of de- clension and partial reform just described was the rise and decay of the noble and far-sighted school-system projected by Charlemagne, and entrusted to the superintendence of Alcuin. Its relation to monachism as distinguished from the history of education, is that one of its main features was the capitulary of 789, which directed that, besides the primary school attached to each monastery, all the more important houses were to found and open secondary ones also, with a higher range of subjects, even if such schools were interior or claustral, and only for the junior monks and novices, not exterior and free to the general public. Several of these schools rose to consider- able efficiency and repute, notably those of Fulda, St Gall, Tours, and Rheims, discharging to some extent the functions of universities. But the weakness of the later Carolings involved this plan in the troubles which ended in the break-up of the empire of the Franks, and the 10th century saw~~

~~*the end of it. In England monachism shared the common destiny of decay. It had been marked during the period known as the Heptarchy by a degree of royal favour unparalleled elsewhere ; for it may almost be said that the number of kings, queens, and persons of royal race who here betook themselves voluntarily to the cloister—and not under political compulsion, as often in con- temporary France—exceeds the aggregate of those in all other countries. Yet it is likely that the fashion set in this wise helped to hasten decay, by inducing many persons to adopt the monastic life with little taste for its restric- tions; and it is certain that secularity (chiefly manifesting itself in costly dress), riotousness, and drinking had become frequent amongst the English monks of the 8th and the early part of the 9th century. The decay was further precipitated by the spread of the institute of Chrodegang, which thinned the supply of recruits to monachism proper, as the easier life of canons regular was preferred. The game cause affected the convents of nuns, for an order of canonesses was established about this time on similar lines. The one bright spot in the history of 9th century mona- chism is the conversion of Sweden by Anskar, a monk trained in the famous house of Old Corbie in Picardy, which, albeit Benedictine, had been mainly planted by a colony from the stricter Columbanian house of Luxeuil, and had thus kept the traditions of a purer time almost unimpaired.*~~

~~*The 10th century—emphatically the "Dark Age" or "Age of Lead"—was the time when monachism, both in East and West, touched its lowest point. Three causes contributed to this in the West :—first may be placed the raids of the Northmen; next, the growth of the feudal system, converting abbots into secular lords in virtue of*~~

~~*the lands held by their monasteries being chargeable with |*~~

~~*feudal obligations ; and lastly, the seizure and impropria- tion of monastic revenues by kings, princes, and bishops. The last of these causes was at work in the East also, further complicated, as we learn from the decrees of a council held at Constantinople in 861, by the founda- tion of monasteries intended from the first merely as sources of pecuniary advantage to the founders; although the success of Greek monks in the conversion of Bul- garia, Moravia, and, somewhat later, southern Russia, showed that the*~~

~~*cloister had not become quite effete even under the conditions of the Byzantine empire in that era.*~~

~~*What the state of things was in the West, even at the outset of the 10th century, may be learned from the language of the council of Trosley, near Soissons, in 909. It speaks of the ruin of many abbeys by the heathen, and of the disorderly condition of many which survived. Monks abandon their profession ; married lay*~~

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~~*abbots, with guards and hunting retinue, occupy the cloisters of monks, canons, and nuns; and the rules are universally disregarded. But, as constantly before, so then, reformers were at hand. Berno first abbot of Cluny in France, Dunstan in England, and, somewhat later, Anno archbishop of Cologne in Germany, undertook, and to a considerable extent effected, the work of reform. Only the first of these, however, calls for special notice here; and it will suffice to say that Berno, after having been abbot of Beaume, was set by William the Pious, duke of Aquitaine, over his new foundation of Cluny in 910, where he speedily initiated a reform of the Bene- dictine rule, whose very name, and even the memory of the reforms of Benedict of Aniane, had been forgotten in nearly all the so-called religious houses of the time. This new rule is the first example of the establishment of an order within an already existing order, of which it still formed part, many subsequent instances of which occur later. It was stricter than the original code in several particulars, notably as regards fasting and silence ; and it laid especial stress on liturgical splendour. Cluny became the head of a large number of dependent houses, and, under the government of Berno's successors, Odo, Aymard, Majolus (who refused the papacy), Odilo, and Hugh L, rose to great eminence, but was nearly brought to ruin by Pontius, abbot in 1109, who was soon deposed, and succeeded by Hugh IL, and then by Peter the Venerable, who completed the work of drafting the statutes of the new order, begun long before, but not finished, by his pre- decessors. In his time (1093-1156) the Cluniacs spread over not only the whole of France, but had houses in Italy, Spain, England, Palestine, and in Constantinople itself, and the "Arch-Abbot," as he was called, had more than 300 churches, colleges, and monasteries under his authority. It is*~~

~~*enough to say, with regard to Dunstan's reforms in England, that they were directed to two objects: the substitution of monks for secular canons, and the introduction of the Benedictine rule, till then practically unknown in England, into the monasteries,—for the mona chism introduced by Augustine belonged to an earlier type. The 11th century is noticeable for several events in the history of monachism; first of which stands the foundation of the Order of Camaldoli by Romuald, early in the 11th century, a strict community of hermits, living by the system of an Eastern laura of detached cells; but this society has never been of much importance. The Order of Vallombrosa, founded by John Gualbert in 1039, is more remarkable, as being the first to introduce the grade of "lay-brothers," which plays so large a part in later monastic annals,—the object being at once to open the cloister to a class previously barred by the obligation to recite the office in choir, which necessitated a certain degree of education, and to lighten the strain on the choir-brethren by relegating the rough work of the monas- tery to an inferior grade of inmates, thus securing more time for reading and meditation for the cultured monks. A series of struggles between bishops and abbots in this century in respect of monastic jurisdiction—the practice having constantly vacillated in despite of Gregory the Great's decision 400 years earlier—issued mainly, though not wholly, in favour of exemption, and the reforms pushed everywhere rehabilitated monachism in popularity. The great stimulus given to the spirit of ecclesiastical dis- cipline and energy by the Hildebrandine movement con- tinued not only during the reign of Gregory VII., but for a considerable time after: amongst its results were the Order of Grammont, founded in 1074, but not transferred to the place whence it is named till 1124; the far more celebrated and influential Carthusians, a peculiarly ascetic*~~

~~*New orders,*~~

~~*ith cen-*~~

~~*tury.*~~

~~*Military orders.*~~

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~~*community, established by Bruno at the Chartreuse, near Grenoble, in 1084, which still boasts that it is the only order which has never been reformed on the ground of deviation from its original institute; and the Order of Fontevraud, founded for both monks and nuns (more strictly, canons and canonesses) by Robert of Arbrissel in 1100. Regarding the last named two remarkable facts may be cited: that the founder in 1115 entrusted the superior-generalship of the whole institute to the abbess of the nuns; and that he provided that new abbesses should always be elected from secular women, as having more practical knowledge of affairs and capacity for ad- ministration than women trained in a cloister. There is yet one order more belonging to this period of new foundations, of higher note than most —that of the Cister- cians, founded by Robert of Molesme in 1098 at Citeaux, near Dijon. This society, chiefly famous as that to which Bernard of Clairvaux belonged, carried its asceticism into a region whence the other monastic bodies had banished it, that of Divine service. The barest simplicity in build- ings, church furniture, and worship was enjoined by the rule: plain linen or fustian vestments, iron chandeliers, brass or iron censers, no plate save a chalice and a tube (and those of silver rather than of gold), no pictures, stained glass, or images, and only a few crosses of painted wood, and the most rigid simplicity in chanting,—such was the ceremonial code with which they challenged the costly ritual of Cluny. A more durable innovation was the institution of "General Chapters," to which every abbot of a Cistercian house had a right to be summoned to share in the delibera- tions held at the chief establishment, and which he was even bound to attend, that, while each dependent house thus obtained a representation in the parliament of the order, it could be called on to render to the central authority an account of its own doings. The Austin Canons, already mentioned, were probably founded at Avignon about 1061, and the Order of Prémontré by Norbert in 1120. This society was simply a stricter body of Austin Canons, stand- ing towards them much as Cluny did to the Benedictines. But there are yet two other institutes of this active period which differ from all previous foundations. So far, the new orders are merely modifications, more or less sweeping, of the original Egyptian system, but the crusades gave birth to two entirely unprecedented forms of monachism : —the Mili- tary Orders, of which the most celebrated are the Templars, the Hospitallers, and the Teutonic Knights ; and convents of women, affiliated to these orders, who were appointed to serve in the lazar-houses, hospitals,*~~

~~*and similar institutions attached to them, and whose rule, for the first time in monastic history, was drawn up on a distinctly active and not a contemplative basis. Work of the sort had been done long before, but only as a casual accident, not as the primary object of a community.*~~

~~*The military orders arose in a more accidental fashion than any other variety of monachism, being due to the desire felt to lessen the perils which attended pilgrimage to Jerusalem, then almost as much part of the religious craving of Christendom as the hajj to Mecca is with devout Moslems. The Templars were at first designed only as an armed escort to protect the visitors from attack, and the idea of permanent guardianship of the Holy Places did not shape itself till later; while the Hospitallers (afterwards famous as Knights of Rhodes and of Malta, as the main bulwark of Christendom against the Turks, and as main- taining the police of the Mediterranean against all pirates and rovers), borrowed the first idea of their institute from the knightly order of St Anthony of Vienne, founded in Dauphiné about 1095, and devoted themselves originally to tending sick pilgrims at Jerusalem. The Teutonic Knights date from the third crusade, and owe their foundation to*~~

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~~*the sufferings of the duke of Swabia's army at the siege of Acre, as it would seem that the Hospitallers were either unable or unwilling to supply the needed assistance. These knights, when at last the Eastern crusades were abandoned, turned their arms against the heathen of Prussia, which they conquered, as also Livonia, Courland, and Pomerania, besides keeping the Slavonic enemies of Germany in check by frequent raids into Lithuania and Poland, holding their ground as a sovereign order for three centuries, till the Reformation brought about their fall. The common char- acteristic of all these orders was the union of the seemingly incompatible qualities of the monk and the soldier in the same persons, of the convent and the barrack in the same house. But the contrast was not so sharp to medieval eyes as it would be to modern ones ; for while knighthood was surrounded with religious ceremonies and sanctions on the one hand, and on the other the feudal rank of bishops and abbots made them in some sense military chiefs, occa- sionally even taking the field in person, there was no great difficulty*~~

~~*in accepting the permanent combination of what was often found casually united. The military orders passed away when their work was ended: the Templars, as the victims of a great crime, closed by a ghastly tragedy ; the Hospitallers, and those Spanish and Portuguese orders which were enrolled as regiments against the Arab invaders of the Peninsula, though titularly still existing, yet really ceased to be more than a name when the Moslem power in Europe was finally broken. But the active organization of women was a more fruitful germ, and has never since ceased to put forth new developments, varying with the noticed wants of each period. To this epoch belongs also the beginning of that policy of the Roman see of utilizing the monastic orders, won over by special privileges and exemptions, as a body of supporters—almost a militia—more to be relied on than the secular clergy, and thereby the seed of conflict between seculars and regulars, destined to work much evil later, was sown, and also the beginning made of that dena- tionalization of monachism which tended from the first to its unpopularity and decay.*~~

~~*It was found that a new order was the best safety-valve for enthusiasm which might become dangerous if dis- couraged, but which could be made a valuable ally if allowed to take shape in a fresh society, hoping to surpass all its precursors ; and it is worth remarking that the one occasion when this wise policy was departed from, when Peter Waldo vainly sought in 1179 recognition and sanction from Pope Alexander III. for his proposed institute of mission preachers, gave rise to a sect (the Waldenses) which is still existing, and which has given trouble to the Roman Church quite disproportionate to its numbers and influence. The Carmelites, founded by Berthold of Calabria on Mount Carmel about 1180, and incorporated under rule by Albert, Latin patriarch of Jerusalem in 1209, were the last order of importance which sprang up at this time; for the Gilbertines, an English order founded at Sempringham in Lincolnshire in 1148, curious chiefly for their double monasteries for men and women; the Beguines, c. 1170 (who are, however, notable for their semi-secular and parochial organization, whence many later active bodies have borrowed hints); the Humiliati, ec. 1196; and the Trinitarians, for the ransom of captives amongst the Moors and Saracens, founded by John de Matha and Felix de Valois in 1197, never rose to great influence or popularity, though the Servites, an order of the year 1223, became powerful in Italy. This period of rapid multiplication*~~

~~was quickly followed by one of equally rapid decay, the first to show clear tokens of degeneracy being the once rigid Cistercians, who never recovered their old moral foot- ing, and who, it may be mentioned, were accountable for much of that hatred of the Church of the Pale in Ireland~~

~~Mendi- cant Orders, or Friars.~~

~~by the natives, which, given fresh fuel by the Reformation, has lasted to the present day.!~~

~~Yet another fresh departure in the history of monachism, in some respects the most momentous of all, was taken in the 13th century by the institution of the Mendicant Orders, or Friars. Pope Innocent IIL, in the 13th of the 70 constitutions or canons he promulgated at the Lateran council in 1215, had expressly forbidden the foundation of any new orders, bidding all who desired to embrace the monastic life join some approved community, and similarly directing that such as desired to found new houses should take their rule and constitution from one of the recognized societies. But circumstances were too strong for him, and this very pope was destined himself to sanction two of the most remarkable societies which the Latin Church has ever produced. 'The time was an anxious one. The speculative activity of the age, coupled with the abuses in the church, was multiplying sects, formidable in numbers, and still more from the contrast their austere mode of life presented, not only to that of the secular society of the day, but to that of the ecclesiastics, notably those of rank, whose pomp and luxury gave rise to the first faint stirrings of a revolutionary spirit amongst the commons, which the great pope, who was then the most conspicuous figure in Europe, did not fail to observe. No effectual weapon of resistance seemed at hand; the parochial clergy, yielding to the difficulties which an isolated rural life throws in the way of intellectual effort (far graver then than even now), had almost everywhere sunk into sloth and incapacity ; the monastic orders were content, in the better instances, with maintaining their own internal discipline, and had no surplus energy for external work, while in the worse examples (as in that of the Cistercians, just referred to) they served rather as beacons of warning than as patterns for imitation ; and, in~~

~~*short, there was an ever-increasing mass of home mission work to be done, and no one to do it.*~~

~~*But the two men who were to do it were already at hand in the persons of Francis Bernardone of Assisi and Dominic Guzman of Osma. The ruling idea in the mind of the former was the elevation of poverty to the first place amongst Christian graces, as the most obvious way of conforming the life of a Christian to that of the founder of his faith; the more intellectual Spaniard dreamed of an aggressive body of skilfully-trained preachers, able at once to grapple with the subtle dialectic of the enemies of the established creed, and to appeal in clear and homely language to the uneducated, amongst whom the Albigenses and other sectaries were making considerable conquests. Francis, the poet and devotee, in renouncing even the scantiest provision which the strictest orders of his time secured for their members, and bidding his followers to live on alms daily begged, taking, in the most literal sense,*~~

~~*1 There is a very curious letter from Arnulf, bishop of Lisieux, to Pope Alexander ITI. (1159-1181), asking him to dissolve the Benedictine abbey of Grestain in that diocese, and to draft its inmates into other houses, which illustrates both the kind of abuses which were sometimes found and the desire of the authorities to suppress them. He charges the monks with lack of charity and hospitality, in that they reserved even the broken scraps from the common table as perquisites for their private friends ; that they habitually quarrelled, and wounded one another with their knives, being prevented from homicide only by the knife-blades having no point; that one monk had actually murdered the cook, who had complained of his visits to the cook's wife; that the abbot did not provide for the daily wants of the community, but allowed the monks to roam abroad, picking up food for themselves as best they might ; that some of them had caused the death of a sick woman by plunging her into ice-cold water under pretext of working a miraculous cure ; that the abbot was frequently absent on pretence of business but really living a loose life; that he had been thus two years in England, till recalled by the bishop, who was forced to send him away again, after appointing a deputy ; that this deputy, when drunk, had wounded two of the monks, who thereupon murdered him ; so that the house was practically past reformation, and ought to be dissolved.*~~

~~*no thought for the morrow, appealed to the popular imagination, always ready to kindle at the sight of genuine self-sacrifice ; Dominic, with not less insight as a thinker whose first care was for doctrinal orthodoxy, as that of Francis was for personal piety, saw that there was a demand ready to spring up for more exact and intelligent religious teaching than could then be had, save in a few great cities. The occasion which urged him to the task he undertook is noteworthy. He had long been a canon of Osma, the strictest and sternest member of an ascetic community, when in 1203 he had to go on a journey with his bishop, which brought them into the very midst of the Albigenses in the county of Toulouse, where they saw how powerless the clergy were to contend against their rivals. On their road home the bishop and Dominic met the three papal legates returning discomfited from Languedoc, but attended with as much pomp as a triumphal progress would have justified. Dominic rebuked them sternly, tell- ing them that it was not by splendid retinues and costly garb that the heretics won their converts, but by zealous preaching, by humility, by austerity, and by at least seeming holiness. Both the new founders sought and obtained at Rome, after some difficulty, the approval of their new institutes, and that in the very year 1215 which had seen the formal prohibition of all fresh orders. Francis speedily returned to his home, but Dominic, whose idea had by this time expanded from that of converting merely the Albigenses of Provence and Languedoc to that of influencing the whole world of nominal Christians and outer heathen, settled himself in Rome, where the pope appointed him to the important office of Master of the Sacred Palace, which has ever since been held by a Dominican, and carries with it the authority of chief censorship of the press. The two new foundations borrowed from each other, Francis copying Dominic's scheme of itinerant preachers, and Dominic imposing on his disciples the mendicant poverty of Assisi. These two particulars, the total absence—at any rate at first—of such endowments as had proved a snare to the older societies, and the substitution of itinerancy for inclosure, are the features which distinguish the friars from the monks who preceded them. The Franciscan institute was a bold attempt to democratize the church; Dominic's Friar Preachers, though recruited freely from men of a humble grade, have always had somewhat more of an aristocratic tone about them, due to their intellectual calling ; they have held a high place in*~~

~~*Christian art, counting amongst them such names as Fra Angelico and Baccio della Porta ; and their reputation for orthodoxy and for a purer type of moral theology than the Jesuit one has always stood high. They also count amongst their members the two most eminent divines of the Middle Ages, Albertus Magnus and Thomas Aquinas, and they have been fruitful in producing zealous missionaries ; but the one great blot on their career is that they have been the directors and officials of the Inquisition ever since the formal constitu- tion of that tribunal as a permanent organization. The Franciscans, less distinguished for mental triumphs than their competitors, have yet some famous names, chief of which are Duns Scotus and Roger Bacon—for Bonaven- tura, though set by the Franciscans as the '"Seraphic Doctor" in competition with Aquinas, the " Angelic Doctor" of the Doniinicans, is scarcely entitled to very high intellectual rank—and at one time they seemed likely to establish as firm a hold on the university of Oxford as the Dominicans did on that of Paris. The swiftest success and popularity attended the two new orders; privileges and exemptions were showered on them from Rome ; wealth, in despite of their vow of mendicancy, was emulously thrust upon them by the laity ; and, above all,*~~

~~*MONACHISM*~~

~~*a remarkable and widespread religious revival, a dead-lift to ministerial efficiency in every direction, repaid their early labours, while they had between them almost a monopoly of the popedom for nearly two hundred years. And one peculiarity of their organization gave them a degree of strength which no other orders possessed. Each monastery of the older societies was practically isolated and independent of all others, unless it were itself a dependent priory or cell belonging to a greater house. Some societies had, it is true, general chapters, but these were rare, and at best only effectual in establishing a certain uniformity of practice in all houses of the same rule. But the Friars, like the Templars and Hospitallers of an earlier day, and like the Jesuits of a later one, were enrolled in something of military fashion, under a superior- general, with wide powers, who directed and controlled their actions from one central point. Every group of neighbouring friaries was formed into a congregation, under a local head or provincial, and he was always in direct communication with the general, so that a common government united the whole body into a compact mass.*~~

~~*But their very success was fatal to their character. The vow of poverty was the first part of their institute to break down. Even before they began to be counted amongst the richest orders of Christendom, there is indisputable evidence—that of Bonaventura, himself general of the Franciscans—that the mendicant system was working nothing but mischief. He tells us, writing while the order was still very young, and within fifty years of the founder's death, that it was even more en- tangled in money cares and business concerns than the endowed communities, precisely because there were no funds available to fall back on in emergencies; that the brethren, discouraged from work by mendicancy, were habitually idle; that they roamed about in disorderly fashion under pretext of questing; that they were such brazen and shameless beggars as to make a Franciscan as much dreaded by travellers as a highwayman; that they made undesirable acquaintances, thus giving rise to evil reports and scandal; that conventual offices had to be en- trusted to untried, unspiritual, and incompetent brethren ; that vast sums were lavished on costly buildings; and that the friars were greedy in the pursuit of burial fees and of legacies, so that they encroached upon the rights of the parochial clergy. If such were the mischiefs at work before the first zeal had begun to cool, it may readily be gathered how entire was the failure at a later time. Indeed, as regards the Franciscans, not only did they endeavour to evade the stringency of their institute even in their founder's lifetime, but the whole society was soon divided into two hostile camps, one of which desired to adhere closely to the original rule, while the other was content to fall in with the habits of the "possessioners," as they had been wont contemptuously to name the endowed orders. And what is very curious in this connexion is that the friars who were loyal to the principle of poverty broke away for the most part from the church, forming new sects, such as the Fratricelli, or attaching themselves to elder ones, like the Beghards and the Apostolici, which handed on in secret the Gnostic traditions of the third century, apparently stamped out in the crusade against the Albigenses, while those who openly disregarded the will of their founder remained steadfastly in the Latin church. No order, except the Benedictines, has had so many branches and reforms as the Franciscans ; amongst which it will suffice to name the Capuchins, the Minims, the Observants, and the Recollects; while the Poor Clares, the nuns of the institute, have also divided into Clarissines and*~~

~~Urbanists. The institution of Tertiaries, seculars affiliated to the order as honorary members, while~~

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~~continuing to live in the world, and adopting a certain modified daily rule, was a powerful factor in the success and strength of the order, and was adopted, but with less conspicuous results, by the Dominicans, The rivalry of these two great bodies with each other, prolonged with much bitterness for centuries, and their disputes with the parochial clergy, whom they long displaced in general repute and influence, belong rather to general church history than to the annals of monachism, and may be passed by with this brief allusion ; while it suffices to say that all the support they, and the other less important communities of the same kind, such as the Carmelite and Austin Friars, received from the popes, whose most effective allies they were in every country where their houses were found, was not able to avert their decline in general estimation; and there is no figure in later medizval literature on which the vials of contempt and indignation are so freely poured as on: the begging friar, and that, it must be said, deservedly.~~

~~As the 13th century is the apogee of later monachism, Decline so the decline begins steadily at the very outset of the of mona-~~

~~14th (which is also the date of ordination becoming the normal custom for choir-monks, instead of the exception, as formerly), continuing down to the crash of the Reforma- tion! The great schism of the West, the rise of the Wickliffites and Lollards in England, and of the body later known as Hussites in Bohemia, could not fail to act injuriously on the monastic orders; and, though the creation of fresh ones continued, none of those founded during this era were influential, and few durable. It will suffice to name some of the more prominent :—the Olivetans in 1313, who were rigid Benedictines; the nuns of Bridget of Sweden in 1363, who followed a rule compiled from those of Basil and Augustine; the Hieronymite monks in 1374; the Brethren of the Common Life, founded by Gerard Groot in 1376, who did much for education and in home mission work, but are chiefly famous now in virtue of one member of their society, Thomas a Kempis; the Hieronymite Hermits in 1373-1377 ; the Minims in 1435; the Barnabites, a preaching and edu- cational order, in 1484; the Theatins (a body of Clerks~~

~~*Regular who aimed at little more than raising the tone of clerical life, made but slight pretension to austerity, and are, indeed, mainly noticeable as having suggested to Igna- tius Loyola several points which he adopted in regulating the mode of life to be pursued by the members of his institute) in 1524; and the Capuchins in 1525.*~~

~~*In the Reformation era itself the monastic bodies had sunk so low in the estimation of even the rulers of the church that one clause in the report of the committee of cardinals appointed by Pope Paul III. (a body composed of Sadolet, Contarini, Reginald Pole, Giberti, Fregoso, Badia, Aleandro, and Caraffa, afterwards Paul IV.), delivered in 1538, was worded as follows :—*~~

~~*'* Another abuse which needs correction is in the religious orders, beeause they have deteriorated to such an extent that they are a grave scandal to seculars, and do the greatest harm by their example. We are of opinion that they should be all abolished,*~~

~~*not so as toinjure [the vested interests of] any one, but by forbidding them to receive novices ; for in this wise they can be quickly done*~~

~~*1 The language of Nicolas de Clamenges (1360-1440)—reetor of the university of Paris, known as the " Doctor Theologus "—in his treatise De Corrupto Ecclesie Statu, paints the moral decay of the monastic bodies, and especially of the Mendicants, in the very darkest colours. He not only charges them with waste, idleness, gluttony, drunkenness, and profligacy, but alleges the condition of convents of nuns to be such that there was little practical difference between allowing a girl to take the veil and openly consigning her to a life of public vice. And the Revelations of Bridget of Sweden (1802-1878), approved by the coun- cils of Constance and Basel, and by Popes Urban VI., Martin V., and Paul V., fully confirm the darkest features of this testimony as regards the religious houses of the 14th century.*~~

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~~*away with without wrong to any oue, and good religious can be put in their place. At present we think the best thing to be done is to disiniss all the*~~

~~*unprofessed youths from their monasteries."*~~

~~*As this formal document showed the current of high ecclesiastical opinion, so the lay view took expression in the Epistole Obscurorum Virorum of Ulrich von Hutten, which was to the Dominicans of the 16th century almost what the Provinciales of Pascal were to the Jesuits of the 17th; while they came also under the more delicate scalpel of Erasmus's wit. Not that the objections were wholly new, for it is evident from Thomas Aquinas's defence of monachism against its detractors that they were nearly all used in the 13th century. The interests involved were, however, too vast and complicated, the supposed impolicy of an admission on so large a scale of the charges alleged against monachism by the men of the New Learning too serious, to allow of any such sweeping measure of reform as that proposed by the cardinals being carried out. A certain amount of discouragement shown towards the older societies; the enactment of some partial corrections by the council of Trent, not touching any principle whatever, but apparently saying something because public feeling looked for something to be said ; and, above all, the crea- tion of a new type of order, the famous Company of the Jusurrs (1534), represent the total action taken by the Roman Church during the actual crisis of the Refor- mation. Apart from such direct revolts from the Latin obedience as those in Bern, Zurich, Denmark, and Sweden, which at once involved the monasteries in the general overthrow of the old system of things religious, the most remarkable proceedings in the reaction against monachism were those taken in England, at a time when no breach with the Roman Curia was thought of. So far back as the 13th century Kings John and Edward I, and yet again in 1837 Edward IIL, had confiscated the 'alien priories," as those houses were called which were depend- encies of foreign monasteries, and the last named let out their lands and tenements until the peace with France in 1361, when he restored their estates; and similar raids were made on them both in his reign and in that of Richard IT. Henry IV. showed them more favour; but in 1410 the House of Commons proposed the confiscation of all the temporalities held by bishops, abbots, and priors, petition- ing the crown to employ their revenues in paying a standing army of knights and soldiers, in augmenting the incomes of some of the nobles and gentry, in endowing a hundred hospitals, and in making small yearly payments to the secular clergy. This fact attests the unpopularity of the church and the*~~

~~*religious orders at the time, and, though the large scheme was dropped, yet in 1416 parlia- ment dissolved all the alien priories, and vested their estates in the crown. They were for the most part applied to ecclesiastical purposes; but some portion, at any rate, passed into private hands, and was permanently alienated. Hence there was nothing to create surprise, much less opposition, when Cardinal Wolsey in 1523 obtained bulls from the pope authorizing the suppression of forty small monasteries and the application of their revenues to educational foundations, on the plea that these lesser houses were quite useless, and not homes of either religion or learning, whereas a learned clergy was imperatively needed to combat the new religious opinions which were making rapid way. And that the monasteries had been subject to serious vicissitudes all along appears from the fact that only about one half of all the founda- tions known to have been made in England were in existence at the date of the dissolution. There is little reason to trust the charges of immorality brought against the monks when Henry VIII. had once resolved on the pillage of the monasteries, seeing how the path opened*~~

~~*by Wolsey could be followed up. The characters of the king himself, of Cromwell, his chief agent in the disso- lution, and of Layton, Legh, and others of the visitors appointed to inquire into the condition of the houses, are such as to deprive their statements of all credit; and, besides, the earlier Act of dissolution, granting the smaller monasteries to the king, limits the charges of misconduct to them, expressly acquitting the larger houses. Never- theless, when the appetite for plunder had increased with the first taste of booty, accusations of precisely the same sort were brought up against the great monasteries, though in no instance has any verifiable proof been pre- served.! But there can be no reasonable doubt (especially in view of the visitations of Archbishop Warham and other pre-Reformation prelates), that the religious houses, viewed simply as corporate estates, had been very badly managed for a considerable time, were heavily encumbered, and a weight round the neck of financial progress in England ; and that, as spiritual agencies, they had mainly outlived their usefulness, so that, lamentable as were the circum- stances of their destruction, and scandalous as was the waste of the property seized, there is little reason to*~~

~~*sup- pose that any practical benefit would have flowed from their continuance, whatever might have been the advantages of an honest and economical measure of reform, or even of transfer to other purposes on the principle of cy prés.? The negative evidence of the effeteness of the older orders supplied by their very small share in the counter- Reformation, which lay virtually in the hands of the Jesuits alone, is reinforced by the reports made by the emissaries of the new company to their superiors, which attest that the accusations of the German reformers against both the secular and regular clergy on the score of ignor- ance and dissoluteness were only too well founded.*~~

~~*Accordingly several new societies were instituted during Later the latter half of the 16th century, aiming at putting new Societies.*~~

~~*wine into the old bottles of the Carmelites, Cistercians, Augustinians, Dominicans, and Benedictines ; but none of them proved of much importance. A larger measure of success attended some established on an active basis, such as the Fathers of Christian Doctrine, a catechizing order erected by Pius V. in 1571; two communities for tending the sick, one founded in Italy by Camillo de' Lelli in 1584, the other, the Brothers of Charity, by John of God at Granada in 1538, but not formally sanctioned till 1572; and still more prosperity attended the Ursuline Nuns, a community chiefly devoted to the education of young girls, founded at Brescia by Angela de' Merici in 1537, and confirmed by Paul III. in 1544. Yet, with the single exception of the Jesuits, no new society could be said to have laid hold in any degree of the popular mind, nor were the attempts to revivify the elder bodies continued. It remained for two newer still to rehabilitate the waning respect for monachism of all kinds, and that by borrowing one chief feature of the Jesuit organization, the abandon- ment of that principle of isolation from the outer world which lies at the root of true monachism.? Of these the*~~

~~*Te EEE 1 A full examination of the case against the monasteries will be ae in Dixon, History of the Church of England, vol. i. pp. 324-*~~

~~*3.*~~

~~2 The number of houses suppressed and overthrown by the two Acts of 1536 and 1538 was as follows :—186 Benedictine houses, 173 Augus- tinians, 101 Cistercians, 33 Dominican, Franciscan, Carmelite, and Austin friaries, 32 Premonstratensians, 28 Knights Hospitallers, 25 Gilbertines, 20 Cluniacs, 9 Carthusians, 3 Fontevraud, 3 Minoresses, 2 Bonhommes, 1 Brigittine ; total, 616. Their aggregate revenues were valued at £142,914, 12s, 9d. annually.~~

~~3 Soon after the Jesuits rose into note and popularity, a very curious and little known extension of their institute was made in Flanders. Two English ladies, acting with the sympathy and counsel if not at the recommendation of F. Gerard, rector of the Jesuit college at Liége, founded a community which they named Jesuitesses, adopting~~

~~first was the Oratory, founded by Philip Neri in 1558, but not approved by authority till 1577, and copied inde- pendently by Cardinal de Berulle at Paris in 1611. There were no vows imposed on the members of this society, though they lived under rule, and they employed them- selves in doing all kinds of clerical work under episcopal supervision. The Italian house is chiefly celebrated as having included the famous Cardinal Baronius amongst its earliest recruits ; but the French one held a high place in the religious revival of the 17th century, well-nigh rivalling the Benedictines of St Maur in learning (with such representatives as Simon, Thomassin, Morin, and Malebranche), and the reformed Cistercians of Port-Royal in piety, though sharing with the latter the reproach of Jansenism. But the second was far more influential, and has been fruitful ever since in the works of its copyists as well as in its own. It was the institute of the Sisters of Charity, established by Vincent de Paul in 1634, on the lines of the ancient community of the Hospitaller Nuns of St Augustine, but with some remarkable modi- fications, not only in respect of the vows, which were only yearly and inward, but in the spirit of their discipline, as formulated in his own memorable words,—" Your convent must be the houses of the sick ; your cell, the chamber of suffering ; your chapel, the parish church; your cloister, the streets of the city, or the wards of the hospital; your rule, the general vow of obedience; your grille, the fear of God; your veil to shut out~~

~~*the world, holy modesty." The original scheme of Francis de Sales for the Nuns of the Visitation, founded in 1610, was almost identical ; but the opposition was then far too strong, and he was forced to make them a cloistered community. Vincent's order of Mission Priests, more commonly known as Lazar- ists, was also a successful and useful institute, though not vying in the extent of its influence with the other,*~~

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~~*the convents—of whose real character we get at least one trustworthy glimpse in the account of the abbey of Mau- buisson which Angélique Arnauld reformed—came home to all the Huguenots and their friends, because both before and after the legal continuance of the edict of Nantes they were used (according to a very early application of monastic houses not yet obsolete) as prisons, where Huguenot women and girls were shut up in order to bring about their conver- sion, forcibly if necessary, but somehow in any case. And there is evidence to show that the Huguenots resented this policy most bitterly, not only on polemical grounds, but be- cause they were firmly persuaded that the morals of their wives, daughters, and sisters were in no less peril than their faith in such places. When to this sentiment is added the hostility of the Jansenists to the school of opinion which had persecuted them, razed their famous house of Port- Royal, and literally flung the bones of its deceased members to the dogs, it will be easy to judge how powerful were the forces mustering for the overthrow of monachism, and how little even such stern reforms as De Rancé's at La Trappe, which has always had a marked attraction for soldiers, could do towards abating the danger. Nor were there wanting public scandals and cases before the law- courts which helped to fan the rising flames of hatred. Another cause which contributed much to the decay of discipline and of practical religion in monasteries of both sexes was the custom which prevailed throughout the 16th, 17th, and 18th centuries, of disposing of the younger members of poor but noble families in the cloister as a safe and reputable provision, without any regard to the vocation of those so dedicated, and merely because the sum which sufficed to secure permanent admission was much smaller than that necessary to purchase a commis- sion or public office for a son, or to provide an adequate dowry for a daughter.?*~~

~~At the Revolution, the religious Suppres- houses, amounting (without reckoning various minor colleges sion of and dependent establishments) to 820 abbeys of men and Soe, 255 of women, with aggregate revenues of 95,000,000 livres, monas-~~

~~were suppressed by the laws of 13th February 1790 and teries.~~

~~which, as has been implied, has powerfully affected the organization of many of the active communities which have since been formed. No religious body did more to enable French monachism to bear up against the general~~

~~obloquy it encountered during the 16th, 17th, and early 18th centuries,—a temper on the part of the public due to more than one cause. In the first place, the wars of religion had done much to harden and coarsen the feelings on both sides, and rigid adherence to the extreme positions of Catholics or Huguenots, as the case might be, was set far above any gentler and higher ideas. Next, the monas- teries of both sexes had all but universally fallen into the patronage of the crown (in virtue of the concordat of Bologna, between Pope Leo X. and Francis I.), and were jobbed away as apanages for a dissolute nobility, who squandered the revenues, and suffered discipline to become relaxed, often to the generation of serious scandals. This malversation operated in two ways. It made the monas- teries hard and bad landlords, grasping closely all the feudal privileges and monopolies which they continued to enjoy, a proceeding which bore hard on the tenants and labourers, so that the monks shared to the full the unpopu- larity of the nobles (precisely as was the case in Germany, during the Peasants' War of 1525); and the evil repute of~~

~~the rule and organization of the famous company, and taking the three usual vows, but, with a bold disregard of precedent, not only omitting the customary vow of inclosure, but actually sending the members of the society out as itinerant preachers. Their object was to train a body of emissaries for the Roman Catholic mission in England, who might obtain entrance and escape the incidence of the penal laws in a manner impracticable for men. They had considerable success for a time, and Mrs Ward, their projector, obtained some degree of papal approval, and became " mother-general"' over more than 200 of these female preachers in the various colleges of the~~

~~*society. But after an existence of about eighty years it was suppressed by Pope Urban VIII. in 1680.*~~

~~*18th August 1792. In Germany the storm had broken somewhat earlier, if not quite so violently. The Thirty Years' War had wrought much mischief to not a few of the religious houses, without taking into account the great number which had been destroyed in the territories of the Protestant princes ; and when the death of Maria Theresa in 1780 left her son Joseph II. free to act as he pleased, he dissolved the Mendicant orders, and suppressed, in despite of the personal remonstrances of Pius VI., the greater number of monasteries and convents in his dominions. In Italy, despite the multiplication of new institutes, the process of decay continued throughout the 17th century, and one most remarkable testimony to the fact appears in the report of the Venetian ambassadors at Rome in 1650 to their government of an interview they had with Pope Alexander VII.*~~

~~*1 One of these is interesting, as settling a point which has been often disputed,—the existence of those monastic dungeons known by the name of "in-pace," familiar to the readers of Marmion. It is the condemnation of the abbot of Clairvaux by the parlement of Paris in 1763 to a fine of 40,000 crowns for causing the death of a prisoner in an "in-pace."*~~

~~*2 This worked much evil in France, but produced perhaps even greater mischief in Germany, where what were styled "Noble Abbeys" were not uncommon, entrance to which, save in the inferior capacity of lay-members, was barred against all who could not prove patrician descent and a certain number of armorial quarterings. A relic of this survives in a few secular Stiftungen (Protestant and Catholic) for noble canonesses in Germany; and the notion was at any rate as respectable as that which holds good in some communities even now, where women who can pay a certain sum at entrance are admitted as choir-sisters, while those who cannot do so must accept the humbler position of lay- sisters.*~~

~~*XVI.—go*~~

~~*"The Pontiff. . . began by saying that for some time past the Apostolic See, considering not the abundance only, but the super- fluity of religious institutes, had become convinced that some of them, degenerating from the first design of their founders, had lapsed into a total relaxation of discipline, and that it was just as advisable for the church as for the laity to adopt the expedients used by wise husbandmen when they see that the multitude of branches has impoverished their vines instead of making them more fruitful. That a beginning had been made in that matter by sup- pressing some orders; but this was not enough. ... A great number of very small convents had been suppressed, . . . and it was proposed to continue the work by proceeding to the final abolition of certain others which, by their licentious mode of life, fJled the world with scandal and murmurs. . . . That he proceeded slowly, because he desired, in a matter of so much importance, to obtain the good-will of the secular princes. . " The remarks closed with a recommendation to the republic of Venice to suppress the canons of San Spirito and the Cruciferi in their city, and to apply their revenues towards defraying the cost of the war in Candia. (Ranke, Die Rom. Pdpste, App. No. 129.)*~~

~~*But the policy thus indicated was not carried out by Alexander VII.'s successors, and there is evidence that things did not mend as time went on. The emperor Francis L., in his character of grand-duke of Tuscany, caused an edict to be published at Florence in 1751, forbidding the clergy to acquire property in mortmain, and issued together with it a paper of instructions pointing out the grave social disadvantages of enriching artificial families, such as convents, colleges, and the like, at the ex- pense of natural families. And the menace implied in these documents was carried into operation by the suppression of several convents of nuns, for which the reluctant con- sent of the pope (Benedict XIV.) was extorted. When Francis died in 1765, and was succeeded in Tuscany by his brother Peter Leopold, the latter began his reign with what may be styled a formal act of war against the Roman Curia, by declaring the bull Jn Cana Domini null and void in Tuscany, and forbidding its recognition or publi- cation there. At once he was beset with appeals from priests and nuns, calling his attention to several grave abuses in the church, and notably to moral scandals of the most serious kind in the convents of nuns, especially those under the direction of the Dominicans, accusations which were fortified with full*~~

~~*details of time and place. The result was that Leopold caused a scheme of ecclesiastical reform to be drawn up in 1770, containing stringent enactments for the abatement of monachism, for the suppression of all small convents of mendicants, and for the exclusion of monks and friars from the direction of nunneries, which were to be subject in all spiritual matters to the ordinaries only. And the Jansenist bishop of Pistoia and Prato, Scipio de' Ricci, upon entering on his diocese in 1780, at once began to inquire into the scandals which raged in the Dominican nunneries of his jurisdiction, especially in Pistoia,! the result being that he excommunicated the Dominican friars, and prohibited them from officiating. The pope at that time was Pius VI., an ardent devotee, warmly in favour of mona- chism generally, and of the lately suppressed Jesuits in particular, so that he took up the cause of the friars (though their evil repute had prevailed for 150 years), and issued a brief of censure against Ricci. He laid it before the grand-duke, who wrote a strong remon- strance, accompanied with proofs furnished by Ricci, and informed the pope that unless the brief were promptly withdrawn, and the convents obliged to submit to the ordinary's jurisdiction, he would himself reform at his own discretion every religious house in Tuscany. Accordingly, the brief was retracted, and Ricci was given full liberty to repress the disorders complained of. There is not any similar evidence forthcoming as to the condition*~~

~~*1 As to which documentary evidence will be found in the Appendix to De Potter's Life of Scipio de' Ricct.*~~

~~*of the monasteries in other parts of Italy; but Tuscany is likely, from local causes, to have been above, rather than below, the average moral level. Against this general tendency to monastic decay may be set the foundation of the Passionists in 1725, and of the Redemptorists or Liguorians in 1732; but these two institutes, though pious and respectable, have never exerted much influence.*~~

~~*There is little to chronicle in regard to the later annals of monachism in Spain and Portugal. Peter of Alcantara, as reformer of the Franciscans of the latter country in the middle of the 16th century, and his more famous contemporary, Teresa, as reformer of the Carmelites in Spain, are eminent*~~

~~*figures in the annals of their time; but they cannot be said to have produced any permanent effect on the fortunes and tone of their several institutes, far less upon the common life in general. The stamping out of all varieties of opinion, at any rate in respect of outward expression, by the Inquisition in the Peninsula makes the evidence scanty and vague; but the fact that Portugal took the lead in 1759 in striking at the Jesuits, then the most eminent and powerful of the orders, though far surpassed in mere wealth and numbers throughout Western Europe by the Franciscans, and that its policy in this respect was quickly followed by Spain, attests the growth of a hostile feeling by no means likely to have been limited to the great company. In fact, if popular rhymes and proverbs may be trusted, the charges current against the religious orders in Spain do not seem to have differed from those alleged elsewhere, whatever may have been the amount of truth in them. And the testimony of Blanco White, always to be trusted on matters within his experience, is decidedly adverse.*~~

~~*The terrible crash of the French Revolution, which affected, directly or indirectly, every country in Europe, was not least influential in its incidence on monachism. On the one hand, the actual destruction which it brought upon the religious houses of France was adopted as part of the revolutionary programme in all countries where such institutions were still intact ; and, on the other, there was a considerable measure of improvement brought about in not a few places by the fear of public opinion, while the uew institutes which continued to spring up were all but invariably active, both founders and the sanctioning authorities recognizing that any society seeking to make its footing good must needs first prove its capacity for practical usefulness. In France itself the laws which abolished all religious communities were relaxed by con- nivance in favour of the Sisters of Charity even under the Terror and the Directory ; while in 1801 a decree of the Consular Government, issued by the Minister of the Interior, authorized Citizeness Duleau, former superior of that society, to revive it by taking young women to train for hospital work ; and various other active communities were restored by Napoleon in 1807. Further revivals took place at the Restoration, the most celebrated of which was the Dominican, owing to the talents and elo- quence of Lacordaire and the group he gathered round him; but Benedictines, Carthusians, Trappists, and other societies of the older type were not slow to avail them- selves of the*~~

~~*opportunity to return and to found anew, amidst a poverty which recalls the original institution, their abbeys and priories. But they met with little favour under the Orleanist monarchy, and the Second Empire was their time of most security and progress. Since its fall, they have again been actively discouraged by a strong party in the Republic, and their position remains pre- carious, France has been, further, the chief seat of the many new societies founded for some especial department of charitable work, the most characteristic example of which is perhaps that of the Little Sisters of the Poor,*~~

~~*ie Orin' AOC HAs WT*~~

~~*who house and tend aged invalids. As a broad general rule, nearly every post-Reformation institute is styled, not an "Order," but a "Congregation"; but the only dis- tinction which can be drawn between these two names is that "order" is the wider, and may include several congregations within itself (as the Benedictine order, for example, includes the congregations of Cluny and of St Maur), while a "congregation" is a simple unit,*~~

~~*complete in itself, and neither dependent on another .*~~

~~*institute nor possessed of dependent varieties of its own. Another distinction drawn between the elder and younger societies is that the former are said to make 'solemn vows," the latter only "simple vows." The difference here is not in the matter of the vows, which are usually the same in all cases, nor even in the ceremonies attending their utterance, which may also be alike, but in the superior binding efficacy of the solemn vows in Roman canon law, which rules that they so bind the member to his society, and the society to each member, that neither can sever the connexion, so that only the pope can dissolve it, and that in rare and exceptional cases alone. And it may be added that the term "religious" is restricted in the Latin Church to communities whose institute has been formally approved by the Roman see, and whose vows are for life, and not merely renewable,—a principle which excludes the Sisters of Charity, for example, from the use of this title. By the laws of France, and of some other countries, life-vows are invalid and even prohibited, but when they make part of the original institute, such dis- approval by the civil power is not held to reduce them to the canonical level of temporary vows.*~~

~~*Returning to the history of Western monachism, the fall of the religious houses in Spain dates from the law of 21st June 1835, which suppressed nine hundred monasteries at a blow; and the remainder had but a short respite, as they were dissolved on 11th October of the same year. In Portugal, where a bias against the Roman Curia has been a traditional part of patriotism ever since the revolution of 1640, when the pope sided with Spain against the house of Braganza, there was little feeling to protect the monasteries when it happened that the crown wanted their possessions, and they were all suppressed by the decree of 28th May 1834. No European country had so many religious houses as Portugal in proportion to its population and area, and the number of the foundations dissolved in 1834 exceeded 500. In Switzerland, a con- siderable measure of suppression followed the war of the Sonderbund in 1847; while in Italy, the last country where monachism had remained almost unmolested, an Act was passed in the Sardinian Parliament on 7th July 1866 for the suppression of monasteries within the Piedmontese dominions, and for the confiscation of their property. The measure was extended to the whole of Italy after the unification of the kingdom ; the orders were expropriated in 1873; their houses were declared national property, and were put to secular uses, no exception being made in*~~

~~*715*~~

~~*favour of San Marco at Florence, of Assisi, of Vallom- brosa, or even of Monte Cassino itself.!*~~

~~*On the other hand, several Roman Catholic societies have attained considerable success in the United States and Canada, thus in some degree recovering for the principle they represent part at least of the ground lost in Europe ; while in three religious communions outside the pale of the Latin obedience—the Evangelicals of Germany, the Reformed of France, and the Church of England—the organization of women for charitable and religious work on the lines of various old institutes has been actively carried out. The Deaconesses of Kaiserswerth, founded by Pastor Fliedner in 1836, derive part of their rule, and even of their dress, from the Dames de St Augustine, themselves lineal descendants of the first Hospitallers of the crusades, and have ramified into several countries ; the Strasburg and Miihlhausen*~~

~~*Deaconesses derive theirs partly from the Flemish Beguines and partly from some points in the Moravian organization, itself handed down from those seceding Franciscans to whom the Unitas Fratrum really owes its origin; while the various Anglican communities, of which there are several, have borrowed freely from different sources, according to the preference and knowledge of each founder. Some attempts at reviving the common life for men also have likewise been made, but none on any large scale; only one has as yet exhibited any signs of vitality, a preaching order at Cowley, near Oxford, which has obtained some footing in England, and has even been able to spread to America.*~~

~~*Bibliography.—The bibliography of Monachism is excessively copious, and it is impracticable to indicate more than a few of the most important and trustworthy books, General:—Hospinianus, De Monachis Libri Sex (Geneva, 1659), bitterly hostile, but a copious and trustworthy record of facts; Helyot, Histoire des Ordres Reli- gieux (8 vols., Paris, 1714-1721), and again (as Dictionnaire des Ordres Religieux), with continuation by Badiche (4 vols., Paris, Migne, 1860),—this book has itself a copious catalogue of works on its subject prefixed; Alteserra, Asceficén, sive Originum Ket Monasticew Libri Decem (Paris, 1674); Holstenius, Codex Regularum (3 vols., Rome, 1661); Montalembert, Moines d' Occident (7 vols., Paris, 1860-1877) ; Dugdale, Monasticon Anglicanum (edited by Caley, Ellis, and Bandinel, 8 vols., London, 1846) ; Rosweyde, Vite Patrum (Lyons, 1617). Special :—Benedictines—Mabillon, Acta SS. Ordi- nis S. Benedicti (9 vols., Venice, 1783) ; Cluniacs—Marrier, Bzblio- theca Cluniacensis (Paris, 1614) ; Cistercians—Gaillardin, Les Trap- pistes (Paris, 1844); Besoigne, Histoire de [Abbaye de Port-Royal (8 vols., Cologne, 1752-56); Dominicans—Touron, Histoire des Hommes Illustres de V Ordre de Saint Dominique (6 vols., Paris, 1743-49); Franciscans—Sedulius, Historia Seraphica (Antwerp, 1613) ; Wadding, Annales Minorum (20 vols., Rome, ene*~~

~~*(BR. F. L.)*~~

~~*1 The total number of monasteries, &c., suppressed in Italy down to the close of 1882 was 2255, involving an enormous displacement of property and dispersion of inmates. And yet there is some reason to think that the*~~

~~*state did but do roughly and harshly what the church should have done more gradually and wisely ; for the judgment passed on the dissolution by Pius IX. himself, in speaking to an English Roman Catholic bishop, was: "It was the devil's work; but the good God will turn it into a blessing, since their destruction was the only reform possible to them." (Cited by Rev. R. R. Suffield in Modern Review, vol. ii. p. 359, April 1881.)*~~

~~*CHRONOLOGICAL TABLE oF Monastic FOUNDATIONS.*~~

~~*Tus religious communities which have been formed at various times in the Western Church amount to many hundreds, and receive fresh accessions almost yearly, while some among them have been suppressed, absorbed, or suffered to die out. No official list of those actually in existence and recognized by authority is published ; it is thus impracticable to enumerate them accurately, especially as many of them are only local varieties or branches of identical rules and institutes, and there are not a few cases where a once celebrated and powerful*~~

~~*order has practically disappeared from view, though, as still lingering in one or two houses, not definitely extinct.*~~

~~*The following table,*~~

~~*however, gives the more remarkable foundations in chronological order, some of the earlier dates being only approximate, and even a few later ones uncertain, for the historians often vary as to the exact year, sometimes giving that of the first attempt at organization, and*~~

~~*sometimes that of the final approval by authority.*~~

~~*Date. Name. Founder. Place. Date. Name. Founder. Place. 250 | Monks of the Thebaid ….| Paulthe Hermit ….| Upper Egypt. 395 | Austin Canons (original) ..| Augustine …….. Hippo Regius, BUG) [Miva] oenjviMssic Googodmyasasar IPACHOMINS eer. -= «1-1.*~~

~~*Basil the Great*~~

~~*Basilian Monks*~~

~~*363*~~

~~*Nile. Mataza, Pontus. |*~~

~~*Monks*~~

~~*716*~~

~~*Date.*~~

~~*420. 529*~~

~~*540-570 | Welsh Monks*~~

~~*MONACHISM*~~

~~*- Name.*~~

~~*Monks of Lerins*~~

~~*Benedictines, or*~~

~~*Monks*~~

~~*Founder.*~~

~~*Honoratus of Arles .. Benedict of Nursia*~~

~~*Dubric, Iltut, David*~~

~~*..| Monte Cassino,*~~

~~*Place.*~~

~~*I.*~~

~~*of Lerins, France.*~~

~~*Italy. Wales. Iona, Scotland.*~~

~~*563 Monks of Iona …….. + - (Gules; Saponnacoose*~~

~~*590 | Monks of Luxeuil …..... Columbanus!) ©... Anegray, France.*~~

~~*641 | Nuns (later Canonesses) of | Ituberga, wife of Pip- Nivelles, Flan-*~~

~~*Nivelles pin of Landen ders. |*~~

~~*760 | Canons Regular …….. Chrodegang…….. Metz. :*~~

~~*910 | Benedictines of Cluny ….} Berno ……. Cluny, France.*~~

~~*1012 | Order of Camaldoli…..... Romuald (62. . + + Camaldoli, Italy.*~~

~~*1039 | Order of Vallombrosa…... John Gualbert …... Vallombrosa, Tuscany.*~~

~~*1061(?)} Austin or Black Canons F Avignon (7).*~~

~~*1074 | Order of Grammont …... Stephene ge.) s esis cer Mount Moret, | Limoges.*~~

~~*1084 | Carthusians ……- TSA YD Wrencos GOnsoone Near Grenoble. |*~~
~~*1095 | Order of St Anthony of| Gaston ……. Vienne, Dau- | Vienne phiné.*~~

~~*TOSS | Ciscercianss. <6 cece cscesse Robert …... Bia tazs Molesme, Bur-*~~

~~gunay. | 1100(2)| Cruciferi (suppressed, 1656) | (2) ..... sees cere ees Jerusalem (7). | 1100 | Order of Fontevraud …... Robert d'Arbrissel…. ibs Poi- iers. 1104 | Knights Hospitallers of St | Gerard (Raymond du | Jerusalem. John Puy, first Grand Master) 1118 ae (suppressed inj Hugh de Payens ….| Jerusalem.~~

~~1813~~

~~1119(?)| Knights of St Lazarus ….| (2%) ..... hood d …..| Jerusalem. : 1120 | Canons Regular of Pré| Norbert …….- Prémontré, Pi- | | montré cardy. 1140 | Trappists …... Drtentereeeinrs Rotrou II., count of; La Trappe, Perche France. 1148 | Gilbertines….. ago Do ooBECE Gilbert of Sempring- | Sempringham, ham Lincolnshire. 1156 | Kniglits of Aleantara…... Snero, and Gomez, de | St Julian, Ciudad Barrientos Rodrigo. 1156 | Hermits of St William, or | William de Malaval ..| Pescara, Italy. White-Mantles 1158 | Knights of Calatrava….. .| Sancho IfI., of Castile] Calatrava, Spain. 1162 | KnightsofSt Bennetof Aviz| Alfonso I., of Portugal, Evora, Portugal. 1170 | Knights of Santiago of the | Ferdinand II., of Leon| Compostella, Sword Galicia. 1173 | Beguines …….| Bega, or Lambert le | Liége. Bégue 1191 | Teutonic Knights ……..| Heinrich Walpot ….| Acre, Syria. 1196(7)| Humiliati(suppressed, 1570)) (7) ..... ⁺.1-e seen eee Milan. 1197 | Trinitarians ……|John de Matha and | Meaux, Paris. Felix de Valois … 1198 | Knights Hospitallers ofthe] Guy of Montpellier ..| Montpellier, Holy Spirit France. 1200(2)| Penitents of St Mary Mag- |] (2) ....esssseseeeeaeee Gerniany. dalene 1208 | Franciscans ……| Francis Bernardone ..| Assisi. 209° Wi@armelitesi.. ..1jm6 2c = Albert, titular patri- | Mount Carmel, arch of Jerusalem Palestine. 1212 | Nuns of St Clare , Francis and Clara ….| Assisi, Italy. 1212 | Order of Val- des-Ecoliers ..| William of Paris ….| Chaumont, France. 1214 | Canons Regular of the Holy | Theodore de Celles ..| Clair-Lieu, Bel- Cross giun. 1214(?)| Hermits of St Augustine ..| Giovanni Bono …... Cesena, Italy. 1215 | Dominicans ……| Dominic Guzman ….| Bologna. 1215 | Hermits of St Paul……..| Eusebius, archbp. of | Buda-Pesth. Strigonia 1218 | Order of St Mary of Mercy, | Jayme I., of Aragon..} Barcelona. or Mercedarians 1221 | Francisean Tertiaries……| Francis……..00. Assisi. 1223 | (Servitesis.c. 6s niodoDe …| Buonfiglio Monaldi ..| Florence. 1231 | Sylvestrines ……| Sylvester de' Gozzolini | Osimo, Italy. 1241 | Canons~~

~~Regular of St Mark| Alberto Spinola…… Mantua, 1251 aren Brothers of Peni | Innocent IV. …….. Marseilles. ence 1271 | Cclestines …….| Pietro Morone (Pope | Sulmona, Italy. Celestine V.) 1290 | Grey Sisters (Hospitallers) | (2) …….0..00000005 Franceand Flan- ders. 1296 | Hospitallers of the Charity | Guy de Joinville ….) Paris. of our Lady US13:) | OLUVGRANS W210). /5.6..0.01616 0/0106 steele Tolomei of | Siena (?), Italy. iena 1350(?)| Cellites, or Alexian Brothers] (7) ……..00.0008 Aix-la-Chapelle(?) 1855 | Jesuates.……. Giovanni Colombini ..| Siena. 1363 | Brigittine Nuns, or Order | Bridget of Sweden.…| Wadstena, of St Saviour Sweden. 1st one yee Rauanie ater eye Bridget of Sweden… .! (2). 68(7 servants, or Franciscans | Paoletto de Foligno ..| Bruli of the Strict Observance “ poeneeey 1373 | Hieronymite Monks …… Pedro Ferrando Pecha | Villaescuda, : de Guadalajara Castile. 1378-77 | Ifermits of St Jerome | Pietro Gambacorti or } Pisa. Gambacurta 1376 | Brothers of Common Life..} Gerard Groot …….. Deventer, A Holland. 1380 | Fesulan Mendicants of St} Carlo de Montegraneli | Fiesole, Italy. Jerome (suppressed, 1668) 1390(7)} Hieronymite Nuns.…….. Maria Garcias.……. Toledo. 1395 | Congregation ofthe Lateran | Bartolommeo Colonna | Rome. 1408 | Congregation of St Justina, | Ludovico Barbo.…… Padua. or Reform of Monte Cassino 1408 | Canons Regular of St Stephen Cioniof Siena | Iiceto, Siena. Saviour 1426 | MBermardins) seeesic sect «is Martin Vasga …….. Near Toledo. 1429 | Order of Bursfeld, or Ger | Johann Rodius~~

~~man Benedictine Reform~~

~~Abbey of St Mat- thias, Treves.~~

~~Date.~~

~~1481~~

~~Name.~~

~~Mitigated Carmelites, or~~

~~‘s Billettes ”~~

~~1433(?)| Congregation ofSt Ambrose~~

~~*1433 1435*~~

~~*1443 1444*~~

~~*1453 1484*~~

~~*1493 1503 1524 1525*~~

~~*1531*~~

~~*1532 1533 1534 1537 1538*~~

~~*1554(?)*~~

~~*1558 1568 1571 1877 1578 1579 1584*~~

~~*1588 1588*~~

~~*1594 1595 1596 1608 1609 1610 1611 1611 1615 1617 1617*~~

~~*1618 1621*~~

~~*1624 1624 1624*~~

~~*1625 1629*~~

~~*1633 1639 1640*~~

~~*1641 1641 1643 1643 1645 1650*~~

~~*1653*~~

~~*1655 1660 1661 1663 1678 1679*~~

~~*1684 1686*~~

~~*ad Nemus Oblate Nuns Minims, or Hermits of St Francis Daughters of St Martha (Hospitallers) Augustins of the Lombard Congregation*~~

~~*Madelonettes Barnabites, or Clerks Regu- lar Filles Repenties Annonciades Theatins*~~

~~*eee eect ee eens*~~

~~*eee e tere sere esos*~~

~~*Capuchins, or Reformed Franciscans*~~

~~*Clerks Regular of St Ma- jolus of Pavia, or "So- maschi"*~~

~~*Recollects, or Strict Fran- ciscans*~~

~~*Barnabites of St Paul*~~

~~*Jesuits*~~

~~*Ursulines Brothers of Charity Jesuitesses (suppressed,*~~

~~*1631)*~~

~~*Oratorians Discalced Carmelites Fathers of Christian Doc- trine Feuillants ….. Saiseg ietaters*~~

~~*Oblates of St Ambrose ….*~~

~~*Latin Monks of St Basil ..*~~

~~*Clerks Regular, Ministers of the Sick*~~

~~*Clerks Minor …. eit*~~

~~*Discalced Augustinians…*~~

~~*i ee ee ee*~~

~~*ete.*~~

~~*Congregation of Picpus…. Discalced Trinitarians ….*~~

~~*Notre Dame de St Paul…*~~

~~*Jacobins, or Reformed Do-*~~

~~*minicans English Institute of B. V.*~~

~~*Mary Nuns of the Visitation ….*~~

~~*French Ursulines*~~

~~*French Oratorians ……..*~~

~~*Canons Regular of St Saviour*~~

~~*Hospitaller Nuns of St Charles*~~

~~*Pauline Congregation of the Mother of God*~~

~~*Nuns of Calvary*~~

~~*Congregation of Benedic- tines of St Maur*~~

~~*Hospitaller Nuns of the Charity of Our Lady ….*~~

~~*seca eee*~~

~~*ILETAVOE MS oogpegsnocanae o. Nuns of Our Lady of Refuge*~~

~~*Religieuses de la Croix …. Sisters of Charity.*~~

~~*eee eeeree*~~

~~*OnderiofyMercy see. —16*~~

~~*Sisters of the Blessed Sacra- ment*~~

~~*Bartholomites, or Clerks Secular of Common Life*~~

~~*Nuns of the Good Shepherd*~~

~~*| Order of Our Lady of Char- ity and Refuge*~~

~~*Eudists, or Mission Priests*~~

~~*| Daughters of Providence ..*~~

~~*| Sulpicians:-s…asjace ener*~~

~~*Sisters of St Joseph*~~

~~*| Benedictine Nuns of Per- petual Adoration*~~

~~*Bethlehemites*~~

~~*Hospitaller Nuns of St Thomas of Villanova Union Chrétienne ….....*~~
~~*Reformed Trappists …... | Brothers and Sisters of the | _ Child Jesus |*~~
~~*Daughters of Providence ..*~~

~~*Sisters of the Presentation Ladies of St Cyr*~~

~~*i t*~~

~~*..| Philip Neri*~~

~~*Founder.*~~

~~*.| Rome (2).*~~

~~*Pope Eugenius IV.*~~

~~*Frances of Rome …. Francis de Paola ….*~~

~~*Nicolas Rolin, chan- cellor of Burgundy Gregorio Rocchi…... Bishop de Boppart .. Pope Innocent VIII.*~~

~~*Jean Tisserand …... Queen Jeanne de Valois Giovanni Pietro Ca- raffa(Pope Paul IV.) Matteo di Bassi*~~

~~*....| Giacopo Antonio Mo-*~~

~~*rigia Ignatius Loyola…... Angela de' Merici .. John of God …..... An Englishwoman, named Ward Mheress…....0c64e 00*~~

~~*Jean de la Barriére ..*~~

~~*Carlo Borromeo…... Pope Gregory XIII... Camillo de' Lelli ….*~~

~~*Agostino Adorno … Thomas d'Andrada (Thomas de Jesus)*~~

~~*Vincent Mussart*~~

~~*Juan Baptista Garcias*~~

~~*Madeleine d'Escou- bleau de Sourdis Jean Michaelis*~~

~~*Mary Wards… s.ccss:*~~

~~*Jeanne Frangoise de Chantal*~~

~~*Marie Lhuillier ….…*~~

~~*Cardinal de Berulle ..*~~

~~*Fourrier de Matain-*~~

~~*court*~~

~~*Joseph Calasanza …*~~

~~*Antoinette d'Orléans Didier de la Cour .*~~

~~*Simone Gauguin (Mother Frances of the Cross)*~~

~~*Vincent de Paul…...*~~

~~*Marie Elizabeth de Ranfain*~~

~~*iW" Gueriny oc seiscuaires*~~

~~*Vincent de Paul and Louise Legras*~~

~~*Antoine Yvan and Madeleine Martin*~~

~~*Antoine Lequien*~~

~~*Bartholomew Holz- hauser*~~

~~*Madeleine Lamy ….*~~

~~*Jean Hudes …….*~~

~~*Jean Eudes.…….*~~

~~*Madame de Polallion*~~

~~*Jean Jacques Olier ..*~~

~~*Henri Maupas du Tour*~~

~~*Catherine de Barré (Mechtilde du St- Sacrement)*~~

~~*Pierre de Betancourt*~~

~~*Ange Le Proust*~~

~~*Pére Vachet Armand de Rancé…. Nicolas Barré*~~

~~*Madame Morel ….…*~~

~~*Marie Poussepin*~~

~~*Madamede Maintenon and Louis XIV.*~~

~~*Place.*~~

~~*Milan.*~~

~~*Rome. Vincennes, Paris.*~~

~~*Beaune, France. Pavia.*~~

~~*Metz. Rome.*~~

~~*Paris.*~~

~~*Bourges, France,*~~

~~*Theate or Chieti, Italy.*~~

~~*Pisa,*~~

~~*Pavia.*~~

~~*Spain (7). Milan.*~~

~~*Montmartre, Paris.*~~

~~*.| Brescia, Italy.*~~

~~*Granada, Flanders.*~~

~~*Rome. Avila, Spain. Rome.*~~

~~*Feuillans, France. Milan. Rome. Rome.*~~

~~*.| Genoa.*~~

~~*Talavera.*~~

~~*.| Franconville-*~~

~~*sous-bois, Paris. Val de Pefias, Spain. St Paul, France. Paris. St Omer, France. Annecy, Savoy. Paris. Paris. Lorraine.*~~

~~*Nancy.*~~

~~*.| Rome.*~~

~~*Poitiers.*~~

~~*.| Verdun, France.*~~

~~*Paris, Paris. Nancy.*~~

~~*Roye, Picardy. Paris.*~~

~~*Aix, Provence.*~~

~~*.| Marseilles.*~~

~~*Salzburg.*~~

~~*Caen, France. Caen.*~~

~~*Caen.*~~

~~*Paris.*~~

~~*Paris.*~~

~~*Le Puy en Velay, France.*~~

~~*Paris.*~~

~~-~~

~~*Guatemala, C. Alnerica. Lamballe, France. Charonne, Paris. La Trappe. Paris.*~~

~~*Charleville, France.*~~

~~*.| Sainville, France.*~~

~~*Versailles.*~~

~~*MON—MON*~~

~~*717*~~

~~*Date. Name. Founder. Place. 1686 | Daughters of the Good | Madame deCombe ..| Paris. Shepherd 1704 | Sisters of Charity of St Paul | Louis*~~

~~*Chauvet …... Levéville-la-Che- the Apostie nard, France. 1712 | Congregation of the Good | Elizabeth de Surville | St — Lo, Nor- Saviour mandy. 1713 | Religious of Most Blessed | Pére Vigne ……..... Bousseaux-le-Sacrament Roy, France. 1716 | Daughters of Wisdom .| Marie Louise Trichet | La Rochelle. and Grignon de Montfort VAS | PABBIGHISES) «oo: isis s e's. :5:0%0 Paul of the Cross ….| Rome. 1732 | Redemptorists, or Ligu- | Alfonso de' Liguori ..| Scala, Italy. orians 1785 | Society of the Christian} Antoine Sylvestre | Fontenelles, Retreat Receveur France, 1800 | Ladies of the Sacred Heart | Madame Barat …... Amiens. 1801 | Dames de St André …... Scraphine Hauvarlet | Tournay, Bel- giuin, 1815 | Marist Fathers.……..... Jean C. M. Colin ….! Lyons. 1815 ss = ms of Mary Immacu- | M. de Mazenod …... Aix. ate 1816 | Sisters of Jesus and Mary..} Pére Coindre …..... monet, yons. 1817 | Marist Brothers ……..... Abbé Champagnat ..| Lyons. 1820 | Sisters of Notre Dame …./ Julie Billiart …..... Amiens. 1820 | Sceurs de l'Espérance…... Abbé Noailles…..... Bordeaux. 1822 | Brothers of Christian In- | Abbé Lamennais ….} St Brieuc, France struction 1822 — Companions of | Madame d'Houet ….| Amiens. esus 1822 | Society of Nazareth …... Pierre Roger …....| Montmirail, France. 1824 | Sisters of Bon Secours ….] Madame de Montale..| Paris. 1824 | Marist Sisters ……..... Jean Claude Colin….| Belley, France. 1827 | Sisters of Mercy ……..... Catherine McAuley ..! Dublin. 1828 —_—* Union des Sacrés | Abbé Debrabant .| Douai, France. ceurs 1828 | Institute of Charity, or | Antonio Rosmini-Ser- | Monte Calvario, | Rosminian Fathers bati Italy. 1833 | School Sisters of Notre | Bishop Michael Wiss- | Nuremberg, Dame mann Bavaria. 1833 | Daughters of the Cross ….| Canon J. G. Habets | Liége. and Jeanne Haze 1836 | Deaconesses (Lutheran) ..| Theodor Fliedner ….} Kaiserswerth, Disseldorf. 1837 | Xaverian Brothers …..... Theodore Ryken ….| Bruges, Belgium. 1840 | Deaconesses (French Re- | M. Vermeil and Mdlle. | Paris. formed Malvesin 1840 | Little Sisters of the Poor ..} Abbé le Pailleur…... St Malo. 1842 | Deaconesses of Strasburg | Pastor Harter…....| Strasburg.*~~

~~*(Luth.)*~~

~~*MONACO (French Monegue), the smallest of the sove- reign principalities of Europe, with an area of 8°34 square miles, a population (1878) of 7049,*~~

~~*and an army of 72 men, is situated on the coast of the Mediterranean, 9 miles east of Nice, and bounded on all sides by the French*~~

~~*department of the Maritime Alps. Previous to 1861, when the communes of Mentone (Menton) and Roccabruna (Roquebrun) were sold to France for 4,000,000 francs, the area was about a third larger; but the population, which with those portions again included would now be 15,000, was only about 8000. Monaco has long had the reputa- tion of being one of the most beautiful and sheltered spots on all the Franco-Italian coast : non Corus in tlum Jus habet aut Zephyrus ; solus sua littora turbat Circius, said Lucan ; and a luxuriant growth of aloes and prickly pears (introduced in 1537), palm-trees, eucalyptus, lemon- trees, and geraniums gives a warmer colour to the scene than Lucan can have known. The town occupies the level summit of a rocky headland, rising about 195 feet from the shore, and still surrounded with ramparts. Though largely modernized, the palace is a fine specimen of Re- naissance architecture ; the new "cathedral" (French Re- naissance style), the new church of St Charles, and the museum may also be mentioned. Behind the rock, between Mont Téte de Chien and Mont de la Justice, the high grounds rise towards Turbie, the village on the hill which takes its name from the tropxa with which Augustus marked the boundary between Gaul and Italy. On the eastern side lies the little port or bay of Monaco ; along the lower ground at the head of the bay stretches the vil- lage of Condamine with orange-gardens, manufactures of perfumes and liqueurs, and the chapel of Ste Dévote, the patron saint of Monaco ; farther to the east, on the rocky*~~

~~*Date. Name. Founder. Place. 1842 | Deaconesses of St Loup|M.Germond …..... Echellens, (Swiss Refd.) France. 1843 | Notre Dame de Sion …... PP. Theodore and M. | Paris. A. Ratisbonne 1846 a of the Holy Child | Cornelia Connelly ….) Derby, England. esus 1847 | Society of Holy Trinity of | Priscilla Lydia Sellon | Plymouth. Devonport (Angl.) 1848 on of the Poor Child | Clara Fey ……..... Aix-la-Chapelle. esus 1849 | Poor Handmaids of Jesus | Katharina Kaspar….| Dermbach, Ger- Christ many. 1849 | Sisters of St Mary the] Miss Lockhart …... Wantage, Berks. Virgin (Angl.) 1850 | Sisters of the Most Holy | F. Gaudentius …... Manchester. Cross and Passion 1851 | Sisters of Nazareth…..... Cardinal Wiseman….| Hammersinith, London. 1851 | Sisterhood of All Saints| Rev. W. Upton |*~~

~~London. (Angl.) Richards 1852 | French Oratorians(revived) | Abbé Pététot …..... Paris. 1852 | Deaconesses of Riehen| M. Spittler …..... near Basel. (Swiss Refd.) 1854 | Society of St John Baptist | Hon. Mrs. Charles | Clewer, Windsor. (Angl.) Monsell 1855 | Nursing Sisters of St Mar- | Dr John Mason Neale | East Grinstead, garet (Angl.) Sussex. 1856 | Helpers of the Holy Souls | Eugénie Suret …... Paris. 1861 | Deaconesses (Angl.) .....| Rev. T. Pelham Dale | London. and Elizabeth Cathe- rine Ferard 1861 | Sisterhood of St Peter | Rosamira Lancaster..| Brompton, (Angl.) London. 1861 | Congregation of the Finding | Mary Lefevre …..... London (now of Jesus in the Temple Clifton Wood, Bristol). 1864 | Little Sisters of the As-]} Augustinians of the | Paris. sumption Assumption 1865 errs of St Mary | Rev. Dr Morgan Dix..} New York. Angl. 1865 Mission Priests of St John | Rev. R. M. Benson ..} Cowley St John, the Evangelist (Angl.) Oxford. 1866 | Servants of the Sacred | P. Peter Victor Braun | Paris. Heart of Jesus 1866 | Sisters of Bethany (Angl.) | Etheldreda A. Benett ir eo a ondon. 1869 | Sisterhood of the Good | Bishop Horatio Potter | New York. Shepherd (Angl.) 1870 be rer = the Church | Emily Ayckbowm.…] Kilburn, London. (Angl. 1870 | Little Company of Mary ..| Mary Potter …....|Hyson Green, Nottingham.~~

~~slopes of the Spélugues (Spelunce) are grouped the various buildings of the Casino of Monte Carlo and the numerous villas and hotels which it has called into existence. Previous to 1828 the Spélugues were mere barren rocks; but after~~

~~Reference 1 Palace -Moneco~~

~~2 Cathedral~~

~~5 Baths~~

~~4 Chapelle de $“ Devote 5 Casino- Monte Carlo 6 Hotel de Paris~~

~~ys Enalis h Mile i?~~

~~MEDITERRANEAN SEA Plan of Monaco,~~

~~they were traversed by the new road to Mentone, Count Rey caused them to be covered with soil by Italian convicts ; and since 1858, when the first stone of the Casino was laid, the process of artificial embellishment has been carried~~

~~out on the most magnificent scale. The gaming establish- ment is now in the hands of a joint-stock company with a capital of 15,000,000 francs. None of the inhabitants of Monaco have access to the tables ; and their interest in the maintenance of the status quo is secured by their complete exemption from taxation, and the large prices paid for their lands. Gambling-tables were set up at Monaco in 1856; but it was not till 1860, when M. Blanc, expelled from Homburg, took possession of the place, that Monte Carlo began to be famous.~~

~~A temple of Heracles Monœcus was built on the Monaco head- land at a very early date, probably by the Greeks of Massilia. Monœci Portus or Portus Herculis is frequently mentioned by the later Latin writers. From the 10th century the place was associated with the Grimaldi, a powerful Genoese family who held high offices under the republic and the emperors; but not till a much later date did it become their permanent possession and residence. In the beginning of the 14th century it was notorious for its piracies. Charles I. (a man of considerable mark, who, after doing great ser- vice by sea and land to Philip of Valois in his English wars, was severely wounded at Crecy) purchased Mentone and Roccabruna, and bought up the claims of the Spinola to Monaco. The princes of Monaco continued true to France till 1524, when Augustin Grimaldi threw in his lot with Charles V. Honoré I., Augustin's successor, was made marquis of Campagna and count of Canosa, and people as well as rulers were accorded various important privileges. The right to exact toll from vessels ssing the port continued to be exercised till the close of the 18th century. Honoré II., who re- newed the alliance with France in 1641, was compensated for the loss of Canosa, &c., with the duchy and peerage of Valentinois and various lesser lordships ; and duke of Valentinois long continued to be the title of the heir-apparent of the principality. The Na- tional Convention annexed the principality to France in 1793; restored to~~

~~*the Goyon Grimaldis by the Treaty of Paris in 1814, it was placed by that of Vienna under the protection of Sardinia. King Albert of Sardinia took the opportunity of disturbances that occurred in 1848 to annex Mentone and Roccabruna; but this high-handed proceeding was condemned by the protocol of 1856, and Charles it. (born 1818) entered upon his full rights. With the transference of Nice to France in 1860 the principality passed*~~

~~*again under French protection. See Charles de Venasques, Genealogica et historica Grimaldix gentis arbor (really the work of Honoré I1.).*~~

~~*MONAGHAN, an inland county of Ireland in the province of Ulster, is bounded E. by Armagh, S.E. by Louth, 8. by Meath, S.W. by Cavan, W. by Fermanagh, and N. by Tyrone. The area is 318,806 acres, or 498 sq. miles. The north-western part of the county is included in the great central plain of Ireland ; but in the south-east there is an uprising of Lower Silurian rocks. The surface is irregular, although none of the hills are of great elevation. The principal range is that of Slievebeagh, a rugged and barren tract extending into Fermanagh, its highest summit being 1254 feet above sea-level. Formerly much of the country was under forest, but it is now very bare of trees, except in the many demesnes of the nobility and gentry. The scenery is redeemed from monotony by the large num- ber of small lakes and streams. The lakes number in all nearly 200. The principal rivers are the Finn, which rises near the centre of the county and passes into Fermanagh, and the Blackwater, which forms the boundary with Tyrone. The Ulster Canal passes the towns of Monaghan and Clones, affording communication between Lough Neagh and Lough Erne. LEskers occur at several places. There are seams of unworkable coal in the south-west of the county. The limestone is not only abundant and good, but from the position of the rocks it can be obtained at very small expense in working. Freestone and slates are quarried in considerable quantities. The other minerals include lead ore, antimony, fuller's earth, marble, and manganese; but the quantities obtained are inconsiderable. _ Climate and Agricultwre.—Partly owing to the large proportion*~~

~~*of bog and water the climate is somewhat moist. The soil in the more level portions of the county is very fertile where it rests on limestone, and there isalso a mixed soil of deep clay, which is capa-*~~

~~ble of high cultivation ; but in the hilly regions a strong retentive clay prevails, which could be made productive only by careful drain-~~

~~ing and culture. Spade husbandry generally prevails. . The most comnion manure is a compost of lime and burned turf mould. Marl is abundant, but is little used, and gypsum also is found. The number of holdings in 1881 was 17,849, of which as many as 10,784 did not exceed 15 acres in extent, and 2870 of these did not exceed 5 acres; 6454 ranged between 15 and 50 acres, and only 24 were above 200 acres. The area of arable land was 278,755 acres, or 87 per cent. of the whole, while 5258 were under plantations, 7580 bog and marsh, 5239 barren mountain land, and 21,582 water, roads,~~

~~and fences. The following table shows the areas under the differ- ent crops in 1850 and 1882 :— ner, eee r=] uo) g a | 8 | gis e % ne | 2 se | 5a 38) 3 a 23| 8 8 | oo se 3 E 3 55 5 5 |e 3 $6 i) Oo. Oo} By eH | Oo a5 = 1850 | 5,861 | 80,946 | 7,467 | 22,105 | 7,190 | 2,548 10,157 | 11,399 | 147,668 1882 | 1,228 | 53,997 | 1,665 | 21,321 | 7,562 | 1,583 | 12,848 | 31,480 | 131,184 |~~

~~a~~

~~Horses numbered 10,229 in 1872, and 10,666 in 1882. In the same years mules numbered 300 and 469, and asses 4314 and 3476. The number of cattle in 1872 was 81,333, and in 1882 only 72,266, an average of 25°9 to every 100 acres under cultivation, the average for Ireland being 25°8. Sheep between 1872 and 1882 declined from 17,964 to 9858, a very inconsiderable number ; pigs increased from 26,008 to 29,972; goats from 8873 to 12,391; and poultry from 341,874 to 434,260.~~

~~According to the latest return, the land was divided among 1470 proprietors, who possessed 311,440 acres,with a total annual value of £261,382. The average size of the properties was 211 acres, and the average value per statute acre 17 shillings. The following seven proprietors possessed upwards of 10,000 acres: E. P. Shirley, 26,386 ; marquis of Bath, 22,762; earl of Dartrey, 17,345 ; Lord Rossmore, 14,839 ; Sir John Leslie, 13,621 ; Viscount Templetown, 12,845; A. A. Hope, 11,700.~~

~~*Manufactures.—The only manufacture of consequence is linen, which of late years has been on the increase. The number of scutching mills in 1881 was 55, of which 45 were wrought by water, 8 by steam, and 2 by water and steam.*~~

~~*Administration.—The county includes 5 baronies, 23 parishes, and 1850 town lands. Assizesare held at Monaghan, and quarter- sessions at Carrickmacross, Castleblayney, Clones, and Monaghan. There are 8 petty sessional districts within the county, and part of another. It includes the poor-law unions of Carrickmacross and Monaghan, and portions of Castleblayney, Clogher, Clones, Coote- hill, and Dundalk. It is in the Belfast military district, sub- district of Armagh. There is a barrack station at Monaghan. In the Irish parliament two members were returned for the county and two for the town of Monaghan, but at the Union Monaghan was disfranchised.*~~

~~*Population.—The population in 1841 was 200,442; but in 1851 it had diminished to 141,823, in 1871 to 114,969, and in 1881 to 102,748, of whom 50,077 were males and 52,671 females, At the last census 78 per cent. of the inhabitants were Roman Catholics, 13 per cent. Episcopalians, and 11 per cent. Presbyterians. The number of emigrants from 1st May 1851 to 31st December 1881 was 56,408, or about 1840 persons per annum ; while during the twenty years ending 31st March 1881 the annual rate of emigration was 13°8 per 1000 of the population. The death-rate to every thousand of the population for the ten years ending 1881 was 16°9, the birth- rate 23°4, and the marriage-rate 3°6. The towns possessing more than 1000 inhabitants are—Monaghan 3369, Clones 2216, Carrick-macross 2002, Castleblayney 1810, and Ballyblay 1654. Monaghan, the county town, received its name Muinechan (the town of monks) from a monastery founded there at a very earlyperiod. The town was incorporated by James I., but it was little more than a hamlet till towards the closeoflast century. Besides the usual county buildings, it contains a Roman Catholic college, and National model schools.*~~

~~*History and Antiquities.—In the time of Ptolemy, Monaghan formed part of the territory of the Scoti. Subsequently included in the district of Oriel or*~~

~~*Orgial, and long known as Macmahon's country, it became shire ground in the reign of Elizabeth.*~~

~~*The antiquarian remains of Monaghan are comparatively unim- portant. At Clones there is a round tower in good preservation, but very rude in its masonry; another at Inniskeen is very dilapidated. 'Near Clones there are two large raths. Although there are several old Danish forts, there are no medizval castles of importance. The only monastic structure of which any vestiges remain is the abbey of Clones, which was also the seat of a bishopric. The abbey dates from the 6th century, but was rebuilt in the 14th century after destruction by fire. On the site of the Franciscan abbey at Monaghan a castle was erected, which was in a ruinous condition in the time of James I.*~~

~~*MONARCHIANISM, in its technical Christological sense, designates the view taken by those Christians who,*~~

~~*MON—MON*~~

~~*within the church, towards the end of the 2d century and during the 3d, opposed the doctrine of a hypostatic Logos (hypostasianism) or of an independent personal sub- sistence of the Divine Word. It is usual (and convenient) to speak of two kinds of monarchianism,—the dynamistic and the modalistic. By monarchians of the former class Christ was held to be a mere man, miraculously conceived indeed, but constituted the Son of God simply by the in- finitely high degree in which he had been filled with Divine wisdom and power. This view was represented in Asia Minor about the year 170 by the anti-Montanistic Alogi, so called by Epiphanius on account of their rejection of the Fourth Gospel ; it was also taught at Rome about the end of the 2d century by Theodotus of Byzantium, a currier, who was excommunicated by Bishop Victor, and at a later date by Artemon, excommunicated by Zephyrinus. About the year 260 it was again propounded within the church by Pau of Samosata (¢.v.), who held that, by his unique excellency, the man Jesus gradually rose to the Divine dignity, so as to be worthy of the name of God. Modalistic monarchianism, conceiving that the whole fulness of the Godhead dwelt in Christ, took exception to the "subordi- natianism" of some church writers, and maintained that the names Father and Son were only two different designations of the same*~~

~~subject, the one God, who "with reference to the relations in which He had previously stood to the world is called the Father, but in reference to His appearance in humanity is called the Son." It was first taught, in the interests of the "monarchia" of God, by Praxeas, a con- fessor from Asia Minor,in Rome about 190, and was opposed by Tertullian in his well-known controversial tract. The same view—the " patripassian " as it was also called, because it implied that God the Father had suffered on the cross—obtained fresh support in Rome about 215 from certain disciples of Noetus of Smyrna, who received a modified support from Bishop Callistus. It was on this account that Hippolytus, the champion of hypostasian subordinatian- ism, along with his adherents, withdrew from the obedience of Callistus, and formed a separate community. A new and conciliatory phase of patripassianism was expounded at a somewhat later date by Beryllus of Bostra, who, while hold- ing the divinity of Christ not to be té/a, or proper to Him- self, but zatpixy (belonging to the Father), yet recognized in His personality a new tpocw7ov or form of manifestation on the part of God. Beryllus, however, was convinced of the wrongness of this view by ORIGEN (¢.v.), and recanted at the synod which had been called together in 244 to discuss it. For the subsequent history of modalistic mon- archianism, see SABELLIUS.~~

~~MONASTICISM. See Monacuism.~~

~~MONASTIR, Brrotra, or Tort Monastir, a city of Macedonia, now the chief town of the Turkish vilayet of Roumelia, is situated at a height of 1880 feet above the sea, in a western inlet of the beautiful, fertile, and many- villaged plain which, with a breadth of about 10 miles, stretches for 40 miles eastward from Mount Peristeri (7714 feet high) to the Babuna chain. It is embosomed in rich masses of foliage, and crossed by a rough-channeled mountain stream, the Drahor, which joins the Czerna or Karasu, a tributary of the Vardar. The military advan- tages of its position at the meeting-place of roads from Salonica, Durazzo, Uskiub, and Adrianople led the Turks about 1820 to make Monastir the headquarters of the Roumelian corps d@armée. Since then its general and commercial importance has greatly increased. A consider- able amount of gold and silver work (especially clasps and~~

~~*filigree) is made by the local craftsmen, The population*~~

~~*is about 40,000.*~~

~~*Monastir—so called from the monastery of Bukova (The Beeches),*~~

~~*some hundred feet up the slope of Peristeri—is identified with the |*~~

~~*719*~~

~~*ancient Heraclea Lyncestis on the Egnatian Way ; and its bishopric is still called the bishopric of Pelagonia from the ancient name of the plain. In 1838 the town was the scene of the massacre of the Albanian beys.*~~

~~*MONBODDO, James Burnett, Lorp (1714-1799), author of works on the Origin and Progress of Language (published in 1773), and Ancient Metaphysics (1779), was one of the most marked characters in Scottish literary circles in the 18th century. He was born in 1714 at Monboddo in Kincardineshire, studied at Aberdeen and Groningen, and quickly took a leading position at the Edinburgh bar, being made one of the Lords of Session in 1767. Many of his eccentricities, both of conduct and opinion, appear less eccentric to the present generation than they did to his contemporaries; though he seems to have heightened the impression of them by his humorous sallies in their defence. He may have had other reasons than the practice of the ancients for dining late and _per- forming his journeys on horseback instead of in a carriage. His views about the origin of society and language and the faculties by which man is distinguished from the brutes afforded endless matter for jest to the wags of his day; but readers of this generation are more likely to be sur- prised by the scientific character of his method and the acuteness of his conclusions than amused by his eccentri- city. These conclusions have many curious points of con- tact with Darwinism and Neo-Kantism. His idea of studying man as one of the animals, and of collecting facts about savage tribes to throw light on the problems of civilization, bring him into contact with the one, and his intimate knowledge of Greek philosophy with the other. In both respects Monboddo was far in advance of his neighbours. His happy turn of Virgil's line—*~~

“‘Tante molis erat humanam condere gentem ”’—

might be adopted as a motto by the Evolutionists ; and Neo-Kantians would find it hard to believe that he published his criticism of Locke in 1773. His studied abstinence from fine writing—from ‘the rhetorical and poetical style fashionable among writers of the present day ”—on such subjects as lhe handled confirmed the idea of his con- temporaries that he was only an eccentric concocter of supremely absurd paradoxes. He died, 26th May 1799, at the advanced age of eighty-five.

MONCTON, a town of the Dominion of Canada, in Westmoreland, New Brunswick, 89 miles by rail north- east of St John, is a port at the head of navigation on the Petitcodiac, and the seat of the workshops and general offices of the Intercolonial Railway. The population, about 1200 in 1871, was 5032 in 1881; the growth of the place has been favoured by the establishment of sugar- refining factories, and factories for cotton and brass and iron wares since the Canadian Parliament in 1879 adopted a policy of protection. For the year 1881-82 the exports amounted to_$64,817, and the imports to $252,571.

MONDONEDO, an ancient city of Spain, 27 miles north-north-east from Lugo, in the province of that name, is situated on the Sixto, a small tributary of the Masma, on the Atlantic side of the Cantabrian chain, ina sheltered site surrounded on all sides by considerable hills. The population in 1878 was 10,112. The principal buildings are the cathedral, a Corinthian structure of the 17th century, an ex-convent of Franciscan friars of Alcantara, which is now used for a theatre and a public school, and the civil hospital. The industries, which are unimportant, include lace-making, linen-weaving, and leather manu- facture.

According to local tradition, the bishopric of Dumium, near Braga, was transferred to San Martin de Mondoiiedo (three leagues from Mondojiedo) in the 8th century ; it was brought to Mondoitedo

itself by Dota Urraca in the beginning of the 12th century ; for about sixty years prior to 1238 the see was at Ribadeo. After having

~~been for nearly a century and a half in the hands of the Moors, Mondotiedo was recaptured by Ordofio L. in 858 ; and the Christian possession was made permanent by Alphonso III. in 870. It was taken by surprise by the French in 1809.~~

~~MONDOVI, a city of Italy, in the province of Cuneo, 15 miles east of Cuneo and about 55 west of Genoa by rail, was formerly the chief town of the Sardinian province of Mondovi, and between 1560 and 1719 the seat of a Piedmontese.university. The central quarter occupies the summit of a hill 1670 feet high, and contains the hexa- gonal piazza, a citadel erected in 1573 by Emanuel Phili- bert, the cathedral of St Donatus, a spacious episcopal palace, and the statue of Beccaria, who was a native of the town. At the foot of the hill along the banks of the~~

~~MON—MON~~

~~Ellero (a tributary of the Po) lie the industrial and commercial suburbs of Breo, Borgatto, Pian della Valle, and Carassone, with their potteries, tanneries, marble- works, &c. The mansion of Count San Quintino in Pian della Valle was the seat of the printing-press which from 1472 issued books with the imprint Mons Regalis ; and in modern times the Ducal press founded by Emanuel Phili- bert has acquired a great reputation. The population of the town was 9637 in 1871, with the suburbs 11,958; that of the commune 17,726 in 1861, and 17,902 in 1881.~~

~~Breo is identified with a certain Colonia Bredolensis ; but Mon- dovi proper —Mons Vici, Mons Regalis (Monteregale), or Vicodunum~~

~~—probably did not take its rise till about 1000 a.p. The bishopric dates from 1388.~~

~~MONEY~~

~~1. Definition and Functions of Money.—The precise definition of Money is a question presenting no small difficulty, and it has been complicated by the attempts of some writers to define the term so as to lend support to their favourite theories. The real difficulties of the subject are, however, chiefly connected with paper-money, and as that side of the question has been dealt~~

~~*with in the article BANKING (g.v.) it will here be sufficient to adopt the clear and careful description of money given by a distinguished American economist as being 'that which passes freely from hand to hand throughout the community in final dis- charge of debts and full payment for commodities, being accepted equally without reference to the character or credit of the person who offers it and without the intention of the person who receives it to consume it or enjoy it or apply it to any other use than in turn to tender it to others in dis- charge of debts or payment for commodities." ? In this passage the essential features of money are plainly set forth, though, as is frequently the case in economics, particular cases hard to bring within the description may be found.*?~~

~~*The functions which money discharges in the social organism are—at least in the opinion of all writers worth noticing here—clearly manifest. The most important is that of facilitating exchanges. It is not necessary to dwell on the great importance of this office. The mere consider- ation of industrial organization shows that it is based on the division of employments; but the earliest economic writers saw clearly that division of employments was rendered possible only by the use of a medium of exchange. They saw that the result of increasing specialization of labour was to bring about a state of things in which each individual produced little or nothing directly adapted to satisfy his own wants, and that each one was to live by exchanging his products for those of others. They saw, moreover, that this was not feasible without some object which all would be willing to accept for their peculiar pro- ducts, for otherwise, the difficulty of getting those together whose wants were reciprocal would be a complete hindrance to the development of exchange, which alone made division of labour possible. A second function hardly inferior in importance to the one just mentioned is that of affording a ready means of estimating the comparative value of dif- ferent commodities. Without some common commodity as a standard of comparison this would be almost impossible. "Tf a tailor had only coats and wanted to buy bread or a horse, it would be very troublesome to ascertain how much bread he ought to obtain for a coat or how many coats he*~~

~~*1 F, A. Walker, Money, Trade, and Industry, p. 4.*~~

~~2 For further information as to the discussions relative to the proper definition of " Money," the reader may consult J. 8. Mill, Prin. of Pol. Econ., B. iii. ch. 12, § 7; Jevons, Money, pp. 248 sq.; B. de Laveleye, Marché Monétaire, pp. 226 sq.; and especially Mr H. Sidgwick's article 'What is Money?" in the Wortnightly Review (April 1879), also his Principles of Political Economy, pp. 281 sq.~~

~~should give for a horse;"*® and as the number of com- modities to be dealt with increased the problem would be- come harder, "for each commodity would have to be quoted in terms of every other commodity." Indeed it may be reasonably maintained that the idea of general value could not be formed without the existence of money, and all that is known of savage races tends to bear out this view.* The adoption of some one commodity renders the comparison of values easy. 'The chosen commodity becomes a common denominator or common measure of value in terms of which we estimate the values of all other goods," ° and thus money, which in its primary function renders exchanges possible by acting as an intermediate term in each exchange, also makes exchanges easier by making them definite. Another func- tion of money comes into being with the progress of society. One of the most distinctive features of advancing civiliza- tion is the increasing tendency of people to trust each other. Thus there is a continual increase in relations of contract, as may be seen by examining the development of any legal system. Now a contract implies something to be done in the future, and for estimating the value of that future act a standard is required ; and here money, which already acts as a medium of exchange and as a measure of value at a given time, performs a third function, by affording an approximate means of estimating the present value of the future act, and in this respect may be regarded as a standard of value, or, if the phrase be preferred, of deferred payments. Some writers attribute a fourth function to money, inas- much as they regard it as being a means of easily storing up value. Doubtless it does supply this need, which is a specially pressing one in early civilizations owing to the insecurity which then exists, but with the progress of settled government the need becomes less extreme. Other forms of investment grow up, and the habit of hoarding money becomes unusual. It is therefore better to regard the functions of money as being only three in number, viz., to furnish—(1) the common medium by which exchanges are rendered possible, (2) the common~~

measure by which the comparative values of those exchanges are estimated, and (3) the standard by which future obligations are determined.

2. Causes which Determine the Value of Money. Quantity of Money needed by a Nation.—The problem of the deter- mining causes of the value of money is a particular case of the general problem of values, but there are circumstances which render the inquiry more than usually complicated. Before considering these it will be well to deal with a use of the phrase "value of money" which has led to much con-

3 Mill, Prin., B. iii. ch. 7, § 1.

4 W. Bagehot, Hconomic Studies, pp. 42-48. 5 Jevons, Money, p. 5.

6 For an ingenious argument against the use of the terms " measure : and "standard " of value, see F. A. Walker, Money, pp. 4 sq., 12, and

Money, Trade, and Industry, pp. 27 sq., 60 sq. The shorter title is uniformly used here for his larger treatise.

MONEY ;

fusion. In mercantile phraseology the value of money means the interest charged for the use of loanable capital. Thus, when the market rate of interest is high money is said to be dear, when it is low money is regarded as cheap. Whatever may be the force of the reasons in favour of this use, it is only mentioned here for the purpose of excluding it. For our present subject, "the value of a thing is what it will exchange for; the value of money is what money will exchange for, or its purchasing power. If prices are low, money will buy much of other things, and is of high value ; if prices are high, it will buy little of other things, and is of low value. The value of money is inversely as general prices, falling as they rise and rising as they fall.") 'Now in the general theory of value it appears that the proximate condition which determines it is the equation between supply and demand ; and this is clearly the case with reference to money. These terms, supply and demand, need, however, some elucidation. Let us consider what is meant by the supply of, and demand for, money. The supply of a commodity means the quantity of it which is offered for sale. But in what shape does the

~~*sale of money take place? By being offered for goods. 'The supply of money, then, is the quantity of it which people are wanting to lay out;" or, to put the point more concisely, it is "all the mouey in circulation at the time." Again, to take the case of demand,—the demand for a commodity is the pur- chasing power offered for it.2 Demand in the special case of money consists of all the goods offered for sale. There is, however, a peculiar feature in the case of money which arises from its position as the medium of exchange, viz., that money is, so to say, in a "constant state of supply and demand," since its principal service is to act as the means of purchasing commodities.2 From this it follows that the factors which determine the value of money within a given time are: (1) the amount of money in circulation, and (2) the amount of goods to be sold. On closer exami- nation it will, however, appear that there are other elements to be taken into account. In the first place, the quantity of money is not by itself the sole element on the supply side. In some instances a coin will not circulate more than two or three times in a year, while another coin may make hundreds of purchases. In determining the value of money these varying rates of circulation have to be con- sidered, and by taking an average we may establish the existence of a fresh element to be estimated, namely, the average rapidity with which money does its work, or, to use Mill's expression, "the efficiency of money." On the side of demand, again, it is not the quantity of commo- dities that is the determining element, but the amount of sales, and the same article may, and generally does, pass through several hands before it reaches the consumer. From this it follows that (if the consideration of credit in its various forms be omitted) the value of money is inversely as its quantity multiplied by its efficiency, the amount of transactions being assumed to be constant. This formula requires, however, some further explanations before it can be accepted as a full expression of the truth on the subject. It must be noticed that it is not commodities only that are exchanged for money. Services of all kinds constitute a large portion of the demand, while the payment of interest on the various forms of obligation requires a large amount of the circulating medium. The potent influence of credit also must be dwelt on. This latter force is the main element to be considered in dealing with variations of prices ; but*~~

~~2 For a clear statement of this, see J. E. Cairnes, Leading Principles, part i. ch. 2.~~

~~3 The leading exception to this is in the case of money which is hoarded for an indefinite period, and is therefore withdrawn from cir- culation.~~

~~so far as it is based on a deposit of metallic money it may be looked on as a means of increasing the efficiency of money, and therefore as coming within the formula given above. In its other aspects it lies outside the range of this article. Some interesting conclusions may be deduced from the results we have arrived at. One of these is that the "increased development of trade," or 'expansion of commerce," of itself tends to lower not to raise prices ; for, by increasing the work which money has to do while the amount remains the same, it raises its value. Another consequence is that a large addition may be made to the money in a country without any effect being produced on prices. 'This is evident, since money only acts on prices by being brought into circulation ; therefore, if the money which is added to the national stock is not used in this way, prices will remain unaffected.~~

~~We have now sufficiently considered the proximate con- ditions which determine the value of money ; the next step is to inquire: What is the ultimate regulator of its value ? The value of freely-produced commodities is—according to the ordinary theory of economists—determined by their 'cost of production," or, where the article is produced at different costs, by the cost of production of the most costly portion. We have now to consider how far this theory applies to the special case of money. Gold and silver, the principal materials of money, are the products of mines, and are produced at different costs; therefore the cost of the part produced at greatest cost ought to determine their value. This theory is, however, true only under certain conditions—namely, that competition is perfectly free, and that there are accurate data for computing the cost of pro- duction, and even then it is true only "in the long run." Moreover, cost only operates on value by affecting supply. "The latent influence," says Mill,® "by which the values of things are made to conform in the long run to the cost of production is the variation that would otherwise take place in the supply of the commodity." From these con- siderations it follows that cost of production~~

does not so influentially affect the value of money as some writers have supposed. In former periods it was a common proceeding on the part of the state to either restrict or stimulate coin- age and mining for the precious metals. At all times the working of gold and silver mines has been rather a hazard- ous speculation than a legitimate business. " When any person undertakes to work a new mine in Peru," says Adam Smith,® 'he is universally looked upon as a man destined to bankruptcy and ruin, and is upon that account shunned and avoided by everybody. Mining, it seems, is considered there in the same light as here, as a lottery, in which the prizes do not compensate the blanks ;" and all subse- quent experience confirms this view. With regard to the adjustment of supply to meet an altered cost of production, the difficulties are, if possible, still greater. The supply of money is so large compared with the annual production, that any change can operate but slowly on its value. The total stoppage of fresh supplies from the mines would not be felt for some years in the increased value; and an in- creased amount of production, though more rapid in its operation, takes some time to produce an effect. " Hence the effects of all changes in the conditions of production of the precious metals are at first, and continue to be for many years, questions of quantity only, with little reference to cost of production." On these grounds it is apparent that cost of production is not, for short periods, the controlling force which governs the value of money, and even for long

4 This view, which seems to most persons a paradox, is well put by Adam Smith, Wealth of Nations, p. 81 (ed. M'Culloch) ; also by J. E. Cairnes, Essays on Political Economy, p. 4.

SePrin, Byiliichs 3, § 2.

6 Wealth of Nations, p. 78 (ed. M'Culloch).

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periods the speculative nature of the industries connected with the production of money renders the cost of produc- tion an clement very hard to ascertain. Another considera- tion which gives a peculiar feature to the

~~*problem of money- value is that in the case of other commodities a change in cost of production affects value without any actual change in the supply. The knowledge that a commodity can be produced at a lower cost will cause a reduction in its value. This is not true of money. Hither the quantity or the efficiency of money must be altered to change its value. This is, of course, a result of its position as the circulating medium, When all these circumstances are taken into account it becomes clear that the most correct way to regard the question of money-value is that which looks on supply and demand, as interpreted above, as the regu- lator of its value for a limited time, while regarding cost of production as a force exercising an influence of uncer- tain amount on its fluctuations during long periods. Where the coinage of a state is artificially limited, the value of its money plainly depends on supply and demand as we have interpreted it.*~~

~~*The next question which arises is: What quantity of money does a nation require? What amount of the circu- lating medium is necessary for the proper working of the industrial organism? To this puzzling problem the earlier economists gave answers in the shape of definite formule. Thus, Sir W. Petty was of opinion that the amount of coin required by a country was one-half the rent of land, one- fourth the amount of building rent, and one fifty-second part of the annual wages of labour. Locke's view was that one-fiftieth of labourers' wages, one-fourth landowners' revenue, and one-twentieth of traders' yearly returns, was the properamount. Modern statisticians, however, though having command of much greater resources, decline to attempt a quantitative answer, and content themselves with indicating the conditions which the problem involves. In fact we must first examine the work which money has to perform, and this depends on several conditions. The first of these is the population ; ceteris paribus, twice as many people will want twice as much money. The second is the amount of transactions; for, if the amount of busi- ness done is doubled, the amount of money must be also doubled, unless at the same time some improvement in credit is introduced. The efficiency of money is a third element which affects the quantity needed, and this is largely dependent on the habits of the people and the facilities for communication. Other elements which can be only briefly indicated are—' the degree in which credit exists between man and man ; the amount of travelling which takes place ; and the commercial and banking organization which exists." 1 Another factor which requires to*~~

~~*be estimated is the extent to which habits of hoarding exist ; for all money hoarded is withdrawn from circulation, and therefore increases the total amount needed. The habits of saving in the rural districts of France remarkably exemplify this element in the question. Again, the existence of barter does away with the use of so much money as would be required to*~~

~~*carry on the exchanges effected by barter. The custom of paying wages in kind has a similar effect. This bare statement shows how insoluble the question is. When we*~~

~~*contemplate the matter from an international point of view, the amount needed, after allowance is made for the cost of transporting goods, is plainly that which will keep a country's prices at a level with those of the countries with which it has commercial relations.2 For otherwise the country would have an excess either of importation or of exportation, which would necessitate a flow of money to the country whose prices were lower than the general level.*~~

~~*1 F, A. Walker, Afoney, p. 73. er li oS BE*~~

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~~*This, then, is the condition which determines comparative prices between different countries; and, prices being so determined, the quantity of money needed to keep up those prices depends on the conditions above indicated. In the case of England reliable statistics tend to show that the gold in circulation was, in 1872, about £105,000,000, and the note circulation £43,000,000. In any Continental country the amount would probably be proportionally much greater, owing to the fact that there is in England a greater development of credit.*~~

~~*3. Early Forms of Currency.—Up to the present we have considered money as being fully established and properly adapted to fulfil its various functions. We have now to trace the steps by which a suitable system of currency was evolved from a state of barter. It is important for a right understanding of the question to grasp the fact that ex- changes took place originally between groups, and_ not between individuals. This explains the slow growth of exchanges, as each group produced most of the articles*~~

~~*necessary for itself, and such acts of barter as took place were rather reciprocal presents than mercantile exchanges. Such is actually the case at present among modern savages. "Tt is instructive to see trade in its lowest form among such tribes as the Australians. The tough greenstone valuable for making hatchets is carried hundreds of miles by natives, who receive from other tribes in return the prized products of their districts, such as red ochre to paint their bodies with; they have even got so far as to let peaceful traders pass unharmed through tribes at war, so that trains of youths might be met, each lad with a slab of sandstone on his head to be carried to his distant home and shaped into a seed-crusher. When strangers visit a tribe they are received at a friendly gathering or cor- robboree, and presents are given on both sides, No doubt there is a general sense that the gifts are to be fair exchanges, and if either side is not satisfied there will be grumbling and quarrelling ; but in this roughest kind of barter we do not yet find that clear notion of a unit of value which is the great step in trading."® This vivid description of what is going on at present among lower races enables us to realize the way in which money came into existence. When any commodity becomes an object of desire, not merely from its use to the persons desiring it, but from their wanting it as being readily exchangeable for other things, then that article may be regarded as rudi- mentary money. Thus the greenstone and ochre are on their way to being promoted to the position of currency, and the idea of a "unit of value" is all that is needed to complete the invention. "This higher stage is found among the Indians of British Columbia, whose strings of haiqua- shells worn as ornamental borders to their dresses serve them also as currency to trade with,—a string of ordinary quality being reckoned as worth one beaver's skin."* These shells, therefore, are in reality money, inasmuch as they discharge its functions.*~~

~~*On a review of existing savage tribes and ancient races of more or less civilization we are surprised at the great variety of objects which have been used to supply the need of a circulating medium. Skins, for instance, seem to be one of the earliest forms of money. They are to be found at present among the Indians of Alaska® dis- charging this service, while accounts of leather money seem to show that their use was formerly more general. As the hunting stage gives place to the pastoral, and animals become domesticated, the animal itself, instead of its skin, becomes the principal*~~

~~form of cur- rency. There is a great mass of evidence to show that, in the most distant regions and at very different times, cattle formed a currency for pastoral and early agricultural nations. Alike among existing barbarous tribes and in the survivals discovered among classical nations, sheep and oxen both appear as units of value. Thus we~~

~~find that at Rome, and through the Italian tribes generally, " oxen and sheep formed the oldest medium of exchange, ten sheep being~~

~~3 EK. B. Tylor, Anthropology, pp. 281-282. 4 Tylor, loc. cit. > Whymper, Alaska, p. 285.~~

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~~reckoned equivalent to one ox. The recognition of these objects as universal legal representatives of value, or, in other words, as money, may be traced back to the epoch of a purely pastoral economy." 1 The Icelandic law bears witness to a similar state of things ; while the various fines in the different Teutonic codes are estimated in cattle. The Latin word pecwnia (pecus) isan evidence of the earliest Roman money being composed of cattle. The English fee and the famous term feudal, according to its most probable etymology, are derived from the same root. Ina well-known passage of the /liad? the value of two different sets of armour is estimated in terms of oxen. The Irish law tracts bear evidence as to the use of cattle as one of the measures of value in early Irish civilization. Within the last few years it has been prominently brought before the public that oxen form the principal wealth and the circulating medium among the Zulus and Kaffres. On the testimony of an eye-witness we are assured that, "as cattle constitute the sole wealth of the people, so they are their only medium of such transactions as involve exchange, payment, or reward."4 We find that cattle-rents are paid by the pastoral Indian tribes to the United States Government.5 From the prominence of slavery in early societies it is natural to suppose that slaves would be adopted as a medium of exchange, and one of the measures of value in the Irish law tracts, cwmhal, is said to have originally meant a female slave. They are at present applied to this purpose in Central Africa, and also in New Guinea. On passing to the agricultural stage a greater number of objects are found capable of being applied to currency purposes. Among these are corn—used even at present~~

~~*in Norway—maize, olive oil, cocoa- nuts, and tea. The most remarkable instance of an agricultural product being used as currency is to be found in the case of tobacco, which was adopted as legal tender by the English colonists in North America. Another class of articles used for money consists of ornaments, which among all uncivilized tribes serve this purpose. The haiqua-shells mentioned before are an instance, cowries in India, whales' teeth among the Fijians, red feathers among some South Sea Island tribes, and finally, any attractive kinds of stone which can be easily worked. Mineral products, so far as they do not come under the preceding head, furnish another class. Thus salt was used in Abyssinia and Mexico, while the metals—a pheno- menon which will require a more careful examination—have suc- ceeded in finally driving all their inferior competitors out of the field, and have become the sole substances for money at present.*~~

~~*4. Metallic Forms of Money. Their Superiority over other Substances. Special Advantages of Silver and Gold.— The use of metals as a form of money can be traced far back in the history of civilization, but, as it is not possible to ascertain the historical order of their respective adoptions for this purpose, we will take them in the order of their value, beginning with the lowest. Iron, judging from the statement of Aristotle, was extensively employed ascurrency. One remarkable instance of this which at once occurs to the mind is the Spartan money, which is clearly a survival of the older system that had died out among the other Greeks, though by modern writers it has been attributed to ascetic policy. In conjunction with copper, iron formed an early Chinese currency, and till recently it was a subsidiary coinage in Japan. Iron spikes are used in Central Africa, while Adam Smith notices the use of nails for money in Scotland. Lead has also served as money, as it does at present in Burmah. Copper has been more widely employed than either of the previously-mentioned metals. Its use in China as a parallel standard with iron has just been men- tioned. The early Hebrew coins were chiefly composed of it, while down to 269 3.c. the sole Roman coinage was an alloy of copper. 'Tull a very recent period it formed the principal money of some poorer European states (asSweden), and was the subsidiary coinage of the United Kingdom till the present bronze fractional currency was introduced. Tin was not so favourite a material for money as copper, but the early English coinages were composed of it,*~~

~~*probably on account of the fertile tin mines of Cornwall, and in later times halfpence and farthings of tin have been struck. The*~~

~~*1 Mommsen, Hist. of Rome (Eng. trans.), i. p. 203.*~~

~~*2 The episode between Diomede and Glaucus in the 6th book.*~~

~~*3 Maine, Early History of Institutions, Lect. vi.; Brehon Law Tracts (ed. by Drs Hancock and Richey).*~~

~~*4 Rev, H. Dugmore, quoted by Maine, op. cit., p. 143.*~~

~~*5 F, A. Walker, Money, Trade, and Industry, p. 22.*~~

~~*& Wealth of Nations, p. 11.*~~

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~~*next metal which comes into notice is silver, which up to the last few years was the principal form of money, and even still is able to dispute the field with its most formidable rival. It formed the main basis of Greek coins, and was introduced at Rome in 269 B.c. The medizval money was principally composed of silver, and its position in recent times will have to be subsequently noticed more at length. Gold, which is the most valuable of the metals widely used for monetary purposes, has been steadily gaining ground with the growth of commerce. The earliest trace of its use in common with that of silver is to be found "in the pictures of the ancient Egyptians weighing in scales heaps of rings of gold and silver." ? The only other metals used for money—platinum and nickel—may be easily disposed of. The former of these was coined for a short time by the Russian Government, and then given up as unsuitable. The latter is only used as an alloy.*~~

~~*The examination of the forms of currency, both metallic and non-metallic, in which we have been engaged leads to certain definite conclusions as to the course which the evolution of currency is pursuing. It appears (1) that the metals tend to supersede all other forms of money among progressive peoples, and (2) that certain metals tend to supersede the others. From this we are led to consider the qualities which are desirable in the material of money, and to conclude that the presence or absence of those qualities is the reason of the adoption or rejection of any given substance.*~~

~~*(1) In the first place, it is necessary that the material of money should be desirable, or, in other words, possess value ; and to this condition all the commodities we have reviewed conform, for otherwise they would never have attained the position of being a medium of exchange. This quality, then, is not the reason for the preference of some forms over others. (2) The second requisite clearly is that the value of the article shall be high in proportion to its weight or bulk, or, to put the same truth in another way, it is requisite that it shall be portable. Want of this quality has been a fatal obstacle to many early forms of money retaining their place. Skins, corn, and tobacco were found very difficult to transfer from place to place. Iron and copper too suffered from the same defect, while sheep and oxen, though moving themselves, were expensive to transfer. (3) It is further desirable that the material of money shall be the same throughout, and that one unit shall be equal in value to another. This is a reason for rejecting the widespread currency composed of cattle, as the difference between one and another head is of course often considerable. The metals possess a particular advantage in this respect, as, after being refined, they are almost exactly homogeneous. (4) A fourth requisite is that the substance used as money can without damage be divided and, if needed, united again; here also the desired quality is peculiarly possessed by the metals, as they are easily fusible, while skins or precious stones suffer greatly in value by division, and it need hardly be added that the same is the case with regard to animals. (5) Money must also be durable. This at once removes from the articles suitable for money all animal and many vegetable substances. Eggs or oil will not keep, and conse- quently soon lose their value. Iron, too, is liable to rust, which, combined with its low value, is a reason for its dis- use as currency. (6) Money should be easily distinguishable, and there should*~~

~~*be no trouble in ascertaining its value. This condition is one of the reasons why precious stones have never been much used as money, their value being hard to estimate. The same objection applies to most non- metallic currencies, and is only obviated even in their case by the process of assaying. (7) The last condition which*~~

~~*7 Tylor, p. 283.*~~

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~~*appears desirable for the money material is, that its value shall be steady. This, however, is of but slight importance in early societies, and it is only as deferred payments become a prominent feature of industrial life that this requisite 1s much needed. It is enough for the other purposes of money that it shall not vary within short periods, which is found to be a feature of metals, and especially of silver and gold, while corn especially varies widely in value from season to season. From the foregoing examination of the requisites desirable in the material of money it is easy to deduce the empirical laws which the history of money discloses, since metals, as compared with non-metallic substances, evidently possess those requisites in a great degree. They are all durable, homogeneous, divisible, and recognizable, and in virtue of these superior advantages they are the only substances now used for money by advanced nations. Nor is the case different when the decision has to be made between the different metals. Iron has been rejected because of its low value and its liability to rust, lead from its extreme softness, and tin from its tendency to break. Both these metals, as well as copper also, are unsuitable from their low value, which hinders their speedy transmission so as to adjust inequalities of local prices.*~~

~~*The elimination of these metals leaves silver and gold as the only suitablematerialsfor forming the principal currency. Of late years there has been a movement towards the adoption of the latter as the sole monetary standard, silver being regarded as suitable only for a subsidiary coinage. Indeed this question, which is reserved for subsequent discussion, may be regarded as the principal matter of controversy in the field of metallic currency. The special features of gold and silver which render them the most suitable materials for currency may here be noted. 'The value of these*~~

~~metals changes only by slow degrees ; they are readily divisible into any number of parts which may be reunited by means of fusion without loss; they do not deteriorate by being kept; their firm and compact texture makes them difficult to wear; their cost of pro- duction, especially of gold, is so considerable that they possess great value in small bulk, and can of course be transported with comparative facility ; and their identity is perfect."! (The possession by both these metals of all the qualities needed in money is more briefly but forcibly put by Cantillon when he says that " gold and silver alone are of small volume, of equal goodness, easy of transport, divisible without loss, easily guarded, beautiful and brilliant, and durable almost to eternity."? This view has even been pushed to an extreme form in the proposition of Turgot, that they became universal money by the nature and force of things, independently of all convention and law, from which the deduction has been drawn that to proscribe silver by law is a violation of the nature of things. .~~

~~5. Coinage: its Advantages, and the Principal Questions connected therewith.—The development of monetary systems has now been traced down to the establishment of metallic currencies, These, in the early stages of their existence, passed by weight. The Hebrew records bear witness to this fact, as also do the Greek writers. Aristotle, for ex- ample, after indicating the circumstances which led to the invention of currency, proceeds to point out that it was "afterwards determined in value by men putting a stamp upon it, in order that it may save them from the trouble of weighing it."* There are two distinct stages in the~~

~~1 Ency. Brit. (8th ed.), art. " Money," vol. xv. p. 417.~~

~~2 W.S. Jevons in the Contemporary Review, January 1881. See also Lord Liverpool, Coins of the Realm (Bank of England reprint), p. 10.~~

~~3 See Cairnes, Logical Method of Pol. Econ., p. 131, note; and for an application of the argument to Bimetallism, see EK. de Laveleye, Fort. Rev., July 1881.~~

~~4 Pol., i. 9, 8. The whole passage is worthy of quotation, as showing how clearly Aristotle conceived the primary function of~~

~~*introduction of coining. In the first, only the quality or fineness of the metal is denoted by the stamp, no attempt being made to fix the weight. In other words, the stamp acts as a kind of hall-mark. The Chinese cubes of gold may have been the earliest money. Herodotus attributes the first use of coined gold and silver to the Lydians,° while in another passage he mentions that the first Greek coinage was at /Mgina, by Pheidon of Argos.° The second step was to certify the weight as well as the fineness of the metal, thus completing the invention. The necessity of preventing any interference with the coin after it had been stamped led to the adoption of a regular form, and, though hexagonal or octagonal coins are to be found, the received shape of a coin is that of a flat circle, each side of which is stamped, as well as in many cases the edge. By this con- trivance all persons into whose hands the coin came had a guarantee as to its quality and quantity, and we may reason- ably infer that the great improvement in coinage among the Grecian colonies was the effect, and also in some degree the cause, of the expansion of their commerce in the 6th century B.c. From Greece the art of coining spread to Italy, being introduced by the Greek colonists in Lower Italy. Since then coinage as an art has always existed in the more advanced societies. The progress of invention, however, does not end with the introduction of the art of coining, since a number of practical questions arise with reference to the best system to be adopted, which for a protracted period present great difficulties to those who are called upon to solve them. One of these, before touched on, is: What is the best shape for coins? The answer has finally been in favour of the circular, but square and oblong pieces are also to be found.' Closely allied with this is the question of the most suitable limits of size. The in- ferior limit is plainly fixed by the convenience of those using the coins. They ought not to be so small "that they can be easily lost, or can with difficulty be picked up."8 Instances of violations of this principle occur in the case of the English threepenny piece and the American one-dollar gold piece. The superior limit is a more difficult point. Its determination turns partly on the difficulty of coining large pieces, and partly on the facilities which such large coins as the American gold double-eagle give for im- proper treatment. It is an easy process to drill holes, which can be concealed by hammering, while in some cases the coin has been sawn in two, and the*~~

~~*interior gold removed, the outside surfaces being soldered together, while platinum is put in the midst to maintain the weight. As a general rule it may be laid down that no gold coin much larger than the English sovereign, or silver one at all larger than the half-crown, should be issued. Another considera- tion to be borne in mind when determining the proper size of coins is the relative amount of wear which takes place. Experience proves that large coins are less worn than small ones. " According to experiments made at the mint in 1833, the loss per cent. per annum on half-crowns is about 2s. 6d., on shillings, 4s., and on sixpences, 7s. 6d." This result has been confirmed by other inquiries. From this it follows that the larger coins are less expensive, but their size is limited by the fear of their being tampered with. Again, the character of the stamp to be impressed money: 5d mpos Tas dddAayds Towdrév 7. ouvébevTo mpds opis abrovs didévar kat apBdvew, 8 Tov xpyolmwy ard dv elxe Thy xpelav edueraxelporov mpds Td fv, olov cidypos Kal dpyupos, Kay ef 71 Towodrov erepov, Td pev mpGTov amAGs opicbev peyeGe Kat oTaOuw, 7d be TeAevratov kal xapaxrijpa émiBaddévrwv, iva dmodtan THs mEeTpHTEWS auTous.*~~

~~*> Herodotus, i. 94.*~~

~~*6 7b., vi. 127. See also for a discussion of Pheidon's coinage, Grote, Hist. of Greece, ii. pp. 319 sq. (Cabinet ed.).*~~

~~*7 An instance of the latter is the itzibw of the Japanese coinage,*~~

~~*which is an oblong flat piece of silver. 8 Jevons, Money, p. 155.*~~

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~~*is a matter requiring much care. The objects aimed at in imposing the stamp are (1) to prevent the coin being counterfeited, and (2) to prevent any of the metal being abstracted. The former of these objects can be best at- tained by making the device such as can be obtained only by powerful and expensive machinery. The most improved methods must be adopted, and the greatest pains taken to have the device perfectly executed. The latest improve- ment in the process of coining is the introduction of the knee-joint press. The latter difficulty is best obviated by using special care in marking the edges of the coins. Ancient coins were issued with unstamped edges*~~

~~*which presented no impediment to clipping, but modern coins, at least those of any size, are protected by the edge being milled or by a legend being inscribed round it. The combination of milled edges with a raised legend would be a still more effectual means of protecting the coinage from interference.*~~

~~*Another matter of importance in the process of coining is the nature and proportion of alloy to be used. The necessity for some mixture arises from the fact that gold and silver are both naturally soft, and, to obviate this, cop- per has been mixed with them, so as to produce a harder substance. The Austrian ducat is the nearest approach to purity among the principal coins of Europe, being com- posed of seventy-one parts of pure gold to one of alloy. The English gold coins are eleven-twelfths pure gold, while the silver ones are thirty-seven-fortieths pure silver. The origin of the difference is purely historical. The general gold proportion is nine-tenths gold to one-tenth alloy, while in some coinages the proportion of silver to alloy is nearly five to one, the countries composing the Latin Union having adopted that proportion in order to reduce their smaller silver coins to tokens. Copper is the usual material for alloying, but the Melbourne mint used silver for some time. It is this silvery alloy that accounts for the yellow appearance of many Australian sovereigns. They, however, are rapidly disappearing, as it is profitable to melt them down. It has been mentioned above that the wear of small coins is greater than that of large ones, and it may be added here that the wear of coins in general is an important question in connexion with their legal circula- tion. The English sovereign is believed to remain above the least current weight for from fifteen to twenty years. For the technical processes of coining, &c., reference may be made to the article Mrnr.*~~

~~*The next topic to be considered is: Who should issue money? In the earlier stages of currency the question was not so prominent, but the establishment of coining brought it forward. In Greece each city being autono- mous claimed and exercised the right of freely coining as it desired, the coins being, of course, received in other cities only at their real value. The consequences of this system * were generally beneficial. The Greek coins were usually up to their nominal value, as debased coinage was unable to circulate beyond the place of issue, and therefore ex- tremely inconvenient to the members of the state issuing it.1 Under the Roman republic private*~~

~~*persons were probably allowed to bring metal to be coined, though the coins seem generally to have had the name of one of the consuls for the year on them. Under the empire the doctrine became established that the right of coming be- longed exclusively to the emperor, and till the fall of the Western empire this was acted on. After the establish- ment of the various barbarian kingdoms, each sovereign assumed the privilege of coining, a right which in France was extended to or rather usurped by the principal nobles.? In England the king alone coined silver. At present the*~~

~~*1 See Lenormant, Contemp. Rev., February 1879. 2 Hallam, Aliddle Ages, i. pp. 205-206. 3 Lord Liverpool, Coins of the Realm, ch. v.*~~

~~*control of the operations of the mint is completely in the hands of the executive ; and, until recently, no question on theoretical grounds as to the propriety of this method has ever been raised.**~~

~~*In close connexion with the right of coining comes the consideration as to the proper persons to bear the expense of the process. At first sight the answer seems plain enough. Coins are a manufactured article quite as much as plate, and are rendered more valuable by being assayed, weighed, and certified. It appears there- fore quite proper that those who bring metal to be coined should bear the expense of the coinage, or, in other words, should give up a part of the metal to the mint, thus paying for the service rendered to them in the same manner as those sending letters pay the postal de- partment for their transmission. This course has been usually adopted. England, however, has taken a different line. In order to encourage the coining of the precious metals, no charge was made at the mint beyond that in- volved in the necessary delay in the operation ; and this is at present the case with gold. Though this arrangement was originally introduced in obedience to the prejudices of the mercantile system which regarded gold and silver as being peculiarly wealth, it may be defended on reasonable grounds: for (1) the expense of the mint is very small compared with the amount of coin turned out, and (2) the coins produced are used by the nation, and therefore their expense may quite fairly be defrayed from the national revenue. Again, as the profit on the silver coinage (owing to circumstances to be subsequently discussed) is large, that may be set off*~~

~~*against the free coinage of gold. The charge levied on coining, if confined to the expenses in- curred, is called brassage ; if it is anything above that cost it is known as seigniorage, which latter term is also used to denote both kinds of charge. The effect of seigniorage (using the term in its more extended sense) on the value of coins is to lower them, in fact, as Tooke has put it, seigniorage is always a kind of debasement, unless accom- panied with limitation.> If the same quantity of metal be in circulation there will be a greater number of coins, and therefore nominal prices will be higher. It is, however, possible that the increased prices may check the produc- tion of the precious metals, thus making the value of the metal higher than it would otherwise be. Whether this will happen or not depends on the actual conditions of production, and is incapable of being predicted. One advantage which undoubtedly results from a charge on coinage is that it checks the tendency to melt coin when exported, for where a seigniorage is imposed coins are more valuable than the uncoined metal by the amount of the seigniorage. It therefore becomes the interest of the holder not to melt down the coins, as in doing so he loses the extra value given by the coining. Another factor in the expense of currency is the loss which arises from the wear and tear which money undergoes, and the consequent cost of replacing the light or missing pieces. The last and largest item is the interest on the total amount of money in use. To take the case of England, the value of the metallic currency is estimated at about £130,000,000. The interest*~~

~~*4 'We may take as an example the function (which is a monopoly too) of coining money. . . . Noone, even of those most jealous of state interference, has objected to this as an improper exercise of the powers of government." Mill, Princ., B. v. ch.1,§2. Butsee, for objections, H. Spencer, Social Statics, pp. 400-402, and J, L. Shadwell, System of Pol. Econ., p. 264.*~~

~~*5 Tooke, Hist. of Prices, i. 121 sg. It is impossible, however, to agree with Tooke that uncoined bullion would be higher in value than coin when a seigniorage is charged on the latter. He seems to ignore the fact that the value of the precious metals is partly depend- ent on their use as currency, and that the seigniorage represents a tax levied on the extra value resulting from the use of the metal as money.*~~

~~on this at 5 per cent. wouldamount to £6,500,000. This ap- parently heavy charge is justified by the fact that it is desir- able to have a currency possessing, or at least based on, value. The expense of a metallic currency is, however, combined with its weight, a strong reason for the great developments of representative money and credit in modern times, with the result that gold and silver are hardly ever used in large domestic transactions, all such payments being made by cheques, which are cleared off against one another. For a full account of the modern organization of credit, see the article BANKING.~~

~~6. HIistorical Outline of Depreciations.—The earliest sys- tems of currency whose progressive debasements it is possible in any degree to trace are those of the various Greek states, though even here many details remain in obscurity. The Roman currency system is comparatively better known ; while for the medizval currencies from the time of Charle- magne (800 A.D.) elaborate materials are available, which naturally increase in bulk and precision as we approach~~

~~more modern times. he general treatment of the history~~

~~of coins belongs to Numismatics (q.v.); but the history of monetary depreciations is important in connexion with the theory of money as illustrating the value of sound economic knowledge.~~

~~Until coinage became a state function a continued debase- ment was impossible, since it was open td any one to refuse the money offered in payment if it was not up to the proper standard. When, however, coinage became a function of government strong motives for debasement soon presented themselves. (1) The cost of coinage falling on the state, and being generally defrayed by a seigniorage, led to the idea that this seigniorage could be made more profitable by making it larger, while the existence of any deduction veiled the injustice of a charge exceeding the expense incurred in the operation of coming. (2) The position of most Governments was that of debtors, and as a debasement favoured all debtors at the expense of all creditors it was only natural that rulers, ignorant of the ultimately ruinous effects of a series of debasements, should seek to relieve~~

~~*themselves without exciting the odium incurred by the levy of heavy taxes. A more pressing case than the foregoing, and one where more justification exists, is that of a severe social crisis, when large numbers of the community are burdened with debt, and a depreciation of the monetary standard seems the simplest mode of escaping from so critical a situation. Whatever may be the inducements to enter on the perilous course of tampering with the monetary standard, a long experience has incontestably proved its disastrous effects. One of the great causes of the weakness of France during the "' hundred years' war" was the extremely debased state of its currency, and the dread of further reductions in the value of the coins.} Lord Macaulay has given a graphic picture of the evils which England suffered from its depreciated silver currency towards the end of the 17th century.2. And a debasement brought about by design possesses a further element of evil by creating a belief that similar devices will soon be again resorted to. So manifest are the evils that result froin debasement that it may be reasonably hoped that all civil- ized Governments have abandoned the practice for ever ; though, unfortunately, similar bad effects are produced by the over-issue of inconvertible paper currencies, and this is still an expedient adopted under the pressure of difficulties. "It is proper to observe that coins may be debased in three different ways—(1) by diminishing the quantity or weight of the metal of a certain standard of which any coin of a given denomination is made; (2) by raising the nominal value of coins of a given weight and made of a*~~

~~*1 J, E. T. Rogers, Historical Gleanings, i. p. 97. 2 TWist. of Eng., ch. xxi.*~~

~~*metal of a certain standard, that is, by making them current or legal tender at a higher rate than that at which they passed before ; (3) by lowering the standard or fineness of the metal of which coins of a given weight and denomina- tion are made, that is, by diminishing the quantity of pure metal and proportionally increasing the quantity of alloy." The last of these methods is the most dangerous, since the detection of it is more difficult, as it is so much easier to discover the weight than the fineness of the metal in a coin ; but all of them produce the same results and are adopted for the same reasons.*~~

~~*Greek Depreciations.—The first debasement of coinage known tous on good evidence is that of the Athenian coinage by Solon in 594 B.c.4 In order to obviate the severe distress of that period in Attica, he reduced the quantity of silver in the coins more than 25 per cent., so that 138 new drachme (the standard Athenian coin) were only equiva- lent to 100 pieces of the older coinage. This proceeding was perhaps justified by the critical state of things previously existing, and was a decided success. It is probable that another debasement of the gold coinage took place at Athens in 408 B.c. during the strain of the Peloponnesian War, though doubts have been cast on the reality of this debasement.5 It may, however, be said that generally the Greek cities fairly maintained the standard of money, though some states were notorious for dishonesty in this respect. The existence of an electrum coinage is no proof of a tendency to debasement, since it was regarded as a separate substance, and issued at its cost value, allowing for the expense of coining. As remarked before, this comparative honesty in relation to the coinage may be partly explained by the small extent of the Greek states, so that a debased coinage was unable to circulate beyond the boundaries of the issuing state. The keen perceptions of the more advanced Greek thinkers and their teachings on this subject may have also con- tributed to the same result.®*~~

~~*Roman Depreciations.—The earliest Roman coinage was com- posed of an alloy of copper (#s), and this continued unaltered up to the time of the First Punic War. Silver was introduced in 269 B.c., the proportion between it and the older copper being fixed at 250:1.? The copper currency was first debased during the Punic wars at the most critical period of the Hannibalic inva- sion—"the Romans had debased the silver and copper coin, raised the legal value of the silver currency more than a third, and issued a gold coinage far above the value of the metal."® Soon after this period the copper money, whose successive debasements are recorded by Pliny,® seems to have been reduced to the position of a sub- sidiary currency, so that it is not really a case of debasement of the standard. The silver denarius which at first was yd of a Roman pound, had been debased to gyth of a pound. In 91 B.c. a number of plated denarii were issued at the rate of one for every seven silver pieces issued. This proceeding, which was simply for political purposes, was proposed by Drusus, but in 84 B.c. a proposal for calling in these plated pieces was passed, and was extremely popular. It*~~

~~*is probable that a slight debasement took place under Sulla, and one of the Cornelian laws seems to state the so-called fiat theory of money.!° The denarius was lowered under Nero.to gisth of a pound, while the later period of the empire is a scene of continual tampering with the currency. The gold awrews was at first z;th of a pound, but at the time of Augustus it was only ath, while under Constantine it had come to be only 7yd. The com- parison of Hellenic with Roman monetary history seems to show that a considerable number of small states, all issuing coins, are less likely to meddle with the standard than the mint of a single large empire. It also proves the value of an acquaintance with monetary theory, if we can judge by contrasting the views of the — Greek thinkers with those of the Roman lawyers." A few words of caution may here be added against the danger of a careless com- parison of values, as expressed in ancient or even medizval money with those of modern times. It is extremely hard to accept the*~~

~~*3 Lord Liverpool, Coins of the Realm, p. 37.*~~

~~*4 Grote, Hist. of Greece, part ii. ch. 11.*~~

~~*5 7b., vol. iii. p. 116, note 1.*~~

~~*6 For a full discussion of this point, see Lenormant in Contemp. Rev., February 1879.*~~

~~*7 Mommsen, Hist. of Rom. (Eng. trans.), i. p. 458.*~~

~~*3 70., tgp. do.*~~

~~*SH, N., xxx. Cli Los*~~

~~*10 Mommsen, iii. pp. 418-414 ; Lenormant, op. cit.*~~

~~*11 Compare, for instance, the passage previously cited from Aristotle with the following :—" Quia non semper nec facile concurrebat ut, cum tu haberes quod ego desiderarem, invicem haberem quod tu accipere velles, electa materia est cujus publica ac perpetua estimatio difficul- tatibus permutationum equalitate quantitatis subveniret; eaque*~~

~~*"materia forma publica percussa usum dominiumque non tam ex*~~

~~*substantia prebet quam ex quantitate."'—Paulus, Dig., xviii. 1, 1.*~~

~~*MON EY*~~

~~*prices given by any ancient writer, since the varying factors neces- sary to be estimated are so many, viz., (1) the weight of the coin, (2) its purity, (8) the value of the monetary metal at the time, (4) the value of the commodity sold in relation to other things, (5) the question whether the commodity was in its normal state as regards supply and demand ; to all these may be added (6) the difficulty of determining whether the figures have not been altered.) After the fall of the Western empire, the various barbarian sove- reigns adopted silver as their principal coinage, combined with the greatest diversity in the systems adopted. On the revival of the empire under Charlemagne an effort was made by him to estab- lish a general system of currency, based on the silver pound as a unit, and thus corresponding to the unit of weight. This system was introduced into England, and thence into Scotland, but the rapid decay of the Carlovingian empire prevented any uniformity being: preserved in these different countries, while the different debasements in each produced widely divergent systems, which will require separate notice,*~~

~~*English Depreciations.—The first dcbasement undergone by the English silver coinage was in 1300, when Edward I. reduced the amount of metal in the coins by 14? per cent., or, in other words, 20 shillings and 3 pence were coined out of the Tower pound instead of 20 shillings as previously.2 This was the prelude to a series of changes which were carried out during the next three cen- turies, and which terminated in 1600, when the pound troy of silver was coined into 62 shillings ; since that time the silver coinage has not been debased, the reduction carried out in 1816, by which 66 shillings were coined from the troy pound, being accompanied by a limitation of its use in discharging debts to a maximum amount of £2, as well as by the abolition of the public right of coining silver at the mint. The period extending from 34th Henry VIII. to 6th Edward VI. (1548-1552) has been specially noted by Lord Liverpool as a time of peculiar interference with the fineness of the metal. The old proportion of 11 oz. 2 dwts. of metal to 18 dwts. of alloy, was altered to 10 oz. of metal per pound, then to 6 oz. or one-*~~

~~*half, 4 oz. or one-third, and finally in 1551 to 3 oz. of pure metal and 9 oz. of alloy. A tendency to reformation began under Edward VI., and was finally carried out under Eliza- beth in the recoinage of 1560, which has been fully described by Mr Froude.* Various proposals to depreciate the silver currency have been made since then, and one of these, as above mentioned, was accepted in 1600. The most remarkable of the unsuccessful schemes for debasing the standard was that of Lowndes, which was advanced in 1695, when the discussions preparatory to the recoinage of 1696 were being carried on. Lowndes's plan was to coin the pound troy of standard silver into 77s. 6d., thus debas- ing it 25 per cent. He was resisted by Locke, who, in his Further Considerations concerning Raising the Value of Money, contri- buted materially to the development of monetary theory; and the recoinage was, mainly in consequence of his efforts, in combina- tion with those of Newton and Montague, based on thoroughly sound principles.® The first English gold coinage, so far as has been clearly proved, was that of 1257, in the reign of Henry III., when a small number of gold pennies were coined at the ratio of 10 to 1 to the existing silver coins. Previously to this date the need of gold for business transactions could not have been felt, as the commerce of the country was necessarily limited. It is prob- able that for the few transactions of foreign trade a species of gold coins issued by the Greek emperors at Constantinople, and thence called byzants, were used.6 Another gold coin, known as a florence, from the place where it was first coined, was also used after 1250. The regular series of English gold coinage begins in 1344, when Edward ITI. coined, in imitation of the foreign coin just mentioned, a large number of florins at the rate of 50 to the Tower pound. The gold coinage was, however, for a long period a secondary part of the monetary system, and suffered a series of changes, the last of which took place in 1717.7 The present English coinage system is regulated by the Coinage Act of 1870,8 which amends and consolidates previous Acts on the subject. The schedule to that Act, which is reproduced at p. 484 of the present volume, gives full information as to existing coins, their weight, fineness, "remedy," &c.*~~

~~*Scotch Depreciations.—The coinage of Scotland was derived from the primitive Carlovingian system through the medium of England, and for a long period remained the same as at first. The pressure*~~

~~*1 As to the various elements requisite for a proper estimate of medixval prices, see Cibrario, Della Economia Politica del Medio Evo, 1. iii. c. 8.*~~

~~*2 The Tower pound, which was three-quarters of an oz. troy less than the troy pound, was used in England until the 18th of Henry VIII. (1527), when it was replaced by the troy weight. This should be always remembered in con- sidering the precise amount of depreciation at any given tiie.*~~

~~*3 Coins of the Realm, ch. xiii. 4 Hist. of Eng., vii. p. 2.*~~

~~*5 Macaulay's account of this recoinage, which is written in his typical man- ner, has made this episode of English monetary history very generally known.*~~

~~*6 Lord Liverpool, Coins of the Realm, p. 47.*~~

~~*7 The third great English recoinage was that of the gold coin, which took place in 1773-1775. It is commonly known as the recoinage of 1774,*~~

~~*8 38 & 84 Vic. c. 10.*~~

~~*727*~~

~~*under which the resources of Scotland suffered during the constant wars with England, as well as perhaps the example of their close ally France, led the Scottish sovereigns to debase their coins out of all proportion to the English system. This was the reason for the prohibition of Scotch coins as currency by tale in England, the variation in course of time being so great that in 1600 the pound of silver, which coutained about three pounds sterling English, was made into thirty-six pounds Scotch, the latter being thus twelve times as much debased. After the union of the crowns in 1603 no steps were taken to assimilate the two systems, which con- tinued as before till the complete union of the two countries in 1707. At the latter date a complete recoinage on the basis of the English system was carried out, thus rendering the coinage of both coun- tries exactly similar. This most valuable reform was at first viewed with suspicion by the Scotch people, and a large amount of the old Scotch currency was hoarded or exported.*~~

Lrish Depreciations.—No coined money existed in Ireland before the English invasion in 1170. The English colony, as a matter of course, used the same coinage as the mother-country, but on several occasions inferior money was introduced, as being good enough for a subject country. At the recoinage of 1560 it was pro- posed to send the bad coins that were called in to Treland, but to this Elizabeth refused to assent. From 1689 to 1825 the nominal value of the coinage was 84 per cent. higher in Ireland than in England. In the latter year Irish money was reduced to the English standard,® from which time the United Kingdom has pos- sessed a perfectly uniform system of metallic money.

French Deprecciations.—The monetary system established by Charlemagne throughout his dominions soon disappeared in Italy and the German provinces. It continued to exist in France proper. The general state of confusion, however, and the weakness of the central authority, led to local issues by the various feudal lords. " At the accession of Hugh Capet as many as a hundred and fifty are said to have exercised this power." !° The increase of the power of the Capetian kings enabled them to restrict this freedom of coinage, and to reserve to themselves this profitable function, the seigniorage on the process of coining being a special branch of the royal revenue. They were unfortunately not inclined to confine their gains to this legitimate source. 'The French coinage was recklessly debased during the many centuries from Philip I. (ob. 1108) to Louis XV. (0b. 1774). The management of fle minut under Louis IX. was always regarded as a model for imitation,! but even in his time the livre, originally a pound, was debased to less than one-fourth of its primitive valuc. The dealings with the currency were still more unscrupulous during the protracted wars with England, the result being that at the accession of Louis XI. (1461), when the English had been finally expelled from France, the livre was only about one-fifteenth of its original value. Nor did the depreciation of the currency rest here. The period of something over a century, extending from 1497 to 1602, presents a remarkable series of changes in a downward direction, no less than nineteen depreciations having taken place, many of them consisting of changes in the fineness of the metal.!? Thereis in this respect a remarkable analogy between this epoch ot French coinage and the English period from 1543 to 1552.

~~*The history of French depreciations did not terminate, as that of the English ones did, with the close of the 16th century ; under Louis XIV. the livre was only one-half of what it had been under Henry IV. The final result was that in 1789 the livre had come to be only one seyenty-eighth of its weight in the time of Charle- magne. At the Revolution it was converted into the franc, at the rate of 81 livres to 80 francs.43 It is not, however, to be supposed that the changes in the French currency were always towards debasement. The terrible evils arising from the debased coinage led to a general outcry, which in some cases was so strong as to force the king of the time to reform the monetary standard ; one striking instance occurred in the reign of Philip IV.,!4 whose dealings with the currency led to his receiving the epithet of "le faux monnoyeur."*~~

~~*Depreciations in other Countries.—The very brief notice of the depreciations in the originally uniform currencies of England and France which has just been given is sufficient to establish the general tendency, and throws light enough on the resulting conse- quences ; a similar course was followed in the other countries of Europe, but the details are too unconnected to be conveniently pre- sented. A few facts will suffice. Thus, the German forin "was originally a gold coin of the value of about 10 shillings of our present money; it is now become a silver coin of the value of*~~

~~*9 A survival of this older system is to be found in many charges on Irish lands, which are reduced to English money by deducting one-thirteenth from the nominal amount.*~~

~~*10 Hallain, Middle Ages, i. p. 206.*~~

~~*ll Stephen, Lectures on French History, i. p. 459. .*~~

~~*12 Tooke and Newmarch, Hist. of Prices, vol. vi. p. 374. The views there given are based on those of M. Levasseur, who had specially studied the question.—*~~

~~*13 The silver franc was made to weigh exactly 5 grammes.*~~

~~*14 Stephen, Lect. on French Hist., i. p. 482.*~~

~~only 20d."1 Similar depreciations took place in the cases of the Spanish maravedi and the Portuguese ret. At the present these coins are so subordinate, where they have not been abolished, as to possess little practical interest.~~

~~It is well to notice before concluding the question of depreciations that it is the poorer classes who especially suffer from a change in the coinage. The reasons of this are very plain, for from their ignorance they are less able to understand the nature of the alteration, and, even if it were not so, the absence of available resources places them at a disadvantage in comparison with others. Masters and dealers are quick to discount—so to speak—the nominal value of the depreciated money, and prices are much more speedily adjusted to the new state than wages, so that it may be confidently asserted that a debased coinage is especially injurious to the more helpless classes of society. The same remark applies to an over-issue of inconvertible paper."~~

~~7, Economic Aspects of the Production of the Precious Metals.—In considering various monetary questions it is essential to have some acquaintance with the economic aspects of the production of gold and silver. The technical matters connected with the processes of preparing those metals for use are to be found in the articles GotD and Stiver (q.v.). The first point to which we will here direct attention is the field over which production extends. At one time or other these two metals have been found in every continent. Asia Minor in early times possessed its gold fields, or rather auriferous sands.' Ceylon also undoubtedly contained gold mines. China and India both produced silver to a considerable extent. Egyptian remains show that gold was commonly known in that country, probably procured from Nubia and Abyssinia. On the opposite side of Africa, too, the name of Gold Coast shows that that metal was thence exported. Neither Asia nor Africa, however, has been the main contributor to the stock of money in more modern times. The mines of Laurium in Attica were a source of supply to the Greeks, and were worked as a state monopoly. At an earlier date the Babylonian and Assyrian empires had each large accumulated stores of gold. The Phoenician importations of gold from the Red Sea coasts~~

~~(Ophir) are known from Scripture. The Persian kings from the time of Darius levied tribute on all their provinces,—in gold from India, in silver from the remaining districts; and the larger part of this was stored up in the royal treasuries.° This tendency of sovereigns to accumulate had all through ancient history important effects on the economic structure of society. At present it is quite natural to assume that the materials of money are distributed by means of international trade, and tend to keep at an equal level all the world over,—-an assumption which is in general well grounded, though an important exception exists. Ancient history presents a widely different set of forces in operation. Gold and silver were produced by slaves under the pressure of fear, and were drawn towards the ruling parts of the great empires ; in a word, war, not commerce, was the distribut- ing agency. From this condition of affairs it is easy to see that whatever may be the reasons for assigning to cost of production a potent influence over the value of money in modern times (and grounds have been already advanced for the belief that this influence has been exaggerated), no such reasons then existed. The production of the precious~~

~~1 Lord Liverpool, Coins of the Realm, p. 125.~~

~~2 Readers requiring full details on the subject of the various currency changes may consult Lenormant, Monnaie dans U Antiquité, for ancient times ; Lord Liverpool, Coins of the Realm, for England ; and the works of Le Blanc and Paucton for France.~~

~~3 The Pactolus in Lydia was widely famed for its " golden sands."~~

~~4 1 Kings ix. 28.~~

~~5 See Herodotus, iii. c. 96; also Grote, Hist.,iv. pp. 162 sq.~~

~~metals was carried on, as the great buildings and other works of those periods, on non-economic grounds, and therefore produced quite different effects. The whole his- tory of the Persian monarchy to its overthrow by Alexander (330 3.c.) shows that the mass of the precious metals hoarded up continued constantly to increase. On the cap- ture of Persepolis by the~~

~~*Grecian army an enormous treasure was found there, some estimates placing it as high as 120,000 talents of gold and silver (£27,600,000).° All the temples, too, were receptacles for the precious metals, so that the stock accumulated at about 300 B.c. must have been very great. The only causes which tended to diminish the store were the losses arising from wars, when the various treasuries were liable to be plundered and their contents dis- persed." There was therefore a more unequal distribution of the material of money than at present. The growth of the Roman dominion led to important results, since under their rule the Spanish mines were developed and became a leading. source of supply. The great masses of treasure set towards Rome, so that it became the monetary centre of the world. The overthrow of the Republican government and the peace which followed also affected the conditions of pro- duction. 'The inefficiency of the Roman administration made it advantageous to let out the mines to farmers, who worked them in a wasteful and improvident manner, while the supply of slaves was reduced, thus depriving the lessees of their principal agency for carrying on production. The result was a continuous decline in the store of money. Mr Jacob has made an attempt to estimate the amount at the death of Augustus (14 a.p.), and he arrives at the conclu- sion that it was £358,000,000.8 Without placing much value on this necessarily conjectural estimate, it is safe to assume that this period marked the highest point of accu- mulation.*~~

~~*The succeeding centuries exhibit a steady decline, though it is of course impossible to attach any value to even the most carefully-guarded numerical estimates. The pheno- menon which has since so often attracted notice—the drain of the precious metals to the East—began at this time, and was a subject of complaint to the Roman writers," while the stock of gold and silver being thrown into more general circulation suffered more from abrasion, and was more likely to be lost than when stored up in the royal treasure-houses and temples. These causes tended to depress the scale of prices, while the barbarian inva- sions produced a strong effect on the supply by drawing off the mining population and damaging the various erec- tions used for working the mines. The conjectural esti- mate is, that about 800 a.p. the total supply had been reduced to £33,000,000 (or about one-eleventh of what it had been at the death of Augustus).!° A new period in the history of gold and silver production may be fixed at this date. The*~~

Moors, now firmly established in Spain, began to reopen the mines in that country which had been allowed to fall into disuse. Other European mines also were opened. The international system of currency based on the pound of silver as a unit which was introduced by Charlemagne must have tended to economize the wear of the metals. We may therefore conclude that from this date (800 .D.) the supply was sufficient to coun-

6 Grote, xi. p. 499, note 3.

7 A commercial agency which existed for the distribution of gold and silver was the Pheenician system of trading, which extended all over the Mediterranean.

ania Production and Consumption of the Precious Metals, i. p. —

9 See Pliny, HW. WN., xii. c. 18. 10 Jacob, i. p. 237.

11 It was at this time that the most productive European mines were discovered, namely, those of Saxony and the Harz Mountains, as well as the Austrian mines, which were the chief sources of supply during the Middle Ages.

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teract the loss by wear and exportation,! and accordingly regard the metallic supply as fixed in amount until the next change in the conditions of production, which was the result of the discovery of America. Though 1492 is the date of the first landing, yet for some time no im- portant additions were made to the supply of money. The conquest of Mexico (1519) gave opportunities of working the silver mines of that country, while the first mines of Chili and Peru were almost simultaneously discovered, and in 1545 those of Potosi were laid open. From this latter date we may regard the American supply

TABLE I.—Estimated production of gold and silver from 1498.

a . Value in Millions | Ratio of n Kilos. jzvatlo O Perioa, | No- of Jationetnals of Francs. i Value of ete Years. / Gold to Gold. Silver. Gold.

~~Silver. | Silver. 1493-1520 28 162,400 1,316,000 560 292 11°3~~

~~1521-1544 24 171,800 2,165,000 592 481 11:2~~

~~1545-1580 36 273,000 10,976,000 940 2,439 11°5 1581-1600 20 147,600 8,378,000 508 1,862 11°9 1601-1620 20 170,400 8,458, 000 587 1,880 13°0 1621-1640 20 166,000 7,872,000 572 1,749 13°4 1641-1660 20 175,400 7,326,000 604 1,628 13°8 1661-1680 20 185,200 6,740,000 638 1,498 14°7 1681-1700 20 215,300 6,838,000 742 1,520 15°0 1701-1720 20 256,400 7,112,000 883 1,580 15°2~~

~~1721-1740 20 381,600 8,624,000 1,314 1,916 151~~

~~1741-1760 | 20 492, 200 10,663,000 1,695 2,370 14°8~~

~~1761-1780 20 414,100 13,055,000 1,426 2,900 14‘8 1781-1800 20 355,800 17,581,000 1,226 3,906 15:1~~

~~1801-1810 | 10 177,800 8,942,000 612 1,987 15°6 1811~1820 10 114,400 5, 408,000 394 1,202 15°5 1821-1830 | 10 142,200 4,606,000 490 1,023 158 1831-1840 10 202,900 5,964,000 699 1,325 15°7 1841-1850 10 547,600 7,804, 000 1,886 1,734 15°8 1851-1855 5 987,600 4,431,000 3,402 985 15°4 1856-1860 5 1,030,000 4,525,000 3,549 1,006 15°3 1861-1865 a 925,600 5,506,000 3,188 1,223 15°4~~

~~1866-1870 5 959,500 6,695,000 3,305 1,488 156~~

~~1871-1875 5 853,400 9,847,000 2,940 2,188 16°0 1876 1 171,700 2,365,000 591°5 525°5} 17°8 1877 i 182,800 2,428,000 629°8 539°5| 17°19 1878 1 183,700 2,603,000 632°6 578°3| 17°96 1879 1 156,900 2,557,000 540°3 568°2| 18°39 1876-1879 4 695, 100 9,953,000 2,394 2,211 17°40 1493-1850 358 4,752,100 149,828,000 16,368 33,292 14°05 1851-1879 | 29 | 5,451,200 40,957,000 | 18,778 9,101 15°85 1493-1879 | 387 | 10,203,300 190,785,000 35, 146 42,393 3~~

~~as an influential factor in the matter,? and look upon the stock of money as increasing. The annual addition to the store of money has been estimated as £2,100,000 for the period from 1545 to 1600. At this date the Brazilian~~

~~supply began. The course of distribution of these fresh masses of the precious metals is an interesting point, which has been studied by Mr Cliffe Leslie.2 The flow of the new supplies was first towards Spain and Portugal, and from thence they passed to the larger commercial centres of the other European countries, the effect being that prices were raised in and about the chief towns, while the value of money in the country districts remained unaltered. The additions to the supply of both gold and silver during the two centuries 1600-1800 continued to be very consider- able ; but, if Adam Smith's view be correct, the full effect on prices was produced by 1640,' and the increased amount of money was from that time counterbalanced by the wider extension of trade.6 At the commencement of this cen- tury, the annual production of gold has been estimated as being from £2,500,000 to £3,000,000. The year 1809 seems to mark an epoch in the production of these metals, since the outbreak of the revolts of the various Spanish~~

~~1 Jacob, i. p, 311.~~

~~2 Adam Smith assumes 1570 as the date when prices were affected in England, Wealth of Nations, p. 88. Humboldt estimated the total production (1492-1545) as being about £17,000,000; but see Table I., which contains Dr Sdtbeer's estimates, based on the best available data.~~

~~3 Essays in Pol. and Mor. Phil., Essay xx.~~

~~4 Wealth of Nations, p. 88.~~

~~5 The total production is roughly computed at over £1,200,000,000 for the two centuries 1600-1800; but see Table I. for more precise estimates,~~

~~dependencies in South America tended to check the usual supply from those countries, and a marked increase in the value of money was the consequence. During the period 1809-1849 the value of gold and silver rose to about two and a half times their former level, notwithstanding fresh discoveries in Asiatic Russia.® The annual yield in 1849 was estimated at £8,000,000. The next important date for our present purpose is the year 1848, when the Californian mines were opened, while in 1851 the~~

~~*Australian discoveries took place. By these events an enormous mass of gold was added to the world's supply. The most careful estimates fix the addition during the years 1851-1871 at £500,000,000, or an amount nearly equal to the former stock in existence. The problems raised by this pheno- menon have received the most careful study by several distinguished economists,' to whose writings those desiring more extensive information may refer. The main features of interest may be briefly summed up. (1) The additional supply was almost entirely of gold, thus tending to produce a distinction between the two principal monetary metals and an alteration in the currency of bimetallic countries. Under this influence France, from being a silver-using, became a gold-using, country. (2) The contempora- neous development of the Continental railway systems, and the partial adoption of free trade, with the con- sequent facilities for freer circulation of commodities, led to the course of distribution being different from that of the 16th century. The more backward districts were the principal gainers, and a more general equalization of prices combined with a slight elevation in value was the outcome. (3) The increased supply of gold rendered a general currency reform possible, and made the use of a gold monometallic standard appear feasible. The movements for currency reform, as will be seen, all arose after these discoveries. (4) The change in the value of money, which may for the period 1849-1869 be fixed at 20 per cent., enabled a general increase of wages to be carried out, thus improving the condition of the classes living on manual labour. It may be added that the difficulty of tracing the effects of this great addition to the money stock is a most striking proof of the complexity of modern economic development. (5) The last point to be noticed is the very small influence exercised on the value of silver by the new gold.8 Hardly had the gold discoveries of 1848-1851 ceased to produce a decided effect when new silver mines of unusual fertility came into working. During the period immediately succeeding the gold discoveries the produc- tion of silver remained at an annual amount of from £8,000,000 to £9,000,000. This amount suddenly, about 1870, increased to £15,000,000,9 and remained at that amount for the next five years. More than half of the supply came from new mines opened in Nevada. This increased supply was accompanied by a marked depreciation in the gold price of silver, though the prices of commodities in countries having a silver standard did not rise. The result of the close investigations to which all aspects of the question were subjected was to show that the*~~

~~*increased production of silver was only a minor element in causing its depreciation. The policy pursued by various states—viz., (1) Germany and the Scandinavian*~~

~~*6 The Russian supply became important after 1823.*~~

~~*? The following may be specially consulted :—Chevalier, Depreciation of Gold (trans. by Cobden); Tooke and Newmarch, Hist. of Prices, vol. vi., pp. 135-236 (Part vii.) ; article "Precious Metals," Hncy. Brit. (8th Ed.); J. E. Cairnes, Essays in Pol. Econ., pp. 1-165; T. E. C. Leslie, Essays, pp. 264-374 ; W. S. Jevons, Serious Fall in the Value of Gold.*~~

~~*8 The price of silver in London rose from 593d. per oz. to 624d. per oz., or 22d. per oz.—that is, only 3 to 4 per cent.*~~

~~*9 See Report of Select Committee on the Silver Question, 1876 ; and for another estimate see Table I.*~~

~~*XVI.—92*~~

~~*730*~~

~~*states in adopting a single gold standard, (2) the*~~

~~*countries composing the Latin Union in limiting the*~~

~~*comage of silver, (3) the Indian Government by adopting a new method of drawing bills—proved to be the really influential causes for the decline silver as contrasted with gold.'*~~

~~*Before closing this notice of the economical aspects of gold and silver production, the consumption of those metals must be con- sidered. It may be classed roughly under three heads, viz., (1) their use as merchandise, (2) their use as money, (3) the export to the East. With regard to the first of these, while it is impossible to give precise data, it may be still held with some confidence that the demand for this purpose tends, after society has passed a certain not very advanced stage, to decline. The desire for personal adorn- ment is with most civilized persons not a strong one. It is,*~~

~~*so far as it exists, gratified by other articles than those made of silver or gold. Their use as manufactured goods continues to be large, and is one of the principal forms of use at present. The second head with which we have here to deal is the one by which prices are affected. The laws regulating the value of the metals as money have been considered above, p. 721, the primary one being "that the value of money varies inversely as its quantity multiplied by its efficiency," though this proposition needs limitation and explana- tion. Under the third head a remarkable exception occurs to the general theory of the tendency to equal diffusion of the precious metals. For a period extending over nearly 2000 years the move- ment of silver from West to East has been noticed. Humboldt has made the ingenious remark that these metals move in the opposite direction to civilization, and history bears out his view. During the Middle Ages the chief Eastern products used in Europe were silks and spices, and to pay for these commodities silver was sent from Europe. The discovery of the passage round the Cape of Good Hope increased the Eastern trade, and added to the drain of silver. Humboldt and Sétbeer have given copious details. In more recent times the flow has continued, the amount of silver which passed to Asia by the Isthmus of Suez during the twelve years from 1851 to 1862 being £110,000,000.? There are two points requiring some further notice with reference to the form and the reason for this drain. Silver is the metal which is exported from Europe, since gold is not used for currency purposes in the East, and even as merchandise silver possesses a higher relative value than it does in Europe. Those European countries that had a double standard were the natural source of supply for exportation, their silver currency being replaced by gold. 'The unceasing drain of the precious metals to the East may further be explained by the fact that the greater part of the new metal is used for ornamental and not for currency purposes, and thus the demand is not checked by a rise of prices, Another reason, not generally noticed, is that Eastern prices are very much influenced by custom, and thus do not depend on supply and demand. But it is this tendency of an increased quantity of money to raise prices which forms the basis of the economical theory of the distribution of the precious metals.? This explains the otherwise unaccountable phenomenon of a con- tinual drain of the money material towards those countries where custom has remained most powerful in regard to commercial trans- onuen® or, in other words, the backward countries of India and*~~

~~*ina.*~~

~~*One of the technical features of the production of the precious metals may sometimes produce remarkable economic effects,— namely, the fact that gold is generally found near the surface, while silver is obtained by deep mining. It follows from this that the production of the former metal depends more on accidental circum- stances, while the production of silver is affected chiefly by the state of mechanical skill. In the Nevada mines gold and silver are found together, and their value in a given mass is nearly equal.*~~

~~*8. Miscellaneous Questions regarding Metallic Money.— The recent discussions of matters relating to currency, and the increased intercourse among the more advanced nations, have led to the raising of some questions with regard to the proper constitution of monetary systems. Each country possessing any claim to enlightenment has directed its attention to its own monetary arrangements, and compared them with those of others, while the effect which the cur- rency system of any nation exercises on its neighbours leads to the exciting of a lively interest in its monetary legisla- tion. The principal problems may be summed up under*~~

~~*1 See, for details, the Report of Mr Gosehen's Committee, 1876, and W. Bagehot, Papers on the Depreciation of Silver. ge A. Sétbeer in the Vierteljahrschr. fiir Volkswirthsch., iii.,*~~

~~*3 See Ricardo, Principles of Pol. Econ., p. 79 (ed. M'Culloch).*~~

~~*in the value of*~~

~~*MONBY*~~

~~*three heads: (1) The proper standard to use, the discussion of which in practice turns on the comparative merits of a single standard of gold or silver and of a double standard of gold and silver at a fixed ratio; (2) the system of sub- dividing the currency, which is generally discussed under the title of proposals for decimal coinage ; (3) proposals made in many quarters to assimilate the various currency systems of the world. These take one of two forms. It is either desired that a group of nations shall assimilate*~~

~~*their currencies, in which case the coinage may be called an international one; or a wider view is taken, and a single system is advocated for all states. This may be styled universal coinage. 'The question of the proper standard may be deferred for the present, as it is of a more complex nature than the others. Before discussing even the simpler of these questions it is desirable to state some elementary facts involved in all such points. Every currency system must be based on a standard unit of value which consists of a "fixed quantity of some concrete substance defined by reference to the units of weight or space." Thus the English unit is the pound, which consists of a definite quantity of gold (12327447 grs. standard fineness), while the French unit is the franc (composed of 5 grammes of silver soths fine). It is not, however, necessary that the standard unit shall be a coin. All that is needful is that the current coins shall be multiples or submultiples of the unit, or at all events easily reducible to it. The Portu- guese rei is too small to be coined, and the pound of silver which formed the unit of the early French and English currency was too large. Distinct from both the actual coins and the unit of value is the money of account, though in practice it is usually identical with one of them. In Russia in early times the 7ouble was an imaginary money of account not coined, while the copper copeck was the unit of value. Another distinction must be pointed out, namely, that between standard and token money, the former being of the same value as the metal it is made of, while the latter is rated at a nominal value higher than that of its material. The silver and copper coins in England and the smaller silver coins in the Latin Union are merely tokens, being in the case of the English silver coins about 30 per cent. below their nominal value. The French coins are of inferior fineness (835 per 1000). Token coins are only admissible in small payments, as otherwise—in accordance with an ele- mentary principle to be presently explained—the standard coins would be driven out of circulation. The maximum amount in payment for which they are legal tender is in England 40s. One of the functions of money being to afford a standard for estimating deferred payments,* it is generally used as the means of discharging obligations when they become due, and in this aspect is styled legal tender. The principal coinage of any country is legal tender to an unlimited amount, and, when offered, discharges any pecuniary obligation. It is only the standard coinage which possesses this property, or rather the standard coinage is that which does possess it.*~~

~~*In discussing monetary questions it is also important to remember that a metallic currency has to circulate among the most diverse classes of society, and must be suited to the wants, and even to the prejudices, of the population using it. Many curious instances of the preference of a community for some particular coin could be given. The Austrian Maria Theresa dollar is a special favourite on the coast of Africa, and is still coined exactly as it was in 1780. The inhabitants of California refused to accept the green- backs issued during the American civil war, and conse- quently gold was always used in payments in that State. Many apparently well-devised reforms have miscarried*~~

~~*4 See p. 720, above.*~~

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~~*owing to the habits of the people not having been attended to. Sonie writers have, however, misconceived the prin- ciples of currency and extended this influence to cases where it does not apply. Thus it has been sought to explain the adoption of gold as the principal English coinage after 1696 by assuming that the English deliberately preferred that metal.' The fact of different nations possessing dif- ferent currencies, as the prevalence of gold in England and of silver in France during the 18th century, is to be other- wise accounted for. The great mass of a population, it is true, take and give money without particularly observing it, It is enough if the coin conforms to the usual type. There exists, however, in all mercantile communities a class of dealers in money? who make a profit by selecting the best coins for exportation, or, if two metals are in concurrent use, the coins of that metal which is undervalued in the proportion fixed. The mode in which self- interest thus operates produces an effect which may be briefly formulated by saying that bad money drives out good money. It is often now called " Gresham's law," from a former master of the English mint,? who observed it. The illustrations of its working are numerous. Under its action the gold which was overvalued relatively to silver in England in 1696 became the main English coinage, as above stated. And in order to meet the want of silver coins, Sir I. Newton advocated, and secured, the reduction of the guinea from 21s. 6d. to 21s. The exportation of metallic money when an over-issue of inconvertible paper takes place is another case of the theorem.*~~

~~*By means of this principle we can easily explain the tendency of currency to depreciation, for when once, either by wear or by the issue of inferior coins, a currency has become debased, no reformation is possible unless the debased coins are removed from circulation, as otherwise they will be preferred for payments by dealers, and will not be melted down or exported. All demands for foreign trade will be met from the best part of the coinage. An argument in favour of state coinage has been founded on Gresham's law. It is argued that private coinage would lead to the issue of depreciated money.' It is, however, overlooked in this argument that the action of the law arises from the fact that the depreciated currency is legal tender ; were it not so, coins less than the proper weight would be at once rejected. It may be added that Greek monetary history bears out this view.®*~~

~~*Having disposed of these elementary questions, the general groups into which all currency systems fall may now be stated. The simplest form of currency seems to be that in which the state coins ingots of different metals, and allows them to circulate freely, without any ratio being fixed. This, which is the lowest form of currency proper,® has arisen in many countries through the introduction of coins of various other nations. Turkey is a European example. Many of the South American republics possess a currency of this description. A theoretical form of this system has been advocated in France. It is proposed to issue coins of one, two, five, and ten grammes of gold, and to allow the present silver coins which are multiples of the gramme to circulate along with them. The difficulties of this plan are so obvious that there is no likelihood of its being adopted. The arguments in its favour are of little*~~

~~*1 R. Giffen, Hssays in Finanee, p. 308. ;*~~

~~*2 The Jewish and Lombard merchants discharged this function in the medieval period ; Hallam, Afiddle Ages, iii. p. 369, note ¢.*~~

~~*3 Aristophanes (Ran. 719-733) appears to recognize this principle. Grote (vol. iii. 116 note) has misunderstood him, and seems to deny the principle stated.*~~

~~*4 Jevons, Money, p. 82. 5 See p.. 726, above.*~~

~~§ In his discussion of this subject Prof. Jevons, on whose excellent work much of this section is based, mentions currency by weight as the simplest form, but it is hardly correct to regard this as a currency system ; it is rather a primitive stage, closely akin to barter.~~

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~~force, since it is hardly correct to contend that it is a natural system, when it has never been willingly adopted by any country. The next system to be noticed is that of a single metal being fixed as legal tender. This in early times is the really natural arrangement, and has been widely adopted. It is needless to recapitulate the instances which have already been given in dealing with other matters. There is, however, a difficulty which soon arises under this system. If the metal chosen is not very valuable, it is too cumbrous for large payments; if, on the other hand, it possesses a high value, it is hard to coin pieces suitable for small transactions. Thus, even silver would be too bulky for such payments as frequently occur. £100 in silver at its present value would weigh nearly 40 tb, while it would be impossible to coin gold pieces of the value of a penny or evena shilling. This system thus naturally leads to the use of other metals besides the standard one, and when the state fixes the ratio between these metals a new system has come into existence, which has been called the multiple tender system. In it the ratios between the metals are fixed, either once for all, or until changed by state authority. This system was in force in England from 1257 (or rather 1344) to 1664, the ratio between gold and silver being fixed from time to time by proclamation. France, too, adopted it during the Revolution, the ratio of 154 to 1 being that fixed between gold and silver. The fluctuation of currencies arranged on this method, owing to the action of Gresham's law, has led in England and Germany to a modified system, which seeks to combine any advantages of the multiple standard with the principle of the single standard. By this method one metal is fixed as the principal legal tender, while the smaller coins are made of a less valuable material, and circulated at a nominal value somewhat above their real one, or, in other words, as token coins, but they are only legal tender to a limited amount. This has been called the composite legal tender system."~~

~~*For further details reference may be made to Tables II. and III., and the notes appended. Every currency system requires the exist- ence of subsidiary coins, and, as stated before, this want is met by using a less valuable metal, generally silver, and for smaller payments copper or bronze. But, apart from the question of the material of the smaller coius, it is important to determine the best ratio between them, The simplest of all would be the binary. In it each coin would be the half ofthe next highest one, and double the one imme- diately below it. Nothing, apparently, is plainer or simpler than this scale, but the objection to it is the great number of coins that would be required, as well as the want of conformity with the general arithmetical scale. In a modified form it does prevail in many countries. Thus in England we have the penny, half-penny, and farthing. Ata higher stage we have the florin, shilling, six- penny piece, and threepenny piece, and, again, the sovereign, half- sovereign, five-shilling piece,' and half-crown. The coinages of the Latin and Scandinavian Unions, as also those of Germany and the United States, have several binary series in their coins.? There is, however, no completely binary system known. The old English scale was partly duodecimal, and the arguments in favour of this arrangement are by no meats weak. At present the shilling is duodecimally divided. It is urged in favour of this scale that the main divisions of time (year and month, day and hour, are duo- decimally related, and that time is one of the elements in all questions of value. Another argument is that 12 is capable of being resolved into several factors (2 and 6, 3 and 4), and therefore*~~

~~*? This system came into existence in England accidentally, through silver being overvalued by the mint regulations, but its theoretical basis was given by the often-quoted work of Lord Liverpool, Coins of the Realm (1805), which contains even now the best explanation of its principles.*~~

~~*8 This piece is now almost extinct.*~~

~~*® For instance, the 20-franc, 10-franc, and 6-frane pieces, and, again, 2-franc, 1-franc, and 50-centime pieces in France, &c.; 20-kroner and 10-kroner pieces, and 4-kroner, 2-kroner, 1-krone, 50-dre, and 25-6re pieces in Denmark, &c.; 20-, 10-, and 5-mark pieces, and 2-mark, 1-mark, and 50-*~~

~~*pfennige pieces in Germany ; while the United States have eagle, half-eagle, and quarter-eagle, and also dollar, half-dollar, and quarter-dollar.*~~

~~*0 See S, Laing, Notes of a Traveller, pp. 57-59.*~~

~~*enables a large series of coins to be formed.' The main reason, | weighing and measuring." For the purposes of currency this scale however, for the adoption of a duodecimal system appears to have | is not very convenient, as 10 can be only resolved into two factors been the preference for the number 12 so frequently shown by early (2 and 5), and one of these is a rather high number. This dis- societies ; thus, among the Semitic races, the Jews were organized | advantage has retarded the adoption of decimal coinage, and is the in 12 tribes, and in Italy the Etruscan league consisted of two | base of the objections made to it. It has been contended that it is groups, each of 12 cities. In connexion with this it may be noted | unsuitable for small purchases, and for such fractions as one-third.? that a duodecimal system of currency prevailed south of the Apen- | France adopted the decimal system of coinage in 1799, and it has nines. At Rome the as was divided into 12 wneiw. The modern | now extended over all the countries of the Latin Union (see Table tendency, however, has been to adopt a decimal scale. This method | II.)._ It is also in use in Germany, Denmark, Sweden and Norway, of notation, which is found very widely in use among savage tribes, | the Netherlands, and Finland, as well as in the United States. But is undoubtedly derived from the ten fingers of the human hands. | none of these countries has a decimal coinage pure and simple. In- Though the base 10 is not so convenient as 12, it is firmly established as the only system of counting, and is in process of extension to*~~

~~*2 Tylor, Anthropology, pp. 311-312. 3 Laing and M'Culloch, as quoted above. The former unfortunately pro- phesies that " the decimal division never will come into general use in France ~*~~

~~*1 J. R. M'Culloch in Ency. Brit., art. "Money," vol. xv. p. 431 (Sth ed.). or anywhere else."*~~

~~*TABLE II.—The Coinage Systems of Continental Europe, exhibiting the gold and silver coins, their weight, fineness, remedy, and approximate value in English and United States money. SU nif eUNR* _____.~~

~~*Rem..| Approximate Rem. | Approximate vi =|. ./p.1000} Money Value. vw | — . |p.1000} Money Value. a a) EI £ uh | SS = = ‘a a] E £8 A ee Ge |aerel., #1 S8| B24, , Coins. 2 oe | S5/2ie| 4 Za Coins. S$ | se] 8 (8le| 4 bo s Ed |S8] 0) i 22 S Eo | SS | S| P| $2 a S| S|) ew ‘as = Se | 8) 0 oy es A LAr Dn Ai jelEel § Dn ais als | eck. | ae pete fe | AustTRia-Hunaary* **1— £s. d., $c. || NETHERLANDSS— 2s. di i Sc. 100 Kreutzer 8 Gulden piece} Gold | 6°45161 | 900: ‘2° |2:5/0 15 10 | 3 86 || 100 Cents=1 10 Guilder piece | Gold | 6°720 [900° {1°5‘2:|016 6/4 2 =1Gulden 4 4, 4, 5, | 3°22580 | 900° 2° [2-510 7 11 | 1 93 Guilder. 5 . » | 3°360 [900° 15° (0 8 8/2 1 2 4, 5, _ | Silver |24°6914 | 900° /2- |2°510 3 114) 0 96 2} ¥ Silver (25° 945° 25/250 4 2/1 0 Wigs yy |12°3457 | 900° |2° |2°5]0 1 114) 0 48 1 a », (10° [945 |2°5/9-5}0 1 8 | 0 40 ie ty 5, | 5°8419 |520°/2° |2°510 0 53] 0 12 3 % » | 5° [945° [25/2510 0 10 | 0 20 20 Kreutzer ,, 5» | 2°666 |500°!2 |2510 0 43! 0 10 Ob) Gents nen », | 3°575 [640° [2-5/2:5‘0 0 5 | 0 10 1) Ay y, | 1666 | 400° 12° [2510 0 28/0 5 10, geet eee », | 1:400 [640° |2°512-510 0 2/0 4 . ge cademie », | 0°685 |640° |2°5/25‘0 0 1/0 2 miei ‘sed Beaker. Norway. See DENMARK. PortTuGaL6— ‘ oe, 1000 Reis=1 Crown or $10°000} Gold /17°735 |916°6662" |2° 2 4 5 10 80 100 Ore=1 20 Kroner piece | Gold | 8:960572, 900: |1:51°5]1 2 1] 5 36 Milret. alf-Crown or $5°000| ,, | 8-867 |916-660‘2° |2- 1 2 24) 5 40 Krone. OMNES eas »> | 4°480286| 900: |1°5/2° |0 11 03] 2 68 One-fifth Crown or $2:000] ,, | 3°547 |916-666/2° [2° 0 8 10} 2 16 2 ate 1 {Silver 16-000 | 800-)8- js: 0 2 94) 0 58 One-tenth Crowner $1080) 4, || Nis BiG aaa > Ae ee 0 2 23) 0 54 “ » weed 2 | 4000 | 600° |3: [3+ fo 0 54/ 0 10 200% 0 Meee e 1 | 5°000 |916-666/2" |3- (0 0 104) 0 21 25 1 seeel gy | 2420 600° |3- [3* 10 0 34) 0 OB 100 2. eee 5 | 2°500 |916°666/2" |3° 0 0 53! 0 11 Oy rene] gg | E450 AOON Be IS” 10) OTRO” ae Uae eae », | 1:250 [916-666/2" [3° lo 0 agi o 5 Roumania. See FRANCE. FRANCE3— Russia 7— 100 Centimes 100 Franc piece | Gold |32:25806 | 900-|2- |1° 3 19 3}19 30 || 100 Copecks Iinperialor At =1 Franc. 50 7 ,, {16712908 |900:|2: [1 {119 7919 65 || =1 Rouble, 10 Rouble piece} Gold |13-088 |916°666)nil\2° |1 11 8 | 7 72 20 if », | 6°45161 | 900° j2° |2: |0 15 10 | 3 86 Half Imperial or : 10 »> | 3°22580 | 900° |2- 2: 10 7 11 | 1 93 5 Rouble piece} ,, | 6-544 1916-666) ,, [2° (0 15 10 | 3 86 ” 1 |*~~

~~1°61290 | 900° 2: (3° (0 3 114) 0 96 3 9 »» | 3°926 |916°666|„ |2" }O 9 6] 2 31 5 , Silver |25° 900: j2: |3: |0 3 114) 0 96 1 F : ; : ” a less me fio feos: > 1 0 38 yf Biiven i r900r868-0561 (2 lo 1 7/0 88 sens tee 835° |8- |5 |0 0 9}| 0 19 } fs ” 15-183 868-056) 5, [2° [0 0 941 0 19 IIa entimes…., „ | 25 835”|..|.. |0 0 43) 0 10 20 Copecks ….| „ | 4°146 /750°0 |„ 2° |0 O 74! 0 15 ys ‘call cane pal 835°|..|.. (0 0 2/0 4 10}, sees] 4, | SORT 15, 12510 8o aoa? 5 ey, cee) ss | JP IROST BOZO” ose ONO mem ROMA GERMANY 4— Srervia. See FRANCE. ; 100 Pfennige 20 Mark piece ..! Gold | 7-964954) 900-|.. |.. 019 7 | 4 76 || SPAIN.S See FRANCE. | =1 Mark. 10 „ ..| 4, | 3°982477/900”!.. |: Jo 9 93! 2 38 || SWEDEN. See DenmaRK. | 5 i ae 1991239] 900: 0 4 103] 119 SWITZERLAND. See FRANCE. 5 c eee: TURKEY 9— a. ” —| Silver (27°7777 | 900" |.. |.. (0 4 103] 119 || 100 Piastres © MedjidieorLira| Gold | 7-216 |916-666|2° |2° |0 18 0 | 4 40 | 2 ys gy ITLL] 900°]..]‘.. 0 1119) 0 48 || =1 Medjidie 4 „ » | 3608 |916-666)2" |2° [0 9 0| 2 20 2 eer 5°5555 | 900°|..|.. |0 0 119] 0 24 : aagle: |o- Pe ae ” sa (eee fe Ks ee 3 8 »» | 1:804 1916°666/2" |2° 0 4 6] 1 10 20 nee 11111 | 900- 0 20 Piastres …./ Silver |24°055 |830° {3° |8° 10 3 7 | 0 88 ae or ee ee GREECE See F : Pee 520)| 5) ; ee Tein, ree 2 4, ..2 | 4, | 2°405 [830° [8° 3° (0 0 4/0 9~~

- ~~Inconvertible paper currency.~~

~~A ; : ; Present system introduced in 1870, in place of system of 1857; 8-gulden piece equivalent to 20 francs; silver not freely coined. The Maria Theresa dollar~~

~~(28-0644 grammes, $ths fine) is coined as commercial money.~~

~~2 The system i i i i ; , ante Ae cere ae use in the Scandinavian Union (Denmark, Sweden, and Norway) came into force 1st January 1875. It is a monometallic gold standard~~

~~3 The coinage system of France came into force 6th May 179 France 9. Switzerland) by the convention of 1865, and has since been adapted~~

~~4 The substitution of the mark for the older thaler came i . : ; i i~~

~~not yet complet ely settle a, owing ys the lange aniathdiby ge rerreema genes y 1875. The German coinage law is modelled on the English system, but is ch standard has been several times changed. In 1847 a silver standard di i i it bei i i~~

~~June 1875 the free coinage of cold i=) Z 3 ard was adopted, and continued till 1872, the unit being the silver guilder. Tn~~

~~6 The single gold standard is in force in Portugal. The Engli ign i : ns : ; 1 5 glish sovereign is legal tender for 4500 reis.~~

~~_ ae coins of the Russian mint are exceptionally good. They pass as commercial money at varying prices. Finland has a decimal system reseinbling the rench since 1877, the mark in gold and silver being equivalent to the franc. i! Z~~

~~8 The Spanish coinage was assimilated to the Latin Union in 1871. Spai i 1ish coir ! t I 71. Spain, however, coins a 25- iece; i i 9 The Medjidie coinage was introduced in 1844. English sovereigns circulate at 125 'piastres, oO Naira onTeeeee ala~~

~~MONEY foe~~

~~termediate coins are introduced, ¢.g., in France, 2-franc and 6-franc | can be obtained. One of the schemes advanced takes the present pieces. In fact, most modern currencies are a combination of the Jarthing as its base; then 10 Jfarthings=1 doit (24d.) ; 10 doits=1 decimal and binary systems, England alone adhering to a modified | florin (2s. 1d.); 10 florins=1 pound (20s. 10d.). The advantages duodecimal scale. A decimal comage has for the last sixty years | of this plan are: (1) that the smaller coins nowin use could be been proposed for England, and it is almost certain that if any one | preserved (the penny being 4 farthings), (2) retail prices, which are for scheme could be pointed out as much preferable to any other it | the smaller articles estimated in pence, need not be altered, (3) nor would be accepted. As it is, there are two or three proposals, each | need those which affect postage, tolls, and mileage charges. Against commanding some support, while many advocates of the decimal | these may be set the loss of the unit of value, the pound, which system prefer to~~

~~wait till an international agreement for its adoption | should be raised to 20s. 10d., so that all accounts, and all large~~

~~Taste III.—Currencies of the more important non-European States.~~

~~: Rem. | Approximate Rem. | Approximate ; @ | q „|P: 1000.) Money Value. , % |=. P. 1000.| Money Value. re > : } ms . n —_———_—_- g BE 8a) a 3 28 | ESS . > fel 9) = Rn 5 . “ a om vo: KA ry Coins. 2 3 E 3 3 2 rf a Se Coins. s oe B3 $ = r 34 tt Eo |e gies oI IIR Ss Bo |e] 2 | & Ki hap} A a |aFi 2/2 EY AS a S| 8 | 3) as £ BE g Dn B= BF) § Da ee S |e A. NORTH AMERICA. STATEs OF COLOMBIA 7— £5. d./$ ec. Repent coasnonet — 100 Centavos 20 Peso piece ..) Gold |32°258 | 900° 819 34/19 30 100 Cents=1 Dollar. ae abies 16129 | 900 119 8/965 Mexico 2— Bs. ajc. 5 Peso piece…) 7” | 8-065 | 900°| -. | 2:10 19 10 | 4 82 100 Cents 16 Dollar piece | Gold |27:067 | 875° -|3 4 9 |15 74 2; nal Oy 3°225 | 900°], .. | .. 10 7 113) 1 98 =1 Dollar, 8 »» _[18°588. | 875° . {112 43) 7 87 4 ins | 6767 | 875° . 10 16 24] 393 icee .. Silver |25°0 |! 900°! ..}.. 0 3 114! 0 96 2 a » | 3°888 e ; 0 8 L 1 mS 20 Centavos….| „ | 5:0 |885°|..]..]0 0 93/019 1 ss » | 1692 : . 10 4 08] 0 98 | TO: |e elope liens .10 0 5|010 5 1°25 = =|‘885″ -10 0 2310 5 1 . Silver |27-067 | 900: .|0 4 08] 0 98 . ‘ i 50 Cent piece ..} „ |18°583 | 900° -j/0 2 0) 0 49 | 25 — of 6767 | 900°] ..|.. 10 1 0] 0 24 || Peru *8— UNITED STATEs 3— 100 Centesimos 20 Sol piece….| Gold |32°258 | 900- . |B 19 34/19 30 100 Cents 20 Dollar piece =1 Sol. 10 55 tefeiel|! | sq) (LOS LeO 1900; Pap tae Got 2) =1 Dollar. eee Eagle)} Gold /33°436 | 900°} 2°| 1:]4 2 6 i OS ABCA NM mocrs 8‘065 | 900° — 0 19 10 } 4 82 10 Dollar piece 2 ane 3°225 | 900° . 10 7 113! 1 93 (Eagle) ..... » {16-718 |900°| 2°| 2]2 1 3 1 3 I} 1 1-613 | 900: ‘10 foe 0 96 5 Dollar piece ee 8‘359 | 900°} 2°) 2°11 0 74 3 Pe » | 5015 {900°} 2°} 2-|0 12 44] °° 1 „ ....| Silver [25-0 | 900 . 10 3 113! 0 96 2) Oe or 4179 | 900° e rg (OPO) aay” 50 Centesimos..| „ |12°5 | 900° . }0 1 11}] 0 48 1 ‘ jp tele [aos 21 3°10 4 aah 20, » | 5°0 | 900° . (0 0 94] 019 a 10 A 25 900° -|0 0 49 0 10 aes ach. Silver |26-729 |900-| 3° | 5: h 4 1} oy | 1-25 | 900° 10 0 20 5 50 Cent piece ..| „ |12°500 | 900°] 3°] 5°0 2 0 25 7 » | 6:250 |900°| 8°| 5°10 1 0 10 oF 3 2°500 | 900°} 3°/...0 0 5 VENEZUELA. Sce CoLomBia. 5 ” ss | 1:250 {900°| 8°} ../0 0 23 8 ” » | 0802 }750‘1 8°|..10 0 14 . C. ASIA, B. SOUTH AMERICA. Inp14 (BritisH) 9— ARGENTINE REPUBLIC * 4— : Es ; : OE ye WPMesowpiees:. .)) Gold. |25:838 |000 “ff 1 8/1094 |) Peicemi ana,~~

~~*(Donthe Monen)| Gold ps8 latod| ..|.. s 0 0 4 ss =1 Dollar 49 me » |16°666 | 900: -;2 010) 9 97 | 116 Anas=1 Rupee. 15 Rupee piece : (Peso). ; 5 Fy . 8:33 | 900° .|1 0 5] 4 98 (Mohur) ..../ , '(11°66 J916°6) .. | .. 11 10 0 | 7 29 10 Rupee piece 59 i ae ' ail, 10:10 IIe 1 f Silver |27:11 | 900° 0 4 1/099 5 » | 8886 [916°] ../.. 010 0 | 243, Braziy * 5— 1000 Reis 20 Milreis piece | Gold [17-927 |916°6| .. 2 4 103/10 91 1 = Silver |11°665 |916°6] ..|.. 10 2 0] 0 48 =1 Milrei. 10 mi »» | 8963 |916°6} .. 1 OS || Be i i i ee ae ok ee ; : 0 oe : BiG Gl). (|. 6 1 2 < Silver |25:500 9166] ..|..]0 4 51/1 9 ee » | 1458 19166] «1/1 0 0 8]0 6 1 ie yy) |12°250 |916-6) .. | .. |0 2 23! 0 55 $ oF Ke 6'375 |916°6] ..| .. |0 1 1] 0 27 || Japan* l0—*~~

~~*CIHLI *6— 100Sen=1Yen. 20 Yen piece ..} Gold |33:333 | 900° 14 2 0119 94 100 Centavos 10 Peso piece 10 4 —| 5) {16°668 | 900° a2 SOeoeey =1 Peso. (Condor) ....| Gold |15:253 | 900: 1 17 6 | 9 10 5 8°333 | 900° 1 0 61498 5 Peso piece…) ,, | 7°626 | 900° 018 9} 455 " Pil Be mer : :*~~

~~*2 ~·~ ws{gg,——« | 87051 | 900° (Say 3 |i 1 Se : " a ed sen red "te : : 1 Ts gl : "| 0 1 ,,___..| Silver 12500 j900°]..]..'0 3 9/091 + ms 50 Centavos piece » (12:50 }900°) . . 0 1 103) 0 45 50 Sen piece ..| Silver }10: 800° — 0 2 03) 0 50 20 ' » | 500 |900°|..]..0 0 9/1018 20 ~«, Boll lle 800° . 10 010] 0 20 10 x > | 2°50 |900'|..]..10 0 43/0 9 i) boll vere pee 800° .(0 0 5|010 5 i » | 1:25 |900°|..'..|0 0 2/0 4 RR ee 1 800° .10 0 20 5*~~

- ~~*Inconvertible paper currency.*~~

~~*Remarks.—The currencies of such of the non-European States as were capable of being presented in tabular form have been given above, but a brief outline of the currencies of less-advanced countries where a settled coinage does not prevail may be here added. The systems of the various European colonies in America are, as a rule, similar to their mother-countries. Some of the English possessions acquired by conquest preserve their original currency. In Cayenne the pre- Revolution French money is retained. In Paraguay and Uruguay a much-depreciated paper currency circulates. The Central American states reckon in dollars. The Australian colonies have a currency identical with that of England ; the same currency exists in South Africa. In Mauritius the Indian system has been recently introduced. The various Turkish vassal states possess peculiar coinages. In Egypt, the coins of various European nations form the chief*~~

~~*money. The Asiatic currencies are generally composed of silver. Ceylon has the Indian rupees. The money of Java has since 1877 been assimilated to the latest form of the Dutch monetary system. In China the cash forms the unit, and is made of copper, iron, and tin; silver passes by weight—a fael, which varies from place to place, being the unit; while the silver sycee is the usual medium of exchange. The other Asiatic currencies do not require particular notice.*~~

~~*1 There is no currency issued in Canada ; English and American coins circulate. The standard is gold (£1=$4'80). There were formerly different methods of counting, viz., English sterling, Halifax currency, and Canadian sterling, the respective ratios being 100: 120: 108.*~~

~~*2 The decimal coinage has existed in Mexico since 1867. The gold coins are practically commercial money, and command a premium.*~~

~~*3 The dollar was introduced in 1786 as the unit. In 1794 the ratio of gold to silver was fixed at 1 to 15. This valuation underrated gold, consequently silver becaine the standard. In 1834 the ratio was altered to 1 to 16, and it was again changed in 1837. In these changes gold was overrated, and silver was driven out of circulation. This led, in 1853, to the reduction of the metal in the silver coins, which therefore became a token-currency. The suspension of cash payments took place in 1861. In 1873 silver was demonetized, and gold became the standard. In 1878 the "Bland Bill" was passed, making the silver dollar a legal tender, but confining its coinage to the executive, and fixing the amount at from two to four million dollars per month. These silver dollars have not got into circulation. The United States coin a trade dollar of 420 grs. (27-212 grammes), to compete with the Mexican dollar.*~~

~~*4 The Argentine Confederation professes to have a gold standard. The old South American onza weighed 27 grammes, was 875: fine, and worth £3, 4s. 6d.*~~

~~*5 The Brazilian system is a depreciated form of the Portuguese.*~~

~~*6 Chili has nominally a double valuation at 1 to 163. Gold coins are no longer struck.*~~

~~? The Colombian States have the Latin Union system, with a ratio of 1 to 15}.~~

~~8 When Peru returns to cash payments the system will be almost identical with that of Colombia.~~

~~9 British India has a single silver standard, as the gold coins are only commercial money. The price of the rupee varies ; generally in recent years it has been about ls. 8d. (=40 cents).~~

~~10 The old Japanese coinage consisted of gold cobangs and silver itzibus, with a ratio of 1 to 4. The system was recast in 1871, and the present decimal coinage adopted, the ratio being 1 to 16°17. The standard is now practically silver. In 1875 a trade dollar exactly similar to the Ainerican trade dollar was introduced.~~

~~price quotations, would have to be altered, while the new unit of the farthing would not be assimilated to any other unit. This plan has therefore no chance of acceptance. Another proposal starts from the present pound as unit. It is to be divided into 10 florins (2s.), which would contain 100 mils (or farthings reduced 4 per cent.). A new coin, 10 mils (2s. 4d.), would probably have to be introduced. The advantages of this plan are: (1) the pound would be preserved as unit, (2) the forin and shilling would also be retained—the latter being 50 mils, (3) accounts for large amounts need not be altered. The objections are such as follow—(1) the copper coins, which are those most used by the poor, would all be changed, thus causing great confusion, (2) all charges expressed in pence would be altered to the loss of one of the parties. Still, this scheme is much to be preferred to the one first mentioned. A third plan is based on the fact that 8s. in English money is only $d. more than 10 francs. Having regard to this link between the English and French systems, it is proposed to coin a 10-frane piece in gold to serve as a token for 8s. If the penny were then reduced by 4 per cent. this piece would contain 100 pence, and, by coining a frane or tenpenny piece in silver, a perfect decimal currency would be obtained. This arrangement would involve the abolition of the pownd as well as of most of the present English coins. In fact, it is as yet~~

~~*premature to expect a system which will be international as well as decimal, and the most that can be hoped for is some progress towards that ultimate end. All that can be said at present is that all schemes for the introduction of the decimal system should be considered with regard to their tendency to help towards the assimilation of the English system to other currencies. The problem of international money has during the last twenty years acquired much prominence. In previous historic periods the idea was partially realized. Thus the drachme was an international Hellenic coin, though it had three different values.) Under the Roman hegemony and the succeeding empire the denarius became the coin of the west, the drachme that of the east.2. The next currency which can be called international was the frequently-mentioned Carlovingian system. The growth of the different European nationalities, and their frequent wars, prevented any common coinage system being adopted by them. Each state debased its own coin at different times, so that any original resemblances disappeared. The question of unification of the various monetary systems was thus left open for the present century, when increased facilities for intercourse have led to more complex international relations. An association for promoting unity in weights, measures, and coins was founded in Paris in 1855, and actively advocated its principles. In pursuance of this object a series of conferences and congresses were held on the subject, the first of them in 1860. The congress of 1863 was held at Berlin, and adopted a series of important resolutions. Its report advocates the superior convenience of a gold system with a subsidiary coinage of silver ; the millesimal scale of 900 as to fineness of the higher coins was also approved of, as well as the definition of the weights of coins on the metric system. The first practical outcome of the movement was in the monetary convention of 1865, which founded the so- called Latin Union, by which France, Belgium, Italy, and Switzer- land became a single monetary region, with the franc or lira as unit. The subsequent accessions to the Union are given in the note to the French coinage system (Table II.). In 1867 a monetary conference was held at the same time as the Exhibition of that year, when the idea ofa universal coinage was advocated, and three leading principles were laid down as necessary to that result, viz.—(1) the universal adoption of a single gold standard, (2) the general use of the decimal scale for this coinage, (3) that all coinages should be co-ordinated with the French system. Owing to the*~~

~~*accidents of historical development, certain points of connexion existed between the lead- ing European systems. Thus, the franc being regarded as a unit, the Austrian florin was as 2°47, the American gold dollar as 5:18, and the English pound as 25°22. Very slight changes would bring these coins into a series of 1: 24:5: 25, and it was proposed by the congress of 1863 that, when thus modified, they should lave inter- national currency in all countries where any of the four units pre- vailed. All outside nations were recommended to select whichever of these units they preferred. The subsequent monetary changes in the various European systems have, however, ended rather in the formation of international systems without any tendency towards the establishment of a universal one. Thus, of the three principles laid down by the conference of 1867, two only have been adopted in recent currency reforms. On the creation of a united Germany after the Franco-German war of 1870-1871, it was the aim of the rulers of that country to develop as much as possible all outward expressions of that unity, and, in accordance with that conception a German currency was devised which was monometallic and decimal (see Table II.), but which was not easy to assimilate to the French system, thus rejecting the third principle laid down by the Paris conference, and rendering future progress more difficult. The*~~

~~*1 The Attic, Euboic, and Mginetan ; see Smith, Dict. Gr. and Rom. Ant., s. v. "Drachma." : ee*~~

~~*2 Mommsen, Hist. of Rome, iii. p. 415.*~~

~~*3 See E. de Parieu in Journal des Economistes (Feb. 1, 1878).*~~

~~*MONEY*~~

~~*Scandinavian Union proceeded on very much the same lines as the German reform, and was, in fact, mainly caused by it. The Dutch Government, under the pressure of circumstances, have abandoned the silver standard and coined some gold, but their position is still undecided. The Austrian Government have made a slight step by issuing as gold coins 8- and 4-gulden pieces, which are the same as the 20- and 10-franc coins. In one part of the Russian dominions, Finland, the French system has been introduced, the new mark being equivalent to the franc. The*~~

~~*main Russian system has not been changed, nor have any alterations been made by England, Turkey, or Portugal.4 The question of universal coinage has become implicated with the question of the proper standard, and the strong ground taken up in 1867 has certainly to some extent been abandoned. It may, however, be considered that the present systems of coinage are capable of being assimilated. A comparison of the amount of pure metal in English, French, German, United States, and even Japanese coin shows how small is the difference.® An ingenious proposal was made in 1868 to the English commission on the question, by which the sovereign would be made identical with the French 25-franc piece (if that were coined). It was based on the fact that the sovereign contained only about 1 grain more of gold than the amount in 25 francs. It was proposed to deduct this small amount from the bullion brought for coinage as seignior- age, so that nochange need be made. The advocates of this scheme contended that prices would not be affected by the alteration. This reasoning did not commend itself to the commission. They accepted the view put forward by Newmarch, who argued that all con- tracts would have to be altered to allow for the depreciation caused by the change, and this position seems impregnable, so long as metallic currency alone is considered. Another ingenious plan was that of Bagehot to assimilate the English and American systems, as a step towards a wider change.® At the present moment the great monetary systems of (1) France and her allies, (2) England and the larger part of her colonies, and (3) the United States are so firmly established in their several countries, and the advantages of each system are so equal, that it is hard to see which is to give way. The wide area of the Latin Union, and the perfect decimal division of its coinage, are arguments in favour of the franc; the greater value of the pound, and the immense extent of the English colonies and English trade, are in favour of the British unit of value ; while the dollar, from its convenient size and the prospect of the future growth of the United States, has claims to be con- sidered in the discussion. The most probable conclusion, however, seems to be that the future unit will not be any of these coins, but the result of a compromise, which will lead to a new system being established. The difficultics which arise when universal coinage schemes are brought forward ought not to conceal from us the solid advantages which such an institution would confer on the world. The arguments urged in its favour are various, and*~~

~~are regarded as being of different relative importance by their advocates. They may, however, all be stated as follows. (1) Increased facility of travelling. Though there is a tendency to under-estimate this element of the question, it seems impossible to doubt that the saving of trouble to travellers by any universal coinage system would be very great. The abolition even of the local currencies of Germany and Italy, and their replacement by uniform national systems, has been a great boon to tourists, but an arrangement which would obviate the necessity for procuring any different money whatever would be a still greater advance. In the interests of peace, which is greatly promoted by extended international communication, it is very desirable to remove any obstacle which retards increased intercourse among persons of different countries. (2) Greater ease in adjusting the foreign exchanges. This argument has been sometimes pushed too far. It has been apparently held that, were a universal currency adopted, the problems of the foreign exchanges would no longer exist. There are, however, other factors in the question, namely, those of time and place, which could not be eliminated by the adoption of a single coinage system." Still, the removal of even one complicating element would simplify exchange dealings. The question of mint pars would no longer arise, and the specie points would be stated more simply. The friction which sometimes arises from the necessity of recoining the exported gold would also be removed, and the profits of those dealers who gain by 4 As Austria, Russia, and Turkey possess inconvertible paper currencies, and various foreign coins circulate in the last-named country, the question ° does not possess uch importance for them. Portugal is closely connected with England, and will probably follow her example. It may also be noticed~~

~~that the gold coins of all these countries have a fineness of }4ths. 5 Sovereign=7'32 grammes fine gold.~~

~~25 francs=7'26 79 " U. 8. half-eagle=7°52 a German 20 mnark=7°16 9 "~~

~~Japanese 5 yen=7°50 0 ap~~

~~6 See his pamphlet reprinted from the Economist. It is nearly the same as the first proposal mentioned above, but it differs in contemplating the~~

~~assimila- tion of American money, the 5-dollar piece being equivalent to the new pound.~~

~~7 See, for this, Goschen, Foreign Exchanges, p. 5, and the article BxcHANGE (vol. viii. p. 784 sq.). A practical illustration is the case of Australia, where, though the currency is identical with that of England, bills on England are at a preinium.~~

~~their special knowledge would be saved to ordinary traders. (3) The improvement of the currencics of backward states. Many countries still possess those mixed currencies which were once com- mon all over Europe, and much confusion consequently arises. The commercial coins have been introduced for international circulation,! and a universal currency would perform their function more satis- factorily. (4) Greater facility in comparing price-lists, &c. This advantage, which is reserved for the last, has been regarded by competent judges as the greatest.? It hasa practical and a theo- retical interest : the former, since trade with foreign countries would be rendered easier and safer; the latter, since statistical inquiries would be very much facilitated. At present, it is quite impossible for an ordinary trader to understand a set of foreign price-lists, each perhaps expressed in terms ofa different currency from the others, — a difficulty which is enhanced by the variations of gold and silver values, not to add the case of an inconvertible paper currency. The existence of a common monetary language would remove these diffi- culties, and the premium on gold could be allowed for in the case of depreciated paper. A much wider development of smaller trading transactions would become possible, and would add to the world's wealth. Nor would the greater case of statistical inquiry be unim- portant ; the rates of wages in different countries, and the profits on different transactions, would be readily compared, and the move- ments of labour and capital to the most advantageous points rendered more rapid. Against these great gains can be set only a certain and a possible disadvantage—namely, the loss and trouble involved in change, which would, of course, for the time be con- siderable, but would soon be over, and the chance that some states might issue a depreciated currency, which would expel the other and better~~

~~*coins. In the case of a universal coinage this case would hardly arise, since there would be no field of employment for the purer coins, and they would consequently remain in circulation, but the whole currency would become depreciated. Proper mint regulations, however, would obviate this danger, and could surely be devised. It may be said that the principal hindrance to one coinage system for all civilized states is the as yet unsettled qucs- tion of the standard to be employed. Till the debate on this problem is closed it is vain to expect monetary unification. The establishment of a universal system based on gold seemed quite feasible to the conference of 1867, but doubtful to that of 1878, while a double standard was the proposal discussed in 1881.*~~

~~*9. Considerations on the Questions arising from the Con- jlict of Standards.—In the preceding section the various possible monetary systems were set forth, but no discussion was entered into with respect to their comparative merits. Only three of these systems need be here examined, namely, the single standard system, the multiple standard system, and, lastly, the composite system. Nor even is there any need for examining the various possible single or multiple standards. The single silver standard is the only one of the former, as the double gold and silver standard is the only one of the latter, which need be taken into account. It is true, historical inquiry has shown that the problem of the proper proportion between two different metals when used together presented itself to the Chinese with regard to their iron and copper coinages ; but the course of mone- tary evolution, as discussed in section 3, has resulted in the rejection of the less valuable metals and in confining the material of the principal coins to silver and gold. The use of silver as a principal coinage was, as we have seen, widely diffused. The Hellenic coins were composed of that metal, gold being afterwards introduced as a variable commercial money; and copper was brought in still later as a token currency. 'Though copper preceded silver as money in Rome, the latter, soon after its introduction, succeeded in displacing it, the ratio first fixed being 1 to 250. A regular gold coinage did not exist at Rome till the empire, but gold in bars passed, the legal ratio being 1 to 11°91. Still the questions connected with the use of a double standard do not seein to have arisen. The various European mon- archies had silver as their*~~

~~principal money (see p. 726 sq., above), gold where it was used being, as in Greece, a~~

~~1 The principal of these are—the Austrian Maria Theresa dollar, the Mexican dollar, and the United States trade dollar, which is 74 grs. heavier than the national coin of the same name. See also Tables iI. and III.~~

~~2 H.g., Bagehot and Prof. Jevons. The former dwells on the com- mercial aspect; the latter naturally plaees the scientifie side first.~~

~~3 See Mommsen, Uist. of Rome, ii. p. 382 and iv. p. 553.~~

~~commercial money. The advance of gold to a position parallel to silver was commenced in the 13th and continued in the 14th century, the method of regulating the mixed gold and silver currencies being by proclamation, which fixed the varying ratios from time to time. In England this course was followed from the first introduction of gold coins (1257) to 1663.4 From 1663 to 1717 silver was the standard, and the gold coins passed at thcir mar- ket value. As the silver coins were very much debased, the gold guinea sometimes was deemed equivalent to 30s. After the recoinage of 1696 the guinea passcd at 21s. 6d. At this ratio silver was underrated, and was accordingly exported to Continental Europe and to India. 'The loss of the silver coins aroused the public attention, and the matter was submitted to Sir I. Newton, whose answer was given in his Third Representation. IIe proposed to reduce the guinea from 21s. 6d. to 21s. as an experimental measure.® The proper reduction for the object in view would have been to 20s. 8d. 'The silver drain, therefore, continued, and England came to have a gold currency. An opposite arrangement gave France a silver coinage. The recent facts of French monetary history, as well as those of the United States, illustrate the same condition of affairs. The difficulty of constituting a double standard system on a secure basis is thus made clear, so far at least as regards a single country. For the continuance of the two metals in the currency depends on the market ratio and the legal ratio between gold and silver being the same. The slightest examination of the history of these metals will show how~~

~~*variable they have been. Without accepting the estimates which regard silver as being morc valuable than gold,$ the well-attested variations of the precious metals have been very considerable. Thus, Herodotus estimates the ratio as 1 to 13, Plato 1 to 12, Menander 1 to 10, and in Cxsar's time the ratio was 1 to 9.7 Table I. contains the varia- tions since the discovery of America. In the 14th century the value of gold rose remarkably, and the gradual move- ment has ever since been towards an appreciation of gold relatively to silver. Another point, previously noticed, is the tendency, as wealth increases, to adopt a more valuable form of currency. Greece, Rome, and England all afford illustrations of this movement. The experience of the evils of a mixed currency led the earlier writers on coinage in England to regard a single standard system as the best, and silver as the most suitable metal for the standard. Locke, Petty, and Harris all advocated this view. 'hie earlier Italian writers proposed to combine gold and silver at a ratio of 1 to 12, which they conceived to be the actual pro- portion. The theory of a composite system was, as before mentioned, first given by Lord Liverpool. This method*~~

~~*4 The various changes made can be estimated from the Tables given in James's Essays on Money, &e. 3 seealso Ency. Brit., 8th ed., article '*Moncy." A careful statement will be found in Lord Liverpool's work, ch. xi.*~~

~~*5 Newton's report will be found in Select Tracts on Money, edited by J. R. MCulloch for the Political Economy Club (1856). One passage is worth quoting. 'The demand for exportation arises from the higher price of silver in other places than in England in propor- tion to gold, . . . and may therefore be diminished by lowering the value of gold in proportion to silver. If gold in England, or silver in East India, could be brought down so low as to bear the same propor- tion to one another in both places, there would be here no greater demand for silver than for gold to be exported to India. And if gold were lowered only so as to have the same proportion to the silver money in England which it hath to silver in the rest of Europe, there would be no temptation to export silver rather than gold to any other part of Europe" (p. 277). The italics are in the original pass- age, which has been much diseussed in reeent controversies.*~~

~~8 Del Mar, JJist. of the Precious Metals, p. 221. According to this writer, the variation has been 200 degrees—i.e., from silver being 10 times as valuable as gold, gold has come to be 20 times more valuable than silver.~~

~~7 See Smith, Dict. of Ant. s. v. "' Argentum."~~

~~8 See above, p. 731.~~

~~of regulating the metallic currency was established in England, as it were, accidentally, and deliberately adopted only in 1816. The practical good results which followed made all English economists of that period warm advo- cates of the composite system. Thus, M'Culloch and Tooke agree in supporting the English system, as also does J. S. Mill! On the Continent the weight of authority was more divided, and the existence of the French bi- metallic system gave support to the advocates of a double standard. The result of the gold discoveries in Australia and California was to greatly increase the supply of that metal, and, under the action of Gresham's law, to change the French currency from silver to gold, while Holland, to avoid the evils which were anticipated from the reduced value of that metal, adopted silver as the standard. The movements in favour of a universal currency described above, combined with the course of events, brought the standard question into greater prominence. The proposal of the Paris conference of 1867 for a single gold standard, and a universal coinage on that basis, raised the question to great prominence. Wolowski and Courcelle Seneuil strongly opposed the recommendation, the former predict- ing that a disastrous appreciation of gold would follow. This view seems borne out by the result, for, although a universal coinage was not created, yet Germany and the Scandinavian Union both changed from a silver to a gold standard, while Holland and the United States both made movements in the same direction by demonetizing silver and making preparations for adopting gold. The Latin Union at the same time restricted their silver coinage, which had nearly the same effect as the adoption of a gold stand- ard.2 The result of these extensive changes was to cause much confusion. The more ardent advocates of a double standard, too, attributed most of the continued trade de- pression to this cause. The altered condition of opinion on the question was seen at the~~

~~*monetary conference held at Paris in 1878, where the universal demonetization of silver was considered to be dangerous. The "Bland Act" of the United States, which theoretically decreed the double standard (1878), was another instance of reaction. The great depreciation of silver, which resulted mainly from its having ceased to be money over a large part of the civilized world, severely affected the Indian finances,' and thus the advocates of a double standard were able to command some attention in England. The conference held in Paris in 1881 reflected these changed views. The supporters of the double standard took the initiative and proposed a treaty based on the double standard at a fixed ratio, but no conclusion was arrived at—England, Germany, and the Scandinavian Union upholding the gold standard.*~~

~~*Such, in brief, has been the recent history of the standard question, and it now becomes desirable to examine more closely the conflicting arguments in the various shapes they have taken. The older English advocates of the gold standard have found their best representatives in Lord Liverpool and Tooke. The former of these adopted the argument used by Petty, Locke, and Harris, that only one metal can be the standard of value at a given time, but he held that the advance of England in wealth rendered gold a more suitable material than silver for the principal money. He added that by law the power lay in the sovereign to settle the standard, and, as a matter of fact, he contended that gold was actually at that time (1805) the English standard in common estimation. These arguments were*~~

~~*1 Lord Ashburton was the only person of influence who advocated the double standard. 2 The amounts decreed to be coined each year were as follows :—Frs.*~~

~~*1874=120,000,000 1875 =150, 000, 000 1876 =120,000,000 1877= 65,000,000 1878= 9,000,000*~~

~~*- 1879= 20,000,000 } For Italy only. 3 See, for a full discussion, W. Bagehot, Depreciation of Silver.*~~

~~*MII O NEY*~~

~~supported by a mass of historical examples. Tooke, who dealt with the subject in his History of Prices, severely criticizes the double standard. He points out that it would be impossible to keep both metals in circulation, and that it would be the inferior one which would remain. Hcalso indicates a more refined objection, namely, the difficulty of constituting a bank reserve under the double standard. Thus, if silver were the more valuable, and the reserve consisted mainly of it, there would be an inducement to make a run on the reserve, so as to drain out the small quantity of gold and then get the more valuable silver.> The silver standard was preferred by Ricardo, who fully accepted the arguments against the double standard as conclusive ; his view was, that silver was steadier in value than gold, and was the standard money in other countries, while the objection to it ou account of its greater bulk was, he thought, obviated by the use of paper money for circulation.® J. S. Mill pronounces no opinion as to the comparative merits of gold and silver, but he objects to the double standard on the usual ground that the cheaper metal is the only one used in payments, and that therefore the fluctuations arc more frequent under a double standard régime. The advocates of the concurrent use of the two metals, prominent among whom were Wolowski on the Continent and Scyd in England, contended that these objections were ill- founded, for (1) the double standard, though it produced (z.c., admitting the assumption of their opponents) more frequent fluctuations, still did not vary so widely from the mean, since in each case it was the cheaper metal which determined the valuc,' and (2) the action of Gresham's law would produce a compensatory action. Thus, if silver be undervalued in a double-standard system, a drain sets in to other countries where it is more valuable. The quantity of silver is thus reduced and its value raiscd, while gold is imported, its quantity increased, and its value lowered. Were gold the under- valued metal, the converse process would take place. The sound- ness of this position is illustrated by the case of the great transforma- tion of the French currency (1849-1860). During the rapid increase of the gold supplies the value of silver only rose about 3 per cent. ; in fact the depreciation was spread over the two metals, and not confined to gold. In addition to the above arguments, it was urged by Wolowski that any attempts to establish a universal gold standard as contemplated by the Paris conference of 1867 would cause a great appreciation of gold, which would be disastrous to commercial interests,~~

~~*while silver would lose most of its value. The services which the double-standard countries rendered by acting as intermediaries between gold and silver standard countries was also dwelt on, the ease with which the mass of silver needed for exporta- tion to the East was supplied from France during the years 1853-56 being an instance in point. The monetary difficulties, as indicated above, which followed the adoption of gold by Germany and the Scandinavian Union, as well as the embarrassment of the Indian Government, from the resulting depreciation of silver, revived the double-standard advocates. Cernuschi and De Laveleye came forward as supporters of what the former called bimetallism, that is to say, the establishment of a universal, or at all events a large international, currency, based on the concurrent circulation of the two metals gold and silver at a fixed ratio. This plan has gained many supporters, though the tendency among English economists was at first to decline even to consider it; and not even yet does the question appear to have received that careful examination by monometallists which would be desirable.®*~~

~~*The bimetallists start with a discussion as to the causes which determine the value of money. They point out that there are two extreme theories: one that the value of money depends on the will of the sovereign (the fiat theory); the other that the value of money is entirely independent of state control, and determined by economic conditions (the free trade theory). Neither of these is accepted by the bimetallists. They take up a middle ground and hold that, by its power of deciding what substance shall be deemed legal tender and discharge all obligations, the state is able to deter- mine, within limits, what substances shall be money and what the*~~

~~*4 Coins of the Realm, pp. 128-165.*~~

~~*5 This objection to the double standard is also urged by Prof. Thorold Rogers and by Bagehot. Actual instances of the difficulty occurred in 1860, and again in 1876, with the Bank of France.*~~

~~*6 "¢Proposals for an Economical and Secure Currency," Works (ed. M'Culloch), p. 403.*~~

~~*7 The superposition of two curves, each representing the variations of one metal, and the formation of a third curve representing the lowest*~~

~~*concurrent points of each, will make this clear. See Jevons, Money, p. 138.*~~

~~*8 See J. E. Cairnes, Essays in Pol. Econ., pp. 140-148.*~~

~~*9 Mr A. J. Wilson has collected a series of articles on Reciprocity, Bimetallism, and Land Tenure Reform, and Prof. Bonamy Price dealt with Bimetallism and Fair Trade in his address to the Social Science Congress in 1882. But there is no fair reason for placing H. de Laveleye, Luzzati, Cernuschi, Dana Horton, and other supporters of bimetallism — and we may add Prof. F. A. Walker—in the same category with the advocates of (so-called) ‘ Reciprocity.”*~~

~~*value of those substances shall be. They argue from history that several metals have been successively demonetized, that different ratios have been fixed between metals circulating together, that in- convertible paper currencies have been kept in circulation by the will of the state.! The doctrine of cost of production as determining the value of money is also assailed by them. They hold that it is the quantity of money which governs its value,? and that cost of production has little or no influence in the matter. The next step in the bimetallic argument is to contend that their proposed ratio for gold to silver (1 to 154) can be maintained by the legal regulations to that effect. The common objection to bimetallism is, that which- ever metal was undervalued would be exported. They answer that the same ratio existing over all, or a great part of, the world, there would be no inducement to export either metal, and in support of their argument they appeal to the passage from Newton quoted above, and claim him as the inventor of modern bimetallism.® Thirdly, a greater stability as regards value is claimed for the two metals combined than for either singly, since the fluctuations are distributed over a wider field, and, the conditions of production of gold and silver being somewhat different, fluctuations in them tend to counterbalance each other.*~~

~~*1 See Dana Horton’s paper on the Position of Law in the Doctrine of Money, presented to the monetary conference of 1881 (Appendix ix. C).*~~

~~2 On p. 721, above, the theory of money value has been stated, and the objec- tions to the cost of production theory given. It is strange to find Jevons arguing (in common with Bagehot and Prof. Price) that the value of money ultimately depends on cost of production, when his examination of that doc- trine in general is considered. Compare Contemp. Rev, (May 1881) with Jevons's Theory of Pol. Econ., p. 201 sq. . ; :~~

~~3 Modern bimetallists freely admit that two different bimetallic systems—i.e., having different ratios—could not exist, for each would drain the other of one metal.~~

~~forming a universal bimetallic league which would not be liable to be broken up by war, or impaired by some of the states which com- posed it issuing inconvertible paper. On the other hand, the various international conventions for postal purposes, extradition, com- mercial arrangements, and other matters of interest, are considered by bimetallists as evidences of the feasibility of their plan.~~

~~The above summary gives the main arguments on each side of the discussion as given by the advocates of the contending principles. A short consideration will show that the controversy may be suitably divided into three heads, viz.—(1) the possibility of constructing a universal bimetallic system which shall be in accordance with sound economic principle ; (2), if the first question be answered in the affirmative, the comparative merits of this system as opposed to the present variety of systems, or a future universal gold-standard system ; and (8) the expediency under present circumstances of nations in general, and England in parti- cular, joining in the proposed convention. Each of these topics calls for some remark. (1) The possibility of a bimetallic system can hardly be denied. Under all the difficulties attending its existence in a single country, it was retained in practical work- ing in France during the early part of the 18th century, and it is plain that a widely-extended league would afford a better field for its action. It is quite possible that national preferences for one metal or the other would be displayed, but this would be no~~

~~- hindrance, since the exchanges would be regulated by the legal rate,~~

~~*and prices would depend on the total quantity of both metals (the amount of gold being multiplied by the legal ratio, and added to the amount of silver).? The objection which denies the power of Governments to fix the relative values of gold and silver, and which is supported by the instance of the extreme case of silver being made equal in value to gold, may be set aside by the consideration that the use of the precious metals takes two forms—(a) their use as commodities, (b) their use as money. Since the state can influence the demand for these metals as money, and since therefore it can raise the value of either of them by this increased demand, it follows that, within assignable limits, it can fix the ratios between them, and that these limits are "the ratio which would subsist between their values if gold were demonetized, and that which would subsist if silver were demonetized."® The possibility of bi- metallism, if all nations were agreed, is allowed by some mono- metallists (e.g., Professor Jevons), and an unconscious argument to this effect was given by the proposal of Chevalier, at the time of the Australian gold discoveries, to adopt silver as the standard and demonetize gold, which is a clear recognition of the force of law in monetary questions. It is therefore reasonable to answer in the bimetallists' favour the question first raised. (2) The considerations to be taken into account under the second head are far more com- plex, and do not admit of accurate determination. The present currency systems of England and the Scandinavian Union are based on the composite system, and afford the greatest satisfaction to the inhabitants of those countries. The bimetallic system of the Latin Union has been suspended, the introduction of silver as the principal money not being desired by the various peoples concerned. Germany has lost considerably by the sales of depre- ciated silver, and, were a gold standard once firmly established, it is not likely that any wish for change would be manifested. With silver countries the case is different. They have to receive masses of depreciated silver and to give commodities in exchange, while their purchasing power is reduccd owing to the greater relative value of gold to silver. It would therefore be clearly advantageous for silver-using countries that a system should be adopted which would raise the value of their money, and save them from the necessity of importing large quantities of silver to produce a proper adjustment. The ultimate consequences of the complete demone- tization of silver as regards silver-using countries are not so clear. The supply of gold might suffice for all*~~

~~*wants, and might furnish a better currency than the heavier silver. The preservation of two separate monometallic systems, of gold for the more advanced countries of Europe aud the United States, of silver for Russia and India, would, when the superfluous stock of silver had passed to the East, present little difficulty after equilibrium was attained. The new ratio between silver and gold would become established, and silver prices in silver-using countries would be higher in pro- portion to the fall in the value of silver. It is therefore plain that a suitable adjustment would be reached under any variety of currency systems, and it may therefore be concluded that the comparative merits of the competing standards are not capable of*~~

~~*4 The principal sources for the above summary, besides works before cited, are the pamphlets of Seyd, Cernuschi, and De Laveleye, on the bimetallist side, as well as the articles of the latter in the Fort. and Contemp. Reviews. The monometallist arguments are given by Prof. Jevons (Contemp., May 1881), Mr R. Giffen (Essays in Finance, pp. 286-310), and Lord Sherbrooke (Nineteenth Century, April 1882). See also the Report of the Paris conference, 1881, and Mr T. H. Farrer, The State in its Relation to Trade, pp. 49-52.*~~

~~*5 It is assumed that the other factors which influence the value of money (see p. 722, above) remain constant, eat*~~

~~*6 Mr J. J. Murphy in Dublin Statistical Jowrnal, vol. vili. p. 282. See also M. Walras, Journal des Economistes, May 1881, 'Théorie Mathématique du*~~

~~*bimétallisme." XVI. — 93*~~

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~~*being decided at present. The immediate introduction of a universal gold currency is by the admission of all parties eminently undesirable, and this is the only settled point in the controversy. (3) The last head which the bimetallic question embraces is the practical expediency of joining in a bimetallic league with a ratio of 1 to 154. With regard to this aspect of the question the answer, for England at least, ought to be a negative one. The*~~

~~*present English monetary system has worked well. It is firmly rooted in English habits, and is not therefore to be lightly aban- doned. Again, the interests of English creditors are plainly opposed to any movement calculated to raise the value of silver relatively to gold, and to depreciate prices in general. The threat of some bi- metallists, that all nations will be driven to adopt a gold standard, and thus produce a crisis in the English money market by the resulting gold drain, is of no weight ; any drain of English gold will have to be paid for at a high price, and the simple expedient of raising the bank-rate will restore as much bullion as is needed in England. The interests of other countries cannot be so clearly determined. A state like Germany, holding a large store of depre- ciated silver, may desire other states to become bimetallic, but will hardly desire to do so herself. The interests of India and other silver-standard countries have been considered before. When all these aspects of the question have been examined the most probable conclusion is, that the chances of a bimetallic league in the imme-*~~

~~*diate future are very small, and that future monetary evolution will*~~

~~*be ruled rather by the course of events, and the pressure of circum- stances in each separate state, than by the conscious deliberations of an international conference.*~~

~~*Bibliography.—The literature of the various questions connected with money is very extensive, and only a brief notice of it can be given here. The principal authority among the Greeks is Aristotle, who in two passages (Nic. Eth., v. 5; Pol., i. 9) has discussed the qualities of money, and pointed out its functions with great clear- ness. Xenophon also, in his work On the Athenian State, dealt with the value of the precious metals, though his views are partially erroneous. The only passages worth noticing in Latin literature are those of Pliny, who seems to have held a form of the mercantile theory, and Paulus, who, in a fragment preserved in the Digest, has treated of the origin of money. The medieval literature embraces several works dealing specially with the queen of changes in the standard of money, which were condemned by the theologians, The first treatise professedly on the special subject of money is a work by Nicholas Oresme, bishop of Lisieux (0d. 1882), entitled De Origine, Natura, Jure,*~~

~~*et Mutationibus Monetarwm, reprinted in 1864 (Paris) by Wolowski, and even now worth reading. The next work to be noticed is the De Monetarwm Potestate simul et Utilitate libellus (Nuremberg, 1542), a fragment of a larger treatise on economics, of Gabriel Biel (0b. 1495). It has been remarked that "the favourite subject of the economists of the 16th century was that of money." The first of these works to be noticed is De Monetew Cudendx Ratione by Copernicus, reprinted along with the work of Oresme above mentioned. Ata later date the Jesuit Mariana discussed the varia- tions in prices under the title De Monet# Mutatione. In the same century an anonymous work appeared in German, with the title Gemeine Stimmen von der Muntze (1530). In 1588 Davanzati issued Lezione delle Monete, advocating a bimetallic system. The problem of the elevation of prices caused by the American mines led to the issue of several works, one of the most remarkable being the Dialogues of William Stafford (1581).*~~

~~*In the 17th century Sir W. Petty dealt with money in a tract,*~~

~~*MONFERRATO, or MontTFERRAT, an ancient marquisate of North Italy, in the valley of the Tanaro, the name of which still survives in the fuller title (Casale Monferrato) of the town of Casale. The princes of Monferrato were among the most powerful Italian families of the Middle Ages. Among them were several famous crusaders: Conrad, prince of Tyre from 1187 to 1192, the valiant opponent of Saladin; and Boniface, king of Thessalonica from 1183 to 1207. In 1305, on the extinction of the male line, the marquisate passed to Theodore Paleologus through his mother, the empress Irene. The Palzologi became extinct in 1533. The duchy was subsequently attached to Mantua, and ultimately absorbed in Savoy in the beginning of last century.*~~

~~*MONGE, GasparRp (1746-1818), French mathemati- cian, the inventor of descriptive geometry, was born at Beaune on the 10th May 1746. IIe was educated first at the college of the Oratorians at Beaune, and then in their college at Lyons,—where, at sixteen, the year after he had*~~

~~*Quantulumeumguc (1682). The recoinage of 1696 called forth Lowndes's Essay for the Amendment of the Silver Coins, and Locke's Further Considerations concerning raising the Value of Money. In the 18th century the Reports of Sir I. Newton, as Master of the Mint, are valuable. Cantillon's Hssai (Paris, 1755) contains in its 2d and 3d parts a sound account of currency. Harris's Essay on Money and Coins (1757) is also useful. An earlier tract by Rice Vaughan, Discourse of Coin and Coinage (1675), is brief, but correct in prin- ciple. Adam Smith's Wealth of Nations (London, 1776) discusses the subject of money in B. i. chs. 4 and 5, while seigniorage is examined in B. iv. ch. 6. The treatise, The Coins of the Realm (London, 1805), by the first earl of Liverpool, elaborately discussed the question of the proper standard, and has powerfully influenced monetary legislation in England and Germany. Ricardo's pam- phlets on the bullion question added to the knowledge of the laws which regulated a depreciated currency. Senior, in his Lectures on the Cost of obtaining Money (London, 1829), developed the theory of the international distribution of the precious metals.*~~

~~*The last half century has been a time of active discussion regard- ing monetary questions,—the gold discoveries, international coin- age, decimal coinage, bimetallism, the resumption of specie pay- ments in countries where an inconvertible currency has existed, each of these topics having had its special literature. Some of these works have been mentioned when dealing with the special questions they refer to, and these, in turn, refer to many others. It will suffice here to mention more general works. The theory of money is dealt with by the leading English economists in their systematic works (Mill, Principles, B. iii. chs. 7-10, 19, 21; Fawcett, Manual, B. iii. chs. 5, 6, 15, 16; Shadwell, System, B. iii. chs. 1-3 and 8), also by Cherbuliez (Précis, B. ii. ch. 8, vol. i. and B. ii. ch. 3, vol. ii.). Chevalier has devoted the third volume of his Cowrs (Paris, 1842-50) to the subject, with the title of "La Monnaie." The late Professor W. 8. Jevons's valuable work, Money and the Mechanism of Exchange, and Professor Hussey Walsh's concise T'reatise on Metallic Currency (Dublin, 1858) may also be used. More elaborate than either of these is F. A. Walker's Money, the most comprehensive work on the subject in English ; his smaller work, Money in its Relation to Trade and Industry, is likewise very good. Wolowski's L'Or et V Argent contains much*~~

~~*information, as does also Knies's Das Geld. . Seyd's Bullion and Foreign Exchanges is serviceable, but the changes since its publication (1869) deprive it of most of its value. The various editions of Tate's Cambist give the most accurate (though often imperfect) statements as to the facts of currency. Jacob's work on The Production and Consumption of the Precious Metals gives many interesting details, though the conclusions are often fanciful, and the authorities relied on not trustworthy. The recent work of Del Mar, History of the Precious Metals (London, 1880), furnishes a criticism and continuation of Jacob, and supplies many new details. His criticism of the "' cost of production" theory as applied to gold and silver is especi- ally useful. Some of his views on the moral aspects of the question need qualification. Professor Sumner's History of the American Currency may be relied upon for its facts. The Reports of the various conferences also supply abundant information on their special topics. Among these may be mentioned the Proceedings of the Paris con- ferences of 1867, 1878, and 1881; the Decimal Coinage Commission (1868) ; the French Enquéte Monétacre (1870) ; and the Report of the Committee of the House of Commons on the Depreciation of Silver (1876). The Reports of the (English) Jfint furnish information as to the coinage changes of each preceding year. (C. F. B.)*~~

~~*been learning physics, he was made a teacher of it. Returning to Beaune for a vacation, he made, on a large scale, a plan of the town, inventing the methods of obser- vation and constructing the necessary instruments; the plan was presented to the town, and preserved in their library. An officer of engineers seeing it wrote to recom- mend Monge to the commandant of the military school at Méziéres, and he was received as draftsman and pupil in the practical school attached to that institution; the school itself was of too aristocratic a character to allow of his admission to it. His manual skill was duly appreci- ated: "I was a thousand times tempted," he said long afterwards, "'to tear up my drawings in disgust at the esteem in which they were held, as if I had been good for nothing better." An opportunity, however, presented itself: being required to work out from data supplied to him the "'défilement" of a proposed fortress (an operation then only performed by a long arithmetical process), Monge, substituting for this a geometrical method, obtained the*~~

~~*result so quickly that the commandant at first refused to receive it—the time necessary for the work had not been taken ; but upon examination the value of the discovery was recognized, and the method was adopted. And Monge, continuing his researches, arrived at that general method of the application of geometry to the arts of construc- tion which is now called descriptive geometry. But such was the system in France before the Revolution that the officers instructed in the method were strictly forbidden to communicate it even to those engaged in other branches of the public service; and it was not until many years after- wards that an account of it was published. The method consists, as is well known, in the use of the two halves of a sheet of paper to represent say the planes of xy and xz at right angles to each other, and the consequent repre- sentation of points, lines, and figures in space by means of their plan and elevation, placed in a determinate relative position.*~~

~~*In 1768 Monge became professor of mathematics, and in 1771 professor of physics, at Méziéres; in 1778 he married Madame Horbon, a young widow whom he had previously defended in a very spirited manner from an unfounded charge; in 1780 he was appointed to a chair of hydraulics at the Lyceum in Paris (held by him together with his appointments at Méziéres), and was received as a member of the Academy; his intimate friendship with Berthollet began at this time. In 1783, quitting Mézieres, he was, on the death of Bezout, appointed examiner of naval candidates. Although pressed by the minister to prepare for them a complete course of mathematics, he declined to do so, on the ground that it would deprive Madame Bezout of her only income, arising from the sale of the works of her late husband; he wrote, however (1786), his Tratté élémentaire de la Statique.*~~

~~*Monge contributed (1770-1790) to the Memozrs of the Academy of Turin, the Mémoires des Savants Etrangers of the Academy of Paris, the Mémoires of the same Academy, and the Annales de Chimie, various mathematical and physical papers. Among these may be noticed the memoir "Sur la théorie des déblais et des remblais" (Mdém. de lV' Acad, de Paris, 1781), which, while giving a remarkably elegant investigation in*~~

~~regard to the problem of earth- evork referred to in the title, establishes in connexion with it his capital discovery of the curves of curvature of a surface. Euler, in his paper on curvature in the Berlin Memoirs for 1760, had considered, not the normals of the surface, but the normals of the plane sections through a particular normal, so that the question of the intersection of successive normals of the surface had never presented itself to him. Monge's memoir just referred to gives the ordinary differential equation of the curves of curvature, and establishes the general theory in a very satisfactory manner ; but the application to the interesting particular case of the ellipsoid was first made by him in a later paper in 1795. A memoir in the volume for 1783 relates to the production of water by the combustion of hydrogen ; but Monge's results in this matter had been anticipated by Watts and Cavendish.~~

~~In 1792, on the creation by the Legislative Assembly of an executive council, Monge accepted the office of minister of the marine, but retained it only until April 1793. When the Committee of Public Safety made an appeal to the savants to assist in producing the matériel required for the defence of the republic, he applied him- self wholly to these operations, and distinguished himself by his indefatigable activity therein; he wrote at this time his Description de Vart de fabriquer les canons, and his Avis aux ouvriers en fer sur la fabrication de lacier. He took a very active part in the measures for the establishment of the Normal School (which existed only~~

~~during the first four months of the year 1795), and of the School for Public Works, afterwards the Polytechnic School, and was at each of them professor for descriptive geometry ; his methods in that science were first pub- lished in the form in which the shorthand writers took down his lessons given at the Normial School in 1795, and again in 1798-99. In 1796 Monge was sent into Italy with Berthollet and some artists to receive the pictures and statues levied from several Italian towns, and made there the acquaintance of General Bonaparte. Two years afterwards he was sent to Rome on a political mission, which terminated in the establishment, under Massena, of the shortlived Roman republic ; and he~~

~~thence joined the expedition to Egypt, taking part with his friend Berthollet as well in various operations of the war as in the scientific labours of the Egyptian Institute of Sciences and Arts ; they accompanied Bonaparte to Syria, and returned with him in 1798 to France. Monge was appointed president of the Egyptian commission, and he resumed his connexion with the Polytechnic School. His later mathematical papers are published (1794-1816) in the Journal and the Correspondance of the Polytechnic School. On the forma- tion of the Senate he was appointed a member of that body, with an ample provision and the title of count of Pelusium ; but on the fall of Napoleon he was deprived of all his honours, and even excluded from the list of mem- bers of the reconstituted Institute. He died at Paris on the 28th July 1818.~~

~~For further information see B. Brisson, JWotice historique sur Gaspard Monge; Dupin, Essai historique sur les services et les tra- vaux scientifiques de Gaspard Monge, Paris, 1819, which contains (pp. 162-166) a list of Monge's memoirs and works; and the bio- graphy by Arago (Zuvres, t. ii., 1854).~~

~~Monge's various mathematical papers are to a considerable extent reproduced in the Application de l Analyse a la Géométrie, 4th edition (last revised by the author), Paris, 1819—the pure text of this is reproduced in the 5th edition (revue, corrigée et annotée par M. Liouville), Paris, 1850,which contains also Gauss's Memoir, "'Disquisitiones generales circa superficies curvas," and some valu- able notes by the editor. The other principal separate works are Traité élémentatre de la Statique, 8¢ edition, conformée a la précé- dente, par M. Hachette, et suivie d'une Note etc., par M. Cauchy, Paris, 1846; and the Géométrie Deseriptive (originating, as mentioned above, in the lessons given at the Normal School). The 4th edition, published shortly after the author's death, seems to have been sub- stantially the same as the 7th (@éométrie Descriptive par G. Monge, sutvie d'une théorie des Ombres et de la Perspective, extraite des papiers de Vauteur, par M. Brisson, Paris, 1847). (A. CA.)~~

~~MONGHYR, or Monair, a district in the lieutenant- governorship of Bengal, lying between 24° 22' and 25° 49' N. lat., and 85° 40' and 86° 52'~~

~~E. long., is bounded on the N. by Darbhangah and Bhagalpur, on the E. by Bhagal- pur, on the S. by the Santal Parganas and Hazaribagh, and on the W. by Gaya, Patna, and Darbhangah, with an area of 3922 square miles. The Ganges divides the district into two portions. The northern, intersected by the Buri Gandak and Tiljugd4, two important tributaries of the Ganges, is always liable to inundation during the rainy season, and is a rich, flat, wheat and rice country, support- ing a large population. A considerable area, immedi- ately bordering the banks of the great rivers, is devoted to permanent pasture. Immense quantities of buffaloes are sent every hot season to graze on these marshy prairies ; and the ghi, or clarified butter, made from their milk forms an important article of export to Calcutta. To the south of the Ganges the country is dry, much less fertile, and broken up by fragmentary ridges. The soil consists of quartz, mixed in varying proportions with mica. Ranges of hills intersect this part of the district, and in the extreme south form conical peaks, densely covered with jungle, but of no great height. Irrigation is necessary throughout the section lying on the south of the Ganges.~~

~~In 1872 the population of Monghyr was 1,812,986 (males, 897,074; females 915,912): Hindus, 1,613,546 ; Mohammedans,~~

~~182,269 ; the remainder, consisting mainly of aboriginal tribes and hill races, profess primitive forms of faith. There are also a few Buddhists and Christians. Seven towns contained upwards of 5000 inhabitants in 1872— Monghyr, 59,698 ; Shaikhpura, 11,536 ; Jamalpur, 10,453 ; Barhiya, 10,405 ; Surajgarha, 7935 ; Barbigha, 6362; and Jami, 5197. No trustworthy statistics of the area under cultivation exist since the revenue survey in 1847, when it was returned at 1,311,768 acres ; it is known, however, that cultiva- tion has largely extended since then. The land is held principally under the tenure known as bhdoli-jot, by which the tenant pays rent, either in money or in kind, according to the out-turn of his crops in each year. It is of ancient standing, and popular with the tenantry. Monghyr is famous for its manufactures of iron: firearms, swords, and iron articles of every kind are produced in abundance, but~~

~~*are oted for cheapness rather than quality. The art of inlaying sword-hilts and other articles with gold and silver affords employment to a few families. The most important manu- facture, however, is that of indigo, conducted by means of Euro- pean capital and under European supervision. The total arca under indigo is estimated at about 10,000 acres, with an average out-turn of 2900 cwts. of dye. Minor industries include weaving, dyeing, cabinet-making, boot-making, soap-boiling, and pottery. The principal exports, sent to Calcutta both by rail and river, are oil-seeds, wheat, rice, indigo, gram and pulse, hides, and tobacco ; and the chief imports consist of European piece goods, salt, and sugar. The value of the former in 1876-77 was £430,000, and of the latter £314,000. Education is making fair progress, and in 1874- 75 there were 229 Government and aided schools, attended by 6675*~~

~~*pupils. The climate is dry and healthy. The temperature is high*~~ |

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~~*MON—MON*~~

~~*in the hot weather, reaching 107° Fahr. in May; but the cold weather is cool and pleasant. 'The average annual rainfall is 463 inches. Malarial fever is comparatively uncommon, but epidemics of cholera occur frequently.*~~

~~*Monghyr was one of the principal centres of the Mohammedan administration in Bengal. In the early years of British rule, Monghyr formed a part of Bhagalpur, and was not created a separate district till 1832.*~~

~~*Moncuyr, chief town and administrative headquarters of the above district, is situated on the south bank of the Ganges (25° 22' N. lat., 86° 30' E. long.). The population in 1872 was 59,698: viz., Hindus, 44,900; Mohammedans, 14,346 ; Buddhists, 33; Christians, 305; '" others," 24.*~~

~~*In 1195 Monghyr, a fortress of great natural strength, appears to have been taken by Muhammad Bakhtyar Khilji, the first Moslem conqueror of Bengal. Henceforth it is often mentioned by the Mohammedan*~~

~~chroniclers as a place of military importance, and was frequently chosen as the seat of the local government. After 1590, when Akbar established his supremacy over the Afghan chicfs of Bengal, Monghyr was long the headquarters of his general, Todar Mall; and it also figures prominently during the rebellion of Sultan Shujd against his brother, Aurangzeb. In more recent times Nawab Mir Kasim, in his war with the English, selected it as his residence and the centre of his military preparations. The fame of Monghyr armourers is said to date from the arsenal which he established. The town is now purely a civil station. and in some respects one of the most picturesque in Bengal.~~

~~MONGOLS~~

~~HE early history of the Mongols, like that of all central-Asian tribes, is extremely obscure. Even the meaning of the name " Mongol" is a disputed point, though a general consent is now given to Schott's etymology of the word from "mong," meaning brave. From the earliest and very scanty notice we have of the Mongols in the history of the T'ang dynasty of China (a.p. 619-90) and in works of later times, it appears that their original camping-grounds were along the courses of the Kerulon, Upper Nonni, and Argun rivers. But in the absence of all historical particulars of their origin, legend, as is usual, has been busy with their early years. The Mongol historian Ssanang Ssetzen gives currency to the myth that they sprang from a blue wolf; and the soberest story on record is that their ancestor Budantsar was miraculously conceived of a Mongol widow. By craft and violence Budantsar gained the chieftainship over a tribe living in the neighbourhood of his mother's tent, and thus left a heritage to his son. Varying fortunes attended the descendants of Budantsar, but on the whole their power gradually increased, until Yesukai, the father of Jenghiz Khan, who was eighth in descent from Budantsar, made his authority felt over a considerable area. How this dominion was extended under the rule of Jenghiz Khan has already been shown (see JENGHIZ Kuan), and when that great conqueror was laid to rest in the valley of Keleen in 1227 he left to his sons an empire which stretched from the China Sea to the banks of the Dnieper.~~

~~*Over the whole of this vast region Jenghiz Khan set his second surviving son Oghotai or Ogdai as khakan, or chief khan, while to the family of his deceased eldest son Juchi he assigned the country from Kayalik and Kharezm to the borders of Bulgar and Saksin "where'er the hoofs of Mongol horses had tramped ;" to Jagatai, his eldest sur- viving son, the territory from the borders of the Uigur country to Bokhara; while Tulé, the youngest, received charge of the home country of the Mongols, the care of the imperial encampment and family, and of the archives of the state. The appointment of Ogdai as his successor, be- ing contrary to the usual Mongol custom of primogeniture, gave rise to some bitterness of feeling among the followers of Jagatai. But the commands of Jenghiz Khan subdued these murmurs, and Ogdai was finally led to the throne*~~

~~*by his dispossessed brother amid the plaudits of the assembled Mongols. The ceremony was completed by Ogdai making three solemn genuflexions to the sun, and by the princes taking an oath by which they swore "that so long as there remained of his posterity a morsel of flesh which thrown upon the grass would prevent the cows from eating, or which put in the fat would prevent the dogs from taking it, they would not place on the throne a prince of any other branch." In accordance with Mongol customs, Ogdai signalized his accession to the throne by distribut- ing among his grandees presents from his father's treasures, and to his father's spirit he sacrificed forty maidens and numerous horses. Once fairly on the throne, he set himself vigorously to follow up the conquests won by his father. At the head of a large army he marched southwards into China to complete the ruin of the Kin dynasty, which had already been so rudely shaken, while at the same time Tulé advanced into the province of Honan fromtheside of Shense. Against this combined attack the Kin troops made a vigor- ous stand, but the skill and courage of the Mongols bore down every opposition, and over a hecatomb of slaughtered foes they captured Kai-fung Foo, the capital of their ene- mies. From Kai-fung Foo the emperor fled to Joo-ning Foo, whither the Mongols quickly followed. After sus- taining a siege for some weeks, and enduring all the horrors of starvation, the garrison submitted to the Mongols, and at the same time the emperor committed suicide by hang- ing. Thus fell in 1234 the Kin or "Golden" dynasty, which had ruled over the northern portion of China for more than a century.*~~

~~*But though Ogdai's first care was to extend his empire in the rich and fertile provinces of China, he was not forgetful of the obligation under which Jenghiz Khan's conquests in western Asia had laid him to maintain his supremacy over the kingdom of Kharezm. This was the more incumbent on him since Jelal al-din, who had been driven by Jenghiz into India, had returned, reinforced by the support of the sultan of Delhi, whose daughter he had married, and, having reconquered his hereditary domains, had advanced westward as far as Tiflis and Khelat. Once more to dispossess the young sultan, Ogdai sent a force of 300,000 men into Kharezm. With such amazing ra- pidity did this army march in pursuit of its foe that the*~~

~~*mON GOLS*~~

~~*advanced Mongol guards reached Amid (Diarbekr), whither Jelal al-din had retreated, before that unfortunate sovereign had any idea of their approach. Accompanied by a few followers, Jelal al-din fled to the Kurdish mountains, where he was basely murdered bya peasant. The primary object of the Mongol invasion was thus accomplished; but, with the instinct of their race, they made this conquest but a stepping-stone to another, and without a moment's delay pushed on still farther westward. Unchecked and almost unopposed, they overran the districts of Diarbekr, Meso- potamia, Erbil, and Khelat, and then advanced upon Azerbijan. So great was the terror with which these fierce warriors inspired the people of the provinces they attacked that single Mongols are said to have slain the inhabitants of entire villages without a hand having been raised against them. In the following year (1236) they invaded Georgia and Great Armenia, committing frightful atrocities, sparing neither man nor woman, young nor old, with the exception of those whom they saved to minister to their wants or passions. 'Tiflis was among the cities captured by assault, and Kars was surrendered at their approach in the vain hope that submission would gain clemency from the victors. Meanwhile, in 1235, Ogdai, whose troops were as numerous as their thirst for conquest was devouring, despatched three armies in as many direc- tions. One was directed against Corea, one against the Sung dynasty, which ruled over the provinces of China south of the Yang-tsze Keang, and the third was sent west- ward into eastern Europe. 'This last force was commanded by*~~

~~*Batu, the son of Juchi, Ogdai's deceased eldest brother, who took with him the celebrated Sabutai Bahddur as his chief adviser. Bulgar, the capital city of the Bulgars, fell before the force under Sabutai, while Batu pushed on over the Volga. With irresistible vigour and astonishing speed the Mongols made their way through the forests of Penza and Tamboff, and appeared before the "beautiful city" of Niazan. For five days they discharged a ccaseless storm of shot from their balistas, and, having made a breach in the defences, carried the city by assault on the 21st of December 1237. 'The prince, with his mother, wife, sons, the boyars, and the inhabitants, without regard to age or sex, were slaughtered with the savage cruelty of Mongol revenge ; some were impaled, some shot at with arrows for sport, others were flayed or had nails or splinters of wood driven under their nails. Priests were roasted alive, and nuns and maidens ravished in the churches before their relatives. 'No eye remained open to weep for the dead.'" Moscow, at this time a place of little importance, next fell into the hands of the invaders, who then advanced against Vladimir. After having held out for several days against the Mongol attacks, the city at length succumbed, and the horrors of Riazan were repeated. The imperial family, with a vast crowd of fugitives, sought shelter in the cathedral, only to perish by the swords of the conquerors or by the flames which reduced it to ashes. If possible, a more dire fate overtook the inhabitants of Kozelsk, near Kaluga, where, in revenge fora partial defeat inflicted on a Mongol force, the followers of Batu held so terrible a "carnival of death" that the city was renamed by its captors Mobalig, 'the city of woe." With the tide of victory thus strong in their favour the Mongols advanced against Kieff, "the mother of cities," and carried it by assault. The inevitable massacre followed, and the city was razed to the ground. While the scene of blood- shed was at its height a catastrophe occurred which at any other time would have been considered of supreme horror. Under the weight of a vast crowd of fugitives the flat roof of the metropolitan church fell in, burying all, young and old, in a vast hecatomb.*~~

~~*Victorious and always advancing, the Mongols, having*~~

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~~*desolated this portion of Russia, moved on in two divisions, one under Batu into Hungary, and the other under Baidar and Kaidu into Poland. Without a check, Batu marched to the neighbourhood of Pesth, where the whole force of the kingdom was arrayed to resist him. The Hungarian army was posted on the wide heath of Mohi, which is bounded by 'the vine-clad hills of Tokay," the mountains of Lomnitz, and the woods of Diosgyor. To an army thus hemmed in on all sides defeat meant ruin, and Batu instantly recognized the dangerous position in which his enemies had placed themselves. To add to his chances of success he determined to deliver his attack by night, and while the careless Hungarians were sleeping he launched his battalions into their midst. Panic-stricken and help- less, they fled in all directions, followed by their merciless foes. Two archbishops, three bishops, and many of the — nobility were among the slain, and the roads for two days' journey from the field of battle were strewn with corpses. The king, Béla IV., was saved by the fleetness of his horse, though closely pursued by a body of Mongols, who followed at his heels as far as the coast of the Adriatic, burning and destroying everything in their way. Mean- while Batu captured Pesth, and on Christmas Day 1241, having crossed the Danube on the ice, took Gran by assault. While Batu had been thus triumphing, the force under Baidar and Kaidu had carried fire and sword into Poland. At their approach the inhabitants of Cracow deserted the city, after having given it over to the flames. Disappointed at the loss of their expected spoil, the Mongols advanced to Wahlstatt in the neighbourhood of Liegnitz, where the Polish army under Duke Henry II. of Silesia awaited their onslaught. With savage impetuosity, the troops of Baidar rushed to the attack, and completely defeated the Poles. As usual, no quarter was given. The massacre was fright- ful, and Duke Henry himself was amongst the slain. It was a Mongol habit to cut off an ear from each corpse of their slaughtered foes, and on this occasion it is said that they filled nine sacks with these ghastly trophies. Follow- ing the example of the inhabitants of Cracow, the people of Liegnitz left but the blackened walls of what had once been the town as a prey for the Mongols, who without delay pushed south-eastward into Moravia as far as the vicinity of Troppau. While laying waste the country in the neighbourhood of that town, they received the an- nouncement of the death of Ogdai, and at the same time a summons for Batu to return eastwards into Mongolia.*~~

~~*While his heutenants had been thus carrying his arms in all directions, Ogdai had been giving himself up to ignoble ease and licentiousness. Like many Mongols, he was much given to drink, and it was to a disease produced by this cause that he finally succumbed on the 11th of December 1241. HIe was succeeded by his son Kuyuk, who reigned only seven years. Little of his character is known, but it is noticeable that his two ministers to whom he left the entire conduct of affairs were Christians, as also were his doctors, and that a Christian chapel stood before his tent. This leaning towards Christianity, however, brought no peaceful tendencies with it. On the contrary, we hear of an advance against the sultan of Rum (Asia Minor), and of an expedition into Syria, by which that country was made tributary to the Great Mongol empire, of a fresh campaign against Corea, and of another attack on the Sung dynasty of China. On the death of Kuyuk dissensions which had been for a long time smouldering between the houses of Ogdai and Jagatai broke out into open war, and after the short and disputed reigns of Kaidu and Chapai, grand- sons of Ogdai, the lordship passed away from the house of Ogdai for ever.*~~

~~*On the Ist of July 1251 Mangu, the eldest son of Mangu With Khan.*~~

~~*Tulé, and nephew to Ogdai, was elected khakan.*~~

~~*Hulagu.*~~

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~~*perfect impartiality, Mangu allowed the light of his coun- tenance to fall upon the Christians, Mohammedans, and Buddhists among his subjects, although Shamanism was recognized as the state religion. T'wo years after his accession his court was visited by Rubruquis and other Christian monks, who were hospitably received. The de- scription given by Rubruquis of the khakan's palace at Karakorum shows how wide was the interval which sepa- rated him from the nomad, tent-living life of his fore- fathers. It was "surrounded by brick walls… . Its southern side had three doors. Its central hall was like a church, and consisted of a nave and two aisles, separated by columns. HIere the court sat on great occasions. In front of the throne was placed a silver tree, having at its base four lions,*~~

~~*from whose mouths there spouted into four silver basins wine, kumiss, hydromel, and terasine. At the top of the tree a silver angel sounded a trumpet when the reservoirs that supplied the four fountains wanted replenishing." On his accession complaints reached Mangu that dissensions had broken out in the province of Persia, and he therefore sent a force under the command of his brother Hulagu to punish the Ismailites or Assassins, who were held to be the cause of the disorder. Marching by Samarkand and Kesh, Hulagu crossed the Oxus and advanced by way of Balkh into the province of Kohistan. The terror of the Mongol name induced Rokn al-din, the chief of the Assassins, to deprecate the wrath of Hulagu by offers of submission, and he was so far successful that he was able to purchase a temporary immunity from massacre by dismantling fifty of the principal fortresses in Kohistan. But when once the country had thus been left at the mercy of the invaders, their belief in the old saying "Stone dead hath no fellow" sharpened their battle-axes, and, sparing neither man, woman, nor child, they exterminated the unhappy people. Hulagu then marched across the snowy mountains in the direction of Baghdad. On arriving before the town he demanded its surrender. This being refused, he laid siege to the walls in the usual destruc- tive Mongol fashion, and at length, finding resistance hope- less, the caliph was induced to give himself up and to open the gates to his enemies. On the 15th of February 1263 the Mongols entered the walls, and, following their in- stincts, sacked the city. For seven days it was given up to pillage, fire, and the sword, and the number of killed was said to have reached the enormous sum of 800,000. For the moment the caliph's life was spared, and he was allowed to carry away 100 wives out of 700 who lived in his harem, as being those upon whom "neither the sun nor moon had shone." But his fate soon overtook him. Accounts differ as to the circumstances of his death, some saying that he was sewn up in a sack and trodden to death by horses, others that he was starved to death. To the Moslem world his loss was a religious catastrophe, as by it Islam lost its spiritual head. While at Baghdad Hulagu gave his astronomer, Nasir al-din, permission to build an observatory. The town of Maragha was the site chosen, and, under the superintendence of Nasir al-din and four western Asiatic astronomers who were associated with him, a handsome observatory was built, and furnished with "'armillary spheres and astrolabes, and with a beautifully- executed terrestrial globe*~~

~~showing the five climates." One terrible result of the Mongol invasion was a fearful famine, which desolated the provinces of Irak-Arabi, Mesopotamia, Syria, and Rim. But, though the inhabitants starved, the Mongols had strength and energy left to continue their onward march into Syria. Aleppo was stormed and sacked, Damascus surrendered, and Hulagu was meditating the capture of Jerusalem with the object of restoring it to the Christians when he received the news of Mangu's death, and, as in duty bound, at once set out on his return to~~

~~Mongolia, leaving Kitubuka in command of the Mongol forces in Syria. As a reward for his services, Hulagu received the investiture of his conquests, and established there the empire of the Ikhans.~~

~~While Hulagu was prosecuting these conquests in western Asia, Mangu and his next brother Kublai were pursuing a like course in southern China. Southward they even advanced into Tong-king, and westward they carried their arms over the frontier into Tibet. But in one respect there was a vast difference between the two campaigns. Under the wise command of Kublai all indiscriminate massacres were forbidden, and probably for the first time in Mongol history the inhabitants and garrisons of captured cities were treated with humanity. While carrying on the war in the province of Sze-ch'uen Mangu was seized with an attack of dysentery, which proved fatal after a few days' illness. His body was carried into Mongolia on the backs of two asses, and, in pursuance of the custom of slaughter- ing every one encountered on the way, 20,000 persons were, according to Marco Polo, put to the sword.~~

~~At the Kuriltai, or assembly of notables, which was held at Shang-tu after the death of Mangu, his brother Ku- blai (see Kupiat Kuan) was elected khakan. For thirty-five years he sat on the Mongol throne, and at his death in 1294, in his seventy-ninth year, he was succeeded by his son Timur Khan, or, as he was otherwise called, Uldsheitu Khan. The reign of this sovereign was chiefly remarkable for the healing of the division which had for thirty years separated the families of Ogdai and Jagatai from that of the ruling khakan. Uldsheitu was succeeded by his nephew Khaissan. In accordance with the usual ceremony, on the election being~~

~~*announced four of the princes of the blood raised the new khakan aloft on a piece of white felt, two others supported him, while a seventh offered him the cup. ‘ Meanwhile, while Shaman offered up prayers for his prosperity and saluted him by the title of Kuluk Khan, carts full of gold pieces and rich tissues were brought out and distributed. So many pearls were spread on the ground that it resembled the sky. The feast lasted a week, during each day of which 40 oxen and 4000 sheep were consumed. Libations of milk from 700 sacred cows and 7000 ewes were sprinkled on the ground.” With that tolerance which so markedly char- acterized the Mongols at this period, Kuluk worshipped indiscriminately at the temples of the Chinese Shang-te and before the Buddhist shrines, while at the same time he lent a favourable countenance to John of Montecorvino, who, during the whole of his reign, was archbishop of Peking. Unfortunately the archbishop was not so tolerant as the khakan, and carried on as fierce a dispute with the Nestorian Christians of his day as that which divided the Dominicans and Jesuits in China three centuries later. After a short reign, and at the early age of thirty-one, Kuluk was gathered to his fathers in February 1311. His nephew and successor, Buyantu, was a man of considerable culture, and substantially patronized Chinese literature. Among other benefits which he conferred on letters, he rescued the celebrated inscription-bearing “stone drums,” which are commonly said to be of the Chow period (B.c, 1122- 255), from the decay and ruin to which they were left by the last emperor of the Kin dynasty, and placed them in the gateway of the temple of Confucius at Peking, where they now stand. After a reign of nine years Buyantu was succeeded by his son Gegen, who perished in 1323 by the knife of an assassin,—the first occasion on which a reigning descendant of Jenghiz Khan thus met his fate. Yissun Timur, who was the next sovereign, devoted himself mainly to the administration of his empire. He divided China, which until that time had been apportioned into twelve*~~

~~*| provinces, into eighteen provinces, and rearranged the*~~

~~*Toghon Timur Khan.*~~

~~*MONGOLS*~~

~~*system of state granaries, which had fallen into disorder. His court was visited by Friar Odoric, who gives a minute description of the palace and its inhabitants. Speaking of the palace this writer says—*~~

~~*'Its basement was raised about two paces from the ground, and within there were twenty-four columns of gold, and all the walls were hung with skins of red leather, said to be the finest in the world. In the midst of the palace was a great jar more than two paces in height, made of a certain precious stone called merdacas (jade) ; its price exceeded the value of four large towns. . . . Into this vessel drink was conducted by certain conduits from the court of the palace, and beside it were many golden goblets, from which those drank who listed. . . . When the khakan sat on his throne, the queen was on his left hand, and a step lower two others of his women, while at the bottom of the steps stood the other ladies of his family. All those who were married wore upon their heads the foot of a man as it were a cubit and a half in length, and at the top of the foot there were certain cranes' feathers, the whole foot being set with great pearls, so that if there were in the whole world any fine and large pearls they were to be found in the decoration of those ladies."*~~

~~*The following years were years of great natural and political convulsions. Devastating floods swept over China, carrying death and ruin to thousands of homes ; earthquakes made desolate whole districts ; and in more than one part of the empire the banners of revolt were unfurled. The khakans who now successively occupied the throne, instead of striving to stem the tide of discontent and disorder, gave themselves up to every kind of debauchery. As a natural consequence, the conduct of affairs fell entirely into the hands of their ministers, who but too often reflected the vices of their sovereigns. A comet which appeared in the reign of Toghon Timur Khan, and which was believed to be the precursor of fresh disasters to the reigning house, justified the prediction by being almost immediately fol- lowed by an earthquake, which overthrew the temple of the Imperial Ancestors, from the altars of which, as if to complete the misfortune, the silver tablets of the emperors were in the consequent confusion stolen. It was not long before the popular discontent found vent. In order to prevent the recurrence of the periodical inundations caused by the overflow of the Yellow river, the emperor*~~

ordered a levy of 70,000 men to excavate a new channel for its dangerous stream, and imposed a heavy tax to meet the necessary expenses. These oppressive edicts overstrained the patience of the people, and they broke into open re- bellion. Under various leaders the rebels captured a number of cities in the provinces of Keang-nan and Honan, and took possession of Hang-chow, the capital of the Sung emperors. At the same time pirates ravaged the coasts and swept the imperial vessels off the sea. While these combined disorders were disturbing the country, the emperor, under the guidance of Tibetan Lamas, was being initiated into the sensual enjoyments peculiar to the warmer climates of Asia.

In 1355 a Buddhist priest named Choo Yuen-chang became so impressed with the misery of his countrymen that he threw off his vestments and enrolled himself in the rebel army. His military genius soon raised him to the position of a leader, and with extraordinary success he overcame with his rude levies the trained legions of the Mongol emperor. While unable to defeat or check the rebels in the central provinces Toghon Timur was also called upon to face a rebellion in Corea. Nor were his arms more fortunate in the north than in the south. An

khakan will lose his empire." The fulfilment followed closely on the prophecy. By a subterfuge, the rebels, after having gained possession of most of the central provinces of the empire, captured Peking. But Toghon Timur by a hasty flight escaped from his enemies, and sought safety on the shores of the Dolonor in Mongolia. For a time the western provinces of China continued to hold out against the rebels, but with the flight of Toghon Timur the Mon- gol troops lost heart, and in 1368 the ex-Buddhist priest ascended the throne as the first sovereign of the Ming or "Bright" dynasty, under the title of Hung-woo.

Thus ended the sovereignty of the house of Jenghiz Khan in China, nor need we look far to find the cause of its fall. Brave and hardy the Mongols have always shown themselves to be; but the capacity for consolidating the fruits of victory, for establishing a settled form of govern- ment, and for gaining the allegiance of the conquered peoples, have invariably been wanting in them. For a time their prowess and the

~~*exceptional ability of some of the first emperors of their line held the people of China in a bondage which was only outwardly peaceful, and, when the hands which held the reins lost their nervous power, and the troops, enervated by the softer climate of China, lost much of their hardihood, the long pent-up hatred of a foreign yoke broke out and with gathering strength drove the invaders back to their Mongolian pasture-grounds.*~~

~~*Not content with having recovered China, the emperor Hung-woo sent an army of 400,000 men into Mongolia in pursuit of the forces which yet remained to the khakan. Even on their own ground the disheartened Mongols failed in their resistance to the Chinese, and at all points suffered disaster. Meanwhile Toghon Timur, who did not long survive his defeat, was succeeded in the khakanate by Biliktu Khan, who again in 1379 was followed by Ussakhal Khan. During the reign of this last prince the Chinese again invaded Mongolia, and inflicted a crushing defeat on the khan's forces in the neighbour- hood of Lake Buyur. Besides the slain, 2994 officers and 77,000 soldiers are said to have been taken prisoners, and an immense booty to have been secured. This defeat was the final ruin of the eastern branch of the Mongols, who from this time surrendered the supremacy to the western division of the tribe. At first the Keraits or Torgod, as in the early days before Jenghiz Khan rose to power, exercised lordship over the eastern Mongols, but from these before long the supremacy passed to the Oirad, who for fifty years treated them as vassals. Not- withstanding their subjection, however, the Keraits still preserved the imperial line, and khakan after khakan assumed the nominal sovereignty of the tribe, while the real power rested with the descendants of Toghon, the Oirad chief, who had originally attached them to his sceptre. Gradually, however, the Mongol tribes broke away from all governing centres, and established scattered communities with as many chiefs over the whole of eastern Mongolia. The discredit of having finally disin- tegrated the tribe is generally attached to Lingdan Khan (1604-1634), of whom, in reference to his arrogant and brutal character, has been quoted the Mongolian proverb : "A raging khakan disturbs the state, and a raging saghan (elephant) overthrows his keepers."*~~

~~*At this time the Mongols, though scattered and in The*~~

~~*army which was sent to suppress the revolt was cut to isolated bodies, had recovered somewhat from the shock Cha-*~~

~~*pieces almost to a man. These events made a dream Fret Khars.*~~

~~*which the emperor dreamt about this time of easy inter- pretation. He saw in his sleep "a wild boar with iron tusks rush into the city and wound the people, who were driven hither and thither without finding shelter. Mean-while the sun and the moon rushed together and perished." "This dream," said the diviner, "is a prophecy that the*~~

~~*of the disaster which they suffered at the hand of the Ming sovereign of China. When first driven northwards, they betook themselves to the banks of the Kerulon, from whence they had originally started on their victorious career; but gradually, as the Chinese power became weaker among the frontier tribes, they again pushed southwards,*~~

~~and at this time had established colonies in the Ordus country, within the northern bend of the Yellow river. The Mongol royal family and their immediate surroundings occupied the Chakhar country to the north-west of the Ordus territory, where they became eventually subjugated by the Manchus on the overthrow of the Ming dynasty in 1644 by the present rulers of China. Possibly out of~~

~~China which sprang up after the wars of Altan, began to effect a change in the manner of life of the people. By degrees the pastoral habits of the inhabitants became more agricultural, and at the present day, asin Manchuria, Chinese immigrants have so stamped their mark on the fields and markets, on the towns and villages, that the country has become to all intents and purposes part of China proper.~~

~~Passing now from the inner division of the Mongols—that The is to say, the Chakhars and the 49 banners who live in the Khal- southern and eastern portions of the desert—we come to the aii~~

~~consideration for the royal descent of their chiefs, the Chinese emperors have invariably placed these Mongols in a privileged position, and have incorporated the eight~~

~~banners or military divisions of the Chakhars as one of the eight banners of the imperial Manchu army. The remaining Mongols who submitted to the Manchus were divided into 135 banners, 49 representing all those on the south-east of the desert, and 86 the Khalkhas, whose territory stretched along the north of the desert from the neighbourhood of Barkhul on the west to the Dalai- nor on the north-east. From and before this period the history of the eastern Mongols has been that of all the nomad tribes of central Asia, about which nothing can be more certainly said than that that which appears most improbable is most likely to happen, and that that which might naturally be expected rarely occurs. Each tribe, as its fortunes varied, either rose to power or sank into~~

~~*insignificance. At times the old vigour and strength which had nerved the arm of Jenghiz Khan seemed to return to the tribe, and we read of successful expeditions being made by the Ordu Mongols into Tibet, and even of invasions into China. The relations with Tibet thus inaugurated brought about a rapid spread of Buddhism among the Mongolians, and in the beginning of the 17th century the honour of having a Dalai Lama born among them was vouchsafed to them. In 1625 Toba, one of the sons of Bushuktu Jinung Khan, went on a pilgrimage to the Dalai Lama, and brought back with him a copy of the Tanjur to be translated into Mongolian, as the Kanjur had already been. But though the prowess of the Ordu Mongols was still unsubdued, their mode of living was as barren and rugged as the steppes and rocky hills which make up their territory. Their flocks and herds, on which they are entirely dependent for food and clothing, are not numerous, and, like their masters, are neither well fed nor well favoured. But though living in this miserable condi- tion their princes yet keep up a certain amount of barbaric state, and the people have at least the reputation of being honest. Several of the tribes who had originally migrated with those who finally settled in the Ordu territory, finding the country to be so inhospitable, moved farther eastward into richer pastures. Among these were the Tumeds, one of whose chiefs, Altan Khan, is famous in later Mongol his- tory for the power he acquired. For many years during the 16th century he carried on a not altogether unsuccessful war with China, and finally, when peace was made (1571), the Chinese were fain to create him a prince of the empire and to confer a golden seal of authority upon him. In Tibet his arms were as successful as in China; but, as has often happened in history, the physical conquerors became the mental subjects of the conquered. Lamaism has always had a great attraction in the eyes of the Mongols, and, through the instrumentality of some Lamaist prisoners whom Altan brought back in his train, the religion spread at this time rapidly among the Tumeds. Altan himself embraced the faith, and received at his court the Bogda Sodnam Gyamtso Khutuktu, on whom he lavished every token of honour. One immediate effect of the introduction of Buddhism among the Tumeds was to put an end to the sacrifices which were commonly made at the grave of their chieftains. In 1584 Altan died, and was succeeded by his son Senge Dugureng Timur. The rich territory occupied by the Tumeds, together with the increased intercourse with*~~

~~*outer division, which is divided into 86 banners, and occupies the territory to the north of the desert. Of these the chief are the Khalkhas, who are divided into the West- ern and Eastern Khalkhas. These people form the link of communication between Europe and eastern Asia. Early in the 17th century the Russians sent an embassy to the court of the Golden Khan with the object of persuading the Mongol khan to acknowledge allegiance to the czar. This he did without much hesitation or inquiry, and he fur- ther despatched envoys to Moscow on the return of the Russian embassy. But the allegiance thus lightly acknow- ledged was lightly thrown off, and in a quarrel which broke out between the Khirghiz and the Russians the Khalkhas took the side of the former. The breach, however, was soon healed over, and we find the Golden Khan sending an envoy again to Moscow, asking on behalf of his master for presents of jewels, arms, a telescope, a clock, and ‘“‘a monk who had been to Jerusalem that he might teach the Khalkhas how the Christians prayed.” Their submission to Russia on the north did not save them, however, from the Chinese attacks on the south. In central Asia, as the recent history of Russia in that part of the world shows, the depredations of a tribe on the property of its neighbours supply a ready cause of quarrel at any moment, and the Chinese had no difficulty, therefore, in justifying an invasion of the Khalkha territory. At that time the present Manchu dynasty ruled in China, and to the then reigning sovereign the Khalkhas gave in their submission. For some time the Chinese yoke sat lightly on their consciences, but difficulties having arisen with the Kal- muks, they were ready enough to claim the protection of China. To cement the alliance the emperor K’ang-he invited all the Khalkha chiefs to meet him at the plain of Dolonor. This ceremony brought the separate history of the Khalkhas to a close, since from that time they have been engulfed in the Chinese empire.*~~

~~*Another important branch of the great Mongolian family is the tribe of the Koshod or Eleuths. These claim that their chieftains have maintained unbroken the direct descent from Khassar, a brother of Jenghiz Khan. Their home is in the neighbourhood of the K6k6-n6r, and in the country to the north of the narrow strip of the Kansuh province which separates that district from Mongolia proper. The pasture in the territories thus indicated is rich and abund- ant, and the Eleuths have therefore had*~~

~~fewer temptations to wander than most of their cognate tribes. Being thus stationary and within a short distance of the Chinese fron- tier, they easily fell under the dominion of that empire, and in the year 1725 were incorporated into 29 imperial banners.~~

~~During the Kin dynasty of China the Keraits, as has been pointed out, were for a time supreme in Mongolia, and it was during that period that one of the earliest recognized sovereigns, Merghus Buyuruk Khan, sat on the throne. In an engagement with a neighbouring Tatar tribe their khan was captured and sent as a propitia- tory present to the Kin emperor, who put him to death by nailing him on a wooden ass. On the treacherous Tatar chief the widow determined to avenge herself, and chose the occasion of a feast as a fitting opportunity. With well-disguised friendship she sent him a present of~~

~~ten oxen, a hundred sheep, and a hundred sacks of kumiss. These last, however, instead of being filled with skins of the liquor which Mongolians love so well, contained armed men, who, when the Tatar was feasted, rushed from their concealment and killed him. A grandson of Merghus was the celebrated Wang Khan,who was sometimes the ally and sometimes the enemy of Jenghiz Khan, and has also been identified as the Prester John of early Western writers. In war he was almost invariably unfortunate, and it was with no great difficulty, therefore, that his brother Ki Wang detached the greater part of the Kerait tribes from his banner, and founded the Torgod chieftainship, named probably from * the country where they-settled themselves. The unrest peculiar to the dwellers in the Mongolian desert disturbed the Torgod as much as their neighbours. Their history for several centuries consists of nothing but a succession of wars with the tribes on either side of them, and it was not until 1672, when Ayuka Khan opened relations with the Russians, that the country obtained an even temporarily settled existence. Its position, indeed, at this time made it necessary that Ayuka should ally himself either with the Russians or with his southern neighbours the Turks, though at the same time it was obvious that his alliance with the one would bring him into collision with the other. HIs northern neighbours,~~

~~*the Cossacks of the Yaik and the Bashkirs, both subject to Russia, had the not uncommon propensity for invading his borders and harassing his sub- jects. This gave rise to complaints of the czar's govern- ment and a disposition to open friendly relations with the Krim khan. A rupture with Russia followed, and Ayuka carried his arms as far as Kasan, burning and laying waste thevillages and towns on his route and carrying off prisoners and spoils, Satisfied with this vengeance, he advanced no farther, but made a peace with the Russians, which was confirmed in 1722 at an audience which Peter the Great gave him at Astrakhan. On Ayuka's death shortly after this event, he was succeeded by his son Cheren Donduk, who received from the Dalai Lama a patent to the throne. But this spiritual support availed him little against the plots of his nephew Donduk Ombo, who so completely gained the suffrages of the people that Cheren Donduk fled before him to St Petersburg, where he died, leaving his nephew in possession. With consummate impartiality the Russians, when they found that Donduk' Ombo had not only seized the throne but was governing the country with vigour and wisdom, formally invested him with the khanate. At his death he was succeeded by Donduk Taishi, who, we are told, went to Moscow to attend the coronation of the empress Elizabeth, and to swear fealty to the Russians. After a short reign he died, and his throne was occupied by his son Ubasha. The position of the Torgod at this time, hemmed in as they were between the Russians and Turks, was rapidly becoming unbearable, and the question of migrating "bag and baggage" was very generally mooted. In the war between his two power- ful neighbours in 1769 and 1770, Ubasha gave valuable assistance to the Russians. HIs troops took part in the siege of Otchakoff, and gained a decided victory on the Kalans. Flushed with these successes, he was in no mood to listen patiently to the taunts of the governor of Astrakhan, who likened him to a "bear fastened to a chain," and he made up his mind to break away once and for all from a tutelage which was as galling as it was oppressive. HIe determined, therefore, to migrate eastward with his people, and on the 5th of January 1771 he began his march with 70,000 families. In vain the Russians attempted to recall the fugitives, who, in spite of infinite hardships, after a journey of eight months reached the province of Ili, where they were welcomed by the Chinese authorities. Food for a year's consumption was supplied to each family ;*~~

and land, money, and cattle were freely distributed. How many lost their lives on the toilsome march it is impos- sible to say, but it is believed that 300,000 persons sur- vived to receive the hospitality of the Chinese. This migration is interesting as illustrating the many displace- ments of tribes and peoples which have taken place on

the continent of Asia at different periods of history. Such

another migration occurred between four and five thousand years ago, when the Chinese crossed from western Asia into their present empire ; such, again, was the movement which carried the Osmanli Turks from north-eastern Asia into Asia Minor, and eventually across the Bosphorus. By this desperate venture the Torgod escaped, it is true, the oppression of the Russians, but. they fell into the hands of other masters, who, if not so exacting, were equally de- termined to be supreme. The Chinese, flattered by the compliment implied by the transference of allegiance, settled them on lands in the province of Ili, in the neigh- bourhood of the Altai Mountains, and to the west of the desert of Gobi. But the price they were made to pay for this liberality was absorption in the Chinese empire. Like the other Chinese-subdued Mongols, the Torgod were divided into banners, and from that time forth they lost their individuality.

Among the Mongol chiefs who rose to fame during the rule of the Ming dynasty of China was Toghon, the Kal- muk khan, who, taking advantage of the state of confusion which reigned among the tribes of Mongolia, established for himself an empire in north-western Asia. Death carried him off in 1444, and his throne devolved upon his son Ye-seen, who was no degenerate offspring. Being without individual foes in Mongolia for the same reason that Narvaez had no enemies—namely, that he had killed them all—he turned his arms against China, which through all history has been the happy hunting-ground of the northern tribes, and had the unexampled good fortune to take prisoner the Chinese emperor Ching- tung. But victory did not always decide in his favour, and, after having suf- fered reverses at the hands of the Chinese, he deemed it wise to open negotiations for the restoration of his imperial prisoner. Thus, after a captivity of seven years, Ching- tung re-entered his capital in 1457, not

~~*altogether to the general satisfaction of his subjects. On the death of Ye-seen, shortly after this event, the Kalmuks lost much of their power in eastern Asia, but retained enough in other por- tions of their territory to annoy the Russians by raids within the Russian frontier, and by constant acts of pillage. In the 17th century their authority was partly restored by*~~

~~*Galdan, a Lama, who succeeded by the usual combination Galdan of wile and violence to the throne of his brother Senghé, Khan.*~~

~~*Having been partly educated at Lhasa, he was well versed in Asiatic politics, and, taking advantage of a quarrel be- tween the Black and White Mountaineers of Kashgar, he overran Little Bokhara, and left a viceroy to rule over the province with his capital at Yarkand. At the same time he opened relations with China, and exchanged presents with the emperor. Having thus secured his powerful southern neighbour, as he thought, he turned his arms against the Khalkhas, whose chief ground of offence was their attachment to the cause of his brothers. But his rest- less ambition created alarm at Peking, and the emperor K'ang-he determined to protect the Khalkhas against their enemy. Great preparations were made for the campaign. The emperor, in person commanding one of the two forces, marched into Mongolia. After enduring incredible hard- ships during the march through the desert of Gobi the im- perial army encountered the Kalmuks at Chao-modo. The engagement was fiercely contested, but ended in the com- plete victory of the Chinese, who pursued the Kalmuks for 10 miles, and completely dispersed their forces. Immense XVI — 94*~~

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~~*numbers were slain, among whom was Galdan's wife, and many thousands surrendered themselves to the victors. Galdan, with his son, daughter, and a few followers, fled westward and escaped ; and thus collapsed a power which had threatened at one time to overshadow the whole of Cen- tral Asia. For a time Galdan still maintained a semblance of resistance to his powerful enemy, and death overtook him while yet in the field against the Chinese. The news of his death was received with*~~

~~*great rejoicings at Peking. Theemperor held a special service of thanksgiving to Heaven for the deliverance vouchsafed, and ordered that the ashes of his enemy, whose body had been burned, should be brought to the capital and there scattered to the four winds. The fear which had been thus inspired was no idle terror. Galdan was a man to be feared. The conqueror of Samarkand, Bokhara, Urgenj, Kashgar, Hami, and twelve hundred other towns, might well be considered a formidable foe, and Heaven a merciful deliverer in ridding Asia of so restless and dangerous a chieftain.*~~

~~*But though Galdan was dead the Chinese did not enjoy that complete immunity from war at the hand of his suc- cessor that they had looked for. Tse-wang Arabtan was, however, but the shadow of his brother and predecessor, and a dispute which arose with the Russians during his reign weakened his power in other directions. Little Bok- hara was said to be rich in gold mines, and therefore be- came a coveted region in the eyes of the Russians. Under the vigorous administration of Peter the Great an expedi- tion was despatched to force a passage into the desired province. To oppose this invasion the Kalmuks assembled in force, and after a protracted and undecided engagement the Russians were glad to agree to retire down the Irtish and to give up all further advance.*~~

~~*To Tse-wang Arabtan succeeded Amursama owing to the support he received from the Chinese emperor K'een- lung, who nominated him khan of the Kalmuks and chief of Sungaria. But, though to the ear these titles were as high-sounding as those of his predecessors, in reality the power they represented was curtailed by the presence of Chinese commissioners, in whose hands rested the real authority. The galling weight of this state of dependence drove Amursama before long into revolt. He dispersed the Chinese garrisons stationed in Ili, killed the generals, and advanced his own forces as far as Palikun on the river Ili. To punish this revolt, K'een-lung sent a large force into the rebellious province, As on the previous occa- sion, the Chinese were everywhere victorious, and Amursama fled into Siberia, where he died of smallpox after a short illness. The Chinese demanded his body, but the Russians refused to give it up, though they allowed the Chinese commissioners to identify it. On the death of Amursama, K'een-lung determined to abolish*~~

~~*the khanate, and' in place of it he nominated four Hans to rule over the Sungars, the Torgod, the Khoshod, and the Dorbéd. But this divided authority proved quite as unmanageable as that which had been wielded by the khan, and the new rulers soon at- tempted to throw off the yoke imposed upon them from Peking. Again a Chinese army marched into Ih, and this time a severe measure of repression was meted out to the rebels and their sympathizers. A general massacre of the Kalmuks was ordered, and was faithfully carried out. The province which had been as a fruitful field was utterly wrecked, and the place of the Sungars was taken by exiled criminals from China.*~~

~~*But while China was thus absorbing the Mongols within her reach, Russia was gathering within her borders those with whom she came into contact. Among these were the Buriats, who occupied a large territory on both sides of the Baikal Lake. As usual in such cases, disputes arose out of disturbances on the frontier, and were ended by*~~

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~~*the Buriats and the neighbouring Mongol tribes becom- ing one and all tributary to Russia.*~~

~~*Of the Mongol tribes who became entirely subject to The Russia the principal are those of the Crimea, of Kasan, and Golden of Astrakhan ; of these the Tatars of Kasan are the truest Higule.*~~

~~*representatives of the Golden Horde or Kipchaks, who originally formed the subjects of Batu and Orda. Batu, whose victorious campaign in Russia has already been sketched, was finally awarded as his fief the vast steppes which stretch from the Carpathian Mountains to the Balkash Lake. Over these vast plains the Mongols followed their flocks and herds, while the more settled among them established themselves along the banks of the rivers which flow through that region. Batu himself fixed his head- quarters on the Volga, and there set up his Golden Tent from which the horde acquired the name of the Golden Horde. In 1255 Batu died and was succeeded by his brother Bereke Khan. During the reign of this sovereign the exactions which were demanded from the Russian Christians by the Mongols aroused the Christian world against the*~~

~~barbarian conquerors, and at the command of Pope Alexander IV. a general crusade was preached against them. But though the rage of the Christians was great, they lacked that united energy which might have availed them against their enemies ; and, while they were yet breathing out denuncia- tions, a Tatar host, led by Nogai and Tulabagha, appeared in Poland. After a rapid and triumphant march, the in- vaders took and destroyed Cracow, and from thence ad- vanced as far as Bythom in Oppeln, from which point they eventually retired, carrying with them a crowd of Christian slaves. From this time the Mongols became for a season an important factor in European politics. They corresponded and treated with the European sovereigns, and intermarried with royal families. Hulagu, the famous general, married a daughter of Michael Paleologus ; Toktu Khan took as his wife Maria, the daughter of Andronicus IT. ; and to Nogai Michael betrothed his daughter Irene. But Bereke's in- fluence extended beyond Europe into Egypt, from which country, as well as from Constantinople, he secured the services of artisans to build him dwellings of a more substantial nature than that of his Golden Tent. But his widely extending intercourse with foreign nations brought in its train a consequence which tended fatally to under- mine the existence of the horde. His conversion to Islam introduced a strongly disintegrating influence into the com- munity, and with it were sown the seeds of its final dis- ruption. Bereke was succeeded on his death in 1265 by his grandson Mangu Timur, who throughout his reign was con- stantly engaged in hostilities with the Russians and his other European neighbours. The Genoese alone found under his patronage a means of advancing their possessions. For some time these people had held large colonies in southern Russia, and in the Crimea had divided the trade with the Venetians. By the support of Mangu Timur these last were driven out of the field, and the Genoese were left in the enjoyment of a monopoly of the commerce. The reigns of the khans who succeeded Mangu Timur were no less stormy than his had been; but even in these troublous times the influences which surrounded the Mongols led them onward in the path of civilization. Toktu, the next khan but one to Mangu Timur, is the first Mongol ruler whom we hear of as having struck coins. Those issued during his reign bear the mint marks of Sarai, New Sarai, Bulgar, Ukek, Kharezm, Krim, Jullad, and Madjarui, and vary in date from 1291 to 1312.~~

~~*The adoption of Islam by the rulers of the Golden Horde had as one result the drawing closer of the relations of the Mongols with Constantinople and Egypt. Embassies passed between the three courts, and so important was the alliance with the Mongols deemed by the sultan Nasir,*~~

~~*| Eastern | Kipchak.*~~

~~*mONGO LS*~~

~~*ruler of Egypt, that he sent to demand in marriage a princess of the house of Jenghiz Khan. At first his request was refused by the proud Mongols, but the present of a million gold dinars, besides a number of horses and suits of armour, changed the refusal into an acquiescence, and in October 1319 the princess landed at Alexandria in regal state. Her reception at Cairo was accompanied with feasting and rejoicing, and the members of her escort were sent back laden with presents. With that religious toleration common to his race, Uzbeg Khan, having married one princess to Nasir, gave another in marriage to George the prince of Moscow, whose cause he espoused in a quarrel existing between that prince and his uncle, the grand- prince Michael. Assuming the attitude of a judge in the dispute, Uzbeg Khan summoned Michael to appear before him, and, having given his decision against him, ordered his execution. The sentence was carried out with aggravated cruelty in sight of his nephew and accuser. From this time Uzbeg's sympathies turned towards Christianity. He protected the Russian churches within his frontiers, and put his seal to his new religious views by marrying a daughter of the Greek emperor, Andronicus III. He died in 1340, after a reign of twenty-eight years. His coins were struck at Sarai, Kharezm, Mokshi, Bulgar, Azak, and Krim, and are dated from 1313 to 1340. His son and successor, Tinibeg Khan, after a reign of only a few months, was murdered byhis brother Janibeg Khan, who usurped his throne, and, according to the historian Ibn Haidar, proved himself to be 'just, God-fearing, and the patron of the meritorious." These excellent qualities did not, however, prevent his making a raid into Poland, which was conducted in the usual Mongol manner, nor did they save his country- men from being decimated by the black plague, which for the first time in 1345 swept over*~~

~~*Asia and Europe, from the confines of China to Parisand London. With all their love of war the Mongols had a keen eye to monetary advantage, and Janibeg, who was no exception to the rule, concluded treaties with the merchant-princes of Venice and Genoa, in which the minute acquaintance displayed with shipping dues and customs charges shows how great were the advances the Mongols had made in their knowledge of European commerce since the days of Jenghiz Khan. The throne Janibeg had seized by violence was, in 1357, snatched from him by violence. As he lay ill on his return from a successful expedition against Persia he was murdered by*~~

~~*his son Berdibeg, who in his turn was, after a short reign,*~~

~~*murdered by dis son Kulpa. With the death of Berdibeg the fortunes of the Golden Horde began rapidly to decline. As the Uzbeg proverb says, —"The hump of the camel was cut off in the person of Berdibeg."*~~

~~*But while the power of the Golden Horde was dwin- dling away, the White Horde or Eastern Kipchak, which was the inheritance of the elder branck of the family of Juchi, remained prosperous and full of vitality. The descendants .of Orda, Batu's elder brother, being far re- moved from the dangerous influences of European courts, maintained much of the simplicity and vigour of their nomad ancestors, and the throne descended from father to son with undiminished authority until the reign of Urus Khan (1360), when complications arose which changed the fortunes of the tribe. Like many other opponents of the Mongol rulers, Khan Tuli Khoja paid with his life for his temerity in opposing the political schemes of his connexion Urus Khan. Toktamish, the son of the murdered man, fled at the news of his father's death and sought refuge at the court of the famous Timur-i-leng (Tamerlane), who received him with honour and at once agreed to espouse his cause. With this intention he despatched a force against Urus Khan, and gained some advantage over him, but, while fitting out another army to make a fresh attack,*~~

~~*news reached him of the death of Urus. Only at Sighnak are coins known to have been struck during the reign of Urus, and these bear date from*~~

~~*1372 to 1375.*~~

~~*He was followed on the throne by his two sons, Tuk-Tok- takia and Timur Malik, each in turn; the first reigned but tamish.*~~

~~*for a few weeks, and the second was killed in a battle against Toktamish, the son of his father's enemy. Tok- tamish now seized the throne, not only of Eastern Kipchak but also of the Golden Horde, over which his arms had at the same time proved victorious. His demands for trib- ute from the Russian princes met with evasions from men who had grown accustomed to the diminished power of the later rulers of the Golden Horde, and Toktamish therefore at once marched an army into Russia. Having captured Serpukhoff, he advanced on Moscow. On the 23d August 1382 his troops appeared before the doomed city. For some days the inhabitants bravely withstood the constant attacks on the walls, but failed in their resistance to the stratagems which were so common a phase in Mongolian warfare. With astonishing credulity they opened the gates to the Mongols, who declared themselves the enemies of the grand-prince alone, and not of the people. The usual result followed. The Russian general, who was invited to Toktamish's tent, was there slain, and at the same time the signal was given for a general slaughter. Without dis- criminating age or sex, the Mongol troops butchered the wretched inhabitants without mercy, and, having made the streets desolate and the houses tenantless, they first*~~

~~*plundered the city and then gave it over to the flames.*~~

~~*The same pitiless fate overtook Vladimir, Zvenigorod, Yurieff, Mozhaisk, and Dimitroff. With better fortune, the inhabitants of Pereslavl and Kolomna escaped with their lives from the troops of Toktamish, but at the expense of their cities, which were burned to the ground. Satisfied with his conquests, the khan returned homewards, travers- ing and plundering the principality of Riazan on his way. Flushed with success, Toktamish demanded from his patron Timur the restoration of Kharezm, which had fallen into the hands of the latter at a period when disorder reigned in the Golden Horde. Such a request was not likely to be well received by Timur, and, in answer to his positive refusal to yield the city, Toktamish marched an army of 90,000 men against Tabriz. After a siege of eight days the city was taken by assault and ruthlessly ravaged. Meanwhile Timur was*~~

~~collecting forces to punish his rebellious protégé. When his plans were fully matured, he advanced upon Old Urgenj and captured it. More merci- ful than Toktamish, he transported the inhabitants to Samarkand, but in order to mark his anger against the rebellious city he levelled it with the ground and sowed barley on the site where it had stood. On the banks of the Oxus he encountered his enemy, and after a bloody battle completely routed the Kipchaks, who fled in confu- sion. A lull followed this victory, but in 1390 Timur again took the field. To each man was given "a bow, with thirty arrows, a quiver, and a buckler. Thearmy was mounted, and a spare horse was supplied to every two men, while a tent was furnished for every ten, and with this were two spades, a pickaxe, a sickle, a saw, an axe, an awl, a hundred needles, 84 ib of cord, an ox's hide, and a strong pan." Thus equipped the army set forth on its march. After a considerable delay owing to an illness which over- took Timur his troops arrived at Kara Saman. Here envoys arrived from Toktamish bearing presents and a message asking pardon for his past conduct; but Timur was inexorable, and, though he treated the messengers with consideration, he paid no attention to their prayer. In face of innumerable difficulties, as well as of cold, hunger, and weariness, Timur marched forward month after month through the Kipchak country in pursuit of Toktamish. At~~

~~last, on the 18th of June, he overtook him at Kandurcha, in the country of the Bulgars, and at once forced him to an engagement. For three days the battle lasted, and after inclining now to this side and now to that victory finally de- cided in favour of Timur. The Kipchaks were completely routed and fied in all directions, while it is said as many as 100,000 corpses testified to the severity of the fighting. Timur pursued his flying enemy as far as the Volga, slaughtering all who fell into his hands, and ravaged and destroyed the towns of Sarai, Saraichuk, and Astrakhan. Having inflicted this terrible blow on the Golden Horde, Timur distributed rewards to his chieftains, and presided at a series of banquets in celebration of his victory. These rejoicings over, he returned to Samarkand laden with spoils and trophies. But Toktamish, though defeated, was not subdued, and in 1395 Timur found it necessary again to undertake a campaign against~~

~~*him. This time the armies met upon the Terek, and after a fiercely-contested battle the Kipchaks again fled in confusion. When the victory was gained, Timur, we are told, knelt down on the field and returned thanks to Heaven for his success. The pur- suit along the Volga was vigorously undertaken, and the slaughter among the fugitives was terrible. The hurried advance of Timur's horsemen threw the Russians into a state of wild alarm, and the grand-prince of Moscow ordered that an ancient image of the Virgin which was believed to possess miraculous power should be taken to Moscow to save that city from the destroyer. Success appeared to attend this measure, for Timur, threatened by the advancing autumn, gave up all further pursuit, and retired with a vast booty of gold ingots, silver bars, pieces of Antioch linen and of the embroidered cloth of Russia, &c. On his homeward march southwards he arrived before Azak, which was then the entrepdt where the merchants of the east and west exchanged their wares. In vain the natives, with the Egyptian, Venetian, Genoese, Catalan, and Basque inhabitants, besought him to spare the city. His answer was a command to the Moslems to separate themselves from the rest of the people, whom he put to the sword, and then gave the city over to the flames. Circassia and Georgia next felt his iron heel, and the fastnesses of the central Caucasus were one and all destroyed. After these successes Timur gave himself up for a time to feasting and rejoicing, accompanied by every manifestation of Oriental luxury. " His tent of audience was hung with silk, its poles were golden, or probably covered with golden plates, the nails being silver ; his throne was of gold, enriched with precious stones; the floor was sprinkled with rose water." But his vengeance was not satisfied, and, having refreshed his troops by this halt, he marched northwards against Astrakhan, which he utterly destroyed. The inhabitants were driven out into the country to perish with the cold, while the commander of the city was killed by being forced beneath the ice of the Volga. Sarai next shared the same fate, and Timur, having thus crushed for the second time the empire of Toktamish, set out on his return home by way of Derbend and Azerbijan. The defeated khan succeeded shortly afterwards in recapturing Sarai; but, being again driven out, he retired in 1398 to Kieff, a fugitive from his king- dom. During his reign, which lasted for twenty-four years, he struck coins at Kharezm, Krim, New Krim, Azak, Sarai, New Sarai, Saraichuk, and Astrakhan. The power in the hands of the successors of Toktamish*~~

~~never revived after the last campaign of Timur. They were constantly engaged in wars with the Russians and the Krim Tatars, with whom the Russians had allied themselves, and by degrees their empire decayed, until, on the seizure and death of Ahmed Khan at the beginning of the 16th cen- tury, the domination of the Golden Horde came to an end.~~

~~MONGOUS~~

~~One solitary fragment of the Golden Horde, the khanate of Astrakhan, maintained for a time an existence after the fall of the central power. But even this last remnant ceased to be a Mongol apanage in 1554, when it was captured by the Russians and converted into a Russian province. 'The fate which thus overtook the Golden Horde was destined to be shared by all the western branches of the great Mongol family. The khans of Kasan and Kasimoff had already in 1552 succumbed to the growing power of Russia, and the fall under the same yoke. the Krim Tatars first appear as an independent power, they attempted to strengthen their position by allying themselves with the Russians, to whom they looked for help against the attacks of the Golden Horde. But while they were in this state of dependence another power arose in eastern Asia which modified the political events of that region. In 1453 Constantinople was taken by the Osmanli Turks, who, having quarrelled with the Genoese merchants who monopolized the trade on the Euxine, sent an expedition into the Crimea to punish the presumptuous traders. The power which had captured Constantinople was not likely to be held in check by any forces at the disposal of the Genoese, and without any serious opposi- tion Kaffa, Sudak, Balaclava, and Inkerman fell before the troops of the sultan Mohammed. It was plain that, situated as the Crimea was between the two great powers of Russia and Turkey, it must of necessity fall under the direction of one of them. Which it should be was decided by the invasion of the Turks, who restored Mengli Girai, the deposed khan, to the throne, and virtually converted the khanate into a dependency of Constanti- nople. But though under the tutelage of Turkey, Mengli Girai, whose leading policy seems to have been the desire to strengthen himself against the khans of the Golden Horde, formed a close alliance with the grand-prince Ivan of Russia. One result of this friendship was that the Mongols were enabled, and encouraged, to indulge their predatory habits~~

~~*at the expense of the enemies of Russia, and in this way both Lithuania and Poland suffered terribly from their incursions. It was destined, however, that in their turn the Russians should not escape from the marauding tendencies of their allies, for, on pretext of a quarrel with reference to the succession to the Kasan throne, Mohammed Girai Khan in 1521 marched an army northwards until, after having devastated the country, massacred the people, and desecrated the churches on his route, he arrived at the heights of Vorobieff overlooking Moscow. 'The terror of the unfortunate inhabitants at the sight once again of the dreaded Mongols was extreme ; but the horrors which had accompanied similar past visitations were happily averted by a treaty, by which the grand-prince Vasili undertook to pay a perpetual trib- ute to the Krim khans. This, however, proved but a truce. It was impossible that an aggressive state like Russia should live in friendship with a marauding power like that of the — Krim Tatars. The primary cause of contention was the khanate of Kasan, which was recovered by the Mongols, and lost again to Russia with that of Astrakhan in 1555. The sultan, however, declined to accept this condition of things as final, and instigated Devlet Girai, the Krim khan, to attempt their recovery. With this object the latter marched an army northwards, where, finding the road to Moscow unprotected, he pushed on in the direction of that ill-starred city. On arriving before its walls he found a large Russian force occupying the suburbs. With these, however, he was saved from an encounter, for just as his foremost men approached the town a fire broke out, which, in consequence of the high wind blowing at the time, spread with frightful rapidity, and in the space*~~

~~*Krim Tatars were next to The In the 15th century, when Krim*~~

~~*MONGOLS*~~

~~*of six hours destroyed all the churches, palaces, and houses, with the exception of the Kremlin, within a compass of 30 miles. Thousands of the inhabitants perished in the flames. 'The river and ditches about Moscow," says Horsey, "' were stopped and filled with the multitudes of people, laden with gold, silver, jewels, chains, ear-rings, and treasures. So many thousands were there burned and drowned that the river could not be cleaned for twelve months afterwards." Satisfied with the destruction he*~~

~~*had indirectly caused, and unwilling to attack the Kremlin, the khan withdrew to the Crimea, ravaging the country as he went. Another invasion of Russia, a few years later (1572), was not so fortunate for the Mongols, who suffered a severe defeat near Molody, 50 versts from Moscow. A campaign against Persia made a diversion in the wars which were constantly waged between the Krim khan and the Russians, Cossacks, and Poles. So hardly were these last pressed by their per-tinacious enemies in 1649 that they bound themselves by treaty to pay an annual subsidy to the khan. But the fortunes of war were not always on the side of the Tatars, and with the advent of Peter the Great to the Russian throne the power of the Krim Mongols began to decline. In 1696 the czar, supported by a large Cossack force under Mazeppa, took the field against Selim Girai Khan, and gained such successes that the latter was compelled to cede Azoff to him. By a turn of the wheel of fortune the khan had the satisfaction in 1710 of having it restored to him by treaty ; but this was the last real success that attended the Tatar arms. In 1735 the Russians in their turn invaded the Crimea, captured the celebrated lines of Perekop, and ravaged Baghchi Serai, the capital. The inevitable fate which was hanging over the Krim Tatars was now being rapidly accomplished. In 1783 the Krim, together with the eastern portion of the land of the Nogais, became absorbed into the Russian province of Taurida.*~~

~~*Another branch of the Mongol family which requires mention is that of the Kazaks (see Kireuiz, vol. xiv. pp. 95, 96), whose ancient capital was Sighnak, which, as we have seen, passed into the hands of the great Timur. It will now only be necessary to refer briefly to the Uzbegs, who, on the destruction of the Golden Horde, assumed an important position on the east of the Caspian Sea. The founder of their greatness was the khan Abulkhair, who reigned in the 15th century, and who, like another Jenghiz Khan, consolidated a power out of a number of small clans, and added lustre to it by his successful wars. Sheibani Khan, his grandson, proved himself a worthy successor, and a doughty antagonist of the great Moghul emperor Baber. In 1500 he inflicted a severe defeat on Baber's forces, and captured Samarkand, Herat, and Kandahar. By these and other conquests he became possessed of all the country be- tween the Oxus and the Jaxartes, of Ferghana, Kharezm, and Hissar, as well as of*~~

~~*the territory of Tashkend from Kashgar to the frontiers of China. In the following year, by a dashing exploit, Baber recovered Samarkand, but only to lose it again a few months later. During several succeed- ing years Sheibani's arms proved victorious in many fields of battle, and but for an indiscreet outrage on the terri- tories of the shah of Persia he might have left behind him a powerful empire. The anger, however, of Shah Ismael roused against him a force before which he was destined to fall. The two armies met in the neighbourhood of Merv, where, after a desperate encounter, the Uzbegs were completely defeated. Sheibani, with a few followers, sought refuge in a cattle-pound. But, finding no exit on the farther side, the refugees tried to leap their horses over the wall. In this attempt Sheibani was killed. When his body was recognized by his exultant enemies*~~

~~*they cut off the head and presented it to the shah, who caused the skull to be mounted in gold and to be converted intoa drinking-cup. After this defeat the Uzbegs withdrew across the Oxus and abandoned Khorasan. Farther east the news aroused Baber to renewed activity, and before long he reoccupied Samarkand and the province " Beyond the River," which had been dominated by the Uzbegs for nine years. But though the Uzbegs were defeated, they were by no means crushed, and ere long we find their khans reigning, now at Samarkand, and now at Bokhara. As time advanced and European powers began to encroach more and more into Asia, the history of the khanates ceases to be confined to the internecine struggles of rival khans. Even Bokhara was not beyond the reach of Russian ambition and English diplomacy. Several European envoys found their way thither during the first half of the present century, and the murder of Stoddart and Connolly in 1842 forms a melancholy episode in British relations with that fanatical capital. With the absorption of the khanate of Bokhara and the capture of Khiva by the Russians the individual history of the Mongol tribes in Central Asia comes to an end, and their name has left its imprint only on the dreary stretch of Chinese-owned country from Manchuria to the Altai Mountains, and to the equally unattractive country in the neighbourhood of the K6k6-ndr. (R. K. D.)*~~

~~*Language and Literatwre.—The Mongol tongue is a member of the great stock which recent scholars designate as Finno-T'ataric or Ural-Altaic, which comprehends also the languages of the Tungoos (Manchu), Turko-Tatars, Finns, and Samoyeds. The members of this group are not so closely related to one another as those of the Indo-European stock ; but they are all bound together by the com- mon principle of agglutinative formation, especially the so-called harmony of vowels, by their grammatical structure, and also by certain common elements in the stock of roots which run through them all, or through particular more closely-connected families within the group.!*~~

~~*The fatherland proper of the Mongols is the so-called Mongolia. It stretches from Siberia in the north towards the Great Wall of China in the south, from Dauria and Manchuria in the east to the Altai and the sources of the Irtish, Thian-shan (7.¢., heaven moun- tains), and East Turkestan in the west. In the centre of this country is the desert of Gobi (Chinese Sha-mo, i.¢., sand-sea). The Mongolian population, however, extends in the south over the Great Wall to the basin of the Kok6-n6r (blue lake), and thence extends due west over Tangut and the northern border of Tibet. Crossing the political frontier, we find Mongols in the Russian province Turkestan, in the territories of Semiryetshensk (land of the seven streams), Alatau, and Semipalatinsk in the west, in the south of the province of Tomsk, with a more populous region due north in Siberia, round the Baikal Lake. The country north of the Gobi, from the Altai, Tangnu, and the Saian mountains in the west to Manchuria in the east, is called Khalkha, with the chief districts Urga (Kiiré), Uliassutai, Khobdo (Kobdo). In a north-westerly direction from Gobi, between Thian-shan and the Altai, is Sungaria. The sum total of the Mongol population under Chinese government is calculated at between two and three millions.*~~

~~*Generally the whole Mongol tribe may be divided into three branches: East Mongols, West Mongols, and Buriats.*~~

~~*(1) The East Mongols are divided into the Khalkhas in the borders just mentioned, the Shara Mongols south of the Gobi along the Great Wall north-eastward to Manchuria, and lastly the Shir- aigol or Sharaigol in Tangut and in northern Tibet.*~~

~~*(2) On the signification and employment of the different names of the West Mongols (Kalmuks, Oeléd, Oirad or Dorbon Oirad = the four Oirad, Mongol Oirad), and also as regards the subdivision of the tribes, there is much uncertainty. The name Kalmuk, so generally employed among us, is in fact only used by the Volga Kalmuks (Khalimak), but even with them the name is not common, and almost a byname. It is of foreign origin, and most likely a Tataric word which has yet to be explained. O*vrad means the "near ones," the "related." The usual explanation given is that the single tribes consider themselves as being related to each other,—hence Mongol Oirad, "the Mongol related tribe." This is the favourite name among Kalmuks. Dérbon Oirad, or the four related tribes, comprise (1) Sungars, (2) Torgod, (3) Khoshod, (4) Dorbéd.*~~

~~*1 Compare W. Sehott, Versuch iiber die tatarischen Sprachen (Berl., 1836), Ueber das altai'sche oder finnisch-tatarische Sprachengeschlecht (Berl., 1849), Altajische Studien, Parts i.-v. (Berl., 1860-1870); and A. Castrén, Ethnologische Vorlesungen iiber die Altat'schen Volker ; edited by A. Schiefner (Petersb., 1857).*~~

~~*750*~~

~~*The signification of the name Oeléd, in the East Mongolian Ocgeled, now the most widely spread among the tribes living in China, is likewise very doubtful. Some assert that * Oeléd" is nothing but the Chinese transcription of Oirad, as the ordinary Chinese language does not possess the sound 7, We have, however, to bear in mind that we have a Mongolian root dgelekii, with the sense ""to be in- imical," "to bear hatred, ill-will," &c. The main population of the Kalmuks live, or rather drag out, their existence after the usual fashion of nomad tribes in Sungaria, in the eastern part of the Thian- shan, on the south border of the Gobi, on Koké-nor, and in the province of Kan-suh. All these are under the Chinese Government. In consequence, however, of the extension of the Russian empire in Thian-shan and Alatau, many hordes have come under the Rus- sian sway. According to an approximate account we may reckon in the territory Semiryetshensk (Kuldja) and Sentipalatinsk 34,000 Kalmuks, while in the southern part of the government Tomsk, on the Altai, the Kalmuk population amounted formerly to 19,000. Besides these*~~

~~*we find a section of Kalmuk population far in the west, on the banks of the Volga (near Astrakhan). From their original seats in Sungaria they turned in their migrations to the north, crossed the steppe of the Kirghiz, and thus gradually reached the Emba and the Or. Between these two rivers and the Ural the Torgod settled in 1616; thence they crossed the Volga in 1650, and took possession of the now'so-called steppe of the Kalmuks, being followed in 1673 by the Dérbéd, and in 1675 by the Khoshod. In 1771 a considerable number returned to the Chinese empire. At the present time there is a not unimportant population in the so-called steppe of the Kalmuks, which extends between the Caspian and the Volga in the east and the Don in the west, and from the town of Sarepta in the north to the Kuina and the Manytch in the south. According to modern statistical accounts, this popula- tion amounts to 75,630. To these we have to add 24,603 more on the borders of the Cossacks of the Don, and lastly 7298 in the bordering provinces of Orenburg and Saratoff. The sum total of the so-called Volga Kalmuks is therefore 107,531.*~~

~~*(3) In the southern part of the Russian province of Irkutsk, in a wide circle round the Baikal Lake, lies the heirdom proper of the Buriats, which they also call the "Holy Sea;" the country east of the lake is commonly called Transbaikalia, Their country practically extends from the Chinese frontier on the south within almost parallel lines to the north, to the town Kirensk on the Lena, and from the Onon in the east to the Oka, a tributary of the Angara, in the west, and still farther west towards Nijni-Udinsk. 'They are most numerous beyond the Baikal Lake, in the valleys along the Uda, the Onon, and the Selenga, and in Nertchinsk. These Trans-Baikalian Buriats came to these parts only towards the end of the 17th century from the Khalkhas. While Mongols and Kal- muks generally continue to live after the usual fashion of nomads, we find here agricultural pursuits, most likely, however, due mainly to Russian influence. Christianity is also making its way. The sum total of the Buriats amounts at present to about 250,000.*~~

~~*Another tribe separated from the rest of the Mongols is the so- called Hazara (the thousand), and the four Aimak (7.¢., tribes), who wander about as herdsmen in Afghanistan, between Herat and Kabul. In external characteristics they are Mongols, and in all probability they are the*~~

~~*remains of a tribe from the time of the Mongol dynasty. Their language, which shows, of course, Persian influence, is strictly Mongolian, more particularly West Mongolian or Kalmuk, as has been proved by H. C. von der Gabelentz.!*~~

~~*Agreeably with this threefold division of the Mongols we have also a threefold division of their respective languages: (1) East Mongolian or Mongolian proper, (2) West Mongolian or Kalmuk, (3) Buriatie.*~~

~~*The dialects just mentioned are found to be in close relation to each other when we examine their roots, inflexions, and graminatical structure. The difference between them is indeed so slight that whoever understands one of them understands all. Phonetically a characteristic of them all is the "harmony of vowels," which are divided into two chief classes: the hard a, 0, w; and the soft e, 6, i; between which 2 is in the middle. All vowels of the same word must necessarily belong to the same class, so that the nature of the first or root-vowel determines the nature of the other or inflexion- vowels ; now and then a sort of retrogressive harmony takes place, so that a later vowel determines the nature of the former. The consonants preceding the vowels are equally under their influence.*~~

~~*The Mongolian characters, which in a slightly altered form are also in use among the Manchus, are written perpendicularly from above downward, and the lines follow from left to right, the alpha- bet having signs for seven vowels a, ¢, 7, 0, u, 6, u%, and diphthongs derived from them ao, at, et, 11, 01, ut, Gi, ii, and for seventeen con- sonants n, b, kh, gh, k, g, m, l, r (never initial), t, d, y, s (ds), ts, ss, sh, w. All these are modified in shape according to their position, in the beginning, middle, or end of a word, and also by certain orthographic rules. In Mongolian and Manchu writing the syllable (i.e., the consonant together with the vowel) is considered as a unit,*~~

~~*1 See his essay, "Ueber die Sprache der Hazaras und Aimaks," in the Zeit- ' schrift der deutschen morgenldndischen Gesellschaft, vol. xx. pp. 326-335.*~~

~~*MONGOLS*~~

~~*in other words, a syllabarium rather than an alphabet. The exist- ing characters are lineal descendants of the original Uigurian forms, which were themselves derived from the Syriac, having been brought to the Uigurs by Nestorian missionaries. An Indian and Tibetan influence may also be noticed, while the arrangement of the char- acters in perpendicular lines is common to the Chinese. The writ- ing was brought into its present shape by the learned Lamas Sa- skya Pandita, Phags-pa Lama, and "shoitshi Odser in the 13th century,! but is exceedingly imperfect. To express the frequently- occurring letters borrowed from Sanskrit and Tibetan, which are wanting in the Mongol alphabet, a special alphabet called Galik is employed. Every one who has tried to read Mongolian knows how many difficulties have to be overcome, arising from the ambi- guity of certain letters, or from the fact that the same sign is to be pronounced differently according to its position in the word. Thus, there are no means for distinguishing the o and w, 6 and i, the consonants g and &, tand d, yand s (ds). A and e, o (wu) and & (ui), a (e) and n, g and kh, t (d) and on, are liable to be mistaken for each other. Other changes will be noticed and avoided by advanced students. It isa great defect that such common words as ada (a fury) and ende (here), ende (here) and nada (me), aldan (fathom) and altan (gold), ordu (court-residence) and wrtw (long), onokhu (to seize) and wnwkhu (to ride), tere (this) and dere (pillow), gebe (said) and kebe (made), gem (evil) and em (measure), ger (house) and ker (how), naran (sun) and nere (name), yagou (what) and dsagon (hundred), should be written exactly alike. This list might be largely increased. These defects apply equally to the Mongohan and Buriatic alphabets.*~~

~~*In 1648 the Saya Pandita composed a new alphabet (the Kalmuk), in which these ambiguities are avoided, though the graphic differences between the two alphabets are only slight. The Kalmuk alphabet avoids the angular and clumsy shapes of the Mongolian, and has, on the contrary, a rounded and pleasing shape. The Kalmuk alphabet has also this great advantage, that every sound has its distinct graphic character ; a mistake between two characters can scarcely occur. The Kalmuk words once mastered, they can be easily recognized in their Mongolian shape. The dialectical differ- ences are also very slight.*~~

~~*The Kalmuk, therefore, is the key of the Mongolian, and should form the groundwork of Mongolian studies. The Kalmuk and East Mongolian dialectsdonot differ much, at least in thespoken language ; but the Kalmuks write according to their pronunciation, while the Mongols do not. For example, sén (dsén), '"hundred," is pronounced alike by the Kalmuks and the East Mongolians ; but according to Mongolian orthography the word appears in the form dsagon. The dialectic difference between the two dialects very frequently lies only in a different pronunciation of some letters. Thus East Mon- golian ds is in Kalmuk soft s, &c. The chief difference between the two dialects lies in the fact that in Kalmuk the soft guttural g be- tween two vowels is omitted, while, through the joining of the two vowels, a long vowel is produced. In the pronunciation of common East Mongolian the g is likewise omitted, but it is written, while in Kalmuk, as just now mentioned, the guttural can only be traced through the lengthening of the syllable. Thus we find: Mongol khagan, "prince," Kalmuk khan; M. dagon, " voice, sound," K, don, dun; M. dologan, "seven," K. dolén; M. agola, "mountain," K. 6la, ala; M. nagor, "lake," K. nér, niir ; M. ulagan, "red," K. ulan; M. yagon, "what," K. yon (yan) ; M. dabagan, "mountain- ridge," K. daban ; M. ssanagan, *' thought," K. ssandn ; M. baragon, 'on the right," K. barn, barun ; M. shibagon, bird," K. show6n ; M. chilagon, stone," K. chilén (chulun) ; M. jirgogan, Mey be 1 surgan; M. degere, 'high, above," K. dére; M. ugukhu, "to drink," K. akhu; M. togodshi, "history," K. tédshi, tudshi; M. egiden, "door," K. éden; M. dsegiin, "'left," K. son; M. dgede, **in the height," K. dds; M. égeled, "the Kalmuks," K. oléd ; M. iitleged, 'if one has done," K. wiléd; M. kobegiin, "son," K. kéwon; M. gegiin, "'mare," K. gun; M. kegiir, " corpse," K. kur; M. kharigad, "returned," K. kharéd, &c.*~~

~~*The Buriatic, in these peculiarities, is almost always found with East Mongolian, with which it is in every respect closely allied. In the pronunciation of some letters the transition of East Mongolian tsa, tse into Buriatic ss is noticeable ; for instance: Mong. ¢setseh,, '*~~

~~*The noun is declined by the help of appended particles, some of which are independent post-positions, viz., Gen. yin, wu, un ; Dat. dur, a; Acc. yi, 7; Ablat. etse; Instrum. ber, yer; Associative, luga, lage. The dative and*~~

~~*accusative have also special forms which have at the same time a possessive sense, viz., Dat. dagan, degen ; Accus. ben, yen. The plural is expressed by affixes (war, ner, od, ss, d), or frequently by words of plurality, "all," "many," ¢9., kitmiin nogod (man, many=men). 'The oblique cases have the*~~

~~*1 Cf. H. C. von der Gabelentz, in the Zeitschrift f. d. Kunde d. Morgenlandes Gottingen, 1838, vol. ii. pp. 1-21, " Versuch tiber emealte mongolische Inschrift.'*~~

~~*same endings in singular and plural. Gender is not indicated. The adjective is uninflected both as attribute and as predicate ; there is no comparative form, this idea being expressed by the con- struction or by the use of certain particles. The personal pronouns are bi, 1; tchi, thou ; bida, we; ta, ye; their genitives serve as pos- sessives. The demonstratives are ene, tere (this, that), plural ede, tede ; interrogative ken, who? The relative is lacking, and its place is supplied by circumlocutions. The numerals are: 1, nigen; 2, khoyar ; 3, gurban; 4, dérben; 5, tabun; 6, jirgugan ; 7, dologan; 8, naman; 9, yisun; 10, arban; 100, dsagon; 1000, minggan. The ordinals are formed by appending tugar, tiger. The theme of the verb is seen in the imperative, as bari, grasp. The conjugation is rich in forms for tense and mood, but person and number are with few exceptions unexpressed. The present is formed from the theme by adding mut (barimui), the preterite by bai or luga (baribai, bari- luga), the future by sswgat or ssu (barissugai, barissu). The preterite has also in the third person the terminations dsugui and run; the future has in the third person yw, and in the first ya. The con- ditional ends in bassw (baribassu), the precative in tugai, tiger, the potential in sa (barimuisa), the imperative plural in ktwn, the gerund in the present in 7, dsu (barin, baridsu) or tala, 'while, till" (baritala, 'inter capiendum"'), in the preterite it is formed in gad (barigad) ; the present part. has ktchi (bariktchi), the past part. kssan (barikssan); the supine ends in ra, the infinitive in khw (bartkhit, or when used substantively barikhii). There is but one perfectly regular conjugation, and derivative forms, derived from the theme by infixes, are conjugated on the same scheme. Thus the*~~

~~*passive has infixed ta or kda (barikdakhu, to be grasped), the causative gul (bariguikhu, to cause to grasp), the co-operative or sociative ltsa or lda (bariltsakhu, to grasp together).*~~

~~*There are no prepositions, only post-positions. Adverbs are either simple particles (affirmative, negative, interrogative, modal, &c.), or are formed by suffixes from other parts of speech. There are very few conjunctions ; the relations of clauses and sentences are mainly indicated by the verbal forms (part., sup., conditional, but mainly by the gerund).*~~

~~*The order of words and sentences in construction is pretty much the opposite of that which we follow. In a simple sentence the indication of time and place, whether given by an adverb or a sub- stantive with a post-position, always conies first; then comes the subject, always preceded by its adjective or genitive, then the object and other cases depending on the verb, last of all the verb itself preceded by any adverbs that belong to it. So in the structure of a period all causal, hypothetical, concessive clauses, which can be conceived as preceding the main predication in point of time, or even as contemporary with it, or as in any way modifying it, must come first; the finite verb appears only at the end of the main*~~

~~*redication or apodosis. The periods are longer than in other anguages ; a single one may fill several pages.*~~

~~*Grammars and dictionaries may be divided according to the three dialects. For East Mongolian, I. J. Schmidt gave the first grammar (Petersb., 1831), and a Mongolian-German-Russian dictionary (Petersb., 1835). Next Jos. Kowalewski published in Russian a Mongolian grammar (Kasan, 1835), a chrestomathy (2 vols., Kasan, 1836, 1837), and his great Dictionnaire mongol-russe-francais (3 vols., Kasan, 1844, 1846, 1849). We name also R. Yuille, Short Mongolian Grammar (in Mongolian), xylographed at the mission press near Sselenginsk beyond Lake Baikal (1838). A. Bobrownikow's Russian Grammar of the Mongolian-Kalmuk Igviquage (Kasan, 1849) is also very good. An abridgment of Schmidt's work *;.2 Puini, Elementi della grammatica mongolica (Florence, 1878). A. Popow's ., *golian Chrestomathy appeared in 2 vols. at Kasan (1836). For the Kalmuk we have grammars by Popow (Kasan, 1847), Bobrownikow as above, and H. A. Zwick (s. l. et a.), autographed at*~~

~~*Donaueschingen (1851). Zwick's autographed Kalmuk and German dictionary with a printed German index appeared (s. l. et a.)in 1852; B. Jiilg's edition of the tales of Siddhi-kir (Leips., 1866) gives a complete glossary to these stories. There are small Russian and Kalmuk vocabularies by P. Smirnow (Kasan, 1857) and C. Golstunskyi (Petersb., 1860).*~~

~~*MONGOOS, or Muncoos. See IcuNEUMON.*~~

~~*MONITION, in the practice of the English ecclesiastical courts, is an order requiring or admonishing the person complained of to do something specified in the monition, "under pain of the law and penalty thereof." It is the lightest form of ecclesiastical censure, but disobedience to it, after it has been duly and regularly served, entails the penalties of contempt of court. See Phillimore, Lccles:- astical Law (London, 1873).*~~

~~*MONK, Gzorce (1608-1669), English general, was the second son of Sir Thomas Monk, a gentleman of good family but in embarrassed circumstances, and was born at Potheridge, near Torrington in Devonshire, on 6th De- cember 1608. An exploit which brought him within the reach of the law compelled him to begin his career as a soldier of fortune at the age of seventeen. He acted under Sir R. Grenville as a volunteer in the expedition to*~~

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~~*For the Buriatic we have Castrén, Versuch einer Burjdtischen Sprachlehre, edited by Schiefner (1857), and A. Orlow's Russian grammar of the Mongol-Buri- atic colloquial language (Kasan, 1878).*~~

~~*Literature.—A clear distinction must be drawn between the higher and nobler written or book-language and the common or conversational language of every- day life. The difference between the two is very considerable, and may be fairly compared to that between the Modern High German book-language and the different dialects. All grammars and dictionaries as yet published treat only of the book-language; and so also, with a few exceptions, the published literary documents are written in this higher style. The exceptions are the Gesser-Khan, and the Siddhi-*~~

~~*kiir and Djangariad (the last two published by Golstunskyi). The popular or conversational language has only quite lately been fixed in writing by A. Pozdnyeyew in his Russian work, Specimens of the Popular Literature of the Mongolian Tribes, part i., " Popular Songs" (Petersb., 1880), which contains rich material for the study of the popular literature.*~~

~~*'The literature known at present consists mostly of translations from the Tibetan, the holy language of Buddhism, which is still the language of the learned. The Tibetan Buddhist literature is itself translated from the Sanskrit ; hence, now and then, through Mongols and Kalmuks we get acquaiuted with Indian works the originals of which are not known in Sanskrit. Such is the case, for instance, with the tales of Siddhi-kiir. Many books have also been translated from the Chinese. Most of the writings are of a religious, historical, philosophical, medical, astronomical, or astrological character. Favourite sub- jects are folk-lore and fairy tales. Among the religious books, perhaps the most important is that containing the legends entitled wliger tin dalai, "ocean of coinparisons" (edited by the late I. Jacob Schmidt under the title, Der Wetse and der Thor, in Tibetan and German, Petersb., 1843). To this may be added the boddhi mér, or "the holy path," the altan gerel, "gleaming of gold," the nant gambo, and yertiintcht yin toli, 'mirror of the world." What was known of poetical literature before Pozdnyeyew is scarcely worth mentioning. In some parts of the historical and narrative literature we find, wherever tlie nar- rative takes a higher flight, an admixture of poetical diction. The poetry appears in a certain parallelism of the phrases, with a return either of the same endings (rhyme) or of the same words (refrain). Frequently we find, besides the rhyme or refrain, alliteration. The essay of H.C. yon der Gabelentz in Z. f. d. Kunde des Morgenlandes, vol. i. pp. 20-37, " Biniges tiher Mongolische Poesie," has been superseded by the work of Pozdnyeyew.*~~

~~*Among historical works a high place is due to that composed by the tribal prince, Ssanang Ssetsen, in the middle of the 17th century (Geschichte der Ost- Mongolen und thres Fiirstenhauses, Mong. and Germ., by I. J. Schmidt, Petersb., 1829), and to the Altan tobtchi, i.e., 'Golden knob" or " precious contents" (text and Russian translation by the Lama Galsang Gomboyew, Petersb., 1858). Of folk-lore and fairy tales, we have the*~~

~~*legend of the hero Gesser- Khan (text ed. by I. J. Schmidt, Petersb., 1836, and German version, 1839; comp. Schott, Ueber die Sage v. Geser-Khan, Berl., 1851, and B. J lilgin the Transactions of the Wiirzburger Philol. Versam. of 1868, pp. 58 sqq., Leips., 1869); and the tales about Ardshi Bordshi (Russian version by Galsang Gomboyew, Petersb., 1858; text and German trans. by B. Jtilg, Innsbr., 1867, 1868). A favourite book is the tales of Siddhi-ktr based on the Sanskrit Vetdla panchavincati (Russian trans. by Galsang Gomboyew, Petersb., 1865; nine of the tales in Mongolian and German by B. Jtilg, Innsbr., 1868). The fuller collection of these tales in Kalmuk first became known by the Gerinan trans. of B. Bergmann in vol. i. of his Nomadische Streifereien unter d. Kalmiken (4 vols., Riga, 1804, 1805); an autographed edition in the vulgar dialect was published by C. Golstunskyi (Petersb., 1864; text and German trans. with glossary by B. Jiilg, Leips., 1866). A poetic heroic story is the Djangariad, extracts from which were given by Bergmann (op. cit., iv. 181 sqq.); a complete Russian version by A. Bobrownikow (Petersb., 1854); a German version by F. v. Erdmann in Z.D.M.G., 1857 (Kalmuk text by Golstunskyi, Petersb., 1864). A similar poem is the history of Ubashi Khuntaidshi and his war with the Oirad, Kalmuk text and Russian trans. by G. Gomboyew in his Altan tobtchi as above, and text alone autographed by Golstunskyi (Petersb., 1864). Some books of religion for the Christian Buriats (transcribed in Russian characters) represent the Buriatic dialect. The Russian and English Bible Societies have given us a translation of the whole Bible. I. J. Schmidt translated the Gospels and the Acts into Mongolian and Kalmuk for the Russian Bible Society (8 vols., Petersb., 1819-1821),—a masterly work. The English missionaries, E. Stallybrass and W. Swan, and afterwards R. Yuille, translated the whole Old Testament into Mongolian (1836-1840). This work was printed at a mission press erected at great cost for the purpose near Sselenginsk, beyond Lake Baikal in Siberia. In 1846 the New Testament by the same hands appeared at London.*~~

~~*The richest collections of Mongolian and Kalmuk printed books and MSS. are in the Asiatic museum of the Petersburg Academy, and in the libraries of Kasan and Irkutsk; there is also a good collection in the royal library at Dres- den. Consult in general, besides the already-cited works of Bergmann and Po- zdnyeyew, P. 8. Pallas, Sammlungen historischer*~~

~~*Nachrichten wu. d. Mongolischen Volkerschaften (2 vols., Petersb., 1776-1801); I. J. Schmidt, Forschungen im Gebiete der dlteren . . . Bildungsgeschichte der Volker Mittelasiens, vorz. d. Mongolen und Tibeter (Petersb. and Leips., 1824); B. Jtilg, "On the Present State of Mongolian Researches," Journ. R. As. Soc., xiv. (1882), pp. 42-65. (B. J.)*~~

~~*Cadiz, and the next year did notable service at the Isle of Rhé.*~~

~~*In 1629 Monk went to the Low Countries, the training ground for military men, where in Oxford's and in Goring's regiments he obtained a high reputation for courage and for a thorough knowledge of his trade. In 1638 he threw up his commission in consequence of a quarrel with*~~

~~*.the Dutch civil authorities, came to England, and obtained*~~

~~*the lieutenant-coloneley of Newport's regiment during the operations on the Scottish border. Here he showed his skill and coolness in the dispositions by which he saved the English artillery at Newborn, though himself destitute of ammunition ; and in the councils of war he confidently voted with Strafford for fighting, and against retreat or composition. One of Monk's biographers relates that he now thought of joining the adventurers who proposed to colonize Madagascar. The Irish rebellion, however, offered*~~

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~~*more congenial employment, and in February 1641 he landed at Dublin as colonel of Lord Leicester's regiment. Here he greatly increased his reputation. Under the most difficult circumstances he was ever cool, patient, vigorous. A rigid disciplinarian, he was always attentive to the wants of his men, and completely won their confidence and affec- tion. All the qualities for which he was noted through life, the calculating selfishness which kept him ever on the winning side and by which he accomplished his great historic success, the imperturbable temper and impene- trable secrecy, were fully displayed in this employment. He had but one interest, that of George Monk; and to secure that interest he laboured, while retaining his free- dom from party ties, to make himself indispensable as a soldier. The govérnorship of Dublin was vacant, and*~~

~~*Monk was appointed by Leicester. But Charles I. overruled the appointment in favour of Lord Lambert, and Monk, with great shrewdness, gave up his claims. Ormond, however, who viewed him with suspicion as one of the two officers who refused the oath to support the royal cause in Eng- land, sent him under guard to Bristol. He now deemed it safest to affect Royalist views. His value caused him to be received at once into Charles's confidence ; he was appointed major-general of the Irish brigade, and served under Byron at the siege of Nantwich. Here he was taken prisoner by Fairfax, on 25th January 1644, in one of the most skilful operations of the war. After a short captivity in Hull he was placed in the Tower, where he remained for three years (during which his father died), beguiling his imprisonment by writing his Observations on Military and Political Affairs. '*~~

~~*So long as the war lasted Monk could not be released. Charles, however, became a prisoner; the troubles in Ireland made the parliament anxious to secure Monk's services, and he was told that if he would take the Cove- nant he might have an important command. With some show of hesitation the terms were accepted, and, after a service of two months in Lord Lisle's abortive expedition, Monk was placed in command of the British forces in the north of Ireland. Compelled in 1649 to conclude a pacifi- cation with the rebel O'Neill, he returned to England after the king's execution. In the same year he succeeded, by his elder brother's death, to the family estate. His idleness lasted but a short while. Cromwell gave him a regiment and the command of the ordnance in the Scotch war of 1650, and after the battle of Dunbar, in which he led the attack, he was left with 6000 men to subdue the country, which, after taking Edinburgh, Tantallon, and Stirling castles, he did most completely in a few weeks. In 1651 he was seized with fever, but recovered at Bath, and in the same year was appointed on the commission for pro- moting the Union. In 1653, with Admiral Dean, he commanded the British fleet against the Dutch, and on 2d and 3d June and 29th July fought two of the most sanguinary naval battles on record, in which both his colleague and Van Tromp were slain. A peace on very humiliating terms to the Dutch was concluded, but policy shortly led Cromwell to allow milder conditions,—a conces- sion against which Monk strongly remonstrated. On his return he married his mistress, Anne Clarges, a woman of the lowest extraction, "ever a plain*~~

~~*homely dowdy," says Pepys, who, like other writers who mention her, is usually still less complimentary. Monk was now sent to quell the revolt headed by Middleton in Scotland, and, when this service was over, settled down to a steady government of the country for the next five years. For fanaticism in any shape he had no sympathy, and he set himself to diminish the influence of the Presbyterian clergy—Cromwell's chief opponents,—taking from them the power of excommuni- cation and their general assemblies, but allowing them to*~~

~~*MONK*~~

~~*retain their presbyteries. Equal repression was exercised against the nobility and gentry. 'The timely discovery of a plot fomented by Overton for killing Monk on New Year's Day gave him an excuse for thoroughly purging his army of all Anabaptists, Fifth Monarchy men, and other danger- ous enthusiasts. It is doubtful whether at this time Monk had proposed to himself the restoration of the king. He probably had it always in his mind as a possibility, but he would run no risks, His very reticence, however, caused alarm on one side and hope on the other. In 1655 he received a letter from Charles II., a copy of which he at once sent to Cromwell, whom, however, we find writing to him in 1657 in the following terms: "There be that tell me that there is a certain cunning fellow in Scotland called George Monk, who is said to lye in wait there to introduce Charles Stuart ; I pray you, use your diligence to appre- hend him, and send him up to me."*~~

~~*During the confusion which followed Cromwell's death Monk remained silent and watchful at Edinburgh, careful only to secure his hold on his troops. In July 1659 direct and tempting proposals were again made to him by the king. His brother Nicholas, a clergyman, was em- ployed by Sir J. Grenvil to bring to him the substance of Charles's letter. No bribe, however, could induce him to act one moment before the right time. He bade his brother go back to his books, and refused to entertain any proposal. But when Booth rose in Cheshire for the king, so tempting did the opportunity seem that he was on the point of joining forces with him; and a letter was written to the Rump parliament threatening force if it did not at once fill up its numbers. His habitual caution, however, induced*~~

him to wait until the next post from England, and the next post brought news of Booth's defeat. On 17th October he heard of Lambert's coup @état. From that moment his plan of action seems to have been settled. In most vehement language he dis- carded the idea of restoring Charles, and, with admirable perception of the state of English feeling, took for his principles that in all cases the army must obey the civil government, and that the civil government must be parliamentary. At present the Rump was crushed by the military party; the first thing, therefore, to be done was to free it. His army underwent a second purging of dis- affection, and he then issued a declaration embodying the principles mentioned above, and wrote to Lenthall the speaker, and to the military party to the same effect. In a treaty with the Committee.of Safety his commissioners, who were to treat only on the basis of the restoration of parliament, were outwitted. Monk at once refused to accept the terms proposed, and marched to Berwick, having received an offer from Fairfax of assistance if he would promise that the secluded members should be restored. Meanwhile Lambert had marched northwards to oppose his advance.

Monk's action gave fresh heart to the adherents of the parliament. The old council of state met, and named him general of all the forces; the fleet and the Irish army, hitherto hostile, came round to his side, and so did Whetham at Portsmouth. Monk now, in the depth of winter, crossed the Tweed at Coldstream and marched by Morpeth to Newcastle, receiving letters on his way from the lord mayor and corporation of London urging him to declare for a free parliament. On his approach Lambert's army fell away from their general, and no obstacle re- mained on the path to London. At York, when urged by Fairfax, he refused to declare for the king, and is said to have caned an officer who affirmed that such was his design. The parliament now ordered him to come to London. Fleetwood's army which occupied the city was, however, a great obstacle ; and it was not until the parlia-

ment, in accordance with his desire, had arranged for its dispersion that he would enter with his troops. Even now his intentions were strictly concealed ; the spies set upon him by the various anxious parties were

~~*baffled by his impenetrable reserve. He was careful to appear only as the servant of parliament, but when he was desired to take the oath of abjuration he skilfully evaded the request. The city, always jealous of the Rump, now refused to pay taxes except at the orders of a free parliament. Monk, in consequence, was ordered to march his troops into the city, take down the chains and posts, and unhinge the gates. He obeyed these unpleasant orders to the letter on 10th February, thus permitting the hatred against the Rump to rise to the height, while he showed how unwilling an instrument of its will he was. On the 11th, however, he threw off the mask, and wrote to the Rump, peremp- torily ordering them to admit the secluded members, and to arrange for the dissolution of parliament by 6th May. On 21st February he conducted the secluded members to their seats. At the same time he refused to restore the Lords, and issued an order disowning Charles Stuart to all officers commanding garrisons. Every day brought him fresh opportunities for tact or evasion. His partisans urged him to take the protectorate himself; another party pressed upon him to accomplish the restoration by the army alone ; a body of his officers sent him a declaration*~~

~~*expressing their fears that his action would lead to the*~~

~~*restoration of monarchy; the parliament tried to make him their own by the offer of Hampton Court. His trained habits of dissimulation and evasion, assisted now and again by downright lying, carried him triumphantly through all these dangers, and at length the dissolution of parliament on 17th March removed his greatest difficulties.*~~

~~*It was now that, with the utmost secrecy, he gave an interview for the first time to the king's agent Grenvil, and by him sent to Charles the conditions of his restoration, afterwards embodied in the Declaration of Breda. For himself at present he would accept nothing but a royal commission as captain-general, which he carefully kept to himself. All parties were anxious to gain the credit of the now certain restoration. The Presbyterians in parti- cular, fearful of the king being restored without terms, did their best to discredit Monk and to impose the old Isle of Wight conditions ; but in vain. The new parliament was elected, and the House of Lords restored ; an insurrection by Lambert, who had escaped from the*~~

~~*Tower, was quelled by Monk's prompt measures, and on the 25th of April he received the solemn thanks of both Houses, and the title of captain-general of the land forces. Even yet the farce was kept up. Monk received with feigned surprise the king's official letter from Grenvil, denied all knowledge of its contents, and handed it over sealed to the council, who decided to defer opening it until the meeting of parliament on the Ist of May.*~~

~~*With the Restoration the historic interest of Monk's career ceases. The rude soldier of fortune had played the game with incomparable dexterity, and had won the stakes. He was made gentleman of the bedchamber, knight of the Garter, master of the horse, commander-in-chief, and duke of Albemarle, and had a pension of £7000 a year allotted him. His utmost desires were satisfied, and he made no attempt to compete further in a society in which neither he nor his vulgar wife could ever be at home, and which he heartily despised. As long as the army existed of which he was the idol, and of which the last service was to suppress Venner's revolt, he was a person not to be displeased. But he entirely concurred in the measure for disbanding it, and thenceforward his influence was small, though men's eyes turned naturally to him in emergency. In the trial of the regicides he was on the side of moderation, and his*~~

~~*interposition saved Hazelrig's life; but his action at the time of Argyll's trial will always be regarded as the most dishonourable episode in his career. In 1664 he had charge of the admiralty when James was in command of the fleet, and when in 1665 London was deserted on' account of the plague, Monk, with all the readiness of a man accustomed to obey without thinking of risk, remained in charge of the government of the city. Once more, at the end of this year, he was called upon to fight, having a joint commission with Prince Rupert against the Dutch. The whole burden of the preparations fell upon him. On 23d April 1666 the admirals joined the fleet, and on the Ist of June began a battle near Dunkirk which lasted four days, followed by another on 23d July, in which Monk showed all his old coolness and skill, and a reckless daring which had seemed hitherto foreign to his character. His last service was*~~

~~*in 1667, when the Dutch fleet sailed up the Thames, and Monk, ill as he was, hastened to Chatham to oppose their further progress. From that time he lived much in privacy, and died of dropsy on the 3d of December*~~

~~*1669.*~~

~~*See the Lives of Monk by Dr Gumble, his chaplain (London, 1671), and Dr Skinner (London, 1724), and Guizot's Essar , which contain all necessary information concerning his life up to the Restoration.*~~

~~*The numerous and amusing notices of him in the court of Charles in Pepys's Diary should on no aecount be omitted. (O, A.)*~~

~~*MONKEY. See Apr,*~~

~~*MONMOUTH, a maritime county of England, is bounded Plate*~~

~~*E. by Gloucester, N.E. by Hereford, N.W. by Brecknock, W. and 8.W. by Glamorgan, and S. by the Bristol Channel. Its greatest length from north to south is about 35 miles, and its greatest breadth about 28 miles. The area is 368,399 acres, or about 572 square miles.*~~

~~*The surface of Monmouth is very varied, and in many districts picturesque, especially along the valley of the Wye, and between that river and the Usk. In the west and north the hills rise to a considerable height, and this mountain region encircles a finely undulating country. The highest summits are Sugar Loaf (1954 feet), Blorenge (1908), and Skyridd Vawr (1601). Along the shore on both sides of the Usk are two extensive tracts of marsh land, called the Caldicot and Wentllooge levels, stretching from Cardiff to Portskewett, and protected from inunda- tions by strong embankments.*~~

~~*The principal rivers are: the Wye, which forms the eastern boundary of the county with Gloucester, and falls into the Severn; the Monnow, which forms a portion of its boundary with Hereford, and falls into the Wye at the town of Monmouth ; the Usk, which rises in Brecknock, and flows southward through the centre of the county to the Bristol Channel ; the Ebbw, which rises in the north-west, and enters the estuary of the Usk at*~~

~~*Newport; and the Rumney, which rises in Brecknock, and, after forming the boundary between Monmouth and Glamorgan, enters the Bristol Channel a little to the east of Cardiff. Salmon abound especially in the Wye and the Usk, and trout are plentiful in all the streams. The Monmouthshire canal extends from Newport to Pontypool, where it is joined by the Brecknockshire canal, which enters the county near Abergavenny. The Crumlin canal also joins it a little north of Newport.*~~

~~*Geology and Minerals.—The geological formation is principally Old Red Sandstone and Carboniferous,—the Old Red forming the larger and eastern half of the county, from a line drawn between Abergavenny and Newport, and varying in thickness from between 8000 and 10,000 feet in the north to about 4000 feet in the south. In the centre of the county adjoining the Usk there is an outcrop of Silurian rocks, extending to a distance of about 8 miles north and south and 4 miles east and west, with a thickness of 1500 feet. Towards the east the Old Sandstone rocks dip beneath the Moun- tain Limestone, which enters the county from the Forest of Dean coal-field, and gives its peculiar character to the fine scenery along the banks of the Wye. The formation varies in thickness from*~~

~~*a of*~~

~~*754*~~

~~*500 to 700 feet. The Carboniferous rocks connected with the great coal-field of South Wales, which occupy the western half of the county, include —(1) the Coal-measures, consisting of shales and ironstones, sandstones and coal-beds, of which there are about twenty-five beds more than 2 feet thick—total thickness of the strata 11,650 feet; (2) Millstone Grit, thickness 330 feet; (3) Carboniferous Limestone surrounding the coal-field, thickness 1000 feet; (4) Old Red Sandstone, thickness 600 feet; and (5) Devonian beds, consisting of red and brown sandstone, marls, &c., thickness about 6000 feet. The coal-field'of Monmouth has an area of about 90,000 acres. The beds are very rich and easily wrought, the most common way of reaching them being by excavating pas- sages in the sides of the hills instead of by perpendicular shafts. The number of collieries in operation in 1881 was 124, and the quantity of coal obtained 5,412,840*~~

~~*tons. The ironstone of Mon- mouth occurs both in beds and in large detached masses, the yield of iron being 18 to 55 per cent. 'The ore is the common clay iron- stone. 'The iron industry was proseeuted successfully at Ponty- pool in the 16th century by a family of the name of Grant, who were succeeded by the Hanburys. In 1740 Monmouth contained, however, only two furnaces, which made together about 900 tons annually ; but during the present century they have increased with great rapidity. In 1881 the number of furnaces built was 52, of which 35 were in operation ; the amount of pig-iron made was 527,277 tons. The works are situated chiefly in the neighbourhood of Pontypool, and oecupy the valleys running in the direction of Merthyr-Tydfil in Glamorganshire. The following were the Mon- mouth ironworks in 1881: Abersychan, Pontypool, Pontnewynydd, Ebbw Vale, Victoria, Blaenavon, Cwmbran, Nantyglo, Oakfields, Blaina, Rhymney, and Tredegar. In all, there were 258 puddling furnaces and 42 rolling mills in operation. The tinplate manufacture is extensively carried on, the number of mills in the Monmouth and Gloucester district in 1881 being 95, the majority of which are in Monmouth. Fireclay is extensively dug ; 57,680 tons were obtained in 1881.*~~

~~*Soil and Agriculture.—Along the seashore the soil is deep and loamy, and admirably suited for the growth of trees. The most fertile land is that resting on Red Sandstone, especially along the banks of the Usk, where wheat is raised of a very fine quality. In the more mountainons regions there is very little land that is cap- able of cultivation, the soil being generally thin and peaty. More attention is paid to grazing than to the raising of crops. There are a considerable number of dairy-farms, but sheep-farming is much more largely followed. Of the 5241 holdings existing in 1880—the latest year in regard to which there is information —3661 were under 50 acres, 1521 between 50 and 300 aeres, and only 59 above 300 acres. Aecording to the agricultural returns for 1882 there were 243,068 acres, or almost exactly two-thirds of the total area, under cultivation. Of this, 176,137 acres were permanent pasture, and 14,729 rotation grasses. Of the 35,038 aeres under corn erops, 16,151 were under wheat, 8596 under barley, and 8711 under oats. Turnips occupied 7486 acres, and potatoes only 1777. 'The area under woods was 29,856, and under orchards 3921. The total num- ber of horses in 1882 was 11,631; of*~~

~~*which the number used solely for agricultural purposes was 6449. Of the 44,168 cattle, 16,500 were cows and heifers in milk or in calf. Sheep numbered 134,682, and pigs 17,621. Aecording to the latest return there were 7811 proprietors possessing 296,971 acres, with a gross annual rental of £837,254, Of the owners, 4970, or 68 per cent., possessed less than 1 acre, 17 possessed between 1000 and 2000 aeres, and 15 betweeu 2000 and 5000. The following four proprietors possessed over 5000 acres each: Lady Llanover, 6312; the executors of C. H. Leigh, 10,211 ; Lord Tredegar, 25,229; and the duke of Beaufort, 27,299.*~~

~~*Railways.—The South Wales Railway passes along the eoast, and many branch lines cross the county in various directions, the majority of them being connected either with the Great Western Railway or with the London and North-Western.*~~

~~*Administration and Population.—Monmouth comprises six hun- dreds, and the municipal boroughs of Monmouth (6111) and Newport (38,427). In addition to these two boroughs there are fifteen urban sanitary districts, viz., Abergavenny (6941), Abersychan (18,496), Abertillery (6003), Blaenavon (9451), Caerleon (1099), Chepstow (8591), Christehnrch (3114), Ebbw Vale (14,700), Llanvrechva (4177), Panteg (8321), Pontypool (5244), Rhymney (8663), Risca (5540), Tredegar (18,771), Usk (1470). With the exception of Abergavenny, Cacrleon, Chepstow, Pontypool, and Usk, these towns are all of modern growth, and: owe their rise chiefly to the iron manufacture,—some, however, being partly dependent on that of tinplate. 'lhe county returns two members to parliament ; and Monmouth, Newport, and Usk, with a united population in 1881 of 46,033, constitute the Monmouth distriet of boroughs, which returns one member. The county has one court of quarter sessions, and is divided into twelve petty sessional divisions. It is within the diocese of Llandaff, and contains 147 civil parishes, townships, or places. The population, which in 1801 was 45,568, had increased in 1841 to 134,368, in 1871 to 195,448, and in 1881 to 211,267 (of whom 108,262 were males, and 103,005 females).*~~

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~~*History and Antiquities.—At the time of the Romans, Mon- mouthshire formed part of the territory of the Silures, whose princi- pal seat was at Caerwent, and who were finally subdued by Julius Frontinus in the year 78. The old Roman road, the Via Julia, leading from the mouth of the Severn to Caerwent, Caerleon, and onwards to Neath in Glamorgan, can still be traced. The Romans made Caerwent, under the name of Venta Silurwm, one of their principal stations. Tesselated pavements, pottery, coins, and the remains of a Roman villa, have been found, and portions of the walls still exist. The great station of the Romans was, however, Tsea Silwrum, now Caerleon (Caer legionis), so called from the fact that it was the headquarters of the second imperial legion. By Richard of Cirencester it is called a colonia, being the only station of that dignity in Wales. The mound of the old fortress still remains, as well as portions of an amphitheatre. Other less important stations were those of Gobanniwm (Abergavenny), Blestiwm (Mon- mouth), and Burrium (probably Usk). Monmouthshire is closely associated with Arthurian legends. In one of the Welsh tales Arthur is represented as holding his court at Caerleon during Easter and Pentecost; and an oval bank near the town is pointed out as Arthur's Round Table. When Wales was subdivided into three king- doms on the death of Rhodri the Great, Monmouth and Glamorgan were placed under a separate government distinct from either of these. In the 9th and 10th centuries Monmouth was frequently invaded by the Danes. Edward the Confessor, after various vic- tories in Wales, is said to have established a palace at Porth-is-coed (Portskewett). At the Norman Conquest the district was delivered over to certain Norman nobles called the " Lords of the Marches," who held the lands which they conquered per barontam, with the right of administering justice. Frequent contests took place between the lords of the marches and the Welsh princes, until, in 1535, the jurisdiction of the lords of the marches was abolished by Henry VIII., and Monmouth was included among the English counties. Monmouth was the scene of frequent contests during the Civil War.*~~

~~*Of Norman fortresses in Monmouth, either built or taken possession of by the lords of the marches, there are remains of no less than twenty-five. The more interesting and important are: Caldicot, the seat of the De Bohuns, still entire; Chepstow, one of the finest examples of the old Norman fortress extant, built by Fitz Osborn in the 11th century, in an*~~

~~*imposing situation on a cliff above the Wye ; Newport, now used as a brewery ; Abergavenny, now partly occu- pied as a private house ; the gateway and hall of Grosmont, once the residence of the dukes of Lancaster ; and Usk Castle, rebuilt by the Clares in the time of Edward IV. Raglan Castle, begun in the reign of Henry V., is a very extensive ruin, still in good preser- vation, and contains examples of several styles of architecture. Charles I. resided in it after the battle of Naseby. In 1646 it was delivered up to the parliament.*~~

~~*At the Reformation there were in Monmouth two hospitals and fifteen other religious houses ; but of these there are now important remains of only two—Llanthony Abbey and Tintern Abbey. Llan- thony Abbey in the Black mountains was founded by William de Lacy for Cistercians in 1103, and is one of the earliest examples in England of the Pointed style. The ruins consist of portions of the nave, transept, central tower, and choir. Tintern Abbey, belong- ing to the same order, and founded by Walter de Clare in 1131, occupies a position of great beauty on the Wye. The building, which is Early English to Decorated, is almost entire, with the exception of the roof, and may be ranked as among the finest of the monastic ruins in England. Of the churches, those chiefly worthy of mention are Abergavenny, belonging to a Benedictine priory, and containing a number of old tombs ; Chepstow, partly Norman, and possessing a richly-moulded doorway ; St Woolos church, Newport, also Norman; the Norman church of St Thomas, Monmouth ; Christ Church, principally Norman ; Matherne, Early English, with a tablet to Tewdris, king of Gwent ; and Usk, formerly attached to a Bene- dictine priory.*~~

~~*Monmovts (Welsh Aynwy), a parliamentary and muni- cipal borough of England, and the county town of Mon- mouthshire, is picturesquely situated at the confluence of the Wye and Monnow, in a valley almost surrounded by hills, 18 miles south of Hereford, and 128 west of London. By means of the Wye it has water communication with Bristol and with Hereford, but the former trade by barges has now ceased. Portions of the old walls and of the four gates still remain; but there are only insignificant ruins of the old castle in which Henry V. was born, and which was originally a Saxon fortress. After the Norman Conquest it was placed in the hands of William Fitz Osborn, whose descendant, John lord*~~

~~*of Monmouth, rebuilt it on a more extensive scale. Subsequently it came into the possession of John of Gaunt, and thus becaine attached to the house*~~

~~*of Lancaster. In 1646 it was taken by the parliamentary*~~

~~*MONM*~~

~~*forces. Besides the churches—the new church of St Mary, completed in 1882, and the church of St Thomas, an Old Norman structure—the principal public buildings are the market-house, the town-hall, and Jones's free grammar school in the Tudor style, which dates from 1614. The manufactures of the town are unimportant. The fine scenery of the Wye attracts a large number of tourists.*~~

~~*Monmouth was one of the strongholds of the Saxons; and under the name of Blestium formed one of the stations of the Romans. It was incorporated by Edward VI., and received additional privileges from Queen Mary, James I., and Charles II. It has sent members to parliament since the 27th of Henry VIIL., and, along with New- port and Usk, forms the Monmouth district of boroughs. he area of the municipal and parliamentary borough is 4983 acres, with a population in 1871 of 5879, and in 1881 of 6111.*~~

~~*MONMOUTH, a small manufacturing city of the United States, in Warren county, Illinois, 180 miles south- west of Chicago by the main line of the Chicago, Burling- ton, and Quincy Railroad, and 182 miles north of St Louis, by the St Louis division of the same railway. The Iowa Central Railway passes through the city. An opera- house and Monmouth College are among the principal buildings. The population increased from 4662 in 1870 to 5000 in 1880. 'The city charter dates from 1852.*~~

~~*MONMOUTH, James, Doxe oF (1649-1685), was the son of Lucy Walters, "a brown, beautiful, bold, but insipid creature," who became the mistress of Charles II. during his exile at the Hague. He was born at Rotterdam on 9th April 1649. That Charles was his father is more than doubtful, for Lucy Walters had previously lived with Robert Sidney, brother of Algernon, and the boy resem- bled him very closely. Charles,*~~

~~*however, always recog- nized him as his son, and lavished on him an almost doting affection. Until the Restoration he was placed under the care, first of Lord Crofts, and then of the queen-dowager, receiving his education to the age of nine from Roman Catholics, but thenceforward from Protestant tutors. In July 1662 he was sent for by Charles, and at thirteen was placed under the protection of Lady Castlemaine and in the full tide of the worst influences of the court. No formal acknowledgment of his relation to the king was made until his betrothal to Anne Scott, daughter of the earl of Buccleuch, and the wealthiest heiress of Scotland, whom he married in 1665. During 1663 he was made duke of Orkney, duke of Monmouth, and knight of the Garter, and received honorary degrees at both universities. At court he was treated asa prince of the blood. In 1665 he served with credit under the duke of York in the san- guinary naval battle off Lowestoft. A captaincy in the Life Guards was given him, and in 1670, on the death of Monk, he was made captain-general of the king's forces. Offices of wealth also were showered upon him, and he was admitted to the privy council. In 1670 Monmouth was with the court at Dover, and it is affirmed by Reresby that the mysterious death of Charles's sister, the duchess of Orleans, was due to her husband's revenge on the dis- covery of her intrigue with the duke. It is certain, from an entry by Pepys, that as early as 1666 he had estab- lished a character for vice and profligacy. He was the direct author of the attack in December 1670 on Sir John Coventry, and only a few months later received the royal pardon for his share in the wanton murder of a street watchman. De Gramont, in his vivid sketch of Mon- mouth, after describing the beauty and bodily prowess for which he was celebrated, notices the fatal emptiness and poverty of his mind: "Tous les avantages du corps par- loient pour lui; mais son esprit ne disait pas un petit mot en sa faveur. Il n'avait de sentimens que ce qu'on lui en inspirait." F*~~

~~*Hitherto Monmouth had been but the spoiled child of a wicked court. Now, however, by no act or will of his*~~

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~~*own, he began to be a person politically important. As early as 1662 the king's excessive fondness for him had caused anxiety. Even then the fear*~~

~~*of a "difference" between Monmouth and James, duke of York, exercised men's minds ; and every caress or promotion kept the fear alive. Who could tell but that, in default of legitimate issue from his queen, Charles might declare Monmouth himself his lawful son? A civil war would be the certain consequence. Soon after 1670 the matter took a more serious aspect. The anti-popery spirit was rapidly becoming a frenzy, and the succession of James a probability and a terror. Charles was urged to legitimize Monmouth by a declara- tion of his marriage with Lucy Walters. He returned answer that, much as he loved the duke, he would rather see him hanged at Tyburn than own him for his legiti- mate son. Every attempt, however, was henceforth made, especially by Shaftesbury, to accustom people to this idea. He was taught to regard himself as the representative of the Protestant interest, and his position was emphasized by James's second marriage with the Roman Catholic princess Mary of Modena. From this time his popular title was "the Protestant duke." Charles was induced to confer many proniinent employments upon him. The influence of James, however, was strong enough to prevent his obtaining the lord-lieutenancy of Ireland ; but he received the command of the 6000 troops who assisted the French in the second Dutch war, and, though without any claims to generalship, behaved with courage in the field. In 1674 he was made "'commander-in-chief ;" and, in connexion with this, another unsuccessful attempt, graphically described in Clarke's Infe of James, was made to gain from Charles. a tacit admission of his legitimacy. At Shaftesbury's instance he was placed in command of the army employed in 1675 against the Scottish Covenanters, and was present at Both- well Bridge (22d June 1679). He was also, at the king's request, elected chancellor of the university of Cambridge. In 1678, when Charles was driven into war with Louis, Monmouth took the command of the English contingent, and again gained credit for personal courage at the battle of St Denis. On his return to London England was in the throes of the popish terror. The idea of securing the Protestant succession by legitimizing Monmouth again took shape and was eagerly pressed on by Shaftesbury ; at the time it seemed possible that success would wait on the audacity.*~~

~~*The Pensionary parliament was dissolved in January 1678-79, and was succeeded by one still more determined in its anti-popery spirit. To avoid*~~

~~*the storm, and to save, if possible, his brother's interests, Charles instructed him to leave the country. James retired to Brussels, the king having previously signed a declaration that he "never was married, nor gave contract to any woman whatsoever but to my wife Queen Catherine." In spite of this, Mon- mouth might naturally now nourish ambitious views. His rival was off the stage ; Shaftesbury, his chief supporter, was president of the remodelled privy council; and he himself was the favourite of the city. In the summer of 1679 the king suddenly fell ill, and the dangers of a dis- puted succession became terribly apparent. The party opposed to Monmouth, or rather to Shaftesbury, easily prevailed upon Charles to consent to his brother's tem- porary return. When, after the king's recovery, James went back to Brussels, he received a promise that Mon- mouth too should be removed from favour and ordered to leave the country. Accordingly, in September 1679, the latter repaired to Utrecht, while shortly afterwards James's friends so far gained ground as to obtain for him permission to reside at Edinburgh instead of at Brussels. Within two months of his arrival at Utrecht, Monmouth secretly returned to England, arriving in London on 27th*~~

~~*November. Shaftesbury had assiduously kept alive the anti-popery agitation, and Monmouth, as the champion of Protestantism, was received with every sign of popular delight. The king appeared to be greatly incensed, deprived him of all his offices, and ordered him to leave the kingdom at once. This he refused to do, and the only notice taken of the disobedience was that Charles forbade him to appear at court.*~~

~~*It was at this time that the Appeal from the Country to the City, written by Ferguson, was published, in which the legitimacy was tacitly given up, and in which it was urged that "he that hath the worst title will make the best king." Now it was too that the exclusionists, who, in the absence of parliament, were deprived of their best basis for agitation, developed the system of petitioning. So promptly and successfully was this answered by the "abhorrers" that Charles, feeling the ground safer under him, recalled James to London,—a step immediately fol- lowed by the resignation of the chief Whigs in the council.*~~

~~*Once more, however, a desperate attempt was made, by the fable of the "black box," to establish Monmouth's claims ; and once more these claims were met by Charles's public declarations in the Gazette that he had never been married but to the queen. Still acting under Shaftesbury's advice, Monmouth now went upon the first of his progresses in the west of England, visiting the chief members of the country party, and gaining by his open and engaging manner much popularity among the people. In August 1680 James returned to Edinburgh, his right to the suc- cession being again formally acknowledged by Charles. Monmouth at once threw himself more vehemently than ever into the plans of the exclusionists. He spoke and voted for exclusion in the House of Lords, and used lan- guage not likely to be forgotten by James when an oppor- tunity should come for resenting it. He was ostenta- tiously feasted by the city, the stronghold of Shaftesbury's influence ; and it was observed as he drove to dinner that the mark of illegitimacy had been removed from the arms on his coach.*~~

~~*The year 1681 seemed likely to witness another civil war. The parliament finished a session of hysterical pas- sion by passing a series of resolutions of extreme violence, of which one was that Monmouth should be restored to all his offices and commands; and when Charles summoned afresh parliament to meet at Oxford the leaders of the exclusionists went thither with troops of armed men. Not until the dissolution of this last parliament on 27th March 1681 did the weakness of Monmouth's cause appear. In a moment the ground was cut from under the feet of his supporters; their basis for agitation was gone; pamphlets and broadsheets could ill supply the place of a determined and unscrupulous majority of the House of Commons, The deep-seated respect for legitimate descent asserted itself, and a great reaction took place. In November Dryden published Absalom and Achitophel. Shaftesbury was attacked, but was saved for the time by a favouring jury. Monmouth himself did not escape insult in the street and from the pulpit. He thought it wise to try to make his peace with the king, but he did so in terms which incensed Charles the more. He was forbidden to hold communication with the court ; and, when he went in September 1682 on a second progress through the western and north-western counties, his proceedings were narrowly watched, and he was at length arrested at Staf- ford. Severity and extreme lenity were strangely mingled in the treatment he received. He was released on bail, and in*~~

~~*February 1683, after the flight and death of Shaftes- bury, he openly broke the implied conditions of his bail by paying a third visit to Chichester with Lord Grey and others on pretence of a hunting expedition.*~~

~~*MONMOUT?TSE*~~

~~*It is probable that Monmouth never went so far as to think of armed rebellion ; but there is little doubt that he had talked over schemes likely to lead to this, and that Shaftesbury had gone further still. The Rye HIouse plot gave an excuse for arresting the Whig leaders; Russell and Sidney were judicially murdered ; Monmouth retired to Toddington in Bedfordshire, and was left untouched. Court intrigue favouring him, he succeeded, by the betrayal of his comrades and by two submissive letters, in reconciling himself with the help of HIalifax both to the king and to James, though he had the humiliation of seeing his con- fessions and declarations of penitence published at length in the Gazette. HIis character for pettishness and folly was now amply illustrated. HIe denied that he had given evidence ; he then wrote a recantation of the denial. HIe managed by importunity to get from the king the paper of recantation ; and lastly, by the advice of his wife, he offered again to sign the paper which he had withdrawn. Charles heartily despised him, and yet appears to have retained affection for him. HIis partial return to favour raised the hopes of his partisans ; to check these, Algernon Sidney was executed. Monmouth was now subpcenaed to give evidence at the trial of young HIampden. To escape from the difficulties thus opened before him he fled to HIolland, probably with Charles's connivance, and though he once more, in November 1684, visited England, it is doubtful whether he ever again saw the king. From that time till the king's death he lived with HIenrietta Went- worth, his mistress, in HIolland and at Brussels.*~~

~~*The quiet accession of James II. soon brought Monmouth to the crisis of his fate. Though at first desirous of retire- ment, his character was too weak to withstand the urgency of more determined men. Within two months of Charles's death he had yielded to the impetuosity of Argyll and others of the exiles, and to vague invitations from England. It is curious, as showing the light in which his claims were viewed by his fellow-*~~

~~conspirators, that one of the terms of the compact between them was that, though \ionmouth should lead the expedition, he should not assume the title of king without their consent, and should, if the rebellion were successful, resign it and accept whatever rank the nation might offer. Now, as always, he was but a puppet in other men's hands.~~

~~On the 2d of May Argyll sailed with three ships to raise the west of Scotland; and three weeks later, with a following of only eighty-two persons, of whom Lord Grey, Fletcher of Saltoun, Wade, and Ferguson, the author of the Appeal from the Country to the City, were the chief, Monmouth him- self set out for the west of England, where, as the strong-hold of Protestant dissent and as the scene of his former pro- gresses, he could alone hope for immediate support. Even here, however, there was no movement ; and when on 11th June Monmouth's three ships, having eluded the royal fleet, arrived off Lyme Regis, he landed amid the curiosity rather than the sympathy of the inhabitants. In the market-place his "declaration," drawn up by Ferguson, was read aloud. In this document James was painted in the blackest colours. Not only was he declared to be the murderer of Essex, but he was directly charged with having poisoned Charles to obtain his crown. Monmouth soon collected an undisci- plined body of some 1500 men, with whom he seized Axminster, and entered 'Taunton. Meanwhile the parlia- ment had declared it treason to assert Monmouth's legiti- macy, or his title to the crown; a reward of £5000 was offered for him dead or alive, and an act of attainder was passed in unusual haste. Troops had been hurriedly sent to meet him, and when he reached Bridgwater Albemarle was already in his rear. From Bridgwater the army marched through Glastonbury to attack Bristol, into which Lord Feversham had hastily thrown a regiment of foot-~~

~~guards. The attempt, however, miscarried; and, after summoning Bath in vain, Monmouth, with a disordered force, began his retrograde march through Philips-Norton and Frome, continually harassed by Feversham's soldiers. At the latter place he heard of Argyll's total rout in the western Highlands. He was now anxious to give up the enterprise, but was~~

~~*overruled by Grey, Wade, and others. On the 3d of July he reached Bridgwater again, with an army little better than a rabble, living at free quarters and behaving with reckless violence. On Sunday the 5th Feversham entered Sedgemoor in pursuit ; Monmouth the same night attempted a surprise, but his troops were hope- lessly routed. He himself, with Grey and a few others, fled over the Mendip Hills to the New Forest, hoping to reach the coast and escape by sea. The whole country, however, was on the alert, and at midnight on the 8th, within a month of their landing, James heard that the revolt, desperate from the first, was over, and that his rival had been captured close to Ringwood, in Hampshire.*~~

~~*The poor strain in Monmouth's character was now shown. On the day of his capture he wrote to James in terms of the most unmanly contrition, ascribing his wrong- doings to the action of others, and imploring an interview. On the 13th the prisoners reached the Tower, and on the next day Monmouth was allowed to see James. The accounts of this interview are difficult to reconcile in some points, but all agree that Monmouth's behaviour was un- manly in the extreme. No mercy was shown him, nor did he in the least deserve mercy ; he had wantonly attacked the peace of the country, and had cruelly libelled James. The king had not, even in his own mind, any family tie to restrain him from exercising just severity, for he had never believed Monmouth to be the son of any one but Robert Sidney. Two painful interviews followed with the wife for whom he bore no love, and who for him could feel no respect ; another imploring letter was sent to the king, and abject protestations and beseechings were made to all whom he saw. He offered, as the last hope, to become a Roman Catholic, and this might possibly have proved successful, but the priests sent by James to ascertain the sincerity of Ins "conversion" declared that he cared only for his life and not for his soul.*~~

~~*He met his death on the scaffold with calmness and dignity. In the paper which he left signed, and to which he referred in answer to the questions wherewith the busy bishops plied him, he expressed his sorrow for having assumed the royal style, and at the last moment confessed that Charles had denied to him privately, as he had publicly, that he was ever married to Lucy Walters. He died at the age of thirty-six, on the 15th of July 1685. 'Thus ended," says Evelyn, "this quondam duke, darling of his father and*~~

~~the ladies, being extremely handsome and adroit ; an excellent souldier and dancer, a favourite of the people, of an easy nature, debauched by lusts, seduced by crafty knaves, who would have set him up only to make a pro- perty, and took the opportunity of the king being of another religion to gather a party of discontented men. He failed and perished."~~

~~Authorities for Monmouth's career are, besides the known modern histories, Roberts's Life (1844), Evelyn's and Pepys's Diaries, Old- mixon's History (1724), James II.'s A/cmoirs, Clarke's Life of James, Reresby's Memoirs, Sidney's Diary (1843), Scott's notes to Absalom~~

~~and Achitophel, and The Heroic Life, &c. (1683). For the rebellion, Lord Grey's Secret History should be consulted. (O. A.)~~

~~MONMOUTH, Grorrrey or. See GEOFFREY or Mon- MOUTH..~~

~~MONOPHYSITES. CHURCH.~~

~~MONOPOLI, a city of Italy, in the province of Bari, is situated on the coast of the Adriatic, 25 miles by rail south-east of Bari. It is a bishop's see, is surrounded by~~

~~See Evtrycues and JAcoBITE~~

~~757~~

~~ancient walls, and possesses a castle built by Charles V. in 1552, a cathedral, and a hospital dating from 1368. The harbour is neither large nor well protected, but a certain amount of trade is carried on in the export of local pro- ducts. The population was about 12,000 in the 17th century ; 12,377 in 1861; and 13,000 in 1871, that of the commune being 20,918. Monopoli probably grew up after the destruction of Egnatia (5th century), the ruins of which lie a few miles to the south.~~

~~MONOPOLY (povorwia, exclusive sale). Though still used in the sense of the original Greek, the term is more accurately applied only to grants from the crown or from parliament, the private act of an individual whereby he obtains control over the supply of any particular article being~~

~~*properly defined as "engrossing." It was from the practice of the sovereign granting to a favourite, or as a reward for good service, a monopoly in the sale or manu- facture of some particular class of goods that the system of protecting inventions arose, and this fact lends additional interest to the history of monopolies (see Parents). When the practice of making such grants first arose it does not appear easy to say. Sir Edward Coke laid it down that by the ancient common law the king could grant to an inventor, or to the importer of an invention from abroad, a temporary monopoly in his invention, but that grants in restraint of trade were illegal. Such, too, was the law laid down in the first recorded case, Darcy v. Allin (the case of monopolies, 1602), and this decision was never overruled, though the law was frequently evaded. The patent rolls of the Plantagenets show few instances of grants of mono- polies (the earliest known is temp. Edw. III.), and we come down to the reign of Henry VIII. before we find much evidence of this exercise of the prerogative in the case of either new inventions or known articles of trade. Elizabeth, as is well known, granted patents of monopoly so freely that the practice became a grave abuse, and on several occasions gave rise to serious complaints in the House of Commons. Lists prepared at the time show that many of the commonest necessaries of life were the subjects of monopolies, by which their price was grievously enhanced. That the queen did not assume the right of making these grants entirely at her pleasure is shown, not only by her own statements in answer to addresses from the House, but by the fact that the preambles to the instruments convey- ing the grants always set forth some public benefit to be derived from their action. Thus a grant of a monopoly to sell playing- cards is made, because "divers subjects of able bodies, which might go to plough, did employ them- selves in the art of making of cards"; and one for the sale of starch is justified on the ground that it would prevent wheat being wasted for the purpose. Accounts of the angry debates in 1565 and 1601 are given in Hume and elsewhere. The former debate produced a promise from the queen that she would be careful in exercising her privileges ; the latter a proclamation which, received with great joy by the House, really had but little effect in stopping the abuses complained of. A few grants were cancelled, others limited, and others again left to the action: of the ordinary law courts (instead of the privy council). In speaking of the results of the proclamation, previous writers seem to have*~~

~~been misled by the promises made in the queen's speech, promises by no means carried out in the text of the document itself, a copy of which still exists in the British Museum.~~

~~'In the first partament of James I. a "committee of grievances " was appointed, of which Sir Edward Coke was chairman. Numerous monopoly patents were brought up before them, and were cancelled. Many more, however, were granted by the king, and there grew up a race of "'purveyors," who made use of the privileges granted them~~

~~under the great seal for various purposes of extortion, One~~

~~of the most notorious of these was Sir Giles Mompesson, who fled the country to avoid trial in 1621.~~

~~promises, the Statute of Monopolies was passed in 1623.~~

~~This made all monopolies illegal, except such as might be granted by parliament, or were in respect of new manu- Upon this excepting clause is built up the entire English system of letters patent for inven-~~

~~factures or inventions.~~

~~tions, the statute itself (amended by later Acts) being still in force. The Act was strictly enforced, and by its aid the evil system of monopolies was eventually abolished. This result was not indeed immediately achieved, for even during the Protectorate cases of monopoly patents were brought up, and the patents cancelled as grievances. Parliament has, of course, never exercised its power of granting to any individual exclusive privileges of dealing in any articles of trade, such as the privileges of the Elizabethan monopolists ; but the licences required to be taken out by dealers in wine, spirits, tobacco, &c., are lineal descendants of the old monopoly grants, while the quasi-monopolies enjoyed by railways, canals, gas and water companies, &c., under Acts of Parliament, are also representative of the ancient practice.~~

MONOTHELITES (povodeAfjra:, monothelite) was the name given to those who, in the 7th century, while other- wise orthodox, fell into the heresy of maintaining that Christ had only one will. The monothelite controversy had its origin in the efforts of the emperor Heraclius to win back for the church and the empire the excommuni- cated and persecuted Monophysites or Eutychians of Egypt and Syria. It seems to have been while in Armenia in 622 that, in an interview with Paul, the head of the Severians (Monophysites) there, he first broached the doc- trine of the pia évépyeva of Christ, ze, the doctrine that the divine and human natures, while quite distinct in His one person, had but one activity and operation.' At a somewhat later date he wrote to Arcadius of Cyprus, com- manding that "two energies" should not be spoken of ; and in 626, while in Lazistan (Colchis), he had a meeting with the metropolitan, Cyrus of Phasis, during which this command was discussed, and Cyrus was at last bidden seek further instruction on the subject from Sergius, patriarch of Constantinople, a strong upholder of the pia évepyera, and the emperor's counsellor with regard to it. So well did he profit by the teaching he received in this quarter that, in 630 or 631, Cyrus was appointed to the vacant patriarchate of Alexandria, and in 633 succeeded in recon- ciling the Severians of his province on the basis of pia Deavdpixi) évépyeva (one divine-human energy). He was, however, opposed by Sophronius, a monk from Palestine, who, after vainly appealing to Cyrus, actually went to Con- stantinople to remonstrate with Sergius himself. Shortly afterwards Sergius wrote to Pope Honorius, and received a friendly reply. Sophronius, however, who meanwhile had been made patriarch of Jerusalem (634), refused to be silenced, and in his Epistola Synodica strongly insisted on the "two energies." So intense did the controversy now become that at last, towards the end of 638, Heraclius published his Zcthesis, or Exposition of the Faith, which prohibited the use of the phrase "one energy," because of its disquieting effects on some minds, as seeming to militate against the doctrine of the two natures; while, on the other hand, the expression " two energies" was interdicted because

1 According to some church historians, it was Paul who introduced the doctrine; but this statement seems to rest on a misinterpretation of the authorities. See Hefele, Conciliengesch., iii. p. 124 sg. (1877), who also traces the previous history of the expressions pia évépyea, Oeavdpixy

~~*evépyera, especially as found in the writings of the Pseudo- Dionysius Areopagita.*~~

~~*After the introduction of sevcral bills, and several attempts by James to compromise the matter by orders in council and*~~

~~*it seemed to imply that Christ had two wills. That Christ had but one will was declared to be the only orthodox doctrine, and all the faithful were enjoined to hold and teach it without addition or deduction. The document was not acceptable, however, to Popes Severinus and John IV., the immediate successors of Honorius ; and Maximus, the confessor, succeeded in stirring up such violent opposi- tion in North Africa and Italy that, in 648, Constans IT. judged it expedient to withdraw his grandfather's offensive edict, and to substitute for it his own Typus (TUmos rept miorews), forbidding all discussion of the questions of the duality or singleness of either the energy or the will of Christ. The scheme of doctrine of the first four general councils, in all its vagueness as to these points, was to be maintained; so far as the controversy had gone, the dis- putants on either side were to be held free from censure, but to resuine it would involve penal consequences. The reply of the Western Church was promptly given in the unambiguously dyothelite decrees of the Lateran synod held by Martin I. in 649; but the cruel persecutions to which both Martin and Maximus were exposed, and finally succumbed, secured for the imperial 7'ypus the assent at least of silence. With the accession of Constantine Pogo- natus in 668 the controversy once more revived, and the new emperor resolved to summon a general council. It met at Constantinople in 680, having been preceded in 679 by a brilliant synod under Pope Agatho at Rome, where it had been agreed to depart in nothing from the decrees of the Lateran synod. At Constantinople the condemnation of the monothelite heresy was explicit and complete, Pope Honorius being anathematized by name along with the others who had supported it. Beyond the limits of the empire, monothelism survived for some centuries in Lebanon among the Maronitzs (¢.v.), who did not abjure their heresies until 1182.*~~

~~*Sce the church historians, and especially Hefele (op. cit.), whose*~~

~~*obvious partisanship can only slightly affect the reader's apprecia- tion of his full and accurate Icarning.*~~

~~*MONREALE, a contraction of '"monte-reale," was so called from a palace built there by the Norman Roger L, king of Sicily. It is now a town of about 16,300 inhabit- ants, situated 5 miles inland from Palermo, on the slope of Mount Caputo overlooking the beautiful and very fer- tile valley called 'La Concha d'Oro" (the Golden Shell), famed for its orange, olive, and almond trees, the produce of which is exported in large quantities. The town, which for long was a mere village, owed its origin to the found- ing of a large Benedictine monastery, with its church, the seat of the metropolitan archbishop of Sicily.!. This, the greatest of all the monuments of the wealth and artistic taste of the Norman kings in northern Sicily, who in 1072 expelled the Mohammedans and established themselves there with Palermo as their capital, was begun about 1170 by William IT., and in 1182 the church, dedicated to the Assumption of the Virgin Mary, was, by a bull of Pope Lucius III., elevated to the rank of a metropolitan cathe- dral. It was, and is even now, one of the most magni- ficent buildings in the world, and Pope Lucius in no way exaggerated its splendour when he said in his bull, "ut simile opus per aliquem regem factum non fuerit a diebus antiquis."*~~

~~*The archiepiscopal palace and monastic buildings on the south side were of great size and magnificence, and were surrounded by a massive precinct wall, crowned at intervals by twelve towers. This has been mostly rebuilt, and but little now remains except ruins of some of the towers, a great part of the monks' dormitory and frater, and the very splendid cloister, completed about 1200. This latter is well*~~

~~*1 An earlier church appears to have existed at Monreale since the 6th century, but no traces of it now remain.*~~

~~*preserved, and is one of the finest cloisters both for size and beauty of detail that now exists anywhere. It is about 170 feet square, with pointed arches covered with marble inlay, supported on pairs of columns in white marble, 216*~~

~~*SOUTH AISLE OF CHOIR*~~

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~~*Plan of the cathedral of Monreale, as built in the 12th century, omitting later additions.*~~

~~*(NOW DESTROYED.)*~~

~~*1, 1. Stairs to towers, now altered. 11. High altar and baldacchino. 2. Chapel under the south ambo. 12, Altar in northern apse. 3. Stairs to ambo. 13. Altar in southern apse. 4, Holy-water stoup. 14. Altar at tomb of William I. 5, 5. *Pulpitum” or choir-screen, 15. Archbishop’s throne. now destroyed. 16, 16. Seats for clergy. — 6,6. Screens behind stalls, now 17. Door to great cloister. destroyed. 18, Door to chapter house. 7, 7. Stalls, now destroyed. 19. Door to sacristy. 8. King’s throne. 20, 20. Doors to royal palace. 9. Archbishop’s throne. 21. Bronze door by Barisanos. 10, 10. Sanctuary screen. 22, Bronze door by Bonannus.*~~

~~*in all, which are sumptuously decorated either by rich sur- face carving or by bands of patterns in gold, silver, and colours, made of glass tesseree, arranged either spirally or vertically from end to end of each shaft. The marble caps are each richly carved with figures and foliage executed with great skill and wonderful fertility of invention—no two being alike. At one angle, a square pillared projection*~~

contains the marble fountain or monks' lavatory, evidently the work of Moslem sculptors.

The chief feature of the place—the church—tike the main cloister, is fortunately well preserved. In plan it is a curious mixture of Eastern and Western arrangement (sce fig.). The nave is like an Italian basilica, while the large triple-apsed choir is like one of the early three-apsed churches, of which so many examples still exist in Syria and other Eastern countries (see De Vogué, Syrie Cen-

trale). It is, in fact, like two quite different churches put together endwise. The basilican nave is wide, with narrow aisles. Monolithic columns of Oriental granite (except

one, which is of cipollino), evidently the spoils of older buildings, on each side support eight pointed arches much stilted. There is no triforium, but a high clerestory with wide two-light windows, with simple tracery like those in the nave-aisles and throughout the church. The other half, Eastern in two senses, is both wider and higher than the nave. It also is divided into a central space with two aisles, each of the divisions ending at the east with an apse. The roofs throughout are of open woodwork very low in pitch, constructionally plain, but richly decorated with colour, now mostly restored. At the west end of the nave are two projecting towers, with narthex-entrance between them. A large open atrium, which once existed at the west, is now completely destroyed. The outside of the church is plain, except the aisle walls and three eastern apses, which are decorated with intersecting pointed arches and other ornaments inlaid in marble. The outsides of the principal doorways and their pointed arches are magni- ficently enriched with carving and inlay, a curious com- bination of three styles—Norman-French, Byzantine, and Arab.

It is, however, the enormous extent (80,630 square feet) and glittering splendour of the glass mosaics covering the interior, which make this church so marvellously splendid (see Mosaic). With the exception of a high dado, itself very beautiful, made of marble slabs enriched with bands of mosaic, the whole interior surface of the walls, including soffits and

~~jambs of all the arches, is covered with minute mosaic-pictures in brilliant colours on a gold ground, This gorgeous method of decoration takes the place of all purely architectural detail, such as mouldings and panelling. The mosaic covers even the edges of the arches and jambs, which are slightly rounded off, so as to allow them to be covered by the glass tesseree. This device gives apparent softness to all the edges, and greatly enhances the richness of effect produced by the gleaming gold grounds. The only carving inside is on the sculptured caps of the nave arcade, mostly Corinthian in style. The mosaic pictures are arranged in tiers, divided by horizontal and vertical bands of elaborate flowing mosaic ornament. In parts of the choir there are five of these tiers of subjects or single figures one above another. The half dome of the central apse has a colossal half-length figure of Christ, with a seated Virgin and Child below ; the other apses have full- length colossal figures of St Peter and St Paul. Inscrip- tions on each picture explain the subject or saint repre- sented; these are in Latin, except some few which are in Greek. The subjects are partly from the Old Testa- ment types of Christ and His scheme of redemption, with figures of those who prophesied and prepared for His coming. Towards the east are subjects from the New Testament, chiefly representing Christ's miracles and suffer- ing, with apostles, evangelists, and other saints. The design, execution, and choice of subjects all appear to be of Byzantine origin, the subjects being selected from the Menologium drawn up by the emperor Basilius Porphyro- genitus in the 10th century.~~

~~No other mosaics perhaps so closely resemble the Mon-~~

~~reale ones as those over the nave columns in the Church of the Nativity at Bethlehem. They are alike, not only in design and treatment, but also in the curious mixture of Latin and Greek in the inscriptions (see De Vogué, Eglises de la Terre Sainte, 1860). This similarity is easily accounted for by the fact that these two sets of mosaics, though so far apart, were executed about the same date and under the same conditions, viz., by the hands of Byzantine artists, working for Norman-French kings.~~

~~*In the central apse at Monreale, behind the high altar, is a fine marble throne for the archbishop. This position of the throne is a survival of the early basilican arrange- ment, when the apse and altar were at the west end. In that case the celebrant stood behind the altar at mass, and looked over it eastwards towards the people. This posi- tion of the throne was frequently reproduced in churches which, like this, have the apse at the east. On the north side, in front of the high altar, is another somewhat similar throne for the use of the king. The tomb of William I., the founder's father—a magnificent porphyry sarcophagus contemporary with the church, under a marble pillared canopy—and the founder William II.'s tomb, erected in 1575, were both shattered by a fire, which in 1811 broke out in the choir, injuring some of the mosaics, and destroying all the fine walnut choir-fittings, the organs, and most of the choir roof. The tombs were rebuilt, and the whole of the injured part of the church restored, mostly very clumsily, a few years after the fire. On the north of the choir are the tombs of Margaret, wife of William I, and her two sons Roger and Henry, together with an urn containing the viscera of St Louis of France, who died in 1270. The pavement of the triple choir, though much restored, is a very magnificent specimen of marble and porphyry mosaic in "opus Alexandrinum," with signs of Arab influence in its main lines.*~~

~~*Two bronze doors, those on the north and west of the church, are of great interest in the history of art. They are both divided into a number of square panels with sub- jects and single figures, chiefly from Bible history, cast in relief. That on the north is by Barisanos of Trani in southern Italy, an artist probably of Greek origin. It is inscribed BARISANUS TRAN. ME FECIT. The cathedrals at Trani and Ravello also have bronze doors by the same sculptor. The western door at Monreale, inferior to the northern one both in richness of design and in workmanship, is by Bonannus of Pisa, for the cathedral of which place he cast the still existing bronze door on the south, opposite the leaning tower. The one at Monreale is inscribed A.D, MCLXXXVI IND. III. BONANNUS CIVIS PISANVS ME FECIT. It is superior in execution to the Pisan one. The door by Barisanos is probably of about the same time, as other examples of his work with inscribed dates show that he was a contemporary of Bonannus. (See MrTAL-work.) The monastic library*~~

~~*contains some valuable MSS., especi- ally a number of bilingual documents in Greek and Arabic, the earliest being dated 1144. The archbishop now occu- pies the eastern part of the monastic buildings, the original palace being destroyed.*~~

~~*See Serradifalco, Duomo di Monreale, &c., 1838 ; Gravina, Duomo di Monreale, the best work on the subject, 1859 sg. ; Testa, Vita del Re Guglielmo II., 1765; Tarallo, I Reali Sepolert di Mon- reale, 1826; Hittorf et Zanth, Architecture de la Sicile, 1835; Gally Knight, Saracenic and Norman Remains in Sicily, London, 1840 ; W. Burges, Notes on Medizxval Mosaic, 1863; M. D, Wyatt, Mosaics of Middle Ages, London, 1849 ; Hessemer, Arabische wnd Alt-Italienische Bau-Verzierungen, 1853 ; Garrucci, Arte Cristiana, 1882. (J. H. M.)*~~

~~*MONROE, James (1758-1831), fifth president of the United States, was born 28th April 1758, in the county of Westmoreland, Virginia. According to the family tradition, their ancestors are traced back to a family of*~~

~~*Scottish cavaliers descended from Hector Monroe, an officer of Charles I. At the outbreak of the Revolutionary war, James Monroe was a student at the College of William and Mary, but left his studies in 1776 to join the continental army. He took part as lieutenant in the New Jersey campaign of that year, and was wounded at the battle of Trenton. The next year he served with the rank of captain on the staff of General William Alexander ("Lord Stirling"), but, thus being out of the line of promotion, he soon found himself without military employment. In 1780 he began the study of the law under the direction of Jefferson, then governor of Virginia. His intimacy with Jefferson at this time had probably a controlling influence upon his subse- quent political career. Hecontinued through all vicissitudes to possess the friendship and support of both Jefferson and Madison.*~~

~~*In 1782 Monroe was in the State legislature, and from 1783 to 1786 was a member of Congress. On retiring from Congress he entered upon the practice of the law at Fredericksburg, and was again elected to the legislature. In the Virginia convention of 1788 for the ratification of the*~~

constitution, he was among the opponents of that instrument ; but his course was approved by the legisla- ture of his State, who elected him United States senator in 1790 to fill the vacancy caused by the death of William Grayson. As senator he was a decided opponent of the Federalist administration. Nevertheless he was selected by Washington in 1794 as minister to France in place of Gouverneur Morris, a Federalist, recalled upon the request of the French Government. Being of the party who sym- pathized with the revolutionary struggle in France, it was expected that his appointment would be flattering to the Government of that country, and would also conciliate the French partyat home. The Governmentof the National Con- vention received Monroe with open signs of favour, and on his part he expressed his own and his country's sympathy with the French Republic with so much enthusiasm that Washington deemed his language not in keeping with the neutral policy which the administration had recently pro- claimed. At about the same time John Jay had negotiated a treaty of amity and commerce with England which gave great umbrage to France. It was alleged that the earlier treaty of 1778 with France was violated by the stipulations of the Jay treaty ; and the Directory seemed disposed to make of this a casus belli. In this emergency it was believed by Washington and his advisers that Monroe failed to represent properly the policy of the Government, and he was therefore recalled in 1796. In justification of his diplomatic conduct, he published the next year his View, a pamphlet of 500 pages. In 1799 he became governor of Virginia, and was twice re-elected. In the meantime the Republican party had come into power, with Jefferson as president, and Monroe was again called upon to fill an important diplomatic station. He was com- missioned on 10th January 1803 to act with Livingston, resident minister at Paris, in negotiating the purchase of New Orleans and the territory embracing the mouth of the Mississippi, which formed a part of the province of Louisiana, recently ceded by Spain to France. In view of the anticipated renewal of hostilities between England and France in 1803, Napoleon was anxious, for a consideration, to part with his new acquisition, which in the event of a war with England he would probably lose by conquest. The American commissioners met therefore with little difficulty in the accomplishment of their object. But, in the absence of instructions, they assumed the responsibility of negotiating the purchase not only of New Orleans but of the entire territory of Louisiana—an event

~~*that is hardly second in importance to any in the history of the country. Monroe was next commissioned as minister to England,*~~

~~*MON—MON*~~

~~*to succeed Rufus King, who had resigned. In 1804 he undertook a mission to Madrid, with the object of negotiating the purchase of the Floridas; but in this he was unsuccessful, and returned to London in 1805. next year he was joined in a commission with William Pinkney to negotiate a treaty with England to take the place of the Jay treaty, which expired in that year. Lords Auckland and Howick having been appointed on the part of England, a treaty was concluded on the last day of the year, which was perhaps more favourable to the United States than the Jay treaty ; but, like the latter, it contained no provision against the impressment of Ameri- can seamen. For this reason President Jefferson refused to subinit it to the Senate for ratification, but sent it back for revision. In the meantime Canning had become foreign secretary in place of Fox, and refused to re- open the negotiation. Monroe returned to the United States in 1807, and, as in the case of his first French mission, he drew up a defence of his diplomatic conduct in England. In 1808 certain disaffected Republicans attempted to put Monroe forward as the candidate for the presidency, but as Virginia declared in favour of Madison Monroe withdrew his name. In 1810 he was again in the legislature of his native State, and the next year its governor. But in this year he was called from the state to the national councils, superseding Robert Smith as secretary of state in Madison's cabinet, and took an active part in precipitating the war against England in 1812. On the retirement of Armstrong, after the capture of Washington in 1814, Monroe assumed the duties of the war department in addition to those of the state depart- ment, and by his energy and decision infused something of vigour into the conduct of the war. He was elected president in 1816, and was re-elected in 1820 without opposition. The period of his administration (1817-25) has been called "the era of good feeling," for the reason that the party issues of the past were mostly dead, and new issues had not yet arisen. In the formation of his cabinet Monroe showed the soundness of his judg- ment, selecting for the leading positions J. Q. Adams, J. C. Calhoun, W. H. Crawford, and William Wirt. With these*~~

~~*able advisers he devoted himself to the economic development of the country, which had been so long retarded by foreign complications. As president, more- over, he was able to accomplish in 1819 the acquisi- tion of the Floridas, which as minister to Spain he had failed to do in 1804, and to define the boundary of Louis- iana, which he had been the agent in purchasing in 1803. But Monroe is best known to later generations as the author of the so-called "Monroe doctrine," a declaration inserted in his seventh annual message, 2d December 1823. It was the formulation of the sentiment, then beginning to prevail, that America was for Americans. One of the principles of the neutral policy of the country, which had been established with much difficulty, had been that the United States would not interfere in European politics ; and now this policy was held to include the converse as a necessary corollary—that is, that Europe should not inter- fere in American politics, whether in North America or South America. The occasion of proclaiming this doctrine was the rumoured intervention of the Holy Alliance to aid Spain in the reconquest of her American colonies. President Monroe believed that such a policy entered upon by the allied continental powers of Europe would be dangerous to the peace and safety of the United States ; he therefore declared that "we would not view any intervention for the purpose of oppressing them (the Spanish American states) or controlling in any manner their destiny, by any European power, in any other light than as the manifesta- tion of an unfriendly disposition towards the United*~~

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~~*States." This declaration, together with the known hos- tility of England to such a project, was sufficient to prevent further action on the part of the Alliance.*~~

~~*_ On the expiration of his presidential term Monroe re- tired to Oak Hill, his residence in London county, Vir- ginia ; but at the time of his death, 4th July 1831, he was residing in New York. He was married about 1786, and left two daughters. He was a man of spotless character ; and, though not possessing ability of the first order, he ranks high as a wise and prudent statesman. His Infe has been written by D. C. Gilman. (F. SN.)*~~

~~*MONROE, a city of the United States, county seat of Monroe county, Michigan, lies 32 miles south-south-west of Detroit, on both banks of the Raisin river, 3 miles inland from Lake Erie, with which it has been connected by a ship-canal since 1843. It is a station on the Canada Southern, the Flint and Pére Marquette, and the Detroit division of the Lake Shore and Michigan Southern Rail- ways. Agricultural implement factories, a spoke and hub factory, foundries and engineering-works, carriage-works, grist-mills, paper-mills, and fruit-drying establishments are in operation. From 400 to 500 tons of grapes are shipped yearly from the neighbouring vineyards, and over 100,000 gallons of wine are made here. The population in 1880 was 4928. Settled as Frenchtown by a body of Canadians in 1784, Monroe received its present name, in honour of President Monroe, in 1817. Its city charter dates from 1837. It was the scene of the battle of the river Raisin, 22d January 1813.*~~

~~*MONROVIA. See Liperza, vol. xiv. p. 508.*~~

~~*MONS, a town of Belgium, the capital of the province of Hainault, on the rivers Haine and Trouille, and 31 miles south-west of Brussels. The population in 1880 was 25,600. Mons is divided by the river Trouille into an upper and lower town, the first built on rising ground in the shape of an amphitheatre, the second extending into the plain ; four bridges connect the two. The place is pleasing and cheerful of aspect, having broad well-paved streets and handsome squares. The fortifications, once among the strongest of the Continent, have quite recently been razed, their site being now occupied by an extensive avenue or boulevard. Among the monuments worthy of mention are—the church of St Waudru, one of the best types of original architecture to be found in Belgium ; the church of St Elizabeth, a combination of the Gothic style and the Corinthian ; the town-hall, erected in 1458; and the belfry tower, next to which formerly rose the old castle of the counts of Hainault, the demolition of which led, a few years ago, to the discovery of some curious mural paintings belonging to the 12th century. Mons possesses a military arsenal, a school of engineering, and a public library of importance; the administration of law and government for the province is concentrated there. It contains manufactures of cotton, velvet, cloth, muslin, soap, and clay pipes; also brass-foundries, tan-yards, and breweries, and a market*~~

~~*of some note for agricultural produce, cattle, horses, and tobacco. The main source of the wealth and prosperity of Mons is derived from the collieries which exist in its vicinity, and yield annually between two and three million tons of first-class coal, the greater part of which is carried into France ; in the imme- diate neighbourhood of the town are the large and important villages of Jemmapes, Quaregnon, Frameries, Paturages, Wasmes, and Dour, each with a population of from ten to twelve thousand inhabitants; these localities, together with many others somewhat less peopled, form an agglomeration called the Borinage, rich in coal-mines, in iron-foundries, in stone and marble quarries, and may be considered as one*~~

~~*of the busiest centres in the world. Mons is built on the site of a Roman camp erected by Julius*~~

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~~*occupied by a brother of Cicero, who was cre Spee of the Eburones. In the 8th cen- tury a lady of the name of Waudru or Waltrud, countess of Hain- ault, founded a convent, which became the centre of Hs town. In 804 Charlemagne made it the capital of the county of Hainault ; it was fortified in 1148. Baldwin VI., afterwards Latih emperor of Constantinople, was very active in promoting the interests of Mons, and endowed it with a celebrated charter in the year 1200. After being reduced by nearly one half by the plague, Mons received within its walls the Jews whom Philip the Long had expelled from France. The city attained its highest degree of prosperity under Charles V., but its greatness was arrested during the government of the duke of Alva by civic disturbances, which lasted until the reign of Albert and Isabella. In more recent times Mons has had to pay tribute to the warlike spirit of its neighbours ; it was taken by Louis XIV. in 1691, given back in 1697, and retaken in 1701 and again in 1709. In 1748 it fell into the hands of Austria; the Belgian insurgents stormed it in 1789; the French in 1792, when Dumouriez won the battle of Jemmapes under its walls; in 1814 it belonged to the Netherlands, and has formed part of the Belgian kingdom since 1830.*~~

~~*MONSOON. INDIAN OCEAN,*~~

~~*MONSTER. Monsters or monstrous births are the sub- ject of Animal Teratology, a department of morphological science treating of deviations from the normal development of the embryo. The term "embryo" is conventionally limited, in human anatomy, to the ovum in the first three months of its intra-uterine existence, while it is still develop- ing or acquiring the rudiments of its form, the term "fostus" being applied to it in the subsequent months during which the organism grows on the lines of development already laid down. It is mostly in the first or embryonic period that those deviations from the normal occur which present themselves as monstrosities at the time of birth ; these early traces of deviation within the embryo may be slight, but they "grow with its growth and strengthen with its strength," until they amount to irreparable defects or accretions, often incompatible with extra-uterine life. The name of '"teratology," introduced by Etienne Geoffroy St- Hilaire (1822), is derived from répas, the equivalent of monstrum ; teratology is a term new enough to have none but scientific associations, while the Latin word has a long record of superstitions identified with it. The myths of siren, satyr, Janus, cyclops, and the like, with the cor- responding figures in Northern mythology, find a remote anatomical basis in monstrosities which have, for the most part, no life except in the foetal state. The mythology of giants and dwarfs is, of course, better founded. The term monster was originally used in the same sense as portent : Cicero(De Div.,i.) says, "Jfonstra, ostenta, portenta, prodigia appellantur, quoniam monstrant, ostendunt, portendunt, et predicunt." Luther! speaks of the birth of a monstrous calf, evidently the subject of contemporary talk, as pointing to some great impending change, and he expresses the hope that the catastrophe might be the Last Day itself. The rise of more scientific views will be sketched at the close of the article.*~~

~~*Although monstrosities, both in the human species and in other animals, tend to repeat certain definite types of erroneous development, they do not fall readily into classes. It is remarked by Vrolik that a scientific classification is impracticable from being too cumbrous, and that a con- venient grouping is all that need be attempted. The most usual grouping (originally suggested by Buffon, 1800) is into monstra per excessum,*~~

~~*monstra per defectum, and monstra per fabricam alienam. It seems useful, however, to place the more simple cases of excess and of defect side by side; and it is necessary, above all, to separate the double monsters from the single, the theory of the former being a distinct chapter in teratology.*~~

~~*See METEOROLOGY, supra, p. 148 sq., and*~~

~~*1 Tn a passage quoted by Bischoff from the 19th volume of Luther's works, Halle ed., p. 2416.*~~

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~~*1. Monstrosities in a Single Body.—The abnormality may extend to the body throughout, as in well-proportioned giants and dwarfs; or it may affect a certain region or member, as—to take the simplest case—when there is a finger or toe too many or too few. It is: very common for one malformation to be correlated with several others, as in the extreme case of acardiac monsters, in which the non-development of the heart is associated with the non- development of the head, and with other radical defects.*~~

~~*Giants are conventionally limited to persons over 7 feet in height. The normal proportions of the frame are adhered to more or less closely, except in the skull, which is relatively small; but accurate measurements, even in the best-proportioned cases, prove, when reduced to a scale, that other parts besides the skull, notably the thigh-bone and tlie foot, may be undersized though overgrown." In persons who are merely very tall, the great stature depends often on the inordinate length of the lower limbs ; but in persons over 7 feet the lower limbs are not markedly disproportionate. In many cases the muscles and viscera are not sufficient for the overgrown frame, and the individuals are usually, but not always, of feeble intelligence and languid disposition, and short-lived. The brain-case especially is undersized—the Irish giant in the museum of Trinity College, Dublin, is the single exception to this rule—but the bones of the face, and especially the lower jaw, are on a large scale. Giants are never born of gigantic parents; in fact, sterility usually goes with this monstrosity. Their size is some- times excessive at birth, but more often*~~

~~*the indications of great stature do not appear till later, it may be as late as the ninth year; they attain their full height before the twenty-first year. They have been more frequently male than female ; the German giantess lately exhibited (1882) was as tall as any authentic case in the male sex.*~~

~~*Dwarfs are conventionally limited to persons under 4 feet. They are more likely than giants to have the modu- lus of the body perfect. "In the true dwarf, as far as I have been able to ascertain, the proportions between the several parts of the frame are good, corresponding, or nearly corresponding, with those of the normal adult ; and the diminutive stature depends, accordingly, not upon re- latively imperfect growth of any particular segments, or even upon the permanence of a feetal or childlike con- dition, but upon the whole frame being undersized" (Humphry). Where disproportion occurs in the true dwarf it takes the form of a large-sized head, broad shoulders and capacious chest, and undersized lower limbs. Dwarfs with rickets are perhaps to be distinguished from true dwarfs ; these are cases in which the spine is curved, and sometimes the bones of the limbs bent and the pelvis deformed. As in the case of giants, dwarfs are seldom the progeny of dwarfs, who are, in fact, usually sterile ; the unnatural smallness may be obvious at birth, but is more likely to make itself manifest in the years of growth. Dwarfs are much more easily brought up than giants, and are stronger and longer-lived; they have usually also strong passions and acute intelligence. The legends of the dwarfs and giants are on the whole well based on fact (see DwaRF and GANT).*~~

~~*Redundancy and Defect in Single Parts.—The simplest case of this redundancy is a sixth digit, well formed, and provided with muscles (or tendons), nerves, and _blood- vessels like the others ; it is usually a repetition of the little finger or toe, and it may be present on one or both hands, or on one or both feet, or in all four extremities, as in the giant of Gath. The want of one, two, or more digits on hand or foot, or on both, is another simple anomaly ; and,*~~

~~*? See the tables in Humphry's Treatise on the Human Skeleton, p. 109.*~~

~~*MONSTER*~~

~~*like the redundancy, it is apt to repeat itself in the same family. Meckel saw a girl who had an extra digit on each extremity, while a sister wanted four of the fingers of one hand. Where the supernumerary digits are more than one on each extremity, the whole set are apt to be rudimentary or stunted ; they look as if two or more of the embryonic buds had been subject to cleavage down the middle, and to arrest of longitudinal growth. There are two or three authentic instances of a whole lower limb ap- pearing at birth as two withered halves, as if from embry- onic cleavage. Other redundancies of the skeleton are extra vertebrae (sometimes the coccygeal, giving the ap- pearance of a rudimentary tail), or an extra rib. A double row of teeth is occasionally met with; the most interesting case of this anomaly is that in which the rudiments of a double row exist from the first, but the phenomenon is sometimes produced by the milk teeth persisting along with the second set. One or more extra teeth are occasionally met with in line with the rest. Among redundancies of the soft parts, by far the most frequent is an extra nipple, or pair of nipples. It is only the nipple, or the most external mechanical adjunct of the mammary apparatus, that is repeated, and very seldom, if ever, the breast structure itself. The nipple, although it is the latest addition to the mechanism of lactation, is in the individual mammal developed on the skin before the gland is formed underneath ; and that facility, which applies to the development of external characters generally, appears to be the reason why there may be one or more extra nipples but no redundant gland. In the same connexion, it is interesting to observe that the supernumerary nipple has been shown by statistics on a large scale to be twice as common in men as in women, although in the male the mammary function never comes to maturity, and even the structure retrogrades after puberty. Traces of an additional nipple, or pair of them, in more or less symmetrical position below the normal ones, are not very uncommon when care- fully looked for. Among the sense organs there is a remarkable instance recorded of doubling of the appendages of the left eye, but not of the eyeball itself ; the left half of the frontal bone is double, making two eye-sockets on that side, and the extra orbit has an eyebrow and eyelid." The external ear (pinna) has also been found double on one side. Doubling of any of the internal organs is extremely rare, and is probably always traceable to a more or less complete fissuring or lobation. The ducts or vessels con- nected with organs, and playing a*~~

~~purely mechanical part, are not unfrequently doubled ; thus each kidney may have two ureters, and a similar variation may occur in veins and arteries.~~

~~Monstrosities from Defective Closure in the Middle Line.—Under this head come some of the commonest congenital malformations, including slight deficiencies such as harelip, and serious defects such as a gap in the crown of the head with absence of the brain. The embryo is originally a circular flattened disc spread out on one pole of the yolk, and itis formedintoa cylindrical body (with four appendages) by the free margins of the disc, or rather its ventral lamina, folding inwards to meet in the middle line and so close in the pelvic, abdominal, thoracic, pharyngeal, and oral cavities. Meanwhile, and indeed rather earlier, two longitudinal parallel ridges on the top or along the back of the disc have grown up and united in the middle line to form the second barrel of the body—the neural canal—of small and uniform width in the lower three-fourths or spinal region, but expanding into a wide chamber for the brain. This division into neural (dorsal) and hemal (ventral) canals~~

~~1 See Forster's Alas, Taf. viii., figs. 13 and 14.~~

~~2 See preparation in the Wiirzburg Museum, figured by Forster, Taf. viii., figs. 9-12.~~

~~underlies all vertebrate development. Imperfect closure along either of those embryonic lines of junction may pro- duce various degrees of monstrosity. The simplest and commonest form, hardly to be reckoned in the present cate- gory, is harelip with or without cleft palate, which results from defective closure of the ventral laminz at their extreme upper end. Another simple form, but of much more serious import, is a gap left in the neural canal at its lower end : usually the arches of the lumbar vertebre are deficient, and the fluid that surrounds the spinal cord bulges out in its membranes, producing a soft tumour under the skin at the lower part of the back. This is the condition known as hydrorhachis, depending on the osseous defect known as spina bifida. Children born with this defect are difficult to rear, and are very likely to die in a few days or weeks. More~~

~~*rarely the gap in the arches of the vertebra is in the region of the neck. If it extend all along the back, it will probably involve the skull also. Deficiency of the crown of the head, and in the spine as well, may be not always traceable to want of formative power to close the canal in the middle line ; an over-distended condition of the central water-canal and water-spaces of the cord and brain may prevent the closure of the bones, and ultimately lead to the disruption of the nervous organs themselves ; and injuries to the mother, with inflammation set up in the foetus and its appendages, may be the more remote cause. But it is by defect in the middle line that the mischief manifests itself, and it is in that anatomical category that the malformations are included. The osseous deficiency at the crown of the head is usually accompanied by want of the scalp, as well as of the brain and membranes. The bones of the face may be well developed and the features regular, except that the eyeballs bulge forward under the closed lids ; but there is an abrupt horizontal line above the orbits where the bones cease, the skin of the brow joining on to a spongy kind of tissue that occupies the sides and floor of the cranium. 'This is the commonest form of an anencephalous or brainless monster. There are generally mere traces of the brain, although, in some rare and curious instances, the hemispheres are developed in an exposed position on the back of the neck. The cranial nerves are usually perfect, with the exception sometimes of the optic (and retina). Vegetative existence is not im- possible, and a brainless monster has been known to survive sixty-five days. The child is usually a very large one.*~~

~~*Closely allied, as we have seen, to the anencephalous condition is the condition of congenital hydrocephalus. The nervous system at its beginning is a neural canal, not only as regards its bony covering, but in its interior; a wide space lined by ciliated epithelium and filled with water extends. along the axis of the spinal cord, and expands into a series of water-chambers in the brain. As development proceeds, the walls thicken at the expense of the internal water-spaces, the original tubular or chambered plan of the central nervous system is departed from, and those organs assume the practically solid form in which we familiarly know them. If, however, the water-spaces persist in their embryonic proportions notwithstanding the thickening of the nervous substance forming their walls, there results an enormous brain which is more than half occupied*~~

~~*inside with water, contained in spaces that correspond on the whole to the ventricles of the brain as normally bounded. A hydrocephalic foetus may sur- vive its birth, and will be more apt to be affected in its nutrition than in its intelligence. In many cases the hydrocephalic condition does not come on till after the child is born. The microcephalous condition, where it is not a part of cretinism, is not usually a congenital defect in the strict sense, but more often a consequence of the*~~

~~*premature union of the bones of the skull along their sutures*~~

~~*or lines of growth. Returning to the ventral middle line,*~~

~~*breast-bone (fissure of the sternum),*~~

~~*or two above the pubes. At that point in the embryo there issues the allantois, a balloon-like expansion from the ventral cavity, which carries on its outer surface blood-vessels from the embryo to interdigitate with those of the mother on the uterine surface. Having served its temporary purpose of carrying the blood-vessels across a space, the balloon-like allantois collapses, and rolls up into the rounded stem-like umbilical cord through most of its extent; but a portion of the sac within the body of the foetus is retained as the permanent urinary bladder. That economical adaptation of a portion of a vesicular organ, originally formed for purposes of communication between the embryo and the mother, appears to entail sometimes a defect in the wall of the abdomen just above the pubes, and a defect in the anterior wall of the bladder itself.*~~

~~*This is the distressing congenital condition of fissure of —*~~

~~*the urinary bladder, in which its interior is exposed through an opening in the skin; the pubic bones are separated by an interval, and the reproductive organs are ill formed; the urachus is wanting, and the umbilicus is always placed exactly at the upper end of the gap in the skin. A monstrosity recalling the cloacal arrangement of the bird is met with as a more extreme defect in the same parts. .*~~

~~*Hermaphroditism.—Although this anomalous condition does not fall under defective closure in the middle line, it may be said to be due to a similar failure of purpose, or to an uncertainty in the nisus formativus at a corresponding stage of development. There is a point of time, falling about the eighth week, up to which the embryo may de- velop either the reproductive organs of the male or the reproductive organs of the female ; in the vast majority of cases the future development and growth are carried out on one line or the other, but in a small number there is an ambiguous development leading to various degrees of hermaphroditism or doubtful sex. The primary indecision, so to speak, affects only the ovary or testis respectively, or rather the common germinal ridge out of which either may develop; the uncertainty in this embryonic sexual ridge sometime' leads actually to the formation of a pair of ovaries and a pair of small testes, or to an ovary on one side and a testis on the other ; but even when there is no such double sex in the essential organs (as in the majority of hermaphrodites) there isa great deal of doubling and ambiguity entailed in the secondary or external organs and parts of generation. Those parts which are rudimentary or obsolete in the male but highly developed in the female, and those parts which are rudimentary in the female but highly developed in the male tend in the hermaphrodite to be developed equally, and all of them badly. In some cases the external organs of one sex go with the internal organs of the opposite sex. It has been observed that when middle life is reached or passed the predominance in features, voice, and disposition leans distinctly towards the masculine side. The mythological or classical notions of hermaphroditism, like so much else in the traditions of teratology, are exaggerated.*~~

~~*Cyclops, Siren, &c.—The same feebleness of the forma- tive energy (the Bildungstrieb of Blumenbach) which gives rise to some at least of the cases of defective closure in the middle line, and to the cases of undecided sex, leads also to imperfect separation of symmetrical parts. 'The most*~~

~~*there may be defects of closure below the lips and palate, as in the at the navel (the last point to close in any case), and along the middle line of the abdomen generally. The commonest point for a gap in the middle line of the belly is at its lower part, an inch*~~

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~~*remarkable case of the kind is the cyclops monster. At a point corresponding to the root of the nose there is found a single orbital cavity, sometimes of small size and with no eyeball in it, at other times of the usual size of the orbit and containing an eyeball more or less complete. In still other cases, which indicate the nature of the anomaly, the orbital cavity extends for some distance on each side of the middle line, and contains two eyeballs lying close together. The usual nose is wanting, but above the single orbital cavity there is often a nasal process on the forehead, with which nasal bones may be articulated, and cartilages joined to the latter; these form the framework of a short fleshy protuberance like a small proboscis. The lower jaw is sometimes wanting in cyclopeans; the cheek-bones are apt to be small, and the mouth a small round hole, or altogether absent ; the rest of the body may be well developed. The key to the cyclopean condition is found in the state of the brain. The olfactory nerves or lobes are usually described as absent, although Vrolik has found them in some instances ; the brain is very imper- fectly divided into hemispheres, and appears as a somewhat pear-shaped sac with thick walls, the longitudinal partition of dura mater (falx cerebri) being wanting, the surface almost unconvoluted, the corpus callosum deficient, the basal ganglia rudimentary or fused. The optic chiasma and nerves are usually replaced by a single mesial nerve, but sometimes the chiasma and pair of nerves are present. The origin of this monstrosity dates back to an early period of development, to the time when the future hemispheres were being formed as protrusions from the anterior cerebral vesicle or fore-brain ; it may be conceived that, instead of two distinct buds from that vesicle, there was only a single outgrowth with imperfect traces of cleav- age. That initial defect would carry with it naturally the undivided state of the cerebrum, and with the latter there would be the absence of olfactory lobes and of a nose, and a single eyeball placed where the nose should have been. A cyclops has been known to live for several days. The monstrosity is not uncommon among the domestic animals, and is especially frequent in the pig. There is another congenital malformation, in which an eyeball is wanting from one of the sockets ; but in that case there is no defect of development in the bones, and the brain and nose are normal.*~~

~~*Another curious result of defective separation of sym- metrical parts is the siren form of foetus, in which the lower limbs occur as a single tapering prolongation of the trunk like the hinder part of a dolphin, at the end of which a foot (or both feet) may or may not be visible. The defects in the bones underlying this siren form are very various : in some cases there is only one limb (thigh and leg-bones) in the middle line ; in others all the bones of each limb are present.in more or less rudimentary condition, but adhering at prominent points of the ad- jacent surfaces. The pelvis and pelvic viscera share in the abnormality, A much more common and harmless case of unseparated symmetrical parts is where the hand or foot has two, three, or more digits fused together. This syn- dactylous anomaly runs in families.*~~

~~*Limbs Absent or Stunted.—Allied to these fused or un- separated states of the extremities, or of parts of them, are the class of deformities in which whole limbs are absent, or represented only by stumps. The trunk (and head) may be well formed, and the individual healthy ; all four extremities may be reduced to short stumps either wanting hands and feet entirely, or with the latter fairly well developed ; or the legs only may be rudimentary or wanting, or the arms only, or one extremity only. Al- though some of these cases doubtless depend upon aber- rant or deficient formative power in the particular direc-*~~

~~*tions, there are others of them referable to the effects of mechanical pressure, and even to direct amputation of parts within the uterus.*~~

~~*Acardiac and Acranial Monsters.—It sometimes happens in a twin pregnancy that one of the embryos fails to develop a heart and a complete vascular system of its own, depending for its nourishment upon blood derived from the placenta of its well-formed twin by means of its umbilical vessels. It grows into a more or less shapeless mass, in which all traces of the human form may be lost. Other viscera besides the heart will be wanting, and no head distinguishable ; the most likely parts to keep the line of development are the lumbar region (with the kidneys), the pelvis, and the lower limbs. The twin of this monster may be a healthy infant.*~~

~~*Reversed Position of the Viscera.—This is a develop- mental error depending on the retention of the right aortic arch as in birds, instead of the left as is usual in mammals. The position of all the unsymmetrical viscera is transposed, the spleen and cardiac end of the stomach going to the right side, the liver to the left, the caecum resting on the left iliac fossa, and the sigmoid flexure of the colon being attached to the right. This condition of situs inversus viscerum need cause no inconvenience ; and it will probably remain undetected until the occasion should arise for a physical diagnosis or post-mortem inspection. There are numerous other anomalies in the development of the great vessels. In the heart itself there may be an imperfect septum ventriculorum, and there is more frequently a patency of the foetal communication between the auricles, permitting the venous blood to pass into the arterial system, and producing the livid appearance of the face known as cyanosis.*~~

~~*The causes of congenital anomalies are difficult to specify. There is no doubt that, in some cases, they are present in the sperm or germ of the parent; the same anomalies recur in several children of a family, and it has been found possible, through a variation of the circumstances, to trace the influence in some cases to the father alone, and in other cases to the mother alone. The remarkable thing in this parental influence is that the malformation in the child may not have been manifested in the body of either parent, or in the grandparents. More often the malformation is acquired by the embryo and fœtus in the course of development and growth, either through the mother or in itself independently. Maternal impressions during pregnancy have often been alleged as a cause, and this causation has been discussed at great length by the best authorities. The general opinion seems to be that it is impossible to set aside the influence of subjective states of the mother altogether. The doctrine of maternal impres- sions has often been resorted to when any other explana- tion was either difficult or inconvenient; thus, Hippocrates is said to have saved the virtue of a woman who gave birth to a black child by pointing out that there was a picture of a negro on the wall of her chamber. Injuries to the mother during pregnancy have been unquestion- ably the cause of certain malformations, especially of congenital hydrocephalus. The embryo itself and its membranes may become the subject of inflammations, atrophies, hypertrophies, and the like; this*~~

~~*causation, to which Otto traced all malformations of the feetus, is doubtless accountable for a good many of them. But a very large residue of malformations must still be referred to no more definite cause than the erratic spontaneity of the embryonic cells and cell-groups. The nesus formativus of the fertilized ovum is always made subject to morpho-logical laws, but, just as in extra-uterine life, there may be deviations from the beaten track; and even a slight deviation at an early stage will carry with it far-reaching*~~

~~*consequences. This is particularly noticeable in double monsters.*~~

~~*2. Double Monsters.—Twins are the physiological analogy of double monsters, and some of the latter have come very near to being two separate individuals. Triple monsters are too rare to dwell upon, but their analogy would be triplets. The Siamese twins, who died in 1874 at the age of sixty, were joined only by a thick fleshy ligament from the lower end of the breast-bone (xiphoid cartilage), having the common navel on its lower border ; the anatom- ical examination showed, however, that a process of peri- toneum extended through the ligament from one abdominal cavity to the other, and that the blood-vessels of the two livers were in free communication across the same bridge. There are one or two cases on record in which such a liga- ment has been cut at birth, one, at least, of the twins surviving. From the most intelligible form of double monstrosity, like the Siamese twins, there are all grades of fantastic fusion of two individuals into one down to the truly marvellous condition of a small body or fragment parasitic upon a well-grown infant,—the condition known as foetus in foetu. These monstrosities are deviations, not from the usual kind of twin gestation, but from a certain rarer physiological type of dual development. In by far the majority of cases twins have separate uterine appendages, and have probably been developed from distinct ova; but in a small proportion of (recorded) cases there is evidence, in the placental and enclosing structures, that the twins had been developed from two rudiments arising side by side ona single blastoderm. It is to the latter physiological category that double monsters almost certainly belong ; and there is some direct embryological evidence*~~

~~*for this opinion. Allen Thomson observed in the blastoderm of a hen's egg at the sixteenth or eighteenth hour of incubation two "primitive traces" or rudiments of the backbone form- ing side by side ; and in a goose's egg incubated five days he found on one blastoderm two embryos, each with the rudi- ments of upper and lower extremities, crossing or cohering in the region of the future neck, and with only one heart between them. Somewhat similar observations had been previously published (four cases in all) by Wolff, Von Baer, and Reichert. Malformations in the earliest stages of the blastoderm have been more frequently observed of late, especially in the ova of the pike; and these point not so much to a symmetrical doubling of the primitive trace as to irregular budding from the margin of the germinal disc. In any case, the perfect physiological type appears to be two rudiments on one blastoderm, whose entirely separate de- velopment produces twins (under their rarer circumstances), whose nearly separate development produces such double monsters as the Siamese twins, and whose less separate development produces the various grotesque forms of two individuals in one body. There can be no question of a literal fusion of two embryos ; either the individuality of each was at no time complete, or, if there were two dis- tinct primitive traces, the uni-axial type was approximately reverted to in the process of development, as in the forma- tion of the abdominal and thoracic viscera, limbs, pelvis, or head. Double monsters are divided in the first instance into those in which the doubling is symmetrical and equal on the two sides, and those in which a small or fragment- ary foetus is attached to or enclosed in a fœtus of average development,—the latter class being the so-called cases of * parasitism."*~~

~~*Symmetrical Double Monsters are subdivided according to the part or region of the body where the union or fusion exists—head, thorax, umbilicus, or pelvis. One of the simplest cases is a Janus head upon a single body, or there may be two pairs of arms with the two faces. Again, there may be one head with two necks and two complete trunks*~~

~~*and pairs of extremities. Two distinct heads (with more or less of neck) may surmount a single trunk, broad at the shoulders but with only one*~~

~~*pair of arms. The fusion, again, may be from the middle of the thorax downwards, giving two heads and two pairs of shoulders and arms, but only one trunk and one pair of legs. In another variety, the body may be double down to the waist, but the pelvis and lower limbs single. The degree of union in the region of the head, abdomen, or pelvis may be so slight as to permit of two distinct organs or sets of organs in the respective cavities, or so great as to have the viscera in common ; and there is hardly ever an intermediate condition between those extremes. Thus, in the Janus head there may be two brains, or only one brain. The Siamese twins are an instance of union at the umbilical region, with the viscera distinct in every respect except a slight vascular anastomosis and a common process of peritoneum ; but it is more usual for union in that region to be more extensive, and to entail a single set of abdominal and thoracic viscera. The pelvis is one of the commonest regions for double monsters to be joined at, and, as in the head and abdomen, the junction may be slight or total, The Hungarian sisters Helena and Judith (1701-1723) were joined at the sacrum, but had the pelvic cavity and pelvic organs separate; the same condition obtained in the South Carolina negresses Millie and Christina, known as the ‘“two-headed nightingale,” and in the other recent case of the Bohemian sisters Rosalie and Josepha. More usually the union in the pelvic region is complete, and produces the most fantastic shapes of two trunks (each with head and arms) joining below at various angles, and with three or four lower limbs extending from the region of fusion, sometimes in a lateral direction, sometimes downwards. A very curious kind of double monster is produced by two otherwise distinct foetuses joining at the crown of the head and keeping the axis of their bodies in a line. It is only in rare instances that double monsters survive their birth, and the preserved specimens of them are mostly of foetal size.*~~

~~*Unequal Double Monsters, Foetus in Feetu.—There are some well-authenticated instances of this most curious of all anomalies. The most celebrated of these parasite- bearing monsters was a Genoese, Lazarus Johannes Baptista Colloredo, born in 1716, who was figured as a child by Licetus, and again by Bartholinus at the age of twenty- eight as a young man of average stature. The parasite adhered to the lower end of his breast-bone, and was a tolerably well-formed child, wanting only one leg;*~~

~~*it breathed, slept at intervals, and moved its body, but it had no separate nutritive functions. The parasite is more apt to be a miniature acardiac and acephalous fragment, as in the case of the one borne in front of the abdomen of a Chinaman figured by I. Geoffroy St-Hilaire. Some- times the parasite is contained in a pouch under the skin of the abdominal wall, and in another class (of which there is a specimen in the Hunterian Museum) it has actually been included, by the closure of the ventral lamine, within the abdominal cavity of the fcetus,—a true fetus im fetu. Shapeless parasitic fragments containing masses of bone, cartilage, and other tissue are found also in the space behind the breast-bone (mediastinal teratoma), or growing from the base of the skull and protruding through the mouth . epignathous teratoma," appearing to be seated on the jaw), and, most frequently of all, attached to the sacrum. These last pass by a most interesting transition into common forms of congenital sacral tumours (which may be of enormous size), consisting mainly of one kind of tissue having its physiological type in the curious gland- like body (coccygeal gland) in which the middle sacral artery comes to an.end. The congenital sacral tumours have a tendency to become cystic, and they are probably related to*~~

~~*the more perfect congenital cysts of the neck region, where there is another minute gland-like body of the same nature as the coccygeal at the point of bifurcation of the common carotid artery. Other tumours of the body, especially certain of the sarcomatous class, may be regarded from the point of view of monstra per excessum ; but such cases suggest not so much a question of aberrant development within the blastoderm as of the indwelling spontaneity of a single post-embryonic tissue; and they fall to be con- sidered more properly, along with tumours in general, in the article PATHOLOGY (¢.v.).*~~

~~*The scientific appreciation of monsters hardly began before the 18th century ; even so great a rationalist in surgical practice as Ambroise Paré (1517-1590), although he was attracted as a scholar in later life to the subject, did not advance in it materially beyond the fantastic and credulous standpoint of the timc, which is exem- plified in the claborate*~~

~~*treatise of Lycosthenes, Prodigiorwm ae osten- torum ehronieon, Basel, 1557. Throughout the 17th century fabulous monsters continued to be described along with actual specimens ; the embryological studies of Harvey (1651) were doubtless calculated to help in the growth of rational opinion about monsters, thougl: Harvey himself mentions them only casually. The first systematic discussion of them from a strictly objective or anatomical point of view occurs in various writings of Haller from 1735 to 1753, and the subject continued after that to engage a large amount of precise and philosophical thought on the part of Caspar Friedrich Wolff (1785-1794), who first stated the relation of monstrosities to em- bryonic deviations in words that even now hardly require to be altered, and of Blumenbach, Sémmering, Autenrieth, Tiedemann, and others. The engrossing interest of the subject in the early part of the 19th century is shown by the fact that J. F. Meckel's Handbuch der pathologisehen Anatomie (1817) was largely occupied with congenital malformations. Geoffroy St-Hilaire, the father, gave them a prominent place in his Philosophie Anatomique (Paris, 1822), and his son Isidore made them the subject of a special and very elaborate treatise in 3 vols. (Paris, 1832-37), illustrated by a small and inadequate atlas of plates. Monstrosities were at this period a prominent part of all text-books of morbid anatomy. From 1840 to 1850 may be regarded as the period in which human tera- tology reached its highest point ; in 1840-42 the special treatise of Vrolik was published (2 vols., Amsterdam), containing an introduc- tion on the normal development, and his sumptuous and incompar- able atlas to the same followed in 1849; in 1841 Otto published at Warsaw a description of 600 monsters with 80 folio plates ; and in 1842 the embryologist Bischoff contributed to Wagner's Handwort- erbuch der Physiologie, vol. i., an article on teratology as elucidated by the best information on mammalian development. An article by Allen Thomson in the London and Edinburgh Monthly Journal of Medical Science, July 1844, followed by a critical survey in the next number, is of the first importance for the theory of double monsters, and it is one of the few notable English contributions to animal teratology apart from museum catalogues,—the general article in Todd's Cyclopxdia of Anatomy and Physiology having been written by Vrolik, while the special subject of Hermaphroditism is treated of in a long and learned article by J. Y. Simpson (reprinted in his collected works). One of the latest important*~~

~~*works on monsters is that by Forster (Jeua, 1861), Die Missbildungen des Menschen systematisch dargestellt, with an atlas of 26 4to plates containing 524 figures (on a small scale), of which 162 were drawn from original specimens, mostly in the Wiirzburg Museum ; this work has a very great variety of illustrations from all sources, and most copious bibliographical references. The newest treatise is Ahlfeld's Afiss-bildungen des Menschen (Leipsic, 1880-82), with an extensive atlas of folio plates, as comprehensive as Forster's and on a larger scale. Monsters have of late been assigned a comparatively subordinate position in pathological teaching, owing, doubtless, to the more im- mediate interest of microscopic and experimental pathology. Among recent pathological text-books that of Perls (Stuttgart, 1877-79) may be named as containing an adequate treatment of the subject. The two most considerable contributors to teratology recently have been Panum (Berlin, 1860), and Dareste (Paris, 1877), both of whom have occupied themselves mainly with producing monstrosities arti- ficially in the bird's egg by varying the temperature in the hatching oven. See also L. Gerlach, Die Entstehungsweise der Doppelmissbil- dungen bet den hoheren Wirbelthieren, Stuttgart, 1888. (C. C.)*~~

~~*MONSTRELET, Encurrranp DE (0b. 1453) (who, rather owing to accident than to merit, held, until within the present century, the same position as chronicler of French affairs during the early part of the 15th century as Froissart deservedly holds with regard to the last half of the 14th), was born at an uncertain date, apparently not later than 1400, and died in July 1453. IIe was of*~~

~~*a noble family in the district of Boulogne. IIe held in 1436, and later, the office of lieutenant-gavenier (receiver of the gave, a kind of church rate) in the city of Cambray, and seems to have usually resided there. Besides this he was for some time bailiff of the chapter of that city, and later provost. IIe was married, and left children. But this almost exhausts the amount of our knowledge respect- ing him, except that he was present, not at the capture of the Maid of Orleans, but at her subsequent interview with the duke of Burgundy. As a subject of this latter prince he naturally*~~

~~*takes the Burgundian side in his history, which extends in the genuine part of it to two books, and covers the period from 1400 to 1444. At this time, as another chronicler Matthieu de Coucy informs us, Monstrelet ceased writing. But, according to a habit by no means uncommon in the Middle Ages, a clumsy sequel, extending to a period long subsequent to his death, was formed out of various other chronicles and tacked on to his work. The genuine part of this, dealing with the last half of the Hundred Years War, is valuable because it contains a large number of documents which are certainly, and reported speeches which are probably, authentic. It has, however, little colour or narrative merit, is dully, though clearly enough, written, and is strongly tinged with the pedantry of its century,—the most pedantic in French history. The best edition is that published for the Société de l'Histoire de France by M. Douet d'Arcq in 1856.*~~

~~*MONTAGU, Lapy Mary Wortiry (1690-1762), one of the most brilliant letter-writers of the 18th century, was the eldest daughter of Evelyn Pierrepont, duke of Kingston, and Lady Mary Fielding, daughter of the earl of Denbigh. Her near relationship with Fielding the novelist is worth remarking. She was born at Thoresby in Nottingham- shire in 1690. Her mother died when she was a child, and by some chance she received or gave herself an un- usually wide literary education, had the run of her father's library, was encouraged in her studies by Bishop Burnet, and while still a girl translated the Lnchiridion of Epic- tetus. After a courtship in which she showed a singular power of thinking for herself, she was married in 1712, against her father's wish, to Mr. E. Wortley Montagu, an accomplished and scholarly friend of the Queen Anne wits. At the new court of George I. her beauty and wit brought her much homage; Pope was among her most devoted worshippers, and she even gained and kept the friendship of the great duchess of Marlborough. Her husband being appointed ambassador to the Porte in 1716, she accompanied him to Constantinople, and wrote to her friends at home brilliant descriptions of Eastern life and scenery. These letters were not published till 1763, the year after her death ; but, copies being handed about in fashionable circles, their lively, witty style, graphic pictures of unfamiliar life, and shrewd and daring judg- ments gave the writer instant celebrity. In one of them she described the practice of inoculation for the smallpox, and announced her intention of trying it on her own*~~

son, and of introducing it in spite of the doctors into England. The most memorable incident in her life after her return from the East was her quarrel with Pope, caused, accord- ing to her account, by her laughing at him when he made love to her in earnest. He satirized her under the name of Sappho, and she teased him with superior ingenuity and hardly inferior wit. From 1739 to 1761 Lady Mary lived abroad, apart from her husband, maintaining an affectionate correspondence with her daughter Lady Bute, in which she set forth views of life largely coloured by the asceticism of her master Epictetus, and wearing an appearance of oddity and eccentricity from their contrast with conventional thought. The character of coldness and unwomanliness which Pope contrived to fasten on his

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enemy was far from being deserved ; her letters show her to have been a very warm-hearted woman, though on principle she turned the hard side to the world. She died 21st August 1762. The best edition of her works is that of 1861, with a memoir by Moy Thomas. MONTAIGNE, Micuen pr (1533-1592), essayist, was born, as he himself tells us, between eleven o'clock and noon on 28th February 1533. The patronymic of the Montaigne family, who derived their title from the chateau at which the essayist was born and which had been bought by his grandfather, was Eyquem. It was believed to be of Eng- lish origin, and the long tenure of Gascony and Guienne by the English certainly provided abundant opportunity for the introduction of English colonists. But the elaborate re- searches of M. Malvézin have proved the existence of a family of Eyquems or Ayquems before the marriage of Eleanor of Aquitaine to Henry II. of England, though no connexion between this family, who were Sieurs de Lesparre, and the essayist's ancestors can be made out, Montaigne is not far from Bordeaux, and in Montaigne's time was in the province of Perigord. It is now in the arrondissement of Bergerac and the department of Dordogne. The Eyquem family had for some time been connected with Bordeaux. Indeed, though they possessed more than one estate in the district, they were of doubt- ful and certainly very recent

~~*nobility. Pierre Eyquem, Montaigne's father, had been engaged in commerce (a herring-merchant Scaliger calls him), had filled many municipal offices in Bordeaux, and had served under Francis I. in Italy as a soldier. The essayist was not the eldest son, but the third. By the death of his elder brothers, however, he became head of the family. He had also six younger brothers and sisters. His father appears, like many other men of the time, to have made a hobby of education. Michel was not a strong boy, indeed he was all his life a valetudinarian, and this may have especially prompted his father to take pains with him. At a time when the rod was the universal instru- ment of teaching it was almost entirely spared to Montaigne. He was, according to the French fashion common at all times, put out to nurse with a peasant woman. But Pierre Eyquem added to this the unusual fancy of choosing his son's sponsors from the same class, and of accustoming him to associate with it. He was taught Latin orally by servants who could speak no French, and many curious fancies were tried on him, as, for instance, that of waking him every morning by soft music. But he was by no means allowed to be idle. A plan of teaching him Greek, still more out of the common way than his Latin course, by some kind of mechanical arrangement, is not very intelligible, and was quite un- successful. These details of his education (which, like most else that is known about him, come from his own mouth) are not only interesting in themselves, but remind the reader how, not far from the same time, the other greatest writer of French during the Renaissance was also exercising himself, though not being exercised, in plans of education almost as fantastic. At six years old (for the father's reforming views in education do not seem to have disgusted him with the extremely early age at which it was then usual to begin school training) Montaigne was sent to the Collége de Guienne at Bordeaux, then at the height of its reputation, having more than double the number of scholars (two thousand) that even the largest English public school has usually boasted. Among its masters were Buchanan, afterwards the teacher of James I., and Muretus, one of the first scholars of the age. These, with their colleague Guérente, composed Latin plays for their pupils to act, and are held to have given no small impulse to the production of the classical French tragedy*~~

~~*of the Pléiade. Montaigne remained at school seven years, and, like almost all Frenchmen of all times, retained no pleasant or complimentary memory of it. At thirteen he left the Collége de Guienne and began to study law, it is not known where, but probably at Toulouse, the most famous university, despite its religious intolerance, of the south of France. Of his youth, early manhood, and middle life extremely little is known. Allusions to it in the Essays are frequent enough, but they are rarely precise. In 1548 he was at Bordeaux during one of the frequent riots caused by the gabelle, or salt tax. Six years afterwards, having attained his majority, he was made a counsellor in the Bordeaux parliament. In 1558 he was present at the siege of Thionville. Like his father, he certainly served in the army, for he has frequent allusions to military experiences. He was also much about the court, and he admits very frankly that in his youth he led a life of pleasure, if not exactly of excess. In 1566 he married Francoise de la Chassaigne, whose father was, like himself, a member of the Bordeaux parliament. Three years later his father died, and he succeeded to the family possessions. Finally, in 1571, as he tells us in an inscription still extant, he retired to Montaigne to take up his abode there. This was the turning-point of his life.*~~

~~*It has been said that his health was never strong, and it had been further weakened by the hard living (in both senses of that phrase) which was usual at the time. He resolved, accordingly, to retire to a life of study and con- templation, though he did not in the least seclude himself, and indulged in no asceticism except careful diet. Mon- taigne was a large country house unfortified (in which circumstance its astute possessor saw rather safety than danger from the turbulence of the religious wars), and its owner's revenues, without being large, appear to have been easy. He neither had nor professed any enthusiastic affection for his wife, but he lived on excellent terms with her, and bestowed some pains on the education of the only child (a daughter) who survived infancy. In his study, which he has minutely described, he read, wrote, dictated, meditated, inscribed moral sentences, which still remain on the walls and rafters, and in other ways gave himself up to learned ease. He was not new to literature. In his father's lifetime, and at his request, he had translated the Theologia Naturalis of Raymond de Sebonde, a Spanish*~~

~~*schoolman. On first coming to live at Montaigne he edited the works of his deceased friend Etienne de la Boétie, who had been the comrade of his youth, who died early, and who, with poems of real promise, had composed a declamatory and schoolboyish theme on republicanism, entitled the Contr' Un, which is one of the most over- estimated books in literature. But the years of his studious retirement were spent on a work of infinitely greater importance. Garrulous after a fashion, as Montaigne is, he gives us no clear idea of any original or definite impulse leading him to write the famous Zssays. It is very probable that if they were at first intended to have any special form at all it was that of a table-book or journal, such as was never more commonly kept than in the 16th century. But the author must have been more or less conscious of an order existing in the disorder of his thoughts, and this may have induced him to keep them apart in chapters, or at least under chapter-headings, and at the same time not to cut them up into mere pensées. It is certainly very noticeable that the earlier essays, those of the first two books, differ from the later in one most striking point, in that of length. Speaking generally, the essays of the third book average fully four times the length of those of the other two. This of itself would suggest a difference in the system of composition. For the present, however, we may confine ourselves to the first*~~

~~*two books. These appeared in 1580, when their author was forty-seven years old.*~~

~~*They contain, as at present published, no less than ninety-three essays, besides an exceedingly long apology for the already-men- tioned Raymond Sebonde, which amounts to about a quarter of the whole in bulk, and differs curiously from its companions in matter no less than in scale. The book begins with a short avis (address to the reader), opening with the well-known words, "C'est icy un livre de bon foy lecteur," and sketching in a few lively sentences the character of meditative egotism which is kept up throughout. HIs sole object, the author says, is to leave for his friends and relations a mental portrait of himself, defects and all; he cares neither for utility nor fame. The essays then begin without any*~~

~~attempt to explain or classify their subjects. Their titles are of the most diverse character. Sometimes they are proverbial sayings, or moral adages, such as: " Par divers moyens on arrive 4 pareille fin", "Quw'il ne faut juger de notre heur qu'apres la mort"', " Le profit de l'on est ledommage de l'aultre." Sometimes they are headed like the chapters of a treatise on ethics: " De la tristesse"', "De loisiveté", "De la peur", "De l'amitié." Sometimes a fact of some sort which has awaked a train of associations in the mind of the writer serves as a title, such as: "On est puni de s'opiniastrer 4 une place sans raison", "De la bataille de Dreux", &c. Occasionally the titles seem to be deliberately fantastic, as: " Des puces", " De l'usage de se vestir." Sometimes, though not very often, the sections are in no proper sense essays, but merely commonplace book entries of singular facts or quotations with hardly any comment. These point to the haphazard or indirect origin of them which has been already suggested. But generally the essay-character—that is to say, the discussion of a special point, it may be with wide digressions and divergences—displays itself. The digressions are indeed constant, and sometimes iar the appearance of being absolutely wilful. The nominal title, even when most strictly observed, is rarely more than a starting-point ; and, though the brevity of these first essays for the most part prevents the author from journeying very far, he contrives to get to the utmost range of his tether. Quotations are very frequent. These are the principal external characteristics of the book ; its internal spirit had better be treated when it can be spoken of completely.~~

~~Between the publication of the first two books of essays in 1580 and the publication of the third in 1588, Mon- taigne's life as distinguished from his writings becomes somewhat better known, and somewhat more interesting. He had, during the eight years of composition of his first volume, visited Paris occasionally and travelled for health or pleasure to Cauterets, Eaux Chaudes, and elsewhere. Charles IX., apparently, had made him one of his gentle- men in ordinary, and perhaps conferred on him the order of St Michael. The fiercest period of the religious wars, save that yet to come of the League, passed over him with- out harming him, though not without subjecting him to some risks. But his health grew worse and worse, and he was tormented by stone and gravel. He accordingly re- solved to journey to the baths of Lucca. Late in the 18th~~

~~century a journal was found in the chateau of Montaigne, giving an account of this journey, and it was published in 1774; part of it is written in Italian and part dictated in French, the latter being for the most part the work of a secretary or servant. Whatever may be the biographi- cal value of this work, which has rarely been reprinted with the Essays themselves, it is almost entirely destitute of literary interest. Written, moreover, according to its own showing merely for the author's own eye, it contains abundance of details as to the medicinal effect of the various baths which he visited, details which may be said to be superfluous to a medical reader, and disgusting to any other. The course of the journey was first north- wards to Plombiéres, then by Basel to Augsburg and Munich, then through Tyrol to Verona and Padua in Italy. Montaigne visited most of the famous cities of the north and centre, staying five months at Rome, and finally establishing himself at the baths of Lucca for nearly as long a time. There he received news of his election as mayor of Bordeaux, and after some time journeyed home- wards, The tour contains much minute information about roads, food, travelling, &c., but the singular condition in which it exists, and the absence of a really good critical~~

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~~edition hitherto, make it rather difficult to use it as a document. The freak of writing part of it in a strange dog-Italian is not uncharacteristic of Montaigne, but the words of his last and best editors, MM. Courbet and Royer, who speak of the letters as "l'unique complément des essais," seem to indicate that they are not of those who accept the published Voyage as authentic. Of the fact of the journey there is no doubt whatever.~~

~~Montaigne (as was not unnatural in a man of his tempera- ment, who had for some years, if not for the greater part of his life, lived solely to please himself) was not altogether delighted at his election to the mayoralty, which promised him two years of responsible if not very hard work. The memory of his father, however, and the commands of the king, which seem to have been expressed in a manner rather stronger than a mere formal confirmation, induced him to accept it ; and he seems to have discharged it neither better nor worse than an average magistrate. Indeed,~~

~~*he gave sufficient satisfaction to the citizens to be re-elected at the close of his term, and it may be suspected that the honour of the position, which was really one of considerable dignity and importance, was not altogether indifferent to him. Unfortunately, it cannot be said that nothing in his office became him like the leaving of it, for it was at the close of his second tenure that he gave the only sign of the demoralizing effect which is sometimes alleged by severe moralists to come of the half epicurean, half sceptical philo- sophy which he undoubtedly professed, Itwas his business, if not exactly his duty, to preside at the formal election of his successor, the maréchal de Matignon ; but there was a severe pestilence in Bordeaux, and Montaigne writes to the jurats of that town, in one of the few undoubtedly authentic letters which we possess, to the effect that he will leave them to judge whether his presence at the election is so necessary as to make it worth his while to expose himself to the danger of going into the town in its then condition, "which is specially dangerous for men coming from a good air as he does." That is to say, the chief magistrate of one of the greatest towns in France not only declined to visit it because of sickness prevailing there, but had left it to itself at a time when nearly half the population perished, and when, according to the manners of the age, civil dis- turbance was almost sure to follow accordingly. Attempts have been made to justify Montaigne, and it may be at least said that he at no time pretended to unselfish heroism ; but it is to be feared that the facts and the inference drawn from them admit of no dispute, At the least, Montaigne's conduct must be allowed to contrast very little to his advantage with that of Rotrou in the next century under somewhat similar circumstances though in a position of much less responsibility. It may, however, be urged in Montaigne's favour that the general circumstances of the time, where they did not produce reckless and foolhardy daring, almost necessarily produced a somewhat excessive caution. The League was on the point of attaining its greatest power; the extreme Calvinist and Navarrese party, on the other side, was (as may be seen in Agrippa d'Aubigné) no less fanatical than the League itself, and the salvation of France seemed to lie in the third party of politiques, or trimmers, to which Montaigne belonged. 'The capital motto of this party was that of the Scotch saying, "Jouk and let the jaw gang by," and the continual habit of parry- ing and avoiding political dangers might be apt to extend itself to dangers other than political. However this may be,*~~

~~*Montaigne had difficulty enough during this turbulent period, all the more so from his neighbourhood to the chief haunts and possessions of Henry of Navarre. He was able, however, despite the occupations of his journey, his mayoralty, and the pressure of civil war and pestilence, which was not confined to the town, to continue his essay*~~

~~*writing, and in 1588, after a visit of some length to Paris, the third book of the Essays was published, together with the former ones considerably revised. The new essays, as has been remarked, differ strikingly from the older ones in respect of length; there being only one which confines itself to the average of those in the first two books. The whimsical unexpectedness of the titles, moreover, reappears in but two of them: "Des coches" and "Des boiteux." They are, however, identical with the earlier ones in spirit, and make with them a harmonious whole—a book which has erly been second in influence to any of the modern world.*~~

~~*This influence is almost equally remarkable in point of matter and in point of form, as regards the subsequent history of thought and as regards the subsequent history of literature. The latter aspect may be taken first. Montaigne is one of the few great writers who have not only perfected but have also invented a literary form. The essay as he gave it had no forerunner in modern literature, and no direct ancestor in the literature of classical times. It is indeed not improbable that it owes something to the body of tractates by different authors and of different dates, which goes under the name of Plutarch's Morals, and it also bears some resemblance to the miscellaneous work of Lucian. But the resemblance isin both cases at most that of suggestion. The peculiar desultoriness and tenta- tive character of the essay proper were alien to the orderly character of the Greek mind, as were also its garrulity and the tendency which it has rather to reveal the idiosyncrasy of the writer than to deal in a systematic manner with the peculiarities of the subject. It has been suggested that the form which the essays assumed was in a way accidental, and this of itself precludes the idea of a definite model even if such a model could be found. Beginning with the throwing together of a few stray thoughts and quotations linked by a community of subject, the*~~

~~*author by degrees acquires more and more certainty of hand, until he produces such masterpieces of apparent desultoriness and real unity as the essay " Sur des vers de*~~

~~*irgile." In matter of style and language Montaigne's position is equally important, but the ways which led him to it are more clearly traceable. His favourite author was beyond all doubt Plu- tarch, and his own explicit confession makes it undeniable that Plutarch's translator Amyot was his master in point of vocabulary, and (so far as he took any lessons in it) of style. Amyot was unquestionably one of the most remarkable writers of French in the 16th century, and to him more than to any one else is due the beauty of the prose style which marked the second half of that century, a style which, though unequal and requiring to be modified for general use, is at its best the very flower of the lan- guage. Montaigne, however, followed with the perfect independence that characterized him. He was a contemporary of Ronsard, and his first essays were published when the innovations of the Pléiade had fully established themselves. He adopted them to a great extent, but with much discrimination, and he used his own judg- ment in Latinizing when he pleased. In the same way he retained archaic and provincial words with a good deal of freedom, but by no means to excess. In the arrangement as in the selection of his language he is equally original. There is little or no trace in him of the interminable sentence which is the drawback of early prose in all languages when it has to deal with anything more difficult to manage than mere narrative. He has not the excessive classicism of style which mars even the fine prose of Calvin, and which makes that of some of Calvin's followers intolerably stiff. Asa rule he is careless of definitely rhythmical cadence, though his sentences are always pleasant to the ear. But the principal characteristic of Montaigne's prose style is its remarkable ease and flexibility. These peculiarities, calculated in themselves to exercise a salutary influ- ence on a language as yet somewhat undisciplined, acquired by accident an importance of an extraordinary kind. A few years after Montaigne's death a great revolution, as is generally known, passed over French. The criticism of Malherbe, followed by the establishment of the Academy, the minute grammatical censures of Vaugelas, and the severe literary censorship of Boileau turned French in less than three-quarters of a century from one*~~

~~of the freest languages in Europe to one of the most restricted. The Latinisms and Grecisms of the Pléiade were tabooed at the same time with the most picturesque expressions of the older tongue. The efforts of the reformers were directed above all things to weed and to refine, to impose additional difficulties in the way of writing exquisitely, at the same time that, by holding outa strictly-defined model, they assisted persons of little genius and imagination to write tolerably. During this revolution only two writers of older date held their ground, and those two were Rabelais and Montaigne,— Montaigne being of his nature more generally readable than Rabe- lais. The Essays, the popularity of which no academic censorship could touch, thus kept before the eyes of the 17th and 18th cen- turies a treasury of French in which every generation could behold~~

~~the riches of their ancestors. The study of them influenced all the great prose writers of France, and they could not fail to be influ- enced in the direction which it was most important that they should take by the racy phrase, the quaint and picturesque vocabulary, and the unconstrained constructions of Montaigne.~~

~~It would be impossible, however, for the stoutest defender of the importance of form in literature to assign the chief part in Mon- taigne's influence to style. It is the method or rather the manner of thinking of which that style is the garment which has in reality exercised influence on the world. Like all writers except Shake- speare, Montaigne thoroughly and completely exhibits the intellec- tual and oral complexion of his own time. When he reached man- hood the French Renaissance (which was perhaps on the whole the most characteristic example of that phenomenon, the religious element being neither in excess asit was in England and Germany, nor in defect as it had been in Italy) was at high water, and the turn of the tide was beginning. Rabelais, who died when Montaigne was still in early manhood, exhibits the earlier and rising spirit, though he needs to be completed on the poetical side. The Renaissance had, as all revolts against authority must have, a certain sceptical element, but it was not at first by any means eminently sceptical.~~

~~*Despite the half ironical, half warning termination of Pantagruel, an immense confidence and delight, as of the invader of a promised land, fills the pages of Rabelais. HIe rejoices in his strength, in his knowledge, in his freedom, in the pleasures of the flesh and the spirit. With Montaigne begins the age of disenchantment. By the time at least when he began to meditate his essays in the retirement of his country house it was tolerably certain that no golden age was about to return. The Reformation had brought not peace but a sword, and the Calvinists were as intolerant as the Catholics. The revival of learning had, whatever its benefits, merely changed the outward guise of pedants instead of extirpating pedantry. The art of printing had multiplied rubbish as well as valuable matter. The discovery of America had brought ruin to the discovered, and disease and discord to the discoverers. 'The horrors of a disputed succession were already aeenies: France. These things were enough to make thoughtful men dubious about the blessings of progress and reform ; but the extreme dissoluteness which charac- terized the private life of the time also brought about its natural result of satiety. Physical science had hardly yet emerged to occupy some active minds; scholasticism was dead, while Bacon and Des- cartes had not arisen; nothing like a theory of politics had been evolved, though Bodin anda few others were feeling after one. As the earlier Renaissance had peed occupied itself with the prac- tical business and pleasures of life, so the later Renaissance specially mused on the vanity of this business and these pleasures. The pre- disposing circumstances which affected Montaigne were thus likely to incline him to scepticism, to ethical musings on the vanity of life and the like. But toall this there had to be added the peculiarity of his own temperament. This was a decidedly complicated one, and neglect of it has led some readers to adopt a more positive idea of Montaigne's scepticism than is fully justified by all the facts. The municipality of Rome has put up a tablet on the house occupied by Montaigne during his visit there, which speaks of him as a "founder of the new philosophy." In Italian mouths at the present day this is equivalent to an assertion that Montaigne was an enemy of Christianity. No assumption can be more gratuitous or less borne out by the text of his works and the reasonable inferences to be drawn from them. The attitude which he assumed was no doubt ephectic and critical chiefly. HIe decorated his study at Montaigne with inscriptions (still, by dint of*~~

accidental preservation and restoration not accidental, legible there), most of which are of the most pessimist and sceptical character. Ecclesiastes, Ecclesiasticus, Horace, Lucretius, Sextus Empiricus, the fragments of the Greek dramatists and philosophers, are ransacked for epigraphs indicating the vanity of human reason, human wishes, human belief, human thoughts and actions of every kind. In one curious essay (if indeed it is to be called an essay), the " Apologie de Raymond Sebonde," he has apparently amused himself with gathering together, in the shape of quotations as well as of re- flexions, all that can be said against certainty in esthetics as well as in dogmatics. But the general tenor of the essays is in complete contrast with this sceptical attitude, at least in its more decided form, and it is worth notice that the motto " Que scai-je ?" does not appear on the title page till after the writer's death. The general disposition, moreover, manifested in these famous writings is very far from being determinedly Pyrrhonist or despairingly misanthro- pic. Montaigne is far too much occupied about all sorts of the ininutest details of human life to make it for a moment admissible that he regarded that life asa whole but as smoke and vapour. HIe is much too curious of the varieties of belief, and too keenly interested in following them out, to leave himself in peril of the charge that all belief was to hima matter of indifference. The reason of the misapprehension of him which is current is due very mainly to the fact that he was eminently a humorist in the midst of a people to whom, since his time, humour has been nearly un- kuown. But there is more than this. The humorist as a recog-

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nized genus almost always passes into the satirist. The temper which has been admirably defined as thinking in jest while feeling in carnest uaturally throws itself into opposition, though it may not always take the irreconcilable form of the opposition of Swift. Perhaps the only actual parallel to Montaigne in literature is Lamb. There are differences between them, arising naturally enough from differences of temperament and experience; but both agree in their attitude—an attitude which is sceptical without being negative, and humorist without being satiric. There is hardly any writer in whom the human comedy appears treated with such completeness as it is in Montaigne. There is discernible in his

~~*essays no attempt to map out a complete plan, and then to fill up its outlines. But in the desultory and haphazard fashion which distinguishes him there are few parts of life on which he does not touch. The exceptions are chiefly to be found in the higher and more poetical strains of feeling to which the humorist temperament lends itself with reluctance and distrust, though it by no means excludes them. The French disposition, by a change which has never been sufficiently accounted for, and of which the most accurate examination of documents fails fully to detect the reason, had become, after being strongly idealist in the earlier Middle Ages, absolutely positive in the later, and from this positiveness it has never since quite freed itself. This positiveness isalready notice- able in Rabelais ; it becomes more noticeable stillin Montaigne. He is always charming, but he is rarely inspiring, except in a very few passages where the sense of vanity and nothingness possesses him with unusual strength. Asa general rule, an agreeable grotesque of the affairs of life (a grotesque which never loses hold of good taste sufficiently to be called burlesque) occupies him. There is a kind of anticipation of the scientific spirit in the careful zeal with which he picks up odd aspects of mankind, and comments upon them as he places them in his museum. Such a beep rament is most pleasantly shown when it is least personal. The letter to the Bordeaux jurats does not, as has been said, show Montaigne in his best light, nor does another letter to his wife, in which he condoles with her on the death of one of their children in a strain which must have drawn from any woman of sensibility and spirit a torrent of indignant tears. But what is almost offensive in immediate and private relationships becomes not only toler- able but delightful in the impersonal and irresponsible relationship of author to reader. A dozen generations of men have rejoiced in the gentle irony with which Montaigne handles the Judicrwm hu- mani sxcult, in the quaint felicity of his selection of examples, and in the real though sometimes fantastic wisdom of his comment on his selections.*~~

~~*Montaigne did not very long survive the completion of his book. His sojourn at Paris for the purpose of getting it printed was by no means uneventful, and on his way he stayed for some time at Blois, where he met De Thou. In Paris itself he had a more disagreeable experience, being for a short time committed to the Bastille by the Leaguers, as a kind of*~~

~~hostage, it is said, for a member of their party who had been arrested at Rouen by Henry of Navarre. But he was in no real danger. He was well known to and favoured by both Catherine de' Medici and the Guises, and was very soon released. In Paris, too, at this time he made a whimsical but pleasant friendship. Marie le Jars, Demoiselle de Gournay, one of the most learned ladies of the 16th and 17th centuries, had conceived such a venera- tion for the author of the Zssays that, though a very young girl and connected with many noble families, she travelled to the capital on purpose to make his acquaint- ance. He gave her the title of his "fille d'alliance" (adopted daughter), which she bore proudly for the rest of her long life. She lived far into the 17th century, and became a character and something of a laughing-stock to the new generation; but her services to Montaigne's literary memory were, as will be seen, great. Of his other friends in these last years of his life the most important were Etienne Pasquier and Pierre Charron. 'The latter, indeed, was more than a friend, he was a disciple ; and Montaigne, just as he had constituted Mademoiselle de Gournay his "fille d'alliance," bestowed on Charron the rather curious compliment of desiring that he should take the arms of the family of Montaigne. It has been thought from these two facts, and from an expression in one of the later essays, that the marriage of his daughter Léonore had not turned out to hissatisfaction. But family affection, except towards his father, was by no means Montaigne's strongest point.~~

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~~Not much is known of him in these later years, and indeed, despite the laborious researches of many bio- graphers, of whom one, Dr Payen, has never been excelled in persevering devotion, it cannot be said that the amount of available information about Montaigne is large at any time of his life. It would seem that the essayist had returned to his old life of study and meditation and working up his Hssays. No new ones were found after his death, but many alterations and insertions. His various maladies grew worse ; yet they were not the direct cause of his death. He was attacked with quinsy, which rapidly brought about paralysis of the tongue, and he died on the 11th of September 1592, under circumstances which, as Pasquier reports them, completely disprove any intention, at least on his part, of displaying anti-Christian or anti- Catholic leanings. Feeling~~

~~himself on the point of death, he summoned divers of his friends and neighbours to his chamber, had mass said before him, and endeavoured to raise himself and assume a devotional attitude at the elevation of the host, dying almost immediately afterwards, He was buried, though not till some months after his death, in a church in Bordeaux, which after some vicissi- tudes became the chapel of the Collége. During the Revolution the tomb and, as it was supposed, the coffin were transferred with much pomp to the town museum ; but it was discovered that the wrong coffin had been taken, and the whole was afterwards restored to its old position. Montaigne's widow survived him, and his daughter left pos- terity which became merged in the noble houses of Ségur and Lur-Saluces. But it does not appear that any male representative of the family survived, and the chateau is not now in the possession of any descendant of it.~~

~~When Mademoiselle de Gournay heard of the death of Mon- taigne she undertook with her mother a visit of ceremony and con- dolence to the widow, which had important results for literature. Madame de Montaigne gave her a copy of the edition of 1588, annotated copiously ; at the same time, apparently, she bestowed another copy, also annotated by the author, on the convent of the Feuillants in Bordeaux, to which the church in which his remains lay was attached. Mademoiselle de Gournay thereupon set to work to produce a new and final edition with a zeal and energy which would have done credit to any editor of any date. She herself worked with her own copy, inserting the additions, marking the alterations, and translating all the quotations. But when she had got this to press she sent the proofs to Bordeaux, where a poet of some note, Pierre de Brach, revised them with the other annotated copy. The edition thus produced has with justice passed as the standard even in preference to those which appeared in the author's lifetime. Unluckily, Mademoiselle de Gournay's original does not appear to exist, and her text was said, until the appearance of MM. Courbet and Royer's edition, to have been somewhat wantonly corrupted, especially in the important point of spelling. The Feuillants copy is in existence, being the only manuscript or partly manuscript authority for the text. It was edited in 1803 by Naigeon, the disciple of Diderot ; but, according to later inquiries, considerable liberties were taken with it. The first edition of 1580, with the various readings of two others which appeared during the author's lifetime, was~~

~~*reprinted by MM. Dezeimeris and Burck- hausen. Hitherto the edition of Le Clerc (3 vols., Paris, 1826-28) and in a more compact form that of Louandre (4 vols., Paris, 1854) have been the most useful. The edition, however, of MM. Courbet and Royer, which is based on that of 1595, will undoubtedly be the standard ; but, though the text is complete (Paris, Lemerre, 1873- 1877), the fifth volume, containing the biographyjand all the editorial apparatus, has unluckily yet (1883) to make its appearance. The editions of Montaigne in France and elsewhere, and the works upon him during the past three centuries, are innumerable. His influence upon his successors has already been hinted at, and cannot here be traced in detail. In one case, however,—that of Pascal—it is of sufficient importance to deserve mention. Pascal, who has left a special discourse on Montaigne, was evidently profoundly influenced by him, and the attitude towards his teacher is an interesting one. The sceptical method of the essayist is at once tempting and terrible to him. He accepts it in so far as it demolishes the claims of human reason and heathen philosophy, but evidently dreads it in so far as it is susceptible of being turned against religion itself. In England Montaigne was early popular. It was long supposed that the autograph of Shakespeare in a copy of Florio's translation showed his study of the Zssays. The autograph has been disputed,*~~

~~*7hA but divers passages, and especially one in The Tempest, show that at first or second hand the poet was acquainted with the essayist. Towards the latter end of the 17th century, Cotton, the friend of Isaac Walton, executed a complete translation, which, though not extraordinarily faithful, possesses a good deal of rough vigour. It has been frequently reprinted with additions and alterations. The most noteworthy critical handling of the subject in English is unquestionably Emerson's in Representative Men. (G. SA.)*~~

MONTALEMBERT, Cuartzs Forzes pr (1810-1870), historian, was born on 29th May 1810. The family was a very ancient one, belonging to Poitou, or rather to Angoumois. Direct descent is said to be provable to the 13th century, and charters and other documents carry the history of the house two centuries further back. For some generations before the historian the family had been dis- tinguished, not merely in the army, but for scientific attain- ments. Montalembert's father, René, emigrated, fought under Condé, and subsequently served in the English army. He married a Miss Forbes, and his eldest son Charles was born at London. At the Restoration René de Montalembert returned to France, was raised to the peerage in 1819, and became ambassador to Sweden (where Charles received much of his education) in 1826. He died a year after the overthrow of the legitimate monarchy. Charles de Montalembert was too young to take his seat as a peer (twenty-five being the necessary age), but he retained other rights ; and this, combined with his literary and intellectual activity, made him a person of some importance. He had eagerly entered into the somewhat undefined plans of Lamennais and Lacordaire for the establishment of a school of Liberal Catholicism, and he co-operated with them, both in the Avenir (see LamEn- NAIS, vol. xiv. pp. 239, 240) and in the practical endeavour, which absorbed some of the best energies of France at the time, to break through the trammels of the system of state-education. This latter scheme first brought Montalembert into notice, as he was formally charged with unlicensed teaching. He claimed the right of trial by his peers, and made a notable defence, of course with a deliberate intention of protest. His next most remarkable act was his participa- tion in the famous pilgrimage to Rome of his two friends. This step, as is well known, proved useless to mitigate the measures which private intrigues, and perhaps a not alto- gether injudicious instinct, prompted the Roman curia to take against the Avenir and the doctrines of its promoters. Montalembert, however, submitted dutifully to the ency- clical of June 1835, and only devoted himself more assiduously to the work on which he was engaged, the Life of St Elizabeth of Hungary. This appeared in 1836. It displayed Montalembert's constant literary characteristics, and, though inferior to Les Moines d'Occident in research and labour, is perhaps superior to it as a work of art. The famous speech by which Montalembert is best known, —" Nous sommes

~~*les fils des croisés et jamais nous ne re- culerons devant les fils de Voltaire", expresses, or at least indicates, his attitude not insufficiently. He was an ardent student of the Middle Ages, but his medizval enthusiasm was strongly tinctured with religious sentiment, and at the same time by no means connected with any affection for despotism. Montalembert still clung to his early liberalism, and he made himself conspicuous during the reign of Louis Philippe by his protests against the restrictions imposed on the liberty of the press, besides struggling for freedom in national education. The party which he represented, or rather which he strove to found, was by no means wholly Legitimist at heart, and at the downfall of Louis Philippe Montalembert had no difficulty in accepting the republic and taking, when elected, a seat in the assembly. He had not a little to do with the support given by France to the pope. As he had accepted the republic, he was not disinclined to accept the empire; but the measures which*~~

~~*followed the cowp d'état disgusted him, though he still sat in the chamber. A defeat in 1857 put an end to his parliamentary appearances. He was still, however, recog- nized as one of the most formidable of the moderate opponents of the empire, and he was repeatedly prosecuted for anti-imperialist letters and pamphlets. In the ten years between 1840 and 1850 he had written little but political pamphlets, but after the establishment of the empire, and especially after he lost his seat in the chamber, he became more prominent as an author. Even before this he had produced a volume on the Avenir Politique de ? Angleterre (1855), and another on Pie LX. et Lord Palmer- ston (1856), besides numerous articles and pamphlets, the chief of which were perhaps Une Nation [Poland] en Deuul, and L'Eglise Libre dans Etat Libre.*~~

~~*His great work, the fruit of many years' labour, did not appear till he was fifty years old, and ten years before his death, which occurred before its completion. Les Mownes d'Occident depuis St Bénoit jusqwa St Bernard has some of the peculiar drawbacks which have characterized almost all historical work of any literary pretensions during the present generation. It is planned on too large a scale, and executed with too much regard to*~~

~~*profusion of pictur- esque detail and abundance of fiuent argument on points which the writer has at heart. Its best passages are inferior to the best of a younger writer of very different opinions though not dissimilar style and temperament—M. Ernest Renan ; but it is a work of great interest and value.*~~

~~*Montalembert, who had married Mademoiselle de Merode, sister of one of Pius IX.'s ministers, but who had no male offspring, died in March 1870, the year so fatal to France. His health had long been very bad, and was understood to have suffered from the chagrins attending his exclusion from political life and the defeat of most of his plans. Since his death his works have appeared in a complete edition, They have, regarded from the literary point of view, many of the faults of their time. A voluminous and vigorous writer, Montalembert was more of a journalist, a pamphleteer, and an orator than of a man of letters properly so called. His talents were diffused rather than concen- trated, and they were much occupied on merely ephemeral topics. But of picturesque eloquence in a fluent and rather facile kind he was no inconsiderable representative.*~~

~~*MONTALVAN, Jovan Perez Dx (1602-1638), Spanish dramatist and writer of fiction, was the son of the king's bookseller, and was born at Madrid in 1602. At the early age of seventeen he became a licentiate in theology, and in 1626, after entering the priesthood, he received a notarial appointment in connexion with the Inquisition. His overtasked brain succumbed under the numerous literary labours he imposed on it, and he died when only thirty- six years old (25th June 1638).*~~

~~*In 1624 he published eight prose tales (Sucesos y prodigios en amor, en ocho novelas eyemplares), one of which, " The Disastrous Friendship," has been characterized by Ticknor as one of the best in the language. This, as well as a subsequent volume of stories (Para todos: Exemplos morales, hwmanos y divinos, 1633), was fre- quently reprinted. His last prose writing was a popular panegyric on his lately deceased friend and master Lope de Vega (Hama pés- twma de Lope de Vega, 1638), whom he almost rivalled in dramatic productiveness, and whose conventional manner, flimsiness in con- struction, and carelessness in execution he too closely followed. The first volume of his collected Comedias appeared in*~~

~~*1638, the second in 1639. On the Spanish stage they were in great request, and Montalvan's repute led inferior writers in some cases to borrow his name. His dramas are distinctly superior to his " Autos sacramentales," but even of the former the tragedy Los Amantes de*~~

~~*Terwel is the only one that has enjoyed permanent popularity. See Ticknor, Hist. of Span. Lit., vol. ii. (1868).*~~

~~*MONTANA, one of the north-western Territories of the United States, is limited on the N. by British Columbia, on the E. by Dakota, on the 8. by Wyoming and Idaho, and on the W. by Idaho. Its boundaries, as established*~~

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~~*by statute, are as follows :—on the N., the 49th parallel ; on the E., the 27th meridian west of Washington, or the 104th west of Greenwich; on the 8. and W. the boun- dary follows the 45th parallel from the 27th meridian west to the 34th meridian west, then turns south along the latter meridian to its point of intersection with the conti- nental watershed, thence along the crest-line of this water- shed westward and north-westward until it reaches the Bitter-root Mountains; it then follows the crest of this range north-westward to the point where it is crossed by the 39th meridian west, which it follows north to the line of British Columbia. The total area is about 146,080 square miles—an approximate estimate, as the boundary along the continental watershed and the Bitter-root Mountains has not been exactly surveyed. The average elevation above sea-level has been estimated at 3900 feet.*~~

~~*Topographically, Montana may be separated into two great divisions—that of the plains comprising the eastern two-thirds, and that of the mountains comprising the western portion. The former, a monotonous rolling ex- panse, broken only by the beds of the few streams which traverse it, and by a few small groups of hills, extends over nine degrees of longitude in a gentle uniform slope, rising from 2000 feet above the sea at the eastern boundary to 4000 at the base of the Rocky Mountains. Except along the streams and upon the scattered groups of hills, this section is entirely devoid of forest-growth of any kind. Vegetation is*~~

~~*limited to the bunch grasses, artemisia, and cacti. The grasses are the most abundant and luxuriant near the mountains, where the rainfall is greatest. The mountain section, comprising the western third of the Territory, is composed, in general terms, of a succession of ranges and valleys running very uniformly somewhat in a north-west and south-east direction. The mountains vary in height from 8000 to 10,000, even in isolated cases reaching 11,000 feet, with mountain-passes 6000 to 8000 feet above the sea. Towards the north the ranges become almost continuous, forcing the streams into long and circuitous courses in order to disentangle themselves from the maze of mountains, while, on the other hand, the ranges of the south-western part of the Territory are much broken, afford- ing numerous low passes and water-gaps.*~~

~~*In the mountainous part of the Territory are the head- waters of the Missouri (Atlantic basin) and Clark's Fork of the Columbia (Pacific basin). The former rises in the south-west of the territory in three large branches, the Jefferson, Madison, and Gallatin, which meet at the foot of the Gallatin valley at a point known as the "Three Forks of the Missouri." Here the Missouri is a good-sized stream, fordable with difficulty even when the current is lowest. From this point to its mouth navigation is pos- sible when the stream is not below its mean height; it is interrupted only at the Great Falls of the Missouri, near Fort Benton, above which, however, it is practically little used for navigation. Its other principal tributaries in its upper course are the Sun, Teton, Marias, Musselshell, and Milk rivers, all of which vary much in size with the season,—the last two being nearly or quite dry near their mouths in the fall of the year. The Yellowstone, one of the most important tributaries of the Missouri, has nearly all its course in Montana, and is navigable for small steamers as far as the Crow Agency, except when the water is low. Clark's Fork of the Columbia is formed by the junction of the Flathead and the Missoula or Hellgate river. The former rises in the mountains of British Columbia and flows nearly south through Flathead Lake to its point of junction with the Missoula, The latter rises opposite the Jefferson river and flows north-westward, receiving on its way several large affluents. Below the point of junction of these streams, Clark's Fork flows north-west along the*~~

~~*base of the Bitter-root Mountains intoIdaho. This stream is very rapid, and is not navigable. Its course, as well as those of most of its tributaries, passes through narrow valleys, the surrounding country being well watered and covered with dense forests of Conifere.*~~

~~*Geology.—Most of the mountain area belongs to the Eozoic and Silurian formations. Along the base of the mountains is a Triassic belt of variable width. Succeeding this is a broad area of nearly horizontal Cretaceous beds, followed by the Tertiary formation, which covers nearly one-third of the Territory. These recent for- mations are interrupted here and there by volcanic upheavals.*~~

~~*Climate.—The climate of Montana differs almost as greatly in different parts of the Territory as that of California. In the north- west it resembles that of the Pacific coast. The westerly winds blowing off the Pacific do not meet with as formidable a barrier as farther south, and consequently are not chilled, or deprived of so large a proportion of their moisture. The result is that the north- western portion of Montana enjoysa mild temperature and a rainfall sufficient for the needs of agriculture. The valleys of the Kootenai, Flathead, Missoula, and Bitter-root can be cultivated without irriga-*~~

~~*clad from summit to base; and the narrower valleys are also covered, while the timber is of larger size and of much greater commercial value than elsewhere in the Territory,—the valuable timberconsisting entirely of the various species of Coniferz, pine, fir, cedar, &c. Of the broad-leaved speeies, willow, aspen, and cotton-wood are abundant.*~~

~~*Fauna.—The native fauna is not sharply distinguished from that of neighbouring States and Territories. The higher latitude is, however, indicated by the relatively greater abundance of species favouring a colder climate. The moose and the Roeky Mountain goat, though by no means abundant, still frequent chosen haunts in the mountains,—the former in the cool marshy valleys, the latter upon the most rugged*~~

~~*inaccessible elevations. The black-tailed and mule deer, the antelope, elk, and mountain sheep are abundant, and the bison still ranges the plains, though in sadly reduced numbers. Among Carnivorz, the black and grizzly bears, mountain lion, lynx, wild cat, and several species of wolves are still plentiful.*~~

~~*Agriculture and Industry.—Agriculture is dependent in most parts of Montana upon the supply of water furnished by the streams. Owing to this fact it is probable that not more than 8 per cent. of the total area of the Territory can ever, even under the most economical distribution of the water-supply, be brought under cultivation. In the drainage area of Clark's Fork are*~~

~~*Sketch Map of M*~~

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~~*tion with little danger of loss from drought. Farther east and south the rainfall decreases. In the valleys of the upper Missouri, tho Jefferson, Madison, Gallatin, and the upper Yellowstone irrigation is almost everywhere required, as well as over the broad extent of the plains. Over most of the Territory the rainfall ranges from 10 to 15 inches annually ; in the north-western corner it rises to 25. The general temperature is comparatively mild for the latitude, the elevation above the sea being decidedly less than that of the average of the Rocky Mountain region. The mean annual temper- ature ranges from 40° to 50° Fahr., but the variations are very great and violent. Frosts and snowstorms are possible during every month of the year, so that agriculture and stock-raising are more or less hazardous. On the other hand, the ordinary extremes of temperature are not so great asin more arid portions of the country. forests.—Throughout the Territory, as everywhere else in the Cordilleran region, forests follow rainfall. The plains are treeless ; the mountain valleys about the heads of the Missouri are clothed only with grass and artemisia, many localities extending to a con- siderable height up the mountains, which are themselves timbered, though not heavily. In the north-western part, roughly defined as the drainage area of Clark's Fork, where the rainfall is somewhat greater, the forests become of importance. The mountains are forest- West 106 from Greenwich*~~

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~~several fine valleys containing a considerable extent of arable land, such as those of the Missoula, Bitter-root, Deer Lodge, Jocko, and Flathead. Upon the head-waters of the Missouri is also a large extent of arable land. The valleys of the Jefferson and Madison also deserve mention. Along the eastern base of the mountains, near the head-waters of the Sun, Teton, and Marias rivers, are consider- able areas susceptible of irrigation. Below the Forks the Missouri flows for 75 miles through a broad valley, much of which can be irri- gated ; below Fort Benton, however, the bluffs become higher and close in on the river. The Yellowstone, also, after leaving the moun- tains, flows through a similar kind of valley, which extends with a few minor breaks down to the point where the river turns from an east to a north-east course, when it enters a country of mawvatses terres, which, except as a mausoleum of fossil remains, is utterly valueless.~~

~~Owing to the comparatively isolated position of the Territory, agricultural pursuits have been limited by the demands of home consumption. The census of 1880 reported the area in farms to con- sist of 405,683 acres, with an average of 267 acres to each farm. The whole is less than one-half per cent. of the entire area of the Terri- tory. The improved land is reported as amounting to 262,611 acres. The following are the amounts of the principal agricultural products :—wheat, 469,688 bushels; maize, 5689 bushels; oats,~~

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~~900,915 bushels ; barley, 39,970 bushels ; hay, 63,947 tons ; wool, 995,484 pounds ;—value of all farm products, $2,024,923. The live- stock interest is large, and is increasing rapidly. The great extent of pasture afforded by the plains and the broad valleys of the mountains would seem to promise an almost unlimited extension of this industry in the future. Both cattle and sheep owners, however, labour under disadvantages as~~

~~compared with the owners farther south. The lower temperature and heavier snows, and particularly the danger of great extremes of temperature, require that provision of shelter and food be made for a part or all of the winter season, otherwise the rancheman runs the risk of occasional severe losses. 'The census of 1880 furnishes the following statistics of live-stock : — horses, 35,114 ; mules and asses, 858 ; working oxen, 936; milch cows, 11,308 ; other cattle, 160,143; sheep, 184,277 ; swine, 10,278 ; — total value of live-stock, $5,151,554.~~

~~In mineral production Montana has never taken a leading place, although in the early days some of the placer ground yielded well. The rich placers of Little Prickly Pear, Bannack, and Alder Gulch were quickly exhausted. The produce of the latter has been reported variously at from $25,000,000 to $40,000,000, the greater part of which was extracted in a few months. In the year 1879-80 $1,805,767 worth of gold and $2,905,068 of silver were extracted, about three-fourths from deep mines and one-fourth from placers. For the year 1882 the total mineral production is reported at $8,004,000, of which about $1,000,000 was for copper and lead.~~

~~Population. — Owing largely to its remote position the population as well as the material prosperity of Montana have had a slow growth in comparison with other more favoured portions ofthe west. The population in 1880, as reported by the census, was 39,159 (28,177 males, and 10,982 females), — an increase of 90°1 per cent. over that in 1870. There were 27,638 natives, and 11,521 of foreign birth, while 35,385 werc whites, 346 negroes or of mixed negro blood, 1765 Chinese, and 1663 citizen Indians. By far the greater portion of the popula- tion is found in the western half, upon the head-waters of the Missouri and Clark's Fork. The eastern halfis as yet but very sparsely settled, and probably it will never sustain more than a small population.~~

~~The Territory is divided into eleven counties, which, with their population in 1880, were the following : — Beaverhead, 2712; Choteau, 3058; Custer, 2510; Dawson, 180 ; Deer Lodge, 8876 ; Gallatin, 3643 ; Jefferson, 2464 ; Lewis and Clark, 6521 , Madison, 3915 ; Meagher, 2743; Missoula, 2537. The principal settlements are—Helena, the capital~~

~~*(3624); Butte, a mining town (3363) ; and Bozeman, in the Gallatin valley upon the Northern Pacific Railway, which in 1880 had a population of 894 and has probably double that number at present (1883).*~~

~~*The total number of Indians in Montana is estimated by the Indian office at 19,764. These are nominally congregated at five agencies, although in reality they roam over the entire Territory. They are of various tribes, the principal of which are the Sioux, Crow, Blackfoot, Gros Ventre, Assinaboine, and Pend' d Oreille. Their reservations cover more than one-third of the Territory.*~~

~~*Government and Finance.—The government of Montana is similar to that of the other Territories. The governor, secretary, chief jus- tice, and two associate justices are appointed by the president of the United States. The treasnrer, auditor, and superintendent of public instruction are elected by the people of the Territory, as are also the members of the two houses of the legislature. Montana is repre- sented in Congress by a delegate, also elective, who has liberty to take part in debate but has no vote. The Territorial debt at the close of 1881 was but $70,000. The amount raised by Territorial taxation was $93,211.*~~

~~*History.—The Montana country was originally acquired by the United States under the Lonisiana purchase. It became successively a part of Louisiana Territory, of Missouri Territory, of Nebraska Territory, and of Dakota. On 26th May 1864 it was organized under a Territorial government ofits own, with practically its present boundaries. The exploration of this region commenced with the celebrated expedition of Lewis and Clark in 1803-1806. Between 1850 and 1855 it was traversed and mapped by a number of exploring partics, having in view the selection of trans-continental railroad routes. Since then numberless expeditions have examined it, and some systematic topographic work has been done under different branches of the United States Government. The first settlers entered the Territory in 1861, discovered placer gold on Little Prickly Pear Creek, and shortly after built the city of Helena. Later, the placers at Bannack were discovered, and a small "rush" to the Territory commenced. In 1863 the rich placers at Alder Gulch were brought to view, and miners and adventurers swarmed in from all parts. Then it was*~~

~~that the early social history of Cali- fornia was repeated on a smaller scale in Montana. The lawless elements assumed control, and for many months neither life nor property was safe. Indeed, for a time the community was in a state of blockade ; no one with money in his possession could get out of the Territory. Finally, the citizens organized a '* Vigilance Committee" for self-preservation, took the offensive, and after a short sharp struggle rid the community of its disturbing elcments. After the exhaustion of the placers, the population decreased, owing~~

~~to the migration of the floating mining class; but their place was soon taken by more permanent settlers. (. G7=)~~

~~MONTANISM is a somewhat misleading name for the movement in the 2d century which, along with Gnos- ticism, occupied the most critical period in the history of the early church. It was the overthrow of Gnosticism and Montanism that made the "Catholic" church. The credit of first discerning the true significance of the Montanistic movement belongs to Ritschl.!~~

~~In this article an account will be given of the general significance of Montanism in relation to the history of the church in the 2d century, followed by a sketch of its origin, development, and decline.~~

~~1. From the middle of the 2d century a change began to take place in the outward circumstances of Christianity. The Christian faith had hitherto been maintained in a few small congregations scattered over the Roman em- pire. These congregations were provided with only the most indispensable constitutional forms, neither stricter nor more numerous than were required by a religious bond resting on supernatural expectations, strict discipline, and brotherly love ('Corpus sumus de conscientia_re- ligionis, de unitate discipline, de spei federe"). This state of things passed away. The churches soon found numbers within their pale who stood in need of super- vision, instruction, and regular control. The enthusiasm for a life of holiness and separation from the world, the eager outlook for the end of the world, the glad surrender to the gospel message, were no longer the influences by which all minds were swayed.~~

~~*In many cases sober convictions or submissive assent supplied the want of spontaneous enthusiasm. There were many who did not become, but who were, and therefore remained, Christians,—too powerfully attracted by Christianity to abandon it, and yet not powerfully enough to have adopted it for themselves. Then, in addition to this, social distinctions asserted themselves amongst the breth- ren. Christians were already found in all ranks and occupations—in the imperial palace, among the officials, in the abodes of labour and the halls of learning, amongst slaves and freemen. Were all these to be left in their callings? Should the church take the decisive step into the world, consent to its arrangements, conform to its customs, acknowledge as far as possible its authorities, and satisfy its requirements? Or ought she, on the other hand, to remain, as she had been at first, a society of religious devotees, separated and shut out from the world by a rigorous discipline and working on it only through a direct propaganda? This was the dilemma that the church had to face in the second half of the 2d century : either she must commence a world-wide mission in the comprehensive sense by an effective entrance into Roman society—renouncing, of course, her original peculiarities and exclusiveness; or, retaining these peculiarities and clinging to the old modes of life, she must remain a small insigni- ficant sect, barely intelligible to one man in a thousand, and utterly incapable of saving and educating nations. That this was the question at issue ought to be obvious enough to us now, although it could not be clearly per- ceived at the time. It was natural that warning voices should then be raised in the church against secular tendencies, that the well-known counsels about the imita- tion of Christ should be held up in their literal strictness before worldly Christians, that demands should be made for a restoration of the old discipline and severity, and for a return to apostolic simplicity and purity. The church asa whole, however, under pressure of circumstances rather than by a spontaneous impulse, decided otherwise. She marched through the open door into the Roman state, and settled*~~

~~*1 Entstehung der Altkatholischen Kirche, 24 ed., Bonn, 1857.*~~

~~*MONTANISM*~~

~~*down there for a long career of activity, to Christianize the state along all its thoroughfares by imparting to it the word of the gospel, but at the same time leaving it everything ex- ceptits gods. On the other hand, she furnished herself with everything of value that could be taken over from the world without overstraining the elastic structure of the organiza- tion which she now adopted. With the aid of its philosophy she created her new Christian theology; its polity furnished her with the most exact constitutional forms; its juris- prudence, its trade and commerce, its art and industry, were all taken into her service; and she contrived to borrow some hints even from its religious worship. Thus we find the church in the 3d century endowed with all the resources which the state and its culture had to offer, entering into all the relationships of life, and ready for any compromise which did not affect the confession of her faith. With this equipment she undertook, and carried through, a world- mission on a grand scale. But what of those believers of the old school who protested in the name of the gospel against this secular church, and who wished to gather together a people prepared for their God regardless alike of numbers and circumstances? Why, they joined an enthusiastic movement which had originated amongst a small circle in a remote province, and had at first a merely local importance. There, in Phrygia, the cry for a strict Christian life was reinforced by the belief in a new and final outpouring of the Spirit,—a coincidence which has been observed elsewhere in church history, as, for instance, in the Irvingite movement. The wish was, as usual, father to the thought; and thus societies of "spiritual" Christians were formed, which served, especially in times of persecu- tion, as rallying-points for all those, far and near, who sighed for the end of the world and the excessus e sxculo, and who wished in these last days to lead a holy life. These zealots hailed the appearance of the Paraclete in Phrygia, and surrendered themselves to his guidance. In so doing, however, they had to withdraw from the church, to be known as ' Montanists," or '"' Kataphrygians," and thus to assume the character of a sect. Their enthusiasm and their prophesyings were denounced as demoniacal ; their expectation of a glorious earthly kingdom of Christ was stigmatized as Jewish, their passion for martyrdom as vainglorious, and their whole conduct as hypocritical. Nor did they escape the more serious imputation of heresy on important articles of faith ; indeed, there was a disposi- tion to put them on the same level with the Gnostics. The*~~

~~effect on themselves was what usually follows in such circumstances. After their separation from the church, they became narrower and pettier in their conception of Christianity. The strict rules of conduct which ina former age had been the genuine issue of high-strung religious emotion were now relied on as its source. Their asceticism degenerated into legalism, their claim to a monopoly of pure Christianity made them arrogant. As for the popular religion of the larger church, they scorned it as an adulter- ated, manipulated Christianity. But these views found very little acceptance in the 3d century, and in the course of the 4th they died out. Regardless of the scruples of her most conscientious members, and driving the most earnest Christians into secession and the conventicle, the church went on to prosecute her great mission in the world. And before she was able, as church of the state and of the empire, to call in the aid of the civil power to suppress her adversaries the Montanistic conventicles were almost extinct.~~

~~2. Such is, in brief, the position occupied by Montanism in the history of the ancient church. The rise and progress of the movement were as follows.~~

~~At the close of the reign of Antoninus Pius—probably in the year 156 (Epiphanius)—Montanus appeared at~~

~~Ardaban in Phrygia, bringing revelations of the "Spirit" to Christendom. It is unnecessary to seek an explanation of his appearance in the peculiarities of the Phrygian temperament. The Christian churches had always held that prophecy was to be continued till the return of Christ, although, as a matter of fact, prophets had not been parti- cularly numerous. Montanus claimed to have a prophetic calling in the very same sense as Agabus, Judas, Silas, the daughters of Philip, Quadratus, and Ammia, or as Hermas at Rome. Ata later time, when the validity of the Mon- tanistic prophecy was called in question in the interest of the church, the adherents of the new movement appealed explicitly to a sort of prophetic succession, in which their prophets had received the same gift which the daughters of Philip, for example, had exercised in that very country of Phrygia. The burden of the new prophecy was a more exacting~~

~~*standard of moral obligations, especially with regard to marriage, fasting, and martyrdom. But Mon- tanus had larger schemes in view. He wished to organize a special community of true Christians to wait for the coming of their Lord. The small Phrygian towns of Pepuza and Tymion were selected as the headquarters — the Jerusalem, as the prophet called them — of his church. He spared no effort to accomplish this union of believers. Funds were raised for the new organization, and from these the leaders and missionaries, who were to have nothing to do with worldly life, drew their pay. But the ecstasy of the prophet did not prove so contagious as his preaching. Only two women, Prisca and Maximilla, were moved by the Spirit ; ike Montanus, they uttered in a state of frenzy the commands of the Spirit, which spoke through them sometimes as God the Father, sometimes as the Son, and urged men to a strict and holy life. This does not mean that visions and significant dreams may not have been of frequent occurrence in Montanistic circles. But, as chosen and permanent organs of the Paraclete, only three persons were recognized — Montanus, Prisca, and Maximilla ; by their side, however, Alcibiades and Theo- dotus, from a very early date, played an active part as missionaries and organizers.*~~

~~*For twenty years this agitation appears to have been confined to Phrygia and the neighbouring provinces. How could it be otherwise? To assemble the whole of Christendom at Pepuza was a rather impracticable pro- posal. But after the year 177 a persecution of Christians, from some unexplained causes, broke out simultaneously in many provinces of the empire. Now in these days every persecution was regarded as the beginning of the end. It quickened the conscience, and gave more strength to eschatological hopes ; it was a call to observe the signs of the times and the intimations of God's presence. It would seem that before this time Montanus had disappeared from the scene ; but Maximilla, and probably also Prisca, were working with redoubled energy. And now, through- out the provinces of Asia Minor, in Rome, and even in Gaul, amidst the raging of persecution, attention was attracted to this remarkable movement. The desire for a sharper exercise of discipline, and a more decided renuncia- tion of the world, combined with a craving for some plain indication of God's will in these last critical times, had prepared many minds for an eager acceptance of the tidings from*~~

~~*Phrygia. There the Spirit, whom Christ had promised to His disciples, had begun His work ; there, at least, there were holy Christians and joyful martyrs. The oracles of the Phrygian prophets became household words in distant churches, and it was always the more serious- minded who received them with undisguised sympathy. And thus, within the large congregations where there was so much that was open to censure in doctrine and con- stitution and morals, conventicles were formed in order*~~

~~*that Christians might prepare themselves by strict discipline for the day of the Lord.*~~

~~*Meanwhile in Phrygia and its neighbourhood—especially in Galatia, and also in Thrace—a controversy was raging between the adherents and the opponents of the new prophecy. Between 150 and 176 the authority of the episcopate had been immensely strengthened, and along with it a settled order had been introduced into the churches. It need hardly be said that, as a rule, the bishops were the most resolute enemies of the Montanistic enthusiasm. It disturbed the peace and order of the con- gregations, and threatened their safety. Moreover, it made demands on individual Christians such as very few could comply with. But the disputation which Bishops Zoticus of Cumana and Julian of Apamea arranged with Maximilla and her following turned out most disastrously for its promoters. The "spirit" of Maximilla gained a signal victory, a certain Themison in particular having reduced the bishops to silence. Sotas bishop of Anchialus attempted to refute Prisca, but with no better success ; he too had to retire from the field in disgrace. These proceedings were never forgotten in Asia Minor, and the report of them spread far and wide. In after times the only way in which the discomfiture of the bishops could be explained was by asserting that they had been silenced by fraud or violence. This was the commencement of the excommunication or secession, whichever it may have been, of the Montanists in Asia Minor. "Iam pursued like a wolf," exclaimed the spirit that spoke through Maximilla; and her admonitions about the end became more emphatic than ever :—' After me there will come no other prophetess, but the end." Not only did an extreme party arise in Asia Minor rejecting all prophecy*~~

~~*and the Apocalypse of John along with it, but the majority of the churches and bishops in that district appear (c. 178) to have broken off all fellowship with the new prophets, while' books were written to show that the very form of the Montanistic prophecy was sufficient proof of its spuriousness.!*~~

~~*In Gaul and Rome the prospects of Montanism seemed for a while more favourable. The confessors of the Gallican Church were of opinion that communion ought to be maintained with the zealots of Asia and Phrygia; and they addressed a letter to this effect to the Roman bishop, Eleutherus. Whether this is the bishop of whom Ter- tullian (Adv. Prax., 1) relates that he was on the point of making peace with the churches of Asia and Phrygia— i.¢., the Montanistic communities—is not certain ; it was either he or his successor Victor. It is certain, at any- rate, that there was a momentary vacillation, even in Rome. Nor is this to be wondered at. The events in Phrygia could not appear new and unprecedented to the Roman Church. If we may believe Tertullian, it was Praxeas of Asia Minor, the relentless foe of Montanism, who succeeded in persuading the Roman bishop to with- hold his letters of conciliation.*~~

~~*Early in the last decade of the 2d century two consider- able works appeared in Asia Minor against the Kataphry- gians. The first, by a bishop or presbyter whose name is not known, is addressed to Abircius bishop of Hierapolis, and was written in the fourteenth year after the death of Maximilla, z.e., apparently about the year 193. The other was written by a certain Apollonius forty years after the appearance of Montanus, consequently about 196. From these treatises we learn that the adherents of the new prophecy were very numerous in Phrygia, Asia, and Galatia (Ancyra), that they had tried to defend them-*~~

~~*1 Miltiades, wept rod wh detv mpodirnv év éxaordoer adelv. At*~~

~~*the same time as Miltiades, if not earlier, Apollinaris of Hierapolis also wrote against the Montanists.*~~

~~*MONTA4ADISH*~~

~~*selves in writing from the charges brought against them (by Miltiades), that they possessed a fully-developed independent organization, that they could boast of many martyrs, and that they were still formidable to the church in Asia Minor. Many of the small congregations had gone completely over to Montanism, although in large towns, like Ephesus, the opposite party maintained the ascendency. Every bond of intercourse was broken, and in the Catholic churches the worst calumnies were retailed about the deceased prophets and the leaders of the societies they had founded.*~~

~~*In many churches outside of Asia Minor a different state of matters prevailed. Those who accepted the message of the new prophecy did not at once leave the Catholic Church in a body. They simply formed small conventicles within the church ; in many instances, indeed, their belief in the new prophecy may have remained a private opinion which did not affect their position as members of the larger congregation. Such, for example, appears to have been the case in Carthage (if we may judge from the Acts of the martyrs Perpetua and Felicitas) at the commencement of the persecution of Septimius Severus about the year 202. But even here it was impossible that an open rupture should be indefinitely postponed. The bishops and their flocks gave offence to the spiritualists on so many points that at last it could be endured no longer. The latter wished for more fasting, the prohibition of second marriages, a frank, courageous profession of Christianity in daily life, and entire separa- tion from the world; the bishops, on the other hand, sought in every way to make it as easy as possible to be a Christian, lest they should lose the greater part of their congregations. The spiritualists would have excluded from the church every one who had been guilty of mortal sin; the bishops were at that time specially anxious to relax the stringency of the old disciplinary laws. And lastly, the bishops were compelled more and more to take the control of discipline into their own hands, while the spiritualists, appealing to the old principle that God alone can remit or retain sins, insisted that God Himself—i.e. the Spirit—was the sole judge in the congregation, and that therefore all proceedings must be conducted according to the directions of the prophets. On this point especially a conflict was inevitable. It is true that there was no rivalry between the new organization and the old, as in Asia and Phrygia, for the Western*~~

~~*Montanists recognized in its main features the Catholic organization as it had been developed in the contest with Gnosticism ; but the demand that the "organs of the Spirit" should direct the whole discipline of the congregation contained implicitly a protest against the actual constitution of the church. Even before this latent antagonism was made plain, there were many minor matters which were sufficient to precipitate a rupture in particular congregations. In Carthage, for example, it would appear that the breach between the Catholic Church and the Montanistic con-venticle was caused by a disagreement on the question whether or not virgins ought to be veiled. For nearly five years (202-207) the Carthaginian Montanists strove to remain within the church, which was as dear to them as it was to their opponents. But at length they quitted it, and formed a congregation of their own, declaring that the Catholic Church was henceforth only a body of "psychic" Christians, because she would not acknowledge the Spirit whom God had at last poured out on His people.*~~

~~*It was at this juncture that Tertullian, the most famous theologian of the West, left the church of which he had been the most loyal son and the most powerful supporter, and whose cause he had so manfully upheld against pagans and heretics. He too had come to the conviction that the*~~

~~*church at large was given over to worldliness, that she had forsaken the old paths and entered on a way that must lead to destruction. The writings of Tertullian afford the clearest demonstration that what is called Mon-tanism was a reaction against secularism in the church, and an effort to conserve the privileges of primitive Chris- tianity. At the same time, they show no less clearly that Montanism in Carthage was a very different thing from the Montanism of Montanus. Western Montanism, at the beginning of the 3d century, admitted the legitimacy of almost every point of the Catholic system. It allowed that the bishops were the successors of the apostles, that the Catholic rule of faith was a complete and authoritative exposition of Christianity, and that the New Testament was the supreme rule of the Christian life. How, then, one may well ask, was it possible to separate from the Catholic Church? On what ground could the*~~

~~separation be justi- fied? How could it be said that a new era of the Spirit had come in when the Spirit had already given all neces- sary instructions in the Scriptures of the New Testament ? And what claim could be thought to exceed the legitimate rights of the successors of the apostles? Montanus himself and his first disciples had been in quite a different position. In his time there was no fixed, divinely-instituted congrega- tional organization, no canon of New Testament Scriptures, no anti- Gnostic theology, and no Catholic Church. There were simply certain communities of believers bound to- gether by a common hope, and by a free organization, which might be modified to any required extent. When Montanus proposed to summon all true Christians to Pepuza, in order to live a holy life and prepare for the day of the Lord, there was nothing whatever to prevent the execution of his plan except the inertia and lukewarmness of Chris- tendom. But this was not the case in the West at the beginning of the 3d century. At Rome and Carthage, and in all other places where sincere Montanists were found, they were confronted by the imposing edifice of the Catholic Church, and they had neither the courage nor the inclination to undermine her sacred foundations. This explains how the later Montanism never attained a posi- tion of influence. In accepting, with slight reservations, the results of the development which the church had undergone during the fifty years from 160 to 210 it reduced itself to the level of a sect. For, if the stand- point of the Catholic Church is once acknowledged, then Montanism is an innovation ; and if the canon of the New Testament is accepted the doctrine of a new era of the Spirit is heresy. 'Tertullian exhausted the resources of dialectic in the endeavour to define and vindicate the relation of the spiritualists to the "psychic" Christians ; but no one will say he has succeeded in clearing the Mon- tanistic position of its fundamental inconsistency.~~

~~Of the later history of Montanism very little is known. But it is at least a significant fact that prophecy could not be resuscitated. Montanus, Prisca, aud Maximilla were always recognized as the inspired authorities. At rare intervals a vision might perhaps be vouchsafed to some Montanistic old woman, or a brother might now and then have a dream that seemed to be of supernatural origin ; but the overmastering power of religious enthusiasm was a thing of which the Montanists knew as little as the Catho- lics. Their discipline was attended with equally disap-~~

~~*pointing results. In place of an intense moral earnestness binding itself by its own strict laws, we find in Tertullian a legal casuistry, a finical morality, from which no good could ever come. It was only in the land of its nativity that Montanism held its ground till the 4th century. It maintained itself there in a number of close communities, probably in places where no Catholic congregation had been formed ; and to these the Novatians at a later period*~~

~~*attached themselves. In Carthage there existed down to the year 400 a sect called Tertullianists; and in their comparatively late survival we have a striking testimony to the influence of the great Carthaginian teacher. On doctrinal questions there was no real difference between the Catholics and the Montanists. The early Montanists (the prophets themselves) used expressions which seem to indicate a Monarchian conception of the person of Christ. After the close of the 2d century we find two sections amongst the Western Montanists, just as amongst the Western Catholics, —there were some who adopted the Logos-Christology, and others who remained Monarchians.*~~

~~*Sources.—The materials for the history of Montanism, although plentiful, are fragmentary, and require a good deal of critical sifting. They may be divided into four groups. (1) The utterances of Montanus, Prisca, and Maximilla! are our most important sources, but unfortunately they cousist of only twenty-one short sayings, (2) The works written by Tertullian after he became a Montanist furnish the most copious information,—not, however, about the first stages of the movement, but only about its later phasc, after the Catholic Church was established. (8) The oldest polemical works of the 2d century, extracts from which have been preserved, especially by Eusebins (Hist, Eccles., bk. v.), form the next group. These must be used with the utmost caution, because even the earliest orthodox writers give currency to many misconceptions and calumnies. (4) The later lists of heretics, and the casual notices of church fathers from the 3d to the 5th century, though not con- taining much that is of value, yet contain a little.2*~~

~~*Literature.—Ritschl's investigations, referred to above, super- sede the older works of Tillemont, Wernsdorf, Mosheim, Walch, Neander, Baur, and Schwegler (Der Montanismus und die christ- liche Kirche des 2ten Jahrhunderts, Tiibingen, 1841), The later works, of which the best and most exhaustive is that of Bonwetsch, Die Geschichte des Montanismus, 1881, all follow the lines laid down by Ritschl. See also, Gottwald, De Montanismo Tertulliani, 1862 ; Réville, "Tertullien et le Montanisme" in the Revue des Deux Mondes, Ist November 1864 ; Stroelin, Essai swr le Montanisme, 1870 ; De Soyres, Montanism and the Primitive Church, London, 1878 ; W. Cunningham, The Churches of Asia, London, 1880; Renan, " Les Crises dn Catholicisme Naissant" in Rev. d. Dewx Mondes, 15th Feb- ruary 1881; Moller, art. "Montanismus" in Herzog's Theol. Realencyklop., 2d ed. Special points of importance in the history of Montanism have been quite recently investigated by Lipsius, Over- beck, Weizsicker (Theol. Lit.-Zeitung, Nr. 4, 1882), and Harnack (Das Ménchthum, seine Idcale und seine Geschichte, 2d ed., 1882, and 4. f. Kircheng., iii. pp. 369-408). Weizsacker's short essays are extremely valuable, aud have elncidated several important points hitherto overlooked. (A. HA.)*~~

~~*MONTARGIS, chief town of an arrondissement in the department of Loiret, France, lies 40 miles east-north-east of Orleans on the railway from Paris to Lyons. Traversed by the Loing, Montargis belongs to the basin of the Seine, but it communicates with the Loire by the Orleans and the Briare canals. It has a fine church (Ste Magdelaine), dating in part from the 12th century, a museum, and a public library ; and it still preserves portions of its once magnificent castle, which was capable of containing 6000 men, and, previous to the erection of Fontainebleau, was so favourite a residence of the royal family that it acquired the title of " Berceau des Enfans de la France." Paper-making (introduced in the beginning of the 18th century) and several other considerable industries are carried on. The population of both commune and town was 9175 in 1876.*~~

~~*Montargis (Afons Argi or Algi, M. Arginus, Montargiwm) was formerly the capital of the Gatinais (Pagus Vastinensis). Having passed in 1188 from the Courtenai family to Philip Angustus, it long formed part of the*~~

~~*royaldomain. In 1528 Francis I. mortgaged town, castle, and forest (this last a tract of great value) to Renée d'Este, daughter of Louis XII, the famous HInguenot princess; and in 1570 Charles IX. gave them in full property to her daughter Anne, through whom they descended to the dukes of Guise, but they were repurchased for the crown in 1612. Montargis was several times taken or attacked by the English in the 15th century, and is parti- cularly proud of the successful defence it made in 1427. Both Charles VII. and Charles VIII. held court in the town ; it was the latter who set the famous Dog of Montargis to fight a ducl with his master's murderer whom he had tracked and captured.*~~

~~*1 Collected by Miinter, and by Bonwetsch, Geschichte des Montan- ismus, p. 197 sq.*~~

~~*2 On the sources, see Bonwetsch, pp. 16-55.*~~

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~~*778*~~

~~*MONTAUBAN, chief town of the department of Tarn- et-Garonne, France, is situated on a slight eminence be- tween the right bank of the Tarn and its tributary streams the Tescou and Lagarrigue, 128 miles by rail east-south- east of Bordeaux. It is connected with the suburb of Ville-Bourbon on the left bank of the Tarn by a remark- able brick bridge of the 14th century, which is 672 feet in length, and consists of seven pointed arches resting on piers, themselves pierced by pointed arches. The cathe- dral, built in 1739, contains the Vow of Louis XIIL., one of the finest paintings of Ingres, a native of Montauban, and at the end of the Carmelite walk a monument was erected to his memory in 1871. In the town-house, once occupied as a palace by the counts of Toulouse and by the Black Prince, are the paintings bequeathed by Ingres, an archeological collection, and a very curious library containing the bequests of several celebrated collectors. Montauban possesses a Protestant theological college. The town has some trade in corn, wine, and grapes. The manu- facture of corn-dressers, coarse cloth, pens, and earthen and china ware are the principal industries; and there are also corn and woollen mills. The population in 1881 was 28,335.*~~

Montauban was only a village in the time of the Romans. In the 8th century a monastery was founded there by the Benedictines, who exercised lordship over the neighbouring population. A considerable impetus was in the 12th century given to its prosperity by a decree of the counts of Toulouse offering freedom to all serfs taking up their residence in the town. Montauban was twice besieged by Simon de Montfort in the Albigensian wars, and was sacked in 1207. By the treaty of Bretigny (1860) it was ceded to the English ; but shortly afterwards they were expelled by the inhabitants. In 1560 the bishops and magistrates embraced Pro- testantism, expelled the monks, and demolished the cathedral. About ten years later it becaine one of the Huguenot strongholds, and formed a small independent republic. It was the headquarters of the Huguenot rebellion of 1621, and was vainly besieged by Louis XIII. for eighty-six days; nor did it submit until after the fall of Rochelle in 1629, when its fortifications were destroyed by Richelieu. In the same year the plague cut off over 6000 of its inhabitants.

MONTBELIARD, chief town of an arrondissement in the department of Doubs, France, is situated 1020 feet above the sea at the confluence of the Allaine and the Lusine, tributaries of the Doubs, and on the canal between the Rhine and the Rhone, about 40 miles north-east of Besangon. Once a fortified city, it still retains the old castle of the counts of Montbéliard. A bronze statue of Cuvier, the inost illustrious native of Montbéliard, and several fine foun- tains adorn the town, which also possesses a museum of natural history and antiquities, and a Protestant normal school. Since 1870 a considerable impetus has been given to its prosperity by the arrival of Alsatian immigrants. The industries embrace watchmaking, the manufacture of graving tools, iron wire, files, watch-springs, and pumps, cotton spinning and weaving, printing, and tanning. The chief exports are cheese, leather, and wood. The popu- lation in 1881 was 8784, of which the great majority were Protestants.

After belonging to the Burgundians and Franks, Montbéliard was, by the treaty of Verdun (843), added to Lorraine. In the 11th century it became the capital of a countship, which formed part of the second kingdom of Burgundy, and latterly of the German empire. From the end of the 14th century until 1793 it belonged to the house of Wiirtemberg. It resisted the

~~attacks of Charles the Bold, King Louis XIT., and the duke of Guise, but was taken in 1676 by Marshal Luxembourg, who razed its fortifications. In 1871 the~~

~~battle of Héricourt between the French and Germans had its com- mencement within its walls.~~

~~MONTE CARLO. See Monaco.~~

~~MONTE CASINO (orCasstno). The Benedictine monas- tery known as the abbey of Monte Cassino is a huge square building of three stories, built on the usual Benedictine plan (see ABBEY) on the summit of a picturesque isolated hill, about 34 miles,to the north-east of the town of Cassino~~

~~(Casinum) or San Germano (population about 5000), which lies midway between Rome and Naples in the valley of the Garigliano. The most prominent architectural feature is the large church (1727), richly decorated in the interior with marbles, mosaics, and paintings. The library and archivio have been spoken of elsewhere (vol. xiv. pp. 531, 548).~~

~~The date of Benedict's withdrawal from Subiaco to Cassino is 529. At that time Cassino was the site of a temple of Apollo and of a grove sacred to Venus. The result of the saint's preaching was that the natives demolished both, chapels to St Martin and John the Baptist being built in their stead, while farther up the hill a monastery began to risc. About 589 the monks were driven from it to Rome by the Lombards of Benevento, and it lay waste for more than a century, until resuscitated by Gregory II. (719). In 787 it received fresh privileges from Charlemagne ; in 884 it was burnt by the Saracens, and was not restored until about seventy years later. From 1322 to 1366 the abbot held episcopal rank ; under the house of Anjou he bore the title of Abbas abbatum, and ranked as first baron of the realm. In 1504 the abbey was sacked by the troops of Gonzalo de Cordova. In 1866 it shared the fate of all other religious houses in Italy ; it is now~~

~~*inhabited by a few monks, and used as a seminary, having about 200 pupils.*~~

~~*MONTECUCULI, Ratmonpo, Count or (1608-1680), a prince of the empire and duke of Melfi, a famous Austrian general, was born at the castle of Montecuculi in Modena, in 1608. At the age of nineteen he began his career in a regiment of infantry under his uncle, Ernest, count of Montecuculi; and during the Thirty Years' War he found many opportunities of displaying his military genius in the imperial service. In 1631, having been severely wounded, he was made prisoner while retreating after the battle of Breitenfeld. Soon after his release he was promoted to the rank of major; and he distinguished himself at the siege of Nérdlingen in 1634, and at the storming of Kaiserslautern in 1635. As colonel, he took part in much hard fighting in Pomerania and in Bohemia; and in 1639 at Melnik, where he tried to prevent the Swedes from crossing the Elbe, he was taken prisoner a second time, being compelled on this occasion to spend more than two years in Stettin. The time was not lost, for he devoted it to a thorough study of military science. In 1642 he was again at work in the imperial army, and for eminent services in Silesia he was made a major-general of cavalry. After a brief visit to Italy, during which he entered the service of the duke of Modena, he returned to Germany, and became councillor of war in 1644. In the following year he supported the archduke Leopold in a campaign against Prince Rakoczy of Transylvania, resisted Marshal Turenne in the Rhine country, and fought with the Swedes in Silesia and Bohemia. The victory at Triebel in Silesia, in 1647, was due chiefly to him, and he was rewarded by being raised to the rank of general of cavalry. After the peace of Westphalia in 1648 he occupied himself for some time with the work of the council of war; and in 1654 he undertook diplomatic missions to Christina, queen of Sweden, and to Cromwell. In 1657 he commanded an expedition against Prince Rakoczy and the Swedes, who had attacked the king of Poland, and Rakoczy was soon forced to withdraw from the Swedish alliance, and to accept terms of peace. As field-marshal he was sent to the aid of Denmark against Sweden; and this war he conducted so successfully that the peace of Oliva was concluded in 1660. In 1663 he resigned the command of an army with which, for about three years, he had been opposing the Turks; but in 1664 he was again made*~~

~~*commander-in-chief, and in the same year he defeated the Turks so decisively near the abbey of St Gotthard that they concluded an armistice for twenty years. He had to deal with more. formidable enemies in 1672, when, the emperor and the imperial diet having resolved to uphold the Dutch against Louis XIV., Monte- cuculi, who had been serving as president of the council of war and director of artillery, was appointed commander of the imperial forces. He took Bonn, and, although closely*~~

~~*watched by Turenne, contrived to effect a junction with the prince of Orange, thereby overthrowing all the calcula- tions of the French. When the elector of Brandenburg received the supreme command in 1674 Montecuculi with- drew from the army; but in 1675, being restored to his former position, he resumed operations against Turenne. The two commanders manceuvred so brilliantly that for about four months neither could do the other much injury ; but, Turenne having been killed by a cannon-ball on the 27th of July 1675, Montecuculi pursued the French into Alsace, and besieged Hagenau and Zabern, retiring from Alsace only when he found himself confronted by Condé. Montecuculi's last achievement in war was the siege of Philippsburg. During the rest of his life he was president of the council of war. In 1679 the emperor Leopold made him a prince of the empire, and shortly afterwards he received from the king of Naples the dukedom of Melfi. Having accompanied the emperor to Linz during the pestilence, he was injured by the fall of a beam wlien entering the castle, and died at Linz on the 16th of October 1680.*~~

~~*Montecuculi was an ardent lover of science, and wrote several important military works. The Opere conwlete di Montceuculi were published in two volumes, at Milan in 1807, at Turin in 1821; and there is a German translation (1786) of his Memorie della guerra ed istruzioni dun generale.*~~

~~*See Campori, Raimondo Montecuculi, la sua famiglia e 4 suot tempi (1877).*~~

~~*MONT-DORE-LES-BAINS, a village of France in the department of Puy de Déme, 17 miles as the crow flies south-west of Clermont Ferrand, 3432*~~

feet above the sea, on the right bank of the Dordogne not far from its source. The Monts Dore, from which it takes its name, close the valley towards the south ; their culminating peak, Puy de Sancy (6188 feet), is the highest eminence of central France. The mineral springs of Mont Dore were known to' the Romans. The eight now used yield 94,600 gallons in twenty-four hours. Bicarbonate of soda, iron, and arsenic are the principal ingredients of the water; to the two last it owes its efficacy in cases of pulmonary consumption, bronchitis, asthma, and nervous and rheumatic paralysis. From the elevation and exposure of the valley, which opens to the north and runs up towards mountains never quite free from snow, the climate of Mont-Dore-les-Bains is severe, and the season is consequently short. About 5000 patients visit the place between 15th June and 15th September, when a casino and theatre are opened. The chief building is the solid but sombre bath-house (hot baths). The surrounding country, with its fir woods, pastures, waterfalls, and mountains, is very attractive. In the "park" at Mont-Dore-les-Bains, which forms a little promenade along the Dordogne, relics from the old Roman baths have been collected, but the ancient establishment must have been on a larger scale than the present one. A pantheon erected about the time of Augustus existed till the 16th century. The population in 1881 was 1438.

MONTELEONE (usually called Monteleone of Cala- bria to distinguish it from Monteleone of Apulia in the province of Avellino, which gave its name to the medieval duchy of the Pignatelli family) is a city of Italy in the province of Catanzaro, on the western side of the Bruttian peninsula, and is beautifully situated on an eminence gently sloping towards the gulf of Sta Eufemia. It was almost totally destroyed by earthquake in 1783, and for many years afterwards consisted mainly of slight wooden erec- tions, but under the French occupation it was made the capital of a province and the headquarters of General Regnier, and it is now a well-built town. The castle was built by Roger, count of Sicily, whom tradition accuses of carrying off the ruins of the ancient temple of Proserpine to the cathedral of Mileto. The population of the town was 9244 in 1871, that of the commune 10,262 in 1861 and 12,047 in 1881.

~~*Monteleone is identified with the ancient Hipponium, a Greek city first mentioned in 389 B.c., when its inhabitants were removed to Syracuse by Dionysius. Restored by the Carthaginians (356), held for a time by Agathocles of Syracuse (294), and afterwards occupied by the Bruttians, Hipponium ultimately became as Vibo Valentia a flourishing Roman colony. Thc harbour established by Agathocles proved of great service as a naval station to Cxsar and Octavius in their wars with Pompeius Magnus and Sextus Pompeius, and remains of its massive mason-work still exist at the village of Bivona on the coast. In the town itself there are no traces of antiquity beyond a mosaic pavement in the church of St Heel (patron saint of Monteleone) and one or two Latin inscrip- 1011S.*~~

~~*MONTELIMAR, chief town of an arrondissement and canton in the department of Dréme, France, is situated near the left bank of the Rhone, 93 miles south of Lyons on the railway to Marseilles. The waters of the Roubion and Jabron, which unite at Montélimar, spread fertility over the plains surrounding the town. A well-planted park separates the town from the station, but within the four gates that still remain the streets are narrow and unin- viting. The ancient castle, one of the most interesting military remains of central France, is now used as a prison. Silk throwing and spinning, and the manufacture of flowered silks and of hats, are the principal industries ; there are also foundries, tool-shops, and tanneries, and agricultural implements and hydraulic lime are made. Montélimar is famed for its nougat, a cake composed of almonds and honey. The population of the town in 1881 was 12,894.*~~

~~*Montélimar was called by the Romans Acusium. At a later period it belouged to the family of Aymar or Adhémar, whence its present name. After coming into the possession of the counts of Valentinois, and then of the dauphins of Viennois, it was united by Louis XI. to the crown of France. It frequently changed hands during the religious wars, and, although it resisted Coligny, it was taken in 1589 by Lesdiguiéres.*~~

~~*MONTENEGRO, often pronounced and sometimes written MonTENERO (Montenegrin, 7.¢., Servian, Crnagora, Russian Z'chernogoriya, and Turkish Karadagh, all equi- valent to Black Mountain), one of the smallest of Euro- pean countries, lies on the*~~

~~*eastern side of the Adriatic, and is bounded by Dalinatia, Herzegovina, Bosnia, and Albania. Previous to 1878 it had an area variously estimated at 1669 square miles (Kaptsevitch), 1711 (Kiepert), and, including the Kutchi territory, 1796 (Behm). The enlargement to about 5272 square miles proposed by the San Stefano treaty (1878) would probably have swamped the Montenegrin nationality, and the Berlin congress brought the total area only up to 3680 miles, or almost exactly half the size of Wales.!*~~

~~*Apart from her new maritime district, Montenegro seems*~~

~~*1 Since 1870 several rectifications of frontier and exchanges of territory have been arranged between Montenegro and Turkey, but these have left the area practically undisturbed. All the figures are approximate estimates, as the only geodetic survey of the country, carried out by Russian officers, is still (1883) in progress. The old frontier line had the great disadvantage to the Montenegrins of leaving the fortress of Niksitch in the north-west, and that of Spuzh in the south-east in the hands of the Turks, who thus commanded the valley of the Zeta, and strategically almost cut the country in two, the distance from the frontier near Niksitch to the frontier near Spuzh being only some 15 miles. The present frontier includes not only these strong- holds, but also those of Podgoritza, Zhabliak (Jablac), and Lesendra, a great part of Lake Scutari, and the coast district with Antivari and Dulcigno. To get access to the sea had long been the ambition of Montenegro, which in her early days had possessed not only Dulcigno but Durazzo, and had surrendered them to purchase from Venice assistance in her struggle against the Turks. The Berlin con- gress gave her the coast from Cape Maria to Cape Kruci or Krutch, but Spizza, the harbour to the north, was retained by Austria, and Dulcigno, to the south, by Turkey. In the beginning of 1880, by the Corti compromise, the Kutchi territory and the plain of Podgoritza were accepted by Montenegro in lieu of Plava and Gussinye, assigned to her by the congress; but the exchange was deferred, and the terms ultimately modified by the congress so as to include Dulcigno in Montenegrin territory. The occupation of the district (November 1880) was only effected after a naval demonstration on the part of the great powers. '*~~

little better at first than a chaos of mountains, but on closer examination it appears that there are two distinct groups, an eastern and a western, divided by the Zeta- Moratcha valley. The loftiest summit is Dormitor, 8146 feet high, in the new territory near the north frontier, next come Kom Kutchi (8031), Kom Vassoyevitzki (7946), and Dormitor Schlime (7936).! Had the original frontier of the Berlin congress towards the south-east been retained it would have run along the still higher Prokletia range. Many of the mountain-tops remain white with snow for the greater part of the year, and from some of the dark ravines the snow never disappears. The south-western portion of the country consists of limestone, the north- eastern mainly of Paleozoic sandstones and schists with underlying trap.? In their general aspect the two regions are strikingly distinct. The former seems, as it were, one enormous mass of hard crystalline rock, bare and calcined, with its strata dipping to the south-west at an angle often of 70 degrees. Its whole surface has been split by atmo- spheric agencies into huge prismatic blocks, and the cracks

< Kovatch Planina o Nova Varosh a es > wren ic s ‘ Ra, . Zon, A a 34M Dormitor™ r=) w h f eet OMY pba Priepotia Y va bs ” a} Ay WwW Z f ty

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have been gradually worn into fissures several fathoms deep. In some places the process has resulted in clusters of im- mense sharp-pointed crags, the sides of which are furrowed by rain-channels, while in others there are countless funnels running down into the rock for 200 feet and more. In like manner the interior of the mass is hollowed out into immense galleries and caves, and during the rainy season subterranean landslips frequently produce local earthquakes, extending over an area of 10 or 12 miles. The sandstone region, on the other hand, presents lofty but rounded forms, clothed for the most part with virgin forest or rich alpine pasture, broken here and there by dolomitic peaks.

1 Bull. de la Soc. de Géogr., Paris, 1881.

~~2 Dr Tietze, whose full report was to appear in the Jahrb. der Reichsan-stalt for 1883, informed the writer that the existence of the following formations in Montenegro has been clearly ascertained :—(1) Paleozoic schists, (2) Wirfen strata of Lower Trias, (3) Trap of the Palxozoic and Wirfen strata, (4) Triassic limestone, (5) Jurassic limestone, (6) Cretaceous limestone, (7) Flysch, in part certainly Eocene, and (8)~~

~~Neogenic or younger Tertiary formations. The existence of nummulitic limestone is still doubtful.~~

~~MONTENEGRO~~

~~The watershed between the Adriatic and the Black Sea crosses the country from west to east in a very irregular line, the southern districts being drained by the Zeta- Moratcha river system, which finds its way to the Adriatic by Lake Scutari and the Boyanna, while the streams of the northern districts form the head-waters of the Drina, which reaches the Danube by way of the Save. The Zeta, rising in Lake Slano, is remarkable for its subterranean passage beneath a mountain range 1000 feet high. Ata place called Ponor the water plunges into a deep chasm, seeming almost to lose itself in foam, but at a distance of several miles it reappears on the other side of the mountains. Its whole course to its junction with the Moratcha is about 30 miles. Rising in the Yavorye Planina, the Moratcha sweeps through the mountain gorges as a foam- ing torrent till it reaches the plain of Podgoritza; then, for a space, it almost disappears among the pebbles and other alluvial deposits, nor does it again show a current of any considerable volume till it approaches Lake Scutari. In the neighbourhood of Duklea* and Leskopolye it flows through a precipitous ravine from 50 to 100 feet high. In the dry season it is navigable to Zhabliak. The whole course is about 60 miles. Of the left-hand tributaries of the Moratcha the Sem or Tsievna deserves to be mentioned for the magnificent caiion through which it flows between Most Tamarui and Dinosha. On the one side rise the mountains of the Kutchi territory, on the other the immense flanks of the Prokletia range,—the walls of the gorge varying from 2000 to 4000 feet of vertical height. Lower down the stream the rocky banks approach so close that it is possible to leap across without trouble. The Ryeka issues full-formed from an immense cave~~

~~south- east of Cettinye (Tsettinye) and falls into Lake Scutari. The three tributaries of the Drina which belong in part to Montenegro are the Piva, the Tara, and the Lim, respect- ively 55, 95, and 140 miles in length. The Tara forms the northern boundary of the principality for more than 50 miles, but the Lim leaves the country altogether after the first 30 miles of its course. Great alterations have taken place on Lake Scutari in recent times. The river Drin, which previous to 1830 entered the Adriatic to the south of Alesia near S. Giovanni di Medua, subsequently changed its course so as to join the Boyanna just below its exit from the lake; one of the chief results has been to raise the level of the lake, and so to flood the lower valleys of the tributary streams. When the International Frontier Com- mission was at Scutari in April 1879, the water stood 8 feet deep in some of the principal streets, and the inundation of city and suburbs lasted that year eight months. A few small lakes are scattered among the mountains, and it is evident that their number was formerly much greater. The plain or hollow of Cettinye was doubtless filled with water at no very distant (geological) date, and even now, when the sudden rains cannot escape fast enough by the ordinary subterranean outlet, the royal village suffers from a flood.~~

~~If the new territory be left out of view, there is but little farming land in Montenegro; the peasant is glad to enclose and protect the veriest patches of fertile soil retained by the hollows in the mountain sides, and one may see "flourishing little crops not a yard square." "The largest landed proprietor is the holder of 60 acres" (Denton, Montenegro, p. 143); the other freehold estates vary from 2 to 20 acres, and it is usually not to the individual but to the house or family that the ownership belongs. Woods and pastures are the common property of the clan (pleme). The people live in small stone-built cottages, grouped for the most part in little villages, and their whole life is~~

~~3 Duklea is the name still borne by the ruins of the Roman Doclea, often, but wrongly, called Dioclea from its association with the family of Diocletian.~~

~~MO N—~~

~~*marked by extreme simplicity. Chastity is a national virtue, and in time of war the women and children of the Turks have often found their safest asylum among their hereditary foes. The main stock of the people is of Servian descent ; and, though the purity of both blood and language has been to some extent affected by foreign elements, mostly Albanian and Turkish, the national unity has not been im- paired. The curious Gipsy colony, which, though speaking Servian, never intermarries with the Montenegrins, is numerically of little importance.! The great mass of the people belong to the Orthodox Greek Church, only some 7000 being Roman Catholics, and 3000 Mohammedans. According to Kaptsevitch, the population was 10,700 in 1838, 120,000 in 1849, 124,000 in 1852, and 170,000 in 1877, but in 1879 it was found that, inclusive of the new territory, the number could not exceed 150,000; since then about 15,000 have been added with Dulcigno. The official returns for 1882 (not based on a census, however) give 236,000 as the total, of whom some 23,000 live in the so-called towns.*~~

~~*Fauna.—Bears are still found in the higher forests, and wolves, and especially foxes, over a much wider arca. A few chamois roam on the loftiest summits, the roebuck is not infrequent in the backwoods, the wild boar may be met with in the same district, and the hare is abundant wherever the ground is covered with herbage. There are one or two species of snakes in the country, including the poisonous Illyrian viper. Esculent frogs, tree frogs, the common tortoise, and various kinds of lizards are all common. The list of birds observed by Baron Kaulbars includes golden eagles and vul- tures, 12 species of falcons, several species of owls, nightingales, larks, buntings, hoopocs, partridges, herons, pelicans, ducks (10 species), goatsuckers, &c. 'he abundance of fish in Lake Scutari and the Tower course of the Ryeka is extraordinary, the shoals of bleak (scor- antza, Leuciscus alburnus) that come up the river formiug almost solid masses. Both trout and salmon are caught in the Moratcha.*~~

~~*Flora.—The flora of Montenegro is comparatively scanty. In the forest districts the beech is the prevailing tree up to a height of 5000 or 5500 feet, and then its place is taken by the pine. 'I'he chestnut forms little groves in the country between the sea and Lake Scutari, but never*~~

ascends more than 1000 feet, and the olive also is mainly confined to the neighbourhood of the Adriatic. Pomegranate bushes grow wild, and in many parts of the south cover the foot of the hills with dense thickets, the rich blossoms of which are one of the special charms of the spring landscape. Wheat, rye, barley, maize, capsicums, and a little tobacco are grown in the north, and in the south, vines, figs, peaches, apples, cherries, citrons, oranges, &c. The potato, introduced in 1786, is cultivated considerably beyond the local demand ; the planting of mulberry trees and the rearing of silk-worms is of growing econoniical importance.

Towns.—CETTINYE (q.v.), With about 2000 inhabitants, is the capital of the country. Podgoritza (about 6000 or 7000 in 1879, since reduced to 4000) is the principal trading town ; it lies at the foot of the mountains (as its name imports), at the junction of the Ruibnitza with the Moratcha, and in Turkish hands was one of the strongest of their fortresses towards Montenegro. Dulcigno (see vol. vii. p. 520) has 3000 inhabitants (before the transfer 5000 to 7000). Niksitch, a fortified place on a slight eminence in the midst of a plain, is about the same size. Antivari (see vol. ii. p. 138), so called from its position opposite Bari in Italy, suffered greatly in the war 1879-80, and lost half of its 5000 inhabitants. Danilovgrad, with 2000, lies on the north side of the Zeta valley ; in the vicinity is Orialuka, the prince's palace with its mulberry uurseries, and the monasteries of Zhdrebanik (burnt by the Turks in 1877, but since rebuilt), while Tcheliya, Moratcha (the most ancient in the principality), and Ostrog (visited annually by about 10,000 pilgrims) are not far off. Spuzh (Spouge), a little lower on the same side of the stream, is a fortified post with about 1000 inhabit- ants. Nyegush or Nyegosh (1200), about three hours distant from Cettinye on the road to Cattaro, is the native seat of the reigning family, which originally came thither from Nyegush in Herzegovina. Zhabliak (1200) was once the "capital," and has been a fortified post since the time of the Venetian power. Ryeka (1500), on the river of that name, is next to Podgoritza in commercial importance ; the prince has two residences in the town. Grahovo (2000) is famous for the great battles of 1851 and 1876.

Montenegro is an absolute hereditary monarchy, vested accord- ing to the principle of primogeniture in the family of Petrovitch Nyegush. The

~~*prince bears the title " Prince of Montencgro and the Berda (mountains) '" — Montenegro here meaning the old Mon- tenegrin nahias (provinces) of Katunska, Tzrmitza, Ryetchka, and*~~

~~*1 See Bogisié in Das Ausland, 1874.*~~

~~*Lyeshanska, and Berda the territory added in the 18th century, or the provinces Byelopavlitchska, Piperska, Moratchska, Vasoye- vitchska, and Kutska. A responsible ministry was introduced in 1877, and there are uow separate departments of justice, foreign affairs, war, and finance and education. The highest administra- tive body is the council of state, instituted in 1879, and consisting of eight members appointed by the prince. Justice in ordinary cases is rendered in primitive fashion. Formal codes were drawn up by Peter I. (1798) and by Danilo (1855), but the real statute book is national custom. A great court, consisting of the minister of justice, and five members named by the prince, is held in the capital, and there are inferior courts in cach of the captaincies (86 in 1879). While formerly the very president of the senate, Mirko Petrovitch (0b. 1865), whose songs are the delight of his countrymen, could neither read nor write, primary education has been widely diffused during the reign of Prince Nicholas (Nikita). In 1851 there was only one school, but before the recent war they had increased to 58, nearly every clan having one for girls as well as for boys. The female Montenegrin Institute (founded and sup- ported by the empress of Russia) attracts pupils from beyond the frontier. It was from the printing-presses of Cettinye and Ryeka that the first books in the Slavonic languages were issued between 1483 and 1493, under the patronage especially of Ivan Beg and George (IV.) Crnoyevitch, "' waywodes of the Zeta," but this pro- mise of literary productiveness was soon cut off by wars with the Turks. Peter Petrovitch Nyegush (1813-1851), who was called to rule in 1830, is recognized as perhaps the greatest of all Serviau poets, —his Gorski Viyenac, or " Mountain Wreath," giving dramatic expression to the " very soul of the Serbian people." Though the press which he established in 1834 was destroyed in the war of 1852-53, another was soon obtained, and under Prince Nicholas, himself a poet, his memory has proved a potent stimulus to*~~

~~*intellectual culture. The first Montenegrin newspaper, Crnogorac, now Glas Crnogorca, began to appear in 1870; the first book-shop was opened in 1879.7*~~

~~*The Montenegrins, however, have had more to do with the sword than with the pen. " Every man, dressed in the picturesque costume of luis tribe, carries his pistol and yataghan in his girdle." Nominally the age of military service is between sixteen and sixty-five, but when war breaks out schoolboy and superannuated veteran are equally eager for the fray. When Prince Nicholas tried to prevent an old man of eighty from joining his forces, the insulted warrior drew his pistol and shot himself. War with the Turks, indeed, is the essence of Montenegrin history. On the death of the Servian king Stephen Dushan, Prince Balsha became independent lord of the province of the Zeta; and when the Servian power was shattered by the Turks in the battle of Kossovo (1389) his territory formed the asylum of all those who determined to make another stand for freedom. In 1485 Ivan Crnoyevitch, finding Zhabliak untenable, fixed his " capital" at Cettinye. In 1516 his son George, who had succeeded him, left his country to its fate; but the people chose their bishop as their chief. Prince-bishops or vladykas, elected by the people, continued to lead them with success against the common foe of Christendom till 1697, when the authority was handed over to Petrovitch Nyegush, with the right of appointing his successors, subject to national approval. At length, in 1851, Danilo, nephew and nominee of the previous vladyka Peter II., prevailed on the "skuptchina"' to declare Mon- tenegro a secular state with the hereditary government of a prince. HIs nephew Nicholas succeeded to the throne in 1860, and at the close of the war 1876-78 Montenegro was declared a sovereign 'principality. For an account of the defeats and victories (the latter by far the more numerous) which have marked the national struggle for existence during its four centuries, the reader is referred to*~~

~~*Denton's Montenegro (Lond., 1877).*~~

~~*See Observations on Montenegro (St Pet., 1881), by Baron Kaulbars, Russian member of the International Commission; Wilkinson's Dalmatia and Montenegro (1848); Wingfield, Tour in Dalmatia, &c. (1859);*~~

~~*Viscountess Strangford, The Eastern Shores of the Adriatic (1864); A. J. Evans, Illyrian Letters (1878) ; W. E. Gladstone in the Nineteenth Century, i.; Freeman, in Macmillan's Mag., 1876; Schwarz, Montenegro (1882). See also the bibliographies in Bull. de la Soc. de Géogr. (Paris, 1865) and Valentinelli, Bib. della Dalmazia (Agram, 1855).)*~~

~~*H. A. W.*~~

~~*MONTEREY, a city of the United States, the capital of California up to 1847, is situated on Monterey Bay, 125 miles south from San Francisco by the southern division of the Southern Pacific Railroad. Originally founded in 1770 as a mission station and presidio (garrison) by Junipero Serra, it is still in the main a Spanish-looking town, with Spanish talked in its streets and painted on its signboards. At the meeting of the first constitutional convention of California Monterey was a port of entry with a flourishing trade and a promising future; but it soon suffered from the rivalry of San Francisco, and it is*~~

~~*2 Cf. Pypin and Spasoviteh, Hist. of Slav. Literatures, vol. i.*~~

~~*now a sleepy place, straggling and dirty, with many of its adobe buildings abandoned to decay. The flourishing Mou- terey whaling company (chiefly Portuguese from the Azores) has its station under the old fort ; and, the Southern Pacific Railroad Company having erected (1881) a magnificent hotel, the place bids fair to become one of the leading water-ing-places on the Californian coast. The mission church of San Carlos, about four miles from the town, is a curious and striking ruin. Population is now (1883) about 1400.*~~

~~*See Franc. Palou, Vida del ven. padre fray J. Serra, Mexico, 1787; Lady Duffus Gordon, Through Cities and Prairie-lands, 1882 ; and Harper's Monthly Magazine, October 1882.*~~

~~*MONTEREY, a city of Mexico, capital of the state of Nuevo Leon, lies 1600 feet above the sea on a sub-tributary of the Rio Grande del Norte, 150 miles south-south-west of Nuevo Laredo, and 190 west-south-west of*~~

~~*Matamoras. A handsome and well-planned city, with a cathedral and a number of good public buildings, Monterey is also in com- mercial and manufacturing activity the most important place in the northern parts of the republic, and one of the principal stations on the railway opened in 1882 between the city of Mexico and the United States frontier (at Matamoras and Nuevo Laredo). The population was about 37,000 in 1880. 'The city was founded in 1596, became a bishopric in 1777, and was captured by the United States forces under General Taylor in September 1846.*~~

~~*MONTE SAN GIULIANO, a city of Sicily, in the pro- vince of Trapani and 12 miles north-east of the town of Trapani, occupies the summit of the mountain from which it takes its name. Rising in the midst of an undulating plain, this magnificent and conspicuous peak (the Eryx of the ancients) has, whether seen from sea or land, such an appearance of altitude that, while it really does not exceed 2464 feet, it has for ages been popularly considered the culminating point of western Sicily, and second only to Mount Etna. By the Phoenicians it was early chosen as the site of a temple, which continued down to the time of the Roman empire to be one of the most celebrated of all the shrines of Venus (Venus Erycina). The ancient city of Eryx, situated lower down the mountain side, disappears from history after the establishment of the Roman power in Sicily,—the inhabitants having probably taken advan- tage of the protection afforded by the sanctity, fortifica- tions, and garrison of the temple-enclosure. In the modern town, the population of which has recently decreased to about 3000 by the migration of considerable numbers to the plain, the chief points of interest are the cathedral, internally restored in 1865, the castle, which occupies the site of the temple, and the three so-called torr del Balio, which probably represent the propylea. Remains of Phoenician masonry are still seen on the north side of the town. The great rock-hewn cistern in the garden of the castle is very like one of the cisterns of the Haram at Jerusalem.*~~

~~*The antiquities of Monte San Giuliano have been carefully in- vestigated by Giuseppe Polizzi (I Monumenti d' Antichita della Provincia di Trapani), and by Professor Salinas (Archivio Storico Siciliano, i., &c.).*~~

~~*Compare Renan, Mélanges d'Histoire et de Voyages; and Sayce in Academy, 30th December 1882.*~~

~~*MONTE SANT' ANGELO, a city of Italy in the pro- vince of Foggia (Capitanata), 10 miles north of Manfre- donia, stands on an offshoot of Monte Gargano 2824 feet high. In 491 the archangel Michael pointed out the place to St Laurentius, archbishop of Sipontum (Man- fredonia), and the chapel, which was built over the cave, to which he drew more particular attention, soon became a famous place of pilgrimage. Though plundered by the Lombards in 657, and by the Saracens in 869, St Michael's was already a wealthy sanctuary in the 11th century, and its prosperity continued till the time of the French occupation. The canons (Canontci Garganici, as*~~

~~*they are usually called) maintained a prolonged contest with the Sipontine archbishops for episcopal independence. According to Ughelli (/talia Sacra, vol. vii. p. 816), a marble statue of the saint by Michelangelo Buonarroti took the place of a silver image. The bronze doors still preserved are fine pieces of Byzantine work, made, as an inscription bears witness, in Constantinople in 1076. The town of Sant'? Angelo, which had only about 3000 inhabitants in the 17th century, numbered 14,759 in 1861, and 13,902 in 1871. Besides the festival of the saint celebrated on the 9th of May, there is a great fair on the 29th of September.*~~

~~*MONTESQUIEU, CHartes LoviIs DE SECONDAT, BARON DE LA BrepE ET DE (1689-1755), philosophical his- torian, was born at the chateau of La Brede, about 10 miles to the south-east of Bordeaux, in January 1689 (the exact date being unknown), and was baptized on the 18th of that month. HIs mother was Marie Francoise de Penel, the heiress of a Gascon-English family. She had brought La Bréde as a dowry to his father, Jacques de Secondat, a mem- ber of a good if not extremely ancient house, which seems first to have risen to importance in the early days of the 16th century. The title of Montesquieu came from his uncle, Jean Baptiste de Secondat, "président & mortier" in the parliament of Bordeaux,—an important office, which, as well as his title, he left to his nephew. Montesquieu was in his youth known as M. de la Bréde. HIs*~~

~~*mother died when he was seven years old, and when he was eleven he was sent to the Oratorian school of Juilly, near Meaux, where he stayed exactly five years, and where, as well as afterwards at Bor- deaux, he was thoroughly educated. The family had long been connected with the law, and Montesquieu was destined for that profession. He was made to work hard at it not- withstanding his prospects (for his uncle's office was his by reversion); but, as in his later life, he seems to have tempered much study with not a little society. His father died in 1713, and a year later Montesquieu, or, as he should at this time strictly be called, La Brede, was admitted coun- sellor of the parliament. In little more than another twelve- month he married Jeanne Lartigue, an heiress and the daughter of a knight of the order of St Louis, but plain, somewhat ill-educated, and a Protestant. Montesquieu does not seem to have made the slightest pretence of affection or fidelity towards his wife—things which, indeed, the times did not demand ; but there is every reason to believe that they lived on perfectly good terms. Like the three previous years, 1716 was an eventful one to him ; for his uncle died, leaving him his name, his important judicial office, and his whole fortune. He thus became one of the richest and most influential men in the district. He continued to hold his presidency for twelve years, in the course of which he had much judicial work to perform, as well as the nonde- script administrative functions which under the old régeme fell to the provincial parliaments. He was none the less addicted to society, and he took no small part in the pro- ceedings of the Bordeaux Academy, to which he contributed papers on philosophy, politics, and natural science. He also wrote much less serious things, and it was during the earlier years of his presidency that he finished, if he did not begin, the Lettres Persanes. They were completed before 1721, and appeared in that year anonymously, with Cologne on the title-page, but they were really printed and published at Amsterdam. This celebrated book (the original notion of which is generally set down to a work of Dufresny, the comic author, but which is practically original) would have been surprising enough as coming from a magistrate of the highest dignity in any other time than in the regency of the duke of Orleans, and even as it was it rather scandalized the graver among Montesquieu's contemporaries. In the guise of letters written by and to two Persians of distinction*~~

~~*SOM TE SOU i EU*~~

~~*travelling in Europe, Montesquieu not only satirized un- mercifully the social, political, ecclesiastical, and literary follies of his dayin France, but indulged in a great deal of the free writing (so free as very nearly to deserve the term licentious) which was characteristic of the tale-tellers of the time. But what scandalized grave and precise readers naturally attracted the majority, and the Lettres Persanes were very popular, passing, it is said, through four editions within the year, besides piracies. Then the vogue suddenly ceased, or at least editions ceased for nearly nine years to appear. It is said that a formal ministerial prohibition was the cause of this, and it is not improbable ; for, though the regent and Dubois must have enjoyed the book thoroughly, they were both shrewd enough to perceive that underneath its playful exterior there lay a spirit of very inconvenient criticism of abuses in church and state. The fact is that the Lettres Persanes is the first book of what is called the Philosophe movement. The criticism is scarcely yet aggressive, much less destructive, and in Montesquieu's hands it never became so; but what it might become in the hands of others was obvious enough. It is this pre- cursorship in his own special line which in all probability made Voltaire so jealous of Montesquieu, as well as the advantage which a wealthy and well-born noble of high official position had over himself. It is amusing to find Voltaire describing the Lettres as a "trumpery book," a "book which anybody might have written easily." It is not certain that, in its peculiar mixture of light badinage with not merely serious purpose but gentlemanlike modera- tion, Voltaire could have written it himself, and it is certain that no one else at that time could. The reputa- tion acquired by this book brought Montesquieu much into the literary society of the capital, and he composed for, or at any rate contributed to, one of the coteries of the day the clever but rather rhetorical Dialogue de Sylla et d Eucrate, in which the dictator gives an apology for his conduct. For Mademoiselle de Clermont, a lady of royal blood, a great beauty and a favourite queen of society, he wrote the curious prose poem of the Temple de Gnide. This is half a narrative, half an allegory, in the semi-classical or rather pseudo-classical taste of the time, decidedly frivolous and dubiously moral, but of no small elegance in its peculiar style. A later jeu d'esprit of the same kind, which is almost but not quite certainly*~~

~~*Montesquieu's, is the Voyage a Paphos, in which his warmest admirers have found little to praise. In 1725 Montesquieu was elected a member of the Academy, but an almost obsolete rule requiring residence in Paris was appealed to, and the election was annulled. It is doubtful whether a hankering after Parisian society, or an ambition to belong to the Academy, or a desire to devote himself to literary pursuits of greater importance, or simple weariness of not wholly congenial work determined him to give up his Bordeaux office ; it is certain that he continued to hold it but a short time after this. It is tolerably clear that he had already begun his great work, and the character of some papers which, about this time, he read at the Bor- deaux Academy is graver and less purely curious than his earlier contributions. In 1726 he sold the life tenure of his office, reserving the reversion for his son, aud went to live in the capital, returning, however, for half of each year to La Bréde. There was now no further formal obstacle to his reception in the Académie Frangaise, but a new one arose. Tll-wishers had brought the Lettres Persanes specially under the minister Fleury's attention, and Fleury, a precisian in many ways, was shocked by them. There are various accounts of the way in which the difficulty was got over, but all seem to agree that Montesquieu made concessions which were more effectual than dignified. He was elected and received in January 1728. Almost immediately after- wards he started on a tour through Europe to observe*~~

~~*men, things, and constitutions. He travelled through Austria to Hungary, but was unable to visit Turkey as he had proposed. Then he made for Italy, where he met Chesterfield. They sojourned together at Venice for some time, and a curious story is told of the way in which either a piece of mischief on Chesterfield's part, or Montesquieu's own nervousness and somewhat inordinate belief in his own importance, made the latter sacrifice his Venetian notes. At Venice, and elsewhere in Italy, he remained nearly a year, and then journeyed by way of Piedmont and the Rhine to England. Here he stayed for some eighteen months, and acquired an admiration for English character and polity which never afterwards deserted him. He returned, not to Paris, but to La Bréde, and to outward appearance might have seemed to be settling down as a squire.*~~

~~*He altered his park in the English fashion, made sedulous inquiries into his own genealogy, arranged an entail, asserted, though not harshly, his seignorial rights, kept poachers in awe, and so forth. Nor did he neglect his fortune, but, on the contrary, improved his estates in every way, though he met with much opposition, partly from the dislike of his tenants to new-fangled ways, and partly from the insane economic regulations of the time, which actually prohibited the planting of fresh vineyards.*~~

~~*Although, however, Montesquieu was enough of a grand seigneur to be laughed at, and enough of a careful steward of his goods to be reviled for avarice, by those of his con- temporaries who did not like him, these matters by no means engrossed or even chiefly occupied his thoughts. In his great study at La Bréde (a hall rather than a study, some 60 feet long by 40 wide) he was constantly dic- tating, making abstracts, revising essays, and in other ways preparing his great book. Like some other men of letters, though perhaps no other has had the experience in quite the same degree, he found himself a little hampered by his earlier work. He may have thought it wise to soften the transition from the Lettres Persanes to the Esprit des Lois, by interposing a publication graver than the former and less elaborate than the latter. He had always, as indeed was the case with most Frenchmen of his century, been interested in ancient Rome and her history ; and he had composed not a few minor tractates on the subject, of which many titles and some examples remain, besides the already-mentioned dialogue on Sylla. All these now took form in the Considérations sur les Causes de la Grandeur et la Décadence des Romains, which appeared in 1734 at Amsterdam, without the author's name. This, however, was perfectly well known; indeed, Montesquieu formally presented a copy to the French Academy. Anony- mity of title-pages was a fashion of the day which meant nothing. The book was not extraordinarily popular in France at the time. The author's reputation as a jester stuck to him, and the salons affected to consider the Lettres Persanes and the new book respectively as the " grandeur " and the "décadence de M. de Montesquieu ;" but more serious readers at once perceived its extraordinary merit, and it was eagerly read abroad. A copy of it exists or existed which had the singular fortune to be annotated by Frederick the Great, and to be abstracted from the Potsdam library by Napoleon. It is said, moreover, by competent authorities to have been the*~~

~~most enduringly popular and the most widely read of all its author's works in his own country, and it has certainly been the most frequently and carefully edited. Its merits are indeed undeniable. Merely scholastic criticism may of course object to it, as to every other book of the time, the absence of the exactness of modern critical inquiry into the facts of history; but this is only a new example of a frequent ignoratio elenchi. The virtue of Montesquieu's book is not in its facts but in its views. It is (putting Bossuet and Vico aside) almost~~

~~the first important essay in the philosophy of history. The point of view is entirely different from that of Bossuet, and it seems entirely improbable that Montesquieu knew anything of Vico. In the Grandeur et Décadence the characteristics of the Lsprit des Lois appear with the neces- sary subordination to a narrower subject. Two things are especially noticeable in it: a peculiarity of style, and a peculiarity of thought. The style has a superficial defect which must strike every one, and which was not overlooked by those who were jealous of Montesquieu at the time. The page is broken up into short paragraphs of but a few lines each, which look very ugly, which irritate the reader by breaking the sense, and which prepare him to expect an undue and ostentatious sententiousness. The blemish, however, is chiefly mechanical, and, though no editor has hitherto had the perhaps improper audacity so to do, it would be perfectly possible to obliterate it without changing a word. On the other hand, the merits of the expression are very great. It is grave and destitute of ornament, but extraordinarily luminous and full of what would be called epigram, if the word epigram had not a certain connotation of flippancy about it. It isa very short book ; for, printed in large type with tolerably abundant notes, it fills but two hundred pages in the last edition of Montesquieu's works. But no work of the century, except Turgot's second Sorbonne Discourse, contains, in proportion to its size, more weighty and original thought on historical subjects, while Montesquieu has over Turgot the immense advantage of style.~~

~~*Although, however, this ballon d'essai, in the style of his great work, may be said to have been successful, and though much of that work was, as we have seen, in all probability already composed, Montesquieu was in no hurry to publish it. He went on "cultivating the garden" diligently both as a student and as an improving landowner. He had lawsuits, sometimes on his own account, sometimes on that of others, and in one case he won from the city of Bordeaux no less than eleven hundred arpents of, it is true, the un- productive dandes of the country. He is said to have begun a history of Louis XI, and there is a story that it was completed but burnt by mistake. He wrote the sketch of Lysimaque for Stanislaus Leczinski; he published new and final editions of the Z"emple de Gide, of the Lettres Persanes, of Sylla et Eucrate (which indeed had never been published, properly speaking). After allowing the Grandeur et Décadence to be reprinted without alterations some half dozen times, he revised and corrected it. He also took great pains with the education of his son Charles and his daughter Denise, of whom he was extremely fond. He frequently visited Paris, where his favourite resorts were the salons of Madame de Tencin and Madame d'Aiguillon. But all the time he must have been steadily working at his book, indeed, a contemporary accuses him of having only gone into society to pick up materials for it. But it seems that he did not begin the final task of composition till 1743. Two years of uninterrupted work at La Bréde finished the greater part of it, and two more the rest. It was finally published at Geneva in the autumn of 1748, in two volumes quarto. The publication was, however, pre- ceded by one of those odd incidents which in literature illus- trate Clive's well-known saying about courts-martial in war. Montesquieu summoned a committee of friends, according to a very common practice, to hear and give an opinion on his work. It was an imposing and certainly not an unfriendly one, consisting of Hénault, Helvétius, the financier Silhouette, the dramatist Saurin, Crébillon the younger, and lastly, Fontenelle,—in fact, all sorts and conditions of literary men. The members of this eminently competent tribunal unanimously, though for different reasons and in different forms of expression, advised the author not to*~~

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~~*publish a book which has been recently described by a judge of certainly not less competence as "one of the most: important books ever written," and which, when importance of matter and excellence of manner are jointly considered, may be almost certainly ranked as the greatest book of the French 18th century.*~~

~~*Montesquieu, of course, did not take his friends'advice. In such cases no man ever does, and in this case it was certainly fortunate. The Esprit des Lois represents the reflexions of asixgularly clear, original, and comprehensive mind, cor- rected by forty years' study of men and books, arranged in accordance with a long deliberated plan, and couched in language of remarkable freshness and idiosyncrasy. The title has been somewhat cavilled at, and, like that of the Considérations, it gave a handle to the somewhat malicious frivolity of the salons. But if it had been preserved in full it would have escaped much of the criticism which it has received. In the original editions it runs L'L£sprit des Lois: ou du Rapport que les Lois doivent avoir avec la Constitution de chaque Gouvernement, les Moeurs, le Climat, la Religion, le Commerce, etc. It consists of thirty-one books, which in some editions are grouped in six parts. This division into parts is known to have entered into the author's original plan, but he seems to have changed his mind about it. Speaking summarily, the first part, containing eight books, deals with law in general and with forms of government; the second, containing five, with military arrangements, with taxation, &c. ; the third, containing six, with manners and customs, and their dependence on climatic conditions; the fourth, containing four, with eco- nomic matters; and the fifth, containing three, with religion. The last five books, forming a kind of supplement, deal specially with Roman, French, and feudal law. The most noteworthy peculiarity of the book to a cursory reader lies in the section dealing with effects of climate, and this indeed was almost the only characteristic which the vulgar took in, probably because it was easily susceptible of parody and reductio ad absurdum, But this theory is but the least part of the claims of the book to attention. Its vast and careful collection of facts, the novelty and prilliancy of the generalizations founded on them, the constructive spirit which penetrates it, its tolerance, its placid wisdom lighted up by vivacious epigram, could only escape the most careless reader. The singular spirit of moderation which distinguishes its views on*~~

~~*politics and religion was indeed rather against it than in its favour in France, and Helvétius, who was as outspoken as he was good-natured, had definitely assigned this as the reason of his unfavourable judgment. On the other hand, if not destructive it was sufficiently critical, and it thus raised enemies on more than one side. Montesquieu was thought too English in his ideas by some, the severe defenders of orthodoxy considered him latitudinarian, and one zealous Jansenist informed him that he was "a pig." It was long suspected, but is now positively known, that the book (not altogether with the goodwill of the pope) was put on the Index, and the Sorbonne projected, though it did not carry out, a regular censure. To all these ob- jectors the author replied in a masterly défense; and there seems to be no foundation for the late and scandalous stories which represent him as having used Madame de Pompadour's influence to suppress criticism. The fact was that, after the first snarlings of envy and incompetence had died away, he had little occasion to complain. Even Voltaire, who was his decided enemy, was forced at length to speak in public, if not in private, complimentarily of the Esprit, and from all parts of Europe the news of success arrived.*~~

~~*Montesquieu enjoyed his triumph rather at La Bréde than at Paris. He was becoming an old man, and, unlike Fonte-*~~

~~*nelle, he does not seem to have preserved in old age the passion for society which had marked his youth. A rather dubious description, published long after his death, repre- sents him as " wandering in his woods from morn to night with a white cotton nightcap on his head, and a vine prop on his shoulder." This, in the florid language of its time (the Republican period), is probably only an imaginative expression of his known interest in managing his estate. But he certainly spent much of his later years in the country, though he sometimes visited Paris, and on one visit had the opportunity, which he is likely to have en- joyed, of procuring the release of his admirer La Beaumelle from an imprisonment which La Beaumelle had suffered at. the instance of Voltaire. He is said also to have been instrumental in obtaining a pension for Piron. Indeed, indigent or unlucky men of letters found in him a constant protector, and*~~

~~*that not merely at the royal expense. Nor did he by any means neglect literary composition. The curious little romance of Arsace et Isménie, a short and unfinished treatise on Taste, many of his published Pensées, and much unpublished matter date from the period subsequent to the Lsprit des Lois. HIe did not, however, live many years after the appearance of his great work. At the end of 1754 he visited Paris, with the intention of getting rid of the lease of his house there and finally retiring to La Bréde. HIe was shortly after taken ill with an attack of fever, which seems to have affected the lungs, and in less than a fortnight he died, on 10th February 1755, aged sixty-six. HIe was buried in the church of Saint Sulpice with little pomp, and the Revolution obliterated all trace of his remains.*~~

~~*The literary and philosophical merits of Montesquieu and his position, actual and historical, in the literature of France and of Europe, form a subject of rather unusual interest in its kind. At the beginning of this century the vicomte de Bonald classed him with Racine and Bossuet, as the object of a 'religious veneration " among Frenchmen. But Bonald was not quite a suitable spokes- man for France, and it may be doubted whether the author of the Esprit des Lois lias ever really occupied any such position in his own country. Fora generation after his death he remained indeed the idol and the great authority of the moderate reforming party in France, and at such times as that party recovered power during the revolutionary period Montesquieu recovered vogue with it. But the tendency of the century and a quarter which have passed since his death has been to reduce the numbers and position of this party ever more and more, and Montesquieu is not often quot- able, or quoted, either by Republicans, Bonapartists, or Legitimists, at the present day. Again, his serious works contain citation of or allusion to a vast number of facts, and the exact (let it be hoped that posterity will not call it the pettifogging) criticism of our time challenges the accuracy of these facts. Although he was really the founder, or at least one of the founders, of the sciences of comparative politics and of the philosophy of history, his descend- ants and followers in these sciences think they have outgrown him. In France his popularity has always been dubious and con- tested. It isa singular thing that, until within the last decade, there has been no properly edited edition of his works, and nothing even approaching a complete biography of him, the place of the latter being occupied by the meagre and rhetorical*~~

~~£loges of the last century. HIe is, his chief admirers assert, hardly read at all in France to-day, and a tolerable familiarity with modern French literature enables its possessor to corroborate this by first-hand knowledge, to the effect that no writer of equal eminence is so little quoted. The admirers just mentioned attempt to explain the fact by confessing that Montesquieu, great as he is, is not altogether great according to French principles. It is not only that he is an Anglo-maniac, but that he is rather English than French in style and thought. HIs work, at least the Esprit, is lacking in the pro- portion and the almost ostentatious lucidity of arrangement which a Frenchman demands. HIs sentences are often enigmatical, and suggestive rather than clear. HIe is almost entirely dispassionate in politics, but he lacks the unswerving deductive consistency which Frenchmen love in that science. HIs wit, it is said, is quaint and alittle provincial, his style irregular and in no definite genre.~~

~~Some of these things may be allowed to exist and to be defects in Montesquieu, but they are balanced by merits which render them almost insignificant. Of the minor works, which are on the whole rather unworthy of their author, nothing need be said here. In the few Pensées, and in detached thoughts of the same kind~~

~~scattered about the tolerably numerous letters which have reached us, there is much acuteness and oint, as also in some of the best sentences of the Considérations and of the Esprit. But no one would put Montesquieu as a pensée, or maxim, writer beside La Roche- foucauld and Joubert, Pascal and Vauvenargues. It is on his three principal works that his fame does and must rest. Each one of these is a masterpiece in its kind. It is doubtful whether the Lettres Persanes yield at their best either in wit or in giving lively pictures of the time to the best of Voltaire's similar work, though they are more unequal. There is, moreover, the great difference between Montesquieu and Voltaire that the former is a rational reformer, and not a mere persiflewr or Jrondeur, to whom fault- finding is more convenient for showing off his wit than acquiescence. Of course this last description does not fully or always describe Voltaire, but it often does. It~~

~~*is seldom or never applicable to Montesquieu. Only one of Voltaire's own charges against the book and its author must be fully allowed. HIe is said to have replied to a friend who urged him to give up his habit of sneering at Montesquieu, "il est coupable de lése-poesie," and this is true. Not only are Montesquieu's remarks on poetry (he himself occasion- ally wrote verses, and very bad ones) childish, but he is never happy in purely literary appreciation. The Considérations are noteworthy, not only for the complete change of style (which from the light and mocking tone of the Lettres becomes grave, weighty, and sustained, with abundance of striking ex ression), but for the profundity and originality of the views, and for the completeness with which the author carries out his plan. These words—except, perhaps, the last clause—apply with increasing force to the Esprit des Lois. The book has been accused of desultoriness, but this arises, in part at least, from a misappreheusion of the author's design. At the same time, it is impossible to say that the equivocal meaning of the word "law," which has misled so many reasoners, has not sometimes misled Montesquieu himself. For the most: part, however, he kceps the promise of his sub-tit!e (given above) with fidelity, and applies it with exhaustive care. It is only in the last few books, which have been said to be a kind of appendix, that something of irrelevancy suggests itself, The real importance of the Esprit des Lois, how- ever, is not that of a formal treatise on law, or even on polity. It is that of anassemblage of the most fertile, original, and inspiriting views on legal and political subjects, put in language of singular sugges- tiveness and vigour, illustrated by examples which are always apt and luminous, permeated by the spirit of temperate and tolerant de- sire for human improvement and happiness, and almost unique in its entire freedom at once from doctrinairianism, from visionary enthusiasm, from egotism, and from an undue spirit of system. As for the style, no one who does not mistake the definition of that much used and much misused word can deny it to Montesquieu. HIe has in the Esprit little ornament, but his composition is wholly admirable. Every now and then there are reminiscences, perhaps a little more close than is necessary, of the badinage of the Lettres Per- sanes, but these are rare, and the author's wit is for the most used only to lighten his pages. Yet another great peculiarity of this book, as well as of the Considérations, has to be noticed. The genius of the author for generalization is so great, his instinct in political science so sure, that*~~

~~*even the falsity of his premises frequently fails to vitiate his conclusions. He has known wrong, but he has thought ri*~~

~~*at sole edition of Montesquien which need be mentioned here is that of Edouard Laboulaye (7 vols., Paris, 1875-1879), the sole biography that of Louis Vian (Paris, second edition, 1879). From the latter the facts of the above notice are principally drawn. The bibliography of Montesquieu's published works is not of any special interest, but in respect of anecdota he occupies a singular position. There is known to exist at La Bréde a great mass of MSS. materials for the Esprit des Lois, additional Lettres Persanes, essays and fragments of all kinds, diaries, letters, notebooks, and so forth. The present possessors, however, who represent Montesquieu, though not in the direct male line, have hitherto refused permission to examine these to all editors and critics, though the publication of some of them has been vaguely promised. At present they are chiefly known by a paper contributed nearly half a century ago to the Transactions of the Academy of Agen (1834).*~~

~~*G. SA,*~~

~~*MONTEVERDE, Craupio (1568-1643), the cncniay of the "free style" of musical composition, was born at Cre- mona in 1568; he was engaged at an early age as violist to the duke of Mantua, and studied composition with some success under Ingegneri, the duke's "maestro di capella," though without thoroughly mastering the difficulties of musical science. His knowledge of counterpoint was limited, and his ear imperfect, but he was a bold experimenter, and his undisguised empiricism led to discoveries which exercised a lasting influence upon the progress of art. He was the first composer who ventured to useunprepared dissonances,— employing them first in his madrigals, the beauty of which they utterly destroyed, but afterwards introducing them into music of another kind with such excellent effect that their value was universally recognized, and all opposition to their use effectually silenced. In 1603 he succeeded*~~

~~*Ingegneri as "maestro di capella ;" and in 1607 he produced, for the marriage of Francesco Gonzaga, his first opera, Ariana, in which he employed the newly-discovered dis- cords with irresistible effect. Though he did not invent the lyric drama—Peri's Huridice having been produced at Florence in 1600—he raised it to a level which distanced all contemporary competition. His second opera, Orfeo, composed in 1608, was even more successful than Ariana, and was based upon a principle which is held by some modern critics to embody the only law to which the dramatic composer owes obedience—that of accommodating the music to the exigencies of the scene. In 1613 Monte- verde was invited to Venice, as " maestro di capella" at St Mark's. Here he composed much sacred music, the greater part of which is lost,—acircumstance the less to be regretted, since his Vespers and Masses bear no comparison with those produced by his predecessors in office. In 1630 he wrote another grand opera, Proserpina rapita. In 1639 he pro- duced L'Adone, and in 1641 Le Nozze di Enea and Il ritorno dUlisse. These later works show him still greatly in advance of his age, notwithstanding the progress made by other composers since the production of Orfeo. Monteverde was ordained priest in 1633; and he died in 1643, uni- versally respected. Though his free employment of the dominant seventh and other unprepared discords put an end to the school of Palestrina, it led the way to the greatest achievements of modern music.*~~

~~*MONTEVIDEO, San Fetire y SANTIAGO DE, the capital of the republic of Uruguay (Banda Oriental) in South America, lies on the eastern side of a nearly semicircular bay on the northern shore of the estuary of the La Plata, 120 miles from Buenos Ayres, with which communication is maintained by a daily service of steamers. The small peninsula on which the city is built does not rise more than 95 feet above the level of the sea; but the headland of Cerro, 505 feet high, which forms the western side of the bay, is notable enough on that low-lying coast to justify the name Montevideo; it is crowned by a lighthouse, and by an old Spanish fort, once of considerable strength. About 620 acres is the area occupied by the city proper; the suburbs stretch for miles into the country. The plan both of the old and the new town is regular ; they are separated by the Calle de la Ciudadela on the line of the old ramparts. A somewhat Oriental appearance is produced by the low houses with their flat terraced roofs*~~

~~*and miradors or watch- towers, from which the merchants look out for ships. As a whole, the city is overbuilt, and immense wealth has been squandered in Italian marbles and other forms of archi- tectural decoration. The streets are for the most part well paved, and there is an extensive tramway system. Mare's grease was for some time employed to make gas for light- ing; but an epidemic having commenced at the gas-yard the works were for a time closed, and when they were re- opened coal-gas was substituted. Previous to 1870, when water was introduced from a distance of 40 miles, the whole supply was dependent on the rainfall. In the old town the principal square is the Plaza de la Constitucion, the south side of which contains the " cathedral," and the north side the cabildo (law-courts, senate-house, and prison). The cathedral (as it is usually called, though the bishop is a bishop in partibus, and takes his title from Megera in Asia Minor) is a somewhat imposing building, consecrated 21st October 1804, with a dome and two side towers 133 feet high, which form one of the best landmarks of the bay. In the line of the old ramparts formerly stood the old Spanish citadel, which was built by the seven years' forced labour of 2000 Guarani Indians. From 1835 to 1868 it served as the principal market in the city; in 1877 it was removed and the area united with the fine Plaza de la Independencia at the south-western end of the Calle del 18 Julio, a broad*~~

~~*town.*~~

~~*street which runs in a straight line right through the new The new market, covering 2 acres, was built in 1867 at a cost of £86,000, and there are besides the Port market (cost £55,320) and the Mercado Chico. The ex- change, constructed after the style of the house at Bordeaux,*~~

~~*dates from 1864, and cost £32,000. Of note also are the*~~

~~*custom-house, the post office (1866), the museum, the public library (founded in 1830 by Dr J. M. Perez Castellano), the*~~

~~*university (dating from 1849), the Solis theatre (1856), the British hospital (established in 1857, present building 1867),*~~

~~*the Hospital de Caridad (founded by Francisco A. Macil in 1825), having an average of 300 patients, the new lunatic*~~

~~*asylum (1877), the Basque church (1858), and the English church (1845), built on the site of a battery taken in 1807 by Sir Samuel Auchmuty's forces.*~~

~~*Since thé beginning of*~~

~~*Map of Montevideo.*~~

~~*the century the depth of water in the bay has been allowed to diminish 5 feet, and the area has been reduced by the construction (1868) of an embankment to carry the railway across it. Dredging has been tried from time to time, but on too limited a scale. The so-called harbour is a space of less than half a mile square off the north-west face of the town ; in 1870 it was reported to be yearly becoming smaller and less safe, and vessels are now obliged to anchor farther out. Among modern improvements in the port the most noteworthy are the Maua dry docks, opened in 1873, and the larger docks, erected in 1877 at a cost of 2,000,000 dollars, at the foot of the Cerro on the other side of the bay. The trade of Montevideo consists mainly in the ex- port of the raw products of the slaughter-house (horns, hides, hair, tallow, wool, bones), with a certain quantity of live stock and preserved meat, and in the import of European manufactures. During the five years 1877-1881 the average value of the exports was £2,303,061, and that of the imports £3,469,997. Of the 1044 vessels (tonnage 780,870) which entered in 1879, 285 were English, 157 Spanish, 145 Italian, 112 German, and 99 French. The population is largely of foreign origin, Italian, Spanish, Basque, and French. In 1874 the Italians, who had rapidly increased after the siege, were about 40,000 strong, and in several quarters of the city nothing was to be heard save North-Italian dialects. Even in 1880, after the exodus caused by the confiscations of 1875, they numbered 36,300. The greater proportion are engaged as petty traders. In 1879 the total population of the town was 73,879; it had been 92,260 in 1878, and 105,296 in 1871, and now (1883), including the environs, is 110,167.*~~

~~*Montevideo owes its origin not to the commercial advantages of its position but to the jealousy of the Spaniards towards the Portuguese, which led Zabala, viceroy of Buenos Ayres, to erect a*~~

~~*fort at this point in 1717. In 1726 the first settlers were intro- duced from the Canary Islands and Andalusia, and more than fifty*~~

~~*years passed before the settlement was declared a port; but by 1781 it had 6460 inhabitants, and by 1792 was importing to the value of 2,993,267 dollars, and exporting to the value of 4,150,523. In 1808 the governor of Montevideo was the first to revolt against the Spanish authorities, and to establish an independent junta; twenty years later, after much disastrous confusion and conflict, the city became the recognized capital of the newly-formed republic of Banda Oriental. Its population, which had been about 36,000 at the opening of the century, was reduced to 9000 by 1829; and it had hardly recovered its ground in this respect (31,189) when, in 1843, Rosas, dictator of Buenos Ayres, wishing to compel annexa- tion to Buenos Ayres, commenced the sicge which was irregularly maintained till 1852, and left the city and the country exhausted and almost ruined. By 1860, however, the population had in- ereasced to 49,548; and though the Brazilians blockaded the port in 1864-5 and reinstated ex-president Flores the prosperity of the lace was but little impaired. During the Paraguayan war, which asted till 1864, Montevideo grew rapidly rich, attracting a large share of the trade diverted from Buenos Ayres. Immigrants flocked from all quarters, and excessive investments were made in all kinds of real property. The valuation of the city and suburbs, which was 14,156,000 dollars in 1860, reached the sum of 74,000,000 dollars in 1872. Reckless speculation, political dis- sension, and the financial mismanagement of the Government have told heavily ; the value of house property has greatly diminished, and commercial activity has been grievously restricted. Since 1881, however, Montevideo has been rapidly recovering, and its natural advantages are so great that, with better political circumstances,*~~

~~*a future of yet higher prosperity may be anticipated.*~~

~~*Notices of Montevideo will be found in Bonelli, Travels in Bolivia, &c., 1854; Hadfield, Brazil, the River Plate, &c., 1854, and his supplemental volume, 1868 ; Mulhall, Handbook of the River Plate Republics, 1874; and Gallenga, South America, 1881. See also Brignardello, Delle vicende dell' America merid. e specialm. di Montevideo nell' Uruguay, Genoa, 1879; The Republic of Uruguay, 1883 ; the reports of the municipal junta, and Vaillant's statistical publications.*~~

~~*MONTEZUMA. See Corres and Mexico.*~~

~~*MONTFAUCON, Bernarp DE (1655-1741), critic and scholar, was born of a noble and ancient family at the chateau of Soulage (now Soulatgé, in the department of Aube, France), on 13th January 1655. Though destined for the army, he passed most of his time in the library of the castle of Roquetaillade (the usual residence of his family), devouring books in different languages and on almost every variety of subject, his studies being directed by a learned friend of his father, Pavillon, bishop of Aleth. In 1672 he entered the army, and in the two following years served as a volunteer in Germany under Turenne. But ill-health and the death of his parents brought him back to his studious life, and in 1675 he entered the cloister of the Congregation of St Maur, at La Daurade, Toulouse, taking the vows there on 13th May 1676. Apart from his vast literary labours, the remainder of his life presents little to record. He lived successively at various abbeys — at Soréze, where he specially studied Greek and examined the numerous MSS. of the convent library, at La Grasse, and at Bordeaux; and in 1687 he was removed to Saint Germain des Prés. From 1698 to 1701 he lived in Italy, chiefly in Rome. Returning to Saint Germain, he was made a member of the Académie des Inscriptions et Belles- Lettres in 1719. He died on 21st December 1741.*~~

~~*His first publication, in which he was assisted by Lopin and Pouget, was the first volume ofa never completed series of previously unpublished Analecta Greea (1688). In 1690 appeared his defence of the literally historical character of the book of Judith.*~~

~~*the Academy of Inscriptions, will be found in the Meuvelle Biographie Générale, s.v. “ Montfaucon.”*~~

~~*MONTFORT, Simon peg, Eart or LEtcester (c. 1200- 1265), a great political leader, and sometimes even re- ferred to as the “founder of the English House of Com- mons,” born in France about the beginning of the 13th century, was the fourth and youngest son of Simon IV. de Montfort and of Alice de Montmorency. Of his early life and education nothing is known, the first definitely recorded fact about him being that in April 1230 he was in England and had attached himself to the service of Henry III., who granted him a temporary pension of 400 marks, with a promise of the earldom which his father had held.1 In the following year he did homage for the honour of Leicester, and in 1232 the king confirmed to him all the land with appurtenances which had belonged to the late earl in England. But, though thus formally admitted to the ranks of the English baronage, he did not for several years succeed in making way against the strong dislike in which “aliens” were now held, and until 1236 most of his time was spent, in considerable poverty, abroad. In that year, however, he attended the king’s marriage to Eleanor of Provence as lord high steward, and thenceforward began to take part in the business of the royal council. Handsome, talented, and brave, he gained the love of Eleanor, widow of the earl of Pembroke, and sister of the king, to whom he was privately married at Westminster on 7th January 1238, Henry himself giving away the bride. When the fact became known, the indignation of the baronage and of the people had almost broken out in open rebellion, and, after Simon had with difficulty averted this by propitiating his brother- in-law, Richard, earl of Cornwall, he found it necessary to go to Rome to meet the objections which the church had raised on the ground of an alleged previous vow made by Eleanor. Having succeeded in obtaining (by bribery, it would seem) the papal sanction to his marriage, he re- turned to England in October, and early next year, still in the enjoyment of the royal favour, he had the earldom of Leicester formally conferred upon him in presence of the assembled barons. In June (1239) he assisted as god- father and high steward at the baptism of Prince Edward ; but the machinations of his enemies were soon afterwards successful in bringing about a change in the fickle humour of Henry, and when Simon came back to Westminster in August to attend*~~

~~the churching of the queen the king met him with the information that he was an excommuni- cated person, and ordered him to leave the church.? Along with his wife he forthwith went into voluntary exile in France; but in April 1240 he returned to England, and was received by the king on a footing of at least outward friendship. Of his private and public life during the~~

~~1 Simon IV. de Montfort, the well-known Albigensian crusader, in right of his mother, Amicia de Beaumont, sister and co-heiress of Robert Fitz-Pernell, earl of Leicester, succeeded to that earldom in 1204, and in 1207 was confirmed in the high stewardship of England, hereditary in connexion with the title. Soon afterwards he was deprived of his English possessions under some pretext, the real reason doubtless being his position as captain-general of the French forces against the Albigenses (1208). He received them again towards the end of Jolin's reign, their custody, however, being committed to his nephew, the earl of Chester. The long hostility between England and France during the early years of Henry III. made it practically impossible for the alien De Montforts to maintain any hold upon their English earldom on the death of Simou IV. in 1218; in 1231, after the peace, the eldest son Amaury (now constable of France) renounced all claim to it, thus leaving the field clear to his next surviving brother Simon.~~

~~2 There is no evidence that Simon actually had been excommuni- cated, but it seems clear that certain payments he had agreed to make to the Roman curia had not been punctually attended to, and that some annoyance had been in this way caused to the king. The charge of immoral] relations with Eleanor was probably only a conveniently coarse way of restating the ecclesiastical offence for which De Mout- fort had already purchased absolution.~~

~~next eight years very few facts have been preserved. There is some ground for believing that he went to the Holy Land in 1240, and a letter is still extant in which the nobility of the kingdom of Jerusalem ask Frederick II. (June 1241) to allow Simon de Montfort, earl of Leicester, to act as regent till the arrival of his son Conrad. In 1242 he accompanied Henry's~~

~~*unsuccessful expedition to France. In the parliamentary history of these years his name appears but seldom, but where he is mentioned he is invariably found on the side of the people, resisting alike the arbitrary wastefulness of the king and the rapacious exactions of the pope. In 1248 De Montfort was appointed for six years the king's "seneschal," or "locum-tenens," in Gascony. In this capacity he was very inadequately supported from home with either men or money; he more than once subdued the rebellious provinces, indeed, but meanwhile his enemies at home gained strength and encouraged the Gascons in repeated accusations and complaints against the seneschal. These re- sulted in one-sided inquiries, but ultimately in his acquittal, and led to a demand on his part for reparation, and a con- sequent quarrel with the king. Towards the end of 1252 De Montfort retired into France, where such was the reputation he enjoyed as a statesman that, on the death of the queen-regent and in the absence of Louis IX., he was offered the office of high steward and a place among the guardians of the crown. This, however, he declined, " being unwilling to prove a renegade;" and, after a partial recon- ciliation with Henry, he returned to England in 1254, In the following year he was sent on a secret mission into Scotland, and in 1257 he was one of the king's ambassadors to France ; but his chief activity between 1254 and 1258, if we are to judge by the prominent place he took in the revolution of the last-named year, must have been in the meetings of parliament. At the Westminster parliament in April 1258 it was significantly upon the earls of Glou- cester and Leicester that the king's half-brother, Wilham de Valence, laid the blame of all the evils under which the country was groaning, De Montfort in particular being called by him "an old traitor and a liar." At Leicester's suggestion the barons leagued for the defence of their rights, and presented themselves armed at the meeting, which extorted the appointment of the committee of twenty-four to meet at Oxford and proceed at once with the reform of the realm. The Provisions of Oxford having been signed (October 1258), De Montfort received the cus- tody of the castle of Winchester, where the parliament con- tinued its session, he meanwhile apparently holding the position of military commander-in-chief; and, after the removal of the barons to London, he was appointed member of an embassy to Scotland. In the early part of 1259 he was chiefly busied with the task of adjusting the terms of a peace with France, which was not settled until the end of*~~

~~*that year. From the date of the conclusion of that peace, owing to divisions in the reforming party, the king began to regain his lost power, and in 1262 he felt himself strong enough to repudiate the Provisions of Oxford, thus giving the signal for civil war. The successes of the barons, led by De Montfort, in the west, and his victorious entry into London again reduced the king to submission, but only to bring once more also into prominence the divided state of Leicester's supporters. Louis's one-sided Mise of Amiens (1264), however, rendered another appeal to arms on the part of the barons inevitable, and by the victory of Lewes (14th May 1264) De Montfort for the time became master of England. Taking Henry, his prisoner, along with him to London, he summoned thither the parliament, which met in June, and drew up the constitution or scheme of government associated with his name, of which the most striking feature is the new development it gives to the*~~

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~~*representative system. A still further advance in the development took place in 1265, when borough members, as distinguished from county members, were for the first time summoned. Meanwhile troubles in the west required De Montfort's presence in the field, and, by the alliance of his rival Gloucester with Roger Mortimer, as well as by the escape of Prince Edward, who put himself at the head of the royalist opposition, the great parliamentary leader was placed in serious straits. At Evesham, where he had halted on his march to join his son at Kenilworth, he was surprised by the army of Prince Edward, and after a struggle of about two hours was slain on the field of battle (4th August 1265). As regards the personal character of De Montfort, it is not surprising to find that contemporary opinion was divided ; but of his determination, constancy, and energy there can be no question, while much is re- vealed by the fact that, though in an unauthorized way, his memory was revered in England as a saint and martyr, offices were drawn up in his honour, his intercession in- voked, and miraculous virtues attributed to his relics. The painstaking labours of recent investigators have tended to bring into clearer light the purity and nobleness of pur- pose of Simon de Montfort*~~

~~*as a consistent defender of the rights of the governed; on the other hand, it has also be- come obvious that the representative institutions of Eng- land, though largely helped forward by him, can hardly be claimed as his creation. Thus on both sides the statement of Hume that the House of Commons was planted by the inauspicious hand of this bold and artful conspirator must be rejected as inconsistent with the facts.*~~

~~*Compare ENGLAND, vol. viii. p. 810 sqq., and see the monographs of Pauli (Simon von Montfort, Graf von Leicester, Der Schépfer des*~~

~~*Hauses der Gemeinen, Tiibingen, 1867) and Prothero (The Life of Simon de Montfort, 1877), and the literature there referred to.*~~

~~*MONTGOMERY (Welsh, Sirydd Tre Faldwyn), an inland county of Wales, is bounded E. by Shropshire, N.E. by Denbigh, N.W. by Merioneth, 8.W. by Cardigan, and §. by Radnor. Its greatest length from south-east to north- west is about 40 miles, and its breadth from east to west about 35 miles. The area is.495,089 acres, or about 773: square miles. The surface is broken and undulating, but it is only round the borders of the county that the hills reach any great height, the highest summits of the different ranges being generally in the adjoining counties. To the north are the Berwyn chain, stretching into Denbigh- shire, in the east the Breidden hills, in the south the Kerry hills, and in the south-west Plinimmon, the highest summit of which is in Cardigan. These various mountain ranges form the watershed of the numerous rivers of Montgomery- shire. With the exception of the Dyfi, which rises near Bala Lake and falls into Cardigan Bay, and the Wye, which flows south into Radnorshire, all the principal rivers are tributaries of the Severn (Welsh, Hafren), which rises on the east side of Plinlimmon and traverses the whole length of the county from south-west to north-east. The principal of these tributaries are the Clywedog, the Taranon, the Rhiew, and the Vyrnwy. This fine succession of river- valleys broaden out as they reach the great vale of the Severn, and the beauty of the scenery is enhanced by an abundance of oak and other trees. The Montgomeryshire canal, which has a length of 27 miles, and passes the principal towns, is connected with the Ellesmere canal, thus affording water communication with Chester and Shrewsbury.*~~

~~*Montgomeryshire is occupied chiefly by Lower Silurian rocks. The boundary between it and Merioneth is formed by the Bala beds. In the centre and east, near Llanfair and Montgomery, Wenlock shales prevail. In the neigh- bourhood of Welshpool the Silurian rocks have been fre- quently dislocated by volcanic masses, one of the most*~~

~~*remarkable of which is Corndon Hill, rising to a height of 1700 feet. In some places the sedimentary rocks have been penetrated by trap mingled with shale or schist. Along the lines of dislocation there are frequent deposits of metallic lodes, carried there by the heated water rising from below. The lead mines of Montgomeryshire are of con- siderable importance, and at present the metal is wrought at seven different places. In 1881 the amount of lead ore obtained in the various mines was 3432 tons, yielding 2693 tons of lead and 25,432 oz. of silver, the total value being £36,495. There were also obtained 1414 tons of zinc ore, yielding 610 tons of zinc, of a total value of £3231.*~~

~~*Agriculture.—The climate is mild and genial, and the soil in the valleys remarkably fertile, especially along tlie banks of the Severn. A considerable portion on the borders of Merioneth is, however, occupied chiefly by heath and moss. The number of holdings has been rather decreasing of late years, the decrease being chiefly in those below 50 acres in extent, which in 1880 (the latest year regarding which there is information) numbered 3572, while there were 1650 between 50 and 300 acres, and 45 above 300 acres, of which 2 were above 1000. According to the agricultural returns of 1882, the total area of arable land was 256,084 acres, or nearly one- half of the whole. Of this 53,538 were under corn crops, 163,441 were permanent pasture, 23,882 rotation grasses, and only 11,107 green crops ; 457 acres were under orchards, 2 under market gardens; 37 under nursery grounds, and 22,744 under woods. Of the corn crops, wheat occupied 18,665 acres, and oats 23,937 acres. Cattle, which are chiefly Herefords and cross-breeds, though there are some Devons and a few of the old Montgomeryshire breed, numbered 62,033 in 1882, of which 21,912 were cows and heifers in milk or in calf. Horses in 1882 numbered 18,985, of which 7060 were used solely for agricultural*~~

~~purposes. The county was long famous for its hardy breed of small horses called merlins, which are still to be met with. Many good hunters and cart-horses are uow bred. The number of sheep in 1882 was 305,641. On some of the heath lands in the centre and west of the county a diminutive breed of sheep called eluns is pastured, but those kept in the better cultivated regions are principally Shropshire Downs. According to the latest return, the land was divided among 3241 proprietors, possessing 387,342 acres, with a gross annual rental of £378,512. Of these, 1314, or 40 per cent., possessed less than one acre, 32 possessed between 1000 and 2000 acres, and 25 between 2000 and 5000; the following possessed upwards of 5000 acres, viz.—Earl Powis, 83,545 ; Sir W. W. Wynn, 32,968 ; Lord Sudeley, 17,158; J. Naylor, 9275; and marquis of Londonderry, 7400.~~

~~Manufactures.—In all the towns the manufacture of woollen cloth, especially Welsh flannel, is carried on, and although the industry was lately on the decline it is now reviving.~~

~~Administration and Population.—Montgomeryshire comprises nine hundreds, and the municipal boroughs of Llanidloes (3421) and Welshpool (7107). lLilanfyllin, Llanidloes, Machynlleth, Mont- gomery, Newtown, and Welshpool form the Montgomery district of boroughs, with a total population in 1881 of 19,925, and return one member to parliament. One member isalso returned for the county. Montgomeryshire is partly in the dioceses of Bangor, Hereford, and St Asaph, and contains sixty-eight civil parishes, townships, or places, as well as parts of other parishes in adjoining counties. From 65,700 in 1831 the population had increased in 1851 to 67,335, and in 1871 to 67,623, but in 1881 it had diminished to 65,718, of whom 33,004 were males and 32,714 females.~~

~~History.—At the time of the Roman invasion, Montgomery was possessed by a tribe of the Cymri called Ordovices. Traces of several of the old British camps still remain, the principal being those at Dolarddyn, on Breidden Hill, and at Caereinion. There are also a large number of cairns and barrows. The county was tra- versed by the great Roman road, the Via Devana, which was joined by a number of others ; but the remains of Roman camps or stations are unimportant. After being vacated by the~~

~~*Romans, little is known of the history of Montgomery, until Wales was subdivided into three districts at the death of Rhodri the Great. Montgomery was then included under Powys, and formed the chief portion of Powys Gwenwynwyn, sometimes called Upper Powys. Powys or Powis Castle, the seat of the rulers of Upper Powys, was founded in 1108. Baldwyn, from which the county takes its Welsh name, was lieutenant of the marches ; and, for the purpose of holding the dis- trict in check, a castle was built about the end of the 11th century, which, after being captured by the natives, was retaken by Roger de Montgomery. He gave his name to the castle, and to the sur- rounding district of ancient Powys, which was made a county by Henry VIII. in 1533.*~~

~~*MontcomErY, the county town, is situated on the decli- vity of a well-wooded hill near the eastern bank of the Severn, 214 miles south by west of Shrewsbury, and 1872*~~

~~*789*~~

~~*by rail north-west by north of London. It is a clean and well-built town, but somewhat scattered and irregular. The principal buildings are the parish church of Saint Nicholas (an old cruciform structure) and the town-hall. The borough has returned members to parliament since the time of Henry VIII, but by the Reform Act of 1832 it was constituted one of the Montgomery district of boroughs, which together return one member. The population of the borough (area, 3323 acres) was 1194 in 1881.*~~

~~*There are only a few crumbling remains of the old fortress of Montgomery, originally founded in the time of William the Con- queror to overawe the Welsh, and held by Roger de Montgomery, from whom the town takes its name. The castle was greatly enlarged in the time of Henry IT1., when it was the scene of fre- quent contests between that monarch and Llewelyn the Great. In the 14th century it was held by the Mortimers, from whom it passed to the house of York. By the crown it was granted in the 15th century to the Herberts of Cherbury, but during the Civil War it was surrendered by Lord Herbert of Cherbury to the Parliamentary forces, by whom it was dismantled.*~~

~~*MONTGOMERY, a district in the lieutenant-governor- ship of the Punjab, lying between 29° 58' and 31° 33' N. lat., and between 72° 29' and 74° 10' E. long., is bounded on the N.E. by Lahore, on the S.E. by the river Sutlej, on the S.W. by Multan, and on the N.W. by Jhang. The area is 5573 square miles. ° Montgomery district, formerly known as Gugaira, occupies a wide extent of the Bari Dodb, or wedge of land between the Sutlej and the Ravi, besides stretching across the latter river into the adjoining Rechna Dodb. In the former tract a fringe of cultivated lowland skirts the bank of either river, but the whole interior upland consists of a desert plateau partially over- grown with brushwood and coarse grass, and in places with impenetrable jungle. On the farther side of the Ravi,*~~

~~*again, the country at once assumes the same desert aspect.*~~

~~*The census of 1868 returned the population at 359,437 (males 200,016, females 159,421), viz., HIndus, 69,805 ; Mohammedans, 277,291 ; Sikhs, 12,286 ; and "others," 55. The Jats, or pastoral tribe, form the most distinctive class in the district. They bear the name of " Great Ravi," in contradistinction to the purely agri- cultural classes, who are contemptuously styled "Little Ravi." They possess a fine physique, with handsome features, claim a Rajput ancestry, and despise all who handle the plough. In former days they exercised practical sovereignty over the agricul- tural tribes. Only two towns in the district contain over 5000 inhabitants, viz., Pak Pattan (6086) and Kamalia (5695). The town of Montgomery, the headquarters station, had a population of only 2416 in 1868.*~~

~~*Out of a total assessed area of 3,569,746 acres, only 538,240 are returned as under cultivation. In 1872-73 the rabé (or spring harvest) acreage was as follows :—wheat (the chief crop), 162,989 acres; barley, 30,134; gram, 21,416; mustard, 2077 ; and tobacco, 1303 acres. Inthe same year the kharif (or autumn harvest) acreage was :—jodr, 20,509 acres ; rice, 18,727; cotton, 16,916; ¢é, 12,457; kangni, 9493 ; and sugar-cane, 498 acres. Irrigation is practised from rivers, canals, and wells ; the total area irrigated by public works is 66,495 acres, and by private works, 158,709. The desert uplands afford after the rains a scanty pasturage for the scattered herds of the Great Ravi Jats, and yield an impure carbonate of*~~

soda (sajjt) from the alkaline plants with which they abound. The commercial staples include wheat, rice, gram, millets, cotton, wool, ghi, hides, and sajjt. Large numbers of camels are bred for exportation. The imports comprise sugar, salt, oil, English piece goods, metals, indigo, and fruits. The manufactures consist of country cloth, coarse striped silk, and lacquered wood-work. The Lahore and Multan railway intersects the district, which is also traversed in every direction by good unmetalled highways. The revenue of the district in 1871-72 amounted to £47,954, of which £42,355 was derived from the land-tax. Education iu 1871-72 was afforded by 59 aided and unaided schools, with a total of 1417 pupils. The average annual rainfall for the seven years ending 1872-73 was 9°6 inches.

From time immemorial the Rechna Doab has formed the home of a wild race of pastoral Jats, who have constantly maintained a sturdy independence against the successive rulers of northern India. The historians of Alexander's invasion mention a tribe called the Cathzans, who probably had their capital at Sangala in the Jhang district, and the Malli with their metropolis at Multan, as in possession of this part of the country. The sites of Kot Kamalia and Harappa in Montgomery contain large mounds of antique bricks and other ruins, while many other remains of ancient cities

or villages lie scattered along the river bank, or dot the now barren stretches of the central waste, clearly marking the former existence of a considerable population. The pastoral tribes of this barren expanse do not appear to have paid more than a nominal allegiance to the Moslem rulers, and even in later days, when Ranjit Sinh extended the Sikh supremacy as far as Multan, the country yielded little or no revenue, and the population for the most part re- mained in a chronic state of rebellion. British influence was first exercised in the district in 1847, when an officer was deputed to effect a summary settlement of the land revenue. Direct British rule was effected on the annexation of the Punjab in 1849. The only incident since then was a general rising of the wild clans dur- ing the

~~*mutiny of 1857, several actions being fought before the clans were defeated and dispersed and order restored.*~~

~~*MONTGOMERY, a city of the United States, the capital of Alabama, is built on a high bluff on the left bank of the Alabama river, 158 miles north-east of Mobile, with which it is connected by rail (180 miles) and by a steamboat service (330 miles). The State-house, rebuilt in 1851 at a cost of $75,000, occupies a commanding site on Capitol Hill. There are a city-hall, a court-house, and two theatres, a large flour-mill, a cotton-factory, two oil-mills, a fertilizer-factory, and several foundries and machine shops. The population was 16,713 in 1880; and, in consequence of the marked increase in commercial and industrial activity since that date, it is now (1883) esti- mated at 19,000. Founded in 1817, and named after General Richard Montgomery (1736-75), the town of Mont- gomery became in 1847 the seat of the State Government instead of Tuscaloosa. From February 1861 to May 1862 it was the capital of the Southern Confederation. In 1865 it was seized by the Federal forces under General Wilson.*~~

~~*MONTGOMERY, ALExanpDER, whose life fell between 1550 and 1610, was the last of the series of Scottish poets who flourished in the 16th century under the patronage of the Jameses. With the union of the crowns, and the transference of James VI. from Edinburgh to London, court favour was withdrawn from Lowland Scotch; it practically ceased to be a literary language, and no poetry of mark was written in the dialect, if we except that of Allan Ramsay's school, till it reappeared in literature as the instrument of the Ayrshire peasant. By a curious coincidence, Montgomery seems to have been, like Burns, a native of Ayrshire. A commendatory sonnet from his pen, extravagantly flattering, as was the custom of the time, was printed with King James's Essays of a Prentice in 1584; he received a pension from the crown a few years later, fell into disgrace apparently for a time, was reinstated in favour, and accompanied his patron to Eng- land. As might be expected from the poet of a court where the king himself was a keen critic, Montgomery's miscellaneous poems show a careful attention to form; he tried many metrical experiments, and managed many complicated staves with skill, The sonnet form, at that time a leading fashion in English verse, was also*~~

~~*cultivated at the Scottish court, and Montgomery's sonnets possess considerable merit. His most successful poem, published in 1597, and frequently reprinted in Scotland, was the allegory of The Cherry and the Slae. The poet, smitten by Cupid, conceives a longing for some cherries, beautiful fruit, but growing high up on a steep and dangerous bank, above a roaring waterfall. Shall he climb and win? Hope and courage and will urge him to try; dread and danger and despair counsel him to be content with the humbler fruit of the sloe, which grows within easy reach. Experience, reason, wit, and skill debate the question. In the end he resolves to venture for the cherry, with the active help of these last-named powers. The conflicting counsels of the poet's advisers are very pithily expressed in proverbs for and against the adventurous enterprise, and the description of the situation is strong and vivid. Mont- gomery was no unworthy successor to Henryson and*~~

~~*Dunbar in executive finish, but the want of originality in his poems shows that the old impulse was nearly ex- hausted. There are traces of Italian influence in his sonnets and love songs, but it was much less powerful with him than with his English contemporaries. MONTGOMERY, James (1771-1854), poet and jour- nalist, was justly described by Lord Byron, in a footnote to English Bards and Scotch Reviewers, as "a man of con- siderable genius," though it was going far beyond the mark to speak of his Wanderer of Switzerland (his first notable poem, published in 1806) as being worth a thousand "Tyrical Ballads." Montgomery was born 4th Novem- ber 1771, at Irvine in Ayrshire, Scotland. Part of his boy- hood was spent' in Ireland, but he received his education in Yorkshire, at the Moravian school of Fulneck, named after the original home of the Moravians, to which sect his father belonged. He drifted at an early age into journalism, and edited the Sheffield Jris for more than thirty years. When he began his career the position of a Dissenting jour- nalist was a difficult one, and he twice suffered imprisonment (in 1795 and 1796) on charges that now seem absurdly forced andunfair. His Wanderer was mercilessly ridiculed by the Edinburgh Review, but in spite of this Montgomery pub- lished many poems, which had a wide popularity :— The West Indies, 1810; The World Before the Flood, 1812; Greenland,*~~

~~1819; Songs of Zion, 1822; The Pelican Island, 1827. Onaccount of the religious character of his poetry, he is sometimes confounded with Robert Montgomery, very much to the injustice of hisreputation. The inspiring force of James Montgomery's poetry was the humanitarian senti- ment which has been such a power in the political changes of this century, and the pulse of this sentiment is nowhere felt beating more strongly than in his verse. His poetry has thus an historical interest altogether apart from its intrinsic value as poetry. But this value is far from con- temptible or commonplace. Strictly speaking, Montgomery was more of a rhetorician than a poet, but his imagination was bold, ardent, and fertile, and more than one of his greater contemporaries owed occasional debts to his vigorous inven- tion and even to his casual felicities of diction, while some passages from his poems keepa place in the literature that is universally read and quoted. At the close of his career as a journalist, when all parties agreed in paying him respect, he claimed for his poetry that it was at least not imitative, and the claim was just as regarded conception and choice of subjects; but as regards diction and imagery the influence of Campbell is very apparent in his earlier poems, and the influence of Shelley is supreme in the Pelican Island, his last and best work as a poet. His Lectures on Poetry and General Literature, published in 1833, show considerable breadth of sympathy and power of expression. Jfemoirs of him were published in seven volumes in 1856-8. They furnish valuable materials for the history of English provincial politics in the 19th century. He died at Sheffield 30th April 1854. MONTGOMERY, Rosert (1807-1855), author of Zhe Omnipresence of the Deity (1828), Satan (1830), and Zhe Messiah (1832), was the Montgomery ridiculed and de- nounced in Macaulay's famous essay. Asa poet, he deserved every word of Macaulay's severe censure; the marks of intellectual feebleness — tautologous epithets, absurdly mixed metaphors, and inapt lines introduced for the sake of rhyme—are visible in every page of his versification. It should be mentioned that Macaulay's "'trouncing" did not diminish the sale of lis so-called poems; one of the works expressly ridiculed reached its 28th edition in 1858. His real name is said to have been Gomery. MONTH. See Astronomy, vol. i. CALENDAR. MONTILLA, a small and unimportant city of Spain in**

p- 800, and

~~the province of Cordova, 32 miles to the south of the city of Cordova, on the Malaga railway, is strikingly situated on two hills which command a beautiful and extensive prospect of the surrounding country. The manufactures (princi- pally weaving) are unimportant, and the trade of the place is chiefly in agricultural produce. The oil of the surround- ing district is abundant and good; and it is the peculiar flavour of the pale dry light wine of Montilla that gives its name to the sherry known as Amontillado. The popu- lation in 1878 was 13,207. Montilla was the birthplace of "The Great Captain," and still shows the ruins of the castle of his father, Don Pedro Fernandez de Cordova.~~

~~MONTLUC, Buatsz pE LassERAN-MAssENCOME, SEIG- NEUR DE (c. 1503-1577), marshal of France, was born about 1503, at the family seat near Condom in the modern department of Gers. He was the eldest son, and his family was a good one, but it was large and poor, and, like most gentlemen of Gascony, he had to trust for endow- ment to hissword. He served first as a private archer and man-at-arms in Italy, with Bayard for his captain, fought all through the wars of Francis I., and was knighted on the field of Cérisoles (1538). Having apparently enjoyed no patronage, he was by this time a man of middle age. Thenceforward, however, his merits were recognized by his appointinent to various important posts. His chief feat was the famous defence of Siena (1555), which he has told so admirably. When the religious wars broke out in France, Montluc, a staunch royalist, held Guienne for the king, and exercised severe but impartial justice on Catholics and Protestants alike. He would have nothing to do with the Massacre of St Bartholomew. Henry III., however, made him marshal of France, an honour which he had earned by nearly half a century of service and by numerous wounds. He died at Estillac near Agen in 1577. Montluc's eminence above other soldiers of fortune in his day is due to his Commentaires (Bordeaux, 1592), in which he described his fifty years of service. This book, the "'soldier's Bible" (or "'breviary," according to others), as Henry IV. called it, is one of the most admirable of the many admirable books of memoirs produced by the unlearned gentry of France at that time. It is said to have been dictated, which may possibly account in some degree for~~

~~the singular vivacity and picturesqueness of the style. Hardly any author excels Montluc in the clearness with which he brings military operations before the reader. As with most of his con- temporaries, his work is didactic in purpose, and he often pauses to draw morals for the benefit of young commanders, but never tediously. The eloquence displayed in some of the speeches is remarkable. These Commentaires are to be found conveniently in the collection of Michaud and Poujoulat, but the standard edition is that of the Société de l Histoire de France, edited by M. de Ruble (5 vols.~~

~~1865-72).~~

~~MONTLUCON, the industrial capital of the centre of France, sometimes called the French Manchester, is the head of an arrondissement, and the largest town (26,079 inhabitants in 1881) of the department of Allier. The upper town consists of steep, narrow, winding streets, and preserves several buildings of the 15th and 16th centuries ; the lower town, traversed by the river Cher (there converted into a canal communicating with that along the Loire), is the seat of the manufacturing industries, which embrace glass, steel, and iron works, lime-kilns, saw-mills, and a wool-spinning factory. The Commentry coal-mines are only a few miles distant. There is railway connexion with Moulins (50 miles to the east-north-east), Bourges, Limoges, and Clermont-Ferrand, and a new line is about to be opened to Tours wa Chateauroux. Of the churches, Notre Dame is of the 15th century, St Pierre partly of the 12th, and St Paul modern. The town-hall, with a library, occupies the~~

~~site of an old Ursuline convent, and two other convents now~~

~~serve as college and hospital.~~

~~Montlugon, which existed as early as the 10th century, was taken by the English in 1171 and by Philippe Auguste in 1181; the English were beaten under its walls in the 14th century. The castle, rebuilt by Louis II., duke of Bourbon, was taken by Henry IV. during the religious wars ; at present it is occupied as a barracks.~~

~~*MONTMORENCY, the name of one of the oldest and*~~

~~*'most distinguished families in France, is derived from*~~

~~*Montmorency, now in the department of Seine-et-Oise, in the immediate neighbourhood of Enghien and St Denis, and about 9 miles to the north-north-west of Paris. The family, since its first appearance in history in the person of Boucnarp or Burcuarp LI., sire de Montmorencyin the 10th century, has furnished six constables and twelve marshals of France, several admirals and cardinals, numerous grand officers of the crown and grand masters of various knightly orders, and was declared by Henry IV. to be, after that of the Bourbons, the first house in Europe. Marrurev L, sire de Montmorency, received in 1138 the post of constable, and diedin 1160. His first wife was Aline, the natural daughter of Henry I. of England; his second, Adelaide or Alice of Savoy, widow of Louis VI. and mother of Louis VII. According to Duchesne, he shared the regency of France with Suger, during the absence of the latter king on the second crusade. Marruiev II. had an important share in the victory of Bouvines (1214), and was made grand constable in 1218. During the reign of Louis VIII. (1223-1226) he distinguished himself chiefly in the south of France (Niort, Rochelle, Bordeaux). On the accession of Louis IX. he was one of the chief supports of the queen- regent Blanche of Castile, and was successful in reducing all the vassals to obedience. Hediedin 1230. His younger son, Guy, in right of his mother, became head of the house of Montmorency-Laval. AnnE de Montmorency (1493-1567), so named, it is said, after his godmother Anne of Brittany, was the first to attain the ducal title. He was born at Chantilly in 1493, and was brought up with the dauphin, afterwards Francis I., whom he followed into Italy in 1515, distinguishing himself especially at Marignano. In 1516 he became governor of Novara; in 1520 he was present at the Field of Cloth of Gold, and afterwards had charge of important negotiations in England. Successful in the defence of Méziéres (1521), and as commander of the Swiss troops in the Italian campaign of the same year, he was made marshal of France in 1522, accompanied Francis into Italy in 1524, and was taken prisoner at Pavia in 1525, Released soon afterwards, he was one of the negotiators of the treaty of Madrid, and in 1530 reconducted the king's sons into France. On the renewal of the war by Charles V.'s*~~

~~invasion of France in 1536, Montmorency compelled the emperor to raise the siege of Marseilles ; he afterwards accompanied the king of France into Picardy, and on the termination of the Netherlands campaign marched to the relief of Turin. In 1538, on the ratification of the ten years' truce, he was rewarded with the office of constable, but in 1541 he fell into disgrace, and did not return to public life until the accession of Henry II. in 1547. In 1548 he repressed the insurrections in the south-west, particularly at Bordeaux, with great severity, and in 1549- 1550 conducted the war in the Boulonnais, negotiating the treaty for the surrender of Boulogne on 24th March 1550. In 1551 his barony was erected into a duchy. Soon after- wards his armies found employment in the north-east in connexion with the seizure of Metz, Toul, and Verdun by the French king. His attempt to relieve St Quentin issued in his defeat and captivity (10th August 1557), and he did not regain his liberty until the peace of Cateau-Cambrésis in 1559. Supplanted in the interval by the Guises, he was treated with coldness by the new king, Francis IL, and compelled to give up his mastership of the royal house-~~

~~hold,—his son, however, being appointed marshal by way of indemnity. On the accession of Charles IX. in 1560 he resumed his offices and dignities, and, uniting with his former enemies, the Guises, played an important part in the Huguenot war of 1562. Though the arms of his party were victorious at Dreux, he himself fell into the hands of the enemy, and was not liberated until the treaty of Amboise (19th March 1563). In 1567 he again triumphed at St Denis, but received the death-blow of which he died soon afterwards at Paris. His eldest son, FRaNcoIsE de Montmorency (1530-1579), was married to Diana, natural daughter of Henry II.; another son, Henri I. de Mont- morency (1534-1614), was constable of France from 1593. Henry II. (1595-1632), son of duke Henry I., succeeded to the title in 1614, having previously been raised by Louis XIII. to the office of grand admiral. In 1625 he defeated the French Protestant fleet under Soubise, and seized the islands of Rhé and Oleron, but the jealousy of Richelieu deprived him of the means of following up these advantages. In 1628-1629 he was allowed to command against the duke of Rohan in Languedoc; in 1630 he defeated the~~

~~*Piedmon- tese, and captured Prince Doria, at Avigliana, and took Saluces. In the same year he was created marshal. In 1632 he joined the party of Gaston, duke of Orleans, and placed himself at the head of the rebel army, which was defeated by Marshal Schomberg at Castelnaudary (1st September 1632); severely wounded, he fell into the enemy's hands, and, abandoned by Gaston, was executed as a traitor at Toulouse on 30th October. The title passed to his sister CHARLOTTE-MARGUERITE, princess of Condé.*~~

~~*MONTORO, a town of Spain, in the province of Cordova, 27 miles to the north-north-east of that city, on the Madrid railway, stands on a rocky peninsula on the south bank of the Guadalquivir, here crossed by a fine bridge of four arches dating from the 16th century. Its most conspicuous build- ing is a hospital, said to be one of the best in Andalucia. The most important article of commerce is the oil of the swrounding district. The population of the ayuntamiento was 13,293 in 1878.*~~

~~*MONTPELIER, a town of the United States, the capital of Vermont (since 1805), and the county seat of Washington county (since 1811), is situated in 44° 17' N, lat. and 72° 36' W. long., on the Winooski or Onion river, which falls into Lake Champlain. It has a station on the Central Vermont Railroad, and is the western terminus of the Montpelier and Wells River and the Montpelier and White River Railroads. The State-house, in the form of a Greek cross with a dome and Doric portico, was erected at a cost of $150,000, to replace the structure burned down in 1857. Under the portico stands a marble statue (by Larkin G. Mead) of Ethan Allen (1737-1789), the hero of Vermont. The State library contains 20,000 volumes. From 2411 in 1860 the population had increased to 3219 in 1880.*~~

~~*MONTPELLIER, chief town of the department of Heérault, France, is situated at the junction of several railway lines, on a small hill rising above the Lez, at its confluence with the Merdanson, about 480 miles south of Paris, and about 7 miles from the Mediterranean, from which it is separated by the lagoons of Pérols and |'Arnel. As the headquarters of the 16th corps d'armée, as the seat of a bishop, of a university, and of a court of appeal, Montpellier is the principal place of lower Languedoc. The Place du Peyrou, 575 feet in length by 410 in breadth, one of the*~~

~~*finest squares in France, occupies the highest part of the town, and terminates in a terrace, commanding a magnificent view of the coasts of the Mediterranean, and of a wide stretch of country reaching to the Cevennes on the north, to the spurs of the Pyrenees on the south-west, and to those of the Alps on the north-east. On the terrace is situated the reservoir of the town, the water being*~~

~~*brought from a distance of 5 or 6 miles by an aqueduct of two tiers of arches, about 70 feet in height. In the centre of the square is an equestrian statue of Louis XIV. To the right and left are promenades, on which the chief boulevards converge. The Boulevard Henri IV. to the north leads to the botanical garden, medical college, and cathedral; to the east the Rue Nationale leads to the palace of justice, the préfecture, and the citadel. The cathe- dral, which until 1536 was the church of a Benedictine monastery, suffered severely during the religious wars, but about thirty years ago it was restored in the style of the 13th century. It has four towers, and is one of the largest churches in southern France, being more than 300 feet in length, 92 in breadth, and 88 in height. The monastery, after being converted into the bishop's palace, has since 1795 being occupied by the famous medical school. The portrait of Rabelais hangs in the gallery of former professors. Connected with the medical school is an anatomical museum and a rich library. Montpellier also possesses a faculty of science, with several fine collections, a faculty of letters, a higher school of pharmacy, an agricultural college, and a sericultural institute. The museum contains more than 600 paintings, in addition to collections of marbles, bronzes, and antiquities. The botanical garden, more than 10 acres in extent, is the oldest in France, having been laid out in 1593. The esplanade, ornamented by fine old trees planted by the duc de Roquelaure, formerly governor of Languedoc, leads towards the citadel. The inner city has narrow and tortuous streets, but many good houses. Among the public buildings, the principal are the palace of justice —a modern structure, the facade adorned with statues of the statesman Cambacérés and of Cardinal Fleury—the barracks, several hospitals, the juvenile seminary, and the central prison for females. There are several learned societies, including an academy of science and letters, an*~~

~~*antiquarian society, several medical societies, and others for various separate branches of study, including the dialect of Languedoc. The Lez has been deepened and widened so as to connect Montpellier with the Canal du Midi and with the sea at Palavas. The town has a considerable trade in wine and brandy. The principal industrial establishment is a manufactory for wax-tapers, candles, and soap, doing business to the amount of £400,000 per annum. There are also chemical works, cooperages, distilleries, &c. The population in 1881 was 56,005. Montpellier first rose into importance after the destruction of Maguelone by Charles Martel in 737. Its prosperity dates from the beginning of the 12th century, when its school of medicine (see vol. xv. p. 807) first began to acquire fame. It had a school of law in 1160, and a university was founded by Pope Nicholas IV. in 1292. St Louis (Louis IX.) granted to the town the right of free trade with the whole of the kingdom, a privilege which greatly increased its prosperity. In 1204 Montpellier became a dependency of the house of Aragon, through marriage, and in 1350 it was sold to Philip of Valois. In the time of Charles VIII. it is said to have had 35,000 hearths. It took the place of the bishopric of Mague- lone in 1536. At the time of the Reformation it became one of the most important centres of Protestantism, but was taken by Louis XIII., who erected the citadel commanding the town. Several years afterwards Montpellier was partly depopulated by the plague. Of the old fortifications little now remains save the gate of Peyrou, a triumphal arch of date 1712, opposite the place*~~

~~*of the same name.*~~

~~*See Germain, Histoire du commerce de Montpellier antéricurement & Touverture du port de Cette (2 vols., 1861), and Histoire de la commune de Montpellier (3 vols., 1851); Aigrefeuille, Histoire de la ville de Montpellier (1877).*~~

~~*MONTPENSIER, ANNE Marie LovisE D'ORLEANS, DUCHESSE DE (1627-1693), one of the most remarkable names on the somewhat arbitrary list of royal and noble authors, was born at the Louvre on 29th May 1627. Her father was Gaston of Orleans, " Monsieur," the brother of Louis XIII., celebrated for the invariable ill fate which attended his*~~

~~*favourites and partisans. Her mother was Marie de Bourbon, heiress of the Montpensier family. Being*~~

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~~*thus of the blood-royal of France on both sides, and an heiress to immense property, she appeared to be very early destined toa splendid marriage. It was perhaps the greatest misfortune of her life that "Mademoiselle" (as her courtesy title went) was encouraged or thought herself encouraged to look forward to the throne of France as the result of a marriage with Louis XIV., who was, however, eleven years her junior. Ill-luck, or her own wilfulness, frustrated numerous plans for marrying her to various persons of more or less exalted station, including Charles IJ. of England, then Prince of Wales. She was just of age when the Fronde broke out, and, attributing as she did her disappointments to Mazarin, she sympathized with it not a little. It was not, however, till the new or second Fronde that she dis- played in a very curious fashion a temper and courage as masculine and adventurous as those of her father Gaston had always been effeminate and timid. She not only took nominal command of one of the armies on the princes' side, but she literally and in her own person took Orleans by escalade, crossing the river, breaking a gate, and mount- ing the walls with the applause of the populace of the city, but in face of the refusal of the authorities to admit her. No good result, however, came to her party from this extraordinary act, and she had to retreat to Paris, where she practically commanded the Bastille and the adjoining part of the walls. On the 2d of July (1652) the battle of the Faubourg Saint Antoine, between the Frondeurs under Condé and the royal troops under Turenne, took place, and the former, being beaten, found themselves in an awkward situation, between their conquerors and the walls of a city, which, though not exactly hostile to them, was not nominally on their side, and had closed its gates against them. Mademoiselle saved them by giving orders not merely for the gates under her control to be opened but for the cannon of the Bastille to fire on the royalists, which was done. Her own residence (and indeed her pro- perty) was the Luxembourg, and here she found herself during the riots which followed the battle; but in the heat of the émeute she installed herself in the hétel de ville, and played the part of mediatrix between the opposed*~~

~~*parties. Her political importance lasted exactly six months, and did her little good, for it created a lifelong prejudice against her in the mind of her cousin, Louis XIV., who never forgave opposition to his sovereign power. Nor had she any support to look for from her pusillanimous father, who hastened to make terms for himself,—a matter the less difficult that his known faithlessness had pre- vented the chiefs of the Fronde from engaging him at all deeply in their schemes. Mademoiselle, on the other hand, was for some years in disgrace, and resided on her estates. It was not till, 1657 that she reappeared at court, but, though projects for marrying her were once more set on foot, she was now past her first youth. Her incurable self-will, moreover, still stood in her way, and suitor after suitor was rejected for reasons good or bad. She was nearly forty, and had already corresponded seriously with Madame de Motteville on the project of establishing a ladies' society "sans mariage et sans amour," when a young Gascon gentleman named Puyguilhem, afterwards celebrated as M. de Lauzun, attracted her atten- tion. It was some years before the affair came to a crisis, but at last, in 1670, Mademoiselle solemnly demanded the king's permission to marry Lauzun. Madame de Sévigné's letter on this occasion is one of the most famous of her collection. Louis, who liked Lauzun, and who had been educated by Mazarin in the idea that Mademoiselle ought not to be allowed to carry her vast estates and royal blood to any one who was himself of the blood-royal, or even to any foreign prince, gave his consent, but it was not imme- diately acted on. The pride of the other members of the*~~

~~*royal family, and the spite of the king's brother, Monsieur, who had, after the death of Henrietta of England, made offers to his cousin, prevailed with Louis to rescind his permission. Not long afterwards Lauzun, for another cause, was imprisoned in Pignerol, and it was years before Mademoiselle was able to buy his release from the king by settling no small portion of her estates on Louis's bastards. The elderly lovers (for in 1681, when Lauzun was released, he was nearly fifty, and Mademoiselle was fifty-four) were then secretly married, if indeed they had not gone througli the ceremony ten years previously. But Lauzun, a coarse and*~~

~~*brutal adventurer, tyrannized over his wife, and her spirit, which was yet unbroken, at length got the better of her passion. It is said that on one occasion he addressed her thus, " Louise d'Orléans, tire-moi mes bottes," and that she at once and finally separated from him, She lived, how- ever, for some years after he had achieved his last adven- ture (that of assisting the family of James II. to escape from England, and attempting to defend their cause in Ireland), gave herself to religious duties, and finished her Jlémotres, which extend to within seven years of her death (9th April 1693), and which she had begun when she was in disgrace thirty years earlier. These Mémoires (Amster- dam, 1729) are of very considerable merit and interest, though, or perhaps because, they are extremely egotistical and often extremely desultory. Mademoiselle writes with- out art, but with the hereditary ability of her family, and the strongly personal view which she takes of public events is rather an advantage than a disadvantage. They are to be found in the great collection of Michaud and Poujoulat, and have been frequently edited apart. (G, SA.) MONTREAL, the largest city in the Dominion of Canada, its chief seat of commerce and principal port of entry, is situated on an island of about 30 miles in length and 7 in breadth, at the confluence of the rivers Ottawa and St Lawrence, 45° 32' N, lat. and 73° 32' W. long. It stands at the head of ocean navigation, 160 miles above Quebec, and nearly 1000 miles (986) from the Atlantic Ocean, and lies at the foot of the great chain of river, lake, and canal navigation which extends westward through the great lakes. Montreal is built upon a series of terraces, the former levels of the river or of a more ancient sea. Behind those rises Mount Royal, a mass of trap-rock thrown up through the surrounding limestone strata to a height of 700 feet above the level of the river. From this rock the city derives its name, though its original founder, Paul de Chomedey, sire de Maisonneuve, in 1642, gave it the name of Ville-Marie, when it was dedicated with religious enthu- siasm, not as a centre of commercial enterprise, but as the seat of a mission which aimed specially at the conversion of the native Indians. The modern city of Montreal occupies an area of about eight square miles,—its principal streets running parallel with the river. On the north side of the Mountain the Trenton limestone approaches the surface, and is there quarried for building purposes. Of this grey limestone most of the public edifices and many of the better class of private dwellings are built. But both brick and wood are*~~

~~*largely used for workshops and private houses of a humbler class. The western slope of the Mountain is occupied by the Céte des Neiges (Roman Catholic) ceme- tery, and the Mount Royal (Protestant) cemetery. The upper portion of the Mountain, embracing an area of 430 acres, is now laid out as a public park, with fine drives shaded by well-grown trees. From its commanding site, and the wide expanse of the valley of the St Lawrence, the views on all sides are of great variety and beauty. A well-cultivated and wooded country, watered by the Ottawa and the St Lawrence, stretches away on either hand, being bounded on the west by the lakes of St Louis and the Two Mountains, and on the distant horizon by XVI.—100*~~

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~~*the Laurentian Hills, the Adirondacks, and the Green Mountains of Vermont. On the east side the city occupies the slope towards the river St Lawrence, which has here a breadth of from one to two miles. Two islands, the Nun's and St Helen's Isles—the latter rising to a height of 150 feet, beautifully wooded, and laid out as a public park—occupy the bed of the river immediately below the Lachine Falls, and between them the river is spanned This wonderful triumph*~~

~~*AS*~~

~~*Plan of Montreal.*~~

~~*6. Notre Dame.*~~

~~*7. Champ de Mars.*~~

~~*8. Court House.*~~

~~*9. City Hall. 10. Bonsecours Market.*~~

~~*. M'Gill College.*~~

~~*. Christchurch Cathedral (Episcop.) . Church of the Gesu.*~~

~~*. St Peter's Cathedral.*~~

~~. Railway Station.~~

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~~piers are constructed with a view to resist the enormous pressure of the ice in spring. Near at hand the towers, spires, and domes of numerous churches and public build- ings rise from the general mass of houses, The wharves and docks are crowded with shipping during the season of navigation, for the St Lawrence is navigable to Montreal by the largest ocean steamers. But immediately above the city the river is impeded by a natural dyke of trap and limestone which here arrests the waters in their descent, forming the Lake St Louis at a height of 44 feet above the level of Montreal harbour. The river here forces its way through a channel of about half a mile wide, with a rapidity of about 18 miles an hour, forming the Lachine or St Louis Rapids. Owing to the immense volume of water concentrated in a narrow channel, steamers drawing ten feet of water are safely navigated down the rapids, but these necessarily present an insuperable barrier to the ascent of the river. This is accordingly surmounted by means of the Lachine Canal, which, commencing at the port of Montreal, passes round the falls by a series of locks, in a course of nine miles, to Lake St Louis, opposite the Indian village of Caughnawaga. The fall of water~~

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~~in the canal furnishes water-power for saw-mills, boiler and engine works, sash, blind, door, edge-tool, and other factories, established on its banks. Sugar-refining has also been carried on here with great profit. Woollen and cotton mills, silk factories, a large rubber factory, rope and cordage works, boot and shoe factories, &c., are likewise organized on an extensive scale. The water supply of Montreal is derived from the river above the city; and, after passing along an open canal 5 miles in length, it is raised to a reservoir excavated out of the solid rock on the east slope of the Mountain, 205 feet above the level of the harbour.~~

~~The circumstances attendant on the foundation of Montreal, and the marked contrasts in its mixed population of French and English, give a peculiar character to its religions and benevolent institutions. This has led~~

~~*to the multiplication of churches, colleges, convents, and religious and charitable foundations, and to a rivalry in the zeal of their promoters, one result of which is seen in the scale and imposing character of many of their buildings. The Metropolitan Cathedral of St Peter, designed to reproduce on a reduced scale the chief features of St Peter's at Rome, was projected by Bishop Bourget after the destruction of his church mt 2 palace in the great fire of 1852. It occupies a prominent site in Dorchester Street, at the corner of Dominion Square ; and, when surmounted by the projected dome and finished in front with its classic fagade, it will form a striking feature in the general view of the city. The parish church of Notre-Dame, on the Place d'Armes, affords accommodation for 10,000 worshippers. The Jesuits' Church is another large church, elaborately painted in the interior. Near it is the College of St Mary. Christchurch Cathedral (Protestant) is a fine specimen of Decorated Gothic, built externally of the native limestone, but with the chief facings and carvings of the exterior and the whole of the interior of fine Caen stone. It was erected under the direction of Bishop Fulford, the first Anglican bishop of Montreal, to whose memory a memorial cross, after the mode! of the Queen Eleanor crosses, has been erected on the south side of the cathedral. The other churches of the various Protest- ant denominations include St George's, Anglican, St Andrew's and St Paul's (Presbyterian), St James Street Methodist Church, the Church of the Messiah, Unitarian, &c.*~~

~~*The Hétel Dien, founded in 1644 for the cure of the sick, now occupies a bnilding at the head of St Famille Street. A body of professed sisters and novices perform the duties of nursing and attendance, and upwards of 3000 sick persons are annually received into its wards. The order of the Grey Nuns, founded in 1737, have built a new hospital in Guy Street. The professed sisters of this religious community, numbering at present 310, receive under their care the aged and infirm and orphan and foundling children of the French Canadian population, They also undertake the care of varions asylums and schools in different parts of the city. Mont- real has also a General Hospital, founded in 1822; a Protestant House of Industry, the Mackay Institution for Deaf-Mutes, the Protestant Orphan Asylum, Infants' Home, &c. The curiously mixed character of the Pg aercenye of Montreal is further shown in its separate daily and weekly*~~

newspapers in the English and French langnages, and in its various national societies, of St George, St Andrew, St Patrick, St Jean Baptiste, and New England, — each confining its charitable operations to those of the nationality which it represents. There are two theatres in Montreal, but the Roman Catholic clergy have systematically discountenanced the stage, and the diverse languages have further tended to limit the nnmbers who patronize the {sae

Among the chief civic buildings is the city hall, built in the modern French style, with lofty mansard roofs, and a central pavilion. It affords accommodation for all the municipal offices, including the waterworks and fire alarm departments, the recorder's court, the police office, and for the meetings of the city corpora- tion, which consists of a mayor and twenty-seven aldermen. Three aldermen are elected by each of the nine wards, one of whom retires every year. The court house, situated close to the city hall, between the Champ de Mars and Jacques Cartier Square, is a hand- some classical building where all the law courts hold their sittings ; and accommodation is provided for the Advocates' Library, which numbers upwards of 10,000 vohimes, including a fine collection of books in the department of old French civil law. Bonsecours Market in St Panl Street is a large structure surmounted by a dome, which forms a prominent feature in every view of the city. When it is crowded with the peasants bringing in their country produce, and by the French Canadian city populace as purchasers, as is the case especially on Tnesdays and Fridays, the scene is very striking to a stranger.

Foremost among the educational institutions is the university of M'Gill College, fonnded by James M'Gill, a Scotchman, who in the later years of the 18th century engaged in the north-west fur trade,

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and ultimately became one of the leading merchants iu Montreal. At his death In 1813 he left his property tor the founding of a col- lege. The most recent and liberal addition to it is the Peter Red- path Museum, valucd at upwards of $100,000, the gift of a wealthy citizen. The university embraces the faculties of arts, law, and medicine, and has also a department of practical science. The college buildings stand in a

~~*pleasant park fronting on Sherbrooke Street, at the base of the Mountain. Theological colleges in con- uection with the Church of England, the Presbyterian, Methodist, and Congregational Churches, occupy buildings in the vicinity, and their students attend the classes at M'Gill College for secular instruc- tion. The Seminary of St Sulpice is a theological training school for priests, where the larger portion of the Roman Catholic clergy of the province of Quebec have received their training, and also a college where a large number of the French Canadian youth obtain their education. This seminary is held in high esteem, and attracts inany Roman Catholic students from the United States. Laval University, which has its chief seat at Quebec, has also a branch at Montreal, with a large staff of professors, chiefly in theology, law, and medicine. The M'Gill and the Jacques Cartier Normal Schools for training teachers for the Protestant and Roman Catholic public schools are couducted under the Protestant and Roman Catholic boards of public instruction ; and model schools attached to them afford the requisite practical training for teachers. The principal public monuments are the column erected in honour of Lord Nelson, and a bronze statue of Queen Victoria, by the late Marshall Wood, which occupies a good site in Victoria Square.*~~

~~*The commerce of Montreal is well represented by the architec- tural character of its banking establishments and many of the large mercantile houses. It is also the seat of a large manufacturing industry. But the most substantial evidence of its importance as a commercial centre is its harbour. The solidly-built basins, wharves, quays, and canal locks extend for upwards of a mile and a half along the river-side. In 1849, at a period of depression, the total value of the imports and exports amounted to £2,013,478 sterling. In 1882 they had risen to £15,633,657 sterling, The business of the port at the saine date is thus expressed in Canadian culrency:—total value of exports $26, 334, 312, of imports$49, 749,461; customs duties collected estimated at $8,100,366. The number of sea-going vessels in port was 648, of which fully one-half were ocean steamers, in addition to which the inland vessels arriving at the port nuinbered 6543. The estimated value of real estate in Montreal 1s $65,978,930. The population in 1851 numbered 57,715; in 1881 it had increased to 140,747, of whom 78,684 were of French and 28,995 of Irish origin, and of the whole number, 103,579 were Roman Catholic.*~~

~~*The city returns three members to the Canadian HOuse of a and the same number to the provincial legislature of*~~

~~*uehec.*~~

~~*When the first French explorers landcd on the island of Montreal under the leadership of Jacques Cartier in 1535, a large Indian palisaded town existed a little to the west of Mount Royal, and not far from the present English cathedral. To this fortified town the Indians gave the name of Hochelaga, and Jacques Cartier describes it as surrounded by fields of grain and other evidences of a settled native population. The name is now applied to the eastern suburb of the modern city. Sixty years later, when Samuel de Champlain made his way up the St Lawrence, and climbed to the summit of Mount Royal, the populous native town had disappeared, and only two Indians were found from whom some obscure hints were derived of war between rival tribes, followed by the destruction of the town and the extermination or flight ofitsformer occupants. The enmity thus established between the Wyandotts or HIurons of Canada and the Iroquois sctttled in the valley of the HIudson and south of Lake Ontario was perpetuated throughout the whole period of French occupation. Champlain took the side of the HIurons, while the Troquois allied themselves with the Dutch and English settlers on the HIudson. Thus the early history of Montreal is largely occupied with incidents of Indian warfare. In 1665 the marquis de Tracy arrived from France, bringing with him a regiment of French soldiers, with whose aid the Indian assailants were driven off, and forts erected and garrisoned to repel their incursions; thus pro- tected, Montreal became the centre of the fur trade with the west, and entered on its history as a commercial city. In 1722 it was fortified with a bastioned wall and ditch, under the directions of De Lery ; and the citadel was erected on a height now laid out as Dalhousie Square. The taking of Quebec by the English under General Wolfe in 1759 was followed ere long by the surrender of Montreal. Since that date it has rapidly developed as an impor- tant centre of commercial and manufacturing enterprise. (D. W.)*~~

~~*MONTROSE, a royal and parliamentary borough and seaport of Forfarshire, Scotland, is situated on the German Ocean at the mouth of*~~

~~*the South Esk, on a branch of the Caledonian Railway, 30 miles east-north-east of Dundee, and 38 south-south-west of Aberdeen. Its harbour basin,*~~

~~*795*~~

~~*formed by the estuary of the South Esk, has an area of about 4 square miles, and is dry at ebb-tide, but at high water there is a depth of about 18 feet at the bar. The length of the quays and docks is about 14 miles. The South Esk is crossed by a suspension bridge erected in 1829 at a cost of £20,000, and having a length from the*~~

~~*| points of suspension of 422 feet (with its approaches 800*~~

~~*feet). On the links to the east of the town is one of the finest golfing greens in Scotland. In the High Street, which is of considerable width, and contains several very lofty houses, there are monuments to Sir Robert Peel and to Joseph Hume, formerly member for the Montrose boroughs. The principal buildings are the parish church—one of the largest churches in Scotland—the town-house, the infirmary, and the academy. There is a public library with 19,000 volumes, and a mechanics' library with 7000 volumes. Besides the staple industry of flax-spinning, there are manufactures of linen, sail-cloth, sheetings, starch, and soap. Jron-founding, tanning, and brewing are also carried on. The export trade is chiefly in manufactured goods, agricultural produce, and fish; the principal imports are timber and coal. In 1881 the number of ships that entered coastwise was 373 of 48,828 tons, the number that cleared 250 of 21,877 tons; the number engaged in the foreign and colonial trade in the same year was—entered 108 of 34,868 tons, cleared 42 of 10,359 tons. Montrose is also one of the principal fishing-stations in Scotland, the number of registered boats in 1881 being 342 of 4168 tons, giving constant employment to 697 persons, and occa- sional employment to 300. Montrose joins with Arbroath, Brechin, Forfar, and Inverbervie in returning one member to parliament. The population of the royal burgh in 1871 was 15,720, and 16,280 in 1881; the population of the parliamentary burgh in the same years was 14,452 and*~~

~~*14,975.*~~

~~*Montrose received a charter fron: David I. in the 12th century, and was made a royal burgh by David II. in 1852. The town was destroyed by fire in 1244. It was from the port of Montrose that Sir James Douglas in 1330 embarked for the Holy Land with the heart of Bruce, and that Prince James Stuart, "the Old Pretender," set sail in 1716 for France, after the failure of his cause in Scotland. The town is the birthplace of Andrew Melville, of the great marquis of Montrose, and of Joseph Hunie.*~~

~~*MONTROSE, James GraHAM, Marquis or (1612- 1650), born in 1612, became the fifth earl of Montrose by his father's death in 1626. He was educated at St Andrews; and in 1629, at the early age of seventeen, he married Magdalene Carnegie, daughter of the earlof Southesk. In 1636, on his way home from a prolonged visit to the Conti- nent, he sought an introduction to Charles I., but, as it is said, was frustrated in his hope of obtaining the king's favour by an intrigue of the marquis of Hamilton. Not long after the outbreak of the Scottish troubles in 1637 he joined the party of resistance, and was for some time its most energetic champion. He had nothing puritanical in his nature, but he shared in the ill feeling aroused in the Scottish nobility by the political authority given by Charles to the bishops, and in the general indignation at the king's ill-judged scheme of imposing upon Scotland a liturgy which had been drawn up at the instigation of the English court, and which had been corrected in England by that Archbishop Laud who now became known in Scot- land under the nickname of "the pope of Canterbury." Montrose's chivalrous enthusiasm eminently qualified him to be the champion of a national cause, and the resistance of Scotland was quite as much national as it was religious. He signed the Covenant, and became one of the foremost Covenanters. The part assigned to him was the suppres- sion of the opposition to the popular cause which arose around Aberdeen and in the country of the Gordons. Three times, in July 1638, and in March and June 1639, Montrose*~~

~~*entered Aberdcen, where he thoroughly succeeded in cffect- ing his object, on the second occasion carrying off the head of the Gordons, the marquis of Huntly, as a prisoner to Edinburgh.*~~

~~*In July 1639, after the signature of the treaty of Berwick, Montrose was one of the Covenanting leaders who visited Charles upon the borders. This change of policy on his part is frequently ascribed to the fascination of the king's conversation. In reality it arose from the nature of his own convictions. He wished to get rid of the bishops without making presbyters masters of the state. His was essentially a layman's view of the situa- tion. Taking no account of the real forces of the time, he aimed at an ideal form of society in which the clergy should confine themselves to their spiritual duties, and in which the king, after being enlightened by open communi- cation with the Scottish nation, should maintain law and order without respect of persons. In the Scottish parliament which met in September, Montrose attempted to carry out this policy, and found himself in opposition to Argyll, who had placed himself at the head of the Presbyterian and national party, which, by an alteration of the rules that had hitherto regulated the selection of the Lords of the Articles, gave supremacy in parliament to the representa- tives of the middle classes. Montrose, on the other hand, wished to bring the king's authority to bear upon parlia- ment to defeat this object, and offered him the support of a great number of the nobles, who were by this time as much opposed to the predominance of the Presbyterian clergy acting upon the middle classes as they had before been opposed to the predominance of the bishops. He failed, because Charles could not even then consent to abandon the bishops, and because no Scottish party of any weight could be formed unless Presbyterianism were estab- lished ecclesiastically. 7 '*~~

~~*Rather than give way, Charles prepared in 1640 to in- vade Scotland. As usual, he prepared difficulties for those who wished to support him. Montrose was of necessity driven to play something of a double part. In August 1640 he signed the Bond of Cumbernauld as a protest against the particular and direct practising of a few—in other words, against the ambition of Argyll. But he took his place amongst the defenders of his country, and in the same month he was the first to wade across the Tweed at the head of the invaders of England. After the invasion had been crowned with success, Montrose still continued to cherish his now hopeless policy. On 27th May 1641 he was summoned before the Committee of Estates charged with intrigues against Argyll, and on 11th June he was imprisoned in Edinburgh Castle. When Charles visited*~~

~~*Scotland to give his formal assent to the abolition of Episcopacy, Montrose communicated to him his belief that Hamilton was a traitor. It has indeed been alleged, on Clarendon's authority, that he proposed to murder Hamilton and Argyll ; but this is in all probability only one of Claren- don's many blunders. His letters to Charles, however, must be taken in connexion with this so-called incident. During the progress of the investigation of this plot, Mon- trose remained in custody, and upon the king's return to England he shared in the amnesty which was tacitly accorded to all Charles's partisans.*~~

~~*For a time Montrose retired, not voluntarily, from public life. Aftcr the Civil War in England began he constantly pressed Charles to allow him to make a diversion on Scot- land. At last in 1644, when the Scottish army entered England to take part against the king, Montrose, now created a marquis, was allowed to try what le could do. He set out to invade Scotland with about 1000 men. But his followers deserted, and his condition appeared hopeless. Genius, however, inspired him with courage. Disguised*~~

~~*as a groom, he, with only two gentlemen, started on 18th August to make his way to the Highlands. No enterprise might seem rasher. Highlanders had never before been known to combine together, but Montrose knew that most of the clans detested Argyll, not because they were royalist but because Argyll, as the head of the Campbells, was the chief of an aggressive and unscrupulous tribe. Montrose did not miscalculate his chances. The clans rallied to his summons. About 2000 Irish had crossed the sea to assist him. He won battle after battle. He defeated the Cove- nanters at Tippermuir on Ist September, and at the Bridge of Dee on 12th September. Rapidity of movement was the distinguishing feature of his generalship. He crossed the mountains deep with a winter's snow into the country of Argyll, burning and destroying as he rested for a time from more active operations. On 2d February 1645 he crushed the Campbells at Inverlochy, whilst the head of the house, who was no warrior, looked on at the disaster from a boat. The Scottish parliament declared Montrose to have forfeited his life and estate as a traitor, but it could not reach him*~~

~~*to execute the sentence. On 19th February he captured Elgin, through March he was ravaging Aber- deenshire and Kincardineshire, on 3d April he stormed Dundee, then on 9th May came the victory of Auldearn, on 2d July the victory of Alford, and on 15th August the great victory of Kilsyth. Never till after this battle had Mon- trose ventured far from the Highland hills. The High- landers had the habit of running home after a victory to secure their booty. Now, however, Montrose found himself apparently master of Scotland. In the name of the king, who now appointed him lord-lieutenant and captain-general of Scotland, he summoned a parliament to meet at Glasgow on 20th October, in which he no doubt hoped to reconcile loyal obedience to the king with the establishment of a non-political Presbyterian clergy. That parliament never met. In England Charles was in evil case. He had been defeated at Naseby on 14th June, and Montrose must come to his help if there was to be still a king to proclaim. He never had a chance of knowing what Montrose could do against the "new model" army. David Leslie, the best of the Scottish generals, was despatched against Montrose to anticipate the invasion. On 12th September he came upon Montrose, deserted by his Highlanders and guarded only by a little group of followers, at Philiphaugh. He won an easy victory. Montrose cut his way through to the Highlands; but he failed to reorganize an army. On 3d September 1646 he embarked for Norway.*~~

~~*Moutrose was to appear once more on the stage of Scot- tish history. In June 1649 he was restored by the exiled Charles II. to his nominal lieutenant-governorship of Scot- land. In March 1650 he landed in the Orkneys to take the command of a small force which he had sent on before him. Crossing to the mainland, he tried to raise the clans, but the clans would not rise, and on 27th April he was surprised and captured at Corbiesdale in Ross-shire. On 18th May he entered Edinburgh as a prisoner. On the 20th he was sentenced to death by the parliament, and he was hanged on the 21st, with Wishart's laudatory biography of him put round his neck. To the last he protested that he was a real Covenanter and a loyal subject. 'The Cove- nant which I took," he said, "I own it and adhere to it. Bishops, I care not for them; I never intended to advance their interest." Something, at least, of Montrose's dream, so impossible to realize at that time, has been realized in Scotland. Scotland has remained*~~

ecclesiastically Presby- terian. The political legality which Montrose wished to uphold against factions by mcans of the king has been upheld by means of the political ripeness of the Scottish nation itself. (sma: ©)

MONT ST MICHEL, a curious rocky islet, consisting

of a mass of granite about 3000 feet in compass and 165 fect in height, rises at a distance of nearly a mile from the shore in the bay of St Michel, near the mouth of the Couésnon, at the vertex of the angle formed by the coasts of Brittany and Normandy. The quicksands by which it is surrounded, and which stretch far to scaward, are ex- posed at low water, and highly dangerous to those who venture on them without a guide. Recently efforts at reclamation have been made, and amongst other works a causeway has been constructed connecting Mont St Michel with the nearest point of the mainland (near Moidrey) ; an unfortunate consequence of these operations has been that some portions of the ramparts of the island have been sapped by the altered tidal currents. The fortress-abbey, to which the rock owes its fame, stands upon the more precipitous side towards the north and west; the sloping portion towards the east and south is occupied by dwelling- houses. The strong machicolated and turreted wall by which the whole is surrounded is pierced only by a single gateway. The northward wall of the abbey (La Merveille), dating from the 13th century, is of remarkable boldness ; it is 246 feet in length and 108 feet in height, is sup- ported by twenty buttresses, and is pierced by a variety of openings. The single street of the island, leading from the one gateway up to the donjon of the fortress, is lined with houses, most of them used as lodging-houses by visitors and pilgrims; it contains an old parish church, and the house of Du Guesclin is also pointed out. The abbey consists principally of two parallel buildings of three stories each, that on the cast containing hospitium, refectory, and dormitory, and that on the west the cellar, knights' hall, and cloister. The knights' hall is a superb piece of Gothic architecture, measuring 85 feet by 59, with three rows of richly-ornamented pillars. The cloister is one of the purest and most graceful works of the 13th century (1228). The church has a number of imperfect turrets, and is

surmounted by a square tower of the 17th century, with a statue of St Michael, which was crowned in 1877. The nave, which dates from the 11th century, is Norman ; but the choir, which collapsed in 1421, has been rebuilt in the flamboyant style. Beneath is a fine crypt.

Mont St Michel was a sacred place even in the time of the Druids. It became a seat of Christian worship in the 8th century, when a monastery was founded upon it (with the usual miraculous accom- paniments) by St Aubert, bishop of Avranches. It soon became a favourite resort of pilgrims, not only from all parts of France, but also from Great Britain and Ireland, and even from Italy. It was plundered by the Normans; but Rollo, on his conversion, made restitution. At the time of the Conquest it supplied William of Normandy with six ships, and received a considerable share of the English spoils. Abont this time the monks began to give them- selves to learning and to collect a large library, and in the 12th century the establishment reached its highest prosperity. It was burnt by the troops of Philip Augustus, who afterwards furnished large sums for its restoration (La Mervecille). St Louis (Louis IX.) made a pilgrimage to Mont St Micliel, and was afterwards very liberal to it. During the hundred years' war it offered a memorable resist- ance to the English; and herc, on Ist August 1469, Louis XI. instituted the order of St Michel, and held a brilliant chapter. A similar celebration was held by Francis I. During the religious wars the Huguenots madc repeated unsuccessful attempts to seize the fortress ; it opened its gates to Henry IV. after his abjuration. About 1615 the Benedictine monks of Mont St Michel were re- placed by monks of the Congregation of St Maur ; after the Revolu- tion the abbey was used as a prison for political offenders. It is now an historical monument; it contains an orphanage, and is under- going repalrs.

MONTSERRAT, one of the Leeward Islands in the West Indies, situated 16° 45' N. lat. and 62° 7' W. long., is 12 miles long and 8 broad in its widest part, and has an area of 32 square miles. The uneven and rugged surface suggests possibly volcanic origin. Its general appearance is very picturesque, the most interesting natural feature being the Souffriére. The island was discovered by Columbus in 1493, and received its name either because

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~~of its broken appearance or after the mountain in Spain. It was colonized by the English under Sir Thomas Warner in 1632, and was taken by the French in 1664, Restored to the English in 1668, it capitulated to the French in 1782, but was again restored in 1784. It is now a pre- sidency under the general government at Antigua, and has a legislative council, composed of officials and crown nomi- nees. The climate is the most healthy in the West Indies. The population (10,087) consists principally of negroes, with several hundred whites. The revenue and expendi- ture average £5600 per annum. Sugar exports range from 1200 to occasionally 2000 tons. An important industry is the cultivation of limes and the manufacture of juice. About 700 puncheons of raw lime juice, 300 hogsheads of concentrated juice, and an increasing quantity of fresh green limes are exported annually. For the three years ending 1880 the average value of imports was £26,390, of exports £32,963. The principal town is Plymouth, lying midway along the south-west coast.~~

~~MONTSERRAT. Thirty miles to the north-west of Barcelona in Spain there rises a very remarkable mountain of grey conglomerate, 24 miles in circumference, and at its loftiest point (San Geronimo) a little more than 4000 feet in height. From the comparative lowness of the surround- ing district, and from its extraordinary configuration, it is a conspicuous object for many miles around. The mountain consists of jagged pinnacles and spires rising abruptly from the base of the mass, which is cloven with many clefts, and abounds with steep precipices. It is the Mons Serratus of the Romans, the Jfonte Serrado of the Spaniards, and is thus named either in allusion to its jagged appearance, like the teeth of a saw, or because the eastern face is split, as if sawn,—which occurred, say the Spanish legends, at the time of the crucifixion, when the rocks were rent. The arms of the monastery represent a mountain with a saw resting upon it and penetrating some distance into its mass. Its pinnacles and pyramids and sharp angular masses resemnble a mountain of hard crystalline volcanic tuff which occurs between Akureyri and Kalmanstunga in Iceland. The effect of Montserrat may be realized faintly if we place ourselves upon the roof of Milan cathedral, and imagine the forest of spires magnified a thousandfold. The central spire will represent San~~

~~*Geronimo. The result of this varied contour in the case of Montserrat is to make it one of the most picturesque places in Europe. Paths wind along the faces of the precipices, ascending to bare grey summits, descending to sheltered valleys filled with evergreens and flowers. The Pyrenees are seen in one direction, the sea in another, while the Llobregat winds at the foot of the mountain through the village of Monistrol. Manresa and other villages are seen scattered over the plain; and hills covered with a warm red soil alternate with rich valleys. Street says of Montserrat, 'After much experience of mountains, it strikes me more each time that I see it as among' the very noblest of rocks."*~~

~~*The monastery, a great pile of buildings, stands upon a narrow platform on the edge of a vast chasm in the eastern face of the mountain. It owes its existence to an image of the Virgin, said to have been carved by St Luke, and brought to Barcelona by St Peter in 30 a.p. When the Moors invaded the province in 717, the image was taken to Montserrat and hidden ina cave. In 880 Gondemar, bishop of Vich, was attracted to the cave by sweet sounds and smells, and there found the image, which he determined to take to Manresa. But ata certain spot on the mountain the image refused to proceed farther; there it was conse- quently deposited, and a chapel was erected to contain it. A stone cross near the walls of the monastery still marks the spot where the image refused to move. Round the chapel a nunnery was built, and in 976 this was enlarged*~~

~~*and converted into a Benedictine monastery. Philip II. built the present church. In 1835 the monastery was suppressed and despoiled of the vast treasures which had accumulated during the Middle Ages. But the buildings were allowed to remain, as well as a few of the fathers to take charge of the Virgin's shrine. At present they number 19; a hundred years ago there were 76 monks, 28 lay- brothers, 25 singing boys, together with surgeon, physician, and servants. The possessions then consisted of numerous hamlets, besides great quantities of plate and jewels, includ- ing 85 silver lamps.*~~

~~*Nuestra Setiora de Montserrat, Patrona de Catalufia, is one of the most celebrated images in Spain, and her church is visited annually by more*~~

~~than 80,000 pilgrims. It is a small carved wooden itnage, 'yegularly handsome, but the colour of a negro woman," and pos- sesses magnificent robes and jewels. It has been visited by numbers of sovereigns and high ecclesiastics, and by millions of Catalonians. In September 1881 it was solemnly crowned by Leo XIIL., who sent a crown from Rome for that purpose. Quantities of ex votos are offered at the shrine: wax models of injured or diseased limbs, models of ships, pictures and clothes, jewels and silver hearts. As the celebrity and sanctity of Montscrrat increased, so did the number of devotees. Ignatius Loyola laid his sword upon the altar of the Virgin, and, placing himself undcr her protection, started from Montserrat to comineuce his new life. Many eminent Spaniards, weary of the world, have retired to this monastery to end their days. Some preferred solitary hermitages perched among the rocks. Of these there were fiftcen, eleven of which once formed a via sacra, ending at the summit of San Geronimo. They were destroyed by the French, but the ruins of some of them still remain. From all the view is magnificent; some are indced placed on the edges of preci- pices in almost inaccessible places. There are also caves in the moun- tain, some of which were formerly occupied by monks. The most celebrated of these are the cave of the Virgin, in which the Santa Imagen remained hidden until found by Gondemar, and the cave of Fray Juan Garin, a notorious sinner, who ended his days in the practice of revolting penances at Montserrat. At Collbato, on the south-east side of the mountain, near the base, there are also some very curious caves.~~

~~MONTUCLA, Jean-Errenne (1725-1799), a learned mathematician, was the son of a merchant, and was born at Lyons in 1725. IIe attended the college of the Jesuits in his native city, and was early distinguished for his tenacious memory and his aptitude for mathematics. At the age of sixteen he removed to Toulouse to prosecute the study of law; and after taking the usual degrees he re- paired to Paris. There his conversational powers, his solid information, and his acquirements as a linguist soon intro- duced him to the notice of the learned. In the society of D'Alembert and Lalande his taste for mathematical studies was confirmed and stimulated. After publishing two anony- mous treatises on the Quadrature of the Circle and on the Duplication of the Cube, he gave to the world in 1758 the first part of his great work, The IIistory of Mathematics. Not long after this his~~

~~*merits were recognized by the Government, and he was promoted to several important _ Offices. HHe was appointed intendant-secretary at Grenoble in 1758, secretary to the expedition for colonizing Cayenne in 1764, and " premier commis des batiments " and censor- royal for mathematical books in 1765. During the next twenty-five years his time was divided between his official duties and the study of his favourite science. The Revolu- tion then ensuing deprived him of his income, and left him in great destitution. The offer in 1795 of a mathematical chair in one of the schools of Paris was declined on account of his infirm health, and he was still in straitened circum- stances in 1798 when he published a second edition of the first part of his Zistory. HHe also enlarged Ozanam's Mathematical Recreations, afterwards published in English by Dr HHutton (4 vols., Lond., 1803). About four months before his death (December 1799) a pension of 2400 francs was conferred upon him. HHis LHistory of Mathematics was completed by Lalande, and published at Paris in 1799-1802 (4 vols. 4to).*~~

~~*Montucla's work was the first history of mathematics worthy of the*~~

~~*name. It is characterized alike by elegance of style and by breadth oftreatment. Montucla rarely fails in candour, and never in breadth of sympathy ; he lived at a time when it would have been pardon- able to treat mathematics "as a French science," yet he cannot with justice be accused of Chauvinism. The study of the history of mathematics has greatly revived of late years, especially in Germany, and numerous monograplis on special departments have appeared, in which, as was to be expected, many defects and some positive errors in Montucla's work have been pointed out, but, taken as a whole, it stands as yet unsuperseded, unrivalled, fit, as to itsadmirable style and endwiing quality, to be compared with Gibbon's Deeline and Fall of the Roman Empire.*~~

~~*MONZA (locally Monscia), a city of Italy in the pro- vince of Milan, at the branching of the railway for Lecco and Como, lies on the Lambro, a tributary of the Po, mainly on the right bank, in a healthy and attractive situation. Of the medieval fortifications little remains save the Porta d'Agrate. The cathedral of St John Baptist is the principal object of interest : Theodelinda's basilica was enlarged at the close of the 13th century by throwing the atrium into the main building, and the present marble facade was erected about the middle of the 14th by Matteo da Campione. On the left-hand side of the front rises an incongruous brick-built tower, 278 feet high, erected by Peregrini. Within the church are the iron crown of Lombardy (removed by Austria in 1859, and since restored) and the relics of Theodelinda, comprising her crown, fan and comb of gold, and the golden hen and seven chickens, representing Lombardy and her seven provinces. Next to the cathedral in artistic importance come the church of Santa Maria in Istrada, and the broletto or old palace of the commune, usually styled the Arengario: the former (founded in 1357) has a rich Bramantesque facade, reckoned one of the best pieces of terra-cotta work in Lombardy, and the latter is raised on a system of pointed arches, and has a tall square tower terminating in machicolations surrounding a sharp central cone. San Michele was the scene of the coronation of Conrad III. in 1128, and San Gerardo (formerly Sant' Ambrogio) is named after the patron saint of Monza, Gerardo de' Tintori, who founded the first local hospital in 1174. The royal palace of Monza*~~

~~(1777), with its exten- sive gardens and parks, lies not far from the town on the banks of the Lambro. Cotton goods and felt hats are the staple products of Monza industry ; then dyeing, organ- building, and a publishing trade. The population of the city was 15,450 in 1871, and that of the commune increased from 24,661 in 1861 to 28,012 in 1881.~~

~~Local antiquaries claim for Monza (Modicia or Modetia) the rank of a Roman colony, but it cannot have been a place of consequence till it attracted the discerning eye of Theodoric ; and, though it was a favourite residence with his immediate successors, its first im- portant associations are with Thcodelinda (see vol. xiv. p. 815). During the period of the republics Monza was sometimes inde- pendent, sometimes subject to Milan. The Visconti, who ulti- mately became masters of the city, built a castle in 1325 on the site now occupied by the Palazzo Durini. In the course of its history Monza has stood thirty-two sieges, and been repeatedly plun- dered, notably by the forces of Charles V. The countship (1499- 1796) was purchased in 1546 by the wealthy banker Durini, and remained in his family till the Revolution.~~

~~MOOLTAN. See Murray.~~

~~MOON, Tue. The subject of the moon divides itself into two separate branches, the one concerned with the con- stitution of the lunar globe, the other with its motions. For the first subject the reader is referred to the article Astronomy (vol. ii. p. 801 sq.) ; the present article is con- fined to the second, which is commonly called the Lunar Theory.~~

~~The lunar theory does not yet form a well-defined body of reasoning and doctrine, like other branches of mathematical science, but consists only of a series of researches, extending through twenty centuries or more, and incapable of being welded into a consistent whole.~~

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~~This state of things arises from the inherent difficulties and complexities of the subject, and from the fact that no one method or system has yet been discovered by which all the difficulties can be surmounted and all the com- plexities disentangled. HIence each investigator, when he has~~

~~*desired to make any substantial advance beyond his predecessors, has been obliged to take up the subject from a new point of view, and to devise such method as might seem to him most suitable to the special object in hand. The historical treatment is therefore that best adapted to give a clear idea of the results of these investigations. The ancient and modern histories of the subject are quite distinct, the modern epoch commencing with Newton. The great epoch made by Copernicus did not extend to the case of the moon at all, because in every investigation of the moon's motion, modern as well as ancient, the motion is referred to the earth as a centre. Hence the heliocentric system introduced no new conception of this motion, except that of taking place round a moving earth instead of round a fixed one. This change did not affect the consideration of the relative motion of the earth and moon, with which alone the lunar theory is concerned. The two stages of the lunar theory are therefore—(1) that in which the treat- ment was purely empirical, (2) that in which it was founded rationally on the law of gravitation.*~~

~~*It is in the investigation of the moon's motion that the merits of ancient astronomy are seen to the best advan- tage. In the hands of Hipparchus (see Astronomy, vol. ii. p. 749) the theory was brought to a degree of precision which is really marvellous when we compare it, either with other branches of physical science in that age, or with the remarks and speculations of contemporary non- scientific writers. Whether this was wholly the work of Hipparchus, or whether he simply perfected a system already devised by his predecessors, it is now impossible to say ; but, so far as certain knowledge extends, the works of his predecessors did not embrace more than the deter- mination of the mean motion of the moon and its nodes. Although the general fact of a varying motion may have been ascertained, the circumstances of the variation had probably never been thoroughly investigated. The dis- coveries of Hipparchus were :—*~~

~~*1. The Eccentricity of the Moon's Orbit.—He found that the moon moved most rapidly near a certain point of its orbit, and most slowly near the opposite point. The law of this motion was such that the phenomena could be re- presented by supposing the motion to be actually circular and uniform, the apparent variations being explained by the hypothesis that the earth was not situated in the centre of the orbit, but was displaced*~~

~~*byan amount about equal to one- twentieth of the radius of the orbit. Then, bya well-known law of kinematics, the angular motion round the earth would be most rapid at the point nearest the earth—that is, at perigee—and slowest at the point most distant from the earth—that is, at apogee. Thus the apogee and perigee became two definite points of the orbit, indicated by the variations in the angular motion of the moon.*~~

~~*2. The Motion of the Perigee and Apogee.—As already defined, the perigee and apogee are at the ends of that diameter of the orbit which passes through the eccentrically situated earth, or, in other words, they are on that line which passes through the centre of the earth and the centre of the orbit. This line was called the line of apsides. On comparing observations made at different times, it was found that the line of apsides was not fixed, but made a complete revolution in the heavens, in the order of the signs of the zodiac, in about nine years.*~~

~~*3. The Numerical Determination of the Elements of the Moon's Motion.—In order that the two capital discoveries just mentioned should have the highest scientific value it*~~

~~*ioe*~~

~~*was essential that the numerical values of the elements involved in these complicated motions should be fixed with precision, This Hipparchus was enabled to do by lunar eclipses. Each eclipse gave a moment at which the longi- tude of the moon was 180° different from that of the sun, and the latter admitted of ready calculation. Assuming the mean motion of the moon to be known and the perigee to be fixed, three eclipses observed in different points of the orbit would give as many true longitudes of the moon, which longitudes could be employed to determine three unknown quantities—the mean longitude at a given epoch, the eccentricity, and the position of the perigee. By taking three eclipses separated at short intervals, both the mean motion and the motion of the perigee would be known beforehand, from other data, with sufficient accuracy to reduce all the observations to the same epoch, and thus to leave only the three elements already mentioned un- known. In the hands of a modern calculator the problem would be a very simple one, requiring little more than the solution of a system of three equations with as many un- known*~~

~~*quantities. But without algebra the solution was long and troublesome, and not entirely satisfactory. Still, it was probably correct within the necessary limits of the errors of the observations. The same three elements being again determined from a second triplet of eclipses at as remote an epoch as possible, the difference in the longitude of the perigee at the two epochs gave the annual motion of that element, and the difference of mean longitudes gave the mean motion. Such was the method of determining the elements of the moon's motion down to the time of Copernicus.*~~

~~*The determination of the eccentricity from eclipses, as above described, leads to an important error in the resulting value of the eccentricity, owing to the effect of the neglected evection. We*~~

~~*know from our modern theory that the two principal inequalities in the moon's true longitude are — 6°°29 sin g (Equation of centre) +1°-27 sin (2D-g) (Evection),*~~

~~*where g = mean anomaly, and D = mean angular distance of the moon from the sun. Now during a lunar eclipse we always have D = 180° very nearly, and 2D = 360°, Hence the evection is then — 1°27 sin g, and so has the same argument, g, as the equation of centre, and so is confounded with it. The value of the equation of centre derived from eclipses is thus (6°°29 — 1°27=5°-02) sin g.- Therefore the eccentricity found by Hipparchus and Ptolemy was only 5°, and was more than a degree less than its true value.*~~

~~*The next important step in advance was the discovery of the '"evection," which is described by Ptolemy (see AsTRONOMY, vol. ii. p. 750) as if made by himself. In view of the bad habit which Ptolemy had of making his own observations verify results previously arrived at, which were sometimes in error, we must view such a discovery by him as quite exceptional, and as best explainable by the large magnitude of the outstanding error. Although, as just shown, the erroneous eccentricity found by Hipparchus would always represent eclipses, so that the error could never be detected by eclipses, the case was entirely different when the moon was in quadratures. Comparing the in- equalities already*~~

~~*written with that found by Hipparchus, we see that the latter required the correction—*~~

~~*1°27 {sin g+sin (2D — g)} =*~~

~~*1°:27 {(1 — cos 2D) sin g + sin 2D cos g} . At quadratures we have D= +90°, 2D=180", and hence cos 2D=-1 and sin2D=0. The omitted inequalities at these points of the orbit have therefore the value 2°54 sin g, a quantity so large that it could not fail to be detected by careful observations with the astrolabe. Such an inequality as this, superposed upon the eccentric motion of the moon, was very troublesome to astronomers who had no way of representing the celestial motions except by geometrical construction. The construction proposed by Ptolemy was so different from those employed for the*~~

~~*motions of the planets, and withal so intricate, that little interest attaches to it.*~~

~~*The student of Arabian science may find much to interest him in the astronomical speculations of the Arabs, but this people do not seem to have furnished anything in the way of suggestive theory. In the fourth book of De Revolu- tionibus,: where we find the lunar theory of Copernicus, no writer later than Ptolemy is referred to. Moreover, as already intimated, the work of Copernicus in this particu- lar direction forms little more than an episode in the his- tory of the subject. The working hypothesis of the great founder of modern astronomy was borrowed from the ancients, and was that the celestial motions were all either circular or compounded of circular motions. The hypo- thesis of equal circular motions, though accepted by Ptolemy in name, was so strained by him in its applications that little was left of it in the Admagest (the Arabic translation of his Syntaxis), But, by taking the privilege of compound- ing circular motions indefinitely—in other words, of adding one epicycle to another—Copernicus was enabled to repre- sent the planetary and lunar inequalities on a uniform system, though his heavens were perhaps worse " scribbled o'er" than those of Ptolemy. To one epicycle representing the equation of the centre he added another for the*~~

~~evection, and thus represented the longitude of the moon both at quadratures and oppositions, But the third inequality, "variation," which attains its maxima at the octants and vanishes at all four quarters, was unknown to him, To Tycho Brahe is commonly and justly ascribed the discovery of the variation. Joseph Bertrand of Paris has indeed claimed the discovery for Abu 'l-Wefd, an Arabian astro- nomer, and has made it appear probable that Abu 'l-Wefd really detected inequalities in the moon's motion which we now know to have been the variation. But he has not shown, on the part of the Arabian, any such exact de- scription of the phenomena as is necessary to make clear his claim to the discovery. As regards Tycho, although he discovered the fact, he could add nothing in the way of suggestive theory. To the double epicycle of Copernicus he was obliged to add a motion of the centre of the whole lunar orbit round a circle whose circumference passed through the centre of the earth, two revolutions round this circle being made in each lunation. Kepler, by intro- ducing a moving ellipse having the earth as its focus, was enabled to make a nearer approach to the truth than any of his predecessors. But the geometrical hypotheses by which he represented the inequalities due to the action of the sun form no greater epoch in the progress of science than do the geometrical constructions of his predecessors. We may therefore dispose of the ancient history of the lunar theory by saying that the only real progress from Hipparchus to Newton consisted in the more exact deter- mination of the mean motions of the moon, its perigee and its line of nodes, and in the discovery of three new inequalities, the representation of which required geometri- cal constructions increasing in complexity with every step.~~

~~The modern lunar theory commenced with Newton, and consists in determining the motion of the moon deductively from the theory of gravitation. But the great founder of modern mechanics did not employ the method best adapted to lead to the desired result, and hence his efforts to con- struct a lunar theory are of more interest as illustrations of his wonderful power and correctness in mathematical reasoning than as germs of new methods of research. He succeeded perfectly in explaining the elliptic motion of two mutually attracting bodies round their common centre of gravity by geometrical constructions. But when the prob-~~

~~*1 The full title, De Revolutionibus Orbium Celestium Libri VI. (small folio, Nuremberg, 1543).*~~

~~*MOON*~~

~~*lem was one of determining the variations from the elliptic motion which would be produced by a third body, such constructions could lead only to approximate results. The path to modern methods was opened up by the Continental mathematicians, whose great work consisted in reducing the problem to one of pure algebra. The chasm between the laws of motion laid down by Newton and a problem of algebra seems so difficult to bridge over that it is worth while to show in what the real spirit of the modern method consists. We call to mind the statement of Newton's first two laws of motion: that a body uninfluenced by any force moves in a straight line and with uniform velocity for ever, and that the change of motion is proportional] to the force impressed upon the body and in the direction of such force. These two laws admit of being expressed in alge- braic language thus :—let us put m the mass of a material point; # its distance from any fixed plane whatever; ¢ the time; X the sum of the components of all the forces acting upon the point in the direction perpendicular to the fixed plane, it being supposed that each force is resolved into three mutually perpendicular components, one of which is perpendicular to the fixed plane; then the differential equation*~~

~~*expresses Newton's first two laws of motion with a com- pleteness and precision which is entirely wanting in all statements in ordinary language. The latter can be no- thing more than lame attempts to express the equation in language which may be understood by the non-mathe- matical reader, but which bear the same relation to the algebraic equation that a statement of the operations of the Bank of England in the symbolic language of a tribe of savages would bear to the bank statement in pounds, shillings, and pence. By taking two other planes, perpen- dicular to each other and to the first plane, we have three equations like the one last written. The law of gravitation and Newton's third law of motion enable us to substitute for X and the other forces the masses and coordinates of the various attracting bodies. Thus the data of the problem are expressed by a triplet of three equations for each attract- ing body.*~~

~~*The integration of these equations is a problem of pure algebra, which, when solved, leads to expressions that give the position of each body in terms of the time, which is what is wanted. The special form which it is necessary to give the equations has not been radically changed during the century and a half since this method of research was opened out. The end aimed at is the algebraic expression of all the quantities involved in the form of an infinite series of terms, each consisting of a constant coefficient multiplied by the sine or cosine of an angle increasing uniformly with the time. It is indeed a remarkable fact that, notwithstanding the great advances which modern mathematics has made in the discovery of functions more general than the old-fashioned sines and cosines of ele- mentary trigonometry, especially of elliptic functions, yet the form of development adopted by the mathematicians of the last century has remained without essential change.*~~

~~*It will be instructive to notice the general and simple property of the trigonometric functions to which is duc their great advan- tage in the problems of celestial mechanics. It may be expressed thus :—Jf we have any number of quantities, each of which ts ex- pressed in the form of a trigonometrie series in which the angles tnerease uniformly with the time, then all the powers and products of these quantities, and all their differentials and integrals with respect to the time, may be expressed in series of the same form. This*~~

~~*theorem needs only an illustration by an example. Let our quan- tities be XY and Y, and let us suppose them expressed in the form X=a cos 4+b cos B+e cos C+, &e. Y=da sin A'+0' sin B' e' sin C'4, &e., in which we may suppose that the quantities a, b,c, &c., converge towards zero. In forming their product, the first term will be*~~

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~~*aa' cos A sin A'. But we have cos 4 sin A'=4 sin (A'+A) +4 sin (A'—.A). Hence the product XY will be of the form*~~

~~*X Y=haa' sin(A'+A)+4 aa'sin(d'- A)+4}ab'sin(A+ B'+),&e., which is another series of the same general form. Moreover, if we suppose the*~~

~~*angles 4, B, &., to increase uniformly with the time—that is, to admit of expression in the form*~~

~~*A=atmt, A'=a'+ n't, Ke— we shall have, by integrating, aw ad! 2 ROW thi — 1008 2S em ae cos (A'— A), &e.,*~~

~~*which, again, is a trigonometric series of the same general form, which admits of being manipulated at pleasure in the same way as the original expressions X and Y. This property does not belong to the elliptic functions, and in consequence, notwith- standing the great length of the trigonometric series, no attempt to supersede them has been successful.*~~

~~*The efforts to express the moon's motion by integrating the differential equations of the dynamical theory may be divided into three classes. (1) Laplace and his immediate successors found the problem so complex that they sought to simplify it by reversing its form ; instead of trying from the beginning to express the moon's coordinates in terms of the time, they effected the integration by expressing the time in terms of the moon's true longitude. Then, by a reversal of the series, the longitude was expressed in terms of the time. Although it would be hazardous to say that this method is unworthy of further consideration, we must admit that its essential inelegance is such as to repel rather than attract study, and that it holds out no promise of further development. (2) By the second general method the moon's coordinates are obtained in terms of the time by the direct integration of the differential equations of motion, retaining the algebraic symbols which express the values of the various elements. Most of the elements are small numerical fractions : e, the eccentricity of the moon's orbit, about 0°055; ¢', the eccentricity of the earth's orbit, about 0°017; y, the sine of half the inclination of the moon's orbit, about 0°046; m, the ratio of the mean motions of the moon and earth, about 0°075 ; and the expressions for the longitude, latitude, and parallax appear as an infinite trigonometric series, in which the coefficients of the sines and cosines are themselves infinite series proceeding accord- ing to the powers of the above small numbers. This method was applied with success by Pontécoulant and Sir John W. Lubbock, and afterwards by Delaunay. It should be remarked that the solution by the first method appears in the same form as by this one after the true longitude is expressed in terms of*~~

~~*the mean longitude. (3) By the method just mentioned the series converge so slowly, and the final expressions for the moon's longitude are so long and complicated, that the series has never been carried far enough to insure the accuracy of all the terms. This is especially the case with the development in powers of m, the convergence of which has often been questioned. Hence, when numerical precision alone is aimed at, it has been found best to avoid this difficulty by using the numerical values of the elements instead of their algebraic symbols. This method has the advantage of leading to the more rapid and certain determination of the numerical values of the several coefficients of sines and cosines. It has the disadvantage of giving the solution of the problem only for a particular case, and of being inapplicable in researches in which the general equations of dynamics have to beapplied. It has been employed by Damoiseau, Hansen, and Airy.*~~

~~*The methods of the second general class are those most worthy of study. And among these we must assign the first rank to the method of Delaunay, developed in his Théorie du Mouvement de la Lune, because it contains a germ which may yet develop into the great desideratum of a general method in celestial mechanics. To explain it, we must call to mind the general method of "variation of*~~

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~~*elements," due to Lagrange. This method is applicable to cases in which a problem of dynamics can be completely solved when any small forces which come into play are left out, but which does not admit of direct solution when these forces are included. Omitting the small forces, commonly called "disturbing forces," let us suppose the problem of the motion of a body under the influence of the "principal forces" completely solved. This will mean that we have found algebraic expressions for the coordi- nates which determine the position of the body in terms of the time, and (in the case of a material point) of six constant quantities, to which we may assign values at pleasure. Then Lagrange showed how, by supposing these constant quantities to become variable, the same expressions could be used for the case in which the effect of the disturbing forces was included. In other words, the effect of the disturbing*~~

~~*forces could be determined by assuming them to change the constants of the first approxi- mate solution into very slowly varying elements.*~~

~~*In the researches on the lunar theory before Delaunay the principal force was taken to be the attraction of the earth upon the moon, and the disturbing force was that due to the sun's attraction. When the action of the earth alone was included the moon would move in an ellipse, in accord- ance with Kepler's laws. The effect of the sun's action could be allowed for by supposing this ellipse to be mov- able and variable. But when it was required to express this variation the problem became excessively complicated, owing to the great number of terms required to express the sun's disturbing force. Now, instead of passing from the elliptic to the disturbed motion by one single difficult step, Delaunay effected the passage by a great number of easy steps. Out of several hundred periodic terms, the sum of which expressed the disturbing force of the sun, he first took one only, and determined the variations of the Keplerian ellipse on the supposition that this term was the only one. In the solution the variable elements of the ellipse would be expressed in terms of six new con- stants. He then showed how these new constants could be taken as variables instead of the elements of the original ellipse. Taking a second term of the disturbing force, he expressed the new constants in terms of a third set of con- stants, and so repeated the process until all the terms of the disturbing force were disposed of.*~~

~~*Among applications of the third or numerical method, the most successful yet completed is that of Hansen. His first work appeared in 1838, under the title /unda- menta nova investigationis orbitx vere quam luna perlustrat, and contained an exposition of his ingenious and peculiar methods of computation. During the twenty years follow- ing he devoted a large part of his energies to the numerical computation of the lunar inequalities, the re-determination of the elements of motion, and the preparation of new tables for computing the moon's position. In the latter branch of the work, he received material aid from the British Government which published his tables on their completion in 1857. The computations of Hansen were published some seven years later by the Saxon Royal Society of Sciences.*~~

~~*It is found on comparing the results of Hansen and Delaunay that there are some outstanding discrepancies, which, though too small to be of great practical importance, are of sufficient magnitude to demand the attention of those interested in the mathematical theory of the subject. It is therefore desirable that the numerical inequalities should be again determined by an entirely different method. This is the object of Sir G. B. Airy's Wumerical Lunar Theory, which is not yet completely published, but is sufficiently far advanced to give hopes of an early comple- tion, The essence of Sir George's method consists in*~~

~~*starting with a provisional approximate solution (that of Delaunay being accepted for the purpose), and substituting the expressions for the moon's coordinates in the funda- mental differential equations of the moon's motion as dis- turbed by the sun. If the theory were perfect, the two sides of each equation would come out equal. As they do not come out exactly equal, Sir George puts the problem in the form: What corrections must be applied to the expressions for the coordinates that the two sides may be made equal? He then shows how these corrections may*~~

~~*be found by solving a system of equations.*~~

~~*The several methods which we have described have for their immediate object the determination of the motion of the moon round the earth under the influence of the combined attractions of the earth and sun. In other words, the question is that of solving the celebrated "problem of three bodies" in the special case when one of the bodies, the sun, has a much greater mass than the other two, and is at a much greater distance from them than they are from each othcr. All methods lead to a solution of the same general form which we shall now describe. Let us put g the moon's mean anomaly ; g' the mean anomaly of the sun (or earth) ; w the angular distance of the lunar perigee from the moon's node on the ecliptic; w' the angular distance of the sun's perigee from the moon's node on the ecliptic. When no account is taken of the action of the sun the angles g and g' increase uniformly with the time, representing in fact*~~

~~the uniform motion of the moon round the earth and of the earth round the sun, while w and w' remain constant. When account is taken of the action of the sun all four of the angles change with a uniform progressive motion. In conse- quence, the mean orbit of the moon round the earth becomes a moving ellipse whose major axis makes a revolution round the earth in about nine years, and the line of whose nodes makes a revolution in about eighteen and a half years. All the other ele- ments of this ellipse —namely, its major axis, its eccentricity, and its inclination to the ecliptic —remain absolutely constant however long the motion may continue, unless some other disturbing force than that of the sun comes into play. But in the actual motion of the moon there are periodic deviations from this ellipse, which cal be represented by an infinite trigonometric series, each term of whic is of the form~~

~~e (sin or cos) (tg +7'¢ +jw+j'w'), in which the quantities c are absolutely constant coefficients, and a, v', j, and j' are integers which may take all combinations of values —positive, negative, or zero. The circular function is, a sine in the expression for longitude or latitude, a cosine in the expression for the parallax. Also, 7 and 7' must be both even or both odd in the expressions for longitude and parallax, but the one even and the other odd in the case of tle latitude. For example, if we sup- pose j, 7', and @ all zero, we shall have terms of the form ¢, sin g' +é, sin 29'¢, sin 3g/, &c. : To write other terms, suppose 7=1, then we have terms of the orm é, sin (g—g/) +¢, sin (g +g) +¢3 sin (g+29')+, &e.~~

~~Taking the case when j=2 and j'= —2, we shall have terms of~~

~~the form m, sin (g—g/ +2w—2w') +m, sin (g -29'2w—Qw'), &e.~~

~~As the indices 7, 7', 7, and 7' become larger, the coefficients c, e, m, &c., become smaller; but the number of terms included in the theories of Hansen and Delaunay amount to several hundreds. In the analytical theories, like that of Delaunay, each of the coeffi- cients é, é, m, &c., isa complicated infinite series, but in the numerical theories it is a constant number. And the principal problem of the modern theory of three bodies is to find the appropriate co- efficient for each of these hundreds of ternis.~~

~~*Action of the Planets on the Moon.—For nearly two centuries it has been known from observations that the mean motion of the moon round the earth is not absolutely constant, as it ought to be were there no disturbing body but the sun. The general fact that the motion has been accelerated since the time of Ptolemy was first pointed out by Halley, and the amount of the acceleration was found by Dunthorne. After vain efforts by the greatest mathe- maticians of the last century to find a physical cause for the acceleration, Laplace was successful in tracing it to the secular diminution of the eccentricity of the earth's orbit, produced by the action of the planets. He computed its amount to be 10" per century—that is, if the place of the moon were calculated forward on its mean motion at the beginning of any century, it would at the end of the century be 10" in advance of its computed place. This theoretical result of Laplace agreed so closely with the acceleration found by Lalande from the records of ancient and medieval eclipses that it was not questioned for nearly a century. In 1852 Mr John C. Adams showed that Laplace had failed to take account of a series of terms, the effect of which was to reduce*~~

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~~*the acceleration to 6" or less. The result was inconsistent with the accounts of ancient eclipses of the sun, and a cause for the discrepancy had to be sought for. A probable cause was pointed out, first by Ferrel, and afterwards by Delaunay. The former, in papers published in Gould's Astronomical Journal, and in the Proceedings of the American Academy of Arts and Sciences, showed that the action of the moon on the tidal waves of the ocean would have the effect of increasing the time of the earth's axial rotation or the length of the day, which is necessarily taken as the unit of time. Since, as the days became longer, the moon would move farther in one day, though its absolute motion should remain unchanged, and hence an apparent acceleration would be the result. That this cause really acts there can be no doubt. But the data for determining its exact amount are discrepant. If we take only such data as are purely astronomical—namely, the eclipses recorded by Ptolemy between 720 B.c. and 150 a.D., and those observed by the Arabians between 800 and 1000 a.p.—the apparent excess of the observed acceleration to be accounted for by the tidal retarda- tion amounts to only 2" per century, and may be even*~~

less. But this small acceleration is entirely incompatible with conclusions drawn from certain supposed accounts of total eclipses of the sun, notably the eclipse associated with the name of Thales. This is the famous eclipse supposed to be alluded to by HIerodotus when he describes a battle as stopped by a sudden advent of darkness, which had been predicted by Thales. If the true value of the co- efficient resulting from the combinced effect of tidal retardation of the earth and secular acceleration of the moon is less than 10", then not only could the path of totality not have passed over the field of battle but the greatest eclipse could not have occurred till after sunset. In fact, to represent this and other supposed eclipses of the sun, the acceleration must be increased to about 12", which is near the value found by HIansen from theory, and adopted in his tables of the moon. But his theoretical computation is un- doubtedly incorrect, because in computing in what manner the eccentricity of the earth's orbit enters into the moon's motion he took account only of the first approximation, as Laplace had done. The following is a summary of the present state of the question :— The theoretical value of the acceleration, assuming the

day to be constant, is, according to Delaunay ……. 6176 HIansen's value, in his Z'ables de la Lune, iS …...ccccecccee 12°18 HIansen's revised but still theoretically erroneous result is 12°56 The value which best represents the supposed eclipses

(1) of Thales, (2) at Larissa, (3) at Stikkelstad, isabout 11:'7 The result from purely astronomical observations is…... 8°3 The result from Arabian and modern observations alone

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Inequalities of Long Period.—Combined with the question of the secular acceleration is another which is still entirely unsettled— namely, that of inequalities of long period in the mean motion of the moon round the earth. Laplace first showed that modern observations of the moon indicated that its mean motion was really less during the second half of the 18th century than during the first half, and hence inferred the existence of an inequality having a period of more than a century. All efforts to find a satisfactory explanation were, however, so unavailing that

~~Poisson, in 1835, disputed the reality of the inequality. But Airy, from his discussion of the Greenwich observations between 1750 and 1830, conclusively proved its existence. About the same time Hansen announced that he had found from theory two terms of long period arising from the action of Venus which fully corre- sponded to the inequalities indicated by the observations. These terms, as employed in his Tables de la Lune, are~~

~~15°34 sin (—g-169' +189" + 33° 36') +21"°47 sin (8g" — 13g' +4° 44'),~~

~~in which g, g', and g" represent the mean anomalies of the moon, the earth, and Venus respectively. During the first few years after the publication of Hansen's tables they represented observa- tions so well that their entire correctness was generally taken for granted. But doubt soon began to be thrown upon the inequalities of long period just mentioned. Indeed, Hansen himself admitted that the second and larger term was partly empiri- cal, being taken so as to satisfy observations between 1750 and 1850. Delaunay re-computed both terms, and found for the first term a result substantially identical with that of Hansen. But he found for the second or empirical one a coefficient of only 0:27, which would be quite insensible. With this smaller coefficient the obser- vations from 1750 could not be satisfied, so that, so far as observa- tions could go in deciding a purely mathematical question, the evidence was in favour of Hansen's result. But on comparing Hansen's tables with observations between 1650 and 1750 it was found that the supposed agreement with observation was entirely illusory. Moreover, since 1865 the moon has been steadily falling behind the tabular place. These inequalities of long period have not yet been satisfactorily explained. The most plausible supposi- tion is that they are due to the action of one or more of the larger planets. But the problem of the action of the planets on the meon~~

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~~is the most difficult and intricate of celestial mechanics, and no satisfactory general method of attacking it has yet been found. The sources of difficulty are two in number. First, the disturbing action of the planets is modified by that of the sun in such a way that the ordinary equations of disturbed elliptic motion are no longer rigorous, and hence~~

new and more complicated ones must be constructed. And, secondly, the combination of the four bodies — moon, earth, sun, and planet — leads to terms so numerous and intricate that it has hardly been found possible to isolate them. The question has, indeed, been raised whether the rotation of the earth on its axis, and hence the unit of time, may not be subjcct to slow and irregular changes of a nature to produce apparent corre-sponding changes in the motion of the moon. But it has recently been found, from a discussion of the observed transits of Mercury since 1677, that, although such inequalities may exist, they cannot have the magnitude necessary to account for the observed changcs of long period in the moon's motion.

The following is a summary of the present state of the various branches of the lunar theory. (1) The numerical solution of the problem of the sun's action on the moon may be regarded as quite satisfactory, at least when Hansen's results shall have been verified by an independent method. (2) The analytic theory needs to be perfected by finding some remedy for the slow convergence of the series by which itis expressed, but its general form may be regarded as quite satisfactory. (8) Except in one or two special cases, the action of the plancts on the moon, when treated with the necessary rigour, is so intricate that no approach to a satisfactory solution has yet been attained. When this desideratum is reached, the mathematical theory will be coinplete. (4) The general discussion of ancient and modern observations with a view to finding what real or apparent inequalities of long period in the mean motion may exist is still to be finished. With it the astronomical theory will be complete. (S. N.)

MOORCROFT, Witxt1am (c. 1770-1825), traveller in Asia, was born in Lancashire, about 1770. HIe was edu- cated as a surgeon in Liverpool, but on completing his course he resolved to devote himself to veterinary surgery, and, after studying the subject in France, began its practice in London. In 1795 he published a pamphlet of directions for the medical treatment of horses, with special reference to India, and in 1800 a Cursory Account of the Methods of Shoeing HIorses. Waving been offered by the East India Company the inspectorship of their Bengal stud, Moorcroft left England for India in 1808. Under his care the stud rapidly improved ; in order to perfect the breed, he resolved to undertake a

~~*journey into Central Asia to obtain a stock of Turcoman horses. In company with Captain William Hearsay, and encumbered with a stock of merchandise for the purpose of establishing trade relations between India and Central Asia, Moorcroft left Josimath, well within the mountains, on 26th May 1812. Proceeding along the valley of the Dauli, they reached the summit of the frontier pass of Niti on lst July. Descending by the towns of Daba and Ghortope, Moorcroft struck the main upper branch of the Indus near its source, and on 5th August arrived at the sacred lake of Manasarowara. Returning by Bhutan, he was detained some time by the Gurkhas, and reached Calcutta in November. This journey only served to whet Moorcroft's appetite for more extensive travel, for which he prepared the way by sending out a young Hindustani, who succeeded in making very extensive explorations. In company with this young man and George Trebeck, Moor- croft set out on his second journey in October 1819. His enterprise was looked upon rather coldly by the directors, who merely allowed him his pay for a time, all the expenses being borne by Moorcroft himself. By way of Almord and Srinagar, Lahore was reached on 6th May 1820. On 14th August the source of the Biyah (Hyphasis) was discovered, and subsequently that of the Chenab. Leh, the capital of Ladak, was reached on 24th September, and here several months were spent in exploring the surrounding country. A commercial treaty was concluded with the Government of Lada&k, by which the whole of Central Asia was virtually opened to British trade. Kashmir was reached on 3d November 1822, and by the Pir Panjél mountains Jalalabad on 4th June 1824, Cabul on 20th June, and by*~~

~~*Khulm, Kunduz, and Balkh Moorcroft arrived at Bokhara on 25th February 1825. Everywhere he bought horses for the company, and endeavoured to establish trade relations. At Andkho in Cabul Moorcroft was seized with fever, of which he died on 27th August 1825, Trebeck surviving him only afew days. It wasnot till several years afterwards that his papers were obtained by the Asiatic Society, and published under the editorship of Horace Hayman Wilson in 1841 under the title of Travels in the Himalayan Provinces of Iindustan and the Punjab, in Ladakh and Kashmir, in Peshawur, Kabul, Kunduz, and Bokhara, from 1819 to 1825.*~~

~~*Though published so long after the traveller's death, the narrative was a valuable contribution to a knowledge of Central Asia, and still remains a classic. In vol. xii. of Asiatic Researches will be found an account by Moorcroft of his first journey, and in the Transactions of the Royal Asiatic Society, vol. i., a paper on the Purik sheep.*~~

~~*MOORE, Epwarp (1712-1757), minor poet, dramatist, and miscellaneous writer, was the son of a dissenting minis- ter of Abingdon, where he was born in 1712. HIe was the author of the thrilling domestic tragedy of The Gamester, originally produced in 1753 with Garrick in the leading character, and still in the repertory of acting plays. It is perhaps the strongest lesson against gambling ever preached from stage or pulpit. The literary merit of the play is not great, but it is powerfully constructed and full of impressive incident, and the career of Beverley the gambler (a character modelled on Fielding's Captain Booth) affords great scope for the actor. Moore also wrote two comedies. As a poet he produced clever imitations of Gay and Gray, and with the assistance of Lyttelton, Chesterfield, and HIorace Walpole conducted The World (1753-57) during the great decade of the revival of periodical essay-writing. The World followed Johnson's Rambler, and was followed by The Idler ; it had as rivals The Adventurer and The Connoisseur. Moore died at London in 1757.*~~

~~*MOORE, Dr Joun (1730-1802), born at Stirling in 1730, was one of the most prominent writers of travels and novels in the latter part of the 18th century. HIs novel Zeluco (published in 1789) produced a powerful impression at the time, and indirectly, through the poetry of Byron, has left an abiding mark on literature. The novel would in these days be called a psychological novel ; it is a close analysis of the motives of a headstrong, passionate, thoroughly selfish and unprincipled profligate. It is full of incident, and the analysis is never prolonged into tedious reflexions, nor suffered to intercept the progress of the story, while the main plot is diversified with many interesting episodes. The character took a great hold of Byron's imagination, and probably influenced his life in some of its many moods, as well as his poetry. It is not too much to say that the common opinion that Byron intended Childe HIarold as a reflexion of himself cannot be cleared of its large mixture of falsehood*~~

~~without a study of Moore's Zeluco. Byron said that he intended the Childe to be "a poetical Zeluco," and the most striking features of the portrait were un- doubtedly taken from that character. At the same time it is obvious to everybody acquainted with Moore's novel and Byron's life that the moody and impressionable poet often adopted the character of Zeluco, fancied himself and felt himself to be a Zeluco, although he was at heart a very different man. Moore's other works have a less marked individuality, but his sketches of society and man- ners in France, Germany, Switzerland, Italy, and England furnish valuable materials for the social historian. Like his countrymen Burnett and Boswell, he was a sagacious, penetrating, and in the main unprejudiced observer, with something of a natural historian's interest in the human species ; and he had exceptional opportunities of observation.~~

~~[le was a doctor by profession, and the son of a Stirling- shire clergyman. After taking his medical degree at Glasgow, he served with the army in Flanders, then was attached to the household of the English ambassador at Paris, then practised for five years in Glasgow, next travelled on the Continent for five years with a young nobleman, settled for some years as a physician in Lon- don, accompanied Lord Lauderdale to Paris in 1792 and witnessed some of the principal scenes of the Revolution. All classes thus came under his observation, while his pro- fession preserved him in an unusual degree from flippant bias. His works attest great shrewdness and sagacity of judgment, and show no small skill in literary presentation. He died at London in 1802.~~

~~MOORE, Sm Joun (1761-1809), the only English general who has gained lasting fame by the conduct of a retreat, was the son of Dr Moore (the subject of the pre- ceding notice), and was born at Glasgow on 13th November 1761. It was his appointment as tutor to the young duke of Hamilton which procured for John Moore educational advantages by which he profited so much as to be called in after life the most cultivated officer in the army. It was then the fashion for young noblemen to travel from court to court, and Moore accompanied his father and the duke to all the chief capitals in Europe, until he was suddenly ordered in 1777 to~~

~~*join the 51st regiment, in which he had been appointed an ensign. He learned his drill at Minorca, and in 1779 was appointed lieutenant and paymaster in a new regiment recently raised by the duke of Hamilton, with which he served in America till the peace of 1783. In 1784 Moore, though but twenty-three years of age, was returned by the duke of Hamilton as member of parliament for the united boroughs of Selkirk, Peebles, and Linlithgow. In parliament he does not seem to have opened his mouth, though he always voted with the Govern- ment; but he made some useful friends, notably the duke of York and Pitt. In 1788 he was promoted to a majority in the 5lst regiment, and in 1790 he became lieutenant- colonel and resigned his seat in parliament. He soon got his regiment in fine order, and in 1792 sailed with it for the Mediterranean. He was too late to assist at Toulon, but was engaged throughout the operations in Corsica, and especially distinguished himself at the taking of Calvi. After the expulsion of the French, Moore became very in- timate with Paoli and many of the leading Corsican patriots, which intimacy was so obnoxious to Sir Gilbert Elliot, the viceroy, that Moore was ordered to leave the island in forty- eight hours. . Sir Gilbert's hasty conduct by no means met with approval in London, and Moore was gazetted briga- dier-general, and ordered to proceed with his brigade to the West Indies. In April 1796 he reached Barbados, and at once became the right hand of Sir Ralph Aber- cromby, the commander-in-chief. The first enterprise was the reconquest of the island of St Lucia, which was com- pletely occupied by an agent of Victor Hugues with a mixed force of Caribs, negroes, and Frenchmen. The key of the island was a fortified and almost impregnable height called the Morne Fortuné, which was at last stormed, though with great loss, by the valour of brigadier-generals Moore and Hope, who were to be comrades on a yet more memor- able field. After this success, Sir Ralph left the island, and appointed Moore governor and commander-in-chief. A difficult post he found his government, owing to the swarms of Caribs and negroes in the woods; but just as he was on the point of triumphing he fell ill of yellow fever, and was ordered home. In 1798 he was well and again eager to be on active service, and he accompanied his friend Abercromby over to Ireland, where he received the com- mand of the Bandon district. In the Irish rebellion of 1798 he distinguished himself by his activity in saving*~~

~~*Wexford from destruction after the battle of Vinegar Hill. His services were in universal request, and Abercromby insisted upon his serving with him in the expedition to the Helder in 1799, where he did creditably all that was credit- ably done in that ill-managed expedition. On his return from Holland he was made colonel of the 52d regiment, and in 1800 accompanied Abercromby to the Mediterranean as major-general.*~~

~~*Throughout the Egyptian expedition he commanded the reserve, and especially distinguished himself at the battle of Alexandria, when he was wounded in three places, and behaved with such distinction that he was recognized uni- versally as the greatest English general, now that Aber- cromby was gone. The short interval of the peace of Amiens did not injure Moore's prospects, and in 1803 he was appointed commandant of the camp at Shorncliffe. Here he proved his greatness as an organizer, for it was at this time that he organized those light regiments which were to form the reserve in his own campaign and the light division in the Peninsular War. While at Shorncliffe he renewed his intimacy with Pitt, who was then residing at Walmer Castle, and who on his return to office made Moore a knight of the Bath, and consulted him on every military project. Fox, when he succeeded to office, showed the same appreciation of Moore, and in May 1806 appointed him second-in-command to his brother, General Fox, who was ordered with a strong force to Sicily to supersede Sir John Stuart. Moore won but little credit at this time, for there was none to gain, but employed his time, according to Napier, in falling in love with Miss Fox, to whom, however, he never proposed, fearing to be accepted for his position and not for himself. In 1807 he was able to escape from the intrigues of the Sicilian court, and was ordered to Portugal, which he reached too late to make any defence of Lisbon, already in the possession of the French. He then went home, and had four months' rest, the last he ever had. In May 1808 he was ordered with a force of 11,000 men to Sweden to assist the king against the united forces of France and Russia. The mad conduct of the Swedish king, however, who even went so far as to declare Sir John Moore under arrest when he refused to acquiesce in his plans, ruined any chance of successful co-operation, and the English general made his escape and*~~

~~*returned to England. He was at once ordered to proceed with his division #6 Portugal, where Sir Arthur Wellesley had already landed; but the appointment of Dalrymple and Burrard to the chief commands was even more of a slight on' Moore as a general of European experience than on Wellesley, whose laurels had hitherto been won in India. He regarded himself as personally insulted by the ministers, and especially by Lord Castlereagh, but deemed it his duty to go where he was ordered. He met his reward; for when, after the excitement caused by the Convention of Cintra, Dalrymple and Burrard went home, he was left in com- mand of the largest English army since the commencement of the war. Wellesley had appreciated him, and in an interesting letter (published in the Wellington Despatches) had expressed his desire to use his own great political influence to reconcile him to the ministers and the ministers to him.*~~

~~*Now began the glorious three months on which Moore's reputation as a soldier and a statesman must rest. The Spaniards, flushed with their former success at Baylen, regarded Napoleon, who had in person crossed the Pyrenees, as another Dupont, and loudly summoned Moore to a share in their coming victories. Moore knew better what was the value of Napoleon's genius, but he had been commanded to assist the Spaniards, and therefore gave the order to advance. His army marched in four distinct divisions, and on 13th November 1808 he concentrated at Sala-*~~

~~*manca, where he waited to see what would happen. He heard that a subsidiary force under Sir David Baird had arrived at Corunna, and ordered it up to join him. At Salamanca he remained a whole month watching the triumphant successes of Napoleon and his lieutenants, and learning how little Spanish reports or Spanish valour were to be relied on. Though irritated by the menaces and abuse of Frere, the English minister to the junta, he waited till the 13th December, hearing daily of Spanish defeats, and then he determined to draw off upon his own small force the weight of Napoleon's power, and thus give Andalucia the winter in which to organize an army and prepare for another Baylen. With this intention he advanced through Toro and Mayorga, where Baird joined him, to*~~

~~*Sahagun. He judged rightly that Napoleon would never advance into Andalucia and leave the English behind him, but that he would turn all his power against them. Having once drawn Napoleon's attention to himself, he began his famous retreat and fell back quickly, fighting every day and invariably with success. He now could test the military spirit he had taught at Shorncliffe, for the reserve under Sir Edward Paget consisted entirely of his own light regiments. To detail each step of the retreat and every skirmish would be but to rewrite Napier ; suffice it to say that, with great loss of life and material, Moore reached Corunna on 12th January 1809. But the fleet to take the army home was not there ; and the English would have to fight Soult, whose army was even more weakened and demoralized than Moore's, before they could embark. It was on 16th January that Moore fought his last battle ; he fell early in the day, and knew at once that his wound was mortal. His last hours were cheered with the know- ledge of victory, but were spent in recommending his old friends, such as Graham and Colborne, to the notice of the Government. Sir H. Hardinge's description of these hours is in its way inimitable, and in it must be studied how a modern Bayard should die in battle, every thought being for others, none for himself.*~~

~~*It may be possible in the face of his heroic death to exaggerate Moore's actual military services, but his influence on the British army cannot be overrated. The true military spirit of discipline and of valour, both in officers and men, had become nearly extinct during the American war. Abercromby, who looked back to the traditions of Minden, was the first to attempt to revive it, and his work was carried on by Moore. The formation of the light regi- ments at Shorncliffe was the answer to the new Frencii tactics, and it was left to Wellington to show the success of the experiment. Moore's powers as a statesman are shown in his despatches written at Salamanca, and he had the truest gift of a great man, that of judging men. It may be noticed that, while Wellington perpetually grumbled at the bad qualities of his officers and formed no school, Moore's name is associated with the career of all who made their mark, Among generals, Hope, Graham, Sir E. Paget, Hill, and Craufurd, all felt and submitted to his ascendency, and of younger officers it was ever the proud boast of the Napiers, Colborne, the Beckwiths, and Barnard that they were the pupils of Moore, not of Wellington. Nay more, he inspired*~~

~~an historian. The description of Moore's retreat in Napier is perhaps the finest piece of military history in the English language, not only because the author was present, but because his heart was with the leader of that retreat ; and, if Napier felt towards Wellington as the soldiers of the tenth legion felt towards Cesar, he felt towards Moore the personal love and devotion of a cavalier towards Montrose.~~

~~The great authority for Moore's life is the Life of Sir John Moore, by his brother, J. C. Moore (1833); see also Narrative of the Campaign of Sir John Moore in Spain, by his brother, J. C. Moore (4to, with plans, 1809); Napier, Peninsular War, Bk. iv., and his Life of Sir Charles Napier. For views adverse to Moore's retreat, see Charmilly, Narrative (1810), and Sir Bartle Frere, Life of the Ri. Hon. J. H. Frere (published in vol. i. of his works). Consult also Wilson, Campaign in Egypt, for Moore's services there, and the Life of Gilbert Elliot, First Lord Minto, for the squabble in Corsica.~~

~~MOORE, Tuomas (1779-1852), born at Dublin on 28th May 1779, fairly shares with Lord Byron the honour of being the most popular poet of his generation. Whatever may be thought now of the intrinsic qualities of his verse, this much cannot be denied. The most trustworthy of all measures of popularity is the price put upon a writer's work~~

~~in the publishing market, aud when Moore's friend Perry, in negotiating the sale of the unwritten Lalla Lookh, claimed for the poet the highest price that had up to that time been paid for a poem the publisher at once assented. Moore was then in the heyday of his reputation, but twenty years later publishers were still willing to risk their thou- sands on his promise to produce. Much of Moore's success was due to his personal charm. This at least gave him the start on his road to popularity. There is not a more extraordinary incident in the history of our literature than the instantaneousness with which the son of a humble Dublin grocer just out of his teens, on his first visit to London, captivated the fashionable world and established himself in the course of a few months as one of its prime favourites. The youth crossed St George's Channel in 1799 to keep terms at the Middle Temple, carrying with him a translation of the Odes of~~

~~*Anacreon, which he wished to publish by subscription. In a very short time he had enrolled half the fashionable world among his subscribers, and had obtained the permission of the prince of Wales to dedicate the work to him. The mere power of writing graceful and fluent amatory verses would not alone have enabled the poet to work this miracle. Moore's social gifts were of the most engaging kind. He charmed all whom he met, and charmed them, though he was not a trained musician, with nothing more than with his singing of his own songs. The piano, and not the harp, was his instru- meht, but he came nearer than anybody else in modern times to Bishop Percy's romantic conception of the minstrel. To find a parallel to him we must go back to the palmy days of Provencal song, to such troubadours and jongleurs as Arnaud Daniel and Perdigon, whose varied powers of entertainment made them welcome guests wherever they went. It was not merely the fashionable world that the young adventurer captivated ; the landlady of his lodgings in London, a countrywoman of his own, offered to place at his disposal all the money of which she had the command.*~~

~~*The fragment of autobiography in which Moore draws a softly-coloured picture of his early life in Dublin lets us into the secret of the seeming miracle of his social con- quest. Externals apart, the spirit of his social surround- ings in Little Aungier Street had much in common with the society to which he was introduced in London. He was born in the proscribed sect of Catholics, whose exclu- sion from the society of the Castle produced a closer union among their various ranks, and thus, from the first, Moore was no stranger to the more refined gaieties of social inter- course. It was, upon the whole, a gay life in Catholic society, though the conspiracy of the United Irishmen was being quietly formed beneath the surface. Amateur theatricals was one of their favourite diversions, and gifts of reciting and singing were not likely to die for want of applause. Moore's schoolmaster was a leader in these entertainments, a writer of prologues and epilogues and incidental songs; and at a very early age Master Thomas Moore was one of his show-boys, ardently encouraged in all his exercises by a very affectionate mother at home. Before he left school he had acquired fame in his own circle as a song-writer, and had published, in the Anthologia Hibernica, verses "to Zelia on her charging the author with writing too much on love." This wasin*~~

~~*1793. In that year the prohibition against Catholics entering Trinity College was removed, and next year Moore took advantage of the new freedom. As one of the first Catholic entrants, he had an exceptional stimulus to work, and there industriously acquired that classical scholarship with which he won the hearts of such learned Whigs as Lansdowne and Holland, while he charmed fashionable ladies with the grace of his songs. Young Moore's social atmosphere was, of course, strongly charged with patriotism and hatred of the excesses of*~~

~~*English despotism. Some of his closest friends in Trinity were deep in the conspiracy of 1798. But even for his patriotism—a genuine passion which he never sought to disguise—Moore found plenty of sympathy among the Whig political leaders, when he made their acquaintance in the first years of the century.*~~

~~*Moore was fairly established in London society in the first year of the century, and from that time the hope of its applause was the ruling aspiration of his life and its judgment the standard of his work. In his letters to his mother, which are delightful prose lyrics and show the most charming side of Moore's character—he wrote to her constantly and with warm affection in his busiest weeks—we find him, even in 1800, declaring himself surfeited with duchesses and marchionesses, and professing his readiness at any moment to exchange all his fineries for Trish stew and salt fish. But he never did make the exchange, even for more potent attractions than the fare of his youth. He could not bear the shortest banishment from fashionable drawing-rooms without uneasy longings. The dignity and ease, the luxury, the gaiety, the bright- ness of fashionable life, wholly satisfied his joyous and self- indulgent nature. When men of rank courted his company, when princesses sang his songs and peeresses wept at them, Moore was too frank to affect indifference ; he was in the highest heaven of delight, and went home to record the incident to his relatives or transmit it to posterity in his diary. If prudence whispered that he was frittering away his time and dissipating his energies, he persuaded him- self that his conduct was thoroughly worthy of a solid man of business: that to get alucrative appointment from his*~~

~~*political friends he must keep himself in evidence, and that to make his songs sell he must give them a start with his own voice. But his mind was seemingly not much troubled either with sordid care or with sober prudence; he lived in the happy present, and he liked fashionable company for its own sake,—and no wonder, seeing how he was petted, caressed, and admired. Swift's saying that great men never reward in a more substantial way those whom they makethe companions of their pleasures was often in Moore's mind. It was verified to some extent in his own case. Through Lord Moira's influence he was appointed registrar of the admiralty court in Bermuda in 1803. He went there to take possession, but four or five months of West India society, jingling pianofortes, and dusky beauties bored him excessively, and he appointed a deputy and returned to London, after little more than a year's absence. The office continued to bring him about £400 a year for fourteen or fifteen years, but at the end of that time embezzlement by the deputy, for whom he was responsible, involved him in serious embarrassment. This was all that Moore received from his great political friends, ~—no great boon as things went in the days of patronage. He had hopes from Lord Moira in the Grenville ministry in 1806,—hopes of an Irish commissionership or something substantial, but the king's obstinacy about Catholic emancipation destroyed the ministry before anything worth having turned up. The poet's long-deferred hopes were finally extinguished in 1812, when Lord Moira, under the Liverpool administration, went out as governor-general to India without making any provision for him. From that time Moore set himself in earnest to make a living by literature, his responsibilities being increased by his marriage in 1811. From his boyhood to 1812 may be called the first period of Moore's poetical activity. He had formed the design of translating Anacreon while still at college, and several of the pieces published in 1801 under the nom de plume of "Thomas Little" were written before he was eighteen. The somewhat ostentatious scholarship of the notes to his Anacreon, the parade of learned authorities, he explained*~~

~~*by his habit of omnivorous reading in Trinity College library. Throughout his literary life he retained this habit of out-of-the-way reading and clever*~~

~~*display of it. Moore had really abundance of miscellaneous scholarship as well as great quickness in the analogical application of his knowledge ; and, though he made sad havoc of quantities when he tried to write in Greek, there was probably no scholar of his time who would have surpassed him in the interpretation of a difficult passage. He seems to have spent a good deal of time in the libraries of the great houses that he frequented; Moira, Lansdowne, and Holland were all scholarly men and book-collectors. It might be asked,— What had "' passion's warmest child," whose " only books were women's looks," to do with obscure medieval epigrammatists, theologians, and commentators? But it would seem that Moore took the hints for many of his lyrics from books, and, knowing the great wealth of fancy among medieval Latinists, turned often to them as likely quarters in which to find some happy word-play or image that might serve as a motive for his muse. The public, of course, were concerned with the product and not with the process of manufacture, and " Little's" songs at once became the rage in every drawing-room. He found his songs in Virginia when he landed there on his way to Bermuda. And not only were his songs sung but his poems were read, passing rapidly through many editions. The bulk of them were simple fancies, gracefully, fluently, and sometimes wittily expressed, the lyrist's models being the amatory poets of the 17th century from Carew to Rochester. Carew is the only eminent poet of that century with whom Moore will bear comparison. The highest praise that can be given to his amatory lyrics is that he knew his audience, wrote directly for them, and pleased them more than any of his competitors. His publication of 1806 was savagely reviewed in the Edin- burgh by Jeffrey, who accused him of a deliberate design to corrupt the minds of innocent maidens with his wanton fancies, and who had in consequence to figure in a ludicrous attempt at a duel—ludicrous in its circumstances, though Moore was ferociously in earnest. We may well acquit Moore of the diabolic intention attributed to him, but Jeffrey's criticism of his poetry as poetry was just enough. The only parts of the volume that Jeffrey praised were the satirical epistles. The vein essayed in these epistles Moore pursued afterwards in his Corruption, Intolerance (1808), and The Sceptic, a philosophical satire (1809) ; but as long as he kept to the heroic couplet and the manner of Pope he could not give full scope to his peculiar powers asa satirist. It may be remarked in passing that the result of the*~~

~~*hostile meeting with Jeffrey is a striking evidence of the impressiveness of Moore's personality ; in the course of a few minutes' conversation he changed a bitter critic into a lifelong friend. Of all the poetical enterprises that Moore undertook, either at this period or later, none was so exactly suited to his powers as the task proposed to him by the publisher Power of supplying fit words to a collection of Irish melodies. The first number appeared in 1807, and it was so successful that for twenty-seven years afterwards writing words to music was one of Moore's most regular occupations and his steadiest source of income, Power pay- ing him an annuity of £500. Six numbers of Irish melodies were published before 1815; then they turned to sacred songs and national airs, issuing also four more numbers of Irish melodies before 1834. Moore entered into this work with his best and most practised powers and with all his heart. From his boyhood he had been in training for it. The most characteristic moods of Irish feeling, grave and gay, plaintive and stirring, were embodied in those airs, and their variety touched the whole range of Moore's sensi- tive spirit, carrying him far beyond the shallows of his*~~

~~*MOORE*~~

~~*spurious Anacreontic sentiment, namby-pamby when not prurient ; he wrote with full inspiration, unreserved sin- cerity, and thoroughly roused faculty. Divorced from the music, many of them are insipid enough, but they were never meant to be divorced from tlie music; the music was meant, as Coleridge felt when he heard them sung by the poet himself, to twine round them and overtop them like the honeysuckle. Moore accomplished this with exquisite art. HIs most conspicuous failures may be traced to his habit of taking as his starting-point not an emotional incident but some unmanageable intellectual con- ceit. HIence arose intellectual discords, incongruous and imperfectly harmonized fancies, which even the music can hardly gloss over.*~~

~~*. The regent's desertion of the Whigs in 1812 cut them off from all hope of office for many years to come, and Moore from his last hope of a snug sinecure, when Lord Moira also was practically "oblivious" of him. There was at once a marked increase in his literary fertility, and he broke ground in a new field, which he cultivated with pre-eminent success—*~~

~~*political squib-writing. Moore was incapable of anything like rancour, but he felt the dis- appointment of his hopes enough to quicken his fancy and sharpen the edge of his wit. The prince regent, his old friend and patron, who was said to have begged all Lord Moira's appointments for personal favourites, was his first butt. The prince's defects and foibles, his fatness, his huge whiskers, his love for cutlets and curagoa, for aged mistresses and practical jokes, were ridiculed with the lightest of clever hands. Moore opened fire in the Morning Chronicle, and crowned his success next year (1813) with a thin volume of "'Intercepted Letters," The Twopenny Post Bag.*~~

~~*The disappointment of 1812, which started Moore on his career as a squib-writer, nerved him also to- a more sustained effort in serious verse than he had before at- tempted. Lalla Rookh would never have been written if the author's necessities had not compelled him to work. To keep himself at the oar, he contracted with the Long- mans to supply a metrical romance on an Eastern subject, which should contain at least as many lines as Scott's Rokeby, and for which the publishers bound themselves to pay three thousand guineas on delivery. The poem was not published till May 1817. Moore, as was his habit,*~~

~~*made most laborious preparation, reading himself slowly into familiarity with Eastern scenery and manners. He retired to a cottage in Derbyshire, near Lord Moira's library at Donington Park, that he might work uninterruptedly, safe from the distractions of London society ; and there, "amid the snows of a Derbyshire winter" as he. put it, he patiently elaborated his voluptuous pictures of flower- scented valleys, gorgeous gardens, tents, and palaces, and houris of ravishing beauty. The confidence of the publishers was fully justified. Moore's contemporaries were dazzled and enchanted with Lalla Rookh. It was indeed a wonderful tour de force. There was not a single image or allusion in it that an ordinary Englishman could understand without a foot-note. High testimonies were borne to the correctness of the local colouring, and the usual stories were circulated of Oriental natives who would not believe that Moore had never travelled in the East. Moore was less successful in*~~

~~*realizing Oriental character than he was in details of dress and vegetation. His fire-worshipper is an Irish patriot betrayed by an informer, his Zelica a plously nurtured Catholic maiden brooding over unpardoned sin, his Mokanna a melodramatic stage monster,—though they are so thickly covered with Oriental trappings that their identity is considerably disguised. Of the four tales put into the mouth of Feramorz, the " Veiled Prophet " was the least suited.to Moore's Turkey-carpet treatment. We can understand the enthusiasm with which Moore's Orien-talism was received as ""'the best that we have had yet," and we can honour the honest labour with which he achieved this success ; but such artificial finery, as the poet himself had the sense to suspect, could have onlya temporary reputation. He deliberately sacrificed the higher qualities of poetry for accuracy of costume and soft melody of rhyme and rhythm, and he had his reward. His next Orientalism, the Loves of the Angels, published in 1822, was hardly less popular than Lalla Rookh. The artificiality of the manufacture was shown by the ease with which, after a few editions, he changed his angels from Jews into Turks, to evade a charge of impiety which was supposed to impede the sale of the work. . Immediately after the completion of Lalla Rookhk Moore changed his residence to Sloperton Cottage in Wiltshire, to be near Lord Lansdowne and the library at Bowood, his next literary project being a life of Sheridan. His plans were inter- rupted by the consequences of the rascality of his deputy at Bermuda, which has been already mentioned. To avoid arrest for the sum embezzled, Moore retired to the Continent, and fixed his residence at Paris. He could not return till November 1822, when the affair was com- promised. His friends lamented that the attractions of Paris occupied so much of his time, but, though his diary contains almost daily records of visits to operas, fétes, and fashionable entertainments, it shows also that he was busier than he seemed. He wrote a goodly number of squibs during his exile, besides composing the Loves of the Angels and accumulating materials for his prose tale of the Epicurean—a fair amount of production consider- ing his slow and painstaking habits of composition. His alertness of mind, self-possession, and steadiness of purpose enabled him to work as few men could in the midst of diver- sions and distractions; and, although he himself took a brilliant part in conversation, we can see, from a compart- son of his diary with his published writings, that he kept his ears open for facts and*~~

~~*witticisms which he afterwards made his own. The darling of the drawing-room was as much bee as butterfly. On his return to England he resumed work steadily at his memoirs of Sheridan, writing Captain Rock as a jeu desprit by the way. The Sheridan triumphantly despatched in the autumn of 1825, Moore's next important work was the Life of Byron. The first*~~

~~*volume of this was published early in 1830, and the. second was ready by the end of the same year. In 1831 he com- pleted a memoir of Lord Edward Fitzgerald, for which he had been collecting materials for some time. Moore's biographies call for no comment, except that they were faithful and conscientious pieces of work. He spent much industry in the collection of characteristic anecdotes, for which his position in society gave him exceptional opportunity. His connexion with the burning of Byron's autobiography is too complicated a question to be dis- cussed here. His own version of the circumstances is given in his diary for May 1824.*~~

~~*Tt was a misfortune for the comfort of the last twenty years of Moore's life that he allowed himself to be drawn into a project for writing the "History of Treland" in Lardner's Cyclopedia. Scott and Mackintosh scribbled off the companion volumes on Scotland and England with very little trouble, but Moore had neither their historical training nor their despatch in writing. Laborious con- scientiousness and indecision are a fatal combination for a man who undertakes a new kind of task late in life. The history sat like a nightmare on Moore for fifteen years, and after all was left unfinished on the melancholy collapse of his powers in 1845, From the time that he burdened himself with it Moore did very little else, beyond a few occasional squibs and songs, the last flashes of his genius, and the Travels of an Irish Gentleman in Search of a Religion, although he had tempting offers of more lucrative and, it might have been thought, more congenial work. Moore's character had a deeper manliness and sincerity than he often gets credit for; and his tenacious persistence in this his last task was probably due to an honourable ambition to connect himself as a benefactor with the history of his country, by opening the*~~

~~*eyes of the English people to the misgovernment of Ireland, It was a misjudgment altogether ; the light irony of Captain Rock was much more effective than the minute carefully- weighed details of the history. Moore's last years were harassed by the weakness and misconduct of his sons, and by pecuniary embarrassments. An annual pension of £300 was conferred upon him in 1833, and he had always received large sums for his work ; but, while waiting for the sinecure which never came, he had contracted an unfortunate habit of drawing upon his publishers in advance. After the death of his last child in 1845, Moore became a total wreck, but he lingered on till 26th February 1852. The diary, which he seems to have kept chiefly that it might be the means of making some provision for his wife, and which contains so many touching expressions of his affection for her, was edited by Lord John Russell with his letters and a fragment of autobiography in 1853- 56. The charge of vanity has often been brought against this diary from the writer's industry in recording many of the compliments paid him by distinguished personages and public assemblies. It is only vanity that is annoyed by the display of vanity in others. (Ww. M.)*~~

~~*MOOR-HEN,! the name by which a bird, often called Water-hen and sometimes Gallinule, is most commonly known in England. An earlier name was Moat-hen, which was appropriate in the days when a moat was the ordinary adjunct of most considerable houses in the country. It is the Gallinula chloropus of ornithologists, and almost too well known to need description. About the size of a small Bantam-hen, but with the body much compressed (as is usual with members of the Family Rallidz, to which it belongs), its plumage above is of a deep olive-brown, so dark as to appear black at a short distance, and beneath*~~

~~*1 Not to be confounded with '* Moor-cock " or '* Moor-fowl," names formerly in general use for the Red Grouse (vol. xi. 221).*~~

~~*MIO36=—*~~

~~*MOO*~~

~~*iron-grey, relieved by some white stripes on the flanks, with the lower tail-coverts of pure white,—these last being very conspicuous as the bird*~~

~~swims. A scarlet frontlet, especially bright in the spring of the year, and a red garter on the tibia of the male render him very showy. Though often frequenting the neighbourhood of man, the Moor- hen seems unable to overcome the inherent stealthy habits of the Rallidx, and hastens to hide itself on the least alarm; but under exceptional circumstances it may be induced to feed, yet always suspiciously, with tame ducks and poultry. It appears to take wing with difficulty, and may be often caught by an active dog; but, in reality, it is capable of sustained flight, its longer excursions being chiefly performed by night, when the peculiar call-note it utters is frequently heard as the bird, itself invisible in the darkness, passes overhead. The nest is a mass of flags, reeds, or other aquatic plants, often arranged with much neatness, almost always near the water's edge, where a clump of rushes is generally chosen ; but should a mill-dam, sluice-gate, or boat-house afford a favourable site, advan- tage will be taken of it, and not unfrequently the bough of a tree at some height from the ground will furnish the place fora cradle. The eggs, from seven to eleven in number, resemble those of the Coot (vol. vi. p. 341), but are smaller, lighter, and brighter in colour, with spots or blotches of reddish-brown. Jn winter, when the inland waters are frozen, the majority of Moor-hens betake themselves to the tidal rivers, and many must leave the country entirely, though a few seem always able to maintain their existence however hard be the frost. The common Moor-hen is extensively spread throughout the Old World, being found also at the Cape of Good Hope, in India, and in Japan. In America it is represented by a very closely-allied form, G. galeata, so called from its rather larger frontal helm, and in Australia by another, G. tenebrosa, which generally wants the white flank-markings. Both closely resemble G. chlor- opus in general habits, as does also the G. pyrrhorrhoa of Madagascar, which has the lower tail-coverts buff instead of white. Celebes and Amboyna possess a smaller cognate species, G. hematopus, with red legs; tropical Africa has the smallest of all, G. angulata ; and some more that have been recognized as distinct are also found in other more or less isolated localities. One of the most remarkable of these is the G. nesiotis of Tristan da Cunha,? which has wholly lost the power of flight concomitantly with the shortening of its wings and a considerable modification of its external apparatus, as well as a strengthening of its pelvic girdle and legs.2 A more extreme development in this direction appears to be exhibited by the singular~~

~~*Habroptila wallacit of Jilolo,t and to some extent by the Pareudiastes pacificus of Samoa,® but at present little is known of either. Of other forms, such as the common Gallinula (Erythra) phenicura, and Gallirex cristata of India, as well as the. South-American species classed in the genus Porphyriops, there is not room to speak; but mention should be made of the remarkable Australian genus 7ribonyx, containing three species,® which seem to be more terrestrial than aquatic in their haunts and habits.*~~

~~*Allied to all these is the genus Porphyrio, including the bird so named by classical writers, and perhaps a dozen other species often called Sultanas and Purple Water- hens, for they all have a plumage of deep blue,—some becoming violet, green, or black in parts, but preserving the white lower tail-coverts, so generally characteristic 2 Proc. Zool. Society, 1861, p. 260, pl. xxx. Ss*~~

~~*3 A somewhat intermediate form seems to be presented by the Moor-hen of the island of St Denis, to the north of Madagascar (Proc, Zool. Society, 1867, p. 1036), hitherto undescribed.*~~

~~*4 Op. cit., 1860, p. 365, pl. clxxii.*~~

~~*5 Op. cil. 0871, Pp: es PleiL*~~

~~*8 Ann. Nat. History, ser. 3, xx. p. 128.*~~

~~*MOO—MOR*~~

~~*of the group; and their beauty is enhanced by their scarlet bill and legs. Two, P. alleni of the Ethiopian Region and the South-American P. parva, are of small size. Of the larger species, P. ceruleus is the " Porphyrio" of the an- cients, and inhabits certain localities on both sides of the Mediterranean, while the rest are widely dispersed within the tropics, and even beyond them, as in Australia and New Zealand. But this last country has produced a more exaggerated form, Votornis, which has an interesting and perhaps unique history. First described from a fossil skull by Prof. Owen,! and then thought to be extinct, an example was soon after taken alive,? the skin of which (with that of another procured like*~~

~~*the first by Mr Walter Mantell) may be seen in the British Museum. Other fossil remains were from time to time noted by Prof. Owen ®; but it began to be feared that the bird had ceased to exist,* until a third example was taken about the year 1879, the skin and most of the bones of which, after undergoing examination in New Zealand by Dr Buller and Prof. T. J. Parker,> found their way to the museum of Dresden, where Dr A. B. Meyer discovered the recent remains to be specifically distinct from the fossil, and while keeping for the latter the name NV. mantelli gives the former that of WV. hochstetteri. What seems to have been a third species of Motornis formerly inhabited Lord HIowe's Island, but is now extinct (see BiRDs, vol. iii. p. 732, note). Whether the genus Aptornis, of which Prof. Owen has described the remains from New Zealand, was most nearly allied to Votornis and Porphyrio caunot here be decided. Prof. T. J. Parker (doc. cit.) con- siders it a "development by degeneration of an ocydromine type" (see OcyDROME). (A. N.)*~~

~~*MOOSE. See DeEsrr, vol. vii. p. 24.*~~

~~*MORADABAD. See Murapapap.*~~

~~*MORAL PIHILOSOPHY. See Eruics, vol. viii. p. 574.*~~

~~*MORATIN, Leanpro FERNANDEZ bE (1760-1828), Spanish dramatist and poet, was the son of N. F. Moratin mentioned below, and was born at Madrid on 10th March 1760. HIis poetical and artistic tastes were early deve- loped, but his father, keenly alive to the difficulties of the literary calling, caused him to be apprenticed to a jeweller. At the age of eighteen Moratin surprised his friends by winning the second prize of the Academy for a heroic poem on the conquest of Granada, and two years afterwards he attracted still more general attention by a similar success of his Leccion Poetica, a satire upon the popular poets of the day. Through Jovellanos he was now appointed secre- tary to Cabarrus on his special mission to France in 1787, and during his stay there he diligently improved his oppor- tunities of becoming acquainted with the contemporary French drama, and of cultivating the acquaintance of men of letters. Of the literary friendships he then formed the most important was that with Goldoni; indeed, Moratin is much more correctly styled 'the Spanish Goldoni" than "the Spanish Moliére." On his return to Spain*~~

~~*Florida Blanca presented him to a sinecure benefice in the diocese of Burgos; and in 1790 his first play, Ill Viejo y la Nisa (The Old Husband and the Young Wife), a highly finished but somewhat dreary verse comedy in three acts, written in 1786, but delayed by objections of the actors,*~~

~~*1 Proe. Zool. Society, 1848, p. 7; Trans., iii. p. 386, pl. lvi.*~~

~~*2 Proce, 1850, pp. 209-214, pl. xxi.; Zrans., iv. pp. 69-74, pl. XXV.*~~

~~*3 Thus the leg-bones and what appeared to be the sternum were described and figured by him (Zrans., iv. pp. 12, 17, pls. ii. iv.), and the pelvis and another femur (vii. pp. 369, 373, pls. xlii. xliii.); but the supposed sternum subsequently proved not to be that of Notornis, and Professor Owen's attention being called to the fact he rectified the error (Proc., 1882, p. 689) which he had previously been "inclined to believe"' (Zrans., viii. p. 120) he had made.*~~

~~*4 Notwithstanding the evidence, which it must be allowed pre-*~~

~~*sented some incongruities, offered by Mr Mackay (Ibis, 1867, p. 144). 5 Trans. N. Zeal. Inst., xiv. pp. 238-258.*~~

~~*S09*~~

~~*was at length produced at the Teatro del Principe. Its success was only moderate. Ill Café or La Comedia Nueva, on the other hand, given at the same theatre two years afterwards, at once became deservedly popular, and had considerable influence in modifying the public taste. It is a short prose comedy in two acts, avowedly intended to expose the follies and absurdities of the contemporary dramatists—the school of Lope de Vega run to seed—who commanded the support of the masses ; and it is still read with pleasure for the simple ingenuity of its plot, the live- liness of its dialogue, and the easy grace of its style, while to the student of literature it throws much useful light on the contemporary state of the Spanish drama, and on the reforming aims of the author and his party. In the same year (1792) Florida Blanca was disgraced, but Moratin at once found another patron in Godoy, who provided him with a pension and the means for foreign travel ; he accord- ingly passed through France into*~~

~~*England, where he began the free and somewhat incorrect translation of Hamlet which was printed in 1798, but which has never been per- formed. From England he passed to the Low Countries, Germany, Switzerland, and Italy, and on his return to the Peninsula in 1796 he received a lucrative post at the Foreign Office. HIs next appearance in the drama did not take place until 1803, when £7 Baron was first publicly exhibited in its present form. It successfully weathered a determined attempt to damn it, and still keeps the stage. It was followed in 1804 by La Mogigata (The Female Hypo- crite), of which imperfect manuscript copies had begun to circulate as early as 1791. It was favourably received, as on the whole it deserved to be, by a public which was now at one with the author as to the canons of his art, and an attempt to suppress it by means of the Inquisition on alleged religious grounds (La Mogigata being an imitation, a somewhat feeble one, of Molitre's Zartuffe) was success- fully frustrated. Moratin's last and crowning triumph in the department of original comedy was achieved in 1806, when Zl Si de las Nifias (A Girl's Yes) was performed night after night to crowded houses, ran through several Spanish editions in a year, and was soon translated into several foreign languages. In 1808, on the fall of the Prince of the Peace, Moratin found it necessary to leave Spain, but shortly afterwards he returned and consented to accept the office of royal librarian under Joseph Bona- parte—a false step, which, as the event proved, permanently alienated from him the sympathies of his country, and compelled him to spend almost all the rest of his life in exile. In 1812 his Escuela de los Maridos, a translation and adaptation to the more dignified and stately Spanish standard of Moliére's Ecole des Maris, was produced at Madrid, and in 1814 E17 Medico a Palos (from Le Médecin Malgré Ini) at Barcelona. From 1814 to 1828 Moratin lived in France, principally at Paris, and devoted himself to the preparation of a learned work on the history of the Spanish drama (Origenes del Teatro Espaiiol), which unfor- tunately stops short of the period of Lope de Vega. HIe died at Paris on 21st June 1828.*~~

~~*An edition of his Obras Dramaticas y Liricas in three vols. was published at Paris in 1825. The lyrical works, consisting of odes, sonnets, aud ballads, are of comparatively little interest; they reflect the influence of his father and of the Italian Conti. The best edition of the Obras is that*~~

~~published by the Spanish Academy of History in four vols. at Madrid in 1830-1881 ; see also vol. u. of Biblioteca de Autores Espajioles (1846).~~

~~MORATIN, Niconas FERNANDEZ DE (1737-1780), Spanish poet, was descended from an old Biscayan family, and was born at Madrid in 1737. He was educated at the Jesuit college in Calatayud, and afterwards studied law at the university of Valladolid. He then received an appointment in the service of Queen Elizabeth, the widow of Philip V., which enabled him to see much of the society~~

~~Nearly 97 per cent. of the soil of Moravia is productive, arable land occupying 53, gardens and meadows 8°, pasturage 9, and forests 26 per cent. of the total. It is one of the chief corn-growing regions of the Austrian empire, and also produces excellent hemp, flax, potatoes, vegetables, and fruit, The following table shows the amount of the chief crops in 1881 :—~~

~~Wheat . . 454,480 qrs. Leguminous crops 27,850 ewt.~~

~~of leading statesmen, poets, and men of letters; and ultimately he became the leading spirit of the club of literary men which frequented the Fonda de San Sebastian and included Ayala, Cadahalso, Iriarte, Conti, and others. In 1772 he left the court, and was called to the bar ; four years afterwards he succeeded Ayala in the chair of poetry in the Imperial College. He died on 11th May 1780. Moratin became at an early period of his life a convert to the opinions of those who (such as Montiano and others) were attempt-~~

~~ing to drive the native romantic drama from the Spanish stage, and Ha et et " a (for sugar) TE " his first literary efforts were devoted to the cause of theatrical Ae eo 1.497 450 " Hem 2 ee " reform, In 1762 he published three small pamphlets entitled Maize ae: 8 tel ee Desengatio al Teatro Espatiol (The Truth told about the Spanish Potatoes . 1,271,850ewb Wine… 9369, 460 ' ay~~

~~Stage), in which he severely criticized the old drama generally, and particularly the still flourishing "auto sacramental." They were so far successful that the exhibition of " autos sacramentales " was prohibited by royal edict three years afterwards (June 1765). In 1762 he also published a play entitled La Petimetra (the Petite- Maitresse, or Female Fribble), the earliest original Spanish comedy formed avowedly on French models. It was preceded by a disserta- tion in which Lope de Vega and Calderon are very unfavourably criticized. Neither the Petimetra, however, nor the Luereeia, an original tragedy still more strictly in accordance with the conventions of the French stage, ever obtained the honour of a public repre- sentation. Two subsequent tragedies, Hormesinda (1770) and Guzman el Bueno (1777), were exhibited with partial success. In 1764 Moratin published a collection of short pieces, chiefly lyrical, under the title of Zl Poeta, and in 1765 a short didactic poem on the chase (Diana o Arte de la Caza). HIs "'epic canto" on the destruction of his ships by Cortes (Las Naves de Cortes Destruidas), written, but without success, for a prize offered by the Academy in 1777, was not published until after his death (1785). It is justly characterized by Ticknor as " the noblest poem of its class produced in Spain during the 18th century ;" it must be remembered, how- ever, that the historical epic in Spain is chiefly remarkable for its mass. A: volume of Obras Postwmas, with a life, was published at Barcelona in 1821, and reprinted at London in 1825. See also Biblioteca de Autores Espaioles, vol. ii. (1846).~~

~~MORAVIA (in German Maren), a margraviate and crownland in the Cisleithan part of the Austrian-HIungarian empire, lies between 15° 5' and 18° 45' E, long., and 48° 50' and 50° 10' N. lat. Its superficial extent is about 8580 square miles. Physically Moravia may be described as a mountainous plateau sloping from north to south, and bordered on three sides by mountain ranges of considerable elevation. On the north it is separated from Austrian and Prussian Silesia by the Sudetes, which attain a height of 4775 feet in the Altvater or Schneeberg, and sink gradually towards the west, where the valley of the Oder forms a break between the German mountains and the Carpathians. The latter are the dividing range between Moravia and HIungary, having here an average height of 3000 to 4000 feet. On the west are the so-called Bohemian-Moravian~~

~~*mountains, forming the elevated east margin of Bohemia and descending in terraces, but without clearly-defined ridges, to the river March. Branches of these different ranges intersect the whole country, making the surface very irregular, except towards the south, where it consists of fertile and extensive plains. Owing to this configuration of the soil the climate varies more than might be expected in so small an area, so that, while the vine and maize are cultivated successfully in the southern plains, the weather in the mountainous districts is somewhat rigorous. The mean average temperature at Briinn is 48° Fahr. The harvest amid the mountains is often four or five weeks later than that in the south. Almost the whole of Moravia belongs to the basin of the March or Morava, from which it derives its name, and which, after traversing the entire length of the country in a course of 140 miles and receiving numerous tributaries (Thaya, Hanna, &c.), enters the Dan- ube at Pressburg. The Oder rises among the mountains in the north-east of Moravia, but soon turns to the north and quits the country. With the exception of a stretch of the March none of the rivers are navigable. Moravia is destitute of lakes, but contains numerous large ponds. There are also several mineral springs.*~~

~~*Large quantities of hay and other fodder, besides hops, clover-seed, anise, fennel, &sc., are also raised. The forests on the slopes of the Sudetes produce abundance of excellent timber, The live-stock of Moravia in 1880 consisted of 122,858 horses, 677,807 cattle, 158,852 sheep, 205,976 swine, and 116,880 goats. The breed of sheep on the Carpathians is of an improved quality, and the horses bred in the fertile plain of the Hanna are highly esteemed. Geese and poultry are also reared. In 1880 Moravia contained 83,440 beehives, and the produce of wax and honey may be estimated at 3500 to 4000 cwts.*~~

~~*The mineral wealth of Moravia, consisting chiefly of coal and iron, is very considerable. In 1881 the produce included 392,625 tons of anthracite coal, 50,665 tons of lignite, 5700 tons of iron-ore, 1713 tons of graphite, and smaller quantities of alum, potter's clay, and roofing-slate. The mines give employment to 4500 persons, and the annual value of the raw minerals produced is about £370,000. The amount of raw and cast*~~

~~*iron produced by the ironworks and foundries in 1880 was 40,000 tons, and the value about £320,000.*~~

~~*In point of industry Moravia belongs to the foremost*~~

~~*provinces of the empire. The principal manufactures are woollen, cotton, linen, and cast-iron goods, beet-sugar, leather, and brandy. Its woollen cloths and flannels, the manufacture of which centres in Briinn, have long been celebrated. The linen manufacture is decreasing in importance as cotton manufactures develop. The quantity of sugar made from beetroot is steadily increasing ; in 1880 about 600,000 cwts. of sugar were produced in fifty- seven factories. About 10 per cent. of the total value of the manufactures of Austria, representing an annual amount of £13,000,000 to £15,000,000, falls to the share of Moravia. The trade of Moravia consists mainly in the exchange of the various raw and manufactured materials above men- tioned for colonial produce, salt, and raw manufacturing material. The lack of navigable rivers or canals is com- pensated by good roads and an extensive railway system. The most important commercial towns are Brinn for manu- factures and Olmiitz for live-stock. In educational matters Moravia compares favourably with most of the Austrian states. It contains 10 gymnasia, 10 real-gymnasia, 13 real-schools, numerous schools for special purposes, and nearly 2000 lower schools. The old university of Briinn is now represented by a technical academy anda theological seminary. Of children of school-going age 79 per cent. attend school regularly. In 1870 about 46 per cent. of the Moravian recruits could write their names, as compared with the extremes of 83} per cent. in Lower Austria and 1} per cent. in Dalmatia. Fully 95 per cent. of the inhabitants are Roman Catholics under the ecclesiastical jurisdiction of the archbishop of Olmiitz and the bishop of Briinn, while about 2 per cent. are Jews, and 3 per cent. Protestants.*~~

~~*Moravia sends 36 members to the Austrian reichstag, 9 of these representing the landed proprietors, 16 the towns and chambers of commerce, and 11 the peasantry.*~~

~~*Provincial affairs are managed by the landtag, consisting of the Roman Catholic archbishop and bishop, 30 repre- sentatives of the landed gentry, 37 representatives of the towns and chambers of commerce, and 31 representatives of the country districts. There are six courts of justice of the first instance in Moravia, and one of the second instance (at Briinn), whence appeal lies to the supreme court at Vienna. For military and judicial purposes Moravia is united with Austrian Silesia.*~~

~~*Moravia belongs to the group of old Slavonic states which have preserved their nationality while losing their political independence. Upwards of 70 per cent. of the inhabitants are Slavs, who are scarcely distinguishable from their Bohemian neighbours. The differences in dialect. between the two countries are very slight, and are being gradually lost in a common literary language. The name of Czech, however, is usually reserved for the Bohemians, while the Slavs of Moravia and West Hungary are called Moravians and Slovaks. The Czechs have lost sight of their ancient tribal names, but the Moravians are still divided into numerous secondary groups (Hovaks, Hanaks, &c.), differing slightly in costume and dialect. The peasants usually wear a national costume. In the south of Moravia are afew thousand Croats, still preserving their manners and language after three centuries' separation from their kinsmen in Croatia; and in the north-east are numerous Poles. The Germans form about 26 per cent. of the population, and are found mostly in the towns and in the border districts. The Jews are the best educated of the inhabitants, and in a few small towns form a full half of the population. Their sympathies generally lie with the Germans. In 1880 the population was 2,153,407, showing an increase of 136,133 since 1869. Moravia is oneof the most densely-populated parts of Austria-Hungary, the proportion being 252 persons per square mile. About 12 per cent. of the births are illegitimate. The chief towns are Briinn, the capital and industrial centre (82,660 inha- bitants), Olmiitz, a strong fortress defending the "' Moravian Gate" (20,176 inhabitants), Znaim, and Iglau.*~~

~~*History.—At the earliest period of which we have any record Moravia was occupied by the Boii, the Celtic race which has per- petuated its name in Bohemia. Afterwards it was inhabited by the Germanic Quadi, who accompanied the Vandals in their westward migration ; and they were*~~

~~*replaced in the 5th century by the Rugii and Heruli. The latter tribes were succeeded about the year 550 a.p. by the Lombards, and these in their turn were soon forced to retire before an overwhelming invasion of Slavs, who, on their settlement there, took the name of Moravians (German, Mehranen or Mahren) from theriver Morava. 'These new colonists became the permanent inhabitants of this district, and in spite of the hostility of the Avars on the east founded the kingdom of Great Moravia, which was considerably more extensive than the province now bearing*~~

~~*the name. 'Towards the end of the 8th century they aided Charle- magne in putting an end to the Avar kingdom, and were rewarded*~~

~~*by receiving part of it, corresponding to North Hungary, as a fief*~~

~~*of the German emperor, whose supremacy they also acknowledged more or less for their other possessions. After the death of Charlemagne the Moravian princes took advantage of the dissen- sions of his successors to enlarge their territories and assert their independence, and Rastislaus (cirea 850) even formed an alliance with the Bulgarians and the Byzantine emperor. The chief result of the alliance with the latter was the conversion of the Moravians to Christianity by two Greek monks, Cyril and Methodius, des- a on from Constantinople. Rastislaus finally fell into the*~~

~~*ands of Louis the German, who blinded him, and forced him to end his days as a monk ; but his successor, Suatopluk (0b. 890), was equally vigorous, and extended the kingdom of Great Moravia to the Oder on the west and the Gran on the east. At this period there seemed a strong probability of the junction of the north- western and south-eastern Slavs, and the formation of a great Slavonic power to the east of the German empire. This prospect, however, was dissipated by the invasions of the Magyar hordes in the 10th century, the brunt of which was borne by Moravia. The invaders were encouraged by the German monarchs and aided by the dissensions aud mismanagement of the successors of Suatopluk, and in a short time completely subdued the eastern part of Great Moravia. The name of Moravia was henceforth confined to the*~~

district to which it now applies. For about a century the posses- sion of this marchland was disputed by Hungary, Poland, and Bohemia, but in 1029 it was finally incorporated with Bohemia, and so became an integral part of the German empire. Towards the close of the 12th century Moravia was raised to the dignity of a margraviate, but with the proviso that it should be held as a fief of the crown of Bohemia. It henceforth shared the fortunes of this country, and was usually assigned as an apanage to younger menibers of the Bohemian royal house. In 1410 Jobst, margrave of Moravia, was made emperor of Germany, but died a few months after his election. In 1526, on the death of Louis II. of Hungary, Moravia came with the rest of that prince's possessions into the hands of the Austrian house. During the Thirty Years' War the depopulation of Moravia was so great that after the peace of West- phalia the states-general published an edict giving every man permission to take two wives, in order to "'repeople the country." After the Seven Years' War Moravia was united in one province with the remnant of Silesia, but in 1849 it was made a separate and independent crownland. The most noticeable feature of recent Moravian history has been the active sympathy ofits inhabitants with the anti-Teutonic home-rule agitation of the Bohemian Czechs (see BOHEMIA).

Authorities.—Dudik, Mahrens allgemeine Geschichte (Briinn, 1860-76); Wolny, Die Markgrafschaft Mahren, topographisch, statistisch, und historisch geschildert (Briinn, 1835-40); D'Elvert, Beitrdge zur Geschichte der Neugestaltung Mdhrens wm 1?ten Jahrhundert (1867); Trampler, Heimatskunde der Mark Mdhren (Vienna, 1877); Statistische Jahrbticher of the Imperial Statistical Commission (Vienna). (J. F. M.)

MORAVIAN BRETHREN, Taz, are a society of Chris- tians whose history can be traced back to the year 1457 and their origin found among the religious movements in Bohemia which followed the martyrdom of John Huss by the council of Constance. The beginnings of the Bohemian Brethren (for that was their earlier name) are somewhat obscure. The followers of Huss broke up into two factions, one of which, the Calixtines, was willing to acknowledge allegiance to Rome, provided the " compacts " of the council of Basel permitting the Lord's Supper sub utraque specie were maintained, and in the end it became the national church of

~~Bohemia; the other, the Taborites, refused all terms of reconciliation, and appealed to arms. Separate from both these were many pious people who were content to worship God in simple fashion, in quiet meetings for prayer and Scripture-reading, like the Gottesfreunde of Germany, and who called themselves Brethren. Bohemian historians have conclusively shown that the Brethren repre- sent the religious kernel of the Hussite movement, and do not come either from the German Waldenses or from the Taborites. Before 1457 many of these quiet Christians were known as the Brethren of Chelcic, and were the followers of Peter Chelcicky, a Bohemian, whose religious influence, strongly Puritan in its character, seems to have been inferior only to that of Huss. In that year the Calix- tine leader, Rokyzana, wishing to protect them, permitted his nephew Gregory to gather them together at Kunewald near Senftenberg, and form them into a community. This meeting was really the foundation of the Brethren or Unitas Fratrum, and its founder Gregory announced that he and his companions received and taught the rejection of oaths, of the military profession, of all official rank, titles, and endowments, and of a hierarchy. They did not profess communism, but they held that the rich should give of their riches to the poor, and that all Christians should live as nearly as possible in the fashion of the apostolic com- munity at Jerusalem. At the synod of Lhota near Reichenau, in 1467, they constituted themselves into a church separate from the Calixtine or national church of Bohemia. They appointed ministers of their own election and with the guidance of the "lot," and had an organiza- tion and discipline of their own ; at their head was a bishop, who, it is said, received ordination from the Austrian Waldenses, but apostolic succession among the Brethren is one of the most obscure parts of their history.~~

~~The constitution of the society was revised at a second synod held at Lhota under the direction of Luke of Prague, who may be regarded as their second founder. This re-~~

~~organization enabled the society to grow rapidly. In the earlier years of the 16th century the Unitas included nearly 400 congregations in~~

~~*Bohemia and Moravia with 150,000 members, and, including Poland, embraced three provinces Bohemia, Moravia, Poland. Each province had its own bishops and synods, but all were united in one church and governed by the general synod.*~~

~~*The Lutheran movement in Germany awakened lively interest among the Brethren, and some unsuccessful at- tempts were made under the leadership of Augusta to unite with the Lutheran Church (1528-1546) ; but when the Calvinist reformation reached Bohemia the Brethren found themselves more in sympathy with it than with the Lutheran. The Jesuit anti-Reformation, instigated by Rudolf and his brothers Matthias and Ferdinand, found the Brethren a prosperous church, but the pitiless persecu- tion which followed the unsuccessful attempt at revolution crushed the whole Protestantism of Bohemia, and in 1627 the Evangelical churches there had ceased to exist. About the same time the Polish branch of the Unity, in which many refugees from Bohemia and Moravia had found a home, was absorbed in the Reformed Church of Poland. A few families, however, especially in Moravia, held religious services in secret, preserved the traditions of their fathers, and, in spite of the vigilance of their enemies, maintained some correspondence with each other. In 1722 some of these left home and property to seek a place where they could worship in freedom. The first company, led by Christian David, a mechanic, settled by invitation from Count Zinzendorf on his estate at Berthelsdorf near Zittau, in Saxony. They were soon joined by others (about 300 coming within seven years), and built a town which they called Herrnhut. The small community at first adopted the constitution and teaching of the old Unitas. The epis- copate had been continued, and in 1735 David Nitschmann was consecrated first bishop of the Renewed Moravian Church. The new settlement was not, however, destined to be simply a revival of the organization of the Bohemian Brethren. Zinzendorf, who had given them an asylum, came with his wife, family, and chaplain to live among the refugees. He was a Lutheran who had accepted Spener's pietism, and he wished to form a society distinct from national churches and devoted to good works. After long negotiation a union was effected between the Lutheran element and the adherents of the ancient Unitas Pratrum. The emigrants at Herrnhut attended the parish church at Berthelsdorf, and were simply a Christian society within*~~

~~*the Lutheran Church (ecclesiola in ecclesia). This pecu- liarity is still to some extent preserved in the German branch of the church, and the Moravian Brethren regard themselves as a church within the church, or the Brethren's Congregation within the Evangelical Protestant churches, which enables them to do evangelistic work without pro- selytizing. The society adopted a code of rules in 1727, and ordained twelve elders to carry on pastoral work. This was the revival of the Unitas Fratrum as a church.*~~

~~*Constitution.—The Unity of Moravian Brethren at present em- braces three provinces—German, English, and American. Each province has its own government by synod and provincial elders' conferences ; but it forms with the other two one organic whole, and is therefore under the control of a general government also. The general synod, which governs the whole church, meets every ten years at Herrnhut, and is attended by delegates from all the pro- vinces and from the missions. The elders' conference of the Unity is an executive board, which superintends all the provinces and the missions. The present constitution dates from 1857, when the old organization of the Unitas Fratrum was remodelled.*~~

~~*Ministers and Worship.—The ministers are bishops, presbyters, and deacons. The bishops alone can ordain, but they are not diocesan. They are appointed by the general synod, or by the elders' conference of the Unity, and have official seats both in the*~~

~~*synods of the provinces where they preside, and in the general synod. Unordained assistants in the ministry, whether men or*~~

~~*women, are formally set apart as acolytes. The worship is litur- gical. Special services are used on the festivals of the ecclesiastical year, on the "Memorial Days" 1st March, 12th May, 17th and 25th June, 6th July, 13th and 21st August, 16th September, 31st October, and 13th November. Love-feasts are still held, but the feet-washing and the use of the lot in the election of ministers and in marriages have fallen into disuse. The use of the lot in marriages was abolished in 1818.*~~

~~*Doctrine.—The Moravian Church has no formal creed, but its doctrine, as found in the catechism, in the Easter morning litany, and in the Synodal Results, embraces the following points (settled by the synod of 1879) :—(1) that Scripture is the only rule of faith and practice, (2) the total depravity of human nature, (3) the love of God the Father, (4) the real Godhead and the real humanity of Jesus Christ, (5) our reconciliation unto God, and our justification before Him, through the sacrifice of Jesus Christ, (6) the doctrine of the Holy Ghost and the operations of His grace, (7) good works as the fruit of the Spirit, (8) the fellowship of believers one with another in Christ Jesus, (9) the second coming of the Lord in glory, and the resurrection of the dead unto life or unto condemnation.*~~

~~*Work.—(a) Home Work in the Three Provinces.—This embraces two divisions. (1) Besides congregational work, special home missions are carried on in each province. In the German province there is a peculiar home mission called the Diaspora, which dates from 1729. Its object is unsectarian. It seeks to excite and foster spiritual life by means additional to those provided by the estab- lished churches, and does not make proselytes nor strive to draw members from other Protestant churches. The work is carried on in Denmark, in Norway and Sweden, in the various parts of Germany, in the Baltic provinces of Russia, in Poland, cl in Switzerland. In the English province home mission work is conducted on the principle of establishing preaching-stations in populous places, which may ultimately become congregations connected with the church. There is also a society for propagating the gospel in Ireland. The work in the American province is of the same kind. (2) The Brethren have always paid special attention to education. Each province has a theological college, and there are in the three pro- vinces forty-seven boarding-schools for boys and girls not connected with the Moravian Chien. At these schools nearly 2500 pupils are educated.*~~

~~*(b) Foreign Missions,—The Moravian Church since its reorgani- zation by Zinzendorf has been the missionary church par excellence. The third jubilee of missions was celebrated in 1882. The first period began with 1732, when two men, Leonard Dover and David Nitschmann, were sent to preach to the negroes of St Thomas ; when it ended in 1782, the church*~~

~~*had 167 brethren and sisters occupying 27 stations. In 1832 the church had to record 40,000 converts under the direction of 209 missionaries at 41 stations. The latest statistics show 115 stations with 317 additional preach- ing-places, 7 normal schools with 70 scholars, 215 day schools with 15,616 pupils, 215 teachers, and 634 monitors, 94 Sunday schools with 18,355 pupils and 884 teachers, 312 missionaries (male and female), 1471 native assistants, and 76,646 converts.*~~

~~*(ce) The Bohemian Mission.—The Brethren early made missionary circuits from Herrnhut and Silesia through Bohemia and Moravia, and since 1862 this itinerating work was largely increased. In 1869 it was resolved to re-establish the church in these countries of its birth, and the first congregation was inaugurated in October 1870. It now contains four congregations, and in 1880 obtained legal sanction.*~~

~~*(d) The Leper Mission was begun in 1822 in South Africa, and carried on there till 1867, when the English Government appointed a chaplain to do the work. The Leper Home in Jerusalem was established in 1867, and formally taken over by the elders' confer- ence of the Unity in 1881.*~~

~~*Statistics,—*~~

~~*The Three Home Provinces. Foreign and Bohemian Missions. Bishops '. 10 Bishops : : 3 Presbyters and Deacons 291 Missionaries . 167 Communicants 18,871 Female Agents 110*~~

~~*Native Ministers and Assistants . : 35*~~

~~*Native Agents 1,524*~~

~~*Communicants 26,455*~~

~~*Literature.—Gindely, Geschichte der bohm. Briider, 2 vols., Prag., 1868 ; Goll, Geschichte d. béhm. Briider, Prag., 1882; Holmes, History of the United Brethren, 2 vols., London, 1825; Bost, Hist. de VEglise des Fréres, 2 vols., Paris, 1844 (also Eng. translation); Seifferth, Church Constitution of the Bohemian and Moravian Brethren. (I. M. L.)*~~

~~*MORAYSHIRE. See Exem, vol. viii. p. 129.*~~

~~*MORBIHAN, a department of western France, formed of part of Lower Brittany, lies on the Atlantic seaboard between 2° 2' and 3° 45' W. long., and between 47° 26' and 48° 12' N. lat., being bounded S.E. by the department of Loire-Inférieure, E. by that of Ille-et-Vilaine, N. by Cotes*~~

~~*du Nord, and W. by Finistere. Its chief town, Vannes, is 248 miles west-south-west of Paris in a direct line and 310 by rail. From the Montagnes Noires on the northern frontier the western portion of Morbihan slopes southward towards Finistére, watered by the Quimperlé, the Blavet with its affluent the Scorff, and the Auray; the eastern portion, on the other hand, dips towards the south-east in the direction of the course of the Oust and its feeders, which fall into the Vilaine. Though the Montagnes Noires con- tain the highest point (975 feet) in the department, the most striking orographic feature of Morbihan is the dreary, tree- less, streamless tract of moorland and marsh known as the Landes of Lanvaux, which extends (west-north-west to east- south-east) with a width of from 1 to 3 miles for a distance of 31 miles between the valley of the Claie and that of the Arz (affluents of the Oust), A striking contrast to this district is afforded by the various inlets of the sea, whose shores are clothed with vegetation of exceptional richness, large fig-trees, rose-laurels, and aloes growing as if in Algeria. The coast-line is exceedingly irregular: the mouth of the Vilaine (the longest river of the department), the peninsula of Ruis, the great gulf of Morbihan (Inner Sea), from which the department takes its name, and the mouth of the Auray, the long Quiberon peninsula attached to the mainland by the narrow isthmus of Fort Penthiévre, the deep-branching estuary of Etel, the mouths of the Blavet and the Scorff uniting to form the port of Lorient, and, finally, on the borders of Finistére the mouth of the Laita, follow each other in rapid succession. Off the coast lie the islands of Groix, Belle-isle, Houat, and Hoedik. Vessels drawing 13 feet can ascend the Vilaine as far as Redon; the Blavet is canalized throughout its course through the department ; and the Oust, as part of the canal from Nantes to Brest, forms a great waterway by Redon, Josselin, Rohan, and Pontivy. The climate of*~~

~~*Morbihan is characterized by great moisture and mildness, due to the influence of the Gulf Stream.*~~

~~*Of the 2625 square miles forming the department, nearly one half is occupied by moors (andes), arable soil forming little more than a third part of the whole, meadows a tenth, and woodlands a fifteenth. The horses number 36,000, horned cattle 285,000, sheep 92,000, pigs 60,000, goats 6000, and beehives 76,000. In 1882 the agricultural produce comprised 3,751,680 bushels of rye and 1,544,170 bushels of wheat; and considerable quantities of buckwheat, oats, potatoes, pease and beans, chestnuts, beetroot, hemp, colza, and flax are grown. A little wine also is made, but the usual liquor of the district is cider (manufactured to the extent of 11 to 13 million gallons per annum). 'The sea-ware gathered along the coast helps greatly to improve the soil. Outside of Lorient there is little industrial activity in Morbihan, though canvas, leather, preserved foods, paper, and chemical products derived from the sea are all manufactured. Salt marshes give employment to 400 hands, and yield on an average 9892 tons of salt; and slate, kaolin, iron-ore, and granite are also worked. The catching and curing of sardines and the breeding of oysters form the business of many of the inhabitants of the coast, who also fish for anchovies, lobsters, &c., for tinning. There are 154 miles of railway in the department, and it was intended (1883) that the line from Nantes to Brest should have branches from Auray to St Brieuc and to Quiberon, and from Questembert to Plocrmel. Morbihan is divided into four arrondissements,—Vannes, Lorient, Ploermel, and Pontivy—87 cantons, and 249 communes. The population in 1881 was 521,614.*~~

~~*Few departments contain so many localities interesting for their historical associations. Besides the megalithic monuments of Carnac (2800 inhabitants) (g.v.) and of Locmariaquer (2050), may be mentioned—Sarzeau (5720) with its castle of Sucinio, one of the ancient dukes of Brittany ; Josselin (2710) with the tomb of Olivier de Clisson, constable of France, and of his second wife Marguerite de Rohan ; the castle of the Rohans, and in the neighbour- hood a column in memory of the " Combat of the Thirty ;" Guéméné (1570) and the chateau of the Rohan Guéméné family ; Le Palais (4885), the chief place in Belle-isle, containing the chateau of Fouquet (Louis XIV.'s superintendent of*~~

~~*finance) and the hospital erected by his wife. Quiberon (2380) is associated with the disaster of the French émigrés ; Hennebont (6050) has a magnificent railway viaduct over the Blavet, and La Roche Bernard (1230) a suspension*~~

~~*nee over the Vilaine, 646 feet long and 108 feet above spring 1des.*~~

~~*MORDAUNT, Cuares. See PETERBOROUGH, EARL OF.*~~

~~*MORDVINIANS, more correctly Morpva or Morpvs, are a people numbering about one million, of Finnish origin, belonging to the Ural-Altaic family, who inhabit the middle Volga provinces of Russia and spread in small detached communities to the south and east of these. Their settlement in the basin of the Volga is of high antiquity. One of the two great branches into which they are divided, the Aorses (now Erzya), is mentioned by Ptolemy as dwelling between the Baltic Sea and the Ural mountains, whilst the Aorses of Asia occupied at the same time the country to the north-east of the Caspian between the Volga and the Jaxartes. Their king is said to have come with 200,000 horsemen to aid Mithradates in his wars. Strabo mentions also the Aorses as inhabit- ants of the country between the Don, the Caspian Sea, and the Caucasus. The name of Mordvs is mentioned for the first time by Jordanes, and they were known under the same name to the Russian annalist Nestor. The Russians made raids on the Mordvs in the 12th century, and after the fall of Kasan they rapidly invaded and colonized their abodes. The Mordvs now occupy the Russian provinces of Simbirsk, Penza, Samara, and Nijni- Novgorod, as well as those of Saratoff and Tamboff. But their villages are dispersed among those of the Russians, and they constitute only 10 to 12 per cent. of the popu- lation in the four first-named provinces, and from 5 to 6 per cent. in the last two. They are unequally distri- buted over this area in ethnographical islands, and con- stitute as much as 23 to 44 per cent. of the population of several districts of the governments of Tamboff, Simbirsk, Samara, and Saratoff, and only 2 or 3 per cent. in other districts of the same provinces. A small number of Mordvs are found also in the provinces of Ufa, Orenburg, Astrakhan, and even in Siberia as far east as the river Tom. They are divided into two*~~

~~*great branches, the Erzya and the Moksha, differing in their ethnological features and in their language. The southern branch, or the Moksha, have a darker skin and darker eyes and hair than the northern. A third branch, the Karatays, is due to mixture with Tatars, whilst a fourth branch, mentioned by several authors, is, according to Mainoff, but a local name for pure Mordvs. 'Their language is considered by M. Ahlqvist as the third branch of the Western Finnish family, the two other branches being the Laponian and the Baltic Finnish, which last embodies now the languages of the Karelians, the Tavastes, the Wotes, the Wespes, the Esthes, and the Lives. The Mordvs are for the most part completely Russified,—even the Mokshas who consider themselves as the only pure Mordvs,—yet they have well maintained their ethnological features, and can be easily distinguished even when living completely as Russians. They have nearly quite forgotten their own language, only a few women remembering it among the Mokshas; but they have maintained a good deal of their old national dress, especially the women, whose profusely embroidered skirts, original hair-dress, large earrings which sometimes are merely hare-tails, and numerous necklaces covering all the chest and consisting of all possible ornaments easily dis- tinguish them from Russian women. They have mostly dark hair, but blue eyes, generally small and rather narrow. The cephalic index of the Mordvs is very near to that of the Finns. They are brachycephalous, or sub-brachycepha- lous, and a few are mesaticephalous. They are finely built, rather tall and strong, and broad-chested. Their chief occu- pation is agriculture ; they work harder and (in the basin of the Moksha) are more prosperous than their Russian neighbours. 'Their capacities as carpenters were well*~~

~~*known in Old Russia, and Ivan the Terrible used them to build bridges and clear forests during his advance on Kasan. At present they manufacture in their villages great quantities of wooden ware of various sorts. They are also great masters of apiculture, and the commonwealth of bees often appears in their poetry and religious beliefs. All explorers are unanimous in recognizing their honesty, morality, and sympathetic character ; it is noticed also that they have remarkable linguistic capacities, and learn with great ease not only Russian but also several*~~

~~*Finnish and Turkish dialects. Nearly all are Christians; they received baptism in the reign of Elizabeth ; the Noncon- formists have recently made many fervent proselytes among them. But they still preserve very much of their own rich mythology, which they have adapted to a certain ex- tent to the Christian religion. They have preserved also, especially the less Russified Moksha, the practice of kid- napping brides, with the usual battles between the party of the bridegroom and that of the family of the bride. The worship of trees, water (especially of the water-divinity which favours marriage), the sun or Shkay, who is the chief divinity, the moon, the thunder, and the frost, and that devoted to the home-divinity Kardaz-serko can be seen in full force among them; and a small stone altar or flat stone covering a small pit to receive the blood of slaughtered animals can be found in very many houses. Their burial- customs are of a quite pagan character. On the fortieth day after the death of a kinsman the dead is not only supposed to return home but a member of his household, dressed in his dress, plays his part, and, coming from the grave, speaks in his name. The practice of animal sacrifice is still deep rooted among the Mokshas, who continue to drink the warm blood of immolated animals.*~~

~~*The Mordvs have always had a great attraction for Russian inquirers ; Strahlenberg, Georgi, Pallas, and especially Lepekhin have written about them. Melnikoff has published in several Russian periodicals interesting sketches of their religious beliefs. A great number of smaller sketches have appeared in periodicals ; these are enumerated by Mainoff in the Izvestia of the Russian Geo- graphical Society for 1877. Entrusted by the Geographical Society with the study of this race, Mainoff has recently made extensive anthropological measurements and studies of their customs and common-law. The results are published, but not yet in full, in the Izvestia of the Russian Geographical Society for 1878, and in the periodicals Slovo for 1879, and Old and New Russia for 1878, They were to appear in full in the Memoirs of the Society.*~~

~~*MORE, Hanwaw (1745-1833), who was born at Staple- ton near Bristol in 1745, may be said to have made three reputations in the course of her long life: first, as a clever verse-writer and witty converser in the circle of Johnson, Reynolds, and Garrick ; next, as an animated writer on moral and religious subjects on the Puritanic side; and lastly, as a practical*~~

~~*philanthropist. She was the youngest but one of the five daughters of Jacob More, a scion of a landed Norfolk family, who taught a school at Stapleton in Gloucestershire. The sisters established a boarding- school at Bristol in 1767. Hannah's first literary efforts were pastoral plays, suitable for young ladies to act, published in 1773 under the title of A Search after Happiness. Metastasio was one of her literary models; on his opera of Regulus she based a drama, The Inflexible Captive, published in 1774. An annuity from a wealthy admirer set the young lady free for literary pursuits. Some verses on Garrick's Lear led to an acquaintance ; Miss More was taken up by the great female Mecenas, Mrs Montague; and her unaffected enthusiasm, simplicity, vivacity, and wit won the hearts of the whole Johnson set, the great lexicographer himself being especially fasci- nated.. Miss More was petted, complimented, and en- couraged to write. Her ballad, Hldred of the Bower, was praised and quoted by the highest living authorities ; and she wrote for Garrick the tragedy Percy, which was*~~

~~*acted with great success in 1777. Another drama, The*~~

~~*Fatal Falsehood, produced in 1779 after Garrick's death, was less successful. In these dramas she borrows from Shakespeare situation, imagery, and phraseology with greater freedom than modern criticism would tolerate ; but they are written with great vigour, freshness, and effect. Her Sacred Dramas appeared in 1782. These and the sprightly octosyllabic poems Bas-Bleu and Florio (1786) mark her gradual transition to more serious views of life, which were fully expressed in prose in her Thoughts on the Manners of the Great (1788), and An Estimate of the Religion of the Fashionable World (1790). She had never been overpowered by the flattering reception given her in fashionable society ; she had received its attentions with misgivings and reservations, never touching cards, keeping Sunday strictly, and preferring company where she could*~~

~~*have serious conversation ; and finally, soon after Garrick's*~~

~~*death, she set herself against theatre-going under any pretence. There is great uniformity of tone and topic in her ethical books and tracts :—Strictures on Female Educa- tion (1799), Hints towards forming the Character of a Young Princess (1805), Caelebs in Search of a Wife (only nominally a story, 1809), Practical Piety (1811), Chros- tian Morals (1813), Character of St Paul (1815), Moral Sketches (1818). The tone is uniformly animated; the writing fresh and vivacious; her favourite subjects the minor immoralities, the thoughtless self-indulgences and infirmities which are rather indirectly than directly harmful. She was a rapid writer, and her work is consequently discursive and formless; but there was an originality and force in her way of putting commonplace sober sense and piety that fully accounts for her extraordinary popularity. 'An interesting episode in her literary life was her three years' labour in writing spirited rhymes and prose tales in the Cheap Repository series (1795-1798) to counteract the doctrines of Tom Paine and the influence of the French Revolution. Two millions of these rapid and telling sketches were circulated in one year, teaching the poor in rhetoric of most ingenious homeliness to rely upon the virtues of content, sobriety, humility, industry, reverence for the British constitution, hatred of the French, trust in God and in the kindness of the gentry. Perhaps the noblest testimony to Hannah More's sterling worth was her indefatigable philanthropic work—her long-continued exertions to improve the condition of the children in the benighted districts in the neighbourhood of her country residences at Cowslip Green and Barley Wood. She limited her aims strictly, as a good churchwoman and anti-Revolutionist, to teaching them to read good books and trying to raise their moral tone ; but no philanthropist ever laboured at greater self-sacrifice or with purer motives. In her serene old age, philanthropists from all parts of the world made pilgrimages to see the bright and amiable old lady, and she retained all her faculties till within two years of her death, dying at Clifton on 7th September 1833, at the mature age of eighty-seven.*~~

~~*MORE, Henry (1614-1687), one of the most remark- able and interesting of the "Cambridge Platonists," was born at Grantham in Lincolnshire in the year 1614. His father was "Alexander More, Esq., a gentleman of fair estate and fortune," highly spoken of by his son, who attributes to his father his own poetical tastes and generous love of learning from his*~~

~~*early youth. Both his father and mother, he further tells us, were "earnest followers of Calvin," but he himself "could never swallow that hard doctrine." As soon as he went to Eton he gave himself up to what he considered a more genial and encouraging train of religious thought. From his boyhood in the Eton playing-fields he was a philosophical and religious dreamer, and he describes his moods of religious reverie in a very*~~

~~*MOO Ry*~~

~~*interesting manner.! His communings and ecstasies have no morbid taint ; they are the natural carriage of a strangely gifted spirit. " From the beginning all things in a manner came flowing to him," and his mind, according to his own saying, "'was enlightened with a sense of the noblest theories in the morning of his days." In 1631 he went to Cambridge, and was admitted at Christ's College about the time Milton was leaving it. He immersed himself 'over head and ears in the study of philosophy," and fell for a time into a sort of scepticism, from which, however, he was delivered by a study of the " Platonic writers." He was fascinated especially by Neo-Platonism, and this fascination never left him. The Theologia Germanica also exerted a great and permanent influence over him. He entered upon a course of spiritual self-discipline which made all his previous studies seem of comparatively no value ; and gradually light as well as peace came to him. He got "into a most joyous and lucid state of mind," which he described in a Greek epigram, as he had formerly described his state of mental and spiritual darkness in the same manner. He took his bachelor's degree in 1635, his master's degree in 1639, and immediately afterwards was chosen fellow of his college. In this position he may be said to have remained all his life. Many offers of prefer- ment were made to him, but he refused them all, with one exception. Fifteen years after the Restoration, he accepted a prebend in Gloucester cathedral, but only to resign it in favour of his friend Dr. Edward Fowler, afterwards the well-knowft bishop of Gloucester. He had no ambition, and steadily declined all attempts to draw him towards public life. He would not even accept the mastership of his college, to which, it is understood, he would have been preferred in 1654, when Cudworth was appointed. He drew many young men of a refined and thoughtful turn of mind around*~~

~~him, but among all his pupils the most interesting was a young lady of noble family, a " heroine pupil," as his biographer (Ward) says, "of an extraordinary nature." This lady is supposed to have been a sister of Lord Finch, afterwards earl of Nottingham, a well-known statesman of the Restoration. She afterwards became Lady Conway, and at her country seat at Ragley in Warwickshire More continued at intervals to spend "a considerable part of his time." She and her husband both greatly appreciated him, and amidst the woods of this pleasant retreat he composed several of his books. There is reason to think that the spiritual enthusiasm of Lady Conway was a considerable factor in some of More's speculations, none the less that she at length passed from his religious pupilage into the ranks of the Quakers. Susceptible to all the excited impulses of her time, this lady became the friend not only of More and Penn but of Baron van Helmont and Valentine Greatrakes, mystical thaumaturgists who played a considerable part amid the teeming enthusiasms of the 17th century. Ragley became a centre not only of devotion but of wonder-working spirit- ualism.? "Many happy days," More says, he spent in this "paradise," and its fantastic mysticism had more allure- ments for him than he himself realized. His genius suffered in consequence, and the play of rationality which distin- guishes his earlier is much less conspicuous in his later works. He was a voluminous writer both in verse and prose, and the mere list of his works would occupy more space than we can give to it. Many of his productions are now unreadable; but the Divine Dialogues, published in 1668, may be still read with pleasure. It is animated and sometimes even brilliant, with less prolixity and~~

~~1 '¢Prefatio Generalissima" prefixed to his Opera Omnia, 1679.~~

~~2 The place and its religious marvels are glanced at in the romance of John Inglesant (chap. xv.).~~

~~the advantage for modern readers that it condenses his general view of philosophy and religion. Most of his characteristic principles may in fact be gathered from it.~~

~~*The year in which he composed the Diine Dialogues may be said to mark the highest point of his intellectual activity. HIs Manual of Metaphysics and elaborate treat- ises on Jacob Boehme and Spinoza were subsequent to this ; but the elasticity and freshness of his philosophical genius are less buoyant in these efforts, and the prophetico- mystical elements which were a weakness in his mental constitution from the first grew as his years advanced. HIe represents more than any other member of the school the mystical and theosophic side of the Cambridge move- ment. Its lofty rationality, the rationality of which he himself had spoken earlier in noble language, at length evaporates in him in intellectual reverie and dreams. The Neo-Platonic extravagances which lay hidden in the school from the first came in his writings to a head, and merged in pure phantasy,—a set of favourite ideas which not merely guided but dominated the reason. Withal HIenry More can never be spoken of save as a spiritual genius and significant figure in the history of British philosophy, less robust and manly and in some respects less learned than Cudworth but more interesting and fertile in thought, and more sweet, singular, and genial in character. From youth to age he describes himself as gifted with a most happy and buoyant temper. The presence of nature filled him with rapture ; he wished he could be always sub dio. ' Walk- ing abroad after his studies: his sallies towards nature would be often inexpressibly ravishing, beyond what he could convey to others." HIs own thoughts were to him a never-ending source of pleasurable excitement. HIs mind moved with great rapidity and at a lofty elevation, so that, as he says, he seemed "all the while to be in the air." This mystical glow and elevation were the chief features of his mind and character, a certain transport and radiancy of thought which carried him beyond the common life without raising him to any false or artificial height, for his humility and charity were not less conspicuous than his piety. The last ten years of his life are without any special record, and he died on the morning of 1st September 1687, and was buried in the chapel of the college he loved so well, where within less than a year his friend Cudworth was laid beside him.*~~

~~*Before his death More issued complete editions of his works, his Opera Theologica in 1675, and his Opera Philosophica in 1678. The chief authorities for his life are Ward's Life, 1710 ; the " Pre- fatio Generalissima" prefixed to his Opera Omnia, 1679 ; and also a general*~~

~~*account of the manner and scope of his writings in an Apology published in 1664. The collection of his Philosophical Poems, 1647, in which he has "compared his chief speculations and experiences," should also be consulted. An elaborate analy- sis of his life and works is given in Principal Tulloch's Rational Theology, vol. ii., 1874. (J. T.)*~~

~~*MORE, Tuomas (1478-1535), lord chancellor, and one of the most illustrious Englishmen of his century, was born in Milk Street in the City of London, 7th February 1478. He received the rudiments of education at St Anthony's School in Threadneedle Street, at that time under Nicolas Holt held to be the best in the city. He was early placed in the household of Cardinal Morton, archbishop of Canterbury. Admission to the cardinal's family was esteemed a high privilege, and was sought as a school of manners and as an introduction to the world by the sons of the best families in the kingdom. Young Thomas More obtained admission through the influence of his father, Sir Thomas, then a rising barrister and after- wards a justice of the Court of King's Bench. The usual prognostication of future distinction is attributed in the case of More to Cardinal Morton, "who would often tell the nobles sitting at table with him, where young Thomas waited on him, whosoever liveth to trie it shall see this*~~

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~~*child prove a notable and rare man."} At the proper age young More was sent to Oxford, where he is said vaguely to have had Colet, Grocyn, and Linacre for his tutors.? All More himself says is that he had Linacre for his master in Greek. Learning Greek was not the matter of course which it has since become. Greek was not as yet part of the arts curriculum, and to learn it voluntarily was ill looked upon by the authorities. Those who did so were suspected of an inclination towards novel and dangerous modes of thinking, then rife on the Continent and slowly finding their way to England. More's father, who intended his son to make a career in his own profession, took the alarm; he removed him from the university without a degree, and entered him at New Inn to commence at once the study of the law. The young man had been kept in a state of humiliating dependence in money matters, having had no allowance made him, and*~~

~~*having had to apply to his father even for a pair of new shoes when the old were worn out. This system was pursued by his parents not from niggardliness but on principle ; and Thomas More in later years often spoke with appro- bation of this severe discipline, as having been a ineans of keeping him from the vulgar dissipations in which his fellow-students indulged. After completing a two-years' course in New Inn, an Inn of Chancery, More was admitted in February 1496 at Lincoln's Inn, an Inn of Court. "At that time the Inns of Court and Chancery presented the discipline of a well-constituted university, and, through professors under the name of readers and exercises under the name of mootings, law was systematically taught " (Campbell). In his professional studies More early dis- tinguished himself, so that he was appointed reader-in-law in Furnival's Inn; but he would not relinquish the studies which had attracted him in Oxford. We find him deli- vering a lecture to audiences of "all the chief learned of the city of London."? The subject he chose was a com- promise between theology and the humanities, being St Augustine's De Civitate. In this lecture More sought less to expound the theology of his author than to set forth the philosophical and historical contents of the treatise. The lecture-room was a church, St Lawrence Jewry, placed at his disposal by Grocyn, the rector.*~~

~~*Somewhere about this period of More's life two things happened which gave in opposite directions the determin- ing impulse to his future career. More's was one of those highly susceptible natures which take more readily and more eagerly than common minds the impress of that which they encounter on their first contact with men. Two principal forms of thought and feeling were at this date in conflict, rather unconscious than declared, on Eng- lish soil. Under the denomination of the "old learning," the sentiment of the Middle Ages and the idea of church authority was established and in full possession of the religious houses, the universities, and the learned profes- sions. The foe that was advancing in the opposite direc- tion, though without the conscience of a hostile purpose, was the new power of human reason animated with the revived sentiment of classicism. In More's mind both these hostile influences found a congenial home. Each had its turn of supremacy, and in his early years it seemed as if the humanistic influence would gain the final victory. About the age of twenty he was seized with a violent access of*~~

~~*devotional rapture. He took a disgust to the world and its occupations, and experienced a longing to give himself over to an ascetic life. He took a lodging near the Charterhouse, and subjected himself to the disci- pline of a Carthusian monk. He wore a sharp shirt of hair next his skin, scourged himself every Friday and*~~

~~*1 Life by B. R. 2 Life by B. R. 3 Roper, Life.*~~

~~*MORE*~~

~~*other fasting days, lay upon the bare ground with a log under his head, and allowed himself but four or five hours' sleep. This access of the ascetic malady lasted but a short time, and More recovered to all outward appearance his balance of mind. But he never entirely emancipated himself from the sentiment of devotion, though in later life it exhibited itself in a more rational form. Even when he was chancellor he would take part in church services, walking in their processions with a surplice. This, however, was at a later time. For the moment the balance of his faculties seemed to be restored by a revival of the antagonistic sentiment of humanism which he had imbibed from the Oxford circle of friends, and specially from Erasmus. The dates as regards More's early life are uncertain, and we can only say that it is possible that the acquaintance with Erasmus might have begun during Erasmus's first visit to England in 1499. 'Tradition has dramatized their first meeting into the story given by Cresacre More,4—that the two happened to sit opposite each other at the lord mayor's table, that they got into an argument during dinner, and that, in mutual astonish- ment at each other's wit and readiness, Erasmus ex- claimed, "Aut tu es Morus, aut nullus," and the other replied, "Aut tu es Erasmus, aut diabolus!" Reject- ing this legend, which bears the stamp of fiction upon its face, we have certain evidence of acquaintance between the two men ina letter of Erasmus with the date "Oxford, 29th October 1499." If we must admit the correctness of the date of Hp. 14 in the collection of Erasmus's Epistolz, we should have to assume that their acquaintance had begun as early as 1497. Ten years More's senior, and master of the accomplishments which More was ambitious to acquire, Erasmus could not fail to exercise a powerful influence over the brilliant young Englishman. More's ingenuous demeanour, quick intelligence,*~~

~~and winning manners fascinated Erasmus from the first, and acquaint-ance rapidly ripened into warm attachment. This contact with the prince of letters revived in More the spirit of the "new learning," and he returned with ardour to the study of Greek, which had been begun at Oxford. The humanistic influence was sufficiently strong to save him from wrecking his life in monkish mortification, and even to keep him for a time on the side of the party of progress. He ac- quired no inconsiderable facility in the Greek language, from which he made and published some translations. His Latin style, though wanting the inimitable ease of Erasmus and often offending against idiom, is yet in copiousness and propriety much above the ordinary Latin of the English scholars of his time.~~

~~More's attention to the new studies was always subor- dinate to his resolution to rise in his profession, in which he was stimulated by his father's example. As early as 1502 he was appointed under-sheriff of the city of London, an office then judicial, and of considerable dignity. He first attracted public attention by his conduct in the parliament of 1504, by his daring opposition to the king's demand for money. Henry VII. was entitled, according to feudal laws, to a grant on occasion of his daughter's marriage. But he came to the House of Commons for a much larger sum than he intended to give with his daughter. The members, unwilling as they were to vote the money, were afraid to offend the king, till the silence was broken by More, whose speech is said to have moved the House to reduce the subsidy of three-fifteenths which the Govern- ment had demanded to £30,000. One of the chamberlains went and told his master that he had been thwarted by a beardless boy. Henry never forgave the audacity ; but, for the moment, the only revenge he could take was upon~~

~~4 Life, p. 93.~~

~~More's father, whom upon some pretext he threw into the Tower, and he only released him upon payment of a fine of £100. Thomas More even found it advisable to with- draw from public life into obscurity. During~~

~~*this period of retirement the old dilemma recurred. One while he devoted himself to the sciences, "perfecting himself in music, arithmetic, geometry, and astronomy, learning the French tongue, and recreating his tired spirits on the viol,"! or translating epigrams from the Greek anthology ; another while resolving to take priest's orders.*~~

~~*From dreams of clerical celibacy he was roused by making acquaintance with the family of John Colt of New Hall, in Essex. The "honest and sweet conversation" of the daughters attracted him, and though his inclination led him to prefer the second he married the eldest, not liking to put the affront upon her of passing her over in favour of her younger sister. The death of the old king in 1507 restored him to the practice of his profession, and to that public career for which his abilities specially fitted him. From this time there was scarce a cause of import- ance in which he was not engaged. His professional in- come amounted to £400 a year, equal to £4000 in present money, and, "considering the relative profits of the law and the value of money, probably indicated as high a station as £10,000 at the present day" (Campbell). It was not long before he attracted the attention of the young king and of Wolsey. The Latin verses which he pre- sented to Henry on the occasion of his coronation did not deserve particular notice amid the crowd of congratulatory odes. But the spirit with which he pleaded before the Star Chamber in a case of the Crown v. the Pope recom- mended him to the royal favour, and marked him out for employment. More obtained in this case judgment against the crown. Henry, who was present in person at the trial, had the good sense not to resent the defeat, but took the counsel to whose advocacy it was due into his service. In 1514 More was made master of the requests, knighted, and sworn a member of the privy council. He was repeatedly employed on embassies to the Low Countries, and was for a long time stationed at Calais as agent in the shifty nego- tiations carried on by Wolsey with the court of France. In 1519 he was compelled to resign his post of under-sheriff to the city and his private practice at the bar. In 1521 he was appointed treasurer of the exchequer, and in the parliament of 1523 he was elected speaker. The choice of this officer rested nominally with the House itself, but in practice was always dictated by the court. Sir Thomas More was pitched upon by the court on this occasion in order that his popularity with the Commons might be employed to carry the money*~~

~~grant for which Wolsey asked. 'To the great disappointment of the court More remained firm to the popular cause, and it was greatly owing to his influence that its demands were resisted. From this occurrence may be dated the jealousy which the cardinal began to exhibit towards More. Wolsey made an attempt to get him out of the way by sending him as ambassador to Spain. More defeated the design by a personal appeal to the king, alleging that the climate would be fatal to his health. Henry, who saw through the artifice, and was already looking round for a more popular successor to Wolsey, made the gracious answer that he would employ More otherwise. In 1525 More was appointed chancellor of the duchy of Lancaster, and no pains were spared to attach him to the court. The king frequently sent for him into his closet, and discoursed with him on astronomy, geometry, and points of divinity. This growing favour, by which many men would have been carried away, did not impose upon More. He dis-~~

~~1 Roper, Life.~~

~~couraged the king's advances, showed reluctance to go to the palace, and seemed constrained when there. Then the king began to come himself to More's house at Chelsea, and would dine with him without previous notice. Roper mentions one of these visits, when the king after dinner walked in the garden by the space of an hour, holding his arm round More's neck. Roper afterwards congratu- lated his father-in-law on the distinguished honour which had been shown him. "I thank our Lord," was the reply, "T find his grace my very good lord indeed ; and I believe he doth as singularly favour me as any subject within this realm. Howbeit, son Roper, I may tell thee I have no cause to be proud thereof, for if my head would win him a castle in France, it should not fail to go." As a last resource More tried the expedient of silence, dissembling his wit and affecting to be dull. This had the desired effect so far that he was less often sent for. But it did not alter the royal policy, and in 1529, when a successor had to be found for Wolsey, More was raised to the chancellorship. The selection was justified by More's high reputation, but it was also significant of the modification which the policy of the court~~

~~*was then undergoing. It was a concession to the rising popular party, to which it was supposed that More's politics inclined him. The public favour with which his appointment had been received was justified by his conduct as judge in the Court of Chancery. Having heard causes in the forenoon between eight and eleven, after dinner he sat again to receive petitions. The meaner the suppliant was the ore affably he would speak to him, and the more speedily he would despatch his case. In this respect he formed a great contrast to his predecessor, whose arrears he soon cleared off. One morning being told by the officer that there was not another cause before the court, he ordered the fact to be entered on record, as it had never happened before. He not only refused all gifts, such as had been usual, himself, but took measures to prevent any of his connexions from interfering with the course of justice. One of his sons-in-law, Heron, having a suit in the chan- cellor's court, and refusing to agree to any reasonable accommodation, because the judge "was the most affec- tionate father to his children that ever was in the world," More thereupon made a decree against him.*~~

~~*Unfortunately for Sir Thomas More, a lord chancellor is not merely a judge, but has high political functions to perform. In raising More to that eminent position, the king had not merely considered his professional distinction but had counted upon his avowed liberal and reforming tendencies. In the Utopia, which, though written earlier, More had allowed to be printed as late as 1516, he had spoken against the vices of power and declared for indif- ference of religious creed with a breadth of philosophical view of which there is no other example in any English- man of that age. At the same time, as he could not be suspected of any sympathy with Lutheran or Wickliffite heretics, he might fairly be regarded as qualified to lead the party which aimed at reform in state and church within the limits of Catholic orthodoxy. But in the king's mind the public questions of reform were entirely sunk in the personal one of the divorce. The divorce was a point upon which Sir Thomas would not yield. And, as he saw that the marriage with Anne Boleyn was determined upon, he petitioned the king to be allowed to resign the great seal, alleging failing health. With much reluctance, the royal permission. was given and the resignation accepted, 10th May 1532, with many gracious expressions of good will on the part of the king. The promise held out of future bounty*~~

~~was never fulfilled, and More left office, as he had entered it, a poor man. His necessitous condition was so notorious that the clergy in convocation voted him~~

~~XVI. —— 103~~

~~818~~

~~a present of £5000. This he peremptorily refused, either for himself or for his family, declaring that he " had rather see it all cast into the Thames." Yet the whole of his 'neome after resigning office did not exceed £100 a year.~~

~~Hitherto he had maintained a large establishment, not on the princely scale of Wolsey, but in the patriarchal fashion of having all his sons-in-law, with their families, under his roof. When he resigned the chancellorship he called his children and grandchildren together to explain his reduced circumstances. 'If we wish to live together," said he, "you must be content to be contributories together. But my counsel is that we fall not to the lowest fare first : we will not, therefore, descend to Oxford fare, nor to the fare of New Inn, but we will begin with Lincoln's Inn diet, where many right worshipful men of great account and good years do live full well; which if we find our- selves the first year not able to maintain, then we will in the next year come down to Oxford fare, where many great learned and ancient fathers and doctors are continu-ally conversant ; which if our purses stretch not to main- tain neither, then may we after, with bag and wallet, go a-begging together, hoping that for pity some good folks will give us their charity."~~

~~More was now able, as he writes to Erasmus, to return to the life which had always been his ambition, when, free from business and public affairs, he might give himself up to his favourite studies and to the practices of his devotion. Of the Chelsea interior Erasmus has drawn a charming picture, which may vie with Holbein's celebrated canvas, The Household of Sir Thomas More.~~

~~"More has built, near London, upon the Thames, a modest yet commodious mansion. 'There he lives surrounded by his numerous~~

~~*family, including his wife, his son, and his son's wife, his three daughters and their husbands, with eleven grandchildren. There is not any man living so affectionate to his children as he, and he loveth his old wife as if she were a girl of fifteen. Such is the excellence of his disposition that whatsoever happeneth that could not be helped, he is as cheerful and as well pleased as though the best thing possible had been done. In More's house, you would say that Plato's Academy was revived again, only, whereas in the Academy the discussions turned upon geometry and the power of numbers, the house at Chelsea is a veritable school of Christian religion. In itis none, man or woman, but readeth or studieth the liberal arts, yet is their chief care of piety. There is never any seen idle; the head of the house governs it not by a lofty carriage and oft rebukes, but by gentleness and amiable manners. Every member is busy in his place, performing his duty with alacrity ; nor is sober mirth wanting." }*~~

~~*But More was too conspicuous to be long allowed to enjoy the happiness of a retired life. A special invitation was sent him by the king to attend the coronation of Anne Boleyn, accompanied with the gracious offer of £20 to buy a new suit for the occasion! More refused to attend, and from that moment was marked out for vengeance. A first attempt made to bring him within the meshes of the law only recoiled with shame upon the head of the accusers. They were maladroit enough to attack him on his least vulnerable side, summoning him before the privy council to answer to a charge of receiving bribes in the administration of justice. One Parnell was put forward to complain of a decree pronounced against him in favour of the contending party Vaughan, who he said had pre- sented a gilt cup to the chancellor. Morestated that he had received a cup as a New Year's gift. Lord Wiltshire, the queen's father, exultingly cried out, 'So, did I not tell you, my lords, that you would find this matter true?" "But, my lords," continued More, "having pledged Mrs. Vaughan in the wine wherewith my butler had filled the cup, I restored the cup to her." Two other charges of a like nature were refuted as triumphantly. But the very futility of the accusations must have betrayed to More*~~

~~*1 Ep, 426, app.*~~

~~*MORE*~~

~~*the bitter determination of his enemies to compass his destruction. Foiled in their first ill-directed attempt, they were compelled to have recourse to that tremendous engine of regal tyranny, the law of treason. A bill was brought into parliament to attaint Elizabeth Barton, a nun, who was said to have held treasonable language. Barton turned out afterwards to have been an impostor, but she had duped More, who now lived in a superstitious atmosphere of convents and churches, and he had given his countenance to her supernatural pretensions. His name, with that of Fisher, was accordingly included in the bill as an accomplice. When he came before the council, it was at once apparent that the charge of treason could not be sustained, and the efforts of the court agents were directed to draw from More some approbation of the king's marriage. But to this neither cajolery nor threats could move him. The preposterous charge was urged that it was by his advice that the king had committed himself in his book against Luther to an assertion of the pope's authority, whereby the title of " Defender of the Faith " had been gained, but in reality a sword put into the pope's hand to fight against him. More was able to reply that he had warned the king that this very thing might happen, that upon some breach of amity between the crown of England and the pope Henry's too pronounced assertion of the papal authority might be turned against himself, "therefore it were best that place be amended, and his authority more slenderly touched." "Nay," replied the king, "that it shall not; we are so much bound to the see of Rome that we cannot do too much honour unto it. Whatsoever impediment be to the contrary, we will set forth that authority to the utmost; for we have received from that see our crown imperial," "which," added More, "till his grace with his own mouth so told me, I never heard before." Anything more defiant and exasperating than this could not well have been said. But it could not be laid hold of, and the charge of treason being too ridiculous to be proceeded with, More's name was struck out of the bill. When his daughter brought him the news, More calmly said, 'I' faith, Meg, quod differtur, non aufertur: that which is postponed is not dropt." At another time, having asked his daughter how the court went, and how Queen Anne did, he received for answer, "Never better; there is nothing else but dancing and sport- ing." To this More answered, "Alas, Meg, it pitieth me to remember unto what misery, poor soul, she will shortly come; these dances of hers will prove such dances that she will spurn our*~~

~~*heads off like footballs ; but it will not be long ere her head will dance the like dance."? So the speech runs in the Life by More's great-grandson ; but in the only trustworthy record, the life by his son-in-law Roper, More's reply ends with the words, "she will shortly come." Tn this, as in other instances, the later statement has the appear- ance of having been an imaginative extension of the earlier.*~~

~~*In 1534 the Act of Supremacy was passed, and the oath ordered to be tendered. More was sent for to Lambeth, where he offered to swear to the succession, but steadily refused the oath of supremacy as against his con- science. Thereupon he was given in charge to the abbot of Westminster, and, persisting in his refusal, was four days afterwards committed to the Tower. After a close and even cruel confinement (he was denied the use of pen and ink) of more than a year, he was brought to trial before a special commission and a packed jury. Even so More would have been acquitted, when at the last moment Rich, the solicitor-general, quitted the bar and presented himself as a witness for the crown. Being sworn, he detailed a confidential conversation he had had with the*~~

~~*2 Cresacre More, p. 231.*~~

~~*prisoner in the Tower. He affirmed that, having himself admitted in the course of this conversation "that there were things which no parliament could do,—e.g., no parlia- ment could make a law that God should not be God," Sir Thomas had replied, "No more could the parliament make the king supreme head of the church." By this act of perjury a verdict of "guilty" was procuredfromthe jury. The execu- tion of the sentence followed within the week, on 7th July 1535. The head was fixed upon London Bridge. The ven- geance of Henry was not satisfied by this judicial murder of his friend and servant ; he enforced the confiscation of what small property More had left, expelled Lady More from the house at Chelsea, and even set aside assignments which had been legally executed by More, who foresaw what would happen before the commission of the alleged treason. More's property was settled on Princess Elizabeth, afterwards queen, who kept possession of it till her death. At his death Sir Thomas More was in the fifty-eighth year of his age. He was twice*~~

~~*married, but had children only by his first wife. His eldest daughter Margaret, married to William Roper, is one of the foremost women in the annals of the country for her virtues, high intelli- gence, and various accomplishments. She read Latin and Greek, was a proficient in music, and in the sciences, so far as they were then accessible. Her devotion to her father is historical; she gave him not only the tender affection of a daughter but the high-minded sympathy of a soul great as his own.*~~

~~*It is unfortunate for More's reputation that he has been adopted as a champion of a party and a cause which is arrayed in hostility to the liberties and constitution of his country. Apart from the partisan use which is made of his name, we must rank him among the noblest minds of England, as one who became the victim of a tyrant whose policy he disapproved and whose servile instruments he despised. If his language towards the tyrant is often more servile than became a freeman, we must remember that such was the court style of the period, and that we must not construe liter- ally phrases of compliment. It is, however, impossible to deny that More's policy in later life did not bear out the more liberal convictions of his earlier years. His views and feelings contracted under the combined influences of his professional practice and of*~~

~~*ublic employment. In the Utopia, published in 1516, he not only Tenennedd the ordinary vices of power, but evinced an enlightenment of sentiment which went far beyond the most statesmanlike ideas to be found among his contemporaries, pronouncing not merely for toleration but rising even to the philosophical conception of the indifference of religious creed. It was to this superiority of view, and not merely to the satire on the administration of Henry VII., that we must ascribe the popularity of the work in the 16th cen- tury. For, as a romance, the Utopia has little interest either of incident or of character. It does not, as has been said, anticipate the economical doctrines of Adam Smith, and much of it is fanciful without being either witty or ingenious. Mackintosh says of it: 'Tt intimates a variety of doctrines, and exhibits a multiplicity of projects, which the writer regards with almost every possible degree of approbation and shade of assent, from the frontiers of serious and entire belief, through gradations of descending plausi- bility, where the lowest are scarcely more than exercises of ingenuity, and to which some wild*~~

~~*paradoxes are appended, either as a vehicle, or as an easy means, if necessary, of disavowing the serious inten- tion of the whole of this Platonic fiction."*~~

~~*The Epistola ad Dorpiwm at a later date exhibits More em- phatically on the side of the new learning. It contains a vindi- cation of the study of Greek, and of the desirability of printing the text of the Greek Testament, — views which at that date required an enlightened understanding to enter into, and which were con- demned by the party to which More afterwards attached himself. At the most, he can be doubtfully exculpated from the charge of having tortured men and children for heresy. It is admitted by himself that he inflicted punishment for religious opinion. Erasmus only ventures to say in his friend's defence "that while he was chancellor no man was put to death for these pestilent opinions, while so many suffered death in France and the Low Countries."*~~

~~*The Life of Sir Thomas More was written by his son-in-law Roper about the end of Mary's reign. It was preserved in MS. during the reign of Elizabeth, and handed about in copies, many of which were carelessly made. It was not given to the press till 1626, with the date of Paris. Reprints were made by Hearne (1716), by Lewis (1729, 1731), and by Singer (1817, 1822). Roper's life is the source of all the many subsequent biographies. More's Life in MS. (Harleian*~~

~~*6253), anonymous, but by Nicolas Harpsfield, was also written in Mary's reign. All that is material in this MS. is taken from Roper. Another anonymous Life,*~~

~~*written in 1599, printed in Wordsworth's Ecclesiastical Biography, ii. 43-185, is chiefly compiled from Roper and Harpsfield. The preface is signed B. R.*~~

~~*Stapleton (Tres Thome, s. res geste S. Thome apostoli, S. Thome archiepiscopt Cantuariensis, Thom# Mori, Douay, 1588, Cologne, 1612, and the Vita Thome Mori (separately), Gratz, 1689) translates Roper, interweaving what material he could find scattered through More's works*~~

~~*and letters and the notices of him in the writings of his contemporaries. Cresacre More, great-grandson of Sir Thomas, compiled a new life about the year 1627. It was printed without date, but, according to the editor, Hunter, in 1631. The title of this edition is—The Life of Sir Thos. More, Lord High Chancellour of England, 4to, s. 1. eta., and with new title-page, 1642, 1726, 1828. This life is cited by the subsequent biographers as an independent authority. But it is almost entirely borrowed from Roper and Stapleton. The additions made have sometimes the appearance of rhetorical amplifications of Roper's simple statements. At other times they are decor- ative miracles. The whole is couched in that strain of devotional exaggeration in which the lives of the saints are usually composed. The author seems to imply that he had received supernatural communications from the spirit of his ancestor. Already, only eighty years after More's execution, hagiography had taken possession of the facts, and was transmuting them into an edifying legend. Cresacre More's Life cannot be alleged as evidence for any facts which are not otherwise vouched. It has been remarked by Hunter that More's life and works have been all along manipulated for political purposes, and in the interest of the holy see. In Mary's reign, and in the tide of Catholic reaction, Roper and Harpsfield wrote lives of him; Ellis Heywood dedicated his J? Moro to Cardinal Pole, and Tottell reprinted the folio of his English works. Stapleton prepared his Tres Thome in 1588, when the recovery of England to the see of Rome was looked for by the Spanish invasion. In 1599, when there was a prospect of a disputed succession, the anonymous Life by B. R. was composed ; and soon after Charles had allied himself with a Catholic, the Life by Cresacre More issued from the press. Hunter might have added that Stapleton was being reprinted at Gratz at the time when the conversion of England was expected from James II. The later lives of Sir Thomas More have been numerous, but the only one which has any critical value is that by G. T. Rudhart Thomas Morus, aus den Quellen bearbeitet, Nuremberg, 1829. Other lives are by J. Hoddesdon, London, 1652, 1662; by Cayley, 2 vols., London, 1808; by Mackintosh, Lardner's Cab. Cyclop., London, 1831, 1844; and in More's Works, London, 1845 ; by Lord Campbell in Lives of the Chancellors, vol. i., 1848-50; by D. Nisard in Renaissance et Réforme ; by Baumstark, Freiburg, 1879. A biographical study on More's Latin poems is Philomorus by J. H. Marsden, 2d ed., London, 1878.*~~

~~*More's writings are numerous, and a complete bibliography of them would occupy several columns. His English Works were collected and published in one vol. folio by Rastall, London, 1530, and reprinted by Tottell, London, 1557. His Latin Works were also separately collected in one vol., Basel, 1563 ; Louvain, 1566; and, most complete, Frankfort and Leipsic, 1689, The Utopia has had numerous editions, the first is Louv., 1516. There are two English translations of the Utopia, by R. Robynson, London, 1551, 1556, 1624, and by Gilb. Burnet, 1688. The Latin poems, Progymnasmata, appeared in 1518, 1520, 1563. This last edition contains the Utopia and other prose Latin pieces. (M. P.)*~~

~~*MOREAU, Hi&cxusrppx, a minor lyric poet of disputed but considerable talent, was born at Paris on the 9th April 1810, and died in the hospital of La Charité on the 10th December 1838. In his early youth his parents, who were very ill-off, migrated to Provins, where the mother went into service and the father took the post of usher in a public school. Both died in the same refuge for the desti- tute which afterwards received their son. Hégésippe was fairly educated and was apprenticed to a printer, but he preferred the work (in France usually paid most miserably) of "maitre d'études" ina school. He went to Paris before 1830, and appears to have practised both his occupations there, though for the most part he either adopted by choice or was driven by ill-fortune to adopt the singular life of alternate hardship and cheap dissipation which is dignified in France by the name of Bohemianism. In Moreau's case there is no doubt that the hardships exceeded the dissipa- tion. He was habitually houseless, and is said to have exposed himself to the dangers of a cholera hospital in the great epidemic of 1832 simply to obtain shelter and food. Then he revisited Provins and published a kind of satirical serial called Diogéne. Some years of this life entirely ruined his health, and it was only just before his death that he succeeded in getting his collected poems published, selling the copyright for £4 sterling and eighty copies of the book. It was received not unfavourably, but, as has happened in other cases, the author's death, which happened soon in the circumstances mentioned, was required to excite an interest which was proportionately excessive. Moreau's work, like that of many other young poets, has a strong note of imitation, his model being especially Béranger; and his character, both moral and literary, is not improved by obvious affectation*~~

~~*in political, religious, and social matters. But some of his poems, such as La Voulzie and the charming La Fermiére, have great sweetness, and he had a faculty of writing both in prose and poetry which seems to show that with better fortune, or, to speak honestly, with more intelligence and more per- severance he might easily have saved himself from the miserable destitution which was his lot.*~~

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~~*MOREAU, Jean Victor (1763-1813), the greatest general of the French republic after Napoleon and Hoche, 'vas born at Morlaix in Brittany in 1763. His father was an "avocat" in good practice, and instead of allowing iim to enter the army, as he wished, insisted on his studying law at the university of Rennes. Young Moreau showed no inclination for law, but revelled in the freedom of a student's life. Instead of taking his degree he con- tinued to live with the students as their hero and leader. In that capacity he became a person of political importance, and in the troubles of 1787 formed the law students into a sort of army, which he commanded as their provost. In 1789 he became yet more important, and commanded the students in the daily affrays which took place at Rennes between the young noblesse, who protested against the mode of election to the states-general, and the populace. Though he had hardly weight enough to be chosen a deputy, he was elected one of the committee of correspondence with the deputies at Paris. He was thus able to follow the course of events in the early days of the Revolution, and was early impressed with the conviction that no compromise with the court was possible, and a republic the only re- source. These opinions estranged him from his father, who belonged to the party of Breton independence and preferred Brittany to France. At last, in 1792, at the call for volunteers he organized a battalion, and was at once elected its commandant. With it he served under Dumouriez, and in 1793 the good order of his battalion, and his own martial character and republican principles secured his promotion as general of brigade. Carnot, who had an eye for the true qualities of a general, promoted him to be general of division in 1794, and gave him com- mand of the right wing of the army which, under Pichegru, was destined to drive the English and Austrians out of Flan- ders by separating the Austrians from the English. This wing was then to cover*~~

~~*the occupation of Holland by the main army under Pichegru. These operations established his military fame, and in 1795 he was given the command of the army of the Rhine and the Moselle, with which he crossed the Rhine and advanced into Germany. He was at first completely successful, and won several victories, but at last had to execute before the archduke Charles a retreat which only increased his fame, as he managed to bring back with him more than 5000 prisoners. In 1797 he again crossed the Rhine, but his operations were checked by the con- clusion of the preliminaries of Leoben between Bonaparte and the Austrians. It was at this time he found out the traitorous correspondence between his old comrade and commander Pichegru and the prince de Condé, which he foolishly concealed, and naturally has ever since been sus- pected of at least partial complicity. After Fructidor the Directory ceased to employ his service, until the absence of Bonaparte and the advance of Suwaroff made it necessary to have some great general in Italy. Yet it was only as chief of the staff that he served under Scherer and Joubert, and led back the French army after the latter's death at Novi. When Bonaparte returned from Egypt he found Moreau at Paris, greatly dissatisfied with the Directory both as a general and as a republican, and obtained his assistance in the coup @état of Brumaire, when Moreau commanded the force which occupied the Luxembourg. In reward, the first consul again gave him command of the army of the Rhine, with which he fought his last great campaign, that of Hohenlinden, when his success was due rather to the splendid military qualities of his generals and their troops, and his own tactical genius, than to any inspiration of victory. On his return to Paris he married Mdlle. Hullot, an ambitious woman, who gained a complete ascendency over him, and with the enormous fortune acquired during his campaigns he purchased a luxurious hotel in Paris and*~~

~~*also Barras's country-seat of Grosbois. His wife exercised an*~~

~~*evil influence over him, and collected around her all who were discontented with the aggrandizement of Napoleon. This "club Moreau" frightened Napoleon, and encouraged the royalists ; but Moreau, though*~~

~~*not unwilling to become a military dictator to restore the republic, would not intrigue for the restoration of Louis XVIII. All this was well known to Napoleon, who seized the conspirators. Moreau*~~

~~*he treated with real leniency, and permitted to retire first*~~

~~*to Spain, and then to America. Here the general lived in great content for seven years, when his wife, who could not allow him to rest, made him enter into negotiations with Bernadotte, his old comrade, who was now crown- prince of Sweden. At his suggestion Moreau entered the service of the czar Alexander; and with Bernadotte he planned the campaign of 1813. Fortunately for his fame asa patriot he did not live to invade France, but was mortally wounded while talking to the czar at the battle of Dresden on 27th August 1813, and died on 2d September. His wife received a pension from the czar, and was given the rank of maréchale by Louis XVIII.*~~

~~*Moreau's fame as a general stands very high, and from his mar- vellous coolness in conducting retreats he has been called the general of retreats. His combinations were splendid, and his temper always unruffled when most closely pressed ; but he lacked the sudden spirit of seizing a victory which distinguished Napoleon in his early cam- paigns. Moreau was a sincere republican, though his own father was guillotined in the Terror ; and the army of the Rhine was the hot- bed of republicanism, as that of Italy was the great support ofa military tyranny. Asa man, he was little given to personal ambi- tion till his marriage, and would probably not only have served Napoleon well but moderated his tendency to absolutism by his very existence, had uot his wife ruined any such hope by involving him in intrigues. He was fortunate in the moment of his death, though he would have been more so had he died in America. He seems by his final words, "Soyez tranquilles, messieurs ; c'est mon sort," not to have regretted being removed from his equivocal position as a general in arms against his country.*~~

~~*The literature on Moreau is copious, the best book being C. Jochmus, General Moreau—Abriss einer Geschichte seines Lebens und seiner Feldztige, Berlin, 1814. A more ordinary work is A. de Beauchamp, Vie politique, militaire, et privés du Général Moreau, translated by Philippart,*~~

~~London, 1814; and there is a curious tract on his death in Russian, translated into English under the title Some De-~~

~~tails concerning General Moreau and his Last Moments, by Paul Svinin, London, 1814. (H. M. 8.~~

~~MOREL or Morcuetia. See MusHRoom.~~

~~MORELIA, formerly VALLADOLID, a city of Mexico, capital of the state of Michoacan de Ocampo, is situated 125 miles west by north of Mexico, at a height of 6400 feet above the sea, in 19° 42' N. lat. and 101° W. long. The site is a rocky hill on the Guayangareo valley, and the western horizon is bounded by the great Quinceo mountain (11,000 feet). Since the middle of the centurya considerable extension of the city has taken place, especially towards the north: its streets, which run for the most part at right angles to each other, had increased from thirty in 1856 to ninety-nine in 1873. The principal square is the Plaza de los Martires (formerly de Armas), where Matamoros was shot by the Spaniards in 1814 ; its one side is occupied by the cathedral (1745), a large building with two towers about 200 fect high. The churches of the Carmelites (del Carmen) and San José are of some note, and of the nine convents, now for the most part in ruins, several were wealthy and extensive. That of the Capuchins is now used as a hospital, the old seminary has been turned into a, state-house, and the tobacco factory, ene of the most ancient buildings in the city, serves as municipal offices. An important institution, supported by the state, is the college of San Nicolas de Hidalgo, originally founded by Juan de San Miguel in the 16th century and rebuilt in 1868. The Ocampo theatre dates from 1869-1870. Water is brought from a distance of about 3 miles by a fine aqueduct, constructed in 1788 by D. Antonio de San Miguel, but the quality is often deteriorated by the pre- sence of vegetable matter. Morelia lies too far from any great natural route to have much commerce in the present~~

~~state of the country, and its manufactures are limited to the production, on a small scale, of cotton, woollen, and silk goods.~~

~~*In 1541 Mendoza chose the Guayangarco valley as the new site for the city of Michoacan, and in 1545 the place received the name of Valladolid. Iturbide and Morelos were both born within its pecinae ; and in 1828 the Government did this latter patriot the*~~

~~*onour of renaming the city Morelia. In 1863 it was madc the seat ofan archbishop. See Bol. Soc. de geogr. dela Rep. Mex., Mex. , 1873.*~~

~~*MORELLET, Anpré (1727-1819), economist and miscel- laneous writer, was born at Lyons on the 7th of March 1727. IIe was long regarded as almost the last survivor of the Philosophe school ; and in this character he figures in many memoirs,—for instance in Madame de Remusat's. IIe was educated by the Jesuits in his native town, then at a seminary in Paris, and finally at the Sorbonne; and he took holy orders, but his designation of abbé was the chief thing clerical about him. IIe early joined the Philosophe party, and was a frequenter of most of their salons, being something of a butt (especially to his fellow-abbé and rival in political economy, Galiani), but having the credit of a ready and biting pen. Voltaire called him "L'Abbé Mord-les." IIis work was chiefly occasional, and the most notable parts of it were a smart pamphlet in answer to Palissot's scurrilous play Les Philosophes (which procured him a short sojourn in the Bastille for an alleged libel on Palissot's patroness, the princesse de Robeck), and a reply to Galiani's Commerce des Blés (1770). Later, he made himself useful in quasi-diplomatic communications with English statesmen, and was pensioned, being, moreover, elected a member of the Academy in 1785. The outbreak of the Revolution (soon after which he was engaged in a con- troversy with Chamfort on the question of the advantages and deserts of the Academy) did not, as it did with many of his friends, drive him from the country or put his life in danger, but it put him in considerable straits of fortune. IIe maintained a kind of moderate liberal tone, and the return of something like order under the Consulate and the Empire restored him to prosperity and pensions. A year before his death, at the great age of ninety-two, on the 12th of January 1819 at Paris, he brought out a series of Mélanges, composed chiefly of selections from his former publications ; and after his death appeared his memoirs, which are of value for the Philosophe period. Morellet, though not a man of extraordinary ability or of specially*~~

~~amiable or estimable character, was in both respects a fair specimen of the man of letters of all work of the time. He was, in fact, a journalist with a special turn for econo- mical subjects.~~

~~MORERI, Lovis. See ENcycLop#p1, vol. viii. p. 194.~~

~~MORETO, Acustin (1618-1669), Spanish dramatist and playwright, was born at Madrid in 1618. Of his personal and even of his literary history little is known. He studied at Alcala between 1634 and 1639, and after- wards removed to Toledo, where he entered the household of the cardinal-archbishop and took holy orders. Ulti- mately he withdrew altogether from the world, and died a member of an ascetic religious brotherhood in 1669.~~

~~Moreto in his younger years was a prolific writer for the stage, and almost rivalled Calderon in popularity. Three volumes of his plays were printed between 1654 and 1681, and many dramas besides are attributed in whole or in part to him. He employed all the dramatic forms then in vogue. Of his religious plays, Los mas Dichosos Hermanos (The Most Fortunate Brothers), embody- ing the legend of the seven sleepers, may be mentioned as the least bombastic and absurd. Others are El Rosario Perseguido, turning on the persecutions connected with the introduction of the rosary~~

~~into Spain, and Maria Egypeiaca, a curious representation of the extraordinary legend of St Mary of Egypt. His heroic drama, El~~

~~Valiente Justiciero (The Brave Justiciary), a story of the times of Pedro the Cruel, is one of considerable power. His "comedias de figuron," or "character comedies," as they are called (compare vol. vii. p. 422), include Hl Lindo Don Diego (The Handsome Don Diego) and El Desden con el Desden (Disdain met with Disdain), the latter partly borrowed from Lope de Vega's Milagros del, Desprecio, and in turn imitated by Moliére (in his Princesse d'Elide), by Carlo Gozzi (Principessa Filosofa), and by Schreyvogel (Donna Diana). The Comedias Escogidas de Don Agustin~~

~~*Moreto y Cabaiia form the 39th volume of the Biblioteca de Autores Espa- foles (Madrid, 1856).*~~

~~*MORETTO, It ("The Blackamoor," a term which has not been particularly accounted for), is the name currently bestowed upon ALEssANDRO Bonvictno (1498-c.1560), acele- brated painter of Brescia, Venetian school. He was born at Rovato in the Brescian territory in 1498, and studied first under Fioravante Ferramola of Brescia, afterwards, still youthful, with Titian in Venice. His own earlier method, specially distinguished by excellent portrait-paint- ing, was naturally modelled on that of Titian. Afterwards he conceived a great enthusiasm for Raphael (though he does not appear to have ever gone to Rome), and his style became partially Raphaelesque. It was, however, novel in its combination of diverse elements, and highly attractive,— with fine pencilling, a rich yet not lavish use of perspective and decorative effects, and an elegant opposition of light and shade. The human figure is somewhat slender in Bonvicino's paintings, the expression earnestly religious, the flesh-tints varied, more so than was common in the Venetian school. The backgrounds are generally luminous, and the draperies well modified in red and yellow tints with little intermixture of blue. The depth of Bonvicino's talent, however, was hardly in proportion to its vigour and vivacity ; and he excelled more in sedate altar-pieces than in subjects of action, and more in oil-painting than in fresco, although some fine series of his frescos remain, especially that in the villa Martinengo at Novarino, near Brescia. Among his celebrated works in the city are—in the church of 8. Clemente, the Five Virgin Martyrs, and the Assumption of the Madonna (this latter may count as his masterpiece) ; in 8. Nazaro e Celso, the Coronation of the Madonna; in S. Maria delle Grazie, St Joseph ; in S. Maria de' Miracoli, St Nicholas of Bari. In the Vienna Gallery is a St Justina (once ascribed to Pordenone) ; in the Stadel Institute, Frankfort, the Madonna enthroned between Sts Anthony and Sebastian ; in the Berlin Museum, a colossal Adoration of the Shepherds, and a large votive picture (one of the master's best) of the Madonna and Child, with infant angels and other figures above the clouds, and below, amid a rich landscape, two priests ; in the London National Gallery, St Bernardin and other saints, and two impressive portraits. I] Moretto is stated to have been a man of childlike personal piety, preparing himself by prayer and*~~

fasting for any great act of sacred art, such as the painting of the Virgin-mother. HIs dated works extend from 1524 to 1554, and he was the master of the pre-eminent portrait-painter Moroni. HIs death took place towards 1560.

MORGAGNI, Griovannt Bartista (1682-1771), the founder of pathological anatomy, was born 25th February 1682 at Forli, an ancient and important town on the ZEmilian road southwards from Bologna. HIs parents were in comfortable circumstances, but not of the nobility; it appears from his letters to Lancisi that Morgagni was ambitious of gaining admission into that rank, and it may be inferred that he succeeded from the fact that he is described on a memorial tablet at Padua as "nobilis Forolensis." At school he was conspicuous for his talents, and he was especially noted for his readiness in classical

1 A statue of the illustrious citizen was erected at Forli in 1875, and the town library preserves fourteen MS. volumes of his writings.

study philosophy and medicine, and he graduated with

much éclat as doctor in both faculties three years later (1701). HIe acted as prosector to Valsalva (one of the distinguished pupils of Malpighi), who held the office of "demonstrator anatomicus" in the Bologna school. HIe assisted Valsalva more particularly in preparing his cele- brated work on the Anatomy and Diseases of the Lar, which came out in 1704. Many years after (1740), Morgagni edited a collected edition of Valsalva's writings, with im- portant additions to the treatise on the ear, and with a memoir of the author. When Valsalva was transferred to Parma Morgagni succeeded to his anatomical demon-

stratorship. At this period he enjoyed a high repute in Bologna; he was made president of the Academia Inquietorum when in his twenty-fourth year, and he

is said to have signalized his tenure of the presiden- tial chair by discouraging abstract speculations, and by setting the fashion towards

~~*exact anatomical observa-*~~

~~*tion and reasoning. He published the substance of his*~~

~~*communications to the Academy in 1706 under the title*~~

~~*of Adversaria Anatomica, the first of a series by which he became favourably known throughout Europe as an accurate anatomist; the book included 'Observations on the Larynx, the Lachrymal Apparatus, and the Pelvic Organs in the Female." After a time he gave up his post at Bologna, and occupied himself for the next two or three years at Padua and Venice with anatomical studies (of fishes at the latter city), as well as with chemistry and pharmacy, and with reading in the libraries. He then settled in practice in his native town, and soon attracted a large amount of business; there was hardly a case of much difficulty about which he was not consulted even by the older physicians, "adeo erat in observando attentus, in predicendo cautus, in curando felix." Such at least is the contemporary eulogy. After less than three years of this career, which he found fatiguing, he sought an opportunity of returning to more academical work. At Padua he had a friend in the elder Guglielmini, professor of medicine, but better known as a writer on physics and mathematics, whose works he afterwards edited (1719) with a biography. Guglielmini desired to see him settled as a teacher at Padua, and the unexpected death of Guglielmini himself made the project feasible, Vallisnieri being transferred to the vacant chair and Morgagni succeeding to the chair of theoretical medicine. He came to Padua in the spring of 1712, being then in his thirty-first year, and he taught medicine there with the most brilliant success until his death sixty years later (6th December 1771). When he had been three years in Padua an opportunity occurred for his promotion (by the Venetian senate) to the chair of anatomy, in which he became the successor of an illustrious line of scholars, including Vesalius, Fallopius, Fabricius, Gasserius, and Spigelius, and in which he enjoyed a stipend that was increased from time to time by vote of the senate until it reached twelve hundred gold ducats. Shortly after coming to Padua he married a lady of Forli, of noble parentage, who bore him three sons and twelve daughters ; of the daughters, four died in infancy, and the other eight took the veil as they*~~

~~*grew up; of the sons, one died in boyhood, one entered the Jesuit order, and the eldest settled at Forli, where he married and lived to the age of fifty-two, predeceasing his father by five years and leaving a family to his care. Morgagni enjoyed an unequalled popularity among all classes. He was of tall and dignified figure, with blonde hair and blue eyes, and with a frank and happy expression; his manners were polished, and he was noted for the elegance of his Latin style. He lived in harmony with his colleagues, who are said not even to have envied him his unprecedentedly large stipend; his house and lecture-theatre were frequented*~~

~~*"tanquam officina sapientie" by students of all ages*~~

~~*attracted from all parts of Europe ; he enjoyed the friend-*~~

~~*ship and favour of distinguished Venetian senators and of cardinals; successive popes conferred honours upon him ; and on two occasions when a hostile army occupied the Emilia his house was ordered to be treated with the same marked distinction that the great Emathian conqueror showed to the house of Pindar. Before he had been long in Padua the students of the German nation, of all the faculties there, elected him their patron, and he advised and assisted them in the purchase of a house to be a German library and club for all time. No person of any learning came to Padua without seeing and conversing with Morgagni, and no one ever left him without admiring equally his character and his teaching. One of his bio- graphers and editors, the celebrated Tissot of Lausanne, observes that he had met with several Englishmen re- turning from Italy who told with pleasure and gratitude "quam humaniter illos exceperat, et quantum ex illius colloquiis, doctis, variis, jucundis profecerant." He was elected into the Imperial Cxsareo-Leopoldina Academy in 1708 (originally located at Schweinfurth), and to a higher grade in 1732, into the Royal Society in 1724, into the Paris Academy of Sciences in 1731, the St Petersburg Academy in 1735, and the Berlin Academy in 1754. Among his more celebrated pupils were Scarpa (who died in 1832, connecting the school of Morgagni with the modern era), Cotunnius (Cotugno), and Caldani, the author of the*~~

~~*magnificent atlas of anatomical plates published in 4 vols. at Venice in 1801-1814.*~~

~~*Meanwhile he published on a variety of subjects. In his earlier years at Padua he moe out (1717-1719) five more series of the 'Adversaria Anatomica by which his reputation was first made ; but for more than twenty years after the last of these his strictly medical publications were few and casual (on gall-stones, varices of the vena cava, cases of stone, and several memoranda on medico-legal points drawn up at the request of the curia). Classical scholarship in those years occupied his pen more than anatomical observations ; and the reason of this appears to have been that he spent the summer months in the country for the sake of his health, and occupied his leisure with literary studies. HIs writings in this class include letters to Lancisi on the manner of Cleopatra's death, commentaries on Celsus and Sammonicus, notes on Prosper Alpinus, Varro, Vegetius, Columella, and Vitruvius, and antiquarian researches into the topography of the country round Ravenna and his own birthplace (Forum Livii). HIs edition of the works of Valsalva,*~~

~~*ublished in 1740 (in 2 vols. 4to) with platcs, occupied much of*~~

~~*is time, being enriched with a life and a commentary, and with many additional observations of his own. It was not until 1761, when he was in his eightieth year, that he brought out the great work which, once for all, made pathological anatomy a science, and diverted the course of medicine into new channels of exactness or precision—the De Sedibus et Causis Morborum per Anatomem tndagatis. HIe died on 6th December 1771. During the preceding ten years the De Sedibus, notwithstanding its bulk, was reprinted several times (thrice in four years) in its original Latin, and was translated into French (1765), English (1769, 3 vols. 4to), and German (1771). Some account of this remarkable work remains now to be given.*~~

~~*The only special treatise on pathological anatomy previous to that of Morgagni was the work of Théophile Bonet of Neuchatel, Sepul-ehretum: sive Anatomia practica ex cadaveribus morbo denatts, first published (Geneva, 2 vols. folio) in 1679, three years before Morgagni was born ; it was republished at Geneva (8 vols. folio) in 1700, and again*~~

~~at Leyden in 1709. Although the normal anatomy of the body had been comprehensively, and in some parts exhaustively written by Vesalius and Fallopius, it had not occurred to any one to examine and describe systematically the anatomy of diseased organs and parts. Harvey, a century after Vesalius, naively re- marks that therc is more to be learned from the dissection of one paueen who had died of consumption or other chronic malady, than rom the bodies of ten persons who had been hanged. Glisson indeed (1597-1677) shows, in a passage quoted by Bonet in the preface to the Scpulchrctum, that he was familiar with the idea, at least, of systematically comparing the state of the organs in a series of cadavera, and of noting those conditions which invariably accompanied a given set of symptoms. The work of Bonet was, however, the first attempt at a system of morbid anatomy, and, although it dwelt mostly upon curiosities and monstrosities, it~~

~~enjoyed much repute in its day; Haller speaks of it as "an im- mortal work, which may in itself serve for a pathological library." Morgagni, in the preface to his own work, discusses the defects and merits of the Sepulchretwm ; it was largely a compilation of other men's cases, well and ill authenticated; it was prolix, oftcn inaccurate and misleading from ignorance of the normal anatomy, and it was wanting in what would now be called objective impartiality,—a quality which was introduced as decisively into morbid anatomy by Morgagni as it had been introduced two centuries earlier into normal human anatomy by Vesalius. Morgagni has narrated the circumstances under which the De Scdibus took origin. Having finished his edition of Valsalva in 1740, he was taking a holiday in the country, spending much of his time in the company of a young friend who was curious in many branches of knowledge. The conversation turned upon the Sepulchretum of Bonet, and it was suggested to Morgagni by his dilettante friend that he should put on record his own observations. It was agreed that letters on the anatomy of diseased organs and parts should be written for the perusal of this favoured youth (whose name does not transpire) ; and they were continued from time to time until they numbered seventy. 'Those seventy letters constitute the De Sedibus et Causis Morborum, which was given to~~

~~*the world as a systematic treatise in 2 vols. folio, Venice, 1761, twenty years after the task of epis- tolary instruction was begun. The letters are arranged in five books, treating of the morbid conditions of the body a capite ad calcem. The five books are dedicated respectively to Trew, Brom- field, Senac, Schreiber, and Meckel, as representing the several learned societies of which Morgagni was a foreign member. The five books together contain, according to an enumeration by the present writer, the records of some 640 dissections. Some of these are given at great length, and with a precision of statement and ex- haustiveness of detail hardly surpassed in the so-called "protocols" of the Gernian pathological institutes of the present time ; others, again, are fragments brought in to clucidate some question that had arisen. The symptoms during the course of the malady and other antecedent circumstances are always prefixed with more or less ful- ness, and discussed from the point of view of the conditions found after death. Subjects in all ranks of life, including several cardinals, figure in this remarkable gallery of the dead. Many of the cases are taken from Morgagni's early experiences at Bologna, and from the records of his teachers Valsalva and Albertini not elsewhere published. Those six hundred or more cases are selected and arranged with method and purpose, and they are often (and some- what casually) made the occasion of a long excursus on general pathology and therapeutics. The range of Morgagni's scholarship, as evidenced by his references to early and contemporary literature, strikes one with astonishment. It has been contended that he was himself not free from prolixity, the besetting sin of the learned ; and certainly the form and arrangement of his treatise are such as to make it difficult to use in the present day, notwithstanding that it is well indexed in the rarer) edition, in that of Tissot (3 vols. 4to, Yverdun, 1779), and in more recent editions. It differs from modern treatises in so far as the symptoms determine the order and manner of presenting the anatomical facts. Although Morgagni was the first to understand and to demonstrate the absolute necessity of basing diagnosis, prognosis, and treatment on an exact and com- prehensive knowledge of anatomical conditions, he made no attempt (like that of the Vienna school sixty years later) to exalt pathological anatomy into a science disconnected from clinical medicine and remote from practical needs. His orderliness of anatomical method (implying his skill with the scalpel), his precision, his exhaustive- ness, and his freedom*~~

~~*from bias are his essentially modern or scientific qualities; his scholarship and high consideration for classical and foreign work, his sense of practical ends (or his common sense), and the breadth of his intellectual horizon prove him to have lived before medical science had become largely technical or mechanical. Itis clear that Morgagni's immense personal influence during his lifetime did not alone make his book famous; at a distance of two hundred years from his birth, and more than one hundred from his death, the opinion is unanimous that his treatise was the commencement of the era of steady or cumulative progress in pathology and in practical medicine. Symptoms from that time ceased to be made up into more or less conventional groups, each of which was a disease ; on the other hand, they began to be viewed as "the cry of the suffering organs," and it now became possible to develop Sydenham's grand conception of a natural history of disease in a catholie or scientific spirit. Laennec's application of the stetho- scope to detect the sounds given out in diseased states of the heart and lungs, and Bright's application of the test-tube and re-agents to reach the structural and functional conditions of the kidney through the state of the urine, were the direct results of Morgagni's endeavour to lay bare the seats and causes of disease by anatomy ; and those two means of diagnosis are the daily and hourly resource of every modern practitioner. In more general terms, Morgagni's work substituted localization for generalization and precision for vagueness.*~~

~~*A biography of Morgagni by Mosca was published at Naples in 1768. HIs*~~

~~*life may also be read in Fabroni's Vita illustr. Italor., and a convenient abridg- ment of Fabroni's memoir will be found prefixed to Tissot's edition of the De Sedibus, &c. A collected edition of his works was published at Venice in five vols. folio in 1765. (Cc. C.)*~~

~~*MORGAN, Sypney Owxnson, Lapy (177741859), novelist and miscellaneous describer and critic, was one of the most vivid and hotly-discussed literary personages of her generation. She was the daughter of an Irish actor, but it was one of her whims to keep the year of her birth a secret; "once upon a time" on Christmas day was her answer to inquiries.*~~

~~*She began her literary career with a precocious volume of poems. Her second venture, St Clair (1804), a novel of ill-judged marriage, ill-starred love, and impassioned nature-worship, in which the influence of Goethe and Rousseau was apparent, at once attracted attention. Another novel, The Novice of St Dominick (1806), was also praised for its qualities of copious imagina- tion and description, though the critics were inclined to nibble at the writer's grammar. But the book which made her reputation and brought her name into warm con- troversy was The Wild Irish Girl, also published in 1806. In this she appeared as the ardent champion of her native country, a politician rather than a novelist, extolling the beauty of Irish scenery, the richness of the natural wealth of Ireland, the noble traditions of its early history, and sketching types of the various classes with direct refer- ence to the misgovernment to which she traced their evil features. She followed this up with Patriotic Sketches and Metrical Fragments in 1807, fitting some Irish melodies with words ("Kate Kearney" among the number) in the same year in which Moore began a similar task. Miss Owen- son's politics and the favour shown her by the Whig aristocracy probably prompted the savage attack made upon her next novel, da, a Woman of Athens, in the first number of the Quarterly (1809). From first to last her style was open to the reproach of being made up too much of quotations, and her grammar was not always correct ; but exuberant humour, keen wit, and fertility in the inven- tion of striking and romantic incidents carry any unbiassed reader easily over all minor faults of composition. Her great ambition was to draw vivid pictures of the mingled "mirth and misery, ferocity and fun," of the Irish under English rule, and she succeeded. Her novels suffer as stories from this political purpose ; she drags in too many character-sketches, and, though they are always drawn with vivacity and sharp penetration, they are drawn with too much bias of romantic enthusiasm on the one side and satirical spite on the other. In 1812 she was married to Sir T. C. Morgan, but books still continued to flow from her facile pen. In 1814 she produced her best novel, O'Donnel, a decided advance on previous work. She published an elaborate study of France under the Bourbon restoration in 1817. This was attacked with outrageous fury in the Quarterly, the authoress being accused of Jacobinism, falsehood, licentiousness, and im- piety. She took her revenge indirectly in the novel of Florence Macarthy (1818), in which a Quarterly reviewer, Con Crawley, is insulted with supreme feminine*~~

ingenuity. Italy, a companion work to her France, was published in 1821; Lord Byron bears testimony to the justness of its pictures of life. The results of Italian historical studies were given in her Life and Times of Salvator Rosa (1824). Then she turned again to Irish manners and politics with a matter-of-fact book on Absenteeism (1825), and a highly stirring and romantic novel, The O'Briens and the O' Fla- hertys (1827). The Book of the Boudoir (1829) consisted of miscellaneous reflexions and reminiscences. Under the ministry of Lord Grey Lady Morgan obtained a pension of £300. During the last thirty years of her long life she broke no new ground, but to the last she was an entertam- ing writer, and sent some sprightly verses to the Atheneum

in January 1859, a few weeks before her death, protesting against being called old. The titles of her books in this period are :—France in 1829-30, Dramatic Scenes from Real Life (1833), The Princess (1835), Woman and her Master (1840), The Book without a Name (1841), Passages from my Autobiography (1859). More of her autobiography and many interesting letters were edited with a memoir by Hepworth Dixon in 1862. He respected her prejudice against disclosing her exact age. MORGANATIC MARRIAGE. See MarriaceE. MORGHEN, RarraELto Sanzio (1758-1833), a distin- guished engraver, was born at Naples on 19th June 1758. He received his earliest instructions from his father, him- self an engraver ; but, in order to be initiated more fully in the art, he was afterwards placed as a pupil under the celebrated Volpato. He assisted this master in engraving the famous pictures of Raphael in the Vatican, and the print which represents the miracle of Bolsena is inscribed with his name. He married Volpato's daughter, and, being invited to Florence to engrave the masterpieces of the Florentine gallery, he removed thither with his wife in 1782. His reputation now became so great as to induce the artists of Florence to recommend him to the grand-duke as a fit person to engrave the Last Supper of Leonardo da Vinci; apart, however, from the dilapidated statc of the picture itself, the drawing made for Morghen was unworthy of the original, and the print, in consequence, although an admirable production, fails to convey a correct idea of the style and merit of Leonardo. Morghen's fame, however, soon extended over Europe ; and

~~*the Institute of France, as a mark of their admiration of his talents, elected him an associate in 1803. In 1812 Napoleon invited him to Paris and paid him the most flattering attentions. IIe died at Florence on 8th April 1833. A list of the artist's works, published at Florence in 1810, com- prised 200 compositions ; the number was afterwards considerably inereased. Amongst the most remarkable, besides those already mentioned, may be noticed the Transfiguration from Raphael, a Magdalen from Murillo, a IIead of the Saviour from Da Vinci, the Car of Aurora from Guido, the IIours and the Repose in Egypt from Poussin, the Prize of Diana from Domenichino, the Monument of Clement XIII. from Canova, Theseus vanquishing the Minotaur, Francesco Moneado after Vandyke, portraits of Dante, Petrarch, Ariosto, Tasso, and a number of other eminent men. IIis prints have hardly maintained the reputation which they enjoyed during theartist's lifetime. Though carefully and delicately executed, they are somewhat mechanical and wanting in foree and spirit. MORIIOF, Dante, Grore (1639-1691), the learned author of a survey of universal literature entitled Polyhistor sive de auctorum notitia et rerum commentari, was born at Wismar in 1639, studied law at Rostock, and was appointed professor of poetry there in 1660. In 1665 he went to the new university of Kiel as professor of eloquence and poetry ; this chair he exchanged for that of history in 1673. IIe died at Liibeck in 1691. Of his numerous writings only the Polyhistor continues to be of value to the literary historian as a bibliographical work displaying judgment as well as knowledge. The first seven books (Polyhastor Interarius) appeared in 1688-1698 ; the publication of the two remaining parts (P. Philosophicus and P. Practicus) was completed by Moller in 1707. The best edition is that of A. Fabricius (2 vols. 4to, Leipsic, 1747). MORIAII. In 2 Chron. iii. 1 we read that Solomon built the Temple at Jerusalem on Mount Moriah (13 7719), This name for the Temple hill, the ancient Zion, is not found elsewhere in the Old Testament, and can hardly have been a current one. But a mountain in the "Jand of Moriah" was the place where Abraham was com- manded to sacrifice Isaac ; Josephus (Ant., i. 13, 2) assumes that this Maprov épos was the Temple hill, and the same view is expressed in the Targums, where it is exegetically based on the obscure verse, Gen. xxii. 14 (comp. Jerome,*~~

~~Quest. Heb. in Gen. xxii. 2). Probably this tradition already existcd in the time of the Chronicler, who appears to connect the name etymologically with Jehovah's mani- festation of himself, as is done in Gen. xxii. 14.1~~

~~Jerome repeatedly ealls the Temple hill Mount Moriah, but the curreney which the name has with modern writers is mainly due to the erroneous identification of Zion with the western hill beyond the Tyropwon. In Christian tradition the place of Isaac's sacrifice was identified with Calvary (see Theodosius, De Sitw Terre Sanctz), and it is now shown in a chapel adjoining the echurch of the Holy Sepulehre.~~

~~MORIER, James (1780-1849), traveller and author, was born in 1780. Through the influence of his uncle Admiral William Waldegrave, Baron Radstock, he at an early period entered the diplomatic service, and as secretary to Lord Elgin followed the grand vizier in the Egyptian cam- paign. An account of his Eastern experiences was pub- lished in 1812, under the title A Journey through Persia, Armenia, and Asia Minor to Constantinople in 1808-9. From 1810 to 1816 he was the English representative at the court of Persia, and after his return he published A Second Journey through Persia to Constantinople between the years 1810 and 1816. His knowledge of Eastern life and man- ners he algo turned to account in the composition of several entertaining romances, displaying some skill in the deline- ation of Oriental scenery and character, and considerable powers of wit and humour. The most popular of these were: —The Adventures of Hajji Baba of Ispahan, 1824 ; The Adventures of Hajji Baba of Ispahan in England, 1828; Zohrab the Hostage, 1832; and Ayesha the Maid of Kars, 1834. Morier died at Brighton, 23d March 1849.~~

~~MORILLON, a name commonly given by fowlers to the female or immature male of the GotpEN-EvE (vol. x. p. 757), the Clangula glaucion of modern ornithology, under the belief which still very generally obtains among them, as it once did among naturalists, that they formed a distinct species of Duck. The mistake no doubt originated in, and is partly excused by, the facts that the birds called Morillons were often of opposite sexes, and differed greatly fromthe adult male Golden-Eye, whosefull and~~

~~*beautiful plu- mage is not assumed until the second year. The word is used in French in precisely the same form, but is in that language applied to the Tufted Duck, Fuligula cristata, and is derived, according to Littré, from more, signifying black. (A. N.)*~~

~~*MORIN, Jay, or, in Latin, Joannes Morinus (1591- 1659), the most learned Catholic theologian of his time and one of the founders of Biblical criticism, was born in 1591 at Blois of Protestant parents, acquired Latin and Greek at Rochelle, and continued his studies at Leyden. Immersed in Biblical and patristic lore, he began to waver in his Protestantism, and moved to Paris, where he made many friends in literary circles, particularly Cardinal Du Perron, to whom his conversion to Catholicism is ascribed. In 1618 he joined the recently formed Parisian Oratory, where he could give himself to quiet study, and in due course took priest's orders. In 1625 he visited England in the train of Henrietta Maria, and in 1640 he was at Rome, on the invitation of Cardinal Barberini, and was received with special favour by Pope Urban VIII, who employed him on the commission for forwarding his pro- ject of union with the Eastern Church. He was, however, soon recalled to Paris by Richelieu, and the rest of his life was spent among books in incessant literary labour, his health, memory, and intellectual vigour remaining unim- paired even in old age. His pen sometimes brought him into trouble. The Histoire de la délivrance de U Eglise Chrétienne par Vemp, Constantin, et de la grandeur et souveraineté temporelle donnée a [Eglise Romaine par les rots de France (1630) gave great offence at Rome, and a*~~

~~*_ 1) The word Moriah, however, can hardly come from MN, "'see;" it is perhaps akin to Moreh, "revealer," "teacher."*~~

~~*MOR—MOR*~~

~~*Déclaration (1654), directed against faults in the adminis- tration of the Oratory and reflecting on the general (Father Bourgoing), was strictly suppressed. So, too, his great work on penance gave equal offence to the Jesuits and to Port- Royal, and even after his death (1659) the polemical vehemence of his Hercitationes Biblice, and the exaggera- tion of his assertion "apud neotericos Hereticos verba Scripturarum non esse integra, non superficiem, non folia, nedum sensum, medullam et radicem*~~

~~rationis" long led Protestants to treat his valuable contributions to the history~~

~~of the Hebrew text asa mere utterance of Popish prejudice. Morinus was a voluminous and prolix writer on ecclesiastical antiquities. His principal works in this field are Commentarius historicus de disciplina in administratione sacramenti penitentiz XITI primis sceulis in Eccl. Occid. ct hucusque in Orient. observata (1651), and Comm. de sacris Ecclesizw ordinationibus secundum antiquos ct recentiores Latinos, Grecos, Syros et Babylonios (1655). The second of these works expresses those irenical views on the subject of ordination which recommended Morinus to Urban VIII. The literary correspondence of Morinus appeared in 1682 under the title of Antiquitates Ecclesiw Orientalis (edited by R. Simon).~~

~~The chief fame of Morinus, however, now rests on his Biblical and critical labours. By his editio princeps of the Samaritan Penta- teuch and Targum, in the Paris Polyglott, he gave the first impulse in Europe to the study of this dialect, which he acquired without a teacher (framing a grammar for himself) by the study of MSS. then newly brought to Europe. Not unnaturally he formed a very exaggerated view of the value of the Samaritan tradition of the text, exalting it above the tradition of the Jews (Lzercttationes in utrum- que Samaritanorum Pentateuchum, 1631). A similar tone of ex- aggerated depreciation of the Hebrew text, coloured, as has been remarked above, by polemical bias against Protestantism, mars his greatest work, the posthumous Excrcitationes bibliew de Hebrexici Grecique textus sinceritate (1660), in which, following in the foot- steps of Cappellus, but with incomparably greater learning, he brings irrefragable arguments against the then current theory of the absolute integrity of the Hebrew text of the Old Testament, and the antiquity of the vowel points. The second part of this work is still valued as a copious storehouse of materials for the history of the Hebrew text collected by the most self-denying labour— mets ingratiis, as he said himself.~~

~~MORLAIX, the chief town of an arrondissement in the department of Finistére, France, lies 350 miles west of Paris on the railway from Paris to Brest, and at the con- fluence of two small streams, 7 miles distant from the sea. Its port has 13 feet of water at ordinary and 23 feet at spring~~

~~*tides. The entrance of the roadstead is defended by the Chateau du Taureau, which stands on a rock in the sea, and was built in 1542 to protect the town from the English. Morlaix still contains a considerable number of curious wooden houses of the 15th, 16th, and 17th centuries; but the most striking piece of architecture in the town is the gigantic two-storied viaduct of the railway from Paris to Brest, 934 feet long and 207 feet above the quays. The old church of the Dominicans is now occupied by the town library. The hospital has beds for 500 patients, and can accommodate 300 female lunatics besides. A tobacco-factory, employing 400 men and 700 women, is the principal industrial establishment ; and there are also extensive paper-mills, a considerable flax-mill, canvas-factories, foundries, and saw-mills. A considerable trade is carried on in grain, yarn, canvas, leather, tallow, wax, and horses; anda large quantity of butter, cattle, and vegetables is exported from Roscoff, a village in the neighbourhood, which is also known for its sea-bathing and its zoological station. he population of Morlaix was 15,183 in 1876.*~~

~~*Judging by the numerous coins found on the spot, the site of Morlaix was probably occupied in the time of the Romans. The counts of Leon held the lordship in the 12th century, but the dukes of Brittany disputed possession with them, and in 1187 Henry II. of England, guardian of Arthur of Brittany, made himself master of the town after a siege of several weeks. During the War of the Hundred Years Morlaix was again captured and recaptured by the French and the English, and pillaged by the latter in 1522. Queen Mary of Scotland, on her way to be married to the Dauphin, made solemn entry into Morlaix in 1548. And finally, the town having joined the League, the castle was taken by storm in the name of Henry IV. in 1594.*~~

~~*MORLAND, Gerorcx (1763-1804), animal and subject painter, was born in London on the 26th of June 1763. HIe came of a race of artists. HIis father, a painter, mezzotint- engraver, and picture-dealer, gave him a careful art-training, and at an exceptionally early age he produced works of wonderful promise. At sixteen he exhibited sketches at the Royal Academy, and even before this his productions found ready purchasers, and some of them had been engraved, But already the taste for dissipation, which was stronger in Morland than even his love for art, had begun to manifest itself, and at seventeen he escaped from the over-strict discipline of his father's house, and began a career of reckless prodigality which has hardly a parallel in art-biography, gathering round him an entourage of the most abandoned associates, and supporting himself by the sale of the pictures—rustic subjects and scenes from low life—which he threw off with unexampled rapidity. About 1786 there appeared to be some prospect of amendment. HIe went to reside at Kensal Green, came under the influ- ence of better companions, and married a beautiful and virtuous girl, a sister of James Ward the animal-painter and William Ward the engraver. The subjects which Morland painted during this period reflect the change in his way of life. The Idle and Industrious Mechanic, and Letitia or Seduction, moralities in the style of HIogarth, were engraved and became exceedingly popular. But soon the force of old habit asserted itself, the desire for freedom and lawlessness returned to the artist with redoubled violence, and he again drifted into a career of riot and intemperance. The means of dissipation were not wanting ; the dealers were eager for his productions ; indeed, so greatly were they esteemed that skilled copyists were employed to make many transcripts from the pictures on which he was at work, which were sold as originals to an unsuspecting public. The finest of Morland's subjects date from 1790 to 1792. In 1791 was painted the Inside of a Stable, now in the National Gallery, probably the artist's masterpiece. In spite of his popularity and his industry his affairs became inextricably embarrassed. For a time he eluded the bailiffs with singular dexterity, but in November 1799 he was arrested. Obtaining the Rules of the Bench, he took a house within bounds, and con- tinued to practise both his art and his debauchery. HIe was released under the Insolvent Act of 1802, but his health was ruined and he was speedily stricken with palsy. Partially*~~

~~*recovering, he continued to paint, but before long he was again arrested for debt, and died in a sponging- house in Eyre Street, Coldbath Fields, on the 29th of October 1804. His wife survived him only some three days, and they were buried in one grave.*~~

~~*The most characteristic works of Morland are those which deal with rustic and homely life. They show much direct and instinct- ive feeling for nature, and admirable executive skill, but they have no elevation of subject, no great beauty of colour or truth of atmo- sphere. They suffer from the haste in which the artist habitually worked. Many of them have been admirably mezzotinted by J. R. Smith and his pupils, William Ward and John Young. Par- ticulars of Morland's life will be found in the biographies by J. Hassell (1804), G. Dawe (1807), and Blagton (1806), and in Memoirs of a Picture, by W. Collins, 1805.*~~

~~*MORMONS, or The Church of Jesus Christ of Latter- Day Saints, are a religious sect founded by Joseph Smith at Manchester, New York, in 1830, and for the last thirty- six years settled in Salt Lake City, Territory of Utah, United States. Smith was born 23d December 1805 at Sharon, Windsor county, Vermont, from which place ten years later his parents, a poor, ignorant, thriftless, and not too honest couple, removed to New York, where they settled on a small farm near Palmyra, Wayne county (then Ontario). Four years later, in 1809, they removed to Manchester, some 6 miles off; and it was at the latter place when fifteen years old that Joseph began to have*~~

~~*his alleged visions, in one of which on the night of 21st September 1823 the angel Moroni appeared to him three times, and told him that the Bible of the Western Continent, the supplement to the New Testament, was buried in a certain spot near Manchester. Thither, four years later and after due disciplinary probation, Smith went, and had delivered into his charge by an angel of the Lord a stone box, inwhich was a volume, 6 inches thick, made of thin gold plates 8 inches by 7, and fastened together by three gold rings. The plates were covered with small writing in the*~~

~~*“reformed Egyptian” tongue, and were accompanied by a pair of supernatural spectacles, consisting of two crystals set in a silver bow, and called “ Urim and Thummim ;” by aid of these the mystic characters could be read. Being himself unable to read or write fluently, Smith employed as amanuensis one Oliver Cowdery, to whom, from behind a curtain, he dictated a translation, which, with the aid of a farmer, Martin Harris, who had more money than wit, was printed and published in 1830 under the title of The Book of Mormon, and accompanied by the sworn statement of Oliver Cowdery, David Whitmer, and Martin Harris that an angel of God had shown them the plates of which the book was a translation. This testi- mony all three, on renouncing Mormonism some years later, denounced as false; but meanwhile it helped Smith to impose on the credulous, particularly in the absence of the gold plates themselves, which suddenly and mysteri- ously disappeared. The Book of Mormon, in which Joseph Smith was declared to be God’s “ prophet,” with all power and entitled to all obedience, professes to give the history of America from its first settlement by a colony of refugees from among the crowd dispersed by the confusion of tongues at the Tower of Babel down to the year 5 a.p. These settlers having in course of time destroyed one another, nothing of importance occurred until 600 3.c., when Lehi, his wife, and four sons, with ten friends, all from Jerusalem, landed on the coast of Chili, All went well until the death of Lehi, when the divine appointment to the leadership of Nephi, the youngest son, roused the resentment of his elder brothers, who were in consequence condemned to have dark skins and to be an idle mischievous race,—hence the North-American Indians. Between the Nephites and the bad Hebrews a fierce war was maintained for centuries, until finally, in spite of divine intervention in the person of the crucified Christ, the Nephites fell away from the true faith, and in 384 a.p. were nearly annihilated by their dark-skinned foes in a battle at the hill of Cumorah, in Ontario county, New York. Among the handful that escaped were Mormon and his son Moroni, the former of whom collected the sixteen books of records, kept by suc- cessive kings and priests, into one volume, which on his death was supplemented by his son with some personal reminiscences and by him buried in the hill of Cumorah,—he being divinely assured that the book would one day be discovered by God’s chosen prophet. This is Smith’s account of the book ; but in reality it was written in 1812 as an historical*~~

romance by one Solomon Spalding, a crack- brained preacher ; and the MS. falling into the hands of an unscrupulous compositor, Sidney Rigdon, was copied by him, and subsequently given to Joseph Smith. Armed with this book and with self-assumed divine authority, the latter soon began to attract followers. On 6th April 1830 the first conference of the new sect, called by their neighbours Mormons, but by themselves subsequently Latter-Day Saints of Jesus Christ, was held at Fayette, Seneca county, New York, and in the same year another revelation was received by Smith, proclaiming him "seer, translator, prophet, apostle of Jesus Christ, and elder of the church." Smith now began to baptize; but, his character, which was none of the best, being too well known in Fayette, he

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found it convenient to remove with his followers, now thirty in number, to Kirtland, Ohio, which was to be the seat of the New Jerusalem. HIere he had another revelation, directing the saints to consecrate all their pro- perty to God and to start a bank. This being done and Smith appointed president of the bank, the country was soon flooded with worthless notes, which fact, added to other grievances, so enraged the neighbouring Christian settlers that on the night of 22d May 1832 a number of them dragged Smith and Rigdon from their beds and tarred and feathered them. One year later, the church was fairly organized, with three presidents, Smith, Rigdon, and Frederick G. Williams, who were styled the first presidency, and entrusted with the keys of the last

kingdom. About this time the licentiousness of Smith

might have led to the dissolution of the church but for the accession of Brigham Young, a Vermont painter and glazier, thirty years old, who turned up in Kirtland in 1832, and was immediately ordained elder. Young's indomitable will, per- suasive eloquence, executive ability, shrewdness, and zeal soon made their influence felt, and, when a further step was taken in 1835 towards the organization of a hierarchy by the institution of the quorum of the "twelve apostles," who were sent out as proselytizing missionaries among the " gen- tiles," Young was ordained one of the ""'twelve" and de- spatched to preach throughout the eastern

~~*States. In 1836 a large temple was consecrated in Kirtland, and in the follow- ing year Orson Hyde and Heber C. Kimball were sent off as missionaries to England, where, among the labouring masses in Manchester, Liverpool, Birmingham, Leeds, Glasgow, and the mining districts of South Wales they achieved a remarkable success. Early in 1838 the Kirtland bank failed, and Smith and Rigdon fled to Caldwell county, Missouri, where a large body of the saints, after having been driven successively from Jackson and Clay counties, had taken refuge and flourished. Smith's troubles, how- ever, continued to increase. His gross profligacy had repelled many of his leading supporters and bred internal dissensions, while from the outside the brethren were harassed and threatened by the steadily growing hostility of the native Missourians. To counteract the efforts of his enemies, a secret society was organized in Smith's favour in October 1838, called the Danites, with the avowed purpose of supporting Smith at all hazards, of upholding the authority of his revelation and decrees as superior to the laws of the land, and of helping him to get possession, first of the State, then of the United States, and ultimately of the world. To such a height did the inner dissensions and the conflicts with the "gentiles" grow that they assumed the proportions of a civil war, and necessitated the calling out of the State militia. Defying the legal officers, Smith fortified the town and armed the saints, but finally had to. succumb to superior numbers. Smith and Rigdon were arrested and imprisoned on a charge of treason, murder, and felony, and their followers to the number of 15,000 crossed over into Illinois and settled near Commerce, Han- cock county. Here they were shortly afterwards rejoined by Smith, who succeeded in escaping from prison, and, having obtained a charter, they founded the city of Nauvoo. Such were the powers granted them by this charter as to render the city practically independent of the State Government, and to give Smith all but unlimited civil power. He organized a military body called the Nauvoo legion, of which he constituted himself commander with the title of lieutenant-general, while he was also president of the church and mayor of the city. On 6th April 1841 the foundations of the new temple were laid, and the city continued to grow rapidly in prosperity and size. But Smith's vices were beginning to bear fruit. Some years*~~

~~*previously he had prevailed on several women to cohabit*~~

~~*with him, and in order to pacify his lawful wife and silence the objections of the saints he had a revelation on 12th July 1843 expressly establishing and approving polygamy. The proclamation of the new doctrine excited widespread indignation, which found special expression in the pages of the Hxpositor, a newspaper published by an old friend of Smith, one Dr Foster. Smith at once caused the Zv- positor printing-office to be razed and Foster expelled, on which the latter procured a warrant for the arrest of Smith, his brother Hyrum, and sixteen others, Smith resisted ; the militia was called out ; the Mormons armed themselves; and a civil war seemed imminent, when the governor of the State persuaded Smith to surrender and stand his trial. Accordingly, on 27th June 1844 he and Hyrum were imprisoned in Carthage jail; but that same night a mob broke into the prison and shot the two men dead. This shooting was the most fortunate thing that had ever happened to the Mormon cause, investing the murdered president with the halo of martyrdom, and effacing public recollection of his vices in the lustre of a glorious death. Of the confusion that followed Smith's "taking off" Brigham Young profited by procuring his own election to the pre- sidency by the council of the " twelve apostles,"—a position for which his splendid executive abilities well fitted him, as subsequent events abundantly proved. The following year witnessed what appeared to be the culmination of their misfortunes. The legislature of Illinois repealed the charter of Nauvoo, and so critical did the situation become that the leaders resolved to emigrate imme- diately, and preparations were begun for a general exodus westward. Early in 1846 a large number of the body met at Council Bluffs, Iowa, and those who had stayed behind soon found cause to regret that they too had not left Nauvoo, as in the September of the same year that city was cannonaded, and the Mormons were driven out. Meanwhile pioneers had been despatched to the Great Salt Lake valley, Utah, and, their report proving favourable, a large body of emigrants was marched with military discipline across the wilderness to the valley, where they immediately proceeded to found Salt Lake City, and where on 24th July 1847 they were joined by their chief, Brigham Young. In the May following the main body of the saints set out to rejoin their brethren, and in the autumn of that year reached Salt Lake City. Large tracts of land*~~

~~were at once put under cultivation, a great city sprang up as by magic, and the untiring industry, energy, and zeal of the emigrants turned a barren wilder- ness into a fertile and blooming garden. An emigration fund was organized, missionaries were sent out, and soon settlers began to pour in from all quarters of the globe, particularly from Great Britain, Sweden and Norway, and in less numbers from Germany, Switzerland, and France. Strangely enough, and the fact deserves emphasis, Ireland has furnished few if any recruits to the cause of Mormon- ism. In March 1849 a convention was held at Salt Lake City, and a State was organized under the name of Deseret, meaning "'the land of the honey-bee." A legislature was also elected, and a constitution framed, which was sent on to Washington. This Congress refused to recognize, and by way of compromise for declining to admit the proposed new State into the Union President Fillmore in 1850 organized the country occupied by the Mormons into the Territory of Utah, with Brigham Young as governor. District judges were also appointed by the Federal Govern- ment; but in 1851, a few months after their appointment, they were forced to leave by the aggressive tactics of Young. Such bold defiance of the Federal Government could not be ignored; Brigham was suspended from the governorship, and Colonel Steptoe of the United States army appointed in his stead. The new governor, backed~~

~~by a battalion of soldiers, arrived in Utah in August 1854 ; but so strong was the opposition which he met with that he dared not assume office, and was forced to content him- self with merely wintering in Salt Lake City, after which he withdrew his troops to California. Nor did the other civil officers appointed by the United States Government at the same time show any bolder front. In February 1856 a band of armed Mormons broke into the court- room of the United States district judge, and forced Judge Drummond to adjourn his court sine die. HIs surrender precipitated the flight of the other civil officers, and with the sole exception of the United States Indian agent they withdrew from Salt Lake City. These facts led President Buchanan to appoint a new governor in the person of Alfred Cumming, the superintendent of Indian affairs on the upper Missouri, who in 1857 went to Utah, accom- panied by Judge~~

~~*Eckels of Indiana as chief justice, and by a force of 2500 soldiers. Enraged by this aggressive action, Brigham Young boldly called the saints to arms. In September the United States army reached Utah, but on 5th and 6th October a band of mounted Mormons destroyed a number of its supply trains, and a few days later cut off 800 oxen from its rear and drove them into Salt Lake City. The result was that the United States army, now commanded by Colonel A. S. Johnston, was compelled—it being now mid-November—to go into winter quarters at Black's Forks, near Fort Bridger. In the same year a party of Mormons and Indians, instigated and led by a Mormon bishop named John D. Lee, attacked a train of 150 non-Mormon emigrants at Mountain Mea- dows, near Utah, and massacred every soul. Governor Cumming at once declared the Territory in a state of rebellion; but in the spring of 1858, through the inter- vention of Thomas L. Kane of Pennsylvania, armed with letters of authority from President Buchanan, the Mormons were induced to submit to the Federal authority, and accepted a free offer of pardon made to them by the United States Government as the condition of their submission. Matters being thus settled, the Federal troops encamped on the western shore of Lake Utah, some 40 miles from Salt Lake City, where they remained until withdrawn from the Territory in 1860. On the close of the American Civil War a Federal governor was again appointed, and in 1871 polygamy was declared to be a criminal offence, and Brigham Young was arrested. This action, however, on the part of the United States Government was merely spasmodic, and the Mormonscontinued to practise polygamy, and to increase in wealth and numbers until 29th August 1877, when Brigham Young died, leaving a fortune of $2,000,000 (£400,000) to 17 wives and 56 children. He was succeeded in office by John Taylor, an Englishman, although the actual leadership fell to George Q. Cannon, "'first coun- sellor" to the president, and one of the ablest men in the sect. The year 1877 was otherwise signalized in Mormon history by the trial, conviction, and execution of John D. Lee for the Mountain Valley massacre of 1857. Of late years the question of Mormonism has largely occupied public attention. In 1873 Mr Frelinghuysen introduced a bill severely censuring polygamy, and declaring that the wives of polygamists could claim relief by action for divorce. In 1874 the committee of the House of Representatives reported a bill which reduced Utah to the position of a province, placing the control*~~

~~of affairs in the hands of Federal officials, and practically abolishing polygamy. In the same year George Q. Cannon was elected a delegate from Utah, and though his election was contested it was confirmed by the House of Representatives. This decision, however, was accompanied by the passing of a resolution by a vote of 127 to 51, appointing a committee of investiga- tion into Delegate Cannon's alleged polygamy,—he having,~~

~~it was asserted, four wives.~~

~~Mormonism, passed the House in spite of the eloquent opposition of Cannon. Other steps in the same direction have since been taken, and bills passed, having for their~~

~~object the extirpation of polygamy, but all without imme- It is, however, a question of~~

~~diate and practical effect. time merely; polygamy is doomed. 'The secession, chiefly because of his opposition to the practice, of Brigham Young's son, a Christian preacher, and of a large body~~

~~of other anti-polygamists who claim to be the true Latter-~~

~~Day Saints, represents not an individual opinion but the~~

~~deep-rooted conviction of a great party, and the day is not~~

~~far distant when the Mormons who acknowledge John Taylor as chief prophet must consent to lop off polygamy or cease to exist as a corporate body of the United States. Already there are not wanting signs of approaching dis- solution, of which perhaps the most significant is the con- ference of the "Reorganized Church of Jesus Christ of Latter- Day Saints," held on 6th April 1883, at Kirtland, Lake county, Ohio. This sect originated in 1851, seven years after the death of Joseph Smith, when several officers of the church met and claimed to have received a revelation from God, directing them to repudiate Brigham Young, as not being the divinely-appointed and legitimate successor of Joseph Smith,~~

~~*and as being the promulgator of such false doctrines as polygamy, Adam-God worship, and the right to shed the blood of apostates. Nothing of special importance occurred, however, until 1860, when Joseph Smith jun., the eldest son of the founder of the faith, became identi- fied with the Reorganized Church as its president. Since then the seceders have prosecuted missionary work through- out the United States, Great Britain, Canada, Scandinavia, Switzerland, Australia, and the Society Islands, until their communicants are said to number over 27,000. Their headquarters are at Plano, Illinois, to which place they removed from Lamoni, Iowa, in 1881. The Reorganized Church holds that the legitimate successor to Joseph Smith was his eldest son, that the allegation that Smith intro- duced polygamy on the strength of divine revelation was an invention of Brigham Young, that the Utah Church has departed grievously from the faith and practices laid down in the Book of Mormon and subsequent revelations to Joseph Smith, and that the Reorganized Church is the only true and lawful continuation of, and successor to, the original church, and as such is legally entitled to all that church's property and rights. And it was to celebrate the decision of the United States Court of Ohio confirming this last claim, and vesting in them the right to the temple consecrated in Kirtland, Ohio, in 1836, and for nearly forty years disused owing to litigation, that the Reorganized Church met in that temple on the 6th of April 1883.*~~

~~*Returning to the main body, it may be added that the population of Utah is 147,000, of whom 123,000 are Mormons ; but as the saints are scattered over the globe it is difficult to arrive at a just estimate of their complete numerical strength. In Idaho, Arizona, Washington, Colorado, Montana, and Wyoming they have of late years made great progress, and their number in the United States outside of Utah cannot fall much under 27,000. In Europe they have also many adherents, and a careful study, based on recent official statistics, would place their entire number at 213,000.*~~

~~*Government.—At the head of the body is a president, who pos- sesses supreme authority, supported by two counsellors. These three are supposed to be the successors of Peter, James, and John, and constitute what is known as the "first presidency." Then comes the " patriarch,"*~~

~~*whose chief duty is to bless and lay on hands, and after him the " twelve apostles," forming a travelling high council, and receiving a salary of $1500 a year each. Of these the president is ex officio one, and endowed with authority equal to the other*~~

~~*Later in the same year the Utah Judiciary Bill, attacking the very foundation of*~~

~~*MOR—MOR*~~

~~*eleven. Their duticsare important. They ordain all other officers, elders, priests, teachers, and deacons, lead all religious meetings, and administer the rites of baptism and sacrament. Fourth come the seven presidents of the "seventies," each body comprising seventy elders; there are cighty seventies in Utah, each of which has seven presidents, and cvery seven one president. 'These seventies make annual reports, and are the missionaries and propagandists of the body. Fifth come the "high priests," whose chief duty is to officiate in all the offices of the church in the absence of any higher autho- rities. After them comes the presiding bishop, who superintends the collection of tithes, which amount to $1,100,000 annually. The church is made up of 28 stakes, each having a president, and is divided into wards, which are subdivided into districts, each of which has a certain number of teachers, a meeting-house, Sunday school, day school, and dramatic, debating, and literary societies.*~~

~~*Doctrine. —The Mormons no longer claim to be a Christian sect, any more than do the Mohammedans. A system of polytheism has been grafted on the original creed, according to which there are grades among the gods, the place of Supreme Ruler of all being 'taken by the primeval Adam of Genesis, who is the deity highest in spiritual rank, while Christ, Mohammed, Joseph Smith, and Brigham Young also partake of divinity. The business of these deities is the propagation of souls to people bodies begotten on earth, and the sexual rclation permeatcs every portion of the creed as thoroughly as it did that of ancient India or Egypt. The saints on leaving this world are deified, and their glory is in proportion to the number of their wives and children,—hence, the necessity and justification of polygamy, and the practice of having many wives sealed to one saint. Thcir distinguishing points of faith are :—religiously, a belief*~~

~~*in a continual divine revelation through the inspired medium of the prophct at the head of the church ; morally, polygamy, though this is expressly condemned in the Book of Mormon, and was grafted on the original faith by Smith ; and, socially, a complete hierarchical organization. They believe in the Bible as supplemented by the Book of Mormon and the Book of Doctrine ; in the gift of prophecy, miracles, and casting out devils ; in the imminent approach of the cnd of the world; in their own identity with the apocalyptic saints who shall reign with Christ in a temporal kingdom, cither in Missouri or Utah; in the literal resurrection of the body; in absolute liberty of private judgment in religious matters; and in the salvation of a man only if he believes in Christ's atonement, repents, is baptized by immersion by a Christ-appointed apostle, and receives the laying on of hands for the gift of the Holy Ghost by duly authorized apostles. Among their minor rules as laid down in 4 Word of Wisdom, supposed to have been revealed to Joseph Smith, 27th February 1838, are thesc recommendations :—that it is not good to drink wine or strong drink, except at the Lord's Supper (and even then it should be home-made grape-wine), or to use hot drinks or tobacco, —the former being meant for the washing of the body, and the latter for the healing of bruiscs and sick cattle; man's proper food is herbs and fruit, that for beasts and fowls, grain ; and, except in winter and in case of famine and severe cold, flesh should not be eaten by man. Infant baptism is also condemned, but the children of the saints who have reached their eighth year should be baptized. The deceased, also, can be baptized by proxy, and in this way Washington, Franklin, and others have been vicariously baptized into the church.*~~

~~*See Book of Mormon (1879); Book of Doctrine and Covenants(1876); John Hyde jun., Mormonism, its Leaders and Designs (1857); B. G. Ferris, Utah and the Mormons (1854); N. W. Green, Mormonism (1870); T. B. H. Stenhouse, Rocky Mountain Saints (1873); H. Mayhew, The Mormons ; Elder John Jaques, Cate-*~~

~~*chism for Children (1877); John W. Gunnison, Mormons, or Latter-Day Saints (1852); Hepworth Dixon, Spiritual Wives (1868); J. H. Beadle, Life in Utah (1870). (J. FR.)*~~

~~*MORNAY, Putxipre DE (1549-1623), Seigneur du Ples- sis-Marly, very generally known as Mornay Du Plessis or Du Plessis-Mornay, one of the most distinguished members of the Protestant party in France, was born at Buhy in Normandy on 5th November 1549. As a younger son he was destined for the church, and with this view was sent to the Collége de Lisieux in Paris, but in his eleventh year, along with the rest of his family, he abandoned Roman Catholicism, continuing, however, with zeal and success his studies not only in classical and general litera- ture but also in theology. In the autumn of 1567, on the outbreak of the second religious war, he joined the army of Condé, but was prevented from taking an active part in the campaign by a fall from his horse, which broke his leg. In the following year he went abroad, and, after spending the winter at Heidelberg, travelled extensively in Italy, Germany, the Low Countries, and England, learning the languages and acquiring the friendship of many of the distinguished men of all these countries. In*~~

~~*June 1572 he returned to France, and had begun to enter upon a diplomatic career (his earliest extant "mémoire," laid by Coligny before Charles IX., had reference to the duty of France to support the Low Countries in their struggle for independence) when the St Bartholomew mas- sacre, from which he escaped with difficulty, compelled him to take refuge across the Channel. There he rendered valuable services to William of Orange, and also to the duke of Alencgon-Anjou, as a semi-official political agent. Returning to France at the instance of La Noue towards the end of 1573, he took part with various success in numerous military enterprises, and was made prisoner at Dormans in 1575 (10th October), but not having been re- cognized he got off fora small ransom. Shortly afterwards he married Charlotte Arbaleste at Sedan, and at her re- quest wrote as a bridal present the Discours de la Vie et de la Mort (1576), which has been so often reprinted and translated. In 1577 Henry of Navarre made him a mem- ber of his council and sent him on a diplomatic mission to England, and during this visit, which lasted more than a year, he found time among his other pressing occupations to prepare for the press his Z'raité de ['Eglise o& Von traite des principales questions qui ont été mues sur ce point en nostre temps (1578), which at*~~

~~*once became popular. From July 1578 till his return to France in 1582 he was chiefly in the Low Countries, engaged in public business, and during this interval he wrote and published a considerable work in apologetical theology (Z'raité de la vérité de la religion chrétienne contre les Athées, Epicuriens, Payens, Juafs, etc, 1581). With the death of the duke of Anjou in 1584, by which Henry of Navarre was brought within sight of the throne of France, the period of Mornay's greatest political activity began; his importance in the Huguenot counsels was further increased in 1588 by the death of the prince of Condé, to whose influence he practi- cally succeeded. In April 1589 he was rewarded for the reconciliation of the two Henries with the governorship of Saumur, and he took active part in many of the military operations that followed the assassination of Henry ITI. in the following August. He was present at the siege of Dieppe, fought by the side of Henry IV. at Ivry, and was one of the besiegers of Rouen in 1591-92, until sent on a mission to the court of Elizabeth. A crisis in his political career was marked by Henry's abjuration of Protest- antism in July 1593, which gradually led to Mornay's withdrawal from the court. In this year it was that he founded the Protestant academy or university of Saumur, which had a distinguished history until its suppression by Louis XIV. in 1683. In 1598 he published a work on which he had long been engaged, entitled De [institution, usage, et doctrine du saint sacrement de [Hucharistie en V Eglise ancienne. It having reached his ears that Cardinal Du Perron had alleged that of the (thousands of) citations in this controversial work he could point out five hundred that were falsified or misunderstood, he challenged his assailant to a public discussion. This was at last arranged for by the good offices of the king, and took place at Fontainebleau on 4th May 1600. Only nine passages were discussed, but in each case the decision, one is not surprised in the circumstances to learn, went against the Protestant. Mornay, from whom every indication of the particular passages to be impugned had been persistently withheld, was forced by supervening illness to withdraw. Only once again did he appear at court, in 1607. He continued, however, to give his party the benefit of his counsel and active support to the end of his long and busy life. His last work, entitled ALystére diniquité, c'est a dire, Vhistoire de la Papauté, appeared in 1611. In 1618 he was chosen a deputy to represent the French Protest- ants at the synod of Dort. Prohibited by Louis XIH.*~~

~~from personally attending, he nevertheless contributed materially to the deliberations of that assembly by written communications. In 1621 he was deprived of his governor- ship; and his death took place at La Forét-sur-Sevre on llth November 1623.~~

~~Two volumes of Afémoires, from 1572 to 1589, appeared at La Forét in 1624, and a continuation, in two volumes, at Amsterdam in 1652; a more complete edition (Mémoires, correspondances, et vie) in twelve volumes, 8vo, was published at Paris in 1624-25. The~~

~~greater number of his works were translated into English during his lifetime.~~

~~MORNY, Cuaries Avucuste Louis Josepu, Duc DE (1811-1865), was the natural son of Hortense Beauharnais, queen of Holland, and of the comte de Flahaut, a leading dandy of the period, and was thus brother to Napoleon III. The secret of his birth (23d October 1811) was care- fully kept; he was acknowledged as son by the comte de Morny for a consideration, and was brought up by his paternal grandmother, Madame de Souza, a' writer of society novels, and a woman of great wit and high breeding. As a boy of nineteen he was declared after the revolution of 1830 a hero of July, and was entered at the staff college. In 1832 he was gazetted sub-lieutenant, and served in Algeria as aide-de-camp to General Oudinot ; he was pre- sent at Mascara and Constantine, and was made a chevalier of the Legion of Honour. In 1838 he returned to Paris, and began his career as dandy and speculator. In the first capacity he set the fashions both of dress and manners to the young men of Paris, and conceived the idea of the modern society journal, and in the second established a manufactory of beetroot sugar at Clermont-Ferrand. This last idea brought about his election for the department of the Puy-de-Déme. In the chamber he voted consistently with the ministers. The republic of 1848 marked the crisis in his fortunes, and by 1851 all his speculations had failed, and all his property was sold. In desperation he determined to play a part in politics, and was the heart and soul of the coup d'état of December 1851. The success of the coup d'état was certain, owing to the fear of the extreme republicans entertained by the great~~

~~*majority of the nation, and all that was needed was a head for intrigue and an utter absence of scruples to shed innocent blood. Morny and St Arnaud fulfilled these requisites. Morny was on the day of the cowp @état made minister of the interior, but he had no taste for the drudgery of adminis- tration, and in January 1852 found an excuse for resigning on the question of the property of the Orleanist princes. The empire established, he was again able to begin specu- lating, and used both the money of the state and his influence with his brother for the success of his schemes. HIe had been in 1852 re-elected deputy for Clermont-Ferrand, and was in 1854 elected president of the corps legislatif, an office which he held for the rest of his life. This office in every way suited him; he had large pay, and resided in a magnificent official residence, where he produced little plays to admiring audiences. The work was not hard, being chiefly to maintain the Government majority in a good humour by sumptuous entertainments, and to win over the Liberals by the same tactics. HIe still speculated in railways, pictures, mines, and even in a new watering-place, Deauville, and, being absolutely unscru- pulous and venal, amassed an immense fortune in spite of the utmost extravagance. In 1856 he was special ambassador at the coronation of Czar Alexander IT., when he spent immense sums, and married a wealthy Russian, Princess Troubetzkoy. In 1862 he was created a duke, and in 1865, after continuing to the last his career of dissi- pation, died of sheer anemia from the measures he took to keep himself fit for yet further excesses.*~~

~~*Of the duc de Morny little good can be said either as a statesman oraman. HIe looked upon everything from a purely selfish point*~~

~~*Plate X.*~~

~~*830*~~

~~*of view, and would not have denied it ; but he was shrewd enough to perceive that the empire rested on the prestige it. maintained for France not only in war but in fashion, and in assisting the empress to make Paris the centre of fashion for the whole civilized world he*~~

~~*knew he was not only pleasing himself but doing a service to the*~~

~~*empire. He was a thorough man of the world, and was witty as such, but the wit docs not appear at its brightest in his plays, published under the name of Saint-Remy, of which perhaps the most readable is If. Choufleury restera chez lu. He had great influence over the emperor, but could lay no claim to personal fidelity, as could his less able but equally unscrupulous colleague, M. de Persigny.*~~

~~*_For his life consult H. Castille, M. de Morny, 1859, and De la Gueronniére, Etudes et portraits politiques (1856); also Alton-Shee's Mémoires (1868-69). His char- acter is admirably sketched as the duc de Mora in A. Daudet's novel Le Nabab.*~~

~~*MORO, Arron: (c. 1512-1581), otherwise known as Sip ANTHONY Mors, an eminent portrait-painter, was born at Utrecht, in 1512 according to some, but in 1525 according to Van Mander in his Het Leven der Schilders. He studied his art under Jan Schoorel ; and after making a professional visit to Italy he commenced to paint por- traits in the style of Hans Holbein. His rise to eminence was rapid. In 1552 he was invited to Madrid by the emperor Charles V. to execute a likeness of Prince Philip. Two years afterwards he was in London painting the portrait of Queen Mary. For this picture an annual salary and, as some suppose, the honour of knighthood were conferred upon him. He was also employed to sketch the likenesses of several of the English nobility. On the death of Mary in 1558 Moro returned to Spain, and lived there for two years in great honour with Philip IL., executing, in addition to portraits, several copies after Titian. Having compromised himself with the Inquisition, he repaired to the Netherlands and was received into the service of the duke of Alva. His death took place at Antwerp about 1581. Among his figure-pictures Van Mander specifies the Circumcision of Christ, executed for Antwerp cathedral, as one of the most notable. His portraits are full of individuality, and characterized by firm and solid rendering of flesh. Several admirable examples are preserved in Madrid; among the rest the portrait of Queen Mary of England, which has been excellently etched by Milius (Z'Art, 8th December 1878). "Moro's style," says Stanley in his Dutch and Flemish Painters, "so much resembles that of Holbein as to fre- quently create a doubt to which of them a portrait is to be attributed ;*~~

~~*but he is not so clear and delicate in his colouring (perhaps from having painted so much in Spain) as that master."*~~

~~*MOROCCO, or Marocco, the term (corrupted from the name of the city Marrakush) used in English to designate the Maghrib al-Aks4 or extreme west of the Arabs, is the country at the north-western corner of the African continent, with the Mediterranean ou the north and the Atlantic on the west. Its landward limits can only be vaguely defined. The eastern frontier towards Algeria, determined by the treaty of 1844, is a purely conventional line starting from the mouth of a small stream called the Skis and running across country in a general south-south-east direction. The southern boundaries expand and contract according to the power and activity of the central authorities. Behm and Wagner (1882), who include Tafilelt, Kenatsa, Figig, Twat, Gurara, Tidikelt, the plateau of Tedmaid, &c., estimate the total area of the sultanate at 305,548 square miles; and this, which is about twice the size of Algeria, or five times that of England and Wales, may be taken as a maximum. The allegiance of many of the tribes within this compass is questionable and intermittent. Morocco isstill the portion of Northern Africa about which European information is most defective, and the ordinary maps are composed to a large extent of most unscientific material eked out by probabilities and conjecture. Since the middle of the present century a good deal has been done in the way of*~~

~~*exploration, mainly in the lowlands and steppes sloping towards the Atlantic—the country of the great historical cities of Tangiers, Fez, Meknes (Mequinez), and Morocco ; but even there what lies but a few miles east or west of some track traversed by Europeans for centuries remains matter of question.*~~

~~*Since the publication of Arlett's survey from Cape Spartel to Cape Bojador (1840-44) and of Vincendon- Dumoulin and Kerhallet's surveys from the Strait of Gib- raltar to the Algerian frontier (1853-57) the seaward aspect of Morocco has been known in detail. To the Mediter-*~~

~~ranean it presents for a distance of about 200 miles the rugged profile of the Rif hills (still unexplored), which generally end in lines of cliff broken at intervals by narrow sweeps of sandy beach, but occasionally open up into beau- tiful and fertile valleys, with abundant evidence of human occupancy and tillage. About 6 miles west of the Skis lies the mouth of the great river Muluya; and 10 miles farther on, opposite Cape del Agua (Ras Sidi Beshir), is a group of dry and barren islands known as the Zafarines, which form the best roadstead on the Rif coast. Be- tween Point Quiviana and Melilla runs a low and sandy shore in front of a great salt marsh, the Puerto Nuevo of the Spaniards. Melilla (Malila) is a fortified town, held by the Spaniards since 1653, built on a rocky peninsula and connected by lines of rampart with Fort Rosario on the heights behind. Near the village of Azanen is a wide open shore with the only sand-dunes on all this coast. The fine semicircular bay of Alhucemas is the seaward end of one of the most beautiful valleys in the Rif, clothed with verdure and dotted with hamlets. A Spanish presidto occupies one of the larger of the Alhucemas islands (Al- Mazemma), which are identified with the Ad Sex Insulas of the itineraries. Another Spanish fortress crowns the rocky island of San Antonio or Peiion de Velez; and in the valley off which it lies stood a town known to the Spaniards as Velez de Gomera, to the Arabs as Badis, which continued to be a place of importance in the 16th century. The so-called Bay of Tetuan (Tett4win)—the town is just visible from the sea—is little more than the straight stretch of coast between Cape Mazari on the south and Cape Negro or Negrete on the north ; but the prominence of these two headlands gives it an appearance of depth. From Cape Negro northwards to Ceuta the most notable object on the horizon is the summit of Jebel Musa, which, though situated on the Strait of Gibraltar, towers above the inter- vening hills. Ceuta (Sebta), the most important and flourishing of the Spanish settlements in Morocco, occupies a peninsula, —the head, Mt. Acho, standing about 4 miles out to sea, and the neck being low and narrow. It marks the eastern end of the strait. Westwards, the first point of interest is again Jebel Mus, the Elephas of Strabo, and the Apes' Hill of English charts; the truncated top is usually hid in clouds. About 20 miles farther along the coast lies the Bay of Tangiers (Tanja), by far the finest harbour in Morocco. West from Tangiers runs the Jebel Kebir (880 feet at its highest), the seaward extremity of which forms the celebrated Cape Spartel, the north-west angle of the African~~

~~*continent, known to the ancients as Ampelusia or Cotes Promontorium. The lighthouse, built in 1864 at the cost of the sultan of Morocco, and main- tained at the joint expense of England, France, Italy, and Spain, is the only one on the western coast.*~~

~~*The Atlantic coast of Morocco is remarkable for its regularity and sameness; not a single gulf or noteworthy*~~

~~*estuary occurs throughout its whole length; the capes*~~

~~*1 The name is derived from the Arab tribe of the Beni Ja'far, who settled on the neighbouring mainland at the conquest. Since 1848 the islands have belonged to Spain. They are identified with the Ad Tres Insulas of the Roman itineraries.*~~

~~*MOROCCO*~~

~~*are few and for the most part feebly marked. South- ward from Cape Spartel the shore sinks rapidly till it is within a few feet of the sea-level. In the low cliff which it forms about 44 miles from the lighthouse there is a great quarry, which from remote antiquity has yielded the hand-mills used in the Tangiers district. A stretch of low marshy ground along the Tahaddart—the estuary of the Wadi Kebir (W. Muharhar) and W. al-Kharrib—agrees with Scylax's Gulf of Cotes (Tissot). Three or four miles farther south lie the ruins of the town of Nebrosh, built by Moors from Andalusia ; and 4 or 5 miles more bring us to Azilé or Arzilla, the ancient Colonia Julia Constantia Zilis or Zéles. Since its bombardment by the Austrians in 1829 it has been a wretched little place, with a mixed Moorish and Jewish population of about 1200.1 For the next 16 miles, between Azil4 and Larash or Ex-AratsuH (g.v.) the coast has a tolerably bold background of hills, Jebel Sarsar near Fez forming an important landmark for the latter town, which, with its Phoenician, Roman, and medizval remains, is historically one of the most interesting places in Morocco. A line of reddish cliffs about 300 feet high runs south for about 10 miles from the W. Aulkos, at whose mouth the town is built ; then the coast sinks till it reaches Mula Bu Selham, an eminence 220 feet high. Between Mula Bu Selham (often wrongly called Old Mamura or Marmore) and a similar height crowned by the tomb of Sidi 'Abd Allah*~~

~~*Jelilf lies the outlet of the Blue Lake (Marja Zarka), 10 or 12 miles long. Farther south, and separated from the sea by an unbroken line of rounded hills (230-260 feet), is the much more extensive lagoon of Ras al-Dura, which in the dry season becomes a series of marshy meres, but in the rainy season fills up and discharges into the Sebi. Eastward it is connected with the Marjat al-Gharb, fed by the W. Meda. On the south side of the outlet of the Sebi lies Ma'mtra, probably founded by 'Abd al-Mumen, and originally named Mahdtya, after the Almohade Mahdi. Twenty miles farther is the mouth of the Bu Rakrak, with its cluster of interesting towns: Sallee (Salat) on the north side, long famous for its piracies and still one of the most fanatical places in the empire, and on the south side New Sallee (Rabat) with its conspicuous tower of Hasan, and Shella (Sella of Leo Africanus) with its inter- esting ruins. Onward for 100 miles to Point Azammur and the mouth of the Umm Rabf' rivera line of hills skirts the sea; the shore is for the most part low, and, with the exception of capes at Fadala (a small village) and Dar al- Baidé or Casa Blanca, it runs in a straight line west-south- west. Casa Blanca, the ancient Anfa, once a flourishing port, was ruined by the Portuguese (1468) in revenge for its piracies. It is now a place of 4000 inhabitants, and has a thriving export trade in maize, beans, and wool, and a European colony of about 100 persons. Azammur (that is, in Berber, "The Olives," viz., of the Sheikh Bu Shuaib), with 1000 inhabitants dependent on the shebbel fisheries in the river, stands on an eminence about 14 miles from the sea on the south side of the Umm Rabtf*. The bay of Mazagan (Mazighan), a few miles to the south, curves westward with a boldness of sweep unusual on this coast. The town of Mazagan was founded by the Portu- guese in 1506, and held by them till 1769.2. About 8 miles to the south and less than a mile inland lie the extensive ruins of Tit, a town which proved a thorn in the side of the people of Mazagan till they sallied forth*~~

~~*1 The absurd story that about the 9th century it was an English possession has its root in the visits of the Normans to this quarter. The modern town sprang from a fortress built to protect the coast against them (Dozy, Recherches, 3d ed., ii. 264 sq.).*~~

~~2 The Portuguese settlers, who had to leave it when Don José decided onsurrendering this last stronghold of his country in Morocco, were afterwards sent to Brazil, where they founded Villa Nova de Mazagan.~~

~~and destroyed it. At Cape Blanc (so called from its white cliffs) the coast, which bulged out at Cape Mazagan, again bends east to resume much the same general direction for 55 miles to Cape Cantin. On this stretch the only point of interest is Walidiya, formerly Al-Ghait ; the excellent harbour praised by Edrisi is formed by an extensive lagoon, and M. Tissot thinks that by a little dredging the place would again become the safest ship- ping station on the whole Morocco seaboard.2 Beyond Cape Cantin (300 feet high) the coast becomes bolder and more irregular, especially after the mouth of the Tensift is passed. About 18 miles farther lies Saffi (Asfi), "by far the most picturesque spot on the west coast," with the high walls and square towers of its Portuguese fortifications shown to advantage by the ruggedness of the site. South of Mocapor(q.v.),and onwards beyond the limits of Morocco, the coast, becoming ever more and more inaccessible and dangerous in winter, is emphatically known as the Iron Coast. From Cape Sim or Ossim (Ras Tagriwalt), 10 miles south of Mogador, the direction is due south to Cape Gir (Igir Ufrani), the termination of Jebel Ida u Tanan (Rabbi Mardochée), the last spur of the Atlas proper. Rounding this headland we reach Agadir (Agadir 'n Igir), the Santa Cruz Major or Santa Cruz de Berberia of the Spaniards, formerly known as the Gate of the Soudan.' It is a little town with white battlements three-quarters of a mile in circumference, on a steep eminence 600 feet high. In the 15th century it was seized by the Portuguese, and Don Manuel caused it to be fortified; but in 1536 it was captured by Muley (Mauldi) Ahmed al-Hasan. Its merchants were removed to Mogador in 1773. At the mouth of the Sus Leo places three little towns called Messa (Massa), with a mosque popularly reputed the scene of Jonah's restoration to terra firma. The port of this name,® regularly visited by the Genoese traders in the 16th century, who exported skins, gum, wax, gold, and indigo, is no doubt at the mouth of the W. Massa, 20 miles farther south.® Ifni, situated in 29°-23'N. lat., and Sidi Worzek, the Cape Non? of the Portuguese, are the only points calling for~~

~~*notice till the better known Cape Nun is reached, which lies 5 or 6 miles north of the W. Der'a. With the Der'a the Sahara may be said to begin.*~~

~~*On most maps the interior of Morocco is represented as extremely mountainous ; but, while it is traversed from east to west by more than one strongly-defined range, the greater part of the surface is really occupied by undulating steppe- like tracts diversified by low hills. The backbone of the country is the Great Atlas (Daran of the Berbers).§ At its western extremity the range averages from 4000 to 5000 feet in height ; after a slight falling off for a few miles it rises till it attains an elevation of 10,000 feet ; beyond the pass (about 60 miles from the sea) which leads from Morocco to Taértdant the summits seem to be between 11,000 and 11,500 feet ; about 40 miles farther east there is a second pass at an altitude of about 7000 feet; and beyond that the main ridge continues 30 miles at a height of about 12,000 feet, with a few peaks reaching to 13,000 or 13,500 feet. Snow lies on some of the summits as late*~~

~~*3 Bull. de la Soc. de Géogr., Paris, 1875.*~~

~~*4 This must not be confounded with Santa Cruz de Mar Pequefia, a post established in 1476 somewhere on this coast by Herrera, lord of the Canary Islands, and in modern times the subject of much geo- graphical disputation. After obtaining permission to reoccupy the site the Spanish Government was unable to identify it.*~~

~~*5 See Valentin Ferdinand, Beschreibung West Afrika's (Mem. of the Acad. of Munich, 3d Class, pt. viii.).*~~

~~*6 Ya'kubl, Descr. al-Maghridi, p. 126 ; Hist. des Berbdéres, ii. 279.*~~

~~*7 No, Non, Nor, Naum, Nao, are among the various readings. It was another Cape Non to the south of Cape Bojador which seems to have given rise to the proverb, Quem pasar o cabo de Ndo ou tornara ou ndéo. See Bol. de la Soc. Geogr., p. 316, Madrid, 1880.*~~

~~*8 Pliny says the natives called the Atlas " Dyrin."*~~

~~*as June, but it is probable that none of them retain it throughout the year. Taken as a whole, the Atlas has a mean elevation higher than that of any other range of equal length in Europe or in the African and Asiatic countries bordering on the Mediterranean. From the lowlands to the north it has a very fine appearance, rising, as it seems, in steep and almost abrupt ascent, though the real distance from foot to summit is a slope of 15 miles (compare the panorama prefixed to Hooker and Ball's Morocco).*~~

~~*What is the culminating point of the range is quite unknown; the Miltsin peak has no claim to that distinction. 'The English embassy of 1829-1830 advanced up the northern slope only a little beyond Tasseremut (3534 feet), and Davidson in 1836 merely reached the town, and then turned westwards. From Tasseremut eastwards the yange is altogether unexplored for 200 miles till we come to the route followed by Ahmed b. Hasan al-Mtuvi (1789), Caillié (1827), and Rohlfs (1863). The English expedition of 1871 (Hooker and Ball, &c.), besides visiting Tasseremut, went up the Urika valley to a height of 4000 fect, up the Ait Mesan valley to the Tagherot pass (11,484), and up the Amsziz valley to the summit of Jebel Tezah (11,972 feet). the party who reached the watershed ; but from Jebel Tezah a good view was obtained southward across the great valley of the Sus to the Anti-Atlas, which appeared to be from 9000 to 10,000 fect high. In 1880 Dr Lenz crossed the range by the ordinary route from Morocco to Taéridant. " First," he says, "is a chain of comparatively low and flat hills consisting of Cretaccous aud Tertiary rocks ; then follows a plateau with ranges of red, probably Triassic, saudstone ; and finally come the higher and steeper peaks of clay slate with great metallifcrous deposits. 'The pass where the descent towards Sus begins is called Bibauan, and lies 4000 fect above the sea. The route down to ' Emnislah' is steep, difficult, and at times dangerous." As to the relation of the Anti-Atlas to the Atlas proper at its western end nothing certain is known.*~~

~~*All the principal rivers of Morocco take their rise in the Atlas mountains, and the headwaters of the Multya, the Sebu, the Umm Rabi', the Der'a, and the Ziz are all to be placed in that part of the range which lies between 32° 20' and 32° 30' N. lat., and between 3° 30' and 5° W. long. In almost every instance the summer current is ' comparatively feeble, but*~~

~~*the wide beds and often high steep banks are sufficient of themselves to show the change produced by the rains of winter and the thaws of spring. The Muliya (Mulucha and Malva of Pliny, &c.) is mainly interesting as the river which the French have long wished to make the western boundary of Algeria. Its course is almost entirely unexplored. About 34° 20' N. lat. Captain Colvile found it some 200 yards wide but quite shallow ; about 25 miles east of its source where it is crossed by the route to Ziz it is already a powerful stream with a deep bed cut in the granite rock, and shortly afterwards it is joined by the W. Sgimmel, a still larger affluent (Rohlfs). Of the lesser streams which flow into the Mediterranean it is enough to mention the W. Martil or Martin (otherwise W. Bu Sfiha, W Ras, W. Mejeksa), which falls into the Bay of Tetuan, and is identified with the Tamuda of Pliny and Thaluda of Ptolemy. On the Atlantic seaboard north of the Sebu there are a number of comparatively small streams, the chief of which is the very winding W. Aulkos or Lokkos, with several tributaries. If Renou's statement that the Sebt (the Subur magnificus et navigabilis of Pliny) had a course not much inferior to that of the Seine be somewhat of an exaggeration, it may at least be compared to the Thames in length and width, though not in steadiness and depth of current. At Meshra'at al-Ksiri, about 70 miles from its mouth, it is about 10 feet deep in the month of May and more than 460 feet wide; and, though its banks are 21 feet high, extensive inundations occur from time to time. The tide ascends as far as Al-Kantara, 15 miles above Ma'mura, and steam barges with a small draught of water could make their way to the ford just mentioned, and possibly even as far as Fez (Trotter). Affluents of the Sebu are W. Mikkes and W. Al-Redem (90 miles long).*~~

~~*In the Tagherot pass Mr Maw was the only one of*~~

~~*MOROCCO*~~

~~*The swift and muddy current of W. Beht usually loses itself in a swamp before it reaches the main stream. The impetuous Umm Rabi', with a rocky bed and many rapids, is perhaps as large as the Sebi; but as there are no important cities in the country through which it flows its course is not so well known. W. al-Abiad, W. al-Akdur, and W. Tessaut seem to be the principal affluents. This last is separated by about 10 miles only from*~~

~~*the valley of the Tensift, the river which flows to the north of the city of Morocco; and, by the W. Nefis, the Asif al-Mil (Asif is Berber for "river"), the W. Usbi, and other smaller tributaries, receives the waters of about 180 miles of the Atlas range. The valley between the Atlas and the Anti-Atlas is traversed by the W. Sts, whose ever-flowing stream is sufficient to turn the whole district into a garden, The Massa or W. al-Ghas (Wholgras of Davidson, Oued Ouel R'as of Delaporte), though its headwaters drain only one or two of the lesser valleys at the south-west end of the Anti-Atlas, is "about 50 yards from bank to bank at the mouth, with a depth at high water and in the proper channel of something over a fathom." Farther south is the Assaka or W. al-Aks4, long known to European geographers by the name of W. Nun; and finally the famous W. Der'a is reached, which in length of course exceeds all the rivers of Morocco, but, except in spring when the snows are melting in the highlands, remains throughout all its lower reaches a dry sandy channel, hardly noticed by the traveller in the surrounding desert. In the upper valleys, on the contrary, innumerable streams from the south side of the main chain of the Atlas, the W. Dades from the east, and the Asif Marghen, W. al-Molah, or Warzazet from the west, flow through populous and fertile valleys, and uniting to form the Der'a cut their way southward through a gorge in the Jebel Soghér, which, as the name implies, is a lower range running parallel to the Atlas proper. For the next 130 miles the noble stream holds south-south-east, drained at every step by the irrigation canals which turn this region into a green oasis, till at last its dwindling current bends westward to the sebkha (salt marsh) of Debiaya. Fora few weeks once a year the thaw-floods fill this shallow but extensive basin and rush onwards to the Atlantic ; but in summer it dries up, and, like the bed of the river for some distance below, is covered with flourishing crops. From the south of the Atlas still farther east descend a number of other streams, the W. Zfz (with its tributaries the W. Todgha and W. Gheris), the W. Ghir, the W. Kenatsa, &c., which, after watering the oases of Medghara, Tafilelt (Sijilmésa), Kenatsa, &c., lose themselves in the sands of the Sahara. Besides the lakes and lagoons of the coast district already mentioned, there are several others, such as the Daya Sidi Ali Mohammed, which Rohlfs passed near the summit of the Atlas, but they do not form a feature of the country. The eastern frontier runs across the*~~

~~great Western Shatt, and south from that point lies the extensive Sebkha Tighri.~~

~~According to Dr Lenz, in his geological map of West Africa (1882), the stretch of country in the vicinity of Ceuta and Tetuan is Ju- rassic ; modern Tertiary and Eocene rocks cover all the rest of the great northern promontory for some distance south of Wazan, and extend in an irregular belt from the neighbourhood of Fez south- west to the province of Abda ; between these two areas there lies a district of Cretaceous formations which extends to the Atlantic, and skirts the whole African coast from Larash as far south as Cape Blanc (700 miles south of the Der'a) ; nearly all the rest of the north- western slope of the country is occupied by alluvium. The west- ward portion of the Atlas shows a belt of Cretaceous rocks, a broader Jurassic belt, and one still broader of Red Sandstone, porphyrites and porphyritic tuffs forming the backbone of the ridge. From Taridant eastward runs a strip of clay slates, possibly of Carbou- iferous origin, and from Anti-Atlas in the west and Figig in the~~

~~1 See Castries on the "Oued Dradi"' in Bull. de la Soc. de Géogr.,~~

~~1880.~~

~~east Devonian rocks stretch for hundreds of miles into the Sahara, The plain around the city of Morocco has a sheet-like covering of tufaceous crust rising over hill and valley and following all the undulations of the ground, the result probably of the intense heat of the sun rapidly drawing up water charged with soluble carbonate of lime from the calcareous strata, and drying it layer by layer on the surface till an accumulation several feet thick has been produced (Maw). This crust is extensively burned for lime, and it forms a natural strong roof for the matamores or underground cellars which the Moors excavate in the soft strata beneath. An enormous deposit of boulders occurs in the lateral valleys and along the escarpment of the Atlas, and the opinion that these are the pro- ducts of remote glacial action is supported by the existence of true moraines in the upper part of the glens. All along the west coast there are indications of an elevation of the land in the shape of raised beaches, at Tangiers 40,~~

~~*at the south of Cape Spartel 50, at Mogador 60 or 70 feet high ; but a number of other facts seem to show that at present a process of subsidence is in progress.**~~

~~*That mineral deposits of great value exist in Morocco there is little doubt. At Jebel Hadid or the Iron Mountain, the heights to the north of Mogador, old scoriz are found. In the Beni Madan hills near Tetuan are mines, closed, it is said, by the sultan 'Abd al-Rahman ; but whether they furnished copper or lead anthorities differ. On the road to Kenatsa, Rohlfs saw lead and antimony worked by the Beni Sithe. Antimony especially secms to be abun- dant to the south of the Atlas; Rohlfs found it in a very pure state near Tesna, and Dr Allen (whose account was not published when this article was written) informed the writer that he saw splendid veins of it north of the Der'a. That gold mines existed in Sus was long suspected ; Gatell proved it. Rock-salt occurs in the mouutains north of Fez, in the valley of the W. Martil, and probably in Jebel Zarhtin. In several places, as in the route from Saffi to Morocco, are brine lakes, from which the salt is collected and exported as far as Central Africa.*~~

~~*The general aspect of the lowlands of Morocco varies so much according to the season of the year that, while one stranger finds it arid and sunburnt and monotonous, another is delighted with the richness of its vegetation and the bright variety of its colours. In some of the Atlas valleys there is a wealth of timber, enormous conifers, 10 to 12 feet in girth of stem, oaks, &c.,? but the greater part of the couutry has been cleared of every vestige of woodland, and consequently depends for its appearance on herbage, brush- wood, and the lesser fruit-trees. Cultivation is confined to such comparatively narrow limits that the natural flora has full scope for its development. Cowan, writing more immediately of the country between Morocco and Mogador, speaks of "drifts of as- phodel, white lilies, blue convolvuli, white broom flowers, thyme and lavender, borage, marigold, purple thistles, colossal daisies and poppies ;" and Captain Trotter tells how for miles the undu- lating plateau of Kasr Ferd'tin was literally covered with wild flowers, whose varied colours, and the partiality with which each species confined itself to certain ground, gave to the landscape a brilliant and most unique appearance. Dark-blue, yellow, and red — iris, marigold, and poppy—*~~

~~occurred in patches an acre in SIZE ; farther on whole hills and valleys were of a delicate blue tint from convolvulus and borage. At times the traveller's tent is pitched on a carpet of mignonette, at times on a carpet of purple bugloss. In the country of the Beni Hasan squills are so abundant that the fibres of the bulbs are used instead of hair in making tent- cloth ; and in the north of Ksar al-Kebir the moors are covered for miles with a beautiful white heather. From such gorgeous com- binations of colour one can well imagine that the Moors drew the inspiration of their chromatic art ; but the season of floral splen- dour is brief, and under the hot African sun everything soon sinks into the monotony of straw.~~

~~The botany of Morocco has been explored by Balansa (1867), Hooker, Ball, and Maw (1871), Rein and Fritsch (1873), Ibrahim Ammeribt (a Berber collector, 1873-6), the Rabbi Mardochée Abi Serur (1872-3) ; and the results have been systematically arranged in Cosson's Compendium Flore Atlantice : ow Flore des Etats bar- baresques (Paris, 1881, &c.). From the presence of a large propor- tion of plants of central and northern Europe (none of the northern plants, however, being of alpine or arctic type) and the absence of southern types characteristic of the sub-tropical zone Ball concludes that "the mountain flora of Morocco is a southern extension of the European temperate flora, with little or no admixture of ex- traneous elements, but so long isolated from the neighbouring regions that a considerable number of new specific types have been developed." Of the individual plants none are more remarkable than the 'arér and the argan. The former (Callitris quadrivalvis, Thuja articulata of Shaw) is a cypress-like tree that grows on the~~

~~1 See Mourlon in Bull. de l' Acad. Roy. de Belgique, vol. xxx., 1870; Coquand, Bull. de la Soc. Géol. de France, vol. iv.; and especially Maw's paper appended to Hooker and Ball's Morocco.~~

~~2 Rohlfs says larches, but there is strong reason to doubt this.~~

~~3 Compare Drude, ' Floristische Erforschung Nord-Afrika's" in Petermann's Mittheilungen, 1882.~~

~~*and its beautiful and enduring timber has been identified with the alerce with which the Cordova cathedral (mosque) was roofed, and*~~

~~*with the citron-wood of the ancient Romans. The argan (Argania Sideroxylon) is confined even in Morocco to a tract of country extend- ing only about 150 miles along the coast, from the river Tensift almost to the river Sus, and about 30 miles in breadth ; and it is found nowhere else in the world. A gnarled trunk and wide- spreading contorted thorny branches give it a striking appearance. Large specimens have a height of from 20 to 30 feet, and a girth of 25 or 26 feet. The fruit, which ripens between May and August, is an olive-looking nut, greedily eaten by camels, mules, goats, sheep, and horned cattle (but not by horses) for the sake of the fleshy pericarp, and crushed by the natives to extract the oil from the kernel. Though "its strong and fulsome savour" renders it nauseous to the European palate, this oil is largely used in the cookery of southern Morocco. The prickly pear forms one of the features of the landscape from the coast up to the slopes of the mountains. The cork tree, common in the time of Addison, has lost ground enormously, though it probably forms the staple of the Ma'mura forest, which extends for some 20 miles between the Bu Rakrak and the Sebi. Though not so widespread as in Algeria or some districts of southern Europe, the palmetto is often locally very abundant. Citrons, lemons, limes (sweet and sour), shaddocks, mulberries, walnuts, and chestnuts are common in many parts. Tctuan is famous for oranges, Meknes for quinces, Morocco for pomegranates, Fez for figs, Tafilelt and Akka for dates, Sus for almonds, Dukalla for melons, Tagodast, Edantenan, and Rabat for grapes, and Tartdant for olives (Cowan). The grape is extensively cultivated ; the Jews manufacture crude but palatable wines. Sugar, once grown in Sits, to supply the demands of the whole of Morocco, has disappeared. Both hemp and tobacco are cultivated under the restrictions of an imperial monopoly,—the former (of prime quality) being largely used as hashish, the latter, though never smoked, as snuff. Barley is the most usual ccreal; but excellent crops of wheat, maize, millet, rye, beans, pease, chick-peas, and canary seed are also obtained. Potatoes are coming into favour in certain districts.*~~

~~*It is still true, as in the time of Addison, that the Moors " seldom reap more than will bring the year about," and the failure of a single harvest causes inevitable dearth. Captain Colvile calculates that not more than a hundredth part of the available land is culti- vated at all; and the cultivated portion possessed by each tribe is divided into three parts, one only of which is sown each year. With a plough of the most primitive description the Moorish peasant scarcely scratches the surface of the soil; and his harrow is a few branches of trees weighted with heavy stones. The corn is cut close to the ear with short curved knives, and the straw left standing. Underground granaries or matamores (matnuira) are constructed, sometimes capable of holding 2000 quarters; they preserve their contents in good condition for many years.*~~

~~*There is abundant space in the country for wild animals, even of the larger kind ; but the absence of woodland keeps them in check. Besides the lion, which exists only in very limited numbers, and, according to local proverbs, with diminished courage, the spotted leopard, the hyena, jackal, lynx, fox, and wild boar are the most important. The audad or wild sheep is found in the more inaccessible parts of the Atlas. Rabbits swarm in the country to the north of the Bu Rakrak, and since 1870 they have crossed this, which used to be their southern limit. A kind of ground-squirrel, the stdsib, occurs in the southern provinces. Monkeys of the same species as those of Gibraltar frequent the neighbourhood of Jebel Musé or Apes' Hill. The list of the ordinary wild birds includes blackbirds, goldfinches, linnets, greenfinches, robins, wagtails, skylarks, and crested larks, as well as turtle-doves, nightingales, and jays. The house-sparrow is not found ; between Morocco and Mogador its place is taken by a beautiful bird (Zmberiza striolata), locally called tabtb, or "the doctor" (Leared). The stranger is struck by the immense variety and number of hawks, and still more by the familiar terms on which they build their nests in the walls and rocks along with blue rock-pigeons and starlings. All through the country the red-legged partridge is the main resource of the sportsman, though he may also bag other varieties of partridge, bustards, and ducks and other water-fowl. Along the coasts thero is no lack of gulls, whimbrel, oyster-catchers, &c. Every town has its colony of storks. Lizards, chameleons, tortoises, and frogs are familiar objects; itis from Morocco that the small tortoises hawked about the*~~

~~*streets of London are usually obtained. The profusion of insect-life is one of the plagues of the country in the eyes of the European ; and even the Moor, who has got reconciled to his mosquitoes and fleas, considers the locust one of his deadliest enemies.*~~

~~*The camel is the great beast of burden in Morocco, though asses and mules are also employed. The horse, never reduced to such base uses, is usually a sturdy little animal, but far below the ancient reputation of the Barbary steed. Roughly broken when young, his mouth is soon spoiled by barbarous bits, and his feet by square shoes. The finest animals are said to be bred in Shiadina*~~

~~*XVI. — 105*~~

~~*834*~~

~~*and Abda. In form and size the mules are much superior, and*~~

~~*they usually fetch two or three times the price. The horned cattle are not unlike Alderneys; and the sheep, for the improve- ment of which nothing is done, have spiral horns (not unfrequently four), rounded foreheads, and long fine wool. Domestic fowls are kept in great uumbers; they are of the Spanish type, small and rolifie.*~~

~~*7 The mackerel fishery off the coast at Casa Blanca and Tangiers attracts fishers from Spain, Portugal, and other parts of Europe. Occasionally a small shoal may be found as far south as Mogador. Soles, turbot, bream, bass, conger ecl, and mullet are common along the coast, and a large fish called the aslimsah (rough scaled and resembling a cod). Lobsters and crayfish swarm in the rocky places, but the natives have no proper method of catching them. The tunny, pilchard, and sardine, and a kind of shad known as the 'Mogador herring," all prove at times of practical importance. "The catching of the shebbel or Barbary salmon, a species of shad, is a great industry on all the principal rivers of the coast, and vast numbers of the fish, which are often from 5 to 15 pounds in weight, are dried and salted." They ascend from the sea in spring. Bar- bels and a few other small fish swarm in the streams, but for the angler there is little real sport.* '*~~

~~*Of the population of Morocco only the vaguest estimate is pos- sible. Behm and Wagner give 6,410,000—probably too high a number. Ethnographically it consists of three main elements—Berbers or Shelluh, Arabs, and Jews—with a large infusion of Negro blood, and a sprinkling of Negro individuals. A distinction is sometimes drawn between the country Arab and the city "' Moor," as he is called par-excellence ; but the difference between them is one not so much of race (though the '"' Moor" has probably absorbed a greater variety of heterogeneous elements) as of wnethod of life, and the superficial physical results of the same. The Berbers are the original occupants of the country (as may be proved by the ancient words preserved by classical writers), and they still form not ouly the most numerous but the most industrious and civilizable section of the people. While the Arab is still by preference a dweller in tents, the Berber for the most part builds himself houses of stone or clay. On the whole, the Arabs are predominant in the lowlands and the Berbers in the hilly districts and mountains.*~~

~~*Greatly corrupted, even in the time of Ibn Khaldun, the Arabic of Morocco has now, with the complete decay of literature, reached a state of extreme degradation. Of the Schilha dialects very little is known, but everything goes to prove their general philological agreement with the better-investigated representative of the Ber- ber. The Jews are the great commercial class in the community. They are usually said to number about 150,000 to 200,000, but Rohlfs (Petermann's Mitth., 1883) shows reason to suppose that they do not exceed 62,800. Having come largely from Spain, they still use among themselves a corrupt Spanish."*~~

~~*That at onc time Morocco was a much morc populous country is evident from the description of Leo Africanus, though even in his time the number of ruined or decaying towns was very great. Besides Tangiers, Larash, Sallee, and the other places on the coast already described, there are only a few large cities in the country. Four of these—F rz (q.v.), Meknes or MEQuinez (q¢.v.), Wazan, and Teza—are in the basin of the Sebt. On the Zarhun range, north of Meknes, lies the town of Muley Edris or Zarhun, which no Christian is allowed to enter, though in 1801 Jackson did manage to pay a hurried visit. According to Captain Trotter, who got within three- quarters ofa mile, it isa place of apparently 1500 to*~~

~~2000 inhabitants, compact, and witli several large buildings. Wazan(Rohlfs's Wesan) is par excellence a sacred city, bcing the seat of a sherif, whose influence is even more widely acknowledged than that of the sultan. It was probably raised from a mere village by Muley 'Abd Allah al-Sherif (ob. 1675). At present it is one of the cleanest and best-kept placcs in the empire. Teza (Taza) is a considerable trading centre on the route between Fez and the Algerian frontiicr. Leo, Ali Bey, and Rohlfs agree in describing it as a place of grcat beauty, embowered in orchards, and the houses give evidence of wealth. The population, in Leo's time 20,000, is now 5000, of whom 800 are Jews. About 120 iniles east of Teza, and only 10 from the frontier, is Wajda (Ouchda of the French), clean and neat, in the midst of an orange grove. The only other inland town of importance is Kasr al-Kebir (see ALCAZAR Kusir), the Oppidum Novum of the Romans, which, except on market-days, wears a look of great decay. In all the country between the basin of the Sebu and the Tensift, a distance of upwards of 200 miles, there is nothing that a European would consider a town ; and Morocco itself is the only really large city of south Morocco. Tartdant, the capital of Sus, lies between the Atlas and the river ; it is a place of from 30,000 to 40,000 inhabit- ants, has recently been garrisoned and refortified by the sultan, and may be considered the frontiicr city of his empire. TIligh (Llir,~~

~~_ 1 Ascientific list of some thirty or forty fishes from Morocco will be found in Ber. Senck. Ges., 1874; an account of angling experiences in Payton, Mosses from a Rolling Stone.~~

~~2 The evidence for the existence of a tribe of warlike Jews in the interior leans on the whole to the positive side.~~

~~M O ROCCE 0~~

~~Illec, &c.), 100 miles south-south-east on a stream which joins the Massa, is the chief town of Tazerwalt or the state of Sidi Hisham,~~

~~an independent principality founded by Sidi Ahmed u Musa; and Auguilmin (Gulemin or Glimin), in like manner, is the chief town~~

~~*of the state of 'Abd Allah u Salem, or, as it is usually called by Europeans, Wad Nun. Tagawost (Tagaost of Ibn Khaldun), about 40 miles inland from Ifni, was formerly a large city, and*~~

~~*in the 16th century the seat of a Spanish factory trading in archil.*~~

~~*Throughout Morocco the nomenclature of ordinary maps gives a very misleading idea of the number of inhabited sites. Most of the seeming villages are either market-places, completely deserted except on market-days, or the tombs of saints, with possibly not a house in the vicinity, or stations for caravans, with a small com- pany of soldiers. The markets are named after the days of the week, as Suk al-Thalatha, Tuesday market ; the kubbas or saints' tombs are distinguished as Sidi (my master) so and so; and the stations are marked Nzéla, or some such corruption as Inzella.*~~

~~*The prehistoric antiquities of Morocco are of considerable interest. In a cave at Cape Spartel M. Tissot found regularly shaped arrow- heads, and in his travels through the north of the country he met with dolmens, barrows, and croinlechs, just as in Algeria or Tunis. The dolmens usually form a trapezium, and the dead body seems to have been buried with the knees drawn up to the chin. At Mzorah (Mazorah), a quaint little village of widely-scattered houses built of rough blocks of yellow soft sandstone, about 8 or 10 miles south- east from Azila, stands a group of megalithic monuments of ex- traordinary extent. They have been visited and described by Sir Arthur de Capell Brooke (1880), Davidson (1835), Farley (1860), Tissot, Watson, Trotter, &c. Watson's account is the most detailed. Round the base of a mound (15 feet high) of yellow sandstone lies a circle of sixty-seven large stones, one of which (at the west side) is more than 20 feet high. In the vicinity are several other groups, some of still larger blocks. Roman roads seem to have run from Tan- giers southwards to the neighbourhood of Meknes, and from Azila to the south of Rabat ; and Roman sites are in several instances marked by considerable remains of masonry. At Kasr Fara'in (Pharaoh's castle), on the western slope of J. Zarhun, are the ruins of Volubilis. The enceinte, constructed of large stones and flanked by round towers, is 12,000 feet in extent. Four gates are still recognizable, and a triumphal arch erected in 216 a.D. in honour*~~

~~*of Caracalla and Julia Domna. The stones of this site have been used for Meknes. Banasa (Colonia Alia, originally Valentia) is identified with the ruins of Sidi Ali Bu Jenun, and Thamusida with those of Sidi Ali b. Hamed. At Tchemmish, up the river from Larash, the city of Lixus (Trinx of Strabo) has left splendid specimens of Punic and Roman stone- work, and the similar remains on the headland of Mula Bu Selham probably belong to the Mudelacha of Polybius. Of early Moorish architecture good examples are comparatively few, and badly pre- served. Besides those in Fez, Meknes, and Morocco, it is sufficient to mention the mausoleum of the Bent-Merin (13th to 16th centuries) at Shella, which, with the adjoining mosque, is roofless and ruined, but possesses a number of valuable inscriptions (see Athenaeum, 1875).*~~

~~*The present state of Morocco is deplorable. The government is an Oriental despotism under an independent quasi-hereditary sultan ; there are no administrative functionaries with definite responsibility and regular salary ; the distribution of justice is utterly arbitrary, and the punishments often barbarous in the extreme ; education, in the European sense of the word, there is none ; foreign commerce is hampered by vexatious prohibitions and restrictions, internal trade by the almost complete absence of roads and bridges, and by the generally lawless state of the country (the very peasant has his gun beside him as he ploughs) ; the only substitute for a postal system isa class of running couriers; and even the army (in which the sultan does take an interest) is only just beginning to show signs of disci- pline and effectiveness under the supervision of Kaid M'Clean and other foreign officers. The last remnants of the once powerful Moorish fleet are rotting beyond recognition in the harbour of Larash. With good government and freedom of trade the country might soon be restored to a high state of prosperity: its climate, soil, products, and the qualities of its predominant population are full of promise; and the evident decrease of hostility towards the Christian, which may be observed since the beginning of the cen- tury, and especially within recent years, gives hope that European influence, apart from European conquest, may before long remove from Morocco the reproach of being "the China of the West," the most backward and barbarous of civilized nations.*~~

~~*History.—Morocco corresponds to the Roman Mauretania Tingi- tana (see MAuURETANIA). Conquered by the Vandals (429 a.D.), Mauretania was recovered to the Eastern Empire by Belisarius. The Arabs first penetrated into the country under 'Okba (supra, p. 567), but the Berbers opposed an obstinate resistance to Islam, and their conversion and subjection to the caliphate was only com- pleted in the reign of Walid by Musa b. Nosair, the conqueror of Spain (supra, p. 573). The dominion of the caliphs was of short duration ; the 'Abbasids had very little hold of the Berber countries, and in the 9th century, while the Aghlabites were practically inde- pendent at Kairaw4n, the regions west of the salt marsh of Sebkha*~~

~~*al-Hodna were autonomous under a number of indigenous or foreign princes. The chief of these principalities were that of the Idrisites at Fez (supra, p. 581), the kingdom of Tahart, and that of Nakur. In the first years of the 10th century the Fatimite caliphs, at the head of the powerful Berber tribe of Ketama, overthrew the Aghla- bites, thus putting an end for ever to Arab rule in North Africa, and rapidly extended their empire to the Atlantic. When the Fati- mites established themselves in Egypt, the Zirid dynasty reigned as their vassals in the west, and maintained themselves with varying fortunes till the rise of the great empire of the ALMORAVIDES (g.1.), who yielded in turn to the ALMOHADES (q.v.). The latter dynasty was extinguished by the princes of the Beni-Merin, whose chief, Ya'ktb b. 'Abd al-Hakk, captured Morocco in 1269 A.p. The sub- scquent history of Morocco and Fez under the Merinids and their successors presents little interest, being as full of internecine wars, contested successions, fratricides, general bloodshed, and barbarities as it is empty of all indications of an advance in civilization. As regards the relations of the country to Kuropean nations, four periods may be distinguished—(1) a period lasting down to the close of the 14th century, when the Moorish potentates were still the most pro- minent representatives of aggressive Mohammedanism ; (2) a period during which the Portuguese and Spaniards, having expelled their invaders, made vigorous reprisals and obtained possession of many towns on the coast of Morocco ; (8) a period in which these nations, disheartened by*~~

~~*the disastrous defeat in the Battle of the Three Kings (1579), allowed the Moors to recover much of the ground they had lost, and to become, by their piracies and defiance of inter- national law, an object if not of terror yet of apprehension and irritation ; and (4) a period in which the prestige of this after- glow of greatness has gradually died out.*~~

~~*The following are the more noteworthy events in the Moorish annals since the beginning of the 15th century.*~~

~~*1415. Ceuta captured by the Portuguese. 1436. First expedition against Tangiers by Don Duarte ; capture of Don Fernando, who died in exile in 1459 (it was proposed to ransom him by cession of Ceuta, but the pope objected). 1459. Capture of Alcazar Seguir. 1471. Capture of Tangiers. 1510-1540. Rise of the dynasty of the Sherifs. 1577. Edmond Hogan sent by Queen Elizabeth of England to Muley 'Abd al-Melek (see Report in Hakluyt). 1578. Defeat of King Sebastian (see Leared, Visit to Court of Morocco, appendix). 1585. Founding of the Company of Barbary Merchants (earls of War- wick, Leicester, &c.) in London ; Elizabeth's second ambassador Henry Roberts well received. 1610. The Moors from Spain settle partly at Rabat, &c., and prove troublesome. 1649. Muley Zidan sends to King Charles I. requesting him to attack Sallee by sea. About this time Ali Sherif of Yanbo, near Medina, is recognized as ruler of TAfilelt, and gradually of the rest of the empire except the city of Morocco; with him commences the dynasty of the Alides ; on his death his sons, Mohammed and Arshid, dispute the succes- sion. 1662. Tangiers (Portuguese since 1471) becomes an English possession as part of the dowry of Catherine of Braganza. 1664-1672. Reign of Arshid, a warlike, active, and cruel prince, who was the first to take the title of sultan. 1672-1727. Reign of Ishmael, who in ability and ferocity completely outdid his brother Arshid, and supported his throne by an enormous army of slaves from the Siidan. 1678. Great plague; ambassadors sent to Louis XIV. to ask the hand of Mademoiselle Blois, the king's natural daughter. 1682. The sultan sends two lions to the king of England. 1684. Sir Cloudesley Shovel defends British interests on the coast ; with- drawal of the English from Tangiers. 1687. Capture of Larash from the Spaniards. 1694. Siege of Ceuta. 1725. Thomas Betton, who had been a slave in Morocco, left £13,000, the half of his fortune, for the ransom of British captives in that*~~

~~*country. 1727-17380. Disputed succession. 1757-1789. Reign of Mohammed. 1778. Locusts. 1780. Great famine; Agadir opened to the Dutch. 1794- 1822. Reign of Soliman ; abolition of Christian slavery in Morocco ; suppression of piracy. 1822-1859. Reign of Abd er Rahman; rupture with Spain on account of the decapitation of Consul Darmon for the wounding of a Moor. 1844. Defeat of forces sent to assist 'Abd al-Kader in Algiers ; bombardment of Tangiers and Mogador by the prince de Joinville ; rout of the Moorish forces in the battle of Isly ; and peace of Tangiers. 1845. Naval demonstration at Tangiers and ratification of treaty ; surrender to Spain of disputed territory at Ceuta. 1853. Establishment of a customs line and regular military posts along the Algerian frontier. 1856. English commercial treaty by which no duty shall exceed 10 per cent. of the value of the wares. 1859-1873. Reign of Mohammed ; Spanish invasion. 1860. Decisive battle between General O'Donnell and the Moors near Tetuan (March). By the treaty of Tetuan Morocco was to pay 20,000,000 piastres to Spain, to surrender territory at Santa Cruz de Mar Pequeitia for a commercial establishment, and to allow the Spanish missionaries to have a house at Fez like that which they had at Tangiers. Money not being obtainable to pay the indemnity, the Spaniards obtained control of the customs for a term of years. 1864. Decree permitting Europeans to trade in any part of the empire. 1873. Accession of Hasan. 1880. English embassy for improvement of commercial relations ; conference at*~~

~~*Madrid to define the rights of European representatives in regard to the protection afforded by them to subjects of the sultan ; num- ber of protégés limited to three. 1882. Expedition to subdue Sid Hosein of Iligh. 1883. Protest of the English Government against the slave trade in Morocco.*~~

~~*Lists of works in regard to Morocco will be found in Renou, Descript. géogr. de Temp. de Maroc, Paris, 1846, forming part of L'explor. scient. de lV Algérie ; in Bol. de la Soc. geogr. de Madrid, 1877, 1878; and in Rivista Contemporanea, Madrid, 1881. Besides Renou's Description—a masterly criticism of all previous geographical material—the following may be mentioned :—Ibn Khaldun, Hist. des Berberes (tr. by Baron de Slane); Leo Africanus, Descript. Africe ; Diego de Torres, Origen y*~~

~~*sucesso de los Xarifes.. . de Marruecos, &c., 1585; Marmol, Deser. de lV Afrique, 1667 ; Faria y Sousa, Africa Portuguese, Lisbon, 1681; Addi- son, Account of West Barbary, 1671 (Pinkerton's Coll., xv.) ; Chenier, Rech. hist. sur les Mawres, 1787; Jackson, Account of the Emp. of Morocco, 1809, and Tim- buctoo and Mousa, 1820; Drummond Hay, Western Barbary, 1844; John David- son, Notes taken during Travels in Africa, 1839 ; De Aguirra, Expedicion al Rif, 1858; Mrs. E. Murray, Sixteen Yeurs in Morocco, Spain, &c., 1859; Richardson, Trav. in Morocco, 1860; Maltzan, Dret Jahren im Nordwesten von Afrika, 1868 (4 vols.); Rohlfs, Reise durch Marokko, Bremen, 1868; Fritsch in " Mittheil. d. Vereins fiir Erdk.," Halle, 1878 ; Leared, Morocco and the Moors, 1875, and Visit to the Court of Morocco, 1879; De Amici's Marocco, Milan, 1878—a very graphic sketch, which has been deservedly translated into English, French, Gerinan, &c.; Tissot, Rech. sur la géogr. comparée de la Maurétanie Tingitane, 1877 ; Cas- tellanos, Deser. hist. de Marruecos, Santiago, 1878; Hooker and Ball, Morocco and the Great Atlas, 1878; Gatell, Viajes por Marruecos, 1879; Payton, Mosses from a Rolling Stone, 1879; Liana y Rodrigafiez, El imp. de Marruecos, 1880 ; Watson, A Visit to Wazan, 1880; Trotter, Mission to the Court of Marocco, 1881 ; Cowan and Johnstone, Moorish Lotus Leaves, 1882.*~~

~~*Morocco, or Marocco (Marraékush), one of the quasi- capitals of the sultanate (Fez and Meknes being the other two), lies in a spacious plain about 15 miles from the northern underfalls of the Atlas, and 90 miles east-south- east of Saffi, at a height variously estimated as 1639 feet (Hooker and Ball), 1410 (Beaumier), and 1500 (Leared). Ranking during the early centuries of its exist- ence as one of the greatest and most flourishing cities of Islam, Morocco has long been in a state of grievous decay; and were it not for the exceptional beauty of its situation, the luxuriant groves and gardens by which it is encom- passed and interspersed, and the magnificent outlook which it enjoys towards the mountains, it would be altogether a very miserable place. The wall, 25 or 30 feet high, and relieved by square towers at intervals of 360 feet, 1s so dilapidated that foot-passengers, and in places even horse- men, can find their way in and out through the breaches. Open spaces of great extent are numerous enough within the walls, but for the most part they are defaced by mounds of rubbish and putrid refuse. With the exception of*~~

~~*the tower of the Kutubia Mosque and a certain archway which was brought in pieces from Spain, there is not, it is asserted, a single stone building in the city; and even bricks (though the local manufacture is of excellent quality) are sparingly employed. T'dbiya, or pounded clay, is the almost universal material, and the houses are consequently seldom raised more than two stories in height. The palace of the sultan covers an extensive area, and has its parks and gardens enclosed by walls similar to those of the city proper, but is architecturally quite insignificant. In the whole of Morocco the tower of the Kutubia alone is a worthy memorial of the constructive genius of the early Moors ; both ++ and the similar tower of Hasan at Rabat are after the type of the Giralda at Seville, and, if tradition may be trusted, all three were designed by the same architect Jabir. The mosque to which the tower belongs is a large brick build- ing erected by 'Abd al-Mumen ; the interior is adorned with marble pillars, and the whole of the crypt is occupied by avast cistern excavated by Manstr. Other mosques of some note are those of Ibn Yusuf, Al-Mansur, and Al-Mo'lzz; the chapel of Sidi Bel Abbas, in the extreme north of the city, possesses property to the value of £200,000, and serves as a great almshouse and asylum. As in most other towns throughout Morocco, there is a special Jews' quarter walled off from the rest. The general population is of a very mixed and turbulent kind; crimes of violence are extremely common, and there are countless varieties of the profes- sional thief. Almost the only manufacture extensively prosecuted is that of Morocco leather, mainly red and yellow, about 1500 men being employed as tanners and shoemakers. The city was founded in 1062 by Yusuf b.*~~

~~*Tashefin. Before it was more than a hundred years old it is said to have had 700,000 inhabitants, but at present tlic total number probably does not exceed 50,000 or 60,000. See Leo Africanus; Lambert's detailed description in Bul. de la Soe. de géogr., Paris, 1865; and Dr Leared's rifaeimento of Lam- bert. Lambert's plan of Morocco is reproduced with some additions by Dr Leared; and another may be found in Gatell. (H. A. W.)*~~

~~*MORON, or Moron DE LA FRonTERA, a town of Spain, in the province of Seville, about 32 miles to the south- east of that city, occupies an irregular site upon broken chalk hillocks at a distance of a mile and a half from the right bank of the Guadaira. It is connected by rail with Utrera on the Cadiz and Seville linc. On the highest elevation to the eastward are the ruins of the ancient castle, of considerable importance during the Moorish period, and afterwards used as a palace by the counts of Ureiia. In 1810-11 it was fortified by the French, but blown up by them in the following year. The chief public building of Moron is the large parish church, which dates from the 16th century, but presents no noteworthy features. The fine district between Moron and the Serrania de Ronda is largely occupied by olive plantations, and the trade in oil and other agricultural produce forms the chief industry of the town. Moron is also famous throughout Spain for its chalk (cal de Moron), from which the white- wash extensively used in the Peninsula is derived. The population of the town was 14,879 in 1878.*~~

~~*MORONI, Gramparrista (c. 1510-1578), an eminent portrait-painter of the Venetian school, was born at Albino near Bergamo about 1510, and became a pupil of Bonvicino named I] Moretto. Beyond the record of his works very few particulars regarding him have reached us. Titian, under whom also Moroni, while still very young, is said to have studied (but this appears hardly probable), had at any rate a high opinion of his powers; he said that Moroni made his portraits "living" or "actual" (ver). And if the magnates of Bergamo came to the great Vene- tian for their likenesses he advised them to go to their own countryman. In truthful and animated portraiture Moroni ranks near Titian himself. HIs portraits do not indeed attain to a majestic monumental character; but they are full of straightforward life and individuality, with genuine unforced choice of attitude, and excellent texture and arrangement of draperies. There is a certain tendency to a violet tint in the flesh, and the drawing and action of the hands are not first-rate. As leading samples of his portraits may be mentioned—in the Uffizi Gallery, Florence, the Nobleman pointing to a Flame, in- scribed "Et quid volo nisi ut ardeat?"; in the National Gallery, London, the portraits of a Tailor, a member of the Fenaroli family, Canon Ludovico de' Terzi, and others ; in the Berlin Gallery, his own portrait ; and in Stafford HIouse, the seated half-figure of the Jesuit Ercole Tasso,*~~

currently termed ""Titian's Schoolmaster "——not as indicat- ing any real connexion between the sitter and Titian, but only the consummate excellence of the work. Besides his portraits, Moroni painted, from youth to his latest days, the ordinary round of sacred compositions; but in these he falls below his master I] Moretto, and his design, which partakes more of the Lombard or Milanese style than of the Venetian, has at times some of the dryness of the quattrocento. One of the best is the Coronation of the Virgin in 8. Alessandro della Croce, Bergamo; also in the Cathedral of Verona, Sts Peter and Paul, and in the Brera of Milan, the Assumption of the Virgin. Moroni was engaged upon a Last Judgment in the church of Corlago when he died on 5th February 1578.

MOROSINI, the name of a noble Venetian family. According to the best authorities, Cappellari and Bar- baro, there would seem to have been two families of that

name, distinguishing themselves by the variation of their shield. The one came from Mantua at the time of Attila's invasion, and bore or, a fess azure. The other came from Illyria in the 7th century ; they bore or, a bend azure. However that may be, nothing authentic is known of the Morosini till we find them settled as one family in Venice during the 8th century. The Morosini belong to the Case Vecchie, or twenty-four families of Venetian nobility who were descended from the tribunes of the confederate islands before Venice became united in one centre at Rialto. The 10th century was a period of danger for the family. They became involved in a blood feud with another noble house, the Caloprini, who were Ghibelline in politics, and relied upon the emperor Otto for support. The Morosini, how- ever, proved the stronger, thanks to their popularity ; and the year 991 saw them victorious through the deposition of the doge Memo, who had favoured their enemies. The Morosini engaged in commerce with the East, and in the 14th century two brothers of the family, Alban and Marco, founded a house at Aleppo with branches in Damascus, Beyrttt, and elsewhere in Syria. The wealth and importance of the family may be gathered from the fact that in 1379 no less than fifty-nine Morosini subscribed towards the fund for carrying on the war of

~~*Chioggia. The house of Morosini gave four doges to Venice, and numbered among its honours two royal marriages, two cardinals, twenty-four procurators of St Mark, besides numerous generals of the republic. The Morosini continued to flourish till the opening of the last century, when the family began to decline ; it is now represented by one sur- viving member.*~~

~~*Among the more distinguished members of the house must be mentioned : —Giovanni, who in 982 founded the nionastic establishment on 8. Giorgio Maggiore after the order of St Benedict; Domenico, doge 1148-1156—in the third year of his reign Pola and Istria, which had rebelled, were reconquered; Marino, doge 1249-1252, during whose reign the Inquisition, in a modified form and under the surveillance of Venetian officers, was introduced into Venice for the first time. In this same century (1290) Tommasina Morosini, the sister of Albertino il Grande, married Stephen, prince of Hungary. Their son Andrew succeeded to the throne, and was directed in his govern- ment by his uncle Albertino, on whom he conferred the dukedom of Slavonia and the county of Morlacchia. A cousin of Tommasina, Costanza, married Ladislaus, king of Servia. In 1382 Michele Morosini was elected doge. He had acquired a large fortune and a reputation for astuteness by buying Venetian property while the Genoese were still in Chioggia ; and much was expected of him in the restoration of his country's finance when that war came to an end. But he died the year of his election. Andrea Morosini the historian was born in 1558. He studied at Padua, and on coming of age embarked on public life. He passed through the various offices of state, till in 1618 he was a candidate for the dogeship, but failed to secure it, and died the same year. On the death of the official historian Paolo Paruta, in 1598, Andrea was commissioned by the Council of Ten to con- tinue his work, and received authority to consult the state papers down to 1594. He wrote his history in Latin. It covers from 1521 to 1615, and was first published in Venice, 1623.*~~

~~*Andrea's other works, of which only the firsthas been edited, are:— (1) L'imprese ed espeditioni di Terra Santa e Vacquisto fatto del? Imperio di Costantinopoli dalla Serenissima Republiea di Venetia, Venice, 1627 ; (2) De vis que Veneta Respublica ad Istriw oras gessit adversus Othonem*~~

~~*Federici Imperatoris filium, in the Corner-Duodo collection of MSS. ; (3) De forma reipubliew Venetx, in the National*~~

~~*Library, Paris; (4) Raccolta delle Leggi del Cons. X., in the Archivio Generale at the Frari, Venice ; (5) De rebus gestis ae nece*~~

~~*MO R—*~~

~~*Franeisct Carmaniolz, in the Corner-Duodo collection. The life of | Andrea has been written by Luigi Lollin, bishop of Belluno (1623), by Niccolo Crasso (1621), and by Antonio Palazzoli (1620).*~~

~~*The most distinguished member of the house of Morosini was Francesco, the captain-general of the republic against the Turks and conqueror of the Morea. HIe was born in 1618. In 1666 he was in command during an unfortunate campaign in Candia. In 1687 he conquered Patras, and so opened the Morea to the Venetian arms. In the follow- ing year he was elected doge. After his return to Venice the republic suffered severely in Candia, and though now an old man Francesco took the field again in 1693, but died the next year at Nauplia, seventy-six years of age. A more detailed account of his exploits will be found in the article VENICE.*~~

~~*Authorities. —Barbaro, Gencalogie delle Famiglie Patrizie Venete, MS., clas. vii. cod. decccxxvii., in the Marcian Library, Venice ; Cappellari, Campidoglio Veneto, MS., clas. vii. cod. xvii., in the same library ; Romanin, Storia doewmentata di Venezia ; Freschot, La Nobilta Veneta ; Cicogna, Iscrizione Veneziane.*~~

~~*MORPETH, a municipal and parliamentary borough of Northumberland, England, is situated in a fine valley on the Wansbeck, and on the North-Eastern Railway, 50 miles south of Berwick and 16 north of Newcastle. The Wans- beck, which is crossed by a stone and two wooden bridges, winds round the town on the west, south, and east, and a small rivulet, the Cottingburn, bounds it on the north. Morpeth is irregularly built, but possesses a number of good shops. The parish church of the Blessed Virgin, a plain building of the 14th century, is situated on Kirk HIll, a short distance from the town. Among the other public buildings are the Edward VI.'s grammar school, reopened*~~

~~| ser term Morphology (yop¢7, form), introduced by~~

~~Goethe to denote the study of the unity of type in organic form (for which the Linnean term METAMORPHOSIS (g.v.) had formerly been employed), now usually covers the entire science of organic form, and will be employed in this more comprehensive sense in the present article.~~

~~§ 1. Historical Outline—If we disregard such vague likenesses as those expressed in the popular classifications of plants by size into herbs, shrubs, and trees, or of terrestrial animals by habit into beasts and creeping things, the history of morphology commences with Aris- totle. Founder of comparative anatomy and taxonomy, he established eight great divisions (to which are ap- pended certain minor groups) — Viviparous Quadrupeds, Birds, Oviparous Quadrupeds and Apoda, Fishes, Ma- lakia, Malacostraca, Entoma, and Ostracodermata — dis- tinguishing the first four groups as Enaima ("with blood") from the remaining four as Anaima ("blood- less"). In these two divisions we recognize the Ver- tebrata and Invertebrata of Lamarck, while the eight groups are identical with the Mammals, Birds, Reptiles, Fishes, the Cephalopods, Crustaceans, other Articulates, and Testaceans of recent zoology. Far, too, from com- mitting the mistake often attributed to him of reckoning Bats as Birds, or Cetaceans as Fishes, he discerned the true affinities of both, and erected the latter into a spe- cial yévos beside the Viviparous Quadrupeds, far more on account of their absence of limbs than of their aquatic habit. Not only is his method inductive, and, as in modern systems, his groups natural, z.e., founded on the aggregate of known characters, but he foreshadows such generalizations as those of the correlation of organs, and of the progress of development from a general to a special form, long afterwards established by Cuvier and Von Baer respectively. In the correspondence he suggests~~

~~in 1857 after a Chancery suit lasting 150 years ; the town- hall, erected in 1870 to supersede a building of 1714 by Vanbrugh ; and the county-hall and former gaol, in the baronial style, built in 1814. Nothing remains of~~

~~*the old castle except the gateway. Morpeth had at one time one of the largest cattle-markets in England. The industries of the town include tanning, brewing, malting, iron and brass founding, and the manufacture of flannels, agricultural implements, and bricks and tiles. The population of the municipal borough (231 acres) in 1871 was 4517, and in 1881 it was 4556. The population of the parliamentary borough (17,085 acres) in the same years was 30,239 and*~~

~~*33,459.*~~

~~*™ Morpeth (Morepath, i.e., the path over the moor) had attained gome size before the Norman Conquest, when it was granted to William de Merlay. From the De Merlays it passed through the Greystocks and Dacres to the Howards, carls of Carlisle. Soon after the Conquest it obtained the privilege of a market, and in 1552 arms were granted to it by Edward VI. It is a borough by prescription, and was incorporated by Charles II. By the Municipal Act of 1835 the government was placed in a mayor and burgesses, but there is a local board of health distinct from the corporation, having control over an area slightly larger than that of the municipal borough. From 1558 the borough sent two members to parliament, but since 1832 only one member has been returned, and in 1868 the area of the borough was increased.*~~

~~*MORPHEUS is a personification, apparently invented by Ovid (Metam., xi. 635), of the power that calls up shapes before the fancy of a dreamer. The name (from poppy) expresses this function ; Ovid translates it artifer simulatorque figure. Morpheus is naturally represented as the son of Sleep (Somnus).*~~

~~*MORPHIA. See Opium.*~~

~~*OLOGY*~~

~~*between the scales of Fishes and the feathers of Birds, or in that hinted at between the fins of Fishes and the limbs of Quadrupeds, the idea of homology too is nascent ; and from the compilation of his disciple Nicolaus of Damascus, who regards leaves as imperfectly-developed fruits, he seems almost to have anticipated the idea of the metamorphosis*~~

~~*of plants. In short, we find a knowledge of structural facts and a comparative freedom from the errors induced by physiological resemblance, of which his successors such as Theophrastus and Pliny, generally mere classifiers by habit, show little trace, and which the moderns have but slowly regained. Little indeed can be recorded until the 13th century, when the reappearance of Aristotle's works gave a new impulse to the study of organic nature. Of the works of this period that of Albertus Magnus is far the most important; but they are all no more than re- vivals of Aristotle, marking the reappearance of scientific method and the reawakening of interest in and sympathy with nature. Meanwhile leech and apothecary, alchemist and witch, were accumulating considerable knowledge of plants, which, after the invention of printing, became collected and extended in the descriptive and well-illus- trated folios of Gesner and his successors, Fuchs, Lobel, and others, as well as by the establishment of botanic gardens and scientific academies, while, as Sachs expresses it, "in the sharpest contrast to the naive empiricism of the German fathers of botany came their Italian contemporary Ceesalpinus, as the thinker of the vegetable world." Both made systematic efforts,—the Germans vaguely seeking for natural affinities in mere similarities of habit, the Italian with no inconsiderable success striving towards an intel- lectual basis of classification. Monographs on groups of plants and animals frequently appeared, those of Belon on Birds and Rondelet on Fishes being among the earliest ; and in the former of these (1555) we find a comparison of the*~~

~~*skeletons of Bird and Man in the same posture and as nearly as possible bone for bone,—an idea which, despite the contemporaneous renaissance of human anatomy Int tiated by Vesalius, disappeared for centuries, unappreciated save by the surgeon Ambroise Paré. Palissy, like Leonardo before him, discerned the true nature of fossils ; and such flashes of morphological insight continued to appear from time to time during the 17th century. Thus, J oachim Jung recognized "the distinction between root and stem, the difference between leaves and foliaceous branches, the transition from the ordinary leaves to the folia jlorts," and Harvey*~~

~~anticipated the generalizations of modern embryo- logy by his researches on development and his theory of epigenesis.~~

~~The encyclopedic period of which Gesner is the highest representative was continued by Aldrovandi, Jonston, and others in the 17th century, but, aided powerfully by the Baconian movement, then profoundly influencing all scientific minds, it developed rapidly into one of genuinely systematic aim. At this stage of progress by far the most important part was taken by John Ray, whose classificatory labours both among plants and animals were crowned with marvellous success. He first definitely expelled the fabulous monsters and prodigies of which the encyclopzedists had faithfully handed on the tradition from medieval times, and, like his predecessor Morison, classifying in a truly modern spirit by anatomical characters, he succeeded, particularly among plants, in distinguishing many natural groups, for which his very terms sometimes survive, €.9., Dicotyledons and Monocotyledons, Umbelliferze and Legu- minose. The true precursor of Linnzus, he introduced the idea of species in natural history, afterwards to become so rigid, and reformed the practice of definition and termino- logy. Of the many works which followed up Ray's systematic and monographic labours, though often, like those of Tournefort and Rivinus, Réaumur and Klein, of great importance, none can be even named until we come to those of his great successor Linnzeus, whose extraordinary grasp of logical method and unparalleled lucidity of thought and expression enabled him to reform and reorganize the~~

~~whole labours of his predecessors into a compact and-~~

~~definite "systema nature." The very genius of order, he established modern taxonomy (see Brotocy), not only by the introduction of the binomial nomenclature and the renovation of descriptive terminology and method, but by the subordination of the species—henceforth clearly defined—under the successive higher categories of genus, order, and class, so finally reconciling the analytic and synthetic tendencies of his predecessors. Although the classification of plants by the number of their essential organs (which vastly advanced not only the cultivation of botany but the knowledge of the flora of the globe, and by which he is popularly~~

~~*remembered) is highly artificial, it must be remembered that this artificiality is after all only a question of degree, and that he not only distinctly recognized its provisional character but collected and ex- tended those fragments of the natural system with which Jussieu soon afterwards commenced to build. HIs classi- fication of animals, too, was largely natural, and, though on the whole he unfortunately lent his authority to main- tain "that disastrous philosophic and scientific aberration " inherited from the alchemists through the last encyclopzdist of Gesner's school—the notion of three kingdoms of nature—he at least at one time discerned the fundamental unity of animals and vegetables, and united them in opposition to the non-living world as Organisata. At the same time he was still far more a scholastic naturalist than a modern in- vestigator, and his works represent little more than the full completion of the ancient era, and in the hands of fanatical followers served often to retard the commencement of the*~~

~~*whose names and labours are imperishable.*~~

~~*MOR PH Gal OG Y*~~

~~*modern one. So, too, his excessive systematicand descriptive precision, united as it was with comparative inattention to other than superficial characters, established a tendency, even yet not extinct, to rest contented with mere method and nomenclature instead of aiming at complete morpho- logical knowledge.*~~

~~*While the artificial system was at the zenith of its fame and usefulness, Bernard de Jussieu was arranging his garden on the lines afforded by the fragmentary natural system of Linneus. HIs ideas were elaborated by his nephew and successor Antoine de Jussieu, who for the first time published diagnoses of the natural orders, so giving the system its modern character. Its subsequent elaboration and definite establishment are due mainly to the labours of Pyrame de Candolle and Robert Brown. The former concentrated his own long life and that of his*~~

~~*son upon a new "systema nature," the colossal Prodromus .-*~~

~~*systematis naturalis (20 vols., 1818-1873), in which 80,000 species were described and arranged. Meanwhile the pene- trative genius of Brown enabled him to unravel such struc- tural complexities as those of Conifers and Cycads, Orchids and Proteacez, thus demonstrating the possibility of ascer- taining the systematic position of even the most highly modified floral types. Both Candolle and Brown were thus no mere systematists, but genuine morphologists of the modern school. The former, as we shall afterwards see, established the theory of floral symmetry on grounds of pure comparative anatomy, and distinguished with greater success than hitherto between fundamental unity of struc- tural type and mere superficial similarity of physiological adaptation. The latter (Humboldt's "facile princeps*~~

~~*botanicorum"), using the same ideas with even keener in- sight, made many memorable anatomical researches, such as those on the structure of the ovule and the seed, and*~~

~~*indeed by his demonstration of the affinities of the gym- nosperms almost anticipated the discoveries of Hofmeister, who stands pre-eminent among his modern successors on*~~

~~*account of his elucidation of the secret of phanerogamic*~~

~~*reproduction.*~~

~~*The labours of Bernard and Antoine de Jussieu initiated too a vast parallel advance in zoology, the joint memoir on the classification of mammals with which Cuvier and Geoffroy St-Hilaire almost commenced their career recelv- ing its dominant impulse from the " genera" of Antoine. Cuvier's works correspond. in zoology to those of the whole period from the Jussieus to Brown, and epitomize the results of that line of advance. Although in some respects preceded by Haller and Hunter, who compared, though mainly with physiological aim, the same parts in different organisms, and much more distinctly by Vicq d'Azyr, the only real comparative anatomist of the 18th cen- tury, he truly opens the era of detailed anatomical research united with exact comparison and clear generalization. The Régne Animal (1817) and the theory of types (verte- brate, molluscan, articulate, and radiate) are the results of this union of*~~

~~analysis and synthesis (although he himself, exasperated by the aberrations of the Naturphilosophie, was accustomed to proclaim the importance of detailed empiricism alone), and mark the reconstitution of taxonomy on a new basis, henceforth to be no longer a matter of superficial description and nomenclature but a complete expression of structural resemblances and differences. More even than Linneus he is the founder of a great school, In Germany, Bojanus, Meckel, Von Siebold, and the illustrious Johannes Miiller, with his many living pupils, have carried on the work ; in France, too, a succession of brilliant anatomists, such as De Quatrefages, Milne-Edwards, and Lacaze- Duthiers, are his intellectual heirs ; and in England he has been admirably represented by Owen.~~

~~mom Poa oO 1: OG ¥~~

~~The histological movement inaugurated by Bichat will be subsequently discussed ; the rise of embryology, how- ever, may be briefly noted, especially since it supplied the most obvious deficiency of the Cuvierian school. Here the principal figure is Von Baer, who established independently the four types of Cuvier on developmental grounds, so for the first time applying embryology as the touchstone of anatomical classifications, besides establishing his famous law of differentiation from a general towards a special form.~~

~~It is now necessary to return to Linnzus, whose more speculative writings contain, though encumbered by fan-~~

~~tastic hypotheses, the idea of floral metamorphosis (" Prin-'~~

~~cipium florum et foliorum idem est," &c.). About the same time, and quite independently, C. F. Wolff, the embryo- logist, stated the same theory with greater clearness, for the first time distinctly reducing the plant to an axis bearing appendages—the vegetative leaves—which become meta- morphosed into bud-scales or floral parts through diminu- tion of vegetative force. 'Thirty years later the same view was again independently developed by Goethe in his now well-known pamphlet (Versuch die Metamorphose der~~

~~*Pflanzen zu erkldéren, Gotha, 1790). In this brilliant essay'*~~

~~*the doctrine of the fundamental unity of floral and foliar parts is clearly enunciated, and supported by arguments from anatomy, development, and: teratology. All the organs of a plant are thus modifications of one funda- mental organ—the leaf—and all plants are in like manner to be viewed as modifications of a common type—the Urpflanze. The controversy as to the merits and import- ance of this essay, and of Goethe's morphological work in general, can scarcely be entered upon here. That Goethe discerned and proclaimed, and that more clearly than any of his predecessors or contemporaries, the fundamental idea of all morphology—the unity which underlies the multi- farious varieties of organic form—and that he systematically applied this idea to the interpretation of the most import- ant, most complex, and most varied animal and vegetable structures, is unquestionable. The difficulties arise when we seek to estimate the importance of his works in the chain of progress, and when we inquire whether, as some historians hold, his "urpflanze" was a mere ideal archetype, bringing forth as its fruit the innumerable metaphysical abstractions of the Naturphilosophie, and leading his countrymen, to their fall, into all the extravagances of that system ; or whether, as Haeckel maintains, it represented a concrete an- cestral form, soanticipating the view of modern evolutionists. That to him Schelling was largely indebted for the founda- tion upon which he erected his philosophic edifice, as also that Goethe largely shared the same ideas, is unquestion- able; but it must be remembered that he lived and made progress for forty years after the publication of this essay, that he was familiar with the whole scientific movement, and warmly sympathized with the evolutionary views of Lamarck and Geoffroy St-Hilaire ; it is not therefore to be wondered at that his writings should furnish evidence in favour of each and every interpretation of them. His other morphological labours must not be forgotten. Inde- pendently of Vieq d'Azyr, he discovered the human pre- maxillary bone ; independently of Oken, he proposed the vertebral theory of the skull; and before Savigny, he dis- cerned that the jaws of insects were the limbs of the head.*~~

~~*In 1813 A. P. de Candolle published his Théorce Ele- mentaire dela Botanique, which he developed into the classic Organographie Végétale*~~

~~(1827), Although at first unac- quainted with Goethe's essay, and not clearly discerning the homology of leaves and floral parts, he established his theory of symmetry, reducing all flowers to "symmetrical" groupings of appendages on an axis and accounting for their various forms by cohesion and adhesion, by arrested or excessive development. The next great advance was the~~

~~investigation by Schimper and Braun of phyllotaxis—the ascending spiral arrangement of foliar and floral organs—~~

~~thus further demonstrating their essential unity.~~

~~The term morphology was first introduced by Goethe in 1817, in a subsequent essay (Zur Naturwissenschaft tiberhaupt, besonders zur Morphologie). It did not come into use in botany until its popularization by Auguste de St-Hilaire in his admirable Morphologie Végétale (1841), and in zoology until later, although De Blainville, who also first employed the term type, had treated the external forms of animals under "morphologie." Though the Na- turphilosophie of Schelling and its countless modifications by his followers, its mystic theories of "polarization" and the like, its apparatus of assumption and abstraction, hy- pothesis and metaphor, cannot here be discussed, its un- doubted services must not be forgotten, since it not only stimulated innumerable reflective minds to the earnest study of natural science, but, by its incessant proclamation of the unity of nature and the free use of Platonic arche- types, gave a most powerful impulse to the study of com- parative anatomy, and nobly vindicated the claims of philo- sophie synthesis over those of merely analytic empiricism. Among its many adherents, some are of more distinctly theological type, others metaphysical, others mystical or poetic, others, again, more especially scientific ; but its most typical and picturesque figure is Lorenz Oken, who epitomizes alike the best and the worst features of the school, and among whose innumerable pseudo- morpholo- gical dreams there occasionally occurred suggestions of the greatest fruitfulness,—notably, for instance, the independ- ent statement of the vertebral theory of the skull.~~

~~*Although Lamarck shared in this movement, his great work (the Philosophie Zoologique, 1809), being etiolo- gical rather than morphological, scarcely claims discussion here. By far the most distinguished anatomist of the transcendental school is Geoffroy St-Hilaire, who being comparatively free from the extravagances of Oken, and uniting a depth of morphological insight scarcely inferior to that of Goethe with greater knowledge of facts and far wider influence and reputation in the scientific world (which affected to sneer at the poet as necessarily a mere amateur), had enormously greater influence on the progress of science than either. He started from the same studies of anatomi- cal detail as Cuvier, but, profoundly influenced by Buffon's view of unity of plan and by the evolutionary doctrines of Lamarck, he rapidly diverged into new lines, and again reached that idea of serial homology of which we have so frequently noted the independent origin. His greatest work, the Philosophie Anatomique (1818-1823), contains his principal doctrines. These are—(1) the theory of unity of organic composition, identical in spirit with that of Goethe ; (2) the theory of analogues, according to which the same parts, differing only in form and in degree of development, should occur in all animals; (3) the "principe des con- nexions," by which similar parts occur everywhere in similar relative positions ; and (4) the "principe du balancement des organes," upon which he founded the study of tera- tology, and according to which the high development of one organ is allied to diminution of another. The advance in morphological theory is here obvious ; unfortunately, how- ever, in eager pursuit of often deceptive homologies, he wandered into the transcendentalism of the Naturphilo- sophie, and seems utterly to have failed to appreciate either the type theory of Cuvier or the discoveries of Von Baer. He earnestly defended Buffon's and Bonnet's earlier view of unity of plan in nature ; and the controversy reached its climax in 1830, when he maintained the unity of structure in Cephalopods and Vertebrates against Cuvier before the Academy of Sciences. On the point of fact*~~

~~*he was of course utterly defeated; the type theory was*~~

~~*te*~~

thenceforward fully accepted and the Naturphilosophie received its deathblow, while a "second empiric period " of exact anatomical and embryological research seemed for ever to replace it. Such was the popular view ; only a few, like the aged Goethe, whose last literary effort was a masterly critique of the controversy, discerned that the very reverse interpretation was the deeper and essential one, that a veritable "scientific revolution" was in pro- gress, and that the supremacy of homological and synthetic over descriptive and analytic studies was thenceforward assured. The irreconcilable feud between the two leaders really involved a reconciliation for their followers ; theories of homological anatomy had thenceforward to be strictly subjected to anatomical and embryological verification, while anatomy and embryology acquired a homological aim. This union of the solid matter and rigorous method of Cuvier with the generalizing spirit and philosophic aims of Geoffroy is well illustrated in the works of Owen ; and, in short, the so-called Cuvierian school is in reality thenceforward also Geoffroyan.

The further evolution of the idea of homology is sketched below (§ 7), while the extent and rapidity of the subsequent progress of the knowledge of all the structural aspects of plants and animals alike make an historical survey impos- sible up to the appearance of the Origin of Species (1859) ; however, no further qualitative advance was possible, since, as Sachs has best pointed out, morphology necessarily contains, under the Linnean dogma of the constancy of species, the same two inconsistent and irreconcilable lines of thought which we saw represented by Cesalpinus and the early German botanists respectively,—on one side the want of strictly scientific classification, and on the other the vaguely felt existence of a natural relationship. Strict classification of forms supposed constant excludes in fact any natural relationship. The type theory, the theory of unity of organic composition, and the like, are susceptible indeed of two explanations—they may be regarded as either ex- pressing a creative plan, or taken as purely Platonic and archetypal ideas. Both are tenable on theological and metaphysical grounds respectively, but the fact must

~~not be disguised that of this unity of type no explanation in the least degree scientific, 7.¢., in terms of the pheno- mena of the natural world, does or can exist. The need- ful solution was effected by Darwin. The "urpflanze" of Goethe, the types of Cuvier, and the like, at once became intelligible as schematic representations of ancestral organ- isms, which, in various and varying environments, have undergone differentiation into the vast multitude of exist- ing forms. All the enigmas of structure become resolved ; "representative" and "aberrant," " progressive" and "degraded," ""'synthetic" and "isolated," 'persistent " and "prophetic" types no longer baffle comprehension ; conformity to type represented by differentiated or rudi- mentary organs in one organism is no longer contradicted by their entire disappearance in its near allies, while systematist and morphologist become related simply as specialist and generalizer, all through this escape from the Linnean dogma of the fixity of species. The phenomena of individual development receive interpretation in terms of ancestral history; and embryology thus becomes divided into ontogeny and phylogeny, the latter, too, coming into intimate relation with paleontology, while classification seeks henceforth the reconstruction of the genealogical tree. All these results were clearly developed in the most important work of the new period, HIaeckel's Generelle Morphologie (1866), while the valuable contemporaneous Principles of Biology of HIerbert Spencer also gave special attention to the relation of morphology to physiology.!~~

~~1 For bibliography see Carus, Geschichte der Zoologie ; Sachs, Ges-~~

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~~§ 2. Results.—Though the preceding is but a meagre outline of the rise and progress of the science, no corre- sponding sketch of its results can be here attempted. A description of the refined applications of the doctrine of floral inetamorphosis, an inquiry into the morphology of the Cryptogams, or an account of such beautiful homo- logies as those presented by the Arthropods or the Echino- derms is alike impossible; least of all can we consider the splendid simplification of the supremely complex prob- lem of vertebrate structure by the elaboration of a new theory of the skull, and by such luminous discoveries as those of the~~

segmental organs, or of the origin and homo- logies of the spinal and cranial nerves. Jor these organo- logical conceptions the reader must study such articles as those on AMPHIBIA, Brrps, Hyprozoa, Motiusca, &c., and such works as those of Huxley, Gegenbaur and Haeckel, Balfour and Parker, Payer, Eichler, or Asa Gray, and (provided with the needful bibliographical equipment afforded by the various "' Jahresberichte" and the kindred English publications) must indeed also plunge into the current literature of the science. And there too must be sought the innumerable attempts at taxonomic synthesis which such organological progress is constantly originating (see AnIMAL Kincpom, Biooey, vol. iii. p. 690 sg., and VEGETABLE Kincpom). Embryological generalizations, such as Hneckel's "' gastreea theory," Lankester's rival " pla- nula theory," or the ingenious "ccelome theory" of Hert- wig, have been recently thoroughly criticized in Balfour's Embryology. The present article will be confined to a brief discussion of a few main problems, commencing with the cell theory and the problem of organic individuality — these being selected partly because of their special illus- trativeness and intrinsic importance, partly because they have somewhat less recently been summarized.

§ 3. Histology—Cell Theory.—Although the application of the simple microscope to the minute structure of plants and animals had been in progress since the end of the 17th century, the rise of modern histology really dates from the Anatomie Générale (1801) of Bichat, which analyses the organism into a series of simple tissues with definite structural characters. This new impulse, together with the improvement of optical appliances, led to much further rescarch. "Fibres" and "globules," 'lamine" and "nuclei," were described, and even "cells" by Mirbel in 1806, and in 1835 Johannes Miiller pointed out the existence of cells resembling those of plants in the vertebrate notochord. The cellu- lar and nucleated structure of epidermis and other tissues was soon demonstrated, while Robert Brown discovered the nucleus of the vegetable cell. In 1838 Schleiden referred all vegetable tissues to the cellular type, and traced back the plant embryo to a single nucleated cell, while in 1839 Schwann boldly extended this con- ceptiou of plant structure and development to the animal world, and so fully constituted thie "cell theory."

~~*Schwann's cells were essentially nucleated vesicles with fluid contents which originated in an intracellular substance ; but this view was soon abandoned. Dujardin had discovered that the bodies of Foraminifera were composed of a viscous granular contractile sarcode, and Von Mohl described independently in similar terms the contents of the vegetable cell as protoplasm. This was identi- fied by Max Schultze as Dujardin's sarcode, the newer name sur- viving ; and this living matter, and not the membrane, he showed to be the essential constituent of the cell, since which his amended definition of the cell as a unit-mass of nucleated protoplasm las been generally accepted. Prevost and Dumas had noticed the segmentation of the ovum into masses as early as 1824, and these were naturally identified as cells immediately after the publication of Schwann's work. In 1846 Kélliker showed that all tissues arise from these segmentation masses, and that the multiplication of animal and vegetable cells takes place by a continuation of the same process, —that of transverse division already observed in the Protozoa.*~~

~~*These points gained, the attention of histologists was withdrawn for a considerable time from the scrutiny of the minute structure of the cell itself to be concentrated on the modes of origin of these unit-masses, and their subsequent differentiation and aggregation into tissues and organs. The minute structure and histogenesis of*~~

~~*chichte d. Botanik ; Cuvier, Hist. d. Sci.; Is. G. St-Hilaire, Hist. Nat.*~~

~~*Gén.; Masters in Mféd.-Chir. Rev., 1858, &c.; also articles GOETHE, LINNZUs, OKEN, &c,*~~

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~~*plants, as well as of at least the higher animals, have been studied with much and ever-increasing accuracy of detail. (See ANa- Tomy, Hisro.ocy, Emspryontocy.) Both vegetable and animal tissues have been simply classified both according to their adult forms and according to the embryonic layers from which they respectively arise. This scrutiny of plant and animal structure over and above the special generalizations of the botanist and the zoologist has afforded much result to general histology. The improvement of technical methods has of late years largely*~~

~~*aided the progress of discovery. A return from the study of the cell-aggregate to that of the cell has commenced, and the question of cell-structure may be said to be again paramount in histology. The process of transverse-division has of late been much elucidated, and, although its complex details cannot here be entered upon, the result has been to establish a minute and thorough correspond- ence in cases so widely dissimilar as pollen-grains from a flower-bud, the epidermis of a tadpole, or the cells of a tumour—a result which obviously enhances the morphological completeness of the cell theory. Minor modes of cell-multiplication also are not without their morphological interest. Gemmation, familiar in the yeast pee occurs in other low and simple organisms, and may probably*~~

~~*e identified with the formation of polar vesicles in ova as a modi- fication of transverse division. Schleiden had supposed all new cells to originate within pre-existing cells, and this process, known as free-cell-formation, may really be observed in various plant and animal tissues. The protoplasm groups itself round new nuclei, the new cells being in fact formed much as Schwann had in his turn supposed ; but these nuclei have repeatedly been shown to arise from segmentation of the original nucleus, and thus this pro- cess too seems a mere modification of the general one of transverse division. Conjugation, too—that coalescence of two similar cells which may be observed in many Algex, Fungi, and Protozoa—is to be considered as the undifferentiated forin of that fertilization which occurs in higher animals and plants, the two apparently similar masses having become respectively differentiated into ovum and spermatozoon, or into egg-cell and antherozoid. An indefinite number of amceboid cells sometimes flow together into a single mass,—a phenomenon regarded by some as multiple-conjugation, or perhaps more probably as an almost mechanical coalescence of exhausted cells, from which conjugation proper and finally fertili- zation may indeed have originated. The ameboid cells of higher animals similarly unite when drawn, and this formation of plas- modia, as these are termed, seems to be a deep-seated property of the amceboid cell. Similarly, too, the process of rejuvenescence which occurs in many of the lowest plants and animals, such as Protococcus and Amceba, where the protoplasm passes from a rest- ing and encysted to a naked and mobile stage, has many analogues*~~

~~*not only among the Protista but even in the tissues of higher animals, while the phases which the lowest organisms more or less exhibit—the encysted, the ciliated, the amceboid, and the plasmo- dial—may be regarded as the fundamental forms of a ** life-cycle," fully represented indeed only in such extremely low organisms as Protomyxa and Myxomycetes, yet nowhere completely sup ressed. The very highest plants and animals may thus be considered as aggregates of more or less differentiated and variously arranged encysted, ameeboid, and ciliated cells, while their development and subsequent changes, their variations normal and pathological, in reality exhibit phases more or less distinct of the ancestral life- cycle.*~~

~~*viThe exainination of the precise modes of cell-division, particularly in the hands of botanists (see BroLocy, and summary in Sachs's Vorlesungen tiber Pflanzen Physiologic, 1883), are also constantly throwing the most interesting light upon the structure of the adult organism. Thus then, in our own day as in those of Bichat or Schwann, the labours of the histologist, when inspired by higher aims than that of the mere multiplication of descriptive detail, are of supreme morphological importance, and result in the demonstra- tion of a unity of organic structure deeper even than any which we owe to Linneus or Cuvier, Goethe or Geoffroy.*~~

~~*§ 4. Individuality.—Probably no subject in the whole range of biology has been more extensively discussed than that of the nature of organic individuality. The history of the controversy is of interest, since besides leading up to solid results it serves, perhaps better than any other case, to illustrate the slow emergence of the natural sciences from the influence of scholastic thought. Starting from the obvious unity and indivisibleness of Man and other higher animals, and adopting some definition such as that of Mirbel (exceptionally unmetaphysical, however), " Tout être organisé, complet dans ses parties, distinct et séparé des autres étres, est un individu," it was attempted times without number to discover the same conception elsewhere in nature, or rather to impose it upon all other beings, plants and animals alike. The results of different inquirers were of course utterly discrepant. It seemed easy and natural to identify a tree or herb corresponding to the individual animal, yet difficulties at once arose.*~~

~~*Many apparently distinct plants may arise from a common root, or a single plant may be idlecomposed into branches, twigs, shoots, buds, or even leaves, all*~~

~~*841*~~

~~*often capable of separate existence. These, again, are decompos- able into tissues and cells, the cells into nucleus, &c., and ultimately into protoplasmic molecules, these finally into atoms,—the inquiry thus passing outside organic nature altogether and meeting the old dispute as to the ultimate divisibility of matter. In short, as Haeckel remarks, scarcely any part of the plant can be named which has not been taken by some one for the individual. It is necessary, therefore, briefly to notice some of the principal works oe subject, and these may conveniently be taken in descending order.*~~

~~*While Cassini practically agreed with Mirbel in attempting to regard separate plants as individuals, the widest interpretation of the individual is that of Gallesio (1816), who proposed to regard as an individual the entire product of a single seed, alike whether this developed into a uni-axial plant extended continuously like a Banyan, or multiplied asexually by natural or artificial means like the Weeping-willow or the Canadian Pondweed, of each of which, on this view, there is only a single individual in Britain, happily discontinuous.*~~

~~*At once the oldest and most frequently maintained view is that which regards the bud or shoot consisting of a single axis with appendages as the plant-individual, of which the tree represents a colony, like a branched hydroid Polyp. This conception, often attributed to Aristotle, but apparently without foundation, appears distinctly in the writings of Hippocrates and Theophrastus,—the latter saying, " The bud grows on the tree like a plant in the ground." The aphorism of Linnzus, "Gemme totidem herbe," is well known ; and in this view C. F. Wolff and Humboldt concurred, while Erasmus Darwin supported it by an appeal to the facts of anatomy and development. 'The most influential advocate of the bud theory during the first half of the present century was, however, Du Petit-Thouars, who, although starting much as usual with a "' principe unique d'existence," supported his theory on extensive though largely incorrect*~~

~~*observations on stem structure and growth. For him the tree isa colony of phytons, each being a bud with its axillant leaf and fraction of the stem and root. Passing over numerous minor authors, we come to the central work of Alex. Braun (1853), in which, as Sachs has clearly pointed out, the illegitimate com- bination of Naturphilosophie with inductive morphology reaches its extreme. He reviews, however, all preceding theories, admits the difficulty of fixing upon any as final, since the plant, physio- logically considered, is rather a dividwum than an individuum, and proposes as a compromise, or indeed as a partial cutting of the knot, the adoption of the shoot as the morphological in ividual, comparable to an animal, especially because, unlike the cell, leaf, &c., it includes all the representative characters of the species. Darwin and Spencer on the whole also accept the bud or shoot as at any rate the most definite individual.*~~

~~*The theory of metamorphosis naturally led Goethe, Oken, and others to regard the leaf as the individual, while Johannes Miiller, Steenstrup, and others adopted the same view on various physio- logical grounds. Gaudichaud elaborated a theory intermediate between this view and that of Du Petit-Thouars, according to which the plant was built up of individuals, each consisting of a leaf with its subjacent internode of stem, which was regarded as the leaf-base, and this was supported by Edward Forbes and others, while the nominally converse view—that of the leaf as a mere outward ex- pansion of the stem-segment—was proposed by Hochstetter.*~~

~~*Though sundry attempts at identifying various tissues, such as the fibro-vascular bundles, as the constituent individuals may be passed over, those associated with the cell theory are of great importance. Schwann decided in favour of the cell and regarded the plant as a cell-community, in which the separate elements were like the bees of a swarm,—a view virtually concurred in in all essential respects by Schleiden, Virchow, and other founders of the cell theory. Yet, although the structure and functions of the plant are ultimately and exclusively cellular, it is impossible to ignore the fact that, save in the very lowest organisms, these are subordi- nated and differentiated into larger aggregates, and form virtually but the bricks of a building, and hence the later theories outlined above. Of attempts to*~~

~~*find the individual in the nucleus or the protoplasm granules it is of course unnecessary to speak further.*~~

~~*So far the theories of absolute individuality. The conception of relative individuality is well traced by Fisch upwards froin the more or less vague suggestions in the writings of Goethe, Roeper, and the elder De Candolle to its clear expression in Alphonse de Candolle and Schleiden, both of whom take the cell, the shoot, and the multi-axial plant as forming three successive and subordinated categories. Nagelitoo recognized not only the necessity of establish- ing such a series (cell, organ, bud, leafy axis, multi-axial plant) but the distinction between morphological and physiological: in- dividualities afterwards enunciated by Haeckel.*~~

~~*Passing over the difficulties which arise even among the Protozoa (see FoRAMINIFERA), we find that a similar controversy (fully chronicled in Haeckel's Kalksehwamme) has raged over the in- dividuality of Sponges. While the older observers were content to regard each sponge-mass as an individual, aviewin which Lieberkuhn*~~

~~*Vi 160*~~

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~~*and other monographers substantially concurred, the application of the microscope Ted to the view suggested by James Clark, and still stoutly supported by Saville Kent, that the Sponge is a city of amceboid or infusorian individuals. Carter looked upon the separate ampullaceous sacs as the true individuals, while Schmidt, defining the individual by the possession of a single exhalent aperture, dis- tinguishes Sponges into solitary and social. Later, however, he terms them Zoa impersonalia.*~~

~~*For the higher animals the problem, though perhaps really even more difficult, is less prominent. As Haeckel points out, the earlier discussions and even the comparatively late essay of Johannes Miller take an almost purely psychological or at least a physiological point of view; and the morphological aspect of the inquiry only came forward when the study of much lower forms, such as Cestoid Worms (see PLATYHELMINTHES) or Siphonophores (see Hyprozoa), had raised the difficulties with which*~~

~~*botanists had so long been familiar. With the rapid progress of embryology, too, arose new problems ; and in 1842 Steenstrup introduced the conception of an "alternationof generations" as a mode of origin of distinct individuals by two methods, for him fundamentally similar, the sexual from im- pregnated females and the asexual from unimpregnated " nurses, "'— a view adopted by Edward Forbes and many other naturalists, but keenly criticized by Carpenter and Huxley. In Leuckart's remark- able essay on polymorphism (1853) the Siphonophora were analysed into colonies, and their varied organs shown to be morphologically equivalent, while the alternate generations of Steenstrup were reduced to a case of polymorphism in development. Leuckart further partly distinguished individuals of different orders, as well as between morphological and physiological individuals. ;*~~

~~*In 1852 Huxley proposed the view which he still substantially maintains (see BioLocy). Starting from such an undoubted homo- logy as that of the egg-producing process of Hydra with a free- swimming Medusoid, he points out that the title of individual, if applied to the latter, must logically be due to the former also, and avoids this confusion between organ and individual by defining the individual animal, as Gallesio had done the plant, as the entire product of an impregnated ovum,—the swarm of Aphides or free Meduse which in this way might belong to a single individual being termed Zooids.*~~

~~*In Carus's System of Animal Morphology (1853) another theory was propounded, but the problem then seems to have fallen into abeyance until 1865, when it formed the subject of a prolonged and fruitful discussion in the Principles of Biology. Adopting the cell (defined as an aggregate of the lowest order, itself formed of physio- logical units) as the morphological unit, Spencer points out that these may either exist independently, or gradually exhibit unions into aggregates of the second order, like the lower Alge, of which the individnality may be more or less pronounced. The union of such secondary aggregates or compound units into individuals of a yet higher order is then traced through such intermediate forms as are represented by the higher seaweeds or the Liverworts, from the thallus of which the axes and appendages of Monocotyledons and Dicotyledons are ingeniously derived. The shoot of a*~~

~~*flowering- plant is thus an aggregate of the third order ; it branches into an ageregate of the fourth or higher order, and finally as a tree "acquires a degree of composition too complex to be any longer defined." Proceeding to animals, the same method is applied. The Protozoa are aggregates of the first order. These, like plants, exhibit transitions, of which Radiolarians, Foraminifera, and Sponges are taken as examples, to such definite compound wholes as Hydra; and such secondary aggregates multiply by gemmation into permanent aggregates of the third order, which may exhibit all degrees of integration up to that of the Siphonophora, where the individualities of the Polyps are almost lost in that of the aggregate form. The whole series of articulated animals are next interpreted as more or less integrated aggregates of the third order, of which the lower Annelids are the less developed forms, the Arthropods the more highlyintegrated and individualized. Molluscs and Vertebrates are regarded as aggregates of the second order.*~~

~~*In 1866 appeared the latest morphological classic, the Generelle Morphologie of Haeckel. Here pure morphology is distinguished into two sub-sciences,—the first purely structural, teetology, which regards the organism as composed of organic individuals of different orders; the second essentially stereometric, promorphology. 'To tectology, defined as the science of organic individuality, a large section of the work is devoted. Dismissing the theory of absolute individuality as a metaphysical figment, and starting from the view of Schleiden, De Candolle, and Nageli of several successive categories of relative individuals, he distinguishes more clearly than heretofore the ee individual (or bion), characterized by definiteness and independence of function, from the morphological individual (or morphon), characterized similarly by definiteness of form ; of the latter he establishes six categories, as follows :—*~~

~~*1. Plastides (cytodes and cells), or elementary organisms.*~~

~~*2. Organs (cell-stocks or cell-fusions), simple or homoplastic or-*~~

~~*gans (tissues), or heteroplastic organs. Organ-systems, organ-apparatuses,*~~

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~~*3. Antimeres (opposite or symmetrical or homotypic parts), ¢.g., rays of radiate animals, " halves of bilaterally symmetrical animals."*~~

~~*4. Metameres (successive or homodynamous parts), eg., stem- segments of Phanerogams, segments or zoonites of Annelids or Vertebrates.*~~

~~*5. Persone, shoots or buds of plants, polyps of Ccelenterates, &c., "individuals" in the narrowest sense among the higher animals.*~~

~~*6. Corms (stocks or colonies), ¢.g., trees, chains of Salpx, polyp- stocks, &c.*~~

~~*In his subsequent monograph on calcareous Sponges, and in a final paper, he somewhat modifies these categories by substituting one category of extreme comprehensiveness, that of the idorgan, in place of the three separate orders of organs, antimeres, and meta- meres, The idorgan (of course clearly distinguished from the physiological organ or biorgan) is finally defined as a morphological unit consisting of two or more plastids, which does not possess the positive character of the person or stock. These are distinguished into homoplasts or homo-organs and alloplasts or alloe-organs, the former including, as subdivisions, plastid-aggregates and plastid- fusions, the latter idomeres, antimeres, and metameres. The former definition of the term antimere, as denoting at once each separate ray of a radiate, or the right and left halves of a bilaterally sym- metrical animal, is corrected by terming each ray a paramere, and its symmetrical halves the antimeres, Thus an ordinary Medusoid has four parameres and eight antimeres, a Star-fish five and ten. The con- ception of the persona is largely modified, not only by withdrawing the comparison of the animal with the vegetable shoot and by omit- ting the antimere and metamere as necessary constituents, but by taking the central embryonic form of all the Metazoa—the gastrula (fig. 1) and its assumed ancestral representative, the gastreea—as the simplest and oldest form of per- sona, The different morphological stages to which it may attain are clas- sified into three series: (1) Monax- onial} inarticulate persons, 7.¢., uni- axial and unsegmented without anti- meres or metameres, as in Sponges, or lowest Hydroids; (2) Stauraxonial? inarticulate persons with antimeres, but without metameres, ¢.g., Coral, Medusa, Turbellarian, Trematode, Bry- ozoon ; (3) Stauraxonial articulate per- sons with antimeres and*~~

~~metameres, e.g.,Annelids, Arthropods, Vertebrates. The colonies of Protozoa are mere idor- gans. True corms, composed of united persone, occur only among Sponges, Hydroids, Siphonophores, Corals, Bry- _ outer and innerlayers,ectoderm ozoa, Tunicates, and Echinoderms, of @2dendoderm. (After Haeckel.) which the apparent parameres are regarded as highly centralized per- sone of a radially-budded worm colony; and these can be classified according to the morphological rank of their constituent persone. They usually arise by gemmation from a single persona, yet in Sponges and Corals occasionally by fusion of several originally distinct~~

~~ersons or corms. The theory of successive subordinate orders of~~

~~individuality being thus not only derived from historical criticism of previous theories but brought into conformity with the actual facts of development and descent,—various groups of organisms being referred to their several categories,—the remaining problem of tectology, that of the relation of the morphological to the physio- logical individuality, is finally discussed. Of the latter, three cate- gories are proposed :—(1) the " actual bion or complete physiological individual," this being the completely developed organic form which has reached the highest grade of morphological individuality proper to it as a representative of, ¢.g., its species ; (2) the 'virtual bion or potential physiological individual," including any incompletely developed form of the former from the ovum upwards ; and (3) the "partial bion or apparent physiological individual," such frag- ments of the actual or virtual bion as may possess temporary inde- pendence without reproducing the species—this latter category having, however, inferior importance.?~~

~~Haeckel's theory, indeed in its earlier form, has been adopted by Gegenbaur and other morphologists, also in its later form by Jager, who, however, rejects the category of idorgan on the ground of the general morphological principle that every natural body which carries on any dewtical changes with its environment becomes differentiated into more or less concentric layers ; but the subject, especially as far as animals are concerned, is again recently dis- cussed in a large work by Perrier. Starting from the cell or plastid, he terms a permanent colony a méride,~~

~~*and these may remain isolated like Sagitta or Rotifer, or may multiply by gemmation to i a*~~

~~*Fic. 1.—Gastrula in optical sec- tion, showing primitive opening and digestive cavity (blasto- pore and arch-enteron), as also*~~

~~*1 For explanation of these terms see § 5, Promorphology, p. 844.*~~

~~*2 For criticism of this theory on the ground of its making physiological de- pend on morphological individuality, see Fisch, Aufedhlung und Kritik der verschiedenen Ansichten tiber das pflanzliche Individuum, p. 11.*~~

~~*form higher aggregates which he terms zoides. Such zoides may be irregular, radiate, or linear aggregates, of which the two former classes especially are termed démes. The organ—Haeckel's idorgan—is excluded, since tissues and organs result from division of labour in the anatomical elements of the mérides, aud so have only a secondary individuality, "carefully to be distinguished from the individuality of those parts whose direct grouping has formed the organism, and which live still, or have lived, isolated from one another." Perrier further points out that undifferentiated colonies are sessile, as Sponges and Corals, while a free state of existence is associated with the concentration and integration of the colony into an individual of a higher order.*~~

~~*So far the various theories of the subject; detailed criticism is impossible, but some synthesis and reconciliation must be attempted. Starting from the cell as the morphological unit, we find these forming homogeneous aggregates in some Protozoa and in the early development of the ovum. But integration into a whole, not merely aggregation into a mass, is essential to the idea of individu- ality ; the earliest secondary unit, therefore, is the gastrula or méride. This stage is permanently represented by an unbranched Hydra or Sponge or by a Planarian. These secondary units may, however, form aggregates either irregular as in most Sponges, in- definitely branched as in the Hydroids and Actinozoa, or linear as in such Planariansas Catenula. Such aggregations, colonies, or demes, not*~~

~~*being aggregated, do not fully reach individuality of the third order, This is attained, however, for the branched series by such forms as Siphonophores among Hydrozoa, or Renilla or Pennatula among Actinozoa; for linear aggregates again by the higher Worms, and still more fully by Arthropods and Vertebrates. Aggregates of a yet higher order may occur, though rarely. A longitudinally dividing Nais or laterally branched Syllis are obviously aggregates of these tertiary units, which, on Haeckel's view, become integrated in the Echinoderm, which would thus reach a complete indivi- duality of the fourth order. A chain of Salpz or a colony of Pyro- soma exhibits an approximation to the same rank, which is more nearly obtained by a radiate group of Botryllus around their central cloaca, while the entire colony of such an Ascidian would represent the individual of the fifth order in its incipient and unintegrated state, —these and the preceding intermediate forms being, of course, readily intelligible, and indeed, as Spencer has shown, inevitable on the theory of evolution.*~~

~~*The exclusion of tissues and organs from rank in this series is thus seen to necessarily follow. Ectoderm and endoderm cannot exist alone; they and the organs into which they differentiate arise merely, as Jager expresses it, from that concentric lamination, or, with Perrier, from that polymorphism of the members of the colony, which is associated with organic and social existence. The idea of the antimere is omitted, as being essentially a promorpho- logical conception (for a Medusoid or a Star-fish, though of widely distinct order of individuality, are equally so divisible) ; that of the metamere is convenient to denote the secondary units of a linear tertiary individual ; the term persona, however, seems un- likely to survive, not only on account of its inseparable psycho-logical connotations, but because it has been somewhat vaguely applied alike to aggregates of the second and third order ; and the term colony, corm, or deme may indifferently be applied to those aggregates of primary, secondary, tertiary, or quaternary order which are not, however, integrated into a whole, and do not reach the full individuality of the next higher order. The term zooid is also objectionable as involving the idea of individualized organs, a view natural while the medusoid gonophores of a Hydrozoon were looked at as evolved of its homologue in Hydra, whereas the latter is really a degenerate form of the latter. Passing to the vegetable*~~

~~*world, here as before the cell is the unit of the first order, while aggregates representing almost every stage in the insensible evolu- tion of a secondary unit are far more abundant than among animals. Complete unity of the second order can hardly be allowed to the thallus, which Spencer proposes to compound and integrate into tertiary aggregates— the i pies ; as in animals the embryo- logical method is preferable, both as avoiding gratuitous hypothesis and as leading to direct results. Such a unit is clearly presented by the embryo of higher plants in which the cell-aggregate is at once differentiated into parts and integrated into a whole. Such an embryo possesses axis and appendages as when fully developed (fig. 2). The latter, however, being as organs mere lateral expan- sions of the concentric layers into which the plant embryo, like the animal, is differentiated, and so neither stages of evolution nor capable of separate existence, are not entitled to individual rank. The embryo, the bud, shoot, or uni-axial plant, all thus belong to the second order of individuality, like the Hydroid they resemble. Like the lower Ccelenterates, too, aggregates of such axes are formed by branching out from their low degree of integration. Such colonies can hardly be termed individuals of the third, much less of higher order, at least without somewhat abandoning that unity of treatment of plants and animals without which philosophi- cal biology disappears. Individuality of the second order is most fully reached by the flower,—the most highly differentiated and*~~

~~*integrated form of axes and appendages.*~~

~~*843*~~

~~*Such a simple inflores- cence as a raceme or umbel approximates to unity of the third order, towhich acomposite flower-head must be admitted to have attained, while a compound inflorescence is on the way to a yet higher stage.*~~

~~*If, as seems probable, a nomencla- ture be indispensable for clear ex- pression, it may be simply arranged in conformity with this view. Start- ing from the unit of the first order, the plastid or monad, and terming any undifferentiated aggregate ademe, we have a monad-deme integrating into a secondary unit or dyad, this rising through dyad-demes into a triad, this forming triad-demes, and these when differentiated becoming tetrads,*~~

~~*the Botryllus-colony with which the evolution of compound individuality terminates being a tetrad-deme. The separate living form, whether monad, dyad, triad, or tetrad, requires also some dis- tinguishing name, for which persona will probably ultimately be found most appropriate, since such usage is most in harmony with its inevi- table physiological and psychological connotations, while the genea- logical individual of Gallesio and Huxley,common also to all the cate- gories, may be designated with Haeckel the ovwm-product or ovwm- cycle, the complete series of forms needed to represent the species being the species-cycle (though this coincides with the former save in cases where the sexes are separate, or polymorphism occurs). For such a peculiar case as Diplozoon paradoxwm, where two separate forms of the same species coalesce, and still more for such heterogeneous individuality as that of a Lichen, where a composite unit arises from the union of two altogether distinct forms—Fungus and Alga,—yet additional categories and terms are required.'*~~

~~*§ 5. Promorphology.—Just as the physiologist constantly seeks to interpret the phenomena of function in terms of mechanical, physical, and chemical laws, so the morphologist is tempted to inquire whether organic as well as mineral forms are not alike reducible to simple mathematical law. And just as the crystallo- grapher constructs an ideally perfect mathematical form from an imperfect or fragmentary crystal, so the morphologist has frequently attempted to reduce the complex-curved surfaces of organic beings to definite mathematical expression.? Canon Moseley (Phil. T'rans., 1838) succeeded in showing, by a combination of measurement and mathematical analysis, that the curved surface of any turbinated or discoid shell might be considered as generated by the revolution, about the axis of the shell, of a curve, which continually varied its dimensions according to the law of the logarithmic spiral. For Goodsir this logarithmic spiral, now carved on his tomb, seemed a fundamental expression of organic curvature and the dawn of a new epoch in natural science—that of the mathematical investiga- tion of organic form—and his own elaborate measurements of the body, its organs, and even its component cells seemed to yield, now the triangle, and again the tetrahedron, as the fundamental form. But such supposed results, savouring more of the Natur- philosophie than of sober*~~

~~*mathematics, could only serve to dis- courage further inquiry and interest in that direction. Thus wo find that even the best treatises on botany and zoology abandon the subject, satisfied with merely contrasting the simple geometrical ground-forms of crystals with the highly curved and hopelessly complicated lines and surfaces of the organism.*~~

~~*But there are other considerations which lead up to a mathe- matical conception of organic form, those namely of symmetry and regularity. These, however, are usually but little developed, botanists since Schleiden contenting themselves with throwing organisms into three groups—first, absolute or regular ; second, regular and radiate ; third, symmetrical bilaterally or zygomorphic—the last being capable of division into two halves only in a single plane, the second in two or more planes, the first in none at all. Burmeister, and more fully Bronn, introduced the fundamental improvement of defining the mathematical forms they sought not by the surfaces but by axes and their poles; and Haeckel has developed the subject with an elaborateness of detail and nomen- clature which seems unfortunately to have impeded its study and acceptance, but of which the main results may, with slight varia- tions chiefly due to Jager (Lehrb. d. Zool., i. 283), be briefly out- lined.*~~

~~*A. ANAXONIA—forms destitute of axes, and consequently wholly irregular in form, ¢.g., Amcebe and many Sponges.*~~

~~*'B. AXONIA—forms with definite axes.*~~

~~*1G. 2.—Embryo of Dicotyledon (after Sachs), showing incipient axis and appendages, as also the three concentric embryonic layers.*~~

~~*1 See Haeckel, Gen. Morph. i., Kalkschwamme i., and Jena. Zettschr. xX. ; also Sachs, Geschichte d. Bot.; Fisch, Aufzdhlung u. Kritik, &c., Rostock, 1880; Perrier, Les Colonies Animales, 1882, as from these all other references can be obtained. ,*~~

~~*2 The sciences of organic and mineral form would thus (as Haeckel points out) become thoroughly analogous, for, as promorphology develops the crystallo- graphy of organic form, so mineralogy,in the study of such*~~

~~phenomena as those of pseudomorphism or of mineral development, becomes parallel to morphology;~~

~~844~~

~~I. HomAxonrA—all axes equal.~~

~~(a) Spheres, where an indefinite number of equal axes can be drawn through the middle point, ¢.g., Spherozoum. (b) Polyhedra, with a definite number of like axes. Of these aconsiderable number occur in nature, for example, many Radiolarians (fig. 8), pollen-grains, &c., and they are aaa classifiable by the ANS) number and regularity of their faces. GOO YS II. ProraxontA, where all the parts O) oS VO these we distinguish— SII) 1. Monaxonia, with not more than one CIO definite axis. Here are distinguished (a) those with similar Lae spheroid (Coccodiscus) and cylinder (Pyrosoma) SS OW} cone (Conulina). S CL 2. Stawraxonia, where, besides the p,4 3 — Radiolarian (Ethmo- main axes, a definite number of second- gphera), an irregular endo- ary axes are placed at right angles, and spheric polyhedron with equi- the stereometric ground- form becomes #ngular faces. Type — em guished (a) those with poles similar, Stawraxonia homopola, where the stereometric form is the double pyramid (fig.4), and (b) those with poles dissimilar, Stawraxonia hetero- pola, where the stereometric form is the single pyramid, and where we distin- apical, aboral, or anal pole. The bases of these may be either regular or irre- gular polygons, and thus a new classi- fication into Homostawra and Hetero- staura naturally arises. may have either an even or an odd number of sides, and thus among the * Homostaura we have even-sided and odd-sided, single and double pyramids. In those Homostaura with an even radial and inter-radial axes have simi- lar poles; but in the series with an odd number of sides, like most Echi- noderms, each of the transverse axes is half radial and half semi-radial (fig. 5). mids the twelve-sided pollen-grain of as example of Stauraxonia ho- Passiflora (fig. 4) may be taken as an mopola. Ground-form a regu- example, having the ground-form of lr double pyramid of six sides. the hexagonal system, the hexagonal dodecahedron. Of the equal even-sided single pyramids (Heteropola homostaura), Alcyonium, amples of the eight-sided, six-sided, and four-sided pyramids, while those with an odd~~

~~number of sides may be illustrated by eo or Primula with five sides, and the flower of Lily or Rush with three In the highest and most complicated group, the Heterostaura, the basal poly- gon is no longer regular but amphithect (duplOnxros = double-edged). Such a 2 polygon has an even number of sides, and yyg 5,~~

~~are arranged round a main axis, and of ISI~~

~~and (b) those with dissimilar poles, ¢ a pyramid. Here, again, may be distin- —_ guish a basal, usually oral, pole from an~~

~~The simpler group, the Homostaura, number of sides, such as Meduse, the Of the group of regular double pyra- p44 pollenof Passion Flower, Geryonia, Aurelia may be taken as ex- sides, can be divided into symmetrical halves~~

~~—Starfish, an example s : ; of Heteropola homostaura. by each of two planes intersecting at right Ground-form a regular single~~

~~augles in the middle point,and thus divid- PYT#mid of five sides.~~

~~ing the whole figure into four congruent polygons. The longer of these axes may be termed lateral, the shorter the equatorial or dorso- ventral ; and these two axes, along with the main axes, always define the three dimensions of space. Ctenophores (fig. 6) furnish examples of eight-sided amphithect pyramids, some Madrepore Corals of six- sided, Crucifers, some Medusx, and Cestodes of four-sided amphi- thect pyramids.~~

~~_ In these forms the poles of the dorso-ventral and lateral axes are similar, and, as in the preceding Monaxonia and Stauraxonia, the centre of the body is defined by a line; and they are therefore termed Centraxonia, while the Protaxonia, which are defined by their central point, are called Centrostigma. There are, however, other forms, and these the most complicated, in which the poles of at least the dorso-ventral axis are unlike, and in which the body is thus defined not with reference to a line but to a median plane, and these have accordingly received the name of Centropipeda. Their ground-form is a polygon with an even number of sides, which can only be divided into two symmetrical halves~~

~~*by the one median plane. It can be obtained by halving an amphithect pyramid of double the number of sides, and is consequently termed a half amphithect pyramid (fig. 7). The whole amphithect pyramid may be most con-*~~

~~*venicntly obtained by the reduplication of the ground-form as if in a mirror. Of half amphithect pyramids there are again two forms, termed by Haeckel Amphipleura and Zygoplewra, the former in- cluding the " bilaterally symmetrical " or irregularly radiate forms of previous authors, such as Spatangus, Viola, Orchis, while the Zygopleura include forms bilaterally symmetrical in the strictest sense, in which not more than two radial planes, and these at right*~~

~~*Fig. 6. Fig. 7. Fia. a (Eucharis). Ground-form an eight-sided double amphithect Fi> 7.—Spatangus. Ground-form a fiye-sided half amphithect pyramid. angles to each other, are present. The stereometric ground-form isa half rhombic pyramid. Haeckel again divides these, according to the number of antimeres, into Tetraplewra and Dipleura,*~~

~~*Promorphology has thus shown that the reigning dogma of the fundamental difference of organic and mineral forms is false, and that a crystallography of organic forms is possible,—the form of the cell or the cell-aggregate differing from the crystal merely by its more or less viscous state of aggregation, its inherited peculi- arities, and its greater adaptability to the environment. The classification into bilateral and radiate forms which usually does duty for more precise promorphological conceptions must be aban- doned as hopelessly confusing essentially different forms, or at least must be rigidly restricted,—the term radial to regular and double pyramids, the term bilateral to the Centropipeda if not indeed to dipleural forms. Similarly, the topographical and relative terms, anterior and posterior, upper and under, horizontal and vertical, must be superseded by the terms above applied to the axes and their poles, oral and aboral, dorsal and ventral, right and left.*~~

~~*§ 6. Nature of Morphological Changes.—The main forms of organic structure being analysed and classified and their stage of individu- ality*~~

being ascertained, the question next arises, by what morpho- logical changes have they arisen, and into what categories can these modes of differentiation be grouped? They at first sight seem innumerable, yet in reality are few. Goethe somewhat vaguely generalized them for the flower as ascending and descending meta- morphosis, expansion and contraction of organs, &c. ; but the first attempt at careful enumeration seems to be that of Auguste de St- Hilaire, who recognized defects of development, adherences, excesses of production or "dédoublements," metamorphosis and displace- ment of organs. Subsequent authors have variously treated the subject ; thus Asa Gray enumerates as modifications of the flower — coalescence, adnation, irregularity, abortion, non-alternation or anteposition, multiplication, enation, unusual development of the axis, and other morphological modifications connected with fertili- zation. These are obviously too numerous, as may best be shown by a single comparison with the view of an animal morphologist. Thus Huxley, in discussing the arrangement of the Vertebrata, recognizes only three processes of modification, not only in the ancestral evolution of the Equide, but in the individual develop- ment of animals generally ; these are "(1) excess of development of some parts in relation to others, (2) partial or complete suppres- sion of certain parts, (3) coalescence of parts originally distinct." It is probable that this " threefold law of evolution" may include all observed cases of change, even in the flower ; thus Chorisis and Peloria may be regarded as peculiar forms of excess, while displace- ment is probably in all cases only apparent, and really due to adhesion or coalescence (see Brouoey, vol. iii. p. 681 sg.).

§ 7. Nature of Morphological Correspondence — Categories of Homology.— To indicate all the steps by which the idea of mor- phological has been distinguished from that of physiological resemblance would be to examine the whole history of morphology; it must suffice to discuss the terminology of the subject which has, as ever, served not only as an index but as an engine of progress. For these two distinct forms of resemblance the terms homology and analogy gradually became specialized, aud were finally estab- lished and clearly defined by Owen in 1843,—" the former as the same organ in different animals under every variety of form and function (e.g., fore-limbs of Draco volans and wings of Bird); the second as a part or organ in one animal which has the same function

~~1 Compare A. de St-Hilaire, Morphologie; Gray, Manual, p. 179 (1858); Huxley, Proc. Zool. Society, p. 619, Lond., 1880.~~

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~~as another part or organ in a different animal (¢.g., parachute of Draco and wings of Bird)." He further distinguishes three kinds of homology : —(1) special, being "that above defined, namely, the correspondence of a part or organ determined by its relative position and connexions with a part or organ in a different animal, the determination of which homology indicates that such animals are constituted on a common type," e.g., basilar process of human occipital with basi-occipital of fish ; (2) general, that "higher relation in which a part or series of parts stands to the fundamental or general type, involving a knowledge of the type on which the group in question is constituted," eg., the same human bone and centrum of the last cranial vertcbra ; (3) serial homology, "repre-sentative or repetitive relation in the segments of the same skeleton "~~

~~(demonstrated when general and special homologies have been'~~

~~determined); thus usually the basi-occipital and basi-sphenoid are "homotypes." These terms were henceforth accepted by naturalists; but the criterion of analogy and homology became for Agassiz and other embryologists developmental as well as comparative, reference to the ideal archetype becoming less and less frequent. Passing over the discussions of Agassiz and Bronn, of which the latter is criticized and partly incorporated by Haeckel, we find the last-named (1) placing serial under general homology ; (2) erecting categories of homology partially corre- sponding to those of individuality, —(a) homotypy (of antimeres), hence distinct from that of Owen, (b) homodynamy (of metameres), (c) homonomy (of parts arranged on transverse axes) ; (3) defining special homology in terms of identity of embryonic origin. In 1870 this latter point was more fully insisted upon by Ray Lan- kester, who, decomposing it into two others, proposed to supersede the term homology by homogeny, being the correspondence of common descent, and homoplasy, denoting any superinduced correspondence of position and structure in parts embryonically distinct. Thus, the fore-limb of a mammal is homogenous with that of a bird, but the right and left ventricles of the heart in both are~~

~~only homoplastic, these having arisen independently since the divergence of both groups from a uni-ventriculate ancestor in relation to similarity of physiological needs. Mivart uext pro- als to retain homology as a generic term, with homogeny and~~

~~omoplasy as two species under it, and carried the analysis into pet detail, distinguishing at first twenty-five, but later fifteen, inds of correspondence :—(1) parts similar in function only, ¢.g., legs of Lizard and Lobster ; (2) parts sunilar both in function and relative position, wings of Bat and Bird; (3) parts of common descent, fore-limb of HIorse and Rhinoceros ; (4) parts of similar embryonic origin, whatever be their racial genetic relations, ¢.9., occipitals of Panther and Perch ; (5) parts of dissimilar embryonic origin, whatever be their racial genetic relations, ¢.g., legs of Diptera; (6, 7, 8, 9, 10) laterally, vertically, serially, antero- posteriorly, and radially homologous parts ; (11) subordinate serial homologues, ¢.g., joints of antenna; (12 and 13) secondary and tertiary subordinate serial homologues ; (14 and 15) special and general homologies (in Owen's sense). In his Kalkschwamme HIaeckel proposed to term homophyly the truly phylogenetic homology in opposition to homomorphy, to which geuealogic basis is wanting ; and finally Von Jhering has published a repetition of Lankester's view.~~

~~In this discussion, as in that of individuality, it is evident that we are dealing with numerous logical cross-divisions largely corre- sponding, no doubt, to the complex web of inter-relations presented by nature, yet remaining in need of disentanglement. Though we must set aside analogies of functional activity, the resemblances in external shape or geometric ground-form which correspond to these, c.g., HIydrozoa and Bryozoa, Fishes and Cetaceans, mimetic organisms, are nevertheless, as our historic survey showed, the first which attract attention ; and these homoplastic or homomor- phic forms, as HIaeckel has shown, come as fairly within the province of the promorphologist as do isomorphic crystals within that of his an-organological colleague the erystallographer. HIere, too, would be considered "radial," " vertical," "lateral" homology, "homotypy of antimeres," and all questions of symmetry, for which HIaeckel's nomenclature of homaxonial, homopolic, &c., is distinctly preferable. Entering the field of tectology or morphology~~

~~*in the ordinary sense, we may next consider whether two organisms compared are of the same category of individuality—are homocategoric ; and under this serial homology, for instance, would come as a minor division, the correspondence between the units or parts of units of a linear dyad-deme or triad. From a third point of view, that of the embryologist, we trace the development of each multi- cellular organism (1) from the embryonic layers and systems into which the secondary unit (gastrula or plant embryo) differentiates, (2) from a unit-deme or unit of the inferior order or orders of individuality. The parts and units thus recognized by ontogenetic research, respectively or successively homodermic, homosystemic, and homodemic, may then conveniently be termed (indifferently save for considerations of priority) either " specially homologous," "homogenous," "" homophylic," or " homogenetic," in the language of phylogenetic theory. These three great classes of morphological*~~

~~*correspondence—promorphological, tectological, and embryological—may or may not coincide. But the completest homology, in which all forms of resemblance unite and from which they differentiate, is that expressed in the cell theory, or rather in that ovum theory which underlies it, and which Agassiz therefore not unjustly regarded as " the greatest discovery in the natural sciences of modern times." }*~~

~~*§ 8. Results to Taxonomy.—The advance and modification of classifications which follow each morphological advance have been pointed out above, and taxonomy thus never quite reaches a level with morphological knowledge. That it requires much reform at present is obvious. Although the dogma of the constancy of species is no longer maintained, its results survive, and perhaps a majority of groups have still to be remonographed in the generalizing spirit with which Haeckel has treated the calcareous Sponges, or Car- penter, Parker, and Brady the Foraminifera. The union of the Protophyta and Protozoa into the Protista (a generalization which research is constantly confirming) involves a final abandonment of the medieval figment of three kingdoms of nature, and a revival of the Organisata of Linneus. Physiological prejudices, too,*~~

~~*are not completely expelled ; hence, for instancc, the constant attempts to separate Animalia and Vegetabilia by physiological character- istics, which would be irrelevant even if in themselves valid. A strictly morphological standard must be applied to the construction of classifications and the pruning of genealogical trees ; organisms are " higher" or 'lower " not according to their stage of evolution in beauty or intelligence but (as Huxley has most clearly pointed out in the essay referred to under § 6) to the degree of morphological differentiation by excess, suppression, or coalescence which they exhibit. Thus the supreme position of Man in classification must be abandoned, since the Primates are simply one of the less special- ized, z.e., lower orders of Mammals, and the Mammals themselves are on the whole distinctly less specialized than the Birds, or per- haps even some of the higher Reptiles. The morphological import- ance of the 'vegetable kingdom" sinks when tested by such a standard. The Cormophytes are all nothing more than an axis with appendages, and as such may fairly be compared, not with the entire animal assemblage, but merely to that group which is homomorphic (or rather isomorphic) with them as reducible to axis and appendages too. Such a group we find in the Hydrome- duse, which we can easily model in imagination into all the special- izations of the floral world, a single genus like Clava or Tubularia affording a starting-point for countless 'natural orders."*~~

~~*§ 9. Relation of Morphology to Physiology.—Although the pure morphologist investigates laws of structure only, and rightly elimi- nates the conceptions of life, environment, and function, yet if kept permanently apart from physiological considerations his labours would be incomplete and his results inexplicable, if not indeed almost illusory. For, however deeply one penetrates through super- ficial and adaptive characters to an apparently permanent and fundamental morphological type, this is itself but an earlier adapta- tion, showing the fading traces of an earlier adaptation still. And, conversely, the most superficial of adaptive characters, if trans- mitted to numerous varying descendants, may attain high morpho- logical importance. The morphological aspect of an organism is merely statical, and, like that of an eddy or a vortex-ring, becomes only truly intelligible when viewed in its dynamic aspect; and thus, though the demonstration of the structural unity of the organic*~~

world is in itself a great result, yet the desire of a deeper explanation of form as determined by function and environment is thereby rendered all the more pressing. An example may be taken from botany. Thus Airy beautifully explains the pheno- mena of phyllotaxis as adaptations to bud-life. Or again, in a common flower, say the Dead-nettle, all the details of form are in- deed described by the systematist with equal minuteness (a pro- ceeding which, except in so far as serving for specific identification, is of no further scientific value), but receive separate interpretation from the two distinct standpoints of the toa leet and physio- logist. The latter, to whom form is important merely so far as explanatory of function, shows how the tough persistent calyx is protective against various dangers, how the corolla serves to lure the fertilizing bees, which find in its lip a landing stage and in each lateral process a hold-fast, while its Head at once protects the pollen against rain and determines the curvature of the stamens, — this curvature, as well as their didynamous arrangement, median position, and linearly arranged anther-lobes being all adaptations through the medium of the bee's hairy back to meet the similarly placed stigma of another flower, — and so on. The morphologist, on the other hand, analyses the calyx into its five constituent sepals, reduces the corolla to a regular pentamerous type, ascertains the position of the four stamens, and asserts the loss of a fifth posterior one, finds the ovary to be primitively two-celled, and thus reaches a schematic conception of a not archetypal but ancestral form. This ground-form itself, however, suggests a new train of considera-

1 For bibliography see Lankester, An. Mag. Nat. Hist., 1870, or Geddes, Jena. Zeitschr., 1883.

this primeval flower from a somewhat fern-like Cryptogam, of which the foliage-leaves, the envelopes of the spore-bearing leaves, the

micro- and macrosporangiosphores had become permanently differ- entiated in ascending order; of which the microspores, doubtless through the intervention of a spore-eating insect, had come to ger- minate upon the macrosporangium instead of upon the ground ; and in which this variation (evidently advantageous, since making ferti- lization at once

~~more certain and more economical) was aided to per- petuate itself by the contemporaneous evolution of those floral colours which are nascent even among the Thallophytes. And thus the mor- phologist, though excluding teleological and functional econsidera- tions fron his anatomical researches, has yet a physiological ideal, and enters sooner or later upon a new serics of inquiries—those of the interdependence of structure and function. Milne-Edwards's law of the physiological division of labour, Dohrn's principle of functional change, the speculations of Claude Bernard, Spencer, and Hacckel, experimental inquiries such as those of Semper, where organisms are subjected to special modifications of their environment, and the like, are all contributions to this newest and evolutionary department of morphology. Such ideas are even applied to the study of cellular morphology. Thus, Spencer points out the relation~~

~~MORRIS, Ropert (1734-1806), American statesman, was born at Liverpool, England, on 20th January 1734. At the age of thirteen he accompanied his father to America, and after serving in a counting-house at Philadelphia he became in 1754 partner in the business. From 1776 to 1778 he was delegate to the Continental Congress, and he was one of those who signed the Declaration of Inde- pendence. During the war he served on the committee of ways and means, and freely placed his immense wealth at the disposal of his country, his personal credit being at one time pledged to the amount of $1,400,000. He also in 1780 established the Bank of North America, and until 1784 acted as superintendent of finance. In 1786 he be- came a member of the Pennsylvania legislature, and he was one of the convention which framed the Federal constitu- tion in 1787. From 1786 to 1795 he was United States senator. On account of the disastrous result of some of his financial speculations Morris passed the later years of his life in a debt prison. He died at Philadelphia, 8th May 1806. Robert Morris had as his assistant-superin- tendent of finance Gouverneur Morris (1752-1816), with whom he engaged also in several mercantile enterprises. Gouverneur Morris, who rose to some eminence as a states- man and orator, was more fortunate in his speculations than his colleague, and latterly became celebrated for the munificence of his hospitality. He was the author of a series of essays on currency and finance, which are included in the Life, Correspondence, and Writings of Gouverneur Morris, 3 vols., edited by Jared Sparks, 1832.~~

~~*MORRIS-DANCE, or Morrice-DANCE, a performance for a long time associated with certain festive seasons in England, but now wholly discontinued. The origin of the name is doubtful ; and whether the dance was indigenous to England, or was introduced by John of Gaunt from Spain, or was borrowed from the French or Flemings, must be left to conjecture. That, as the name would seem to indicate, it was a development of the morisco- dance or Spanish fandango is not, however, invalidated by the fact that the morisco was for one person only, for, although latterly the morris-dance was represented by various characters, uniformity in this respect was not always observed, and the elements of the dance may have been borrowed from the morisco. There are few references to it earlier than the reign of Henry VII., but it would appear that in the reign of Henry VIII. it was an almost essential part of the principal village festivities. Although allusions to it in poems are very frequent in the 16th and 17th centuries, nothing more than fragmentary descriptions have been handed down to us, so that an accurate know- ledge of its characteristic features at even any particular period is impossible. In earlier times it was usually*~~

~~*of the shapes of cells to their environments; James ingeniously explains the oecurrence of cell-division by the rapid inerease of bulk over surface which the growth of a solid involves, and the corresponding inerease of difficulty of nutrition ; and the writer has attempted to explain the forms of free and united eells as specializations of a (protomyxoid) cyele in which variations of func- tional aetivity are accompanied by the assumption of corresponding forms, the whole series of changes depending npon the properties of protoplasin under the variations in the supply of energy from the environment. Rauber, His, and others have even attempted to explain embryological phenomena in terms of the simplest cellular mechanies, but as yet such speculations are somewhat erude.!*~~

~~*$10. Orientation and Subdivisions of Morphology.—The position of morphology in the classification of the sciences and the proper mode of subdividing it cannot be diseussed within these limits, although the latter*~~

~~*is especially the subject of much disagreement. The position above assumed, that of including under morphology the whole statical aspects of the organic world, is that of Haeckel, Spencer, Huxley, and most recent animal morphologists ; botanists frequently, however, still use the term under its earlier and more limited significance." (P. GE.)*~~

~~*danced by five men and a boy dressed in a girl's habit, who was called Maid Marian. There were also two musicians ; and, at least sometimes, one of the dancers, more gaily and richly dressed than the others, acted as "foreman of the morris." The garments of the dancers were ornamented with bells tuned to different notes so as to sound inharmony.? Robin Hood, Friar Tuck, and Little John were characters extraneous to the original dance, and were introduced when it came to be associated with the May-games. At Betley, in Staffordshire, there is a painted window of the time of Henry VIIL, or earlier, portraying the morris,—the characters including Maid Marian, Friar Tuck, the hobby-horse, the piper, the tabourer, the fool, and five other persons apparently representing various ranks or callings. The hobby-horse, which, latterly at least, was one of the principal characters of the dance, consisted of a wooden figure attached to the person of the actor, who was covered with trappings reaching to the ground, so as to conceal his feet. The morris-dance was abolished along with the May-games and other festivities by the Puritans, and, although revived at the Restoration, the pageant gradually degenerated in character and declined in importance. Maid Marian latterly was personated by a clown who was called Malkin. Though the dance is now wholly discontinued, it is probable that some of the original elements of it still survive in a country-dance which, under the same name, is still popular in the north of England. See Douce, " Dissertations on the Ancient Morris Dance," in his Illustrations of Shakspeare (1839); Strutt, Sports and Pastimes of the People of England ; and Brand, Popular Antiquities (1849). MORRISON, Rosert (1782-1834), the first Protestant missionary to China, was born of Scottish parents at Morpeth, Northumberland, on 5th January 1782. After receiving an elementary education in Newcastle, he was apprenticed to a lastmaker, but his spare hours were devoted to studies connected with theology, and in 1803 he was received into the Independent academy at Hoxton. In the following year he offered his services to the London Missionary Society, by which,*~~

~~after he had attended the mission college of Gosport and studied Chinese under a native teacher, he was sent to Canton in 1807. He was appointed translator to the East India Company's factory~~

~~1 See, Bronoey, vol. iii. p. 681 sg. ; Spencer, Principles of Biol. ; Haeckel, Gen. Morph. ; C. Bernard, Phénoménes d. 1. vie communs aux an. et aux vég.; Semper, Animal Life (1880); James, Edin. Med. Journal, 1883 ; Geddes, Zool. Anzeiger, 1883 ; Rauber, Morph. Jahrb., vi. ; Haeckel, Kalkschwamme, i. p. 481, &c.~~

~~2 See Haeckel, Gen. Morph., i. Introduction ; also Comte, Phil. Pos., iii. (1851-1854) ; Spencer, Prin. of Biol., i. ; Gegenbaur, Comp. Anat. ; Asa Gray, Manual; and the article BroLoay ; also Geddes, Jena Zeitsehr., 1883.~~

~~3 See Sir Walter Scott's Fair Maid of Perth, note on a dress pre- served by the glover incorporation of Perth.~~

~~there in 1808, and, in addition to his official duties con- nected with this post, laboured with intense application at a Chinese Grammar and a translation of the New Testament, both of which were published in 1814. In 1817 he published A View of China for Philological Pur- poses, and his translation of the entire Bible was completed~~

~~instantaneously any distance along a wire; and if it were interrupted a spark would appear. It now occurred to him that the spark might represent a part of speech, either a letter or a number; the absence of the spark, another part; and the duration of its absence, or of the spark itself, a third, so that an alphabet might be easily formed, and words indicated.~~

~~in the following year. His next enterprise was the estab- lishment of an Anglo-Chinese college at Malacca for "the reciprocal cultivation of Chinese and European literature," which was opened in 1820. In 1821 his Chinese Dictionary was published by the East India Company at an~~

~~*expense of £15,000. Leaving China at the close of 1823 he spent two years in England, where he advocated Chinese missions before large and enthusiastic audiences, and was elected a Fellow of the Royal Society. Returning to China in 1826 he set himself to promote education and to prepare a Chinese commentary on the Bible and other Christian literature. He died at Canton on lst August 1834. His Memoirs, compiled by his widow, were published in 1839 (2 vols. 8vo, London).*~~

~~*MORRISTOWN, a city of the United States, county seat of Morris county, New Jersey, lies on the Whippany river, 81 miles from New York by the Morris and Essex division of the Delaware, Lackawanna, and Western Rail- road. It was twice the headquarters of the American army during the War of Independence, and Washington's residence, owned by the Washington Association, assisted by the State, is a half-mile to the east. On Whatnong mountain, 3 miles distant, stands the State insane asylum, usually called Morristown Asylum, a vast granite building 1243 feet long, erected in 1874-1875, and capable of ac- commodating 1000 patients. The population in 1880 was 5418.*~~

~~*MORSE, Samuet Finney BREESE (1791-1872), artist and inventor, was born at the foot of Breed's Hill, Charles- town, Massachusetts, on 27th April 1791. His father was the Rev, Jedediah Morse, D.D., the author of Morse's Geography. At the age of fourteen Samuel Morse entered Yale College ; under the instruction of Professors Day and Silliman he received the first impulse towards those elec- trical studies with which his name is mainly identified. In 1811 Morse, whose tastes during his early years led him more strongly towards art than towards science, be- came the pupil of Washington Allston, then the greatest of American artists, and accompanied his master to England, where he remained four years. His success at this period was considerable; but on his return to America in 1815 he failed to obtain commissions for historical paintings, and after working on portraits for two years at Charleston, S.C., he removed first to Washington and afterwards to Albany, finally settling in New York. In 1825 he laid the foundations of the National Academy of Design, and was elected its first president, an office which he filled until 1845. The year 1827 marks the revival of Morse's interest in electricity. It was at that time that he learned from Professor J. F. Dana of Columbia College the ele-*~~

~~*mentary facts of electromagnetism. As yet, however, he was devoted to his art, and in 1829 he again went to Europe to study the old masters.*~~

~~*The year of his return, 1832, may be said to close the period of his artistic, and to open that of his scientific life. On board the packet-ship "Sully," which sailed from Havre Ist October 1832, while discussing one day with his fellow-passengers the properties of the electromagnet, he was led to remark: "If the presence of electricity can be made visible in any part of the circuit, I see no reason why intelligence may not be transmitted by electricity." Tt was not a novel proposition, but the process of formu-lating it started in his mind a train of new and momentous ideas. 'The current of electricity, he knew, would pass*~~

~~*In a few days he had*~~

~~*completed rough drafts of the necessary apparatus, which he displayed to his fellow-passengers.!_ During the twelve years that followed Morse was engaged in a painful struggle to perfect his invention and secure for it a proper presenta- tion to the public. mission him to paint one of the great historical pictures in the rotunda of the Capitol seemed to destroy all his old artistic ambition. prise, making his own models, moulds, and castings, deny- ing himself the common necessaries of life and encountering embarrassments and delays of the most disheartening kind. It was not until 1836 that he completed any apparatus that would work, his original idea having been supple- mented by his discovery in 1835 of the "relay," by means of which the electric current might be reinforced or renewed where it became weak through distance from its source. Finally, on 2d September 1837, the instrument was exhibited to a few friends at his room in the university building, New York, where a circuit of 1700 feet of copper wire had been set up, with such satisfactory results as to awaken the practical interest of the Messrs Vail, iron and brass workers in New Jersey, who thenceforth became asso- ciated with Morse in his undertaking. Morse's petition for a patent was dated 28th September 1837, and was soon followed by a petition to Congress for an appro-priation to defray the expense of subjecting the telegraph*~~

~~*The refusal of the Government to com-*~~

~~*In poverty he pursued his new enter-*~~

~~*to actual experiment over a length sufficient to establish its feasibility and demonstrate its value. The committee on commerce, to whom the petition was referred, reported favourably. Congress, however, adjourned without making the appropriation, and meanwhile Morse sailed for Europe to take out patents there. The trip was not a success. In England his application was refused, on the alleged ground that his invention had been already published ; and, while he obtained a patent in France, it was subse- quently appropriated by the French Government without compensation to himself. His negotiations also with Russia proved futile, and after a year's absence he returned to New York. On 23d February 1843 Congress passed the long-delayed appropriation, steps were at once taken to construct a telegraph from Baltimore to Washington, and on the 24th of May 1844 it was used for the first time. Morse's patents were already secured to him and his asso- ciates, and companies were soon formed for the erection of telegraph lines all over the United States. In the year 1847 Morse was compelled to defend his invention in the courts, and successfully vindicated his claim to be called the original inventor of the electromagnetic recording tele- graph. Thenceforward Morse's life was spent in witnessing the growth of his enterprise and in gathering the honours which an appreciative public bestowed upon him, As years went by he received from the various foreign Govern- ments their highest distinctions, while in 1858 the repre- sentatives of Austria, Belgium, France, the Netherlands, Piedmont, Russia, the Holy See, Sweden, Tuscany, and Turkey appropriated the sum of 400,000 francs in recog- nition of the use of his instruments in those countries. In the preparations for laying the first Atlantic cable he took an active part, though the attempt of 1857, in which he personally engaged, was not successful. He died 2d April*~~

~~*1 Five years later the captain of the ship identified under oath Morse's completed instrument with that which Morse had explained on board the "Sully" in 1882.*~~

~~*1872, at New York, where his statue in bronze now stands in the Central Park. His instrument and alphabet are now used on 95 per cent. of the telegraph wires of the world. (GE-ee)*~~

~~*MORSHANSK, a district town of Russia, situated in the government of Tamboff, 58 miles (187 miles by rail) to the north of the capital of the province on the Tsna river, a tributary of the Oka, and on the railway between Moscow and Orenburg. The village Morsha was founded only in the middle of the 17th century, and received municipal institutions in 1779 ; but a hundred years ago it was already a wealthy town, owing to its situation ina most fertile district. Since it was brought into railway communication with Riazhsk (on the railway between Moscow and Riazan) it has acquired still more importance, and has become the chief centre for trade in wheat raised in the governments of Tamboff, Penza, Saratoff, and in the eastern districts of the government of Riazan. Merchants from Moscow, Yaroslav, Vladimir, St Petersburg, and the Baltic ports come to Morshansk to make large purchases of grain, flour, hemp-seed, tallow, and potash. These are sent, either to the Shilovskaya loading-place, or by rail to Moscow. There are in Morshansk several steam flour- mills, distilleries, and large store-houses for grain; the town, though built of wood, is cleaner than most of the towns of the black-earth region. Morshansk has also some importance for the import of manufactured ware brought from the north and sent thence to the villages of the neigh- bouring districts. Population, 20,000.*~~

~~*MORTALITY TABLES. See INsuRANcE, vol. xili. p. 169 sq.*~~

~~*MORTGAGE. The general object of mortgage is to secure a money debt by making it a charge on land, so that, if the debt be not paid by a time agreed upon between the parties, the creditor may sell the land and pay himself out of the proceeds. In English law this is done by a conveyance of the land in absolute terms to the creditor, subject only to its being defeated if the debt should be paid at the time fixed—an arrangement to which the law has attached peculiar incidents designed to carry out its real object. An absolute conveyance, however, is by no means essential to the purposes of mortgage.*~~

~~*The history of mortgage transactions in Roman law shows three well-marked stages. In the beginning the estate was conveyed absolutely to the creditor, who made a covenant (fiducia) to reconvey it when the debt should be paid. All the interest, however, in the meantime passed from the debtor to the creditor, and should the latter refuse to reconvey there was no remedy to the original owner except a personal action. In the second stage (that of pignus) the property did not pass to the creditor ; he merely received possession of the thing pledged, together with certain rights of sale, &c., in the event of payment not being made at the time appointed. Lastly, without part- ing with the possession even of the pledge the debtor could create a lien or charge (hypotheca) over it in favour of the creditor, who acquired thereby a right on failure of payment to follow the thing by real action against the possessor, whosoever he might be, and to repay himself from the proceeds of his sale.*~~

~~*The mortgage of English law is the result of two dis- tinct influences, Its origin and form belong to the common law; the restrictions by which it is made to serve the purpose of a security only, and nothing more, belong to the courts of equity. In the eye of the common law the mortgagee was the owner of the estate conveyed in the mortgage; in equity the mortgager remains the real owner, and the mortgagee is merely an encumbrancer. A, the owner of land in freehold, conveys to B and his heirs, with a proviso that on repayment of money lent by B to A, on*~~

~~*a future day, with interest until payment, B or his heirs will reconvey the estate to A and his heirs, and that, until default be made in payment, A and his heirs may hold without interruption from B and his heirs. This is a common mortgage of land, and at law, after failure of payment, the land belonged absolutely to the mortgagee, while in the meantime, before payment, the legal estate was considered to be vested in him, subject only to being defeated by payment at the proper time. The Court of Chancery first interfered in the reign of James I. to decree a redemption after forfeiture, and a case in the reign of Charles I. decides that payment after forfeiture has the same effect as payment before. The right of the mortgager to redeem his estate after it has been forfeited, according to the terms of the deed, is called his equity of redemption. No agreement between the parties was suffered to oust the jurisdiction of the court, or to deprive the debtor of his equity of redemption. And this equity, at first regarded as a mere right of the debtor, became established in course of time as an estate in land which descended to the heirs of the mortgager. On the other hand, the interest of the mortgagee is part of his personal estate, and passes to his executor and not to his heir. In spite of the terms of the mortgage, the owner of the land is still the owner, and the mortgagee is a creditor for the money he advanced and the interest thereon. It may be a question whether a given deed is a conveyance or a mortgage, and the court, in deciding, will look at all the circumstances of the case, and will treat it as a mortgage when it was the real intention of the parties that it should operate as a security only. Thus, if the price was grossly inadequate, if the purchaser was not let into immediate possession, if he accounted for the rents to the grantor, retaining an amount equivalent to interest, if the expense of the deed was borne by the grantor, there would be reason to believe that the conveyance was only meant to be a mort- gage. And "once a mortgage, always a mortgage;" no subsequent agreements can change its character.*~~

~~*A mortgagee may, however, on default of payment file a bill of foreclosure requiring the mortgager to pay the amount of the debt with interests or costs by an appointed day, or submit to be deprived of his equity of redemption. The effect of failure to pay by the time appointed would be to make the mortgagee absolute owner of the estate ; but the court in any*~~

~~*foreclosure suit may, at the request of either side, order a sale instead of a foreclosure. And a power of sale is now implied as one of the incidents of the mortgage, unless forbidden or varied by express des- tination. The mortgagee is entitled to retain out of the proceeds of the sale the amount of his principal, interest, and costs, the surplus belonging to the mortgager. A mortgager cannot require the creditor to receive payment before the time appointed in the deed; and, on default of payment at the appointed time, he must give the creditor six months' notice of his intention to pay off the mortgage, so that the creditor may have time "to look out for a fresh security for his money."*~~

~~*When the same land is successively mortgaged to different persons, their rights take priority according to their chrono- logical order. But the operation of equitable doctrines in the formation of the law of mortgage leads to an im- portant modification of this rule. Of the successive mort- gagees, the first only takes the legal estate, and this, according to the maxim of the Court of Chancery, will turn the scale when there is an equality of equitable rights between two contracting parties. Thus, if the third mort- gagee had no notice at the time of making his advance of the existence of the second mortgagee, the equities of the two claimants are supposed to be equal, and if nothing else intervened priority of time would decide the order of*~~

~~*their rights. But if the third mortgagee gets an assign- ment of the first mortgage, he can tack his third mortgage to the first, and so postpone the second mortgagee. And if the first mortgagee himself makes an additional advance after the date of the second mortgage, but without notice of it, his whole debt will take precedence of the second mortgagee. A similar result of equitable rules is seen in the consolidation of securities. Two separate estates, mortgaged at different times and for different sums of money by the same mortgager to the same mortgagee, are regarded as consolidated, so that the whole of the land becomes security for the whole of the money, and the owner cannot redeem either mortgage without redeeming the other. So that, as Mr Justice Williams reasons, no person can safely lend money on a second mortgage, for, in addition to the risk of a third*~~

~~*mortgagee tacking, there is the danger that, if the mortgager should have mortgaged another estate for more than its value, the holder of the deficient security may buy in the first mortgage, consoli- date it with his own, and exclude the second mortgagee. An equitable mortgage is constituted simply by the deposit of title-deeds in security for money advanced. The enactment of the Statute of Frauds that no action shall be brought on "any contract or sale of lands," &c., or any interests in or concerning them unless the agreement be in writing and signed by the party to be charged, has been cited as incompatible with the recognition of equitable mortgages, but it is argued by Lord Abinger that the Act was never meant to affect such a transaction. 'The deeds which are the evidence of title could not be recovered in an action at law, and, if they were claimed in equity, the court would require the claimant to do equity by repaying the money borrowed on the deposit. Any subsequent legal mortgagee, having notice of the deposit, will be post- poned to the equitable mortgagee, and when the legal mortgagee has not inquired as to the title-deeds the court will impute to him such knowledge as he would have acquired if he had made inquiry. As to mortgages of personal property see PLEDGE. United States.—In the United States there is great diversity in the extent to which equitable principles have been formally substi- tuted for the rules of the common law in dealing with mortgages. Washburn (Law of Real Property, vol. ii.) arranges the States into three "pretty well-defined classes." In the first, the mortgage deed is held to createa seizin of and an estate in the premiscs, with all its common law incideuts, to be enforced if need be by eject- ment. In the second, the mortgagee's rights are limited to such as the rules of equity prescribe, and may not be enforced by a suit at law. In the third, the mortgagee's interest is not deemed an estate at all, but is here only to be enforced by the sale of the pre- mises as a means of paying the debt. In the first class come Massachusetts, Maine, Connecticut, New Hampshire, Rhode Island, Vermont, Indiana, Missouri, North Carolina, Mississippi, Minnesota ; in the second, Iowa, Illinois, Pennsylvania, Kentucky, Ohio, Wisconsin, and Texas ; in the third, California, Georgia, and New York, to which may be added Oregon. (E. R.) » MORTIFICATION, a term used in surgery signifying 2 local death. Any cause which interferes with the blood-supply of a portion of the body will, if sufficiently pro- longed or sufficiently severe, give rise to mortification. In some cases the death may*~~

~~be preceded by inflammation ; in others, as in old people with diseased vessels, the part may die in consequence simply of insufficient blood-supply without any previous inflammation. The part is said to mortify ; the process is termed gangrene ; the dead part is called a slough. A severe injury may end in mortifica- tion, Extreme heat as in severe burns, or extreme cold as in frost-bite, may give rise to the condition. Those parts of the body farthest from the centre of the circula- tion are most liable to mortification. Frost-bite, for ex- ample, may attack the toes or fingers as well as those parts which are most exposed to the cold, more particu- larly the point of the nose or the ears. The part affected~~

~~becomes pale, bloodless, cold, and' insensible. point to attend to is to restore the circulation gradually, using gentle friction. fire, or if any hot applications are used, then a rapid re-~~

~~followed by mortification.~~

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~~The great~~

~~If the person is brought before a~~

~~action may issué in a severe inflammation, which may be Chilblain is a mild form of frost-bite occurring in young people with sluggish circula- tions, very often caused by sitting down before a strong fire with cold feet; any one suffering from cold feet or hands should take plenty of exercise, and if after a return from a sharp walk the feet remain cold the heat should be restored by rubbing with a rough towel.~~

~~MORTMAIN, Statutes or. The object and effect of these enactments are treated in the articles Cuarrry and CorPoRATION (q.v.). The following is a list of the Mort- main Acts :—~~

~~9 Henry III. c. 36 (Magna Charta); 7 Edward I. st. 2, ¢. 1 (De Religiosis) ; 18 Edward I. c. 32; 13 Edward I. ¢. 415 18 Ed- ward I. st. 1, c. 3; 27 Edward I. st. 2; 34 Edward I. st. 3; 18 Edward III. st. 3, c. 3; 15 Richard II. c. 5; 21 Henry VIII. c. 6, s. 5; 23 Henry VIII. c. 10; 1 and 2 Philip and~~

~~*Mary, c. 8, s. 51; 35 Elizabeth, c. 4; 21 James I. c. 1; 13 and 14 Charles II. ¢. 6, s. 10; 29 Charles II. c. 8; 7 and 8 William III. c. 37; 9 George II.*~~

~~*ce. 36; 43 George III. c. 108; 9 George IV. c. 85; and 2 and 3 William IV. c. 115.*~~

~~*MORTON, James Dovenas, fourth earl of (1530-1581), regent of Scotland, second son of Sir George Douglas of Pittendriech, was born at Dalkeith in 1530, Having married Elizabeth, daughter of the third earl of Morton, he through her succeeded in 1558 to the title and estates of his father-in-law. After the return of Queen Mary in 1561 he was chosen a privy councillor, and in 1563 he became lord high chancellor. Though his sympathies were Protestant, he took no part in the combination of Protestant barons in 1565, but he headed the armed force of 150 men who took possession of Holyrood Palace to effect the assas- sination of Rizzio, and it was to his house that the leading conspirators adjourned while a messenger was sent to obtain Mary's signature to the "bond of security." The queen, before complying with the request, escaped to Dunbar, and on her return to Edinburgh with an escort of 2000 men Morton and the other leaders fled to England. After her marriage with Bothwell, Morton returned, and with 600 men appeared before Borthwick Castle, where the queen, in dread of a rising, had taken refuge. He was present at the remarkable conference at Carberry Hill, and he also took an active part in obtaining the consent of the queen at Lochleven to an abdication. Thereupon he was reappointed lord high chancellor, and also succeeded Bothwell as lord high admiral. On the death of the earl of Mar he became regent (October 1572), Through his persistence in recovering the crown jewels from the countess of Argyll, widow of the earl of Moray, Morton awakened the bitter animosity of Argyll and Athole, who persuaded the young king James VI. to assume the government. Morton deemed it prudent to resign, and for a time retired to Lochleven, but shortly afterwards, with the assistance of his nephew, the earl of Mar, he obtained possession of Stirling Castle, where the king was residing, and thus for a time recovered his old influence. Suddenly, however, he was accused by James Stewart, earl of Arran, of having taken part in the murder of Darnley, the father of the king, and being tried by a jury of*~~

~~*sixteen peers, most of whom were his enemies, was condemned to death and be- headed on 2d June 1581.*~~

~~*MORVEAU. See Guyton DE MoRvVEAU.*~~

~~*MOSAIC (late Greek Yijpwous, from jos, a small stone; also povcetor, z.e., refined, delicate work ; hence the Latin opus musivum) is the fitting together of many, generally small, pieces of marble, opaque glass, coloured clays, or other substances, so as to form a pattern; the*~~

~~*design may be of various degrees of elaboration, from the simplest, almost monochromatic, geometrical pattern to the most elaborate picture, with figure-subjects represented in colours of countless gradations.*~~

~~*The earliest existing specimens of mosaic belong to one of the less important branches of the art — namely, the ornamentation on a small scale of jewellery, ivory thrones, and other furniture, or more rarely of some elaborate archi- tectural ornament. Most of this earliest sort of mosaic resembles in execution what are called clotsonnée enamels. In the Louvre and in the British Museum are preserved some very beautiful ivory carvings in low relief, some from Nineveh and others from Egypt, in which figures of deities, ornaments formed of the lotus and papyrus plants, and royal cartouches are enriched by small pieces of glass or lapis-lazuli and other gem-like stones, which are let into holes made in the ivory. Each minute piece is separated from the next by a thin wall or cloison of ivory, about as thick as cardboard, which thus forms a white outline, and sets off the brilliance of the coloured stones. The favourite pattern in this sort of work for decorating the larger sur- faces appears to have been suggested by the feathers on a bird's wing. See Ivory, vol. xiii. pl. vii. fig. 3.*~~

~~*Recent excavations at Tel al-Y4hudiya in Lower Egypt have brought to light some mosaics on a larger scale, but treated in the same way. These are caps of columns, wall tiles, and other objects, either of white*~~

~~*limestone or earthen- ware, in which designs, chiefly some forms of the papyrus, are formed by brilliantly-coloured bits of glass or enamelled earthenware, let into a sinking in the tile or column. This form of mosaic was employed by the Greeks: the Erechtheum at Athens, built in the middle of the 5th century B.c., had the bases of some of its white marble columns ornamented with a plait-like design, in which pieces of coloured glass were inserted to emphasize the main lines of the pattern.*~~

~~*Another, quite different sort of mosaic was known to the Egyptians of the Ptolemaic and Roman periods. This is made entirely of glass, and is extremely minute. The finest known specimen is in the British Museum: it is a small tablet about three-eighths of an inch square, apparently the bezel of a ring, on which is represented the sacred hawk,—every feather on the bird's wing being produced with a great number of colours and tints, each quite dis- tinct, and so minute that a strong magnifying glass is required to distinguish its details.*~~

~~*The way in which this wonderful little mosaic was pro- duced is extremely ingenious. Numbers of long sticks of various-coloured glass were arranged in such a way that their ends produced the figure of the hawk ; other sticks of blue glass were placed all round so as to form the ground. The whole bundle of sticks of glass when looked at endwise now presented the figure of the hawk with a blue background, immensely larger than it afterwards be- came. 'The bundle was then heated till the sticks melted together, and the whole thick rod, softened by fire, was then drawn out to a greatly-diminished thickness. In this process the relative positions of the sticks of coloured glass forming the design were not altered. A slice of the rod was then cut off, and its faces polished,—the design, much reduced in size, of course being equally visible at both sides of the slice ; and thus the microscopic minute- ness of the mosaic was produced, with astonishing delicacy and refinement; many slices, each showing the same mosaic, could be cut from the same rod.*~~

~~*The more important use of mosaic has been on a large scale either for pavements or for walls and vaulted ceil- ings. Mosaic for these purposes has by many writers, both ancient and modern, been divided on various systems into classes; perhapsthe simplest classification is the following:—*~~

~~*MOSATIC*~~

~~*I. For Pavements :—(a) Tesselated, in which the design is formed of small cubes, generally of marble, more rarely of glass or clay; (6) Sectile, formed of larger pieces of marble, shaped and cut so as to fit accurately one with another. Il. For Walls and Vaults:—Fictile or vermicu- lated ; pieces of opaque glass, in small cubes, arranged so as to form complicated pictures.*~~

~~*This classification is not altogether satisfactory, more than one method often being employed in the same mosaic ; as, ¢.g., in the "opus Alexandrinum" of medieval writers, which is often partly tesselated and partly sectile.*~~

~~*Until Roman times we know but little of these kinds of mosaic. There is some evidence (in Pliny and other writers) to show that elaborate mosaic pavements, Ac6o- atpwrov or AvGoAdynpa, were made by the Greeks in the 4th century B.c., or even earlier; but most of the nu- merous fine specimens of tesselated work still existing in Greece, such as those at Sparta and Athens, must be re- ferred to the time of the Roman occupation. The best examples of Hellenic mosaic are some pavements dis- covered during the recent excavations at Olympia (see fig. 1 and Ausgrabungen zu Olympia, 1877-82).*~~

~~*Among the Romans the use of mosaic, both of marble and opaque glass, was very extensive. According to Pliny (.N., xxxvi. 25), they derived this art from the Greeks, but not until the time of the Third Punic War, 146 B.c., while glass mosaics for walls, '"vitree parietes," were a recent invention in his time. Many of these have been found at Pompeii; most commonly they are used to decorate niches for fountains or statuettes, Judging from the description given by Vitruvius (vii. 1), and an examina- tion of numerous specimens of Roman tesselated mosaics,*~~

~~*ax*~~

~~*Fra. 1.—Greek Pavement from the Temple of Zeus at Olympia.*~~

~~*the process of manufacture was the following. The earth was first carefully rammed down to a firm and even surface , on this was laid a thick bed of stones, dry rubbish, and lime, called "rudus," from 6 to 9 inches deep, and above this another layer, 4 to 6 inches thick, called '" nucleus," of one part of lime to three of pounded brick, mixed with water ; on this, while still soft, the pattern could be sketched out with a wooden or metal point, and the tesseree or small bits of marble stuck into it, with their smoothest side upper- most. Lime, pounded white marble, and water were then mixed to the consistency of cream, forming a very hard- setting cement, called "marmoratum." This cement, while fluid, was poured over the marble surface, and well brushed into all the interstices between the tesserae, When the*~~

~~*MOSAIC*~~

~~*concrete and cement were both set, the surface of the pave- ment was rubbed down and polished. This kind of mosaic was largely used for floors of hypocausts ; the concrete bed was then supported on large tiles resting on numbers of short pillars,*~~

~~*If used for upper floors very strong joists were re- quired, and both Pliny (xxxvi. 25) and Vitruvius (vii. 1) recommend a double layer of boards, one crossing the other, on which the concrete and cement bedding was to be laid.*~~

~~*The usual Roman pavement was made of pieces of marble, averaging from a half to a quarter of an inch square, but rather irregular in shape. A few other, but quite exceptional, kinds of mosaic pavements have been found, such as that at the Isola Farnese, 9 miles from Rome, made of tile-like slabs of green glass, and a fine '"'sectile" pavement on the Palatine Hill, made of various-shaped pieces of glass, in black, white, and deep yellow. In some cases—e.g., in the " House of the Faun" at Pompeii—glass tesscre in small quantities have been mixed with the marble ones, for the sake of greater brilliance of colour. Pompeii is especially rich in its mosaics both on floor and walls, almost every house having at least its vestibule paved in this way.*~~

~~*In addition to graceful flowing patterns and geometrical de- signs, picture-like subjects of great elaboration frequently occur: of these the most important is the large and minutely-executed scene of the battle of Issus, found in the " House of the Faun." It is of special value as being the chief classical historical picture still existing. It is a well-designed though somewhat crowded com- position, representing the moment of Alexander's victorious charge against the cavalry of Darius, The expression of the faces and the characteristic dresses of the Greeks and Persians are repre- sented with great skill (see fig. 2). The tessere, as was always the case in this sort of work, arc not all the same size, the smallest (only about one-tenth of an inch square) being reserved for the faces, where greatest refinement of detail was required. This was a floor-mosaic, though generally these minutely-exccuted works were affixed to walls.*~~

~~*The most skilfully-executed of all existing mosaics of this pictorial kind is that known as "' Pliny's Doves," found in Hadrian's villa at Tivoli, and now in the Capitoline Museum. It may possibly be the one so highly praised by Pliny (xxxvi. 25) as the work of Sosus, for, although he describes it as being at Pergamum, yet it was a common practice with the Romans to transport these mosaics from one place to another, and this very celebrated one may well have been brought to Tivoli to adorn the emperor's villa. It is treated in a very realistic way: the light on the gold bowl, the plumage of the doves, and especially the reflexion in the water of the drinking dove, are represented with wonderful skill. It is, in fact, far too pictorial, and, like the late mosaics in St Peter's, Rome, is more remarkable for its technical skill than for any real artistic merit. This excessive realism, produced with great difficulty and cost, is a not uncommon fault of the more elaborate Roman mosaics, and was the inevitable result of the luxury and ostentation of imperial Rome, which made art the bond-slave of the wealthy, rather than the free and natural expression of a whole people, as it was among the earlier Greeks. om*~~

~~*Another interesting mosaic from the wall of a house at Pompeii, of extremely delicate work, is a rehearsal scene in a Greek theatre, where the choregus is instructing the actors: it is specially re- markable from its being signed as the work of Dioscorides of Samos. Other figure-subjects*~~

~~are not uncommon, such as various representations of the victory of Theseus over the Minotaur, others of Achilles in Scyros, many hunting seenes, and the like, ;~~

~~Throughout England, Germany, France, Spain, Asia Minor, and Northern Africa in no way have signs of Roman occupation been left so clearly and in so con- spicuous a form as by the numerous large and generally well-preserved mosaic pavements which have at various times been discovered in all these countries. In many cases, long after all traces of the walls of the buildings have disappeared, owing to their being dug up and re- moved for building purposes, the mosaics still remain to testify of the artistic power and mechanical skill of the Roman colonists.~~

~~Few countries are richer than England in these remains ; the great pavements of York, Woodchester, Cirencester, and many other places are as elaborate in design and as~~

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~~skilfully executed as any that now exist even in Rome itself. In whatever country these mosaics are found, their style and method of treatment are always much the same; the materials only of which the tessere are made vary according to the stone or marble supplied by each country. In England, for instance, limestone or chalk often takes the place of the white marble so common in Italian and North African mosaics; while, instead of red marble, a fine sort of burnt clay or red sandstone is gene- rally used ; other makeshifts had to be resorted to, and many of the Anglo-Roman mosaics are made entirely with- out marble. It is perhaps partly owing to the great wealth of Northern Africa in marbles of many colours and of varying shades that the finest of all Roman mosaics have been found in Algeria and Tunis, especially those~~

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Fic. 2.—Part of a Persian's Head from the Battle of Issus ; full size.

from Carthage, some of which have been brought to the British Museum. See Archeologia, vol. xxxvili. p. 202. The range of colour in the marble tesserz is very great, and is made use of with wonderful taste and skill: there are three or four different shades of red, and an equal number of yellows and greens, the last colour in all its tints being almost peculiar to this part of Africa, and one of the most pleasant and harmonious in almost any com- bination. Deep black, browns, and bluish-greys are also abundant. 'The white marble which forms the ground of nearly all the designs is often not pure white, but slightly striated with grey, giving great softness and beauty of texture to the surface, and doing away with too great monotony of tone. The Roman practice, common to all their mosaics, of not fitting the tessere quite closely together, but allowing the cement joints to show freely, was also of great value in giving effect to the general texture of the surface—a point quite forgotten by some later mosaic-workers, who thought that the closer their tesserae were fitted together the better the mosaic would be. This remark does not apply to sectile mosaic, in which sufficient variety can be given by the markings and veins in each piece of marble. To return to the mosaics from Carthage, they are no less excellent in design than in the richness and beauty of their materials. Large spaces

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are filled by grand sweeping curves of acanthus and other leaves, drawn with wonderful boldness and freedom of hand, and varied with great wealth of invention. With- out the use of very small tesserae, much richness of effect is given by gradations of tints, suggesting light and shade, without a painful attempt to represent actual relief. The colours of

~~*the marbles used here and elsewhere by the Romans are so quiet and harmonious that it would have been almost impossible to produce with them a harsh or glaring design, and when used with the skill and strong artistic feeling of the mosaic-workers at Carthage the result is a real masterpiece of decorative design, In Rome, and in the Roman colonies of Europe, this kind of marble tesselated mosaic was largely produced, with but little alteration in style or method of treatment, till the 4th century. In Syria and Asia Minor the art survived some centuries later.*~~

~~*Perhaps the latest existing example in Rome is that which deco- rates the vault of the ambulatory of the circular church of S. Costanza, built by Constantine the Great (320), outside the walls of Rome. This very interesting mosaic might from its style and materials have been executed in the 1st century, and is cqual in beauty to any work of the kind in Italy. It shows no trace what- ever of the Byzantine influence which, in the next century, intro- duced into Italy a novel style of mosaic, in materials of the most glittering splendour. These S. Costanza mosaics are almost unique in Italy as an application of the old classical marble mosaic to the decoration of a Otinatan church. On the main compartment of the vault the surface is covered by vine branches, laden with grapes, twining in graceful curves over the space. In the centre is a large medallion with life-sized male bust, and at the lower part are vintage scenes—oxen carts bringing the grapes, and boys treading them in avat. Other more geometrical designs, of circles framing busts and full-length figures, with graceful borders, cover other parts of the vault. Farther east this classical style of mosaic appears to have lasted till the 6th century. At Kabr-Hiram, near Tyre, M. Renan discovered among the ruins of a small three-apsed Christian church a fine mosaic pavement, covering the nave and aisles, thoroughly classical in style. The design, consisting of circles enclosing figures emblematic of the seasons, the months, and the winds, is almost the same as that of some mosaics discovered on the site of the Roman Italica near Seville, and others at Ephesus and Halicarnassus in Asia Minor. No trace of other than classical influence is visible, and yet it is pretty clear, from the evidence of an inscription, inlaid among the marble tessere, that the date of this pavement is not earlier than the latter part of the 6th century. A very similar mosaic, of about the same date, was discovered at Neby Yunas, near Sidon.*~~

~~*Medizval Mosaics.—These may be divided into four principal classes :—(1) those used to decorate walls and vaults, made of glass cubes ; (2) those for pavements, made of marble, partly in large shaped pieces, and partly in small tesseree ; (3) glass in small pieces, either rectangular or triangular, used to enrich marble pulpits, columns, and other architectural features ; (4) wood mosaics.*~~

~~*1. The wall mosaics were, in their origin, purely Byzan- tine, and appear to date from the beginning of the 5th century. They are made of coloured glass, rendered opaque by the addition of oxide of tin. The melted glass was cast into flat slabs, generally about half an inch thick, and then broken into small cubes. Every possible colour and grada- tion of tint was produced by the medieval glassmakers. Tesseree of gold (which were very largely used) and of silver were made thus :—the metal leaf was spread over one of the glass slabs, the colour of which did not matter, as it was hidden by the gold or silver; over this metal- coated slab a skin of colourless glass was fused, so as to protect the metal leaf from injury or tarnish; and then the slab was broken up into cubes, the y¥jdor ypiocor of Byzantine writers.*~~

~~*The method of putting together the mosaic was much the same as that employed by the Romans in their tesse- lated pavements. A thick coat of cement was applied to the wall or vault, the outline indicated with a metal point, and the cubes stuck one by one into the cement while it*~~

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~~*was yet soft,—the main difference being that no rubbing down and polishing were required, the faces of the glass tessere showing the natural surface of the fracture, which was not quite level, and by this slight inequality of surface great additional lustre and brilliance of effect were given to the whole picture.*~~

~~*Owing to the intense conservatism of Byzantine art, no regular stages of progression can be traced in this class of mosaic. Some of the 5th century mosaics at Ravenna are, in every way, as fine as those of the 12th, and it was not till the end of the 13th century that any important change in style took place, when Cimabue, and more especially his pupils Jacopo da*~~

~~*Turrita and Taddeo Gaddi, applied their increased knowledge of the human form and of the harmonies of colour to the production of the most beau- tiful of all mosaics, such as those in the apse of 8. Maria Maggiore in Rome. It must not, however, be supposed that during all this time (from the 5th to the 14th century) one steady level of excellence was kept up. The mosaics of the 9th century are inferior in drawing and general treatment to those both of the earlier and later time, while in Italy at least this art was almost entirely extinct during the 10th and 11th centuries. Extreme splendour of colour and jewel-like brilliance combined with the most stately grandeur of form are the main characteristic of this sort of decoration. Its most frequent application is to the sanc- tuary arch and apse of the early basilicas.*~~

~~*A "majesty," or colossal central figure of Christ with saints standing on each side, is the most frequent motive. In many cases, especially in the 5th and 6th centuries, Christ was represented as a lamb, to whom the twelve apostles, in the form of sheep, are paying adoration. Christ, the Good Shepherd, is sometimes depicted asa beardless youth, seated among a circle of sheep—the treatment of the motive being obviously taken from pagan representations of Orpheus playing to the beasts. The tomb of Galla Placidia has a good example of this subject, with much of the old Roman grace in the drawing and composition. Frequently the Virgin Mary, or the patron saint of the church, occupies the central space in the apse, with ranges of other saints on each side.*~~

~~*The "Doom," or Last Judgment, is a favourite subject for domes and sanctuary arches ; the Florence baptistery has one of the grandest mosaic pictures of this subject, executed in the 13th century. 'The earlier baptisteries usually have the scene of Christ's baptism,—the river Jordan being sometimes personified in a very classical manner, as an old man with flowing beard, holding an urn from which a stream pours forth. S. Vitale at Ravenna has in the sanctuary a very interesting representation of Justinian and his empress Theo- dora (see fig. 8), attended by a numerous suite of courtiers and ladies ; these mosaics are certainly of the 6th century, and may be contemporary with Justinian, though the fact that he and Theodora are each represented with a circular nimbus appears to indicate that they were not then alive. Scenes from both Old*~~

~~*and New Testaments or the lives of the saints are also represented in almost endless variety,—generally on the walls of the body of the church, in square-shaped pictures, arranged in one or more tiers over the nave columns or arcade.*~~

~~*In mosaics of the best periods the treatment of the forms and draperies is broad and simple, a just amount of relief being expressed by delicate gradations of tints. In mosaics of the 9th century the drawing is very awkward, and the folds of the robes are rudely expressed in outline, with no suggestion of light and shade.*~~

~~*A further application of this work was to the decoration of broad bands over the columns of the nave, as at 8. Maria Maggiore in Rome, 5th century, and in the two churches of §. Apollinare at Ravenna, 6th century. In some cases almost the whole interior of the church was encrusted in this magnificent way, as at Monreale Cathedral, the Capella Palatina of Palermo, and §. Mark's at Venice, the magnificence of which no words can describe; it is quite unrivalled by that of any other buildings in the world. See MoNREALE.*~~

~~*In these churches the mosaics cover soffits and angles entirely, and give the effect of a mass of solid gold and colour producing the utmost conceivable splendour of*~~

~~*MOSAIC*~~

~~*decoration.! In many cases vaulted ceilings were covered with these mosaics, as the tomb of Galla Placidia, 450 A.D., and the two baptisteries at Ravenna, 5th and 6th centuries. For exteriors, the large use of mosaic was usually confined to the west facade, as at 5S. Miniato, Florence, 8. Maria Maggiore, Rome, and 8. Mark's, Venice. In almost all cases the figures are represented on a gold ground, and gold is freely used in the dresses and ornaments—rich jewels and embroidery being represented in gold, silver, sparkling reds, blues, and other colours, so as to give the utmost splendour of effect to the figures and their drapery.*~~

~~*The revival of the art of painting in Italy and the*~~

~~*Fia. 8.—Mosaic of Theodora and attendants, from S. Vitale, Ravenna; over life-size.*~~

~~*'ntroduction of fresco work in the 14th century gave the deathblow to the true art of wall-mosaics. Though at first the simple and archaic style of Cimabue and his*~~

~~*ee*~~

~~*i Unfortunately the world-wide fame of 8. Mark's and the other great churches of Italy has subjected these extraordinary works to the fatal process of " restoration," and wherever any sign of decay in the cement backing (the tessere themselves are quite indestructible) has given the least excuse the "restorers" have destroyed whole masses of ancient work, and supplied its place with worthless modern copies. The mosaics of the 8. Mark's baptistery, and of the apses at 8. Miniato, at Pisa, and many other places have in this way been wantonly renewed within the last few years.*~~

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~~*pupils Jacopo da Turrita, Giotto, and Taddeo Gaddi was equally applicable to painting or mosaic, yet soon the development of art into greater realism and complexity required a method of expression unfettered by the necessl- ties and canons of mosaic-work. Pietro Cavallini, a Roman artist, was one of the last who worked according to the old traditions. His mosaic of the birth of the Virgin in S. Maria in Cosmedin, Rome, executed about the middle of the 14th century, is not without merit, though his superior knowledge of form has only caused his composi- tion to be somewhat feeble and insipid compared with the works of the earlier artists. Even in the 15th century a few good mosaics were produced at Venice and elsewhere. Since then many large pictures have been copied in glass mosaic, generally attempts to imitate oil paintings, executed with great skill and wonderful patience, but all utterly worthless as works of art, merely costly monuments of human folly and misapplied labour. The mosaics from Titian's pictures on the west end of S. Mark's at Venice, Raphael's in the Chigi Chapel in 8. Maria del Popolo, and many large pictures in §. Peter's in Rome, are the most striking examples of these.*~~

~~*The following list, in chronological order, comprises a selection*~~

~~*from among the most important medizval glass wall-mosaics during the period when mosaic-working was a real art :—*~~

~~*5th Century.*~~

~~*Ravenna. Orthodox Baptistery—vault. Tomb of Galla Placidia—vault, 450. Archbishop's Chapel—vault. Rome. S. Paolo fuori le mura—triumphal arch. 8. Maria Maggiore—square pictures over nave columns, and triumphal arch. Milan. S. Ambrogio, Chapel of 8. Satiro—vault. Fundi. Cathedral—apse. Nola. Cathedral—apse. 6th Century. Ravenna. Arian Baptistery—vault. 8. Apollinare Nuovo—apse and nave, with 9th century additions. 3. Vitale—apse and whole sanctuary, ctrea 547. 8. Apollinare in Classe—apse and nave, 549. Rome. 88. Cosmas and Damian—apse. Milan. 8. Lorenzo, Chapel of 8. Aquilinus—vault. Constantinople. 8. Sophia—walls and vault, circa 550. : Thessalonica. Church of St George—apse, dc. ; and 8. Sophia—dome and apse. Trebizond. 8. Sophia—apse. 7th Century. Rome. 8. Agnese fuori le mura—apse, 626. 8. Teodoro. Jerusalem, "Dome of the Rock "—arches of ambulatory, 68S. 8th Century. Rome. Baptistery of 8. Giovanni in Laterano.*~~

~~*8S. Nereus and Achilles. Mosque of Al-Aksa—on dome. Chapel of the Transfiguration.*~~

~~*9th Century.*~~

~~*Jerusalem. Mount Sinai.*~~

~~*Rome. S. Cecilia in Trastevere—apse S. Marco—apse. F S. Maria della Navicella—apse, and "Chapel of the Column.' S. Prassede—triumphal arch. S. Pudenziana, 884. Milan. §. Ambrogio—apse, 832. 10th Century. Cordova. Mihrab (sanctuary) of Mosque. llth Century. Jerusalem. "Dome of the Rack "—base of cupola, 1027. Constantinople. Church of 8. Saviour—walls and domes. 12th Century. Venice. S. Mark's—narthex, apse, and walls of nave and aisles. Caput. Cathedral—apse. Torcello. Cathedral—apse. Murano. Cathedral—apse. Salerno. Cathedral—apse.*~~

~~*Palermo. Capella Palatina, begun 1132—the whole walls. Church of La Martorana—vault. Monreale. Cathedral—the whole walls, 1170-90. Bethlehem. Churcl of the Nativity, 1169. Cefalu. Cathedral—apse, 1148. Rome. §. Clemente—apse. S. Francesca Romana—apse. S. Maria in Trastevere—apse. 13th Century. Florence. Baptistery vault, begun ¢. 1225 by Fra Jacopo. 8. Miniato—apse and west front. Rome. 8. Paolo fuori le mura—apse.*~~

~~*S. Clemente—triumphal arch, 1297. ;*~~

~~*§. Giovanni in Laterano—apse by Jacopo da Turrita, 1290.*~~

~~*§. Maria Maggiore—apse and west end by Jacopo da Turrita, 1292-1299, and Taddeo Gaddi.*~~

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~~*14th Century.*~~

~~*Florence. Baptistery, finished by Andrea Weie Pisa. Cathedral—east apse by Cimabue, 1302, north and south apses by his pupils. Rome. g. Peter's—navicella, in atrium by Giotto. 8. Maria in Cosmedin—on walls by Pietro Cavallini, c. 1340. Venice. 8S. Giovanni e Paolo—in arch over effigy of Doge Morosini.*~~

~~*This list is by no means exhaustive, and only gives some of the best and most typical examples of the mosaic-work of each century.*~~

~~*The Byzantine origin of these great wall-mosaics, wherever they are found, is amply proved both by internal and documentary evidence. The gorgeous mosaics of 8. Sophia and S. Saviour's in Constantinople, 6th century, and the later ones in the monasteries of Mount Athos, at Salonica and at Daphne near Athens, are identical in style with those of Italy of the same date. Moreover, the even more beautiful mosaic-work in the " Dome of the Rock" at Jerusa- lem, 7th and 11th centuries, and that in the sanctuary of the great mosque of Cordova, of the 10th century, are known to be the work of Byzantine artists, in spite of their thoroughly*~~

~~*Oriental design. he same is the case with the rarer mosaics of Germany, such as those in S. Gereon at Cologne and at Parenzo.. ;*~~

~~*A very remarkable, almost unique, specimen of Byzantine mosaic is now preserved in the "Opera del Duomo," Florence. This is a diptych of the 11th century, of extremely minute, almost micro- scopic, work, in tessers of glass and metal, perhaps the only example of tesseree made of solid metal. It has figures of saints and inscrip- tions, each tessera being scarcely larger than a pin's head. This beautiful diptych originally belonged to the imperial chapel in Con- stantinople, and was brought to Florence in the 14th century.*~~

~~*2. The second medieval class, mosaic pavements, though of great beauty, are of less artistic importance.*~~

~~*This so-called "opus Alexandrinum " is very common throughout Italy and in the East, and came to greatest perfection in the 13th century. It is made partly of small marble tessere forming the main lines of the pattern, and partly of large pieces used as a ground or matrix. It is generally designed in large flowing bands which interlace and enclose circles, often of one stone sliced from a column. The finest example is that at S. Mark's, Venice, of the 12th century. The materials are mainly white marble, with green and red porphyry, and sometimes glass,*~~

~~*Besides the countless churches in Italy possessing these beautiful pavements, such as 8. Lorenzo, 8. Marco, 8. Maria Maggiore, and S. Maria in Trastevere, in Rome, we have, in the Chapel of the Confessor, and in front of the high altar at Westminster, very fine specimens of this work, executed about 1268 by a Roman artist called Odericus, who was brought to England by Abbot Ware, on the occasion of a visit made by the latter to Rome. Another inglish example is the mosaic pavement in front of the shrine of Becket at Canterbury ; this is probably the work of an English- man, though the materials are foreign, as it is partly inlaid with bronze, a peculiarity never found in Italy. There are also many fine examples of these pavements in the churches of the East, such as that in S. Sophia at Trebizond, of the most elaborate design and splendid materials, very like the S. Mark's pavement at Venice. Palermo and Monreale are especially rich in examples of sectile mosaic, used both for*~~

~~*pavements and walls,—in the latter case generally for the lower part of the walls, the upper part being covered with the glass mosaics. The designs of these Sicilian works, mostly executed under the Norman kings in the 12th cen- tury, are very Oriental in character, and in many cases were actually executed by Moslem workmen. Fig. 4 gives a specimen of this*~~

~~*Fic. 4.—Marble Mosaic at Monreale Cathedral.*~~

~~*mosaic from Monreale cathedral. Its chief characteristic is the absence of curved lines, so largely used in the splendid opus Alex- andrinum of Italy, arising from the fact that this class of Oriental design was mainly used for the delicate panelling in wood on their*~~

~~*MOSAIC*~~

~~*pulpits, doors, &c.,—wood being a matcrial quite unsuited for the production of large curves.*~~

~~*3. Glass mosaic, used to ornament ambones, pulpits, tombs, bishops' thrones, baldacchini columns, architraves, and other marble objects, is chiefly Italian. The designs, when it is used to enrich flat surfaces, such as panels or architraves, are very similar to those of the pavements last described. The white marble is used as a matrix, in which sinkings are made to hold the glass tessere ; twisted columns are frequently ornamented with a spiral band of this glass mosaic, or flutings are suggested by parallel bands on straight columns. The cloisters of §. Giovanni in Laterano and S. Paolo fuori le mura have splendid examples of these enriched shafts and architraves.*~~

~~*This style of work was largely employed from the 6th to the 14th centuries. One family in Italy, the Cosmati, during the whole of the 13th century, was especially skilled in this craft, and the various members of it produced an extraordinary amount of rich and beauti- ful work. The pulpit in S. Maria in Ara Cceli, Rome, is one of the finest specimens (see fig. 5), as are also the ambones in 8. Cle- mente and S. Lorenzo,and that in Salerno a , sone eens ;*~~

~~*omb of Henry III., a — = It dat i oo i the Confessor, 1269, at CN Westminster are the only ; Sard riihl TNA examples of this work \ in England. They were executed by '* Petrus civis Romanus," probably a pupil of the Cosmati.*~~

~~*In India, especially during the 17th century, many Mohammedan buildings were decorated with fine marble inlay of the class now called " Flor- entine." This is seetile mosaic, formed by shaped pieces of various-coloured marbles let into a marble matrix. A great deal of the Indian mosaic of this sort was executed by Ital- ian workmen ; the finest examples are at Agra,suchi as the Taj Mehal.*~~

~~*The modern so-called "Roman mosaic" is formed of short and slen- der sticks of coloured glass fixed in cement, the ends, which form the pattern, being finally rubbed down and polished.*~~

~~*Many not unsuccessful attempts have been ade lately to reproduce the Roman tesselated work for pavements; and at Mu- rano, near Venice, glass wall-mosaics are still pro- duced in imitation of the magnificent works of me- dival times.*~~

~~*4. Mosaies in wood are largely used in Moham- medan buildings, especially from the 14th to the 17th centuries. The finest specimens of this work are at Cairo and Damascus, and are used chiefly to decorate the magnificent pulpits and other woodwork in the mosques. The patterns are very Seliante and complicated, worked in inlay of small pieces of various-coloured woods, often further en- riched by bits of mother-of-pearl and minutely carved ivory. The general effect is extremely splendid from the combined beauties of the materials and workmanship, as well as from the marvellous grace and fancy of the designs. This art was also practised largely by the Copts of Egypt, and much used by them to ornament the magnificent iconostases and other screens in their churches.*~~

~~*Another application of wood to mosaic-work, called " intarsia- tura," was very common in Italy, especially in Tuscany and Lom- bardy, during the 15th and early 16th centuries. Its chief use was for the decoration of the stalls and lecterns in the church-choirs. Very small bits of various-coloured woods were used to produce geometrical patterns, while figure-*~~

~~*subjects, views of buildings with strong perspective effects, and even landscapes, were very skilfully produced by an inlay of larger pieces. Ambrogio Borgognone, Raphael, and other great painters often drew the designs for this sort of work. The mosaic figures in the panels of the stalls at the*~~

~~*Fia. 5.—Part of Marble Pulpit with glass mosaic, church of Ara Ceeli, Rome.*~~

~~*MOS—MOS*~~

~~*Certosa near Pavia were by Borgognone, and are extremely beauti- ful. The stalls in Siena cathedral and in S. Pietro de' Casinensi at Perugia, the latter from Raphael's designs, are among the finest works of this sort, which are very numerous in Italy. It has also been used on a smaller seale to ornament furniture, and especially the "Cassoni," or large trousseau coffers, on which the most eostly and elaborate decorations were often lavished. Some traditional skill in this art still lingers in Italy, especially in the city of Siena.*~~

~~*AutTHorIties.—Classical Mosaics.—Pliny, I. N., xxxvi.; Vitruvius ; Franks, Slade Collection of Ancient Glass, and Excavations at Carthage, 1860; Artaud, Histoire de la peinture en mosaique, 1835; Monumentos Arquitectonicos de Espatia ("Italica," '*Cordoba," and " Elche"), 1859-83 ; Laborde, Mosaitque d'Italica, pres de Seville, 1802; Ciampini, Vetera Monumenta, Rome, 1747; Von Minutoli, Mosaikfussboden, &c., 1835; Lysons, Mosaics of Horkstow, 1801, and Roman Antiquities of Woodchester, 1797; Mazois, Les ruines de Pompéi, Paris, 1812-38 ; Real Museo Borbonico, various dates; Roach Smith, Roman London, 1859; Ausgrabungen zu Olympia, 1877-82.*~~

~~*Christian.—Theophilus, Diversarwm Artium Schedula, ii. 15; S. Kensington Musewm Art Inventory, part i., 1870; Renan, Mission de Phénicie, 1875; Garrucci, Arte Cristiana, 1872-82, vol. iv. ; De Rossi, Musaict Cristiant di Roma, 1872-82 ; Parker, Archeology of Rome, and Mosaic Pictwres in Rome and Ravenna, 1866 ; Jouy, Les Mosaiques chrétiennes de Rome, 1857; Gravina, Duomo di Monreale, Palermo, 1859 sq. ; Serradifalco, Monreale ed altre chiese Siculo-Normanne, 1838 ;*~~

~~*Salazaro, Mon. dell' Arte Merid. d'Italia, 1882; M. D. Wyatt, Geometrical Mosaics, of the Middle Ages, 1849 ; Salzenberg, Alt-Christliche Baudenkmale von Constanti-*~~

~~*nopel, 1854; Pulgher, Fglises Byzantines de Constantinople, 1883; Texier and*~~

~~*Pullan, Byzantine Architecture, 1864; Quast, Alt-Christlichen Bawwerke von*~~

~~*Ravenna, 1842; De Vogué, Eglises de la Terre Sainte, 1860; Milanesi, Del Arte*~~

~~*del Vetro pel Musaico, 16th century (reprinted at Bologna in 1864); Rohault de*~~

~~*Fleury, Monuments de Pise, 1866; Kreutz, Basilica di S. Marco, Venezia, 1843 ;*~~

~~*Gally Knight, Ecclesiastical Architecture of Italy, 1842-4; Fossati, Aya Sophia, 1852; Didron, "La peinture en Mosaique," Gaz. des B. Arts, vol. xi., p. 442; Gerspach, La Mosaique, 1883.*~~

~~*Moslem.—Hessemer, Arabische wnd Alt-Italienische Bau-Verzierungen, 1853 ; Prisse d'Avennes, L'Art Arabe, 1874-1880; Prangey, Mosquée de Cordoue, 1830 ;*~~

~~*Owen Jones, Alhambra, 1842; De Vogue, Temple de Jérusalem, 1864; Texier, Asie Mineure, 1862, and L' Arménie et la Perse, 1842-52 ; Bourgoin, Les Arts Arabes,*~~

~~*1868 ; Coste, Monwments modernes de la Perse, 1867; Flandin and Coste, Voyage*~~

~~*en Perse, 1843-54,*~~

~~*Wood-Mosaic—Tarsia.—Ornati del Coro di S. Pietro Cassinense di Perugia, 1830; Caffi, various works on Rafaello da Brescia and other*~~

intarsiatori, 1851, &c.; Tarsie ed intagli di S. Lorenzo in Genova, 1878. (J. H. M.)

MOSCHELES, Icnaz (1794-1870), one of the most

refined and accomplished pianists of the present century, was born at Prague, 30th May 1794, and first studied music at the Conservatorium in that city under the direc- tion of Dionys Weber. At the age of fourteen he made his first appearance before the public in a pianoforte con- certo of his own composition with marked success. Soon after this he removed to Vienna, where he studied coun- terpoint under Albrechtsberger and composition under Salieri. In 1814 he prepared, with Beethoven's consent, the pianoforte arrangement of Jidelto, afterwards published by Messrs Artaria. In the following year he published his celebrated Variationen tiber den Alewandermarsch, a con- cert piece of great difficulty, which he played with so great effect that he was at once recognized as the most brilliant performer of the day. He then started on a tour, during the course of which he visited most of the great capitals of Europe, making his first appearance in London in 1822, and there securing the friendship of Muzio Clementi and John Cramer, the fathers of the English school of piano- forte playing. For a concert given by the latter he wrote his famous Hommage & Handel, a duet for two pianofortes, which afterwards became a lasting favourite with the public. His reception in England was sufficiently encouraging to justify his return in 1823, when he again met with a hearty welcome. During a visit to Berlin in 1824 he first became acquainted with Mendelssohn, then a boy of fifteen; anda friendship sprang up between them which was severed only by Mendelssohn's early death.

In 1826 Moscheles relinquished his wandering habits, and settled permanently in London, surrounding himself with a clientele fully capable of appreciating his talents as an artist and his social worth as a firm and loyal friend. His position was henceforth a more than ordinarily en- viable one. He was recognized from end to end of Europe as a virtuoso of the highest rank ; and his popularity both as a performer and as a teacher was based on grounds whicli effectually secured it from the caprice of changing fashion or ephemeral patronage. He was

~~*undoubtedly for some con- siderable time the greatest executant of his age; but, using his brilliant touch as a means and not as an end, he con- sistently devoted himself to the further development of the*~~

~~*true classical school, interpreting the works of the great masters with conscientious fidelity, and in his extempore performances, which were of quite exceptional excellence, exhibiting a fertility of invention which never failed to please the most fastidious taste.*~~

~~*In 1837 Moscheles conducted Beethoven's Ninth Sym- phony at the Philharmonic Society's concerts with extra- ordinary success; and on this and other occasions contri- buted not a little, by his skilful use of the baton, to the prosperity of the time-honoured association. During the course of his long residence in London he laboured inces- santly in the cause of art, playing at innumerable concerts, both public and private, and instructing a long line of pupils, who flocked to him, in unbroken succession, until the year 1848, when, at Mendelssohn's earnest solicitation, he removed to Leipsic, to carry on a similar work at the Conservatorium then recently founded in that city. In this new sphere he worked with unabated zeal for more than twenty years, dying 10th March 1870.*~~

~~*Moscheles's most important compositions are his Pianoforte Con- certos, Sonatas, and Studies; his Hommage & Handel ; and his three celebrated Allegri di Bravura.*~~

~~*MOSCHUS, of Syracuse, is one of the Greek bucolic poets ; he was a friend of the Alexandrian grammarian Aristarchus (about 200 B.c.). His chief work is the epi- taph of Bion of Smyrna, another of the bucolic poets, who seems to have lived in Sicily. It is probable that the miscellaneous collection of poems which we possess by the three poets Theocritus, Bion, and Moschus was known to Artemidorus in 200 B.c. His poetry is the work of a well- educated man with a trained artistic eye; he models his works on those of Bion, writing epigrammatic, epic, and idyllic or elegiac verses, all except a few lines being in hexameter verse; but he treats all his subjects ina de- scriptive, not in a narrative or an*~~

~~*epigrammatic style. Besides the epitaph of Bion, he wrote two little epic poems, "Buropa" and "Megara," and a pretty little epigram, "Love the Runaway ;" and a few short pieces of his are also preserved. They are written with much elegance, but the style is perhaps too refined and carefully wrought, and he has few of the higher qualities of a poet.*~~

~~*MOSCOW, a government of Central Russia, bounded by Tver on the N.W., Vladimir and Ryazan on the E., Tula and Kaluga on the S., and Smolensk on the W., and having an area of 12,858 square miles. The surface is undulating, with broad depressions occupied by the rivers, and varies in elevation from 500 to 850 feet. Moscow is situated in the centre of the so-called Moscow coal-basin, which extends into the neighbouring governments, and consists of limestones of the Upper and Lower Carboni- ferous, the latter containing beds of inferior coal, while the former contains several good quarries of marble. The Carboniferous formation is covered with Jurassic clays, sandstones, and sands, which yield a good china-clay at Gjeli, copperas, a sandstone much employed for building, and a white sand used for the manufacture of glass. The whole is thickly covered with boulder-clayand alluvial sands.*~~

~~*The government is watered by the Volga, which skirts it for a few miles on its northern boundary, by the navigable Sestra, which brings it in communication with the canals leading to St Peters- burg, by the Oka, and by the Moskva. This last takes its origin in Smolensk, and, after a course of 280 miles right across Moscow, reaches the Oka at Kolomna; it is navigable from the town of Moscow. The Oka and Moskva from a remote period have been important channels of trade, and continue to be so notwithstanding the development of railways. The Oka brings the government into water communication with the Volga, whose tributaries cover nearly the whole of middle and eastern Russia, and are separated by short land distances from the Northern Dwina and the Don. Large quantities of grain, metals, glass ware, skins, and other com- modities are shipped up and down the Moskva, whilst the Myach-*~~

~~*kovo stone quarries situated on its banks supply the capital with building stone. There are several marshes, mostly in the north,*~~

~~*where also, as well as in the north-east, notwithstanding the immense consumption of wood in manufactures and for use in the capital, extensive forests are still found. Very large supplies of timber are also imported by rail or river, especially from the adjoin- ing north-eastern provinces. The soil is somewhat unproductive, the average crops ranging from 3% to 43 returns; agriculture is carried on everywhere, but only two districts (Ruza and Volsko- lamsk) export corn, all the others being more or less dependent on extraneous supplies. 'The agricultural holdings of the peasants are very small, and their condition on the whole unsatisfactory.* Grass crops have some importance in several districts, and kitchen- gardening is an important source of wealth in Vereya, Dmitroff, and Zvenigorod. Cattle are not extensively reared, but the horse- breeding industry is somewhat important. ;*~~

~~*The population, 1,581,700 in 1864, numbered 1,913,700 in 1873, one-third being urban. They are nearly aJl Great-Russians, and belong to the Greek Church, or are nonconformists. Many are employed in factories, the number of which in 1879 was 1546, occupying about £20,000,000 sterling. 1 ing activity of Moscow to be greater than that of any other Russian government, while the value produced is upwards of one-fifth of the total for all Russia in Europe, including Poland. Cotton, woollen, and silk goods are the chief products. The sanitary condition of the factories is very bad; the number of children below fifteen years employed is as high as 16 per cent., the hours of daily-work are often 13 to 16, and the mortality is very great. The total income obtained by the population of the government from their manufacturing industry is estimated at £485,600. The chief income of the people is derived, however, from a variety of petty in- dustries, carried on in their villages by the peasants, who coutinue at the same time to cultivate the soil. Taxation during the last twenty years has been increasing rapidly, and in some parts of the government has reached an average of 12 roubles per house. The chief ceutres of trade are Moscow, Kolomna, Scrpukhoff, Bogorodsk, Serghievsk, and Pavlovsk. There are 125 fairs. Transport is much facilitated by railways, and by good highroads ra iating from the capital. Moscow is divided into thirteen districts, the chief towns with their respective populations being—Moscow (670,000), Bogorodsk (6600), Bronnitsy (3500), Ruza (4000), Kolomna (18,800), Serpukhoff (16,800), Podolsk (11,000), Zvenigorod*~~

~~*(7800), Mojaisk (4200), Volokolamsk (3000), Klin (6700), Dmitroff (7600), and Vereya (5500). In addition to these administrative centres may be men- tioned Voskresensk (6000), Serghievski Posad (27,500), in the neighbourhood of the monastery of Troitsa, a rich commercial and industrial town, and Pavlovski Posad (4500). Many of the villages are far more important from their industries and trade than the district towns.*~~

~~*MOSCOW (Russian, Jfoskva), the second capital of the Russian empire and chief town of the government and district of the same name, is situated in 55° 45' N. lat. and 37° 37' E. long., on both banks of the river Moskva, a tributary of the Oka, at its confluence with the rivulet Yauza. The popular idea is that Moscow is built on seven hills, and in fact the city covers several eminences, the altitudes of its different parts varying from 500 to 850 feet above the level of the sea. It is 400 miles from St Petersburg, 813 from Archangel, 900 from Ufa, 938 from Astrakhan, 933 from Odessa, and 811 from Warsaw. It lies to the north of the most densely-peopled parts of Russia (the "black-earth region"), whilst the country to the north of it is rather thinly peopled as far as the Volga, and very sparsely beyond that. The space between the middle Oka and the Volga, however, was the very cradle of the Great-Russian nationality (Novgorod and Pskov excluded) ; and four or five centuries ago Mos- cow had a quite central position with regard to this.*~~

~~*The present city measures 7 miles from north to south, and 9 miles from west-south-west to east-north-east, and covers an area of 32 square miles (about 40 when the suburbs are included). In the centre, on the left bank of the Moskva, stands the "Kreml" or Kremlin, occupying the Borovitsky hill, which in the 12th century was covered by a dense forest. To the east of the Kremlin is the Kitay-Gorod, formerly the Great Posad, the chief centre*~~

~~*; 1 According to recent investigations instituted by the Moscow pro- vincial assembly, 10 per cent. of the agricultural population (abont 20,000 households) have no land at all; 15 per cent., while holding land, are bankrupt; and 13 per cent. are without cattle or implements.*~~

~~*162,700 hands, and having.an annual production of These figures show the manufactur-*~~

~~*for trade. The Byelyi-Gorod, which was formerly enclosed by a stone wall (whence the name), surrounds the Kremlin and the Kitay-Gorod on the west, north, and north-east. A line of boulevards now occupies the place of its wall (destroyed in the 18th century), and forms a first circle of streets around the centre of Moscow. The Zemlanoy- Gorod (earthen enclosure) surrounds the Byelyi-Gorod, including the " Zamoskvoryechie" on the right bank of the Moskva. The earthen wall and palisade that formerly enclosed it no longer exist, their place being taken by a series of broad streets with gardens on both sides,—the Sadovaya, or Gardens Street. The fourth enclosure (the "Kamer-College earthen wall") was made during the reign of Catherine IL.; it is of irregular shape, and encloses the outer parts of Moscow, whilst the suburbs and the villages which have sprung up on the highways extend 4, 5, and 6 miles beyond. The general view obtained from the west or south is very picturesque, especially on account of the numerous churches, monasteries, and towers with characteristic architecture, and the many gardens and ponds scattered among clusters of houses. The Kremlin is an old fort of pentagonal (nearly triangular) shape, 98 acres in extent, occupying a hill about 100 feet above the level of the Moskva. It is enclosed by a high stone wall 2430 yards in length, restored during the present century, and having eighteen towers. Its five gates are surmounted by high towers. The Spasskiya (Saviour's Gate) was erected in 1491 by a Milanese architect, the Gothic tower that surmounts it having been added in 1626 by the English architect Holloway. A sacred picture of the Saviour was placed upon it in 1685, and all who pass through the gate must uncover. The towers surmount- ing the four other gates were erected by order of Ivan Ill. Of the sacred buildings of the Kremlin the most venerated is the Uspensky cathedral. The former church of this name was erected in 1326 by Ivan Kalita, but, on its falling into disrepair, a new one was built on the same place in 1475-1479, by Fioraventi, in the Lombardo- Byzantine style, with Indian cupolas. It was restored in the 18th century and in 1813. It contains the oldest and most venerated holy pictures in Russia, one of which is attributed to the metropolitan Peter, another to St Luke. This last was brought from Kieff to Vladimir in 1155, and thence to Moscow in 1395; its jewelled metallic cover is valued at £20,000. The*~~

~~*cathedral pos- sesses also a gate brought from Korsun, the throne of Vladimir I., and numerous relics of saints, some of which date from the 14th century. The Russian metro- politans and patriarchs were consecrated in this cathedral, as well as the czars after Ivan IV. The Arkhangelsk cathedral was originally built in 1333, and a new one was erected in its place in 1505. It has suffered very much from subsequent restorations and decorations. It contains the tombs of the czars from Simeon (1353) to Ivan Alexeevitch (1696), and possesses vast wealth. The Bla- govyeschensk cathedral, recalling the churches of Athos, was built in 1489; the remarkable pictures of Rubleff (1405), contained in the original structure of 1397-1416, have been preserved. It was the private chapel of the czars. Vestiges of a very old church, that of the Saviour in the Wood (Spas na bort), contemporaneous with the foundation of Moscow, still exist in the yard of the palace. A stone church took the place of the old wooden structure in 1330, and was rebuilt in 1527. Several other churches of the 15th century, with valuable archeological remains, are found within the walls of the Kremlin. The Vozne- sensky convent, erected in 1393, and recently restored with great judgment, is the burial-place of wives and sisters of the czars. The Chudoff monastery, erected in 1365, was the seat of theological instruction and a state*~~

~~*prison. Close by, the great campanile of Ivan Veliky, erected in the Lombardo-Byzantine style by Boris Godunoff in 1600, rises to the height of 271 feet (328 feet including the cross), and contains many bells, one of which weighs 1285 cwts. The view of Moscow from this campanile is really wonderful, and its gilded cupola is seen from a great distance. Close by is the well-known Tsar-Kolokol (Czar of the Bells), 60 feet in circumference round the rim, 19 feet high, and weighing 3850 cwts. It was cast in 1735, and broken during the fire of 1737 before being hung. The treasury of the patriarchs (riznitsa) contains not only such articles of value as the sakkos of the metropolitan Foty with 70,000 pearls, but also very remarkable monuments of Rus- sian archeology. The library has 500 Greek and 1000*~~

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~~very rare Russian MSS., including a Gospel of the 8th century. :~~

~~The great palace of the emperors, erected in 1849, is a fine building in white stone with a gilded cupola, It con- tains the terems, or rooms erected for the young princes in 1636 (restored in 1836-1849, their former character being maintained), a remarkable memorial of the domestic life of the czars in the 17th century. In the treasury of the czars, Granovitaya Palata and Orujeynaya Palata, now public museums, the richest stores connected with old Russian archeology are found—crowns, thrones, dresses, various articles of household furniture belonging to the czars, Russian and Mongolian arms, carriages, &c.~~

~~The four sides of the Senate Square are occupied by~~

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~~Plan of Moscow.~~

~~buildings of various dates, from the 15th century onwards. The senate, now the law courts, was erected by Catherine II. Facing it is the arsenal, containing full ammunition for 200,000 men.~~

~~The Temple of the Saviour, begun in 1817 on the Vorobiovy hills, in commemoration of 1812, was abandoned in 1827, and a new one was built during the years 1838- 1881 on a hill on the bank of the Moskva, at a short dis- tance from the Kremlin. Its style is Lombardo-Byzantine, with modifications suggested by the military taste of Nicholas I. Its colossal white walls are well proportioned, and its gilded cupolas are seen from a great distance. The buildings that surround it are to be cleared away, and its wide squares adorned by obelisks, and by monu-~~

~~ments to Kutuzoff, Barclay de Tolly, Alexander I., and Nicholas I.~~

~~*The Kitay-Gorod, which covers 121 acres, and has 20,000 inhabitants, is the chief commercial quarter of Moscow. It contains the Gostinoy Dvor, consisting of several stone buildings divided into 1200 shops, where all kinds of manufactured articles are sold. The " Red Square," 900 yards long, whose stone tribunal was formerly the forum, and afterwards the place of execution, separates the Gostinoy Dvor from the Kremlin. At its lower end stands the fantastic Pokrovsky cathedral (usually known as Vasili Blajennyi), which is the wonder of all strangers visiting Moscow, on account of its towers, all differing from each other, and representing, in their variety of colours, pine-*~~

~~*apples, melons, and the like. It was built under Ivan the Terrible by an Italian. The exchange, built in 1838 and restored in 1873, is very lively, and its twenty-three "exchange artels" (associations of nearly 2000 brokers, possessing a capital of more than £100,000) are worthy of remark, Banks, houses of great commercial firms, streets full of old bookshops carrying on a very large trade, and finally the Tolkuchy rynok, the market of the poorest dealers in old clothes, occupy the Kitay-Gorod, side by side with restaurants of the highest class. In the Kitay-Gorod are also situated the house of the Romanoffs, rebuilt in 1859 in exact conformity with its former shape; a Greek monastery ; and the printing-office of the synod, containing about 600 MSS. and 10,000 very old printed books, to- gether with a museum of old typographical implements. At the entrance to the Kitay-Gorod stands the highly- venerated chapel of the Virgin of Iberia, which is a copy, made in 1648, of a holy picture placed on the chief gate of the monastery of Athos. Close by is the recently opened historical nuseum, which will contain collections respect-ively illustrating separate periods of Russian history.*~~

~~*The northern parts of the Byelyi-Gorod are also the centre of a lively trade. Here are situated the Okhotnyi Ryad (poultry market) and the narrow streets Tverskaya and Kuznetsky-Most, the rendezvous of the world of fashion. Here also are the theatres. In the south-west of the*~~

~~*Byelyi- Gorod, opposite the garden of the Kremlin, stand the uni- versity, the public museum, and the military riding school.*~~

~~*The Zemlyanoy-Gorod, which has arisen from villages that surrounded Moscow, exhibits a variety of characters. In the neighbourhood of the railway stations it is a busy centre of traffic; other parts of it are manufacturing centres, whilst others—as, for instance, the small quiet streets in the west of the boulevard of Prechistenka, called the old Konushennaya, with their wooden houses and spacious yards—are the true abodes of the families of the old, for the most part decayed, but still proud nobility. The Zamoskvoryechie, on the right bank of the Moskva, is the abode of the patriarchal merchant families. Each house is surrounded by a yard whose gate is rarely opened, and each house, with its dependencies and gardens, bears the character of a separate estate.*~~

~~*The climate of Moscow is cold and continental, but healthy. The average annual temperature is 40°°1 Fahr. (January, 14°; July, 66°°5). The summer is warm (64°‘2), and the winter cold and dry (15°°8), great masses of snow covering the streets. The spring, as is usually the case in cold continental climates, is beauti- ful. The prevailing winds are south-west and south. The river Moskva is frozen, on the average, for 153 days (from 12th Novem- ber to 13th April).*~~

~~*Besides the Moskva and the Yauza, Moscow is watered also by the Neglinnaya, which now flows in an underground channel under the walls of the Kremlin. The city has about 200 ponds. The Moskva is crossed by five bridges; a branch of it, or rather a channel, makes an elongated island in the centre of the town. Water of excellent quality, principally from the Mytischi springs and ponds, 11 miles distant, is led to fountains in different parts of the town, whence it is taken by watermen. But this supply amounts only to 1,865,000 gallons a day, and the great mass of the inhabitants make use of the contaminated water of the Moskva and even of the Yauza, or of private wells.*~~

~~*The population of Moscow, which is steadily increasing, is esti- mated at 670,000 ; but an accurate census has not yet been made. In the middle of the 18th century it was estimated at only 150,000 ; in 1812, at 250,000 in summer and 400,000 in winter. In 1864 it was estimated (probably under*~~

~~*the truth) at 365,000. The inhabit- ants are mostly Great-Russians, and only about 6000 are foreigners. They chiefly belong to the Greek Church, or are nonconformists, the number of Lutherans and Catholics being only 8000 to 9000. The mortality is very great: in 1879 and 1880 it reached 37°9 and 41°8 per thousand (men 39°3; women 43°9), and usually exceeds the birth-rate. Moscow, moreover, is often visited by epidemics which immensely increase the mortality, in consequence of the almost entire absence of sanitary regulations. Fires are very fre- quent ; within ten years (1870-1879) they numbered 2492, the loss being estimated at £2,865,300.*~~

~~*MOSCOW*~~

~~*Since the 14th century Moscow has been an important commer-. cial city. Its merchants carried on a brisk trade with Novgorod and Pskov, with Lithuania, Poland, Hungary, Constantinople, Azoff, and Astrakhan. About the end of the 15th century its princes transported to Moscow, Vladimir, and other Russian towns no fewer than 18,000 of the richest Novgorod merchant families, and took over the entire trade of that city, entering into direct relations with Narva and Livonia. The shops of the Gostinoy Dvors of Moscow astonished foreign visitors in the 16th century by their large supply of foreign wares, and by the low prices at which the products of western Europe were sold,—a circumstance explained by the barter character of the trade. The annexation of Kazan and the conquest of Siberia gave a new importance to Moscow, bringing it into direct commercial relations with Khiva, Bokhara, and China, and supplying it with Siberian furs. The fur-trade engrossed the minds of all European merchants in the 16th century, and an English company, "The Mystery," having received the monopoly of the Archangel trade, caused the traffic to be sent by the White Sea instead of the Baltic. Moscow thus became the centre for nearly the whole trade of Russia, and the czar himself engaged in large commercial operations. All boyars, and the church too, were traders; and the poorest Moscow mer- chants participated in the trade through their corporations. Persians, Greeks, Armenians, Swedes, English, Germans, and Lithuanians had each its own Gostinoy Dvor (or caravanserai). Situated at the junction of six important highways (along which communication was maintained by special yamshiks), Moscow was*~~

~~*the great storehouse and exchange-mart for the merchandise of Europe and Asia. The opening of the port at St Petersburg affected its commercial interest unfavourably at first; but the Asiatic and internal trade of Moscow has since then enormously increased. At present it is the chief centre of railway traffic. The revenue of its custom-house was in 1880 double that of St Petersburg (30,000,000 roubles, as against 15,620,000 at St Petersburg and 9,000,000 at Warsaw). But the home traffic is the most important branch of the Moscow trade. The city is the chief centre for the trade in grain, in hemp, and in oils, sent to the Baltic ports; in tea, brought both by Siberia and by St Petersburg ; in sugar, refined there in large quanti- ties ; in grocery wares for the supply of more than half Russia and all Siberia ; in tallow, skins, wool, metals, timber, wooden wares, and all other produce of the manufactures of middle Russia. No less than 10,000,000 cwts. of corn are annually brought to Moscow, half of which is sent to the Baltic ports. The yearly return of the Moscow trade was estimated at £9,000,000 in 1848,—probably only a half or a third of the real value, which is believed to have been at least trebled since that time, The quantity of goods carried by the six railways from Moscow to St Petersburg, Yaroslav, Nijni, Ryazan, Kursk, and Brest, amounted in 1878 to 162,343,500 cwts. (out of 635,740,000 for the whole of Russia) ; and the number of passengers was 8,637,890 (1,263,530 military) out of a total for all Russia of 37,580,800 (civil and military) in that year.*~~

~~*From the 15th century onwards the villages around Moscow were renowned for the variety of small trades they carried on ; the first large manufactures in cottons, woollen fabrics, silk, china, and glass in Great Russia appeared at Moscow in the 17th and 18th centuries. After 1830, in consequence of protection tariffs, the manufactories in the government of Moscow rapidly increased in number ; and at present two-thirds of them, or about 1000, annu- ally producing articles to the value of upwards of £10,000,000 (the real production is probably much higher), are concentrated in the capital, There are at Moscow about 170 cotton-mills, 90 manu- factories of woollens, and 70 of silks, the silk manufactured being chiefly Caucasian, although a good deal is also imported from the west ; there are also upwards of 20 large tanneries, 50 tobacco- factories, 15 large candle-works, 70 larger workshops in metals, 18 wax-candle works, 30 carriage manufactories, 20 watch manu- factories.*~~

~~*The income and expenditure of Moscow in 1882 were respectively 4,921,067 and 6,124,068 roubles, as compared with 4,730,724 and 5,490,433 in 1881.*~~

~~*Moscow has many educational institutions and scientific societies. The university, founded in 1755, exercised a powerful influence on the intellectual life of Russia during the years 1830-1848; and it still continues to be the most frequented Russian university. In 1882 it had 2430 students and a teaching staff of 334; the students are mostly poor, the sum of 107,588 roubles having been given in 1881 in scholarships to 854 of their number, and 14,000 roubles in the form of occasional assistance. The library contains nearly 200,000 volumes, and has rich collections in mineralogy, geology, and zoology. There is also an excellent higher technical school ; and an agricultural college is situated in the Petrovskoye suburb. Moscow has also a theological academy, a commercial academy, a school of topography, an institute (of Lazareff) for the study of Oriental languages, a musical conservatory, four institutes for women, a free university for women, seven colleges for boys and three for girls, three corps of military cadets, very numerous primary and technical schools, and many private schools, But*~~

~~*still these are insufficient for the population, and the municipal schools every year refuse admission to about 1500 boys and girls. The scientific societies are specially distinguished for their services in the exploration of the country. The following deserve parti- cular mention :—the society of naturalists (founded in 1805); the society of Russian history and antiquities, which has published many remarkable works ; the society of amateurs of Russian litera- ture ; the physical and medical society ; the mathematical society ; the society for the diffusion of useful books ; the very active archxo-*~~

~~*logical society, founded in 1864; a society of gardening and of*~~

~~*agriculture ; several technical, artistic, and musical societies ; and the very active young society of the friends of natural science, which already has published many useful volumes.*~~

~~*' Among the museums of Moscow, the museum, formerly Ruman- tseff's, now connected with the so-called " public museum," occupies the first rank. It contains a library of 150,000 volumes and 2300 MSS., remarkable collections of old pictures, sculptures, and prints, as well as a rich mineralogical collection, and an ethnographical*~~

~~*collection representing very accurately the various inhabitants of*~~

~~*Russia. The historical museum has already been mentioned. The*~~

~~*private museum of Prince Golitzyn contains a good collection of*~~

~~*paintings and MSS.; and great treasures of archeology are amassed in various private collections in Moscow and its suburbs.*~~

~~*The periodical press does not on the whole exercise great influ- ence; twenty-five periodicals are published, besides those of scientific societies. But Moscow publishes a far larger number of books for primary instruction and ofthe humblest kind of literature and prints for the use of peasants than any other Russian city.*~~

~~*The philanthropic institutions are numerous, the first rank being occupied by the immense Foundlings' Hospital, erected in 1764. The hospitals, municipal, military, aud private, are very large, but much below the standard of other capitals. The number of private philanthropic institutions is very considerable.*~~

~~*Though the drama was introduced into Russia at Kieff, Moscow was the place ofits development. The earliest stage representations*~~

~~*were made at Moscow in 1640, and the first comedy—a translation of*~~

~~*Moliére's Médecin Malgré Lwi—was played in the palace before Sophie, the sister of Peter I. It was only in 1759 that a theatre was erected. A large stone theatre was erected in 1776, and rebuilt in 1856 after a fire. It is for the Moscow stage that the best Russian drainas have been written, and it was in the "small theatre" that the best Russian actors—Schepkin,*~~

~~*Sadovsky, Shumsky, and Madame Vasi- lieff—exhibited the comedies of Gogol, Griboyedoff, and Ostrovsky.*~~

~~*Moscow, where the Great-Russian language is spoken in its greatest purity, was the birthplace of the two chief Russian poets, Pushkin and Lermontoff, as well as of Griboyedoff, Ostrovsky, and Herzen. A monument to Pushkin was erected in 1880, on the Tverskoy boulevard. Griboyedoff, in his remarkable comedy Goré ot uma, has given a lively picture of the higher Moscow society of the beginning of this century, which continued to hold good until within the last few years. His remark as to the unmistakable individuality of the Moscow type also maintainsits truth; although the physiognomy of Moscow has much changed since his day, it still has its special features that distinguish it from every other capital. The division of classes is much more felt at Moscow than elsewhere. The tendency towards originality, the love of grandiose undertakings, a kind of brag, together with little feeling of inde- pendence, a good deal of laziness, and much cordiality, still charac- terize the educated classes. The merchants live quite aloof from any political or even intellectual movement, under a rude patri- archal system, well described in the dramas of Ostrovsky. A large proportion of them are nonconformists. Their sons, the well- known kupecheskiye synki, " merchants' sons," when they leave this kind of life, astonish the capital with their extravagances and absurd display of wealth. But Moscow takes its present physiog- nomy chiefly from its busy lower classes. The streets are full of merchants and peasants, who continue to wear the old Russian garb, go on foot in the streets, drink tea in modest restaurants, and trans- act large business. From being a town of the aristocracy, Moscow is coming to be more and more a town of the wealthy middle classes, who persist in keeping the low educational level of the peasants in the villages, and have but one aspiration, to become in their turn "merchants" of the type described by Ostrovsky.*~~

~~*Suburbs.—Moscow is surrounded by beautiful parks and pictur- esque suburbs. Of theformerone of the most frequented isthe Petrov- sky Park, to the north-west. A little farther out is the Petrovskoye-Razumovskoye estate, with an agricultural academy and its de- pendencies (botanical garden, experimental farm, &c.)._ Another large park and wood*~~

~~surround an imperial palace in the village of Ostankino. 'The private estates of Kuzminki, Kuskovo, and Kuntzevo are also surrounded by parks; the last has remains of a very old graveyard, supposed to belong to the pagan period. Twenty-eight miles westward from the cityis the Savvin-Storojevsky monastery, situated, like so many other Russian monasteries, in avery fertile country, amidst beautiful forests; it has a pretty cathedral, avich treasury, and library. Farther westward still is the New Jerusalem monastery erected by the patriarch Nikon.~~

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~~In the south-west, on the right bank of the Moskva, which here makes a great bend to the south, are the Vorobiovy hills, which are accessible by steamer from Moscow, and afford one of the best views of the capital. In the bend of the Moskva is situated the Novo-Dyevitchiy convent, erected in 1525, and connected with many events of Russian history. It is now the burial-place of the Moscow aristocracy, and one of the richest nunneries in Russia. The village Arkhangelskoye has also a good park and a palace built by Rastrelli. Iliynskoye, formerly a private estate, was purchased by the imperial family in 1864.~~

~~In the south, on the road to Serpukhoff, is the village of Kolomenskoye, the residence of Alexis Mikhailovitch, with a church built in 1531 (a striking monument of Russian architecture, restored in 1880). Diakovo has also a church built in the 16th and 17th centuries—a pure example of the architecture of Moscow, recalling the temple of Vasili Blajennyi. One of the best sites in the neighbourhood of Moscow is occupied by the park of Tsaritzyno (11 miles from the Kursk railway station), purchased by Catherine II., with an unfinished palace and a beautiful park. The monastery Nikolo-Ugryeshskiy, 12 miles from the city, between the Kursk and Ryazan railways, also occupies a beautiful site, and is much visited by Moscow merchants, to venerate a holy picture by which Dmitry Donskoy is said to have been blessed before going to fight the Mongols.~~

~~In the north, the forest of Sokolniki, covering 43 square miles, with its radial alleys and numerous summer residences, is the part of Moscow most frequented by the middle classes. Close by, towards the east, is situated the Preobrajenskoye suburb, the centre of the nonconformists,~~

~~*and farther south the village of Izmailovo, with a home for invalids and a model farm for apiculture. To the west of Sokolniki is situated the wood of Mariina, the favourite resort of the merchants and "' merchants' sons," who there spend fabulous sums of money on choirs of Gipsy singers.*~~

~~*History.—The Russian annals first mention Moscow in 1147 as a place where Yuri Dolgoruki met with Svyatoslav of Syeversk and his allies. The site was inhabited from a very remote antiquity by the Merya and Mordvinians, whose remains are numerous in the neighbourhood, and it was well peopled by Great-Russians in the 12th century. To the end of the 13th century Moscow re- mained a dependency of the princes of Vladimir, and had to suffer from the raids of the Mongols, who burned and plundered it in 1237 and 1293. It is only under the rule of Daniil, son of Alex- ander Nevsky (1261-1302), that the prince of Moscow acquired some importance for the part he took in the wars against the Lithuanians. He annexed to his principality Kolomna, situated at the confluence of the Moskva with the Oka. His son in 1302 annexed Pereyaslavl Zalessky, and next year Mojaisk (taking thus possession of the Moskva from its head to its mouth), and so inaugurated a policy which lasted for centuries, and consisted in the annexation by purchase and other means of the neighbouring towns and villages. In 1300 the Kremlin, or fort, was enclosed by a strong wall of earth and wood, offering a protection to nu- merous emigrants from the Tver and Ryazan principalities who went to settle around the new city. Under John Kalita (1825- 1341) the principality of Vladimir—where the princes of Kieff and the metropolitan of Russia had taken refuge after the wars that desolated south-western Russia—became united with Moscow ; and in 1325 the metropolitan Peter established his seat at Moscow, giving thus a new importance and a powerful support to the young principality. In 1367 the Kremlin was enclosed by stone walls, which soon proved strong enough to resist the Lithuanians under Olgerd (1368 and 1371). The son and grandson of Kalita steadily pursued the same policy. The latter (Dmitry Donskoy) annexed the dominions of Starodub and Rostoff, and took part in the re- nowned battle of Kulikovo (1380), where the Russians ventured for the first time to oppose the Mongols in a great pitched battle. The church, which strongly supported the princes of Moscow, ascribed the presumed victory to him and to the holy pictures of the Moscow monasteries.*~~

~~At this time Moscow occupied a wide area covered with villages. The Kremlin had three cathedrals—old, small, and dark buildings, having narrow windows filled with mica-plates—which were sur- rounded by the plain wooden houses of the prince and his boyars.+ To the east of the Kremlin was the posad, or city, also enclosed by a wall, and even then an important centre for trade. Different parts of the town belonged to different princes. In 1366 Moscow suf- fered from pestilence. Two years after the battle of Kulikovo it was taken and plundered (for the last time) by the khan (Toktamish).~~

~~The gradual increase of the principality continued during the first half of the 15th century, and at the death of Vasili IL. the Blind, in 1462, it included not only the whole of what is now the government of Moscow, but also large parts of the present govern- ments of Kaluga, Tula, Vladimir, Nijni- Novgorod, Kostroma, Vyatka, Vologda, Yaroslav, and Tver. Still the prince, although assuming, like several others, the title of Great Prince, had simply~~

~~Ce eS SS SS 1 The name of boyars, or bolars, was given to the descendants of the former military bands of the princes, who had become counsellors and landowners. ~~

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~~a little more influence than other independent rulers in the affairs of north-eastern Russia, and was recognized as the eldest prince by the khans. The towns which recognized his supremacy were quite independent, and only paid to his representatives the judi- ciary taxes, in exchange for military protection. It is only under Ivan Il]. (called the Great by some Russian historians) that the~~

~~rince of Moscow asserted his claims on other parts of Russia, and called himself " Ruler of all Russia" (Hospodar vseya Htosit). At was about this time, when the wealth of Moscow was rapidly in-~~

~~creasing by the extension of its trade, that the embellishment of~~

~~*the town begau. In room of the old cathedral Uspeusky, a new structure was built by Fioraventi of Bologna, aided by N ovgorod masons. 'The cathedral Arkhangelsky was also rebuilt, and a third, Blagovyeschensky, was erected, as well as a stone palace and other buildings. The Kremlin was fortified by strong towers, and the houses and churches built close to the walls were destroyed. In 1520 Moscow was said to contain 45,000 houses and 100,000 in- habitants. Its trade was very active. Ivan IV. finally annexed Novgorod and Pskov to Moscow, and subdued Kazan and Astra- khan. But after this reign Moscow suffered for a long time a series of misfortunes, In 1547 two dreadful conflagrations destroyed nearly all the city, and a few days later the khan of the Crimea advanced against it with 100,000 men. He was compelled to retire from the banks of the Oka, but in 1571, taking advantage of the state into which Russia was brought by the extravagances of Ivan, he took Moscow and burned all the town outside the Kremlin. The gates of the Kremlin having been shut, thousands of people died in the flames, and the annals record that of the 200,000 who then formed the population of Moscow, only 30,000 remained. In 1591 the Mongols were again in Moscow and avenged their repulse from the Kremlin on the inhabitants of the open town.*~~

~~*By the end of the 16th century Moscow was a large city, not less than 14 miles in circumference. The " Great Posad," or city, containing several Gostinoy Dvors for merchants of all nationali- ties, was enclosed in 1534 by a trench and stone wall, which still exist. The '* White Town" which enclosed the Kremlin and Great Posad from west and north was also fortified, in 1586, by a stone wall (destroyed in the 18th century) ; and in 1588 a third enclosure, a palisaded carthen wall, the Zemlyanoy-Gorod, was begun, including all the town that surrounded the three former subdivi- sions ; it remained until the end of the 18th century. Foreigners who visited Moscow spoke with astonishment of its wealth and its beauty. But the internal affairs of the capital were in very bad case. During the century, owing to the increase of population, new annexations, and a lively trade, the power of the boyars had gradually increased. The peasants who settled on their lands, or on the estates of the prince given to boyars, had gradually become their serfs; and the Teele tendency of the boyars, supported by the wealthier middle classes (which had also a rapid develop- ment in the same century), was to become rulers of Russia, like*~~

~~*the noblesse of Poland. During the reign of Theodore, Boris Godunoff, the regent, ordered the murder of the heir to the throne, Demetrius, son of Ivan IV., and himself became czar of Russia. Moscow suffered severely in the struggle which ensued, especially when the populace rose and exterminated the Polish garrison, on which occasion the whole of the town outside the Kremlin was again burned and plundered. But in compensation it had acquired in the eyes of the nation a greatly-increased moral importance, as a stronghold against foreign invasions. The monastery of 'Troitsa, which the Poles besieged without taking, was invested with a higher sanctity. The town also by and by recovered its commercial importance, and this the more as other commercial cities were ruined, or fell into the hands of foreigners ; and thirty years after 1612 Moscow was again a wealthy city. Owing, however, to the ever-increasing concentration of power in the hands of the czars, and the steady development of autocracy, it lost much of its political importance, and assumed more and more, especially under Alexis Mikhailovitch, the character of a private estate of the czar, its suburbs becoming mere dependencies of his vast household.*~~

~~*During the whole of the 17th century Moscow continued to be the scene of many troubles and internal struggles. The people several times revolted against the favourites of the czar, and were subdued only by cruel executions, in which the streltzy—a class of citizens and merchants rendering hereditary military service— supported the czar. Afterwards appeared the raskol or noncon- formist movement, and in 1648, when the news spread that Stenka Razin was advancing on Moscow "' to settle his accounts with the boyars," the populace was kept from rising only by severe repres- sive measures and by the defeat of the invader. Later on, the streltzy themselves engaged in a series of rebellions, which led the youthful Peter I. to shed rivers of blood. The opposition encoun- tered at Moscow by his plans of reforming Russia according to his ideal of military autocracy, the conspiracies of the boyars and mer- chants, the distrust of the mass of the people, all compelled him afterwards to leave the city, and to seek, as his ancestors had done, for a new capital. This he founded on the very confines of the military empire he was trying to establish.*~~

~~*In the course of the 18th century Moscow became the seat of a passive and discontented opposition to the St Petersburg Govern- ment. Peter I., wishing to see Moscow like other capitals of western Europe, ordered that only stone houses should be built within the walls of the town, that the streets should be paved, and so on; but his orders were only — executed. In 1722 the Kremlin was restored. In 1739 the city became once more the prey of a great conflagration ; two others followed in 1748 and 1753, and gave an opportunity for enlarging some streets and squares. In 1755 the first Russian university was founded at Moscow. Catherine II. tried to conciliate the nobility, and applied herself to benefit the capital with new and useful buildings, such as the senate house, the foundlings' and several other hospitals, salt stores, &e. The cemeteries within the town were closed after the plague of 1771; several streets were enlarged, and the squares cleared of the small shops that encumbered them. Water was brought by an aqueduct from the Mytischi villages. In 1787 the city had 303 churches, 24 monasteries and convents, 8965 houses (of which 1595 were of stone), one printing-office, and 314 manufactories and larger workshops.*~~

~~*The last public disaster was experienced by Moscow in 1812. On 13th September, six days after the battle of Borodino, the Russian troops evacuated Moscow, leaving 11,000 wounded, and the next day the French occupied the Kremlin. The same night, while Napoleon was waiting for a deputation of Moscow notables, and received only a deputation of the rich raskolnik merchants, the capital was set on fire by its own inhabitants, the Gostinoy Dvor, with its stores of wine, spirits, and chemical stuffs, becoming the first prey of the flames. 'The inhabitants abandoned the city, and it was pillaged by the French troops, as well as by Russians them- selves, and the burning of Moscow became the signal of a general rising of the peasants against the French. The want of supplies and the impossibility of wintering in a ruined city, continually attacked by Cossacks and peasants, compelled Napoleon to leave Moscow on 19th October, after he had unsuccessfully tried to blow up certain parts of the Kremlin. (P. «A. K.)*~~

~~*MOSELLE. See Rarne.*~~

~~*MOSER, Jonann Jaxos (1701-1785), jurist, was born at Stuttgart on 18th January 1701. IIe studied at the university of Tiibingen, where, at the early age of nineteen, he became professor extraordinarius of law. A year later he resigned his chair, with the expectation of receiving an appointment at Vienna, but this was refused him on his declining to join the Catholic Church. From 1729 he for some years held an ordinary professorship of law at Tiibingen, and in 1736 he accepted a chair and directorship in the university of Frankfort-on-the-Oder. On account, however, of differences with King William I. of Prussia, he resigned these in 1739 and retired to Ebersdorf, a village in the principality of Reuss, where for several years he devoted himself wholly to study, and especially to the production of his Deutsches Staatsrecht. In 1751 he was called back to Wiirtemberg as '" landschaftsconsulent," and in 1759 was imprisoned at IIohentwiel on account of the steps he had taken in connexion with this office against certain tyrannical proceedings of the duke. In 1764 he received his liberty and was restored to office, but from that time took little part in political affairs. IIe died 30th September 1785.*~~

~~*Moser was the first to discuss in an adequate form the subject of European international law, and he is the most voluminous German writer on public law. In all, he wrote more than 500 volumes, his principal works being Deutsches Staatsrecht, 1737-1754 ; Newes Deutsches Staatsrecht, 1766-1775 ; Deutsches Staatsarchiv, 1751-1757 ; Grundriss der heutigen Staatsverfassung von Dertsehland, 1754.*~~

~~*See Schmid, Das Leben J. J. Moser's, 1868 ; Schulze, J. J. Moser, der Vater des Deutsehen Staatsrechts, 1869.*~~

~~*MOSES. Of the life of Moses we have few certain details, though the history of Israel bears witness to the importance of his work. To what has been said under TsRAEL there will here be added a brief summary of what has been handed down about him. IIis origin and the history of his childhood can be read in Exod. i, ii. (comp. vi. 16 sg.); the statements there given are enlarged and modified in the Jewish Midrash, particularly as we find it in Josephus and Philo.! The daughter of Pharaoh, we are*~~

~~*told, was called Thermutis (Ant, ii. 9, 5), or Merris (Euseb.,*~~

~~*1 Tn still more fantastic form in the Palestinian Targum on Exodus, the details of which need not be repeated here,*~~

~~*MOSES*~~

~~*Prep. Ev., ix. 27); she named the boy Mwioys, not because she used the Hebrew verb mtn to express the fact that he was drawn out of the water, but because the Egyptian word for water was po, and vons applies to those who have been delivered from it (Ant., ii. 9, 6; comp. Philo, ed. Mangey, ii, 83; Euseb., d.c., ix. 28), She took care to have him trained in all the wisdom of the Egyptians (Acts vii. 22) and in that of the Greeks, Assyrians, and Chaldeans as well (Philo, ii. 84). To his great intellectual endowments corresponded his personal beauty, of which Josephus speaks in extravagant terms (Ant., ii. 9, 6-7). It was on account of this beauty that, when on one occasion, as a young man, he led an Egyptian army against Meroe, the Ethiopian princess Tharbis opened the gates of the capital to him in oo to make him her husband (Anz., ii. 10; comp. Numb. a, 1h).*~~

~~*For reasons explained in Exod. ii. 11 sg., Moses left the land of Pharaoh and came to Midian to the Kenite priest Jethro (also called Hobab Ben Raguel and Raguel), whose daughter Zipporah he married, becoming by her the father of two sons, Gershom and Eliezer (Exod. ii. 21 sq.; xviii. 2 sq.). During his stay in Midian he received, at the foot of Sinai (Horeb), the divine revelation at the burning bush whereby he was called to become the liberator of Israel from Egyptian bondage. With much reluctance he at last accepted this vocation, and, already expected by his brother Aaron and the elders, returned to his people.' Arrived in Egypt, he associated Aaron with him as his interpreter, being himself no orator, but a man of counsel and action, and appeared before Pharaoh to demand of the king in Jehovah's name permission for the people to go with flocks and herds into the wilderness to celebrate there a festival (the spring festival of the Passover) in honour of their God. Jehovah gave emphasis to the demand by great signs and wonders,—the plagues of Egypt, which have their explanation for the most part in evils to which Egypt is periodically liable, but are treated by Israelite tradition as the*~~

~~*weapons of Jehovah in his ever-intensifying conflict with the king and the gods of Egypt. At length, by the slaying of the first-born, the stubbornness of Pharaoh was broken, so that he consented to, and even urged, the de- parture of the Hebrews. By and by, however, he changed his mind, and, setting out in pursuit of the Hebrews, over- took them at the Red Sea; but Jehovah fought for them, and annihilated Pharaoh's chariots and all his host. In order to present themselves in proper festal array at the celebration for the sake of which they were going into the wilderness, the Hebrew women had borrowed dresses and ornaments from those of Egypt; the Egyptians could now only blame themselves and their hostile conduct if those articles were not returned."*~~

~~*By the miracle wrought at the Red Sea Moses was pointed out to the Hebrews as the man of God, to whom accordingly they now committed the task of caring for their outward life as well as their spiritual guidance. He led them first to Sinai, where the law was revealed and the worship in connexion with the ark of the covenant insti- tuted. When he had communed face to face with the Godhead for forty days on the holy mountain, the skin of his face shone so that he had to wear a veil (hence the horns, properly rays, on his forehead). Driven from Sinai in consequence of their worship of the golden calf, the Israelites removed to Kadesh with the view of entering*~~

~~*1 On the road occurred the remarkable incident which, in the view of the narrator, led to the circumcision of infants being substituted*~~

~~*for that of the bridegroom (Exod. iv. OA, 255 pos pan), to mark the substitution,—compare the euphemism in Isa. vii. 20).*~~

~~*2 Quite contrary to the sense of the Biblical narrative, Justin (xxxvi. 2, 13) says, " Sacra ASgyptiorum furto abstulit ;" and still more per- verse is the gloss which Ewald, proceeding upon this expression of Justin, gives.*~~

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~~*Palestine. But this plan was defeated by their unbelief and faintheartedness, and, as a punishment, they were compelled to sojourn*~~

~~*forty years in the wilderness of Kadesh (Paran, Sin). It was here and now that the people went to school with Moses; here, at the sanctuary of the camp, he declared law and judgment; and here, according to the view of the oldest tradition, the foundations of the Torah were laid (Exod. xviii.). The region of Kadesh was also the scene of almost all the miracles and other cir- cumstances we read about Moses. Here he showed himself to be at once the father and mother of the people, their judge, priest, and seer. It was not till towards the very close of his life that he led the Israelites from Kadesh into northern Moab, which he wrested from the Amorite king, Sihon of Heshbon. Here he died on Mount Pisgah or Nebo, after taking leave of the people in the great legisla- tive address of Deuteronomy. According to Deuteronomy xxxiv. 6, he "was buried in a valley in the land of Moab, _ . . but no man knoweth of his sepulchre unto this day." * As his successor in the leadership, Moses had named Joshua ben Nun, but the real heirs to his position and influence were the priests at the sanctuary of the ark of the covenant. Of his personal character the Bible tells us nothing (for yy in Numb. xii. 3 means only " heavily burdened"); but later Judaism is all the more at liberty on this account to expatiate upon it (see especially J osephus, Ant., iv. 8, 49).*~~

~~*Such in brief réswmé are the accounts of Moses given in the Bible4 and the Midrash. In addition to these we have also the statements of Hellenistic writers, preserved chiefly in the Contra Apionem of Josephus. These are all of an Egyptian complexion, and probably embody no ancient and independent tradition, but, in all that relates to the Hebrews, where they do not rest upon pure conjec- ture, merely go back upon obscure rumours of Jewish origin and dress them up after the manner of the Midrash—only in a con- trary sense, with hatred and not with love—and then seek to fit them as well as may be into the Egyptian history and chronology as known from other sources. The great number of new proper names of places and persons which occur in the writings of Manetho and bis like cannot be urged against this view, for the Midrash also is full of them. 'The very name Osarsiph, given to Moses himself, moreover, suggests a suspicion of dependence on the Asaphsuph, "mixed multitude" of Numb. xi. 4 (comp. Exod. xii. 38); what is said in these places is known to have played a great part in the rise of the idle Egyptian tales about the origin of the Jews and of their lawgiver.*~~

~~*For literature, see the various commentaries on the Pentateuch, and especially Dillmann on Exodus. (J. WE.)*~~

~~*MOSES oF CHorENE was a native of Khor'ni ° in Tar6n, a district of the Armenian province of Turuberan. Accord- ing to the only trustworthy authority—the History of Armenia® which bears his name—he was a pupil of the two fathers of Armenian literature, the patriarch or catho- licos Sahak the Great and the vartabed Mesréb. Shortly after 431 he was sent by these men to Alexandria to study the Greek language and literature, and thus prepare him- self for the task of translating Greek writings into Armenian. Moses took his journey by Edessa and the sacred places of Palestine. After finishing his studies in the Egyptian capital he set sail for Greece ; but the ship was driven by contrary winds to Italy, and he seized the opportunity of paying a flying visit to Rome. He then visited Athens, and towards the end of winter (440) arrived in Constantinople, whence he set out on his homeward journey. On his arrival in Armenia he found that his patrons were both dead. The History of Armenia speaks of its author as an old, infirm man, constantly engaged in the work of translating.' In the later Armenian tradition*~~

~~*Se ee Tea ae 3 The legend of his assumption is of later growth ; see the apocryphal*~~

~~*Assumptio Moysis (APOCALYPTIC LITERATURE, vol. ii. p. 177), and*~~

~~*compare Luke ix. 30, 33; Jude 9. ;*~~

~~*4 Outside of the Hexateuch, however, he is almost never mentioned.*~~

~~*5 Of, Sukias Somal, Quadro della storia letteraria di Armenia, p.*~~

~~*94 sq. 6 iii, 61 sq., 68, 65.*~~

~~*7 On linguistic grounds, the Mechitarists ascribe to him the transla-*~~

~~*tion of Eusebius's Chronicle and of the Pseudo-Callisthenes.*~~

~~*we find other notices of this celebrated man,'—such as, that he was the nephew of Mesrdéb, that he was publicly complimented by the emperor Marcian, that he had been ordained bishop of Bagrewand by the patriarch Giut, and that he was buried in the church of the Apostolic Cloister at Mush in the district of Tarén ; but these accounts must be received with great caution. This remark applies especially to the statement of Thomas Ardsruni,? that Moses, like his Hebrew prototype, lived to the age of 120 years, and recorded his own death in a fourth book of his great work.? The same caution must be extended to another tradition, based on an arbitrary construction of a passage in Samuel of Ani,' which places his death in the year 489.*~~

~~*Of the works of Moses® the best known is the History of Armenia,§ or, as the more exact title runs, the Genealogi- cal Account of Great Armenia. It consists of three books, and reaches down to the death of Saint Mesr6éb, in the second year of Jazdegerd II. (17th February 440).'—It is dedicated to Sahak Bagratuni (who was afterwards chosen to lead the revolted Armenians in the year 481), as the man under whose auspices the work had been undertaken. This work, which in course of time acquired canonical authority among the Armenians, is partly compiled from sources which we yet possess, viz., the Life of Saint Gregory by Agathangelos, the Armenian translation of the Syriac Doctrine of the Apostle Addai, the Antiquities and the Jewish War of Josephus, and above all the History of Mar Abas Katina (still preserved in the extract from the book of Sebéos),8 who, however, did not. write, as Moses alleges, in Syriac and Greek, at Nisibis, about 131 B.c., but was a native of Medsurch, and wrote in Syriac alone about 383 A.D., or shortly thereafter. Besides these, Moses refers to a whole array of Greek authorities, which were known to him from his constant use of Eusebius, but which cannot possibly have related all that he makes them relate.® Although Moses assures us that he is going to rely entirely upon Greek authors, the contents of his work show that it is mainly drawn from native sources. He is chiefly indebted to the popular ballads and legends of Armenia, and it is to the use of such materials that the work owes its perma- nent value. Its importance for the history of religion and mythology is, in truth, very considerable, a fact which it is the great merit of Emin 1° and Dulaurier ! to have first pointed out. For political history,*~~

~~*on the other hand, it is of much less value than was formerly assumed. In particular, it is not a history of the people or of the country, but a history of the Armenian aristocracy, and, in*~~

~~*Collected by Langlois, Collection des historiens de U' Arménie, ii. 47 sq.*~~

~~*2 In Brosset, Collection d'historiens Arméniens, i. 68.*~~

~~*3 There is not the slightest allusion elsewhere to any such book,*~~

~~*4 In Brosset, ii. 387.*~~

~~*® Complete edition of the Mechitarists, Venice, 18483; new ed., 1865, 8vo.*~~

~~*6 The oldest MS, is that of S. Lazaro of the 12th century. Col- lations of MSS. of Etchmiadzin and Jerusalem are given by Agop Garinian, Tiflis, 1858, 4to. The book has been edited and translated by Whiston, London, 1736, 4to ; and by Le Vaillant de Florival, Venice and Paris, s.a. (1841), 2 vols. 8vo.*~~

~~*7 The commencement of this king's reign has been fixed by Néldeke (Geschichte der Sassaniden aus Tabari, p. 423) as 4th August 438 ; and this date has subsequently been established by documentary evidence from the fact of the martyrdom of Pethion (see Hoffmann, Ausziige aus Syrischen Akten persischer Martyrer, p. 67) ' 8 Translated in Langlois, i. 195 sq.*~~

~~*® For the following statements, the proofs may be found in the article ' Ueber die Glaubwiirdigkeit der Armenischen Geschichte des Moses von Khoren," by the present writer, in the Berichte der phil. ie Classe der Kénigl. Stichs. Gesellschaft der Wissenschaften, 1876, pe 1 sq. :*~~

~~*The Epic Songs of Ancient Armenia (Arm.), Moscow, 1850.*~~

~~*"1 " Etudes sur les chants historiques et les traditions populaires de Vancienne Arménie," in the Journ. Asiat., iv., sér. 19 (1852), p. 5 sq.*~~

~~*MOSES*~~

~~*opposition to the Mamikonian tendency which pervades the rest of the older Armenian historical literature, it is written in the interest of the rival Bagratunians. Down to the 3d century it is proved by the contemporary Graeco-Roman annals to be utterly untrustworthy ; but even for the times of Armenian Christianity it must be used far more cautiously than has been done, for example, by Gibbon. The worst feature is the confusion in the chronology, which, strange to say, is most hopeless in treating of the con- temporaries of Moses himself. What can be thought of a writer who assigns to Jazdegerd I. (399-420) the eleven years of his predecessor Bahrém IV., and the twenty-one years of Jazdegerd I. to his successor Bahram V. (420-439) 4 The present writer }* formerly attempted to explain this unhistorical character of the narrative from a tendency arising out of the peculiar ecclesiastical and political cir-*~~

~~*'cumstances of Armenia, situated as it was between the*~~

~~*eastern Roman and the Persian empires, circumstances which were substantially the same in the 5th as they were in the two following centuries. In the course of further investigations, however, he has come to the conclusion that, besides the many false statements which Moses of Khor'ni makes about his authorities, he gives a false account of himself. That is to say, the author of the History of Armenia is not the venerable translator of the 5th century, but some Armenian writing under his name during the years between 634 and 642. The proof is furnished on the one hand by the geographical and ethno- graphical nomenclature of a later period and similar anachronisms,!° which run through the whole book and are often closely incorporated with the narrative itself, and on the other hand by the identity of the author of the History with that of the Geography, a point on which all doubt is excluded by a number of individual affinities,!* not to speak of the similarity in geographical terminology. The critical decision as to the authorship of the Geography settles the question for the Hvstory also.*~~

~~*The Geography is a meagre sketch, based mainly on the Choro- graphy of Pappus of Alexandria (in the end of the 4th century), and indirectly on the work of Ptolemy. Only Armenia, the Persian empire, and the neighbouring regions of the East are independently described from local*~~

~~information, and on these sections the value of the little work depends. Since the first published text » contains names like “ Russians ” and “ Crimea,” Saint Martin in his edition * denied that it was written by Moses, and assigned its origin to the 10th century. It was shown, however, by L. Indjidjean!’ that these are interpolations, which are not found in better manuscripts. And in fact it is quite evident that a book which gives the division of the Sasanid empire into four spahbehships in pure old Persian names cannot possibly have been composed at a long interval after the time of the Sasanide. But of course it is equally clear that such a book cannot be a genuine work of Moses of Khor’ni; for that division of the empire dates from the early part of the reign of King Chosrau I. (581-579). Accordingly the latest editor, K. P. Patkanow,!® to whom we are indebted for the best text of the~~

~~12 ** Ueber die Glaubwiirdigkeit,” &c., p. 8 sq.~~

~~13 Instances of these may be found in i. 14, where the arrangement of Armenian provinces I., II., III., IV., introduced in the year 536, is carried back to Aram, an older contemporary of Ninus; and in the passage iii, 18, according to which Shapfir II. penetrated to Bithynia, although the Persians did not reach that till 608.~~

~~14 See the confusion, common to both books, between Cappadocia I. and Armenia I., in consequence of which Mazaka and Mount Argéus are transferred to the latter locality (Hist.,i. 14; Geogr., Saint Martin’s ed., li. p. 354); also the passages which treat of China and Dchenbakur (Hist., ii. 81; Geogr., ii. p. 876), &c.~~

~~15 Edition with translation by Whiston, London, 1736, 4to.~~

~~16 In the Mémoires historiques et géographiques sur 0 Arménie (Paris, 1819, 8vo), ii. p. 801 sq.~~

~~7 Antiquities of Armenia (Arm.), iii. p. 303 sq.~~

~~18 See Noldeke’s Tabari, p. 155 sq.~~

~~19 Armjanskaja gcographija vit. wika po r. Ch. (pripisiw awschajasja Moiseju Chorenskomu), St Petersburg, 1877, 8vo. Before him Kiepert (in the Mfonatsb. d. Berliner Akad., 1873, p. 599 sq.) had substantially arrived at the right conclusion when he 'assigned the portions of the Geography referring to Armenia to the time between Justinian and Maurice. : 6~~

~~Geography, is of opinion that we have in it a writing of the 7th century. In this judgment we must concur; and, if the limits within which the Geoyraphy was composed are to be more nearly defined, we may say that, from isolated traces of Arab rule? (which in Armenia dates from 651), it must have been written certainly after that year, and perhaps about the year 657."~~

~~Another extant work of Moses is a Manual of Rhetoric, in ten books, dedicated to his pupil Theodorus. It is drawn up after Greek models, in the taste of the rhetoric and sophistry of the later imperial period. The examples are taken from Hermogenes, Theon, Aphthonius, and Libanius ; although the author is also acquainted with lost writings, ¢.g., the Peliades, of Euripides. On account of the divergence of its style from that of the History of Armenia, Armenian scholars? have hesitated to ascribe the Rhetorie to Moses of Khor'ni; but, from what has been said above, this is rather to be regarded as a proof of its authenticity.~~

~~Smaller works bearing the same honoured name' are—the Letter to Sahak Arderuni; the History of the Holy Mother of God and her Image (in the cloister of Hogotsvanch in the district Andzevatsi of the province of Vaspurakan), which is also addressed to Sahak ; and the Panegyrie on Saint Rhipsime. Of the sacred poems attri- buted to him, there is only one 'short prayer, contained in the hymnal of Sharakan, which can really claim him as its author.~~

~~Of works passing under the name of Moses of Khor'ni, the follow- ing are regarded by the historians of Armenian literature as spurious : a History (distinct from the Pancgyrie) of the wanderings of Saint Rhipsime and her companions ; a Homily on the transfiguration of Christ ; a~~

~~*Discourse on Wisdom (i.e., the science of grammar) ; the Commentaries on grammar (an exposition of Dionysius Thrax). In the case of the grammatical writings, it has been suggested that there may have been some confusion between Moses of Khor'ni and a Moses of Siunich, who lived in the 7th century. (A. v. G.)*~~

~~*MOSHEIM, Jowann Lorenz von (c. 1694-1755), well known as a church historian, but also distinguished in his day as a master of eloquence, was born at Liibeck on the 9th of October. There is some uncertainty as to the year, but the probability is in favour of 1693 or 1694. HIe received a somewhat irregular education at the gymnasium of his native place, and afterwards entered the university of Kiel, where he took his master's degree in 1718. HIis first appearance in the field of literature was in a polemical tract against Toland, Vindicie antique Christianorum dis-ciplinz (1720), which was soon followed by a volume of Observationes sacre (1721). These works, along with the reputation he had acquired as a lecturer on philosophy, and also as a fervent and eloquent preacher while acting as assistant to Albrecht zum Felde, his teacher and future father-in-law, secured for him a call to a theological chair at HIelmstadt, in 1723. The Institutionum HIistoria Eccle- siastice Libri IV. appeared in 1726 (2 vols., 12mo), and in the same year he was appointed by the duke of Bruns- wick abbot of Marienthal, to which dignity and emolu- ment the abbacy of Michaelstein was added in the following year. Mosheim was much consulted by the authorities when the new university of Géttingen was being formed ; especially had he to do with the framing of the statutes of the theological faculty, and with the provisions for making the theologians independent of the ecclesiastical courts. But having signed in 1726 a promise to remain in HIelmstidt he was unable to accept the call to the Georgia Augusta which was urgently pressed upon him, until the year 1747, when the duke of Brunswick at last released him from his obligation. To enhance the dignity he already possessed as a learned and brilliant theological professor at Géttingen, a new office was specially created for him, that of chancellor, which, however, proved some- what burdensome, exciting the jealousy of the nobles whom he governed, HIe died at Géttingen on 9th September me eee Sr OPN ee i*~~

~~1 The passage about the trade of Basrah, which was founded in 635, is decisive on this point (Saint Martin's edition, ii. p. 368).~~

~~2 The peculiar interest which the author (Saint Martin, ii. p. 340) takes in the origin of the Slavs in Thrace is best explained by the war against them which called the emperor Constans II. away from the East in the year 657. In other respects the writer displays the most complete indifference, and even ignorance, with regard to the state of affairs in the West.~~

~~3 Cf. Langlois, ii, 49, 4 Cf, Langlois, /.e.~~

~~1755, shortly after the completion of a new and greatly improved edition of his Church History.~~

~~For Mosheim's place as an ecclesiastical historian, see CHURCH History, vol. v. p. 765. In this department of literature, in addition to the Jnstitutiones must be specially mentioned his De Rebus Christianorum ante Constantinum Magnum Commentarit (1753), and Gibbon's just criticism : "Less profound than Petavius, less independent than Le Clerc, less ingenious than Beausobre, the historian Mosheim is full, rational, correct, and moderate." His exegetical writings, characterized by learning and good sense, include Cogitationes in N. T. loc. select. (1726), and expositions of 1 Cor. (1741) and the two Epistles to Timothy (1755). In his sermons (Heilige Reden) considerable eloquence is shown, and a mastery of style which justifies the position he held as president of the German Society. There are two English versions of the Insti- tutes, that of Maclaine, published in 1764, and that of Murdock (1832), which is much more correct. The latter was revised and re-edited by Reid in 1848. An English translation of the De Rebus Christianorum, begun in 1813 by Vidal, was completed and edited by Murdock in 1851.~~

~~MOSQUE (Jémi', or more fully Masjid Jami', the place of congregational prayer). Owing to the almost complete absence of ritual in the Moslem worship, the mosque, at least in its earlier forms, is one of the simplest of all re- ligious buildings,—its normal arrangement being an open court (Sahn) surrounded by a covered cloister (Liwdn), in the centre~~

~~*of which is a cistern for the ablutions requisite before prayer (Mida'a) ;5 the side of the mosque which is towards Mecca is occupied by a roofed building (JJaksira), or place reserved for prayer, sometimes screened off from the court, but frequently quite open towards it. In the centre of this sanctuary is a niche (Jfhrdb or Kibla) showing the direction of Mecca; and by the side of the niche is a lofty pulpit (fimbar). In front of the pulpit is a raised platform (Dakka) from which certain exhortations are chanted, and near it one or more seats and lecterns combined from which chapters of the Koran are read to the people.*~~

~~*Minarets (Ma ddhin, sing. Ma'dhana) were not built*~~

~~*during the first half-century after the Flight, but now as*~~

~~*a rule no mosque is without at least one. From the upper gallery of this the Jfoedhdhin announces to the faithful the times for prayer,—five times during the day, and twice at night. Blind men are generally selected for this office, so that they may not overlook the neighbouring houses.*~~

~~*Most mosques have endowed property, which is admi- nistered by a warden (Wdzir), who also appoints the imams and other officials. The larger mosques have two iméms: one is called (in Arabia and Egypt) the Khatib, and he preaches the sermon on Fridays (the Moslem Sabbath) ; the other, the Rdtib, reads the Koran, and recites the five daily prayers, standing close to the Mthrdb, and \eading the congregation, who repeat the prayers with him, and closely follow his postures. The imams do not form a priestly sect ; they generally have other occupations, such as teaching in a school or keeping a shop, and may at any time be dismissed by the warden, in which case they lose the title of imam. Doorkeepers and attendants, to sweep the floor, trim the lamps, and perform other menial offices, are attached to each mosque, in numbers varying according to its size and endowment. Moslem women, as a rule, are expected to say their prayers at home, but in some few mosques they are admitted to one part specially screened off for them. 'This is the case in the mosque of Sitta Zainab in Cairo. In the Aks4 mosque at Jerusalem there is a latticed balcony for the women, who can see without being visible to the male worshippers below.*~~

~~*The greatest possible splendour both of material and workmanship is often lavished on the building and its*~~

~~*5 In mosques frequented by Turks or other members of the Hanafi sect running water is provided from a raised tank with flowing jets, called a hanafiya after the sect who require it. Other Sunnis are content to wash in a stagnant tank. _*~~

~~*fittings. The whole outside is frequently decorated with the most elaborate surface-carving in stone or marble,—the pavement of the richest marbles, inlaid in intricate patterns, the walls panelled in a similar way, or decorated with the most minute mosaics of glass, mother-of-pearl, agates and other costly stones. The central niche and the pulpit are of special magnificence ; and, if the latter is of wood, it is often covered with delicate ivory carvings, and inlay of pearl and ebony. Very beautiful surface-ornament, executed in hard stucco, and enriched with gold and colours, is used to decorate arches, wall surfaces, and the penden- tives of domes, which latter generally have the so-called "'stalactite" form of ornament—one of great beauty and complexity. The woodwork of doors, screens, and ceilings is frequently very gorgeous with carving, inlay, and ela-*~~

~~*borate painting ; the whole of the doors outside are often*~~

~~*covered with very delicate pierced and embossed work in bronze, or more rarely iron. The magnificent tiles from Persia, Damascus, and Rhodes, enamelled in brilliant blue, green, and red, on a white ground, are often used to cover the walls. Traceried windows in pierced marble or stucco work often occur; these are filled with brilliant coloured glass, always in very small pieces, forming a transparent mosaic of jewel-like richness.1 Lamps of enamelled glass, or of bronze inlaid with silver, were once common, but are now rapidly disappearing.*~~

~~*Some mosques, especially the Kartibin mosque at Fez in Morocco, possess a collection of magnificent illuminated MSS., chiefly copies of the Koran and other religious books ; in the large collection at Fez, MSS. of*~~

Aristotle's Natural History, with the works of Averroes and other commenta- tors, exist in considerable number ; some few of the MSS. are as early as the 10th century.

Plans of Mosques.—Considerable diversities exist in the plan and arrangement of mosques in various countries, either because the Moslem conquerors adopted to some extent the existing buildings and architecture of the conquered people, or on account of the new mosque being built on a site already cramped by surrounding buildings. The first of these causes influenced to some extent the mosques of India, and to a much greater extent those of European Turkey. The second cause, the cramped site, especially in Cairo, created a special type of plan. Nevertheless, when free from such disturbing influences, there is one normal plan adopted, at least in early times, by the Mos- lems in all countries—from India to Cordova, and from northern Syria to Egypt.2 This normal plan is a very simple one, and is the natural product of a country like Arabia, unskilled in architecture, where land was worth but little,.and timber very scarce. (See fig. 1.)

Though not the earliest, the great mosque of Cordova is the most magniticent, and in the main the best preserved, of this typical form.? It was begun in 784-5 by the caliph 'Abd al-Rahman I. (Abderame) and completed by his son Hisham in 793-4 ; thongh it was afterwards enlarged, and then to some extent injured by addi- tions—the work of the Christians, who made it into a cathedral—yet it still remains but little altered, except by the loss of its mag- nificent carved and inlaid wood ceiling and sumptuous Mimbar. It consists (omitting recent additions) of two main parts, a large cloistered _open court, with at one side a covered building for prayer. In one respect only it differs from the usual plan: the open court is generally much larger than the roofed space, whereas at Cordova it is smaller. For the sake of brevity this arrange- ment will, in the rest of the article, be referred to as the "' normal

plan." In spite of neglect and alterations this mosque is still one of the most imposing buildings in the world. The long ranges of

1 See Coste, Architecture Arabe, 1837-39; Bourgoin, Les Arts Arabes, 1868; Prisse d'Avennes, Art Arabe, 1874-80; and Texier, DT Arménie et

~~*la Perse, 1842-52.*~~

~~*? The great mosque of Mxcca (q.v.) is unique in plan. account of the mosque of Medina, see MEDINa.*~~

~~*3 Contreras, Arte Arabe en Espafia, 1875; Academy, 19th Novem- ber 1881, " Mosque of Cordoba," by J. H. Middleton ; Mon. Arqui. de Espatta ; and Prangey, Mosquée de Cordoue.*~~

~~*For an*~~

~~*MOSQUE*~~

~~*aisles, nineteen from east to west and thirty-one from north to south—on their marble columns the spoils of many a Greek and Roman temple—seem to stretch almost endlessly in every direction, and each range of pillars appears to lose itself in the gloom of distance, so that from no point can any idea be formed of what is the real size of the whole building. The side towards the court was quite open, and all over the court orange-trees were planted at regular intervals, continuing the lines of the columns within, and set at the same distances apart ; so that aisles of orange-trees in long ranges covered the open space, just as the marble columns did within. No words can describe the jewel-like splendour of the mosaics in the sanctuary, which in complicated Arabesque patterns, mixed with elaborate Cufic inscriptions, cover the walls and even the arches, which cross and recross each other in the most fanciful and daring way, forming a sort of aisle round three sides of the sanctuary. There is documentary evidence to show that these glass mosaics, though of thoroughly Oriental design, are, like those in the mosques of Jerusalem and Damascus, the work of Christian artists from Byzantium.*~~

~~*The most important early mosques were all built on this normal plan, with but very slight variations. The following are some of the finest examples of this type :—*~~

~~*Mosque of 'Amr, Old Cairo, begun in 642 a.p., but much en- larged at the end of the 7th century, and afterwards partly rebuilt (see fig. 1).*~~

~~*Mosque of Sidi-'Okba at Kairawan in Tunis, latter part of 7th century.*~~

~~*Mosque of Sidi-'Okba near Biskra in Algeria, about 684.*~~

~~*Mosque of Edris at Fez in Morocco, end of 8th century.*~~

~~*Great mosque of Damascus, 708.*~~

~~*Great mosque of Cordova, 784-794 (described above).*~~

~~*Mosque of Ibn Tulin, Cairo, 879.*~~

~~*Mosque of Al-Azhar, Cairo, begun about 970.*~~

~~*Great mosque at Old Delhi, 1196-1235.*~~

~~*The first of these, the mosque of 'Amr (see Coste, Architecture*~~

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~~*vollincws*~~

~~*mM Fe i i 4 Af a MII i tka*~~

~~*OF*~~

~~*Sreet*~~

~~*GAARBAAAR Oo*~~

~~*Fic. 1.—Plan of Mosque of 'Amr, Old Cairo.*~~

~~*1. Kibla. 2. Mimbar. 8.Tombof'Amr. 4. Dakka. 5. Fountain for Ablu- tion. 6, 6. Rooms built later. 7. Minaret. 8. Latrines.*~~

~~*Arabe), is now ina partly ruined condition. Its east wall probably still retains some of the original work of 'Amr, who in 642 built a small mosque on the site of the present one. But little remains except its fine antiqne marble columns to tell of its former splendour in mosaic, stucco*~~

~~*reliefs enriched with painting, and magnificent inlaid wood ceilings and screens. According to Makrizi, it once contained 1290 MSS. of the Koran, and was lighted by 18,000 lamps. In general effect, like all mosques of this simple and extensive plan, it is very stately, from the vast size of its area, and its great number of closely-ranked columns and arches, the latter being of many forms—pointed, semicircular,*~~

~~*MOSQUE*~~

~~*and horse-shoe. Fig. 1 gives its plan as a good typical specimen of this normal type of mosque.*~~

~~*The mosque at Kairawan, Tunis, said to have been founded by 'Okba (see supra, p. 567), follows the normal plan, with 439 fine antique marble columns, horse-shoe arches, some pointed and others round, and flat ceiling of dark wood, once magnificently painted. Its sanctuary is ten aisles deep by seventeen wide. In the centre of the court is a marble fountain over the sacred well, said to communi- cate with the spring Zemzem at Mecca. Its minaret, a rather later addition, is very massive and stately ; it is square, in three stories, each battlemented, the walls battering considerably. The sanctuary is domed, and the Mihraéb is decorated with magnificent tiles. Adjoining the sanctuary is a small room for a library.*~~

~~*The other great mosque of Sidi-'Okba, built soon after his death in 682, and containing his tomb, is in Algeria near Biskra ; it much resembles the Kairawan mosque, but is less splendid, some of the columns being not of marble but of baked clay decorated with painting.*~~

~~*The great mosque of Fez, about the same date, is also very large and magnificent, with Mimbar and Mihrab richly ornamented with minute mosaics; it has also a fine inlaid and painted wood ceiling, and some elaborately-carved doors, It still possesses a fine library. (See Amici, Journey to Fez, 1878.)*~~

~~*The great mosque of Damascus was built on the site of a Christian basilica, erected by Theodosius in 395-408. From 636, when the Arabs conquered Damascus, until 708 this basilica was used jointly both by the*~~

~~*Christians and the Moslems. The basilica was then pulled down, and the present mosque built by the caliph Walid. It has the normal plan, and is 508 feet by 320 feet. Its sanctuary is only three aisles deep; it has a central dome on the south or Mecca side, and on the east and west a large porch. Sambhudi records that one of the conditions of peace con- cluded between the Byzantine emperor and Walid was that the emperor should furnish a certain number of workers in mosaic for the decoration of the mosques at Mecca, Medina, Jerusalem, and Damascus.*~~

~~*The mosque of Ahmed Ibn Tulin, in Cairo, completed in 879, has the normal plan, with the exceptional addition of an outer court, or wide passage, running round three sides of the rectangle, — probably to cut it off completely from the noise of the surrounding streets. It is built of brick, coated with delicate reliefs in stucco, once enriched with painting. The Mihradb has beautiful mosaics, and the Mimbar is a marvel of delicate carving and inlay. The pillars and arches are of brick enriched with elaborate stucco-work. It has a very remarkable minaret on the west side, with a spiral external staircase. The architect was a Copt, an Egyptian Chris- tian. It is perhaps the earliest important building in which the pointed arch is largely used.*~~

~~*The mosque Al-Azhar, " The Splendid," was built in the centre of New Cairo about 970 and, though frequently restored, has in the main been little altered. It is on the normal plan, with ranges of pointed and slightly horse-shoe arches, supported on more than 400 fine antique columns of marble and porphyry, chiefly from Roman buildings. Among its later decorations are magnificent wall-coverings of the most beautiful Persian tiles. It has a special interest in being the chief university of the Moslem world, con- taining some thousands of students (mujdwirin), for whom certain parts of the mosque (Riwék) are screened off, according to the country from which they come. Thus special parts are reserved for natives of the various provinces of Egypt, of Morocco, Syria, Arabia, India, Turkey, &c. Each student can, if he is too poor to hire lodgings, live, eat, and sleep in the mosque, Each has a large chest in which to keep his clothes and books; these are piled against the walls to a height of seven or eight feet. The students pay no fees, but the richer ones give presents to the lecturers, who sit on the matting in various parts of the sanctuary or*~~

~~*cloister, while the students sit round each lecturer in a circle. The usual course of study lasts for three years, though some students remain for much longer. The chief of the lecturers, called the Sheikh al-Azhar, receives about £100 a year, the others little or nothing, as regular pay. The Koran, sacred and secular law, logic, poetry, and arithmetic, with some medicine and geography, are the chief subjects of study.*~~

~~*Of mosques which are not built on the normal plan the earliest and most important are the two in the Hardm al-Sherif (High Sanctuary) at Jerusalem (see vol. xiii. p. 642).*~~

~~*The Kubbet al-Sakhra (Dome of the Rock), popularly, but wrongly, called the " Mosque of Omar," is not, strictly speaking, a mosque atall. It belongs rather to the class of " shrines,"—generally small square, circular, or octagonal buildings erected over some sacred spot or tomb. It is a very beautiful building, with high central dome, and double ambulatory round it,—the outer wall being octa- gonal, and the dome, with the pillars that carry it, circular in plan. It is decorated in a very sumptuous way by inlay of rich marbles and very splendid glass mosaics. The outer wall and most of the internal mosaics are later than the dome itself. Its windows of mosaic-like stained glass are very beautiful, and are almost the only*~~

~~*865*~~

~~*built in a crowded site with a wing for a tomb. In plan it is cruciform, the central part being open to the sky; the eastern arm of the cross is the sanctuary, and farther eastis the stately domed tomb of the sul- tan himself. All four arms of the cross are vaulted in stone with a plain waggon vault. Its inagnificent entrance on the north, with an en- ormously high arch, de- corated with stalactite reliefs in stone, is set somewhat askew to fol- low the line of the old street. It has two mi- narets, one of great height and grandeur. The Muristan Kalatin is a combination of hospital, tomb, and mosque,—an enormous G building covering avery large area. It was built by Sultan Kalaun at the beginning of the 14th century; his tomb, built 1320, which forms part of this great building, is a massive square edifice 1,2, Main entrance. 3. Court open to sky. with vory grand and 6, Boselag 66, Noh ang uty eid 7 ransepts edo € well-designe*~~

~~octagonal bar ag 8,9. Dakka. 10. Teron i. Mimbar. dome. Its wall-mosaics 12, Kibla. 13. Door to tomb. 14. Domed tomb- in pearl and precious chamber. 15, Tomb within screen. 16. Kibla. stones are unusually 17, 17. Minarets. 18, 19, 20. Various entrances to magnificent. mosque. 21. Small rooms connected with' service~~

~~: Even 4 of the mosque. 22. Sultan's private entrance. bare list of the mosques~~

~~of Cairo would occupy a large space; they are over four hundred in number, and are mostly remarkable for some beauty in design orrichness in their ornament and material.~~

~~The mosque of Ibrahim Agha should specially be noted for the splendid Persian tiles which cover the east wall of its sanctuary ; these are of the end of the 16th century, and are unrivalled in beauty both of drawing and colour. The tiles are 9 inches square, aud work into large designs with very graceful sweeping curves of foliage, drawn with the greatest skill, and painted in the most brilliant yet harmonious colours—perfect masterpieces of coloured decoration. See Mura, DECORATION,~~

~~The so-called " Tombs of the nag at " really tomb-mosques of Egyptian sultans, are a large group of very fine buildings, less than a mile outside the walls of Cairo. The largest is that of Sultan Barkuk, with a superb dome and two stately minarets. In addi- tion to an extensive open court, it has on each side of the sanctuary a mnagnificent tomb-chamber containing the bodies of the sultan himself, who died in 1899, and various members of his family.~~

~~The most beautiful and graceful of all these mosques is that which contains the tomb of Sultan K4it-Bey, who died in 1496; its dome is entirely covered externally with beautiful and delicate reliefs carved in stone. Its minaret is a masterpiece of invention and extreme grace of outline, combined with the richest and most exquisite detail; like most of the Cairo mosques, its exterlor 1s ornamented by bands of red stone alternating with the yellow Mokattam limestone. Inside, marble inlaid pavements and mosaic on the walls, with decorations in painted stucco and wood carved and inlaid give extreme splendour to the building. Fig. 3~~

~~*gives its plan as a typical example of the combined mosque and tomb,—the latter the more important. The mosque inside the walls of aoe ea eee*~~

~~*1 See De Vogué, Temple de Jérusalem, 1864; Texier, Asie Mineure, 1862.*~~

~~*Fra. 2.—Plan of Mosque of Sultan Hasan, Cairo.*~~

~~*Cairo, built by the same sultan, is also very beautiful, and re- markable for its carvings and mosaics.*~~

~~*It should be observed that the mm beg magnificent mosques of Egypt, jie as of other countries, owe little or nothing to the native archi tectural talentof the Arabs them- {J] ™. selves. Their own buildings at the time of the Prophet were of the simplest and rudest descrip- tion, but they were always ready to make use of the architectural skill and constructive power of the people they conquered.*~~

~~*The earlier buildings of Egypt are mainly the product of Coptic and Byzantine skill, while rather later the art of Persia, both inits general designs and details of workmanship, exercised a para- mount influence over the whole Moslem world. Another influ- ence must not be forgotten, that of French and English Gothic, a panes by the buildings erected Fra. 3—Mosque-tomb of Sultan Kait-*~~

~~*y the crusaders during their oc- ~ Bey, Cairo.*~~

~~*cupation of Palestine. Oneofthe 4 yyain entrance. 2. Lobby and cis- Cairo mosques, that of Kalatn, terns for ablution. 3. Great minaret. possesses a fine arched doorway, 4. Kibla. 5. Mimbar. 6, Sultan's tomb- taken from a Christian church Chamber. 7. The tomb within a screen. at Acre—a fine specimen of Early ~ é*~~

~~*English work, which would not be out of place in Salisbury Cathe- dral. Moslem translations of the clustered jamb-shafts and deep arch-*~~

~~*mouldings of this style often occur.*~~

~~*The rest of northern Africa contains many mosques of great size and splendour ; among these the most important, in addition to those alpaacly mentioned as having the normal plan, are—(1) the mosque- tomb of 'Abdallah b. Wadib in Kairawan, Tunis, a very large build- ing, containing several courts and cloisters, dating from the same early period as the other great mosque in Kairawdn ; its minaret is covered outside with fine blue and green tiles ; (2) the great mosque of Algiers, 10th century ; and (3) that of Tlemcen, in the extreme west of Algeria, built in the middle of the 12th century ; this has a very splendid pavement, partly composed of Algerian onyx, and a beautiful bronze chandelier, 8 feet in diameter, given by Sultan Yarmorak, 1248-83.*~~

~~*In Spain, at Zahra near Cordova, was one of the grandest of the early mosques, finished in 941; but nothing of it now exists. Several churches in Spain were originally built as mosques, such as S. Cristo de la Luz at Toledo, a small, nearly square building, roofed by dome-like vaulting on marble pillars.*~~

~~*In Persia but little now remains of the magnificent early mosques, built with such splendour, especially during the reign of Harin al- Rashid. At Erzeroum there is a fine mosque, combined with tomb and hospital, almost Early Gothic in style, dating from the 13th century.' At Tabriz there is another church-like mosque, evidently the work of Byzantine builders; according to Texier, this belongs to the 16th century, but it is probably two or three hundred years carlier.*~~

~~*The mosque of Houen, near Cesarea in Cilicia, is a fine large rectangular building, covered with low domes on square piers. It dates from the second half of the 12th century.*~~

~~*At Tchekirghe near Broussa is a very remarkable mosque—that of Murad I., built in the 13th century, almost in the style of con- temporary Italian Gothic. Its main facade bears an extraordinary resemblance to one of the earlier Sienese palaces.*~~

~~*The later capital of Persia—Ispahan—became the centre of the highest development of the Persian arts under Shah 'Abbas L, 1585-1629 ; to this period belongs the splendid mosque called Masjid Shah, a strangely-planned building of great size, enriched in the most sumptuous way, inside and out, by wall-coverings of the finest Persian enamelled tiles. The mosque of Sultan Hoscin, built as late as 1730, preserves much of the old beauty of design and decoration.*~~

~~*India is especially rich in mosques of great size and beauty. The earlier ones are much influenced by the still older Hindu architec- ture, and some of the larger mosques are built of materials from the old Jain temples. It is recorded that twenty-seven Hindu temples were destroyed to build the great mosque in Old Delhi, erected 1196 to 1285, which presents a curious mixture of the semi-barbarous Hindu carved work with the more refined and graceful decoration of the Moslem builders. This great mosque is on the normal plan, as is the 13th century mosque at Ajmir, also cl attest aml aay, et a a enc aca el a ae a*~~

~~*eS—*~~

~~*1 See Texier, L'Arménie et la Perse, 1842-52 ; Coste, Monuments*~~

~~*ce de la Perse, 1867; Flandin and Coste, Voyage en Perse,*~~

~~*built on the ruins of a Hindu temple. A whole volume would not suffice to describe the magnificent mosques of India, such as those at Ahmedabad, Mandu, Maldah, Bijapur, Fathipur, and countless others. The introduction in the 17th century of Florentine marble and mosaic workers produced a new and very splendid style of building, of which the 'pearl mosque" and the Taj Mehal at Agra are the finest specimens.*~~

~~*At Srinagar in Kashmir there is a large and very remarkable mosque of the normal plan, constructed entirely of wood logs, with numerous pillars of deodar pine ; it was built by Shah Hamadan, and isan extremely picturesque building. (See Cole, Ancient Build- ings in Kashmir, 1869.)*~~

~~*In Turkey the mosques are either old Christian basilicas, such as S. Sophia and S. Saviour's at Constantinople, and the numerous fine early churches of Thessalonica and Trebizond, or else are mostly copies, more or less accurate, of Justinian's splendid church of S. Sophia, a building which seems to have been enthusiastically ad- mired and appreciated by the Ottoman conquerors. The mosque of Solaiman the Magnificent, 1550-1555, is the finest of these Turkish reproductions of S. Sophia. Another, rather less close a copy, is the mosque of Sultan Ahmed, 1608. None of this latter class are of course earlier than the middle of the 16th century.?*~~

~~*In the present century Moslem art has produced but little of architectural importance. The great mosque of Mohammed Ali, on the citadel of Cairo, is the work of a German architect, and though built of rich materials is of small artistic value or interest ; it is a large but feebly designed building of the S. Sophia type. Unfor- tunately European influence seems now to be rapidly destroying the feeling for true art that still survives among Moslem nations.*~~

~~*Literature.—In addition to works referred to above see Monumentos Arquitec- tonicos de Espana, 1859-83; Murphy, Arabian Antiquities of Spain, 1813; Owen Jones, Alhambra, 1842; Antiguedades Arabes de Espafia, 1870; Hay's Views in Cairo, 1840; Roberts, Holy Land, Egypt, &c., 1842-9; Hessemer, Arabische Bau-Verzierungen, 1853; Castellani, Architettura Orientale; Launay and Mon- tani, Architecture Ottomane, 1873; Salzenberg, Alt-Christliche Baudenkmale*~~

~~*von Constantinopel, 1854; Lewis, Illustrations of Constantinople, 1837 ; Chardin, Voyage en Perse, 1735; Fergusson, Architecture of India, &c., 1876; Cole, Ancient i M*~~

~~*Delhi. J. H. M.*~~

~~*MOSQUITO (sometimes written "Mosquita"), Svasiih word signifying "little fly," is a name popularly applied to certain annoying dipterous insects, and, strictly speaking, it should probably be used only for species of Culicide (and for the genus Culew in particular), for which " gnat" is the English synonym; but in many countries it is by almost common consent applied to all small dipterous in- sects that suck human blood,*~~

~~and therefore includes what we know as "'sand-flies," "midges," é&c., of the genera Ceratopogon, Simulium, and others, By Englishmen a distinction is often falsely drawn between " mosquito " and "gnat," the former being supposed to represent an insect native chiefly of hot climates, whereas the latter is their own too-well-known pest. In effect the terms are really synonymous, and any actual difference can only be specific. In very hot seasons we not uncommonly hear alarming reports of mosquitoes having made their appear- ance in London and elsewhere in the British Isles, and means whereby they were imported are often suggested, — the real facts of the case being that extra heat may render the native species more annoying, or that it causes a bodily condition in which their bites are more severely felt. The "mosquitoes" of high northern latitudes may be species both of Culex and Simuliwm.~~

~~Accounts of the numbers of these insects in tropical countries and in high latitudes, and of their irritating attacks, are to be met with—seldom exaggerated—in most books of travel. Even in Britain the annoyance caused by gnats is very great, and in marshy districts often unen- durable, especially to new-comers, for it seems probable that the insects really attack a visitor more furiously than they do the natives of the district, but, on the other hand, the latter may be more indifferent to their assaults. In some subjects even the "piping" by which a hungry gnat announces its presence has most distressing effects. In~~

~~2 Texier and Pullan, Byzantine Churches, 1864; Pulgher, Eglises de Constantinople, 1882.~~

~~3 A few years ago a London hotel, popular with American visitors, was said to harbour mosquitoes, which some of the visitors had brought with them from the Southern States. An examination revealed the fact~~

~~that the cistern was uncovered and exposed, and was the breeding-place for hosts of gnats,~~

~~high latitudes they are driven off by anointing the body with fish-oil ; and in hot climates " mosquito curtains" are part of the ordinary bed-~~

~~furniture. It is only the female that bites ; and, as it is but a very small proportion of them that can ever taste human blood or that of any warm-blooded animal, blood would not appear to be essential to their wel- fare. It has been suggested that warm blood may have an influence on the ova, but it cannot be supposed that the eggs of those multitudes of individuals that never get a chance to taste blood are necessarily infertile ; everything tends to prove the opposite.~~

~~Of late mosquitoes have been accused of playing a hitherto unsuspected part in the dissemination of certain entozoic diseases. According to the researches of Drs Manson and Cobbold and others, it appears certain that the insects, in sucking the blood of persons who are hosts of the entozoon known as Filaria sanguis-hominis, take these parasites into their own system, and it is believed that they afterwards (by their death and otherwise) con- taminate drinking water with them, and thus convey the entozoa into the blood of persons previously unaffected.~~

~~Mosquitoes are aquatic in their early stages. The~~

~~£~~

~~B Fia. 1.—Mosquito (Culex), A, natural size; B, enlarged. (After Curtis.)~~

~~female deposits her eggs in boat-shaped masses on the surface of the water. The larve are very active, and have a peculiar jerking mo-~~

~~tion ; the last segment is furnished with a respiratory apparatus, the form of which pro- bably varies according to the species, but it is usually a long tube, the extremity of which can be exposed to the externalair. The pup are also active (contrary to the condition in most dipterous pupe), and are odd-looking creatures owing to the great development of the thoracic region; the respiratory ap- paratus is in the thorax in this state, the extremity of the body having two swimming-plates ; the pups do not eat, but their activity is very great.~~

~~No notice of the mosquito or gnat would be complete without an explanation of the mouth-parts by which it is enabled to cause such extreme irritation. When these parts are closed one upon the other the~~

~~*whole looks like a long proboscis ; but in reality this consists of seven distinct slender pieces separated to the base, viz.—the labium, two maxille, two mandibles, the lingua, and the labrum. The nomenclature of the mouth-parts varies with different authors. G. Dimmock (Anatomy of the Mouth-parts and of the Sucking-apparatus of some Diptera), the latest investigator of this complex apparatus, states that the labium has for function, for the most part, the protection of the fine sete which form the true piereing organ of Culex. In the female of Culex the protective sheath is formed by the labium alone. When the mosquito has found a place which suits it for piereing—for it often tries different places on our skin before deciding on one—it plants its labelle firmly upon the spot, and a moment later the labium is seen to be*~~

~~*Fia. 2.—A, larva of Culex; B, pupa. (After Packard.)*~~

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~~*flexing backwards in its middle ; the sete, firmly grouped together, remain straight and enter the skin. When the sete have entered to nearly their full length, the labium is bent double beneath the body of the insect. When the mosquito wishes to withdraw the sete it probably first withdraws the two barbed maxille beyond the other sete, that is, so that their barbs or papille will be kept out of action by the mandibles and hypopharynx ; then it readily withdraws the sete, perhaps aiding their withdrawal by the muscles*~~

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~~*Fia. 3.—Mouth-parts, &c., of female Culex (after Dimmock). a, antenne; c, clypeus; h, hypopharynx; lr-e, labrum-epipharynx; J, labium; m, mandibles ; mz, maxillz (with the tip of one of them enlarged),*~~

~~*of the labium, for during the process of extracting the sete from the skin, while they are slowly sinking back into the groove upon the upper side of the Sinem | labium, the mosquito keeps the labella pressed firmly upon the skin. The withdrawal of blood is effected by means of a pumping*~~

~~*apparatus at the base of the mouth-parts. As no investigator appears to have been able to detect a poison gland, it has been considered that the irri- tation caused by the bite of a mosquito was solely of mechanical origin ; but the extreme irritation and its duration have not caused this idea to be commonly accepted. Dimmock avows his belief that there is use made of a poisonous saliva. In the male of Culex the mouth-parts vary considerably from those of the female,—a conspicuous point of difference being that in this sex the mandibles are absent, aud the maxille are not barbed.*~~

~~*About 35 species of Culex (mosquito or gnat) have been deseribed as inhabiting Europe, and about 130 from the rest of the world, but their differentiation is involved in great difficulty and uncer- tainty, and it is probable that the number of true species may be very niuch less. A species from Cuba has received the name Culex mosquito ; but there is not one species that specially deserves the name more than another from a popular point of view, nor from a seientifie point of view is there any difference between a mosquito and a gnat.*~~

~~*MOSQUITO COAST. See Nicaracua.*~~

~~*MOSSES, or Musct, one of the two divisions of the botanical class Muscinexe, which includes also the Liver- worts or Hepatice. See MUScINEA.*~~

~~*MOSSLEY, a manufacturing town of Lancashire, England, is situated on the London and North-Western Railway and on the Huddersfield canal, near the west bank of the Tame, which here separates Lancashire from Cheshire, 3 miles north-east of Ashton-under-Lyne, and 10 east-north-east of Manchester. The houses are for the most part built of stone. To supersede the old church of St George, erected in 1757, a new building was begun in 1881. A mechanics' institute was erected in 1858. In the vicinity of the town is an eminence called Hartshead Pike, on which is a lofty circular tower surmounted by a spire rebuilt of stone in 1758. Mossley has risen into importance since the introduction of the cotton manufacture about fifty years ago. A fairisheld annually. The town was placed under the Local Government Act in 1864, the district to which its*~~

provisions extend including also part of Saddle- worth in Yorkshire. The total population was in 1871 10,578, and 13,372 in 1881.

MOSTAR, the chief town of Herzegovina, is built on both banks of the Narenta, about 35 miles from its mouth, and 40 miles south-west of Seraievo (Bosna Serai), the capital of Bosnia. Among the public buildings are a palace, two Greek churches, and forty mosques, in several cases with Roman or Byzantine tracery in their windows. The fine old bridge from which the town takes its name

(Most Star, Old Bridge) is probably Roman. The town has a good trade and manufactures excellent Damascus swords; and the grapes and wine of Mostar are celebrated throughout the south Slavonic countries. The population, 7300 in 1844, had increased to 10,848 by 1879.

Whether its aneient name was Saloniana, Sarsenterum, or An- dretium, there is little doubt that Mostar, or, to use the older Slavonie name, Vitriniteha, dates from the time of the Romans. It was enlarged in 1440 by Radivoi Gost, mayor of the palace to Stephen, first duke of St Sava. Immediately on their conquest of Herzegovina it was chosen by the Turks as their headquarters ; and it afterwards became the capital of the independent government of

Ahi Pasha and Stolac.

See Evans, Through Bosnia and Herzegovina, 1876 ; Wilkinson's Dalmutia and Montenegro, vol. ii. (view and plan at pp. 59-60); and Caix de Saint Aymour in Rev. des D. Mondes, February 1883.

MOSUL, an important town in Mesopotamia, on the right bank of the Tigris, in 36° 35' N. lat. and 43° 3' E. long. In Mosul, as in Baghdad, only part of the space within the walls is covered with buildings and the rest is occupied by cemeteries ; even the solid limestone walls of the ancient town are half in ruins, being serviceable only in the direc- tion of the river, where they check inundations. Of the town gates at present in use, five are on the south, two on the west, two on the north, and the great

~~*bridge gate on the east. Leaving Mosul by the last named, the traveller first crosses a stone bridge, 157 feet long; then a kind of island (140 feet), which is overflowed only in spring and summer by the Tigris; next a stretch of the river which, at such times as it is not fordable, is spanned by a bridge of boats, the bridge proper covering only one-sixth of the full width of the stream. During the season of low water excellent vegetables, particularly water-melons, are grown upon the islands and dry portions of the river-bed.*~~

~~*The interior of Mosul has an insignificant appearance, only a few of the older buildings being left, among which may be mentioned the Great Mosque, with its leaning minaret, formerly a church dedicated to St. Paul. The private houses are partly of brick and partly of stone, the district furnishing an excellent and easily- wrought building-stone resembling marble. HIandsome well-built halls (fwdns) may be seen in many houses; the underground dwellings also, to which the inhabitants retire during the day-time in the hot months of summer, are well and solidly built. The houses are high, and during three or four months of the year the inhabitants sleep on the flat roofs. The streets are for the most part badly paved and very narrow, a small square in the market- place, overlooked by airy eoffee-booths, being almost the only open space, The shops are few and poor. The industry, in comparison with former times, when the town had so considerable a manufac- ture in "muslin" as to give its name to that fabric, is very unim- portant ; trade also, which is almost exclusively in the hands of native merchants, has fallen off greatly. Gall nuts, gathered on the neighbouring Kurdish mountain slopes, are mostly exported, but are also made use of by native dyers ; and hides, wax, cotton, and gum are sold. Very few Europeans live in Mosul, though the market is abundantly supplied with European goods. The whole- sale trade, conducted by means of caravans, has greatly declined -from its former importance, owing not only to changes which have been taking place in commercial routes generally, but also to the dangers of the roads near Mosul ; for to the north and east of the town there are wild tribes of Kurds, some of whom continue to*~~

~~*assert their independence of the Osmanli rule, while the Yezidis, a Kurdish tribe who have never yet aeeepted Islam, dwell in the — Sinjar mountains, upon a northern spur of which the town stands. Seini-independent tribes of Bedouins also roam over the plains in the immediate vicinity. The wild hordes of the Shammar Bedouins have often plundered or threatened the citizens. Mosul, therefore, has a somewhat isolated position, and this perhaps is one reason why Christians and Mosleins have lived together on better terms here than elsewhere. Both are animated by an active local patriot- ism, and both honour the same patron saints, Jirjis (St George) and Jonah ; the grave of the latter is pointed out on an artificial mound on the left bank of the Tigris.*~~

~~*The language of the people of Mosul is a dialect of Arabic, partly influeneed by Kurdish and Syriac. The population is probably 25,000 to 30,000. It is stated that the town is divided into 32 quarters, of which one is Jewish and three are Christian, while the rest are Moslem. The Moslems eall themselves either Arabs or Kurds, but the prevalent type, very different from the true Arabian of Baghdad, proves the Aramzan origin of many of their number. Of the Christians the community of the Chaldeans, 7.e., those who have gone over from Nestorianism to Catholicism, seems to be the most important ; there are also Syrian Catholics and Jacobites. Mosul has for several centuries been a eentre of Catholic missionary activity, the Dominieans especially, by the foundation of schools and printing-offices, having made a marked impression upon an intelligent and teachable population. There are very few Protest- ants.*~~

~~*Mosul shares the severe alternations of temperature experienced by Upper Mesopotamia (see Mrsoporamra), The summer heat is extreme, and in winter frost is not unknown. Nevertheless the climate is considered healthy and agreeable ; copious rains fall in general in winter. The drinking water is got from the muddy Tigris. At the north-east corner of the town is a sulphur spring, and 4 leagues to the south there is a hot sulphur spring (Hammam 'Ali), much frequented by invalids.*~~

~~*Mosul probably oceupies the site of a southern suburb of aneient NINEVEH (q.v.), but it is very doubtful whether the older name of Mespila ean be traced in the modern Al-Mausil (Arab., the place of*~~

~~*connexion); it is, however, certain that a town with the Arabic name Al-Mausil stood here at the time of the Moslem conquest (636 A. D.). The town reached its greatest prosperity towards the beginning of the decline of the caliphate, when it was for a time an independent capital. The dynasty of the Hamdanids reigned in Mosul from 934, but the town was conquered by the Syrian Okailids in 990. In the 11th century it belonged to the Seljuks, and in the 12th, under the sway of the Atabeks, particularly of Zenki, it had a short period of splendour. Saladin besieged it unsuccessfully in 1182. Among the later rulers of Mosul the only conspicuous name is that of Lulu, in the first half of the 13th century. The town suffered severely from the Mongols under Hulagu ; under Turkish rule it became the capital of a small pashalik, bounded on the one side by the vilayet of Diarbekr, on the other by that of Baghdad. The Persians occupied Mosul for a short time in 1628, until it was, soon afterwards, recovered by Sultan Murad IV. It was visited by an earth- quake in 1667, and was unsuccessfully besieged by the Persians under Nadir Shah in 1743. The governorship of the pashalik was long hereditary in the originally Christian family of the 'Abd-al-Jalil, until the Porte, during the course of the present century, succeeded after a long and severe contest in establishing a more centralized system of government.*~~

~~*Compared with what it was in the Middle Ages the present town is much deteriorated, its decay having advanced steadily from the beginning of the Turkish dominion.*~~

~~*See Ritter, Asien, vol. vii. A map of the town accompanies Cernik's paper,*~~

~~*'"«Studienexpedition durch die Gebiete des Euphrat und Tigris," in Erginzungs- heft No. 45 of Petermann's Mittheilungen, 1876.*~~

~~*END OF VOLUME SIXTEENTH.*~~

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~~*When insertion throughout the text ts desired, the Plates to be placed opposite the Jollowing pages :—*~~

~~*Plate IJ. page 214 | Plate VI. page 521*~~

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~~*VOL. XVI. MISSISSIPPI PLATE VI.*~~

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DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XVII

EDINBURGH: ADAM AND CHARLES BLACK

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ENCYCLOPADIA

OTANABBI, or Motenepst. Abt ’l-Tayyib Ahmed

ibn al-Hosain of Cufa, called Al-Motanabbi (915/6-

965), is the most famous representative of the last period of Arabic poetry, though some Eastern critics place him below Abt Tammam. He was the son of a water-carrier, and is said to have picked up much of the literary knowledge for

which he was afterwards famous by haunting the book-

stalls of his native city. He spent, too, some years of his youth among the nomads of the Syro- Arabian desert, learning their purer dialect and becoming imbued with their self-reliant spirit. Thus he grew up a brave proud man, a gallant warrior as well as a poet, full of ambition, not easily satisfied either with wealth or honours, indifferent to the Koran and to the fasts and prayers of Islam, but untainted by the looseness of morals common to the poets of those days. Such a character was not well fitted for the part of a courtier, the only career that then lay open to a poet ; for, though no Arab poet deems himself humi- liated by the most extravagant praises of a generous patron, and none has written in this vein more extrava- gantly than Abt ’l-Tayyib, he was as exacting of due acknowledgment as prodigal of adulation, and was too

proud to endure a slight, even where it was dangerous to |

show resentment. At first he essayed a greater and more

perilous road to distinction, appearing in the character of |

a prophet in the desert between the Euphrates and Syria, where he formed a considerable party, but was arrested by the governor of Emesa. A prison and the pillory cooled his enthusiasm ; his prophetic pretensions indeed are hardly a proof of genuine religious fervour, for in the lands of Islam a

revolutionary popular leader almost necessarily seeks a supernatural sanction for his attempt. The name of Al-Motanabbi (he who plays the prophet) clung to him, however, and is that by which he is still commonly known. Regaining his liberty, he had to struggle for a time with poverty and neglect. But his poetical talents at length found him patrons, and in 337 a.n. (948/9 a.p.) he became attached to the court of that famous warrior and patron of letters, Saif al-Dawla, prince of Aleppo, to whom many of the best fruits of his muse were dedicated, and by whose side he approved his valour in the field. But he had rivals who knew how to inspire jealousy between him and the prince, and an angry scene with the grammarian Khala-

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waih, in which the latter closed a philological dispute by striking Motanabbi on the face with a key which he had in his sleeve, in the very presence of the prince and with- out rebuke from him, led the poet to leave the court and seek a new career in the realm of the Ikhsh{dites. He now took as his patron and the object of his eulogies Kafur, the regent of Egypt—a hideous black eunuch whom it was indeed a humiliation to praise, but who knew how to open the poet's lips by great gifts and honours. Motanabbi, how- ever, sought a higher reward, the government of Sidon, and at length broke with Kafur, wrote satires against him, and had to fly for his life to Cufa. A curious anecdote relating to this part of his career will be found in Lane's Arabian Nights, chap. viii. note 18. His next great patron was 'Adud al-Dawla of Shiraz, and on a journey from Shiraz to Cufa he was waylaid and slain, fighting bravely, by a chieftain of the Asad named Fatik, whose kinsfolk he had satirized (Sept. 965).

The poetry of Motanabbi is to European taste much less attract- ive than the verses of the ancient Arab poets, being essentially artificial and generally unreal, though it has great technical merits and displays lively fancy and considerable inventive powcr. It is mainly court poetry, but the poet has the credit of never losing his self-respect in the presence of his patrons. Oriental taste, on the other hand, places him on a very high pedestal, as may be judged from the fact that more than four hundred commentaries were written on his Diwan (H. Khal., iii. 306). Dieterici's edition of the poet,

Berlin, 1858-61, gives the commentary of Wahidi; the Egyptian edition of 1870 has the commentary of ‘Okbari.

See Abulfeda, Ann. Mosl., ii. 482 sq.; Ibn Khallikan, ed. De Slane, p. 51 sq., and the notes to De Slane’s translation ; De Sacy, Chrest. Ar., vol. iii. ; Bohlen, Commentatio de Motenebbio, Bonn, 1824; Dieterici, Mutanebbi und Seifuddaula, Leipsic, 1847.

MOTHER-OF-PEARL. The shells of many molluscous animals display a brilliant pearly and iridescent lustre, resulting from the peculiar manner in which the layers of calcareous matter of which they are composed have been successively formed. Such shells, even when small in size, form bright and, specially to the untutored eye, attractive ornaments, and as such are used for necklaces and similar purposes. When the shells are of sufficient size to cut and shape for purposes of utility, they become an article of some commercial importance under the name of Mother- of-Pearl. This term, though applicable to all pearly shells, is in commerce principally applied to the shells of the bivalve pearl-mussel Meleagrina a which is

the principal source of the commercial product. The Meleagrina margaritifera is a native of tropical seas, and is found around the coasts of all the lands within the tropics. The shells vary in size, the largest reaching to

about the dimensions of a dessert plate, with a weight of

from 1 to 1} tb. They also vary in colour to a consider- able extent, some being dark and smoky round the outer edge with little iridescence, others dark but possessing a rich play of colours, and the greater part pearly white with varying iridescence. The principal sources of supply are the islands of the East Indian archipelago, the Pacific islands, the north-west Australian coast, the Persian and Red Seas, and the Gulf of Panama. The largest and steadiest consumption of mother-of-pearl is in the button trade, and much is also consumed by cutlers for handles of fruit and dessert knives and forks,

pocket-knives, &c. It is also used in the inlaying of Japanese and Chinese lacquers, European lacquered papier-maché work, trays, &ec., and as an ornamental inlay generally. In an innumerable variety of small and fancy articles mother-of-pearl is also employed, its use being limited only by the moderate dimensions and thickness of material obtainable, and its rather brittle nature. The carving of pilgrim shells and the elaboration of crucifixes and ornamental work in mother-of-pearl is a distinctive industry of the monks and other inhabitants of Bethlehem. Among the South Sea Islands the shell is largely fashioned into fishing-hooks, a purpose for which its brilliant conspicuous appearance appears to render it suitable without the addition of any bait or other lure. Among shells other than those of Meleagrina margaritifera used as mother-of-pearl may be mentioned the Green Ear or Ormer shell (aliotis tubercu- lata) and several other species of Haliotis, besides various species of Turbo.

The pearl-shell fishery is an important industry on the north and north-west coasts of Australia, producing about 800 tons yearly, valued at over £100,000, the Papuan islanders of Torres Straits being cmployed as divers under European supervision, with skilled appliances. The shell of the golden-tipped variety of Avicula found here is much more valuable than the dark-edged one of the South Seas. The value of the fisheries depends much more on the shell than on the occasional pearls found, which indeed are sometimes, along with the ‘‘fish,” a perquisite of the diver; but on the west coast, about Shark’s Bay, a smaller variety of the same mollusc pro- duces valuable pearls, their exciting cause being possibly present there in greater abundance. That the pearl itself is not due to disease, or to the presence of any irritating cause, seems clear from the fact that the mollusc can reject it at will, and often does so when taken (for which reason the diver, in seizing him, at once places his hand over the opening so as to close the shell) ; but it is believed now that the pearl is secreted and held ready to be dissolved by the powerful acid of the sac, and spread in uacreous layers over the spot irritated by the borer (Pholax sp.). Accordingly pearls are seldom found in the young ‘“‘fish,” whose shells are much harder outside, and not susceptible to such attacks. A mass of nacreous layers formed round a point of irritation or ‘‘ blister” can some- times be cut out of the shell, and might easily be mistaken for (and sold as) a pearl, but it is never quite perfect all round and is always hollow. Sometimes, after having secured the loose

pearls, the fisher- men deposit the mollusc again, unharmed, in a secure and accessible locality, and repeat the process for three and four years successively.

MOTHERWELL, a police burgh of Lanarkshire, Scot- land, is situated on the Caledonian Railway a short distance from the right bank of the Clyde, 2 miles north-east of Hamil- ton and 11 east-south-east of Glasgow. The village, which takes its name from an old well dedicated to the Virgin, contained only 900 inhabitants in 1851, and owes its rapid increase to the coal and iron mines in the neighbour- hood. It possesses one of the largest ironworks in Scotland, and also extensive engineering works. Motherwell was erected into a police burgh in 1865. The population in 1871 was 5746, and in 1881 it was 12,904.

MOTHERWELL, Wiittam (1797-1835), poet, anti- quary, and journalist, born in 1797, rendered service in the collection of fugitive border poetry and wrote one or

two very touching songs in the Scotch dialect, dying before he had fulfilled the promise of his earlier work. His short life was diversified by few incidents. The son of an iron- monger in Glasgow,he waseducated partly in Edinburgh and partly in Paisley. At the age of fifteen he was apprenticed in the office of the sheriff-clerk at Paisley, and appointed sheriff-clerk depute there in 1819. The impulse given by Scott to the pursuit of local ballads was still strongly in force, and the young law apprentice spent his leisure in collecting materials for a volume which he published in 1819 under the title of The Harp of Renfrewshire. In the course of the next eight years he extended his studies in the same field and published the results in 1827 in Min- strelsy Ancient and Modern, prefaced by a very thorough historical introduction. Meantime he made a reputation by casual poems in newspapers and magazines, of which Jeanie Morrison, My Heid is like to break, and Wearie’s Cauld Well have taken a fixed place in Scotch literature. These poems are his best work, but he gave most of the energy of his vigorous intellect to writing ballads and songs in English ; and he interpreted the martial spirit of the Norse sea-rovers with an enthusiasm and force which one would not expect from the plaintive character of his Scotch poems. His critical power and his learning were probably too great for his

executive faculty; but, what- ever may be thought of his promise as a poet, it was un- doubtedly quenched by his entrance into journalism and the fatiguing work of newspaper editing. He became editor of the Paisley Advertiser in 1828, of the Glasgow Courier in 1830, and died suddenly of apoplexy in 1835. A trying examination before a Parliamentary Committee was thought to have hastened his end; but Conservative journalism at the time of the Reform Bill was exciting and uphill work, and it is a fair inference from the sad tone of some of his later poems that a baffled longing to achieve enduring fame added to the poet's worries and increased the strain on his constitution. A small volume of his poems was published in 1832, and a larger volume with a memoir in 1849.

MOTHS. See Burrerrfiies.

MOTLEY, Joun Lorurop (1814-1877), the well-known historian of the Dutch Republic, was born on 15th April 1814 at Dorchester, now a part of Boston, Massachusetts, and from 1827 waseducated at Harvard, where he graduated in 1831. He then studied for two years at Gottingen and Berlin, and after a period of European travel, chiefly in Italy, returned to America in 1834, where he became a student of law, and ultimately was called to the bar. In 1837 he married, and two years afterwards he published anonymously his earliest literary work, a two- volume novel, entitled Morton's Hope, or the Memoirs of a Young Provincial, which attained, and indeed deserved, only a moderate success. In 1841 he received his first diplomatic appointment, being made secretary of legation to the Russian mission, but, finding the atmosphere of St Peters- burg uncongenial, he resigned his post within a few months and definitely resolved on a literary career. Besides con- tributing various historical and critical essays to the Worth American Review, he published in 1849, again anonymously, a second novel entitled Merry Mount, a Romance of the Massachusetts Colony. About the year 1846 the project of writing a history of Holland had begun to take shape in his mind, and he had already prepared a considerable quantity of MS., when; finding the materials at his dis- posal in the United States quite inadequate for the com- pletion of his work, he resolved to migrate to Europe along with his family in 1851. The next five years were spent at Berlin, Dresden, Brussels, and the Hague in laborious investigation

of the archives preserved in those capitals, and resulted in 1856 in the publication of The Rise of

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the Dutch Republic, a Ehstory (London and New York, 3 vols. 8vo). This work, which, after a large historical introduction, minutely follows the history of the Low Coun- tries from the abdication of Charles in 1555 down to the assassination of William the Silent in 1584, immediately becanie highly popular by its graphic manner and the warm and sympathetic spirit in which it was written, while at the same time it was frankly recognized by scholars as a painstaking and conscientious piece of original work. It speedily passed through many English editions, was trans- lated into French (with an introduction by Guizot) in 1859, and also into Dutch (with introduction and notes by Bakhuizen van den Brink, himself a distinguished historian), as well as into German and Russian. Pursuing his researches in England, France, Belgium, and Holland, Motley was able to publish in 1860 the first two volumes of the History of the United Netherlands, covering the period from the death of William the Silent in 1584 to shortly after the destruction of the Armada, by which the Spanish project for subjugating England and reconquering the Netherlands was finally defeated. This work, which was on a somewhat larger scale than the preceding, em- bodied the results of a still greater amount of original research, not only in the Dutch archives, in the copies of the Simancas archives, and in the portions of those archives still retained in Paris, but also in the London State Paper Office, and in the MS. department of the British Museum. By two new volumes published in 1868 the work was brought down to the twelve years' truce in 1609, and it was announced that the author was engaged in writing a con- tinuation which should embrace the history of the Thirty Years' War. Meanwhile Motley from the close of 1861 to 1867 had held the post of United States minister at Vienna ; in 1869 he was appointed to a similar position at the court of St James's, but was recalled in 1870. After a short visit to Holland he again took up his resi- dence in England, where The Life and Death of John Barneveld, Advocate of Holland, with a view of the primary Causes of the Thirty Years' War (2 vols.) appeared in 1874. Il] health now began to interfere with sustained literary work, and, after a

protracted period of failing vigour, he died at Kingston Russell House, near Dorchester, Dorset- shire, on 29th May 1877.

Motley was member of a number of learned societies in Europe and America, and held a variety of honorary degrees. Among minor works not noticed above may be mentioned a pamphlet on the Causes of the Civil War in America (1861), which originally appeared in the correspondence columns of the 7imes newspaper, and Democracy, a Historical Essay (1869), originally delivered as an address to the New York Historical Society. The merits of Motley as an historian are undeniably great ; he has told the story of a stirring period in the history of the world with full attention to the character of the actors and strict fidelity to the numerous vivid details of the action. But it may safely be said that his tale is best where most unvarnished, and probably no writer of the same rank has owed less to the mere sparkle of highly polished literary style.

See John Lothrop Motley, a Memoir, by Oliver Wendell Holmes (1878).

MOTMOT, according to Hernandez in his Historia Avium Nove Hispaniz (p. 52), published at Rome in 1651, was the Mexican name of a bird which he described well enough to leave no doubt as to what he meant; but the word being soon after printed Momot by Nieremberg and others gave rise to the Latinized Momotus, invented by Brisson as a generic term, which has since been generally adopted by ornithologists,! though Motmot has been re- tained as the English form. Linneus knew of only one species of Motmot, and referred it to his genus Ramphastos (properly Rhamphastus) under the name of R. momota. This is the Momotus brasiliensis of modern ornithologists,

1 Its barbarous origin induced Mliger to substitute for it the word

Prionites, and his example has been followed by some nomenclatural purists.

and from its geographical range cannot be the original Mfotmot of Hernandez, but is most likely the “ Guéra guai- numbr” of Marcgrave.

The Motmots have been for many years recognized as forming a distinct family, Momotide or Prionitidz, of the heterogeneous assemblage known as Picarix or Coccygo- morphe ; and the only question among systematists has been as to their position in that group. This has been discussed and illustrated with his usual assiduity by Dr Murie (Jbis, 1872, pp. 383-412, pls. xiii-xv.), who con- clusively showed that the Topy (¢.v.) was the Motmot's nearest existing relative, while he believed that both Momotide and Todide might be placed in one section (Serratirostres) with the Coraciidx (ROLLER, q.v.), Mero- pide, and Alcedinidx (cf. KincrisHEr, vol. xiv. p. 81). To the latter allocation Garrod (Proc. Zool. Society, 1878, pp. 100-102) has since partly demurred, though admitting the Kingfisher affinity, while upholding the former, and even declaring that Motmots and Todies form but a single family. As the conclusions of both these investigators are based on the sure ground of anatomical structure, they are of incomparably greater value than most of those arrived at by prior systematists who judged from external characters alone.

In outward appearance the Motmots have an undoubted resemblance to Bee-eaters, but, though beautiful birds, various shades of blue and green predominating in their plumage, they do not exhibit such decided and brilliant colours ; and, while the Bee-eaters are only found in the Old World, the Motmots are a purely Neotropical form, extending from southern Mexico to Paraguay, and the majority of species inhabit Central America. They are said to be solitary birds, or at most living in pairs, among the gloomy forests, where they sit on the underwood nearly motionless, or only jerking their long tail as the cry "houtou " (or something like it) is uttered. Their ordi- nary food is small reptiles, insects, and fruits. The nest of one species, as observed by Mr Robert Owen, is at the end of a hole bored in the bank of a watercourse, and the eggs are pure white and glossy (bis, 1861, p. 65). Little else has been recorded of their ways.

The AMomotidx form but a small group, containing, according to the latest enumeration of them in 1873 by Messrs Sclater and Salvin (Nomenclator, pp. 102, 103), but seventeen species,? distributed into six genera, of which last, however, Dr. Maurie (/.c.) would only recognize four—Momotus, Baryphthengus, Hylomanes, and Eumomota —the second including Urospatha, and the last Priono- rhynchus. The distinctions between these

groups would require more space to indicate than can here be allowed ; but it may be stated that, while all have a general resem- blance in the serrated edges of the bill and many other characters, Momotus has the normal number of twelve rectrices, while the rest have only ten, which in Hylomanes have the ordinary configuration, but in adult examples of all the others the shaft of the median pair is devoid of barbs for the space of about an inch a little above the extremity, so as to produce a spatulate appearance, such as is afforded by certain humming-birds known as “ Racquet- tails” (HumMinc-BirD, vol. xii. p. 357), Kingfishers of the genus Tangsiptera (KINGFISHER, vol. xiv. p. 82), and Parrots of the group Prioniturus. Waterton (Wanderings, Journey 2, chap. iii.), mentioning the species JL. brasiliensis by its native name “ Houtou,” long ago asserted that this peculiarity was produced by the Motmot itself nibbling off the barbs, and this extraordinary statement, though for

2 The same number was recognized by the first-named of these gentlemen in his review of the Family (Proc. Zool. Society, 1857, pp. 248-260), where they are all diagnosed, a species, subsequently described by Dr Cabanis (Mus. Heineanum, ii. p. 115), not being admitted.

a while doubted, has since been shown by Mr Salvin (Proc. Zool. Society, 1873, pp. 429-433), on Mr Bartlett’s authority, to be perfectly true. The object with which the operation is performed is wholly unknown. It is sometimes incompletely executed, and the tail has then an asymmetrical form. This must have been the case with the example that Hernandez described (/.c.), and brought on himself the criticism of Willughby (Ornithologia, p. 298) for so doing. Much of the bibliography of the family is given in Dr Murie’s paper already quoted ; and it may be remarked that in 1734 Seba, probably misled by wrong information, figured (Rerum Nat. Thesaur., tab. 67, fig. 2) under the name of “ Motmot” a bird which has been identified with a species of GUAN (vol. xi. p. 232), and is the Ortalis motmot of modern ornithology. (A. N.)

MOTRIL, a town of Spain in the province of Granada, is charmingly situated at the foot of an offshoot of the Sierra Nevada, on the edge of a rich alluvial plain about a mile from the Mediterranean and 40 miles south-

south- east from Granada, with which it is connected by a good carriage road. The town has no buildings of special archi- tectural or historical interest. The climate is semi-tropical, and the ‘“‘ vega” or plain of Motril has been found pecu- liarly adapted for the culture of the sugar-cane, of which the annual average yield has recently been estimated at 113,636 tons. In the district there are five sugar-factories, —two in the immediate vicinity of the town, and three at Salobrefia, a village about 3 miles to the westward at the mouth of the Rio Grande (Guadalfeo). Some cotton is also grown and manufactured. This neighbourhood is rich in lead, chiefly wrought by companies having very limited capital; the ore is for the most part smelted on the spot and afterwards sent to Malaga, or direct to England. Zinc and copper are also found, but in smaller quantities. Esparto grass is exported. The population of Motril in 1878 was 16,665. The harbour (El Puerto de Motril) lies about 64 miles to the south-eastward at the village of Calahonda.

MOTT, VauentiIne (1785-1865), an eminent American surgeon, was born at Long Island, New York, on the 20th August 1785. He graduated at Columbia College, studied under Sir Astley Cooper in London, and also spent a winter in Edinburgh. After acting as demonstrator of anatomy he was appointed professor of surgery in Columbia College in 1809. From 1811 to 1834 he was in very extensive practice as a surgeon, and most successful as a teacher and operator. He tied the innominate artery in 1818; the patient lived twenty-six days. He performed a similar operation on the carotid forty-six times with good results; and in 1827 he was also successful in the case of the common iliac. He is said to have performed one thousand amputations and one hundred and sixty-five lithotomies. After spending seven years in Europe (1834- 1841) Mott returned to New York and founded the university medical college of that city. He translated Velpeau’s Operative Surgery, and was foreign associate of the Imperial Academy of Medicine of Paris. His death occurred on the 26th of April 1865.

MOTTEVILLE, Francoise Bertraut, MapAME DE (1621-1689), was born in 1621. She was of fair family (the poet-bishop Jean Bertaut being her kinsman), and by her mother of Spanish blood. This circumstance attracted Anne of Austria to Madame Bertaut, and the child Francoise was made a member of the queen’s house- hold and pensioned at seven years old. The

influence of Richelieu, however, who constantly endeavoured to deprive the queen of confidantes, exiled mother and daughter to Normandy. There, at the age of eighteen, Francoise married Nicholas Langlois, Seigneur de Motteville, first president of the Chambre des Comptes. She was very soon

a widow, but she had before that date (1641) visited the court, renewed her relations with the queen, and been rewarded by a pension increased from 600 to 2000 livres. No sooner did Anne of Austria become her own mistress by the deaths of Richelieu and of her husband than she summoned Madame de Motteville to court and made her her most intimate friend. Through all the intrigues and troubles of the Fronde, Madame de Motteville preserved the honourable reputation of being devoted to her mistress without any party ties or interests. She was also on very intimate terms with Henrietta Maria of England during her residence in France. After Anne of Austria's death Madame de Motteville lived in retirement, but not in absolute seclusion, seeing especially Madame de Sévigné and Madame de la Fayette. She died on 29th December 1689. Some letters of hers are preserved, especially a curious correspondence with "La Grande Mademoiselle" on marriage, but her chief work is her Mémoires, which are in effect a history of Anne of Austria, written briefly till the date of Madame de Motteville's return to court, and then with fulness. The author is something of a partisan, but not an intentionally unfair one, and her judgment and power of observation are very considerable. The style of her book is not of the most peculiar or strik- ing, but it is simple, easy, and good. The J/émoures may be most conveniently read in Michaud and Poujoulat's Collection, vol. xxviii.

MOUKDEN. See Mancuurta, vol. xv. p. 466.

MOULINS, chief town of the French department of Allier, is situated 195 miles by rail south-south-east from Paris on the right bank of the Allier, which is here crossed by a remarkable bridge about 1000 feet in length, consisting of thirteen semicircular arches. The town, which stands at an altitude of about 740 feet above sea- level, is adorned with gardens and fine boulevards, and still contains several buildings of historical interest and many houses of the Middle Ages. The cathedral has a very beautiful choir, with richly-painted windows of the 15th and 16th centuries. The nave, in

the Pointed style, is of recent construction, as are the two towers with stone spires rising to the height of 312 feet. The white stone chiefly employed is happily contrasted with ornamental columns of black basalt. The chapel of the lyceum, which oceupies the site of an ancient convent of the Visitation, contains a richly-carved mausoleum to the memory of Duke Henry of Montmorency, who was beheaded in the reign of Louis XIII. Among other objects of interest in Moulins are some remains of the old chateau of the dukes of Bourbon, and the clock tower. The library of nearly 25,000 volumes contains a manuscript Bible of the 12th century which was used at the council of Constance in 1415. There are no industries of importance, except the manufacture of wire ropes for mines, and of sulphate of barium. The population in 1881 was 21,126.

The history of Moulins does not go farther back than the 10th century, and its importance dates from the 14th, when it became the residence of the dukes of Bourbon. After the constable de Bourbon's desertion to Charles V. the town, along with Bourbon- nais, fell into the hands of the king of France. In 1566 an assembly of the states-general was held in the town by Charles IX. and Catherine de Medici. Moulins has suffered frequently from epidemics and inundations, and the ducal palace was destroyed by fire in 1755.

MOULMEIN. See Mavutmarn. |

MOUNTAINS. For mountains in general see GEOLOGY, vol. x. p. 370sg. The more important groups of mountains are discussed under separate headings, as ALPs, HIMALAYA, ANDES, &c.

MOUNT VERNON, a city of the United States, county seat of Knox county, Ohio, and a railway junction on the Baltimore and Ohio and the Cleveland, Mount Vernon, and Columbus Railroads, 45 miles north-north-east of

Columbus. Settled in 1805, it had become a well-built flourishing place of 5249 inhabitants in 1880, engaged in various manufacturing industries.

MOURZUK, or Murzux. See Frzzay, vol. ix. p. 130.

MOUSE. The bright and active, though mischievous, little animal known to us by the name of Mouse and its close relative the Common Rat are the most familiar and also the most typical members of the Murine, a sub-family containing about 250 species assignable to no less than 18 distinct genera, all of which, however, are so super- ficially alike that one or other of the English names rat or mouse would be fairly appropriate to any of them. Together they form one, and that by far the largest and most important, of the 10 sub-families into which the Muridz or Rat family (order Rodentia) are divisible. Their nearest neighbours are the Tree-mice (Dendromyinz) and the Hamsters (Cricetinz), from which they differ by various cranial and dental characters. Among themselves they have for the most part very strong resemblances ; nearly all are of very rat-like exterior, of light and active build, with large ears, bright and well-developed eyes, long and

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Fig, 1.—The Australian Brown-footed Rat (Mus fuscipes, Waterh,) (After Gould.)

scaly tails, and nearly always of dull and inconspicuous coloration, as is suitable to their usually burrowing and nocturnal habits. The more important characteristics of the group, their anatomical, cranial, and dental peculiarities, have already been touched upon in the article MAMMALIA (vol. xv. p. 415 sq.), and therefore we may now pass to the division of the sub-family into smaller groups.

Primarily the Murine are divisible into the Mures, or those with their molar teeth, as in the Common Rat, and the Sigmodontes, or those with their molars, like those of the Rice-rat of America. Fig. 2 will explain this: A represents the upper molars of a Mus, and B the correspond- ing teeth of a Sigmodont. It will thus be seen that Mus has molars composed essentially of cusps arranged triserially —that is to say, with three series of cusps across each tooth—while in the

Sigmodontes the cusps are arranged bi- Fig. 2. serially in pairs along the teeth, To , Cader sutinen we the first of these groups, the Mures, be- Mus. 3B. Upper mo-

; igmodont. long the following genera :— vis inaiateits

I. Mus, L. Incisors narrow, not grooved. Molars small, their

structure as shown in fig. 2, A. Incisive foramina long. Coronoid process of lower jaw well developed. Eyes and ears large. Fur soft, though sometimes mixed with spines; pollex with a short nail instead of a claw. No cheek-pouches. Tail long, nearly naked, with rings of overlapping scales.

This, the typical genus of the family, is by far the largest of the order, and indeed of the whole class Mammalia, containing not less than 120 species spread over the whole of the Old World with the exception of Madagascar. Of these, about 30 belong to what is known as the Palearctic zoological region, 40 to the Oriental, 30 to the Ethiopian, and 20 to the Australian, the number of species being on the whole much more considerable in tropical than in temperate regions, while but very few are found where the climate is excessively cold. It is an interesting fact in connexion with climate that many of the species living in hot countries have their fur more or less mixed with flattened spines, and that these spines appear to be shed during the winter and to be replaced by hairs, the latter naturally affording a warmer covering for the animal than the former. °

The most important characters that have been used for the deter- mination of the various species of Mus are the size and proportions of the body, limbs, ears, and tail, the number of mamme, which ranges from 6 to 20, and various more or less important differences in the shape and proportions of the skull and teeth. Of the numer- ous species the following are those most worthy of note :—

Mus decumanus, Pall., the Common Brown or Norway Rat, dis- tinguished by its large size, brownish grey colour, short tail and ears, powerful skull, and the possession of from 10 to 12 mamme. It is extremely fierce and cunning, and easily overcomes in the struggle for existence all the other allied species with which it comes in contact. Its original home would seem

to have been some part of Central Asia, an indigenous species recently described from China, Mf. humiliatus, being in fact so extremely like it that in all probability the latter is the original race from which it has sprung. Thence it has spread to all parts of the world, driving out the house-haunting species everywhere, as it has in England all but exterminated the next species.

M. rattus, L., the old English Black Rat, readily distinguishable from the Brown Rat by its smaller size, longer ears and tail, and glossy black colour. It shares the roving habits of If. decumanus, frequenting ships, and from them passing to the land in various parts of the world. On this account it, or its tropical representa- tive M. alcxandrinus, Geof., is extremely common in many places to which M. decumanus has not yet penetrated, for instance in South America, where it has had only the far less highly-organized Sigmodontes to compete with, and where it has therefore gained a firm footing. It is extremely interesting to observe that this long- tailed rat, originally a native of India, would seem to have first penetrated to all parts of the world and to have overcome and nearly or quite exterminated the indigenous rats, and that then M. decumanus, a more recent and powerful development of the House-rat type, has followed, and in its turn has overcome and nearly exterminated it.

M. musculus, Linn., the Common House-mouse, is, like the last species, originally a native of India, whence it has spread to all the inhabited parts of the globe. Its habits and appearance are too well known to need any description.

M. sylvaticus, L.,the Wood or Long-tailed Field-mouse, is a species very common in many parts of England, often taking to barns and outhouses for shelter during the winter. It is of about the same size and proportions as Mf. musculus, but of a bright reddish grey colour, with a pure white belly. .

M. minutus, Pall., the Harvest-mouse, is the smallest of the European mice, seldom exceeding 24 or 8 inches in length. It is of a yellowish red colour, with comparatively short ears and tail. It lives entirely away from houses, commonly taking up its abode in wheat or hay fields, where it builds a round grass nest about the size of a cricket-ball, in which it brings up its young.

These five English species may be taken as types of the 120 species of Mus. None are much larger than M. decwmanus or smaller than M. minutus, and they all have habits generally similar to those of one or other of the English species, although there are some which either live in trees like squirrels, or in the water like the English Water-voles, among which latter is the species shown in fig. 1, M. fuscipes, Waterh., the Brown-footed Rat of western and southern Australia.

II. Nesokia, like Mus, but with the incisors and molars very much broader, and the transverse lamine of the latter more clearly defined.

This genus, so closely allied to Mus as to be barely worthy of separation, contains five or six species of clumsily-built rats spread over southern Asia from Palestine to Formosa, and from Cashmere to Ceylon. The most noteworthy member of the group is the Great Bandicoot or Pig-rat of the continent of India (N. bandicota, Bechs.), the largest of all the rat tribe, often considerably exceed- ing a foot in length. The other species vary in size between this and a brown rat. NV. bengalensis, Gr., the common Field-rat of

India, has no less than eighteen mamme, nearly the largest number found among the Muride.

III. Golunda, Gray, like Mus, but with a distinct groove down the front of the upper incisors. There are only two species, one from western India, and the other from eastern Africa.

IV. Uromys, Peters., differs from Jfus in having the scales of the tail not overlapping, but set edge to edge, so as to form a sort of mosaic work. There are about six species of Uromys, spread over the northern part of the Australian region from the Aru Islands to Queensland.

V. Hapalotis, Licht. Hind-limbs elongated. Incisive foramina very large. No coronoid process to the lower jaw. This genus is confined to Australia, where there are about fifteen species known. They are pretty little animals,

with long ears and tail, and in many respects resemble the Jerboas, whose place they seem to take on the sandy Australian deserts.

VI. Mastacomys, Thomas, like Afus, but with the molars remark- ably broadened, and with only four mamme. The single species in the genus is as yet only known from Tasmania, though it has been found fossil in New South Wales ; it is somewhat similar in size and general appearance to the English Water-vole, but has much longer and softer fur.

VII. Aeanthomys, Less. Fur almost entirely composed of flattened spines. Coronoid process very small. There are six species of Spiny-mice known, all of about the size of the Common Mouse. They are found in Syria, Palestine, and eastern Africa as far south as Mozambique.

VIII. Echinothriz, Gray, a very remarkable rat with an ex- tremely elongated muzzle, all the bones of the face being much produced. The incisors are faintly grooved. The only species is E. leucura, an animal of about the size of the Common Rat, with its fur thickly mixed with spines. It is found in Celebes.

The remaining genera belong to the Sigmodontes ; they are rather more numerous than those of the Mures, but, on the whole, present somewhat less strongly marked generic differences.

IX. Hypogeomys, Grand., a very peculiar form of large size, with long ears, feet, and tail. There is only one spccies, H. antimena, a fawn-coloured rat about 9 inches long.

X. Nesomys, Peters., contains two species of long-haired rats, more or less rufous in colour, about the size of the House-rat.

XI. Braehytarsomys, Giinther, contains only B. albicauda, a pretty velvety-haired fawn-coloured rat, with short feet and a long tail.

XII. Hallomys, Jent. The only species, H. audebertt, is very like a Nesomys, but has much longer hind-feet. This and the last three genera are confined to Madagascar.

XIII. Hesperomys, Waterh. Molar structure as shown in fig. 2, B. The Aus of the New World, containing the great mass of the rats and mice of America, and having no very special generic charac- ters common to all its members. This large genus is composed of at least seventy distinct species spread over all America from Canada to Cape Horn, of which none are quite as large as Afus decumanus, while several are considerably smaller than Aus musculus. They have been split up into ten sub-genera, of which perhaps the best marked is Rhipidomys, a small group containing about ten species, remarkably like Dormice in their habits and general appearance, having soft woolly fur and long hairy tails, and living entirely in trees, bushes, or in the roofs of houses. The other Hesperomys are all terrestrial in their habits, much as the Old-World rats and mice are. One only, H. spinosus, a native of Peru, has as yet been found with spines in its fur,—a rather remarkable circumstance when we remember how many of the tropical species of the allied genus Afus have more or less spiny fur.

XIV. Holocheilus, Brandt, like Hesperomys, but with the third upper molars proportionately larger and the skull more stoutly built. This genus, confined to Brazil, contains about six species, some of which are the largest indigenous rats of America. Two species are aquatic in their habits, and have therefore developed short webs between the toes of their hind-feet.

XV. Sigmodon, Say and Ord, differs from Hesperomys in the pattern of the molar teeth. It contains one species only, the Rice- rat, S. hispidus, which ranges from the United States to Ecuador.

XVI. and XVII. Reithrodon, Waterh., and Ochetodon, Coues., more or less like Hesperomys, but with grooved upper incisors. The first of these is a South-American genus, and contains four rat-like species, one from Venezuela and the other three from Patagonia. The second consists of three North American mice, of about the size and proportions of the English Wood-mouse, Mus sylvaticus.

XVIII. Neotoma, Say and Ord, a peculiar North – American group, in which the tceth have the prismatic appearance of those of the

From the ranges of the genera given above it will be

seen that all the first group, the Mures, are confined to the Old World, and that of the Sigmodontes four genera are found in Madagascar and the rest in America, thus giving us a very remarkable instance of the peculiar affinity that the fauna of Madagascar has with that of the New World. This affinity is usually explained by the fact that those animals which show it belong as a rule to groups formerly distributed over both the Old and New Worlds, and that since the isolation of Madagascar these, owing to the competition of more highly-organized forms, have been exterminated or strongly modified throughout the continents of the eastern hemisphere, while in the western they have been preserved to the present time. Thus in the present case it seems probable that the original ances- tors of the A/urinz, if not indeed of the whole family Muride, were Sigmodontes having molars with their cusps biserially arranged, and that these, being less powerful in the struggle for existence, as is shown by the manner in which roving members of the Mures rapidly multiply at the expense of the indigenous Sigmodontes of any place they may be introduced into, have gradually succumbed to the more recently developed Mures wherever the latter were able to penetrate, —Madagascar having previously become an island, and therefore inaccessible to them. Other groups, however, also probably descendants of Sigmodont Muride, have become so strongly modified either as to structure or habits as to have been able to avoid the rivalry of the Mures, and thus to exist side by side with the latter; such probably are the Hamsters (Cricetus) and the Voles (Arvicola), both of which have modifications of the biserial arrangement of the molars. As to the Murines from Australia—a region isolated from the rest of the world far earlier than Madagascar—with their very various degrees of specialization, it seems prob- able, as Mr Wallace has suggested,? that from very early times individual rats and mice have drifted on floating trees and other objects from island to island along the Indian archipelago down to Australia, and that the de- scendants of the earliest arrivals have become the most modified, and that others have been continually joining them, until we get the present state of affairs, namely, one or two genera very markedly different from Mus, others but slightly different, and finally numerous species not generically separable from the European and Asiatic rats and mice. Ort) MOUSE-BIRD (Dutch Muisvogel), the name by which in Cape Colony and Natal the members of the genus Colius* of Brisson are known—partly, it would seem, from their general coloration, but more probably from their singular habit of creeping

along the boughs of trees with the whole tarsus applied to the branch. By the earlier systematists, who had few opportunities of examining the internal structure of exotic forms, Colius was placed among the Fringillide ; but nearly all travellers who had seen one or another species of it in life demurred to that view. Still its position was doubtful till Dr Murie, in an elabo- rate treatise on its osteology ([bis, 1872, pp. 262-280), showed that it was no Passerine, and subsequently (iis, 1873, p. 190) proposed Pamprodactyle as the name of the group of which the Family Coliide is the sole type—this word being coined to indicate the obvious character of all the toes being ordinarily directed forwards, but by no means the only peculiar character these birds possess. A few years later most of Dr Murie's views were confirmed

1 The teeth of the extinct genus Cricetodon from the Miocene of France and Germany are in their essential structure quite similar to those of Hesperomys.

2 Australasia, p. 58, 1879.

3 Some other generic divisions have been suggested, but on grounds so slender as hardly to merit consideration.

by Garrod (Proc. Zool. Society, 1876, pp. 416-419), who added considerably to our knowledge of the general anatomy of the Family, which he considered to be related on the one hand to the Picidz, and on the other to the Alcedinidx (see KINGFISHER, vol. xiv. p. 81) and Bucerotidx (see Horn- BILL, vol, xii. p. 169). The Coliidz are small birds, with a

Mouse-Bird,

rather Finch-like bill, a more or less crested head, a very long tail, and generally of a dun or slate-coloured plumage that sometimes brightens into blue or is pleasingly diver- sified with white or chestnut. They feed almost wholly on fruits, but occasionally take insects, in quest of which they pass in bands of fifteen or twenty from tree to tree, and hang in all attitudes from the branches as they feed. It is even said that they sleep suspended by their

powerful and versatile toes. Seven species are believed to exist, all belonging to the Ethiopian Region (of which the Family is one of the most characteristic), and ranging from Abyssinia southwards. Three species inhabit Cape Colony. (A. N.) MOVERS, Franz Karu (1806-1856), a German Orien- talist, was born at Koesfeld 17th July 1806, studied at Minster, was consecrated priest in 1829, and was pro- fessor in the Catholic theological faculty at Breslau from

1839 to his death on 28th September 1856. He was one of

the most learned Catholics of Germany, and his elaborate work on Pheenicia? attained a high and in some respects an exaggerated reputation. It is a monument of great industry but of little judgment, and the progress of epi- graphic studies has superseded much of the author's mate- rial. The first volume in particular, which deals with the religion of the Phcenicians, may be viewed as quite out of date. Movers himself modified some of his views in his article "Phénizien" in Ersch and Gruber's Encyklopédie. Of his other writings two Biblical studies were of some importance, viz., his Kritische Untersuchungen wiber die ATliche Chronik (1834) and Latin essay on the two re- censions of the text of Jeremiah (1837).

MOZAMBIQUE, a colonial province of Portugal, ex- tending for about 1200 miles along the east coast of Africa from Cape Delgado (10° 41' 8. lat.) to Lorenzo Marques on the south side of Delagoa Bay (25° 58'S. lat.). On paper it forms an imposing territory of at least 38,000 Square miles without any definite limit towards the interior ; but in reality it consists of a few settlements and military posts feebly authoritative over the surrounding

} Die Phinizier: vol. i., Religion (1840); Alterthum (3 parts, 1849-50-56).

vol. ii., Das Phénizische

tribes. The Portuguese divide the province into the military districts of Mozambique, Cape Delgado, Angoche, Quilimane, Tete, Sofala, and Lorenzo Marques, with the presidential territory of Bazaruto. The small coral island of Mozambique, which gives its name to the province and contains the provincial capital, lies in 15° S. lat., about 3 miles off the coast of the peninsula Mossuril. It is defended by three forts, of which the

principal, St Se- bastian, is built entirely of stone brought from Portugal in 1510. The streets of the town (properly St Sebastian of Mozambique) are narrow and crooked, and the stone-built flat-roofed houses are for the most part dull and lifeless in spite of their being washed with pink, brown, and white. Its principal buildings are the palace of the governor- general, formerly a Jesuit college, the custom-house, the hospital, and three churches. The population includes, be- sides Portuguese and Africans, Banyans, Parsees, and Arabs. The district of Cape Delgado includes the archipelago of the Querimba Islands, and on the opposite mainland Mucimba, Pangane, Lumbo, Quissanga, Montepes, Arimba, besides the colony of Europeans founded in 1857 on the Bay of Pemba. The chief town is Ibo, with over 2000 inhabit- ants, situated on the island of the same name. Of the twenty-eight islands some are nearly deserted, although both their climate and that of the opposite coast is good. Ibo has a considerable trade, —the exports being sesame, calumba root, oil-seeds, ivory, and wax. Turtle fishing is carried on; but little has been done to develop the agricultural capabilities of the district. The district of Angoche extends nominally as far south as the Quirimbo river, and includes the Angoche and Primeira islands and a small settlement on the Angoche river. The trade is very limited. The district of Quilimane is the centre of the commerce of the Zambesi, and the town ranks next to Mozambique as a port. Near the village of St Marcal de Sena, the headquarters of the sub-military government of Sena, there are said to be very rich gold mines. Tete, to the north-west of Sena, is situated in the centre of an immense coal-basin. It includes a number of settlements on the Zambesi reaching as far as Zumbo, where a great native fair is held. The chief town is St Thiajo Major, about 250 miles from the mouth of the Zambesi. The climate is genial, and the soil is specially suitable for wheat, maize, tobacco, cotton, and sugar-cane. The chief town of the Sofala district is Sofala on the island of Chi- loane in the estuary of the Sofala river. It was the original capital of the colony, and still possesses a good harbour, which, however, is not always easily accessible, and requires good piloting. The district is rich in gold mines, and is supposed by some to be the Ophir with which King Solomon traded. Inhambane, opposite Gasa, is very much encroached upon by the Zulu tribes. The natural products are similar to those in the Zambesi valley. A species of oil-plant is very abundant, as well as amber and sarsaparilla, The district of Lorenzo Marques is almost wholly confined to the town of that name (¢.v.). The archipelago of Bazaruto

comprises the islands of Bazaruto, Benguerua, Xegine, Bango, and Santa Carolina. The soil and climate are both excellent, and there are important pear! fisheries.

Before the 12th century this portion of the east coast of Africa had been partly colonized by Arabs from the Red Sea, who were in possession of the island of Mozambique and other districts when in 1498 the island was sighted by the Portuguese. From that time the Portuguese armadas were in the habit of frequently touching this coast on their way to India, and in 1505 Albuquerque erected a stockade at the mouth of the Sofala river and established the first Portuguese settlement under the name of the captaincy of Sofala. The fortunes of the Portuguese have been frequently chequered with disasters, and in the earlier years of their settle- ment they had great difficulty in withstanding successive attacks of the Kaffres, the Turks, and the Arabs. The Banyan traders began

to frequent the Portuguese settlements in 1687, and were succeeded by the Battias from Hindustan. From Cape Delgado to Quilimane the native race on the coast is the Makua, who, notwithstanding the presence of Arabs, Banyans, and Battias, have preserved ina remarkable degree their purity of descent, although their language has undergone considerable change. The whole of the country

between the Rovuma and the Zambesi is thickly populated by

branches of this race governed by numerous petty independent despots. The Makua are divided into four families or groups—the Low Makua, the Lomwe or Upper Makua, the Maua, and the Medo. The Makololo, a powerful Basuto tribe who inhabited the valley of the Zambesi, were about twenty-five years ago not only con- quered but almost annihilated by the Manganja and Makua races. South of the Zambesi are the Landeens or Northern Zulus, who under Umzeila subdued Gasa, and press closely on the coast settle- ments of the Portuguese, which again are bounded on the south by Usibepu’s land.

Natural Features and Resources.—Though the climate of the Mozambique country is subject to sudden and great alterations, the mean annual temperature is high. The cool season lasts from April to August. In the rainy season, which begins in December and sometimes continues to March, the heat when rain is not falling, which is scarcely ever, is almost insupportable. On the rivers and the coast the mangrove swamps cause fever to Europeans, but the climate is not dangerous if moderate care is taken.

The whole of the country south from the Rovuma to the Zambesi possesses naturally great fertility, the richest portion, however, be- ing that between Angoche and Quilimane. The mountain ranges which flank Lake Shirwa are of great height and towards Quilimane extend almost to the coast. In the basin of the Zambesi thé soil is fertilized by the inundations of the river, and yields abundantly with almost no labour. The low coast land of the Gasa country is almost equally fruitful. The whole region of Mozambique is inter- sected by numerous rivers, some of which are navigable, while at several of the estuaries there are admirable natural harbours. Ebony, the gum-copal tree, the india-rubber climber, sandal-wood, and a large number of valuable timber trees are found in the extensive forests. In the interior elephants, antelopes, and buffaloes abound, as well as lions and leopards, and the rhinoceros and hippopotamus frequent certain regions. Game in immense variety is plentiful, and the pearl and other fisheries are valuable. The mineral resources of the country are of exceptional importance. There are immense deposits of coal in the neighbourhood of the Zambesi and of Delagoa Bay, and adjoining the coalfields ironstone of the best quality is very plentiful. Malachite and copper are found in the interior, north-west of Mozambique. The gold-mines of Manica, about 120 niles west of Sofala, are supposed to be the richest on the east coast of Africa.

Industry and Commerce.—Almost nothing has been done to develop the resources of the country, and the Portuguese have scarcely carried their discoveries beyond the regions where they have settled. Journeys througli the Makua country have lately been made by H. E. O’Neill and the Rev. Chauncey Maples.! The Zambesi valley and the districts round Lakes Nyassa and Shirwa have been explored by Kirk and Livingstone. The regions border- ing on the Transvaal have been visited by Carl Mauch and St Vincent Erskine. Although a great part of the country is admir- ably

adapted for the growth of cotton, coffee, and sugar, scarcely any attempt has been made to form plantations. The caju tree, which yields an intoxicating liquor, is, however, largely cultivated, and the cocoa-nut tree is also grown. The number of independent chiefs in the Makua country renders it almost inaccessible to traders, but ivory is sold in large quantities for the Indian market, the annual value being about £70,000. The other exports include bees- wax, corn, gums, india-rubber, and oil. The financial difficulties of the Portuguese Government have completely retarded the com- mercial enterprise of the settlements. The trade is almost entirely in the hands of the Banyans, who are supplied by French and Dutch houses with goods, chiefly cotton and silk cloths, brandy, wine, and old guns, which they barter for produce with the natives on the coast. The only river by which there is regular communi- cation with the interior is the Zambesi. On the coast of Mozam- bique there are several native ports of call, between which and Madagascar a large surreptitious trade in slaves was carried on until 1877. With this island, and also with Zanzibar, there is a large general coasting trade. The British India Company's steamers from Zanzibar in connexion with steamers from Aden and Lisbon also call every twenty-eight days at Mozambique, and a monthly steamer from Natal calls at Delagoa Bay, Inhambane, Quilimane, aud Mozambique. The general shipping trade is carried on by about 400 vessels, of which about one-half are coasters. English vessels in 1877 were said to number 79 of 30,000 tons, French 72 of 18,000 tons, Portuguese 41, Arab 19, Dutch 8, and German 9.

For the Portuguese settlements see the report by Consul Elton in Accounts and Papers, 1876, and L. de B., Les Colonies Portugaises: court exposé de leur

1 See Proc. Roy. Geog. Soc., 1882.

situation actuelle, Lisbon, 1878. For the region in general see the ve of a

travellers referred to.

MOZARAB, Spanish Mozdrabe, is a corruption of the Arabic Musta'rib, coll. Musta'riba, which denotes persons not Arab by race who have assimilated themselves to the Arabs. This name was applied by the Moslems in Spain to the Christian communities existing among them, in

Cordova, Seville, Toledo, and other large cities, in the exercise of their own laws and religion. The ancient liturgy (see vol. xiv. p. 707) used by the Christians of Toledo, the first great body of this kind who were freed from the Moslem yoke, is commonly known as Mozarabic.

MOZART, Worrcane AmaApEus? (1756-1791), one of the greatest musicians the world has ever produced, was born at Salzburg, 27th January 1756. He was educated by his father, Leopold Mozart, a violinist of high repute, in the service of the archbishop of Salzburg. _ When only three years old he shared the harpsichord lessons of his sister Maria, five years his senior.

2 Tn the baptismal register his name stands, Joannes Chrysostomus Wolfgangus Theophilus (Lat. Amadeus, Germ. Gottlieb). 3 The German diminutive of Wolfgang.

third set of sonatas, dedicated: to the queen ; and wrote an anthem for four voices entitled God is our Refuge, for presentation to the British Museum.) In July 1764 he played at Tunbridge Wells, and soon afterwards Leopold Mozart caught a severe illness, during the continuance of

which he stayed with Dr Randall in Five Fields Row,

now Lower Ebury Street, Chelsea. On 12th February 1765 the children gave a concert at the Little Theatre in the Haymarket, and another on 13th May at Hickford’s Room. After this they gave private performances at the Swan and Hoop Tavern, Cornhill; and on 17th September the family left England for the Hague, where they remained some time, and where in March 1766 the young composer made his first attempt at an oratorio, commanding in Holland a success as great as that he had already attained in London, and astonishing his hearers at Haarlem by performing on the then largest organ in the world. It would be impossible within the limits of a sketch like the present to follow the history of this gifted boy through all its extraordinary details. Towards the close of 1766 we find him at home in Salzburg, diligently studying Fux’s Gradus ad Parnassum. In Septem- ber 1767 he paid a second visit to Vienna, and at the suggestion of the emperor Joseph II.

composed an opera buffa, La Pinta Semplice, which, though acknowledged by the company for which it was written to be “fan incom- parable work,” was suppressed by a miserable cabal. The archbishop of Salzburg hearing of this commanded a representation of the rejected work in his palace, and appointed the young composer his ‘‘maestro di capella.” The office, however, was merely an honorary one, and, since it did not involve compulsory residence, Leopold Mozart determined to complete his son’s education in Italy, to which country he himself accompanied him in December 1769.

Wolfgang, now nearly fourteen years old, was already an accomplished musician, needing experience rather than instruction, and gaining it every day. His talent was universally acknowledged. At Milan he received a com- mission to write an opera for the following Christmas. At Bologna he found firm friends in the venerable Padre Martini and the still more famous sopranist Fari- nelli. At Florence he became so tenderly attached to Thomas Linley, a boy of extraordinary promise and ex- actly his own age, that he parted from him with tears, which seemed almost prophetic—for Linley was drowned in England at the early age of twenty-two. Arriving in Rome on the Wednesday in Holy Week, he went at once to the Sistine Chapel to hear the celebrated Miserere of regorio Allegri, which, on returning to his hotel, he wrote down from memory note for note—a feat which created an immense sensation, for at that time the singers were forbidden to transcribe the music on pain of excommuni- cation. In May he played at the Conservatorio della Pieta, in Naples, where the audience, attributing his power to the magical effect of a ring, insisted upon its removal from his finger. Returning to Rome towards the end of June, he was invested by the pope with the order of “The Golden Spur,” of which he was made a cavaliere,? an honour which he prized the more highly because, not many years before, it had been conferred upon Gluck. In July he paid a second visit to Bologna, when the Acca- demia Filarmonica, after subjecting him to a severe examina- tion, admitted him to the rank of “compositore,” notwith- standing a statute restricting this preferment to candidates of at least twenty years old. The exercise which gained him this distinction is a four-part composition in strict

1 The original autograph of this is now numbered ‘‘Select case C, iL (ole 2 Auratz militie eques.

counterpoint on the antiphon Querite primum, written in the severe ecclesiastical style of the 16th century and abounding in points of ingenious imitation and device.®

In October 1770 Wolfgang and his father returned to

Milan for the completion and production of the new opera. The libretto, entitled Mitridate, Re di Ponto, was furnished by an obscure poet from Turin, to the great disappointment of the young maestro, who had hoped to set a drama by Metastasio. The progress of the work was interrupted from time to time by the miserable intrigues which seem inseparable from the lyric stage, exacerbated in this particular case by the jealousy of the resident professors, who refused to believe either that an Italian opera could be written by a native of Germany, or that a boy of four- teen could manage the orchestra of La Scala, at that time the largest in Europe. Fortunately the detractors were effectively silenced at the first-full rehearsal; and on the 26th of December Wolfgang took his seat at the harpsichord and directed his work amidst a storm of genuine applause. The success of the piece was unprecedented. It had a continuous run of twenty nights, and delighted even the most captious critics. _ Wolfgang’s triumph was now complete. After playing with his usual success in Turin, Verona, Venice, Padua, and other Italian cities, he returned with his father to Salzburg in March 1771, commissioned to compose a grand dramatic serenata for the approaching marriage of the archduke Ferdinand, and an opera for La Scala, to be performed during the season of 1773. The wedding took place at Milan on 21st October; and the serenata, Ascanio in Alba, was produced with an effect which com- pletely eclipsed Hasse’s new opera, Ruggiero, composed for the same festivity. The empress Maria Theresa was so delighted with it that in addition to his fee she pre- sented Wolfgang with a watch set with diamonds and enamelled with her portrait ; and Hasse, forgetful of his own defeat, generously uttered the often-quoted prophecy, “This boy will cause us all to be forgotten.”

During the absence of Wolfgang and his father the good archbishop of Salzburg died; and in the spring of the year 1772 Hieronymus, count of

Colloredo, was elected in his stead, to the horror of all who were acquainted with his real character. The Mozart family did their best to propitiate their new lord, for whose installation Wolfgang, after his return from Milan, composed an opera, Jd Sogno di Scipione ; but the newly-elected prelate had no taste for art, and was utterly incapable of appreciating the charm of any intellectual pursuit whatever. For the present, however, things went on smoothly. In October the father and son once more visited Milan for the preparation and production of the new opera, Lucio Silla, which was produced at Christmas with a success quite equal to that of Mitridate, and ran between twenty and thirty nights. Unfortunately, however, these artistic triumphs were far from profitable in their pecuniary aspect. The family grew poorer and poorer ; and the archbishop Hieronymus was not the man to rescue them from penury.

In the meantime Wolfgang continued to produce new works with incredible rapidity. In 1775 he composed an opera for Munich, La inta Giardiniera, produced on 13th January. In the following March he set to music Metastasio's dramatic cantata, /7 Re Pastore. Concertos, masses, symphonies, sonatas, and other important works, both vocal and instrumental, followed each other without a pause. And this fertility of invention, instead of ex-

3 An exact copy of this most interesting production, transcribed from the original autograph still preserved among the archives of the Accademia, will be found in the appendix to Holmes's Life of Mozart (London, 1845).

1. ◦ Questo ragazzo ci fara dimenticar tutti."

hausting his genius, seemed only to stimulate it to still more indefatigable exertions. But the pecuniary return was so inconsiderable that in 1777 Leopold Mozart asked the archbishop for leave of absence for the purpose of making a professional tour. This was refused on the ground of the prelate's dislike to "that system of begging." Wolfgang then requested permission to resign his appoint- ment, which was only an honorary one,

for the purpose of making the tour with his mother. The archbishop was furious; but the plan was carried out at last, and on the 23d September the mother and son started for Munich. The results were not encouraging. Leopold hoped that his son, now twenty-one years old, might obtain some pro- fitable court appointment ; but in this he was disappointed. And, worse still, poor Wolfgang fell in love at Mannheim with a promising young vocalist named Aloysia Weber, whose father, the prompter of the theatre, was very nearly penniless. On hearing of this Leopold ordered his wife and son to start instantly for Paris, where they arrived on 23d March 1778. Wolfgang's usual success, however, seemed on this occasion to have deserted him. His recep- tion was a cold one; and, to add to his misery, his mother fell seriously ill. He wrote home in unspeakable distress ; but the worst had not yet come. On 3d July the parent to whom he was so tenderly attached expired in his arms. Reduced almost to despair by this new trouble, he left Paris in September, rested for a while on his way home in Mannheim and Munich, was received by Aloysia Weber with coldness almost amounting to contempt ; and in June 1779 he returned to Salzburg, hoping against hope that he might make some better terms with the archbishop, who re- lented so far as to attach a salary of 500 florins (about £50) tohis " concertmeister's" appointment, with leave of absence in case he should be engaged to write an opera elsewhere.

Two years later the desired opportunity presented itself. He was engaged to compose an opera for Munich for the carnival of 1781. The libretto was furnished by the abbate Varesco, court chaplain at Salzburg, a truly sympa- thetic collaborateur. On 29th January 1781 the work was produced under the title of Zdomeneo, Re di Creta with triumphant success, and thenceforth Mozart's position as an artist was assured; for this was not only the finest work he had ever written but incontestably the finest opera that had ever yet been placed upon the stage in any age or country. It marked an era in the history of art, and raised the lyric drama to a level till then unknown.

And now the archbishop's character exhibited itself in its true colours. Art for its own sake he utterly dis. dained ; but it flattered his vanity to retain a famous artist in his service with the power of insulting him at will. On hearing of the success of Jdomeneo he instantly summoned the composer to Vienna, where he was spending the season. Mozart lost not a moment in

presenting him- self, but he soon found his position intolerable. That he should be condemned to dine with his patron's servants was the fault of the age, but the open disrespect with which the lowest menials treated him was due to the arch- bishop's example. Though received as an honoured guest in the houses of the haute noblesse of Vienna, he was uni- formly addressed by the archbishop in the third person singular, a form used in Germany to express the utmost possible contempt. His salary was reduced from 500 to 400 florins, he was left to pay his own travelling ex- penses, and he was not permitted to add to his means by giving a concert on his own account or to play anywhere but at the archiepiscopal palace ; indeed it was only at the instance of a large number of the nobility that he obtained leave to take part, gratuitously, in a concert given for the poor. Archbishop Hieronymus was hated at court, and most of all by the emperor Joseph, who, on

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retiring to Laxenburg for the summer, did not place his name on the list of invited guests. This offended him so deeply that he left Vienna in disgust. The household were sent on to Salzburg, but Mozart was left to find lodgings at lis own expense. Thereupon he sent in his resignation ; and for this act 'of contumacy was insulted by the archbishop in terms too vulgar for translation. He persevered, however, in his resolution, taking lodgings in a house rented by his old friends the Webers, and vainly hoping for pupils, since Vienna at this season was per- fectly empty. Happily he had a sincere though not a_ generous well-wisher in the emperor, and a firm friend in the archduke Maximilian, who, in common with many noblemen of rank, were disgusted with the archbishop's behaviour. By the emperor's command he wrote a German opera, Die Entfiihrung aus dem Serail, which on 16th July 1782 was received with acclamation, and not long afterwards was performed with equal success at Prague. This great work raised the national "singspiel" to a level commensurate with that which Jdomeneo had already attained for the Italian "opera seria." Gluck's great reform .of the lyric drama (based, not, as is sometimes erroneously supposed, on new principles invented by him- self, but on those enunciated by Peri and his associates as early as the year 1600, when the first Italian opera was produced at Florence) had already attracted immense atten- tion in Paris, and was everywhere producing good fruit. It was impossible that it should do

otherwise, for it was founded on pure dramatic truth. But what Gluck worked out in obedience to a carefully-elaborated theory Mozart effected by simple force of natural dramatic instinct. Moreover, with all his love for graceful melody, his power of expression, and dramatic force, Gluck was not great as a constructive musician, On the other hand, the erudi- tion which in 1770 had won Mozart's diploma from the Accademia at Bologna was no mere rusty exhibition of scholastic pedantry. It enabled him to cast his music into symmetrical and well-considered form, without sacrificing the demands of dramatic consistency ; to enchant the un- learned hearer with an endless flow of melody, while satis- fying the cultivated musician with the most ingenious part-writing that had ever been imagined in connexion with the stage ; to construct the grand finales that have made his operas the finest in the world ;—-and all this with equal reverence for the claims of legitimate art on the one side and those of passionate expression on the other. For the finales are no dead forms, but living scenes developing the action of the drama. And the impassioned utterances are no poor passages of "sound and fury, signifying nothing," but well-constructed music, shapely and beautiful,~~—music which Gluck himself, with all his genius, could no more hope to rival than Hasse could hope to rival the choruses in Israel in Egypt. For Gluck, though his taste was as refined and his intellect as highly cultivated as Mozart's, was, as Handel justly observed, no contrapuntist ; and works like Mozart's needed an intimate acquaintance with the mys~~ teries of counterpoint, no less than purity of taste and intellectual culture. And so it comes to pass that Mozart's operas still retain a stronger hold upon the affections, both of the general public and the initiated worshipper of art, than any other dramatic music that has ever been written.

The next great event in Mozart's life was a disastrous one. Though Aloysia Weber had long since rejected him, his renewed intimacy with the family led to a most unfor- tunate marriage with her younger sister, Constance, a woman who, neither his equal in intellect nor his superior in prudence, added little to the happiness of his life and less than nothing to its prosperity. The wedding took place at St Stephen's on 16th August 1782. By the end of the year the thriftless pair were deeply in debt. Mozart

composed incessantly, played at numberless concerts, and was in greater favour than ever at court and with the nobility; but to the last day of his life his purse was empty. He had, however, many kind friends, not the least affectionate of whom-was the veteran Haydn, who was sincerely attached to him. With Gluck he was on terms of courteous intercourse only. Salieri detested him, and made no secret of his dislike.

Mozart's next dramatic venture was a German singspiel

~~in one act, Der Schauspieldirektor, produced at Schén~~ brunn, 7th February 1786. Not quite three months later, on lst May, he produced his marvellous Le Wozze di Figaro, the libretto for which was adapted from Beaumarchais by the abbé Da Ponte. The reception of this magnificent work was enthusiastic. But Vienna was a hotbed of intrigue. Everything that could be done by jealous plotters to mar the composer's success was done, and that so effectively that Mozart declared he would never bring out another opera in the city which treated him so meanly. Fortu- nately, Figaro, like Die Entfiihrung, was repeated with brilliant success at Prague. Mozart went there to hear it, and received a commission to write an opera for the next season, with a fee of 100 ducats. Da Ponte furnished a libretto, founded on Tirso de Molina's tale, Zl Convidado de Predra, and entitled I Don Giovanni. By 28th October 1787 the whole was ready with the exception of the over- ture, not a note of which was written on the evening before the performance. This circumstance has led to the idea that it was composed in haste, but it is certain that Mozart knew it all by heart and transcribed it during the night from memory, while his wife told fairy tales to keep him awake. The opera was produced on 29th October with extraordinary effect, and the overture, though played with- out rehearsal, was as successful as the rest of the music.} Yet, when reproduced in Vienna, Don Giovanni pleased less than Salieri's comparatively worthless Tarare.

On returning to Vienna Mozart was appointed kammer- compositor to the emperor with a salary of 800 gulden (£80). He also conducted Baron van Swieten's concerts, and composed great quantities both of sacred and secular music, but continued miserably poor, while his wife had become a confirmed invalid. In April 1789 he accompanied Prince Lichnowski to Berlin, where King Frederick William II. offered him the post of "

kapellmeister” with a salary of 3000 thalers (£450). Though most unwilling to quit the emperors service, he informed him of the offer and re- quested leave to resign his appointment in Vienna. “Are you going to desert me, then?” asked the emperor; and Mozart, wounded by the reproach, remained to starve. The emperor now commissioned Mozart to compose another Italian opera, which was produced 26th January 1790 under the title of Cos? fan tutte. Though the libretto by Da Ponte was too stupid for criticism, the music was deli- cious, and the opera would probably have had a long run but for the emperor’s death on 7th February. The new em- peror, Leopold IT., was elected at Frankfort in September, and Mozart went thither in the hope of giving some con- certs, but he was obliged to sell his plate to pay the expenses of the journey, and returned in December. In March 1791 Mozart consented to write a German opera upon an entirely new plan for Schikaneder, the manager of the little theatre in the Wieden suburb. The piece was addressed especially to the Freemasons and contained cease- less allusions both in the words and music to the secrets of the brotherhood. Deeply interested in the affairs of a body of which he was himself a member,? Mozart excelled

1 Michael Kelly, in his Reminiscences, has left a delightful account of the circumstances.

? Freemasonry did not at that time involve the censure of the Catholic Church, or Mozart would certainly have renounced it.

himself in this new work, for the overture of which he in- vented a new art-form, that of the ‘‘symphonic fugue.” He was rewarded for his labours by a brilliant artistic success, but Schikaneder alone reaped the financial benefit of the speculation.

Before the completion of Die Zauberfléte a stranger called on Mozart, requesting him to compose a Requiem and offering to pay for it in advance. He began the work under the influence of superstitious fear, believing that the messenger had been sent from the other world to forewarn him of his own approaching death. Meanwhile he received a commission to compose an opera, La Clemenza di Tito, for the coronation of the emperor at Prague.

He worked incessantly, and far beyond his strength. The coronation took place on 6th September, and its splendours threw the opera very much into the shade. Die Zauberflite was pro- duced on 30th September and had a splendid run. But the Regwem still remained unfinished ; the stranger there-fore made another appointment, paying a further sum in advance. Mozartworked atit unremittingly, hoping to make it his greatest work. His sacred music, though less florid than Haydn's, was even more voluptuously beautiful,— perfect in its kind, though showing no trace of the stern grandeur of Handel, or the devotional purity of Palestrina. In the Mequiem he surpassed himself, but he was not permitted to finish it. When the stranger called the third time the composer wasnomore. The score of the Requiem was completed by Siissmayer, whose task, simplified by the instructions he had received from Mozart on his death-bed, was a purely mechanical one. Jt is now known that the work was commissioned by Count Walsegg, who wished to perform it as his own.

Mozart died 5th December 1791, apparently from fever, though he believed himself poisoned. His funeral was a disgrace to the court, the emperor, the public, society itself. On the afternoon of the 6th his body was hurried to a pauper's grave; and because it rained Van Swieten, Siissmayer, and three other "friends" turned back and left him to be carried to his last long home alone.

Mozart's compositions, whether for the church, the theatre, or the concert-room, are pervaded by an individuality of style which can never be mistaken. Of the truthful expression of his dramatic music we have already spoken. Apart from its innate beauty, its artistic strength cousists in its perfect adaptation to the situation for which it is designed. The same great quality charactcrizes his symphonies, his concertos, and his sonatas for the pianoforte and other solo instruments. Each work presents us with the logical and consistent development of a noble idea, of which we never lose sight for a moment. No trace of indecision or inconsequence is discernible in any part of the composition. Every note is fitted into its place with a definitc purpose, and takes its share in the arrangement of the design with a certainty which leaves no doubt as to the object for which it was introduced. The result of this well-considered symmetry is a degree of technical perfection which no composer, ancient or modern, has ever surpassed. But

tech- nical perfection does but supply the body into which true genius alone can breathe the living soul. And here it is that we must look for the inexpressible charm which Mozart's music never fails to exercise upon all who hearit. Its boundless wealth of melody is governed by a refinement of taste which excludes every subject, every phrase, every minutest cadence which is not both beautiful in itself and capable of enhancing the beauty of its fellow-phrases. Mozart himself has left us, in a letter to Baron V- , 2 memorable description of the loving care he exercised in the selection of his charming phrases. He tells us that his ideas flowed best when he was alone and feeling cheerful. Having once conceived an idea he subjected it to a process of mental elaboration which continued until the composition was complete. Then, and not till then, he com- mitted it to paper ; and hence it was that he was able to write out the overture to Don Giovanni on the day of its first performance.

_Von Kéchel's Chronologischthematisches Verzeichniss, 1862, contains a com- plete list of Mozart's works. (W. 8. R.)

MOZDOK, a Russian town in the government of the Caucasus and province of Stavropol, lies on the left bank of the Terek, 465 feet above the level of the sea, in 43° 41' N. lat. and 44° 39' E. long., 58 miles north of Vladi-

kavkas, with which it is connected by a highroad, and 364 miles east of the Prochladnaya station on the Rostoff- Vladikavkas railway. Built on the site of an oak-wood (moz, noz, thick or dark, dok, wood, in Kabardine) in 1763 by Kogorko-Kontchukin, prince of Kabarda, it soon be- came an important point in the Russian line towards the Caucasus, and was fortified with earthen rampart and ditch. In 1840 it was attacked by Schamyl and 5000 mountaineers. The population (8760 in 1863) numbered 11,008 in 1877, 52 per cent. being " Orthodox " (with very few sectaries), 29 per cent. Armenians, 15 per cent. Moham- medans, and 2 per cent. Catholics. Gardening and agri- culture are the main means of subsistence, scarcely fifty individuals living by trade. The melons and water-melons of Mozdok are widely famed ; and, though vine-growing was only begun in 1873, by 1876 there was a production of 563 casks of wine or 1,416,000 bottles. An

oil-mill, tanneries, and soapworks are among the industrial estab- lishments. Three fairs are held in the year.

MOZLEY, James Bow.ine (1813-1878), English theo- logian, a native of Lincolnshire, born in 1813, was edu- cated at Oriel College, Oxford, where he graduated in 1834. He was appointed to a fellowship at Magdalen College in 1837, was ordained deacon in 1838, priest in 1844, and became vicar of Shoreham in 1856. In 1869 he became canon of Worcester, and in 1871 regius professor of divinity at Oxford.. He died at Shoreham on 4th January 1878,

He wrote 4 Treatise on the Augustinian Doctrine of Predestination (1855); The Primitive Doetrine of Baptismal Regeneration (1856) ; «l Review of the Baptismal Controversy (1863) ; Subseription to the Articles: a Letter (1863) ; Lectures on Miracles, being the Bampton Lectures for 1865; University Sermons, 1876 ; and a volume on the Old Testament entitled Ruling Ideas in Early Ages (1877). In all these works he has advocated his views, those of a strongly- convinced English High-Churchman, with uprightness, Icarning, acuteness, and sagacity.

MTSENSK (popularly called Amchensk), a district town of Russia, situated in the government of Orel on the navigable Zusha river, 17 miles from its junction with the Oka, on the Moscow and Kursk railway, 32 miles to the north-east of Orel. It is mentioned in the Russian chronicles as early as 1147 as a town of the principality of Tchernigoff. Many battles were fought for its possession, and the plains around are dotted with grave-mounds. Though protected by a fort which occupied a strong posi- tion, the town was taken and plundered several times by the Tatars, the Russians, the Poles, and the Lithuanians. From 1320 to 1530 it was under the rule of Lithuania : in the latter year it was taken by Russia, and became one of her chief strongholds against the raids of the Tatars. It is now an important centre for trade in grain, hemp, hemp-seed oil, tobacco, and Wine-spirit, shipped on the Zusha, Oka, and Volga to and from Moscow, Nijni- Novgorod, and St Petersburg, or forwarded by rail to Moscow, Libau, and Riga, Population, 15,000.

MUCILAGE, a term which denotes a viscid or glutinous mixture of water and any gummy vegetable substance. The principal sources of mucilaginous matters are enu- merated under Gum (vol. xi. p. 276). A mucilage indi-

cates a physical condition or property rather than any definite chemical constitution, and consequently it may possess various characters, but as a rule the term is re- stricted to the bodies which swell into a kind of jelly with water, having the insoluble gum bassorin as their prin- cipal constituent. Such mucilages are useful in medicine as emollients and demulcents, and in the arts as thickeners (in calico-printing, dyeing, &c.). A remarkable variety of mucilage has been recently obtained by Stanford of Glasgow from certain of the commoner kinds of Algz, and called from its source algin. The Laminariz yield it

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in abundance and in a comparatively colourless condition ; it is also found in uct, but darkly coloured. It is a sub- stance of considerable thickening character, and has the peculiar property of gelatizing on the addition of a dilute mineral acid. A solution containing only 2 per cent. of algin when thus treated sets into a solid jelly. Alcohol has the same effect upon it.

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It is extracted from the plants by sodium carbonate, and as it can be obtained in large quantity it may become useful in the dressing of fabrics, or as a thickener in calico-printing. MUGGLETON, Lopowicx (1610-1698), the founder of the sect of the Muggletonians, was born in Bishopsgate Street, London, about the year 1610. His father was a farrier, but he himself was bred to be a tailor. In 1651 he began to have revelations by “a motional voice,” and to proclaim himself and a brother tailor, John Reeve, as the two witnesses mentioned in the Apocalypse, and as the “true prophets of the only high, immortal, glorious God, Jesus Christ.” An exposition of their doctrines was pub- lished in 1656 under the title of The Divine Looking-Glass. Among other views (besides the doctrine of the divine mission of the authors) this work taught that the distinc- tion of the three persons in the Trinity is merely nominal, that God has a real human body, and that He left Elijah as His vicegerent in heaven when He Himself descended to die on the cross, These opinions, strange to say, gained considerable currency, and naturally also called forth much opposition. William Penn’s book, The New Wetnesses

proved Old Heretics (1672),. was directed against them,

and in 1676 Muggleton was tried at the Old Bailey and convicted of blasphemy. Reeve died in 1658, but Muggle- ton survived till 1698. His collected works, including the posthumous Acts of the Witnesses, were published in 1756 ; and in 1832 some sixty Muggletonians subscribed to bring cut a new edition of The Works of J. Reeve and L, Muggleton (in 3 vols. 4to). Even as-late as 1846 The Dwine Looking-Glass was reprinted by members of the sect, which is now, however, believed to be extinct.

MUHLHAUSEN, a busy manufacturing town of Thuringia in the district of Erfurt, Prussia, is situated on the right bank of the Unstrut, 25 miles to the north- west of Gotha. It consists of a new and an old town surrounded by five suburbs, and with its numerous old churches and towers presents a quaint and picturesque appearance. The most interesting churches are those of the Blessed Virgin and St Blasius, dating respectively from the 14th and from the 12th century ; the town-house is also a fine medieval structure. Miihlhausen contains a gymnasium, a “real school,” a theatre, an orphanage, and two hospitals. Its chief industries are the spinning and weaving of woollens and cottons, in which about 50,000 spindles and 3000 looms are employed; but a list of its other manufactures includes the most varied articles, such as needles, machinery, cigars, soap, hosiery, and shoes. There are also numerous large establishments for dyeing, tanning, lime-burning, iron-making, brewing, and the pre- paration of liqueurs. The active trade of the town is mainly in grain, fruit, garden-stuff, wool, and cattle, and is fos- tered by the fertility of the surrounding country, which is remarkable for the abundance of its streams and water- courses. The great majority of the inhabitants, numbering 23,478 in 1880, are Protestants.

Muhlhausen is one of the oldest towns in Thuringia, and is said to have been fortified in 925. Its early importance is shown by the grant of imperial privileges made to it by the emperor Henry I., and by the diet held there in 1135. At the epoch of the Refor- mation Miihlhauscn became notorious as one of the chief seats of the Anabaptists. Thomas Miinzer, one of their leaders, was captured in the vicinity and executed in the town. Internal dissensions and injury received during the Thirty Years’ War and the Seven Years’

War afterwards reduced Mihlhausen to unimportance. In 1802 it lost its independence and passed to Prussia, in 1807 it was

attached to the kingdom of Westphalia, and in 1815 it again became Prussian. The Teutonic Order established itself at Mihl- hausen in 1200, and acquired considerable property there, which ultimately passed into the possession of the town.

MUIR, Joun (1810-1882), Sanskrit scholar, was born on 5th February 1810 in Glasgow, where his father, William Muir, was a merchant. He was educated at the grammar school of Irvine, the university of Glasgow, and the East India Company's college at Haileybury. He went to India in 1828, and served with distinction in various offices, as assistant secretary to the board of revenue, Allahabad, as magistrate and collector at Azimgarh, as principal of the Victoria College, Benares, and as civil and session judge at Futtehpoor. He was throughout remarkable for his zeal in cultivating and encouraging the study of San- skrit, in finding methods and furthering schemes for the enlightenment and amelioration of the Hindus. He was persuaded that the only way in which they could escape from the tyranny of caste, with all its attendant evils, was by being made to know how they had become what they were, and also how the freer and more civilized Western peoples believed and lived. He worked assidu- ously at the organization and development of the higher edu- cation of India, and endeavoured to stimulate the learned classes to the study of their own most ancient literature, and of the religious and philosophical literature of the West. He did while in India much work in both depart- ments, and was the occasion of still more being done both by Hindus and Europeans. In 1853 he retired from the service and settled in Edinburgh, where he may be said to have continued under more favourable conditions his Indian labours. In 1862 he endowed the chair of Sanskrit in the university of Edinburgh, and was the main agent in founding the Shaw fellowship in mental philosophy. He was a D.C.L. of Oxford, LL.D. of Edinburgh, and Ph.D. of Bonn. He died 7th March 1882.

In 1858 appeared vol. i. of his Original Sanskrit Texts (2d ed. 1868) ; it was on the origin of caste, an inquiry intended to show that it did not exist in the

Vedic age. Vol. ii. (Ist ed. 1860, 2d 1871) was concerned with the origin and racial affinities of the Hindus, exhibiting all the then available evidences of their con- nexion, their linguistic, social, and political kinship, with the other branches of the Indo-European stock. Vol. iii. (Ist ed. 1861, 2d 1868) was on the Vedas, a full and exhaustive inqniry as to the ideas of their origin, authority, and inspiration held both by the Vedic and later Indian writers. Vol. iv. (1st ed. 1868, 2d 1873) was a comparison of the Vedic with the later representations of the principal Indian deities, an exhibition of the process by which three gods hardly known to the Vedic hymns became the deities of the former Hindu Trimurti. Vol. v. (1870) was on the Vedic myth- ology. These texts form still our most exhaustive work on the Vedic age, and show better than any others the point from which the peculiar religious and political development of India started. Dr Muir was also the author of a volume of Metrical Translations from the Sanskrit, an anonymous work on Inspiration, several works in Sanskrit, and many essays in the Jowrnal of the Royal Asiatic Society and elsewhere.

MULA, a town of Spain, in the province of Murcia, is situated 22 miles to the westward of that town on the slope and summit of an eminence on the left bank of the Mula, a small tributary of the Segura, periodically liable to destructive floods. The Sierra Espuiia rises on the south to a height of nearly 5200 feet. The usual public buildings, grouped round the central square of the town, present no features of special interest. The ground of the neighbourhood is somewhat broken, but of the cultivable portion about one-half is occupied with olives and vines. ‘The industries and trade of the place are con- nected principally with agriculture. The population in 1877 was 10,597. About 34 miles to the eastward are two groups of houses known as the Bafios de Mula, with warm sulphurous springs of considerable local repute.

MULBERRY. The mulberry family (Moracex) is usually included, along with the closely-allied figs, bread-

fruits, nettles, hops, planes, and elms, in one vast alliance of monochlamydeous Exogens, the order Urticacex (or Ul- macex, as Baillon prefers to call it). The Moracex include three sub-families, of which the

typical genera are: Dor- stenia, which is almost a Fig; Broussonetia, the Paper Mulberry of Japan, the East Indies, and the South Sea Islands ; and Aforus, the Mulberry proper, of which the ten or twelve species are all native to temperate regions in Asia and America, or to hill regions in their tropics, but are readily cultivated in similar climates in Europe, Africa, and Australia.

The Black Mulberry (Morus nigra, L.) is mainly culti- vated for its purplish black compound fruit (a sorosis formed by the aggregated drupes of the whole female in- florescence), which is wholesome and palatable if eaten fresh from the tree before acetous fermentation has had time to set in. Save in syrup, and on account of its rich dark-red colouring matter, it has no longer any pharma- ceutical uses. (See HorticuLturg, vol. xii. p. 272.

The White Mulberry (Jf. alba, L.), so called from its nearly white fruit, is the one mainly employed in seri- culture. There are many varieties, among which the Philippine Mulberry (var. multicaulis) is perhaps most highly esteemed. The American and Indian species (1. americana and JZ. indica, the latter not to be confounded with Morinda crtrifolia, a cinchonaceous tree, sometimes also called Indian Mulberry) are also cultivated for the same purpose.

For systematic and descriptive purposes see ‘‘ Morus ” in Baillon, Hist. d. Plantes, vi.; or Luerssen, Aled. Pharm. Botanik, vol. ii. For history and economic uscs sce F. v. Miller, Seleet Plants for Culture in Victoria, Melbourne, 1876; and Hehn, Kulturpflanzen, &c., 3d ed., Berlin, 1877 ; also Sruk.

MULE, Though this term is not unfrequently applied to the produce of two creatures of different species, and is synonymous with hybrid, yet in its ordinary accepta- tion it is employed to designate the offspring or “cross” between the equine and asinine species. There are two kinds of mule—the Mule proper (Lquus Asinus, var. y ; Mulus ; Fr., Mulet or Grand Mulet; Ger., Grosser Maul- esel), which is the hybrid produce of a male ass with a mare, and the Hinny (Equus Asinus, var.6; Hinnus; Fr., Bardot or Petit Mulet; Ger., Kleiner Maulesel), the offspring of the stallion and female ass. The mule is the more valu- able of the two, and to its production the attention of breeders is entirely directed. Indeed, the hinny is so rarely

produced, owing to the antipathy of the stallion to the female ass, that many authorities deny its existence.

Intercourse between the mare and male ass is very sel- dom voluntary; indeed, horses will not associate with asses, and combats between them are often serious. The male ass will freely mate with the mare, but the latter has a Strong repugnance to him, as has also the stallion for the female ass. Hence in mule-breeding the mare has to be blindfolded and otherwise deceived, or secured in a travis or by ropes, before she will allow the ass to approach her. Fecundation is not so certain between the ass and horse species as between the male and female of either species, for, while of four mares three at least will be fecindated by the stallion, as a rule only two will be so by the ass.

Fecundation of the hybrid female by the male ass or the stallion is not very rare; but it is otherwise with the male hybrid, no instance being recorded in which he has been prolific, though physically the animal appears to be perfect, and often exhibits an intense ardour for the female. The female mule, when fecundated, seldom reaches the natural term of pregnancy, and rarely brings forth a living offspring. The duration of gestation in a mare impregnated by the ass is a little longer than in impregnation by the stallion, — the average being 375 days. Abortion readily occurs, and more care is necessary than in breeding horses or asses.

In breeding mules the choice in the male parent is limited so far as shape is concerned, as the best-formed asses have, relatively to their height, the head too large, short neck, sides too flat, low shoulders, narrow croup, thin arms and thighs, and very narrow hoofs. To obtain well-shaped mules, therefore, the selection of the mare is of the greatest importance in remedying the defects of the sire. Mares with a small head, round body, short back, wide chest and muscular croup, large thighs and arms, a long neck well set-on, and wide round hoofs are the best. Height is not of so much moment, but a mare measuring from 14 to 15 hands high is preferable. A good height for the male ass is between 13 and 14 hands. Mules inherit to an extraordinary degree the shape and peculiarities of the sire; from the mare they derive size, but rarely her bad shape or unsoundnesses. ‘This is for- tunate, for,

though it is always desirable to breed from sound well-formed stock, yet mares so unsound or defective in shape as to be disqualified for horse-breeding may be uti- lized for mule-breeding.

The mule foal is not so strong on its limbs as the horse foal, and it does not grow so quickly. It is longer in reaching maturity, for it is of little use under four years of age ; but it is useful for a longer period than the horse, often working until it is twenty, thirty, and even forty years of age. When full grown the mule is from 13 to 15, and sometimes 16 hands high; but those from 14 to 15 hands are generally preferred.

The mule is endowed with the chief characteristics of its parents. In its short thick head, long ears, thin limbs, small narrow hoofs, short mane, absence of chestnuts (horny growths) inside the hocks, and tail destitute of hair at the root it is asinine ; while in height and body, shape of neck and croup, uniformity of coat, and in teeth it is equine. It has the voice neither of the ass nor of the horse, however, but emits a feeble hoarse noise. The most common colour of the mule is a brown or bay-brown,—bay, or bright bay, or piebald being rare; a chestnut tint is sometimes noticed. It possesses the sobriety, patience, endurance, and sure-footedness of the ass, and the vigour, strength, and courage of the horse. As a beast of burden it is preferable to the horse, being less impatient under the pressure of heavy weights, while the skin being harder and less sensitive renders it more capable of resisting sun and rain. It is very frugal, easily fed, and equally good for carrying as for drawing loads; it walks well and steadily, easily traverses the worst roads or paths, will climb or descend a steep mountain, or pick its steps by the side of a precipice, with the surety and safety of a goat. For hot and dry countries, especially those which are mountainous, it is well adapted, though cold and wet regions are not suitable for it.

The mule, like the ass, enjoys an extraordinary immunity from disease. After the campaign in Egypt in 1882 the English horses suffered most extensively and severely from a kind of malarious fever, but the mules were entirely exempt. A similar exemption has been noticed during the prevalence of epizootic maladies at other times. Neverthe- less those diseases which attack the mule (and the asinine species) run their course with great rapidity ; for example, glanders, which often appears in a chronic

form in the horse, is most acute in the mule and ass. These are also very liable to tetanus from trifling injuries.

The mule has been in use from very early times; the inhabitants of Mysia and Paphlagonia are said to have been the first breeders. With the Greeks and Romans, the latter especially, the mule was much valued for its good qualities, being employed to draw carriages and carry loads. At the present day it is extensively used in nearly every part of the world, in some countries almost supplanting

the horse, while for military purposes it is undoubtedly the best transport animal.

The principal mule countries in Europe are the south of France, Spain, Portugal, and Italy, where they are used for pack and draught. The French mules are most numerous on the borders of the Pyrenees, in Gascony, and in Poitou. In Spain mules are used in the Catalan provinces, in the mountainous districts of Andalusia, and in the pro- vince of Alicante. Good draught-mules are bred in La Mancha and in the districts on the slopes of the Pyrenees, where they are employed to carry loads. But in Spain, Italy, and some other countries theyare also extensively used in carriages ; in Spain particularly, where large, fine mules are bred for this purpose, a pair of these animals will often cost more than a pair of horses. The mules of Asia Minor, Syria, Cyprus, Egypt, and Algeria, as well as those of the district between the Tigris and the Persian frontier and in North China, are good. In the Punjab provinces of British India many excellent mules are bred, breeding being largely promoted by the Government. Good mules are reared in North and South America, the principal districts for breeding them in the United States being Kentucky, Missouri, and Kansas. The Kentucky mules are well shaped and showy, being derived from nearly thoroughbred mares known as Kentucky trotters, while those reared in Missouri are hardy, and can endure much privation and hardship. The Mexican mule, bred by a male ass out of a mustang mare, is also a very hardy, strong, and useful animal.

France is perhaps the most important mule-raising country in Europe, four centres being more particularly devoted to this kind of industry : Poitou, the mountainous districts of central France, the Pyrenees, and Dauphiné, The mules of these different parts chiefly differ in height ; those of Poitou are large, powerful, and long in the body, and are mainly exported to the departments of Languedoc and Provence, as well as to Spain, Italy, and America i those of Dauphiné are of medium height, with a short, thick body; while those of the centre and the Pyrenees are lighter and smaller, but more active.

Mule-breeding in Poitou is one of the most important branches of industry, and is supposed to date from the time of Philip V. of Spain, when the particular breeds of horses and asses were imported into that region and Gascony. But there is evidence to show that so early as the 10th century the mules of Poitou were of excellent quality. Though this industry has for a number of years been in a most flourishing condition, this has not always been the case ; more than a century ago it was the object of violent attacks, and, had it not been for the great advantages the breeders derived from it and the com- paratively small expense incurred in carrying it on, it must have languished or ceased altogether. The Government could not understand why so many mares should be lost to horse production and kept to breed mules alone ; and in 1717 the intendant-general of the haras went so far as to prohibit male asses being put to mares measuring more than 12 hands from the withers to the top of the hoof under penalty of a fine and confiscation of the ass 3 and the minister Bertin issued a decree to the effect that all the male asses in Poitou were to be castrated. It was only at a recent period that the haras administration ceased to oppose mule-breeding, when it found that it could not be successfully suppressed ; for, while in the one depart- ment of Deux-Sévres 13,000 mares were employed in mule production in 1816, fifty years afterwards there were 23,000. Besides, it was discovered not only that this in- dustry added largely to the national wealth but that mules were extremely useful in the army as pack animals, as well as for draught, especially for mountain artillery.

The Poitou mules are large, and strong enough to be used for heavy draught; those produced elsewhére in France, especially in Gascony, are light and better adapted for weight carrying. In Poitou at the present time about 50,000 mares are kept for mule production ; of these it is estimated that 38,000 are bred from every year, and of the produce 18,000 are sold annually. In the fairs of Poitou some mules fetch the large price of 1300 to 1500 francs, and many are sold for 900 or 1000 francs. If the average price be fixed at only 600 francs, it will be seen that Poitou alone realizes annually from its mule- breeding no less than 10,800,000 francs. The statistics of 1840 give the number of mules in France at 373,841, of 1852 at 315,331, of 1862 at 330,987, and the census of 1866 at 345,243. The average price of a mule in 1840 was reckoned at 172 francs, in 1852 at 183 francs, and in 1862 at 278 francs. The total value of the mules in 1840 was estimated at 64,284,246 francs, in 1862 it had increased to 92,078,458 francs. The total amount of revenue derived from the trade in mules was: in 1840, 21,244,148 frances; in 1852, 87,548,310 francs; and in 1862, 162,341,162 frances. Since the last-mentioned date it is probable that there has been a further increase.

In the United Kingdom mules are seldom bred, and their services do not appear to be much appreciated ; hence their importation is almost nil. After the war in Egypt in 1882 a large number of mules which had been purchased by the British Government for that campaign were brought to England and sold by public auction, but the average price realized was probably not more than one- half the amount they had cost in the countries in which they were originally purchased.

Mules have in recent times been largely employed in British campaigns, as in the Crimea, India, Abyssinia, South Africa, and Egypt. In the Abyssinian campaign more than 10,000 pack-mules were obtained from Cyprus, Brindisi, Malta, Smyrna; Gibraltar, Alicante, Valencia, Scanderoon, and Beyrout. The order in which

these places are enumerated indicates the relative adaptability of

the mules for pack transport during that campaign.

During the Zulu war, South-African or Colonial, South-American, North-American, and French mules were employed ; but of these the South-African and South-American were found to be the most suitable.

In India mules form part of the permanent transport of the Pun- jab irregular force, and are used as pack animals in the mountain batterics. They have also been largely used for transport in the mahy expeditions which have taken place on the north-western frontier. During the recent Afghan war it was proved that for mountain warfare the mule was by far the best beast of burden; and the director of transport with the Indian division during the late Egyptian campaign reported highly of the work done by the Punjab mules, which are somewhat famed for undergoing a great amount of exertion on little food. The breeding of pack-mules, as also of those adapted for batteries of mountain artillery, too much neglected hitherto, is now much encouraged by the Govern- ment of India, which supplies many good male asses to different districts free of charge. These asses are chiefly Arab, Spanish, French, and Italian ; but very good animals are at times obtained from Bokhara. By stimulating the breeding of improved asses an increasing supply of good sires and mules is obtained.

The experience of British and other European armies in favour of the mule has been corroborated by that of the United States. In the quartermaster-general's report for 1865 it is stated: '*The experience of this (secession) war has convinced all officers of this department that for the army-trains mules are much superior to horses, and of late the horses have almost entirely disappeared from the trains, being transferred to the cavalry or artillery and replaced by mules."

Mules are well adapted for the sick or hospital transport of an army in the field as pack animals, being smaller, surer- footed, and shorter-paced than horses ; but they should be specially selected and trained for this purpose, animals of sufficicnt strength and docility being necessary. A loaded mule will walk a little more than 3 miles an hour, though the pace will much depend upon the roads. The pace is slow moving down hill, quick up hill. Mules sleep from three to four hours in the twenty-four, the soundest slecp being towards dawn. The male mule can carry more weight than the female,

though the latter is steadier for work, being more docile; male mules are often vicious and carry

loads badly, so that to render them more tractable they are some-

times castrated. For saddle purposes those which more resemble the horse than the ass are preferable.

The carrying power of the mule varies according to a variety of

circumstances from 100 tb to 300 tb, the average being about 200 ib including the pack-saddle.

: ; In a journey made in 1856 from the city of Del Norte to Chihuahua and Durango in Mexico, a distance

of about 500 miles, it was found that out of a train of seventy-five mules the most it was possible for any mule to carry was 275 tb; not more than twenty mules could convey more than 250 ib, the

average weight carried by the whole train being a little less than 200 tb. The distance per day was about 15 miles. In another

journey it was noted that some of the very best mules, out of a very superior description specially selected, which were loaded with

300 tb, gave out completely at the end of two weeks. In the

Abyssinian expedition the load had to be reduced to 100 Tb, not

including the pack-saddle. It has been stated that a good compact mule, when well trained, properly fitted and handled, will earry in ordinary field service 30 per cent. of its own weight. If the load is in proportion to the size of the animal, small mules have tho advantage. A 600 Ib mule is quite as good for a 200 tb load as a 900 Tb mule is for a 270 tb load.

During the Peninsular War mules were hired by the commissariat for a Spanish dollar a day and rations for the driver. The weight of the load was fixed at 200 tb, and the length of journey in a moun- tainous country with bad roads was from 10 to 12 miles loaded, 15 to 16 unloaded. The maximum price paid for mules purchased for the Bhutan (India) expedition was 180 rupees ; those purchased at Baghdad and Bushire for the Abyssinian expedition averaged 124 rupees 8 annas, in Syria about £20. The mules purchased in the Punjab for the same expedition cost 225 rupees each ; those procured in Egypt about £26 10s. per animal. The mules purchased in New York for the Zulu war cost £42 per head, though good serviceable mules can be bought at St Louis for from £25 to £30. A firm in London at the same time tendered to supply mules from Spain at £35 each for pack, and £37 10s for draught. The South-African mules bought during the Zulu war cost on an average £23 each.

It has been observed that large mules are not so durable as medium-sized ones, especially for military service. In Algeria it was rare to find a mule over 14 hands more than fifteen years of age, and those approaching 15 hands died younger, while those between 18 and 14 hands were frequently more than twenty yearsold. The older animals were very often mares. (G. FL.)

MULHAUSEN (in French Mulhouse), the chief town of a circle and the industrial centre of Upper Alsace, Germany, lies between the Ill, an affluent of the Rhine, and the Rhine-Rhone Canal, about 56 miles to the south of Stras- burg and 18 to the north-west of Basel. The old town, surrounded by arms of the Ill, has narrow and irregular streets, while to the south, on the canal, lie the handsome villas and fine promenades of the new town. Most of the older buildings have had to make way for manufactories, so that the town-house, dating from 1552, is an almost solitary witness to the town's medieval prosperity. The Roman Catholic church of St Stephen, the new Protest- ant church, the building of the Société Industrielle, and the new Musée are the most prominent modern buildings. The educational institutions include a gymnasium, modern schools, technical schools for the various handicrafts, and an academy in which designers are trained for the textile industries of the town. The most important interest of Milhausen centres in the making of cotton and muslin goods, and calico-printing. This industry was introduced in 1746, and has since steadily prospered in the hands of several wealthy families which are closely connected by intermarriage and lend each other a firm and powerful finan- cial support. From 20,000 to 24,000 hands in the town and upwards of 60,000 in the neighbourhood are engaged in textile manufactures, the products of which are exported to all parts of the world. The manufactures of machinery, locomotives and railway plant, chemicals, and hardware are also important. A very noteworthy feature connected with the rise of the commercial prosperity of the town is the attention paid by the manufacturers to the wellbeing of their workpeople. In 1853 John Dollfuss, mayor of the town, founded the " workman's quarter" to the north- east of the old town, which now consists of about 1000 model buildings, with public bath-, wash-, aud bake-houses,

library, &c. The houses are let on a system by which the occupant becomes the owner after the payment of a certain number of monthly instalments. Besides this more pro- minent effort, which has been the model for similar at- tempts in many other towns, a "Société Industrielle " for the encouragement of original discovery and invention among the workmen has existed since 1825, and there are various benevolent societies, including a

large institu- tion with 250 beds for the reception of aged workmen. Miilhausen also carries on an active trade in grain, wine, colonial produce, and timber, which is much facilitated by its fine river harbour. After the annexation of Alsace to Germany in 1871 the French sympathies of the inhabitants were shown by the extraordinary decrease in the number of its inhabitants. The population has now, however, re- gained its full proportions, amounting in 1880 to 63,629, of whom 47,395 were Roman Catholics.

Mentioned as early as 717, Miilhausen was raised to the rank of a free town of the empire in 1198, and received very extensive privileges from Rudolph of Hapsburg in 1273. It suffered con- siderably in the various wars of the Middle Ages, but generally managed to maintain its independence. In 1446 it expelled its nobles and formed an alliance with Switzerland, and this became a permanent union in 1515. By the peace of Westphalia (1648) it was recognized as an independent ally of the Swiss League. In 1798 it sought incorporation with France from motives of com- mercial policy, and in 1871 it passed to Germany.

Compare Metzger, La République de Mulhouse 717-1798 (1876); and Schall, Das Arbeiterquartier von Miilhausen (1876).

MULHEIM-AM-RHEIN, the chief town of a circle in the district of Cologne, Prussia, lies on the right bank of the Rhine, 2 miles below Cologne. It is a pretty and well-built town, with important manufactures of silk, velvet, ribbons, sail-cloth, belting for machinery, leather articles, yarn, and chemicals. It also contains a rolling- mill, boiler-works, telegraph-works, malt manufactories, several breweries, and a shipbuilding yard. Miilheim carries on a brisk trade by rail and river, serving as an outlet for the manufactures of Bensberg and Gladbach, and for the wines of the upper Rhine, Nahe, and Moselle. Its educational institutions include a flourishing weaving school and a “real school” of the first class. The most striking building is the modern Gothic church. Though of ancient foundation, Miilheim did not receive a muni- cipal charter till 1587. Its industrial prosperity is in great part due to the influx of Protestants expelled from Cologne at the beginning of the 17th century. The popu- lation in 1880 was 20,420.

MULHEIM-AN-DER-RUHR, the chief town of a circle in the district of Diisseldorf, Prussia, is situated on the Ruhr, an affluent of the Rhine, about 7 miles from Essen and at the intersection of several railways. Like most of the towns in this district, Miilheim finds its chief industry in iron-working, and contains numerous blast- furnaces, rolling-mills, foundries, and engine-works ; it also carries on manufactures of leather, wool, cotton, calico, tobacco, paper, and other miscellaneous goods. About 6,000,000 tons of the Ruhr coal are annually forwarded by river and rail from Miilheim, which also carries on a consider- able trade in timber and colonial produce. In the neigh- bourhood are important sandstone quarries, a large zinc foundry, glass-works, and a carpet manufactory. Miil- heim, which possesses a church of the 12th century, was formerly included in the duchy of Berg, and became a town in 1508. In 1880 it contained 22,146 inhabitants, about two-thirds of whom were Protestants.

MULL, an island of Scotland, county of Argyll, and the largest of the Inner Hebrides, is bounded W. by the Atlantic, N. by Loch Sunart, N.E. by the Sound of Mull, and 8.E. by the Firth of Lorn. Its area comprises about 235,000 acres, of which only about 13,000 are arable. It is triangular in shape, its greatest length being about 24

miles, and its greatest breadth about 30 miles. Lochs Na-Keal and Scridain form deep indentations on its western coast, and there are a large number of smaller inlets. The coast-line is rocky, and especially on the west there are numerous caverns and horizontal terraces of basalt. The prevailing rock is Old Red Sandstone, but the valleys are filled up with Miocene rocks, consisting chiefly of lava flows and ashes of great terrestrial volcanoes. ‘There is an intrusion of granite towards the south, and also a narrow belt of limestone. The surface is for the most part rugged and mountainous, Ben More rising to the height of 3185 feet. Sheep and black cattle are kept, and barley, oats, and potatoes are grown. Herring fishing is prosecuted at Tobermory, where is one of the best and safest of the western harbours of Scotland. There are several ancient. castles, the principal being those of Duart and Aros. The population of the island in 1881 was only 5229, MULLER, Joann (1436-1476). See Recromontanvs. MULLER, Jonann von

(1752-1809), an eminent Swiss historian, was born on 3d January 1752 at Schaffhausen, where his father was a clergyman and rector of the gymnasium. In 1769 he went to the university of Géttingen in order to study theology ; but, under the influence of Schlozer, he devoted himself chiefly to historical research. Having passed his theological examination, he was made professor of Greek at the Schaffhausen gymnasium in 1772; and in the same year he published his first work, Bellum Cimbricum. By the advice of Bonstetten, his most intimate friend, he went in 1774 to Geneva, where he acted for some time as a tutor in the house of a councillor of state. At Schaffhausen he had begun to study care- fully the sources of Swiss history, and at Geneva he con- tinued his investigations with increasing ardour. Lectures on universal history which he delivered during this period formed the basis of his Vierundzwanzig Bucher allgemeiner Geschichten, one of his most brilliant writings. In 1780 appeared the first volume of his Geschichte der Schweizer, a work which placed him immediately in the front rank of the historical writers of his day. During a visit to Berlin he had an interview with Frederick the Great, from whom he hoped to receive an appointment worthy of his genius and reputation. Disappointed in this expectation, he accepted the professorship of the science of statistics at Cassel, where he wrote his Reisen der Péipste. In 1786, having spent two years partly at Bonstetten's country seat and partly in Bern, he entered the service of the elector of Mainz, by whom he was rapidly promoted to important offices in the state. He was also ennobled and made a knight of the empire (Reichsritter), At Mainz he issued several books, besides the second volume of his History of the Swiss Confederation. When Mainz was occupied by the French in 1792 Miiller settled in Vienna, where he re- mained for twelve years, being connected with the imperial library from 1800. Failing to receive the promotion to which he thought he was entitled, and being forbidden after the appearance of the third volume of his Swiss History to continue the publication of the work, he went in 1804 to Berlin, where he became historiographer and a councillor of war. In Berlin he finished the fourth volume of his Geschichte der Schweizer, edited the works of Herder, and wrote various treatises for the Academy, in- cluding one Uber die Geschichte Friedrich's II. Up to this time Miiller had been an enthusiastic advocate of free

| institutions, but he now modified his convictions; and in

1807 he accepted from Napoleon the office of secretary of state in the kingdom of Westphalia. Early in 1808 he was transferred at his own request to the office of director- general of public instruction. On 29th May 1809 he died at Cassel.

The value of Miller’s contributions to history is marred by the

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occasional extravagance and obscurity of his style, and by his in- adequate appreciation of the tests of historic credibility ; but his learning, his generous sympathies, his grasp of great principles, and his power of vividly presenting some aspects of character secure for his writings an enduring place in German literature. An edition of his Sémmtliche Werke, in 40 vols. (published origin- ally in 27 vols. in 1810 to 1819) was issued in 1831 to 1835. Bio- graphies of Miiller were compiled by Doring and other writers.

MULLER, Jonannes (1801-1858), one of the most distinguished physiologists of Germany, was born at Coblentz on 14th July 1801. He became a privat-docent in the university of Bonn in 1824. In 1826 he was appointed extraordinary professor of physiology in the same university, and he became the ordinary professor in 1830. Jn 1833 he was removed to the university of Berlin, where he filled the chair of anatomy and physiology with great distinction until his death on 28th April 1858. Miller made numerous researches in various departments of physiology, and in particular he extended knowledge as to the mechanism of voice and speech and of hearing, and as to the chemical and physical properties of lymph, chyle, and blood. It was, however, less as an original investigator than as a deep and far-seeing thinker that Miiller made his mark on physiological science. From about 1740, when Haller flourished, numerous contribu- tions to physiological science had been made by Whytt, Cullen, John Hunter, Spallanzani, Prochaska, Bichat, Charles Bell, Berzelius, Magendie, and others, but in 1830, when Miiller may be said to have begun his labours, it was necessary to reduce these facts to order, to educe general principles, and to direct physiologists into new lines of research indicated by the brilliant discoveries made in physics and in chemistry since the beginning of the century. This Miiller did, and he may therefore be regarded as the founder of modern physiology. The appearance of his Elements of

Physiology between 1837 and 1840 (translated into English by Dr William Baly, and published in London in 1842) was the beginning of a new period. In this work Miiller shows remarkable power both in marshalling facts and in philosophical reasoning. As a rule he not merely states and criticizes the labours of others but also contributes the results of his own observations. Whilst he is cautious in the accept- ance of theories, he always places them before the reader in an original and suggestive light. The most important portion of the work is that dealing with nervous action and with the mechanism of the senses. Here he states the fruitful principle, not before recognized, that the kind of sensation following irritation of a sensory nerve does not depend on the mode of irritation but upon the nature of the sense-organ. Thus light, pressure, or mechanical irritation acting on the retina and optic nerve invariably produce luminous impressions. This is sometimes termed the law of specific nervous energy. As a teacher Miiller exercised a powerful influence, and the great majority of the distinguished physiologists, such as Helmholtz, Du Bois Reymond, Ludwig, Volkmann, and Vierordt, who have made Germany famous in physiological science during the past thirty years, owe much to the germinating ideas of their great teacher.

Besides editing for many years a periodical entitled Archiv We Anatomie, Physiologie, u. wissenschaftl. Mediein, to which he also contributed papers, he published the text-book on physiology above alluded to, and various important memoirs. For a list of these see Poggendorff, Biog.-Litter. Handwérterbuch, vol. ii.

Two men of the same name, Johannes Miiller, have been cele- brated in science: (1) Jonn Miter (1699-1784), a professor of artillery and fortification at Woolwich, who wrote a mathematical treatise published in 1737 ; (2) Jonannes Miityer (born 1806), a writer on pharmacy and physiological chemistry, who published many memoirs from 1840 to 1850.

MULLER, Kart Orrrrep (1797-1 840), an eminent writer on ancient Greece, was born at Brieg in Silesia on 28th

ly August 1797. His father was a chaplain in the Prussian army. Miller was educated partly in Breslau, partly in Berlin, where his enthusiasm in the study of Greek litera- ture, art, and history was fostered by the influence of

Boeckh. In 1817, after the publication of his first work, Aigineticorum Liber, he received an appointment at the Magdaleneum in Breslau ; and in 1819 he was made a pro- fessor of the university of Géttingen, his subject being the archeology of art. His aim was to form a vivid con- ception of Greek life as a whole ; and for this object he carried on a series of profound researches, setting forth the results in his lectures, which produced a great impres- sion on his students, and in numerous works, which marked an epoch in the development of Hellenic studies. Miiller's position at Gottingen being rendered unpleasant by the political troubles which followed the accession of Ernest Augustus to the throne of Hanover in 1837, he applied for permission to travel ; and in 1839 he left Germany. In April of the following year he reached Greece, having spent the winter in Italy. He carefully investigated the remains of ancient Athens, Visited many places of interest in the Peloponnesus, and finally went to Delphi, where he began with his usual zeal to conduct excavations. While engaged in this work he was attacked by intermittent fever, of which he died at Athens on 1st August 1840.

Miillcr combined with astonishing industry a penetrating critical judgment and an almost unrivalled power of appreciating Greek modes of thought and feeling. Among his historical works the foremost place belongs to his Geschichte hellenischen Stémme und Staaten, which includes Orchomenos und die Minyer (1820), and Die Doricr (1824). He wrote also Uber die Wohnsitze, Abstam- mung, und altere Geschichte des macedonischen Volks (1825); and by his maps he introduced a new standard of accuracy in the treat- ment of the geography of ancient Greece. In 1828 he published Die Etrusker. Wis Prolegomenen zu einer wassenschaftlichen My- thologie (1825) prepared the way for the scientific investigation of myths ; and the study of ancient art he promoted by his Handbuch der Archiclogie der Kunst (1830), and by Denkméiler der alten Kunst (1832), which he wrote in association with Osterley. In 1840 appeared in England his Wistory of the Literature of Aneient Greece, and the original German work from which it had been translated—Geschichte der griechisehen Literatur bis auf das Zeit- alier Alexander's—was issued in Germany by the author's brother in 1841. Amid the labours to which Miiller especially devoted himself he found time to write an admirable translation of the Eumenides of Aischyltis (1838), to prepare new editions of Varro (1833) and Festus (1839), and to contribute

many articles to the Commentationes soctetatis regiz scientiarum Gottingensis, the Git- tinger gelehrien Anzeigen, and other periodicals. In 1841 the facts of his life were recorded by Liicke in Lrinnerungen an Otfried Miller,

MULLER, Wir11am James (1812-1845), English land- scape and figure painter, was born at Bristol on 28th June 1812, and was the son of a Prussian gentleman, a writer on scientific subjects and curator of the Bristol Museum. He re- ceived a careful education, being especially trained in botany and natural history, and it was intended that he should become an engineer ; but his leanings towards art were too definite to be resisted, and he was placed under J. B. Pyne to receive his first instructions as a painter. His early subjects deal mainly with the scenery of Gloucestershire and Wales, and he learned much from his study of Claude, Ruysdael, and the other earlier landscape-painters. In 1833 he figured for the first time in the Royal Academy with his Destruction of Old London Bridge—Morning, and next year he made a tour through France, Switzerland, and Italy. Four years later he visited Athens, extending his travels to Egypt, and in the sketches executed during this period and the paintings produced from them the power and individuality of the artist are first apparent. Shortly after his return he left Bristol and settled in London, where he exhibited regularly, and found purchasers, at moderate sums, for his pictures. In 1840 he again visited France, where he executed a series of sketches of Renais- sance architecture, twenty-five of which were lithographed

and published in 1841, in a folio entitled Zhe Age of Francis I. of France. He was anxious again to visit the East, and in 1843 he accompanied, at his own request and his own charges, the Government expedition to Lycia, where he produced an extensive collection of masterly sketches of scenes unfamiliar to the artvof his time. They were exhibited in London ; their merit was fully recognized by the British public, and the artist received numerous commissions for finished pictures. But his health was seriously impaired, he was suffering from heart-disease and from continued nasal

hemorrhage ; and, returning to his native city, he died there on 8th September 1845.

The works of Miiller are distinguished by much power and origin- ality, by great speed and directness of execution, by the vigour and emphasis which mark the born sketcher, and by brilliant power of splendid and sharply-contrasting colour. The qualities of tender- ness, gradation, and mystery, in which they are commonly wanting, might have been within the reach of the artist had his life been longer. Since his death, and especially since the Gillott sale of 1872, his works have commanded very large prices. The Chess- Players at Cairo, for which Miiller received £25, has since sold for upwards of £4000. The print room of the British Museum possesses, through the bequest of Mr John Henderson, a very rich collection of ie “ig sketches. His biography by N. Neal Solly was published in .

MULLET. This name is applied to two very different kinds of fishes, which are distinguished as Red Mullets and Grey Mullets. Red Mullets (genus Mullus, the name given by the ancient Romans) are marine fishes, with two short dorsal fins remote from each other: the first is com- posed of feeble spines, the second of branched rays; the anal fin is similar to the second dorsal. The body is covered with large thin scales. The form of the head is quite peculiar and characteristic; its anterior profile slopes downwards to the small mouth, which has but very small and feeble teeth, and from which two cylindrical barbels are suspended. These organs of touch are generally laid backwards and hidden in a groove between the branches of the lower jaw, but can be erected and called into action independently of each other. About forty different species of Red Mullets are known, chiefly from the tropical and sub-tropical parts of the Indo-Pacific Ocean. In the Atlantic the species are much less numerous, the most celebrated being the European JMullus barbatus (see vol. xii. p. 638, fig. 10), which is abundant in the Mediterra- nean, and tolerably common on the coasts of England and Ireland. Formerly a second species, Mullus surmuletus, was believed to exist in the European seas, but ichthyolo- gists now incline more and more to the belief that this is only the female of JZ. barbatus.

Red Mullets do not attain to any considerable size, the largest of the tropical species weighing only two or three pounds. ‘They are ground-feeders,

evidently using their barbels in discovering their food, which consists of ani- malcules, worms, and, in the larger species, of small fishes; that they feed on putrid flesh is not borne out by the evidence drawn from their feeble jaws and dentition, but it is very probable that they are attracted to a decomposing body by the presence of the small crustaceans which feast upon it. Although the colours of these fishes are very brilliant, they are simple and evanescent ; only a few of the tropical species exhibit ornamentations in the form of black spots or bands. In many, as also in the European species, red colour prevails, and its preservation after death is con- sidered to enhance the fitness of the fish for the table, and consequently its value for the market. To produce the intensity of this red colour, fishermen scale the red mullet immediately before its death, a process by which the red pigment-cells or chromatophores are excited to ex- pand ; fishes which are allowed to die in the water show but little red, and therefore red mullets caught by the trawl are less valuable than those obtained in a trammel-

net, by which the majority of the fish are secured alive. All the species of Red- Mullets seem to be esteemed as food ; but none equal in this respect the European species, which was held in exaggerated esteem by the gourmands of the corrupt period of the Roman empire. They ex- hibited the living fish and allowed them to die at the table immediately before they were consigned to the cook ; they kept them in large reservoirs until they were wanted, and paid fabulous prices for fishes somewhat above the average size. In our times red mullets have justly main- tained their value as a delicacy for the table; and from a commercial point of view their cultivation in suitable enclosed waters cannot be too strongly recommended to pisciculturists. Unfortunately, very little is known about their habits ; during the winter they retire into deep water, late in spring and during the summer they approach the coasts and enter even brackish water, but the state of their sexual organs shows clearly that these fishes do not come towards the shore in order to breed; in fact nothing is

known of their propagation.

The Grey Mullets, like the Red Mullets, belong to the spiny-rayed fishes, but form a widely-different and distinct family, Mugilide. They are not exclusively marine, but freely enter brackish water, live always close to the shore, and some of the tropical forms inhabit the pure fresh water of streams and rivulets, without, however, penetrating far inland. Their body is elegantly formed, wedge- shaped, and covered with scales of moderate size, firmly adherent to the skin. The two short dorsal fins are remote from each other, and the anterior is composed of four stiff spines. The anal fin is similar to the second dorsal; the caudal fin strong and bilobed. The form of the snout is very peculiar and characteristic ; the mouth narrow, transverse in the true Afugil, and without, or with but feeble, teeth.

About seventy different species are known, from almost every coast of the temperate and tropical zones; they swim in small schools and are abundant wherever they occur. Four species are found on the British coasts—Jlugil septentrionalis, Mugil capito, Mugil octoradiatus, and Mugil auratus, the first two being about equally and generally distributed, whilst the others are scarcer. Some of the freshwater Grey Mullets of the tropics, especially those of the West Indian and Indo-Pacific islands, have the mouth more lateral or have distinct, though very minute, teeth ; they therefore have been formed into separate genera, Agonostoma and AMyxus.

Grey Mullets, at least some of the species, grow to a weight of 10 or 12 tb; but the fish which usually come into the inarket rarely exceed halfthat weight. Those in which distinct teeth are developed feed principally on small aquatic animals, whilst the diet of those without teeth consists of animalcules or minute organic substances mixed with the mud or sand which they swallow in large quantities ; also confervoid growths to which small shells adhere are freely taken. To prevent the gills from being clogged by sand or mud, a peculiar apparatus separates these organs from the pharynx. Each branchial arch is provided on each side, in its whole length, with a series of closely-set gill-rakers, eacli series fitting into the series of the adjoin- ing arch ; they constitute together a sieve admirably fitted to permit the passage of the water, and to retain at the same time every other substance in the cavity destined for mastication. Also the structure of the intestinal tract is adapted in a remarkable manner to the peculiar diet of these fishes. One portion of the stomach is globular and surrounded by a

thick mass of muscles, the cavity being small and coated with a tough epithelium. In fact this structure reminds us of the stomach of birds, in which it also serves for the trituration of hard substances. The intestine itself is long, six or seven times as long as the fish. Grey Mullets are very plainly coloured, gene- rally greenish on the upper parts and more or less silvery on the side. They are wholesome food, well flavoured when taken out of clean water. As young fish bear transport easily, and rapidly grow to a marketable size in suitable enclosed waters, their cultivation deserves every attention on the part of pisciculturists. Indeed, in the fish- farrns of Western Italy, greymullets, besides eels,red mullets, flat-fish, are the principal fish cultivated.

MULLINGAR, a market-town of Ireland, capitalof West- meath, is situated near the Brosna and on the Royal canal, 44 miles west by north of Dublin. The principal buildings are the parish church with tower and spire, the Roman Catholic church, the court-house, the barracks, and the in- firmary. Tanning, brewing, and the manufacture of coarse woollens are carried on. The population in 1881 was 4787. Mullingar was one of the ancient palatinate towns. It

possessed an Augustine convent founded in 1227, and a

Dominican convent founded in 1239, but both were dis- solved by Elizabeth. The town was the headquarters of William III. before the siege of Athlone. It formerly returned two members to parliament, but was disfranchised at the Union.

MULREADY, Witt14m (1786-1863), subject painter, was born at Ennis, county Clare, on 30th April 1786. When he was about five years old his father, a leather-breeches maker by trade, removed to London, where the son received a tolerable education, chiefly under Catholic priests. He was fond of reading, furtively studying Pope’s Homer and other works at the book-stalls, and fonder still of drawing.) When eleven years old Mulready was employed by an artist named Graham as the model for a figure in his picture of Solomon Blessed by his Father David. The painter’s interest in the lad did much to confirm his artistic proclivities; and, having studied at

home for two years, Mulready applied for advice to Banks the sculptor, who sent him to a drawing-school and perniitted him to work in his own studio. In 1800 he was admitted a student of the Academy, and two years later he gained the silver palette of the Society of Arts. About this time he was associated with John Varley, the eccentric water-colour painter and drawing-master, whom he assisted in the tuition of his band of talented pupils, which included Cox, Fielding, Linnell, William Hunt, and Turner of Oxford. At eighteen he married a sister of Varley's, and at twenty-four he was the father of four sons. The marriage was a singularly unhappy one, and the pair separated before many years. With all these "hostages to fortune" he had a hard struggle, but he was blessed with unfailing energy and the power of steady application. He "tried his hand at everything," as he said, "from a miniature to a panorama." He painted portraits, taught drawing, and up till 1809 designed illustrations to a long series of children's penny books. His first pictures were classical and religious subjects of no great merit, and the early works which he sent to the Academy were mainly landscapes ; but he soon discovered his special aptitude for genre-painting, and in 1809 produced the Carpenter's Shop, and in 1811 the Barber's Shop, pictures influenced by the example of Wilkie and the Dutch painters. In 1813 he exhibited his Punch, a work more original and spontaneous in treatment, which brought the artist into notice, and two years later his Idle Boys procured his election as associate. Next year he received full academic honours, and the election was fully justified by the Fight Interrupted which he then exhibited. It was followed by the Wolf and the Lamb (1820), the Convalescent (1822), Interior of an English Cottage (1828), Dogs of Two Minds (1830), the Seven Ages (1838), and in 1839 and 1840 by the Sonnet and First Love, two of the most perfect and poetical of the artist's works. In 1840 he designed the well-known postal envelope for Rowland Hill, and a, set of illustrations to the Vicar of Wakefield, which were succeeded by his paintings of the Whistonian Con- troversy (1844), Choosing the Wedding Gown (1846), and Sophia and Burchell Haymaking (1849). His later works, like the Bathers (1849), Mother teaching her Children (1859), and the Toy Seller (1862) show declining powers, mainly attributable to failing health. The last evening of his life was spent at a meeting of the Academy, of which, for nearly fifty years, he had been a most active and effi- cient member. He died of heart-disease on the 7th July

1863.

In his way of work Mulready was most painstaking and con- scientious, executing for each picture very elaborate studies for the

1 Some reproductions of his early attempts in this direction are given, along with details of his life, in a scarce volume for the young, entitled The Looking Glass, written by William Godwin under the nom-de- plume of Theophilus Marcliffe, and published in 1805,

several parts, and many sketches for colour and effect. His pro- ductions are characterized by accuracy of drawing and richness of colouring ; but they want something of the force and fire which come of less considered and elaborate, but more instinctive and inspired, workmanship.

MULTAN, or Moorray, a district in the lieutenant- governorship of the Punjab, lying between 29° 22’ and 30° 45’ N. lat. and 71° 4’ and 72° 54’ E. long., is bounded on the N. by the Jhang district, on the E. by that of Montgomery, on the 8. by the Sutlej, and on the N.W. by the Chendb, and has an area of 5880 square miles. Along the banks of the Chendb, Sutlej, and Ravi extend fringes of cultivation varying in width from 3 to 20 miles, but the interior uplands have the same barren character as the district of Monrcomery (¢.v.). Midway between the boundary rivers, a high dorsal ridge enters from Montgomery, forming a part of the sterile region known as the bér. It dips into the lower plateau on either side by abrupt banks, which mark the ancient beds of the Ravi and the Beas (Bids). These two rivers once flowed much farther southward before joining the Chenab and the Sutlej, and their original course may still be distinctly traced, not only by the signs of former fluvial action, but also by the existence of dried-up canals. At the present day the Beas (Bias) is totally lost to the district, the Ravi merely waters a small corner, and the only rich cultivation is that which stretches along the Chendb and the Sutlej. The soil, though naturally good, requires abundant irrigation to bring it under efficient tillage. Numerous canals supply water from the Sutlej to the surrounding country, and pools or jhéls collect during the rainy weather in the hollows formed by the old watercourses.

The census of 1881 returned the population at 551,964 persons (males 304,517, females 247,447), Mohammedans numbering 435,901, Hindus 112,001, Sikhs 2085, Europeans 1709, Eurasians 110, native Christians 42, and ‘‘others” 116. Only one town had a population excecding 10,000—Multan, 68,674. Most of the people are grouped together in villages on the irrigated lowlands, only a scattered nomad population being found on the sterile up- land tract. In 1878-79 the area under Government assessment was 8,763,200 acres, of which 799,360 were cultivated, 245,760 uncul- tivable waste, 2,618,080 cultivable, and 100,000 grazing lands. Cultivation is, however, spreading steadily, though the character of the agriculture remains slovenly, as the Jat tribes who comprise the mass of the rural population have not yet lost their predatory and pastoral propensities. Near the city, however, capitalist farmers have brought their land into a high state of cultivation. The areas under crop in 1881-82 were as follows :—rice 15,998, wheat 209,183, great millet 53,605, spiked millet 13,254, Italian millet 724, barley 7460, gram 8303, peas 24,443, and tobacco 1624. Indigo forms the most important commercial staple. The chicf articles of trade are sugar and indigo from the lowlands, and wool and ght from the pasture lands of the bér. Silk and fine cotton fabrics are produced at Multan ; coarse cotton cloth for home con- sumption is woven in every village. The Sind, Punjab, and Delhi Railway connects the city with the Northern Punjab and with the East Indian line at Delhi, and the Indus Valley State Railway runs through a portion of the district. The total length of roads is 907 miles and of railways 130.

The total imperial revenue of the district in 1880-81 was 953,408 rupees, of which 561,052 were derived from the land revenue. A small provincial and local revenue is also raised. Education, especially among the Mohammedans, is in a backward state, and in 1872-73 only 3062 children attended school, of whom the Hindus contributed 46 per cent., although they only form 18% per cent. of the whole population. The climate is proverbial even among the hot and dusty Punjab plains for its heat and dust. The mean temperature in the shade for the six years ending 1876 was in January 54°°70 Fahr., in June 95°°78, in October 76°°68, the average annual rainfall for the same years being 7‘27 inches ; in 1881 it was only 3°7.

At the time of Alexander’s invasion Multan appears as the chief seat of the Malli; but the Greek power soon came to an end, and the country passed under the rule of the Gupta dynasty of Magadha. The early Arab geographers mention Multan as forming part of the kingdom of Sind, which was conquered for the caliphate by Mohammed Kasim in the middle of the 8th century. The whole province was conquered by Mahmud of Ghazni in 1005 a.p. It afterwards formed a part of the Mughal empire of Babar, and con- tinued so till the extinction of that power. The history of the

district during the latter half of the 18th century is a story of alternate invasion by Marhattas, Afghans, and Sikhs. At length, in 1779, Muzaffar Khan, of the Sadozai family, succeeded in obtain- ing the governorship of Multan. Ranjit Sinh after a long siege carried the capital by storm in 1818, and put Muzaffar Khan and five of his sons todeath. In 1829 he made over the administration of Multan with five neighbouring districts to the famous Sawan Mall, who raised the province to a state of prosperity by excavating canals and inducing new inhabitants to settle. After the establish- ment of the council of regency at Lahore, difficulties arose between Miulraj, son and successor of S&wan Mall, and the British officials, which led to his rebellion, and culminated in the second war and the annexation of the whole of the Punjab. The city of Multan, after a stubborn defence, was carried by storm in January 1849. The district at once passed under direct British rule, and order has not been disturbed since.

MUuUutTAN, or MootTAan, cityand headquarters of the above district, is situated 4 miles from the present left bank of the Chenab (30° 12’ N. lat., 71° 30’ E. long.). The total population in 1881 was 68,674. The town is enclosed on three sides by a wall, but open towards the south, where the dry bed of the’old Ravi intervenes between the town and citadel. Large and irregular suburbs have grown up out- side the wall since the annexation in 1849. Within the city proper, narrow and tortuous streets, often ending in culs- de-sac, fill almost the whole space; but one broad bazaar runs from endtoend. The principal buildings include the shrines of two Mohammedan saints and the remains of an ancient Hindu temple. The civil station contains a court- house and treasury, commissioner’s offices, jail, post-

office, telegraph-office, dispensary, and staging bungalow The Church Missionary Society maintains a station here. As a trade centre Multan possesses great importance, its chief imports being cotton and other piece-goods, while the main staples of export are sugar, cotton, indigo, and wool. Trade continues to develop slowly but steadily. The value of the imports for 1879, 1880, 1881 was 75, 84, and 87 lakhs of rupees, and of the exports 36, 37, and 40 lakhs respectively. Lately there has been a great revival of the indigo trade.

MULTIPLEPOINDING is the technical term for a form of action in Scotch law by which conflicting claims to the same fund or property are determined. The action is brought either by the holder or by a claimant in his name. All who have any claims in the fund or property in question are ordered to appear and give in their claims ; the court then prefers them according to their respective rights, and the holder of the fund or property in dispute on payment or delivery is absolved from any further claim in regard to it.

MUMMY. The origin of mummification in Egypt has given rise to much learned conjecture (see EMBALMING), now, however, superseded by positive knowledge,—a com- parative study of sepulchral texts having furnished Egypto- logists with convincing proof that the inviolate preservation of the body was deemed essential to the corporeal resurrec- tion of the “justified” dead. The living man consisted of a body, a soul, an intelligence, and an appearance or evdolon,—in Egyptian, a ka. Death dissociated these four parts, which must ultimately be reunited for all eternity. Between death on earth and life everlasting there inter- vened, however, a period varying from 3000 to 10,000 years, during which the intelligence wandered, luminous, through space, while the soul performed a painful pro- bationary pilgrimage through the mysterious under-world. The body, in order that it should await, intact, the return of the soul whose habitation it was, must meanwhile be guarded from corruption and every danger. Hence, and hence only, the extraordinary measures taken to ensure the preservation of the corpse and the inviolability of the sepulchre ; hence the huge pyramid, the secret pit, and the subterraneous labyrinth. The shadowy and impalpable ka —the mere aspect, be it remembered, of the man—was

supposed to dwell in the tomb with the mummied body. This fragile conception was not, however, indestructible, like the soul and the intelligence. Being an aspect, it must perforce be the aspect of something material ; and, if the body which it represented were destroyed or damaged, the ka was liable to the like mischance. In view of this danger, the Egyptian, by stocking his sepulchre with portrait statues, sought to provide the ka with other

chances of continuance, these statues being designed, in a strictly literal sense, to serve as supports or dummies for the ka. The funereal portrait statues of the ancient empire (Dynasties I. to VI.) are marvels of realistic art in basalt, diorite, limestone, and wood. As many as twenty duplicates have been found in a single tomb, and always secreted in hidden chambers constructed in the thickness of the walls of the sepulchre. The Bulak Museum is very rich in ka statues of the ancient empire; and the British Museum contains two in wood from the tomb of Seti L, of the period of Dynasty XIX.

For the processes of mummification, as narrated by Greek and Latin authors, see Empatminc. The details which follow are taken from original Egyptian sources.

The embalmment of a man of wealth, done in the costliest manner, consisted of —(1) the “going into the good abode,” (2) the Zeb, (3) the Kesau. The first of these was the process of evisceration, cleansing, &c., which occupied 15 or 16 days; the second was the salting or bituminizing, and took 19 or 20 days; the third was the spicing and bandaging, and took 34 or 35 days,—making 70 or 72 days in all. There were four special “rituals” for the guidance of the priestly operators and assistants—(1) that of ‘‘ going into the good abode,” which was a kind of surgical manual for the use of the paraschists, enu- merating the incisions to be made in the body; (2) that of “the Kesau,” a corresponding manual for the use of the taricheutes, containing lists of the necessary gums, resins, spices, &c., directions as to the number and nature of the bandages, and prayers to be

repeated while adjusting them ; (3) the “water ritual” or service-book of litanies, to be recited during the transport of the mummy to the cemetery, which was almost always done by boat; (4) the funereal ritual, performed on consigning the mummy to the tomb. No copy of the first of these documents is known, but its substance is summarized in the Rhind papyrus. Of the other three, contemporary copies written on papyrus exist in various museums. Establishments for the reception and mummification of the dead were attached to all the great cemeteries. These mortuary suburbs, by the Greeks called “memnonia” (pepvdvera), were inha- bited by a large population of embalmers, mummy-case makers, gilders, painters, scribes, priests, and the like;

and it has been calculated that from 500 to 800 corpses must always have been on hand in the workshops attached to the necropolis of Memphis. To prevent mistakes in delivering the mummies to their families, the bandagers were in the habit of marking the wrappings with the name and age of the deceased, sometimes adding the name and regnal year of the king in whose time he died. The ink in which these entries were written was made from nitrate of silver, like the marking-ink of the present day. The bandages were of linen only. The texture varied with the rank of the mummy, some being as fine as the finest India muslin, and some extremely coarse. The quantity used was enormous, and persons used to save their old linen for this purpose all their lives long. Each limb, finger, and toe was first separately swathed ; and finally the whole body was enveloped in numberless convolutions, the contours of the shrunken form being skilfully restored by means of padding. From 700 to 1250 yards of band- ages, in strips of 3 to 4 inches wide, have been found on mummies.

The processes of mummification varied in different parts of Egypt and at different periods). The mummies made at Memphis are black, dry, and brittle, whereas those of the best Theban epoch are yellowish, flexible, and so elastic that the flesh yields to the touch of the finger and the limbs may be bent without breaking. Champollion- Figeac attributes this exquisite softness and elasticity to the injection of costly chemical liquids into the veins, whereby the substance of the flesh was preserved. The natron

process, on the contrary, destroyed the flesh, leaving only the skin and the bones. By some schools of embalmers the cavity of the skull, after the withdrawal of the brain, was washed out by an injection of refined bitumen, the effect of which was to preserve the membranous covering which has frequently been found inside the brain-pan, dried and unimpaired. Mair is constantly found on the heads of mummies, sometimes plaited, sometimes frizzled,—thus showing that the fashion of wearing wigs was by no means universal. The under bandages of mummies were laid on wet, having probably been dipped in spirits. They some- times come off with the solidity of a pasteboard mask ; and life-like portraits of the dead have been reproduced by simply casting plaster into these masks as into a mould. When Syrian turpentine came into use the Theban mummies ceased to maintain their supremacy, and became even blacker than those of Memphis, the corpse and its bandages forming one solid mass almost as hard as stone. In Memphite mummies, especially of the Ramesside and Saitic periods, the cavity of the chest is found filled with scarabeei and amulets in mietra dura. The Theban mummies, on the other hand, from Dynasty XI. to Dy- nasty XXIII., were adorned with rings, pectoral orna- ments, collars, bracelets, &c., in exquisitely- wrought gold inlaid with lapis-lazuli, carnelian, green felspar, and other precious stones. Under the Greeks and Romans the art of mummification declined. Rudely-painted wooden coffins were substituted for the granite sarcophagi and richly- decorated mummy-cases of former times. The mummies became ashen-grey, or, being boiled in bitumen, were black, heavy, and shapeless. Those of Graeco-Roman tines are frequently found wrapped in painted shrouds, and sometimes with coarsely-daubed encaustic portraits on panel laid above the faces. Dr Birch gives 700 a.p., as the date at which mummification practically ceased. It was formerly supposed that the bodies of the dead were merely desiccated under the ancient empire, and that actual embalming was not practised before 2000 B.c. Recent ex- plorations among the ruined pyramids of Sakkarah have, however, brought to light the mummied corpse of King Merenra, and part of the mummy of King Pepi, his father,

both of Dynasty VI. Though denuded of its wrappings by ancient tomb-breakers, the mummy of Merenra is distinctly impressed in the usual

manner with marks of its former bandages ; and portions of the bandages and a “‘well-embalmed” hand were recovered from the débris of that of King Pepi. It is thus shown that mummifi- cation was an established rite towards the close of the ancient empire, and that the processes then in use were identical with those of later times, which compels us to ascribe a-very early date (possibly 3800 or 4000 B.c.) to the beginnings of the art.

The styles of sarcophagi and mummy-cases vary accord- ing to periods and places as much as do the styles of mummification. At Gizeh, Sakkarah, and Meydum, in tombs of the ancient empire (Dynasties I. to VI.), the dead are found in unpainted wooden coffins with carved human faces, these coffins being enclosed in massive rect- angular sarcophagi of black basalt, red granite, and lime- stone, Interments of the earliest Theban period (Dynasty XI.) yield cases shaped like the mummy within, and carved out of solid tree-trunks. The masks are painted yellow, white, or black, and on the breast Isis and Nephthys are depicted as if overshadowing the mummy- case With their wings. These cases are sometimes found enclosed in large rectangular wooden coffers with flat lids. With Dynasty XVII. (Theban) there appears the mummy- case with hands carved in relief and crossed upon the breast. The ground-colour of these cases is generally white or black, painted with transverse bands of hiero- glyphed inscriptions, the mask is red or gilded, and a vulture with extended wings is depicted on the breast. From Dynasty XIX. to Dynasty XXI. the coffins are highly ornamented in gay colours, figures being more abundant than inscriptions, and yellow varnishes much in favour. The mummy is frequently found enclosed in two, three, and even four such cases, each a size larger than the last. Cases with black grounds are succeeded by cases with brown grounds, and these again by white, resembling those of Dynasties XVII. and XVIII. The masks are now painted red, with richly-decorated head-dresses imitating wigs. Under the priest-king or Amenide domination these triple and quadruple “nests” of mummy-cases are found enclosed in gigantic rectangular outer sarcophagi of wood, highly painted and varnished. From Dynasty XXII. to Dynasty XXVI. the inscriptions are mostly painted in green on a white ground. At Memphis, meanwhile, the granite, basalt, or limestone sarcophagus—sometimes rect- angular with rounded corners, sometimes mummy-shaped with sculptured hands and feet, sometimes resembling a long bath—continued to hold its ground. The Saitic period (Dynasties XXVI. to XXX.) is distinguished by

the minute finish and artistic beauty of its sculptured sarcophagi in basalt and granite. Last of all, in the extreme decadence of the art, come squared wooden cofiins, unpainted, unvarnished, and rudely scrawled in ink with hieroglyphed legends so corrupt as to be almost illegible. According to the religious law of ancient Egypt, the rites of mummification were universal and compulsory, being performed, not only for every native in a style consistent with his rank in life, but also for all strangers and foreigners who died in the land, for all slaves and captives, and even for outcasts, criminals, and lepers.

The most ancient mummified—or, at all events, desic- cated—human remains, not being pre-historic, which are known to science are the fragments of the body of Menkara (Gr., Mycerinus), third king of Dynasty IV., and builder of the smallest of the three great pyramids of Gizeh. These fragments were found by Colonel Howard Vyse strewn on the floor of the upper chamber of that pyramid, together with the woollen wrappings and empty

cedar-wood coffin of this pharaoh. All these are now in the British Museum. The fragments consist of the ribs and vertebree and the bones of the legs and feet, the dried flesh upon the thighs being perfectly preserved. The date of these remains may be approximately assigned to 4000 Bc. Next in antiquity comes the mummy of King Merenra of Dynasty VI., now in the Bulak Museum, the date of which is about 3600 B.c. Most famous and most interesting of all, however, are the royal mummies of Dynasties XVII, XVIII, XIX., and XXL, found at Dair al-Baharf, near the great temple of Queen Hatshepsu, on the left bank of the Nile opposite Karnak, in July 1881. The circumstances of this, the most extraordinary archeo- logical discovery of any age, are too remarkable to be passed over in silence.

The so-called ‘‘Theban Arabs” are the busiest treasure-seekers and antiquity-vendors in Egypt. But not often, apparently, have they lighted upon a royal interment. The royal sepulchres in the Valley of.the Tombs of the Kings and the neighbourhood have tempted the cupidity of all ages ; and we have the direct evidence of two legal documents of the time of Rameses

IX., 7th pharaoh of Dynasty XX., to show that bands of organized tomb-breakers infested the cemeteries of Thebes at that comparatively early

eriod.

. It is now about twelve ycars since certain objects of great rarity and antiquity, mostly belonging to the period of the Amenide Dy- nasty (XXI.), began to find their way to Europe from Upper Egypt. Foremost in importance among the said relics were four funereal papyri (consisting of extracts from the Ritual or Book of the Dead) written for royal personages of the Amenide family. Concurrent testimony pointed to a family of Arab brothers named Abd er- Rasoul as the origina! holders of these papyri; it was therefore concluded that the tombs of Pinotem I. and of the Queens Notem- Maut and Hathor Hont-taui (for whom the papyri were written) had by them becn discovered and pillaged. The eldest brother was ultimately induced to reveal the secret, and pointed out a lonely spot at the foot of the cliffs not far from the ruins of the great temple of Hatshepsu, on the western bank of the Nile, where the bottom of a hidden shaft opened into a short corridor leading to a gallery 74 metres in length, at the end of which was a sepul- chral vault measuring 7 metres by 4. The whole of this gallery and vault were crowded with mummies and mortuary furniture, as sacred vessels, funereal statuettes, canopic and libation vases, and precious objects in alabaster, bronze, glass, acacia wood, and the like. The mummies were thirty-six in number, including upwards of twenty kings and queens from Dynasty XVII. to Dynasty XXI., besides princes, princesses, and high priests, all of which, together with four royal papyri and a miscellaneous treasure consisting of upwards of 6000 objects, are now in the Bulak Museum.

The door-jambs of the mortuary chamber at the end of this long gallery are inscribed with various attestations of burial. These entries refer to interments of meinbers of the Amenide line only. It is also to be observed that only members of that line were found inside the chamber, so proving that the sepulchre was the family vault of the descendants of the first priest-king. All the other royal mummies, and all the objects appertaining to those mummies (that is to say, to the representatives of Dynasties XVII., XVIII., and XIX.) were found in the long gallery outside. When these earlier kings,

queens, and priucesses were brought out into the light of day, and conveyed to the museuin of Bulak, it was discovered that the coffins of some, and the wrappings of others, were inscribed with short official entries written thereon at different times and in different places by successive inspectors of tombs. The dates of these visits of inspection are restricted to the period of Dynasty XXI., whence it is evident that the necessity for protecting the last homes of the illustrious dead was as urgent then as the ‘‘ Amherst” and ‘‘ Abbott” papyri prove it to have been in the reign of Rameses IX. The terms of these entries show that it was the duty of the said inspectors to enter the sepulchres of the ‘‘royal ancestors,” to report upon the condition of the mummies, to repair their wrappings and mummy-cases when requisite, and, if expedient, to remove them from their own tombs into any othcrs which might be regarded as more secure. The mummies and mummy-cases thus inscribed are five in number— namely, those of Amenhotep I., Thothmes II., Rameses I., Seti I., and Rameses II. Two eutries on the coffin-lid of Amenhotep I. show his tomb to have been inspected and his wrappings renewed in the 6th year of Pinotem II., fourth of the priest- king line, and again in the 16th year of the pontificate of Masahirti, his son and successor. In the 6th year of Pinotem I. the same was done for the mummy of Thothmes II. The three pharaohs of Dynasty XIX.—Rameses I., Seti I., and Rameses I].—seem, however, to

have been still more anxiously looked after. Either because their mummies were specially revered, or because their sepulchres had already been attacked by the tomb-breaking gangs of that period, we find them continually being removed from one tomb to another. In the 6th year of Her-Hor, the founder of the Amenide line, while they yet occupied their own splendid sepulchres in the Valley of the Tombs of the Kings, they were there examined by a Government inspector, who ‘‘renewed their funerary equip- ments” and made an entry of his visit on the coffins of Seti I. and Rameses II. After this Rameses I. and Rameses II. were removed to the tomb of Seti I. (the tomb known as Belzoni’s), whence, in the 16th year of Her-Hor, all three mummies, father, son, and grandson, were transferred to the tomb of Queen Ansera. This act of transfer is written, dated, signed, and witnessed on all three coffins. Again, in the 10th year of Pinotem I.,

grandson of Her-Hor, occur more entries showing them to have been conveyed from the tomb of Queen Ansera to the tomb of one of the Amen-hoteps. Finally, in bold hieratic characters, written with marking- ink upon the breast-bandages of Rameses II., we find the following memorandum recording how, ten years later still, the mummy of this illustrious pharaoh was again taken back to the tomb of his father Seti I. :—

“The year 16, the third month of Pert (z.e., seed-time), the sixth day, being the day of carrying the defunct King Ra-user-Ma Sotep- en-Ra, for the renewal of his funerary appointments, into the tomb of the defunct King Ra-men-Ma Seti, by the first prophet of Amen, Pinotem.”’

At what precise date these and the earlier royal mummies were brought into the Dair al- Bahari vault does not appear; but, as that vault was finally closed on the burial of Queen Isi-em-Kheb, we may conclude that, as a last resource against possible depreda- tion, the ‘‘ royal ancestors” were deposited therein at or about that time. This would be in the reign of King Menkheperra (brother and successor of Masahirti, and husband of Isi-em-Kheb), whose seal, impressed on clay, was found upon the shattered door of the mortuary chamber. The condition of the various mummies and mumniy-cases thus hospitably sheltered gives every indication that their original sepulchres had been previously violated. The coffins of Thothmes III. and Rameses I. are much damaged. That of Rameses II. was probably destroyed, since the one in which his mummy now reposes is of Dynasty XXI. workmanship. The mummy of Rameses I. is doubtful, that of Thothmes I. is miss- ing, as are also the coffins of Queen Ansera, Queen Merit-Amen, and Queen Sitka. The mummy of Thothmes III.—greatest of all Egyptian pharaohs— greater than even Seti I. or Rameses II. —is broken in three picces. All this is.apparently the work of ancient marauders.

For these identifications, see especially two articles on Dynasty XXI. (Manethonian) in the Zeit. f. Aigyp. Sp., 1882, by Dr R. Lepsius and Dr A. Wiedeniann ; also in Recueil des Travaux, vol. iii., 1883, an article on ‘ Relics from the Tomb of the Priest-Kings at Dayr el-Baharee,” by Amelia B. Edwards.

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MUMPS (syn. Cynanche parotidea, parotitis, also “ The Branks”), a contagious disease characterized by inflam- matory swelling of the parotid and other salivary glands, frequently occurring as an epidemic, and affecting mostly young persons. The disease generally sets in with symp- toms of a cold or catarrh accompanied with slight febrile dis- turbance, but soon the nature of the ailment is announced by the occurrence of swelling and stiffening in the region of the parotid gland in front of the ear. The swelling speedily increases in size and spreads downwards towards the neck and under the jaw, involving the numerous glands in that locality. The effect is to produce much disfigure-

‘ment, which becomes still greater should the inflammation

spread, as often happens, to the glands on the other side of the face and neck. Pain is present in the swollen parts, but it is seldom very severe, nor is there much redness or any tendency to suppuration. There is, however, con- siderable interference with the acts of mastication and swallowing. After continuing for four or five days the swelling and other symptoms abate, and the parts are soon restored to their normal condition. During the period of convalescence there occasionally occur some swelling and

tenderness in other glands, such as the testicles in males, and the mamme or ovaries in females, but these are of short duration and of no serious significance. That this com- plaint is highly contagious is shown by the readiness with which it spreads among children in schools, &c. The nature

of the infecting agent is unknown, but the medium of communication is most probably the breath or secre- tions of the mouth. Mumps is in general a mild disease, and requires but little treatment beyond a gentle laxative, the application of warm fomentations to the swollen and painful parts, and the use of soft food.

MUNCHAUSEN, Baron, the modern Philopseudes, “of whom Ferdinand Mendez Pinto was but a type,” is commonly identified with Hieronymus Karl Friedrich von Miinchausen, of Bodenswerder in Hanover, who, having entered the Russian service and served in several campaigns against the Turks, amused himself in his retirement by relating extraordinary instances of his prowess as soldier and sportsman. He died in 1797. In 1785 a little book of 48 pages, Baron Munchausen’s Narrative of his Marvel- lous Travels and Campaigns in Russia, was published in London. A second edition was printed at Oxford next year ; an enlarged London edition speedily followed, and the book had gone through five editions before, in 1787, it was introduced to the German public in a translation, with a preface by the poet Birger. Birger very naturally passed in Germany for the writer; and it was not until 1824 that a communication from his editor Karl von Reinhard to the Gesellschafter fixed the authorship upon Rudolf Erich Raspe. Raspe, a man of versatile talent, the author of some works on natural history and painting and of a poem entitled Hermin and Gunilde, was born at Hanover in 1737, and had been professor of archeology and curator of the museum at Cassel, which appointments he lost upon a charge of stealing medals. He fled to England, where he had already been elected an honorary

_ fellow of the Royal Society, though his name was sub-

sequently expunged. From 1782 to about 1788 he was assay-master and storekeeper at Dolcoath mine in Corn- wall, where his ingenuity was still remembered in the middle of the present century. In 1794 he accepted a similar situation at Muckross in Ireland, but died there before entering upon his post. His authorship of Mun- chausen rests entirely upon the testimony of Von Reinhard, but the fact was in all probability communicated to the latter by Biirger ; it has never been disputed, and is con- firmed by the appearance of the book in London during Raspe’s residence in England. The father of Adolf Ellisen, a recent German editor, visited Baron

Miinchausen himself in 1795, two years before his death, and found him very uncommunicative. He was convinced, however, by the evidence of acquaintances that the baron had in his younger days fully entitled himself to the distinction thrust upon him by Herr Raspe.

It would be superfluous to descant on the qualities of a work so universally known,whose name has become a house- hold word. It is to be observed, however, that the typical Munchausen is chiefly to be encountered in the 48 pages originally published by Raspe, and that the subsequent accessions, while quadrupling the dimensions of the book, are far from adding proportionably to its merit. There is hardly such another instance in literature of eleven buckram-men growing out of two. The most important of these additions is entitled “A Journey to the Moon and Dog Star,” and is mainly borrowed from Lucian’s True History. A very inferior appendix, published in 1793, represents the baron in conflict with the French revolutionists and Tippoo Saib; and there are several un- disguised imitations. The family likeness of the stories published by Raspe himself renders it probable that they

were actually derived by him from Miinchausen, of whom he speaks respectfully in his preface, attributing to his inventions the moral purpose of “awakening and shaming the common sense of those who have lost it by prejudice or habit.” It is nevertheless likely that Miinchausen shone rather as a narrator than an inventor, some of his marvels having been traced to Bebel’s Facetiz, to Lange’s Mendacia Ridicula, to Castiglione’s Cortegiano, and even to a Portuguese magazine.

The best English edition is that by Teignmouth Shore (1872), with illustrations by Gustave Doré and additions by Théophile Gautier ; the best German edition that by Ellisen (1849), to which is prefixed a valuable essay upon the literature of pseudology in general, The English edition of 1809 has plates by Rowlandson.

MUNCIE, a city of the United States, county seat of Delaware county, Indiana, 54 miles north-east of Indian- apolis. It is a flourishing pleasant-

looking place of 5219 inhabitants (census 1880), with city-hall, court-house, public library, and considerable industrial activity.

MUNDAY, Antony (1553-1633), was one of the most versatile miscellaneous writers of the Shakespearean age. In the introduction to his comedy John a Green and John a Cumber, reprinted for the Shakespeare Society, Collier enumerates 47 works of which Munday was whole or part author, the subjects being very various—pastoral poems, journalistic tracts and pamphlets, translations of romances, plays, pageants. The most interesting remnant of this miscellaneous work is a pamphlet reprinted in the Harleian Miscellany, the Hnglish Romayne Life, a lively account of adventures among Roman Catholic refugees in France and Italy. Munday's experiences were the result of a youthful escapade. Born in 1553, and the son of a London citizen of the Drapers' Company, he had early shown a restless dis- position: he took to the stage for some time, tried steady business for a year or two as apprentice to a stationer, tired of it, put all his wealth in his purse, and set out with a companion for the Continent, moved by "a desire to see strange countries as also affection to learn the languages." According to his own account, he was robbed on the way to Amiens, drifted into the company of Popish refugees, and was by them forwarded to Rome, where he obtained admission as a pope's scholar to the English seminary. Returning to England about 1581, and using the knowledge thus gained of designs against the English Government, he was a prominent witness in the trials of Campion and other English Jesuits; and, probably as a reward, was appointed one of the "Messengers of Her Majesty's Chamber." Thereafter he wrote steadily for the booksellers and the theatres, compiling religious publica- tions, putting words to popular airs, translating French romances, and so forth. Webbe in 1586 praised him for his pastorals—only the title is now extant, Sweet Sobs and Amorous Complaints of Shepherds and Nymphs ;—and in 1598 Meres mentioned him honourably among dramatic writers as "our best plotter." Critical Ben Jonson was less complimentary, and in Zhe Case is altered ridiculed Munday severely as 'Antonio Balladino, pageant poet." Judging from the plays on the subject of Robin Hood reprinted in Collier's Supplement to Dodsley's Old Plays, the joint work of Munday and Chettle, his literary faculty was of a very commonplace description, and deserved Jonson's taunts about "stale stuff" and want of character. Still Munday seems to have

been in great request as a collaborator in the last years of Elizabeth's reign, and afterwards he wrote many of the city "pageants." He obtained repute also as an antiquary, and published an enlarged edition of Stow's Survey of London in 1618. This last work was the only literary achievement inscribed on his monument in St Stephen's church. He died 10th August 1633.

MUNGO, Str. See KENTIGERN, vol. xiv. p. 40.

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MUNGOOS, or Moncoos. p. 629.

MUNICH (in German, Miinchen), the capital of the kingdom of Bavaria and the fourth largest town in the German empire, is situated in an elevated and barren plain to the north of the Bavarian Alps, in 48° 8' N. lat. and 11° 35′ E. long. Owing to its lofty site (1700 feet above the sea) and the proximity of the Alps the climate is rather changeable, and its mean annual temperature, 49° to 50 Fahr., is little higher than that of many places much farther to the north. The annual rainfall is stated at nearly 30 inches. The situation of Munich is devoid of physical advantages, and the surrounding district is In no way remarkable for its wealth, but the construction of roads and railways has counterbalanced the lack of natural highways, while the central position of the town makes it easy of access from all parts of Europe.

Munich is divided into nineteen municipal districts, fourteen of which, including the old town, lie on the left bank of the small river Isar, while the suburban districts of Au, Haidhausen, Giesing, and Ramersdorf are on the opposite bank. The old town, still containing many narrow and irregular streets, forms a semicircle with its diameter towards the river, while round its periphery has sprung up the greater part of modern Munich, including the hand- some Maximilian and Ludwig districts. The wall with which Munich was formerly surrounded has been pulled down, but some of the gates have been left standing. The most interesting of these is the Isar Thor, restored in 1835 and adorned with modern frescos. The Sieges Thor or gate of victory is a modern imitation of the arch of Constantine at Rome, while the stately Propylea is a reproduction of the gates of the Athenian Acropolis.

At the beginning of the present century Munich was in no way distinguishable from the crowd of second-rate German towns, but since the accession of Louis I. in 1825 it has undergone a metamorphosis of the most remarkable character. This splendour-loving prince devoted himself heart and soul to the embellishment of his “residence,” and his successors have followed in his footsteps with such zeal that Munich is now almost unrivalled for archi- tectural magnificence among the smaller capitals of Europe, while its collections of art entitle it to rank alongside of Dresden and Berlin. Most of the modern buildings have been erected after celebrated prototypes of other countries and eras, so that, as has been said by Carriére, a walk through Munich affords a picture of the architecture and art of two thousand years. The want of local colouring is perhaps a blemish in this ‘‘museum of architecture,” and it has also been objected that the prevailing uniformity of surface in the buildings does not produce sufficient contrast of light and shade. In carrying out his plans Louis I. was ably seconded by the architect Klenze, while the external decorations of painting and sculpture were mainly designed by Cornelius, Kaulbach, and Schwanthaler.

A large proportion of the most notable buildings in Munich are in two streets, the Ludwigstrasse and the Maximilianstrasse, the creations of the monarchs whose names they bear. The former, three-quarters of a mile long and 60 yards wide, chiefly contains buildings in the Re- naissance style by Gartner. The most striking of these are the palaces of Duke Max and Prince Luitpold; the Odeon, a large building for concerts, adorned with frescos and marble busts ; the war office; the royal library, in the Florentine Pala- tial style ; the blind asylum ; the Ludwigskirche, a success- ful reproduction of the Italian Romanesque style, containing a huge fresco of the Last Judgment by Cornelius; and, lastly, the university. At one end this street is terminated by the above-mentioned Sieges Thor, while at the other is the Feldherrnhalle or hall of the marshals, a copy of the

See IcuHNEUMON, vol. xii.

Loggia dei Lanzi at Florence, containing statues of Tilly and Wrede. Adjacent is the church of the Theatines, an imposing though somewhat over-ornamented example of the Italian Rococo style; it contains the royal

burial-vaults. In the Maximilianstrasse, which extends from Haid- hausen on the right bank of the Isar to the Max-Joseph Platz, King Maximilian II. tried to introduce an entirely novel style of domestic architecture, formed by the com- bination of older forms. At the east end it is closed by the Maximilianeum, an extensive and imposing edifice for the instruction of civil servants, adorned externally with large sculptural groups and internally with huge paintings representing the chief scenes in the history of the world. Descending the street towards the west we pass in succes- sion the national museum, the new gymnasium, the pro- vincial government buildings for Upper Bavaria (in which the composite styleof Maximilian has been most consistently carried out), and the mint. On the north side of the Max- Joseph Platz lies the royal palace, an extensive building, consisting of the Alte Residenz, the Konigsbau, and the Festsaalbau. The old palace, dating from 1601 to 1616, was designed by Peter Candid, and was formerly considered a very fine building. The apartments are handsomely fitted up in the Rococo style, and the private chapel and the trea- sury contain numerous interesting and valuable objects. The Festsaalbau, erected by Klenze in the Italian Renaissance style, is profusely adorned with mural paintings and sculptures, while the Kénigsbau, a reduced copy of the Pitti Palace, contains a series of admirable frescos from the Wiebelungenlied by Schnorr. Adjoining the palace are two theatres, the Residenz or private theatre, and the handsome Hoftheater, the largest theatre in Germany, accommodating 2500 spectators. The Allerheiligen-Hof- kirche or court-church is a tasteful little edifice in tlie Byzantine style with a Romanesque facade, somewhat recalling St Mark’s at Venice.

The Ludwigstrasse and the Maximilianstrasse both — end at no great distance from the Marien Platz in the ~ centre of the old town. Here stands the Frauenkirche, the cathedral-church of the archbishop of Munich-Freising, with its lofty cupola-capped towers dominating the whole town. Though scarcely a pleasing piece of architecture, it is imposing from its size, and interesting as one of the few examples of indigenous Munich art. On other sides of this square are the old town-house, restored in 1865, and the new town-house, the latter a handsome modern Gothic erection, freely embellished with statues, frescos, and stained-glass windows. The column in the centre of the square was erected to commemorate the defeat of the Protestants near Prague in the Thirty Years’ War (1638).

Among the other churches of Munich—the town con- tains about forty in all—the chief place is perhaps due to St Boniface's, an admirable copy of an early Christian basilica. It is adorned with a cycle of religious paintings by Hess, and the dome is supported by sixty-four mono- liths of grey Tyrolese marble. The new parish church of Au, in the Early Gothic style, contains gigantic stained- glass windows and some excellent wood-carving ; and the church of St John in Haidhausen is another fine Gothic structure. St Michael's, in the Renaissance style, erected for the Jesuits in 1583 to 1595, contains the monument of Eugéne Beauharnais by Thorwaldsen. The facade is divided into stories, and the general effect is by no means ecclesiastical. St Peter's is interesting as the oldest church in Munich (12th century), though no trace of the original basilica remains. One of the two Protestant churches is also a tasteful Gothic building.

The valuable collections of Munich, in virtue of which it ranks among the art-centres of Europe, are enshrined in handsome and appropriate buildings, most of them in

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the new Maximilian suburb on the north side of the town. The old Pinakothek, erected by Klenze in 1826-1836 and somewhat resembling the Vatican, is embellished exter- nally with frescos by Cornelius and statues of twenty- four celebrated painters by Schwanthaler. It contains a very valuable and extensive collection of pictures by the earlier masters, the chief treasures being the early German and Flemish works and the unusually numerous examples of Rubens. It also affords accommodation to 300,000 engravings, 10,000 draw- ings, and a large collec- tion of vases. Opposite stands the new Pina- kothek, the frescos on which, designed by Kaulbach, already show the effects of wind and weather. It is devoted to works by painters of the present century, among which Rottmann's Greek landscapes are per- haps the most important. The Glyptothek, a build- ing by Klenze in the Tonic style and adorned with several groups and single statues, contains a valuable series of sculp- tures, extending from Assyrian and Egyptian monuments down _ to works by Rauch, Thor- | waldsen, and other mo- dern masters. The cele- brated Aiginetan marbles preserved here, found in the island of A'gina in 1811, are perhaps the most important

remains of archaic Greek sculp- ture. Opposite the Glyp- tothek stands the exhibi- tion building, in the Corinthian style, used for periodic exhibitions ofart. Munich also con- tains several important private galleries, among which is Count Schack's unequalled collection of modern German pic- & tures. The Kaulbach museum contains a selec- tion of the pictures and sketches left by the painter of that name ; and a collection has also been made of the models of Schwanthaler's works. The scientific collections of Munich are on a par with its galleries of art. The immense collection in the above- mentioned Bavarian national museum, illustrative of the march of progress from the Roman period down to the present day, is superior in completeness and proportion to the similar collections at South Kensington and the Hétel de Cluny. On the walls is a series of well-executed frescos of scenes from Bavarian history, occupying a space of 16,000 square feet. The ethnographical museum, the museum of plaster casts, the cabinet of coins, and the collections of fossils, minerals, and physical and optical instruments are also worthy of mention. The art union, the oldest and most extensive in Germany, possesses good collections of

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1. Theatinerkirche. 2. Feldherrnhalle,

8. Allerheiligen Church. 4, Residenztheater.

modern works. The chief place among the scientific insti- tutions is due to the Academy of Science, founded in 1759, to which some of the above- mentioned collections belong. The royal library, containing 1,000,000 printed volumes and numerous valuable manuscripts, occupies the third

place among the libraries of the world. The antiquarium is a collection of Egyptian, Greek, and Roman antiquities in the old palace. The observatory is admirably equipped with fine instruments by the celebrated Fraunhofer.

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Plan of Munich.

5. Hoftheater. 6. St Michael’s Church.

7. Frauenkirche, 8. St Peter’s Church.

At the head of the educational institutions of Munich stands the university, founded at Ingolstadt in 1472, removed to Landshut in 1800, and transferred thence to Munich in 1826. It has a staff of about 130 professors and lecturers, and in 1882 was attended by 2183 students. In addition to the four usual faculties there is a fifth, of political economy. In connexion with the university are medical and other schools, a priests’ seminary, and a library of 200,000 volumes. The polytechnic institute, contained in a handsome brick edifice, adorned with medallions of celebrated architects, mathematicians, and naturalists, is also attended by a large number of students. Munich contains three gymnasia or grammar-schools, a real-gymnasium, a military academy, a veterinary college, two industrial schools, a commercial school, a school for

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architects and builders, several normal schools, a con- servatory of music, a dramatic training school, and about twenty-five elementary schools. Among the numerous benevolent institutions the most prominent are the asylums for the blind, the deaf and dumb, and the insane, and the general hospital. The general prison in the suburb of Au is considered a model of its kind; and a large military prison has just been erected. Amongst the other public buildings which call for mention are the crystal palace, 765 feet in length,

erected for the great exhibition of 1854; the slaughter-houses, covering 9 acres of ground ; the Wittelsbach palace, in the Early English Pointed style ; the post-office ; the arsenal, containing a military museum; the new railway station, the art-industrial in- stitution, the Maximilian barracks, the corn hall, and the aquarium. Among the numerous monuments with which the squares and streets are adorned, the most important are the colossal statue of Maximilian II. in the Maximilianstrasse, the equestrian statues of Louis I. and the elector Maximilian, and the obelisk erected to the 30,000 Bavarians who perished in Napoleon's expedi- tion to Moscow.

Munich is well supplied with public parks. The Eng- lish garden, to the north-east of the town, is 600 acres in extent, and was laid out by the celebrated Count Rumford in imitation of an English park. On the opposite bank of the Isar, above and below the Maximilianeum, extend the Gasteig promenades, commanding fine views of the town. To the south-west of the town is the Theresienwiese, a large common where the popular festivals are celebrated. Here is situated the Ruhmeshalle or hall of fame, a Doric colonnade containing busts of eminent Bavarians. In front of it is a colossal bronze statue of Bavaria, 170 feet high, designed by Schwanthaler. An admirable view is obtained from its summit. The finest of the cemeteries of Munich is the southern cemetery, outside the Sendlinger Thor. The dead-houses in the cemeteries are used for the strange custom of keeping the corpses several days before interment, dressed in their usual attire and exposed to public view. The botanical garden, with its large palm- house, and the Hofgarten, surrounded with arcades con- taining fine frescos of Greek landscapes by Rottmann, complete the list of public parks.

The population of Munich amounted at the census of 1880 to 230,023 inhabitants, of whom 110,033 were males and 119,990 females. These lived in 8791 dwelling- houses, and formed 53,457 households. The garrison numbers about 7000 men. Only 37 per cent. of the in- habitants are born in Munich, most of the remainder coming from the country districts of Bavaria (53 per cent.) and other parts of Germany (53 per cent.). Another census was taken in 1882 to elicit the occupations of the inhabitants, when it was found that 148,913 persons, or considerably more than half the population (64 per cent.), were supported by trading and manufacturing, while of the remainder 27,592 (12 per cent.) belonged to the official, military, and

professional classes, 30,038 (13 per cent.) had no profession and 24,237 (10°5 percent.) were engaged in domestic ser- vice. The population has been quintupled since 1801, when it was only 48,885. In 1680 it was 20,000, in 1783 it was 38,000. The annual death-rate is high, exceeding 30 per thousand. ‘This is, however, mainly accounted for by the abnormal mortality among children, after allowance for which the rate is not over 20 per thousand. About 85 per vent. of the inhabitants are Roman Catholics, and many of Munich’s most characteristic features are due to the fact that it is the centre of Roman Catholicism in southern Germany. Since the census of 1875 the number of Pro- testants in Munich has increased by 32 per cent., while the Roman Catholics have increased by 135 per cent. only.

MUNICH

Munich is the seat of the archbishop of Munich-Freising, and of the general Protestant consistory for Bavaria. About thirty newspapers are published here, including the prin- cipal Ultramontane sheets of south Germany. Some of the festivals of the Roman Church are celebrated with con- siderable pomp; and the people also cling to various national fétes, such as the Metzgersprung, the Schifilertanz (occurring septennially), and the great October festival in the Theresienwiese. The popular life of Munich may be said to revolve round its breweries and beer-gardens, where the manners and customs of the people may be conveniently studied.

The commerce and manufactures of Munich are scarcely commensurate with its artistic importance, though it has lately begun to take rank among the great industrial centres. It has long been celebrated for its artistic handicrafts, such as bronze-founding, glass-staining, silver- smith’s work, and wood-carving, while the astronomical instruments of Fraunhofer and the mathematical instru- ments of Ertl are also widely known. Lithography, which was invented at Munich at the end of last century, is still extensively practised here. The other industrial products include wall-paper, railway plant, machinery, gloves, and artificial flowers. Perhaps the most charac- teristic industry, however, is the preparation of the national beverage. In 1879 upwards of 28 million gal- lons of beer were brewed in Munich, only one-fifth of which was sent to other parts of Bavaria or exported. This represents an annual consumption of at least 125 gallons per head of

population, while the rate in England is only 40 gallons per head. ‘Trade, especially in grain and artistic goods, is now rapidly growing. Four important markets are held at Munich annually.

History.—The history of Munich, as distinct from that of Bavaria, has been very uncventful. The Villa Munichen or Forum ad Monachos, so called from the monkish owners of the ground on which it lay, was first called into prominence by Duke Henry the Lion, who established a mint here in 1158, and made it the em- porium for the salt of Hallcin and Reichenhall. The dukes of the Wittelsbach house occasionally resided at Munich, and in 1255 Louis the Severe made it his capital, having previously surrounded it with walls and a moat. The town was almost entirely destroyed by fire in 1327, after which the emperor Louis the Bavarian, in recognition of the devoted loyalty of the citizens, rebuilt it very much on the scale it retained down to the beginning of the present century. Among the following rulers those who did most for the town in the erection of handsome buildings and the foundation of schools and scientific institutions were Albert V. (1550-1579), William V. (1579-1596), Maximilian J. (1597-1651), Max Joseph _ (1745-1777), and Charles Theodore (1778-1799). _In 1632 Munich was occupied by Gustavus Adolphus, and from 1705 to 1715, and again in 1742, it was in possession of the Austrians. In 1791 the fortifications were razed, and room thus made for the enormous development the city has since experienced. The modern history of Munich may be dated from the accession of King Louis I. in 1825, since which, as already indicated, nearly all the most handsome streets and buildings of the town have been constructed. Like the Bavarians in general, the citizens of Munich are naturally inclined to adhere to the traditionary both in politics and in religion, but a late the population has become permeated with more advanced ideas.

Munich’s importance in the history of art is entirely of modern growth, and may be dated from the acquisition of the Hginetan marbles by Lonis I., then crown prince, in 1812. Among the emi- nent artists of this period whose names are more or less identified with Munich were Klenze, Ohlmiiller, Gartner, and Ziebland, the architects ; Cornelius, Kaulbach, Schnorr, and Rottmann, the painters ; and Schwanthaler, the sculptor. The art of fresco-painting may be said to have been resuscitated in Munich during this reign,

and the artistic handicrafts of bronze-founding and glass-staining were also practised with a success previously noknown i modern days. Munich is still the leading school of painting in Germany, but the romanticism of the earlier masters has been abandoned for drawing and colouring of a thoroughly realistic char- acter. Piloty and W. Diez stand at the head of this school.

_ Authorities.—Mittheilungen des statistischen Bureaus der Stadt AMiinchen, vols. i.-v., 1875-1882; Soltl, Munchen mit seinen Umgebungen, 1854; Reber, Bau- technischer Fiihrer durch die Stadt Miinchen, 1876; Trautwein, Fuhrer durch Mtnchen, 12th ed., 1881; Daniel, Handbuch der Geographie, new ed., 1882- 1883. (J. F. M.)

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MUNICIPALITY. A municipality is an organization for the self-government of a city or town by means of a corporation empowered generally to maintain peace and order, and to manage the affairs of the inhabitants. Such a corporation consists of a head as a mayor or provost, and of superior members as aldermen and councillors, together with the simple corporators who are represented by the governing body ; it acts as a person by its common seal and has a perpetual succession with power to hold lands subject to the restrictions of the Mortmain Laws, and it can sue or be sued or be indicted, although there are of course many personal matters which do not come within the functions and liabilities of such bodies politic. Where necessary for its primary objects, every corporation has power to make byelaws and to enforce them by penalties, provided they are not unjust or unreasonable or otherwise inconsistent with the objects of the incorporation or char- ter or other instrument of foundation ; and in the case of a municipality such byelaws will be binding even upon strangers within the district.

Great Britain has no general system of self-government. A certain number of cities and towns have been from time to time incorporated by the crown, or have successfully claimed the privilege as existing from time immemorial, either because in fact they have governed theniselves from very ancient times, or because they have had such a repre- sentation in parliament as led to a presumption of their having been incorporated like

the rest. The other urban districts have been regarded as mere “upland towns” or populous townships, with nothing but a parochial organiza- tion, or the faint semblance of municipal institutions which grew out of the administration of fairs and markets. These are now comprised in the various local government districts existing under the Public Health Acts, “lighting and watching districts” constituted under an Act passed for the purpose in 1833, and improvement districts governed under the powers given by a number of local Acts. Pro- vision has been made by the Acts which regulate these corporations for the grant of powers of self-government to new municipal boroughs subject to the approval of the committee of the privy council. The making of corporations, however, is regarded as one of the highest prerogatives of the crown, and the legislature has always been careful to avoid unnecessary interference with the right; the func- tions of the committee are therefore confined to the allow- ance or refusal of municipal powers as constituted by statute, the right of the crown to make corporations of other kinds being left in theory untouched.

The term “municipal borough” was introduced when the larger corporations were reformed in 1835 to denote a place to which the new powers of self-government were applied, whether such a place were a parliamentary borough or not. It has now become nearly equivalent to ‘‘munici- pality” owing to the provisions of the Act of 1883 for extinguishing the less important of the small unreformed municipalities, and for bringing the rest within the purview of the Municipal Corporations Act, 1882, by which the provisions of the statute of 1835 and its forty-two amend- ing Acts were consolidated. The meaning of the word “borough” has undergone many changes. It seems at first to have denoted a walled town or city, but it was soon applied especially to such of them as possessed some kind of organization for the transaction of the local business. At a later period the term implied the right to be repre- sented in parliament. This may be illustrated by the proceedings in the case of Torrington in the reign of Edward III. This place, whether a “burgh” or a mere “‘vill,” had in fact sent burgesses to parliament, but after it was determined that such representation was improper the town was omitted from the category of boroughs. In

summoning the commons to parliament each sheriff was directed to procure the election of two citizens from every city and two burgesses from every borough in his bailiwick. But it soon became the practice to omit places which had been represented, and to include others with no title to the privilege except. their situation on the royal demesnes, or their political or commercial importance. It resulted that the word “borough” came to denote only those places

. which were usually represented in parliament, whether they

were walled towns or not, and whether they had or had not received charters of incorporation ; and in course of time it was taken for granted that every parliamentary borough must have been incorporated at some ancient time, or in other words was entitled to the privileges of a borough by prescription. The first Reform Act changed the meaning of the word again by depriving the smaller boroughs of their parliamentaryfunctions and reducing them to the same position as those districts which were known as boroughs in a popular sense, as having originally had a representation which had been lost, or as being important places enjoying municipal rights under charters like those which had been granted to the parliamentary boroughs.

We shall now proceed to describe the ordinary constitu- tion of an English municipal borough, omitting the small municipalitics which are now in course of extinguishment, and for other reasons omitting the city of London, which, on account of its singular importance and its peculiar cir- cumstances, will probably become without much delay the subject of separate legislation (see Lonpon).

These boroughs are governed by corporations composed in each case of a mayor, aldermen, and burgesses, acting by a council elected by the general body of qualified cor- porators. If the borough is a city, the burgesses are de- scribed as the “citizens.” With a few exceptions arising under local Acts, the following description applies to all the municipal boroughs in England and Wales, similar provi- sions having been made for the boroughs of Scotland and Ireland (see vol. iv. p. 63) by Acts of Parliament passed for those parts of the United Kingdom. The powers and duties of the council are defined by the Municipal Corpora- tions Act, 1882, which forms a

complete municipal code. The number of councillors varies from twelve to forty-eight according to the size of the borough, and in the case of a new incorporation the number is fixed by a provision in the charter. The qualification of a councillor is to be an enrolled resident burgess, or, if not resident within the district, residing within 15 miles of the borough and having in either case the property qualification required by the Act, provided that he is not a clergyman or a regular dissenting minister, or interested in any office, place, or contract with which the corporation is concerned. The qualification of a burgess is to be enrolled on the burgess-roll as the rate-paying occupier of a house or other building in the borough or within 7 miles distance from it. Women may be burgesses, but are not qualified for corporate office. In many boroughs there are ancient classes of freemen qualified as such by birth, servitude, or marriage (and formerly in many cases qualified by gift or purchase) ; but these freemen as such have not the rights of burgesses, though they are entitled to the parliamentary franchise and to their share in the charities and corporation property under titles accruing to their class before the reform of 1835, The qualification, of an alderman is the same as that of a councillor, and' the mayor is chosen from the aldermen, or councillors, or persons qualificd for such positions.

The councillors hold office for three years, one-third of their number being annually renewed by ballot. If the borough is divided into wards, an alderman acts as return- ing-officer for the elections in each ward ; if not, the mayor

acts as the returning-officer for the borough. Municipal elections fall within the provisions of the Corrupt Practices Act, 1883. The aldermen hold office for six years, one-half of their number retiring every three years in rotation. The mayor holds office for one year. His election is the first business at the quarterly meeting held on the 9th day of November, when the amount of his remuneration is fixed by the council. He is the only member of the corporation who receives a salary. The council chooses the mayor and aldermen and appoints the officers of the corporation, as the town-clerk and treasurer, the sheriff when the borough is a county of itself, and the coroner and clerk of the peace when it has separate quarter-sessions. The council

appoints such general and special committees as may be required, and has the general management of the corporate property, subject to the supervision of the treasury; it makes all necessary byelaws, subject to disallowance by the privy council if necessary. With exceptions arising from the provisions of local Acts, the council regulates the police force, the lighting and watching of the borough, the management of markets and burial-grounds, and the execution of the laws relat- ing to public health. The expenses are defrayed out of the borough fund, which includes the income of the general corporate estate, supplemented by a borough- rate paid out of the poor-rate or assessed upon a similar basis. A watch-rate, if required, may be levied on the whole borough or on a selected portion of the district. When expenditure is required for objects of a permanent character, the council is empowered to raise the amount by loans, charged on the rates and repayable by instal- ments, subject to the approval of the treasury or other public department entrusted with the control of the matter, according to the nature of the improvement required, The whole of the accounts are audited by borough auditors, of whom one must be a councillor appointed by the mayor, and the other two elected by the burgesses from persons qualified to be councillors. A return is made to the Local Government Board of the receipts and expenditure for the year, and an abstract of all these returns is laid every year before parliament. Some con- trol over the expenditure is also reserved to the High Court of Justice by a provision that all orders for payment must be signed by three councillors and the town-clerk, and that any such order may be moved by certiorari into the Queen’s Bench Division. The aldermen have no greater powers than other councillors, excepting that they may act as the returning-officers for wards as above mentioned, and that an alderman may act for the mayor if he is temporarily unable to discharge his duty and has not appointed a deputy. The mayor is the head of the cor- poration, and is ex officio a magistrate for the borough and a member of the watch committee. He is the return- ing-officer at parliamentary elections, and acts with two elected revising assessors as the revising officer if the borough is not represented in parliament. His office is vacated by death or bankruptcy, and must be filled up with all convenient speed after any such vacancy occurs. The last ex-mayor is also ex officio a magistrate for the borough.

Where the borough has a separate commission of the peace, the borough justices, with the last-mentioned excep- tions, are appointed by the crown. A separate commission does not of itself exempt the borough from the concurrent jurisdiction of the county justices. A stipendiary magis- trate may be appointed bya secretary of state on the appli- cation of the council, and when appointed he is ex officio a Justice for the borough. When the borough has a separate court of quarter-sessions the recorder is the judge, but in certain cases may appoint an assistant or deputy ; the recorder must be a barrister of five years' standing, and

is appointed by the crown on the recommendation of the home secretary; the recorder is also ex officio a justice for the borough. When the borough has such a court it ceases to be liable to the county-rate, but must contribute to the expenses arising from prosecution and conviction of prisoners from the borough at the assizes. In the case of boroughs which were liable before 1832 to contribute to the county-rate, a contribution to the expenses of the county is still required. Subject to an exception as to judges and assessors appointed before 1835, and to the provisions of various local Acts, the recorder is the judge of any civil court existing in the borough by prescription.

We shall now discuss more generally the origin of these municipalities upon the Continent as well as in the United Kingdom. The conception of the borough as it now exists has obviously been copied from the Roman munici- pium. As to England, however, the coincidence is in one sense accidental, inasmuch as it had a municipal system before the lawyers adopted the notion of a corporation from the civilians, though it may be true that no such system could grow up without being influenced by ideas which were familiar to the churchmen. In some parts of the West the Roman system appears to have lived on without an actual breach of continuity. The "curia" seems to have continued in the cities of Provence until the outbreak of the great revolution. At Treves and Cologne "the Roman language perished, but the institu- tions survived ;" and the libertas Romana or full body of municipal privileges was extended gradually to other cities on the Rhine and the trading communities of Holland and Brabant. It is possible also that some relics of the

| Imperial administration may have continued in southern

Italy and in a few of the Lombard cities. One element at least in the corporation of Paris can be traced back to the Nautzx Parisiaci, a college of merchants established in the first period of the empire. But the English munici- palities are in no sense a legacy from the.imperial times, or a continuation of the system which prevailed in the cities of Britain, even in the few instances, as in London, York, and Exeter, where there may have been an unbroken succession of occupancy. Almost all the towns were destroyed in the course of the English conquest, and some which became important again, as Bath, Cambridge, and Chester, are known to have lain waste for centuries. In other instances the English kings soon learned to hold their courts in the fortresses, and to set up their farmsteads in the desolated palaces, or elsewhere a Roman camp may have been taken as a convenient point fora garrison, which in time became a “civil centre” and the site of a muni- cipal borough.

The French municipalities can be traced to several dis-: The chief activity was in the north ; the southern cities kept their Roman traditions or’

tinct sources of origin.

imitated the Italian model, as those in the east endeavoured. to secure the same privileges as the mercantile communities: on the Rhine; in the central provinces the towns for the most part retained the organization of the parish, and were rather bourgeoisies or privileged market-towns than communes with powers of self-government. The rise of the communes began under Philip I., and they became general in the 13th century. The first charter was granted

to Le Mans in 1072, and another to Cambray in 1076;

these were followed by grants to Laon, Beauvais, Amiens, Soissons, and many other places; and similar privileges were granted in the 12th century by the counts of Flanders, the dukes of Burgundy, and other princes,—the general effect of the grants being to fix the lord’s rent or tribute, to commute the military service, and to give jurisdiction to magistrates either

freely elected or chosen by the townsnien in conjunction with their feudal lords. Speci

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mens of these charters can be seen in the Ordonnances des Rois, Kemble's Anglo-Saxons, and Bouthors's Coutwmes locales du Baillage d Amiens. They show us a political revolution directed against the feudal lord by townsmen associated in merchant-guilds or sworn into a new sort of brotherhood. To break the oath of loyalty to the com- mune is a crime of the gravest kind. "If any of us aid or comfort our enemies he is guilty of lése-commune, and we will pull down his house, if we can. . . . Whoever wounds with weapon any of his fellows shall lose his fist or pay nine livres" (Amiens). 'The men shall take what wives they please, first asking leave ; if their lord refuse, and a man take a wife from another lordship, he shall pay but five sous for a fine. Every one living within the dis- trict shall take the communal oath or answer with house or goods" (Soissons). These charters are important because the communa of London was founded under Richard I. in direct imitation of the French example, and soon became the type of the independence which the other boroughs continually struggled to attain ; and, as in France, the great men deplored the revolt as tumor plebis, tumor regis, tepor sacerdotu, while the kings for their own pur- poses encouraged the popular movement. And in the same way Philip Augustus and his successors were so ready to protect the communes that they eventually claimed and obtained an immediate seigniory over all the chartered boroughs to the exclusion of any private lords to whom the towns had formerly belonged. Another point of importance lies in the fact that the lords not only settled the local laws of inheritance and other customs "running with the land," but sometimes changed them at the townsmen's request, as if it were merely an affair between lord and tenant. There are English examples of the same practice, which seems to have been not entirely discontinued until the reign of Edward I. A prerogative of this nature was exercised by the archbishop in Kent, and Simon de Montfort in 1255, at the request of his burgesses of Leicester, abolished the custom of descent to the youngest son. Fitzosberne appears by Domesday Book to have granted a separate set of customs to his "Frenchmen" in Hereford, and a difference of the same kind which existed at Stafford and Nottingham

must have been caused by similar grants; in the latter place it was found on a trial in the reign of Edward III. that there were two districts in the town, the one called the “French “borough” and the other the “English borough,” where descent was to the youngest son, a circumstance which gave its name to the custom of “‘ borough-English.” Municipal freedom was granted in Spain at an earlier date and on an ampler scale, as beseemed the poverty of the kings, the weakness of the nobles, and the constant danger from the Moors. The Visigothic laws were imbued with the principles of the Theodosian code, and it was easy for the Spaniards to regard the incorporated cities as bodies politic of the highest importance. The first instance of the erection of such a community was the grant in 1020 of a code of privileges to Leon. Such grants were treaties between the king and the chartered towns, by which the latter obtained fixed laws, extensive territories, and the choice of their own magistrates in return for a tribute and universal service in the militia. The king appointed a governor to take charge of the fortified places, but in almost every other respect the inhabitants governed them- selves. This democratic constitution was after a time impaired by the claims of the knights or “caballeros” to a monopoly of office ; but what actually led to its destruc- tion was the increase in the power of the crown. The disorders inseparable from popular elections were declared, as in England under the Tudors, to be a reason for vesting the government in a small and close corporation, which

was soon found to be quite amenable to the influence and dictation of the court.

The municipalities of every country have a separate history of their own, and it is difficult to find any general law for determining their methods of development. Ac- cording to their opportunities the oppressed wear out their conquerors’ patience and too often become oppressors in their turn: as the state becomes more complex the old confederacies are broken up, and the scattered communities are reduced to order by a central government, and as privilege begins to disappear the towns are regulated by a common set of rules, or the whole country, as in France, is parcelled out again into a new series of communes or corporate districts. In Spain, as we have seen,

the needs of the state gave immediate freedom to its defenders. In Italy the cities grew too soon into a crowd of independent republics. The history of Lincoln and Exeter and the cities of the Danelagh shows that ‘the tendency of the great cities of England was towards a more than muni- cipal independence” (Freeman, Engl. Towns, p. 206). If these movements had not been checked by the Norman Conquest, English history might have been “like that of the imperial kingdoms.” But, as this event turned out, there is little in the record of the German cities which bears upon that of English municipalities, excepting some slight resemblances between the powers acquired by the city of London and those of the Hanse towns and the mercantile principalities of Nuremberg and Augsburg. The free cities of Germany were at first divided between the emperors and their immediate vassals, the former ruling through the bishops as imperial vicars ; in the 12th century the citizens began to elect councils and to administer a concurrent jurisdiction ; in the next century they either purchased full powers or drove out the vicars and bailiffs by force; the revolutions which followed the fall of the Hohenstauffen family enabled the cities to free themselves from the mediate lords and to hold directly of the empire, and they were soon afterwards admitted to the diet on equal terms with the rest of its sovereign constituents.

The borough when it appears in English history is essentially a place of defence, and the definition includes the powerful city which formed the metropolis of an ancient kingdom, the border-fortress, the walled seaport, the “burh” erected in a disaffected province, and the fortified village on the private demesne of the king. There is another sense of the word “borough,” as used in Kent and the neighbouring counties, to denote the small rural division which is elsewhere called a “ tithing,” the constable or tithing-man being the same officer as the “ borsholder ” or “borough-elder ” of the eastern counties; but the verbal similarity is accidental, the rural “borough” having been the district of the “ frank-pledges” or neighbours under a pledge or “borh” to act as bail for each other. The borough or “ burh” was confined to the precinct of the walls, though the town or city might extend to a greater distance, or the burgesses might be joint-owners of estates outside the lines of defence. There might even be two “burhs” side by side if the nature of the locality required it. We read in the Chronicle, for instance, of the con- struction of the “northern burh” at Hertford in 913, and

of “burhs” being built five years later on both sides of the river at Buckingham ; and many other examples will be found collected in Kemble’s list of the towns.

Little is known of the civil constitution of the boroughs before the Norman Conquest, and even the Domesday survey fails to give much information as to their internal affairs where the king’s rights were not immediately con- cerned. It appears indeed that Lincoln and the other cities of the Danelagh were almost independent ; an aristo- cratic commonwealth in each case was governed by twelve

hereditary judges, and the same kind of organization, but with a less degree of independence, appeared at Chester and Ipswich. The size and the wealth or power of places like Canterbury, Taunton, and Sandwich entitled them to be treated as separate “hundreds,” and the constitution of London must have been based on that ofa shire ; but, speak- ing generally, it may be said that the ordinary boroughs were without any powefts of self-government. Each borough was administered as if it were a township or cluster of, town- ships, intersected in most cases by a number of separate jurisdictions and subject to the obligations of tenure which bound many of the burgesses to lordships outside the walls. The borough-courts were held by the reeve or bailiff, who may have been in many cases elected, but was always answerable to an external authority. If the place was of mercantile importance it was called a port (from “ porta,” the city-gate), and the court and its president, as in London, Canterbury, and Bath, were styled the “port- mote” and “nort-reeve.” In the smaller boroughs the reeve’s func- tions must have resembled those of the steward in the ordinary manorial courts. When municipal rights were granted by the Plantagenet kings this officer was replaced by the “mayor,” whose appearance is always the sign of the establishment of an independent commune. The first steps toward self- government were taken when the burgesses became the owners, as at Oxford and Colchester, of pro- perty which they managed in common. But a more important source of municipal privilege is to be found in the institution of the guilds, which in time acquired the control and monopoly of the local commerce, so that in the reign of Henry II. the possession of a

merchant-guild, or “hanse” as it was called in the north, became ‘the token of municipal independence,” the guild being in fact (if not in theory) the governing body of the town. The courts in later times have accordingly held, as in the case of Totnes, that the grant of gilda mercatoria implies the incorporation of the borough. The guilds appear first in a religious form, and date in all probability from the times when the neighbours met to drink at the pagan festivals or the feasts in honour of the dead. Other voluntary associations of the same kind were formed as clubs and friendly societies for mutual insurance and defence. The “frith-gild” of London, as it existed in the reign of Athelstane, and the later “knighten-guild,” the “thanes’ guild” at Cambridge, and the guilds of Canterbury and Exeter were all fraternities of this kind. The “chapman- guild” (“hanse”- or merchant-guild) was an association on the same model but on a larger scale, comprising all the traders in the town, and assuming the power to make by- laws to regulate all the local business which did not fall within the jurisdiction of the regular courts. The London knighten-guild, until it was suppressed by Henry I, had a legal jurisdiction in the district of Portsoken Ward. The ancient descriptions of Winchester mention two knighten-guilds where the “ probi homines” were wont. to drink their guild (“ potabant gildani suam ”). The “ gild- halla” of the men of Dover is mentioned in Domesday Book. When the boroughs were enfranchised as communes upon the French model care was taken to confirm and establish these trading fraternities as forming the most important members of the new corporations. Thus in 1200 King John granted to the burgesses of N ottingham “a merchant-guild with all the liberties and free customs which ought to pertain thereto,” and the grant to Ipswich in the same reign, besides preserving and extending the jurisdiction of the twelve “portmen” or capital burgesses, provides that the common council shall elect a fit man to be alderman of the merchant-guild. The same king granted to Dublin the right of having guilds “as in Bristol.” York and Beverley had the right to havea “hans-hus”

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some time before, in the latter case by the grant of Arch- bishop Thurstan in the reign of Henry I.

Another valuable franchise was obtained when the boroughs procured a separate assessment of their dues to the crown. Except in the case of the most important cities, the boroughs were regarded as parts of the counties in which they were situate and as answerable accordingly to the sheriff. It was of the highest importance to the burgesses that their share of the county-dues should be ascertained, and even before the Norman Conquest it became the practice for the borough to answer for its own dues under the name of jirma burgi. The Domesday survey shows that Dover, Sandwich, Bath, Huntingdon, and many other boroughs had obtained a privilege of this kind. A borough paying its fixed assessment to the king or other lord, through the reeve or alderman of the mer- chant-guild, was regarded as a single tenant holding the borough for years or at will or in perpetuity, according to the nature of the contract. When its dues and services were assessed in perpetuity the borough was said to be "affirmed" or held in fee-farm, and the burgesses were thenceforth treated as freeholders by a burgage tenure. The only rights remaining to complete their municipal independence were attained when the sheriff's jurisdiction was ousted and the burgesses were allowed to elect their own magistrates to administer justice in the local courts, In the reign of Henry IIT. the great lords began to enfranchise their boroughs in imitation of the royal example. The statute of Quo Warranto in 1290 led to the confirmation of these charters by the crown, and the doctrine was soon established that none but the king had authority to erect a commune. The Scottish boroughs obtained complete self-government at an earlier date, King David I. (1124- 1153) having been anxious to attract commerce, and the walled towns having soon been filled with "a crowd of willing settlers from southern Britain and Flanders." Edinburgh, Stirling, Roxburgh, and Berwick formed an important commercial league, "to which the other burghs conformed as they came into existence" (Robertson, Harly Kings, i. 298). Both in England and Scotland the boroughs, whether founded by the crown or by private lords, were important elements in the state, and in England both classes were summoned to parliament indifferently; in 1298 a writ was issued for Northallerton, which belonged to the bishop of Durham, though by a curious anomaly his city of Durham only acquired the franchise by an Act passed in 1673. The introduction of the metaphysical idea of a corporation may be ascribed to the influence of Bracton, who wrote under Henry III. (De Legibus, 57 ; Fleta, vi. 13). We find Edward J. in 1284 granting

franchises to the burgesses and community of Nottingham and their ‘‘ successors,” the old form being ‘‘to the burgesses and their heirs.” The practice varied according as the feudal or the ecclesiastical way of regarding such grants prevailed, until in 1440 the town of Kingston-upon-Hull was incor- porated as a body politic according to the modern form. The government of the boroughs soon fell to close govern- ing bodies, constituted by restraining ordinances, and the Stuarts made incessant attempts to obtain the nomination even of these smaller bodies. After the fall of the corpora- tion of London in 1681 the provincial boroughs lost or surrendered their privileges; and, though the charters were revived at the Revolution, the narrow and corrupt system remained. The commissioners of 1835 reported a general and just dissatisfaction with the state of the municipal institutions, great distrust of the self-elected councils, and discontent under the burden of local taxation for purposes which were regarded with suspicion. The reform in England followed swiftly on the famous report, and by acts passed soon afterwards the Scotch and Irish boroughs,

which had long been subject to the same evils, were recon- structed under similar schemes.

The privileges of the cities in the United States illustrate the proposition that the history of every country must determine the type of its municipalities. In almost all parts of Europe the civic franchises arose out of some treaty or contract between the lord and his dependents ; in France, however, the character of the corporations was gradually modified as the communal system was extended to the rural districts. In the United States the French model has been followed with the addition of many improvements ; and where self-government has been impartially granted to the county, the township, and the village the purely muni- cipal organization has lost its special significance. It is regarded in the American courts as a revocable agency established by the State (without contract or consideration for the grant) for the purpose of carrying out the necessary details of civil government among the inhabitants of an urban district. It is considered to have no vested right to any of its powers or franchises, which are only

allowed to exist in furtherance of the design for which the munici- pality was constituted, that object being the exercise in subordination to the legislature of certain minor powers of government over part of the territory of the State (see Philadelphia v. Fox, Supreme Court of Pennsylvama Rep., vol, xiv.). Each city has the general powers of a corpora- tion and no others, in the absence of special laws. It has executive functions and powers of legislation for civic pur- poses, which are vested in the mayor and his subordinate officers, but it is not in any other way entrusted with judicial authority (see Zhe Polstical Code of New York, titles 4, 5, ss. 947-8).

Besides the authors cited above and the ordinary historical text-books, see Gneist, Self-Government ; and the work on Local Government by M. D. Chalmers, and the Memoranda by R.S. Wright there cited. For France, see Thierry, Lettres sur Uhistoire de France; Leber, Pouvoir municipal, 1829; Clos, Régime municipal dans le Midi, 1853; Riviere, Biens communaua, &c., 1856; Béchard, Drott muni- cipal; Savary, Origine du droit municipal,1868. For Spain, consult Marina, Teoria de las Cortes, and Ensayo historico-critico, and compare the review on the latter work, Edinb. Rev., No. 43. For Germany and Italy, see Wilda, Gildenwesen, 1831 ; Hiillmann, Siddtewesen, 1828 ; Bethmann-Hollweg, Ursprung der Lombard. Stddte- Sreiheit, 1846 ; Lambert, Die Entwickelung der Deutschen Stadteverfassung, 1865 ; Gaupp, Deutsche Stadtrechte, 1851; Horneyer, Stadtbicher des Mittelalters, 1860 ; Gengler, Codex Juris Municipalis, 1867; and Maurer, Gesch. der Stddteverfassung in Deutschland, 1870-1871. (C. I. E.)

MUNSTER. See IRELAND.

MUNSTER, the chief town of the province of West- phalia in Prussia and formerly the capital of the important bishopric of its own name, lies in a sandy plain about half- way between Cologne and Bremen on the Aa, an insigni- ficant affluent of the Ems. It is one of the best-preserved old towns in Germany, its quaint medizval character being most strongly impressed on the “ prinzipal-markt,” with its lofty gabled houses, its arcades, the town-house, a fine Gothic building of the 14th century, and many churches. Of the latter the most important is the cathedral, one of the most original and striking structures in Germany, though much disfigured by modern

decoration, rebuilt after a fire in the 13th and 14th centuries, and exhibiting a combination of Romanesque and Gothic forms ; the church of St Ludgerus, originally erected in the Romanesque style in 1170, was extended in the Gothic style in 1383, with a tower terminating in a picturesque lantern; the Lieb- frauenkirche is of the 14th century ; the old church of St Maurice, founded about 1070, was rebuilt in 1859-1862. The room in the town-house in which the peace of West- phalia was signed in 1648 contains portraits of the am- bassadors present at the ceremony. On the tower of St Lambert's church (14th century), the upper part of which has recently been pulled down as insecure, were hung three lron cages in which the bodies of John of Leyden and two of his followers were exposed in 1536 (see ANABAPTISTS). The old Stadtkeller contains a collection of early German pamtings. The university of Miinster, founded after the

Seven Years' War and closed at the beginning of this cen- tury, is now represented by an academy with the rank of a university, possessing faculties of philosophy and theology (Roman Catholic). In connexion with it are botanical and zoological gardens, several scientific collections, and a library. The private houses of Minster afford an ad- mirable picture of German domestic architecture in the 16th, 17th, and 18th centuries,—Gothic, Renaissance, and Rococo. |

Miinster is the seat of a Roman Catholic bishop, of the headquarters of an army corps, and of the administrative and judicial authorities of Westphalia. The Westphalian Society of Antiquaries and several other learned bodies also have their headquarters here. The population in 1880 was 40,434, including about 6000 Protestants, The rela- tive industrial importance of Miinster is no longer main- tained, but manufactures of cotton, linen, and woollens, candles, leather, &c., are still carried on, and it is the centre of a tolerably brisk trade in these products, as well as in cattle, Westphalian hams, grain, and books.

History.—The first historical mention of Miinster takes us back to the close of the 8th century, when Charlemagne fixed ‘‘ Mime- gardevoord ” as the residence of the newly-appointed bishop of the Saxons. The growth of the settlement round the ‘‘ Monasterium ” was slow, owing to its distance from

any navigable river or im- portant highway, and it was not till 1180 that it received a municipal charter. The name Miinster had supplanted the original one about a century earlier. During the 13th century Miinster was one of the most important members of the Hanseatic League. At the time of the Rcformation the citizens were inclined to adopt Protestantism, but the excesses of the ANABAPTISTS (q.¥.) led to the armed intervention of the bishop and the forcible suppres- sion of all divergence from the ancient faith. The Thirty Years' War, during which Miinster suffered most from the Protestant armies, – was terminated by the peace of Westphalia or Miinster, signed in the town-hall here on 24th October 1648. The authority of the bishops, who seldom resided at Miinster, was usually somewhat limited, but in 1661 Bishop Bernhard von Galen took the town by force, built a citadel, and deprived the citizens of most of their privileges. In the Seven Years' War Miinster was occupied both by the French and by the allied troops. Towards the close of last century Miinster was recognized as one of the intellectual centres of Germany, being the home of Hemsterhuis, Princess Gallitzin, F. von Stolberg, Fiirstenberg, and other notabilities.

The bishopric of Miinster, which possessed the freedom of the empire, embraced an area of 2500 square miles and contained about 350,000 inhabitants. In the 17th century Bishop Galen was of such importance—he supported an army of 20,000 men—that his alliance was sought by the English in 1665 in the war against Holland. The bishopric was secularized and annexed to Prussia in 1803.

Comp. Geisberg, Merkwiirdigkeiten der Stadt Minster (6th ed., 1877); Erhard, Geschichte Munsters (1837).

MUNSTER, Serpastran (1489-1552), Hebraist, geo- grapher, and mathematician, was born at Ingelheim in the Palatinate in 1489. After studying at Heidelberg and Tiibingen, he entered the Franciscan order, but abandoned it for Lutheranism about 1529. Shortly afterwards he was appointed court preacher at Heidelberg, where also he lectured in Hebrew and Old Testament exegesis, From 1536 he taught at Basel, where he died of the plague on 23d May 1552. He was described on his tombstone as the Ezra and the Strabo of the Germans.

Minster, a disciple of Elias Levita, was the first German to edit the Hebrew Bible (2 vols. fol., Basel, 1534-1535) ; this edition was accompanied by a new Latin translation and a large number of annotations. He published more than one Hebrew grammar, and was the first to prepare a Grammatica Chaldaica (Basel, 1527). His lexicographical labours included a Dictionariwm Chaldaicwm (1527) and a Dictionarium Trilingue (Latin, Greek, and Hebrew, 1530). One of Miinster's best-known works was a geography book (Cosmo- graphia Universalis, fol., Basel, 1544), which was often reprinted in Latin and frequently translated into German. Among his other writings (for which see the Biogr. Générale) are a treatise on dialling (Horologiographia, Basel, 1531), one on the planetary motions (Organum Uranicum, 1536), and a volume entitled Rudimenta Mathematica (Basel, 1551). The notes on the Old Testament are incorporated in the Critict Sacri.

MUNTJAK, one of the native names, now generally

adopted in European languages, for a small group of Deer, the members of which are indigenous to the southern and eastern parts of Asia and the adjacent islands, and which are separated by very marked characters from all their allies. They are also called " Kijang" or " Kidjang," and constitute the genus Cervulus of Blainville and most zoolo- gists, Stylocerus of Hamilton Smith, and Prox of Ogilby. They are all of small size compared with the majority of Deer, and have long bodies and rather short limbs and neck. The antlers, which as in most Deer are present in the male only, are small and simple, and the main stem or beam after giving off a very short brow-antler inclines back- wards and upwards, is unbranched and pointed, and when fully developed curves inwards and somewhat downwards at the tip. These small antlers are supported upon pedicles or permanent processes of the frontal bones, longer than in any other Deer, and the front edges of which are continued downwards as strong ridges passing along the

sides of the face above the orbits, and serving to protect the large frontal cutaneous glands which lie on their inner sides. The lacrymal pit of the skull, in which is lodged the large anteorbital gland or crumen, is of great

depth and extent. The upper canine teeth of the males are strongly developed and sharp, curving downwards, back- wards, and outwards, projecting visibly outside the mouth as tusks, and loosely implanted in their sockets. In the females they are very much smaller. The limbs exhibit several structural peculiarities not found in other Deer. The lateral digits of both fore and hind feet are very little developed, the hoofs alone being present and their bony supports (found in all other Deer) wanting. In the tarsus the navicular, cuboid, and ectocuneiform bones are united.

The Muntjaks are solitary animals, very rarely even two being seen together. They are fond of hilly ground covered with forests, in the dense thickets of which they pass most of their time, only coming to the skirts of the woods at morning and evening to graze. They carry the head and neck low and the hind-quarters high, their action in running being peculiar and not very elegant, somewhat resembling the pace of a sheep, hence in southern India they bear the popular but erroneous name of “jungle sheep.” Though with no power of sustained speed or ex- tensive leap, they are remarkable for flexibility of body and facility of creeping through tangled underwood. Another popular name with Indian sportsmen is “ barking deer,” which is given on account of their alarm-cry, a kind of short shrill bark, like that of a fox but louder, which

may often be heard in the jungles they frequent both by day and by night. When attacked by dogs the males use their sharp canine teeth with great vigour, inflicting upon their opponents deep and even dangerous wounds.

There is some difference of opinion among zoologists as to the number of species of the genus Cervulus. Sir Victor Brooke, who investigated this question in 1878 (see Proceedings of the Zoological Society of London for that year, p. 898), came to the conclusion that there are certainly three which are quite well marked.

1. C. muntjae, found in British India, Burmah, the Malay Pen- insula, Sumatra, Java, Hainan, Banca, and Borneo. The general colour is a bright yellowish red, darker in the upper parts of the back ; the fore-legs from the shoulder downwards and the lower part of the hind legs, dark bluish brown

; anterior parts of the face from the muzzle to between the eyes, brown—a blackish line running up the inside of each frontal pedestal; chin, throat, inside of hind legs, and under surface of tail, white. The female has a black bristly tuft of hair on the spot from which the pedicles of the antlers of the male grow. The average length of the male, according to Jerdon, is 34 feet, tail 7 inches, height 26 to 28 inches. The female is a little smaller. The specimens from Java, Sumatra, and Borneo are of larger size than those from the mainland, and may possibly be of distinct species or race.

2. C. laerymans of Milne-Edwards, or Sclater's Muntjak of Swin- hoe, from Moupin, and near Hangchow, China.

3. C. reevesi, a very small species from southern China.

Although the limbs of the modern genus Cervulus have attained a considerable degree of specialization, the characters of the cranium, antlers, and teeth are primitive, and almost exactly reproduce those of an extinct deer of the middle Miocene period, the remains of which are found abundantly at Sansan in the south of France and Steinheim in Wirtemberg, which has been described under the names of Dierocerus elegans and Cervus fureatus (see Die Fauna von Steinheim, by Oscar Fraas, Stuttgart, 1870).

MUNZER, TuomAs(1490-1525),was born of poor parents at Stolberg in the Harz in 1490, was educated at Halle and Leipsic, where he graduated in 1515, was a teacher in the Martini gymnasium in Brunswick in 1517, and was appointed in the beginning of 1520 preacher in the church of St Mary at Zwickau. There he became the opponent of the friars on the one hand and of the humanist reformers on the other, while his eloquence, combined with his Christian socialism, gave him great power over the people. The weavers in Zwickau, who formed the most important trade in the town, were greatly influenced by Nicolas Storch, a man whose views were not unlike those of Miinzer, and who had been in close communication with those various communities in Bohemia who represented the Taborites, the Waldenses, and the Bohemian Brethren. Along with Storch, Miinzer formed a society governed by twelve apostles and seventy-two disciples, and in secret conventicles proclaimed the revelations of the Holy Spirit which he and some of his disciples claimed to possess. When the society became known

conflicts arose with the civil and ecclesi- astical authorities, but Miinzer and Storch seem to have maintained their position. In September 1521 Miinzer and several of his disciples began making preaching tours. Storch went to Wittenberg (see LuTHER), while Miinzer went through Bohemia, then by Silesia to Brandenburg and Saxony. He and his followers were fiercely opposed by Luther, who often asked the princes of the lands in which they appeared to banish them from their territories. In 1524 Miinzer was in Thuringia and in south Germany. Wherever he went his Christian socialism was welcomed by the oppressed peasantry, who were encouraged to rise in the insurrection (Peasants' War) which ended so disastrously: for them at Miihlhausen, 1525. After the battle Miinzer was taken prisoner and executed.

Miinzer was a successor in the 16th century of those enthusiastic sectaries the medieval disciples of St Francis of Assisi, who combined intense sympathy with the lot of the poor with strange semi-pantheist notions and ideas of a visible theocracy.

See Seidemann, Thomas Miinzer, eine Biographie, Dresden, 1842 ;

Ranke, Deutsche Geschichte im Zeitalter der Reformation, ii. ; Jorg, Deutschland in der Revolutionsperiode von 1522-26.

from the Himalayas.

MUN—MUR

MUNZINGER, WERNER (1832-1875), African traveller and linguist, was born at Olten in Switzerland, 4th April 1832. After studying at Bern, Munich, and Paris, he went to Egypt in 1852 and spent a year in Cairo studying the language. Entering a French mercantile house, he went as leader of a trading expedition to various parts of the Red Sea, fixing his quarters at Massowah in 1854 to 1855, where he acted as French consul. In 1855 he removed to Keren, the chief town of the Bogos, in the north of Abyssinia, which country he explored in all directions during the next six years. In 1861 he joined the expedi- tion under Heuglin to Central Africa, but separated from it in November in northern Abyssinia, proceeding along the Gash and Atbara to Khartim, and thence in 1862 to Kordofan, failing,

however, in his attempt to reach Darfur and Wadai, having meantime succeeded Heuglin as leader of the German African expedition. After a short stay in Europe in 1863, Munzinger returned to the north and north-east borderlands of Abyssinia, and in 1865 was appointed British consul at Massowah, rendering valuable aid to the English Abyssinian expedition in 1867, among other things exploring the almost unknown Afar country. In acknowledgment of his services he received the honour of C.B. In 1868 he was appointed French consul, and in 1871 by the khedive governor of Massowah with the title of “bey.” In 1870, with Captain Miles, Munzinger visited the interior of southern Arabia. As governor of Massowah he annexed to Egypt a part of northern Abyssinia, and in 1872 was made pasha and governor- general of the eastern Sudan. In an expedition from Tajurra Bay to the kingdom of Shoa, Munzinger was killed, along with his wife and many of his companions, in an attack by a body of Gallas on 14th November 1875, in the neighbourhood of Lake Assal.

Munzinger’s contributions to our knowledge of the country, people, and languages of north-eastern Africa are of solid value. See Proe. R. G. S., vol. xiii.; Jl. R. G. S., vols. xxxix., xli., and xlvi. (obituary notice) ; Petermann’s Mittheilungen for 1858, 1867, 1872, et sg.; Dietschi and Weber, Werner Munzinger, ein Lebensbild (1875). Munzinger published the following works :— Sitten und Reeht der Bogos (1859) ; Ostafrikanisehe Studien (1864) ; Die deutsehe Expedition in Ostafrika (1865); Vocabulaire de la Langue de Tigré (1865), besides papers in the geographical serials referred to, and a memoir on the northern borders of Abyssinia in the Zeitschrift fiir allgemeine Erdkunde, new series, iti.

MURADABAD, or Morapazan, a district in the lieu- tenant-governorship of the North-Western Provinces of India, lying between 28° 13’ and 29° 15’ N. lat. and 78° 7 and 79° 2’ E. long., is bounded on the N. by Bijnaur and the Tarai, on the E. by Rampur state, on the 8. by Budaun, and on the W. by the Ganges. The area is 2284 square miles. It lies within the great Gangetic plain, and is demarcated into three subdivisions by the rivers Ram- gangi and Sét. The eastern tract consists of a submontane country, with an elevation slightly greater than the plain below, and is traversed by numerous streams descending The central portion consists of a level central plain descending at each end into the valleys of the Ramganga and Sét. The

western section has a gentle slope towards the Ganges, with a rapid dip into the low- lands a few miles from the bank of the great river. The district is well wooded throughout, and mango groves abound in the neighbourhood of the flourishing villages which cluster thickly over its whole surface. Cultivation has spread over almost every part, patches of jungle rarely occurring, and only a few stray pieces of sandy soil or usar waste being found among the uplands. Shallow lakes (jhéls) are found at intervals, and are in every case utilized for irrigation. The district as a whole consists of a well- tilled and somewhat monotonous alluvial plain, unrelieved

by any striking natural features. The census of 1881 returned the population of the district, ex-

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clusive of non- Asiatics, at 1,155,173 (males 610,291, females 544,882), Hindus numbering 767,844, Mohammedans 384,713, and native Christians 1877. Muradabad contains five municipal towns, viz., Muradabad, 67,387; Amroha, 36,145; Sambhal, 35,196; Chan- dausi, 27,521 ; Dhanaura, 5204. The total area under cultivation in 1881-82 amounted to 1291 square miles, the staple crops being millets, wheat, pulses, and sugar-cane. As a whole the people are well off and live better than the peasantry in other districts. The labourers too have prospered, wages having risen considerably of late years. About two-sevenths of the cultivators possess hereditary rights, the remainder hold as tenants-at-will. Floods upon the Ganges and Ramganga cause much damage to the crops, and the district is liable to famine caused by drought. The last famine in 1868-69 was due to the failure of the raintall, but with the aid of Govern- ment relicf the difficulty was tided over without serious losses. The chief exports are grain and sugar-cane. The main line of the Oudh and Rohilkhand railway crosses the district ; there are also 654 miles of good road. The total revenue of Muradabad in 1881-82 amounted to 1,775,303 rupees, of which 1,399,450 were derived from the land-tax. Education was carried on in 1881 by means of 181 schools, with an aggregate of 5496 pupils. The climate is gen- erally healthy, except in the submontane tract bordering on the Tarai and in the lowlands of the Ganges and Sét. The average annual rainfall in the ten years ending 1870 was 37°6

inches. The annual mean temperature is 74°°5 Fahr., the lowest monthly mean being 56° in January, and the highest 86° in June.

For the early history of Muradabad sce BARELI. It passed into the possession of the British in 1801, and in 1857 joined in the general rebellion of that year. Order was restored early in May 1858.

MurApDABAD, town and headquarters of the above dis- trict, is situated on the right bank of the Ramganga river (28° 49’ N. lat., 78° 49’ E. long.), with a population in 1881 of 67,387, of whom 34,584 were males, and 32,803 females. It was founded in 1625 by Rustam Khan, who built the fort which overhangs the river bank. The town forms a large centre of trade in country produce. The engraved metal-ware of Muradabad has lately attracted much attention, the total value of the annual output being about 34 lakhs of rupees.

MURAENA is the name of an eel common in the Mediterranean, and highly esteemed by the ancient Romans ; it was afterwards applied to the whole genus of fishes to which the Mediterranean species belongs, and which is abundantly represented in tropical and sub- tropical seas, especially in rocky parts or on coral reefs. Some ninety species are known. In the majority a long

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Murena pieta, from the Indo-Pacific.

fin runs from the head along the back, round the tail to the vent, but all are destitute of pectoral and ventral fins. The skin is scaleless and perfectly smooth, in many species ornamented with a pretty pattern of very varied and bright colours, so that these fishes are frequently mistaken for snakes. The mouth is wide, the jaws strong and armed with formidable, generally sharply-pointed, teeth, which enable the Murena not only to seize its prey (which chiefly con- sists of other fishes) but also to inflict serious, and even sometimes dangerous, wounds on its enemies. It readily attacks persons who approach its places of concealment in shallow water, and is therefore justly feared by fishermen.

Plate I.

Some of the tropical Murenas exceed a length of 10 feet, but most of the species, among them the Mediter- ranean species, attain to only half that length. The latter, the “Morena” of the Italians and the Murexna helena of ichthyologists, was considered by the ancient Romans to be one of the greatest delicacies, and was kept in large

MURAL DE

HERE is scarcely one of the numerous branches of

decorative art which has not at some time or other

been applied to the ornamenting of wall-surfaces. Tt will

be convenient to classify the various methods under dif- ferent heads.

1. Reliefs sculptured in Marble or Stone.—This is the oldest method of wall-decoration, of which numerous ex- amples still exist. The tombs and temples of Egypt are very rich in this kind of mural ornament of various dates, extending over the enormous period of nearly 5000 years. These sculptures are, as a rule, carved in very low relief ; in many cases they are “counter-sunk,” that is, the most projecting parts of the figures do not extend beyond the

flat surface of the ground. Some unfinished reliefs dis-

covered in the rock-cut tombs of Thebes show the manner in which the sculptor set to work. The plain surface of the stone was marked out by red lines into a number of squares of equal size. The use of this was probably twofold: first, as a guide in enlarging the design from a small drawing, a method still commonly practised ; second, to help the artist to draw his figures with just proportions, following the very strict canons which were laid down by the Egyptians. No excessive realism or indi- viduality of style arising from a careful study of the life- model was permitted.2 When the

surface had been covered with these squares, the artist drew with a brush dipped in red the outlines of his relief, and then cut round them with his chisel.

When the relief was finished, it was, as a rule, entirely painted over with much minuteness and great variety of colours. More rarely the ground was left the natural tint of the stone or marble, and only the figures and hiero- glyphs painted. In the case of sculpture in hard basalt or granite the painting appears often to have been omitted altogether. The utter absence of perspective effects and the severe self-restraint of the sculptors in the matter of composition show a keen sense of artistic fitness in this kind of decoration, That the stern rigidity of these sculptured pictures did not in any way arise from want of skill or observation of nature on the part of the artists is at once apparent when we examine their representations of birds and animals; with the most unerring skill and precision the special characteristics of each creature and species were caught by the ancient Egyptian and repro- duced in stone or colour, not literally, but in a half-symbolic way, suggesting exactly those peculiarities of form, plum- age, or movement which are the essence and “ differentia ” of each, all other ideas bearing less directly on the point being carefully eliminated.

The subjects of these great mural sculptures are endless

life here or beyond the grave is reproduced with the closest attention to detail. The tomb of Tih at Sakkarah (about 4500 B.c.) has some of the finest and earliest specimens of these mural sculptures, especially rich in illustrations of the every-day domestic life and occupations of the Egyptians. The later tombs, as a rule, have sculptures

1 See also Fresco, Mosaic, KAsuf, and Tapestry.

? During the earliest times—more than 4000 years before our era |

there appear to have been exceptions to this rule.

; j ; ; human figures. in their variety ; almost every possible incident in man's | –

ponds and aquaria, It is not confined to the coasts of southern Europe, but is spread over the Indian Ocean, and is not uncommon on the coasts of Australia. Its body is generally of a rich brown, beautifully marked with large yellowish spots, each of which contains smaller brown spots.

depicting the religious ritual and belief of the people, and the temples combine these hieratic subjects with the history of the reigns and victories of the Egyptian kings.

The above remarks as to style and manner of execution may be applied also to the wall-sculptures from the royal palaces of Nineveh and Babylon, the finest of which are shown by inscriptions to date from the time of Sennacherib to that of Sardanapalus (from 705 to 625 n.c.). These are carved in very low relief with almost gem-like delicacy of detail on enormous slabs of white marble. The sacred sub- jects, generally representing the king worshipping one of the numerous Assyrian gods, are mostly large, often colossal in scale. The other subjects, illustrating the life and amuse-

ments of the king, his prowess in war or hunting, or long processions of prisoners and tribute-bearers coming to do him homage, are generally smaller and in some cases very minute in scale (fig. 1).

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Fic. 1.—Assyrian Relief, on a marble Wall-slab from the Palace of Sardanapalus at Nineveh.

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reliefs in long horizontal bands, and their reserved con- ventional treatment are somewhat similar to those of ancient Egypt, but they show a closer attention to anatomical truth and a greater love for strong dramatic effect than any of the Egyptian reliefs. As in the art of Egypt, birds and animals are treated with far greater realism than The plastic art of no period or country has ever surpassed in skill and life-like truth the Assyrian

reliefs of horses, mules, hounds, goats, lions, and many

other animals. A relief in the British Museum, represent- ing a lioness wounded by an arrow in her spine and dragging helplessly her paralysed hind legs, affords an example of wonderful truth and pathos. Very remarkable

technical skill is shown in all these sculptures by the way

in which the sculptors have obtained the utmost amount of effect with the smallest possible amount of relief (see

| BaBYLoNtIA, vol. iii. p. 190), in this respect calling strongly

meet Pe CORATION

to mind a similar peculiarity in the work of the Florentine Donatello.

The palace at Mashita on the hajj road in Moab, built by the Sasanian Chosroes IT. (614-627 a.p.), is ornamented on the exterior with very beautiful surface sculpture in stone. The designs of this are of peculiar interest as forming an evident link between Assyrian and Byzantine art, and they are not remotely connected with the decora- tion on Moslem buildings of comparatively modern date.!

Especially in Italy during the Middle Ages a similar treatment of marble in low relief was frequently used for wall-decoration. The most notable example is the beauti- ful series of reliefs on the west front of Orvieto cathedral, the work of Giovanni Pisano and his pupils in the early part of the 14th century. These are small reliefs, illustra- tive of the Oldand New Testaments, of most graceful design and skilful execution. A growth of branching foliage serves to unite and frame the tiers of subjects.

Of a widely different class, but of considerable import- ance in the history of mural decoration, are the very beautiful reliefs, sculptured in stone and marble, with which Moslem buildings in many parts of the world are ornamented. These are mostly geometrical patterns of great intricacy and beauty, which cover large surfaces, fre- quently broken up into panels by bands of more flowing ornament or Arabic inscriptions. The mosques of Cairo, India, and Persia, and the domestic Moslem buildings of Spain are extremely rich in this magnificent method of decoration. In western Europe, especially during the 15th century, stone panelled-work with rich tracery formed a large part of the scheme of decoration in all the more splendid buildings. Akin to this, though without actual relief, is the very sumptuous stone tracery,—inlaid flush into rough flint walls,—which was a mode of ornament largely used for enriching the exteriors of churches in the counties of Norfolk and Suffolk. It is almost peculiar to that district, and is an admirable example of the skill and taste with which the medizval builders adapted their method of ornamentation to the materials which came naturally to hand.?

2. Marble Veneer.—Another widely-used method of mural decoration has been the application of thin marble linings to wall-surfaces, the decorative effect being pro- duced by the natural beauty of the marble itself and not by sculptured reliefs. One of the oldest buildings in the world, the so-called

“‘Temple of the Sphinx” among the Gizeh pyramids, is built of great blocks of granite, the inside of the rooms being lined with slabs of beautiful semi-transparent African alabaster about 3 inches thick. In the Ist century very thin veneers of richly-coloured marbles were largely used by the Romans to decorate brick and stone walls. Pliny (ZF. W., xxxvi. 6) speaks of this practice as being a new and degenerate invention in his time. Many examples exist at Pompeii and in other Roman buildings. Numerous Byzantine churches, such as St Saviour’s at Coustantinople, and St George’s, Thes- salonica, have the lower part of the internal walls richly

1 Among the Mashita carvings occurs that oldest and most widely spread of all forms of Aryan ornament—the sacred tree between two animals, The sculptured slab over the ‘‘lion-gate” at Mycene has the other common variety of this motive—the fire-altar between the beasts. These designs, occasionally varied by figures of human wor- shippers instead of the beasts, survived in a most extraordinary way long after their meaning had been forgotten ; even down to the present day in some form or other they frequently appear on carpets and other textiles of Oriental manufacture.

? Wilkinson, Anc. Egypt. (1847); Descr. de V Egypte (Paris, 1809, et sq.); Layard, Monuments of Nineveh (1849-53); Botta, Mon. de Ninive (1847-50) ; Texier, L’Arménie, la Perse, &c. (1840-52) ; Gruner, Die Bas-reliefs . . . zu Orvieto (1858); Champollion, Mon. de V Egypte (1835-45) ; Mariette, Descr. de Denderah (1878-75) ; Ros- sellino, Monwmenti ad’ Egitto, 1826.

ornamented in this way. It was commonly used to form a dado, the upper part of the building being covered with mosaic. The cathedral of Monreale and other Siculo- Norman buildings owe a great deal of their splendour to these linings of richly-variegated marbles. In most cases the main surface is of light-coloured marble or alabaster, inlaid bands of darker tint or coloured mosaic being used to divide the surface into panels. The peculiar Italian-Gothic of northern and central Italy during the 14th and 15th centuries, and at Venice some centuries earlier, relied greatly for its effects on this treatment of marble. St Mark’s at Venice and the cathedral of Florence are mag- nificent examples of this work used externally. It is in every case a mere skin, and is in no way connected with the stability of the structure.

Both inside and out most of the richest examples of Moslem architecture owe much to this method of decoration ; the mosques and palaces of India and Persia are in many cases completely lined with the most lustrous and brilliant sorts of marble, of con- trasting tints arranged and fitted together with consummate skill and knowledge of harmony.

3. Wall-Linings of Glazed Bricks or Tiles.—This is a very important class of decoration, and from its almost imperishable nature, its richness of colour, and its brilliance of surface is capable of producing a splendour of effect that can only be rivalled by glass mosaics. In the less important form —that of bricks modelled or stamped in relief with figures and inscriptions, and then coated with a brilliant colour in siliceous enamel—it was largely used by the ancient Egyptians and Assyrians as well as by the later Sasanians of Persia. In the 11th and 12th centuries the Moslems of Persia brought this art to great perfection, and used it on a large scale, chiefly, though not invariably, for internal walls. The main surfaces were covered by thick earthenware tiles, overlaid with a white enamel. These were not rectangular, but of various shapes, mostly some form of a star, arranged so as to fit closely together. Very delicate and minute patterns were then painted on the tiles, after the first firing, in a copper-like colour with strong metallic lustre, produced by the deoxidization of a metallic salt in the process of the second firing. Bands and friezes with Arabic inscriptions, modelled boldly in high relief, were used to break up the monotony of the surface. In these, as a rule, the projecting letters were painted blue, and the flat ground enriched with very minute patterns in the lustre-colour. This combination of bold relief and delicate painting produces great vigour and richness of effect, equally telling whether viewed in the mass or closely examined tile by tile. In the 15th century lustre-colours, though still largely employed for plates, vases, and other vessels, especially in Spain, were but little used for tiles; and another class of ware, rich in the variety and brilliance of its colours, was extensively used by Moslem builders all over the Mohammedan world. The most sumptuous sorts of tiles used for wall coverings are those of the so-called “‘ Rhodian” and Damascus wares, the work of Persian potters at many places. Those made at Rhodes are coarsely executed in comparison with the produce of the older potteries at Ispahan and Damascus (see Pottery). These are rectangular tiles of earthenware, covered with a white “slip” and painted in the most brilliant colours with

slightly conventionalized representa- tions of various flowers, especially the rose, the hyacinth, and the carnation. The red used isa very rich harmonious colour, applied in considerable body, so as to stand out in slight relief. Another class of design is more geometrical, forming regular repeats; but the most beautiful composi- tions are those in which the natural growth of trees and flowers is imitated, the branches and blossoms spreading freely over a large surface covered by hundreds of tiles

without any repetition. One of the finest examples is the “Mecca wall” in the mosque of Ibrahim Agha, Cairo; and other Egyptian mosques are adorned in the same magnifi- cent way (fig. 2). Another variety, the special production

Cairo. 10 inches square.

of Damascus, has the design almost entirely executed in blue. It was about the year 1600 a.p., in the reign of Shah Abbas I., that this class of pottery was brought to greatest perfection, and it is in Persia that the most magni- ficent examples of its use are to be found. Nothing can surpass the splendour of effect produced by these tile- coverings, varieties of which, dating from the 12th to the 17th centuries, were largely used in all the chief buildings of Persia. The most remarkable examples for beauty of design and extent of surface covered by these tiles are the mosque at Tabriz, built by Ali Khoja in the 12th century, the ruined tomb of Sultan Khodabend (1303-1316 a.p.) at Sultanieh, the palace of Shah Abbas I. and the tomb of Abbas II. (0b. 1666 a.p.) at Ispahan, all of which buildings are covered almost entirely inside and out with this magnificent sort of decoration.

Another important class of wall-tiles are those manu- factured by the Spanish Moors, called “azulejos,” especially during the 14th century. These are in a very different style, being designed to suggest or imitate mosaic. They have intricate interlacing geometrical patterns marked out by lines in slight relief; brilliant enamel colours were then burned into the tile, the projecting lines forming boundaries for the pigments. A very rich effect is pro- duced by this combination of relief and colour. They are mainly used for dados about 4 feet high, often surmounted by a band of tiles with

painted inscriptions. The Alham- bra and Generalife palaces at Granada, begun in the 13th century, but mainly built and decorated by Yusuf I. and Mohammed V. (1333-1391 a.p.), andthe Alcazar at Seville have the most beautiful examples of these “azulejos.” The latter building chiefly owes its decorations to Pedro the Cruel (1364 a.p.), who employed Moorish workmen for its tile-coverings and other ornaments. Many other buildings in southern Spain are enriched in the same way, some as late as the 16th century.

Almost peculiar to Spain are a variety of wall-tile the work of Italians in the 16th and 17th centuries. These are effective, though rather coarsely painted, and have a rich yellow as the predominant colour. The Casa de

Pilatos and Isabel’s chapel in the Alcazar palace, both at Seville, have the best specimens of these, dating about the year 1500. In other Western countries tiles have been used more for pavements than for wall-decoration.1

4, Wall-Coverings of Hard Stucco, frequently enriched with Reliefs.—The Greeks and Romans possessed the secret of making a very beautiful hard kind of stucco, creamy in colour, and capable of receiving a polish like that of marble ; it would stand exposure to the weather. Those of the early Greek temples which were built, not of marble, but of stone, such as the Doric temples at Avgina, Phiga- leia, Peestum, and Agrigentum, were all entirely coated inside and out with this beautiful material—itself pleasant both in texture and hue, and an admirable surface for the further polychromatic decoration with which all Greek buildings seem to have been ornamented. Another highly artistic use of stucco among the Greeks and Romans for the interiors of buildings consisted in covering the walls and vaults with a smooth coat, on which while still wet the outlines of figures, groups, and other ornaments were sketched with a point; more stucco was then applied in lumps and rapidly modelled into delicate reliefs before it had time to set. Some tombs in Magna Grecia of the 4th century B.c. are decorated in this way with figures of nymphs, cupids, animals, and wreaths, all of which are models of grace and elegance, both in form and action, and extremely

remarkable for the dexterous way in which a few rapid touches of the modelling tool or thumb have

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Fia. 3.—Modelled Stucco Wall-Relief, from a Tomb in Magna Grecia.

About half full-size.

produced a work of the highest artistic beauty and spirit (fig. 3). Roman specimens of this sort of decoration are very common, fine examples have been found in the baths of Titus and numerous tombs near Rome, as well

1 See Layard, Nineveh ; Texier, L' Arménie, &c.; Prisse d'Avennes and Bourgoin, L' Art Arabe (1869-77); Hessemer, Arabische Bau- Verzierungen (1853); Owen Jones, Alhambra (1842); Murphy, Arabian Antiquities of Spain (1818) ; Monumentos Arquitectonicos de Espaita (1859-82), article '' Alhambra"; Parvillée, Architect. et décor. Turques, xv' Siecle (1874) ; Coste, Mon. mod. de la Perse (1867).

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as in many of the houses of Pompeii. executed with great skill and frequently with good taste, though in some cases, especially at Pompeii, elaborate architectural compositions with awkward attempts at effects of violent perspective, modelled in slight relief on flat wall-surfaces, produce a very unpleasing effect. Other Pompeian examples, where the surface is divided into flat panels, each containing a figure or group, have great merit for their delicate richness of effect, without offending against the canons of wall-decoration, one of the first conditions of which is that no attempt

should be made to disguise the fact of its being a solid wall and a flat surface.

The Moslem architects of the Middle Ages, who excelled in almost all possible methods of mural decoration, made great use of stucco ornament in the most elaborate and magnificent way, both for external and internal walls. The stucco is modelled in high or low relief in great variety of geometrical patterns, of wonderful beauty and richness, alternating with bands of more flowing ornament, or long Arabic inscriptions. Many of their buildings, such as the mosque of Tultin at Cairo (879 a.p.), owe nearly all their beauty to this fine stucco work, the purely architectural shell of the structure being often quite simple and devoid of ornament. These stucco reliefs were, as a rule, further decorated with delicate painting in gold and colours, pro- ducing an effect of indescribable beauty and splendour. The Moorish tower at Segovia in Spain is a good example

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of this class of ornament used externally. With the exception of a few bands of brick and the stone quoins at the angles, the whole exterior of the tower is covered with a network of stucco reliefs in simple geometrical patterns. The Alhambra at Granada and the Alcazar at Seville have the richest examples of this work, both in the delicate intricacy of the designs and in the brilliant colours with which they are painted. The lower part of the walls 1s lined with marble or tiles to a height of about 4 feet, and above that in many cases the whole surface is encrusted with these reliefs, the varied surface of which, by pro- ducing’ endless gradations of shadow, takes away any

DECORATION

These are mostly | possible harshness or over-gaudiness from the brilliance of

| were well tanned and cut into rectangular shapes. | were then covered with silver leaf, which was varnished

the gold and colours (fig. 4).}

During the 16th century, and even earlier, stucco wall- reliefs were used with considerable skill and decorative effect in Italy, England, and other Western countries. Per- haps the most graceful examples are the reliefs with which Vasari in the 16th century encrusted pillars and other parts of the court in the Florentine Palazzo Vecchio, built of plain stone by Michelozzi in 1454. These are very beau- tiful reliefs, some of flowing vines and other plants winding spirally round the columns. The English examples of this work are very effectively designed, though coarser in exe- cution. The outside of an old half-timbered house in the market-place at Newark-upon-Trent has high reliefs in stucco of canopied figures, dating from the end of the 15th century. The counties of Essex and Suffolk are very rich in examples of this work used externally ; and many 16th- century houses in England have fine internal stucco de- coration, especially Hardwicke Hall (Derbyshire), one of the rooms of which has the upper part of the wall en- riched with life-sized stucco figures in high relief, forming a deep frieze all round. The best English stucco work of this sort is very remarkable for its freedom and spirit of design, as well as for certain grace of line, which is a sur- vival of the old medizval sense of beauty, then rapidly passing away.

5. Sgraffito.—This is a variety of stucco work used chiefly in Italy from the 16th century downwards, and employed only for exteriors of buildings, especially the palaces of Tuscany and northern Italy. The process is this. The wall is covered with a coat of stucco made black by an admixture of charcoal; over this a second very thin coat of white stucco is laid. When it is all hard the design is ©

| produced by cutting and scratching away the white skin,

so as to show the black under-coat. Thus the drawing appears in black ona white ground. This work is effective at a distance, as it requires a bold style of handling, in which the shadows are indicated by cross-hatched lines more or less near together.2, Flowing arabesques mixed with grotesque figures occur most frequently in sgraffito. It is still largely practised in northern Italy, and has been used with success in the external decoration of the South Kensington Academy of Music.

6. Stamped Leather.—This was a very magnificent and expensive form of wall-hanging, chiefly used during the 16th and 17th centuries. Skins, generally of goats or calves, They

with a transparent yellow lacquer, making the silver look like gold. The skins were then stamped or embossed with patterns in relief, forméd by heavy pressure from metal dies, one in relief and the other sunk. The reliefs were then painted by hand in many colours, generally brilliant in tone. Italy and Spain (especially Cordova) were important seats of this manufacture ; and in the 17th century a large quantity was produced in France. Fig. 5 gives a good example of Italian stamped leather of the 16th century. In England, chiefly at Norwich, this manufacture was carried on in the 17th and 18th centuries, in many cases of very excellent design. In durability and richness of effect stamped leather surpasses most other forms of movable wall-decoration.

7. Painted Cloth.—Another form of wall-hanging, used most largely during the 15th and 16th centuries, and in a less extensive way a good deal earlier, is canvas painted to imitate tapestry. English medizval inventories both

1 Tt is unfortunate that the otherwise valuable work of Owen Jones on the Alhambra gives a very false and unpleasing notion of the colouring of the place.

2 A good description of the process is given by Vasari, Tre Arti del Disegno, cap. Xxvi.

of ecclesiastical and domestic goods frequently contain items such as these: ‘“stayned cloths for hangings,” “ paynted , of q) .

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1c. 5.—Italian Stamped Leather ; 16th century cloths with stories and batailes,” or “paynted cloths of beyond sea work,” or “of Flaunder’s work.” Many good artists working at Ghent and Bruges during the first half of the 15th century produced very fine work of this class, as well as designs for

real tapestry. Several of the great Italian artists devoted their utmost skill in composition and invention to the painting of these wall-hangings. The most important existing example is the magnificent series of paintings of the triumph of Julius Czesar executed by Andrea Mantegna (1485-1492) for Ludovico Gonzaga, duke of Mantua, and now at Hampton Court. These are usually, but wrongly, called “cartoons,” as if they were designs meant to be executed in tapestry; this is not the case, as the paintings themselves were used as wall-hangings. They are nine in number, and each compartment, 9 feet square, was separated from the next by a pilaster. They form a continuous procession, with life-sized figures of unrivalled grace and beauty, remarkable alike for their com- position, drawing, and delicate colouring,—the latter un- fortunately much disguised by the most coarse and tasteless “restoration.” Like most of these painted wall-hangings, they are executed in tempera, and rather thinly painted, so that the pigment might not crack off through the cloth falling slightly into folds.) Another remarkable series of painted cloth hangings are those at Rheims cathedral, admirable for their noble breadth of design and rich colour- ing.? In some cases actual dyes were used for this sort of work, A MS. of the 15th century® gives receipts for “painted cloth,” showing that sometimes they were dyed in a manner similar to those Indian stuffs which were afterwards printed, and are now called chintzes. These receipts are for real dyes, not for pigments, and among them is the earliest known description of the process called

1 See Crowe and Cavalcaselle, Painting in North Italy, i. p. 404, 1871; and Waagen, Art Treasures, 1854.

2 Leberthais, Toiles peintes de Reims (Paris).

3 Merrifield, Treatises on Painting, 1849.

“setting” the woad or indigo vat, as well as a receipt for removing or “discharging” the colour from a cloth already dyed. Another method employed was a sort of ‘ encaustic ” process ; the cloth was rubbed all over with wax, and then painted in tempera; heat was then applied so that the

colours sank into the melting wax, and were thus firmly fixed upon the cloth.

8. Printed Hangings and Wall-Papers.—The printing of various textiles with dye-colours and mordants is probably one of the most ancient of the arts. Pliny (1. WV., xxxv.) clearly describes a dyeing process employed by the ancient Egyptians, in which the pattern was probably formed by printing from blocks. Various methods have been used for this work — wood blocks in relief, engraved metal plates, stencil plates, and even hand-painting ; frequently two or more of these methods have been employed for the same pattern. The use of printed stuffs is of great antiquity among the Hindus and Chinese, and was cer- tainly practised in western Europe in the 13th century, and perhaps earlier. The South Kensington Museum has 13th-century specimens of block-printed silk made in Sicily, of very beautiful design. Towards the end of the 14th century a great deal of block-printed linen was made in Flanders, and largely imported into England.

Wall-papers did not come into common use in Europe till the 18th century, though they appear to have been used much earlier by the Chinese. A few rare examples exist in England which may be as early as the 16th cen- tury; these are imitations, generally in flock, of the fine old Florentine and Genoese cut velvets, and hence the style of the design in no way shows the date of the wall- paper, the same traditional patterns being reproduced for many years with little or no change. Machinery enabling paper to be made in long strips was not invented till the end of the last century, and up to that time wall-papers were printed on small square pieces of hand-made paper, difficult to hang, disfigured by numerous joints, and com- paratively costly ; on these accounts wall-papers were slow in superseding the older and more magnificent modes of mural decoration, such as wood-panelling, painting, tapestry, stamped leather, and painted cloth. A little work by Jackson of Battersea, printed in London in 1744, throws some light on the use of wall-papers at that time. He gives reduced copies of his designs, mostly taken from Italian pictures or antique sculpture during his residence in Venice. Instead of flowing patterns covering the wall, his designs are all pictures— landscapes, architectural scenes, or statues——treated as panels, with plain paper or painting between. They are all printed in oil, with wooden blocks worked with a rolling press, apparently an invention of his

own. They are all in the worst possible taste, and yet are offered as great improvements on the Chinese papers which he says were then in fashion.

The method of printing wall-papers of the better sort is probably the same now that it has always been. Wooden blocks with the design cut in relief, one for each colour, are applied by hand, after being dipped in an elastic cloth sieve charged with wet tempera pig- ment, great care being taken to lay each block exactly on the right place, so that the various colours may ‘‘register” or fit together. In order to suit the productions of the paper-mills these blocks are made, in England 21 inches wide, and in France 18 inches wide ‘ the length of the block is limited to what the workman can easily lift with one hand,—2 feet being about the limit, as the blocks are necessarily thick, and in many cases made heavier by being inlaid with copper, especially the thin outlines, which, if made of wood, would not stand the wear and tear of printing. In “flock” and gold or silver printing the design is first printed in strong size ; the flock (finely cut wool of the required colour), or metallic powder is then sprinkled by hand all over the paper ; it adheres only to the wet size, and is easily shaken off the ground or unsized part. If the pattern is required to stand out in some relief this process 1s repeated several times, and the whole paper then rolled to com- press the flock. Cheaper sorts of paper are printed by machinery, the design being cut on the surface of wooden rollers, under which

the paper passes. The chief drawback to this process is that all the colours are applied rapidly onc after the other, without allow- ing each to dry separately, as is done in hand printing. A some- what blurred appearance is the usual result.

Though at first wall-papers were a mere makeshift and feeble imitation of rich textiles, yet, with a good feeling for the harmonies of colour and a regard for the technical necessities of the process, very rich and beautiful effects may be produced at a comparatively small cost if hand- printing be adopted. Imitations of stamped leather are now produced with great success, though of inferior dura- bility. Very thick tough paper is used for this, and

treated in the same way as the real skins mentioned above. Fig. 6 is a good English example of 18th-century wall-

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Fic. 6.—Early 18th-century Wall-Paper.

22 inches wide.

paper printed on squares of stout hand-made paper 22 inches wide. The design is apparently copied from an Indian chintz.

PAINTING.

This is naturally the most important and the most widely used of all forms of wall-decoration, as well as perhaps the earliest.

Egyptian Paintings—Egypt is the chief storehouse of ancient specimens of this, as of almost all the arts. Owing to the intimate connexion between the sculpture and paint: ing of early times, the remarks above both as to subjects and treatment under the head of Egyptian wall-sculpture will to a great extent apply also to the paintings. It is a very important fact, and one which testifies clearly to the enormous antiquity of Egyptian civilization, that the earliest paintings, dating more than 4000 years before our era, are also the cleverest both in drawing and execution. In later times the influence of Egyptian art, especially in painting, was very important among even very distant

nations. In the 6th century B.c. Egyptian colonists, in- troduced by Cambyses into Persepolis, largely influenced the painting and sculpture of the great Persian empire and throughout the valley of the Euphrates. In a lesser degree the art of Babylon and-Nineveh had felt consider- able Egyptian influence several centuries earlier. The same influence affected the early art of the Greeks and the Etrurians, and it was not till the middle of the 5th century B.c. that the further development and perfecting of art in Greece obliterated the old traces of Egyptian mannerism. After the death of Alexander the Great, when Egypt came into the possession of the Lagide (320 B.C.), the tide of influence flowed the other way, and Greek art modified though it did not seriously alter the charac- teristics of Egyptian painting and sculpture, which still retained much of their early formalism and severity. And yet the increased sense of beauty, especially in the human face, derived from the Greeks was counterbalanced by loss of vigour and force; art under the Ptolemies ceased to have a real life and became a mere dull copyism of earlier traditions,

The general scheme of mural painting in the buildings of ancient Egypt was very complete and magnificent. Columns, mouldings, and other architectural features were enriched with patterns in brilliant colours; the flat wall- spaces were covered with figure-subjects, generally in horizontal bands, and the ceilings were richly ornamented with sacred symbols, such as the vulture, or painted blue and studded with gold stars to symbolize the sky. The wall-paintings are executed in tempera on a thin skin of fine lime, laid over the brick, stone, or marble to form a smooth and slightly absorbent coat to receive the pigments, which were most brilliant in tone and of great variety of tint. Not employing fresco, the Egyptian artists were not restricted to “earth colours,” but occasionally used purples, pinks, and greens which would have been destroyed by fresh lime. The blue used is a very beautiful colour,

and is generally laid on in considerable body—it is fre- quently a “‘smalt” or deep-blue glass, coloured by copper oxide, finely powdered. Red and yellow ochre, carbon- black, and powdered chalk-white are most largely used. Though in the paintings of animals and birds considerable realism is often seen (fig. 7), yet for human figures certain

Fic. 7.—Egyptian Wall-Painting of the Ancient Empire, in the Bulak Museum, ‘Taken from Loftie’s Ride in Egypt.

conventional colours are employed, ¢.g., white for females’ flesh, red for the males, or black to indicate people of negro race. Heads are painted in profile, and little or no shading is used. Considerable knowledge of harmony is shown in the arrangement of the colours; and otherwise harsh combinations of tints are skilfully softened and brought into keeping by thin separating lines of white or yellow. Though at first sight the general colouring, if seen in a museum, may appear crude and gaudy, yet it should be remembered that the internal paintings were much softened by the very dim light that was sparingly

admitted into Egyptian buildings, and those outside were |

subdued by contrast with the brilliant blue sky and glowing sunshine under which they were always seen.!

Etruscan Painting. —The rock-cut sepulchres of the Etrurians (see Erruria, vol. viii. p. 645) supply the only existing specimens of their mural painting ; and, un- like the tombs of Egypt, only a small proportion appear to have been decorated in this way. The actual dates of these paintings are very uncertain, but they range possibly from about the 8th century s.c. down to almost the Christian era. The tombs which possess these paintings are mostly square-shaped rooms, with slightly-arched or gabled roofs, excavated in soft sandstone or tufa hillsides. The earlier ones show distinct Egyptian influence alike in drawing and in composition: they are very broadly designed with flat unshaded tints, the faces in profile, except the eyes, which are drawn as if seen in front. Colours, as in Egypt, are used conventionally—male flesh red, white or pale yellow for the females, black for demons. In one respect these paintings differ from those of the Egyptians ; very few colours are used—red, brown, and yellow ochres, carbon-black, lime or chalk-white, and occasionally blue are the only pigments. The rock-walls are prepared by being covered with a thin skin of lime stucco, and hme or chalk is mixed in small quantities with all the colours ; hence the restriction to “earth pigments,” made doubly necessary

by the constant dampness of these sub- terranean chambers. The process employed was in fact a kind of fresco, though the stucco ground was not applied in small patches only sufficient for the day's work; the dampness of the rock was enough to keep the stucco skin moist, and so allow the necessary infiltration of colour from the surface. Many of these paintings when first dis- covered were quite fresh in tint and uninjured by time, but they are soon dulled by exposure to light. In the course of centuries great changes of style naturally took place ; the early Egyptian influence, probably brought to Etruria through the Phoenician traders, was succeeded by an even more strongly-marked Greek influence—at first archaic and stiff, then developing into great beauty of drawing, and finally yielding to the Roman spirit, as the degradation of Greek art advanced under their powerful but inartistic Roman conquerors.

- Throughout this succession of styles—Egyptian, Greek, and Greco-Roman—there runs a distinct undercurrent of individuality due to the Etruscans themselves. This appears not only in the drawing but also in the choice of subjects. In addition to pictures of banquets with musicians and dancers, hunting and racing scenes, the workshops of different craftsmen and other domestic sub- jects, all thoroughly Hellenic in sentiment, other paintings occur which are very un-Greek in feeling. These repre- sent the judgment and punishment of souls in a future life. Mantus, Charun, and other infernal deities of the Rasena, hideous in aspect and armed with hammers, or furies, depicted as black bearded demons winged and brandishing live snakes, terrify or torture shrinking human souls. Others, and not the earliest in date, represent human sacrifices, such as those at the tomb of Patroclus— a class of subjects which, though Homeric, appears but rarely to have been selected by Greek painters. The con- stant import into Etruria of large quantities of fine Greek painted vases appears to have largely contributed to keep up the supremacy of Hellenic influence during many cen-

1 See Champollion, Panthéon Egyptien (1825); De Joannis, Pein- tures murales . . . des Kgyptiens; Biechy,, La Peinture chez les Egyptiens (1868); Lenormant,

turies, and by their artistic superiority to have prevented the development of a more original and native school of art. Though we now know Etruscan painting only from the tombs, yet Pliny mentions (//. W., xxxv. 3) that fine wall-paintings existed in his time, with colours yet fresh, on the walls of ruined temples at Ardea and Lanuvium, executed, he says, before the founding of Rome. As before mentioned, the actual dates of the existing paint- ings are very uncertain. It cannot therefore be positively asserted that any existing specimens are much older than 600 B.c., though some, especially at Veli, certainly appear to have the characteristics of more remote antiquity. The most important of these paintings have been discovered in the cemeteries of Veii, Cere, Tarquinii, Vulci, Cervetri, and other Etruscan cities."

Greek Painting.—This is a very obscure subject, for, although Strabo, Pliny, Pausanias, and others have left us minute descriptions of Greek paintings and ample accounts of painters and styles, yet of the pictures themselves almost nothing now remains. Even in Egypt the use of colour does not appear to have been more universal than it was among the Greeks, who applied it freely to their marble statues and reliefs, the whole of their buildings inside and out, as well as for the decoration of flat wall-surfaces. They appear to have cared but little for pure form, and not to have valued the delicate ivory-like tint and beautiful texture of their fine Pentelic and Parian marbles, except as a ground for coloured ornament. A whole class of artists, called dyadpdrwv éyxavorai, were occupied in colouring marble sculpture, and their services were very highly valued. In some cases, probably for the sake of hiding the joints and getting a more absorbent surface, the marble, however pure and fine in texture, was covered with a thin skin of stucco made of mixed linie and pow- dered marble. Among the extremely rare specimens of Greek painting still existing, the most important is an alabaster sarcophagus, found in a tomb near Corneto, and now in the Etruscan museum at Florence.* This is decorated outside with very beautiful and purely Greek paintings, executed on a stucco skin as hard and smooth as the alabaster itself. The pictures represent combats of the Greeks and Amazons, drawn with marvellous beauty of outline and grace of movement and composition. The colouring, though rather brilliant, is very simply treated, and the figures are kept strictly to one plane without any attempt at complicated perspective. Other most valuable specimens of

Greek art, found at Herculaneum and now in the Naples museum, are some small paintings, one of girls playing with dice, another of Theseus and the Minotaur. These are painted with miniature-like delicacy on the bare surface of marble slabs ; they are almost mono- chromatic, and are of the highest beauty both in drawmg and in their skilfully-modelled gradations of shadow— quite unlike any of the Greek vase-paintings. The first-mentioned painting is signed AAESANAPOS AOHNAIOZ. It is probable that the strictly archaic paintings of the Greeks, such as those of Polygnotus in the 5th century B.c., executed with few and simple colours, had much resemblance to those on vases, but Pliny is certainly wrong when he asserts that, till the time of Apelles (c. 350-310 B.c.), the Greek painters only used black, white, red, and

2 See Dennis, Cities and Cemeteries of Etruria (1878) ; Golini, Pitture murali Etrusche; Micali, Mon. inediti; Mon. and Ann. d. Inst. Arch. (Rome, various years); Canina, L'entica Etruria (1846, et sq.) 3 Bartoli, Sepolchri Rom. ed Etrus. (1727); Miiller, Htrusker, and other works ; Helbig, Pitture Cornetane (1863); Inghirami, Afon. Etruschi (1821-26) ; Byres, Sepulchral Caverns of Tarquinia (1842) ; eigaom Rochette, Mon. d' Antiquité Grecque, Etrusque, et Romaine

3 This process, cireumlitio, is mentioned by Pliny (ZZ. V., xxxv. 40).

4 See Afon. Inst. .irch., Rome, ix. plate 60.

yellow.! Judging from the peculiar way in which the Yreeks and their imitators the Romans used the names of colours, it appears that they paid more attention to tones and relations of colour than to actual hues. Thus most Greek and Latin colour-names are now quite untranslatable. Homer's "wine-like sea" (oivow), Sophocles's " wine- coloured ivy" (Gd. Col.), and Horace's " purpureus olor" probably refer less to what we should call colour than to the chromatic strength of the various objects and their more or less strong powers of reflecting light, either in motion or when at rest. Nor have we any word like Virgil's "flavus," which could be applied both to a lady's hair and to the leaf of an olive-tree.?

During the best periods of Greek art the favourite classes of subjects were scenes from poetry, especially Homer, and contemporary history. The names rwaxobjKy and rod roxéAn were given to many public buildings from their walls being covered with paintings. Additional interest was given to the historical subjects by the intro- duction of portraits ; ¢.g.,in the great picture of the battle of Marathon (490 B.c.), on the walls of the oroa qorKxiAy in Athens, portraits were given of the Greek generals Miltiades, Callimachus, and others. This picture was painted about forty years after the battle by Polygnotus and Micon. One of the earliest pictures recorded by Pliny (xxxv. 8) represented a battle of the Magnesians (c. 716 B.c.); it was painted by Bularchus, a Lydian artist, and bought at a high price by King Candaules. Many other important Greek historical paintings are men- tioned by Pausanias and earlier writers. The Pompeian mosaic of the defeat of the Persians by Alexander is probably a Romanized copy from some celebrated Greek painting ; it obviously was not designed for mosaic work.

Landscape painting appears to have been unknown among the Greeks, even as a background to figure subjects. The poems especially of Homer and Sophocles show that this was not through want of appreciation of the beauties of nature, but partly, probably, because the main object of Greek painting was to tell some definite story, and also from their just sense of artistic fitness, which prevented them from attempting in their mural decorations to dis- guise the flat solidity of the walls by necessarily delusive effects of aerial perspective and distance.

It is interesting to note that even in the time of Alex- ander the Great the somewhat archaic works of the earlier painters were still highly appreciated. In particular Aris- totle gives high praise to Polygnotus, both for his power of combining truth with idealization in his portraits and for his skill in depicting men’s mental characteristics ; on this account he calls him 6 7}Ooypados. Lucian too is no less enthusiastic, and praises Polygnotus alike for his grace, drawing, and colouring. Later painters, such as Zeuxis and Apelles, appear to have produced easel pictures more than mural paintings, and these, being easy to move, were mostly carried off to Rome by the early emperors. Hence Pausanias, who visited Greece in the time of Hadrian, mentions but few works of the later artists. Owing to the lack of existing specimens of Greek painting it would be idle to attempt an account

of their technical methods, but no doubt those employed by the Romans described below were derived with the rest of their art from the Greeks. Speaking of their stucco, Pliny refers its superiority over that made by the Romans to the fact

1 Pliny's remarks on subjects such as this should be received with caution. He was neither a scientific archeologist nor a practical artist.

2 So also a meaning unlike ours is attached to Greek technical words —by révos they meant, not ''tone," but the gradations of light and shade, and by &puoy7 the relations of colour. See Pliny, 1. '., xxxv. 5; and Ruskin, Afod. Painters, pt. iv. cap. 18.

the Ancients, deliv. at Univ. Coll. Lon. (1882) ; Hermann,

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that it was always made of lime at least three years old, and that it was well mixed and pounded in a mortar before being laid on the wall; he is here speaking of the thick stucco in many coats, not of the thin skin mentioned above as being laid on marble.

Greek mural painting, like their sculpture, was chiefly used to decorate temples and public buildings, and com- paratively rarely either for tombs ® or private buildings,— at least in the days of their early republican simplicity. They were in the true sense of the word works of monu- mental art, and were no doubt designed and executed with that strict self-restraint and due subordination to their architectural surroundings which we see so strongly marked in all Greek sculpture of the best periods.*

Roman Painting.—A very large number of Roman mural paintings now exist, of which by far the greatest quantity was discovered in the private houses and baths of Pompeii, nearly all dating between 63 a.D., when the city was ruined by an earthquake, and 79 a.p., when it was buried by Vesuvius. A catalogue of these and simi- lar paintings from Herculaneum and Stabiz, compiled by Professor Helbig, comprises 1966 specimens. The ex- cavations in the baths of Titus and other ancient build- ings in Rome, made in the early part of the 16th century, excited the keenest interest and

admiration among the painters of that time, and very largely influenced the later art of the Renaissance. These paintings, especially the “grotesques” or fanciful patterns of scroll-work and pilasters mixed with semi-realistic foliage and figures of boys, animals, and birds, designed with great freedom of touch and inventive power, seem to have thoroughly fasci- nated Raphael during his later period, and many of his pupils and contemporaries. The “loggie” of the Vatican and of the Farnesina palace are full of carefully-studied 16th-century reproductions of these highly-decorative paint- ings. Of late years the excavations on the Palatine and in the garden of the Farnesina in Rome have brought to light some mural paintings of the 1st century of our era, perhaps superior in execution even to the best of the Pompeian series.

The range of subjects found in Roman mural paintings is very large—mythology, religious ceremonies, genre, still life, and even landscape (the latter generally on a small scale, and treated in an artificial and purely decora- tive way), and lastly history. Pliny mentions several large and important historical paintings, such as those with which Valerius Maximus Messala decorated the walls of the Curia Hostilia, to commemorate his own victory over Hiero II. and the Carthaginians in Sicily in the 3d century B.c. The earliest Roman painting recorded by Pliny was by Fabius, surnamed Pictor, on the walls of

3 One instance only of a tomb-painting is mentioned by Pausanias (vii. 22). Some fine specimens have recently been discovered in the Crimea, but not of a very early date; see Stephani, Compte rendu, &C., St Petersburg, 1878, &c.

4 Some of the following works contain accounts of the painting of the Romans as well as of the Greeks :—Letronne, La Peint. histor. murale (1835); Hittorf, L’Arch. polychrome chez les Grecs (1851) ; Wornun, Ifist. of Painting (1847) ; Newton, Lect. on the Painting of Die Poly- gnotischen Gemélde ; Lenormant, Les Peintures de Polygnote (1864) ; Winckelmann, Storia dell’ Arti (1784) ; Miller, Handbuch d. Archiol. der Kunst, &c. (1830) ; Pliny, I. N., Books xxxv., xxxvi.; Pausanias, x. 25-31, — description of paintings in the Lesche at Delphi, — and various other passages throughout his work ; Artaud de Montor, Peintres primitifs (1841-

48) ; Humphrey Davy, “Colours used by the Ancients,” Trans. Roy. Soc. (1815, pp. 97-124) ; Bluemner, Gewerbe u. Kunst bei Griechen u. Romern (1879); Brunn, Gesch. der Griech. Kunstler (1853-56) ; Durand, Iist. de la Peinture Ancienne (1725) ; Meyer, Gesch. der bildenden Kiunste (1824); Raoul Rochette, La Peinture des Grecs (1840), and Mon. @ Antig. (1833) ; Poynter, Deco- rative Art, series of lectures published by the Society for the Protection of Ancient Buildings (1882).

the temple of Salus, executed about 300 Bc. (H. &,, xxxv. 4).

Unfortunately no existing Roman paintings seem to be earlier in date than the Christian era, and all belong to a period of decline in art. Pliny (xxxv. 1) laments the fact that the wealthy Romans of his time preferred the costly splendours of marble and porphyry wall-linings to the more artistic decoration of paintings by good artists. Historical painting seems then to have gone out of fashion ; among the numerous specimens now existing very few from

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Fig. 8.—One Figure from a Pompeian Wall-Painting—Ariadne and Dionysus. Now in the Naples Museum.

Pompeii represent historical subjects; one has the scene of Masinissa and Sophonisba before Scipio, and another of a riot between the people of Pompeii and Nocera, which happened 59 a.p.

Mythological scenes, chiefly from Greek sources, occur most frequently: the myths of Eros and Dionysus are especial favourites. Only five or six relate to purely Roman mythology. We have reason to think that some at least of the Pompeian pictures are copies, probably at

third or fourth hand, from celebrated Greek originals. The frequently repeated subjects of Medea meditating the murder of her children and Iphigenia at the shrine of the Tauric Artemis suggest that the motive and composition were taken from the celebrated originals of these subjects by Timanthes. Those of Io and Argus, the finest example of which is in the Palatine "'villa of Livia," and of Andro- meda and Perseus, often repeated on Pompeian walls, may be from the originals by Nicias.!

In many cases these mural paintings are of high artistic merit, though they are probably not the work of the most distinguished painters of the time, but rather of a humbler class of decorators, who reproduced, without much original invention, stock designs out of some pattern-book. They are, however, all remarkable for the rapid skill and extreme "verve" and freedom of hand with which the designs are, as it were, flung on to the walls with few but very effective touches. Though in some cases the motive and composi- tion are superior to the execution, yet many of the paint- ings are remarkable both for their realistic truth and technical skill. The great painting of Ceres from Pompeii, now in the Naples museum, is a work of the highest merit—the simple grandeur of the drawing and the delicate modelling of the flesh, executed in the easiest and most direct manner possible, are alike admirable. The round juiciness of the fruit in her basket, rapidly painted with a few telling strokes of the brush, recalls to mind in effect, though not in execution, the startling realism of the Dutch painters of still life, who laboured painfully to gain the effect produced with such rapidity and ease by the Roman artist. Fig. 8, from a Pompeian picture, is a fine example of good modelling of flesh.

In the usual scheme of decoration the broad wall-surfaces are broken up into a series of panels by pilasters, columns, or other architectural forms. Some of the panels contain pictures with figure-subjects; others have conventional ornament, or hanging festoons of fruit and flowers. The lower part of the wall is painted one plain colour, forming a dado; the upper part sometimes has a well-designed frieze of flowing ornaments. In the better class of painted walls the whole is kept flat in treatment, and is free from too great subdivision, but in many cases great want of taste is shown by the introduction of violent effects of architectural perspective, and the space is broken up in a disagreeable way by complicated schemes of design, studded

with pictures in varying scales which have but little relation to their surroundings. The colouring is on the whole very pleasant and harmonious —quite unlike the usual chromolithographic copies. Black, yellow, or a rich deep red' are the favourite colours for the main ground of the walls, the pictures in the panels being treated separately, each with its own background.

Technical Methods of the Romans.—Much has been written on this subject, and the most varying opinions have been expressed. The real fact appears to be that several methods were employed in each painting. First, the ground of the required colour was laid on while the stucco was still moist. This ground therefore was true fresco or "'fresco buono." On this, when dry, the various pictures and ornaments were painted in tempera. That the pictures themselves were not in true fresco is shown: (1) because the coloured ground always exists wnder the pictures ; (2) by the wide distances apart of the " fresco edges " or joinings in the stucco, showing that a much larger area of stucco was applied at once than could have been covered with the frequently elaborate paintings before the stucco was dry ; (3) by the fact that many of the brilliant pigments were not such as could have been used upon moist stucco. The next point is how these tempera paintings on the fresco ground were fixed so as to last for nearly eighteen hundred years uninjured by the damp which necessarily soaked through into the soil and ashes in which they were buried. This was probably effected by the "'encaustic" process (@yxavors). When the painting was finished and dry, hot melted wax was brushed all over it; and then a red-

- See Newton, Lect. on Painting of the Ancients, 1882.

hot iron or brazier of burning charcoal was held near the face of the wall till, bit by bit, all the wax disappeared from the surface and soaked thoroughly into the absorbent stucco,—thus fixing the pig- ments with a vehicle that could stand the effects of damp. 'This application of hot wax appears to have been repeated more than once. 'The extreme smoothness of the fresco ground under the tempera pictures seems to show that the ground itself was both waxed and polished before the pictures were painted over it. By another method of encaustic the pigments themselves were mixed with

hot wax, probably rendered more fluid and easy to work by the addition of some mineral spirit or essential oil. The final application of heat to the painted surface blended the colours together and fixed them on and into the absorbent stucco ground. Vitruvius (vii. 9) describes the former process, in which the wax was applied after the colours were laid on the wall. According to him this was necessary in order to prevent the painted surface becoming patchy, especially in the case of the red ground made of vermilion, an oxide of mercury. This, as well as the evidence of the paintings themselves, shows that Pliny is mistaken in assert- ing that encaustic work could not be used for walls.1 Vitruvius (vii.) also gives an interesting account of the great care that was needed in preparing stucco for painting. Three coats of old slaked lime and ra were first to be laid, and then three more coats mixed with pounded white marble, each coat of more finely powdered marble than the one beneath ; the last coat was to be polished till it gave a reflexion like a mirror. Damp or external walls were to be built hollow, and the cavity ventilated; this was sometimes done, ¢.g., in the Palatine villa, by facing the wall inside with hollow bricks or tiles, on which the stucco was laid. Vitruvius, who probably died shortly before the Christian era, laments the decay of taste in his time, much as Pliny does ; he specially depre- cates the use of gaudy red lead, and the sham architectural paint- ings in which candelabra, reeds, and other incongruities are made to support heavy cornices and roofs of buildings. He complains also-of the novel taste for expensive but inartistic colours, such as purple and azurc.?

arly Christian Mural Paintings in Italy.——A very interesting series of these exists in various catacombs, especially those of Rome and Naples. They are of great value, both as an important link in the history of art and also as throwing considerable light on the mental state of the early Christians, which was distinctly influenced by the older faith. Thus in the earlier paintings of about the 4th century we find Christ represented as a beardless youth, beautiful as the artist could make him, with a lingering tradition of Greek idealization, in no degree like the “Man of Sorrows” of medieval painters, but rather a kind of genius of Christianity in whose fair outward form the peace and purity of the new faith were visibly sym- bolized, just as certain distinct attributes were typified in the persons of the gods of ancient Greece. The favour- ite early subject, Christ the Good Shepherd (fig. 9), is represented as Orpheus playing on his lyre to a circle

of beasts, the pagan origin of the picture being shown unmistakably by the Phrygian cap and by the presence of lions, panthers, and other incongruous animals among the listening sheep. In other cases Christ is depicted standing with a sheep borne on his shoulders like Hermes Criophoros or Hermes Psychopompos—favourite Greek subjects, especially the former, a statue of which Pausanias (ix, 22) mentions as existing at Tanagra in Beeotia. Here again the pagan origin of the type is shown by the presence in the catacomb paintings of the pan-pipes and

4 His remarks on the subject (xxxv. 11) are quite unintelligible.

*“ Gell and Gandy, Pompeiana (1817-19 and 1835); Herculaneum et Pompei, Recueil des Peintures, &c., Paris (1870-72); Jorio, Deser. des Peintures antiques (1825); Renier et Perrot, Les .Peintures du Palatin (1870); Hittorf, Arabesques of the Ancients; Real Museo Bor- bonico (1824 et seg.) ; Mau, Gesch. der Decorativen in Pompet (1882) ; Donner and Helbig, Wandgemiéilde der vom Vesuv verschiitteten Stadte (1868); Ann. and Bull. dell’ Inst. di Cor. arch. di Roma (various years); Ternite and Miiller, Wandgemélde aus Pompei ; Zahn, Gemdlde aus Pompei (1828); Rochette, Peintures de Pompei (1844-59); Mazois, Ruines de Pompei (1824); Overbeck, Pompei, &c. (1856); Revue Archéol., vol. ii. (1845); Le Pitture antiche d’ Ercolano (1757-79) ; Fiorelli, Pomp. ant. Hist. (1860-4) ; Sogliano, Le Pitture murali Cam- pane (1880); Paderni, Dipinti, &c., di Pompei, Ercolano, &c. (1865) ; Caylus, La Peinture & 0 Encaustique (1755); and Minervini, Bull. arch. Napol. (1852-59), See also the list of works on Greek painting.

pedum, special attributes of Hermes, but quite foreign to the notion of Christ. Though in a degraded form, a good deal survives in some of these paintings, especially in the

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In the centre Orpheus, to represent Christ the Good. Shepherd, and round are smaller paintings of various types of Christ.

earlier ones, of the old classical grace of composition and beauty of drawing, notably in the above-mentioned repre- sentations where old models were copied without any adaptation to their new meaning. Those of the 5th and 6th centuries still follow the classical lines, though in a rapidly deteriorating style, until the introduction of a foreign—the Byzantine—element, which created a fresh starting-point on quite different lines. The old naturalism and survival of classical freedom of drawing is replaced by stiff, conventionally hieratic types, very superior in dignity and strength to the feeble and spiritless compositions pro- duced by the extreme degradation into which the native art of Rome had fallen. The designs of this second period of Christian art are very similar to those of the mosaics, such as many at Ravenna, and also to the magnificently illuminated MSS. on which the utmost skill and labour of the time were lavished. For some centuries there was but little change or development in this Byzantine style of art, so that it is impossible in most cases to be sure from mere internal evidence of the date of any painting. This to some extent applies also to the works of the earlier or pagan school, though, roughly speaking, it may be said that the least meritorious pictures are the latest in date. These catacomb paintings range over a long space of time; some may possibly be of the Ist or 2d century, e.g., those in the cemetery of Domitilla, Rome; others are as late as the 9th century, eg., some full-length figures of St Cornelius and St Cyprian in the catacomb of St Callixtus, under which earlier paintings may be traced. In execution they somewhat resemble the Etruscan tomb-paintings; the walls of the catacomb passages and chambers, excavated in soft tufa, are covered with a thin skin of white stucco, and on that the mural and ceiling paintings are simply executed in earth colours. The favourite sub- jects of the earliest paintings are scenes from the Old Testament which were supposed to typify events in the life of Christ, such as the sacrifice of Isaac (Christ’s death), Jonah and the whale (the resurrection), Moses striking the rock, or pointing to the manna (Christ the water of life, and the Eucharist), and many others. The later paintings deal more with later subjects, either events

in Christ’s life or figures of saints and the miracles they performed. A very fine series of these exists in the lower church of 8. Clemente in Rome, apparently dating from the 6th to the 10th centuries ; among these are representa- tions of the passion and death of Christ—subjects never chosen by the earlier Christians, except as dimly fore- shadowed by the Old Testament types. When Christ Himself is depicted in the early catacomb paintings it is in glory and power, not in His human weakness and suffering.

Other early Italian paintings exist on the walls of the church of the Tre Fontane near Rome, and in the Capella di 8. Urbano alla Caffarella, executed in the early part of the 11th century. The atrium of §8. Lorenzo fuori le mura, Rome, aad the church of the Quattro Santi Incoro- nati have mural paintings of the first half of the 13th century, which show no artistic improvement over those at S. Clemente four or five centuries older.

It was not in fact till the second half of the 13th century that stiff traditional Byzantine forms and colouring began to be superseded by the revival of native art in Italy by the painters of Florence, Pisa, and Siena (see Fresco). During the first thirteen centuries of the Christian era mural painting appears to have been for the most part confined to the representation of sacred subjects. It is remarkable that during the earlier centuries council after council of the Christian church forbade the painting of figure-subjects, and especially those of any Person of the Trinity; but it was quite in vain. The double desire, both for the artistic effect of painted walls and for the religious teaching afforded by the pictorial representation of sacred scenes and the celebration of the sacraments, was too strong. In spite of the zeal of bishops and others, who sometimes with their own hands defaced the pictures of Christ on the walls of the churches, in spite of threats of excommunication, the forbidden paintings by degrees be- came more numerous, till the walls of almost every church throughout Christendom were decorated with whole series of pictured stories. The useless prohibition was becoming obsolete when, towards the end of the 4th century, the learned Paulinus, bishop of Nola, ordered the two basilicas which he had built at Fondi and Nola to be adorned with wall-paintings of sacred subjects, with the special object, as he says, of instructing and refining the ignorant and drunken people. These painted histories were in fact the books of the unlearned, and we can now hardly realize their value

and importance as the chief mode of religious teach- ing in ages when none but the clergy could read or write.!

English Mural Painting.—During the Middle Ages, just as long before among the ancient Greeks, coloured decoration was used in the widest possible manner, not only for the adornment of fiat walls, but also for the enrichment of sculpture and all tne fittings and archi- tectural features of buildings, whether the material to be painted was plaster, stone, marble, or wood. It was only the damp and frosts of northern climates that to some

1 See Rossi, Roma sotterranea (1864-77) ; Northcote and Brownlow Subterranean Rome (1877); Bottari, Roma sotterr. (1737-54); Perret, Catacombes de Rome (1851-55) ; Bellermann, Katacomben zu Neapel f Garrucci, Arte Cristiana (1880) ; Mullooly, Paintings in S. Clemente, Rome (1868) ; Lord Lindsay, Christian Art (1847); Agincourt, Hist. de VArt, w*- xvi® siécle (1823-47) ; Theophilus, Div. Art. Schedula Hendrie's ed. (1847); Eraclius, De Art. Romanorum, MS. in Bibl. Roy., Paris, partly printed by Raspe; ‘‘ Mappa Clavicule ”—a 12th- century MS.—Archeologia, xxxii. pp. 183-244; Cennino Cennini Trattato della Pittura; Vasari, Tre Arti del Disegno, Milanesi's ed. (1882); Mrs Merrifield, Fresco Painting (1856); L. Batista Alberti De Re edificatoria; Richmond, Monumental Painting, Lectures on Art published by the Society for the Protection of Ancient Buildings (1882); Martigny, Dict. des Antiquités Chrétiennes (1877); Dionysius of Zagora, Eppnveta THs Swypadixjs (1853); Eastlake, Materials for Hist. of Painting, new ed. (1869) ; Wessely, Iconographie Gottes u. der Heili- gen (1874); Didron et Durand, Jeonographie Chrétienne (1845); Cave Thomas, Mural Decoration ; Bull. di Arch. Cristiana (1864-65).

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extent limited the external use of colour to the less exposed parts of the outsides of buildings. The varying tints and texture of smoothly-worked stone appear to have given no pleasure to the medieval eye; and in the rare cases in which the poverty of some country church prevented its walls from being adorned with painted ornaments or pictures the whole surface of the

stone-work inside, mould- ings and carving as well as flat wall-spaces, was covered with a thin coat of whitewash. Internal rough stone- work was invariably concealed by stucco, forming a smooth ground for possible future paintings. Unhappily the ignorant barbarity of the 19th century has in the case of most English cathedrals and parish churches stripped off the internal plaster, often laying bare rubble walls of the roughest description, never meant to be exposed, and has scraped and rubbed the surface of the masonry and mould- ings down to the bare stone. In this way a great proportion of mural paintings have been destroyed, though many in a more or less mutilated state still exist in England. It is difficult (and doubly so since the so-called “restoration ” of most old buildings) to realize the splendour of effect once possessed by every important medizval church. From the tiled floor to the roof all was one mass of gold and colour. ‘The brilliance of the mural paintings and richly- coloured sculpture and mouldings was in harmony with the splendour of the oak-work—screens, stalls, and roofs— all richly decorated with gilding and painting, while the light, passing through stained glass, softened and helped to combine the whole into one even mass of extreme decorative effect. Colour, and not in dull tints, was boldly applied everywhere, and thus the patchy effect was avoided which is so often the result of the modern timid and partial use of painted ornament. Even the figure-sculpture was painted in a strong and realistic manner, sometimes by a wax encaustic process, probably the same as the circumlatio of classical times. In the accounts for expenses in decor- ating Orvieto cathedral wax is a frequent item among the materials used for painting. In one place it is specially mentioned that wax was supplied to Andrea Pisano (in 1345) for the decoration of the beautiful reliefs in white marble on the lower part of the west front.

General Schemes of Mural Painting.—From the 11th to the 16th century the lower part of the walls, generally 6 to 8 feet from the floor, was painted with a dado—the favourite patterns till the 13th century being either a sort of sham masonry with a flower in each rectangular space (fig. 10), or a conven- KO] tional representation of a |-= curtain with regular folds |/< stiffly treated (Plate I.). Above this dado ranges of pictures with figure-sub- jects were painted in tiers one above the other, each picture frequently sur- rounded by a_ painted frame with arch and gable I/< sGa- of architectural design. Fic. 10.—Wall- Painting, of the 13th Painted bands of chevron

century. ‘‘ Masonry pattern.” or other geometrical ornament till the 13th century, and flowing ornament afterwards, usually divide the tiers of pictures horizontally and form the top and bottom bound- aries of the dado. In the case of a church, the end walls usually have figures to a larger scale. On the east wall of the nave over the chancel arch there was generally a large painting of the “Doom” or Last Judgment. One of the commonest subjects is a colossal figure of St Christopher (fig. 11), usually on the nave wall opposite the principal entrance,—selected because the sight of a picture of this saint was supposed to bring good luck for the rest of the

day. Figures were also often painted on the jambs of the windows and on the piers and soffit of the arches, especially that opening into the chancel.

Fic. 11.—Wall-Painting of St Christopher. Large life-size.

The little Norman church at Kempley in Gloucestershire (date about 1100) has perhaps the best-preserved specimen of the com- . plete early decoration of a chancel.! The north and south walls are occupicd by figures of the twelve apostles in architectural niches, six on each side. The east wall had single figures of saints at the sides of the central window, and the stone barrel vault is covered with a representation of St John’s apocalyptic vision — Christ in majesty surrounded by the evangelistic beasts, the seven candlesticks, and other figures. The chancel arch itself and the jambs and mouldings of the windows have stiff geometrical designs, and over the arch, towards the nave, is a large picture of the “Doom.” The whole scheme is very complete, no part of the internal plaster or stone-work being undecorated with colour. Though the drawing is rude, the figures and their drapery are treated broadly and with dignity. Simple earth colours are used, oye in tempera on a plain white ground, which covers alike

oth the plaster of the rough walls and the smooth stone of the arches and jambs.

In the 13th century the painters of England reached a very high point of artistic power and technical skill, so much so that at that time paintings were produced by native artists quite equal, if not superior, to those of the

same period anywhere on the Continent, not except- ing even Italy. The central paintings on the walls of the chapter-house and on the retable of the high altar of Westminster Abbey are not surpassed by any of the smaller works even of such men as Cimabue and Duccio di Buoninsegna, who were living when these Westminster paintings were executed. Unhappily, partly through the poverty and anarchy brought about by the French wars and the Wars of the Roses, the development of art in England made but little progress after the beginning of the 14th century, and it was not till a time when the renaissance of art in Italy had fallen into a state of degra- dation and decay that its influence reached the British shores, In the 15th century some very beautiful and noble work, somewhat affected by Flemish influence, was produced in England (fig. 12), chiefly in the form of figures painted on the oak panels of chancel and chapel screens, especially in Norfolk and Suffolk ; but, fine as many of these are, they cannot be said to rival in any sense the works of the Van Eycks and other painters of that time in Flanders. To return to the 13th century, the culminating period of English art in painting and sculpture, much was owed to Henry III.'s love for and

1 See Archexologia, vol. xlvi., 1880.

'patterns for the borders

patronage of the fine arts ; he employed a large number of painters to decorate his various castles and palaces, especi- ally the palace of Westminster, one large hall of which was known as the "painted chamber" from the rows of fine pictures with which its walls were covered. After the 13th century the "masonry pattern" was disused for the lower parts of walls, and the chevrony and other stiff

Fra. 12.—15th-century English Painting—St John the Evangelist.

were replaced by more flowing designs (Plate I.). The character of the painted figures became less monumental in style; greater freedom of drawing and treatment was adopted, and they cease in any way to recall the archaic majesty and grandeur of the Byzantine mosaics. A detailed description of the develop- ment of the successive styles of mural painting

would be almost a complete history of English art, which space does not allow here, but it may be noted that during the

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14th century wall-spaces unoccupied by figure-subjects were often covered by graceful flowing patterns, drawn with great freedom of hand and rather avoiding geome- trical repetition. Fig. 13, from the church of Stanley St Leonard's, Gloucestershire, is a p>—=s J –

good characteristic specimen of 14th-century decoration; it is on the walls of the chancel, fill- ing up the spaces between the painted figures ; the flowers are blue, and the lines red on a | white ground. In some cases the motive of the design is taken from encaustic tiles, as at Bengeo Church, Herts, where the wall is |\= : i : — G a divided into squares, each con- taining an heraldic lion. This Fic. 18.—Flowing Pattern ; imitative notion occurs during Si crela eumeli ba all periods—masonry, hanging == = ~ curtains, tiles, and architectural features such as niches and canopies being very frequently represented, though always in a simple decorative fashion with no attempt at actual deception,—not probably from any fixed prin- ciple that shams were wrong, but because the good taste of the medixval painters taught them that a flat unrealistic treatment gave the best and most decorative effect. Thus in the 15th and 16th centuries the com- monest forms of unpictorial wall-decoration were various patterns taken from the beautiful damasks and cut velvets of Sicily, Florence, Genoa, and other places in Italy, some form of the "pine-apple" or rather "arti- choke" pattern being the favourite (fig. 14), a design

which, developed partly from Oriental sources, and coming to perfection at the end of the 15th century, was copied and reproduced in textiles, printed stuffs, and wall-papers with but little change down to the present century,— a remarkable instance of survival in design. Fig. 15 is a specimen of 15th- century English decorative painting, copied from a 14th-century Sicilian silk damask. Diapers, powderings with flowers, sacred monograms, and sprays of blossom were frequently used to ornament large surfaces in @ simple way. Many of these are extremely beautiful (fig. 16).

Subjects of Medieval Wall-Paintings.—In churches and domestic

buildings alike the usual subjects represented on the walls were specially selected for their moral and religious teaching, cither stories from the Bible and Apocrypha, or from the lives of saints,

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Fic. 15.—15th-century Wall-Painting, the design copied from a 13th-century Sicilian silk damask.

or, lastly, symbolical representations setting forth some important theological truth, such as figures of Virtues and Vices, or the Scala Humane Salvationis, showing the perils and temptations of the human soul in its struggle to escape hell and gain paradise—a rude foreshadowing of the great scheme worked out with such per- fection by Dante in his Commedia. A fine example of this subject exists on the walls of Chaldon Chureh, Sur- rey.! In the selection of saints for paintings in England, those of English origin are na- turally most frequently represented, and dif- ferent districts had cer- tain local favourites. St Thomas of Canter- bury was one of the most widely popular ; but few examples now remain,owing to Henry VIIL.’s special dislike to this saint and the strict orders that were issued for all pictures of him to be destroyed. For a similar reason most paintings of saintly popes were ob- literated.

Methods of Execu- tion. — Though Erac- lius, who probably wrote before the 10th century, mentions the use of an oil-medium, yet till about the 13th century mural paintings appear to have been executed in the most simple way, in tempera mainly with earth colours ap- plied on dry stucco ; even when a smooth stone surface was to be painted a thin coat of whitening or fine gesso was laid as a

Fic, 16.—Powderings used in 15th-century Wall-Painting.

1 See Collections of Surrey Archeol. Soc., vol. v. part ii, 1871. A useful though necessarily incomplete list of English medieval mural paintings has been published by the Science and Art Depart., S. Kens. Mus. Fresh wall-paintings are constantly being discovered under later coats of whitewash, so that any list needs frequent additions.

eround. No instance of true fresco has been discovered in Eng- jand. In the 13th century, and perhaps earlier, vil was commonly used both as a medium for the pigments and also to make a varnish to cover and fix tempera paintings. Vasari's statement as to the discovery of the use of oil-medium by the Van Eycks is certainly untrue, but it probably has a germ of truth. The Van Eyeks introduced the use of dryers of a better kind than had yet been used, and so largely extended the application of oil-painting. Before their time it seems to have been the custom to dry wall- paintings laboriously by the use of charcoal braziers, if they were in a position where the sun could not shine upon them. This is speeially recorded in the valuable series of aecounts for the expenses of wall-paintings in the royal palace of Westminster during the reign of Henry III., printed in Vetusta Monwmenta, vol. vi., 1842. All the materials used, including charcoal to dry the paintings and the wages paid to the artists, are given. The materials mentioned are plumbum album et rubewm, viridus, vermilio, synople, oere, azura, aurum, argentum, eollis, oleum, verniar.

Two foreign painters were employed—Peter of Spain and William of Florence—at sixpence a day, but the English painters seem to have done most of the work and received higher pay. William, an English monk in the adjoining Benedictine abbey of West- minster, received two shillings a day. Walter of Durham and various members of the Otho family, royal goldsmiths and moneyers, worked for many years on the adornment of Henry III.'s palace and were well paid for their skill. Some fragments of paintings from the royal chapel of St Stephen are now in the British Museum. 'They are very delicate and carefully-painted subjects from the Old Testament, in rich colours, each with explanatory inscription underneath. The scale is small, the figures being seareely a foot high. Their

method of execution is curious. First the smooth stone wall was covered with a coat of red, painted in oil, probably to keep back the damp ; on that a thin skin of fine gesso (stuceo) has been applied, and the outlines of the figures marked with a point; the whole of the background, crowns, borders of dresses, and other ornamental parts have then becn modelled and stamped with very minute patterns in slight relief, impressed on the surface of the gesso while it was yet soft. The figures have then been painted, apparently in tempera, gold leaf has been

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Fig. 17.—Pattern Plaster, decorated with gilding and transparent colours ; 15th-eentury work. Full size.

applied to the stamped reliefs, and the whole has been covered with an oil varnish. It is difficult to realize the amount of patience and labour required to cover large halls such as the above chapel and the "‘ painted chamber," the latter about 83 feet by 27, with this minute and gorgeous style of decoration.

In many cases the grounds were entirely covered with shining metal leaf, over which the paintings were executed ; those parts, such as the draperies, where the metallic lustre was wanted, were painted in oil with transparent colours, while the flesh was painted – Opaque tempera. The effect of the bright metal shining through a rieh colouring is very magnificent. This extreme minuteness 7 much of the medixval wall- decoration is very remarkable.

arge wall-surfaces and intricate mouldings were often completely

covered by elaborate gesso patterus in relief of almost microscopic delicacy (fig. 17). The cost of stamps for this is among the items in the Westminster aceounts. These patterns when set and dry were further adorned with gold and colours in the most laborious way. So also with the arehitectural painting ; the artist was not con- tent simply to pick out the various members of the mouldings in different colours, but he also frequently

covered each bead or fillet with painted flowers and other patterns, as delicate as those in an illuminated MS.,—so minute and highly-finished that they are almost invisible at a little distance, but yet add greatly to the general richness of effect. All this is completely neglected in modern reproductions of medieval painting, in which both touch and colour are alike coarse and harsh—mere caricatures of the old work, such as unhappily disfigure the Sainte Chapelle in Paris, and many cathedrals in Franee, Germany, and England. Gold was never used in large quantities without the ground on which it was laid being broken up by some such delicate reliefs as that shown in fig. 17, so its effect was never gaudy or dazzling.

Mural painting in England fell into disuse in the 16th century. For domestic purposes wood panelling, stamped leather, and tapestry were chiefly used as wall-coverings, In the reign of Henry VIII, probably in part through Holbein's influence, a rather coarse sort of tempera wall- painting, German in style, appears to have been common.!

A good example of arabesque painting of this period in black and white, rudely though boldly drawn and very Holbeinesque in character, was discovered in 1881 behind the panelling in one of the canons' houses at Westminster. Other examples exist at Haddon Hall (Derbyshire) and elsewhere.

Several attempts have been made in the present century to revive the art of monumental wall-decoration, but mostly, like those in the new Houses of Parliament, un- successful both in method and design. A large wall-painting by Sir Frederick Leighton of the Arts of War, on a wall in the South Kensington Museum, is much disfigured by the disagreeable gravelly surface of the stucco. The process employed is that invented by Mr Gambier Parry, and called by him "spirit fresco." A very fine series of mural paintings has been executed by Mr Madox Brown on the walls of the Manchester town-hall. These also are painted in Mr Parry's "spirit fresco," but on a smootli stucco surface, free from the unpleasant granular appearance of the South Kensington picture.

The Medizval Wall-Paintings of the Continent.—In the main the above remarks on English mural decoration apply equally to that of France, Germany, and Scandinavia. Though each of these countries had certain

peculiarities of style, mostly slight and unimportant, yet in method of execution, choice and arrangement of subjects, and division of the wall-spaces there is a very close similarity between them all. Italy, on the other hand, developed a style of her own, more purely pictorial, with less regard to the exigencies of architecture. In northern lands the mural paintings were strictly subordinate to the main features of the structure for which they were designed, while in Italy as a rule the architect did but little to decorate the interior of his buildings, and left the painter free to treat the walls as he pleased.

The very close similarity of the mural decoration in the churches of Sweden to those of England is very remarkable, and some of the Swedish churches have very magnificent and well-preserved schemes of decoration, covering walls and ceilings alike, of dates varying from the 13th to the 15th centuries, all of which have little or nothing to dis- tinguish them from contemporary work in England. Man- delgren's Monuments Scandinaves (1862) has well-executed reproductions of some of the best of these, especially the fine and complete specimens in the churches of Bjeresjoe,

1 Shakespeare, Henry JV., part ii., aet 2, sc. 1: " Falstaff. And for thy walls, a pretty slight drollery, or the story of the prodigal, or the German hunting in waterwork, is worth a thousand of these bed- hangings and these fly-bitten tapestries."

Ameneharads Rida, Risingé, and Floda. One of these, the north chancel wall of the church of Rada, 13th century, has been selected (Plate I.) as a good and characteristic example of the treatment of a large wall-space in the 14th century ; the dado of painted curtain-folds, the tiers of single life-size figures in architectural niches treated with great breadth and decorative skill, and the band below of subjects on a rather smaller scale give a good idea of a common scheme of ecclesiastic decoration. An inscription on one of these paintings gives the date of their execution as 1323. The lower subject represents the death of the Virgin, above are figures of the apostles, and highest of all, painted on the curved boarding of the waggon-vault, are a row of seated prophets under round arches. The other examples on the same plate, given as specimens of 15th-century flowing patterns, are from

the church of Kumbla, also in Sweden, and fully illustrated in Mandel-gren's valuable work. Oriental Painting.—In the churches and monasteries of

MURANO, the ancient Ammariuno, an island in the Venetian lagoon about 1 mile north of Venice, is 5 miles in circumference, a large part of which is occupied by gardens. It contains about 4000 inhabitants, but was once much more populous than it is at present, its inhabit- ants numbering 30,000. It was a favourite resort of the Venetian nobility before they began to build their villas on the mainland; and in the 15th and 16th centuries its gardens and casinos, of which some traces still remain, were famous. It was here that the literary clubs of the Vigilanti, the Studiosi, the Occulti, used to meet.

The town is built upon one broad main canal, where the tidal current runs with great force, and upon several smaller ones. 'The cathedral, S. Donato, is a fine basilica, probably of the 11th century. The pavement is as richly inlaid as that of St Mark's, and the mosaics of the tribune are remarkable. The exterior of the tribune is very beauti- ful, and has been successfully restored. The 15th-century church of St Peter the Martyr contains a fine picture by Gentile Bellini. Murano has from ancient times been cele- brated for its glass manufactories. When and how the art was introduced is wrapped in great obscurity, but there are notices of it as early as the llth century; and in 1250 Cristoforo Briani, encouraged by the accounts of the gems of Guinea which the traveller Marco Polo brought to Venice, attempted the imitation of agate and chalcedony. From the labours of his pupil Miotto sprang the whole of that branch of the glass trade which is concerned with the imitation of gems. In the 15th century the first crystals were made, and in the 17th the various gradations of coloured and iridescent glass were invented, together with the composition called "'aventurine"; the manufac- ture of beads is now a main branch of the trade. The art of the glass-workers was taken under the protection of the Government in 1275, and regulated by a special code of laws and privileges ; two fairs were held annually, and the export of all materials, such as alum and sand, which enter into the composition of glass was absolutely forbidden. With the decay of Venice the importance of the Murano glass-works declined; but at the present time there are signs of renewed activity.

As many as eight firms, em- ploying 2500 hands, are engaged in the trade, —the most renowned being "'The Venezia Murano Company" and Salviati. The municipal museum contains a collection of glass illustrating the history and progress of the art.

The island of Murano was first peopled by the inhabitants of Altino, when they fled before their barbarian invaders. It origin- ally enjoyed independence under the rule of its tribunes and judges, and was one of the twelve confederate islands of the lagoons. In

the Greeks mural painting is still practised very much as it was in the 12th or 13th centuries.1 Neither colouring, nor drawing, nor method has in the least altered during the last six hundred years. Everything is fixed by certain unchangeable hieratic rules, and the Greek painter-monk would think it impious to improve upon or deviate from the artistic canons for sacred subjects handed down from century to century. For this reason it is generally impos- sible, from internal evidence, to guess the date of the interesting wall-paintings with which many churches in eastern Europe, Egypt, and Asia Minor are decorated.

In India and Ceylon mural painting has been largely used from very early times, especially to decorate the walls of temples. Some of these appear to be executed in true fresco. Birth-stories of Buddha and other sacred subjects most frequently occur. As among the medieval and modern Greeks, the strong conservatism of the Hindu races makes it difficult to judge as to the dates of these paintings.? (Ww. Mo.—J. H. M.)

the 12th century the doge Vital Micheli II. incorporated Murano in Venice and attached it to the Sestiere of S. Croce. From that date it was governed by a Venetian nobleman with the title of podesta, whose office lasted sixteen months. Murano, however, still retained its original constitution of a greater and a lesser council for the transaction of municipal business, and also the right to coin gold and silver, as well as its judicial powers civil and criminal. The interests of the town were watched at the ducal palace by a nuncio and a solicitor; and this constitution remained in force till the fall of the republic.

Books. —Venezia e le Sue Lagune; Paoletti, Il Fiore dit Venezia; Bussolin, Se iil vetrarie di Murano; Romanin, Storia Docwmentata di Vene- MURAT, Joacutm (1768-1815), king of Naples and a celebrated French cavalry leader, was, according to most accounts, the younger son of an innkeeper at Bastide For- tuniére in the department of Lot, France, and was born in 1768, but by his own account his father was a well-to-do farmer in that village. This is most probably the truth, as after being educated at a seminary at Cahors he was entered at the university of Toulouse, where he studied canon law. He was intended for the priesthood, but led a reckless life ; and after spending all his money he enlisted in a cavalry regiment. He had attained the rank of “maréchal des logis” in 1789, and was the recognized leader of the young soldiers from his great prowess in all athletics and feats of daring. His influence was so great and so prejudicial to authority that he received unlimited leave of absence in 1790. In November 1791 he was elected by the department of Lot a member of the garde

1 See Byzantine MS. from Mt. Athos, quoted by Didron, Jconogr. Chrét.

2 Many books given under the head of ‘‘ Early Christian paintings in Italy” apply also to this last division, Plates and descriptions of medieval paintings are niostly scattered through the proceedings of various societies, such as those of the Society of Antiquaries (Arch#o- logia, Vet. Mon., and Proceedings), the Archeological Institute, the Archzological Association, and many other central and local societies in England and abroad. The ‘‘ List of English buildings with mural decoration” (Science and Art Depart., 8. Kens. Mus., 1872) gives references to illustrations of most of the paintings catalogued. See also Merrifield, Original Treatises on Painting, 12th to 18th century (1849); Latilla, Treatise on Fresco, Encaustic, and Tempera (1842) ; Woltmann and Woermann, Hist. of Painting, vol. i. (1880); Blackburn, Decorative Painting (1847); Collins, Gothic Ornaments (1850); Meri- mée, Peintures del’ Hglise de S. Savin (1845) ; Straub, Peint. mur. en Alsace; Voisin, Peint. mur. dela Cathédral de Tournay; Fleury, Peznt. mur, du Laonnois (1860); Galembert, Peint. mur. de St Mesme de Chinon (1855); Gaucherel, Decoration appliquéal’ Architecture; David, Hist. de la Peinture au Moyen Age (1868); Hotho, Gesch. d. christ- lichen Malerei (1872); Zahn, Ornamente aller klassischen Kunstepochen (1848-48); Salazaro, Mon. dell’ Italia Meridionale, 4to al 13mo sec. (1872-80);

Racinet, Polychromatic Ornament (1878); Owen Jones, Grammar of Ornament (1842-45); Gailhabaud, L’ Architecture du v. a xvit. siécle (1869-72); Forster, Gesch. der Ital. Kunst ; Dohme, Kunst a. Kiinstler d. Mittelalters (1877); Ridolfi, Maraviglie dell’ Arte.

constitutionelle of the king. In May 1792 the garde was disbanded, but Murat had shown such military qualities and such advanced principles that he was at once appointed 4 sub-lieutenant in the chasseurs-4-cheval, and on the out- break of war aide-de-camp to General Hué. He was rapidly promoted to be captain and major in the 21st chasseurs, but after Thermidor found himself looked upon with sus- picion on account of his former advanced republican senti- ments. He was recalled from the front, and happened to be wandering about Paris in the spring and summer of 1795, like another unemployed officer, Napoleon Bonaparte, whose acquaintance he made, and whose friendship he won. When Bonaparte was requested by Barras to undertake the defence of the convention in Vendémiaire 1795 he at once called Murat to his side and commissioned him to bring up from Sévres the artillery with which the sections were shot down. His services on this occasion were re- cognized by his receiving the lieutenant-colonelcy of the 21st chasseurs and the appointment of first aide-de-camp to General Bonaparte in Italy. In the first battles of the famous campaign of 1796, Montenotte, Ceva, Dego, and Mondovi, Murat so greatly distinguished himself that he was chosen to carry the flags taken from the enemy to Paris. He was promoted to be general of brigade, and re- turned to Italy in time to be of essential service to Bona- parte at Bassano and Corona and Fort St Georges, where he was wounded. He then was sent on a diplomatic mis- sion to Genoa, but returned in time to be present at Rivoli. In the advance into Tyrol in the summer of 1797 he commanded the vanguard, and by his passage of the Tag- liamento hurried on the preliminaries of Leoben. In 1798 he was for a short time commandant at Rome, and then accompanied Bonaparte to Egypt. At the battle of the Pyramids he led his first famous cavalry charge, and so dis- tinguished himself in Syria that he was made general of division. He returned to France with Bonaparte, and on the 18th Brumaire led into the orangery of Saint Cloud the sixty grenadiers whose appearance broke up the Council of Five Hundred. He was, after the

success of the coup détat, made commandant of the consular guard, and in January 1800 married Marie Annonciade Caroline Bona- parte, the youngest sister of the first consul. He com- manded the French cavalry at the battle of Marengo, and was afterwards made governor in the Cisalpine Republic. He was made a marshal of France in 1804; he was titular governor of Paris, was invested with the grand eagle of the Legion of Honour, and appointed grand admiral of France with the title of prince in 1805. He commanded the cavalry of the grand army in the German campaign of 1805, and was so conspicuous at Austerlitz that Napoleon made him grand-duke of Berg and Cleves. He commanded the cavalry at Jena, Hylau, and Friedland, and in 1808 was made general-in-chief of the French armies in Spain. He entered Madrid on 25th March, and did much to hurry on the Spanish policy of Napoleon. The inhabitants of Madrid showed their hatred for the French by murdering on 2d May all the isolated or wounded Frenchmen they could find. Murat vigorously put down the riot, but not cruelly, for only 158 Spaniards fell to 500 Frenchmen; and he hoped for the throne of Spain as his reward. But the throne of Spain was given to Joseph Bonaparte, and Murat received Joseph's former kingdom of Naples.

King Joachim Napoleon, as he called himself, entered Naples in September 1808, and soon won great popularity by his handsome presence and his gaiety of manner. He took Capri from the English, and organized a Neapolitan army of 80,000 infantry and 10,000 cavalry. But his attention was not confined to military matters ; he effected other great reforms in finally abolishing all relics of feud- alism and putting down brigandism. Unfortunately much

injustice was done by General Manhés in this last reform, which seriously affected Murat's popularity in Calabria. He was not present at Aspern or Wagram, but once more commanded the cavalry of the grand army in the Russian campaign of 1812. He manifested his usual headlong valour in the disastrous retreat, but, being offended by Napoleon, he suddenly threw up his command and left for Naples. He then began an intrigue with Austria. Whether it was that he hoped to escape from a doubtful cause or that he was

really offended by Napoleon’s preference for Eugéne Beauharnais is not known, but in March 1813 he sent Prince Cariati to Vienna to declare that he would surrender his claims to Sicily if Austria would guarantee Naples to him. In January 1814 the alliance with Austria was de- clared by Murat’s seizing the principality of Benevento, while Austria promised him Ancona for a force of 30,000 men. At the congress of Vienna his independence was attacked by Talleyrand, who was his personal enemy, and it was as much from distrust of Austria as anything else that he declared in March 1815 that he intended to restore the unity and independence of Italy. He had hoped that Lord William Bentinck, the English general, would have supported him, but in vain. The Austrians steadily ad- vanced, and on 2d May he suffered a disastrous defeat at the battle of Tolentino. With difficulty he escaped, and reached France on 27th May. He offered his sword to Napoleon, who indignantly refused his offer, and he then hid in seclusion near Toulon with a price upon his head. After Waterloo he was refused an asylum in England, and went to Corsica, where he was joined by a few rash spirits, who urged him to strike another blow for his kingdom of Naples. He refused an offer of asylum from Metternich, and started with six ships. Bya great mistake he landed in Calabria, where he was hated for the cruelty of Manhés, on 6th October ; his ships deserted him, and he was taken prisoner by a captain named Trenta-Capilli, whose brother had been executed by Manhés. He was imprisoned in the fort of Pizzo, and on 13th October 1815 was tried by court-martial, under a law of his own, for disturbing the public peace and was sentenced to be shot in half an hour. After writing a touching letter of farewell to his wife and children, he bravely met his fate, and was buried at Pizzo.

As a king much good can be said of him; by his valour he had risen from nothing to royalty, and instead of being careless of the good of his adopted country he showed himself a truly wise king. Asa general he was the most dashing cavalry leader of the age, and, as he himself said, his presence at Waterloo would have given more concentrated power to the French cavalry charges, and possibly success. As a man he was rash, hot-tempered, and impetuously brave ; he was adored by his troopers, who followed their idol, the “golden eagle,” into the most terrible fire and against the most terrible odds.

For the life of Murat and his rule in Naples consult Vie de Joachim Murat, by M* * **, 1815; A{cmorie sulla condotta politica e milttare tenuta da Gioacchino Murat, 1815; Gioacchino Murat, o Storia del Reame di Napoli dal 1800 al 1815, Milan, 1839 ; Cam- pagnes des Autrichicns contre Murat en 1815, by V** * C* * de Br., Brussels, 1821; and particularly Freiherr von Helfert, Joachim Murat, seine lctzten Kéimpfe und scine Ende, Vienna, 1878. For his daring attempt in 1815 and his death see A. de Beauchamp, Catastrophe de Murat, 1815; Francis Macirone, Interesting facts relating to the fall and death of Joachim Murat, King of Naples, London, 1817 ; P. Colletta, Pochi fatti su Gioacchino Murat, Naples, 1820, correcting Macirone, and translated by L. Gallois, Paris, 1828 ; Galvani, Mémoires sur les Evénements qui out précédé la mort dc Joachim, roi des Deux Siciles, Paris, 1843; and Jean de la Rocca, Le Rot Murat ct ses dernicrs jours, from the papers of Multedo, who accompanied the king, Paris, 1868. (H. M. 8.)

MURATORI, Lupovico Anron1o(1672-1750), a learned Italian scholar, historian, and antiquary, was born at Vig- nola in the duchy of Modena 21st October 1672. Whilst still young he attracted the attention of Father Bacchini,

the librarian of the duke of Modena, by whom he was inspired with a taste for historical and antiquarian research, and introduced to the study of MSS. Having taken minor orders in 1688, Muratori proceeded to his degree of doctor a utroque jure before 1694, in which year he was appointed by Count Carlo Borromeo one of the doctors of the Ambrosian library at Milan. From manuscripts now placed under his charge, and which had been hitherto neglected, he made a selection of materials for several volumes (Anecdota), which he published with critical and explanatory notes. The reputation he in consequence acquired was such that the duke of Modena offered him the situation of keeper of the public archives of the duchy. Muratori hesitated, until the offer of the additional post of librarian, on the resignation of Father Bacchini, determined him in 1700 to return to Modena. The remainder of his life was an almost uninterrupted course of ardent and indefatigable

intellectual labour. The preparation of numerous valuable tracts on the history of Italy during the Middle Ages, and of dissertations and discussions on obscure points of his- torical and antiquarian interest, as well as the publication of his various philosophical, theological, legal, poetical, and other works absorbed the greater part of his time and attention. These as they successively appeared added to his growing reputation, and brought him into communica- tion with the most distinguished scholars of Italy, France, and Germany. But they also exposed him in his later years to the machinations of the envious. His enemies spread abroad the rumour that the pope, Benedict XIV., had discovered in his writings passages strongly savouring of heresy, even of atheism. Muratori appealed to the pope, repudiating the accusation. His Holiness assured him of his protection, and, without expressing his appro- bation of the opinions in question of the learned anti- quary, freed him from the imputations of his enemies. Muratori died, after a lengthened illness, on 23d January 1750, and was buried with much pomp in the church of Santa Maria di Pomposa, in connexion with which he had laboured as a diligent parish priest for many years. His remains were afterwards, in the year 1774, removed to the church of St Augustin.

The most important of the works of Muratori, which amounted altogether to upwards of sixty-four, are: Aneedota ex Ambrosianz Bibliotheew Codd., Milan, 1697, 1698; Padua, 17138, 2 vols. 4to ; Ancedota Greca, Padua, 1709, 3 vols. 4to;

MURCHISON, Sir Roperick Impey (1792-1871), geologist, was descended from a small clan or sept which for many generations lived in the west of Ross-shire, furnish- ing factors for some of the greater lairds, occupants of farms among the western sea-lochs, and even occasionally a parish minister. His father, educated as a medical man, acquired a competent fortune in India, and while still in the prime of life returned to Scotland, where, marrying one of the Mackenzies of Fairburn, he purchased the estate of Tarradale in eastern Ross and settled for a few years as a resident Highland landlord. At Tarradale his eldest son, the subject of this notice, was born on 19th February 1792. Young Murchison left the Highlands when only three years old, and at the age of seven was sent to the grammar school of

Durham, where during six years he received the only connected general education he ever

obtained. He was then placed at the military college, Great Marlow, to be trained for the army. With some difficulty he succeeded in passing the not very stringent examinations of the time, and at the age of fifteen was gazetted ensign in the 36th regiment. A year later (1808) he landed with Wellesley in Galicia, and was present at the actions of Roriga and Vimiera. Subsequently under Sir John Moore he took part in the retreat to Corunna and the final battle there. These six months of active service formed the only part of his military career in which he was exposed to the hardships and dangers of actual warfare. The defeat of Napoleon at Waterloo seeming to close the prospect of advancement in the military pro- fession, Murchison, after eight years of service, quitted the army, and married the daughter of General Hugonin, of Nursted House, Hampshire. With her he then spent rather more than two years on the Continent, particularly in Italy, where her cultivated tastes were of signal influence in guiding his pursuits. He threw himself with all the enthusiasm of his character into the study of art and antiquities, and for the first time in his life tasted the pleasures of truly intellectual pursuits.

Returning to England in 1818, he sold his paternal property in Ross-shire and settled in England, where, find- ing art studies no longer practicable, he took heart and soul to field-sports. He soon became one of the greatest fox-hunters in the northern counties; but at last, getting weary of such pursuits and meeting Sir Humphrey Davy, who urged him to turn his energy to science, he was in- duced to attend lectures at the Royal Institution. This change in the current of his occupations was much helped by the sympathy of his wife, who, besides her artistic acquirements, took much interest in some branches of natural history. Eager and enthusiastic in whatever he undertook, he was soon fascinated by the young science of geology, and threw himself heartily into its prosecution. He joined the Geological Society of London and soon showed himself one of its most active members, having as his colleagues there such men as Sedgwick, Lyell, Buck- land, Herschel, Whewell, and Babbage. Exploring with his wife the geology of the south of England, he devoted special attention to the rocks of the north-west of Sussex and the adjoining parts of Hants and Surrey, on which he wrote his first scientific paper, read to the Society towards the close of 1825. From that early period on to the end of his long life his industry and enthusiasm

remained pre- eminent. Though he had reached the age of thirty-two before he took any interest in science, he developed his taste and increased his knowledge so rapidly by unwearied dili- gence that in the first three years of his scientific career he had explored large parts of England and Scotland, had obtained materials for three important memoirs, as well as for two more written in conjunction with Sedgwick, and from the position of a mere beginner had risen to bea prominent member of the Geological Society and one of its two secretaries.

Turning his attention for a little to Continental geology, he explored with Lyell the volcanic region of Auvergne, parts of southern France, northern Italy, Tyrol, and Switzerland. A little later, with Sedgwick as his com- panion, he attacked the difficult problem of the geological structure of the Alps, and their joint paper giving the results of their study will always be regarded as one of the classics in the literature of Alpine geology.

It was in the year 1831 that Murchison found the field in which the chief work of his life was to be accom- plished. Acting on a suggestion made to him by Buck- land he betook himself to the borders of Wales, with the view of endeavouring to discover whether the greywacke rocks underlying the Old Red Sandstone could be grouped

into a definite order of succession, as the Secondary rocks of England had been made to tell their story by William Smith. For several years he continued to work vigorously in that region. The result was the establishment of the Silurian system,—a definite section of the geological record, bringing into notice for the first time a remarkable series of formations, each replete with distinctive organic remains older than and very different from those of the other rocks of England. The full import of his discoveries! was not at first perceived ; but as years passed on the types of existence brought to light by him from the rocks of the border counties of England and Wales were ascertained to belong to a geological period of which there are recog- nizable traces in almost all parts of the globe. Thus the term “Silurian,” derived from the name of the old British tribe Silures, soon passed into the familiar vocabulary of geologists in every country.

The establishment of the Silurian system was followed by that of the Devonian system, an investigation in which Sedgwick and Murchison were fellow-labourers, both in the south-west of England and in the Rhinelands. Soon after- wards Murchison projected an important geological cam- paign in Russia with the view of extending to that part of the Continent the classification he had succeeded in elaborating for the older rocks of western Europe. He was accompanied by De Verneuil and Keyserling, in con- junction with whom he produced a magnificent work on Russia and the Ural Mountains. The publication of this monograph in 1845 completes the first and most active half of Murchison's scientific career.

In 1846 he was knighted, and later in the same year he presided over the meeting of the British Association at Southampton. During the later years of his life a large part of his time was devoted to the affairs of the Royal Geographical Society, of which he became president. So constant and active were his exertions on behalf of geo- graphical exploration that to a large section of the con- temporary public he was known rather as a geographer than as a geologist. He particularly identified himself with the fortunes of David Livingstone in Africa, and did much to raise and keep alive the sympathy of his fellow- countrymen in the fate of that great explorer. The chief geological investigation of the last decade of his life was devoted to the Highlands of Scotland, where he suc- ceeded in showing that the vast masses of crystalline schists, previously supposed to be part of what used to be termed the Primitive formations, were really not older than the Silurian period, for that underneath them lay beds of limestone and quartzite containing Lower Silurian fossils. By this important discovery he not only changed at once the accepted views of the structure of half a king- dom but furnished a gigantic example of regional meta- morphism, the true significance of which in regard to theories of metamorphism is not yet adequately appreciated.

In the year 1855 Murchison was appointed director- general of the geological survey and director of the Royal School of Mines and Geological Museum, Jermyn Street, London, in succession to Sir Henry de la Beche, who had been the first to hold these offices. Official routine now Occupied much of his time, but he found opportunity for the Highland researches just alluded to, and also for pre- paring successive editions of his work Siluria,

which was meant to present the main features of the original Silurian System together with a digest of subsequent discoveries, particularly of those which showed the extension of the Silurian classification into other countries. His official position gave him still further opportunity for the exercise

ue The results of these researches were embodied in a massive quarto volume entitled The Silurian System (London, 1839).

of those social functions for which he had always been distinguished, and which a considerable fortune inherited from near relatives on his mother's side enabled him to display on a greater scale. His house was one of the great centres where science, art, literature, politics, and social eminence were brought together in friendly inter- course. In 1863 he was made a K.C.B., and three years later was raised to the dignity of a baronet. The learned societies of his own country bestowed their highest rewards upon him: the Royal Society gave him the Copley medal, the Geological Society its Wollaston medal, and the Royal Society of Edinburgh its Brisbane medal. There was hardly a foreign scientific society of note which had not his name enrolled among its honorary members. The French Academy of Sciences awarded to him the Prix Cuvier, and elected him one of its eight foreign members in succession to Faraday.

One of the closing public acts of Murchison's life was the founding of a chair of geology and mineralogy in the university of Edinburgh, for which he gave the sum of £6000, an annual sum of £200 being likewise provided by a vote in parliament for the endowment of the pro- fessorship. While the negotiations with the Government in regard to this subject were still in progress, Murchison was seized with a paralytic affection on 21st November 1870. At first his life was in danger, but he eventually rallied, and was able to see his friends, read, and take in- terest in current affairs until the early autumn of the fol- lowing year, when his malady began to make rapid progress. At last after a brief attack of bronchitis he died on 22d October 1871.

The chief work for which Murchison will always hold a high place in the annals of geology is the investigation of the older Paleozoic rocks, which culminated in the establishment and subse- quent development of the Silurian system of formations. He added a new chapter to geological history, and one of peculiar interest, because it contains the story of almost the earliest appearance of living things upon this planet. From the year 1825, when his first paper was read, down to the year of his death he continued to augment the literature of his favourite science with papers and memoirs. These, upwards of 150 in number, were published in the transactions of scientific societies at home and abroad. His Szlu- rian System, Russia and the Ural Mountains, and Siluria were the most voluminous and important of his independent works. Asa careful original observer, a sympathetic and liberal friend of scientific progress, and a man of wealth and good social position Murchison enjoyed a peculiar eminence among the scientific men of his day, and occupied a place which none of his surviving compcers could wholly fill. See Murchison's Life by A. Geikie, 1875. (A. GE.)

MURCIA, a maritime province of south-eastern Spain, is bounded on the E. and 8. by Alicante and the Mediter- ranean, on the W. by Almeria and Granada, and on the N. by Albacete, and has an area of 4478 square miles. The total extent of coast is about 75 miles; from Cape Palos westwards to Villaricos Point (where Almeria begins) it is fringed by hills reaching their greatest elevation immediately to the east of Cartagena; northwards from Cape Palos to the Alicante boundary a low and sandy tongue of land encloses the shallow lagoon called Mar Menor. Eastward from the Mar Menor and northward from Cartagena stretches the plain known as E] Campo de Cartagena, but the surface of the rest of the province is diversified by ranges of hills of which the general direction, connecting the mountains of Almeria and Granada with those of Alicante, is from south-west to north-east, and which reach their highest point (5150 feet) on the Sierra de Espuiia, between the Mula and Sangonera valleys. They belong to the Nevada system, and their geology will be best treated in connexion with that of Spain generally ; they are rich in iron, copper, and argentiferous lead, and also yield large quantities of alum, sulphur, and salt- petre; and important mineral springs occur at Mula, Archena (hot sulphur), and Alhama (hot chalybeate).

The greater part of the province drains into the Mediter- ranean, chiefly by the Segura, which enters it in the north- west below Hellin in Albacete, and leaves it a little above Orihuela in Alicante; within the province it receives on the left the Arroyo del Jua, and on the right the Cara- vaca, Quipar, Mula, and Sangonera. The insignificant “arroyos” of Nogalte and Albujon fall directly into the Mediterranean and the Mar Menor respectively. The climate is hot and dry, and agriculture is largely dependent on irrigation, which, where practicable, has been carried on since the time of the Moors with great success. Besides the usual cereals (wheat, barley, maize), hemp, oil, and wine (the latter somewhat rough in quality) are produced ; fruit, especially the orange, is abundant along the course of the Segura; mulberries for sericulture are extensively grown around the capital; and the number of bees kept throughout the province is exceptionally large. Esparto grass is gathered on the sandy tracts suited to its growth. The live stock consists chiefly of asses, mules, goats, and pigs, horses and sheep being relatively few. Apart from agriculture, the principal industry is that of mining, which has its centre near Cartagena; next comes the culture of the silkworm, the greater part of the crop being exported for manufacture in France. Large quantities of lead and esparto, as well as of zinc, iron, and copper ores and sulphur, are exported from Cartagena ; from Aguilas the chief exports are esparto and agricultural produce ; the port of Mazarron has some trade in alum as well. The province is traversed by a railway line which connects Albacete with Cieza, Archena, Murcia, Orihuela, and Cartagena ; the capital is also connected with Lorca and Alicante by good high roads. The communications other- wise are somewhat defective. The canal to connect Huescar in Granada with Cartagena remains only a project. The population of the province in 1877 was 451,611. Besides the cities of Murcia, Cartagena, and Lorca, the following towns in that year had a population exceeding 5000 :— Abanilla, Aguilas, Alhama, Bullas, Caravaca, Cehegin, Cieza, Fortuna, Fuente-Alamo, Jumilla, Mazarron, Molina, Mora- talla, Mula, Torre-Pacheco, Totana, La Union, Yecla.

The province of Murcia was the first Spanish possession of the Carthaginians, by whom Nova Carthago was founded. The Romans included it in Hispania Tarraconensis. Under the Arabs the province was

known as Todmir, which included, according to Edrisi, the cities Murcia, Orihuela, Cartagena, Lorca, Mula, and Chinchilla. The kingdom of Murcia, which came into independent existence after the fall of the Omayvads, included the present Albacete as well as

Murcia. It became subject to the crown of Castile in the 13th century. Until 1833 the modern province also included Albacete.

Morcta, a city of Spain, capital of the above province, stands on the Segura, nearly in the centre of the beautiful and fertile valley known as the “huerta” or garden of Murcia, which is sheltered on the south by the eastward continuation of the Sierras Alcaraz and Segura, and on the north by the low hills of the Sierras de Molina. The main part of the town stands on the left bank of the river, and is connected with the suburb of San Benito on the right by a very fine stone bridge of two arches. The streets are mostly broad, straight, and well paved ; the chief shops are in the narrow Calles de Plateria and Traperia, which are also a favourite resort with loungers, being shaded with awnings of canvas in hot weather. The chief square is the Plaza de la Constitucion, which is planted with orange and other trees; other promenades are the Paseos del Carmen and de Florida Blanca. Of public buildings the most prominent is the cathedral, a late Gothic (1388- 1467) structure with a Corinthian facade in the taste of the 17th century ; the tower is also composite, having been begun in 1521 and completed in 1766. Murcia has been the seat of the bishop of Cartagena since 1261; the present palace was erected in 1748-52. Near it are the

colleges of San Fulgencio and San Isidoro. Other con- spicuous public buildings are the hospital of San Juan de Dios, the silk and saltpetre factories, and the “alhondiga” or grain warehouse. The bull-ring is in San Benito. The manufactures of the town are not important ; the chief articles of commerce are the silk grown on the huerta, fruit, and agricultural produce. The population in 1877 was

91,805.

Murcia has been identified by some with the Roman Vergilia. In the time of Edrisi it was the populous and strongly-fortified capital of the country of Todmir. It was taken in 1240 by Don Alfonso (afterwards King Alfonso el Sabio), who by his own request lies buried here. The town was plundered by General Sebastiant, and in 1810 and again in 1812 suffered from the attack of a detach- ment of Soult's army. In 1829 an earthquake caused considerable injury, especially to the cathedral.

MURDER, MANSLAUGHTER. In the law of England the unlawful killing of a human being is either murder or manslaughter according as it is or is not accom- panied by circumstances constituting the element of malice aforethought. That, according to the old definition of Coke, is the criterion by which murder is distinguished from manslaughter.1 In like manner Blackstone lays it down as a "general rule" that all homicide is in the eye of the law malicious, and therefore murder, unless it is either justified by the command or permission of the law, excused on account of accident or self-preservation, or allemated into manslaughter by being the involuntary consequence of some act not strictly lawful, or occasioned by some sudden and sufficiently violent provocation. An exact account of these related offences can only be obtained by an examination of a vast number of judicial decisions, most of which are to be found in the ordinary text-books. (See, more particularly, Russell On Crimes and Misde- meanours.) The task of evolving exact definitions from this mass of material has been successfully undertaken by Mr Justice Stephen, and we cannot do better than present here the conclusions at which he has arrived. Art. 223 of his Digest of the Criminal Law is as follows :—" Man- slaughter is unlawful homicide without malice aforethought. Murder is unlawful homicide with malice aforethought. Malice aforethought means any one or more of the follow- ing states of mind preceding or coexisting with the act or omission by which death is caused, and it may exist when that act is unpremeditated : —(a) an intention to cause the death of, or grievous bodily harm to, any per- son, whether such person is the person actually killed or not; (6) knowledge that the act which causes death will probably cause the death of, or grievous bodily harm to, some person, whether such person is the person actually killed or not, although such knowledge is accompanied by indifference whether death or grievous bodily harm is caused or not, or by a wish that it may not be caused ; (c) an intent to commit any felony whatever ; (d) an in-

tent to oppose by force any officer of justice on his way to, on, or returning from the execution of the duty of arresting, keeping in custody, or imprisoning any person whom he is lawfully entitled to arrest, keep in custody, or imprison, or the duty of keepimg the peace or dispersing an unlawful assembly, provided that the offender has notice that the person killed is such an officer so employed." The expression 'officer of justice" in this clause includes every person who has a legal right to do any of the acts mentioned, whether he is an officer or a private person. Notice may be given either by word, by the production of a warrant or other legal authority, by the known official character of the person killed, or by the circumstances of the case. Art. 224 states that "homicide which would

1 "When a person of sound memory and discretion unlawfully

killeth any reasonable creature in being and under the king's peace with malice aforethought either express or implied" (Coke, 3 Jnst.).

otherwise be murder is not murder but manslaughter if the act by which death is caused is done in the heat of passion, caused by provocation," the acts amounting to which are enumerated. But provocation does not extenuate the offence "' unless the person provoked is at the time when he does the act deprived of the power of self-control by the pro- vocation which he has received, and in deciding the ques- tion whether this was or was not the case regard must be had to the nature of the act by which the offender caused death, to the time which elapsed between the provocation and the act which caused death, to the offender's conduct during that interval, and to all other circumstances tend- ing to show the state of his mind."

The law of the future is almost certainly to be found in the draft code presented by the Criminal Code Bill Com- missioners of 1879, and founded on Mr Justice Stephen's Digest above cited. The enactment of this measure being a mere question of time some of its provisions may usefully be stated here.

After defining homicide and culpable homicide, the code (sect. 74) declares culpable homicide to be murder in the following cases :—(a) if the offender means to cause the death of the person killed; (0) if the offender means to cause to the person killed any bodily injury which is known to the offender to be likely to cause death, and if the offender, whether he does or does not mean to cause death, is reckless whether death ensues or not; (c) if the offender means to cause death or such bodily injury as aforesaid to one person, so that if that person be killed the offender would be guilty of murder, and by accident or mistake the offender kills another person though he does not mean to hurt the person killed; (d) if the offender for any unlawful object does an act which he knows or ought to have known to be likely to cause death, and thereby kills any person, though he may have desired that his object should be effected without hurting any one.

Further (sect. 75), it is murder (whether the offender means or not death to ensue, or knows or not that death is likely to ensue) in the following cases : —“ (a) if he means to inflict grievous bodily injury for the purpose of facilitating the commission of any of the offences hereinafter mentioned, or the flight of the offender upon the commis- sion or attempted commission thereof, and death ensues from his violence; (0) if he administers any stupefying thing for either of the purposes aforesaid and death ensues from the effects thereof ; (c) if he by any means wilfully stops the breath of any person for either of the purposes aforesaid and death ensues from such stopping of the breath.” The following are the offences referred to :—‘“high treason and other offences against the queen’s authority, piracy and offences deemed to be piracy, escape or rescue from prison or lawful custody, resisting lawful appre- hension, murder, rape, forcible abduction, robbery, burglary, arson.” The code (sect. 76) reduces culpable homicide to manslaughter if the person who causes death does so “in the heat of passion caused by sudden provoca- tion ;” and “any wrongful act or insult of such a nature as to be sufficient to deprive any ordinary person of the power of self-control may be provocation if the offender acts upon it on the sudden, and before there has been time for his passion to cool.” Whether any particular wrongful act or Insult amounts to provocation and whether the offender was deprived of self-control shall be questions of fact ; but no one shall be deemed to give provocation by doing that Which he had a legal right to do, or which the offender incited him to do in order to provide an

excuse for killing him or doing grievous bodily harm. Further, “an arrest shall not necessarily reduce the offence from murder to manslaughter because an arrest was illegal, but if the ille-

a)

gality was known to the offender it may be evidence of provocation.” The “provocation” clause is not very happily expressed and will doubtless have to be recast. America.—The most notable difference between England and the United States in regard to the law on this subject is the recognition by recent State legislation of degrees in murder. English law treats all unlawful killing not reducible to manslaughter as of the same degree of guilt. American statutes seek to discriminate between the graver and the less serious forms of the crime. Thus an Act of the legislature of Pennsylvania (22d April 1794) declares all murder which shall be perpetrated by means of poison or by lying in wait or by any other kind of wilful, deliberate, and premeditated killing, or which shall be committed in the perpetration of or attempt to perpetrate any arson, rape, robbery, or burglary shall be deemed murder of the first degree ; and all other kinds of murder shall be deenied murder of the second degree. This statute, says Bishop (Commentaries on the Criminal Law, vol. ii. § 745), ‘‘is the parent of all the others.” In Michigan it has been enacted in exact words; and in most of the other States which have adopted this line of legislation the departure from the language of the Pennsylvania provision is not such as calls for the application of different prin- ciples of interpretation. It is pointed out by Bishop that the lan- guage used in these statutes to discriminate the degrees of murder is similar to that by which the common law distinction between murder and manslaughter is usually expressed. Thus in Massachu- setts murder committed with ‘“‘deliberately premeditated malice aforethought ” is in the first degree. In Indiana the expression used is ‘‘purposely and of deliberate and premeditated malice.” The technical interpretation of ‘‘malice aforethought”’ in English law is of course inapplicable to these phrases. There are also statutory degrees of manslaughter in the legislation of some of the States, but Bishop observes that ‘‘the books do not contain sufficient ad- judications to direct us into a profitable discussion of this subject.”

For some historical account of the law reference should be made to Mr Justice Stephen's History of the Criminal Law of England (London, 1883), vol. iii. c. 26. Stephen finds in the laws of Alfred the earliest and most important recog- nition of the properly criminal consequences of homicide as distinguished from the damages to be paid to the family of the deceased and the compensation to be made to the person whose peace had been broken, which are the prominent points of the early law of homicide.

MURDOCK, Wirt1am (1754-1839), inventor, was born near the village of Auchinleck in Ayrshire on 25th August 1754. His father, John Murdoch (as the name is spelt in Scotland), was a millwright and miller, and William was brought up in the same occupation until 1777, when, at the age of twenty-three, he entered the employment of Boulton and Watts in the Soho Works at Birmingham. Shortly afterwards he was sent to Corn- wall to superintend the fitting of Watts's engines, which had come to be in demand there. While staying at Red- ruth he had carried a series of experiments in the distil- lation of coal-gas so far that in 1792 he was able to apply the new invention to the purpose of lighting his cottage and offices; renewing his researches after his return to Birmingham (where he had become a partner in the firm), he made such progress in the discovery of practical methods for making, storing, and purifying the new illumi- nant that in 1802 the whole exterior of the factory was lighted with it in celebration of the peace of Amiens. Murdock was also the inventor of important improvements in the steam-engine; besides introducing the double D slide-valve, he was the first to devise an oscillating engine, and as early as 1784 he had constructed a model high- pressure engine torunon wheels. His inventive ingenuity was also directed to various applications of compressed air and of the exhausted air-tube ; and in 1803 he also con- structed a steam-gun. He retired from business in 1830, and died in 1839. His "Account of the Application of the Gas from Coal to Economical Purposes" appeared in the Phil. Trans. for 1808.

MURE, Wi11am (1799-1860), historian of Greek litera- ture, was born at the family seat near Caldwell, Ayrshire, Scotland, 9th July 1799. He was educated at West- minster school and Edinburgh, and he spent several years at the university of Bonn, where he laid the foundations of his classical

knowledge. From 1846 to 1855 he repre- sented the county of Renfrew in parliament in the Con- servative interest, and he was lord rector of Glasgow

university in 1847-48. For many years he devoted his leisure to Greek studies, and in 1850-57 he published five volumes of a Critical History of the Language and Lntera- ture of Ancient Greece, which, however, he did not live to complete. While C. O. Miiller's work, as translated and continued by Donaldson, is the best general history of Greek literature in English, Mure's treatment of the Homeric poems, of the lyric poets, and of the historians of the Attic period is the fullest in our language, and is everywhere marked by thorough knowledge, at first hand, of the Greek authors. Of the unity of the authorship of the Iliad and Odyssey he is a strenuous defender, attribut- ing both to the one person, Homer. Colonel Mure was for many years commandant of the Renfrewshire militia. He died at London on 1st April 1860. ~

His other works are—Remarks on the Chronology of the Egyptian Dynasties, 1829; Dissertation on the Calendar of the Zodiac of Aneient Egypt, Edinburgh, 1832 ; Journal of a Tour in Greeee and the Ionian Islands in 1838, Edinburgh, 1842. He also edited the Caldwell Papers, 3 vols., for the Maitland Club.

MURET, or Murerus, Marc Anrornz (1526-1585), French humanist, was born of respectable parentage at Muret near Limoges on 12th April 1526. Nothing is recorded of his early education, but at the age of eighteen he was already sufficiently accomplished to attract the notice of the elder Scaliger, and to be invited to prelect upon Cicero and 'Terence in the archiepiscopal college at Auch. He afterwards taught Latin at Villeneuve, and then at Bordeaux, where the youthful Montaigne was one of his pupils and played some of the principal parts in his Latin tragedies. Some time before 1552 he received a regency in the college of Cardinal Lemoine at Paris, and his brilliant lectures were largely attended, Henry II. and his queen being occasionally, it is recorded, among his hearers. His success seems to have excited more than the usual amount of envy; and in consequence of a dis- graceful charge—which, however, was never established— he was thrown into prison. Here he had begun to carry out a resolution to starve himself to

death, when the exer- tions of powerful friends procured lis release. Hardly had he resumed lecturing at Toulouse when his career was again cut short by a new charge similar to that which had proved so disastrous at Paris ; he saved his life by timely flight, but the records of the town bear that he was burned in effigy as a Huguenot and as shamefully immoral (1554). After a wandering and insecure life of some years in Italy, he received and accepted the invitation of the Cardinal dEste to settle in Rome in 1559. Henceforward his life was one of unclouded prosperity. He was even able to revisit France in 1561 as a member of the cardinal's suite at the colloquy of Poissy. The interest shown in his lec- tures on the Hthics of Aristotle, and on the Pandects, almost recalled his early successes in Paris, and in 1578 his services as a teacher of jurisprudence were sought by the "natio Germanorum" studying law at Padua, and also by the king of Poland for his new college at Cracow. Muretus, however, who about 1576 had taken holy orders, was induced by the liberality of the pope to remain in Rome, where he died on 4th June 1585.

The first collected edition of the works of Muretus appeared at Verona in 1727-1730 (5 vols. 8vo) ; a more complete edition was published by Ruhnken at Leyden in 1789 (4 vols. 8vo) ; there is also an edition by Frotscher and Koch (8 vols., Leipsic, 1834-41), and two volumes of Scripta selecta have been edited by Frey (Leipsic, 1871- 73). He annotated wholly or partially, in a learned and scholarly way that has proved more or less serviceable to subsequent editors, Terence, Horace, Catullus, Tibullus, Propertius, Tacitus, Sallust, Cicero, Aristotle, Xenophon. His other works include Juvenilia et poemata varia, Orationes, and Epistole. His merits as a stylist at one time secured for his Orationes a place among Latin school-books, but, although, according to his pupil Montaigne, he was recog- nized alike by France and Italy to be "' the best orator of his time," the modern judgment must rather be in substance that of a later

critic, that, if he ''appears to have had a more delicate ear than almost any of the moderns and his Latinity surpasses in elegance that of any of the Romans themselves, excepting Cicero and Cesar," he at the same time was ''conceited, fautastical, and weakly- minded" (Landor, Jm. Conv., ''

Chesterfield and Chatham ”). MURGER, Henry (1822-1861), French man-of-letters, was born in February 1822 at Paris. His father was a concierge, with which employment he combined the trade of tailoring. At the age of fifteen Murger was sent into a lawyer’s office, but the occupation was very uncongenial to him, and his father’s trade still more so. He thus incurred the paternal displeasure, and in his devotion to literature and liberty began to meet with not a few of the hardships which he afterwards described. He was, however, for a time saved from actual want by the employment of secretary to the Russian Count Tolstoy, which was procured for him by M. de Jouy (an old academician of the classical faction, but a very kind friend to youthful literary aspirants) in the year 1838. For the next ten years little positive is known of Murger’s life except that it probably provided the experi- ences, and certainly supplied him with the ideas, of his most famous book. He made his first independent appear- ance as an author in 1843 with a book entitled Via Dolorosa, but it made no mark. He also tried journalism, and the paper Ze Castor, which figures in the Vie de Bohéme, and which combined devotion to the interests of the hat trade with recondite philosophy and elegant litera- ture, is said to have been a fact, though a shortlived one, At length he was introduced to better work, either in the Corsaire, then a favourite organ of the second romantic generation, or in the Artiste; for both stories are told. In 1848 appeared the collected sketches called the Vie de Bohéme. This book, which is of its kind famous, describes the fortunes and misfortunes, the loves, studies, amuse- ments, and sufferings, of a group of impecunious students, artists, and men of letters, of whom Rodolphe represents Murger himself, while the others have been more or less positively identified. Murger, in fact, belonged to a set or clique of so-called Bohemians, the most remarkable of whom, besides hunself, were Privat d’Anglemont and Champfleury. The Scénes dela Vie de Bohéme have been very variously judged. Their very easy-going morality, and the supposed danger of their pictures in prompting to imitation have prejudiced some readers against the book. It is fair, however, to Murger to say that he neither holds up the Bohemian as a hero, nor in the least disguises the hardship and the folly of his ways. He was himself an instance of the dangers of Bohemianism. From the date above mentioned it was perfectly easy for him to make a comfortable living by journalism and general literature. He was introduced in 1851 to the Revue des Deux Mondes, and contributed to it for two or three years, and he never had any

difficulty in securing or keeping literary employment. But he was a slow, a fastidious, and a very capricious worker, and his years of hardship and dissipation had very seriously impaired his health. He continued, however, to produce work pretty regularly, publishing Claude et Marianne in 1851, Le Dernier Rendezvous and Le Pays Latin in 1852, Adeline Protat (one of the most graceful and innocent if not the most original of his tales) in 1853, and Les Buveurs d'Eau in 1854. This last, the most powerful of his books next to the Vie de Bohéme, exhibits a reverse side to the picture by tracing the fate of certain artists and students who, exaggerating their own powers and foolishly disdaining merely profitable work, come to an evil end not less rapidly if more respectably than by dissipation. Some years before his death, which took place in a maison de santé near Paris on 28th January 1861, Murger went to live at Marlotte, near Fontainebleau, and it was there that he wrote, and in 1859 published, an unequal book entitled Le Sabot Rouge,

in which the character of the French peasant is very uncom- plimentarily treated. Besides the books already mentioned, Murger's published works fill several volumes of prose and one of verse. The poems contained in the latter (Les Nuits @Hiver) are not very strong, but graceful and fre- quently pathetic. The prose volumes, with the exception of a novel of some scale, Les Rouertes de ' Ingénue (which the author left unfinished at his death), consist almost exclusively of short tales in the manner, and more or less on the subject, of the Vie de Bohéme. All exhibit the same characteristics—an excellent descriptive faculty, lively humour in drawing the follies of youth, frequently pathos, and not seldom a tender and poetical melancholy.

MURILLO, Barrotomé Esrrepan (1617-1682), the greatest ecclesiastical painter of Spain, was the son of Gaspar Esteban Murillo and Maria Perez, and was born at Seville in 1617, probably at the very end of the year, as he was baptized on 1st January 1618. Esteban-Murillo appears to have been the compound surname of the father, but some inquirers consider that, in accordance with a fre- quent Andalusian custom, the painter assumed the surname of his maternal grandmother, Elvira Murillo, in addition to that of his father. His parents (of whom nothing dis- tinct is known, save that they

were of a humble class), having been struck with the precocious sketches with which the unlettered boy was accustomed to adorn whatever available surface came in his way, wisely resolved to place him under the care of their distant relative, Juan del Castillo, the painter. Juan, a correct draughtsman and dry colourist, taught him all the mechanical parts of his profession with extreme care, and Murillo proved himself an apt and docile pupil. The artistic appliances of his master's studio were by no means abundant, and were often of the simplest kind. A few casts, some stray fragments of sculpture, and a lay figure formed the principal aids available in those days for the Sevillian student of art. A living model was a luxury generally beyond the means of the school, but on great occasions the youths would strip in turn and proffer an arm or a leg to be studied by their fellows. Objects of still life, however, were much studied by Murillo, and he early learned to hit off the ragged urchins of Seville pursuing their adventures in the market-place. Murillo in a few years painted as well as his master, and as stiffly. His two pictures of the Virgin, executed during this period, show how thoroughly he had mastered the style, with all its defects. Castillo was a very kind man, but his removal to Cadiz in 1639-40 threw lis favourite pupil entirely upon his own resources. The fine school of Zurbaran was too expensive for the poor lad ; his parents were cither dead or too poor to help him, and he was compelled to earn his bread by painting rough pictures for the "feria" or public fair of Seville. The religious daubs exposed at that mart were generally of as low an order as the prices paid for them by their rude purchasers. A "pintura de la feria" (a picture for the fair) was a proverbial expression for an execrably bad one; yet the street painters who thronged the market-place with their "clumsy saints and unripe Madonnas" not unfrequently rose to be able and even famous artists. This rough-and-ready practice, partly for the market-place, partly for converts in Mexico and Peru, for whom Madonnas and popular saints were produced and shipped off by the dozen, doubtless increased Murillo's manual dexterity ; but, if we may judge from the picture of the Virgin and Child still shown in the Murillo- Toom at Seville as belonging to this period, he made but little improvement in colouring or in general strength of design. Struck by the favourable change which travel had wrought upon the style of his brother artist Pedro de Moya, Murillo in 1642 resolved to make a journey to Flanders or Italy in quest of further insight into art. But how was

frio or cold style.

he, already struggling for existence and with a poor sister dependent on him, to raise the means necessary for such an expedition? Having bought a large quantity of canvas, he cut it into squares of different sizes, which he converted into pictures of a kind likely to sell, The American traders at once bought up his pieces, and he now found himself sufficiently rich to carry out his much-cherished design. He placed his sister under the care of some friends, and without divulging his plans to any one set out for Madrid. On reaching the capital he waited on Velazquez, his fellow- townsman, the great court-painter, then at the summit of his fortune, and, communicating to him his simple story, asked for some introduction to friends in Rome. The master liked what he saw of the manly youth, and in the noblest manner offered him lodging in his own house, and proposed to procure him admission to the royal galleries of the capital. Murillo accepted the offer, and here enjoyed the masterpieces of Italy and Flanders without travelling beyond the walls of Madrid. The next two years were chiefly spent in copying from Ribera, Vandyck, and Velazquez; and in 1644 he so greatly astonished the latter with some of his efforts that they were submitted to the inspection of the king and the court. His patron now urged him to go to Rome, and offered him letters to smooth his way; but Murillo, from whatever cause, preferred re- turning to his sister and his native Seville.

The friars of the convent of San Francisco in Seville had about this time piously determined to adorn the walls of their small cloister in a manner worthy of their patron saint. But the brotherhood had no money; and after endless begging they still found themselves incapable of employing an artist of name to execute the task. Murillo was needy, and offered his services ; after balancing their own poverty against his obscurity the friars bade him begin. Murillo covered the walls with eleven large pictures of remarkable power and beauty,—displaying by turns the strong colouring of Ribera, the life-like truthfulness of Velazquez, and the swectness of Vandyck. Among them were to be found representations of San Francisco, of San Diego, of Santa Clara, and of San Gil. These pictures were executed in his earliest style, commonly called his It was based chiefly on Ribera and

Caravaggio, and was dark with a decided outline. This rich collection is no longer to be met with in Seville ; Marshal Soult carried off ten of the works. The fame of these striking productions soon got abroad, and “El Claustro Chico ” swarmed daily with artists and critics. Af{urillo was no longer friendless and unknown. ‘The rich and the noble of Seville overwhelmed him with their commissions and their praises.

In 1648 Murillo married a wealthy lady of rank, Dona Beatriz de Cabrera y Sotomayor, of the neighbourhood of Seville, and his house soon became the favourite resort of artists and connoisseurs. About this time he was associated with the landscape-painter Yriarte—the two artists interchanging figures and landscapes for their respective works; but they did not finally agree, and the co-operation came to an end. Murillo now painted the well-known Flight into Egypt, and shortly afterwards changed his earliest style of painting for his calido or warm style. His drawing was still well defined, but his outlines became softer and his figures rounder, and his colouring gained in warmth and transparency. His first picture of this style, according to Cean Bermudez, was a representation of Our Lady of the Conception, and was painted in 1652 for the brotherhood of the True Cross; he received for it 2500 reals (£26). In 1655 he executed his two famous paint- ings of San Leandro and San Isidoro at the order of Don Juan Federigo, archdeacon of Carmona, which are now to be seen in the cathedral of Seville. These are two noble

portraits, finished with great care and admirable effect, but the critics complain of the figures being rather short. His next picture, the Nativity of the Virgin, painted for the chapter, is regarded as one of the most delightful speci- mens of his calido style. In the following year (1656) the same body gave him an order for a vast picture of San Antonio de Padua, for which he received 10,000 reals (£104). This is one of his most celebrated performances, and still hangs in the baptistery of the cathedral. It was “repaired” in 1833; the grandeur of the design, however, and the singular richness of the colouring may still be traced. The same year saw him engaged on four large pictures of a semicircular form, designed by his fast friend and patron Don Justino Neve y Yevenes, to adorn the walls of the

church of Santa Maria la Blanca. The first two were meant to illustrate the history of the festival of Our Lady of the Snow, or the foundation of the Roman basilica of Santa Maria Maggiore. The one represents the wealthy but childless Roman senator and his lady asleep and dreaming ; the other exhibits the devout pair relating their dream to Pope Liberius. Of these two noble paint- ings the Dream is the finer, and in it is to be noticed the commencement of Murillo's third and last style, known as the vaporoso or vapoury. It should be noted, however, that the three styles are not strictly separable into date- periods ; for the painter alternated the styles according to his subject-matter or the mood of his inspiration, the caledo being the most frequent. In the vaporoso method the well-marked outlines and careful drawing of his former styles disappear, the outlines are lost in the misty blend- ing of the light and shade, and the general finish betrays more haste than was usual with Murillo. After many changes of fortune, these two pictures now hang in the Academy of San Fernando at Madrid. The remaining pieces executed for this small church were a Virgin of the Conception and a figure of Faith. Soult laid his hands on these also, and they have not been recovered.

In 1658 Murillo undertook and consummated a task which had hitherto baffled all the artists of Spain, and even royalty itself. This was the establishing of a public academy of art. By superior tact and good temper he overcame the vanity of Valdes Leal and the presumption of the younger Herrera, and secured their co-operation. The Academy of Seville was accordingly opened for the first time in January 1660, and Murillo and the second Herrera were chosen presidents. The former continued to direct it during the following year ; but the calls of his studio induced him to leave it, now flourishing and pros- perous, in other hands.

Passing over some half-length pictures of saints and a dark-haired Madonna, painted in 1668 for the chapter- room of the cathedral of his native city, we enter upon the most splendid period of Murillo's career. In 1661 Don Miguel Mafiara Vicentelo de Leca, who had recently turned to a life of sanctity from one of the wildest profli- gacy, resolved to raise money for the restoration of the dilapidated Hospital de la Caridad, of whose pious guild he was himself a member. Majfiara commissioned his friend Murillo to paint eleven pictures for this edifice of San Jorge. Three of these pieces

represented the Annun- ciation of the Blessed Virgin, the Infant Saviour, and the Infant St John. The remaining eight are considered Murillo's masterpieces. They consist of Moses striking the Rock, the Return of the Prodigal, Abraham receiving the Three Angels, the Charity of San Juan de Dios, the Miracle of the Loaves and Fishes, Our Lord healing the Paralytic, St Peter released from Prison by the Angel, and St Eliza- beth of Hungary. These works occupied the artist four years, and in 1674 he received for his eight great pictures 78,115 reals or about £800. The Moses, the Loaves and

Fishes, and the San Juan are still to be found at Seville; but the French carried off the rest. On these pictures Murillo evidently expended all his strength, and he has left in them an enduring monument of his genius. For compass and vigour the Moses stands first; but the Pro- digal's Return and the St Elizabeth were considered by Bermudez the most perfect of all as works of art. The front of this famous hospital was also indebted to the genius of Murillo; five large designs in blue glazed tiles were executed from his drawings. He had scarcely com- pleted the undertakings for this edifice when his favourite Franciscans again solicited the aid of his pencil. He accordingly executed some twenty paintings for the hum- ble little church known as the Convent de los Capucinos. Seventeen of these Capuchin pictures are still preserved in the Museum of Seville. Of these the Charity of St Thomas of Villanueva is reckoned the best. Murillo him- self was wont to call it "su lienzo" (his own picture). Another little piece of extraordinary merit, which once hung in this church, is the Virgin of the Napkin, believed to have been painted on a "'servilleta" and presented to the cook of the Capuchin brotherhood as a memorial of the artist's pencil.

In 1670 Murillo is said to have declined an invitation to court, preferring to labour among the brown coats of Seville. Eight years afterwards his friend the canon Justino again employed him to paint three pieces for thie Hospital de los Venerables: the Mystery of the Immacu- late Conception, St Peter Weeping, and the Blessed Virgin. As a mark of esteem, Murillo next painted a full-length portrait of the canon, in which all the artist's skill is visible. The sleek spaniel reposing at the feet of the priest has been known before now to call forth a snarl from a living dog as he approached it. His portraits generally, though few, are of great beauty. Towards the close of his life Murillo executed a series of pictures illustrative of the life of "the glorious

doctor” for the Augustinian convent at Seville. This brings us to the last work of the artist. Mounting a scaffolding one day at Cadiz (whither he had gone in 1681) to execute the higher parts of a large picture of the Espousal of St Catherine, on which he was engaged for the Capuchins of that town, he stumbled, and fell so violently that he received a hurt from which he never recovered. The great picture was left unfinished, and the artist returned to his beloved Seville only to die. He died as he had lived, a humble, pious, brave man, on the 3d of April 1682 in the arms of the chevalier Pedro Nufiez de Villavicencio, an intimate friend and one of his best pupils. Another of his numerous pupils was Sebastian Gomez, named “ Murillo’s Mulatto.” Murillo left behind him two sons (one of them at first an indifferent painter, afterwards a priest) and a daughter,—his wife having died before him. His body was laid in the church of Santa Cruz, which he had greatly frequented during his last illness; and by his own desire it was covered with a stone slab bearing his name, a skeleton, and the words “ Vive moriturus.” Soult sacked this church, and nothing is to be seen of it now but a heap of rubbish.

Murillo has always been one of the most popular of painters—not in Spain alone. His works show great technical attainment with- out much style, and a strong feeling for ordinary nature and for truthful or sentimental expression without lofty beauty or ideal elevation. His cestasies of Madonnas and Saints,~~the themes of some of his most celebrated achievements, neither raise the mind nor seize upon the imagination ; but they stimulate sluggish per~~ ceptions and lukewarm devotceism, and are accepted as ravishingly pious by mobs of the fashionable and the unfashionable. Take as an example the Immaculate Conception (or Assumption of the Virgin, for the titles may, with reference to Murillo’s treatments of

this subject, almost be interchanged) in the Louvre, a picture for which, on its sale from the Soult collection, perhaps the largest

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price on record was given in 1852, some £24,600. His subjects may be broadly divided into two great groups—the scenes from low life (which were a new kind of experiment in Spanish art, so far as the subjects of

children are concerned), and the Scriptural, legendary, and religious works. The former, of which some salient specimens are in the Dulwich Gallery, are, although undoubtedly truthful, neither ingenious nor sympathetic ; sordid unsightliness and roguish squalor are their foundation. The children have little of the charm of childhood, and none of its auroral promise. The embodiments are accurate and knowing studies of ungainliness. Works of this class belong mostly to the earlier years of Murillo's practice. The subjects in which the painter most eminently excels are crowded compositions in which some act of saintliness, involving the ascetic or self-mortifying element, is being performed,—subjects which, while obtrusively repulsive in some of their details, emphasize at once the broadly human and the expressly Catholic conceptions of life. A famous example is the picture, now in the Madrid academy, of St Elizabeth of Hungary washing patients afflicted with the scab or itch, and hence commonly named E] Titioso. Technically con- sidered, it unites his three styles of painting, more especially the cold and the warm. His power of giving atmosphere to combined groups of figures is one of the marked characteristics of Murillo's art; aud he may be said to have excelled in this respect all his prede- ecssors or contemporaries of whatever school.

Seville must still be visited by persons who wish to study Murillo thoroughly, and to relish the full and native flavour of his art. A large number of the works which used to adorn this city have, however, been transported elsewhither. In the Royal Gallery at Madrid are forty-five specimens of Murillo—the Infant Christ and the Baptist (named Los Nijios della Concha), St Ildefonso vested with a Chasuble by the Madonna, &c. ; in the Museo della Trinidad, Christ and the Virgin appearing to St Francis in a Cavern, an immense composition, and various others. In the London National Gallery the chief example is the Holy Family ; this was one of the master's latest works, painted in Cadiz. Murillo, who was the last pre-eminent paintcr of Seville, was an indefatigable and most pro- lifie worker, hardly leaving his painting-room save for his assiduous devotions in church; he realized large prices according to the standard of his time, and made a great fortune. His character is recorded as very amiable and soft, yet not the less independent,

subject also to sudden impulses, not unmixed with gusts of passion. For further inforination see, especially, Stirling, Annals of the Artists of Spain,

3 vols., London, 1848; Richard Ford, Handbook for Spain, London, 1855; and

Curtis, Catalogue of the Works of Velazquez and Murillo (1883). (W. M. R.)

MUROM, a district town of Russia in the province of Vladimir, on the craggy left bank of the Oka close by its junction with the Tesha, 107 miles by rail south-east of Vladimir. Murom is the chief entrepdt for grain from the basin of the lower Oka and carries on an active trade with Moscow and Nijni-Novgorod, partly by the Oka, partly by rail, a branch line to Kovroff connecting it with the rail- way between the towns just mentioned. Murom is still famed, as in ancient times, for kitchen-gardens, raising especially cucumbers and seed for canary-birds. Its once famous tanneries have lost their importance, but the manu- facture of linen has greatly increased ; it has also steam flour-mills, distilleries, manufactories of soap, &c., and of iron implements. There are also several distilleries in the district. The population is 11,000.

MURPHY, Arravur (1727 -1805), dramatist, was the son of a Dublin merchant, and was born near Elphin in Roscommon in 1727. From 1740 to 1747 he was a student at St Omer (France). He then entered the counting-house of his uncle, a merchant at Cork. But four years afterwards he was in London, prosecuting litera- ture as a profession and publishing Zhe Gray’s Inn Journal, a periodical in the style of The Spectator. The

. drama was also occupying his attention. He produced the farce of The Apprentice, and appeared as an actor in the character of Othello. His dramas were more successful than his acting. After treading the stages of Covent Garden and Drury Lane for one season each, he aban- doned the profession. His next undertaking was the edit- Ing of a political periodical called The Test. In this, too,

© Was unsuccessful, He next turned his attention to the study of law, and was called to the bar by the Society a Lincoln’s Innin 1757. But the

smallness of his practice orced him to have recourse to his former vocation of writ- Ing for the stage. Among his many popular dramas, Zhe

Upholsterer, in 1758; The Way to Keep Him, in 1760; All in The Wrong, in 1761; The Grecian Daughter, in 1772 ; and Know Your Own Mind, in 1777, were very suc- cessful, and secured for their author both fame and wealth. Murphy is also notable as the first biographer of Fielding, and amidst the miscellaneous literary work of his later years he produced an ‘‘essay on the life and genius” of Johnson and translations of Sallust and Tacitus. Towards the close of his life the office of a commissioner of bank- rupts, and a pension of £200, were conferred upon him by Government. He died in June 1805.

MURPHY, Roperr (1806-1843), mathematician, was the son of a poor shoemaker, and was born at Mallow in Ireland in 1806. At the age of thirteen, while working as an apprentice in his father’s shop, he became known to certain gentlemen in the neighbourhood as a self-taught mathema- tician of wonderful precocity. Through their exertions, after attending a classical school in his native town, he was admitted to Caius College, Cambridge, in 1825. Third wrangler in 1829, he was elected in the same year a fellow of his college. But the temptations of prosperity were too strong for him. A course of extravagant dissipation soon led him into debt ; his fellowship was sequestered for the behoof of his creditors, and he was obliged to leave Cam- bridge in December 1832. After living for some time with his relations in Ireland, he repaired to London in 1836, a penniless literary adventurer. He had already contributed several mathematical papers to the Cambridge Philosophical Transactions, and had published Elementary principles of the theories of Electricity, &c., Camb., 1833. His pen was now employed in writing for the “Library of Useful Knowledge” a 7’reatise on the Theory of Algebraical Equations (Lond., 1839). He was labouring diligently to throw off the load of debt that still pressed heavily upon him when a disease of the lungs cut short his career in March 1843.

Murphy’s mathematical writings are remarkable for elegance and ingenuity, and parts of his work on the theory of equations and on the mathematical theory of electricity still retain their importance.

MURRAIN, a term usually restricted to extensive out- breaks of disease in cattle, but also applied to serious disorders among sheep and pigs, is taken in this article to cover general or infectious disorders of all the domesti- cated animals, and as synonymous with plague or epizooty.

It is now an established fact that murrains are all in- fectious, ¢.e., capable of transmission from diseased to healthy creatures of the same, or perhaps of many different species, the manner and degree of infectiousness varying somewhat in some of the disorders. It is also an established fact that several of them—and presumably all—owe their existence and spread to a micro-organism or germ, vegetable or animal in its nature, which, obtaining access to a healthy body disposed to its reception, grows and multiplies rapidly there, and produces characteristic morbid symptoms and alterations in tissues and organs. On the presence and dissemination of this germ or virulent agent these diseases depend for their continuance and extension; and _ this knowledge furnishes us with the indications for the sani- tary measures required to limit their spread, or to effect their extermination.

In previous ages the great outbreaks of murrains only occurred at comparatively rare intervals, in regions more or less remote from those to which they were native ; and then they generally owed their diffusion to the events of war, which sometimes carried them far beyond their ordinary boundaries. In modern times their extension has been greatly facilitated by the vastly improved means of communi- cation. The movement of large numbers of animals through the channels of commerce and their rapid transport from

one country to another, their concentration in markets, their incessant renewal, the mixing of native with foreign animals, a general indifference to the existence of con- tagious diseases and the losses they might inflict, the absence of anything like an organization to control and regulate this movement, carry out sanitary regulations, and investigate and suppress these murrains all these have operated in rendering some of the most harassing and destructive scourges more or less cosmopolitan, spread- ing

them from a very limited area in the middle of a continent to every quarter of the globe, where they flourish as vigorously and persistently as if indigenous to the soil.

The best-known murrains are discussed below.

1. Anthrax.—This is one of the most diffused and interesting of murrains, affecting, as it does, wild as well as domesticated animals. It prevails, in one or more of its forms, over the entire surface of the globe. It at times decimates the reindeer herds in Lapland and the Polar regions, and is only too well known in the tropics and in temperate latitudes. It has been observed and described in Russia, Siberia, Central Asia, China, Cochin China, Egypt, West Indies, Peru, Paraguay, Brazil, Mexico, and. other parts of North and South America, in Australia, and on different parts of the African continent, while for other European countries the writings which have been published with regard to its nature, its peculiar character- istics, and the injury it inflicts are innumerable. Countries in which are extensive marshes, or the subsoil of which is tenacious or impermeable, are usually those most frequently and seriously visited. Thus there are regions notorious for the prevalence of this murrain, such as the marshes of Sologne, Dombes, and Bresse in France ; certain parts of Germany, Hungary, and Poland; in Spain it is severely felt in the half-subinerged valleys and the maritime coasts of Catalonia, as well as in the Romagna and other marshy districts of Italy; while it is epizootic, and even panzootic, in the swampy regions of Esthonia, Livonia, Courland, and especially of Siberia, where it is known as the Stbor- skaja jaswa (Siberian boil-plague), and where it sometimes happens that, in order to suppress its ravages, battalions of soldiers must be sent to bury or burn the carcases of infected animals which float in the canals or lie in the swamps, rendering the air and the water pestilent. The records of the anthrax go back to a very ancient date. It is supposed to be the murrain of Exodus. Classical writers allude to the anthrax as if it were the only cattle disease worthy of mention (see Virgil, @eorg., iii.). It figures largely in the histories of the Early and Middle Ages as a devastating pestilence among animals, and through them to mankind; and our oldest Anglo-Saxon manuscripts contain many fantastic recipes, leechdoms, charms, and incantations for the prevention or cure of the “blacan blezene” (black blain) and the relief of the “elf- shot”

creatures. From these up to our own times it has attracted more and more attention, as even in the last and this century it has sometimes spread in an epizootic manner over the whole of Europe, from Siberia to France. It was in this malady that the presence of disease-producing germs (bacilli) was first discovered by Pollender and veteri- nary surgeon Brauell of Dorpat, and their real character afterwards verified by Davaine; and it has been in their experiments with this disease that Chauveau, Toussaint, and Pasteur have shown how to make the morbific poison its own antidote.

Symptoms.—These vary according as the disease runs its course as a general or localized affection. While death is usually rapid or sudden when the malady is general, constituting what is desig- uated splenic apoplexy or anthrax fever, in the local form, marked by the formation of carbuncles before general infection occurs, it is more protracted. In the apoplectic form there is apparently no local manifestation, and dissolution may take place so quickly (in

a few minutes) that there is no time to afford relief. One or more of the best-conditioned and perhaps robust animals in a herd or flock, which until then exhibited no sign of the disease, are sud- denly struck down as if shot while grazing, feeding in the stable, or travelling, and rise no more. Or they commence all at once to tremble and stagger; the breathing becomes hurried and the pulse very rapid, while the heart beats violently ; the internal tempera- ture of the body is high; blood flows from the nose, mouth, and anus; the visible mucous membranes are almost black in tint; and death soon supervenes, being immediately preceded by delirium, convulsions, or coma. In some cases the animal rallies from a first attack, but soon a second ensues, to which it speedily succumbs, the creature in the interval remaining drowsy and showing mus- cular tremors. In the carbuncular form the tumours may appear in any part of the body, being preceded or accompanied by fever. When the tongue is affected, the disease is usually known as blain of the tongue, tongue evil, or glossanthrax.

The tumours or malignant pustules are developed in the sub- cutaneous connective tissue, where this is loose and plentiful, in the interstices of the muscles, and in the lymphatic glands. In the various animals affected they

have their special affinities for certain regions, as between the branches of the lower jaw, upper part of the throat, lower portion of the neck, breast, behind the shoulders, back, flank, substance of the tongue, &c. If the part where an anthrax tumour is about to appear is covered with hair, this will be observed to become erect, and if the hand is passed over the part perhaps a slight crepitation will be felt ; there is also increased sensibility. In many cases there soon appears a nodosity, simple or multiple, about the size of a small nut and circular or irregular in outline. Ordinarily this is little sensitive in itself, the pain the animal experiences being due to the increased sensibility of the surrounding parts. In other instances the tumour suddenly com- mences in the appearance of a soft edematous swelling, crepitating and undefined. When the eruption takes this form the tumours are quickly developed, and in a few hours invade all the neighbour- ing parts, extending in every direction with equal rapidity,—the skin eovering them becoming tense and hard like parehment, and crackling on pressure. As they extend they become cold and in- sensible, a variable number of phlyctene arise on their surface, and these quiekly bursting give issue to a serous irritant fluid. Ifan ineision is made in the swelling at this stage there is no symptom of pain, and a black or reddish scrum escapes, extremely fcetid and corrosive, which produces a noise as it flows like the crackling of paper or the bubbling of boiling water. Sometimes passive heemor- rhage ensues after the incision is made, and continues until death.

In whatever form the tumours are developed, their course is always the same, being more rapid the earlier they appear. In from two to eight hours they attain a considerable size, and the tissues mortify as they are invaded. As they are developed the animal seems to become relieved, the fever abates, and the more urgent symptoms vanish. But, when they have attained certain proportions, general symptoms are manifested, and these vary aecording as the malady is to tcrminate favourably or otherwise. In some rare instances the matter which constitutes the tumours is suddenly absorbed, abundant sweats, an inereased flow of urine, or a serous feetid diarrlicea ensue, and the animal promptly recovers. In other eases, by surgieal intervention, the evolution of the tumours is limited to a certain extent ; they reach the sup pura stage, and finally disappear. In ordinary circumstances, however, it happens that after the interval which follows the eruption, the organism being incapable of eliminating the morbid element,

the tumours vanish; but this is only a transference, for the disease assumes all the grave characters of anthrax fever without local manifestations, the general symptoms reappear, and, running their course with marvellous rapidity, the animal perishes in a few hours.

A form of anthrax affects the horse more especially, and this by some authors has becn designated anthrax typhus. It manifests itself locally and generally, and is very fatal (Fleming, Veterinary Sanitary Seience and Police, vol. ii. p. 122).

In cattle there is a disease very fatal among young stock, and known to breeders and graziers by various names, the most com- mon of which is ‘‘ black quarter,” which had always been classed among the forms of anthrax until its nature was investigated by Arloing and Cornuvin, who have termed it symptomatic anthrax (Charbon symptomatique), while by others it has been named anthra- coid crysipelas, &c. ‘This is at first a local disease, affecting usually one hind quarter, and occurring among young animals more espe cially, particularly those fed on rich food and thriving rapidly. It also occurs very suddenly, runs its course in a very brief space, and nearly always terminates fatally unless surgical and medical treat- ment is promptly resorted to. It is caused also by a bacillus or bacterium somewhat different from that of ordinary anthrax.

In splenic fever or splenie apoplexy, the most marked alterations observed after death are—the effects of rapid decomposition, evidenced by the foul odour, disengagement of gas beneath the skim and in the tissues and eavities of the body, yellow or yellowish- red gelatinous exudation into and betwcen the muscles, effusion

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of citron- or rust-coloured fluid in various cavities, extravasations of blood and local congestions throughout the body, the blood in the vessels generally being very dark and tar-like. The most notable feature, however, in the majority of cases is the enormous enlargement of the spleen, which is engorged with blood to such an extent that it often ruptures, while its tissue is changed into a violet or black fluid mass.

Inoculation. —Anthrax in all its forms is an inoculable disease, transmission being surely and promptly effected by this means, and it may be conveyed to nearly all animals either by inoculation or through the digestive organs. The abraded skin is often the channel for the introduction of the bacilli; and persons who handle diseased animals or their products—as flesh, skin, wool, or hair—often die from anthrax, which presents similar symptoms in mankind to those it exhibits in animals. The bacillus of anthrax, under certain con- ditions, retains its vitality for a long time, and rapidly grows when it finds a suitable fluid in which to develop, its mode of multi- plication being by scission and the formation of spores, and depend- ing, to a great extent at least, on the presence of oxygen. The morbid action of the bacillus is indeed said to be due to its affinity for oxygen ; by depriving the red corpuscles of the blood of that most essential gas, it renders the vital fluid unfit to sustain life. Others assert that the fatal lesions are produced by the enormous number of bacilli blocking up the minute blood-vessels, especially of the lungs, and thus inducing asphyxia.

It was by the cultivation of this micro-organism, or attenuation of the virus, that Pastcur has been enabled to produce a prophy- lactic remedy for anthrax, which has already been demonstrated to be very effective ; and his discovery is likely to lead to most im- portant results in procuring protective agents for other similar and fatal disorders in nan and beast. Though his discovery was first made with regard to the cholera of fowls, a most destructive dis- order which annually carries off great numbers of poultry, yet as applied to anthrax it has attracted most attention. This so-called attenuation or cultivation of the virus of the disease by Pasteur is effected by growing the bacillus in an albuminous fluid, the prefer- ence being given to chicken-broth which has been previously steril- ized by being raised to a temperature of 115°C. This broth is inoculated with a drop of anthrax blood which has been taken with antiseptic precautions from an animal about to die of the disease ; it is kept in pure air at a temperature of 42° to 43° C. ; at 45° the process of cultivation will not go on. After a certain time another quantity of broth is inoculated with a drop of the first, and kept under the same conditions; and so this cultivation is carried on until a sufficient number of generations of the bacilli have been grown and the required degree of attenuation ensured. This is attained by attention to the temperature, allowing a certain inter- val to elapse between each inoculation

of the broth and the number of generations cultivated. The resulting ‘‘ vaccine,” as it has been improperly designated, when inoculated into the body of an animal liable to anthrax, confers immunity from the disease, if certain rules are attended to.

Toussaint had, previous to Pasteur, attenuated the virus of anthrax by the action of heat; and Chauveau has more recently corroborated by numerous experiments the value of Toussaint’s method, demonstrating that, according to the degrce of heat to which the virus is subjected, so its innocuousness when trans- ferred toa healthy creature. The attenuation of heat, according to this method, is a safer and readier way to obtain a protective virus than Pasteur’s broth cultivations.

2. Cattle-Plague or Rinderpest.—The next disease is that which has, since the commencement of the last century, been generally described as “the murrain,” but which is now better known as the ‘“cattle-plague” or ‘“rinderpest” (German). animals attacked, the most universal of all diseases, being transmissible to nearly every living creature, including man- kind, cattle-plague is limited to ruminants (oxen, sheep, goats, camels, buffaloes, yaks, deer, &c.). It is an Asiatic malady, and prevails frequently and with great severity in southern Russia (imported), Central Asia, Mongolia, China (south, west, and north), Cochin China, Burmah, Hindu- stan, Persia, Ceylon, and the islands in the Indian and Malay Archipelagos. It is only known in Europe as an exotic and imported malady, it has not yet appeared on the American continent, in Australia, in New Zealand, or on the African continent, except in Egypt, into which it has been carried on several occasions, aud where, owing to the absence of sanitary measures, it now prevails constantly. It is one of the most infectious and fatal diseases of ani- mals—a specific fever which runs its course so rapidly,

While anthrax is, with regard to species of.

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and attacks such a large percentage of ruminants when it is introduced into a country, that from the earliest times it has excited terror and dismay.

It has been noted that its irruptions into Europe in the earlier centuries of our era always coincided with invasions of barbarous tribes in the east of Europe; and even at a later period the disease accompanied the events of war, when troops with their commissariat moved from the east towards the west, or cattle, when they were carried in the same direction. One of the earliest recorded irruptions of cattleplague into western Europe occurred in the 5th century after the sanguinary invasion of the Huns under Attila, the expulsion of the Goths from Hungary, and the fierce internecine wars of the whole Germanic population. The disease appears then to have been carried from Hungary through Austria to Dalmatia, while by Brabant it obtained access to the Low Countries, Picardy, and so on to the other provinces of france. In the curious poem De Mortibus Bovum written by St Severus, who lived at that period, the course and destructiveness of the disease are specially alluded to. Many invasions of Europe are described, and in several of these Britain was visited by it —as in 809-810, 986-987, 1223-1225, 1513-1514, and notably in 1713, 1745, 1774, 1799. In 1865 and 1872 it was imported direct from Russia,

Symptoms.—Like some other general diseases, this does not offer any exclusive or pathognomonic symptoms, but is rather charac- terized by a group of functional and anatomical alterations. An exact knowledge of its symptoms and necroscopical appearances is of the utmost importance, as its extension and consequent ravages ean only be arrested through its timely recognition and the imme- diate adoption of the necessary sanitary measures. Intense fever, diarrhoea or dysentery, croupous inflammation of the mucous mem- branes in general, sometimes a cutaneous papular eruption, and great prostration mark the course of the affection, which is frequently most difficult to diagnose during life, especially if its presence is not suspected. Its introduction and mode of propagation can, im many instances, be ascertained only at a late period, and when great loss may already have been sustained. In the majority of cases the exantination of the carcase of an animal which has died or been purposely killed is the best way to arrive at a correct dia- gnosis. Indeed, this is practically the only certain means of con- cluding as to the presence of the malady, as in different invasions, and even in different countries and different individuals during the same invasion, there are obscrved considerable variations in the

chicf symptoms with regard to their intcnsity as well as in the secondary symptoms or epiphenomena.

Among cattle indigenous to the regions in which this malady may be said to be enzootic the symptoms are often comparatively slight, and the mortality not great. So much is this the case that veterinary surgeons who can readily distinguish the disease when it affects the cattle of western Europe, can only with difficulty diagnose it in animals from Hungary, Bessarabia, Moldavia, or other countries where it is always more or less prevalent. In these the indications of fever are usually of brief duration, and signs of lassitude and debility are, in some instances, the only marks of the presence of this virulent disorder in animals which may, neverthe- less, communicate the disease in its most deadly form to the cattle of other countries. Slight diarrhea may also be present, and a cutaneous eruption accompanied by gastric disturbance, shedding of tears, and infrequent cough. In the more malignant form the fever runs very high, sometimes to 107°6° Fahr., and all the char- acteristic symptoms of the disorder are well marked, the lesions during life being observed in the cheese-like deposits on the gums, the presence of petechie on the mucous membranes, discharges from the eyes, nosc, and mouth, eruption on the skin, cough and laboured breathing, certain nervous phenomena, and dysenteric dejections. Death generally occurs in four or five days, the course of the disorder being more rapid with animals kept in stables than with those living in the open air, and in summer than in winter. After death the chief alterations are found in the digestive canal, and consist in evidence of inflammation of a more or less acute kind, with ulceration, extravasation of blood, gangrene, &c. The mem- brane lining the air-passages offers similar alterations ; indced, all the mucous membranes of the body appear to be involved, and the malady might almost be considered as a malignant infectious catarrhal fever.

Protective inoculation has often been advocated and practised (particularly in Russia) for this disorder, but the advantages de- rived have not been sufficient to compensate for the danger attend-

ing it. Quite recently, Semmer of the Dorpat veterinary school has made experiments with cultivated or attenuated virus, and so far the results have

been encouraging.

3. Pleuro-Pneumonia or Lung-Plague.—The next murrain in importance, with regard to destructiveness, is the so-called “lung-plague” or contagious “pleuro-pneumonia” of cattle.

This disease is particularly interesting from the fact that within less than two centuries it has been spread from a very small area over nearly every part of the world. The earliest notices of it testify that it first prevailed in central Europe, and in the last century it was present in certain parts of southern Germany, Switzerland, and France, and had also appeared in upper Italy. Though Valentine described an epizooty occurring among cattle in 1693 in Hesse, yet doubts have been entertained as to whether it was this malady. It was not until 1769 that it was definitely described as prevailing in Franche-Comté by the name of “murie.” From that date down to 1789 it appears to have remained more or less limited to the Swiss mountains, the Jura, Dauphiné, the Vosges, Pied- mont, and upper Silesia; it showed itself in Champagne and Bourbonnais about the time of the Revolution, when its spread was greatly accelerated by the wars that followed, and the consequent demand for cattle for the commissariat parks of the contending armies. Since that time the continually increasing commercial relations be- tween various countries have carried it to the ends of the earth, the long duration of latency, and the some- what slow course of the disorder, eminently adapting it for conveyance to great distances. In this century its diffusion has been accurately determined. It invaded Prussia in 1802, and soon spread over North Germany. It was first described as existing in Russia in 1824; it reached Belgium in 1827, Holland in 1833, the United Kingdom in 1841, Sweden in 1847, Denmark in 1848, Finland in 1850, South Africa in 1854, the United States —Brooklyn in 1843, New Jersey in 1847, Brooklyn again in 1850, and Boston in 1850; it was also carried to Melbourne in 1858, and to New South Wales in 1860; New Zealand received it early in 1864. It has also been carried to Asia Minor, and has made its presence felt at Damascus. In Austria it is less prevalent than in some other European countries, being scarcely known except in Bohemia, Moravia, and a portion of Tyrol. In Hungary it appears to be almost unknown, in consequence of the minimum importation of foreign cattle; and in countries to which it has not been introduced by infected animals it is

not seen. In consequence of its insidious invasion, the subtlety of its contagion, and the great fatality attending it, there can be no doubt that it is one of the most disas- trous plagues that can afflict a cattle-producing country. Fortunately, unlike the two preceding murrains, it is con- fined entirely to the bovine species ; no well-authenticated instances of its transmission, either accidental or experi- mental, to other species have been recorded.

In its nature it is a specific infectious disease, generally affecting the lungs and the lining membrane of the chest, producing a particular form of lobar or lobular pleuro- pneumonia, and in the majority of cases, if not in all, it is transmitted through the medium of the inspired air,— hence its localization in the lungs. Inoculation with the fluid from the diseased lungs does not produce any effect on other than the bovine species ; but in this its action is most energetic. Producing, after a certain interval, char- acteristic lesions at the seat of inoculation, the morbid change or infective process soon involves parts beyond, and if not checked may cause most serious damage and even the death of the inoculated animal; though it does not develop the lung lesions always observed in accidental in- fection, yet there is a local anatomical similarity or identity.

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Symptoms.—The malady is slow and insidions in its course, last- ing from two to three weeks to as many months, the chief symptoms being fever, diminished appetite, a short cough of a peculiar and pathognomonic character, with quickened breathing and pulse, and physical indications of lung and chest disease. The progress of the malady is marked by exacerbation of the symptoms, and towards the end there is great debility and emaciation, death generally en- suing after hectic fever has set in. Recovery is somewhat rare.

The pathological changes are generally limited to the chest and its contents, and consist in a peculiar marbled-like appearance of the lungs on section, and fibrinous deposits on the plenral mem- brane, with oftentimes great effusion into the cavity of the thorax.

Willems of Hasselt (Belgium) in 1852 introduced and practised inoculation as a protective measure for this scourge, employing for this purpose the serum obtained from a diseased lung ; and his suc- cess was so marked that he made known his procedure. Since that time inoculation has been extensively resorted to, not only in Europe, but also in Australia and South Africa ; and its protective value has been generally recognized. When properly performed, and when certain precautions are adopted, it would appear to confer immunity from the disease. The usual seat of inocnlation is the extremity of the tail, the virus being introduced beneath the skin by means of a syringe or a worsted thread impregnated with the sernm. One or two drops are sufficient to cause the local and constitutional disturbance which mark successful prophylactic infection. A par- ticular micro-organism has been discovered in the diseased textures and fluids of animals affected with contagious pleuro-pneumonia, which is supposed to causc the malady. It has been cultivated, and inoculation experiments have been made with it. The intra- venous injection of the virns has been found to be a safer method of conferring immunity than inoculation beneath the skin, and quite as certain a method. ,

4. Foot-and-Mouth Disease (Epizootic Aphtha, Eczema epizootica), if we were to judge by the somewhat vague descriptions of different disorders by Greek and Roman writers, has been a European malady for more than 2000 years. But no reliance can be placed on this evidence, and it is not until we reach the 17th and 18th cen- turies that we can find trustworthy proof of its presence, when it was reported as frequently prevailing extensively in Germany, Italy, and France. During this century, owing to the vastly-extended commercial relations between every civilized country, it has, like the lung-plague, become widely diffused. In the Old World its effects are now experienced from the Caspian Sea to the Atlantic Ocean. It gradually extended towards Britain at the commence- ment of this century, after invading Holland and Belgium, and about 1839 appeared in England, where it was imme- diately recognized as a new disease; it quickly spread over the three kingdoms. From the observations of the best authorities it would appear to be an altogether exotic malady in the west of Europe, always invading it from the east; at least, this has been the course noted in all the principal invasions. It was introduced into Denmark in 1841, and into the United States of America from Canada, where it had been carried by

diseased cattle from England. It rapidly extended through cattle traffic from the State first invaded to adjoining States, but was extinguished, and does not now appear to be known on the American continent. It was twice introduced into Australia in 1872, but was stamped out on each occasion. It appears to be well known in India, Ceylon, Burmah, and the Straits Settlements. In 1870 it was introduced into the Andaman Islands, where it had not previously been seen, by cattle imported from Calcutta, where it was then prevailing. There is evidence that it is common in South Africa, and is frequently epizootic there, causing great inconvenience, owing to the bullocks used for draught purposes, which travel great distances, becoming unfit for work, by which traffic is much interfered with. These cattle also spread the contagion. It is not improbable that it also prevails in Central Africa, as Schweinfurth alludes to the cattle of the Dinkas suffering from a disease of the kind. Though not a fatal malady, and in the majority of cases readily amenable to treatment, yet it is a most serious scourge. It is transmissible to nearly all the

domestic animals, even mankind sometimes becoming infected, but its ravages are most severe among cattle, sheep, and pigs. Since it was introduced into the United Kingdom it has proved more disastrous on the whole, perhaps, than any other murrain, and has most injuriously affected agricultural interests. What makes it more serious ‘s the fact that one attack is not protective against another, an animal sometimes being affected a second time within a few months.

Symptoms. —This is an eruptive fever, characterized by vesicles or blisters in the mouth, sometimes in the nostrils, and on parts of the body where the skin is thin and least covered with hair, as on the udder and towards the feet. The animal cannot eat so well as usual, suffers much pain and inconvenience, loses condition, and, if a milk-yielding creature, gives less milk, or, if pregnant, may abort. Sometimes the feet become very much diseased, and the animal is so crippled that it has to be destroyed. It is often fatal to young creatures. It is transmitted more especially by the saliva and the discharges from the vesicles on the feet and udder, though all the

secretions and excretions are doubtless infective, as well asall articles soiled by them. The disease can be produced by injecting the saliva intravenously.

These are the best-known murrains affecting cattle ; but there are others which, though they cannot be noticed here, are of some moment. One in particular demands most serious consideration, the disease known as “consumption,” “pining,” and (from the appearance of the morbid growths in the chest) “ grapes,” and to the medical and veterinary pathologist as “tuberculosis.” It is a highly-infectious disorder in cattle, is becoming very common among the improved breeds, and causes heavy losses in dairy stock. It has been experimentally demonstrated that the tuber- culous matter, as well as milk and the juice of the flesh of diseased cows, when given to healthy animals or inocu- lated in them, will produce the malady, and this leads to the grave question as to the danger incurred by mankind through the consumption of the flesh and milk of tubercu- lous cows. ‘This is a pressing sanitary problem which demands early solution.

Prevention of Murrains.—The legislative measures necessary for prevention or suppression of murrains are based upon the fact that these diseases depend for their extension solely upon their contagious properties. The object is, therefore, either to prevent the admission of the contagious principle, z.¢., through diseased animals or articles which have become infective by contact with them, or to destroy it as quickly as possible. The necessity for this is abundantly evident on every page in the history of these scourges. It is almost impossible to realize the loss and embarrass- ment caused by cattle-plague, lung-plague, and foot-and-mouth disease only. By the first-named murrain it has becn estimated that the loss in Europe from 1711 to 1796 only was 200,000,000 head of cattle. And in this century the disease has not been less severe, though its opportunities for extension, much greater than before, have been much diminished by the progress made in veteri- nary science. From 1841 to 1844 Egypt lost 400,000 head of cattle ; and 1,000,000 perished in Russia in 1844-1845. From 1849 to 1863 the Austrian states lost 258,107. In Hungary from 1861 to 1867 this steppe murrain appeared in 680 communes having a bovine population of 908,209 ; 25 per cent. were attacked, and of these 145,474 or 63°9 per cent. were lost. In 1860-1861 Austria lost 4800 cattle; and in Russia 183,678 died in 1860. In 1865-1866 Great Britain is supposed to have lost 233,629 head,

valued at from five to eight millions of pounds, though this is probably far below the actual figure; and Holland, receiving the infection from England, at this time lost 115,000 cattle. In 1870 Germany reported 8122 as dead from rinderpest ; and during the Franco- German war, when the diseasc was introduced into France by the German troops, the Bas-Rhin dcpartment alone lost 6104 cattle and shecp at the pcriod of the invasion, and 582 cattle and 944 sheep when the troops returned, the amount of indemnity paid for cattle destroyed being 1,622,249 francs, while in Lorraine 5000 cattle and more than 3000 sheep, and in the Haut-Rhin 14,000 cattle perished, the compensation to cover this loss being estimated at 1,500,000 francs. In August 1873 thirteen governments in Russia were invaded by rinderpest, and it was computed that 18,000 animals were attacked, 14,000 of which died or were destroyed.

These figures give but a faint idea of the appalling destruction wrought by rinderpest ; and lung-plague, though its ravages are not so striking or immediate, has been scarcely less formidable. For Instance, in Holland in 230 parishes the average yearly loss has been

reckoned at 49,661. In 705 parishes in Wiirtemberg 1706 stables contained 10,214 cattle; of these 4200 were attacked, and 2583 were killed or died. In France, according to published statistics, the loss caused by this murrain in 217 communes of the department of the Nord during seven consecutive years was 11,200 in a bovine population of 280,000 —or a total in nineteen years of 218,000 head, the estimated value of which was fifty-two millions of francs. In the departments of Aveyron, Cantal, and Lozére the average loss for a long time was not less than 35 per cent. of the entire cattle. In Australia the losses caused by it during thirteen years were supposed to be at least 30 to 40 per cent. of the whole number of cattle, or about 1,404,097 head, which, if valued at only £6 each, would amount to about £8,500,000. Only a very imperfect notion can be formed of the destruction it has caused in Great Britain and Ireland since its introduction ; but for the six years ending with 1860 it has been calculated that there perished con- siderably more than a million of cattle in the United Kingdom, the value of which

must have amounted to more than twelve millions of pounds. From 1863 to 1866 the death-rate from the scourge was from 50 to 60 per cent. annually.

The deaths from foot-and-mouth disease vary in number at dif- ferent outbreaks, and are much less than in the invasions of steppe murrain and lung-plague. The most serious feature of this murrain is its affecting a large percentage (frequently nine-teuths) of the ruminants and pigs on a farm or ina district. In 1839, ina dis- trict in Wiirtemberg comprising about 8 square miles and con- taining 11,000 head of cattle, only 1300 or 12 per cent. escaped ; in the arrondissement of Miilhausen, Alsace, containing 32,000 animals, in 1862-3-4 only about 4000, or one in eight, were not attacked; in the department of the Nord in 1839 of 277,000 cattle 120,000 were affected, more than one-half of the sheep, and one-fifth of the pigs. In Baden in 1864 of 607,825 cattle 189,995 were infected. It is scarcely possible to arrive at anything like a correct estimate of the number of cattle affected during any par- ticular outbreak in Britain. Perhaps it would not be an exaggera- tion to assert that 150,000 or 200,000 suffered froin the disease in 1872, and from 1839 up to 1874 it was estimated that the money loss it caused the country was £13,000,000, but this is probably far below the mark. It has been calculated that the loss experienced from an outbreak in Baden in 1869 was no less than £103,000, and for the southern states of Germany £833,000. France is sup- posed to have lost from this disease, among cattle only, in twenty years £4,000,000.

When it is considered how rapidly animals lose condition, especi- ally fat stock; what losses occur when it appears among milch cows and those in calf, or amongst oxen used for draught, and among sheep, pigs, and poultry ; what embarrassment it may occasion to agriculture and the cattle and milk trade, not to speak of the expense of curative measures,—it will be secn what a serious mnwrain this is, even under the most favourable circumstances. It is still more so when it assumes a severe character, which it often does, and is likely to be accompanied by complications. The great rapidity with which it spreads greatly increases these losses. In a very few months it has been observed to enter the eastern frontiers and spread over a large portion of the continent of Europe, infecting Germany, Switzerland, France, Holland, and Belgium, and reaching England, always following the course of cattle traffic.

These examples and estimates afford after all only a very faint notion of the devastation, misery, embarrassment, and loss that murrains occasion, and it is this which has compelled enlightened Governments to adopt severe measures for their extinction, or at least limitation. These measures are successful in proportion as they are well deviscd and energetically carricd out, for all the mutrains or contagious diseases are perfectly amenable to con- trol, and may even be totally suppressed by international agreement and combined action. There is reason to hope that this most desirable result will be ultimately attained, but at present it isa long way off—some infected countries, in consequence of imperfect measures or the absence of any veterinary sanitary police, proving a standing menace to others which are cither free from infection, or are energetically endeavouring to get rid of it. The measures now in force may be briefly said to be interdiction of the import- ation of cattle from countries in which cattle-plague, foot-and-mouth discase, or contagious pleuro-pneumonia is prevalent, or compulsory slaughter at the ports of debarkation. In some of the infected countries, as in the United Kingdom, where foot-and- mouth disease and contagious pleuro-pucumonia are always more or less prevalent, infected cowsheds, farms, or districts are rigor- ously isolated, so far as the movement of animals from them is concerned, none being allowed to leave until the disease has been suppressed, and cattle-markets or fairs nay be closed for a certain period. In contagious pleuro-pneumonia, discased animals and those which have been in contact with them are slaughtered, and compensation allowed the owner for the latter by the local authori- ties, while measures of cleansing and disinfection are enforced. Mie movement of cattle in, into, and from the infected area is closcly watched to extinguish the contagion as specdily as possible

by prohibiting communication between sick and healthy animals susceptible to the malady, and so preventing the formation of new infectious centres. Evasion or infraction of the legislative orders in force for the suppression of contagious diseases in animals is punishable by fine or imprisonment. (G. FL.) MURRAY COD. Of the numerous freshwater Perches inhabiting the rivers and watercourses of Australia the Murray Cod (Oligorus macquariensis) is one of the largest, if not the largest, and the

most celebrated on account of the excellent flavour of its flesh. In conferring upon the fishes of the new country familiar names, the early colonists were evidently guided by the fancied resemblance in taste or appearance to some fish of their northern home rather than by a consideration of their taxonomic affinities. These, as far as the Murray Cod is concerned, lie in the direction of the Perch and not of the Cod family. The shape of the body is that of a Perch, and the dorsal fin consists of a

Murray Cod.

spinous and rayed portion, the number of spines being eleven. ‘The length of the spines varies with age, old individuals having shorter spines, that is, a lower dorsal fin. The form of the head and the dentition also resemble those of a Perch, but none of the bones of the head have a serrated margin. The scales are small. The colour varies in different localities; it is generally brownish, with a greenish tinge and numerous small dark green spots. As implied by the name, this fish has its headquarters in the Murray river and its tributaries, but it occurs also in the northern parts of New South Wales. It is the most im- portant food fish of these rivers, and is said to attain to a length of more than 3 feet, and to a weight of 120 hb. MURRAY RIVER, the largest river in Australia, rises in the Australian Alps about 36° 40’ S. lat. and 147° E. long., and, flowing north-westwards, skirts the borders of New South Wales and Victoria until it passes into South Australia, shortly after which it bends southward into Lake Alexandrina, a shallow lagoon, whence it makes its way to the sea at Encounter Bay by a narrow opening at 35° 35’ S. lat. and 138° 55’ E. long. Near its source, the Murray Gates, precipitous rocks, tower sheer above it to the height of 3000 feet ;. and the earlier part of its course is very tortuous, broken, and uneven. Farther on it in some parts loses so much by evaporation as to become merely a series of pools. Its length till it debouches into Lake Alexandrina is 1120 miles, its average breadth in summer is 240 feet, its average depth about 16; and it drains an area of about 270,000 square miles. For small steamers it is navigable as far as Albury. Periodically it overflows its banks, causing wide inundations. Opera- tions have lately been undertaken to render its mouth accessible for ships; but, owing to the force of the southern ocean, navigation is difficult and dangerous. The principal tributaries of the Murray are those from New South Wales, including the Edward river, the

united streams of the Murrumbidgee and Lachlan, and the Darling or Callewatta. It was in 1829 that Captain Sturt traced the Murrumbidgee river till it debouched in a magnificent stream 300 feet wide. This stream, the Murray river, he followed down to Lake Alexandrina, but was compelled, after enduring great hardships, to return without discovering its outlet to the sea. In 1831 Captain

Barker, while attempting to discover its outlet, was mur- dered by the natives. In 1836 the discovery was made by Major Mitchell that the Darling flowed into the Murray, (See AUSTRALIA, vol. iii. pp. 105, 107.)

MURRAY, or Moray, James Stuart, Seconp Earn or (1533-1570), regent of Scotland, was the illegitimate son of James V. by Margaret Erskine, daughter of the fourth Lord Erskine. While only in his fifth year he was appointed prior of the abbey of St Andrews in order that James V. might obtain possession of its funds. Under the tutorship of George Buchanan his intellectual training was carefully attended to, and as early as his fifteenth year he gave evidence of rare courage and decision by an impetuous attack on an English force which had made a descent on the Fife coast, and which he routed with great slaughter, In addition to the priory of St Andrews, he subsequently received those also of Pittenweem and of Mascon (France), but on reaching manhood he manifested no vocation for monasticism. The discourses of Knox, which he heard at Calder, won his high approval, and shortly after the return of the Reformer in 1559 Murray left the party of the queen-regent and joined the lords of the congregation, who resolved to adopt the bold measure of forcibly abolishing the Popish service. After the return of Queen Mary in 1561 he became her chief adviser, and his cautious firmness was for a time effectual in inducing her to adopt a policy of moderation and tolerance towards the Reformers. In 1562 he was created earl of Mar, and soon after married Lady Agnes Keith, daughter of the earl marischal. The earldom of Mar being claimed by Lord Erskine, he resigned the title and propertyand was created earl of Murray. After the defeat of Lord Huntly, leader of the Catholic party, who died soon afterwards, the policy of Murray met for a time with no obstacle or hindrance, but he awakened the displeasure of the queen by his efforts in behalf of Knox

when accused of high treason, and, as he was also strongly opposed to her marriage with Darnley, he was after that event declared an outlaw and compelled to take refuge in England. Returning after the death of Rizzio, he found the sentiments of the queen towards him very greatly altered, and received a full pardon. On the abdication of Queen Mary at Lochleven he was appointed regent. The position was full of temptation and difficulty, but his con- spicuous integrity and moderation, joined to unflinching courage and the utmost readiness of resource, proved to be adequate to what the circumstances demanded. When Mary made her escape from Lochleven, he occupied her attention with pretended negotiations until he had gathered his adherents in sufficient force, when he completely defeated her at Langside (13th May 1568) and compelled her to flee to England. Immediately afterwards he frustrated an attempt at insurrection by the duke of Chatelherault, whom he confined in the castle of Edinburgh. The dis— appointed partisans of the queen resolved to have revenge, and one of their number, Hamilton of Bothwellhaugh, shot him through the body at Linlithgow, 21st January 1570. The wound proved fatal, and he died the same evening.

MURRAY, Jonny, M.D. (1778-1820), lecturer on chemistry and materia medica, was born in Edinburgh in 1778 and died in 1820. He was a clear and popular lecturer, and his books well represent the chemistry of the time, but he will be chiefly remembered on account of his opposition to Davy's theory of chlorine. In support of the old view that chlorine is a compound of oxygen and anhydrous muriatic acid, he attempted to prove experi mentally that muriatic acid gas contains combined water, and that chlorine contains oxygen. Dr John Davy con- clusively proved that Murray's experiments were inac- curate, and that all the phenomena can be perfectly well explained without assuming the existence of the unknown

anhydrous muriatic acid or the compound nature of the ap- parently elementary chlorine. It is interesting to note that 'twas in the course of the experiments made with the view of disproving Murray's conclusions that Davy discovered phosgen, the compound of carbonic oxide and chlorine.

Murray wrote Elements of Chemistry, 2 vols. 8vo, Edinburgh, 1801 (fourth edition, 1816); Elements of Materia Medica and Pharmacy, 2 vols. 8vo, 1804 (new edition, 1810); 4 System of Chemistry, 4 vols. 8vo, 1806 (fourth edition, 1818) ; and numerous papers in the Transactions of the Royal Society of Edinburgh and Nicholson's Journal.

MURRAY, Sir Ropert (c. 1600-1673), one of the founders of the Royal Society, was the son of Sir Robert Murray of Craigie, Ayrshire, and was born about the be- gimiing of the 17th century. In early life he served for some years in the French army, and, winning the favour of Richelieu, he rose to the rank of colonel. On the outbreak of the civil war he returned to Scotland and was energetic in collecting recruits for the royal cause. The triumph of Cromwell compelled him for a time to return to France, but he took an active part in the Scottish insurrection in favour of Charles II. in 1650, and was named lord justice elerk and a privy councillor. These appointments, which on account of the overthrow of the royal cause proved to be at the time only nominal, were confirmed at the Restora- tion in 1660. Soon after this event Sir Robert Murray began to take a prominent part in the deliberations of a club instituted in London for the discussion of natural science, or, as it was then called, the 'new philosophy." When it was proposed to obtain a charter for the society he undertook to interest the king in the matter, the result being that on 15th July 1662 the club was incorporated by charter under the designation of the Royal Society. Sir Robert Murray was its first president, and during the remainder of his life exerted himself with great zeal and ability to extend its influence. He died in June 1673.

MURREE, or MaArrl, a sanatorium and hill station in the Rawal Pindi district, Punjab, is situated in 33° 54' N. lat. and 73° 26' E. long. It forms the great northern sanatorium for the Punjab, and is the ordinary summer resort of the local Government. The houses crown the summit and sides of an irregular ridge of the Murree hills, 7507 feet above sea-level, and command a magnificent view. The climate is admirably adapted to the constitution of Europeans ; the lowest recorded temperature is 21° Fahr., the highest 96°. The resident population in 1868 was 2346; but in the height of the season it probably amounts to 12,000 or 14,000, numbers of visitors

being attracted from Lahore, Rawal Pindi, Pesh4war, and the plains generally.

MURSHIDABAD, or MoorsHEDABAD, a district in the lieutenant-governorship of Bengal, lying between 23° 43’ and 24° 52’ N. lat. and 87° 43’ and 88° 47’ E. long,, is bounded along its whole fronticr from the extreme N. to the §.E. by the Ganges, separating it from the Nadiya and Rajshahi districts ; on the 8. by Nadiydé and Bardwan —the Jalangi river marking its boundary for a consider- able distance; and on the E. by Birbhum and the Santal Pargands district. The area is 2141 square miles. The district is divided into two nearly equal portions by the Bhagirathi, the ancient channel of the Ganges, which flows due north and south. The tract to the west, known as the Rarh, consists of hard clay and nodular limestone. The general level is high, but interspersed with bils or broad marshes and seamed by hill torrents. The Bagri or eastern half differs in no respect from the ordinary alluvial plains of eastern Bengal. There are few per- manent swamps; but the whole country is low-lying, and hable to annual inundation. In the north-west are a few small detached hillocks, said to be of basaltic formation. The river system is constituted by the Ganges or Padma, and its offshoots and tributaries the Bhagirathi, Bhairab,

Sidlmari, Jalangi, and Sing4,—the first mentioned being by far the most important river within Murshidabad, though only navigable during half the year. It is em- banked along the entire length of its left bank. There are no canals in the district.

The census of 1881 returned the population of the district at 1,226,790 (males 586,483, females 640,307),—Hindus numbering 634,796, Mohammedans 589,957, native Christians 250, and aborigines 836. The population eomprises Bengalis of the delta, hill tribes from Chutia Nagpur, and the peculiar Hindu castes of Behar, while the presence of the court has introdueed Rajputs from the north-west for railway serviee or trade, Afghans and Persians from beyond the frontier, and a bodyguard of Habshis from the east coast of Africa. The six following towns contained. in 1872 a population exceeding 5000,—Murshidabad, 46,182; Barhampur, 27,210; Kandi, 12,016; Jangipur, 11,361; Beldanga, 6037 ; and Margram, 5766.

Other places of some importance are the river marts of Azimganj and Jiaganj, situated opposite each other on the Bhagirathi, Bhagwangola and Dhulian on the Ganges, and the railway stations of Murarai and Nalhati. Sites of historieal interest include the now deserted Kasiimbazar, Badrihat, Rangamati, and the battlefield of Gheria.

Rice constitutes the staple crop, the éman or winter rice being prevalent in the western half of the district, and the aus or early rice in the eastern. A second or cold weather crop of wheat, barley, and many varieties of oil-seeds and pulses is also grown in this latter tract, jute is but little grown, and the cultivation of indigo and of mulberry for silkworms is on the decline. There is little that is peculiar in the land tenures of the district beyond the ramndés or deer parks, held revenue-free by the nawab, and the cultivating tenure known as wé-bandi, according to which the peasant pays rent, not for lis entire holding, but only for the land actually cultivated, the amount being determined by the nature of the crops grown, and being paid in kind. Silk is still manufactured, but the industry is rapidly losing its importance. At Murshidabad city and at Barhampur there are special industries of ivory-carving, bell-metal work, and gold and silver embroidery. The district is favourably situated for trade, both by river and rail. In 1876-77 the exports amounted to £1,020,124; the imports to £739,906. The principal exports consisted of riee, gram and pulses, wheat, silk, and indigo; the principal imports of European piece goods, salt, and raw cotton.

In 1881-82 the net revenue amounted to 1,803,828 rupees, of whieh 1,298,735 were derived from the land-tax. Education in 1876 was afforded by 506 seliools, attended by 14,664 pupils. The special educational institutions are the Barhampur College, founded in 1853; the Nizd4mat College, limited to the education of the relatives of the nawab; and the Nizimat free school in Murshidabad city. The climate does not differ from that common to Lower Bengal, except that it experiences to some extent the burning winds of Central India during the hot season. The average annual temperature is 78°°6 Fahr. In 1880-81 it was 59°82, and in 1881-82 it was 47°76. The average annual rainfall is 54°30 inches. The district has a low standard of health. The stagnant pools formed by the Bhagirathi during the dry season. constitute a perennial source of malaria, and cholera is rarely

absent from the city and suburbs. Elephantiasis and hydrocele are also endemic.

The history of the district centres round the city of Murshidabad, the latest Mohammedan capital of Bengal. In 1704 the nawab Murshid Kulia Khan changed the seat of government to the little town of Maksudabad, but when Ali Vardi Khan won the throne by conquest in 1740 he also adopted Murshidabad as his capital. The great family of Jagat Seth maintained their position as state bankers at Murshidabad from generation to generation. Even after the con- quest of Bengal by the British, Murshidabad remained for some time the seat of administration. Warren Hastings removed the supreme civil and criminal courts to Calcutta in 1772, but in 1775 the latter court was brought back to Murshidébad again. In 1790, under Lord Cornwallis, both the entire revenue and judicial stafls were ultimately fixed at Calcutta.

MursHIpABAD, principal city of the above district, is situated on the left bank of the Bhagirathi river, in 24° 1l’ N. lat. and 88° 18’ E. long. Its importance has entirely departed since it ceased to be the capital of Bengal, and its population has steadily diminished. In 1872 the population was 46,182 (Hindus 27,211, Moham- medans 18,824, Christians 38, “others” 109). It is still a great centre of trade and manufacture, and the Jain merchants of Murshidabad still rank as the wealthiest of their class in Bengal. Their dealings in gold and silver bullion are especially large, and some of their number almost monopolize the local traffic on the Brahmaputra as

far as the north-east frontier of Assam. The principal industries of the city are those fostered by the luxury of the native court. Carving in ivory, conducted with much skill and finish, is an old speciality of the city. The principal building is the new palace of the nawdb nazim, a large and imposing pile of buildings on the banks of the river, and nearly in the centre of the city.

MURZUK. See Ferzzan, vol. ix. p. 130.

MUS, the name of a family of the plebeian gens of the Decii. Two members of the family, a father and a son, crowned distinguished careers in the service of Rome by a singular act of self-devotion. The father, Publius Decius Mus, won his first laurels in the Samnite war, when in 343 B.c., while serving as tribune of the soldiers, he rescued the Roman main army from an apparently hope- less position. In 340 B.c. he was consul, and had, with his colleague Manlius Torquatus, the command in the Latin war. A decisive battle took place under Mt. Vesuvius ; the Romans wavered, and Decius, repeating after the chief pontiff a solemn formula by which he devoted “the legions and auxiliaries of the enemy along with himself to the Du Manes and the earth-goddess,” dashed into the ranks of the Latins and met a death which was followed by a crushing defeat of the enemy (Livy, viii. 9).

The son, who was also called Publius, was consul for the fourth time in 295 B.c., and devoted himself after the pattern of his father in the battle of Sentinum, when the left wing which he commanded was shaken by the Gauls (Livy, x. 28). The story of the elder Decius is regarded by Mommsen as an unhistorical “doublette” of what is related on better authority of the son.

MUSEUS is the name of three Greek poets. The first is an almost fabulous personage, who is said to have flourished in Attica, and to have been buried on the Museum Hill in Athens. The mystic and oracular verses and usages of Attica, and especially of Eleusis, attach them- selves to his name, and when this representative character is deducted nothing of his individuality remains.

The second Muszeus was an Ephesian who was attached to the court of the Pergamenian kings.

The third is of uncertain date, but probably belongs to the 5th century a.D., as the structure of his hexameters is evidently modelled after the canons of Nonnus. The poem in 340 lines which he wrote on the story of Hero and Leander is by far the most beautiful Greek poem of the age. He conveys the pathetic tale of love and death by selecting a few striking situations; he describes each of them in a telling manner, with no attempt to represent ethical char- acter or earnest thought, but with a good eye to the situa- tion,

the dramatic and rhetorical effect. The work shows the influence of the schools of rhetoric, and is evidently the forerunner of the love romances of the Byzantine period.

MUSAUS, J. K. A. (1735-1787), a German author. He studied theology at Jena, his birthplace, and would have become the pastor of a parish but for the resistance of some peasants, who objected that he had been known to dance. In 1760 to 1762 he published in three volumes his first work, Grandison der Zweite, afterwards (in 1781-82) rewritten and issued with a new title, Der deutsche Grandi- son. The object of this book was to show the comic aspects of Richardson's hero, who had many sentimental admirers in Germany. In 1763 Musius was made tutor of the court pages at Weimar, and in 1770 he became a professor at the Weimar gymnasium. His second book — Physiognomische Reisen—did not appear until 1778-79. It was directed against Lavater, and attracted much favour- able attention. In 1782 to 1786 he published his most famous work, Volksmdrchen der Deutschen. Even in this series of tales, the substance of which Musius collected among the people, he could not refrain from expressing

the satirical tone which had marked his previous writings. The stories, therefore, lack the unconscious simplicity which characterizes genuine folk-lore. Still, they are very brightly written, and retain at the present day some of their original popularity. In 1785 was issued Ireund Hein's Erscheinungen in Holbewn's Manier by J. R. Schellenberg, with explanations in prose and verse by Musius. A collec tion of stories entitled Straussfedern, of which a volume appeared in 1787, Musdus was prevented from completing by his death, which occurred on the 28th of October 1787. After his death appeared his Moralische Kinderklapper and Nachgelassene Schriften, the latter edited by his friend and relative Kotzebue. Musius was a man of cheerful and genial temperament, and this dominant characteristic is reproduced in his writings, in which, although satirical, he is never morose. His style is animated, light, and graceful.

See Miiller, Johann Karl August Musdéus (1867).

MUSCAT, or more correctly MasKat, the chief town of ‘Oman in Arabia, lies upon the sea-coast in 23° 40’ N. lat. and 58° 25’ E. long., at the extremity of a small cove in the gorges of a great pass leading iniand through dark mountain walls, scorched with the sun and utterly without vegetation, which rise almost right out of the sea to a height of from 300 to 500 feet on both sides of the cove. The town itself is built on a sloping shore, which affords space for some scanty patches of cultivated ground beyond the gates. The interior aspect of Muscat does not correspond to the extremely striking appearance it presents when approached from the sea. The ruins of the Portuguese cathedral, the palace, the minarets, and.a few other great buildings tower over narrow crowded streets and filthy bazaars, long rows of good houses now falling into decay, and a mass of mean dwellings of sun-dried brick or wretched huts of palm branches. ‘The whole aspect was described by Palgrave in 1863 as that of decay, but the town was still populous, and Palgrave estimated the inhabitants at 40,000, exclusive of the suburbs. Indeed the excellent harbour so admirably situated for the Indian and Persian Gulf trade, the strength of the whole position, which is defended by forts on the encircling rocks and might easily be rendered impregnable, together with the command of the passes to the fertile lands beyond, make it naturally the most important point on all the coast. The inhabitants and government are favourably spoken of ; the population is a mixture of the most varied nationalities, including very many Indians; but good order is maintained and equal justice administered to all creeds. The Mohammedan citizens have a consider- able strain of African blood, the slave trade having been very active before the convention of England with Zanzibar. The climate is not good; the summer heat in so confined a situation is very great, and epidemic fevers are common. The exports (salt, dates, fish, cotton, pearls, mother-of- pearl, &c.) and imports (rice, coffee, sugar, piece goods, &c.) are very considerable, amounting perhaps together to a million sterling per annum.

Round the cape which forms the north-west limit of the cove lies the prosperous and well-built town of Matrah, with 20,000 to 25,000 inhabitants, and a considerable production of ‘Oman stuffs. It may be regarded as a suburb of Muscat, though the land road over the cape is so rough that communication between the towns is con- ducted chiefly by boats.

Muscat is an ancient place, perhaps identical with the Moscha of the Periplus. In the 9th century of the Christian era ships trading from Sirdf to China took in water at Muscat from the well which still supplies the town ; but the place was then quite small, Sohar, farther up the gulf, being the chief place on the ‘Oman coast. The importance of Muscat appears to date from the Portuguese occupa- tion (1508-1658). In the first half of last century the contests of the rival imams of ‘Oman, Saif and Ibn Murshid, placed the town

in the hands of the Persians, who were expelled about 1749 by Ahmed b. Sa‘id. The residence of this prince was at Rustak, but

his grandson Sa‘id made Muscat the capital, and cultivated the friendship and commerce of the English in Bombay and of the United States, to the great advantage of the city. Under Sa‘id’s successor Thuaini family feuds and the intervention of the Wahha- bites impaired the prosperity of the state. Thuaini was murdered in 1867, but after some further troubles his son Turki was estab- lished on the throne by the aid of British influence. .

MUSCATINE, a city of the United States, the county seat of Muscatine county, Iowa, is built on a rocky bluff on the west bank of the Mississippi, at the apex of what is known as the Great Bend. It carries on a large busi- ness in lumber, milling, canning fruits and vegetables, &c. Settled in 1836, and incorporated as a city in 1853, it in- ereased its population from 5324 in 1860 to 8295 in 1880.

MUSCINEA. The Muscinez are a highly interesting class of plants on account of the important part they play in the economy of nature, and also from the remarkable conditions of their development and formation. In many parts of the world it is principally the mossy covering of forests which, by collecting the rainfall like a sponge, pre- yents the pouring down from mountains of violent and excessive torrents of water, while the Bog-moss (Sphagnum) plays an important part in the formation of peat; and many other Mosses which grow on rocks produce by the decay of their dead parts a thin layer of mould (humus) in which the seeds of higher plants are able to take root. The importance, however, of Mosses in a morphological

point of view proceeds from their position in the botanical system. ‘The Muscinee immediately follow the first divi- sion of the vegetable kingdom, the Thallophytes, under which are included the Alge and Fungi, because their vegetative body is a ‘“‘thallus,’—that is to say, is not divided into stem and leaf like that of higher plants, nor are they possessed of roots like those observed in higher plants (Ferns, Conifers, Monocotyledons, Dicotyledons, &e.). Their anatomical structure is also very simple, the individual essential tissue-elements being but little differen- tiated from each other.

The Muscineze agree in many of their conditions with the Thallophytes, in others again with the next higher division, the vascular Cryptogams (Pteridophytes), to which the Ferns, Equisetums, and Lycopodiums belong. In many Muscinez of the division of Liverworts (Hepa- tice) the vegetative body has still the form of a thallus (fig. 1), which is ribbon-shaped and grows in close con- tact with the substratum. There are, however, several gradual stages of transition from this ribbon-shaped thallus to a leaved stem, such as many Liverworts (Hepatic) and all Leaf-mosses (Musct frondosi) possess. Yet the struc- ture of the leaves and of the stem, even in the latter, is very simple. The leaves present for the most part a cell- surface of one layer, and that (if we leave out of sight those in the middle part of the leaf, which in Leaf-mosses form the “mid-rib”) is ordinarily composed of cells of uniform character. There is thus no epidermis as in higher plants, and the leaf itself attains but very trifling dimensions. The stem is also of simple structure; it possesses no ‘vascular bundles,” but consists only of simple cells, among which there is no differentiation, except that those which lie outside often have thicker walls, and thus form a firmer rind-layer, while the interior Ones are more elongated and serve for the storage and transmission of the plastic substances (albumen, hydro- carbons, é&c.). The roots also by which the stems are attached to the ground are of very simple organization. They are either hair-like tubules as in many Liverworts, or rows of cells as in the Leaf-mosses. To distinguish them from the roots of higher plants they have been termed “rhizoids.” In many cases the vegetative body scarcely attains one twenty-fifth of an inch in length, in others, however, it rises into a much-branched form of

-the female sexual organ, the archegonium.

from about 4 to about 12 inches or more. The duration of its life reaches in some small forms (Zphemerum, Phascum, &c.) only a few weeks or months; in most cases, how- ever, it is virtually unlimited, since the vegetative body continues to grow at its point while the older parts below are dying away. From this cause too the branches are isolated from each other, and become independent plants. In a peat-moor, for instance, the Bog-moss plants on the upper surface are the points and branches of the very same plants whose under-parts have long ago died away, and have principally contributed to the formation of the peat. This isolation of the branches through the dying away of the older parts which keep them together is at the same time a means of multiplication. Mosses also possess many other arrangements for asexual multiplica- tion, as through gemme, “innovations,” &c. In the Liver- worts, for instance, almost every cell is capable of giving origin to a new plant.

The most extensive propagation, however, of the Mosses is that by means of spores, small roundish cells which are formed in a peculiar capsule, the sporogonium. The forma- tion of these sporogonia is especially characteristic of the Muscinee. They originate, as a consequence of fertiliza- tion, from a cell—the ovum-cell—which is generated in These arche— gonia (fig. 6) have, when ready for fertilization, the form of a flask. They consist of an inferior and somewhat swollen portion, which contains the ovum-cell, and of a superior portion drawn out to some length, the neck. The neck forms a canal through which the male fertilizing bodies, the spermatozoids (fig. 5, D), enter to blend with the ovum-cell. In the immature condition the arche- gonium is closed, its neck portion is filled up with a string of cells and covered at the top by a layer of cells which closes it like a lid (fig. 6). At a later period, however, the membranes of the string of cells which fills up the neck (the canal-cells of the neck) are converted into a jelly, which on contact with water swells up greatly, forces open the apex of the neck portion, and thus pre- sents an open access to the ovum-cell. The mucilage which arises from the swelling up of the canal-cells of the neck is also so far of importance with regard to fertiliza- tion that by it

the freely-moving male fertilizing bodies are stopped when they reach the neck of the archegonium. The male fertilizing bodies are here, as in many Alge, in the vascular Cryptogams, and in most animals, termed spermatozoids, They are spirally-coiled filaments, thick- ened et the posterior extremity, finely pointed at the anterior, and bearing at this thin end two long fine cilia by means of which they can move in water. The sperma- tozoids are formed in the male sexual organs, the an- theridia (fig. 5, C), which are bodies with long or short stalks, and of spherical, oval, or club-shaped form, sur- rounded by a wall-stratum consisting of a simple layer of cells, and which possess in their interior a tissue formed of numerous small cells, in each of which one spermatozoid takes its origin. When the wall-layer of the antheridium is torn asunder the spermatozoids are set free at its apex, and move in water by means of their cilia, like Infusoria. Thus water is always necessary to fertilization ; it is only in water that the neck of the archegonium opens, and that the spermatozoids can move. Since either the Mosses grow in moist localities, or those which spring up in dry situa- tions always form little turfs so as to suck up every drop of rain like a sponge, their fertilization is always secured, provided the organs of both sexes are present.

Even before the opening of the archegonium-case the oosphere has formed itself in the inferior portion of the archegonium. Originally in this inferior ventricose por- tion of the archegonium is a large cell, the central cell

(fig. 6). From this a small cell is severed in an upward direction, which perishes at a later period, and is called the ventral canal-cell (fig. 6, 6), while the inferior cell becomes round and forms itself into the oosphere. When ready for fertilization the ovum-cell is a spherical por- tion of protoplasm with a cell-nucleus (fig. 6, ¢). Fer- tilization follows on the blending of one or perhaps several spermatozoids with the oosphere. The first result of fertilization is that the oosphere becomes surrounded by a membrane of cellulose, and then grows very notably, while correspondingly with this growth it becomes divided by cell-walls, and thus becomes a cellular body. From the fertilized oosphere proceeds the moss-fruit, the

sporogonium. The embryo which has proceeded from the fertilized oosphere lives at the expense of the vegetative body on which the archegonium is situated, like a para- site on the plant that nourishes it. The ventral portion of the archegonium grows along with the embryo. In Riccia, the lowest form of one subdivision of the Liver- worts, the sporogonium remains even during the whole lifetime of the plant shut up within the ventral portion of the archegonium, and the spores formed in the sporo- gonium are not set free until that part of the plant on which the archegonium is situated withers away. In

most other Liverworts also the sporogonium attains almost °

its entire development within the ventral portion of the archegonium, which grows contemporaneously with it, and it is not until the spores are mature that the stalk of the sporogonium extends itself considerably (fig. 3,(1), 4); then the ventral portion of the archegonium springs in pieces and the spore-capsule issues forth and scatters its spores,— an occurrence which is completed within a few days. The ventral portion of the archegonium, which increases con- siderably after fertilization and which surrounds the embryo like a sheath, is termed calyptra. In the case of the Liverworts this calyptra is burst open by the sporogonium ; in the Mosses, however, the elongated fusiform-embryo tears away the calyptra at its base and raises it up like a cap on its apex, and it is then found situated on the extremity of the sporogonium. In many Leaf-inosses (Polytrichum, Hypnum crista castrensis) the sporogonium requires more than a year for its development.

The function of the sporogonium is the production of spores. The simplest mode in which this takes place is seen in the species Riccia. Here the sporogonium is a spherical cell-body, consisting of a wall-layer-and an interior tissue. The cells of this latter are called the mother-cells of the spores, because each of them by division forms four spores. In the species, however, which stand higher we can distinguish in the sporogonium a foot, which fre- quently penetrates into the tissue of the vegetative body, and in many Liverworts and almost all Mosses prolongs itself into a stalk supporting the capsule in which the spores are formed (figs. 3, 7, 8). In the case of most Liverworts we find in this capsule, besides the spores, also a number of cells which do not become spores. These either act as “‘nutrient

cells” to the spore-forming cells, which gradually consume the matters stored up in them (Riella), or they form themselves into fusiform-cells with spiral thickenings of parts of the wall—the so-called elaters, which play a part in the dispersion of the spores. The sporogonia of Mosses do not possess elaters. They are rather complex structures, and attain a higher anatomical differentiation than the moss-stem itself. For example, at certain points in their epidermis they possess openings (stomata), which are entirely absent on the stem. In order to ensure the dispersion of the spores, special arrangements are found in the sporogonia of Mosses.

The course of development of the Muscinez divides itself into two sharply-defined stages. The vegetative

body, whether it be only a thallus as in many Liverworts, or a leafy stem, produces the sexual organs, the antheridia and the archegonia. From the fertilized oosphere of the archegonium arises a special structure, the sporogonium, which does not nourish itself independently, but lives like a parasite upon the moss-plant, and produces the spores only ina sexual way. The two stages—on the one hand the moss-plants that bear sexual organs, and on the other the sporogonium developed as the result of fertilization—are termed generations; accordingly in the Muscinez the course of development consists in a regular alternation of these two stages—in an alternation of generations. The one genera- tion possesses sexual organs, and is thus the sexual one. The other generation, the result of fertilization, possesses no sexual organs and is asexual, but produces the spores. Such alternation of generations is exhibited still more strikingly in Ferns. In this case, however, it is the proper leafy fern-plant which is the asexual generation, producing spores, but possessing no sexual organs. It arises out of a fertilized oosphere, and thus corresponds to the sporo- gonium of the Muscineze. The sexual generation of the Ferns is a small and insignificant expansion, the prothallium, which bears antheridia and archegonia, and thus corre- sponds to the sexual generation of the Muscinez, which is here represented by the proper moss-plant. The vege- tative body of the Mosses which bears the sexual organs is not, however, the immediate product of the

germination of the spore, from which there is produced in the first place a simple structure, a pro-embryo (specially developed in the Mosses proper, where it is termed “ protonema,” and where it assumes the appearance of a much-branched fila- mentous confervaceous Alga, fig. 15); it is from this pro- embryo that the leafy stems arise as lateral buds.

From a systematic point of view the Muscinez are divided into two sections —Liverworts (Hepatice) and Mosses (Musci frondosi). The two sections are closely related to each other, but in external characters they are separated by rather sharp boundary lines.

J. Liverworts (Lepaticz).

Liverworts stand below the Mosses proper in regard to the number both of species and of individuals. They are also of much more limited occurrence, for they are found, for the most part, only in damp and shady localities, and seldom occupy any large extent of ground. The most extensive growths are those of many Marchantiacex—as, for example, Fegatella conica, which often forms a con- tinuous covering on moist stones, walls, dc.

(1) The Organs of Vegetation.—With a few exceptions, the vege- tative body is closely united to the substratum on which it grows, and fastened to it by clasping-roots (rhizoids) composed of a single cell. The side turned ae towards the substratum is of different structure from the upper or dor- sal side. The Liver- worts thus belong, with the exception of two species, to the class of ,} dorsi-ventral plants, or those possessing two sides of different struc- ture, a dorsal side and a ventral side, as in vertebrate animals.

The vegetative body of the Liverworts is either a thallus or a Fic. 1.— Metzgeria furcata (magnified about 10 dia- leafy plant; and we meters). The anterior portion of a thallus, seen

h 1 on the right hand from above and on the left ave consequently to hand from below. m, mid-rib; s, s’, 9’, the grow-

distinguish between ing points; f, f, the wing-like expanded poe thallose and foliose Li- of the thallus, composed of a single layer of cells ; verworts to later If. f”, its development by ramification. (After

have already been snp

termed Hepatice frondose. ‘There occur, however, transitional

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LIVERWORTS. |

forms between these two. Fig. 1 represents an example of a thallose Liverwort, showing the anterior portion of a plant of Metzgeria furceta. On the right hand is shown the upper, on the left the under side. The vegetative body is a ribbon-shaped thallus, on the under side of which the clasping-roots (rhizoids) spring out of the mid-rib. Here the mid-rib is sharply separated from the side portions, but in other cases (as Anewra and Pellia) it passes into them by a very gradual transition. In front, in an indentation of the growing point (s), are found the only organs which are formed upon it. These are hairs secreting mucilage (papille), and which stand on the under side. The mucilage which they secrete is prob- ably intended for the purpose of protecting the vegetative point against the effects of drought.

A peculiar exception appears in the growth of the genus Riella (fig. 2). In this case a membranous wing, about cw one-fifth of an inch in width, of the finest green rere and of extreme delicacy, turns regularly on a central rib or axis, so as to form with the axisa sort of screw or winding staircase, having the form of an invertcd cone with the apex down- wards. The length of the whole plant of Riella helicophylia is about 2 inches. This plant, which is decidedly one of the most remarkable forms in the vegetable kingdom, grows upright in water, and was discovered in Algiers. At its lower end it is attached to the ground by clasping- roots. This is the only thallose Liverwort that grows upright, and also one of the few that grow in water. There are likewise two species of Riccta which swim in water— Riccia natans and Riccia fiwitans ; but these also possess forms which live on land, and it is these forms which attain to the formation of sporogonia. It follows hence that these plants also were originally in every case land plants. A few others too, such as Pellia epiphylla and Marchantia polymorpha, have the power of vegetating in water, but this happens only exceptionally, and the plants are then sterile.

Returning to the thallose Liverworts that live on land, we have to remark that the differentia- \N tion of their tissues is a very simple one. The fin cells of the thallus, so far as they are not em- Ai ployed in the formation of clasping-roots or of Fic, 2,—Plant of sexual organs, are all homogeneous. Those only Riella helicophylla, of the mid-rib present a difference in Metzgeria, rom Algiers. Siyttia, and others by their lengthened form. From this simple form has arisen a further complication in the development of the vegetative body in two different series. In the Marchantiacex the vegetative body retains the form of a thallus, but its anatomical organization is of higher structure. In the Jungermanniacew® it is the external organization of the vegetative body which is the richer, and here the transition takes place in it to the foliose Liverworts, which possess a stem with leaves.

We may consider as representative of the Marchantiacex the very widely – spread Marchantia poly- morpha. Its ve- are body is a

road_ ribbon- shaped thallus, which has on its under side clasp- Ing-roots (single- celled tubules, which are either simple, or have on their inner side characteristic coni- cal or tubercular thickenings) and two rows of mem- branous lamelle, the uppermost of Which cover the growing point and p, form a protection to it. (See the section through Fegatella, an allied form, fig. 3,(1), Z.) The upper surface

G. 3.—(1) Longitudinal section through the growing- point (apex) of Fegatella conica, On the upper side of the thallus are formed the air- chambers, as depres- sions in the upper surface K. On the under side of the thallus are formed membranous scales L, which always proceed from one cell. (2) Surface-view of a young portion of the thallus; the stomata appear as gaps in the epidermis. They are surrounded by a few

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presents a division into small rhom- oidal spaces (ar- eole), and in the middle of hole.

concentric cells, of which the first are represented. (3), (4), (6) Marchantia polymorpha ; development of the air-chambers and stomata. In (5) a

number of cell- threads containing chlorophyll are seen sprouting from the bottom of the air-chamber.

each space is an opening, the stoma or breathing A section through the thallus shows a strongly-marked

epidermis broken through at definite spots by the stomata or breathing holes, which, however, in this case have a very different structure from that presented in the higher plants. In Marchantia (fig. 8, (5), Sp) they are of barrel-shaped figure, and consist of several rings or tiers of cells placed over one another. Their origin may be traced in fig. 8, (3) and (4). Below the epidermis we find chambers filled with air. These, however, are not empty; from their base sprout forth cellular threads (fig. 3, (5)), the cells of which contain a large quantity of chlorophyll. It is in these that the assimilation of the carbon takes place. Those cells of the thallus which lie beneath serve only for the storing up and transmission of the materials for construction. The individual chambers are separated from each other by flat layers of cells, and on these rest the rhomboidal areole of the upper surface which can be seen with the naked eye. In other Marchantiex the stomata are of a different structure. In Fegatella, for example, they are not barrel-shaped, but are bounded by several concentric circles of cells, which all lie on the upper surface of the thallus. Early stages of these are repre- sented in fig. 8, (2). The way in which the air-chambers and stomata attain their condition is very remarkable. Small depressions in the cell-layer of the upper surface are formed in large numbers behind the growing point (fig. 3, (1), UV). These widen considerably, and beconie, as it were, roofed over by the neighbouring parts, so that an epidermis (fig. 3, (1), #) grows in this manner over the hol- lows from the bottom of which at a later period the green cellular threads sprout forth. The strings of mucilage-cells which are found in the tissue of Fegatella, the brown threads which appear in that of Preissia, and the cells filled with a brown oily secretion which are found in Marchantia and other species must also be mentioned.

The second series, which comes next to the simple thallose forms, is that of the foliose or leafy Junyermannice. Forms intermediate between the thallose and the foliose are represented by the species Blasia and

Fossombronia. The former, which not unfrequently grows in the damp soil of forests, possesses a flat, thallus-like stem, which bears on its longitudinal axis two rows of leaves inserted parallel to each othcr, and has also on the under side two rows of toothed scales, the amphigastria. Fossombronia makes a nearer approach to the proper leafy forms ; it possesses two rows of leaves inserted obliquely to the longitudinal axis of the flattened stem. In the foliose Jungermanniew, in the narrower sense of the term, the stalk is thin and thread-like, and bears distinctly defined leaves. In this case also—with the exception of the upright growing Haplomitrium Hookeri—the stem grows in close connexion with the substratum. The leaves stand in three rows: two lateral, and one ventral towards the substratum. The ventral leaves are in this case also, as in Blasia, termed amphigastria or under leaves. They are smaller than the side leaves, and are sometimes reduced to the form of mere hairs, or even are entirely wanting, as in Jungermannia bicuspidata, where it is only in rare exceptional cases that they appear. The leaves of Liverworts consist of a single layer of cells without any mid-rib. They are commonly bifid at the apex, but in many forms this condition is only recognizable in early development, and disappears before maturity.

In general the leaves stand so thickly that they overlap each other with their margins, and quite cover the upper surface of the stem. ‘The way in which the leaves overlap has been employed as a systematic character. Overshot leaves (folia succuba) are those in which the anterior margin turned towards the vegetative point of the stem stands higher than the posterior one, and thus the anterior margin of each leaf overlaps the posterior margin of the leaf which stands before it, while its own posterior margin is overlapped by the anterior margin of the leaf which stands behind it. In the opposite case of wadershot leaves (folia incuba), the posterior margin of the leaf is higher than its anterior margin, and the anterior margin, inclining obliquely outwards, is overlapped by the posterior margin of the leaf which comes next before it, as in fig. 4. The mode in which the leaves overlap each other depends on a difference in the relative amount of growth of the upper or dorsal and the under or ventral side respectively. If the growth of the upper side preponderates, then we have the overshot, in the opposite case the undershot mode of covering. Originally the leaves do not stand obliquely to the longitudinal axis; it is only gradually that they are shifted out of their place. The position of the leaves is explained by their origin.

The apex of the stem is occupied by a cell which has the form of a three-sided pyramid with a vaulted base. The surface of one side of the pyramid is directed downwards, the two others are directed laterally. This apical cell is divided by walls which are parallel alternately to one of the side walls. Thus seg- ments are cut off from the apical cell and lie in three rows. From each of these segments arises a leaf. The leaves are thus necessarily likewise arranged in three rows, one of which is turned towards the substratum. ;

The anatomical structure of the stem is also a very simple one. Its exterior cells have their walls somewhat more strongly thickened, and thus form a firmer rind-layer. We must also notice the secre- tion of dark-brown oily corpuscles, which undergo no further con- version, and are met with in certain leaf-cells. In the thallose

forms the ramification is of a forked character (dichotomous) (fig. 1). Frequently too, on the older portions, ‘‘adventitious” shoots

Fia. 4.—A. A leafy (foliose) Jungermannia (Chiloscyphus polyanthos corda) with three sporogonia ; on the right above is one with the capsule open, while in the two others it is still closed. B. A ‘‘ perianthium,” with the perichetial leaves below.

are formed ; they may frequently be seen to spring from the margin and the mid-rib of the thallus of Metzgeria furcata. ‘The ramifica- tion of the foliose Liverworts is a very complex one, but is never of a really forked character. The branchlets commonly stand below the leaves on the sides of the stem.

The above-mentioned ‘‘adventitious” shoots serve the purpose of vegetative increase. ‘The same end is attained by the gemme, which are of many different forms. In Ancwra individual cells detach themselves from the thallus and grow up into new plants. In the Marchantice the gemme are formed in peculiar receptacles which stand on the upper side of the ribbon-shaped thallus. In Marchantia polymorpha these receptacles have the form of a basket open at the top, while in Lunularia the margin of the same recep- tacle is semieircular. The gemme, which are developed on the base of the receptacle, are flat upright cellular bodies, with two indentations at the

sides, out of whieh at a later period, at the time of germination, proceed two growing points. The gemma, however, are of similar structure on both sides. Which side is at the time of germination to become dorsal with stomata and air-chambers, and whieh ventral with root-hairs, is decided by its position with respect to the light. It is always the side turned towards the light which develops itself into that which bears stomata. This occurs even when gemme that swim on water receive light only from below. In that case the under side becomes that which possesses stomata and the air-chambers described above, while the upper side develops root-hairs (rhizoids). Blasta pusilla has also very pecu- liar receptacles for gemme, provided with a long channel leading outwards, while in many foliose Jungermanniew—for example, Jungermannia ventricosa, Scapania nemorosa, Jungermannia bicus- pidata, and others—gemme eonsisting of a few cells are formed on the leaves or the stem respectively.

(2) The Organs of Scx.—The antheridium in Liverworts is a spherical or ellipsoidal cellular body with a shorter or longer stalk (fig. 5, C), and consists of a wall-layer and an interior tissue, the mother-cells of the spermatozoids. In each of these cells a spermatozoid is formed, and, as it appears, in the following way :— the peripheral layer of the cell-nueleus becomes thickened, and splits up into a ribbon, either annular or rolled up spirally. The cilia by means of which the spermatozoid moves in water appear, on the other hand, to be formed from the protoplasm in which the cell- nucleus lies. The process, however, requires still closer investigation. Each antheridium is originally a simple cell, which grows by repeated subdivision and becomes the antheridial body. By the swelling up of the walls of the spermatozoid mother-cells, the cells of the antheridium-wall are forced asunder at the apex, and the spermatozoids, each imbedded in mucilage, are emitted in jets either free from one another or united into a pulp. This pulp 1s often ejected by an explosion of the antheridium, as may be easily observed in Frullania dilatata. In water the spermatozoids isolate themselves, and in the most favourable cases are carried over to the archegonia. Since very many spermatozoids are formed in one antheridium, and since one or very few of these suffice for the

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fertilization of an archegonium, it is evident that an enormous number of them must perish.

The archegonia also proceed from one cell, through the division of which their construction is accomplished. They always take their origin from the cells of the upper surface, and the same is the case with those of Anthoceros, which, however, are sunk into the tissue of the thallus, so that their neck and ventral portions remain united with the tissue of the thallus and do not project freely over it.

The distribution of the organs of sex is either monccious or

Fic. 5.—Marchantia polymorpha. A. Anterior portion of a thallus, ¢, with two erect antheridial inflorescences hu. B, Longitudinal vertical section through a young antheridial inflorescence. The antheridia are situated in depressions of the upper surface. 6, scales; h, roots (rhizoids); 0, 0, the openings of the depressions in which the antheridia lie. C. A nearly mature antheri- dium ; st, its stalk; w, the wall. D. Two spermatozoids, magnified 800 dia- meters. Each possesses two fine cilia. (After Sachs.)

dicecious. In the latter case the antheridia and archegonia are found on different individual plants, as in Sphwrocarpus terrestris, where the male plant is smaller than the female. In the former case the antheridia and archegonia are found on the same plant. In the thallose forms they are always inserted on the dorsal side of the thallus, and commonly sunk into a cavity in it (fig. 5, B). In Anthoceros the antheridia even stand in closed cavities, which do not open till the antheridium is mature. The organs of sex stand either on ordinary branches, which at a later period vegetate and grow, or on special sexual shoots. These are of especially remarkable construction in the Marchanticx, of which Marchantia polymorpha may serve asanexample. In this species the antheridia are found on the upper side of a peltate radially-lobed disk, supported on a stalk (fig. 5, 4). The archegonia stand on the under side of a similar receptacle. These structures may be termed. ‘‘inflorescences.” They are not simple branches, but systems of branches which have arisen from the repeated bifurcation of a thallus-shoot. Each indentation in the disk of the “inflorescence ” corresponds to the

vegetative point of a braneh, and this explains the fact that the oldest antheridia are found in the centre of the disk ; and from this point to the periphery, where the vegetative points are found, are successive groups of antheridia of younger growth, for the youngest organs of sex always stand next to the vegetative point of the shoot. The stalk of the inflorescence is nothing else than the inferior portion of the branch-system greatly prolonged. In the leafy Jungermannicx the distribution of the organs of sex is also either moneecious or dicecious. The arche- gonia in this case stand either singly (Lejewnia, &c.) or in larger groups. ‘The first archegonium always arises from the apical cell of the shoot connected with it, so that with it the latter closes its longitudinal growth. This circumstance has been employed in the classification of the foliose Jungermannicx (with the exception of Haplomitriwm) as aerogynous in contradistinction to the anacrogy- nous, in which latter the archegonia never proceed from the apex of the shoot itself.

Whilst the archegonia of the thallose forms are protected by being lodged in an excavation of the thallus, or surrounded by @ luxuriant growth of its tissue, the archegonia of the foliose Junger- mannics# are enveloped by the leaves of the stem-bud, which on that account are termed perichetial leaves (/olia perichextialia), or, collectively, perichetium. Between these perichetial leaves and the archegonia there grows up in most forms a second involucre, of a goblet or pitcher shape, the ‘‘ perianthium ” (fig. 4, B). It springs up in the form of a circular fence, gradually growing up- wards. In many Jungermannice (Calypogeia) the archegonia are enclosed in a kind of sack-shaped structure, which forces its way into the ground, in which, in fact, it takes root. This ‘‘ fruit- sac” in the Jungermannicew geocalycee is the hollowed-out shoot from which the archegonia arise. Its extremity becomes thickened and forms a circular fence about the archegonia ; thus there arises a structure about two twenty-fifths of an inch long, whieh is con- stantly becoming deeper, and at the bottom of which the arche- gonia are placed. ‘here is always an endeavour to protect and envelop the archegonia. This is notably conspicuous in the Marchantiee, where round every archegonium there grows after

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fertilization a special goblet-shaped involucre, whilst every group of archegonia is also enveloped by two scales, which incline towards each other like the valves of a mussel-shell.

Fic. 6.—Marchantia polymorpha. Archegonia at different stages of development, in longitudinal section. (1) An archegonium not yet open; its neck portion is still covered at its point by the lid-cells d. In the ventral portion fies a large cell, which has divided into a small upper cell, the ‘ventral canal-cell,” b, and a lower one, the oosphere. In (2) the neck portion of the archegonium is open; the oosphere has assumed a spherical form; the ventral canal-cell is shrivelled up. (38) A fertilized archegonium ; the oosphere has become developed into an embryo, here consisting of eight cells, d is an involucre, which in Marchantia grows round the archegonium after fertilization. (After Sachs.)

(3) Development of the Asexual Generation of the Sporogonium.— Just as in the vegetative classification we are led in a continuous series from the simple thallose forms to the foliose forms, so in the perfecting of the fertilized oosphere into an embryo (here the sporo- gonium) there is a gradual advance from simple to more complex forms. The first result of fertilization always is that the oosphere becomes surrounded by a membrane, grows, and transforms itself by division into a cellular body. In the simplest ease, in iccia (fig. 7, 4), the only differentia- tion which takes

lace in this cel- ular body is that it forms a wall- layer which is soon reabsorbed, while the whole of the interior cells form spores

mm such a way

that by division

four spores pro- ceed from every mother-cell. In

Marchantia (fig.

7, 2) we find a Fra. 7.—Young embryos of Liverworts in longitudinal

Separation tak- section (semi-diagrammatic), The cells from the divi-

ing place in the sion of which the mother-cells of the spores proceed are

emb re shaded. A. A spherical embryo of Riccia, without stalk.

CMbryo, Nwhich B. Marchantia polymorpha; the upper part of the em

its inferior por- bryo Ka turns into the capsule, the lower part into the

tion (that be- stalk. ©, Pellia epiphylla; the cell a forms an append- neath the line i, 28° to the embryo; the stalk proceeds from the cells

- » marked by brackets, and from those above is formed the) ecomes the capsule, whose wall and internal mass are now distin-

short stalk of the Jag The whole inner portion of the capsule pro-

sporogon} ceeds from the division of four cells. D. Anthoceros

4 a and levis; col, columella. E. Jungermannia bicuspidata. : perlor por- F, Radula complanata, E shows the arrangement of the

tion becomes the

capsule. In the

Jungermannicx

cells of the embryo which is characteristic of the Jun- germanniee ; it is composed of a number of transverse disks, which always consist of four cells. (fig. 7, C, H, F) we find in the young embryo a group of cells from which proceed the mother-cells of the spores (shown by hatched | lines in the figures); they are covered by a layer of cells which at a later period becomes the wall of the spore-cap- sule. Lower down (distinguished by a bracket in fig. 7, C) Comes that part of the embryo out of which the stalk of

the Sporogonium is formed, while the cell a represents an appendage ofthe embryo. The inferior portion of the stalk often swells into a thickened foot, which frequently penetrates deeply into the tissue

of the fertile shoot (fig. 8). The upper part of the sporogonium, in which the spores and elaters are formed, swells into a sphere.

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.at their apex they are

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In the Jungermanniew, when the sporogonium attains maturity, the stalk becomes very considerably lengthened, the ventral part of the archegonium, which had hitherto kept pace with it in growth, flies asunder, and the capsule emerges. This opens in various ways. In the Junger- manniex the wall breaks up into four valves (fig. 4). The sporogonia of Anthoceros behave in a very peculiar manner. The period occupied by their development is much longer than that of the Jungermannice. While they are dis- charging mature spores

still growing at their base, and forming new spores. The sporogon- ium dehisces by two valves, and is traversed in the middle line by a longitudinal string of cells not employed in the formation of spores. This persists till the maturation of the sporogonium as a little column, and is termed

Fic. 8.—Jungermannia bicuspidata, Longitudinal section of the immature sporogoniuin sg, sur- rounded by ar, the calyptra (the ventral por- tion of the archegonium which has kept pace with it in growth). In the sporogonium three parts are to be distinguished: the globular cap- sule in which lie the mother-cells of the spores and the elaters, the cylindrical stalk which at

the ‘‘columella” (see a later period lengthens very considerably, and fic. 7 D) The cells the swollen foot which has penetrated deeply 8: 4; g a into the tissue of the fruit-shoot.

ar’, arche- gonia which have remained unfertilized ; p, base cells of the spores pro- of the perianthium; st, stem (fruit-shoot); 0,

ceed have here the form Jeaf- (After Hofmeister.) of a dome and enclose an inner portion which becomes the columella, while the inferior portion of the embryo becomes its foot. In Dendroceros, a foreign form of Anthoceros, it drives tubules resem- bling roots into the tissue of the plant on which the sporogonium is seated. There is no want of transitional steps between this method of formation of the sporogonia and that of the Jungermannice. The species Notothylas is especially noteworthy in this respect. The spores, which proceed from one mother-cell by division into four parts, are enveloped by a membrane consisting of two layers— an outer one, which has the character of a cuticle in its great resistance to external agencies, and an inner one, which is composed of cellulose. The plants do not proceed directly from the germina- tion of the spores; there is a pro-embryo of simple structure, which, however, in most cases passes over at its end into the plant itself. In the foliose Jungermannice the first step in germination is the springing up of a row of cells in the cell at the end of which the growth of the shoot next takes place. The young germ-plant next develops leaves of very simple structure, and at first there generally appear on it only two rows of leaves at the sides. In Radula, however, and Frullania, both of them leafy forms, a cake- like cell-surface is first developed in germination ; and it is from one of the cells of the margin of this that the growth of the leafy plant proceeds.

from which te mother-

CLASSIFICATION OF LIVERWORTS A. Marchantiacce,

I. Riecice.—The vegetative body is a dichotomously branched thallus, on the dorsal side of which are air-chambers, either covered by an epidermis like the Marchantiew, or opening outwards in their whole breadth. On the under side of the thallus is a row of scale-shaped lamellz, which become split up at a later period. The sexual organs are scattered on the dorsal side of the ordinary shoots. In the spore-cavity are neither elatérs nor sterile cells .

ll. Corsinicw.—The organs of sex are united in groups, which stand in cavities on the dorsal side of the thallus. In the spore- space are stcrile cells, which in Boschia are transformed into elaters. The dorsal side of the thallus possesses stomata.

Ill. Marchanticwe.—The thallus is ribbon – shaped, and has a layer of air-chambers on the dorsal side opening outwards through a stoma. On the ventral side are two rows of scales. In the spore- space are elaters. The formation of the ‘‘inflorescences ” in the lowest forms agrees with those of Corsinia ; in the highest forms they appear as branch-systems.

B. Jungermanniacce.

I. Jungermannicw.—The vegetative body is a thallus without air-chambers, or isaleafystem. Between these are transitional forms. The sporogonium is differentiated into capsule, stalk, and foot ; the capsule dehisces by four valves. _ ; :

(a) Anacrogynous.—The apex is not employed in the formation

of the archegonium. To this division belong all the thal-

lose forms (including Blasia and Fossombronia), as well as Haplomitrium Hookeri. In Riella and Sphwrocarpus the capsule is without elaters, but possesses sterile cells mor- phologically corresponding to them. All the others have elaters.

(b) Acrogynous.—The apex or the apical cell itself is employed in the formation of the archegonium. All the forms are foliose, except Haplomitriuwm, which also, in the develop- ment of its leaves, does not correspond with the foliose forms, but with Fossombronia.

II. Anthocerotese.—Thallose forms. The archegonia, immediately on their first formation, are sunk into the tissue of the thallus. The antheridia stand in closed cavities. The formation of the sporogonium shows no distinction between stalk and capsule, but is pod-shaped and fixed by its swollen foot

into the thallus. At maturity the sporogonium opens with two valves, between which the columella becomes visible. At its base it possesses a long and permanent growth.

Il. Mosszs (Musci or Musci Frondost).

The Mosses proper play a much larger part in the economy of nature than the Liverworts ; they occur in much greater quantity and are more widely distributed, the con- ditions of their production not being confined within such narrow limits. While the Liverworts, for the most part, thrive only in localities that are not too dry, though some forms that grow upon bark, such as Radula and Frullania, can even endure drought, Mosses, on the other hand, have an almost ubiquitous character. Many grow in water (Conomitrium, Fontinalis, &c.), in swamps (various kinds of Hypnum and others), on dry rocks (Grimmia, Andreea), on roofs, in fields, and on trees, —in short, under favour- able circumstances, a growth of Mosses develops itself almost everywhere. This is connected with the fact that very many have the capacity of enduring drought, and of suspending their growth while it continues and resuming it again in moist weather. Besides, a few, such as Hypnum cupressiforme, Ceratodon, Barbula ruralts, can grow upon any kind of substratum. Others grow by preference on organic substrata: as Buxbaumia imdusiata on decayed trunks, Splachnum on old cowdung or on a damp humus- soil, Orthotrichum and the species of Weckera on the firm bark of trees, Phascum in manured fields, a great number like Grimmia and Andrea on rocks. As regards the chemical quality of the substratum, we can distinguish be- tween Mosses that live on chalk (Seligeria, the species of Gymnostomum, and some Hypna) and those that avoid chalk (Andreea, Dicranum). The species of Polytrichum and Thuidium abietinum are fond of sandy soils, Ephem- erum, Iissidens taxifolius, and others of loamy soils, while Archidium phascoides grows on muddy ground. This wide extension of the Leaf-mosses is rendered possible by their uncommonly great capacity for reproduction. Not only is the formation of spores in most species very extensively carried on, but we have to add to this the manifold pro- duction of asexual means of multiplication, such as gemme, &c. The sexual as well as the asexual generation of Mosses attains to a higher grade of perfection than that of Liverworts.

(1) The Sexual Generation.—The extent of the sexual generation of the Moss-plants proper varies within wide limits. While the stem of Hphemerum and some species of Phascum appears in the form of a small bud, often searcely visible to the naked eye, there are species of more than 4 inches in length, as Sphagnum, Fontinalis, and the tropical species Spzridens. In every case, however, we have here a really leafy stem ; no thallose forms exist.

The leaves are simple and always small. They either consist of one layer in their whole extent, or are traversed by a mid-rib of several layers, which is often of rather complex structure, and consists of thick-walled and thin-walled tissue-elements, of which the former give mechanical firmness to the leaf, while it is principally in the latter

that the conveyance to the stem of the matter formed in the leaf takes place. In the species of Polytrichum the middle nerve occupies the greatest part of the leaf, and is covered with lamellz, which consist of cells bearing chlorophyll. Instead of these lamellze, we find in some other Mosses simple rows of cells, as in Pharomitrium subsessile. A peculiar structure of the leaf is also found in Leucobryum glaucum and Sphagnum. The first-named Moss forms thick greenish-white turfs in damp spots. A transverse section through a leaf shows it to be composed of two (or three) layers of cells. Above and below is a layer of large cells devoid of contents, the membrane of which is per- forated in various places, so that the cavities of the individual cells communicate with each other; thus arises a system of capillary tubes which suck up water and retain it like a sponge. Between the angles of every two of these colourless cells we find inserted a cell containing chlorophyll. The colourless cells are filled with air instead of water, and thus the whole plant has a whitish appear- ance (Leucobryum), while the green hue comes out at the approach of moisture. The leaves of Sphagnum possess a similar structure. In these too are perforated cells devoid of contents, and surrounded by the meshes of cells contain- ing chlorophyll. The inner wall of the empty cells devoid of chlorophyll is for the most part set with peculiar thickenings of annular or spiral form (fig. 9, f), which give

Fie. 9.—Sphagnum acutifolium. A. A part of the surface of the leaf, seen from above. It consists of tubular cells containing chlorophyll cl, and large empty cells, which are thickened on their inner surface by spiral bands f, and pierced in some places with openings 7. B. Transverse section of the leaf ; cl, cells containing chlorophyl); ls, the large empty cells. (After Sachs.)

it the necessary firmness, as in the vessels of higher plants.

In this case too the empty perforated cells are intended

for the purpose of absorbing water; and the same end is

attained by cells of similar structure, which form the rind of the stem.

The stem of Mosses is distinguished by its slight but uniform thickness, which for the most part does not exceed that of a thick thread. Compared with this deli- cacy, the compact, firm, and tough quality of the corre- sponding forms in higher plants is so much the more strik- ing. It depends on the fact that the exterior layers of cells in the stem have thickened cell-walls, generally of a brown colour, while the central parts have thin walls. The differ- entiation of the tissues reaches its highest point in Polytri- chum, Hookeria, Splachnum, and others. Strings of sepa- rated cells pass from the leaves into the stem, and apply themselves to its central tissue, which is of different conformation from the rest of the tissue of the stem,—a circumstance which requires mention because this is the first indication of the fact of such extensive occurrence

among “ vascular” plants that the vascular bundles which run off from the leaf pass into the stem and there apply themselves to others. The stems are thickly set with leaves. It is but seldom that these stand in two rows on the sides, as in Fissidens, Conomitrium, and the sterile shoots of Schistostega. The last-named plant is of special interest as possessing two kinds of shoots of totally differ- ent appearance. ‘The fertile ones have their leaves placed on all sides of the stem in a spiral manner ; the sterile ones, on the other hand, have leaves placed on two sides, and have the appearance of a fern-

leaf. This position, however, only comes to pass through a shifting and twist- ing of the stem. Originally, in the bud, the leaves of the sterile stems stand in a spiral line. On examination of the end of the stem it is found that the growing point from which the leaves arise contains, as in the foliose Liverworts, an apical cell of the form of a three-sided pyra- mid with a vaulted base. By means of partition walls which are successively parallel to one of the side walls of the apical cell “segments” are cut off; and from each of these proceeds a leaf, as well as a part of the rind of the stem and of the inner tissue. On the direction of the partition walls in the apical cell depends likewise the arrangement of the leaves. The branches do not spring as in most phanerogamous plants from the axil of a leaf, but from the upper surface of the stem below a leaf, and only out of one of its cells, which becomes the apical cell of the branch.

In the relation of the ramification to the general struc-

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Fic, 10.—Longitudinal section through the summit of a small male plant of Funaria hygrometrica, with antheridia in various stages of development. @18a young antheridium—at its point is a “‘two-edged” apical cell; b, an antheridium, nearly mature ; ¢, paraphyses, hair-like structures which stand between the antheridia and of which the terminal cells are swollen into a ape form ; d, section of leaves through the mid-rib; e, section of leaves hrough the leaf-surface (lamina). Magnified 300 diameters. (After Sachs.)

ture of the moss-plant two leading classes have to be dis- tinguished—the

acrocarpous and pleurocarpous Mosses. In = former the growth of the stalk concludes with the ormation of a sporogonium ; for the archegonium, out of which the former springs, proceeds from the apical cell

itself. In the pleurocarpous Mosses the sporogonium

stands on the tip of a side-branch, and the growth of the principal stem is thus not interfered with by fructification. In many acrocarpous Mosses the stalk dies after fructifica- tion, and the Moss is then an annual, as in many Phasca- cee. In those acrocarpous Mosses which are perennial the further development is taken up by a side-branch, and a so-called “innovation ” is formed. By the dying away of the principal stem, these innovation-shoots become at a later period independent plants. The roots consist of simple rows of cells, spring- ing from the surface of the stem, especially at its base (see p. 72). | | (2) The sexual organs of the |j\} Leaf-mosses, the antheridia \\ and the archegonia, in their mature condition correspond in the main with those of the Liverworts, from which, how- ever, they differ somewhat in their development. They oc- cur generally in groups at the extremity of a shoot. Such groups containing, as the case may be, either solely anther- idia, or solely archegonia, or a mixture of the two, are termed “flower.” An ox. tt ores ‘o thor fhe snthenile ception to this condition of magnified. C. A mature motile sper- the antheridia is found in ™#0*ld- (After Schimper) Sphagnum (fig. 11,4). Here the antheridia do not stand in groups on the summit of the male branch, but are arranged along it, so as to stand beneath the leaves on the prolonged axis of the shoot. In the rest of the Mosses, with the excep- tion of Polytrichum, the first antheridium (or ar- chegonium) of a group proceeds from the apical cell itself; and thus the growth of the shoot con- nected with it is closed. The general character of the male “flowers” is very various, in the form of buds, heads, or disks. They are enveloped by a number of leaves, the “ nerigonium ” (fig. 11). The male plants of dice- cious Mosses are often considerably smaller than the female ones. This is the case with funaria hygrometrica, and to a remarkable extent with Dicranum undulatum and Leucobryum glaucum. Dicecious Mosses are fre- quently sterile on account cell of the shoot. of the absence of one of the

sexes. The female “ flowers ” (fig. 12) are in the shape of buds, enveloped by a number of leaves, which become smaller towards the inside. The archegonia have in general the same structure as those of Liverworts, but are distinguished by a very much developed stalk, diminishing towards the base in the form of a wedge

Fia. 11.—Sphagnum acutifolium,

Fic. 12.—Longitudinal section through the female “flower” of Sphagnum squarrosum, which shows four archegonia with long stalks. H, the neck portion; C, the ven- tral portion; St, the stalk ; B, ventral canal- cell; H, oosphere. The archegonium in the middle has proceeded from the apical

(fig. 12). single cell. (3) Lhe development of the fertilized oosphere into the sporogonium differs considerably from that of the Liver- worts, both as regards the external processes of growth and as regards the differentiation in the interior of the embryo. In the first of these points the greatest resem- blance to the Liverworts is exhibited by Sphagnum. Here the sporogonium continues almost till maturity to be en- closed by the ventral portion of the archegonium —the calyptra,—which keeps pace with it in growth, and which is irregularly ruptured by it at the period of maturity. Archidium, one of the Phascacee, behaves similarly. In all the other Mosses, however, the sporogonium at an early period bursts through the ventral portion of the arche- gonium, tearing off the calyptra at its base and raising it up as a cap. The sporogonium possesses a stalk which grows up gradually, but which in Sphagnum, Andreea, and Archi- dium is very short. In the two first-named genera the shortness of the stalk is made up for by a stalk- like elongation of that portion of the stem on which the archegonium is placed. Thus arises a false stalk, a “pseudopodium,” which is to be distinguished from the real stalk, which belongs to the sporogonium. The capsule is often of complex structure. In the Bryinex it pos- sesses a distinct epidermis, often provided with stomata, which is al- together wanting in the vegetative parts of Mosses.

—with the exception of Archidiwm, Fie. 13.—Longitudinal section

They originate, as do the antheridia, from a

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which in this respect approaches the renee eee aero Pree Liverworts. The embryo, the young sporogonium, is originally fusiform (fig. 14, B, C), and is differentiated into capsule and stalk (seta). The latter commonly penetrates into the tissue of the fruit- shoot, which forms, outside the base of the sporo- gonium, an exuberant growth like a fence—the ‘“ vaginula”—on which we not unfrequently find archegonia that have miscarried (fig. 13, v). In Mosses, as in Liverworts, the spores proceed from the division of one mother-cell into four parts. The phenomena of their germination are very peculiar.

sporogonium of Phascum bry- oides. (The cells are not shown.) The sporogonium has torn away the ventral portion of the archegonium from its base and lifted the upper part of the archego- nium as a cap (calyptra; cal in fig.). Beneath the calyp- tra is the capsular portion of the sporogonium. Inits wall- layer there has been formed an annular intercellular space a, filled with air. The cells from which the mother-cells of the spores proceed (arche- sporium) are marked ¢; co, columella; 0, endotherium ; h, neck of archegonium ; 1, air-space; s, stalk of the sporogonium (seta); v, vagin- ula; f, leaves of the shoot that bears the archegonia. Mag- nified 60 diameters,

In the great majority of the Mosses there

arise from the germinating spore cellular filaments re- sembling Confervee. They have quite the appearance of Algee, and formerly were even confounded with them. They bear the name of protonema, and often form a thick green covering on the ground in forests. Such a proto- nema consists of two parts: one above and the other below the ground. Both are rows of cells, but those above the ground contain chlorophyll and have transverse walls placed rectangularly, while those belowtheground contain no chlorophyll and their transverse walls are placed obliquely. They serve as roots for the protonema, and of similar structure are the roots (rhizoids) which spring from the

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surface of the leafy stem, especially from its base. On this protonema, and especially from the basal cells of the threads which are above ground, the moss-stem is formed. This originates from ; anoutward pouching of one of these cells, and this becomes the apical cell of a moss- stem. Several moss-plants may beformed on one and the same protonema, which has itself proceeded from one spore. The spores of the Bog- moss (Sphagnum) form quite another kind of pro-embryo when they germinate on dampearth. They then transform them- selves into an intri- cately ramified ex- pansion or cell-sur- face; and any cell of this surface may then become the api- cal cell of the stem. When they germi- nate in water the spores of Sphagnum form a thread-like pro-embryo. In some other Mosses too, especially An-

Fic. 14.—Funaria hygrometrica. A. Rudiment of the sporogonium or embryo f/’, in the ventral portion of the archegonium, The embryo is a cellular body, showing atits point a large ‘*‘two- edged” wedge-shaped apical cell, which forms segments on the right and left. B and C are

drexa, T’ etraphis, aa) oe – ae plone the sporogo- , : _ nium, and of the calyptrac., The inferior por-

and Dip hy RAR, Be tion of the embryo has penetrated into the tissue

markable forms of of the shoot. h, neck of the archegonium.

pro-embryo occur, which, however, can only be alluded to here. In no case does a moss-spore grow directly into a moss-stem.

Fia. 15.—Funaria hygrometrica. A. Germinating spores ; v, vacuole; w, root; s, exosporium, JB. Part of a developed protonema, about three weeks after germination ; h, a procumbent primary shoot with brown wall and oblique septa, out of which arise ascending branches of limited growth b; K, rudiment of a leaf-bearing axis with root w. .A is magnified 550, B about 90 diameters.

Mosses propagate themselves very extensively, not only by means of spores, but in a vegetative way. Every one of the hair-shaped roots (rhizoids) which spring out of the stem has the power, when exposed to the light, of forming protonema, and moss-buds upon this. On this depends the

fact that the Mosses which grow on tiled roofs (Grimmia and others) are hardly to be extirpated. Even if the turf is removed, the roots that have made their way

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into the pores of the tiles still survive, and develop pro- tonema, and new moss-plants upon this. In Phascum and Ephemerum, which are apparently annual Mosses, the pro- tonema is perennial, and forms new plants in the following year. Gemme also arise in abundance on the protonema (e.g., of the species of Barbula)—cellular bodies which are surrounded by a dark-coloured membrane, and whose cells are densely filled with a store of material. They are able to endure drought, and on germinating they either form moss-buds directly or protonema in the first place. Pro- tonema may also proceed directly from the cells of the leaves and stems of moss-plants, and thus subserve their multiplication. Portions even of the sporogonium may transform their cells back into protonema. If we cut off young sporogonia and place them in damp sand, there will arise from their interior cells (or the wall of the capsule) threads of protonema, on which new plants spring up. Many Mosses also possess special gemme. In Tetraphis pellucida they are stalked cellular bodies, enveloped by a leafy calyx, from which at a later period they fall away. In Aulacomnium androgynum they spring from the ex- tremity of a leafless prolongation of the stalk, in Grimmia Hartmanmi and Barbula papillosa from the leaves, &e.

CLASSIFICATION OF Mosszs. n

1, Sphagnacew.—The Turf-mosses are characterized as well by their anatomical structure as by the development of their sporo- gonia. The stem, which at first is unbranched, possesses roots only in its earliest stage. The stems then stand in a thickly-set turf, and receive water through the whole of their surface. The ramification is very abundant. Two kinds of branches are formed in the terminal buds—long whip-shaped ‘‘flagelle”’ which hang down, and whose duration is annual; and besides these there is formed every year, after the fruit has reached maturity, a side shoot called an ‘‘innovation,” which acts in the same way as the main stem, and at a later period becomes an independent plant. The sexual organs, antheridia and archegonia, are developed on the side branches. he peculiar structure of the

leaves has been already mentioned. That of the stem is analogous to it. The latter possesses a rind, formed out of cells with thin walls, whose protoplasmic contents have completely disappeared. Like the empty cells of the leaf, they are penetrated by openings, and thus form a system of narrow capillary tubes which stand in connexion with each other and open outwards, and through which the water mounts upwards.

The branches that bear the male ‘‘ flowers” make an approach to those of the Liverworts in the fact that the antheridia do not stand on the summit of the shoot, but singly close to its leaves. On the other hand, the archegonia agree in their position and deve- lopment with those of the other Mosses. The embryo—the young Sporogonium—is at first a pear-shaped body of cellular tissue, the basal portion of which penetrates deeply into the soft tissue of the fruit-branches on which the archegonium is seated. The sporo- gonium differs considerably from that of the other Mosses. Thoso eells which give origin to the mother-cells of the spores—termed col- lectively ‘‘archesporium ’—form a dome-shaped layer in the upper portion of the embryo ; thus they are not traversed by the sterile cellular tissue, the columella. Each mother-cell is divided as usual into four spores. The short stalk of the capsule extends itself at maturity only so far as to cause the sporogonium to break through the calyptra, the place of a stalk being practically supplied by the

“pseudopodium.”! The pro-embryo is a cell-surface.

2. The Andresacew are small blackish Mosses growing on rocks. Their antheridia resemble those of the other Mosses. The develop- ment of the embryo is anomalous. The archesporium is, as in Sphagnum,a dome-shaped layer of cells. On the extremity of the mature capsule is placed the calyptra, which has been torn away, as a delicate cap. The mode of dehiscence of the capsule here reminds us of the Liverworts. This takes place by four longitu- dinal clefts, which allow the exit of the spores, and are open in _ dry and closed in damp weather. In this group also the stalk of

the sporogonium remains short, its place being supplied by a

pseudopodium.”

3. The Phascacee, which are small and generally annual Mosses, are distinguished from the following division by the fact that the capsule does not open by separation of a lid, but remains closed, and the Spores are not set free till the wall of the capsule decays. A remarkably anomalous form is Archidium ; the development of ee ee

- The possession of an clastic stalk has this advantage for the sporo-

gonium, that it promotes the scattering abroad of the spores by means of the wind.

itsembryo reminds us of that of the Liverworts ; the mature. sporo- gonium also possesses no calyptra, but breaks through the ventral portion of the arehegonium like that of Sphagnum and that of the Liverworts. The Phascacex are termed ‘‘cleistocarpous” in con- tradistinction to the ‘‘stegocarpous” Mosses.

4. The Bryinew comprehend by far the greatest number of all the species of Mosses. They are characterized above all by the structure of their sporogonia. Here the parts of the latter are always the longer or shorter bristle-shaped stalk (seta), the eapsule, and the calyptra carried up on its summit. That part of the stalk where it passes into the capsule is termed apophysis; on its epidermis, as well as on that of the capsule, we almost always find stomata. As regards the structure of the capsule, at a very early period a space filled with air makes its appearance, which divides the interior mass from the wall, which is composed of several layers. This interior complex mass of tissue consists of those cells which give rise to the mother-cells of the spores (the archesporium), of a few layers of cells which surround these only externally, and of an inner mass of tissue, the columella. The latter, however, passes in this case through the cells of the archesporium ; these latter form, as in the Phascacex, a stratum of cells which has the form of a barrel, open above and below (fig. 13), and encloses the columella. The Bryinew are also char- acterized by the way in which the capsule opens. The upper part of the wall of the capsule is in this

case always thrown off as a lid (operculum). This happens in one of two ways: either a layer (or several layers of cells lying upon one another), placed between the inferior portion of the capsule and the operculum, forms a ring (annulus), the cell-walls of which become thickened and partially swollen, so that the annulus becomes loosened and thus causes separation of the operculum and the capsule from each other, or there remains simply a thin-walled annular zone of cells belonging to the wall of the capsule, which splits asunder in dry weather. When the operculum falls away the margin of the open capsule appears in most cases set round with a single or double ring of tooth-like formations, which are termed peristome. This is wanting in Gymnostomum and Hymenostomum. It occurs in its simplest form in Tetraphis. Here the epidermis of the upper conical portion falls off as an operculum, while the whole tissue that lies beneath splits crosswise into four valves, which form the peristome. In the other Mosses, with the exception of Poly- trichum, the teeth of the peristome have an essentially different origin. They are in faet nothing but the thickened portions of cell – membranes, whose unthickened portions have per- ished and been torn asunder. Fig. 16 shows a portion of a longitudinal section through the upper part of the capsule of Funaria hygromet- ried.

The capsule pos- sesses a brown epider- mis ¢, whose walls are greatly thickened ; se is the tissue that lies between the epi- dermis and the air-spaces h, ? of the cap- sule; sthemother-cells of the spores, and fartherinwards follows the columella. Im- mediatcly above the air-space rises the stratum of cells which forms the peri- stome, of one tooth of which a longitudinal section is given in fig. 16. Itarises from the great thickening of the outer side of the walls of a row of superposed cells. At . : maturity the upper Fic. 16.—Part of a longitudinal section through the

i upper part of a capsule of Funaria hygrometrica, _ eines – Ly om Ati -~ aare the teeth of the peristome ; ¢, pointed 0 Ss

(After Sachs.) off as an operculum, : the cells marked p disappear, and only the thickened parts of the cell- membranes remain as the teeth of the peristome. In Funaria and in other cases the peristome is double, for those cell-walls (fig. 16, 7)

cells.

which look inwards of the stratum of cells which forms the peri- stome have also in these cases become somewhat thickened, and continue as ‘‘cilia,” while the thin portions of membrane placed at right angles to them perish. In other cases (Fontinalis anti- pyretica) the peristome forms a lattice-work. The number of teeth in the peristome is always four, or a multiple of four. They are very hygroscopic ; their function is to close up the opening of the capsule in wet weather, and so to hinder the exit of the spores, which are scattered abroad by the wind. In the same way also any germination of the spores in the interior of the capsule is pre- vented. The columella shrivels up after the formation of the spores, so that at that time we find nothing in the capsule but the spore-dust. The Polytrichacew have special arrangements for the protection of the spores. Here the opening of the capsule is covered over by a kind of plate (‘‘cpiphragma”), which is supported by thirty-two or sixty-four teeth, consisting of fibre-like cells.

Retrospective View.— Comparing generally the Mosses with the Liverworts, we see that, however great the variety of the forms they comprehend, they still form two connected series. In several of the subdivisions of the Leaf-mosses conditions occur which remind us of the Liverworts. Such are, in Sphagnum, the form and posi- tion of the antheridia, the tearing open of the ventral portion of the archegonium, and the want of a “calyptra a on the sporogonium which proceeds from it. This last is also found in Andreea, in which the method of opening of the sporogonium likewise reminds us of the Liverworts. Among the Phascacex, the Archidium agrees with Liver- worts in the absence of a columella. Some few cells in the interior of the sporogonium are formed into mother- cells of spores, and push aside the rest of the tissue. Here, too, the calyptra is absent.

The simplest Liverworts make a near approach to the Alege. The sporogonium of Miccia is of scarcely higher organization than the mass of tissue which proceeds from the fertilized ovum-cell of Coleochete, a green freshwater Alga, Among plants of a higher order we find no group closely allied to the Muscinezx. It is true that the Ferns have a perfectly analogous

alternation of generations, but it is not a sporogonium which is produced from the fer- tilized oosphere, but the leafy fern-plant. No transitional forms occur between these two sections; the chasm which divides them is the widest with which we are acquainted in the whole vegetable kingdom. (K. E. G.)

MUSES, Tue, according to the view which prevailed among the Greek writers and has become a commonplace of modern literature, were nine goddesses who presided over the nine principal departments of letters: Calliope, Muse of epic poetry ; Euterpe, of lyric poetry ; Erato, of erotic poetry; Melpomene, of tragedy; Thalia, of comedy; Poly- hymnia, of the hymn as used in the worship of the gods; Terpsichore, of choral song and the dance which formed its hecessary accompaniment ; Clio, of history; and Urania, of astronomy. They are represented in ancient art as fully draped figures characterized by attitude, dress, and symbols appropriate to the departments over which they presided. In the simpler conception that prevails in earlier literature they were said to be daughters of Zeus and Mnemosyne, 2.é., memory personified. In chorus round thealtar of Zeus they sing the origin of the world, of gods, and of men, the might and the glorious deeds of Zeus. At the banquets of the gods their joyous music is heard. They honour also the great heroes; they sing at the marriage of Cad- mus and of Peleus; their mourning song at the death of Achilles drew tears from both gods and men. They know all things past and future and impart to their chosen poets the knowledge and the skill to write. They are usually maiden goddesses, but some of the mythic poets—Orpheus, Linus, Ialemus —are said to be sons of a Muse.

This conception of the number. and character of the Muses is as old as Hesiod and the Odyssey (xxiv. 60), yet it is far removed from the genuine religious stratum out of which the poets fashioned it. The religion of the Muses

had two chief seats, on the northern slope of Mount Olym- pus around Dion in Pieria, by the holy springs Leibethron and Pimpleia, and on the slope of Mount Helicon near Ascra and Thespiz.

Nothing is known of the cultus in itsolder form, but it appears to have been connected with the religion of Dionysus. The Muses must have been originally a variety of the Nymphs (see Nympus), the spirits of nature who live in the fountains and forests ; hence they are asso- ciated with Pegasus, the winged horse of the thunder-cloud, The half-mythic race called Thracian, which is specially associated with the two localities where the worship of the Muses had its seat, survived in Greek memory as a race of bards ; and this character of the race coloured its concep- tion of the spirit-life which it saw in nature. The spirits who know or who remember (Motoca = Movria, from man, to think) sang to them in the voice of the water and the trees. At first they gave no definite number or form to their conception of these spirits; the number nine is the invention of a later time and of a different order of thought, and some accounts speak of three Muses or of a single Muse,

MUSHROOM. There are few more useful, more easily recognized, or more delicious members of the vegetable king- dom than the common mushroom (Agaricus campestris, L.). It grows in short grass in the temperate regions of all parts of the world. Many edible Fungi depend upon minute and often obscure botanical characters for their determination, and may readily be confounded with worthless or poisonous species, but that is not the case with the Common Mush- room, for, although several other species of Agaricus some- what closely approach it in form and colour, yet the true mushroom, if sound and freshly gathered, may be distin- guished from all other Fungi with great ease. It almost invariably grows in rich, open, breezy pastures, in places where the grass is kept short by the grazing of horses, herds, and flocks. Although this plant is popularly termed the ‘meadow mushroom,” it never as a rule grows in meadows. It never grows in wet boggy places, never in woods, or on or about stumps of trees. An exceptional specimen or an uncommon variety may sometimes be seen in the above- mentioned abnormal places, but the best, the true, and common variety of our tables is the produce of short, up- land, wind-swept pastures. A true mushroom is never large in size; its cap very seldom exceeds 4, at most 5 inches in diameter. The large examples measuring from 6 to 9 or more inches across the cap belong to Agaricus arvensis (Sch.), called from its large size and coarse texture the Horse Mushroom, which grows in meadows and damp shady places, and though generally wholesome is

coarse and sometimes indigestible. The mushroom usually grown in gardens or hot-beds, in cellars, sheds, &c., is a distinet variety, known as Agaricus hortensis (Cke.). This is @ compact and inferior form of the true mushroom, or it may indeed be a hybrid or even a distinct species.

The parts of a mushroom consist chiefly of stem and cap; the stem is furnished with a clothy ring round its middle, and the cap is furnished underneath with numerous radiat- ing coloured gills. In the accompanying illustration (1) represents a section through an infant mushroom, (2) a mature example, and (3) a longitudinal section through 4 fully-developed mushroom. The cap p, £ is fleshy, firm, and white within, never thin and watery ; externally it Is pale brown, dry, often slightly silky or floccose, never vis- cid. The cuticle of a mushroom readily peels away from the flesh beneath, as shown at Fr. The cap has a narrow dependent margin or frill, as shown at a, and in section at 4; this dependent frill originates in the rupture of a delicate continuous wrapper, which in the infancy of the mushroom entirely wraps the young plant; it is shown in its continuous state at 4, and at the moment of rupture at | k. The gills underneath the cap 1, m, n are at first

|

MUBHROOM

white, then rose-coloured, at length brown-black. A point of great importance is to be noted in the attachment of the gills near the stem at o, P; the gills in the true mush- yoom are (as shown) usually more or less free from thé

Fic. 1.—Pasture Mushroom (Agaricus campestris, L.).

stem, they never grow boldly against it or run down m3 they may sometimes just touch the spot where the stem joins the bottom of the cap, but never more ; there is usually a slight channel, as at p, all round the top of the stem. When a mushroom is perfectly ripe and the gills are brown-black in colour, they throw down a thick dusty deposit of fine brown-black or purple-black spores ; it is essential to note the colour. The spores on germination make a white felted mat, more or less dense, of mycelium ;

this, when compacted with dry, half-decomposed dung, is the mush- room spawn of gardeners (see HorTIcULTURE, vol. xii. p. 284), The stem is firm, slightly pithy up the middle, but never hollow ; it is furnished with a floccose ring near its middle, as illustrated at 9, q; this ring originates by the rupture of the thin general wrapper k of the infant plant. On being cut or broken the flesh of a true mushroom re- mains white or nearly so, the flesh of the coarser Horse Mushroom changes to buff or sometimes to dark brown. To summarize the characters of a true mushroom :—it grows only in pastures ; it is of small size, dry, and with unchange- able flesh; the cap has a frill; the gills are free from the stem, the spores brown-black or deep purple-black in colour, and the stem solid or slightly pithy. When all these characters are taken together no other mushroom-like fungus—and nearly a thousand species grow in Britain— ean be confounded with it.

Like all widely-spread and much-cultivated plants, the edible mushroom has numerous varieties, and it differs in different places and under different modes of culture in much the same way as our kitchen-garden plants differ from the type they have been derived from, and from each other. In some instances these differences are so marked that they have led some botanists to regard as distinct species many forms usually esteemed by others as varieties ouly.

A small vaviety of the common mushroom found in pastures has been named A. pratensis (Vitt.); it differs from the type in having a pale reddish-brown scaly top, and the flesh on being cut or broken changes to pale rose-colour. A variety still more marked, with a

tker brown cap and the flesh changing to a deeper rose, and sometimes blood-red, has been described as 4. rufescens (Berk.). The well-known compact variety of mushroom-growers, with its white cap and dull purplish clay-coloured gills is 4. hortensts (Cke.). Two sub-varieties of this have been described under the names of A, Buchanani and A. elongatus, and other distinct forms are known to botanists. A variety also grows in woods named A. silvicola (Vitt.); this can only be distinguished from the Pasture Mushroom by its elongated bulbous stem and its externally smooth cap. There is also a fungus well known to botanists and cultivators which appears to be intermediate between the pasture variety and the wood

variety, named A. vaporarius (Otto). The large rank Horse Mushroom, now generally referred to as .4. arvensis (Sch.), is prob-

ably a variety of the Pasture Mushroom ; Sowerby has described jt under the name of 4. Georgii and Dr Badham as A. exquisitus ; it has also been published as A, edulis. It grows in rings in woody places and under trees and hedges in meadows ; it has a large scaly round cap, and the flesh quickly changes to buff or brown when cut or broken; the stem too is hollow. An unusually scaly form of this has been described as A. villaticus and another as 4. augustus. Dr Badham has also described a variety under the name of 4. anceps.

A species, described by Berkeley and Broome as distinct from both the Pasture Mushroom and Horse Mushroom, has been pub- lished under the name of A. elvensis. This grows under oaks, in clusters, —a most unusual character for the mushroom. The species is said to be excellent for the table. An allied fungus peculiar to woods, with a less fleshy cap than the true mushroom, with hollow stem, and strong odour, has been described as a close ally of the Pasture Mushroom under the name of A. silvaticus (Sch.); its qualities for the table have not been described.

Many instances are on record of symptoins of poisoning, and even death, having followed the consumption of plants which have passed as true mushrooms; these cases have probably arisen from the examples consumed being in a state of decay, or from some mistake as to the specieseaten. It should always be specially noted whether the fungi to be consumed are in a fresh and wholesome condition, otherwise they act as a poison in precisely the same way as does any other semi-putrid vegetable or putrid meat. Many instances are on record where mushroom-beds have been invaded by a growth of strange fungi and the true mushrooms have been ousted to the advantage of the new-comers ; such instances are very perplexing, but they tend to show that a proper supervision should be kept over fungi when used for food as over other vegetables, fruit, meat, and fish, When mushrooms are gathered for sale by persons unacquainted with the different species mistakes are of frequent occurrence. A very common spurious mushroom in mar- kets is A. velutinus (P.), a slender, ringless, hollow-stemmed, black-

gilled fungus, common in gardens and about dung and stumps; it is about the size of a mushroom, but thinner in all its parts and far more brittle; it has a black hairy fringe hanging round the edge of the cap when fresh. Another spurious mushroom, and equally common in dealers' baskets, is A. lacrymabundus (Fr.); this grows in the same positions as the last, and is somewhat fleshier and more like a true mushroom ; it has a hollow stem and a slight ring, the gills are black-brown mottled and generally studded with tear- like drops of moisture. In both these species the gills distinctly touch and grow on to the stem. Besides these there are numerous other black ~~gilled species which find a place in baskets,—some species far too small to bear any resemblance to a mushroom, others large and deliquescent, generally belonging to the stump~~ and dung- borne genus Coprinus. The true mushroom itself is to a great ex- tent a dung-borne species, therefore mushroom-beds are always liable to an invasion from other dung-borne forms. Thespores of all fungi are constantly floating about in the air, and when the spores of dung-infesting species alight on a mushroom-bed they find a nidus already prepared that exactly suits them ; and if the spawn of the new-comer becomes more profuse than that of the mushroom the stranger takes up his position at the expense of the mushroom. There is also a fungus named Xylaria vaporaria (B.), which some- times fixes itself on mushroom-beds and produces such an enormous quantity of string-like spawn that the entire destruction of the bed results. The spawn is sometimes so profuse that it is pulled out of the beds in enormous masses and carted away in barrows.

Sometimes cases of poisoning follow the consumption of what have really appeared to gardeners to be true bed-mushrooms, and to country folks as small Horse Mushrooms. The case is made more complicated by the fact that these highly-poisonous forms now and then appear upon mushroom-beds to the exclusion of the mush- rooms. This dangerous counterfeit is A. fastibilis (Fr.), or sometimes A. crustuliniformis (Bull.), a close ally if not indeed a mere variety of the first. A description of one will do for both, 4. fastibilis being a little the more slender of the two. Both have fleshy caps, whitish, moist, and clammy to the touch ; instead of a pleasant odour, they have a disagreeable one; the stems are ringless, or nearly so; and the gills, which are palish clay – brown, distinctly touch and grow on to the solid or pithy stem. These two fungi usually grow in woods, but sometimes in

hedges and in shad) places in meadows, or even, as has been said, as invaders on mush- room-beds. ‘The pale clay-coloured gills, offensive odour, and clammy or even viscid top are decisive characters. A reference to the accompanying illustration (fig. 2), which is about one-half natural size, will give a good idea of A. fastibilis ; the difference in the nature of the attachment of the gills near the stem is scen at R, the absence of a true ring at s, and of a pendent frill at T. The colour, with the exception of the gills, is not unlike that of the mushroom. In determining fungi no single character must be relied upon as con- clusive, but all the characters must be taken together. Sometimes a beautiful, somewhat slender, fungus peculiar to stumps in woods is mistaken for the mushroom in A. cervinus (Sch.); it has a tall, solid, white, ringless stem and somewhat thin brown cap, furnished

underneath with beautiful rose-coloured gills, which are free from the stem as in the mushroom, and which never turn black. ~ It is

MZ

Fic. 2.—Poisonous Mushroom (Agaricus fastibilis, Fr.)

probably a poisonous plant, belonging, as it does, to a dangerous cohort. Many other species of Agaricus more or less resemble .A. campestris, notably some of the plants found under the sub-genera Lepiota, Volvaria, Pholiota, and Psalliota, but when the characters are noted they may all with a little care be easily distinguished from each other. The better plan is to discard at once all fungi which have not been gathered from open pastures ; by this act alone more than nine-tenths of worthless and poisonous species will be excluded.

In cases of poisoning by mushrooms immediate medical advice should be secured. The dangerous principle is a narcotic, and the symptoms are usually great nausea, drowsiness, stupor, and pains in the joints. A good palliative is sweet oil; this will allay any corrosive irritation of the throat and stomach, and at the same time cause vomiting.

The mode of cultivating mushrooms artificially out of doors and in sheds is described under HorTICULTURE, vol. xii. p. 284. Paris mushrooms are cultivated in enormous quantities in dark under- ground caves at adepth of from 60 to 160 feet from the surface. The stable manure is taken into the tortuous passages of these caves, and the spawn introduced from masses of dry dung where it occurs naturally. In France mushroom – growers do not use the compact blocks or brieks of spawn so familiar in England, but much smaller flakes or ‘‘leaves”’ of dry dung in which the spawn or mycelium can be seen to exist. Less manure is used in these caves than we generally see in the mushroom-houscs of England, and the surface of each bed is covered with about an inch of fine white stony soil. The beds are kept artificially moist by the application of water brought from the surface, and the different galleries bear crops in succession. As one is exhausted another is in full bearing, so that by a systematic arrangement a single proprietor will send to the surface from 300 Ib to 3000 Ib of mushrooms per day. The passages sometimes extend over several miles, the beds sometimes occupying over 20 miles, and, as there are many proprietors of caves, the produce of mushrooms is so large that not only is Paris fully supplied, but vast quantities are forwarded to the different large towns of Europe ; the mushrooms are not allowed to reach the fully-expanded condition, but are gathered in a large button state, the whole growth of the mushroom being removed and the hole left in the manure covered with fine earth. The beds remain in bearing for six or eight months, and then the spent manure is taken to the surface again for garden and field purposes. The equable temperature of these caves and their freedom from draught is one cause of their great success; to this must be added the natural virgin spawn, for by continually using spawn taken from mushroom-producing beds the poteney for reproduetion is weak- ened. The beds produce mushrooms in about six weeks after this spawning.

The Fairy-ring Champignon.—This fungus, Marasmius Oreades (Fr.), is more universally used in France and Italy than in England, although it is well known and frequently used both in a fresh and ina dry state in England. It is totally different in appearance from the Pasture Mushroom, and, like it, its characters are so dis- tinct that there is hardly a possibility of making a mistake when its peculiarities are once comprehended. It has more than one advantage over the Meadow Mushroom in its extreme commonncss, its

profuse growth, the length of the season in which it may be gathered, the total absence of varietal forms, its adaptability for being dried and preserved for years, and its persistent delicious taste. It is by many esteemed as the best of all the edible fungi found in Great Britain. Like the mushroom, it grows in short open pastures and amongst the short grass of open roadsides ; some- times it appears on lawns, but it never occurs in woods or in damp shady places. Its natural habit is to grow in rings, and the grassy fairy-rings so frequent amongst the short grass of downs and pas- tures in the spring are generally caused by the nitrogenous manure applied to the soil in the previous autumn by the decay of a circle

of these fungi. Many other fungi in addition to the Fairy-ring Champignon grow in circles, so that this habit must merely be taken with its other characters in cases of doubt.

A glance at the illustration (fig. 3) will show howentirely the Fairy- ring Champignon differs from the mushroom. In the first place, itis about one-half the size of a mushroom, and whitish-buff in every part, the gills always retaining this colour and never becoming salmon-coloured, brown, or black. The stem is solid and corky, much more solid than the flesh of the cap, and perfectly smooth, never being furnished with the slightest trace of aring. The buff- gills are far apart (v), and in this they greatly differ from the some- what crowded gills of the mushroom ; the junction of the gills with the stem (Ww) also differs in character from the similar junction in the mushroom. The mushroom is a semi-deliquescent fungus which rapidly falls into putridity in decay, whilst the champignon dries up into a leathery substance in the sun, but speedily revives and takes its original form again after the first shower. To this character the fungus owes its generic name (Marasmius) as well as one of its most valuable qualities for the table, for examples may be gathered from June to November, and if carefully dried may be

Fic. 3.—The Fairy-ring Champignon (Marasmius Oreades, Fr.).

hung on strings for culinary purposes and preserved without deteri- oration for several years ; indeed, many persons assert that the rich flavour of these fungi increases with years. Champignonsare highly esteemed (and

especially is this the case abroad) for adding a most delicious flavour to stews, soups, and gravies.

A fungus which may carelessly be mistaken for the mushroom is M. peronatus (Fr.), but this grows in woods amongst dead leaves, and has a hairy base to the stem and a somewhat acrid taste. Another is MZ. wrens (Fr.); this also generally grows in woods, but the gills are not nearly so deep, they soon become brownish, the stem is downy, and the taste is acrid. An Agaricus named A. dryophilus (Bull.) has sometimes been gathered in mistake for the champignon, but this too grows in woods where the champignon never grows ; it has a hollow instead of a solid stcm, gills crowded together instead of far apart, and flesh very tender and brittle instead of tough. A small eseulent ally of the champignon, named M. seovodonius (Fr.), is sometimes found in pastures in Great Britain; this is largely consumed on the Continent, where it is esteemed for its powerful flavour of garlic. In England, where garlic is not used to a large extent, this fungus is not sought for. Another small and common species, Af. porreus (Fr.), is pervaded with a garlic flavour to an equal extent with the last. A third species, Af. alliaceus (Fr.), is also strongly impregnated with the scent and taste of onions or garlic. Two species, Af, impudicus (Fr.) and M. fetidus (Fr.), are in all stages of growth highly fetid. The curious little edible Agaricus esculentus (Jacq.), although placed under the sub-genus Collybia, is allied by its structure to Marasmius. It is a small bitter specics common in upland pastures and fir plantations early in the season. Although not gathered for the table in England, it is greatly prized in some parts of the Continent. Fries, the greatest authority on the higher Fungi, writes: ‘‘In Austria in cibariis magni estumatur.” The odour and taste in fungi when raw are often valuable characters in deciding species.

Morel.—This delicious edible fungus, AMorchella esculenta (Pers.), is more common in Britain than is generally supposed. It grows after warm rains in the spring or early summer in woody places and in orehards and gardens, often in placcs where the ground has been burnt. Like the champignon, the morel can be easily dried and kept suspended on strings in necklace fashion for winter use. It is generally 3 or 4 inches high, with a hollow stem and a hollow, irregularly globose, honeycombed head, pale buff in colour all over, and furnished with an agreeable odour. There is

more than one esculent species of morel: Af. semilibera (D.C.) is the next best known, but this is rare in Britain. A large species named J. eras- stipes (Pers.)—the Mf. smithiana of Cooke—attains a height of from 9to12inches. This is a fragrant and delicious species, but only suit- able for use in a fresh state; it cannot be readily dried. Another valuable edible species is Gyromitra esculenta (Fr.), recognized by its brownish-black globose head'; it grows amongst firs and is con- sidered rare. ' (W. G. SM.)

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PART I.—HISTORY.

USIC! is the art which employs sounds as a medium of artistic expression for what is not in the pro- vince of literature, of sculpture, of painting, of acting, or of architecture. Whereas literature, whether in verse or prose, describes or states emotions, or perceptions, or im- pressions ; whereas sculpture imitates the outward forms of animated beings, and physiognomically, either in the face, or, to speak more broadly, in the moulding and attitude of the entire figure, displays personal character and the effect of passion upon it; whereas painting vitalizes with colour the forms of sculpture, and extends its range of subjects from animate to inanimate nature ; and whereas acting adds speech to the written words of the dramatist, and enforces or even qualifies their meaning by vocal inflexion, and illustrates it by changeful gesture, thus giving the mobility of life to the forms of sculpture and painting ;—music embodies the inward feelings of which all those other arts can but exhibit the effect. Those other arts are imitative in respect of their repro- ducing natural objects or circumstances; it is otherwise with architecture, which makes but conventional reference to nature, and wholly arbitrary application of the lines, the lights, and the shadows of the natural world; and in this particular music has an analogy to architecture which it has not to the other fine arts. In the matter of expression also, architecture may be compared with music in the earlier stages of its development, since represent- ing and also prompting a general idea of solemnity, or grandeur, or gaiety; but music left

architecture far behind when, in later times, it assumed the power of special, individual, and personal utterance of every variety of passion. The indefiniteness of musical expression furnishes no argument that music is inexpressive, but is one of the qualities that place it on the highest level of art-excel- lence, enabling it to suggest still more than it displays, and to stimulate the imagination of the witness as much as to exercise that of the artist. The musician is then a poet, whether we regard the term in its primary sense of “maker,” the exact translation of the Greek word by which versifiers were styled in early English, or in its ap- plied sense of one who expresses thought and feeling through the medium of highly-excited imagination. Music, then, is that one of the fine arts which appropriates the phenomena of sound to the purposes of poetry, and has a province of its own in many respects analogous to, but yet wholly distinct from, that of each of the other arts. It is common to style it “the universal language ;” but the definition is untrue, for in every age and in every clime there are varieties of musical idiom which are unsympa- thetic, if not unintelligible, to other generations than those among whom they are first current, and, still more, the very principles that govern it have been and are so variously developed in different times and places that music which 18 delightful at one period or to one people is repugnant at another epoch or to a different community. An attempt will here be made to sketch the progress of the art through Western civilization, to show how it has been changed from artificial or calculated into natural or spontaneous, and to describe some of the chief forms of its manifestation.2 i From the Greek wovotxy; but this included all arts and sciences over which the Muses presided—the encyclopedia of learning. The oo of sounds was particularly involved in that of the stars, and ce the word had special reference to these two in their relation to

numbers; and in its comprehensive sense it was employed to denote

the entire mental training of a Greek youth. In Latin the word had 4 more restricted meaning.

- William Chappell’s History of Music is the authority for the cor-

To define the special science, and the art which is its Harmony application, that is denoted by our word music, the Greek and language has two other

words, harmonia or harmonike ™¢l04y. and melodia,—harmonia implying the idea of “fitting,” and so being a term for propriety or general unity of parts in a whole, not in our limited technical sense of combined sounds, but with reference to the whole principle of orderly and not specially tonal regulation, melodia imply- ing the rising and falling of the voice in speech, and being applied only at a subsequent epoch to a succession of musical notes.® i

We thus owe our three chief musical terms to the Greeks, and in our prevailing system much more besides ; they themselves, however, owed all to earlier sources, for the essentials of their knowledge and practice are traced to Egypt.

It has been ingeniously suggested and well sustained by Origin. Mr. J. F. Rowbotham that in prehistoric times music passed through three stages of development, each charac- terized by a separate class of instrument, and the analogy of existing uses in barbarous nations tends to confirm the assumption. Instruments of percussion are supposed to be the oldest, wind instruments the next in order of time and of civilization, and string instruments the latest invention of every separate race. The clapping of hands and stamping of feet, let us say, in marking rhythm exemplify the first element of music, and the large family of drums and cymbals and bells is a development of the same principle. Untutored ears are quicker to perceive rhythmical accentuation than variations of pitch, so the organ of time makes earlier manifestation than the organ of tune, though, musical sound being a periodic succes- sion of vibrations, the operation of the latter is truly but a refinement on that of the former. The sighing of wind, eminently when passing over a bed of reeds, is Nature’s suggestion of instruments of breath; hence have been reached the four methods of producing sound through pipes : —by blowing at the end, as in the case of the English flute and the flageolet; at the side, as in that of the ordinary con- cert flute; through a double reed, as in that of the hautboy or oboe and bassoon ; and over a single reed, as in that of the clarionet—all of which date from oldest existing records ; and also upon the collection of multitudinous pipes in that colossal wind instrument, the organ. An Egyptian fable ascribes the invention of the lyre to the god Thoth; a different Greek fable gives the same credit to the god Hermes ; and both

refer it, though under different circum- stances, to the straining of the sinews of a tortoise across its shell,—whence can only be inferred that the origin of the highest advanced class of musical instruments is un- known. This class includes the lyre and the harp, which give but one note from each stretched string; the lute, which, having a neck or finger-board, admits of the pro- duction of several notes from each string by stopping it at different lengths with the fingers ; the viol, the addition of the bow to which gives capability of sustaining the tone ; and the dulcimer, finally matured into the pianoforte, wherein the extremes of instrumental fabrication meet, since this is at once a string instrument and an instrument rection of errors in the works wherein the history and theory of Greek music were first treated in modern times, errors that have been re- peated by intervening writers; and it is the authority for explanation of Greek technicalities that are misrepresented in Latin translations, and falsely understood in our own day.

3 Harmonia had a special signification with the disciples of Pytha-

goras, who used the word in place of enharmonia, of which more hereafter.

Inter- vals.

Analogy to astro- nomy.

of percussion, having the hammer of the drum to strike the string of the lyre.

Musical intervals are named numerically from any given note, say Cas the Ist, the note next to which is thus D the 2d, the one beyond is E the 3d, and so on to another C, the 8th. Beyond the 8th, numerical names are only used for the rare combinations of the 9th, the 11th, and the 13th. This is because the 8th is in some sense a reproduction of the lst, as all intervals beyond it are reproductions of the 8th below them—reproductions, that is, uniting identity and difference, the relation of tones in the higher octave being just what it is in the lower, while each tone is so or so much more acute than its under 8th, an analogy to which may be sought in the reduction of any visual object to half its size while all its propor- tions are preserved, the larger and

the smaller, as in the interval of the Sth, thus uniting identity with difference. When two voices or instruments produce the same sound they are in unison; the unison or Ist} is styled perfect ; so too is its reproduction, the 8th; the 8th is unequally divisible into a 5th anda 4th, and these two are classed with the Ist and 8th as perfect. There are many specialities that distinguish the four perfect intervals in music from every other. The two notes of which each is constituted are, save in one instance, of the same quality—as natural, or sharp, or flat; to raise or lower either of the two notes by a chromatic semitone? changes a perfect interval into a dis- cord, whereas the other intervals are elastic, that is, they may be major or minor from having a chromatic semitone more or less in their extent, and are not changed from concords to discords, or the reverse, by the modification. To invert a perfect interval by placing the higher note beneath the lower produces another perfect interval, whereas to invert any of the other intervals reverses its character of major or minor, The progression of two parts together from one to another 1st or 8th, from one to another 5th or 4th, has, save in excep- tional instances, the bad effect that all musical grammar forbids, whereas the progression of two parts in 3ds or 6ths with each other has a good effect. In the resolution of funda- mental discords the progression of perfect intervals is free, whereas that of the imperfect intervals is restricted ; and further, in the relation of subject and answer in a fugue, one perfect interval may be changed for another, but never for an imperfect interval. Many technicalities are antici- pated in the foregoing which can only be explained in the sequel, but present mention of them is unavoidable in reference to a position now to be stated. The Egyptians perceived the distinction of the perfect intervals from others, if not all the above specialities, and regarded them as typical of the seasons, spring bearing the proportion of a 4th to autumn, of a 5th to winter, and of an 8th to summer. The distinction, then, has been observed for many centuries, but neither ancients nor moderns have adduced any explanation of the phenomenon, and the wondrous fact that perfect intervals differ in constitution and treatment from other intervals appears to defy reason, and not even to incite speculation.

The anciently supposed affinity of music to astronomy was taught by Pythagoras (585 B.c.), who derived the notion from the Egyptians, and

exemplified it by com- parison of the lyre of seven strings with the planetary system. The Sun, then believed to rotate round the

1 Literally, the Ist is not a musical distance ; but, as it is a fre- quent combination in counterpoint, and as its repetition is not rare in melody, it is conveniently classed as an interval.

BAN chromatic or minor semitone is between two notes of the same alphabetical name, as C and 0, or D and bD ; a diatonic or major semitone is between two notes of different alphabetical names, as C and bD, or C and B; the ratio of the latter is +2, and that of the former varies with the place of the interval in the chromatic scale.

earth, was deemed the chief planet, next to which were, on the one side Mercury, Venus, and the Moon, and on the other side Mars, Jupiter, and Saturn. lyre, not the notes they sounded, were thus named :—Mesé

with our A on the fifth line with the bass clef, and likened to the Sun ; Paramesé (next to middle) or B flat, likened to

pitch) or C, likened to Venus ; and Neété or Neaté (lowest)

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The strings of the

(middle), being the principal or keynote, corresponding

Mercury; Paranété (next to lowest, 2.¢., shortest = highest in

or D, likened to the Moon ; these constituted the upper tet- rachord or scale of four notes, to which the lower tetrachord was conjoined by having Mesé for its acutest note, which was the gravest of the other tetrachord ; next to it was Lichanos (forefinger string) or G, likened to Mars; then Parhypaté (next to highest, ¢.e., longest = lowest in pitch) or F, likened to Jupiter ; and lastly Hypaté (highest) or E, likened to Saturn. The Moon being of all the

planets the nearest to, and Saturn the farthest from, the earth, they are analogous to the shortest and the longest string. ;

The Greek lyre (see Lyrz, vol. xv. p. 113) had at first Greck four strings, to which subsequently were added the longest lyr. | three; then an 8th, corresponding with our E, tuned toan 8th above Hypaté ; then three below the latter, which took the scale down in pitch to B on the second line with the bass clef ; afterwards three above the former, which took the scale up to A in the second space with the treble clef; and finally Proslambanomenos, corresponding with our A in the first space with the bass clef, extended the " greater system" of fifteen notes to an 8th below Mesé and an 8th above it.?

Tradition has it that Pythagoras made his discovery of Pythe the ratios of the perfect intervals by listening to some' smiths who struck the iron on their anvil with hammers *" of different weights, and thus produced different notes from the metal. But the narrator of the tale has disregarded the obvious fact that, save for slight variation due to the greater or less heat of its different parts, a metallic bar, like a string, always sounds a note of the same pitch whatever be the weight of the instrument with which it is struck.4 The smithy wherein Pythagoras worked his musical problems was the land of Egypt, where he is said to have acquired and whence he imported his knowledge. His division of the Ist and 2d degrees and the 2d and 3d degrees of the tetrachord, counting downward in pitch into equal intervals of a major tone, left but a leimma (remnant), which was less than a semitone between the 3d and 4th degrees. Aristoxenus (300 B.c.), who has been called the father of temperament, discovered the difference between the major and minor tones, the first having the ratio 3, and the second having that of 42. His followers formed a school opposed to that of Pythagoras, and there was severe contention between the two. Subsequent theorists disputed whether the major or the minor tone should be above the other, and it was Claudius Ptolemy (c. 150 a.p.) who enunciated that the major tone should be below the minor, which is the pri ciple that directs the intonation of our present scale. This intonation may account for the difference between the effect in proceeding from the minor chord of the supertonic to the major chord of the tonic, and the effect in proceeding from the minor chord of the submediant to the major chord of the dominant, of

which the latter, at the interval of a minor tone, is acceptable and the former, at the interval of a major tone, is repugnant to cultivated ears.

3 Terpander (700 Bc.) was the first of whom it is said that “he added a new string to the lyre,” but the ascription to him was probably figurative and not literal, for the proverbial expression was applied to any one who discovered a novelty in science or excelled in art.

4 Not only was this manifest fiction repeated from age to age, but 1h was transferred from the ancient philosopher to Handel by a writer of

some sixty years since, who assumed that the composer derived a melody from the various sounds of smiths’ hammers on one piece of iron.

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The Greeks had four modes or scales included in their “ greater system.” The Dorian comprised a, series of eight notes from D to D, of which)B was the 6th, and had its semitones between the 2d and 3d and the 5th and 6th degrees counting upward. The others were exact trans- positions of this, as all our modern scales are transpositions of the scale of C, the identity of intervals being induced by the various tuning of the lyre strings. The Phrygian mode lay between E and E, and had ¢F and §B, the Lydian between #F and $F had #G and $C, and the Mixo-Lydian between G and G had bBand bE. ‘These four were styled authentic, and were distinguished by having the dominant (or predominant note) at the interval of a 5th above the tonic. Each had a plagal or relative mode at the interval of a 4th below the authentic, distinguished by having the dominant a 4th below the tonic, and defined by the prefix “hypo ” to the name of the authentic mode, as Hypo-Dorian beginning on A, Hypo-Phrygian on B, &e. To each mode was assigned its special character of subject, which may be accounted for by the different qualities of voices that could sing in lower or higher keys, the majestic being fitted to a bass, who would sing in the Dorian, the tender to a tenor, who would sing in the Lydian, and so forth. In later but still classic times other modes were added to these, but on the same principle of precise notal trans- position. .

The tetrachords above described—having a semitone between the lowest note and that next above it, a tone between the 2d and 3d, anda tone between the 3d and 4th, the latter of which Ptolemy made smaller than the other, and so left a semitone between the 2d and Ist degrees—were called diatonic, as A, bB, C, D. To lower by a semitone the 2d note from the highest produced a chromatic tetrachord, as A, bB, (B, D. To tune the 2d string from the top yet a semitone lower reduced it to the same pitch as the 3d string, which was equivalent to its total rejection, and this form of tetrachord was the enhar- monic, the invention of which was ascribed to Olympus (640 z.c.). If we observe the two tetrachords that occur, for instance, in the Dorian mode—that from D down to A, and that from A down to E—with the addition of the tonic D below, it will be seen that our modern scale of D minor with the omission of the 4th and 7th degrees was in the enharmonic genus, and that the chromatic genus gave the minor and major 3d and the minor and major 6th with still the omission of the 4th and 7th:—enharmonic, D, E, F, A, bB, D; chromatic, D, E, F, #F, A, bB, OB, D; and the other authentic modes were transpositions of this. Inthe harmonic scale of nature the 7th from the generator is too flat, and the 11th (octave above the 4th) is too sharp, for accepted use; the rejection of these two notes indicates a refinement of ear that shrank from the natural and equally refused the artificial intonation of these degrees of the scale. Mr. Carl Engel proves the rejection of the said 4th and 7th from the keynote by nations of high civilization in remote parts of the world ; we call a scale that is so formed Scottish, but in China, Mexico, and other places than Great Britain the same ar- rangement is found to have prevailed in the remotest periods of which we have knowledge. An important principle is here involved which has affected all musical theory directly or indirectly, and is now seen to lie at the foundation of modern rules of harmony or the combining of musical sounds, The Pythagoreans advocated the use of the en- harmonic genus, and so received the appellation of Enhar- inonicists, or were as often called Harmonicists, and hence the twofold application of the term ‘“ harmonia.”

Anacreon (540 B.c.) sang to the accompaniment of the magadis (doubling bridge), an instrument imported from Egypt to Greece; it had a bridge, across which the strings

Mm US Iec

were drawn at one-third of their entire length, when of course the shorter division sounded the note an 8th higher than the longer. Aristotle (384 8B.c.) describes antiphon (16 avridwvov) as the singing of a melody by men an 8th lower than it is sung at the same time by boys—in other words, what is miscalled in modern church congregations “ singing in unison.” The same writer enunciates that the antiphon may not be at either of the other perfect intervals, the 5th or the 4th below a melody, and in this he anticipates a rule till lately deemed inflexible in modern music. Be- yond these two instances of the combination of the 8th, no allusion has been found in ancient writings to the use of harmony in the modern sense of the word, and the only three examples of ancient Greek music that are known to exist are melodies (notes in succession), and supposition assigns them to the 3d or 4th century a.D. They are hymns to Apollo, Nemesis, and Calliope, with the respective verses, and their translation into modern notation has only been possible through reference to the verbal accent, because there are no extant rules of that era for purely musical measure. Nevertheless we have Egyptian paintings of the period of Dynasty IV., and Greek sculptures of players on pipes of different lengths which must have produced notes of different pitches, and sometimes in the same party players on string instruments with necks whereon two strings, differently stopped and yet sounded together, would have yielded a combination of different notes; and this, though a speechless, is a strong evidence that the musicians so represented made at least a forecast of modern harmony. One cannot but marvel that, while copious treatises have come down to us upon niceties that have here been adduced, nothing has been brought to light but pictorial testimony as to ancient knowledge of chords ; and the three specimens

just mentioned are all that have been found of musical

composition in any form.

The classic Greeks used music in rhapsodizing or chant- Greek ing with vocal inflexions the epic poems; they employed applica- it in religious rites and to accompany military evolutions ; oe and prizes were awarded for its performance by voices and : on instruments (including, during the last two

centuries B.c., the organ) at their Olympic and other games. It belonged essentially to the drama, which had its origin in the dithyrambic hymns; these were gradually developed into the tragedy, which took its name from the tragos (goat) that was sacrificed to Dionysus during the perform- ance, Possibly Thespis (536 B.c.) may have spoken the recitations with which he was the first to intersperse the hymns; but some interpreters of Greek writings affirm, and others while doubting do not disprove, that in the mature drama all the characters sang or chanted, seemingly after the manner of the rhapsodists, and the impersonal chorus sang to instrumental accompaniment during their orchestric evolutions, from which motions or marchings the part of the theatre wherein the chorus were stationed between the audience and the proscenium was called the orchestra. Here, then, was the prototype of the modern opera, the main departure from which is the trans- planting of the chorus to the stage and giving to its members participation in the action. /Eschylus wrote the music to his own tragedies ; Sophocles accompanied on the cithara the performance of his Thamyris, if not of other of his plays; Euripides left the composition of the music for his works to another genius than his own, and such was the case with after dramatists.

In ancient Rome the choristers in tragedies were very Roman numerous, including female as well as male singers ; they oa were accompanied by a large number of instruments, aMONE | usic. which trumpets were conspicuous. This we learn from

Seneca, who employs the idea of multitudinous unity it pre-

sents to illustrate figuratively the organization of a state.

How or when the musical system of the Greeks fell into disuse is still untraced ; certainly it prevailed and engaged

The system of notation by letters of the Greek alphabet Nou. had fallen into disuse. A system by neumes (7vevya) ortion

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Ambro- sian music.

Errors of

Boetius. writers on music, but his voluminous treatise De Jnstitu- | the initial syllables—nonsense without the completion of tione Musica proves that the Greek principles of the art | the words—of six lines of a hymn to St John the Baptist had in his time become matter of antiquarianism ; nay, it | as names of the notes—Ut, Re, Mi, Fa, Sol, La. proves further that he did not understand the technical Hucbald (930 a.p.) invented a system, not of notation, Seale terms he professed to translate. For instance, he mistook | but of scales, wherein the semitone was always between the word for the shortest string of the lyre (Néte), which | in, 04 and 3d of a tetrachord, as G, A, bB, C, so the naturally gave the acutest sound, to signify the gravest | pp and #F of the second octave were in false relation to the note; and he mistook the word for the longest string | pp ang GF of the first two tetrachords. To this scale of (Hypaté) to signify the acutest note. It is not necessary a ; here to catalogue this author’s many verbal errors ;! but | four notes, G, A,pB, C, were subsequently added a note it is important to mention that he ignored the advance | below and a note above, which made the hexachord with made by Didymus and completed by Ptolemy in the tuning | the Seu) between the 3d and 4th both up and down, of the scale with the major and minor tones, and the | as F, G, A,bB, C, D. It was at a much later date that modern semitone of +s, counting upward, and returned to | the 7th, our leading note, was admitted into a key, and for the Pythagorean division of two major tones, inducing a | this the first two letters of the last line of the above-named discordant 3d, and the leimma 33§.2 The very eminence hymn, ‘‘Sanctus Johannes,” would have been used, save of Boetius makes it matter of regret that he ever wrote | for the notion that as the note Mi was at a semitone below upon music. His Latin book being accessible when those of | Fa, the same vowel should be heard at a semitone below Greek authors were not, it was established as a text-book | the upper Ut, and the syllable Si was substituted for Sa. on the art in the English universities, and musical degrees | Long afterwards the syllable Ut was replaced by Do in were granted for knowledge of the principles it

set forth ; | Italy, but it is still retained in France ; and in these two musical progress was thus seriously retarded, and the 18th | countries, with whatever others employ their nomenclature, century was far advanced before search for sound theory | the original Ut and the substituted Do stand for the sound dispelled reverence for his scholastic dogma. defined by the letter C in English and German termin-

Grego- As St Ambrose ordained a ritual for Milan which bore ology. The literal musical alphabet thus accords with the

rian his name, so also St Gregory the Great (590 ap.) : rN Cc D SF G

music. ordained one for Rome which was called Gregorian. The | °Y Habie : La, Si, UtorDo, Re, Mi, Fa, Sol in

the attention of philosophers for some centuries of the Christian era. The first notices of music in the Western Church refer to the manner but not to the matter of the performance. The name of St Ambrose (384 a.D.) is familarly associated with the music of his metropolitan church in Milan ; but all that is proved of his connexion with the art is that, advised by Flavian of Antioch, he adopted for the first time in the West the practice of dividing the verses of the Psalms between responsive choirs, an usage which has a natural connexion with the so-called ‘‘ paral- lelism” of Hebrew poetry, indicated in the English version of the Psalter by the colon that divides each verse. This practice has come to be falsely called antiphonal singing—falsely, because, according to the etymology of the word and to Aristotle’s definition, the Greeks used it for singing together, whereas the church uses it for singing in alterna- tion. St Ambrose regulated the order of the prayers, the ritual, and other matters in the service besides the music ; his ordinances prevailed in Milan, and were distinguished by his name; so the term Ambrosian denotes the “use of Milan” in all things in which that differs from the practice of other churches. No proof is given that the melodies so defined belong to the date of St Ambrose.

Boetius (475 A.D.) was the most copious of the Roman

terms Ambrosian and Gregorian are now erroneously applied to a system of music that came first into use centuries after the dates of the two bishops,

and they are applied even to melodies constructed upon that system. This sentence of St Isidore, the friend and survivor of Gregory, distinctly proves that no music of the time of the Roman pontiff was or could be preserved: ‘‘ Unless sounds are retained in the memory, they perish, because they cannot be written.” Whatever the age of the oldest church melodies, belief cannot associate them with the days of St Gregory. 1 See Chappell, op. cit.

2 The ratios of the three may thus be stated with reference to modern notation, the last being the temperament now in use :—

1D 1 FE : i Pithavsies 576 ©6648.—~=—(i‘v29”~=«#76B’ A system of modes had already been established for * Didymus . 576 640 720 768 ecclesiastical music which differed essentially from the a? Ptolemy 576 «= 648740 768 Greek modal system in having no notes inflected by sharps

pneumeter, of later date than St Gregory, employed signs over or under the syllables to indicate the rising or falling of the voice but not to define its extent, and, in the manner of modern punctuation, to show where breath should be taken. This was followed by, though for a time practised coincidently with, one in which the Roman letters stood for notes. Afterwards, something like our staff was em- ployed, of which the spaces only and not the lines were used, the syllables being placed in the higher or lower of them to denote to what extent the melody should rise or fall. Of earlier date than anything that has been found of like advance in other countries is a service-book which belonged to Winchester cathedral, and contains music written on the lines as well as in the spaces of a staff of four lines ; and this comprises a prayer for Ethelred II., who died in 1016. It has been stated and constantly repeated that staff notation was invented by Guido, a monk of Arezzo, who was alive in 1067, and whose book, Micrologus, refers only to writing in spaces, and who throughout his works professes no more than to describe established principles, and these far less advanced than what then prevailed in England. To him is falsely ascribed the first use of a red line for the note F, and a saffron for the note C, and to him, as unduly, the appropriation of

Germany, however, a remnant of Greek use prevails in having the note above A at the interval of a semitone, namely bB, as was the classical Paramesé above Mesé, and the Teutons employ the 8th letter H to denote

the sound we call {B, and the Italians and French $i. which, whenever instituted, did not pass out of use until the present century, regarded the hexachord and not the octachord, employed both letters and syllables, made the former invariable while changing the latter according to key relationship, and acknowledged only the three keys of G, C, and F; it took its name from having the Greek letter gamma with Ut for its lowest keynote, though the Latin letters with the corresponding syllables were applied to all the other notes.

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or flats, and consequently a different distribution of tones and semitones in each mode from that in all the others. The sole exception from this was the permissible bB in the second octave, the toleration of which was for the sake of avoiding the interval of the augmented 4th between 9B and F below it, but the inflected note was admitted in the fifth mode only. Here the numbers of the modes must be explained and the later misapplication to them of the Greek names. The two classic forms of authentic and plagal were employed in the structure of melody, that having its dominant above the tonic or final, this having its dominant below it. The four authentic modes bore the uneven numbers—first beginning its scale from D, third from E, fifth from F, wherein the >B might be used, and seventh from G. The four plagal modes bore the even numbers, which showed their parallelism or rela- tion to their respective authentic modes—second beginning from A, fourth from B, sixth from C, and eighth from D. Inthe latter half of the 9th century, Notker, abbot of St Gall, applied the Greek names to these, regardless of the distinction that by use of inflected notes the classic modes had all the same disposition of tones and semitones, whereas by the omission of sharps and of flats the church modes varied from each other in the arrangement of inter- vals. The confusion of F for the church Lydian with $F for the Greek Lydian is obvious, and the reader may easily trace the discrepancies between the systems if he consider the diverse principles on which the two are based. Some centuries later, the ninth and tenth modes, /olian and Hypo-iolian, beginning respectively on A and E,

were added, and later still, the eleventh and twelfth, Ionian and Hypo-Ionian, beginning respectively on C and G. The mode or scale that comprised b)B was called mollis, and those which had 9B were each called dura, and hence the sign “b” to indicate a flat, the word bémol to define the same in French, the word be or its first letter to name a flat, and the terms moll and dur to express minor and majorin German. Lastly, as bearing on the aversion from the augmented 4th between F and B, and on the omission of the 4th and 7th in several characteristic national scales, it must be added that, whenever the 5th above or 4th below a tonic or final was B, C instead of this note was dominant of the mode.

Coincidently with the church practice of constructing unrhythmical melody in one or other of these unnatural and arbitrarily devised modes, and of singing the same without accompanying harmony, the people of Northern nations had the habit, as has been proved in many districts, – of singing tunes with the accompaniment of different parts performed by other voices. Among what tradition has pre- served of these tunes, some indeed are in one or other of the church modes, as was inevitable in the productions of people who had experience of this artificial system in the music of the daily service; but many approxi- mate far nearer to the scale of present use, and are thus susceptible of just harmonic treatment, which is in- compatible with the modal system. So devoted to their Song-tunes were the English people in the later Saxon times that churchmen, as is well attested, would often sing these to attract the public to divine worship, and alter the Norman settlement it was a frequent custom to wnite words of hymns to fit secular tunes, which tunes and their titles are preserved through this appropriation only, with the Latin words written under the notes.

The appropriation of popular tunes to church use was followed by the adoption of the harmonic practice or part-singing of the people in many English districts, and probably in other Northern lands. At the end of the [lth or beginning of the 12th century, a part added to another received the name of descant (dis-cantus, some-

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thing apart from or extra to the song), and rules were gradually framed for its extemporaneous invention. It

was preceded by faburden (the singing of a single note or Fabur- drone throughout a given melody), and this latter term den.

was retained with a wider contrapuntal signification, whence difficulty has arisen as to its primary meaning. To “bear the burden” was to sing the bass below. either a single part or fuller harmony; when the bass was a single note, which was of course the tonic, this being generally F or Fa, it constituted the faburden or drone ; that the term is translated fawxbourdon and falsobordone in French and Italian may have referred at first to its being a single note or drone, and not a part changing with the changeful harmony.

The assertion that previously to the period now being pja- considered there prevailed a church custom of accompany- phony.

ing melodies with a transposition of the same at the interval of the 5th or 8th above or below is disproved by Aristotle’s injunction that the antiphon might be at the 8th below, but not at any other of the perfect intervals ; and the blundering of Boetius could not eradicate the fact, though it might obscure the rule. It is also dis- proved by the habit of the peoples of the North to sing in harmony, showing unschooled perception of the principles of combining sounds, and making it impossible that either they or their priests (who must casually have heard their natural performances) could have tolerated the cacophonous progression of parts at perfect intervals from each other. It is disproved by the identity of human perceptions to-day with those of a thousand years ago, and by the certainty that men of old positively could not have sung with satisfaction, or heard with respect, things that are in the highest degree offensive to us all, An explanation may be speculatively ventured, that the manuscripts wherein two parts appear to be written in 5ths or 4ths with each other are not scores showing what was to be sung in combination, but the parts for separate choirs, showing what was to be sung in response; thus, when

D

A + stand as the initials of three melodies, the top or

D the bottom may have been intended to be sung alone, the middle to follow, and the other to succeed. In this is to be seen the germ of the fugue, if we may suppose that the part which first held the cantus was continued in descant, when the cantus was sung a 5th higher by another part. Music written as here described is defined as diaphony,—a term at least as appropriate to the successive as to the simultaneous singing of a melody at the interval of a 5th above or below.

One of the most inscrutable things to the modern student Musical is the lateness at which notation was devised for defining measure.

the relative length of musical sounds. The rhythmical sense is the earliest of the musical faculties to be developed, and is often the strongest in its development among individuals and nations. Still, the ancients have left no record that they had signs of indication for the length of notes, and centuries rolled over Christendom before there was any chronicled attempt to find a principle for supply- ing this musical necessity. Here again conjecture will insist that the practice of singing longer and shorter notes with stronger and weaker accent must have prevailed before a system was framed for its regulation; and in this supposition offers that the instincts of the people must have given example for the canons of the school- men. Franco of Cologne, in the 12th century, is the first writer who codified the uses of ‘measured music,” and all he enunciates is expanded in the treatises of Walter Odington, a monk of Evesham who was appointed arch- bishop of Canterbury in 1228. At this period and after- ; XVII. — 11

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wards, bar-lines were drawn across the whole or a portion of the staff to show the end of a musical phrase in accord- ance with that of the line or verse which was to be sung to it, and the number of notes between these bar-lines was more or less, according to the number of syllables in the verse. It was not, however, till more than three hundred years later that music was first divided into bars of equal length, and not until a still later

date that these were applied to their most valuable purpose of showing the points of strongest emphasis. Prior to this invention the distribution of accent was styled perfect or imperfect time, according to whether the strongest note was to be the first of three or the first of two, or according to whether three or two should follow during the continuance of one, corresponding with present division into triple or duple time. Our compound times were denoted by such directions as “imperfect of the first and perfect of the second,” which may be translated by

our sign Oe meaning that a bar is divisible into

two equal notes (dotted minims or dotted crotchets), and each of these into three equal notes (crotchets or quavers). It is not only that early music is, on account of this vague notation, difficult to interpret, but writers seem to have had undefined notions of where their accent should lie ; and hence we have varying versions of melodies, partly because the transcribers may have doubted how to express them, and partly because composers, when choosing them as themes against which to construct other parts, lengthened or shortened any of the notes at the prompting of their own fancy. It was not until the 18th century that the plan was fully accepted of having the strongest note on the first of every bar, and of having, with rarest excep- tions, the close or cadence or conclusion of every phrase on this note of strongest accent. To induce such termina- tion of a phrase many a strain must begin with a half bar, or with a shorter or longer fragment, and the excep- tions from the rule are so few as to be easily mastered, and so clear as to aid in strengthening the principle.

Descant, which has become a term of general use for disquisition on a stated subject, has been shown to owe its first meaning and musical application to the words dis- cantus. A like meaning belongs to the word motet, which seems to have come from motetus, to denote a florid or moving part against a fixed theme in longer notes.’ It may be supposed that the term anthem had reference originally, similarly to the word motet, to a free part constructed against or upon the plain-song. The word descant has passed out of use as a musical definition; motet now generally signifies a composition to Latin text for the Roman Church, and it is also applied to the works pro- duced in North Germany in the centuries next following the

Reformation which were elaborations of the choral melodies ; and anthem is applied to pieces designed for use in the Church of England.

When descant ceased to be improvised, and with the advance of notation the writing of a carefully-planned accompanying part became more and more practicable,. such a part was defined as counterpoint—point or note against note. Counterpoint is simple when each melody is in notes of the same length as those of an accompanying melody ; it is florid when one melody proceeds in longer or shorter notes than another melody. At first the use of perfect concords only was allowed in counterpoint, but of these

1 Among other grounds for this derivation a strong one is that in the 13th and 14th centuries the word motetus often defined a florid part next above that which was styled tenor, because it held the chief melody, the word motetus being subsequently changed for medius or mean when that part stood midway between the ¢enor and the third part above it or treble. Bass, or base of the harmonic column, was then designated the burden.

never two at the same interval, as two 5ths or two 8ths, in succession. 3ds and 6ths were afterwards introduced. Then discords were admitted under either of two condi- tions: (1) that they were approached and quitted by step and not by leap, and were always unaccented ; (2) that they were suspended from a note of a previously-sounded chord, or from a note without harmony, and that they were resolved by passing to a concord while the harmony lasted against which they were discordant. Subsequently one more class of discords was employed ; these were elements of the harmony, being added to, not substituted for, the notes of a chord, and they were resolved, with the change of the entire chord, upon notes of that chord whose root was at the interval of a 4th above the root of the discord. It is from the institution of the art of constructing counter- point that the history of the music we know, and the capa- bility to produce it, are truly to be dated. Throughout the period of transition from what must be regarded as an instinct of the people to what was truly a scholastic problem, there were English writers on music in such numbers as to prove the high

consideration in which it was held in Britain, and the great pains spent there to evolve principles for its regulation.2. John of Dunstable is especially to be noted, of whom Tinctor the Netherlander (c. 1460 a.D.) wrote, in discussing the art of counterpoint : ‘Of this new art, as I may call it, the fountain and source is said to have been among the English, of whom Dunstable was the chief.” Contemporaneous with Dunstable, but far behind him in esteem, was Egide Binchois, a musician of Picardy. The first essays at composition in harmony were in thes

form of canon—that is, in which successive parts have the ”

same melody, but begin each at a stated period after its precursor. When the first part completes a rhythmical sentence prior to the entry of the second part and con- tinues the melody as accompaniment to the second, and so on with regard to the third or fourth parts if there be so many, the composition has in England always been styled a round or catch, as distinguished from the closer canon, in which the successive parts enter without regard to the close of a phrase ; but elsewhere than in England no distinction is made between the catch and the canon. The term round refers to the return to the beginning by the first part, while the other parts respectively continue the melody. The term catch springs from each later part catching up the tune during its continuance by the others. The term canon relates to the problem of finding the one or more points in a melody whereat one or more successive parts should begin the same tune. Very early allusion is made to the singing of catches by the English people, which continued in practice until after the Restoration ; every trade had its characteristic catch ; there were many on pastoral subjects; those which engaged composers in the time of Charles II. are mostly of a bacchanalian cast; and the form was appropriated in the later Georgian era to sentimental subjects, when the practice of singing catches had passed from the people at large, but was pre- served in some convivial clubs that consisted of men of fortune, who paid and listened to, but took no part with, professional singers.

Quite distinct from the canon is the fugue (fuga). In¥ it a short complete melody /lzes (hence the name) from one part to another, while the original part is continued in counterpoint against it. To suit the different compass of high and low voices, this melody is transposed into the key of the dominant

(the 5th above or 4th below) when assigned to the second entering voice; in the first instance it is called the subject or dua, in the second it is called the

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2 John Cotton (referred to as Johannes Anglicanus by the almost fabulous Guido) was the earliest to indicate the good effect of contrary motion between two simultaneous melodies.

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answer or comes, and they were formerly also distin- guished as masculine and feminine. A subject is real when it admits of exact transposition into the key of the dominant; it is zonal when it needs modification to be fitted for this change, and then, if authentic, its answer must be plagal, and, if the subject be plagal, the answer must be authentic. The copious rules of fugal develop- ment needed many years for their ripening, but the begin- ning of this art-form dates from very primitive times, and a speculation has been already offered as to its origin (p. 81).

The earliest piece of music for several voices that has

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passion of the age there was generally provision for the teaching of music.!

In the 15th century and later, because musical erudi- tion was still applied entirely to the service of the church, and because Italy was the ecclesiastical centre, musicians of all lands went to Italy, and especially to Rome. It was, however, in England first, and it has been only in England until America adopted the practice, that academi- cal honours have been given to musicians. John Hamboys (c. 1470), author of some treatises on the art, is the reputed first doctor of music. The record exists that in 1463 the

university of Cambridge conferred the degrees of doctor Academi- and bachelor respectively on Thomas Seynt Just and Henry ¢@! de- Habyngton. Probably these degrees were granted on the ®”°**

g been found in any country is an English ‘‘six men’s song,” – contained in a manuscript which best judges assign to the period prior to 1240. It isa canon for four voices, with

independent parts for two more, which stand as a foot, or burden, or ground bass to support all the others. The original words are a description of summer; these are proof of the secular origin of the music, but there are also written to the notes the words of a Latin hymn, which prove the practice above noticed of utilizing the people’s songs for church purposes. The Arundel MS., which had lain unnoticed in the library of the Royal Society and has lately been transferred to that of the British Museum, comprises several compositions in two-part and three-part counterpoint, and it belongs to the year 1260—a new addition to the many proofs of the earlier and greater advance of music in England than in other countries. In the Parisian library are some pieces by Adam de la Hale, the Hunchback of Arras, which consist of a secular tune as bass with its original words, and two florid parts above it with sacred Latin words. The reputed author lived in the later half of the 13th century, but it is surmised that the contrapuntal parts may have been added to his tune at a subsequent period by another hand; if this be so, the English pieces are the first, and seem to be the only extant specimens of counterpoint of the period.

Thus far the advance of music was earlier and greater in England than elsewhere. In the 15th century Flanders produced the musicians of most esteem and greatest influ- ence. Early among these was Ockenheim or Ockeghem of Hainault (c. 1420-1513), who was surpassed in fame by his pupil Josse Després (more commonly known by what must have been his pet name of Josquin) of Hainault. He practised the art in his own country, in Italy, in France, and in Austria, and was everywhere regarded as its highest ornament. Though not credited with the origin- ation of principles, he is highly extolled for his practical application of those already acknowledged, and the renown of many of his scholars shows him to have been as good a teacher as he was a voluminous composer. In his works, however, the

artificiality of the prevailing style is obvious ; many of them have some secular song for “cantus fermus” which supports the florid melodies set to sacred texts that it was the musician’s highest aim to engraft upon them. Some of them are notable for a pleasantry or even a jest framed on a punning application of the names of the notes, or on the choice of a text that was pertinent to the occasion for which they were written. Others are distinguished for the multiplicity of their parts. All are of a character to elicit admiration of their ingenuity rather than Induce delight by their beauty.

Tinctor, already mentioned, founded in Naples the first musical conservatory, and coincidently Willaert, another Fleming, founded one in Venice, their object being, as implied in the definition, to conserve the art of music from corruption. Not only in these exclusively musical Schools and in similar institutions which sprang up in the same and other cities was the art cultivated, but in the academies of general learning that were established in all the Italian cities when study of the classics became the

strength of pedantic lore formally required. In the follow- ing century a musical composition also was exacted from candidates for graduation. It may seem an anomaly that art-excellence should be tested by academical regulation, since by some supposed to soar above rule; but, rise as it may, to be art it must be founded on principle, and, if in its working of to-day it overstep its limits of yesterday, it is for ever unfolding new exemplifications of those natural laws whereon it is based, and the greatest artist of any time is he who can most deeply probe, and is thus best able to apply, the phenomena; upon these grounds, then, it is not beyond the province of the schoolman to test and to declare the qualifications of an artist.

The knightly calling, in the age of chivalry, not only referred to heroic acts and deeds of arms, but regarded skill in verse and melody, in singing and accompaniment. Princes and nobles of highest rank practised these arts, and were then styled troubadours, who were sometimes attended and assisted by jongleurs to play to their singing. See TRouBADoURS. ‘Their music seems to have been rhythmi- cal, as was necessary to fit the verses, and the perfect, or ternary, or triple time is said to have prevailed in it more commonly than that which we should now write as two or four in a bar. A

similar race of knightly songsters in Germany were the minnesiinger (see vol. x. p. 525). They set great value on the invention of new metres, and he who produced one with a melody to suit it was called a meister (master), while he who cast his verses in a previously accepted metre or adapted them to a known melody was styled tondieb (tone thief). For the most part, their pieces comprised a fore-song, a far longer section in several stanzas, to each of which the same melody was repeated, and an after-song, all three divisions having their own separate melody. Their music is said to have been in the church style of the period, but was distinctly their own composition. The exercise of the gentle arts by the nobility declined with the decline of chivalry, and as it fell into disuse among them it was adopted by the burgher class in the guilds of meistersinger (see vol. x. p. 526). One of the most meritorious and by far the most prolific of the whole craft—his compositions being numbered by thousands —was Hans Sachs of Nuremberg (1494-1576). He was by trade a shoemaker, and all the members of the guild followed some such calling, and devoted themselves to the study and practice of song as recreation from their daily labour. They cultivated the arts of both composition and performance of

song in its twofold aspect of verse and tune, for which, ae 1 As belonging to this branch of the subject, the principal schools for musical education that have been instituted of late, and are now in existence, may here be named : —the Paris Conservatoire, 1795, and its five provincial branch schools ; the Conservatoire of Brussels ; the Conservatorio of Naples, an offspring of earlier institutions ; the Royal Academy of Music, London, 1822; the Conservatorium of Leipsic, instituted in 1848, mainly through the instrumentality of Mendelssohn ; the Conservatorium of Vienna, and like institutions in Dresden, Cologne, Stuttgart, Munich, and Frankfort, and also in Milan and Bologna; and the Hochschule fiir Musik, a branch of the Academy of Arts, Berlin.

Madri- gals and part- songs.

Roman school,

according to tradition, they enacted most rigid and perhaps pedantic laws. None of their work has come down to us, but the name they have left affords an instance of the aspira- tions of the common people to that intellectual condition which is not the exclusive prerogative of the church nor the privilege of the wealthy. Guilds of meistersinger were also established in other towns of North Germany. The title and its application generally declined until the 17th century, but lingered feebly in a few places until 1836, when the latest-lived guild was dissolved at Ulm.1

The dawn of the 16th century is marked by the appro- priation of musical scholarship to secular writing. It was about that time that the madrigal came into vogue. The etymology of the word is obscure, but the class of music to which it is applied is clearly distinguished. It is stamped with the imitative character of the canon, but is free from the rigid continuance of one melody by the successively entering voices; and it has as much resemblance yet un- likeness to the fugue in having the flight of a musical phrase from one to another of the vocal parts, but not being steadfast to one subject throughout its design,—nay, imitation sometimes ceases in the madrigal when particu- lar words need special emphasis. The villanella, villancico, chanson, or the part-song of the period is distinguished from madrigal by the definite rhythm, a quality excluded from this latter by the response in one part to the uncompleted phrase of another; and the lighter species of composition was so arranged as to suit a single voice with a lute accompaniment when a voice to each part was not avail- able for the performance. Still more marked in rhythm and more slight in structure was the ballet, so named be- cause it was sung as an accompaniment to dancing (ballata, from ballare), or the fal-la, so named because often set to these two syllables. All these classes of music were as often played as sung, and in English copies are generally de- scribed as “‘apt for voices or viols.” The Flemish masters have left as many and as admirable specimens of secular work as of church music; Italian musicians, who rose from the teaching of the Flemings, successfully emulated the two- fold example; but in England secular composition seems to have been the indigenous development of national intui- tion, and at its outset at least to have had a style of its own. This is exemplified in the pieces comprised in the Fayrefax MS., which are mostly of a pastoral and always of a tuneful character; of these, Dr. Robert Fayrefax the collector, Sir Thomas Phelyppes (a priest), Newark,

Theryngham, Turges, Tudor, Browne, Gilbert Bannister, Richard Davy, Cornyshe, and others were the composers.

The renowned Roman school, to which we must now pass, owed its existence to the precept as much as to the example of foreigners, chiefly from Flanders. Claude Goudimel (c. 1510-1572), known as a Fleming, though his birth be assigned to Avignon, was the first to open a seminary for musical tuition in Rome, and the most famous musicians of the century were its pupils— Pales- trina (0b. 1594), Orlando di Lasso (0d. 1594), the brothers Animuccia, the brothers Nanini, and many more. Lasso, Lassus, or Latres of Mons is signalized among these for the great number and great beauty of his works, and for the wide area over which he spread his labours. In his own land, in Rome, in France, in England, and chiefly in Bavaria, he was active as a choir-master and as a composer, and did as much to advance art by making his music express

1 Late in the 13th century a society somewhat similar in its object was established in London, consisting of the wealthier merchants. It was called the Puy (the name also given to the poetical festivals in honour of the Virgin in some Norman towns; see Littré, s.v.). Ad- mission to its ranks was possible only through manifestation of musical or poetic merit. Severe judgment decided on the claims of contesting ae for honours, which were great and public when desert was

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the words to which it was set as by teaching the executants to realize this expression in performance. He is praised for breaking from the long previous practice of writing prolix florid passages to single syllables, a weakness mani- fest in the music of his countryman Despres and of inter- vening writers.

Several musical treatises by Spanish writers of this period Spanis, are extant, which are not regarded highly for the novelty writer, of their views, nor for more than usual perspicacity in the statement of them. It might have been supposed that Spain would have been as favourable to the production of musical talent as Italy has always been. That the con- trary is the fact is,

however, patent ; but the explanation lies with the ethnologist rather than with the musician.

Though the church from time to time appropriated the Purifa.| secular art-forms from their rise to their maturity, its chief Hoo | authorities were always jealous of these advances, and — issued edicts against them. So in 1322 Pope John XXII ~ denounced the encroachments of counterpoint, alleging that the voluptuous harmony of 3ds and 6ths was fit but for profane uses. So too the twelfth or Ionian mode—the modern scale of C major, the only one of the church modes, save under special conditions the fifth or Lydian mode, that accords with the tonality of present use—was stigmatized as “ lascivious” and proscribed from the sanc- tuary. More accordant with present views of propriety was the many-sided objection to the employment of tunes of the people in place of the church’s plain-song as bases on which to erect counterpoint, and the construction of this counterpoint in the most ornate of the several florid species. Enlarging on the primitive practice of adapting Latin words to popular tunes, the best approved masters, in the two centuries preceding the epoch now under notice, took tunes of this class, to which it is stated the original words were commonly sung by congregations at least, and even by some members of the authorized choir, while other of the singers had such extensive passages to execute that to make the sacred syllables distinct was impracticable. The whole custom of composition and performance was rigorously condemned by the council of Trent, in conse- quence of which Palestrina was commissioned in 1563 to write music for the mass that should be truthful to the spirit of devout declamation and aim at the utmost approach to musical beauty. To this end he made three experiments ; the first two were declared successful, and the third was accepted as the fulfilment of all that could be desired for religion and for art; it was named, after the preceding pope, “Missa Papze Marcelli.” This great work was set forth as the standard to which all ecclesiastical composi- tion was required to conform ; and so it did conform until a new musical idiom arose, until the popular ear thirsted for new forms of expression, and until musicians sought and found favour in meeting the general demand. In the three hundred years between that time and this, pontifis and conclaves have again and again enacted statutes to conserve the purity of ecclesiastical art, but art as often has run out of control and proved that every succeeding

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purity of performance. A Treatise on Counterpoint by Stefano Vanneo of Recanati (1531), however, expressly states that the notes in the modes were subject to mM flexion, that accomplished singers necessarily knew what

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notes should be raised or lowered by sharps or flats, and that these signs were never written but for the direction of boys and other executants who had not attained to mastery of their art. The treachery of tradition is exemplified in the loss of the rules for this once generally under- stood practice of notal inflexion; but the inference is strong that, could these rules be recovered, many of the melodies now called Gregorian might resume a musical character of which they are robbed by strict adherence to their written notes.

In England during the 16th century choral music kept pace with the age. This is evidenced in the works of Tallis and Byrde (Bird, or Byrd), who wrote for the Roman ritual, and continued their labours for the Anglican service as modified by the Reformation, which exercised the genius of many another, of whom Orlando Gibbons was the crown- ing glory, for the few of his works that are accessible in comparison with what he is believed to have produced are classed among the masterpieces of their style and their period. The same musicians, or most of them, are as notable for their secular as for their sacred writings.

It was in the middle of the 16th century that the class of composition now ranked as the highest was originated. The oratorio dates its existence and its name from the meetings held by San Filippo Neri in the oratory of his church in Rome, at first in 1556, for religious exercise and pious edification, He was the confessor and friend of Giovanni Animuccia, whom he engaged to write music to be interspersed throughout his discourses. Originally this consisted of Jaudi or short hymns, the extent of which was afterwards enlarged; by and by the spoken matter was replaced by singing, and ultimately the class of work took the form in which it is cast by present composers. Such is the source of the didactic oratorio; the dramatic oratorio is an offshoot of the same, but-is distinguished by its representation of

personal characters and their involvement in acourse of action. The first instance of this kind of writing was the production of Emilio del Cavalieri, La Rappresentazione dell'? Anima e del Corpo, which, like its didactic precursor, was given in the oratory of a church in Rome (1600).

To the beginning of the 16th century is due a more significant matter than the secularization of studied music, ' than the reform of the music of the church, and even than the labours of those musicians of whose great names only the most notable have been cited. The matter in question refers not to art-forms nor to artists, but to the fact that music has its foundation in the natural laws of acoustics, and thus it lays open the principle for which Pagan philosophers and Christians had been vainly groping through centuries, while a veil of mathematical calculation hung between them and the truth. Jean Mouton of Holling in Lorraine (1475- 1522) is the earliest musician in whose works has been found an example of the phenomenal chord of the dominant 'th approached with the full freedom of present-day prac- tice. The discovery is usually ascribed to Claudio Monte- verde, of whom and of his great art services much will be said when treating of the ensuing century. Like others of the wonders of nature, the chord and its application seem not to have come suddenly into knowledge, much less into acceptance, but to have been experimented upon with less or more of hardihood by one musician after another, until good effect had silenced dispute and authorized the adoption of this beautiful harmony into the language of music. The discovery of the grounds of its justification is to be traced to a still later time. The speciality of the chord consists m its comprising between its 3d and 7th the interval of the diminished 5th, the two notes of our diatonic scale

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which are omitted by many primitive nations—the 4th and 7th from the keynote—and which perplexed the con- siderations of theorists and practitioners, as has in the foregoing been repeatedly shown. Speculation as to the new delight the first hearing of this combination must have occasioned is precarious ; the opposition with which it was encountered by the orthodox is certain.

Yet another prominent feature in musical history dates from the beginning of the 16th century, the practice of hymnody. Luther is said to have been the first to write metrical verses on sacred subjects in the language of the people, and his verses were adapted sometimes to ancient church melodies, sometimes to tunes of secular songs, and sometimes had music composed for them by himself and others. Many rhyming Latin hymns are of earlier date whose tunes are identified with them, some of which tunes, with the subject of their Latin text, are among the Reformer's appropriations ; but it was he who put the words of praise and prayer into the popular mouth, associated with rhythmical music which aided to imprint the words upon the memory and to enforce their enunciation. In conjunction with his friend Walther, Luther issued a collec- tion of poems for choral singing in 1524, which was followed by many others in North Germany. The English versions of the Psalms by Sternhold and Hopkins and their pre- decessors, and the French version by Marot and Beza were written with the same purpose of fitting sacred minstrelsy to the voice of the multitude. Goudimel in 1566 and Le Jeune in 1607 printed harmonizations of tunes that had then be- come standard for the Psalms, and in England several such publications appeared, culminating in Ravenscroft's famous collection (1621); in all of these the arrangements of the tunes were by various masters. The English practice of hymn-singing was much strengthened on the return of the exiled Reformers from Frankfort and Geneva, when it became so general that, according to Bishop Jewell, thousands of the populace who assembled at Paul's Cross to hear the preaching would join in the singing of psalms before and after the sermon.

The placing of the choral song of the church within the lips of the people had great religious and moral influ- ence; it has had also its great effect upon art, shown in the productions of the North German musicians ever since the first days of the Reformation, which abound in exercises of scholarship and imagination wrought upon the tunes of established acceptance. Some of these are accompaniments to the tunes with interludes between the several strains, and some are compositions for the organ or for orchestral instruments that consist of such elaboration of the themes as is displayed in accompaniments to voices, but of far more complicated and extended character.

reat fame by success in its practice, of whom Reinken (1623-1722), Pachelbel (1653-1706), Georg Boehm, and the great Bach are specially memorable. The hymnody of North Germany has for artistic treatment a strong advantage which is unpossessed by that of England, in that for the most part the same verses are associated with the same tunes, so that, whenever the text or the music is heard, either prompts recollection of the other, whereas in England tunes were always and are now often composed to metres and not to poems ; any tune in a given metre is available for every poem in the same, and hence there are various tunes to one poem, and various poems to one tune.2 In England a tune is named generally after

1 The Correspondence of this account with that of the rise of Greek tragedy is obvious.

2 The old tune for the 100th Psalm and Croft's tune for the 104th are almost the only exceptions, unless ''God save the King " may be

Hymns and chorals.

Elabora- tion of choral tunes.

Recita- tive and lyrical drama.

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some place—as '"' York," '" Windsor," '' Dundee,"—or by some other unsignifying word ; in North Germany a tune is mostly named by the initial words of the verses to which it is allied, and consequently, whenever it is heard, whether with words or without, it necessarily suggests to the hearer the whole subject of that hymn of which it is the musical moiety undivorceable from the literary half. Manifold as they are, knowledge of the choral tunes is included in the earliest schooling of every Lutheran and every Calvinist in Germany, which thus enables all to take part in performance of the tunes, and hence expressly the definition of "choral." Compositions grounded on the standard tune are then not merely school exercises but works of art which link the sympathies of the writer and the listener, and aim at expressing the feeling prompted by the hymn under treatment.

On the verge of the 17th century a novelty in music was originated that was as pregnant of consequence as anything that has yet been noticed; this was recitative with its special characteristics. Vincenzo Galilei was one of a band of Florentine nobles and gentry who devised the appropriation of music to free declamation, and they engaged. authors and productive and executive musicians to put the conception into practice. Galilei had already come promi- nently into public notice in a controversy with Giuseppe Zarlino, the most esteemed of all the writers on music in his age, who was the author of a treatise that expounded and justified the Ptolemaic division of the scale with the major and minor tones, and the former below the latter ; this was answered by Galilei in support of the Pythagorean doctrine of equal tones, which is confuted by the pheno- menon of harmonics, and Zarlino in turn replied to him. During two and a half centuries the art of music had been untouched by the New Learning, which had had the effect of regenerating all the other arts, and had wrought the intellectual change now known as the Renaissance. The members of the Florentine association thought it possible to apply ancient principles in modern practice, and so to re- produce the effect to which the newly-revealed writings of Greece testified, but of which these gave no such technical description as could be the groundwork of any reorganiza- tion. Obviously, the poetic power of Greek music must have lain in the force it gave to declamation ; in exalting speech into song it must have given to words a clearer yet more varied significance than they could else have had, and to the passions words embody it must have given an otherwise impossible medium of expression. There existed two classes of music at the time under notice. The music of the people consisted of concise rhythmical tunes that were either composed to accompany dancing, or so constructed that, though made for singing, they were applicable to that other use; and these tunes, being repeated again and again to the almost countless stanzas of some ballad poems, could have in themselves no quality of expression beyond a vague character of sadness or gaiety ; for, what might have been expressive of the pre- valent feeling at one stage of a long story would neces- sarily be fallacious in the subsequent diversities of the tale. The music of the schools consisted of ingenious con- trivances of wholly artificial nature, either to assign the same melody to several successive voices in canonic con- tinuance or fugal imitation, or else to multiply more and more the parts for simultaneous execution; in the former case definition of rhythm is annulled, as has been shown by the

entry of one part with a phrase while that phrase was uncompleted in another part, and in the latter case the manifold melodies so obscured the sound of one another

classed under hymnody. In Scotland, also, the tune for the 124th Psalm is associated with its proper text.

that none could be distinguished,—a fact that must be self- apparent if we think of the sound of twelve, or twenty- four, or so many as forty simultaneous currents of song, In this music there could neither be expression nor even articulation of the words, and hence, our Floren- tines assumed, the purpose of music was perverted and its inherent poetical essence was abused. Such combination of diverse melodies is now styled polyphony, a term that might better be applied to simple counterpoint in which the many sounds are onefold in accent than to the florid counterpoint it is employed to define, wherein the many parts have various movement. With the idea before them of the ancient rhapsodists the association proposed the setting of music to verses with the main, nay, only object of expressing the words. This music was not to be rhythmical, but was to consist of longer or shorter phrases in accordance with the literary sense; its intervals were not to be chosen with regard to their melodic interest, but in imitation or idealization rather than exaggeration of the rising and falling of the voice in ordinary speech, the speed being hurried or relaxed by the exigency of the passing sentiment ; and the accompaniment of the singer was to be on some unobtrusive instrument or, later, some combination of instruments, that should, as did the lyre of old, verify the intonation and, in the new era (what had not been in the classic), enhance the vocal expression by some pungent harmony. Applied solely to recitation, the new invention ~ was called recitativo (recitative), musica parlante, or stilo rappresentativo. The first instance of its composition is said to have been a cantata—that is, a piece for a single voice with instrumental accompaniment—ZJ/ Conte Ugolino, composed by Galilei, but of this no copy is known to exist. Doubt prevails as to whether 17 Combattimento a’ Apolline col Serpente by Giulio Caccini or ZZ Satiro by Emilio del Cavalieri was the earlier production;

they were both given to the world in 1590, were both in dramatic form, and both exemplified the new, if not the revived, classic style of music. Caccini was fitted to make the experiment by practice and excellence as a vocalist more than by con- trapuntal erudition, and he was soon associated with Jacopo Peri, a musician of his own class, in the composi- tion of Dafne, a more extensive work than the foregoing, indeed a complete lyrical drama, which was privately per- formed in the palace of one of the Florentine instigators of the experiment in 1597, or, according to some, in 1594. These two again worked together on the opera of Luridiee, which was publicly represented in Florence at the nuptials of Henry IV. of France with Maria dei Medici in 1600, its production having been preceded by that of Cavalieri's posthumous oratorio in Rome, La Rappresentazione dell' Anima e del Corpo, before noticed. That the first public performance of a dramatic oratorio and of a secular opera, both exemplifying the recently-devised declamatory power of music, should have occurred in the same year is a re- markable coincidence. That the first experiments in the novel art of lyrical declamation were confided to practised executants who brought their experience as vocalists to bear upon composition for a hitherto untried phase of vocal effect was excellent for the purpose of proving the proposition. The success of the experiment was, how- ever, to be established when a composer already renowned as such, one who had drawn exceptional attention by his then new views of harmony, gave the force of his genius and the weight of his name to the novel class of writing. Such was Monteverde (1568-1643), who in 1607 brought out at the court of Mantua his opera of Arianna, followed in 1608 by his Orfeo. In these works, and in those of the same nature that he subsequently produced at Venice, is anticipated the principle (and, so far as the resources of the time allowed, the practice also) which was revived by

Gluck some hundred and fifty years later, and of which the votaries of Richard Wagner in the present day assume their hero to have been the originator,—the principle, namely, that the exigencies of the action and the require- ments of the text should rule the musical design in a lyrical drama, and that the instrumental portions of the composition should, quite as much as those assigned to voices, illustrate the progress of the scene and the

signifi- cance of the words. The last speciality is exemplified in the harmonies and figures of accompaniment, and in the appropriation of particular instruments to the music of particular persons, so as to characterize every member of the action with special individuality. Such must be the true faith of the operatic composer ; it has again and again been opposed by the superstition that feats of vocal agility and other snares for popular applause were lawful elements of dramatic effect ; but it has ever inspired the thoughts of the greatest artists and revealed itself in their work, and no one writer more than another can claim to have devised or to have first acted upon this natural creed.

Monteverde had been attacked by Giovanni Battista Artusi for his use of what are now known as fundamental harmonies, which the composer might have learned from the music of Mouton (already named), but which he more

af. probably rediscovered for himself; he had defended the

practice, and his theoretical assailant had retorted. Pol- emics ran high as to the relative rights of contrapuntal legislation which had been developed through the course of ages, and the freedom of thought which had as yet neither rule nor tradition ; for every separate use of an unprepared discord was tentative as to effect and specula- tive as to reception by its hearers. It will presently be shown that the discovery (no lighter term will suffice) of Mouton and Monteverde has its base in the laws of nature ; here it is enough to say that it was a turning-point in the history of music, the throwing open the resources of the modern as opposed to the limitations of what may justly be called the archaic. The distinction of these two styles was not clearly defined till long afterwards; but a writer may here be named, Angelo Berardi, whose work (1687) more fully than any other sets forth the con- trapuntal code and enunciates the requirements in fugal writing, such as the affinity of subject to answer, and whatever else marks the style and the class of com- position.

The opera now became a fixed institution in Italy, its performance was no longer restricted to the palaces of princes and nobles, and it became the best-esteemed enter- taimment in public theatres. The dramatic oratorio was transferred from the church to the secular stage, becoming m every respect

a sacred opera, and only specimens of this a were suffered to be represented during the season of

ent,

Conspicuous, as much for the merit as the multitude of his productions, was Alessandro Scarlatti (1659-1725), who gave to the world 115 secular operas, many oratorios, and, besides these, which might well have been a long Iife's labour, a far greater quantity of ecclesiastical music, some of which is characterized as most dense and massive. He Js accredited with three novelties in his dramatic writing: the repetition, Da Capo, of the entire first part of an aria after the second part, of which, how- ever, Some specimens by earlier writers are said to exist ; the accompanied recitative, wherein orchestral interludes illustrate the declamation and figurative accompaniment enforces it, as distinguished from speaking recitative, wherein the accompaniment does little more than indicate the harmony whereon the vocal phrases are constructed ; and the sinfonia or overture which is often associated with his name, as distinguished in plan from that which

was first written by Lully, his being sometimes styled the French and Scarlatti's the Italian form of instrumental preface to an extensive work! Alessandro Scarlatti is little less famous as a teacher than as an artist ; he was at the head of all the three conservatories then flourishing in Naples, and the long list of his pupils includes his son Domenico and most of the other chief Italian notabilities of the next generation. Conspicuous among his contem- poraries were Cavalli and Cesti.

Opera was first introduced in France by Cardinal Maza- French rin, who imported a company of Italian performers for an pera.

occasion. 'he first French opera, Akebar, Row de Mogul (1646), was composed by the abbé Mailly for court per- formance. So was La Pastorale (1659), by Cambert, who built his work on the Florentine model, and,

encouraged by success, wrote several others, on the strength of which he, with his librettist Perrin, instituted the Académie Royale de Musique, and obtained a patent for the same in 1669, exclusively permitting the public performance of opera. Jean Battiste Lully ? (1633-1687) procured the transfer of this patent in 1672, and by it gained oppor- tunity not only for the exercise of his own genius but for the foundation of the French national lyrical drama, which to this day is wrought upon his model.

The ballet had been a favourite subject of court diver- Lully.

sion since Beaujoyeaulx produced in 1581 Le Ballet Comique de la Royne, a medley of dancing, choral singing, and musical dialogue. Lully, in his course to the summit of royal esteem, had composed several pieces of this order, which were performed chiefly by the courtiers, and in which the king himself often sustained a part; and, experienced in the taste of the palace, and indeed of the people, our musician incorporated the ballet as an essential in the opera, and so in France it still remains. It was not singly in the structural intermixture of dancing with singing that Lully's operas were, and those of his French successors are, unlike the works of the same order in other countries, he gave such care to and exerted so much skill in the recitative that he made it as interesting as the rhythmical matter, nay, varied it often with metrical vocal phrases and accompanied it constantly with the full band, whereas, until Rossini's Otello in 1818, speaking recitative (recitativo parlante, recitativo secco) was always a main element in the operas of Italy.

In Germany the seed of opera fell upon stony ground. German Heinrich Schtitz wrote music to a translation of Peri's °Pe!®-

Dafne, which was performed for a court wedding at Torgau in 1627; but only importations of Italian works with Italian singers came before the public until nearly the end of the century.

In England the lyrical drama found an early home, English The masques performed at Whitehall and at the Inns of °Per.

Court were of the nature of opera, and were largely infused with recitative. Eminent among others in their composition were Nicholas Laniere (c. 1588-

1664), born of an Italian father who settled in England in 1571 ; Giovanni Coperario, who during his sojourn in Rome had thus translated his patronymic of John Cooper ; Robert Johnson, who wrote the original music for Zhe Tempest; Dr Cam-

1 The Italian ‘‘sinfonia” mostly begins with an allegro, which is succeeded by a shorter adagio, and ends with a second quick movement that is sometimes the resumption of the first and is sometimes inde- pendent of it, and it is exemplified in the overtures to the Seraglio of Mozart, the Kuryanthe of Weber, and several of Auber. The French “ouverture” (the original form of the word, which still remains in France) generally begins with a majestic movement, which is followed by an allegro, often of a fugal character, and concludes with a march or gavotte or some other description of dance, and it is exemplified in the overtures of Purcell and nearly all of those of Handel.

2 This is the French form of his names Giovanni Battista Lulli, adopted after he was taken from Florence to Paris as a page.

Puritan infin- ence.

Cantata.

pion, Ives, and William and Henry Lawes. The name of Henry Purcell (1658-1695) figures brightly in this class of composition; but, except his Dido and Eneas, written when he was eighteen, his so-called operas are more properly spoken dramas interspersed with music—music of highly dramatic character, but episodical rather than elemental in the design. This is due to an axiom of Dryden, the principal and indeed the model dramatist of the day, that music is not the natural medium of speech, and hence may only be assigned in dramatic representation to preternatural beings, such as spirits, enchanters, and witches,—maniacs also, through the abnormality of their

condition, being admitted into the privileged category of –

those who may sing their conceits, their spells, their charms, and their ravings. The “frost scene” in King Arthur, the “incantation” in the Indian Queen, and the cantatas for Altisidora and Cardenio in Don Quixote are masterpieces of lyrical art that give warrant of the success that might have been achieved had Purcell’s librettists given range in the province of humanity for his vivid imagination.

Earlier in the history of English opera was the pro- duction of The Siege of Rhodes, an entirely musical com- position, the joint work of Dr Charles Colman, Captain Henry Cook, Henry Lawes, and George Hudson, which was performed at Rutland House in Charterhouse Square in 1656, under the express licence of Cromwell to Sir William Davenant, and retained the stage until some years after the Restoration ; the existence of its music is unknown, but a copy of its libretto in the British Museum amply details its construction. Separate mention is made of this remarkable historical incident as serving to refute the common supposition that Puritan influence impelled the decadence of music in England. In truth, this influence stirred the spirit of opposition in persons of a different tendency and was virtually the cause of a very powerful counteraction, and through this of many highly-significant things as to the perpetuation of our music of the past, if not of the continuance of our music in the future. It was during the Commonwealth that John Playford printed Ayres and Dialogues, a book that comprises with many pleasant pieces the first three that ever were defined by the word glee,—a term that later times have wontedly acknowledged and boasted as the designation of a class of music specially English. It was during the Common- wealth that the same publisher issued several editions of The Dancing Master, each being a variation of the fore- going; and this is the work to which we owe the preserva- tion of all the beautiful English ballad-tunes of earlier date that are, many of them, not to be found in previous print or manuscript. It was in that very opera, Zhe Srege of Rhodes, that Mrs Colman, daughter-in-law of one of the composers, sustained the character of Ianthe, she being the first female who ever took part in a public musical or dramatic performance in England.

Notice must not be omitted of the application of recita- tive to other than theatrical purpose. The cantata of Galilei has been cited; it was followed by many a piece under the same designation, dramatic monologues in which

the mainly prevailing declamation was relieved by occa- sional rhythmical strains, and in the composition of these Carissimi, Stradella, Clari, Purcell, and Blow have left admirable specimens. Later, the term acquired a widely-changed meaning, it having been applied in Germany to compositions comprising matter for solo voices and for chorus, expressly for church use, and in England to works equally extensive on sometimes sacred, sometimes secular subjects. Cantatas are sometimes didactic, sometimes narrative, and sometimes dramatic, though never designed for theatrical use.

M User

The music of the English Church might demand a Rpeiy, separate history, because of its importance by the side of the chuc\ art of other lands, because of the longer permanence of «| |

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its examples thar of works in other branches, and because of its unbroken succession of contributors, covering a period of beyond three centuries, whose style has varied with the age in which they wrought, but who in this department have ever aimed to express themselves at their highest, Here, however, only the names of the most noted wniters, with an approximation to chronological order, can be given —Tallis, Byrde, Farrant, Orlando Gibbons, Dr Child, Dr Benjamin Rogers, Dean Aldrich (as distinguished in logic and in architecture as in music), Dr Blow, Michael Wise, Pelham Humphrey, Henry Purcell, Dr Croft, Dr Greene, Dr Boyce, Dr Nares, Dr Cooke, Battishill, after whom the art sank in character till it received new life from the in- fusion of the modern element by Attwood, coeval with whom was Samuel Wesley, and lastly are to be noted Sir John Goss, Dr 8S. S. Wesley, Dr Dykes (popular for his hymn- tunes), and Henry Smart, who bring the list down to recent personal remembrance. Well esteemed among living re- presentatives of this department of music are Barnby, J. B. Calkin, Sir G. J. Elvey, Gadsby, Dr Garrett, Dr Gladstone, Dr H. Hiles, Dr Hopkins, Dr E. G. Monk, Dr W. H. Monk, Sir F. A. G. Ouseley, Dr Stainer, Dr Steggall, Sir Arthur Sullivan, and E. H. Turpin, to which names many might be added. It must be owned, however, that the vast increase of facilities for publication within recent years have multi- plied church music almost immeasurably, and exercised the pens more than the wits of writers who

prove themselves to be amateurs less by love of music than by love of composing, and still more by love of notoriety, which is gratified in the circulation among their own connexions of works that gain no acceptance by the world at large. The style, in strictly technical sense, of music for the church is and always has been, in England and elsewhere, identical with that which characterizes contemporaneous music on lay subjects. Some English musicians have of late aimed at, or perhaps only spoken of, a distinction of styles for the church and for the chamber, and this under a supposition that to be archaic was to be sacred, a supposition seemingly founded on the present use of, and high respect for, more ecclesiastical music of early date than of secular music of like age. The supposition overlooks the facts, however, that the church appropriated the tunes of the people eight hundred years ago, while the people framed some of their tunes on the peculiar church modes, that harmony was practised by the people before it was employed by the church, that the style of madrigals appears coincidently in sacred writing, that recitative was first applied to the opera and to the oratorio in the same year, that Monteverde's innovations in musical combination were at once adopted by church composers, that Purcell, Handel, and Bach wrote in onefold style for both situations, that the glee-writing of the latter half of the 18th century is undistinguishable from the services and anthems of the period, that Attwood had no different phraseology for the cathedral and the theatre, and that even now, though disguised to the glance by the antiquated notation of minims instead of crotchets, the thoughts expressed and the idiom which is their medium belong not more or less to the one than to the other purpose. Though contention be strong for the contrary, this is true art, presenting the feelings of the time in the time's own language and not making the sanctuary walls a boundary between art and artifice.

Attention must now be directed to the natural as a el ,

opposed to the artificial basis of music. Marin Mersenn had great love and much practical knowledge of music; he directed his profound learning and rare mathematical attai- ments to the investigation of the phenomena of sound; and

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his treatise Harmonie Universelle (1636) first enunciated the fact that a string yields other notes than that to which its entire length is tuned. The discovery was extended by William Noble and Thomas Pigot, respectively of Merton and Wadham Colleges, Oxford, to the perception of the mode in which a string vibrates in sections, each section sounding a different note. The ancient musicians tested by calculation the few phenomena of sound then discovered rather than by observation of the principles these exemplify. The measurement of major and minor tones was, after the distinction of perfect intervals, the subject dearest to their consideration, and it seems the furthest limit to which their knowledge attained. All the laws for melody, all the rules for counterpoint, werefounded on this mathematical method. The step or the leap of stated intervals was prescribed ; combinations of sounds were reckoned by intervals from a named note, as 5th, or 6th, or 3d, not as constituting com- plete chords traceable to a common source, and intervals which are discordant were permissible only if softened in effect by the previous sounding of their discordant note ; the canons for the progression of a single part and for the union of several parts were arbitrarily devised, peremptorily fixed, and rigidly enforced. Mouton and Monteverde found the good effect of musical combinations for which there was no account in the theory of their time, and employed them in their works ; the innovation was stigmatized by musical grammarians, but it gave delight to the public and was adopted by subsequent composers. No explanation was, however, given of the natural source of fundamental har- monies, as chords of this class are now defined, and their employment was still exceptional, still an act of daring. In 1673 the two Oxonians above named, simultaneously, but independently, noticed the beautiful fact that a stretched string yields a different sound at every one of its nodal divisions, and the same is true of a column of air passing through a tube. The sounds so generated received from

Sauveur! the name of harmonics, by which they were known for nearly two centuries, but they have of late been renamed partial tones or over-tones.” of the series :—

Here is a table of seventeen

The figures under the notes show the number of each harmonic, counting from the generator or prime as the Ist. The notes marked * differ in intonation from the corresponding notes in our tempered scale, the 7th and 14th, and also the 13th, and likewise the 17th being slightly flatter, and the 11th being slightly sharper than our con- ventional notes; but the matter of temperament must rest for later consideration. The 8th above any note is double the number of that note; thus every higher C is double the number of the C below it, namely, 1, 2, 4, 8, 16; and so with every higher G, namely, 3, 6, 12; again

the Fleming and the Italian with such good effect that the world accepted it under the conditions of accompani- ment with which those men employed it, and felt that a new element of beauty had been incorporated in the re- sources of the artist. The occurrence, in the harmonic series, of the two notes that are separated by this interval accounts for the discord they produce when sounded together, not needing the artifice of preparation which is required to mitigate the harshness of other discords ; they are brought into being when the generator is sounded, and their assign- ment to voices or instruments in performance is but to make more articulate, or, so to speak, to confirm what nature prepares—in fact, what is induced by the generator. As light comprises all the colours and every gradation between each colour and the next, but yet seems spotless, so every musical sound comprises all other sounds, but yet seems to be one single note; the blue, or the red, or the yellow, or any other ray is separated from its prismatic brotherhood and seems then a complete and independent object to the vision, and so any sound is separated from the harmonic column and then seems all in all to the sense of hearing. Let the reader observe in the musical example that the intervals become closer and closer as they rise, and that when the 8th or double of a note occurs, if there be any break in the numerical succession between such 8th and the note that would, by example of the lower octave, stand next below it, then some new harmonic appears whose number adjusts the broken order; between the lowest C and the next is no break; between this C and the one above it, 2 and 4, what would else

be a blank is filled by G, the third harmonic; between 4 © and 6 (G) what would be a blank is filled by E, the fifth harmonic, and so on throughout the series. No division of an interval is ever equal, the lower portion being always the larger ; the interval between 2 and 4 is divided into a 5th and a 4th, that between 4 and 6 is divided into a major 3d and a minor, that between 6 and 8 by an interval less than a minor 3d and a 2d, and that between 8 and 10 by a major tone and a minor tone. It may be well to pause at this point, as it is the natural justification of what Ptolemy calculated, but Pythagoras failed to perceive. Thus much having been noticed, readers may be left to trace the same principle of larger and smaller division throughout the series. Beyond the 17th harmonic (the note known as the minor 9th when forming part of a chord) the series continues on the same principle of ever lessening distance, ever finer gradation, until the intervals become so small as to be almost impossible of articulation and of perception. What has here been adduced of the natural preparation of the discord of the harmonic 7th applies as truly to the discords of the major 9th, the 11th, the major 13th, the minor 9th, and the minor 13th, which last is too high in the harmonic series for convenient exemplification by gradual ascent in this place, and these notes are now all used in combination by composers.

Scientific discovery has seldom been made singly. When Art the

with : i i Se higher E, namely, 5, 10; and with the higher time has been ripe for the revelation of a phenomenon, Precur-

DB, namely, 7, 14. The number of each harmonic is the sor of

same as that of its relative number of vibrations in any given time as compared with those of the variously- numbered harmonics, namely, the 8th above has two vibrations to each one of the note from which the interval 1s reckoned, the 5th has three vibrations to two, and so forth throughout the series. From bB to E, the 7th and 10th, is the interval of the augmented 4th, which was shunned in classic times, ignored by the Chinese, the Mexicans, and the Scots, ruled against by contrapuntists, and avoided in melody and harmony until employed by ee. 8

‘ See Poggendorff, Geschichte d. Physik, p. 808. See Helmholtz, Die Lehre von den Tonempfindungen.

several observers have coincidently witnessed its existence, and simultaneously or nearly so displayed if not explained it to the world. In the instance under consideration, art foreran science, and its votaries continued the employment of harmonies which as yet could alone be justified by their beautiful effect, and even musical theorists did not for ages to come perceive the important, the all-powerful bearing of the principle of harmonics upon the subject they treated. What Mouton first ventured to write must be styled the starting-point of the modern in music, and one cannot too much marvel at the strong insight into the beautiful which those after-minds possessed,—that, with no theory to guide, without star or compass, they XVII. — 12

Purcell.

Handel.

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made wider and wider application of the principle he had exemplified, and displayed in their works its utmost power of expansion. ‘Three of the world’s greatest musicians may be cited to show the force owned by genius of piercing to the utmost depth of a natural law, while having but their own delicate sense of propriety to restrain them within its bounds. Henry Purcell and his two colossal successors, George Frederic Handel (1685-1759) and Johann Sebastian Bach (1685-1750), wrote every combination of musical notes that down to our own latest times has ever been employed with good effect ; and the more the works of these masters are studied the more are they found to foreshadow the supposed novelties in harmony employed by subsequent artists. Thisrefers but to the technical imaterials of which their music is wrought; it is impossible in the present article to discuss fully the form and excellence of their works.

Purcell’s voluminous and superb works for the church, his many compositions for the theatre, his countless con- vivial pieces, and his far less numerous instrumental writ- ings are now but little known, and the ignorance of the age is its loss. They have a wealth of expression that cannot be too highly esteemed, and a fluency of melody that proves the perfect ease of their production. The idiom of the period in which they were

written is perhaps a par- tial barrier to their present acceptance, and the different capabilities of instruments and of executants upon them of those days from the means at a modern musician's com- mand make the music written in the earlier age difficult sometimes to the verge of possibility, and yet weak in effect upon ears accustomed to later uses.1

Handel's music has never, since he wrote, been wholly unknown or unloved, at least in England. He was engaged to come hither as a dramatic composer because of his Con- tinental renown; this was immensely increased by the large number of Italian operas he wrote for the London stage, but, excellent of their kind as are these, the change of structure in the modern lyrical drama unfits the wonted witnesses of the works of the last hundred years to enjoy the com- plete performance of those of earher time, and hence we hear but detached excerpts from any of them. – It is upon Handel's oratorios and his secular works cast in the same mould that general knowledge of his mighty power rests, and these are a monument that cannot perish. The Messiah and Israel in Egypt are didactic oratorios, with which may be classed L' Allegro, al Penseroso, ed ul Mo- derato, and Alexander's Feast. The others were defined by himself each as an 'oratorio or sacred drama," and Acis and Galatea, Semele, and ITercules are similarly con- structed. Esther (his earliest English oratorio) and Acts and Galatea were composed for performance in the mansion of the duke of Chandos in 1720 and 1721, and were publicly produced with the author's sanction in 1732, but then, as was expressly notified, without dramatic action. Their success established the class of work and form of representation in Enghsh use, for, though Handel subse- quently wrote Itahan operas, he from time to time engaged a theatre for the performance of complete works in concert wise, and yearly composed some new piece for production in this manner. In 1741 he visited Dublin, taking the Messiah, which had been written with a view to the occa-

1 Here must be defined the chromatic genus in its modern applica- tion, which is signally exemplified in this master's music; it admits of notes foreign to the signature of the key, but which induce no modu- lation, or, in other words, change of tonality. Notes expressible only by accidentals are as essential to the chromatic scale of any prevailing kcy as are those elemental in the diatonic scale which are indicated by the key-signature. Chromatic

chords were used by Purcell and his nearest followers, chromatic passing-notes (notes that form no portion of chords) came little into use until after the middle of the 18th century.

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sion, and this masterpiece was first heard on the 13th April 1742 in the Irish capital. The reverence with which the work is regarded in England all but equals that for its subject, and the countless repetitions of its performance have made.it so familar to all hearers that the unversed in musical knowledge, little less than the profoundest musicians, feel its sublimity and listen to it with such awe as no other work of art induces. No master has ever excelled Handel in verbal declamation (as at the descent on the last word of ‘‘sheds delicious death” in the air of Acis,-at that on the last word of “so mean a triumph I disdain” in the air of Harapha, and the extraordinary use of an almost toneless low note of the tenor voice on the last word of ‘‘He turned their waters into blood” in Israel in Egypt), in poetic expression (as in the choruses ‘“ He sent a.thick darkness” in Jsrael, and “Wretched lovers” in Acis and Galatea), or in dramatic

characterization (as in all the personages in Jephtha, who

are each distinguished from the others far better in their musical than their verbal phraseology) ; but the quality in his music which compels the epithet sublime is the broad, simple grandeur of the choral writing, which, rich in the

devices of counterpoint, never fails in clearness, never in .

the melodious flow of each of its parts, and is hence as

pleasant to executants as it is perspicuous to auditors. He

wrote under the sway of contrapuntal law, from which theorists had not yet defined the exceptions, but the force of his genius broke occasionally through its despotism, and

so, in his works as in Purcell’s, the principle of fundamen-

tal harmony and the application of the chromatic element are freely demonstrated.*

Bach was one of a very large family of musicians, who Bach. |

for two centuries practised the art, in many instances with great success; the family glory culminated in him, and was scattered among his many sons, in whom it became ex- tinct. Bach was a more assiduous student than either his predecessor or his contemporary who are here classed with him. It was later in life than they that he issued his earhest works, for his youthful renown was more as a player than as a producer. Having no theoretical instructor, he made searching study of all the music of earlier times and of his own.? Whatever Bach learned of the principles of counter-

2 A custom of the age is largely and, we now feel, sadly exempli- fied in Handel’s art legacies, namely, the writing in. many instances but an outline of the score which was to be filled up extemporaneously by a player on the organ or harpsichord with counterpoint that is necessary to the effect, and even essential to the idea. So long as the composer lived to make these improvisations, we know they added interest and we doubt not they added beauty to the music; but after- organists lack the ability or courage or both to supply the deficiency. Mendelssohn wrote for Zsrae/ such an organ part as he would have played in the performance of the oratorio, diffidently deliberating on what originally was trustcd to the fortune of the moment, and the like has rarely been done by other musicians for other works. Mozart wrote for the Messiah, Acis, Alexander’s Feast, and the Ode for St Cecilia’s Day wind-instrument parts comprising such matter as might have been played on the organ had one been in the hall wherein these pieces were first performed in. Vienna; but they modernize the char- acter and often alter the idea, while they complete and perhaps adorn the music. That these parts exist, and that their merit induces their adoption when the works are performed, have been a licence for the production of ‘‘ additional accompaniments” to many 4 masterpiece of Handel, when such genius as Mozart had has not inspired the writer. The former custom and the later licence are both to be deplored, particularly in our age, when with regard to

other arts the aim prevails to purify the works of older time from additions by strange hands that have accumulated to disfigure them.

3 Among the masters from whose example he deduced his own principles, some of the most famous are Girolamo Frescobaldi of Fer- rara (c. 1587), his pupil Johann Caspar Kerl (1628-1693), Dietrich Buxtehude (1637-1707), Johann Jacob Froberger, another pupil of Frescobaldi (0b. 1667), Georg Muffat (0b. 1704), whose son was even. more prolific and perhaps more noted than he, Johann Pachelbel, Georg Boehm, and most probably Johann Joseph Fux (1660-1741), whose work on counterpoint, Gradus ad Parnassum, was the text-book by which both Haydn and Mozart taught, and is still held in high respect.

point from profounder musicians, he owed his views of plan or design in the structure of a composition to his fami- _ liarity with the concertos of Antonio Vivaldi and Tomaso Albinoni, both Venetian violinists who visited Germany, and he gained this familiarity by arranging for the organ many of the concertos for several instruments, as also much that the same authors wrote for a single violin. His arrangement consisted in adding parts to the original, which he kept intact, and so retained the plan while en- riching the harmony. To his latest days he was wont to retouch his own music of former years, doubtless with the purpose of improvement, and he thus showed himself to be still a student to the very end of his career. A class of oratorio of which Luther had planted the earliest germ, the recitation of the Divine Passion, had grown into extensive use in North Germany prior to the period of Bach, and to this belongs his largest if not most important work. This is his setting of the portion of St Matthew’s Gospel which narrates the incidents, interspersed with re- flective passages, some taken from the chorals of .common use in the Lutheran and Calvinistic churches (the tunes proper to which have special harmonic treatment when ’ here appropriated), and some set in the form of airs, duets, and choruses to verses written for the occasion. Bach set also St ~~John’s version of the Passion, and others. He wrote likewise for church use cantatas peculiar to every Sunday’s requirement in the Lutheran service, and left five series of these, each for an entire year. He produced other sacred and many secular cantatas, a mass of~~

~~such colossal proportions that it is unavailable for the purpose of celebration, other pieces for the Roman Church, very much for the organ alone that has never been equalled in its intrinsic qualities or as a vehicle for executive display, many concertos and suites for the orchestra of the day, and a vast number of pieces for the harpsichord or clavecin. Among these last must be signalized Das wohltemperirte Clavier (1722), and a sequel to the same, XXIV. Pre~~ ludien und Fugen durch allen Tonarten, sowohl mut der grossen als kleinen Terz (1740).1 These two distinct works are now commonly classed together as Yorty-eight Preludes er- and Fugues. To describe their purpose reference must be made to the discrepancies between the tuning of intervals by 3ds, or by 8ths, or by 5ths. The Bg, which is reached by successive 3ds above C, has 250 vibrations in the same period that the C, which is reached by 8ths from the same starting note, has 256, and in the same period that the B4, which is reached by 5ths from the original C, has 259 and a fraction. The same is true of every other musical sound as of C, namely, that tuning by 3ds, or 8ths, or Dths, yields a different note from the other two. Hence. it results that notes which are in tune in one key are out of tune in other keys, and consequently musical composition was of old limited to those very few keys that have several notes in common with the key of C.2 The organ Handel presented to the chapel of the Foundling Hospital, London, had the raised or black keys divided, with each half to act On pipes different from the other half, and thus gave different notes: for C# and for Db, and the like; and other organs of the period were similarly constructed. Bach's Notion was so to temper the intonation that, while the tuning of no key-should be perfect, the discrepancies should be divided so nicely between all keys that no one would be Offensive to the hearer, and to illustrate this he wrote in his 38th year a series of pieces in every one of the keys Mm its major and minor form, calling it "The clavier with equal temperament." This bears on a supposition, once

RS : Supposed by some to have been completed in 1744. It is supposed that early organs were tuned with true 3ds and od 5ths (the ''mean tone" system of Zarlino and Salinas), and Mersenne enunciates, though obscurely, a rule for this division.

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diffidently advanced and since confirmed by men who have soundly studied the subject, as much as by constant observa- tion of him who first conceived it, although disputed by others ; it is, that the ear receives tempered sounds as they should be, instead of as they are, perceiving a different effect from the note whose tonal surroundings prove it to be Gb from that which is yielded by the same string on a pianoforte when it is required to represent Fg. Such is the practical application in modern use of the term enharmonic with reference to keyed instruments when it means the giving different names to one note ; on the voice, however, and on bowed instruments the smallest gradations of pitch are producible, and so all notes in all keys can be justly tuned, which, among others, is one reason for the exceptional delight given by music that is represented by either of these means. The enharmonic organ and _har- monium of Mr Bosanquet are provided with a keyboard of a general nature in which the restriction to closed circles of 5ths is avoided. Systems reducible to series of 5ths of any character can therefore be placed on this keyboard. As the relative position of the keys determines the arrange- ment of the notes, the fingering is the same in all keys, and depends only on the intervals employed. The modern use of the word chromatic has already been stated, and it only remains to say of the other of the three Greek genera,

Enhar- monics.

diatonic, that the term now defines music consisting of Diatonic.

notes according to the signature of the prevailing key.* To return to Bach, his orchestration is completer than Handel’s, though yet needing the addition of an organ part that he did not write, but his scores are liable to misrepresentation in modern performance because several of the instruments are obsolete for which they were designed ; Bach’s orches- tral treatment differs from that of later days in having often a special selection of instruments for a single move- ment in a work, which are engaged throughout that piece with small variety of interchange, and likewise in having mostly the separate counterpoint for every instrument employed instead of combining instruments of different tone in one melody. But seldom Bach wrote in one or other of the ecclesiastical modes, as did

Handel more rarely, and he used more freely than his contemporary the extreme chromatic discords. He may indeed be regarded as a double mirror, reflecting the past in his contrapuntal writing and forecasting the future in his anticipation of modern harmonies.

Notice of these two extraordinary men would be incom- plete without an attempt to parallel if not compare them. Born within a month and within walking distance of each other, speaking the same tongue, professing the same religious tenets, devoting themselves to the same art and to the same productive and executive branches of that art with success that cannot be surpassed, they were as different in the character of their works as in their personal traits and their courses of life. The music of Handel for its simple, massive, perspicuous grandeur may be likened to a Grecian temple, and that of Bach to a Gothic edifice for its infinite involution of lines and intricacy of detail. The greater complexity of the one makes it the more diffi- cult of comprehension and more slow in impression, while the sublime majesty of the other displays itself to a single glance and is printed at once on the mental vision. Handel wrote for effect and produces it with certitude upon thousands ; Bach wrote as a pleasurable exercise for mastery, and gives kindred pleasure to those who study his work in the spirit that incited him to produce it.

Contemporary with the working of these two glorious Rameau.

Saxons were the labours of Jean Philippe Rameau (1683- SESE OS semi dadheiemmbadlal Rabbis ieee Sa

3 Some theorists use the generic terms in limited sense :—diatonic, proceeding by 2ds; chromatic, proceeding by semitones ; enharmonic, changing the name of a note. ‘

Chord of

the 11th.

Chord of the add- ed 6th.

Marcello.

1764), a native of Dijon, who made his mark on history. He wrote many operas and ballets which are held in less esteem than those of Lully, some cantatas and sacred pieces, and a large number of compositions for the organ and clavecin, but, notwithstanding the merit of these and their success, it is more as a theorist than as an artist that he is now regarded. He published several treatises, embracing principles of performance as well as rules of harmony and a system of composition, and the original views these enunciate have obtained high regard. He distinguishes what he styles the "basse continue" from what he names the "basse fondamentale" in tracing inverted chords to their roots, and differs in this from writers on counter-point who treated only of intervals from each actual bass note. Thus he looked in the direction of later theories of fundamental harmony, but scarcely obtained sight of the object. He speaks of a chord of the 11th apart from the suspension of the 4th; but his examples show this to be the double suspension of the 9th and 4th, to be resolved on the root and minor 3d of a chord of the prepared 7th, which further has to be resolved on a chord whose root stands at a 4th

above its own, We =a Steg Sea eS]

and so this chord, oe having nothing ee ee a exceptional in sae ee ee ee

structure or treat-

ment, needs no distinctive title. Another point is indeed original, and has obtained somewhat wide acceptance ; this is his theory of the chord he defines as the "great 6th," which is named the "added 6th" by his English followers. It consists of a common chord (usually of the subdominant) with a 6th added, and its resolution is on the chord whose root is at a 4th below that of the discord, the 5th in the former chord being retained as the root in the latter.

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Against this view it may be urged that all harmonic in- tervals are at uneven numbers from the generator, the even numbers standing for the octaves

above any of these, as

: – re or else for their inversions, as § : _ and hence

the 6th (D in the above example) is not an original but an inverted interval ; further, whatever note may be added in a column of harmony does not affect the concordance or discordance of the notes below it, but is itself the dis- cordant element in the chord, whereas the addition of the 6th to a common chord changes its concordant 5ths into a discord, and therefore the 6th must be otherwise traced. Other theorists have, more in the direction of truth, defined this chord as a first inversion, reckoning the 6th from the bass as the inverted root, but giving no account of its exceptional resolution. It was not till the following cen- tury that the theory for this chord was propounded with the seeming of truth, showing that the 7th below its given bass (G under the F in the above) is the real generator, and showing this to be an incomplete inversion of the chord of the 11th, of which Rameau invented but mis- applied the name. The subject will be more fully discussed when the period is treated to which this last theory belongs.

Benedetto Marcello (1686-1739) was a Venetian of wealthy parentage. He was pressed by his father into the pursuit of the law, and held lucrative appointments in his profession, but his love was for music, and in music he has some renown, partly for his compositions, the best known of which are the settings for one or more voices of fifty of the Psalms in an Italian version, and partly for his writ- ings on music, especially a satirical pamphlet, J7 Teatro alla moda (1720), as remarkable for the justice with which

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it censures the corruptions that cankered dramatic art as for its humour. ‘This treatise quotes the principles of the Florentine assumed musical revival in 1600, and is regarded as the precursor of the practical reform effected by Gluck, —

The renowned Jean Jacques Rousseau (1712-1778) is Roy. often accredited as a musical theorist because of his severa]sem, ~ publications on the subject, especially his Dictionnaire de Musique, which was finished in

1764, licensed in 1765, but not published till 1768. Its repute must have been gained – by the grace of his language rather than by the soundness of his views, which are elegantly stated but rarely stable when they look to either side of the beaten track of accepted principles. He wrote violently against French music and the French language as a musical medium, being promi- | nent in the literary disputes known as, the “Guerre des Bouffons,” but recanted when Gluck’s genius was exercised on French opera. Rousseau produced some slight musical dramas, but proof has been adduced that they were the works of other hands.]

Padre Martini (1706-1784) worked to far higher purpose Marta, than the last named, and the deeper impression he made on music is due to the depth of his knowledge. He was a mathematician and a scholar in other branches of learn- ing, all of which he brought to bear upon his musical studies. He composed for the church and for the theatre vocal and instrumental chamber music, and pieces for the organ. He enunciated no new theory, but rendered great service by the collected publication of many art rarities exemplifying the musicianship of earlier times, and proving his ability to estimate their merit by the inclusion of a | large number of canons of his own, which latter are pre- sented in the enigmatic form of ancient use wherein the primary part or parts alone are given, and the reader has to discover the canon that fixes the period and the interval at which the response is toenter. He issued at different dates three volumes of a History of Music, and did not live tocom- plete the fourth, which would have brought the subject only down to the Middle Ages. He was revered by the musicians of all lands, and he is honoured by those of our own time for the penetration with which he discovered the excellence of the boy Mozart, and the encouragement that aided largely to confirm the self-reliance of this everlasting prodigy.

German opera owes its birth to Reinhard Keiser of of Weissenfels (1673-1739). His first dramatic effort, Jsmene, Ee | was produced at the court of Brunswick. Success induced prop, him. to further exertion in the same field, and its con- — tinuance enabled him to undertake the management of the Hamburg theatre, in which, between 1694 and 1734, he produced 116 operas. Even these were but a portion of his works, for he wrote several dramatic oratorios, and made more than one setting of Zhe Passion, which last preceded the compositions of the class by Handel and Bach. Little of

his music survived him, but his influence on the art of his country was enduring. Matthison dis- tinguished himself in Keiser's theatre, which also was the scene of the young Handel's first dramatic essays. Karl Heinrich Graun, a singer, and Johann Friedrich Agricola belong to the next generation of writers of German opera, both of whom won large renown.

It is now time to revert to dramatic music in Italy. Prost Giovanni Battista Buononcini (1672-1750) and his brother 4 * Mare Antonio were famed in and out of their own ; country. They both visited London, where the former opposed Handel, and the rivalry between the Italian and the German musician is notable in the history of the time. Nicola Antonio Porpora (1686-1767) owes his fame more to the success of his pupils in singing, of whom Farinelli and Caffarelli were the most distinguished, than to the merit of his numerous compositions. Leonardo Leo

operas, except the first, to Italian words for Italian singers,

and may therefore be best classed among the composers of

that country, where also he received his musical education. His excellence as a tenor singer, his skill as a clavecinist,

and his marriage to Faustina Bordogni, the renowned

vocalist, all helped to bring him and his music into note. His remark, when at the age of eighty he superintended the production of his last opera at Milan coincidently with Mozart's bringing out of his Ascanio in Alba when fourteen years old, that "this youngster will surpass us all," says as much for his penetration as for the diffidence of one who had passed a long life with success. Giovanni Battista Gesi (1710-1736), being born at Pergola, was called by his schoolmates Il Pergolese, and is known by all the world under this instead of his family name. Little acknow- ledged while he lived, he accomplished during his almost momentary career such work as places his name among those of the most famous of his countrymen. His comic opera La Serva Padrona, little noticed when first given in Naples, had such success when reproduced in Paris that it was shortly afterwards played in

every country in Europe. If this piece did not initiate it confirmed the application of music as much to subjects of real as of heroic life, and therefore, though slight in structure and brief in extent, it is historically conspicuous. This and his setting of the Stabat Mater for female voices, which occupied him during his last illness, are the compositions by which he is best remembered. Nicolo Jomelli (1714-1774) was born and died in the Neapolitan territory ; he pro- duced many operas in Naples, several in. Rome, Bologna, and Venice, and he held for fifteen years an engagement in Stuttgart, where his genius was active ; he is particularly esteemed for his expression of sentiment, in which quality some of his critics account him the forerunner of Mozart ; much as he wrote for the stage, his predilection was for church music, but the amount of his erudition or his power to apply it scarcely justified this preference. This com- poser may close the present list, as being the first to break through the example of Alessandro Scarlatti, and to write airs without the ““Da Capo” which general approval of that example had rendered conventional if not indispensable. The plan claims respect as proving and fulfilling design, but it is inconsistent with truthful treatment of a subject which naturally proceeds in a continuous course and does not admit of the plenary recapitulation of feeling that has already been developed after this has passed into a different direction ; as a matter of effect, the “Da Capo” is rarely charming and often tedious, it is less inappropriate in instrumental than vocal music, and even there some modified allusion to previously stated ideas is far more interesting than the unqualified restatement of what has already been set forth. One characteristic must be named that marks the whole period under present survey—the subordination of dramatic propriety to the display of vocal specialities ; these were classified in distinct orders, and custom became tyrannic in exacting that every singer in an opera should have an aria of each class, and that the story must be so conducted as to admit of their timely or untimely introduction. The entire action of the Italian opera of the period is conducted in

spoken recitative, with few exceptions of accompanied reci- tative in the most impassioned situations, and the arias or thythmical portions of the work are episodical, being The volu-

expatiative or reflective on the circumstances. bility that then was esteemed the main, if not the highest,

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(1694-1746) wrote largely for the stage, but is most prized for his church music, which is of a character so different from his other productions that he is entitled to the twofold estimation of being a light and a severe com- poser. Johann Adolph Hasse (1699-1783), though born in the neighbourhood of Hamburg, wrote all his many

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qualification of a vocalist had its imperative exercise in all works for the stage, and the original purpose of dramatic music was thus foiled in making the business of the scene to wait upon the exhibition of the representative.

Tnstrumental music now began to assume the importance which at present it holds by universal suffrage. Composi- tions for the organ by Italian and German masters had been numerous, but executancy on bowed instruments was little advanced, and music written for them was accord- ingly limited in its style and construction. Vivaldi has been named as a pioneer in the art of design, and to the precedent set by him must be attributed the power of unfolding and arranging musical thought which gives to the orchestral and chamber works of after time a supreme position as intellectual and imaginative exercises. Ae name of Arcangelo Corelli (1653-1713) figures prominently Corelli. in the annals of violin playing, but, whatever the merit of his tone and his style, he employed but.a limited portion of his instrument’s compass; and this is proved by his writ- ings, wherein the parts for the violin never proceed above D on the first string, the highest note in the third position ; it is even said that he refused to play, as im- possible, a passage which extended to A in altissimo in the overture to Handel’s Zrionfo del Tempo, and took serious offence when the composer played the note in evidence of its practicability. His compositions are still highly esteemed ; they consist of concertos—a term which at the time defined concerted pieces for a band, not, as now, pieces for a solo player with orchestral accompani- ment——and sonatas, some for one, some for two violins with a bass; they are melodious, but their harmony is not always

pure, and, strange to say, though they were written in Italy, where the laws of rhythm and accent were first established, these are slighted in the music; indeed, the longevity of Corelli's works must be due to some other cause than their merit.

Giuseppe Tartini (1692-1770) greatly advanced the Tartini. art of the violinist, as is testified by his compositions for the instrument and his treatise on its capabilities, and is further proved by the eminence of many of his pupils. Tartini contributed to science as well as to art in his discovery (1714) of "resultant tones," often called "Tartini's tones," and yet some writers ascribe the first perception of the phenomenon to Storge, a German, who described it sixteen years later. The phenomenon is this :— when any two notes are produced steadily and with great intensity, a third note is heard, whose vibration nuniber is the difference of those of the two primary notes. It follows from this that any two consecutive members of a harmonic series have the fundamental of that series for

their difference tone—thus, je the fourth and fifth harmonic, produce C, the prime or generator, at the interval of two octaves under the lower of those two notes; 4 the third

and fifth harmonic, produce C, the second harmonic, at the interval of a Sth under the lower of those two notes. The discoverer was wont to tell his pupils that their double- stopping was not in tune unless they could hear the third note ; and our own distinguished player and teacher Henry Blagrove (1811-1872) gave the same admonition. The phenomenon has other than technical significance ; an ex- periment by the Rev. Sir F. A. G. Ouseley showed that two pipes, tuned by measurement to so acute a pitch as to render the notes of both inaudible by human ears, when blown together produce the difference tone of the inaudible primaries, and this verifies the fact of the infinite upward range of sound which transcends the perceptive power of human organs. The obverse of this fact is that of any sound being deepened by an 8th if the length of the strmg

Piano- forte.

Drama- tie con- certed music.

or pipe which produces it be doubled. The law is without exception throughout the compass in which our ears can distinguish pitch, and so, of necessity, a string of twice the length of that whose vibrations induce the deepest perceiv- able sound must stir the air at such a rate as to cause a tone at an 8th below that lowest audible note. It is hence manifest that, however limited our sense of the range of musical sound, this range extends upward and downward to infinity.

The pianoforte owes its invention to the period now under review. This instrument may be styled the voice of the musician, the only means whereby unaided he can give complete utterance to his thoughts, the only vehicle for the communication of musical ideas in their entirety. This is not said in depreciation of other in- struments of various excellence which have qualities im- possible to the pianoforte, but has reference to the totality of musical speech that is possible, and to the convenience with which this is produced on the instrument in question. The characteristic difference between this instrument and earlier ones of a similar class is that the strings of the pianoforte are struck by hammers impelled by the keys under the performer’s finger, and yield louder or softer tone according to the force he uses, whereas its prede- cessors yielded variety of loudness only by mechanical instead of personal means, and hence were not the living exponents as it is of the executant’s impulse. Whether one speak of the happiness kindled in the homestead by this most facile and most self-sufficient instrument, or of the fuel of such happiness, namely, the measure-less amount of music of every style and quality that has been written for the pianoforte, its existence is to be accounted as an influence all but infinite upon society as much as upon art. The term “pian e forte” is applied to a musical instrument by Paliarino or Pagliarini, a manufacturer of Modena, in 1598, but no particulars have reached us of its structure or effect. Some instru- ments which foreshadow the chief essentials of the modern pianoforte, made by Bartolomeo Cristofori, a Paduan then working in Florence, are described in letters of 1709, and must have been made some years earlier, and pianofortes by this ingenious inventor still exist bearing date 1720 and 1726. Marius, a Frenchman, submitted plans for an instrument with hammer action to the Académie Royale des Sciences in

1716, and Schroter, a German, claimed to have devised two models in 1717 and 1721; but the first pianofortes made away from Italy were by Gottfried Silbermann in 1726, who worked from the designs of Cristofori.

Let us now revert to the opera, in which vast modifica- tions were germinated towards the middle of the 18th century, and ripened before its close into noble maturity. Allusion has been made in the notice of Pergolese to the appropriation of the lyric element to comic subjects. At first wholly unregarded as a sphere for art uses, then admitted for interludial purposes in a fabrication styled untermezzo that was played between the acts of a serious composition, comedy became in course of time the basis of the most highly important, because the most comprehensive and truly the grandest, and further because the most especially musical, application of the art to dramatic ends. The class of writing here to be considered is that struc- ture of concerted vocal music through which a continuous action proceeds, involving the embodiment of the charac- teristics of the several persons concerned, with their opposi- tion and combination. Handel had been remarkably happy in uniting in one piece the utterances of three, four, and

1 These dates have been gathered and verified by Mr A. J. Hipkins,

to whose exhaustive papers on this class of instruments and their best esteemed makers readers are referred. See also PIANOFORTE,

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| HISTORY,

even five distinct persons ; he did not, however, make these several individualities interchange speech in dialogue, but caused them to sing, as it were, somany monologues at once, each independent of the others, and Handel was not singular in his occasional practice though he was in his excellence, Nicolo Logroscino (1700-1763), a Neapolitan, who never would write but to the dialect of his own country, was so exclusively comic and so surpassingly successful as to gain the cognomen of “Tl Dio dell’ opera buffa.” It was he who first enchained a series of pieces (technically styled movements) in unbroken sequence, during which different persons entered or left the scene, discoursed in amity or disputation, or united either in the

outpouring of a common sentiment or in the declaration of their various passions. For some time this form of lyrical dramatic art was only applied to comic subjects; Paesiello is said to have been the first musician who introduced its use into serious opera; it reached perfection under the masterly, magical, nay, superhuman touch of Mozart, whose two finales in Figaro and two in Don Giovanni are models which should be the wonder of all time~and yet can never be approached. The spoken drama is limited to the onefold utterance of a single person, for, however rapid the colloquy, if any two spoke together, each would eclipse the other's voice—retort may be instantaneous, but cannot be simultaneous. In a painting the different char- acters and emotions of the persons presented are shown at once, but, as if under the glance of Medusa, they are fixed for ever in one attitude with one expression. In an opera finale the manifold passions of as many human beings, vivified by the voices of the same number of singers, come at once on our hearing with prolonged manifestation, and this is the wielding of a power that is not in the capability of any other of the fine arts.

Christoph Willibald Gluck (1714-1787) was a Bohemian Gluck.

by birth, and a wanderer by habit. He was a grand reformer, or rather restorer, of dramatico-musical art, yes, and a prophet, for he not only revived the principles enunciated in Florence on the threshold of the 17th century, which had been superseded by the vocalisms that had usurped the throne of truth, but he fully forestalled by this revival all that is good in what is nowadays denoted by the cant term "music of the future." As was the wont of his age, Gluck went to extend his art experience, perhaps to complete his education, to Italy, and there produced so many meritorious works in the style of the time as to establish a high reputation. This led to his engagement to write for the Italian Opera in London, whither he came in 1746. The work he composed for this occasion and one he then reproduced met with small favour, and a " pasticcio" from his previous works, Piramo e Tisbe, had no better fortune. The failure brought the conviction that, whatever the abstract merit of music, a piece that was appropriate to one character in one situation could not be fitted to dnother personage under different circumstances, and that admired pieces culled from different works could not be concocted into a whole with appearance of unity. Gluck therefore resolved to abandon the prevailing customs in writing for the

stage, and to devise a system of dramatic composition wherein the musical design should grow out of the action of the scene, being ever dependent upon and illustrative of it, and yet being always a design faithful to the principles of what may be named musical architec ture. As did Monteverde and his contemporaries, so did this composer aim to distinguish his dramatic persons by assigning music of different character to each; he required that the overture should announce the cast of feeling and thought that was to pervade the work, and he strove to make the whole of the music appropriate to the individuals, to the situations in which they were concerned, and to the

words they uttered. He did not reject the essential of rhythmical melody, which is ever necessary to a musical work, and which stands in relation to passages of pure declamation as metaphor in poetical speech stands in relation to circumstantial statement. An orator will pause in the disclosure of facts to enforce them by the mention of a similitude, or brighten them by reflexions from his own mind, and it is an application of the same art when 4 character in a drama stays to comment on the scene in which he is involved, and show in words the passion that is seething in his heart. Analogous to this is the occa- sional arrest of intercourse between the musical persons for the expression of the feeling by which one is swayed, and such is a song in an opera during which, if the action be stagnant, the character more than elsewhere proves its vitality. Plan in a musical work consists (1) in uniform or contrasted rhythm, (2) in the relationship and enchain- ment of keys, (3) in the development and elaboration of phrases, and (4) in their occasional recurrence. Some plans have by frequent appropriation become to a great extent conventional, and their philosophic basis accounts for and justifies the fact that much music is framed upon them ; it is the special province, however, of the writer for voices, and still more so of the writer for the stage, to ignore con- vention, though never to neglect design, and to construct his plans according to the situations they are to fill and to the materials with which he has to work. For sixteen years Gluck pondered the prevalent improprieties and the possible proprieties of dramatic art, and prepared himself by technical study and polite conversation to strike the blow which was to effect a revolution, the while,

strange to say, he wrote several operas in his old style for production in different towns of Italy, Germany, and other countries. At length in 1762 what he meant to be the representative work of his then matured principle, Orfeo ed Huridice, appeared in Vienna and made strong impression. Some lighter pieces filled the interim between this, which with- out exaggeration may be regarded as an event in musical history, and the production in the same city of Alceste (1767). The opera was published, as also was Paride ed Elena (1769), each with a statement of the artist's views ; and these two essays have since been regarded as constitut- ing a grammar of dramatic music. Gluck was not content with the Viennese reception of the works on his new model, and was less so with the accessories that city afforded for giving theatrical effect to his compositions. He went, therefore, to Paris, wrote music to an adaptation of Racine's Iphigénie en Aulide, which fulfils his purpose in a higher degree than his previous pieces, and brought it out with extraordinary success. Orphée (1774), Alceste (1776) (both rearranged from the Italian versions), Armide (1776), and lastly Iphigénie en Tauride (1779) rose each to a loftier level, and met with just acceptance.

It must be owned that other forces concurred with musical merit in Gluck's Parisian triumphs. He had taught singing to Marie Antoinette before she became dauphiness, and she now was an ardent partisan of her former instructor. Mme. Du Barry held a rival court to that of the young princess, her jealousy of whom and of her state was evinced by every possible means. Accord- ingly she invited to Paris Nicola Piccini (1728-1800), and strove to establish him in opposition to the German master. His Roland set toa libretto by Marmontel was brought out in 1777, anticipating the subject of Gluck's Armide ; It was followed by other French operas, and the contest ended with the production of his Iphigénie en Tauride (1781), Subsequently to that with the same title, the masterpiece of his opponent. This musical warfare much resembled that of some forty years earlier between Handel and Buononcini in London, when the king headed the

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partisans of the German and the Prince of Wales those of the Italian artist; but the Parisian feud was waged with far the greater violence, for, not only

were the courts of the two ladies involved in it, but every literatist of note sided with one or the other faction, and hurled poems, or pamphlets, or essays, or critiques at his antagonists, that were crammed with remorseless invective. It pre- tended to be a dispute as to national style, but was a quarrel between two leaders of fashion. Piccini's music is marked by the melodious grace for which his country claims pre-eminence, Gluck's by the graver thought by which the Teutonic muse is more distinguished. Gluck, however, was not profound, he was no contrapuntist, and his often grand and always expressive harmony sprang more from intuition than knowledge ; Piccini had dramatic power, and he advanced greatly Logroscino's invention of continuous concerted music conformable to the business of the scene, but applied this only to comic operas, and so turned it to no account in his compositions for Paris. His most successful production, La buona Figliuola (1760), passed from its birthplace, Rome, to every European capital, and is not even now forgotten.

The origin, development, and supreme importance of the Sym- symphony next claim our attention. The term is and always Phony.

has been used in Italy to define the instrumental preface, which elsewhere is called an overture, to a long vocal work. Handel and others, early in the 18th century, defined by it an instrumental piece incidental to such a work, gener- ally depicting some supposed action, such as a battle, or a multitudinous entry. The term is also applied to the prelude and interludes in a single vocal piece of however small extent. Its significance is far more comprehensive in the application now to be described. Its nearest analogy among earlier compositions is to what of old was called a concerto, and the two names, derived respectively from Greek and Latin, have at root the same meaning. Like the antecedent concerto, the symphony is a composi- tion, consisting of several movements or self-complete divisions, for a full band; unlike its predecessor, the plan of at least its first movement has in the course of years been so distinctly organized that musicians shrink from applying the definition symphony to any work wherein there is not the aim to fulfil this design. At first the term was loosely employed, for even so late as Haydn's visits to London in 1791 and 1794 the symphonies he wrote for first performance there were sometimes announced as such, sometimes as overtures, and sometimes as "full pieces." Its structural requirements

especially connect it with works for the chamber, which, if for one or two solo instruments, are styled sonatas, if for three or four or more, trios or quartets, or what not, according to the number of parts they comprise. The word “plan,” always used by that distinguished teacher Cipriani Potter (1792- 1871) as meaning musical design, happily, because posi- tively, expresses the arrangement of ideas according to a purpose, to which, being intangible and invisible, the word “form” is but metaphorically applicable. Sebastian Bach, Corelli earlier, and Purcell before them, designated com- positions as sonatas which, however, are not modelled on the plan of the modern symphony.! Bach in some of his later preludes and in other instances has the incipient germ from which the plan has been evolved, and sonatas by Domenico Scarlatti (1683-1757) comprise movements

1 The earliest use that has been traced of the term sonata or suonata is in its application to some pieces for the organ by the uncle and nephew Gabrieli, who wrote in Venice towards the end of the 16th century. They form portions of larger works of which the rest is vocal; they are brief, solemn, and slow, and are seemingly designed to pour sound in long continuance or in large masses. Similar pieces by early German masters have the same definition, and the next generation extended the plan by appending a quick movement.

wherein it is more developed. These musicians were by no means the first, however, to strike the vein of ore for which divination seems to have been carefully in search long prior to their labours. This justifies the belief that its source is in nature, that it was discovered, not created, by man’s genius; and the work of successive genera- tions of artists has been to rear and mature that which, having once been found, is the heirloom of the present and the future. The practice of all ages proves common consent that a musical composition must begin and end in one and the same key, and this statement refers not more to our own time than to that of the ancients, whose modes are comparable though not identical with the keys of modern establishment. Continuance of one key throughout a piece of considerable length would be monotonous; to relieve this, modulation is effected into other keys in the course of a composition. To obtain tonal variety without

violence, the choice of alternative keys must be made first and chiefly from those which have the nearest tonal relationship to the primary key. After the harmonic 8th (which is a miniature of the Ist) the harmonic 5th is next in prominence, from this note a chord rises as complete as that of the generator, from this chord a second key proceeds by natural evolution; the note, the chord, the key, are each named the dominant, since dominating, commanding, or defining the tonality of the fundamental note. The key of the dominant is hence the one most often chosen for the principal alternative to the primary key if the latter be major; but the key of the 3d and that of the 6th are occasionally selected instead by a further application of the harmonic system. If the primary key be minor, the choice of the chief alternative key is often made in the contrary direction; the tonic itself is assumed to be a harmonic 3d or else a 6th, and the chief modulation is made to the key at one of these inter- vals below the original keynote, having reference to the submediant or the mediant as the source whence the minor form of a key is derived. Besides the chief alternative, other keys, more or less frequent, more or less remote, according to the greater or less length of a piece, are also employed in the course of a composition. The distribution of keys constitutes the ground-plan and the elevation of a musical structure ; the style of harmony, whether diatonic or chromatic, whether contrapuntal or massive, is its material ; the ideas, or subjects, or themes, or phrases, or figures, or—as of late they have been whimsically named— motives, stand for the ornamentation, such as portico, frieze, statuary, and carving, which are sometimes essential in a design. This, then, is a brief summary of the plan of the first movement of a symphony—a first subject in the primary key, which consists of a single idea, or of several connected by tonal identity though melodically distinct ; a second subject in the chief alternative key, which also may be onefold or manifold in its matter ; and these first and second subjects complete the first part. Thus far has been but a simple statement of ideas, which is here followed by a working of the same matter, drawing from it what varieties of expression it may yield through compression or expansion by means of any or every re-source of the musician’s art; the second part is aptly often named the free fantasia, because unrestricted to a fixed course of modulation, the composer’s creative power being at full liberty as to course of keys and manner of development ; then for the first time the music reverts to the primary key for a retrospect of the entire matter of the first part, with,

however, all that belongs to the second subject transposed from the chief alternative key into that which is the origin and centre whence all the modulations radiate ; lastly, there is often, but by no means always, a coda, which is a summing up of the whole argument, or

a valediction to the hearer. The first movement, always cast in this mould, is succeeded generally by one in a slow tempo, sometimes planned like a first allegro, sometimes otherwise, according to outlines that cannot here be detailed, and this exhibits the sentiment of the artist, as did the preceding his scholarship and ingenuity. Then follows generally (again one must say, for there is no necessary prescription) a movement of lighter character than either of the foregoing, sometimes having the musical shape of a dance such as the minuet, sometimes having an arbitrary plan which still is based upon harmonic, and therefore natural, and consequently philosophical, principles. To con- clude, there is a movement that is sometimes constructed like the first and is sometimes as complicated, but in other instances has an arbitrary design. Such is the highest class of musical composition : firstly, because it is wholly musical, springing entirely from the artist’s imagination without the prompting of words, needing no words to express its meaning to the auditor, being in itself poetry; secondly, because it may comprise every means within the author’s power to wield melody,—counterpoint, harmony, modulation,—all that but for the symphony would be special to the fugue, orchestration, and, above all, the arrangement of ideas in a consistent logical method with reference to principles that are the very foundation of art. Let it be hoped that this outline of the elements, essence, and plan of the symphony justifies the use of the words supreme importance in reference to the class of composition at the outset of these remarks.

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Haydn (1732-1809) is commonly styled the father of Bayi:

the symphony. If truly, then Carl Philip Emanuel Bach (1714-1788), the second of the many sons of the great Sebastian, stands as grandfather in the

genealogy of that species of music; and its remoter ancestry may be traced to all but forgotten men in whose works is certainly a forecast of the plan above described. C. P. E. Bach wrote 18 symphonies, and upon these and upon the instru mental chamber music of the same author, Haydn avowedly modelled the plan of his compositions. The earlier writer had not the profundity of his father, nor the grace of Haydn, but his music represents the transition from one to another use in instrumental writing, and it fixed the plan which, however it may be expanded, can never be disestablished from the canons of art. Haydn produced the marvellous number of 125 symphonies (some of them, indeed, were overtures for theatrical use), besides 77 quartets for bowed instruments (the last one unfinished), 52 pianoforte sonatas, and pieces that are almost countless for various combinations of instruments ; and in these one knows not whether to wonder more at the infinite fluency of melody or at the artistic mastery. In summing up the enormous amount of his works regard must also be given to his 3 oratorios, his 14 masses, his operas, and his many detached pieces for one and several voices, and then it is hard to believe that all this can have been accomplished in a single life.

Next in chronology as a symphonist stands Mozart Mo

(1756-1791). Particular comparison must be made of these dates with those of Haydn, as illustrating the re lation of the mighty musicians to each other, and the influence each may be supposed to have exercised on his friend—for warmest friends they were and truest esti- mators of each other’s powers. If the young Mozart pro- fited by Haydn’s example, as doubtless he did, the old Haydn learned greatly from Mozart’s, for there is s0 obvious a rise in the character of his music from the beginning to the end of his long career as shows that he was under a continuous course of self-schooling. It is because his was self-schooling, and because he seems to have had no distinct principle of harmony, but to have

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experimented without infallible success on every unusual combination he wrote, and because likewise in orchestra- tion his writing often appears to

have been tentative rather than proving intuition of an effect and a means for its production—it is for these reasons, in spite of his pro- digious command of counterpoint, that he may without disrespect be classed after the man whom circumstances compel us to regard as his rival. Mozart wrote 48 sym- phonies, some of them in the tenderest years of childhood, and repeated the design in many chamber works for several or for a single instrument. These differ in merit, mainly, it may be assumed, because some were written to meet the exigencies and the limitations of particular occasions; but, every one compelling admiration, the last three are con- spicuous among the music of all time for the excellence of each and for their difference in character from one another, and these were composed in less than seven weeks, between 96th June and 10th August 1788, during which interval several other lesser and larger pieces also were produced, some for voices and some for instruments. The symphony in E flat, No. 46, is notable for sweetness and playful grace ; that in G minor, No. 47, is a torrent of passionate fervour ; and that in C, No. 48 (in England named Jupiter), is a combination that has never been surpassed of all the means possible to a musician. In the final movement of this last, a fugue is wrought on the symphonic plan, which is also the case in the overture to the author's latest opera, Dve Zauberflite, a completer fusion than has elsewhere been made of the two most distinguishable art-forms, and the formalism is hidden under the beauty of the ideas.

History now steps on to the great name of Beethoven (1770-1827), who in his 9 symphonies, his 6 concertos (which are pieces on the same plan with the addition of a part for a solo instrument), and his priceless bequest of chamber music commands the world's adoration. It is the shallow practice of the present day to depreciate his two great predecessors, especially Mozart, in his favour; but comparative criticism is to ill purpose if it can only exalt one master by the dethronement of another. Beethoven enlarged the symphony, in some respects changed its character, and perhaps advanced its consideration ; above all, after writing for a while in the idiom of those two masters, he stamped his own individuality upon music. One finds, however, a prototype for each thing critics describe as particularly Beethovenish in the writings of Mozart, so that the manifest originality of the later musician lies in the new aspect given by happy expansion to prior existences more than in the creation of new forms of thought. Though he

often strove at fugal excellence, he was a child at counterpoint as compared with the two adults who preceded him, and he lost rather than gained fluency in this branch of art as his life proceeded. The ideas of a great artist bear the impress of his age, which is remarkably the case with the musical thoughts of Beethoven, and as his age was nearer to our own, so is his frame of mind more congenial with that of present hearers than are those of Haydn and Mozart. The figure may be reversed; the individuality of an artist is the Matrix in which the feelings and thoughts of his age, and still more of the age that next follows him, are moulded, but there must be affinity of temperament between the one and the many for this interchange of impressions to be possible. We of to-day have Beethoven and the con-Sequences of Beethoven, and the influences of these have been active in the interval between our time and the period previous to the French Revolution; and the polli- tical, moral, and artistic changes that have been wrought by the ones upon the many as much as by the many on the ones indispose us to the recognition of the beautiful under its earlier aspect. Let us delight in Beethoven—

who can fail?—but let us also love Mozart and revere Haydn. Two points are notable in Beethoven's instru- mental music—(1) the linking together of the several movements of a work which usually are separated by an interval of silence; but such union is in some of Mozart's early symphonies and some also of Emanuel Bach's; (2) the expression of feelings excited by subjects external to the music and entitling works accordingly, as Sinfonia Pastorale, and sonata, Les Adveux, l Absence, et le Retour; but Dietrich Buxtehude of Liibeck had a century earlier produced seven pieces characteristic of the seven planets, and Vivaldi had represented the four seasons in as many concertos, to say nothing of the chaos which opens Haydn's Creation. Beethoven's professed purpose in this last particular was to give utterance to impressions rather than to present pictures, and such is the legitimate scope of music, which is not an imitative but an expressive art.

Next in time came Spohr (1784-1859), whose delici- ously-phrased rich-toned symphonies have lost regard in late years, but not beauty. Of his seven symphonies, four bear titles which refer them to an objective purpose; but they are still subjective, for the personality of the writer is expressed in every bar. Mendelssohn (1809-1847) did less but achieved more than Spohr ; far less numerous, his instrumental writings for the concert-room and for the chamber have vitality and permanence which are not in those of the other master; they belong as much to here- after as to now, while those of Spohr are already of the past. Mendelssohn too made musical pictures, owning that ‘“‘as Beethoven had opened the road it was impossible not to follow ;” his two finest symphonies, those in A and in A minor, represent, though not so entitled by him, his im- pressions of Italy and Scotland, and his characteristic over- tures are translations into sound of the poems after which they are named. He also, in more than one instance, joined the several movements of a work, and he employed other devices—his own by felicity of appropriation more than by first use—for enforcing the relationship of the several portions of a musical structure. Schumann (1810-1856) has suffered through the persistence of his partisans in compar- ing him with another instead of displaying and extolling his own merit. Party spirit and the opposition it kindles has passed, and the delicacy, often subtle in its refinement, the grace, the deep feeling, the ingenuity, but rarely grandeur, that mark his symphonic and chamber music, are now fully perceived, Johannes Brahms is a living worker in this class of art who has already planted his foot in the future and given warrant for transmitting to the coming genera- tion the great model he received from the past, which, because of the masterpieces that have been cast in it, justly bears the name of classical. Cherubini (1760-1842) is the one Italian known to have written a symphony, and this work gives small reason for regret that it stands thus alone; he arranged the same as a violin quartet and wrote two original pieces of this class. Méhul (1763-1817) is the French representative of the symphonic art best known and best esteemed.

The Englishmen who have best succeeded in this highest form of music are Dr Crotch (1775-1847), Cipriani Potter, J. Henry Griesbach (1798-1875), Henry Westrop (1812-1879), and Sterndale Bennett (1816- 1875). The last-named cannot be passed with a mere mention. The wide recognition of Bennett’s genius at home and in Germany distinguishes him; far more so

does the quite individual charm of his music, and most of all does the tender age at which he wrote his best works and the facility with which he produced them. Three of his pianoforte concertos, one of his symphonies, and four of his concert overtures may be cited as repre- sentative pieces, wherein sometimes a ee always the

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phraseology, and, in those for the pianoforte, the treatment of the instrument are peculiar to the author in sweetness and elegance; the eternal riddle of the beautiful is pro- pounded in every cadence, and still defies analysis, still remains unsolved. As living writers in this department, Aguilar, Banister, J. F. Barnett, Cowen, Davenport, Wal- ter Macfarren, Hubert Parry, Prout, Stanford, Stephens, and Sullivan must be named.

To have spoken of orchestral music compels notice of instrumentation as an element of the art that has high significance. It is analogous to colouring with the painter, being extra to the composition or plan of his work, but essential in vivifying and varying its effect. Its root is the appropriation of passages to the capabilities of instru- ments for which they are designed, and this is planted in the earliest as much as the latest essays in composition. Its trunk and branches are the combinations of voices and instruments of the same or different qualities of tone, so as to give greatest prominence to the chiefest parts in a musical texture, so as to produce effects of sound which cannot be yielded by the means separately used, but are liable to infinite diversity from the manifold compounds in which they are clustered, and, most of all, so as to secure distinctness of every part in the complex woof which strikes the ear as onefold. Instrumentation may be styled the chemistry of sound, which by the synthesis of distinct tones produces new organisms; it is the blending of any of the rays of the musical prism which produces previously unheard colours. Mozart was the first to evince the very fine sense which perceives the parity and disparity of qualities, how some sounds will mix with and some will penetrate through others, how some instruments by pour- ing forth a stream of harmony may enrich or nourish a melody that floats on its surface in another quality of tone. Prior musicians had used instruments in alternation for variety of effect, or in combination for the sake of loud- ness ; but it was Mozart that both originated and perfected instrumentation as above described, and it has been prac- tised with more or less success in so far as his principles have been fulfilled, with more or less failure in so far as his principles have been abandoned. In two centuries instruments have undergone large modification, and their treatment has been modified accordingly. Writing for the harpsichord is widely different from that for the pianoforte, which also has been changed in character from generation to generation of composers, not only because of improve- ments in the manufacture of the instrument, but because of enlarged insight into its capabilities; hence the music of Emanuel Bach, Mozart, Dussek, Beethoven, Clementi, Cramer, Hummel, Moscheles, John Field, C. M. von Weber, Mendelssohn, Chopin, Schumann, Liszt, Thalberg, Stern- dale Bennett, and Anton Rubinstein forms a continuous scale of development in aptitude and diversity. The transformation of the viol of various sizes into the violin, violoncello, and

double bass of present use is a subject for special history, but its course is inseparably associated with the names of the great Cremonese manufacturers, Andrea Amati (1540), his two sons and his grandson, the family Guanarius, and Straduarius, who all practised their craft as an art more than as a trade, setting each the stamp of his own genius on the instruments he produced and leaving models that have never yet been equalled. The extended resources of bowed instruments have come wholly through extended skill of executants, especially of Viotti, Rudolphe Kreutzer, Rode, Baillot, Paganini, Spohr, De Beriot, Molique, Ernst, Blagrove, Sivori, Sainton, Vieuxtemps, Joachim, and Carrodus on the violin; of Crosdill, Cervetto, Lindley, and Piatti on the violoncello ; and of Dragonetti and Bot- tesini on the double bass. The entire construction of flutes and reed instruments was changed by Theobald

Boehm (1794-1881), and all makers now work upon his principle. Facilities have been increased on each of these classes of instruments, but on horns and trumpets modern use has in some respects diminished them ; that is, employ- ing only notes of the harmonic scale, players of the time of Purcell, Handel, and Bach practised so constantly in the upper register that they easily produced the 12th harmonie and above this sometimes notes up to the 18th, and these they executed with volubility akin to that displayed on fingered instruments ; it is now the custom to exercise the lips on the lower notes and on longer continued sounds, and hence the passages written by the elder masters are difficult to the verge of the impossible to present prac- titioners, and a totally different character distinguishes modern from earlier music for brass instruments. On the other hand, Charles Joseph Sax (1791-1865), and far more his still living son Adolphe, have devised such systematic changes in the fabrication of all brass instruments as to give them an entirely new place in the orchestral category; by means of the pistons of their sax-horns, cornets, and saxophones, these instruments yield the complete chromatic scale, which, superficially, appears to be an advantage ; but, save for military bands, the alteration is a serious evil and has an incalculably pernicious effect upon the orchestration of the day. This

strong but careful statement is justified by the beautiful effects in music written earlier than the use of valves, from the characterization, firstly, of particular keys in a musical composition ; secondly, of certain chords in the keys; and, thirdly, of special notes in each of these chords through appropriation to them of selected sounds from the limited harmonic series, whereas composers who apply Sax's invention to orchestral use reduce the band to a one-toned machine that has the same quality throughout its range. Let proof be drawn from example; in the andante in A flat in Beethoven's symphony in C minor, the horns and trumpets are crooked in C, they can therefore be used but for peculiar notes in the primary key of the piece, but they give especial tone to the key of C, into which the music thrice modulates, that distinguishes it from the entire context; in the finale of the same mas- ter's symphony in F the return to the primary key from the remote tonality of F sharp minor is marked by the tone of the F trumpet, whose keynote is the enharmonic of the E sharp of the foregoing harmony; and yet again, im the ''dona nobis" of the same master's mass in D, the phrases for the trumpets in B flat are distinguished from what surrounds by the tone and the key, and thus give technical significance to the author's purpose, '"'a prayer for peace in the midst of war." Inability to resist the tempta- tion of the semitonic scale, and so to use "sounding brass" as freely as instruments of more delicate tone and greater natural volubility, is exemplified in the writings of many a.living musician, and regretted by many of his admirers.

A class of opera, defined in French as opéra comique, Oper

dates ostensibly from 1715. The definition is unsound,

tragic nature. The separation of this from the grand opéra lies in the latter having music throughout, its rhythmical pieces being divided by accompanied recita- tive, while the opéra comique consists of music inter- spersed with spoken dialogue. The distinction arose from what was considered an infringement of the patent of the Parisian Opera House by a company who performed musical pieces at the Théatre de la Foire, and an agree- ment between the two establishments was authorized at the date above cited to the effect that the assumed intruder must have speaking in

every piece it presented. The name of Rameau is the earliest of note among composers of this class of work, and his success in L'Endriaque

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(1721) and L'Enrolement d'Arlequin (1726), which were comical enough in plot to sanction the definition, procured hearing for his larger and graver dramatic efforts. Most conspicuous of those who later have gained fame as com- posers of opéras comiques are Monsigny, Dalayrac, Grétry, Méhul, Boieldieu, the profound Cherubini, Halévy, Auber, Ambroise Thomas, and Gounod, many of whom also pro- duced masterly pieces in the other class of opera. The singspiel is the German parallel to the opéra comique, and its examples comprise some of the greatest works that adorn the lyric stage. Among these are the Lntfihrung aus dem Serail and the Zauberfléte of Mozart, the /delio of Beethoven, which stands above comparison with all dramatic music save only the Figaro and the Don Gio- vanmi of Mozart, and suffers not in being placed side by side with these prodigies of genius and mastery, the aust and the Zemira und Azor of Spohr, the Frecschiitz of C. M. yon Weber, and Heimkehr aus der Fremde of Mendelssohn. It was a novelty of Weber to break from set forms in his dramatic monologues and frame from the promptings of the situation a special plan for each, which has frequent variations of tempo but always coherence of key, and which never fails to manifest a conceived and fulfilled design ; and this successful innovation, as much as their musical merit, gives historical importance to his works for the stage. Spohr, with Jessonda (1823), was the first to appropriate continuous music with full orchestra to the German stage, and he wrote in the journals to defend his innovation, which had been preceded in Italy by Rossini with Otello, wherein the " recitativo parlante" was for the first time in that country discarded. Spoken dramas profusely interspersed with music and called operas have had vogue in England since the time of Purcell, whose genius was cramped by the literary conceit that music was unfit for expression of human feelings on the stage. The

principle was superseded, but the form resulting from it was preserved in the ballad operas, which from 1727 for more than a century were the sole vehicles for music in our theatres; but these had the speciality that for the most part their music consists of the popularities of the day and rarely includes original composition. Dr Arne, Stephen Storace, Shield, Dibdin, and Sir H. R. Bishop wrote all the music for pieces of this class, and the last appropriated, or modified, or restored to its pristine form the glee in his dramatic works, and by specimens of this he is and will be chiefly remembered. In 1834a new impulse was given to English opera by the warm welcome of John Barnett's Mountain Sylph, which, though it has speaking, is far more essentially musical in structure than its predecessors, and it has been followed by many a work of merit by the same hand, by Balfe, E. J. Loder, Wallace, and others, several of these being wholly lyrical, according to the requirements of French grand opéra.

Side by side with the activity in other countries just reviewed was the progress of opera in Italy. Important contributors to this were Giovanni Paesiello (1741-1815) and Domenico Cimarosa (1749-1801), who both wrote extensively, succeeded greatly, and impressed the art with their specialities. Of vastly greater consequence in the future was Mozart, who produced many Italian operas, and, of all musicians that have ever composed for the theatre, brought dramatic music the most nearly to perfection in fitness to the scene, delineation of character, and technical design, The name of Rossini (1792-1868) is conspicuous in the history of opera from the once universal fashion to admire his writings, from the new manner of vocal flourishes he introduced, which strongly tended to revive the inconsistencies against which Gluck had striven, from the ardent imitators who at the time of his triumphs emu- lated his peculiarities, from his entire change of style in

his later productions, and from his all but ceasing to pro- duce during nearly forty years. The languishing Bellini (1802-1835) and the spirited and far more prolific Doni- zetti (1796-1848) proved their artistic strength by avoid- ing the Rossini idiom, but neither can be accredited with asserting a

style. Giuseppe Verdi has proved melodie creativeness equal to either of theirs, with a stronger power of characterization and a better regard for the exi- gencies of the scene.

A new species of composition has sprung into being Opéra within these thirty years, which in France is defined as bouffe.

opéra bouffe, and in England as comic opera, but is totally distinct from the opera buffa of Italy or the opéra comique of France, while less unlike the intermezzo of Italian use in the 18th century. It may be described as burlesque, sometimes of stories that have held mankind's respect for ages, sometimes of modern social absurdities, but having the ridiculous for its main quality, and extra- vagant in every essential. It consists of an intermixture of lightest and most frivolous music with spoken dialogue, and depends as much on its literary sprightliness as on its musical tunefulness, for success. It may be said to have been originated by Offenbach (1819-1882) of Cologne, who settled in Paris when young, where in 1855 he engaged a theatre for the production of his lyrical caricatures, initiated them with Les Deux Aveugles, and wrote in all sixty-nine pieces. He has several imitators in the country of his adoption, and is represented in England by Sir Arthur Sullivan.

Operatic history may be epitomized in a few sentences. The Greek tragedy was essentially lyrical, and it portrayed the characters and the incidents with which all who wit- nessed were intimate. It fell asleep with the other forms of classic art, to be awakened at the end of the 16th cen- tury ; but those who aimed at restoring it to the active world chose subjects from the antique which stirred the wonder more than the sympathy of their audiences. Re- gard for the gods and heroes of ancient myths, or for the figures of medieval chivalry, who were little less outside general familiarity, long gave an artificial air to theatrical writing. It was the comic branch of opera that first broke from the trammels of the pedagogue, and in repre- senting people of its own time applied the grandest attri- bute of music—the expression of passions common to us all under circumstances experienced by us all in phrase- ology familiar to us all. In the pieces for the Countess and the Count in Figaro Mozart rose to earnestness, and in those for Donna Anna, Ottavio, and the Commandant in Don Giovanni still higher to the

grandest tragedy, and always on the lips of persons in a period so near to our own that we recognize our own feelings in their utterances. The preternatural is also shown to be within the range of this art in the music of the Statue in Don Giovanni, which may confidently be compared for effect with the ghost scenes in Hamlet, in answer to those who raise quarrelsome questions as to the relative power of music and speech to embody analogous situations. All musicians since Mozart have chosen subjects, however serious, from modern history or from still later modern life, and the preternatural has exercised the imagination of Spohr, Weber, Marschner, and Barnett, to whom Mendelssohn must be added on account of the fragments of Loreley.

During the last thirty years Richard Wagner (181 3-1883) has striven to revolutionize the lyrical drama by his polem- ical writing, by his compositions for the theatre, of which he is the twofold author of words and notes, and by his extraordinary means of bringing these conspicuously before the public. His principles were all gathered from antece- dent reformers ; their application was his own. His works of art are, by himself and his supporters, professed to be

Sum-

mary of operatic history.

Wagner.

Oratorio.

neither dramas nor music, but this cannot exempt them from dramatic and musical censure. The very remarkable commotion he has made in the world of art might be com- pared with that excited by the rivalry between Buononcini and Handel in London and that between Piccini and Gluck in Paris, but that these were in each instance the conten- tion between one musician and another, whereas in the present case it is the opposition of one writer to all the musicians in the world, save the few members of the pro- fession who, believing in the man, his doctrine, and his power to apply it,

undertake propagandism as a duty, and endeavour to make proselytes to their faith. Wagner's recent death has left judgment free as to his theoretical and practical merit ; a few years will determine the perma- nence or evanescence of his productions, and an article on his name in the present work may be written far enough from now to chronicle the result.

Within the present century the oratorio has undergone large modification, somewhat in structure and more in style. Haydn's Creation is planned on the model of the several settings of music to the recitation of the Divine Passion which were frequent from the date of the Reformation till the 18th century was one-third advanced. Its text con- sists of a Bible narrative interspersed with reflective verses which have no pretension to be defined as poetry. The work was said to have been suggested to the composer by his hearing some of Handel's oratorios during his two visits to England, but it differs in character as widely from these as was natural in coming from a musician whose genius, however great, was wholly unlike that of his pre- decessor. The Seasons, by the same master, has a secular subject which is secularly treated, and in this, equally with the other, the manner of the author, as evinced in his instrumental music, is ever apparent. Beethoven's Jount of Olives is in dramatic form, though changed into narra- tive in several English versions. The portions of this that have most interest are those which are the least sacred— for instance, the chorus of the soldiers who come to seek and then to arrest the Accused of Iscariot. The Deluge, by Schneider, is also a drama by a modern hand. It and the Moses of Marx have sent only the reputation of their esteem into England. Spohr's three oratorios—especially Dre letzten Dinge, known here as the Last Judgment —bear so strongly the impress of his speciality in the constant prevalence of the chromatic element throughout them, and in the rich but always transparent orchestration, and they were so largely imitated by contemporaries, that they may be said to have opened an epoch which, however, was early closed. Far more important in themselves and in their influence are the two works of the class by Mendelssohn, with which may be associated the Lobgesang (Hymn of Praise), written to commemorate the 400th anniversary of the invention of printing. In these the dramatic, the narrative, and the didactic elements all appear, the first so conspicuously and so grandly in consonance with the spirit of the time that it specially distinguishes the works as they do the master who, through them, holds a

rank in England as a sacred writer all but parallel to that of Handel. The influence of Mendelssohn's oratorios is obvious in the works of other musicians, and public approval attests it to be an influence for good. Compositions styled oratorios have been produced by Liszt and Gounod which seem to aim largely at novelty, but a future generation must judge whether they have struck the mark. In England, Crotch's Palestine emulated Handelian precedent, and stood for long alone as a native production. Many years later Sir Stern- dale Bennett's Woman of Samaria won wider sympathy. The living writers who have courted and gained fame in England by longer or shorter oratorios are J. F. Barnett, Sir J. Benedict, Sir M. Costa, and Sir A. Sullivan.

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'of the system professed to have derived it from Miss

[HISTORY,

With some pleasure and some regret must be mentioned Toni, the active exertions of John Curwen (1816-1880), a Non-Sol-f, | conformist minister, with a large staff of adherents, in the promulgation of a professedly new musical system under the title of "Tonic Sol-fa": pleasure, because of the wide extension of musical study resulting from his indefatigable zeal ; regret, because perhaps a larger and certainly a better result would have rewarded like energy in the propagation of musical knowledge in the shape that has grown into maturity through eight centuries, and possesses the whole world's acceptance. He who is honoured as the founder

Glover of Norwich, whose method he but modified and expanded; but hers was based upon the ancient gamut already described, omitting the constant recital of the alphabetical name of each note, together with the arbitrary syllable that indicates its key relationship, and omitting too the recital of two or more of these syllables when the same note is common to as many keys, as ''C, Fa, Ut," meaning that the note C is the subdominant of G and the tonic of C. The notes are represented by the initials of the seven syllables still used in Italy and France as the fixed names of the seven notes; but in "Tonic Sol-fa" the seven letters refer to key relationship and not to pitch, Further, the system has a wholly different terminology from that in

universal use. It would be uncandid not to state that many men of greatest eminence outside the musical profession and many musicians support the system ; here may only its bare principles be stated and not its merits discussed. A somewhat analogous action has, at the same time, been busy with regard to musical notation in France. Emile Chevé (1804), a surgeon in the French marine service, having married Nanine, the sister of Aime Paris, learned from her the views of her brother (who had adopted them from Galin) as to another new system of musical notation, and he, Chevé, in 1844 applied himself to its dissemination. The system bears the name of ‘‘ Galin- Paris-Chevé,” and, like the other, refers the notes to key relationship and not to pitch, but employs the first seven numerals as their symbols, This invention, if so it may be called, was strongly discouraged by the most esteemed musicians of Paris, but its advocates persevere in its pro- pagation.

As a summary of all the precept and example that has Day’s been cited in this survey of the centuries let the writer “a state his convictions on musical theory, which are, that the goo Treatise on Harmony (1845) by Alfred Day (1810-1849) and div comprehends whatever is practically available, and recon- tinctio! ciles the previously apparent discrepancies between prin-% sty ciple and use. The laws of the primitive diatonic style had never been repealed ; the discovery by Noble and Pigot of generated harmonics had been held as belonging to science and not pertaining to art; composers had employed what may be classed as natural in distinction from arbitrary combinations, but each only on the prompting of his own genius and only with the justification of their effect. The author now cited was the first to classify the ancient, strict, uniform, diatonic, contrapuntal style, apart from the modern, free, exceptive, chromatic, massive style, to sepa- rate the principles that guide the one from the laws that control the other, and to place a subject that is at once sublime and beautiful in a light of unfailing clearness. He showed that one or another beautiful chord and the progressions thence were not capricious violations of rule, permissible to genius though unallowable to ordinary writers ; he showed that such things were acceptable not only because great masters had written them, and so small musicians might repeat the trespass; he proved this by demonstrating the self-perfection of the ancient canon and the also perfect modern system that rests on a basis totally

distinct from that of the other. He classed diatonic har- mony, with its uniform treatment of all the notes in a key, into concords which include not the 4th from the bass, and three species of discords, namely, passing notes of several varieties, suspensions resolved on a note of the harmony in which they are discordant, and essential or elemental discords resolved with the progression of the whole chord to a chord whose root is at a 4th above the root of the discord. In this style discordant notes have identical treatment according to the number of their interval (as 7th or 9th), unaffected by its quality (as major or minor). He traced all the notes of the scale available in the diatonic style to the tonic, the 5th below it, and the 5th above it, as their roots, having thus a minor tone between the domi- nant and submediant in the major form of akey. Present composers with ability for its‘ production may, by obser- vance of this ancient canon, make music in the style of the 16th century with as good likelihood of beauty as had the great masters of that period, but without imitating them, since working by their method and not necessarily by their example. Day showed that peculiar treatment of certain notes of the diatonic scale, together with the inclusion of the chromatic element which has crept into use during the later centuries, constitutes a style totally distinct from the other, and justly to be called exceptional. The basis of this system is the derivation of harmonics from specified fundamental notes or generators in every key. Thus exceptionally the 4th above the bass is a con- cord, when it is the root inverted above the 5th in the triads of the tonic, the subdominant, and the dominant. Thus exceptionally the 3d in the dominant triad has pecu- liar poignancy to which modern ears are sensitive, and the dominant triad is imitable on the supertonic by employ- ment of its chromatic major 3d that has the same special character as the 3d of the dominant. Thus exceptionally the 7th may be added to the dominant triad. This com- bination may also be imitated on the supertonic, and the addition likewise of a chromatic minor 7th to the tonic triad makes another chord consisting of the same intervals as the dominant 7th, namely, perfect 5th, major 3d, and minor 7th, the last two

being at a diminished 5th asunder. Again exceptionally the minor or the major 9th may be added to each of these chords of the 7th, the 11th to the chords of the 9th, and the minor or major 13th to the chords of the 11th, beyond which the ascent by 3ds_ pro- ceeds no more, as the 15th is the double octave of the root. The 9th, 11th, and 13th are susceptible of resolution each on a note of its own chord, which is not so with the 3d and 7th; or they may, like the 3d and 7th, be resolved on some note of another chord when the entire harmony changes. The chords of the 9th, still less of the 11th, and of the 13th least, rarely appear complete, the root being frequently, and other notes occasionally, omitted. In this style the discordant notes (3d, 7th, minor or major 9th, 11th, and minor or major 13th) are identical in quality to whichever of the three roots they belong ; but they vary in treatment according to their source; and in these two specialities they are distinguished from diatonic discords. Broadly it may be stated, but subject to amplification, that the natural resolution of dominant discords is upon the tonic concord, that the natural resolution of supertonic discords is either upon a tonic concord or upon a dominant discord, and that the natural resolution of tonic discords 1s either upon a dominant discord or upon a supertonic discord, the several elements of each harmony proceeding variously according to what note must follow it in the ensuing chord, The term fundamental discords is aptly applied to these which are traced to their harmonic generator, and their pertinence to one key is established by their all being resolvable on chords peculiar to the same

tonality.

The theory steps a degree further in proving

that the harmony of the augmented 6th s with its several

varieties of accompaniment consists of the primary and secondary harmonics of a common generator, and that the dominant and tonic are the notes in any key whence this harmony is derived, yielding respectively the augmented

6th on the minor 6th of the chromatic scale, and the augmented 6th on the minor 2d. The bold venture of Mouton, repeated by Monteverde and defended by the latter against the fierce disputation of the orthodox, is theoretically justified in this system on the principle of natural harmonics first enunciated in Oxford, and the ingenious searchings after truth by Rameau are shown in this system to have been on a false track and so to have passed round instead of to their mark. Day's Treatise, on its appearance, was denounced by the chief musicians in London, and a single believer for some time alone main- tained and taught its enlightened views. These have now the acquiescence of many more musicians than originally opposed them, they are upheld by-several eloquent sup- porters, and they are widely disseminated throughout England. They have not yet been promulgated beyond that country ; but the advance they have made there in thirty-eight years may be taken as augury of their ad- mission elsewhere when time and circumstance may be opportune for their presentation.

Music, in the modern special sense of the word, was Epitome.

with the early Greeks regulated declamation to the accom- paniment of instruments with stretched strings that were plucked or struck. With the Greeks it was also produced from pipes of metal or wood or horn, with reeds or with- out, as signals or incentives in war and for domestic amuse- ment. Far later, and in imperial Rome, it acquired a more definite form of what is now called melody. The transition of its principles from those which ruled in the classic ages to those which had been slowly developed in the course of after centuries is veiled with a mist like that which obscures the setting of paganism and the dawn- ing of Christianity. Many fallacies are still entertained as to the dated organization of music in the church, and none greater than its ascription to St Ambrose and St Gregory, and the credit given to Guido for the enunciation of its rules. From the end of the 10th century music was in England in advance of other nations until its rise in Flanders in the 15th, when still our forefathers kept abreast of their contemporaries. Throughout the ecclesi- astical reign of scholarship, the untutored people had a music of their own, which in its tonal and rhythmical affinity to that of later date commands present sympathy, and which, throughout the North, having the element of harmony or the combination of sounds, was the foundation of all to which science and art

have together attained. The Flemings planted schools in Rome, Naples, and Venice, and the rise of the art in Germany was due to their influ- ence. Adopted from the people by the church, the art of harmony was reduced to a system under the name of counterpoint. Its artificial ordinances were broken through at the end of the 16th century, against violent opposition but with permanent success. Coincident with this innova- tion of principles was another innovation in the form of applying them, which was intended as a revival of antique use, but which issued, working together with the first-named change, in the establishment of the modern in music; these two were the discovery of fundamental dis- cords and the originating of free musical recitation. The acoustical phenomenon whereon fundamental discords are grounded was first perceived in England, and this in the last quarter of the 17th century. Empirical rules drawn from the tentative practices of great musicians were from

Regu- larity.

Pitch defined by fre-

quency,

time to time enunciated ; but no theory till that described in the last foregoing paragraph probed the natural prin- ciples upon which, unknowingly, masters have wrought, nor distinguished between these and the ingenious artifices whereby in former times musical etymology and syntax were regulated. The development of plan or design in musical composition has been the fruition of the last two

centuries, and, in spite of all dispute as to its paramount necessity, hope points to it as the everlasting standard of genuineness in art.

To distinguish allusions to the present time in compari- son with former dates throughout this article, and to mark the period to which its narration reaches, statement must be made that it is completed in 1883. (¢. a. m.)

PART JI.—SCIENTIFIC BASIS.

Musical sounds reach our ears through the air. This is proved by showing that a sounding body placed in a space void of air, as under the receiver of an air-pump, is unable to emit sound. It will be sufficient for our present pur- pose to admit that musical sounds are transmitted through the air with substantially unchanged quality, even to great distances. The law according to which the apparent in- tensity of a musical sound diminishes as it spreads itself over an increasing surface of air is as yet uncertain ; we can only say with certainty that it does diminish.

The origin of musical sound consists in the regular periodic vibration of some surface in contact with air, whereby motion is imparted to the air, and thus transmitted to the ear. Experience tells us as follows :-—

1. Regular repetition is characteristic of those motions

which give rise to musical sounds.

2. The pitch of the note produced depends on the time in which the motion takes place.

3. The loudness or intensity of the note depends on the magnitude of the motion and on the pitch.

4. The quality of the note depends on the form or shape of the motion, that is to say, on the manner in which it is executed within the time in which it takes place.

1. Regular repetition characterizes musical notes 3 irre- gularity in the movements in successive periods charac- terizes unmusical noises. This is most usefully illustrated by cases in which false notes are obtained, Strings, for instance, sometimes cannot be tuned. In these cases the motion can frequently be seen to be irregular.

2. The time in which the motion takes place is defined conveniently by the number of times the whole motion is repeated in a second. The number which expresses this may be called the vibration number, or the frequency of the note. Pitch, then, is defined by frequency. Notes of different frequencies present sounds to the ear which are essentially different from one another, The physical ana- logy based on frequency would compare notes of different pitch to light of different colours ; this analogy does not, however, extend to the nature of the perceptions, The notes of a uniform instrument present a closer analogy with a definite colour in virtue of their uniform quality, so far as perception goes. And from this point of view there is nothing in the perception of colour analogous to the per- ception of difference of pitch in music, In speaking of the perception of combinations of notes we shall see that the ear possesses, in a more or less perfect form, the power of analysing combinations and hearing the notes Separately. If we admitted the physical analogy between pitch and colour this would correspond to a power of seeing com- pound colours analysed into their constituents, This of course does not exist. Though we may know by experi- ence what a compound colour consists of, no amount of experience will enable us to see the components separately in the same way in which we hear the notes of a combina- tion separately. The modes of perception are therefore wholly different in the two cases.

_ When one note is produced by a motion whose frequency 1s twice that of another, a relation subsists between the sounds of the two notes which appears not to be capable

of further explanation, They are said to form octaves with one another. It is easy to give some account of the formation of the octave regarded as a concord, but the in- explicable peculiarity of the relation consists in a sort of quasi-identity between the sounds of the two notes. Many persons cannot distinguish with certainty two notes an octave apart, particularly if the quality of tone employed be one in the use of which the observer is not practised, and this is the case even with ears of considerable acute- ness and cultivation ; but it does not apply to those ears of the highest class which possess the power of the recollec- tion of absolute pitch. Such ears can usually distinguish octaves with certainty. But in all cases the similarity of effect between notes differing in pitch by one or more octaves will be

admitted. It is a purely mental pheno- menon, and no explanation can be given of it. If fora moment we recur to the physical analogy of colour simply for the purpose of illustration, the whole range of visible colour corresponds to less than an octave. The musical phenomenon of the similarity of octaves is as if part of the invisible spectrum, say in the ultra-red, excited a sensation having some similarity to the sensation of its octave in the visible spectrum, the two sensations being such that there is a continuous change from the one to the other. Nothing of the kind actually exists in the case of light. The actual impression on the nervous system of the ear which is con- cerned with the perception of pitch is believed to be sub- stantially the same in different individuals. But the mental processes attached to this perception differ so widely that for all practical purposes the results are different in dif- ferent individuals. The chief difference appears to consist in the different development of the memory of the actual sound of definite notes, which we may speak of as the perception of absolute pitch. This is developed in all degrees: from almost complete absence, in which case we have a want of musical ear arising from the failure to retain the pitch of a note heard even for the shortest time, to that highest degree of perfection in which the memory retains permanently the sound of every note that is once heard. It is not believed that the possession of this memory is capable of cultivation to any considerable ex- tent. It appears rather to be a natural gift, as it usually appears at once in childhood where it is possessed at all. Roughly speaking, and in the absence of reliable statistics, we may say that the possession of the perception of ab- solute pitch is distributed as follows:—say 1 per cent. possess it, 1 per cent. are entirely destitute of it, so as to be said to have no ear, and the remaining 98 per cent. or SO possess it in a more or less modified form. Of this usual condition we may take as a type cases in which the mental effect of a musical note can be retained in the memory for some minutes.

We have to consider the musical perception of the class Percep-

possessing the power, and of the numerically much larger ti class who only possess it in a modified form. A simple tune or melody produces the same effect in all cases as far

as we know, except that those who have the perception of pitch.

absolute pitch know what notes are employed, while others are only conscious of the intervals, ¢.c., of the relative pitch. All the analytical perceptions are as a rule much better

developed in the case of those who possess the perception of absolute pitch than in other cases. In those whose perceptions fall below a certain mark the analysis of com- binations of notes by the ear fails more or less entirely. In this particular, however, cultivation is generally possible. And this agrees with the assumption that the mechanism of the ear is generally the same. For the perception of differences of pitch is conceived to be due to a mechanism universally present, which effects the analysis of combina- tions by the same means by which the pitch is distinguished. The phenomena which give rise to this belief may be stated as follows. If we sound two notes together and cause one of them to change its pitch, we can examine the sensations produced by all sorts of binary combinations. If the two notes have the same pitch at starting, then when they separate beats are’heard. Up to a certain point, which is not very far from the point where the two notes are half a semitone apart, the effect in the ear is as if one note was heard, having the alternations of intensity which constitute beats and a pitch generally intermediate between the constituent notes. At this distance of about half a semitone the ear begins to perceive the two separate notes beside the beats. As the distance between the constituent notes increases the two notes become more prominent, the beats grow fainter, and ultimately, when the constituent notes are a little more than a whole tone apart, the beats disappear and the two notes are recog- nized as separate and distinct sensations.

Now this observation is explained by Helmholtz’s hypo- thesis of the existence of a resonant mechanism in the ear. Just as a harp, or a piano with the dampers raised, will have the strings corresponding to any sound that reaches it set in vibration, so we suppose that there exists a collection of resonant bodies in the ear which respond to vibrations of pitch nearly coincident with their own. The question then arises, Is the range of

sympathy, the distance at which a certain response is excited in the vibrating mechanism of the ear, the same in all cases ?

It is easily seen that, if the above phenomena are sub- stantially the same in all cases, the character of the mechanism must also be the same. The interval at which the two notes of a binary combination begin to be separately distinguished can be observed with considerable accuracy, and is critical in the matter. So far as such observations have been hitherto attempted, this interval is very nearly the same in persons of the highest type of ear, who have the perception of absolute pitch in an advanced degree, and in persons occupying a position not high among those who only possess the power of relative per- ception. In all cases, moreover, where beats are observed, the beats are the same to all persons, so far as our present knowledge goes. And as some of these beats arise within the ear itself, they depend upon the properties of its mechanism. ‘The result is that, so far as ordinary obser- vation goes, the main features of the mechanism of the ear may be safely pronounced to be the same,—in the great Majority of cases, at all events. Some slight differences in this respect have been observed ; but there can be little doubt that the great differences which exist in the endow- ment of the ears of different persons do not arise from differences in the receptive mechanism, but have their source in the nervous or mental actions which lie behind the mechanism. In this we are not referring to the differences which exist between the range of hearing in different individuals. These undoubtedly arise from what may be spoken of as differences in the compass of the re- ceptive instrument in different individuals. These differ- ences exist both at the upper and lower extremities of the scale, Those in whom the upward range is defective fail to hear the noises of certain insects, and are also unable to

hear organ-pipes of very high pitch. The absence of the lower range of hearing is less well established.

The complete range of audible musical sounds comprises about nine octaves. taves below the lowest note of a bass voice, to somewhere about

three octaves above C in alt. The upper notes of this range are not audible to some persons. Organ-pipes are made having notes covering this whole range, except about the top half-octave. The position of notes is so frequently referred to the length of the corresponding organ- pipe that it is convenient here to give these lengths, with the usual notation for the notes to which they correspond. 2 octaves above.

i 2 inch. 8va, = == cv 1} inches. — itn = i or —— CY cinaltissimo. 3 inches. oe ——— o™ oin alt. 6 inches. —_—— —— c™ ¢ treble. 1 foot. —= C c middle. 2 feet. a C° a: tenor. 4 feet. ——— CG Great c. 8 feet. se

—— Cor 16 feet.

=

S == C or 32 feet.

la

2 octaves below.

N.B.—The letter notation is continued from each C upwards through the octave, and changes at the next C above.

The normal perception of pitch does not, however, cover all this range. Its extent varies much in different indivi- duals. We cannot assume that pitch can be completely perceived in the normal manner in either the uppermost octave or the lowest octave of the foregoing range. The lower half of the uppermost octave is easily examined, wherever an organ is available, by drawing the fifteenth alone and sounding the notes of the upper half octave of the keyboard. These notes will generally be heard as sounds, but if a bit of a melody be sounded on them, for instance a simple scale passage, it will generally be found unrecognizable. The same is the case with the lowest octave lying between the 16-foot and 32-foot notes. There has been considerable doubt as to the reality of the notes which profess to occupy this position. All instruments sound notes of a complex character, which include sounds of a higher pitch than the nominal note, in fact the harmonics, of which the nominal note is the fundamental. And doubts have

been raised, which have in some cases proved to be well founded, whether the deep notes in question really contain any of the nominal note or funda- mental at all, and do not rather consist entirely of har- monics, or of sounds whose real pitch is much higher than the nominal one.

Range of

It extends from the 32-foot C, two oc- musical

sounds,

Deter- mination of fre- queney.

104

These doubts have been settled in the case of the low notes of the organ by the process of analysis by beats. Where two notes differing slightly in pitch form beats, the number of beats in a second is equal to the difference of the frequencies. If, then, the frequencies of the notes sounded differ by one vibration per second nearly, there will be one beat per second ; if they differ by two or three per second there will be two or three beats. The frequencies of the two lowest notes of the 32-foot range are sufficiently nearly—
C.=1%

C= 18.

If, therefore, C and C¥ are true notes they should give about one beat per second. The octaves of these notes give about two beats per second, and the twelfths give about three beats per second. The notes of large-scale open 32-foot pipes when thus tested give one beat per second. The notes of stopped pipes vary very much ac- cording to the scale and voicing, but in these low notes no fundamental has as yet been detected. They always present the three beats characteristic of the twelfth.

This is contrary to the statement, long accepted on the authority of Helmholtz, that large-scale stopped pipes give nearly pure tones. It does not appear that that statement was ever verified, and it appears not to be correct. 32-foot stops are not very common, but these principles can be illustrated

with 16-foot stops. Here the fundamental beat is about two per second, the octave four, and the twelfth six for adjoining semitones at the bottom of the range. ‘The same results are easily found. As a rule the large open 16-foot stops of the pedal give their funda- mentals quite pure, while stopped pipes professing to speak the same notes almost invariably present the six beats of the twelfth, sometimes with and sometimes without funda- mental. The conclusion we may draw is that the enor- mous power laid on to the lower notes of the organ enables the test of audibility to be made under most favourable circumstances, and that under these circumstances the limit of audible sounds can be carried down to a point close to the 32-foot C, or to a frequency of about 17.

The determination of the frequency or vibration number of par- ticular notes was first effected by calculations depending on the mechanical theory of strings. Subsequently the method of beats was employed, and the first reliable determinations appear to have been made by this method, which was developed by Scheibler. The usual process consists of providing a series of notes each of which makes four beats with its next neighbour, whence every such pair has vibration numbers differing by four. The series extends over an octave, whence the total difference of frequency between the extreme notes which form the octave is known. And this number is equal to the frequeney of the lower note of the octave. This method, however, is diffieult of execution, and depends on a number of observations, each of which is liable to error.

The method deseribed in most of the books depends on the employment of the ‘‘siren.” This consists essentially of a circular plate, revolving on an axis through its centre at right angles to its plane. Series of holes are arranged in eircles, and puffs of air are sent through the holes as they move over fixed holes. In this way a known number of impulses is produced at each revolution. The revolutions are counted by a wheel work. With the more perfect forms of this instrument fair determinations of frequency could be effected by bringing the note of the instrument into coin- cidence with that to be determined, and counting the impulses de- livered during a certain time. But until quite recently there was great uncertainty as to the actual frequency of the notes in use. In particular, the forks sold some time ago as 512 for treble C were for the most part several vibrations higher. And the

various forks sold as philharmonic have at different times represented a great variety of pitches. The pitch of treble C has in recent times varied between the limits 512 and 540, being almost exactly a semitone. A few of the principal pitches may be summarized as follows :—

——*——= =512—old theoretical pitch. 518—equal temperament equivalent of French dia- pason normale. A=435. ale = 4 of Arts. Helmholtz's theoretical itch.

Pp 540—Modern concert pitch.

MUSIC

[SCIENTIFIC BASis,

There is a tendency in practice to keep the pitch rising. This appears to arise from the habit among musicians of considering flatness in the orchestra or in singing a more heinous offence than sharpness. Everybody tries, at all events, not to be flat. Wind instruments made to concert pitch force the piteh up at all public performances. A rise is easily made, but a fall only with great difficulty. It will be seen that the pitch of the French diapason normale is the best part of a semitone below modern concert pitch, and the difficulty of getting it adopted is well known.

Forks stamped with the numbers of vibrations are now issued privately by some of the principal musical firms, and they appear to be fairly accurate. Probably they are copied from certain series of forks beating four per second which have been constructed according to Scheibler's process, so as to furnish the vibration numbers.

The most easy and convenient way of settling the frequency of tuning-forks, or rather of adjusting any vibrating body to a standard note, appears to be by means of a uniform rotation machine con- . trolled by a clock so as to revolve exactly once per second. A disk is mounted on the machine, having say 135 radial slits spoke- wise. A light behind the disk then throws 135 flashes per second. If a tuning-fork or other vibrating body be placed in front of the disk and looked at against the illuminated background, it presents — a pattern which will be stationary if the fork be 135 or 270 or

405 or 540, or any other multiple of 135. If the fork is sharp the pattern moves one way, if flat the other. In this way the vibra- tion number of a vibrating body is referred directly to the clock, and the adjustment to the standard note is one easily made, and not requiring great delicacy of observation.

3. The loudness or intensity of notes undoubtedly in- Intensit

creases with the magnitude of the displacements of which the vibrations consist, or rather perhaps with the magni- tude of the changes of pressure which occur in the neigh- bourhood of the ear. It has been customary to speak of the energy of the vibration as affording a measure of in- tensity, and this is true from a mechanical point of view. But the subjective intensity or loudness is certainly not correctly measured by any of these quantities. Further, the same changes of pressure or the same mechanical intensity cause sounds which vary in loudness according to the pitch. Taking this last point first, it is easy to show that a given mechanical intensity produces a very much louder sound in the higher parts of the scale than in the lower. The simplest way of looking at this is to consider the work employed in exciting the pipes of an organ-stop. The upper pipes take only a small fraction of the wind, and consequently of the power, used by the lower ones, and yet the upper pipes appear quite as loud. It has been shown that with a particular stop the work consumed was proportional to the length of the pipe, and so inversely as the vibration number.

It has been maintained lately that the loudness of sound is measured by the amplitude of the motion, or by the changes of pressure, rather than by the mechanical inten- sity. The experiments on which this view is based consist of dropping weights from different heights. A weight m from a height A gives a certain loudness. Now let the weight be doubled, the question is whether the loudness remains the same when the height is halved, or when it is

divided by ./2. The experiments appear to prove that the latter is the case. The estimation of the loudness is difficult on account of the apparent change of timbre, but the experiments are carefully arranged and discussed, and appear to establish a prima facie case! The experiments are based upon Fechner’s law, and appear to afford proof of its applicability. Fechner’s law

may be stated thus :— equal differences of sensation are produced by changes which are equal fractions of the whole excitation. Thus we may take the change in the mechanical excitation to consist in doubling it; then every time that it is doubled a change will be made in the sensation which is in all cases equally recognizable. The general probability of the truth of this will be seen by enumerating ten different magnitudes under which sounds may be classified ; these represent fairly equal differences of sensation :—

1 Norr. Zeitschrift fir Biologie, 1879, p. 297.

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SCIENTIFIC BASIS. |

Loud. Not loud. + ~~—_—_———_—_—_———[eee 4 op oe. 7 8. 9 . 10 tif If ff mf mp p pp ppp Magnitude | serves for sounds louder than those used in music, 10 for sounds softer than those used in music,— microscopic sounds, so to speak. It seems reasonable, without going into detail, to assume that the mechanical ratio of any two consecutive magnitudes is the same, The general expression of this law is, The measure of sensation is the logarithm of the mechanical excitation. It appears probable that the ratio of energy corresponding to one of the above differences of magnitude is somewhere about 2 or 3. The corresponding ratio depending on amplitude or compression would be from 1:4 to 1°7, but these quan~~ tities are not known with any a¢curacy. 4, The pitch depending on the period or frequency and the loudness on the amplitude or magnitude of the changes,

st0 there remains on the one hand the quality of tone, and on

the other the form of the vibration or the manner in which the motion takes place between the prescribed limits. These may be expected to correspond with each other, and in fact they do so. The peculiarities of form of vibration are most easily discussed in the case of a musical string whose vibrations are started or maintained in a given manner, The smoothest and purest quality of tone that can be produced is*known as a simple tone. When a string produces a simple tone its motion is such that its shape at any

moment is that of a curve of sines, and that every point of the string executes oscillations according to the pendulum law.

Simple tones are also produced by any vibrating surface which moves according to the pendulum law. The method for producing simple tones given by Helmholtz, and com- monly employed, is to use tuning-forks as the sources of sound, and present their extreme faces to the opening of a resonator or air-chamber arranged so as to vibrate to the same note as the fork. Resonators may be conveniently made from wide-mouthed bottles with flat corks having holes bored in them. ‘The dimensions are usually found by trial, though data exist for their calculation. Simple tones have also been produced by fitting a sort of organ- pipe mouthpiece into the corks of such bottles. The mouths require to be cut up much higher than usual; the notes produced are of an exceedingly full and pure char- acter. Such bottle-notes can be blown from an organ- bellows, and being easily manipulated are very suitable for experiments on the properties of simple tones.

The law of Ohm states that the simple tone or pendulum vibration is that to which the sensation of pitch is at- tached in its simplest form. If the motion which consti- tutes the vibration of a note be of any other type, it is capable of being analysed by the ear into a series of simple tones according to what is called Fourier’s Theorem. This 1s most simply described in connexion with stretched strings, assuming that the notes which are exhibited in the form of the string pass over into the air through the sound-board without essential alteration of quality, which appears to be true in a general way. TF ourier’s Theorem, as applied to a string, states that the motion of the string Is equivalent to the sum of the motions which would result if there were a curve of sines of the whole length, two curves of sines each of half the length, three each of one- third the length, and so on,—the amplitudes being deter- mined when the total motion to be represented is given. This equivalence is true mechanically ; the law of Ohm Says that it is also true for the ear. Hence a great Presumption that the ear acts by a receptive mechanism obeying the laws of mechanics.

The notes formed by the division of a string into two,

om WS oc

three, or more parts are commonly called harmonics. They are also called overtones; but this word includes such cases as those of bars, &c., where the notes produced by these divisions are not harmonious with the fundamental. Har- monics play an important part in the theory of consonant combinations, but the theory of consonance cannot be rested entirely upon the properties of harmonics.

CoNSONANCE AND DISSONANCE.

It was already known in ancient times that lengths of the same stretched string having the ratio of any two small whole numbers form consonant intervals, or perhaps we may more correctly say smooth combinations, since the interval of a fourth (3:4) is regarded as a dissonance in technical music, though it is a smooth combination. The question why smooth combinations are associated with small whole numbers is known as the Pythagorean ques- tion. The modern knowledge that the length of a given string is inversely as the vibration number refers the ques- tion more generally to vibration numbers rather than to lengths of string. This question has been answered by Helmholtz; we proceed to give a short account of his answer, with some slight modifications.

It has been long known that when two notes form an imperfect unison, or nearly form almost any smooth combination, flutterings or beats are heard. These have been already described in the case of imperfect unisons where two notes differ but little from each other in pitch. They exist also, in most cases, where two notes nearly, but not quite, form a smooth combination. According to Helmholtz, beats are the cause of the sensation of disson- ance, and to seek further for this cause we must seek the cause of beats. We may note that this must be taken with some limitation, since the fourth is regarded as a dissonance, though it presents no beats. In the case of imperfect unisons there is no difficulty. Such beats have been long explained as arising out of the alternate coin- cidences and oppositions of the motions or pressures arising from the two sets of vibrations.

In other cases, however, this explanation is not applic- able. Explanations similar in principle have been given by Smith, an English writer of the last

century; but these only amount to reckoning the recurrence of certain configurations arising from the superposition of the two sets of motions. No hypothesis is made as to the actual nature of the receptive mechanism of the ear, and no attempt is made to determine of what sounds the beats consist, nor how such sounds arise. We have already seen that the ear receives separately notes which are more than one or two semitones apart. They appear to be received on different parts of the aural mechanism. The production of the beats in the case of imperfect fifths, octaves, &e., where the impulses fall on different parts of the receptive mechanism, appears therefore to be due to secondary causes rather than to the direct superposition of the impulses.

Beats of Harmonics.—This class of beats arises from the fact that in compound notes containing harmonics a pair of notes representing two small whole numbers gives rise to the coincidence of a pair of harmonics forming a unison, and, if the interval be mistuned, the harmonics form an imperfect unison. Beats of this description are easily identified by the pitch of the harmonics. The imper- fect unison gives rise to alternations of sound and silence, or to variations of intensity, of a note having the pitch in question. With practice these variations can be heard with the unaided ear. But the employment of resonators, tuned to the pitch in question and connected with the ear, causes the beat to be heard with great intensity.

Beats of Combination Tones—When two notes are

sounded loudly at the same time they give rise to the | appearance of certain other notes within the ear, which are called combination tones. Call the vibration num- bers of the two notes p and g. Then the first combina- tion tone (Tartini tone, difference tone) has the frequency p-q. Other combination tones are also formed, whose fre- quencies are of the forms p —2g, »—3g, and so on. Each of these has its region of greatest intensity when its frequency is smallest consistently with its forming an audible sound. Thus the first difference tone (p—q) is most powerful when p and gq differ only by one or more semitones, though the note is still recognizable

by the beats it produces when p and q are a fifth or an octave apart. The beats of mistuned consonant intervals other than the beats of harmonics are produced by the formation of im- perfect unisons between combination tones and primaries, or among the combination tones themselves,

Intervals of the form h:1.—These comprise the inter- vals formed between fundamental and harmonics. The beats of mistuned consonances of the form 4:1, other than the beats of harmonics, consist of variations of in- tensity of the lower note of the pair. This rule has been established experimentally by the employment of the pure notes furnished by bottles blown from an organ-bellows.

Octave. Let the notes be 100: 201. p—g=101, which

with 100 gives one beat per second.

Twelfth. Let the notes be 100: 301. p-—2q¢=101, which

with 100 gives one beat per second.

Double octave. Let the notes be 100: 401. p—3g=101.

One beat per second as before, and so on.

These explanations satisfy the observation that the beats are on the lower notes of the combinations.

Other Consonant Intervals.—The chief remaining con- sonance which furnishes beats is the fifth. There is no doubt that the beats of the fifth, other than the beats of harmonics, are chiefly on the octave below the lower note. Hence the following explanation :—

MUS—MUS

Fifth. Let the notes be 200: 301, p-q=10l 2g—-p= 99

2 beats per second, an octave below the lower note of the pair.

Triad with Mistuned Third.—If a fifth be tuned per- fect and a third inserted, the note two octaves below the lowest note of the triad can generally be heard distinctly, If the third be mistuned, beats are heard on that note,

Let the notes be 400, 501, 600,

501 -400=101

600—-501— 99

2 beats per second, two octaves below the lowest note of the triad. There can be little doubt that the definition of con- sonances as intervals which can be tuned free from beats lies at the basis of almost all music. There can also be little doubt that the power of the perception or memory of absolute pitch, though sparely distributed, must ensure to those musicians who have it influence on the progress of the art. With these persons the influence of conson- ance or smoothness is generally subordinate to the recog- nition of the pitch of the notes used. Between these two elements scales of different kinds have been evolved in different parts of the world. These scales have almost invariably a basis of consonances, generally fifths. But when once developed the melodic effects almost invariably supersede the reference to the consonances in the ears of expert persons. The scales of different countries and systems, embodied in melodies, sound atrocious to those accustomed to other scales, quite independently of the consonant relations on which they are all founded in common, The subject of Temperament deals with the general theory of the construction of scales from slightly mistuned consonances, (R. H. M. B.)

MUSICAL-BOX, an instrument for producing by me- chanical meang tunes or pieces of music. The modern musical-box is an elaboration of the elegant toy musical snuff-box in vogue during the 18th century. The notes or musical sounds are produced by the vibration of steel teeth, or springs cut in a comb or flat plate of steel. The teeth are graduated in length from end to end of the comb or plate, the longer teeth giving the deeper notes ; and, where necessary, by filing or loading with lead the individual teeth are accurately attuned. Each tone and semitone in the scale is represented by three or four separate teeth in the comb, to permit of successive repetitions

of the same note when required by the music. The teeth are acted upon and musical vibrations produced by the revolution of a brass cylinder studded with projecting pins, which, as they move round, raise and release the proper teeth at due intervals according to the nature of the music. An entire revolution of the cylinder completes the performance of the special pieces of music for which the apparatus is set, but upon the same cylinder there may be inserted pins for performing as many as thirty-six separate airs. This is accomplished by making both the points of the teeth or springs and the projecting pins which touch them very fine, so that a very small change in the position of the cylinder is sufficient to bring an entirely distinct set of pins in contact with the note teeth. In the more elaborate musical-boxes the cylinders are removable, and may be replaced by others containing distinct sets of music. In these also there are combinations of bell, drum, cymbal, and triangle effects, &c. The revolving motion of the

cylinder is effected by a spring and clock-work, and the rate of revolution is regulated by a fly regulator. The head- quarters of the musical-box trade is Geneva, where the manufacture gives employment to upwards of a thousand persons.

The musical-box is a type of numerous instruments for produc- ing musical effects by mechanical means, in all of which a revolving cylinder or barrel studded with pins is the governing feature. The principle of the barrel operating by percussion or by wind on reeds, pipes, or strings governs carillons or music bells, barrel organs, mechanical flutes, celestial voices, harmoniphones, and the sometimes huge and complex orchestrions in which a combination of all orchestral effects is attempted. A principle of more recent introduction than the studded cylinder consists of sheets of perfo- rated paper or card, somewhat similar to the Jacquard apparatus for weaving. The perforations correspond in position and length to the pitch and duration of the note they represent, and as the web or long sheet of paper passes over the instrument, the perforated holes are brought in proper position and sequence under the influence af the suction or pressure of air from a bellows, and thereby the notes are either directly acted on, as in the case of reed instruments, or the opening and closing of valves set in motion levers or liber- ate springs which govern special notes. The United States

are the original home of the instruments controlled by perforated paper known as orguinettes, organinas, melodeons, &c. ;

MUSK, a substance of powerful and most enduring odour, is a secretion of the male Musk Drxr (q.v.). Three kinds of musk are distinguished in commerce, the most important and valuable being the Chinese or Tong-king musk, imported principally from Shanghai. It is put up in small tin-lined silk-covered caddies, each contain- ing from two to three dozen pods. These are generally adulterated to an enormous extent with dried blood, frag- ments of leather, leaden pellets, peas, &c., so that often

little more than the smell of the original tenant of the pod remains. The Chinese pods may vary in value accord- ing to quality and genuineness from 14s. to 40s. per oz. Musk collected from the western Himalayas is exported from India to the extent of from 3000 to 5000 oz. annually. It is much less prized than genuine Tong-king musk. The third variety, known as Kabardine or Siberian musk, is imported from Central Asia by way of Russia. It is in large pods, said to be yielded by a distinct species of deer, and is very inferior in point of odour.

Good musk is of a dark purplish colour, dry, smooth, and unctuous to the touch and bitter in taste. It dissolves in boiling water to the extent of about one-half, alcohol takes up one-third of the substance, and ether and chloroform dissolve still less. A grain of musk will distinctly scent millions of cubic feet of air without any appreciable loss of weight, and its scent is not only more pene- trating but more persistent than that of any other known sub- stance. Its chemical constitution has not been specially investi- gated; but in addition to its odoriferous principle it contains ammonia, cholestrin, fatty matter, a bittcr resinous substance and other animal principles. Asa material in perfumery it is of the first importance, its powerful and enduring odour giving strength and permanency to the vegetable essences, so that it is a principal ingredient in nearly all compounded perfumes. Musk, or some substance possessed of the musk odour, is also contained in glands in the jaw of alligators and crocodiles, whence it has been extracted for use in perfumery in India and Egypt. The musk-ox and the musk-rat (Indian and European) are, as their names

indicate, re- markable for a musk odour (sce below). Inthe vegetable kingdom also a musky smell pervades the seeds of Abelmoschus moschatus, the entire plant Mimulus moschatus, and the sumbul root (Luryangium Sumbul).

MUSK-DEER, an animal belonging to the genus J/os- chus, of the section Pecora, a division of the Artiodactyle Ungulates (see MAMMALIA, vol. xv. p. 430), and allied to the Deer (Cervidzx). In many respects it differs from the typical members of that group and stands by itself as an isolated zoological form, retaining characters belonging to the older and more generalized types of ruminants before they were distinctly separated into the horned and the antlered sections now dominant upon the earth. One of these characters is that both sexes are entirely devoid of any ‘ sort of frontal appendage. In this, however, it agrees with one genus of true deer (Hydropotes) ; and, as in that animal, the upper canine teeth of the males are remarkably deve- loped, long, slender, sharp-pointed, and gently curved, pro- jecting downwards out of the mouth with the ends turned somewhat backwards. Among the anatomical peculiarities in which it differs from all true deer is the presence of a gall-bladder.

Although, owing to variations of colour presented by different individuals in different localities and seasons, several nominal species have been described, zoologists are now generally agreed that there is but one, the Moschus moschiferus of Linnzeus. In size it is rather less than the Huropean roe-deer, being about 20 inches high at the shoulder. Its limbs, especially the hinder ones, are long. The feet are remarkable for the great development of the lateral pair of hoofs, and for the freedom of motion they all present, so that they appear to have the power of grasping Projecting rocky points,—a power which must be of great assistance to the animal in steadying it in its agile bounds among the crags of its native haunts. The ears are large, and the tail quite rudimentary. The hair covering the body 1s long, coarse, and of a peculiarly brittle and pith-like char- acter, breaking with the application of an extremely slight force ; it is generally of a greyish-brown colour, some- times inclined to yellowish red, and often variegated with lighter patches. The Musk-deer has a wide distribution over the highlands of central and eastern Asia, includ- Ing the greater part of southern Siberia, and extends to Kashmir on the south-west and Cochin-

China on the south- east, always, however, at great elevations,—being rarely found in summer below 8000 feet above the sea-level, and

ranging as high as the limits of the thickets of birch, rho- dodendron, and juniper, among which it mostly conceals itself in the day-time. It is a hardy, solitary, and retiring animal, chiefly nocturnal in its habits, and almost always found alone, rarely in pairs and never in herds. It is ex. ceedingly active and surefooted, having perhaps no equal in traversing rocks and precipitous ground; and it feeds on moss, grass, and leaves of the plants which grow on the mountains among which it makes its home.

Musk-deer.

Most of the animals of the group to which the Musk- deer belongs, in fact the large majority of mammals, have some portion of the cutaneous surface peculiarly modified and provided with glands secreting some odorous and oleaginous substance specially characteristic of the

species. This, correlated with the extraordinary develop- ment of the olfactory organs, appears to offer the principal means by which animals in a state of nature become aware of the presence of other individuals of their own species, or of those inimical to them, even at very great distances, and hence it is of extreme importance both to the wellbeing of the individual and to the continuance of the race. The situation of this specially modified portion of skin is extremely various, sometimes between the-toes, as in sheep, sometimes on the face in front of the eyes, as in many deer and antelopes. Sometimes it is in the form of a simple depression or shallow recess, often very deeply involuted, and in its most complete state of development it forms a distinct pouch or sac with a narrow tubular orifice. In this sac a considerable quantity of the secre- tion can accumulate until discharged by the action of a compressor muscle which surrounds it. This is the form taken by the special gland of the Musk-deer, which has made the animal so well known, and which has proved the cause of an unremitting persecution to its possessor. It is found in the male only, and is a sac about the size of a small orange, situated beneath the skin of the abdomen, the orifice being immediately in front of the preputial aperture. The secretion

with which the sac is filled is of dark-brown or chocolate colour, and when fresh described as being of the consistence of “moist gingerbread,” but becoming dry and granular after keeping. It has a peculiar and very powerful scent, which when properly diluted and treated forms the basis of many of our most admired perfumes. When the animal is killed the whole gland or “pod” is cut out and dried, and in this form reaches the market of the Western world, chiefly through China,

For further details on the anatomy and zoology of Moschus see Pallas, Spicilegia Zoologica, xiii. (1779); A. Milne- Edwards, ‘“‘ Recherches Anatomiques, Zoologiques, et Paleontologiques sur la Famille des Chevrotains,” in Annales des Sciences Naturelles, 5th ser., zool., ii. (1865); Brandt and Ratzeburg, Medieinische Zoologie, i. pp. 41-51 (1839); W. H. Flower, Proe, Zool. Soe. London, 1875, pp. 159-190; A. H. Garrod, ibid., 1877, pp. 287-292.

MUSKEGON, a city of the United States, the county seat of Muskegon county, Michigan, at the upper end of Muskegon Lake, a fine sheet of water formed by the Muskegon river before it falls into Lake Michigan. ~The staple trade is in lumber, which is floated down the river, worked up by its saw-mills and planing-mills, and exported by boat and rail. : The cut of lumber in the season of 1882 was 650,000,000 feet. There are also car, engine, and boiler works, and various manufactories of wooden ware. The population increased from 6002 in 1870 to 11,262 in 1880. Settled in 1836, and laid out in 1853, Muskegon was incorporated as a village in 1861 and as a city in 1870.

MUSKELUNGE. See Pix.

MUSK-OX. The animal commonly known by this name, though approaching in size the smaller varieties of oxen, is in structure and habits closely allied to the sheep, its affinities being well expressed by the generic name Ovbos bestowed upon it by De Blainville. The specific name Moschatus, as also the common English appellatives “musk-ox,” “musk-buffalo,” or “musk-sheep” applied to it by various authors, refer to the musky odour which the animal exhales. This does not appear to be due to

the secretion of a special gland, as in the case of the Musk-deer ; but it must be observed that, except as regards the osteology, very little is known of the anatomy of this species,

The Ovibos moschatus about equals in size the small

Musk-ox.

Welsh and Scotch cattle. The head is large and broad. The horns in the old males have extremely broad bases, meeting in the median line, and covering the brow and whole crown of the head. They are directed at first downwards by the side of the face and then turn upwards and forwards, ending in the same plane as the eye. Their basal halves are of a dull white colour, oval in section and coarsely fibrous ; their middle part smooth, shining, and round ; their tips black. In the females and young males the horns are smaller, and their bases are separated from each other by a space in the middle of the forehead. The ears are small, erect, and pointed, and nearly concealed in the hair. The space between the nostrils and the upper lip 1s covered with short close hair, as in sheep and goats, without any trace of the bare “muffle” of oxen. The greater part of the animal is covered with long brown hair, thick, matted, and curly on the shoulders, so as to give

the appearance of a hump, but elsewhere straight and hanging down,—that of the sides, back, and haunches reaching as far as the middle of the legs and entirely con- cealing the very short tail. There is also a thick woolly under-fur, shed in the summer. The hair on the lower jaw, throat, and chest is long and straight, and hangs down like a beard or dewlap, though there is no loose fold of skin in this situation as inoxen. The limbs are stout and short, terminating in unsymmetrical hoofs, the external being rounded, the internal pointed, and the sole partially covered with hair.

The Musk-ox is at the present day confined to the most northern parts of North America, where it ranges over the rocky barren grounds between the 60th parallel and the shores of the Arctic Sea, Its southern range is gradually contracting, and it appears that it is no longer met with west of the Mackenzic river, though formerly abundant as far as Eschscholtz Bay.

Northwards and eastwards it extends through the Parry Islands and Grinnell Land to north Greenland, reaching on the west coast as far south as Melville Bay ; and it was also met with in abundance by the German polar expedition of 1869-1870 at Sabine Island on the east coast. No trace of it has been found in Spitzbergen or Franz Joseph Land. As proved by the discovery of fossil remains, it ranged during the Pleistocene period over northern Siberia and the plains of Germany and France, its bones occurring very generally in river deposits along with those of the reindeer, mammoth, and woolly rhinoceros. It has also been found in ordinary Pleistocene gravels in several parts of England, as Maidenhead, Bromley, Freshfield near Bath, Barnwood near Gloucester, and also in the lower brick earth of the Thames valley at Crayford, Kent.

It is gregarious in habit, assembling in herds of twenty or thirty head, or, according to Hearne, sometimes eighty or a hundred, in which ‘there are seldom more than two or three full-grown males, They run with considerable speed, notwithstanding the shortness of their legs. Major H. W. Feilden, naturalist to the Arctic Expedition of 1875, says: ‘‘No person watching this animal ina state of nature could fail to see how essentially ovine are its actions. When alarmed they gather together like a flock of sheep herded by a collie dog, and the way in which they pack closely together and follow blindly the vacillating leadership of the old ram is unques- tionably sheep-like. When thoroughly frightened they take to the hills, ascending precipitous slopes and scaling rocks with great agility.” They feed chiefly on grass, but also on moss, lichens, and tender shoots of the willow and pine. The female brings forth one young one in the end of May or beginning of June after a gestation of nine months. According to Sir J, Richardson, ‘‘ when this animal is fat its flesh is well tasted, and resembles that of the caribou, but has a coarser grain. The flesh of the bulls is highly flavoured, and both bulls and cows when lean smell strongly of musk, their flesh at the same time being very dark and tough, and certainly far inferior to that of any other ruminating animal existing in North America.” The carcase of a Musk-ox weighs, exclusive of fat, above 3 cwt. On this subject Major Feilden says: ‘The causc of the disagreeable odour which frequently taints the flesh of these animals has received no elucidation from my observations. It does not appear to be confined to eithcr sex, or to any particular season of the year; for a young unweaned

animal, killed at its mother's side and transferred within an hour to the stew-pans, was as rank and objectionable as any. The flesh of some of these animals of which I have partaken was dark, tender, and as well flavoured as that of four-year old Southdown mutton" (Zoologist, September 1877).

See Richardson, Fauna Boreali-Americana (1829), and Zoology of H.M.S. Herald (1882); W. Boyd Dawkins, "'Ovibos moschatus," in British Pleistocene Mammalia, part v.; Memoirs of the Paleontographical Society (1872).

MUSK-RAT. A name commonly applied to an animal also called Musquasn (Fiber zibethicus), of the sub-family Arvicoline, family Muridzx.1 It is related in structure and habits to the English water-vole, but is of larger size, the head and body being about 12 inches in length and the tail but little less. It is rather a heavily-built animal, with a broad head, no distinct neck, and short limbs ; the eyes are small, and the ears project very little beyond the fur. The fore-limbs have four toes and a rudimentary thumb, all with claws ; the hind limbs are larger, with five distinct toes, united by short webs at their bases. The tail is laterally compressed, nearly naked, and scaly. The hair much resembles that of a beaver, but is shorter; it

' See Mamata, vol. xv. p. 419, where also an illustration (fig. 94, p. 418) of its skull and dentition is given.

consists of a thick soft under-fur, interspersed with longer | 1 foot in length by 3 feet in breadth, and having 104

stiff, glistening hairs, which overlie and conceal the former, on the upper surface and sides of the body. The general colour is dark umber-brown, almost black on the back and grey below. The tail and naked parts of the feet are black. The musky odour from which it derives its name is due to the secretion of a large gland situated in the inguinal region, and present in both sexes.

The Musk-rat is the only species of its genus and is peculiar to America, being extensively distributed in suit- able localities in the northern part of the continent, extend-

Musk-rat.

ing from the Atlantic to the Pacific, and from the Rio Grande to the barren grounds bordering the Arctic Seas. It is aquatic in its habits, living on the shores of lakes and rivers, swimming and diving with great facility, feed- ing on the roots, stems, and leaves of water-plants, or on fruits and vegetables which grow near the margin of the streams it inhabits. Musk-rats are most active at night, spending the greater part of the day concealed in their burrows dug out of the bank, consisting of a chamber with numerous passages, all of which open under the surface of the water. For winter quarters they build more elaborate houses of conical or dome-like form, composed of sedges, grasses, and similar materials plastered together with mud. As their fur is an important article of commerce, large numbers are annually killed, being either trapped or speared at the mouths of their holes.

The name Musk-rat is applied in India to a large species of Shrew (Sorex exruleseens or indieus) which frequents houses at night, hunting round rooms for cockroaches and other insects, occasion- ally uttering a sharp shrill cry. The strong musky odour of the animal arises from large glands beneath the skin of the side of the body, a short distance behind the fore- limbs. This odour is 80 powerful and penetrating that it is popularly believed in India that if the animal runs over a corked bottle of wine or beer it will Infect the fluid within. Jerdon says that certainly many bottles are met with quite undrinkable from the peculiar musky odour of their contents, but, rejecting the possibility of its passing through the glass, he attributes it to the corks having been infected pre- viously to bottling, stating in corroboration of this view that he has never found the odour in liquors bottled in England.

MUSLIN, a term embracing the thin delicate woven cotton fabrics, the lightest and most airy of all textures. The word is derived from Mosul; the original home of muslin-weaving is the East Indies, where even yet won- derful fabrics for airy lightness and delicacy continue to be woven with the aid of only the most rude and primitive appliances, The most delicate

muslins are made at Dacca, where webs have been woven of yarn calculated to be equal to 380° (that is, 380 hanks, each 840 yards in length, weigh 1 1b), Such a web measuring 10 yards

threads of warp and 100 of weft per inch, was found to weigh not more than 1565 grains. Figured, embroi- dered, colour-woven, and printed muslins are made at various places, principally in Madras province, and gold and silver printed muslins are made at Jeypore and Hy- derabad in India. The making of muslin in Europe was first attempted at Glasgow by Robert Monteith about the year 1780, but he had to procure Indian bird-nest yarn for his web. The improvements in machinery effected about that time, however, soon enabled spinners to produce yarn of high counts, and thereafter the muslin trade took firm hold in the west of Scotland. In recent times the perfection of combing machinery, &c., has enabled spinners to supply yarn of much greater tenuity than has ever been spun in India, and indeed vastly finer than is of any use for weaving purposes. A few yards of muslin have been woven with 700° cotton, but it is of use only to indicate the limit up to which it is possible to weave yarn. Fine muslin or tarlatan has been woven of 440° yarn by M. Thivel Michon of Tarare in France, but to the eye and touch it is less fine and delicate than Dacca ‘‘mulmul khas,” owing possibly to dressing with starch, and to the less degree of condensation in machine-spinning as compared with hand-spinning. The varieties of European muslins and their applications are numerous. Among plain mus- lins are included books, mulls (from ‘ mulmul ”), jacconets, tarlatans, Bishop and Victoria lawns, nainsooks, &c., chiefly distinguished by variety of finish, dressing, folding, dc. For window-curtains, hangings, &c., there are manufactured harness and book muslins, lenos, sprigs, spots, and lappets ; and for ladies’ dresses plain, striped, and figured grenadines, and saccarillas, besides which dyed and printed muslins are largely used. Sewed muslin, which was formerly an important Scottish industry, also continues to be a branch of the trade.

MUSSCHENBROEK, Preter van (1692-1761), natural philosopher, was born at Leyden in March 1692, and studied at the university of his native city. The teacher from whom he derived the most profit was the eminent mathematician Gravesande. A scientific partnership was formed in 1717 between the master and the pupil for the prosecution of natural philosophy

according to the prin- ciples of Newton, and in opposition to those of Descartes ; Gravesande concentrating his attention on the theoretical part of the study, while Musschenbroek conducted the experiments. The consequence was that the downfall of Cartesianism and the establishment of Newtonianism were very much accelerated in Holland. Graduating in 1715 with a dissertation, De aeris presentia in humoribus ant- malium, Musschenbroek was appointed professor at Duis- burg in 1719. In 1723 he was promoted to the chair of natural philosophy and mathematics at Utrecht. In 1731 he declined an invitation to Copenhagen, and was promoted in consequence to the chair of astronomy at Utrecht in 1732. The attempt of George II. of England in 1737 to

attract him to the newly-established university of Gottingen

was also unsuccessful. At length, however, the claims of his native city overcame his resolution to remain at Utrecht, and he took possession of the mathematical chair at Leyden in 1739, where, declining all offers from abroad, he con- tinued till his death in September 1761. His first important production was Epitome elementorum physico- mathematicorum, 12mo, Leyden, 1726,—a work which was after- wards gradually altered as it passed throngh several editions, and which appeared at length (posthumously, edited by Ludolf) in 1762, under the title of Introductio ad philosophiam naturalem. The Physic experimentales et geometrice dissertationes (1729) threw new light on magnetism, capillary attraction, and the cohesion of bodies. A Latin edition with notes (1731) of the Italian work Saggi di naturali esperienze fatte nell' Accademia del Cimento con- tained amid many other curious investigations a description of a

new instrument, the pyrometer, which Musschenbroek had invented, and of several experiments which he had made on the expansion of bodies by heat. Musschenbroek is also the author of Hlementa physica, 8vo, 1734 (English translation 1744 by Colson), and of papers in the Mémoires of the Paris and St Petersburg Academics, and in the London Philosophical Transactions.

MUSSEL, a term applied in England to two families of Lamellibranch Molluscs,—the marine Mytilacea, of which the Edible Mussel, Mytilus

edulis, is the representa- tive, and the fresh-water Unionacea, of which the River Mussel, Unio pictorum, and the Swan Mussel, Anodon eyg- neus, are the common British examples. It is not obvious why these fresh-water forms have been associated popularly with the Mytlacea under the name Mussel, unless it be on account of the frequently very dark colour of their shells. They are somewhat remote from the sea mussels in struc- ture, and have not even a conimon economic importance.

The Sea Mussel (Mytilus edulis) belongs to the second order of the class Lamellibranchia (see vol. xvi. pp. 685 sy.), namely, the Heteromya, in which the anterior or pallial adductor is much smaller than the pedal or posterior adductor. It and the other Afytilacea are remarkable for the comparatively free condition of the gill-filaments, which, whilst adhering to one another to form gill-plates (vol. xvi. p. 689, fig. 133), are yet not fused to one another by con- crescence. It is also remarkable for the small size of its foot and the large development of two glands in the foot— the byssus-forming and the byssus-cementing glands.

The byssus is a collection of horny threads by which the Sea Mussel (like many other Lamellibranch or Bivalve Molluscs) fixes itself to stones, rocks, or submerged wood, but is not a permanent means of attachment, since it can be discarded by the animal, which, after a certain amount of locomotion, again fixes itself by new secretion of byssus from the foot. Such movement is, however, very rare. Mytilus possesses no siphonal tube-like productions of the margin of the mantle-skirt, nor any notching of the same, representative of the siphons which are found in its fresh- water ally, the Dreissena polymorpha.

Mytilus edulis is an exceedingly abundant and widely distributed form. It occurs on both sides of the northern Atlantic and in the Mediterranean basin. It presents varieties of form and colour according to the depth of water and other circumstances of its habitat. Usually it is found on the British coast encrusting rocks exposed at low tides, or on the flat surfaces formed by sandbanks overlying clay, the latter kind of colonies being known locally as “scalps.” Under these conditions it forms con- tinuous masses of individuals closely packed together, sometimes extending over many acres of surface and numbering millions. The readiness with which

the young Mytilus attaches itself to wicker-work is made the means of artificially cultivating and securing these molluscs for the market both in the bay of Kiel in North Germany and at the mouth of the Somme and other spots on the coast of France.

Natural scalps are subject to extreme vicissitudes: an area of many acres may be destroyed by a local change of current producing a deposit of sand or shingle over the scalp, or by exposure to frost at low tide in winter, or by accumulation of decomposing vegetable matter. The chief localities of natural scalps on the British coast are Morecambe Bay in Lancashire and the flat eastern shores, especially that of the Wash of Lincoln, and similar shallow bays. These scalps are in some cases in the hands of private owners, but the English Government has not granted sufficiently definite rights to such individuals to enable them to protect their property from marauders, and to justify them in undertaking artificial cultivation.

The Sea Mussel is scarcely inferior in commercial value to the oyster. In 1878 the value of mussels exported from Antwerp alone

to Paris to be used as human food was £280,000. In Britain their chief consumption is in the deep-sea line fishery, where they are held to be the most killing of all baits. Twenty-eight boats en- gaged in haddock-fishing at Eyemouth used between October 1882 and May 1883 920 tons of mussels (about 47 million individuals), costing nearly £1800 to the fishermen, about one-half of which sum was expended on the carriage of the mussels. It is quite impossible to calculate the number of tons of mussels annually used in this way by British fishermen, but it amounts to some hundreds of thousands, and the supplying of the market would offer a lucrative investment for capital did the Government grant definite proprietary rights over the fore-shore and sea-bottom to those ready to enter upon such enterprise. Many thousand tons of mussels are waste- fully employed as manure by the farmers on lands adjoining scalp- producing coast, as in Lancashire and Norfolk, three half-pence a bushel being the price quoted in such cases. It is a curious fact, illustrative of the ignorant procedure and arbitrary fashions of fisher-folk, that on the Atlantic seaboard of the United States the Sea Mussel, Mytilus edulis, though common, is not uscd as bait

nor as food. Instead, the Soft Clam, Mya arenaria, a Lamellibranch not used by English or Norwegian fishermen, though abundant on their shores, is employed as bait by the fishermen to the extent of 1} million bushels per annum, valued at £120,000. At the mouth of the river Conway in North Wales the Sea Mussel is crushed in large quantities in order to extract pearls of an inferior quality which are occasionally found in these as in other Lamellibranch Molluses (Gwyn Jeffreys).

Mytilus edulis is considered of fair size for eating when it is 2 inches in length, which size is attained in three years after the spat or young mussel has fixed itself. Under favourable circumstances it will grow much larger than this, specimens being recorded of 9 inches in length. It is very tolerant of fresh water, fattening best, as does the oyster, in water of density 1014 (the density of the water of the North Sea being 1026). Experiments made by removing mussels from salt watcr to brackish, and finally to quite fresh water show that it is even more tolerant of fresh water than the oyster; of thirty mussels so transferred all were alive after fifteen days. Mytilus edulis is occasionally poisonous, owing to conditions not satisfactorily determined.

The fresh-water Mussels, Anodon cygneus, Unio picto- rum, and Unio margaritiferus belong to the order Isomya of Lamellibranch Molluscs, in which the anterior and posterior adductor muscles are equally developed. An account of the anatomy of Anodon is given in the article Mouuusca. Unio differs in no important point from Ano- don in internal structure. The family Unionacea, to which these genera belong, is of world-wide distribution, and its species occur only in ponds and rivers. A vast number of species arranged in several genera and sub-genera have been distinguished, but in the British Islands the three species above named are the only claimants to the title of

“fresh-water mussel.”

Anodon eygneus, the Pond Mussel or Swan Mussel, appears to be entircly without economic importance. Unio pictoruwm, the common River Mussel (Thames), appears to owe its name to the fact that the shells were used at one time for holding water-colour paints as now shells of this species and of the Sea Mussel are used for holding gold and silver paint sold by artists’

colourmen, but it has no other economic value. Unio margaritiferus, the Pearl Mussel, was at one time of considerable importance as a source of pearls, and the pearl mussel fishery is to this day carried on under peculiar state regulations in Sweden and Saxony, and other parts of the Continent. In Scotland and Ireland the pear! mussel fishery was also of import- ance, but has altogether dwindled into insignificance since the open- ing up of commercial intercourse with the East and with the islands of the Pacific Ocean, whence finer and more abundant pearls than those of Unio margaritiferus are derived.

In the last forty years of the last century pearls were exported from the Scotch fisheries to Paris to the value of £100,000 ; round pearls, the size of a pea, perfect in every respect, were worth £3 or £4. The Pearl Mussel is still used as bait in the Aberdeen cod fishery.

For an account of the anatomy of Mytilus edulis the reader is referred to the treatise by Sabatier on that subject (Paris, 1875). Its development from the egg has not been fully studied, but some very important facts as to the struc- ture of the free-swimming young or spat are to be found in the memoir by Lacaze Duthiers, Annales des Sciences Naturelles, 1856. The essay by Mr Charles Harding on Molluscs used for Food or Bait, published by the committee of the

London International Fisheries Exhibition, 1888, may be consulted as to the economic questions connected with the Sea Mussel. (B. R. L.)

MUSSELBURGH, a Scottish burgh of barony and re- gality, a municipal and parliamentary burgh in the parish of Inveresk and county of Midlothian, 54 miles east of Edinburgh. The burgh, which stretches about a mile

along the south shore of the Firth of Forth, is intersected by the river Esk and embraces the village of Fisherrow. In the town is Pinkie House, an ancient baronial resi- dence, formerly a seat of the abbot of Dunfermline, whose monastery held the lands and regality before the Reforma- tion, About a mile to the south-east the battle of Pinkie, so disastrous to the Scottish arms, was fought in 1547. Musselburgh is a place of great antiquity

; one of the two stone bridges over the Esk is said to represent an ancient Roman structure, and remains of Roman work have been found at Inveresk in the immediate vicinity. The town has an important factory for fishing-nets, a paper mill, breweries, and other manufactories, and there is a harbour, chiefly for fishermen, at Fisherrow. Loretto School here has its name from the old chapel of Loretto, founded in 1534 by Thomas Duthy, a hermit from Mount Sinai. The Musselburgh Links, east of the river, are much fre- quented by golfers, and upon the Links there is a good racecourse. The population of the burgh in 188] was

7866.

MUSSET, ALFRED bE (1810-1857), poet, play-writer, and novelist, was born on the 11th December 1810 in a house in the middle of old Paris, near the Hétel Cluny. His father, Victor de Musset, who in the course of his life held several ministerial posts of importance, traced his descent back as far as 1140. In Alfred's childhood there were various things which fostered his imaginative power. Heand his brother Paul, who afterwards wrote a biography of Alfred, delighted in reading old romances together, and in assuming the characters of the heroes of these romances. But it was not until about 1826 that Musset gave any definite sign of the mental force which afterwards distin- guished him. In the summer of 1827 he all but won a prix V@honneur by an essay on " The origin of our feelings," and in 1828, when Scribe, Mélesville, and the elder Brazier were in the habit of coming to Madame de Musset's house at Auteuil, where drawing-room plays and charades were constantly given, Musset, excited by this companionship, wrote his first poem, which, to judge from the extracts pre- served, was neither better nor worse than much other work of clever boys who may or may not afterwards turn out to be possessed of genius. Shortly after his first attempt in verse he was taken by Paul Foucher to Victor Hugo's house, where he met such men as Alfred de Vigny, Mérimée, and Sainte-Beuve. It was under Hugo's influence, no doubt, that he composed a play. The scene was laid in Spain, and some lines, showing a marked advance upon his first effort, are preserved. In 1828, when the war between the classical and the romantic school of literature was grow- ing daily more serious and exciting, Musset, who had pub- lished some verses in a country newspaper, boldly recited some of his work to Sainte-Beuve, who wrote of

it to a friend, “There is amongst us a boy full of genius.” At eighteen years old Musset produced a translation, with a few insertions of his own, of De Quincey’s Opium-Eater. This was published by Mame, attracted no attention, and has been long out of print. His first original volume was published in 1829 under the name of Contes Espagne et Itake, had an immediate and striking success, provoked bitter opposition, and produced many unworthy imitations. In December 1830 he was just twenty years old, and was already conscious of that curious double existence within him so frequently symbolized in his plays,—in Octave and Célio for instance (in Les Caprices de Mari- ne), who also stand for the two camps, the men of matter and the men of feeling,—which he has elsewhere described as characteristic of his generation. At this date his piece the Wwit Vénitienne was produced by Harel, manager of the Odéon. The exact causes of its failure might now be far to seek ; unlucky stage accidents had something to do

with it, but there seems reason to believe that there was a strongly-organized opposition. However this may be, the result was disastrous to the French stage; for it put a complete damper on the one poet who, as he afterwards showed both in theoretical and in practical writings, had the fine insight which took in at a glance the merits and defects both of the classical and the romantic schools. Thus he was strong and keen to weld together the merits of both schools in a new method which, but for the fact that there has been no successor to grasp the wand which its originator wielded, might well be called the school of Musset. The serious effect produced upon Musset by the failure of his Nuit Vénctienne is curiously illustrative of his character. A man of greater strength and with equal belief in his own genius might have gone on appealing to the public until he compelled them to hear him. Musset gave up the attempt in disgust, and waited until the public were eager to hear him without any invitation on his part. In the case of his finest plays this did not happen until after his death ; but long before that he was fully recog- nized as a poet of the first rank, and as an extraordinary master of character and language in prose-writing. In his complete disgust with the stage after the failure above referred to there was no doubt something of a not ignoble pride, but there was something also of weakness—of a kind of

weakness out of which it must be said sprang some of his most exquisite work, some of the poems which could. only have been written by a man who was face to face with difficulties which were old enough in the experience of mankind, though for the moment new and strange to him, and by which he felt himself to be overwhelmed.

In 1833 Musset published the volume called Un Spec- tacle dans un Fauteuil. One of the most striking pieces in this—Namouna—was written at the publisher's request to fill up some empty space; and this fact is noteworthy when taken in conjunction with the horror which Musset afterwards so often expressed of doing anything like writ- ing "to order,"—of writing, indeed, in any way or at any moment except when the inspiration or the fancy happened to seize him. The success of the volume seemed to be small in comparison with that of his Contes @ Espagne, but it led indirectly to Musset's being engaged as a contributor to the Revue des Deux Mondes. In this he published, in April 1833, André del Sarto, and he followed this six weeks later with Les Caprices de Marianne. This play, which now ranks as one of the classical pieces in the repertory of the Thé&tre Frangais, is a fine illustration of the method above referred to, a method of which Musset gave something like a definite explication five years later. This explication was also published in the Revwe des Deus Mondes, and it set forth that the war between the classical and the romantic schools could never end in a definite victory for either school, nor was it desirable that it should so end. 'It was time," Musset said, "for a third school which should unite the merits of each." And in Les Caprices de Marianne these merits are most curiously and happily combined. It so happens that, as the piece is generally given on the stage, with the omission of one change of scene, the classical unities are almost exactly preserved, while the whole play is impregnated with romanticism in the best sense of the word. It has perhaps more of the Shakespearean quality—the quality of artfully min gling the terrible, the grotesque, and the high comedy tones—which exists more or less in all Musset's longer and more serious plays than is found in any other of these. In Claudio, the husband, the terrible and the grotesque are strangely and powerfully allied; Tibia, his serving-man, is grotesque with a touch of grimness caught from his master ; Octave and Célio represent the two elements which were always warring in Musset's own heart—one is the careless half-

cynical man of the world and the other the wholly tender romantic lover ; Marianne is that type of the highest comedy to which events lend a touch of tragedy, while in Hermia, Célio's mother, is the very poetry of maternal love. The piece is called a comedy, and it owes this title to its ex- traordinary brilliance of dialogue, truth of characterization, and swiftness in action, under which there is ever latent a sense of impending fate. Many of the qualities indicated are found in others of Musset's dramatic works, and notably 'in On ne badine pas avec ' Amour, where the skill in insen- sibly preparing his hearers or readers through a succession of dazzling comedy scenes for the swift destruction of the end is very marked. But Les Caprices de Marianne is per- haps for this particular purpose of illustration the most compact and most typical of all. One other point in Musset's method may be noted in connexion with this play. Paul de Musset asked him where he had ever met a Marianne. He answered, 'Everywhere and nowhere ; she is not a woman, she is woman." The appearance of Les Caprices de Marianne in the Revue was followed by that of Rolla, a marked symptom of the 'maladie du siecle." Then came the unfortunate journey which Musset made to Italy with George Sand. It is well known that the rupture of what was for a time a most passionate attachment had a disastrous effect upon Musset, and brought out the weakest side of his moral character. He was at first absolutely and completely struck down by the blow. But it was not so well known until Paul de Musset pointed it out that the passion expressed in the Nwet de Décembre, written about twelve months after the journey to Italy, referred not to George Sand but to another and quite a different woman. The story of the Italian journey and its results are told under the guise of fiction from two points of view in the two volumes called respectively ile et Lui and Lui et Eile. During Musset's absence in Italy Fantasio was published in the Revue, and not long after his return On ne badine pas avec ' Amour appeared in the same way. In 1835 he produced Lucie, La Nuit de Mai, La Quenoutlle de Barberine, Le Chandelier, La Loi sur la Presse, La Nuit de Décembre, and La Confession @un Enfant du Stécle. The last-named work, a prose work, is exceptionally interesting as exhibiting the poet's frame of mind at the time, and the approach to a revulsion from the Bonapartist ideas amid which he had been brought up in his childhood. To the supreme power of Napoleon he in this work attri- buted that moral sickness of the time

which he described. ‘One man,” he wrote, “absorbed the whole life of Europe; the rest of the human race struggled to fill their lungs with the air that he had breathed.” When the emperor fell, “‘a ruined world was a resting-place for a genera- tion weighted with care.” The Confession is further im- portant, apart from its high literary merit, as exhibiting in many passages the poet’s tendency to shun or wildly protest against all that is disagreeable or difficult in human life— a tendency to which, however, much of his finest work was due. In 1836 appeared, amongst other things, I] ne faut Jurer de Rien, a comedy which holds, and is likely long to hold, the stage of the Théatre Francais, and the beginning of the brilliant letters of Dupuis and Cotonet on romanti- cism, 1 ne faut jurer de Rien is as typical of hiy comedy work as is Les Caprices de Marianne of the work in which a terrible fatality underlies the brilliant dialogue and light keen characterization. In 1839 were published the Caprice (which afterwards found its way to the Paris stage through, in the first instance, the accident of Madame Allan the actress hearing of it in a Russian translation) and some of the Vouvelles, In 1839 he began a romance called Le Poétte Déchu, of which the existing fragments are full of passion and insight. In 1840 he passed through a period of feel- ing that the public did not recognize his genius—as,

indeed, they did not—and wrote a very short but very strik- ing series of reflexions headed with the words “A trente Ans,” which Paul de Musset published in his Life. Tn 1841 there came out in the Revue de Paris Musset’s Le Rhin Allemand, an answer to Becker’s poem which appeared in the Revue des Deux Mondes. This fine war-song made a great deal of noise, and brought to the poet quantities of challenges from German officers. Between this date and 1845 he wrote comparatively little. In the last-named year the charming “‘‘proverbe” J/ faut qu’une Porte soit owverte ou fermée appeared. In 1847 Un Caprice was produced at the Thédtre Francais, and the employment in it of sucha word as “rebonsoir” shocked some of the old guard of the oldschool. In 1848 J/ ne faut jurer de Rien was played at the Théatre Francais, and the Chandelier at the Théatre Historique. Between this date and 1851 Betéine was pro- duced on the stage and Carmosine written ; and between this time and the date of his death,

from an affection of the heart, in May 1857, the poet produced no large work of importance.

Alfred de Musset now holds the rank which Sainte-Beuve first accorded, then denied, and then again accorded to him as a poet of the first rank. He had genius, though not genius of that strongest kind which its possessor can always keep in check. His own char- acter worked both for and against his success as a writer. His very weakness and his own consciousness of it produced such beautiful work as, to take one instance, the Nuit d'Octobre, but it too often prevented him, from one cause or another, from producing any work at all. His Nowvelles are. extraordinarily brilliant ; his poems are charged with passion, fancy, and fine satiric power ; in his plays he hit upon a method of his own, in which no one has dared or availed to follow him with any closeness. He was one of the first, most ori- ginal, and in the end most successful of the first-rate writers included in the phrase ''the 1880 period." The wildness of his life, though it cannot be denied, has probably been exaggerated ; and it has lately been suggested by M. Arsene Houssaye that the symptoms of the heart disease which caused his death may sometimes have been mistaken for the symptoms of intoxication. His brother Paul de Musset has given in his Biographie a striking testimony to the finer side of his character. In the later years of his life Musset was elected, not without some difficulty, a member of the French Aca- demy. Besides the works above referred to, the Nouvelles et Contes and the Guvres Posthawmes, in which there is much of interest concerning the great tragic actress Rachel, should be specially mentioned. Musset has had no successor in France either as a poet or as a dramatist. (W. H. Be

MUSTARD. The varieties of mustard-seed of com- merce are produced from several species of the Cruciferous genus Brassica. Of these the principal are the Black or Brown Mustard, Brassica nigra (Sinagis nigra, L.), the White Mustard, Brassica alba, and the Sarepta Mustard, B. juncea, The finest qualities of Black and White Mustard are cultivated in the eastern counties of England. The former is a plant requiring a rich soil and much care in its treatment, but its seeds, which are very minute, weigh- ing not more than one-fiftieth of a grain, are the most valuable for commercial purposes. The peculiar pungency and odour to which mustard owes much of its value are due to an essential oil developed by the action of water on

two peculiar chemical substances contained in the black seed. These. bodies are a compound termed by its dis- coverers myronate of potassium, but since called sinigrin, C,H, ,KNS,O,,, and an albuminoid body, myrosin. The latter substance in presence of water acts as a ferment on sinigrin, splitting it up into the essential oil of mustard, a potassium salt, and sugar. It is worthy of remark that this reaction does not take place in presence of boiling water, and therefore it is not proper to use very hot water in the preparation of mustard. Essential oil of mustard is in chemical constitution an iso-sulphocyanate of allyl C,H,NS. It is prepared artificially by a process, discovered by Zinzin, which consists in treating bromide of ally] with sulphocyanate of ammonium and distilling the resultant sulphocyanate of allyl. The seed of White Mustard con- tains in place of sinigrin a peculiar principle called sinalbin,

CypHyN.8,016 in several aspects analogous to sinigrin. In presence of water it is acted upon by myrosin, present also in White Mustard, splitting it up into sulphocyanate of acrinyl, sulphate of sinapine, and sugar. Sulphocyanate of acrinyl is a powerful rubefacient principle, whence White Mustard, although yielding no volatile oil, forms a valuable material for cataplasms. The seeds of Brassica juncea have the same constitution and properties as Black Mustard, as a substitute for which they are extensively cultivated in Russia. The mustard-seed imported from the East Indies is also largely composed of B. juncea.

Both as a table condiment and as a medicinal substance, mustard has been known from a very, remote period. Under the name of va7v it was used by Hippocrates in medicine. The form in which table mustard is now sold in the United Kingdom dates from 1720, about which time Mrs Clements of Durham hit on the idea of grinding the seed in a mill and sifting the flour from the husk. The bright yellow farina thereby produced under the name of “Durham mustard” pleased the taste of George I, and rapidly attained wide popularity. As it is now prepared mustard consists essentially of a mixture of black and white farina in certain proportions. Several grades of pure mustard are made containing nothing but the farina of mustard-seed, the lower qualities having larger amounts of the white cheaper mustard ; and

corresponding grades of a mixed preparation of equal price, but containing certain proportions of wheaten or starch flour, are also prepared and sold as “mustard condiment.” The mixture is free from the unmitigated bitterness and sharpness of flavour of pure mustard, and it keeps much better.

All varieties of mustard-seed contain from 25 to 35 per cent. of a bland inodorous yellow-coloured fixed oil, free from pungency and with little tendency to become rancid. It is extensively used in India for cooking and all ordinary purposes, and is one of the ordinary commercial oils of Western countries: The mustard papers commonly used as rubefacients and vesicants are made from mustard flour entirely deprived of its fixed oil.

MUTINY. This word, which primarily means a com- motion and then an insurrection or sedition, is in English military law applied to a sedition in any forces belonging to Her Majesty’s regular, reserve, or auxiliary forces, or mavy. Such offences are dealt with by courts-martial, which up to the year 1879 derived their authority from the annual Mutiny Act (Act for punishing Mutiny and Desertion and for the better payment of the Army and their Quarters), the maintenance of a standing army in time of peace being illegal without the consent of parlia- ment. For further details see Mmrrary Law and Court MARTIAL.

MUTTRA, a district in the lieutenant-governorship of the North-Western Provinces, India, lying between 27° 14 and 27° 58’ N. lat. and 77° 19’ and 78° 33’ E. long., is bounded on the N. by Aligarh and Gurgaon, on the E. by Aligarh, Mdinpuri, and Etah, on the 8. by Agra, and on the W. by Bhartpur state, with an area of 1453 square miles. The district consists of an irregular strip of terri- tory lying on both sides of the Jumna. The general level 1s only broken at the south-western angle by low ranges of limestone hills. The eastern half consists for the most part of a rich upland plain, abundantly irrigated by wells, rivers, and canals, while the western portion, though rich in mythological association and antiquarian remains, is comparatively unfavoured by nature. The crops are Scanty, and the larger forest trees are not found. For eight months of the year the Jumna shrinks to the dimen- sions of a mere rivulet, meandering through a waste of sand. During the rains, however, it swells to a mighty Stream, a mile or more in breadth. ‘Till

recently nearly the whole of Muttra consisted of pasture and woodland, but new roads constructed as relief works in 1837-38 have

thrown open many large tracts of country, and the task of reclamation has since proceeded rapidly.

The census of 1881 returned the population of Muttra at 671,690 (males 360,967, females 310,723), Hindus numbering 611,669 and Mohammedans 58,088. There were only 65 native Christians. The population of the three municipal towns in 1881 was as follows :—Muttra, 55,016; Brindaban, 21,467 ; and Kosi, 11,281. In 1881-82, 1048 square miles were rcturned as cultivated, 172 as cultivable, and 103 as uncultivable. Jodr and cotton form the principal staples for the autumn (kharif) harvest, while gram and barley are the chief grains grown for the spring (rab) harvest. Sugar-cane, tobacco, indigo, and vegetables are all but unknown. The mass of the population is fairly well off, and the peasantry are described as being in better circumstances than those of neighbour- ing districts. Great extremes of temperature occur, the cold of winter being comparatively excessive, while hot winds blow from the west with great violence during April, May, and June. The average rainfall for the ten years ending 1869 was 23°6 inches.

The central portion of Muttra district forms one of the most sacred spots in Hindu mythology. A circuit of 84 kos around Gokul and Brindaban bears the name of the Braj-Mandal, and carries with it many associations of the earliest Aryan times. Here Krishna and his brother Balarama fed their cattle upon the plain ; and numerous relics of antiquity in the towns of Muttra, Gobard- han, Gokul, Mahaban, and Brindaban still attest the sanctity with which this holy tract was invested. During the Buddhist period Muttra became a centre of the new faith. After the invasion of Mahmud of Ghazni the city fell into insignificance till the reign of Akbar ; and thenceforward its history merges in that of the Jats of Bhartpur, until it again acquired separate individuality under Sur4j Mall in the middle of the last century. The Bhartpur chiefs took an active part in the disturbances consequent on the declining power of the Mughal emperors, sometimes on the imperial side, and at others with the Mahrattas. The whole of Muttra passed under British rule in 1804.

Murrra, chief town and administrative headquarters of the above district, is situated on the right bank of the Jumna, about 30 miles above Agra, in 27° 30’ N. lat. and 77° 43’ E. long., with a population (1881) of 55,016, viz., males 28,769, and females 26,247.

It is an ancient town, mentioned by Fa Hian as a centre of Buddhism about 400 A.p.; his successor Hiouen Thsang, about 650, states that it then contained twenty Buddhist monasteries and five Brahmanical temples. Muttra has suffered more from Mohammedan sack and plunder than most of the towns of northern India. It was sacked by Mahmud of Ghazni in 1017-18; about 1500 Sultan Sikandar Lodi utterly destroyed all the Hindu shrines, temples, and images ; and in 1636 Shah Jahan appointed a governor expressly to ‘“‘stamp out idolatry.” In 1669-70 Aurangzeb visited the city and continued the work of destruction. Muttra was again captured and plundered by Ahmad Shah with 25,000 Afghan cavalry in 1756. The town still forms a great centre of Hindu devo- tion, and large numbers of pilgrims flock annually to the festivals.

MUZAFFARGARH, a district in the lieutenant-gover- norship of the Punjab, India, lying between 29° 1’ and 30° 46’ N. lat. and 70° 33’ and 71° 49’ E. long., is bounded on the N. by Dera Ismail Khan and Jhang districts, on the E. and §.E. by the Chendb river, and on the W. by the Indus, with an area of 3136 square miles. It occupies the extreme southern apex of the Sind Sdgar Dodb, the wedge-shaped tract between the Indus and the Five Rivers or Panjnad. The district stretches northward from their confluence in a narrow ridge of land, gradually widening for about 120 miles, until at its northern border it is 55 miles broad. In the northern half of the district is the wild thal or central desert of the Sind Sagar Dodb, an arid elevated tract with a width of 40 miles in the extreme north, which gradually contracts until it disappears about 10 miles south of Muzaffargarh town. Although apparently a tableland, it is really composed of separate sandhills, with intermediate valleys lying at a lower level than that of the Indus, and at times flooded. Scattered amid this waste of sand-heaps are a few good plots of land, which the industry of the Jat cultivators has appropriated. The border strips fringing the thal towards the rivers are also for the most part under cultivation. South of the thal, the country consists of rich and

productive lands, out of the reach of excessive flooding and at the same time within

reach of easy irrigation. But in the extreme south the floods froni the two rivers spread at times over the whole intervening tract. On abating they leave luxuriant pastur- age ; and, if the subsidence takes place sufliciently early, magnificent crops of wheat, pease, and other grain are raised in the cultivated portion. The towns stand on high sites or are protected by embankments ; but the villages scattered over the lowlands are exposed to annual inundations, during which the people abandon their grass-built huts and take refuge on wooden platforms attached to each house. Throughout the cold weather large herds of camels, be- longing chiefly to the Povindah merchants of Afghanistan,

graze upon the sandy waste.

The census of 1881 returned the population at 338,605 (males, 184,510, females 154,095), viz., 292,476 Mohammedans, 43, 297 Hindus, 2788 Sikhs, 38 Christians, and 44 ‘‘others.” The district contains only one town with a population exceeding 5000—namely, Kot Adu or Parhar (5552). Muzatfargarh, the headquarters station, has only 3136 inhabitants. The area under cultivation in 1881 was returned at 397,529 acres, of which 279,108 were irrigated by government works, and 118,376 by private individuals. ‘The areas under the different crops in 1881-82 were rice 38,589 acres, wheat 193,749, great millet 15,915, spiked millet 15,431, barley 11,450, pease 382,388, gram 7959, masar 6882, and tobacco 655. Most of the land is cultivated by the proprietors themselves ; and the rents, where they exist, are almost universally paid in kind. Trade is mainly in the hands of Povindah merchants. The district is un- usually hot and dry, the average rainfall for the seven years ending 1872-73 being only 5-9 inches.

Muzaffargarh possesses hardly any distinct annals of its own, having always formed part of MULTAN (q.v.).

MUZAFFARNAGAR or MozurrerNuccEr, a district in the lieutenant-governorship of the North-Western Provinces, India, lying between 29° 11’ and 29° 45’ N. lat. and 77° 3’ and 78° 10’ E. long., is bounded on the N. by Saharanpur, on the E. by the Ganges, on the S. by Meerut, and on the W. by the Jumna, with an area of 1656 square miles. It lies near the northern extremity of the Doab or great alluvial plain between the Ganges and the Junina, and shares to a large extent in the general monotony of that level region. A great portion of the area is sandy and unfertile, but under irrigation the soil is rapidly improving, and in many places the villages have succeeded in introducing a high state of cultivation.

The census of 1881 returned the population at 758,444 (males 409,436, females 349,008). The excessive proportion of males is doubtless due to the practice of female infanticide, which Govern- ment has done all in its power to suppress. In 1874 no less than ninety-four villages were still on the ‘ proclaimed” list under the Infanticide Act. Hindus numbered °535,218, Mohammedans 218,842, Christians 54, and Buddhists 9330. The population of the four municipal towns in 1881 was as follows—Muzaffarnagar (the chief town and administrative headquarters), 15,080 ; Kairana, 18,374; Kandhla, 11,109; Shamli, 7359. Out of a total area of 1,059,910 acres in 1881-82, 707,394 were returned as under culti- vation. In the radi harvest the chief crops are wheat, barley, millet, and pulse. _ The kharif or autumn crops include the above grains, together with sugar-cane, cotton, and indigo. Irrigation was afforded in 1881-82 by one or other of the great canals to 219,121 acres. The condition of the peasantry is comfortable, and the village communities are prosperous and intelligent. Most of the land is cultivated by husbandmen with rights of occupancy ; the number of tenants-at-will is rapidly declining. Rents are more frequently paid in kind than in cash. Before the opening of the canals Muzaffarnagar was liable to famines caused by drought ; but the danger from this has been minimized by the spread of irriga- tion. Its trade is confined to the raw materials it produces. The climate of the district is comparatively cool owing to its proximity to the hills ; and the average rainfall is about 29 inches,

Hindu tradition represents Muzaffarnagar as having formed a portion of the Pandava kingdom of the Mahébhérata ; authentic history, however, dates from the time of the Moslem conquests in the 13th century, from which

time it remained a dependency of the various Mohammedan dynasties which ruled at Delhi until the practical downfall of the Mughal empire in the middle of the last century. In 1788 the district fell into the hands of the Mahrattas. After the fall of Aligarh, the whole Dodb as far north as the Siwalik hills passed into the hands of the British without a blow, and Mu-

zaffarnagar became part of Saharanpur. It was created a separate Jurisdiction in 1824,

MUZAFFARNAGAR, chief town and administrative head- quarters of the above district, is situated on the militar road from Meerut to Landaur in 29° 28’ N. lat. and 77° 44’ E. long. The population in 1881 was 15,080, of whom 8814 were males and 6266 females. It is a closely-built town, crowded with small lanes, and was founded in 1633, It is now a station on the Sind, Punjab, and Delhi Rail- way, and has a considerable trade in agricultural produce,

MUZAFFARPUR or Mozurrerrorg, a district in the lieutenant-governorship of Bengal, India, lying between 25° 30’ and 26° 51’ N. lat. and 84° 55’ and 85° 58’ E. long,, is bounded on the N. by Nepal, E. by Darbhangah, on the S. by Patnd, and W. by Saran and Champaran districts, with an area of 3004 square miles. It was formed in January 1875 out of the great district of Tirhut, which up to that time was the largest and most populous district of lower Bengal. Of its six subdivisions, the three eastern were in January 1875 formed into the new district of Darbhangah, and the three western—Muzaffarpur, Hajipur, aud Tajpur—ainto the district of Muzaffarpur.

The census of 1881 returned the inhabitants at 2,582,060 (males 1,265, 7381, feinales 1,316,329), viz., Hindus 2,265,380, Mohammedans 316,308, Europeans 140, mixed races 48, native Christians 179, The cultivated area amounts to 1,435,859 acres, of which 762,830

are under rice. Muzaffarpur suffered severely from the famines of 1866 and 1874.

MUZAFFARPUR, chief town and administrative head- quarters of the above district, is situated on the right or south bank of the Little Gandak river in 26° 7’ N. lat. and 85° 26’ E. long., with a population (1881) of 42,460. The town is clean, with many broad and well-kept streets; it has a good collectorate and court-houses, jail, dispensary, and several good schools. A large trade is carried on both by road and river. The town, however, is liable to inun- dation, and suffered severely from this cause in 1871.

MUZIANO, Grrotamo (1528-15901), an eminent Italian painter, was born at Acquafredda near Brescia in 1528, Under Romanino, an imitator of Titian, he studied his art, designing and colouring according to the principles of the Venetian school. But it was not until he had left his native place still in early youth, and had repaired to Rome about 1550, that he came into notice. There his pictures soon gained for him the surname of J/ Giovane de’ Paesi (“the young man of the landscapes”); chestnut- trees are predominant in these works. He next tried the more elevated style of historical painting. He imitated Michelangelo in giving great prominence to the anatomy of his figures, and became fond of painting persons ema- ciated by abstinence or even disease. His great picture of the Resurrection of Lazarus at once established his fame. Michelangelo praised it, and pronounced its author one of the first artists of that age. It was placed in the church of Santa Maria Maggiore, but was afterwards transferred to the Quirinal palace. Muziano, with dogged perseverance (at one time he shaved his head, so as not to be tempted to’ go out of doors), continued to proceed in the path on which he had entered. He grew excellent in depicting foreign and military costumes, and in introduc ing landscapes into his historical pieces after the manner of Titian. Mosaic working also occupied his attention while he was employed as superintendent at the Vatican ; and it became under his hands a perfect imitation of painting. His ability and industry soon gained for him a handsome fortune. Part of this he expended in assisting to found the Academy of St Luke in Rome. He died in 1590, or, according to another authority, in 1592, and was buried in the church of Santa Maria Maggiore.

Many of Muziano’s works are in the churches and palaces of Rome ; he also worked in Orvieto and Loreto. In Santa Maria

degli Angeli, Rome, is one of his chief works, St Jerome preaching to Monks in the Desert; his Circuincision is in the church of the

Gest, his Ascension in the Araceli, and his St Francis receiving the Stigmata in the church of the Conception. A picture by him, yepresenting Christ washing the feet of his disciples, is in the cathedral of Rheims.

MYCEN AZ, one of the most ancient cities of Greece, was situated in the north-eastern extremity of the fertile Argive plain—pixy “Apycos imroBdrow. Its situation is exceedingly strong, and it commands all the roads leading from Corinth and Achaia into the Argive plain ; this fact, combined.with its distance from the sea, shows that the city was founded by a race which came from the direction of Corinth and not by immigrants landing on the coast. The walls of Mycen are the greatest monument that remains of the Heroic age in Greece; part of them is similar in style and doubtless contemporary in date with the walls of the neighbouring town Tiryns, but other parts seem to be the work of a rather later time. There can therefore be little doubt that the two towns were the strongholds of a single race, Tiryns commanding the sea-coast and Mycenz the inner country. The city of Argos, on the other hand, has no remains to connect it with this early Mycenzan race ; and legend tells of the rivalry between the dynasties of the Pelopidee at Mycenz and of the Preetidee at Argos. The long warfare between the two cities lasted till 468 B.c., when Mycenee was dismantled and its inhabitants dispersed. The city never revived ; Strabo asserts that no trace of it remained in his time, but Pausanias describes the ruins.

Subjoined are the most important monuments. 1. The ‘‘ Trea- suries” of Atreus and his sons, as Pausanias calls them. They were subterranean buildings of beehive shape, in the side of the hill south- west of the city ; one of them is still almost perfect. A sloping passage, Spduos, led to the doorway, with its ornamented columns, at the base of the building. The great circular chamber inside was probably covered with plates of bronze ; a door in one side admitted toa second smaller chamber. Such buildings, which are found in other parts of Greece—e.g., Orchomenus, Sparta, Attica, lolcus, &.— were undoubtedly the sepulchres of noble families.

2. The graves discovered by Dr Schliemann in 1876 within the city wall. They are encloscd within a circular wep/Sodos with a single entrance, and the place was therefore a holy place in the ancient Mycenean time; on the other hand the part of the city wall which encloses them is a later addition to the original wall. At some period before 468 8.¢. this addition was built ; before that time the zepiSodo0s was outside the wall. Some heroes of the race were worshipped here by the ancient inhabitants, but their names are not recorded by any trustworthy authority. In the time of Pausanias, six centuries after Mycenz was destroyed, local legend Maintained that these were the graves of Atrcus, Agamemnon, Cassandra and her children, and Eurymedon ; but it is uncertain whether this was the original legend, or a later tale that grew under the influence of Greek literature.

8. The Lion-Gate. The principal entrance to the city is approached by a dpduos, flanked on each side by the city wall and leading up to a gateway. Over the entrance is placed a triangular slab of stone on which are carved two lions in relief; they are rampant, facing one another, but separated by an upright column. The art of this relief shows no resemblance to archaic Greek art ; it is foreign in character, the work of an immigrant racc, which brought with it a well-developed civilization.

Greek legend always maintains that the Pclopide of Mycenx came from Phrygia, and this is corroborated by the evidence of archeology. The objects found in excavations, and the sculptured ornament on the doorways of the ‘‘ Treasuries” and over the Lion- Gate, all point to foreign influence and particularly to Asia Minor. The same type of the two lions and the column has been recently found over the entrance to a colossal sepulchre in the rocks near the south-westcrn corner of the Sangarius valley in Phrygia. Legend and remains alike show that a rich and powerful dynasty of foreign origin ruled at Myccne ; the only early remains in the Greek world that equal thei in interest are the ruins of ancient Troy. It is precisely these two cities which are described in the Homeric poems as the two great cities of the Greek world.

MYDDLETON, Sir Hucu (c. 1555-1631), the projector of the New River scheme for supplying London with water, was the sixth son of Richard Myddleton, governor of Denbigh Castle in the reigns of Edward VI., Mary,

and Elizabeth. Hugh Myddleton became a goldsmith in London, occupying a shop in Bassihaw (now Basinghall)

Street, and he is also mentioned in the records of Denbigh, for which he was chosen M.P. in 1603, as a merchant adventurer. In the state papers there is an entry of £250 paid to him for a jewel supplied to the queen. In connexion with his business as goldsmith Myddleton worked silver and lead mines in Cardiganshire, and in this way obtained the practical knowledge of engineering which enabled him to put in operation his scheme for supply- ing London with water (see Lonpon, vol. xiv. p. 825). In recognition of his services he was created a baronet by James I. in 1622; but pecuniarily the enterprise was a complete failure. Myddleton died 10th December 1631, and was buried in the churchyard of St Matthew, Friday Street, London. See Pinks, History of Clerkenwell.

MYELITIS (pveAds, marrow) is a disease which by in- flammation induces destructive changes in the tissues com- posing the spinal cord. In the acute variety the nerve ele- ments in the affected part become disintegrated and softened, but repair may take place ; in the chronic form the change is slower, and the diseased area tends to become denser (sclerosed), the nerve-substance being replaced by connect- ive tissue. Myelitis may affect any portion of the spinal cord, and its symptoms and progress will vary accordingly. Its most frequent site is in the lower part, and its exist- ence there is marked by the sudden or gradual occurrence of weakness of motor power in the legs (which tends to pass into complete paralysis), impairment or loss of sensi- bility in the parts implicated, nutritive changes affecting the skin and giving rise to bed-sores, together with bladder and bowel derangements. In the acute form, in which there is at first pain in the region of the spine and much constitutional disturbance, death may take place rapidly from extension of the disease to those portions of the cord connected with the muscles of respiration and the heart, from an acute bed-sore which is very apt to form, or from some intercurrent disease. Recovery to a certain extent may, however, take place; or, again, the disease may pass into the chronic form. In the latter the progress is usually slow, the general health remaining tolerably good for a time, but gradually the strength fails,

the patient becomes more helpless, and ultimately sinks exhausted, or is cut off by some complication. The chief causes of myelitis are injuries or diseases affecting the spinal column, extension of inflammation from the membranes of the cord to its substance (see MENINGITIS), exposure to cold and damp, and occasionally some pre-existing constitutional morbid condition, such as a fever. Any debilitating cause or excess in mode of life will act powerfully in predisposing to this malady. The disease is most comnion in adults. The treatment for myelitis in its acute stage is similar to that for spinal meningitis. When the disease is chronic the most that can be hoped for is the relief of symptoms by careful nursing and attention to the condition of the body and its functions. Good is sometimes derived from the employment of electricity, and the use of baths and douches to the spine.

MYNPOOREE. See MArnpuRi.

MYRIAPODA. The Myriapoda or Centipedes are usually treated of in text-books as one of the classes of the group Arthropoda, being associated in that group with the Crustacea, Arachnida, and Insecta as equivalent divisions of the animal kingdom. In consequence, however, of recent evidence which points to a community of origin of all the Tracheate forms apart from that of the Crustacea, it is probably more natural to divide the Arthropoda (with the exception of certain minor groups of obscure affinities) into two classes, one consisting of the Crustacea, the other of the Tracheata. If this plan of classification be adopted, the Myriapoda form a sub-class of the Tracheata, It 1s necessary that the peculiar contrast in structure between

the remarkable genus Peripatus and all other Tracheata should be clearly indicated in any systematic arrangement. Perypatus, an account of which, in consequence of its im- portant relations to the Myriapoda, is given in the present article, has been variously placed by systematists as con- stituting a separate class of the Arthropoda, the ‘ Pro- tracheata,” or as worthy of higher or lower rank than indicated by such position. It will be regarded here as representing a special sub-group of the Tracheata—the Protracheata as opposed to the remaining Tracheates or Eutracheata—thus :—

Class— CRUSTACEA. Arthropoda. Group— Sub-class— Class— Protracheata. Peripatidea. TRACHEATA. Sub-class— Group— Myriapoda. Eutracheata. Insecta. Arachnida.

Linneus included the Myriapoda in his Insecta Aptera, together with the Crustacea and Arachnida. In 1779 Fabricius first separated the Myriapoda as a distinct order under the name Mitosata, but still retained several separate orders of Crustacea as equivalent. In 1796 Latreille divided the Aptera of Linnzeus into seven orders, one of which was constituted by the Myriapoda (so first named by him), but he included with them the Isopoda. In 1800 Cuvier and Lamarck first separated Linnzeus's Insecta into three primary natural classes, creating the Crustacea and retaining as the two others the Arachnida and Insecta. In 1825 Latreille, finally following Leach (1815), set up the Myriapoda as a fourth class, separating them from the Insécta connected with them. Subsequently the class Myriapoda was a constant source of controversy amongst naturalists, and many attempts were made to overthrow it altogether. Thus the Myriapoda were connected by Macleay with the Insecta, and also by Kirby in 1826, further by Burmeister in 1837, and by Von Siebold with Crustacea in 1848.

The Prorracuzata may be defined as—

Tracheata with imperfectly – jointed appendages, and numerous stigmata indefinite in number, scattered in various regions of the body; the first pair of post-oral appendages only modified to act as jaws; the second pair rudimentary, bearing the opening of the duct of a slime- gland ; remaining pairs numerous, all alike ; ambulatory legs, each provided with a pair of claws; no definite infra- cesophageal nerve-ganglion ; ventral nerve-cords imperfectly ganglionated, widely divaricated, united posteriorly dorsad of the rectum ; complicated segmental organs present, open- ing at the bases of the legs; arch-enteron in the embryo formed by invagination ; a wide slit-like blastopore formed in the embryo, which gives rise to the mouth anteriorly and anus posteriorly,

The sole representatives of this group of the Tracheataare the seven or eight known species of the genus Peripatus (fig. 1). These are soft-

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Fic. 1.—Large adult example of Pertpatus capensis of natural size. (From Moseley.)

bodied animals very like lepidopterous caterpillars in form, ofa brown or blackish colour, with a series of pairs of short conical legs placed laterally at equal intervals along the entire length of the ventral surface behind the mouth. The legs in advanced embryos show a distinct division into five joints by transverse constrictions, but in the adults this jointing is much obscured. The skin not being protected by chitinous plates, but only by fine papille armed with chitine, no definite hinge-joints are formed comparable to those so usually present in other Tracheata. The terminal joint of each leg or foot is provided with a pair of curved claws. The num- ber of legs present varies in the different species. The head bears a

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pair of simple eyes and a pair of antennz composed of very numer. ous joints. The first pair of legs, which in the embryo closely resembles those developed behind it (fig. 2), becomes in the process of development g turned in in front of the mouth, and its claws become modified into a pair of sickle- shaped toothed jaws which work against one another in front of the mouth, and are completely enclosed in the adult in a wide buccal cavity. This cavity opens to the exterior ventrally on the under side of the head by the buccal aperture, which is oval in form and is surrounded by tumid lips, and has often been described as the mouth, although the true mouth lies within the buccal cavity underneath the jaws (figs.

3, 4

The second pair of appendages of the em- bryo becomes converted in the adult into a pair of short papille,—the oral papilla, which bear at their tips the openings of a pair of large glands secreting a viscid sub- stance. Respiration is effected in Pertpatus by means of an immense number of small tracheal tufts. Each of these tufts consists of a short tubular chamber

or sac, opening at one end, which is narrowed, to the ex- terior by a niinute simple aperture (stigma) in the cuticle, and provided at its opposite cnlarged extremity with a tuft of very fine Fic. 2.— arly embryo of air-tubes. In these fine tracheal tubes only ? le ges Bi ifoun Ps a very faint indication of an eee spiral sees = antennal thickening of the chitinous lining mem- ¢, procephalie lobe; @ brane can be detected. The tubes are, intestine; 0, mouth; 1, 2, with very rare exceptions, unbranched ; ha Post-oral 67a they are freely distributed to the various ; muscles, viscera, &c. These tracheal tufts closely resemble in structure those of the Diplopod Myriapoda, but their disposition differs from that occurring in all other Tracheata. Instead of a definite small number of stigmata only being present, placed in definite positions on the successive somites, an in- definite number is present in Peripatus. Certain of these are scattered irregularly over the whole body-surface, whilst others are concentrated more or less thickly in a double row on each side of the dorsal median line, in a correspond- ing double ‘vontral sow, and 7c, 8Vantl view of the he of ange further on the anterior and (from Balfour, after Moseley) é, mal G posterior aspects of the legs thickening of epiblast of procephalic lobe and round the bases of the

to form supra-cesophageal ganglion; m, legs. A series of segmental process from procephalic lobe growing organs is present, a pair for

over the first post- oral appendage ; 0, mouth ; 1 and 2, first and second pairs of each pair of legs. They are post-oral appendages, becoming later the coiled tubes opening at one Jaws and oral papille respectively. end into the body cavity and at the other to the exterior at the bases of the legs on their inner or ventral aspects.

The nervous sys- tem consists of a pair of supra-ceso- phageal ganglia fused together in the middle line, from which arise the ventral cords, which remain widely divaricated throughout the length of the body to its hinder ex- tremity, where they unite above the dorsal surface

of the rectum. The Fic. 4.—Ventral view of a head of an ya pen

. 4atan advanced stage of development (from Moseley). iit th «p The figure shows the jaws (the modified pair of claws pear at tirst with- of the first pair of appendages) turned in towards out ganglionic en- the mouth, the dark

spot between them, which to- largements but in gether with them is enclosed by the wall of the buc- reality wadin ari cal cavity. The second post-oral appendages or oral ary ganglionic

papille are seen to be distinctly five-jointed. swellings are present on them corresponding with the origins of the nerves for the jaws, oral papille, and all the legs. They

are connected by fine transverse commissures forming a so-called rope-ladder nerve-system. Visceral nerves are present, with an arrangement similar to that in Chetopods rather than that found im Arthropoda. A dorsal and a ventral blood-vessel are present. The dorsal vessel is, according to Gaffron, a true muscular heart provided with a pair of dorsally-placed valvular openings on each segment of the body, but without any trace of vessels in connexion with these. It lies as in other Tracheata in a pericardial sinus formed bya horizontally-stretched septum, and especially approaches in its general structure the corresponding organ of Diplopoda.

The ovary in the female is closely similar to that of Lithobius in structure. The animal is viviparous, and the pair of long oviducts function as uterus. In the male the spermatozoa are long and filiform, exactly like those of Lithobius. They are actively mobile, and perform exactly the same movements as those of Lithobius, and, as in that genus, are formed into rod-like spermatophores.

In its embryological development, which cannot here’be followed, conclusions as to the affinities of Peripatus with the Tracheates receive strong confirmation. Early embryos of Peripatus bear a yemarkable resemblance to those of scorpions, spiders, and Myria- pods, and the mode of formation of the procephalic lobes, nerve- system, and limbs is closely similar. The five-jointing of the limbs of the embryo of Peripatus is remarkably similar to that occurring in embryo spiders, such as Agelena. In one important respect the embryonic history of Peripatus differs most remarkably from that of all other Tracheata, as far as is known. A large, open, slit-like blastopore is, as discovered by Balfour, formed in the very carly embryo of P. capensis, This slit closes in its centre, and its ante- rior

extremity apparently remains permanently open as the mouth, whilst its posterior region persists as the anus. In the embryos of other Tracheates the only representative of this no doubt ancestral mode of development surviving is the so-called mesoblastic groove.

The species of Peripatus live in moist places, in hollows in de- eayed wood, and under stones and logs. The animals walk with a gait similar to that of caterpillars, with their bodies completely supported from the ground by their legs. When irritated they eject from their oral papille fine jets of the viscid slime secreted by their slime-glands. ‘These fine jets form networks of fine threads, looking like a spider’s web, which cling to the fingers with the tenacity of bird-lime. The New Zealand species is said to catch insects for food by means of these slime-jets. The animals roll themselves up like Julws when quiescent. They appear to be noc- turnal in habits. :

The group HurracnzaTé may be thus defined—

Tracheata of various form, usually with completely jointed appendages ; never bearing diffuse stigmata indefinite in number, but with not more than two pairs on each somite ; ventral nerve-cords closely approximated, with well-marked infra-cesophageal ganglion, never united posteriorly dorsad of the anus; no segmental organs present; no blasto- pore formed in the embryo; mouth and anus formed as a stomodeum and a proctodzum respectively.

The sub-class Myriapopa may be defined as follows—

Eutracheata with a head distinctly separate from the numerous closely similar posterior somites, with a pair of antenne and two pairs of jaws; with numerous similar jointed walking legs ; Malpighian tubes present.

The Myriapoda, like Peripatus, approach the Annelids in having elongate bodies, either cylindrical or more or less flattened, composed of numerous similar joints or somites. They bear numerous pairs of walking legs on the somites posterior to the head, and in this particular differ most markedly from all insects except some of the most primitive forms, such as the Campodeide, which approach them by the possession of rudimentary abdominal legs, and with which, as will be described, they are possibly

connected to some extent by such a form as Scolopendrella. Some forms (Glomeride) most remarkably resemble woodlice in shape, and hence Latreille's connexion, already referred to, of the Myriapoda with the Isopodous Crustacea. The head of Myriapoda is very like that of Insecta, and bears a single pair of antenne, the eyes when present, and two pairs of jaws. The first pair of jaws, the stout toothed mandibles, are, as in insects, always devoid of palps, but in nearly all cases they are jointed, a primitive condition not occurring in Insects. The second pair, the maxille, are fused together to form a sort of under-lip. In one aberrant family (Poly- zonidz) the mouth parts are formed into a tubular pricking

and sucking apparatus. The body behind the head is composed of distinctly separated similar segments, usually numerous (in Pauropus nine only). There is no division of the body into thoracic and abdominal regions. The ventral nerve-cord stretches the entire length of the body, and is provided with a ganglion more or less distinct for each somite. The first three of its ganglia are fused to- gether. Eyes are wanting in some forms, in others they are present on the sides of the head as simple ocelli or groups of ocelli. In one form only (Scutigera) are they compound and faceted. The structure of the ocelli differs remarkably from that of the simple eyes of spiders, in that the crystalline rods in each ocellus are so placed that their axes lie parallel to the plane of the equator of the simple lens, at right angles to the optic axis of the eye instead of in its direction. They are also not isolated by pigment. Grenacher hence concludes that it is impossible that any definite image can be formed on the rods, so as to convey any impression of it to the retinal cells with which they are in connexion. Hence these eyes must discrimi- nate only variations in intensity of light. In Scutigera the internal structure of the eyes, though closely simulating that of the compound eyes of insects in 'many details, is in reality very peculiar and different from that in all other Arthropods. The digestive canal is simple and straight, except in Glomeridx, and ends in a terminalanus. At the commencement of that portion which acts as a rectum, and which in the embryo is formed from the proctodzum, two or four long coiled urinary tubes (Malpighian tubes), homo- logous with those of insects, open into it. There is a dorsal tubular heart, divided into a series of chambers correspond- ing with the somites,

and, as in insects, contained within a blood sinus (pericardium), formed by a horizontal septum stretched across the body-cavity, and provided with a series of pairs of wing-like muscles (ale cords), by which the sinus- cavity is dilated. Respiration is effected by means of air- tubes or trachez as in insects. In the Diplopoda, except- ing the Glomeridex, in which they are ramified as in the Chilopoda, these are of essentially the same structure as in Peripatus, viz. tufts of unbranched tubes with feebly- developed spiral filaments springing from a common short sac-like chamber (fig. 5). Four of these sac-like chambers

Fic. 5.—Inner view of the sterna of a single segment of Julus lond inensis, much enlarged to show the structure and arrangement of the tracheal organs (after Voges). The two pairs of trachez are seen in situ, the posterior pair over- lapping the anterior. h, posterior margin of the body-ring (tergum); 7, anterior border ; between the two lie the two terga ; st, tubular chamber of trachex ; t, fine trachee given off from it; ms, respiratory muscle attached to tracheal sac ; m, ventral body muscle.

open on the ventral surface of the body by means of two pairs of stigmata on each somite. In the Chilopods wide tracheal tubes with well-developed spiral thickening of their lining membrane, springing directly from the stigmata, freely branching, and often anastomosing like those in in- sects, are always present. In all cases single pairsof laterally-

placed stigmata only are present on each somite. In the aberrant Scolopendrella possibly a single pair of stigmata only are present on the sides of the head, and in Scutigera there are only seven unpaired stigmata present in the middle dorsal line. In this latter form the trachez proceeding from the stigmata are very short ; they branch a few times dichotomously, and then terminate in blind enlargements. From these the air is conveyed throughout the body in connexion with the fat bodies and peculiar folds of mem- brane as far as into the tarsi, the arrangement thus approach- ing somewhat that of the tracheal lungs of Arachnida. Re- markable glandular structures provided with ducts opening to the exterior occur in various Myriapoda. In all the Diplopoda there are rows of apertures placed laterally one on each somite on either side of the body, known as foramina

repugnatoria, because each acts as the opening of the duct of a gland producing an acrid offensive fluid, which is dis- charged by the animal on irritation. In a species of Fontaria, one of the Polydesmidz, as has been recently discovered, this secretion contains a chemical body, probably benzol and petroleum ether, which readily breaks up into prussic acid, and another substance, probably benzaldehyde. The animal thus, when irritated, smells strongly of prussic acid. Similar glands are wanting in most Chilopods, but in Geophilus Gabrielis there are a series of glands opening to the exterior by means of a series of perforated chitinous plates placed ventrally in the median line, which discharge a red fluid, probably of a similar defensive nature.

The foramina repugnatoria of the Diplopods were by early observers mistaken for stigmata, as they correspond in position with the stigmata of the Chilopods. It is worthy of note that, if Moseley's hypothesis that tracheal organs have arisen in evolution as modifications of univer- sally scattered cutaneous glands is correct, the lateral fora- mina repugnatoria and glands of the Julide may be after all to some extent homologous with the lateral stigmata and trachez of the Scolopendridz, the ventral trachez of the Julidx with the ventral glands of Geophilus Gabrielis, whilst the dorsal stigmata of Scutigera represent the sur- vival of part of the dorsal trachese of an ancestral form, with scattered trachee like Peripatus. In some derived forms the glands have survived as trachee in one region of the body, in others in another region, in somite certain of them have remained as glands or reverted to that con- dition, in others they have developed into enlarged trachez.

The generative organs of the Myriapoda are usually elongate, unpaired, tubular organs, often with paired ducts, always provided with accessory glands, and in the female often with a receptaculum seminis. In the Chilopods the ducts open at the hinder extremity of the body; in the Diplopods on the ventral surface of the third somite pos- terior to the head.

The Myriapoda are usually divided into two orders— the Diplopoda and the Chilopoda. Of these the former appears to be the most ancient and primitive, as proved by its general structure, and especially by that of its

trachee, and by geological evidence go far as knowledge extends. They may be thus characterized.

Order Diplopoda (= Chilognatha).

Myriapoda with bodies circular or semicircular in section ; antenne short, of no more than seven joints; no append- ages acting as poison-claws; each somite in the middle and hinder region of the body bearing two pairs of legs ; a variable small number of anterior somites always bearing single pairs only; stigmata ventral, two pairs to each somite; tracheal organs tuft-shaped with sac-like main tube, not branching or anastomosing ; laterally – placed repugnatorial glands present ; a single pair of Malpighian tubes present ; generative organs opening on the third

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post-cephalic somite ; larve at birth provided with only three pairs of functionally active legs.

In the genus Julus, the well-known Millepedes, which may be taken as types of this order, the body is nearly cylindrical, slightly flattened beneath, and composed of a series of chitinous rings, one to each somite, which are bevelled off at their posterior borders for a certain part of their breadth so as to fit each within the next succeeding ring (fig. 6). The rings (‘‘ terga’’) are not com- plete, but interrupted by a narrow in- terval corresponding with the ventral median line, which is closed in each ring by a pair of ventral plates (‘‘ ster- na”) placed one in front of the other. Each of these ventral plates, except in the first four post-oral somites, bears a pair of short jointed legs composed each of five joints and a single terminal claw, the bases of the legs of opposite sides being so closely approximated in the middle .line as to bé in contact. Just in front of the base of each leg is a simple stigma communicating with a tuft-shaped tracheal organ (fig. 5). There are thus two pairs of legs to all except the most anterior somites, and two pairs of trachee. The mandibles mostly have broad chewing surfaces : wales mastication of pégaiiia mat- gn 7 Disgaea ter, The maxille of the two sides are ozoic Diplopoda (after Scud- fused together to form a four-lobed der). 1, cross section of a plate acting as an wnder-lip. There ee See ee are no poison-claws as in the Chilo- ofa recent; 4, of a Paleozoic pods, but the leg-

shaped appendages Diplopod. In 1 and 8 the of the first post-cephalic somite, the SPace occupied by the sterna tergum of which is in most forms en-

3 4

is indicated by fine lines pro- larged and shield-like, are turned to- oe oe breed aa z. wards the mouth, ar | probablyassistin In 2 and 4 the posterior be- the process of feeding. In the males jCled eee the of some forms these appendages are the foramina repugnatoria are shaped into peculiar short blunt grasp- shown.

ing hooks, bearing spines on their bases (fig. 7). Of the succeeding three somites one (the third post-cephalic) is devoid of legs, and also of sternal plates ; the other two bear a single pair of legs each only. The remainder of the somites bear each two pairs of legs (hence the term Diplopoda), except the seventh post-oral in the male, on which a complicated paired copulatory organ, formed out of modifications

Fic. 7.—1, head and anterior somites of Siphonophora portoricensis (after Koch). 2, diagram of the arrangement of the anterior somites and appendages of the female Julus londinensis (original). a, modified tergum of first post-oral somite (dorsal-plate or collum); }, short single appendage of same somite, of four joints and a claw only, turned towards the mouth; ¢, single appendage of second somite of five joints and a claw like the remaining appendages ; d, third or generative somite devoid of appendages and sterna, but bearing the gener- ative apertures ; e, single appendage of fourth somite; f, g, dual appendages of succeeding somites. 3, hook-like first post-cephalic appendage of male of saine attached to its plate of support (= one-half of modified sternum’). 4, reper of same. 5, the four-lobed plate formed by the fused single pair of Inaxille.

of the sterna and other components of the normal somite, is pre: sent. The form of these copulatory organs varies very much in species and genera of Diplopoda, and is of great systematic value. In both male and female Judus the generative ducts open by a pair of apertures on the ventral surface of the third segment, just behind the bases of the second pair of legs, the

copulatory organs in the male being without internal connexion with the ducts of the testis.

The Julidx coil themselves up spirally when at rest or when attacked, like Peripatus, The whole of the Diplopods are vegetable

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feeders. In the tropics very large representatives of the Julidw occur, especially species of the genus Spirobolus, which do consider- able damage in gardens by devouring leaves. In the Polyzonide (fig. 7) the mouth parts are formed into a pricking and sucking beak or tube. In the Polydesinidw the body is semi-cylindrical in section, with the lateral regions of each tergum broadened out into a pair of horizontal projecting plates. In sapag day, the Paleozoic Diplopoda, Lupherberia and its allies, the terga bore each six stout projecting spines, forming rows of spines along the body (fig. 6); the sterna en- closed one-third of the circuit of the body instead of only an insignificant ventral streak as in the Julide. In addition to the stigmata there are found on the ven- tral aspect of these fossil forms certain paired organs supposed by Scudder, who conjectures that these ancient Diplopoda may have been amphibious in habits, to have given support to gills. In the Glo- meridz the body is shortened, of twelve or thirteen somites only, and closely simu- lates that of the woodlouse in appearance. The males of Spherotherium, a genus of this family, possess a stridulating appara- tus at the hinder end of the body

Very important from a zoological point of view are the genera Polyxenus and Paw- ropus, the species of both of which are ex- tremely small. Polyxenus (fig. 8) is about one-twelfth of an inch in length, and has fourteen pairs of legs, only the first four ls 8.—Ventral ye of pairs of which are borne on the first four i ee gh eM = ost-cephalic somites. The body is covered with bundles of hairy scales. In Pauropus 1s i [(fig. 9) only nine pairs of legs arc present. of generpiive opomnee The antenne are branched at their tips; the first post-cephalic somite bears a single pair of legs, the second post-cephalic a single

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tual length a little over yath ofan inch. «, position

Fia. 9.—Enlarged view of Pawropus Huzleyt.

(After Lubbock.)

pair of legs, and the remaining somites, except the posterior which bears a single pair, two pairs each. Sir John Lubbock, the dis- eoverer of this form, which has many aberrant features besides those described above, referred it to a sepayate order of Myriapods,

Pauropoda. Order Chilopoda.

Myriapoda mostly of dorso-ventrally compressed form, with long multi-articulate antenne ; with the second pair of post-cephalic appendages applied to the mouth as poison-claws ; only one sternum and one pair of legs to each somite; stigmata lateral (in Scutigera dorsal); tracheal organs ramified, not tuft-shaped, often anastomosing ; generative openings posterior ; larvee born with more than three pairs of functionally active legs.

In Scolopendra (fig. 10) the body is band-like and flattened dorso- ventrally. The terga and sterna are nearly flat broad plates of chitinous material, connected laterally by more flexible softer skin, in which in each somite lies on either side a single stigma. The corresponding large ramified tracheal trunks, which are provided internally with well-developed spiral filaments, are connected on each side by lateral longitudinal anastomosing tubes. The antenne are many-jointed, long, and tapering; the head is followed by a second compound somite formed of four embryonic somites fused, termed the ‘‘ basilar somite,” which is covered by a single enlarged shield-like tergum. The legs are borne at the lateral margin of the ventral surface, their bases being wide apart ; one pair is present to every post-basilar somite. The mandibles are provided with sharp cutting teeth ; the maxille are fused together in the middle line as in Diplopods. They do not form a plate, but in the centre a small bilobed process only, and bear a pair of soft palps laterally (fig. 11). The basilar somite bears as the first pair of post-cephalic

appendages a pair of palp-like legs turned forwards in front of the mouth, and as the second a pair of large powerful limbs, the poison-claws, provided

with a pair of curved claws perforated at their extremities by the ducts of poison-glands embedded in the claws and their penultimate

joints. ‘The basilar somite may bear posteriorly in addition a pair ~ y of walking legs, but this pair is frequently ‘ aborted in the adult animal. The last pair of

legs at the hinder extremity of the body is elongated and directed backwards in the line * of the body posteriorly. The generative ducts open posteriorly beneath the anus.

The Chilopoda are all carnivorous, catching their prey and killing it by means of the poison- claws. ucorybas ecrotalus of 8. Africa makes 7)’ with its hind legs a rattling noise hke that of v the rattlesnake.

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Fig. 11.

Fig. 10.—Scolopendra morsitans (after Buffon). «, cephalic tergite; b, basilar tergite; c, first post-cephalic appendage (=third post-oral); d, third post- cephalic ; e, antenna; f, second post-cephalie (=poison-claws) ; g, last pair of appendages enlarged and directed backwards.

Fic. 11.—Mouth pairs of Scolopendra morsitans (after Buffon), 1, the poison- claws or fourth post-oral appendages ; s, median cutting processes formed by the anterior edge of the basilar sterna; 2, one of the mandibles with its cutting edge to the left; 3, the maxille and third post-oral appendages a; ¢, palp-like maxilla ; 6, small process formed by their fused bases; 4, ventral view of head with jaws removed ; &, eyes; é, labrum.

Geophilide, which are without cyes, have very long worm-like

bodies, composed of very numerous segments. They live gregari-

ously in moist earth. In Lithobius, the commonest British Cen- tipede, the somites are unequal in size, there being nine larger and six smaller terga and fifteen legs composed each of six joints and

a claw. The genus Scwtigera and its allies form a remarkable

family, Seutigeride (fig. 12), in which the antenne are bristle-like

and as long as the body, and the legs are extremely long, increasing in length towards the hinder end of the body. The peculiarities

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Fic. 12.—A. Scutigera rubrolineata (after Buffon). B. Tergum and part of a second of the same enlarged to show the position of the stigmata 0, 0; p, hinder margin of tergum.

of their eyes and respiratory organs have already been referred to

above. Most important is the aberrant genus Scolopendrelia, which

has lately been shown to have certain marked features indicating alliance to the primitive insects, Thysanwra. ‘The species of Seolo- pendrella are minute forms five or six mm. in length, appearing

(fig. 12), as indicated by the name, at first sight like small Seolo-

pendras (fig. 13). The head and antennx nearly resemble those of

Campodea. The body bears, according to Wood Mason, dorsally

fifteen tergites behind the head, the first of these being quite rudi-

mentary. Ventrally thirteen corresponding indications of somites only can be detected ; and these bear twelve pairs of functional appendages. Two of

the tergites appear to be devoid of sternites and appendages. ‘The first post-cephalic appendages (= third post- orals) are small anid turned towards the mouth ; the eleven following ventrally-indicated somites bear each, besides a pair of functional

ambulatory legs, a second pair of rudimentary appendages lying in- ternally to these latter. The legs are five-jointed and bear each a pair of claws as in Campodca and Peripatus instead of a single claw as in other Myriapoda (Zithobius sometimes bears a pair on the anal legs only). There is a pair of caudal stylets on the last somite per- forated by the ducts of silk glands. The arrangement of the stigmata is nucertain. Hasse finds only a single pair on the head, Wood Mason and , others many pairs on the body so- mites. Peculiar paired segmental organs are present on the ventral surface which may be excretory. It appears not impossible that Seolo- pendrella may have originally pos- sessed two pairs of appendages to each somite, and may thus represent to some extent a transition form be- tween the ancient Diplopoda and the more recent Chilopodous type ; but as theanatomy of Seolopendrelia is as yet imperfectly known, and nothing is known asto itsembryonic development, its place in elassifica- tion must remain for the present au open question. By Ryder a sepa- rate order (Symphyla) has been ‘ formed for it, whilst Packard has placed it amongst the Thysanura notwithstanding its numerous jointed legs, which constitute the most essential distinction of Myria- poda from Insecta.

Remains of representatives of the Chilopoda have not been found in Paleozoic strata. The earliest known are Secondary from the Solenhofen slate.

Fig. 13.—1, Scolopendrella immaculata highly magnified (slightly modified from Packard); a, caudal stylets ; b, b, first post-cephalic appendages ; c, antenne ; 2, one of the functional legs further enlarged (from Wood Mason), showing the five joints and terminal pair of claws ; 0, inner rudi- mentary leg of same somite.

Development of the Myriapoda.—Scolopendrais viviparous like Peripatus, Lithobius lays its eggs loosely amongst earth ; they are very hard to find

there, and nothing is thus known of its development.

The female Geophilus lays her

eggs in heaps and watches

over them; in the case of

Julus the process is similar.

Information as to the develop-

ment of the Myriapoda gener-

ally is at present very imper- fect. In no case as far as yet known is a blastopore formed asin Peripatus. The first struc- ture to appear in Strongylo- soma (Polydesmide) is a ventral

thickened plate. The append- pro 14.

ages are formed in succession G@uerinii just hatched. —

from before backwar ds, aia Balfour, after Metschnikoff.) the mouth and anus as stomodeum and proctodeum.

The embryo when hatched (fig. 14) has nine post-cephalic

somites, the second of which is without appendages, whilst

the first, third, and fourth each bear a functional pair of limbs, the fifth bears two pairs of rudimentary limbs be- neath the larval skin, and the sixth a single pair, which very soon becomes double. The young Strongylosoma is thus provided with three pairs of functionally active legs. The young Julus has a similar number, the third post-cephalic somite being apodous, and it was formerly considered that this fact established a connexion between the Myriapoda and the Insecta, the three pairs of larval legs of the Myriapod being supposed to correspond with the three pairs of legs of insects. Such, however, is not the case ; there being no second maxille in Myriapoda, the first pair of legs in the larva must correspond with the

second maxillz of insects ; and even if this could be shown to be incorrect, the three pairs of legs would still not corre-

Larva of Strongylosoma

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spond with those of insects, because in the young Stron- gylosoma the second and in Julus the third post-cephalic somites are devoid of legs. Moreover, the larve are only apparently hexapodous, not in realityso. In Pawropus there is a hexapodous larval stage. In the Chilopoda no functional]

or real hexapodous larval stage occurs, as far as is known, Bibliography.—Newport, ‘‘ On the organs of Reproduction and Development of the Myriapoda,” in Phil. Trans., 1841; “On the Nervous and Circulatory Systems,” tbid., 1843; Koch, System der Myriapoden, 1847; Karsch, “‘ Zur For- menlehre der pentagonen Myriapoden,” Arch. f. Naturg., 47 Jahrg., pt, ple Kolrausch, ‘‘ Gattungen u. Arten der Scolopendriden,” ibid. ; Grenacher, ‘Uber die Augen einiger Myriapoden,” Arch. f. Mikr. Anat., vol. xviii.; Voges, “ Beitrige zur Kenntniss der Juliden,” Z. f. wiss. Zool., vol. xxxi.; Gulden Steeden-Egeling, ‘‘Hydrocyanic Acid of Fontaria,” in Arch. f. Physiologie, Pfltiger, vol. XXViii. ; Seudder, ‘‘ Archipolypoda, a subordinal Type of spined Myriapods from the Car. boniferous Formation,” in Trans. Bost. Soc. Nat. Hist., vol. iii.; Lubbock, “On Pauropus,” Trans. Linn. Soc., vol. xxvi.; Bode, ‘ Polyxenus lagurus, ein Beitrag zur Anat. &c.,” Zettschr. f. ges. Naturw., Halle, 1877; Ryder, ‘‘The Structure and Affinities and Species of Scolopendrella,” Proc. Acad. Nat. Soc. Philad,, 1881; Menge, ‘‘ Myriapoden der Umgegend v. Dantzig,” Neueste Zschr. d. Naturforsch, Gesell. in Danzig, iv., pt. 4; Packard, ‘*Scolopendrella and its Position in Nature,” Amer. Naturalist, vol. xv.; Wood Mason, ‘“‘Notes on the Structure, post-embryonic Developinent, and systematic Position of Seolopendrella,” Ann, and Mag. Nat. Hist.,1883; Moseley, ‘‘On the Structure and Development of Peri- patus capensis,” Phil. Trans., 1874; Gaffron, ‘‘

Beitrage zur Anatomie und His- tologie von Peripatus,” Zool. Beitrdge von A. Schneider; Balfour, ‘‘The Anatomy and Development of Peripatus capensis,” Quart. Journ. Micros. Sc., 1883, and A Treatise on Comparative Embryology, ch. xvii. (H. N. M.)

MYRISTICA. See Nutmzca.

MYROBALANS, See Lzaruer, vol. xiv. p. 382.

MYRON, one of the chief sculptors of the older Attic school, was born at Eleutherz on the borders of Boeotia and Attica, and flourished in the middle of the 5th century B.C. He was, like Phidias, a pupil of Ageladas of Argos. He worked almost exclusively in bronze; the only known exception is his wooden statue of Hecate at Augina. He made some statues of gods and heroes, but these were not the works on which his fame rested. The ancient critics, as quoted by Pliny, censured his inability to represent the feelings of the mind ; hence the lofty ideals of Phidias and the Attic school in general were beyond the scope of his art. His works seemed to live and move before the spec- tator; but he could make an athlete hurling the discus, not a Zeus hurling the thunder. His most famous works were the Cow, the runner Ladas, and the Discobolus. Of the first, which was esteemed his greatest work, no copy is known, and, though thirty-six epigrams celebrate the realism and the life of this animal, which might be mistaken for a living cow, none of them give any information as to the attitude in which it was represented. The statue of Ladas is also unrepresented in modern museums ; no imitation has yet been found. Ladas, an Argive runner, died from over-exerting himself in the long race at the Olympic games. To judge from two epigrams, Myron represented him in the moment of his supreme effort, with flanks con- tracted as if the last breath had gone out from them and was still hovering on the open lips. The copies that have been preserved of two other works of Myron make it easier to realize the qualities that the ancient critics praise in him. The Discobolus is known from several copies, the best being a life-size statue in the Massimi palace at Rome. The athlete is represented at the moment when, after swinging the discus (five pounds in weight) back to the full stretch of his arm, he is quickening every sinew to begin the forward motion, and to employ in delivering the discus the full strength of

every muscle and the whole weight of the body and the impetus acquired by the longest possible swing of the arm.

A similar moment, the critical point when one motion is suddenly transformed into its opposite, was seized in another work, of which several copies remain. Its discovery is due to the penetration of Brunn, and, thongh his ingenious combination has not yet found universal acceptance, it will probably be confirmed by future dis- covery. He compared arelief on the Acropolis of Athens, described by Pausanias without the artist's name with the words of Pliny, (Myron feet) Satyrum admirantem tibias et Minervam, and recog: nized imitations of this scene on an Attic coin, a vase-painting, and an Attic relief, in which Marsyas is represented starting back with outstretched arms before the goddess Athena. He also recognized the figure of Marsyas alone in a marble statue of the Lateran museum,

which has been restored as a dancing satyr ; and a bronze statue in the British Museum has since been recognized as a slight variation of the same subject. None of these works agree completely with the words of Pausanias or with one another, but the general resem- plance is so striking that they must be free imitations of a single work. Marsyas is surprised either by the sight of the flute which Athena has thrown away or by the threatening action of the god- dess ; his forward motion is suddenly checked, but he has not begun a retrograde motion. His hands, the parts which the mind com- mands most quickly, are thrown wide apart without any definite object in their motion, and the body is poised between the preced-

ing action and the new action that will begin immediately. Pliny mentions a competition between Myron and Pythagoras of Rheginm, in which the Pancratiast of the latter was adjudged superior.

MYREH is a gum-resin highly esteemed by the ancients as an unguent and perfume, used for incense in temples and also in embalming. The word is Semitic; it appears in the Old Testament as 719 (Exod. xxx. 23; Ps. xlv, 8; Cant. passim), in Arabic as "morr." In Exod. (/.c.) "pure myrth" should rather be "flowing myrrh," that is, the "myrrha stacte" of classical writers, —the finest myrrh, ac- cording to Pliny (xii. 35), exuding without incisions

in the bark. So Johnson! says that it exudes from cracks in the trunk near the root and flows freely on stones under- neath, the exudation being sometimes aided by bruising the bark with a stone. Myrrh was one of the gifts offered by the Magi, and a royal oblation of gold, frankincense, and myrrh is still annually presented by the queen on the feast of Epiphany in the Chapel Royal in London, this custom having been in existence certainly as early as the reign of Edward 1.2 Until the present century the botanical source of myrrh was enveloped in great obscurity. In 1826 Ehrenberg brought home specimens of the myrrh trees found at Jizdn on the east side of the Red Sea, in lat. 16° 40’ N., and also on the neighbouring mountains of Jara. The more recent investigations of Hildebrandt (1878) show that one of the plants brought home by Ehrenberg and named Balsamodendron Myrrha yields the true myrrh. It was found by Hildebrandt growing on sunny slopes of the Sarat mountains at an elevation of 1600 to 3200 feet. It forms a low tree, attaining a height of not more than 10 to 12 feet, with thorny branches and a light grey bark, bearing some resemblance to those of the hawthorn, The leaves are ternate, the two lateral leaflets being minute in comparison with the central one ; they are smooth, obovate, and denticulate. The fruit is about the size of a pea, oval and somewhat compressed. The tree grows interspersed among Acacix and Huphorbix in dwarfish thickets. The myrrh, according to Ehrenberg, when it first exudes is of an oily and then of a buttery con- sistence, and of a yellowish white colour, gradually assum- ing a golden and ultimately a reddish tinge as it hardens. Myrrh is chiefly collected, according to Vaughan,® in the Somali country and in the neighbourhood of Harar (9° 20! N., 42° 17’ E.) south-west of Zeila, in the months of July and August (Johnson, loc. cit.), and is brought to the great fair of Berbera held in November, December, and January. Thence it is transported to Aden and shipped to Bombay, where it is sorted, the inferior kinds being sent chiefly to China and the finer sorts to Europe. The Banians of India, who trade in myrrh, have their’ business houses at Bombay, but employ partners or agents, who reside at Makallah and Aden to attend the fair at Berbera, and ex- change Indian or English piece goods for myrrh, bdellium, and frankincense. Myrrh of the best quality is known as Turkey myrrh, and the inferior quality as East Indian myrrh, from being exported from Bombay. At the present time, however, all myrrh is imported either direct from Aden or from Bombay. The Somalis also cross over to

1 Travels in Abyssinia, i. 249.

- Liber quotidianus Contra-rotulatoris Garderobe Edw. I., Lond., 1787, pp. xxxii, and 27. 3 Pharm. Journ., (1), xii. p. 227.

the Arabian shore and collect this gum-resin on the hills about Shugra and Sureea to the east of Aden, where myrrh trees abound. The myrrh of this district differs slightly in appearance, and is less resinous than that of Somali Land, and in the opinion of Hanbury (Pharm., p. 143) is probably the produce of a distinct species of Balsamoden- dron. The difference between African and Arabian myrrh was known to the ancients, who considered the Troglodyte or African myrrh the best. At Bombay this difference is still recognized. Specimens of the Arabian myrrh tree collected by Wykeham Perry in 1878 were less spinous than those of the Somali plant, but were too imperfect to determine if they belonged to a distinct species. Balsamo- dendron Kua, R. Br., a small spiny Abyssinian species allied to B. Myrrha, as yet undescribed, was found by Salt to yield myrrh.

Myrrh is usually imported in chests containing from one to two cwt., and is mixed with other gum-resins obtained from different species of Balsamodendron. The principal of these are subjoined.

(1) Baisa Bol, Bhesa Bol, or Bissa Bol, probably the produce of Balsamodendron Kataf, Kunth, a tree which is known to the Somalis as hebbakhade, and which has much larger leaves than the myrrh tree. This gum-resin resembles myrrh in appearance, but has a disagreeable taste and is scarcely bitter. At Aden bissa bol is worth only 24 rupees per maund (28 ib), while myrrh sells for 9 rupees per maund. It is used in China, mixed with food, to give to milch cows to improve the quality and increase the quantity of milk, and when mixed with lime as a size to impart a gloss to walls. (2) Opaque bdellium, probably identical with the gum hotai described by Vaughan (oc. cit.), and produced by B. Playfair. When shaken with water it forms a slight but permanent lather, and on this account is used by the Somali women for cleansing their hair and by the men to whiten their shields. It is known as meena hdrma in Bombay, and is there used for the ex- traction of the guinea-worm. (8) African bdellium is the

produce of B. africanum, and is probably the tree described by Adanson as Wistoutt. The last two gum-resins are without the white streaks which are characteristic of myrrh and bissa bol; the former presents an opaque and the latter a resinous appearance, both being acrid, but having scarcely any bitterness or aroma. (4) Indian bdellium, probably identical with the Indian drug googul obtained in Scinde and Baluchistan from Balsamodendron Mukul and B. pubescens, Hook, has an acrid taste, an odour resembling cedar-wood, and softens in the hand. It is probably the produce of B. Afukul which has recently been found by Balfour in Socotra.

As met with in commerce true myrrh occurs in pieces of irregular size and shape, from half an inch to 2 or 3 inches in diameter, and of a reddish-brown colour. The transverse fracture has a resinous appearance with white streaks; the flavour is bitter and aromatic and the odour characteristic. It consists of a mixture of resin, gum, and essential oil in varying proportions from 23 to 44 per cent., the resin being present in good specimens to the extent of 27 per cent., and the oil from } to 3 per cent. The resin appears to. be a complex body, partly soluble in ether and partly in bisulphide of carbon. The gum is soluble in water and forms an adhesive mucilage. The odour of myrrh is due to the volatile oil, which is heavier than water. The bitterness is believed to be due to a glucoside, the chemical constitution of which has not been ascertained. It is obtained by treating with warm water the resin extracted by means of alcohol.

Myrrh is used in medicine at present chiefly as an auxiliary to

other drugs, such as iron and aloes, in order to strengthen and modify their action. It appears to have a special action on the

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mucous membrane, improving the quality of its secretions and diminishing them in quantity when excessive. When taken internally it produces a sensation of warmth extending over the whole abdomen. The appetite is increased and the digestive process much facilitated, especially in cases in which there is weakness and torpidity of the intestinal canal. As au

emmenagogue It 1s found especially useful where pulmonary complications exist. The tincture diluted with water is used as an application to spongy gums and the aphthous sore mouth of children. : ; mM The Hebrew Jét, erroneously translated myrrh in Genesis xxxvil. 25; xlili. 11 (Sept. craxry ; Vulg. staete), is generally identified with ladanwm (vol. xii. p. 718), which has been used as a medicine and perfume from the earliest times,! and is still an article of commerce in Turkey. An excellent account of the mode of collecting it is

iven by Tournefort (Voyage, i. 79). O Pllop ih. —Forsk®, Fl, Agypt. Arab., p. 80; Nees, Beschreib. Officin. Pflanzen, p. 357, 1829; Marehand, Adansonia, vil. p. 258 ; Pharmacographia, 2d ed., pp. 140-146; Bentley and Trimen, Medicinal Plants, p. 60; Pharmaceutical Journal, (1), xii. pp. 226, 227; (8), vi. p. 6615 (3), ix. p. 893 5 (3), x. pp. 80-845 xi. pp. 41, 42; Cooke, Report on Gum-Resins in the India Museum, 1874, p. 72; Hil-debrandt in Sitzungsbericht d, Gesellsch. naturforsch. Freunde, Berlin, November 1878, p. 196. CE. M. H.)

MYRTLE. The pipros of the Greeks, the myrtus of the Romans, and the Myrtle, Afyrtus communis, of botanists, as now found growing wild in many parts of the Mediterranean region, doubtless all belong to one and the same species. It is a low-growing evergreen shrub, with opposite leaves, varying 1n dimensions, but always small, simple, dark-green, thick in texture, and studded with numerous receptacles for oil. When the leaf is held up to the light it appears . as if perforated with pin-holes owing to the translucency of these oil-cysts. The fragrance of the plant depends upon the presence of this oil. Another peculiarity of the myrtle is the existence of a prominent vein running round the leaf within the margin. The flowers are borne on short stalks in the axils of the leaves. The flower-stalk is dilated at its upper end into a globose or ovoid receptacle enclos- ing the 2- to 4-partitioned ovary. From its margin proceed the five sepals, and within them the five rounded, spoon- shaped, spreading, white petals. The stamens spring from the receptacle within the petals and are extremely numer- ous, each consisting of a slender white filament and a small yellow two-lobed anther. The style surmounting the ovary is slender, terminating in a small button-like stigma. The fruit is a purplish berry, consisting of the receptacle and the ovary blended into one succulent investment enclosing very

numerous minute seeds destitute of perisperm. The embryo-plant within the seed is usually curved.

In cultivation many varieties arc known, dependent on variations in the size and shape of the leaves, the presence of so-called double flowers, &c. The common myrtle is the sole representative in Europe of a large genus which has its headquarters in extra-tropical South America, whilst other members are found in Australia and New Zealand. The genus Myrtus also gives its name to a very large natural order, the general floral strueture of which is like that of the myrtle above described, but there are great differences in the nature of the fruit or seed-vessel according as it is dry or capsular, dehiscent, indehiscent, or pulpy. Minor differences exist according to the way in which the stamens are arranged. The aromatic oil to which the myrtle owes its fragrance, and its use in medicine and the arts, is a very general attribute of the order, as may be inferred from the fact that the order includes, amongst other genera, the Eucalyptus, the Pimenta, and the Eugenia (cloves). Brazil nuts,

sapucaya nuts, and souari nuts are all produced by trecs belonging to this order.

MYSIA, in ancient geography, was the name given to a province in the north-west of Asia Minor, which was bounded by Lydia and Phrygia on the S., by Bithynia on the N.E., and by the Propontis and Aigean Sea on the N. and W. But its precise limits are very difficult to assign,—the frontier on the side of Phrygia being, as observed by Strabo himself, very vague and fluctuating, while the north-western corner of the province, adjoining the Hellespont, was usually separated from Mysia under the name of the Troad, a district which was sometimes included in the name of Mysia, sometimes not. The river Alsepus, according to Strabo, constituted

? Celsus, Hierobot, i. 280-286 ; Herod., iii. 112; Dioseorides, p. 128.

the boundary between the two, but on this subject also there was much discrepancy among ancient geographers,

The physical geography of Mysia (considered apart from that of the Troad) is characterized by two mountain- chains: that of Olympus in the north, which may be regarded as constituting the boundary between Mysia and Bithynia, and rises to a height of more than 6000 feet ; and that of Temnus in the south, which for some distance separates Mysia from Lydia, and is afterwards prolonged through the former province to the neighbourhood of the Gulf of Adramyttium. The only considerable rivers are the Rhyndacus and its tributary the Macestus in the northern part of the province, both of which have their sources in the high tableland of Phrygia, and, after diverging widely in their course through Mysia, ultimately unite their waters below the Lake of Apollonia at a dis. tance of only about 15 miles from the Propontis. The Caicus in the south takes its rise in Mount Temnus, and from thence flows westward to the Algean Sea, passing within a few miles of the city of Pergamum, and dis- charging its waters into the Elaitic Gulf. In the northern portion of the province are two considerable lakes: that of Apollonia, formed by the expansion of the waters of the Rhyndacus, and nearly 50 miles in circumference; and that of Miletopolis, about 30 miles round, the waters of which are discharged into the Macestus.

The most important cities of Mysia were Pergamum in the valley of the Caicus, about 20 miles from the sea, which under the successors of Alexander became the seat of a flourishing Greek monarchy (see PercaMumM), and Cyzicus on the shores of the Propontis, a Milesian colony, which attained to a high degree of wealth and prosperity. But the whole of the sea-coast from thence round to the Gulf of Adramyttium was studded with a series of Greek towns, extending along the south shore of the Propontis, as well as the Hellespont and the Troad, several of which were places of considerable importance, including Parium, Lampsacus, and Abydos. In like manner the whole sea- coast from the Gulf of Adramyttium to the mouth of the Caicus, and from thence to the Elaitic Gulf, was occupied by Greek colonies, many of them dating from a very early period, and for the most part of AMolian origin, from which circumstance the whole of this coast district was known by the name of ANolis, as the corresponding district between Lydia and the sea was called Ionia (Alonis).

The most considerable of these Greek towns were Assos and Adra-myttium, on the gulf that derived its name from the latter city, and farther south, on the Elaitic Gulf, Ela, Myrina, and Cyme.

Ancient writers all agree in describing the Mysians as a distinct people, like their neighbours the Lydians and Phrygians, though they never appear in history as an inde- pendent nation. Their ethnological relations, like those of the other tribes of western Asia, are rather obscure; but it appears from Herodotus and Strabo that they were a kindred race with the Lydians and Carians, a fact attested by their common participation in the sacred rites at the great temple of Zeus at Labranda, as well as by the state- ment of the historian Xanthus of Lydia (a competent authority upon such a point) that their language was a mixture of Lydian and Phrygian. Strabo was of opinion that they came originally from Thrace, and were a branch of the same people as the Mysians or Meesians who dwelt on the banks of the Danube, —a view not inconsistent with the preceding, as he considered the Phrygians and Lydians also as having migrated from Europe into Asia. According to a Carian tradition reported by Herodotus (i. 171) Lydus and Mysus were brothers of Car,—an idea which also points to the belief in a common origin of the three nations. The Mysians appear in the list of the ‘Trojan allies in

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Homer ; but nothing else is known of their early history.

The story told by Herodotus (vii. 20) of their having invaded Europe in conjunction with the Teucrians before the Trojan War is probably a mere fiction ; and the first historical fact we learn concerning them is their subjuga-

tion, together with all the surrounding nations, by the Lydian king Croesus. After the fall of the Lydian monarchy they naturally passed under the Persian empire, and so continued until its overthrow by Alexander. After the death of the conqueror they were annexed to the Syrian monarchy, of which they continued to forma part until the defeat of Antiochus the Great

(190 B.c.), after which they were transferred by the Romans to the dominion of Eumenes, king of Pergamum, as a reward for his services during the war. After the extinction of the Pergamenian dynasty (130 B.c.) Mysia became a part of the Roman province of Asia, and from this time disappears from his-

tory. The inhabitants probably became gradually Hellen-

ized, but none of the towns of the interior, except Pergamum, ever attained to any importance.

The only relic of the Mysian language is a very short inscription found by Mr Frank Calvert in the acropolis of

Thymbria, and supposed by Professor Sayce to be in the Mysian dialect, but its evidence is very inconclusive. MYSORE or Maisur (i.c., Mahesh-asura, “ Buffalo- demon ”) is a native state in southern India, lying between 11° 40’ and 15° N. lat. and 74° 40’ and 78° 30’ E. long., and surrounded entirely by British territory, with an area of 24,723 square miles. The Mysore country above the Ghats, though frequently called “the tableland,” is by no means flat or a plain, but is in some parts mountainous and everywhere undulating. Deep ravines are situated in the angle where the Eastern and Western Ghats converge into the group of the Nilgiri hills. An interesting feature of the country is the large number of isolated rocks (drig, “difficult of access”) which often rear their heads as stupendous monoliths to the height of 4000 or 5000 feet above sea-level. Some of these rocks—in particular Nandidrig (4810 feet) and Savandrig (4024 feet)—have been the scene of many a hard-fought contest, while Kabaldrig obtained an evil fame as a state prison. The eight highest peaks in Mysore are Muldina-giri (6317 feet), Kuduri-mukha (6215), Babé Budan-giri (6214), Kalhatti (6155), Rudra-giri (5692), Pushpa-giri (5626), Merti-gudda (5451), and Wodin-gudda (5006 feet). Five of these are comprised in the Ba4b&é Budan or Chandradrona range, a magnificent horse-shoe-shaped cluster of mountains. My- sore is naturally divided into two regions of distinct character—the hill country called the Malndd, on the west, and the more open country known as the Maidan, comprising the greater part of the state, where the wide-spreading valleys and plains are covered with villages and populous towns. The drainage of the country, with a slight exception, finds its way into the

Bay of Bengal, and is divisible into three great river systems—that of the Krishna on the north, the Cauvery on the south, and the Pennair, Penar, and Palar on the east. A few minor streams flow west into the Arabian Sea. Owing to either rocky or shallow beds none of the Mysore rivers are navigable, but some are utilized for floating down timber at certain seasons. The main streams, especially the Cauvery and its tributaries, support an extensive system of irrigation by means of channels drawn from immense dams (anicuts), which retain the water at a high level and permit only the overflow to pass down stream. The streams which gather from the hill-sides and fertilize the valleys are embanked at every favourable point in such a Manner as to form a series of reservoirs or tanks, tlie out- flow from one at a higher level supplying the next lower, and so on, all down the course of the stream at short

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intervals. These tanks, varying in size from small ponds to extensive lakes, are dispersed throughout the country to the number of 20,000; the largest is the Sulukere Lake, 40 miles in circumference.

The census of 1881 returned the population of Mysore at 4,186,188 (males 2,085,842, females 2,100,846), viz., Hindus 3,956,336, Mohammedans 200,484, Christians 29,249, ‘‘others” 119. The population of the chicf towns in the exccutive districts was as follows:—Bangalore, 155,857 ; Mysore, 60,292; Shimoga, 12,040; Kolar, 11,172; Tumkdtr, 9909; Chikmagalur, 7088; Hassan, 5950; and Chitalchoog, 4271. In 1880-81 out of a total of 4,280,674 acres of cultivable land 3,139,560 were occupied by rdégi and other dry crops, 554,752 by rice, 21,058 by wheat, 147,464 by oil-secds, 24,076 by sugar cane, 20,893 by cotton, 159,165 by coffee, 185,542 by cocoa- nut and areca-nut, and the remainder by fibres, tobacco, vegetables, mulberry, pepper, and lac. Two cinchona plantations have becn recently established, and promise good results. In the Lal Bagh or Government garden at Bangalore, attempts have been made with some success to grow vanilla, cocoa, rhea, ipecacuanha, and various other exotic plants, while the culture of apples, peaches, straw- berries, and other fruits has been greatly improved.

The drought which affected all southern India in 1876-78 fell with especial severity upon Mysore. From October 1875 to October 1877 four successive monsoons failed to bring their full supply of rain. The harvest of 1875 was gencrally below the average, and remissions of revenue were found necessary ; but it was not till the close of 1876 that actual famine occurred. During tho wholo of 1877 famine was at work ; but in October of that year the monsoon broke with a fair rainfall, and cultivation at last became possible. It will, however, take many ycars before Mysore recovers its normal ~ condition of prosperity ; and it is estimated by competent authorities that one-fourth of the entire population of the state was swept away by starvation or disease, while the mortality among cattle was yet more heavy. In 1880-81 also 200,000 head of cattle perished. In September 1877, when affairs were at. their worst, no less than 280,000 persons were in receipt of relief. The total amount ex- pended on state relief, apart from loss of land revenue, was upwards of a million sterling.

The chicf manufacture of Mysore is iron-smelting at Bangalore. Gold-mining is pursued in Kolar and Bangalore (since 1881) dis- tricts. Jewellery is a speciality of Bangalore. Carpets, rugs, cotton textures, silk cloths, cumblics, &c., are also manufactured, the total estimated value being 6,281,651 rupees. Sandal-wood, which forms a state monopoly, yields an average annual income of about £15,000. The Madras railway runs through the state. An excellent net-work of provincial and district roads intersects the state, and great attention has been paid to the numerous passes through the Western Ghats to the low country beyond.

The total revenue for 1880-81 was 10,270,383 rupees. Local funds to the extent of 700,697 rupees were also levied for the main- tenance of district roads and tanks, and for the support of village schools. Municipalities have been established at all district head- quarters, and also in sixty-seven other towns. The system of judicial procedure, both civil and criminal, has been assimilated to that in force in British territory. Mysore pays a yearly subsidy to the British Government of 2,450,000 rupees for the maintenance of a force for the defence of its territory. Thero is also a local force. In 1880-81 the total number of schools of all classes in the state was 899 Government schools and 1881 aided schools, tho total number of scholars being 42,657.

There are in all 20 hospitals or dispensaries ; the average daily attendance in 1880-81 was 1500.

In the carliest historical times the northern part of Mysore was held by the Kadamba dynasty, whose capital, Banawasi, is men- tioned by Ptolemy; they reigned with more or less splendour during fourteen centuries, though latterly they became feudatorics of the Chalukyas. The Cheras were contemporaries with the Kadambas, and governed the southern part of Mysore till they were subverted by the Cholas in the 8th century. Another ancient race, the Pallavas, held a small portion of the eastern side of Mysore, but were overcome by the Chalukyas in the 7th century A.D. These were overthrown in the 12th century by the Ballalas, an enter- prising and warlike race professing the Jain faith. They ruled over the greater part of Mysore, and portions of the modern districts of Coimbatore, Salem, and Dharwar, with their capital at Dwara- samudra (the modern Halebid) ; but in 1810 the Ballala king was captured by Malik Kafur, the general of Ala-ud-din ; and seventeen years later the town was entirely destroyed by another force sent by Muhammad Tughlak. After the subversion of the Ballala dynasty, a new and powerful Hindu sovereignty arose at Vijaya- nagar on the Tungabhadra (see INDIA, vol. xi. p. 794). In 1565 a confederation of the Mohammedan kingdoms defeated the Vijaya- nagar sovereign, Raja Ram, at the battle of Talikot ; and his descendants ultimately became extinct as a ruling house. During the feeble reign of the last king, the petty local chiefs (paligars) asserted their independence. The most important of these was

the wodeyar (‘‘lord”) of Mysore, who in 1610 seized the fort of Seringapatam, and so laid the foundation of the present state. His fourth successor, Chikka Deva Raj, during a reign of thirty- four years, made his kingdom one of the most powerful in southern India. In the 18th century the famous Haidar Ali usurped the throne, and by his military prowess made himself one of the most powerful princes of India. His dynasty, however, was as brief as it was brilliant, and ended with the defeat and dcath of his son Tipu at Seringapatam in 1799. A representative of the ancient Hindu line was then replaced on the throne. Owing to his career of

misgovernment, the British administration assumed the authority in his name in 1831. He died in 1868, leaving an adopted son, Chikka Krishna Arasu, a minor, during whose pupilage and train- ing the state management was conducted by British officers. The full sovereignty of the state was handed over to him in March 1881. Mysore, the ancient capital of the above state, 1s situated 10 miles south-west of Seringapatam, in 12° 18’ N. lat. and 76° 41’ E. long., with a population of 60,292 in 1881. The town, which is spread over an area of about 3 square miles, lies at the foot of the Chdamundi hill, in a valley formed by two parallel ridges running north and south. The streets generally are broad and regular, except in the fort. The majority of the houses are tiled, and some of them are substantial buildings two or three stories high. Altogether, the town has a clean and prosperous look, and its sanitary condition has been greatly improved of late years. The fort stands in the south of the town, forming a quarter by itself; the ground-plan is quadrangular, each of the sides being about 450 yards long. In the interior is the palace of the maharaja, built in an extravagant style of Hindu architecture, and adorned inside with a few paintings by a European artist, the principal object of interest being the throne, which is said to have been presented to Chikka Deva Raj by the emperor Aurangzeb. A new palace has been erected at Bangalore for the young maharaj4. Opposite the western gate of the fort is a lofty and handsome building known as the Mohan Mahal, erected by the late maharaja for the entertainment of the European officers. The houses of the European residents are, for the most part, to the east of the town. The residency was built by Colonel Wilks in the beginning of this century. It has a handsome portico; and a room at the back, added by Sir John Malcolm, is said to be the largest in India. The building now used for the district offices was originally built by Colonel Wellesley (duke of Wellington) for his own occupation. Mysore was the capital of the state up till 1831, when on the British occupation the seat of adminis- tration was removed to Bangalore. (W. W. H.) MYSTERIES. This name was applied to certain cere- monies in Greek religion which were esteemed peculiarly sacred and might not be freely spoken about. The sub- ject is one of great difficulty on account of the absolute silence maintained with regard to it by many writers, and the guarded terms in which the few references to it are couched, The obligation to silence was not felt by the Christian writers, and it is to them that we owe most of our knowledge. Their testimony is of doubtful value, and it has been keenly debated whether any trust can be

placed in it; but it is in such perfect accord with the few refer- ences In pagan authors that this scepticism is unjustifiable. The Christian writers on whom we have to depend were arguing against pagan opponents, and their arguments would have lost all force if it had been possible to retort that the descriptions and facts were inaccurate. The Mysteries were the chief stronghold of those pagan con- troversialists who maintained that all the truths and the morality advocated by the Christian writers were contained in the Greek religion, and therefore the Christians directed their arguments chiefly against this strongest part of their opponents' case. It results from a study of the evidence that, on the whole, they stated the case in favour of the Mysteries with much clearness and fairness, admitting

the good points, but directing their polemic against the weak side.

Of the many Mysteries which existed in different parts of Greece, the Eleusinian were the most famous, the most widely popular, the most representative in every way. In several parts of Greece—e.g., at Phlius—there were Mys. teries directly adopted from Eleusis ; in other places, such as Lerna, Andania, &c., a genuine old mystic cultus was greatly modified by the same example.! The Christian writers therefore direct their polemic mainly against the Eleusinian Mysteries, and the material for study is far less scanty in their case than in any other. The following remarks, accordingly, will be almost entirely confined to them. Any discussion of the subject must be founded on Lobeck's great work Aglaophamus (1829), in which, with equal learning and acuteness, he destroyed once for all the a proort theories current before his time, that the Mysteries enshrined a primitive revelation of divine truth made to mankind, or contained a philosophic doctrine borrowed by the Greeks from the wisdom of the East and handed down unmodified from generation to generation.2 As a con- structive work, Lobeck's treatise is not so perfect. What we are in search of is not so much the objective facts of the Mysteries as the place which they held in the Greek mind. The effect of a religious institution like the Mys- teries depends chiefly on subjective considerations ; actions and rites in themselves quite commonplace may bear to the eye of faith the most sacred and impressive character. This point of view is not taken into account by

Lobeck. Again, the polemical character detracts from the value of his work as a final statement of the question; he is some- times satisfied with proving that ancient evidence does not bear out the theories which he combats, but he does not estimate duly its actual worth. Finally, additional evi- dence has been accumulated since his time ; inscriptions and works of art have afforded important corroborative evidence, and it is certain that statements which Lobeck set aside as not referring to the Eleusinian religion do really relate to it.?

There is no ancient authority to show that the ritual of the Mysteries differed essentially from that of the general religion of Greece. All ancient testimony tends to prove that the ritual was based on religious myths, similar to those which were common in Greece, and that the difference between mystic and exoteric rites lay chiefly in the accompaniments. Atheneus* says that the Mysteries were distinguished from the ordinary festivals by their peculiar magnificence and expense, and by the ““inystic paradosis” which took place at them, 2.¢., certain sacred things were exposed in a peculiarly impressive manner to the worship of the participants. Their magnti- ficence must have been very great. Painting, sculpture,

1 The contrast between the account given by Pausanias of the Mysteries of Andania in the 2d century after Christ and the account given in the great inscription 91 B.c. shows how the example of Eleusis had worked in the interval.

- The chief older theories of the Mysteries were those of Warburton, St Croix, and Creuzer.

3 The principal special authorities on the Mysteries since Lobeck are :—Sauppe, Mysterieninschr. von Andania ; Foucart’s commentary on this inscription in Le Bas, Voyage Archéol. (1847-77), Inser. de la Peloponn.; Foucart, ‘‘Inscr. d’Eleus.” in Bull. Corr. Hell,, 1880 ; id., Associations Relig. chez les Grecs ; C. Lenormant in Mém. de U Acad. a’Inscr. et de Belles Lettres, xxiv. 343 ; Guignaut, ‘‘ Myst. de Cer. et de Pros.,” ibid., xxi. 68; K. O. Miiller in Ersch and Gruber’s Allg. Lncyk., art. ‘‘Eleusinia ;” id. in Orchomenos, p. 453; Preller in Pauli’s Realencyklop., arts. ‘‘Eleusinia,” ‘* Mysteria,” ‘¢ Orpheus,””—the best statement of the subject ; id., Demet.

und Perseph.; Gerhard, Griech. Mystericnbilder ; id., Ueber d. Bilderkreis von El. (1863-65) ; Stephani in Compte Rendu, St Petersb., 1859 ; Millingen in Annali Inst. Arch, vol, xv.3 A. Mommsen, Heortologie (1864); F, Lenormant, Réch. Archéol. & El.; id., La Voie Sacrée Eleus.; id., ‘‘Eleus. Myst.” in Ninetcenth Century, 1881, May, J uly, September.

4 Athen., ii. p. 40 D.

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architecture, music, dancing, &c., were combined with lavish

The strictest secrecy was enjoined and observed in regard to the Mysteries and everything connected with them ; put this secrecy was not that of a narrow cult, confined to a small number of participants. The Eleusinian Mysteries were open as early as the time of Herodotus to any of the Greeks who wished to be initiated.2 There was, therefore, no secret to keep inviolate from the uninitiated. Just as in the actual representation of the Mysteries a silence so strict as to be proverbial? was maintained, so it was a condition of their good effect that they should not here- after be lightly spoken of. Those who believed in the Mysteries kept in their heart, as a saving and sacred pos- session, the knowledge of what they had seen and heard and kissed and handled; the thought was too holy to be rashly spoken of, even to the initiated.® Numerous refer- ences prove that this mystic silence was generally very carefully observed. In the poets we sometimes find an affectation of observing silence about myths which are quite common property ; and writers of religious or super- stitious character frequently make a mystic secret of matters that less scrupulous writers speak freely about.® The degree to which silence was observed depended entirely on the individual conscience, and the fact that it was in general so strictly maintained is the best proof of the vitality and power of the Mysteries over the popular mind.

The saving and healthy effect of the Eleusinian Mysteries was believed in not only by the mass of the people but by many of the most thoughtful and educated intellects, Pindar, Sophocles, Isocrates, Plutarch, &c.’ Plato, who finds no language too strong to stigmatize the demoralizing effect of the Orphic Mysteries, speaks of the Eleusinia with great respect; he compares

the contemplation of the “ideas” by the disembodied souls to the contemplation of the “phasmata”® revealed in the Mysteries. This saving power is expressly connected with the future life; he that has been initiated has learned what will ensure his happiness hereafter. This point, which is ridiculed by Lobeck (pp. 70-1), must be examined carefully. The words of Pindar, Sophocles, Isocrates agree with the words of the Homeric Hymn (1. 480) that the initiated have peculiar advantages in the future world, and many other passages are equally clear and distinct. Lobeck maintains that they have no special meaning, inasmuch as Isocrates says the same about all men who live an upright life.® This argument misses the most important religious ques- tion with regard to the subject,—lIs the salvation in the future life, which is assured by initiation, attained by mere ritualistic observances, or does it depend on the effect produced by initiation on the life and character of the Initiated person? Plato condemns in the strongest terms the Orphic Mysteries, which promise salvation in return

! Inscription published by Foucart in Bull. Corr. Iell., 1880.

2 Herod., viii. 65. It was an accusation against Socrates that he alone of all the Athenians had not been initiated, Lucian, Dem., ix. 237 ; Lobeck, p. 21.

3 Philostr., Vit. Apoll., i. 15, 17, damep év uvornplots éowrwy, &c.; see Lobeck, p. 67.

: Strab., p. 357, 4 xpvyus 7 mvorikh ceuvorroret 7d Oetov.

‘ Macrob., Sat., i. 18, 286; Lobeck, p. 135.

; Theocr., iii. 50, and many passages in Herod. and Paus.

’ Pind., fr. 102; Soph., fr. 719, Daf. ; Isocr., Pan., vi. p. 59, § 28 ; Crinagoras in Jac., Anthol., ii. 382; Cic., Legg., ii. 14; Lobeck, § 11.

‘ Plat., Phedr., p. 250, Epin., p. 986.

Isocr., Symmach., xii, 266.

for mere ritualistic acts of purification and initiation ; if he respects the Eleusinian Mysteries, which also promise salvation as the reward of initiation, this can be only because he believes that they promise it on different grounds. ‘The reason is explained by Isocrates, who expressly says that this salvation in the future life, the reward of the initiated, is gained by all who live a pious and just life. In like manner, Diodorus says that the initiated are said to grow better; and Andocides makes a similar remark about the object of the Mysteries. Accord- ing to Sopater, initiation establishes a kinship of the soul with the divine nature; and Theon Smyrneus says that the final stage of initiation is the staté of bliss and divine favour which results from it.!°

These quotations prove the general belief that the aim of the Eleusinian Mysteries was high, and that a lasting effect was produced by them on the initiated. This im- plies a high stage of religious thought, such as no other ancient faith, except that of the Hebrews, attained ; but a passage in a Rhodian inscription of the 5th century B.c. shows that this idea was not wholly unfamiliar in Greek religion. The first and most important condition required of those who would enter the temple at Lindus is that they be pure in heart, and not conscious of any crime ; conditions of ceremonial purity are enumerated as secondary matters.!! Now, with regard to the profanation of the Mysteries by those persons who ridiculed them, it is easy to understand that the very simple character of the rites, the commonplace nature of the sacred things which were exposed as the crowning ceremony of the Mysteries to the adoration of the people, lent themselves readily to ridicule when contrasted with the solemn preparations that led up to the crowning act, and the great effects that were expected from the initiation. The people who had been initiated, who believed in the salutary effect of the admission to handle and kiss the sacred objects, were naturally both shocked and indignant at the ridicule thus cast on their holy sacra- ment by the pitiless analysis of a cold disbelieving intellect. They felt that more than met the eye existed in these sacred things. The Mysteries occupied a place among the ancients analogous to that of the Holy Sacrament in the Christian church. The intention was to admit all that were not notoriously wicked ; the disqualifying crime was unexpiated murder. The belief was entertained that the solemnity and impressiveness of the ceremony tended to produce a strong effect on the character of the initiated.

There is overwhelming proof in ancient writers that the effect of the Mysteries was not dependent on any dogmatic instruction. Even the doctrine of a future life, which is always associated in the old writers with the Mysteries, was not expressly inculcated in them, but left to the spec- tators to gather for themselves from the spectacle presented. to them.!2 On the other hand, ancient testimony shows a striking unanimity in describing the manner in which the Mysteries were believed to educate the people. One of the most important passages is that where Galen main- tains that the study of nature, if prosecuted with the con- centrated attention given to the Mysteries, is even more fitted than they are to reveal the power and wisdom of God, inasmuch as these truths are more obscurely expressed in the Mysteries than in nature. Plato compares the con- templation of the “ideas” with that of the Mysteries; Chry- sippus calls the discussion on the nature of the gods, which forms the last section of the Stoic physic, teAery.’® From

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10 Diod. Sic., Hist., v. 48; Andoc., De Myst., § 31; Sopat., Digwr. Zetem., p. 120, in Walz, Rhet. Gree. ; Theon Smyrn., Afathem., 1. p. 18, ed. Bull; see Lobeck, pp. 39, 189.

11 Inscription quoted by Foucart in Inscr. de la Peloponn., p. 171, in Le Bas, Voy. Archéol.

12 Lobeck, §§ 216-19.

13 Lobeck, §§ 19-20.

these passages we may infer the belief of the writers that important truths were cnigmatically! expressed in the Mysterics, and that the intellect wlich could pene- trate beneath the surface was able to apprehend them. Plutarch says that it required a philosophic training and a reverent religious frame of mind to comprehend the Mysteries. Similarly Aristotle expressly says that no 1n- struction was given to the ptoro, but that, while in a suitable state of receptivity, their emotions and character were acted upon. The testimony of the Christian writers is entirely to the same effect; while stigmatizing the

im- pure character of some of the rites, they always admit that the Mysteries were intcnded to lead the people up to a knowledge of religious truth? It is obvious that the essential point on which the effect of the ceremony depended was that the mind of the initiated should be wrought up to a pitch of eager, rapt expectancy and breathless attention. The attentive silence of the spectators at the Mysteries was proverbial. Many means contributed to produce this state. A certain amount of previous training and instruction was imparted by the pvataywyot to the candidates. It is true that all who had been initiated had the right to act as wroraywyot, that they were left legally free to introduce any one whom they thought fit, that the amount of instruction they could impart varied accord- ing to their character and education. Lobeck has em- phasized all these elements which tended to impair the character and lessen the effect of the Mysteries. But though this point is incapable of proof, the general char- acter of the Mysteries suggests that custom may have modified to some degree the freedom allowed by law, and that the Eleusinian officials tried to regulate the instruc- tion given. Moreover, the lesser Mysteries were a kind of preparation for the greater, and Clement mentions that in them, and in them alone, a certain amount of instruction was given to the piorau.? with the general belief of the people in the holiness and power of the Mysteries to produce in the mind of the pooras an expectant feeling and a disposition to look for some meaning in the spectacle.

The grades of admission to the Mysteries tended to pro- duce the same impression. The process of initiation was not a momentary one, completed in one act; it extended over an elaborate series of stages, and the ancients certainly associated these successive steps with a gradual increase of knowledge and insight. The candidate was initiated in the lesser Mysteries in Anthestcrion (February) at Athens ; he was admitted as a ptorns at Eleusis in the following Boedromion (September), but he could not attain the higher initiation as erdarys till at least one year more had elapsed. It was also believed that a higher order of initiation was reserved for those who were qualified for the offices of tepopavrns and Sgdodxos, in which the last knowledge of the cultus was imparted to them.4

Finally, the physical circumstances of the initiation were such as to produce an excited and high-strung nervous condition. The nine days’ fast, very

strictly observed,5 the long march from Athens to Eleusis and the frequent

} The word ‘‘enigma” is used by Sopater, Diwr. Zetem, L220) Clem. Alex., Stérom., p. 658, and Christian writers frequently ; Lobeck, pp. 148, 189.

? Plut., Zsid., Ixviii. ; Aristot. ap. Synes., Or, p. 48 (ed. Petav.) ; Cic., NM. D., i, 42, is important, rerum magis natura cognoscitur quam deorun,

3 Cl. Alex., Strom., v. 689 ; Lobeck, p. 140.

4 Theon Smyrn., Mfathem. , 1. p. 18, quoted by Lobeck, p. 39.

5 It is nowhere mentioned that the Horas fasted nine days, but the analogy of the nine days' fast of Demeter makes it quite safe to assume that this was the rule for her worshippers; see Hymn, 1. 47-9. The fast was perhaps, like the Mohammedan Ramadan, observed only while the sun was up; but, in addition to this, various kinds of food were wholly prohibited, see Lobeck, pp. 189-91.

'Phrygian rites.

These circumstances combined.

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religious ceremonies with which it was marked, the wander. ing by night around the shores and plain of Eleusis with torches in search of the lost Cora,—all tended to produce

a strained enthusiastic state. And the season of the year

and of the month—for the nights were dark—co-operated ;

Boedromion fell about the end of the hot season, when the bodily strength is usually low. Then came the actual Mysteries: the wvrrar were admitted to the holy building the splendid illumination seemed dazzlingly bright after the darkness outside ; the strange apparitions, the impressive voices, the gorgeous dresses of the actors, the magnificence of the sacred drama, to which the highly suggestive and symbolic art of Greece no doubt contributed largely,—all these they saw and heard in awestruck silence. Then came the crowning act of the ceremony: they had perhaps before this drunk the sacred draught with which the god- dess had refreshed herself after her long fast, but now the holy things which the goddess had herself shown to the daughters of Celeus were revealed to them. They were admitted one by one to touch, to kiss the holy things, to lift them from the cist, to put them into the basket, to taste them, to replace them in the cist, and to pronounce the sacred formula. The scene that takes place in every modern Greek church on the eve of Easter Sunday gives some faint idea of the character of this rapéSocts.

This state of enthusiasm was common to all Mysteries, especially to the Phrygian. It was susceptible of great abuses, ¢.g., the self-mutilation and the immorality of the But the spirit of Hellenism toned down the excesses, while it tried to preserve the fervour and self-forgetfulness of the Phrygian and Baccliic orgies, The relation of the state to the Mysteries contributed to regulate the excited fervour of the celebrants. While it never interfered with the established ritual, the state was the last judge in cases of misdemeanour ; it appointed officials to control the expenditure and conduct the public part of the ceremony. Inscriptions® have thrown much light on this point, but it is not possible here to dwell on it. The Mysteries of Eleusis were the one great attempt made by the Hellenic genius to construct for itself a religion that should keep pace with the growth of thought and civilization in Greece. The strained enthusiasm at- tendant upon them seems at first strange and unhellenic to a mind accustomed to the moderated chastened tone of Greek art and literature, and to the spectacular character of Greek cxoteric religion with its utter want of vitality and religious fervour. The public religion either became, like the Panathenaia, a purely political display of the power and splendour of Athens, or else, like much of the old ceremonial of the acropolis, was performed perfune- torily. It had no hold on the mind of the people; its simple antique ceremonies told nothing of the subjects which troubled men’s minds, the thoughts of sin, of a future life, and of punishment for guilt. But the Mysteries con- cerned themselves preciscly with these subjects: they pro- vided a series of preliminary purifications for their votaries; they turned men’s minds to the deeper problems of life and death, and gave them new views; they made some attempt to reach and touch the individual mind. Thus, while the public Hellenic religion sank into disrepute, the Mysteries became more and more important as time elapsed.

It is impossible to reconstruct the mystic ceremonial, but sufficient indications are given for us to understand its general character. It consisted of acts and words, Spodpeva, and Xeyopeva, which supplemented one another, and were both required to make an intelligible whole. en ee

6 See the inscription of Andania, and the important inscription of Eleusis published in Bull. Corr. Hell., 1880.

7 The case of the young man in Sopater’s imaginary trial proves this very clearly.

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The Acydpeva were obscurely- worded phrases and tradi- tional songs, whose sanctity was due to their antiquity. They had no didactic character, and were hardly intelligible without preparatory instruction. They were chanted by the hierophant, and that a fine voice was one of the requisites for this office several epigrams and inscriptions bear witness. The mythic ancestor of the family, in whom are embodied the requirements for the office, was called Eumolpus. The Spwpeva appear to have been a dramatic representa- tion of the life of the deities by whom the Mysteries had been instituted. These deities were presented on the stage in appropriate dresses, the parts being played by the minis- ters of the cultus. At Andania this is known to have been the case,! and Porphyry enumerates the parts played by the chief officials of Eleusis at one point in the mystic drama.” It is also certain that figures, probably of great size, were introduced by machinery. The terms fdcpara ay.a, evdai- pova, Geta, dppyra, are applied to the mystic sights.*

The Homeric Hymn to Demeter is a religious, not an historical myth. It does not relate the origin of agricul- ture, for the gift with which the goddess rewards her Eleusinian hosts is not the art of agriculture but the knowledge of the Mysteries (1. 273, 474). It springs directly from the cultus of Eleusis, and contains the tepos Adyos, the fortunes of the two goddesses, mother and daughter, the periodical representation of which formed the basis of the ritual. It is, of course, not a complete description of the ritual; it is an exoteric and poetic statement, in which the most holy of the rites and the most mysterious of the personages are alluded to only in an indirect way. The express statement of Clement,* that the whole myth of Cora was represented at Eleusis, con- firms the inference drawn from the Hymn. Many writers® refer to the appearance presented by the shores and bay of Eleusis on the dies lampadum, when the worshippers wandered in the

darkness with torches searching for the lost Cora. This ceremony took place in the open country, and was therefore not a part of the mystic ritual revealed to the pvora: in the teAcoTHpiov. It probably took place on Boedromion 21, on the night before the mystic rites proper began. The picra: waited outside the sacred en- closure in perfect darkness on the moonless eve of Boedro- mion 22, Suddenly the wportAaca were thrown open, and the light was seen streaming through the oatov in the roof of the reAcor#pcov and through the open door in which stood the dadotyos holding up the sacred torches. This scene is frequently alluded to.6 The scenes inside the te\eoTHptov are mentioned less frequently,' but the few references point to episodes in the myth of Demeter and Cora. The hymn refers in guarded terms to the rapddocrs Tov tepdy, the central act of the mystic ritual. Clement enumerates the simple objects that were displayed, and gives the formula in which each piorys replied as he received from the hierophant the holy objects: "I have fasted, and I have drunk the xvxewv; I have taken from

1 See 1. 24, dca de def Stackevdager Oa els OeGv SidBeotv, with Sauppe's and Foucart's commentaries.

2 Ap. Euseb., Prep. Hvang., iti. 12, p. 117.

- Themist., Or., xvi. p. 244, rip elpfunv elofyev Gomep ev redeTH aWopyri kai dmpaypovws ; Stob., Serm., exix. p. 604; Aristid., Or., xix. = &e, 4 Ol. Alex., Protrept., ii. p. 12.

Themist., Or., xx. p. 235 (p. 288, ed. Dind.); Lobeck, p. 52;

Claudian, De Rapt. Proserp., 1. 5-15; Lucian, Catapl., 22; Plut. ap. ee Serm., cxix. p. 604, and Plut., Prof. Virt. Sent., i. p. 312 (ed. yut),

® Ar., Ran, 340-52 ; Soph., Gid. Col., 1045; Eur., Zon, 1075 sq. ; 4isch., Fragm., quoted by schol. on Soph., l.e., &e.

a Procl. on Plat., Polit., p. 384, airijs rs weylorns Oedis lepo's Twas éy amoppyroas Ophvous ai Tederal mapadidodcr; Apollod. ap. sehol. Theocr. , i. 36, "AOqvyo. tov iepopdvTny tis Képns émixadoupévys émuxpovew 7d kaovpevov HxEtov 5 Hecate appeared on the stage (JZymn, 1. 52); Claud.,

Rapt. Pros., 15; Helios and Hermes (Hymn, 1. 74, 346) both appeared on the stage, see note 2 above.

the xiory ; after tasting I have deposited in the xéAa6os, and from the xéAa@os in the kiory.”® In these words he professed that he had fulfilled the sacred duties.

This whole myth bears most evidently the character of having been acted continuously at one time. It could not have been divided without losing its power over the atten- tion and emotions of the picra:. But it seems almost certain that there were two nights of mystic ceremonial, 22 and 23 Boedromion.® It is probable, therefore, that another play with a distinct subject was acted on one of these nights, and as the play just described is certainly the original and central point in the Eleusinian ritual it was probably acted on the first night. Again, it is certain that there was a distinction between piora: and éromrrai at Eleusis. As the piorae were not admitted to witness the ritual of éroyus, it is highly probable that the second night was devoted to the higher ceremonial. It would be exceedingly difficult to effect a change in the middle of the night from the piynors to the eroyts, and the good order and regularity for which the Eleusinia were famed could hardly have been maintained. The //ymn refers in covert terms to the holy child Iacchus, to his death and resurrection (262-4). There seems no place for Jacchus in the ritual as yet described. It is therefore a plausible conjecture that the éoyus was devoted more especially to the mystic child; and further examination will make this conjecture almost a certainty.

The development of the Eleusinian religion is a matter of speculation, but cannot be wholly passed over. Several elements must be distinguished.

1. Demeter always represents the productive and nourishing power of the earth. (ca) In the simplest form of her cultus the act by which tho earth-goddess is fertilized is conceived as an out- rage and a deed of violence. The goddess, enraged, hides herself in a eave; winter and death reign in the world. At last she is appeased ; sho bathes in the sacred stream ; her child is born, and the life of spring blooms on the earth. This cultus is most dis- tinctly seen in Arcadia. (6) The worship of Demeter Thesmophorus is the

rcligion of a more educated race; the goddess is the giver of all law, especially of the law of marriage, on which all society is founded. The worship of Demeter Thesmophorus is restricted more or less completely to women. It appears to have been the national religion of the Cadmcones, and the house of Cadmus at Thebes was the first temple of the goddess; but it spread carly into Attica, The Argolic Demeter is very similar, but her cultus has been affected by Eleusinian influence, The Thesmophoric rites are so obscure that no sure idea can be gained of the relation between them and the simpler Arcadian cultus. The anger of Demeter Achea or Achaia formed part of them, and the ritual has, as A. Mommsen observes, an Oriental character of vehement mourning ; but we know not how the wrath of the goddess was kindled and allayed, how the alternation of winterand summer was conceived. (c) Eleusis was apparently the original scat of a modified form of this cnltus, in which Demeter was associated with Cora. The modification. per- haps arose through the fusion of the religions of two races which united in the fertile Eleusinian plain.

2. The marriage of Cora is a form of the widespread idea that the marriage of the god and goddess each spring is the pledge and cause of the fertility of earth. The ‘‘holy marriage” was eele- brated in Samos, Argos, &c., with the rites of an earthly marriage, and vestiges of the primitive custom of marriage by capture can be traced in the ceremony. According to the lepds Adyos of Eleusis, the rape of Cora takes placo in the spring (Hymn, |. 6, 425); it is the holy marriage by capture. But the Eleusinian myth is marked as composite and not original by an important fact ; it does not explain the vicissitude of winter and summer. The abduction takes place once in the spring ; winter arises from the anger of Demeter ; but ever afterwards Cora goes to her husband in the autumn with her mother’s consent and returns in the spring. The myth has ecased to bo closely and obviously connected with the life of nature. The two cults cach lost something when they were amalgamated. Tho annual Theogamia, a central point in the original worship of Cora, becomes a mere disagreeable episode in the life of the two SC ES SET 1 LST aa tdci “tities sa SE

8 Protrept., p. 18; Arnob., v. 26, ‘qu rogati saerorum in aceep-

tionibus respondeant.”

9 Mommsen and Lenormant have given several reasons to think that there were two nights of Mysterics.

10 Heortol., under “Thesmophoria’’; cf. Plut., Solon, Ue,

1 At Nysa, Cyzieus, and elsewhere.

goddesses. Demeter ceases to be directly connectcd with the life of the year, and affects it only through the fortunes of her daughter. It is an important point that the vehement self-forgetting enthu- siasm characterizing devotees who fecl their complete dependence on their deities can be traced from the beginning in the worship of the mother of all earthly life. This enthusiasm was increased by the next stage in the development of the Mysteries, the fusion of the cults of Demeter-Persephone and of Dionysus. It is uncertain how and when this fusion began ; it is certain that it was not com- pleted till after the union of Eleusis and Athens.

3. The worship of Dionysus can be traced in two phases. The cultus of the wine-god with simple rural character, rude and gross symbolism, was the religion of uneducated peasants, its chief seat being in the borderland of Attica and Beotia. Another form of the religion of Dionysus with its orgiastic enthusiasm and its mystic character penetrated into Greece from Thrace, was accepted at Delphi alongside of the Apolline worship,! and established itself at Eleutherz and on Mount Parnassus, where the women of Phocis and Attica united in the rites and revels of the god every second winter. The Dionysus of Eleuthere was carried to Athens when the places were united, and the worship of Dionysus Eleuthercus was one of the most splendid and most impressive in the state ; under its shelter grew the Attic drama.

The unification of the Attic land required as its pledge and com- pletion the unification of the Attic religion. A common religion bound together every association in Greece; a people united poli- tically, yet divided religiously, was an unintelligible idea to the ancient mind. When, through the decay of the Megarian power, the Eleusinian valley was incorporated in the Attic state, the wor- ship of the Eleusinian goddess was established under the

Athenian acropolis, and the whole land united in her worship. Eleusis always occupied a peculiarly independent position in Attica; it retained its own cultus in its own hands, and it had, like Salamis, the right of issuing coins. It seems to have been only at a late date that the religious fusion was completed, and the relation be-

tween the Eleusinian and Attic religions was conceived in a very.

different style from the crude fictions by which at an earlier time

Poseidon and Apollo had been incorporated in the Attic state –

religion.? The political and religious system which produced peace among the warring sections of the Attic people was due to Solon. His friendship with the mystic Epimenides, an historical fact encrusted with much legend, shows the tone in which the religious part of the task was cxecuted. But the work of Solon would not have proved efficient if it had done more than formulate and legalize the actual tendencies of the country. Especially in religion the system was growing before Solon and continued to grow after him. To this period—i.e., the 6th century B.c.—and to the spirit of mysticism which was so strong in Attica and in Greece generally at ae time we must attribute the final moulding of the Eleusinian ritual.

According to the mystic theory, the multitude of deities are merely forms of the ultimate single divine nature dividing itself into male and female to become the origin of life on the earth. This theory was that of the Orphic theology, and many facts show that the Orphic theology moulded the Eleusinian ritual. Dionysus, under the mystic. name Iacchus, was identified with the son of ‘Demeter, Plutus, the prosperity that she bestows on the world. Elcusis and Athens were united in one mystic ritual, part of which was performed in Athens, part on the road from Athens to Eleusis, and the most important rites in Eleusis. The process by which the shrines along the Sacred Way became connected with the religion of Demeter and Iacchus was doubtless gradual ; but the outlines of the systcm were certainly complete before the battle of Salamis (Herod., viii. 65). Not only in the Eleusinian ritual, but throughout Attic religion, a tendency to mix the cult of Athena with that of Demeter can be traced. They are very often enshrined in the same temple. In the autumn the holy ploughings were

performed in the Rharian plain, at Sciron, and under the acropolis by the Bougvyns. Demeter in her anger wears the -yopyévecoy on her breast ; she was so represented in the colossal statue at Eleusis, a fragment of which is now in Cambridge. The religious thought which expressed itself in this way obviously identified Demeter with Athena. Again, we find through Attic art and literature in the 5th century B.c. a tendency to mix Apollo and Dionysus, to show an Apollo Cisseus, a Dionysus Melpomenus, to invoke Séorora pirddagve Bdxye mady ’Amédddov etAupe. Apollo and Dionysus shared the presidency of Delphi.4 The tendency which Gerhard has proved to represent Demeter and Cora as undistinguishable spfings from the same mystic system. The identification of Artemis

1 Apollo ruled at Delphi for nine months of the year, Dionysus for the other three.

2 Kohler in Mittheil. Inst. Ath., iv. 250.

e The god Toceddv Tarjoyos kat ’EpexGevs, a fiction of the state religion ; Apollo, a son of Athena and Hephestus in Attic legend; ef. Harpocr, on eds rarp@os with Cic., NV. D., iii. 22.

4 Eur., Zon, 1075 sq.

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and Persephone, which Aischylus makes, was probably taught at Eleusis (Hymn, 1. 440).

If material existed to study the ritual of the shrines along the Sacred Way, we should find abundant examples of the working of the mystic system. Pausanias tells that the cultus of Apollo in the pass of Dafni grew into a worship of Demeter, Cora, Athena, and Apollo. Again, in reference to the worship of the hero Cya. mites on the Sacred Way, he says that those who have been initiated at Hleusis, or who have read the Orphic books, will understand his religious silence. The same writer *® mentions that Orphic hymns were used in the Eleusinian ritual, and Preller has conclusively

proved the great influence exerted by Orphic teaching at Eleusis, Through this close connexion of Orphism with the Eleusinian Mysteries, we understand how, when the family of the Dadouchi died out in the 4th century B.c., the office was not filled up from the closely related family of the Ceryces, but given to the Lycomida, who held in their hands the Orphizing mystic cultus of Phlya, If there had not been a great similarity between the ritual of Eleusis and of Phlya, it is inconceivable that the high office of dadobyos should have becn given to a family unconnected with Eleusis, It is easy to trace the same mystic tendency in later time. In the Alexandrine period it was usual to identify Isis with Demeter, and even to maintain that the Eleusinian Mysteries were derived from Egypt. In later times the Neo-Platonic philosophy acquired influence at Eleusis, and hence we find that, according to Porphyry, the hierophant represented the ‘‘ demiurgos.”’

There is every reason to believe that the Bacchic rites can be traced through Thrace to Phrygian influence, and that the spirit of Orphism was that of the Oriental Phrygian cultus. Moreover, the most holy and perfect rite in the Eleusinian Mysteries was to show an ear of corn mowed down in silence,§ and this was a symbol of the Phrygian Atys. Now Clement describes in great detail a mystic ceremony, some parts of which he attributes to Phrygia, though the general tone of the passage rather refers it to Eleusis ; some of the grossest details of this ceremony are expressly referred to Hleusis by other Christian writers.’ These facts lead to the belief—(1) that Clement purposely mixes up two ceremonies which were similar to one another, Phrygian and Eleusinian Mysteries ; (2) that this scene was acted at Eleusis on the eve of Boedr. 23; (8) that it was intro- duced: under the influence of the Orphic mystic philosophy. Know- ing that the Phrygian rites were decried by many who praised the Eleusinian, Clement delights to emphasize points of resemblance between them. ‘The details given in the long account of Clement fully justify the invectives of the Christian writers. Itis, however, easy to understand the answer that the Neo-Platonic philosophers who admired the Mysteries would make to their assailants. Reli- gion places men face to face with the actual facts of life ; when the mind is exalted and ennobled by intense religious enthusiasm it is able to look with pure insight at phenomena of life in which the vulgar unpurified mind sees nothing but gross materialism. The language of religion is plainer

and more direct than the language of common life. Those who distinguished between the character of the Eleusinian and Phrygian rites might say that the same symbolism can be looked at with gross eyes or with idealized eyes, and might quote the contrast between the Aphrodite of Praxiteles and its rude Pheenician prototype ; the attitude, the position of the hands is the same, but the whole meaning is changed.

It is unnecessary to enter into the question whether the Mys- teries go back toa primitive “ Pelasgic” religion, or are borrowed from Oriental religion. All that gives elevation and ideality to them was added by the Hellenic genius. But that spirit of enthu- siastic self-abandonment which made the piora: forget themselves in the divine nature never belonged to the true Hellenic tempera- ment; the Mysteries were an attempt of the Hellenic genius to take into its service the spirit of Oriental religion.

It is impossible here to speak of the other Mysteries ; subjects of similar nature are referred to under MiTHRAS, ORPHEUS, PHRYGIA. The Eleusinian Mysteries were the most perfect example of the type in Greece ; but our scanty information leads to the belief that all Hellenic Mysteries tried more or less successfully to attain the same results. ‘Those non-Hellenic Mysteries which found their way into Greece from the 5th century B.c. onwards are of course excluded from this statement.® (W. M. RA.)

MYSTERY, or Mrractz Pray. See Drama, vol. vi. p. 413.

MYSTICISM is a phase of thought, or rather perhaps of feeling, which from its very nature is hardly suscep- tible of exact definition. It appears in connexion with the endeavour of the human mind to grasp the divine essence

or the ultimate reality of things, and to enjoy the blessed-

2 Tayi, 1, Whe ibe, D7,

8 Philosophumena, ed. Miller, v. 8, p. 115.

7 Cl., Protr., p. 113 see quotations in Lobeck, p. 199 sq.

8 On these non-Hellenic Mysteries see Foucart, Assoc. Relig.

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ness of actual communion with the Highest. The first is the philosophic side of mysticism ; the second, its religious side. ‘The first effort is theoretical or speculative ; the second, practical. present with the mystic is that of a supreme, all-pervading, and indwelling power, in whom all things are one. Hence the speculative utterances of mysticism are always more or less pantheistic in character. On the practical side, mysticism maintains the possibility of direct intercourse with this Being of beings —intercourse, not through any external media such as an historical revelation, oracles, answers to prayer, and the like, but by a species of ecstatic transfusion or identification, in which the individual be- comes in very truth “partaker of the divine nature.” God ceases to be an object to him and becomes an experience. In the writings of the mystics, ingenuity exhausts itself in the invention of phrases to express the closeness of this union. Mysticism differs, therefore, from ordinary pan- theism in that its inmost motive is religious. Pantheism, considered merely as such, may be either an elevating or a degrading theory ; it expresses merely the resolution of all things into one metaphysical power or substance. But the mystic is animated not merely by the desire of intellectual harmony ; he seeks the deepest ground of his own being, in order that he may cast aside whatever separates him from the true life. This religious impulse is shown in the fact that, whereas pantheism, as such, seems to lead logically to passive acquiescence in things as they are—all things being already as divine as it is their nature to be—mysticism, on the contrary, is penetrated by the thought of alienation from the divine. Even where it preaches most our essential unity with God,

its constant and often painful effort is directed towards overcoming an admitted alienation. In other words, the identity with God which it teaches is not a mere natural identity, as in ordinary pantheism, but one which is the goal of achievement.

These considerations do not serve, however, to differen- tiate mysticism sufficiently from the general course of religious thought. Alienation from, and yet implicit one- ness with, the divine are the two poles on which all religious speculation and practice revolve. It follows from the above that mysticism is distinguished from other religious theories of the relation of man to God by the intensity with which it realizes the divine factor in the relation. The realization is so vivid that, though the theory takes its rise in the needs of the individual, the individual tends in the sequel to be lost altogether in the excess of the divine light. All relations tend to become unreal for the mystic except that between himself and God; his very sense of personality is weakened. The mystical ideal, therefore, is not a life of ethical energy among mankind; it is the eye turned wholly inwards, the life spent in contemplation and devout communion. The type of character to which mysticism is allied is passive, sensuous, and feminine, rather than inde- pendent, masculine, and ethically vigorous. In full-blown mysticism the individual may be said to be deprived of the rights which belong to him as an ethical personality.

The speculative bias, it will be seen, is much stronger in the mystic than in the generality of religious persons ; and his speculative insight, it may be added, is usually much finer than theirs, The ordinary man, in religious matters as in others, constantly speaks of the infinite in such a way as Virtually to make it finite. As Spinoza says, he passes confidently from finite to infinite and contrariwise, but never attempts to bring the two ideas together. Now mysticism does bring them together, but unfortunately in such a way as to paralyse the individual for action. Ultimately stated, the explanation of this result is to be found in the mistaken

categories under which the relation is conceived. The con- ception of a universal substance or ground of things is

The thought that is most intensely

naturally the first resort of the mind awakened to specu- lation ; and it is a form which constantly recurs when men are roused afresh to philosophical activity. Nevertheless, the conception is evidently rude. It expresses properly a relation existing between material things in space ; and, when applied elsewhere, is necessarily inadequate, analogical, metaphorical. But it is characteristic of mysticism that it does not distinguish between what is metaphorical and what is susceptible of a literal interpretation. Hence it is prone to treat a relation of ethical harmony as if it were one of substantial identity, or chemical fusion ; and, taking the sensuous language of religious feeling literally, it bids the individual aim at nothing less than an interpenetration of essence. And, as this goal is unattainable while reason and the consciousness of self remain, the mystic begins to consider these as impediments to be cast aside. Our consciousness of self is the condition under which we possess a world to know and to enjoy; but it likewise isolates us from all the world beside. Reason is the revealer of nature and of God; but, by its very act, reason seems to separate the things reasoned about. Hence mysticism demands a faculty above reason, by which the subject shall be placed in immediate and complete union with the object of his desire,—a union in which the consciousness of self has dis- appeared, and in which, therefore, subject and object are one. This is the intuition or ecstasy or mystical swoon which appears alike among the Hindus, the Neo-Platonists, and the medieval saints. And here it will be observed that the original acceptance of metaphor as speculative truth has terribly avenged itself ; for, with the renunciation of self- conscious reason, the divine has been degraded into an object of sense, and its highest realization has come to be placed either in a state of brutish torpor or in a moment of equally unnatural nervous excitation. Not that mysticism always appears in this extreme form, but such is the goal towards which it constantly tends. If the sensuous meta- phors of unsophisticated religious feeling be put forward as a metaphysical theory of the supersensuous, it is only to be expected that the practice deduced from such a theory will be a sophisticated or morbid development of sense, a strain put upon the bodily organs to make them yield a realization of the theory and achieve what is impossible to the sane and conscious reason. The morbid play of the nerves is objectified by the

over-driven brain and treated as a sensuous union of the created with the creative spirit, an actual seeing, nay, tasting, of the divine essence.

To sum up, then, we may say that, compared with pan- theism, mysticism is dependent upon a specifically religious impulse ; but, whereas religion is ordinarily occupied with a practical problem and develops its theory in an ethical reference, mysticism displays a predominatingly speculative bent, starting from the divine nature rather than from man and his surroundings, taking the symbolism of religious feeling as literally or metaphysically true, and straining after the present realization of an ineffable union. The union which sound religious teaching represents as realized +n the submission of the will and the ethical harmony of the whole life is then reduced to a passive experience, to some- thing which comes and goes in time, and which may be of only momentary duration.

From these general remarks it will be sufficiently apparent that mysticism is not a name applicable to any particular system. It may be the outgrowth of many differing modes of thought and feeling. Most frequently it appears historically, in relation to some definite system of belief, as a reaction of the spirit against the letter. When a religion begins to ossify into a system of formulas and observances, those who protest in the name of heart-religion are not unfrequently known by the name of mystics. At times they merely bring into prominence again the ever-

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fresh fact of personal religious experience ; at other times mysticism develops itself as a powerful solvent of definite dogmas.

A review of the historical appearances of mysticism will serve to show how far the above characteristics are to be found, separately or in combination, in its different phases.

In the East, mysticism is not so much a specific pheno- menon as a natural deduction from the dominant philosophic systems, and the normal expression of religious feeling in the lands in which it appears. Brahmanic pantheism and Buddhistic nihilism alike teach the unreality of the seeming world, and preach mystical absorption as the highest goal ; in both, the sense of the worth of human personality is lost. India consequently has always been the fertile mother of practical mystics and devotees. The climate itself en- courages to passivity, and the very luxuriance of vegetable and animal life tends to blunt the feeling of the value of life. Silent contemplation and the total deadening of consciousness by perseverance for years in unnatural atti- tudes are among the commonest forms assumed by this mystical asceticism. But the most revolting methods of self-torture and self-destruction are also practised as a means of rising in sanctity. The sense of sin can hardly be said to enter into these exercises ; that is, they are not undertaken as penance for personal transgression. They are a despite done to the principle of individual or separate existence.

The so-called mysticism of the Persian Sufis is less intense and practical, more airy and literary in character. Sufism (probably derived from codés) appears in the 9th century among the Mohammedans of Persia as a kind of reaction against the rigid monotheism and formalism of Islam (see MoHAMMEDANISM, vol. xvi. p. 594). It is doubtless to be regarded as a revival of ancient habits of thought and feeling among a people who had adopted the Koran, not by affinity, but by compulsion. Persian literature after that date, and especially Persian poetry, is full of an ardent natural pantheism, in which a mystic apprehension of the unity and divinity of all things heightens the delight in natural and in human beauty. Such is the poetry of Hafiz and Saadi, whose verses are chiefly devoted to the praises of wine and women. Even the most licentious of these have been fitted by Mohammedan theologians with a mystical interpretation. The delights of love are made to stand for the raptures of union with the divine, the tavern symbolizes an oratory, and intoxication is the be- wilderment of sense before the surpassing vision. Very often, if not most frequently, it cannot be doubted that the occult religious significance depends on an artificial exegesis ; but there are also poems of Hafiz, Saadi, and other writers, religious in their first intention. These are unequivocally pantheistic in tone, and the desire of the soul to escape and rest with God is expressed with all

the fervour of Eastern poetry. This speculative mood, in which nature and beauty and earthly satisfaction appear as a vain show, is the counterpart of the former mood of sensuous enjoyment.

For opposite reasons, neither the Greek nor the Jewish mind lent itself readily to mysticism,—the Greek, because of its clear and sunny naturalism ; the Jewish, because of its rigid monotheism and its turn towards worldly realism and statutory observance. It is only with the exhaustion of Greek and Jewish civilization that mysticism becomes a prominent factor in Western thought. It appears, there- fore, contemporaneously with Christianity, and is a sign of the world-weariness and deep religious need that mark the decay of the old world. Whereas Plato's main problem had been the organization of the perfect state, and Aris- totle's intellect had ranged with fresh interest over all departments of the knowable, political speculation had

become a mockery with the extinction of free political life, and knowledge as such had lost its freshness for the Greeks of the Roman empire. Knowledge is nothing to these men if it does not show them the infinite reality which is able to fill the aching void within. Accordingly, the last age of Greek philosophy is theosophical in character, and its ultimate end is a practical satisfaction. Neo-Platonism seeks this in the ecstatic intuition of the ineffable One, The systematic theosophy of Plotinus and his successors does not belong to the present article, except so far as it is the presupposition of their mysticism; but, inasmuch as the mysticism of the medizval church is directly de rived from Neo-Platonism through the speculations of the Pseudo-Dionysius, Neo-Platonic mysticism fills an import- ant section in any historical review of the subject.

Neo-Platonism owes its form to Plato, but its under- Neo.Ph. lying motive is the widespread feeling of self – despair tonism,

and the longing for divine illumination characteristic of the age in which it appears. Before the rise of Neo- Platonism proper we meet with various mystical or semi- mystical expressions of the same religious craving. The contemplative asceticism of the Essenes of Judsea may be mentioned, and,

somewhat later, the life of the Therapeute on the shores of Lake Meeris. In Philo, Alexandrian Judaism had already seized upon Plato as “the Attic Moses,” and done its best to combine his speculations with the teaching of his Jewish prototype. Philo’s God is described in terms of absolute transcendency ; his doctrine of the Logos or Divine Sophia is a theistical transformation of the Platonic world of ideas; his allegorical interpretation of the Old Testament represents the spiritualistic dissolu- tion of historical Judaism. Philo’s ethical ideal is renun- ciation, contemplation, complete surrender to the divine influence. Apollonius of Tyana and the so-called Neo-

-Pythagoreans drew similar ethical consequences from their

eclectic study of Plato. Wonder-workers like Alexander of Aboniteichos exhibit the grosser side of the longing for spiritual communion. The traits common to Neo-Platonism and all these speculations are well summed up by Zeller (Philos. der Groechen, iii. 2. 214) as consisting n—“ (1) the dualistic opposition of the divine and the earthly ; (2) an abstract conception of God, excluding all knowledge of the divine nature ; (3) contempt for the world of the senses, on the ground of the Platonic doctrines of matter and of the descent of the soul from.a superior world into the body; (4) the theory of intermediate potencies or beings, through whom God acts upon the world of phenomena ; (5) the re- quirement of an ascetic self-emancipation from the bondage of sense and faith in a higher revelation to man when in a state called enthusiasm,” Neo-Platonism appears in the first half of the 3d century, and has its greatest repre- sentative in Plotinus (204-269 a.p.). He develops the Platonic philosophy into an elaborate system by means of the doctrine of emanation. The One, the Good, and the Idea of the Good were identical in Plato’s mind, and the Good was therefore not deprived of intelligible essence. It was not separated from the world of ideas, of which it was represented as either the crown or the sum. By Plotinus, on the contrary, the One is explicitly exalted above the votds and the “ideas”; it transcends existence altogether (éréxewva tijs ovcias), and is not cognizable by reason. Remaining itself in repose, it rays out, as it were, from its own fulness an image of itself, which is called vots, and which constitutes the system of ideas or the intelligible world. The soul is in turn the image or product of the vots, and the soul by its motion begets corporeal matter. The

soul thus faces two ways—towards the vots, from which it springs, and towards the material life, which is its own product. Ethical endeavour consists in the repudiation of the sensible; material existence is

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MYSTICISM

itself estrangement from God. (Porphyry tells us that Plotinus was unwilling to name his parents or his birth- place, and seemed ashamed of being in the body.) Be- yond the xabdpoes, or virtues which purify from sin, lies the further stage of complete identification with God (ovK ew dpaptias elvat, dAAG Oeodv eivat). To reach the ulti- mate goal, thought itself must be left behind ; for thought isa form of motion, and the desire of the soul is for the motionless rest which belongs to the One. The union with transcendent deity is not so much knowledge or vision as ecstasy, coalescence, contact (xotacus, arAwors, dd}, Ennead., vi. 9. 8-9). But in our present state of exist- ence the moments of this ecstatic union must be few and short ; “I myself,” says Plotinus simply, “have realized it but three times as yet, and Porphyry hitherto not once.”

It will be seen from the above that Neo-Platonism is not mystical as regards the faculty by which it claims to apprehend philosophic truth. It is first of all a system of complete rationalism ; it is assumed, in other words, that reason is capable of mapping out the whole system of things. But, inasmuch as a God is affirmed beyond reason, the mysticism becomes in a sense the necessary complement of the would-be all-embracing rationalism. The system culminates in a mystical act, and in the sequel, especially with Iamblichus and the Syrian Neo- Platonists, mystical practice tended more and more to overshadow the theoretical groundwork.

It was probably about the end of the 5th century, just as ancient philosophy was dying out in the schools of Athens, that the speculative mysticism of Neo-Platonism made a definite lodgment in Christian thought through the literary forgeries of the Pseudo-Dionysius. The doctrines of Christianity were by that time so firmly established that the church could look upon a

symbolical or mystical inter- pretation of them without anxiety. The author of the Theo- logia Mystica and the other works ascribed to the Areopa- gite proceeds, therefore, to develop the doctrines of Proclus with very little modification into a system of esoteric Chris- tianity. God is the nameless and supra-essential One, ele- vated above goodness itself. Hence “negative theology,” which ascends from the creature to God by dropping one after another every determinate predicate, leads us nearest to the truth. The return to God (évwors, Féwors) is the consummation of all things and the goal indicated by Christian teaching. The same doctrines were preached with more of churchly fervour by Maximus the Confessor (580-622). Maximus represents almost the last speculative activity of the Greek Church, but the influence of the Pseudo-Dionysian writings was transmitted to the West in the 9th century by Erigena, in whose speculative spirit both the scholasticism and the mysticism of the Middle Ages have their rise. Erigena translated Dionysius into Latin along with the commentaries of Maximus, and his system is essentially based upon theirs. The negative theology is adopted, and God is stated to be predicateless Being, above all categories, and therefore not improperly called Nothing. Out of this Nothing or incomprehensible essence the world of ideas or primordial causes is eternally created. This is the Word or Son of God, in whom all things exist, so far as they have substantial existence. All existence is a theophany, and as God is the beginning of all things, so also is He the end. Erigena teaches the restitution of all things under the form of the Dionysian adunatio or deificatio. These are the permanent outlines of what may be called the philosophy of mysticism in Christian times, and it is remarkable with how little variation they are repeated from age to age.

In Erigena mysticism has not yet separated itself in any way from the dogma of the church. There is no revulsion, as later, from dogma as such, nor is more stress

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laid upon one dogma than upon anotlier ; all are treated upon the same footing, and the whole dogmatic system is held, as it were, in solution by the philosophic medium in which it is presented. No distinction is drawn, indeed, between what is reached by reason and what is given by authority ;

the two are immediately identical for Erigena. In this he agrees with the speculative mystics everywhere, and differentiates himself from the scholastics who followed him, The distinguishing characteristic of scholasticism is the acceptance by reason of a given matter, the truth of which is independent of rational grounds, and which re- mains a presupposition even when it cannot be understood. Scholasticism aims, it is true, in its chief representatives, at demonstrating that the content of revelation and the teaching of reason are identical. But what was matter of immanent assumption with Erigena is in them an equat- ing of two things which have been dealt with on the hypothesis that they are separate, and which, therefore, still retain that external relation to one another. This externality of religious truth to the mind is fundamental in scholasticism, while the opposite view is equally funda- mental in mysticism. Mysticism is not the voluntary demission of reason and its subjection to an external authority. In that case, all who accept a revelation with- out professing to understand its content would require to be ranked as mystics ; the fierce sincerity of Tertullian's credo quia absurdum, Pascal's reconciliation of contra- dictions in Jesus Christ, and Bayle's half-sneering sub- ordination of reason to faith would all be marks of this standpoint. But such a temper of mind is much more akin to scepticism than to mysticism ; it is characteristic of those who either do not feel the need of philosophizing their beliefs, or who have failed in doing so and take refuge in sheer acceptance. Mysticism, on the other hand, is marked on its speculative side by even an overweening confidence in human reason. Nor need this be wondered at if we consider that the unity of the human mind with the divine is its underlying presupposition. Hence where reason is discarded by the mystic it is merely reason overleaping itself ; it occurs at the end and not at the beginning of his speculations. Even then there is no appeal to authority ; nothing is accepted from without. The appeal is still to the individual, who, if not by reason then by some higher faculty, claims to realize absolute truth and to taste absolute blessedness.

Mysticism first appears in the medieval church as the protest of practical religion against the predominance of the dialectical spirit. It is so with Bernard of Clair- Bernard vaux (1091-1153), who condemns Abelard's distinctions of Clat- and reasonings as externalizing and degrading the faith. aes Bernard's mysticisni is of a practical cast, dealing mainly with the

means by which man may attain to the know- ledge and enjoyment of God. Reason has three stages, in the highest of which the mind is able, by abstraction from earthly things, to rise to contemplatio or the vision of the divine. More exalted still, however, is the sudden ecstatic vision, such as was granted, for example, to Paul. This is the reward of those who are dead to the body and the world. Asceticism is thus the counterpart of medieval mysticism ; and, by his exaniple as well as by his teaching in such passages, Bernard unhappily encouraged practices which necessarily resulted in self-delusion. Love grows with the knowledge of its object, Bernard proceeds, and at the highest stage self-love is so merged in love to God that we love ourselves only for God's sake or because God has loved us. 'Te enim quodammodo perdere tanquan! qui non sis, et omnino non sentire te ipsum et a te 1pso exinaniri et pene annullari, celestis est conversations. – . Sie affici deificari est." "As the little water-drop poured into a large measure of wine seems to lose its own

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nature entirely and to take on both the taste and the colour of the wine, or as iron heated red-hot loses its own appearance and glows like fire, or as air filled with sun- light is transformed into the same brightness so that it

does not so much appear to be illuminated as to be itself

light,—so must all human feeling towards the Holy One

be self-dissolved in unspeakable wise, and wholly transfused

into the will of God. For how shall God be all in all if anything of man remains in man? 'The substance will

indeed remain, but in another form, another glory, another |

power” (De diligendo Deo, c. 10). These are the favourite similes of mysticism, wherever it is found.

Mysticism was more systematically developed by Ber- nard’s contemporary Hugo of St Victor (1096-1141). The

Augustinian monastery of St Victor near Paris became the headquarters of mysticism during the 12th century. It had a wide influence in awakening popular piety, and

the works that issued from it formed the text-books of

mystical and pietistic minds in the centuries that followed. Hugo’s pupil, Richard of St Victor, declares, in opposition to dialectic scholasticism, that the objects of mystic con- templation are partly above reason, and partly, as in the intuition of the Trinity, contrary to reason. He enters at length into the conditions of ecstasy and the yearnings that precede it. Walter, the third of the Victorines,

carried on the polemic against the dialecticians. Bona- ventura (1221-74) was a diligent student of the Victor-

ines, and in his Itinerarium mentis ad Deum maps out the human faculties in a similar fashion. He introduces the terms “apex mentis” and “scintilla” (also “syn- deresis” or cvvrijpyots) to describe the faculty of mystic intuition. Bonaventura runs riot in: phrases to describe the union with God, and his devotional works were much drawn upon by mystical preachers. Fully a century later, when the system of scholasticism was gradually breaking up under the predominance of Occam’s nominalism, Pierre d’Ailly (1350-1425), and his more famous scholar John Gerson (1363-1429), chancellor of the university of Paris, are found endeavouring to combine the doctrines of the Victorines and Bonaventura with a nominalistic philo- sophy. They are the last representatives of mysticism within the limitations imposed by scholasticism. From the 12th and 13th centuries onward there is ob- servable in the different countries of Europe a widespread reaction against the growing formalism and worldliness of the church and the scandalous lives of many of the clergy. Men began to feel a desire for a theology of the heart and an unworldly simplicity of life. Thus there arose

in the Netherlands the Beguines and Beghards, in Italy the Waldenses (without, however, any mystical leaning), in the south of France and elsewhere the numerous sect or sects of the Cathari, and in Calabria the apocalyptic gospel of Joachim of Floris, all bearing witness to the commotion of the time. The lay societies of the Beghards and Beguines (for men and women respectively) date from the end of the 12th century, and soon became extremely popular both im the Low Countries and on the Rhine. They were free at the outset from any heretical taint, but were never much in favour with the church. In the beginning of the 13th century the foundation of the Dominican and Franciscan orders furnished a more ecclesiastical and regu- lar means of supplying the same wants, and numerous convents sprang up at once throughout Germany. The German mind was a peculiarly fruitful soil for mysticism, and, in connexion either with the Beguines or the church organization, a number of women appear about this time, combining a spirit of mystical piety and asceticism with sturdy reformatory zeal directed against the abuses of the time. Even before this we hear of the prophetic visions of Hildegard of Bingen (a contemporary of St Bernard)

and Elizabeth of Schonau. In the 13th century Elizabeth, of Hungary, the pious landgravine of Thuringia, assisted in the foundation of many convents in thenorth of Germany, For an account of the chief of these female saints the reader is referred to the first volume of Preger’s Geschichte der deutschen Mystik. Mechthild of Magdeburg appears to have been the most influential, and her book Das Jjliessende Licht der Gottheit is important as the oldest work of its kind in German. It proves that much of the terminology of German mysticism was current before Kckhart’s time. Mechthild’s clerico-political utterances show that she was acquainted with the “eternal gospel” of Joachim of Floris. Joachim had proclaimed the doctrine of three world-ages—the kingdom of the Father, of the Son, and of the Spirit. The reign of the Spirit was to begin with the year 1260, when the abuses of the world and the church were to be effectually cured by the general adoption of the monastic life of contemplation. Very similar to this in appearance is the teaching of Amalrich of Bena (0b, 1207); but, while the movements just men- tioned were reformatory without being heretical, this is very far from being the case with the mystical pantheism derived by Amalrich from the writings of Erigena. His followers held a progressive

revelation of God in the ages of the Father, Son, and Holy Spirit. Just as the Mosaic dispensation came to an end with the appearance of Christ, so the sacraments of the new dispensation have lost their meaning and efficacy since the incarnation of God as Holy Spirit in the Amalricans. With this opposition to the church they combine a complete antinomianism, through the identification of all their desires with the impulses of the-divine Spirit. Amalrich's teaching was condemned by the church, and his heresies led to the public burning of Krigena's De divisione nature in 1225. The sect of the New Spirit, or of the Free Spirit as it was afterwards called, spread widely through the north of France and into Switzerland and Germany. They were especially numerous in the Rhineland in the end of the 13th and during the 14th century; and they seem to have corrupted the originally orthodox communities of Beghards, for Beghards and Brethren of the Free Spirit are used henceforward as convertible terms, and the same immoralities are related of both. Such was tle seed-ground in which what is speci- fically known as German mysticism sprang up.

In Meister Eckhart (1260-1329 ;—see Ecxuarr) the Beha. German mind definitively asserts its pre-eminence in the sphere of speculative mysticism. Eckhart was a dis- tinguished son of the church; but in reading his works we feel at once that we have passed into quite a different sphere of thought from that of the churchly mystics; we seem to leave the cloister behind and to breathe a freer atmosphere. The scholastic mysticism was, for the most part, practical and psychological in character. It was largely a devotional aid to the realization of present union with God ; and, so far as it was theoretical, it was a theory of the faculties by which such a union is attainable. Mysticism was pieced on somewhat incongruously to a scholastically accepted theology; the feelings and the intellect were not brought together. But in Eckhart the attitude of the churchman and traditionalist is entirely abandoned. Instead of systematizing dogmas, he appears to evolve a philosophy by the free exercise of reason. His system enables him to give a profound significance to the doctrines of the church ; but, instead of the system being accommodated to the doctrines, the doctrines—and especi- ally the historical facts—acquire a new sense in the system, and often become only a mythical representation of specu- lative truth. . The freedom with which Eckhart treats historical Christianity allies

him much more to the German idealists of the 19th century than to his scholastic prede-

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cessors. In his speculative depth as well as in the fond- ness for reconciling apparent contradictions which often lends an air of paradox to his statements Eckhart bears a striking resemblance to Hegel ; but in some determinations of his system, such as his doctrine of the Absolute, he approaches more nearly to Schelling. In view of these affinities, it has been customary to say that his interest is prevailingly intellectual, and that he is lacking in religious warmth. But this is largely due to the fusion of intellect and feeling which is often found in highly speculative natures. ckhart's system is in itself the expression or formulation of religious feeling, and the speculative state- ment possesses for him a rich spiritual unction of its own. In this he is the typical representative of: German, in op- position to what is often called Romanic, mysticism. The latter, both in scholastic times and in its later Catholic representatives, confines itself to the facts of religious feeling without showing itself attracted by ontological speculation.

Eckhart distinguishes between the godhead and God. The godhead is the absolute Essence (Wesen), unknowable not only by man but also by itself; it is darkness and absolute indeterminateness, " Nicht " in contrast to ''Icht" or definite and knowable existence. Yet it is the poten- tiality of all things, and its nature is, in a triadic process, to come to consciousness of itself as the triune God. Crea- tion is not a temporal act, but an eternal necessity of the divine nature. I am as necessary to God, Eckhart is fond of saying, as God is necessary tome. In my knowledge and love God knows and loves Himself. "The eye with which I see God is the same eye with which God sees me. My eye and God's eye are one eye, one vision, one recog- nition, one love." To know God, we must become ignorant of ourselves and of all creatures. '" Couldst thou annihilate thyself for a moment, thou wouldst possess all that God is in Himself." The complete renunciation of selfhood is called by Eckhart "decease ;" and when I am in this state God brings forth His Son in me. Or, conversely, it is I who beget God anew in my soul; "God has begotten me from eternity that I may be Father and beget Him

who begat me.” Our identity with God is recognized by the purely rational and uncreated activity of the soul, which Eckhart calls the “Fiinklein,” or spark. By this we press on beyond God into the abyss of the godhead, and Eckhart prays paradoxically “to be rid of God, that is, that God by His grace would bring him into the Essence—that Es- sence which is above God and above distinction.”

In spite of Eckhart’s daring assertions of the identity of the human and the divine, there is no reason to call in question his genuinely religious and Christian spirit. His spirit, however, was Christian in a wide sense rather than ecclesiastical ; it showed itself in zeal for the upbuilding of Christian life among the people. The condemnation of the church had its effect in later times in obscuring Eckhart’s importance, but it did not avail to check his powerful influ- ence upon his contemporaries. They constantly appeal to him as “the master,” the “wise,” the ‘“‘ divine” master, “from whom God concealed nothing.”

The political circumstances of Germany in the first half of the 14th century were in the last degree disas- trous. The war between the rival emperors, Frederick of Austria and Louis of Bavaria, and the interdict under which the latter was placed in 1324 inflicted extreme misery upon the unhappy people. From some places the interdict was not removed for twenty-six years. Men’s minds were pained and disquieted by the conflict of duties and the absence of spiritual consolation. The country was also visited by a succession of famines and _ floods, and in 1348 the Black Death swept over Europe like a terrible scourge. In the midst of these unhappy sur-

roundings religion became more inward in men of real piety, and the desire grew among them to draw closer the bonds that united them to one another. Thus arose the society of the Friends of God (ottesfreunde) in the south The and west of Germany, spreading as far as Switzerland on Gottes- the one side and the Netherlands on the other. They/’”* formed no exclusive sect. They often took opposite sides in politics, and they also differed in the type of their religious life; but they uniformly desired to strengthen one another in living intercourse with God. Among them chiefly the followers of Eckhart were to be found. Such were Heinrich Suso of Constance (1295-

1366) and John Tauler of Strasburg (1300-61), the two most cele- brated of his immediate disciples. Suso was a remarkable combination of self-torturing austerity with an inexhaust- ible play of poetic fancy. He has been called “the minnesinger of the love of God.” ‘Tauler’s eloquence may be said to have made him the centre of religious life in the south-west of Germany for more than quarter of a century. In his sermons, while the standpoint is the same as Eckhart’s, the speculative groundwork tends, as is natural, to be less insisted on, and more scope is given to its practical consequences and to direct religious ex- hortation. Nicolas of Basel, the mysterious layman from whose visit Tauler dates his true religious life, seems to have been the chief organizing force among the Gottes- freunde. He was known as “the great friend of God in the Oberland,” and Basel continued to be a quiet haven of reunion for the members of the society. Tauler and others retired thither at intervals from the political storms of the time. The society counted many members among the pious women in the convents of southern Germany. Such were Christina Ebner of Engelthal near Nuremberg, and Margaretha Ebner of Medingen in Swabia. Laymen also belonged to it, like Hermann von Fritzlar and Rulman Merswin, the rich banker of Strasburg (author of a mystical work, Buch der newn Felsen, on the nine rocks or upward steps of contemplation). Letters passed between the members, as well- as presents of books or relics. Some of them, like Heinrich von Nérdlingen, the friend of Margaretha Ebner, went much from place to place, and in that way helped to keep up a living connexion among the friends. It was doubtless one of their number who sent forth anonymously from the house of the Teutonic Order in Frankfort the famous handbook of mystical devotion called Hine deutsche Theologie. Shortly after the middle of the century most of the friends of whom anything is known drop out of sight. But the combina- tion of warm piety and spiritual freedom in Tauler’s sermons and the Deutsche Theologie exercised a continuous influence on the religious life of Germany till the time of Luther. As is well known, the Deutsche Theologie was first published in 1516 by Luther, who accompanied it by a pre- face expressing his own obligations to the “ noble book,” and ranking it inferior only to the Bible and St Augustine. The fact that the book was put into his hands by Staupitz, the vicar-general of the Augustinian order, shows that Luther’s high estimate was not singular at the time.

John Ruysbroeck (1293-1381), the father of mysticism Ruys- in the Netherlands, stood in connexion with the Friends of broeck. God, and Tauler is said to have visited him in his seclusion at Vauvert (Griinthal) near Brussels. He was decisively influenced by Eckhart, though there is noticeable occa- sionally a shrinking back from some of Eckhart's phrase- ology. The sect of the Free Spirit is the frequent object of his polemic, and this leads him into somewhat careful definitions of truth and error. For the rest, Ruysbroeck's mysticism is more of a practical than a speculative cast. He is chiefly occupied with the means whereby the unio mystica is to be attained, whereas Eckhart dwells on the

union as an ever-present fact, and dilates on its meta- physical implications. Towards the end of Ruysbroeck's life, in 1378, he was visited by the fervid lay-preacher Gerhard Groot (1340-84), who was so impressed by the life of the community at Vauvert that he conceived the idea of founding a Christian brotherhood bound by no monastic vows, but living together in simplicity and piety with all things in common, after the apostolic pattern. This was the origin of the Brethren of the Common Lot (or Common Life), The first house of the Brethren was founded at Deventer by Gerhard Groot and his youth- ful friend Florentius Radewyn. Similar brother-houses soon sprang up in different places throughout the Low Countries and Westphalia, and even Saxony. Thomas a Kempis (1380-1471), to whom the brotherhood chiefly owes its fame, forms the subject of a separate article.

It has been customary for Protestant writers to represent the mystics of Germany and Holland as precursors of the Reformation. In a sense this is true; and the direct influence of Tauler and the Deutsche Theologie upon Luther has already been referred to. But it conveys a false im- pression if it is understood to mean that these men pro- tested against the doctrines of the church in the way the Reformers felt themselves called upon to do. There is no sign that Tauler, for example, or Ruysbroeck, or Thomas a Kempis had felt the dogmatic teaching of the church jar in any single point upon their religious consciousness. Nevertheless, mysticism did prepare men in a very real way for a break with the traditional system. Mysticism instinctively recedes from formulas that have become stereotyped and mechanical into

the perennially fresh experience of the individual. In the first place, therefore, it brings into prominence only those broad and universal doctrines which it finds to be of vital and present moment for the inward life, while others, though they may have an important place in the churchly system, are (uncon- sciously) allowed to slip into temporary forgetfulness. It is thus we must explain that almost total absence of dis- tinctively Romish doctrine in Thomas a Kempis which makes the Imitation as acceptable to the Protestant as to the devout Catholic. In the second place, mysticism accustoms men to deal with their experience for themselves at first hand, and to test the doctrines presented to them by that standard. This growth of spiritual freedom is especially to be marked in the German mystics. It is to be noted, however, that mysticism affords in itself no founda- tion fora religious community. Its principle is pure inward- ness, but it possesses no norm by which the extravagances of the individual may be controlled. Thus, when the Reformers appeared to do their work, the mystics were found opposing the new authority of Scripture to the full as bitterly as they had opposed the old authority of the church. To the thoroughgoing mystic individualist the one standard is as external as the other. When Cellarius was called upon by Luther to substantiate his positions by reference to Scripture, he struck the table with his fist and declared it an insult to speak so to a man of God. A germ of reason may be discerned in this indignation, but none the less we must recognize that, while mysticism showed itself capable at the Reformation of dissolving society into anarchy and atomism, it showed itself per- fectly destitute of a reconstructive power. The same people who would claim the pre-Reformation mystics as Protestants in disguise are indignant at the way in which the later mystics oppose, or hold aloof from, the Reforma- tion movement. But the truth seems to be that, in both cases, mysticism was true to its principle. Without some fixed letter to attach itself to, it sinks away into utter form- lessness ; but its relation to the system is always more or less one of opposition to what it regards as external. —

Mystics and the Reformna- tion.

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prophets, merging eventually into the excesses of the Gem' Peasants' War and the doings of the Anabaptists jp Mste Miinster, first roused Luther to the dangerous possibilities of mysticism asa disintegrating force. He was also called upon to do battle for his principle against men like Schwenkfeld (1490-1561) and Sebastian Frank (1500-45), the latter of whom developed a system of pantheistic mysticism, and went so far in his opposition to the letter __ as to declare the whole of the historical element in Serip. ture to be but a mythical representation of eternal truth, Valentin Weigel (1533-88), who stands under manifold obligations to Frank, represents also the influence of the semi-mystical physical speculation that marked the transt tion from scholasticism to modern times. The final break- down of scholasticism as a rationalized system of dogma may be seen in Nicolaus of Cusa (1401-64), who received his education, like Thomas a Kempis, at Deventer, and after- wards rose to be a cardinal of the church. He distinguishes between the

Mysticism did not cease within the Catholic Church at Other the Reformation. In St Theresa (1515-82) and John fom of the Cross the counter-reformation can boast of saints second to none in the calendar for the austerity of their mortifications and the rapture of the visions to which they were admitted. But, as was to be expected, their mysticism moves in that comparatively narrow round, and consists simply in the heaping up of these sensuous ex- periences. The speculative character has entirely faded out of it, or rather has been crushed out by the tightness with which the directors of the Roman Church now held the reins of discipline. Their mysticism represents, there- fore, no widening or spiritualizing of their theology ; in all matters of belief they remain the docile children of their church, The gloom and harshness of these Spanish mystics are absent from the tender, contemplative spirit of Frangois de Sales (1567-1622); and in the quietism of Madame Guyon (1648-1717) and Miguel de Molinos (1627-96) there is again a sufficient implication of mys tical doctrine to rouse the suspicion of the ecclesiastical authorities. Quietism, name and thing, became the talk of all the world through the bitter and protracted controversy to which it gave rise between Fénelon and Bossuet.

In the 17th century mysticism is represented in the philosophical field by the so-called Cambridge Platonists, and especially by Henry More (1614-

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ology only serves to blur important distinctions. How- ever absolute a philosopher's idealism may be, he is errone- ously styled a mystic if he moves towards his conclusions

influence of the Kabbalah is combined with a species of Christianized Neo-Platonism. Pierre Poiret (1646-1719) exhibits a violent reaction against the mechanical philo- sophy of Descartes, and especially against its consequences in Spinoza. He was an ardent student of Tauler and Thomas a Kemplis, and became an adherent of the quiet- istic doctrines of Madame Bourignon. His philosophical works emphasize the passivity of the reason. The first influence of Boehme was in the direction of an obscure religious mysticism. J. G. Gichtel (1638-1710), the first editor of his complete works, became the founder of a sect called the Angel-Brethren. All Boehme's works were translated into English in the time of the Commonwealth, and regular societies of Behmenists were formed in England and Holland. Later in the century he was much studied

by the members of the Philadelphian Society, John Pordage,

Thomas Bromley, Jane Lead, and others. The mysticism of William Law (1686-1761) and of St Martin in France (17 43-1803), who were also students of Boehme, is of a much more elevated and spiritual type. The ' Cherubic Wanderer," and other poems, of Johann Schefiler (1624- 77), known as Angelus Silesius, are more closely related in style and thought to Eckhart than to Boehme.

The religiosity of the Quakers, with their doctrines of the "inner light" and the influence of the Spirit, has decided affinities with mysticism; and the quaint auto- biography of George Fox (1624-91), the founder of the sect, proceeds throughout on the assumption of supernatural guidance. Stripped

of its definitely miraculous character, the doctrine of the inner light may be regarded as the familiar mystical protest against formalism, literalism, and scripture-worship. Swedenborg, though selected by Emer- son in his Representative Men as the typical mystic, be- longs rather to the history of spiritualism than to that of mysticism as understood in this article. He possesses the cool temperament of the man of science rather than the fervid Godward aspiration of the mystic proper ; and the speculative impulse which lies at the root of this form of thought is almost entirely absent from his writings. Accordingly, his supernatural revelations resemble a course of lessons in celestial geography more than a description of the beatific vision.

Philosophy since the end of the last century has fre- quently shown a tendency to diverge into mysticism. This has been especially so in Germany. The term mysticism is, indeed, often extended by popular usage and philo- sophical partisanship to the whole activity of the post- Kantian idealists. In this usage the word would be equi- valent to the more recent and scarcely less abused term, transcendentalism, and as such it is used even by a sym- pathetic writer like Carlyle ; but this looseness of phrase-

only by the patient labour of the reason. Hegel there-

fore, to take an instance, can no more fitly be classed as a

mystic than Spinoza can. It would be much nearer the truth to take both as types of a thoroughgoing rationalism. In either case it is of course open to any one to maintain that the apparent completeness of synthesis really rests on the subtle intrusion of elements of feeling into the rational process. But in that case it might be difficult to find a systematic philosopher who would escape the charge of mysticism ; and it is better to remain by long-estab- lished and serviceable distinctions. Where philosophy despairs of itself, exults in its own overthrow, and yet revels in the “mysteries” of a speculative Christianity, as in J. G. Hamann (1730-88), the term mysticism may be fitly applied. So, again, it is in place where the move- ment of revulsion from a mechanical philosophy takes the form rather of immediate assertion than of reasoned demon- stration, and where the writers, after insisting generally on the spiritual basis of phenomena, either leave the

posi- tion without further definition, or expressly declare that the ultimate problems of philosophy cannot be reduced to articulate formulas. Examples of this are men like Novalis, Carlyle, and Emerson, in whom philosophy may be said to be impatient of its own task. Schelling's explicit appeal in the " Identitdts-philosophie" to an intellectual intuition of the Absolute, is of the essence of mysticism, both as an appeal to a supra-rational faculty and as a claim not merely to know but to realize God. The opposition of the reason to the understanding, as used by Coleridge, is not free from the first of these faults. The later philosophy of Schelling and the philosophy of Franz von Baader, both largely founded upon Boehme, belong rather to theosophy than to mysticism proper.

Authorities.—The authorities for the teaching of individual mystics will be found under their names. Besides the sections on mysticism in the general histories of philosophy by Erdmann and Ueberweg, and in works on church history and the history of dogma, reference may be made for the medieval period to Heinrich Schmid, Der Mysticismus in seiner Enistehungsperiode, Jena, 1824 ; Helfferich, Die christliche Mystik, Hamburg, 1842; Noack, Die christliche Mystik des Mittclalters, Konigsberg, 1858. On the German mystics the works are very numerous, but decidedly the best is the Geschichte der deutschen Mystik, in course of publication by W. Preger. 'The first volume, published at Leipsic in 1874, deals with Meister Eckhart and his precursors ; the second, which appeared in 1881, deals with Suso and the general development of mysticism in Eckhart's school, but without including Tauler. The works of Eckhart and his precursors are contained in Pfeiffer's Deutsche Mystiker des 14ten Jahrhunderts, vol. i. (1845), vol. i. (1857). The Theologia Germanica and a selection from Tauler's Sermons have been translated into English by Miss Susannah Winkworth. (A. SE.)

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eee (pvOodroyia) is the science which ex-

amines p30o1, or legends of cosmogony and of gods and heroes. Mythology is also used asa term for these legends themselves. Thus when we speak of "the mytho- logy of Greece" we mean the whole body of Greek divine and heroic and cosmogonic legends. When we speak of the "science of mythology" we refer to the various attempts which have been made to

explain these ancient narratives. Very early indeed in the history of human thought men awoke to the consciousness that their religious Stories were much in want of explanation. The myths of civilized peoples, as of Greeks and the Aryans of India, contain two elements, the rational and the irrational. The rational myths are those which represent the gods as beautiful and wise beings. The Artemis of the Odyssey

"taking her pastime in the chase of boars and swift deer, while with her the wild wood-nymphs disport them, and high over them all she rears her brow, and is easily to be known where all are fair," is a perfectly rational mythic representation of a divine being. We feel, even now, that the conception of a ‘‘ queen and huntress, chaste and fair," the lady warden of the woodlands, is a beautiful and natural fancy which requires no explanation. On the other hand, the Artemis of Arcadia, who is confused with the nymph Callisto, who, again, is said to have become a she-bear, and later a star, and the Brauronian Artemis, whose maiden ministers danced a bear-dance (dpxrevery ; compare Harpo- cration on this word), are goddesses whose legend seems unnatural, and is felt to need explanation. Or, again, there is nothing not explicable and natural in the con-

ception of the Olympian Zeus as represented by the great chryselephantine statue of Zeus at Olympia, or in the Homeric conception of Zeus as a god who "turns every- where his shining eyes" and beholds all things. But the Zeus whose grave was shown in Crete, or the Zeus who played Demeter an obscene trick by the aid of a ram, or the Zeus who, in the shape of a swan, became the father of Castor and Pollux, or the Zeus who was merely a rough stone, or the Zeus who deceived Hera by means of a feigned marriage with an inanimate object, or the Zeus who was afraid of Attes, is a being whose myth is felt to be un- natural and in great need of explanation. It is this irrational and unnatural element—as Mr Max Miiller says, "the silly, senseless, and savage element"—that makes mythology the puzzle which men have so long found it.

arly Explanations of Myths.—The earliest attempts at a crude science of mythology were efforts to reconcile the legends of the gods and heroes with the religious sentiment which recognized in these beings objects of worship

and respect. Closely as religion and myth are intertwined, it is necessary to hold them apart for the purposes of this discussion. Religion may here be defined as the conception of divine or at least supernatural powers, entertained by men in moments of gratitude or of need and distress, in hours of weakness, when, as Homer says, “all folk yearn after the gods.” Now this conception may ‘be rude enough, and it is nearly related to purely magical ideas, to efforts to secure supernatural aid by magical ceremonies, Still the roughest form of spiritual prayer has for its basis the hypothesis of beneficent beings, visible or invisible. The senseless stories or myths about the gods are soon felt to be at variance with this hypothesis. As an example we may take the instance of Qing, the Bushman hunter. Qing, when first he met white men, was asked about his religion. He began to explain, and mentioned Cagn. Mr Orpen, the chief magistrate of St John’s Territory, asked, “Is Cagn good or malicious? how do you pray to him?” Answer (in a low imploring tone), “‘O Cagn! O Cagn! are we not your children ? do you not see our hunger 9 give us food ;’ and he gives us both hands full” (Cape Monthly Maga- zine, July 1874). Here we see the religious view of Cagn, the Bushman god. But in the mythological account of Cagn given by Qing he appears as a kind of grasshopper, supernaturally endowed, the hero of a most absurd cycle of senseless adventures. Even religion is affected by these irrational notions, and the gods of savages and of many civilized peoples are worshipped with cruel, obscene, and irrational rites, But, on the whole, the religious sentiment strives to transcend the mythical conceptions of the gods, and is shocked and puzzled by the mythical narratives. As soon as this sense of perplexity is felt, by poets, by priests, or by most men in an age of nascent criticism, explana- tions of what is most crude and absurd in the myths are put forward, Men ask themselves why their gods are wor- shipped in the form of beasts, birds, and fishes 3 why their gods are said to have prosecuted their amours in bestial shapes ; why they are represented as lustful and passion- ate—thieves, robbers, murderers, and adulterous. The answers to these questions sometimes become myths them- selves. Thus both the Mangaians and the Egyptians have been puzzled by their own gods in the form of beasts. The Egyptians invented an explanation—itself a myth —that in some moment of danger the gods concealed themselves from their foes in the shapes of animals. The Mangaians, according to Mr Gill, hold that “the heavenly family had taken up their abode in these birds, fishes, and reptiles,”2

A people so curious and refined as the Greeks were

1 Plutarch, De Iside et Osiride. ° Myths and Songs from the South Pacific, p. 35, 1876,

certain to be greatly perplexed by even such comparatively pure mythical narratives as they found in Homer, still more by the coarser legends of Hesiod, and above all by the ancient local myths preserved by local priesthoods. Thus, in the 6th century before Christ, Xenophanes of Colophon severely blamed the poets for their unbecoming legends, and boldly called certain myths “the fables of men of old.”* Theagenes of Rhegium (520 B.c. 2), accord- ing to the scholiast on Iliad, xx. 67,4 was the author of a very ancient system of mythology. Admitting that the fable of the battle of the gods was “unbecoming,” if liter. ally understood, Theagenes represented it as an allegorical account of the war of the elements. Apollo, Helios, and Hepheestus were fire, Hera was air, Poseidon was water, Artemis was the moon, xal rd Aourd dspuolws. Or, by another system, the names of the gods represented moral and intellectual qualities. Heraclitus, too, disposed of the myth of the bondage of Hera as allegorical philosophy, Socrates, in the Cratylus of Plato, expounds “a philosophy which came to him all in an instant,” an explanation of the divine beings based on crude philological analyses of their names. Metrodorus, rivalling some recent flights of conjecture, resolved not only the gods but even heroes like Agamemnon, Hector, and Achilles “into elemental combina- tions and physical agencies.” Euripides makes Pentheus (but he was notoriously impious) advance a “ rationalistie” theory of the story that Dionysus was stitched up in the thigh of Zeus. When Christianity became powerful the heathen philosophers evaded its satire by making more and more use of the allegorical and non-natural system of explanation. That method has two faults. First (as Arnobius and Eusebius reminded their heathen opponents), the allegorical explanations are purely arbitrary, depend upon the fancy of their author, and are all equally plaus- ible and equally unsupported by evidence.® Secondly, there is no proof at all that, in the distant age when the myths were developed, men entertained the moral notious and physical philosophies which are supposed to be “wrapped up,”

as Cicero says, “in impious fables.” Another system of explanation is that associated with the name of Euemerus (316 3.c.). According to this author, the myths are history in disguise. All the gods were once men, whose real feats have been decorated and distorted by later fancy. This view suited Lactantius, St Augustine, and other early Christian writers very well. They were pleased to believe that Euemerus “ by historical research had ascertained that the gods were once but mortal men.” Precisely the same convenient line was taken by Sahagun in his account of Mexican religious myths. As there can be no doubt that the ghosts of dead men have been worshipped in many lands, and as the gods of many faiths are tricked out with attributes derived from ancestor-worship, the system of Euemerus retains

“some measure of plausibility. While we need not believe

with Euemerus and with Mr Herbert Spencer that the god of Greece or the god of the Hottentots was once a man, we cannot deny that the myths of both these gods have passed through and been coloured by the imaginations of men who practised the worship of real ancestors. For example, the Cretans showed the tomb of Zeus, and the Phocians (Pausanias, x. 5) daily poured blood of victims into the tomb of a hero, obviously by way of feeding his ghost. The Hottentots show many tombs of their god, Tsui-Goab, and tell tales about his death ; they also pray regularly for aid at the tombs of their own parents.’ We

3 Xenoph., Fr., i. 42. 4 Dindorf’s ed., vol. iv. p. 281.

° Grote, Hist. of Greece, i. 404, ed. 1869,

6 Cf. Lobeck, Aglaophamus, i. 151-152, on allegorical interpreta- tion of myths in the mysteries,

? Hahn, Tsuni-Goam, the Supreme Being of the Khoi-Khoi, p. 118.

me = ei GeO dr OvG Y

may therefore say that, while it is rather absurd to believe

that Zeus and Tsui-Goab were once real men, yet their myths are such as would be developed by people accus-

tomed, among other forms of religion, to. the worship of

dead men. Very probably portions of the legends of real men have been attracted into the mythic accounts of gods of another character, and this is the element Gt truvh ait the bottom of Euemerism. This is not the place to deal fully with the modern form of the system as set forth by Mr Herbert Spencer.

Later Explanations of Mythology.—The ancient systems of explaining what needed explanation in myths were, then, physical, ethical, religious, and historical. One student, like Theagenes, would see a physical philosophy underlying Homeric legends. Another, like Porphyry,

would imagine that the meaning was partly moral, partly.

of a dark theosophic and religious character. Another would detect moral allegory alone, and Aristotle expresses the opinion that the myths were the inventions of legis- lators "'to persuade the many, and to be used in support of law" (Met, xi. 8, 19). A fourth, lke Euemerus, would get rid of the supernatural element altogether, and find only an imaginative rendering of actual history. When Christians approached the problem of heathen mythology, they sometimes held, with St Augustine, a form of the doctrine of Euemerus.! In other words, they re- garded Zeus, Aphrodite, and the rest as real persons, dia- bolical not divine. Some later philosophers, especially of the 17th century, misled by the resemblance between Biblical narratives and ancient myths, came to the conclusion that the Bible contains a pure, the myths a distorted, form of an original revelation. The abbé Banier published a mythological compilation in which he systematically re- solved all the Greek myths into ordinary history.?- Bryant published (1774) A New System, or an Analysis of Ancient Mythology, wherein an Attempt is made to divest Tradition of Fable, in which he talked very learnedly of "that won- derful people, the descendants of Cush," and saw every- where symbols of the ark and traces of the Noachian deluge. Thomas Taylor, at the end of the 18th century, indulged in much mystical allegorizing of myths, as in the notes to his translation of Pausanias (1794). At an earlier date (1760) De

Brosses struck on the true line of interpretation in his little work Du Culte des Dieux Fétiches, ou Paralléle de Pancienne Religion de l Egypte avec la Religion actuelle de Nigritie. In this tract De Brosses explained the animal-worship of the Egyptians as a survival among a civilized people of ideas and practices springing from the intellectual condition of savages, and actually existing among negroes. A vast symbolical explanation of myths and mysteries was attempted by Friedrich Creuzer.?. The learning and sound sense of Lobeck, in his Aglaophamus, exploded the idea that the Eleusinian and other mysteries revealed or concealed matter of momentous religious importance. It ought not to be forgotten that Lafitau, a Jesuit missionary in North America, while inclined to take a mystical view of the secrets concealed by Iroquois myths, had also pointed out the savage element surviving in Greek mythology.‘

The Most Recent Mythological Systems.—Up to a very Tecent date students of mythology were hampered by orthodox traditions, and still more by ignorance of the ancient languages and of the natural history of man. Only recently have Sanskrit and the Egyptian and Chal-

1 De Civ. Det, vii. 18; viii. 26.

- La Mythologie et les Fables expliquées par U Histoire, Paris, 1788, 3 vols, dto,

® Symbolik und Mythologie der Alten Volker, Leipsic and Darm- Stadt, 1836-48,

- Meewrs des Sauvages, Paris, 1724.

dean languages become books not absolutely sealed. Again, the study of the evolution of human institutions from the lowest savagery to civilization is essentially a novel branch of research, though ideas derived from an unsystematic study of anthropology are at least as old as Aristotle. The new theories of mythology are based on the belief that “it is man, it is human thought and human language combined, which naturally and necessarily pro- duced the strange conglomerate of ancient fable.”® But, while there is

now universal agreement so far, modern mythologists differ essentially on one point. There isa school (with internal divisions) which regards ancient fable as almost entirely "'a disease of language," that is, as the result of confusions arising from misunderstood terms that have survived in speech after their original significance was lost. Another school (also somewhat divided against itself) believes that misunderstood language

played but a very slight part in the evolution of mythology, and that the irrational element in myths is merely the survival from a condition of thought which was once

common, if not universal, but is now only found among savages, and to a certain extent among children. The

former school considers that the state of thought out of which myths were developed was produced by decaying

language; the latter maintains that the corresponding

phenomena of language were the reflexion of thought.

For the sake of brevity we might call the former the "philological" system, as it rests chiefly on the study of language, while the latter might be styled the "historical"

or "anthropological" school, as it is based on the study of man in the sum of his manners, ideas, and institutions.

The System of Mr Max Miiller.—The most distinguished

and popular advocate of the philological school is Mr

Max Miiller, whose ideas must now be stated. Their

exposition is chiefly to be found in Mr Miiller's Selected Essays and in his Lectures on Language.

As the opposite system, the historical or anthropological system, is that

which will be adopted in the remainder of this article, our criticism of Mr Miiller's ideas must be accepted as that of an opponent. The problem set himself by Mr Miiller is to explain what he calls "the silly, savage, and senseless"

element in mythology (Sel. Ess., i. 578). (1.) Mr Miiller says (speaking of the Greeks), "their

poets had an instinctive aversion to everything excessive

or monstrous, yet they would relate of their gods what would make the most savage of Red Indians creep and shudder,"—stories, that is, of the cannibalism of Demeter, of the mutilation of Uranus, the cannibalism of Cronus, who swallowed his own children, and the like. "Among the lowest tribes of Africa and America we hardly find anything more hideous and revolting."

(2.) Mr Miiller refers the beginning of his system of mythology to the discovery of the connexion of the Indo- European or, as they are called, "Aryan " languages. Celts, Germans, speakers of Sanskrit and Zend, Latins and Greeks, all prove by their languages that their tongues may be traced to one family of speech. The comparison of the various words which, in different forms, are common to all Indo-European languages must inevitably throw much light on the original meaning of these words. Take, for example, the name of a god, Zeus, or Athene, or any other. The word may have no intelligible meaning In Greek, but its counterpart in the allied tongues, especially in Sanskrit or Zend, may reveal the original significance of the terms. "To understand the origin and meaning of the names of the Greek gods, and to enter into the original intention of the fables told of each, we must take into account the collateral evidence supplied by Latin, German, . _ aE eS

5 Max Miiller, Lectures on Language, 2d series, p. 410, 1864. XVII. — 18

Sanskrit, and Zend philology" (Lect. on Lang., 2d ser., p. 406). A name may be intelligible in Sanskrit which has no sense in Greek. Thus Athene is a

divine name with- out meaning in Greek, but Mr Miiller advances reasons for supposing that it is identical with akana, “the dawn,” in Sanskrit. It is his opinion, apparently, that whatever story is told of Athene must have originally been told of the dawn, and that we must keep this before us in attempting to understand the legends of Athene. Thus (op. cit., p. 410), he says, “we have a right to explain all that is told of him” (Agni, “ fire”) “as originally meant for fire.” To take another example, Mr Miiller proves by aid of Sanskrit philology that Zeus originally meant the sky, and, as a result, “there was nothing that could be told of the sky that was not in some form or other ascribed to Zeus.” Tf, then (to take an example of our own), we read that Zeus, to pacify the jealousy of Demeter, muti- lated a ram, and pretended to have mutilated himself, are we to suppose that this story had originally a meaning in reference to the sky? The system, at all events, is simply this: the original meaning of the names of gods must be ascertained by comparative philology. The names, as a rule, will be found to denote elemental phenomena. And the silly, savage, and senseless elements in the legends of the gods will be shown to have a natural significance, as descriptions of sky, storms, sunset, water, fire, dawn, twi- light, the life of earth, and other celestial and terrestrial existences. Stated in the barest form, these results do not differ greatly from the conclusions of Theagenes of Rhegium, who held that “ Hephestus was fire, Hera was air, Poseidon was water, Artemis was the moon, Kat ra Aowra époiws.” But Mr Miiller’s system is based on scien- tific philology, not on conjecture, and is supported by a theory, which we shall try to explain, of the various pro- cesses in the evolution of myths out of language.

(3.) The following is an abstract of Mr Miiller’s theory of one process by which myths were developed out of language. “The keenest eye of the antiquary and the philosopher” cannot see farther back, he says, than the period when expressions were coined for the most neces- sary ideas, and when a grammar began which was destitute of national peculiarities, but contained the germ of all the Turanian as well as the Aryan and Semitic forms of speech. This age Mr Miiller calls the Rhematic period (Sel. Ess., 1, 806). (As yet there were no myths, or none alluded to by Mr Miller.) This was followed by an age in which at least two families of language, the Aryan and Semitic, left “the nomadic stage of grammar,” and received once for all the peculiar impress of their formative system. There were as yet no

such tongues as the Greek, Sanskrit, and Latin we know, only the Aryan speech from which these languages differentiated themselves. This was the Dialectic period. (As yet we understand that there were no myths, or none which Mr Miiller takes into account.) We now come to the Mythopeic age. It was “half-way between the Dialectical period, presenting the human race gradually diverging into different families and languages, and the National period, exhibiting to us the earliest traces of nationalized language, and a nationalized litera- ture in India, Persia, Greece, Italy, and Germany ” (op. cit., 1, p. 811). The Mythopeic age, according to Mr Miiller (op. cut., 1. 308), came after the “unavoidable divergence of dialects and languages,” between that period and the age of “the establishment of laws and customs and the first beginnings of religion and poetry.” Mr Miiller’s next step is to examine the intellectual and social conditions of man in the Mythopeeic age. This he does by aid of Philology. He analyses the words which, being common to Sanskrit, Greek, Latin, and German, must have existed in Aryan speech before the nations that talked these

languages separated from the common stock. Although, as we have seen, the Mythopceic age came before “the earliest concentrations of political societies, the establish. ment of laws and customs,” yet Mr Miiller demonstrates that man, in the Mythcpeeic age, had political societies, and customs if not laws. Man, in the age called Mythopeeic, the age when myths were made, already possessed the modern, or at all events the patriarchal, form of the family. His life was ‘half nomadic, half pastoral.” He had abundance of domesticated animals, he practised agriculture, and had invented the plough. His political institutions included kingship. He was a builder of cities and a constructor of roads. He could weave, and work the metals, includ- ing iron. He possessed a system of decimal arithmetic, “which could only have been secured,” says Mr Miiller, ‘by the wear and tear of language in literary and practical use.” Thus, as he possessed a literature, his language must have been tolerably definite and, so to say, stereo- typed in meaning. “This earliest period, then, previous to any national separation, is what I call the Mythopeeie period, for every one of these common Aryan words is, in a certain sense, a myth” (op. cit, i. p. 355). It will be observed that, in the Mythopceic age, man was essentially

civilized, and that his language had passed through “ liter- ary wear and tear.”

(4.) Having thus defined the social, political, and literary status of men in the Mythopeeic age, Mr Miiller goes on to describe the style of their conversation, which in the long run was the source of their myths. In the language of that day (as we gather from an examination of Aryan words) a number of terms, which later became abstract, ‘expressed something substantial, something open to sensuous perceptions.” ‘In ancient languages every one of these words” (such as “day,” “night,” “earth,” ‘‘spring,” “ dawn ”) “had necessarily a termination expres- sive of gender, and this naturally produced the corre- sponding idea of sex, so that these names received not only an individual but a sexual character… . What must have been the result of this? As long as people thought in language it was simply impossible to speak of morning or evening, of spring and winter, without giving to these conceptions something of an individual, active, sexual, and at last personal character. They were either nothings, as they are nothings to our withered thought, or they were something ; and then they could not be conceived as mere powers, but as beings powerful.” Now let us take an example to show how, if the original sense of the names of those “powerful beings” were lost, while the names themselves survived in language as part of a traditional saying, a myth would arise where no myth was intended. Let us suppose that in the Mythopceic age some one said “the shining one pursues the burning one,” meaning the sun follows the dawn. Let it further be supposed that the word for “shining one” was an Aryan prototype of the Greek 2Avos, “the sun,” and that the word for the “burning one” was, similarly, an Aryan prototype of the Sanskrit ahana or dahana, “the dawn.” Then grant that the term for Helios came to be confused with Apollo (a god who has points in common with the sun), grant that the word for the “burning one” became, from some- thing like akana or dahana, Daphne, and admit that a certain tree was also called daphne, because its wood burned easily. When all these changes had happened and had been forgotten, Greeks would find in their language this expression, “Apollo pursues Daphne.” They would see that “ Apollo” was a masculine, “ Daphne” a feminine, word. And they would thus be led to suppose that Apollo was a young amorous god who chased a fair reluctant nymph Daphne, and that

Daphne, to avoid his pursuit, changed herself, or was changed, into a tree bearing the

mate OL OG Y

same name! “All this seems to me as clear as daylight,” gays Mr Miiller.

So far two linguistic influences have been exhibited in their effect on mythology. One is the existence of gender terminations, producing in the human mind the belief that inanimate things spoken of as sexual must be sexual living powers. The other process (illustrated to some extent by the change of a phrase meaning “sunrise follows dawn” into “Phoebus chases Daphne”) is the retention by a verb of its full original activity. The full theory of “auxiliary verbs” which originally possessed “a more material and expressive character” than they now retain will be found in Selected Essays, i. 365. Thus the Latin fui, “1 was,” corresponds to vw, and in Greek “still shows its original and material power of growing.” The theory

is, then, that both substantives and auxiliary verbs “ said”

more than they ought to say” in the Mythopeic age, and that this surplus of meaning, misunderstood, became the « Aberglaube,” the irrational surplus of faith, in the myths.

(5.) The philological processes in the evolution of mytho- logy are still unexhausted. It is plain that as long as every one knew that language “said more than it ought to say,” as long as it was discounted and understood at its true value, it would not produce much mythology. “Tt is,” says Mr Miiller, “the essential character of a true myth that it should no longer be intelligible by a refer- ence to spoken language.” For the full development of myths, then, the old rich overweighted terms must have gone on existing, stereotyped in phrases, but their original significance must have ceased to be intelligible. But how did spoken language retain the words and the sayings, while it utterly lost their meaning? The process must be explained in the words of Mr Miller himself.

“‘ Most nouns, as we have seen before, were originally appellatives or predicates expressive of what seemed at the moment the most characteristic

attribute of an object. But as most objects have more than one attribute, and as, under different aspects, one or the other attribute might seem more appropriate to form the name, it happened by necessity that most objects during the early period of language had more than one name, In the course of time the greater number of these names became useless, and they were mostly replaced in literary languages by one fixed name, which might be called the proper name of such objects. The more ancient a language, the richer it is insynonyms. Synonyms, again, if used constantly, must naturally give rise to a number of homonyms. If we may call the sun by fifty names expressive of different quali- ties, some of these names will be applicable to other objects also, which would happen to possess the same quality. These different objects would then be called by the same name, they would become homonyms." (Sel. Hss., i. 376-8.)

Thus, while one thing had many names, many things would have the same name. Again, '"'as the meanings of metaphors are forgotten, or the meanings of roots whence words were derived became dimmed and changed, many of these words would lose their radical as well as their poetical meaning. They would become mere names handed down in the conversation of a family ; understood, perhaps, by the grandfather, familiar to the father, but strange to the son, and misunderstood by the grandson." As an ex- ample, Mr Miiller gives Zevs, which, "originally a name of the sky, like the Sanskrit Dyaus," became gradually a proper name, which betrayed its appellative meaning only ina few proverbial expressions, such as Zevs vex (" Zeus, or the sky, rains"), or sub Jove frigido (" under the chill air"). In this example, it is true, we have neither homonyms nor synonyms presented to us, nor do we see why the grandfather should have talked of the sky as a thing, while the grandson was driven to the inference that the sky was & person, and a very remarkable person too.

1 This explanation of the myth of Daphne is compiled from Selected Essays, i. 398, 399, 607, 608. Meanwhile a well-known American Sanskrit scholar denies that ahana ever meant *¢ dawn," or that it could become dahana and daphne by any philological process.

river.

nyms."'

(6.) Mr Miiller's next step is to collect illustrations of the processes he has described, and to adduce proofs that these processes really existed and acted. He looks for his proofs and his examples in Sanskrit poetry, in the poetry of the sacred hymns or Vedas. Here is his evidence for the action (in the Mythopeeic age) of the processes he calls synonymy or polyonymy (many names for one thing) and homonymy (many things with one name):

'¢In the Veda the earth is called urvt (wide), prithvi (broad), mahi (great), and many more names of which the Nigantha mentions twenty-one. These twenty-one words would besynonyms. But urvi (wide) is not only given as a name of the earth, but also means a Prithvi (broad) means not only earth, but sky and dawn. Mahi (great, strong) is used for air and speech, as well as for earth. Hence earth, river, sky, dawn, air, and speech would become homo- (Sel. Ess., i. 371.)

It will therefore be evident that, if the great-grandsons of the people of the Vedic age did not know whether their

traditional expressions referred to earth, dawn, sky, air, or

speech, confusions would arise, and from the confusions myths. Mr Miiller ends by analysing and explaining some Greek stories.

We have now given as clear and distinct an account of Mr Miiller's system of mythology as is possible within our limited space. It will be observed that the explanation applies to people speaking Indo-European languages, is grounded on a view of their early history as elucidated by philology, and on the whole resolves itself into this, that "mythology is a disease of language," a result of misunderstood phrases and of the gender-terminations of words. We now approach the criticism of Mr Miller's system, and our criticism will lead up to a new examination of the problem of mythology.

(1.) Mr Miiller started with the wish to explain how the Greek poets, with their aversion to everything excessive or monstrous, came to ascribe the most abominable offences to their own gods. The gods were incestuous, were sinners of nameless sins. 'They disguised themselves in animal shapes

; they tasted human flesh ; they amused themselves with obscene jests; they died and were buried ; they were born, and their birth-places were known. The first objection to Mr Miiller's system is that it does not explain, but usually keeps clear of, the very horrors that need ex- planation. 'True, he easily shows that the sun can be regarded, now as the child, now as the bridegroom, of the dawn, and hence a story of incest may arise. The growing crop (to take an instance familiar to the early heathen apologists) may be regarded as the child of the showery sky, and again as its bride, and hence an unbecoming story, like the loves of Zeus and Persephone, might come to be credited. Once more, Zeus may be regarded as the father of all men, and hence the separate myths of his physical amours, whence spring the royal families of Hellas, might have originated. But, even if we accept all these explanations, we still must ask Mr Miiller the questions which the early Christians asked the heathen expositors of and apologists for the myths. How are the disgusting details, the "savage, silly, and senseless" details, to be explained? Zeus is the heaven, and woos the earth, or the lower air, but why does he take the form of a bull or a cuckoo, why does he deceive Hera by celebrating a false marriage with a log of wood? Why does he try to expiate his amour with Demeter by his conduct to the ram? Why, when conceived of as the father of noble houses, does he adopt the shape of an ant, a swan, an eagle, a pull, a serpent? What mean the amours and animal metamorphoses of the other gods? Grant that Procris 1s the dew, as Mr Miiller says it is, and how do you explain her unspeakable services to King Minos? Grant that Cronion only means " the ancient of days," and that, being misunderstood to mean 'son of Cronus," the name gave

rise to the myth of Cronus, and how do you explain that god's mutilation of his father, and his habit of swallowing down alive each of his own children, whom he afterwards Grant that Dionysus only means the vine and its influence, and how do you explain his unspeakable conduct as recorded in the mysteries at Halimus in Attica ? How, in short, as Arnobius asked the heathen, how, if the myths represent pure natural facts and phenomena, do they come to be crowded with the obscene details which disgusted philosophers six hundred years before Christ ? In what stage of society did this 'impure way of stating Mr Miller must fix the period at which such

details were invented, some time between his Mythopceic age and the age of Xenophanes and In the meantime his system does not explain and scarcely touches on the very facts that most call for Why did the Greek poets relate divine myths of which we find the parallels “among the lowest

disgorged ?

pure facts” win favour ?

Theagenes. explanation.

tribes of Africa and America” ?

(2.) Mr Miiller’s system is a result of the philological discoveries that establish the linguistic unity of the Indo- European peoples, and is founded on an analysis of their But myths precisely similar in irrational and repulsive character to those of the Aryan races exist among Australians, South Sea Islanders, Eskimo, Bushmen in Africa, among Solomon Islanders, Iroquois, and so forth. The facts being identical, an identical explanation should be sought, and, as the languages in which the myths exist are essentially different, an explanation founded on the Mr Miiller

language.

Aryan language is likely to prove too narrow. indeed, has ventured into Finnish philology and mythology,

‘but a wider examination is needed. Once more, even if we discover the original meaning of a god’s name, it does not follow that we can explain by aid of the significance of the name the myths about the god. For nothing is | more common than the attraction of a more ancient Myths of unknown antiquity, for example, have been attracted into the legend of Charlemagne, just as the bons mots of old

story into the legend of a later god or hero.

wits are transferred to living humorists. Therefore,

though we may ascertain that Zeus means “sky” and Agni “fire,” we cannot assert, with Mr Miiller, that all the myths about Agni and Zeus were criginally told of fire and sky. When these gods became popular they would inevitably inherit any current exploits of earlier heroes or gods. These exploits would therefore be explained

erroneously if regarded as originally myths of sky or fire.

We cannot convert Mr Miiller’s proposition “there was

nothing told of the sky that could not in some form

or other be ascribed to Zeus” into there was no- thing ascribed to Zeus that had not at some time or

other been told of the sky.” This is also, perhaps, the proper place to observe that names derived from natural phenomena—sky, clouds, dawn, and sun—are habitually assigned by Brazilians, Ojibways, Australians, and other savages to living men and women. Thus the story origin- ally told of a man or woman bearing the name “gun,” “dawn,” “cloud,” may be mixed up later with myths about the real celestial dawn, cloud, or sun. For all these reasons the information obtained from philological analysis of names is to be distrusted. We must also bear in mind that early men when they conceived, and savage men when they conceive, of the sun, moon, wind, earth, sky, and so forth, have no such ideas in their minds as we attach to these names. They think of sun, moon, wind, earth, and sky as of living human beings with bodily parts and passions, Thus, even when we discover an elemental meaning in a god’s name, that meaning may be all unlike what the word suggests to civilized men. A final objection is that philologists differ widely as to the true analysis and

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real meaning of the divine names. Mr Miiller, for ox. ainple, connects xpévos with xpévos, “time”; Preller with kpaivw, “TI fulfil,” and so forth.

(3.) The objection to Mr Miiller’s doctrine of the Rhematic and Dialectic periods of language as bearing on mythology is that he either supposes man to have had no myths in these periods, or takes no account of the myths they may havehad. Yet it iscertain, and admitted by himself, that we do find myths in languages of al] known sorts. If man on his way to being Aryan or Semitic, if man in the Rhematic and Dialectic stages, possessed no myths, he must have differed from all men of whom we know anything. If he did possess myths these cannot have been produced by the conditions of Mr Miiller’s Mythopeic age, because that age had not yet been reached. And if man in the Rhematic and Dialectic periods had myths, and if they survived into the Mytho. peeic and later periods, they cannot be explained by Mr Miller’s Mythopceic theory. Especially if these earlier myths crystallized round a god or hero of later date will the effort to explain the earlier stories by analysis of the later names be fruitless. As to the Mythopceic period itself, as described by Mr Miiller, it was rather an age when the materials for myths were accumulated than when myths themselves were developed.

(4.) Mr Miiller attempts to show how the conversation of men in the Mythopweic age became the source of myths. Here he is endeavouring, really, to account for that universal attribution of life, sex, action, and thought to all phenomena which is, indubitably, the essential con- dition of mythology. He explains this “animism ” as an ‘erroneous condition of thought into which men essentially civilized were driven by the nature of language. In lan- guage all words denoted gender, hence (he thinks) men were led to suppose that gender and sex, with all that follows, were possessed by all objects. But it is scarcely necessary to reply (the truth being so obvious) that the gender-termina- tions of words reflected, and must have arisen from, a state of the human intellect in which all things were regarded as persons. The civilized men of the Mythopeic age were not compelled, as Mr Miller thinks, to believe that all phenomena were persons, because the words which denoted the phenomena had gender-terminations. On the other hand, the gender-terminations were survivals from an early stage of thought in which personal characteristics, including sex, had been attributed to all phenomena. This condition of thought is demonstrated to

be, and to have been, universal among savages, and it may notoriously be observed among children. Mr Miiller explains it as the result of reflexions on gender-terminations, but how does he explain these terminations themselves? His theory is that, somehow, gender-terminations arose in language. Then, when they had become a tradition of language, they "reacted on the mind with irresistible power," and men, who had previously been as sensible as ourselves, felt themselves obliged to animate and personify all pheno- mena. Mr Miiller remarks "there is some truth in this," (that is, in the contention that a belief in the personal character of phenomena reflected itself in gender-termina- tions), "but it only serves to confirm the right view of the influence of language on thought, for this tendency, though in its origin intentional, and therefore the result of thought, became soon a mere rule of tradition in language, and then it reacted on the mind with irresistible power" (Sel. Ess., 1, 604). Mr Miiller thinks that men first held nature to be animated and personal. This belief reflected itself in language, but it (apparently) produced no myths. Ina later and civilized age language brought back the old state of intellect, and myths were produced. This becomes 4 superfiuous hypothesis of degradation, for the original state

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of intellect was enough for the genesis of myths, without the conjectured reaction of language.

(5.) The elaborate theory of the persistence of phrases without meaning in language is inconsistent with all that Mr Miiller has told us about the civilization of Mythopceic man. He belonged to a settled society, with a literature of its own. No proof is given that men so advanced in civilization would forget the meanings of ordinary phrases and yet retain the phrases in their language. How could a society with such shifting speech develop "by literary wear and tear" a system of decimal arithmetic? But Mr Miiller says that the rapid process of oblivion which begat myths might occur in four generations. ;

(6.) Again, no proof is given of the existence of the processes called homonymy and polyonymy. Mr Miiller, by way of proof, quotes the Vedas, —artificial poems pro- duced in a language which did not even exist in

what he calls the Mythopeeic age. An Englishman might as well illustrate the conversation of his ancestors by examples chosen from Hymns Ancient and Modern. Mr Miiller gives instances of homonymy and polyonymy in the Vedas, but he does not show that these processes made it impossible for the descendants of the Vedic poets to know what they were talking about. He says the descendants of Mytho- peic mendid not know what their traditional phrases meant, but he advances no proof that Mythopceic men used the processes called homonymy and polyonymy. Finally, when he looks for illustrations, he finds them, not in the Mytho- peeic period at all, but in the established national languages of the Greeks and of the Aryans of India. And in these illustrations the very points which most demand explana- tion—the "'silly, senseless, and savage" details—are left not only unexplained but almost untouched. Thus Mr Miiller's theory that myths are "'a disease of language " seems destitute of evidence, and inconsistent with what is histori- cally known about the relations between the language and the social, political, and literary condition of men.

Theory of Mr Herbert Spencer.—The system of Mr Herbert Spencer, as explained in Principles of Sociology, has many points in common with that of Mr Miiller. Mr Spencer attempts to account for the state of mind (the foundation of myths) in which man personifies and ani- mates all phenomena. According to his theory, too, this habit of mind may be regarded as the result of degenera- tion, for in his view, as in Mr Miiller's, it is not primary, bilt the result of misconceptions. But, while language is the chief cause of misconceptions with Mr Miiller, with Mr Spencer it is only one of several forces all working to the same result, Statements which originally had a different significance are misinterpreted, he thinks, and names of human beings are also misinterpreted in such a manner that early races are gradually led to believe in the person- ality of phenomena. He too notes "the defect in early speech" —that is, the "lack of words free from implica- tions of vitality "—as one of the causes which "favour per- sonalization." Here, of course, we have to ask Mr Spencer, seve asked Mr Miiller, why words in early languages

imply vitality." These words must reflect the thought of the men who use them before they react upon that thought and confirm it in its misconceptions. So far Mr Spencer seems at one with the philological

school of mytho- logists, but he warns us that the misconstructions of language in his system are “different in kind, and the erroneous course of thought is opposite in direction.” According to Mr Spencer (and his premises, at least, are correct), the names of human beings in an early state of Society are derived from incidents of the moment, and often refer to the period of the day, or the nature of the Weather. We find, among Australian natives, among

Abipones in South America, and among Ojibways in the

North, actual people named Dawn, Gold Flower of Day, Dark Cloud, Sun, and so forth. Mr Spencer’s argument is that, given a story about real people so named, in process of time and forgetfulness the anecdote which was once current about a man named Storm and a woman named Sunshine will be transferred to the meteorological phenomena of sun and tempest. Thus these purely natural agents will come to be “personalized” (Prin. Soc., 392), and to be credited with purely human origin and human adventures. Another misconception would arise when men had a tradition that they came to their actual seats from this mountain, or that lake or river, or from lands across the sea. They will mistake this tradition of local origin for one of actual parentage, and will come to believe that, like certain Homeric heroes, they are the sons of a river (now personified), or of a mountain, or, like a tribe mentioned by Garcilasso de la Vega, that they are descended from the sea. Once more, if their old legend told them that they came from the rising sun, they will hold, like many races, that they are actually the children of the sun. By this process of forgetfulness and misinterpretation, mountains, rivers, lakes, sun, and sea would receive human attributes, while men would degenerate from a more sen- sible condition into a belief in the personality and vitality of inanimate objects. As Mr Spencer thinks ancestor- worship the first form of religion, and as he holds that per- sons with such names as sun, moon, and the like became worshipped as ancestors, his theory results in the belief that nature-worship and the myths about natural pheno- mena —dawn, wind, sky, night, and the rest—are a kind of transmuted worship of ancestors and transmuted myths about real men and women. “Partly by confounding the parentage of the race with a conspicuous object marking

the natal region of the race, partly by literal interpretation of birth names, and partly by literal interpretation of names given in eulogy" (such as Sun and Bull, among the Egyptian kings), and also through "implicit belief in the statements of forefathers," there has been produced belief in descent from mountains, sea, dawn, from animals which have become constellations, and from persons once on earth who now appear as sun and moon.

The chief objection to these processes is that they require, as a necessary condition, a singular amount of memory on the one hand and of forgetfulness on the other. The lowest contemporary savages remember little or nothing of any ancestor farther back than the grandfather. But men in Mr Spencer's Mythopceic age had much longer memories. On the other hand, the most ordinary savage does not misunderstand so universal a custom as the imposition of names peculiar to animals or derived from atmospheric phenomena. He calls his own child Dawn or Cloud, his own name is Sitting Bull or Running Wolf, and he is not tempted to explain his great-grandfather's name of Bright Sun or Lively Raccoon on the hypothesis that the ancestor really was a raccoon or the sun. Moreover, savages do not worship ancestresses or retain lively memories of their great-grandmothers, yet it is through the female line in the majority of cases that the animal or other ancestral name is derived. The son of an Australian whose family

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name is Crane takes his mother's name, Swan or Cockatoo, or whatever it may be, and the same is the general rule in Africa and America among races who rarely remember their great-grandfathers. On the whole, then (though

degeneracy, as well as progress, is a force in human evolu- tion), we are not tempted to believe in so strange a com-

bination of forgetfulness with long memory, nor so excessive a degeneration from common sense into a belief in the personality of phenomena, as are required no less by Mr Spencer's system than by that of Mr Miiller.

A New Examination of Mythologies.—We have stated and criticized the more prominent modern theories of mythology. It is now necessary first to recapitulate the chief points in the problem, and then to attempt to explain them by a comparison of the myths of various races. ‘The difficulty of mythology is to account for the following among other apparently irrational elements in myths: the wild and senseless stories of the beginnings of things, of the origin of men, sun, stars, animals, death, and the world in general; the infamous and absurd adventures of the gods; why divine beings are regarded as incestuous, adulterous, murderous, thievish, cruel, cannibals, and addicted to wearing the shapes of animals; the myths of metamorphosis into plants, beasts, and stars ; the repulsive stories of the state of the dead; the descents of the gods into the place of the dead, and their return thence. It is extremely difficult to keep these different categories of myths separate from each other. If we investigate myths of the origin of the world, we often find gods in animal form active in the work of world-making. If we examine myths of human descent from animals, we find gods busy there, and if we try to investigate the myths of the origin of the gods, the subject gets mixed up with the mythical origins of things in general.

Our first question will be, Is there any stage of human society, and of the human intellect, in which facts that appear to us to be monstrous and irrational are accepted as ordinary occurrences of every-day life? Mr Lane, in his preface to the Arabian Nights, says that the Arabs have an advantage over us as story-tellers, They can introduce such incidents as the change of a man into a horse, or of a woman into a dog, or the intervention of an afreet, without any more scruple than our own novelists feel in describing a duel or the concealment of a will. Among the Arabs the actions of magic and of spirits are regarded as at least as probable and common as duels and concealments of wills in European society. It is obvious that we need look no farther for the explanation of the supernatural events in Arab romances, Now let us apply this system to mythology. It is admitted that Greeks, Romans, Aryans of India in the age of the Sans- krit commentators, Egyptians of the Ptolemaic and earlier ages, were as much puzzled as we are by the mythical adventures of their gods. But is there any known stage of the human intellect in which these divine adventures, and the metamorphoses of men into animals, trees, stars, and converse with the dead, and all else that puzzles us in the civilized mythologies, are regarded

as possible incidents of daily human life? Our answer is that every- thing in the civilized mythologies which we regard as irrational seems only part of the accepted and rational order of things to contemporary Savages, and in the past seemed equally rational and natural to savages concern- ing whom we have historical information, Our theory is, therefore, that the savage and senseless element in mythology is, for the most part, a legacy from ancestors of the civilized races who were in an intellectual state not higher than that of Australians, Bushmen, Red Indians, the lower races of South America, and other worse than barbaric peoples, As the ancestors of the Greeks, Aryans

of India, Egyptians, and others advanced in civilization, their religious thought was shocked and surprised by myths (originally dating from the period of savagery, and natural in that period) which were preserved down to the time of Pausanias by local priesthoods, or which were stereotyped in the ancient poems of Hesiod and Homer, or in the Brakhmanas and Vedas of India, or were retained in the popular religion of Egypt. This theory recommended itself to Lobeck. ‘‘We may believe that ancient and early tribes framed gods like themselves in action and in experience, and that the allegorical element in myths is the addition of later peoples who had attained to purer ideas of divinity, yet dared not reject the religion of their ancestors” (A glaoph., i. 153). The senseless element in the myths would by this theory be for the most part a “sur. vival.” And the age and condition of human thought from which it survived would be one in which our most ordinary ideas about the nature of things and the limits of possibility did not yet exist, when all things were con- ceived of in quite other fashion,—the age, that is, of savagery. It is universally admitted that “ survivals” of this kind do account for many anomalies in our institu. tions, in law, politics, society, even in dressand manners, If isolated fragments of an earlier age abide in these, it is still more probable that other fragments will survive in anything so closely connected as mythology with the conservative religious sentiment. Again, if this view of mythology can be proved, much will have been done to explain a problem which we have not yet touched, namely, the distribution of myths. The science of mythology has to account, if it can, not only for the existence of certain stories in

‘the legends of certain races, but also for the presence of

stories practically the same among almost all races. In the long history of mankind it is impossible to deny that stories may conceivably have spread from a single centre, and been handed on from races like the Indo-European and the Semitic to races as far removed from them in every way as the Zulus, the Australians, the Eskimo, the natives of the South Sea Islands. But, while the possi- bility of the diffusion of myths by borrowing and trans- mission must be allowed for, the hypothesis of the origin of myths in the savage state of the intellect supplies a ready explanation of their wide diffusion. Archeeologists are acquainted with objects of early art and craftsmanship, rude clay pipkins and stone weapons, which can only be classed as “human,” and which do not bear much impress of any one national taste and skill. Many myths may be called “human” in this sense. They are the rough pro- ducts of the early human mind, and are not yet characterized by the differentiations of race and culture. Such myths might spring up anywhere among untutored men, and anywhere night survive into civilized literature, There- fore where such myths are found among Greeks, Austral- lans, Egyptians, Mangaians, and others it is unnecessary to account for their wide diffusion by any hypothesis of borrowing, early or late. The Greek “key” pattern found on objects in Peruvian graves was not necessarily borrowed from Greece, nor did Greeks necessarily borrow from Aztecs the “wave” pattern which is common to both. The same explanation may be applied to Greek and Aztec myths of the deluge, to Australian and Greek myths of the original theft of fire. Borrowed they may have been, but they may as probably have been independent inventions. It is true that some philologists (among others Professor Sayce) deprecate as unscientific the comparison of myths which are found in languages not connected with each other. The objection rests on the theory that myths are a disease of language, a morbid offshoot of language, and that the

legends in unconnected languages must therefore be kept apart. But, as the theory which we are explaining does

not admit that language is more than a subordinate cause in the development of myths, as it seeks for the origin of myths in a given condition of thought through which all races have passed, we need do no

more than record the ob- jection of Professor Sayce. Our next step must be briefly to examine the intellectual condition of savages, that is, of races varying from the condition of the Andaman islanders to that of the Solomon Islanders and the ruder Red Men of the American continent.

The Intellectual Condition of Savages. Nature of our Evidence.—In a developed treatise on the subject of mythology it would be necessary to criticize, with a minuteness which is impossible here, our evidence for the very peculiar mental condition of the lower races. Mr Max Miiller has asked (when speaking of the mental con- dition of men when myths were developed), “was there a period of temporary madness through which the human mind had to pass, aud was it a madness identically the same in the south of India and the north of Iceland?” To this we may answer that the human mind had to pass through the savage stage of thought, that this stage was for all practical purposes “identically the same” everywhere, and that to civilized observers it does resemble “a temporary madness.” Many races are still abandoned to that tem- porary madness ; many others which have escaped from it were observed and described while still labouring under its delusions. Our evidence for the intellectual ideas of man in the period of savagery we derive partly from the reports of voyagers, historians, missionaries, partly from an examination of the customs, institutions, and laws in which the lower races gave expression to their notions. As to the first kind of evidence, we must be on our guard against several sources of error. Where religion is con- cerned, travellers in general and missionaries in particular are biased in several distinct ways. The missionary is sometimes anxious to prove’ that religion can only come by revelation, and that certain tribes, having received no revelation, have no religion or religious myths at all. Sometimes the missionary, on the other hand, is anxious to demonstrate that the myths of his heathen flock are a corrupted version of the Biblical narrative. In the former ease he neglects the study of savage myths; in the latter he unconsciously accommodates what he hears to what he calls “the truth.” The traveller who is not a missionary may either have the same prejudices, or he may bea sceptic about revealed religion. In the latter case he is perhaps unconsciously moved to put burlesque versions of Biblical stories into the mouths of his native informants, or to represent the savages as ridiculing the Scriptural traditions which he communicates to them. Yet again we must re- member that the

leading questions of a European inquirer may furnish a savage with a thread on which to string answers which the questions themselves have suggested. “Have you ever had a great flood?” “Yes.” ‘Was any one saved?” The question starts the invention of the Savage on a deluge-myth, of which, perhaps, the idea has never before entered his mind. There still remain the difficulties of all conversation between civilized men and unsophisticated savages, the tendency to hoax, and other sources of error and confusion. In receiving this kind of evidence, then, we need to know the character of our Informant, his means of communicating with the heathen, his power of testing evidence, and his good faith. His testimony will have additional weight if supported by the

uudesigned coincidences” of other evidence, ancient and modern. If Strabo and Herodotus and Pomponius Mela, for example, describe a custom, rite, or strange notion in the Old World, and if mariners and missionaries find the Same notion or custom or rite in Polynesia or Australia or Kamchatka, we can scarcely doubt the truth of the

reports. The evidence is best when given by ignorant men, who are astonished at meeting with an institution which ethnologists are familiar with in other parts of the world. Another method of obtaining evidence is by the comparative study of savage laws and institutions. Thus we find in Asia, Africa, America, and Australia that the marriage laws of the lower races are based on a belief in kinship with animals. The evidence for this belief is thus en- tirely beyond suspicion. We find, too, that political power, sway, and social influence are based on the ideas of magic, of metamorphosis, and of the power which certain men possess to talk with the dead and to visit the abodes of death. All these ideas are the stuff of which myths are made, and the evidence of savage institutions, in every part of the world, proves that these ideas are the universal inheritance of savages. As to the quantity of evidence, it is actually overpowering in amount.

Savage Ideas about the World.—We all “move about in worlds not realized,” though science is constantly occupied in winning over more material from the chaos of the un- known to the realm of rational knowledge. Savage men are like ourselves in curiosity and anxiety causas

cognoscere rerum, but with our curiosity they do not possess our powers of attention. They are as easily satisfied with an explanation of phenomena as they are eager to possess an explanation. Inevitably they furnish themselves with their philosophy out of their scanty stock of acquired ideas, and these ideas and general conceptions seem almost imbecile to civilized men. Curiosity and credulity, then, are the characteristics of the savage intellect. When a phenomenon presents itself the savage requires an explanation, and that explanation he makes for himself, or receives from tradition, in the shape of a myth. The basis of these myths, which are just as much a part of early conjectural science as of early religion, is naturally the experience of the savage as construed by himself. Man's craving to know "the reason why" is already "among rude savages an in- tellectual appetite," and "even to the Australian scientific speculation has its germ in actual experience."' How does he try to satisfy this craving? Mr Tylor replies, 'When the attention of a man in the myth-making stage of intellect is drawn to any phenomenon or custom which has to him no obvious reason, he invents and tells a story to account for it." Against this statement it has been urged that men in the lower stages of culture are not curious, but take all phenomena for granted. If there were no direct evidence in favour of Mr Tylor's opinion, it would be enough to point to the nature of savage myths themselves. It is not arguing in a circle to point out that almost all of them are nothing more than explanations of intellectual difficulties, answers to the question, How came this or that phenomenon to be what it is? Thus savage myths answer the questions,—What was the origin of the world, and of men, and of beasts? How came the stars by their arrangement and movements? How are the motions of sun and moon to be accounted for! Why has this tree a red flower, and this bird a black mark on the tail? What was the origin of the tribal dances, or of this or that law of custom or etiquette? Savage mytho- logy, which is also savage science, has a reply to all these aud all similar questions, and that reply is always found in the shape of a story. The answers cannot be accounted for without the previous existence of the questious.

We have now shown how savages come to have a mytho- logy. It is their way of satisfying the early form of scientific curiosity, their way of realizing the world in which they move. But they frame their stories, neces- sarily and naturally, in harmony with their general theory Ween ee

1 Tylor, Primitive Culture, i, 369, 1871.

of things, with what we may call ‘savage metaphysics.” Now early man, as Mr Miiller says, “not only did not think as we think, but did not think as we suppose he ought to have thought.” The chief distinction between his mode of conceiving the world and ours is his vast extension of the theory of personality. The history of thought is the history of the process of narrowing the range and intensifying the conception of personality. To civilized man only human beings seem personal. We scarcely regard each of the more intelligent lower creatures as “‘an J,” and we can hardly be said to attribute definite personality at all to the less intelligent creatures, such as fishes. It is only by the half-conscious survival of older thought in poetry that we attribute personality to the sun or the wind, or say, ‘“‘at one stride comes the Dark.” But to the savage, and apparently to men more backward than the most backward peoples we know, all nature was a congeries of ‘animated personalities. The savage’s notion of personality is more a universally diffused feeling than a reasoned conception, and this feeling of a personal self he impartially distributes all over the world as known to him. One of the Jesuit missionaries in North America thus describes the Red Man’s philosophy :! “Les sauvages se persuadent que non seulement les hommes et les autres animaux, mais aussi que toutes les autres choses sont animées.” Crevaux, in the Andes, found that the Indians believed that the beasts have piays (sorcerers and doctors) like themselves.? This opinion we may name personalism, and it is the necessary condition of savage (and, as will be seen, of civilized) mythology. The Jesuits could not under- stand how spherical bodies like sun and moon could be mistaken for human beings. Their catechumens put them off with the answer that the drawn bows of the heavenly bodies gave them their round appearance. ‘‘The wind was formerly a person; he became a bird,” say the Bush- men, and g‘60 ka/ kat, a respectable Bushman once saw the personal wind at Haarfontein.? The Egyptians, ac- cording to Herodotus (iii. 16), believed fire to be Onplov eupuxov, a live beast. The Bushman who saw the Wind meant to throwa stone at it, but it ran into a hill, From the wind as a person the Bhinyas in India (Dalton, p. 140) claim descent, and in Indian epic tradition the leader of the ape army was a son of the wind. The Wind, by certain mares, became

the father of wind-swift steeds men- tioned in the J2iad. The loves of Boreas are well known. These are examples of the animistic theory applied to what, in our minds, seems one of the least personal of natural phenomena. The sky (which appears to us even less personal) has been regarded as a personal being by Samoyeds, Red Indians, Zulus,4 and traces of this belief survive in Chinese, Greek, and Roman religion.

Thus the savage mind regards even the most abstract phenomena as persons, with human parts and passions, That idea alone will account for much that is strange in mythology. But we must remember that, to the savage, Sky, Sun, Sea, Wind are not only persons, but they are savage persons. Their conduct is not what civilized men would attribute to characters so august; it is what un- civilized men think probable and befitting among beings like themselves. Now savage man's view of his own place and his own powers in the world is so unlike our modern view of human relations to the universe that it requires a separate explanation.

Savage Theory of Man's Relations with the World.—It has already been shown that the savage regards even the most abstract phenomena (sky, earth, wind, and so forth) as animated and personal. It must be added that he has

1 Relations, 1636, p. 114. 2 Voyages, p. 159. 3 South African Folk-Lore Journal, May 1880. 4 Tylor, op. cit., ii. 256.

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the same opinion of the personality and human character of all animals. 'Ils tiennent les poissons raisonnables, comime aussi les cerfs," says a Jesuit father about the North-American Indians (Relations, loc. cit.). In Aus. tralia the natives believe that the wild dog has the power of speech, like the cat of the Coverley witch in the Spec. tator. The Breton peasants, according to M. Sébillot, credit all birds with language, which they even attempt to interpret. The old English and the Arab superstitions about the language of beasts are examples of this opinion surviving among civilized races. The bear in Norway is regarded as almost a man, and his dead body is addressed and his wrath deprecated by Samoyeds and Red Indians, "The native bear Kwr-bo-roo is the sage counsellor of the aborigines in all their difficulties, When

bent on a danger- ous expedition, the men will seek help from this clumsy creature, but in what way his opinions are made known is nowhere recorded.”> Schoolcraft mentions a Red Indian story explaining how “the bear does not die,” but this tale Mr Schoolcraft (like Herodotus in Egypt) “cannot bring himself to relate.” He also gives examples of Iowas conversing with serpents. These may serve as examples of the savage belief in the human intelligence of animals, Man is on an even footing with them, and with them can interchange his ideas. But savages carry this opinion much further. Man in their view is actually, and in no figurative sense, akin to the beasts. Certain tribes in Java “believe that women when delivered of a child are fre- quently delivered at the same time of a young crocodile.”6 The common European story of a queen accused of giving birth to puppies shows the survival of the belief in the possibility of such births among civilized races, while the Aztecs had the idea that women who saw the moon in certain circumstances would produce mice. But the chief evidence for the savage theory of man’s close kinship with the lower animals is found in the institution called totemism. This is not the place to discuss totemism in all its bearings. It is, roughly speaking, the belief that certain stocks of men in the various tribes are descended by blood descent from certain objects animate or inani- mate, but especially from beasts. The strength of the opinion is proved by its connexion with very stringent marriage laws. No man (according to the rigour of the custom) may marry a woman who bears the same family name as himself, that is, who is descended from the same inanimate object or animal. Nor may people (if they can possibly avoid it) eat the flesh of animals who are their kindred. We have only space to indicate briefly here the wide diffusion of this extraordinary belief. Among the Murri, or natives of Australia, the local tribes are divided into stocks which may not intermarry, and which regard themselves as being descended from kangaroos, cockatoos, emus, pelicans, and other animals. A man and a woman who both claim descent from the same animal consider themselves as “of one flesh,” brother and sister in the emu or kangaroo stock, and therefore may not inter- marry (Dawson, p. 26). As the cannibals of New Cale- donia do not eat their own tribesmen, so these stocks abstain from the flesh of their animal tribe-fellow. The Australians have a still more curious division of all nature into groups of kindred, so that one man may be descended, indeed, from the fish-hawk, but he also counts cousins with smoke and the honeysuckle tree. Again, the kangaroo and men-kangaroos

are akin to summer, the wind, and the shevak tree. “The South Australian savage looks upon the world as the Great Tribe, to one of whose divisions he himself belongs, and all things, animate or inanimate, which belong to his class are parts of the body corporate 5 Brough Smyth, Aborigines of Victoria, i. 446, 1878. § Hawkesworth, Voyages, iii. 756.

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whereof he himself is part.”!_ Turning from Australia to the west coast of Africa, we find similar ideas prevailing there. Among the Ashantees, as among the Australians, there are local divisions of the people, through which are

scattered stocks claiming descent from animals, plants, and

other natural objects.2_ As in Australia, the families may not eat the animals to which they are akin. The same notions prevail among the Basutos and other African tribes.® In America the amount of evidence for similar institutions grounded on similar creeds is too large to be dealt with here. The old missionaries, as Charlevoix and Bancroft, the old historian of the Peruvian tribes, Garcilasso de la Vega, the travels of Franklin, the collections of, Bancroft and Schoolcraft, bear irrefutable testimony to the American belief in descent from animals and from inanimate objects, the kinship being recognized, as in Australia, by marriage laws of the strictest character. In India the idea of animal kinship is just as powerful as elsewhere.* The Hos and Mundas exhibit this creed in their marriage law. “The Mundaris, like the Oraons, adopt as their tribal distinction the name of some animal, and the flesh of that animal is tabooed to them as food; for example, the eel and the tortoise” (Dalton, pp. 189, 254). Turner describes analo- gous institutions in his Polynesia (p. 196). The Samoans, like the Egyptians, refuse to eat their own tribal gods, but consume those of their neighbours. Siberian examples are given in Sir John Lubbock’s Origin of Civilization, under the head of the Jakuts. Among the Bonis (negroes relapsed into savagery out of slavery in Cayenne) one family reveres the red ape, another the cayman, a third the turtle.® The higher religion of the Bonis is a survival of Christianity. The language is a mixture of English, Dutch, and Creole patois. These instances from almost every quarter of the globe, from Siberia to Peru, from Bengal to Canada, from Ashantee to the

Cape, will suffice to indicate the strength and wide diffusion of the savage belief in animal kinship with men. Considerable proof of the survival of this sen- timent among the Semitic races is given by Professor Robertson Smith in " Animal Worship and Animal Tribes

among the Arabs and in the Old Testament," Jowrnal of

Philology, vol. ix. No. 17.6

Savage man, then, regards all objects as animate and personal, and himself as physically akin to plants, animals, and other animate and inanimate things. He also believes that many of his own tribe-fellows have the power of as- suming the shapes of animals, and that the souls of his dead kinsfolk revert to animal forms. Sir A. C. Lyal, writing from Hindustan, observes that "to those who live in a country where wicked people and witches are constantly taking the form of wild beasts the explanation of lycan- thropy by a confusion between Aevxds (white) and Avkos (a wolf) seems wanton." Our sense of the wantonness and in- adequacy of this etymological explanation is increased when we find phenomena like LycanrHropy (q. v.) believed in everywhere, whatever the language spoken by the believers. Mr Lane, in his introduction to the Arabian Nights (i. p. 58), says he found the belief in these transmigrations accepted solemnly in Cairo. Bancroft brings evidence to prove that the Mexicans supposed pregnant women would

1 Fison, Kamilaroi and Kurnat, p. 169. Sir George Grey's Travels and Mr G. 8. Lang's lecture on The Aborigines of Australia may also be consulted.

; Bowditch, Mission to Ashantee, pp. 180, 181, 1873.

: Casalis, p. 211; Livingstone, p. 13.

' Evidence will be found in Dalton, Ethnology of Bengal, pp. 63, 166.

: Crevaux, Voyage dans l Amérique du Sud, p. 59.

For similar survivals among Aryans see Famity (vol. ix. pp. 20, 21), and The Politics of Aristotle (Bolland and Lang), p. 96. The original observer of these institutions and ideas, Mr M'Lennan, printed his remarkable papers

on ‘‘The Worship of Plants and Animals ” in the Fortnightly Review, Nov. 1869, Feb. 1870.

turn into beasts, and sleeping children into mice, if things went wrong in the ritual of a certain solemn sacrifice. There is a well-known Scotch legend to the effect that a certain old witch was once fired at in her shape as a hare, and that where the hare was hit there the old woman was found to be wounded. Lafitau tells the same story as current among his Red Indian flock, except that the old witch and her son took the form of birds, not of hares. A Scandinavian witch does the same in the Egil saga. In Lafitau’s tale the birds were wounded by the magic arrows of a medicine man, and the arrow-heads were found in the bodies of the human culprits. In Japan’ people chiefly transform themselves into badgers. The sorcerers of Honduras (Bancroft, i. 740) “possessed the power of trans- forming men into wild beasts.” Regnard, the French dramatist, found in Lapland (1681) that witches could turn men into cats, and could themselves assume the forms of swans, crows, falcons, and geese. Among the Bushmen’ “sorcerers assume the form of beasts and

jackals.” Dobrizhofer, a missionary in Paraguay (1717-

1791), learned that “sorcerers arrogate to themselves the power of changing men into tigers” (Eng. transl., i. p. 63). He was present at a conversion of this sort, though the miracle beheld by the people was invisible to the missionary. Near Loanda Livingstone noted that “a chief may metamorphose himself into a lion, kill any one he chooses, and resume his proper form.” The same accomp- lishments distinguish the Barotse and Balonda.? Among the Mayas of Central America sorcerers could transform themselves “into dogs, pigs, aud other animals; their glance was death to a victim” (Bancroft, ii. 797 yale Thlinkeets hold that their shamans have the same powers.1° A bamboo in Sarawak is known to have been a man. Metamorphoses into stones are aS common among Red Indians and Australians as in Greek mythology. Com- pare the cases of Niobe and the victims of the Gorgon’s head.!! Zulus, Red Indians, Aztecs,!? Andaman Islanders, and other races believe that their dead assume the shapes of serpents and of other creatures, often reverting to the form of the animal from which they originally

descended. In ancient Egypt “the usual prayers demand for the deceased the power of going and coming from and to every- where under any form they like.” A trace of this opinion may be noticed in the 4ineid. The serpent that appeared at the sacrifice of Alneas was regarded as possibly a “manifestation” of the soul of Anchises (dneid, v. 84)— ‘« Dixerat hec, adytis quum lubricus anguis ab imis Septem ingens gyros, septena volumina, traxit,” and Aineas is ‘“Incertus, Geniumne loci, famulumne parentis Esse putet.”

On the death of Plotinus, as he gave up the ghost, a snake glided from under his bed into a hole in the wall. Com- pare Pliny } on the cave “in quo manes Scipionis Africani majoris custodire draco dicitur.”

Without further investigating the survivals of these ideas among civilized races (the most notorious examples are the Indian and Pythagorean theories of transmigration), enough has been said to prove the savage belief in man’s kinship with the animals and its survival in civilization. The last peculiarity in savage philosophy to which we need call attention here is the belief in spirits and in human 1n- tercourse with the shades of the dead. The topic has been

7 Mitford, Tales of Old Japan, 1871.

8 Bleek, Brief Account of Bushman Folk-Lore, pp. 15, 40.

9 Missionary Travels, pp. 615, 642.

10 Dall, Alaska, p. 423, 1870.

1 Dorman, Origin of Primitive Superstitions, 12 Sahagun, French Transl., p. 226.

13 Records of the Past, x. 10. 14 Plotini Vita, p. 2, 95.

pp. 130, 134,

1B oT, N., xv. 44, 85. XVII. — 19

so exhaustively treated by Mr Tylor in his Primitive Cul- ture, and the evidence so fully set forth, that we need do little more than set on record the general facts. With the savage natural death is not a universal and inevitable ordinance. ‘All men must die” is a generalization which he has scarcely reached ; in his philosophy the proposition is more like this, “all men who die die by violence.” a natural death is explained as the result of a sorcerer’s spirit- ual violence, and the disease is attributed to magic, or to the action of hostile spirits. After death the man survives as a spirit, sometimes taking an animal form, sometimes invisible, sometimes to be observed “in his habit as he lived.” As to the origin of the belief in the continued existence and activity of the dead, the current theories will be found in the article Apparitions. The philosophy is shortly put in the speech of Achilles (liad, xxiii. 103) after he has beheld the dead Patroclus in a dream: “ Ay me, there remaineth then even in the house of Hades a spirit and phantom of the dead, for all night long hath the ghost of hapless Patroclus stood over me, wailing and making moan.” It is almost superfluous to quote here the voluminous evidence for the intercourse with spirits which savage chiefs and medicine men are believed to maintain. They can call up ghosts, or can go to the ghosts, in Australia, New Caledonia, New Zealand, North America, Zulu- land, among the Eskimo, and generally in every quarter of the globe. The men who enjoy this power are the same as they who can change themselves and others into animals. They too command the weather, and, says an old French missionary, “are regarded as very Jupiters, having in their hands the lightning and the thunder” (Relations, loc. cit.). They make good or bad seasons, and control the vast animals who, among ancient Persians and Aryans of India, as among Zulus and Iroquois, are supposed to grant or withhold the rain, and to thunder with their enormous wings in the region of the clouds.

We are now in a position to sum up the ideas of savages about man’s relations to the world. We started on this inquiry because we found that savages regarded sky, wind,

sun, earth, and so forth as practically men, and we had then to ask, what sort of men, men with what powers?

The result of our examination, so far, is that in savage Opinion sky, wind, sun, sea, and many other phenomena have, being personal, all the powers attributed to real human persons. These powers and qualities are—(1) relationship to animals and ability to be transformed and to transform others into animals and other objects ; (2) magical accomplishments, as—(a) power to visit or to procure the visits of the dead, (6) other magical powers, such as control over the weather.

Once more, the great forces of nature, considered as persons, are involved in that inextricable confusion in which men, beasts, plants, Stones, stars, are all on one level of personality and animated existence. This is the philosophy of savage life, and it is on these principles that the savage constructs his myths, while these, again, are all the scientific explanations of the universe with which he has been able to supply himself.

Hxamples of Mythology.—Myths of the origin of the world and man are naturally most widely diffused. Man has everywhere asked himself whence things came and how, and his myths are his earliest extant form of answer to this question. So confused and inconsistent are the mythical answers that it is very difficult to classify them according to any system. If we try beginning with myths of creative gods, we find that the world is sometimes represented as pre-existent to the divine race. If we try beginning with myths of the origin of the world, we frequently find that it owes its origin to the activity of pre-existent supernatural beings. According to all modern

in myths, whether of civilized or savage races,

views of creation, the creative mind is prior to the universe

which it created. There is no such consistency of Opinion Perhaps the plan least open to objection is to begin with myths of the gods. But when we speak of gods, we must not give to the word a modern significance. As used here, gods merely mean non-natural and powerful beings, sometimes ‘magnified non-natural men,” sometimes beasts, birds, or insects, sometimes the larger forces and phenomena of the universe conceived of as endowed with human personality and passions. When Plutarch examined

the Osirian myth (De Isid., xxv.) he saw that the “gods” in the tale were really “demons,” “stronger than men, but having the divine part not wholly unalloyed,”——“ magnified non- natural men,” in short. And such are the gods of mytho- logy. In examining the myths of the gods we propose to begin with the conceptions of the most backward tribes, and to advance to the divine legends of the ancient civil- ized races. It will appear that, while the non-civilized gods are often theriomorphic, made in accordance with the ideas of non-civilized men, the civilized gods retain many characteristics of the savage gods, and these characteristics are the “irrational element” in the divine myths.

Myths of Gods. Savage ideas.—The Boo-noo-rong, an Australian coast-tribe, regard as an early creative god a being named Bun-jel or Pund-jel. He is the chief of a supernatural set of beings, earlier than men, with human relationships. He has a wife whose face (in accordance with a widely-diffused scruple of savage etiquette) he has never seen, any more than Urvasi in the Vedic myth was allowed to see Pururavas without his garments, “for such is the custom” (says the Veda) “of women.” The name Bunjel means “eagle-hawk,” and the eagle-hawk is a “totem,” or worshipful ancestral animal, among certain Australian tribes. Conceived as a supernatural bird-god, Pund-jel answers to the birds as they describe themselves in Aristophanes (Aves, 703)—

Bde pev eopev TOAD TperBiTaTot TAéVTWOVY paKkdpwr. He belongs to the age of birds, “altogether wiser and more skilful in all things than men,” “by far the most ancient of all gods.” In an anthropomorphic myth of the Kurnai, Pund-jel figures as “an old man who lives at the sources of the Yarra river” and is rich in cattle. The term Bun-jel is also used as a kind of title of honour be- stowed on the older men of the Kurnai and Briakolung, some of whom have magical powers. In the northern parts of Victoria the aborigines believe in Pund-jel in his bird-form as a creative Eagle. Pund-jel takes the part, not only of a creator, but of an instructor—a ‘‘culture-hero,” to use a fashionable compound term. He instructed man in the arts of life, taught the males how to spear kangaroos, and the women how to dig roots. Pund-jel disappeared from the world he had made when a rival power, the Jay, opened certain great bags of wind he possessed, and blew Pund-jel into the heavens. The Australians draw no very hard-and-fast line between their

“ birraarks,” or sorcerers, and their gods. The Kurnai give the name of Brewin to a powerful spirit, but the name was also conferred on a birraark who disappeared for many days, holding converse with the invisible. The native bear is a beast they adore, and they have given his name to a famous sorcerer. The West Wind is the name of a human sorcerer who happens to be able to make the west wind blow with violence. There is thus a come and go of titles, powers, and attributes be- tween sorcerers, totems, and vague powerful spirits, and in this medley of beliefs a god may have the form of a bird, a man the attributes of a god, so that every sort of irrational transformation is not only not unnatural but is inevitable in such a system. The basis of that system,

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of course, is the belief in the equal personality and com- mon kindred of all things. Pund,jel, and his rivals the Crow and the Jay, appear to belong to the supernatural prehuman race of Nurrumbunguttias, or “old spirits,” answering to the divine races of Titans and gods in Greece, and to the Californian and Ovaherero ‘old ones in heaven.” }

Before leaving the Australian divine myths it should be remarked that the widely-spread dualistic myth is found among the Australians. “Why do things go wrong?” men ask, and answer, in Australia as in Persia, by the myth of the mischievous power who thwarted the maker of things. Among the Australians the Crow was always at war with the creative Eagle. The Eagle, by the way (like the elder brothers of Zeus), was once swallowed by a powerful god who afterwards became the moon, and was disgorged alive. The Eagle’s adventures as a creator will more properly be considered among cosmogonic myths. His share in the dispersion of mankind, and in causing the deluge, cannot but be regarded with some suspicion, though they bear but distant resemblances to the Biblical narratives.

The chief being among the supernatural characters of Bushman mythology is the insect called the Mantis. ? Cagn or Ikaggen, the Mantis, is sometimes regarded with religious respect as a benevolent god. But his adventures are the merest nightmares of puerile fancy. He has a wife, an adopted daughter,

whose real father is the “swallower” in Bushman swallowing-myths, and the daughter has a son, who is the Ichneumon. The Mantis made an eland out of the shoe of his son-in-law. The moon was also created by the Mantis out of his shoe, and it is red, because the shoe was covered with the red dust of Bushman-land. The Mantis is defeated in an encounter with a cat which happened to be singing a song about a lynx. The Mantis (like Poseidon, Hades, Metis, and other Greek gods) was once swallowed, but disgorged alive. The swallower was the monster Ilkhwdi-hemm. Like Heracles when he leaped into the belly of the monster which was about to swallow Hesione, the Mantis once jumped down the throat of a hostile elephant, and so destroyed him. The heavenly bodies are gods among the Bushmen, but their nature and adventures must be dis- cussed among other myths of sun, moon, and stars. As a creator, Cagn is sometimes said to have “given orders, and caused all things to appear and be made.” He struck snakes with his staff and turned them into men, as Zeus did with the ants in /Egina. But the Bushmen’s mythical theory of the origin of things must, as far as possible, be kept apart from the fables of the Mantis, the Ichneumon, and other divine beings. Though animals, these gods have human passions and character, and possess the usual magical powers attributed to sorcerers.

Concerning the mythology of the Hottentots and Namas, we have a great deal of information in a book named Tsuni-Goam, the Supreme Being of the Khoi-Khoi (1881), by Dr T. Hahn. This author has collected the old notices of Hottentot myths, and has added material from his own researches. The chief god of the Hottentots is a being named Tsuni-Goam, who is universally regarded by his worshippers as a deceased sorcerer. According to one old believer, “Tsui-Goab” (an alternative reading of the god’s name) “was a great powerful chief of the Khoi-Khoi—in fact, he was the first Khoi-Khoib from whom all the Khoi-Khoi tribes took their name.” He is

! The chief sources used here are Fison and Ridley’s Kamilaroi and

Kurnai, with Brough Smyth’s Aborigines of Victoria. Dawson’s work,

and Gason on the Dieyries, with Sir George Grey’s Travels, may also be consulted.

2 Accounts of the Mantis and of his performances will be found in

the Cape Monthly Magazine, July 1874, and in Dr Bleek's Brief

Account of Bushman Folk-Love.

always represented as at war (in the usual crude dualism

of savages) with "another chief" named Gaunab. The prayers addressed to Tsui-Goab are simple and natural in character, the "private ejaculations" of men in moments of need or distress. As usual, religion is more advanced than mythology. It appears that, by some accounts, Tsui-Goab lives in the red sky and Gaunab in the dark sky. The neighbouring race of Namas have another old chief for god, a being called Heitsi Eibib. His graves are shown in many places, like those of Osiris, which, says Plutarch, abounded in Egypt. He is propitiated by passers-by at his sepulchres. He has intimate relations in peace and war with a variety of animals whose habits are sometimes explained (like those of the serpent in Genesis) as the result of the curse of Heitsi Eibib. Heitsi Eibib was born in a mysterious way from a cow, as Indra in the Black Yajur-Veda entered into and was born from the womb of a being who also bore acow. The Aig-Veda (iv. 18, 1) remarks, "His mother, a cow, bore Indra, an unlicked calf,"—probably a metaphorical way of speaking. Heitsi Eibib, like countless other gods and heroes, is also said to have been the son of a virgin who tasted a parti- cular plant, and so became pregnant, as in the German and Gallophrygian marchen of the almond tree, given by Grimm and Pausanias. Incest is one of the feats of Heitsi Eibib. Tsui-Goab, in the opinion of his worshippers, as we have seen, is a deified dead sorcerer, whose name means Wounded Knee, the sorcerer having been injured in the knee by anenemy. Dr Hahn tries to prove (by philology's "artful aid") that the name really means "red dawn," and is a Hottentot way of speaking of the infinite. The philological arguments advanced are extremely weak, and by no means convincing. If we grant, however, for the sake of argument, that the early Hottentots worshipped the infinite under the figure of the dawn, and that, by forgetting their own meaning, they came to believe that the words which really meant 'red dawn" meant "sounded knee," we must still admit that the devout have

assigned to their deity all the attributes of an ancestral sorcerer, In short, their “Red Dawn,” if red dawn he be, is a person, and a savage person, adored exactly as the actual fathers and grandfathers of the Hottentots are adored, We must explain his legend, then, on these principles, and not as an allegory of the dawn as the dawn appears to civilized people. About Gaunab (the Ahriman to Tsui-Goab’s Ormuzd) Dr Hahn gives two dis- tinct opinions. ‘“ Gaunab was at first a ghost, a mischief- maker and evil-doer” (op. cit. p. 85). But Gaunab he declares to be “the night-sky” (p. 126). Whether we regard Gaunab, Heitsi Eibib, and Tsui-Goab as originally mythological representations of natural phenomena, or as deified dead men, it is plain that they are now venerated as non-natural human beings, possessing the customary attributes of sorcerers. Thus of Tsui-Goab it is said, “Fe could do wonderful things which no other man could do, because he was very wise. He could tell what would happen in future times. He died several times, and several times he rose again” (statement of old Kxarab in Hahn, p. 61).

The mythology of the Zulus as reported by Callaway (Unkulunkulu, 1868-70) is very thin and uninteresting. The Zulus are great worshippers of ancestors (who appear to men in the form of snakes), and they regard a being called Unkalunkdlu as their first ancestor, and sometimes as the creator, or at least as the maker of men. It does not appear they identify Unktfilunkflu, as a rule, with “the lord of heaven,” who, like Indra, causes the thunder. The word answering to our lord is also applied ‘‘even to beasts, as the lion and the boa.” The Zulus, like many distant races, sometimes attribute thunder to the “thunder-

bird,” which, as in North America, is occasionally seen and even killed by men. “It is said to have a red bill, red legs, and a short red tail like fire. The bird is boiled for the sake of the fat, which is used by the heaven- doctors to puif on their bodies, and to anoint their lightning-rods.” ‘The Zulus are so absorbed in propitiating the shades of their dead (who, though in serpentine bodies, have human dispositions) that they appear to take little pleasure in mythological narratives. At the same time, the Zulus have many “nursery tales,” the plots and inci- dents of which often bear the closest resemblance

to the heroic myths of Greece, and to the marchen of European peoples.' These indications will give a general idea of African divine myths. On the west coast the "ananzi" or spider takes the place of the mantis insect among the Bushmen. For some of his exploits Dasent's Tales from the Norse (2d ed., Appendix) may be consulted.

Turning from the natives of Australia, and from African races of various degrees of culture, to the Papuan inhabit- ants of Melanesia, we find that mythological ideas are scarcely on a higher level. 'There is an excellent account of the myths of the Banks Islanders and Solomon Islanders in Journ. Anthropol. Inst. (February 1881), by the Rev. R. H. Codrington. The article contains a critical descrip- tion of the difficulty with which missionaries obtain infor- mation about the prior creeds. The people of the Banks Islands are chiefly ancestor-worshippers, but they also believe in, and occasionally pray to, a being named I Qat, one of the prehuman race endowed with supernatural powers who here, as elsewhere, do duty as gods. Here is an example of a prayer to Qat,—the devotee is supposed to be in danger with his canoe. '"Qate! Marawa! look down on me, smooth the sea for us two that I may go safely on the sea. Beat down for me the crests of the tide- rip ; let the tide-rip settle down away from me, beat it down level that it may sink and roll away, and I may

come to a quiet landing-place." Compare the prayer of

Odysseus to the river, whose mouth he had reached after three days' swimming on the tempestuous sea: "' Hear me, O king, whosoever thou art, unto thee I am come as to one to whom prayer is made. . . nay, pity me, O king, for I avow myself thy suppliant.'? So spake he, and the god stayed his stream, and withheld his waves, and made the water smooth before him" (Odyssey, v. 450). The prayer of the Melanesian is on rather a higher religious level than that of the Homeric hero. The myths of Qat's adventures, however, are very crude, though not so wild as some of the Scandinavian myths about Odin and Loki, while they are less immoral than the adventures of Indra and Zeus. Qat was born in the isle of Vanua Levu ; his mother was either a stone at the time of his birth, or was turned into a stone afterwards, like Niobe. The mother of Apollo, according to A®lian, had the misfortune to be changed into a wolf. Qat had eleven brothers, not

much more reputable than the Osbaldistones in Rob Foy. The youngest brother was “ Tangaro Lologong, the Fool.” His pastime was to make wrong all that Qat made right, and he is sometimes the Ahriman to Qat’s Ormuzd. The creative achievements of Qat must be treated of in the next section. Here it may be mentioned that, like the hero in the Breton mirchen, Qat “ brought the dawn” by introducing birds whose notes proclaimed the coming of morning. Before Qat’s time there had been no night, but he purchased a sufficient allowance of darkness from I Qong, that is, night considered as a person in accordance With the law of savage thought already explained. Night

1 These are collected by Callaway, Zulu Nursery Tales, 1868. Simi- lar Kaffre stories, also closely resembling the popular fictions of Euro- pean races, have been published by Theal. Many other examples are published in the South African Folk- Love Journal, 1879, 1880.

is a person in Greek mythology, and in the fourteenth book of the Jéad we read that Zeus abstained from punishing Sleep ‘because he feared to offend swift Night.” Qat produced dawn, for the first time, by cutting the darknegs with a knife of red obsidian. Afterwards ‘the fowls and birds showed the morning.” On one occasion an evil power (Vui) slew all Qat’s brothers, and hid them in a food-chest. Asin the common “swallowing-myths ” which we have met among Bushmen and Australians, and wil] find among the Greeks, Qat restored his brethren to life, Qat is always accompanied by a powerful supernatural spider named Marawa. He first made Marawa’s acquaint- ance when he was cutting down a tree for a canoe. Every night (as in the common European story about bridge- building and church-building) the work was all undone by Marawa, whom Qat found means to conciliate. In all his future adventures the spider was as serviceable as the cat in Puss-in-Boots or the other grateful animals in European legend. Qat’s great enemy, Qasavara, was dashed against the hard sky, and was turned into stone, like the foes of Perseus. The stone is still shown in Vanua Levu, like the stone which was Zeus in Laconia. Qat, like so many other “culture-heroes,” disappeared mysteriously, and white men arriving in the island have been mistaken for Qat. His departure is sometimes connected with the myth of the deluge. In the New Hebrides, Tagar takes the réle of Qat, and Suge of the bad principle, Loki, Ahriman, Tangaro Loloqong, the Australian

Crow, and so forth. These are the best-known divine myths of the Melanesians, and it is obvious that such gods as exist there are magnified non-natural men or animals with the powers of sorcerers. So far there seems to be no good reason for connecting the gods (if gods they can be called) with the elemental phenomena.

It is “a far cry” from Vanua Levu to Vancouver’s Island, and, ethnologically, the Ahts of the latter region are extremely remote from the Papuans with their mixture of Malay and Polynesian blood. The Ahts, however, differ but little in their mythological beliefs from the races of the Banks Islands or of the New Hebrides. In Sproat’s Scenes from Savage Life (1868) there is a good account of Aht opinions by a settler who had won the confidence of the natives between 1860 and 1868. ‘There is no end to the stories which an old Indian will relate,” says Mr Sproat, when “one quite possesses his confidence.” ‘The first Indian who ever lived” is a divine being, something of a creator, something of a first father, like Unkdlunktlu among the Zulus. His name is Quawteaht. He married a pre-existent bird, the thunder-bird Tootah (we have met him among the Zulus), and by the bird he became the father of Indians. Wispohahp is the Aht Noah, who, with his wife, his two brothers, and their wives, escaped from the deluge in a canoe. Quawteaht is inferior as a deity to the Sun and Moon. He is the Yama of an Aht paradise, or home of the dead, where “everything is beautiful and abundant.” From all that is told of Quawteaht he seems to be an ideal and powerful Aht, imaginatively placed at the beginning of things, and quite capable of inter- marriage with a bird. His creative exploits must be con- sidered later. Quawteaht is the Aht Prometheus Purphoros, or fire-stealer.

Passing down the American continent from the north- west, we find Yehl the chief hero-god and mythical per- Sonage among the Thlinkeets. Like many other heroes or gods, Yehl had a miraculous birth. His mother, & Thlinkeet woman, whose sons had all been slain, met a friendly dolphin, which advised her to swallow a pebble and a little sea-water. The birth of Yehl was the result. In his youth he shot a supernatural crane, and can always fly about in its feathers, like Odin and Loki in Scandi-

navianmyth. He is usually, however, regarded as a raven, and holds the same relation to men and the world as the eagle-hawk Pund-jel does in Australia. His great opponent (for the eternal dualism comes in) is Khanukh, who is a wolf, and the ancestor or totem of the wolf-race of men as Yehl isof the raven. The opposition between the Crow and Eagle-hawk in Australia will be remembered. Both animals or men or gods take part in creation. Yehl is the Prometheus Purphoros of the Thlinkeets, but myths of the fire-stealer would form matter for a separate section. Yehl also stole water, in his bird-shape, exactly as Odin stole “Suttung’s mead” when in the shape of an eagle. Yehl’s powers of metamorphosis and of flying intothe air are the common accomplishments of sorcerers, and he is a rather crude form of first father, “culture-hero,” and creator.?

Among the Cahroc Indians we find the great hero and divine benefactor in the shape of, not a raven, nor an eagle- hawk, nor a mantis insect, nor a spider, but a coyote. Among both Cahrocs and Navajos the Coyote is the Pro- metheus Purphoros, or, as the Aryans of India call him, Matarisvan the fire-stealer. Among the Papagos, on the eastern side of the Gulf of California, the Coyote or Prairie Wolf is the creative hero and chief supernatural being. In Oregon the Coyote is also the “demiurge,” but most of the myths about him refer to his creative exploits, and will be more appropriately treated in the next section.

Moving up the Pacific coast to British Columbia, we find the Musk-rat taking the part played by Vishnu, when in his avatar as a boar he fished up the earth from the waters. Among the Tinnehs a miraculous dog, who, like an enchanted fairy prince, could assume the form of a handsome young man, is the chief divine being of the myths. He too is chiefly a creative or demiurgic being, answering to Purusha in the Rig-Veda, So far the peculiar mark of the wilder American tribe legends is the bestial character of the divine beings, which is also illustrated in Australia and Africa, while the bestial clothing, feathers or fur, drops but slowly off Indra, Zeus and the Egyptian Ammon, and the Scandinavian Odin. All these are more or less anthropomorphic, but retain, as will be seen, nume- rous relics of a theriomorphic condition.

Passing from the lower savage myths, of which space does not permit us to offer a larger selection, we turn to races in the upper strata of barbarism. Among these the Maoris of New Zealand, and the Polynesian people generally, are remarkable for a mythology largely intermixed with early attempts at more philosophical speculation. The Maoris and Mangaians, and other peoples, have had speculators among them not very far removed from the mental condition of the earliest Greek philosophers, Empedocles, Anaximander, and the rest. In fact the pro- cess from the view of nature which we call personalism to the crudest theories of the physicists was apparently begun in New Zealand before the arrival of Europeans. In Maori mythology it is more than usually difficult to keep apart the origin of the world and the origin and nature of the gods. Long traditional hymns give an account of the 'becoming out of nothing" which resulted in the evolution of the gods and the world. In the beginning (as in the Greek myths of Uranus and Gea), Heaven (Rangi, conceived of as a person) was indissolubly united to his wife Earth (Papa), and between them they begat gods which necessarily dwelt in darkness. These gods were some in vegetable, some in animal form ; some traditions place among these gods Tiki the demiurge, who (like Prometheus) made men out of clay. The off- spring of Rangi and Papa (kept in the dark as they were) held a council to determine how they should treat their

: Dasent, Bragi's Telling: Younger Edda, p. 94. " Bancroft, vol. iv.

parents, ''Shall we slay them, or shall we separate them?" In the Hesiodic fable, Cronus separates the heavenly pair by mutilating his oppressive father Uranus. Among the Maoris the god Tutenganahan cut the sinews which united Earth and Heaven, and Tane Mahuta wrenched them apart, and kept them eternally asunder. The new dynasty now had earth to themselves, but Tawhiramatea, the wind, abode aloft with his father. Some of the gods were in the forms of lizards and fishes; some went to the land, some to the water. As among the gods and Asuras of the Vedas, there were many wars in the divine race, and as the incantations of the Indian Brakmanas are derived from those old experiences of the Vedic gods, so are the incantations of the Maoris. The gods of New Zealand, the greater gods

at least, may be called “ departmental ;” each person who is an elementary force is also the god of that force. As Te Heu, a powerful chief, said, there is division of labour among men, and so there is among gods. ‘One made this, another that ; Tane made trees, Ru mountains, Tanga-roa fish, and so forth.” ? The “de- partmental” arrangement prevails among the polytheism of civilized peoples, and is familiar to all from the Greek examples. Leaving the high gods whose functions are so large, while their forms (as of lizard, fish, and tree) are often so mean, we come to Maui, the great divine hero of the supernatural race in Polynesia. Maui in some respects answers to the chief of the Adityas in Vedic mythology ; in others he answers to Qat, Quawteaht, and other savage divine personages. Like the son of the Vedic Aditi,* Maui is a rejected and abortive child of his mother, but after- wards attains to the highest reputation. As Qat brought the hitherto unknown night, so Maui settled the sun and moon in their proper courses. He induced the sun to move orderly by giving him a violent beating. A similar feat was performed by the Sun-trapper, a famous Red Indian chief. These tales belong properly to the depart- ment of solar myths. Maui himself is thought by Mr E. B. Tylor to be a myth of the sun, but the sun could hardly give the sun a drubbing. Maui slew monsters, invented barbs for fish-hooks, frequently adopted the form of various birds, acted as Prometheus Purphoros the fire-stealer, drew a whole island up from the bottom of the deep; he was a great sorcerer and magician. Had Maui succeeded in his attempt to pass through the body of Night (considered as a woman) men would have been immortal. But a little bird which sings at sunset wakened Night, she snapped up Maui, and men die. This has been called a myth of sun- set, but the sun does what Maui failed to do, he passes through the body of night unharmed. The adventure is one of the myths of the origin of death, which are almost universally diffused. Maui, though regarded as a god, is not often addressed in prayer.°

The whole system, as far as it can be called a system, of Maori mythology is obviously based on the savage con- ceptions of the world which have already been explained. The Polynesian system differs mainly in detail ; we have the separation of heaven and earth, the animal-shaped gods, the fire-stealing, the exploits of Maui, and scores of minor myths in Gill’s Myths and Songs of the South Pacific, in the researches of Ellis, of Williams, in Turner’s Polynesia, and in many other accessible works.

The Maoris and other Polynesian peoples are perhaps the best examples of a race which has risen far above

3 Taylor, New Zealand, p. 108.

4 Rig-Veda, x. 72, 1, 8; Muir, Sanskrit Texts, iv. 18, where the fable from the Satapatha-Brahmana is given.

5 The best authorities for the New Zealand myths are the old traditional priestly hymns, collected and translated in the works of

Sir George Grey, in Taylor's New Zealand, in Shortland's Traditions of New Zealand (1857), and in Bastian's Heilige Sage der Polynesier.

arrived at the stage in which great centralized monarchies appear. The Mexican and Peruvian civilizations were far ahead of Maori culture, in so far as they possessed the elements of a much more settled and highly-organized society. Their religion had its fine lucid intervals, but their mythology and ritual were little better than savage ideas, elaborately worked up by the imagination of a cruel and superstitious priesthood. In cruelty the Aztecs sur- passed perhaps all peoples of the Old World, except certain Semitic stocks, and their gods, of course, surpassed almost all other gods in bloodthirstiness. But in grotesque and savage points of faith the ancient Egyptians, the Greeks, and the Vedic Indians ran even the Aztecs pretty close. Bernal Diaz, the old "conquistador," has described the hideous aspect of the idols which Cortes destroyed, "idols in the shape of hideous dragons as big as calves," idols half in the form of men, half of dogs, and serpents which were worshipped as divine. The old contemporary missionary Sahagun has left one of the earliest detailed accounts of the natures and myths of these gods, but, though Sahagun took great pains in collecting facts, his speculations must be accepted with caution. He was convinced (like Caxton in his Destruction of Troy, and like St Augustine) that the heathen gods were only dead men worshipped. Ancestor- worship is a great force in early religion, and the qualities of dead chiefs and sorcerers are freely attributed to gods, but it does not follow that each god was once a real man, as Sahagun supposes. Euemerism cannot be judiciously carried so

far.as this. Of Huitzilopochtli, the famed god, Sahagun says that he was a necromancer, loved ‘“ shape- shifting,” like Odin, metamorphosed himself into animal

forms, was miraculously conceived, and, among animals, –

is confused with the humming-bird, whose feathers adorned his statues.! This humming-bird god should be compared with the Roman Picus (Servius, 189). That the humming- bird (Nuitziton), which was the god’s old shape, should become merely his attendant (like the owl of Pallas, the mouse of Apollo, the goose of Priapus, the cuckoo of Hera), when the god received anthropomorphic form, is an example of a process common in all mythologies. Plutarch observes that the Greeks, though accustomed to the con- ceptions of the animal attendants of their own gods, were amazed when they found animals worshipped as gods by the Egyptians. Miiller? mentions the view that the humming- bird, as the most beautiful flying thing, is a proper symbol of the heaven, and so of the heaven-god, Huitzilopochtli. This vein of symbolism is so easy to work that it must be regarded with distrust. Perhaps it is safer to attribute theriomorphic shapes of gods, not to symbolism (Zeus was a cuckoo), but to survivals from that quality of early thought which draws no line between man and god and beast and bird and fish. If spiders may be great gods, why not the more attractive humming-birds? Like many other gods, Huitzilopochtli slew his foes at his birth, and hence received names analogous to Aewuds and Pd Bos. Mr Tylor (Primitive Culture, ii. 307) calls Huitzilopochtli an “inextricable compound parthenogenetic god.” His sacrament, when paste idols of him were eaten by the com- municants, was at the winter solstice, whence it may, per- haps, be inferred that Huitzilopochtli was not only a war- god but a nature-god,—in both respects anthropomorphic, and in both bearing traces of the time when he was but a humming-bird, as Yehl was a raven (Miiller, op. cit., p. 595). As a humming-bird, Huitzilopochtli led the Aztecs to a new home, as a wolf led the Hirpini, and as a woodpecker led the Sabines. Quetzalcoatl, the Toltec deity, is as much a sparrow (or similar small bird) as Huitzilopochtli is a humming-bird. Acosta says he retained the sparrow’s head

1 See also Bancroft, iii. 288-290, and Acosta, pp. 352-361. * Geschichte der Amerikanischen Urreligionen, p. 592.

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in hig statue. For the composite character of Quetzalcoatl as a “culture-hero” (a more polished version of Qat), as a “nature-god,” and as a theriomorphic god see Miiller (op, cit., pp. 583-584), Miiller frankly recognizes that not only are animals symbols of deity and its attributes, not only are they companions and messengers of deity (as in the period of anthropomorphic religion), but they have been divine beings in and for themselves during the earlier stages of thought. The Mexican ‘‘departmental” gods answer to those of other polytheisms; there is an Aztec Ceres, an Aztec Lucina, an Aztec Vulcan, an Aztec Flora, an Aztec Venus. The creative myths and sun myths are crude and very early in character.

Egyptian Myths.—On a much larger and more magnifi- cent scale, and on a much more permanent basis, the society of ancient Egyptsomewhatresembled that of ancient Mexico, The divine myths of the two nations had points in common, but there are few topics more obscure than Egyptian mytho- logy. Writers are apt to speak of Egyptian religion as if it were a single phenomenon of which all the aspects could be observed at a given time. In point of fact Egyptian religion (conservative though it was) lasted through perhaps five thousand years, was subject to innumerable influences, historical, ethnological, philosophical, and was variously represented by various schools of priests. We cannot take the Platonic speculations of Iamblichus about the nature and manifestations of Egyptian godhead as evidence for the belief of the peoples who first worshipped the Egyptian gods an innumerable series of ages before Iamblichus and Plutarch. Nor can the esoteric and pantheistic theories of priests (according to which the various beast-gods were symbolic manifestations of the divine essence) be received as an historical account of the origin of the local animal- worships. It has already been shown that the lowest and least intellectual races indulge in local animal-worship, each stock having its parent bird, beast, fish, or even plant, or inanimate object. It has also been shown that these back- ward peoples recognize a non-natural race of men or

animals, or both, as the first fathers, heroes, and, in a sense, gods. Such ideas are consonant with, and may be traced to the confused and nebulous condition of, savage thought. Pre- cisely the same ideas are found at various periods among the ancient Egyptians. If we are to regard the Egyptian myths about the gods in animal shape, and about the non- natural superhuman heroes, and their wars and loves, as esoteric allegories devised by civilized priests, perhaps we should also explain Pund-jel, Qat, Quawteaht, the Mantis god, the Spider creator, the Coyote and Raven gods as priestly inventions, put forth in a civilized age, and retained by Australians, Bushmen, Hottentots, Ahts, Thlinkeets, Papuans, who preserve no other vestiges of high civilization. Or we may take the opposite view, and regard the story of Osiris and his war with Seth (who shut him up in a box and mutilated him) as a dualistic myth, originally on the level of the battle between Gaunab and Tsui-Goab, or between Tagar and Suge. We may regard the local beast- and plant-gods of Egypt as survivals of totems and totem-gods like those of Australia, India, America, Africa, Siberia, and other countries. In this article the latter view is adopted. The beast-gods and dualistic and creative myths of savages are looked on as the natural product of the savage reason and fancy. The same beast-gods and myths in civilized Egypt are looked on as survivals from the rude and early condition of thought to which such conceptions are natural.

_In the most ancient Egyptian records the gods are not pictorially represented, and we have not obtained from these records any descriptions of adoration and sacrifice. There is a prayer to the Sky on the coffin of the king of Dynasty IV., known as Mycerinus to the Greeks. The

wy PreoLocyY king describes himself as the child of Sky and Earth. He

also somewhat obscurely identifies himself with Osiris.

We thus find Osiris very near the beginning of what is This being is rather a culture-hero, a member of a non-natural race of men like

known about Egyptian religion.

Qat or Manabozho, than a god. His myth, to be after- wards narrated, is found pictorially represented in a tomb and in the late temple of Phile, is

frequently alluded to +n the litanies of the dead about 1400 B.c., is indicated with reverent awe by Herodotus, and after the Christian era +s described at full length by Plutarch. Whether the same myth was current in the far more distant days of Mycerinus, it is, of course, impossible to say with dogmatic certainty. The religious history of Egypt, from perhaps Dynasty X. to Dynasty XX., is interrupted by an invasion of Semitic conquerors and Semitic ideas. Prior to- that invasion the gods, when mentioned in monuments, are always repre- sented by animals, and these animals are the object of strictly local worship. The name of each god is spelled in hieroglyphs beside the beast or bird. The jackal stands for Anup, the hawk for Har, the frog for Hekt, the baboon for Tahuti, and Ptah, Asiri, Hesi, Nebhat, Hat-hor, Neit, Khnum, and Amun-hor are all written out phonetically, but never represented in pictures. Different cities had their different beast-gods. Pasht, the cat, was the god of Bubastis; Apis, the bull, of Memphis; Hapi, the wolf, of Sioot ; Ba, the goat, of Mendes. The evidence of Hero- dotus, Plutarch, and the other writers shows that the Egyptians of each district refused to eat the flesh of the animal they held sacred. So far the identity of custom with savage totemism isabsolute. Of all the explanations, then, of Egyptian animal-worship, that which regards the practice as a survival of totemism and of savagery seems the most satisfactory. So far Egyptian religion only re- presented her gods in theriomorphic shape. Beasts also appeared in the royal genealogies, as if the early Egyptians had filled up the measure of totemism by regarding them- selves as actually descended from animals.

With one or two exceptions, “the first (semi-anthropo- morphic) figures of gods known in the civilized parts of Egypt are on the granite obelisk of Bezig in the Fayyum, erected by Usertesen I. of Dynasty XII., and here we find the forms all full-blown at once. The first group of deities belongs to a period and a district in which Semitic influences had undoubtedly begun to work.”} From this period the mixed and monstrous figures, semi-theriomorphic, semi-anthropomorphic, hawk-headed and ram-headed and jackal-headed gods become common. ‘This may be attri- buted to Semitic influence, or we may suppose that the process of anthropomorphizing theriomorphic gods was naturally developing itself; for Mexico has shown us and Greece can show us abundant examples of these mixed figures, in which the anthropomorphic god retains traces of his theriomorphic past.

The heretical worship of the solar disk interrupted the course of Egyptian religion under some reforming kings, but the great and glorious Ramesside Dynasty (XIX.) restored “Orus and Isis and the dog Anubis” with the rest of the semi-theriomorphic deities. These survived even their defeat by the splendid human gods of Rome, and only “fled from the folding star of Bethlehem.”

Though Egypt was rich in gods, her literature is not fertile inmyths. The religious compositions which have sur- vived are, as a rule, hymns and litanies, the funereal service, the “Book of the Dead.” In these works the myths are taken for granted, are alluded to in the course of addresses to the divine beings, but, naturally, are not told in full. As in the case of the Vedas, hymns are poor sources for the

: 1 This extract, with much of what goes before, is from a paper read © the Royal Literary Society by Mr Flinders Petrie.

study of mythology, just as the hymns of the church would throw little light on the incidents of the gospel story or of the Old Testament. The “sacred legends” which the priests or temple servants freely communicated to Hero- dotus are lost through the pious reserve of the traveller. Herodotus constantly alludes to the most famous Egyptian myth, that of Osiris, and he recognizes the analogies between the Osirian myth and mysteries and those of Dionysus. But we have to turn to the very late authority of Plutarch (De Iside et Osiride) for an account, confessedly incomplete and expurgated, of what mythology had to tell about the great Egyptian “culture-hero,” “demon,” and god. Osiris, Horus, Typhon (Seth), Isis, and Nephthys were the children of Seb (whom the Greeks identified with Cronus) ; the myths of their birth were peculiarly savage and obscene. Osiris introduced civilization into Egypt, and then wandered over the world, making men acquainted with agriculture and the arts, as Pund-jel in his humbler way did in Australia. On his return Typhon laid a plot for him. He had a beautiful carved chest made which exactly fitted Osiris, and at an entertainment offered to give it to any one who could lie down in it. As soon as Osiris tried, Typhon had the box nailed up, and threw it into the Tanaite branch of the Nile. Isis wandered, mourn- ing, in search of the body, as Demeter

sought Persephone, and perhaps in Plutarch's late version some incidents may be borrowed from the Eleusinian legend. At length she found the chest, which in her absence was again discovered by Typhon. He mangled the body of Osiris (as so many gods of all races were mangled) and tossed the fragments about. Wherever Isis found a portion of Osiris she buried

it; hence Egypt was as rich in graves of Osiris as Nama-

qualand in graves of Heitsi Eibib. The phallus alone she did not find, but she consecrated a model thereof ; hence (says the myth) came the phallus-worship of Egypt. Afterwards Osiris returned from the shades, and (in the form of a wolf) urged his son Horus to revenge him on Typhon. 'The gods fought in animal shape (Birch, in Wilkinson, iii. 144). Plutarch purposely omits as "too

blasphemous" the legend of the mangling of Horus.

Though the graves of these non-natural beings are shown, the priests (De Is. et Os., xxi.) also show the stars into which they were metamorphosed, as the Eskimo and Aus- tralians and Aryans of India and Greeks have recognized in the constellations their ancient heroes. Plutarch re- marked the fact that the Greek myths of Cronus, of Dionysus, of Apollo and the Python, and of Demeter, "all the things that are shrouded in mystic ceremonies and are presented in rites," "do not fall short in absurdity of the legends about Osiris and Typhon." Plutarch natur- ally presumed that the myths which seem absurd shrouded some great moral or physical mystery. But we apply no such explanation to similar savage legends, and our theory is that the Osirian myth is only one of these retained to the time of Plutarch by the religious conservatism of a race which, to the time of Plutarch, preserved in full vigour most of the practices of totemism. As a slight confirma- tion of the possibility of this theory we may mention that Greek mysteries retained two of the features of savage mysteries. The first was the rite of daubing the initiated with clay.2 This custom prevails in African mysteries, in Guiana, among Australians, Papuans, and Andaman Islanders. The other custom is the use of the turndun, as the Australians call a little fish-shaped piece of wood tied to a string, and waved so as to produce a loud booming and whirring noise and keep away the profane, especially

women. It is employed in New Mexico, South Africa, New Zealand, and Australia. This instrument, the Kavos,

ee ee ee 2 Demosthenes, De Corona, p. 318, Kat Kadalpwr Tovs TeNoupevoUS kal droudrrwv T@ WAG Kat Tols miTVpors.

was also used in Greek mysteries.! Neither the use of the x@vos nor of the clay can very well be regarded as a civilized practice retained by savages. The hypothesis that the rites and the stories are savage inventions surviving into civilized religion seems better to meet the difficulty. That the Osirian myth (much as it was elaborated and allego- rized) originated in the same sort of fancy as the Tacullie story of the dismembered beaver out of whose body things were made is a conclusion not devoid of plausibility. Ty-phon's later career, "committing dreadful crimes out of envy and spite, and throwing all things into confusion," was parallel to the proceedings of most of the divine beings who put everything wrong, in opposition to the being who makes everything right. This is perhaps an early " dualistic" myth.

Among other mythic Egyptian figures we have Ra, who once destroyed men in his wrath with circumstances sug- gestive of the deluge ; Khnum, a demiurge, is represented at Phile as making man out of clay on a potter's wheel. Here the wheel is added to the Maori conception of the making of man. Khnum is said to have reconstructed the limbs of the dismembered Osiris. Ptah is the Egyptian Hephestus ; he is represented as a dwarf; men are said to have come out of his eye, gods out of his mouth,—a story like that of Purusha in the Aig-Veda. As creator of man, Ptah isa frog. Bubastis became a cat to avoid the wrath of Typhon. Ra, the sun, fought the big serpent Apap, a8 Indra fought Vrittra. Seb is a goose, called "the great cackler ;" he laid the creative egg."

Divine Myths of the Aryans of India. Indra.—The gods of the Vedas and Brahmanas (the ancient hymns and canonized ritual-books of Aryan India) are, on the whole, of the usual polytheistic type. More than many other gods they retain in their titles and attributes the character of elemental phenomena personified. That personification is, as a rule, anthropomorphic, but traces of theriomorphic personification are still very apparent. The ideas

which may be gathered about the gods from the hymns are (as is usual in heathen religions) without consistency. There is no strict orthodoxy. As each bard of each bardic family celebrates his favourite god he is apt to make him for the moment the pre-eminent deity of all. This way of thinking about the gods leads naturally in the direction of a pantheistic monotheism in which each divine being may be regarded as a manifestation of the one divine essence. No doubt this point of view was attained in centuries extremely remote by sages of the civilized Vedic world. It is easy, however, to detect certain peculiar characteristics of each god. As among races much less advanced in civilization than the Vedic Indians, each of the greater powers has his own separate department, how- ever much his worshippers may be inclined to regard him as an absolute premier with undisputed latitude of personal government. Thus Indra is mainly concerned with thunder and other atmospheric phenomena; but Vayu is the wind, the Maruts are wind-gods, Agni is fire or the god of fire, and so connected with lightning. Powerful as Indra is in the celestial world, Mitra and Varuna preside over night and day. Ushas is the dawn, and Tvashtri is the mechanic among the gods, corresponding to the Egyptian Ptah and the Greek Hephestus. Though lofty moral qualities and deep concern about the conduct of men are attributed

l Kavos évAdprov of c&jmrra 7d oraprlov, Kat ev rais rederais ébo- vetro ta poem. Quoted by Lobeck, Aglaophamus, i. 700, from Bas- tius ad Gregor., 241, and from other sources; cf. Arnobius, v. c. 19, where the word turbines is the Latin term.

- Wilkinson, iii. 62, see note by Dr. Birch. The authorities on Egyptian religion are given under Eaypr (vol. vii. pp. 714-719). Un- fortunately Egyptologists have rarely a wide knowledge of the myths a ie lower races, while anthropologists are seldom or never Egypto- ogists.

to the gods in the Vedic hymns, yet the hymns contajn traces (and these are amplified in the ritual books) of a divine chronique scandaleuse. In this chronique the gods, like other gods, are adventurous warriors, adulterers, in- cestuous, homicidal, given to animal transformations, cowardly, and in fact charged with all human vices, and credited with magical powers. It

would be difficult to speak too highly of the ethical nobility of many Vedic hymns. The “hunger and thirst after righteousness” of the sacred poet recalls the noblest aspirations and regrets of the Hebrew psalmist. But this aspect of the Vedic deities is essentially matter for the science of religion rather than of mythology, which is concerned with the stories told about the gods. Religion is always forgetting, or explaining away, or apologizing for these stories. Now the Vedic deities, so imposing when regarded as vast natural forces (as such forces seem to us), so benignant when appealed to as forgivers of sins, have also their mythological aspect. In this aspect they are natural phenomena still, but phenomena as originally conceived of by the personifying imagination of the savage, and eredited, like the gods of the Maori or the Australian, with all manner of freaks, adventures, and disguises. The Veda, it is true, does not usually dilate much on the worst of these adventures, The Veda contains devotional hymns; we can no more expect much narrative here than in the psalms of David. Again, the religious sentiment of the Veda is half-consciously hostile to the stories. As M. Barth says, ‘‘ Le sentiment religieux a écarté la plupart de ces mythes, mais il ne lesa écartés tous.” The Brahmanas, on the other hand, later compilations, canonized books for the direction of ritual and sacrifice, are rich in senseless and irrational myths. Sometimes these myths are prob- ably later than the Veda, mere explanations of ritual incidents devised by the priests. Sometimes a myth prob- ably older than the Vedas, and maintained in popular tradition, is reported in the Brakmanas. The gods in the Veda are by no means always regarded as equal in supre- macy. There were great and small, young and old gods (#.-V., i. 27, 13). Elsewhere this is flatly contradicted : ‘“‘None of you, oh gods, is small or young, ye are all great” (&.-V., viii. 30, 1). As to the immortality and the origin of the gods, there is no orthodox opinion in the Veda. Many of the myths of the origin of the divine beings are on a level with the Maori theory that Heaven and Earth begat them in the ordinary way. Again, the gods were represented as the children of Aditi. This may be taken either in a refined sense, as if Aditi were the “infinite” region from which the solar deities rise,4 or we may hold with the Taitterya-Brahmana® that Aditi was a female who, being desirous of offspring, cooked a brakmandana offering for the Sadhyas. Various other fathers and mothers of the gods are mentioned. Some gods, particu- larly Indra, are said to have won divine rank by “austere fervour” and asceticism, which is one of the processes that makes gods out of

mortals even now in India.6 The gods are not always even credited with inherent immortality. Like men, they were subject to death, which they over- came in various ways. Like most gods, they had struggles for pre-eminence with Titanic opponents, the Asuras, who partly answer to the Greek Titans and the Hawaiian foes of the divine race, or to the Scandinavian giants and the enemies who beset the savage creative beings. Early man, living in a state of endless warfare, naturally believes that

3 For examples of the lofty morality sometimes attributed to the gods, see Max Miller, Hibbert Lectures, p. 284; Rig-Veda, ii. 28; iv. 12, 4; viii. 93 sg.; Muir, Sanskrit Texts, v. 218.

4 Miiller, Hibbert Lectures, p. 230.

5 Muir, 8, 7… ogee 7.

® See Sir A. Lyal, Asiatic Studies, For Vedic examples, see R.-V., x. 167, 15 x. 159, 4; “Muir, 8. 7, v. 15.

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his gods also have their battles. The chief foes of Indra are Vrittra and Ahi, serpents which swallow up the waters, pre- cisely as frogs do in Australian and Californian and An- It has already been shown that such

daman myths. creatures, thunder-birds, snakes, dragons, and what not, people the sky in the imagination of Zulus, Red Men, Chinese, Peruvians, and all the races who believe that beasts hunt the sun and moon and cause eclipses.? Though hostile to Asuras, Indra was once entangled in an intrigue with a woman of that race, according to the Atharva-Veda (Muir, S. T., v. 82). The gods were less numerous than the Asuras, but by a magical stratagem turned some bricks into gods (like a creation of new peers to carry a vote),—so says the Black Yajur-Veda.? Turning to separate gods, Indra first claims attention, for stories of Heaven and Earth are better studied under the heading of myths of the origin of things. Indra has this zoomorphic feature in common with Heitsi Eibib, the Namaqua god,’ that his mother, or one of his mothers, was acow (f.-V., iv. 18,1). This statement may be a mere way of speaking in the Veda, but it is a rather Hottentot

way.* Indra is also referred to as a ram in the Veda, and in one myth this ram could fly, like the Greek ram of the fleece of gold. He was certainly so far connected with sheep that he and sheep and the Kshatriya caste sprang from the breast and arms of Prajapati, a kind of creative being. Indra was a great drinker of soma juice ; a drinking-song by Indra, much bemused with soma, is in #2-V., x 10. On one occasion Indra got at the soma by assuming the shape of a quail. In the 7'aitt. Samh. (ii, 5g i. 1) Indira is said to "have been guilty of that most hideous crime, the killing of a Bréhmana."° Once, though uninvited, Indra drank some soma that had been prepared for another being. 'The soma disagreed with Indra; part of it which was not drunk up became Vrittra the serpent, Indra's enemy. Indra cut him in two, and made the moon out of half of his body. This serpent was a uni- versal devourer of everything and everybody, like Kwai Hemm, the all-devourer in Bushman mythology. If this invention is a late priestly one, the person who introduced it into the Satapatha-Brahmana must have reverted to the intellectual condition of Bushmen. In the fight with Vrittra, Indra lost his energy, which fell to the earth and produced plants and shrubs. In the same way plants, among the Iroquois, were made of pieces knocked off Chokanipok in his fight with Manabozho. Vines, in particular, are the entrails of Chokanipok. In Egypt, Wine was the blood of the enemies of the gods. The Aryan versions of this sensible legend will be found in Satapatha-Brahmana® 'The civilized mind soon wearies of this stuff, and perhaps enough has been said to prove that, in the traditions of Vedic devotees, Indra was not a god without an irrational element in his myth. Our argument is, that all these legends about Indra, of which only a sample is given, have no necessary connexion with the worship of a pure nature-god as a nature-god would now be constructed by men. The legends are survivals of a time in which natural phenomena were regarded, not as we regard them, but as persons, and savage persons, and became the centres of legends in the savage manner. Space does not permit us to recount the equally puerile and barbarous legends of Vishnu, Agni, the loves of Vivasvat in the form of a horse, the adventures of Soma, : See Tylor, Primitive Culture, i. 288, 329, 356. The chief authority for the constant strife between gods and Asuras is the Satapatha-Brahmana, of which one volume is translated in Saered Books of the East (vol. xii.).

3 Hahn, Tsuni-Goam, the Supreme Being of the Hottentots, p. 68.

4 z : : z og Muir, S. 7., v. 16, 17, for Indra’s peculiar achievements with a cow.

>» Sacred Books of the East, xii. 1, 48.

6 J,, xii. 176, 177.

nor the Vedic amours (paralleled in several savage mytho- logies) of Pururavas and Urvasi.’

Divine Myths of Greece.—If any ancient people was thoroughly civilized the Greeks were that people. Yet in the mythology and religion of Greece we find abundant survivals of savage manners and of savage myths. As to the religion, it is enough to point to the traces of human sacrifice and to the worship of rude fetich stones. The human sacrifices at Salamis in Cyprus and at Alos in Achaia Phthiotis may be said to have continued almost to the conversion of the empire (Grote, i. 125, ed. 1869). Pausanias seems to have found human sacrifices to Zeus still lingering in Arcadia in the 2d century of our era.

| «On this altar on the Lycaan hill they sacrifice to Zeus

ina manner that may not be spoken, and little liking had I to pry far into that sacrifice. But let it be as it is, and as it hath been from the beginning.” Now “from the beginning ” the sacrifice, according to Arcadian tradition, had been a human sacrifice. In other places there were manifest commutations of human sacrifice, as at the altar of Artemis the Implacable at Patree, where Pausanias saw the wild beasts being driven into the flames.® Many other exam- ples of human sacrifice are mentioned in Greek legend. Pausanias gives full and interesting details of the worship of rude stones, the oldest worship, he says, among the Greeks. Almost every temple had its fetich stone on a level with the pumice stone, which is the Poseidon of the Mangaians.® The Argives had a large stone called Zeus Cappotas. The oldest idol of the Thespians was a rude stone, Another has been found beneath the pedestal of Apollo in Delos. In Achxan Phare were thirty squared stones, each named by the name of a god. Among mon- strous

images of the gods which Pausanias, who saw them, regarded as the oldest idols, were the three-headed Artemis, each head being that of an animal, the Demeter with the

horse's head, the Artentis with the fish's tail, the Zeus with

three eyes, the ithyphallic Hermes, represented after the fashion of the Priapic figures in paintings on the walls of caves among the Bushmen. We also hear of the bull and the bull-footed Dionysus. Phallic and other obscene emblems were carried abroad in processions in Attica both

by women andmen. The Greek custom of daubing people all over with clay in the mysteries results as we saw in the mysteries of Negroes, Australians, and American races, while the Australian turndun was exhibited among the toys

at the mysteries of Dionysus. The survivals of rites, objects

of worship, and sacrifices like these prove that religious con-

servatism in Greece retained much of savage practice, and the Greek mythology is not less full of ideas familiar to the lowest races. 'The authorities for Greek mythology are numerous and various in character. The oldest sources as literary documents are the Homeric and Hesiodic poems. In the Jliad and Odyssey the gods and goddesses are beautiful, powerful, and immortal anthropomorphie beings. The name of Zeus (Skr. Dyaus) clearly indicates his con- nexion with the sky. But in Homer he has long ceased to be merely the sky conceived of as a person ; he is the a eS SS i ee

7 On the whole subject, Dr Muir's Ancient Sanskrit Texts, with translations, Ludwig's translation of the Rig- Veda, the version of the Satapatha-Brahmana already referred to, and the translation of the Aitareya-Brahmana by Haug, are the sources most open to English readers. Mr Max Miiller's translation of the Rig-V eda, unfortunately only deals with the hymns to the Maruts. The Indian epics and the Puranas belong to a much later date, and are full of deities either unknown to or undeveloped in the &ig- Veda and the Brahmanas. It is much to be regretted that the Atharva- Veda, which contains the magical formule and incantations of the Vedic Indians is still

untranslated, though, by the very nature of its theme, it must contain matter of extreme antiquity and interest.

8 Pansanias, iii, 16 3 vii. 18. Euman sacrifice to Dionysus, ance, vii. 21; Plutarch, De Ts. et Os.. 853 Porphyry, De AMiR%, Shia BE

9 Gill, Afyths and Songs from the South Pacific, p. 60.

chief personage in a society of immortals, organized on the type of contemporary human society. ‘There is a great deal of human nature” in his wife Hera (Skr. Svar, Heaven). It is to be remembered that philologists differ widely as to the origin and meaning of the names of almost all the Greek gods. Thus the light which the science of language throws on Greek myths is extremely uncertain. Hera is explained as “the feminine side of heaven” by some authorities. The quarrels of Hera with Zeus (which are a humorous anthropomorphic study in Homer) are represented as a way of speaking about winter and rough weather. The other chief Homeric deities are Apollo and Artemis, children of Zeus by Leto, a mortal mother raised to divinity. Apollo is clearly connected in some way with light, as his name PofGos seems to indicate, and with purity.2, Homer knows the legend that a giant sought to lay violent hands on Leto (Od., xi. 580). Smintheus, one of Apollo’s titles in Homer, is connected with the field-mouse (cpivOos), one of his many sacred animals. His names, Atxws, Avknyevis, were connected by antiquity with the wolf, by most modern writers with the light. According to some legends Leto had been a were-wolf.? The whole subject of the relations of Greek gods to animals is best set forth in the words of Plutarch (De Js. et Os., lxxi.), where he says that the Egyptians worship actual beasts, ‘“‘whereas the Greeks both speak and believe correctly, saying that the dove is the sacred animal of Aphrodite, the raven of Apollo, the dog of Artemis,” and so forth. Each Greek god had a small menagerie of sacred animals, and it may be conjectured that these animals were originally the totems of various stocks, subsumed into the worship of the anthropomorphic god. Apollo, in any case, is the young and beautiful archer-god of Homer ; Artemis, his sister, is the goddess of archery, who

takes her pastime in the chase. She holds no considerable place in the Iliad; in the Odyssey, Nausicaa is compared to her, as to the pure and lovely lady of maidenhood. Her name is commonly connected with dprepajs,—pure, unpol- luted. Her close relations (un-Homeric) with the bear and bear-worship have suggested a derivation from dpxtos—Apkrenis. In Homer her "gentle shafts" deal sudden and painless death; she is a beautiful Azrael. A much more important daughter of Zeus in Homer is Athene, the "grey-eyed" or (as some take yAavkdmus, rather improbably) the "owl-headed" goddess. Her birth from the head of Zeus is not explicitly alluded to in Homer. In Homer, Athene is a warlike maiden, the patron-goddess of wisdom and manly resolution. In the twenty-second book of the Odyssey she assumes the form of a swallow, and she can put on the shape of any man. She bears the aegis, the awful shield of Zeus, Another Homeric child of Zeus, or, according to Hesiod (This 92), of Hera alone, is Hepheestus, the lame craftsman and arti- ficer. In the Jtad® will be found some of the crudest Homeric myths. Zeus or Hera throws Hephestus or Ate out of heaven, as in the Iroquois myth of the tossing from heaven of Ataentsic. There is, as usual, no agreement as to the etymology of the name of Hephestus. Preller

1 Cf, Preller, Griechische Mythologie, i. 128, note 1, for this and other philological conjectures.

® The derivation of 'Awé\wy remains obscure. The derivation of Leto from \aetv, and the conclusion that her name means 'the con- cealer," that is, the night, whence the sun is born, is disputed by Cur- tius (Preller, i, 190, 191, note 4), but appears to be accepted by Mr Max Miiller (Selected Essays, i. 386), Latmos being derived from the same root as Leto, Latona, the night.

® Aristotle, H. An., 6; Alian, NV. A., 4, 4.

4 Her name, as usual, is variously interpreted by various etymolo- gists. Some connect 'AO#vn with aif, as in alOyjs. Mr Max Miiller connects it with ahana (Skr., dawn), but it is not universally admitted

that ahana does mean "dawn," nor that the derivation is correct, 5 xiv. 257; xviii, 395; xix. 91, 132,

inclines to a connexion with #$@a:, to kindle fire, but Mr Max Miiller differs from this theory. About the close relations of Hephestus with fire there can be no doubt. He is a rough, kind, good-humoured being in the tad. In the Odyssey he is naturally annoyed by the adultery of his wife, Aphrodite, with Ares. Ares is a god with whom Homer has no sympathy. He is a son of Hera, and detested by Zeus (Iliad, vy. 890). He is cowardly in war, and on one occasion was shut up for years in a huge brazen pot. This adventure was even more ignominious than that of Poseidon and Apollo when they were compelled to serve Laomedon for hire.

.The payment he refused, and threatened to “cut off

their ears with the sword” (diad, xxi. 455), Poseidon is to the sea what Zeus is to the air, and Hades to the underworld in Homer.® His own view of his social position may be stated in his own words (Iliad, xv. 183, 211).

‘Three brethren are we, and sons of Cronus, sons whom Rhea bare, even Zeus and myself, and Hades is the third, the ruler of the people in the underworld. And in three lots were all things divided, and each drew a lot of his own,’ and to me fell the hoary sea, and Hades drew the mirky darkness, and Zeus the wide heaven in clear air and clouds, but the earth and high Olympus are yet common to all.”

Zeus, however, is, as Poseidon admits, the elder-born, and therefore the revered head of the family. Thus Homer adopts the system of primogeniture, while Hesiod is all for the opposite and probably earlier custom of “jlingsten-recht,” and makes supreme Zeus the youngest of the sons of Cronus. Among the other gods Dionysus is but slightly alluded to in Homer as the son of Zeus and Semele, as the object of persecution, and as connected with the myth of Ariadne. The name of Hermes is derived from various sources, as from dépydv and spy}, or, by Mr Max Miiller, the name is connected with Sarameya (Sky). If he had originally an elemental character, it is now diffi- cult to distinguish, though interpreters connect him with the wind. He is the messenger of the gods, the bringer of good luck,

and the conductor of men's souls down the dark ways of death. In addition to the great Homeric gods, the poet knows a whole "Olympian consistory" of deities, nymphs, nerecids, sea-gods and goddesses, river- gods, Iris the rainbow goddess, Sleep, Demeter who lay with a mortal, Aphrodite the goddess of love, wife of Hephestus and leman of Ares, and so forth. As to the origin of the gods, Homer is not very explicit. He is acquainted with the existence of an older dynasty now deposed, the dynasty of Cronus and the Titans. In the Ztad (viii. 478) Zeus says to Hera, "For thine anger reck I not, not even though thou go to the nether- most bounds of earth and sea, where sit Iapetus and Cronus . . . and deep Tartarus is round about them." "The gods below that are with Cronus" are mentioned (ii., xiv. 274; xv. 225). Rumours of old divine wars echo in the iad, as (i, 400) where it is said that when the other immortals revolted against and bound Zeus, Thetis brought to his aid AZgzon of the hundred arms. The streams of Oceanus (J/., xiv. 246) are spoken of as the source of all the gods, and in the same book (290) "Oceanus and mother Tethys" are regarded as the parents of the immortals. Zeus is usually called Cronion and Cronides, which Homer certainly understood to mean "son of Cronus," yet it is expressly stated that Zeus " imprisoned Cronus beneath the earth and the unvintaged sea." The whole subject is only alluded to incidentally. On the whole it may be said that the Homeric deities are power- ful anthropomorphic beings, departmental rulers, united by the ordinary social and family ties of the Homeric

® The root of his name is sought in such words as wéros and rorapss. " We learn from the Odyssey (xiv. 209) that this was the custom of sons on the death of their father.

mY HO LOG Y

age, capable of pain and pleasure, living on heavenly food, but refreshed by the sacrifices of men (Od., v. 100, 102),

able to assume all forms at will, and to intermarry and Their

ast has been stormy, and their ruler has attained power after defeating and mediatizing a more ancient dynasty of

propagate the species with mortal men and women.

his own kindred.

From Hesiod we receive a much more elaborate, prob- ably a more ancient, certainly a more barbarous, story of In the beginning the gods (here used in a wide sense to denote an early non-natural race) were begotten by Earth and Heaven, conceived of as

the gods and their origin.

beings with human parts and passions (Hesiod, Theog., 45), This idea recurs in Maori, Vedic, and Chinese mytho- logy. Heaven and Earth, united in an endless embrace, produced children which never saw the light.

pair had to be sundered.! Hesiod enumerates the children whom Earth bore “when couched in love with Heaven.” They are Ocean, Cceus, Crius, Hyperion, Iapetus, Theia, Rhea, Themis, Mnemosyne, Phoebe, Tethys, and the youngest, Cronus, “and he hated his glorious father.” Others of this early race were the Cyclopes, Bronte, Sterope, and Arge, and three children of enormous strength, Cottus, Briareus (Aigeon), and Gyes, each with one hundred hands and fifty heads. Uranus detested his off- spring, and hid them in crannies of Earth. Earth excited Cronus to attack the father, whom he castrated with a sickle. From the blood of Cronus (this feature is common in Red Indian and Egyptian myths) were born furies, giants, ash-nymphs, and Aphrodite. A number of monsters, as Echidna, Geryon, and the hound of hell, were born of the loves of various elemental powers. The chief stock of the divine species was continued by the marriage of Rhea (probably another form of the Earth) with Cronus. Their children were Hestia, Demeter, Hera, Hades, and Poseidon. All these Cronus swallowed ; and this ‘‘swallow- myth” occurs in Australia, among the Bushmen, in Guiana, in Brittany (where Gargantua did the swallow trick), and elsewhere. At last Rhea bore Zeus, and gave Cronus a stone in swaddling bands, which he disposed of in the usual way. Zeus grew up, administered an emetic to Cronus (some say Metis did this), and had the satisfaction of seeing all his brothers and sisters disgorged alive. The stone came forth first, and Pausanias saw it at Delphi (Paus., x. 24). Then followed the wars between Zeus and the gods he had rescued from the maw of Cronus against the gods of the elder branch, the children of Uranus and Gza,—Heaven and Earth. The victory remained with the younger branch, the immortal

Olympians of Homer. The system of Hesiod is a medley of later physical specu- lation and of poetic allegory, with matter which we, at least, regard as savage survivals, like the mutilation of Heaven and the swallow-myth.? _Jn Homer and in Hesiod myths enter the region of literature, and become, as it were, national. But it is probable that the local myths of various cities and tem- ples, of the “sacred chapters” which were told by the priests to travellers and in the mysteries to the initiated, were older in form than the epic and national myths. Of these “sacred chapters” we have fragments and hints in

See Tylor, Prim. Cult., i. 826.

- Bleek, Bushman Folk-Lore, pp. 6-8. Mr Max Miiller suggests another theory (Selected Essays, i. 460): ‘‘Kpévos did not exist till yng after Zevs in Greece.” The name Kpoviwy, or Kpovléns, looks

e€ » patronymic. Mr Miiller, however, thinks it originally meant only “connected with time, existing through all time.” Very much later the name was mistaken for a genuine patronymic, and “* Zeus the ancient of days” became “ Zeus the son of Cronus.” Having thus bel a Cronus, the Greeks—and ‘‘the misunderstanding could have

appened in Greece only ’’—needed a myth of Cronus. They there-

In New Zealand, Chinese, Vedic, Indian, and Greek myths the

Herodotus, Pausanias, in the mythographers, like Apollo- dorus, in the tragic poets, and in the ancient scholia or notes on the classics. From these sources come almost all the more inhuman, bestial, and discreditable myths of the gods. In these we more distinctly perceive the savage element. The gods assume animal forms: Cronus becomes a horse, Rhea a mare; Zeus begets separate families of men in the shape of a bull, an ant, a serpent, a swan. His mistress from whom the Arcadians claim descent becomes a she-bear. It is usual with mythologists to say that Zeus is the “‘all-father,” and that his amours are only a poetic way of stating that he is the parent of men. But why does he assume so many animal shapes? Why did various royal

houses claim descent from the ant, the swan, the she-bear, the serpent, the horse, and so forth? We have already seen that this is the ordinary pedigree of savage stocks in Asia, Africa, Australia, and America, while animals appear among Irish tribes, and in Egyptian and ancient English genealogies? It is a plausible hypo- thesis that stocks which once claimed descent from animals, sans phrase, afterwards regarded the animals as avatars of Zeus. In the same way “the Minas, a non-Aryan tribe of Rajputana, used to worship the pig ; when the Brahmans got a turn at them, the pig became an avatar of Vishnu ” (Lyal, Asiatic Studies). The tales of divine cannibalism to which Pindar refers with awe, the mutilation of Dionysus Zagreus, the unspeakable abominations of Dionysus, the loves of Hera in the shape of a cuckoo, the divine powers of metamorphosing men and women into beasts and stars,—these tales come to us as echoes of the period of savage thought. Further evidence on this point will be given below in a classification of the principal mythic legends. The general conclusion is that many of the Greek deities were originally elemental, the elements being personified in accordance with the laws of savage imaginations. But we cannot explain each detail in the legends as a myth of this or that natural pheno- menon or process as understood by ourselves. Various stages of late and early fancy have contributed to the legends. Zeus is the sky, but not our sky ; he had origin- ally a personal character, and that a savage or barbarous character. He probably attracted into his legend stories that did not originally belong to him. He became anthro- pomorphic, and his myth was handled by local priests, by family bards, by national poets, by early philosophers. His legend is a complex embroidery on a very ancient tissue. The other divine myths are equally complex. Scandinavian Divine Myths—The Scandinavian myths of the gods are numerous and interesting, but the evidence on which they have reached us demands criticism for which we lack space. That there are in the Eddas and Sagas early ideas and later ideas tinged by Christian legend seems indubitable, but philological and historical learning has by no means settled the questions of relative purity and antiquity in the myths. The Hddic songs, according to Mr Powell, one of the editors of the Corpus Poeticum Sep- tentrionale (the best work on the subject), “cannot date earlier” in their present form “than the 9th century,” and may be vaguely placed between 800-1100 a.p. The collector of the Edda probably had the old poems recited to him in the 13th century, and where there was a break ee ee

fore invented or adapted the “ swallow-myth ” so familiar to Bushmen and Australians. This singular reversion to savagery itself needs some explanation. But the hypothesis that Cronus is a late derivation from Kpovidns and Kpovlwy is by no means universally accepted. Others derive Kpévos from kpalyw, and connect it with xpdvea, a kind of har- vest home festival. Schwartz (Prihistorisch-anthropologische Studien) readily proves Cronus to be the storm, swallowing the clouds. Perhaps we may say of Schwartz’s view, as he says of Preller s— ‘das ist Gedankenspiel, aber ninmermehr Mythologie.” 3 Elton, Origins of English Mistory, 298-301.

in the memory of the reciters the lacuna was filled up in prose. ‘As one goes through the poems, one is ever and anon face to face with a myth of the most childish and barbaric type,” which “carries one back to pre- Aryan days.” Side by side with these old stories come fragments of a different stratum of thought, Christian ideas, the belief in a supreme God, the notion of Dooms- day. The Scandinavian cosmogonic myth (with its par- allels among races savage and civilized) is given elsewhere. The most important god is Odin, the son of Bestla and Bor, the husband of Frigg, the father of Balder and many other sons, the head of the A‘sir stock of gods. Odin’s name is connected with that of Wuotan, and referred to the Old High German verb watan wuot=meare, cum empetu ferrt (Grimm, Teut. Myth., Engl. transl., i. 131). Odin would thus (if we admit the etymology) be the swift goer, the “ ganger,” and it seenis superfluous to make him (with Grimm) “the all-powerful, all-permeating being,” a very abstract and scarcely an early conception. Odin’s brethren (in Gylji’s Mocking) are Vile and Ve, who with him slew Ymir the giant, and made all things out of the fragments of his body. They also made man out of two stocks. In the Hava-Mal Odin claims for himself most of the attributes of the medicine-man. In Loka Senna, Loki, the evil god, says that ‘“‘Odin dealt in magic in Samsey.” The goddess Frigg remarks, “‘ Ye should never talk of your old doings before men, of what ye two Ausir went through in old times.” But many relics of these “old times,” many traces of the medicine-man and the “skin- shifter,” survive in the myth of Odin. When he stole Suttung’s mead (which answers somewhat to nectar and the Indian soma), he flew away in the shape of ‘an eagle. The hawk is sacred to Odin; one of his names is “the

Raven-god.” He was usually represented as one-eyed, having left an eye in pawn that he might purchase a draught from Mimir’s well. This one eye is often explained as the sun. Odin’s wife was Frigg; their sons were Thor (the thunder-god) and Balder, whose myth is well known in English poetry. The gods were divided into two, not always friendly, stocks, the A’sir and Vanir. Their relations are, on the whole, much more amicable than those of the Asuras and Devas in Indian mythology. Not necessarily immortal, the gods restored their vigour by eating the apples of Iduna. Asa Loki was a being of mixed race, half god, half giant, and wholly mischievous and evil. His legend includes animal metamorphoses of the most obscene character. In the shape of a mare he became the mother of the eight-legged horse of Odin. He borrowed the hawk-dress of Freya, when he recovered the apples of Iduna. Another Eddie god, Heene, is described in phrases from lost poems as “the long-legged one,” “lord of the ooze,” and his name is connected with that of the crane, The constant enemies of the gods, the giants, could also assume animal forms. Thus in Thiodolf’s H aust-long (com- posed after the settlement of Iceland) we read about a shield on which events from mythology were painted ; among these was the flight of “giant Thiazzi in an ancient eagle’s feathers.” The god Herindaland Loki once fought a battle in the shapes of seals. On the whole, the Scan- dinavian gods are a society on an early human model, of beings indifferently human, animal, and divine,—some of them derived from elemental forces personified, holding sway over the elements, and skilled in sorcery. Probably after the viking days came in the conceptions of the last

1 Indra was a hawk when, ‘‘ being well-winged, he carried to men the food tasted by the gods ” (R.-V., iv. 26, 4). Yehl, the Thlinkeet god-hero, Was a raven or a crane when he stole the water (Bancroft, ili, 100-102). The prevalence of animals, or of god-animals, in myths of the stealing of water, soma, and fire, is very remarkable. Among

the Andaman Islanders, a kingfisher steals fire for men from the god Puluga (Anthrop. Journal, November 1882).

war of gods, and the end of all, and the theory of Odin All-father as a kind of emperor in the heavenly world. The famous tree that lives through all the

world is regarded as “foreign, Christian, and confined to few poems.” There is, almost undoubtedly, a touch of the Christian dawn on the figure and myth of the pure and beloved and ill-fated god Balder, and his descent into hell. The whole subject is beset with critical difficulties, and we have chiefly noted features which can hardly be regarded as late, and which correspond with widely-distributed mythical ideas.?

It is now necessary to cast a hasty glance over the chief divisions of myths. These correspond to the chief problems which the world presents to the curiosity of untutored men. They ask themselves (and the answers are given in

myths) the following questions :—What is the Origin of

the World? The Origin of Man? Whence came the Arts of Life? Whence the Stars? Whence the Sun and Moon? What is the Origin of Death? How was Fire procured by Man? The question of the origin of the marks and characteristics of various animals and plants has also pro- duced a class of myths in which the marks are said to survive from some memorable adventure, or the plants and animals to be metamorphosed human beings. Examples of all these myths are found among savages and in the legends of the ancient civilizations. A few such examples may now be given.

Myths of the Origin of the World.—We have found it difficult to keep myths of the gods apart from myths of the origin of the world and of man, because gods arc frequently regardcd as creative powers. The origin of things is a problem which has cverywhere cxereised thought, and been rudely solved in myths. These vary in quality with the civilization of the races in which they are current, but the same ideas which we procecd to state pervade all cosmogonical myths, savage and civilized. All these legends waver between the theory of creation, or rather of manufacture, and the theory of evolution. The earth, as a rule, is supposed to have grown out of some original matter, perhaps an animal, perhaps an egg which floated on the waters, perhaps a fragment of soil fished up out of the floods by a beast ora god. But this conception does not exclude the idea that many of the things in the world, minerals, plants, people, and what not, are fragments of the frame of an animal or non-natural magnified man, or are excretions from the body of a god. We proceed to state briefly the various

forms of these ideas. The most backward races usually assume the prior existence of the earth.

The aborigines of the northern parts of Victoria (Australia) be- licve that the earth was made by Pund-jel, the bird-creator, who sliced the valleys with a knife. Another Australian theory is that the men of a previous race, the Nooralie (very old ones), made the earth.

The problem of the origin of the world secms scarcely to have troubled the Bushmen. They know about "'mcn who brought the sun," but their doctrines are revealed in mystcries, and Qing, the informant of Mr Orpen (Cape Monthly Magazine, July 1874), "did not dance that dance," that is, had not becn initiated into all the secret doctrines of his tribe. According to Qing, creation was the work of Cagn (the mantis insect), ''he gave orders and caused all things to appear." Elsewhere in the myth Cagn made or manufactured things by his skill.

As arule the most backward races, while rich in myths of the origin of men, animals, plants, stones, and stars, do not say much about the making of the world. Among people a little more ad- vanced, the earth is presumed to have grown out of the waters. In the Iroquois myth (Lafitau, Ifeurs des Sawvages, 1724), a heavenly woman was tossed out of heaven, and fell on a turtle, which developed into the world. Another North-Amcrican myth assumes a single

2 Dasent's Prose or Younger Edda (Stockholm, 1842), the Corpus Septentrionale already referred to, Mr Keary's Mythology of the Eddas, Pigott's Manual of Scandinavian Mythology (1888), and Laing's Karly Kings of Norway may be consulted by English students. For Germanic myths at large, Grimm's celebrated German Mythology, translated by Mr Stallybrass, may be studied, and Mr Keary's Outlines of Primitive Belief. German divine myths are necessarily scarce, owing to the early conversion of Germany before a pre-Christian literature, like the Hddas, was preserved. Obscure classical notices, and survivals in folk-lore, medizval and modern, are the ehief sources of information. The divine names, however, prove that the German was in form not alien to the Scandinavian mythology. The marchen in Grimm's and other collections belong rather to the heroic myths than to those con- cerned with gods.

island in the midst of the waters, and this island grew into the world. ‘The Navajosand the Digger Indians take earth for granted asa starting-point in their myths. The Winuebagos, not untouched by Christian doctrine, do not go farther back. The Great Manitou awoke and found himself alone. He took a piece of his body and a piece of earth and made aman. Here the existence of earth is assumed (Bancroft, iv. 228). Even in Guatemala, though the younger sons of a divine race succeed in making the earth where the elder gon (as usual) failed, they all had a supply of clay as first material. The Pimas, a Central-American tribe, say the earth was made by a powerful being, and at first appeared ‘‘like a spider’s web.” This reminds one of the Ananzi or spider creator of West Africa. The more metaphysical Tacullies of British Columbia say that in the beginning nought existed but water and a musk-rat. The musk- rat sought his food at the bottom of the water, and his mouth was frequently filled with mud. T his he kept spitting out, and so formed an island, which developed into the world. Among the Tinnehs, the frame of a dog (which could assume the form of a handsome young man) became the first material of most things. The dog, like Osiris, Dionysus, Purusha, and other gods, was torn to pieces by giants ; the fragments becaine many of the things in the world (Bancroft, i. 106). Even here the existence of earth for the dog to live in is assumed.

Coming to races more advanced in civilization, we find the New Zealanders in possession of ancient hymns in which the origin of things is traced back to nothing, to darkness, and to a metaphysical process from nothing to something, from being to becoming. The hymns may be read in Sir George Grey’s Polynesian Mythology, and in Taylor’s New Zealand. It has been suggested that these hymns Dear traces of Buddhist and Indian influence; in any case, they are yather metaphysical than mystical. Myth comes in when the Maoris represent Rangi and Papa, Heaven and Earth, as two vast beings, male and female, united in a secular embrace, and finally severed by their children, among whom Tane Mahuta takes the part of Cronus in the Greek myth. The gods were partly elemental, partly animal in character ; the lists of their titles show that every human crime was freely attributed to them. In the South Sea Islands, generally, the fable of the union and separation of

Heaven and Earth is current ; other forms will be found in Gill’s Myths and Songs from the South Pactfie.

The Greek cosmogonic myths have already becn alluded to in the passage on divine myths in Greece.

The cosmogonic myths of the Aryans of India are peculiarly inter- esting, as we find in the Vedas and Brahmanas and Puranas almost every fiction familiar to savages side by side with the most abstract metaphysical speculations. We have the theory that earth grew, as in the Iroquois story of the turtle, from a being named Uttanapad (Muir, v. 885). We find that Brahmanaspati ‘‘ blew the gods forth from his mouth,” and one of the gods, Tvashtri, the mechanie among the, deities, is credited with having fashioned the earth and the heayen (Muir, v. 354). The ‘‘ Purusha Sukta,” the 90th hymn of the tenth book of the Rig- Veda, gives us the Indian version of the theory that all things were made out of the mangled limbs of Purusha, a magnified non-natural man, who was sacrificed by the gods. As this hymn gives an account of the origin of the castes (which elsewhere are scarcely recognized in the Rig-Veda), it is sometimes regarded as a late addition. But we can searcely think the main conception late, as it is so widely scattered that it meets us in most mythologies, including those of Chaldea and Egypt, and various North-American tribes. Not satisfied with this myth, the Aryans of India accounted for the origin of species in the following barbaric style. A being named Purusha was alone in the world. He differentiated himself into two beings, husband and wife. The wife, regarding union with her producer as incest, fled from his embraces as Nemesis did from those of Zeus, and Rhea from Cronus, assuming various animal disguises. The husband pursued in the form of the male of each animal, and froin these unions sprang the various specics of beasts (Satapatha-Brahmana, xiv. 4, 2; Mur, i. 25). The myth of the cosmic egg from which all things were pro- duced is also current in the Brahmanas. In the Puranas we find the legend of many successive creations and destructions of the world a myth of world-wide distribution.

As a tule, destruction by a deluge (see Deuce) is the most favourite myth, but destructions by fire and wind and by the wrath of a god are commou in Australian, Peruvian, and Egyptian tradi- tion. The idea that a boar, or a god in the shape of a boar, fished up a bit of earth which subsequently became the world out of the waters, is very well known to the Aryans of India, and

recalls the feats of American musk-rats and coyotes already described. The tortoise from which all things sprang, in a myth of the Satapatha- Brahnana, reminds us of the Iroquois turtle. The Greek and Mangaian myth of the marriage of Heaven and Earth and its dis- solution is found in the Aitareya-Brahmana (Haug's trans., ii. 808 ; Rig-Veda, i. 1xii.).

So much for the Indian cosmogonic myths, which are a collection

of ideas familiar to savages, blended with sacerdotal theories and ritual mummeries. The philosophical theory of the origin of things, a hymn of remarkable stateliness, is in Aig-Veda, x. 129. The Scandinavian cosmogonic myth starts from the abyss, Ginnungagap, a chaos of ice, from which, as it thawed, was produced the giant Ymir. Ymir is the Scandinavian Purusha. A man and woman sprang from his armpit, like Athene from the head of Zeus. A cow licked the hoar-frost, whence rose Bur, whose children, Odin, Vile, and Ve, slew the giant Ymir. ''Of his flesh they formed the earth, of his blood seas and waters, of his bones mountains, of his teeth rocks and stones, of his hair all manner of plants." This is the story in the Prose Edda, derived from older songs, such as the Grimnersmal. However the distribution of this singular myth may be explained, its origin can scarcely be sought in the imagina- tion of races higher in culture than the Tinnehs and Tacullies, among whom dogs and beavers are the theriomorphic form of Purusha or Yimir.

Myths of the Origin of Man.—These partake of the conceptions of evolution and of creation. Man was made out of clay by a super- natural being. Australia: man was made by Pund-jel. New Zealand man was made by Tiki; 'he took red clay, and kneaded it with his own blood." MJangaia: the woman of the abyss made a child from a piece of flesh plucked out of her own side. Melanesia: '* man was made of clay, red from the marshy side of Vanua Levu ; " womall was made by Qat of willow twigs. Greece: men were wAGT MATE andod, figures baked in clay by Prometheus." India : men were made after many efforts, in which the experimental beings did not har- monize with their environment, by Prajapati. In another class of myths, man was evolved out of the lower animals,—lizards in Aus- tralia ; coyotes, beavers, apes, and other beasts in America. 'The Greck myths of the descent of the Arcadians, Myrmidons, children of the swan, the cow,

and so forth, may be compared. Yet again, men came out of trees or plants or rocks: as from the Australian wattle gum, the Zulu bed of reeds, the great tree of the Ovahereros, the rock of the tribes in Central Africa, the cave of Bushman and North-American and Peruvian myth, "'from tree or stone" (Odyssey, xix. 163). This view was common among the Greeks, who boasted of being autochthonous. The Cephisian marsh was one scene of man's birth according to a fragment of Pindar, who mentions Egyptian and Libyan legends of the same description.

Myths of the Arts of Life.—These are almost unanimously attri- buted to "culture-heroes," beings theriomorphic or anthropomorphic, who, like Pund-jel, Qat, Quawteaht, Prometheus, Manabozho, Quet- zalcoatl, Cagn, and the rest, taught men the use of the bow, the processes (where known) of pottery, agriculture (as Demeter), the due eourse of the mysteries, divination, and everything else they knew. Commonly the teacher disappears mysteriously. He is often regarded by modern mythologists as the suu.

Star Myths.—"'The stars came otherwise," says Mr Browning's Caliban. In savage and civilized myths they are usually meta- morphosed men, women, and beasts. In Australia, the Pleiades, as in Greece, were girls. Castorand Pollux in Greece, as in Australia, were young men. Our Bear was a bear, according to Charlevoix and Lafitau, among the North-American Indians; the Eskimo, according to Egede, who settled the Danish colony in Greenland, regarded the stars " very nonsensically," as "so many of their ancestors ;" the Egyptian priests showed Plutarch the stars that had been Isis and Osiris. Aristophanes, in the Pax, shows us that . the belief in the change of men into stars survived in his own day in Greece. The Bushmen (Bleek) have the same opinion. The Satapatha-Brahmana (Saered Books of the East, xii. 284) shows how Prajapati, in his incestuous love, turned himself into a roc- buck, his daughter into a doe, and how both became constellations. This is a thoroughly good example of the savage myths (as in Peru, according to Acosta) by which beasts and anthropomorphic gods and stars are all jumbled together.? The Rig-Veda eontains examples of the idea that the good become stars.

Solar and Lunar Myths.—These are universally found, and are too numerous to be examined here. The sun and moon, as in the Bulgarian ballad of the Sus Bride (a mortal girl), are looked on as living beings. In Mexico they were two men, or gods of a human character who were burned. The Eskimo know the moon as a man who visits earth, and, again, as a girl who had her face spotted by ashes which the Sun threw at her. The Khasias make the sun a woman, who daubs the face of the moon, a man. The Homeric hymn to Helios, as Mr Max Miiller observes, ‘‘ looks on the sun as a half-god, almost a hero, who had once lived on earth.” This is precisely the Bushman view ; the sun was a man who irradiated light from his armpit. In New Zealand and in North America the sun is a beast, whom adventurers have trapped and beaten. Medicine has been made with his blood. In the Andaman Islands the Sun is the wife of the Moon (Jour. of Anth. Soe., 1882). Among aboriginal tribes in India (Dalton, p. 186) the Moon is the Sun’s bride; she was faithless and he cut her in two, but occasionally

eee ee ee SS 2 Aristophanes, Aves, 686; Etym. Magn., s.v. Ixévioy, Pausanias saw the clay (Paus. x. iv.). The story is also quoted by Lactantius from Hesiod. 3 Sce also Vishnw Purana, i. 131.

1 Black Yajur-Veda and Satapatha-Brahmana ; Muir, i. 52.

lets her shine in full beauty. The Andaman Islanders account for the white brilliance of the moon by saying that he is daubing himself with white clay, a custom common in savage and Greek mysteries. The Red Men accounted to the Jesuits for the spherical forms of sun and moon by saying that their appearance was caused by their bended bows. The Moon in Greek myths loved Endy- mion, and was bribed to be the mistress of Pan by the present of a fleece, like the Dawn in Australia, whose unchastity was rewarded by a gift of a red cloak of opossum skin. Solar and lunar myths usually account for the observed phenomena of eclipse, waning and waxing, sunset, spots on the moon, and so forth, by various mythical adventures of the animated heavenly beings. In modern folk-lore the moon is a place to which bad people are sent, rather than a woman ora man. The mark of the hare in the moon _has struck the imagination of Germans, Mexicans, Hottentots, Cingalese, and produced myths among all these races.}

Myths of Death.—Few savage races regard death as a natural event. All natural deaths are supernatural with them. Men are assumed to be naturally immortal, hence a series of myths to account for the origin of death. Usually some custom or ‘‘ taboo” is represented as having been broken, when death has followed. In New Zealand, Maui was not properly baptized. In Australia, a woman was told not to go near a certain tree where a bat lived ; she infringed the prohibition, the bat fluttered out, and men died. The Ningphoos were dismissed from paradise, and became mortal, because one of them bathed in water which had been tabooed (Dalton, p. 13). In the Atharva-Veda, Yama, like Maui in New Zealand, first ‘‘spied out the path to the other world,” which all men after him have taken. In the Rig-Veda (x. 14), Yama “sought out a road for many.” In the Solomon Islands (Jour. Anth. Inst., Feb. 1881), ‘* Koevari was the author of death, by resuming her cast-off skin.” The same story is told in the Banks Islands. In the Greek myth (Hesiod, Works and Days, 90), men lived without ‘‘ill diseases that give death to men” till the cover was lifted from the forbidden box of Pandora. As to the myths of Hades, the place of the dead, they are far too many to be men- tioned in detail. In almost all the gates of hell are guarded by fierce beasts, and in Ojibway, Finnish, Greek, Papuan, and Japanese myths no mortal visitor may escape from Hades who has once tasted the food of the dead. ;

Myths of Fire-stealing.—Those current in North America (where an animal is commonly the thief) will be found in Bancroft, vol. iv. The Australian version, singularly like one Greek legend, is given by Brough Smyth. Stories of the theft of Prometheus are recorded by Hesiod, Aischylus, and their commentators. Muir and Kuhn may be consulted for Vedic fire-stealing.

Heroie and Romantic Myths.—In addition to myths which are clearly intended to explain facts of the universe, most nations have their heroic and romantic myths. Familiar examples are the stories of Perseus, Odysseus, Sigurd, the Indian epic stories, the adventures of Ilmarinen and Wainamoinen in the Kalewala, and so forth. To discuss these myths as far as they can be considered apart from divine and explanatory tales would demand more space than we have at our disposal. It will become evident to any student of the romantic myths that they consist of different arrange-

ments of a rather limited set of incidents. These incidents have been roughly classified by Von Hahn.2 We may modify his arrangement as follows.

There is (1) the story of a bride or bridegroom who transgresses a commandment of a mystic nature, and disappears as a result of the sin. The bride sins as in Eros and Psyche, Freja and Oddur, Pururavas and Urvasi.2 The sin of Urvasi and Psyche was seeing their husbands—naked in the latter case. The sin was against ‘“‘the manner of women.” Now the rule of etiquette which forbids seeing or naming the husband (especially the latter) is of the widest distribution. The offence in the Welsh form of the story is naming the partner—a thing forbidden among early Greeks and modern Zulus. Presumably the tale (with its example of the sanction) sur- vives the rule in many cases. (2) “ Penelope formula.” The man leaves the wife and returns after many years. A good example occurs in Chinese legend. (3) Formula of the attempt to avoid fate or the prophecy of an oracle. This incident takes numerous shapes, as in the story of the fatal birth of Perseus, Paris, the Egyptian prince shut np ina tower, the birth of Edipus. (4) Slaughter ofa monster. This is best known in the case of Andromeda and Perseus, (5) Flight, by aid of an animal usually, from cannibalism, human sacrifice, or incest. The Greek example is Phrixus, Helle, and the ram of the golden fleece. (6) Flight of a lady and her lover from a giant father or wizard father. Jason and Medea furnish the Greek example. (7) The youngest brother the successful adventurer, and the head of the family. We have seen the example of Greek mythic illus- ee oe

1 See Cornhill Magazine, ‘‘How the Stars got their Names” (1882, p. 35); hg is pome Solar and Lunar Myths ” (1882, p. 440); Max Miiller, Selected Essays, 2 Griechische und Albanestsche Mérchen, i. 45.

3 Tenth Book of Rig-Veda and “ Brahmana” of Yajur-Vede ; Miller, Selected Essays, i. 410.

trations of ‘‘jiingsten-reclit,” or supremacy of the youngest, in the

Hesiodic myth of Zeus, the youngest child of Cronus. (8) Bride

given to whoever will accomplish difficult adventures, or vanquish

girl in race. The custom of giving a bride without demanding bride-price, in reward for a great exploit, is several times alluded to in the JUiad. In Greek heroic myth Jason thus wins Medea, and (in the race) Milanion wins Atalanta. In the Kalewala much of the Jason cycle, including this part, recurs. The rider through the fire wins Brunhild but this may belong to another cycle of ideas. (9) The grateful beasts, who, having been aided by the hero, aid him in his adventures. Melampus and the snakes is a Greek example. This story is but one specimen of the personal human character of animals in myths, already referred to the intellectual condition of savages. (10) Story of the strong man and his adventures, and stories of the comrades Keen-eye, Quick- ear, and the rest. Jason has comrades like these, as had Ilmarinen and Heracles, the Greek ‘‘strong man.” (11) Adventure with an ogre, who is blinded and deceived by a pun of the hero’s, Odysseus and Polyphemusis the Greek example. (12) Descent into Hades of the hero. Heracles, Odysseus, Wainamoinen in the Kale. wala, are the best-known examples in epic literature. These are twelve specimens of the incidents, to which we may add (13) “the false bride,” as in the poem of Berte aua grans Piés, and (14) the legend of the bride said to produce beast-children. The belief in the latter phenomenon is very common in Africa, and in the Arabian Nights, and we have seen it in America.

Of these formule (chosen because illustrated by Greek heroic legends)-——(1) is a sanction of barbarous nuptial etiquette ; (2) is an obvious ordinary incident; (8) is moral, and both (3) and (1) may pair off with all the myths of the origin of death from the infringe- ment of a taboo or sacred command; (4) would naturally oceur wherever, as on the west coast of Africa, human victims have been offered to sharks or other beasts ; (5), the story of flight from a horrible crime, occurs in some stellar myths, and is an easy and natural invention ; (6), flight from wizard father or husband, is found in Bushman and Namaqua myth, where the husband is an elephant ; (7), success of youngest brother, may have been an ex- planation and sanction of “jiingsten-recht,”—Maui in New Zealand isan example, and Herodotus found the story among the Scythians; (8), the bride given to successful adventurer, is consonant with heroic manners as late as Homer; (9) is no less consonant with the belief that beasts have human sentiments

and supernatural powers ; (10), the ‘‘strong man,” is found among Eskimo and Zulus, and was an obvious invention when strength was the most admired of qualities; (11), the baffled ogre, is found among Basques and Irish, and turns on a form of punning which inspires an ‘‘ananzi” story in West Africa ; (12), descent into Hades, is the natural result of the savage conception of Hades, and the tale is told of actual living people in the Solomon Islands and in New Caledonia ; Eskimo Angekoks can and do descend into Hades,—it is the prerogative of the necro- mantic magician; (18), “the false bride”, found among the Zulus, does not permit of such easy explanation,—naturally, in Zululand, the false bride is an animal; (14), the bride accused of bearing beast-children, has already been disposed of ; the beliefis inevitable where no distinction worth mentioning is taken between men and animals. English folk-lore has its woman who bore rabbits.

The formule here summarized, with others, are familiar in the marchen of Samoyeds, Zulus, Bushmen, Hottentots, and Red Indians. For an argument intended to show that Greek heroic myths may be adorned and classified marchen, in themselves survivals of savage fancy, see Fortnightly Review, May 1872, ‘‘ Myths and Fairy Tales.” The usual explanation is that marchen are degenerate heroic myths. This does not explain the mirchen of African, and per- haps not of Siberian races.

In this sketch of mythology that of Rome is not included, be- cause its most picturesque parts are borrowed from or adapted into harmony with the mythology of Greece. Japanese, Chinese, and Persian matters are omitted from want of information, and because of the extreme obscurity of the subject. Greece, India, and Scandi- navia will supply a fair example of Aryan mythology (without entering on the difficult Slavonic and Celtic fields).

There is perhaps no single work which contains a good comparative view of civilized and savage mythologies. Tylor’s Primitive Cultwre comes nearest to what a reader interested in truly comparative mythology desires. As a rule, writers like Cox, Gubernatis, and other “elemental” mythologists lay little stress on non-Aryan stories. Gubernatis’s Zoological Mythology and Cox’s Mythology of the Aryan People must be consulted with caution. Schwartz, in his Der Ursprung der Mythologie, has got hold of a correct

idea (the belief in meteoric animals), but he works his idea too hard. The writings of Max Miiller, Muir's Ancient Sanskrit Texts, and other standard works have already been repeatedly quoted. The old writers, like Bryant, are useless, except for occa- sional references to ancient authorities. There are many useful references In Mr Brown's Great Dionysiak Myth, but the reasonings need not be adopted.

As a rule the German treatises adopt various forms of the "meteorological" and 'solar" hypotheses, (A. L.)

MYTILENE. See Lzszos. MZENSK, another form of Mrsznsx (¢.2.).

4 See Castrén, Callaway, Theal, Bleek, Schooleraft, whose Algic Researches must be read with caution.

N

denotes the dental nasal in all the languages in which N our alphabet is used. But the sound which we call the dental nasal varies slightly in different languages accord- ing to the position of the point of the tongue. This may be pressed against the back of the teeth ; and then we havea true "dental" sound. But the point of the tongue may also be placed not against the teeth but against the front part of the palate immediately behind the gums; and it is in this way that our English dentals are formed.

But this same letter N, either alone or together with another letter, or distinguished by some diacritical mark, can be used for a much wider range of nasal sounds. It has been already pointed out (see letter M) that there are in every language as many nasals as there are clearly distinguished classes of sound produced at different parts of the mouth, eg., guttural or back-palatal, front-palatal, dental, labial, and others less easily apprehended. Each of these classes will have its nasal, which will vary from the sonant of the class only by the different position of the uvula: for the sonant (as, for example, d) the uvula is pressed up so as to cover the passage through the pharynx into the nostrils, and the voice therefore escapes wholly through the mouth ; for the nasal (as for z) the uvula hangs down, so that the voice

passes partly behind it through the nose, partly through the mouth; in all other respects the position of the vocal organs for d and for m is just the game, and the material of the sound is the same, 2.¢., breath made gonant by the vibration of the glottis. In an im- proved alphabet, therefore, we ought in each language to have several symbols for the nasals, as in Sanskrit, which had five different symbols. But no European language has more than two simple symbols; and, of these two, m is confined to one class, viz., the labial; , simple or modified, denotes the other sounds, and therefore often differs in different languages, and sometimes in the same language. It may also be employed to denote a wholly different class of sounds, as the nasalized vowels of the French, which will be described below.

The guttural nasal is heard in ‘“‘anger,” “finger,” 4 hunger”; it is easy to note the difference of the n as heard in these words, and in “an,” “fin,” &c. In English, when the sound occurs at the end of a word, it is represented by ng, as “hang,” “sing,” &c., sometimes also when medial, as in the derivatives “hanger,” ‘“‘ singer.” convenient if, as has often been proposed, the superfiuous symbol g were employed for this nasal. The sound is heard in German as well as in English; but in French it is unknown. On the other hand, the front palatal nasal is heard in the French “Boulogne,” Italian “Campagna,” Spanish “afio,” “otoiio,” dc., the diacritical mark being always used in Spanish; it is not known with us; but its

position in the mouth is shown by that of the correspond- |

ing closed consonants, English ch and j, and of the frica- tive consonant of the same class, which is y. The peculiar class of sounds called “cerebral” in Sanskrit was formed by turning the point of the tongue a little backward toward the top of the palate; of these the nasal was by far the most frequent. Our English “ dental” lies between the cerebral and the true “dental,” for which (as in India) the tongue actually touches the teeth,—our dental being of the kind already mentioned, in which the tongue does not come farther forward than the front palate.

From what has been said, it will appear that the nasals might be called nasalized consonants. The guttural nasal 1S gy nasalized ; the dental nasal is d nasalized: part of

_ by a nasal. It would be |

the voice in each case is diverted from the mouth through the nostrils, and some nasal sound is already heard while the passage through the mouth is closed by the tongue, or by the lips for the production of the labial nasal ; but the complete nasal sound is not heard till the block of the tongue or of the lips is removed, exactly as in the produc- tion of g, or d, or &. But it is possible to nasalize vowels as well as to nasalize consonants. The position of the uvula can be altered when the mouth is set for sounding the vowel a just as well as when it is set for the sound of g; and then instead of the pure a-sound we get one of a nasal quality; as instead of the final consonant sound of “hag” we get the nasalized guttural in “hang.” These nasalized vowels are unknown to us in England; and this is the reason why we find so much difficulty in pronouncing them in French. An Englishman learning French will always begin by pronouncing “en” as if it were “eng,” and “on” as if it were “ong.” But the French “en” is not the vowel e plus the guttural nasal 7; it is the vowel ¢ nasalized.

It is probable, though not provable, that nasal vowels were used in Latin. ‘The evidence lies in the varying spelling of words like “censor” and “cesor,” “consul ” and “cosol,” &c.; neither is right, but each seems to be an attempt to avoid an error ; “censor” is a protest against sounding a nasal e as pure e; and “‘cesor” against sound- ing it as e + ». Again, the Latin has ‘con-ficere,” but “com-ponere”; now f and p are both labials, and there- fore we should expect the same treatment of the final 2 in “con” before each; probably the » marked a nasal vowel (used before a fricative consonant), whereas the m was a true nasal consonant before the closed consonant p. Cicero’s doctrine (Orat. 159) that the vowel ¢ is naturally long in “in-sanus,” “in-felix, ” é&c., but short in “in-doctus,” points to the same conclusion—that the 2 before s and f marked a long nasalized vowel. Lastly, we have the spelling of Greek words like Oycavpés as “thensaurus” in Latin ; it is improbable that the m here was the full consonant.

Tt is not unlikely that the appearance and non-appear- ance of the nasal in the dialects of the same language indicates an original nasalized vowel which has in one case disappeared, in the other has passed into a vowel followed Thus in German we find “ sanft” correspond- ing to English

“soft,” “gans” to ‘goose, ” &e. But the vowel has been modified in such cases in compensation for the loss of its original nasal quality.

The phenomenon of the so-called “ parasitic” nasal arises from careless pronunciation ; before sounding a closed consonant (like g) the uvula is not sufficiently raised, and so a nasal of the same class is heard before the g, as in “nightingale” (compare German ‘“nachtigal”). Yet more common is the development by the nasal itself of a parasitic closed consonant of its own class; many such have long been firmly established, as in the words “sound” (Middle English “soun,” like French ‘‘son,” Latin “ sonu-s”), “thunder” (A.S. ‘“ thunor »), still rightly pro- nounced in the north of England as “ thunner vat “ gownd,” “ sing-ging,” though familiar enough, have not yet made their way into polite speech. These parasitic sounds are also due to careless pronunciation ; if the passage through the nostrils be not kept open till the articulating organs of the mouth have separated, the nasal quality at the end of the sound is lost, and the closed con- sonant must follow. There has been an odd loss of n at the beginning of several English words which has often

been noted. It arises from our double form of the indefinite article ““a” and “an.” Sometimes the ‘a” has abstracted the “n” from the beginning of the noun: thus ‘‘a nadder ” has turned into ‘‘an adder,” ‘‘a napron ” into “an apron,” “a nauger” into “an auger.” On the other hand the letter has had one compensatory gain: ‘“‘an ewt” (eft) has turned into “a newt.” (5. P.)

NABATZZANS, a famous people of ancient Arabia, whose settlements in the time of Josephus (Ant., 1. 12, §4; comp. Jerome, Qu. in Gen. xxv.) gave the name of Nabatene to the border-land between Syria and Arabia from the Euphrates to the Red Sea. The language of Josephus suggests, and Jerome, apparently following him, directly affirms, that the name is identical with that of the Ishmaelite tribe of Nebaioth (1132, Gen. xxv. 13; Isa. lx. 7), which in later Old Testament times had a leading place among the northern Arabs, and is associated with Kedar much as Pliny v. 11 (12) associates Mabatxi and Cedret. ‘The identification is-still followed by many scholars, but is rendered uncertain by the fact that the name Nabatean is properly spelled with ¢ not ¢ (3w2) on the inscriptions, Arabic Nabat, Nabit, &c.).

Thus the history of this remarkable people cannot with certainty be carried back beyond 312 3.c., at which date they were attacked without success by Antigonus in their mountain fortress of Petra. They are described by Diodorus (xix. 94 sg.) as being at this time a strong tribe of some 10,000 warriors, pre- eminent among the nomadic Arabs, eschewing agriculture, fixed houses, and the use of wine (which were forbidden on pain of death), living on flesh and milk, and drinking water sweetened with manna, but adding to pastoral pursuits a considerable and profitable trade with the seaports in myrrh and spices from Arabia Felix, as well as a trade with Egypt in bitumen from the Dead Sea used in the preparation of mummies. Their arid country was the best safeguard of their cherished liberty ; for the bottle-shaped cisterns for rain-water which they excavated in the rocky or argillaceous soil were carefully concealed from invaders, Petra or Sela was the ancient capital of Edom; the Nabateans must have occupied the old Edomite country, and succeeded to its commerce, after the Edomites took advantage of the Babylonian captivity to press forward into southern Judea, This migration, the date of which cannot be determined, also made them masters of the shores of the Gulf of “Akaba and the important harbour of Elath. Here, according to Agatharchides (Geog. Gr. Mu., i. 178), they were for a time very troublesome, as wreckers and pirates, to the reopened commerce between Egypt and the East, till they were chastised by the Greek sovereigns of Alexandria.

Tenacious as they were of the nomad usages of their ancestors, the Nabatezans had already some tincture of foreign culture when they first appear in history. That culture was naturally Aramaic ; they wrote a letter to Antigonus “in Syriac letters,” and Syriac continued to be the language of their coins and inscriptions when the tribe grew into a kingdom, and profited by the decay of the Seleucids to extend its borders northward over the more fertile country east of the Jordan. They occupied the Hauran, and about 85 B.c. their king Aretas (Haritha) became lord of Damascus and Ccele Syria. Allies of the first Hasmoneans in their struggles against the Greeks, they became the rivals of the Judean dynasty in the period of its splendour, and a chief element in the disorders which invited Pompey’s intervention in Palestine. The Roman arms were not very successful against the sons of the desert (expedition of Scaurus, 63 B.c.); King Aretas retained his whole possessions, including Damascus, as a Roman vassal,

q Compare 2 Cor. xi, 82. The Nabatean Aretas or Alneas there mentioned reigned from 7 B.c. to 40 A.D. or thereby.

NA B—N AD

As “allies” of the Romans the Nabateeans continued to flourish throughout the first Christian century. Their power extended far into Arabia, particularly along the coast of the Red Sea; and Petra was a meeting-place of many nations, though the importance of its commerce was diminished by the rise of the Eastern trade-route from Myoshormus to Coptus on the Nile. Under the Roman peace they lost their warlike habits, and were a sober, acquisitive, orderly people, wholly intent on trade. They had now agriculture and houses of stone, and were not unacquainted with foreign luxuries and arts (Strabo, xvi. 4). Such a people might have long been a valuable bulwark between Rome and the wild hordes of the desert but for the short-sighted cupidity of Trajan, who reduced Petra and broke up the Nabataan nationality (105 a.p.).. The new Arab invaders who soon pressed forward into their seats found the remnants of the Nabatzans transformed into

fellahin, and speaking Aramaic like their neighbours.

Hence Nabateeans became the Arabic name for Arameans, whether in Syria or “Irak, a fact which was misinterpreted by Quatremére into a theory that the Nabateans were originally Aramzan immigrants from Babylonia. More recent inquiry has shown this view to be quite false. The Nabateeans were true Arabs—as the proper names on their inscriptions show—who came under the influence of Aramean civilization. See especially Néldeke in Z, D. DEO G., Rv. 00”89,, xx. WD seg,

For the inscriptions and coins of the Nabateans consult De Luynes in Revue Numism., 1858; Levy in Z. D. M. G., xiv. 363 sg.; De Vogué, dfé7. d’ Arch. Or., 1868, Syrie Centrale, 1866-77, and Inser, Sémitiques, 1868-77. The character of De Vogué’s inscriptions from the Hauran appcars to be the parent of the Cufic Arabic. The so-called Faléha Nabatiya, or ‘‘ Nabatean agricul- ture,” which professes to be an Arabic translation by Ibn-Wahshiya from an ancient Nabatezan source (MSS. in Leyden and elsewhere), is a

forgery of the 10th century. See Gutschmid in 7. D. I. G., xv. 1 sg.; and Noldeke, Zbid., xxix. 445 sq.

NABHA, or NaRBAL, one of the Cis-Sutlej states in the Punjab, India, lying between 30° 17’ and 30° 40’ N. lat., and between 75° 50’ and 76° 20’ E. long., has an area of 863 square miles, with a population in 1881 of 261,824. The first relations of the state with the British were in 1807-8, when the r4j& applied for and obtained protection against the threatened encroachments of Ranjit Sinh. During the mutiny in 1857 this chief showed distinguished loyalty, and was rewarded by grants of territory to the value of over £10,000. The rdjd is a Sikh of the Sidhu Jat tribe; he has full powers of life and death over his subjects, and has an estimated annual revenue of £65,000. The chief products of the state are sugar, cereals, cotton, and tobacco,

NABULUS, or Nasuits. See Sucre.

NADIM. Abulfaraj ibn Ishdk of Baghdad, known as Ibn abi Ya kub al-Nadim (0d. 995 a.p.), is the author of one of the most interesting works in Arabic literature, the Ithrist, or “list of the books of all nations that were to be found in Arabic,” with notices of the authors and other particulars, carried down to the year 377 a.n. (987-88 A.D.). A note in the Leyden MS, places the death of the author eight years later. Of his life we know nothing; the name Nadim belonged to a distinguished family of Persian origin. The oldest Arabic scholars, of whose works comparatively little has been preserved to us, had a much wider range of interest than their successors. Even then Islam and the Korén were the centre of all study; but curiosity was not limited by religious scruples; men were eager to know the wisdom and the literature of all nations and sects; the free thought which was afterwards so sternly suppressed in the reaction of orthodoxy towards the close of the 9th century lifted men above narrow pre- judices. The work of Al-Nadim gives us a complete picture of the most active intellectual period of the Arab

empire. He traces the rise and growth of philology and belles-lettres, of theology, orthodox and heretical, of law and history, of mathematics and

astronomy, of medicine and alchemy; he does not despise the histories of knights errant, the fables of Kalfla and Dimna, the facetis of the “boon companions,” the works of magic and divination. But to us no part of his work is more interesting than his account of the beliefs of sects and peoples beyond Islam. Here, fortunately, still more than in other parts of his work, he goes beyond the functions of the mere cataloguer ; he tells what he learned of China from a Christian missionary of Najran, of India from a description of its religion compiled for the Barmecide Yahya; his full accounts of the Sabians of Harrén and of the doctrines of Mani! are of the very first importance for the historian of Asiatic religions.

The Fihrist was much pillaged by later writers, but the author was sedulously ignored, and MSS. of his work are very scarce. Hottinger possessed one (now lost), and used it in his Historia Orientalis. There are others (all imperfect) at Paris, Leyden, and Vienna; a small part of the book is altogether lost. Fltigel pub- lished an abstract of the work in Z. D. M. G., xiii. (1859); his

edition, with notes, appeared posthumously (vol. i., text, Lcipsic, 1871; vol. ii., notes, 1872).

NADIR SHAH. See Persia.

NADIYA, or Nuppsa, a district in the leutenant- governorship of Bengal, lying between 22° 52’ 33” and 94° 11’N. lat., and between 88° 11’ and 89° 24’ 41″ E. long,, pounded on the N. by Rajshahi, on the E. by Pabnaé and Jessor, on the 8. by the 24 Parganas, and on the W. by Higli, Bardwan, Birbhum, and Murshidabad districts, with an area of 3404 square miles. It is emphatically a district of great rivers. Standing at the head of the Gangetic delta, its alluvial surface, though still liable to periodical inunda- tion, has been raised by ancient deposits of silt sufficiently high to be permanent dry land. Along the entire north- eastern boundary flows the wide stream of the Padma or Ganges ; and all the remaining rivers of the district are offshoots of the great river. ‘The Bhagirathi on the eastern border, and the Jalangi and the Matabhanga meandering through the centre of the district, are the chief of these offshoots, and are called distinctively the “ Nadiya rivers.” But the whole surface of the country is interlaced with a network of minor streams, communicating with one another by side channels. All the rivers are

navigable in the rainy season for boats of the largest burthen, but during the rest of the year they dwindle down to shallow streams, with dangerous sandbanks and bars.

In former times the Nadiyd rivers afforded the regular means of communication between the upper valley of the Ganges and the seaboard; and much of the trade of the district still comes down to Calcutta by this route during the height of the rainy season. But the lines of the East Indian and Eastern Bengal Railways, with the main stream of the Ganges and the Sundarbans route, now carry by far the larger portion of the traffic.

The census of 1881 returned the population at 2,017,847, of whom 1,146,603 were Mohammcdaus and 864,773 Hindus. Of the 6439 Christians, 6304 were natives. Krishnagar had 24,477 inhabitants in 1881; and six others had in 1872 a population exceeding 5000:—Santipur, 28,635; Kushtia, 9245; Ranaghat, 8871; Nadiyd, 8863; Mihrpur, 5562; and Kumarkhali, 5251. Nadiy4, the ancient capital, was formerly situated on the east bank of the Bhdgirathi (which has since changed its course). It has always been celebrated for the sanctity and learning of its pandits. The battlefield of Plassey was situated in this district, but the floods of the Bhagirathi have washed away the scene of that memorable engagement.

Rice is the staple crop, and there are four harvests in the year. Indigo is the chief export staple; but the district was the centre of the indigo riots in 1860, and the industry then reeeived a blow from which it has never recovered. A large proportion of the cul- tivable area of the district is held on utbandi tenure—that is, for a single season only, the rents being assessed according to the out- IE En en i en a

1 The former translated in Chwolson’s Ssabier und Ssabismus,

i the latter in Fliigel’s Mand, seine Lehre und seine Schriften,

turn of the crop. Floods are common, and frequently cause much damage.

The number of indigo factories is still considerable. Cotton- weaving is carried on, but is everywhere on the decline, especially at the town of Santipur, where, in the beginning of the century, the Company nsed to purchase muslin to the annual value of £150,000. Santipur muslin is still exported to a small extent. Raw date sugar is largely mannfactured. The chief exports are indigo, jute, linseed, wheat, pulses and gram, rice, chillies, sugar, and tobacco.

The only institutions in the district worthy of note are the éols or indigenous Sanskrit schools. In these smriti (Hindu social and religious law) and nydya (logic) are tanght by learned pandits to eager pupils. The ¢ols consist generally of a mere collection of mud hovels round a quadrangle, where the students live in the most primitive manner, each in his own hut, with his brass water- pot and mat, and seldom any other furniture. A student generally remains at the ¢ol for eight or ten years. No fees are charged, and the pandits depend for their livelihood on the presents which their fame as teachers ensures them at religious cerenionies. Most of the tols are in Nadiya town, but there are also a few in the surrounding villages. Their number is rapidly decreasing.

The district revenue in 1880-81 amounted to Rs. 1,654,818, Rs. 1,051,776 being derived from the land-tax. Education was afforded in 1877 by 897 schools, attended by 28,489 pupils. The principal educational institution is the Government college at Krishnagar. The average annual temperature is 77° Fahr.; the average anuual rainfall about 65 inches. Besides remittent and intermittent fevers, which cause very great mortality, small-pox, diarrhoea, dysentery, and cholera are prevalent. Cattle disease is common.

NAVIUS, Guaus, is the second in order of time among the creators of Latin literature. He had made his appear- ance as an author within five years after the first dramatic representation of Livius Andronicus ; he was some ten or fifteen years older than Plautus, and preceded Ennius by a generation. As distinguished from Livius he was a native Italian, not a Greek ; he was also a writer of original power, not a mere adapter or translator. If it was due to Livius that the forms of Latin literature were, from the first, moulded on those of Greek literature, it was due to Neevius that much of its spirit and substance was of native growth. Long before the formal recognition of

litera- ture in Rome, which dated from the year 240 B.c., there had existed various kinds of inartistic composition, written or spoken, in Saturnian verse. The most important of these were satiric and dramatic medleys, known by the name of sature, and commemorative verses in praise of eminent men, which were first sung at funeral banquets, and seem afterwards to have been preserved among family records. ‘The fact that Nevius wrote his most important poem in Saturnian verse, the disparaging reference made to him by Ennius as the writer of verses like those of the old native “Fauni and Vates,” the claim which he makes in his epitaph to be the last purely Latin poet, the political satire which he introduced into his comedies, the national and commemorative character of his epic poem, all point to him as a medium of connexion between the nameless authors of these satiric and commemorative verses and the recognized authors of Roman comedy, satire, and even epic poetry.

Though the fragments preserved from his numerous writings are few and inconsiderable, yet they corroborate the impression derived from ancient testimony that he was a man of originality and force of mind, and of a bold and vigorous character. The impulse which he sought to give to Latin literature was somewhat antagonistic to that actually given by Ennius ; and either the greater genius and richer culture of the latter or his greater adaptation to his times determined that his influence should be pre-dominant. Probably the genius of Ennius was the higher creative force; it was more in harmony with the serious Roman spirit, and with the grandeur of Roman institu- tions; it more naturally allied itself with the aristocratic ‘nfluence which was predominant in the state for two

generations after the death of Nevius; it was also more Ayal = 2

capable of assimilating the Greek culture, which was the formative element in the literary art of the Romans. Yet the racy popular spirit of Neevius gained for him admirers even in the Augustan age, and Cicero represents the great master of Latin oratory, Crassus, as the highest compli- ment he could pay to the pure idiomatic speech of his

mother-in-law, Lzelia, comparing it to the style of Neevius.

and Plautus. Though a richer vein of imaginative feeling was introduced into the Latin language and literature by Ennius, yet much was lost in their subsequent develop- ment by the partial suppression of the aggressive boldness and freedom of Neevius, as well as of the exuberant mirth and humour of Plautus.

There is great uncertainty in regard to the facts and dates of the life of Nevius. From the expression of Gellius characterizing his epitaph as written in a vein of ‘‘Campanian arrogance” it has been inferred that he was born in one of the Latin communities settled in Cam- pania. But the phrase “ Campanian arrogance” seems to have been used proverbially for ““gasconade”; and, as there was a plebeian Gens Vevia in Rome, it is quite as probable that he was by birth a Roman citizen. The strong political partisanship which he displayed in his plays is favourable to this supposition, as is also the active interference of the tribunes on his behalf. On the other side weight must be given to the remark of Mommsen, viz., “the hypothesis that he was not a Roman citizen, but possibly a citizen of Cales or of some other Latin town in Campania, renders the fact that the Roman police treated him so un- scrupulously the more easy of explanation.” He served either in the Roman army or among the socéd in the First Punic War, and thus must have reached manhood before the year 241 B.c. We learn from Cicero that he lived to a good old age, and that he died in exile about the end of the 3d century B.c. The date of his birth may be thus fixed with approximate probability about the year 265 B.c. No particulars of his military service are recorded. Sicily was the great battlefield of the combatants during the latter years of the war. No important Sicilian city was without its theatre, and it seems legitimate to connect the new taste for regular dramatic performances (and especially for tragedy, to which there was nothing corresponding among the Italian races) developed at Rome immediately after the conclusion of the First Punic War with the Sicilian ex- periences of the Roman and allied armies serving in the war. Another important influence in Roman literature and Roman belief which first appeared in the epic poem of Neevius also had its origin in Sicily, viz., the recognition of the mythical connexion of /Eneas and his Trojans with the foundation of Rome. The origin of this belief may probably be attributed to the Sicilian historian Timeus : but the contact of the Romans and Carthaginians in the neighbourhood of Mount Eryx may have

suggested that part of the legend which plays so large a part in the ined, which brings Aineas from Sicily to Carthage and back again' to the neighbourhood of Mount Eryx. The actual collision of Phcenician and Roman on the western shores of Sicily, of which Nevius may well have been a witness, if it did not originate, gave a living interest to the mythical origin of that antagonism in the relations of 4Eneas and Dido.

The career of Nevius as a dramatic author began with the exhibition of a drama in or about the year 235 B.c., and was carried on energetically for thirty years afterwards, Towards the close of this career he incurred the hostility of some of the nobility, especially, it is said, of the family of the Metelli, by the attacks which he made upon them on the stage, and at their instance he was imprisoned,—a circumstance to which Plautus alludes in a passage of the Miles Gloriosus (211). After writing two plays during his

NA VIUS

mee

imprisonment, in which he is said to have apologized for his former rudeness (Gellius, ii. 3, 15), he was liberated through the interference of the tribunes of the commons; but he had shortly afterwards to retire from Rome (in or about the year 204 B.c.) to Utica. The generally received accounts assigned his death to that year; but Cicero (Brutus, 15, 60) quotes Varro as an authority for the belief that his life was prolonged beyond that date. It may have been during his exile, when withdrawn from his active career asa dramatist, that he composed or completed his poem on the First Punic War.! Probably his latest composition was the epitaph already referred to, also written in Saturnian verse — '*Immortales mortales flere si foret fas,

Flerent dive Camene Neviuin poetam ;

Itaque postquam est Orcino traditus thesauro

Obliti sunt Romai loquier lingua Latina." ?

If, as has been supposed, these lines were dictated by a jealousy of the growing ascendency of Ennius, the life of Nevius must have been

prolonged considerably beyond the year 204 B.c., as it was only in that year that Ennius first settled, and began his career as an author, in Rome.

Like Livius, Nevius professed to adapt Greek tragedies and comedies to the Roman stage. Among the titles of his tragedies are igisthus, Lycurgus, Andromache or Hector Proficiscens, Equus Trojanus, &c. We find in the letters of Cicero a reference to a representation of the last-named play at the opening of the theatre of Pompey in 55 B.o.; but it seems to have retained its popularity so long not so much from its dramatic merits as from the scope it afforded for the gratification of the Roman taste for gorgeous spectacles. The few fragments preserved from the tragedies show the first rude beginnings of that artificial poetical phraseology and poetical word-formation which the impulse derived from Greek literature developed in the speech of Latium, and also the more native product of pithy sayings (such as the “laudari a laudato viro,” ‘‘sero sapiunt Phryges”) which had passed into proverbs in the age of Cicero. The national cast of his genius and temper was further shown by his deviating from his Greek originals, and producing at Icast two specimens of the fabula prasteata, onc founded on the childhood of Romulus and Remus (Romulus s. Alimonium fomuli et Remi), the other called Clastidiwm, which celebrated the contemporary victory in which Marcellus carried off the spolia optima.

But it was as a writer of comedy that he was most famous, most productive, and most original. ‘While he is never ranked as a writer of tragedy with Ennius, Pacuvius, or Accius, he is plaeed in the canon of the grammarian Volcatius Sedigitus third (immedi- ately after Cycilius and Plautus) in the rank of Roman comic authors. He is there characterized as ‘Nevius qui fervet,” a phrase expressive of his ardent, impetuous character aud style. He is also appealed to, along with Plautus and Ennius, as a master of his art in one of the prologues of Terence. His comedy, like that of Plautus, seems to have been rather a free adapta- tion of his originals than a rude copy of them, as those of Livius probably were, or an artistic copy like those of Terence. The titles of most of them, like those of Plantus, and unlike those of Cecilius and Terence, are Latin not Greek. Among the few lines preserved from them we find in one the ‘ Laurentines and Prenestines”” spoken of, just as we find mention of provineial Italian towns frequently in Plautus. He drew from the writers of the old political comedy of Athens, as

well as from the new comedy of manners, and he attempted to make the stage at Rome, as it had been at Athens, an arena of political and personal warfare. A strong spirit of partisanship is recognized in more than one of his fragments; and this spirit is thoroughly popular and adverse to the senatorian ascendency which became more and more confirmed with the progress of the Second Punic War. Besides his attack on the Metelli and other members of the aristocracy, the great Seipio (whose services and world-wide fame he acknowledges) is the object of a censorious criticism on account of a youthful escapade attri- buted to him. Among thc few lines still remaining from his lost comedies, we seem to recognize the idiomatic force and rapidity of movement characteristic of the style of Plautus. There is also found that love of alliteration which is a marked feature in all the older Latin poets down even to Lucretius. In one considerable comic fragment attributed to him,—the description of a coquette,— there is great truth and shrewdness of observation. But we find

? Cicero (De Sen., 14) speaks of it as the work of his old age.

_* “Tf it were permitted that immortals should weep for mortals, the divine Camene would weep for Nevius the poet ; for sinee he hath passed into the treasure-house of death men have forgotten at Rome how to speak in the Latin tongue. ”

no trace of the exuberant comic power and geniality of his great contemporary. His critical spirit and vehement temper dcclare his affinity rather to Lucilius than to Plautus.

He was not only the oldest native dramatist, but the first author of an epic poem,—which, by combining the representation of actual contemporary history with a mythical background, may be said to have created the Roman type of epic poetry. ‘The poem as he gave ‘+ to the world was one continuous work, and was divided into seven books by a grammarian of a later age. The earlier part of it treated of the mythical adventures of Aneas in Sicily, Carthage, and Italy, and borrowed from the interview of Zeus and Thetis in the first book of the Iliad the idea of the interview of Jupiter and Venus, which Virgil has made one of the cardinal passages in the Zineid.

The later part of the poem treated of the events of the First Punic War in the style of a metrical chronicle. The few remaining fragments produce the impression of vivid and rapid narrative, to which the flow of the native Saturnian verse, in con- tradistinction to the weighty and complex structure of the hexa- meter, was naturally adapted. Mommsen has noticed that in these fragments the story is told in the present tense. The dis- paraging criticism of Ennius—

- Scripsere alii rem Versibu' quos olim Fauni vatesque canebant, &¢."— applies to the rudeness of the versc, not to the spirit or substance of the work. Cicero speaks of it as giving pleasure, like a statue of Myron, and the grudging admission of Horace— " Nevius in manibus non est et mentibus heerct Pane reeens "—

attests the fresh pleasure with which it still could he read in the Augustan age.

The impression we get of the man is that, whether or not he actually enjoyed the full rights of Roman citizenship, he was a vigorous representative of the bold combative spirit of the ancient Roman commons, —of the political not, like Plautus, of the bour- geois type of the Roman plebcian. Energy of character and vitality of temperament are shown by the prolonged continuation

of his career as a writer, notwithstanding the discouragement of

his imprisonment, and, what was a greater trial than temporary imprisonment, his exile. The chief service which he rendered to Roman letters was that he was one of those who made the Latin language into a great organ of literature, and that with the new formative energy which he applied to it he transmitted the force of the best popular speech of his time. The phrases still quoted from him have nothing of an antiquated sound, while they have a genuinely idiomatic ring. As a dramatist he worked more in the spirit of Plautus than of Ennius, Pacuvius, Accius, or Terence; but the great Umbrian humorist is separated from his older con- temporary, not only by his breadth of comic power, but by his general attitude of moral and political indifference. Nevius was the more genuine Italian gift—the power of satiric criticism—the ''Italum acetum" which was employed in making

men ridiculous, not, like that of Plautus, in extracting amusement from the humours, follies, and eccentricities of life His more truly creative faculty seems to have shown itself, not only in rapid and animated narrative, but in pregnant invention which still lives in literature, owing to the recognition of its value by the receptive and reproductive genius of Virgil. Although our means of forming a fair estimate of Nevins are more scanty than in the case of the other makers of Roman literature whose work is only known to us in fragments, yet all that we do know of him leads to the con- clusion that he was far from being the least among them, and that with the loss of his writings there was lost a vein of national feeling and genius which reappears rarely in the writings of the later republican and the imperial times—the vein which probably was predominant in Cato, which may still be traced in the fragments of Lucilius and in the personal and political lampoons of Catullus, and may be detected under the rhetorical invective of Juvenal.

Collections of the Fragments have been made and commented on by Kluss- mann (1843) and Vahlen (1852). A short study of the life and writings of Nevius (De Cn. Nevii vita et scriptis) has been written by M. Berchem. (WwW. Y. 8.)

NAVUS, a term in surgery signifying that form of tumour which is almost entirely composed of enlarged blood-vessels. There are three principal varieties :—(1) the capillary nevus, consisting of enlarged capillaries, fre- quently of a purplish colour, hence the term “ port-wine stain”; (2) the venous nevus, in which the veins are en- larged, of a bluish colour; (3) the arterial nevus, in which there is distinct pulsation, it being composed of enlarged and tortuous arteries. The nevus can be lessened in size by pressure. It is generally met with in the skin or immediately under the skin; sometimes it lies in the mouth in connexion with the mucous membrane. It is often congenital, hence the term “mother’s mark,” or it may appear in early childhood. It often grows rapidly,

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sometimes slowly, and sometimes growth is checked, and it may gradually diminish in size, losing its vascularity and becoming fibrous and non-vascular. This natural cure is followed by less deformity than a cure by artificial means. It is a good rule not to interfere unless the tumour is growing rapidly and at a rate out of proportion to the growth of the child. Various methods are used by surgeons when an operation is called for:—(1) the tumour may be excised ; (2) a ligature tightly tied may be applied to the base of the tumour; (3) inflammation may be set up in the growth by the injection of irritating agents,— in this way its vascularity may be checked and the forma- tion of fibrous tissue encouraged ; (4) the blood in the enlarged vessels may be coagulated by the injection of coagulating agents or by electrolysis. In large neevi the last method is very suitable, and the resulting cure most closely resembles the natural cure already described.

NAGA HILLS, a district in the south-eastern corner of the chief-commissionership of Assam, India, lies between 95° 13’ and 26° 32’ N. lat., and between 93° and 94° 13’

E. long., being a mountainous borderland between Now-

gong district and Manipur state, with an area of about 6400 square miles. It forms a wild expanse of forest, mountain, and stream. ‘The valleys and hills are covered with dense jungle, dotted with small lakes and marshes. Coal ig known to exist in many localities, as well as lime- stone, chalk, and slate. The chief rivers are the Dayang, Dhaneswari, and Jamuna, only navigable for small boats during the rainy season.

In 1870 the deputy-commissioner roughly estimated the strength of the different tribes as follows :—Assamese, 705; Aitaniyas, 355; Cacharis, 3505; Mikirs, 8820; Kukis, 2524; Nagas, 66,535; total, 82,444. The estimated population in 1881-82 was 93,000. Agriculture is conducted in a rude, nomadic fashion, the only im-

lements of tillage being the ddo or hill knife, and a koddli or hoe. Rice and millet are the main crops. In some places great skill is displayed in irrigation. The tea plant is indigenous, and a large number of natives are now employed in the tea-gardens. The manufactures embrace the production of the few rude articles re- quired for domestic use or as clothing, and the forging of ddos, koddlis, and spear-heads. ‘Trade is

generally conducted by means of barter, and has considerably increased of late years. The local products available for export comprise rice, cotton, cloth woven from nettle fibre, ivory, beeswax, and various dyes obtained from the jungle. Salt and iron are imported ; but the one great desire of every N4g4 is to have a gun. ‘The revenue is nominal. British administration was first introduced into the distriet in 1867 ; but it has not yet been surveyed, and it constitutes perhaps the least orderly portion of the Indian empire. It is inhabited by several wild aboriginal tribes, collectively known as the Nagas. Those within British territory are comparatively peaceful, but beyond the reach of British influence are several savage and predatory tribes, who are in the habit of raiding on the plains, and killing or carrying off inoffensive British subjects. Repeated expeditions have been despatched to chastise them in their native hills. In 1873 a survey party under Lieutenant Holcombe were treacherously massacred. In January 1875 a force escorting & survey party under Captain Butler was attacked by Nagas, but unsuccessfully ; later in the same year, however, he was cut off and killed. In 1879-80 the Nagas murdered the deputy-commissioner, Mr Damant, and, after receiving a sharp punishment, made a foray on the CAchar side, murdering a tea-planter and committing other ravages. For some time the district has been in a more settled condition. The construction of a road to Kohima, the principal town, and the settlement of a British governor there have pro- duced a salutary effect. The eastern Nagas are becoming rapidly civilized. NAGASAKI, or sometimes 1, th seaport on the western coasts of Japan, 1s situated in 39° 44’ N. lat. and 129° 52’ E. long., in the island of Kiu-shiu, and gives its name to a ken (province of Hizen or Hi-shiu). The harbour is formed by @ beautiful inlet of the sea, stretching northward for a distance of about 4 miles, with an average width of about a mile, enclosed on both sides by a delightful framework of hills (1500 feet), and adorned by a number of the most picturesque-looking

islands. The city lies near the upper end of the inlet on

Nancasaki, the leading

its eastern side, extending about a mile in length and 2 of a mile in breadth. Immediately to the south, and con- nected with the mainland by a bridge,

lies the half-artificial island of Desima (600 feet by 240), which, originally occupied by the Portuguese (1637-39), was for more than two hundred years (1641-1854) the trading post and prison-house of the Dutch traders. Southwards along the shore, on ground largely reclaimed from the sea, runs the foreign settlement, with the American, British, French, and Portuguese consulates on the hilly ground behind. The magnificent dock (460 feet long, 89 wide, and 28 deep), commenced by the prince of Hizen in 1865, and rebuilt in 1874-79, occupies a deep gorge between two hills at Tatagami, on the western side of the firth opposite the city ; a few hundred yards to the north of the dock are the engine-works of Akaonura (with an area of 7 acres) ; and at Koski there is a fine patent slip constructed for the prince of Satsuma (the prince of Hizen's rival). Nagasaki is laid out with great regularity and neatness, the streets crossing each other at right angles; beginning to climb the hills, they not infrequently end in stairs. Among the public buildings may be mentioned the hospital estab- lished in 1861, the oldest in Japan, and the great Govern- ment school, with its department for European languages and sciences, attended by hundreds of Japanese of all ages and ranks. Population about 80,000.

Tn 1825 the trade of the Dutch monopolists, who were allowed to have only two vessels, amounted to upwards of £100,000 (£31,154 imports and £72,373 exports). By 1871, twelve years after the opening of the port, this sum was multiplied more than sevenfold (£317,727 imports, £449, 855 exports), and since then there has been a slight additional increase—£755,180 being the average of the four years 1878-81. The principal exports are coal (£228,000 in 1881), camphor, rice (now largely sent to Australia), tea, tobacco, dried fish, and vegetable wax. Most of the coal, which makes excel- lent coke, and is freely used by men-of-war and merchant steamers, is brought from the Takashima mines about 6 miles distant, which give employment to 4000 workmen. The export of camphor has steadily increased from 2380 piculs in 1877 to 11,640 piculs (worth £42,928) in 1881. Of the 333 vessels which entered the port in 1881, 280 were British. Nagasaki has regular steamship communi- cation with Shanghai, and is the terminus of submarine telegraphs from that city and from Vladivostok.

NAGINA, a town in Bijnaur district, North-Western Provinces of India, is situated on the road from Hardwar to Muradabad, in 29° 27' 5" N. lat. and

78° 28’ 50″ E. long., with a population of 20,503 in 1881. The headquarters of the district were removed from it to Bijnaur town in 1824, It is celebrated for its ebony carvings. There are also manufactures of glassware, ropes, and matchlocks, and a large export of sugar.

NAGOYA, sometimes N: OGOYA, one of the largest and most active of the cities of Japan, the chief town of Aichi ken (province of Owari), and formerly the seat of the princes of Owari (one of the “three august families ” closely allied to the Tokugawa line of shoguns), lies at the head of the shallow Owari Bay, about 30 miles from Yokai-ichi, its port, with which it communicates by light- draught steamers. Nagoya is well known as one of the great seats of the pottery trade (though the master potters for the most part get their goods manufactured at Seto, about 13 miles distant, where the clay has been worked for wellnigh two thousand years) ; fans and enamels are also made in the city. The castle of N: agoya, occupying about 400 acres of ground at the north side of the city, erected in 1610, suffered comparatively little during the revolution of 1868, and is now the headquarters of the N; agoya muitary district, with extensive barracks and drill-grounds, The central keep of the citadel is a remarkable structure, covering close upon half an acre, but rapidly diminishing m each of its five stories till the top room is only about 12 yards square. Gabled roofs and hanging rafters break the almost pyramidal outline; and a pair of gold-plated

dolphins 8 feet high form a striking finial. Both were removed in 1872, and one of them was at the Vienna Exhibition in 1873; but they have been restored to their proper site. Among the religious buildings perhaps the most interesting is the Kenchiu-ji, a monastery of the Jo.do sect, containing the burial-place of the princes of Owari. A superior court, a middle school, a girls’ school, a normal school, the prefecture, the telegraph and post-office, and the hospital are the principal foreign-style buildings in Nagoya. The population is 325,000.

NAGPUR, a district in the division of the same name, in the Central Provinces of India, lying between 20° 36’ and 21° 43’ N. lat., and between 78° 17’ and 79° 42’ EB. long., bounded on the N. by Chhindwara and

Seoni, E. by Bhandara, 8. by Chanda and Wardha, and W. by Wardha and Elichpur, with an area of 3786 square miles. Nag- pur district lies immediately below the great table-land of the Sdtpura range. A second line of hills shuts in the district on the south-west, and a third runs from north to south, parting the country into two plains of unequal size. These hills are all offshoots of the SAtpuras, and nowhere attain any great elevation. Their heights are rocky and sterile, but the valleys and lowlands at their feet are fertile, yielding rich crops of corn and garden produce. The western plain slopes down to the river Wardha, is watered by the Jim and Madar rivers, tributaries of the Wardha, and contains the most highly-tilled land in the district, abounding in fruit trees, and the richest garden cultivation, The eastern plain (six times the larger), stretching away to the confines of Bhandara and Chanda, consists of a rich undulating country, luxuriant with mango groves, and dotted towards the east with countless small tanks. It is watered by the Kanhan, with its tributaries, which flows into the Wainganga beyond the district.

The population in 1881 was 697,356 (British-born, 1063 ; other Europeans and Americans, 383 ; Eurasians, 630; aborigines, 42,750; Hindus, 606,228; Mohammedans, 39,765; Buddhists and Jains, 3569). The most numerous of the aboriginal tribes are the Gonds (43,885). The population of the nine principal towns was as fol- lows :—Nagpur, 79,842; Kamthi, 36,364; Umrer, 12,784; Ramtek, 6978; Khapa, 6664; Narkher, 6498; Mohpa, 5256; Kalmeshwar, 4842; Saoner, 4739.

Of the area of 3786 square miles, 1863 were cultivated in 1882. Wheat in 1882 occupied 314,037 acres, rice 38,127, other food grains 489,111, oil-seeds 224,495, cotton 101,166, and sugar-cane 1545. During the last few years there has been a great increase in the manufacture of cotton in the Empress mills at Nagpur. There were 30,000 spindles in operation in 1882, the output of yam and cloth being 1,804,530 and 149,995 tb respectively. The Nagpur branch of the Great Indian Peninsula Railway runs through the district for a distance of 26 miles, The gross revenue in 1876-77 was 1,460,168 rupees.

NAcpur, the chief town of Nagpur district, and the administrative headquarters of the Central Provinces, India, is situated in the centre of the

district, on the banks of a small stream, the Nag, in 21° 9’ 30” N. lat., 79° 7’ E. long. The population was 79,842 in 1881. The muni- cipal limits include, besides the city proper, the suburb of Sitdbald{, and the European station of Sitabaldi, with Takli. In the centre stands SitAbaldi Hill, crowned with the fort, which commands a fine view of the country round. On the north and west lies the prettily wooded station of Sitabald{; beyond, to the north, are the military lines and bdzdrs, and, again, beyond these the suburb of Takli. Close under the southern side of the hill is the native suburb of Sitdbaldf. Below the eastern glacis of the fort is the railway terminus. Beyond this lies the broad sheet of water known as the Jam4 Taldo, and farther east is the city, completely hidden in a mass of foliage. Three great roads connect the city with the European station. Hand- some tanks and gardens, constructed by the Mahratta princes, lie outside the city. Many Hindu temples, elaborately carved in the best style of Mahratta archi-

tecture, ornament the town; but the palace, built of black basalt, profusely ornamented with wood carving, was burnt down in 1864, and only the great gateway now remains. The tombs of the Bhonsl4 kings lie to the south of the city.

Nagpur doesa large and increasing trade, the chief imports being

wheat and other grain, salt, country cloth, European piece goods, silk, and spices. export. are still, in spite of the competition of English stuffs, in great request. Most of the public offices are in the station of Sitabaldi.

NAGY-KOROS (.¢., Great Korés) is a town, or rather an overgrown village, in Hungary, in the district and 50 miles to the south-west of Pesth. It lies in the midst of a sandy plain, and is a station on the railway from Pesth to Temesvar. In 1880 it contained 22,769 inhabitants, chiefly Protestants, who are engaged in wine- culture and the rearing of cattle and sheep. Its gymnasium is esteemed one of the best schools in Hungary.

NAGY-VARAD. See GrosswaRDEIN.

NAHARRO, Bartrotomé DE Torres, a Spanish dra- matist of the period immediately preceding that of Cervantes and Lope de Vega, born at Torres in the neigh- pourhood of Badajoz, was for some time a captive in Algiers, and after receiving his freedom visited the court of Leo X. at Rome. Here his satirical pen excited such hostility that he was compelled to fly to Naples, where he lived for some time under the protection of Fabricio Colonna, and where he published his Propaladza in Ley. He died in poverty and obscurity ; the time and place are unknown. See Drama, vol. vii. p. 420.

NAHUM. “The book of the vision of Nahum the Elkoshite” (O1M2, “compassionate”), which stands seventh among the minor prophets, is entirely directed against Nineveh, and predicts the utter destruction of the bloody and rapacious city, its empire, and its gods by the tardy but sure and irresistible vengeance of Jehovah. The fall of Nineveh is the deliverance of Judah; Jehovah, so terrible to His adversaries, so unfailing in His righteous judgments, is a sure and gracious defender to them that take refuge with Him. It appears therefore that, when the prophet. wrote, the Judeans were still suffering from Assyrian oppression, perhaps even from present or recent invasion, for in i. 15 [ii. 1] he speaks of the annual feasts and the sacrifices of the sanctuary as disturbed by the “wicked one” passing through the land. It is not, how- ever, from a merely patriotic standpoint that Nahum regards the Assyrian harlot as Jehovah’s enemy ; she is the enemy of mankind, who sells all nations through her witcherafts and whoredoms—that is, in the strength of her heathenish religion (iii. 4),—and she shall perish with none to pity her, for all have suffered continually from the wickedness of the ruthless empire. ‘The exordium in chap. 1, which depicts Jehovah as the jealous and avenging God, isa noble utterance of faith in the righteousness which rules in the world’s history. The other two chapters are entirely occupied with the catastrophe of Nineveh ; the battle without and within the walls is described with great poetic force, not in finished pictures but with broad effec- tive strokes and daring imagery, and apparently with some local knowledge, though the latter is hardly so detailed as to justify the conclusion that the prophet had himself seen the imperial city. It might be argued on the same prin- ciple that he had also seen No-Ammon or Thebes, a description of the sack of which forms an episode in chap. iii. 8 sg. The reference here seems to be to the taking of No by Assurbanipal (G. Smith, Hist. of Assurbanipal, 55, 70; Schrader, KX. A. 7’, 2d ed., p. 450)

about 660 B.c. —an event only known from the Assyrian monuments. Nahum must have prophesied after this date, probably not

Cloth forms the chief article of manufacture and The finer fabrics of Nagpur have long bcen famous, and

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long after, that is, in the troublous times of Manasseh, which agrees well with i, 15. To suppose that his pro- phecy was occasioned by the actual approach of the Medes to destroy Nineveh, or by one of the earlier campaigns which preceded their final success, is arbitrary; for the judgment is predicted on general principles of divine justice, and there is no indication that the prophet knew what nation was to execute it. His descriptions, though pictorially vivid, are historically quite vague. The details of the decadence of the Assyrian empire are in truth so obscure that to search for the immediate occasion of the prophecy is mere guesswork.

Thename Elkoshite OWPPY, in the LXX. ’EAneoatos—the pronun- ciation therefore is uncertain) denotes the prophet’s home or birth- place. Jerome’s mention of a ruined “‘viculus Elccsi” in Galilee stands quite alone; Hitzig supports the idea that the prophet was a Galilean by the name Capernaum, which probably means “ village of Nahum,” but of what Nahum we do not know. The confused account by R. Jos. Schwarz (D. Heil. Land, p. 149) of a grave shown as that of the prophet Nahum an hour north of Tiberias lacks confirmation. Internal evidence Jeads us rather to conclude that Nahum was a man of Judah, and John vii. 52 appears to show that he was not held to be a Galilean in the time of Christ, when the fashion of localizing tombs of prophets was already in full force (Matt. xxiii. 29). Later tradition associated Nahum with the region against which he prophesicd, and in the 12th century Benjamin of Tudela visited his synagogue at Mosul and histomb in Babylonia. It was probably under Christian influence that the site of this tomb was ultimately fixed at Alkésh, the seat of the later Nestorian patriarchs, near the convent of Rabban Hormizd, a few miles north of Mosul, where it is now reverenced by Christians, Moslems, and Jews. The sepulchre is a simple plaster box without signs of antiquity (Layard, Nineveh, i. 233). The history of this identification of Elkosh is obscure ; it is mentioned in the 16th century by Masius (ap. Asse- mani, B.

O., i. 525), as also in two Nestorian MSS. written at Alkésh by the same scribe in 1709 (Wright, Cat., 1068) and 1713 (Assem., iii. i. 852) ; it seems, moreover, to be implied in a gloss of Bar Ali, given by Payne Smith (Thes. Syr., 221), but not in Hoffmann's edition. On the other hand no very early notice either of the tomb or of the place has yet bcen found. Alkésh, but not the Nahum legend, is mentioncd in a poem of the 11th century in Cardahi, Liber Thesauri (Rome, 1875); the same author places one Israel of Alkésh in the 8th century, but the date is questionable (see Néldeke in Z. D. AL. G., xxxi. 165). The grave is undoubtedly a fabrication, and the evidence is not favourable to Ewald's con-

jecture that the name is ancient and the place really the city of

Nahum. His further conjecture that some difficult words in Nahum may be Assyrian has not been confirmed by students of the inscriptions.

Literature.—The commentaries on the minor prophets ; O. Strauss, Nahumt de Nino vatictnium, 1853. For alist of other books see Reuss, Gesch, d. A. T., p. 369. (WwW. R. S.)

NAIADS. See NYMPHS.

NAILS. A nail is a headed pin or spike of thetal, commonly of iron, The primary and principal use of nails is in wood work (joinery and carpentery), but they are also employed in upholstery, shoemaking, saddlery, slating, sheet-metal working, horse-shoeing, and numerous other trades. The consumption in all civilized communities is enormous, but it is exceptionally great where timber houses and wooden erections generally prevail, as in the United States of America, and in many British colonies. Size, form of head, nature of point, and special uses all give names to different classes of nails. Thus we have the names tacks, sprigs, and brads for very small nails ; rose, clasp, and clout, according to the form of head; and flat points or sharp points according to the taper of the spike. Arranged according to the manner in which they are manufactured, nails may fall into four principal classes : —(1) ordinary or hand-wrought nails; (2) machine-wrought and cut nails; (3) wire or French nails ; and (4) cast nails. The nailer handicraft was at one time a great industry in the country around Birmingham, and to this day in conjunction with chain-making it constitutes

an important though declining trade. It 1s essentially a family industry, carried on in the meanest of workshops, with a very few simple blacksmith’s tools and appliances. The nails are forged from nail-rods heated in a small

smith’s hearth, hammered on a low anvil, the nail length cut off on a chisel attached to the anvil, and the head formed by dropping the spike into a hole ina “ bolster ” of steel, from which enough of the spike is left projecting to form the head, which is variously flattened out. The head, in the case of clasp nails, is formed with two strokes of the hammer, while rose nails require four blows. The heads of the larger-sized nails are made with the aid of an “oliver” or mechanical hammer, and for ornamental or stamped heads ‘“‘swages” or dies are employed. The conditions of life and labour among the hand nailers in England are exceedingly unsatisfactory : married women and young children of both sexes are set to work long hours in small filthy sheds attached to their dwellings, and their employment is controlled by middle- men or nail-niasters, who supply them with the nail-rods and pay for work done, sometimes in money and sometimes in kind on the truck system. The handicraft is, however, an expiring industry, as machine-wrought and cut nails are rapidly supplanting most corresponding kinds of hand- made nails. Horse nails alone continue to be made in large measure by hand labour (at St Ninians near Stirling, as well as in the Birmingham district). These are made from the finest Swedish charcoal iron, hammered out to a fine sharp point. They must be tough and homogeneous throughout, so that there may be no danger of their breaking over and leaving portions sunk in the hoof. The credit of perfecting machinery for the making of nails belongs to American inventors, and by numerous stages the nail-making machines have arrived at a high degree of efliciency. Of late years mild steel, such as the plates employed for shipbuilding, has been largely used for machine-made nails. Without much detail it would be impossible to convey an idea of how the machine, fed with heated (to black heat only) strips of metal having a breadth and thickness sufficient for the nail to be made, shears off by means of its slicer the “nail blank,” which, falling down, is firmly clutched at the neck till a heading die moving with sufficient force strikes against its upper end and forms the head, and the nail

now completed is liberated, passing out through an inclined shoot. In the case of large nails the taper of the shank and point is secured by the sectional form to which the strips are rolled; brads, sprigs, and small nails, on the other hand, are cut from uniform strips in an angular direction from head to point, the strip being turned over after each blank is cut so that the points and heads are taken from Opposite sides alter- nately, and a uniform taper on two opposite sides of the nail, from head to point, is secured. The machines turn out nails with wonderful rapidity, varying with the size of the nails produced from about 100 to 1000 per minute. Wire or French nails are made from round wire, which is unwound, straightened, cut into lengths, and headed by a machine the same in principle as the pin-making apparatus (see Pins), but the pointing is accomplished by the pressure of dies in the same manner as the head is formed. Cast nails, which are cast in sand moulds by the ordinary pro- cess, are used principally for horticultural purposes, and the hob-nails or tackets of shoemakers are also cast. NAIN, Lz. The three brothers Le Nain, who have of late attracted much attention, occupy a peculiar position in the history of French art. Although they figure amongst the original members of the French Academy, their works show no trace of the influences which prevailed when that body was founded. Their sober execution and choice of colour recall characteristics of the Spanish school, and when the world of Paris was busy with mythological allegories, and the “heroic deeds” of the king, the three Le Nain devoted themselves chiefly to subjects of humble life such as Boys Playing Cards, The Forge, or The Peasants’

Noonday Meal. These three paintings, together with others, amongst which is the noble Procession in the Interior of a Church (erroneously attributed to the Le Nain), are now in the Louvre; various others may be found in loca] collections, and some fine drawings may be seen in the British Museum and in the Albertina; but their signature

is rare, and is never accompanied by initials which might

enable us to distinguish the work of one or other of the brothers. Their lives are lost in obscurity ; all that can be

affirmed is that they were born at Laon in Picardy early in the 17th century. In 1633 Antoine, the eldest, was admitted painter at Paris; in 1648 he and

his brothers Louis and Mathew were received into the Academy, and in the same year both Antoine and Louis died. Mathew lived on till 1677; he bore the title of chevalier, and painted many portraits. Mary of Medici and Mazarin were amongst his sitters, but these works (like his portrait

of the unfortunate Cinq Mars, sold by auction at the Palais

Royal in 1848) seem to have disappeared. Champfleury

has written two works on the brothers Le Nain (1850,

1865),

NAIRN, a small maritime county in the north-east of Scotland, is bounded W. and 8, by Inverness, E. by Elgin,

and N. by the Moray Firth. Its greatest length from

north to south is about 20 miles, and its greatest breadth about 15 miles; the area is 114,400 acres, or about 179 square miles,

The coast is low and sandy, and is skirted by sandbanks which render navigation dangerous. The eastern part of the seaboard district is formed of low sand-hills which extend into Morayshire. Parallel with the coast-line there is a great deposit of sand and gravel, which forms a terraced bank rising to the height of about 90 feet, and extends from 4 to 5 miles inward; it rests on Old Red Sandstone, which sometimes protrudes on the surface. This undulating plain is bordered by a hilly region which occupies two-thirds of the county. Where it joins the plain it is skirted by a strip of Devonian associated with coarse conglomerate. The hills, some of which reach a height of about 1500 feet, are formed of granite and grey gneiss, with occasional beds of primitive limestone. Free- stone is plentiful, and there is also a species of dark bluestone which is greatly valued for ornamental building. Shell-marl is obtained from several of the lochs. The only rivers are the Nairn and Findhorn, with their tributaries. The Nairn, after entering the county, flows north-east for a distance of about 30 miles, and falls into the Moray Firth at the town of Nairn. The Findhorn, which also rises in Inverness, flows north-east through the southern and hilly

district of the county into Morayshire. The soil of the alluvial plain on the coast is light and porous, and has been rendered very fertile by careful cultivation. There is also some rich land on the Findhorn. The most advanced methods of agriculture are in operation, but only a small proportion of the surface is capable of tillage, scarcely more than a fifth of the total area being under crops. The hills are for the most part covered with heath or pasture suitable for sheep, intermixed with fir and larch plantations.

The number of holdings in 1880 was only 392, and of these 214 did not exceed 50 acres in extent, 92 were between 50 and 100 acres, and 86 above 100 acres. According to the agricultural returns of 1882 there were 26,463 acres under cultivation, of which 9359 were under corn crops, 4871 under green crops, 10,081 under rotation grasses, and 2124 permanent pasture ; 12 acres were under orchards, and 18,241 under woods, Very little wheat is grown, the prin- cipal corn crops being barley or bere, 3156 acres, and oats, 5917 acres. Ofthe green crops 4201 acres were under turnips or swedes, and 617 under potatoes. Horses in 1882 numbered 1292, cattle

5992 (1801 being cows or heifers in milk or in calf), sheep 17,442, and pigs 981,

The valued rental of the county in 1674 was £15,162 Scots, or about £1268 sterling, Exclusive of railways, the valuation in 1881-82 was £36,217. According to the latest return the number

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of proprietors was 537, possessing lands of a gross annual value of Of these 467 possessed less than 1 acre, and 5 more

£41,767. than 5000 acres, viz., earl of Cawdor, 46,176 acres ; James C. G.

Brodie, 22,378; N. J. M‘Gillivray, 12,600; earl of Leven and

Melville, 7805; and Hugh Davidson, 6363. There are several fine mansions in the county,

lodges. is Ee ood harbour at Nairn. The county possesses no special trade or manufacture, but there is a large distillery at a short distance from the county town.

Nairn includes three entire parishes, Nairn, and portions of the parishes of Cawdor, Croy, Dyke, Moy, Petty, Daviot, and Urquhart,—the last two being detached por- tions, lying within Inverness and Ross respectively, at considerable distances from the rest of the county. Since 1801, when it was 8322, the population has been slowly but steadily increasing, and sn 1881 numbered 10,455 (4979 males and 5476 females). There is one royal burgh, Nairn, and a burgh of barony, Auldearn. The county is under the same sheriffdom as Elgin and Banff, and unites with Elgin in returning a member to parliament. Anciently Nairn was included under the province of Moray, which was governed by ariormormaer. Roman coins have been found at a vitrified fort on the summit of a hill in the parish of Cawdor. There are numerous stone circles, including a very perfect one on the summit of Lethenbar Hill, one at Golford, and one at Moyness consisting of two concentric circles and a rocking stone. Cawdor Castle, a

fine baronial structure, in a very picturesque situation, 5 miles south of Nairn, is associated in unauthentic legend with the murder of King Duncan by Macbeth; but no part of the building is really older than the 15th century.

Naren, a royal and parliamentary burgh and county town, is pleasantly situated near the Moray Firth, on the left bank of the Nairn, and on the Highland Railway, 93 miles west-north-west of Aberdeen and 15 north-east of Inverness. ‘The principal buildings are the town and county hall (1818) surmounted by a spire, the hospital (1846) in the Italian style, the new public hall erected at a cost of £12,000, and the academy. Nairn is much frequented in summer for sea-bathing, and possesses very complete artificial baths. There is a commodious harbour with breakwater and pier. The principal exports are corn, eggs, potatoes, herrings, haddocks, freestone, and timber, and the principal imports coal, lime, and provisions. There are freestone quarries in the neighbourhood, and the town possesses rope and twine factories. There is also a salmon fishery. The burgh unites with Fortrose, Forres, and Inverness in returning a member to parliament.

The population of the parliamentary burgh in 1881 was 4161, and that of the royal burgh 4665.

The town, whose original name was Invernairn, stood at first at some distance from its present site. Its earliest extant charter, which bears, however, to be a renewal of one received from Alexander I. in the 12th century, was granted by James VI. in 1589. At that time the inhabitants of the western half of the town spoke only Gaelic, and until a late period the distinction between the two sections of the town inhabited by different races was very clearly marked.

NAIRNE, Caroune OxrpHant, Baroness (1766- 1845), the authoress of many fine Scotch songs, was born in the “auld hoose” of Gask, Perthshire, 16th August 1766. She was descended from an old family which had settled in Perthshire in the 13th century, and which could boast of kinship with the royal race of Scotland. Her father, Laurence Oliphant, was one of the foremost sup- porters of the Jacobite cause, and she was named Caroline in memory of Prince Charlie. In early childhood her health was extremely delicate, but a certain refined sensibility was the only trace of this which she retained in after years. In the schoolroom she was known as “pretty Miss Car,” and afterwards her striking beauty and pleasing manners earned for her the name of the “Flower of Strathearn.” Miss Oliphant was one of the earliest admirers of Robert Burns, and induced her brother Laurence to enter his name as subscriber to the first edition of his poems. It was the attempts of Burns in the Scots Musical Museum to adapt words of a more refined character to the old Scotch airs that suggested to her to undertake

in addition to a number of shooting The coast is skirted by the Highland Railway, and there

Ardclach, Auldearn, and

genuine

a similar enterprise. Her first effort was a new version of the “Pleughman,” which her brother introduced at an entertainment to the Gask tenantry, and

which soon met with great popularity throughout central Scotland. In June 1800 she married William Murray Nairne, whose rank as fifth Lord Nairne was in abeyance on account of attainder. He was then assistant inspector-general of barracks in Scotland. At the instigation of the Misses Hume, daughters of Baron Hume, she some time after her marriage undertook to bring out a collection of national airs set to appropriate words. To the collection she con- tributed a large number of original songs, adopting the signature “ B.B.”—“ Mrs Bogan of Bogan.” The music was edited by R. A. Smith, and the collection was published at Edinburgh under the name of the Scottish Minstrel (6 vols., 1821-24). Her husband was restored to his rank in 1824, but died 9th July 1830. After his death she took up her residence at Enniskerry, county Wicklow, but on account of the delicate health of her only son she went to the Continent, where she spent several years. The son died at Brussels in 1838. Lady Nairne returned to Gask in 1843, and died there 26th October 1845.

The songs of Lady Nairne may be classed under three heads :— (1) those illustrative of the characters and manners of the old Scotch gentry, such as ‘‘The Laird of Cockpen,” ‘‘The Fife Laird,” and “John Tod”; (2) Jacobite songs, composed for the most part to gratify her kinsman the aged chief of Strowan, among the best- known of which are perhaps ‘‘Wha’ll be King but Charlic,” “‘Oharlie is my Darling,” “The Hundred Pipers,” ‘‘He’s owre the Hills,” and ‘‘ Bonnie Charlie’s noo awa”; and (3) songs not included under the above heads, ranging over a varicty of subjects from ‘‘Caller Herrin’” to the ‘Land o’ the Leal.” For vivacity, athos, and bright wit her songs are surpassed only by those of Burns, and, although their note is less full and strong than his, it is perhaps in some respects morc mellow and tender.

Lays from Strathearn, by Caroline, Baroness Nairne, arranged with Symphonies and Accompanimenis for the Pianoforte by Finlay Dun, appeared without date some time after her death. Her poems were published in vol. i. of the Modern Scottish Minstrel, 1857; but the most eomplete eolleetion is that contained in Life and Songs of the Baroness Nairne, with a Memoir and Poems of Caroline Oliphant the Younger, edited by Rev. Charles Rogers, LL.D., 2d ed., 1869.

NAKHICHEVAN, or NaKHJEVAN, a city of Russian Armenia, the chief town of a circle in the government of Erivan, is situated in 39° 12’ N. lat. and 45° 25’ E. long., 100 miles south-east of Erivan and 267 miles from Tiflis. It occupies the brow of one of the last spurs of the Karabakh Mountains (Anti-Caucasus), 3015 feet above the sea, and looks out over the wide and beautiful valley of the Araxes. Built and rebuilt again and again, Nakhichevan is full of half-obliterated evidence of former periods of prosperity. The present houses have for the most part been quarried from ancient ruins; of the palace of the Atabeks of Azerbijan there still remains a gateway with a Persian inscription, flanked by two brick towers; and ata little distance stands the so-called Tower of the Khans, a richly decorated twelve-sided structure about 102 feet in circumference and 75 feet in height, dating, to judge by the marvellously executed inscription which runs round the cor- nice, from the 12th century. There are also ruins of a large mosque. Situated on the highroad to Tabriz and Teheran, Nakhichevan is the seat of a considerable transit trade. In the Persian period the city is said to have had 40,000 inhabitants; in 1863 there were only 6251, and in 1873 6877 (2157 Armenians, 4697 Tartars). At the latter date there were 1200 houses, one Russian Greek church, three Armenian churches, four mosques, and two caravanserals.

The origin of Nakhichevan (the Naxuanaof Ptolemy) is unknown. Armenian tradition claims Noah as its founder, and a mean mound of earth in the city is still visited by many pilgrims as his grave. Laid waste by the Persians in the 4th century, Nakhichevan sank into comparative insignificance, but by the 10th century had recovered its prosperity. In 1064 it was taken by Alp Arslan, and sn the 13th century it fell a prey to the followers of Jenghiz Khan. It afterwards suffered frequently during the wars between the Persians, Armenians, and Turks, and it finally passed into Russian possession by the peace of Turkmen-Chai in 1828.

NAKHICHEVAN-ON-THE-DON, a town of southern

Russia, situated in the government of Ekaterinoslaff, dis- trict of Rostoff, 6 miles by rail to the north-east of the latter town, on the right bank of the Don. It was founded in 1780 by Armenians who emigrated from the Crimea

and were allowed to settle on the banks of the Don, forming there an independent district between Azoff and the fort of St Demetrius, now Rostoff; they gave to the chief town of their new settlement the name of the older city in Caucasus. Owing to the fertility of the region, its advantageous situation for trade, and the privileges granted to the settlers, Nakhichevan soon became a wealthy place, and it still is the administrative centre of the ‘‘ Armenian district,” which extends as a narrow strip along the banks of the Don, with a population of upwards of 25,000, of whom 16,500—principally Armenians, with some 2000 Russians—are settled at Nakhichevan. The town has several tobacco and wadding factories, tallow-melting houses, soap-works, brick-works, and tanneries, with an aggregate annual production of about £100,000. The chief occupation of the Armenians, however, is trade, which they carry on throughout southern Russia, while the less wealthy of them are renowned as innkeepers on the Caucasus. The rural population depend mainly on cattle- breeding, and to some extent also on fishing. NAMAQUALAND, a vast region of south-western Africa, extending along the west coast for a distance of 600 miles from the south of Damaraland (22° 43’S. lat.) to the north of the county of Clanwilliam (30° 35’ 8. lat.), and stretching inland from 80 to 350 miles. It is divided by the lower course of the Orange River into two portions — Little Namaqualand to the south, and Great Namaqua- land to the north. Little Namaqualand, incorporated with Cape Colony since 1865, has an area of 20,635 square miles, and in 1875 had a population of 12,233, of whom 2675 were whites. The seat of magistracy is at Spring- bokfontein, on a branch of the Buffels River, about 60 miles from the coast, with which it communicates by a mule-railway (96 miles long) ending at Port Nolloth on Robbe or Seal Bay. Ookiep, 6 miles to the north of Springbokfontein, is, next to the diamond fields of Kimberley, the most important mining place in South Africa, its copper mines (worked by the Cape Copper Mining Company) giving employment to about 1500 people ; the output in 1882 was 16,311 tons of extremely rich ore. The European miners are mainly from Corn- wall and Mansfeld. Copper is also worked at Concordia, Spektakel, and (since 1853) Kodas. Great Namaqualand has an area of 987,000 square miles, about sixteen times the size of England; but its population does not exceed 20,000, mostly Namaquas and other Hottentots (see Horrentots). For 30, 40, or even 100 miles inland the country is a sandy waste, and on the eastern side it passes off into the great Kalahari desert.

The central portion is traversed from north to south by the Fish River or Oub and its tributaries, which ultimately reach the Orange River about 70 miles above its mouth 3 but, except after rain, they are mere dry beds. And the rains are periodical and partial,—the result almost always of thunderstorms. In a few minutes after the thunder- clouds have burst the country is flooded ; turbid currents half a mile wide roar through a ravine which has not shown a drop of water for years previously ; rivulets flow where one would think water had never run before (J. F. Wilson). The surface of the interior part of the country is covered with hills, irregularly distributed, but with a general tendency to run in lines parallel to the coast. Towards the south-east the Gei Kharas mountains reach a height of 6570 feet, and the smaller Khari Kharas group about 5200. The Nuaibeb mountains on the borders of

Damaraland are a little higher (6700 feet). The only Europeans as yet settled in Great Namaqualand are the Basel and the Wesleyan missionaries; but it has been decided to establish a regular German colony at Angra Pequefia, the only important bay on the whole coast. The country, like Little Namaqualand, has long been known to be rich in minerals. The proposal made about 1876 to annex it and Damaraland to Cape Colony fell through.

See Andersson, Lake Ngami, &c., London, 1856 ; Tindall, Lecture on Namaqualand, Cape Town; Carl Zerrenner, Reise des Ingenieurs A. Thies nach den Kupferbergwerken Namaqualands, Freiberg, 1860; Petermann’s Mittheilungen, 1865, p. 889-91; W. C. Pal- grave’s Report of Mission to Damaraland and Great Namaqualand in 1876, Cape Town, 1877; Cape Monthly Magazine, 1871 and 1880; Rev. Benjamin Ridsdale, Scenes and Adventures in Great Namaqua- land, 1883.

NAMES. Names, and the study of proper names of persons and places, are not without scientific and historical importance, but, on the whole, are perhaps rather matter of curious interest. It stands to reason that, even in the earliest societies of “articulate speaking men,” all known persons, places, and groups of human beings must have had names by which they could be spoken of and by which they were recognized. The study of these names and of their survival in civilization enables us in some cases to ascertain

what peoples inhabited districts now tenanted by persons of far different speech. Thus the names of mountains and rivers in many parts of England are Celtic, —for example, to take familiar instances, Usk, Esk, and Avon. There are also local names (such as Mona, Monmouth, Mynwy, and others) which seem to be relies of tribes even older than the Celtic stocks, and "vestiges of non-Aryan people, whom the Celts found in possession both on the Continent and in the British Isles."1 These are affairs of somewhat dubious conjecture, but it is certain enough that the Celtic names, with their mysterious and romantic sounds, do linger in English valleys like the last echoes of Arthur's horn among the hollows of the hills. And it is no less certain that the English name is some- times the mere translation, perhaps unconscious, of the earlier Celtic appellation, often added to the more ancient word. Penpole Point in Somerset is an obvious example of this redoubling of names. As to the meaning and nature of ancient local names, they are as a rule purely descriptive. A river is called by some word which merely signifies 'the water"; a hill has a name which means no more than "the point," "the peak," "the castle." Celtic names are often of a more romantic tone, as Ardna- murchan, "the promontory by the great ocean," an admirable description of the bold and steep headland which breasts the wash of the Atlantic. As a general rule the surviving Celtic names, chiefly in Ireland, Wales, and Scotland, all contain some wide meaning of poetic appropriateness. The English names, on the other hand, commonly state some very simple fact, and very frequently do no more than denote property, such and such a town or hamlet, "ton" or "ham," is the property of the Billings, Uffings, Tootings, or whoever the early English settlers in the district may have been. The same attachment to the idea of property is exhibited in even the local names of petty fields in English parishes. Occasionally one finds a bit of half humorous description, as when a sour, starved, and weedy plot is named "starvacre"; but more usually fields are known as "Thompson's great field," "Smith's small field," "the fouracre," or the like. The name of some farmer or peasant owner or squatter of ancient date survives for centuries, attached to what was once his pro- perty. Thus the science of local names has a double historical value. The names indicate the various races

Elton, Origins of English History, p. 165; Rhys, Lectures on Celtie Philology, 181, 182.

(Celtic, Roman, and English in Great Britain) who have set in the form of names the seal of their possession on the soil, Again, the meanings of the names illustrate the characters of the various races. The Romans have left us names connected with camps (castra, chesters) and inilitary roads; the English have used simple descriptions of the baldest kind, or have exhibited their attachment to the idea of property; the Celtic names (like those which the red men have left in America, or the blacks in Australia) are musical with poetic fancy, and filled with interest in the aspects and the sentiment of nature. Our race carries with it the ancient names of an older people into every continent, and titles perhaps originally given to places in the British Isles by men who had not yet learned to polish their weapons of flint may now be found in Australia, America, Africa, and the islands of the furthest Seas.

Local names were originally imposed in a handy local manner. The settler or the group of cave-men styled the neighbouring river “the water,” the neighbouring hill “the peak,” and these terms often still survive in relics of tongues which can only be construed by the learned. The history of personal names is longer and more complex, but proceeds from beginnings almost as simple. But in personal names the complexity of human character, and the gradual processes of tangling and disentangling the threads of varied human interest, soon come in, and personal names are not imposed once and for all. Each man in very early societies may have many names, in different characters and at different periods of his life. The oldest personal names which we need examine here are the names which indicate, not an individual, but a group, held together by the conscious sense or less conscious sentiment of kindred, or banded together for reasons of convenience. An examination of customs prevalent among the most widely separated races of Asia, Africa, Australia, and America proves that groups conceiving themselves to be originally of the same kin are generally styled by the name of some animal or other object (animate or inanimate) from which they claim descent. This object is known as the “totem,” from the Red-Indian word dodhaim. Of this topic it must here suffice to say that the earliest and most widely spread class and family names among uncivilized people are totemistic. The groups of supposed kin, however widely

scattered in local distribution, are known as wolves, bears, turtles, suns, moons, cockatoos, reeds, and what not, according as each group claims descent from this or that stock, and wears a badge representing this or that animal, plant, or natural object. Unmistak- able traces of the same habit of naming exist among Semitic and Teutonic races, and even among Greeks and Romans. The origin of this class of names cannot well be investigated in this place, but it may be observed that the names chosen are commonly those of objects which can be easily drawn in a rude yet recognizable way, and easily expressed in the language of gesture. In addition to the totem names (which indicate, in each example, supposed blood-kindred), local aggregates of men received local names. We hear of the “hill-men,” “the cave-men,” “the bush-men,” “the coast-men,” the ‘men of the plain,” precisely as in the old Attic divisions of Aktaioi, Pediaioi, and so forth. When a tribe comes to recognize its own unity, as a rule it calls itself by some term meaning simply “the men,” all other tribes being regarded as barbarous or inferior, Probably other neighbouring tribes also call themselves “the men” in another dialect or language, while the people in the neighbourhood are known by an opprobrious epithet, as Rakshasas among the early Aryan dwellers in India, or Eskimo (raw-eaters) in the far north of the American continent.

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Leaving tribal for personal names, we find that, among most uncivilized races, a name (derived from some incident or natural object) is given at the time of birth by the parents of each new-born infant. Occasionally the name is imposed before the child is born, and the proud parents call themselves father and mother of such an one before the expected infant sees the light. In most cases tke name (the earliest name) denotes some phenomenon of nature ; thus Dobrizhofer met in the forests a young man styled “Gold flower of day,” that is, “Dawn,” his father having been named “Sun.” Similar names are commonly given by the natives of Australia, while no names are more common among North-American Indians than those derived from sun, moon, cloud, and wind. This simple historical fact is very damaging to the mythological theories which resolve into solar or elemental myths all legends where the names of the characters can be philologically twisted into descriptions of natural phenomena. It is concluded that these

myths originally described incidents in the life of clouds, winds, and tides, whereas names like those on which the theory depends are commonly applied by savage peoples to ordinary human beings. Marshal Saxe was not the sun because his mistress was named “Aurore,” and Cephalus and Procris were real persons to those who heard their story, although by a series of logical jumps their names may be interpreted as synonyms of the sun and the dew.

The names of savage persons are not permanent. The name first given is ordinarily changed (at the ceremony answering to confirmation in church) for some more appropriate and descriptive nickname, and that, again, is apt to be superseded by various “honour-giving names” derived from various exploits. The common superstition against being “named” has probably produced the custom by which each individual is addressed, when possible, by some wide term of kinship—‘“ brother,” “ father,” and the like. The bad luck which in Zulu customs as in Vedic myths attends the utterance of the real name is evaded by this system of addresses. Could we get a savage—an Iroquois, for example—to explain his titles, we would find that he is, say, “ Morning Cloud” (by birth-name), “Hungry Wolf” (by confirmation name), “He that raises the white fellow’s scalp” (by honour-giving name), of the Crane totem (by family and hereditary name, as under- stood by ourselves). When society grows so permanent that male kinship and paternity are recognized, the custom of patronymics is introduced. The totem name gives place to a gentile name, itself probably a patronymic in form; or, as in Greece, the gentile name gives place to a local name, derived from the deme. Thus a Roman is called Caius; Julius is his gentile name (of the Julian clan) ; Cesar isa kind of hereditary nickname. A Greek is Thucydides (the name usually derived from the grand- father), the son of Olorus, of the deme of Halimusia.

This system of names answered the purposes of Greek and Roman civilization. In Europe, among the Teutonic races, the stock-names (probably totemistic in origin) sur- vive in English local names, which speak of the “ton” or “ham” of the Billings or Tootings. An examination of these names, as collected in Kemble’s Anglo-Saaons, proves that they were originally derived, as a rule, from animals and plants. Our English ancestors had for personal names compound words, as ‘‘ Noble Wolf” (Ethelwulf),

“Wolf of War,” and so forth, and these names certainly testify to a somewhat primitive and fierce stage of society. Then came more vulgar nicknames and personal descriptions, as “Tong,” “ Brown,” “ White,” and so forth. Other names are directly derived from the occupation or craft (Smith, Fowler, Sadler) of the man to whom they were given, and

yet other names were derived from places. The noble and XVII. — 22

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landowner was called “of” such and such a place (the German von, and French de), while the humbler man was called not “of” but “at” such a place, as in the name “ Attewell,” or merely by the local name without the particle. If we add to these patronymics formed by the addition of “son,” and terms derived from Biblical characters (the latter adopted after the Reformation as a reaction against the names of saints in the calendar), we have almost exhausted the sources of modern English and European names.

NAMUR, a province of Belgium, is bounded on the N. by South Brabant, on the E. by Li¢ge and Luxemburg, on the 8. by France, and on the W. by Hainault, having a maximum length from north to south of 55 miles; its greatest breadth is 45 muiles, and the area 1413 square miles. The surface is much varied by hill and dale, being traversed by the forest of Ardennes, which here attains a height of about 2100 feet; in some parts, especially in the valley of the Meuse between Dinant and Liége, the scenery is beautiful and romantic. The principal rivers are the Meuse and its tributary the Sambre, which joins it at Namur. Geologically the province belongs to the Carbon- iferous system; the iron mines are very rich, and along with the coal-pits employ a considerable proportion of the industry of the province. Lead mines are also worked to some extent; and building-stone, slate, and excellent marble are quarried. The soil in the arrondissement of Namur is a rich marl, fertile and well-cultivated ; about one-third of the entire province is occupied by wood, and in the arrondissement of Dinant there are considerable stretches of heath. The climate is, generally speaking, moist and cold, Wheat, rye, oats, barley, hemp, flax, and hops are the principal crops raised, but the vine is also grown, As regards live stock, sheep are preferred to horned cattle ; large numbers of horses, strong and of a good breed, are also reared. The special manufacture of Namur is cutlery, for

which the province is famed. Among the other industries may be mentioned porcelain and glass- making, paper-making, cotton-spinning, and tanning. At the census of 1876 the population was 315,796. There are three arrondissements,—Dinant, Namur, and Philippe- ville.

Namor (Flem., Vamen), capital of the above province, is picturesquely situated on both banks of the Sambre, at the point of its junction with the Meuse, 35 miles south- east from Brussels. The rivers are crossed by several stone bridges. The streets are broad and clean, and there are two or three good squares. There are almost no buildings of any considerable antiquity now standing, if the 1lth-century belfry and the palace of justice, dating from 1464 as the monastery of St Albinus, be excepted. The cathedral church of St Aubain or St Albin is a modern building (1751-72) in the Renaissance style, adorned in front with several statues in white marble. The interior has statues by Delvaux and Parmentier, a fine carved oak pulpit by Geerts, and the tomb of Don John of Austria, who died at his camp at Bouges, about a mile to the north-east of the town, in 1578. The church of St Loup is also a fine building, richly adorned in the interior with marble and stone carving. Besides several other churches, the town has a town-hall, a theatre, a seminary, a picture gallery, library, and archeological museum, various charitable institutions, barracks, de. The manufactures are considerable, cutlery being the specialty. Tanning is also extensively carried on, and a great number of the inhabitants are employed in the mines and quarries of the neighbourhood. The situation of

Namur gives it great advantages as a centre for trade, The population in 1875 was 27,068.

In Cesar’s time Namur was the capital of the Aduatuci, who, he tells us (B. G., ii. 29), after his defeat of the Nervii, leaving all their other strongholds betook themselves to this one town ‘‘eoregie natura munitum.” Defended by walls of considerable thickness, by well-constructed outworks on both sides of the rivers, and by the citadel on a rocky eminence at their junction, it was long a place of great strength in modern times also. It was taken by Louis XIV. in 1692, an event which was recorded by Racine and celebrated in verse by Boileau, but it was recovered in 1695 by the British and Dutch

under William IT1., after a siege of ten months, The fortifications were destroyed in 1784 by Joseph II. of Austria, restored and strengthened in 1817 under the inspection of Wellington, and finally razed in 1866.

NANAK. See Inp1a, vol. xii. p. 808.

NANA SAHIB is the common designation of Dandhu Panth, adopted son of the ex-peshwa of the Mahrattas, Baji Rao, who took a leading part in the great Indian mutiny, and was proclaimed peshwa by the mutineers. See Iyp1a, vol. xii. p. 810. Nana Sahib was responsible for the massacres at Cawnpore, and was engaged in the protracted campaigns in Oudh. In the closing days of 1859, when the last remnants of the rebels disappeared over the Nepalese frontier, the Nana was among the fugitives. His death was reported some time afterwards, but his real fate remains obscure. Compare NEPAL.

NANCY, the ancient capital of Lorraine, afterwards the chief town of the French department of Meurthe, and since 1872 that of the department of Meurthe-et-Moselle, is situated 219 miles east of Paris by railway, on the left bank of the Meurthe, 6 miles above its junction with the Moselle. It consists of two distinct portions: the old

town in the north-west, between the citadel and the streets and square which bear the name of Stanislas, is composed

a

Plan of Nancy.

of narrow and winding streets ; the Stanislas town in the south-east has, on the other hand, wide straight streets which cross each other at right angles and allow views of the hills around the city. Beyond the gates (several of which are preserved on account of their antiquarian interest, and still indicate the line of the old civic boundaries) long suburbs stretch out into the country. The railway from Paris to Strasburg skirts the city on the south-west side, and to the east and north lie the Meurthe

and the canal from the Marne to the Rhine. Other railways—to Metz, to Epinal by Mirecourt, to Chateau Salins—join the main line in the neighbourhood, and make the place an important junction. The Place Stanislas is worthy of a capital city: in the centre stands the statue of Stanislas Leczinski, ruler of Lorraine (who still remains the most popular personage in the town which he embel- lished), and on all sides rise imposing buildings in the 17th- century style—the town-hall, episcopal palace, theatre, &c. The streets opening into the square have railings of artistic workmanship. A fine triumphal arch known as the King's Gate leads from the Place Stanislas to the Place Carriére, which forms a beautiful tree-planted promenade, and at its further end contains the Government palace and the so- called Pepiniére (nursery), with fine clumps of trees, grass, and flowers. Other open spaces in the city are the Place ' Alliance (formed by Stanislas, with a fountain in memory of the alliance between Louis XV. and Maria Theresa in 1756), the Place de YAcadémie, the Cours Léopold, the Place St Epvre, the Place Dombasle, and the Place de la Gare. The town-hall contains a picture gallery. The cathedral, built in the 18th century, has a wide facade flanked by two dome-surmounted towers, and a somewhat frigid and sombre interior. Of particular interest is the church of the Franciscans (Cordeliers), in the old town, built by René II. to commemorate his victory over Charles the Bold in 1476. Pillaged during the Revolution period, but restored to religious uses in 1825, it contains the tombs of Antony of Lorraine and his wife Marie 'Harcourt, Philippe of Gueldres, second wife of René IL, the engraver Jacques Callot, Henry III, count of Vaudé-mont, and Isabella of Lorraine his wife, René IL. (a curious monument raised by his widow in 1515), and Cardinal de Vaudémont. Here also is a chapel built in the beginning of the 17th century to receive the tombs of the princes of the house of Lorraine. The church of St Epvre, rebuilt between 1864 and 1874 on the site of an old church in the style of the 13th, 14th, and 15th centuries, has a fine spire and belfry and good stained glass windows. Bonsecours Church, at the end of the St Pierre Faubourg, contains the mausoleums of Stanislas (by whom it was built) and his wife Catherine, and the heart of their daughter Marie, queen of France. Of the old ducal palace, begun in the 15th century by Duke Raoul and completed by René IL, there remains but a single wing, and of this a portion was destroyed by a great

fire in 1871, and has been replaced by an upper primary school built in the same 15th-century style as the rest of the building. The entrance to this wing is a delightful specimen of the late Gothic of the beginning of the 16th century. From the ground-floor gallery a fine staircase ascends to the Galerie des Cerfs, which accommo- dates the archeological museum of Lorraine ; one of the greatest treasures of the collection is a piece of tapestry 92 feet long and 13 feet broad, which was found in the tent of Charles the Bold after the battle of Nancy. At a short distance from the railway station a cross marks the spot where the duke's body was found. Of the old gates of Nancy the most remarkable is the Porte de la Craffe. Nancy is the seat of a bishop and of a court of appeal, and the headquarters of a military division dependent on the Chalons corps d'armée. It is also a university town, with the four faculties of medicine, literature, science, and law, and as an educational centre has risen in importance since 1871. It possesses a large library, archives of anti- quarian interest, a botanical garden, and a museum of natural history, an academy, a geographical society, and an important school of forestry (see vol. ix. p. 403). The first agricultural station founded in France (1822) is at Roville in the vicinity. Timber, grain, and hops (largely

grown in the district), rags for the paper-mills of the Vosges, and the embroidery which was its earliest industry have long been the objects of an extensive trade at Nancy; during the last fifty years the commercial and industrial importance of the place has been greatly increased by the construction of the railway and the canal from the Marne to the Rhine, now supplemented by the new eastern canal between the Meuse, the Moselle, and the Sadéne ; and since the Franco-German war the manufacturing class has been recruited by numerous immigrants from Alsace. Round about the city are now to be seen the chimneys of iron-works and foundries, cotton-mills, chemical-works, and glass-works ; and large numbers of the inhabitants are also employed in making straw-hats, artificial flowers, boots and shoes, and hosiery. A printing and publishing establish- ment of some importance has been transferred from Strasburg. The population was about 28,000 in the close of the 18th century, 43,000 in 1856, 52,000 in 1871, and 66,000 (73,225 as a commune) in 1881.

At the close of the 11th eentury Odelric of Nancy, brother of Gerard of Alsace, possessed at Nancy a castle which enabled him to defy the united assaults of the bishops of Metz and Treves and the count of Bar. In the course of the next century the town was surrounded with walls, and became the capital of the dukes of Lorraine ; but its real importance dates from the 15th century, when (in 1477) Charles the Bold and his schemes of conquest perished at its gates. Enlarged, embellished, and admirably reforti- fied by Charles III., it was taken by the French in 1633 (Louis XIII. ‘and Richelieu being personally present at the siege); and when in 1661 it was restored by Louis XIV. Charles was eompelled to raze its fortifications. After the peace of Ryswick in 1697 Duke Leopold, at length in quiet possession of his duchy, set himself to repair the disasters of the past. He founded academies, established manufactures, and set about the construction of the new town. But it was reserved for Stanislas Leczynski, to whom Lorraine and Bar were assigned in 1736, to carry out the plans of improvement and embellishment in a style which made Nancy one of the palatial cities of Europe, and rendered himself the most popular as he was the last of the dukes of Lorraine. The city, which became French in 1766, was occupied by the allies in 1814 and 1815, and put to ransom by the Prussians in 1870.

NANKING, or “the southern capital,” is the name by which Keang-ning, the chief city in the province of Keang- soo, in China, has been popularly known for several centuries. The present city, which stands in 32° 5’N. lat.

and 118° 47′ E. long., dates only from the beginning of the Ming dynasty (1368), although it is built on the site of

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Plan of Nanking.

one which for more than two thousand years has figured under various names in the history of the empire. The more ancient city was originally known as Kin-ling ; under the Han dynasty (206 B.c. to 25 A.D.) its name was con- verted into Tan-yang; by the T’ang emperors (618-907

A.D.) it was styled Keang-nan and Shing Chow; by the first sovereign of the Ming dynasty (1368-1644 a.p.) it was created the “southern capital” (Nan-king), and was given the distinctive name of Ying-t’een; and since the accession to power of the present Manchu rulers it has been officially known as Keang-ning, though still popularly called Nan-king. Asa matter of fact it was the seat of the imperial court only during the reigns of the first two emperors of the Ming dynasty, and was deserted for Shun- t’een (Peking) by Yung-lo, the third sovereign of that line, who in 1403 captured the town and usurped the crown of his nephew, the reigning emperor. But even when speaking of the city rebuilt by the Ming emperors it is necessary to use the past tense. The Tai- ping rebels, who carried the town by assault in 1853, made a clean sweep of all the national monuments and most of the more conspicuous public buildings it contained, and destroyed or were the means of destroying the greater part of the magnificent wall which surrounded it. The following description, therefore, must be understood as referring to the town as it existed before it was invaded

by those ruthless destroyers.

The city is said by Chinese topographers to have been surrounded by a wall measuring 96 le, or 32 miles, in circumference. This computation has, however, been shown by more accurate calcula- tion to be a gross exaggeration, and it is probable that 60 le, or 20 miles, would be nearcr the actual dimensions. The wall, of which only small portions now remain, was about 70 feet in height, measured 30 fect in thickness at the base, and was pierced by thirteen gates. Encircling the north, east, and south sides of the city proper was a second wall which enclosed about double the space of the inner enclosure. The public buildings were on a scale befitting one of the foremost cities in the empire, which was and still is the permanent seat of the provincial government, and which for a time was the abode of the imperial court. The inner city, which is nominally inhabited by the Manchu garrison only, is crossed from north to south by four main thoroughfares, which are intersected by roads connecting the gatcs in the eastern and western walls. In the north-east corner of the town stood the imperial palace reared by Hung-woo, the imperial fonnder of the modern city. After suffering mutilation at the time of the overthrow of the Ming dynasty, this magnificent building was finally burnt to the ground on the recapture of the

city from the Taiping rebels in 1864. But beyond comparison the most conspicuous public build- ing at Nanking was the famous porcelain tower, which was designed by the emperor Yung-lo (1403-28) to commemorate the virtues of hismother. Twelve centuries previously an Indian priest deposited on the spot where this monument afterwards stood a relic of Buddha, and raised over the sacred object a small pagoda of threc stories in height. During the disturbed times which heralded the close of the Yuen dynasty (1868) this pagoda shared the fate of the surrounding buildings, and was utterly destroyed. It was doubt- less out of respect to the relic which then perished that Yung-lo chose this site for the erection of his “ token-of-gratitude” pagoda. At noon on the fifteenth day of the sixth month of the tenth year of the reign of this monarch (1413) the building was begun. But before it was finished Yung-lo had passed away, and it was reserved for his successor to see the final pinnacle fixed in its place, after nineteen years had been consumed in carrying out the designs of the imperial architect. In shape the pagoda was an octagon, and was about 260 feet in height, or, as the Chinese say, with that extra- ordinary love for inaccurate accuracy which is peculiar to them, 32 chang (a chang equals about 120 inches) 9 feet 4 inches and xy of an inch. The outer walls were cased with bricks of the finest white porcelain, and each of the nine stories into which the building was divided was marked by overhanging eaves composed of green glazed tiles of the same material. The summit was crowned with a gilt ball fixed on the top of an iron rod, which in its turn was encircled by nine iron rings, Hung on chains which stretched from this apex to the eaves of the roof were five large pearls of good augury for the safety of the city. One was supposed to avert floods, another to prevent fires, a third to keep dust-storms at a distance, a fourth to allay tempests, and a fifth to guard the cit against disturbances. From the eaves of the several stories there hung one hundred and fifty-two bells, and countless lanterns adorned the same coignes of vantage. The strange form and beauty of the edifice, which might have been expected to have preserved it from destruction, were, however, no arguments in its favour in the eyes of the Taiping rebels, who razed it to the ground when they made themselves masters of N anking.

Nanking is about 194 geographical miles to the west of

Shanghai, and is nearly equidistant between Canton and Peking. It is situated on the south bank of the Yang- tsze Keang, and has a population of 400,000 souls, In bygone days it was one of the chief literary centres of the empire, besides being famous for its manufacturing industries. Satin, crape, nankeen cloth, paper, pottery, and artificial flowers were among its chief products. Of late years, however, these peaceful industries have been superseded by the production of all kinds of warlike material. As at Fuh-chow, the arsenal at Nanking is superintended by Europeans, under whose guidance steam ships of war and cannon of the newest and most approved type are there manufactured. In the history of the political relations of England with China, Nanking principally figures as the city where, after its capture by British ships in 1842, Sir Henry Pottinger signed the " Nanking treaty." (R. K. D.) NANTES, a city of France, chief town of the department of Loire-Inférieure, is situated on the right bank of the Loire, 35 miles above its mouth, in 47° 13' N. lat. and 1° 33' W. long. In population (117,555 inhabitants in 1881) it is the first city of Brittany. At Nantes the Loire receives on the left hand the Savre Nantaise, and on the right the Erdre, which forms the outlet of the canal between Nantes and Brest; and a large number of bridges spanning the various branches of the different Streams join the several quarters of the city. Along the left bank of the Loire stretches an ever-extending line of factories and shipbuilding yards. [In all there are 6 miles of quays, 23 miles traversing the city in its greatest breadth from east to west along the main river, The

Environs of Nantes. largest vessels at present come no farther than St N. azalre, but a canal is being made on the left bank which will allow vessels drawing 16 feet to come up to the city. Nantes lies 264 miles west-south-west of Paris by the Angers and Le Mans Railway, and 40 miles from St Nazaire. Other lines connect it with Rennes via Chateaubriant, La Roche-sur-Yon, Paimbceuf, and Pornic.

The cathedral of Nantes, commenced in 1434 in the Gothic

style, is still unfinished. Its length will be, when completed, °

335 feet, and the nave is 85 feet wide and 123 feet in height, The towers are 205 feet high. There are two interesting monuments in the transept,—on the right Michel Colomb's tomb of Francis IL., duke of Brittany, and his second

wife Marguerite de Foix (1507), and on the left that of General Lamoriciére by Paul Dubois. The former consists of a white marble base covered by a black marble slab on which rest the two effigies, the four corners being occupied by upright figures of J ustice, Fortitude, Temperance, and Prudence. Of the other churches the more interesting are St Nicolas, a modern building in the style of the 13th century, Ste Croix, which occupies the site of an ~ pagan temple, and St Jacques on the left bank of the olre.

Between the cathedral and the Loire, from which it is separated only by the breadth of the quay, stands the castle of Nantes, founded in the 9th or 10th century. Re- built by Francis IT. and the duchess Anne, it was flanked by Mercceur in the time of the League with huge bastions decorated with the Lorraine cross. From being the resi-

dence of the dukes of Brittany it became a state prison (Cardinal de Retz, Fouquet, and the duchess of Berri were confined within its walls), and it is now occupied by the artillery headquarters. The chapel in which the marriage of Louis XII. with Anne of Brittany was cele- brated was destroyed by an explosion in 1800. Nantes possesses a fine theatre, a court-house, a prefecture, and an exchange, which includes both the tribunal and the chamber of commerce. The town-hall possesses a curious casket in gold and enamel which once, it is said, contained the heart of Anne of Brittany. The public library is in the old corn-market, and the museum of painting and sculpture finds scanty accommodation in the old cloth-market. Apart from the beautiful collection presented to the town by the duke of Feltre, the catalogue includes 1000 pictures and 130 statues. An archeological museum has its quarters in the old church of the Convent of the Oratory, where Fouché, afterwards duke of Otranto, taught before the Revolution; part of the old mint is occupied by the school of science and arts; and not far off is the museum of natural history, comprising a complete collection of the minerals of the department. The botanic garden consists

of a purely scientific portion and a landscape garden which forms one of the finest promenades of its kind. Between

Plan of Nantes.

1, Cathedral. 4. Picture Gallery. |

2. Hotel de Ville. 5, Bourse. 3. Palais de Justice. 6. Cours St André.

the Loire and the Erdre run Cours St Pierre and Cours St André, adorned at the two ends of the line by statues of Anne of Brittany and Arthur III, Du Guesclin and Olivier de Clisson, and separated by the Place Louis XVI., with a statue of that monarch on a column 92 feet high. The Place Royale, the great meeting-place of the principal thoroughfares of the city, contains 4 monumental foun- tain in blue Rennes granite, with a white marble statue of the town of Nantes and bronze statues of the Loire and four of its affluents —the Sévre, the Erdre, the Cher, and the Loir. A flight of steps at the west end of the town leads up from the quay to the colossal cast-iron statue of St Anne, whence a splendid view may be obtained over the valley of the Loire. Several old houses of the 15th and 16th centuries, the fish market, the railway station, and the Nalorges (a vast granite building now used as a bonded warehouse) are all of interest. Besides two great hospitals —st Jacques on the left bank of the Loire, with 1600 beds, and the Hétel-Dieu, recently rebuilt in Gloriette island, with 1200 beds—Nantes contains a deaf-mute institute, a secondary school of medicine and pharmacy, a hydrographic school, a drawing school, a branch establish- ment of the conservatoire at Paris, and a lyceum. It is the see of a bishop, and the headquarters of the 11th

7. Cours St Pierre. 8. Place de la Duchesse Anne.

corps @armée. As a seat of the sugar manufacture Nantes stands next to Paris and Marseilles. In city or suburbs there are vast establishments for the manufacture of iron, copper, and lead, shipbuilding yards, factories for agricultural and similar implements, oil-works, soap-works, a national tobacco factory employing 1800 hands, a stained- glass factory, manure works, and granite yards. Food- preserving is a rapidly growing industry in all the three departments of meat, fish, and vegetables (the last largely grown in the neighbourhood). Commercially Nantes does not occupy so high a position as formerly, being now only eleventh in the list of French ports, though its custom- house still ranks second in amount of receipts. It imports coal from England (duty free), wood from Scandinavia, colonial wares from the Antilles. Its shipowners, whose vessels are rather more numerous than those of Havre, keep possession of the greater part of the trade of the lower Loire and the coast fisheries. In 1875 they had 745 vessels, of 150,000 tons aggregate burden. The com- mercial movement of the port was 235,000 tons; and the value of the exports and imports amounted to £5,000,000. In 1880 the movement was upwards of 400,000 tons.

Previous to the Roman occupation, Nantcs (Condivicenum) was the chief town of the Nannctes, and under the conquerors it became a great commercial and administrative centre. In the middle of the 8d century Christianity was introduced by St Clair. Clotaire I. got possession of the city in 560, and placed it under the government of St Felix the bishop, who executed cnormous works to cause the Loire to flow under the walls of the castle. After being scveral times subdued by Charlemagne, Brittany revolted under his successors, and Nominoé, proclaimed king in 842, ordered the fortifications of Nantes to be razed because it had sided with Charles the Bald. The Normans held the town from 848 to 936. About this time began the rivalry between Nantes and Rennes. Pierre de Dreux, declared duke of Brittany by Philip Augustus, made Nantes his capital, surrounded it with fortifications, and defended it valiantly against John of England. During the Breton wars of succession Nantes took part first with Montfort, but afterwards with Charles of Blois, and did not open its gates to

Montfort till his success was assured and his English allies had retired. In 1560 Francis II. granted Nantes a communal constitution. In the course of the 15th and 16th centuries the city suffered from several epidemics. Averse to Protestantism, it joined the League along with Merceeur, governor of Brittany, who helped to raise the country into an independent duchy; and it was not till 1598 that it opened its gates to Henry IV., who here signed on May 2d of that year the famous edict which until its revocation by Louis XIV. in 1685 was the charter of Huguenot liberties in France (sec vol. ix. p 564, 579, and vol. xii p. 838-9). It was at Nantes that Count Chalais was punished for plotting against Richelieu, that Fouquet was arrested, and that the Cellamare conspirators were executed under the regent. Having warmly embraced the cause of the Revolution in 1789, the city was in 1798 treated with extremest rigour by Carrier, of noyade fame. Under the empire its foreign commerce was ruined. ‘The duchess of Berri was arrested at Nantes in 1882 while trying to stir up La Vendée against Louis Philippe. Anne of Brittany, Charles Errard, founder of the French Academy at Rome, Generals Cambronne and Lamoriciere, and Jules Verne were born in the city.

NANTEUIL, Roserr (1623-1678), a crayonist, and one of the most eminent of French line engravers, was born about 1623, or, as other authorities state, in 1630, the son of a merchant of Rheims. Having received an excel- lent classical education, he studied engraving under his brother-in-law, Nicholas Regnesson; and, his crayon portraits having attracted attention, he was pensioned by Louis XIV., and appointed designer and engraver of the cabinet to that monarch. It was mainly duc to his influ- ence that the king granted the edict of 1660, dated from St Jean de Luz, by which engraving was pronounced free and distinct from the mechanical arts, and its practitioners were declared entitled to the privileges of other artists. The plates of Nanteuil, several of them approaching the scale of life, number about three hundred. In his early practice he imitated the technique of his predecessors, working with straight lines, strengthened, but not crossed, in the shadows, in the style of Claude Mellan, and in other

prints cross-hatching like Regnesson, or stippling in the manner of Jean Boulanger; but he gradually asserted his full individuality, modelling the

faces of his portraits with the utmost precision and completeness, and employing various methods of touch for the draperies and other parts of his plates. Much of the beauty and artistic character of his prints is due to the fact that he was himself a skil- ful portraitist, accustomed to work much from the life, and that he commonly engraved from his own designs. His subjects are quiet, tender, and silvern in effect, but, compared with those of his great contemporary Edelinck, they are less rich and varied in the rendering of the rela- tive weights of colour. Among the finest works of his fully developed period may be named the portraits of Pomponne de Bellitvre, Gilles Ménage, Jean Loret, the Duc de la Meilleraye, and the Duchesse de Nemours. A list of his works will be found in Dumesnil's Le Peintre Graveur Francats, vol. iv. He died at Paris in 1678.

NANTUCKET, an island, county, and town of the United States, forming (since 1693) part of Massachusetts. The island, with an area of about 50 square miles, lies within the 10-fathom line, but is separated from the main- land by Nantucket Sound, which nieasures from 25 to 30 miles in breadth, and has a general depth of from 5 to 8 fathoms. With the exception of a few inconsiderable hills, the surface for the most part consists of open, breezy, and now almost treeless downs. The soil is generally sandy, but affords in some places good pasture. On the north or landward side of the island there is a large lagoon-like harbour formed by a long narrow tongue of land—the Coatue Beach—which, curving north-west, runs out into Great Point, the end of which is marked by a white light- house tower in 41° 23' 24" N. lat. and 70° 2' 24" W. long. Within the harbour the depth at low water is about 12 or 14 feet, but on the bar it is only between 6 and 7. The western end of the island shelves out in a broad submarine platform (Tuckernuck Bank), which supports the two considerable islands of Tuckernuck and Muskeget, both included in the county. Nantucket post-village, the prin- cipal settlement, lies at the south-west end of the harbour, —a quiet place, but beginning to attract attention as a summer residence. A library and museum are maintained in the Atheneum building.

Nantucket (Natocko on the map of 1630) was visited by Gosnold (1602), who found it covered with oaks and other trees, and in- habited by about 1500 Indians. Governor Mayhew, in 1659, granted nine-tenths of the island to ten men for £30 and two beaver hats, and shortly afterwards the first

settler, Thomas Macy, took posses- sion. The town of Nantucket (known as Sherburne from 1673 to 1795) was incorporated in 1671; the original site was at Maddequet, 5 or 6 miles west of the present position, to which it was removed in the following year. About the same time whaling operations were commenced, and Nantucket gradually became the greatest whaling station in the world. In 1775 it had 150 vessels engaged in the business ; but since the beginning of the century its pro- sperity has rapidly declined: in 1852 there were still 18,105 tons of its registered shipping employed in whale-fishing ; in 1868 there were only 3739; and the number has gradually sunk to zero. The last full-blood Indian in Nantucket died in 1821; the last half- breed in 1854. The population of the county was 4500 in 1775 9012 in 1840, 6094 in 1860, 4123 in 1870, and 3797 in 1880. ;

NANTWICH, a market-town of Cheshire, situated on two railway lines and on both sides of the Weaver, 20 miles south-east of Chester and 36 south-south-west of Manchester. There is water communication by the Grand Junction Canal, which near it joins the Ellesmere Canal. The town, which consists of three main streets, is some- what irregularly built. The principal buildings are the church of SS. Mary and Nicholas, in the Decorated Gothic style, with octagonal tower; the grammar school, founded in 1611; the town-hall, in the Gothic style; and the new market-hall, which replaced the old one in 1867. There are several almshouses and other charities. The ancient

castle, erected by the Normans, was in ruins before the time of Henry VII., and there are now no remains of it, The principal industry is the manufacture of boots and shoes; there are also several clothing factories. The population of the urban sanitary district in 1871 was 6673, and in 1881 it was 7495

Nantwieh, which is said to have existed in the time of the Romans, was originally called Halen Gwyn, the white salt town. In Domesday it is entered as the part possession of the king and Earl Edwin, to whom its numerous salt springs supplied a con- siderable revenue. It was erected into a barony by Hugh Lupus, first Norman earl of Chester. The town suficred severely from fire in 1438 and in 1583, from a kind of mad ague in 1587,

and from plague in 1604. In the reign of Henry VIII. it possessed three hundred salt-works, but, on account of the discovery of salt in 1624 at a district of the Vale of Weaver more convenient for water carriage, the industry rapidly declined, and is now wholly discontinued. Brine baths have bcen erected (1888) bchind the town-hall.

NAPHTALI, the son of Jacob by Bilhah, Rachel's maid, and uterine brother of Dan. The narrator of Gen. xxx. 8 explains the name "MD? by the verb DAD), "wrestle." The seats of the tribe lay in the eastern half of upper Galilee, a fertile mountainous country sloping down to the headwaters of Jordan and the Sea of Galilee (Josh. xix. 32-39), Within this country the Canaanites continued to hold Beth-shemesh and Beth-anath (Judg. i. 33). After the wars with Sisera, in which the tribe took a prominent part (Judg. iv.; v. 18), and with Midian (Judg. vii. 23), we hear little of Naphtali.' Dwelling near the settlements of the Arameans, the tribe was an early sufferer in the bloody conflicts of Damascus with Israel (1 Kings xv. 20), and it was depopulated in the first Assyrian captivity by Tiglath Pileser (2 Kings xv. 29; Isa. ix. 1 [viti. 23]).

NAPHTHA, a word originally applied to the limpid liquid portion of the petroleum which exudes abundantly at Baku, é&c., on the shores of the Caspian Sea. It is the védb6a of Dioscorides, and the naphtha or bitumen liquidum candidum of Pliny. Both in commerce and in science the term is now used somewhat vaguely, but more in a generic sense, to embrace several bodies having certain properties in common, than as a specific name for a particular sub- stance. Naphtha indeed has no distinct place or meaning in modern chemistry. By the alchemists the word was used principally to distinguish various highly volatile, mobile, and inflammable liquids, such as the ethers,— sulphuric ether and acetic ether having been known respectively as Maphtha sulphurict and Naphtha aceti. In recent times naphtha has been employed to indicate the volatile, limpid, inflammable hydrocarbons obtained by destructive distillation of organic substances artificially conducted, as well as those produced by similar agencies acting within the earth. In commerce the application of the term is still more restricted, and in general it embraces no more than the more volatile portion of the fluid hydro- carbons separated in the distillation of tay.

Under the name naphtha we thus find the subjoined serics of substances comprehcnded. (1) Coal-tar naphtha consists of the lightest and first separated portions of the hydrocarbons obtained in the distillation of gas-tar. It embraces the hydrocarbons having a specific gravity ranging from about 850° up to 950°, and is, especially in its lighter fractions, rich in benzole. (2) Shale naphtha is obtained in the purification of the crude oil got by the destructive distillation of shale and other carbonaceous minerals. The first fraction secured, having a specific gravity ranging from 640° to 680°, is termed gasoline; and coming between this and the ordinary burning oils is a light volatile and highly inflammable oil with a specific gravity of 700°-760°, known commonly as naphtha, but also more conveniently termed shale spirit. It is valuable as a solvent, and is also used to some extent for burning in open air. (See Pararrin.) (3) Native naphtha is the more fluid portion of the rock oil or petrolcum found in many parts of the world. (4) Wood naphtha, or methyl alcohol, has been already described under Mrrnyt, vol. xvi. p.195. (5) Caoutchouc naphtha : a series of hydrocarbons can be prepared by the distillation of india-rubber,

and may be separated by means of fractional distillation ; together, under the name of caoutchine, they form a most efficient solvent for india-rubber itself. (6) Bone naphtha, or bone oil, known also as Dippel’s animal oil, is a most offensively smelling product of the distillation of bones in the preparation of animal charcoal. The persistent and repulsive stench of this substance effectually precludes its industrial use among the naphthas.

NAPHTHALINE. See Tar.

NAPIER, a seaport and borough of New Zealand, on the south-east coast of North Island, is the chief town of the province of Hawke’s Bay, and is built on a peninsula (known as Scinde Island) about 12 miles from the southern end of the bay, in 39° 29’S. lat. and 176° 44’ E. long., about 200 miles by seafrom Wellington. It is a thriving place, the centre of a large agricultural and pastoral district. The main portion of the town, with the banks, churches, hotels, &c., stretches along the flat shore-land, while the suburban dwelling-houses of the wealthier inhabitants scatter themselves over the hills to the north. The stag- nant salt lagoons which formerly occupied the

southern boundary have been reclaimed. In 1881 the population was 5756; and the municipality, with its area of 879 acres, now contains about 1300 dwellings, with rateable property valued in 1882 at £57,866. An atheneum, a small hospital, a lunatic asylum, a philosophical society, and an acclimatization society are among the public institutions. The town (named after Sir Charles James Napier) is the seat of the bishop of Waiapu, and returns a member to the New Zcaland House of Representatives. A railway is now open as far as Makatuku (70 miles). The har- bour (Port Ahuriri), 1} miles to the west, is very unsatis- factory, and though there is good anchorage the road- stead is greatly exposed to easterly and southerly winds.

NAPIER, Sir Cuartzs (1786-1860), British admiral, was the second son of Captain the Hon. Charles Napier, R.N., and grandson of Francis, fifth Lord Napier, and thus cousin to the three famous Napiers, Sir Charles, Sir George, and Sir William, and was born at Merchiston Hall, near Falkirk, on March 6, 1786. He became a midshipman in 1800, was promoted lieutenant in 1805 and commander in 1807, and distinguished himself in the West Indies, where he fought his famous action with three French ships of the line, and took the “ Hautpoult,” seventy-four guns, into which the admiral promoted him captain. On his return to England his rank was confirmed, but he was put on half-pay. He spent some time at the university of Edinburgh, and then went to Portugal to visit his cousins in Wellington’s army. In 1811 he served in the Mediter- ranean, and in 1813 on the coast of America and in the expedition up the Potomac. The first years of his leisure he spent in Italy and in Paris, but speculated so much in a steamboat enterprise that by 1829 he was quite ruined. In that year he was appointed to the “Galatea,” forty-two, and was at the Azores when they were held by the Count de Villa Flor for the queen of Portugal. He so much impressed the constitutional leaders that they begged him to take command of the fleet, which offer he accepted in February 1833. With it he destroyed the Miguelite fleet off Cape St Vincent on July 5, and on the demand of France was struck off the English navy list. Continuing his Portuguese services, he commanded the land forces in the successful defence of Lisbon in 1834, when he was made Grand Commander of the Tower and Sword, and Count Cape St Vincent in the peerage of Portugal. On his return to England he was restored to his former rank in the navy in 1836, and received command of

the “Powerful,” eighty-four, in 1838. When troubles broke out in Syria he was appointed second in command, and distinguished himself by leading the storming column at Sidon on September 26, 1840, and by other services, for which he was made a K.C.B. He went on half-pay in

1841, and was in 1842 elected M.P. for Marylebone in the Liberal interest, but lost his seat in 1846. He was pro- moted rear-admiral the same year, and commanded the Channel fleet from 1846 to 1848. On the outbreak of the Russian War he received the command of the ficet destined to act in the Baltic, and hoisted his flag in February 1854. Ile refused to attack Cronstadt, and a great outcry was raised against him for not obeying the orders of the Admiralty and attempting to storm the key of St Petersburg; but his inaction has been thoroughly justified by posterity. On his return in December 1854 he was not again offered a command. He was elected M.P. for Southwark in February 1855, and maintained his seat, though broken in health, until his death on November

6, 1860.

Sce Major-General E. Napier’s Life and Correspondence of Admiral Sir Charles Napier, K.C.B., 2 vols., London, 1862; Napier’s own War in Syria, 2 vols., 1842; The Navy, its past and present state, in @ series of letters, edited by Sir W. F. P. Napier, 1851; and The History of the Baltie Campaign of 1854, from doewments and other materials furnished by Vice- Admiral Sir C. Napier, K.C.B., 1857. Sec also The Life and Exploits of Commodore Napier, 1841; and Life of Vice-Admiral Sir C. Napier, 1854.

NAPIER, Sm Cuartes James (1782-1853), the acknowledged hero of a family of heroes, was born at White- hall, London, in 1782, and was the eldest son of Colonel George Napier, of the Guards (a younger son of the fifth Lord Napier), and of his wife Lady Sarah Lennox—the Lady Sarah who had charmed King George HI. After the custom of those times Charles Napier had been gazetted an ensign in the 33d regiment in 1794, and in 1797 his father secured for him the appointment of aide- de-camp to Sir James Duff, the general commanding the Limerick district. Longing for more active service, Napier obtained a commission as lieutenant in

Manningham’s rifles in 1800. This newly formed corps was designed to supply a body of light troops for the English army fit to cope with the French voltigeurs and tirailleurs, and was specially trained at first under the eye of Colonel Manningham, and then in the famous camp at Shorncliffe, under the immediate supervision of Sir John Moore. Moore speedily perceived the military qualities of the Napiers, and inspired the three elder brothers—Charles, George, and William—with an enthusiasm which lasted all their lives; but, though happy in his general, Charles Napier quarrelled bitterly with William Stewart, the lieutenant-colonel, and in 1803 left the regiment to accompany General Fox to Ireland as aide-de-camp. The great influence of his uncle, the duke of Richmond, procured him in 1804 a captaincy in the staff corps, and in the beginning of 1806a majority in the Cape regiment. On his way to the Cape, however, he exchanged into the 50th regiment, with which he served +n the short Danish campaign under Lord Cathcart in 1807. Shortly after his return from Denmark the 50th was ordered to Portugal, and shared all the glories of the famous retreat to Corunna. At the battle of Corunna, one of the last sights of Sir John Moore before he was struck was the advance of his own old regiment under the command of Charles Napier and Edward Stanhope, and almost his last words were “ Well done, my majors !” Being badly supported from the right, the 50th were almost entirely cut to pieces, and both the majors left for dead upon the field. Napier’s life was saved by a French drummer named Guibert, who brought him safely to the headquarters of Marshal Soult, Soult treated him with the greatest kindness, and he was allowed by Ney to re- turn to England to his “old blind mother” instead of being interned. He had not been long in England when he heard that his exchange had been arranged, and, volunteering for the Peninsula, he joined the light division before Ciudad Rodrigo. As a voluntecr he served in the actions on the

Coa, and again at Busaco, where he was badly wounded in the face. He was ordered to England, but refused to go, and was present with the light division in all the actions which took place during Wellington’s pursuit of Masséna. His services were rewarded soon after by the leutenant- colonelcy of the 102d regiment, which had been entirely demoralized at Botany Bay,

and when he joined it at Guernscy was one of the worst regiments in the service ; when he left it in 1813 it was one of the best. He accompanied it in June 1812 from Guernsey to Bermuda, where he wrought a wonderful change in the spirit both of officers and mcn. By treating his men as friends he won their love and admiration, and became in a peculiar degree the hero of the British soldiers. In September 1813 he exchanged back into the 50th regiment, and in December 1814, believing all chance of active service to be at an end, retired on half-pay. He was gazetted one of the first C.B.'s on the extension of the order in 1814, and was present as a volunteer at the capture of Cambray, though he just missed the great battle of Waterloo. Though an officer of some experience and more than thirty years of age, he nowjoined the military college at Farnham, and completed his military education. In 1819 he was appointed inspecting field officer at Corfu. From Corfu he was moved in 1822 to Cephalonia, where he remained for eight years as governor and military resident. What he did there he has described in a book of his own, and how he loved the place is shown by his wish to the very end of his life to return and die there. He was the model of a despotic colonial governor, and showed all the qualities of a benevolent despot. He made good roads and founded great institutions, but everything must be done by him, and he showed himself averse to interference whether from the lord high commissioner of the Ionian Islands or fron the inhabitants of his own little colony. An interesting episode in his command was his communication with Lord Byron when he touched at Cephalonia on his way to his death at Missolonghi, and the insurrection of the Greeks, who would have called him to be their commander-in-chief had the Greek committee in London encouraged his pretensions. But at last his struggle with the authorities of the colonies grew to such a pitch that in 1830 he was obliged to leave Cephalonia. He retired to Normandy, where he published his work on the colonies, and also an historical romance on William the Conqueror. In 1834 he refused the governorship of Australia, still hoping for military employment. In 1837 he was promoted major-general with his brother George, and in 1838 was made a K.C.B.; but he was to wait till 1839 before he received an offer of employment. In that year he was made commanding officer in the northern district, and found his command no sinecure, owing to the turbulent state of the Chartists in the towns of Yorkshire and Lancashire. His behaviour during the tenure of his command is described by William Napier in his life of his brother, and his inability to

hold a command which did not carry supreme authority is plainly portrayed. In 1841, to the content of the Government, he resigned his command and went to India. He was stationed at Poona, and in September 1842, when troubles were expected there, was ordered to Sind.

His command in Sind from 1842 till August 1847 is the period of his life during which, according to his brother, he made good his title to fame, but his acts, more especially at first, have been most severely criticized. In fact there can be little doubt that from the moment he landed in the province he determined to conquer the ameers, and to seek the first opportunity of doing so. He was to be accompanied by Colonel Outram, who had been resident in Sind during the Afghan war, and who felt a

great admiration for him, but who had alsoa warm affection for the ameers, and believed that he could put off the day of their destruction. On February 17, 1843, while Outram was still absent engaged in negotiation, Napier attacked the Baluch army 30,000 strong with but 2800 men. With these 2800 men, including the 22d regiment, which would do anything for him, he succeeded in winning the victory of Meanee. It was a battle of the olden type, in which generals had to fight like privates. Sir Charles was in his element, and himself engaged in the fray. In the March following he finally destroyed the army of the amcers at the battle of Hyderabad. His success was received with enthusiasm both by the governor-general, Lord Ellen-borough, and by the English people, and he was at once made a G.C.B. The conqueror of Sind now had an opportunity to prove his administrative powers, and pro- ceeded to apply the same material means of civilization to Sind which had formerly been successful in Cephalonia. Whether or not the conquest of Sind at that particular period can be justified, there can be no doubt that Charles Napier was the best administrator who could be found for the province when conquered. Sind, when it came under English rule, was in a state of utter anarchy, for the Baluches had formed a military government not unlike that of the Mamelukes in Egypt, which had been extremely tyrannical to the native population. This native population was particularly protected by Sir Charles Napier, who completed the work of the destruction of the Baluch supremacy which he had commenced with the

victory of Meanee. The labour of administration was rendered more difficult by the necessity of repressing the hill tribes, which had been encouraged to acts of lawless- ness by the licence which followed the Afghan war. The later years of his administration were made very stormy by the attacks on the policy of the conquest which had been made in England. He left Sind, after quarrelling with every authority of the presidency of Bombay, and nearly every authority of the whole of India, in August 1847, and received a perfect ovation on his return from all the hero-worshippers of the Napiers, of whom there were many in England. His short stay in England was occupied with incessant struggles with the directors of the East India Company; but, however much the directors hated him, it was not long before they had to besecch him in humble terms to become their commander-in-chief. The news of the indecisive victory of Chillianwalla created a panic in England, and the East India Company was obliged by the force of public opinion to summon the greatest general to take the command of its armies. Sir Charles started almost at a moment's notice, but on reaching India found that the victory of Gujrat had been won and the Sikh war was over. No taint of envy was in his nature, and he rejoiced that he had not to supersede Lord Gough in the moment of defeat. His restless and imperious spirit was met by one equally imperious in the governor-general, Lord Dalhousie. From the very beginning of his com-mand the governor-general and the commander-in-chicf disagreed, and in April 1850 Sir Charles was reprimanded on some trifling point of discipline. The reprimand was reiterated by the duke of. Wellington, and in December 1850 Napier once more left for England. His constitution was undermined by the Indian climate, and especially by his fatiguing command in Sind, and on August 29, 1853, he died at Portsmouth.

Charles James Napier, recognized by his brothers as the greatest representative of the Napiers, though without the literary genius of his brother William, had all the restless energy which distinguished the whole family,—the same impatience of command and contra- diction, the same power of inspiring the people with a reverential

enthusiasm which impressed cven the dullest. At Meanee he showed himself to be a gallant general; but he was also a great soldier.

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Possibly he had not the coolness which forms a Wellington, but he had the power of inspiring his soldiers with an enthusiastic love Besides being a great soldier he was avery great administrator, and both in Cephalonia and in Sind proved what work a man never fatigued The most discussed question in his life is the conquest of Sind. There can be no There can be no doubt that the conquest was disapproved by statesmen in England. Mr Gladstone's own testimony is to the effect that the conquest of Sind ''was disapproved unanimously by the cabinet of Sir Robert

and admiration which Wellington could never inspire.

and never afraid of responsibility could do.

doubt that he hurried on that conquest.

Pecl, of which I can speak, as I had just entered it at that time.

But the ministry were powerless inasmuch as the mischief of re- taining was less than the mischief of abandoning it, and it remains

an accomplished fact" (Contemporary Review, November 1876).

But that the mischief was not greater was due to Sir Charles's Many men havc been gallant generals, great soldiers, and even great administrators, but no man of the 19th century was a hero as well, and it is the heroic side of his character "which it is most difficult to analyse, and most easy to perceive. It appears all through Sir William Napier's life of his brother, but itis most clearly and trenchantly brought out in a letter of Carlyle to 'The fine and noble qualities of the man are very recognizable to me: his subtle piercing intellect turned all to the practical, giving him just insight into men and into things; his in- exhaustible adroit contrivances, his fiery valour, sharp promptitude A lynx-eyed fiery man, with the spirit of an old knight in him, more of a hero than

administrative power.

the biographer.

to seize the good moment that will not return.

any modern I have seen for a long time. :

The chicf authority for Sir Charles Napicr’s life is his Life and Opintons, by

his brother, 1857; consult also MacCall, Career and Character of 0. J. Napier,

1857; and M‘Dougall, General Sir C. J. Napier, Conqueror and Governor of His own works are Memoir of the Roads of Cephalonia, 1825; The

Scinde, 1860.

Colonies, 1833; Colonization, 1835 ; Remarks on Military Law and the Punish-

ment of Flogging, 1837; A Letter on the Defence of England by Corps of Volunteers

and Militia, 1852; A Letter to the Right Honourable Sir J. C. Hobhouse on the

Baggage of the Indian Army, 1849; Defects, Civil and Military, of the Indian Government, 1853; and William the Conqueror, a Historical Romance, edited by Sir W. Napicr, 1858. On Sind, consult primarily Sir W. Napier, The Conquest of Scinde, 1845; The Administration of Scinde, 1851; Compilation of General Orders issued by Sir C. Napier, 1850; and Outram, The Conquest of Scinde, a Commentary, 1846. For his command-in-chief, and the controversy about his resignation, consult J. Mawson, Records of the Indian Command of General Sir C.J. Napier, Calcutta, 1851; Minutes on the Resignation of the late General Sir C. Napier, by Field-Marshal the Duke of Wellington, &¢., 1854; Commenis by Sir W. Napier on a Memorandum of the Duke of Wellington, 1854; and Sir William Napicr, General Sir C. Napier and the Directors of the East India Com-pany, 1857. (H. M. 8.)

NAPIER, Joun (1550-1617), the inventor of log- arithms, was born at Merchiston near Edinburgh in 1550, and was the eighth Napier of Merchiston. The first Napier of Merchiston, ‘‘ Alexander Napare,” acquired the Merchiston estate before the year 1438, from James I. of Scotland. He was provost of Edinburgh in 1437, and was otherwise distinguished. His eldest son Alexander, who succeeded him in 1454, was provost of Edinburgh in 1455, 1457, and 1469; he was knighted and held various im- portant court offices under successive monarchs ; at the time of his death in 1473 he was master of the household to James III. His son, John Napier of Rusky, the third of Merchiston, belonged to the royal household in the life- time of his father. He also was provost of Edinburgh at various times, and it is a remarkable instance of the esteem in which the lairds of Merchiston were held that three of them in immediate lineal succession repeatedly filled so important an office during perhaps the most memorable period in the history of the city. He married a great- granddaughter of Duncan, eighth earl of Levenax (or Lennox), and besides this relationship by marriage the Napiers claimed a lineal male cadency from the ancient family of Levenax. His eldest son, Archibald Napier of Edinbellie, the fourth of Merchiston, belonged to the house- hold of James IV. He fought at Flodden and escaped with his life, but his eldest son Alexander (fifth of Merchis- ton) was killed. Alexander’s eldest son (Alexander, sixth of Merchiston) was born in 1513, and fell at the battle of Pinkie in 1547. His eldest son was Archibald, seventh of Merchiston, and the father of John Napier, the subject of this article. a

In 1549 Archibald Napier, at the early age of about fifteen, married Janet, daughter of Francis Bothwell, and in the following year John Napier was born. In the

siagiik criminal court of Scotland, the earl of Argyll, hereditary justice- general of the kingdom, sometimes presided in person, but more frequently he delegated his functions ; and it appears that in 1561 Archibald Napier was appointed one of the justice-deputes. In the register of the court, extending over 1563 and 1564, the justice-deputes named are “Archibald Naper of Merchistoune, Alexander Banna- tyne, burgess of Edinburgh,

James Stirling of Keir, and Mr Thomas Craig.” About 1565 he was knighted at the same time as James Stirling, his colleague, whose daughter John Napier subsequently married, In 1582 Sir Archibald was appointed master of the mint in Scotland, with the sole charge of superintending the mines and minerals within the realm, and this office he held till his death in 1608. His first wife died in 1563, and in 1572 he married a cousin, Elizabeth Mowbray, by whom he had three sons, the eldest of whom was named Alexander.!

As stated above, John Napier was born in 1550, the year in which the Reformation in Scotland may be said to have commenced. In 1563, the year in which his mother died, he matriculated at St Salvator’s College, St Andrews. He early became a Protestant champion, and the one solitary anecdote of his youth that is known to exist occurs in his address “to the Godly and Christian reader” prefixed to his Plaine Discovery. He writes :—

“In my tender yearcs, and barneage in Sanet-Androis at the Schooles, having, on the one parte, contracted a loving familiaritic with a certaine Gentleman, &c. a Papist ; And on the other part, being attentive to the sermons of that worthie man of God, Maister Christopher Goodman, teaching upon the A pocalyps, I was so mooved in admiration, against the blindnes of Papists, that could not most evidently see their seven hilled citie Rome, painted out there so lively by Saint John, as the mother of all spiritual whoredome, that not onely bursted I out in continual reasoning against my said familiar, but also from thenceforth, I determined with my selfe (by the assistance of Gods spirit) to employ my studie and diligence to search out the remanent mysteries of that holy Book: as to this houre (praised be the Lorde) I have bin doing at al such times as conveniently I might have occasion.”

The names of nearly all Napier’s classfellows can be traced as becoming determinantes in 1566 and masters of

arts in 1568; but his own name does not appear in the eee) eee eee ee

1 The descent of the first Napier of Merchiston has been traced to * Johan le Naper del Counte de Dunbretan,” who was one of those who swore fealty to Edward I. in 1296 and defended the castle of Stirling against him in

1304; but there is no authority for this genea- logy. The legend with regard to the origin of the name Napier was given by Sir Alexander Napier, eldest son of John Napier, in 1625, in these words:—‘‘ One of the ancient earls of Lennox in Scotland had issue three sons: the eldest, that succeeded him to the earldom of Lennox; the second, whose name was Donald ; and the third, named Gilchrist. The then king of Scotland having wars, did convocate his lieges to battle, amongst whom that was commanded was the earl of Lennox, who, keeping his eldest son at home, sent his two sons to serve for him with the forces that were under hiscommand. This battle went hard with the Scots; for the enemy pressing furiously upon them forced them to lose ground until it came to flat running away, which being perceived by Donald, he pulled his father’s standard from the bearer thereof, and valiantly encountering the foe, being well followed by the earl of Lennox’s men, he repulsed the enemy and changed the fortune of the day, whereby a great victory was got. After the battle, as the manner is, every one drawing and setting forth his own acts, the king said unto them, ye have all done valiantly, but there is one amongst you who hath Na-Peer [i.e., no equal]; and calling Donald into his pres- ence commanded him, in regard to his worthy service, and in angmen- tation of his honour, to change his name from Lennox to Napier, and gave him the lands of Gosford, and lands in Fife, and made him his own servant, which discourse is confirmed by evidences of mine, wherein we are called Lennox alias Napier.” Sir Archibald adds that this is ‘‘the origin of our name, as, by tradition from father to son, we have generally and without any doubt received the same.” This written statement of the legend was occasioned by the following circumstance. Robert Napier, a cousin of John Napier, had amassed riches abroad as a merchant; he was created a baronet in 1612, and in order to put his genealogy formally on record in the heralds’ books, he applied for an authentic certificate to Sir Archibald, afterwards Lord Napier, who resided at Merchiston, as the head of the family ; and Sir Archibald in reply wrote out in his own hand the document from which the preceding extract has been made.

lists. The necessary inference is that his stay at the university was short, and that only the groundwork of his education was laid there. Although there is no direct evidence of the fact, there can be no doubt that he left St Andrews to complete his education on the Continent, and that he probably studied at the university of Paris, and visited Italy and Germany. He did not, however, as has been supposed, spend the best years of his manhood abroad, for he was certainly at home in 1571, when, being just of age, the preliminaries of his marriage were arranged at Merchiston ; and for many years after that event he took an earnest interest in the affairs of the church, the most engrossing element in the politics of the time.

In 1572 John Napier married Elizabeth, daughter of Sir James Stirling of Keir, mentioned above. This mar- riage took place almost immediately after his father's second marriage. About the end of the year 1579 John Napier's wife died, leaving him one son, Archibald, the first Lord Napier, and one daughter, Jane.

On the 17th of October 1593 a convention of delegates was held at Edinburgh at which a committee was appointed to follow the king and lay before him in a personal inter- view certain instructions relating to the punishment of the rebellious Popish earls and the safety of the church. This committee consisted of six members, two barons, two ministers, and two burgesses—the two barons selected

being John Napier of Merchiston and James Maxwell of.

Calderwood. The delegates found the king at Jedburgh, and the mission, which was a dangerous one, was success- fully accomplished. Shortly afterwards another convention was held at Edinburgh, and it was resolved that the delegates sent to Jedburgh should again meet the king at Linlithgow and repeat their former instructions. This was done accordingly, the number of members of the committee being, however, doubled. These interviews took place in October 1593, and on the 29th of the following January Napier wrote to the king the letter which forms the dedica- tion of the Plaine Discovery.

The full title of this first work of Napier's is given be- low.' It was written in English instead of Latin in order that "hereby the simple of this land may

be instructed”; aud the author states that he “was constrained of com- passion, leaving the Latine, to haste out in English this present worke.” He apologizes also for the language and his own mode of expression in the following sentences :—

‘“Whatsoever therfore through hast, is here rudely and in base language set downe, I doubt not to be pardoned thereof by all good men, who, considering the necessitie of this time, will esteem it more meete to make hast to prevent the rising againe of Anti. christian darknes within this Iland, then to prolong the time in painting of language’; and ‘I graunt indeede, and am sure, that in the style of wordes and utterance of language, we shall greatlie differ, for therein I do judge my selfe inferiour to all men: so that scarcely in these high matters could I with long deliberation finde wordes to expresse my minde.” 2 ee ee

1A plaine discovery of the whule Revelation of Saint Iohn: set downe in two treatises: The one searching and proving the true inter- pretation thereof: The other applying the same paraphrastically and Historically to the text. Set foorth by John Napeir L. of Marchis- toun younger. Whereunto are annexed certaine Oracles of Sibylla, agreeing with the Revelation and other places of Scripture. Edin- burgh, printed by Robert Walde-grave, printer to the King’s Majestie, 1593. Cum privilegio Regali.

2 The work was translated into French by George Thomson, a naturalized Scotsman residing in La Rochelle, and published by him at that town in 1602, under the title Ouverture de tous les sccrets de ? Apocalypse, de. Par Jean Napier (c. a. d.) Nonpareil, Sieur de Merchiston, reveue par lui-meme, et mise en Francois par Georges Thomson, Escossois. There was a sccond edition of the translation in 1605, and a third edition in 1607. There was also a German transla- tion published at Frankfort, which reached its third edition in 1627.

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It is not to be supposed that Napier’s Plaine Discovery was in any respect due to a visionary cloud passing over his mind, or toany temporary

infatuation; on the contrary, it is a serious and laborious work, to which he had devoted years of care and thought, and which is closely connected with the history of the times. In one sense it may be said to stand to theological literature in Scotland in some- thing of the same position as that occupied by the Canon Mirijicus with respect to the scientific literature, for it is the first published original work relating to theological interpretation, and is quite without a predecessor in its own field. In judging of the book, the circumstances of the time and the state of the country have to be. taken into account. Napier lived in the very midst of fiercely con- tending religious factions, and his home was situated in a district which was the scene of constant wars and disturb- ances ; there was but little theological teaching of any kind, and the work related to what were then the leading political and religious questions of the day.

After the publication of the Plaine Discovery, Napier seems to have occupied himself with the invention of secret instruments of war, for in the Bacon collection at Lambeth Palace there is a document, dated June 7, 1596, and signed by Napier, giving a list of his inventions for the defence of the country against the anticipated invasion by Philip of Spain. The document is entitled “Secrett Inventionis, proffitabill and necessary in theis dayes for defence of this Iland, and withstanding of strangers, enemies of God’s truth and religion,” * and the inventions consist of (1) a mirror for burning the enemies’ ships at any distance, (2) a piece of artillery destroying everything round an arc of a circle, and (3) a round metal chariot, so constructed that its occnpants could move it rapidly and easily, while firing out through small holes init. It has been asserted (by Sir Thomas Urquhart) that the piece of artillery was actually tried upon a plain in Scotland with complete success, a number of sheep and cattle being destroyed.

In 1614 appeared the work which in the history of British science can be placed as second only to Newton’s Princyia. The full title is as follows :— Mirifici Log- arithmorum Canonis descriptio, Ejusque usus, in utraque Trigonometria ; ut etiam in omni Logistica Mathematica, Amplissem, Facillimi, & expeditissimi explicatio. Auth- ore ac Inventore Loanne Nepero, Barone Merchistoniu, &c., Scoto. Edinburgi, ex officind Andrew Hart Bibliopole, CIO, DC. XIV, This is printed on an ornamental title-

page. The work is a small-sized quarto, containing fifty- seven pages of explanatory matter and ninety pages of tables.

The nature of logarithms is explained by reference to the motion of points in a straight line, and the principle upon which they are based is that of the correspondence of a geometrical and an arithmetical series of numbers. The table gives the logarithms of sines for every minute to seven figures ; it is arranged semi-quadrantally, so that the diferentix, which are the differences of the two logarithms in the same line, are the logarithms of the tangents. Napier’s logarithms are not the logarithms now termed

The second English edition appeared in 1611, and in the preface to it Napier states he intended to have published an edition in Latin soon after the original publication in 1593, but that, as the work had now been made public by the French and German translations, and as he was “advertised that our papistical adversaries wer to writc larglie against the said editions that are alreadie set out,” he defers the Latin edition ‘‘ till having first seene the adversaries objections, I may insert in the Latin edition an apologie of that which is rightly done, and an amends of whatsoever is aniisse.” No criticism on the work was ever published, and there was no Latin edition. in 1645,

3 A facsimile of this document is given by Mr Mark Napier in his Memoirs of John Napier.

A third cdition appeared

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=2°7182818… system, the connexion being expressed by the equation—

log Nap. n=10,000,000 log (10,000,000) – 10,000,000 log. 2 ;

7

or log Nap. n=10’ loge(x) ,

n

A translation of the Canon Mérificus into English was made by Edward Wright, and published after his death by his son Samuel Wright, at London, in 1618, under the title 4 Description of the admirable Table of Logarithmes. Edward Wright, who was a fellow of Caius College, Cambridge, occupies a conspicuous place in the In 1599 he published Certaine errors in Navigation detected and corrected, and he was the author of other works; to him also is chiefly due the invention of the method known as Mercator's sailing. He at once saw the value of log- arithms as an aid to navigation, and lost no time in preparing a translation, which he submitted to Napier himself. The preface to Wricht's edition consists of a translation of the preface to the

history of navigation.

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Canon Mirificus, together with the addition of the following sentences written by Napier himself:—‘‘ But now some of our Countreymen in this Island well affected to these studies, and the

more publique good, procured a most learned Mathematician to

translate the same into our vulgar English tongue, who after he had finished it, sent the Coppy of it to me, to bee seene and I having most willingly and gladly

considered on by myselfe. done the same, finde it to bee most exact and precisely conform- able to my minde and the originall.

Translator, with as much good will as we recommend it unto you.”

There is a short “ preface to the reader” by Brigys, and a descrip- tion of a triangular diagram invented by Wright for finding the proportional parts. The table is printed to one figure less than in the Canon Mirificus. Edward Wright died in 1615, and his son in

the preface states that his father ‘‘ gave much commendation of this

work (and often in my hearing) as of very great use for mariners” ; and with respect to the translation he says that ‘‘ shortly after he had it returned out of Scotland, it pleased God to call him away afore he could publish it.”

In 1617 Napier published his Rc ddologia,! a duodecimo of one hundred and fifty-four pag +s; there is prefixed to it as preface a dedicatory epistle to the high chancellor of Scotland. The method which Nap‘er terms “ Rabdologia ” consists in the use of certain numerating rods for the performance of multiplications and divisions. These rods, which were commonly called “Napier’s bones,” will be described further on. The second method, which he calls the “Promptuarium Multiplicationis” on account of its being the most expeditious of all for the performance of multi- plications, involves the use of a number of lamellee or little plates of metal disposed in a box. Im an appendix of forty-one pages he gives his third method, “ local arithmetic,” which is performed on a chess-board, and depends, in principle, on the expression of numbers in the scale of radix 2. In the Rabdologia he gives the chrono- logical order of his inventions. He speaks of the canon of logarithms as “a me longo tempore elaboratum.” The other three methods he devised for the sake of those who would prefer to work with natural numbers ; and he mentions that the promptuary was his latest invention. In the preface to the appendix containing the local arith- metic he states that, while devoting all his leisure to the invention of these abbreviations of calculation, and to examining by what methods the toil of calculation might be removed, in addition to the logarithms, rabdologia, and promptuary, he had hit upon a certain tabular arithmetic, whereby the more troublesome operations of common arith- metic are performed on an abacus or chess-board, and which may be regarded as an amusement rather than a labour, for, by means of it, addition, subtraction, multiplication, division, and even the extraction of roots are accomplished simply by the motion of counters. He adds that he has appended

1 Rabdologie, seu Numerationis per virgulas Libri duo: Cum Appendice de expeditissimo Multiplicationis Promptuario. Quibus aecessit & Arithmetice Localis Liber unus. Authore & Inventore Toanne Nepero, Barone Merchistonti, &e., Scoto.

Edinburgi, Hxcu- debat Andreas Hart, 1617. af

Napierian, that is to say, logarithms to the base e where e ; but they are closely related to this

Therefore it may please you who are inclined to these studies, to receive it from me and the

it to the Radbdologia, in addition to the promptuary, because he did not wish to bury it in silence, nor to publish so small a matter by itself. With respect to the calculating rods, Napier mentions in the dedication that they had already found so much favour as to be almost in common use, and even to have been carried to foreign countries; and that he has been advised to publish his little work relating to their mechanism and use, lest they should be put forth in some one else's name.

John Napier died on April 4, 1617, the same year as that in which the Rabdologia was published, so that his death must have taken place very soon after its appear- ance. His will, which is extant, was signed on the fourth day before his death. No particulars are known of his last illness, but it seems likely that death came upon him rather suddenly at last. In both the Canon Mirvicus and the Rabdologia, however, he makes reference to his ill-health. In the dedication of the former he refers to himself as "mihi jam morbis pen? confecto," and in the "Admonitio" at the end he speaks of his "infirma vale- tudo"; while in the latter he says he has been obliged to leave the calculation of the new canon of logarithms to others "ob infirmam corporis nostri valetudinem."

It is usually stated that John Napier was buried in St Giles's church, Edinburgh, and there can be no doubt that some of the family of Napier were buried there in the 16th or 17th century, but the late Professor Wallace, in a paper read before the Society of Antiquaries of Scotland in 1832, and quoted by Mr Mark Napier on pp. 425-427 of his Memoirs of John Napier of Merchiston, gives evidence for believing that he was buried in St Cuthbert's church. Professor Wallace's words are—

‘ My authority for this belief is unquestionable. It is a Treatise on Trigonometry, by a Scotsman, James Hume of Godscroft, Berwickshire, a place still in possession of the family of Hume. The work in question, which is rare, was printed at Paris, and has the date 1636 on the title-page, but the royal privilege which secured it to the author is dated in October 1635, and it may have been written several years earlier. In his treatise (page 116) Hume says, speaking of logarithms, ‘L’inuenteur estoit un Seigneur de grande condition, et duquel la posterité est aujour- d’huy en possession de grandes dignitéz dans le royaume, qui estant sur lage, et grandement trauaillé des gouttes ne pouvait faire autre chose que de s’adonner aux sciences, et principalment aux mathe- matiques et & la logistique, 4 quoy il se plaisoit infiniment, et auec estrange peine, a construict ses Tables des Logarymes, im- primees & Edinbourg en l’an 1614… . Il monrut lan 1616, et fut enterré hors la Porte Occidentale d’Edinbourg, dans l’Kglise de Sainct Cudbert.’”

There can be no doubt that Napier’s devotion to mathe- matics was not due to old age and the gout, and that he died in 1617 and notin 1616; still these sentences were written within eighteen years of Napier’s death, and their author seems to have had some special sources of information. Additional probability is given to Hume’s assertion by the fact that Merchiston is situated in St Cuthbert’s parish. It is nowhere else recorded that Napier suffered from the gout.

The Canon Mirificus contains only an explanation of the use of the logarithms without any account of the manner in which the canon was constructed. In an “ Admonitio” on the seventh page he states that, although in that place the mode of construction should be explained, he proceeds at once to the use of the logarithms, “ut prelibatis prius usu, et rei utilitate, czetera aut magis placeant posthac edenda, aut minus saltem displiceant silentio sepulta.” He awaits therefore the judgment and censure of the learned “ priusquam czetera in lucem temere prolata lividorum detrectationi exponantur”; and in an « Admonitio” on the last page of the book he states that he will publish the mode of construction of the canon “si huius inventi usum eruditis gratum fore intellexero.”

Napier, as we have seen, died in 1617, immediately after the appearance of the Rabdologia, and before he had

published the promised account of the method of construc- tion of the canon. This work was, however, issued by Robert Napier, his second son by his second marriage, in 1619. The Constructio consists of a preface of two pages, followed by sixty-seven pages of text. In the preface Robert Napier says that he has been assured from undoubted authority that the new invention is much thought of by the ablest mathematicians, and that nothing would delight them more than the publication of the mode of construc- tion of the canon. He therefore issues the work to satisfy their desires, although, he states, it is manifest that it would have seen the light in a far more perfect state if his father could have put the finishing touches to it; and he mentions that, in the opinion of the best judges, his father possessed, among other most excellent gifts, in the highest degree the power of explaining the most difficult matters by a certain and easy method in the fewest possible words.

It is important to notice that in the Constructio log- arithms are called artificial numbers; and Robert Napier states that the work was composed several years (aliquot annos) before Napier had invented the name logarithm. The Constructio therefore may have been written a good many years previous to the publication of the Descriptio in

1614.2

The Canon Mirificus, on its appearance in 1614, at once attracted the attention of perhaps the two most eminent English mathematicians then living—Edward Wright and Henry Briggs. The former, as we have seen, translated the work into English, but died in 1615 before he could publish his translation. The latter was concerned with Napier in the change of the logarithms from those originally invented to decimal or common logarithms, and it is to him that the original calculation of the logarithmic tables now in use is mainly due (see Brrees). He died on January 26, 1631, aged about seventy-four years, so that at the time of the publication of the Canon Mirificus he was about fifty-seven years of age. In a letter to Archbishop Ussher, dated Gresham House, March 10, 1615, Briggs wrote,

‘“Napper, lord of Markinston, hath set my head and hands a work with his new and admirable logarithms. I hope to see him this summer, if it please God, for I never saw book which pleased me better, or made me more wonder.’ I purpose to discourse with him

1 The full title was—Mirifict logarithmorum canonis constructio; Et eorum ad naturales ipsorum numeros habitudines; und cum Appen- dice, de alia eAque prestantiore Logarithmorum specie condenda. Quibus accessere Propositiones ad triangula spherica faciliore calculo resolvenda: Und cum Annotationibus aliquot doctissini D. Henrict Briggii, in eas & memoratam appendicem. Authore & Inventore foanne Nepero, Barone Merchistonii, &c. Scoto. Ldinburgi, Excude- bat Andreas Hart, Anno Domini 1619. There is also preceding this title-page an ornamental title-page, similar to that of the Canon Mirt- jicus of 1614; the words are different, however, and rnn—Mitrifici logarithmorum canonis descriptio . . . Accesserunt Opera Posthuma: Primo, Mirifici ipsius canonis constructio, & TLogarithmorum ad naturales ipsorum numeros habitudines. Secundd, A ppendiz de alia, edque prestantiore Logarithmorum specie construenda. Tertis, Pro- positiones quedam eminentissine, ad Triangula spherica mira factli- tate resolvenda. .... It would thus appear that the Canonis Descriptio and the Canonis Constructio were issued together in 161 g, or that at all events this was the intention.

- Both the Descriptio and Constructio were reprinted by Bartholomew Vincent at Lyons in 1620, and issued together under the title Logarith- morum Canonis Descriptio, seu

3 Dr Thomas Smith thus describes the ardour with which Briggs studied the Canon Miérijicus :—‘‘ Hunce in deliciis habuit, in sinu, in manibus, in pectore gestavit, oculisque avidissimis, et mente attentis- sima, iterum iterumque perlegit, . . .” Vite quorundam eruditisst- morum et illustrium virorum (London, 1707).

NAPIER

[OF MERCHISToN,

concerning eclipses, for what is there which we may not hope for at his hands” ; and he also states “ that he was wholly taken up and employed about the noble invention of logarithms, lately discovered.” In the summer of 1615 he went to Merchiston and stayed with Napier a whole month; he repeated his visit in 1616, and, as he states, he “would have been glad to make him a third visit, if it had pleased God to spare him so long.” William Lilly, the astrologer, in his Life and Times, 1721, gives the fol- lowing account of the meeting between Napier and Briggs on the occasion of the first visit :—

“*T will acquaint you with one memorable story, related unto me by Mr John Marr, an excellent mathematician and geometrician, whom I conccive you remember: he was servant to King James and Charles I. At first, when the Lord Napier, or Marchiston, first made publick his logarithms, Mr Briggs, then reader of the Astro- nomy Iccture at Gresham College in London, was so surprised with admiration of them that he could have no quictness in himself, until he had secn that noble person the Lord Marchiston whose only invention they were: he acquaints John Marr herewith, who went into Scotland before Mr Briggs, purposely to be there when these two so learned persons should meet. Mr Briggs appoints a certain day when to meet at Edinburgh: but failing thereof, the Lord Napier was doubtful he would not come. It happened one day as John Marrand the Lord Napier were speaking of Mr Briggs ; ‘Ah, John,’ saith Marchiston, ‘Mr Briggs will not now come’; at the very instant one knocks at the gate; John Marr hasted down and it proved Mr Briggs to his great contentment. He brings Mr Briggs up into my Lord’s chamber, where almost one quarter of an hour was spent, each beholding the other almost with admira- tion, before one word was spoke. At last Mr Briggs began— ‘My Lord, I have undertaken this long journey purposely to see your person, and to know by what engine of wit or ingenuity you came first to think of this most excellent help unto Astronomy, viz., the Logarithms; but my Lord, being by you found out, I wonder nobody else found it out before, when now known it is so easy.’ He was nobly entertained by the Lord Napier, and every summer after that, during the Lord’s being alive, this venerable man, Mr Briggs went purposely into Scotland to visit him.”

With respect to the change of the logarithms to decimal logarithms, the concluding paragraph of the ‘‘ Admonitio” which appears on the last page of the Canon of 1614 is “‘‘Verum si huius inventi usum eruditis gratum fore intel- lexero, dabo fortasse brevi (Deo aspirante) rationem ac methodum aut hunc canonem emendandi, aut emendatiorem de novo condendi, ut ita plurium Logistarum diligentia, limatior tandem et accuratior, quam unius opera fieri potuit, in lucem prodeat. Nihil in ortu perfectum.” In some copies, however, this “Admonitio” is absent. In Wright’s translation of 1616 Napier has added the sentence—“‘ But because the addition and subtraction of these former numbers may seeme somewhat painfull, I intend (if it shall please God) in a second Edition, to set out such Logarithmes as shall make those numbers above written to fall upon decimal numbers, such as 100,000,000, 200,000,000, 300,000,000, &c., which are easie to be added or abated to or from any other number” (p. 19); and in the dedication to the Rabdologia (1617) he wrote “ Quorum quidem Logarithmorum speciem aliam multd prestan- tiorem nunc etiam invenimus, & creandi methodum, und cum eorum usu (si Deus longiorem vite & valetudinis usuram concesserit) evulgare statuimus; ipsam autem novi canonis supputationem, ob infirmam corporis nostri valetudinem, viris in hoc studii genere versatis relin- quimus : imprimis verd doctissimo viro D. Henrico Briggio Londini publico Geometrizx Professori, et amico mihi longé charissimo.”

Briggs published in 1617, after Napier’s death, his Logarithmorum Chilias Prima, containing the decimal logarithms of the first thousand numbers to 14 places of decimals. This isthe first table of common (or Briggian) logarithms calculated or published. In 1624 he published his Arithmetica Logarithmica, containing the logarithms of the first 20,000 numbers and of the numbers from 90,000 to 100,000 to 14 places of decimals. In the short preface

to the Chilias (1617) Briggs states that the reason why his logarithms are different from those introduced by Napier “sperandum, ejus librum posthumum, abunde nobis propediem satisfacturum.” The “liber posthumus”

was the Constructio (1619), in the preface to which Robert

Napier states that he has added an appendix relating to another and more excellent species of logarithms referred to by the inventor himself in the Rabdologia, and in which the logarithm of unity is0. He also mentions that he has published some remarks upon the propositions in spherical trigonometry and upon the new species of logarithms by Henry Briggs, “qui novi hujus Canonis supputandi laborem gravissimum, pro singulari amicitia que illi cum Patre meo L. M. intercessit, animo libentissimo in se suscepit ; creandi methodo, et usuum explanatione Inventori relictis. Nunc autem ipso ex hac vita evocato, totius negotii onus doctis- simi Briggii humeris incumbere, et Sparta hee ornanda illi sorte quadam obtigisse videtur.” In the address pre- fixed to the Arithmetica Logarithmica (1625) Briggs bids the reader not to be surprised that these logarithms are different from those published in the Canon Mirificus :— “Fgo enim, cum meis auditoribus Londini, publice in Collegio Greshamensi horum doctrinam explicarem; animadverti multo futurum commodius, si Logarithmus sinus totius servaretur 0 (ut in Canone mirifico) Logarithmus autem partis decimz ejusdem sinus totius, nempe sinus 5 graduum, 44, m. 21, s., esset 10000000000. atque ea de re scripsi statim ad ipsum authorem, et quampriinum per anni tempus, et vacationem a publico docendi munere licuit, profectus sum Edinburgum; ubi humanissime ab eo acceptus hesi per integrum mensem. Cum autem inter nos de horum mutatione sermo haberetur ; ille se idem dudum sensisse, et cupivisse dicebat: veruntamen istos, quos jam paraverat edendos curasse, donec alios, si per negotia et valetudinem liceret, magis commodos confecisset. Istam autem mutationem ita faciendam censebat, ut 0 esset Log- arithmus unitatis, et 10000000000 sinus totius: quod ego longe commodissimum esse non potui nou agnoscere. Ccepi igitur, ejus hortatu, rejectis illis quos anted paraveram, de horum calculo serio cogitare; et sequenti xstate iterum profectus Edinburgum, horum

quos hic exhibeo precipuos, illi ostendi. idem etiam tertia estate

libentissime facturus, si Deus illum nobis tamdiu superstitem esse voluisset.”

There is also a reference to the change of the logarithms on the title-page of the work.1

These extracts contain all the original statements made by Napier, Robert Napier, and Briggs which have reference to the origin of decimal logarithms. It will be seen that they are all in perfect agreement. Briggs pointed out in his lectures at Gresham College that it would be more convenient that 0 should stand for the logarithm of the whole sine as in the Canon Mirificus, but that the logarithm of the tenth part of the whole sine (that is to say, of the sine of 5° 44’ 21”) should be 10,000,000,000. He wrote also to Napier at once; and as soon as he could he went to Edinburgh to visit him, where, as he was most hospitably received by him, he remained for a whole month. When they conversed about the change of system, Napier said that he had felt and desired the same thing, but that he had published the tables which he had already prepared, so that they might be used until he could con- struct others more convenient. But he considered that the change ought to be so made that 0 should be the logarithm of unity and 10,000,000,000 that of the whole sine, which Briggs could not but admit was by far the most convenient of all. Rejecting therefore those which he had prepared already, Briggs began, at Napier’s advice, to consider seriously the question of the calculation of new tables. In the following summer he went to Edinburgh and showed Napier the principal portion of the logarithms which he published in 1624. These probably included

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: The title runs as follows :—Arithmetica Logarithmica, sive Log- arithmorum chiliades triginta. ... Hos numeros primus invenit clarissimus vir lohannes Neperus Baro Merchistonij ; eos autem ex

etusdem sententia mutavit, eorumque ortum et usum illustravit Henri- cus Briggius. .

the logarithms of the first chiliad which he published in

1617.

Unfortunately Hutton in his history of logarithms, which was prefixed to the early editions of his Mathematical Tables, and was also published as one of his Mathematical Tracts, has charged Napier with want of candour in not telling the world of Briggs's share in the change of system, and he expresses the suspicion that "' Napier was desirous that the world should ascribe to him alone the merit of this very useful improvement of the logarithms." Accord- ing to Hutton's view, the words "7 zs to be hoped that his posthumous work". . . . which occur in the preface to the Chilias, were a modest hint that the share Briggs had had in changing the logarithms should be mentioned, and that, as no attention was paid to it, he himself gave the account which appears in the Arithmetica of 1624. 'There seems, however, no ground whatever for supposing that Briggs meant to express anything beyond his hope that the reason for the alteration would be explained in the posthumous work ; and in his own account, written seven years after Napier's death and five years after the appearance of the work itself, he shows no injured feeling whatever, but even goes out of his way to explain that he abandoned his own proposed alteration in favour of Napier's, and, rejecting the tables he had already constructed, began to consider the calculation of new ones. The facts, as stated by Napier and Briggs, are in complete accordance, and the friendship existing between them was perfect and unbroken to the last. Briggs assisted Robert Napier in the editing of the "posthumous work," the Constructio, and in the account he gives of the alteration of the logarithms in the Arithmetica of 1624 he seems to have been more anxious that justice should be done to Napier than to himself; while on the other hand Napier received Briggs most hospitably and refers to him as "amico mihi longé charissimo."

Hutton's unfair suggestions are all the more to be regretted as they occur in a history which is the result of a good deal of investigation, and which has been referred to as an authority by many English and foreign writers. He seems to have felt a strong prejudice against Napier for some reason, and all his statements with regard to the origin of logarithms and Napier's connexion with them are untrustworthy. While speaking of the change of the logarithms, it should be noticed that the "« Admonitio" on the last page of the Canon Mirificus, containing the refer- ence to the new logarithms, does not occur in all the copies. It is printed on the back of the last page of the table itself, and so cannot have been torn out from the copies that are

without it. As there could have been no reason for omit- ting it after it had once appeared, we may assume that the copies which do not have it are those which were first issued. It is probable therefore that Briggs's copy con- tained no reference to the change, and it is even possible that the " Admonitio" may have been added after Briggs had communicated with Napier. As special attention has not been drawn to the fact that some copies have the "« Admonitio" and some have not, different writers have assumed that Briggs did or did not know of the promise contained in the '""Admonitio" according as it was present or absent in the copies they had themselves referred to, and this has given rise to some confusion. It ought also to be borne in mind that had Napier lived to publish the Constructio himself, he would probably have referred to Briggs in much warmer terms than those used by Robert Napier, who doubtless regarded it as due to his father's memory to simply state the facts as he knew them. The character of Briggs is very amiable and perfect ; he states with modesty and simplicity his own share in the improvement; and with complete loyalty to his friend, and

with great earnestness, he devoted the rest of his life to extend the utility of Napier's splendid invention.

Napier's original canon is a table of logarithms of sines, and it was clearly Briggs's original intention to calculate logarithms of sines also; it does not appear from the account he gives who it was who first suggested the tabulation of the logarithms of numbers instead of sines.

Kepler received the invention of logarithms with great enthusiasm. His first mention of them occurs in a letter to Schikhart dated March 11, 1618, in which he writes —"Extitit Scotus Baro, cujus nomen mihi excidit, qui preclari quid preestitit, necessitate omni multiplicationum et divisionum in meras additiones et subtractiones com- mutata, nec sinibus utitur: at tamen opus est ipsi tangentium canone: et varietas, crebritas, difficultasque additionum subtractionumque alicubi laborem multiplicandi et dividendi superat." This erroneous estimate was formed when he had seen the Canon Mirificus but had not read it ; and his opinion was very different when he became ac- quainted with the nature of logarithms. The dedication of his

Hphemercs for 1620 consists of a letter to Napier dated July 28, 1619, and he there congratulates him warmly on his invention and on the benefit he has conferred upon astronomy generally and also upon his own Rudolphine tables. He says that, although Napier's book had been pub- lished five years, he first saw it at Prague two years before; he was then unable to read it, but last year he had met with a little work by Benjamin Ursinus! containing the substance of the method, and he at once recognized the importance of what had been effected. He then explains how he verified the canon, and so found that there were no essential errors init, although there were a few inaccuracies near the begin- ning of the quadrant, and he proceeds, " Heec te obiter scire volui, ut quibus tu methodis incesseris, quas non dubito et plurimas et ingeniosissimas tibi in promptu esse, eas publici juris fieri, mihi saltem (puto et ceteris) scires fore gratis- simum ; eoque percepto, tua promissa folio 57, in debitum cecidisse intelligeres." This letter was written two years after Napier's death, of which Kepler was ignorant, and in the same year as that in which the Constructio was published. In 1624 Kepler published a table of N. apierian logarithms, with certain modifications and additions.

In a letter from Kepler to Petrus Cugerus there occurs the remarkable sentence—" Nihil autem supra N eperianam rationem esse puto: etsi quidem Scotus quidam literis ad Tychonem A. ciotoxcrv. scriptis jam spem fecit Canonis illus Mirifici." It is here distinctly stated that some Scotsman in the year 1594, in a letter to Tycho Brahe, gave him some hope of the logarithms; and as Kepler joined Tycho after his expulsion from the island of Huen, and had been so closely associated with him in his work, he would be likely to be correct in any assertion of this kind. In connexion with Kepler's statement the following

story, told by Anthony Wood in the Athene Oxonienses, should be noticed : —

''It must be now known, that one Dr Craig, a Scotchman. . . coming out of Denmark into his own country, called upon Joh. Neper, Baron of Mercheston, near Edinburgh, and told him, among other discourses, of a new invention in Denmark (by Longomontanus, as "tis said), to save the tedious multiplication and division in astro- nomical calculations. Neper

being solicitous to know farther of him concerning this matter, he could give no other account of it than that it was by Penne! numbers. Which hint Neper taking, he desired him at his return to call upon him again. Craig, after some weeks had passed, did so, and Neper then showed him

1 The title of this work is—Benjaminis Ursint . . . Cursus Mathe- matict Practict volumen Primum continens Illustr. & Generost Dn, Dn. Johannis Neperi Baronis Merchistontj de, Scott. Trigonometriam logarithmicam Usibus discentium accommodatam … Colonix gar Cl) IOC XIX. At the end, Napier's table is reprinted, but to two figures less. As this work was published in 1619, and Vincent's reprint of the Descriptio and Constructio not till 1620, it forms the earliest publication of logarithms on the Continent,

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a rude draught of what he called Canon mirabilis Logarithmorum. Which draught, with some alterations, he printing in 1614, it came forthwith into the hands of our author Briggs, and into those of Will. Oughtred, from whom the relation of this matter came."

Longomontanus was Tycho's assistant, and this story, though obviously untrue in its facts, is of importance, as it connects Dr Craig with Napier and Longomontanus. In the early part of this article Thomas Craig was mentioned as one of the colleagues of Sir Archibald Napier, John Napier's father, in the office of justice-depute. He is well known as the author of a celebrated legal work De Feudis, and between his third son John Craig and John Napier a friendship sprang up which may have been due to their common taste for mathematics. There are extant three letters from Dr John Craig to Tycho Brahe, which show that he was on the most friendly terms with him. In the first letter, of which the date is not given, Craig says that Sir William Stewart has safely delivered to him, "about the beginning of last winter," the book which he sent him. Now Mr Mark Napier found in the library of the univer- sity of Edinburgh a mathematical work bearing a sentence in Latin of which the translation is "To Doctor John Craig of Edinburgh, in Scotland, a most illustrious man, highly gifted with various and excellent learning, professor of medicine, and exceedingly skilled in the mathematics, Tycho Brahe hath sent this gift, and with his own hand written

this at Uraniburg, 2d November 1588." As Sir William Stewart was sent to Denmark to arrange the pre- liminaries of King James's marriage, and returned to Edinburgh on November 15, 1588, there can be little doubt that this was the volume referred to by Craig. It appears from Craig's letter, to which we may therefore assign the date 1589, that, five years before, he had made an attempt to reach Uraniburg, but had been baffled by the storms and rocks of Norway, and that ever since then he had been longing to visit Tycho. Now John Craig was physician to the king, and in 1590 James VI. spent some days at Uraniburg before returning to Scotland from his matrimonial expedition. It seems not unlikely therefore that Craig may have accompanied the king in his visit to Uraniburg. In any case it is certain that Craig was a friend and correspondent of Tycho's, and there can be but little doubt that he was the "Scotus quidam."

It is therefore clear that as early as 1594 Napier must have communicated to Craig his hope of being able to effect the simplification of the processes of arithmetic. Everything tends to show that the invention of logarithms was the result of many years of labour and thought, under- taken with this special object, and it thus appears that Napier had seen some prospect of success nearly twenty years before the publication of the Canon Mirijicus. It is very evident that no mere hint with regard to the use of proportional numbers could have been of any service to Napier, but it is possible that the news brought by Craig of the difficulties placed in the progress of astronomy by the labour of the calculations may have stimulated him to persevere in his efforts.

The "new invention in Denmark" to which Anthony Wood refers as having given the hint to Napier was probably the method of calculation called prosthapheresis (often written in Greek letters tpooOadalpeois), which had its origin in the solution of spherical triangles2 The method consists in the use of the formula

sina sinb=}{cos(a-6)—cos(a+d)}, by means of which the multiplication of two sines is

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2 A careful examination of the history of the method is given by Scheibel in his Hinlettung zur mathematischen Biicherkenntniss, Stick vii. (Breslau, 1775), pp. 13-20; and there is also an account in Kastner's Geschichte der Mathematik, vol. i. (1796), pp. 566-569 ; in Montucla's Histoire des Mathématiques, vol. i. pp. 583-585 and 617- 619: and in Kliigel's Worterbuch (1808), article ‘‘ Prosthapheresis."

reduced to the addition or subtraction of two tabular results taken from a table of sines; and, as such products occur in the solution of spherical triangles, the method affords the solution of spherical triangles in certain cases by addition and subtraction only. It seems to be due to Wittich of Breslau, who was assistant for a short time to Tycho Brahe ; and it was used by them in their calcula- tions in 1582. Wittich in 1584 made known at Cassel the calculation of one case by this prosthapheresis ; and Justus Byrgius proved it in such a manner that from his proof the extension to the solution of all triangles could be deduced. Clavius generalized the method in his treatise De Astrolabio (1593), lib. i. lemma lili. The lemma com- mences as follows :—

"« Questiones omnes, que per sinus, tangentes, atgue secantes absolvi solent, per solam prosthaphzresim, id est, per solam additionem, sub- tractionem, sine laboriosa numerorum multiplicatione divisioneque expedire.

"Hdidit ante tres quatuorve annos Nicolaus Raymarus Ursus Dithmarsus libellum quendam, in quo preter alia proponit inven- tum sane acutum, et ingeniosum, quo per solam prosthapheeresim pleraque triangula spherica solvit. Sed quoniam id solum putat fieri posse, quando sinus in regula proportionum assumuntur, et sinus totus primum locum obtinet, conabimur nos eam doctrinam magis generalem eflicere, ita ut non solum locum habeat in sinibus, et quando sinus totus primum locum in regula proportionum obtinet, yerum etiam in tangentibus, sccantibus, sinibus versis et aliis numeris, et sive sinus totus sit in principio regule proportionum, sive in medio, sive denique nullo modo interveniat: que res nova omnino est, ac jucunditatis et voluptatis plena."

The work of Raymarus Ursus, referred to by Clavius, is his Pundamentum Astronomicum (1588). Longomontanus, in his Astronomia Danica (1622), gives an account of the method, stating that it is not to be found in the writings of the Arabs or Regiomontanus. As Longomontanus is mentioned in Anthony Wood's anecdote, and as Wittich as well as Longomontanus were assistants of Tycho, there seems little room for doubt that Wittich's prosthapheresis is the method referred to by Wood.

In 1610 Herwart ab Hohenburg published at Munich a multiplication table extending to 1000 × 1000, a huge folio volume of more than a thousand pages; and some writers, misled by the title,! have supposed that it contained logarithms. It appears from a correspondence between Kepler and Herwart,? which took place at the end of 1608, that Herwart used his table when in manuscript for the performance of multiplications in general, and that the occurrence of the word prosthapheresis on the title is due to Kepler, who pointed out that by means of the table spherical triangles could be solved more easily than by Wittich's prosthaphzeresis.

It is evident that Wittich's prosthapheresis could not be a good method of practically effecting multiplications unless the quantities to be multiplied were sines, on account of the labour of the interpolations. It satisfies the con- dition, however, equally with logarithms, of enabling multiplication to be performed by the aid of a table of Single entry ; and, analytically considered, it is not so different in principle from the logarithmic method. In fact, if we put ry = (X + Y), X being a function of x only and Y a function of y only, we can show that we must have X=Ac*, y=Be"; and if we put ay=¢(X+Y) ~$(X—Y), the solutions are d(X+Y)=}(x+y)%, and =sinX, y=sinY, $(X+Y)=—4cos(X+Y). The

) Tabule arithmetice mpocOadatperews universales, quarum sub- sidio humerus quilibet, ex multiplicatione producendus, per solam additionem ; et quotiens quilibet, e divisione eliciendus, per solam sub- tractionem, sine tediosd, & lubricd Multiplicationis, atque Divisionis Operatione, etiam ab eo, qui Arithmetices non admodum sit gnarus, ee, ecleriter & nullo negotio invenitur.

The correspondence is printed in Frisch's cdition of Kepler's works, ip. W. pp. 527-530. See also a paper ''On Multiplication by a ee of Single Entry,"

in the Philosophical Magazine for November

former solution gives a method known as that of quarter- squares ; the latter gives the method of prosthapheresis.

An account of the logarithmic table of Justus Byrgius is given in the article LocariTHms.

The more one considers the condition of science at the time, and the state of the country in which the discovery took place, the more wonderful does the invention of logarithms appear. When algebra had advanced to the point where exponents were introduced, nothing would be more natural than that their utility as a means of performing multiplications and divisions should be remarked ; but it is one of the surprises in the history of science that logarithms were invented as an arithmetical improvement years before their connexion with exponents was known. It is to be noticed also that the invention was not the result of any happy accident. Napier deliberately set himself to abbreviate multiplications and divisions,— operations of so fundamental a character that it might well have been thought that they were in rerum natura incapable of abbreviation; and he succeeded in devising, by the help of arithmetic and geometry alone, the one great simplifica- tion of which they were susceptible,—a simplification to which the following two hundred and seventy years have added nothing.

When Napier published the Canon Mirificus England had taken no part in the advance of science, and there is no British author of the time except Napier whose name can be placed in the same rank as those of Copernicus, Tycho Brahe, Kepler, Galileo, or Stevinus. In England, Robert Recorde had indeed published his mathematical treatises, but they were of trifling importance and without influence on the history of science. Scotland had produced nothing, and was perhaps the last country in Europe from which a great mathematical discovery would have been expected. Napier lived, too, not only in a wild country,

which was in a lawless and unsettled state during most of

his life, but also in a credulous and superstitious age. Like Kepler and all his contemporaries he believed in astrology, and he certainly also had some faith in the power of magic, for there is extant a deed written in his own handwriting containing a contract between himself and Robert Logan of Restalrig, a turbulent baron of des- perate character, by which Napier undertakes “to serche and sik out, and be al craft and ingyne that he dow, to tempt, trye, and find out” some buried treasure supposed to be hidden in Logan’s fortress at Fastcastle, in considera- tion of receiving one-third part of the treasure found by his aid. In the deed Logan also agrees to conduct Napier from Edinburgh to Fastcastle and back again, without his being despoiled of his third part or otherwise harmed, when the deed is to be cancelled and destroyed asa dis- charge in full. ‘And incaiss the said Jhone sal find na poiss to be thair eftir all tryall and utter diligens tane ; he referris the satisfactione of his trawell and painis to the discretione of the said Robert.” Of this singular contract, which is signed “Robert Logane of Restalrige” and “‘Jhone Neper, Fear of Merchiston,” and is dated July 1594, a facsimile is given in Mr Mark Napier’s Afemoirs.? As the deed was not destroyed, but is in existence now, it is to be presumed that the terms of it were not fulfilled ; but the fact that such a contract should have been drawn

3 Of the contract itself Mr Mark Napier writes: ‘*The singularity of his holding conference with one who had just been proclaimed an out- law, and whose lawless violence is alluded to and provided against by Napier himself, must be accounted for by the rude state of society, and the simplicity of our philosopher’s character. He took care to word the contract itself, however, and there is not an expression which indi- cates an idea beyond the most legitimate purpose ; but, under the shield of his own innocence, he never dreamed of contamination from his company, was fond of the romance of science, and not averse (nothing derogatory in his times) to the prospect of gold.” —Memoitrs, p. 223,

up by Napier himself affords a singular illustration of the state of society and the kind of events in the midst of which logarithms had their birth. Considering the time in which he lived, Napier is singularly free from

supersti- tion: his Plaine Discovery relates to a method of interpre- tation which belongs to a later age; he shows no trace of the extravagances which occur everywhere in the works of Kepler; and none of his writings contain any allusion to

astrology or magic. :

After Napier's death his manuscripts and notes came into the possession, not of his eldest son Archibald, but of his second son by his second marriage, Robert, who edited the Constructio ; and Colonel Milliken Napicr, Robert's lineal male representative, was still in the possession of many of these private papers at the close of the last century. On one occasion when Colonel Napier was called from home on foreign service, these papers, together with a portrait of John Napier and a Bible with his autograph, were deposited for safety in a room of the house at Milliken, in Renfrew- shire. During the owner's absenee the house was burned to the ground, and all the papers and relics were destroyed. The manu- scripts had'not been arranged or examined, so that the extent of the loss is unknown. Fortunately, however, Robert Napier had transcribed his father's manuscript De Arte Logistica, and the copy escaped the fate of the originals in the manner explained in the following note, written in the volume containing them by Francis, seventh Lord Napier:—" John Napier of Merchiston, inventor of the logarithms, left his manuscripts to his son Robert, who appears to have eaused the following pages to have been written out fair from his father's notes, for Mr Briggs, professor of geometry at Oxford. They were given to Francis, the fifth Lord Napier, by William Napier of Culcreugh, Esq., heir-male of the above-named Robert. Finding them in a neglected state, amongst my family papers, I have bound them together, in order to preserve them entire.—NAPIER, 7th March 1801."

An account of the contents of these manuscripts was given by Mr Mark Napier in the appendix to his Memoirs of John Napier, and the manuscripts themselves were edited in their entirety by him in 1889 under the title De Arte Logistica Jounnis Naperi Mer- chistonit Baronis Libri qui supersunt. Impressum Ldinburgi M.DCOO.XXX.Ix., as one of the publications of the Bannatyne Club. The treatise occupies one hundred and sixty-two pages,

and there is an introduction by Mr Mark Napier of ninety-four pages. The Arithmetic consists of three books, entitled—(1) De Compu- tationibus Quantitatum omnibus Logistics speciebus communium ; (2) De Logistica Arithmetica; (3) De Logistica Geometrica. At the end of this book occurs the note—‘‘I could find no more of this geometricall pairt amongst all his fragments.” The Algebra Joannis Naperi Merchistonti Baronis consists of two books :—(1) ‘‘De nominata Algebree parte; (2) De positiva sive cossica Algebre parte,” and concludes with the words, ‘There is no more of his algebra orderlie sett doun.” The transcripts are entirely in the handwriting of Robert Napier himself, and the two notes that have been quoted prove that they were made from Napier’s own papers. The title, which is written on the first leaf, and is‘also in Robert Napier’s writing, runs thus:—‘‘ The Baron of Merchiston his booke of Arithmeticke and Algebra. For Mr Henrie Briggs, Professor of Geometrie at Oxforde.”

These treatises were probably composed before Napier had invented the logarithms or any of the apparatuses described in the Rabdologia ; for they contain no allusion to the principle of loga- rithms, even where we should expect to find such a reference, and the one solitary sentence where the Rabdologia is mentioned (‘sive omnium facillime per ossa Rhabdologie nostre”) was no doubt added afterwards. It is worth while to notice that this reference occurs in a chapter “‘ De Multiplicationis et Partitionis compendiis miscellaneis,” which, supposing the treatise to have been written in Napier’s younger days, may have been his earliest production on a subjeet over which his subsequent labours were to exert so enormous an influence.

Napier uses abundantes and defective for positive and negative, defining them as meaning greater or less than nothing (‘ Abun- dantes sunt quantitates majores nihilo: defective sunt quantitates minores nihilo”). The same definitions oecur also in the Canon Mirificus (1614), p. 5:—‘‘ Logarithmos sinuum, qui semper majores nihilo sunt, abundantes vocamus, et hoc signo +, aut nullo preno- tamus. Logarithmos autem minores nihilo defectivos vocamus, prenotantes eis hoc signum —.” Napier may thus have been the first to use the expression ‘‘quantity less than nothing.” He uses ‘‘radicatum”’ for power ; for root, power, exponent, his words are radix, radicatum, index.

Apart from the interest attaching to these manuscripts as the work of Napier, they possess an independent value as affording evidence of the exact state of his algebraical knowledge at the time when logarithms were invented. There is nothing to show whether the transcripts were sent to Briggs as intended and returned by him,

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or whether they were not sent' to him. Among the Merchiston papers is a thin quarto volume in Robert Napier's writing contain- ing a digest of the principles of alchemy; it 1s addressed to his son, and on the first leaf there are directions that it is to remain in his charter-chest and be kept secret except from a few. This treatise and the transcripts seem to be the only manuscripts which have escaped destruction.

The principle of. '' Napier's bones" may be easily explained by

imagining ten rectangular slips of cardboard, each divided into nine squares. In the top squares of the slips the ten digits are written, and each slip contains in its nine squares the first nine multiples of the digit which appears in the top square. With the exception of the top squares, every square is divided into two parts by a diagonal, the units being written on one side and the tens on the other, so that when a multiple con- sists of two figures they are separated by the diagonal. Fig. 1 shows the slips corresponding to the numbers 2, 0, 8, 5 placed side by side in contact with one another, and next to them is placed an- other slip containing, in squares without diagonals, the first nine digits. The slips thus placed in contact give the multiples of the number 2085, the digits in each parallelogram being added to- gether; for example, corresponding to the number 6 on the right hand slip, we : have 0, 8+38, 044, 2, 1; whence we find Fig. 1. 0, 1,5, 2,1 as the digits, written backwards, of 6 × 2085. The use of the slips for the purpose of multiplication is now evident ; thus to multiply 2085 by 736 we take out in this manner the multiples corresponding to 6, 3,7, and set down the digits as they are ob- tained, from right to left, shifting them back one

place and adding up the columns as in ordinary multiplication, viz., the figures as written down are—

12510 6255 14595

1534560

Napier’s rods or bones consist of ten oblong pieces of wood or other material with square ends. Each of the four faces of each rod contains multiples of one of the nine digits, and is similar to one of the slips just described, the first rod containing the multiples of 0, 1, 9, 8, the second of 0, 2, 9, 7, the third of 0, 3, 9, 6, the fourth of 0, 4, 9, 5, the fifth of 1, 2, 8, 7, the sixth of 1, 3, 8, 6, the seventh of 1, 4, 8, 5, the eighth of 2, 3, 7, 6, the ninth of 2, 4, 7,5, and the tenth of 8, 4, 6, 5. Each rod therefore contains on two of its faces multiples of digits which are com- plementary to those on the other two faces; and the multiples of a digit and of its comple- ment are reversed in position. The arrange- ment of the numbers on the rods will be evident from fig. 2, which represents the four faces of the fifth bar. The set of ten rods is thus equivalent to four sets of slips as described above, and by their means we may multiply every number less than 11,111, and also any number (consisting of course of not more than ten digits) which can be formed by the top digits of the bars when placed side by side. Of course two sets of rods may be used, aud by their means we may multiply every number less than 111,111,111, and so on. It will be All 8 | 2) noticed that the rods only give the multiples Ki of the number which is to be multiplied, or of 1g. 2. the divisor, when they are used for division, and it is evident that they would be of little use to any one who knew the multiplication table as far as 9×9. In multiplications or divisions of any length it is generally convenient to begin by forming a table of the first nine multiples of the multiplicand or divisor, and Napier’s bones at best merely provide such a table, and in an incomplete form, for the additions of the two figures in the same parallelogram have to be performed each time the rods are used. The Rabdologia attracted more general attention than the logarithms, and there were several editions on the Continent. An Italian translation was published by Locatello at Verona in 1623, and a Dutch translation by De Decker at Gouda in 1626. Ursinus published his Rhabdologia Neperiana at Berlin in 1623, and the Rabdologia itself was reprinted. at Lyons in 1626. Nothing

shows more clearly the rude state of arithmetical knowledge at the beginning of the 17th century than the universal satisfaction with which Napier’s invention was wel- comed by all classes and regarded as a real aid to calculation.

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Napier also describes in the Raddologia two sther larger rods to facilitate the extraction of square and cube roots. logia the rods above from the manuscript on arithmetic they are referred to as «bones ’” (ossa).

Besides the logarithms and the calculating rods or bones, Napier’s name is attached to certain rules and formule in spherical trigono- metry. ‘‘ Napier’s rules of circular parts,” which include the com- plete system of formule for the solution of right-angled triangles, may be enunciated as follows. Leaving the right angle out of con- sideration, the sides including the right angle, the complement of the hypotenuse, and the complements of the other angles are called the circular parts of the triangle. Thus there are five circular parts, a, b, 90°—A, 90°—c, 90°—B, and these are supposed to be arranged in this order (é.¢., the order in which they occur in the triangle) round a circle. Selecting any part and calling it the middle part, the two parts next it are called the adjacent parts, and the remaining two parts the opposite parts. The rules then are—

sine of the middle part = product of tangents of adjacent parts

= product of cosines of opposite parts.

These rules were published in the Canon Mirificus (1614), and Napier has there given a figure, and indicated a method, by means of which they may be proved directly. The rules are curious and interesting, but of very doubtful utility, as the formule are best remembered by the practical calculator in their unconnected form.

‘ Napier’s analogies” are the four formule—

cos$(a—b)

tan(A+B)= cota 5) oote” : tam (A — B)= ete cot bC tang(a+0) = SSP tamde, tan $(a—- 2) =e Bnd :

They were first published after his death in the Constructio among the formule in spherical trigonometry, which were the results of his latest work. Robert Napier says that these results would have been reduced to order and demonstrated consecutively but for his father’s death. Only one of the four analogies is actually given by Napier, the other three being added by Briggs in the remarks which are appended to Napier’s results. The work left by Napier is, however, rough and unfinished, and it is uncertain whether he knew of the other formule or not. They are, however, so simply deducible from the results he has given that all the four analogies may be properly called by his name. An analysis of the formule contained in the Deseriptio and Constructio is given by Delainbre in vol. i. of his Histoire de 1 Astronomie modcrne.

To Napier seems to be due the first use of the decimal point in arithmetic. Decimal fractions were first introduced by Stevinus in his tract Za Disme, published in 1585, but he used cumbrous exponents (numbers enclosed in cireles) to distinguish the different denominations, primes, seconds, thirds, &c. Thus, for example, he

would have written 123°456 as 123(0)4(1)5 (2)6@). In the Rab- dologia Napier gives an ‘‘ Admonitio pro Decimali Arithmetica,” in which he commends the fractions of Stevinus and gives an example of their use, the division of 861094 by 432. The quotient is written 1993,273 in the work, and 1993,2′7″3’” in the text. This single instance of the use of the decimal point in the midst of an arith- metical process, if it stood alone, would not suffice to establish a claim for its introduction, as the real introducer of the decimal point is the person who first saw that a point or line as separator was all that was required to distinguish between the integers and fractions, and used it asa permanent notation and not merely in the course of performing an arithmetical operation. The decimal point 1s, however, used systematically in the Constructio (1619), there being perhaps two hundred

decimal points altogether in the book. The decimal point is defined on p. 6 of the Constructio in the words :—‘‘In numeris periodo sic in se distinctis, quicquid post periodum notatur fractio est, cujus denominator est unitas cum tot cyphris post se, quot sunt figure post periodum. Ut 10000000-04 valet idem, quod 10000000,4,. Item 25-803, idem quod 25,8,03,. Item 9999998 ~~0005021, idem valet quod 9999998539245, & sic de ceteris.” On p. 8, 10502 is multiplied by 3°216, and the result found to be 33°774432; and on pp. 23 and 24 occur decimals not attached to integers, viz., ‘4999712 and 0004950. These examples show that Napier was in possession of all the conventions and attri~~ butes that enable the decimal point to complete so symmetrically our system of notation, viz., (1) he saw that a point or separatrix was quite enough to separate integers from decimals, and that no signs to indicate primes, seconds, &c., were required ; (2) he used ciphers after the decimal point and preceding the first significant figure ; and (3) he had no objection to a decimal standing by itself without ou Integer. Napier thus had complete command over decimal Tactions, and understood perfectly the nature of the decimal point.

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In the Labdo- are ealled ‘‘virgule,” but in the passage quoted

Briggs also used decimals, but in a form not quite so convenient as Napier. Thus he prints 63:0957379 as 630957379, viz., he prints a bar under the decimals; this notation first appears without any explanation in his ‘‘ Lucubrationes” appended to the Construetto. Briggs used the notation all his life, but in writing it, as appears from manuscripts of his, he added also a small vertical line jnst high enough to fix distinctly which two figures it was intended to separate: thus he might have written 630957379. The vertical line was printed by Oughtred and some of Briggs’s successors. It was a long time before decimal arithmetic came into general use, and all through the 17th century exponential marks were in conimon use. There seems but little doubt that Napier was the first to make use of a decimal separator, and it is curious that the separator which he used, the point, should be that which has been ultimately adopted, and after a long period of partial disuse.

The hereditary office of king's poulterer (Pultrie Regis) was for many generations in the family of Merchiston, and descended to John Napier. The office, Mr Mark Napier states, is repeatedly mentioned in the family charters as appertaining to the ‘‘ pultre landis” near the village of Dene in the shire of Linlithgow. The duties were to be performed by the possessor or his deputy ; and the king was entitled to demand the yearly homage of a present of poultry from the feudal holder. The pultrelands and the office were sold by John Napier in 1610 for 1700 marks. It has been erroneously asserted that Napier dissipated his means; there is no truth in this statement. With the sole exception of the pultre- lands all the estates he inherited descended undiminished to his posterity.

With regard to the spelling of the name, Mr Mark Napier states that among the family papers there exist a great many documents signed by John Napier. His usual signature was “ Jhone mveper, but in a letter written in 1608, and in all deeds signed after that date, he wrote ‘‘ hone Nepair.” His letter to the king prefixed to the Plaine Discovery is signed ‘‘John Napeir.” His own chil- dren, who sign deeds along with him, use every mode except Napier, the form now adopted by the family, and which is comparatively modern. In Latin he always wrote his name ‘‘Neperus.” The form ‘‘Neper” is the oldest, as John, third Napier of Merchiston, so spelt it in the 15th century.

Napier frequently signed his name ‘‘Jhone Neper, Fear of Mer- chiston.” He was ‘‘ Fear of Merchiston” because, more majorum, he had been invested with the fee of his paternal barony during the lifetime of his father, who retained the liferent. He has been some- times erroneously called ‘‘ Peer of Merchiston,” and in the 1645 edition of the Plaine Discovery he is so styled, probably by a misprint (see Mr Mark Napier's Memoirs, pp. 9 aud 173, and Libri qui supersunt, p. Xciv).

Napier's home at Merchiston is thus described by Sir Walter Scott in his Provincial Antiquities of Scotland :—‘‘ This fortalice is situated upon the ascent, and nearly upon the summit of the eminence called the Borough-moor-head, within a mile and a half of the city walls. In form it is a square tower of the 14th or 15th century, with a projection on one side. The top is battlcmented, and within the battlements, by a fashion more common in

Scotland than in England, arises a small building with a steep roof, like a stone cottage erceted on the top of the tower. . . The celebrated John Napier of Merchiston was born in this weather-beaten tower ; and a small room in the summit is pointed outas the study in which he secluded himself while engaged in the mathematical researches which led to his great discovery. The battlements of Merchiston tower command an extensive view of great interest and beauty." There is a view of Merehiston tower in Mr Mark Napier's A/emoirs of John Napier, and in the Libri qui supersunt.

One well-known character of the time, Dr Richard Napier, was cousin to John Napier. The eldest son of Alexander, sixth Napier of Merchiston, was Archibald, the father of John Napier ; his second son, named Alexander, settled at Exeter, and married an English lady by whom he had two sons, the eldest of whom, Robert, was the merchant, mentioned in the note near the beginning of this article as having been created a baronet. The second son was a fellow of Exeter College, Oxford, and became rector of Lynford, Buckingham- shire. He was a friend and pupil of Dr Simon Forman, a well-known Rosicrucian adept of the time, and at his death became the possessor of his secret manuscripts. Dr Richard Napier, who was more of a physician than a divine, was a great pretender to astro- logy, necromancy, and magical cures. There is a portrait of him in the Ashmolean Museum, Oxford (engraved in Mr Mark Napier's Memoirs), which is interesting on account of the similarity of some of the features to those of John Napier. It does not appear that there was ever any friendship or correspondence between John Napier and Richard Napier.

In 1787 An Account of the Life, Writings, and Inventions of John Napier of Mer- chiston was published at Perth by David Stewart, earl of Buehan, and Walter Minto, LL.D. It is a quarto work of one hundred and thirty-four pages, only twelve of whieh relate to the life of Napier, the rest being devoted to a eareful explanation of the eontents of his works. The partieulars given of Napier's life are very seanty, but, sueh as they are, they form the souree from whieh nearly all the notices of Napier whieh have appeared sinee have been drawn, The work

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has also given rise to the impression that there was but little chance of further information being obtained with respect to Napier's life. In 18384 Mr Mark Napier published his Memoirs of John Napier of Merchiston, his Life, Lineage, and Times, with a Ifistory of the Invention of Logarithms, a large quarto volume of five hundred and thirty-four pages. Mr Mark Napier, who had already devoted great attention to the history of Scotland with special reference to the families of Lennox and Napicr, had full access to all the charters and papers in the possession of the family, and he spared no pains in examining every document and investigating every point which seemed likely to throw light upon the life of Napier and the circumstances amidst which his life was passed. The

work contains a vast mass of general information relating to Napier and his rela-.

tives, and the people with whom he was brought into contact, besides much col- lateral matter which serves to illustrate the state of the country at the time. The facts relating to Napier's own life are so interwoven with the other contents of the volume, and the work is so large, that in the absence of an index it is very difficult to extract the comparatively small portion that relates to Napier himself. From this work, which is the sole authority upon the private events of Napier's life, all the facts given in this article with respect to his descent and personal history have been derived. 1n 1839 Mr Mark Napier completed his labonrs by editing Napier's uupublished manuscripts, of which he had only been able to give a résuméin the Memoirs, and to this he prefixed an introduction, the greater part of which, how- ever, is included inthe Memoirs. Three different portraits of Napier are known to be in existence; one was engraved as the frontispiece to the earl of Buchan's Account, and another forms the frontispiece to the Memoirs. There is also an engraving of Napier in Lilly's Life and Times (1822). Forau account of the con- tents of Napier's mathematical works and thcir place in the history of science, the reader is referred to Delambre's Histoire del' Astronomie moderne.

It may be useful to give, in conclusion, a list of Napicr's works with a brief state- ment of the contents of each. The works published in his lifetime are —(1) The Plaine Discovery (1593), containing an interpretation of the Book

of Revelation; (2) the Canonis Mirifici Logarithmorum Descriptio, containing the first annouuce- ment of the invention of logarithmsand a table of log sines, also the rules of circu- lar parts; (3) the Raddologia (1617), containing the description of Napier's bones, the promptuary, and the method of local arithmetic,—all three designed for the simplification of multiplications and divisions. The posthumous works are—(1) the Canonis Minyici Logarithmorum Constructio (1619), edited by his son Robert, con- taining an account of the mode of construction of the canon, and Napier's analogies ; this book is the first in which the decimal point was systematically employed ; (2) the treatise De Arte Logistica, edited by Mr Mark Napier in 1839, containing treatises on arithmetic and algebra, transcribed from Napier's notes by his son Robert, (J. W. L. G.)

NAPIER, Str WittraM Francis Patrick (1785-1860), the third son of Colonel and Lady Sarah Napier, and brother of Sir Charles and Sir George Napier, was born at Cellbridge, near Dublin, on the 17th of December 1785, He became an ensign in the Royal Irish Artillery in 1800, but at once exchanged into the 62d, and was put on half- pay in 1802. He was afterwards made a cornet in the Blues by his uncle the duke of Richmond, and exchanged into the 52d regiment. He obtained a company in a West India regiment, but exchanged again into the 43d when it was being trained at Shorncliffe under Sir John Moore, who took Napier into special favour, and won his ever- lasting gratitude. He served in Denmark, and was present at the engagement of Kioge, and, his regiment being shortly afterwards sent to Spain, he bore himself nobly through the retreat to Corunna, In 1809 he became aide-de-camp to his uncle in Ireland, but joined the 43d when ordered again to Spain. With the light brigade (the 43d, 52d, and 95th), under the command of General Craufurd, he marched to Talavera in the famous forced march which he has described in his //%story, and had a violent attack of pleurisy on the way. He, however, refused to leave Spain, was wounded on the Coa, and shot near the spine at Cazal Nova. His conduct was so conspicuous during the pur- suit of Masséna after he left the lines of Torres Vedras that he as well as his brother George was recommended for a brevet majority. He became brigade niajor, was present at Fuentes d'Onor, but had so bad an attack of ague that he was obliged to return to England. In England he fell in love with and married Caroline Fox, the daughter of General Henry Fox, with whom Moore had been in love in

Sicily. Three days after his marriage he again started for Spain, and was present at the storming of Badajoz, where his great friend Colonel M‘Leod was killed. In the absence of the new lieutenant-colonel he took command of the 43d regiment, and commanded it at the battle of Salamanca. After a short stay at home he again joined his regiment at the Pyrenees, and did his greatest military service at the battle of the Nivelle, where, with instinctive military insight, he secured the most strongly fortified part of Soult’s position, practically without orders. He served with his regiment at the battles of the Nive, Orthes, and Toulouse. For his services he was made brevet lieutenant-colonel, and one of the first C.B.’s. Like

his brother Charles he then entered the military college at Farnham. He commanded his regiment in the army of occupation in France until 1819, when he retired on half- pay. As it was impossible for him to live on his half-pay with a wife and family, he determined to become an artist, and took a house in Sloane Street, where he studied with George Jones, the academician. The years he had spent in France he had occupied in improving his general education, for it will hardly be believed that the author of the History of the War in the Peninsula could not spell or write respect- able English till that time. But his career was to be great in literature, not in art. The tendency appeared in an able review of Jomini in 1821, and in 1823 Mr Bicker- steth, afterwards Lord Langdale, suggested to him the expediency of writing a history of the Peninsular War. For some time he did not take kindly to the suggestion, but at last determined to become an author in order to defend the memory of Sir John Moore, and to prevent the glory of his old chief being overshadowed by that of Wellington. The duke of Wellington himself gave him much assistance, and handed over to him the whole of Joseph Bonaparte’s correspondence which had been taken at the battle of Vittoria ; this was all in cipher, but Mrs Napier, with great patience, discovered the keys. In 1828 the first volume of the History appeared, and it was at once seen that the great deeds of the Peninsular War were about to be fitly commemorated. The excitement which followed the publication of each volume is proved by the innumer- able pamphlets issued by thoge who believed themselves to be attacked, and by personal altercations with many distinguished officers. But the

success of the book was proved still more by the absence of competition than by these bitter controversies. The histories of Southey and Lord Londonderry fell still-born, and Sir George Murray, who had determined to produce the history, gave up the attempt in despair. This success was due to a combina tion of qualities which have justly secured for Napier the title of being the best military historian England has produced. The best military histories have always been written by eye-witnesses. It is impossible for a new generation to analyse the military combinations and under- stand the minute facts which account for the winning or losing of a battle, though it may often unravel political intrigues which were veiled to the eyes of contemporaries. Napier added to this qualification a wonderful insight into the nature of war, and was able to describe and understand the movements and feelings of the French as well as of the army in which he himself served. But neither contem- porary knowledge nor military ability could have made his History memorable without a peculiarly appropriate literary style. He knew well how to mingle passages relating to individuals with descriptions of military movements, and how to relieve the dryness of details by an occasional glance at more extended subjects. He possessed an enthusiastic admiration for nearly all the heroes whose deeds he touched on. His admiration for Napoleon was only second to that for Moore, and he could feel for Soult in defeat as well as for Wellington in the hour of victory. When in 1840 the last volume of the //istory was published, his fame not only in England but in France and Germany was safely established. His life during these years had been chiefly absorbed in his //story, but he had warmly sympathized with the movement for political reform which was agitating England. The Radicals of Bath pressed him to sit for their city, and it was commonly reported that if the re- formers had found it necessary to resort to force Colonel Napier would have been their commander-in-chief, In 1842 he was promoted major-general, and had given him the lieutenant-governorship of Guernsey. Here he found plenty of occupation in controlling the relations between

the soldiers and the inhabitants, and also found time to propound a complete scheme of reform for the govern- ment of the island. While he was at Guernsey his brother Charles had conquered Sind, and the attacks made on

the policy of that conquest brought William Napier again into the field of literature. In 1845 he published his History of the Conquest of Scinde, and in 1851 the corresponding History of the Administration of Scinde—books which in style and vigour rivalled the great History, but which, being written for controversial purposes, are not likely to maintain such an enduring popularity. In 1847 he re- signed his governorship, and in 1848 was made a K.C.B., and settled at Scinde House, Clapham Park. His time was fully occupied in defending his brother, in revising the numerous editions of his Hzstory which were being called for, and in writing letters to the 7%mes on every con- ceivable subject, whether military or literary. His energy is the more astonishing when it is remembered that he never recovered from the effects of the wound he had received at Cazal Nova, and that he often had to lie on his back for months together. His domestic life was shadowed by the incurable affliction of his only son, and when his brother Charles died in 1853 the world seemed to be darkening round him. He de- voted himself to writing the life of that brother, which appeared in 1857, and which is in many re- spects hismost characteristic book. In the end of 1853 his younger brother, Captain Henry Napier, R.N., the historian of Florence, died, and in 1855 his brother Sir George. Inspired by his work, he lived on till the year 1860, when, broken by trouble, fatigue, and ill-health, he died (on February 12) at Clapham.

As a military historian Sir William Napier is incomparably superior to any other English writer, and his true com-

eers are Thucydides, Cesar, and Davila. All four had been soldiers in the wars they describe; all four possessed a peculiar insight into the mainsprings of action both in war and peace ; and all four pos- sessed a peculiar and inimitable style. Napier always wrote as if he was burning with an inextinguishable desire to express what he was feeling, which gives his style a peculiar spontaneity, and yet he rewrote the first volume of his History no less than six times. His descriptions of sieges and of battles are admirable by them- selves, and his analyses of the peculiarly intricate Spanish intrigues are even more remarkable, while the descriptions and analyses are both lit up with flashes of political wisdom and military insight. It is to be noted that he displays the spirit of the partisan, even when most impartial, and defends his opinions, even when most undoubtedly true,

as if he were arguing some controverted question. If his style was modelled on anything, it was on Czsar’s comment- aries, and a thorough knowledge of the writings of the Roman general will often explain allusions in Napier. The portraits of Sir John Moore and Colonel M‘Leod, and the last paragraphs descriptive of the storming of Badajoz, may be taken as examples of the great natural eloquence which arose from the loving recol- lection of friends, or the deep impression made by a most terrible Scene upon his vivid imagination.

<* Sir William Napier’s life, see his Life and Letters, edited by the Right pag i. A. Bruce (now Lord Aberdare), 2 vols., 1862. The dates of his a S are given above. The edition of the History published in 1851 is the ae , and contains the answers to various criticisms which sum up the eontro- ah arising from statements in the work, The French translation is by Count athieu Dumas. (H. M.S.)

NAPLES (Ital. Vapoli, Gr. and Lat. Veapolis), formerly the capital of the kingdom of the Two Sicilies, and. since 1860 the chief town of a province in the kingdom of Italy, 18 the largest and most populous city in the country, and disputes with Constantinople the claim of occupying the

most beautiful site in Europe. It is situated on the northern shore of the Bay of Naples (Sinus Cumanus), in 40° 52’ N. lat. and 14° 15’ 45” E. long., as taken from the lighthouse on the mole. By railit is distant 161 miles from Rome.

No other place in the world combines within the same compass so much natural beauty with so many objects of interest to the antiquary, the historian, and the geologist as the Bay of Naples. Its circuit is about 35 miles from the Capo di Miseno on the north-west to the Punta della Campanella on the south-east, or more than 52 miles if the islands of Ischia, at the north-west, and of Capri, at the south entrance, be included. At its opening between these two islands it is 14 miles broad; and from the opening to its head at Portici the distance is 15 miles. It affords good anchorage, with nearly 7 fathoms water, and is well sheltered, except from winds which blow from

Environs of Naples. points between south-east and south-west. There is a perceptible tide of nearly 9 inches.

On the north-east shore of the bay, east of Naples, is an extensive flat, forming part of the ancient Campania Feliz, and watered by the small stream Sebeto and by the Sarno, which formerly flowed by Pompeii. From this fiat, between the sea and the range of the Apennines, rises Vesuvius, at the base of which, on or near the sea-shore, are the town-like villages of San Giovanni Teduccio, Portici, Resina, Torre del Greco, Torre dell’ Annunziata, d&c., and the classic sites of Herculaneum and Pompeii. At the south-east extremity of the plain, 3 miles beyond the outlet of the Sarno, a great offshoot of the Apennines, branching from the main range near Cava,

and projecting as a peninsula more than 12 miles west, divides the Bay of Naples from the Bay of Salerno (Sinus Pestanus), and ends in the bold promontory of the Punta della Campanella (Promontorium Minerve), which is separated by a strait of 4 miles from Capri. On the north slope of this peninsula, where the plain ends and the coast abruptly bends to the west, stands the town of Castellammare, near the site of Stabizw, at the foot of Monte Sant' Angelo, which rises suddenly from the sea to a height of 4722 feet. Farther west, and nearly opposite to Naples across the bay, are Vico, Meta, Sorrento, Massa, and many villages.

The north-west shore of the bay, to the west of Naples, is more broken and irregular. 'The promontory of Posillipo,

which projects due south, divides this part of the bay into two smaller bays —the eastern, with the city of Naples, and the western, or Bay of Baiw, which is sheltered from all winds. A tunnel through the promontory, 2244 feet long, 21 feet broad, and in some places as much as 70 feet high, possibly constructed by Marcus Agrippa in 27 B.c., forms the so-called grotto of Posillipo; at the Naples end stands the reputed tomb of Virgil. Beyond Posil- lipo is the small island of Nisida (Wests); and at a short distance inland are the extinct craters of Solfatara and Astroni, and the Lake of Agnano. Farther west, on a tongue of land, stands Pozzuoli (Puteoli); and beyond it, round the Bay of Bais, are Monte Nuovo, a

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Churches. 1, S. Maria del Carmine. 2. S. Annunziata.

3. Cathedral and S. Resti- tuta. 4, 8. Filippo Neri.

5. S, Domenico Maggiore. 8. 8. Chiara. 10. S. Martino.

crescents. The western crescent, known as the Chiaja ward, though merely a long and narrow strip between the sea and Vomero hill, is the fashionable quarter most affected by foreign residents and visitors. A fine broad street, the Riviera di Chiaja, commenced in the close of the 16th century by Count d'Olivares, and completed by the Duke de Medina Celi (1695-1700), runs for a mile and a half from east to west, ending in the quarter of Mergellina and Piedigrotta at the foot of the hill of Posillipo. In front lie the Villa Nazionale (Reale) public gardens, the chief promenade of the city, which were first laid out in 1780, and have been successively extended in 1807, in 1834, and under the new régime; and the whole edge of the bay

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hill thrown up in a single night in September 1538; the classic site of Baise; the Lucrine Lake; Lake Avernus; the Lake of Fusaro (Acherusia Palus); the Elysian Fields ; and the port and promontory of Misenum. Still farther to the south-west lie the islands of Procida (Pro- chyta) and Ischia! (Pithecusa, dinaria, or Inarime), which' divide the Bay of Naples from the extensive Bay of Gaeta.

The city of Naples is built at the base and on the slopes of a range of volcanic hills, and, rising from the shore like an amphitheatre, is seen to best advantage from the water. From the summit occupied by the castle of St Elmo a transverse ridge runs south to form the promontory of Pizzofalcone, and divides the city into two natural

Seale of 1 English Mile

Plan of Naples, 13, S. Franeesco di Paola. | 7. Teatro Mereadante.

12. Teatro S. Carlo. Nuovo. 14. ,, Sannazaro. » 8. Carlino.

Theatres. a: Ve; 6. Teatro Bellini. 11. from the Castel dell' Ovo to Posillipo is lined by a massive embankment and carriage-way, the Via Caracciolo, con- structed in 1875-81. The eastern crescent includes by far the largest as well as the oldest portion of Naples—the ports, the arsenal, the principal churches, &c. The main thoroughfare is the Toledo (as it is still popularly called, though the official name is Via di Roma), which runs almost due north from the Piazza (Largo) del Plebiscito in front of the Palazzo Reale, till, as Strada Nuova di Capodimonte,

1 Since the article Iscura (g.v.) was written the island has been visited by another severe shock of earthquake (July 28, 1883), which completely ruined Casamicciola, Forio, Lacco Ameno, and Serrara Fontana, and destroyed about 2800 people.

crossing the Ponte della Sanita (constructed by Murat across the valley between Santa Teresa and Capodimonte), it reaches the gates of the Capodimonte palace. A new drive, Corso Vittorio Emmanuele, winds along the slopes behind the city from the Str. di Piedi (at the west end of the Riv. di Chiaja) towards the continuation of the Toledo. The character of the shore of the eastern crescent is being rapidly altered by the new harbour works: about the middle of the curve lies the new Villa del Popolo, or People's Park, constructed on land reclaimed from the bay.

The streets of Naples are generally well-paved with lava or volcanic basalt, which, however, renders them both noisy and slippery for horses. Side-pavements, where they exist, are usually narrow. In the older districts there is a count- less varicty of narrow gloomy streets, many of them steep. The houses throughout the city are more remarkable for their size and the solidity of their construction than for taste and elegance. They are niostly five or six stories high, are covered with stucco made of a kind of pozzuo-Jana which hardens by exposure, and have large balconies and flat roofs frequently ornamented with flowers, shrubs, and small trees planted in

boxes filled with earth. The castle of St Elmo (St Ermo, St Erasmus), which dominates the whole city, had its origin in a fort (Belforte) erected by King Robert the Wise in 1343. The present building, with its rock-hewn fosses and massive ramparts, was con- structed by Don Pedro de Toledo at the command of Charles V. in 1535, and was long considered practically impregnable. Damaged by lightning in 1857, it was after- wards restored, but it is no longer used for defensive pur- poses, On a small island (I. del Salvatore, the Megaris of Pliny) now joined to the shore at the foot of the Pizzo- falcone by an arch-supported causeway 800 feet long, stands the Castel dell' Ovo (so called from its shape, though medieval legend associates the name with the enchanted egg on which the magician Virgil made the safety of the city to depend), which, dating from 1154, was for several centuries a place of great strength. The walls of its chapel were frescoed by Giotto; but the whole building was ruined by Ferdinand IT. in 1495, and had to be restored in the 16th century. Castel Nuovo, a very picturesque building constructed near the harbour in 1283 by Charles I. of Anjou, contains between the round towers of its facade the triumphal arch erected in 1470 to Alphonso L., and numbers among its chambers the Gothic hall of Giovanni Pisano in which Celestine V. abdicated the papal dignity. Castel del Carmine, founded by Ferdinand I. in 1484, was occupied by the populace in Masaniello's insurrection, was used as a prison for the patriots of 1796, and became municipal property in 1878. The royal palace, begun in 1600 by the Count de Lemos, from designs by Domenico Fontana, partly burned in 1837, and since repaired and enlarged by Ferdinand IL, is an enormous building with a sea frontage of 800 feet, and a main facade 554 feet long and 95 feet high, exhibiting the Doric, Ionic, and Composite orders in its three stories. On their visits to Naples, Kings Victor Emmanuel and Humbert have usually preferred the suburban palace of Capodimonte, begun by Charles III. and completed by Ferdinand II. Naples is the see of a Roman Catholic archbishop, always a cardinal. The cathedral has a chapter of thirty canons, and of the numerous religious houses formerly existing thirteen have in whole or in part Survived the suppression in 1868. The city is divided Into forty-seven parishes (the boundaries of which are administrative and not topographical, so that different Stories of the same house are sometimes in different parishes), and there are 257 Roman Catholic churches and 57 chapels. Most of the churches are remarkable rather for richness of internal decoration than for archi-

tectural beauty. The cathedral of St Januarius, occupy- ing the site of temples of Apollo and Neptune, and still containing some of their original granite columns, was designed by Nicola Pisano, and erected between 1272 and 1316. Owing to frequent restorations occasioned by earthquakes, it now presents an incongruous mixture of different styles. The general plan is that of a basilica with a nave and two (Gothic vaulted) aisles separated by pilasters. Beneath the high altar is a subterranean chapel containing the tomb of St Januarius (San Gennaro), the patron saint of the city ; in the right aisle there isa chapel (Cappella del Tesoro) built between 1608 and 1637 in popular recognition of his having saved Naples in 1527 “from famine, war, plague, and the fire of Vesuvius”; and in a silver tabernacle behind the high altar of this chapel are preserved two phials partially filled with his blood, the periodical liquefaction of which forms a prominent feature in the religious life of the city (see JANUARIUS). Acces- sible by a door in the left aisle of the cathedral is the church of Sta Restituta, a basilica of the 7th century, and the original cathedral. Santa Chiara (14th century) is interesting for a fresco ascribed to Giotto (at one time there were many more), and monuments to Robert the Wise, his queen Mary of Valois, and his daughter Mary, empress of Constantinople. San Domenico Maggiore, founded by Charles II. in 1285, but completely restored after 1445, has an effective interior particularly rich in Renaissance sculpture. In the neighbouring monastery is shown the cell of Thomas Aquinas. San Filippo Neri or dei Gerolomini, erected in the close of the 16th century, has a white marble facade and two campaniles, and contains the tombstone of Giambattista Vico. Sta Maria del Parto, in the Chiaja, occupies the site of the house of Sannazaro, and is named after his poem De Partu Virginis. San Francesco di Paola, opposite the royal palace, is an imita- tion of the Pantheon at Rome by Pietro Bianchi di Lugano (1815-37), and its dome is one of the boldest in Europe. The church of the Certosa (Carthusian monastery) of San Martino, on the hill below St Elmo’s castle, has now become in name, as so many of the churches are in reality, a museum. Dating from the 14th century, and restored by Fonsega in the 17th, it is a building of extraordinary rich- ness of decoration, with paintings and sculpture by Guido Reni, Lanfranco, Caravaggio, D’Arpino, Solimene, Luca Giordano, and notably a Descent from the Cross by Ribera. One of the

cloisters by Fonsega is particularly fine. A more ancient Christian monument than any of the convents or churches is the catacombs, which extend a great distance underground. The entrance is at the Ospizio dei Poveri di San Gennaro (see Schulze's monograph, Jena, 1877).

Of all the sccular institutions in Naples none is more remarkable than the national museum, better known‘as the Museo Borbonico. The building, begun in 1586 for cavalry barracks, and remodelled in 1615 for the university, received its present destination in 1790. Enriched by the Farnese collection, by all that was most valuable in Naples, and by everything that would bear removal from Herculaneum, Pompcii, Stabie, Puteoli, Pestum, &c., the museum is unique as a treasure-house of Roman and early Italian antiquities. The collection of Etruscan and Italo-Greek vases is unsurpassed. Nor is the variety of objects greater than the artistic value of some of the items—such as the Farnese Hercules, the Farnese Bull (Amphion and Zethus binding Dirce to its horns), the Dancing Faun (bronze), the statues of the Balbi (marble). For the rich librarics of Naples see vol. xiv. pp. 580, 548. The Club Alpino has a unique collection (25,000 volumes) of Vesuvian and seismo- graphical literature. ; :

The university of Naples is one of the oldest in Italy, having been founded by Frederick II. in the first half of the 13th century. It had fallen to insignificance under the Bourbons, but since 1860 it has rapidly recovered. It comprises five faculties (literature and philosophy, jurisprudence, mathematics, natural science, and medi- cine), and is well equipped with zoological, mineralogical, and geological museums, a physiological institute, a cabinet of anthro- pology, botanical gardens, and an observatory on Mount Vesuvius,

The students in 1882-3 numbered 3421. Originally erected in 1557 for the use of the Jesuits, the university buildings are regarded as the best work of Marco di Pino; the quadrangle, surrounded by a simple but effective peristyle, contains statues of Pietro della Vigna (Frederick's chancellor), Thomas Aquinas, Vico, aud Giordano Bruno. The famous zoological station at Naples, whose aquarium is the principal building in the Villa Nazionale, is not conneetcd with the university ; it was founded in 1872 by Dr Dohrn,

aud has become one of the greatest centres of biological research in Europe. Its Mitthetlungen began to be published in 1878, and a great work on the fauna and flora of the Gulf of Naples is in progress. The Royal Society of Naples, dating originally from 1756, was reconsti- tuted in 1861, and now comprises three ‘‘academies” or depart- ments, dealing respectively with the physical and mathematical

scienees, the moral and political sciences, and literature, archeology, _

and the fine arts. The famous Accademia Pontaniana, founded in 1471 by Ant. Panormita and J. J. Pontanus, was restored in 1809, and still exists. The royal school of Oriental languages (35 pupils in 1880) owes its existence to Matteo Ripa, who in 1732 estab- lished a college for Chinese missionaries with money which he had collected by visiting various European courts in company with ten or twelve young Chinamen. Since 1857 Ludovico da Casoria, relying on public subscriptions, has carried on a special college for the education of Africans (Coll. dei Mori a Capodimonte). The royal college of music, practically founded by Charles III. in 1760, and thus one of the oldest as it is one of the most celebrated insti- tutions of its class, was re-established in 1879. It has a teaching staff of nearly forty persons, takes in boarders (50 Italians gratui- tously), and carries on a free day school for males and females. A large and beautiful building in Strada Fuori Porta Medina, erectcd in a Pompeiau style by Francesco del Giudice, accommodates the royal institute for the encouragement of the natural and economical sciences, the royal technical institute (535 pupils), and the nautical institute (46 pupils); and in Str. del Salvatore there is a royal school of engineering with 250 pupils. Four technical schools are maintained by the municipality. The primary educa- tion of the people was so much neglected under the Bourbons that after twenty years of a better régime there were still 294,384 persons in Naples who could neither read nor write. That some progress had been made was shown in 1881 by the fact that the number of persons under thirty years of age who could both read and write had increased from 79,224 in 1871 to 101,277. In 1872 there were 14,461 children attending school; in 1879 there were 75,311. The educational expenditure of the commune was £64,972 in 1882 for the education of 30,000 children. About one-fourth of the children attending the infant schools are gratuitously supplied with soup at midday,

and the children of the working classes are taught free of charge. Among the various private educational enter- prises Mrs Salis Sehwabe's Froebel Institute, founded in 1873, the Jtalian Protestant schools, and the institution established by the Marquis Casanova in 1869 to take charge of boys leaving school and bring them up to some special trade, deserve special mention. There are three schools for the blind—notably Lady Strachan's (1865) and the "Prince of Naples," founded by Martuscelli (1873) —and as many for the deaf and dumb.

Charitable institutions are unusually numerous in Naples. The oldest civil hospital is S. Eligio, dating from 1270; but the largest is the Casa Santa degli Incurabili, founded in 1521 by Francesca Maria Longo. It is open to patients of both sexes and any rank, contains upwards of 1000 beds, and has an annual income of about £32,000. In 1877 an international hospital was established by the foreign residents. The Albergo dei Poveri (poorhouse) occupies a magnificent range of buildings, commenced in 1761 by Charles ITI. at the suggestion of Padre Rocco. Starting with an income of about £3000, it now disposes yearly of £48,000 ; and it has succes- sively absorbed various minor institutions such as the Conservatorio of St Francis of Sales (1816) and the deaf-mute school (1818). The great almshouse of St Januarius for old men (Ospiz. di S. Gennaro dei Poveri) dates from 1666. Besides the great provincial lunatic asylum (340 patients), now transferred to the convent of St Francis of Sales, there are three smaller asylums in the suburbs. Nothing perhaps is more characteristic of Naples than its so-called Arci-con- Sratermita, associations similar to our friendly and burial societies, but entering more into the life of all classes of society. There are about one hundred and thirty of them. The cldest which has kept the date of its origin is that of the Bianchi della Carita, founded in 1382; seven belong to the 15th century and twenty-seven to the 16th. Mutual benefit societies are also numerous.

There are about a score of theatres in Naples. The San Carlo opera-house, with its area of 5157 square yards, and its pit capable of containing one thousand spectators, is one of the largest in Europe. It was originally erected in 1737 under Charles III. after the designs of Giovanni Medrano, but had to be almost completely rebuilt after the fire of 1816. Though closely associated with the names of Rossini, Bellini, Donizetti, Mercadante, &c.,

San Carlo has always had to be subsidized—first by the Bourbon princes, and since 1860 by the municipality, which

also helps to support the Mercadante theatre. It is enough to mention the Teatro Nuovo, the Sannazaro, the Dei Fiorentini (de- voted to the Italian drama), and the Bellini (dating from 1876, and'second to none in the matter of decoration). The San Carlino, though mean and incommodiouns, is largely frequented by all classes from royalty downwards, its Pulcinella farces, always in the Nea- politan dialect, being a purely local institution, connected it may be with the Atellan plays.

At a very early date the original harbour at Naples, now known in its greatly reduced state as Porto Piccolo, and fit only for boats and lighters, became toosmall. In 1302 Charles II. of Anjou began the construction of the Porto Grande by forming the Molo Grande or San Gennaro, which stretched eastward into the bay, and was ter- minated by a lighthouse in the 15th century. By the addition of a new pier ruuning north-east from the lighthouse, and protected by a heavily armed battery, Charles II]. in 1740 added greatly to the safety of the harbour. In 1826 the open area to the south of the Porto Grande was formed into the Porto Militare by the con- struction of the Molo San Vincenzo, 1200 feet long. Shortly after the formation of the new kingdom of Italy attention was called to the insufficiency of the harbour for modern wants ; and new works were commenced in 1862. Besides the lengthening of the Molo San Vincenzo to a total of more than 5000 fect, the scheme as authorized in 1879 includes the formation of a new pier, which is to extend from the Castel del Carmine a distance of about 2460 feet, the con- struction of quays along the shore between the fort and the Porto Grande, the deepening of the enclosed area to about 25 feet, and the establishment of new bonded warehouses and a floating dock on the Clark-Stanfield system. The contract provides for the com- pletion of the works in 1885. The entrance to the harbour will then measure more than 2000 feet.

The port of Naples is second in the kingdom. The total tonnage of foreign and coasting trade (entrance and clearance) had increased from 1,812,138 register tons in 1863 to 4,128,057 in 1882. In the foreign trade the first

place belongs to French shipping, 956,171 tons; the second to British, 374,608 ; and the third to Italian, 93,424. Cotton, cereals, sugar, coffee, tobacco, wool, &c., are the chief imports; pastes, coral (to the value of £1,500,000), and jewellers' work, dried fruit, hats, tartar and wine lees, wine, and olive oil are the chief exports. The total value of imports and exports was £9,374,940 in 1881 and £8,055,798 in 1882. Coral, kid gloves, and macaroni are manufactured in the city on an extensive scale.

Naples has several good local springs (notably the Acqua del Leone at Mergellina) ; a covered channel brings the waters of Monte Somma (Vesuvius) to the lower parts of the town; an aqueduct, constructed in the 17th century at the cost of Criminello and Carmignano, taps the Isclero at Sant' Agata dei Goti, 30 miles distant; and a number of artesian wells have proved successful as far as quantity is concerned. But in spite of all these resources the water supply has long been far below the demand; and a city which from its position might be one of the best-drained, cleanest, and healthiest in the world has had an unenviable reputation for dirtiness and unwholesomeness. At present extensive works are in progress by which good drinking water is to be brought from Serino (nearly 50 miles distant) and laid on at three different high levels at the rate of 22,000,000 gallons daily for the use of the inhabitants and 1,000,000 for public purposes.

Naples, the most densely peopled city in Europe, is slowly but steadily increasing. The commune—which includes not only the urban districts (fraziond) of S. Ferdinand, Chiaja, S. Giuseppe, Monte Calvario, Avvocata, Stella, San Carlo all' Arena, Vicaria, S. Lorenzo, Mercato, Pendino, and Porto, but also the suburban districts of Vomero, Posillipo, Fuorigrotta, Miano-Mianella, and Piscinola-Marianella—has advanced from 404,000 inhabitants in 1788 to 493,115 in 1881, and the city proper (the first twelve dis- tricts) from 326,130 in 1812 to 461,962 in 1881. In the condition of the lower classes considerable improvement has been effected since 1860; the lazzaroni, who bulked so largely in the experience of the tourist in the early part of the century, no longer exist, their place being taken by the dock-labourer, the fisherman, and the artisan.

History.— All ancient writers agree in representing Naples as a Greek settlement, though its foundation is obscurely and differently narrated. It

seems that the oldest city on its site was founded by a colony from the neighbouring Greek town of Cume. They are said to have given it the name of Parthenope, from a legendary connection of the locality with the siren Parthenope, whose tomb was still shown at the time of Strabo. A number of Chalcidic and Athenian colonists are reported to have afterwards joined the original settlers, and to have built for themselves separate dwell- ings, which they called Neapolis, or the new city, in contra- distinction to the old settlement, which in consequence was styled Palzpolis, or the old city. All modern attempts to define the respective extent and situation of Palepolis and Neapolis have failed ; but Livy's testimony leaves no doubt that they were close to each other, and identical in language and government.

In the year 328 z.c., the Palepolitans having provoked the hostility of Rome by their incursions upon her Campauian allies,

NAWLES

the consul Publilius Philo marched against them, and, having taken his position between the old and the new city, laid regular siege to Palepolis. By the aid of a strong Samnite garrison which they received, the Palepolitans were long able to withstand the attacks of the consul ; but at length the city was betrayed into the hands of the Romans by two of her citizens. Neapolis possibly sur- rendered to the eonsul without any resistance, as it was received on favourable terms, had its liberties secured by a treaty, and obtained the chief authority, which previously seems to have been enjoyed by the older city. From that time Palepolis totally disappeared from history, and Neapolis became as an allied city—

federata civitas—a dependency of Rome, to whose alliance it re-

mained constantly faithful, even under most trying circumstatices. In 280 8.c. Pyrrhus unsuccessfully attacked its walls; and in the Second Punic War Haunibal was by their strength deterred from attempting to make himself master of the town. During the civil wars of Marius and Sulla, a body of partisans of the latter having entered it by treachery, 82 B.c., made a general massacre of the inhabitants ; but Neapolis soon recovered the blow, as it was again a flourishing city in the time of Cicero. It became a muntcipium after the passing of the lex Julia; under the empire it is noticed as a colonia,

but the time when it first obtained that rank is uncertain—possibly under Claudius.

Though a municipal town, Neapolis long retained its Greek culture and institutions; and even at the time of Strabo had gymnasia and quinquennial games, and was divided into phratriz, atter the Greek fashion. When the Romans became masters of the world, many of their upper classes, both before the close of the republic and under the empire, from a love of Greek manners and literature or from indolent and effeminate habits, resorted to Neapolis, either for education and the cultivation of gymnastic exercises or for the enjoyment of music and of a soft and luxurious climate. Hence we find Neapolis variously styled—by Horace as “otiosa Neapolis,” by Martial as ‘‘docta Parthenope,” by Ovid as ‘in otia natam Parthenopen.” It was the favourite residence of many of the emperors: Nero made his first appearance on the stage in one of its theatres ; Titus assumed the oftice of its archon; and Hadrian became its demarch. It was chiefly at Neapolis that Virgil composed his Georgics; and he was buried on the hill of Pausilypus, the modern Posillipo, in its neighbourhood. It was also the favourite residence of the poets Statius and Silius Italicus, the former of whom was a Neapolitan by birth.

After the fall of’the Roman empire, Neapolis suffered severely during the Gothic wars. Having espoused the Gothic cause in the year 536, it was taken, after a protracted siege, by Belisarius, who turned aside an aqueduct, marched by surprisc into the city through itschannel, and put many of the inhabitants to the sword. In 542 Totila besieged it and compelled it to surrender ; but, being soon after recovered by Narses, it remained long a dependency of the exarchate of Ravenna, under the immediate government of a duke, appointed by the Byzantine emperors. When the Lombards invaded Italy, and pushed their conquests in the southern provinces, the limits of the Neapolitan duchy were considerably narrowed. In the beginning of the 8th century, at the time of the Iconoclastic controversy, the emperor Leo the Isaurian having forced compliance to his edict against the worshipping of images, the Neapolitans, encouraged by Pope Gregory III., threw off their allegiance to the Eastern emperors, and established a republican form of government under a duke of their own appointment. Under this régime Neapolis retained her independence for nearly four hundred years, though

constantly struggling against the powerful Lombard dukes of Benevento, who twice unsuccessfully besieged it. In 1027, however, Pandulf IV., a Lombard prince of Capua, succeeded in making himself master of it ; but he was expelled in 1080 by Duke Sergius, chiefly through the aid of a few Norman adventurers. The Normans, in their turn, gradually superseded all powers, whether Greek, Lombard, or republican, which had previously divided the south of Italy, and furthermore checked the Saracens in the advances they were making through Apulia. .

For the consolidation of the Norman authority over Sicily and Naples, the reader is referred to the article Normans. It is sufhieient here to state that the leaders of the house of Hauteville m 1053 did homage to the pope for all conquests they had made or might make both in the island and upon the mainland, and that mm 1130 Count Roger of that family assumed the style of king. In this way the south of Italy, together with the adja- cent island of Sicily, was converted into one political body, which, Owing to the peculiar temper of its Norman rulers and their powerful organization, assumed a more feudal character than any other part of the peninsula. The ‘‘regno,” as it was called by the

aians, constituted a state apart, differing in social institutions,

orelgn relations, and type of home government from the common- Wealths and tyrannies of upper Italy. It should furthermore be hotieed that the indirect right acquired by the popes as lords uot over this vast section of Italian territory gave occasion i. et the most serious disturbances of Italy between the end of the

and the beginning of the 16th centuries, by the introduction

of the house of Anjou into Naples and the disputed succession of Angevine and Aragonese princes. From the date at which the south of Italy and Sicily werc subjugated by the Normans, the history of Naples ceases to be the history of a republie or a city, and merges itself, as the history of a kingdom, in that of the kingdom of tho Two Sicilies. Naples henceforth formed the metropolis of the Italian portion of that kingdom, owing this pre-eminence

to its advantageous position on the side of Italy towards Sicily, and to the favour of successive princes. Separated from Sicily between the years 1282 and 1442, reunited to Sicily between 1442 and 1458, again separated between 1458 and 1504, and finally reunited in the year 1504, the kingdom of Naples remained froin that date forward, with short interruptions, under one crown, together with Sicily, until 1861. Then both Sicily and Naples were absorbed in the Italian kingdom through the cession by Garibaldi of his conquest to the popularly sanctioned sceptre of the house of Savoy.

It is impossible to write the history of Naples in modern times apart from that of Sicily, or to separate it from that of the several dynasties which have held royal or vice-royal state in Naples as their capital. But an epitome of the main vicissitudes which it has undergone during the last seven centuries and a half may be supplied. The Norman dynasty controlled both Sicily and Naples until the year 1194, when their rights were transmitted, by failure of legitimate male issue, to Henry VI., emperor, and husband of Constance de Hauteville. The popes, in pursuance of their Guelf policy, persecuted the great imperial house of Hohenstaufen to extinction, subdued the Ghibelline party in southern Italy, and conferred the kingdom of the Two Sicilics upon Charles of Anjou after his victory at Grandella, in the year 1265. As a consequence of the Sicilian Vespers, Charles had to relinquish Sicily in 1282 ; but he continued to be king of Naples. It was then shown that, though the Normans had welded Sicily and the southern provinces of Italy into one substantial political whole, the island and the mainland had no strong bond of national cohe- sion. The subsequent history of the sister kingdoms makes this even more apparent. Scven prinecs of the house of Anjou ruled Naples after the death of Charles until the year 1442. Meanwhile Sicily obeyed the house of Aragon, whose rights wero derived from Constance, the daughter of Manfred, a bastard son of the emperor Frederick II]. In 1442 Alphonso V. of Aragon and Sicily, surnamed the Magnanimous, expelled René of Anjou from the kingdom of Naples, and reunited the Two Sicilies under his own rule. Upon his death in 1458, his brother John became king of Aragon and Sicily; while his natural son Ferdinand assumed the crown of Naples, which was bequeathed to him by Alphonso as being his own property by right of conquest. The bastard Aragonese dynasty thus founded continued to hold sway in Naples, separate from Sicily, through four successive princcs, until their line ended by the

expulsion of Frederiek, Alphonso's grandson, in 1501. Betrayed by his cousin Ferdinand of Spain, this prinee surrendered to a French army and died in captivity in France three years later. The French and Spaniards were at this epoch disput- ing the possession of Italy. Charles VIII. of France had already, in 1494, reasserted the claims of the Angevine line, and had con- quered the kingdom of Naples ; but he proved unable or unwilling to maintain his conquest more than a few months. His suc- cessor Louis XII. covenanted in 1500 to partition Naples with Ferdinand the Catholic of Spain, who was already king of Sicily. Ferdinand, however, having no intention of fulfilling his engage- ments with his French ally, succeeded in possessing himself of the whole kingdom of Naples, which he now reunited to that of Sicily, and governed together with Castile and Aragon. From 1504 until 1707 Naples and Sicily owed immiediate obedience to viceroys of the kings of Spain,—the only important episode in the history of the city throughout this period being the revolt of MAsANIELLO (g.v.) in 1647. After 1707, during the wars of the Spanish succes- sion, the Austrians made themselves masters of both Sicily and Naples; and, though Sicily was ceded by them in 17138 to the house of Savoy, and in 1718 conquered by Spain, they becamo again in 1720 possessors of both kingdoms. Naples was at this time of her history administered by Austrian, as previously by Spanish, viceroys. The war of the Polish succession gave monarchial independence once more to the Two Sicilies ; for in 1735 Don Carlos, a younger son of Philip V., of the Bourbon dynasty in Spain, after a successful campaign against the Austrians, was crowned sovereign of both kingdoms at Palermo. He founded the Bourbon line, which reigned in Sicily and Naples until the year 1861, interrupted only by the disturbances of the French Revoln- tion and by a brief French occupation (1806-15), during which Joseph Bonaparte bore the title of king of Naples for two years and Joachim Murat for seven years. Sicily throughout this period of French influence remained beneath the sway of her Bourbon princes. For the events which led to the expulsion of the Bourbons and the annexation of both Sicily and Naples to the crown of Italy, the reader is referred to the article IrALy ; see also MASANIELLO, NoRMANS, SICILY.

Date of Bona- parte's birth,

Military educa- tion.

NAPOLEON I.

HE family Bonaparte (written by Napoleon's father T' and by himself down to 1796 Buonaparte, though the other spelling occurs in early Italian documents) was of Tuscan origin. A branch of it was settled in Corsica at least as early as the 16th century, from which time the Bonapartes appear as influential citizens of Ajaccio. They had an ancient title of nobility from the Genoese republic, and Napoleon's grandfather obtained letters of nobility also from the grand-duke of Tuscany. They had therefore the right to sign De Buonaparte, but ordinarily dropped the preposition of honour. Charles Marie de Buonaparte (born in 1746, studied law at the university of Pisa, where he took his doctor's degree in 1769) married at the age of eighteen Letitia Ramolino, who was not quite fifteen. The lady had beauty, but apparently neither rank nor wealth. In the children of this marriage the father, a somewhat indolent Italian gentleman with a certain taste for literature, seems traceable in Joseph, Jerome, and partly also in Lucien ; the energy of which Lucien had a share, which Caroline also displayed, and which astonished the world in Napoleon, seems attributable to the Corsican blood of the mother. Thirteen children were born, of whom eight grew up. The list is as follows :-—Joseph (king, first of Naples, then of Spain), Mapoleon, Lucien, Eliza (Princess Bacciochi), Pauline (married, first to General Leclerc, afterwards to Prince Borghese), Caroline (married to Murat, became queen of Naples), Louis (king of Holland), Jerome (king of Westphalia). Of these the eldest was born in 1768, the youngest in 1784. See BoNAPARTE.

Besides his brothers and sisters, Napoleon raised to importance Joseph Fesch, half-brother of his mother, a Swiss on the father's side, who was afterwards known to the world as Cardinal Fesch.

The accepted opinion is that Napoleon was born at Ajaccio on August 15, 1769. This opinion rests indeed on the positive statement of Joseph Bonaparte, but it is certain from documents that on January 7, 1768, Madame Letitia bore a son at Corte, who was baptized by the name of Nabulione. And even in legal documents we find contradictory statements about the time and place of birth, not only of Napoleon, but also of Joseph.

All diffi- culties disappear at once if we suppose that Napoleon and Nabulione were one and the same, and that Joseph was really the second son, whom the parents found it con- venient to pass off as the first-born. This they may have found convenient when, in 1779, they gained admission for a son to the military school of Brienne. A son born in 1768 would at that date be inadmissible, as being above ten years of age. Thus it is conceivable that Napoleon was introduced by a fraud to that military career which changed the face of the world. Nevertheless it is certain from Lucien's memoir that of such a fraud nothing was known to the younger members of the family, who regarded Joseph as without doubt the eldest.

After passing two or three months in a school at Autun for the purpose of learning French—he had hitherto been a thorough Italian—Napoleon entered Brienne on April 23, 1779, where he remained for more than five years, and then in September 1784 passed, as " cadet-gentilhomme," into the military school of Paris. In the next year, 1785, he obtained his commission of lieutenant in the regiment La Feére, stationed at Valence. He had already lost his father, who, undertaking a journey to France on business, was entertained at Montpellier in the house of an old Corsican friend Madame Permon, mother of the celebrated

memoir-writer Madame Junot, and died there of the dis. ease which was afterwards fatal to Napoleon, on February 25, 1785, at the age of thirty-eight years.

The fact principally to be noticed about Napoleon's extraction and boyhood is that he was by birth a noble, needy and provincial, and that from his tenth year his education was exclusively military. Of all the great rulers of the world none has been by breeding so purely a military specialist. He could scarcely remember the time when he was not a soldier living among soldiers. The effects of this training showed themselves too evidently when he had risen to the head of affairs. At the same time poverty in a society of luxurious noblemen, and the consciousness of foreign birth and of ignorance of the French language, made his school life at times very unhappy. At one time he demands passionately to be taken away, at another time he sends in a memorial, in which he argues the ex- pediency of subjecting the cadets to a more Spartan diet, His character declared itself

earlier than his talents. He was reported as “taciturn, fond of solitude, capricious, haughty, extremely disposed to egoism, seldom speaking, energetic in his answers, ready and sharp in repartee, full of self-love, ambitious, and of unbounded aspirations.” So he appeared to his teachers, and an Englishman who re- membered him at Brienne makes him a complete Timon, living as a hermit, and perpetually at war with his school-fellows. His abilitiesdo not seem to have excited wonder, but he was studious, and in mathematics and geography made great progress. He never, however, so Carnot tells us, became a truly scientific man. He had neither taste nor talent for grammatical studies, but was fond of books, and books of a solid kind. Of the writers of the day he seems to have been chiefly influenced by Raynal and Rousseau.

He is now a lieutenant of artillery in the service of Louis XVI, The next years are spent mainly with his regiment at Valence, Lyons, Douai, Paris, Auxonne, Seurre, Auxonne again, But he takes long holidays with his family at Ajaccio, obtaining permission on the ground of ill-health. Thus he was at Ajaccio in 1787 from February to October, again from December 1787 to May 1788, again

from September 1789 to February 1791. During this Barly | period he is principally engaged in authorship, being con- author

sumed by the desire of distinction, and having as yet no*”™

other means of attaining it. He produces Letters on the LTistory of Corsica, which he proposes to dedicate first to Paoli, afterwards to Raynal; he competes for a prize offered by the academy of Lyons for the best essay written “to determine the truths and feelings which it is most important to inculcate on men for their happiness.” Among his smaller compositions is Zhe Narrative of the Masked Prophet. Of all these writings, which are to be distinguished from the pamphlets written by him with a practical object, it may be said that they show more character than literary ability. As the compositions of a boy they are indeed remarkable for their precocious seriousness, but what strikes the reader most in them is a sort of suppressed passion that marks the style, a fierce impatience, as if the writer knew already how much he had to get through in a short life. But his sentiments, love of liberty, of virtue, of domestic happiness, are hollow, and his

affectation of tenderness even ridiculous. The essay, aS a composition, is positively bad, and was natur- ally unsuccessful.

Meanwhile his active life had begun with the Revolution of 1789. The first chapter of it is separate from the rest,

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and leads to nothing. That astonishing career which has all the unity of a most thrilling drama does not begin till 1795. The six years which preceded it may be called his Corsican period, because for the greater part of it he may be thought to have regarded Corsica as the destined scene of his future life. It must be very summarily treated here.

In 1789 the Italian island of Corsica had been for twenty years a dependency of France. But France had acquired it in a most unscrupulous manner by purchasing the rights of the republic of Genoa over it. She did this in 1768, that is, when Corsica had contested those rights in a war of nearly forty years, and had been practically independent and happy for about thirteen years under the dictatorship of Pasquale Paoli. It was an act similar to the partition of Poland, and seems to mark a design on the part of France—which had just lost its American colonies—to extend its power by way of the Mediterranean into the East. Paoli was compelled to take refuge in England, where he was still living when the French Revolu- tion broke out. In the fall of Corsica a certain Matteo Buttafuoco played a disgraceful part. He had been sent by Paoli to treat as plenipotentiary with France, was won over by Choiseul, declared against the national cause, and appeared in the island as colonel of Louis XV.’s Corsican regiment. He too was still living when the states-general met, and represented there the noblesse of Corsica, while Salicetti, a name of no little prominence in the Revolution, was one of the representatives of the Corsican tiers état.

The Revolution was as dangerous an event to the rela- tion between France and Corsica as to that between France and St Domingo. Would the island

assert its independence, and, if so, could the assembly deny its right todoso? The islanders and the exiled Paoli at their head took a moderate view. France must guarantee a good deal of local freedom ; on such conditions, they thought, the relation might continue, if only to prevent the republic of Genoa from reviving its pretensions. Accordingly, on November 30, 1789, Corsica was declared by the National Assembly to be a province of France on the motion of Salicetti himself, and the protest against this decree made by Genoa was treated with contempt. Paoli left London, was received in France with an ovation, appeared before the National Assembly on April 22, 1790, where he received the honours of the sitting, and landed in Corsica on July 14th, after an absence of twenty-one years. Thus was Corsica reconciled to France by the Revolution of 1789; but the good work was undone by the Second Revolution of 1792.

Since 1769 the French power in the island had rested mainly on the noblesse and clergy. The Bonaparte family, as noble, had been on the unpatriotic side; Napoleon's father appears always as a courtier of the French governor Marbceuf and as a mendicant at Versailles ; Madame Letitia in soliciting a place for her son Louis styles herself " the widow of a man who always served the king in the administration of the affairs of the island of Corsica." It is therefore a remarkable fact that almost immediately after the taking of the Bastille Napoleon hurried to Ajaccio and placed himself at the head of the revolutionary party With all the decision characteristic of him. He devoted himself to the establishment of a National Guard, of which he might hope to be the La Fayette, and he published a letter to Buttafuoco which, properly understood, is a solemn desertion of the principles of his family, similar to that of Mirabeau. This letter has all the intensity of his other early writings, but far more effectiveness. It lashes Buttafuoco for his treason of 1768, describing him as a cynic, who had no belief in virtue, but supposed all men to be guided by selfish interest. The invective has lost its

edge for us who know that Bonaparte soon after openly professed this very creed. In declaring for the Revolution he obeyed the real inclination of his feelings at the time, as we may see from his writings, which are in the

revolu- tionary tone of Raynal. But had he not really, we may ask, an ulterior object, viz., to make Corsica independent of France, and to restore the old rule of Paoli, aiming himself at Paoli's succession? Probably he wished to see such a result, but he had always two strings to his bow. In his letter to Buttafuoco he carefully avoids separating Corsican liberty from the liberty offered by the French Revolution. Had the opportunity offered, he might no doubt have stood forth at this time as the liberator of Corsica ; but circum- stances did not prove favourable, and he drifted gradually in quite the opposite direction.

In October 1790 he met Paoli at Orezza, where Corsica constituted itself as a French department, Paoli being president, Salicetti procureur-général syndic, Arena and Pozzo di Borgo (also from Ajaccio) members of the Directorium. Paoli is said to have hailed Napoleon as 'one of Plutarch's men." As the only Corsican officer trained at a royal military school, Napoleon might aspire to become commander of a paid native guard which it was proposed to create for the island. But France had mis- givings about the use to which such a guard might be put, and the minister of war rejected the proposal. In the next year, however, he was successful in a second attempt to get the command of an armed force in Corsica, and betrayed in the course of this attempt how much more intent he was at this time upon Corsican than upon French affairs. It was decided to create four battalions of national volunteers for Corsica, and Napoleon became candidate for the post of lieutenant-colonel in the district of Ajaccio. The choice was in the hands of the'volunteers themselves, and in pursuing his canvass Napoleon did not hesitate to outstay his furlough, and thus forfeit his French commission by wilful absence from a great review of the whole French army which was appointed for the opening day of 1792. He was, however, elected, having, its said, executed the first of his many coups d'état by violently imprisoning a commissioner sent down to superintend the election. We can understand his eagerness when we remark that anarchy in Corsica was steadily increasing, so that he may have believed that the moment for some military stroke was at hand. He did not long delay. At the Easter festival of 1792 he tried to get possession of Ajaccio under cover of a tumult between the volunteers and the refractory clergy. The stroke failed, and he fled from the island. The European war was just breaking out, and at

Paris everything was in confusion ; otherwise he would probably have been tried by court-martial and shot.

A rebel in Corsica, a deserter in France, what was he to do? He went to Paris, where he arrived on May 21. The Second Revolution was at hand, and he could observe while no one had leisure to observe him. He witnessed the 10th of August and the downfall of the monarchy. To him this revolution was a fortunate event, for the new Government, attacked by all Europe, could not dispense with the few trained officers whom the emigration had left. On August 30th his name was restored to the army list with the rank of captain, a commission dated back to the 6th February, and arrears of pay. He was saved from the most desperate condition to which he was ever in his whole life reduced. On September 2d (terrible date!) he is engaged in withdrawing his sister Eliza from St Cyr (the House of St Louis having been suppressed). The next step he takes is remarkable. The great war which was to carry him to the pinnacle of fame was now in full progress. By undeserved good luck his military rank is XVI. — 25

restored to him. Will he not hurry to his regiment, eager to give proof of his military talents? No, his thoughts are still in Corsica. On the pretext of conducting his sister to her home he sets off without delay for Ajaccio, where he arrives on the 17th. The winter was spent in the unsuccessful expedition, which may be called Napoleon’s first campaign, made from Corsica against the island of Sardinia. On his return he found a new scene opened. The Second Revolution was beginning to produce its effect in Corsica, which was no mere province of France, and in which everything was modified by the presence of Paoli. Elsewhere the Convention was able by its Representatives in Mission to crush opposition, but they could not so erush Corsica and Paoli. There was thus a natural opposition between the Convention and Paoli, and the islanders began to fall into opposite parties, as adherents of the former or of the latter. It might have been expected that Bonaparte, who all his life had glorified Paoli, and whose early letters are full of hatred to France, would have been an enthusiastic Paolist. But a breach seems to have taken place between them soon after Napoleon’s return from Paris, perhaps in consequence of his escapade of Easter 1792.

The crisis came on April 2d, when Paoli was denounced before the Convention, among others by Marat, and it was decreed that he and Pozzo di Borgo should come to Paris and render an account of their conduct to the Convention. Paoli refused, but with the remarkable, perhaps excessive, moderation which char- acterized him offered to leave Corsica if his presence there appeared to the Convention undesirable. But the islanders rallied round him almost as one man.

There could be no reason why the horrors of the Second Revolution should extend to Corsica, even if we consider them to have been inevitable in France. For a Corsican patriot no fairer opportunity could offer of dissolving with universal approbation the connexion with France which had begun in 1769. Napoleon took the opposite side. He stood out with Salicetti as the leading champion of the French connexion and the bitterest opponent of Paoli. Was his motive envy, or the bitterness caused by a recent personal quarrel with Paoli? We cannot positively say, but we can form an estimate of the depth of that insular patriotism which fills the Letters on the History of Corsica. Paoli summoned a national consulta at the end of May, and the dissolution of the French connexion now began. The consulta denounced the Bonaparte family by name. Napoleon answered by desperate attempts to execute his old plan of getting possession of the citadel of Ajaccio. But he failed, and the whole Bonaparte family, with Madame Letitia and Fesch, pursued by the fury of the people, took refuge in France. With this Hijra the first period of Napoleon comes to an end.

Up to this time Napoleon has regarded the French nation with dislike, French ways and habits are strange and foreign, and he has more than once turned aside from a French career when it seemed open to him. Henceforth he has no other career to look for, unless indeed it may be possible, as for some time he continued to hope, to make his way back to Corsica by means of French arms. A certain change seems now to pass over his character. Up to this time his writings, along with their intensity, have had a highly moral and sentimental tone. He seems sincerely to have thought himself not only stronger and greater but better than other men. At school he found himself among school-fellows who were a hundred “fathoms below the noble sentiments which animated himself,” and again much later he pronounced that “the men among whom he lived had ways of thinking as differ- ent

from his own as moonlight is from sunlight.” Prob- ably he still felt that he had more vivid thoughts than

other men, but he ceases henceforth to be a moralist, His next pamphlet, Le Souper de Beaucaire, is entirely free from sentiment, and in a very short time he appears as a cynic, and even pushing cynicism to an extreme.

It was in June 1793 that the Bonaparte family found At themselves at Toulon in the midst of the Corsican emigra- Toulon, tion. France was in a condition not less disturbed than Corsica, for it was the moment of the fall of the Girondins, Plunged into this new party strife, Bonaparte could hardly avoid taking the side of the Mountain. Paoli had been in a manner the Girondin of Corsica, and Bonaparte had headed the opposition to him. In Le Souper de Beaucaire (published in August 1793), which is the mani- festo of this period as the Letter to Buttafuoco is of the earlier period, he himself compares the Girondins to Paoli, and professes to think that the safety of the state re— quires a deeper kind of republicanism than theirs. The immediate occasion of this pamphlet is the civil war of the south, into which he was now plunged. Marseilles had declared against the Convention, and had sent an army under Rousselet which had occupied Avignon, but had evacuated it speedily on being attacked by the troops of the Mountain under Carteaux. Bonaparte took part in the attack, commanding the artillery, but it seems an unfounded statement that he specially distinguished himself. This was in July, and a month later the pamphlet was written. It is a dialogue between inhabit- ants of Marseilles, Nimes, and Montpellier and a military man. It is highly characteristic, full of keen and sarcastic sagacity, of clear military views; but the temperature of its author’s mind has evidently fallen suddenly ; it has no warmth, but a remarkable cynical coldness. Among the Representatives in Mission recently arrived at Avignon was the younger Robespierre, with whom Salicetti was intimate. Bonaparte, introduced by Salicetti and recom- mended by this pamphlet, naturally rose high in his favour.

He is now a Jacobin. We must not be misled by the violence with which Bonaparte attacked this party some years later, and the horror he professed to feel for their crimes, so as to conclude that his connexion with the Jacobins, and especially the Robespierres, was purely accidental and

professional. What contemporary evidence we have exhibits Bonaparte at this time as holding the language of a terrorist, and we shall see how narrowly. he | escaped perishing with the Robespierres in Thermidor. | Of course it is not necessary to disbelieve Marmont when he says that the atrocities of the Robespierrists were not {

to Bonaparte's taste, and that he did much to check them within the sphere of lis influence.

Bonaparte marched with Carteaux into Marseilles late in August, and about the same time Toulon delivered itself into the hands of the English. Just at this moment he was promoted to the rank of chef de batadllon in the second regiment of artillery, which gave him practically the command of the artillery in the force which was now formed to besiege Toulon. The story of his relations with the generals who were sent successively to conduct the siege, Carteaux the painter, Doppet the physician, Dugommier the brave veteran, and of his discovery of the true way to take Toulon, are perhaps somewhat legendary, but he may probably have been eloquent and persuasive at the council of war held November 25th, in which the plan of the siege was laid down. That he distinguished himself in action is more certain, for Dugommier writes, "Among those who distinguished themselves most, and who most aided me to rally the troops and push them forward, are citizens Buona Parte, commanding the artillery, Arena and Cervoni, adjutants general" (A/oniteur, December 7, 1793). He was now named general of brigade.

artillery there. He left Marseilles for Paris on May 5, Ordered feeling that all the ground gained by his activity at Toulon, to the

1795.]

oinsthe Bonaparte now passes out of the civil into the foreign my of war. 'The military system of the Convention is by this

taly. army of

time in full operation. Distinct armies face each enemy, and the great military names of the Revolution are already in men's mouths. The army of the north has Jourdan, Leclerc, Vandamme, Brune, Mortier; that of the Moselle has Hoche, Bessiéres, Moreau ; that of the Rhine Pichegru, Schérer, Berthier ; that of the West Marceau and Kléber. Bonaparte joins the army of Italy as general of artillery and inspector-general; to the same army is attached Masséna as general of division; Dumerbion is general-in- chief. Itis now that for the first time we find Bonaparte's exceptional ability remarked. Restless pushing ambition he had shown all along, but that he was more than a mere intriguer seems to have been first discerned by the younger

'Robespierre, who in a letter of April 5, 1794, describes

him as "cf transcendent merit." In the brief campaign of the army of Italy which occupied the month of July 1794 he took no part, while Masséna commanded in the illness of Dumerbion. But in July he made his first essay in diplomacy. Genoa was among the earliest of the many

feeble neutral states which suffered in the conflict of the

Revolution with the great powers, and at the expense of which the revolutionary empire was founded. Bonaparte was sent by the younger Robespierre to remonstrate with the Genoese Governinent upon the use which they suffered the Coalition to make of their neutral territory. He was in Genoa from July 16 to July 23; he urged the French claim with success; he returned to Nice on July 28. But July 28, 1794, is the 9th Thermidor, on which Bonaparte's patron perished with his elder brother on the scaffold.

and by the admiration he had begun to inspire, was lost again, that his career was all to recommence, and in pecu- harly unfavourable circumstances.

This is the last ill turn he ever received from fortune. Tt has been attributed to the Girondist spite of a certain Aubry.against the Montagnard Bonaparte. The truth seems rather to be that the Committee of Public Safety felt that the Corsican element was too strong in the army of Italy; they remarked that "the patriotism of these refugees is less manifest than their disposition to

enrich themselves." Lacombe Saint Michel knew Corsica; and the new general of the army of Italy, Schérer, remarks of Bonaparte just at this moment that "he is a really good artillerist, but has rather too much ambition and intrigue for his advancement."

The anecdote told by Bonaparte himself of his ordering an attack of outposts in order to treat a lady to a.sight of real war, "how the French were successful, but necessarily no result could come out of it, the attack being a pure fancy, and yet some men were left on the field," belongs to the last months of his service in the army of Italy. It is worthy of notice, as showing his cynical insensibility, that he acted thus almost at the very beginning of his military career, and not when he had been hardened by

long familiarity with bloodshed. On his arrival at Paris Remains he avoids proceeding to the army of the west, and after ™ Paris.

a time obtains from Doulcet de Pontécoulant a post in the topographical section of the war office. Here he has an opportunity of resuming his old work, and we find him furnishing Doulcet, as he had before furnished

_Con- Probably the connexion of Bonaparte with the Robes- | Robespierre junior, with strategical plans for the conduct nexion pierres was closer than Bonaparte himself at a later time | of the war in Italy. Late in August he applies for a Mie liked to have it thought. ''He was their man, their plan- | commission from Government to go to Constantinople at pierres, Maker," writes Salicetti; "he had acquired an ascendency | the head of a party of artillerists in order to reform that

over the Representatives (?.¢., especially Robespierre junior) which it is impossible to describe," writes Marmont. Accordingly after Thermidor the Representatives in Mission who remained with the army of Italy, viz., Salicetti, Albitte, and Laporte, suspended Bonaparte from his functions, and placed him provisionally under arrest (August 6). He was imprisoned at the Fort Carré near Antibes, but fortu- nately for him was not sent to Paris. On the 20th he was set provisionally at liberty on the ground of "the possible utility of the military and local knowledge of the said Bonaparte."

His escape was due, according to Marmont, to Salicetti's favour and to the powerful help he himself succeeded in procuring ; "he moved heaven and earth." His power of attaching followers also now begins to appear ; Junot and Marmont, who had become acquainted with him at Toulon, were prepared, if he had been sent to Paris, to set him free by killing the gens d'armes and carrying him into the Genoese territory. Marmont has graphically described the influence exerted upon himself at this time by Bonaparte ; "there was so much future in his mind," he writes,

This was a passing check ; early in 1795 he suffered a greater misfortune. He had been engaged in a maritime expedition of which the object was to recover Corsica, now completely in the power of the English. On March 3d he embarked with his brother Louis, Marmont, and others on the brig " Amitié." On the 11th the fleet set sail. It fell in with the English, lost two ships, and returned defeated. The enterprise was abandoned, and by the end of the same month we find Lacombe Saint Michel, member of the Committee of Public Safety, sending orders to the Seneral of brigade Bonaparte to proceed immediately to the army of the west in order to take command of the

department of the Turkish service. He sends in a testimonial from Doulcet which describes him as "a, citizen who may be usefully employed whether in the artillery or in any other arm, and even in the department of foreign affairs." But at this moment occurs the crisis of his life. It coincides with a remarkable crisis in the history of France.

The Second Revolution (1792) had destroyed the mon- archy, but a republic, properly speaking, had not yet been established. Between 1792 and 1795 the government had been provisionally in the hands of the National Conven- tion, which had been summoned, not to govern, but to create a new constitution. Now at length, the danger from foreign enemies having been averted, the Convention could proceed to its proper work of establishing a definite republic.

But there was danger lest the country, when appealed to, should elect to undo the work of 1792 by recalling the Bourbons, or at least should avenge on the Mountain the atrocities of the Terror. To preserve the continuity of government an expedient was adopted. As under the new constitution the

assemblies were to be renewed periodically to the extent only of one-third at a time, it was decreed that the existing Convention should be treated as the first Corps Législatif under the new system. Thus, instead of being dissolved and making way for new assemblies, it was to form the nucleus of the new legislature, and to be renewed only to the extent of one-third. This additional law, which was promulgated along with the new constitu- tion, excited a rebellion in Paris. The sections (or wards) called into existence a revolutionary assembly, which met at the Odéon. This the Convention suppressed by military force, and the discontent of the individual sections was thereby increased. At the same time their confidence was

Checks revolt of the

’ sections.

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mander of army of Italy.

heightened by a check they inflicted upon General Menou, who, in attempting to disarm the section Lepelletier, was imprisoned in the Rue Vivienne, and could only extricate himself by concluding a sort of capitulation with the insurgents. Thereupon the Convention, alarmed, put Menou under arrest, and gave the command of the armed force of Paris and of the army of the interior to Barras, a leading politician of the day, who had acquired a sort of military reputation by having held several times the post of Representative in Mission. Barras knew the army of Italy and the services which Bonaparte had rendered at Toulon, and nominated him second in command.

It does not seem that Bonaparte showed any remarkable firmness of character or originality of genius in meeting the revolt of the sections on the next day (Vendémiaire 13, z.e., 5th October) with grape shot. Menou was a warning that the Convention required de- cisive action, and the

invidiousness of the act fell upon Barras, not upon Bonaparte. Indeed in the official report drawn by Bonaparte himself his own name scarcely appears; instead of assuming courageously the responsi- bility of the deed, he took great pains to shirk it. He appeared in the matter merely as the instrument, as the skilful artillerist, by whom Barras and the Convention carried their resolute policy into effect. It will be observed that on this occasion he defends the cause of Jacobinism. This does not require to be explained, asat a later time he took much pains to explain it, by the consideration that, odious as Jacobinism was, on this particular occasion it was identified with “the great truths of our Revolution.” Bonaparte at this period appears uniformly as a Jacobin. He was at the moment an official in the Jacobin Govern- ment, and speaks in his letters of the party of the sections just as a Government official might be expected to do.

In this affair he produced an impression of real military capacity among the leading men of France, and placed Barras himself under a personal obligation. He was re- warded by being appointed in succession to Barras, who now resigned, commander of the army of the interior. In this position, political and military at the same time, he preluded to the part reserved for him later of First Consul and Emperor. He also strengthened his new position materially by his marriage with Josephine de Beauharnais, née Tascher. The Bonaparte legend tells of a youth call- ing upon him to claim the sword of his father, guillotined in the Terror, of Bonaparte treating the youth kindly, of his mother paying a visit of thanks to the general, of an attachment following. But even if Bonaparte was really attached to Josephine, we must not think of the match as one of mere unworldly affection. It was scarcely less splendid for the young general Bonaparte than his second match was for the emperor Napoleon. Josephine was prominent in Parisian society, and for the lonely Corsican, so completely without connexions in Paris, or even in France, such an alliance was of priceless value. She had not much either of character or intellect, but real sweet- ness of disposition. Her personal charm was not so much that of beauty as of grace, social tact, and taste in dress. The act of marriage is dated Ventose 19, year IV. (2.e., 9th March 1796). On this day Bonaparte had already been appointed to the command of the army of Italy. His great European career now begins. .

The fourth year of the Revolutionary War was opening. The peculiar characteristic of that war is that, having been for France, at the commencement, a national war of libera- tion on the grandest scale, it changed its character after two years and became an equally unprecedented national war of conquest. The conquest of Austrian Flanders had been made in 1794, that of Holland in the winter of the same year. The whole left bank of the Rhine was in

The disgrace of

NAPOLEON

[1795-

French occupation, and the war had passed over to the right bank. The question was no longer of the principles of the Revolution, but only of inducing the emperor and

the Germanic body to conclude treaties in which Belgium

and the left bank should be ceded. It was a war for territory similar to so many wars of the 18th century, but exceeding all of them in the energy with which it was conducted and the extent which it covered. Never had the warlike spirit been so predominant before in Europe. Bonaparte did not introduce, but found already intro- duced, the principle of conquest.

Prussia, with most of the North-German princes and Spain, had retired from the war early in 1795. Austria was now the great enemy of France by land. Accordingly the direct struggle was waged chiefly on the upper Rhine, where Austria had then extensive territories. But Austra could also be attacked on the side of Italy, where she possessed the duchy of Milan. On this side, however, a less important belligerent intervened, viz., Sardinia. It was natural to suppose that Sardinia, which since 1792 had lost Savoy and Nice, which since the military regeneration of France could not expect victory, and which had been in the habit of regarding Austria rather as a rival than as a friend, would gladly be quit of the war. Could she but be pushed aside, Austria might be attacked on the plains of Lombardy. Bonaparte had nursed this idea ever since he had been connected with the

army of Italy ; since Vendémiaire he had discussed it with Carnot, and it was Carnot, now one of the five Directors, who, as he himself tells us, procured Bonaparte's appointment to the Italian command.

But not only Austria could be attacked in Italy. The French Revolution, by undertaking a sort of crusade against monarchy, had furnished itself with a justification for attacking almost all states alike, for almost all were either monarchical or at least aristocratic. Italy was full of small states which could be attacked as Mainz or Holland had been attacked before. Tuscany had an Austrian prince; Rome was the patron of the prétres insermentés; Venice was aristocratic. Bonaparte instinctively saw that he had a charter for indiscriminate conquest and plunder. He announced this to the army without the least disguise: "Soldiers, you are naked and ill fed; I will lead you into the most fruitful plains in the world. Rich provinces, great cities will be in your power. There you will find honour and fame and wealth!" In this announcement is the key to the history of Europe for the next twenty years.

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This order of the day was issued from Nice, where Italia|

Bonaparte had arrived on March 27th. began on April 10th. This, the first of Bonaparte's cam- paigns, has been compared to his last. As in 1815 he tried to separate Bliicher and Wellington, hoping to over- come them in turn, so now with more success he attacked first the Austrians under Beaulieu and then the Sardinians under Colli. Defeating the Austrians at Montenotte, Millesimo, and Dego, he turned on the 15th against Coll, defeated him at Ceva, then at Mondovi, and concluded the convention of Cherasco on the 28th. By this con- vention, which was soon after tumed into a treaty of peace, Sardinia was severed from the Coalition, and her principal fortresses put into the hands of France. What Bonaparte had so long dreamed of he accomplished in a single month, and turned himself at once to the conquest of Lombardy.

The month of May was devoted to the invasion. On the 7th he crossed the Po at Piacenza, stormed the bridge over the Adda at Lodi on the 11th, and,

as the archduke who governed Lombardy had quitted Milan on the 9th, retiring by Bergamo into Germany, Bonaparte entered

The campaign cami

1797.]

Milan on the 15th. That day Bonaparte told Marmont that his success hitherto was nothing to what was reserved for him. “In our days,” he added, “no one has con- ceived anything great; it falls to me to give the example.” June was spent in consolidating the conquest of Lombardy, in spoiling the country, and repressing the insurrections which broke out among the Italians, astonished to find From the

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existing Government we see that he has completely emanci- pated himself from it, and that his acts are those of an independent ruler, as had been those of Cesar in Gaul or of Pompey in the East while the Roman republic was still nominally standing. As early as June 1796 he said to Miot, ‘‘The commissioners of the Directory have no concern with my policy; I do what I please.”

themselves plundered by their “ liberators.” middle of July the war, as far as Austria is concerned, becomes a war for Mantua. Austria makes desperate and repeated efforts to raise the siege of this all-important

From the outset it had been contemplated to make the Levying invasion of Italy financially profitable. Contributions of con- were levied so rapaciously that in the duchy of Milan, ttibu- where the French had professed to appear as brothers and “°”*

fortress. On July 29 arrived Wiirmser at the head of 50,000 men, making his way through Tyrol from the Rhine. He advanced on both sides of the Lake of Garda, and threatened Bonaparte’s communications by occupying Brescia. Bonaparte abandoned the siege of Mantua, and brought his whole

force to meet the enemy. On this one occasion we find the young commander's resource and courage failing him. He called councils of war, and declared in favour of retreating across the Po. When Augereau resisted this determination, he left the room declaring that he would have nothing to do with the matter, and, when Augereau asked who was to give orders, answered "You!" The desperate course was rewarded with success. The Austrians were defeated at Castiglione on August 5th, and retired into Tyrol. But Mantua had been revictualled, and Bonaparte had suffered the loss of his slege-train.

Early in September Bonaparte, having received reinforce- ments from France, assumed the offensive against Wiirmser, and after defeating him at Bassano forced him to throw himself with the remainder of his army into Mantua (September 15).

At the end of October Austria had assembled a new army of 50,000 men, mostly, however, raw recruits. They were placed under the command of Alvinzi. Bonaparte was to be overwhelmed between this army and that of Wiirmser issuing from Mantua.

fell upon Alvinzi's rear at Arcola. The struggle lasted

through three days, during which Bonaparte's life was at _ one moment in great danger, and ended in a complete |

victory for the French (November 15-17). From Arcola he used ever afterwards to date his profound confidence in his own fortune. Mantua, however, still held out, and early in January (1797) a fourth and last attempt was made by Alvinzi to relieve it, but he was again completely defeated at Rivoli, and a whole Austrian corps @armée under Provera laid down its arms at Roverbella (January 16). On receiving the intelligence of this disaster Wiirmser concluded the capitulation by which the French were put In possession of Mantua.

Such was the campaign of Bonaparte against Austria, by which he raised his reputation at once above that of all the other generals of the republic, Jourdan, Moreau, or

But by a night march he |

liberators, a rebellion against them speedily broke out, which Bonaparte suppressed with the merciless cruelty he always showed in such cases. He kept the promise of his first proclamation: he made the army rich. “ From this moment,” writes Marmont, ‘‘the chief part of the pay and salaries was paid in coin. This led toa great change in the situation of the officers, and to a certain extent in their manners. The army of Italy was at that time the only one which had escaped from the unprecedented misery which all the armies had so long endured.” The amount of confiscation seems to have been enormous. Besides direct contributions levied in the conquered territory, the domains of dispossessed Governments, the revenues and property of churches and hospitals, were at Bonaparte’s disposal. There seems reason to think that but a small proportion of this plunder was ever accounted for. It went to the army chest, over which Bonaparte retained the control, and the pains that he took to corrupt his officers is attested in the narrative of Marmont, who relates that Bonaparte once caused a large sum to pass through his hands, and when he took great pains to render a full account of it, as the officers had then une fleur de délicatesse, Bona- parte blamed him for not having kept it for himself.

As he made himself financially independent of tle His Government, so he began to develop an independent policy. Italian Hitherto he has had no politics, but has been content to policy.

talk the Jacobinism of the ruling party ; now lhe takes a line, and it is not quite that of the Government. He had already, in June 1796, invaded the papal territory, and concluded a convention at Bologna by which he extorted 15 millions from the pope; immediately after the fall of Mantua he entered the States of the Church again, and concluded the treaty of Tolentino on February 19. We see how freely he combines diplomacy with war ; he writes without disguise to the Directory, October 5, “‘ You incur the greatest risk whenever your general in Italy is not the centre of everything.” But now in dealing with the pope he separates his policy from that of the Directory. He demands indeed the cession of Bologna, Ferrara, and the Romagna, besides Aviguon and the Venaissin, and the temporary cession of Ancona. But he recognizes the pope by treating with him, and

towards the Catholic religion and the priesthood he shows himself unexpectedly merciful.

es as Hoche. But he had acted by no means merely as a_ Religion is not to be altered in the ceded Legations, and pena general of the republic against Austria. He had assumed | Bonaparte extends his protection in the most ostentatious can from the beginning the part of an independent conqueror, | manner to the prétres insermentés, whom he found in large queror, Neither bound by the orders of his Government nor by any | numbers in the States of the Church. This was the more

rules of international law or morality.

The commander of a victorious army wields a force which only a Government long and firmly established can hold in check. A new Government, such as the Directory in France, having no root in the country, is powerless before a young victor such as Bonaparte. The danger had been early perceived : Hoche had been pronounced danger- ous by Robespierre ; it became imminent when Bonaparte with his unrestrained ambition pushed before the other generals, The coup d'état of Brumaire was in Bonaparte's mind before he had been many weeks at the head of the army of Italy. But long before he ventured to strike the

marked as they were at this time objects of the bitterest persecution in France. Here is the first indication of the policy of the Concordat, but it is also a mark of Bonaparte's independent position, the position rather of a prince than of a responsible official; nay, it marks a deliberate intention to set himself up as a rival of the Government. His manner of conducting the war was as unprecedented as his relation to the Government, and in like manner foreshadowed the Napoleonic period. It was not that of a civilized belligerent, but of a universal con- queror. The Revolution had put all international law into abeyance. Bonaparte in Italy, as in his later wars, knows

Advance on Austria.

nothing of neutrality. Thus Tuscany, the first of all states to conclude a treaty with the French republic, is not thereby saved from invasion. Bonaparte's troops march in, seize Leghorn, and take possession of all the English property found in that port. More remarkable still is the treatment of Venice. The. territory of the republic is turned unceremoniously into a field of battle between France and Austria, and at the end of the war the Venetian republic is blotted out of the map.

Further is to be remarked the curious development which was given tothe principle of plunder. The financial distress of France and the impoverishment of the army at the opening of the campaign might account for much simple spoliation. But Bonaparte introduced the practice of transferring pictures and statues from the Italian palaces and galleries to France. This singular revival of primitive barbaric modes of making war becomes more striking when we reflect that the spoiler of Italy was himself an Italian.

Altogether these campaigns brought to light a personality entirely without precedent in modern European history. True, the Revolution behind him and the circumstances around him were absolutely unprecedented. Marmont remarked at the time the rapid and continual development which just then showed itself in Bonaparte's character. "Every day," he writes, '""he seemed to see before him a new horizon." An ambitious man had suddenly become aware that a career entirely unparalleled was open to him, if only he could find audacity and unscrupulous energy to enter upon it. Add to this that he had lived for three years in the midst of disorders and horrors such as might well have dissipated all principles, beliefs, and restraints. Even as early as the 13th Vendémiaire we find him impressed with a fatalist belief in his own luck (IT received no hurt; Iam always lucky," he writes), and there are indications that his wonderful escape at Arcola greatly heightened this belief in a mind naturally some- what superstitious.

At this moment, as Bonaparte's private political views begin to appear, his Jacobinism, even his republicanism, slips from him like a robe. As early as May 1797 he said to Miot and Melzi, "Do you suppose that I triumph in Italy for the glory of the lawyers of the Directory, a Carnot or a Barras? Do you suppose I mean to found a republic? What an idea! a republic of thirty

millions of people! with our morals, our vices! how is such a thing possible? The nation wants a chief, a chief covered with glory, not theories of government, phrases, ideological essays that the French do not understand. They want some playthings ; that will be enough ; they will play with them and let themselves be led, always supposing they are cleverly prevented from seeing the goal towards which they are moving." His contempt for the French char- acter and his opinion of their unfitness for republican institutions was sincere ; it was the opinion of a Corsican accustomed to more primitive, more masculine ways of life; we meet with it in Bonaparte's earliest letters, written before the thought of himself ruling France had occurred to him.

When the fall of Mantua had established the French power in North Italy, Bonaparte's next thought was to strike at the heart of Austria from this new basis. Early in March, having secured his position in Italy by the treaty of Tolentino with Rome and by a treaty with Sardinia, he set his troops in motion. He sent Joubert with 18,000 men into Tyrol, while he prepared to march in person upon Vienna from Friuli through Carinthia and Styria. The archduke Charles had been called to the command of the troops opposed to him, but these were thoroughly demoralized. Bonaparte dislodged him from the line of

the Tagliamento, then from that of the Isonzo, and advanced steadily until he reached Leoben im Styria on April 7th. Here began negotiations.

not been properly understood. preliminaries containing conditions 10st triumphant for France, since they were won by an invasion which stopped little short of Vienna, and followed a series of victories most ruinous to the Austrian military power. But it was not France that imposed these conditions, it was Bonaparte, whose interest was not by any means identical with that of France. His object was not so much to vanquish Austria as to eclipse the French generals on the Rhine and wrest from them the honour of concluding the war. In order to do this it was necessary to surprise Austria by his modera- tion, and this he did in the preliminaries of Leoben. The

object of the war on the part of France had long been to obtain definitive possession of Belgium and the Rhine frontier; this might now have been obtained at the expense of Bonaparte's Italian conquests. At Leoben, however, no such arrangement was made. Belgium indeed, so far as it belonged to Austria, was ceded, and the emperor agreed to "recognize the limits of France as decreed by the laws of the republic." This expression afterwards was made to seem ambiguous, but at the time it appears to have been understood to refer almost exclusively to the Belgian terri- tories, which had been organized by the French into nine departments. It seems certainly not to have included that large territory limited by the Rhine which it was not com- petent to Austria to cede, since in the main it did not belong to Austria but to the Germanic empire. But what was to become of Bonaparte's conquests in Lombardy? Here we meet with a principle of action which, though not invented by him, was mainly instrumental in found- ing his empire. An independent republic was to be set up in Lombardy, and for this Austria was to receive as an indemnity the continental possessions of the Venetian republic as far as the Oglio, with Istria and Dalmatia. But how came this territory to be at the disposal of Bonaparte, since the Venetian republic was a neutral state ? The answer is that its neutrality had been utterly disre- garded by Bonaparte during the war, and that, as its territory had been freely trampled on by his troops, irrita- tion had necessarily arisen among the Venetians, thence quarrels with the French, thence on the side of the French an attack on the aristocratic government and the setting up of a democracy. Of all this the result was now found to be that the Venetian empire was a conquered territory, which in her next treaty France could cede in exchange for any desired advantage. 'This had been the principle of the partition of Poland; it was now to be the principle of a universal conquest.

The summer of 1797 was passed by Bonaparte at Montebello near Milan. Here he rehearsed in Italy the part of emperor, formed his court, and accustomed himself to all the functions of government. He was chiefly engaged at this time in accomplishing the dissolution of the Venetian republic. He had begun early in the spring by provoking insurrections in Brescia and Bergamo. In April the insolence of a French officer provoked a rising against the French at Salo, for which Junot, sent by Bonaparte, demanded satisfaction of the senate on the 15th. The French now attempted

to disarm all the Venetian garrisons that remained on the terra jirma, and this led to a rising at Verona in which some hundreds of French- men were massacred (April 17th). sea-captain, violating the customs of the port at the Lido, was fired upon from a Venetian fort. Bonaparte now declared that he would be a new Attila to Venice,

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| There has been much misconception of the preliminaries Prelimin! of Leoben, because Bonaparte's position and objects have aries of : We expect to find these Leoben. |

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On the 19th a French Occupa-

1797.]

and issued a declaration of war. The feeble Government could only submit. A revolution took place at Venice, and French troops took possession of the town on May 16th. A treaty was now concluded by Bonaparte " establishing peace and friendship between the French republic and the republic of Venice," and providing that " the French occu- pation should cease as soon as the new Government should declare that it no longer needed foreign assistance." 'A principal object of this treaty," as Bonaparte candidly explained to the Directory, "was to obtain possession

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probable that he would in any case have sided with the majority of the Directory, since anything which favoured the Bourbons was a hindrance to his ambition. And thus the armies of the republic stood united against the tendency of public opinion at home. Imperialism stood opposed to parliamentary government, believing itself—such was the bewilderment of the time—to be more in favour of the sovereignty of the people than the people itself, and not aware that it was paving the way for a military despot.

without hindrance of the city, the arsenal, and everything.” At the time that he was thus establishing friendship he was, as we know, ceding the territory of Venice, including

The catastrophe came on 18th Fructidor (September Coup 4, 1797), when Augereau, one of Bonaparte’s generals of @éat of

division, who had been sent by Bonaparte to Paris, sur- ae

at last the town, to Austria.

When we read the letters written by him at this period we see that already, only a year after he assumed for the first time the command of an army, he has fully conceived the utmost of what he afterwards realized. Had he been shown in vision at this time what he was to be at his zenith in 1812, when he was the astonisliment and terror of the world, he would probably have said that it fell short of his expectations.

One concession he had made in order to prevent Hoche and Moreau from sharing his laurels; at Leoben he had granted good terms to Austria. But the definitive treaty was not yet concluded, and it was still possible to with- draw this concession. This was the more possible as Austria might now be threatened with an attack from Bonaparte and Hoche at the same time. By virtue of the new principle she might also be bribed. The town of Venice might be ceded to her as well as the province, and in return for the left bank of the Rhine indemnity might be granted to her within the Germanic empire. The principle of ceding what is not one’s own is evidently capable of wide application. But Austria had still one hope, for it seemed impossible that France herself could sufier Bonaparte to run his headlong career without inter- ference, especially as she now had popular assemblies. The difficulty which Bonaparte had dissipated by his cannon in Vendémiaire had returned, as it could not fail todo. A Jacobinical regicide republic had to support itself in the midst of a nation which was by no means Jacobinical, and which had representative assemblies. These assem- blies, renewed by a third for the second time in the spring of 1797, placed Pichegru, suspected of royalism, in the chair of the Five Hundred, and Europe began to ask Whether the restoration of the Bourbons was about to follow. Bonaparte at Montebello found that the Austrian negotiators were bent upon delay.

The rising party was not perhaps mainly royalist ; its most conspicuous representative, Carnot, the Director, was himself a regicide. In the main it aimed only at respectable government and peace, but a minority were Open to some suspicion of royalism. This suspicion was fatal to the whole party, since royalism had at this time been thoroughly discredited by the follies of the émigrés. An outery is raised by the soldiers. We can measure the Steady progress which had been made by the military power since Vendémiaire; it had then been an instru- ment in the hands of the Government, now it gives the law and makes the Government its instrument. The armies of the Rhine, represented by Hoche, oppose the hew movement ; as to Bonaparte, he was driven into op- position by self-defence. Dumolard, a deputy, had called attention to his monstrous treatment of the Venetian re- public; he anticipated the judgment of history by com- paring it to the partition of Poland. Bonaparte had already divulged to a friend the secret that he despised republicanism, but this attack made him once more, for the last time, a republican and a Jacobin. It is, however,

rounded the Corps Législatif with twelve thousand men and arrested the most obnoxious representatives, while another force marched to the Luxembourg, arrested the Director Barthélemi, and would have arrested Carnot had he not received warning in time to make his escape. This stroke was followed by an outrageous proscription of the new party, of whom a large number, consisting partly of members of the Councils, partly of journalists, were transported to die at Cayenne, and the elections were annulled in forty-eight departments.

Such was Fructidor, which may be considered as the third of the revolutions which compose the complex event usually known as the French Revolution. In 1789 the absolute monarchy had given place to a constitutional monarchy, which was definitively established in 1791. In 1792 the constitutional monarchy fell, giving place to a republic which was definitively established in 1795. Since 1795 it had been understood that revolution was over, and that France was living under a constitution. But in Fructidor this constitution also fell, and govern- ment became revolutionary again. It was evident that a third constitution must be established ; it was evident also that this constitution must set up a military form of

government,—that is, an imperialism; but two more years passed before this was done.

The benefit of the change was reaped in the end by Bonaparte. Naturally he favoured it and took a great share in contriving it. But it seems an exaggeration to represent him as the exclusive or even the principal author of Fructidor. Hoche took the same side as Bonaparte; Augereau outran him (and yet Augereau at this time was by no means a mere echo of Bonaparte); the division of the army of Italy commanded by Bernadotte, which had been recently detached from the army of Sambre-et-Meuse, and stood somewhat aloof from Bonaparte's influence, sided with him in this instance. The truth is that the rising party of Moderates gave offence to the whole military world by making peace their watchword. Outside the armies too there was profound alarm in the whole repub- lican party, so that the circle of Madame de Staél was strongly Fructidorian, and this certainly was not guided by the influence of Bonaparte, though at this time Madame de Staél was among his warmest admirers. When the blow had been struck, Bonaparte knew how to reap the utmost advantage from it, and to exhibit it in its true light as mortal at the same time to the Moderates and to the republican Government itself, which now ceased to be legal and became once more revolutionary, and as favourable only to the military power and to the rising imperialism. He congratulated the armies on the fall of 'the enemies of the soldier and especially of the army of Italy," but accorded only the faintest approval to thie Directory.

The death of Hoche, occurring soon after, removed from Bonaparte's path his only rival in the affections of the already omnipotent soldiery. Hoche alone among the generals beside Bonaparte had shown political talents ;

had he lived longer, he might have played with success the part in which Moreau afterwards failed.

The revolution of Fructidor, being military, had an immediate effect on foreign affairs. It commences the period which was to last till the fall of Napoleon, a period of war pursued by France for its own sake, and as a kind of national business. As negotiations with England are at once violently

broken off, so a change comes over the negotiations with Austria. With the fall of the peace party Austria loses all hope of favourable terms. Bonaparte is now residing at Passeriano in a villa belonging to Doge Manin, and the negotiations take place at Udine in the neighbourhood. As at Leoben, Bonaparte 1s more pacific than the Directory. They are prepared to recommence the war; his ambition is to win from the other generals the distinction of terminating it. The struggle between them concerns the fate of Venice, the complete possession of which is a bribe sufficient to induce Austria to recede entirely from the preliminaries of Leoben, but which the Directory is unwilling to cede. Betwcen the beginning of September and the middle of October this

Treaty of struggle continued ; at length, on October 17th, the treaty

Campo Formio,

Returns to Paris.

was signed at the little village of Campo Formio (more correctly Campo Formido) close to Udine. Bonaparte took his own course, gave Venice, Istria, Dalmatia, and all Venetian territory beyond the Adige to Austria, founded the Cisalpine Republic, and reserved for France, besides Belgium, Corfu and the Ionian Islands. A congress was to open at Rastatt, and Austria bound herself by a secret article to do her best to procure for France from the Germanic body the left bank of the Rhine. By retaining the Ionian Islands Bonaparte gave the first intimation of his design of opening the Eastern question.

He uow left Italy, setting out from Milan on November 17th, made a flying visit to Rastatt, where the congress had already assembled, and reached Paris on December 5th. What next would be attempted by the man who at twenty-seven had conquered Italy and brought to an end the most memorable Continental war of modern times ? From a speech delivered by him on the occasion of his reception by the Directory it appears that he had two thoughts in his mind,—to make a revolution in France (“when the happiness of the French people shall be based on the best [or on better] organic laws, all Europe will be free”) and to emancipate Greece (“the two most beautiful parts of Europe, once so illustrious for arts, sciences, and the

great men of whom they were the cradle, see with the loftiest hopes the genius of liberty issue from the tombs of their ancestors”). He had now some months in which to arrange the execution of these plans. The Directory, seeing no safety but in giving him employment, now committed the war with England to his charge. He becomes “général en-chef de l’armée d’Angleterre.” His study of internal politics soon landed him in perplexity. Should he become a Director, procuring an exemption from the rule which required the Directors to: be more than forty years of age? He could decide on nothing, but felt himself unprepared to mingle in French party strife. He decided therefore that “the pear was not ripe,” and turned again to the military schemes which might raise his renown still higher during the year or two which the Directory would require to ruin itself. It seemed possible to com- bine war against England with the Oriental plan which had been suggested to him, it is said, by Monge at Passeriano. During the last war between Russia and Turkey some publi- cists (including Volney, an acquaintance of Bonaparte’s) had recommended France to abandon her ancient alliance with Turkey and seek rather to share with Russia in her spoils. Thus was suggested to Bonaparte in Italy the thought of seizing Greece. Now as head of the army of

England he fixed his eyes on Egypt also. In India the tgyp. |

game was not yet quite lost for France, but England had tian To save therefore °*Peti- what remained of her establishmentsin India, France must 7°”

now seized the Cape of Good Hope.

seize Egypt. She must not only conquer but colonize it (“if forty or fifty thousand European families fixed their industries, their laws, and their administration in Egypt, India would be presently lost to the English much more even by the force of events than by that of arms”). Such was the scheme, according to which Turkey was to be partitioned in the course of a war with England, as Venice had disappeared in the course of a war with Austria.

That such a scheme could scarcely fail to kindle a new European war more universal than that which Bonaparte had just brought to a close was probably its principal recom- mendation in hiseyes. He also instinctively saw that, while he conquered in the Hast, France, deprived of her best troops and generals, would suffer disasters at home, though he could not anticipate what actually happened—that she would be unfortunate both at home and in the East. But the European war showed signs of recommencing even before he could set sail. For the tide of militarism in France could not be arrested for a moment; scarcely a month passed but was marked by some new aggression and annexation. In the spring of 1798 the old constitution of Switzerland was overthrown, French troops entered Bern and seized a treasure of 40,000,000 francs; at the same time a quarrel was picked with the Papal Government ; it was overthrown, the treasury plundered, and the aged pope, Pius VI., carried into captivity. Thus, as Berthier said, money was furnished for the Egyptian campaign ; but on the other hand Europe was thoroughly roused ; England could meet the threatened attack by forming a new Coalition, and at the beginning of May, three weeks before Bonaparte set sail, the probability of a new Continental war was already so great that he writes, for the benefit of General Brune, a plan for defending Italy against an attack by a superior force of Austrians. It is asserted by Miot that at the last moment Bonaparte would gladly have abandoned his Eastern expedition, since it would have suited him as well to take the command again against Austria, but that the Directory, to be rid of him at all hazards, forced him to depart.

In any case the departure of Bonaparte for the Hast with 30,000 men and Generals Murat, Berthier, Desaix, Kléber, Lannes, and Marmont—Nelson in front of him and a European war behind—perhaps marks the moment of wildest confusion in the modern history of Europe. From his letters written on board “ L’Orient ” it would seem that he scarcely realized the terrible risk he ran; it is to be considered that the superiority of the English marine had not yet been clearly proved, and that the name of Nelson was not yet redoubtable. He set sail on May 19, having stimulated the zeal of his soldiers by promising that each should return rich enough to buy six “arpents” of land (the Directory were obliged to deny the genuineness of the proclamation), and, eluding Nelson, who had been driven by a storm to the island of St Pietro near Sardinia, arrived on June 9 at Malta, where a

squadron from Civita Vecchia and another from Ajaccio had preceded him. This island was in the possession of the Knights of St John of Jerusalem, who acknowledged the king of Naples as their feudal superior and the czar as their protector. To attack them was the direct way to involve France in war both with Naples and Russia. Bonaparte, demanding admission into the harbour for his fleet, and receiving answer that the treaties which guaranteed the neutrality of Malta permitted only the admission of four ships, attacked at once, as indeed he had been expressly com-

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manded by the Directory to do (Nap. Corr., iv. 53). The people rose against the knights; the grand master Hompesch opened negotiations, and on the 12th Bonaparte entered La Valette. He is enthusiastic about the strength and importance of the position thus won. “It is the strongest place in Europe; those who would dislodge us must pay dear.” He spent some days in organizing a new Government for the island, and set sail again on the 19th. On July 2 he issues his first order in Alexandria.

During the passage we find him prosecuting his earlier scheme of the emancipation of Greece. Thus from Malta he sends Lavalette with a letter to Ali Pasha of Janina. His plan therefore seems to embrace Greece and Egypt at once, and thus to take for granted the command of the sea, almost as if no English fleet existed. The miscalcula- tion was soon made manifest. Bonaparte himself, after

occupying Alexandria, set out again on the 8th and

marched on Cairo; he defeated the Mamelukes first at Chebreiss and then at Embabeh within sight of the Pyramids, where the enemy lost 2000 and the French about 20 or 30 killed and 120 wounded. He is in Cairo on the 24th, where for the most part he remains till January of 1799. But a week after his

arrival in Cairo the fleet which had brought him from France, with its admiral Brueys, was destroyed by Nelson in Aboukir Bay. For the first time, in reporting this event to the Directory, it seems to flash on Bonaparte's mind that the English are masters of the sea. The grand design is ruined by this single stroke. France is left at war with almost all Europe, and with Turkey also (for Bonaparte's hope of deceiving the sultan by representing himself as asserting his cause against the Mamelukes was frustrated), and her best generals with a fine army are imprisoned in another continent.

It might still be possible to create a revolution in Turkey in Asia, if not in Turkey in Europe. The Turks were pre- paring an army in Syria, and in February 1799 Bonaparte anticipated their attack by invading Syria with about 12,000 men. He took El Arish on the 20th, then Gaza, and arrived at Jaffa on March 3. It was taken by assault, and a massacre commenced which, unfortunately for Bonaparte's reputation, was stopped by some officers. The consequence was that upwards of 2000 prisoners were taken. Bonaparte, unwilling either to spare food for them or to let them go, ordered the adjutant-general to take them to the sea-shore and there shoot them, taking precautions to prevent any from escaping. This was done. ' Now," writes Bonaparte, "there remains St Jean D'Acre." This fortress was the seat of the pasha, Jezzar. It is on the sea-shore, and accord- ingly England could intervene. Admiral Sir Sidney Smith, commanding a squadron on the coast, opened fire on the French as they approached the shore, and was surprised to find his fire answered only by musketry. In a moment he divined that the siege artillery was to come from Alexandria by sea, and very speedily he discovered the ships that carried it and took possession of them. On March 19 Bonaparte is before Acre, but the place receives supplies from the sea, and support from the English ships, while his artillery is lost. He is detained there for two whole months, and retires at last without success. This check, he said, changed the destiny of the world, for he calculated that the fall of Jezzar would have been followed by the adhesion of all the subject tribes, Druses and Christians, which would have given him an army ready for the con- quest of Asia.

The failure had been partially redeemed by a victory Won in April over an army which had marched from the mterior to the relief of Acre under

Abdallah Pasha, and which Bonaparte defeated on the plain of Esdraelon (the battle is usually named from Mount Tabor). In the muddle of May the retreat began, a counterpart on a small

scale of the retreat from Moscow, heat and pestilence taking the place of frost and the Cossacks. On the 24th he is again at Jaffa, from which he writes his report to the Directory explaining that he had deliberately abstained from entering Acre because of the plague which, as he heard, was ravaging the city. On June 14 his letters are again dated from Cairo. Hissecond stay in Egypt lasts two months, which were spent partly in hunting the dethroned chief of the Mamelukes, Murad Bey, partly in meeting a new Turkish army, which arrived in July in the Bay of Aboukir. He inflicted on it an annihilating defeat near its landing-place ; according to his own account ten or twelve thousand persons were drowned. This victory masked the final failure of the expedition. It was a failure such as would have ruined Bonaparte in a state enjoying publicity, where the responsibility could have been brought home to him and the facts could have been discussed. For a year of warfare, for the loss of the fleet, of 6000 soldiers, and of several distinguished officers (Brueys, Caffarelli, Cretin), for disastrous defeats suffered in Europe, which might have been averted by Bonaparte and his army, for the loss for an indefinite time of the army itself, which could only return to France by permission of the English, there was nothing to show. No progress was made in con- ciliating the people. Bonaparte had arrived with an inten- tion of appealing to the religious instinct of the Semitic races. He had imagined apparently that the rebellion of France against the Catholic religion might be presented to the Moslems as a victory of their faith. He had declared himself a Mussulman commissioned by the Most High to humble the cross. He had hoped at the same time to conciliate the sultan ; it had been arranged that Talleyrand should go to Constantinople for the purpose. But Talleyrand remained at Paris, the sultan was not con- ciliated, the people were not deluded by Bonaparte’s reli- gious appeals. Rebellion after rebellion had broken out,

and had been repressed with savage cruelty. It was time for him to extricate himself from so miserable a business.

It appears from the correspondence that he had promised to be back in France as early as October 1798, a fact which shows how completely all his calculations had been dis- appointed. Sir Sidney Smith now contrived that he should receive a packet of journals, by which he was informed of all that had passed recently in Europe and of the disasters that France had suffered. His resolution was immediately taken. On August 22 he wrote to Kléber announcing that he transferred to him the command of the expedition, and that he himself would return to Europe, taking with him Berthier, Lannes, Murat, Andréossi, Marmont, Monge, and Berthollet, and giving orders that Junot should follow in October and Desaix in November. After carefully spreading false accounts of his intentions, he set sail with two frigates in the night of the same day. He arrived after a voyage of more than six weeks, during which he revisited Corsica, in the harbour of Fréjus on October 9.

From this moment the tide of his fortune began to flow again. His reappearance seemed providential, and was hailed with delight throughout France. The system established in Fructidor was essentially military. It had led directly to the violent aggressions of 1798, and to a great law of military service introduced by General Jourdan, which was the basis of the Napoleonic armies; it had created a new European war. But it was evidently inconsistent with the form of government established in 1795. A Directory of civilians were not qualified to conduct a policy so systematically warlike. Hence the war of 1799 had been palpably mismanaged. The armies and the generals were there, but the presiding strategist

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and statesman was wanting. In Italy conquest had been pushed too far. Half the troops were locked up in for- tresses or occupied in suppressing rebellions; hence Macdonald at the Trebbia and Joubert at Novi were defeated by Suwaroff, Mantua fell, and the work of Bonaparte in Italy was well-nigh undone. Government was shaken by these disasters. A kind of revolution took place in June. Four new members entered the Directory, of whom three—Gohier, Roger-Ducos, and General Moulin —represented on the whole the revival of the J acobinism of 1793, while the fourth, Sieyés, the most important politician of this crisis, represented the desire for some new con- stitutional experiment. The remedy which first suggested itself was to return to the warlike fury and terrorism of 1793. The Jacobin Club revived and held its sittings in the Salle du Manége. Many leading generals, especially Jourdan and Bernadotte, favoured it. But 1793 was not to be revived. Its passions had gone to sleep, and the memory of it was a nightmare. Nevertheless a sort of Terror began. The hardship of recruitment caused rebel- lions, particularly in the west. Chouannerie and Royalism revived, and the odious Law of Hostages was passed to meet them. After seven years of misery France in the autumn of 1799 was perhaps more miserable than ever.

Tf 1793 could not be revived, what alternative? Sieyés perceived that what was needed was a supreme general to direct the war. But, though he had ceased to believe in popular institutions, and had become a convert to a new kind of aristocracy, he did not wish his supreme general to control civil affairs. He looked for an officer who should be intelligent without being too ambitious. His choice fell upon Joubert, who was nominated commander of the army of Italy that he might acquire the necessary renown. But Joubert was killed at Novi in August. From this time Sieyés had remained uncertain. Advances were made in vain to Moreau. Who can say what might have happened in a few months? Some general of abilities not very commanding would have risen to a position in which he would have controlled the fate of France. Perhaps Masséna, whose reputation at this moment reached its highest point through the victories of Zurich, but who was not made either for an emperor or for a statesman, might have come forward to play the part of Monk.

Upon this perplexing gloom the reappearance of Bonaparte came like a tropical sunrise, too dazzling for Sieyés himself, who wanted a general, but a general he could control. On October 16 he arrived at his old Parisian house in the Rue de la Victoire, and on the 9th and 10th of November (Brumaire 18, 19) the revolution took place. Bonaparte had some difficulty at first in under- standing the position. He found a Jacobin party clamour- ing for strong measures and for a vigorous prosecution of the war ; at the head of this party he saw military men, par- ticularly Jourdan and Bernadotte. Asan old Robespierrist, a Fructidorian, and a soldier, he was at first attracted to this faction. Sieyés, the object of their most bitter attacks, he was at first disposed to regard as his principal enemy. Gradually he came to perceive that this time he was to rise not as a Jacobin but as the soldier of anti- Jacobinism, and that he must place his sword at the service of Sieyés. For his part Sieyés could not but perceive that Bonaparte was not precisely the war minister he sought, But by the efforts of Lucien and Joseph Bona- parte, of Roederer, and Talleyrand a coalition was at last effected between them, though Sieyés continued to predict that after the success Bonaparte would throw him off. The movement which now took place was the most respect- able, the most hopeful, as for a long time it seemed the most successful, effort that had been made since 1792 to lift France out of the slough. ‘Instead of reviving

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Jacobinism it was resolved to organize a strong and skilled Government. A grand party of respectability rallied round Sieyés to put down Jacobinism. Ducos among the Direc- tors (he had been converted), the majority of the Council of Ancients, Moreau and Macdonald, the generals of purest reputation, Bonaparte and the generals personally attached to him, composed this party. On the other side the Jacobinical party consisted of the Directors Gohier and Moulin, the majority of the Council of Five Hundred, Gene- rals Jourdan and Bernadotte. Which party would be fol- lowed by the rank and file of the army was an anxious question.

It was determined to take advantage of a provision of the constitution which had been originally inserted by the Girondists as a safeguard against

aggressions from the municipality of Paris, and to cause the Council of Ancients to decree a meeting of the Councils outside Paris at the palace of St Cloud. At this meeting it was intended to propose a reform of the constitution. The proposal would be supported by a majority in the Council of Ancients, and by many, but probably not a majority, in the Council of Five Hundred. It was foreseen that the Jacobins might give trouble, and might need to be eliminated, as they had themselves eliminated the Girondins. With a view to this, when the decree was passed on November 9th, General Bonaparte, made commander of all the troops in Paris, was entrusted with the execution of it. It is carefully to be observed that he does not, like Cromwell, act of his own free will against the assembly, but is appointed by the assembly to act in its name. No one thought of destroying the republic ; the question was of introducing the famous perfect constitution of Sieyes. Bonaparte appeared, surrounded by the generals of his party, in the Council of Ancients, where he skilfully evaded taking the oath to the constitution. He then reviewed the troops, and it became apparent that he could count on them. From this moment Brumaire may be said to have been decided. The next step was that Sieyés and Ducos resigned their places on the Directory; Barras was in- duced to follow their example; but Gohier and Moulin were firm. Gohier was placed under ward of Moreau at the Luxembourg, while Moulin made his escape. It now only remained to deal with the Council of Five Hundred, the stronghold of Jacobinism.

The revolution was consummated on the next day at St Cloud. Bonaparte and Sieyés sat in a private room while the Councils began their deliberations; but, being informed that it was proposed to renew the oath to the existing constitution, Bonaparte determined to interfere. There seems to have been mismanagement here. Sieyés, not Bonaparte, should have interfered, but probably he was rendered helpless, as often happened to him, by timidity. Bonaparte then entered the Council of Ancients, where he delivered a confused harangue which did him little good, though the assembly was well-disposed to him. His position was a false one, though he urged very justly that the existing constitution had been practically destroyed by the illegalities of Fructidor, Floréal, and Prairial. He then passed to the hostile Council of Five Hundred, where he was received with

cries of Hors la lot / A bas le dictateur! He was seized by the collar and attempts were made to push him out of the hall.

He was now almost in despair, and no wonder! By the backwardness of Sieyés he had been pushed into the part of Cromwell. But Cromwell had soldiers devoted to him, and of theocratic rather than republican ideas ; the soldiers of Bonaparte had only just been put under his command, and they were fanatical republicans. The false step must be retrieved. The soldiers must be persuaded that Bonaparte was no Cromwell, but a staunch republican,

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and that they were not called upon to act against an assembly, but only against a traitorous minority, as at Fructidor. Lucien Bonaparte, who was president of the Five Hundred, performed this miracle. Bonaparte had sent grenadiers to rescue him. Lucien was at the tribune, where le was defending his brother amidst noisy interrup- tion. At the appearance of the grenadiers he threw off his official dress and retired under their escort. In the hall he mounted on horseback and addressed the troops who were employed to guard the legislature, declaring that the council was oppressed by assassins, brigands paid by England ; he charged the soldiers to deliver the majority from this oppression by clearing the hall. He brandished a sword and swore to stab his brother if ever he attacked the liberties of Frenchmen. On the clear understanding that no violence against the assembly was intended, and with the express sanction of its president, the soldiers then cleared the hall. In the evening at 9 o’clock Lucien reassembled a certain number of the members and proposed to them to nominate a committee which should report on the state of affairs. This committee was at once named, and speedily presented a report to the effect that Sieyés, Roger-Ducos, and Bonaparte should compose a provisional executive under the title of consuls, that the legislature should adjourn till February 20 (1 Ventose), a committee of twenty-five members from each Council being left to deliberate along with the consuls upon the changes to be made in the constitution; at the same time, as in Fructidor, a certain number of members (fifty-five) were to be expelled from the Councils.

Thus the original plan was on the whole carried into effect. But it had been sadly marred by the unseemly

Grand Elector, whose main function consisted in choosing two consuls, of whom one was to take the home and the other the foreign department. Here again Bonaparte ac- quiesced as far as he could. He adopted the consuls and the triple executive, even lowering apparently the grand elector of Sieyés by giving him the more republican title of First Consul. But he displayed signally and for the first time the adroitness, rapid and audacious, which was to be the characteristic of his diplomacy. He declaimed violently against the feebleness of the grand elector and the consuls in this scheme, feigning to overlook that it concentrated power intentionally in the Senate; then instead of sending back the scheme for revision he simply strengthened immensely the attributions of the first consul, leaving the other consuls and the assemblies as weak as before. By this stroke a strong aristocracy was turned into a strong despotism, and at the same time advantage was taken of the very peculiar character of Sieyés, who always when he met with opposition sank into an im- penetrable silence. Bonaparte boasted afterwards that he had sealed his victory over Sieyés by a handsome bribe at the expense of the public.

The provisional consulate of Sieyés, Ducos, and Bona- parte lasted only from November 10th to December 13th. Then through the promulgation of the new constitution it made way for the definitive consulate of Bonaparte, Cambacérés, and Lebrun, which lasted four years. By the constitution of 22 Frimaire, year VIII. (which was never debated in any assembly, but, after being devised by the two legislative committees meeting at the Luxem- bourg under the presidency of Bonaparte, and in the presence of the other consuls, and after being redacted by

Daunou, was introduced by a popular vote), Bonaparte Bona- became First Consul for ten years with a salary of half a parte million francs, with a sole power of nominating the council becomes

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appearance of Bonaparte and by his gasconades, in which he bade the Council remember that he “marched under the escort of the god of fortune and the god of war.” An

attempt was made to conceal these mistakes by publishing onsul,

in the JMoniteur a garbled report of his speech.

Brumaire taken by itself is the victory of Sieyés rather than of Bonaparte. It raised Sieyés to the position he had so long coveted of legislator for France. The con- stitution now introduced was really in great part his work, but his work so signally altered in one point that it resulted in the absolute supremacy of Bonaparte. We should especially notice that it is Sieyés, not Bonaparte, who practically suppresses representative institutions. The long-expected scheme of Sieyés was at last promulgated, and we see with astonishment that the man of 1789, the author of Quest ce que le Tiers Etat? himself condemns political liberty. In this scheme the assemblies, of which there are three, the Senate, the Tribunate, and the Corps Législatif, are not chosen by popular election at all. The two latter are nominated by the Senate, and the Senate is chosen at the outset in part by the provisional consuls and in part by co-optation. The Tribunate alone had the right of public debate, which was separated from the right of voting. This latter was assigned to the Corps Législatif. These arrangements, which caused the nullity of parlia- mentary institutions in the Napoleonic period, were devised not by Bonaparte but by Sieyés, who confined popular elec- fon to certain lists of notability out of which the assemblies were required to be chosen. By this scheme Sieyés, who Tetained all his hatred for the old régime and the old noblesse, passed sentence upon the whole constructive work of the Revolution; this sentence was only ratified by Bonaparte.

_But, while he absolutely condemned democracy, Sieyés did not want to set up despotism. The Senate was to be Supreme ; it was to be a kind of hereditary aristocracy, the depositary of the tradition of the Revolution ; above it, and capable of being deposed by it, was to be a doge called

fleet, and most of the judges and local officials, and with a power in nominal conjunction with the other consuls of initiating all legislation and deciding war and _ peace. Sieyés and Ducos retired, and under the new constitution the second and third consuls were Cambacérés, an eminent legist, and Lebrun, an old official of Louis XV.'s time. The party of Brumaire had intended to set up a republic, but this constitution created a strong monarchy under the thinnest disguise.

For the moment it was much that France renounced Jacobinism and ceased to tear herself to pieces. The civil war of the west and the foreign war were alike energetic- ally taken in hand. A proclamation to the imhabitants of the west (December 28th) breathed for the first time the spirit of tolerance, of respect for religion, and con- sideration for the clergy. It was a precursor of the Concordat, and attacked the civil war at its root. It was accompanied by the most imperious threats against the refractory, who are to be treated "like the Arabs of the desert," who are warned that they have to do with a man "accustomed to rigorous and energetic measures,"—an allusion apparently to the massacres of Jaffa and Cairo. This policy, accompanied by decisive military action, was speedily successful. By the end of February all was quiet in the west; Frotté, the most active leader in Normandy, had surrendered at discretion, and had been shot, though Bonaparte had expressly announced that if he surrendered he might count on the generosity of the Government. In preaching a religious peace at home Bonaparte was sincere; he was less so In announcing a policy of peace in Europe, for he well. knew that he needed a victory to cover his apostasy from republicanism. Nevertheless the announcement was necessary as part of the national renunciation of Jacobinism; and it was

His jealousy of Moreau.

harmless, for the Coalition was scarcely likely to accept peace when they had the military advantage. Indeed they could not consistently do so, since they had gone to war on the ground that peace with the Directory had appeared in 1798 to be less endurable than war, and the accession of Bonaparte could not but seem to them likely to make matters worse. In thinking thus they were substantially right, as the sequel proved, but they

did not sufficiently understand that Bonaparte was not now the “champion of Jacobinism,” as Pitt called him, but had become its enemy and destroyer. When England and Austria refused his overtures, Bonaparte had the good fortune of getting precisely what he wanted, viz., war, in precisely the way he wished, that is, as apparently forced upon him. This war is peculiar in the circumstance that throughout its course Bonaparte has a military rival with whom he is afraid to break, and who keeps pace with him in achievements —Moreau. To Moreau the success of Brumaire had been mainly due, and he had perhaps thought that the new constitution, as it did not seem to contemplate the First Consul commanding an army, had removed Bonaparte from the path of his ambition. He now held the command of the principal army, that of the Rhine, in which post Bonaparte could not venture to supersede him. The problem for Bonaparte throughout the war was to prevent Moreau, and in a less degree Masséna, who was now in command of the army of Italy, from eclipsing his own military reputation. Russia had now retired from the Coalition, so that, as in 1796, Austria and England were the only belligerents. Italy had been almost entirely lost, and Masséna, at the head of the army of Italy, opposed to General Melas, was almost where Bonaparte had been before his Italian campaign began. But France had retained the control of Switzerland, and Moreau with more ‘than 100,000 men arranged along the Rhine from the Lake of Constance to Alsace stood opposed to Kray, whose headquarters were at Donaueschingen. It seemed that the campaign would be conducted by Moreau and Masséna receiving instructions from Bonaparte at Paris. That the decisive campaign would have been in Bavaria seems so evident that the military writer Biilow conjectures that the French were afraid of alarming Europe by a too decisive victory, which would have brought them at once to the walls of Vienna, and that they therefore transferred the campaign to Italy. But where would Bonaparte have been had Moreau won Hohenlinden in the spring of 1800 while he remained ingloriously at Paris? While therefore in writing to Moreau he carefully adopts the language of one who, much to his own regret, has become a mere civilian, he plans the campaign so that both Moreau and Masséna are confined to the task of holding the enemy in play while an army of reserve descends from one of the Alpine passes into Italy. This army of reserve, which was so carefully concealed that few people believed in its existence, is to be commanded, he writes, by some general “to be named by the consuls” ; a little later Berthier

is nominated. As late as the end of March he told Miot that he did not mean to leave Paris. Moreau is also to detach 25,000 men under Lecourbe, who are to join Berthier in Ttaly ; in this way security was taken that Moreau should not be too successful. On April 24 the campaign in Germany began by the passage of the Rhine at a number of points at once. Up to May 10 Moreau is the hero of the war. He is victorious at Engen, at Mosskirchen, and forces Kray to retire to Ulm. But on May 9 Bonaparte is at Geneva, and it appears at once that he is commander, and Berthier only his chief of the staff. At the same time Carnot in person is sent with unusual formality to demand from Moreau the detachment of troops.

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The campaign of Marengo was astonishingly short.

before the end of June. Masséna had been struggling vainly against the superior forces of Melas; since the 21st he had been shut up in Genoa, where Austria and England could co-operate in the siege. In Italy the affairs of France looked darker than ever, when Bonaparte threw himself on the rear of Melas by passing the Great St Bernard between May 15 and 20. Other divisions passed the Little St Bernard and the Mont Cenis, while the detachment from Moreau's army (under Moncey, not Lecourbe) descended the St Gotthard. It seems that the Austrians had absolutely refused to believe, what nevertheless was openly discussed in the Paris journals, that Bonaparte intended to cross the Alps. Bonaparte had another surprise in store for them. Though Genoa was now suffering all the horrors of famine, he made no attempt to relieve it, but turned to the left, entered Milan, and took possession of the whole line of the Ticino and the Po. Meanwhile Genoa capitulated to General Ott. Melas was now at Alessandria, where Bonaparte sought him on the 13th. On the 14th Melas marched out, crossed the Bormida, and arrived at Marengo. The victory here won by Bonaparte, though in its consequences more decisive than any other, and marking in a certain sense the culmina- tion of his career, yet was due almost entirely to accident. A sudden charge of cavalry by Kellermann changed a great Austrian victory into a decisive Austrian defeat. On the next day Melas (having, as it seems, quite lost his head) signed a convention by which

Austria sacrificed almost all North Italy, restoring something like the position of Campo Formio. “Had he fought another battle,” says Marmont, “he would certainly have beaten us.” Bonaparte returns to Paris, victorious at once over Austria and over Moreau and Masséna. He did not, however, succeed in tearing from Moreau the honour of concluding the war. Marengo did not lead to peace; this was won, where naturally it could only be won, in Bavaria by Moreau’s victory of Hohenlinden (December 3d), a victory perhaps greater than any of which at that time Bonaparte could boast.

Never was Bonaparte more recklessly audacious, never was he more completely and undeservedly successful, than in this campaign. Brumaire had given him a very uncer- tain position. Sieyés and the republicans were on the watch for him on the one side; Moreau seemed on the point of eclipsing him on the other. His family felt their critical position: “had he fallen at Marengo,” writes Lucien, “we should have been all proscribed.” Perhaps nothing but a stroke so rapid and startling as that of Marengo could have saved him from these difficulties. But this did more, and developed the empire out of the consulate.

His appeal for peace after Brumaire had not been purely insincere, though he wanted victory before peace. He proposes to Rouget de l’Isle to write “a battle hymn which shall express the idea that with great nations peace comes after victory.” After Marengo he devotes himself to giving peace to the world; he did this by three great acts, so that in 1802 for the first time for ten years under the new Augustus “no war or battle sound was heard the world around.” These three acts are the treaty of Lunéville, February 1801, the Concordat, July 1801, the treaty of Amiens, March 1802. It is worth noticing that the negotiator of all of them is his brother J oseph, as if he especially desired to connect his family name with the pacification of the world.

1. The treaty of Lunéville gave peace. to the Continent. Treaty

It is to be observed that here Bonaparte shows himself at least less rapacious than the Directory. He surrenders

On Cam- May 11 Bonaparte left Geneva, and he is in Paris again Paign of Since the beginning of Apri] Marengo.

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1802.] most of the usurpations of 1798,

after all it might not be possible to find a modus vivende

with the Government of Brumaire.

2. By the Concordat he professed to close the religious

ordat. yar. In reality he crushed the national Gallican Church,

which had been created by the Constitution Civile, and which had perhaps begun to take root, and restored the Papal Church, shorn of its endowments and dependent, so As part of the great pacifica- tion, the Concordat was perhaps mainly a stroke of stage- effect, though its influence upon the later history of France For Bonaparte himself it was important as severing the clerical party from the Bourbons and attaching it to himself, as giving him through the clergy an influence over the peasantry, upon whom he depended for his armies, also as in some degree welding together through the ubiquitous influence of the clergy the different

long as he lived, on the state.

has been great.

states which were already subject to his government. In

negotiating it with Cardinal Consalvi, Bonaparte had recourse more than once to the vulgar fraud and knavery

which earned for him the title of Jupiter-Scapin.

Treaty of 3. After the treaty of Lunéville, as after that of Campo

Amiens. Vormio, England was left to fight France alone; but Bonaparte had now a higher estimate than in 1798 of

England’s naval power. He was able, however, in 1801 to attack her in another way. By her conduct at Malta she had given offence to the czar Paul, and taking advant- age of this Bonaparte was able to revive against her the armed neutrality of 1780. Not only Russia but Prussia was thus brought for the first time, along with Sweden and Denmark, into the French alliance, and the system of Tilsit was for the first time sketched out. But it lasted only for a moment. At the beginning of April the announcement of the murder of Paul and the bombard- ment of Copenhagen by Nelson dissolved it. England and France were now alike disposed for peace, the former because she had lost the support of a European Coalition, the latter because she had lost all means of attack, and also because of Bonaparte’s grand plan of pacification. In the summer Bonaparte’s endeavours are confined to saving the French colony in Egypt from the English, and to snatching a little territory from England’s ally Portugal by means of Spain. But Cairo capitulated to the English in June, in which month also Spain made peace with Portugal. Accordingly in October the preliminaries of London were signed, and the treaty of Amiens followed in March. The allies of France paid for her naval defeats, Spain losing Trinidad and Holland Ceylon; but France, though she lost nothing, acquiesced by this treaty in the total failure of all her designs upon the East. _ The globe was now at peace, and thanked Bonaparte for it. The equilibrium which had been destroyed by the Revolution seemed at length to be restored. Meanwhile the legislative reconstruction of France proceeded rapidly. This is the glorious period of Bonaparte’s life, not, as has often been alleged, because he was as yet uncorrupted by power, but simply because a strong intelligent Government was the great need of France and repose the great need of Europe, and Bonaparte at this time satisfied both needs. oui The work of reconstruction which distinguishes the of French CouSUlate, though it was continued under the empire, is institu most enduring of all the achievements of Napoleon. tions, The Institutions of modern France date, not, as is often said, from the Revolution, but from the consulate. Not that Napoleon personally was endowed with a supreme legislative genius; his principal merit was to have given to France the first secure Government, the first Govern-

Recon-

the Roman and Parthenopean Republics, and returns in the main to the arrangements of Campo Formio,—a proof of moderation which must have led the cabinets to consider whether ‘he Con- i

ment capable of effective legislation, that she had had since the destruction of her ancient institutions. The task of reconstruction fell to him of necessity; his personal interference was in many respects, as we shall see, mis- chievous rather than beneficial; it is, however, also true that he appreciated the greatness of the work, urged it on with vigour, entered into it, impressed it with the stamp of his own personality, and left upon it the traces of his keen sagacity.

The institutions now created, and which form the organi- zation of modern France, are—(1) the restored Church, resting on the Concordat; (2) the University, resting on the law of 11 Floréal, An X. (May 1, 1802); (3) the judicial system, commenced by the law of 27 Ventose, An VIII. (March 18, 1800), and completed by other laws in 1810 ; (4) the Codes:—(a) Code Civil (commission nominated 24 Thermidor, An VIII., August 12, 1800; it received the name Code Napoléon on September 3, 1807), (b) Code de Commerce, promulgated on September 10, 1807, (c) Code Pénal, (d) Code d’Instruction Criminelle (came into force January 1, 1811); (5) the system of local government, resting on the law of 18 Pluviose, An VIII. (February 7, 1800) ; (6) the Bank of France, established 28 Nivose, An VIII. (January 18, 1800); (7) the Legion of Honour, ° established 29 Floréal, An X. (May 19, 1802). These institutions, along with the military system, have in the main continued to the present day after the downfall of all the Napoleonic institutions which were purely political. It is rather the fortune than the merit of Napoleon that no similar mass of legislation can be ascribed to any other sovereign, since no other sovereign has ruled securely over an ancient and civilized country which has been suddenly deprived of all its institutions. It is also a matter of course that much of this legislation has been beneficial, since a tabula rasa relieves the legis- lator of many hindrances. In several points, on the other hand, we can see that France was sacrificed to Napoleon’s personal interest. Thus the Concordat restored the

ancient Papal Church, shorn of its wealth, and receiving from the state a subsidy of about £2,000,000. It was right to restore religion, and the Constitution Civile, which was cancelled by the Concordat, had been an insane act, the principal cause of the miseries of France for ten years. Nevertheless a great opportunity was lost of trying some new experiment, which might have led to a genuine revival of religion; but for this Napoleon cared nothing so long as he could pose as a new Constantine, detach the church from the cause of the Bourbons, and have the pope at his beck. In like manner the freedom of local govern- ment was sacrificed to the exigencies of his despotism. Among the most remarkable of his institutions was the University. The twenty-one universities of old France, including the great mother university of Paris, had fallen victims in 1792 to the insanity of the Legislative Assembly ; nothing of the least efficiency had been established in their place, so that in March 1800 Lucien Bonaparte could write, " since the suppression of the teaching corporations instruc- tion has almost ceased to exist in France." By laws of May 1806 and March 1808 was founded the modern University, that is, the whole teaching profession formed into a corporation and endowed by the state, a kind of church of education. This remarkable institution still exists. It has far too much centralization, and is in no way equal to the old system when that is intelligently worked, as in Germany ; many learned men have severely condemned it ; still it was a great constructive effort, and gave Napoleon the occasion for some striking and original remarks.

From the time of the battle of Marengo the system of Brumaire began to take a development which perhaps

Gradual progress towards mon- archy.

Plot of Nivose.

had not been clearly foreseen. Sieyés had wished to confine Bonaparte to the war department, Moreau _per- haps had wished to keep him at Paris; in either case it had not been intended to create an august monarchy. But the fabulous success of Marengo, joined to the proofs Bonaparte gave of a really superior intelligence and com- manding character, turned the French

mind back into that monarchical groove in which it had so long run before the Revolution. Popular liberty had been already renounced by Sieyés, and the disastrous failure of republican institu- tions, which in four years, from 1795 to 1799, had brought the country to bankruptcy, civil war, and almost barbarism, inclined all public men to agree with him. The choice then could only lie between some form of aristocracy and the revival of monarchy either in the Bourbon family or in another. Napoleon's personal character decided this question. By the Concordat he wrested from the Bourbons the support of the church; by his military glory he seduced the noblesse, as is seen in the case of Ségur ; by the pacification of the world he half reconciled to himself the foreign cabinets. But no sooner did this new form of monarchy begin to appear than Bonaparte began to find himself surrounded by new dangers. He was exposed to the hatred of the republicans, who had hitherto been appeased by the title of consul, and were now thrown into coalition with the defeated Jacobins, and also to the despair of the royalists, who saw themselves disappointed of restoration at the moment of the failure of republicanism. Nearer his person at the same time court-parties began to spring up. His brothers and sisters with Corsican shame- lessness began to claim their share in the spoils. While he doubted what form his monarchy should take, and whether some character greater and more unique than that of a hereditary king could not be invented, they urged the claims of the family. Thus arose a standing feud between the Bonapartes and the Beauharnais, who in the interest of Josephine, already dreading divorce for her childlessness, opposed the principle of heredity.

In grappling with the defeated parties Bonaparte found a great advantage in his position. 'The constitution of Brumaire itself gave him great powers ; popular institutions had been destroyed, not by him, but by the nation itself, which was weary of them 3; under the Directory the public had grown accustomed to the suppression of journals and to periodic coups d@état of the most savage violence, Bonaparte therefore could establish a rigorous despotism under the forms of a consular republic, mutilate the assemblies, and silence public opinion ; he could venture occasionally upon acts of the most sweeping tyranny with- out shocking a people which had so lately seen Fructidor, not to say the Reign of Terror, and had been accustomed to call them liberty. The conspiracies began immediately after the return from Marengo, when the Corsicans Arena and Ceracchi, guilty apparently of

little more than wild talk, were arrested in October 1800 at the Théatre Frangais, But on December 24th of the same year, as he drove with Josephine to the opera, a sudden explosion took place in the Rue Saint-Nicaise, which killed and wounded several people and damaged about fifty houses; the carriage of Bonaparte escaped. He was still in the first fervour of his conversion from Jacobinism, and had not yet become alive to the danger to which he was exposed from royalisin. He could therefore see nothing but Jacobinism in this plot, and proposed to meet the danger by some general measure calculated to eradicate what remained of the Jacobin party. But before this measure could be taken Fouché convinced him that he had been in error, and that he was in the presence of a new enemy, royalism roused into new vigour by the recent change in public opinion. Upon this Bona- parte acted most characteristically. By a singular stretch

of Machiavelism he made use of the mistake into which he had himself led the public to crush the enemy which for the moment he feared most. He arrested and transported one hundred and thirty persons, whom he knew to be innocent of the plot, on the general ground of Jacobinism, substituting for all legal trial a resolution passed by the servile senate to the effect that “ the measure was conservative of the constitution.” This is Nivose, an act as enormous as Fructidor, and with a perfidy of its own.

Making use of victory was almost more Bonaparte’s talent than winning it. These plots, so far from impeding his ascent to monarchy, were converted by him into steps upon which he mounted. They were ‘so many argu- ments for heredity, which, in case Bonaparte should fall a prey to them, would furnish a successor. It had already been argued in the Paralléle entre César, Cromwell, et Bonaparte (October 1800) that heredity only could prevent the nation from falling again under the domina- tion of the assemblies, under the yoke of the § (not Sieyés surely but Soldats) or under that of the Bourbons. He also made the plot of Nivose the occasion of a constitutional innovation, The assemblies devised by Sieyés had hitherto been simply useless, so much idle machinery. But in Nivose the precedent was set of giving the Senate a con- stituent power. To guard the constitution was its

nominal function ; this was now converted into a function of sanctioning alterations in the constitution, since every Innovation became legal when the Senate declared it to be conservative of the constitution. In the hands of Bona: parte such a principle soon became fruitful enough.

The first open step towards monarchy was made at the conclusion of the treaty of Amiens. As pacificator of the globe, it was declared in the tribunate that Bonaparte deserved some mark of public gratitude. Upon this the Senate proposed to re-elect him First Consul for a further term of ten years. Bonaparte, disappointed, declared that he could only owe a prorogation of his magistracy to the people ; to them therefore the question was referred, but in the form, Shall Napoleon Bonaparte be elected consul for life? and in this form it was adopted. Before the final step was taken and the First Consul transformed himself into the Emperor Napoleon, a great and portentous change had

taken place in the spirit of his government. Before the year

1803 there was no fair reason to conclude that Bonaparte was too fond of war. For the two wars of the Revolution he had not been responsible: the first broke out when he was in Corsica, the second when he was in Egypt. But both wars had been brought to an end by him ; he had closed the Temple of Janus, he was the great pacificator. In construc- tive legislation he had shown such zeal that it was easy to imagine him, though a great commander, as one who was capable of feeling the blessedness of the peacemaker. These illusions began to vanish in 1803 at the rupture of the peace of Amiens. This year 1803 is the turning-point in his life, and a great turning-point in French history. It may be considered the first year of modern France. The Revolution is at last over ; the new organization begins to work regularly. The old noblesse is gone, and in place of the old Church there is the humbled Church of the Con- cordat. France is covered with an army of functionaries, servilely dependent on the Government ; astrange silence has settled on the country which under the old régime had been noisy with the debate—if for the most part fruitless debate—of parliaments and estates. The Government is tenfold more imperious than it had been before 1789. And now it: appears that Bonaparte had desired only the glory of having made peace, not peace itself, just as earlier, after making the

peace of Campo Formio, he had taken measures by the Egyptian expedition to embroil Europe

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Rupture again.

1804.]

What he wants is to complete his military success by humbling England. He had failed in 1798, when he

Ingland. pod controlled but a small part of the power of France,

a single army shut np in Egypt, when the French Govern- ment had been feeble and unintelligent, when England had been able to rally a European Coalition to her side. But surely he would succeed now, when the whole power of France, drawing after it Spain, Holland, Switzerland, and North Italy, was in his single hand, and when he could add the fleets of the other maritime powers to that of France; especially as coalitions against France seemed out of date, since Russia and Prussia had been united against England in 1801, and Germany was now suffering internal transformation under the united influence of France and Russia. But after so many years of war could he call on France for another effort? In the first place all the new institutions of France, having grown up in war, were adapted for war rather than for anything else; in the second place he hoped to spare the French all war-taxation by making the expense fall upon the allies.

From this memorable rupture flowed all the terrible events of the Napoleonic age. It is in one respect difficult to understand, because in the eleven years of the war with England Bonaparte was never able to strike a single blow at his enemy, while that enemy destroyed his fleets, con- quered his colonies, and by arming all Europe against him at length brought down his power. Why did Bonaparte engage in a war in which he was condemned

to be so purely passive? It seems that, as in 1798, he totally miscalcu- lated the English maritime power, and that in 1803, though to Lord Whitworth he spoke of the invasion of England as almost impossible, yet in reality he expected to achieve that impossibility, as he had achieved so many others. Thus the angry negotiation witl: Lord Whitworth, the stormy scene at the Tuileries, the violent detention of the English residents in France at the moment of the rupture, are to be regarded as studied contrivances by which he concealed the wantonness of his breach of the European peace and tried to throw the blame of it upon the English. That he was really bent upon forcing a war appears from his allowing S¢bastiani's report of his mission in the East, full of hints of the intention of France to re- occupy Egypt at the first opportunity, to appear in the JMomteur. This report, besides offending England, caused her to keep resolute possession of Malta, and, when Bonaparte appealed to the treaty of Amiens, England replied by pointing to the new annexations of France, which had just divided Piedmont into departments. "Ce sont des bagatelles," Lord Whitworth reports Bona- parte to have answered, but he adds in a parenthesis which

the last disguise and openly restoring monarchy. It was a step which required all his audacity and cunning. He had crushed Jacobinism, but two great parties remained. There was first the more moderate republicanism, which might be called Girondism, and was widely spread among all classes and particularly in the army Secondly, there was the old royalism, which after many years of helpless weakness had revived since Brumaire. These two parties, though hostile to each other, were forced into a sort of alliance by the new attitude of Bonaparte, who was hurry- ing France at once into a new revolution at home and into an abyss of war abroad. England too, after the rupture, favoured the efforts of these parties. Royalism from England began to open communications with moderate republicanism in France. Pichegru acted for the former, and the great representative of the latter was Moreau, who had helped to make Brumaire in the tacit expectation prob- ably of rising to the consulate in due course when Bonaparte's term should have expired, and was therefore hurt in his personal claims as well as in his

republican principles. Bonaparte watched the movement through his ubiquitous police, and with characteristic strategy deter- mined not merely to defeat it but to make it his stepping stone to monarchy. He would ruin Moreau by fastening on him the stigma of royalism ; he would persuade France to make him emperor in order to keep out the Bourbons. He achieved this with the peculiar mastery which he always showed in villainous intrigue. Moreau had in 1797 incurred blame by concealing his knowledge of Pichegru's dealings with the royalists. That he should now meet and hold conversation with Pichegru at a moment when Pichegru was engaged in contriving a royalist rebellion associated his name still more closely with royalism, and Pichegru brought with him wilder partisans such as Georges the Chouan. That Moreau would gladly have seen and gladly have helped an insurrection against Bonaparte is certain; any republican, and what is more any patriot, would at that moment have risked much to save France from the ruin that Bonaparte was bringing on her. But Bonaparte succeeded in associating him with royalist schemes and with schemes of assassination. Controlling the Senate, he was able to suppress the jury; controlling every avenue of publicity, he was able to suppress opinion ; and the army, Moreau's fortress, was won through its hatred of royalism. In this way Bonaparte's last personal rival was removed. There remained the royalists, and Bonaparte hoped to seize their leader, the Comte d'Artois, who was expected, as the police knew, soon to join Pichegru and Georges at Paris. What Bonaparte would have done with him we may judge from the course he took when the

Comte did not come. On March 15, 1804, the Duc Exeeu- d'Enghien, grandson of the Prince de Condé, residing at tion of Ettenheim in Baden, was seized at midnight bya party of oe dragoons, brought to Paris, where he arrived on the 20th, ghien,

has never been printed, "'The expression he made use of was too trivial and vulgar to find a place in a despatch or anywhere but in the mouth of a hackney coachman !"

By this rupture Europe relapsed into the fearful dis-

order from which Brumaire seemed to have rescued it; only in place of revolutionary fanaticism the disturbing cause was now the deliberate

calculating ambition of a great general and crafty politician, who already commanded the resources of a large part of Europe. This same year 1803 saw the first steps taken towards the subjugation of Germany. The annexation to France of the left bank of the Rhine led to a revolution in the Germanic system and to a complete transformation of the Diet, by which Austria lost the greater part of her influence over the minor German states ; this influence passed to France. As soon as the rupture with England took place Bonaparte took up @ position in the heart of Germany by seizing Hanover. All this was done while Bonaparte was still nominally only consul in the French republic. But the rupture with England furnished him with the occasion of throwing off

confined in the castle of Vincennes, brought before a military commission at 2 o'clock the next morning, asked whether he had not borne arms against the republic, which he acknowledged himself to have done, conducted to a staircase above the moat and there shot, and buried in the moat.

This deed was perfectly consistent with Bonaparte's pro- fessed principles, so that no misunderstanding or passing fit of passion is required to explain it. He had made, shortly before, a formal offer to the pretender through the king of Prussia, by which he had undertaken to pay him a handsome pension in return for the formal abdication of his rights. This had been refused, and Bonaparte felt free. That the best course was to strike at the heads of the family was a shrewd conclusion. Neither Louis nor Charles were precisely heroes; and then the whole re-

volutionary party in France would applaud a new tragedy like that of January 1793. (Accordingly Bernadotte and Curée were delighted with it.) That the Duc d'Enghien was innocent of the conspiracy was nothing to the purpose ; the act was political, not judicial ; accordingly he was not even charged with complicity. That the execution would strike horror into the cabinets, and perhaps bring about a new Coalition, belonged to a class of considerations which at this time Bonaparte systematically disregarded.

This affair led immediately to the thought of giving heredity to Bonaparte's power. The thought seems to have commended itself irresistibly even to strong republicans and to those who were most shocked by the murder. To make Bonaparte's position more secure seemed the only way of averting a new Reign of Terror or new convulsions. He himself felt some embarrassment. Like Cromwell, he was afraid of the republicanism of the army, and heredity pure and simple brought him face to face with the question of divorcing Josephine. To propitiate the army he chose from the titles suggested to him—consul, stadtholder, &e.— that of emperor, undoubtedly the most accurate, and having a sufficiently military sound. The other difficulty, after much furious dissension among the two families of Bonaparte and Beauharnais, was evaded by giving Napo- leon himself (but none of his successors) a power of adop- tion, and fixing the succession, in default of a direct heir natural or adoptive, first in Joseph and his descendants, then in Louisand his descendants. Except abstaining from the regal title, no attempt was made to conceal the abolition of republicanism. Bonaparte was to be called Napoleon, and "sire" and "majesté"; grand dignitaries with grand titles were appointed ; and "'citoyen" from this time gave way to '"'monsieur." The change was made by the con- stituent power of the Senate, and the senatus-consulte is dated May 18, 1804.

It required some impudence to condemn Moreau for royalism at the very moment that his rival was re-establish- ing monarchy. Yet his trial began on May 15th. The death of Pichegru, nominally by suicide, on April 6th had already furnished the rising sultanism with its first dark mystery. Moreau was condemned to two years' imprison- ment, but was allowed to retire to the United States.

These changes destroyed all that remained of the political life of France. Jacobinism had been eradicated in Nivose; republicanism and royalism were paralysed now. Hence- forth there was no power or person in France but Bona- parte, and over Europe there hung a danger more terrible than had ever threatened it before. The combined resources of several countries and an unparalleled military force were at the absolute disposal of a general and administrator of commanding ability, who had shown by the manner of his rupture with England that he was bent upon undertaking vast military

enterprises. This danger, which was clearly visible early in 1804, could tiot be averted. His scheme indeed failed. He did not conquer England, nor recover Malta and reoccupy Egypt. His forces were drawn in another direction. But, if England suffered less, Europe suffered far more than could have been feared in 1804. The wars which now begin are not, like those of the French Revolution, wars of principle, for the principles of the Revolution have been recanted and are held by no one in so much contempt as by Bonaparte. Nor are they armed litigations like the old wars of Europe, but unique experiments in which millions of lives are sacrificed to the ambition of an individual.

Throughout 1804 and the first part of 1805 the policy of Bonaparte is such as might be called insane, if he had had the ordinary objects of a ruler; it is explained by the consideration that he wants war, even if it should be war with all the world. He had acted in a similar way in 1798.

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In thinking that he should profit by war he was not mis- Designs Had he only gone to war with the whole Continent against |

ngland!) mated his strength. But he was not, in the long run, a match a a for England and the Continent together; he made at starting nent,

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taken. at once, he would not, as the event proved, have overesti-

the irremediable mistake of not dividing these two enemies, He seems indeed to have set out with a monstrous miscal- culation which might have ruined him very speedily, for he had laid his plan for an invasion of England and a war in Europe at the same time. If we imagine the invasion suc- cessfully begun, we see France thrown back into the position of 1799, her best general and army cut off from her by the sea, while Austria, Russia, and perhaps Prussia pour their armies across the Rhine; but we see that the position would have been far worse than in 1799, since France without Bonaparte in 1805 would have been wholly par- alysed. As it was, the signal failure of his English enter- prise left room for a triumphant

campaign in Germany, and Ulm concealed Trafalgar from the view of the Continent. The European Coalition had been disarmed since Brumaire by the belief that Bonaparte's Government was less intolerably aggressive than that of the Directory; this belief gave place in 1803 to a conviction that he was quite as aggressive and much more dangerous. England therefore might hope to revive the Coalition, and in the spring of 1804 she recalled Pitt to the helm in order that he might do this. The violent proceedings of Bonaparte on the occasion of the rupture, his occupation of Hanover, his persecution of the English representatives in Germany, —Spencer Smith at Stuttgart, Drake at Munich, Sir G. Rumbold at Hamburg,—created an alarm in the cabinets greater than that of 1798, and the murder of D'Enghien shocked as much as it alarmed them. Positive conquest and annexation of territory too now went on as rapidly and as openly as in 1798. The new empire compared itself to that of Charlemagne, which extended over Italy and Germany, and on December 2, 1804, a parody of the famous transference of the empire took place in Notre

Dame, the pope (Pius VII.) appearing there to crown Napole|

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Napoleon, who, however, took the crown from his hands a

and placed it himself upon his own head. Meanwhile the Italian republic was changed into a kingdom, which at first Bonaparte intended to give to his brother Joseph, but in the end accepted for himself. In the first months of 1805, fresh from the sacre in Notre Dame, he visited Italy and received the iron crown of the Lombard kings at Milan. Soon after the Ligurian republic was annexed, and a principality wasfoundfor his brother-in-law Bacciochi in Lucca and Piombino. By these acts he seemed to show himself not only ready but eager to fight with all Europe at once. It was not his fault that in the autumn of 1805, when he fought with Austria and Russia in Germany, he was not also maintaining a desperate struggle in the heart of England; it was not his fault that Prussia was not also at war with him, for his aggressions had driven Prussia almost to despair, and only once—that is, in the matter of Sir G. Rumbold—had he shown the smallest consideration for her. And yet at first fortune did not seem to favour him.

Had public opinion been less enslaved in France, had the frivolity of the nation been less skilfully amused by the operatic exhibitions of the new court and the sacre in Notre Dame, it would have been remarked that, after most needlessly involving France in war with England, Bonaparte had suffered half the year 1803, all the year 1804, and again more than half the year 1805 to pass without strik- ing a single blow, that after the most gigantic and costly preparations the scheme of invasion was given up, and that finally France suffered a crushing defeat at Trafalgar which paralysed her on the side of England for the rest of

the war. In order to understand in any degree the course he took, it seems necessary to suppose that the intoxication of the Marengo campaign still held him, that as then, con- trary to all expectation, he had passed the Alps, crushed his enemy, and instantly returned, so now he made no doubt of passing the Channel, signing peace in London, and return- ing in a month with a fabulous indemnity in his pocket to meet the Coalition in Germany. To conquer England it was worth while to wait two years, but his position was very critical when, after losing two years, he was obliged to confess himself foiled. He retrieved his position suddenly, and achieved a triumph which, though less complete than that which he had counted on, was still prodigious,—the greatest triumph of his life. At the moment when his English scheme was ending in deplorable failure, le pro- duced another, less gigantic but more solid, which he unfolded with a rapid precision and secrecy peculiar to himself. In the five years which had passed since Marengo his position for the purposes of a Continental war had improved vastly. Then he had no footing either in Germany or Italy, and his new office of First Consul gave him a very precarious control over the armies, which themselves were in a poor condition. Now his military authority was absolute, and the armies after five years of imperialism were in perfect organization; he had North Italy to the Adige; he had Hanover; and since the Germanic revolution of 1803 Bavaria, Wiirtemberg, and Baden had passed over to his side. Therefore as the Coalition consisted only of Austria, Russia, and England he might count upon success, and the more confidently

if he could strike Austria before the arrival of the Russian army. It is strange that in this estimate it should be umecessary to take Prussia into the account, since the Prussian army. (consisting of 250,000 men) was at that time supposed to be a match by itself for the French. At the last moment, and in the midst of the Austerlitz campaign, Napoleon might have been brought near to ruin by a sudden resolution on the part of the king of Prussia, and it is to be added that he did not escape this risk by any circumspection of his own. But for ten years Prussia had been rooted in the strangest system of immovable neutrality, and in this war both sides had to put up with the uncer- tainty whether the prodigious weight of the army of Frederick would not be thrown suddenly either into its own or into the opposite scale. It was at the end of August 1805 that Napoleon made his sudden. change of front. At the beginning of that month he had been still intent on the invasion of England; ever since March maritime manceuvres on an unparalleled scale had been carried on with the object of decoying the English fleets away from the Channel, and so giving an opportunity for the army of invasion to cross it in a flotilla under the pro- tection of French fleets. But in spite of all mancervres a great English fleet remained stationary at Brest, and Nelson, having been for a moment decoyed to Barbados, returned again. In the last days of August Admiral Villeneuve, issuing from Ferrol, took alarm at the news of the approach of an English fleet, and instead of sailing northward faced about and retired to Cadiz. Then for the first time Napoleon admitted the idea of failure, and saw the necessity of screening it by some great achievement m another quarter. He resolved to throw his whole force upon the Coalition, and to do it suddenly. Prussia was to be bribed by the very substantial present of Hanover. Five years had passed since Napoleon had taken the field when the second period of his military career began. He now begins to make war as a sovereign with a bound- less command of means. For five years from 1805 to 1809 he takes the field regularly, and in these campaigns he founds the great Napoleonic empire. By the first he

breaks up the Germanic system and attaches the minor German states to France, by the second he humbles Prussia, by the third he forces Russia into an alliance, by the fourth he reduces Spain to submission, by the fifth he

humbles Austria. Then follows a second pause, during which for three years Napoleon’s sword is in the sheath, and he is once more ruler, not soldier.

From the beginning of this second series of wars the principles of the Revolution are entirely forgotten by France, which is now a monarchy and even a propagator of monarchical principles.

Napoleon’s strategy always aims at an overwhelming Cam-

As in 1800, when all eyes were intent on Genoa, Paign against Austria

surprise. and from Genoa the Austrians hoped to penetrate into

France, he created an overwhelming confusion by throwing ana himself across the Alps and marching not upon Genoa but Russia.

upon Milan, so now he appeared not in front of the Austrians but behind them and between them and Vienna. The wavering faith of Bavaria had caused the Austrians to pass the Inn and to advance across the country to Ulm. It was intended that the Russians should join them here, and that the united host should invade France, taking Napoleon, as they fondly hoped, by surprise. So often unfortunate in their choice of generals, they had this time made the most unfortunate choice of all. Mack, who at Naples in 1799 had moved the impatient con- tempt of Nelson, now stood matched against Napoleon at the height of his power. He occupied the line of the Iller from Ulm to Memmingen, expecting the attack of Napoleon, who personally lingered at Strasburg, in front. Meanwhile the French armies swarmed from Hanover and down the Rhine, treating the small German states half as allies half as conquered dependants, and disregarding all neutrality, even that of Prussia, till they took up their positions along the Danube from Donauwérth to Ratisbon far in the rear of Mack. The surprise was so complete that Mack, who in the early days of October used the language of confident hope, on the 19th surrendered at

Ulm with about 26,000 men, while another division, that Capitu-

of Werneck, surrendered on the Nérdlingen, In a month the whole Austrian. army, con- sisting of 80,000 men, was entirely dissolved. Napoleon was

master of Bavaria, recalled the elector to Munich, and received the congratulations of the electors of Wiirtem- berg and Baden (they had just at this time the title of electors). It was the stroke of Marengo repeated, but without a doubtful battle and without undeserved good luck.

After Marengo it had been left to Moreau to win the decisive victory and to conclude the war; this time there was no Moreau to divide the laurels. The second part of the campaign begins at once; on October 28 Napoleon reports that a division of his army has crossed the Inn. He has now to deal with the Russians, of whom 40,000 men have arrived under Kutusoff. He reaches Linz on November 4, where Gyulai brought him the emperor's proposals for an armistice. He replies by demanding Venice and Tyrol and insisting upon the exclusion of Russia from the negotiations, conditions which, as he no doubt foresaw, Gyulai did not think himself authorized to accept. But Napoleon did not intend this time, as in 1797 and in 1800, to stop short of Vienna. Nothing now could resist his advance, for the other Austrian armies, that of the archduke John in Tyrol and that of the archduke Charles on the Adige, were held in play by Ney and Masséna, and compelled at last, instead of ad- vancing to the rescue, to retire through Carniola into Hungary. On November 14 he dates from the palace of Schénbrunn ; on the day before Murat had entered Vienna, which the Austrian emperor, from motives of humanity, had

18th to Murat at lation of

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resolved not to defend, and the French also succeeded by an unscrupulous trick in getting possession of the bridges over the Danube. So far his progress had been triumphant, and yet his position was now extremely critical. The archduke Charles was approaching from Hungary with 80,000 Austrians ; another Russian army was entering Moravia to join Kutusoff, who had with great skill escaped from the pursuit of Murat after the capture of Vienna. Napoleon, though he had brought 200,000 men into Germany,

had not now, since he was obliged to keep open his communications down the valley of the Danube, a large army available for the field. But, what was much more serious, he had recklessly driven Prussia into the opposite camp. He had marched troops across her territory of Ansbach, violating her neutrality, and in consequence on November 3 (while Napoleon was at Linz) she had signed with Russia the treaty of Potsdam, which practically placed 180,000 of the most highly drilled troops in the world at the service of the Coalition. Such had been Napoleon's rashness, for his audacious daring was balanced indeed by infinite cunning and ingenuity, but was seldom tempered by prudence. In this position, it may be asked, how could he expect ever to make his way back to France? What he had done to Mack Prussia would now do to him. The army of Frederick would block the Danube between him and France, while the Russians and Austrians united under the archduke would seek him at Vienna.

As at Marengo, fortune favoured his desperate play. The allics had only to play a waiting game, but this the Russians and their young czar, who was now in the Moravian headquarters, would not consent to do. He was surrounded by young and rash counsellors, and the Russians, remembering the victories of Suwaroff in 1799, and remarking that almost all Napoleon's victories hitherto had been won over Austrians, had not yet learned to be afraid of him. Napoleon became aware of their sanguine confidence from Savary, whom he had sent to the czar with proposals ; he contrived to heighten it by exhibiting his army as ill-prepared to Dolgorouki, sent to him on the part of the czar. The end was that the Russians (80,000 men, aided by about 15,000 Austrians) rushed into the

Battle of battle of Austerlitz (December 2, 1805), which brought Auster- the third Coalition to an end, as that of Hohenlinden had

litz.

brought the second. Nowhere was Napoleon's superiority more manifest ; the Russians lost more than 20,000 men, the Austrians 6000. The former retired at once under a military convention, and before the year 1805 was out the treaty at Pressburg was concluded with Austria (December 26) and that of Schénbrunn with Prussia (December 15). It was a transformation-scene more bewildering than even that of Marengo, and completely altered

the position of Napoleon before Europe. To the French indeed Austerlitz was not, as a matter of exultation, equal to Marengo, for it did not deliver the state from danger, but only raised it from a perilous eminence to an eminence more perilous still. But asa military achievement it was far greater, exhibiting the army at the height of its valour and organization (the illusion of liberty not yet quite dis- sipated), and the commander at the height of his tactical skill; and in its historical results it is greater still, ranking among the great events of the world. For not only did it found the ephemeral Napoleonic empire by handing over Venetia to the Napoleonic monarchy of Italy, and Tyrol and Vorarlberg to Napoleon's new client Bavaria ; it also destroyed the Holy Roman Empire while it divided the remains of Hither Austria between Wiirtemberg and Baden. In the summer of 1806 the emperor of Austria (he had this title since 1804) solemnly abdicated the title of Roman emperor; the ancient diet of Ratisbon was dissolved, and a new organization was created under the

name of Confederation of the Rhine, in which the minor states of Germany were united under the protectorate of Napoleon. Bavaria and Wiirtemberg at the same time were raised into kingdoms. Inall the changes which have happened since, the Holy Roman Empire has never been revived, and this event remains the greatest in the modern history of Germany.

But Austerlitz was greater than Marengo in another way. That victory had a tranquillizing effect, and was soon followed by a peace which lasted more than four years. But the equilibrium established after Austerlitz was of the most unstable kind; it was but momentary, and was followed by a succession of the most appalling convulsions; the very report of the battle was fatal to William Pitt. A French ascendency had existed since 1797, and Napoleon's Government had at first promised to make it less intoler- able. Since 1803 this hope had vanished, but now suddenly the ascendency was converted into something like a universal monarchy. Europe could not settle down. The first half of 1806 was devoted to the internal recon- struction of Germany and to the negotiation of peace with the two great belligerents who remained after Austria and Prussia had retired, viz., England and Russia. But these negotiations failed, and in failing created suddenly a new

Coalition. In England, Fox showed unexpectedly all the firmness of Pitt; and the czar refused his ratification to the treaty which his representative at Paris, D'Oubril, had siened. But the negotiations had gone far enough to give Prussia deep offence. At a moment when she found herself almost shut out of the German world by the new Confederation, Napoleon was found coolly treating with England for the restoration of Hanover to George III. In

August 1806, just at the moment of the dissolution of the War

Holy Roman Empire and'the formation of the Confedera- pe TUSSIa.

tion of the Rhine, Prussia suddenly mobilized her army, and about the same time Russia rejected the treaty. This amounted practically to a new Coalition, or to a revival of the old one with Prussia in the place of Austria. No one knew so well as Napoleon the advantage given by sudden- ness and rapidity. The year before he had succeeded in crushing the Austrians before the Russians could come up ; against Prussia he had now the advantage that she had long been politically isolated, and could not immediately get help either from Russia or England,—for the moment only Saxony and Hesse-Cassel stood by her,—while his armies, to the number of 200,000 men, were already stationed in Bavaria and Swabia, whence in a few days they could arrive on the scene of action. The year before Austria had been ruined by the incapacity of Mack ; Prussia now suffered from an incapacity diffused through the higher ranks both of the military and civil service. Generals too old, such as Brunswick and Méllendorf, a military system corrupted by long peace, a policy without clearness, a diplo- macy without honour, had converted the great power founded by Frederick into a body without a soul. There began a new war of which the incidents are almost precisely parallel to those of the war which had so lately closed. As the Austrians at Ulm, so now Napoleon crushed the Prussians at Jena and Auerstiidt (October 14) before the appearance of the Russians; as he entered Vienna, so now he enters Berlin (October 27); as he fought a second war in Moravia, in which Austria played a second part to Russia, so now from November 1806 to June 1807 he fights in East Prussia against the Russians aided with smaller numbers by the Prussians; as he might then, after all his successes, have been ruined by the intervention of Prussia, so now, had Austria struck m, tre might have found much difficulty in making his way

‘back to France; as at Austerlitz, so at Friedland m June 1807 the Russians ran hastily into a decisive battle

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in which they ruined their ally but not themsclves; as Austria at Pressburg, so Prussia at Tilsit signed a most humiliating treaty, while Russia, as before, escaped, not this time by simply retiring from the scene, but by a treaty in which Napoleon admitted her to a share in the spoils of victory.

Here was a second catastrophe far more surprising and disastrous than that which it followed so closely. – The defeat of Austria in 1805 had been similar to her former defeats in 1800 and 1797; Ulm had been similar to Holenlinden, the treaty of Pressburg to that of Lunéville.

| But the double defeat of Jena and Auerstiidt, in which the

| duke of Brunswick, the old general not only of 1792 but

| of the Seven Years’ War, found his death, dissolved for

ever the army of the great Frederick; and it was followed

‘ by a general panic, surrender of fortresses, and submission

on the part of civil officials, which seemed almost to amount

to a dissolution of the Prussian state. The defence of

Colberg by Gneisenau and the conduct of the Prussian

troops under Lestocq at Eylau were almost the only re-

deeming achievements of the famous army which half a

century before had withstood for seven years the attack of three great powers at once. This downfall was expressed Treatyof in the treaty of Tilsit, which was vastly more disastrous Tikit. to Prussia than that of Pressburg had been to Austria. Prussia was partitioned between Saxony, Russia, and a newly established Napoleonic kingdom of Westphalia. Her population was reduced by one-half, her army from 250,000 to 42,000 (the number fixed a little later by the treaty of September 1808), and Napoleon contrived also by a trick to saddle her for some time with the support of a French army of 150,000 men. She was in fact, and continued till 1813 to be, a conquered state. Russia on the other hand came off with more credit, as well as with less loss, than in the former campaign. At Eylau in January 1807 she in part atoned for Austerlitz. It was perhaps the most murderous battle that had been fought since the wars began, and it was not a victory for Napoleon. Friedland too was well-contested.

In the two years between August 1805 and the treaty of Tilsit Napoleon had drifted far from his first plan of an invasion of England. But he seemed brought back to it now by another route, England had roused a Coalition against him, which he had not only dissolved, but seemed able now to make

impossible for the future. Austria was humbled, Prussia beneath his feet. Why should Russia for the future side with England against him? From the outset her interference in the wars had been somewhat unnecessary ; she had had little real interest in the questions of Malta, Naples, or Sardinia. The Russians themselves felt this so much that after Friedland they forced Alexander to make peace. But as Paul, when he left the Second Coalition, had actually joined France, Napoleon now saw the means of making Alexander do the same. England's tyranny of the seas had been attacked by the great Catherine and again by Paul ; on this subject therefore Russian policy might co-operate with Napoleon, and, if a bribe were needed, he would countenance her in robbing her ally Prussia, and he could promise her freedom in her eastern enterprises. Such was the basis of the treaty of Tisit, negotiated between Napoleon and Alexander on an island in the river Niemen, by which treaty the fate of Prussia was decided, and at the same time the foundation of the Napoleonic empire firmly laid. It was a coalition of France and Russia to humble England, chiefly by means of the Continental system, The invasion of England had failed, and England had destroyed at Trafalgar the allied fleets of France and Spain, a defeat which to the public eye had been lost in the splendid triumph of Ulm Feu Napoleon now returns to the attack upon England at the

1807.|

head of a universal confederacy which he has organized against her,

A pause occurs after Friedland during which Europe begins slowly to realize her position and to penetrate the character of Napoleon. It took sometime to wear out his reputation of peace-maker ; at his breach with England in 1803 he had appealed to that jealousy of England's maritime power which was widely spread; many thought the war was forced upon him, and as to the war of 1805 it could not be denied that Austria and Russia had attacked him. His absolute control over the French press enabled him almost to dictate public opinion.

But the conquest of Germany, achieved in little more Napoleon time than had sufficed to Bonaparte ten years before for 28 king the conquest of Italy,

put him in a new light. He had °! 28s already passed through many phases: he had been the invincible champion of liberty, then the destroyer of Jacobinism and champion of order, then the new Con- stantine and restorer of the church, then the pacificator of the world, then the founder of a new monarchy in France. Now suddenly, in 1807, he stands forth in the new character of head of a great European confederacy. It has been usual to contrast the consulate with the empire, but the great transformation was made by the wars of 1805-7, and the true contrast is between the man of Bruniaire and the man of Tilsit. The empire as founded in 1804 did not perhaps differ so much from the consulate after Marengo as both differed, alike in spirit and form, from the empire such as it began to appear after Press- burg and was consolidated after Tilsit. Between 1800 and 1805 Napoleon, under whatever title, was absolute ruler of France, including Belgium, the left bank of the Rhine, Savoy, and Nice, and practically also ruler of Holland, Switzerland, and North Italy to the Adige, which states had a republican form. ‘The title emperor meant in 1804 little more than military ruler. But now emperor has rather its medieval meaning of para- mount over a confederacy of princes. Napoleon has become a king of kings. This system had been com- menced in the consulate, when a kingdom of Etruria under the consul’s protection was created for the benefit of his ally, the king of Spain; it was carricd a stage further on the eve of the war of 1805, when the kingdom of Italy was created, of which Napolcon himself assumed the sceptre, but committed the government to Eugéne Beauharnais as viceroy. But now almost all Italy and a great part of Germany is subjected to this system. The Bonaparte family, which before had contended for the succession in France, so that Joseph actually refuses, as beneath him, the crown of Italy, now accept subordinate crowns. Joseph becomes king of Naples, the Bourbon dynasty having been expelled immediately after the peace of Pressburg ; Louis becomes king of Holland; Jcronie, the youngest brother, receives after Tilsit a kingdom in North Germany composed of territory taken from Prussia, of Hanover, and of the electorate of Hesse-Cassel, which had shared the fall of Prussia; somewhat earlier Murat, husband of the most ambitious of the Bonaparte sisters, Caroline, had received the grand-duchy of Berg. By the side of these Bonaparte princes there are the German princes who now look up to France, as under the Holy Roman Empire they had looked up to Austria. These are formed into a Confederation in which the archbishop of Mainz (Dalberg)

presides, as he had before presided in the empire. Two of the princes have now the title of kings, and, enriched as they are by the secularization of church lands, the mediatization of immediate nobles, and the subjugation of free cities, they have also the substantial power. A princess of Bavaria weds Eugéne Beauharnais, a princess of Wiirtemberg Jerome Bonaparte, At its

foundation in 1806 the Confederation had twelve mem- bers, but in the end it came to include almost all the states of Germany except Austria and Prussia.

A change seems to take place at the same time in Napoleon's personal relations. In 1804, though the divorce of Josephine was debated, yet it appears to be Napoleon's fixed intention to bequeath his crown by the method of adoption to the eldest son of Louis by Hortense Beauharnais. But this child died suddenly of croup in the spring of 1807, while Napoleon was absent in Germany, and the event occurring at the moment when he attained his position of king of kings probably decided him in his own mind to proceed to the divorce.

It was impossible to give crowns and principalities to the Bonaparte family without allowing a share of similar distinctions to the leading politicians and generals of France. He was therefore driven to revive titles of nobility. To do this was to abandon the revolutionary principle of equality, but Napoleon always bore in mind the necessity of bribing in the most splendid manner the party upon whose support ever since Brumaire he had depended, and which may be described shortly as the Senate. When in 1802 he received the life-consulate, he had proceeded instantly to create new dotations for the senators ; now he feels that he must devise for them still more splendid bribes. His first plan is to give them feudal lordships outside France. Thus Berthier, his most indis- pensable minister, becomes sovereign prince. of Neufchatel, Bernadotte sovereign prince of Pontccorvo, Talleyrand sovereign prince of Benevento. Especiaily out of the Venetian territory, given to France at Pressburg, are taken fiefs (not less than twelve in all), to which are attached the title of duke. These innovations fall in 1806, that is, in the middle of the period of transformation. But after Tilsit, when Napoleon felt more strongly both the power and the necessity of

rewarding his servants, he created formally a new noblesse and revived the majorat in defiance of the revolutionary code. In the end, besides the three sovereign princes just mentioned, he created four hereditary princes (Berthier is in both lists) and thirty-one hereditary dukes. There were also many counts and barons. The system was prodigiously wasteful. Of public money Berthier received more than £50,000 a year, Davoust about £30,000, nine other officials more than £10,000, and twenty-three others more than £4000.

After Marengo he had seen the importance of reconciling Europe to his greatness by making peace. After Tilsit it was still more urgently necessary that he should dispel the alarm which his conquests had now excited everywhere. But this time he made no attempt to do so; this time he can think of nothing but pushing his success to the de- struction of England ; and Europe gradually became aware that the evil so long dreaded of a'destruction of the balance of power had come in the very worst form conceivable, and that her destiny was in the hands of a man whose headlong ambition was as unprecedented as his energy and good fortune.

As in 1805 he had been drawn into the conquest of Germany in the course of a war with England, so now he assails all the neutral powers, and shortly afterwards violently annexes Spain, not so much from abstract love of conquest as in order to turn against England the forces of all the Continent at once. Ashe had left Boulogne for Germany, he now, as it were, returns to Boulogne. His successes had put into his hands two new instruments of war against England, instruments none the less welcome because the very act of using them made him master of the whole Continent. He had hinted at the first of these when the war with England began in 1803, by saying that in this war he did not intend that there should be

any neutrality; what he meant was explained in 1806 by the edict issued from Berlin. In addition to that limited right which the belligerent has by international law to prevent by blockade the trade of a neutral with the enemy and to punish the individual trader by confis- cation of ship and goods, Napoleon now assumed the right of preventing such commerce without blockade by controlling the neutral Governments. English goods

were to be seized everywhere, and the harbours of neutrals to be closed against English ships under penalty of war with France. Such a threat, involving a claim to criticize and judge the acts of neutral Governments and to inflict on them an enormous pecuniary fine, was almost equivalent to the annexation at one stroke of all the neutral states. The other imstrument had a similar character. The French fleet having been crippled at Trafalgar, he pro- posed now to reinforce it by all the other fleets in Europe, and to get possession of all the resources of all the maritime states. His eyes therefore become now fixed on Denmark, Portugal, and Spain.

Such is Napoleon as king of kings, and such are his views. ‘This unique phase of European history lasted five years, reckoning from the treaty of Tilsit to the breach with Russia. Europe consists now of a confederacy of monarchical states looking up to a paramount power (like India at the present day). The confederacy is held together by the war with England, which it puts under an ineffective commercial blockade, suffering itself in return a more effective one. But Napoleon feels that Spain and Portugal must be brought under his immediate administration, in order that their maritime resources may be properly turned against England. Austria also has by no means been sufficiently humbled, and Prussia is humbled so intolerably that she is forced into plans of insurrection, Throughout these five years a European party of insurrection is gradually forming. It has two great divisions, one scattered through Germany, at the head of which Austria places herself in 1809, the other in Spain and Portugal, which is aided by England. In Germany this movement is successfully repressed until 1813, but in the Peninsula it gains ground steadily from 1809. After 1812 both movements swell the great Anti- Napoleonic Revolution which then sets in.

Immediately after Tilsit Napoleon entered on his new course, which had been arranged with Russia in secret articles. In August he required the king of Denmark to declare war with England; but here England, seeing herself threatened by a coalition of all Europe at once, interfered with desperate resolution, She required Denmark to sur- render her fleet (consisting of twenty ships of the line and a number of frigates) in deposit, promising to restore it at the peace, and when she received a refusal took possession of it by force. At the same time an army is formed under Junot for the invasion

of Portugal, with which state, as the old ally of England, Napoleon used no ceremony. The feeble state consented to almost all his demands, agreed to enter the Continental system and to declare war against England; only the regent had a scruple which restrained him from confiscating the property of private Englishmen. From this moment Portugal is doomed, and negotiations are opened with Spain concerning the parti- tion of it. But out of these negotiations grew unexpected events.

For more than ten years Spain had been drawn in the wake of revolutionary France; to Napoleon from the beginning of his reign she had been as subservient as Holland or Switzerland ; she had made war and peace at his bidding, had surrendered Trinidad to make the treaty of Amiens, had given her fleet to destruction at Trafalgar. In other states equally subservient, such as Holland and

French army in Spain.

Popular

rising in

Spain,

1808.]

the Italian Republic, Napoleon had remodelled the govern- ment at his pleasure, and in the end had put his own family at the head of it. After Tilsit he thought him- self strong enough to make a similar change in Spain, and the occupation of Portugal seemed to afford the opportunity of doing this. By two conventions signed at Fontainebleau on October 27th the partition of Portugal was arranged with Spain. The Prince of the Peace was to become a sovereign prince of the Algarves, the king of Spain was to have Brazil with the title of emperor of the two Americas, &c.; but the main provision was that a French army was to stand on the threshold of Spain

ready to resist any intervention of England. ‘The occupation of Portugal took place soon after, Junot arriving at Lisbon on November 30, just as the royal family with a following of several thousands set sail for Brazil under protection of the English fleet. At the same time there commenced in defiance of all treaties a passage of French troops into Spain, which continued until 80,000 had arrived, and had taken quiet possession of a number of Spanish fortresses. At last Murat was appointed to the command of the army of Spain. He entered the country on March 1, 1808, and marched on Madrid, calculating that the king would take flight and take refuge at Seville or Cadiz. This act revealed to the world the nature of the power which had been created at Tilsit. The lawless acts of Napoleon’s earlier life were palliated by the name of the French Revolution, and since Brumaire he had established a character for comparative moderation. But here was naked violence without the excuse of fanaticism ; and on what a scale! One of the greater states of Europe was in the hands of a burglar, who would moreover, if successful, become king not only of Spain but of a boundless empire in the New World. The sequel was worse even than this commencement, although the course which events took seems to show that by means of a little delay he might have attained his end without such open defiance of law. The administration of Spain had long been in the contemptible hands of Manuel Godoy, supposed to be the queen’s lover, yet at the same time high in the favour of King Charles [V. Ferdinand, the heir apparent, headed an opposition, but in character he was not better than the trio he opposed, and he had lately been put under arrest on suspicion of designs upon his father’s life. To have fomented this opposition without taking either side, and to have rendered both sides equally contemptible to the Spanish people, was Napoleon’s game; the Spanish people, who profoundly admired him, might then have been induced to ask him for a king. Napoleon, however, perpetrated his crime before the scandal of the palace broke out. The march of Murat now brought it to a head. On March 17th a tumult broke out at Aranjuez, which led to the fall of the favourite, and then to the abdication of the king and the proclamation of Ferdinand amid universal truly Spanish enthusiasm. It was a fatal mistake to have forced on this popular explosion, and N apoleon has char- acteristically tried to conceal it by a supposititious letter, im which he tries to throw the blame upon Murat, to whom the letter professes to be addressed. It warns Murat against rousing the Spanish patriotism and creating an Opposition

which it will be impossible to put down; it predicts all that actually. happened; but it has all the marks of invention, and was certainly never received by Murat. The reign of Ferdinand having thus begun, all that the French could do was to decline to acknow- ledge him, and to encourage Charles to withdraw his abdication as given under duress. By this means it became doubtful who was king of Spain, and Napoleon, having carefully abstained from taking a side, now Presented himself as arbiter, Ferdinand was induced to

betake himself to Napoleon's presence at Bayonne, where he arrived on April 21st; his father and mother followed on the 30th. Violent scenes took place between father and son; news arrived of an insurrection at Madrid and of the stern suppression of it by Murat; in the end Napoleon succeeded in extorting the abdication both of Charles and Ferdinand. It was learned too late that the insurrection of Spain had not really been suppressed.

This crime, as clumsy as it was monstrous, brought on that great popular insurrection of Europe against the universal monarchy which has profoundly modified all subsequent history, and makes the Anti-Napoleonic Revolu- tion an event of the same order as the French Revolution. A rising unparalleled for its suddenness and sublime spontaneousness took place throughout Spain and speedily found a response in Germany. A new impulse was given, out of which grew the great nationality movement of the 19th century. Meanwhile Napoleon, having first offered the throne of Spain to his brother Louis, who refused it, named Joseph king, retaining, however, a reversion to himself and heirs in default of male heirs of Joseph, who had only daughters. The royal council first, afterwards a junta of nobles assembled at Bayonne, accepted him on July 7th. But it must have become clear to Napoleon almost at once that he had committed the most enormous of blunders. Instead of gaining Spain he had in fact lost it, for hitherto he had been master 'of its resources without trouble, but to support Joseph he was obliged in this same year to invade Spain in person with not less than 180,000 men. With Spain too he lost Portugal, which in June followed the Spanish example of insurrection, and had Spain henceforth for an ally and

not for an enemy. Hitherto he had had no conception of any kind of war not strictly professional. He had known popular risings in Italy, La Vendée, and Egypt, but had never found it at all difficult to crush them. The determined insurrection of a whole nation of 11,000,000 was a new experience to him. How serious it might be he learned as early as July, when Dupont with about 20,000 men surrendered at Baylen in Andalusia to the Spanish general Castafios. In August he might wake to another miscalculation of which he had been guilty. An English army landed in Portugal, defeated Junot at Vimeiro, and forced him to sign the convention of Cintra. By this he evacuated Portugal, in which country the insurrection had already left him much isolated. This occurrence brought to light a capital feature of the insurrection of the Peninsula, viz., that it was in free communication everywhere with the power and resources of England.

Thus the monarchy of Tilsit suffered within a year the Napoleon most terrible rebuff. Napoleon himself now appears upon in Spain.

the scene. His first step was to revive the memory of Tilsit by a theatrical meeting with Alexander, which was arranged at Erfurt in September. The power of the duumvirate was there displayed in the most imposing manner, and the alliance was strengthened by new engagements taken by Napoleon with respect to the Danubian principalities. At the same time he checked the rising spirit of resistance in Prussia by driving from office the great reforming minister Stein. At the beginning of November he was ready for the invasion of Spain. Joseph had retired to Vittoria, and the armies of the insurrection fronted him along the Ebro under the command of Blake, Castafios, and Palafox. Between November 7th and 11th the army of Blake was dissolved by Lefebvre, and Napoleon entered Burgos, which was mercilessly pillaged ; on the 23d Castafios was defeated at Tudela by Lannes; by December 2d Napo- leon, having forced the mountain passes, was before Madrid, and on the 4th he was in possession of the town, where, endeavouring somewhat late to conciliate the

First Ger- man War of Libera- tion,

liberalism of Europe, he proclaimed the abolition of the Inquisition and of feudalism, and the reduction of the number of convents to one-third. He remained in Spain till the middle of January 1809, but he was not allowed repose during the interval. Sir John Moore had advanced from Portugal as far as Salamanca, and determined in the middle of December to assist the insurrection by marching on Valladolid. Soult was at Carrion and was threatened by this advance, since the English force, after Moore had effected his junction with Baird, who arrived from Corunna, at Majorga, amounted to 25,000 men. Napoleon hoped to cut its communications, and so deal one of his crushing blows at the enemy with whom he was always at war yet whom he never, except at Waterloo, met in the field. He set out on the 22d with about 40,000 men, and marched 200 miles in ten days over mountains in the middle of winter. Moore saw the danger, retired to Benavente, and blew up the bridges over the Ezla. Napoleon advanced as far as Astorga ; but he had missed his mark, and professed to receive information which showed him that he was urgently wanted at Paris. He returned to Valladolid,

whence on January 19th he set out for France. The end of Moore's expedition belongs to English history. Another storm was indeed gathering. The down-

fall of Austria in 1805 had been out of all proportion to her military inferiority; it was impossible that she should acquiesce in it. The year that followed Tilsit had given her quite a new prospect. Spain, which before had given Napoleon help, now swallowed up 300,000 of his troops, so that in the autumn of 1808 he had been obliged to withdraw from Prussia the large army which he had kept for more than a year quartered on that- unhappy country. Napoleon could now spare only half his force, and there was now no doubt that Prussia would be as hostile to him as she dared. 'True, the army of Frederick had ceased to exist, but the country was full of soldiers who had belonged to it, full of skilled officers, and Spain had filled all minds with the thought of popular war. Stein and Scharnhorst had been preparing a levée en masse in Prussia and an insurrection in the new kingdom of Westphalia. Under such circumstances began the war of 1809, which may be called the First German War of Liberation, under the leadership of Austria. It was pro- voked rather by Napoleon, who wanted

new victories to retrieve his position, than by Austria, whose interest lay in gaining time, since time was likely to increase the ferment in Germany and weaken the alliance of N apoleon and Russia. Napoleon's superiority, though on the wane, was still enormous. Through the Confederation of the Rhine he had now a great German army at his disposal, which he placed under French generals. His frontier was most formidably advanced through the possession of Tyrol and Venetia. Russia was on his side, and, though she did not actively help him in the field, was of great use in holding down Prussia; England was against him, but could do little for an inland state such as Austria now was. In these circumstances the attitude of Austria had something heroic about it, like that of Spain, and the war throughout is like a somewhat pale copy of the Spanish insurrection. But Austria has what Spain had not, the advantage of organization and intelligence. Since Pressburg she had passed through a period of reform and shown some signs of moral regeneration, Stadion and the archduke Charles doing for her, though not so effectively, what Stein and Scharnhorst did for Prussia, Few wars have begun with less ostensible ground, or more evidently from an intolerable position. Napoleon accused Austria of arming, of wanting war; Austria expostulated, but in vain; and war began. It began early

in April, and the proclamation of the archduke Charles was addressed to the whole German nation. The watchword of Austria against France was now liberty and nationality, A good general conception of the war may be obtained by comparing it with that of 1805, which it resembles in certain large features. Again there is a short but decisive passage of arms in Bavaria; in a five days' struggle, cele- brated for Napoleon's masterly manceuvres, the Austrians are driven out of Ratisbon, and the way to Vienna is laid open. Again Napoleon enters Vienna (May 13th). But the war in Italy this time begins farther east, on the Piave. Eugéne Beauharnais, after an unfortunate commencement, when he was defeated at Sacile by the archduke John, makes a successful advance, and being joined by Marmont, who makes his way to him from Dalmatia by way of Fiume, drives the Austrian army into Hungary, defeats them at Raab, and effects a junction

with Napoleon at Bruck. Then, as before, the war is transferred from Vienna to the other side of the Danube. But the Austrian resist- ance is now far more obstinate than in 1805. From the island of Lobau Napoleon throws his troops across the river in the face of the archduke. A battle takes place which occupies two successive days, and is sometimes called the battle of the Marchfeld, but is sometimes named from the villages of Gross-Aspern and Essling. Like that of Eylau in 1807 it is among the most terrible and bloody battles of the period. In all perhaps 50,000 men fell, among whom was Marshal Lannes, and the French were driven back into their island. Five weeks passed in inaction before Napoleon could retrieve this check, five weeks during which the condition of Europe was indeed singular, since its whole destiny depended upon a single man, who, besides the ordinary risks of a campaign, was threatened by an able adversary who had recently brought him to the verge of destruction, and by outraged populations which might rise in insurrection round him. This is the moment of the glory of Hofer, the hero of the peasant-war in Tyrol. Once more, however, Napoleon's skill and for- tune prevailed. On the night of July 4th he succeeded, under cover of a false attack, in throwing six bridges from Lobau to the left bank of the Danube, over which more than 100,000 men passed before morning and were arrayed upon the Marchfeld.

became the subject of much controversy, the archduke John came too late to his brother's help. The Austrians were worsted, but by no means decisively, and retired in good order.

Austerlitz and Friedland had led at once to peace, because the principal belligerent, Russia, had little direct interest in the war; Wagram ought to have had no similar effect. Austria was engaged in a war of liberation; Tyrol was emulating Spain; there should therefore have been no nego- tiation with the invader. But Germany had as yet but half learnt the Spanish principle of war; in particular the Austrian Government and the archduke Charles himself be- longed to Old Austria rather than to New Germany. In the campaign the archduke had fallen much below his reputa- tion, having allowed it plainly to appear that Napoleon frightened him, and now, instead of appealing again to German patriotism, he signed at Znaim (July 11th) an armistice similar to that which Melas had so unaccount- ably concluded after Marengo. But it was by no means certain that all was yet over. North

Germany might rise as Spain had risen and as Tyrol had _ risen. The archduke Ferdinand had marched into Poland and threatened Thorn, with the intention of provoking such a movement in Prussia, and England was preparing a great armament which the patriots of North Germany, who now began to emulate the Spanish guerilla leaders,—Schill,

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The obstinate battle of Battle of Wagram followed, in which, by a miscalculation which Wagram. |

1810.]

Dérnberg, Katt, Brunswick,—anxiously expected. There seems little doubt that, if this armament had made Germany its object, Germany would at once have sprung to arms and have attempted, perhaps prematurely, what in 1813 it accomplished. What was expected in Germany had happencd already in the Peninsula. Arthur Wellesley had landed at Lisbon on April 22d, and in less than a month had driven Soult in confusion out of Portugal. In July he undertook an invasion of Spain by the valley of the Tagus. Thus both the quantity and quality of resistance to Napoleon was greater than at any former time; but it was scattered, and the question was whether it could

attached to Josephine; this attachment had been an effective feature in the character of republican hero which he then sustained. Mme. de Staél had been profoundly struck, when, on being charged by her with not liking women, he had answered, “J’aime la mienne.” ‘It was such an answer,” she

said, “as Epaminondas would have given |” He is now equally striking in the part of an Oriental sultan, and when he discards his Josephine for ambition he requires to be publicly flattered for his self-sacrifice by the officials, by Josephine herself, and even by her son Eugéne Beauharnais !

The archduchess Marie Louise, who now ventured to

concentrate itself.

take the seat of Marie Antoinette, seems to have been of with But England was unfortunate this time in her interven-

amiable but quite insignificant character. Her letters are —

Treaty of

‘Schon- brunn,

War he could not thus discard Russia without making her an | persuading himself that it was not worth a serious effort, vith enemy, and accordingly the Russian war appears on the | He persisted in saying that the only serious element in the bi horizon at the very moment that the Austrian war is Spanish opposition was the English army ; this would fall i terminated. This transformation was accomplished by | with England herself ; and England, he thought, was on the first humbling Austria, and then, as it were, adopting her | point of yielding to the blockade of the Continental system. and giving her a favoured place in the European con- | He devotes himself henceforth therefore to heightening the federacy. She lost population to the amount of 3,500,000, | rigour of this blockade. From the beginning it had led to besides her access to the sea; she paid an indemnity of | continual annexations, because only Napoleon’s own admin- more than £3,000,000, and engaged to reduce her army | istration could be trusted to carry it into effect. Accord- to 150,000. But, thus humbled, a high and unique | ingly the two years 1810-11 witness a series of annexations honour was reserved for her. We cannot be quite certain | chiefly on the northern sea-coast of Europe, where it was Whether it was part of Napoleon’s original plan to claim | important to make the blockade more efficient. But on the hand of an archduchess, though this seems likely, since | this northern sea-coast lay

the chief interests of Russia. Napoleon would hardly break with Russia unless he felt | As therefore in 1805 he had brought Austria and Russia Secure of the alliance of Austria, and yet in the treaty of | on himself by attacking England, so in 1810 he presses his Schénbrunn he does not hesitate to offend Russia by rais- | hostility to England to the point that it breaks the alliance Ing the Polish question. What is certain is that after his of Tilsit and leads to a Russian war. return to France Napoleon proceeded at once to the divorce, The year 1810 is occupied with this heightening of the that at the same time he asked the czar for the hand of Continental system and the annexations which it involved. his sister, that upon this Austria, alarmed, and seeing her | That he had long contemplated the annexation of Holland Annexa- . own doom in the Russian match, gave him to understand appears from the offer of the crown of Spain which he ee } (as he may very well have calculated that she would do) | made to Louis in 1808, and the language he then used ("La i ' that he might have an archduchess, and that upon this | Hollande ne saura sortir de ses ruines"). He now took west. : he extricated himself from his engagement to the czar with | advantage of the resistance which Louis made to his ruin- phalia. . arudeness which might seem intended to make him an | ous exactions. Louis was driven to abdicate, and the fnemy. At the same time he refused to enter into an country was organized in nine French departments. In sg engagement not to raise the Polish question. August the troops of the king of Westphalia were forced we At an earlier period we saw Napoleon urged by his | to make way for French troops at the mouths of the Elbe bitin a brothers to divorce J osephine, but refusing steadfastly and | and Weser, and a few months later the whole coast between

tion. The armament did not set sail till August, when in Austria the war seemed to be at an end, and when Wellesley, after winning the battle of Talavera, had seen himself obliged to retire into Portugal, and it was directed not to Germany but against Antwerp. It was therefore a mere diversion, and as such it proved unsuccessful. It created indeed a great flutter of alarm in the administration at Paris, which saw France itself left unprotected while its armies occupied Vienna and Madrid, but by mismanage- ment and misfortune the great enterprise failed, and accomplished nothing but the capture of Flushing.

And so the last triumph of Napoleon was achieved, and the treaty of Schénbrunn was signed on October 20th. By this treaty, as by former treaties, he did not merely end a war or annex territory, but developed his empire and gave it a new character. He now brought to an end the duumvirate which had been established at Tilsit. Since Tilsit his greatness had been dependent on the concert of Russia. He had had the czar's permission to seize Spain, the czar's co-operation in humbling Austria. Schénbrunn made his empire self-dependent and self-sup- porting, and thus in a manner completed the edifice. But

apparently resolved upon adopting the eldest son of Louis and Hortense. He had now quite ceased to be influenced by his brothers, but at the same time he had risen to such greatness that he had himself come to think differently of the question. Fourteen years before he had been warmly

childlike. She became a complete Frenchwoman, but, owing to a certain reserve of manner, was never specially popular. On March 20, 1811, she bore a son, who took the title of King of Rome, by which in the Holy Roman Empire the successor had been designated. France had thus become once more as monarchical as in the proudest days of Versailles ; but the child of empire was reserved for what his father called "the saddest of fates, the fate of As- tyanax."

Arrived now at the pinnacle, Napoleon pauses, as he had paused after Marengo. We are disposed to ask, What . use will he now make of his boundless power? It was a question he never considered, because the object he had set before himself in 1803 was not yet attained; he was not in the least satiated, because, much as he had gained, he had not gained what he sought, that is, the humiliation of England. As after Tilsit, so after Schénbrunn, he only asks, How may the new resources be best directed against England? Yet he did not, as we might expect, devote himself to crushing the resistance of the Peninsula. This he seems to have regarded with a mixed feeling of con- tempt and despair, not knowing how to overcome it, and

the Rhine and the Elbe was annexed. At the same time Napoleon began to make war on neutral commerce, especially American, affirming that in

order to complete the destruction of English trade it was only necessary to prohibit it when it made use of neutral bottoms. So

Dissolu- tion of

the alli- ance of Tilsit.

Tnvasion of Russia.

thoroughly in earnest was he with his Continental system ; aud indeed it is beyond dispute that great distress and discontent, nay, at last a war with the United States, were inflicted upon England by this policy.

But the pressure of it was felt even more on the Continent, and the ultimate cause of the fall of Napoleon was this, that under the weight of the Continental sys- tem the alliance of Tilsit broke down sooner than the resistance of England. That alliance had been seriously weakened by the Austrian marriage, and by Napoleon's refusal to give the guarantees which Russia required that Poland should never be restored. Indeed Napoleon had seemed to take pleasure in weakening it, but perhaps he had only desired to make it less burdensome to himself without destroying it. At the end of 1810 measures were taken on both sides which conveyed the impression to Europe that it was practically at an end, Alexander refused to adopt Napoleon's policy towards neutrals ; Napoleon answered by annexing Oldenburg, ruled by a duke of the Russian house; Alexander rejoined by an ukase (December 31st) which modified the restrictions on colonial trade and heightened those on French trade.

In 1811 the alliance of Tilsit gradually dissolves. Napoleon's Russian expedition is hardly to be regarded as a freak of insane pride. He himself regarded it as the unfortunate effect of a fatality, and he betrayed throughout an unwonted reluctance and perplexity. The truth is, he could not now stop. Upon the Continental system he had staked everything. He had united all Europe in the crusade against England, and no state, least of all such a state as Russia, could withdraw from the system without practically joining England. Nevertheless we may wonder that, if he felt obliged to make war on Russia, he should have chosen to wage it in the manner he did, by an over- whelming invasion, Jor an ordinary war his resources were greatly

superior to those of Russia. A campaign on the Lithuanian frontier would no doubt have been unfavour- able to Alexander, and might have forced him to concede the points at issue. Napoleon had already experienced in Spain the danger of rousing national spirit. It seems, how- ever, that this lesson had been lost on him, and that he still lived in the ideas which the campaigns of 1805, 1806, and 1807 had awakened, when he had occupied Vienna and Berlin in succession, overthrown the Holy Roman Empire, and conquered Prussia. He makes a dispute about tariffs the ground of the greatest military expedition known to authentic history! In this we see a stroke of his favourite policy, which consisted in taking with great suddenness a measure far more decisive than had been expected ; but such policy seems here to have been wholly out of place. He was perhaps partly driven to it by the ill-success of his diplomacy. War with France meant for Russia sooner or later alliance with. England, but Napoleon was not able to get the help of Turkey, and Sweden joined Russia. Turkey had probably heard of the partition-schemes which were agitated at Tilsit, and was also influenced by the threats and promises of England. Sweden suffered grievously from the Continental system, and Bernadotte, who had lately become crown prince, and who felt that he could only secure his position by procur- ing for Sweden some compensation for the recent loss of Finland, offered his adhesion to the power which would help him in acquiring Norway. Napoleon declined to rob his ally, Denmark, but Alexander made the promise, and Sweden was won. Against Russia, Sweden, and England (a coalition which formed itself but tardily) Napoleon assembled the forces of France, Italy, and Germany, and hoped to win, as usual, by the rapid concentration of an overwhelming force. The army with which he invaded Russia consisted of somewhat more than 600,000 men,—

the French troops mainly commanded by Davoust, Oudinot, and Ney, the Italian troops by Prince Eugene, the Poles by Poniatowski, the Austrian contingent (33,000 men) by Schwarzenberg, the remaining German troops by Gouvion St Cyr, Reynier, Vandamme, Victor, Mac- donald (who had the Prussian contingent), and Augereau. When we consider that the war of the

Peninsula was at the same time at its height, and that England was now at war with the United States, we may form a notion of the calamitous condition of the world !

Russia had been easily defeated at Austerlitz and Friedland, where it fought far from home for a cause in which it was but slightly interested. Against an invasion it was as invincible as Spain, being strengthened by a profound national religion and perfect loyalty to the Government; in addition it had the strength of its vast extent, its rigorous climate, and the half-nomad habits of its people. By his prodigious preparations Napoleon provoked a new national war under the most difficult circumstances, and yet he appears to have desired peace and to have advanced most reluctantly. His campaign runs the same course as against Austria in 1805 and 1809. There is the successful advance, the capture of the fortress (Smolensk), the great victory (at Borodino), the entry into the capital (Moscow) ; but of all this no result. No negotiation follows, and Napoleon suddenly finds him- self helpless, as perhaps he would have done in 1805 and 1809, had the enemy shown the same firmness. On May 16, 1812, he arrived with Marie Louise at Dresden, where for the last time he appeared as king of kings,—the emperor of Austria, the king of Prussia, a multitude of German sovereigns, Metternich, and Hardenberg paying court to him. Onthe 28th he set out again and travelled by Glogau, Thorn, Dantzic, Konigsberg, Gumbinnen, to Wilkowyski, where he arrived on June 21st. On the 24th the mass of the army passed the Niemen at Kovno, and on the 28th Napoleon entered Vilna, which was evacuated by the Russians. Here he remained till July 16th. In this long delay, as well as in other circumstances, the unwonted perplexity of his mind appears. Alexander, who has by this time gained greatly in decision of character, refuses to negotiate while the enemy stands on Russian territory; Napoleon in conversation with Balacheff shows an almost pathetic desire for an amicable arrangement. He is embarrassed again when a deputation from Warsaw, where a diet had met, bids him only say that “ Poland ewists, since his decree would be for the world equivalent to the reality.” This word he declines to say, alleging his obligations to Austria. From his conversations with Narbonne (Villemain, Souvenirs) we find that he had deliberately considered and rejected what we may call the rational mode of waging war with Russia, that is, through the restoration of Poland. He admitted that he might indemnify Austria and, if necessary, Prussia else-

where, but he argued that he could not afford to open the floodgates of republicanism: ‘Poland must be a camp, not a forum.” He had in fact—perhaps mainly since his second marriage—come to regard himself as the representative of legitimacy against the Revolution. It was thus with his eyes open that he preferred the fatal course of striking at Moscow. His judgment was evidently bewildered by the successes of 1805 and 1806, and he indulges in chimerical imaginations of delivering Europe once for all from the danger of barbaric invasion. It is to be observed that he seems invariably to think of the Russians as Tartars!

In relating this war we have to beware of national exaggerations on both sides. On Napoleon’s side it is absurdly said that he was only vanquished by winter, whereas it is evident that he brought the winter upon

himself, first by beginning so late, then by repeated delays, | by Barclay of one position after another, created the at Vilna, at Vitebsk, and most of all at Moscow. On the greatest consternation among the Russians, as well they other side we must not admit absolutely the Russian | might. Barclay was a German, and might well seem . story that he was lured onward by a Parthian policy, and | another Melas or Mack. A ery arose for his dismissal, to that Moscow was sacrificed by a solemn universal act of | which the czar responded by putting old Kutusoff, who was patriotism. Wellington’s policy of retrograde movements | at least a Russian, at the head of all his armies. This had indeed come into fashion among specialists, and an | change necessarily brought on a great battle, which took entrenched camp was preparing at Drissa on the Dwina in | place on September 6th near the village of Borodino. Battle of imitation of Torres Vedras. But the nation and the army | More than 100,000 men and about six hundred pieces of Boro-were full of reckless confidence and impatience for battle ; artillery were engaged on each side. It ended in a victory, dino. only their preparations were by no means complete. The | but an almost fruitless victory, for the French. They lost long retreat to Moscow and beyond it was unintentional, | perhaps 30,000 men, including Generals Montbrun and and filled the Russians with despair, while at the same | Caulaincourt, the Russians nearly 50,000, including Prince time it agreed with the views of some of the more

en- | Bagration. Here again Napoleon displayed unwonted lightened strategists. indecision, He refused to let loose his guard, consisting As usual, Napoleon took the enemy by surprise, and | of 20,000 fresh troops, who might apparently have effected brought an overwhelming force to the critical point. | the complete dissolution of the hostile army, and materially When he crossed the Niemen the Russians were still | altered the whole sequel of the campaign. He said, “At 800 thinking of an offensive war, and rumours had also been | leagues from Paris one must not risk one’s last reserve.” spread that he would enter Volhynia. Hence their force This battle, the greatest after Leipsic of all the Napoleonic was divided into three armies: one, commanded by the | battles, was followed by the occupation of Moscow on Livonian Barclay de Tolly, had its headquarters at Vilna, | September 14, which, to Napoleon’s great disappointment, a second under Prince Bagration was further south at | was found almost entirely empty. After a council of war Volkowysk, the third under Tormaseff was in Volhynia. | held at Fili, Kutusoff had taken the resolution to abandon But the total of these armies scarcely amounted to 200,000 | the old capital, the loss of which was held not to be so men, and that of Barclay de Tolly opposed little more | irreparable as the loss of the army. But, as with Old than 100,000 to the main body of Napoleon’s host, which | Russian craft he had announced Borodino to the emperor amounted nearly to 300,000. Hence it evacuates Vilna | as a victory, the sensation produced upon the Russian and retires by Svenziany to the camp at Drissa. Barclay | public by the fall of Moscow was all the more overwhelm- arrives at Drissa on July 9th, and here for the first time | ing. Nor did the next occurrence, which immediately Burning the emperor and the generals seem to realize the extent of followed, at first bring any relief. Fires broke out in of the danger. Alexander issues an ukase calling out the | Moscow on the night after Napoleon’s entrance; on the Moscow. population in the proportion of five to every hundred males, | next night, by which time he was quartered in the Kremlin, and hurries to Moscow and thence to St Petersburg in order | the greater part of the city was in flames, and on the day to rouse the national enthusiasm. The Drissa camp is following he was forced by the progress of the conflagration also perceived to be untenable. It had been intended | to evacuate the Kremlin.again. But on the first intelli- to screen St Petersburg, and Napoleon is seen to look | gence of this catastrophe the destruction of Moscow was rather in the direction of Moscow. Barclay retires to |

attributed in Russia to the French themselves, and was Vitebsk, but is obliged, in order to effect his junction with | not by any means regarded as a crushing blow dealt at Bagration, to retreat still further, and Napoleon enters Napoleon by Russian patriotism. Vitebsk on the 28th. The road to Moscow passes between It is indeed not clear that this event had any decisive the Dwina, which flows northward, and the Dnieper, which | influence upon the result of the war. Nor does it seem flows southward, Vitebsk on the one river and Smolensk | to have been the deliberate work of the patriotism of on the other forming, as it were, the two doorposts. We | Moscow. The beginner of it was one man, Count expect to find Napoleon at this point cutting the hostile | Rostopchin, governor of Moscow, who is shown by many armies in two and compelling that of Bagration to a sur- | public utterances to have brooded for some time over the render; he has a great superiority of numbers, and he thought, and is proved to have made preparations for might have had the advantage of a friendly population. | carrying it into effect before leaving the town. It is, But his host seems unmanageable, and the people are | however, supposed that what was begun by him was com- estranged by the rapacity and cruelty to which it is driven | pleted by a rabble which had no object but plunder, and. by insufficient supplies. Barclay and Bagration effect | partly by French soldiers. The immediate effect of it was their junction at Smolensk on August 3d, and now have a | to deepen the alarm of the Russians, and, when this feeling compact army of at least 120,000 men. They evacuated | passed away, to deepen their hatred of the French. Now Smolensk also on the 18th, but only after an obstinate | came the critical moment. Would Alexander negotiate ? defence which left Napoleon master of nothing but a | That is, would he listen to certain timid courtiers about burning ruin, him, such as Romanzoff, or would he be inspired by the Both at Vitebsk and Smolensk he betrayed the extreme | patriotic ardour of his people and lean on his nobler embarrassment of his mind. Should he go into winter | counsellors, the German patriot Stein or Sir Robert Wilson ? quarters? should he press forward to Moscow? It was a | The pressure for a moment was great ; we can imagine choice of desperate courses. His army was dwindling | that had the Russian army been dissolved at Borodino it away ; he had forfeited the support of the Poles ; Germany | might have been irresistible. But he stood firm; he was full of discontent ; and yet a large part of his army | refused to negotiate ; and Napoleon suddenly found that was Polish or German ; how

could he delay? And yetif he | he had before him, not the simple problem he had solved advanced, since August was already running out, he must | so often in earlier life, but the insoluble puzzle he had first encounter the Russian winter. He determined to advance, | encountered in Spain. His failures in Egypt and in relying on the overwhelming effect that would be produced | Spain had been more or less disguised. He was now in y the occupation of Moscow. He would win, as after danger of a failure which could not be concealed, and on Austerlitz and Friedland, through the feebleness and fickle- | a far larger scale; but had he retreated forthwith and ness of Alexander. wintered in Vilna, where he might have arrived early in Meanwhile his unresisted progress, and the abandonment | November, the conquest of Russia Oe — seemed XVII. — 2

Retreat from Moscow.

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only to be postponed for a year. Instead of this he delayed five weeks in Moscow, and then complained of the Russian winter! After planning a demonstration on St Petersburg, weighing Daru's scheme of wintering in Moscow (which he called " un conseil de lion "), and wait- ing in vain for the czar's submission, he set out on October 18th after blowing up the Kremlin. He marched south- ward to Kaluga, hoping to make his way through a richer and unexhausted country. But while his force had dwindled the Russian had increased. Peace with Sweden had released a Russian force in Finland ; peace with Turkey released the army of the Danube; meanwhile levies were proceeding through the whole empire. Napoleon's plan was frustrated by a check he received at Malojaro-

slavetz, and he had to turn northward again and return as"

he had come. He reached Smolensk on November 9th, when he might have been at Vilna. He marched by Oreza to the Berezina, which he struck near Borisoff. Here Tchitchagoff at the head of the Danube army con- fronted him, and two other Russian armies were approach- ing. Napoleon on his side was joined by what remained of the corps of Oudinot and Victor, who had held the line of the Dwina. But what was the army of Napoleon which was thus reinforced ? .

In July it had consisted of more than 250,000 men. It had suffered no decisive defeat, and yet it amounted now only to 12,000; in the retreat from Moscow alone about 90,000 had been lost. The force which now joined it amounted to 18,000, and Napoleon's star had still influ- ence enough to enable him to make his way across the Berezina, and so escape total ruin and captivity. But December came on, and the cold was more terrible than ever. On the evening of December 6th a miserable throng, like a crowd of beggars, tottered into Vilna.

The corps of Macdonald, Reynier, and Schwarzenberg (among whom were included the Austrian and Prussian contingents) had escaped destruction, having been posted partly on the Polish frontier partly in the Baltic provinces. For these we may deduct 100,000 from the total force ; it then appears that half a million had perished or dis- appeared. They had perished not by unexpected cold ; "the cold had but finished the work of dissolution and death almost accomplished by the enemy, by hardship, and especially by hunger" (Charras); nor is cold unusual in Russia in November! Napoleon's error was one which may be traced as clearly in the campaigns of 1805 and 1806, the error of making no provision whatever for the case of ill-success or even success less than complete. It was now the twentieth year that Europe was tearing itself to pieces. For some years past the pretence of Revolution- ary principles had been given up. There was now no pretext for war except the so-called maritime tyranny of England ; but yet the magnitude of wars had increased beyond all measurement. The campaign of 1812 left every- thing in civilized history far behind it. All the abuses of the old monarchy and all the atrocities of the Revolution put together were as nothing compared to this new plague, bred between the Revolution and the old monarchy, having the violence of the one and the vain- glory of the other, with a barbarous destructiveness peculiar to imperialism superadded.

But what was Napoleon's position? Any Government but the strongest would have sunk under such a blow, but Napoleon's Government was the strongest, and at its strongest moment. Opposition had long been dead; public opinion was paralysed; no immediate rising was to be feared. Should he then simply take the lesson home, and make peace with Alexander? This

was impossible ; he must efface the disaster by new triumphs. But, as this was evident to all, Alexander could not but perceive that he

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must not lose a moment, but must hasten forward and rouse Germany before Napoleon should have had time to levy a new army. 1813 must be filled with a war in Germany, as 1812 with the war in Russia.

Napoleon left the wreck of his army at Smorgoni on December 5 (as he had left his Egyptian army thirteen years before), travelling in a carriage placed upon a sledge and accompanied by Caulaincourt and Duroc. He had an interview with Maret outside Vilna, and then travelled to Warsaw, where he saw his ambassador De Pradt, who has left an account of his confused talk. Here, as in the famous 29th bulletin, published a little after, we observe that he consoles himself for the loss of his army by reflect- ing that his own health was never better—he kept on repeating this. Then he said, “From the sublime to the ridiculous there is but a step”; for the retreat from Moscow strikes him as ridiculous! From Warsaw he passed to Dresden, where he saw his ally the king of Saxony, and wrote letters to the emperor of Austria and to the king of Prussia. He then made his way by Erfurt and Mainz to Paris, where he arrived on December 18th. The bulletin had appeared two days before.

He had said to De Pradt that he intended to raise Wars of

300,000 men and be on the Niemen again in the spring, 1818-1) qi

The first part of this intention he fulfilled, for in April he reappeared in the field with 300,000 men; but the campaign was fought not on the line of the Niemen, nor of the Vistula, nor of the Oder, and he had to fight a battle before he could even reach the Elbe. Fora great event took place less than a fortnight after his arrival in Paris, the defection of the Prussian contingent under York from the grand army; this event led to the rising of Prussia against Napoleon. York’s convention with the Russians is dated December 30th. On January 22, 1813, Stein appeared at K6nigsberg and procured the

assembling of the estates of East Prussia, in which assembly the Prussian landwehr was set on foot. On February 27th he con- cluded for the czar the treaty of Kalisch with Prussia, by which the old Coalition of 1806 may be said to have been revived. Prussia now rushed to arms in a wholly new spirit, emulating Spain and Russia in devotion, and adding to devotion an intelligence peculiar to herself. At the same time measures were taken to break up the Confedera- tion of the Rhine. Tettenborn cleared the French out of the northern departments in March ; Saxony too passed into the hands of the allies, and it was hoped that the king himself might be induced to follow the example of the king of Prussia. But April came, and Napoleon took the field again.

By rapidity and energy he was still able to take the offensive. Though Russia and Prussia were now as Spain, yet the process of calling out and drilling their population was only just begun, and it proceeded slowly. Their united available force at the opening of the campaign scarcely exceeded 100,000 men. Austria and the middle states did not abandon Napoleon. With tact and with judicious concession he might yet retrieve his position ; perhaps no one, as yet, had begun to think of his fall. He left Paris for Mainz on April 15th. His object was Saxony, where Dresden, the scene of his last display of omnipotence less than a year ago, was now the residence of the czar and the king of Prussia united against him. Eugene was maintaining himself on the lower Saale with an army of about 70,000 men, and Napoleon was to march by way of Erfurt to join him. Between Erfurt, Bamberg, and Mainz he had by this time about 150,000 men, troops indeed without discipline and with imperfect drill, youths, the last hope of France, but well officered and not wanting in the enthusiasm which his name still inspired. There was, however, a serious deficiency of cavalry. Meal-

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while Davoust, stationed on the Weser with 30,000 men, was holding down the insurrection of North Germany.

The war which now commenced ended not only to the disadvantage of Napoleon, but unlike any former war it ended in a complete defeat of France, nay, in the conquest of France, an event to which nothing parallel had been seen in modern Europe. Nor was this result attained by any political or revolutionary means, ¢.g., by exciting a republican or Bourbon party against Napoleon's authority, but by sheer military superiority. The causes of this remarkable result must be noted as we proceed. Mean- while we remark that the war, though technically one, is really three distinct wars. There is first the war with Russia and Prussia which occupies the month of May, and is concluded by an armistice on June 4th. There is next a war with Russia, Prussia, and Austria, which begins in August and is practically terminated in October by the expulsion of Napoleon from Germany. Thirdly, there is an invasion of France by the same allied powers. This began in January 1814, and ended in April with the fall of Napoleon.

In the first of these wars Napoleon maintained on the whole his old superiority. It has excited needless admiration that with his raw levies he should still have been able to win victories, since of his two enemies Russia had suffered as much as himself in 1812, and Prussia's army was at the beginning of the year actually to make. In the first days of May he advanced down the valley of the Saale, making for Leipsic by Naumburg, Weissenfels, and Liitzen. On the 2d was fought the battle commonly called from Liitzen, though the Germans usually name it from the village of Gross-Gérschen. By this battle, in which the great military reformer of Prussia, Scharnhorst, received the wound of which he died soon after, the allies were driven to retreat across the Elbe, and Dresden was restored to the king of Saxony. The Prussians attribute their ill-success partly to the insufficiency of the Russian commander Wittgenstein, under whom they fought. Napoleon soon pursued the allies across the Elbe, and another battle was fought on May 20 and 21 at Bautzen on the Spree. Here again Napoleon remained master of the field, though his loss seems to have been considerably greater than that of the enemy. The allies retired into Silesia, and a pause took place, which led to the armistice of Poischwitz, signed on

June 4th. During this armistice Napoleon formed the resolution which led to his downfall.

He might seem now to have almost retrieved his losses. If he could not revive the great army of the Revolution which lay buried (or unburied) in Russia, he had reasserted the ascendency of France. Politically he had suffered but one substantial loss, in the rebellion of Prussia. The blows of Liitzen and Bautzen had arrested the movement which threatened to dissolve the Confederation of the Rhine and to unite all Germany against him. They had also shaken the alliance of Prussia and Russia. Between the generals of the two armies there reigned much jealousy ; the old question, raised after Austerlitz and Friedland, Was beginning to be asked again by the Russians, Why Should they fight for others ?

_ At Tilsit Napoleon had dissolved the Coalition by form- mg as it were a partnership with Russia. It might seem possible now to form a similar partnership with Austria. This course had indeed been entered upon at the marriage of the archduchess. Napoleon seems to have taken this alliance seriously. He conceived it as the final suppression of the Revolution, as a complete adhesion on his own part to conservatism. The language of the bulletins at this time is ultra-conservative. Thus the enemy is described as “preaching anarchy and insurrection.” Stein is charged with “rousing the rabble against the proprietors.” But,

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though he had borrowed the Austrian tone, he had not yet enlisted Austrian interests on his side. It was evidently in his power to confer on Austria the greatest advantages, and, as it were, to divide his power with her. Less than this he could not offer, since the losses of France and Russia had given to Austria a decisive weight, but it might seem that he might offer it without much humiliation, as the alliance with Austria had sub- sisted since 1810 and had been cemented by marriage. If he did not thus win Austria, he might expect her to adhere to the other side, for in such a crisis neutrality was out of the question. Could Napoleon then hope to overcome a quadruple alliance of England, Russia, Prussia, and Austria ? Such a hope

was not justified by the victories of Liitzen and Bautzen. The force of Prussia increased every day, and the Spanish enthusiasm with which her new army fought had been displayed even on those fields ; the force of Austria had been impaired by no Russian campaign ; while France was evidently near the end of her resources. The legerdemain by which, in 1800, 1805, 1806, Napoleon had made conquests was now worn out ; his blows were no longer followed by abject submission and surrender ; he was not even able, for want of cavalry, to make his victories decisive. Thus ample concessions to Austria were indis- pensable ; but, these assumed, his position might seem good.

He took the momentous resolution to make no such con- cessions, saw Austria join the Coalition, and after a campaign of two months found himself driven in tumul- tuous ruin across the Rhine. This step is the counter- part of Tilsit, and destroyed the work of Tilsit. Was he simply blinded by passion? His language might lead us to think so. Austria was the state which he had oftenest defeated, and he seems to have been unable to regard it with the respect which he had shown to Russia at Tilsit. From the beginning of 1813 we find him calculating indeed on the help of Austria, and fully recognizing the im- portance of her alliance, yet indignant at the very thought of having to pay for it. He would prefer to make advances to his enemy Russia rather than give his ally Austria any equality with himself in the alliance. Austria on her part seems disposed to be faithful to him. She begins by adhering to the substance of her treaty of March 1812, but requiring certain modifications in it. Napoleon must withdraw from north-west Germany, dissolve the duchy of Warsaw, cede Illyria, perhaps also dissolve the Confedera- tion of the Rhine. But on the last point she might prob- ably have given way, so that Napoleon, already victorious against Russia and Prussia, might now, without yielding any substantial part of his power, have checkmated another Coalition by the help of Austria. Nevertheless it seems as if Napoleon, thoygh this course was open to him for several months, was not for a moment attracted by it, though the clamour for peace which his own army and his own marshals raised compelled him to profess to take it into considera- tion. He continued deliberately to contemplate in prefer- ence a war against Russia, Prussia, and Austria united, and regarded the armistice simply as a delay which would enable him to bring up new forces. Austria on her part was gradually

convinced that no concession was to be obtained from him, and drifted towards the decisive resolution which she could not avoid. Metternich has left us an account of the interview, lasting ten hours, which he had with Napoleon on June 28, in the Marcolini palace at Dresden. We see in it Napoleon's contempt for a power he has so often defeated, his inability to believe that it has still spirit to resist; at the same time we become aware that he believes himself to be necessary to the Austrian emperor, as being the bulwark of all thrones and of monarchy itself against

the Revolution. Metternich can hardly have imagined the famous dramatic trait where Napoleon, on being told that his troops were "not soldiers, but children," answered, turning pale—''You are no soldier; you do not know what passes in a soldier's mind; I grew up in the field, and a man like me troubles himself little about the life of a million of men" (the actual expression he used, adds Metternich, cannot be reported), and then flung his hat into a corner of the room. That this was a true description of his way of thinking had become visible to most since the Russian catastrophe, and the audacious frankness with which he blurts it out is quite in his characteristic manner.

When this interview took place, a treaty had just been signed at Reichenbach by which Austria had engaged, as mediating power, formally to offer conditions of peace to Napoleon and to declare war on him in case of refusal. She proceeded to offer the conditions above mentioned with the exception of that which refers to the Confederation of the Rhine. A congress met at Prague in the course of July, but Napoleon did not allow its deliberations to make serious progress. He paid no attention to an ultimatum presented on August 8th. On midnight of August 10-11 the armistice was declared to be at an end, and the doom of Napoleon was sealed. It was a strange decision on his part, but perhaps he judged rightly that he had no choice but between ruin and absolute, impossible victory!

Europe now plunges again into a struggle as desperate:

and as destructive as that of 1812. More evidently even than in 1812 is Napoleon responsible for this ruin of all civilization. He cannot any longer speak even of the liberty of the seas, for he is forced himself to admit that the Continental system is dead, and yet refuses to surrender that ascendency for which the Continental system had all along been the pretext. Infatuated France, however, has by this time furnished more than 400,000 men to perish in a contest where there might be chances, but could be no probabilities, of victory. His headquarters are now at Dresden, and his armies are arranged along the whole course of the Elbe from Bohemia to its mouth. This position has been somewhat weakened by the adhesion of Austria to the Coalition, for Austria masses her troops on the north-west of Bohemia, threatening Dresden and Napoleon's communications from the left side of the Elbe. The force of the allies (approaching 500,000 men) consists of three great armies, of which the first, principally Austrian, and commanded by Prince Schwarzenberg, is stationed on the Eger in Bohemia; the sovereigns are here. The old Prusso-Russian army, which had made the convention of Poischwitz, is still in Silesia. It contains more Russians than Prussians, but a Prussian officer is now put at the head of it. This is Bliicher, the dashing general of hussars, now an old man of seventy years ; on his staff are some of the leading theorists and enthusiasts of the new Prussian army, such as Gneisenau. But the bulk of the Prussian force is stationed in the mark of Brandenburg. In this final muster of the armies of Europe we see that the moral forces have passed over from France to the allies. In the French camp there reigns weariness and desire for peace, among the Prussians and Russians heroic ardour and devo- tion. But the old mismanagement reappears on the side of the allies. In the Bohemian camp Schwarzenberg's authority was almost annulled by the presence of the sovereigns ; in Silesia the heroic Prussian general is in command of an army mainly Russian. But in the mark perhaps the greatest blunder was made, for here the main Prussian force was put under the orders of the crown prince of Sweden, the Frenchman Bernadotte, wholly alien to the German cause, and bent upon propitiating French public opinion with a view to the succession of Napoleon.

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Bernadotte is not the only member of the old republican opposition who is seen in the allied camp now that Napoleon's fall begins to be thought of as possible, Moreau, the man who helped in 1799 to found the con- sulate, desiring probably to see France ruled by a series of Washingtons each holding office for a short term, appears in the Austrian camp. If Napoleon was to be dethroned, who had a better right to succeed him ?

The campaign opens with a blow aimed at Berlin, where perhaps Napoleon wished to extinguish the popular insur- rection at its source. Oudinot marches on it from Baruth, and is supported by a force from Magdeburg; Davoust sends another corps from Hamburg. Bernadotte proposes to retire and sacrifice Berlin, but in spite of him Bilow fights on August 23d the battle of Grossbeeren, within a few miles of the capital. Here first the landwehr dis- tinguished itself, and Berlin was saved. The attack from Magdeburg was defeated by Hirschfeld at Hagelberg on the 27th. Meanwhile Napoleon himself, at the head of 150,000 men, had marched against Bliicher on the Katzbach. Blticher retired before him, and he was com- pelled to return to the defence of Dresden, but he left Macdonald with perhaps 50,000 or 60,000 men to hold Bliicher in check. Almost immediately after his departure (August 26th) Macdonald was defeated by Bliicher in the battle of the Katzbach. Thus the campaign began with two Prussian victories. But when the great army of Bohemia moved upon Dresden Napoleon showed his old superiority. On August 27th he inflicted on it a terrible defeat. In this battle Moreau, the hero of Hohenlinden, was mortally wounded by a cannon-ball. It seemed for a moment likely that this battle, followed up with Napoleon's overwhelming rapidity, would decide the cam- paign. He prepared to cut off his enemy's retreat into Bohemia. But the news of Grossbeeren and Katzbach arrived ; Napoleon is also said to have been attacked by illness ; he altered his plan in the moment of execution. The grand stroke of the campaign failed, and, instead of cutting off the retreat of the grand army, Vandamme was taken prisoner at Kulm with 10,000 men after a battle in which he had lost half that number (August 30th). It was evident that the times of Marengo and Austerlitz were over. Napoleon's ability and authority were as great as ever ; he controlled larger armies ; he opposed a Coalition which was as unwieldy as former Coalitions; and yet he had suffered four defeats in a single week and had won but one victory. Within another week he suffered another blow. A new

advance was made on Berlin by Ney, who was defeated with great loss at Dennewitz by the Prussians under Biilow (September 6th).

Here then ends Napoleon’s ascendency ; henceforth he fights in self-defence or in despair. Yet the massacre was to continue with unabated fury for two months longer. He spent the greater part of September in restless marches from Dresden, now into Silesia, now into Bohemia, by which he wore out his strength without winning any sub- stantial advantage. Towards the end of the month a new phase of the war begins. From the beginning the allies had given each other rendezvous in the plain of Leipsic. Hitherto Napoleon had held the line of the Elbe, and had presented a single mass to the three separate armies of the Coalition. Now that his collapse begins to be visible, begins the converging advance on Leipsic. The Silesian army crossed the Elbe at Wartenburg on October 3d, and on the next days the northern army also crossed at several points. At the same moment the Confederation of the Rhine began rapidly to dissolve. A troop of Cossacks under Czernicheff upset the kingdom of Westphalia (October 1st). Bavaria abandoned Napoleon, and concluded the treaty of Ried with Austria (October 8th). But for

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sattle of form’s sake a final massacre was still necessary. It took

{ein place on a satisfactory scale between October 14th and

1 19th, and ended in the decisive defeat of Napoleon and

: the capture of Leipsic. Perhaps nearly half a million of

; men were engaged in these final battles. It is reckoned) | that in the last three days the Prussians lost sixteen, the | Russians twenty-one, and the Austrians fourteen thousand

| men—total, fifty-one thousand. Napoleon left twenty-

; three thousand behind him in the hospitals and fifteen

thousand prisoners; his dead may have been fifteen | thousand. He lost also three hundred pieces of artillery. | The sufferings of the wounded almost exceed anything told of the retreat from Moscow. It is a misfortune that the victors allowed him to cross the Rhine in safety ; had they pressed the pursuit vigorously, helped as they now were by the Bavarians, they might have brought his career to an end at this point. But for such a decisive measure perhaps even their political views were not yet ripe. However, as at the Berezina in 1812, so now, he had to clear his road by another battle. The Bavarians under Wrede met him at Hanau, eager to carn some merit with the victorious Coalition; but he broke his way through them and arrived at Frankfort. On November Ist and 2d he carried the remains of his army, some 70,000 men, across the Rhine at Mainz.

The work of eight years was undone; Napoleon was thrown back to the position he had occupied at the rupture of the peace of Amiens. The Russian disaster had cancelled Friedland; Leipsic had cancelled Austerlitz. But could Napoleon consent to humble himself? If he could not make concessions in the summer, still less could he do sonow. Could he return and reign quietly at Paris, a defeated general, his reputation crushed by the two greatest disasters of history? But he might by abdicating have spared France, already mortally exhausted, the burden of another war. It is among the most unpardonable even of his crimes to have dragged his unhappy country through yet another period of massacre, though nothing that could even appear to be a national interest was at stake. In November advances were made to him by the allies, in which peace was proposed on the basis of the “natural frontiers.” This would have secured to France the main fruits of the First Revolutionary War, that is, Belgium, the Left Bank, Savoy, and Nice. Such terms seem generous when we consider the prostration of France and the overwhelming superiority of the allies. But though the Prussian war-party loudly protested against them, and maintained the necessity of weakening France so as to render her harmless, Austria favoured them, being Jealous alike of Prussia and of the spirit of liberty which the war was rousing in the German population. A little compliance on the part of Napoleon might at this moment have made the general desire for peace irresistible. But he showed no such disposition. He first evaded

the pro- posal, and then, too late, accepted it with suspicious qualifications. After having been decimated, France must now be invaded and subjugated, for him.

7 On December Ist the allies issued their manifesto from by a Frankfort, in which they declare themselves at war not allies, With France but with Napoleon (an imitation of the Revolu- tionary principle “Peace with peoples, war with Govern- ments”), and the invasion followed with almost N apoleonic Tapidity. The three armies remain separate as they had been in Germany. The great army under Schwarzenberg passes through Switzerland, and makes its way to the plateau of Langres (the source of the Seine, Aube, and Marne), where lt begins to arrive about the middle of J anuary ; Bliicher’s Silesian army crosses the middle Rhine to Nancy ; the northern army, nominally under Bernadotte, passes through Holland. In the course of the march Switzerland and

Holland were swept into the Coalition, the resources of which were now become overwhelming. It would be difficult to state for what object Napoleon now called on France to fight another campaign, particularly as the allies guaranteed to her a larger territory than she had possessed under the old monarchy. His officers indeed wondered what personal object he could have. They were astonished to hear him talk of another campaign in Germany to be undertaken next spring, of being soon on the Vistula again, &c. He was no doubt a prey to illusions, his fortune having accustomed him to expect results ten times greater than the probabilities justified, but his confidence was founded on (1) the great force which still remained to him shut up in German fortresses, (2) the mutual jealousy of the allies, (3) his own connexion with the emperor of Austria, (4) the patriotism which would be roused among the French, as in 1792, by the invasion. But his calcula- tions were confounded by the rapidity of the invaders, who gave him no time to call out the nation. The Senate did indeed grant him 300,000 men, but to levy, drill, and arm them was impossible, and he had neglected to fortify Paris. In the armies which had returned from Germany there began desertion of all who were not French. The campaign opened at the end of

January and was over at the end of March. The scene of it was the country between the Marne, Aube, and Seine, partly also the department of Aisne, At first, though successful at Brienne, Napoleon seemed unable to resist the superior numbers of the enemy. He was defeated at La Rothiére. But the invaders were as yet irresolute ; they divided their forces. This gave him an opportunity. He attacked Blticher, and, though with greatly inferior forces, won four battles in four days, at Champaubert (February 10th), at Montmirail (11th), at Chateau-Thierry (12th), at Vauchamps (13th). For the moment this brilliant success gave the campaign quite another character ; the hopes and patriotic feelings of the French were roused. A congress had already been opened at Chatillon, and under the impression of these victories it would have been easy to conclude a peace, had not Napoleon's position made a reasonable peace inadmis- sible to him. He felt this, and fell back upon illusions and upon attempts to sever Austria from the Coalition. At the beginning of March the Coalition was strengthened by the treaty of Chaumont, in which each of the four powers bound themselves for twenty years to keep 150,000 men on foot. Directly afterwards Napoleon received a crushing blow from the fall of Soissons and the junction of Bliicher with the northern army under Biilow, which had entered France by way of Holland and Belgium. Their united force amounted to more than 100,000 men. The battles of Craonne and Laon followed, in which Napoleon, without suffering actual defeat, saw his resources dwindle away. On March 18th the conferences at Chatillon came to an end, the plenipotentiaries of the allies declaring Napoleon to have no intention but that of gaining time. About the 24th the allies came to the resolution to march on Paris. They had before them only Marmont and Mortier, for Napoleon himself had resolved to manceuvre in their rear, and had marched to St Dizier. The marshals, after an engagement at Fére Champenoise, made good their retreat to Paris, where the enemy followed them on the 29th. Joseph Bonaparte withdrew Marie Louise and the king of Rome to Tours. On the 30th the allies attacked in three divisions,—the Silesian army on the side of Montmartre, Prince Eugene of Wiirtemberg and Barclay de Tolly by Pantin and Romainville, the crown prince of Wiirtemberg and Giulay by Vincennes and Charenton. In the afternoon, after an obstinate resistance, the marshals offered a capitulation, and engaged to evacuate the town before seven o'clock in the morning. Napoleon, advancing

Napoleon abdi- cates.

by forced marches, was too late. The military struggle is over ; the political struggle begins,

Since 1804 there had been no independent political life in France. During the Russian expedition, indeed, a certain General Malet had spread a false report of Napoleon's death in Russia, and had produced a forged decree of the Senate restoring the republic. His attempt had for the moment had so much success that Napoleon had painfully felt the precariousness of his dynasty, the purely provisional character of the monarchy he had founded. Again, when Napoleon had made his last ap- peal for help to the Corps Législatif, Lainé of Bordeaux had conjured the emperor, while he defended the coun- try, to maintain the entire execution of the laws which guarantee to the French liberty, security, and property, and to the nation the free exercise of its political rights. Napoleon had replied with an outburst of indignation. But now at last it became necessary to take an independent resolution, for in the influential classes it began to be understood that Napoleon must fall, and in particular the generals asked themselves for what rational purpose troops were still levied and battles still fought. But not even the germs were visible of any authority that could replace that of Napoleon. Should he be succeeded by another general, or by a regency for his son, or by the Bourbons? The first course might have been possible had some Moreau been at hand ; even as it was, Bernadotte, who, like Napo- leon, was a Jacobin developed into a prince, made preten- sions which were favoured by the czar. Such a course would have been a revival of the consulate, but it would not have satisfied the republican party, while it would have been rejected by monarchists of every shade. In favour of the regency, as against the Bourbons, there was much to be said. It would not begin with a fantastic transformation-scene, and it would have a hold on the popular imagination. The decision fell out by a sort of accident. To a regency the natural road was by an abdication which would preserve the principle of inheritance. Such an abdication Napoleon gave. On April 4th he reviewed his troops at Fontainebleau, and announced his intention of attacking the allies in Paris. They received his words with enthu- siasm ; but

just at this point the mainstay of his power failed him. The military aristocracy, the marshals, refused to follow him, and Napoleon perceived in a moment that the end was come. Though in arguing with them he had said that a regency of Marie Louise, whom he called “a child,” was impossible, yet he now abdicated on condition that his son should succeed under the regency of the empress. Ney, Macdonald, and Caulaincourt set out for Paris to negotiate the establishment of the regency.

Napoleon’s power rested first on the support of the great military magnates, but secondly on the great civil digni- taries, lavishly enriched by him, whose organ was the Senate. While the marshals forced him to abdicate, his reign had been brought to an end ina wholly different way by the Senate. ‘Talleyrand, vice-president of this body, who had for some time been intriguing in favour of the Bourbons, pronounced openly in favour of them before the sovereigns when they entered Paris. ‘The regency,” he said, “was an intrigue; the Bourbons alone were a prin- ciple.” He convoked the Senate on April Ist, and on April 2d it voted the deposition of Napoleon and his family. This decision was ratified the next day by the Corps Législatif.

Then occurred the abdication in favour of his family, which had the support of the army. The instrument was brought to Paris by not less than three famous mar- shals, Ney and Macdonald having been joined on their way from Fontainebleau by Marmont. The two solutions were thus brought together before the allied sovereigns, of

whom Alexander was not favourably disposed to the Bour- bons, and Francis was the father of Marie Louise. Fora moment the balance trembled.

But Marmont had been brought in contact, during his defence of Paris, with Talleyrand, and had committed him- self to him before he knew of the view of the marshals. After evacuating Paris he had been stationed on the Essonne. Here he had entered into an engagement to place his corps at the service of the new provisional Government which the Senate had constituted ; the arrangement was that on April 5th the corps should quit its position and march into Normandy. But when the marshals passing through his camp from Fontainebleau told him of their commission, he had revealed

his secret with expressions of penitence; he had countermanded his orders to the inferior officers, and had gone with the marshals to Paris. In his absence, however, General Souham, influenced by a fear that the plot had become known to Napoleon, gave orders to the troops to march on Versailles. This appearance of division in the army was fatal to Napoleon's family. It decided Alexander to declare for the Bourbons, and Caulaincourt was instructed to demand from Napoleon an abdication pure and simple. In return he was to retain the title of emperor, and to have the island of Elba in sovereignty, while Marie Louise was to have a principality in Italy.

By an irony of fortune the Government founded at Brumaire, in which everything had been sacrificed to military efficiency, was the only one of the three Govern- ments of France since 1789 which actually succumbed before an invader. The total result of so many con- quests was that France, which, when Napoleon's name was first heard of, was in substantial possession of Bel- gium, the left bank of the Rhine, Savoy, and Nice, had now lost the first two acquisitions ; and we shall see what measures he took to deprive her of the other two. His fatal power of bewildering the popular mind was already at work again. This last campaign, the most unpatriotic he ever fought, had seemed to redeem his faults, and had given him the name of a heroic defender of his country. This view made way fast, as soon as he had the restored Bourbons for a foil.

In the meantime, however, all the hatred, long sup- pressed, of individuals and of parties broke loose upon him, For the moment he seems to have utterly lost heart. On the night of April 11th, after signing the unconditional abdication, he is said to have taken a dose of a poison which ever since the Russian campaign he had kept by him. But vomitings, we are told, came on and saved him. On the 20th, when he bade farewell to his soldiers, he had resolved to live in order "'to narrate to posterity the great deeds we have done together." He soon found another object for life; but a year later, after another downfall far more complete and ignominious, he clings to life, and he clings to it afterwards in captivity. The soldiers idolized him still, and his parting scene at Fontainebleau, when he kissed the eagle, was pathetic ; but when he reached the south of France he met with other demonstrations of feeling. At Avignon and Orgon the crowd attacked the carriages, and wanted to throw the tyrant into the Rhone. He was compelled to disguise

himself. was met by an English frigate which landed him on May 4th at Porto Ferraio, in Elba. It seems to have been arranged among the sovereigns that his wife and child were not to rejoin him, nor did he complain of this. Marie Louise set out on April 23d, and was at Schonbrunn again before the end of May. About the same time Josephine died at Malmaison, in the arms of her children Eugéne and Hortense.

It must have occurred to Napoleon very soon after his arrival in Elba that he was not yet driven to autobio-

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and monstrous as France after he quitted the helm. In twenty years of thrilling events, in the emotions first of tragedy and then of epic poetry, the French had forgotten the Bourbon court, when suddenly the old Comte de Provence (under the name of Louis XVIII.) and the Comte d'Artois, Condé and the Duc d'Angouléme, and the Orpheline du Temple reappeared and took possession of the country before even a royalist party had formed itself in France. Politically, indeed, they brought liberty, for they created a parliament where all assemblies had been mute and servile for fourteen years; but they un- settled all domestic affairs, the position of public men, the prospects of the army, the title of estates, in a manner so sudden and intolerable, and that at a moment when the country had suffered conquest from without, that some new convulsion seemed manifestly imminent. Disgraced, be- wildered, and alarmed at the same time, the French could think with regret even of the reign of Napoleon. The wholesale massacre of the last two years might have been expected to seem like a bad dream as soon as the spell was snapped, but it began to seem regrettable in

comparison with the present humiliation. Another event happened which was like a new revolution. The prisoners and the troops shut up in German fortresses returned to France under the treaty, perhaps not less than 300,000 men. What could be more evident than that if all these soldiers could take the field again, and under Napoleon, France might yet escape the humiliation of a Government imposed by foreigners, and perhaps also recover her lost frontiers. The congress of Vienna entered upon business in Septem- ber, and from this time a new chapter of politics opened. France ceased to be the general bugbear, and new alliances began to be formed in order to check the aggressive spirit of Russia. The European Coalition, once dissolved, might not be so easily reconstituted. Internal politics also had altered. A wild party of ultras had sprung up among the royalists; the church was beginning to give disquiet to the holders of national property; the army was enraged by seeing émigrés who had fought against France appointed in great numbers to the command of regiments.

It was not the first time that Napoleon had gone into a sort of exile. As he had disappeared in the East, and returned to make Brumaire, so he might come from Elba to rescue France. The situation was not less intolerable than in 1799. As then, so now, had he not returned, a revolution would, nevertheless, have taken place. Fouché was weaving a military plot, which would have carried

to power perhaps the duke of Orleans, perhaps the king of Rome. Se He entered upon the last of his thousand adventures on Da February 20, 1815, when he set sail from Porto Ferraio

with Generals Bertrand and Drouot and 1100 soldiers. On March Ist he reached the French coast between Cannes and Antibes. Twenty days after he entered the Tuileries In triumph.

He had judged the feeling of the army correctly, and also the effect which would be produced by his prodigious fame. These causes were more than enough to overthrow a Government so totally without root as that of the Bourbons. From the coast he took the way across the mountains of Provence by Sisteron and Gap to Grenoble. The soldiers sent from this town to stop him were dis- armed when he uncovered his breast and asked, Which of them would fire on his emperor? He was then joined by the

royalist La Bédoyére. Macdonald at Lyons stood firm, but was deserted by his soldiers. Ney, who commanded In the east, at first declared himself violently against his old chief, but the military feeling afterwards gained him, and he joined Napoleon at Auxerre. The king left the

Tuileries on the 19th, retiring northward, and on the next day Napoleon entered Paris.

At Brumaire he had put down Jacobinism, and given the nation order and repose. Now he was summoned, in the name of liberty, to protect the acquisitions of the Revolution and to defend the national honour against the triumphant foreigner. The Hundred Days are the period of popular or democratic imperialism. Those who sided with him told him frankly that he must turn over a new leaf, and he professed himself ready to do so. It would be rash to say that this was impossible. He was but forty-five; his return from Elba was an astonish- ing proof that he still possessed that elasticity of spirit, that power of grasping the future, which he had often shown so remarkably. Here then, as at a second Brumaire, might begin a third Napoleonic period. The mad crusade against England and the world-empire which sprang out of it were now to be forgotten ; he was to stand out as a hero of national independence and of modern ideas together, a representative of the free modern people against the Holy Alliance. This last and most surprising of his transforma- tions was already most prosperously begun. But at this point fortune deserted him once for all. Napoleon Liberator remained a poetical idea, transforming his past life into legend, and endowing French politics with a new illusion; the attempt to realize it came to an end ina hundred days (March 13 to June 22).

The ultimate cause of this failure seems to have been a change in Napoleon himself. It had long been remarked that the emperor Napoleon was wholly different from the general Bonaparte of the Italian campaigns. Bonaparte had been lean, shy, laconic, all fire and spirit, the very type of republican virtue imagined by Rousseau ; the emperor was fat and talkative, and had his fits, according to Marmont, of indolent ease. Once or twice there had

been attacks of illness, by which he had been temporarily incapacitated ; but this had been hushed up. On the whole he had never yet been wanting to himself. Inthe campaign of 1814 his activity had been prodigious, and the march to Paris in twenty days, with which he had opened 1815, had been a great display of vigour. But he could not maintain him- self at this level. A physical decay had begun in him, affecting through his body, not indeed his mind, but his will and his power of application. ‘Ido not know him again,” said Carnot. “He talks instead of acting, he the man of rapid decisions ; he asks opinions, he the imperious dictator, who seemed insulted by advice ; his mind wanders, though he used to have the power of attending to every- thing when and as he would ; he is sleepy, and he used to be able to sleep and wake at pleasure.” This last symptom was the most striking; in some of the most critical and terrible moments of the Waterloo campaign he seems to have been scarcely able to keep himself awake.

The constitutional history of the Hundred Days may be despatched summarily, since it led to nothing. On March 13 an imperial decree was issued from Lyons dissolving the two chambers established by the Bourbons, and convoking an extraordinary assembly in Field of May for the purpose “‘of correcting and modifying our constitutions and of assisting at the coronation of the empress, our dear and well-beloved spouse, and of our dear and well-beloved son.” But the prospect soon changed, and, as it was necessary that the empire, like the monarchy, should have its charter, it seemed impossible to wait till May. Napoleon had recourse to Benjamin Constant, that is, he marked his change of policy by sending for the leader of the opposi- tion. The “Acte Additionnel aux Constitutions de l Empire,” dated April 22, was drawn by Constant, examined by a committee, and then adopted by the council of state. The most remarkable feature of it isthe preamble,

in which he explains his change of attitude by saying that “formerly he had endeavoured to organize a grand federal system in Europe, which he had regarded as agreeable to the spirit of the age and favourable to the progress of civilization,” that ‘for this purpose he had adjourned the introduction of

free institutions," but that "henceforward he had no other object but to increase the prosperity of France by strengthening public liberty." _

This neat misrepresentation deserves notice as having imposed on many people. For the rest it is to be observed that this act creates an hereditary peerage. The Field of May was held, but not till June 1. Napoleon appeared in a grand costume and distributed flags, but the "well- beloved spouse and son" were not there; Europe had declared against him. On the 12th he set out for the campaign.

The great powers had issued, immediately on hearing of Napoleon's disembarkation (March 13th), a declaration putting him outside all civil and social relations, and con- signing him to public vengeance as 'an enemy and disturber of the peace of the world." On March 25th they recon- stituted the Coalition. Was this a disappointment to Napoleon? A war of liberation was perhaps necessary to him. To be freely accepted by the French people, and then to be rejected by Europe, gave him precisely the opportunity he sought of standing forth as the heroic champion of national independence. He had now all the soldiers who at the time of his first fall had been locked up in fortresses or foreign prisons. His position was there- fore such as it had been in 1813, not in 1814, and he proposed to defend not a vast empire but simply France, so that he had on his side patriotism and liberalism. All this, and his own genius! Would not so much suffice? Probably he remembered Brumaire, how low the fortune of France at that time had been, and how sud- denly Marengo had restoredall. For the moment, however, the inequality of numbers was great. In June the allies had in the field more than 700,000, Napoleon little more than 200,000, men. There were already English troops in Belgium, where they were engaged in establishing the new kingdom of the Netherlands, and there were Prussian troops in the Rhenish province which had just been given to Prussia. It was a question for Napoleon whether he should assume a defensive attitude and allow the allies to invade France—this in itself would have suited his new policy best —or carry the war into Belgium, a country long united with France, and attack the English and Prussians. He shrank from inflicting a new invasion upon France, especially on account of the strength of the royalist party in many regions, and thus it was that the scene of the campaign was laid in Belgium. The English had their headquarters at Brussels, the Prussians at

Liége. He formed the plan of dividing them and beating them in turn, as he had served the Austrians and Sardinians at the very beginning of his career. Many circumstances, however, were different. Wellington and Bliicher with Gneisenau were superior to Colli and Beaulieu; the Napoleon of 1815 was vastly inferior to the Bonaparte of

1796.

Of all the Napoleonic campaigns this was by far the most rapid and decisive. Even the Marengo campaign had lasted a month, but this was decided in three days. Leaving Paris on the 12th, Napoleon was in Paris again on the 21st, his own fate and that of his empire and that of France decided. Everything concurred to make this short struggle the most interesting military occurrence of modern history: its desperate intensity, its complete decisiveness, the presence for the first and last time of the English army in the front of the European contest, the presence of the three most renowned commanders, Napoleon,

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Wellington, and Bliicher. Accordingly it has been debated with infinite curiosity, and misrepresented on all sides with infinite partiality. Napoleon's army amounted to 122,401 men; it contained a large number of veterans, besides many who had seen the campaigns of 1813-14, and was perhaps the finest army he had ever com- manded. That of Wellington was composed of English- men, Hanoverians, Brunswickers, Nassauers, Germans, and Netherlanders ; the totalis stated at 105,950. But in the Netherlanders of the newly-established kingdom no con- fidence could be placed, and yet these amounted to nearly 30,000 ; the English too (about 35,000) were in great part raw recruits (the Peninsular veterans being mainly absent in America); altogether Wellington pronounced it "the worst army ever brought together." The army of Bliicher numbered 116,897 disciplined troops, animated by an intensely warlike spirit. Napoleon's opening was prosper- ous. He maintained so much secrecy and used so much rapidity that he succeeded in throwing himself between the two armies. On the 15th he advanced and occupied Charleroi. On the 16th he engaged the Prussians at

Ligny and the English at Quatrebras, desiring to block the cross- road between Quatrebras and Sombreffe, and so to sever the two armies. Napoleon personally commanded against the Prussians, and here he gained his last victory. The battle was very bloody ; about 12,000 Prussians fell, and Bliicher himself was wounded. At Quatrebras Ney met Wellington and was forced to retreat. But the defeat of Bliicher made it necessary for Wellington to retire on Brussels in order to effect a junction with the Prussians. The 17th was spent in this retrograde movement, and on the 18th Wellington accepted battle on the heights of St Jean, from which the French name it, while the English

give it the name of Waterloo, a village four miles nearer Battle of

to Brussels, where Wellington wrote his despatch. accepted battle in full reliance upon the help of the Prussians, who are not therefore to be considered as having saved him from defeat.

Military writers point out several errors, some of them considerable, committed by Wellington, but their criticism of Napoleon, which begins by sweeping away a mass of falsehood devised by himself and his admirers in order to throw the blame upon others, is so crushing that it seems to show us Napoleon after his brilliant commencement acting as an indolent and inefficient general. He first, through mere want of energy, allows the Prussians to escape him after Ligny, and then sends Marshal Grouchy with 33,000 men in the wrong direction in pursuit of them. Owing to this mismanagement Grouchy is at Wavre on the day of the battle of Waterloo, fighting a useless battle against the Prussian corps of Thielemann, while Bliicher is enabled to keep his engagement to Wellington. Everywhere during these days Napoleon appears negligent, inactive, inacces- sible, and rather a Darius than an Alexander, so that it has been plausibly maintained that he was physically incapaci- tated by illness. The battle itself was one of the most re- markable aid terrible ever fought, but it was perhaps on both sides rather a soldiers’ than a generals’ battle. It con- sisted of five distinct attacks on the English position :— (1) an attack on the English right by the division Reille, (2) an attack on the left by the division D’Erlon (here Picton was killed), (3) a grand cavalry attack, where the splendid French cavalry “foamed itself away” upon the English squares, (4) a successful attack by

Ney on La Haye Sainte (which Wellington is thought to have too much neglected ; it was after this that the French prospect seemed brightest), (5) the charge of the guard. In the middle of the third act of this drama the Prussians began to take part in the action. The battle seems to have begun about 11.30, and about 8 o'clock in the evening the ery "Sauve qui peut"

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rose from the guard. A general advance of the English decided the victory, and then the pursuit was very thoroughly accomplished by the Prussians under Gneisenau. Napoleon at first took refuge in a square. At Genappe he left this, and arrived at Charleroi about daybreak with an escort of about twenty horsemen.

He lost probably more than 30,000 out of 72,000 men, but the grand army was utterly dissolved. The whole loss of the allies was somewhat more than 22,000. Had Napoleon been victorious, he would but have opened the war prosperously, for half a million soldiers, in addition to those of Wellington and Bliicher, were on the march for France ; being completely defeated, he had no resource, but was ruined at once. France was conquered, as she had been conquered the year before; but her second fall appears far more humiliating and dismal than her first, when we consider how enthusiastically she had rallied to Napoleon and how instantaneously Napoleon and she had been struck down together. It was a moment of unrelieved despair for the public men who gathered round him on his return to Paris, and among these were several whose fame was of carlier date than his own. La Fayette, the man of 1789; Carnot, organizer of victory to the Convention ; Lucien, who had decided the revolution of Brumaire,—all these met in that comfortless deliberation. Carnot was for a dictatorship of public safety, that is, for renewing his great days of 1793; Lucien too liked

the Roman sound of the word dictator. “Dare!” he said to his brother, but the spring of that terrible will was broken at last. “I have dared too much already,” said Napoleon. Mean- while, in the Chamber of Representatives the word was not dictatorship but liberty. Here La Fayette caused the assembly to vote itself permanent, and to declare guilty of high treason whoever should attempt to dissolve it. He hinted that, if the word abdication were not soon pro- nounced on the other side, he would himself pronounce the word “dechéance.” The second abdication took place on June 22d. “TI offer myself a sacrifice to the hatred of the enemies of France. My public life is finished, and I proclaim my son emperor of the French.” On the 25th he retired to Malmaison, where Josephine had died the year before. He had by no means even yet ceased to hope. When his son was passed over by the Chamber of Repre- sentatives, who named an executive commission of five, he protested that he had not intended to make way fora new Directory ; and, as Carnot and Caulaincourt were on this commission, the circumstances of Brumaire seem to have flashed into his memory. He saw again two Directors supporting him, and the other three (Fouché, Grenier, and Quinette—a traitor and two babies, as he expressed it) might remind him of Barras, Moulin, and Gohier. On the 27th he went so far as to offer his services once more as general, ‘regarding myself still as the first soldier of the nation.” He was met by a refusal, and left Malmaison on the 29th for Rochefort.

France was by this time entering upon another Reign of Terror. Massacre had begun at Marseilles as early as the 25th. What should Napoleon do? He had been before the enemy of every nation, and now he was the worst enemy, if not of France, yet of the triumphant faction in France. He lingered some days at Rochefort, where he had arrived on July 3d, and then, finding it impossible to escape the vigilance of the English cruisers, went on the 15th on board the “ Bellerophon” and surrendered himself to Captain Maitland. It was explained to him that no conditions could be accepted, but that he would be “con- veyed to England to be received in such manner as the ptince regent should deem expedient.” He had written at Rochefort the following characteristic letter to the prince

NAPOLEON

divide my country and to the enmity of the greatest powers of Europe, I have terminated my public career, and I come, like Themistocles, to seat myself at the hearth of the British people. I place myself under the protection of its laws, which I claim from your royal highness as the most powerful, the most constant, and the most generous of my enemies.”

It was perhaps the only course open to him. In France his life could scarcely have been spared, and Bliicher talked of executing him on the spot where the Due d’Enghien had fallen. He therefore could do nothing but what he did. His reference to Themistocles shows that he was conscious of being the worst enemy that England had ever had. Perhaps he remembered that at the rupture of the treaty of Amiens he had studied to envenom the con- test by detaining the English residents in France. Still he might reflect, on the other hand, that England was the only country which had not been trampled down and covered with massacre by his soldiers. It would have been inexcusable if the English Government had given way to vindictive feelings, especially as they could well afford to be magnanimous, having just won the greatest of all vic- tories. But it was necessary to deprive him of the power of exciting new wars, and the experiment of Elba had shown that this involved depriving him of his liberty. The frenzy which had cost the lives of millions must be checked. This was the principle laid down in the dcclara- tion of March 15th, by which he had been excommuni- cated asa public enemy. It was therefore necessary to impose some restraint upon him. He must be separated: from his party and from all the revolutionary party in. Europe. So long as he remained in Europe this would involve positive imprisonment. The only arrangement therefore which would allow him tolerable personal com- fort and enjoyment of life was to send him out of Europe. From these ctnsiderations grew the decision of the Government to send him to St Helena. An Act of Parliament was passed “for the better detaining in custody Napoleon Bonaparte,” and another Act for subjecting St Helena to a special system of government.

He was kept on board the “ Bellerophon ” till August Exile in 4th, when he was transferred to the ‘ Northumberland.” StHelena.

On October 15th he arrived at St Helena, accompanied by Counts Montholon, Las Cases, and Bertrand, with their families, General Gourgaud, and a number of servants. In April 1816 arrived Sir Hudson Lowe, an officer who had been knighted for bringing the news of the capture of Paris in 1814, as governor.

The rest of his life, which continued till May 5, 1821, was occupied partly in quarrels with this governor, which have now lost their interest, partly in the task he had undertaken at the time of his first abdication, that of relating his past life. He did not himself write this narrative, nor does it appear that he even dictated it word

for word. Jt isa report made partly by General Gourgaud, Autobio- partly by Count Montholon, of Napoleon's impassioned s™phy.

recitals ; but they assure us that this report, as published, has been read and corrected throughout by him. It gives a tolerably complete account of the period between the siege of Toulon and the battle of Marengo. On the later periods there is little except a memoir on the campaign of 1815, to which the editors of the Correspondence have been able to add another on Elba and the Hundred Days.

These memoirs have often been compared to the Com- mentaries of Caesar, and their value would indeed be price- less if they related to a period imperfectly known, But an age which has abundance of information, and takes history very seriously, is struck particularly by the elabor- ate falsifications which they contain. A vast number of

regent :—" Royal Highness,—A prey to the factions which | misstatements, many of them evidently intentional, have

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Death.

been brought home to him, and in several cases he has tried to foist into history apocryphal documents.

Here, as throughout his life, he shows quite a peculiar talent for misrepresentation. He knows that nine readers out of ten take a lucid statement for a true one, and his statements are always lucid, precise, and direct. And thus it has been, and is, particularly difficult to eradicate the Napoleonic legend, which has grown up in the very midst of the 19th century, and would perhaps never have been seriously shaken but for the failure of the Second Empire. Its growth was helped by the accident that at the moment of quitting the scene he seemed to be fighting for a good cause. Look at Napoleon's career between 1803 and 1814, when it was shaped most freely by his own will; here everything is anti-popular, illiberal, and immoral, as well as ruinous beyond all precedent. In particular he stands out as the great enemy and oppressor of nationalities, so that the nationality movement, when it begins in Spain and Tyrol and spreads through North Germany, is a reaction against his tyranny. But in 1815 he succeeded in posing as a champion and martyr of the nationality principle against the Holy Alliance. The curtain fell upon this pose. It brought back the memory of that Bonaparte who at the end of the 18th century had seemed the antique republican hero dreamed of by Rousseau, and men forgot once more how completely he had disappointed their expectations. By looking only at the beginning and end of his career, and by disregarding all the middle of it, an imaginary Napoleon has been obtained who isa republican, not a despot, a lover of liberty, not an authoritarian, a champion of the Revolution, not the destroyer of the Revolution, a hero of independence, not a conqueror, a friend of the people, not a contemner of the people, a man of heart and virtue, not a ruthless militarist, cynic, and Machiavellian. This illusion led to the restoration of the Napoleonic dynasty in 1851.

He died of an ulcer in the stomach on May 5, 1821. In his will he declared himself a Catholic, wished his ashes to repose ‘‘on the banks of the Seine in the midst of the French people whom he had loved so well,” spoke tenderly of Marie Louise and his son, and of all his relatives except Louis, whom he “ pardoned” for the libel he published in 1820, disavowed the Manuscrit de Sainte-Héléne, a mysti- fication which had recently had much success, defended the execution of D'Enghien, imputed the two conquests of Hrance

to Marmont, Augereau, Talleyrand, and La Fayette, whom he “forgave,” and devoted the English oligarchy, to whom he ascribed his premature death, to the ven- geance of the English people. In a codicil he added a truly Corsican touch, bequeathing 10,000 francs to the

NAPOLEON IL. is the name given by Bonapartists to Frangois Charles Joseph, duke of Reichstadt, the son of Napoleon I. and Marie Louise, who was born at Paris 20th March 1811, and died of laryngeal phthisis at Schénbrunn, near Vienna, 22d July 1832. His empty imperial title is derived from his father’s two abdications in his favour in 1814 and 1815. He was created duke of Reichstadt in 1818 by his grandfather Francis I. of Austria, at whose court he resided after his father’s fall.

NAPOLEON III. (1808-1873). Louis Napoleon, emperor of the French, was the younger son of Louis, king of Holland (brother of Napoleon I.), and of Hortense, daughter of the empress Josephine by her first husband Beauharnais. He was thus both nephew and step-grandson of Napoleon I. His father and mother were on the worst terms, and rarely lived together. Louis was born at Paris on April 20, 1808, at the house belonging to his mother in

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subaltern officer Cantillon, “who has undergone a trial upon the charge of having endeavoured to assassinate Lord Wellington, of which he was pronounced innocent. Cantillon had as much right to assassinate that oligarchist as the latter had to send me to perish upon the rock of St Helena.”

He was buried at Longwood in St Helena; but in the reign of Louis Philippe his remains were removed by per- mission of the English Government to the Invalides at Paris, where a stately dome was erected over the sarcophagus that contains them.

Posterity has not yet ceased to be perplexed by Napoleon’s Litera. He inflames national partialities more than any other ture,

career, personage, and his activity, by embracing many countries, tran- scends the field of view of the historians of each nation.~ Tilla recent time his life was written chiefly from French iemoirs,— when by French writers, with great ignorance of all affairs not French, when by English writers, with imperfect knowledge of all affairs not French or English, and by all writers alike, especially French writers, with extreme prejudice. Then came M. Thiers (1845), professing to write from official papers; but his untrust- worthiness in particular matters has long been demonstrated, and some recent investigators (sce, for instance, De Martal, Les Histo- riens Fantatsistes) profess to convict him of the most outrageous contempt for truth. The story is now being slowly transferred from the basis of memoirs to that of official papers and correspond- ence. The Correspondence of Napoleon himself in thirty-two volumes (which began to appear in 1858) is necessarily the corner- stone, though it has been edited in the most unsatisfactory way, many letters having been withheld and others mutilated, even if some have not been garbled. On this foundation M. Lanfrey based his history, which extends unfortunately only as far as 1811. It is the first essay towards a scrious estimate of the career ; what the writer chicfly wants is a first-hand knowledge of the affairs of forcign nations. It still remains to fuse together these materials with those equally rich that have been lately furnished by German research and by the opening of the different national archives. On German affairs the principal works are those of Ranke, Pertz, Oncken, and Treitschke. For the substance of them the English reader may refer to Professor Seeley's Life and Times of Stein. A good account (founded on original documents) of the Russian campaign by Bogdanovitch may be read in German. Colonel Jung in two works, Bonaparte et son Temps and Lucien Bonaparte et ses Ménoires, shows himself a true historical critic. The former work renders earlier books on the first period of Bonaparte (Coston, Libri, &c.) superfluous. Of military works, Riistow on the Italian campaigns, Charras on the campaign of 1815, and Charras's fragment on the campaign of 1818, with Mr Dorsey Gardner's volume on the campaign of 1815, may be recommended. Recent years have also brought valuable new memoirs, those of Marmont, of Miot de Melito, of Hardenberg (included in Ranke's Z¢fe), of Mme. de Rémusat, of Metternich. Mme. de Rémusat with the Duchesse d'Abrantes gives the best picture of his private life. This whole class of books should be used with caution. Marmont often excites distrust ; still more the earlier memoir-

writer Bour- ricnne. The reader must also be on lis guard against apocryphal works, such as Mémoires tirés des papiers d'un homme @ état, long attributed quite without ground to Hardenberg, and the Manuserié venu de Ste-Héléne. (J. BR. 8.)

the street that is now Rue Lafitte. He was brought up at Paris, and was occasionally taken to the Tuileries and noticed by the emperor, who gave him the cordon of the Legion of Honour. But it is impossible that the child could have remembered much of Napoleon I., who, from the beginning of the Russian campaign in 1812, was con- stantly away from Paris. When, in 1814, the allies entered the French capital, generosity towards the con- quered was the order of the day. Queen Hortense was courteously treated and visited by the czar Alexander, to whom her boy is said to have given a ring. The family continued to reside in France during the first restoration of the Bourbons, and were there when Napoleon returned from Elba. A story that when Napoleon was on the point of setting out for Waterloo the young Louis inter- rupted him in a conference with Marshal Soult, and begged him not to go to the war, is probably mythical. The

second restoration of the Bourbons was not effected in so gentle a spirit as the first. The family of the Bonapartes was banished from France. Hortense —who, like the rest of her kindred, had enriched herself out of public property —retired to Switzerland, and purchased the chateau of Arenenberg, overlooking the Lake of Constance. The next fifteen years were passed by the young Louis partly at Arenenberg and partly at Augsburg, which his mother chose as the place of his education. He grew upa gentle, studious, brooding youth, and the influence of his Augsburg schooling remained both in his habits of thought and in his German-like pronunciation, which was noticeable long afterwards. Until 1830 he attracted little attention from those around him, and none at all from the world, for he was as yet only one among several cadets of the Napoleonic house, Napoleon's own son, the duke of Reichstadt, being still alive. He seems, however, to have had dreams of a great future at an early age; and the instinct that some knowledge of military affairs would be useful to him led him to serve as an artillery volunteer in the Swiss camp of Thun under

Colonel Dufour. The revolution of 1830, which dethroned the Bourbons and awoke insurrectionary movements in so many countries, first launched Louis Napoleon upon his eventful career. Along with his elder brother he joined the Italian bands who were in revolt against the rule of the pope in Romagna. This revolt was put down by Austrian soldiers. The elder of the two brothers fell ill and died at Forli; Hortense, setting out torescue her sons from their danger, found one dead and the other ill with fever, and on the point of falling into the hands of the Austrians at Ancona. After nursing Louis through his illness she succeeded in carrying him away in disguise,and the mother and son, after a most perilous journey, reached France, which they had not seen for sixteen years. They arrived in Paris in April 1831; but the law banishing the Bonapartes was still in force, and the Government of Louis Philippe did not allow them to remain there more than twelve days. They were sent on, like other exiles, to England, and stayed for some weeks in London, from which they returned to Arenen-berg. Louis, now twenty-three years old, was beginning to form the political theories which the memory of the first empire and the actual state of affairs in France under Louis Philippe naturally suggested to a thoughtful and ambitious mind. A pamphlet called Political Reveries, containing the draft of a constitution for France, and an Lssay on Switzerland, Political and Military, were written by him in 1832-33. The first of these contains im a crude and superficial form the ideas elaborated by the author in his later works; the second gained for him the complimentary rank of captain of artillery from the authorities of Bern. Louis remained quiet for some years in Switzerland, but the death of the duke of Reichstadt in 1832 had made him presumptive head of the house of Bonaparte,—his uncle Joseph, the actual head, having no sons; and, in company with some adventurous friends, he formed the design of overthrowing Louis Philippe’s Government by presenting himself to the army. On the 28th October 1836 he came to Strasburg, and, after passing the next day in consultations with Colonel Vaudrey and a few officers who were in the plot, appeared at the quarters of the 4th artillery regiment, which Vaudrey ‘ommanded. This regiment welcomed him, and Louis then went on to the infantry barracks, where, however, the enterprise ended disastrously. He was arrested and imprisoned, and, after a short interval, sent to America by Louis Philippe without trial. He had not long been mn the United States when he received a letter from

his inother stating that she was about to undergo a dangerous operation. He returned to Switzerland in time to see

her before her death (October 5, 1837), denying, prob- ably with truth, that he had made any promise to Louis Philippe to remain absent from Europe. A pamphlet on the Strasburg affair, which was now published at his insti- gation by one of his companions, Lieutenant Laity, led the French ministry to demand his expulsion from Switzerland. The Swiss Government declining to expel him, and, diffi- culties with France becoming imminent, Louis voluntarily withdrew from the country and went to England, He lived there for the next two years, renting a house in Carlton Terrace, leading the life of a man of fashion, and associating with persons of prominence in society and on the turf. Among the gaieties of the time in which he took a part was Lord Eglinton's famous tournament. His real interests, however, were of a more serious char- acter, and in the autumn of 1839 he published the treatise Des Idées Napoléoniennes, a vigorous but sophistical account of Napoleon's work as an administrator and organizer, and of his foreign policy. He idealized the emperor, contrasting his internal government with that of his successors in a series of questions addressed to the existing rulers of France, and he exhibited his wars of conquest as struggles forced upon him by the English and other Governments in consequence of his efforts to spread civilization, and to unite the peoples of Europe in a federal tie. This work was intended by its author to prepare the way for a new attempt against Louis Philippe; and in August 1840, while the body of Napoleon was being brought back from St Helena, he made his second descent upon France. Above fifty persons assisted him on this occasion, the best-known being Count Montholon, a com- panion of Napoleon I. in his exile. A ship was chartered, and the conspirators landed at Boulogne, carrying with them a tame eagle. The enterprise had not even the gleam of success which attended the expedition to Strasburg. No one joined them, and within an hour or two those of the party who were not shot or drowned in attempting to escape were lodged in prison. Louis was now brought to trial before the Chamber of Peers, where he was defended by Berryer. He was condemned to perpetual imprison- ment, and the castle of Ham, on the Somme, was cliosen as the place of his captivity. For the next six years Louis remained

in confinement. He had the qualities which enable a man to bear imprisonment well,—patience, calm- ness, a low vitality and sluggish temperament, and the power of absorbing himself in work. The fortitude with which, during these six dreary years, he pursued the occupations which he had marked out for himself, and retained, with intervals of depression, the belief in his own future, had certainly something of nobility in it. ‘“ Happi- ness,” he wrote, “lies much more in the imagination than in the real world ; and as I carry my imaginary world with me, composed of memories and hopes, I feel as strong in solitude as in the crowd.” In later life he described the prison of Ham as the university where he had taken his honours; and it was no doubt within this prison that he made himself, so far as literary study and discipline ever made him, a statesman. He published at intervals during his confinement, besides numerous occasional papers, an essay on the sugar question, in which he advocated a policy of protection; a treatise on the Extinction of Pauperism, in which he proposed the colonization of waste lands, and the establishment of communities organized on a somewhat socialistic basis ; a scheme for cutting through the isthmus of Panama; and historical fragments on the English Revolu- tion of 1688. He was working also at a Zustory of Artillery, which was never finished. At the end of six years, after asking in vain for permission to visit his father, who was dying, Louis effected his escape, disguising him- self with the aid of his faithful friend and fellow-prisoner,

Dr Conneau, as a workman, and walking out of the gates of the castle with a plank over his shoulder (May 25, 1846). He went again to London, and it is characteristic of the life of exile and imprisonment which he had hitherto passed that he heard for the first time a French tragedy performed when Rachel played in London in July 1846. He was now again in the fashionable world, and he appears to have been compelled to raise very large suins of money from money-lenders. The house in which he lived was No. 10 King Street, St James’s. In February 1848 Louis Philippe lost his throne. Louis Napoleon at once set off for Paris, offering his services to the provisional Govern- ment. He was, however, requested to withdraw from France, and did so. In April 1848, during the Chartist disturbances, he was serving in London as a special con- stable. But his name was kept before the public in

France ; he was put up for election to the assembly, and was elected at Paris and in three departments. As a Bonapartist movement was now evidently beginning, the executive commission demanded authority to arrest Prince Louis as an avowed pretender. This, however, was refused by the assembly, and it was voted that he should take his seat. Louis, however, had the astuteness to remain in the background until the workmen's insurrection of June was over, declaring himself unwilling to be the cause of any disturbance. The insurrection was put down by Cavaignac ;. reaction set in, and Louis now appeared upon the scene as the candidate of order and the representative of authority. His first appearance in the assembly was on

September 26, 1848; and in December he was elected |

president of the republic by above 5,000,000 votes, Cavaignac, who was second on the list, receiving a million and a half, and Lamartine a few thousands. On assuming office he swore in the presence of God to remain faithful to the republic, and to fulfil the duties imposed on him by the constitution. From this time the political history of Louis Napoleon is the history of France (see article France). The principal foreign affair of his presidency was the expedition to Rome, in which, for the sake of anticipating the action of Austria, French troops put down the Roman republic by force, and restored the pope to his sovereignty. Abroad this gained for Louis Napoleon the bitter hostility of Italian patriots, who remembered him as a companion in insurrection against the pope in 1831; and it was one of the many inconsistencies of his position that he was at once a friend of Italian freedom in his heart and yet, as the "man of order" and the "saviour of society" in France, dependent to a great extent upon the support of the priesthood. On the 2d of December 1851 he executed the coup état, which made an end of constitutional government. Approved at first by an enormous majority of the French people, and even by English public men of the type of Palmerston, this act is now almost universally recognized as a disastrous crime. The sham constitution which was promulgated by the president immediately afterwards lasted less than twelve months. In the following November a plebiscite was taken upon the question whether the imperial dignity should be re-established in the person of Louis Napoleon, and an affirmative answer was given

by nearly 8,000,000 voters, against a dissentient minority of 250,000. The empire was inaugurated on the anniversary of the coup état, and for eighteen years Louis Napoleon was sovereign of France. The first ten years of his reign were successful, and in some respects brilliant. His marriage with Eugenie de Montijo, countess of Téba (January 30, 1853), placed beside him a figure which long charmed Paris and itsvisitors. Adhering to the alliance with England which, since 1830, had served France well against the three eastern courts, Napoleon ITI. entered into war against Russia. He had

always represented the restoration of Poland to be one of the tasks left by his uncle to France; and, had his army encountered fewer difficulties in the Crimea, or had the German powers shown any inclination to take part in the struggle against Russia, he would probably have made some serious attempt to restore at least the duchy of Warsaw. But he was no soldier himself; the war proved a serious and embarrassing matter, and in the end Napoleon was far more anxious to make peace than his English ally. The second nationality which associated itself with Napoleonic history, and which had been crushed by the treaties of 1815, was the Italian. Napoleon III. had warning that the cause of Italy could not be safely abandoned. In January 1858 Orsini attempted to take his life. Whether or not the act of Orsini and the letters which he wrote from prison had the effect of quickening the emperor’s determination to do some- thing for Italy may be disputed ; but the time had now come, and in the interviews which took place between Napoleon and Cavour at Plombiéres in the autumn of 1858 the alliance between France and Sardinia against Austria was arranged. In the spring of 1859 French armies entered northern Italy, and the emperor himself took command. On the 4th of June he witnessed the battle of Magenta, and on the next morning entered Milan in company with Victor Emmanuel. During the battle of Solferino on June 24th, he gave directions from the tower of the church of Castiglione. He met the emperor of Austria at Villafranca on July llth, and there agreed to those preliminaries of peace which so deeply disappointed the hopes that had been excited by his own words,—“ Italy free from the Alps to the Adriatic.” Venice was left to Austria; Lom- bardy west of the Mincio alone was liberated; and the subsequent union of the

peninsula under the house of Savoy was no work of Napoleon III., whose own plan was to form an Italian federation under the presidency of the pope, and in virtual dependence upon France. Never- theless the expulsion of Austria from Lombardy was in itself so great a blow that the later effects, though not foreseen by Napoleon, naturally resulted from it; and he has a better title to the gratitude of the Italians than they have generally acknowledged. The feelings with which Napoleon was regarded in Italy before and after the meet- ing of Villafranca are well exhibited in Mrs Browning's two poems, Napoleon in Italy and An August Voice. The annexation of Nice and Savoy to France excited great uneasiness in the British Government, but the treaty of commerce between France and England, which was signed in January 1860, gave the emperor a popularity in Eng- land which he retained even after his fall. With the termination of the Italian war and the inauguration of a policy of free trade the rule of Napoleon III. had reached its best. His ill-judged interference in the affairs of Mexico ended disastrously; the part played by France in reference to the Danish War of 1864 was weak and incon- sequent; and when the great struggle between Prussia and Austria was impending Napoleon appears to have been duped by Count Bismarck, and to have expected to gain Rhenish territory without taking up arms. Mean- while the splendour of the court, the continuous improve- ments in Paris, the rapid growth of wealth throughout France, the subservience of officials, deputies, and journalists, had veiled the decline of administrative energy and the progress of corruption and mismanagement. At length, after the establishment of a great North-German power in 1866, the prestige of the emperor unmistakably sank. He had to loosen the reins of government at home; and yet the grant of any degree of liberty appeared to jeopardize his own existence, Failing in health, in confidence, in reputation, he was hurried into the war of 1870 by the clerical party at court, and by advisers who saw no help

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for his dynasty but in a successful war. He was present with his only child! at the bombardment of Saarbriicken on August 2d, and then retired into Metz, which he left on the 15th, the day between the battles of Courcelles

and Mars-la-Tour. The empress insisted on the relieving movement which was then undertaken by Macmahon, and the emperor, going with the army, was made prisoner with 90,000 men at Scdan on September 2d. He was sent to the castle of Wilhelmshohe, near Cassel, from which he subsequently retired to England. He lived with the empress at Chislehurst, and died there on January 9, 1873.

Napoleon III. was a thinker and man of letters rather than a statesman. Presuming on the accident of birth to seize absolute power and to direct the affairs of a great nation, he proved him- self totally incapable as an administrator, and allowed office, political and military, to fall into the most unfit hands. Far superior himself, as a man of ideas, to his conqueror the king of Prussia, he never chose and never possessed a minister or a general who could be compared with those selected by his rival. In private life he was kindly and amiable, and the worst acts of his reign were rather those of the adventurers who surrounded him than his

own. (C. A. F.) NAPOLEON, a round game of cards. Any number may play; about four or five makes the best game. When six play the dealer deals himself no hand, but pays or receives the same as the other players. A pack of fifty-two cards is required. The players cut for deal ; the lowest deals. The cards rank as at whist; and the deal goes afterwards in rotation to the left, as at whist. The ecards are shuffled, and cut to the dealer, who deals each player five cards by one at a time, as at whist. The deal being completed, the player to the dealer’s left looks at his hand, and declares how many tricks he will play for (called “standing”). Some players make it compulsory for the eldest hand to declare one trick at least; but if this rule is not in force the eldest hand may decline to play, when he says ‘‘T pass.” If the eldest hand passes, the next player to the left has a similar option of standing or passing, and so on all round. As soon as any one stands, the next player after him must either pass or stand for more tricks than the one before him, and so on all round. If all pass, the hand is not played, and the player to the dealer’s left deals. Some players compel the dealer to play for at least one trick. The stand-hand plays against all the others. He has the first lead, and the first card he leads makes the trump suit. Each player plays one card at a time in rotation, as at whist, except that the played cards remain face upwards on the table in front of the persons playing them. The

cards played one by each player constitute a “trick.” The players must follow suit if able. If unable to follow suit a player may play any card he pleases. No one is obliged to head the trick nor to tramp. If the stand-hand succeeds in making at least the number of tricks he stood for he wins; if not he loses. Tf he wins he receives from each of the other players the amount previously agreed on for each trick stood for; if he loses he similarly pays all the others. If any one declares “Nap,” 2.e., that he will playfor all five tricks, no subsequent Player can stand. The hand is played as before. If the Player declaring Nap wins he receives double stakes all round; if he loses he only pays single stakes all round. ‘ Rules of Play.—There is no misdeal, and consequently no penalty or errors in dealing. If a card is exposed in dealing, or the cards are wrongly dealt, there must be a fresh deal, even if the hand has een partly played. Any one, except the stand-hand, playing out of turn, or exposing a card after the deal is completed, or playing with the wrong number of cards, has to pay a fine of the valuc of three tricks to the stand-hand, in addition to what he may lose if the hand is played out ; and if the stand-hand loses the ‘offender mcelves nothing. If the stand-hand plays with the wrong number

A cards, and wins, he reccives nothing, and there is a fresh deal. a player, not the stand-hand, revokes he has to pay the value of ee E Sane-hand, revokes he has to pay the value of

” Napoleon Eugs ; — i gene Louis, born at Paris, March 16 In Zululand, June 1, 1879. ; ee

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five tricks to the stand-hand, in addition to what he may lose on the hand. The cards are played over again from the point at whieh the revoke was made, and if the stand-hand loses the revoker receives nothing. If the stand-hand revokes he loses what he declared to play for.

NARA, the oldest of the successive capitals of Japan, is situated in the north of Sakai ken (province of Yamato), about 65 miles east of Ozaka, in 34° 4’ N. lat. and 135° 49’ E. long., on the slope of a range of picturesque hills, beautifully wooded, with cryptomerias, evergreen oaks, the rare Podocarpus Nageia, &c. From 710, when it was chosen as her residence by Gemmei

Tenno, till 794, when Kioto was founded by Kuwammu Tenno, Nara was the chief seat of the mikados; and, as during that period Japanese art was in its early vigour, and was largely patron- ized by the Shinto and Buddhist religions, it rapidly became a great and sumptuous city. At present (though hardly a tenth of its former size) it has a population of about 21,500, living in 6000 houses; and in antiquarian interest it is hardly second to any place in the empire. The site of the old imperial palace, which stood about four miles from the town on the way to Ozaka, is now indicated only by a small Shinto temple ; but about a mile off are the tombs of Gemmei Tenno and Gen-cho Tenno. Of the many religious buildings still extant, two especially demand attention—the Shinto temple of Kusuga and the Buddhist To-dai-ji (Great Temple of the East), The former was founded in 767 in the time of Sho-to-ku Tenno ; and its Kami chapels with their rough red-painted log-work afford fine examples of primitive Japanese architecture. A rough wooden building constructed for storing the mikado's furniture in the 8th century is still extant, and among the articles accumulated within are many of those mentioned in the original inventory. In the temple-park are herds of tame deer (Cervus shika, Sieb.); and little images of deer and trinkets from deer's horn are the favourite charms purchased by the pilgrims. Within the enclosure stands a curious old trunk on which are growing the camellia, the cherry, the nandina, the wistaria, and what the Japanese call the seven-colour bush (nana-iro-iro ri) The To-dai-ji was begun by Shomu Tenno in the 8th century, and was last restored in the 18th. At present the buildings enclose a quadrangle 520 feet by 620,—the south side being mainly occupicd by the huge, ungainly, and no longer perpendicular hall containing the Dai Butsu, or colossal statue of Buddha. The casting of this wonderful piece of work was, after eight failures, accomplished in 749 by Takusho, an artist from Corea. On two occasions the head has been melted during the burning of the temple (1180 and 1567), and from 1567 to 1697 the statue stood exposed to the weather ; but in the main it is marvellously perfect. The height of the figure is 55 feet, the face is 13 feet long, the ears 8, the nose 3, and the great halo has a diameter of 80 feet. On a hill to the east of the temple stands a bell- house with a monster bell, cast in 732, 134 feet high, 9 feet across the mouth, and weighing 37 tons. Of the great Buddhist temple Ko-buku-ji, which was founded in 710, and burnt for the third time in 1717, there remains little save a five-storied pagoda 150 feet high, dating from 730.

NARBADA. See Nerspuppa.

NARBONNE, a city of France, chief town of an arrondissement in the department of Aude, lies 5 miles from the Mediterranean, on the Robine Canal, a branch of the Canal du Midi, which connects it with the port of La Nouvelle, and on the railway from Toulouse to Cette, 93 miles east-south-east of the former city, at the point where the line for Barcelona wa Perpignan breaks off. The Robine Canal divides Narbonne into two distinct portions,

the bowrg and the cité. The latter is one of the oldest and most interesting of French towns. The cathedral (St Just) is the third on the site, and dates from the close of the 13th century, when the choir (130 feet high) was built. Two towers were added in the 15th century. An unusual effect is produced by a double row of crenella- tion taking the place of balustrades on the roof of the choir chapels and connecting the pillars of the flying buttresses. Among the sepulchral monuments in the chancel may be noticed the alabaster tomb of Cardinal de Brigonnet, minister of state under Charles VIII. The chapter-house, of the 15th century, has a vaulted roof supported on four free pillars. From the top of the towers, 194 feet high, a magnificent view is obtained over the Narbonne plain, the valley of the Aude, the Montagne Noire, the Cevennes, the hills of La Clape, which lie between the city and the sea, the Canigou, and the Corbiéres. The apse of the cathedral was formerly joined to the fortifications of the archiepiscopal palace, and the two buildings are still connected by a mutilated cloister of the 14th and 15th centuries. On the front of the palace are three square towers of unequal height. Between the Tour des Télégraphes (1318), crenellated and turreted at the corners, and that of St Martial (1380), machicolated and pierced by Gothic openings, a new facade was erected in the style of the 15th century after the plans of Viollet- le-Duc. This portion of the building now serves as hétel de ville, and its upper stories are occupied by the Narbonne museum, one of the best outside of Paris, containing pictures, pottery, nearly three thousand medals, and (in the old guard-room) a rich variety of Greek, Carthaginian, and Roman antiquities. The palace garden also contains many fragments of Roman work once built into the now dismantled fortifications ; and the

Musée Lapidaire in the Lamourguier buildings (formerly a Benedictine convent) has six hundred and twenty bas-reliefs and three hundred and twenty-three ancient inscriptions. The church of St Paul, though partly Romanesque, is in the main a striking and for the south of France a rare example of a building of the first half of the 13th century in the Gothic style of the north. phaguses and fine Renaissance wood carving. Narbonne has a good trade, especially in wine and spirituous liquors,— the surrounding country growing (at the rate of 120 gallons per acre) strong alcoholic wines, largely in demand for “fortifying” weaker vintages. As a matter of course this gives employment to large numbers of coopers; and besides there are in the town several verdigris factories, a sulphur refinery, and tanneries. The honey of Narbonne is famed throughout Europe. The population in 1881 was 28,134.

Long before the Roman invasion of Gaul Narbonne was a flourishing city. It was there that the Romans in 118 z.c, founded their first colony in Gaul; and they constructed great works to protect the city from inundation and to improve its port. The seat of a proconsul and a station for the Roman fleet, Narbo Martius became the rival of Massilia. But in 150 A.v. it suffered greatly from a conflagration, and the division of Gallia Narbonensis into two provinces lessened its importance as a capital. Alans Suevi, Vandals, each held the city for a brief space, and at last, in 418, it was more permanently occupied by the Visigoths. In 719, after a siege of two years, it was captured by the Saracens, and by them its fortifications were restored and extended. Charles Martel, after the battle of Poitiers, and Pippin the Short, in 752, were both repulsed from its walls; but on a new attempt, after an investment of seven years, and by aid of a traitor, the Franks managed again to force their way into Narbonne. Charlemagne made the city the capital of the duchy of Gothia, and divided it into three lordships—one for the bishop, another for a Frankish lord, and the third for the Jews, who, occupying their own quarter, possessed schools, synagogues, and a university famous in the Middle Ages. The viscounts who succeeded the Frankish lord sometimes aeknowledged the authority of the counts of Toulouse, sometimes that of the counts of Barccloua. In the 13th century

It possesses some ancient Christian sarco- ,

the crusade against the Albigenses spared the city, but the arch- bishopric was seized by the pope's legate Amaury, who took the title of duke of Narbonne. Simon de Montfort, however, deprived

'him of this dignity, receiving from Philip Augustus the duchy of

Narbonne along with the county of Toulouse. By his expulsion of the Jews Philip the Fair hastencd the decay of the city; and about the same period the Aude, which had formerly been diverted by the Romans, ceased to flow towards Narbonne and the harbour was silted up, to the further disadvantage of the place. United to the French crown in 1507, Narbonne was enclosed by a new line of walls under Francis I., but having ceased to be a garrison town it had the last portions of its ramparts demolished in 1870.

NARBOROUGH, Sir Joun (0d. 1688), naval com- mander, was descended from an old Norfolk family. He received his commission in 1664, and in 1666 was promoted lieutenant for gallantry in the action with the Dutch fleet off the Downs in June of that year. After the peace he was chosen to conduct a voyage of exploration in the South Seas. He set sail from Deptford on the 26th November 1669, and entered the Straits of Magellan in October of the following year, but returned home in June 1671 without accomplishing his original purpose. A narrative of the expedition was published at London in 1694 under the title An Account of several late Voyages and Doscoveries to the South and North. During the second Dutch war Narborough was second captain of the lord high-admiral's ship the "Prince," and conducted himself with such conspicuous valour at the battle of Solebay (Southwold Bay) in May 1672 that he won special appro- bation, and shortly afterwards was made rear-admiral and knighted. In 1675 he was sent to suppress the Tripoline piracies, and by the bold expedient of despatching gun- boats into the harbour of Tripoli at midnight and burning the ships he induced the dey to agree toa treaty. Shortly after his return he undertook a similar expedition against the Algerines. In 1680 he was appointed commissioner of the navy, an office he held till his death in 1688. He was buried at Knowlton church, Kent, where a beautiful marble monument has been erected to his memory.

NARCISSUS, a genus of bulbous plants belonging to the family Amaryllidacee. There are twenty or thirty wild forms, natives of central Europe and the Mediterranean region, while one extends through Asia to Japan. From

, these, or rather from some of these, by cultivation and

hybridization, have arisen the very numerous forms which adorn our gardens in spring (see vol. xii. p. 257). The most interesting feature botanically is the “corona,” or “cup,” which springs from the base of the flower-segments. This gives the special character to the flower, and the

‘ members of the genus are classified according to the length

of this organ as compared with that of the segments. Much has been written as to the real nature of this cup, but the most probable supposition is. that it does not, as once supposed, represent one or more rows of modified stamens, but is simply an excrescence or “enation” from the mouth of the flower-tube, and probably is in some way connected with the fertilization of the flowers by insect agency. NARCOTICS are substances having the physiological action, in a healthy animal, of producing lethargy or stupor, which may pass into a state of profound coma or uncon- sciousness along with complete paralysis, terminating in death. Certain substances of this class are used in medicine for the relief of pain, and are then called anodynes, whilst another group produce profound sleep, and are consequently known as hypnotics. In one sense, anzesthetics, such as chloroform and ether, may be held to be narcotics, but, as they are usually volatile substances causing unconsciousness for a comparatively short time, they are conveniently separated from the true narcotics, the effects of which are much more lasting. These dis- tinctions are toa great extent artificial, as it is evident that a substance capable of producing partial insensibility

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to pain, or sleep, will mevitably m larger doses cause pro- found coma ending in death. Hence we find the same substances sometimes classed as

anodynes and at other For example, small doses of opium, or of one or other of its preparations, relieve pain, whilst larger doses act as hypnotics, causing deep sleep passing As examples of anodynes, we have optum and some of the alkaloids in it, Cannabis indica or Indian hemp, belladonna and its alkaloid atropia, hyoscyamus or

times as hypnotics.

Into coma.

Name of – Plant.

Name of Substance.

Inspissated juice of Papa- ver somnifer- um, or poppy.

Opium,

From opium.

Morphia. See above.

Alcoholic ex- tract of Canna- bis sativa, as it grows in India and in Ameriea.

Indian Ilemp.

Leaves and roots of Atropa Belladonna.

Atropa Bella- donna,

| Belladonna.

‘ Atropia,

Stramonium| Leaves and

Stramonium.

Hyoscyamus} Leaves and seeds of Hyos-

cyamus niger.

Tops. The dried strobilesofthe female plant of Humulus Lupulus.
Lactuearlum| Coner ete juice of Lac- L | tuca virosa,

Common Names,

Opium,

Morphia.

Indian hemp. Gunjah is the dricd plant sold in Cal- cutta bazaars for smoking ; Churrus is the resinous exudation of the epidermis; Hash- ish is an Arabian preparation.

Deadly shade.

night-

Atropine, .

Jamestown weed,

secds of Datura) thorn-apple.

Tlenbane.

The hop or hop- vine.

Juiee of lettuce,

In 100 parts of

NARCOTICS

Alkaloids.

fine opium I0 parts of morphia, 6 of narcotina, 1 of pa-

paverina, ‘15 of thebaia or para- morphia, ‘03 of

codeia, Ol of me- conia, ‘02 of nar- ceia, and 4 of me- conic acid,

Morphia,

Described in text.

Physiological Action.

classes of animals. May cause eon- vulsions from increased activity of reficx centres in the spinal cord, especially in animals having small brains. Causes slowing of heart’s action by stimulation of inhibitory nerves of heart. Destroys the action of the respiratory eentres in medulla. Stimulates oculo-motor centres, and henee eauscs eontrac- tion of pupil.

Similar to opium. Papaverina, narceia, meconia, eryptopia, codcia,

employed as hydro-| and thebaia or paramorphia have

chlorate of morphia or acetate of morphia.

No alkaloid has been separated. The resin is the active preparation.

Atropia.

Atropine, C,7Ho3NOz , employed as sul- phate of atropine.

Daturia, ldentieal with atropia.

Hyoseyamia. Ci5H23NO3.

Lupulina,

all actions of a narcotic character, but eodcia and thebaia have more of an exciting action and little of a narcotic action.

Exhilaration; great mental excite- ment, with pleasant and often gor- geous visions; a state of ecstasy, with loud laughter; loss of sense of time, or a feeling as if pleasurable sensations were infinitely pro- longed. Pupils dilated. Loss of strength, drowsiness, sleep, coma.

See Atropia.

See deseription in text. In- ereased frequency of pulse, with rise of artetial pressure. Fall of blood pressure with very large doses. Paralyses the inhibitory action of the vagus nerve, so that stimulation of this nerve dnr- ing atropine poisoning does not cause slowing of heart. Small doses cause contraction of capillary vessels, thus acting as a stimulant to vaso-motor centres. Destroys the excitability of motor nerves passing to muscles generally, thus producing inability to move. Weakens and finally abolishes the reflex excitability of the spinal cord. Large doses weaken action of motor nerves concerned in the movements of respiration. Sup- presses secretion of the mucous and salivary glands, probably by paralysing secretory nerves. Large doses lower the temperature of the body. Causes dilatation of pupil, lessened intra-ocular pressure, and paralysis of accommodation.

Saie as belladonna and atropia.

Almost identical with atropia. There is even greater excitement than in cases of belladonna poison- ing, indicating a stronger action on the cerebrum. The action of the heart is first stimulated as with atropia, but it is afterwards much depressed, as shown by the lessen- ing number of pulse beats. Pupil dilated. Mouth dry and parched.

A feeble nareotic, causing, when

{infusions are taken freely heavi-

Laetucinia.

ness, and perhaps slecp.

Very feeble narcotic. In very large doses, say half an ounee, has a soothing sedative cffect.

Acts on all

Poisonous Dose.

Varies according to habit. Opium caters ean take 20 to 30 grains with impunity. Ito3 grains produce well- marked symptoms in ordinary persons. Me- dicinal dose for adult is 3 to 2 grains.

Varies according to habit. 2 to 3 grains by stomach dangerous. 4 of a grain for an adult man or 7, for an adult woman isthe largest safe dose when injected under the skin.

Variesmuch with dif- ferent specimens of resin. 4 of a grain may cause marked effects. 2 to 3 grains dangerous.

80 grains of root have caused death. Somc- times the medicinal extract of belladonna is so weak that a dose of 2 draehms may not be fatal. y, or 7, of a grain of atropine may cause alarming

symptums, and half a grain would almost certainly be fatal.

Not aseertained. Children have been poisoned by eating the seeds,

dy of a grain of hyoscyamia will cause appreeiable effects. ge Of & grain causcs sleepiness, dryness of mouth, and dilatation of pupil. sf causes gnickening of heart’s action; and , will produce first quicken- ing and then slowing of the heart. The half of a grain would be dangerous.

Not regarded as a poison.

Not regarded as a poison,

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| henbane and its alkaloid hyoscyamia, and the anesthetics properly so called, such as chloroform, ether, ethidene, &c. The hypnotics are such

substances as opium and its alka- loids, chloral hydrate, hyoscyamus, lactucarium (obtained from Lactuca virosa, the strong-scented lettuce), and pre- parations of Humulus Lupulus (the common hop), such as inhalations of the steam of infusions, or hop-pillows. In addition we may group as narcotics certain substances which cause not only narcotism, but also the specific effect

Treatment of Case of Poisoning.

Evacuate the stomach by an

emetic or by the stomach-pump. Give at once a large table-spoonful of imustard in a tumblerful of tepld water, and repeat in a quar- ter of an hour if necessary; to be followed by a powder containing 30 grains of sulphate of zinc and 20 grains of ipecacuanha powder. Keep up respiration by constantly inducing the patient to breathe veluntarily. Cause the patient to walk about, and endeavour to keep him awake. Give him very strong infusions of coffee or tea, especially green tea. In the last stages use artificial respiration. Same as for opium.

Seldom fatal, If a large dose has been taken, use emetic of inustard and water, or stomach- pump ; after this keep the patient quiet, allay excitement, and if symptoms of depression come on small doses of alcohol are useful.

Same treatment as for opium poisoning. The object aimed at is to prevent absorption of the poison by the free use of emetics. External stimulation by bathing the fret in mustard and water, by rubbing or kneading the skin, along with the free use of tannic acid suspended in watcr, are the best remedial measures. There is often retention of urine. This must be relieved by the eatheter.

Treatment the sameas for bella- donna and atropia.

Treatment the saine as for bclla- donna aud atropia.

of dilatation of the pupil of the eye, and disorder of the mechanism of focussing the eye for various distances, resulting in dimness and confusion of vision. Such are sometimes called mydriatics (uvdpidors, dimness of sight) ; they embrace belladonna, henbane, stramonium, cryptopia (one of the alkaloids in opium), and Indian hemp.

All of these substances act on the nervous system, and, although the physiological action of each is characteristic, there are many symptoms common to the whole group ; indeed the course of action of all shows three well-defined stages :—(1) there is first a period of apparent exaltation of function ; (2) this is followed by a period of diminution and perversion of functional activity; and (3) there is a time of loss of function, in which there is profound coma and paralysis. This is well illustrated by a description of the symptoms caused by opium. A small dose not unfre- quently acts as a stimulant; there is a sense of vigour, a capability of severe exertion, and an endurance of labour without fatigue.

A somewhat different mode of action is illustrated by the physiological effects of belladonna, or of its alkaloid atropine or atropia. A small dose causes dryness of the throat and mouth, dilatation of the pupils, dimness of vision except for distant objects, and often double vision. The pulse becomes quick, rising, in an adult, from 80 to 120 or 160 beats per minute ; and there is often a bright red flush over the skin. The intellectual powers are at first acute and strong, but they soon become confused. There is giddiness, confusion of thought, excitement, a peculiar talkative wakeful restiveness, in which the person shows that his mind is occupied by a train of fancies or is haunted by visions and spectres. Often there is violent delirium before sleep comes on. The sleep after a large dose deepens into stupor, with great muscular prostration or paralysis. During all the time the pupils are widely dilated. Death occurs from failure both of the heart’s action and of respiration.

NAR—-NAR

The chief facts regarding the true narcotics are briefly summarized in the accompanying table.

Conium or hemlock (the leaves and the fruit of Conium macu- latum) and its alkaloid conia are sometimes erroneously classed as narcotics. These substances act more in the way of depressing or weakening muscular aetivity, by influencing the motor nerves, or the nerve-endings in the muscles, and they have no effect on sensory nerves and sensory centres. Neither is aconite a true nareotic (see ACONITE).

Hydrate of chloral has since 1872, when it was introduced as a therapeutic agent by Dr Oscar Liebreich of Berlin, come into great favour as an anodyneand nareotic. Itis ethylic aldehyde in which a atoms of chlorine are substituted for 3 atoms of hydrogen; thus :— ;

C,H,O + 6Cl = C,HCI,O + 8HCl. Aldehyde. Chlorine. Chioral. Hydrochloric acid.

The formula for the hydrate is C,HCl,0.2HO,. In small doses, say 10 to 20 grains, chloral is a pure hypnotic, and the sleep obtained is quiet and refreshing. In larger doses it is narcotic, abolishing thought and motor power, with profound coma. Re- spiration is much enfeebled, and the pulse becomes small and weak. The pupils are widely dilated. It is not uniform in its action, so that occasionally death may occur after a comparatively small dose, even in persons who have been in the habit of taking the medicine. For this reason, the habit of taking chloral without medical advice, and of taking it frequently, is to be strongly deprecated. An allied substance called croton-chloral hydrate (CgH,C]l30..2HO) has no hypnotic properties, but is of use when applied externally for severe neuralgia of the face, due to affections of the fifth cranial nerve (tic dowlowrcuz).

Narcotics are used in medicine for various purposes. (1) Zo relieve pain. The best one for this purpose is opium, cither in the solid form or as laudanum (tincture of opium). It is most usefulin cases of spasmodic pain. (2) 7’o caase sicep. In some cases opium may be useful for this purpose; but it causes disorder of the digestive functions, and there is the further danger of producing the ‘‘opium habit,” a vice ruinous alike to body and mind. On the whole hydrate of chloral is the best and safest hypnotic, but it is not without its dangers, and it ought not to be taken except under medical advice. (3) Zo allay irritation. Where there is increased sensibility, with continued. irritating though not severe pain in any part, opium or

hyoscyamus inay be used with benefit. (4) Zo cause dilatation of pupil. For this purpose, solutions of atropine are in constant use by ophthalmic surgeons. A few drops of solution of atropine, or a soluble disk containing atropine, introduced into the eye, cause dilatation of the pupil and diminished tension in the eyeball, at the same time soothing pain. (5) Zo arrest secretion. For this purpose opium, or belladonna, and atropine are espeeially useful. Small doses of atropine are given to arrest secretion in cases of profuse salivation, and extract of belladonna applied to the skin is used for stopping the secretion of milk from the mam- mary gland. (J. G. M.)

NARD. See SPIKENARD.

NARSES, an officer in the household of Justinian, who was charged with the reconquest and government of Italy, is one of the most important historical figures of the 6th century. He was a eunuch, but we are nowhere distinctly informed that he was of servile origin. A native of Persarmenia (that is to say, of that portion of Armenia which was allotted to Persia by the partition of 384), he may have been prepared and educated by his parents for service in an Oriental court. If the statement that he died at the age of ninety-five be correct, he was born about the year 478. He was probably brought young to Con- stantinople, and attained a footing in the oficiwm of the grand chamberlain. From a subordinate place he rose in course of time to be one of the three (spectabiles) “chartularii,” a position implying some literary attain- ment, and involving the custody of the archives of the household. Hence, probably in middle life, he became ‘preepositus sacri cubiculi,” an “ illustris,” and entitled along with the preetorian prefects and the generals to the highest rank at the imperial court. In this capacity, in 530, he received into the emperor’s obedience another Narses, a fellow-countryman as well as namesake, together with his two brothers Aratius and Isaac. These Pers- armenian generals, having formerly fought under the standard of Persia, now in consequence of the successes of Belisarius transferred their allegiance to the emperor,

‘ ;) : ;

NARSES

came to Constantinople, and received costly gifts from the great minister.

In the year 532 the celebrated insurrection known as the Nika broke out in Constantinople, when for some hours the throne of Justinian seemed doomed to overthrow. It was saved partly by the courage of his wife, Theodora, and partly by the timely prodigality of Narses, who stole out into the capital, and with large sums of money bribed the leaders of the “blue” faction (which was aforetime loyal to the emperor) to shout as of old “J ustiniane Auguste Tu Vincas.”

The African and Italian wars followed (533-534, 535— 554; see JuSTINIAN, vol. xiii, p. 797). In the fourth year of the latter war the splendid successes of Belisarius, who with a handful of troops had conquered the better part of Italy, reoccupied Rome, and held it against 150,000 Goths, vainly besieging it for 374 days, had awakened both joy and fear in the heart of his master. Reinforcements amounting to 10,000 men were sent into Italy, and Narses the eunuch was placed at their head. Belisarius understood that Narses came to serve under him like any other officer of distinguished but subordinate rank, and he received a letter from Justinian which seemed to support this conclu- sion. But the friends of Narses continually plied him with suggestions that he, a great officer of the household, in the secrets of the emperor, had been sent to Italy, not to serve as a subaltern, but to hold independent command and win military glory for himself. The truth probably lay between the two. Justinian could not deprive his great general of the supreme command, yet he wished to have a very powerful emissary of the court constantly at his side. He would have him watched but not hampered.

The two generals met (538 A.D.) at Fermo on the Adriatic coast. The first interference of Narses with the plans of Belisarius was beneficial. John, one of the officers highest in rank under Belisarius, had pressed on to Rimini, contrary to the instructions of his chief, leaving in his rear the difficult fortress of Osimo untaken. His daring march had alarmed the Goths for Ravenna, and induced them to raise the siege of Rome; but he himself was now shut up in Rimini, and on the point of being forced by famine to surrender. Belisarius and his followers were prepared to let him pay the penalty of his rashness and disobedience. But his friend Narses so insisted

on the blow to the reputation of the imperial arms which would be produced by the surrender of Rimini that he carried the council of war with him, and Belisarius had to plan a brilliant march across the mountains, in conjunction with a@ movement by the fleet, whereby Rimini was relieved while Osimo was still untaken. When Belisarius and Jobn met, the latter ostentatiously thanked Narses and Narses alone for his preservation.

His next use of his authority was less fortunate. Milan, which was holding out for the Romans, was also hard pressed by famine. The two generals who were sent to relieve it loitered disgracefully over their march, and when Belisarius wished to despatch further reinforcements the commanders of these new troops refused to stir till Narses gave them orders. Belisarius wrote to the eunuch pointing out the necessity of unity of purpose in the imperial army. At length, grudgingly, Narses gave his consent, and issued the required orders ; but it was too late. Milan had been compelled by extremity of famine to surrender, and with it the whole province of Liguria fell into the hands of the enemy. This event forced Justinian to recognize the dangers of even a partially divided command, and he recalled Narses to Constantinople.

Twelve years elapsed before Narses returned to Italy. Meanwhile there had been great vicissitudes of fortune both for the Romans and the Goths, Italy, which appeared

to have been won by the sword of Belisarius, had been lost again by the exactions and misgovernment of Alexander. The young and gallant Totila had raised up a new army, had more than kept Belisarius at bay in five difficult campaigns (544-548), and now held nearly all the country. Belisarius, however, in this his second series of campaigns, had never been properly seconded by his master. In the spring of 552 Narses set sail from Salona on the Dalmatian coast with a large and well-appointed army. It was a Roman arniy only in name. Lombards, Heruli, Huns, Gepid, and even Persians followed the standard of Narses, men equal in physical strength and valour to the Goths, and ‘inspired by the liberal pay which they received and by the hope of plunder.

The eunuch seems to have led his army round the head of the Adriatic Gulf. By skilfully co-operating with his fleet he was able to cross the rivers of Venetia without fighting the Gothic general Teias, who intended to dispute their passage. Having mustered all his forces at Ravenna, he marched southward. He refused to be detained before Rimini, being determined to meet the Gothic king as soon as possible with his army undiminished. The occupation of the pass of Furlo (Petra Pertusa) by the Goths prevented his marching by the Via Flaminia, but, taking a short circuit, he rejoined the great road near Cagli. A little further on, upon the crest of the Apennines, he was met by Totila, who had advanced as far as Tadini (which Procopius calls Taginas). Parleys, messages, and harangues by each general followed. At length the line of battle was formed, and the Gothic army (probably greatly inferior in number to the Byzantine) was hopelessly routed, the king receiving a mortal wound as he was hurrying from the battlefield.

With Totila fell the last hopes of the Gothic kingdom of Italy. The brave young Teias, who was proclaimed his successor, protracted for a few months a desperate resistance in the rocky peninsula of Castellaniare, overlooking the Bay of Naples. At length want of provisions forced him into the plain, and there by the river Sarno, almost in sight of Pompeii, was fought (553) a battle which is generally named from the overlooking range of Mons Lactorius (Monte Lettere). The actual site of the battle, however, is about half a mile from the little town of Angri, and its memory is still vaguely preserved by the name Pozzo dew Goti (Well of the Goths). In this battle Teias was killed. He was the last king of the Ostrogoths.

The task of Narses, however, was not yet ended. By the invitation of the Goths an army of 75,000 warlike Alemanni and Franks, the subjects of King Theudibert, crossed the Alps under the command of two Alemannic nobles, the brothers Leuthar and Butilin (553). The great strategic talents of Narses were shown even more conspicuously in this than in his previous and more brilliant campaigns. Against the small but gallant bands of Totila and Teias he had adopted the policy of rapid marches and imperative challenges to battle. His strategy in dealing with the great host from Gaul was of the Fabian kind. He kept them as long as he could north of the Apennines, while he completed the reduction of the fortresses of Tuscany. At the approach of winter he gathered his troops into the chief cities and

declined operations in the field, while the Alemannic brothers marched through Italy killing and plundering. When the spring of 554 appeared, Leuthar with his half of the army insisted on marching back to Gaul, there to deposit in safety the plunder which they had reaped. In an unim- portant engagement near Pesaro he was worsted by the Roman generals, and this hastened his northward march. At Ceneda in Venetia he died of a raging fever. Pestilence broke out in his army, which if not absolutely annihilated thereby was so wasted as to be incapable of further opera-

tions in Italy. Meanwhile his brother Butilin, whose army was also suffering grievously from disease, partly induced by too free indulgence in the grapes of Campania, encamped at Casilinum, the site of modern Capua. Here, after a time, Narses accepted the offered battle. The barbarians, whose army was in the form of a wedge, pierced the Roman centre. But by a most skilful manceuvre Narses contrived to draw his lines into a curve, so that his mounted archers on each flank could aim their arrows at the backs of the troops who formed the other side of the Alemannic wedge. They thus fell in whole ranks by the hands of unseen antagonists. Soon the Roman centre, which had been belated in its march, arrived upon the field and completed the work of destruction. Butilin and his whole army were destroyed, though we need not accept the statement of the Greek historian (Agathias, ii. 9) that only five men out of the barbaric host of 30,000 escaped, and only eighty out of the Roman 18,000 perished (554).

The only other important military operation of Narses which is recorded—and that indistinctly—is his defeat of the Herulian king Sindual, who had served under him at Capua, but who subsequently revolted, was defeated, taken captive, and hanged by the eunuch's order (565). In the main the thirteen years after the battle of Capua (554— 567) were years of peace, and during them Narses ruled Italy from Ravenna with the title of prefect.1 He rebuilt Milan and other cities destroyed in the Gothic war; and two inscriptions on the Salarian bridge at Rome have pre- served to modern times the record of repairs effected by him in the year 564.2

His administration, however, was not popular. The effect of the imperial organization was to wring the last solidus out of the emaciated:and fever-stricken population of Italy, and the belief of his subjects was that no small portion of their contributions remained in the eunuch's private coffers. At the close of 565 Justinian died, and a deputation of Romans waited upon his successor Justin IT. , representing that they found "the Grecks" harder task-masters than the Goths, that Narses the eunuch was determined to reduce them all to slavery, and that unless he were removed they would transfer their allegiance to the barbarians. This deputation led to the recall of Narses, which took place in 567, and was accompanied, according to a somewhat late tradition, by an insulting message from the empress Sophia, who sent him a golden distaff, and bade him, as he was not a man, go and spin wool in the apart- ments of the women. "T will spin her such a hank," Narses is represented as saying, "that she shall not find the end of it in her lifetime "; and forthwith he sent mes- sengers to the Lombards in Pannonia, bearing some of the fruits of Italy, and inviting them to enter the land which bore such goodly produce. Hence came the invasion of Alboin (568), which wrested the greater part of Italy from the empire, and changed the destinies of the peninsula.®

1 Gibbon's statement that Narses was "the first and most powerful of the exarchs of Ravenna" is more correct in substance than in form. The title of exarch does not appear to be given to Narses by any contemporary writer. He is always ' Prefectus Italie," '* Patricins," or '* Dux Italiz," except when he bears the style of his former offices in the imperial household, '' Ex-Prepositus [Cubiculi]" or ''Chartularius" (compare Rubeus, Historia Ravennates, p. 175).

2 See Gruter, p. 161.

3 This celebrated story seems to be unknown to strictly contem- porary authors. We find no hint of it in Agathias (who wrote between 566 and 582), Marius (532-596), or Gregory of Tours (540-594), The possibly contemporary Liver Pontificalis and Isidore of Seville (560-636) hint at the invitation to the Lombards, Fredegarius (so- called), who probably wrote in the middle of the 7th century, and Paulus Diaconus, towards the close of the 8th, supply the saga-like details, which become more minute the further the

narrators are from the action. On the whole, the transaction, though it is too well vouched for to allow us to dismiss it as entirely fabulous, cannot take its place among the undoubted facts of history.

NAR—NAR

Narses, who had retired to Naples, was persuaded by the pope (John III.) to return to Rome. He died there about 573, and his body, enclosed in a leaden coffin, was carried to Constantinople and buried there. Several years after his death the secret of the hiding-place of his vast stores of wealth is said to have been revealed by an old man to the emperor Tiberius IT., for whose charities to the poor and the captives they furnished an opportune supply.

Narses was short in stature and lean in figure. His freehanded- ness and affability made him very popular with his soldiers. Evagrius tells us that he was very religious, and paid especial reverence to the Virgin, never engaging in battle till he conceived that she had given lim the signal. Our best authorities for his life are his contemporaries Procopius and Agathias. For the period after 555 we have to depend chiefly on fragincutary noticcs in the authors whose names have been mentioned above. (T. He)

NARSINHPUR, a district in the chief-commissioner- ship of the Central Provinces, India, lying between 22° 45’ and 23° 15’ N, lat. and between 78° 38’ and 79° 39’ E. long., bounded on the N. by Bhépdl state and by Sagar, Damoh, and Jabalpur districts, E. by Seoni, 8. by Chhind- ward, and W. by Hoshangabad. It forms a portion of the upper part of the Nerbudda valley. The first of those wide alluvial basins which, alternating with rocky gorges, give so varied a character to the river’s course opens out

just below the famous marble rocks in Jabalpur, and

extends westward for 225 miles, including the whole of Narsinhpur, together with the greater part of Hoshangé- bad. The Sdtpurd hills to the south are here a generally regular range, nowhere more than 500 feet above the plain, and running almost parallel to the river, at a distance of 15 or 20 miles. In the intervening valley, the rich level of black wheat land is seldom broken, except by occasional mounds of gravel or nodular limestone, which afford serviceable village sites. Along the foot of the boundary hills the

alluvium gives way to belts of red gravelly soil, rice and sugar-cane take the place of wheat, and forest trees that of mango groves.

The population in 1880 was 365,178, the Hindus numbering 805,562, and the Mohammedans only 13,425. The most numerons of the aboriginal tribes are the Gonds (46,645). Only two towns contained upwards of 5000 inhabitants—Narsinhpur (7816) and Gadarwara (6558). Of the area of 1916 square miles, 974 werc under cultivation in 1882. Wheat is the staple crop, occupying 280,898 acres ; other food grains took up 245,797 acres; cotton, 46,204 acres; and sugar-cane, 2271 acres. Rotation of crops is not practised, but when the soil shows signs of exhaustion grain or some other pulse is substitutcd for two or three years. Cultivators dare not leave their lands fallow, even for a single ycar, for the ground would be immediately occupied by rank kdns grass, which no exer- tions can eradicate till it has run its course of about ten years. The principal export is cotton. Coal mining is carried on at Moh- pani, Sihora, and Setarewa ; and iron-ore of excellent quality is smelted in large quantities at Tendikherd and elscwhere there being 38 mines in operation in 1882,

NARVAEZ, PAmrino pe (ec. 1480-1528), Spanish adventurer, was an hidalgo of Castile, born at Valladolid about 1480. He was one of the subordinates of Velazquez in the reduction of Cuba, and, after having held various posts under his governorship, was put at the head of the force sent to the Aztec coast to compel Cortes to renounce his command ; he was surprised and defeated, however, by his abler and more active compatriot at Cempoalla, and made prisoner with the loss of an eye (1520). After his return to Spain he obtained from Charles V. a grant of Florida as far as the River of Palms; sailing in 1527 with five ships and a force of about 600 men, he landed, probably near Tampa Bay, in April 1528, and, striking inland with some 300 of his followers, reached “Apalache” on June 25. The prospects of fabulous wealth which had sustained them in their difficult and perilous journey having

-proved illusory, a return to the coast was detcrmined, and

the Bahia de log Caballos, at or near St Mark’s, was = eee ee ee 2)

4 Narsinhpur is also the name of a petty native state in Orissa.

reached in the following month. Having built rude boats, the much reduced company sailed hence for Mexico on September 22, but the vessel which carried Narvaez was

driven to sea in a storm and perished. His lieutenant, |

Cabeza de Vaca, with three others who ultimately reached land, made his way across Texas to the Gulf of California.

NARVAEZ, Ramon Maria (1800-1868), Spanish soldier and statesman, was born at Loja, Granada, on August 4, 1800, entered the army at an early age, and saw active service under Mina in Catalonia in 1822. In 1823 the French invasion caused him to retire into private life, whence he re-emerged in 1832, speedily attaining the rank of colonel. He achieved great popularity by his victory over Gomez, the Carlist general, near Arcos, in November 1836, and after clearing La Mancha of brigands by a vigorous policy of suppression in 1838 he was appointed captain-general of Old Castile, and commander- in-chief of the army of reserve. In 1840, for the part he had taken at Seville in the insurrection against Espartero, he was compelled to take refuge in France, where, in con- junction with Maria Christina, he planned the expedition of 1843 which led to the overthrow of his adversary. In 1844 he became prime minister, and was created field- marshal and duke of Valencia, but his policy was too reactionary to be tolerated long, and he was compelled to quit office in February 1846. He now held the post of ambassador at Paris, until again called to preside over the council of ministers in 1847 ; but misunderstandings with Maria Christina led to his resignation in the following year. His ministry succeeded that of O’Donnell for a short time in 1856-57, and he again returned to power for a few months in 1864-65. He once more replaced O’Donnell in July 1866, and was still in office when he died at Madrid on April 23, 1868.

NARWHAL, an animal of the order Cetacea (see Mam- MALIA, vol. xv. p. 398), belonging to the genus Monodon, of which there is but one species known, M. monoceros of Linnzeus. It is included in the family Delphinide

or Dolphins, and closely resembles the Beluga or White Whale in all points of its structure except its dentition, which presents most anomalous characters. In the adult there are but two teeth present, both in the upper jaw. They lie horizontally side by side, and in the female they remain throughout life concealed in cavities of the bone, so that this sex is practically toothless. In the male the night tooth usually remains similarly concealed and abor- tive, but the left is immensely developed, attaining a length equal to more than half that of the entire animal. Ina narwhal 12 feet long, from snout to end of tail, the exserted portion of the tusk may measure 6 or 7 and occa- sionally 8 feet in length. It projects horizontally for- wards from the head in the form of a cylindrical or slightly tapering, pointed tusk, composed of ivory, with a central cavity reaching almost to the apex, without enamel, and with the surface marked by spiral grooves and ridges, running in a sinistral direction. Occasionally both left and right tusks are developed, in which case the direction of the grooves is not reversed, but the same in both. No instance has ever been met with of the complete develop- ment of the right tusk associated with a rudimentary con- dition of the left. In very young animals several small additional teeth, irregular in number and position, are present, but these usually disappear soon after birth.

The head is rather short and rounded; the fore limbs or paddles are small and broad compared with those of most dolphins 3 and (as in Beluga) the median dorsal fin, found in nearly all other members of the group, is wanting or replaced by a low ridge. The general colour of the surface is dark grey above and white below, but variously marbled and spotted with different shades of grey.

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The narwhal is essentially an Arctic animal, frequenting the icy circumpolar seas, and but rarely seen south of 65° N. lat. Three instances have, however, been recorded of its occurrence on the British coasts, one in the Firth of Forth in 1648, one near Boston in Lincolnshire in 1800, while a third, which entangled itself among rocks in the Sound of Weesdale, Shetland, in September 1808, is described by Fleming in the Jemoirs of the Wernerian Society, vol. i. Like most other cetaceans it is gregarious in its habits, being

usually met with in “schools” or herds of fifteen or twenty individuals. Its food appears to be various species of cephalopods, small fishes, and crus- taceans. ‘The purpose served in the animal’s economy by the wonderfully developed asymmetrical tusk—or ‘‘ horn,” as it is commonly but erroneously called—is not known. As it is present only in the male sex, no function essential to the wellbeing of the individual, such as the procuring of sustenance, can be assigned to it, but it must be looked upon as belonging to the same category of organs as the antlers of deer, and perhaps may be applied to similar pur- poses, Very little is, however, known of the habits of narwhals. Scoresby describes them as “ extremely play- ful, frequently elevating their horns and crossing them with each other as in fencing.” They have never been known to charge and pierce the bottom of ships with their weapons, as the swordfish, a totally different animal, often does. The name “Sea Unicorn,” sometimes applied to the narwhal, refers to the resemblance of its tusk to the horn represented as projecting from the forehead of the fabled unicorn. The ivory of which the tusk is composed is of very good quality, but, owing to the central cavity, is only fitted for the manufacture of objects of small size. The entire tusks are sometimes used for decorative purposes, and are of considerable, though very fluctuating, commer- cial value. (wW. H. F.)

NASH, Ricuarp (1674-1761), better known as “ Beau Nash,” was born at Swansea, 18th October 1674. He was descended from an old family of good position, but his father from straitened means had become partner in a glass business. Young Nash was educated at Cacrmarthen grammar school and at Jesus College, Oxford. He obtained a commission in the army, which, however, he soon exchanged for the study of law at the Middle Tcmple. ‘““Here,” it is said, “he went to the very summit of second- class luxury,” and among “wits and men of pleasure” he came to be accepted as an authority in regard to dress, manners, and style. When the members of the Inns of Court entertained William III. after his accession, Nash was chosen to conduct the pageant. This duty he per- formed so much to the satisfaction of the king that he was offered knighthood, but he declined the honour, unless accompanied by a pension. As the king did not take the hint, Nash found it necessary to turn gamester. The pursuit of his calling led him in 1704 to Bath, where he had the good fortune almost immediately to succeed Captain Webster as master of the ceremonies. His qualli- fications for such

a position were unique, and under his conventional authority reforms were introduced which rapidly secured to Bath a leading position as a fashionable watering-place. He drew up a new code of rules for the regulation of balls and assemblies, abolished the habit of wearing swords in places of public amusement, induced gentlemen to adopt shoes and stockings in parades and assemblies instead of boots, reduced refractory chairmen to submission and civility, and introduced a tariff for lodgings. Through his exertions a handsome assembly- room was also erected, and the streets and public buildings were greatly improved. Nash adopted an outward state corresponding to his nominal dignity. He wore an immense white hat as a sign of office, and a dress adorned

with rich embroidery, and drove ina chariot with six greys, laced lackeys, and French horns. Notwithstanding his vanity and impertinence, the tact, energy, and superficial cleverness of Nash won him the patronage and notice of the great, while the success of his ceremonial rule, as shown in the increasing prosperity of the town, secured him the gratitude of the corporation and the people generally. When the Act of Parliament against gambling deprived him of an easy though uncertain means of subsistence, the corporation granted him a pension of six score guineas a year, which, with the sale of his snuff boxes and other trinkets, enabled him to support a certain faded splendour till his death on February 3, 1761. He was honoured with a public funeral at the expense of the town.

A Life of Richard Nash, by Goldsmith, was published anony- mously at London in 1762, has been frequently reprinted, and is now included in the editions of Goldsmith’s collected works. See also London Magazine, vol. xxxi., and a paper on ‘‘The Monarch of Bath” in Blackwood’s Magazine, vol. xlviii.

NASH, Tuomas (c. 1564-1601), poet, playwright, and pamphleteer, was one of the most notable literary celebrities in the brilliant last decade of the reign of Elizabeth. The exact years of his birth and death have not been ascertained ; but from the fact that he proceeded B.A. (St John’s, Cambridge) in 1585 it has been con- jectured that he was born about 1564, and his death was lamented in an epigram by Fitzgeoffrey in 1601. He tells

us himself that his birthplace was Lowestoft. It would seem from a passage in one of his pamphlets that he travelled in Italy after leaving Cambridge, and then he followed the example of Greene and Marlowe, his fellow Cantabs, in trying to make a living by literature in London. Nash was really a journalist born out of due time ; he frequently boasts of his power of writing ‘‘as fast as his hand can trot”; his style was brilliant and picturesque ; he had a keen sense of the ridiculous, was quick in argument, and not without abundance of mis- cellaneous learning. In the circumstances, there being no market for his gifts, he fared like the other university wits who made the same premature venture at the time to ‘distil ink into gold,” struggled brilliantly for some years, and succumbed. It was asa “notable railer” both against individuals and against the vices and the absurdities of the time, as a man than whom none “used better or more bitter gall in ink,” that Nash made his reputation. His first effort was a preface to Greene’s Menaphon, in 1587. In this he made boisterous ridicule, with the arrogance of youth and high spirits, of current literature, laughing especially at the bombast of Marlowe’s Tamburlaine, and promised to follow up his attack with an Anatomy of Absurditie, which appeared in 1589. Meantime the Marprelate tracts gave him another opening for ridicule, into which he rushed joyously, publishing in quick succes- sion Plaine Percevall, Martin’s Month’s Mind, Pasquil in England, An Almond for a Parrot, Pasquil’s Apology. Then he edited Sidney’s poems, with a preface, in 1591. Pierce Penilesse, His Supplication to the Devill, published in 1592, at once shows his power as a gaily humorous critic of national manners and lets us into the secret of the hardness of his struggle to live by the pen. It seems to Pierce a monstrous thing that cautious brainless drudges and knaves wax fat “when as the seven liberal sciences and a good leg will scarce get a scholar bread and cheese,” A patron was what the man of letters wanted, and Pierce humorously begs for a trial, undertaking to make it worth a patron’s while. Nash’s complaints of destitution in this tract are sometimes taken too literally ; it would seem that he had found a noble patron, and was living at his country seat in 1592, away from the plague in London, and writing his satirical masque Summer’s Last Will and Testament. In 1593 he tried his hand at a sermon, Christes Tears over

Jerusalem, a really eloquent composition. In the preface to this, “not basely fear-blasted, or constraintively over. ruled, but purely pacificatory,” he holds out the hand of friendship to Gabriel Harvey, with whom he had begun a match in personal abuse, recorded in D’Israeli’s Quarrels of Authors. The overture was not accepted, and Nash resumed his “humorous objurgation” of the enemy. After Marlowe’s death he put the unfinished tragedy of Dido in shape for the stage, but he had no portion of Marlowe’s genius. In 1597 he was in trouble with the authorities for a play called the Jsle of Dogs, which has not been preserved, The author retired to Yarmouth, and there wrote his last work Lenten Stuf? (1599), nominally ‘in praise of a red herring,” but really a description of Yarmouth which would now make the fortune of a special correspondent.

NASHUA, a city of the United States, in Hillsborough county, New Hampshire, on hilly ground at the confluence of the Merrimac and the Nashua, 40 miles north-north-west of Boston by the Boston, Lowell, and Nashua Railroads, In 1803 the site was “a sandy plain covered with pine trees” ; but after the formation of the Nashua Manufactur- ing Company in 1823 the village rapidly grew up, and by 1853 it was incorporated as a city. Its population increased from 10,543 in 1870 to 13,397 in 1880, The water-power of the Nashua river being rendered easily available by means of a canal 3 miles long and 8 feet deep, constructed in 1825-26, a great variety of industrial establishments are situated in the city. Besides the sheetings, shirtings, prints, and flannels manufactured by the original Nashua company and its younger rivals, iron goods, locks, edge tools, bedsteads, carpets, shuttles, bobbins, shoes, cards, glazed paper, are all produced on a large scale,

NASHVILLE, a city of the United States, capital and largest city of Tennessee, and seat of justice of Davidson county, stands on the Cumberland River (spanned there by a suspension bridge and a truss railway bridge with a “draw” 200 feet long), 200 miles above its junction with the Ohio, in 36° 10’ N. lat. and 86° 49’ W. long. Occupy- ing a site of considerable irregularity, and dominated by the hill (558 feet above the sca) on which the capitol is built, Nashville on the whole presents a picturesque and attractive appearance. The capitol is an imposing stone edifice, erected in 1845 at a cost of nearly $1,000,000, and surmounted by a central tower

206 feet in height. Other public buildings deserving mention are the court-house (1857), the market-house and city-hall (1855), the State penitentiary (1830), the State blind asylum (1850), the four universities, and two large female seminaries. Nashville University, incorporated as Davidson College in 1785, as Cumberland College in 1806, and under its present name in 1825, now embraces three distinct schools,— Montgomery Bell Academy, Nashville Medical College, one of the largest in the Southern States, and the Normal College, established and endowed by the trustees of the Peabody Fund. Vanderbilt University was founded in 1872 by six conferences of the Methodist Episcopal Church, South, and in 1873 was named after Cornelius Vanderbilt of New York, who gave it $1,000,000. His son has given it about $250,000 additional. It has a fine group of buildings and 75 acres of land west of the city. In 1882 it had 51 instructors and 603 students, Fisk University, established in 1866 for the education of men of colour, and widely known through the Jubilee Singers, had 18 teachers and 424 students in 1882. The Tennessee Central (Methodist) College, likewise dating from 1866, is intended for coloured students, as is also the Roger Williams University (Baptist). The State library in the capitol had 27,000 volumes in 1882 3 and the Watkins

Institute library occupies a building erected in 1882 ata cost of $130,000. Being the natural centre of a wide productive region, and well served by river and rail, Nash- ville has an extensive and rapidly growing trade, especially in cotton and tobacco. Its manufacturing establishments comprise three large cotton factories (34,000 spindles, 700 hands in 1882), saw-mills, grist-mills, planing factories, carriage factories, extensive furniture factories, distilleries, paper-mills, cotton-seed-oil mills, and stove foundries. The population was 5566 in 1830, 10,165 in 1850, 16,988 in 1860, 25,865 in 1870, and 43,350 in 1880.

Settled in 1780, Nashville received incorporation as a town in 1784 and as a eity in 1806. It was not till 1843 that it became the eapital of the State, though, with the exeeption of the period from 1815 to 1826, the legislature had met there from 1812. In February 1862 Nashville was evacuated by the Confederate General A. 8. Johnston, and was held from that time by the

Federal forees. The attempt made in Deeember 1864 by the Confederate General Hood to reeover the now strongly-fortified town resulted in the

battle of Nashville," in whieh his army was completely routed by that of General G. H. Thomas,

NASIK, or Nasstck, a district in the Bombay presi-

dency, India, between 19° 34' and 20° 52' N. lat., and between 73° 21' and 75° 2' E. long., bounded on the N. by Khandesh, E. by the Nizam's Dominions, 8. by Ahmed- nagar, and W. by Thana (Tanna), with an area of 5940 square miles. With the exception of a few villages in the west, the whole district is situated on a table-land from 1300 to 2000 feet above sea-level. The western portion is lilly, and intersected by ravines, and only the simplest kind of cultivation is possible. The eastern tract is open, fertile, and well cultivated. The Sahyddri range stretches from north to south; the watershed is formed by the Chander range, which runs east and west. All the streams to the south of that range are tributaries of the Godavari. To the north of the watershed, the Girna and its tributary the Mosam flow through fertile valleys into the TApti. The district generally is destitute of trees, and the forests which formerly clothed the Sahyddri hills have nearly dis-appeared ; efforts are now being made to prevent further destruction, and to reclothe some of the slopes. The district contains several old hill forts, the scenes of many engagements during the Mahratta wars. Nasik district became British territory in 1818 on the overthrow of the peshwé. The population in 1881 was 781,206 (Hindus 683,579, Mohammedans 35,294). NAstx, the chief town of the district (population 22,436), Is situated on the Godavari, and is considered a place of great sanctity by Hindus, who make pilgrimages to its temples from all parts of India. Places of worship fringe both banks of the river, and even the bed of the stream is thickly dotted with temples and shrines. Nasik has brass and copper works, but commercially is of little more than local importance.

NASIR KHOSRAU. Abi Mu'in-ed-din Nasir b. Khosrau, the first great didactic poet of Persia, was a descendant of the imam 'Ali Rida, and was born, according to his own statement in one of his kasidas, 394 a.H. (1004 a.p.), at Kubédiyan, near Balkh in Khor4s4n. The first forty-two years of his life are obscure ; we learn from incidental remarks of his that he was a

Sunnite, probably according to the Hanafite rite, well versed in all the branches of natural science, in medicine, mathematics, astronomy, and astrology, in Greek philosophy, and the Interpretation of the Koran; that he had a comprehensive knowledge of many other philosophic systems and religious creeds professed in the East; and that he was, withal, much addicted to worldly pleasures, especially to excessive wine drinking, the renunciation of which forms a prominent topic in his later odes. He had studied Arabic, Turkish, Greek, the vernacular languages of India and Sind, and perhaps even Hebrew ; he had visited Multén and Lahore,

and been—probably in an official capacity—an eye-witness of the splendid Ghaznavide court under Sultén Mahmud, Firdousi's patron, and his son Mas'id. Later on he had chosen Merv for his residence, and was the owner of a house and garden there. When he first steps into the full light of history, in 437 a.H. (1045 a.p.), we see him in the position of a financial secretary and revenue collector of the Seljuk sultan Toghrulbeg, or rather of his brother Jaghirbeg, the emir of Khordsén, who had conquered Merv in 1037, The introductory passages of the Safarndma, together with a number of verses in the above-mentioned kasida, which belongs to the same period, clearly manifest the peculiar state of mind in which NAsir was at that time. Like Faust he had fathomed the depth of all human knowledge, like him he had passed through the whirlpool of passions and sensual pleasures, he had tried to drown his doubts and troubles in the wine cup, and yet he had only grown more and more dissatisfied with himself ; nothing could quench his ever-increasing thirst for a higher intelligence, for a more profound comprehen- sion of the Godhead, and the manifestations of the divine power in the universe. He had evidently reached the turning-point of his life, and, inspired by a heavenly voice (which he pretends to have heard in a dream), he abjured all the luxuries of life, and resolved upon a pilgrimage to the holy shrines of Mecca and Medina, hoping to find there the solution of all enigmas, and to return a thoroughly reformed man. The graphic description of this Journey is contained in the Safarndéma, a book that, quite apart from the personal interest we feel in the author, ranks high among the memoirs of travel as giving us the most authentic account of the state of the Mussulman world and the condition of Persia, Arabia, Syria,

Palestine, and Egypt in the middle of the 11th century. The minute sketches of Jerusalem and _ its environs, moreover, are of the highest practical value, even at the present day, for our explorations in the Holy Land. During the seven years of his journey (1045-52 A.D.) Nasir visited Mecca four times, and performed all the rites and observances of a zealous pilgrim; but the fascinating influence of the Holy City upon his mind was greatly outweighed by that of Cairo, the capital of Egypt, and the residence of the Fatimite sultan Mostansir billah, the great champion of the Shi'a, and the spiritual as well as political head of the house of 'Alf, which was just then waging a deadly war against the 'Abbaside caliph of Baghdad, and the great defender of the Sunnite creed, Toghrulbeg the Seljuk. At the very time of NAsir's visit to Cairo, the power of the Egyptian Fatimites was in its zenith; Syria, the Hijaz, Africa, and Sicily obeyed Mostansir's sway, and the utmost order, security, and prosperity reigned in Egypt. Cairo appeared as an earthly paradise in Nasir's eyes; he became, as his poems clearly indicate, thoroughly imbued there with Shi'a doctrines, and their successful introduction into his native country was henceforth the sole aim and object of his life. The hostilities he encountered in the propagation of these new religious ideas after his return to Khorasan in 1052 and Sunnite fanaticism compelled him at last to flee, and after many wanderings he found a refuge in Yumgan, in the mountains of Badakhshan, where he spent as a hermit the last decades of his life, and gathered round him a considerable number of devoted adherents, who have handed down his doctrines to many following generations. The Dabistan (translated by Shea and Troyer, Paris, 1843, vol. ii. p. 419 sg.) fixes his flight from Khorasin in 456 A.H. (1064 a.D.), but there is strong evidence in some of his kasidas that this event took place some four or five years before that date; and as his death occurred in 481] A.H. (1088 a.D.) he must have lived in his exile from

twenty-five to thirty years. "* Hujjat."

Most of Nasir's lyrical poems were eomposed in his retirement, and their chief topics are—an enthusiastic praise of 'Ali, his descendants, and Mostansir in particular; passionate outcries against Khorasan and its rulers, who had driven him from house and home; the highest satisfaction with the

quiet solitude of Yumgan; and utter despondency again in secing himself despised by his former associates, and for ever excluded from participation in the glorious contest of life. But scattered through all these alternate outbursts of hope and despair we find precious lessons of purest morality, and solemn warnings against the tricks and perfidy of the world, the vanity of all earthly splendour and greatness, the folly and injustice of men, and the hypocrisy, frivolity, and viciousness of fashionable society and princely courts in particular. It is the same strain which runs, although in a somewhat lower key, through his two larger mathnawis or double-rhymed poems, the Rushandindma, or ‘‘ book of enlightenment,” and the Sa‘ddat- ndma, or “book of felicity.” The former is divided into two sections : the first, of a metaphysical character, contains a sort of practical cosmography, chiefly based on Avicenna’s theories, but frequently intermixed both with the freer speculations of the well- known philosophical brotherhood of Basra, the Ikhwan-es-safé,} and purely Shiitie or Isma‘ilitie ideas; the second, or ethical seetion of the poem, abounds in moral maxims and ingenious

His “nom de plume” was

thoughts on man’s good and bad qualities, on the necessity of

shunning the company of fools and double-faced fricnds, on’ the

deceptive allurements of the world and the secret snares of

ambitious eraving for rank and wealth. It concludes with an imaginary vision of a beautiful world of spirits who have stripped off the fetters of earthly cares and sorrows and revel in the pure light of divine wisdom and love. If we compare this with a similar allegory in Nasir’s diwdn, which culminates in the praise of Mostansir, we are fairly entitled to look upon it as a covert allusion to the eminent men who revealed to the poet in Cairo the secrets of the Isma‘ilitic faith, and showed him what he con- sidered the ‘‘ heavenly ladder ” to superior knowledge and spiritual bliss. The passage, thus interpreted, lends additional weight to the correctness of Dr Ethé’s reconstruction of the date of the Rushandindma, viz., 440 A.H. (1049 A.D.), which, notwithstanding M. Schefer’s objections, is warranted both by the astronomical details and by the metrical requirements of the respective verses. That of course does not exclude the possibility of the bulk of the

poem having been composed at an carlier period; it only ascribes its completion or perhaps final revision to Nasir's sojourn in Egypt. A similar series of excellent teachings on practical wisdom and the blessings of a virtuous life, only of a severer and more uncom- promising character, is contained in the Sa'ddatndma; and, judging from the extreme bitterness of tone manifested in the '* reproaches of kings and emirs," we should be inclined to consider it a protest against the vile aspersions poured out upon Nasir's moral and religious attitude during those persecutions which drove him at last to Yumgin. Of all the other works of our author mentioned by Oriental writers there has as yet been found only one, the Zad-elimusi-firin (in the private possession of M. Schefer, Paris); and we ean very well dismiss the rest as being probably just as apocryphal as Nasir's famous autobiography (found in several Persian tadhkiras or biographies of poets), a mere forgery of the most extravagant description, which is mainly responsible for the confusion in names and dates in older accounts of our author.

See Sprenger's Catalogue of the Libraries of the King of Oudh, 1854; FH. Ethé, "Nasir Chusrau's Rushandindma," in Z. D, M. G., Xxxili., xxxiv., 1879-80; E lagnan, " Le livre de la félicité," in vol. xxxiv. of the same journal, 643-674; Ch, Schefer, Sefer Nameh, publié, traduit, etannoté, Paris, 1881; 11. Ethé, in Gottinger Nachrichten, 1882, pp. 124-152, and Z. D. M. G., 1882, pp. 478-508. Fagnan in Journ. As., 7th ser., vol. xiii. p. 164 sq.,and Rieu, Cat. Pers. MSS. in Br. Mus., concluded that the poet and the pilgrim were diffcrent persons. The opposite view was developed by Ethé. lI. E.)

NASMYTH, Avexanper (17 58-1840), oe and landscape painter, was born in Edinburgh on September 9, 1758. He studied at the Trustees' Academy under Runciman, and, having been apprenticed as an heraldic painter to a coachbuilder, he, at the age of sixteen, attracted the attention of Allan Ramsay, who took the youth with him to London, and employed him upon the subordinate portions of his works. Nasmyth returned to Edinburgh in 1778, and was soon largely patronized as a portrait painter. He also assisted Mr Miller of Dalswinton, as draughtsman, in his mechanical researches and experi- ments; and, this gentleman having generously offered the painter a

loan to enable him to pursue his studies abroad, he left in 1782 for Italy, where he remained two years,

2 Compare the Journal of the Asiatic Society of Bengal, 1848, vol. xvi, part 1, p. 501 sg., and part 2, p. 183 sq. ,

On his return he painted the excellent portrait of Burns,

now in the Scottish National Gallery, so well known through Walker's engraving. time ran high in Edinburgh, and Nasmyth's pronounced

Political feeling at that

Liberal opinions, which he was too outspoken and sincere to disguise, gave offence to many of his aristocratic patrons,

and led to the diminution of his practice as a portraitist.

In his later years, accordingly, he devoted himself mainly to landscape work, and did not disdain on occasion to set his hand to scene-painting for the theatres. He has been styled, not unjustly, the "father of Scottish landscape art." His subjects are carefully finished and coloured, but are wanting in boldness and freedom. Nasmyth was also largely employed by noblemen throughout the country in the improving and beautifying of their estates, in which his fine taste rendered him especially skilful ; and he was known as an architect, having designed the Dean Bridge, Edinburgh, and the graceful circular temple covering St Bernard's Well, which stands near it. Nasmyth died in his native city on 10th April 1840. His youngest son, James, is the well-known inventor of the steam-hammer, His six daughters all attained a certain local reputation as artists, but it was in his eldest son, Patrick, that the artistic skill of his family was most powerfully developed. For an interesting account of the Nasmyth family see James Nasmyth's Autobiography, 1883.

NASMYTH, Parrick (1787-1831), the eldest son of Alexander Nasmyth, was born at Edinburgh on January 7, 1787. Having studied under his father,

he went to London at the age of twenty, and soon attracted attention as a clever landscapist. _He was a diligent student of the works of Claude and Richard Wilson, and of Ruysdael and Hobbema, upon whom his own practice was mainly founded, His most characteristic paintings are of English domestic scenery, full of quiet tone and colour, and detailed and minute expression of foliage, and with considerable brilhancy of sky effect. They were executed with his left hand, his right having in early life been injured by an accident. He died at Lambeth, August 17, 1831, during a thunderstorm, which at his own request he had been raised in bed to contemplate.

NASSAU, now forming the bulk of the government district of Wiesbaden, in the Prussian province of Hesse- Nassau, was till 1866 an independent and sovereign duchy of Germany, consisting of a compact mass of territory, 1830 square miles in area, bounded on the S. and W. by the Main and Rhine, on the N. by Westphalia, and on the E. by Hesse. This territory is divided into two nearly equal parts by the river Lahn, which flows from east to west into the Rhine. The southern half is almost entirely occupied by the Taunus Mountains, which attain a height of 2900 feet in the Great Feldberg, while to the north of the Lahn is the barren Westerwald, culminating in the Salzburgerkopf (2000 feet). The valleys and low- lying districts, especially the Rheingau, are very fertile, producing abundance of grain, flax, hemp, and fruit; but by far the most valuable product of the soil is its wine, which includes several of the choicest Rhenish varieties (Johannisberger, Marcobrunner, Assmannshauser, &c.). Nassau is one of the most thickly wooded regions in Germany, about 42 per cent. of its surface being occupied by forests, which yield good timber and harbour large quantities of game. The rivers abound in fish,—the salmon fisheries on the Rhine being especially important. There are upwards of a hundred mineral springs in the district, most of which formerly belonged to the duke, and afforded him a considerable part of his revenue. The best-known are those of Wiesbaden, Ems, Soden, Schwalbach, Schlang- enbad, Geilnau, and Fachingen. The other mineral wealth of Nassau includes iron, lead, copper, building

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stone, coals, slate, a little silver, and.a bed of malachite. 1ts manufactures, including cotton and woollen goods, are unimportant, but a brisk trade is carried on by rail and river in wine, timber, grain, and fruit. There are few places of importance besides the above-named spas ; Hochst is the only manufacturing town. Wiesbaden, with 50,238 inhabitants, is the capital of the government district as it was of the duchy. In 1864 the duchy contained 468,311 inhabitants, of whom 242,000 were Protestants (including the reigning house), 215,000 Roman Catholics, and 7000 Jews. The ecclesiastical jurisdiction was in the hands of the Protestant bishop of Wiesbaden and the Roman Catholic bishop of Limburg. Education was amply pro- vided for in numerous higher and lower schools. The annual revenue of the dukedom was about 4,000,000 guldens (£400,000). It furnished a contingent of 6000 men to the army of the German Confederation.

During the Roman period the district enclosed by the Lahn, the Main, and the Rhine was at first occupied by the Mattiaci and then by the Alemanni. The latter were subdued by the Franks under Clovis in 496, and at the partition of Verdun in 843 the country became part of the Eastern or German empire. Christianity seems to have been introduced in the 4th century. The founder of the house of Nassau is usually recognized in Count Otho of Laurenburg, brother of King Conrad [., who flourished on the banks of the Lahn in the 10th century. His successors afterwards took the title of counts of Nassau, from a castle which they erected on a steep hill overlooking the Lahn, and in 1192 transferred their allegiance from the archbishop of Treves to the emperor of Germany. In 1255 Walram and Otho, the two sons of Count Henry the Rich, divided between them their paternal inhcritance, which had in the mean- time been steadily increasing, and founded the two Nassovian dynasties which have flourished down to our own times.

The fortunes of the Othonian or younger branch have been the more brilliant, but belong properly to the history of Holland. In 1564 Count William of Nassau, the hero of the Dutch war of inde- pendence, succeeded to the principality of Orange, which furnished the historical title of himself

and his descendants. The house is now represented by the king of the Netherlands.

Adolf of Nassau, the son of the founder of the elder or Walram line, and progenitor of the dukes of Nassau, became emperor of Germany in 1292, but was defeated and slain in 1298 by his rival Albert of Austria. In 1366 the head of the house was created a prince of the empire, and the Reformation was introduced in the second half of the 16th century. The territories of the house of Walram were frequently partitioned among various branch lines, few of which perpetuated themselves beyond a few generations. At the beginning of the 19th century we find two lines still flourishing—Nassau-Ufingen and N assau-Weilburg. Both these Joined the Rhenish Confederation in 1806, and the prince of Nassau- Ufingen, as head of his family, received the ducal title from the hands of Napoleon. After the battle of Leipsic both princes threw In their lot with the allies. In 1816 the duke of N assau-Ufingen died, and the prince of Weilburg succeeded to the whole of the Nassovian territory, with the title of duke of Nassau.

This prince had already, in 1814, granted his subjects a limited constitution, providing for two representative chambers on a landed- property basis, and this came into force in 1818. The estates, however, came almost at once into collision with the duke on the question of the ducal domains, and the dissensions arising from this ~Ource were not compromised till 1834. In1835 the duchy took an important step in the development of its material prosperity by Joming the Zollverein. In 1848 Duke Adolf was compelled to yield to the temper of the times and grant a more liberal constitution, with a single chamber elected by universal suffrage ; but the follow- ms years witnessed a series of reactionary measures which reduced matters to their former unsatisfactory condition. The duke adhered steadfastly to his Conservative principles, while his people showed their sympathies by returning one Liberal chamber after another. In 1866, though the chambers refused a vote of credit for military Purposes, the duke espoused the cause of Austria, and in doing So sealed the fate of his duchy. A little later he was a fugitive

efore the Prussian troops, and on October 3d, 1866, Nassau was formally Incorporated with the kingdom of Prussia.

The little town of N assau, on the right bank of the Lahn, 15 miles above Coblenz, is interesting as the birthplace of the cele- Paied Prussian statesman, Baron Stein. Adjacent are Burg Stein, Bat seat, and Burg Nassau, the cradle of the Nassovian

assau is said to have existed as early as the 8th century under the name of Nasonga. Population (1880) 1786.

See Sehliephake, Geschichte v p é on Nassau, 1866-76; Arnoldi, Geschichte von Ps oe eeaie the Annals of the “Verein fiir Nassauische Alterthumskunde ichtsforschung 3 Daniel, Z7andbuch der Geographie, 5th ed., 1881,

NASSAU, the capital of New Providence, and seat of government of the Bahama Islands, 25° 5’ 36” N. lat., 77° 21’ 15” W. long. At one time the town was. noted as a great rendezvous for pirates. Its harbour, admitting vessels drawing 12 feet, acquired much importance during the blockade of the southern ports in the American War. The population of Nassau, principally negroes and coloured people, is about 8000, out of the total island population of 11,653. Nassau extends for 34 miles along the north shore, It is a very pretty town, celebrated for its healthy climate, and resorted to for sea-bathing by visitors from America. It has a Government house, a plain stone cathe- dral, and several churches and chapels, and is a military station and a bishop’s see. Numbers of the inhabitants support themselves by looking after wrecks. Preserved fruit in tins is exported, also woods, fruit, sponges, salt, &e.

NASTURTIUM. Thecommon water-cress (J. officinale), so largely used as a salad, may be taken as a representative of this genus of Crucifere,—a genus characterized, for the most part, by pinnately divided foliage, white or yellow cruciform flowers, and long pods with a double row of seeds. The embryo root is folded up along the edges of the cotyledons, accumbent. Four species are British, but the only one cultivated is the WV. officinale. Its flavour is due to an essential oil containing sulphur, its antiscorbutic properties to the presence of iodine, iron, and phosphates. Although now so largely consumed, it does not appear to have been cultivated in England prior to the present century, though in Germany, especially near Erfurt, it had been grown long previously. The plants are grown in shallow water in rows parallel to the direc- tion of the current, and from 5 to 7 feet apart. It is

essential that the water be free from impurity, especially sewage. To avoid this latter contingency cresses are sometimes grown in a north border, the soil being kept constantly moist; or they may be grown in pots in a frame or greenhouse, the pots being placed in a saucer of water, and the plants frequently watered. This plan was introduced by Mr Shirley Hibberd, and when the requisite attention is given is highly successful when commercial considerations are not a matter of primary importance. The name Nasturtium is also applied in gardens, but in- correctly, to the species of Tropexolum.

NATAL, a British colony on the south-east coast of Africa, situated nearly between 29° and 31° S. lat. and 29° and 32° E. long., is bounded on the N.E. by Zululand and the Transvaal, on the 8.E. by the Indian Ocean, on the N.W. by the Orange Free State and the Transvaal, and on the §.W. by Basutoland, Griqualand East, and the country of the Pondas. It is of an irregular diamond shape, with a length of about 270 miles from north to south, and a breadth of 170 miles from east to west. The extent of sea-coast is about 150 miles, and its area is about 17,000 square miles, or 11,000,000 acres (one-third of the size of England).

For several miles northward from the Bluff at Durban the coast is low, but well wooded, and broken in several places by the mouths of rivers and streams; to the south of the Bluff it is of moderate elevation near the sea, the hills rising inland to a considerable height. Rich in verdure, and in the wet season clothed with bright green grass and clumps of trees and bushes, and diversified by numerous streams, the landscape indicates a country of great fertility of soil. From the coast to the western boundary of the colony the land rises by terraces or plateaus to an elevation of at least 4000 feet above the sea-level. For about 15 miles inland it is broken and hilly, and thickly covered with long grass, and in some parts studded with jungly bush and clumps of palm,

euphorbia, and mimosa. For some 30 miles farther inland the more elevated but less broken land loses all tropical character, and presents large tracts of good pasturage, but with scarcely any bush or wood. Beyond this district, at an ever-increasing elevation, the country, still hilly and undulating, opens

out in many places into more extensive grass plains, generally denuded of bush or wood, although in some localities and in the “kloofs” with a south-eastern aspect are dense clumps of forest trees netted over in many instances with ferns ; the western boundary of these rising lands is the Drakensberg mountain-range, which has an altitude of some 3000 or 4000 feet above the country at its base, and an absolute maximum altitude of 10,350 feet above sea-level. Apart from the Drakensberg range, the country, though hilly and much broken, has no mountains of note; many large hills, however, with flattened tops (table mountains) stand out singularly high

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Map of Natal.

above the surrounding country, presenting a peculiar ap- pearance to one unaccustomed to South-African scenery. The colony is well watered throughout, but none of the streams are navigable, and all have bars at their entrances : attempts are being made to form harbours at the mouths of the Umkomanzi and the Umzimkulu to the south of Durban. The Umgeni, about 12 miles from Pietermaritz- burg, has a sheer fall of about 360 feet, and when it is flooded the rush of its waters is a magnificent spectacle, The harbour or port of Natal at Durban (strictly D’Urban), the only natural one in the colony, consists of an outer bay or roadstead, which has a fair anchorage, and an inner bay; at the entrance of the latter is a deepwater channel, where ships of large tonnage can be safely moored, but a sand bar at its entrance restricts the passage of large

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ships to the highest tides, and in rough weather renders communication with the outer bay quite impracticable. This bar varies constantly throughout the year, and prob- ably is influenced by the Agulhas stream and other oceanic

currents. Much money has been spent on works for the removal of the bar, without any good result, but other plans are now being adopted, with every hope of success, When this obstacle is removed Natal will possess one of the best harbours on the south-east coast of Africa.

Climate.—The summer or hot rainy season lasts from October to March inclusive, and the six remaining months form the winter or cold dry season. The following are the average temperatures for the three hottest and three coldest months of the year, taken from observations at Durban, Pietermaritzburg, and Byrne extending over ten years:—

Highest. Lowest. Mean. December, January, and February…... 97°5 53°3 71°2 June, duly, and August .. 0.6.0. cece. 83°4 31°9 56°7

In the summer months cloudy afternoons with thunder- storms are frequent, and the accompanying rains are very cool and refreshing. Within 30 miles of the coast fires in dwellings are seldom required throughout the coldest months of the year. The rainfall averages 33-50 inches; it is heaviest in the summer months, but in June and July it frequently happens that there is no rain at all over a large portion of the colony. From July to December the upper districts are occasionally subject to hot winds, during which all vegetation droops as if dying, and languor and depression affect all animal life; but these seldom reach to within 20 miles of the coast. Violent hailstorms are not frequent, but hailstones have occasionally killed fowls, dogs, and goats, and in some instances have cut through iron roofing,

Geology.—Along the coast belt there are evidences of comparatively recent upheaval. The high land of the colony rests on granite, trap, and sandstone, the last of the Old Silurian type. Sandstone of a more recent epoch, well suited for building purposes, is sometimes met with. As arule these fundamental rocks are found under thick beds of shale, the surface being of the most varied descrip- tion, and never of the same quality over any very extensive area. The soil on the coast is mostly sandy loam, except where the valleys have alluvial deposits from disintegrated shales and erupted rocks. In the uplands the deep light, heavy black, and fine red loams are distributed over beds of clay, ironstone, or granite in areas of varying extent. Ironstone is to be met with in great quantities. Coal of several qualities exists in the Klip River county, with seams varying from 4 to 10

feet in thickness; analysis and experiment have shown it to be very suitable for loco- motive and general steam purposes. Some descriptions of it are well suited for gas, and nearly all of it will make good household coal. The area of the available coal-field is some 1350 square miles, and at a moderate computation the mines contain 2,000,000,000 tons of serviceable coal. In association with these seams of coal very valuable iron ore has been discovered. Vast deposits of fine white and yellow crystalline marbles have recently been found about 6 miles inland from the mouth of the Umzimkulu river. Slight indications of copper have been met with. In the extreme north are some mineral springs which have a temperature of about 130° Fahr., and are considered to possess medicinal qualities.

Flora.—The chief forms of plants peculiar to Natal are the liane and mimosa along the coast, and the orchid, aloe, pothos, liliaceous, and fern forms in the upland districts. The heaths and proteads common at the Cape of Good Hope are seldom if ever found in Natal, but almost any varieties of the flora of semi-tropical and temperate countries that are introduced attain perfection. The indigenous timber trees, mostly found in isolated clumps and in somewhat inaccessible situations, are principally the yellow wood (Podocarpus elongatus), sneczewood (Pteroxylon utile), stinkwood (Oreodaphne

bullata), black ironwood (Olea laurifolia), white ironwood (Vepris lanceolata), and the mangrove (Rhizophora); all are very useful woods, and the yellow wood, sneezewood, stinkwood, and ironwood when polished have grain and colour equal to maple, walnut, and ebony. The ‘‘rooibesje,’’ red pear, and milkwood trees are used for boatbuilding. The Australian Hucalyptus and Caswarina in great variety, and many other imported trees, including syringas, wattles, acacias, willows, pines, cypress, cork, and oak all thrive when properly planted and protected from grass fires.

Fauna.—The herds of elephants which roamed in the coast bushes in 1837 have disappeared, and the roar of the lion is no longer to be heard in the uplands. The hippopotamus is very scarce, and nearly all, if not all, the buffalo and quagga have crossed over into Zululand. Leopards or tigers and tiger cats (all called by the natives ‘‘ingwe”), aud hyenas and wild dogs

(Canis pictus) of different species, are still found in or about bush jungles and forest clumps; elands (Antilope orcas) are preserved on some estates, and there are at least ten distinct species of antelope. Ant-eaters (Orycteropus capensis), porcupines, rock rabbits, hares, and cane rats are common in different localities. Baboons (Cynocephalus por- carius) and monkeys of different kinds frequent the mountains and rocky kloofs and bush and timber lands. The birds of Natal are of many species; some have beautiful plumage, but none of them, with the exception of the canary, are to be considered as songsters. The erocodile is to be found at the mouths of all rivers, and fora certain distance inland from the sea. Of snakes there are about forty dis- tinct species or varicties. The most dreaded by the natives are ealled ‘‘imamba,” of which there are at least eight different kinds ; these snakes elevate and throw themselves forward, and have been known to pursue a horseman. One sort of imamba, named by the natives ‘‘indhlondhlo,” is crested, and its body is of a bright flame eolour. The sluggish puff-adder (Clotho arietans) is common aud verydangerous. A hooded snake (Naja hemachates), the ‘‘ imfezi” of the natives, is dangerous, and spits or ejects its poison ; and besides this there area few other varicties of the cobra species. The largest of the serpent tribe, however, is the python (Hortulia nata- lensis), called ‘‘inhlwati” by the natives; its usual haunts are by streams amongst rocky boulders and in jungles, and instances are recorded of its strangling and crushing adult hatives. Insects abound in great numbers, the most troublesome and destructive being the tick (Zxodes natalensis), which infests the pasturage, and the white ant (Zermes mordax). Occasionally vast armies of cater- pillars make a sudden appearance and advance over large tracts of country, devouring all vegetation in their line of march. The fish moth, a steel-grey slimy active fish-shaped insect, is found in every house, and is very destructive in the wardrobe and library. Fish of excellent quality and in great quantities abound on the coast. Prawns, crayfish, and oysters are also obtainable, and turtle (Chelonia mydas) are frequently captured. Little attention, how- ever, has been given to deep-sea fishing, and the only fishermen are the coolies, who use nets along the beach. The natives (Zulus) as a rule will not touch fish. Freshwater scale-fish are mostly full of bones, but fine eels and barbel are plentiful in the rivers.

Agricultwre.—The chief crop is maize, known in South Africa as “meallies,” its grain constituting the principal food of about seven- eighths of the population. Maize, indeed, and Kaffre corn (Sor- ghum Caffrorum), with pumpkins and sweet potatoes (Convolvulus Batatas), “imphee” or ‘‘imfi” (Sorghum saccharatum), and tobacco are about the only crops raised by the natives. The European farmers in the uplands, by irrigating the land in the winter months, produce wheat of very fair quality, but not in sufficient quantity to supply the demands of the colony. Oats, barley, and other grains grow readily ; and nearly all European vegetables yield fair crops in suitable localities. Arrowroot succeeds well on the coast, and is an article of export. Some years ago coffee and cotton had the attention of the planter, but both are now neglected. Rice has been cultivated by some farmers, but not to any great extent. Tobacco flourishes luxuriantly wherever there is good soil, but the difficulties im the way of curing and manufacturing it prevent its being at present an article of export. The cultivation and manufacture of sugar have attracted most attention of late ; sugar, indeed, with its products is the principal staple produced in and exported from Natal. The capsicum for cayenne pepper, and ground-nuts (Arachis hypogec) for oil, are also grown for exportation. Tea has been cul- tivated of late by some few planters on the coast, and promises ere long to be grown on a much larger scale. There are but few indigenous fruits, the principal being the Natal orange (a species of Strychnos), the Natal plum or “‘amatungula” (Arduinia grandi- flora), the Kei apple (Aberia caffra), Cape gooseberry (Physalis pubescens), and the Kaffre fig, the fruit of the Urostigma natalensis. Many subtropical fruits, however, and fruits of European culture thrive well in Natal.

Stock.—Previous to 1855 large and numerous herds of cattle pas- tured over the whole country, but in that year ‘“‘lung-sickness,” an epidemic of the nature of pleuro-pneumonia, broke out with great Virulence, and searcely 4 per cent. of the animals attacked recovered. Lung-sickness and ‘‘red water” still claim many victims annually,

and are the constant dread of the stock farmer. ‘‘ Horse sickness,”

a form of anthrax, is very fatal to horses, especially in wet summers.

The following figures give approximately the number of the several

oe of stock belonging to Kuropeans and natives respectively in 880 :—

Europeans. | Natives. Horned eattle……..... on «| 140,716 379,569 TEGTEOS ves vsiesees. cwases bed 17,261 15,915 Mules and donkeys… sie leh nil. ASTUSOTAN 6 GAD v0. siaslsen’a na’sleaicasaidlecicaaagsdandeasnsearinanawerde 70,589 nil, OGIEAR COREE. sect rode totes naawteate a een atin oti aacnaueian cetivesds 6,159 166,477 TNO ate cure th atetty cee « yet ha slo bare Sates vec ol weieMiars awa a aineilve we ese ees 10,809 5,554 Dineen (WoOl-beaning ix ccesateieteesete testes gsveuesare stoves 410,353 600

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The cattle consist principally of the Zulu, Africander, and Father- land breeds, but recently some English shorthorns and other improved stock have beenintroduced. Ostriches also are farmed for the sake of their feathers, but as yet this industry has not succeeded so well in Natal as in the Cape Colony.

Commerce.—The staple productions of Natal have increased with the introduction of the sugar-cane, and sugar and rum arc thie principal articles of native produce exported. Wool, arrowroot, and feathers are also the outcome of local industry, but the exports of greatest value and importance are the wool and hides of the Transvaal and the Orange Free State, and feathers, ivory, and skins from the interior, which are shipped at Durban. The value of Natal sugar produced in 1856 was stated at £483, and in 1881 at £172,237. The principal imports in 1882 (total value £2,213,538) were clothing, cotton and woollen goods, haberdashery, leather manufactures, iron and ironmongery, spirits, oilman’s stores, and flour, and the chief exports (£731,809) were wool, sugar, hides, ostrich feathers, and Angora hair,—by far the greater part of the imports (£1,784,345) and exports (£595,744) being received from and shipped for the United Kingdom.

Revenue and Expenditure.—The increase in the revenue and expenditure in thirty years is shown as follows :—

Year. Revenue. Expenditure. 1852 £27,158 £24,876

1862 98,086 83,886 1872 180,498 132,978

1882 496,783 489,113

The revenue is principally derived from customs duties, native hut taxes, transfer dues on land sales, and excise: The public debt of the colony on the 31st December 1882 was £2,101,500, with a sinking fund towards its redemption of £153,597.

Roads and Telegraphs. — Until very recently all goods and produce were conveyed in ox-waggons carrying from 3 to 5 tons weight. These had to travel on roads sometimes little better than tracks worn by traffic, and frequently impassable during wet weather; and for some years before the breaking out of the Zulu War (1879) the average cost of carriage was as high as eighteen- pence per ton per mile. Now, however, three lines of railway have been opened,—one of 78 miles from the port at Durban to Pieter- maritzburg, another from Durban 20 miles.north to Verulam through the sugar lands in that district, and a third 7 miles south- ward to the sugar estates by the Isipingo river. These alone have cost the colony about £1,250,000.. An additional line, of 118 miles, to cost about £1,180,000, is in process of construction from Pietermaritzburg to Ladysmith, and will no doubt be at once carried on to connect with the railways of the Orange Free State. The telegraph between Natal and the Cape Colony was opened in 1878, and in the following year telegraphic communication by way of Lorenzo Marques was extended to England. Branches of telegraph arealso carried direct from Natal into the Transvaal and the Orange Free State.

Government.—The colony was annexed as a district to the Cape Colony in August 1845, but in November of the same year it was made a separate government, to be administered by a lieutenant- governor under the general control of the governor of the Cape Colony. At first the lieutenant-governor and an assistant council of four chief officials formed the executive, while the legislative council consisted of the liewtenant-governor and three principal officers. In 1856 Natal became wholly independent of the Cape, and the legislative council was made to consist of sixteen members, twelve elective and four non-elective. In 1869 the lieutenant-governor was empowered to nominate two elective members of the legislative council as members of the executive council. In 1873 the number of members was

increased to twenty, fifteen being elective and five non-elective, and in 1875 eight nominee members were added. The colony is now administered by a governor, the promotion from lieutenant-governor being made 28th January 1882; and by law No. 1, 1883, the legislative council consists of thirty members, twenty-three of whom are elective and seven non-elective, two of the latter holding office during the royal pleasure. The executive

council has been further increased by two nominees not officers of the Government. ‘Ihe qualification for voters is the possession of freehold property worth £50, the occupation of property at an annual rental of £10, or an income of £96 per annum after three years’ colonial residence. All voters are legally eligible as mem- bers. Boroughs or towns having 1000 inhabitants or upwards can form themselves into corporations for the supervision of their own municipal affairs, and townships or villages under certain conditions can frame local bye-laws.

Law and Justice.—The Roman-Dutch law by special enactment prevails within the colony, in addition to which are a number of ordinances and laws enacted by the local legislature, mostly founded upon imperial statute law. The law of evidence is the same as that ~~of the courts of England. It has not been thought practicable as yet to bring the native population under the sane laws as govern the colonists of European descent ; but in 1848 the natives had their own laws confirmed by letters patent, except so far as these might be repugnant to the general principles of humanity as recog~~ nized throughout the civilized world; and they were codified and reduced into writing in 1878. Crimes amongst natives, with some few exceptions, are, however, tried by the ordinary courts. Special laws also have been passed for the benefit of the coolie immigrants. The administration of justice is conducted by a supreme court, and by the courts of the resident magistrates. ‘he three judges of the supreme court, one of whom is chief-justice, sit in Pietermaritzburg tn banco every alternate month, and during the other months circuit courts are held at Durban and in other towns. ‘There is a vice-admiralty court, of which the chief-justice of the supreme court is judge and commissary. In addition to these are courts for the adjudication of

cases under native law with right of appeal to the native high court, which sits under its own special judge assisted. by assessors if need be; and from this high court appeal can be had toa court of which the chief-justice of the colony, the secretary for native affairs, and the judge of the native high court are judges. An appeal lies from all inferior courts to the supreme court, and in suits where the subject-mattcr in dispute is of the value of £500 an appeal ean be had from any final judgment of the supreme court to the privy council.

Education and Religion.—In 1861 there were two collegiate institutions endowed in Natal, the one for Pietermaritzburg and the other for Durban, but little more was done as regards educa- tion until the cducation laws came into force in 1878, when a council of education was created to administer funds voted by the legislative council for scholastic purposes and to control all matters connected with the establishment and working of the public schools of the colony. Most of the religious bodies have good schools in their several parishes or districts ; and public libraries and other literary institutions are to be found not only in Pietermaritzburg and Durban but in the principal towns and villages. Natal was erected into a see in 1858, with its cathedral in Pietermaritzburg, Proceedings were taken against Bishop Colenso (who died June 20, 1888) on certain charges of heresy, and judgment given against him by the South-African bishops in 1863 ; and this led eventually to the formation of a separate see in the colony. On the 25th Janu- ary 1869 the bishop of Maritzburg was consecrated at Cape Town; he is a suffragan of the bishop of Cape Town, and has his cathedral church also in Pietermaritzburg. The Wesleyan Church has a very strong staff of clergy and local preachers in the colony, whilst the Congregational Church, the Dutch Reformed Church, the Presby- terian Church, and the Roman Catholic Church are all represented. At the stations of the Berlin, Free Church of Seotland, American Zulu, Hanoverian, Norwegian, and Trappist missions, great efforts are made to evangelize and train the natives and coolics.

Population.—The total population is about 380,000, of whom about 30,000 are whites, 20,000 Indian coolies, and 330,000 natives, mostly descendants of early refugees from Zululand. Of the white population about one-fifth are of Dutch extraction, and are chiefly resident in the Umvoti, Weenen, Klip

River, and New- castle divisions. Most of thé coolics are located on the coast lands ainongst the planters, who without their assistance would find all field and manufacturing operations impossible, as the natives can- not be depended on for continuous or skilled work.

fistory.—The country was discovered by Vasco da Gama, who sighted the Bluff headland at the entrance to the bay forming the present port at Durban on Christmas Day in 1497, and so named the country Terra Natalis. From that date little is recorded until the survivors of the crew of the Dutch ship ‘‘Stavenisse,” wrecked on the coast in 1686, gave their report of the country and its inhabitants. In 1721 the Dutch formed a settlement, but it was soon abandoned. Subsequently, about 1810, it would seem that Chaka, chief of the Amazulu, swept with his warriors through the whole of Natal and the adjoining territories, destroying all males, and making booty of the cattle and women. One tribe, the Ama- tuli, however, after offering resistance to the invader, retreated into the dense bush near the Bluff and were amongst the few aborigines when the British took possession of the country. In 1824 Liecu- tenant Farewell and about twenty companions landed in Natal

| with the view of colonizing it, and for that purpose entered into a

treaty with Chaka. Some four ycars after their arrival, however, Chaka was murdered by his brother Dingaan, and the settlement was broken up. In 1885 another British officer, Captain Allen Gardner, got permission from Dingaan to introduce missionaries into the country, and at once formed the township of Durban, at the port where there were still a few English settlers. In 1837 several Dutch farmers made an exodus from the Cape Colony, and one of their leaders, Pieter Retief, with the assistance of the Rey. Mr Owen, who had been for some time a resident missionary at Dingaan’s own head kraal, obtained from Dingaan a cession of the whole territory of Natal. Immediately after the conclusion of the treaty Retief and his followers were treacherously murdered, and the attempt was made to extirpate the Boers throughout the length and breadth of the land. The latter with their firearms eventually proved move than a match for their numerous assailants, and joining Mpanda, who had rebelled against his brother Dingaan, utterly routed Dingaan’s army on the banks of the White Umvolozi in 1840, and

drove him to the Amaswazi country, where he was shortly after assassinated. Natal became a British colony on 8th August 1843, and, owing no doubt to the fame of the security and protection to be found under the British flag, large accessions were at once made to the native population by refugees from the several surrounding tribes. Since 1848 the colony has made rapid progress; the native tribes as a rule have been loyal, and, although occasional reports from Zululand have alarmed the colonists, it has very seldom been found necessary to send out the volunteer forces on commando. Any tendency to insubordination on the part of the resident natives has always beeu quickly suppressed, and a spirit of disaffection has never become general. ‘In 1879 the colony became the base of operations against the Zulu king Cetywayo, and in 1881 it was fora short time invaded by the Transvaal Boers in connexion with the fighting which arose out of the annexation of the Trans- vaal in 1877.

Authorities.—Holden, History of Natal: Reports of Grout and Fynn to Native

Commission, 1853; Cloete, Lectures, 1856; Shepstone, Wistoric Sketch of Natal, 1864; Brook, History of Natal, edited by Mann; Johnston, Health and Disease, Natal, 1860; Harvey and Sonder, Flora Capensis: Layard, Birds of South Africa; Smith, Zoology of South Africa; Drummond, Large Game of South Africa; African Pilot for South and East Coasts of Africa; Cadiz, Laws of Natal; Colenso, The Zulu War; Statham, Boers, Blacks, and British, Bird, Form of Government (Natal), 1869; Carter, Narrative of the Boer War. (J. W.T.)

NATAL, a city of Brazil, the capitat of the province of Rio Grande do Norte, is situated on the eastern bank of the river of that name, 2 miles above the mouth, with its fort in 5° 45’ S. lat. and 35° 13’ 12” W. long. Though the water on the bar is only 14 feet at low tide, Natal is the first port of any note to the south of Cape Roque, and trades in cotton, sugar, dye-wood, and other local produce. It was founded in 1597. The population is about 11,000.

NATCHEZ, a city and port of entry of the United Statcs, capital of Adams county, Mississippi, lies on the east bank of the Mississippi, 272 miles above New Orleans. Natchez-under-the-Hill, lying on a low alluvial bank,

con- tains the steamboat landing and a few business houses, The main city, Natchez-on-the-Hill, occupies the summit of a bluff which rises nearly 200 feet above the river, and affords a wide view over the cotton plantations of Louisiana. Among the more conspicuous buildings are the city-hall, the court-house, the market-house, the Roman Catholic cathedral, the Jewish synagogue, and a number of handsome churches. There are two large cotton factorics and other manufacturing establishments. Cotton dealing is the staple trade. The inhabitants numbered 4454 in 1850, 6612 in 1860, 9057 in 1870, and 7058 in 1880,— the city being in population the second in the State.

Fort Rosalie, erected on Natchez Bluff in 1716 by Bienville, and rebuilt in 1729 after its destruction by the Natchez Indians, con- tinued to be a French trading and military post till 1763, when it passed into British hands and received the name of Fort Panmure. Occupied by the Spaniards from 1779 till 1798, Natchez became

at the latter date the capital of the new Territory of Mississippi, retaining that rank till 1820. Its city charter dates from 1808.

NATHANAEL (O83, “he whom God gave,” equivalent to Nethaniah or the Greek Theodore), a common name in later Old Testament times. It appears in the Gospel of John (i. 45 sy., xxi. 2) as the name of a man of Cana of Galilee, one of the first disciples of Jesus. He is not named in the synoptical Gospels, and the fathers (Chrysostom, Augustine, &c.) do not number him among the apostles ;

but his position in the Fourth Gospel has given rise to a prevalent conjecture that Nathanael is the true name of the apostle whose patronymic was Bartholomew (son of Ptolemy). This indeed is mere conjecture, and recent writers have advanced rival hypotheses, ¢.g., that the name is another form for Mattaniah or Matthew (Hilgenfeld), or that Nathanael is identical with the beloved disciple of the Fourth Gospel (Spath) or even a mere symbol of Paulinism (Holtzmann).

NATICK, a town of the United States, in Middlesex county, Massachusetts, near the left bank of the Charles River, a few miles to the south-east of Cochituate Lake, and about 18 miles west-south-west of Boston by the railway between that city and Worcester. It is mainly engaged in the manufacture of boots and shoes, but also produces clothing, boxes, and carriages. The population in 1880 was 8480.

Natick (‘‘our land”) was in 1650 granted to John Eliot, the Indian “‘ Apostle,” for the occupancy of Indians converted to Chris- tianity ; and until 1721 the community was governed by a consti- tution modelled on that of Exodus xviii. Portions of the records, written in the Indian language, are extant. The site of the first Indian church is now occupied by the Unitarian church. Of the Natick Indians only four or five remain, all of mixed blood. The incorporation of the town dates from 1781.

NATIONAL DEBT. Details as to the national debts of individual countries are given under their respective headings, and for the economical principles of the subject the reader is referred to the articles FInaNcE and Powirica Economy. In the present article the subject will be con- sidered briefly in what may be regarded as its technical aspects,—including the special character of the institution, the different classes of debt, the various methods of raising loans, interest, funding systems, comparative statistics of national debts, methods of estimating the burden of debt, and other points.

National debt is so universal an institution that it has been described as the first stage of a nation towards civiliza- tion. A nation, so far as its finances are concerned, may be regarded as a corporate body or even as an individual. Like the one or the other it may borrow money at rates of Interest, and with securities, general or special, propor- tionate to its resources, credit, and stability. But, while in this respect there are certain points of analogy between a@ state and an individual, there are important points of difference so far as the question of debt is concerned. A State, for example, may be regarded as imperishable, and its debt as a permanent institution which it is not bound to liquidate at any definite period, the interest, unless specially stipulated, being thus of the nature of transferrible permanent annuities. While an individual who borrows engages to pay interest to the lender personally, and to reimburse the entire debt within a certain date, a state may have an entirely different set of creditors every six months, and may make no stipulation whatever with regard to the principal. A state, moreover, is the sole judge of its own solvency, and is not only at liberty either to repudiate its debts or compound with its creditors, but even when perfectly solvent may materially alter the con- ditions on which it originally borrowed. These distinctions explain many of the peculiarities of

national debts as con- trasted with those of individuals,—though a nation, like an individual, may by reckless bad faith utterly destroy its credit and exhaust its borrowing powers.

A well-organized state ought to have within itself the means of meeting all its ordinary expenses; where this is not the case, either through insufficiency of resources or maladministration, and where borrowing is resorted to for what may be regarded as current expenses, a state imperils, not only its credit, but, when any crisis occurs, its very existence ; in illustration of this we need only refer to the

cases of Turkey in Europe and some of the states of Central and South America. Even for meeting emer- gencies it is not always inevitable that a state should incur debt; its ordinary resources, from taxation or from state property, may so exceed its ordinary expenses as to enable it to accumulate a fund for extraordinary con- tingencies. This, it would seem, was a method commonly adopted in ancient states. The Athenians, for example, amassed 10,000 talents in the interval between the Persian and the Peloponnesian wars, and the Lacedzmonians are said to have done the same. At Susa and Ecbatana Alexander found a great treasure which had been accumu- lated by Cyrus. In the early days of Rome the revenue from certain sources was accumulated as a sacred treasure in the temple of Saturn ; and we know that when Pompey left Italy he made the mistake of leaving behind him the public treasury, which fell into the hands of Cesar. In later times, also, the more prudent emperors were in the habit of amassing a hoard. We find that the method of accumulating reserves prevailed among some of the early French kings, even down to the time of Henry IV. This system has long prevailed in Prussia, and even at the present day exists to some extent in reconstituted Germany. Frederick II., when he ascended the throne, found in the treasury a sum of 8,700,000 thalers, and it is estimated that at his death he left behind him a hoard of from 60 to 70 million thalers. And similarly, in our own time, of the five milliards of indemnity paid by France as a result of the Franco-German War, 150 millions were set apart to reconstitute the traditional war-treasury. The German empire, apart from the individual states which comprise it, had in 1882 a debt of about £24,000,000, while its invested funds amounted to £37,390,000, including a war-treasure of £6,000,000. The majority of economists disapprove of such an accumula-

tion of funds by a state as a bad financial policy, main- taining that the remission of a proportionate amount of taxation would be much more for the real good of the nation. At the same time the possession of a moderate war-fund, it must be admitted, could not but give a state a great advantage in the case of a sudden war. In the case of England, apart from the private hoardings of a few sovereigns, there does not seem to have existed any deliberately accumulated public treasure ; before the time of William and Mary English monarchs borrowed money occasionally from Jews and from the city of London, but emergencies were generally met by ‘‘benevolences” and increased imposts.

All modern states, it may be said, have been compelled to have recourse to loans, either to meet war expenses, to carry out great public undertakings, or to make up the recurrent deficits of a mismanaged revenue. Resources obtained in this way are what constitute national debt proper. Loans have been divided into forced and voluntary. Forced loans can, of course, only be raised within the bounds of the borrowing country; and, apart from the injustice which is sure to attend such an impost, it is always economically mischievous. The loans which the kings of England were wont to exact from the Jews were really of the character of forced loans, though the method has never been used in England in modern times so extensively as on the Continent. There the sum sought to be obtained in this way has never been anything like realized. In 1793, for example, a loan of this class was imposed in France, on the basis of income; and of the milliard (francs) which it was sought to raise only 100 millions were realized. In Austria and Spain, also, recourse has been had at various times to forced loans, but invariably with unsatisfactory results. Other methods of a more or less compulsory character have been and are

made use of in various states for obtaining money, which, as they involve the payment of interest, may be regarded as of the nature of loans; but the debt incurred by such methods is comparatively insignificant, and some of the methods adopted are peculiarly irritating and mischievous. On the other hand, it has occasionally been attempted to raise voluntary loans by appeals to a nation’s patriotism ; the method has been confined almost exclusively

to France. After the revolutions of 1830 and 1848 appeals were thus made to the patriotism of French capitalists to buy 5 per cents direct from the Government at par, at a time when the French 5 per cents were sclling at 80; but the results were quite insignificant. Even if the amount sought for by a Government could be obtained on the voluntary prin- ciple, the method itself is vicious, withdrawing as it does from the general working capital of the country a sum of serious dimensions. In short, the only economically sound method of meeting expenses which the ordinary resources of a state cannot meet is by borrowing in the open market on the most advantageous terms obtainable. On this normal method of borrowing, loans are divided into different categories, though there are really only two main classes, which may be designated perpetual and terminable. Borrowing in quasi-perpetuity has hitherto been the mode adopted by most states in the creation of the bulk of their debt. Not that any state ever borrows with the avowed intention of never paying off debts; but either no definite period for reimbursement is fixed, or the limit has been so extended as to be practically perpetual, or in actual practice the debt has been got rid of by the creation of another of equal amount under similar or slightly differing conditions as to interest. Of course a state is not bound to retain any part of its debt as a perpetual burden; it is at liberty to liquidate whenever it suits its convenience. This quasi-perpetuity of debt in the case of a state ina sound financial condition involves no hardship upon its creditors, who may at any moment realize their invested capital by selling their titles as creditors in the open money market, it may be at the price they paid, or it may bea little below or a little above it, according to the state of the market at the time. Loans, again, contracted on the terminable principle are of various classes; the chief of these are (1) life annuities, (2) terminable annuities, (3) loans repayable by instalments at certain intervals, (4) loans repayable entirely at a fixed date.

From the time of William III. life and terminable annuities have been a favourite mode in England either of borrowing money or of commuting, and thus gradually paying off, the existing funded debt. At first, and indeed until comparatively recent times, the system of life annuities resulted in serious loss to the country, owing to the calculation of the rate of annuity on too high a scale, a result arising from imperfect data on which to base estimates of the average duration of life. The system of life annuities was

sometimes combined in England with that of perpetual annuities, or interest on the permanent debt,—the life annuity forming a sort of additional induce- ment to lenders of limited means to invest their money. At one time the form of life annuities known as tontine was much in vogue both in England and France, the principle of the tontine being that the proceeds of the total amount invested by the contributors should be divided among the survivors, the last survivor receiving the whole interest or annuity. The results of this system were not, however, encouraging to the state. In England, at least, the terminable annuity has been a favourite mode of borrowing from the time of William III.; it has been generally conjoined with a low rate of permanent interest on the sum borrowed. Thus in 1700 the interest on the consolidated debt amounted to only £260 000, while the

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terminable annuities payable amounted to £308,407. In 1780 a loan of 12 millions was raised at 4 per cent. at par, with the additional benefit of an annuity of £1, 16s. 3d. per cent. for eighty years. Even so late as the Crimean War in 1855, a loan of 16 millions at 3 per cent. at par was contracted, the contributors receiving in addition an annuity of 14s. 6d. per cent. for thirty years. however, this beneficiary system has been abandoned, though the system of terminable annuities has received increased favour, especially as a means of reducing the funded debt. Of the total debt of England in 1882, up-

wards of 354 millions were in terminable annuities, while

in 1883 the sum was only £29,492,125.

The third method of contracting terminable loans, that of gradual repayment or amortization within a certain limit of years, has been a favourite one among certain nations, and specially commends itself to those whose credit is at a low ebb—as Turkey, Russia, and Egypt. When the final term of repayment is fixed upon, a calculation is easily made as to how much is to be paid half-yearly until the expiry of the term, so that at the end the whole, princi- pal and interest, will have been paid. At first, of course, the amount paid will largely represent interest, but, as at each half-yearly drawing of the numbers of the bonds to be finally paid off the principal will be gradually

reduced, there will be more and more money set free from interest for the reduction of the actual debt. This method, as we have said, has its advantages, and when conjoined with stipulations as to liberty of conversion to debt bearing a lower rate of interest than that originally offered, and when the bonds are not issued at a figure much below par, might be the most satisfactory method of raising money for a state under certain emergencies. What is known as the “Morgan loan” of France in 1870 was contracted on such conditions.

The last form of temporary loan, that repayable in bulk at a fixed date, is one which, when the sum is of consider- able amount, is apt to be attended with serious disadvant- ages. The repayment may have to be made at a time when a state may not be in a position to meet it, and so to keep faith with its creditors may have to borrow at a higher rate in order to pay their claims. It has, however, worked well in the United States, most of the debt of which has been contracted on the principle of optional payment at the end of a short period, say five years, and compulsory payment at the end of a longer period, say twenty years. Thus the loan of 515 millions of dollars contracted in 1862 was issued on this principle, at 6 per eent., and so with other loans between that year and 1868. In European states, however, the risks of embarrassment are too great to permit of the application of this method on an extensive scale; and for loans of great amount the methods most likely to yield satisfactory results are loans bearing quasi-perpetual interest, or those repayable by instalments on the basis of half-yearly drawings within a certain period.

What are known as lottery loans are greatly favoured on the Continent, either as an independent means of raising money, or as an adjunct to any of the methods referred to above. These must not be confounded with the lottery pure and simple, in which the contributors run the risk of losing the whole of their investment. The lottery loan has been found to work well for small sums, when the interest is but little below what it would have been in an ordinary loan, and when the percentage thus set aside to form prizes of varying amounts forms but a small fraction of the whole interest payable. The principle is that each contributor to such a loan has a greater or less chance of drawing a prize of varying amount, over and above the repayment of his capital with interest.

Latterly, ©

NATIONAG DEBT

What are known as exchequer bills and treasury bills may be regarded as loans payable at a fixed period of short duration, from three months upwards, and bearing very insignificant interest, even so low as 4 per cent. They are a useful means of raising money for immediate wants and for local loans, and form handy investments for capitalists

who are reserving their funds for a special purpose.

Exchequer bonds are simply a special form of the funded debt, to be paid off generally within a certain period of years.

There are two principal methods of issuing or effecting a loan. Hither the state may appeal directly to capitalists and invite sub- scriptions, or it may delegate the negotiation to one or more bankers. The former method has been occasionally followed in France and Russia, but in practice it has been found to be attended with so many disadvantages to the borrowing state or city that the best financial authorities consider it unsound. The great banking- houses have such a command over the money-market that it is difficult to keep evena direct loan out of their hands. The majority of loaus, therefore, are negotiated by onc or more of thesc houses, and the name of Rothschild is familiar to every one in connexion with such transactions. By this method a borrowing state can assure itsclf of having the proceeds of the loan with the least pos- sible delay and with the minimum of trouble.

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is at liberty at any time to pay off its debts, and, if it can borrow at 3 per cent. to pay off a 6 per cent. debt, it may with perfect justice offer its creditors the option of payment of the principal or of holding it at areduced interest. Government debts are, how- ever, sometimes reduccd after a fashion by no means so legitimate as this; we need only refer to Turkey, where both principal and interest have been enormously reduced on a debt on which little or no interest was ever paid. Other states have been even more un- principled, and have got rid of their debts at one sweep by the

simple method of repudiation; some of the States of the American Union are notorious examples of this easy method.

When a state has a variety of loans at varying rates of intercst, it may consolidate them into a single debt at a uniform interest. For example, in 1751 several descriptions of English debt were con- solidated into one fund bearing a uniform interest of 3 per cent., an operation which gave origin to the familiar term ‘‘consols” (‘‘cousolidated funds”). In the early days of the English national debt, a special tax or fund was appropriated to the pay- ment of the interest on each particular loan. This was the original meaning of ‘‘funds,” a term which has now come to signify the national debt generally. So also the origin of the term ‘funded ” as applied toa debt which has been recognized as at least quasi- permanent, and for the payment of the interest on which regular provision is made. Unfunded or floating debt, on the other hand, means strictly loans for which no permanent provision requires to be made, which have been obtained for temporary purposes with the intention of paying them off within a brief period. Exchequer and treasury bills are included in this category, and such other moneys in the hands of a Government as it may be required to reimburse at any nioment. Where a Government is the recipient of savings banks deposits, these may be included in its floating debt, and so also may the paper-money which is issued so largely by some Governments. The unfunded debt of England is comparatively small, while in Austria and some other states it has attained formid- able and embarrassing dimensions. A state with an excessive float- ing debt must be regarded as in a very critical financial condition.

National debt, again, is divided into external and internal, according as the loans have been raised within or withont the country,—some states, generally the smaller ones, having a con- siderable amount of exclusively internal debt, though it is obvious that the bulk of national debts are both external and internal.

We referred above to various ways of reducing the burden of a debt, and also to methods of contracting loans by which within a certain period they are amortized or extinguished. Most states, however, are burdened with enormous quasi-permanent debts, the reduction or extinction of which gives ample scope for the financial skill of statesmen. A favourite method of

accomplishing this is by the establishment of what is known as a sinking fund, formed by the setting aside of a certain amount of national revenue for the reduction of the principal of the debt. Unless carefully managed, a sinking fund is likely to prove a snare. Where it is the genuine result of surplus revenue, and not of money which is in reality borrowed, the only sure method of making it accomplish its pur- pose is to sink it yearly in the discharge of debt. Where it is allowed to accumulate ‘‘at compound interest,” as in Pitt’s famous experiment, there is great danger of its being diverted from its pur- pose, and the debt increased instead of diminished. In 1786a ‘‘new sinking fund” was established in England, and certain commis- siouers appointed to carry its object into effect. With certain modi- fications in 1829, the fund continued in force till 1875, when another ‘‘new sinking fund” was established by which ultimately almost 29 millions were set aside for the annual service of the debt, the difference between the sum actually required and this fixed amount being applied to purchase of stock. This fund was to continue in operation for ten years. Meantime Mr Childers, chancellor of the exchequer, has had an Act passed (1888) for the creation of a large amount of terminable annuities (from five to twenty years), by the operation of which £178,000,000 of stock will be cancelled in twenty years. The existing 28 millions (over 29 millions in 1883-4) will continue to be the yearly charge of the debt, but, as the annuities into which it is proposed to convert a large portion of the debt fall in, more and more of this sum will be set free for the reduction of the principal of the debt. In the United States the large surplus of revenue over expenditure is regularly applied to the reduction of the debt, so that the enormous liabilities incurred owing to the civil war are being reduced with unprecedented rapidity. The sinking fund also plays a prominent part in the new arrangements which have been made with the creditors of Turkey and Egypt.

Questions as to the policy of a state contracting debt belong Debts of properly to the general subjects of finance and political economy ; different here we shall briefly deal with actual facts, the progress of the countries.

leading national debts, and their present comparative magnitudes.

The debt of the United Kingdom at the Revolution in 1688 United amounted to only £664,268, with an annual charge of £39,855, Kingdom.

During the reign of William III. this increased to the comparatively large sum of £12,767,000, with an annual charge of £1,215,324, which at the acccssion of Gcorge I. had grown to £86,000,000 and

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Germany.

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£3,063,135 respectively. In 1727 the capital had increased to £53,979,000, while by reduction of intcrest the annual charge had diminished to £2,360,930. Partly by the operation of the sinking fund, the debt in 1739 had decreased by upwards of 7 millions, but the wars which followed left it at the treaty of Aix-la-Chapelle in 1748 at the sum of £77,488,940. By the end of the Seven Years' War, however, in 1763, the debt had risen to £183, 287,940, besides terminable annuities, and the annual charge to £5,032,732. At the cominencement of the American War, 1775, the debt had fallen to £126, 842,800, but as a result of that war this was more than doubled, and the burden had grown to £273,000,000, including the capitalized value of terminable annuities. Aftcr a diminution of

about 10 millions during the nine years' peace, the long French |

wars, which terminated in 1815, left the country burdened with a debt of over 900 millions, at an annual charge of £32,645,618. With various fluctuations during the next forty years, the debt gradually diminished to a little over 800 millions. The two ycars of war with Russia cost upwards of 30 millions, and in 1857 the capital sum had risen to £838,900,000 and the annual charge to £28,681,177. In 1870 it had fallen again to 800 millions, which in 1883 had diminished to £756,376,519, with an annual charge of £29,678,672, including terminable annuities and the charge there- on, as wellas the sinking fund. As we have already pointed out, the actual capital of the British debt does not represent by any means the sums actually received by the state. During the past and the early years of the present century enormous sums were borrowed at a price far below par, the

difference adding many millions to the actual burden of the debt. At the same time some relief has been obtained from this burden by judicious conversions into lower- priced stock and the creation of terminable annuities. For the relations between the South Sea Company and the Bank of England and the British uational debt, we must refer to the articles BANK- Ing and Finance. In the above estimates we have taken no account of the indebtcdnesses of cities, counties, and other local divisions, which can scarcely be regarded as included in the debt of the nation as a whole. Were these sums added they would increase the total amount of the debt by about 150 millions.

One peculiarity of the national debt of France is that itis reckoned, not according to capital, but according to rente or interest; so that any estimatcs based on rente must be regarded as approximate. Another peculiarity is the minute distribution of the consolidated debt among a multitude of creditors, most of whom are French ; this arises from the fact that the shares in French debt may be subdivided into minute parts, and an investor may thus purchase a few francs' worth of rente. Thus in 1883 the number of holders of rente was over 4,000,000. The debt of France can be traced as far back as 1875, and at the death of Louis XIV. in 1715 it is estimated to have amounted to a capital of £124,000,000, though this was arbitrarily reduced in the following year to 80 millions. The republican Government of 1793 cancelled nearly the whole of the then existing debt, reducing it to a capital of £32,000,000, with a rente of £1,600,000. During the empire, notwithstanding Napo- leon's extensive wars, the debt had only grown to £70,645,000, including a floating debt of 20 millions. – Under the Bourbons, what with war-levies and constant deficits, it grew rapidly, and in 1830 stood at £141,770,000. To this the Orleans dynasty added 40 millions, leaving the debt in 1848 at 182 millions. During the four years of the republic this grew to £245,250,000, while the enormous deficits and the wars of the second empire raised it to £550,000,000 in December 1870. The further cost of the German war, with its enormous indemnity and the foreign occupation of 1870-73, added upwards of 300 millions to this. Since then the French debt has steadily grown, and in 1883 stood (capitalizing all classes of debt) at about £1,000,000,000, with an annual charge of £52,722, 300,—the largest in the world.

In 1763, at the end of the Seven Years' War, Austria had a debt of only £15,000,000; but, as it is a country of almost constant deficits, this sum has rapidly increased. In 1815 it was £82,500,000; in 1830, 108 millions; in 1848, 125 millions; in 1862, after the French war, £252,671,860, to which the war with Prussia added 40 millions in 1866. Since then it has grown apace, and in 1883 stood at £380,000,000, including floating debt, paper-money, and Austria's special liabilities, amounting to £105,700,000, but excluding the special debt of Hungary, which amounted to over 104 millions ; Hungary, besides, contributes three-tenths to the interest of the common debt, this intercst in 1883 amounting to £1 2,024,070, in addition to over 2 millions for Austria's special debt.

The debt of Prussia in 1800 was only £5,250,000, which as a result of the French wars grew by 1820 to 31 millions. By 1842 10 millions were paid off, but in 1866 it had risen to 42 millions, partly from deficits, partly from war preparations, and partly from money sunk in the construction of railways. The war with Austria, and the annexations in 1866, raised it by 1870 to £56,400,000. Since then it has ncarly doubled, and in 1882 had reached the sum of £102,984,071, with an annual charge of £4,381,032. Much of the debt of Prussia has, however, been contracted for railways and the development of the resources of the country, and is in fact

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nearly covered by the revenue of the state-railways, domains, and miues. The German empire, as such, had no debt at the time of its re-establishment in 1870, though one has sincc been created ; in 1883 the total funded debt was £18,500,000 at 4 per cent. interest, There was also an unfunded debt consisting of state treasury bills amounting to £7,698,210. The expenscs of the French war were far more than covered by the indemnity, while the various invested funds of the empire amounted to £37,390,523. Besides Prussia, each of the German states has its own special debt. In all these amounted to about 170 millions, most of this sum having been borrowed for the construction of railways, so that the actual burden is comparatively small. Thus the total debt of the empire and of the states composing it is only a little over 300 millions.

It is difficult to obtain any trustworthy figures as to the debt of Russia,

Russia. The history of its financc is a history of almost continual deficits, largely covered since the time of Catherine II. by the issue of paper roubles, which at her death amounted to about 30 million pounds sterling, and in 1817 to 125 millions. The total debt was first stated for 1853, when it was given as 125 millions, including paper-money. In 1858, aftcr the Crimean War, it was 240 millions, and in 1869, including the floating debt, 300 millions. In 1880 it was estimated at 640 millions, one-third of which was paper roubles. Were the depreciated rouble taken at par, the sum would be nearly half as much again. The interest on the debt in 1880 amounted to 17 millions, and in the budget for 1882 the total charge of the debt was set down at over 28 millions.

In 1876 the debt of Turkey stood at 296 millions, but since then, by a process of reduction, it has been brought down to 150 millions, besides an internal debt estimated at 20 millions.

The united kingdom of Italy began in 1860 with a debt of 974 million pounds sterling, which, mainly through continual deficits, but partly by the construction of railways, had grown to 4464 millions in 1881, with a net interest of 17 millions, a heavy burden on one of the poorest countries of Europe.

Like Austria, Spain has been a country of constant deficits, combined with frequent repudiations and chronic inability to mcet the claims of creditors. Spain was deeply in debt so long ago as the 16th century ; the amount in 1745 was 9 millions sterling, which was repudiated by Ferdinand VI. A commission in 1822 reported the debt at 140 millions, but in 1822 a second junta reduced it to 52 millions. In 1851, with the floating debt, the amount was 113 millions, one half of which was declared passive, bearing no intercst. In twenty years this had more than doubled, being in 1870 £237,400,000, with an annual charge of £6,735,000. In 1881 the capital sum had increased to 512 millions, but by a pro- cess of conversion this was to be reduced to 240 millions, according to official statement, bearing an annual charge of £9, 500,000.

Portugal has for its size a large debt, the result also of vicious Portugal.

financial administration. It began in 1796 with £900,000, which in 1854 rose to 20 millions, in 1866 to 48 millions, in 1871° to

£64, 333,000, and in 1881 to £97,512,000, with au annual charge of

£3,065, 285.

Greece began her independence by becoming a debtor in 1824 for £800,000, and her borrowings since have loaded the little kingdom with a debt of 15 millions, the interest on which has never been regularly and fully paid. Part of the debt is guaran- teed by England, France, and Russia.

The debt of Holland began in the 16th and 17th ccnturics in her Holland.

struggle with Spain and wars with England, andin 1778 the Dutch were oppressed with a debt of 62 millions, which by 1814 had risen to 144 millions, the annual charge per head of population being over 30s. By 1851 the capital was reduced to 1024 millions, which has gone on steadily decreasing, and in 1882 the capital sum was £78, 442,370, with an annual interest of £2,419,222, being about 12s. per head, thongli the revenue of the state railways makes it somewhat less. A sinking fund of £833,000 is annually devoted to the redemption of the debt. millions taken over from Holland after 1830, which, after growing to 39 millions and again falling by the operation of the sinking fund to £24,400,000 in 1865, has since steadily grown to about 72 millions in 1882, including the railway purchases, the annuities granted for which represent about 13 millions. Most of the remainder of the debt is covered by the proceeds of thc various public works for which it has been raised.

The debt of Denmark was £4,150,000 in 1821.

Turkey.

ltaly.

Spain.

Greece,

The debt of Belgium began with 10 Belgium.

Partly through Den-

deficits, partly through war with Prussia, and partly owing to the mark.

construction of state railways, this grew to £14,862,465 in 1865. This declined to £9,629,257 in 1880, but subsequent loans raised it to over 11 millions in 1882, the annual charge being £554,400. So much of the debt, however, is causcd by productive investments that the annual burden is only 2s, a head: “Only £700,000 of the debt is external.

The existing debt of Sweden began with a railway loan of Swedet.

£1,228,575 in 1858, and nearly all her subsequent loans have been contracted for similar purposes, the total dcbt in 1882 being 125 millions. So much of this is covered by the procecds of the railways that the annual burden is Iess than 9d. per head of population.

| Norway.

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SA TY ORW AL’ DEBT

The debt of Norway, which has grown from £1,656,315 in 1871 to £5,806,222 in 1882, has also been largely contracted for railways, though the nct annual charge pcr head is 2s, 6d.

Switzerland in 1882 had a nominal debt of £1,477,881, more than covered by the “federal fortune” or property belonging to the state. The separate cantonal debts amounted in all to 12 millions sterling, in most cases also covered by the proceeds of cantonal property.

Outside Europe we can only refer to the progress of the debts of the United States and India. The former began their carcer as a federal republic with a debt of 15 millions sterling (1791), on which there was little increase till 1816, when it rcached 25 millions, which in 1835 was almost extinguished. The debt, however, rose again, but never exceeded 14 millions till 1860, the

year before the civil war, when it reached 18 millions. During the next four years the debt rose rapidly, and after the conclusion of the war in 1866 the country was saddled with a debt of £556,685,175. This has gone on decreasing since with wonderful rapidity, on account of the systematic application of the large surplus revenue to its reduction, and in 1882 it had sunk to £383, 662,598, being at the rate of over 10 millions a year. At this rate the debt would be

extinguished within forty years. Each of the States has, besides, a debt of its own, these amounting to about 57 millions sterling in

1882.

The debt of India, as might be expectcd from its peculiar con- India,

ditions, far exceeds that of any other British dependency. During the early years of the century there were considerable deficits in the revenue owing to the various wars, and these by 1820 had reached over 5 millions. In 1834, taking the nominal value of the rupec as 2s., there was a total debt of £41,350,952. When the administration was taken over by the imperial Government there was a debt of 81 millions (1859), which, with slight fluctuations, has gone on increas- ing, until in 1882 it had reached £156,820,614, with interest of about 45 millions. Were the Government guarantees of railway and other undertakings added, this would raise the liabilities of the country to about 250 millions. The large receipts from productive investments, however, considcrably reduce the net burden of the debt, which has fallen from 94d. a head in 1871 to about 5d. at the present time.

In the following table we give a list of the leading national debts (1882 and 1883), with various other items, by which some idea nay be formed of their comparative burdensomeuess :—

Table of Leading National Debts.

Per Head

Annual Debt 0 Population, | Charges. £ Ls: ids £ MEN GSAKGIMEAOM.....seseeverseeescevees 756,376,519 21 9 0 29,678,672 British Possessions— LJ \inns0000:. c 000 ESOC EEE EEE eee eee 156,820,614 015 9 4,558,100 PRPS Aer sscssccs ss cnvocseccessccaevas 95,988,682 338 17 7 4,552,000 PME MMI tence eaios os ROOIOMV sc. ccsucccssascssscesessenses 15,441,700 10 6 0 818,700 DEN er Re feces css sssecscvsseescevgesss 1,631,700 40 0 76,741 France. ....| 1000,000,000 2612 0 52,722,300 STOIGGIE.....ssseeees -| 640,000,000 6138 0 28,000,000 ‘Austria-Hungary. 474,759,955 12 10 11 22,027,805 ENV ye cso -.5ssese «+ 446,502,440 | 1514 0 19 748,071 United States…... 383, 662,598 7 ie) 10 17,775,482 BRUM css. 25.js.c00s vedo 03 240,000,000 14 9 0 9,500,000 DMM acces cccenseee saccesees 149,687,434 Gq ey 2,000,000 (?), 7 0 cross SUNOCO Ee – 109,016,350 1915 0 4,948,023 ROM ees ssc cc cscs occsecesevvessones 102,984,071 315 6 4,381,032 Re sce ccasccsccssosscasesesor 97,512,000 20 11 0 3,065,285 (0000010 :o99068000000000 OSCE eee Eee 85,355,660 810 8 4,850,000 Ben ioc cccsecccccssesecsustesss 78,442,370 19) “Al ¥ 2,419,299 ROMEO eect cc cessccxsc-cenes+seeccecccces 72,222,665 13 10 9 8,512,115 MEMO iss saycocccsietsaacesecee esses 70,168,418 i 19) 4 5,494,369 PMISEMUMS REPUDLIC.....ccsecesceeee 29,427,000 ll 11 8 2,594,000

down at about

The total debt of the British empire may be set 1080 millions sterling, or at the rate of about £4, 6s. per head of the population of the empire. The gross debt of all the states of the world is estimated at about 5200 millions in 1882, or about £6

per head. In some of the Central aud South American states it is seareely possible to obtain the actual amount and burden of the debt, as the interest has remaincd unpaid for years. For example, the debt of Costa Rica is equal to £22, 8s. per head, but as no in- terest has been paid for years, the actual burden is nil. In the case of Honduras, if the overduc interest were added to the outstanding debt, the burden per head would be something like £38. Most of those states, however, have been defaulters, and have sought to eseape the burden of thcir liabilities by not meeting them. The classification given by Mr Dudley Baxter in 1874 (Jour. Stat. Soc.) Is still (except as

regards the United States) essentially correct. Tle classified the boriowing states into four categories, according to the rate of interest on the market-price of their stocks:—(1) low Interest states, 3 and 4 per cent.—United Kingdom, Denmark, Molland, Belgium, Germany, India, Canada, Australasia, Sweden ; (2) moderate interest, 5 to 64 per cent.—Morocco, United States, Brazil, Russia, France, British African colonies, Chili, Argentine Republic ; (3) high intercst states, 6% to 10 per cent.—Portugal, Japan, Hungary, Austria, Colombia, Roumania, Uruguay, Italy, Cuba, Egypt, Pern, Ecuador, Turkey (states whose expenditure exceeds their income, and whose other circumstances show some Tisk to lenders); (4) excessive interest, 14 to 66 per cent.—Guatc- mala, Bolivia, Spain, Mexico, Costa Rica, Paraguay, Venezuela, San Domingo, Greece, Honduras (states of unsettled governments and finances, and threatened or actual default of interest). Most of the last class have been or are defaulting states, and among them, In this respect, should be classed Peru and Ecuador.

The above table cannot be said to represent the real relative amounts and burdens of the various national debts. For example, the interest per head of the British debt is 17s., while that of

Ussia 1s 5s. 10d., of the United States 7s., of Australasia 31s. 9d., and of Egypt 18s. 4d. But it is evident that these figures give ho adequate idea of the real burden, —that the average Englishinan ii more easily afford to pay his 17s. a year, the Australasian his 31s. 9d., and much more the average American his 7s., than the ai. Russian his 5s. 10d., or the poor Egyptian his 18s. 4d. It 1as been sought (Fenn’s Compendium) to show the real comparative

Imports and

Per Revenue |Expenditure| Imports Exports iamonts Population. per Head. | per Head. | per Head. per Head. per ae SS Bs Tl, aa 1S) ad. oo Sade 8 te ah £ s. d. £ s. od. 017 0 2 39) 2 810 ll 7 8 8 0 1915 0 0 0 5} OQ % 4 Or 7% 99 06 3 O 8 014 0 111 9 Ti oe 8) 614 1 19 0 0 17 8 0 36 8 0 0 8 8 ie 3a: BS ig % 417 5 4 611 G) we dl 010 11 3 4 6 316 6 G8) ip 216 3 819 8 (8) 1 5 6 1441 514 3 23 7 vi ie tt) 1 8 0 3 0 0 310 4 5 5 0 316 8 ols 0 5 10 019 4 Ls 38 014 9 015 9 110 G 011 8 2) 10) 40 Dy 3. 10 114 8 117 10 312 1 013 10 2 © 4 2) 108 ot ee 113 6 ay 7 Jt iO 7 0 112 0 10″

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indebtedness by readjusting the capital sums on a 5 per cent. basis. In this way the British debt would be represented by about 460 millions; that of France by 780 millions; Austria, 226 millions; Russia, 4854 millions ; Italy, 4324 millions; United States, 225 millions ; India, 1184 millions ; Belgium, 534 millions ; Holland, 50 millions ; Japan, 93 millions ; Egypt, 99 millions. If, moreover, from these sums be deducted the amount covered by the net earn- ings of reproductive investments, a considerable reduction would have to be made in some cases in the amounts to be provided for by taxation. In tlie case of Prussia, for example, the whole of the debt in 1882 was met by the proceeds of reproductive investments. The Cape Colony, on the 5 per cent. basis, had only half her nomi- nal debt to provide for by taxation, and so more or less with the Australian colonies ; the debt of India would thus be reduced by one-third, of Belgium by about one-half, Norway the same, Sweden by about nine-tenths. Perhaps the most satisfactory test, accord- ing to the above table, of the relative burden of the various debts, is a comparison between the interest per head and the annual value per head of exports. Compare, for cxample, Great Britain with 17s. per head of interest and £8, 8s. of exports, Australasia 31s, 9d. and £17, 8s., Canada 8s, 8d. and £4, 6s. 11d., the United States 7s. and £3, 1s. 7d., and Holland 11s. 9d. and £12, 13s. with France and its £1, 8s. of interest per head and £38, 16s. 8d. of exports, Russia 5s. 10d. and 15s. 9d., Austria-Hungary 11s. 8d. and £1,17s, 10d., Spain 11s. and £1, 8s. 5d., Egypt 18s. 4d. and £2, 8s., Portugal 12s. 11d. and 19s. 5d., Japan 8s. and 8s. 6d.,—and some idea will be obtained of the different conditions of the countries to meet their national liabilities. But even this comparison does not give anything like a complete idea of the real burden of national debt, and should be supplemented by reference to the total income of each nation from all sources and the total amount of its capital, supposing all its assets were realized. Estimates, which can only be regarded as roughly approximate, have been made of the value of national capital of the leading states and the amount of their national income.

Taking, then, the capital of the United Kingdom at 10,000 millions sterling, we find that the national debt, 756 inillions, bears to this the proportion of only a little over 73 per cent.; and even if we added the local debts the proportion would be only about 9 per cent. Taking again the national income at 1200 millions, we find that the annual charge of the debt is only 2} per cent. of this sum, and even if we added the charges of the local

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debts the percentage would scarecly be above 8. The whole national and local debt conld be paid off by about two-thirds of a year's income ; as they could be also by the produce of three years' exports.

The national capital of France may be roughly estimated at 7500 millions sterling, to which the debt, 960 millions, bears the large proportion of 12°8 per cent., while if the local debts be included the proportion rises to 144 per cent. The incoine of France may be taken at 950 millions, to which the annual charge of the debt bears the proportion of 3°65 per cent., and that of the local debts would raise it to 4 at least. It would take nearly five years even of the procecds of the '' general exports" of France to pay off the national debt.

The national capital and income of the United States increase with unexampled rapidity. The former cannot be less at present than 7000 millions, and the latter 1500 millions (more than even that of the United Kingdom). The national debt is 5 per cent. of the former, and the total federal and State debts only 6 per cent., while the interest (including that of the Pacific Railway loans, for which there are reimbursements), £17,775,000, is only 1°2 per cent. of the rapidly increasing income. Onc-fourth of a year's income would pay off the whole of the debt.

If we take the total debts of the German empire and all the states at 300 millions, and the national capital at 4500 millions, we find the former only 6 per cent. of the latter. Belgium and Holland are equally favourably situated in this respect, while in the Scandinavian countries the proportion of debt to national capital is only about 2 per cent. Coming to Russia, we

find the debt bears the enormous proportion of 28 per cent. to the approxi- inate national eapital, while the interest is 5 per cent. of the national income. Estimating the latter at 560 millions, we sce that one year would not suffice to pay off the 640 millions of debt. Austria-Hungary is not quite so bad, as the debt is only 17 per cent. of the capital, and it could be nearly paid off by a year's income. Italy secms even in a worse state than Russia, as her debt is esti- mated at 27 per cent. of her capital, which it would take two ycars' income to pay off, while Spain and Portugal (even with the greatly reduced prineipal of the former) have a combined debt amounting to 29 per cent. of their united national capitals. India and the British colonies are nearly as favourably situated in this respect as the mother-country, while the rapid devclopment of the enormous resources of Canada and the Australian colonies tends constantly to diminish the proportion of debt to capital.

Other elements which ought to be taken into consideration in estiniating the real burden of national debt, besides the above and the increased development of the world's resources, are the increase of population and the depreciation of the precious metals. Thus, while the annual charge of the British debt per head was 34s. 8d. in 1815, it was only 16s. 10d. in 1882, and this not solely from the decrease of the debt, but even more largely by the increase of the population. Moreover, owing to the decreased value of money, 16s. 10d. in 1882 is in reality very considerably less than the half of 34s. 8d. in 1815. Thus even by the operation of the unearned in- crement, not to speak of the increasing value of reproductive investment, the natural tendency is for the actual burden of national debt to decrease every year, unless itis recklessly increased by fresh loans.

See Leroy-Beaulieu, Traité de la Science des Finances; Rau, Finanzwtssen- schaft; M'Cuiloch, On Taxation and the Funding System; Hamilton, Znquiry concerning the Rise and Progress of the English Debt; 'Saylor, iZistory of Taxation in England; Fenn, Compendium of English and Foreign Funds; A. Johnstone Wilson, The National Budget; Dudley Baxter, National Debts, and his paper in the Stat, Soc. Jour., 1874; The Statesman's Year- Book, 1883; M. Block, Annuaire dev Economie Politique et dela Statistique, 1883; Dictionnaire Général de Polt- tique; and Statistique de la France comparée avec les divers pays de UV Europe; Cohen, Compendium

of Finances; J. Garnier, Traité de Finances; papers by Leone Levi (1862), Hyde Clarke, and R. Giffen (1878), and others in Jour. of

Stat. Soc.; paper by Ernest Seyd, in Soc. of Arts Jour., 1878; the parliamentary reports on Public Income and Expenditure, 1688-1869. (J. S. IK.)

NATOLIA, or Anatotia. See Asta Minor.

NATRON. See Sopa.

NATURALIZATION. See ALrEn,

NAUDE, Gasrret (1600-1653), French librarian and scholar, was born at Paris in February 1600. An intense love for books caused him to accept, when only twenty years of age, the appointment of librarian to the president De Mesines, whom: he left in 1626 to finish his medical studies at Padua. On returning to Paris in 1628 he was chosen to deliver a panegyrical discourse on the medical school. The credit thus acquired brought him under the notice of Cardinal Bagni, who took him to Rome and gave him charge of his collection. On Bagni's death in 1641 he became librarian to Cardinal Barberini, under whose patronage he commenced a wearisome controversy with the Benedictines concerning the authorship of De Lmitatione

Christi. Richelieu, wishing to secure the services of Naude, recalled him to Paris in 1642, but, the great minister dying a few months later, Naudé accepted a similar offer on the part of Mazarin, and for the next ten years his unwearied energy was directed to the task of bringing together that noble assemblage of books since known as the Bibliothéque Mazarine (see LIBRARIES, vol. xiv. p. 525), making for the purpose expeditions to all parts of Europe. The troubles of the Fronde caused him to assent to the wish of Queen Christina that he should become her librarian at Stockholm. He was not happy in Sweden, however, and on Mazarin's appeal that he should reform his scattered library Naudé returned at once. But his health was altogether broken, and he died on the journey at Abbeville in July 1653.

The friend of Gui Patin, Gassendi, and all the liberal thinkers of his time, Naudé was no mere bookworm ; each of his books shows traces of the critical spirit which made him a worthy member of the company of humorists and scholars who prepared the way for the better known writers of the “siécle de Louis XIV.”

Ineluding works edited by him, a list of ninety-two pieces is given in the Naudwana. The chief are Le Marfore, ow discours contre les libelles, Paris, 1620, very rare, reprinted 1868; Jnstruetion & la Franee sur la vérité de Vhistoire des Freres de la Roze-Croiz, 1623, 1624, displaying their impostures ; Apologie pour tous les grands personnages faussement soupconnez de magtie, 1625, 1652, 1669, 1712,—Pythagoras, Socrates, Thomas Aquinas, and Solomon are ainong those defended ; Advis pour dresser une bibliothéque, 1627, 1644, 1676, translated by J. Evelyn, 1661, full of sound and liberal views on librarianship; Addition a Uhistoire de Louys XT., 1630 (this includes an account of the origin of printing) ; Bibliographia politiea, Venice, 1638, &c., in French 1642, a mere essay of no bibliographical value ; De studio liberali syntagma, 1632, 1645, a practical treatise fonnd in most collections of directions for studies; De studio militari syntagma, 1637, esteemed in its day ; Considéra- tions politiques sur les coups d’état, Rome [Paris], 1639, first edition rare, augmented by Dumay, 1752 (this contains an apology for the massacre of St Bartholomew) ; Biblioth. Cordesianz Catalogus, 1648, classified ; Jugement de tout ee que a été imprimé contre le Card. Mazarin [1649],;Naudé’s best work, and one of the ablest defences of Mazarin ; it is written in the form of a dialogue between Saint- Ange and Mascurat, and is usually known under the name of the latter.

Authorities. —L. Jacob, G. Naudzi tumulus, 1659; P. Hallé, Elogium Naudet, 1661 ; Niceron, Mémoires, vol. ix.; L. Jacob, Tratcté des plus belles bibliotheques, 1644; Gui Patin, Zetires, 1846; Naudxana et Patiniana, 1703; Saintc-Beuve, Portraits Litt., vol. ii.; Revue des Deux Mondes, 1886; A. Franklin, {Zistoire de la Bibl. Mazarine, 1860.

NAUMACHIA, the Greek word denoting a naval battle, was used by the Romans as the name for mimic sea-fights which were shown as a spectacle to the public. The first that is recorded was given by Julius Ceesar on an

artificial lake which he constructed in the Campus Martius. After this naumachie became a favourite spectacle for the emperors to give to the people. Claudius made a great one on the Lacus Fucinus, Nero another in the amphitheatre at Rome. Gladiators or condemned criminals fought in these battles ; in later times even volunteers took part in them. The combatants were often dressed in costume: Augustus showed a naumachia of Athenians and Persians ; Titus acted a sea-fight between Corinth and Corcyra.

NAUMBURG, the chief town of a circle in the district of Merseburg, Prussian Saxony, and the seat of the pro- vincial law courts, is pleasantly situated on the Saale, near its junction with the Unstrut, in the centre of an amphi theatre of vine-clad hills. The cathedral, an imposing building in the Romanesque Transition style (1207-42), has a Gothic choir at each end, and contains some interesting medizeval sculptures. There are also three other Protestant churches, a Roman Catholic church, a gymnasium, a real- school, an orphanage, and two or three hospitals. The town-hall was originally the residence of the bishop. The inhabitants, who in 1880 numbered 17,868, are chiefly employed in producing wine (12,000 gallons yearly), but also manufacture cotton and woollen fabrics, chemicals, combs, and leather. Trade, facilitated by the navigable river, is

mainly concerned with wine, grain, vegetables, and dried fruit. An annual fair, founded by the emperor Maximilian in 1514, is still held here, but is now of little importance. Near Naumburg are Késen, a favourite watering-place, and the celebrated school of Schulpforta, which has perhaps the strongest claim to the title of a German Eton.

In the 10th century Naumburg was a stronghold of the mar- graves of Meissen, who in 1029 transferred to it the bishopric of Zeitz for protection against the Wends. In Saxon history Naum- burg is memorable as the scene of various treaties; and in 1561 an assembly of Protestant princes was held there, which made a futile attempt to cenient the dissensions of the Protestants on doctrinal points. In 1564 the last bishop died, and the

bishopric fell to the elector of Saxony. In 1631 the town was taken by Tilly, and in 1632 by Gustavus Adolphus. It became Prussian in 1814. An annual festival, with a procession of children, is referred to an apocryphal siege of the town by the Hussites in 1432, but is prob- ably connected with an incident in the Brothers' War, between elector Frederick of Saxony and his brother Duke William (1447- 51). Lepsius the antiquary and his more distinguishcd son the Egyptologist were born at Naumburg.

NAUPACTUS. See Lepanro.

NAUPLIA, a town in the Peloponnesus, at the head of the Argolic Gulf. In the classical period it was a place of no importance, and when Pausanias lived, about 150 a.p., it was deserted. Ata very early time, however, it seems to have been of greater note, being the seaport of the plain in which Argos and Mycene are situated. A hero Nauplius took part in the Argonautic expedition; another was king of Eubcea. The mythic importance of the town revived in the Middle Ages, when it became one of the chief cities of the Morea. It was captured in 1211 by Godfrey Villehardouin with the help of Venetian ships; a French dynasty ruled in it for some time, and established the feudal system in the country. In 1388 the Venetians bought Argos and Nauplia. In the wars between Venice and the Turks it often changed masters. It was given to the Turks at the peace concluded in 1540; it was recap- tured by Venice in 1686, and Palamidhi on the hill over- hanging the town was made a great fortress. In 1715 it was taken by the Turks; in 1770 the Russians occupied it fora short time. The Greeks captured it during the war of independence on December 12, 1822, and it was the seat of the Greek administration till 1833, when Athens became the capital of the country. The population in 1879 was 4598.

NAUTILUS. For the Paper Nautilus (Argonauta argo) See vol. vi. p. 736; and for the Pearly Nautilus (V. pom- pilius) see vol. xvi. p. 670 sq.

NAVARINO, or Neocasrro, a seaport of the Morea, Greece, in the nomarchy of Messenia, stands on the south shore of the Bay of Navarino, in 36° 54' N, lat. and 21° 4\' E. long. It consists of a citadel, situated on a high rock, and a lower town,—the whole being surrounded bya wall. The population is under 2000. The bay, one of the best harbours in Greece, about 4 miles in length by 2 In breadth, with a depth ranging from 12 to 26

fathoms, 18 protected towards the west by the long and narrow island of Sphagia, the ancient Sphacteria, to the south-east of which lies the entrance, now nearly a mile wide, but anciently much narrower (Thucyd. iv. 8).

The word Navarino is explained as equivalent to Avarino, and is said to record an Avar settlement made here in the 6th century. The name Neocastro distinguishes the place from Paleocastro, the alleged site of the ancient Pylus, on the northern shore of the bay. Sphacteria was the scene of the famous blockade and defeat of the Spartans in 425 B.c.; and it was by the victory of the combined fleets of Great Britain, France, and Russia over those of Turkey and Egypt in the Bay of Navarino on October 27, 1827, that the inde- pendence of Greece was virtually secured.

NAVARRA, an inland province of northern Spain, lies between 41° 57’ and 43° 18’ N. lat., and between 40’ and Tl’ 15’ 50” W. long.,—its greatest length from north to South being 90 miles, its breadth from east to west 86

miles, and its area 4046 square miles. The population in 1877 was 304,184. It is bounded on the N. by France (Basses Pyrénées), on the E. by Huesca and Zaragoza, on the 8. by Zaragoza and Logrofio, and on the W. by Alava and Guipuzcoa. It is traversed from east to west by the Pyrenees and by the Cantabrian mountains, their continua- tion in the west; and almost the whole of the province is overrun by the ramifications of this great central cordillera, which on the north-east especially presents an almost impassable barrier, and encloses numberless secluded past- oral valleys. From Navarra there are only three practic- able roads for carriages into France,—those by the Puerta de Vera, the Puerta de Maya, and Roncesvalles. The highest summits in the province are those of Altoviscar (5380 feet) and Adi (5220 feet). Southward of a line drawn from Sanguesa by Tafalla to Estella the country presents a series of descending but comparatively level terraces, until the Ebro isreached. The chief river flowing towards the Atlantic is the Bidasoa, which rises near the Puerta de Maya, and after flowing southwards through the valley of Baztan takes a north-easterly course, and for a short distance above its outfall at Fuenterrabia constitutes the frontier between France and Spain (Guipuzcoa); by far the larger portion of the province has its drainage to the Mediterranean through the Ebro, whose main feeders

there are the Ega and the Aragon with its tributary the Arga. The geology of the province will be best explained in connexion with that of the Pyrenzan system and of the country as a whole. Gypsum, limestone, freestone, and marble are quarried ; there are also mines of copper (near Leiza), lead (Leiza and Vera), and iron (Goizueta and the valley of Aezcoa), employing a considerable popula- tion; and rock-salt is mined at Funes and Valtierra. There are numerous mineral and thermal springs, but none of more than local fame. The hilly districts are almost entirely appropriated to forests and pasture, the most common trees being the pine, beech, oak, and chestnut. Much of the lower part of the province is well adapted for agriculture, producing the various cereals in remunerative abundance ; the principal fruit grown is the apple, from which cider is made in some districts ; hemp, flax, and oil also occur, and the cultivation of the mulberry for the silk-worm is not unknown. Game, both large and small, is abundant in the mountains, not even the bear being wholly extinct ; and the streams abound with trout and other fish. The manufactures of the province, which are not important, include cloth and paper; wool, iron, salt, hides, and liquorice are the chief exports. Administra- tively Navarra is divided into five ‘“merindades” or departments,—those of Pamplona, Tafalla, Olite, Estella, and Sanguesa. The capital is Pamplona, with a popula- tion of 25,630. It is connected by rail on the west with Alsasua on the trunk line between Madrid and San Sebastian, and with the Ebro valley in the south. There are no Other railways in the province. Besides Pamplona, the only ayuntamiento with a population exceeding 10,000 is Tudela (10,086); Baztan comes next with 9931.

Navarra, or Navarre, along with Guipuzcoa, at the time of the Roman conquest formed the territory of the Vascones, which after- wards became part of Hispania Tarraconensis. Never thoroughly subjugated by the Romans, the Basques or Navarrese offered con- siderable resistance to the Visigothie kings in the 5th and 6th centuries, and afterwards in the 8th, with more success, to the Moors. In 778 Charlemagne succceded in imposing his yoke upon them, but with the assistance of their old enemies they soon after- wards asserted their independence of the Franks. Garcias Ximencz (860) is named as having been their first king. In the beginning of the 11th century Sancho III., el Mayor, had made himself sove- reign of Castile and Leon as well as of Sobrarve and Aragon, but before his death in 1035

divided his extensive dominions into four unequal parts, Navarre being assigned to his son Garcia III. Garcia's son Sancho IV. was overthrown in 1076 by a cousin, Sancho I. of Aragon, in whose line the two crowns remained united

until the clection of Garcia Ramirez on the death of Alphonso I. (VII. of Castile). In 1234 Theobald, third count of Champagne, was crowned at Pamplona as Theobald I., having been adopted as heir by Saneho VII., and through Joanna, the granddaughter of Theobald, who married Philip the Fair of France in 1284, the erowns of France and Navarre became united in the person of Louis X. They were again separated on the death of Charles IV. of Franee without male issue; Joanna II., the daughter of Louis X. and wife of Philip, count of Evreux, was crowned queen of Navarre at Pamplona in 1329. Her great-granddaughter Blanche was married first to Martin of Sicily and afterwards to John, son of Ferdinand of Aragon ; the second after her death made himself king of Navarre in spite of the claims of his son Charles, taking the title of John II]. He 'was followed in 1479 by his daughter Eleanor, the wife of Gaston de Foix, and after her death in the same year Francis Phebus, her grandson, succeeded, being crowned in 1482. At his death (1483) his sister Catherine, wife of Jean d'Albret, naturally succeeded, but, the latter having fallen under the papal ban, Ferdinand the Catholic in 1512 seized the whole of what is now Spanish Navarra, only the small portion of the king- dom on the French side of the Pyrenees being retained by Henry II., son of D'Albret (1516). Her grandson, Henry III. of Navarre, became king of France (Henry IV.) in 1589, and united non-Spanish Navarre to the French erown in 1607.

NAVARRETE, Juan Fernanpez (1526-1579), sur- named El Mudo (The Mute), an eminent Spanish painter of the Madrid school, was born at Logrofio in 1526. The illness which deprived him of his hearing occurred in early infancy, but at a very early age he began, it is said, to express his wants by sketching objects with a piece of charcoal. He received his first instructions in art from Fray Vicente de Santo Domingo, a Hieronymite monk at Estella, and afterwards he visited Naples, Rome, Florence, and

Milan. According to the ordinary account he was for a considerable time the pupil of Titian at Venice. In 1568 Philip II. summoned him to Madrid with the title of king's painter and a salary, and employed him to execute pictures for the Escorial. The most celebrated of the works he there produced are a Nativity (in which, as in the well-known work on the same subject by Correggio, the light emanates from the infant Saviour), a Baptism of Christ (now in the Madrid Picture Gallery), and Abraham Receiving the Three Angels (one of his last performances, dated 1576). He executed many other altarpieces, all characterized by boldness and freedom in design, and by

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'the rich warm colouring which has acquired for him the

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surname of "the Spanish Titian." He died at Toledo in February 1579.

NAVARRETE, Martin Fernandez ve (1765-1844), Spanish historian, was born at Abalos, Logrofio, in 1765, received his early education at the seminary in Vergara, Guipuzcoa, and entered the navy asa midshipman in 17380, His ship was engaged in the unsuccessful operations against Gibraltar in 1782, and afterwards in the suppression of Algerine pirates. TIll-health compelled him for a time to withdraw from active service, but he was able to devote the leisure thus forced upon him to historical research, and in 1789 he was appointed by the crown to examine the national archives with a view to the publication of a series of documents relating to the maritime history of Spain. Rejoining the navy in 1793, he was present at the siege of Toulon, and afterwards received command of a frigate. From 1797 to 1808 he held in succession various important posts in the office of the minister of marine. In 1808 the French invasion led to his withdrawal to Andalusia, and the rest of his life was entirely devoted to literature. In 1819 appeared, as an appendix to the Academy's edition of Don Quijote, his Vida de Cervantes, the best biography of the great poet and humorist that has as yet been written, and in 1825 the first two volumes of the Coleccion de los Viajes y Descubrimientos que hicieron por Mar los Espatioles desde jines del Siglo XV.,—characterized by Humboldt as "one of the most important historical monu- ments of modern times,'—were

published. The third followed in 1829, and the fourth and fifth in 1837. After the publication of his Life of Cervantes, Navarrete's literary merits received ample recognition: various public posts were conferred on him, including that of director of the hydro- graphical institute, and in 1837 he was made a senator and director of the academy of history. At the time of his death, which occurred on October 8, 1844, he was assisting in the preparation of the Coleccion de Documentos Ineditos para la Historia de Espatia. The last two volumes of the Coleccion de Viajes were published posthumously, as also were a Disertacion sobre la Historia de la Nautica (1846) and the Biblioteca Maritima Espafiola (1851).

NAVIGATION

AVIGATION is the art of conducting a ship across the ocean. It is here treated to the exclusion of seamanship, which forms a distinct subject. The present article will give, first, a view of the history of the art from the time of the epoch-making voyages of Columbus and the Portuguese, with special reference to advances made in England, and then a sketch of practical: naviga- tion as the art now stands.

Up to the time of the Portuguese exploring expedi- tions, sent out by Prince Henry, which led to the dis- covery of the Azores in 1419, and the rediscovery of the Cape Verd Islands in 1447 and of Sierra Leone in 1460, navigation had been conducted in the most rude, uncer- tain, and dangerous manner it is possible to conceive, Thousands of years had passed without the least improve- ment being introduced, except the magnetic needle about the beginning of the 14th century (see Compass and Macnetism). Prince Henry did all in his power to bring together and systematize the knowledge then obtainable upon nautical affairs; he also established an observatory at Sagres (near Cape St Vincent) in order to obtain more accurate tables of the declination of the sun. John II., who ascended the throne in 1481, followed up the good work of his grand-uncle. He employed Roderick and Joseph, his physicians, with

Martin de Bohemia, from Fayal, to act as a committee on navigation. They calculated tables of the sun's declina- tion, and invented the astrolabe, or at least recommended it as more convenient than the cross-staff. The king established forts and settlements on the coast of Africa ; that at St George

de la Mina was on the Gold Coast, showing by the position a great geographical advance. The backward state of navigation at this time is best understood from a sketch of the few rude appliances which the mariner had. He had a compass, a cross-staff or astrolabe, a moderately good table of the sun's declina- tion, a correction for the altitude of the pole star, and occasionally a very incorrect chart. The first map or sea chart seen in England was brought by Bartholomew Columbus in 1489, and the first map of England was made in 1520. Decimal arithmetic was invented by Simon Stevin about the end of the 16th century. Watches were unknown till 1530, and immediately Gemma Frizon or Frisius seized the idea for the purpose of ascertaining the difference of longitude between two places. They were too rough to be of use, and their advocate proposed to correct them by water-clocks or sand-clocks. Almanacs were first published in Poland in 1470, and in London three years later. These contained tables of the sun's declina-

| tion and that of many of the stars, and tables for finding

NAVIGATION

the latitude by the pole star and the "'pointers." There was not till 1607 any means whatever of measuring a ship's progress through the water, and none in general use till twenty or thirty years later (see Log).

The " cross-staff" appears to have been used by astro- nomers at a very early period for measuring heights and distances, more recently by seamen for measuring alti- tudes. It was one of the few instruments possessed by Columbus and Vasco da Gama. The old cross-staff, called by the Spaniards "ballestilla," consisted of two light battens. The part we may call the staff was about an inch and a half square and 36 inches long. The cross was made to fit closely and to slide upon the staff at right

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Fig, 1. angles; its length was a little over 26 inches, so as to allow the “pinules” or sights to be placed exactly 26 inches apart. A sight was also fixed on the end of the staff for the eye to peep through at the other two sights and objects

to be measured. It was made by describing the angles on a table, and laying the staff upon it (fig. 1). The scale of degrees was marked on the upper face. After- wards shorter crosses were introduced, so that smaller angles could be taken by the same instrument. These angles were marked on the sides of the staff.

Another primitive instrument in common use at the beginning of the 16th century was the astrolabe, which was more convenient than the cross-staff for taking altitudes, but was incapable of measuring distances. Fig. 2 represents an astrolabe as described by Martin Cortes. It was made of copper or tin, about one-fourth of an inch in thickness and 6 or 7 inches in diameter, and was per- fectly circular except at one place, where a projection was provided for a hole by which it was suspended. Weight was considered desirable in order to keep it steady when in use. The face of the metal having been well polished, a plumb line from the point of suspension marked the . & vertical line, which when carefully subdivided gave the horizontal line and centre. The upper left quadrant was divided into degrees. The second part Was a pointer pt of the same metal and same thickness as the circular

Fig. 2. plate, about 14 inches wide, and in length equal to the

diameter of the circle. The centre was bored, and a line was drawn across it the full length, which was called the line of confidence. On the ends of that line were fixed

. Plates s, s, having each a larger and a smaller hole, both

exactly over the line of confidence, as sights for the sun or stars. The pointer moved upon a centre the size of & goose quill. When the instrument was suspended the pointer was directed by hand to the object, and the angle read on the one quadrant only. Some years later the

other quadrant was also graduated, to give the benefit of a second reading.

Among the earliest writers who touched upon naviga- tion was John Werner of Nuremberg, who in 1514, in his notes upon Ptolemy's geography, describes the cross-staff as a very ancient instrument, but says that it was only then beginning to be introduced among seamen. He recommends measuring the distance between the moon and a star as a means of ascertaining the longitude.

Thirty-eight years after the discovery of America, when long voyages had become comparatively common, Gemma Frisius wrote upon astronomy and cosmogony, with the use of the globes. His book comprehended much valu- able information to mariners of that day, and was trans- lated into French fifty years later (1582) by Claude de Bossiére. The system adopted is that of Ptolemy. The following are some of the points of interest for the subject before us. There is a good description of the sphere and its circles; the obliquity of the ecliptic is given as 23° 30'. The distance between the meridians is to be measured on the equator, allowing 15° to an hour of time ; longitude is to be found by eclipses of the moon and con- junctions, and reckoned from the Fortunate Islands (Azores). Latitude should be measured from the equator, not from the ecliptic, ''as Clarean says." The use of globes is very thoroughly and correctly explained. The scale for measuring distances was placed on the equator, and 15 German leagues, or 60 Italian leagues, were to be considered equal to one degree. The Italian league was 8 stadia, or 1000 paces, therefore the degree is taken much too small. We are told that, on plane charts, mariners drew lines from various centres (?.e., compass courses), which were very useful since the virtue of the loadstone had become known; it must be remembered that parallel rulers were unknown. Such a confusion of lines has been continued upon sea charts till very recently. Frisius gives rules for finding the course and distance correctly, except that he treats difference of longitude as departure. For instance, if the difference of latitude and difference of longitude are equal, the course prescribed is between the two principal winds,—that is, 45°. He points out that the courses thus followed are not straight lines, but curved, because they do not follow the great circle, and that distances could be

more correctly measured on the globe. The tide is said to rise with the moon, high water being when it is on the meridian and nadir. From a table of latitudes and longitudes a few examples are here selected, by which it appears that even the latitude was much in error. The figures in brackets represent the positions according to modern tables, counting the longitude from the western extremity of St Michael. Flores is 5° 8’ farther west.

Alexandria…..... .81° 0’ N. (31° 13’) 60° 30’ E. (55° 55’) MORONS. aeons: 37 15 (37 58) 52 45 (49 46) Bab Bios dciescere ves ch 25 0 (32 82) 79 «#0 (70 25) Dantzic v0… 54 80 (54 21) 4415 (44 38) a 52 3 (51 31) 19 15 (25 54) TWD ever cieeiniet Gece cs 34 (0 (35 43) 88 45 (40 31) Reiney a… 41 50 (41 54) 36 20 (88 380)

In 1534 Gemma produced an “astronomical ring,” which he dedicated to the secretary of the king of Hungary. He admitted that it was not entirely his own invention, but asserted that it could accomplish all that has been said of quadrants, cylinders, and astrolabes,—also that it was a pretty ornament, worthy of a prince. As it displayed great ingenuity, and was followed by many similar contrivances during two centuries, a sketch is here given (fig. 3). The description must necessarily be brief.

The outer and principal sustaining eirele EPQm represents the meridian, and is about 6 inches in diameter; P, m are the poles. The upper quadrant is divided into degrees. It is suspended by ,

circle EQ is fixed at right angles to the first, and represents the equinoctial line. The upper side is divided into twenty-four parts, representing the hours from noon or midnight. On the inner side of that circle are marked the months and weeks. The third ring CC is attached to the first at the poles, and revolves frecly within it. On the interior are marked the months, and on another side the corresponding signs of the zodiac; another is graduated in degrees. Itis fitted with a groove which carries two movable sights. On the fourth side are twenty-four nnequal divisions (tangents) for measur- ing heights and dis- tances. Its use is illustrated by twenty problems ; it can do roughly all that any instrument for taking angles can. Thus, to find the

latitude, set the sights C, C to the place of the sun in the zodiac, and shut the cirele till it cor- responds with 12 o’clock. Peep through eaFE

the sights and alter Fig. 3.

the point of suspension till the greatest elevation is attained; that time will be noon, and the point of suspension will be the latitude. The figure is slung at lat. 40°, cither north or south. To find the hour of the day, the latitude and declination being known: the sights C, C being set to the declination as before, and the suspen- sion on the latitude, turn the ring CC freely till it points to the sun, when the index opposite the equinoctial circle will indicate the time, while the meridional circle will coincide with the meridian of the place. In this we may see the germ of the ‘‘ equatorial” now used in the principal observatories.

There is at present in the museum attached to the Royal Naval College at Greenwich an instrument, ticketed as Sir Francis Drake’s astrolabe, prior to 1570. It is not an astrolabe, but may be a combination of astronomical rings as invented by Gemma with other things, probably of a later date. It has the appearance of a large gold watch, about 24 inches in diameter, and contains several parts which fall back on hinges. One part is a sun-dial, the gnomion being in connexion with a graduated quadrant, by which it could be set to the latitude of the place. There are a small compass and an hour circle. It is very neat, but too small for actual use ; it may be simply an ornament representing a larger instrument. There is a table of latitudes engraved inside one lid; that given for London is 51° 34’, about three miles too much.

In 1537 Pedro Nuiiez”(Nonius), cosmographer to the king of Portugal, published a work on astronomy, charts, and some points of navigation. He recognized the errors in plane charts, and tried to rectify them. Among many astronomical problems is one for finding the latitude of a place by knowing the sun’s declination and the altitude when on two bearings, not less than 40° asunder. Gemma did a similar thing with two stars; therefore the problem

now known as a “double altitude” is a very old one..

They could do it by the globe within a degree. ‘Tio Nufiez has been erroneously attributed the present mode of reading the exact angle on a sextant, the scale of a barometer, and various other things, the credit of which is due to Vernier nearly a hundred years later. The mode of dividing the scale which Nuiiez published in 1542 was the following. The are of a large quadrant was furnished with forty-five concentric segments, or scales, the outer one graduated to 90°, the others to 89, 88, 87, ce., divisions. As the fine edge of the pointer attached to the sights passed among those numerous divisions it touched one of them, suppose the fifteenth division on the sixth

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a fine cord or wire placed at the supposed latitude. The second | scale, then the angle was 15 of 90°=15° 52’ 56”.

This was a laborious method ; Tycho Brahe tried it, but aban- doned it in favour of the diagonal lines then in common use, and still found on all scales of equal parts.

In 1545 Dr Pedro de Medina published Zhe Art of Navigation at Valladolid, dedicated to Don Philippo, prince of Spain. This appears to be the first book ever published professedly on navigation. It was soon trans- lated into French and Italian, and many years after into English by John Frampton. Though this pretentious work came out two years after the death of Copernicus, the astronomy is still that of Ptolemy. The general appearance of the chart of the Mediterranean, Atlantic, and part of the Pacific is in its favour, but examination shows it to be very incorrect. A scale of equal parts, near the centre of the chart, extends from the equator to what is intended to represent 75° of latitude ; by this scale London would be in 55° instead of 514°, Lisbon in 372° instead of 38° 42’. The equator is made to pass along the coast of Guinea, instead of being over four degrees farther south, The Gulf of Guinea extends 14 degrees too far east, and Mexico is much too far west. Though there are many vertical lines on the chart at unequal distances they do not represent meridians ; there is no indication of longi- tude. A scale of 600 leagues is given (German leagues, fifteen to a degree), By this scale the distance between Lisbon and the city of Mexico is 1740 leagues, or 6960 miles ; by the vertical scale of degrees it would be

about the same; whereas the actual distance is 4820 miles, Here two great wants become apparent,—a knowledge of the actual length of any arc, and the means of represent- ing the surface of the globe on flat paper. There is a table of the sun's declination to minutes; on June 12th and December 11th (0.s.) it was 23° 33'. The directions for finding the latitude by the pole star and pointers appear good. For general astronomical information the book is inferior to that of Gemma.

In 1556 Martin Cortes published at Seville The Art of Nawgation. He gives a good drawing of the cross-staff and astrolabe, also a table of the sun's declination for four years (the greatest being 23° 33'), and a calendar of saints' days. The motions of the heavens are described accord- ing to the notions then prevalent, the earth being viewed as fixed. He recommends the height of the pole being found frequently, as the estimated distance run was imperfect. He devised an instrument whereby to tell the hour, the direction of the ship's head, and where the sun would set. A very correct table is given of the distances between the meridians at every degree of latitude, whereby a seaman could easily reduce the difference of longitude to departure. In the rules for finding the latitude by the pole star, the star is supposed to be then 3° from the pole; it is now (1883) 1° 18' 54". Martin Cortes attributes the tides entirely to the influence of the moon, and gives instruc- tions for finding the time of high water at Cadiz, when by means of a card with the moon's age on it, revolving within a circle showing the hours and minutes, the time of high water at the place for which it was set would be indicated. He deplores the loss of the earl of Niebla and other valiant captains of Spain, before Gibraltar, in 1436, because the mariners kept no account of the tides. In this instance it was more probably the effect of current. There is a chapter upon the signs which prognosticate fair or foul weather, from Pliny and Aristotle ; another upon "shining exhalations," the "fire of St Elmo," and other old superstitions. Directions are given for making a compass similar to those then in common use, also for ascertaining and allowing for the variation, The east is here spoken of as the principal point, and marked by a cross, after that the true north,

There is a table of difference of latitude and departure in proportion to the tangent of the course.

The third part of Martin Cortes's work is upon charts ; he laments that wise men do not produce some that are correct, and that pilots and mariners will use plane charts which are not true. In the Mediterranean and Channel of Flanders the want of good charts is (he says) less inconvenient, as there they do not navigate by the altitude of the pole.

As some subsequent writers have attributed to Cortes the credit of first thinking of the enlargement of the degrees of latitude on Mercator's principle, his precise words may be cited. In making a chart, it is recommended to choose a well-known place near the centre of the intended chart, such as Cape St Vincent, which call 37°, "and from thence towards the Arctic pole the degrees increase ; and from thence to the equinoctial line they go on decreasing, and from the line to the Antarctic pole increasing." It would appear at first sight that the degrees increased in size as well as being called by a higher nuinber, but a specimen chart in the book does not justify that conclusion. It is from 34° to 40°, and- the divisions are unequal, but evidently by accident, as the highest and lowest are the largest. He states that the Spanish scale was formed by counting the Great Berling as 3° from Cape St Vincent (it is under 24°). Twenty English leagues are equal to 174 Spanish or 25 French, and to 1° of latitude. Cortes was evidently ata loss to know the size of a degree, and consequently the circumference of the globe. The degrees of longitude are not laid down, but for a first meridian we are told to draw a vertical line "through the Azores, or nearer Spain, where the chart is less occupied." It is impossible under such circumstances to understand or check the longitudes assigned to places at that period. Martin Cortes's work was held in high estimation in England for many years, and appeared in several transla- tions. One by Richard Eden in 1609 gives an improved table of the sun's declination from 1609 to 1625—the greatest declination being 23° 30'. The declinations of the principal stars and the times of their passing the meridian, and other improved tables, are given, with a very poor traverse table for eight points. The cross-staff, he said, was in most common use; but he recommends Wright's sea quadraut.

William Cuningham published in 1559 a book called his Astronomical Glass, in which he teaches the making of charts by a central meridional line of latitude in equal parts, with other meridians on each side, distant at top and bottom in proportion to the departure at the highest and lowest latitude, for which purpose a table of departures is given very correctly to the third place of sexagesimals. The chart would be excellent were it not that the parallels are drawn straight instead of being curved. In another example, which is one-fourth of the sphere, the meridians and parallels are all curved ; 1t would be good were it not that the former are too long. The hemisphere is also shown upon a projection approaching the stereographic ; but the eighteen meridians cut the equator at equal distances, instead of being smaller towards the primitive. He gives the drawing of an instrument like an astrolabe placed horizontally, divided into 32 points and 360 degrees, and carrying a small magnetic needle to be used as a Prismatic compass, or even as a theodolite (fig. 4), A sketch 18 given of Ptolemy observing the sun with a primitive Instrument, likely from its great size to give good results after being correctly fixed, except for the amount of error caused by the shrinkage or expansion of the parts.

Gerhard Mercator’s great improvements in charts have

- “Y @alli hazia el polo artico los grados se augmentan: y d’alli

a la linea equinoccial van diminuyendo: y de la linea al polo antartico augmentando,”

been noticed in the article Map, where a sketch is given of his map of the world, of 1569 (vol. xv. p. 521). From facsimiles of his early charts in Jomard, Les Monuments de la Géographie, the following measurements have been made.

79°, is 2 feet long north and south, and 20 inches wide.

eu.

Another of the same date, from the equator to 60° south is 15°8 inches, The charts agree with each other, a slight allowance being made for remeasuring. As com- pared with Dr Inman’s table of meridional parts, the

spaces between the parallels are all too small. Between 0° and 10° the error is 8’; at 20° it is 5’; at 30°, 16’; at 40°, 30°; at) 50°,..61’; at 60°, 104’ » at 70%, 158’; and at 79°, 182’,—that is, over three degrees upon the whole chart. As the measures are always less than the truth itm 4 gp is the standard} SR is possible that Mercator was the radius bar and pointer, with afraid to give the whole. In vanes and pinules at the side; a chart of Sicily by Romoldus CD is a scale of chords which is Mercator in 1589. on which lifted up to touch the pointer and y ; indicate the angle from 90° near two equal degrees of latitude, g to zero near D. By the size of 36° to 38°, subtend 94 inches, the observer in the drawing the the degree of longitude is standard ST was 10 or 12 feet in quite correct at one-fourth 2sth. from the top; the lower part is a mile too large. One of the north of Scotland, published in 1595, by Romoldus, measures 104 inches from 58° 20’ to 61°; the divisions are quite equal and the lines parallel; it is correct at the centre only. A map of Norway, 1595, lat. 60° to 70° = 94 inches, has the parallels curved and equidistant, the meridians straight converging lines; the spaces be- tween the meridians at 60° and 70° are quite correct.

Norman’s discovery of the dip (1576) has been spoken of at vol. xv. p. 221. He mentions and condemns the practice of each country having compass cards set to their variation, and sailors using them indiscriminately in any part of the world.

In 1581 Michael Coignet of Antwerp published sea charts, and also a small treatise in French, wherein he exposes the errors of Medina. He was probably the first who said that rhumb lines form spirals round the pole. He published also tables of declination, and observed the gradual decrease in the obliquity of the ecliptic. He described a cross-staff with three transverse pieces, which was then in common use at sea. Coignet died in 1623.

The Dutch published charts made up as atlases as early as 1584, with a treatise on navigation as an introduction.

In 1585 Roderico Zamorano, who was then the lecturer at the naval college at Seville, published a concise and clearly-written compendium of navigation; he follows Cortes in the desire to obtain better charts. Andres Garcia de Cespedes, the successor of Zamorano at Seville, published a treatise on navigation at Madrid in 1606. In 1592 Petrus Plancius published

his universal map, con- taining the discoveries in the East and West Indies and towards the north pole. It possessed no particular merit ; the degrees of latitude are equal, but the distances between the meridians are noted. He made London appear in 51° 32’ N. (which is near enough) and long. 22°, by which his first meridian should have been more than 3° east of St Michael.

In 1594 Blundeville published a description of Mer-

cator’s charts and globes ; he confesses to not having known upon what rule the meridians were enlarged by Mercator, unless upon such a table as Wright had sent him (see below). Wright’s table of meridional parts is here pub- lished, also an excellent table of sines, tangents, and secants,—the former to seven places of figures, the latter to eight. These are the tables made originally by Regio- montanus, and improved by the Jesuit Clavius.

In 1594 the celebrated navigator John Davis published a pamphlet of eighty pages, in black letter, entitled The Seaman’s Secrets, in which he proposes to give all that is necessary for seamen—not for scholars on shore. He defines three kinds of sailing :—horizontal, paradoxical, and great circle. His horizontal sailing consists of short voyages which may be delineated upon a plain sheet of paper. The paradoxical or cosmographical embraces longi- tude, latitude, and distance,—the getting together many horizontal courses into one “infallible and true,” ¢.¢., what is now called traverse and Mercator’s sailings. His “ para- doxical course” he describes correctly as a rhumb line which is straight on the chart and a curve on the globe. He points out the errors of the common or plane chart, and promises if spared to publish a “ paradoxall chart.” It is not known whether such a chart appeared or not, but he assisted Wright in producing his chart a few years later. Great circle sailing is clearly described by Davis on a globe; and to render it more practicable he divides along distance into several short rhumb lines quite cor- rectly. His list of instruments necessary to a skilful sea- man comprises the sea compass, cross-staff, chart, quadrant, astrolabe, an “instrument magnetical” for finding the variation of the compass, a horizontal plane sphere, a globe, and a paradoxical compass. ‘The first three are sufficient for use at sea, the astrolabe and quadrant being uncertain for sea observations. The importance of knowing the time of the tides when

approaching tidal or barred harbours is clearly pointed out, also the mode of ascer- taining it by the moon's age. A table of the sun's decli- nation is given for noon each day during four years, 1593-97, from the ephemerides of Stadius. The greatest is 23° 28". Several courses and distances, with the resulting difference of latitude and departure, are correctly worked out. A specimen log-book provides one line only for each day, but the columns are arranged similarly to those of a modern log. Under the head of remarks after leaving Brazil, we read, "the compass varied 9°, the south point westward." He states that the first meridian passed through St Michael, because there was no variation at that place; the meridian passed through the magnetic pole as well as the pole of the earth. He makes no mention of Mercator's chart, nor of Cortes or other writers on navigation. Rules are given for finding the latitude by two altitudes of the sun and intermediate azimuth, also by two fixed stars, by the globe. There is a drawing of a quadrant, with a plumb line, for measuring the zenith distance, and one of a curious modification of a cross-staff with which the observer stands with his back to the sun, looking at the horizon through a sight on the end of the staff, while the shadow of the sun, from the top of a movable projection, falls on the sight box. This remained in common use till superseded by Hadley's quadrant. The eighth edition of Davis's work was printed in 1657.

Edward Wright, of Caius College, Cambridge, published in 1599 a valuable work entitled Certain Errors in Navi- gation Detected and Corrected. One part is a translation from Roderico Zamorano ; there is a chapter from Cortes, and one from Nuiiez. A year after appeared his chart of the world, upon which both capes and the recent discoveries in the East Indies and America are laid down truthfully and scientifically, as well as his knowledge of their latitude

and longitude would admit. Just the northern extremity of Australia is shown. Wright said of himself that he had striven beyond his ability to mend the errors in chart, compass, cross-staff, and declination of sun and stars. He considered that the instruments which had then recently come in use ""'could hardly be amended," as they were growing to " perfection,"— especially the sea chart and the compass, though he expresses a hope that

the latter may be “freed from that rude and gross manner of handling in the making.” He gives a table of magnetic declina- tions, and explains its geometrical construction. He states that Medina utterly denied the existence of variation, and attributed it to bad making and bad observations, Wright expresses a hope that a right understanding of the dip of the needle would lead to a knowledge of the latitude, “as the variation did of the longitude.” He gives a table of declinations for every minute of the ecliptic, and another for the use of English mariners during four years— the greatest being 23° 31’ 30”. The latitude of London he made 51° 32’. For these determinations a quadrant over 6 feet in radius was used. He also treats of the “dip” of the sea horizon, refraction, parallax, and the sun’s motions. With all this knowledge the earth is still considered as stationary,—although Wright alludes to Copernicus, and says that he omitted to allow for parallax. Wright ascertained the declination of thirty-two stars, and made many improvements or additions to the art of navi- gation, considering that all the problems could be per- formed arithmetically by the doctrine of triangles, without globe or chart. He devised sea rings for taking observa- tions, and a sea quadrant to be used by two persons, which is in some respects similar to that by Davis. While deploring the neglected state which navigation had been in, he rejoices that the worshipful society at the Trinity House, under the favour of the king (James L.), had removed “many gross and dangerous enormities.” He joins the brethren of the Trinity House in the desire that a lectureship should be established on navigation, as at Seville and Cadiz; also that a grand pilot should be appointed, as Sebastian Cabot had been in Spain, who examined pilots (ze, mates) and navigators. Wright’s desire was partially fulfilled in 1845, when an Act of Parliament paved the way for the compulsory qualification of masters and mates of merchant ships; but such was the opposition by shipowners that it was left voluntary for a few years. England was in this respect more than a century behind Holland. It has been said that Wright accompanied the earl of Cumberland to the Azores in 1589, and that he was allowed £50 a year by the East India Company as lecturer on navigation at Gresham College, Tower Street.

The great mark which Wright made in the world was the discovery of a correct and uniform method for dividing the meridional line and making charts which are still called after the name of Mercator. He considered his charts as true as the globe itself; and so they were for all practical purposes.

He commenced by constructing a meridional line, upon the proportion of the secants of the latitude, for every ten minutes of the arc, and in the edition of his work published in 1610 his calculations are for every minute. His calculations were based upon the discovery that the radius bears the same proportion to the secant of the latitude as the difference of longitude does to the meridional difference of latitude—a rule strictly correct for small arcs only. One minute is taken as the unit upon the arc and 10,000 as the corresponding secant, 2’ becomes 20,000, 3’=30,000, &e., increasing uniformly till 49’, which is equal to 490,001; 1° is 600,012. ‘The secant of 20° is 12,951,199, amd for 20° 1 « “ee 12,251,192 + 10,642,—practically the same as that used

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NAVIGATION

in modern tables. The principle is simply explained by fig. 5, where 6 is the pole and bf the meridian. At any point @ a minute of longitude :a niin, i of lat.::ea (the semi-diameter of the

parallel) : &f (the radius). Again ea ;: kf

:: Af : ki: : radius : sec. akf (sec. of lat.). a

To keep this proportion on the chart, the ©

points of latitude must increase in the

same proportion as the secants of the

arc contained between those points and

the equinoctial, which was then to be k z f done by the “canon of triangles,” ! Fig. 5.

Subsequent writers, including Gunter, Norwood, and Bond, give Wright the credit of having been the first to establish a correct proportion between the meridians and parallels for every part of the chart. This great improve- ment in the principle of constructing charts was adopted slowly by seamen, who,

putting it as they supposed to a practical test, found good reason to be disappointed. The positions of most places had been laid down erroneously, by very rough courses and estimated distances upon an entirely false scale, viz., the plane chart; from this they were transferred to the new projection.?

When Napier's Canon Mirificus appeared in 1614, Wright at once recognized the value of logarithms as an aid to navigation, and undertook a translation of the book, which he did not live to publish (see Naprzr). E. Gunter's tables (1620) made the application of the new discovery to navigation possible, and this was done by T. Addison in his Arithmetical Navigation (1625), as well as by Gunter in his tables of 1624 and 1636, which gave artificial sines and tangents, to a radius of 1,000,000, with directions for their use and application to astronomy and navigation, and also logarithms of numbers from 1 to 10,000. Several editions followed, and the work retained its reputation over a century. Gunter invented the sector, and introduced the meridional line upon it, in the just proportion of Mercator's projection.

The third edition of Gunter's work was published in 1653, and the fifth edition in 1673, amended by Henry Bond, a practitioner in the mathematies, in the Bulwark near the Tower—a thick octavo. A table of meridional parts is given, with instructions to construct it by the addition of secants as Wright did. The table has been

found upon examination to be very correct. The degree is divided into 1000 parts.

With the latitude left, course steered, and difference of longi- tude made good, Bond found the latitude of ship, by projection on the chart, by the sector, or by the following rule:—

tan of course x proportional diff. of lat. radius And conversely, suppose latitude left 50°, course 33° 45', difference of longitude 54°=330'; then cot 30° 45' x 380' radius

=diff. long.

=493°5, prop. diff. lat.,

which, added to the meridional parts corresponding to 50°, will give the number opposite 55°, and 55° is the latitude. Various problems in sailing according to Mercator are solved arithmetic- ally upon the tangents, without the table of meridional parts, Which may also be done geometrically upon the tangent line of the tross-staff. The following important proposition is in Bond's own Wwords:—'* First we must know that the logarithmic tangents from 45° upwards do increase in the same manner as the secants added together do, if we account every half degree above 45° to be a whole degree of Mercator's meridional line; and so the table of allie aint pinned delta mcipaailh

1 The works of Wright passed through at least ten editions; the last which the writer has seen was edited by Moxon in 1657.

2 Ww. Snellius, professor of mathematics at Leyden, published in 1624 a treatise on navigation, after Wright's plan. He mentions the Raine of Wright with others in the introduction, but, as he did not Say what part he took from each, the division of the meridional line to minutes up to 70° was attributed to him, though Wright had done it up to 89° 59' and published it in 1610. Justice was done to

Wright's memory in the Afémoires of the Academy of Sciences, Paris, 1753, p. 275,

logarithmic tangents is a table of meridional parts to every two minutes of the meridian line, leaving out the radius."

The way of using this proposition is as follows. The table begins at 45°, and every 80 minutes is reckoned a whole degree; therefore, when both latitudes are given, take the half of each increased by 45°, subtract the tangent of the lesser sum from that of the greater, and divide the remainder by the tangent of 45° 30/ (radius omitted); the quotient will be the equal, or equinoctial, degrees contained between the two latitudes. Or multiply the aforesaid remainder by ten and divide by half the tangent of 45° 30', and the quotient will be equal to the equinoctial leagues contained between the two latitudes. The logarithmic tangents are here treated as natural numbers, and the

division done by logarithms. Bound lays no stress on the above solution as being new ; it is merely used in lieu of a table of meridional parts.

The subsequent history of the problem of meridional parts may most conveniently be added here rather than in its chronological place. An important letter from Dr Wallis, professor of geometry at Oxford, is given with the Phil. Trans. for 1685, No. 176. The writer says that, the old inquiry about the sum or aggregate of secants having been of late renewed, he thought fit to trace it from its original, with such solutions as seemed proper to it. Archimedes and the ancients divided the curvilinear spaces as figs. 6 and 7. If they reckoned the first four it was too large; if the last four, too small. As the segments increased in number the error diminished. The degrees of longitude decrease as the cosine of the latitude (which is the semidiameter of such parallel) to the radius of the globe or equator. By the straight lines “each degree of longitude is increased above its due proportion, at such rate as the equator (or its radius) is greater than such parallel (or the radius thereof).” The old sea charts represented the degrees of Fic. 7 latitude and longitude all equal. ‘‘ Hereby, pa among other inconveniences (as Mr Edward Wright observed in 1599), the representation of places remote from the equator were distorted.”” Wright advised that the degrees of latitude should be protracted in like proportion with those of lougitude, “that is, everywhere in such proportion as is the respective secant of such latitude to the radius” (see Wright’s explanation of this part, and fig. 5). Fig. 8 represents one quarter of the globe, the surface of which is opened out till the parallel LA becomes a straight line ! as da, and each of the four meridians reaches P, P, P, P. The equator is re-presented by EE; so that the position ,’ of each parallel on the chart should b at such distance from the equator ‘‘as

Fig. 8. are all the secants (taken at equal distances in the arc) to so

many times the radius, . . . which is equivalent to a projection of the spherical surface on the concave surface of a cylinder, erected at right angles to the plane of the equator,” while each division of the meridian is equal to the secant of the latitude answering to such part, as fig. 9. This projection, if expanded

into a plane, will be the same

as a plane figure whose base

is equal to a quadrantal are

extended (or a portion thereof),

on which (as ordinates) are

erected perpeudiculars equal n

to the secants, answering to

the respective points of the s arc extended, as fig. 10. The

first answers to the equator, R

the last to the pole infinite.

“For finding this distance *

answering to each degree and

minute of latitude, Mr Wright \ ~ @ t “

added all the secants from the : Vig. 10

beginning to the position Fig.9. +

required. The sum of all except the greatest (answering to the figure inscribed) is too little. The sum of all except the least (answering to the circumscribed) is too great—which latter Mr Wright followed. It will be nearer the truth than either if we take the intermediate spaces; instead of minutes, take 4, 14, 24, &c., or the double of these, 1, 3, 5, 7, &c., which yet, because on the convex side of the curve, would be rather too little. Hither of these ways will be exact enough fora chart. If we would be more exact, Mr Oughtred directs, as did Mr Wright before him, to divide the arc into parts yet smaller than minutes, and calculate sccants thereto.” Wallis continued the subject and the doctrine of infinite

series; but more than suffieient has been quoted for the purposes of navigation. At the end he adds that the same may be obtained in like manner by taking the versed sines in arithmetical pro- portion.

The next writer who made his mark upon this problem was Dr E. Halley (Phil. Trans., No. 219, 1695). He states that the tangential proportion between the latitude and the divisions of the meridional line was diseovered by ehance, and first published by H. Bond, in Norwood's Epitome of Navigation. James Gregory furnished a demonstration in 1668; but it was long and tedious. Halley claimed for himself the honour of being the first to give a rule whereby the meridional parts between any two latitudes may be ealeulated at onee by the relation of the logarithmie tangents ; but it is practically the same as that published by Bond. Halley said that Wright's table nowhere exceeded the truth by half a mile. Sir Jonas Moore's system, he said, was nearer the truth, but the differenee is not appreciable till beyond navigable waters.

A rather curious paper was read before the Royal Soeiety, June 4, 1666, by Nieholas Mereator upon the meridional line ; he pro- poses to divide it into the hundred-thousandth part of a minute. Roger Cotes wrote upon the same subject an exhaustive paper in Latin, ealled ‘‘ Logometria,” Phil. Trans., No. 338, 1714. He gives an illustrative figure in whieh the rhumb line crosses the meridians at an angle of 45°. His demonstrations by the ratios arrive at similar eonelusions to those elearly expressed by Halley.

All these rules assume the earth to be truly spherical, instead of spheroidal. For the history of inquiry into the exact figure of the earth, see Eantu. It may be mentioned that a pamphlet on this subject by Murdoeh, published in 1741, in whieh meridional parts are adapted to a (very exaggerated) spheroid, shows that plane charts and the roughly-divided Mereator's charts were still used at that date. Plane eharts, indeed. are explained even later, as in Robertson's Navigation, 1755.

The power of taking observations correctly, either at sea or on shore, was greatly assisted by the invention which bears the name of Pierre Vernier, which was published in Brussels in 1631 (see VeRniER). As Vernier's

quadrant was divided into half degrees only, the sector, as he called it, spread over 14} degrees, and that space carried thirty equal divisions, numbered from 0 to 30. As each division of the sector contained 29 minutes of the arc, the vernier could be read to minutes. The verniers now commonly adapted to sextants can be read to 10 seconds. Shortly after the invention it was recommended by Bouguer and Jorge Juan, who describe it in a treatise entitled La Con- struction, dc., du quadrant nouveau. About this period Gascoigne applied the telescope to the quadrant (see MIcROMETER) ; and Hevelius invented the tangent screw, to give slow and steady motion when near the desired posi- tion. In 1635 Henry Gellibrand published his discovery of the change in variation of the needle, which was effected by his comparing the results of his own observations with those of Burrough and Gunter. The latter was his pre- decessor at Gresham College.

In 1637 Richard Norwood, a sailor, and reader in mathematics, published an account of his most laudable exertions to remove one of the greatest stumbling-blocks in the way of correct navigation, that of not knowing the actual size of a degree or nautical mile, in a pamphlet styled The Seaman's Practices. Norwood ascertained the latitude of a position near the Tower of London in June 1633, and of a place in the centre of York in June 1635, with a sextant of more than 5 feet radius, and, having care- fully corrected the declination, refraction, and parallax

2 e i 5) made the difference 2° 28'. He then measured the distance with a chain, taking horizontal angles of all windings, and he made a special table for correcting elevations and depressions. A few places which he was unable to measure he paced. His conclusion was that a degree contained 367,176 English feet ; this gives 2040 yards to a nautical mile,—only about 12 yards too much. Norwood's works went through numerous editions, and retained their popularity over a hundred years; the last which the writer has seen—a good book for the time, free from nonsense—is dated 1732. In it he says that, as there is no means of discovering the longitude, a

seaman must trust to his reckoning. He recommends the knots on the log-line to be placed 51 feet apart, as the just proportion to a mile when used

with the half- minute glass.

Dr Hooke read a paper at the Royal Society, in 1666, upon deep-sea sounding by means of a weight which be- came detached on striking the bottom, and allowed a float to ascend to the surface, while the time was carefully noted —basing his calculations upon performances in known depths. Ile was on the verge of a great success; he required Sir W. Thomson's piano-wire instead of the float.

In the same year a paper was read by Dr Wallis (who had previously published a discourse on tides) showing that the modern theory was not then generally accepted. This was followed by a paper by Sir Robert Moray, who recommended frequent and extended observations, and proposed to form a table which embraced every circum- stance that would appear to be desirable even at the present day. Sir Robert also spoke of the irregularities in the tides past the western islands of Scotland. In Phil. Trans., 1688, vol. xiii. No. 143, there is an account of Flamsteed's tide table for London Bridge, which gave each high tide every day in the year. He justly condemns the old almanacs for deriving the moon's age from the epact, and then allowing forty-eight minutes for every day. Brooker was the first to amend this reckoning, but in a rough manner. Henry Philips, well known by his works on navigation, was the first to bring the inequality toa rule, which was found more conformable to experience than was expected; but Flamsteed made corrections on his rule.

The necessity for having correct charts was equalled by the pressing need of obtaining the longitude by some simple and correct means available to seamen; and we have seen how many plans had already been thought of for this purpose. At one time it was hoped that the longitude might be directly discovered by the variation of the compass; in 1674 Charles II. actually appointed a commission to investigate the pretensions of a scheme of this sort devised by Bond,! and the same idca appears as late as 1777 in 8. Dunn's Epitome. But the only real way of ascertaining the longitude is by knowing the difference of time at two meridians; and till the invention and perfecting of chronometcrs this could only be done by finding at two places the apparent time of the same celestial phenomenon. The most obvious phenomena to select were the motions of the moon among the sun and stars,

which as we have seen were suggested as a means of finding the longitude by Werner in 1514, and continued to receive attention from later writers. But to make this idea practical it was necessary on the one hand to have better instruments for observation, and on the other to have such a theory of the moon's motions as should enable its place to be predicted with accuracy, and recorded before- hand in analmanac. The very principles of such a theory were unknown before Newton's great discovery, when the lunar problem begins to have a chief place in the history of navigation; the places of stars were derived from various and widely discrepant sources ; and almanacs gave little useful information beyond the declination of the sun, the age of the moon, and the time of high water.2_ Another class of phenomena whose comparative frequency recom- mended them for longitude observations, viz., the occulta- tions of Jupiter's satellites, became known through Galileo's discovery of these bodies (1610). Tables for we

1 Bond published in 1676 a quarto volume entitled The Longitude Found.

2 Wharton's Angelus Britannicus, 1662-1715, is a fair specimen of the almanacs of the period.

these were published by Dominic Cassini at Bologna in 1688, and were repeated in a more correct form at Paris in 1693 by his son, who was followed by Pound, Bradley, Wargentin, and many otherastronomers. But this method, though useful on land, is not suited to mariners; when Whiston, for example, in 1737 recommended that the satellites should be observed by a reflecting telescope, he did not sufficiently consider the difficulty of using a telescope at sea, or the infrequency of the occultations, and it is the lunar problem which will chiefly concern us in what follows.

The study of this problem was stimulated by the reward of 1000 crowns offered by Philip III. of Spain in 1598; the states-general followed with an offer of 10,000 florins. But for a long time nothing practical came of this; a pro- posal by J. Morin, submitted to Richelieu in 1633, was pronounced by commissioners appointed to judge of it to be incomplete through the

imperfection of the lunar tables, and in like manner when the question was raised in England in 1674 by a proposal of St Piere to find the longitude by using the altitudes of the moon and two stars to find the time each was from the meridian, and when the king was pressed by St Piere, Sir J. Moore, and Sir C. Wren to establish an observatory for the benefit of naviga- tion, and especially that the moon's exact position might be calculated a year in advance, Flamsteed gave his judg- ment that the lunar tables then in use were quite useless, and the positions of the stars erroneous. The result was that the king decided upon establishing an observatory in Greenwich Park, and Flamsteed was appointed astro- nomical observer on March 4, 1675, upon a salary of £100 a year, for which also he was to instruct two boys from Christ's Hospital. While the small building in the Park was in course of erection he resided in the Queen's House (now the central part of the Greenwich Hospital school), and removed to the house on the hill, July 10, 1676, which came to be known as "Flamsteed House." The institution was placed under the surveyor-general of ordnance,—perhaps because that office was then held by Sir Jonas Moore, himself an eminent mathematician. Though this was not the first observatory in Europe, it was destined to become the most useful, and has fulfilled the important duties for which it was established. It was established to meet the exigencies of navigation, as was clearly stated on the appointment of Flamsteed, and on several subsequent occasions ; and we see now what an ex- 'cellent foster-mother it has been to the higher branches of that science. This has been accomplished by much labour and patience; for, though the most suitable man in the kingdom was placed in charge, it was so starved and neglected that it was almost useless during many years. The Government did not provide a single instrument. Flamsteed entered upon his important duties with an iron sextant of 7 feet radius, a quadrant of 3 feet radius, two telescopes, and two clocks, the last given by Sir Jonas Moore. Tycho Brahe's catalogue of about a thousand Stars was his only guide. In 1681 he fitted a mural arc which proved a failure. Seven years after another mural arc was erected at a cost of £120, with which he set to work in earnest to verify the latitude, and to determine the equinoctial point, the obliquity of the ecliptic, the right ascension and declination of the stars, till he numbered two or three thousand which appeared in the "British catalogue." See FLaMsTEED and AsTRoNomy.

Flamsteed died in 1720, and was succeeded by Halley, who paid particular attention to the motions of the moon with a view to the longitude problem. A paper which he published in the Phil. Trans., 1731, No. 421, shows what had been accomplished up to that date, and proves that it was still impossible to find the longitude correctly by the

moon.'! He repeats what he had published twenty years before in an appendix to Street's Caroline tables, which contained observations made by him (Halley) in 1683-84 for ascertaining the moon's motion, which he thought to be the only practical method of "attaining " the longitude at sea. He found that it only needed a little patience to be able to manage a 5 or 6 foot telescope, capable of showing the occultations of the fixed stars by the moon, on shipboard in moderately fine weather (ships must have been very steady in his days). The Caroline tables of Street, though better than those before him, as well as those of Tycho, Kepler, Bullialdus, and Horrox, were uncertain; sometimes the equations would compensate one another; at other times when they fell the same way the result might be 100 leagues in error. He hopes that the tables will be so amended that an error may scarce ever exceed 3 minutes of motion (equal to 14° of longitude). Sir Isaac Newton's tables, corrected by himself (Halley) and others up to 1713, would admit of errors of 5 minutes, when the moon was in the third and fourth quarters. He blames Flamsteed for neglecting that portion of the work, as he was at the observatory more than two periods of eighteen years. He himself had at this time seen the whole period of the moon's apogee—less than nine years—during which period he observed the right ascension of the moon at her transit, with great exactness, almost fifteen hundred times, or as often as Tycho Brahe, Hevelius, and Flamsteed together. He hoped during 1731 and a few future years to com- pute the moon's position within 2 minutes of motion with certainty, which will be equal to 20 leagues at the equator and 15 in the Channel; and Hadley's quadrant might be applied to taking distances at sea with the desired accuracy."

The last remark calls us to consider this great improve- ment in the instrumental means for taking observations at sea. Up to this time all

instruments either depended on a plumb line or required the observer to look in two directions at once.

Their imperfections are clearly pointed out in a paper by Pierre Bouguer (1729) which received the prize of the Paris Academy of Sciences for the best method of taking the altitude of stars at sea. Bouguer himself pro- poses a modification Gennnma_ of what he calls the : English quadrant, pro- bably the one proposed by Wright and im- proved by Davis. Fig. 11 represents the in- strument as proposed, p capable of measuring fully 90° from E to N.

A fixed pinule was recommended to be placed at E, through which a ray from the

Hor”... (ee CN:

N

sun would pass to the :

sight C. The sight F Fig. 11.

was movable. The observer, standing with his back to the sun, Thus John

1This did not prevent many attempts being made. Jo Herne’s Longitude Unvailed, 1678, proposes to find the moon’s meridian passage at sea by equal altitudes with the cross-staff, and then compare apparent time at ship with London time. In 1717 Henry Kindon proposed both the magnet and meridional lunar distances ; Robert Browne attempted to calculate lunar tables, which he submitted to the board of longitude; while Francis Bodkin proposed.the use of telescopes upon the planets and their satellites. The proposals submitted to the board of longitude to find the longitude by the moon’s meridian passage are too numerous to be mentioned. –

2 Halley’s observations were published posthumously in 1742, and in 1765 the commissioners of longitude paid his daughter £100 for MS.

supposed to be useful to navigation. XVIL — 33

would look through F and C at the horizon, shifting the former up or down till the ray from the sun coincided with the horizon. The space from EK to F would represent the altitude, and the remaining part F to N the zenith distance. The English quadrant which this was to supersede differed in having about half the are from E towards N, and, instead of the pinule being fixed at EK, it was on a smaller arc represented by the dotted line ¢B, and movable. It was placed on an even number of degrees, considcrably less than the altitude; the remainder was measured on the larger arc, as described.!

Hadley's instrument, on the other hand, described to the Royal Society in May 1731 (Phil. Trans., Nos. 420 and 421), embodies Newton's idea of bringing the reflexion of one object to coincide with the other. He calls it an octant, as the arc is actually 45°, or the eighth part of a circle ; but, in consequence of the angles of incidence and reflexion both being changed by a movement of the index, it measures an angle of 90°, and is graduated accordingly ; the same instrument has therefore been called a quadrant. It was very slowly adopted, and no doubt there were numerous mechanical difficulties of centring, graduat- ing, &e., to be overcome before it reached perfection.? In August 1732, in pursuance of an order from the Admiralty, observations were made with Hadley's quadrant on board the "Chatham" yacht of 60 tons, below Sheerness, in rough weather, by persons—except the master attendant—unaccustomed to the motion ; still the results were very satisfactory. Two years later Hadley published (Phil. Trans., 1733) the description of an instrument for taking altitudes when the horizon is not visible. The sketch represents a curved tube or spirit- level, attached to the radius of the quadrant.

From the year 1714 the history of navigation in England is closely associated with that of the " commissioners for the discovery of longitude at sea," a body constituted by Act 13 Anne c. 14 (commonly called 12 Anne ec. 15), with power to grant sums not exceeding £2000 to assist experi- ments and reward minor discoveries, and also to judge on applications for much greater rewards which were offered to open competition. For a method of determining the longitude within 60 geographical miles, to be

tested by a voyage to the West Indies and back, the sum of £10,000 was offered; within 40 miles, £15,000; within 30, £20,000. £10,000 was also to be given for a method that came within 80 miles near the shores of greatest danger. No action seems to have been taken before 1737 ; the first grant made was in that year, and the last in 1815, but the board continued to exist till 1828, having disbursed in the course of its existence £101,000 in all. In the interval a number of other Acts had been passed, either dealing with the powers, constitution, and funds of the commissioners or encouraging nautical discovery ; thus the Act 18 George IT. (1745) offered £20,000 for the dis- covery by a British ship of the North-West Passage, and the Act 16 George III. (1776) offered the same reward for a passage to the Pacific either north-west or north-east, and £5000 to any one who should approach by sea within one degree of the North Pole. All these Acts were swept away in 1828, when the longitude problem had ceased to attract

1JTn 1731 M. Bouguer was awarded another prize by the Royal Academy of Sciences for his method of finding the variation of the compass at sea,

- Davis's quadrant was in common use till 1740; it is described in Robertson's Navigation (1755), and improvements on it are proposed in Phil. Trans., 1781 and 1734.

3 This total comprises the large sums awarded to Harrison and to the widow of Mayer, the cost of surveys and expeditions in various parts of the globe, large outlays on the Nautical Almanac and on subsidiary calculations and tables, rewards for new methods and solu- tions of problems, and many minor grants to watchmakers or for im- provements in instruments. Thus Ramsden. received in 1775 and later about £1600 for his improvements in graduation, and Massey in 1804 got £200 for his log (see Loa). A good deal of money was wasted, and large sums were paid to certain commissioners for attendance,

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competitors, and voyages of discovery were nearly over, The suggestions and applications sent in to the commis- sioners were naturally very numerous and often very trifling ; but they sometimes furnish useful illustrations of the state of navigation. Thus, in a memorial by Captain H.

Lanoue (1736), which seems to be designed to commend a substitute for the log (a box with something, not fully explained, let into the sea), he records a number of recent casualties, which shows how carelessly the largest ships were then navigated. Several men-of-war off Plymouth in 1691 were wrecked through mistaking the Deadman for Berry Head. Admiral Wheeler's squadron in 1694, leaving the Mediterranean, ran on Gibraltar when they thought they had passed the Strait. Sir Cloudesley Shovel's squadron, in 1707, was lost on the rocks off Scilly, by erring in their latitude. Several transports, in 1711, were lost near the river St Lawrence, having erred 15 leagues in the reckoning during twenty-four hours. Lord Belhaven was lost on the Lizard in 1722, the same day on which he sailed from Plymouth.

One of the first points to which the attention of the commissioners was directed was the survey of the coasts of Great Britain, which was pressed on them by Whiston in 1737. He was appointed surveyor of coasts and head-lands, and in 1741 received a grant for instruments. An Act passed in 1740 enabled the commissioners to spend inoney on the survey of the coasts of Great Britain and the "plantations." Ata later date they bore part of the expenses of Cook's scientific voyages, and of the publica- tion of their results. Indeed it is to them that we owe all that was done by England for surveys of coasts, both at home and abroad, prior to the establishment of the hydro- graphic department of the Admiralty in 1795. But their chief work lay in the encouragement they gave on the one hand to the improvement of timepieces, and on the other to the perfecting of astronomical tables and methods, the latter issuing in the publication of the Nautical Almanac. Before we pass on to these two important topics we may with advantage take a view of the state of practical navi- gation in the middle of last century as shown in two of the principal treatises then current.

Robertson's Llements of Navigation passed through six editions between 1755 and 1796. It contains good teaching on arithmetic, geometry, spherics, astronomy, geography, winds and tides, also a small useful table for correcting the middle time between the equal altitudes of the sun,—all good, as is also the remark that 'the greater the moon's meridian altitude the greater the tides will be." He states that Lacaille recommends equal altitudes being observed and worked separately, in order to find the time

from noon, and the mean of the results taken as the truth. There is a sound article on chronology, the ancicnt and modern modes of reckoning time. A long list of latitudes, longitudes, and times of high water finishes vol. i. Thesccond volume is said by the author to treat of naviga- tion mechanical and theoretical ; by the former he means seaman- ship. He gives instructions for all imaginary kinds of sailings, for marine surveying and making Mercator's chart. There are two gootl traverse tables, one to quarter points, the other to every 15 minutes of the arc; the distance to each is 120 miles. There is a table of meridional parts to minutes, which is more minute than customary. Book ix., upon what is now called '"'the day's work," or dead- reckoning, appears to embrace all that is necessary. A great many methods, we are told, were then used for ineasuring a ship's rate of sailing, but among the English the log and line with a half-minute glass were generally used. Bouguer and Lacaille proposed a log with a diver to avoid the drift motion (1753 and 1760), Robertson's rule of computing the equation of equal altitudes is as good as any used at the present day. He gives also a description of an equal- altitude instrument, having three horizontal wires, probably such a one as was used at Portsmouth for testing Harrison's timekeeper. The mechanical difficulties must have been great in preserving a perpendicular stem and a truly horizontal sweep for the telescope. It gave place to the improved sextant and artificial horizon. The second edition of Robertson's work in 1764 contains an excellent dissertation on the rise and progress of modern navigation by Dr James Wilson, which has been greatly uscd by all subsequent writers.

Don Jorge Juan's Compendio de Navegacion, for the use of mide

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NAVIGATION

shipmen, was published at Cadiz in 1757. Chapter i. explains what pilotage is, practical and theoretical. He speaks of the change of variation, '' which sailors have not believed and do not believe now." He described the lead, log, and sand-glass, the latter corrected by a pendulum, charts plane and spherical. Supposing his readers to be versed in trigonometry, he will

explain what latitude and longi- tnde are, and show a method for finding the latter different from what has been tanght. He will show the error of middle latitude sailing, and show that the longitude found by it is always less than the truth. (It is strange that while reckoning was so rough and imperfect in many respects they should strain at such a trifle as that is in low latitudes.) He promised to find the difference of longitude without a departure (a similar rnle to that of Bond). After speaking of meridional parts, le offered to explain the English method, which was discovered by Edmund Halley, but omits the principles upon which Halley founded his theory, as it was too embarrassing. (He was not the first.) He gives instructions for currents and lee- way, tables of declination, a few stars, meridional parts, &c. It 1s wortlty of remark that, after giving a form for a log-book, he added that this had not been previously kept by any one, but he thought it shonld not be trusted to memory. He only required the knots, fathoms, course, wind, and leeway to be marked every two hours. Every hour is quite long enough, and that is often divided now. He gave a sketch of Hadley's quadrant, in shape like those in use fifty years back, but without a clamping screw or tangent screw. Back glasses were much valned in those days,—the force of habit, no doubt. The book is quite free from all extraneous rubbish.

The introduction of timekeepers by which Greenwich time can be carried to any part of the world, and the longitude found with ease, simplicity, and certainty, is due to the invention of John Harrison. The idea of keeping time at sea was no novelty. HuycENs (q.v.) made pendulum watches for the purpose prior to 1665, at which date Major Holmes communicated to the Royal Society (Phil. T'rans., i. 13) the fact of his having tried two of them on the coast of Guinea. He sailed from St Thomas, set his watches, sailed west 700 or 800 leagues, without changing course, then steered towards the coast of Africa N.N.E. 200 or 300 leagues. The masters of the other ships under his charge, fearing the want of water, wished to steer for Barbados. Holmes, on eom- paring the calculations, found them to differ from him from 80 to over 100 leagues. He considered that they were only 30 leagues from the Cape Verd Islands, where they arrived next afternoon. The vague manner of estimat- ing distance is worth notice. William Derham published a scientific description of various kinds of timekeepers in The Artificial Clock-Maker, in 1700, with a table of equations from Flamsteed to facilitate comparison with the sun-dial. In 1714 Henry Sully, an Englishman, pub-

lished a treatise at Vienna, on finding time artificially. He went to France, and spent the rest of his life in trying to make a timekeeper for the discovery of the longitude at sea. In 1716 he presented a watch of his own make to the Academy of Sciences, which was approved; and ten years later he went to Bordeaux to try his marine watches, and died before embarking. Julien le Roy was his scholar, and perfected many of his inventions in watchmaking.

Harrison's great invention was the principle of com- pensation through the unequal contraction of two metals, which he first applied in the invention of the eompensation pendulum, still in use, and then modified so as to fit it to & watch, devising at the same time a means by which the watch retains its motion while being wound up. To what has been said in the article Harrison on his successive attempts, and the success of the trial journey to Jamaica in 1761-62, it may be added that by the journal of the House of Commons we find that the error of the watch (as if there were only one) was ascertained by equal altitudes at Portsmouth and Barbados, the calculations being made by Short. The watch came greatly within the limits of the Act. At Jamaica it was only in error five Seconds (assuming that the longitude previously found by the transit of Mercury could be so closely depended on, which as we now know, was not the case; the observations

were too few in number, and taken with an untrustworthy instrument). Short found the whole error from Novem- ber 6, 1761, till April 2, 1762, to be 1™ 54°5=18 geographical miles in the latitude of Portsmouth. He considered that a position determined by a transit of Mercury was liable to an error of 30° only, and by Jupiter's best satellite to 8″ 448, During the passage home in the "Merlin" sloop-of-war the timekeeper was placed in the after part of the ship, because it was the dryest place, and there it received violent shocks which retarded its motion. It lost on the voyage home 1™ 49*=16 geographical miles.

One might have supposed that Harrison had now secured the prize; but there were powerful competitors who hoped to gain it by lunars, and a bill was passed through the House in 1763 which left an open chance for a lunarian during four years. A second West Indies trial of the watch took

place between November 1763 and March 1764, in a voyage to Barbados, which occupied four months; during which time it is said, in the preamble to Act 5 Geo. III. 1765, not to have erred 10 geographical miles in longitude. We only find in the public records the equal altitudes taken at Portsmouth and at Bridgetown, Barbados. William Harrison assumed an average rate of 18 a-day gaining, as he anticipated that it would go slower by 18 for every 10° increase in tempera- ture. The longitude of Bridgetown was dctermined by Maskelyne and Green by nine emersions of Jupiter's first satellite, against five of Bradley's and two at Greenwich Observatory, to be 34 54™ 208 west of Greenwich. In February 1765 the commissioners of longitude expressed an opinion that the trial was satisfactory, but required the principles to be disclosed and other watches made. Half the great reward was paid to Harrison under Act of Parliament in this year, and he and his son gave full de- scriptions and drawings, upon oath, to seven persons appointed by the commissioners of longitude.' The other half of the great reward was promised to Harrison when he had made other timekeepers to the satisfaction of the commissioners, and provided he gave up everything to them within six months. The second half was not paid till 1773, after trials had been made with five watches. These trials were partly made at Greenwich by Maskelyne, who, as we shall see, was a great advocate of lunars, and was not ready to admit more than a subsidiary value to the watch. A bitter controversy arose, and Harrison in 1767 published a book in which he charges Maskelyne with exposing his watch to unfair treatment. The feud between the astronomer-royal and the watchmakers con- tinued long after this date.

Even after Harrison had received his £20,000, doubts were felt as to the certainty of his achievement, and fresh rewards were offered in 1774 both for timekeepers and for improved lunar tables or other methods. But the tests proposed for timekeepers were very discouraging, and the watchmakers complained that this was due to Maskelyne. A fierce attack on the astronomer's treatment of himself and other watchmakers was made by Mudge in 1792, in A Narrative of Facts, addressed to the first lord of the Admiralty, and Maskelyne's reply does not convey the conviction that full justice was done to timekeepers. Maskelyne at this date still says that he would prefer an eclipse of a bright star by the moon and a number of cor- respondent observations by transits of the moon com- pared with those of

fixed stars, made by two astronomers at remote places, to any timekeeper. The details of these

1 The explanations and drawings are now at the British Museum; and two of his watches, one of which was used by Captain Cook in the "Resolution," are at Greenwich Observatory. In 1767 Harrison estimates that a watch could be made for £100, and ultimately for £70

or £80.

controversies, and of subsequent improvements in time- keepers, need not detain us here. In England the names of Arnold and Earnshaw are prominent, each of whom received, up to 1805, £3000 reward from the commis- sioners of longitude. It was Arnold who introduced the name chronometer.1 The French emulated the English efforts for the production of good timekeepers, and favour- able trials were made between 1768 and 1772 with watches by Le Roy and Berthoud.

Meantime the steady progress of astronomy both by the multiplication and increased accuracy of observations, and by corresponding advances in the theory, had made it possible to construct greatly improved tables. In observa- tions of the moon Greenwich still took the lead ; and it was here that Halley's successor Bradley made his two grand discoveries of aberration and nutation which have added so much to the precision of modern astronomy. Kepler's Rudolphine tables of 1627 and Street's tables of 1661, which had held their ground for almost a century, were rendered obsolete by the observations of Halley and his successor. At length, in 1753, in the second volume of the Commentarii of the Academy of Gottingen, Tobias Mayer printed his new solar and lunar tables, which were to have so great an influence on the history of navigation. Mayer afterwards constructed and submitted to the English Government in 1755 an improved body of MS. tables. Bradley found that the moon's place by these tables was generally correct within 1', so that the error ina longitude found by them would not be much more than halfa degree if the necessary observations could be taken accurately on shipboard. Thus the lunar problem seemed to have at length become a practical one for mariners, and

in England it was taken up with great energy by N. Maskelyne— “the father,” as he has been called, “of lunar observa- tions,”

In 1761 Maskelyne was sent to St Helena to observe the transit of Venus. On his voyage out and home he used Mayer’s printed tables for lunar determinations of the longitude, and from St Helena he wrote a letter to the Royal Society (Phil. T’rans., vol. lii. p. 558, 1762), in which he described his observations made with Hadley’s quadrant of 20 inches radius, made by Bird, and the glasses ground by Dollond. He took the observations both ways to avoid the errors. The arc and index were of brass, the frame mahogany ; the vernier was subdivided to minutes. The telescope was 6 inches long, magnified four times, and inverted. Very few seamen in that day possessed so good an instrument. He considered that ship’s time should be ascertained within twelve hours, as a good common watch will scarcely vary above a minute in that time. This shows that he must have intended the altitude of sun or star to be calculated—which would lead to new errors. He considered that his observations would each give the longitude within 1} degrees. On February 11th he took ten; the extremes were a little over one degree apart.

On his return to England Maskelyne prepared the British Mariner’s Guide (1763), in which he undertakes to furnish complete and easy instructions for finding the longitude at sea or on shore, within a degree, by observing the distance between the moon and sun, or a star, by Hadley’s quadrant. How far that promise was fulfilled, and the practicability of the instructions, are points worth consideration, as the book took a prominent place for some years. The errors which he said were inseparable from the dead-reckoning “even in the hands of the ablest and most skilful navigators,” amount- ing at times to 15 degrees, appear to be overestimated. ee ee eee ee

u A letter by Dalrymple in The Times (February 13, 1806) gives some Interesting details showing how slowly chronometers came into general use,

On the other hand, the lunar equations, which were from Mayer’s tables, would, he believed, always determine the longitude within a degree, and generally to half a degree, if applied to careful observations. He recommends the two altitudes and distance being taken simultaneously

when practicable. The probable error in a meridian altitude he estimated at one or two minutes, and in a lunar distance two minutes (equal to one degree of longitude). He then gave clear rules for finding the moon's position and distance by ten equations, too laborious for seamen to undertake. Admitting the requisite calculations for finding the moon's place to be difficult, he desired to see the moon's longitude and latitude computed for every twelve hours, and hence her distance from the sun and from a proper star on each side of her carefully calculated for every six hours, and published beforehand,

In 1765 Maskelyne became astronomer-royal, and was able-to give effect to his own suggestion by organizing the publication of the Nautical Almanac. The same Act of 1765 which gave Harrison his first £10,000 gave the commissioners authority and funds for this undertaking, Mayer's tables, with his MS. improvements up to his death in 1762, were bought from his widow for £3000; £300 was grantcd to the famous mathematician Eulcr, on whose theory of the moon Mayer's later tables were formed ; and the first Almanac, that for 1767, was pub- lished in the previous year, at the cost and under the authority of the commissioners of longitude. This was not the first almanac in the country, perhaps by a hundred, as that name was applied to small periodical works, frequently of a frivolous character,—though the later and better description gave the sun's declination and moon's meridional passage approximately. In 1696 the French nautical almanac for the following year appeared, an improvement on what had been before issued by private persons, but it did not attempt to give lunar distances,? In the English Nautical Almanac for 1767 we find every- thing necessary to render it worthy of confidence, and to satisfy every requirement at sea, The great aclticve- ment was that of giving the distance from the moon's centre to the sun, when suitable, and to about seven fixed stars, every three hours. The marincr has only to find the apparent time at ship, and clear his own measured distance from the effects of parallax and refraction (for which at the end of the book are given Lyon's and Dun- thorn's methods), and then by simple proportion, or pro- portional logarithms, find the time at Greenwich. The calculations respecting the sun and moon were made from Mayer's last manuscript tables under the inspection of Maskelyne, and were so continued till 1804.3 The calcu- lations respecting the planets are from Halley's tables,

2’The French nautical almanac is still published undet the title of Connaissance des Temps. It appeared under letters patent from the king, dated 24th March 1679—seventeen years before the first issue. The following is a liteval translation of its advertisement :—‘‘ This little book is a collection of holy days and festivals in each month. The rising and setting of the moon when it is visible, and of the sun every day. The aspects of the planets as with respect to each other, the moon, and the fixed stars. The lunations and eclipses. The difference of longitude between the meridian of Paris and the principal towns in France. The time of the sun’s entrance into the twelve signs of the zodiac, The true place of the planets every fifth day, and of the moon every day of the year, in longitude and latitude. The moon’s meridian passage, for finding the time of high water, ‘as well as for the use of dials by moonlight.’ A table of refraction. The equation of time [this table is strangely arranged, as thongh the clock were to be reset on the first of every month, and the explanation speaks of the ‘prentier mobile’]. The time of twilight at Paris. The sun’s vight ascension to hours and minutes. The sun’s declination at noon each day to seconds. The whole accompanied by necessary in- structions.”

3 Mayer’s tables were printed at London under Maskelyune’s super-intendence in 1770.

and those of Jupiter’s satellites from tables made by Wargentin and published by Lalande in 1759, except the fourth satellite. It will be seen by the following outline of contents that the first Almanac contained all the principal points of information which the seaman required; and greater accuracy at that time was not desirable, or at least would not have been appreciated.

Page 1 of each month gave the Sundays and holidays, four phases of the moon, and positions of sun, moon, and planets in the signs of the zodiac; page 2, sun’s longitude, right ascension in time, declination, and equation for noon each day; page 8, sun’s semidiameter, time of passing the meridian, hourly motion of the sun, logarithm of sun’s distance, and place of the moon’s node, for every sixth day; also eclipses of Jupiter’s satellites, time of immersion; page 4, the positions of the four principal planets for

every sixth day; page 5, the configuration of Jupiter's satellites at 11 p.m. of every day; page 6, the moon's longitude and latitude for noon and midnight of every day; page 7, the moon's age, passage over the incridian, right ascension, and declination at noon and midnight; page 8, the moon's semidiameter, horizontal parallax, and logistic logarithm-——each at noon and midnight; pages 9 to 12, the moon's centre from the sun and seven stars for every three hours, while within about 116 degrees. Then follow tables of refraction, moon's parallax in altitude, a catalogue of stars, with their right ascension and declination, table for the ''dip" of the sea horizon, and several other useful things, many of which are omitted in modern Nautical Almanacs, as they are included in and more properly belong to the permanent rules and require- ments of navigation.

Various useful rules and tables were appended to early volumes of the Almanac. Thus the volume for 1771 contains a method and table for determining the latitude by two altitudcs and the elapsed time first published by Cornelius Downes of Amsterdam in 1740.} At the end of the Almanac for 1772 Maskelyne and Whichell gave three special tables for clearing the lunar distance ; still their rule is neither short nor easily remembered. An improvement of Dunthorn's solution is also given, and a problem in Mercator's sailing by Halley solved by Israel Lyons,? viz., the latitude of the point of departure given, distance sailed, and change of longitude, —required the course steered. In the edition for 1773 a new table for cquations of equal altitudes is given by W. Whale. In those for 1797 and 1800 tables are added by John Brinkley for rendering the calculations for double altitudes casicr.

From 1777 to 1788 inclusive, the moon's place was calculated from improved tables by Charles Mason, founded on observations by Bradley, which were pub- lished in the Nautical Almanac for 1774. The difference then only amounted to 1" in longitude, the apogee 56", and the ascending node 45". From 1789 to 1804 the tables were further corrected by Mason, and calculated to tenths of a second. The distances between the moon and the stars were still further corrected by the use of Taylor's logarithms to seconds, and their places by Bradley's observations in 1756 and Maskelyne's in 1809. The places of the planets at that time were from Lalande's Astronomy (the 3d edition was published in 1792), more recently

from vol. iii. of Professor Vince's Astronomy. The places of the moon since the beginning of 1821 were calculated from Burckhardt's tables. They are now taken from Hansen's tables, completed with the aid of the English Government in 1857. The eclipses of Jupiter's Satellites for 1824 and following years were from De- NS eee

: This method, for which the author received £50 from the com- missioners of longitude in 1768, used logarithmic solar tables of Downes's owninvention. As he also used the latitude by dead reckon- ing, the calculation involved repetition and was long. Dr Pemberton, in # paper read to the Royal Society (Nov. 20, 1760), showed that the pro- blem could be worked without the new logarithmic solar tables ; but he also uses the dead reckoning. The problem was not new ; Nufiez had solved it on the globe; and solutions by the globe, disks of talc, or the like, which are useful only as illustrations, have since been repeated from time to time down to our own age. One such by R. Graham (1734) is givenin Phil. Trans. , xxviii. 435, with much boasting. The first discussion of double altitudes in which the motion of the ship between the observations was taken into account was in a pamphlet by N. F. Duillier in 1728.

a Lyons received £10 for his solution of this problem from the com- Mussioners in 1769; and in 1772 he and Dunthorn each got £50 for their improvements in " clearing the distance."'

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lambre's new tables. In 1827 the positions of sixty of the principal stars were given for every tenth day, from the tables of Maskelyne and Dr Pearson. Since 1824 the work has been printed three and latterly four years in ad- vance. The price was 5s. till 1855; but the Almanacs for that and subsequent years have been issued at 2s, 6d.

A book of Tables Requisite to be Used with the Nautical Ephemeris was published byMaskelyne at the same time as the first Almanac, and ten thousand copies were quickly sold. A second edition, prepared by W. Wales, appeared in 1781, an octavo of 237 pages, in the preface of which it is stated, with apparent truth, that it contains everything necessary for computing the latitude and longi- tude by observation. There are in all

twenty-three tables, the traverse table and table of meridional parts alone being deficient as compared with modern works of the kind; dead-reckoning Maskelyne did not touch. He gave practical methods for working several problems; the lunar especi- ally is an improvement on those by Lyons and Dun- thorn, though a rule there given for clearing the dis- tance, called Dunthorn's improved method, is remarkably short. The half sum of three logarithms gives an arc, and the half sum of other two gives half the true distance. The objection is the use of special logarithms. Maskelyne's rule for finding the latitudes by two altitudes and the elapsed time is also good, but with the same objection. The third edition of the ables was issued in 1802. It has been said that Maskelyne neglected the planets; be that as it may, he established the positions of sixty of the principal stars, and completed many other things. He had but one assistant, whereas there are now eight, and the Nautical Almanac is under another department.

As the necessary calculations for clearing the lunar distance from the effects of parallax and refraction were considered difficult to seamen, many efforts were made to shorten the process. Among others Whichell, master of the Royal Naval Academy, Portsmouth, conceived a plan whereby it could be taken from a table by inspec- tion. In October 1765 the commissioners of longitude awarded him £100 to enable him to complete and print 1000 copies of his table. On the following April they gave him £200 more. The work was continued on the same plan by Shepherd, the Plumian professor of astronomy, Cambridge, with some additions by the astronomer-royal. The total cost of the ponderous 4to volume up to the time of publication in June 1772 was £3100, after which £200 more was paid to the Rev. Thomas Parkinson and Israel Lyons for examining the errata. It isa very large and expensive volume, — very ill-adapted for ship's use. Considerable sums were paid by the commissioners from time to time for othcr tables to facilitate navigation—not always very judiciously. It is sufficient to mention here the tables of Michael Taylor and the still esteemed tables of Mendoza, published in 1815. Here also may be mentioned a useful table by Stevens (1780) for finding the latitude by the altitude of the pole star, and Crosswell's tables for facilitating the computation of lunars—partly new and partly after Maskelyne. These appear to be the first tables in which half the logarithmie sine, &c., is given, to save the trouble of halving a sum of four or more logarithnis.

The plan of the Nautical Almanac was soon imitated by other nations. In France the Académie Royale de Marine had all the lunar distances translated from the British Nautical Almanac for 1773 and following years, retaining the Greenwich time for the three-hourly distances. The tables were considered excellent, and national pride was satisfied by their having been formed on the plan proposed by Lacaille. They did not imitate the mode given for clearing the distance, considering their own better. ;

Though the Spaniards were leaders in the art of navi- gation during the 16th and 17th centuries, it was not till November 4, 1791, that their first nautical almanac was printed at Madrid, having been previously calculated at Cadiz for the year 1792. They acknowledge borrowing from the English and French. The lunar distances were reduced from Greenwich meridian to that of Cadiz, by subtracting 25™ 9%. It is in larger and better print than the French almanac. In the book for 1803 the meridian

of the royal observatory at Isla de Leon is placed 24™ 4785 west of Grecnwieh. In the English almanac for 1883 it is given as 24™ 498-6; therefore they were very near the truth in 1791. The almanac for 1810, published at Madrid in 1807, was the first in which the lunar distances were reduced to the meridian of Isla de Leon—that is, giving the distance to the even hours 3, 6, 9, 12, &. The Spanish almanacs for 1813 to 1816 were published in Fleet Street, the first-named only one ycar in advance. From 1820 to 1832 they were good octavos and clear type. Soon after that time they appeared in folio, giving nearly all the information found in the English almanac, but not neglecting the saints' days and festivals. The excellent Berlin Astronomisches Jahrbuch began to appear in 1776, the American Ephemeris in 1849. These two epheme- rides and the French Connatssance des Temps are inde- pendent and valuable works, and for astronomers at least in some respects superior to the English Almanac.

After Maskelyne's death the correctness and reputation of the Nautical Almanac underwent a serious decline. The matter came before parliament in 1818, when the board of longitude was reconstructed, and the old Acts consolidated. Dr T. Young was appointed secretary to the commissioners, and superintendent of the Almanac. Ten years later, in 1828, the board was

swept away, the Almanac was placed under the Admiralty, and Young, with Faraday as a chemist and Sabine as a practical observer, were appointed scientific advisers to the Admiralty, which ever since has spent a certain annual sum on scientific research, The Almanac still gave cause for dissatisfac- tion ; a memorial to the House of Commons, dated January 28, 1829, states that the Nautical Almanac was for the good of astronomy as well as navigation, and that it is so declared in the first Almanac in 1767 ; that in 1818 fifty- eight errors were discovered, and a similar number in the Almanac for 1830, and that it had not kept pace with navigation or astronomy ; that it did not give the moon's distance from the four principal planets as the Portuguese and Danish ephemerides did, nor did it give the positions of those plancts ; that there was no list of the occultating stars which were ascertained to be visible in Halley's time, but were neglected after the invention of Hadley's sextant (they were in the Milan ephemerides); and that the tables of the sun were not correct. This was supported by a paper signed by J. F. W. Herschel, read at the board of longitude April 5, 1827, which stated that the moon's meridian passage was not given at all, that of the sun roughly to the nearest minute. The right ascension and declination of the larger planets were not given with accuracy, as they should have been, as thcir theory was perfect. The moon's right ascension in time and hourly motion should have been given, also the time of semi- diameter passing the meridian, for use with moon-culmin- ating stars. Young replied to this memorial and main- tained that the fifty-eight errors were exaggerated; forty of them were in reality only one in the moon's place, which would put a ship out 5 miles, and which was corrected in the next year's book, "which every accurate navigator is bound to consult, to guard against possible minute acci- dent." The errors of 1830 were, he says, of less import- ance: the French Connaissance des Temps of 1821 was corrected by the English Almanac; some errors were found in Taylor's logarithms ; the error in the solar tables, said to be 15 seconds, was really only one. The ultimate result of these controversies was the appearance of the new and reformed Nautical Almanac in 1834. It may be added that the last remnant of the old laws, the protection of the Almanac against competition by a penalty, was abolished by an Act passed August 6,1861. The number of copies of the Nautical Almanac (for 1851) printed in

1847-48 was 10,000, and the number sold (of various years) 8638, at 5s. each; the gross produce of sale was £2159, and the expense of preparation £3677. In 1882 15,071 copies were sold, of various years, extending to four years in advance ; the cost was £3368, and the gross produce of sale at 2s. 6d. each £1900. The sale of the Nautical Almanac has lately decreased on account of the amount of information given in private publica- tions.

Prior to 1795 the nautical portion of the British com- munity, including the royal navy, were entirely dependent upon private industry and enterprise for charts and _sail- ing directions. On August 12th of that year an order in council placed all such articles as were then in the posses- sion of the Admiralty in charge of Mr Dalrymple, an eminent publisher of such things, who had long been employed by the East India Company, and whose catalogue in 1786 contained 347 charts between England, the Cape, India, and China ;1 thus the germ of the hydrographic department was established. The expense was then limited to £650 a year, just one-tenth of what was allowed last year for drawing and engraving charts alone, besides £5500 for printing and mounting them. In 1881 there were 118,542 charts sold.

After the close of the long devastating war in 1815 both trade and science revived, and several Governments besides that of Great Britain saw the necessity of surveying the coasts in various parts of the globe; the greater portion of the work fell to the English hydrographical department, which took under its charge nearly every place where the inhabitants were not able to do it for themselves. The parts which received immediate attention were the shores of the United Kingdom, the lakes of Canada, Gulf of St Lawrence and Newfoundland, West India Islands, Sicily and the eastern part of the Mediterrancan, west coast of Africa, Australia, Tierra del Fuego and Straits of Magellan, Arabia, Persia, Bay of Bengal from the Hooghly to Malacca Strait, and the Red Sea. Similar good work was carried on by the Governments of France, Norway, Denmark, Sweden, and Russia; Portugal was an exception. Spain had for her own shores the excellent work of Admiral Vincent Tofifio, performed in the latter part of last century. The United States of America have surveyed both shores of that continent since 1832. Since 1837 the British surveyors have been continually employed in Australia and New Zealand, and since 1842 on China and Japan, and the whole west coast of America from Magcllan to Behring’s Straits. British

Columbia has been surveyed in detail, also the great barrier reef of Australia and Torres Strait, the coast of New Guinea and the Fiji group, coast of Arabia, and Persian Gulf. The Gulf of Suezand other parts of the Red Sea have been resurveyed. Fresh require- ments are continually springing up, and greater precision is expected in the surveys, which arc now continued, with the same zeal and unreniitting attention, under the present hydrographer Captain Sir Frederick Evans, K.C.B., to whose paper for the British Association (1881) the reader is referred. The first official catalogue of charts was issued in 1830; the total number was then 962. In 1880 the number had increased to 2699. The greatest increase was on the British coasts, from 51 to 368, the Arctic seas and north-east coast of America, from 57 to 302, and the Pacific Ocean islands, from 11 to 100.

The question of the accuracy with which the sea charts now represent a portion of the globe is entirely set at rest by the possession of a correct knowledge of the figure and

1 In 1783, in an excellent descriptive work of the nature of sail- ing directions, Dalrymple with clear prevision gave his opinion that chronometers would so change geography that new charts would be required,

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size of the earth, as well as the means of ascertaining the latitude and longitude of innumerable places (see Eartu and GzocrapHy). They are now made as precisely as possible to represent the actual surface of the globe. The result of each survey is first plotted with the meridian lines inclined towards the pole, by which means all astronomical bearings coincide. It isafterwards opened proportionately to suit Mercator’s projection and the sailor’s use, as far as 70 or 80 degrees. For the polar regions a circular projection is used, which may comprise a radius of 30 or even 40 degrees. During 1882 sixty-one new plates of charts were engraved, and eighteen improved by the addi- tion of new plans ; 2700 plates received corrections by the engraver. ‘The number of charts printed for the royal navy, Government departments, and to meet the requirements of the general public, during 1882 amounted to 229,700. The Admiralty catalogue of charts and sailing directions now contains 2680 of the former and 83 of the

latter. The tide table for 1883 gives the time of high water at all the ports in Great Britain and Ireland, also for full and change days all over the globe,—upwards of 3200 in number. The cost of the hydrographic department was £43,145 last year, of which £20,958 was for surveys in various parts of the world, hire of vessels, wages, &e.

Many of the early writers and teachers of navigation regretted that no national care was bestowed upon the education of navigators ; they might be rejoiced could they know that the Royal Naval College at Greenwich is main- tained at a cost of £31,800; beside which there is the Naval College at Portsmouth, and the " Britannia" train- ing ship for naval cadets, which latter costs over £17,000 a year, one half being paid by the parents. There is also a school at Greenwich for a thousand boys, the sons of petty officers, seamen, and marines, all of whom (unless physically incapacitated) are destined for the sea. There are also several training vessels connected both with the royal navy and the mercantile marine. There can be no doubt that the educational qualification of seamen of all grades is well provided for, and as little doubt that the kindred qualification "seamanship" is neglected ; but the examination for a lieutenant in the navy will in future include a knowledge of Channel pilotage.

A meteorological conference was held in Brussels in 1853 for devising a uniform system of observations at sea, upon winds and currents; and a meteorological department was established in England soon after, under the Board of Trade and Admiral FitzRoy. In 1866 it was placed under a committee selected by the Royal Society. It is hoped that before long much useful information may result from that source. Wind and current charts are now compiled by the Admiralty, which are very valuable aids in long voyages.

At the commencement of the present century all watches designed for the discovery of the longitude were called "chronometers" ; they were but slowly coming into general use ; the Admiralty only supplied them to flagships, sur- veying ships, and exploring expeditions. Later every ship of war was allowed one, and an additional one if the captain possessed one of his own. The East India Company allowed their ships one each at an early date. Now flagships are allowed five, and ordinary ships of war three each.

Chronometers were soon recognized as a Certain and simple means of ascertaining the difference of longitude between two places ; Captain Cook and others used them in the last century. Between 1817 and 1824 Captain Smyth used five chronometers in the survey of the Mediterranean. Dr Tiarks, 1822-23, used twenty- “Ix to establish the longitude of Pendennis Castle, and for Funchal, Madeira, seventeen. Schubert in 1833 proceeded round the Baltic in a steam-vessel with fifty-six chrono-

meters, reckoning his longitude from Altona. In 1826 King carried eleven in the “Adventure” and “Beagle”; Foster in 1828, seventeen in the ‘“ Chanticleer” ; FitzRoy, 1831, twenty-two in the “Beagle.” In 1839 Lieutenant Raper proposed that eighteen “secondary meridians” should be established, and, these being well spread over the globe, the minor places should be referred to them, and not to each other as formerly. There are now fifty such secondary meridians, and the electric wire has taken the place of the timekeeper, as the time-signal is the most perfect thing which human ingenuity can devise. The elaborate chronometric expeditions of English, Continental, and American astronomers belong rather to the history of astronomy. When the Atlantic cable was laid to New- foundland in July 1866, and time-signals received direct from Greenwich Observatory to Heart’s Content, the Admiralty chart was found to be quite correct. In a similar manner all the principal places in North and South America and the West India Islands have been connected by time-signals with the United States observatories within the last seven years, and found to be fairly correct, the error seldom amounting to two seconds in time. The observatory at Lisbon was found to differ eight seconds of time. It may now be assumed that there is no place within the ordinary navigable parts of the ocean where an error in position exists of sufficient amount to affect a ship’s safety.

A reward was formerly given annually to the maker of the chronometer which stood the best test at the observa- tory; this was instituted in 1822, and discontinued after 1835; the recipients were Poole, Frodsham, Hutton, Hewett, Hiffe, and Dent. Since that time they are re- ceived at the observatory on trial during twenty-eight weeks, and those preserving the

most equal rate are chosen for the public service at a price named by an official in charge of the department, and something above the ordin- ary price. Prior to 1849 as much as £62 was paid for one; in 1883 about six are recommended for purchase at £45 to £38 each. On Dent's catalogue marine chrono- meters range froin 35 to 45 guineas.

The following list of some writers of navigation whose works have not been already inentioned may be found useful :—Thomas Addi- son, Arithmetical Navigation, 1625 (he was the first to apply logarithms); Antonio de Najera (Lisbon, 1628) follows Nufiez and Cespedes, but corrects the declination of sun and stars; Sir R. Dudley, L'areano del mare, 1630-46, 2d ed., Florence, 1661, too ponderous for the use of seamen ; Sir Jonas Moore (1681), one of the best books of the period ; William Jones (1702), a useful compendium containing trigonometry applied to the various sail- ings, the use of the log, and tables of logarithms; Pierre Jean Bouguer, Traité Complet de la Navigation, folio, 1698, good but too large; Manuel Pimental, L'arte de navegar, Lisbon, 1712; Pierre Bouguer, jun., Nowveau Traité de Navigation, 1758 (without tables), published at the request of the minister of marine, im- proved and shortened in 1769 under the superintendence of the astronomer Lacaille ; Nathaniel Colson, Zhe Mariner's New Calen- dar, 1735, a good book ; Seller, Practical Navigation, a book very popular in its time (there was an edition as late as 1739); Samucl Dunn published good star charts and tables of latitude and longitude (1787), and framed concise rules for many problems on navigation (published by the board of longitude); John H. Moore, The Practical Navigator and Seaman's New Daily Assistant, 1772, very popular, and generally used in the British navy, —the 18th and 19th editions (1810, 1814) were improved by J. Dession ; W. Wilson (Edinburgh, 1773), a treatise of good repute at the time ; Samuel Dunn, New Epitome of Practical Navigation, or Guide to the Indian Seas, 1777,—for the longitude he depends chiefly on a variation chart from observations on East Indiamen, and he still makes no mention of the Nautical Almanae or of parallel rulers ; Samuel Dunn (probably a son of the last named), 1781, is the last writer who gives instructions for the use of the astrolabe; he also wrote on ''lunars" (1783, 1793), a word which was generally adopted about this time, and published an exeellent traverse table (1785), and Daily Uses of the Nautical Seiences, 1790; Horsborough, Directory for Hast India Voyages, 1805; A. Maekay, The Complete

Navigator, about 1791, 2d ed. 1810,—there is no instruction for finding longitude by the time-

keeper; Kelly, Spherical Trigonometry and Nautical Astronomy, 1796, 4th ed. 1818, clear and simple; N. Bowditch, Practical Navigator, 1800, passed through many editions, and is still much used in the United States navy ; J. W. Norie, Epitome of Navigation, 1803, 21st ed. 1878, long a favourite in the mercantile marine from its simplicity, and because navigation can be learned from it without a teacher; T. Kerigan, The Young Navigator's Guide to Nautical Astronomy, 1821; Inman, Epitome of Navigation, 1821, with an excellent volume of tables—largely used in the British navy, 9th ed. 1854; E. Riddle, Navigation and Nautical Astronomy, 3d cd. 1824, 9thed., by Escott, 1871, still worthy ofits high reputation, — it does not include great circle sailing; J. T. Towson, Tables for Reduction of Ex-meridian Altitudes, 4th ed. 1854, very useful ; H. Raper, Practice of Navigation, 1840, 10th ed. 1870, an excellent book, perhaps the best; H. Evers, Navigation and Great Circle Sailing, 1850, other works on the same subject by Merrifield and Evers (1868), and Evers (1875); R. M. Inskip, Navigation and Nautical Astronomy, 1865, a useful book, without tables; T. H. Sumner, A Method of finding a Ship's Position by two Observations and Greenwich Time by Chrononeter,—this is set forth as a novelty, but was published by Captain R. Owen, R.N., early in the century, and practised by many officers; H. W. Jeans, Navigation and Nautical Astronomy, 1858, without tables, a good deal used in the British navy,—Jeans revised Inman's tables in 1873; Harbord, Glossary of Navigation, 1863, enlarged ed. 1883, a very excellent book of reference; W. C. Bergen, Practices and Theory of Navigztion, 1872; Sir W.-Thomson, Navigation, a Lecture, 1876, well worth reading.

PRACTICAL OR MODERN NAVIGATION.

The following outline of navigation, as commonly practised in 1883, is sufficient to enable a person to con- duct a ship from one port to another, or at least to show in plain simple terms the principle upon which it is done. There will be no tables or logarithms referred to which are not common to all works on navigation, and in all such books there are instructions for their use. Seamanship forms a separate subject, but there are a few points

wherein it is inseparable from this; no man can be a good navi- gator unless he possesses sound judgment in seamanship.

It is necessary that the ship should be provided with good compasses, in suitable places, an ordinary log and line, as well as any patent log which may be desired, hand leads, deep-sea leads and lines, log-book, work-book, chronometer, tables of logarithms, &c., Nautical Almanac, sextant, artificial horizon, large parallel rulers, a box of mathematical instruments, charts of the ocean, and enlarged plans of the places the ship is likely to visit.

Before the ship leaves her anchorage or other security, the helm should be moved hard over each way, to prove that it is clear, and a leadsman stationed on each side of the ship. When clear of the harbour and adjacent head- lands, the course is set towards her destination or to obtain an offing. At that time a bearing is taken of one known object and the distance estimated, or, two known objects being in a line, a bearing is taken of a third, or two cross bearings; the result in either case is entered in the log-book, with the exact time. This is called the departure (i.e, from the land), and should be secured before rain or fog intercept the view. Thereafter the rough or deck log- book should be marked every hour after the log has been hove (the hour being subdivided when necessary), and the estimated course steered, distance through the water, wind, and leeway (if there be any) carefully entered in their proper columns. The courses may be steered and expressed by degrees, if this is desired. The ship’s reckoning is in- variably made up from noon to noon of each day; all the principal events are entered in the ship’s log-book, which is a very important document.

That part of a ship’s reckoning which is independent of observations of sun, moon, or stars is called dead-reckoning (D.R.), while the position by celestial objects is designated observed (Obs.).

The following illustration of a ship’s log and day’s reckoning will include all the “ sailings” which are usually

treated under separate heads. The force of the wind and state of weather are expressed according to a scale, from 1 to 12, and by symbols which have been in general use about fifty years. Variation and local deviation of the compass must be here attended to; the mode of ascertain- ing the amount

will be explained further on. All problems in this part of navigation are solved by plane trigo- nometry, as if working on a plane, except in finding the proportion between difference of longitude and departure (the latter from the meridian in nautical miles).

The accompanying example of a ship's log represents the greater portion of a page, which would contain the record of what had occurred during two civil days, and therefore embraces one com- plete astronomical day. While the ship remains on the same course the entry should not be repeated; the open space shows more clearly the amount of distance due to each. The ‘‘ North Star" is here supposed to have been under way and clear of the harbour at noon, when the departure was taken from the Eddy- stone, the position of which is 50° 11' N. and 4°15' W. The courses are intended to comprise many varieties of circumstances. If a ship be under steam or has a fair wind, these will be but few; but leeway will always exist according to the strength of the wind, if on the side, though scarcely perceptible by the wake if the ship is going fast. It is supposed that a ship either sailing or steaming even 15 miles an hour, with her broadside to the breeze, will be carried the same distance ata right angle to her course as if she had been stopped during the same period—surface of hull, sails, &c., exposed being similar in each case. It is difficult to estimate the drift of a ship during a gale, but it-is very seldom overrated. Courses and distances within 50 miles are usually obtained by laying the edge of the parallel ruler on the two positions and run- ning it to the compass, which is drawn on the chart; then take the space between the places in the dividers and apply it to the scale of latitude opposite them: the number of miles there indicated will be the distance. Distant places on Mercator's chart, when so treated, will give the course and distance approximately.

To Work the Reckoning Arithmetieally from the Ship's Log.—The true bearing of the Eddystone is reversed and treated as a course. To correct the compass courses, westerly variation and deviation are both applied to the left of the course steered, that is, against the sun, the reverse when they are easterly. In the example the variation is taken as 21° westerly throughout the day's run. The deviation is taken from a table of corrections for a compass to which a magnet had been applied (see Compass and Magnetism). The first course on the ship's log is W. by S. 4S. orS. 73° 8°W.

Apply variation —21°; deviation (5° 30’) being easterly is +; leeway (5° 37’) as the wind is south is also +: result 8. 68°15’ W. Ina similar manner deal with the other courses, marking well the change of sign east or west, and the direction of the wind with regard to the leeway. The direction of the current being true is entered as 8. 79° W. After all the courses and distances for the day have been correctly entered in a traverse table, the correspoud- ing differences of latitude and departure are taken from the tra- verse table of the epitome, and placed in the proper columns. If the angle be less than 45°, read difference of latitude and departure at the top of the page; if greater than 45° it is reversed. As the table is arranged in decimals, 2°5 can be treated as 25 or 250, or conversely, so that large distances may be embraced. This process is called working by inspection, and is sufficiently accurate for the purpose of finding the course and distance made good, or the course aud distance, to places within 300 or 400 miles.

Traverse Table.

Magnetic Course, | True Course. | Distance.

8 7

N s Ss

4° W 9° W 63° W $ 30° W South. § 23° E. 8 53° E, West. West. N 67° W. N 64° W. S 43° W.

As the difference of latitude is south, it must be subtracted from the latitude left. Eddystone, 50° 110 N. 4° 15’ W.

-1 3-1 +2 27

“49 7°9 6 42

49 7:°9=49° 7/54”

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NAVIGATION

|g Wind. sj 2 | 8 H. | Ke] Course sie 5 g 3 g | E3 5 way. P| ps & g gu Remarks, &c. Tuesday, May 9th, 1882. = cS é 3 a Direction. | Force.}| © S ie a 5 el avila | eS ls 1 2 ra ck) ae A.M, Pa oy) Moored in diel pas es an 3 Plymouth #80 on 300 a 4 Sound. Calm 0 or 29°86) 54 6 oss Vole 2 og see Sus rs 6. Unmoored, and shortened in on SB. to 30 fathoms. 7 «. | Single anchor. ae ae aes es eer 8 50 South 4 be 80°70 | 55 9 awe ae 009 ane 9.80, Made all plain sail, Weighed and worked out of Plymouth 10 we oe Sound. 11 Working out. Swes om ace 600 st 12 Vble. 6 bv 80°05 | 57 Noon. Tacked. i q Latitude. i : iati ; a _. _— =o – atitude Longitude oe True Bearings and Distance. an ade roug ae Good. | the Water. sis D.R. Current. = Obs. Obs. 20° 25’ Wly. Eddystone Lighthouse, § 34° E., 1 mile. ieee | 4 WDSiS. 3 |Southerly.| 6 be |53E 58 | ... | PM. 2 8 6 ore pee lee ete roe as ane 585 Tide set W. by S. (truc) 5 miles, during the afternoon. Bi 7 | 6 SW3s. 0 SSE. 6 ter ene. il). 4 6 4 beg es ike Ace con oon 30°0 58 4 Lizard Lighthouses, N,W., 12 miles. (Ship’s head S.W. by W.) 5 a al iss S>Wew. % 6©| Westerly. 5 oq 7E 2 Be Taken aback, by shift of wind. Braced round on the star- 6 7 2 ne coe soe “ sis aaa & board tack. 7 if 6 ree 8 7 8 ho SSE. } SW. 42 W. 11 7 8 ae ee wae a ate a vis 308 oe ube, Tacked. oe se |... W? N3N, Fi ee 7 beq | 2W.]2985| 54 | 45 | Midnight. Two sail in sight. Remarks, &c. Wednesday, May 10th, 1882, 1/38] 5 |° wengn, 3 SW. 7 be |2W. AM. 2 8 Ben WNW. 0 ae ee aa 2.20, Exchanged numbers with the s.s. “ Fox,” bound to London. 4 7 2 NW. 3 Wsw. 6 om {4 W. | 29°80} 50 6 7 ? neo ; ms 7 6 5 5 5 od 7. Variation by azimuth (head N.W.) 24°25 westerly. 9 5 oe Voie. oo 283 10 2 a ins ant Ge 3 or Res 10. Trimmed sails. 1] 7 5 SwWew. 0 SE. 6 be | 74E. sas ots is 12 | lo 2 -, whe 7 bev – 29°9 54 46 | Noon. Set port studding sails. Course ist : Latitude. Longitude. ae made good. atti my al reer Truc Bearings and Distance. $56}° W. Made | Through eveg ; sili Good. | the Water, | D—49°7’54”| D.R. 6-42 ; Current. Lees, Obs. 49° 8’ 13”! Obs, ae Entrance to Strait of Belle Isle. Do. By great circle sailing, bi 1141 174:8 20° 25’ W. N. 85° 9’ W.1858 miles. N. 66° W.—1824‘2 miles. 1 PM.

2 3

With middle latitude 49° 40’ and departure 95°1, enter the traverse table. ‘

Taking the complement of middle latitude as a course, and the departure in its column, the difference of longitude=147 is found in the distance column; which being west is added to the Eddy- stone’s westerly longitude.

Lo find the Course and Distance Made Good by Inspection.— Difference of latitude 63°1 and departure 95°1 will be found opposite 564° and under 114; thercfore it is S. 564° W. 114 miles from the Hddystone.

To do the same more exactly by logarithms, —the multiplication and division of the quantities being performed by the addition and subtraction of their logarithms.

First, required the difference of longitude.

dep. 95°1 x rad. cos mid. lat. 49° 40’

95°1 log+10… 11:978180

= diff. long.

49° 40’ log cos….. 9°811061 A Diff. long. 146°9- log……..... 2°167119 r dep. 95° ° 40’ ep. 95°1 x sec 49° 40 dif lenge rad, Bet Mess. cante 1978180

49°40’ logsec—10 0°188939

Diff long. 146-9 log……..... 2°167119

The proportious which sines, tangents, and secants bear to the course, distance, difference, latitude, and departure, and these to each other, form the principal points in plane trigonometry connected with navigation, which can be easily demonstrated by two figures. If the hypothenuse AB be made radius, as in fig. 12, the whole will be con- tained within the circle, and the sides are in proportion to the sines of their opposite angles; but if the base be made the radius, as in fig. 13, the other side BC is entirely without the circle, touching only at the point C; it is therefore a tangent subtending the angle A, and the hypothenuse AB be- comes the secant of the angle A. In

like manner BC may be made radius, then AC would become the tangent of angle B.

To find the course and distance made good by calculations.

Tangent

Radius

Fig. 13.

Making BC the radius, XVIL — 34

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AC 95-1 log +10… 11°978180

rad. x dep. AC BO G21 “hogs sence 1800029 =e. a wall course, ;

diff. lat. BC ————

B 56° 26’ 7” log tan…. 10°178151

BC G8. low.,...0..0 1°800029

BC x sec B 56° 26’ 7” rad.

B 56° 26’ 7″ log sec – 10 0°257372

= distance. AB dist. T14°1, Tosca. 2°057401

It is not necessary to work out a course to seconds; scarcely so to minutes. Distances are invariably expressed in miles and decimal parts. we

To find the Course and Distance to the Place of Destination,— Suppose it be the Strait of Belle Isle. Choose a point of land, or assuine a position, near the entrance, say 51° 45’ N. and 55° 10’ W. A line drawn on a chart of the Atlantic from the ship’s position to the above will roughly indicate the course usually steered, which is a rhumb line cutting all the meridians at the

same angle, and forming on the globe a spiral curve towards the pole. The excep- tions arc if it be east or west, north or south ; in the former case it would be a small circle round the pole, and in the latter it would be on the meridian (which is 4 great circle) directly to one of the poles. The direction of the line on the chart is found by means of parallel rulers conveying it to the compass, or by a protractor placed on a mcridional line ; and the distance is measured on the scale of latitude at the side between the two places. Long distances are calculated by ‘‘middle latitude,” or ‘‘ Mercator’s sailing.” The former is most convenicnt in low latitudes and when the difference issmall, but the latter isatall times more correct. Middle latitude may be made nearly as good a method by measuring from the chart half way between the two latitudes ; or the same result may be obtained by taking the latitude corresponding to the mean of the meridian parts, as the table of these embodies the whole principle upon which Mercator’s charts are made.

Continuing the day’s work—

Lat. of ship 49° 8’ Near Belle Isle 51 45

2 37=157′ 2)7035°19 Mid. lat. 50° 27’ 30”. Mean 351759

which differs only one mile from the mean taken directly. To find the departure corresponding to the difference of longitude (55° 10’ — 6° 42’= 48° 28’ = 2908’) in mean latitude 50° 27’ 30”:-— diff. long. 2908 x cos 50° 27’ 30” rad. With difference of latitude and departure to find the course :— rad. x dep. 1851°3 sie eemae ie rad. x diff. lat. diff. lat. 157 85° 9’ 10”; dep. The course is evidently 85 degrees to the west of north. To find the distance :— dep. 1851°3 x rad. sin course 85° 9’ 10”

To find the course and distance by Mercator’s sailing. The differ- ence betwcen the meridional parts as above is 246°6, difference of longitude 2908 miles, and difference of latitude 157 ; whence

rad, x diff. long. diff. lat. x rad. merid. diff. lat. cos course

Merid. pts. 3394°29 3640°90

=dep. 1851°3 miles,

= cot course.

= 1858 miles.

= tan course = dist. 1858 miles. 85° 9′ 10”; The result is the same by both methods when the difference of latitude is small. It is obvious that if we subtract the logarithm corresponding to the meridional difference latitude from that of the difference longitude increased by ten in the index, the remainder will be the logarithmic tangent of the course. In like manner, if the logarithmic secant of the course be added to the logarithm of the true difference latitude, and ten in the index rejected, the sum will be the logarithm of the distance.

Under some circumstances, in high latitudes, the ordinary mode of reducing the ship’s run during the twenty-four hours, by taking the difference between the northing and southing as the difference of latitude, and the excess of easting or westing as the departure, would not be correct. For example, suppose that from a position off the west coast of Ireland, in 52° N. and 11° W., a ship were to sailin such a manner as to make during the first eight hours 96 miles on a true N. W. course, during the next eight hours a similar distance due north, and during the last eight hours N.E. 96 miles. Here we should have the two oblique courses producing 67°9 miles each, both of difference of latitude and departure, the departures apparently cancelling each other and leaving the ship on the same meridian. But in reality the ship would not be on the same meridian, as the latter departure was performed in a higher latitude than the former, and they are of opposite names. Therefore this peculiar ‘‘day’s work ” requires to be divided into two distinct parts ; each may be taken by inspection from the traverse table. The first

course N. 45° W. 96 miles will produce latitude 58° 7’ 54”, middle latitude 52° 34’, which with departure 67°9 will give difference longi- tude 111° 6’ W. ‘The second course simply adds 96 miles to the latitude; the third, like the first, increases the latitude by 67°9 miles making it 55° 51’ 48”, and the

middle latitude of the last section 55° 18’, which with departure 67°9 will give difference longitude 119°2; this being east, and preponderating over the former by 7°6 miles, the ship will be 7°6 miles east of the meridian she first sailed from, or in 10° 52’ 24” W.

Great Circle Sailing,—The course between the ship on May 10th and the Strait of Belle Isle, as ascertained by middle latitude and Mercator’s sailing, is a straight line on Mercator’s chart, but is in reality a curve upon the globe, and the nearer the positions are to either pole the greater the curvature and consequent increase of distance. The shortest distance between any two points on the globe is an arc of a great circle, the centre of which is also the centre of the sphere. The equator, ecliptic, and all meridians are great circles, between which an infinite number of others may be drawn in every conceivable direction, cach dividing the surface of the globe into two equal parts. It is only of late years that this subject has been revived, since ships have made long voyages entirely nndcr steam, thereby having the ability to steer any course desired. The practice of this mode of sailing requires but a smal] general knowledge of spherical trigonometry, and to that extent only will spherical problems be here introduced; though a clear understanding of the doctrine of the sphere is very desirable for all navigators. The formule by which spherical problems are solved must here be postulated. They will be proved in TRriGono- METRY. In all spherical triangles there are six parts, three sides and three angles, the sides as well as the angles being measured by degress; any three being given the remainder may be found. The angles measured between heavenly bodies, or their altitudes, are treated as spherical sides. When two places are on the same parallel of latitude, the shortest course is not east or west (except on the equator), as the parallels are small circles having the pole as their common 7 centre. In finding the true course and shortest distance, by calculating a segment of a great circle, the earth is treated as a sphere, ~~— this being sufficiently accurate for the purpose. The advantage of sailing on a great circle instead of a rhumb is best de~~ monstrated by stretch- ing a thread across a globe, cutting the two places under considera- tion; while by calcula- tion it can be found numerically. Returning to the day’s work on May 10th, let us suppose it desired to find the great circle course and distance to Belle Isle. The co-latitude of each place gives the two sides, and the difference of longitude expresses the angle between them at the pole.

Hence the two sides and included angle are given; required the third side and the angle at. ship, which will be the distance and course (see fig. 14). P represents the pole, 8 the ship, and B Belle Isle. It is necessary first to find the angles PSB and PBS. The formula is sin}diff. sides x cot § contained angle

sin § sum of the two sides eos$diff. sides x cot $ contained angle cos 4 sum of sides Instead of subtracting a sine or cosine, it is easier to add the co-secant or the secant and reject the index. The result is— sin $(PS — PB) [=1° 18’ 30”] x cot 4P{ = 24° 147] —tan 4° 33! 15”; sin $(PB+ BS)[=39° 33’ 30] cos $(PS- PB) xcot$P Sas ae con 4(PB + PS) tan 70° 51’ 30”.

Hence 70° 51’ 30” +4° 83’ 15=—75° 24’ 45” is the greater angle B, opposite the greater side ; and 70° 51’ 30” — 4° 33’ 15”—66 18″ 15 is angle S,—the ship’s course at commencing,—say, N. 66 W. At the termination it will be S. 75° W. Having all the angles, we find the third side by the rule that the sines of the angles are proportional to the sines of the opposite sides.

= tan } diff. of other two angles;

= tan 4 sum of other angles.

sin PS 40° 52’ x sin P 48° 28’ mary Pe: f ee 24′ 15″ = 1824-2 distance sin B 75° O4 45” ichae

sin PB38°15 x sin P48° 28’ sin 8 66° 18’ 15”

The distance by Mercator’s sailing was 1858, or 33°8 miles longer.

or =sin BS 30° 24‘15”.

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Should the sum of any two sides exceed 180°, the supplement of each must be used, and the supplement of the angles found. Ifa side be over 90° the logarithm found will be sine of its supplement or the cosine of its excess

over 90°. It will be readily seen by the frequent alterations necessary in the course, to keep near the great circle, that the ship passes the pole, continually changing its bearing, as she would any other distant object on the globe. It is always desirable to ascertain the highest latitude a ship will pass when sail- ing on a great circle; this is done by imagining a perpendicular let fall upon the arc; the position is then found by right-angled spherical trigonometry, the rules for which are very brief. Exclud- ing the right angle, the triangle consists of five parts, three sides and two angles. Two of those parts at least must be given to find the rest. Ifthe two parts given and the one required are joined, the central one is called the ‘‘ middle part.” If they are not joined (that is, an angle omitted between two sides, or a side between two angles, forming part of the equation) the part which is quite separate from the other two is called the ‘‘ middle part.” The solution is then by ‘‘ Napier’s rules,” which have been embodied in the following rhymes :—

“ The product of radius and middle part’s sine

Equals that of the tangents of parts that combine, And also the cosines of those that disjoin.”

- Instead of the angles and hypothenuse Their difference from ninety or complements use.”

We know that the perpendicular will fall upon the are between B and 8, because both the angles already found are acute; thus the triangle is divided into two parts, each having one side and one angle known. ‘Take the hypothenuse PS and angle§S, to find the length of the perpendicular PR. Here are opposite sides and angles, therefore

§ a oO i 7 a ° , tt

sin PS 40″ 52′ x sin S 66°18″ 15 cone 18°15 =sin PR 36° 48’ 30”, which is the

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complement of 53° 11’30’’, the highest latitude the ship will attain. To ascertain the longitude of that point it is necessary to find the angle RPS, which may be done according to the above rules in three ways, by varying the side or angle which is made the mniddle part. Thus,

rad. +log cos PS =log cot PSR+log cotSPR ; rad. +log cos PSR=log cos PR +log sinSPR; rad. + log cos SPR=log tanPR +log cot PS.

As the part required is in each formula coupled with one which is known, the difference between that and the sum of the other two will give the angle SPR=30° 7’ 45”; which, added to the longitude at ship, will give 36° 49’ 45” as the longitude of the highest point. As the original oblique triangle BPS has been divided into two distinct right-angled triangles, having the perpendicular PR common to both, the parts which form BPR may be treated in a similar manner for the purpose of finding the angle BPR and perpendicu- lar PR, either in preference to the first, or as a proof. Other points on the arc may be found by taking a part of the angle at the pole, with the side and angle previously known, and thus forming another oblique spherical triangle, in which two angles and an in-

cluded side are given to find the rest ; or by assuming a distance |

on the are (in degrees and minutes) with the angle and side before

known. In that case two sides and an included angle will be

given to find the other side (co-latitude), and the part of the angle P to indicate the longitude of the assumed point.

= two angles and an included side, to find the other two

sides :— sin 3 diff. of angles x tan 4 side sin 4 sum of angles cos 4 diff. of angles x tan 4 side cos 4sum of angles

=tan4 diff. of other sides ;

=tan 4 sum of other sides.

The second case where two sides and an included angle are given has been done. When the polar angle (difference of longitude) does not much exceed 50°, especially in low latitudes, an approximate curve may be drawn on Mercator's chart by means of a pencil attached toa wire or batten making the curve to pass through three or four known points, after which it can be used from day to day as a guide to the ship's course ; she may not keep on it, but she can keep near it. This curve becomes very incorrect when the angle is large.

One other example of finding the course and distance by each |

method will be given. The position has been chosen to show the great distance an arc of a great circle would carry a ship to the southward of her ordinary course, and also as touching upon the difficulty always experienced in finding a side or angle which is near 90°, in consequence of the very slight change in the value of large sines and small cosines.

Aship off the Cape of Good Hope in 34° 29' S. and 18° 24' E. 1s bound to Portland in Victoria, Assume a position outside the latter port to be in 38° 20' S. and 141° 40' E. The difference of latitude is 8° 51/=231 miles, the meridional difference of latitude 287°14, and difference of longitude 123° 16'=7396.

rad. x diff. long. 7396 merid. diff. lat. 287°14 diff. lat. 231 x rad. cos course 87° 46' 37" diff. lat, 231 < < tiga as iff. la x sec course 87° 46' 37 =distance 5955-1. rad. These two statements produce similar. figures, becanse they are worked by the same course; an error of 10 seconds would produce over 7 miles in the distance, as the logarithm cosine and loga- rithm seeant (arithmetical complements of each other) change very rapidly in large angles.

When the ditference of latitude between two places is compara- tively small, it is better to find the departure and use that in find- ing the distance. The table of meridional parts can be used for that purpose in two ways.

true diff. lat. 231 x diff. long. 7396

merid. diff. lat. 287-14

For this the logarithms of numbers alone are used. The middle

latitude is best found by seeking the latitude corresponding to the

mean of the meridional parts, which in this instance will be 2350°13

and 36° 26’. The latter is the true central position on the chart,

between the two parallels of latitude, the same as if measured on the side of the chart. :

Radius bears the same proportion to the. difference of longitude as

the cosine of middle latitude does to the departure=5950°4. Then

rad. x dep. 5950°4 ote oe Tir lat o31 course 87° 46’ 36 ;

rad. x diff. lat. 231 “dep. 59004

dep. 5950°4 x rad. sin course 87° 46’ 36 ’ Having found by Mercator and middle latitude that a ship from the position off the Cape would, by steering S. 87° 46’E. for the

whole distance, traverse 5954-9 miles before reaching the assumed point near Portland, it is now required to find an arc of a great

=tan course 87° 46’ 37” ;

=distance 5955:1;

=dep. 5950°4.

or =cot course,

z= distance 5954°9.

and

circle passing threugh those points. The co-latitude of each place and the difference of longitude are given,—that is, two sides and an included angle; required the third side and angle C (fig. 15).

1st position 34° 29’: co-lat. =PC 55° 31’ 18° 24’ E od, 38°20″ 4, = PV 51°40″ 141° 40′ E O77 123° 16’=P Half sum 58° 35’ 30” 61° 38’=half P Soi

Half difference 1° 55’ 30”

sin 3 diff. sides 1°55’ 30” x cot 4P 61°38″ : FS, ee See isms of vides 68° $830″ tan 4 diff. of angles 1°17 28 cos 3 diff. of sides x cot 4P cos $ sum of sides

Consequently angle V is 48° 84’ 5” and angle C is 40° 59’ 9”, the larger angle being opposite the larger side. Having all the angles, the remaining side is found by the proportion which the sines of angles bear to their opposite sides; thus

= tan } sum of other two angles 42°16’ 37”.

sin PC x sin P sin vP x sin P sin VO 90° 12% sin V sin C

ig example has been chosen because the side VC is so near to oo Hint on only be treated with certainty by letting fall a perpendicular from P to the arc, as represented by the dotted line PH; which also gives the latitude of the highest point the ship would reach if she sailed on that arc. Thus the oblique-angled triangle, in which all the angles were known, is divided into two right-angled spherical triangles, each possessing one side and

one angle previously known, and the side PH common to both is to be found. First, to find the side (or segment) HC. ‘The angle at C is obviously the ‘‘middle part,” as it is between the known side and the one sought ; they are joined or combined. Therefore

rad. + log (co)sin C=log (co)tan PC + log tan HC;

rad. x cosC S ep

or cot PG =tan HC 47° 42’. tee rad. x cos V eee Similarly cot PV =tan VH 42° 30’.

The sum of the two segments will be 90° 12’, equal to the side VC, represeuting the distance of 5412 miles, which is 548 miles less than the rhumb line. Similar calculations must be made every day at sea to find the new course and remaining distance. It is necessary, before deciding upon a voyage following the are of a great circle, to ascertain the shape of the curve and the highest latitude it will attain ; for which purpose the side PH must be found (fig. 15) by eithcr of the segments as before explained; it will be 32° 43’ 30”, which is the complement of the latitude 57° 16’ 30”. To find the longitude of that point: by opposite sides and angles—

rad. x sin CH sin PC

which added to-the longitude of position off the Cape, 18° 24’, gives 82° 12’ 30” KE. A glance at the chart will show that such a course would run the ship among the icebergs; therefore a position three or four hundred miles farther from the pole should be chosen, according to the time of year, and the course divided in two parts. It is easy to make a pencil curve on the chart in a lower latitude: the saving of distance would still be great.

The are ofa great circle from a position off Rio de Janeiro, 28° 5’ 8. and 43° 4’ W., to the vicinity of Perth in Western Australia, 32° 2’ 8. and 115° 25’ E., would measure 7270 miles. The rhumb line by Mercator (if it were possible) would be 8437 miles, or 1167 more. The highest latitude would be 70° 28’, therefore impracticable. Such a curve as this could not be laid down on Mercator’s chart.

Soundings.—When approaching land in thick weather the pre- caution of taking frequent soundings should not be neglected, especially when the depth and nature of the bottom is clearly defined on the chart, as it is at the entrance of the English Channel. Loss of time should not be made an excuse for incur- ring a serious additional risk. Several ingenious devices have been provided by which the depth of 80 fathoms can be tested without stopping the ship, but the result is not so certain as the old plan of getting the line “up and down” and feeling the lead touch the bottom. If soundings

are taken at ten or more miles apart, and do not coincide with those on the chart, it isa good plan to write them up the edge ofa strip of paper, preserving the distances the ship has run, according to the scale of the chart; when two or three are thus marked the slip should be moved about the chart, with the edge of the paper parallel to the course steered, till it coincides.

Observations. The quadrant and sextant are practically the same instrument: the first is the eighth part of a circle, and by reflexion measures an angle of 90°; the second is the sixth part of a circle, and measures an angle of 120°. Both are fitted with verniers graduated in such a manner that the angle on the are of the quad- rant can be read to half a minute, and that on the sextant to ten or even six seconds. The handling of the instruments for five minutes will be better than a long description. The crrors and adjustments are similar. The large movable mirror must staud perpendicular to the plane of the instrument. This is tested by placing the radius bar near the centre of the are, and looking into the mirror at the reflexion of the uncovered part, which if all be right will continue in a straight line from the arc itself. If it appear broken, the screws must be moved. The error is difficult to remedy; therefore when practicable it is better to send the instrument toa maker. The fixed reflector, or horizon glass, has two adjustments. To make it perpendicular to the plane of the instrument, let the radius bar be placed near zero, and while the instrument is held quite vertical make the direct and reflected view of the horizon coincide, by moving the tangent screw. Then, if by sloping the instrument’on one side or the other that line becomes broken, the glass is not vertical, and the screw for that purpose must be slightly moved till the lines coincide even when the instrument is held sixty degrees on one side or the other of the perpendicular. Also the reflected image of the sun or a star will cover the direct rays from them if the glass be vertical. Ifan horizon be not available, a distant hill or any sharp outline will do as well. The second adjustment is to make it parallel with the movable reflector. If at the end of the adjustment or test just described the radius stands at zero, or within two minutes, no adjustment is necessary. If it be much beyond that amount the radius should be set exactly at zero; and while looking at the horizon, which will appear broken, let the screw under the horizon

=gsin CPH 68° 48’ 30”,

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glass be turned gently till the two parts coincide. To find the amount of index error accurately, the best method is that of measuring the diameter of the sun many times, which will give a number of small angles on and off the arc, as it is commonly called: that is, on the positive and negative side of zero, the mean of which will be the correction, —+ if it be off the arc, and — if on, Thus 32’ 20” on and 30’ 40” off would give a mean of —50”. The observer can at the same time test his own accuracy: thus, in the above example, the sun’s diameter appears to be 31’ 30”; the Nautical Almanac will show if it were so on that day.

There is one error to which all sextants are liable that is seldom mentioned or attended to. It arises from the great difficulty of placing the centre of motion given to the radius bar and movable reflector exactly in the centre of the arc, or from the contraction or expansion of the metal. It has no connexion with the index error, and admits of no adjustment. Its existence and amount are not easily ascertained, but demand both time and patience. As it has no appreciable effect on small angles, it is advisable to use the artificial horizon, and take a set of altitudes, say ten, which will form a mean of about 100° on the arc, noting the time of each accurately by a trustworthy chronometer.. Take similar altitudes in the afternoon, and work each set independ- ently, as though to find the error of the chronometer (see below). Should the time so found coincide with the known rate of the chronometer, there is no error. Should the results differ several seconds of time, it may be assumed that the error of the instrument combined with personal error has caused it. By the rate at which the sun was rising or going down during the observations the amount of angle due to those scconds is easily found. Half that amount will be the error of the sextant upon that angle. As an example, suppose the true reflected altitude to be 100° while the instrument made it 100° 1’, the calculation wonld make it about three seconds later than the truth; in the afternoon a similar error would make it three scconds earlier. Thus a disagreement of six seconds arises for about one minute of altitude. By four or five such sets of altitudes at different parts of the arc sufficient data will be procured from

which to form a table of corrections for all altitudes. This can be done by calculation, but a simple graphic method will be found sufficiently correct. Describe an are of a circle with a radius of 6 or 8 inches. Leta line from the centre of projection indicate zero, from which lay off half the altitudes which have been observed, but give them the full numbers, e.g., mark 45° as 90°, to correspond with the motion of the radius bar and numbers on the sextant. From the points representing the altitudes lay off the errors towards the centre, from any convenient scale of equal parts, perhaps one hundred seconds to half an inch. Between zero and the centre of the are will be found the centre of a second and smaller are which will pass through all the points representing the corrections, or nearly so. The space between the two ares may be remeasured at every 5° or 10° for the table of corrections (plus or minus, as the case may be).

Meridian Altitudes.—The first astronomical observation at sea is usually a meridian altitude of the sun for the purpose of obtain- ing the latitude. The reflexion of the sun's lower limb having been bronght by a sextant or quadrant to the edge of the visible horizontal on May 10, 1882, commencing a few minutes before noon, the greatest altitude that could be obtained was 58° 20' 15". The index correction was + 1' 30", and the eccentric error due to 58 degrees was— 40", The Nautical Almanac shows the sun's semidiameter on that day to be 15' 52"; as the lower limb was observed it is plus. The height of the observer's eye above the sca was 20 feet, which on account of the spherical figure of the earth makes the altitude appear too great. The correction is taken from a small table for the ''dip of the sea horizon," which opposite 20 feet gives 4' 24'—always minus. The result will be the apparent altitude of the sun's centre, which must still be corrected for refraction and parallax, the former on account of the rays of light from any object beyond the earth's atmosphere being deflected upwards, and the latter because the sun does not appear to a person on the earth's surface so high as it is in reference to the centre of the earth; the horizontal parallax is only nine seconds in the winter of the northern hemisphere, when the earth is nearest the sun. A table is usually arranged for refraction, minus the sun's parallax; in one such table the altitude 58° 82' 33" requires a correction of 31 scconds—always minus. The result will be the sun's true altitude, which taken from 90° gives the sun's zenith distance 31° 27' 58", the sun being thus much south of the observer when

on the meridian. By the Nautical Almanac it will be seen that the sun's declination at apparent noon at Greenwich on May 10th was 17° 39' 57" N., increasing 39" honrly. As the ship is in 7° W. long. nearly, the meridian passage was 28™ later, and about 18" must be added. This is of importance when the difference of longitude is great, as Greenwich time must always be found within a few minutes. The observer having found the distance he is north of the sun, and also that the sun is 17° 40' 15" north of the equator, the sum, or 49° 8' 18", will obviously be his distance from the equator, which is the latitude.

NAVIGATION

Finding the latitude by a meridian altitude of a star differs from asimilar operation for the sun only in so far as there is no semi- diameter or parallax to be applied. Star observations are of great value after the sun has been obscured for one or more days, for which reason a navigator should know all the principal stars, so as to recognize them during a very partial clearance of the sky. The Nautical Almanac gives the positions ofall the principal fixed stars. The apparent right ascension of a heavenly body is its angular dis- tance from the true equinox,—expressed by the abbreviation R.A. Sidereal time, given in page il. of each month in the Nautical Almanac for mean noon each day, is the angular distance between the mean or imaginary position of the sun and the true cquinox. Declination is the distance from the equinoctial or celestial equator. Mean time is that shown by a good clock, regulated upon the sup- position that every day is of equal duration. Apparent time has reference to the time actually occupied by the sun between successive transits over any meridian. Equation of time is the difference between mean and apparent time. Sidereal time is measured by the transits of a star over any meridian. See ASTRONOMY. |

To find the time that any star will pass the meridian, subtract the sun's R.A. from that of the star ; or, in other words, find their distance apart as expressed in time by R.A. As an instance, on May 10, 1882, between 7 and 8 p.m. the sun's R.A. was 34 10™ and that of a Urse Majoris 106 56™ ; consequently the star will pass the meridian of the ship in 7° W. at 74 46™, The knowledge of the longitude is only nceessary for finding the Greenwich time (G.T.) and the sun's R.A. The same night, the R.A. of Vega (a Lyre)

being 185 33™ and that of the sun 8) 11™, the star was 15h 22m after the sun, and would pass the meridian about 35 22™ a.m. of next day. To know which suitable star will pass the meridian after a certain hour, add that hour to the sun's R.A., the sum will be the R.A. of the meridian (decreased by twenty-four hours if necessary); the star table will then show the stars of that or greater R.A. Thus, on October 2, 1882, in 160° E. long., which bright star will pass the meridian after 10 p.m.? The difference of longitude in time being 104 40 E.., when the sun has passed the meridian ten hours it will evidently be forty minutes before noon at Greenwich, therefore the sun's R. A. will be 12 334™ at the time named. As it will be 10 P.M. at ship, the R.A. of any star then on the meridian must be (12h 333™ + 10) 22h 334m, The first bright star found in the table having greater R.A. is Fomalhaut (a Pis. Aus.), the R.A. of which is 22 51™, which is seventeen minutes more than the time sought ; consequently that star will pass the meridian of the ship at 10.17 p.m., and Markab (a Pegasi) eight minutes later. Another ship on the same day being in 90°=6 hours west, the sun's R.A. at her 10 p.m. would be 128 36™, and Fomalhaut would pass her meridian at 10.15 p.m., two minutes earlier by apparent time; the difference is due entirely to the change in the sun's position. All doubt will be removed, when finding the approximate time of a star's transit, if it be remembered that the sun (from which we reckon apparent time) indicates a position the R.A. of which is known ; therefore by adding any time which it may have passed the meridian the R.A. of another meridian in the sky is obtained, called the R.A. of the meridian at that moment.

Having the true altitude of a star, and thus the Z.D. (zenith distance), we can determine the latitude without risk of mistake by remembering that the declination in the heavens corresponds with the latitude on the earth ; therefore astar will pass the zenith of every place whose latitude corresponds with its declination. Ifa star having north declination passes south of the observer, the zenith distance must be added to the declination, as the latitude is then the greater. If such a star pass north of the observer, his north latitude will be less than the star's declination, and the differ- ence will be the latitude. The reverse holds good if the star has south declination and the observer is north of the equator. An old tule is also useful and simple :—If the zenith distances be invariably marked north or south according as the observer is north or south of the object observed, and the

declination placed under it marked north or south, add like signs and take the difference of the unlike; the latitude will take the name of that which preponderates,

The oldest of all nautical observations is that of taking the height of the pole-star,—a star which everybody should know whether at sea oron shore. If it were exactly at the pole the corrected altitude Would be the latitude, but it is not so. During 1882 its mean declination has been 88° 41’, therefore it describes a diurnal circle Tound the pole with a radius of seventy-nine minutes. It was once far from the pole, and now advances nearly nineteen seconds annually. The mean R.A. has been during 1882 about 1» 16m, mcreasing about 28% annually. The time it passes the meridian above and below the pole can be found as has been before described ; and 1° 19’ being subtracted from the upper transit or added to the lower one will give the latitude. The great consideration attached to the pole star is in consequence of the facility it affords, with very little calculation, for finding the latitude at all times when the Star and horizon are visible. It is necessary to know the time at ship to the nearest minute. Apparent time is invariably kept on board ships at sea, corrected at noon each day. The change of

longitude since noon must be roughly worked up in order to find the correct apparent time at ship, also the Greenwich time within half an hour, for the purpose of finding from the Nawtical Almanac the sun’s R.A. at that time, which added to the time at ship will give the R.A. of the meridian, rejecting twenty-four hours if neces- sary. With all nautical tables there is one for finding the latitude by the pole star, in which the correction is given for every ten minutcs.

Enter the table with the year and R.A. of meridian. Opposite the latter, or by proportion, will be found a correction + or — to be applied to the true altitude ; the result will be the latitude.

The principle of this table is that when the R.A. of the meridian coincides with that of the star the whole mean distance of the star from the pole for that year must be subtracted, while if the two R.A.’s differ by exactly twelve hours the same distance must be added, as the star is then on the

meridian below the pole. If the star is six hours from the meridian on cither side no correction is necessary. At other points the correction varies as the cosine of the time angle between the pole star and the meridian. Thus the R.A. of the pole star being 14 16™ for 1882, and distance 79 minutes, the correction corresponding to five hours is thus found :

79 x cos 8h 44m rad.

(Multiply the decimals taken from the logarithms of numbers by six, to bring them into seconds.) As the star was less than six hours past the meridian the correction is —. A similar calculation having been made for every ten minutes of one quadrant, the result may be applied inversely to the one below it, and the remaining twelve hours written on the opposite side of the page with the sign + or — the reverse of the first column.

It is evident from the above that the table may be easily dis- pensed with; also, as annual tables must be founded on the mean position of the star during that period, greater accuracy would be obtained by taking the R.A. and declination for the day required from the Nautical Almanac, and finding the corrections as above.

A table for finding the latitude by the pole star when off the meridian is also given in the Nautical Almanac with instructions, It is used with sidereal and mean time ; also an allowance is made for the spheroidal figure of the earth. When the latitude found by any star observation at sea is within one mile of the truth it may be considered satisfactory.

Latitude by the meridian altitude of the moon is obtained in a manner similar to that applied to the sun, but not so simple. First it is necessary to ascertain the approximate time of transit, by reference to p. iv. of each month in the Nautical Almanac. It is there given in mean time both for Greenwich and the anti- podes ; to one of those periods apply the proportion due to the ship’s longitude in time. It is necessary to guard against a false horizon often produced by clouds under the moon. Having obtained the meridian altitude, correct for errors of instrument and dip. From Nautical Almanac, p. iii., take the moon’s semi- diameter (calculated from the centre of the carth) for the nearest noon or midnight, augmenting it by a table for the purpose, as it increases with the altitude (ose a few seconds) ; add it if

the lower limb were observed, and subtract the refraction due to that altitude, Take from the Almanac the horizontal parallax for the time of observation, correcting it for decrease in proportion to altitude by a table for the purpose, and add it to the apparent altitude. Tables generally give the parallax due to altitude, minus refraction, in one correction. Having P, the true altitude, take it from 90°, and mark the zenith distance N. or 8. as it is north or south of the moon. Take the declination for the nearest minute of Green- wich time. It is now given for every hour (mean time), and the change in ten minutes. Place the re- duced declination marked N. or 8. under the zenith distance ; add if the signs are like, or take the differ- ence if unlike, and the result will be the latitude. z

Ex-meridian Altitudes.—It is important to be able to get the latitude when the sun may have been obscured from a few minutes before noon till some minutes after. Such observations near the meridian are called ex-meridian altitudes. When the sky is cloudy the observer should keep the watch in hand in order to secure the apparent time with the altitude nearest the meridian. If the sun be rising fast or declining fast, it will be better to work the sight with two latitudes, and with the assistance of the chrono- meter, as described below. In a low latitude and less than half an hour from noon, the pamphlet by J. T. Towson, containing tables for the reduction of ex-meridian altitudes, will be found very useful, as the correction or allowance for what the sun would further rise (or had risen) can be taken out entirely by inspection, which saves the labour of working four propositions. The principle is illustrated by fig. 16, which is projected with double the angle at P in order to make it more

5b — jh 16m — 3h 44m, =44′ 10”,

“SU Ly +g

intelligible. PS represents the sun’s polar distance when observed, and M his position when he reaches the meridian. Consequently PS and PM are sides of an isosceles triangle, having the distance between the two positions as a base, and equal angles since the sides are equal. The thing sought is the length of ZM, or where PM is to be divided at noon; the lower part being

the true zenith distance and the remainder co-latitude. The data are the same as those in Towson's first example, which he there solves by his table only. Time from noon 28™ 148; sun's true altitude 24° 53' 53", and declination 18° 35' 16" S: to find the angles at the base we use the supplements of the legs, and get sec 71° 24' 44" (180° – 108° 35' 16") x cot $P[=14™ 78]=tan 88° 52' 25", the supplement of each angle at the base ; and

sin ZS 65° 6' 7" x sin PS 108° 35' 16"

sin P 28™ 148

As PZS is very obtuse, and the supplement is really required, it is taken out at once as the sine of 7° 22' 38", which is the angle MZS. The angle PSZ is next found; it is between two known

sides, and the other angles are known, but not the opposite side :— cos $ sum of sides x tan 4 sum of angles ee PSZ cos Fale sides isin alia

which is 5° 22' 12"; taking this from PSM 91° 7' 35", we have the angle ZSM 85° 45' 23". Finally,

sin ZS x sin ZSM sin ZMS

the true meridional zenith distance, which taken from the polar distance gives co-latitude 48° 47' 54", showing that the sum was 18' 45" higher when on the meridian. When the sun is on the equator, both the angles at the base are 90°, and the base MS will be the measure of the angle MPS. Norie's method is short,- but the latitude by dead-reckoning is used, which may cause the whole operation to be repeated. Also the use of a "'log-rising" and natural versed-sines is objectionable. No one possessing a copy of Towson's table need take the trouble to work the problem when in actual want of the latitude.

Double Altitudes. —Another mode of obtaining the latitude is by two altitudes of the sun or a star, with the interval between the observations carefully noted, or by P simultaneous altitudes of two stars having a suitable difference in bear- ing. These are called 'double alti- tudes.'" The principle is the same in each case. The elapsed time in the one and the difference

between the right ascensions in the other indicate the angular distance at the pole. Fig. 17 represents two observations of the sun on the same side of the meridiau,—the dark lines showing the parts which are given and the z dotted lines those which are to be found.

On October 2, 1882, the estimated latitude was 45° 10’ N. and longitude 35° 30’ W. The first altitude was taken about 8.13 A.M. apparent time, and when corrected for errors of instrument, dip, refraction, and parallax was 20°. The second alti- tude, corrected, was 39° 15’, taken . about 10.58 a.m. The elapsed time by a good watch was 2h 44m 338, which being mean time is reduced to apparent time by adding the proportionate increase in the equation taken from the Nautical Almanac, which for 27 hours will be two seconds additive. Therefore the change in apparent time was 2b 44m 358—SPs.

Each altitude taken from 90° will give a zenith distance, 70° and 50° 45 respectively=ZS and Zs. Having the apparent time at ship and the longitude, which converted into time will be 2h 22m, we take the declination of the sun from the Nautical Almanac for apparent noon and correct it for the Greenwich time of each obser. vation, obtaining 3° 36′ 56” S. and 8° 89’ 36” S, “Thoss amannnie added to 90° will give the sun’s polar distance at each period = PS and Ps, Thus four sides and one angle are known, which is all that is required to find the complement of the latitude PZ.

We shall work out this by the most simple method, in order to show the principle upon which it is done. First, in the triangle sPS two sides and the included angle are given, required the other two angles. Add together the sides Ps (93° 89’ 36”) and PS (98° 36’ 56”), and find their half sum and half difference :—

sin 4 sum eos $ diff. x cot 3P cos$sum

=sin PZS.

= sin ZM 64° 47’ 22”,

189 ‘6y “tt

= tan 3 diff. of other angles=0° 3’ 36”;

= tan $sum of other angles=88° 38’ 9”.

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The half difference taken from the half sum gives the smaller of the two angles= 88° 34’ 33’, and the two added give the greater. Had there been no change in declination, the two sides including the elapsed time would with the side Ss form an isosceles triangle, and the first equation would be unnecessary,

As the two sides were each more than 90° the angles found are the supplements of those required. One is sufficient for the present purpose ; 180°-88° 34’ 33”=—91° 25’ 27”, which is PSs opposite the larger sidc. That angle includes the two angles PSZ and ZSs, which must be separated in order to obtain PSZ. The side Ss, which is the spherical distance between the two positions of the sun, is given by the equation

sin Ps x sin sPS sin PSs

In the second part of the problem three sides are given to find an angle, namely ZSs. Write under each other the values of the two sides (SZ and Ss) enclosing the required angle and also the opposite side Zs. Find the half sum of the three sides and the difference between it and the opposite side (Zs). Add together the logarithm cosecant of the first two and logarithm sine of the last two ; half the sum of those four logarithms (rejecting twenty from the index) will be the log. cosine of half the required angle. Thus ZSs = 52° 36’ 36”, which taken from PSs will leave 38° 48’ 51” as the angle PSZ, The third part is similar to the first, two sides and an included angle given, to find the rest, principally the side PZ :— sin 4(PS — ZS) x cot 4PSZ sin 4(PS + Zs) A similar statement using two cosines instead of sines will give the half suin of the angles—87° 3’ 51”. By subtracting the half difference the smaller angle is obtained, ZPS=56° 39’ 30”, which by the figure should evidently be placed opposite ZS. Finally,

sinZSxsinPSZ . eves Sao

~ “anes PZ 44° 49 58 ; which is the complement of the latitude 45° 10’ 2”. Ifthe first observation of the sun had been used to find the longitude by chronometer (the ship being stationary between the observations) the hour angle would coincide with the angle ZPS, and afford a test of its correctness. Simultaneous observations of two stars would be worked in a similar manner, with the advantage of having the difference of R.A., SPs, the spherical distance Ss, and the angles at S and s nearly permanent (requiring only a slight annual correc- tion), consequently that part of the calculation might be used many times. Kerigan’s tables have been mentioned as giving the dis- tances between the principal stars for this purpose. When two altitudes are taken of the same star, the interval by a watch keeping mean solar time must be reduced to sidereal time, as the stars pass the meridian quicker than the sun by 98°8 per hour.

The above illustration has been treated as if the ship were stationary, which at sea would seldom be the case. The bearing of the sun or star should be taken at the time of the first observation, and the run of the ship should be worked with reference to that bearing and also with regard to the change in longitude. Every mile which has been made good in a direct line towards the sun must be added to the first corrected altitude; if from the sun, it is subtracted. For every mile of longitude four seconds must be sub- tracted from the elapsed time if the ship ran west or added if she raneast. The result will then be the same as though the ship had been stationary at the place of the second observation.

Had the observations been taken on opposite sides of the meridian the calculations would be similar to the above, and the figure would differ only in having the triangle PsZ folded over, as it were, to the opposite side of the central line.

Other Double Observations. —The double altitude, though a very interesting problem in connexion with navigation, is at the present day of very little practical utility. When ships are provided with chronometers both latitude and longitude can be found more readily by two distinct observations of any of the heavenly bodies on different bearings. To find the longitude by means of a chrono- meter and also the variation of the compass should be one com- bined operation under ordinary circumstances,

therefore they will be described together. It is desirable that every navigator should accustom himself to act independently of an assistant. A pocket-watch with a distinct second hand being taken to the chronometer, the hours and minutes about to be shown by each may be noted in the "'deck-sight book," and if the observer then counts the half- second beats of the chronometer for five seconds previous to the even minute, the tenth beat will answer the purpose of the word "top" of the assistant, aud more correctly. Let a similar com- parison be made after the sights have been taken, and if there be any difference adopt the mean, or proportion. Take one or three bearings of the sun's centre with the azimuth or standard com-pass in its usual place, noting the time, and then take three or five altitudes of the sun's lower limb. The watch being held in the palm of the left hand, the fingers are free to move the tangent

=sin Ss 41° 8' 38",

= tan }(SZP – ZPS) 30° 24' 21".

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screw till the moment the contact is formed between the sun's reflected image and the edge of the horizon, when the eye is dropped from the telescope of the sextant to the face of the watch, and the second or even the half second noted ; the minntes should be written before commencing, and seen to be correct on finishing the set. Take bearings again of the sun as before, noting the time. Make the mean of the sun's bearings correspond with the mean of the time of sights (7.e., the sun's altitndes).

On October 17, 1882, about 8.24 A.M. apparent time, in 88° 15' N. and 6° 50' E., observations were taken to ascertain the longitude and variation of the compass. The mean of the times by watch when the altitudes were taken was 8 25m 358-5. The result of eomparison between the watch and chronometer was — 7™ 148, the negative sign meaning that the watch was faster than the chrono- meter. Therefore, both those amounts being subtracted, the mean time at Greenwieh was 75 42™ 188-5. The mcan of five observations of the sun's lower limb was 20° 42' 30". The corrections

were index error + 2’ ; eccentric error (in proportion to altitude) -15”; dip of the horizon corresponding to the height of eye, 24 feet, — 4’ 50”; sun’s semidiameter + 16’ 5”; refraction, minus parallax, ~ 2’ 22”; hence the true altitude of sun’s centre was 20° 53’ 8” and zenith distance 69° 6’ 52”. The sun’s declination is more conveniently taken from the Nautical Almanac for mean noon, as the mean Greenwich time is always known by the chronometer, but the hourly variation is given on the opposite page. Thus, on the day in question, 9° 19’ 29” S., having been corrected for 45 18™ before mean noon, gave 9° 15’ 33″ as the sun’s declination at the time of observation. We have now to find the hour angle and azimuth from three sides :—viz., co-latitude 51° 45’, co-declination or sun’s polar distance 99° 15’ 33”, and the zenith distance 69° 6’ 52” (fig. 18). For convenience let these be placed under each other as mentioned, take their sum and half sum (110° 3’ 49”); also the difference between the half sum and the side opposite the required angle, the zenith distance, = 40° 56’ 50”. Add to- gether the logarithm cosecant of the first two and logarithm sine of the last two, remembering that when the degrees exceed ninety the supplement must be used, or the amount over 90° with reverse term. Half the sum of those four logarithms, rejecting twenty from the index, will be the eosine of half the angle required (3h 35m 488-4), the time from noon. This is the principle upon which the angle is found, but it is rather quicker to use the latitude and declination direct. Write the lati- tude, deelination, and zenith distance under each other, matking the declination + if on the eontrary side of the equator to the latitnde, and —if they are on the same side. In the present in- stance the latitude being N. and declination S. the latter is addi- tive. Take the difference between the half sum and the zenith distance, that still being the side opposite the required angle. Add together the secant of latitude, secant of declination, sine of half sum, and sine of difference; the sum of those four logarithms, rejecting twenty from the index, will be the sine of half the hour angle, 1h 47m 548-2, That being doubled and taken from twelve hours shows that the apparent time at ship was 8h 24™ 115-6, The equation at mean noon was 14™ 358-1, the correction for four hours and eighteen minutes before noon was -— 28; leaving 14™ 338-1 to be subtracted from apparent time (as the sun was then in advance ofa mean clock). The result for ship mean time is 8h 9m 388°5, the difference between which and the Greenwich mean time as found by the chronometer, 27™ 208, is the longitude in time= 6° 50’, and it is east, because ship time

is the greater. The azimuth would in practice be partly sought at the same time as the hour angle ; as the sine of the polar distance or cosine of the declination ean be taken at the same opening of the tables where the cosecant or secant was found. We have then

sin Px sin PS sin ZS the sun’s azimuth or angle from north, observing that when the angle is more than 90° the supplement is found opposite the og. Sine, and the amount over 90° opposite the cosine. Thus sin P 3h 35m 488 x sin 80° 45’ (or cos 9° 15’), 58° 40″ sin ZS 69° 7’ =a which is the supplement of PZS, and therefore reckoned from the South, which in this instance is most convenient, as the mean of bearings taken of the sun, by the standard compass, immediately before and after the altitudes for time, was 8. 48° 30’ E., which taken from the sun’s true bearing 8. 58° 40’ E. showed an error of 15° 10’

Fig. 18.

=sin Z,

The latter was known to have been fast on that day 36™ 38, –

westerly,—that is, that the north point of the much to the westward of the true north. It is unnecessary to reckon seconds of angle in an azimuth. It is always necessary to note the direction of the ship’s head at the time of observation, as there is in general an amount of local deviation caused by the iron in the ship. In the instanee given the ship’s head was W.N. Ns on which point, as previously ascertained, the local deviation was 2° westerly; consequently the variation of the compass when freed from the ship’s influence was 13° 10’ westerly.

When it is desirable to take an azimuth without finding the hour angle as above, there appears no clearer or better mode than that of treating it as a spherical triangle in which the three sides are given to find the angle opposite the sun’s polar distance.

From the above exantple take the zenith distance, co-latitude, and polar distance; place the degrees and minutes only under each other in the above order ; take the difference between their half sum and the polar distance, which will be 10° 48’. Add together the logarithm cosecant of the first two terms and the logarithm sine of the last two; half the sum of those four logarithms will be the cosine of 4PZS, Thus PZS=60° 40’ x 2=121° 20’. This is evidently from north, consequently the supplement is S. 58° 40’ E. as before. It is some- times necessary to have recourse to this mode of finding the sun’s bearing even when the honr angle is known, as it may be difficult to decide which side of the east or west line the sun may be npon when the angle is near 90°. As the last method brings ont tho angle in two halves there can be no mistake.

Position by Cross-Bearings of the Sun.—The most practical method of obtaining the greatest amount of information and immediate benefit from observations similar to those just described is by laying off the position on the chart (especially if it be on a large scale), using the estimated latitude by which the sights were worked, and the longitude found by the chronometer, the accuracy of which depends on that of the latitude. Through that position draw a line at right angles with the sun’s bearing; in the above instance it would rnn N. 31° 20′ E. and S. 31° 20’W. Though the latitude were wrong by many miles, the ship would, if all else were correct, be somewhere on that Hine. For the line thus drawn cor- responds to a small arc ¢/ in fig. 18, drawn at right angles to ZS, and all positions for which the sun’s zenith distance=ZS lie on that are.

As an illustration, suppose that the above sights were worked by a dead-reckoning latitude, which the next observations about 108 14m will prove to be 17 miles too far south. The ship sailed during the interval W.N.W. 15 miles, wind south, leeway half a point, variation + 18° W., and local deviation—2° W. Hence the true eourse was N. 77° W., which by inspection, under distance 15, gives diff. lat. 3°4+, and dep. 14°6. The latter opposite the comple- ment of the latitude (38°) gives 185 in the distance column, which is the difference of longitude, subtractive as it was westing and the longitude was east. The latitude was then assumed to be 38° 18’ 24” and longitude 6° 31’ 30”. Draw the bearing taken at 8h 24m through the newly found point, which will represent the line the ship was on at 10h

14m, Five observations of the sun were then taken, and the mean of the times by watch was 10h 17m 398; the comparison showed — 7™ 168, and the error of chronometer (fast) ~~86™ 38. Greenwich mean time was 92 34m 208, The eqna~~ tion was at that time 14™ 348+to mean time, and the corrected declination was 9° 17’ 15” 8. The mean of the altitudes when corrected gave a trne zenith distance of the sun’s centre 53° 39’ 52”, All the data are thus given to find the hour angle as before described =1″ 46™ 208, and apparent time at ship, 102 13m 408; subtract the apparent time at Greenwich, 9) 48™ 548; the differ- ence, 24™ 468, is the longitude in time, =6° 11’ 30” E.

As the longitude carefully worked up from the former sights appeared to be 6° 31’ 80”, it is evident they have both been worked by an erroneous latitude, which is easily discovered.

The sun’s bearing was not taken at the time of the sccond set of observations, as it was too high for accuracy, but the true bearing was calculated as be- fore described and found to be 8. 33° 15’ E., a right angle to which was E. 33° 15’ N. If a chart on a sufficiently large scale be in use (or if one of similar latitude can be sub- stituted) the most simple mode is to lay down the two positions (as A and B, fig. 19) on the

compass was so

Fic. 19.—Cross bearings of the sun. same parallel and draw the two lines through them, as Aa and

Ba. The point of intersection will be the ship’s true position, which can be proved by working the second set of observations again with the corrected latitude. If the chart be too small,

the diagram can be made on a piece of paper, the difference between the two longitudes being laid off from any scale of equal parts ; ¢g,, BA is made to measure 20 and becomes the scale for the remainder of the figure. The lines at right angles from the sun’s bearing intersect at #, whence a perpendicular drawn with the protractor will give y on the base line. Then

By is the total error in longitude to be applied to that found by the second obser- vation, in this case 33’°3, which added to 6° 11’ 30” gives 6° 44’ 48”, The perpendicular zy represents the error in latitude, and would be correctly measured on the side of the chart as 17‘2. But from the plain paper the numerical measurement would be too great in the ratio of the difference of longitude to the departure.

The measurement of ay, on the scale BA=20, would be 21°8. By inspection (in traverse table) distance 21°8 opposite co-latitude 38° is found to give departure 17°2, which in this instance will represent the miles of latitude increased in size to suit the miles of longitude upon which the diagram is formed. That is the required correction to be added to the latitude assumed at the time of the second observation, and will give 38° 35’ 86” as the true latitude at that time. The same corrections may be found arithmetically by plane trigonometry, in which case it will be desirable to draw a rough figure showing how the lines cross, This mode of correcting the latitude admits of easy proof; by working the second set of sights with the latitude increased by 17’ 12”, the longitude will come out 6° 45’, Another good practical method is to work each set of sights by two latitudes, 10 or 20 miles apart. The logarithms can be taken out for the two with little more trouble than one, and they form a check on each other. When the two sets of sights are not worked by the same latitudes, but by latitudes in accord with each other by allowing for the run of the ship during the interval, and when the change of longitude due to 10 miles of latitude is known, the true position can be found by placing equiva- lent proportions under the first longitude brought forward and the second as found, till they agree.

By such double observations H.M.S. “ Devastation,” in January 1847, was enabled, after having been set by current 28 miles past Goree, to which she was bound, to alter course at 11 A.M. instead of increasing her distance by another hour’s steaming.

By this method the greatest accuracy of position may be main- tained throughout the day and night, if the horizon be clear. The one line is very useful though the other may never be obtained, which is not so with the double altitude, where nothing is known till the whole calculation is completed:

In high latitudes during the winter the sun is of little use in finding the longitude; bright stars and planets must be used, taken near twilight when the horizon is clear, and also when they are near east or west if longitude only is required, and with sixty to ninety degrees difference in bearing at other times.

The only difference in the treatment of stars and planets from the treatment of the sun when finding the longitude consists in ap- plying the difference of their right ascensions and that of the sun, reduced to the time of observation in order to obtain apparent time at ship, and from it mean time, to compare with that shown by the chronometer as Greenwich mean time.

Lunar Observation.—The moon is the least serviceable of all the heavenly bodies for the purpose of finding apparent time at ship and longitude by chronometer, in consequence of its rapid motion entailing more care in the corrections, though the Nautical Almanac gives its place with great accuracy for every hour, and the variation in ten minutes. That rapid and uniform motion rendcred it the most valuable and at sea the only means of ascertaining the longitude after the construction of almanacs, and before the present perfection of chronometers. In presence of the latter lunar observations have fallen into the shade, and like double altitudes are found principally in examination papers. As the moon passes the stars at the mean rate of 33” of angle in one minute of time, it is obvious that an error to that amouut in measuring the distance from a star would produce an error of 15 miles in longitude. As the moon’s motion with regard to the sun is nearly one degree a day less, a similar error in the distance would produce still more effect.

The Nautical Almanac gives the true distance between the centre of the moon and the sun while within range by the sextant, as it would be seen from the centre of the earth; and in like manner the distance from some of the principal fixed stars and planets, for every three hours of Greenwich mean timc, with the proportional logarithm of the change in that time. It is essential that the star from which the lunar distance is measured should be near the ecliptic, in order to obtain the greatest amount of change. If the star is quite in the path of the moon the distance may be small, when the measurement will require less steadiness.

We take a star lunar as an example, which will introduce the problem of finding the time at ship by a star (fig. 20). On November 18, 1882, about 9 P.M. apparent time, the ship was in 38° 10’ N. and 45° 15’ W. by dead-rcekoning ; height of the eye 20 feet. There was not a chronometer on board. An assistant was employed to show a light on the arc of the sextant, to take time, and to write down ; consequently the same sextant was used. An altitude of the moon’s lower limb was taken before and another after the other observations, and the mean was reduced by propor- tion to what it would have been if observed at the same instant as the mean of the distances, namely 35° 15’.. Two or more altitudes of Aldebaran were taken before the distances and as many after, the mean of which when reduced to the same instant was 85° 6’. The mean of several measurements of distance from the moon’s farthest limb was 94° 4018”. The index correction was +1’ 20”, eccentric error —2′ 9’, semidiameter at midnight was 16’ 9”, which was augmented by 9” (taken from a table) in consequence of the moon being nearer the observer as it approaches the zenith. As the farthest side of the moon was used, the augmented semidiameter was subtracted. The corrected observed distance was then 94° Zou”.

The observed altitude of Aldebaran was 85° 6’, index correction +1’ 20”, eccentric —25”, dip of the horizon — 4’ 24”; giving ap- parent altitude 35° 2’ 31” and Z.D. 54° 57’ 29”. Apply refraction — 1’ 23”; then the true altitude is 35° 1’ 8” and true Z. D, 54° 58’ 52”. Add the difference between latitude 88° 10’ N. and declination (from Nautical Almanac, p. 3827) 16° 16’ 21” N. to true Z.D. 54° 58! 52”, and note the difference betweeen the half sum and the true Z.D. Add together the logarithm secants of latitude and declination and logarithm sines of half sum and difference ; half the sum of the four logarithms will be the logarithm sine of half angle SPZ=8 51™ 438-8, which is the time the star was east of the meridian. By adding the longitude in time to the time at ship it will appear that Greenwich apparent time was about mid- night, when the sun’s right ascension was 155 37™ 68, That of the star being 45 29™ 148, it is evident that the star would pass the meridian 11) 7™ 59s before the sun, and 12) 52™ 88 after it. The latter is more suitable at present. Taking the time the star is from the meridian from the time it is after the sun, it is seen that the sun had passed the meridian 9% 0™ 248-2, therefore that is the true apparent time at ship, provided the latitude was correct by which it was found. Hence the

necessity of choosing a star when nearly east or west. The equation of time taken from the Almanac and reduced to apparent midnight was 14™ 328°5, and the result was ship mean time=8) 45™ 518-7,

The altitude of the moon's lower limb was 85° 15', index cor- rection +1' 20", eccentric error — 25", dip —4' 24", semidiameter +16' 9', augmentation 9" ; giving apparent altitude 35° 27' 49" and apparent Z.D, 54° 32′ 11". To the latter add the refraction 1' 22", and subtract the parallax due to altitude, 48'12". The result is true Z.D, =58° 45' 21". The horizontal parallax is the angle at the centre of the moon subtended by the semidiameter of the earth, and the parallax due to any altitude of the moon (that 1s, the amount by which the apparent altitude would increase if the observer were sunk to the centre of the earth) is given by the equation—

hor. parallax in seconds x cos of ap. alt. rad.

It must always be added to the apparent altitude. With all navi- gation tables there is one for reducing the parallax, sometimes to every two ininutes in altitude. The refraction is then included in the correction.

The most important part of this problem is finding the true distance between the star and centre of the moon at the moment of observation, from the data already obtained ; it is confined to the triangle ZSM (fig. 20). The two apparent zenith distances 54° 57' 29" and 54° 32' 11" with the apparent distance (that is, as measured) are drawn to scale, and from the three sides we find the angle MZS=127° 53' 54".

As the correction applied to the altitudes of moon and star on account of parallax and refraction were in a direction to or from the zenith, the angle betwcen the two zenith distances will be unaffected by any change in the length of those legs. We have therefore the true zenith distances Zm 53° 45' 21" and Zs 54° 58' 52 with the included angle just found, to find the third side—a pro- blem which has been already exemplified (see fig. 15 and the

= parallax in alt.

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accompanying calculations)! The true distance being over 90° will come out as a small cosine, the change in which (at that angle) is only one unit in the sixth place of figures for seven seconds. It is desirable to avoid angles of this description, which can be done by dropping

a perpendicular from Z to the required side ms, which would then be found in scgments, by two right-angled spheri- cal triangles, as excmpli- fied with fig. 15. The sum of the two segments, 93° 48’ 36”, is ten seconds more than the result obtained directly from the oblique-angled tri- angle, and is more likcly to be correct.

Take the true distance as 93° 48’ 30”, and find in the Nautical Almanac M an approximate distance, which was 93° 40’ 45” at midnight of the 18th; the difference is 7’ 45”. As the moon was approaching the star the greater distance was before midnight. There are tables of proportional logarithms arranged for finding readily the proportion which three hours or three degrees bear to any part of either, or one part to another, The Nautical Almanac gives after each distance the logarithm due to the amount of change during the next three hours, to four places of figures. As the distance in the present instance is so close to one of the periods, namely midnight, it is necessary to take the mean of the two log- arithms before and after, which is ‘2314. The difference between it and the logarithm for 7’ 45” =1°3659 is 1 1345, =13™ 128°5; or it may be found by simple proportion. Greenwich mean time was therefore 11> 46™ 478-5, and ship mean time as found by the star 8h 45m 5185 ; difference 3h 0m 568 = 45° 14’ W. long.

There are various graphic methods for finding the correction to the distance due to parallax and refraction, for which space cannot here be spared, as they are at best but approximations, and belong rather to the progress of the art. See Kelly’s Spherics.

The moon is occasionally used for finding the longitude with the aid of a chronometer, and the method is then similar to that with a planet or star, except that the parallax is so great and the change in right ascension and declination so rapid that the greatest care is necessary in taking out the corrections to the nearest minute of Greenwich time. A star appears to be far preferable for the purpose. The horizon under the moon sometimes assumes a bright sharp appearance which appears tempting ; but caution is

necessary, as a bank of cloud below the moon sometimes cuts off the more distant part of the water and presents a false horizon.

It should be mentioned that extraordinary refractions some- times occur in the daytime which make the horizon appear many minutes of angle higher than it really is. That has been observed in a very remarkable manner in the Baltic. The results of apparently good observations of the sun for the chrono- meter were found to be very erroneous, and, a short time after, the island Gottsko Sandé was seen presenting a second water- line above what had previously appeared to have been the horizon. On another occasion, April 21, 1854, the low islands and land east of Stockholm were seen from a distance of 12 miles as if inverted on the sky, presenting the appearance of level table- land, with dark cliffs, about half a degree above the horizon. On approaching, the upper line gradually disappeared, leaving the low islands covered with fir trees, in their natural state. It was calm at the time, and there was much ice in the Gulf of Bothnia. Fortunately such a state of the atmosphere is not frequent. In the Standard of August 12, 1882, mention is made of an extra- ordinary mirage at Alexandria on the previous evening, which the forts about Aboukir Bay, distant 15 miles, to be plainly visible.

Artificial Horizon.—The artificial horizon is a most useful con- trivanee whereby the effects of mirage or fog are avoided, but unfor- tunately it can only be used on solid ground, though many attempts have been made to overcome the effect of the ship's motion. The artificial horizon in common use is composed of a wooden or copper trough 5 or 6 inches long by 3 to 34 inches broad and 4 inch deep. This being placed on a solid stone or hard ground, 100 yards from Vehicular traffic, and at least 20 yards from foot passengers, Mercury is poured into it from a small-necked bottle, till the bot- tom of the trough is covered. In pouring, the neck of the bottle should be kept well down in order to keep back the scum. A metal frame carrying two pieces of plate glass, which are fixed at 45° from

' The corrected positions of the moon and star in fig. 20, and the dotted line

japresenting the true distance, are not according to scale, as it would be mpossible to draw lines fine enough.

Fig. 20.

the horizon, and at right angles to each other, is placed as a screen over the trough and mercury, to keep off the wind.? By this ar- rangement of the glasses forming the screen, the refractions which a ray of light suffers when passing obliquely through the glasses destroy each other. The observer may be seated close to the hori- zon if the sun or star be high, and the whole disk of the sun will be seen; but with a low altitude the image passes into the box so obliquely that the observer must place himself at a distance and be content with seeing the upper half of the sun's reflected image, to which is brought by the sextant the reflexion of the sun's lower limb. An object with less altitude than 6° or 7° cannot be taken, nor a greater angle than 60°. By using suitable shades the two reflected disks will appear so sharp that a very accurate contact may be made, and repeated as desired.

Rating Chronometers.—Observations in port with the artificial horizon are used to rate chronometers. For this purpose a good watch should be compared with each before leaving the ship, and immediately on returning. The angle measured by the artificial horizon must be halved, after instrumental corrections have been made, and from the altitude thus obtained the mean time at the place can be found just as at sea. But in the present case the longitude is known, and Greenwich mean time will be found from the local mean time by adding or subtracting the longitude in time, according as the latter is W. or E. The difference between it and the time shown by each of the chronometers at the same instant will be their errors, which taken from the last error found and divided by the number of days and fractions of days will give the rate. The errors of chronometers should be ascertained at every port, and every ten days if a ship remains long at one port. "The results being tabulated, the character of a watch during a year can be seen at a glance.

Chronometers should be kept in a dry place and equal tem pera- ture, free from vibration, not too softly padded (for fear that the motion of the balance-wheel should be imparted to the body of the watch) ; and they should not be carried about for any purpose.

'* Equal altitudes" is a term which signifies a mode of obtaining the time by means of altitudes of the sun or a star taken at each side of the meridian ;

it is more accurate in result than any other method, as all crrors, personal or instrumental, are neutralized by the repetition, as are also crrors in latitude. If the object observed were perfectly stationary with regard to the celestial concave, as a star may be considered to be, one-half the elapsed time added to the time of the first observation would be the time of transit ; and, the difference between the star and sun in right ascension being applied to this, the apparent time at place would be obtained. The motions of the planets vary in amount, and must be treated accord- ingly. Jupiter's orbitual motion is so slow that the change during an interval of three or four hours may be disregarded, excepting where great accuracy is required,

When equal altitudes of the sun are observed, a considerable correction has usually to be made in consequence of the change of declination during the interval. Thus in the example illustrated by fig. 21, though the zenith distance was pre- cisely the same before and after noon, the sun in- creased its distance from the pole, and instead of passing by the upper dotted line from S to s it is found to join the curve representing the zenith distance farther south, say at d. During three or four days at each solstice the change in declination is very slight, and may therefore be dis- regarded; also when the sun bears nearly east or : west the change of a few Pig. 21. minutes in declination will not affect the hour angle. If when on the meridian the sun be nearly vertical, and a sca horizon available, an altitude correctly timed ten minutes before noon and ten after will give the time of transit without any calculation. :

In order to secure a set of observations which shall have their mean exactly on either side the meridian, it is customary to fix the arc of the sextant in positions five or ten minutes apart (according to the motion of the sun, and whether the artificial horizon is used or not) in anticipation of the contact, calling ‘‘’top" when it takes place, and to repeat a similar operation in the afternoon with the

2 The older form of the artificial horizon, as described in Robertson's Naviga- tion (1755), was a box placed on gimbals, containing 1 fb of quicksilver, with a parallel glass floating on it. It has been attempted to use a top with a polished plane surface rotating horizontally—which would remain steady on the principle of the gyroscope—as an artificial horizon on

shipboard. An instrument of this kind, the invention of a Mr Scrson, was described in 1752; and Brunel proposed a similar device to be used on the "‘ Great Eastern."

same altitudes, but in the inverse order. It is more convenient to take the first set of sights, five or more, in the ordinary manner, that is, leaving the observer free to use the tangent screw and cry stop when he secures the contact. In the afternoon it will be desirable to begin a minute or two before the time for the greatest altitude, and to continue observations till past the lowest altitude of the forenoon. In other words, take one more at each end, the mean of which is likely to correspond nearly with the mean of the forenoon set. If desirable cut off one of the extremes and rectify any small disagreement by simple proportion till the exact altitude is obtained, with the equivalent time.

Example (fig. 21).—September 9, 1882. On the Mole of Palermo, 38° 8’ 15” N., 13° 22’ 50” E.(=53™ 318°), at 10 A.M. apparetit time, the chronometer showed 9) 43™ 158-5 as a mean when the five alti- tudes of the sun were taken by the artificial horizon, which gave a mean (after all corrections) of 47° 20’ 22”. Precisely the same mean of altitudes was procured in the afternoon when the chronometer showed 15 42™ 518-2. The chronometer was supposed to have been 39™ 30s fast on Greenwich mean time, gaining 18°8 daily.

This last information is only useful for reducing the equa- tion of time and declination; it gives 9h 4m (nearest minute) Greenwich mean time for the first and 1 3™ p.m. for the second sight, or in Greenwich apparent time 10h-long. 53™=9h7™, and gh 53m—jh7m, The declination at apparent noon was 5° 15’ 52″ N., decreasing 56”°7 hourly, which for three hours less seven minutes before noon, gives a correction +2’ 43”; for one hour and seven minutes after noon itis —1’3”. The equation at apparent noon was 2™ 468-4 (to be subtracted from apparent time), increas- ing 08°85 hourly, which for the above periods gives — 28°4 and +18,

The latitude, the reduced declination (marked — because it is on the same side of the equator as the latitude), and the zenith dis- tauce can now be used as in the calculation with fig. 18 to find the hour angle, or time from apparent noon. For the forenoon it is exactly two hours (10 a.m.); for the afternoon, the declination being 3’ 46” less, the latitude and zenith distance the same as before, the hour angle will be 14 59™ 388-8.

In order to make the mode of arriving at the error of the chrono- meter perfectly clear, the figures will be given in full:—

Morning. Afternoon. BVOUE NAM NOE Tr . cceceneesavens 0a 1h 9m 38-8 APpParent TIME. ..0.6. 026.0606 10-0 9O NGHUIEIT ON tee valeaceiswen cece serves -~-0 2 44 -0 2 47-4 WMG ATIELITIIG 3,2: cessenee soe cecee: 10 57 16 1 56 51-4 THOM AWS os… .wascsscesces ee —-0 538 31°3 0 53 31:3 Greenwich mean time…..... 9° 3447 al Fe orl Chronometer No.1 showed 9 43 15°5 1 42 51-2 Chronometer fast…..... 0 39 308 0 39 31:1

Here there is a perfect agreement in the result; as the chrono- meter was supposed to be gaining 18°8 daily, four hours would show an increase of three-tenths. As the altitude and latitude were assumed, they are necessarily faultless ; but in actual practice such a result would rarely occur. The latitude of such a place as Palermo Molec, which was once used as a base from which to take chrono- metrical lines, is undoubted, but the error of one minute in the alti- tude would in this example produce a difference of fourteen seconds between the two results; the mean, however, would be quite correct.

There is no ambiguity in this mode of finding the errors of a dozen chronometers and of the sextant (if it has any) at the same time. The two separate sets of logarithms also afford a desirable check upon the work. The principal reason why ship’s chronometers are not always rated in this manner is that double the boat-work is required, perhaps from a distance. Various shorter methods have been devised: Norie’s is very short, but he uses a special table, with logarithms A and B, with rules respecting the correction being

+ or — ; Inman’s rule is very confusing.

Chronometers can be rated with greater ease by means of a transit Instrument, but that does not come within the reach of an ordinary navigator ; nor can telescopes be used ou board ship to find the longitude by Jupiter's satellites, by occultatious, or eclipses of sun or moon in @ practical and satisfactory manner.

Variation.—The variation of the compass has been slightly touched upon when speaking of the most desirable mode of acquir- ing the longitude, altitude, and variation by the same daily observa- tions. In addition to azimuths taken casually with reference to the direction of the ship's head, it is occasionally necessary to take a round of observations of some kind in order to test the change which altered circumstances have produced in the attraction of iron ae ship (compare METEOROLOGY, section on Terrestrial Mag- netism),

The standard compass by which the ship's course is governed should always be placed in a position which is least affected by the ship's iron, and whence azimuths and all other bearings can be con- veniently taken. Whenever an azimuth or amplitude is taken the direction of the ship's head should be noted and logecd with the variation. The most simple mode of obtaining the variation is by

amplitude—observing the bearing of the sun's centre when it is more than the whole diameter above the horizon, as the refraction will be thirty-four minutes, and the dip four or five more.

To find the true bearing at sunset or sunrise, add together the log. secant of lat. and log. sine of declination ; the sum will be the log. sine of the amplitude, that is, the number of degrees to the right or left of the east or west point according to the declination. Toan observer on the equator the declination is also the bearing. Under the true bearing, however found, place the compass bearing ; the difference will be the variation, which is called east or west accord- ing to the position of the north point, with regard to the meridian, or true north. By keeping that point in view mistakes will be avoided ; the same applies to local deviation. The true bearing may also be taken from the amplitude tables.

The best mode of ascertaining the amount of local attraction or deviation is by means of a second prismatic compass, placed on shore near the ship, free from guns or other metal. While the ship is slowly hove round by hawsers and stopped at each point, simultaneous bearings are taken, noted, and timed. The difference between the two compasses is attributed to error caused by the ship's influence while her head was on each successive point. If landing cannot be effected, the thing may be done by observing a distant object, or by a succession of azimuths. If the latter case it may be found more convenient to use apparent time only for finding the true bearing about every twenty minutes, and the intermediate bearings by simple proportion.

In a time azimuth the apparent time from noon, the co-latitude and co-declination are given to find the angle opposite the latter. As the change in hour angle is the chief thing affecting the azimuth, two or three minutes in declination may be disregarded, and the declination may be treated as constant for two or three hours. Accurate bearings cannot be taken when the sun is more than 25° or 30° above the horizon. Burdwood's azimuth tables are very use- ful; from them the true bearing can be taken out by inspection. When a round of azimuths have been taken for the purpose of ascertaining the deviation of the compass, the variation should also be obtained on shore, or taken from a recent authority, in order to separate the amount due to the ship. It has been found very con- venient to gum a diamond of paper about ;,ths of an inch broad on each point, bearing the number of degrees deviation to be allowed when the ship's head is in that direction, westerly devia- tion being marked in blue or black and easterly in red. There isa very simple graphic method, when the deviation has been found upon six or elght scattered points only, of deducing therefrom the amount due to the intermediate points. Draw a central line through the length of a sheet of foolscap as a datum line, and about forty lines at right angles to it, three-tenths of an inch apart, to represent the thirty-two points of a compass, and a few repeated at eachend. At the left side of the paper write on those lines the names of the points, commencing at north-west and so through north, east, south, and west to north and north- east. Lay off the amount of deviation found on any point npon the corresponding line, taking any convenient scale of equal parts, perhaps one or two tenths of an inch to a degree, according to the amount of deviation; there is no connexion

between this scale and that by which the points are represented. Place the easterly deviation on the right of the datum line and the westerly on the left, till all the points secured have been marked. With a pencil form curves which will pass through those marks, or between them if they are close together and disagree, attributing the difference to errorsin observation. Ultimatcly ink an approved curve and remeasure it, as the corrected scale of deviations. The result of this rough method will be found the same as that bya highly scientific calculation, which would be out of place here. See Admiralty Manual.

To insure the true bearing of a distant object it is necessary to take an angle from the sun (or astar) to the object, and find the bearing of the sun as above by amplitude or azimuth. If the former and the distant object be on the horizon, there is nothing to be done but apply the distance from the sun's centre. Also if the sun has considerable altitude and the distance be measured by a theodolite or standard compass are acting as such, or if the distance measured be 90° no correction is necessary. Otherwise the distance measured by the sextant is one side of a spherical triangle, the sun's zenith distance another, aud the distant object to the zenith the third; and from these the angle at the zenith must be found.

The position of a ship when in the vicinity of land is usually determined by cross-bearings; but if greater accuracy is required, and three objects are visible which are not in the circumference of a circle passing through the ship's position, sextant angles should be taken between them, and laid off on a piece of tracing paper a8 a substitute for a station-pointer. When the three lines are brought to coincide with the three positions prick the point of junction, which will be the ship's true position; or, without tracing paper or station-pointer, lay off the angle from 90° opposite each station towards the other which was observed with it; those lines will

cross in the centre of the circle upon which the ship was situated. Repeat the operation from the centre to the third object, and where the two circles cross will be the ship's position. shore can be ascertained by one such angle subtended by two known objects nearly abeam, which might be useful in keeping a ship outside or within a shoal. About 60° is a desirable spread.

The distance from an island, the extremities of which do not spread sufficiently to give cross-bearings by the compass alone, or the height of a lighthouse, tower, or cliff, may be made useful in like manner.

Tides.—Vhe ability to find the time of high water at any place during the interval between “ full and change.” was once highly estimated, but in the present day, when almanacy are so plentiful, the information can be had without trouble. As a fact a modern navigator never does calculate the time of high water, because the rule only gives a uniform rate of change for all places on the globe, which is more or lessincorrect ; and, knowing tliechange which has taken place at London Bridge since the new moon by the Alnanac, he has but to apply it to the standard of any other place.

The Nautical Almanac gives the mean tine of two tides daily at London Bridge throughout the year, and the apparent time of high water on full and change days at about two hundred placcs in the United Kingdom and on neighbouring coasts. A more full account of the tides is published annually by the Admiralty. The times predicted in the Almanac are but approximations, and are fre- quently half an hour too soon or too late. A ship under sail only, working up or down the British Channcl, will derive great assistance froin the tides by making sh¢rt tacks close to the head-lands and a line joining them in the greatest strength of the tide, during the time it is favourable, and standing out towards the centre of the channel during the adverse tide. —,

Winds and Currenis.—To make good passages a navigator should possess a general knowledge of the prevailing winds and principal currents which he is likely to encounter whether he be under sail or steam. When in the vicinity of land he should always be on his guard against unexpected effects from currents, for none are accurately known or free from change at certain or rather uncertain periods, The strength and direction of ocean currents can only be ascertained by comparing carefully kept dead-reckoning with the result of frequent observations, both of which are apt to be neglected when the navigator is free from land. A great impedi- ment to a better knowledge of the currents is the assumption that they are well known and that the same water circulates across and round the seas, as it would in an enamelled basin. There is decidedly an indraught on the north-west coast of Africa, in

the Bight of Biafra, and in many other places. A navigator should therefore be on the watch when steering parallel to a coast at night.

The advice here offered with regard to the choice of a track is intended for sailing ships only, steamships are more independent.

On leaving England for Gibraltar or Madeira the prevailing winds and currents will be found to set along the coast of Spain and Portugal; generally a passage to the south is easily effected. Westerly gales are frequently very strong; therefore ships should, while able, shape a course well outside of Cape Finisterre, towards which there is frequently an indraught. Should bad weather threaten from the south the ship (unless convenient to a port) should stand to the westward to gain an offing, before the force of the wind is felt or itturns tothe westward. She should then wear and heave to on the starboard tack, which will enable her to bow the sea as the wind changes to west and north-west. ‘This is an invariable rule when north of the equator ; the reverse is the rule in the southern hemi-

- sphere.

Ordinary heavy gales frequently give warning of their approach by causing a set of the sea in the direction of their course, accom- panied by a long swell, the day previous to the force of the wind being actually felt at the ship. The height of the waves from hollow to crest is sometimes over 40 fect.

Ships bound to the West Indies usually call at or pass near Madeira, thence continue south past the Canary Islands till they fairly catch the north-east trade wind, which may be expected in 30° N. lat., or sooner about the month of July. A fair wind and current will then be secured to the Vicinity of the West India Islands, Where it either falls calm, or a light wind from the shore @ oxperienced every night. When bound to ports in the United States 1t 1s necessary to keep to the southward in a similar manner, skirting the northern edge of the tradewind. From either of those places or the Gulf of Mexico the homeward track is the same, that 1s, close to the banks of N ewfoundland, in order to get the prevail- Ing westerly winds,

Ships bound up the English Channel should enter near the centre, avoiding Ushant and Scilly, especially in thick weather. Steam- ships are more under command, and should be more accurately navigated, but the advantage thus gained in point of safety is more than counterbalanced by the unreasonable things required of them, such as Communicating with the lighthouse on Bishop Rock, which on the loss of the “Schiller” and many lives a few years back.

he prevailing wind in the English Channel is south-west, and it

The distance off

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will be found in the western half of the circle two days for every one in which it is in the eastern half.

Ships bound to Sierra Leone and the coast of Guinea should pass Madeira on either side, then outside or through the Canary Islands, and if it be about the month of March inside the Cape Verd Islands, where a strong north-east trade will be blowing. At other seasons pass outside these islands to avoid calms, thence close along shore with westerly and south-westerly winds. The current in this track will be found favourable from the Bay of Biscay to the Bight of Biafra, but not farther south. From Sierra Leone to Loando steer along the coast to Cape Palinas, then stretch across the south-east trade till able to return towards Africa on the opposite tack, which may be at 200 or 300 miles south of Ascension. It is especially necessary to keep well to the southward during July and August, when calms prevail near the shore. From Biafra to near the Cape of Good Hope the usual wind near the coast is from the south-west during the day, and either very light off shore or calm at night.

From England to South America the track will be similar to that to Sierra Leone as far as the Cape Verd Islands, when ships for the north-cast coast may bear away to the westward, but always allowing for the strong current which may set them to leeward of their port during the calms to which they will be liable. Those bound to the southward of Cape St Roque must be careful not to make much westing till they have crossed the equator; the

exact place most desirable for crossing has long been disputed, though the positions generally advocated lie between the meridians 18° and 26°. The argument in favour of the former is the certainty of weathering Cape St Roque, and for the latter less delay by calms between the two trade winds, 7.¢., in the space from about 10° north to the equator, or from 10° to 4° north while the sun is north of the equator; in this half of the ycar the 8.E. trade comes farther north, and on the coast of Brazil it then blows from south-east and south, so that it is advisable to cross the equator at about 20° W. During December and January the wind frequently draws along the south-east coast of Brazil, past Bahia, from the E.N.E. At that scason the line may be crossed in 25° or 26°, All these rules have their exceptions: when the wind deviates from the usual direction, and the deviation is unfavourable, it is unquestionably better to put the ship on the opposite tack till it returns to the usual direction.

From the United States to the South Atlantic the course should be east, keeping to the north of Bermuda (324°) till past 40° W., then south-easterly across the north-east trade, and joining the track of ships from Europe.

After passing the latitude of Cape St Roque, ships for Rio, Monte Video, or Cape Horn may steer dircct courses, but for St Hclena or Benguela they should keep to the port tack, standing to the south- ward till past the twentieth parallel, or a day longer if the wind should then be to the eastward of south-east. Ifbound to the Cape of Good Hope we must be content with making southing ouly till past the latitude of Rio; westerly winds may then be expected. The track indicated by an arc of a great circle from Rio to the Cape is not only the shortest, but about the best with regard to the wind.

When homeward bound from the Cape, ships should pass close to St Helena with a fair wind and current, and steer for about the western limit for crossing the line on the outward voyage, where they would meet the ships from the south-east coast of America, and running together across the centre of the Atlantic join the homeward bound West Indiamen between the Azores and New- foundland, according to the winds experienccd. From the Bight of Benin or any part of the Guinea coast it is necessary to stand south on the starboard tack to within a degree of the equator, then due west till

past the meridian of Cape Palmas, and north-west into the middle of the Atlantic.

In the Mediterranean the prevailing wind is west, therefore there is no difficulty in running up that sea. A slight current sets from all directions towards Cephalonia. Off the coast of Algeria, during westerly gales, heavy hollow waves are experienccd, running at the rate of 10 or 12 miles an hour. When making a passage out of the Mediterranean it is better to keep near the African coast while the wind is to the southward of west, to which it is sure to turn, and then stand over to the Spanish coast, where slielter can be found if required. :

The destructive circular storms or cycloncs in the West Indies called hurricanes are generally preceded by calm gloomy weather and a high barometer. It is very desirable that the electric state of the atmosphere and the earth should be known, which is not the case at present. Their immediate approach is indicated by the barometer falling rapidly ; which is the more remarkable, because the changes in the barometric readings are usually very slight within the tropics. If the ship be in a safe anchorage or harbour, the lower yards and topmasts should be struck and anchors laid out in the direction of the most probable danger. If the anchorage be not satisfactorily protected the sooner she 1s out of it the better. At sea it is necessary to get down the upper spars, and to run, if

there be sea room, across the direction of the wind, from the centre of the storm,—that is, with the wind on the starboard side in north latitude, and on the port side in the southern hemisphere. If it be necessary to scud, it shonld be done with the wind as much on the starboard or port quarter as the ship will bear, in order to avoid running round or into the centre. The wind does not run in parallel circles ronnd the centre, but rushes spirally towards it, especially when close (see fig. 22). : ; 7

There is one dangerons position in which a ship may be placed with respect to an advancing cyclone for which no certain rules have been given, such as at A or | D, or between those two posi- tions, near the track upon which it is advancing.

It is evident from the diagram that to run from A either before the wind, or with it on the starboard quarter, in the direction of the small arrow, would cause the ship to inter- cept the storm's centre. It would be advisable to carry sail with the wind abeam as long as pos- rena Aen Fra. 22.—Cyclone in 30° N. lat.

to on the starboard tack (in north latitude) till the barometer begins to rise and the wind turns more to the south and west.

As the centre of the storm is supposed to move at a rate varying from 12 to 30 miles an hour, a ship sailing 10 or 12 miles an hour in a direct line from the centre, but on the track, would be overtaken by it. The great hurricane of 1830 extended from the West India Islands to Newfoundland at a mean rate of 18 knots an hour, and by the average time occupied in passing in- termediate places (eighteen hours) it must have been about 330 nautical miles in diameter. The centre of the hurricane which devastated Barbados August 10, 1831, moved at a mean rate of about 14 knots an hour. It is evident from those quotations that a ship cannot depend upon running faster than the storm.

The navigator should be ready provided with a representation on tracing paper of a cyclone similar to fig. 22, of a radius equal to 150 miles on the scale of the chart upon which it is to be used. If made for one hemisphere it can be turned over to suit the other. By marking the ship's position on the chart, and placing the tracing over it with one of the arrows correctly corresponding with the direction of the wind at the ship, the direction of the storm's centre will be indicated with certainty, but the distance and track can only be conjectured, —the latter by assuming that it will be similar to those previously ascertained, which may be represented by a pencil line on the chart. If to the south of the 20° N. lat. it will be moving in a westerly direction, if about 30° to the north- west or north, and when about 35° and 40° to the north-east.

It is safer to assume the centre to be nearer than it really is than vice versa; the pencil line will run parallel to the storm's course unless the ship be on the track, as at D. It is evidently her duty to run to the west if there be room till the wind veers to the north- east against the sun, when it will be certain that she is to the west- ward of the storm's track. This is not likely to

happen in the North Atlantic when as far north as 30°, as the centre usually passes along the coast or over the continent of America; but when farther south, and when the storm's progress is to the westward, a ship may escape by running to the southward with the wind at north.

If the position with regard to the storm is supposed to be at B, she should run with the wind on the starboard quarter. Ifat C it will be optional either to run with the wind on starboard quarter or to heave to; for anything in that direction relative to the assumed track will have attained its nearest approach to the centre. When the direction of the wind remains unchanged, the force increasing and barometer falling, the centre must be advancing diréctly on the ship. When the centre begins to recede the wind will decrease in violence and change its direction, with the sun if the ship is east of the track and against the sun if the centre passed to the east- ward of the ship; the barometer will also rise rapidly.

Fig. 22, and the argument upon it, are for the northern hemi- sphere ; the typhoons and all circular storms south of the equator are similar, but the revolutions are reversed, and the track

of centre curves off from west to south-west, south, and south- east!

In ordinary heavy gales in the North Atlantic a ship should heave to on the starboard tack, as the wind generally changes from south to west and north-west. On that tack she will be constantly '*coming up" and bowing the sea as the wind veers, and will be less liable to be taken aback; and for similar reasons the third anchor for use should be carried on the starboard side. The reverse will hold good south of the equator.

The storm peculiar to the west coast of Africa is called a tornado. It is entirely different from a hurricane ; it is not circular; it is very local and of short duration, seldom lasting more than ten or twenty minntes. These storms give good warning by a black cloud first appearing on the horizon, rising quickly. When the cloud is about twenty degrees high a bright arch will be seen under it. The faster it rises and the more distinct the arch the niore severe will be the tornado, which bursts suddenly when at an angle of forty-five degrees. During its rise there will be ample time to shorten all sail and turn the ship's stern towards it; she will be driven violently for a short

time, when it will fall calm as suddenly as the wind came, and a deluge of rain will wash the decks.

Along the coast of California and the west coast of Mexico and Central America voyages can be made to the south-east with westerly and south-westerly winds and favourable current, except during the latter part of May, June, and July, when the trade winds are strongest through the West India Islands ; the wind is then off shore at the southern part of the track mentioned, and easterly, and passages along shore to the south-east are not easily accomplished. With the exception of the time last named, when ships are bound from Central America to California they must stand ont into the trade wind, run down the meridian, and then make northing.

Along the west coast of South America light southerly winds and northerly current prevail, therefore ships bound south from Central America should stand well out from the land. On the southern part of Chili south-west winds prevail. On the west side of North America, beyond the tropic, westerly winds are most frequent, as in a similar belt across the Atlantic.

Ships bound to the East Indies will find, after rounding the Cape of Good Hope, the south-west monsoon froin April till October giving them a fair wind and fine weather through the Mozambique to Bombay or Calcutta. The reverse is the case during the English winter months, that is, from October till April. In the Indian Ocean, as in the northern hemisphere, the most unsettled and stormy weather is about the time of each equinox, but more especially abont the end of September, when circular storms of incredible violence called typhoons are sometimes experienced. When south of the equator, ships should always receive them on the port side, or run with the wind on the port quarter, if there be sea room; if north of the equator, keep the wind on the starboard side, as described above.

Bad weather is frequent on the coast of Malabar during May, and in the Bay of Bengal during October. When running np the Bay of Bengal in May or June before a sonth-west gale, with heavy rain and falling barometer, there will be reason to fear being overtaken by the centre of a typhoon ; it will be advisable to heave to, or run to the eastward, till the barometer rises and weather improves.

In the Red Sea the wind is generally from the south, except dur- ing June, July, and August, when it is north, calm, or on shore by day, and off shore at night. ©

From the Cape of Good Hope to Australia and New Zealand ships have usually westerly winds and a favourable current, which is a good reason for returning to Europe by way of Cape Horn.

About 60 to 100 miles off the south-east extremity of Africa the Agulhas current sets to the westward, sometimes as much as 60 miles a day; its progress is not checked by a westerly gale, and con- sequently one of the most dangerous seas ever experienced is to be found there. About the year 1850, ships making long voyages were frequently navigated upon or approaching a great circle, which led the Australian ships into danger on account of the icebergs which were met in great numbers. In 1866 the Admiralty published ice-charts of the southern hemisphere for the guidance and warning of seamen. Every ship should be provided with wind and current charts for the sea to which she is going, and every officer should help to perfect these by means of careful observations. ;

When a ship is to leeward of her port, or a chase, it is advisable to work up on a direct line towards it, tacking as frequently as con- venient, as then all flaws and changes in the wind will be in her favour. By the contrary mode of action ships have been known to sail round an island, ¢.g., the Bermudas.

A useful graphic method has been devised for shaping a course which will intercept another ship with the least loss of time, or for shaping a course across a current the direction and velocity of which can be estimated (see fig. 28, which for use should be more than twice as large, with a circle for every mile).

1 For full description of circular storms, see Lieut.-Col. W. Reid, Law of Storms, 1850; Henry Piddington on Typhoons, Calcutta, 1840; and W. H. Rosser, The Law of Storms, &c., 1876,

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Ez, 1.—A ship bore N.E. 13 miles, steering S.8.E. 10 knots. { then west, the boat will reach its

Being nearly on a wind, which was E. by N., she could not alter course from her pursuer without loss of speed; the pursuer being a steamship only able to go 94 knots, if he allows the chase to cross his bows she will escape.

Make a spot on the N.E. line, 13 miles from the centre, at A; place the parallel ruler to the course the chase is stecring, S.S.E., and, with the distance representing her speed (10 knots) in the compasses, mark where it will reach on that bearing, from the N.E. line to a position between the circles representing 94 knots,

Fig. 23.

which will be from ato 6. Then a line from the centre through 6 shows the course the pursuer must take, S.E. by E. 4E., which continued will cross the S.S.E. line from A in E, where the vesscls will meet. The distance and time of meeting may be measured on the diagram or calculated by trigonometry. The two ships will continue on the same relative bearings.

Ex. 2.—A point of destination bore W.S.W. 10 miles; a current tan 8. E. by S. 4 miles an hour; the boat can pull at the rate of 6 miles an hour. It is convenient to consider that the object is mov- ing in the opposite direction to the current and at the same speed. As the diagram is so small the proportionate speeds are doubled. Hight miles in the compasses will extend on a line parallel to S.E. by S. from the 12-mile circle at d to the W.S.W. bearing at f. A line from the centre through d@ will indicate the course to be stecred, W. by N.2N. From the point F on the 10 mile circle and 8.8. W. bearing, a line drawn N.W. by N. will cut the former line in D, the place the boat would have teached had there been no current, 16 miles from the centre, Occupying 2h 40m; while DF represents the space through which the water has passed = 104 miles in the same time. When adistant object can be seen in a line with the point steered for, and if the strength of the current be equal all the distance, the same bearing should be preserved. Asan example of crossing a river or channel where the tide will change at a

known time, we may take that part of the Bristol Channel where it is12 miles wide, fay north and south, and the tide runs 5 knots. Suppose the boat can only pull 5 knots. By leaving one shore at an hour and twelve minutes before high water, and steering directly north or south during 2h 24m, regardless of first being carried east and

NAVIGATION LAWS. These laws are a branch rather of municipal law than of the general maritime law (for which see Sra Laws). They are based upon the right of a state to regulate the navigation of its own waters and to protect its own commerce, and may be divided into two classes,

The first class includes all those laws, once so numerous, designed to secure a commercial monopoly to the state

destination, having passed through 12 miles of water only.

Though so much has been done to increase the efficiency of ships, In point both of size and of equipment, a sea voyage is still attended with considerable peril, both by stranding and collision. In the year ending April 1882 there were 4367 vesscls damaged, including 606 total wrecks, with the loss of 1097 lives, round the coast of Great Britain alone. The number entering or leaving British ports during the same period was 676,358, of 139,443,790 tons burthen. The number of vessels at the same time above 50 tons under the English flag was over 22,000. Ships on long voyages were formerly content to make good one degree a day; now steamships occasion – ally run 400 miles in one day. In September 1883 the ‘ Alaska” (Guion Line) made the voyage from Queenstown to New York insix days twenty-one and three-quarter hours, and returned insix days twenty-one hours. During the same month the ‘‘ Oregon” made 20 knots an hour during her trial trip on the Clyde. The “ Ionic” (White Star Line) arrived at Plymouth August 4, 1883, from New Zealand, through the Straits of Magellan, in forty-five days, includ- ing stoppages for coal. Her passage out, round the Cape of Good Hope, was performed in forty-three days. This voyage round the world is the quickest yet accomplished, having occupicd less than eighty-eight days at sea. In May 1888 the ‘‘ British King” returned from

performing a similar voyage, and discharging or receiving 6000 tons of cargo, in less than four months.

Of late years, with the hope of diminishing the number of collisions, an international code of regulations has been drawn up by the Board of Trade and Admiralty, under the authority of the privy council, and sauctioned by nearly all maritime nations. The following is an abridgment of the law as now in force:—

Art. 1. Every ship under sail only is eonsidered a suiling ship, but if any steam be used she is a steamship.

Art. 2. The lights hereafter mentioned, and none other, shall be earried from sunset to sunrise,

Art.3, A steamship under way shall earry a bright white light before the mast at least 20 feet above the deck, a green light on the starboard side, and a red light on the port side.

Art. 4. A steamship towing anything shall earry an extra bright light before the mast, é.e., two vertical lights.

Art. 5, A telegraph cable ship at work, or others not able to steer, to carry three red lights vertically, and by day three balls. Side lights with the above, only when making way through the water.

Art. 6. Sailing ship under way, or being towed, the green light on starboard side, and red on port side only.

Art. 7. Small vessels may earry portable lights similar to the above,

Art. 8. All ships at anchor shall earry a white light, not exceeding 20 feet above the deek.

Art. 9. Pilot vessels to earry a white light at the mast head only, and a flare-up every fifteen minutes.

In lieu of Art. 10. Open fishing boats or other open boats may earry one lantern, green one side and redthe other. Sneh boats when at anchor or fast

to nets to exhibit a bright white light.

Art. 12. Steamships must be provided with an efficient steam whistle, fog-horn, and bell; sailing ships with the last two. Turkish ships to earry a drum instead of a bell.

a. In fog, mist, or snow, by day or night, a steamship must make every two minutes or less a prolonged blast.

6. A sailing ship at similar intervals with fog-horn to make one blast on starboard tack, two on the port taek, and three if the wind be abait the the beam.

c, All ships at anehor in a fog, &e., shall ring a bell every two minutes or less.

Art. 13. Every ship in fog, &e., to “ go at a moderate speed.”

Art. 14. a, A ship running free shall make way for one whieh is close hauled.

6, Ships on the port tuek make way for those on the starboard taek.

c. Similarly if running free. :

d, When running free with the wind on the same side, the ship whieh is to windward shall keep out of the way.

e. A ship whieh has the wind aft shall keep out of the way of any other.

Art. 15, If two steamships are meeting nearly end on so as to involve risk, they shall botli alter eourse to starboard.

Art. 16. When two steamships are erossing, the one whieh has the other on her port side is to keep out of the way.

Art. 17, A steamship shall keep out of the way of a sailing ship.

Art. 18. Steamships shall slacken speed, stop, or reverse if necessary.

Art. 19. Optional signals by the steam whistle:—one short blast means, ‘‘T am altering eourse to starboard”; two short blasts, ‘‘I am going to port”; three short blasts, “I am going full speed astern.”

Art. 20. When one ship overtakes another, the faster ship is to keep out of the

way. Art. 21. In narrow ehannels ships shall keep on the starboard side. The books on navigation in general use are those of Norrie,

Inman (especially his tables), Riddle, Raper, Jeans, and Evers, and Harbord’s Glossary. (H. A. M.)

which enacted them. By laws of this kind trade with Goa was formerly confined to Portuguese subjects. In Great Britain the object was attained by the Navigation Acts, the earliest of which were the 5 Rich. II. stat. 1, c. 8, 14 Rich. II. c. 6, ordaining that no merchandise should be shipped out of the realm except in British ships on pain of forfeiture. The principal Navigation Act was the 12 Car. IL c. 18 (Scottish, 1661, c. 45). Up to 1854

coasting trade was wholly restricted to British ships, and a British ship must have been navigated by a master who was a British subject, and by a crew of whom a certain proportion must have been British subjects. The impolicy of such legislative restrictions, clearly shown by Adam Smith, was at last acknowledged by parliament, and since 1854 the only relics of such restrictions are to be found in the provisions of the 16 & 17 Vict. c. 107, § 324, by which, in order to secure reciprocity, prohibitions or restrictions may by order in council be imposed upon the ships of any country in which British ships are liable to similar prohibitions or restrictions. Subject to these exceptions, a foreign ship is in the same position as a British ship with regard to British trade. This right of foreign ships is expressly recognized by the Customs Law Consolidation Act, 1876; by § 141 of that Act foreign ships engaged in the coasting trade are not to be subject to higher rates than British ships. Any advantages which a British ship has, ¢.g., the right of claiming protection for her flag, the non-attachment to her of a maritime lien for necessaries supplied in a British port, are not directly con- nected

with the policy under which the Navigation Acts have become obsolete. These advantages are not secured toa British ship until she is registered. American law agrees with British in this respect. ‘‘The United States have imitated the policy of England and other commercial nations in conferring peculiar privileges upon American- built ships and owned by our own citizens. . . . The object of the Registry Acts is to encourage our own trade, navigation, and shipbuilding by granting peculiar or exclusive privileges of trade to the flag of the United States, and by prohibiting the communication of those im- munities to the shipping and mariners of other countries” (Kent, Comm., iti. 139). It may be noticed that an alien is generally incapable of becoming the owner of a ship. This incapacity is specially preserved in the case of British ships by the Naturalization Act, 1870.

The second class of navigation laws includes those which deal with the navigation of any waters over which a state has any control, and embraces all that is necessary for the due use of such waters, as rules of the road, management of harbours and lighthouses, and licensing and control of pilots. Such laws may deal with (1) the high seas, (2) tidal waters other than the high seas, (3) non-tidal waters.

1, The claims of various nations to dominion over parts of the high seas have now become matters of merely historical interest. Such claims have been at different times advanced by Great Britain, Holland, Spain, and Portugal, and were once sufficiently important to evoke the Mare Liberum of Grotius and the Mare Clausum of Selden. But, though such claims upon the high seas have long been relinquished, rules for the navigation of the high seas may still be promulgated by any Government. In Great Britain such rules have been made by order in council under the powers of the Merchant Shipping Act, 1862; the rules at present in force are those contained in the order of 14th August 1879. To these rules all the states of Europe except Turkey, and in America the United States, Chili, Brazil, and Ecuador, have assented, so that as far as the assenting states are concerned they are of universal validity. Japan and Turkey have assented to them with certain modifications. In the case of a state which has not assented to them, the only rules enforceable are the general rules of the sea, gradually ascertained by individual cases before courts of admiralty.

2. For the navigation of its tidal waters—so far as they are territorial—a state may legislate without the assent of other states. An example of such legislation is afforded by the Territorial Waters Jurisdiction Act, 1878, a measure passed in consequence of the celebrated case of the Queen

y. Keyn (the "Franconia" case) in 1876. Under the head of territorial waters would fall the "narrow seas" (as the Bristol Channel, Great Belt, or Straits of Messina), bays and harbours, estuaries and arms of the sea, navigable tidal rivers, and the sea for the distance of a marine league from the shore. Such waters being res publice, though not res communes as are the high seas, are prima facie subject to the jurisdiction of the state. In England the soil under such waters, or at least under all but the last kind, is prima facte vested in the crown, subject to the public rights of fishery and anchorage. For the distance of a marine league the crown has certainly jurisdiction for police and revenue purposes. This is a rule of general international law. In England the navigation of most of the principal tidal waters is governed by rules contained in Acts of Parliament and orders in council, the latter for the most part promulgated under the authority given by the Merchant Shipping Act, 1862. Thus the navigation of the Thames is governed by the order of 18th March 1880, of the Mersey by the Mersey Sea Channels Act, 1874, and the order of 5th January 1881, of the Tyne by the order of 12th December 1867, of the Tees by the order of 5th September 1870, of the Humber by the order of 23d December 1881, and of the dockyard ports by the order of 6th March 1868.

3. Non-tidal waters, even though navigable, are in Great Britain prima facie private waters, in which the right of navigation does not exist as a public franchise, but can only be acquired by prescription, founded on a presumed grant by an owner. In Roman law and in the Code Napoléon it is otherwise. Navigable rivers in those systems are always publict juris, whether tidal or non-tidal. Navigation of non-tidal waters in the United Kingdom, whether natural or artificial, is now almost entirely regu- lated by various Navigation and Conservancy Acts, e.g.,, the Thames Conservancy Acts, the Shannon, Trent, Lee, &c,, Navigation Acts, and the various Canal Acts. It may be noticed that the crown is empowered by the Merchant Shipping Act, 1862, to make rules for the navigation of inland waters, even when artificial, on the application of the proprietors. Examples of such rules are

the orders in council regulating the Mersey and Irwell navigation and the Bridgewater navigation, 18th May 1870. Such waters being private property, the application for the rules by the proprietors is recited in the order in council.

The distinction drawn in the United States between navigable and boatable rivers seems to be peculiar to that country, unless indeed it is analogous to the ‘‘fleuves et riviéres navigables ou flottables” of the Code Napoléon, § 538. It is at least unknown in Great Britain.

Remedies for Obstruction.—These may be either criminal or civil,—the criminal by indictment or information, the civil by action for damages or for an injunction, in addition to the criminal remedy, where’ special damage has been sustained. It seems to be a good defence that the obstruction was for the public benefit. This obviously leaves a considerable discretion in the hands of the court.

International Law.—The international law as to the navigation of the high seas has been sketched above. As to territorial waters, it is the general though not the universal opinion of jurists that the state to which the territorial waters belong has a right to forbid their navi- gation by foreigners. The free navigation of rivers has often been the subject of treaties, almost necessarily so where a river is the boundary between two states. In such a case, if a state were to maintain the strict letter of its rights, navigation would be almost impossible, as each state is proprietor down to the middle line of the bed of the river, the mediwm filum aque. By the treaty of Vienna in 1815 it was provided that the navigation of all rivers

separating or traversing the states that were parties thereto should be open for commercial purposes to the vessels of all nations, subject to a uniform system of police and tolls. The treaty of Paris, 1856, extended this principle to the Danube. In America the cases of the Mississippi and the St Lawrence are important. By the treaty of Versailles, 1783, it was provided that “‘the navigation of the Missis- sippi shall for ever remain free and open to the subjects of Great Britain and the citizens of the United States.” But the United States afterwards acquired Louisiana and Florida; and, the

stipulation as to British subjects not being renewed in the treaty of Ghent, 1814, the United States maintain that the right of navigating the Mississippi is vested exclusively in their citizens. As to the St Lawrence, after disputes for a long period between Great Britain and the United States, the right of free navigation for purposes of commerce was secured to the United States by the treaty of Washington, 1871. There are some waters, such as the Bosphorus and the Suez Canal, which are subject to peculiar engagements by treaty or agreement. But asa rule it may be said that in time of peace the territorial waters of a state are open to foreigners for commercial purposes, subject to observance of any rules as to police, pilotage, &c., imposed by thestate. For instance, a system of compulsory pilotage is in existence in many ports, and a vessel refusing to conform to the pilotage regulations might incur serious liabilities. Most of the general law of England on this subject is contained in Part V. of the Merchant Shipping Act, 1854. Tolls may be imposed by the state upon foreigners. This right is expressly recog-nized in most commercial treaties. A notable instance was the claim of Denmark to charge what were called the "Sound dues" from all vessels passing Elsinore, though the Sound was not strictly her territorial water. The right was not universally recognized, though it had prescription in its favour, and was invariably paid. In 1857 the dues were abolished, and compensation paid to Denmark for the loss of her alleged right. (J. w.t)

NAVIGATORS' ISLANDS, or Samoa, a group in the southern Pacific, 420 miles north-east of the Fiji Islands, lying between 13° 30' and 14° 20'S. lat., and between 169° and 173° W. long. It numbers in all thirteen islands, but most of these are little more than barren rocks, and

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'ae beginnings of the British navy may be traced back |

to the long-continued struggle of Alfred and his suc- cessors with Danish invaders and pirates. Alfred has been called the first English admiral, as he was, it is supposed, the first English sovereign who commanded his own fleet In battle ; and it was still to check these marauders, and protect the coasts of the kingdom, that William I., in 1066, established the Cinque Ports, and gave them certain privileges, on condition of their furnishing 52 ships, with 24 men in each, for fifteen days, in cases of emergency. We

should not, perhaps, be far amiss in dating the period of English naval architecture from the Conquest; but there is little to record of the navy till the period of the French wars. In these very numerous fleets were sometimes engaged. King John is said to have fitted out 500 ships in 1213 against Philip of France; and in 1293, in the reign of Edward L, a battle took place in mid Channel where both the French and English fleets met in force, and about 240 ships of the former were captured. In the reign of John a close approach was made to a regular naval establishment, and encouragement given to foreign commerce by a declaration of safe-conduct to all foreign merchants to pass to or repass from England.

three only—Sawaii (Pola), Upolu (Oyalava), and Tutuila (Mauna)—are large enough to be of any importance. Sawaii (700 square miles) is almost entirely occupied by lofty and barren mountains. It has no rivers or streams, the water filtering away through the porous soil; and there is but one harbour. Upolu (550-square miles) is also mountainous, but it is well-wooded and fertile, and possesses several considerable streams. Apia, the chief town, lies at the head of an oval bay on the north coast. Since 1879 it has been under a municipality directed by the consuls of Germany, Great Britain, and the United States. Tutuila (55 square miles, 17 miles long and 5 broad) is almost cut in two by the harbour of Pago-pago (Pango-pango), one of the best in the South Pacific. In general character the island is like Upolu. The Samoans are physically a fine race of men, and those on Upolu are all nominally Christian ; but they discover a great lack of industry and perseverance. Both Upolu and to some extent Tutuila have attracted a considerable number of American and European (mostly German) capitalists, and a large portion of the land has passed into the hands of foreign residents (who number about three hundred). The bulk of the foreign trade belongs to the successors of the famous Hamburg firm of J. C. Godeffroy & Son. Cotton, cocoa-nuts, and breadfruit are cultivated for export, and maize, sugar, coffee, &c., for local consumption. Copra or cobra (z.e., dried cocoa-nuts) is the most important article of trade. In 1881 the planters had about 1800 labourers from the Line Islands, New Britain, New Hebrides, d&c., the Samoans being too independent to hire themselves out. A series of petty wars, continued with little intermission from 1868, has

greatly interfered with the prosperity of the native population, whose numbers have decreased from 56,600 in 1840 to 35,000 in 1872 and 30,000 in 1880.

The Samoan group are possibly the Baumann's Islands of the Dutchman Roggeveen (1722); but it was Bougainville who made them definitely known and who called them Iles des Navigateurs, owing to the skill with which the natives managed their canoes. At Asu or Massacre Bay La Pérouse lost two of his assistants—De Lamanon and De Langle—and a boat's crew. Christianity was introduced by John Williams in 1830.

See Meade, New Zealand and the South Sea Islands (1870), which has views of Pango-Pango and Apia; Dr Forbes in Proc. Roy. Geog. Soc., 1877; Journal des Museums Godefroy, Hamburg,

1871-74.

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There cannot be any doubt that the earlier fleets com- prised many private ships pressed into the king's service. A fleet of Edward the Confessor in 1049 consisted partly of ''king's ships," partly of "' people's ships." In the Black Book of the Admiralty (which is a collection of sea-laws and customs drawn up for the use of the judge of the Court of Admiralty) it is provided that "in case a man be indicted that he hath broken the arrest of his ship, arrested for the king's service, and be thereof convicted by twelve men, he shall lose his ship unless he obtaineth pardon of the king or the high admiral." Richard I. at Grimsby expressly combated by an ordinance the notion that ships were not liable to be pressed ; and in a mandate of Sir Thomas Beaufort, admiral of England, Ireland, and Aquitania, temp. Hen. IV., are to be found instructions to his lieutenant of the North to arrest twenty-four vessels for service abroad, "'upon certain weighty matters." Orders were sent at the same time to press mariners for one of the king's barges.

In an action with the French fleet off the harbour of Sluys (1340), Edward IIL. is said to have slain 30,000 of the enemy, and to have taken 200 great ships, "in one of which only there were 400 dead bodies." All writers

agree in describing the battle as one of the most sanguin- ary and desperate sea-fights ever known. The same monarch, at the siege of Calais, is stated to have blockaded that port with 730 sail, having on board 14,956 mariners, 25 only of which were of the royal navy, bearing 419 mariners, or about 17 men each.

The earlier and middle parts of the reign of Edward III. were particularly famous for the power of the English fleet, and for the dread which it inspired. After a splendid victory over the Spanish fleet in 1350, the title of "king of the sea" was bestowed on the sovereign. Towards the end of that reign, however, naval as well as other affairs were neglected, the seas were left unguarded, the coasts were insulted, and acts of piracy were committed in English waters which a few years before had been impossible. Complaints were loud and frequent. The duke of Lancaster, Edward's brother, was charged with having misspent a sum of money granted to him for the guardianship of the seas, and the anger of the Commons, unable to vent itself upon him, expended itself in a successful impeachment of some of the king's ministers. In the next reign attempts were made to improve niatters ; but, notwithstanding the levies from the Cinque Ports and other towns, the. naval force in 1378 was insufficient to keep even English waters free from pirates, and it was due to the private exertions of John Philpot, a London merchant, who fitted out a squadron at his own expense, that John Mercer, a celebrated Scottish pirate, was captured and his career ended. Plymouth and Hastings were burned, Winchelsea was attacked, and two descents were made, with much damage, upon the Isle of Wight. In one of these descents the French possessed themselves of most of the island, but were finally driven to their ships by Sir Hugh Tyrrel, governor of Carisbrooke, and ''a spur of incredible sharp- ness." Return expeditions were made to French and Spanish towns by the English, who, however, acted rather in the privateer capacity of men who had to take the law into their own hands than as authorized warriors of the English king.

Naval affairs improved under Henry IV., and the reign of Henry V. was most glorious in maintaining the naval superiority over the fleets of France. [rom a letter of this sovereign to his lord chancellor, dated 12th August

1417, discovered by Samuel Lysons among the records in the Tower, and of which the following is a copy, it would appear that there was something like an established royal navy in his reign, independently of the shipping furnished by the Cinque Ports and the merchants, for the king's own use, on occasion of any particular expedition. The letter appears to have been written nine days after the surrender of the castle of Touque, near Honfleur, in Normandy, whence it is dated.

- Aw revérend pere en Diew 1 Evesque de Duresme tire Chanceller d Angleterre. ** By the Kyng—

‘‘ Worshipful fader yn God We sende you closed within this letter a cedule eonteyning the names of eertein Maistres for owr owne grete Shippes Carrakes Barges and Balyngers to the whiehe Maistres We have granted annuitees sueh as is appointed upon eehe of hem in the same Cedule to take yerely of owre grante while that us lust at owr Exehequer of Westm”. at the termes of Miechelmasse and Ester by even poreions. Wherefore We wol and charge yow that unto eehe of the said Maistres ye do make under owr grete seel beyng in yowre warde owr letters patentes severales in forme after th’ effect and pourport of owr said grante. Yeven under owr signet atte owr Castle of Touque the xij. day of August.”

Extract from the Schedule contained in the preceding Letter.

vj. li. xiijs. iiijd. La Grande Nief appelle The [or ‘“‘Jehu’’] dont John Wil- : liam est Maistre vj. li. xiijs. iiijd. La Trinate Royale dont Steph’ Thomas est Maistre

vj. Mariners pot la sauf garde deinz Hannill.

vj. Mariners.

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yj. li. xiijs. iiijd. La Holy Gost dont Jor- dan Brownyng est Maistre

yj. li, xiijs. iiijd. La Carrake appellee le Petre dont John Gerard est Maistre

vj. Mariners.

. Mariners.

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vj. Mariners.

vj i.

; Andrewe dont John Thornyng est Maistr’

vj. li. xiijs. iiijd. La Carrak appellee le

Xpofre dont Tendrell est Maistr’

xlijs. iiijd. La Carrak appellee le

Marie dout William Rieheman est

Maistr’

xiijs. iiijd. La Carrak appellee le

Marie dont William Hethe est

Maistre

xiijs. iiijd, Tua Carrak appellee le}. ars

George dont John Mersh ne Maistr’ 7

vj. Mariners.

yj. li. vj. Mariners.

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The remainder, to the masters of which pensions were thus granted, consist of 17 ‘“niefs, barges, and ballyn- gers,” some with three, and others two mariners only. But history informs us that about this time Henry embarked an army of 25,000 men at Dover’on board of 1500 sail of ships, two of which carried purple sails, embroidered with the arms of England and France,—one

styled the “ King’s Chamber,” the other his ‘ Saloon,” as

typical of his keeping his court at sea, which he considered |

as a part of his dominions. | The general orders for the admiral of a fleet, contained

in the Black Book of the Admiralty, lay it down that “the

admirall ought by his office to elect and order for the king’s person, if he be present, otherwise for his lieutenant, the best and most able shipp of the kingdome, which shall be called the chamber of the king or of his heutenant; and if the king be present then the Comptroller of his household is to make choice of some of the best shipps of the whole ffleete (that is to say) one shipp for the Hall, another for the Wardrobe, the third for the Larder, and the fourth for the Kitchen.” Froissart, writing of the battle of

L'Espagnols sur Mer, in 1350, speaks of a ship called "la Salle du Roi, ot tous ses hétels étoient." It would . appear from a very curious poem,! written in the early

part of the reign of Henry VI. (between 1426 and 1438),

that the navy of his predecessor was considerable, but that,

by neglect, it was then reduced to the same state in which

it had been during the preceding reigns.

Shortly after the time when this poem must have been | written, it appears from the parliament roll (20th Henry VI., 1442) that an armed naval force, consisting only of eight large ships, with smaller vessels to attend them, was to be collected from the ports of London, Bristol, Dart- mouth, Hull, Newcastle, Winchelsea, Plymouth, Falmouth, &e. ; and, of course, the royal ships of 1417, the names of which are contained in the foregoing schedule, were then either gone to decay or dispersed. We are not to judge of the size of the ships from the few mariners appointed to each. These were merely the ship-keepers, or harbour- duty men, placed on permanent pay, to keep the ships im a condition fit for sea when wanted.

The classes of ships and vessels mentioned in the records of what may be called the first period of the British navy are very numerous, varying with the use for which they were designed. Thus there were "cogs," oF large, swift vessels, sometimes of 250 tons, carrying 130 seamen besides archers and soldiers; "barges," oF small cogs, which carried 60 to 80 men; "balingers," oF boats resembling modern barges; "caraks," large vessels, chiefly used in Continental navies; "crayers," transport

1 "The English Policie, exhorting all England to keep the Sea, and namely the Narrow Sea; showing what profit cometh thereof, and also what worship and salvation to England and to all Englishmen"; it 18 printed in the first volume of Hakluyt's Collection of Voyages.

vessels, seldom over 60 tons; ‘‘doggers and lodeships,” fishing and pilot boats, with 30 nien, which were occa- sionally impressed into the king’s service; “fluves,” two- masted vessels, used for conveyance of troops (Edward III. commanded the burgesses of Kingston-upon-Hull to build him a “fluve”); “galleys” and “ galiots”; ‘ hoc- boats,” cargo or store ships. There were also “lynes,” “nersouers,” and “ pikards,” or large boats. ‘* Pinnaces,” with 35 men, figured at Sluys, and at the battle of L’Espagnols sur Mer in 1350; and in 1339 two “espi- naces” were given to Sir Richard Talbot for the defence of Southampton.

It is very probable that, until English merchants engaged in the Mediterranean trade, and the attention of the Govern- ment was turned, in the reign of Henry VII. (about 1496), to imitate Portugal in making foreign discovery, under the skilful seaman Sebastian Cabot, very little was added to the capacity or the power of British ships of war. In his reign was built a ship called the “Great Harry,” the first on record that deserved the name of a ship of war, if it was not the first exclusively appropriated to the service of the state. This is the ship which Camden called the “Henry Grace de Dieu,” but erroneously,—the vessel so named not having been built till the reign of Henry VIII. The “Great Harry” is stated to have cost £14,000; there is reason to suppose that she was renamed the “ Regent” on the accession of Henry VIII.

We now come to that period in which England might be truly said to possess a military marine. Some curious details have been preserved in the Pepysian collection at Magdalene College, Cambridge, from which papers it appears that in the thirteenth year of Henry VIII. the following constituted the royal navy :—

Tons Tons. Henry Grace de Dieu……. TIS OU! || SON OUCNET, «. cooepaancsoekeoses ane 800 fEbricl Royal……..6…..00 650 | Catherine Forteleza,..... 550 Se 600 | John Baptist …..... pope 400 eee eee eec cee eeeees 400 | Great Nicholas……. 400 Bee GLOTLC «0… see ec cee ZOO) || June? VAS. ceecasdoaencn6s oe 240 Henry Hampton……. W2Z0 | Great Wate ..c..cncccacven sa 250 mete Great Galley……. BOO | Meee Mey. sis ccevncsvedeess 180

There were besides two row-barges of 60 tons each, making in all 16 ships and vessels, measuring 7260 tons.

The “Henry Grace de Dieu” is stated in all other accounts, and with more probability, to have been only 1000 tons! This ship, the better-known “Great Harry,” appears to have been begun at Erith, in August or September 1512, to replace the “Regent,” which was burned in the former month in action with the French fleet, when carrying the flag of the lord high admiral. There is a drawing of the ship in the Pepysian papers. Nrom these papers it appears that she carried fourteen guns on the lower deck, twelve on the main deck, eighteen on the quarter-deck and poop, eighteen on the lofty forecastle, and ten in her stern-ports, making alto- gether seventy-two guns. Her regular establishment of men is said to have consisted of 349 soldiers, 301 Marmers, and 50 gunners, making altogether 700 men. The war ships of this period were awkward to manceuvre : on the appearance of the French fleet at St Helens, the

Great Harry,” the first ship built with two decks, had nearly been sunk; and the “ Mary Rose,” of 600 tons, with 500 or 600 men on board, was actually sunk at Spithead, as Raleigh informs us, in consequence of “a little Sway in casting the ship about, her ports being within 16 inches of the water.” On this occasion the fleets cannonaded each other for two hours; and it is remarked as something extraordinary that not less than three hundred cannon-shot were fired on both sides in the course of this

The rules for the measurement of tonnage were probably very linperfect,

action. From the drawings still extant it is quite surpris- ing how the vessels could be trusted on the sea at all, their enormous poops and forecastles making them appear loftier and more awkward than the large Chinese junks, to which, indeed, they bear a strong resemblance.

Henry VIII. may justly be said to have laid the founda- tion of the British navy as a permanent or standing force, He established the dockyards at Deptford, Woolwich, and Portsmouth; he appointed certain commissioners to superintend the civil affairs of the navy, and settled the rank and pay of

admirals, vice-adnirals, and inferior officers, thus creating a national navy, and raising the officers to a separate and distinct profession. The prin- cipal officers of the navy then were—the vice-admiral of England, master of the ordnance, surveyor of the marine causes, treasurer, comptroller, general surveyor of the victualling, clerk of the ships, and clerk of the stores. Each of these officers had his particular duties, but they met at their office on Tower Hill once a week, to consult, and make their reports to the lord high admiral. Henry also established the fraternities or guilds of the Trinity House at Deptford, Hull, and Newcastle for the improve- ment of navigation and the encouragement of commerce, and built the castles of Deal, Walmer, Sandgate, Hurst Castle, &c., for the protection of his fleet and of the coast.

At the death of Henry VIII. in 1547, the royal navy consisted of about 50 ships and vessels of different sizes, the former from 1000 to 150 tons, and the latter down to 20 tons, making in the whole about 12,000 tons, and manned by about 8000 mariners, soldiers, gunners, &c. Thus, as has been well said, “everything was leading up to a time when the perils of the seas should claim all that was most heroic in England’s most heroic age.” In the short reign of his son Edward little alteration seems to have taken place in the state and condition of the royal navy. But the regulations which had been made in the reign of his father for the civil government of naval affairs were revised, arranged, and turned into ordinances, which form the basis of all the subsequent instructions given to the commissioners for the management of the civil affairs of the navy. In the reign of Mary the tonnage of the navy was reduced to about 7000 tons; but her lord high admiral nobly maintained the title assumed by England of Sovereign of the Seas, by compelling Philip of Spain to strike his flag that was flying at the main-top-mast head, though on his way to England to marry Queen Mary, by firing a shot at the Spanish admiral. He also demanded that the whole fleet, consisting of 160 sail, should strike their colours and lower their top-sails, as a homage to the English flag, before he would permit his own squadron to salute the Spanish monarch.

Elizabeth not only increased the numerical force of the regular navy, but established many wise regulations for its preservation, and for securing adequate supplies of timber and other naval stores. She placed her naval

officers on a more respectable footing, and encouraged foreign trade and geographical discovery, so that she acquired justly the title of the Restorer of Naval Power, and Sovereign of the Northern Seas. The greatest naval force that had till then been called together was that which was assembled to oppose the Invincible Armada, and which, according to the notes of Pepys, consisted of 176 ships, with 14,992 men, but these were not all "Shippes Royall," but consisted largely of the contributions of the Cinque Ports and private persons. The number actually belonging to the navy is stated by the commissioners of 1618 in their report (several manuscript copies of which exist) to have been 34 ships of 12,190 tons, carrying 6225 men. Sir Edward Coke (4 Inst. 50) "thinks it matter of boast that the royal navy of England then consisted of 33

ships" (Blackstone). At the end of Elizabeth's reign, however, the navy had greatly increased, the list in 1603 consisting of 42 ships of various descriptions, amounting to 17,000 tons, and manned with 8346 men. Of these, two were of the burden of 1000 tons each, three of 900 tons, and ten of from 600 to 800 tons.

James I. was not inattentive to his navy. He warmly patronized Phineas Pctt, to whom we undoubtedly owe the first essential improvements in the form and construction of ships. The cumbrous top-works were first got rid of under his superintendence. "In my owne time," says Raleigh, "the shape of our English ships hath been greatly bettered ; in extremity we carry our ordnance better than we were wont ; we have added crosse pillars in our royall shippes, to strengthen them; we have given longer floors to our shippes than in older times," &. In 1610 Pett laid down a ship named the " Prince Royal"; her burden was 1400 tons, her keel 114 feet, and she was armed with sixty-four pieces of great ordnance, " being in all respects," says Stowe, "the greatest and goodliest ship that was ever built in England."

The state of the navy at the king's death is variously given by different writers; but on this subject the memoranda left by Pepys are most likely to be correct. From them we learn that in 1618 certain commissioners were

appointed to examine into the state of the navy, and by their report it appears there were then only 39 ships and vessels, whose tonnage amounted to 14,700 tons; while in 1624, on the same authority, the number had decreased to 32 or 33, but the tonnage increased to about 19,400 tons. The commissioners had, in fact, recommended many of the small craft to be broken up or sold, and more ships of the higher rates to be kept up.

Charles I. added upwards of 20 sail to the navy, generally of the smaller kind; but one of them, built by Pett, was of a description, both as to form and dimensions, far superior to any that had yet been launched. This ship was the celebrated "Sovereign of the Seas," launched at Woolwich in 1637. The length of her keel was 128 feet, the main breadth 48 feet, and the length from stem to stern 232 feet. In the description of this ship by Thomas Heywood it is said that she "bore five lanthorns, the biggest of which would hold ten persons upright; had three flush-decks, a forecastle, half-deck, quarter-deck, and round-house. Her lower tier had thirty ports for cannon and demi-cannon; middle tier, thirty for culverins and demi-culverins ; third tier, twenty-six for other ordnance ;

forecastle, twelve ; and two half-decks, thirteen or fourteen °

ports more within board, for murthering pieces ; besides ten pieces of chace ordnance forward, and ten right aft, and many loopholes in the cabins for musquet shot. She had eleven anchors, one of 4400 tb weight. She was of the burden of 1637 tons." It appears, however, that she was found, on trial, to be too high for a good service- able ship in all weathers, and was therefore cut down to a deck less. After this she became an excellent ship, and was in almost all the great actions with the Dutch; she was rebuilt in 1684, when the name was changed to that of 'Royal Sovereign," and was about to be rebuilt a second time at Chatham in 1696 when she was totally destroyed by fire. In this reign the ships of the navy were first classed, or divided into six rates, the first being from 100 to 60 guns, the second from 54 to 36, &e.

In 1642 the management of the navy was taken out of the king's hands, and in 1648 Prince Rupert carried away twenty-five ships, none of which ever returned ; and such, indeed, was the reduced state of the establishment that at the beginning of Cromwell's government he had only fourteen ships of

war of two decks, and some of these carried only 40 guns; but, under the careful management

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of very able men in different commissions which he appointed, such vigorous measures were pursued that, in five years, though engaged within that time in war with the greatest naval power in Europe, the fleet was increased to 150 sail (of which more than a third part had two decks, and many had been captured from the Dutch), while up- wards of 20,000 seamen were employed in the navy. The niilitary marine was, indeed, raised by Cromwell to a height which it had never before reached.

Though Cromwell found the navy divided into six rates or classes, it was under his government that these ratings were defined and established in the manner nearly in which they were till the middle of the present century; and it may also be remarked, that under his government were constructed a large number of frigates, or vessels designed specially for speed and having a peculiar sharpness of form. The first built in England was the ‘“ Constant Warwick.” “She was built,” says Pepys, “‘in 1640, by Mr Peter Pett (son of Phineas), for a privateer for the earl of Warwick, and was sold by him to the state. Mr Pett took his model of this ship from a French frigate which he had seen in the Thames.”

We know comparatively little about ships’ armaments up to this period. It appears, however, that they were furnished about the year 1337 with espringalds, haubergeons, bacinets, bows, arrows, jacks, doublets, targets, pavises (or large shields placed at the side, and serving the double purpose of protection against the sea and the enemy), lances, and ‘“‘ firing barrels.” It also appears that as early as 1338 cannon formed part of the armament of ships, and that about 1372 guns and gunpowder were commonly used. Among the stores belonging to the ‘‘ Christopher of the Tower” in June 1338 were three iron cannon with five chambers, a hand gun, and three old stone bags, probably for shot. The ‘‘ Mary of the Tower” had an iron cannon with two chambers, and one of brass with one chamber. The precise character and description of the earlicr guns are difficult to be found, but among the ‘‘crakys of war”? mentioned as most used on board ship are ‘‘ cannon-paviors,” or stone-shot throwers, and ‘‘murtherers,’” which were

smaller and threw any kind of shot. There were also in the first period of naval history basilisks, port pieces, stock-fowlers, sakers, and bom- bards. The last-named were large instruments of hammered iron, made of bars welded and bound together with iron bands. They threw stone shot of 140 Ib, and even of 195 Ib weight. A battery of these erected on a slip of land at the naval battle of Chioggia (1380), between the Venetians and the Genoese, did great damage. They were loaded over night and fired in the morning—one dis- charge per diem being considered enough for the gun, if not for the enemy. Froissart mentions a bombard at the siege of Oudenarde by Philip van Artevelde, that ‘“‘might be heard five leagues off in the daytime, and ten at night. The report of it was so loud that it seemed as if all the devils in hell had broken loose.” According to Lord Herbert, brass ordnance were first cast in England in the year 1535. They had various names, such as cannon, demi-cannon, culvcrins, demi-culverins, sakers, mynions, falcons, falconets, &e. What the calibre of each of these was is not accurately known, but the cannon are supposed to have been about 60-pounders, the demi-cannon 82, culverins 18, faleons 2, mynions 4, sakers 5, &e. Many of these pieces of different calibres were mounted on the same deck, which must have occasioned great confusion in action in finding for each its proper shot.

On the restoration of Charles IT. the duke of York was immediately appointed lord high admiral, and by his advice a committee was named to consider a plan, proposed by himself, for the future regulation of the affairs of the navy, at which the duke presided. By the advice and able assistance of Pepys as a principal officer of the navy, great progress was speedily made in the reparation and increase of the fleet. The duke remained lord high admiral till 1673, when, in consequence of the test required by parliament, to which he could not submit, he resigned, and that office was in part put in commission, and the rest retained by the king. Prince Rupert was put at the head of this commission, and Pepys appointed secretary of the Admiralty. By his able and judicious management there were in sea-pay, in the year 1679, and in excellent condi- tion, 76 ships of the line, all furnished with stores for six months, 8 fire-ships besides a numerous train of ketches,

smacks, yachts, &c., with more than 12,000 seamen ; and also 30 new ships building, and a good supply of stores in the dockyards. But this flourishing condition of the navy did not last long. In consequence of the dissipation of the king, and his pecuniary difficulties, he neglected the navy on account of the expenses; the duke was sent abroad, and Pepys to the Tower.

The first act on the duke's return was the reappoint- ment of Pepys as secretary of the Admiralty. In 1686, finding the principal officers unequal to the dutics required of them, he appointed a special commission to restore the navy to its former strength and Condition. Sir Anthony Deane, the most experienced of the shipbuilders then in England, was joined with the commissioncrs. He is said to have introduced important improvements in ships of the line, his model being the "Superbe," a French ship of 74 guns, from which he built the "Harwich" in 1664. Others, however, are of opinion that no advance was made on the model of the "Sovereign of the Seas" after she was cut down. The commissioners undertook, in three years, to complete the repair of the fleet, and furnish the dockyards with a proper supply of stores, on an estimate of £400,000 a year, to be issued in weekly payments; and in two years and a half they finished their task to the satisfaction of the king and the whole nation, 108 sail of the line being repaired and under repair, besides smaller vessels. At the time of the king's abdication, the list of the navy amounted to 173 sail, of 101,892 tons, carrying 6930 guns and 42,000 seamen.

The naval regulations were wisely left unaltered at the Revolution, and the business of the Admiralty continued to be carried on for a short time, under the immediate direction of King William, by Pepys, till the arrival of Admiral Herbert and Captain Russell from the fleet, into Whose hands, he says, "he silently let it fall." Upon the general principles of that system, thus established with his aid by the duke of York, the civil government of the British navy has been carried on ever since.

In the second year of William ITI. (1690), no less than 27 ships were ordered to be built, of 60 and 80 guns each; and in 1697 the king, in his speech to parliament, stated that the naval force of the kingdom was increased to nearly double what he found it at his acccs- sion. It was now partly composcd of various classes of French ships which had been

captured in the course of the war, amounting in number to more than 60, and in guns to 2300,—the losses by storms and captures being about half the tonnage and half the guns acquired, At the commencement of William's reign, the navy, as already stated, consisted of 173 ships, measuring 101,892 tons; at his death it had been extended to 272 ships, ee

- Up to this time merchantmen, hired and armed, but commanded by officers of the navy, formed more or less a part of every fleet sent out, Now, however, the navy became independent for fighting pur- Poses, while the development of commerce and colonial trade made

the establishment of a system of convoys and cruisers an absolute necessity,

measuring 159,020 tons, being an increase of more than one-half both in number and in tonnage. The ships of the line numbered then 130, and this continued to be the average number till the middle of the 18th century.

The accession of Queen Anne was immediately followed by a war with France and Spain, and in the second year of her reign she had the misfortune to lose no less than 13 of her ships by one of the most tremendous storms that was ever known; but every energy was used to repair this national calamity. In the course of this war there were taken or destroyed about 50 ships of war, mounting 3000 cannon; and about half that number were lost. At. the death of the queen, in 1714, the list of the navy was reduced in number to 247 ships, measuring 167,219 tons, being an increase in tonnage of 8199 tons.

George I. left the navy pretty nearly in the state in which he found it. At his death, in 1727, the list con- sisted of 233 ships, measuring 170,862 tons, being a decrease in number of 14, but an increase in tonnage of 3643 tons.

George IT. was engaged in a war with Spain in 1739, in consequence of which the size of ships of the line ordered to be built was considerably enlarged. On the restora- tion of peace in 1748 it was found that England's naval strength had prodigiously increased. The loss bad been little or nothing, while the English had taken and de- stroyed 20 French and 15

Spanish sail of the line, besides smaller vessels. The war with France of 1756 added considerably to the list, so that at the king's decease in 1760 it consisted of 412 ships, measuring 321,104 tons.

In the short war of 1762, George III. added no less than 20 sail of the line to the navy. At the conclusion of the American war in 1782, the list of the navy was increased to 600 sail; and at the signing of the prelimin- aries in 1783 it amounted to 617 sail, measuring upwards of 500,000 tons, being an increase of 185 ships and 157,000 tons and upwards since the year 1762. At the peace of Amiens the list of the fleet amounted to upwards of 700 sail, of which 144 were of the line. The number taken from the enemy, or destroyed, amounted nearly to 600, of which 90 were of the line, including 50-gun ships, and upwards of 200 were frigates; the English loss amounted to about 60, of which 6 were of the line and 12 frigates.

The recommencement and long continuance of the revolutionary war, the glorious successes of England in naval actions, and the protection required for the extended commerce, of which, in fact, Britain might be said to enjoy a monopoly, and for the security of the numerous colonies, contributed to raise the British navy to a magni- tude to which the accumulated navies of the whole world bore but a small proportion. From 1808 to 1813 there were seldom less than from 100 to 106 sail of the line in commission, and from 130 to 160 frigates, and upwards of 200 sloops, besides bombs, gun-brigs, cutters, schooners, &c., amounting in the whole to about 500 sail of effective ships and vessels, to which may be added 500 more in the ordinary, and as prison, hospital, and receiving ships,— making at least 1000 pennants, and measuring from 800,000 to 900,000 tons. The commissioners appointed to inquire into the state and condition of the woods, forests, and land revenues of the crown state, in their report to parliament, in the year 1792, that, "at the accession of his majesty (George III.) to the throne, the tonnage of the royal navy was 321,104 tons, and at the end of the year 1788 it had risen to no less than 413,467 tons." In 1808 it had amounted to the enormous total of 800,000 tons, having nearly doubled itself in twenty years. It must not, however, be supposed that the effective navy consisted of more than half this amount of tonnage.

Steam ships of war.

Tron- clads.

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Since the conclusion of the war with France, it would appear that at least one-half of the ships had been sold or broken up as unfit for service; and as, by the list of the navy at the beginning of the year 1821, the number of ships and vessels of every description, in commission, in ordinary, building, repairing, and ordered to be built, had been reduced to 609 sail, we may take the greatest extent of the tonnage at 500,000 tons; but the greater part, if not the whole, of this tonnage was efficient, and in a state of progressive efficiency.

According to the printed list of the 1st January 1821, the 609 sail of ships and vessels appear to be as under :—

1st rates, from 120 to 100 GUMS,.....6..seee ceeeee ences 23 Oy ee Ry BON sg coeccecceteseseesoetenns terres 16 gg.gp gs OE gp se tratetncncsneecre cen saneeane 90 (TIN MS a ye 0) Syme) SR Aeeeieccepaen enseoouonunde. i 20 ET aR ye 0S Gham 20 IAS nepceesronronadresenncncccocr: 107 Goa Se 2B yg) stn etese cre cesee sence eswere 40 Sloops —,, — DZ gg 10 yy ceveeseevescseeseranenaceeeees 136

making a total of 432; gun-brigs, cutters, schooners, tenders, bombs, troop-ships, store-ships, yachts, de.

In the year 1836 the total number of ships of war, including every description mentioned in the above list, amounted to about 560 sail; of which 95 were ships of the line in a state of efficiency for any service, or capable of being speedily put into a fit state for sea ; and many of them were of a very superior class to any employed in the war. In 1846 there were 671 ships, including every description ; and in 1857 there were on the list of the royal navy 735 ships, exclusive of those appropriated to harbour service, and of the coastguard cruisers, making a grand total of 888 ships and vessels of all classes.

Soon after the commencement of Queen Victoria's reign stcam began to assert its superiority over sail-power for the propulsion of ships of war. It has now to a great extent usurped the place of manual labour also in ships, and it has been the main cause of the revolution which has been effected in their type.

The paddle-wheel was first adopted as the means of utilizing the power of steam for propulsion. The first ship of war of any importance fitted with the paddle was the 46-gun frigate ‘‘ Penc- lope.” In 1843 she was cut in two, lengthened, and furnished with engines of 650 horse-power. A number of ships were also built expressly for the paddle, of which class the ‘‘Terrible,” a powerful, frigate-built ship of 21 guns and 800 horse-power, may be taken as a type. The “ Valorous” is almost the only remaining example of it in 1888, and she has been relegated to dockyard service.

The suecess of the screw, however, as a means of propulsion soon made it evident that this must be the system of the future for war- ships. By its use the whole motive power could be protectcd by being placed below the water-line. It interfered much less than the paddle with the efficiency and handiness of the vessel under sail alone, and it enabled ships to be kept generally under sail. Great importance was attached to this, as the handling- of a ship under sail was justly thought an invaluable means of training both officers and men in ready resource, prompt action, and self-reliance. For this reason masts and sails have been retained long after they were admitted to be detrimental to the fighting qualities of battle ships.

The screw was therefore eagerly adopted, and rapid progress was made in the conversion of ships into screw steamers,—some being cut in two and lengthened, others being razécd or having decks removed, while new ships were building, so that the Russian war, which broke out in 1854, found Great Britain in possession of a powerful steam fleet. Of this fleet the three-decker ‘‘Duke of Wellington,” of 700 horse-power (nominal) and 131 guns, the two- decker ‘‘ Agamemnon,” of 600 horse-power (nominal) and 91 guns, and the frigate ‘‘Shannon,” of 600 horse-power (nominal) and 51 guns, may be taken as the finest examples; a powerful flotilla of steam gunboats was built for the occasion. Henceforth ships propelled only by sail were obsolete for war purposes.

In this war mechanical mines or torpedoes were used by the Russians for the defence of their harbours, but with not much effect.

The advance of gunnery, and the disastrous effect of explosive shells, which were new weapons since the great naval wars of forty years before, operated to the disadvantage of ships with wooden walls. The filcets were unable to do much more than blockade, and it became necessary to furnish means by which they miglit also attack.

The French were the first to apply in a practical shape the idea (which appears to have originated in the United States) of reviving

the use of armour, and placing it on the sides of ships. They con- structed five floating batteries clad with 4§ inches of iron, on an oak backing 8 inches thick. Of these the first was the 'Ton- nante,"' mounting 16 guns. She was launched at Brest in March 1855, and was quickly followed by the others. Three of them took part in the bombardment of Kinburn in the Black Sea onthe 17th October following.

The British Admiralty at once put in hand similar vessels, and with such diligence that the " Erebus" and " Terror" arrived at Kinburn on the 24th October. They were hastily constructed for work in shallow water, and were difficult to manage; but the results were sufficiently satisfactory to inducc the French to convert a wooden line-of-battle ship on the stocks into a frigate armoured all over with 4inches of iron. She was launched at Toulon under the name of " La Gloire" in November 1859, and was of 5600 tons displacement and 800 horse-power (nominal).

In December 1858 a committee was appointed under the ad- ministration of Lord Derby, because the attention of the cabinet had been drawn to the very serious increase which had taken place of late years in the navy estimates, while, at the same time, it was represented that the naval force of the country was far inferior to what it ought to be with reference to that of other powers, and especially of France, and that increased efforts and increased expenditure were impcratively called for to place it on a proper footing. One of the main causcs assigned for a prospective increase was the

comparative state of preparation of France, in respect of powerful screw steamers, and the expenditure which had taken place and was still going on in her dockyards.

The committee, in its report, January 6, 1859, directed its remarks principally to the increase in the estimates of 1858 as compared with those of 1852, and omitted the disturbed period between those dates. They say that in 1852 the navy estimates were revised and increased, and measures taken to supply what were supposed to be deficiencies in former years, and to adapt the navy to the altered state of things occasioned by the application of the screw to ships of war. They remark that no one probably in the year 1852 could have anticipated the wonderful progress which a few years had exhibited, superseding practically the use of sailing vessels in the navy, and introducing the use of screw steamers of immense size and power, and involving a more than commensurate additional expense. The total amounts voted were—in 1852, £5,835,588, and in 1858, £8,851,371. They say, at the outbreak of the French revolutionary war England possessed 145 sail of the line, France 77. These comparative numbers were reduced in 1850 to—England 86, and France 45. ‘‘ At this latter period the effective strength of the two navies in line-of-battle ships exclu- sively, and almost exclusively in frigates, consisted of sailing vessels; but, the French having subsequently decided on, and nearly carried out, the conversion of all their sailing ships that were fit for it into steamships, as sailing vessels could not be opposed to steamships with any chance of success, the latter must now be considcred as the only ships really effective for the purposes of war, and the following is at present the relative strength of the two navies in steam line-of-battle ships and frigates, including ships building and converting ”:—

Line-of-battle

5 Frigates. December 1858, sip

English,} French, English. French.

Complete, hull and ma- Screw, 17) Screw, 15) GUINCLY weanieeesestesercsss< \ ~ a Paddle, 9 5 a Paddle,19 § a Receiving engines… B 3 Convertingn….s—)-- 500 (1 Dullcivigy Gavesesesossoocsecessess 6 8 0 BL 46

Iron-plated ships building.. 2006 4 ont

It is curious to observe what happened as a consequence of this report and the circumstances of the time. The committee did not recommend building an iron-plated line-of-battle ship or frigate, although the “ Warrior” was commenced a few months later. They recommended converting 19 sailing ships of the line into steamships of the line and steam frigates. Two years later there were 67 wooden steamships of war building and converting for the royal navy, and navy estimates had gone np to twelve millions and a half; unhappily all these wooden line-of-battle ships and frigates were soon found to be no real addition to the force of the navy, and many of them were not completed. The four iron-plated slips appearing so ominously at the foot of the French list had com- pletely changed the situation.

At this date iron had been gradually encroaching on wood as @ material for the hulls of British merchant ships. It was thought at one time to be unsuitable for war-ships on account of the irregular holes made by shot passing through it, and the difficulty of plugging them, but the use of armour tended to prevent shot, or at least shell, from passing through. Iron presented also the advantage of permitting the use of water-tight bulkheads. (The

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system of subdivision has been largely developed within the last few ycars by the use of double bottoms and of longitudinal as well as transverse bulkheads, and has added much to the security of ships against perils of the sea or acts of the queen’s enemies.) By the use of iron the country was, moreover, relieved from all anxiety on the score of the supply of timber of suitable dimensions and uality.

q fie Admiralty therefore determined to build their first sea-going ironclad ship, the “ Warrior,” of iron, and the decision has been amply justified by the event. Her displacement was 9200 tons, and the indicated horse-power 5470. The central part of the ship was protected by 44-inch armour from the upper deck to 5 feet below the water-line,—the main deck battery being enclosed at its foremost and after ends by armoured transverse bulkheads. She cost, including engines, £357,000, and was able to withstand the fire, at

200 yards, of the heaviest gun of the day, the 68- pounder of 95 cwts. Her own armament consisted of thirty-six of these guns. She was similar in appearance to the frigates of her day, on a large scale. She was launched in December 1860.

Much discussion ensued as to the relative merits of the rival ships ‘‘LaGloire” and ‘‘ Warrior.” The latter was the faster ship, but her great length (3880 feet between perpendiculars) had made it desirable to leave 85 feet at each end entirely unprotected, and, as she had only a single propeller, the steering gear was necessarily by this arrangement exposed to shot. Her length also limited her power of manceuvring.

In the meantime the ‘‘ Black Prince,” a sister ship, had been built; the ‘‘Defence” and ‘‘ Resistance” soon followed on a smaller scale. In 1861 elevenironclads were ordered ; five of them were converted from wooden ships on the stocks, and these no longer appear in the Navy List. The ‘‘ Hector” and ‘‘ Valiant” followed the ‘‘ Warrior,” but the armour on the main deck extended further. In the ‘‘ Achilles” the battery remained as in the “Warrior,” but the armour was extended as a belt, at the sugges- tion of Mr Reed, all round the water-line. The ‘‘ Minotaur,” ‘‘ Agincourt,” and ‘‘ Northumberland” were armoured from end to end, the thickness being increased to 54inches. This additional armour, with the desired fineness of form, involved a length of 400 feet, and a displacement of 10,690 tons. They had five masts. Like the ‘‘ Warrior” they were unhandy, and were thought liable to fall a prey to smaller and nimbler antagonists. The belt type of the ‘‘ Achilles” has survived except where it has been replaced by submerged armoured decks, as in the ‘‘Shannon,” ‘‘ Nelson,” *Inflexible,” and following ships.

During this time the comparative impotence of artillery had suggested recourse to a weapon of the galleys of the Middle Ages. The ram was revived, the French again setting the example. England followed, without however at first making it so prominent a feature as the French. The weapon has since become general, or at least the bows are strengthened to stand the shock of ramming.

After the Russian war torpedoes and submarine mines and counter-mines, mechanical and electrical, attracted much attention. Schools were

established for the instruction of officers and men in their use. For the British navy, the “ Vernon” was set apart for this purpose. In 1871 the secret of the celebrated Whitehead fish torpedo was purchased by the Adiniralty. It has since been acquired by nearly all foreign nations. It was designed to attack ships below water, since their batteries were deemed practically Tuvulnerable. At first it was only arranged to project the tor- pedoes from a submerged tube in the line of keel ahead, but it was found that they could be effectively projected from the broadside above water, and this plan has been extensively adopted. The Whitehead torpedo is projected by means of an impulse of com- pressed air or steam, and is propelled through the water by means of a screw and pair of engines actuated by compressed air, carried within it. The head carries the explosive, which is fired on con- tact, and a secret chamber contains the mechanism regulating the depth below the surface at which it is to travel. It now forms part of the armament of most war-ships.

Fast screw torpedo boats to use the Whitehead or the spar torpedo were introduced by Mr Thornycroft of Chiswick, and they Were at once aequired or copied by all foreign powers.

The superiority of the defence duc to armour was short-lived. Apart from the introduction of new weapons for attack, the artillery continued to advance in power and weight.

With the rivalry between guns and armour sprang up designs for the best mode of defence combined with the most powerful Means of attack. Captain Coles advocated for masted ships the turret system, and Mr Reed (now Sir Edward Reed) the broadside system, each striving to give the utmost protection armour could afford to the battery and other vital parts, whilst enabling the

argest guns to be worked safely under these defences. The broad- side system armoured the battery and the water-line, whilst the

sides and upper portions of the ships remained much as in the older frigates. The turrct aimed at lower sides as offering less target to the enemy, whilst a

deadly fighting power had all-round sway from behind armoured cover. In 1862 the "' Enterprise," *'Favourite,"' and ''Research" were adapted to Mr Reed's prin- ciple,—the belt and battery,—upon which also, with the addition of indented ports at the corners of the battery to give a wider range of fire, were built the '' Pallas," '' Penelope," '' Bellerophon," and **Hercules." In the ''Sultan" an upper deck battery was added with four guns. On the ''Sultan" pattern the '' Audacious' and several other vessels were built. As the guns increased in size, the batteries decreased and the guns became fewer, but the belt remained.

In 1862 also the first turret ship was produced in the shape of Turret the ''Royal Sovereign," a three-decker cut down and converted ; ships.

the ''Prince Albert," built of iron, followed. Both these ships were without sail-power, and calculated for coast defence only.

The ''Monarch," ordered in 1865, was designed as a sea-going rigged turret ship, having 7-inch armour, a free-board of 14 feet, and an armament of four 25-ton guns in two turrets plated with 10- and 8-inch armour. Then came the ''Captain"—a ship de- signed by Captain Coles and Messrs Laird in rivalry of the '*Monarch,"" and built by Messrs Laird at Birkenhead in 1869. She was intended to combine the low freeboard of the ' Royal Sovereign " with the qualities of a sailing frigate ; and for a time she was thought to give promise of such a combination. The calamity of her capsizing, on the night of the 6th of September 1870, with 500 men, of whom only 18 were saved, will not be for- gotten while the annals of the navy are preserved.

At this date (1870) a sea-going mastless turret ship type had been devised under the administration of Mr Childers, and there were three such ships building, the '' Devastation," '' Thunderer," and '' Fury," designed by Mr Reed for service as battle ships at sea. They were, after the loss of the '' Captain," strongly condemned by anticipation by most eminent naval men. But their design has since been fully approved by experience.

The important questions arising out of these changes in types Com- of ships, and especially as to the '' Devastation " class, were dis- mittee cussed in 1871 by a very distinguished committce, known as the on

Committee on Designs, They said in their report :—

‘* A perfect ship of war is a desideratum which has never yet been attained, and is now further than evcr removed from our reach. Any near approach to perfection in one dircction inevitably brings with it disadvantages in another. From the time when ships of war first carried artillery, and were thus cunverted from mere vehicles for the transport of armed men into engines of war, naval architects have been compelled, in designing them, to content themselves with a more or less satisfactory compromise. The difficulty, always great, of bringing into harmony the conflicting features which are desirable in a ship of war was much increased by the adoption of steam-power throughout the navy; the form of hull whicli was thought to be requisite for obtaining the best results undcr steam alone being very different from that most suitable for sailing. When to this was added the still more serious embarrassment arising from the intro- duction of armour-plating, the problem presented to naval architects became onc of extreme difficulty and complexity.

“For some time, indeed, after the necessity of using armour-plating had becn recognized, but before the penetrative power of artillery had reachcd its present stage of development, the question how to unite in one ship the powcr of sailing, steaming, and carrying both heavy guns and armour, although difficult, did not appear to be insoluble, and was met with remarkable ability, and a very large measure of success, by the constructive department of the navy. In the mean- timc, however, a rapid progressive increase in the power of artillery led to a corresponding augmeitation in the thickness and weight of the armour borne by ships, until the point had been reached at which it became impossible to com- bine in one vessel all the qualities which it is desirable a ship of war should possess, consistently with the attainment of a very high degree of efficiency in any of the more important of them.

“The necessity, in some cases at least, of altogether sacrificing some one desirable feature, in order that another may be secured in a higher degree than would otherwisc be possible, was recognized by their lordships when they adopted the design of the ‘ Devastation ‘ class, in which the power of sailing was entirely given up in favour of that of carrying thick armour and

very powerful guns, of moving under steam at a fair although not very high speed, and, finally, of carrying a sufficient quantity of coal to admit of voyages across the Atlantic being made without the aid of sails. Inthe 'Inconstant' class a compromise of a similar character, but in a different direction, had previously been sanctioned, the protection of armour being altogether abandoned in order to secure very high speed under steam, combined with as efficient sail-power as could be attained without interference with the essential feature of grcat specd under steam alone. Each of these types possesses valuable features which are totally wanting in the other. Each in our opinion mcets a part of the rcquirements of modern warfare, and must (subject to modification and improvement) continue to be represented in the British navy." .... ;

" After making every allowance for the disadvantages that attend the use of an enormous dead weight of very costly armour, which after all is not absolutely impenetrable to certain special guns, we cannot lose sight of the indisputable fact that in an action between an armour-clad and an unarmoured ship (assum- ing that they carry guns of equal power) the former has, and must have, an immense advantage in being able to penetrate the sides of her adversary at a distance at which she is herself impenetrable, and, further, in being able to use with effect those most destructive projectiles 'common' shells, which would fall harmless from her own armoured sides. Even assuming that absolute impene- trability to shot proves to be unattainable, it is still our opinion that the time has not come to throw off armour altogether, but that it is necessary that the first ranks of our ships of war should continue to carry armour of as great re- sisting power as possible.) '

"Before quitting this part of our subject, we desire to remark that, although, as before pointed out, there are serious difficulties in the way of increasing to any very material extent the thickness of armour applied in the usual manner to sea-going ships, viz., in the form of a complete belt round the ship, from stem to stern, at the water-line, besides loeal proteetion for guns, men, &e., it is not

by any means certain that some method may not be devised of securing the requisite reserve of buoyancy by other mcans than armour-plating, Were this accomplished, the area of the armour might be diminished, and its thickness increased in a corresponding degree. The ship would then comprise a very strongly plated central citadel, surrounded and supported by an unarmoured raft constructed on a cellular system, or containing some buoyant substance such as cork, which, without offering any material resistance to the passage of pro- jectiles, wonld not be deprived of its buoyancy by penctration." . ...

"At present we find ourselves compclicd to regard the attainment of a very high degree of offensive and defensive power united with real efficiency under sail as an insoluble problem; and we believe that onr transmarine possessions, and other important interests in distant parts of the world, will be more effi- ciently protected by the establishment, where requisite, of centres of naval power, from which vessels of the ' Devastation' class may operate, than by rely- ing upon cruising ships of such limited fighting power as the 'Monarch.' We think, however, that a class of vessel in many respects resembling the * Monarch, although much smaller and less costly, ought to form part of the British navy.

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loading guns in the turrets, and four 6-inch 4-ton guns on the superstructure. The ''Conqneror" is another steel ship, designed especially as a ram, having one turret for two 48-ton guns, and four 6-inch guns unprotected by armour.

The '' Collingwood," commenced in 1880, has a different arrange- Barbettp

ment. In the endeavour to increase the protection of the vital parts, and at the same time to increase the offensive power without going into extravagant dimensions, it was inevitable that the space to be covered should be reduced, and the armour concentrated, The guns being large, it was thought they would not suffer by being mounted ''en barbette," the loading being still done under cover. By these means the revolving turrets were got rid of, and the citadel was no longer required to protect the loading

apparatus. By placing the barbette towers some distance apart it First- In 1873 Italy was contemplating the construction of the ‘‘Duilio” | became possible to mount several broadside guns, not indeed class and ‘‘Dandolo,” large turret ships of the ‘‘ Devastation” type, | protected from the front, but sheltered from raking fire by an turret but intended to mount four very heavy guns which were being | armoured screen extending from the barbette towers to the ship’s ships. constructed by Sir William Armstrong & Co., to be protected by | sides. This then is the design of the ‘ Collingwood” class. The

armour 22 inches in thickness. It was necessary that England should not be behind, and the ‘‘ Inflexible”’ was laid down. She was to carry four 60-ton guns in two revolving turrets, similar to the ‘‘ Devastation,” except that, in order to obtain right-ahead fire of all four guns, and to meet the objections raised by naval officers and in parliament against the lowness of the npper deck of the ** Devastation” class, the turrets were placed ‘‘ en échelon,” the fore- most turret ou the port side and the after one on the starboard side, and a superstructure was erected between them along the centre of the ship. The belt also beyond the citadel was omitted, and a sub- merged armour deck, of 3 inches in thickness, replaced it at the ends. This deck descended forward and helped to strengthen the ram. The armour on the sides was to be 24 inches; before the ship was completed, however, compound armour had been intro- duced, which allowed the thickness on the turrets to be reduced to 16 inches. The total weight of armour was 3155 tons. To enable this great weight to be carried, to provide stability when injured, and to allow all the guns to fire in line of keel, the breadth, which had not before exceeded 60 feet in sea-going ships of war, was increased to 75 feet, the utmost which existing docks allowed, The length was 320 feet, and the displacement reached 11,880 tons. The horse-power was 8000, and this gave her, after she was launched in 1876, a speed of 143 knots, and when fully equipped at Malta 13°87 knots. She is rigged asa brig. This is, however, only an arrangement for peace time. In conseqnence of an important question having been raised in the press and in parliament as to her stability in the event of the unarmoured ends being badly damaged in action, a committee was appointed, who reported that ‘‘it cannot be said that the armoured citadel is invul- nerable, or that the unarmoured ends are indestructible, although the character of the risk they run is different. But in our opinion

the unprotected ends are as well able as the armoured citadel to bear the part assigned to them in encountering the various risks of naval warfare, and therefore we consider that a just balance has been maintained in the design, so that out of a given set of condi- tions a good result has been obtained."

It was subsequently laid down in parliament, by the responsible minister, as a guiding principle in such questions, that in a ship of war there should be the greatest possible offensive power, and the defensive arrangements should be such as to ensure her as far as possible, and in equal degrces, against all the various modes in which she may be disabled or destroyed. From this it would follow that it should not be in the power of the enemy to disable the ship by one single blow delivered by any means at his com- mand, if this could have been prevented by causing other defences, where he has not this power, to surrender a portion of their strength to succour the weak part.

Amplifying this principle, it may be said that there should be defence for the propelling power, for the steering power, and for the floating power against the gun, the ram, and the torpedo. To a very large extent the defence against the two last named must rest with the officer in command ; but to resist them he must retain command of speed and steering gear. He therefore requires that these and his floating power should be equally defended against the gun, which he cannotavoid. The avoidable weapons, the ram and the torpedo, are provided against in all ships, even in the

central belt, which rises but little above the water, has 18-inch compound armour, the barbette towers 12-inch, and the screen 6-inch, Communication is maintained by means of armoured vertical hollow cylinders between the towers and the protected part of the ship below, whence the supply of ammunition is derived. She will mount four 43-ton guns in the towers, six 4-ton guns in the broadside, and numerous lighter guns. The " Rodncy," '* Howe," '*Camperdown," ' Anson," and " Benbow" are similar to the " Collingwood," but they will carry 63-ton guns instead of 43-ton. Possibly the " Benbow" may have two exceeding 100 tons instead of the four 63-ton guns.

The cruising ironclads have also continued to advance. the ‘‘ Alexandra” was commenced, of the ‘‘ Sultan” type.

ahead, and two astern. She has thicker armonr than the “Sultan,” and a bulkhead was placed across the main battery, cutting off the two foremost guns from the rest. In the same year the ‘‘ Temeraire” was commenced. She differed from the ‘‘ Alexandra” in having barbette towers forward and aft, instead of the upper deck battery, the 25-ton guns mounted in them being made to descend, on being fired within the tower, for loading. The towers communicated with the protected part below by means of hollow armoured cylinders. She fires three heavy guns from her armoured batteries in line of keelahead. Then came the ‘‘Shannon,” a much smaller vessel, in which the water-line is protected by an armour belt to within 60 feet of the stem, whence a submerged armour deck extends forward; a bulkhead rises from the same point, which covers two guns firing ahead. ‘he remainder of the guns are unprotected, except from right-aliead fire. She was designed for an armoured cruiser, capable of engaging a second-class ironclad. The ‘‘Nelson” and ‘‘ Northampton” followed, but they have central belts and armoured decks at each end, and armour-covered guns for stern as well as bow fire, with cight broadside guns between.

In 1878, when Russia was threatening Constantinople, three ships then building in England were bought from the Ottoman Government,—the ‘‘ Belleisle” and ‘‘Orion,” belted ships with a central battery and a gun at each of the corners, and the “Superb,” broadside ironclad. At the same time the ‘‘ Neptune,” a masted turret ship like the ‘‘ Monarch,” building for Brazil, was bought.

The ‘‘ Impérieuse” and ‘‘ Warspite,” now building, of steel, are the latest type of ironclad cruisers. They are like the ‘‘ Nelson,” but with barbette towers of the French type forward and aft and amidships instead of the partial battery.

Recent ships are furnished with every appliance that modern science can devise to augment their efficiency and power. The turrets and the turn-tables of the barbctte ships are moved by hydraulic power; the guns are loaded and worked by the same power, and are fired by electricity if desired. Electricity is used to light the batteries and the ship generally, the old fighting lanthorn,

or indeed any other, being extinguished by the shock of discharge of modern artillery. The capstan, the steerage of the ship, the gun, the ram and torpedo, the pumps and ventilation, and electric light all require machinery in every direction, so that the ship has become a factory. A large proportion of the crew are relegated to the stokeholds, and but little is left that recalls the war-ship of our fathers.

In 1873 Cruising In this iron- vessel four powerful guns in the central batteries fire in line of keel clads.

‘*Inflexible,” far less than is the unavoidable weapon, the gun. The equality of defensive power in view of all three weapons is obtained by reckoning as part of the defence against the ram and the

The ‘‘Polyphemus” is the only other vessel to be here men- Expeti- tioned. She is hardly an ironclad ; she comes under the head of mental special ships, and is described in the Navy List as a double screw ships.

torpedo the skill and vigilance of the seaman.

The ‘‘ Ajax” and ‘‘ Agamemnon” were laid down in the year the ‘*Inflexible” was launched (1876). They are of the sanie type but smaller, carrying only 38-ton guns. Of this type also are the ‘‘ Colossus” and ‘‘ Edinburgh,” commenced in 1879, and now (1883) approaching completion. They are the same length as the ‘In- flexible,” but 7 feet narrower. As they are of later date than the ‘‘Iris” (the first war-vessel built entirely of steel), steel is employed almost entirely in their construction, and they have steel-faced armour, ‘They are to be armed with 43-ton brecch-

torpedo-ram of 2640 tons and 5500 horse-power. Her shape is cylindro-conical, of steel—the part above water being covered with 3 inches of steel. She is intended for ramming and to use the Whitehead torpedo. Her only other armament is the machine gun. These guns are mounted in revolving towers.

In this ship the first attempt was made in a sea-going vessel to use the locomotive boiler (working with fresh water) with closed stokeholes and forced draught. Mr Thornycroft and other torpedo- boat builders had used

one such boiler in boats with great succcss. As its weight was very considerably less than the ordinary type of

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boiler, the experiment seemed to be justified. Great difficulties were, however, found to attend the use of such boilers in numbers sufficient for a sea-going vessel, and while the experiments were in progress it was ascertained that, by using closed stokeholes and forced draught, the ordinary cylindrical marine boiler using salt water could be made as economical of weight as the locomotive type. The ordinary practice up to this date had required a total weight of machinery of about 4 ewt. for each indicated horse-power in a sea-going ship. The employment of foreed draught, and con- eurrent improvements in machinery, made it possible to get a horse-power in such ships with not more than from 2 to 24 ewt. total weight of engines and boilers, including the water in boilers

— SSS

Names of Material of tn) Armour, Armoured Ships, Hull. eecea : Thickness in Inches. First CLAss. Turret Ships, MIO SUDIE scicacaajsncnsceess Tron, 7, 16 to 24 Steel-faeed on turrets. Dreadnought…..... * FA 11 to 14 Devastation… & on | 10 ,, 14 Thunderer…... ” ” MO *Colossts…... Steel ™ L 14 ,, 18 { *Edinburght…...cc…00- – .) Steel-faced. Barbette Ships. aero Beanimnenteney Steel. av) E oto 18 (ene pie mk eoeceees tT) ” = ” >?) eees a amperdown…... on ODO W 2 sss com isiwcsnees ” sd t Pts Ri , PNDSOM cecccinecceeeee “ s) ‘ (Srconp Cass. Turret Ships. Agamemnon…….....6. Iron, T. 14 to 18 : Steel-faced on turrets. i Pees eee eeewereneee ” ” ”? ” *CONQUELOM.....2000 Steel : 8} to 12 Steel-faeed DOV. acesatsctscsssecass Tron. A 9 to 14 TREY ee costs cosiescos sae. = Es 8. gall

2) 5 10 ,, 14

Corvettes, Belleisle,..... Perea lron. T. 6 to 12 ha a ” Aa 7 ys 22 Tuirp Crags. Rigged Ships. Superb…... Be asi sascjeis Iron. s. 4 to M2. Neptune (turret) ..... fron, Slieathed. 4 9,, 13 Monarch, do. ..... Iron. e a 1D Hercules. % Cur 2 Sultan…..... . 6,, 9 Alexandra a 6), Le Temeraire +f 8,,

11 MEION|.. 55. Ce a5 ol Northampton… ” ” 6,, 9 PHOUIOOM ccc. eeoeccoss, « Ss. 6,, 9 Bellerophon… Tron. e 6 Penelope…..... a a 5to 6 *Impérieuse…....s.ecc000. Steel.Sheathed. a) 8 ,, 10 j *Warspite (barbette).... P – i Steel-faced. (Audacious ares EN aioe cles Tron. Sheathed. A 6 to 8 Invincible… Iron, = € ,, 8 Jron LO os ” 6 ,, 8 Swiftsure…..... ..{Iron. Sheathed, S: 6 5.8 Triumph…... ere ise one “mn ” 6 ,, 8 Special. Polyphemus…..... at Steel 1 2to 3 Fourtu Cxass, Hand aer Turret Ships. PE SIODBY. ...soesevenscceex ss Iron. TT 6 to i0 ane wit Hf os 6 45 10 ceate…., a0 3 Gi, 10 BETA. cose. eS – 6 10 Prince Albert. ii S. 4; ,, 10 OM ON esas ccsesecaea + = 43 ,, 5 BUN Ges eso ecnvcvses vee 4, 5 Gunboats eee isc T aps: lron. xX: 3 ..../ fron, Sheathed. A 3 Aree eno , lron. Hydraulic. 4} Firra Crass, Rigged Ships, ‘33. cies Iron. S 4} Black Prince… nt 2 41 Achilles…....., 7, a 43 Minotaur… o & 53 Agincourt … fo * ba orthumberland …..... . : 54 eet. od ” ” 44 aliant., – i 44 Defence… : 5 +6 4h erence a vs Fe 4h On arden… Wood. 1 3 Repulse …....., % z ‘ 7

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and condensers. The locomotive boilers have therefore been given up in this ship.

The following extract (with slight variations and additions) from the Statesman’s Year-Book, 1883, gives a fair idea of the

present position and strength of the British ironclad fleet :— ‘*The most important division of the navy, the ironclad fleet of war, eonsisted at the end of 1882 of 74 ships afloat and building, of which unmber 55 were afloat

Strength of iron- elad fleet,

and described as efficient for sea or for coast defence, while 3 were not strictly –

British, being built solely for the defence of the colonies, 6 were on the stocks, and 10 had become inefficient for naval warfare. The following is a tabulated list of the ‘ so-called’ efficient ironelads, and of the ironclads still on the stocks, divided into five elasses according to the strength of armour

and armament and mode of eonstruction.! The ironclads marked with an asterisk were not eom-

pleted at the end of 1882,”

Guns,

eee ha Displace-

F Power wens Number. Weight. ;

4 80 ton. 8,0C0 11,880 4 BS oe 8,200 10,820

4 35, 6,650 9,330

4 Two 35 ton and two 88 ton. 6,270 9,330 9 Fonr 43 ,, five 89 ewt. 6,000 9,150 9 gh gh ead 6,000 9,150 10 Four 43 ton and six 89 ewt. 7,000 9,150 10 ees aa 7,500 9,600 10 a ee ee 7,500 9,600 10 na JGGP Ge i cigae & 7,500 10,000 12 Two 110 oe ven eo? .,, 7,500 10,000 10 Hour (3° 5, siz i69! 7,500 10,000 6 Four 38 ton and two 89 ewt. 6,000 8,500 6 aoe, kar ee 800 «t 6,000 8,500 6 Two 43 » fourso , 4,500 6,200 4 » 18 two tO .. 4,600 5,440 4 Tk – Ol % 3,060 4,010 2 25 ton. 2,870 4,910 4 25 ton, 3,200 4,870 4 Dye 4,040 41870 16 18 ton. 6,580 9,170 6 Four 88 ton and two 12 ton, 8,000 9,810 vi Four 25 ton, two 12 ton, and one 63 ton. 7,840 8,320 lt Eight 18 ,, U2 ey a, HOON = 6,750 8,680 12 ; Eight 18 ton and four 12 ton. 7,720 9,290 12 Two 26 , ten 68 8,610 9,490 8 Four 25 ,,, four th =. 7,520 8,540 12 » wy 4 eiaiti «. 6,640 7,630 12 jee ae 6,070 7,630 9 Two 18 ss seven]2 ,, 3,370 5,390 15 Ten 12 ,, ‘five —.64.,, 6,520 7,550 11 Eight 9 – ,, tliree 40-poundcers, 4,700 4,470 10 Four 18 ,, six 89 ewt. 8,000 7,390 10 eye, Ay ee ss 8,000 7,390 18 Ten 12, eight 22 ,, 4,830 6,010 14 a lees four ill ;, 4,830 6,010 14 rr et mare ly 4,270 6,010 18 le eight 22 ,, 4,910 6,910 14 » 22) Go Stour ail 5,110 6,640 Machine guns only, 5,500 2,640 4 18 ton. 1,660 3,480

4 18! 1,670 3,480

4 Ts 1,750 3,480 4 Ne 1,470 3,480 4 M2 4; 2,130 3,880

4 1, 4 1,450 2,750 4 9, 1,450 2,750

4 Two 6} ton and two 24-pounders (howitzers). 700 1,230 4 a ee es * 740 1,230 4 ” 63 ”? bd 24 bel » 730 1,280 32 Four 9 ton and twenty-eight 6} ton. 5,270 9,210 28 ae » twenty-four 63 ,, 5,770 9,210 16 Fourteen 12 ton and two 64 ton. 5,720 9,820 17 12 ton. 6,700 10,690 £7 Th) oy 6,870 10,690 27 Seven 12 ton and twenty 9 ton. 6,560 10,780 18 Two 9 ,, sixteen 62,, 3,260 6,710 18 a at ae 3,350 6,710 16 a 9 » fourteen 63 ,, 2,540 6,270 16 a 9 a > “63,, 2,430 6,270 18 Two 12 ton, fourteen 9 ton, and two 63 ton. 6,700 7,840 2 9 ton. 3,350 6,190

1 The elussitication is without authority, aud is open to question.

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There are three other 18-ton turret ships of the fourth class, viz., the “Cerberus,” belonging to the Victorian Government, and stationed at Melbourne, and the ‘ Abyssinia” and ‘‘ Magdala,” belonging to the Indian Government, and stationed at Bombay.

From the expericnce of the American civil war and the cruise of

armoured the “ Alabama” was born the modern type of cruiser, the object

erisers.

Materials for ships of war.

of these being to overtake and capture the cruisers of the enemy and to destroy his commerce. It is not supposed that they would be charged with a convoy.

The “Inconstant,” commenced in 1866, was the first of this class. With a view to retain the advantages of copper sheathing in com- bination with the iron construction which was necessary in so long a ship, she was built of iron, of 5782 tons displacement, eased with wood in two thicknesses, and coppered. She was heavily armed, and attained a speed of 16 knots at full power. Her coal supply would last two and a quarter days at this speed, but

it sufficed without the use of sail for forty-one days at 5 knots an hour. The ‘ Active” and ‘‘ Volage” were laid down at the same time on a reduced scale, and their speed was 15 knots. The ‘‘Shah” and ‘‘Raleigh,” commenced in 1870, were of the same type as the ‘

The “Iris” was commenced in 1875. She is remarkable as the first war vessel constructed entirely of steel. She was intended for an armed despatch vessel, and in order to obtain the highest speed it was imperative to use the lightest, or, in other words, the strongest, material in her construction. There was at this time, moreover, a great difficulty in getting uniformly good iron even at extravagaut prices. On these grounds a mild steel was employed, which enabled her designers to put 7700 horse-power into a hull with a load displacement of only 3780 tons, and to attain the speed of 18°572 knots, with a length of only 300 feet. The sister ship, the ‘‘Mercury,” did even more, realizing 18°876 knots, or nearly 22 miles an hour.

The “Comus” was the first of nine vessels built in 1879, and called the C. class from the initial letter of their names. They have iron or steel bottoms, cased with wood, and irou or steel frames and internal fittings. The engines and boilers are protected by a 1$- inch steel deck over them, as well as by the coal as much as possible. They are smaller than the ‘‘ Active” class, and are intended for foreign service. They are variously armed ; the ‘‘Canada”’ carries ten 6-Inch gunson the broadside. The two foremost ones are mounted on central pivot carriages on sponsons or projections from the side. By this method they each cover half the horizon. The ‘‘Calliope” and ‘‘Calypso” are building on a somewhat larger scale. They will mount four 6-inch guns on sponsons, two forward and two aft, with ten 5- or 6-inch guns betwecn them on the broadside. All are coppered.

There are six of a class called the ‘‘Gems,” of which the ‘‘ Ruby ” is the type. They are composite vessels, with iron frames and wood planking, and sheathed with copper.

The next is a new class, built entirely of steel on the lines of the “Tris,” and described as second-class cruisers. All this class have twin screws, and thcir armanients are arrauged ina similar manner to that of the ‘‘Calliope,” and inan open battery. The ‘‘Leander” of this class is of 8750 tons, 5000 horse-power, carries 700 tons of coal, and will have a speed of 16 knots.

The ‘‘ Mersey” is rather smaller, being of 3550 tons, but she has 500 horse-power more, and is expected to steam 17 knots. She will mount fourteen 6-inch guus, and has a covered battery.

All the above-named vessels are protected by a steel turtle-back deek. In the ‘‘ Mersey” class this deck will be carried through- out the length. They will have the Whitehead torpedo and two second class torpedo boats.

There are, besides, numerous sloops and gun vessels, chiefly coim- posite. The floating gun-carriages of the ‘‘Stauuch” type, designed by Mr Rendel in 1867 to carry an 18-ton gun, are small, low, mastless boats, with a speed of about 8 knots. The gunboats forming the ** Mosquito ” fleet in 1854 have mostly disappeared.

The accompanying table gives a lst of English unarmoured ships. The vessels named in italics have a protecting deck—the “Mersey,” ‘‘ Severn,” and ‘‘ Thames” throughout, the others over machinery and magazines.

Materials of Construction.—Henccforward we have a new depar- ture as regards the material for ships of war. As the iron displaced the wooden walls, so now steel is displacing iron. All the new ships, whether armoured or not, are of steel.

A remarkable economy in cost has been effected by these means. The steel is so uniform in quality, and the manufacture is so precise, that there is fair competition, and therefore a nearly uniform rate all over the country, and this rate is only one-half of what was given for iron for the royal dockyards when the ‘‘ Iris” and ‘‘ Mercury” were commenced. At that date (1875) the contract price of Admiralty plates of a standard size was over £20 per tou. Iron plates supplied to the same specification, but not subject to tests, were supplied by different makers at prices differing from each

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English Unarmoured Ships.

pis || a | 2 7 Name. place- ee = 3 ba Material of Iiull.) in t orse a 2 ult. knee ment.) power 8 eS ; Tons. ft. in.| ft. in. Ineonstant..| 5,780 | 7,360 |3887 4/50

3) 1868 Tron (sheathed | 16°20 with wood). Weleiehitec.ses 5,200 | 6,160 | 298 0/49 0 1873 × 15°32 itunes een ccee 6,250 | 7,480 |334 8|52 0 ef – 16°20 Mersey (T)..| 8,550 | 6,000 |300 0/46 0) Building. Steel. 17°00 Severn (T)..| 8,80 | 6,000 |800 0/46 0 EC . 17-00 Thames (T)..| 8,550 | 6,000 |300 0)46 0 a Pe 17:00 Active…..... 3,080 | 4,010 |270 0}42 0 1869 Tron (eased). 14°97 Amethyst…| 1,970 | 2,140 220 0}37 0 1873 Wood. 13°24 Bacehante…| 4,130 | 5,250 |280 0/45 6) 1876 Tron (@ased). 15°00 Boadicea…..| 4,140 | 5,290 | 280 0)45 0} 1875 lron (cased). 14°70 IBviSon <7. .<:- 1,860 | 2,150 |} 210 0;36 0 1869 Wood. 13°13 Canada wun. 2,880 | 2,3 225 0|44 6} Building.| Steel and tron | 13°00 eased with wood. Caroline…..| 1,420 | 1,500 | 200 0/38 0 3 Composite, 13-00 Carysfort….| 2,880 | 2,800 | 225 0/44 6 1878 Steel and iron | 13°00 cased with wood. Calliope… 2,770 | 3,000 |235 0/44 6| Building. 9 13°75 Calypso sss. 2,770 | 8,000 |235 0|44 6 # – 13°75 Cleopatra …| 2,880 | 2,300 |225 0)44 6) 1878 Steel and fron | 13°00 eased with wood. Champion…| 2,880 | 2,800 }225 0}44 6 AS 13°00 COMUS.....0. 2,380 | 2,300 |225 0/44 6 BS a 13-00 Conquest…..| 2,380 | 2,300 | 225 0/44 6 vs ‘5 eae St. Constance …| 2,880 | 2,800 |225 0/44 6 / Building. 0 Le Sb. Cordelia…..\ 2,380 | 2,800 | 225 0}44 6 e P 13°00 Curagoa…...| 2,380 | 2,300 225 0/44 6 1878 be 13°00 Diamond…..| 1,970 | 2,150 |220 0/387 0 1874 Wood. 12°56 DidOses.. cies 1,760 | 2,520 {212 0/36 0 1869 7 13°50 IDYAROG Beornacins 1,860 2,270 220 0/36 0 ” ” 12°90 Felipse…..... 1,760 | 1,950 }212 0/36 0] 1867 al 12°90 Emerald …..| 2,120 | 2,170 |220 0}40 0] 1876 Composite. 13°20 Enecounter..| 1,970 | 2,130 |220 0/37 0} 1873 Wood. 13°19 Euryalus….| 4,140 | 5,270 }280 0/45 6) 1877 Iron (eased). 1472 Garnet…....| 2,120 | 2,000 |220 0)40 0 29 Composite. 13-00 Heroine…...\ 1,420| 950 |200 0/88 0| 1878 – 13°10 Hyacinth…..| 1,420] 950 |200 0/38 0 a » 13°10 Juno….....| 2,240 | 1,880 |200 0}40 4 3867 Wood. 10°87 Modeste…... 1,970 | 2,180 }220 0/37 0 1873 mM 1209) Opal…....0008 2,120 | 2,120 |220 0/40 o| 1875 Composite. 13°37 Pylades w….. 1,420 | 1,500]200 0/38 0/| Building. a 13-00 Rapid …..... 1,420 | 1,500 ; 200 0/388 0 a x 13°00 Rover. ..| 8,460 | 4,960]2°0 0/43 6] 1874 Tron (eased),.| 14°53 Royalist…...| 1,420 | 1,500 | 200 0/38 0 Building. Composite. 13°00 Rudy .esseeeee 2,120 | 1,830 }220 0|40 0| 1876 = 12-28 Sapphire…..| 1,970 | 2,860 |220 0/37 0} 1874 Wood. 13°58 Satellite….. 1,420 950 |}200 0/38 0] 1879 Composite. 13°10 Tenedos…...| 1,760 | 2,040 | 212 0|36 0 1870 Wood, 12°80 Thaliak.<.—.- 2,240 | 1,600 |} 200 0/40 4 1869 " 11°14 TOE anosnce 1,860 | 2,270 |220 0/36 0} 1871 ‘as

13°39 Tourmaline.| 2,120 | 1,970 |220 0/40 0} 1875 Composite. 12°62 Turquoise…) 2,120 | 1,990 | 220 0) 40 0 1876 ee 12°32 iO laeres «cee 3,080 | 4,530 |270 0/42 0 1869 – Tron (cased). 15:08 Tris (T)..... 3,730 | 7,000 | 300 0/46 O| 1877 Steel. 18°00 Mercury (T)| 3,730 | 7.000 |300 0/46 0! 1878 a 18°00 Leander (T)| 3,748 | 5,000 | 300 0}46 6| Building. ss 16°00 | Phaeton (1) | 8,748 | 5,000 |300 0/46 0 a = 16°00 Arethusa(T)| 3,748 | 5,000 |300 0/46 0 = i 16-00 Amphion(T)| 3,750 | 5,000 | 300 0/46 0 – 5 16°00 Scout (T)....-| 1,430 | 8,200 | 220 0}34 0 7 io 16-00 Albatruss….| 940 840 |160 O}|31 4 1873 Composite. 10°61 (ANGI ieeccecss= 1,240 810 |160 0/31 11 1856 Wood. 7‘68 Cormorant..| 1,130 950 |170 0/36 0 1877 Composite. 11°31 1D} :vbU) peace 940 920 1160 0/81 4} 1880 np 10°64 Dragon ……| 1,140 | 1,010 |170 0/86 0] 1878 ” 1152 Dryad……...| 1,620 | 1,570 | 187 0/36 0 1866 Wood. 11°87 Egeria……...| 940] 1,010 |160 0;31 4} 1873 Composite. 11°80 Espidele……| 1,187] 900 |170 0|36 0] Building. 5 11°50 Fantome….. 940! 970 |160 0/31 4) 1878 i. 11°06 awiliteccsrese 1,050 480 1160 0| 31 10 1856 Wood. 9°36 Flying Fish.| 940} 840 [160 0/31 4] 18738 Composite. 10% Gannct,....., 1,180] 900 |170 0/36 0; 1878 ” 1153 Kingfisher…} 1,180} 900 |170 0|386 0; 1879 11°60 Miranda ….. 1,130; 900 [170 0}36 0 a0 on 11°50 Mutine…....| 1,187| 900 |170 0/36 0) Building. . a Osprey …....| 1,180} 1,010 |170 01/36 0} 1876 ae 112 Pegasus……] 1,130} 970 }170 0;36 0} 1878 * lie Peliean…..... 1,130 | 1,060 |170 0|86 0O| 1877 – 11°60 Penguin….. 1,130 760 |170 0)36 0 1876 om 10°00 Sappho…..... 940| 880 |160 0|31 4). 1878 10°59 Wild Swan..| 1,130} 800 |170 0/36 0} 1876 Composite. 10°38 Enchantress} 1,000} 1,820 }220 0/28 2] 1862 Wood. 14°02 Helicon …... 1,000 | 1,610 [220 0/28 2] 1865 ” 13°05 Vigilant……] 1,000 | 1,810 }220 0/28 2] 1871 2 ie HGCA asses 6,400 | 1,760 | 3891 73/388 93 Ese sia lron. 117 in 1s Vesuvius(T)} 244| 390 | 90 0/22 0) 1874 5 an Bittern (T)8| 805| 850 |170 0/29 0} 1869 Wood. ie Algerine 4…) 9835] 810 |157 0)29 6) 1880 Coinposite. we Flirt (T)5….] 603) 580 [155 0/25 O| 1867 59 9

1 Those marked (T) have twin serews. The ‘‘ Enchantress,” “ Helicon, and “ Vigilant have paddles. 4 7

2 These are speeds at measured mile, at load draught of water, either ascer- taincd or estimated.

3 In this class, of tonnage 805, there are 3 gun-vessels.

4 In this class, of tonnage 720 to 950, there arc 16 gun-vessels. v4

5 1n this elass, of tonnage 603 to 756, there are 9 gun-vessels, There are ¢ gunboats of tonnage from 180 to 560.

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Mercan- tile marine,

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other by more than 100 per cent., according as the makers and the particular brand were supposed to have credit in the market. The steel now in use is absolutely faultless as to surface, stronger and more ductile than iron, and very uniform in quality. That actually employed in the “Iris” and “Mercury,” being a new material (Siemens-Martin of special quality), was no cheaper than the highest quality of tested iron. Siuce then the extension of its use in all directions has brought it down to half the price given at first. Siemens-Martin and Bessemer steel are now employed almost indifferently. Between 1866 and 1876 only three small vessels were built of steel in the United Kingdom. It is now employed in all the shipbuilding establishments in the country. In this case the royal navy gave the start, and private shipbuilders followed, in a most important change in the use of materials of construction.

The use of steel in the navy has not been confined to shipbuild- ing. The guns took it up first for internal tubes, and now the whole gun is built of it. The armour has also adopted it, wholly or in part. In England a steel face is cast upon an iron back, the steel being about one-third of the thickness of the plate. The hard face has been found very efficacious in breaking up the

attack- ing projectiles. It has been found by experiment, for example, that flat plates of compound armour 12 inches thick are more effective against iron and steel projectiles, fired normally, at high velocity, from a 9-inch gun, than plates of iron 14 inches thick. But the most important point gained is that it has become impos- sible for iron shill to perforate armour as shell. The hard face of the armour breaks the shell to pieces.

Mercantile Marine. —There has never becn a time in British naval history when the merchant service has failed to supply ships and men for the national defence. For some years prior to 1853 it was the practice to insert in mail contracts clauses providing for the armament of the steamships employed in mail service.

Towards the end of 1852 a report was presented to the Board of Admiralty by a committee of four officers on the question of arming the mail contract steam-packets belonging to the Peninsular and Oriental and Royal West India Mail Packet Companies. Their recapitulation of their report is as follows :—

"That the two companies have 53 vessels (23 of iron); that 16 ply between Southampton and foreign ports; that 5 on an average are always at home and fit for sea; that 8 may be rendered available for war purposes on an emergency, if they cau be spared from the mail packet service within different periods extending altogether over sixty-six days; that they would not make efficient substitutes for regular men-of-war; that they might be fitted for armed packets and armed troop-ships; that it would be prudent in future that the fittings be executed beforehand ; that the fittings necessary to the nature of proposed armaments (including magazines and shell- rooms) would cost from £600 to £800 for first and second class vessels, if attended to while a vessel is in progress of building or undergoing a large repair, and proportionally less for smaller vessels; that guns of such calibre be used as are common in the royal navy (viz., 8-ineh guns of 65 ewt., and 32-pounders of 42 ewt.), to faci- litate the supplies and render fittings and ordnance stores transfer- able from ship to ship ; that a store of guns be kept at the port of Southampton (or Portsmouth), with a proper proportion of ordnance and gunners' stores laid apart ready for an immediate call ; that it would be advisable to introduce a clause in the contracts giving the

Admiralty a right of pre-emption, and possibly to prevent their sale (but with permission) to a foreign power.”

In a seeond report from the same committee, dated March 1858, upon the British and North American, the Pacific, the General Serew, the Australian, the South Western, and the African Companies, the report is summed up in thestatement that out of 91 vessels—belonging to eight distinct companies—employed in mail Contracts, there were only 16 which could be made available on an emergency for auxiliary war purposes. Iron vessels were excluded from those which might be considered, available ‘‘on account of the material used in their construction,” but the committee does not state why the material was considered unsuitable.

© go Into the reasons influencing their decision would make it necessary to refer to the experiments and the scientific and political controversies which had then been going on for ten years. During this time it had been decided to create a war navy of iron ships ; the ships were commenced ; then it was attempted to stop the building of them, but without success ; they were then transforrned mto troop- and store-ships. Of two great parties, one contended that iron had been proved to be unfit for fighting ships, and the other that there had been no such proof, and that in the end wood must be given up.

The ofticers coniposing this committee appear to have agreed with the former party ; and they do not seem to have thought it necessary to give any reason for their rejection of all the large and fine ships employed in the mail service which, at some small expenditure of money, were suitabie for receiving an armament in every particular, exeept that they were built of iron.

In March 1858 a Treasury minute was issucd calling attention

to the enormous cost of the mail packet service, and appointing Mail Among other things contracts,

a committee to consider the whole question. it is said in these instructions : —

“In reviewing the purposes and stipulations of the contracts, the committee will have to consider and report whether they can learn either that the prospect of a reserve of ships of war, which was at one time confidently entertained, has been realized in any sensible degree under these costly arrangements, or whether there is any probability that it can be realized hereafter compatibly with the paramount purpose for which the packcts have been constructed, viz., that of postal vessels. On this point the committee will consult a report which has been presented to the Board of Admiralty by a committee of naval and artillery officers.

“It will also be their duty to observe what provisions have been inserted in the contracts to secure the sufficiency of the ships for the purpose of naval war- fare; to ascertain whether the stipulations have been carefully fulfilled ; whether, in any cases where they have not been so fulfilled, permission to waive them has been regularly sought and obtained from the proper department of the Government; and whether, in consideration of such non-fulfilment, there has been any adequate remission, or any remission, of the price which the state engaged to pay, not for postal service merely, but for the double purpose of postal service, together with a reserve force in aid of the royal navy.”

In July 1853 the committee reported :—

‘The question which appears to us first in the order of consideration is, whether it is desirable to simplify such contracts as may in future be made, by omitting from them all provisions which do not directly bear upon the efficiency of the postal service. In arranging the terms of these contracts, the Govern- ment seized the opportunity of requiring that the vessels should be constructed in a manner that would render them as serviceable for national defence in war as steam packets belonging to the crown would havc been if employed in their stead. A provision to this cffect was first inserted in the contract with the Royal Mail Company in 1810, and in most of the existing contracts stipulations are to be found, requiring that the vessels should be of a construction and strength fit to carry such an armament as the Admiralty may think proper. In several cases they must be built of wood, and not of iron; and there are some contracts which confer on

the Admiralty the right of taking the ships at a valuation when it may be thought desirable to do so.

‘‘ The surveyor’s report upon most of these vessels, as regards their fitness for war purposes, is in the following terms :—‘ Not fitted for armament, but eapable of carrying guns when so fitted.” This report accords with the opinion expressed. by the committee of naval and artillery officers upon the vessels which have eome under their notice. It appears, however, from the statements of that committee that, although the packets they have examined are for the most part of sufficient strength to carry and fire a certain number of guns, the expense of the alterations which would be necessary before they could be got ready for service would be very considerable, and that, even when such alterations had been made, the efficiency of the vessels would be very small in proportion to their size, and that they could not encounter hostile vessels of equal tonnage without endangering the honour of the British flag.

‘“‘With reference to future contracts, we are decidedly of opinion that no ex- pense should be incurred for the sake of imposing conditions for giving a military character to the postal vessels. We believe the imposition of such conditions to be a measure of false economy. Should a war suddenly break out, the imme- diate demand for mail steamers would probably be greater than ever, and it might be exceedingly inconvenient to withdraw them at such a time from their legitimate use for the purpose of arming them for battle. Morcover, the high charge for the packct service has been borne with the greater readiness, because it has been supposed by some to include a provision, of large but unknown amount, for the defence of the country ; while, on the other hand, the naval estimates have sometimes been complained of as excessive, on the ground that the force provided for was in addition to the large reserve of postal war steamers,

“We accordingly recommend that for the future the contracts for the convey- ance of the mails should be wholly free from stipulations of the nature we have been describing, though it may be desirable in some cases to retain the power in the Government to take possession of the vessels in the event of national emergency.”

They add :—“ An erroneous impression appears to have prevailed among the public as to the efficiency of our postal steamers for direct purposes of warfare. We do not believe that those who are charged with the direction of the military atfairs of the country have ever regarded them as likely to be of any great service in an engagement, but their advantage as an auxiliary force will be very consider- able. They will be available, in the event of the breaking out of hostilities, for the rapid conveyance of despatches, of specie, and, to a certain extent, of troops and stores. Their speed will be such as probably to secure them from the risk of capture, and will render them highly valuable for procuring intelligence of hos- tile movements. Thcy may also be expected to furnish queen’s ships with men trained to steam navigation, and possessing an amount of local knowledge which cannot fail to be valuable in several ways.

“Again, it is not only in a military sense that rapidity of communication between all parts of the British empire tends to increase its security. While the mother country continues to exercise any control over the procecdings of the colonies, the inconveniences attending the delay of correspondence are severely felt, and speedy communication is of the highest consequence to the preserva- tion of satisfactory relations between them.”

Within the last few years all references to armament or fitness for warlike services have disappeared from the mail contracts, but there has been in some of them a clause providing that the Admiralty may in cases of great public emergency charter vessels of the company at rates to be agreed on, but in case of difference as to such rates, or dainages consequent upon. such purchase or hiring, the same is to be settled by arbitration.

Since 1852, when the committee refused to accept vessels built of iron, many changes have taken place. There are no wooden mail steamers left: irou or steel has completely displaced wood as a material of construction for such purposes. The great development of incendiary projectiles in war, such as percussion shell, red-hot shot, and hollow shot filled with molten iron, not only led to the adoption of iron arinour, and thus ineidentally to iron frames and skin as well, but showed also that wooden ships would be rapidly set on fire in an action. In the ironclad ship the objection raised to iron for the structure of war ships, viz.,‘that the plating and riveting could

be driven out in numerous and dangerous fragments by projectiles, does not hold. The experiments on the ‘‘Simoom” targets (1849-51) were doubtless in the minds of the officers who made the reports referred to above, and they must not be forgotten,

There are now many ships for fighting purposes built with iron frames and iron skin, and without armour ; but in most of these eases there is stout wooden planking wrought over this iron skin, with the express object of obliging projectiles passing right through the ship to punch a hole in the side by which they pass out, instead of driving off masses of plating by the breaking of the rivets. There can be no doubt also that plates are better, and riveting is sounder now, than they were apt to be twenty years ago. The iron ships in the merchant navy have not this protection. It is difficult to estimate the precise gravity of the defect, but there 1s no doubt that it is sufficiently important to make proper division Into com- partments imperative, so as to give time to cover a damage in the side under water. But, unfortunately, a proper subdivision into compartments, of which the divisional bulkheads rise a sufficient height above the water, is very rare in merchant ships, even in nail steamers. If the compartments are so large and the tops of the bulkhead so low that, by filling a compartment, the top of the bulkhead is brought below the level of the water outside the ship, the loss of the ship is inevitable. Moreover, thesc ships are, as a rule, very narrow in proportion to their displacement, and their risk of foundcring, by the filling of a compartment, is thereby greatly increased, because a narrow ship loses its stability rapidly under these circumstances, and will turn over.

Another disadvantage is the height of the engines and boilers. In ships of war of the size of the mail steamers, and indeed in nearly all, of whatever size, the engincs and boilers are kept below the water, and fairly out of the reach of shot. But in modern mail steamers the engines are worked with

their cylinders standing some feet above the load water-line. The advantage of this arrange- ment, in point of economy of working, is very great, but it involves serious risk in a fighting ship.

In 1856 a most important event occurred seriously affecting this question, viz., the signing of what is known as the Declaration of Paris, a sort of rider to the treaty of Paris of March 1856, by which declaration it was laid down that, ‘‘ whereas it was formerly legal to grant royal commissions to private owners to equip, arm, aud man private cruisers, to capture the eommerce of the enemy for their own profit, this shall no longer be legal; that, while the cruisers of the state may capture and destroy private slips be- longing to subjects of the hostile state, they may not, as of old, search neutral ships in the open seas to discover and confiscate hostile property contained in them, but only to verify their right to fly the neutral flag, and to discover and confiscate property lield to be contraband of war, destined for ports of the enemy.”

This was in fact a ratification in perpetuity of an order in council of the 25th of March 1854, by which, on the outbreak of war with Russia, Great Britain consented to ‘‘ waive her maritime rights” and allow enemies’ goods to be earried in neutral bottoms without liability to seizure.

All the parties to the treaty of Paris agreed to this declaration, and the rights it confers on neutrals are rights now common to all the European powers. Under its operation neutrals would doubt- less insist on exercising for their own profit the right of carriage into and out of those ports of a belligerent which were not effectively bloekaded by the enemy. Privateering being abolished, so far as the European powers are concerned, each maritime nation would seek, on the outbreak of war, to incorporate into the state navy the fastest and most powerful merchant ships it could obtain. Each war navy would become strengthened by the addition of merchant ships capable, at whatever risk to themselves, of mount- ing guns, of ramming, and of employing the torpedo. By this means the naval power would depend, not only on the strength of the war navy, but also upon the strength and excellence of the national mercantile marine. For this purpose only the fastest ships would be useful, and all the rest would fall a prey, in any encounter, to the fast ships in the hands of an enemy.

The great importance attached to the possession of such fast ships may be secn from the figures given below.

British registered merchant ships, sailing and steam (38,939)—esti- Tons. TMHAtealonOss COnMAMe HM TSSON, ...ccccasstesscisecsicacesesseesssesseasseesecetes 10,200,000 Of this the proportion of steamers (6903) WAS.....cccccssscsssecsseceeescescses 4,400,000

At the same date the whole number of British ships built and building having an average ocean speed of 12 knots and upwards did not exceed 400; and ships of this speed built and building for all other maritime powers taken together did not reach 100. The only powers possessing such ships were France, Germany, Holland, Spain, United States, Italy, and Belgium.

Between 1875 and 1882 the number of English merchant steamers of 13 knots ocean speed and upwards inereased from 25 to 65, of 14 knots and upwards from 10 to 35, and the maximum speed rose from 15 to 17 knots.

Since 1875 the Admiralty have been cngaged in forming a list of all ocean-going British ships which, being reasonably divided into eompartments, might be armed in the event of war. The number on this list having an average ocean speed of 12 knots and up- wards is, in 1883, 112, with a total gross register tonnage of 451,470 tons.

NAVY

The number of men and boys actually employed in 1880 in Mercan. registered British sea-going vessels was nearly 200,000, of which tile

nearly 12 per cent. were forcign and the rest British.

Sir Thomas Brasscy estimates that there are in the British mercantile marine 407,000 seamen, exclusive of men in British ships in the colonies and abroad. The total number includes—

Masters and mates, Certificated…....cscsecsrscssceesccescessceoseners 38,200

» not certificated… a 10,000 BISWEnMeM se… -scscesesser-seecee= 150,000 Other sailor men. 151,000 Firemen).-..... 14,000 Apprentices… -. 11,000 Boys in fishing DOatS…....ccscessceesseeceeensesceeaesecenssees cee eescenes 13,000

Naval Guns.—From time immemorial smooth-bore guns in cast iron, or bronze for the smaller ealibres, had been used for throwing spherical shot with charges not exceeding one-third the weight of the shot.

The first usc of rifled guns in the navy was in 1859-60, when Mr (now Sir William) Armstrong's breech-loading 40-pounder and 100- pounder guns were issued to the service. The elongated shot or shell and cartridge were entered from the rear, through a hollow screw. A breech piece in which the vent was formed was dropped through a slot in the breech of the gun, and, being tightened up by the hollow screw, closed the bore. The projectile was coated with lead to take the polygroove rifling. It fired much more aceurately than the smooth-bore; but in 1863, the method of closing the breech having proved inefficient on service in Japan, the manufac. ture was diseontinued.

In 1865 muzzle-loading guns were adopted, built on Armstrong's principle of welded wrought-iron coils round a stcel tube, rifled on the ''shunt" principle, in which a studded projectile was rammed down grooves in the bore, rather deeper than those by which it was afterwards driven out. The guns gradually increased in weight up to the 12-inch 38-ton gun and 16-inch 80-ton gun. In 1876 the 80-ton gun was fired with a projectile of 1700 Tb and a charge of 425 tb at a target composed of four 8-inch iron plates with 5-inch intervals filled with teak, and perforated it. The charge of this gun was afterwards inereased to 450 Ib of prismatic powder.

In 1873 the advantage of an increased diameter of the powder chamber was recognized and adopted in the 38-ton gun, but in order to utilize this chamber in a niuzzle-loading gun the cartridge had to be made small enough to pass through the bore and after- wards expand in the chamber. This involved an awkward cartridge. Breech-loading obviated this difficulty. The use of slow-burning powder required a considerably increased length of bore, and made muzzle-loading exceedingly difficult. Breeeh-loading also offered greater facility for closing the windage of the

shot. These causes have led to a return to breech-loading. The system adoptcd is the French intercepted screw. The plan of reinforcing the steel tube by wrought iron coils has been abandoned, and the approved system of construction is a steel tube, supported by a steel breech, which takes the breech screw and extends to the trunnions, reinforced by one or more layers of steel hoops shrunk on. These guns throw an elongated projectile of about three and a half calibres of the bore in length, with a charge nearly half the weight of the shot, which gives a velocity approaching 2000 feet per second. The powder pressure (17 or 18 tons on the square inch) is no higher than it used to be, but is longer sustained. A few only of these guns are yet afloat.

Boats' guns are similar in type, but of solid steel. The projectiles are the Palliser ehilled shell, or cored shot; the common shell, which contains about one-tenth of its weight of powder ; the shrapnel shell, which eontains bullets and a small cliarge to liberate the bullets ; and the case shot, which is a thin case containing small shot for short ranges.

These guns will be made of all ealibres and weights. Those already tried are the 12-inch 43-ton, 10°4-inch 26-ton, 9°2-inch 18- ton, 8-ineh 11-ton, 6-inch 4-ton, 5-inch 36-ewt., 4-inch 22-cwt.

The Gatling gun is ten-barrelled revolving. It throws bullets of the same size as the rifle. An improved feed has just been tried, and with it the gun is eapable of discharging 1000 rounds a minute. To guard against the attack of torpedo boats a rapid-firing gun of sufficient power to penetrate their sides was necessary, and for this purpose a four-barrel gun, invented by Mr Nordenfelt, was adopted, aud is now supplied to all ships. Quick-firing 6-pounder gums are now under trial capable of firing shot or shell.

personnel, .

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Cost of the Navy.—Sir Thomas Brasscy says, 'In considering the Cost of

general question of our naval expenditure, it is necessary, in justice the to those to whom its administration has been entrusted, to look navy.

back over a serics of years, and to compare the fluctuations in that expenditure with the growth in the value of the trade for the protection of which our navy is maintaincd. In the year 1858-59 the effective expenditure for the navy was £7,106,100, and non- effective £1,334,000. In 1870-71 the effective expenditure was £7,308,000, while the non-effective had increased to £1,705,000. The estimates for the ensuing year (1881-82) provide for an effective expenditure of £8,434,000, while the non-effective expenditure amounts to £2,063,000. If we eompare the expenditure of the army in the same interval, we find that the effective expenditure

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Compara- ‘ tive view – of navies.

J ae |

has grown from £9,337,000 to £12,797,000, with an increase of half a million in the non-effective expenditure.

“The increase in the foreign trade and tonnage of our merchant navy has been out of all proportion with the increase in our naval expenditure. The total tonnage of British merchant ships was 5,711,000 tons in 1860, 7,149,000 tons in 1870, and 8,462,000 tons according to our last returns. Reckoning the carrying power of steamships as fourfold that of sailing ships, we have half the mercantile tonnage of the globe.

“Germany, with a mercantile tonnage of 1,129,000, spends £890,000 on the maintenance and construction of her fleet. France, with 976,000 tons of merchant shipping, expends £2,893,000 on building and repairs, and employs 26,000 workmen in her dock- yards. England, with an excess of tonnage over the French mercantile marine of 7 million tons, employs only 16,000 men in her dockyards, at an expenditure, under votes 6 and 10, of £3,323,000. With these figures before us, it cannot be said that England is leading the way in an aggressive policy, or in the direction of extravagance.”

Comparative View of Navies.—A comparison of the matériel of modern navies would be very misleading if it only took into account the number and

power of the regular ships of war, because for some important services there is but little difference between the value of the ship built for war purposes and of that only adapted to such pur- poses at need. The increasing vulnerability of the ship of war, however carefully built, to weapons which the adapted merchant ship can employ is one of the most notable features in the modern aspect of maritime warfare. The statesman who desires to estimate the naval resources of empires or states will need to consider the quality and extent of their mercantile marine in fast steamships and trained men as well as the number and efficiency of their regular ships of war, and their actual war personnel. A comparison limited to armoured or ironclad ships is vitiated by the defect that it does not account for the protection afforded to what are called unarmoured ships by other means than that of armouring their sides. This is fast becoming so considerable that a new term has been intro- duced (protected ships) to distinguish such vessels from ordinary unarmoured fighting ships.

The fairest available approximate measure of the power of the ships is their displacement or total weight. It always represents power of some kind, although in many cases the distribution of the various elements of power in the ship may be badly suited for many phases of war. Taking this as a measure, and reckoning, not only com- pleted or practically completed ships, but also those in various stages of building, the maritime powers named stand as follows, first as to tonnage of armoured ships,

secondly as to unarmoured ships, and thirdly as to both taken together :—

Tons Displacement. a eS |

Armoured. | Unarmoured. Total. 425,0001] 291,000 | 716,000

127,000 70,000 197,000

105,000 | 72,000 | 177,000

104,000 74,000 178,000

73,000 38,000 111,000

67,000 aye 67,000 60,400 | 32,600 93,000

36,000 85,000 121,000 35,600 * 35,600

29,400 | 14,200 43,600

27,900 16,800 44,700 16,600 2 16,600 14,800 14,800

10,200 ae 10,200

9,000 7,000 16,000

7,300 5,700 13,000

4,100 8,500 12,600

2,500 ; 2,500

- Of this amount complete, z.¢., is building or completing.

183,000 tons is built ef wood, and 155,000 is in-

291

The following facts are noteworthy in connexion with the above figures. (1) Germany, which launched her first ironclad ship in 1864, has not launched one since 1880, and has not one on the slips. (2) The armoured tonnage launched by Italy (1876-88) is greater than that launched by Germany during the same period. (38) The French armoured ships launched before 1873 are, with insignificant exceptions, built of wood. Every armoured ship the French are now building or completing (1883) is of iron or steel. (4) France has in process of construction, z.¢., building or completing, an ironclad navy equal in tonnage to the entire ironclad navy of Germany or Italy built and building ; and equal also in tonnage to all the completed ships in her own navy launched during the previous ten years. (5) France expended in building and completing ships for sea in 1878-77 only one-half what was spent by England in those years. Since 1877 her expenditure on this service has usually equalled, and generally excecded, that of England.

A general survey shows that the great cost of maintain- ing a regular war navy is tending to limit its production and employment in states which either are not wealthy or are obliged to maintain large armies. This must be an increasing tendency for the following reasons. (1) There is a growing necessity for high speed. Commerce increases its speed, and war must at least equal it. High speeds and fair fuel endurance require large coal supplies. The ship with a high speed and large coal supply is already a large ship. To protect such a ship efficiently with armour demands the highest quality of protective material over considerable areas. There is then a further demand for powerful artillery for the purpose of dealing with such armour in an adversary. The attack is constantly develop- ing new methods, and demanding not only the adoption of its weapons but also the creation and adoption of corre- sponding defences against them. So it comes about that nothing but a large and costly ship can take first rank in a regular war navy. (2) The ships so produced need high training in officers and men, and the costly matériel must be accompanied by a correspondingly costly personnel. (3) The warlike usefulness of such ships is narrowed per- petually by the rapidly increasing power of fortresses, aided by torpedoes and torpedo boats, to protect harbours and towns against both attack and blockade. It is narrowed also by their inability to compete in speed and coal endurance with ships not protected or armed. (4) Lastly, and more generally, the occupation of the seas by shipping tends to increase, for economical reasons, in pro- portion as human labour is divided and specialized, and commodities interchanged. This growth in shipping and in the seafaring population will reduce the significance and importance of the single ship of war which it has cost so much to produce.

PERSONNEL OF THE Navy.

The personnel of the British navy is composed of two different bodies of men, the seamen and the marines, each of which has its appropriate officers, The latter body is the subject of a separate article (see MARINES).

Officers —The officers of the navy, exclusive of the marines, are divided into two distinct branches—the military and the civil.

1. The military, or executive, branch consists of the Military undermentioned officers, classed in the order of their Cees

rank:—flag-officers, commodores, captains, staff captains, commanders, staff commanders, lieutenants, navigating lieutenants, sub-lieutenants, chief gunners, chief boat- swains, chief carpenters, gunners, boatswains, carpenters, midshipmen, naval cadets.

Flag-officers are divided into three ranks, viz., rear- Flag- Formerly there were three officer.

admiral, vice-admiral, admiral. subdivisions of each grade, according as the officer belonged to the white, blue, or red squadrons, but this distinction has been abolished (see ADMIRAL). There is also the rank of admiral of the fleet: such an officer, if in com- mand, would carry the union flag at the main.

Captain of the fleet.

The civil powers and duties of the lord high admiral, or lords commissioners of the Admiralty, are treated of in the article Apmirat. Their military powers are more extensive and important. By their orders all ships are built, repaired, fitted for sea, or laid up in reserve, broken up, or sold, put in commission or out of commission, armed, stored, and provisioned, and employed on the home or foreign stations, or on voyages of discovery. All promotion in the several ranks emanates from them ; all honours bestowed for brilliant services, and all pensions, gratuities, and superannuations for wounds, infirmities, and long services are granted by them or on their recom- mendation. All returns from the fleet are sent to the Board of Admiralty, and everything that relates to the discipline and good order of every ship. All orders for the payment of naval moneys are issued to the accountant- general of the navy by the lords commissioners of the Admiralty ; and the annual estimate of the expenses of the navy is prepared by them, and laid before parliament for its sanction. All new inventions and experiments are tried by their orders before being introduced into the service ; all designs of ships must be approved by them ; all repairs, alterations, and improvements in the dockyards, and all new buildings of every description, must be sub- mitted for their decision before they are undertaken.

All flag-officers, commanders-in-chief, are considered as responsible for the conduct of the fleet or squadron under their command. They are bound to keep them in perfect condition for service ; to exercise them frequently in form- ing orders of sailing and lines of battle, and in performing all such evolutions as may occur in the presence of an enemy; to direct the commanders of squadrons and divisions to inspect the state of each ship under their com- mand ; to see that the established rules for good order, discipline, and cleanliness are observed ; and occasionally to inquire into these and other matters themselves. They are required to correspond with the secretary of the Admiralty, and report to him all their proceedings.

Every flag-officer serving in a fleet, but not commanding it, is required to superintend all the ships of the squadron or division placed under his orders, —to see that their crews are properly disciplined, that all orders are punctually attended to, that the stores, provisions, and water are kept as complete as circumstances will admit, that the seamen and marines are frequently exercised, and that every precaution is taken for preserving the health of their crews. When at sea, he is to take care that every ship in his division preserves her station, in whatever line or order of sailing the fleet may be formed ; and in battle he is to observe attentively the conduct of every ship near him, whether of the squadron or division under his immediate command or not; and at the end of the battle he is to report it to the commander-in-chief, in order that commendation or censure may be passed, as the case may appear to merit ; and he is empowered to send an officer to supersede any captain who may misbehave in battle, or whose ship is evidently avoiding the engagement. If any flag-officer be killed in battle his flag is to be kept flying, and signals to be repeated, in the same manner as if he were still alive, until the battle shall be ended; but the death of a flag-officer, or his being rendered incapable of attending to his duty, is to be conveyed as expeditiously as possible to the commander-in-chief.

The captain of the fleet is a temporary rank, where a commander-in-chief has ten or more ships of the line under his command ; it may be compared with that of adjutant- general in the army. He may either be a flag-officer or one of the senior captains; in the former case, he takes his rank with the flag-officers of the fleet ; in the latter, he ranks next to the junior rear-admiral, and is entitled to

the pay and allowance of a rear-admiral. All orders of the commander-in-chief are issued through him, all returns of the fleet are made through him to the commander-in- chief, and he keeps a journal of the proceedings of the fleet, which he transmits every three months to the Admiralty. He is appointed and can be removed from this situation only by the lords commissioners of the Admiralty.

A commodore is a temporary rank, and of two kinds,— Commo. the one having a captain under him in the same ship, and dore,

the other without a captain. The former has the rank, pay, and allowances of a rear-admiral, the latter the pay and allowances of a captain and special allowance as the lords of the Admiralty may direct. They both carry distinguishing pennants.

. When a captain is appointed to command a ship of war Captain,

he commissions the ship by hoisting his pennant; and if fresh out of the dock, and from the hands of the dockyard officers, he proceeds immediately to prepare her for sea, by demanding her stores, provisions, guns, and ammunition from the respective departments, according to her establish-ment. He enters such petty officers, leading seamen, able seamen, ordinary seamen, artificers, stokers, firemen, and boys as may be sent to him from the flag or receiving ship. If he be appointed to succeed the captain of a ship already in commission, he passes a receipt to the said captain for the ship's books, papers, and stores, and becomes respon- sible for the whole of the remaining stores and provisions; and, to enable him to keep a proper check upon the ship's accounts, he is allowed a clerk or assistant-clerk.

The duty of the captain of a ship, with regard to the several books and accounts, pay-books, entry, musters, dis- charges, &c., is regulated by various Acts of Parliament ; but the state of the internal discipline, the order, regularity, cleanliness, and the health of the crews will depend mainly on himself and his officers. In all these respects the general printed orders for his guidance contained in the Queen's Regulations and Admiralty Instructions are particularly precise and minute. And, for the informa- tion

of the ship’s company, he is directed to cause the articles of war, and abstracts of all Acts of Parliament for the encouragement of seamen, and all such orders and regulations for discipline as may be established, to be hung up in some public part of the ship, to which the men may at all times have access. He is also to direct that they be read to the ship’s company, all the officers being present, once at least in every month. He is desired to be particularly careful that the chaplain have shown to him the attention and respect due to his sacred office by all the officers and men, and that divine service be performed every Sunday. He is not authorized to inflict summary punishment on any commissioned or warrant-officer, but he may place them under arrest, and suspend any officer who shall misbehave, until an opportunity shall offer of trying such officer by a court-martial. He is enjoined to be very careful not to suffer the inferior officers or men to be treated with cruelty and oppression by their superiors. He is the authority who can order punishnient to be in- flicted, which he is never to do without sufficient cause, nor ever with greater severity than the offence may really deserve, nor until twenty-four hours after the crime has been committed, which must be specified in the warrant ordering the punishment. He may delegate this authority to a limited extent to certain officers. All the officers and the whole ship’s company are to be present at every punishment, which must be inserted in the log-book, and an abstract sent to the Admiralty every quarter.

The commander has the chief command in small vessels, Com- In larger vessels he is mander

such as sloops and gun-vessels. chief of the staff to the captain, and assists him in main- taining discipline, and in sailing and fighting the ship.

Lieu- tenant.

Navigat- ing officer.

Warrant- officers.

Gunner.

NA

The lieutenants take the watch by turns, and are at such times entrusted, in the absence of the captain, with the command of the ship. The one on duty is to inform the captain of all occurrences which take place during his watch,—as strange sails that may be in sight, signals from other ships in company, change of wind, &c. He is to see that the ship be properly steered, the log hove, and the course and distance entered on the log-board; and, in short, he is to see that the whole of the duties of the ship are carried on with the same punctuality as if the captain himself were present. In the absence of the captain, the commander or senior executive officer is responsible for everything done on board.

The navigating officer receives his orders from the captain or the senior executive officer. His more imme- diate duties are those of stowing the ship's hold and attending to her sailing qualities, of receiving and placing the provisions in the ship, so as most conveniently to come at those which may be wanted. He is to take care that the cables are properly coiled in the tiers. The keys of the spirit-room are in his custody, and he is directed to entrust them only to the officer authorized to use them. He has the charge of the store-rooms of the warrant- officers, which he is ordered frequently to visit ; and he is also entrusted, under the command of the captain, with the charge of navigating the ship, bringing her to anchor, ascertaining the latitude and longitude of her place at sea, surveying harbours, and making such nautical remarks and observations as may be useful to navigation in general. He keeps the ship's log-book and remark-book.

The warrant-officers of the navy may be compared with the non-commissioned officers of the army. They take rank as follows, viz., gunner, boatswain, carpenter ; and, compared with other officers, they take rank after sub-lieu- tenants and before midshipmen. They are charged with the duty of receiving on board from the dockyards, and examining, the stores of their respective departments, and keeping an account of the expenditure of them.

The gunner has the charge of the ship's artillery, and of the powder magazine. He is to see that the locks and carriages are kept in good order, and that the powder is preserved from damp; he is frequently to examine the

musketry and small arms, and to see that they are kept clean and fit for service ; and, in preparing for battle, it is

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his duty to take care that all the quarters are supplied with everything necessary for the service of the guns, and, during the action, that there be no want of ammunition served out. He is frequently to exercise the men at the guns, and to see that they perform this part of their duty with correctness. The armourer and his mates are under the immediate orders of the gunner in everything that relates to the great guns and small arms.

The boatswain is charged with all the stores belonging Boat- to his department, consisting chiefly of the ropes and rig- swain,

ging, the latter of which he is ordered to inspect daily, in order that any part of it chafed or likely to give way may be repaired without loss of time. He is always required to be on deck at such times as all hands are employed; he is bound to see that the men, when called, move quickly upon deck, and when there that they perform their duty with alacrity, and without noise or confusion. The sail- maker and the ropemaker are under his immediate orders.

The carpenter, when appointed to a ship, is carefully to Car- inspect the state of the masts and the yards, whether in penter.

the dockyard or on board of the ship, to see that they are perfectly sound and in good order. He is to examine every part of the ship's hull, magazine, store-rooms, and cabins. He is every day when at sea carefully to examine into the state of the masts and yards, and to report to the officer of the watch if any appear to be sprung, or in any way defective. He is to see that the ports are secure and properly lined, and that the pumps are kept in good order, as also the boats, ladders, and gratings. The caulker, carpenter's mates, and carpenter's crew are placed under his immediate orders.

The midshipmen are considered as the principal subor- Mid- dinate officers, but have no specific duties assigned to them. shipmen.

In the smaller vessels some of the senior ones are entrusted with the watch ; they attend parties of men sent on shore, pass the word of command on board, and see that the orders of their superiors are carried into effect ; in short, they are exercised in all the duties of their profession, so as, after five years' service as cadets and midshipmen, to qualify them to become lieutenants, and are then rated sub-lieu- tenants provided they have passed the requisite examina- tion, and are nineteen years of age.

2. The civil branch comprises the following officers, whose relative rank is stated against their names :—

Denominaticn of Civil Officer.

. 1, Inspector-gencral of hospitals and fleets… 2. Secretary to an admiral of the fleet…..... 8. Paymaster-in-chief…....sssesccoessererseevenes 4. Chief inspector of machinery…....seseceres 5. Deputy-inspector-general of hospitals and HOO eeeoeneneonebecceac osocans Scouberemoccadananon 6. Inspector Of Machinery…..cccecerscrereeee .---e| Of 8 years' service as such. 7. Sccretary to a commander-in-chief…..... | Of 5 years' service as such. 8. Inspector Of Machincry …....cccecseresceeerererees Under 8 years' service as such. 9. Secretary to a commander-in-chief ….... Under 5 years' service as such. 10. Fleet surgeon 506 10 oon 11. Paymaster…..... con cqnodeconacoguceendeDenbiqucebedsae Of 15 years' seniority. 12, Chief engineer … Of 10 years' seniority.

. Naval instructor …... cogdopenc cagaonesndaboosssanane

. Secretary toa junior flag-officcr,commodore of the 1st class, or captain of the fleet…..

. Staff surgeon.. pasneoocd

. Paymaster…....

- Naval instructor…....0.

BIOHICIMONEINGEL....00cc.ccons-ooecesson+orssentonssnes

. Secretary to a commodore of the 2d class…

Of 15 years' seniority

"| of Sand under 15 years' seniority .| Of 8 and under 15 years' seniority. Under 10 years' seniority.

OMA TVASEET. .0…..100s000000s aodotbarcunieboc gacencota: Under 8 years' senfority. 21. Naval instructor…….....+ Under 8 years' seniority. Ee BUDE COW scecsccas—nceseoese ne ses a8 5 23. Assistant-payMaster……..ss0+esseeesoeee .| Of 8 years' seniority. ENGI Myer. eessennc-s—cacoarsersrersneness ..| Of 8 years' seniority.

. Assistant-pay master PBEM SITIGEM, Wei .cercs ces ease . Chief carpenter ……. . Assistant-engineer… . Carpenter…

..| Under 8 years' seniority. ...| Under 8 years' seniority.

G Chaplains shall not hold any naval rank, but shall retain, w Yeenwich Hospital sliall be considered the head of the chaplains,

hen afloat, the

To rank with

Rear-admira!l, according to the date of commission. Captain of 8 years' seniority, according to the time served as suc secretary.

Captain of 3 ycars' seniority, according to date of commission.

Captain of 3 years, whose seniority will reckon from the completion of such 3 years in that rank; that of the inspector of machinery from the com-pletion of 8 years' service as such.

Captain under 3 years' seniority. The secretary to a commander-in-chief is to reckon his seniority from the date of completing 5 years' scrvice as such.

Commander, according to time served as secretary to a commander-in-chicf.

Commander, according to date of commission. The paymaster, chief engineer, and naval instructor to reckon their seniority from the date of completing 10 or 15 years' seniority in their several ranks respectively ; the ficet surgeon from the date of his commission,

Lieutenant above 8 years' seniority, according to date of commission, but the lieutenant, paymaster, and naval instructor are to reckon their seniority from the date of completing 8 years' seniority in their respective ranks.

With but after lieutenant of 8 ycars' seniority.

} | il

tristena under 8 years' seniority, according to date of commission,

bwith but after licutenant under 8 years' seniority. \ Sub-lieutenant, according to date of coramission.

: With but after sub-licutenant. With but after gunners and boatswains. Midshipman, according to date of passing, Naval cadet, according to date of entry.

position to which their office would cntitle them on shore; and the chaplain of

with the title of chaplain of the fleet.

Engineer,

Pay- The paymaster (formerly purser) has the charge of all pale : : caeoee. moneys belonging to the crown, the conduct of all cash the navy. 'Their numbers in the following five peace years were— officers, transactions, and the charge of all the ship's provisions, and of the serving them out for the use of the crew. The | |,ammais regulations and instructions for his guidance are minutely ioe detailed in the general printed instructions, with all the | | Captains various forms established for the keeping of his accounts | | Commanders. with the accountant-general of the navy, to whom he is immediately responsible. To assist him in the performance In the year 1857

there were on the active list of the navy 371 :; ery Heer le eny ys of his duties there are assistant paymasters and clerks. The | captains, 530 commanders, 1122 lieutenants, and on the retired captain. who is responsible for the strict performance of and reserved list 129 captains, 243 commanders with rank of captain b, x i eee ogee (besides 118 commanders on reserved half-pay), 254 lieutenants the duties of all the officers under his orders, acts as a check | with yank of retired commanders (besides 618 on reserved half-pay). on the paymaster in many parts of his duty regarding the | The total number of captains was therefore 743, commanders 897, slop-books, muster-books, &c. He has also to count at | lieutenants 1740. The warrant-officers increased from the average uncertain times the cash in charge of the paymaster, and of about 400 in 1793 and 700 in 1821 to upwards of 1000 in 1857. tomSée, Gidtuitmcorespendeeteh Eledbaliie. Wemacenn The total number of officers of the royal navy and royal marines in , pP lB * | 1857 was upwards of 7300, excluding mates and midshipmen, clerks, For store duties the paymaster has also a steward under warrant-officers, and engineers, who may be computed at 3000,— his immediate orders. making a grand total of 10,300 officers of all ranks. The duties of the medical inspectors of hospitals and The chronic disproportion between the number of officers on the Rules fleets, the medical officer of a ship and his assistants, the active list and the number for whom it was possible to find employ- for ? se mae? ment led to many difficulties. Promotion stagnated, and officers retire- secretary to the commander-in-chief, the chaplain, the | in the higher ranks remained in the service long after the time ment. naval instructor, and inspectors of machinery afloat are | when in the ordinary course of things they should have been too obvious to require specification. retired for = ee eae arene = le Pipe . . were propose remedy vil. r Childers, when first lord o ale The petty officers are very numerous ; they are classified the Admiralty in 1870, framed a scheme much of which remains * as chief petty officers and first and second class working | in force, although amcndments in it have been found necessary. petty officers. Full details are given in the Navy List, and a large body of in- Regula- The regulations under which candidates for the several branches LS eine eet fee gure ie The 2 tions for of officer are received into the navy will be found in the Navy List, p ad . a a re ae aber an “a fiikesiich we - A 5 admis- which is published quarterly under the authority of the lords com- fhe an oe Eye aur nesealOr the mary wandiurome a be ae f .

sion. missioners of the Admiralty. The limits of age vary with the line | °″ ie ed f Lae 5 me } ieee: f fic a owen... Cadts are euterad! betes ; regular flow of promotion by requiring t ne Tetirement of officers at . AA tale andern tered between the ages of twelve and thirteen certain specified ages, or after non-service afloat, irrespective of and a hali, and they must pass after entry two years in study on : : a board the “ Britannia” before final examination cath fienaeaeh eo ure e oieuier er years Tnpaved Sein ay to a sea-going training ship. Since the foundation and opening of . : ; Uae ; Greenwich Naval Coleg, on 1st Fobruary 187, very great allie | 00, eguasions stand at present admirals and vie admial ee a Roe ee ee naval toa : all sixty, or if their flag has not been hoisted for ten years ; captains arenes em PB ee ROE NON Tees SDE re Teatcdl atthe age of fifty-five, “or at any age if seven years z : ‘ : have elapsed since they last served” ; commanders at the age of Regula- By an order in council, the following regulations are estab- a ’ ‘ ; : ° tions for lished for the promotion of eoliniiesionel officers of the navy. ee ey five Te gut pa ENS yo tomo. Meena Been ee elapsed since they last served”; sub-lieutenants (by order in council p shipmen are required to serve five years as midshipmen or cadet ee on board seute of Nor Wicmmtyrsiien Go redder oF eile + 5th February 1872) are compulsorily retired at the age of forty. ‘ de SPS tO Teneer Ulem ven iwle’ tol | Pomaioadias been given to flag-officers, captains, commanders,

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The engineer, when first appointed to a steam-vessel, carefully examines the engines, screw (or paddles), and the boilers, and reports to the commanding officer any defects he discovers. He takes charge of all the engineer’s stores and tools, and keeps account of receipts and expenditure. He is never to quit the engine-room during his watch, and visits it frequently at all times day and night. The engine- room artificers, leading stoker, and stokers are under his immediate control.

the rank and situation of lieutenant; and they must be nineteen years of age. To qualify an officer for sub-lieutenant, he must have served the time, and passed the examination, required to qualify for a lientenancy. No lieutenant can be promoted to the rank of commander except for gallantry in action

until he has served four years as lieutenant, three of them at sea; and no commander to the rank of captain except for gallantry in action until he has served two years as commander, one of them at sea. Captains become admirals in succession according to their seniority on the list, provided they shall have commanded four years in a rated ship during war, or six years during peace, or five years in war and peace combined. Appointmentsas navigating lieutenant (formerly master) are no longer made. The old list of masters, now sub- divided into staff captains, staff commanders, and navigating lieutenants, will gradually die out, and the duties will be per- formed by lieutenants and commanders. No person can be appointed gunner unless he shall have served seven years, one of them as gunner's mate or other petty officer, or seaman gunner, on board one or more of Her Majesty's ships; and he must produce a first class certificate in gunnery, and certificates of his good conduct, and undergo the necessary examination. No person can be appointed boatswain unless he shall have served seven years, —one complete year with the rating, and actually doing the duty, of a petty officer in Her Majesty's navy; and he must produce certifi- cates of good conduct, and undergo the necessary examination. No person can be appointed carpenter unless he has been six months a carpenter's mate or caulker, or twelve months with the rating of

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shipwright or carpentcr's crew, on board one or more of Her Majesty's ships. No person can be appointed chaplain to one of Her Majesty's ships until he has received priest's orders. No person can be appointed paymaster or assistant-paymaster unless he shall have been rated and have discharged the duties of a clerk for three complete years, and shall produce good certificates, Admission to this class is by limited competition for assistant-clerkships. Admission to the medical class is by open competition, Promotion from surgeon to staff surgeon is conferred on qualified officers twelve years from date of entry.

The long-continued wars towards the close of last century neces- Number

sarily created a prodigious increase of the commissioned officers of of

and lieutenants to retire some years sooner than the age of com- pulsory retirement, and arrangements have been made by which they may commute their retired pay, ora part of it, for a lump sum. Staff captains are retired at the age of sixty, ‘‘or at any age if they have not served seven years” ; staff commanders at fifty-five ; and navigating lieutenants at forty-five, or after five years’ non- service, Chief engineers are retired at fifty-five, or after five years’ non-service. Chaplains and naval instructors are retired at the age of sixty, or in case of non-service by the former after five years, by the latter after three years, Of medical officers, inspectors and deputy-inspectors of hospitals are retired at sixty, or after five years’ non-service ; fleet surgeons, staff surgeons, and surgeons at fifty- five, or in each case after five years’ non-service. Paymasters are retired at sixty. Permission is accorded to these officers also to retire five years sooner than the maximum age.

A maximum establishment of warrant-officers has been fixed, and ages specified at which retirement is compulsory. The object has been to favour promotion, the employment of none but vigorous men, and to reduce the list to the maximum number itis considered desirable to employ.

At present (1883) the total number of the officers of Present the royal navy and royal marines is about 7900. Of these number

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upwards of 2100 are in the ranks of engineer officers, sub- offiea

lieutenants, midshipmen, naval cadets, clerks, &., an warrant-officers.

-niform.

Crew.

Admis- sion of boys.

Tmpregs- ment in time of war,

Nay ¥

All officers of the navy wear a uniform, which is

established in pursuance of the pleasure of the sovereign.

It consists of blue cloth, with white collars and cufis to The the officers of the civil branch of the service

the coats, and various embroidery and epaulets. epaulets of

are embroidered in gold and silver. The full dress, with

cocked hats, is worn on state occasions and at courts-martial The first naval uniform (blue and

by all naval officers. white) was established in 1748. The identical patterns then issued may now be seen in the United Service Institution.

the uniform was in 1856. at any time be ascertained by reference to the current number of the Navy List.

Men.—The crew of a ship of war consists of leading seamen, able seamen, ordinary seamen, engine-room artifi-

cers, other artificers, leading stokers, stokers, coal-trimmers, boys, and marines. The artificers and stokers and the marines are always entered voluntarily, the latter in the same manner as soldiers, by enlisting into the corps, the former at some rendezvous or on board particular ships. The supply of boys for the navy, from whom the seamen class of men and petty officers is recruited, is also obtained by voluntary entry. :

The conditions under which boys are entered in Her Majesty’s navy are as follows:—All entrants must understand that they are

bound to serve continuously for ten years from the time of their attaining the age of eighteen ; and they will be required to sign an engagement to that effect ; but no boy will be entered without

the written consent of his parents, guardians, or nearest relations. The age for entry is from fifteen to sixteen and a half, and the following are the

present standards as to height, &c., which, how- ever, are liable to alteration :—

g Measurement (without Shoes). | round the Chest.

Boys between 15 and 153…….....

16

30 in.

308 ,,

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They must produce a certificate of birth, or a declaration made by their parents or guardians before a magistrate, to show they are of the proper age. They must also be of sound constitution, not subject to fits, free from any physical defects or malformation, and able to read and write. No boys will be received from reformatories or prisons, or if they have been committed by a magistrate ; but boys may be admitted from industrial school ships.

Able and ordinary seamen are seldom admitted direct into the navy, as the system of training boys proves very satisfactory. Volunteers are occasionally entered, especially from the naval reserve, and no doubt a large supply of men could be obtained if sought for. The wages given in the merchant service may be higher, but in all other respects the treatment is far superior in the navy: the men have better provisions, continuous employment, and leave on full pay, are subject to much less fatigue and exposure to the weather, are well taken care of in sick- ness, and are entitled to pensions after twenty years’ service or when disabled.

Merchant seamen are admitted into the royal naval reserve, receive an annual payment by way of retainer, perform drill on board Her Majesty’s ships, and are engaged to serve in the navy in case of war or emergency.

Including the fishermen and boys, who form the second and third classes of this reserve, it is to consist of about 20,000 men.

The speedy manning of the fleet, on the first breaking out of a war, is one of the most important duties that can fall on the naval administration. A variety of schemes have been brought forward for attaining this end, but all of them have heretofore failed of success, except the compulsory mode of raising men, under the authority of

press warrants, issued by the lords commissioners of

the Admiralty, by virtue of an order in council,

In the reign of William IV. the facings were for a short time changed to red. The last alteration of The existing regulations may

renewed from year to year. On the occasion of the war with Russia in 1855, however, the fleet was manned, for the first time, without recourse to impressment. There likewise issues, on the breaking out of a war, a proclama- tion from the sovereign, recalling all British seamen out of the service of foreign princes or states; and comnianders of all ships of war are directed to search foreign vessels for such seamen.

The impressment of seafaring men, however anomalous under a free constitution like that of Great Britain, is defensible on state necessity, until it can be shown that the fleet, on an emergency, is capable of being manned without resorting to that measure. In consequence of some doubts being raised on the legality of impressment in the year 1676, when the affairs of the Admiralty were managed immediately under the direction of the king and the great officers of state, a discussion was held on this point, when it was decided by the judges and crown lawyers, that the king had an indefeasible right to the services of his subjects when the state required them, and that the power of impressing seamen was inherent in the crown, seeing that without it the trade and safety of the nation could not be secured. In the Black Book of the Admiralty is an order by Sir Thomas Beaufort, high admiral to Henry IV., commanding the impressment of mariners for

service in the barge “E. de 8,” and punishments were provided for those who failed in service. The statute 2 Ric. II. c. 4 speaks of mariners being arrested and retained for the king’s service as of a thing well known and practised without dispute, and provides a remedy against their running away. By statute 2 & 3 Phil. and M. c. 16 any Thames waterman hiding during the execution of a commission of pressing for the royal service is liable to heavy penalties. By 5 Eliz. c. 5 fishermen are exempted from impressment. The subject of impressment is dealt with in many statutes down to the time of George III., and the power to impress in case of necessity is still conferred by the sovereign in the Admiralty patent. At the present stage of the world’s history, however, this power would not be enforced, except upon application of the maxim “salus populi suprema lex.” The first instance of impressing men in Ireland seems to have been in the year 1678, when the lord-lieutenant received directions from the privy council to raise 1000 seamen for the fleet. In 1690 the lords-justices of Ireland were directed to assist the officers of the navy in impress- ing men in that kingdom. In 1697 a register was taken of all the seafaring men in Ireland, which amounted to 4424 men, of whom it is noted 2654 were Catholics. On several occasions, during Queen Anne’s reign, the lords-justices of Ireland received directions to raise men to serve in the fleet.

In Scotland the mode of raising men by impressment was unknown before the Union; but in various instances the council of Scotland was directed to raise volunteers for the fleet, each man to have 40s. as bounty.

In 1706 an experiment was tried for the speedy manning of the fleet, by virtue of an Act of Parliament, which required the civil magistrates of all the counties to make diligent search for all seafaring men, and 20s. were allowed to the constables for each man taken up,—the seamen to have pay from the day of delivery to the naval officers stationed to receive them; if they deserted after that, they were to be considered as guilty of felony. By the same Act, insolvent debtors, fit for the service, and willing to enter it, were released, provided the debt did not ex- ceed £30; and no seaman in the fleet was to be arrested for any debt not exceeding £20. The whole proceeding under this Act incurred a very heavy expense, and totally failed.

Reserve,

Govern- ment and dis- cipline.

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In the same year the queen referred to the prince of Denmark, then lord high admiral, an address from the House of Lords, relating to the three following points :— (1) the most effectual means for manning the fleet; (2) the encouragement and increase of the number of seamen ; (3) the restoring and preserving the discipline of the navy. His royal highness submitted these points to such of the flag-officers and other commanders as could be assembled, who made a report, recommending (1) that a general register should be kept of all seafaring men in England and Ireland, and that all marines qualified to act as sea- men should be discharged from the army; and (2) that not fewer than 20,000 seamen should be kept in employ in time of peace. With regard to the discipline of the navy, they observed that, no particular defect being specified,

they could pronounce no opinion on that head.

eserve.—In addition to the seamen and marines borne on the strength of the navy, there are four lines of reserves at the disposal of the Admiralty :—the coastguard, the seaman pensioner reserve, the royal naval reserve, and the royal naval artillery volunteers.

To qualify a seaman for admission to the coastguard he must be under thirty-seven years of age, have completed eight ycars' con- tinuous service in man's rating, or such period as the lords com-

missioners of the Admiralty may from time to time direct, be either,

a seaman gunner or trained man, be in possession of at least one good conduet badge, and be recommended by his captain.

Petty officers and seamen of Her Majesty's navy, on being pen- sioned for length of service, are eligible for enrolment in the seaman pensioner reserve provided they are eithcr seamen gunners or trained men, and are under forty-five years of age. Men in the scaman pensioner reserve are required to undergo fourteen days' training annually, and on attaining the age of fifty

they are granted the Greenwich Hospital age pension and exempted from further drill, provided they have attcnded drill every year, and not less than six periods of such drill.

The royal naval reserve comprises those officers and men of the mercantile marine and fishermen who are willing, in consideration of a small retaining salary, to undergo each year a certain number of days' training on board a ship of war or at a naval reserve battery. The regulations in force for the appointment of officers to the royal naval reserve are published in each issue of the Navy List. The inen are divided into three classes. (1) For enrolment in the first class a man must be under thirty years of age, and show proof of at least eight years' sea service in foreigu-going or regular coasting vessels within the ten ycars immediately preceding his application, and must have obtained and held the rating of A.B. three years prior to the expiration of such service, or have completed his indentures as an apprentice for a term of not less than four years, one year of which has been served in foreign-going or regular coasting vessels. Men who have been discharged from the royal navy as able seamen with good characters may be enrolled in the reserve if they are physically fit, provided they do not excecd thirty- five years of age. (2) Candidates for enrolment in the second class reserve must not be under nineteen nor above thirty years of age, and must have followed a seafaring life either in foreign-going, coasting, fishing, or other vessels for three years, of which six nionths at least must have been as ordinary seaman; they must know the compass, and be able to steer and to pull a good oar. (3) Boys who have been eighteen months under training in a mercantile training ship are eligible for enrolment in the third class reserve at the age of sixteen, provided they are under engagement to join a merchant ship for sea service, are 1 hysically and mentally fit, and can show satisfactory proficiency in gunnery drills, as well as in certain elementary subjects connected with navigation and seamanship. They arc eligible for promotion to the second class at the age of nineteen provided they have served six months at sea, and afterwards to the first-class reserve when in all respects qualified as above. Every enrolment in the royal naval reserve is for a period of five years, and on promotion from a lower to a higher class the man is required to re-enrol. The force was originated in 1859, and the officers and men are liable to be called out for general service in the fleet in the event of war.

The royal naval artillery volunteers are enrolled under conditions somewhat akin to those attaching to cnrolment in volunteer regiments. Brigades of this force have been formed at London, Liverpool, and Bristol, with batteries at Brighton, Hastings, Southport, Birkenhead, Carnarvon, Bangor, and Swansea.

The discipline of the navy, or the government of Her Majesty's ships, vessels, and forces by sea, is regulated by the Naval Discipline Act 29 & 30 Vict. c. 109. The Consolidation Act 22 Geo. IL ¢. 33 replaced the

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first parliamentary enactment for the government of the fleet (13 Car. II. § 1, c. 9), and was passed after the peace of Aix-la-Chapelle, "to remedy some defects which were of fatal consequence in conducting the preceding war." Previously to the statute of Charles IT. the government and discipline as well as the pay of the navy had depended, like the government and pay of the army, upon the quasi-household orders of the sovereign.

Under the Naval Discipline Act, the lords commissioners of the Admiralty are empowered to order courts-martial for all offences mentioned therein, and committed by any person in and belonging to the fleet and on full pay ; and also to delegate the same power to officers in command of fleets and squadrons on foreign stations, which power also may devolve on their successors in casc of death or recall. By this Act no court-martial can consist of more than nino or of less than five persons, to be composed of such flag-officers, captains, commanders, and lieutenants, then and there present, as are next in seniority to the officer who presides at the court-martial. Commanders. and lieutenants are not required to sit when four officers of higher rank, and junior to the president, can be assembled.

The former penalty of death for cowardice, or other neglect of duty, in time of action, and for not pursuing the enemy, was, by the 19th George IIL, so far mitigated as to authorize the court-martial "to pronounce sentence of death or to inflict such other punishment as the nature and degree of the offence shall be found to deserve." Under these articles thus mitigated, Admiral Byng would probably not have been condemned to death. The provisions of the present Act (29 & 30 Vict. c. 109) confine sentence of death,

without alternative, to cases of traitorous misconduct in the presence of the enemy, and murder. All other offences which were formerly capital may now be dealt with either by sentence of death or by such other punishment as the court may think fit to award under the provisions of the Act ; and penal servitude or imprison- ment, with dismissal from the service, are now the severest sentences awarded, flogging having been practically abolished.

The discipline of the navy is also maintained by a system of summary punishments, including short terms of imprisonment, which can be awarded by the captains of ships, under the regulations issued from time to time by the lords of the Admiralty.

The first regular code of printed instructions would appear to be that known as the Duke of York's Sailing and Inghting Instructions, bearing date about 1660, which formed the basis of all the subsequent ones. Much, how- ever, of the internal discipline of a ship of war depends upon the captain ; that officer being empowered to punish the men for minor offences, according to the usage of the service, courts-martial on seamen are rarely found ncces- sary In well-regulated ships. In 1853 a more uniform system, defining the nature and duration of minor punish- ments, was promulgated by the Board of Admiralty.

RE ae

By the general printed instructions, the captains of Training.

Her Majesty's ships are required to accustom the men to assemble at their proper quarters, to exercise them at the great guns, to teach them to point, fire, &c., under all circumstances of sea and weather. Practice in these respects is obviously much more necessary on board ships than on shore. :

At Portsmouth and Devonport regular instruction is given in the theory and practice of gunnery, in the principles which regulate projectiles, in the theory and manipulation of torpedoes, in the use of small arms, and in all the scientific departments of the art of war. Chemistry and electricity as applied to war and warlike stores are also

Hygiene.

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taught practically, and every inducement is given to officers to study and to qualify for the post of gunnery officers in the fleet. Extra rates of pay are given to gunnery lieu- tenants according to their proficiency. For the training of the men, who up to 1852 were almost devoid of special skill, there was created a class of "'seamen gunners" who act as instructors on board ship, under the orders of the gunnery officer. Examinations are held at stated times for the purpose of testing the progress made by officers under training. In the higher education of naval men at Greenwich College gunnery forms one of the principal features.

The necessity for this special training, and for special efforts to induce men to undergo it, will be evident upon comparison between the guns of thirty years ago and those of the present day. The cannon with which the greatest victories of the British navy were won were 12-, 16-, and 24-pounders. Out of 104 guns carried by Nelson's "Victory," 44 were 12-pounders, 30 were 24-pounders, and only 30 were 32's. In the Russian War, 56's and a few 68's constituted the armament of the large war-ships. Now ships go about with 2000-pounder guns—of most scientific make and character. For the proper handling and management of these refined engines of destruction it is clear that very special knowledge and very careful training are required. The issues involved in miss or hit are too momentous to be left to careless or ignorant hands.

The state of health on board of a ship of war is, generally speaking, not exceeded in the most favoured spot on shore; and the sea-scurvy may now be considered as unknown in the British navy, since the universal intro- duction of lemon juice, or citric acid, without an ample supply of which no ship is permitted to sail on a foreign voyage. From the official returns collected by Sir Gilbert Blane, M. Dupin, a French author well versed in naval subjects, drew out the following table, which exhibits at one view the progressive diminution of sickness, death, and desertion in the British navy, calculated on 100,000 men :—

gee Deaths. Desertions.

1779 40,815 2,654 1,424 1782 31,617 1) 993

1794 25,027 1,164 662 |

1804 11,978 1,606 914

1813 9,336 698 | 10 |

Hence it would appear that the diminution of sickness and of deaths was in the proportion of 4 to 1 nearly between the years 1799 and 1813. The diminution of desertions from the hospital in the same period is not less remarkable,

The following returns, of more recent date, show the advance of medical science in this department :—

Sick sent to Dead in Run from

llospitals. Hospitals. Hospitals.

1820 3,564 362 2 1830 3,187 187 2 1840 6,589 225 1

1850 9,743 309 E 1855 | 11,748 384 | 2

Annexed is a memorandum showing the invaliding and death-rates in the navy afloat, including the deaths In hospital, from 1856 to 1881. Comparison with the dead lists of former years, even those cited above, will show the wonderful decrease caused by greater medical knowledge and better sanitary arrangements on board ship, This will be the more apparent when it is borne in

mind that the old statistics show only the deaths in hospital, not those which occurred on board ship, through disease or the enemy. The high death-rate of 1870 is accounted for by the sad loss of the ‘‘Captain”; and those of 1878, 1880, and 1881 by the sinking of the “Eurydice” and “ Atalanta” and the blowing up of the “ Doterel.”

Average Invalided. Dead. Complements) | eolrected = | Ratio From | From Ratio for Time. | Number. Total. | per 1000. 1856 51,730 998 | 193 1857 42470 1,460 | 344 1858 43,120 1,763 | 40-9 1859 52,825 1,994 | 377 1860 64,1125 2344 | 444 1861 62,485 2,301 | 382 1862 58,870 1944 | 33: 1863 54,090 1903 | 351 52,500 as 1864 { Lae 1.881 | 35-4

, 50,660!

1865 451‘210f | 1,687 | 32:9

48-775

1866 104 3t 1,698 | 343

50,110 : ‘

1867 { 31000 | 1,492 | 29-2 432 | 155 587 | 115 |

50,390

1868 451/220 1,785 | 84-9 333 | 197 460 | 89

43,550 ‘. .

1869 49/8205 1,374 | 32-2 358 | 126 | 484] 99

43,350)

1870 terior | 1646 | 852 315 | 603 | 918| 196 (47,260 . ™ ” isl | {7 ae 1,528 | 92 302 | 102 | 404] 85 – 46,710 ; a 1872 467830; 1co9 | 34:3 206 | 119 | 385] 82 1873 45,440 1688 | 37-1 74 | 104 | 378 | 93 1874 44,530 1745 | 391 301 | 121 422 | 94 1875 44,360 i526 | 34-4 304 | 88 | 392] 88 1876 45,010 1.636 | 3634 | 270 | 146 | 416] 9-24 1877 44,940 1613 | 3589 | 221 | 96 | 317| 705 1878 46,400 1ee2 | 3581 | 247 | 429 | 669 | 14-41 1879 44,745 1475 | 32°96 | 279 | 105 | 384| 8-58 1880 44,770 1.393 | sll 207 | 356 | 563 | 12:57 1881 44,400 1.388 | 3126 | 234 | 252 | 4×6! 10-94 1272515 | eae ; 1 es ee Totals… | Tors’ogs | #4288 | 846 | 10,888 | 5.228 | 16,116 | 12:59

The encouragement given to the navy from its first regular Pay.

establishment has marked it asa favourite service. The sea-pay, the half-pay, and other emoluments have generally been superior to those enjoyed by the. army, but subject to great fluctuations in every reign, and to frequent changes in the same reign. From the Black Book of the Admiralty it appears that the pay of the navy was fixed as follows in the time of Richard II.:—‘‘ If the admirall bee knight batchellor hee shall have every day at sea four shillings for himselfe, and for each chevalier gooing in his company two shillings, and for every escuier arme twelvepence a day ; and shall have in consideration of thirty hommes d’armes, at the end of each quarter of a yeare, one hundred markes, and so hee shall have for every one. And shall also have for each archer sixpence a day. And soo everyone of his captains shall have theire wages of him. And if the admirall is a baron he shall have six shillings and eight- pence a day; and if hee is an earle hee shall have thirteen shillings and fourpence a day.” The admiral had also fourpence in the pound for all wages paid for his fleet ; but out of this he had ‘““in the night tyme, all the while that the fleet is at sea, to carry at the topp of his mast two lanthornes, to the end that all the masters of the ffleet my know and perceive by the light and the admirall’s course, what course they shall steer.” ‘‘As to the marriners wages upon the voyages of the king or the admirall, each master of a shipp shall have sixpence a day, and every constable (or gunner) of the ffleet shall have the same wages by the day. Each marriner shall have threepence halfpenny per diem, and each marriner shall have sixpence yer week for consideration” (or bounty), ‘‘and eacli sea boy shall have twopence halfpenny per diem.”

The establishment of half-pay was of slow growth. Though the navy, as we have seen, was put upon a regular establishment under the reign of Henry VIII., neither officers nor seamen received any pay or emolument in time of peace until the reign of Charles II., when in 1668 certain allowances were made to flag- officers and their captains out of the £200,000 a year voted for the whole naval service ; and in 1674 certain other allowances were granted, by order in council, to captains who had commanded ships of the first and second rates, and to the second captains to flag- officers, on the ground, as assigned.in the preamble, that they had undergone the brunt of the war, without sharing in the incident advantages of it, as prizes, convoys, and such like, which the com- manders of the small classes of ships had enjoyed. But the first regular establishment of half-pay for all flag-officers,

captains, first- lieutenants, and masters was by King William, in the year 1693,

MVIL =e 36

Prize- money.

Other rewards.

Cost and number of men.

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rovided they had served a year in their respective qualities, or had been in a general engagement with the enemy. A regularly estab- lished half-pay was further sanctioned by an order in council of Qucen Anne in 1700, the conditions of which were, that no officer should enjoy the benefit thereof who had absented himself without permission of the lord high admiral or lords commissioners of the Admiralty, or who had been dismissed for any misdemeanour or by court-martial, or who had not behaved himself to the satis- faction of the lord high admiral, or who should have leisure to go out of His Majesty's dominions, if employed in the merchant service or otherwise, or who enjoyed the benefit of any public employment. Since the above pcriod the rate of half-pay to the several officers of the navy has undergone various modifications. It has included within its area of benefit a larger number of elasses of officers. It has also increased enormously in bulk as a non-effective service charge. So great was the increase in this respect, notwithstanding the subdivision of the half-pay list into 'retired? and "reserved" sections in addition to the ''active" half-pay list, that in the interest of the officers themselves, as well as of the country, it became necessary in 1869 to make a scheme of retirement, in accordance with which officers on the half-pay list, from whatever cause, for more than a prescribed number of years, were permanently retired, and allowed to drawa retired pay, or to commute for a capital sum the valuc of their pay. Half-pay is not given to officers below the rank of sub-lieutenant in the military branch, or of paymaster in the civil. For further details see the Navy List.

Prize-Money.—This additional incentive to exertion on the part of officers and seamen on board ships of war dates from the earliest time. At an early date rules and regulations were made for the due apportionment of prize of war, a large portion going to the king and his admiral. In 1793 precise regulations, in the present sense of the word, were first issued. By them the proceeds arising from eaptures from the enemy were divided into eight equal parts, and were distributed by order of ranks. These have been amended from time to time, and were the subject of special orders in March 1854, The existing orders are contained in a royal proclamation dated May 1871, and direct, subject to the under-mentioned provisos, that one-thirtieth part of the value of prizes shall go to the admiral in command of the capturing vessels (if two admirals they arc to divide the thirtieth, the senior taking two-thirds, the junior one- third), and of the remainder, or of the whole if no flag share is payable, the captain is entitled toa tenth of the entire proceeds. After these deductions the remainder of the net proceeds is to be distributed in ten classes, so that each officer, man, and boy assisting iu the capture of the prize shall receive shares, or a share, according to his class. Officers in the first class, including inspectors-general of hospitals afloat, inspectors of steam machinery, secretary to com- mander-in-chief, are to receive forty-five shares each ; in the second class, including senior lieutenant, staff surgeon, and certain pay- masters, thirty-five shares each ; in the third class, lieutenants, surgeons, captain of marines, and some others, thirty shares each ; in the fourth class, including lieutenants of marines, sub-lieutenants, and warrant-officers, twenty shares each. To the fifth class twelve shares each are assigned; to the sixth, ten shares each; to the seventh, seven shares ; to the eighth, including able seamen, four shares ; to the hinth, including ‘‘idlers,” two shares; and to the tenth, boys, one share. centage charged upon treasure, which, for security’s sake, may be conveyed in ships of war on merchants’ account.

Another great encouragement for young men to enter the naval service arises from the honours bestowed by the sovereign for any brilliant exploit. Exclusive of peerages and baronetcies, the honours bestowed for gallant conduct in the uaval service at present (1883) are the titles of knights grand-crosses of the military order of the Bath, and knights commanders and companions of the Bath, in addition to which there are the civil order of the Bath, and, for colonial services, the order of St Michael and St George.

Royal medals have also been granted of late years for various naval services, and distributed alike to the officers, seamen, and marines; and a number of officers, seamen, and marines have received the Victoria Cross. Good-service pensions are also awarded to a certain number of flag-officers, captains, and general and field-officers of marines. These are selected according to their standing, and length and nature of services, a statement of which is given, in each case, in the annual naval estimates presented to parliament. The amount of the good-service pension ranges from £100 to £300, according to rank and service. There are also naval and Greenwich Hospital pensions established for the relief of retired officers of long service, who are old, infirm, wounded, or disabled. Some of these pensions are allotted to each class of officers.

The cost of the British navy has necessarily varied with the times, with the materials used in the construction of ships, and with the number of men borne on the strength of the fleet. The highest number of men borne in the navy was in 1813—when 147,047 seamen and marines

Another source of emolument is the per-.

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were borne, and when the total charge was £21,212,012, and the year ended with a navy debt of £8,562,291, This was the largest charge ever made for the navy, except in 1855 (the year of war with Russia), when the charge was £21,394, 216.

Below is a statement showing the number of men voted, the number actually borne, and the charge, for typical years between 1690 and 1881 :—

Grant for » | Total borne on|., 4: Navy Debt at Roe Ships’ Books. Of ye ae End of Year.

1691 29,270 85,317 £1,640,760 se 1700 7,000 7,754 638,142 £1,334,282

1710 40,000 46,498 2,096,000 5,655,585 1720 13,500 21,188 1,321,572 1,503,687 1730 10,000 9,686 837,786 1,396,723 1740 35,000 37,181 1,938,704 1,801,525 1750 10,000 11,691 995,521 1,716,923 1760 70,000

86,626 4,926,680 5,228,695 1780 85,000 97,898 6,782,284 10,372,628 1800 110,538 123,527 11,366,579 8,705,886 1810 145,000 146,312 15,801,184 5,591,822 1820 23,000 28,985 6,340,771 1,193,455 18380 29,000 31,160 5,184,955 1,314,060

1840-41 37,456 37,665 5,742,871 abe

1850-51 39,000 39,098 5,772,652 1860-61 84,100 79,018 12,644,570 1868-69 66.770 66,278 10,806,690 1880-81 58,800 57,946 10,321,435

- Including marines, who first appear in 1702 to 1712, and disappear between 17138 and 1738.

¢ Including marines on shore.

¢ After excluding ordnance and conveyance of troops.

In reviewing her resources generally for manning the navy, England may, as Sir Thomas Brassey says, fairly look to the reserves, no less than to the number of men actually borne for fleet service. The coastguard on shore has been maintained for many years at an average strength of 4000 men. The naval reserves have averaged, between 1868 and 1881, 15,785 men. The same authority gave the following figures in 1882 :—pensioner reserve, 1560; first class royal naval reserve, 11,800; second class, 5600; third class, 150; and naval artillery volunteers, 1400. The total reserve for manning a war navy was considered by him to be not less than 40,000 men.

Personnel of Modern Navies Compared.

In any comparison of the personnel of modern navies, the question of the strength of the mercantile marine is more important than it is in relation to the matériel. Sir T. Brassey reminds us that, of the 140 English ships which were assembled to oppose the Spanish Armada, only 28 belonged to the royal navy, and that Drake, Hawkins, and Frobisher, who commanded the fleet under Lord Howard, were masters in the merchant navy; also that Howe’s victory of lst June 1794 was gained by the merchant sea- men of the kingdom. It is estimated by the same authority that, if the system of naval conscription existing in France were applied to England so as to

include, as it does in France, the crews of coasters, fishermen, boatmen, and the workmen in the private shipbuilding yards and the dockyards, there would be a roll of from 700,000 to 800,000 men.

France. —The system here was established under Louis XIV., and it comprises a term of compulsory service, by means of which France inscribes on her rolls some 170,000 men, of whom the great majority are fishermen.!

The personnel of the navy below the rank of officer is recruited, (1) by the men of the maritime inscription, (2) by voluntary engagements, and (3) in the case of an insufficiency of men of the first two categories, by a contingent from the general recruiting of the country told off for the navy.

1. Every individual, having completed eighteen years of age, who has made two long voyages (au long cours) either on Govern- ment or on merchant ships, or who can count eighteen months of

navigation or two years of coast fishing, and who declares his intention of continuing a scafaring life, is inscribed as a sailor, aud

1 See The Armed Strength of France, published (1877) under the superintendence of H.M. Stationery Office.

ean be levied for the service of the fleet. Every sailor who is in- seribed is ealled into aetive service on completing twenty years of age. During the month in whieh he aceomplishes his twentieth year, or during the month whieh follows his return to Franee, he is bound to present himself before a commissary of the maritime inseription. He is then enrolled, sent to a port whieh is the chief town of an arrondissement, and incorporated in a division of sailors of the fleet. If he be considered fit for service, he can, from the age of eighteen years, forestall his call to active service. The young sailor who joins at eighteen years of age performs his service in two periods. During the first, which lasts for five years, he may, when in France, be given renewable furlough without pay, and can then devote himself to navigation of any description. After this first period he remains for two

years longer in the same conditions, on renewable furlough. The time passed in this position of renewable furlough is counted as service to the state for every sailor who engages to navigate only in coasting voyages or in home fishing. After this latter period the sailor cannot again be called out except by deeree in case of emergency. After serving for three years, the sailor who has not been sent on furlough is entitled to an increase of 2d. to his daily pay. The levies of sailors for duty with the fleet are first made amongst those who have not hitherto rendered any service to the state, then, in case of insufficiency, amongst those who have the least service, or, in case of equal service, those are taken who have been longest on furlough. Inscribed sailors have alone the right of carrying on maritime navigation or coast fishing, and enjoy various other privileges and immunities. The minimum age for the engagement of naval apprentices is eighteen years, the privilege of making an engagement at sixteen years being reserved to young men leaving the school for ship boys, and to those specially selected by the minister. The maximum age for young men who have not rendered any service to the state is fixed at twenty-four years. This is increased to thirty for musicians, stokers, earpenters, sailmakers, and caulkers who can count at least five years' previous service since the age of sixteen. For pupils and quartermaster mechanicians (quartiers-mattres mécaniciens) and working mechanicians (owvriers mécanicicns) the minimum limit of age is eighteen and the maximum twenty-five, if they have not previously served the state, or thirty if they belong to either of the eallings above mentioned and have rendered previous service to the state.

2. Voluntary engagements are only allowed aeeording to the requirements of the service. They cannot be made in the colonies. The conditions are the same as for the army. The engagement is made for five years, Re-engagements can be made by sailors of the fleet for three, four, or five years. They are without conditions of age or service, provided only that their length would not retain warrant officers (officiers mariniers) in the service beyond the age of fifty-five, and quartermasters and sailors beyond fifty, if they can unite with this age a service of twenty-five years.

8. For men of the navy who do not belong to the maritime inseription, the time of service is five years and in the reserve four years. They then pass immediately into the reserve of the terri- torial army, in which they remain

until they attain forty years of age. The contingent is furnished in proper proportion from each eanton, and is eomposed of the young men comprised in the first part of the eantonal reeruiting list, to whom the lowest numbers have fallen when drawing lots.

The number of men obtained by the general recruiting was 6056 In 1873, 7040 in 1874, 6406 im 1875, and 4326 in 1876.

The sailors on shore are divided into five divisions, of which two (those at Brest and Toulon) are of the first class and three are of the seeond class. In each division there is a council of administra- tion, entrusted with clothing and pay duties, and, in fact, with all administrative questions. ach first class division consists of a staff and of depét companies, as follows:—one company of seamen gunners (matelots canonniers), one company of seamen fusiliers (matelots fusiliers), one company of mechanicians and stokers, three eompanies of sailors of the maritime inscription, one eom- pany of sailors from the general recruiting. The divisions of the second class are each composed of a staff and depdt companies as follows:—one company of special branches, two companies of sailors of the maritime inscription and from the general recruiting. Kaeh of these companies is divided into two sections. The division at Lorient comprises, in addition, an instruction battalion of fusilier apprentices. In each division there is an elementary school, a sehool for teaching bookkeeping to quartermaster-serjeants, a symnasium, a feneing school, and a swimming school. In the two first divisions there are also music schools. The first masters and second masters belonging to the different special branches and pro- fessions form the cadre of the warrant officers of the flect. When of equal grade, they are classed in the following order:—navigation, gunnery, musketry, steering, mechanicians, carpenters, sailmakers, and eaulkers. When not serving afloat or in the divisions, these masters are placed in disponibilité at their homes, with redueed pay, and are reealled to aetive service according to roster. The

udget for 1878 shows that eighty-nine offcicrs de vaisseau are to be

employed with the shore divisions of crews and with the establish- ment for pupils) The number of men provided for is as below (bandmasters, officers,

quartermasters, sailors, boys, and super- numeraries):—on shore, 8438; afloat, 25,063; reserve, 1607; total,

35,108.

The marine infantry is not employed inservice on board men-of- war in the samc manner as the marines of the British navy. Its duties are to garrison the five military ports and the colonies, and to take part in maritime and other wars. When necessary, it fur- nishes detachments on board ships belonging to the state.

Germany.1—The whole of the maritime population, inclusive of the technical personnel, are absolved from land duties, but arc liable to serve in the flect. The distribution of the annual levy is dependent upon the seafaring population, the quota contributed by each state being deducted from its whole liability for the land and seaforces. It used to be the practice to draw exclusively from the seafaring population of the provinces of Prussia, Pomerania, Hanover, Schleswig-Holstein, and other federal states, but it has been found necessary to draw upon the land population of the above provinces in order to make up the required quota.

The personnel of the navy ineludes the following offieers, non-eommissioned officers, and men :—1 ehief of the admiralty, 4 rear-admirals, 17 (23) captains, 36 (63) captains of corvette, 65 (165) captain lientenants, 104 (118) lieutenants, 86 (140) sub-lieutenants, and 100 (229) naval cadets, 83 (147) deck officers, 580 (1546) uon- commissioned offieers of seamen, 4290 (10,267) seamen, 330 (499) non-commissioned officers. Besides these there are 12 engineers, 90 (304) deck officers (engineers and masters), 110 (189) engineers' mates, 28 engineers' apprentices, 580 (2131) firemen, 154 (570) masters' mates, 450 (698) meehanics, 84 (154) staff sergeants for police purposes.

Every German (except in a few well-defined cases) is liable to service in the army or navy, and is not allowed to provide a sub- stitute nor to purchase exemption. Liability to service commenees with the completion of the seventecnth year, and lasts until the close of the forty-seeond year of age. Of this time, twelve years must be passed in the standing army and landwehr in the ease of a soldier, in the fleet and seewehr in the case of a

seaman. All men liable to service, who may not be ealled into the standing army, fleet, landwehr, or seewehr, are liable to be ealled ont in the Jandsturm in time of war. The estimated seafaring population of North Germany is about 80,000, ineluding fishermen and dock labourers.

Italy.2—The annual classifieation of all individuals fitted for sea service takes place according to fixed instructions. The men who are passed as fit and suited for the navy are divided into two categories by lot. Those of the first category are drawn into the service, and have to serve four years either on board or on shore (they pass the remaining six years on unlimited furlough). The men of the second category, however, are allowed to go at once on unlimited furlough, and are only called up in case of war or similar emergeucy. They are also liable for service for ten years. Volunteers aud boys trained at the various naval training establish- ments are obliged to serve eight years continuously. ‘The number of men per annum who reach the age rendering them liable for ser- viee is about 5050 on an average, of whom 2600 are fit or suited for the serviee. Of these, from 1500 to 1800 are plaeed in the first category (200 volunteers). Naval officers are ehiefly obtained from the naval sehools. Under-offieers seldom obtain the rank of officer, and only then after a searehing examination. The law on pro- motion of the year 1871 fixes the rules of promotion for all ranks.

The ‘‘corpo reale equipaggi” is divided into three divisions, each of which is under the command of a post-captain, and belongs to a ‘‘dipartimento.”? The total establishment was as follows in 1874 :—741 able seamen, 5526 (including 200 boys) seamen and gunners, 704 artificers, 360 employed in ‘‘administration,” 1187 engineers and stokers, 168 ‘‘guardiani,” 29 invalids; total 8715 men. A body of men has been lately formed for torpedo defenee. The estimated seafaring population of Italy is 225,000, chiefly fishermen.

Russia.*—The entire male population, without distinction of class, is liable to military service. The number of men required to com- plete the strength of the army and navy is fixed by the legislature every year on the recommendation of the minister of war, and promulgated to the senate by an imperial ukase. Admission to the service is determined by lot drawing, in which one class only of the population is annually called upon to take part, namely, that which ineludes all the males who have reached the age of

twenty years on the 1st January of the year in question. Persons who Have fulfilled certain educational conditions may relieve them-

1 See The Armed Strength of the German Empire (1876), published under the £uperintendence of H.M. Stationery Office. é 2 See The Armed Strength of Italy, published (1875) under the authority of H.M.

Stationery Office. 7 f 3 The coast-line of Italy is divided into three marittimi. , 4 See The Armed Strength of Russia, published (1882) under the authority of HLM. Stationery Office.

regions called dipartimenti

selves from lot drawing by enlisting as volunteers. In the naval forces the ordinary term of service is ten years, namely, seven with the fleet and three in the reserve. The total number of young men who had attained the age of twenty years in 1880 was 794,000. The contingent to join on the 1st (13th) January 1881 was fixed at 235,000, and of this number 231,961 were enrolled. According to the statutes the number of sailors in the navy should be about 50,000. Of these in time of peace there are scrving afloat 28,000, and employed ashore 12,000,—the remaining 10,000 being on un- limited furlough. In 1879 the appropriation of the conscripts actu- ally enrolled in the navy was 4504 for the Baltic fleet, 446 for the Black Sea fleet, 72 for the Caspian flotilla, and 418 for the Siberian flotilla, The effective was on January 1, 1880, 2303 below the establishment.

Austria-Tungary.1—The duty of military service is general, and must be fulfilled personally by every citizen capable of bearing arms. The term lasts for twelve years, of which three are spent in the standing army, seven in the reserve, and two in the landwehr; men who are incorporated in the landwehr at once serve in it for twelve years. In the navy the period of service is for ten years, of which three years are active and seven years reserve service. ‘The conscription is confined to Dalmatia and the coast districts. One- third of the whole complement of officers and men required to man the fleet in time of war is kept continuously afloat in peace ; the war complement is 8079 of all ranks, of whom 2700 are actively employed ; the war

complement comprises (besides rear-admiral and staif of the squadron)—officers, &c., 571; sailors and gunuers, 5428; navigating personnel, 362; naval police, 158; engine-room artificers, stokers, &c., 781; sanitary personnel, 58; tradesmen, 202; stewards, cooks, officers' servants, &c., 524, —-total, 8079. The peace effective of the corps of seamen is 6152, inclusive of the 400 boys in the training-ship ''Schwartzenberg." The total force on the war establishment is 11,532,

To show briefly the general result of all this organiza- tion of matériel and personnel, it is perhaps sufficient to state the number of ships in commission at a given date in the present year (1883), and the numbers of their crews.

Including stationary and harbour ships, tenders, training and drill ships, troop and surveying ships, there are from 230 to 240 ships and vessels in commission in the British navy, mounting about 1400 guns, and having a personnel, all told, of about 34,000 officers, men, and boys. Exclud- ing the vessels specially referred to above, and taking only those which may be regarded as fighting vessels, the number in commission falls to about 100, with about 800 guns, and 22,000 officers, men, and boys in the crews. Comparing this with foreign navies, the proportions may be fairly stated as follows :—

No. of Ships. | No. of Guns. | Complement.

POUT <2. 25 2s cac ae hese ccs 100 | 800 22,000 France nc RGnOUHBDReaeoUrrae. Ae a550nG 100 500 15,000 Soll aan ee i ned go | 320 8, 500 RUSSIA ese sCONRacIncUnGAGanEOE 60 260 8,300 ETA os te ae viv ax hasancteeee ees 30 230 6,800 Winters: 5. scpseis contac cs 30 250 5,400 UNO MING os wcrscndevna heen ee 40 280 4,800 | POM 0 van Ot 30 220 4,500 Tega va caccemeeeya as 24 100 4,200 IPO an Gpall salindeats Baeeucnademcacnne 20 100 2,500

Of works on British naval history, the following, amoug others, may be consulted :—Nicolas, History of the Navy from the Earliest Times to 1422, 2 vols., 1847; Campbell, Lives of the Admirals to 1727, 4 vols., 1750, and afterwards continued by Berkenhout and Yorke down to 1816 in 8 vols., the last edition being that of 1870; Southey, Lives of the British Admirals, 5

vols., 1833 (from. the Restoration); Lediard, Naval History of Lingland to 1784, 1735: Beatson, Naval and Military Memoirs of Great Britain from 17 27 to 1788, 1st edition, 3 vols., 1790; Brenton, Naval ITistory from 1783 to 1836, 2 vols., 1837; James, Naval History from 1798 to 1827, 6 vols., many editions; Schomberg, Naval Chronology to 1802, 5 vols., 1802; Naval Chronicle from 1799 to 1818, 40 vols. ; Allen, Battles of the British Navy from 1190 to 1840, 2 vols. , 1852; Yonge, History of British Navy from 700 to 1862, 2 vols., 1863. The following deal almost exclusively with the matériel of the navy:—Charnock, History of Naval Architecture, 3 vols., 1801; Derrick, Memoirs of the Navy, 1806; Perigal, Chart of Naval Iistory from the Earliest Period to 1859, 1860. (Gsig 163)

ee See a eee 1 See The Armed Strength of Austria, published (1874) under the authority of H.M. Stationery Office.

NA YY

NAVY OF THE UNITED STATES.

The American navy came into existence shortly after the Declara- tion of Independence. As early as October 1775 Congress author- ized the construction of two national cruisers, and, at the same time, appointed a marine committee to administer naval affairs, The first force, consisting of purchased vessels, badly fitted and built, and insufficiently equipped and manned, embraced two ships of 24 guns each, six brigs carrying from 10 to 12 guns, two schooners each with 8 guns, and four sloops, three of 10 guns and one of 4 guns. On December 22d a personnel of officers was selected, one of the lieutenants being the well-known Paul Jones. Ezekiel Hopkins was made commander-in-chief, but, having incurred the censure of Congress, he was dismissed early in 1777, and since then the title has never been revived except in the person of the president. In November 1776 the grades of admiral, vice-admiral, rear-admiral, and commodore were assimilated in rank and precedence to relative army titles, but they were never created by law until 1862. During the war a number of spirited engagements occurred, but there was a great lack of efficient, material at home, and agents abroad were not able to enlist the active sympathies of nations or rulers. Benjamin Franklin did manage to equip one good squadron, but this was rendered almost useless by internal dissensions, and

it required the victory of Paul Jones in the “ Bon Homme Richard” over the “Serapis” to bring about any tangible result for the risk taken. During the war 800 vessels of all classes were made prizes, but the navy lost by capture 11 vessels of war and a little squadron of gun- boats on the lakes ; and, with 18 ships destroyed to avoid capture by the British, 5 condemned, and 3 wrecked at sea, the country was practically without a naval force between 1780 and 1785.

Owing to the depredations upon commerce 6f the Barbary powers, Congress in 1794 ordered the construction of six frigates, prescribing that four of them should be armed with 44 guns and two with 36 guns; but, the Berbers having made peace, the number of vessels was reduced one half, and no additions were made until 1797, when the “ Constitution,” “ United States,” and “ Constella- tion” were built. Trouble with France from 1798 to 1801 resulted in the formation of four squadrons operating in the West Indies ; these numbered 21 vessels in all, and, besides capturing nearly one hundred prizes, they gained experience and prestige by mauy short and decisive single actions. No further increase was made until 1802, when the war with Tripoli was declared ; up to this time the navy had cost the country, including sites for navy yards, only £2,000,000. In 1808 the “ gunboat policy” was revived, but, though 188 vessels of this class were built, their service was un- important and their usefulness questionable.

At the breaking out of hostilities with Great Britain in June 1812, the naval force of the United States consisted of a number of gunboats fitted for the protection of rivers and inlets, and of 17 sea-going ships, 9 of which were below the frigate class. From the close of the war in 1815 until the beginning of hostilities with Mexico in 1846, the American navy was engaged in the suppression of the slave-trade and of piracy, and in voyages of exploration and discovery. In 1846 California, after being once relinquished, was seized, and during the war the United States vessels were employed in blockading or capturing the ports upon both seaboards of Mexico, and in co-operating with the army,—all hostilities ceasing in 1847 with the oecupation of the city of Mexico. In 1848 Lieutenant Lynch commanded an expedition engaged on the exploration of the Dead Sea and the river Jordan ; in 1856 the ‘* Advance ” and “ Rescue ” searched for Sir John Franklin, followed later by the expeditions of Kane and of Hartstene;

in 1854 Strain made a partial survey of the Isthmus of Panama ; and in 1855 Rear- Admiral John Rodgers, in the ‘‘ Vincennes,” went farther into the Arctic Ocean through Behring’s Strait than any previous navigator. In 1858 the Paraguay expedition successfully finished its work ; and for many years, earnestly aided by Great Britain, a squadron was employed on the coast of Africa and in the West Indies for the suppression of the slave-trade.

The civil war broke out in April 1861, and its naval character was marked by two leading features: the first was that, while one side had a small force of naval vessels, which were generally good of their kind, the other entered the contest with absolutely nothing that could be called a man-of-war ; the second was that, though certain developments in the character and construction of ships and weapons had been foreshadowed before the war, and had even bcen partially realized, it was during the progress of the struggle that those changes took place in marine warfare which amounted to a revolution. The effect of rifle and shell-fire, the employment of the ram, the destructive energy of torpedoes, the application of armour to the sides of vessels, and the superiority of iron-armoured ships—all taught in practice what theory had in vain asserted. At the commencement of hostilities the number of vessels of all kinds in commission was 76 ; 136 were purchased in 1861, making the total 264, while the roll of enlisted men increased from 7500 to 22,000. At the close of the war there were 51,500 seamen and 7000

officers of all grades, and over 600 vessels ; at the navy yards 6880 ‘ maintaining those at New York, Norfolk, and San Francisco (Mare

artisans were employed; 208 steamers were built, and 313 out of |

a total of 481 were purchasod, all at a cost of over £38,000,000 ; 340 were afterwards sold for £1,500,000. On the Ist of January 1865 there were 5278 volunteer officers in service, but in 1870 this number had been reduced to 111, excluding 64 out of 305 applicants who had been admitted to the

regular service. The Confoderate navy was modelled precisely upon that of the Federal States. In the autumn of 1864, when at a maximum, it consisted of 16 iron- clads, 3 of which were rated as floating batteries, of 50 wooden vessels, and of the rover ‘‘Shenandoah.” Abroad cruisers were of great assistance to the Confederacy, the most notable of these being the ‘‘Sumter,” ‘‘Alabama,”’ “‘Georgia,” ‘‘ Florida,” ‘‘ Rappahannock,” and ‘‘ Shenandoah.”

Since the close of the war the United States navy has been doing excellent service in the peaceful pathways of science and humanity, the only warlike demonstrations having been that against Formosa in 1867 and that against Corea in 1870. Expeditions have been sent to the Arctic Ocean; ships have been employed in the survey of every sea; deep-sea soundings have been made both in the Atlantic and the Pacifie ; and five expeditions have tried to solve the problem of the best route for a trans-isthmian and inter-oceanic canal; scientific observers have occupied stations, and with important results, in the transit observations, and to-day the chain of telegraphic measurements of longitude around the whole world is the work of American naval officers.

Administration and Condition.—During the revolutionary war Congress through its cominittees and agents managed naval affairs. In 1789 these duties were entrusted to the secretary of war, and it was not until 1798 that the ‘‘ department of the navy” was ostab- lished. In 1815 a ‘‘ board of commissioners for the navy’’ was constituted, but the Act provided that nothing in it shonld be con- strued to take from the secretary his control of marine affairs. In 1842 this law was repealed, and the bureau system, under which all the duties were divided specifically among five offices, was estab- lished; in 1862 there was a new division of responsibilities, and the eight bureaus now existing were created. Each of these is under the control of a naval officcr, nominated by the executive and con- firmed by the senate, all chiefs of bureaus having assigned them the temporary rank of commodore, actual or relativo, when their own grades are below this. The bureaus are—(1) navigation, which controls all matters relating to pilotage and navigation, with a direct superintendence of the naval observatory and of the hydrographic, signal, naval intclligence, Nautical Almanac, war record, compass, and detail offices,—this last having charge of the personnel of the

service; (2) ordnance, which administers all artillery, ordnance, and torpedo matters; (3) equipment and recruiting, which is in charge of outfits, equipments, stores, recruiting, and apprenticeships ; (4) yards and docks, which super- intends the construetion of docks, naval grounds, buildings, and all civil-engineering work ; (5) medicine and surgery ; (6) provi- sions and clothing, which is responsible for the supplies of food, water, and clothing, and manages the accounts, thns performing under one direction these duties relegated in the army to the quartermaster, commissary, and paymaster ; (7) steam engineering, which designs and has the care of engines and boilers ; and (8) con- struction and repair, which performs the same duties for ships. The first four bureaus are under the direction of line-officers of the navy.

There are no maritime districts in the United States, naval authority being limited strictly to the navy-yard government. At present there are seven navy yards and three naval stations, in which the general administration is entrusted to specific depart- ments, all under the direct command of a line-officer of high rank, and each corresponding to a bureau of the central control. It is the intention of the Government to close all but three of the yards,

Island), together with a repair arsenal at Washington.

The judge advocato's office and the Naval Academy are under tho special supervision of the secretary. The Naval Academy ranks among the bost institutions of the kind in the world. It is situated at Annapolis, Maryland, and is governed by a line-officer super- intendent, assisted by an academic board made up of the heads of the departments of disciplino and of studies, and with a corps of instructors drawn mainly from the line of tho navy, with a few engineer and civilian assistants. All appointments of naval cadets are made by the president upon the nominations of members of Congress ; each of the congressional districts, about three hundred in all, is entitled to one representative at the institution, admission after nomination being based upon a rigorous examination. The curriculum is for four years, supplemented by a two years' cruise before final graduation.

Corrosponding to Greenwich Hospital in its days of old pensioners is the Naval Asylum, situated at Philadelphia ; and at Newport, Rhode Island, are

the headquarters of the torpedo station and of the training system for apprentices. The naval experimental battery is at Annapolis, though not a part of the Naval Academy; and in all the large seaboard towns are rendezvous for the shipping of men, and branches of the hydrographic offico for the dissemina- tion of maritime information.

The personnol of the active lst includes 1410 commissioned officers (602 of whom are at sea and 808 on shore), 7500 men, and 700 apprentices ; there is also a corps of marineinfantry, with 1887 enlisted men and 75 officers. All enlistments of sailors are voluntary, and for a period of three years, with special inducements for re-enlistment within a fixed period, and with the certainty of a pension or of a billet at the Naval Asylum after twenty-one years' service. There is no reserve, the active list representing the available force. Yor officers who have attained sixty-two years of age, or who have seen service for a term varying from forty to forty- five years, there is a retired list which entitles them without delay to 75 per cent. of their highest sea pay. Upon this list also there are officers, and in the Naval Asylum there are men, who are inca- pacitated for active service by reason of physical or other causes. Apprentices are enlisted between the ages of fourteen and eighteen, with obligatory service until the age of twenty-one is attained.

There are five foreign stations, divided geographically,—the North Atlantic, South Atlantic, European, Pacific, and Asiatic. In January 1883 there were 140 vessels of all kinds on the register, 23 of which were in commission for general cruising, aud 5 were employed on special service. Three modern steel steamers are being built ata private yard, and Congress has under consideration a new construction plan; by an annual expenditure of $4,288,000 this will give in ten years a modern steel navy of 70 ships, in every way adequate to the demands of the country. The estimates for the fiscal year ending Juno 30, 1885, require for the ordinary purposes of the navy $16,319,367-62, and for the increase of the navy, including tho completion of four double-turreted monitors of the armoured fleet, $7,449,581°76, or a total of $23,768, 889°38. The present effective cruising force is composed of 1 first rate, 14 second rates, and 21 third rates, or 36 in all; the available armoured vessels are 13 monitors of the old single-turreted type and 6 double-tnrreted monitors, lately rebuilt.

The coast survey and lighthonse establishment, both mainly in charge of naval officers, the revenue marine, life-saving, steamboat inspection, and marine hospital services, are all a part of the treasury department; the transfer of their control to the navy department is asked of Congress by the secretary of the navy, who also recommends the establishment, under his administration, of a bureau of mercantilo marine, the duties of which will be analogous to those of the mercantile marine department of the Board of Trade. (J. D. J. K.)

NAWANAGAR, or N. OWANUGGUR, a native state lying along the southern shore of the Gulf of Cutch, Bombay Presidency, India, between 21° 44’ and 22° 54’ N. lat. and 68° 58’ and 71° E. long,, with an area of 3393 square miles and a population in 1881 of 316,147. The chief, who has the title of jam, is a Hindu of the Jareja Rajput caste, and has powers of life and death over his sub- jects. The gross revenue is about £182,000; a tribute of £12,000 a year is payable jointly to the British Govern- ment, the gaekwdr of Baroda, and the nawab of Jundgarh. The principal products of the state are grain and cotton, and cloth and silk are the chief manufactures. Nawdna- gar, the capital, isa flourishing seaport town, nearly 4 miles 1 circuit, with a large trade, and a population of 39,668.

NAWAWL Mohyi al-Din Abt Zakaryé Yahya b. Sharaf al-Nawawi, born at Nawa in Jauldn, October 1233, head of the Ashrafia academy at Damascus from 1267, died at Nawd 20th December 1277, where his grave is still visited as that of a saint. To this honour he has better claims than most Moslem sheikhs, for not only was his life one of the most intense and unselfish devotion to learning, but be had the rare courage to take open part for his oppressed countrymen against Sultan Bibars, and alone among the Syrian doctors refused to sanction the exactions of which the “ Holy War” was the pretext. “Thou hast a thousand mamelukes,” he said, “‘each of whom wears a golden girdle, and two hundred female slaves adorned with all manner of jewels. When thou hast spent all this, and

thy mamelukes have only girdles of cord and thy slave- girls only clothes without jewels, I will vote for the tax.” The angry sultan banished him from

Damascus, and, though public opinion compelled this sentence to be revoked, Nawawi refused to return while Bibars was in the city.

Forty-two works of Nawawi are catalogued by Wiistenfcld, Leben und Schriften des Scheich . . . el Nawawi, Gottingen, 1849. His biographical ‘‘ Dictionary of Illustrious Men chiefly at the Begin- ning of Islamism,” forming the first part of the Zahdhtb al-asmd. wal-loghdt (a sort of analytical index to six theological and juristic works), was published by the same scholar, Géttingen, 1842-47. An edition of his manual of Shafiite jurisprudence (Minhdj al- tdlibin), a book of great reputation in the East, has been com- menced by L. W. C. van den Berg (vol. i., Batavia, 1882, with French version and notes).

NAXOS, one of the Cyclades, a fertile island in the Egean Sea, a little to the east of Paros. It was rich in vines and famous for its wine, and in consequence became one of the chief seats of the worship of Bacchus. The god found Ariadne asleep on its shore, when she was deserted by Theseus. From its fertility and wealth Naxos was the most powerful of the Cyclades. A tyrant Lygdamis ruled there for some time during the 6th century B.c. In 501 a Persian fleet unsuccessfully attacked it, but in 490 it was captured and treated with great severity. Four Naxian ships took part in the great expedition of Xerxes, but deserted and fought on the Greek side at Salamis in 480. Naxos was a member of the Delian Con- federacy ; it revolted in 471, was captured by Athens, and remained in her possession till her empire was destroyed. The history of the island henceforth is obscure. The most remarkable event was its capture, in 1207 a.p., by the Venetian Marco Sanudo, who founded there a state and a dynasty that flourished till the Turks took the island in 1566. Since the War of Independence it has belonged to the Greek kingdom. The chief town occupies the site of the ancient city on the north-west coast. Naxos, Paros, Antiparos, and some little islets form an eparchza, with a total population of about 21,000.

NAXOS, the earliest Greek colony in Sicily, was founded from Chalcis in 735 B.c., on the east coast immediately south of the modern town of Taormina. Within a few years it became strong enough to found Leontini and Catana. It is impossible here to enter on the tangled history of its relations with the other Greek cities of Sicily, and with the tyrants

Hippocrates, Gelo, &c. Naxos was the warmest ally of Athens in the Sicilian expedition. In 403 B.c. it was completely destroyed by Dionysius, and was never rebuilt. Its place was supplied in 358 by Tauromenium, to which the Naxian exiles flocked.

NAYAGARH, or Nyvacur, a petty state in Orissa, Bengal, India, with an area of 588 square miles. The state is a valuable and well-cultivated territory, abound- ing in noble scenery, with a splendid range of hills from 2000 to 3000 feet in height running through its centre. The population in 1881 was 114,622, most of them Hindus. The chief receives an estimated annual re- venue of £5418, and pays a tribute of £552 to the British Government.

NAYLER, or Naytor, James (1618-1660), a Puritan fanatic, was born at Andersloe or Ardsley in Yorkshire, in 1618. When the civil war broke out in 1641 Nayler, who was then resident in the parish of Wakefield, joined the Parliamentary army, and served as quartermaster under Lambert. In 1651 he adopted Quakerism, and became a zealous advocate of the new principles both as a preacher and writer. Gradually his opinions became tinged with the wildest fanaticism, until he arrived at the seeming conviction that he was a new incarnation of Christ. He gathered around himself a small band of disciples, who followed him from place to place, paying him the homage

due to one gifted with supernatural endowments. In October 1655 he, in imitation of Christ's procession into Jerusalein, entered Bristol on horseback riding single—"a rawboned nude figure, with lank hair reaching below his cheeks,"—attended by seven followers, some on horseback, some on foot, he in silence and they singing '" Hosanna! Holy, holy! Lord God of Sabaoth!" The procession passed on to the High Cross of Bristol, where Nayler and his followers were apprehended by the authorities. His trial occupied the second parliament of Cromwell for several days, and on December 16, 1656, he was convicted of blasphemy and sentenced to be whipped from the Palace Yard to the Old Exchange, to be branded in the forehead, to have his tongue bored with a red-hot iron, to be whipped through the streets of Bristol, and to suffer imprisonment with hard labour for two years. These stern measures had the effect of convincing Nayler that his pretensions to supernatural powers were the result of delusion, and on

May 26, 1657, he, after recantation, received his freedom. He was readmitted into the communion of the Quakers. In October 1660 Nayler set out to visit his long-forsaken family in Yorkshire, but died on the journey in Hunting- donshire.

A collected edition of the Tracts of Nayler appeared in 1716; a Relation of the Life, Conversion, Examination, Confession, and Sentence of James Nayler in 1657; a Memoir of the Life, Ministry, Trial, and Sufferings of James Nayler in 1719; and a Refutation of some of the more Modern Misrepresentations of the Society of Friends

commonly called Quakers, with a Life of James Nayler, by Joseph Gurney Bevan, in 1800.

NAZARENES (Na€wpator), an obscure Jewish-Christian sect or ‘‘ heresy,” existing at the time of Epiphanius in Coele-Syria, Decapolis (Pella), and Basanitis (Cocabe). According to that authority (Pan., xxix. 7) they dated their settlement in Pella from the time of the flight of the Jewish Christians from Jerusalem, immediately before the siege in 70 a.D.; he characterizes them as neither more nor less than Jews pure and simple, but adds that they recognized the new covenant as well as the old, and believed in the resurrection, and in the one God and His son Jesus Christ. He is unable to say whether their christological views were identical with those of Cerinthus and the like, or whether they differed at all from his own. This lacuna is filled up by Jerome (Zp. 79, to Augustine), who expressly says that they believed in Christ the Son of God, born of the Virgin Mary, who suffered under Pontius Pilate, and rose again, but adds that, “‘desiring to be both Jews and Christians, they are neither the one nor the other.” They used the Aramaic recension of the Gospel according to Matthew, which they called the Gospel to the Hebrews, but, while themselves adhering as far as possible to the Mosaic economy as regarded circumcision, sabbaths, foods, and the like, they did not refuse to recognize the aposto- licity of Paul or the rights of heathen Christians (Jer., Comm. in Isa., ix. 1). These facts, taken along with the name (comp. Acts xxiv. 5) and geographical position of the sect, lead to the conclusion that the Nazarenes of the 4th century were the direct representatives of the Jerusalem Christians of the 1st, who owned the presidency of James. Probably they are intended also by Origen (Contra

Cels., v. 61) and Eusebius (#. Z,, iii. 27) when two classes of Ebionites are discriminated, one of which acknowledged the supernatural origin of Christ. Compare EBIONITES; and see Ritschl, Hntstchung d. altkath. Kirche, bk. 1. sec. 3,

NAZARETH, in Galilee, now al-Nasira, the city of Mary and Joseph, and the place where our Lord spent his youth, is pleasantly situated in a hollow on the south slope of the hills (J. al-Sikh) which bound the plain of Esdraelon on the north. Though it had a synagogue (Matt. xiii. 54; Luke iv. 16), and is called in the Gospels a city, Nazareth

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must have been an obscure place! in the time of Jesus, for we find no mention of it outside of the New Testament till Eusebius and Jerome identify it with a “village” which undoubtedly occupied the place of the modern Nasgira. In Jerome’s time it was already visited by pilgrims, but as yet we hear nothing of relics or places associated with special incidents in the life of Jesus. The population was mainly Jewish,—exclusively so, we are told by Epiphanius, down to the time of Constantine,—and the Jews, after their manner in modern as in ancient times, seem to have been the inventors of various marvellous relics and identi- fications which were palmed off upon Christian pilgrims in the 6th century. Such at least is the natural inference from what Antoninus Martyr tells of these wonderfully friendly and communicative Hebrews, A century later Arculphus describes two great churches corresponding to the modern Greek church over the Virgin’s Well and the Latin church of the Franciscan monastery over the Grotto of the Annunciation. The place has since passed through various vicissitudes ; it was most flourishing in the time of the crusaders, who transferred to it the bishopric of Scythopolis. The Ottomans at length expelled the Christians; but the Franciscans established themselves under the protection of Fakhr al-Din in 1620. The town has now a Greek, a Latin, and a Moslem quarter, as well as a Protestant mission and orphanage. The population is variously estimated at from 6000 to 10,000.

The Virgin’s Well, just outside the town, must have been fre- quented by the women of ancient as of modern Nazareth; all the other traditional sites are highly dubious. But this hardly affccts the interest attaching to the town, for

the character of Nazareth must at all times have depended on its position and surroundings. It was a little country town of peasants aud handicraftsmen, nestling in olive groves and green meadows, separated and yet not distant from the busy life of the grcater Galilean cities, surrounded on all sides by the pleasantest landscapes of Canaan. The hill above the

‘town commands one of the finest views in Galilec, from Hermon to

Mount Carmel.

NAZARITE, or Nazirire (3), was the name among the Hebrews for a peculiar kind of devotee. The character- istic marks of a Nazarite were unshorn locks and abstinence from wine (Judg. xiii. 5; 1 Sam. i. 11; Amos ii. 11, 12); full regulations for the legal observance of the Nazarite vow are given in Numb. vi., where every product of the grape-vine is forbidden, and the Nazarite is further enjoined to abstain from approaching a dead body, even if it be that of his nearest relative. The law in question is not pre-exilic, and is plainly directed to the regulation of a known usage. It contemplates the assumption of the vow for a limited period, and gives particular details as to the atoning ceremonies at the sanctuary by which the vow must be recommenced if broken by accidental defilement, and the closing sacrifice, at which the Nazarite, on the expiry of his vow, cuts off his hair and burns it on the altar, thus return- ng to ordinary life. Among the later Jews the Nazarite vow of course corresponded with the legal ordinance, which was further developed by the scribes in their usual manner (Mishna, Vacir; comp. 1 Mac. iii. 49; Acts i. 23 sq.; Joseph., Ant., xix. 6,1; Id., B. J, ii. 15,1). On the other hand, in the earliest historical case, that of Samson, and in the similar case of Samuel (who, however, is not called a Nazarite), the head remains unshorn throughout life, and in these times the ceremonial observances as to uncleanness must have been less precise. Samson’s mother is forbidden to eat unclean things during pregnancy, but Samson him-

- Even the form of the name is uncertain, Na(upér, Naapéd, Na{apd. These variations are intelligible in a Hebrew or Syriac name with fem, termination, but hardly enable us to fix the original form. In Syriac and Arabic the ¢ is transcribed as sharp s; thus the root of the name Nazareth would be N-S-R, and so many ancients and moderns suppose

that in Matt. ii. 23 the prophecy referred to is that of the Branch (néser) in Isa. xi. 1.

self touches the carcase of a lion and is often in contact with the slain.?

In the cases of Samuel and Samson the unshorn locks are a mark of consecration to God (oondsy "13, Judg. xiii. 5) for a particular service,—in the one case the service of the sanctuary, in the other the deliverance of Israel from the Philistines. Since, moreover, the Hebrew root N-z-R is only dialectically different from N-p-R, "to vow," both corresponding to the same original Semitic root (Arabic N-DH-R), it would seem that the peculiar marks of the Nazarite are primarily no more than the usual sign that a man is under a vow of some kind. To leave the locks unshorn during an arduous undertaking in which the divine aid was specially implored, and to consecrate the hair after success, was a practice among various ancient nations, of which examples may be seen in Spencer, De Legibus Heb., iti. 1, cap. 6; but the closest parallel to the Hebrew custom is found in Arabia. There the vow was generally one of war or revenge (//amdsa, p. 167; 'Antara, Aoal., 1. 74; Moh. in Medina, p. 201), and till it was accom- plished the man who vowed left his hair unshorn and unkempt, and abstained from wine, women, ointment, and perfume. Such is the figure of Shanfara as described in his Ldémiya. The observances of the zkrdm belong to the same usage (see vol. xv. p. 674), and we find that at Tif it was customary to shear the hair at the sanctuary after a journey (Moh. in Medina, p. 381). The affinity between the Arabian usage and a case like that of Samson is obvious, and the consecration of Samuel has also its Arabic parallel in the dedication of an unborn child by its mother to the service of the Kaba (Ibn Hisham, p. 76; Azralk, p. 128); but we have not sufficient data to enable us to trace the further development of the Nazarite vow among the Hebrews. 'The spirit of warlike patriotism that character- ized the old religion of Israel could scarcely fail to encour- age such vows (comp. 2 Sam. xi. 11, and perhaps 1 Sam. xxi. 4, 5), and from the allusion in Amos we are led to suppose that at one time the Nazarites had an importance —perhaps even an organization—parallel to that of the prophets, while on the other hand the Canaanized popular religion of the 8th century B.c. made light of an institu- tion that belonged to a very different

religious type from Canaanite nature worship. ‘The Nazarites as they appear in Amos have another parallel in the Rechabites.

NEAL, Danren (1678-1743), author of the [History of the Puritans, was born in London in December 1678. He received his early education at Merchant Taylors’ School and at a Dissenting academy, after which he went to Holland and studied some time at the universities of Utrecht and Leyden. In 1704 he became assistant- minister of the Independent congregation of Aldersgate Street, London, and in 1706 sole pastor. In 1720 he published in two volumes a Jfistory of New England, which reached a second edition in 1747. His occasional printed sermons also assisted to increase his reputation among Nonconformists, and it was at the request of several influential co-religionists that he undertook to write a History of the Puritans, the first volume, which commenced with the Reformation in England, appearing in 1732, and the fourth, bringing the narrative down to the Act of Toleration of 1689, in 1738. The History was attacked for unfairness and misstatements by Bishop Maddox, to whom Neal replied in a pamphlet entitled A Review of the Principal Facts objected to the first volume of the History of the Puritans. The conscientious accuracy of Neal is indeed beyond praise, although he was undoubtedly strongly prepossessed in favour of his own side of the question, Luke i. 15. Compare also the tradition as to James the Just, vol. xiii, p. 553.

and it has been somewhat happily said of his representa- tions of the Puritans, that he “blanches them into a sweet

and almond whiteness.” He died in April 1743.

Neal’s History of the Puritans, accompanied with a life of the author, was edited by Toulmin in six volumes, 1793. This edition has been frequently reprinted, and an edition in two volumes, revised and enlarged by John O. Choules, appeared at New York in 1848.

NEALE, Joun Mason (1818-1866), ecclesiastical historian and hymnologist, was born in London, January 24, 1818, and was educated at Trinity College, Cambridge. He became incumbent of Crawley, Sussex, in

1842, and in 1846 warden of Sackville College, East Grimstead, an appointment which he held till his death, August 6, 1866.

Neale was strongly High Church in his sympathies, and in 1855 founded a sisterhood named St Margaret's. The most important of his publications is his History of the Eastern Church (1850-51). He occupies a high place as a hymnologist, but principally as a translator of ancient and modern hymns, his best-known transla- tions being probably " Brief life is here our portion," '' To thee, © dear, dear country," and '' Jerusalem the golden," which are in- cluded in the poem of Bernard of Cluny, De Contemptwu Mundi, translated by him in full. He also published Essays on Liturgiology, 1863 ; and among his other works are Medieval Preachers, 1857, and History of the so-called Junsenist Church of Holland, 1858.

NEANDER, Aveust (1789-1850), one of the most distinguished and influential of the modern theologians of Germany, was born, of Jewish parents, at Géttingen on January 17,1789. His father, Emmanuel Mendel, is said to have been a common Jewish pedlar ; but little seems to be really known of his circumstances and character. His mother was a woman of tender and noble disposition; and from the maternal side, as in so many other cases, the virtues and talents of the son appear to have sprung. While still very young, he removed with his mother to Hamburg ; and in the grammar school, or Johanneum, of that city he received his classical education. There, as throughout life, the simplicity of his personal appearance and the oddity of his manners attracted notice, but still more, under all outward peculiarities, his great industry and mental power. From the Johanneum young Mendel passed to the gymnasium, where he attended for a year the pre- lections in philology, philosophy, and theology. The study of Plato appears especially to have engrossed him at this time. One of his young friends, Wilhelm Neumann, writes of hini in 1806—" Plato is his idol—his constant watch- word. He sits day and night over him; and there are few who have so thoroughly, and in such purity, imbibed his wisdom. It is wonderful how entirely he has done this without any foreign impulse, merely through his own reflexion and downright study." Considerable interest attaches to his early companionship with the writer of this letter, and certain others, among whom were the afterwards well-known writer Varnhagen von Ense and the poet Chamisso. His letters to Chamisso are

singularly in- teresting. They breathe throughout the most simple and glowing enthusiasm, while the picture of a pure and affec- tionate nature, and the struggling comprehensiveness of a great spirit, are impressed on every page of them. These letters enable us to understand with some degree of clear- ness the great change which now took place in Neander's convictions. They reveal a course of spiritual training very much analogous to that which he has described in many cases in his Church History. He reached the gospel through Platonism. The influence of his teacher's idealism may be visibly traced in some of his conceptions of Christian doctrine. He was baptized on the 25th February 1806, when he adopted, instead of his Jewish name of David Mendel, that under which he was always afterwards known.

In the same year he went to Halle to study divinity. At Halle Schleiermacher was then lecturing in the first height of his fame as a teacher. Neander met in him the

very impulse which be needed, while Schleiermacher found a pupil of thoroughly congenial feeling, and one destined to carry out his views in a higher and more effective Christian form than he himself was capable of imparting to them. But before the year had closed the events of the Franco-Prussian war compelled his removal to the less congenial Gottingen. There, however, he continued his studies with ardour, made himself yet more master of Plato and Plutarch, and especially advanced in sacred learning under the venerable Planck. The impulse com- municated by Schleiermacher was confirmed by Planck, and he seems now to have realized that the original in- vestigation of Christian history was to form the great work of his life.

Having finished his university course, he returned to Hamburg, and passed his examination for the Christian ministry with great distinction. He was not fitted, how- ever, for the pulpit, and seems to have preached but seldom. After an interval of about eighteen months he definitively betook himself to an academic career, " habi- litating" in Heidelberg, where two vacancies had occurred in the theological faculty of the university, from the re- moval of Marheineke and De Wette to Berlin. He entered upon his work here as a

theological teacher in 1811; and in the year following an extraordinary professorship re- warded his learning and industry. In the same year (1812) he first appeared as an author by the publication of his monograph On the Emperor Julian. The fresh insight into the history of the church, and the vivid and striking power of delineation evinced by this work, —vague and sketchy, perhaps, as it now seems in the light of his maturer productions,— at once drew attention to its author, and marked him asa rising theologian. Accord- ingly, even before he had terminated the first year of his academical labours at Heidelberg, he was called to Berlin as the associate of De Wette and Schleiermacher—an illustrious band, whose labours have left an imeffaccable impress upon German theology.

In Berlin Neander's life was only varied by the succes- sive publications which appeared in such fertility from his pen. In the year following his appointment he published a second monograph On St Bernard and his Age, and then in 1818 his work on Gnosticism (Genetische Entwickelung der vornehmsten gnostischen Systeme). A still more extended and elaborate monograph than either of the preceding followed, On Chrysostom, and again, in 1825, another on Tertullian (Antignostikus). He had in the meantime, how- ever, begun his great work, to which these several efforts were only preparatory studies. The first volume of his General History of the Christian Religion and Church, embracing the history of the first three centuries, made its appearance in 1826. The others followed at intervals, — the fifth, which appeared in 1845, bringing down tlic narrative to the pontificate of Boniface VIII. A posthu- mous volume, edited by Schneider in 1852, carried it on to the period of the council of Basel. Besides this great work he published in 1832 his History of the Planting and Training of the Christian Church by the Apostles, and in 1837 his Lefe of Jesus Christ, in its Historical Connexion and Development, called forth by the famous Life of Strauss. In addition to all these labours, he gave to the public many miscellaneous sketches from the history of the church and of theological opinion; as, for example, his Memorabilia from the History of Christian Life (1822), his volume under the title of the Unity and Variety of the Christian Lafe, his papers on Plotinus, Thomas Aquinas, Theobald Thamer, Pascal, Newman, Blanco White, Arnold, &c., and other oc- casional pieces (Kleine Gelegenhettsschriften, 1829), mainly of a practical, exegetical, and

historical character. Since his death a succession of volumes, representing his various

courses of lectures, have appeared (1856-64), in addition to the Lectures on the History of Dogma, admirable in spirit and execution, which were edited by Jacobi in 1857. The life of Neander, as may be gathered from this mere enumeration, was one of unwearied work in his study and in his lecture-room. He lectured usually three times a day, his lectures embracing almost every branch of theology— exegetics, dogmatics, and ethics, as well as church history. He cherished a warm and affectionate interest in his students —his ungrudging self-denial and benefactions in their behalf forming one of the most kindly traditions which surround his name. He was of a very child-like and yet aspiring nature,—simple and affectionate, yet subtle and comprehensive in his views. He died on July 14, 1850, worn out and nearly blind with incessant study.

Neander's theological position can only be explained in connexion with Schleiermacher, aud the manner in which while adopting he modified and carried out the principles of his master. With a mind less restlessly speculative, less versatile, discriminating, and logical, he possessed, in higher union than Schleiermacher, depth of spiritual insight and purity of moral perception with profound philo- sophical capacity. Characteristically meditative, he rested with a secure footing on the great central truths of Christianity, and recog- nized strongly their essential reasonableness and harmony. Alive to the claims of criticism, he no less strongly asserted the rights of Christian feeling. '* Without it," he emphatically says, '' there can be no theology ; it can only thrive in the calmness of a soul consecrated to God." And exactly in the same spirit, and proceeding from the same strong recognition of the absolute necessity of this Christian element in all theology, was his favourite motto, —'' Pectus est quod theologum facit."

His Church History remains the greatest monument of his genius. Defective in graphic personal details, and in aclear exhibition of the political relations of the church, somewhat heavy in style, with a certain vagueness and want of pictorial life throughout, it is yet unrivalled in its union of vast learning and profound philosophic penetration, its varied comprehensiveness and

abundant store of materials, its insight into the living connexion of historical events, but ‘especially into the still more living and subtle nexus which binds together the growth aud development of human opinion,—in its display of such qualities, with the most simple-hearted Christian piety, the most lively appreciative intcrest in the ever-varying fortunes of the church, the finest discernment of all the manifold phases of the Christian life. the most genuine liberality and catholic sympathy.

See Krabbe, August Neander (1852), and a paper by Kling in the Stud. wu. Krit. for 1851. (J. T.)

NEANDER, Joacuim (c. 1650-1680), German hymn- writer, when about twenty years of age came under the influence of a Labadist preacher (see vol. xiv. 163) named Untereyk, in his native city of Bremen. After studying at Heidelberg and Frankfort, where he formed friendships with Spanheim and Spener, he settled at Diisseldorf as rector of the Latin school in connexion with the Reformed Church. His Labadist views were somewhat out of harmony with those of the rulers and of the church, and in 1676 he incurred church censure for abstaining and inducing others to abstain from joining in the celebration of the communion. It was during the term of his suspen- sion from his teaching office that many of his hymns were written. He ultimately renounced his connexion with the separatists, and in 1679 returned to Bremen as one of the preachers of St Martin’s church. In the same year he published the Bundeslieder and Dankpsalmen. He died in 1680. The Neanderthal near Diisseldorf takes its name a him. For his place in hymnology see vol. xii. p.

587.

NEARCHUS, son of Androtimus, one of the most dis- tinguished officers in the army of Alexander the Great, and admiral of his fleet, with which he made an important and interesting voyage of discovery in the Indian Ocean. He was a native of Crete, but settled at Amphipolis in Macedonia, and must have been at an early period of life a person of some consideration, as we find him attached to the court of Philip, where he became the friend and com- Panton of the young Alexander, and when the prince fell

into disgrace with his father Nearchus was banished, together with Ptolemy the son of Lagus, Harpalus, and others, for having participated in the intrigues of Olympias and her son against the old king. But after the death of Philip (336 B.c.) he was at once recalled, and rose to great favour with Alexander, which he appears to have fully merited by his abilities and judgment. He did not, how- ever, accompany him in his earlier campaigns into Asia, having been left behind in the government of Lycia and the adjoining provinces, where he remained for five years. But in 329 B.c. he joined the king with a force of Greek mercenaries at Zariaspa in Bactria, and from this time he held an important post in his army, and took an active part in his Indian campaigns. Hence when Alexander had assembled his fleet on the Hydaspes, with a view to descending that river and the Indus to the sea, he confided the chief command of it to Nearchus. This post must, however, have been one of comparatively little importance, so long as the king himself remained with the fleet; but when, after descending the Indus to its mouth, and making a short excursion upon the Indian Ocean, Alexander him- self undertook to conduct the army by land through the deserts of Gedrosia to Susa, while he confided the command of the fleet to Nearchus, with orders to conduct it to the head of the Persian Gulf, the position became one of great responsibility, and the success with which he accomplished the task rendered his name for ever famous in antiquity. He set out in the first instance from a naval station at some point in the delta of the Indus; but, finding, on reach- ing the mouth of that river, that the monsoon was still blowing with great violence, he remained for twenty-four days in a neighbouring port, to which he gave the name of the Port of Alexander. This is in all probability the same harbour which now forms the well-known seaport of Kurrachee. Sailing thence about the beginning of November (325 B.c.), he proceeded for five days along the coast to the westward as far as the mouth of the Arabis (now called the Poorally), and thence three days further, along the coast of the Oritz, to a place called Cocala, where he was able to communicate for the last time with the land army of Alexander, and lay in a fresh stock of provisions. From thence he still followed the coast of the Orit for three days, as far as a place called Malana, which still bears the name of Cape Malan. It was at this point that the most difficult part of his voyage began, as from hence to the headland of Badis, now called Cape Jask, a distance of above 400 geographical miles, his course lay along the barren and inhospitable shores of the Mekran,

inhabited by a very sparse population, who subsisted, as they do at the present day, almost wholly upon fish, for which reason they were termed by the Greeks Ichthyophagi. Hence the crews of the fleet suffered severely from the want of pro- visions, especially from that of corn or meal of any kind, of which they obtained no supply till their arrival at Badis. In other respects the navigation presented no real difficulties, the coast being free from reefs and other hidden dangers; and at a place called Mosarna they procured a pilot, after which they were able to proceed more rapidly. So slow and cautious had been their previous progress that they took twenty days to accomplish the distance from Malana to Badis, which Nearchus in consequence estimated at 10,000 stadia, or 1000 geographical miles, more than double the true distance. The remainder of the voyage presented comparatively little difficulty. After sighting from a distance the lofty headland of Maceta (Cape Mussendom), which marks the entrance to the Persian Gulf, the fleet put into the river Anamis in the fertile district of Harmozia (Ormuz), where they were agreeably surprised by the tidings that Alexander with his army was cncamped at no great distance in the interior.

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After communicating with the king, Nearchus resumed his voyage along the northern coast of the Persian Gulf to the mouth of the Euphrates, and thence ascended the Pasitigris to Susa.

To conduct a large fleet, consisting principally of war galleys, along so great an extent of an unknown coast was undoubtedly an exploit requiring great prudence and ability on the part of its commander; but the voyage of Nearchus has acquired a much greater celebrity than it really deserves, both in ancient and modern times, from the circumstance that it stood entirely alone in antiquity, the similar expedition of Hanno along the west coast of Africa being almost unknown both to the Greeks and Romans, while in modern days it has attracted a greatly increased amount of attention from the accidental circum- stance that a complete and trustworthy record of it has been preserved. Nearchus himself wrote a detailed narra- tive of his expedition, of which a regular and full abstract was embodied by Arrian in

his work on India,—one of the most interesting geographical treatises that has been trans- mitted to us from antiquity.

The success with which Nearchus had accomplished this arduous enterprise led to his selection by Alexander for the more difficult task of circumnavigating the great peninsula of Arabia from the mouth of the Euphrates to the Isthmus of Suez. But this project was cut short by the illness and death of the king (323 B.c.). In the troubles that followed we hear little of Nearchus, who appears to have assumed no prominent position, but we learn that he attached himself to Antigonus, and probably therefore shared in the downfall of that monarch (301 B.C.).

at narrative of his voyage, as transmitted to us by Arrian, is contained in the editions of that author's works by Raphelius, Schmieder, and Kriiger, as well as in the more recent edition by Dr G. Muller (Paris, 1846), which forms part of Didot's Bidlio- theca Greea. But by far the most valuable edition of the original text is that published by the same author, with copious geographical notes, in the first volume of his Geographi Greci Minores (Didot, Paris, 1855). An English translation, with a very elaborate com- mentary, was published by Dr Vincent in his Commerce and Naviga- tion of the Ancients in the Indian Ocean (4to, London, 1807). But much of his geographical information is now obsolete. (E. H. B.)

NEATH, a municipal and parliamentary borough and market-town of Glamorganshire, South Wales, is prettily situated near the mouth of the Neath, and on two railway lines, 8 miles north-east of Swansea and 39 west-north- west of Cardiff. The older streets are narrow and ill- paved; but there are several handsome villas on the slopes bordering the town. The principal buildings are the parish church of St Thomas, a large and plain structure with an ancient tower; the new church of St David's; the town-hall, with corn exchange in the basement story; and the new market-house. There are slight remains of the castle of Jestyn-ap-Gwrgan, situated about a mile from the town, and rebuilt in 1111 by Richard de Granville. Of the Cistercian abbey—Abbaty-Glyn-Nedd—which he also founded, and which was at one time the finest abbey in Wales, there still exist the external walls, with parts of the chapel, vaulted chapter-house, refectory, and abbot's house. The town is situated in the midst of an important mineral district,

and possesses very extensive tinplate works, as well as blast furnaces, iron foundries, steam- engine factories, copper-works, and chemical manufactures. In the neighbourhood there are large coal-mines. Vessels of 300 or 400 tons can reach the quays at high tide, and parliamentary powers have been secured to erect new docks. With Abernant and Swansea there is water coni- munication by means of canals. There isa large export trade in coal, copper, iron, and tin, the principal imports being timber and general merchandize. Neath is included in the Swansea parliamentary district of boroughs. The

population of the municipal borough (1486 acres) in 1871 was 9319, and in 1881 it was 10,409. That of the par- liamentary borough (1629 acres) in 1881 was 11,216. The town occupics the site of the ancient Nidus or Nidum of the Romans. It was given by Richard Fitz-Hamon to his brother Richard de Granville, the ancestor of the Granvilles, marquises of

Bath. It is a borough by prescription, and reccived its first charter from Edward II.

NEBRASKA, a central State of the American Union, Plate TI,

lies between 40° and 43° N. lat.; the Missouri flows along its eastern side, the most easterly point being 95° 25’ W. long,, and the boundary line separating it from Wyoming on the west is 104° W. long. It is bounded on the §. by Colorado and Kansas, on the E. by Missouri and Iowa, on the N. by Dakota, and on the W. by Wyoming and Colo- rado. The width of the State from north to south is 208} miles, the length from east to west 413 miles, and the area 76,647 square miles, or 49,054,080 acres.

The greater part of Nebraska is a plateau. point is at the mouth of the Nemaha, in the south-eastern part of the State, where the elevation is 880 feet; the highest spot is Scott’s Bluffs, in the extreme western part of the State (6000 feet). The eastern half of the State has an average elevation of 1400 feet ; and the whole State averages 2312 feet above the sea.

There are no mountains, but in the northern and western parts there are some ridges and a few lofty hills. Generally the slopes are gentle, but occasionally precipitous, and in rare cases there are cafions with

perpendicular sides. The lands of three-fourths of the State are gently rolling. The surface owes its present form mainly to erosion. Between all the forms of upland surface the transition is gradual, The bottom lands and valleys are the most con- spicuous modifying features of the surface. They are huge shallow troughs, varying in breadth from a quarter of a mile on the smaller streams to 23 miles on the Platte and the Missouri. Their numerous terraces, like broad steps, gradually lead to the bordering uplands, which in turn are varied in height and form. Occasionally it is hard to determine where the bottom ends and the bordering bluffs begin, but generally both forms are clearly outlined. The innumerable tributaries that creep quietly into the main bottoms greatly complicate and beautify the forms of land-scape. The number of these valleys is very great, the Republican alone having more than four hundred tribu- taries. Not less than 25 per cent. of the entire surface of the State is composed of well-watered valleys. The few destitute of water are regaining the streamlets of former times through the climatic changes brought on by the settlement of the State. Most of these bottom lands, though composed of the richest vegetable mould and alluvium modified by loess materials, are perfectly dry, and rarely subject to overflow. A clear conception of the topography can only be obtained by crossing the State at right angles to the courses of the valleys. The rolling lands bordering the valleys gradually disappear as the divide is approached which separates one drainage system from the next. Here the land swells out into a gently undulating plain that varies in extent from 1 to 30 miles. Some of these higher uplands have a great number of shallow basin-like depressions where soil and grasses closely resemble those of the bottom lands. They are the sites of small lakes that’ recently existed here, and some of them still retain this character, being filled with fresh water from 1 to 15 feet in depth. South of the valley of the Niobrara, and commencing in 100° W. long,, are the noted sand-hills. They vary in height from a few yards to several hundred feet. Almost every form of wind sculptur- ing is found, but the conical predominates. Though formerly naked, these hills have recently become covered with grasses which are fixing the sands, and preserving

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their curious crater-like forms. They extend to the head of the forks of the Loup river, covering an estimated area of 8000 square miles.

The average mean temperature of the summer months— June, July, and August—in eastern Nebraska is 73° Fahr. At the North Platte it is slightly higher. Excepting a small section in the north-western part, the whole State is included between the summer isotherms of 72° and 76°. The mean temperature of the autumn months—September, October, and November—is 49°. As excessive rains rarely fall during these months, the comparatively high mean temperature rendcrs the autumn season long and delight- fully mild. The isotherm of 20° during the winter months—December, January, and February—embraces all of Nebraska except the north-west corner, where the temperature is slightly lower, and the south-east corner, where it is slightly higher. The spring months— March, April, and May—have a mean of 47° Fahr. The mean of the whole year is in the southern half of the State 55°, in the northern half 524°. Rarely does the tempera- ture in midsummer rise to 100°. In twelve years the thermometer fell below zero on an average thirteen times a year. The lowest point ever reached was 32° below zero. The heat of summer is constantly modified by breezes. Owing to the dryness of the atmosphere the cold is not felt more when the thermometer registers — 20° than in moist regions when it marks only zero. In winter the prevailing winds are from the north-west, changing, as spring advances, to the south-west, from which direction they mainly blow through summer and autumn. During some winters there are occasional wind-storms of great severity, preceded by a fall of snow, and followed hy very low temperature. Such storms last from one to three days, and when they cease the temperature reaches the lowest point experienced in this region. The extreme cold continues for a few days only. Fortunately the severe types of such storms are rare even here, and the w.nters on the whole are remarkably adapted to continuous labour in the open air. The atmosphere is wonderfully clear and pure throughout the year; objects can be seen at a great distance, and clouds when formed are outlined with exceptional clearness.

The rainfall in eastern Nebraska is abundant. At the Missouri it averages 40 inches a year; 100 miles farther west 32 inches; 200 miles west of the eastern boundary 30 inches. Beyond this point it more rapidly lessens until the North Platte is reached in western Nebraska, where the average is only 20 inches. In the end of May, or in early June, when the “big rise” of the Missouri and the Platte occurs, a rainy season invariably commences which lasts from three to eight weeks. As this is the time when crops most need rain, destructive droughts are rare m eastern Nebraska. After the wet season rains still occur, but at longer intervals. During winter rain rarely falls, Snow ranges in depth from 1 to 10 inches. There are many facts that show a constantly increasing rain- fall in the State. One reason for this is believed to be the great depth of the soil, and the great increase of absorption produced by cultivation. The loess soils, of which the surface of Nebraska is largely composed, only need the native sod to be broken up to be transmuted into a huge sponge absorbing all the moisture that falls on it.

Nebraska is exceptionally healthy, especially for persons of consumptive tendency. This is owing to its elevation above the sea, the dryness of the atmosphere, and the great amount of ozone in it, the prevalence of winds, and the fine natural drainage of the State. The diseases incident to the climate are rheumatism, neuralgia, and in isolated spots malaria. With the progress of settlement, and a lessen- Ing exposure, these ailments are gradually disappearing. |

In striking contrast to past geological times, there are Lakes.’

now no large lakes in Nebraska. There are, however, a great number of small lakelets. Many of these have been formed by “cut offs” on the Missouri, Platte, Elkhorn, Blue, and other rivers. At the head of the Elkhorn river is a region containing over thirty small lakes, many of which are of great beauty, with pebbly bottoms, and water clear as crystal. A still more extensive region of small lakes is at and between the heads of the Loup rivers. At the head of Pine Creek, a tributary of the Niobrara, there are many saline lakelets and ponds. A large saline bog, fed by a vast number of saline springs, covers about 500 acres, 2 miles west of Lincoln. Many smallcr ones exist in the same vicinity. Salt has been manufactured here in

con- siderable quantity by solar evaporation. abundant along most of the river bluffs and on the rolling lands of eastern Nebraska. On the long reaches of nearly level land springs occur at longer intervals, and on the watersheds still more rarely. Even here water can readily be obtained by wells, from 15 to 50 feet deep, excepting in a few counties like Clay, Fillmore, Adams, and Phelps, where, owing to the great thickness of the superficial deposits in some localities, shafting must be much deeper. Artesian wells have been successful, the depth at which flowing water has been obtained varying from 500 to 1000 feet.} .

The name Nebraska signifies land of broad rivers. Rivers.

Chief of all is the Missouri, which flows in a tortuous course for 500 miles along its eastern boundary, and is navigable for 2000 miles above Omaha. Next in import- ance is the Platte, which flows through the whole length of the State from west to east. Rising in lakelets in the Rocky Mountains, fed by snows, its entire length approxi- mates 1200 miles, When it enters the State it is already a broad and rapid, though shallow, river, flowing over a sandy bed. At North Platte it forks, one branch being known as the South and the other as the North Platte. The Loup is the first large tributary. It rises among the sand-hills south of the Niobrara, ina group of small lakes. It has three main branches, known as the South, Middle, and North Loups, each of which in turn has many tribu- taries. The Middle Loup, whose main direction is south- east, is 250 miles long. The Elkhorn, which empties into the Platte a short distance above the latter's junction with the Missouri, is one of the most beautiful streams of the State. It too has its source ina region of small lakes near 99° 30' W. long. Hereit has a remarkably broad bottom, with low bordering uplands. It flows over a rocky bottom in a south-easterly direction about 250 miles. Its principal tributaries are the North Fork and the Logan, the latter having an extraordinary number of tributaries. Near the south line of the State the Republican river and its numerous affluents drain a large area. It rises in the Colorado plains, but flows 216 miles through the State. Near the northern boundary is the Niobrara river, which rises in Wyoming, and flows 263 miles through the State before uniting with the Missouri. It is the most rapid and turbulent stream in the State. In 102° 30' W. long,, where it is 80 yards wide, it enters a deep cafion with high and often perpendicular walls, which extend for 180

miles. After emerging from the cafion it remains a broad, rapid, and sandy river to its mouth. The most important of its numerous tributaries are the Keya Paha and the Verdigris. Many other rivers in Nebraska are remarkable for the beauty and fertility of the sections which they drain, the most important being the Bows, the Big and Little

1 An artesian well in the Government Square in Lincoln struck brine at 250 feet, and at 550 feet a heavy flow was encountered. ‘The source of the brine was the reddish sandstone of the Dakota group (Cretaceous), which here underlies the superficial deposits.

Springs are Springs.

Flora.

Fauna.

Geology.

Blue, the Great and Little Nemaha, and Salt Creek. The water-power of the State is enormous. Though the streams meander through broad bottoms, places can be found every few miles where the fall is from 3 to 10 feet to the mile.

Nebraska is the meeting-place of two rather distinet floras— that of dry regions from the west, and their relatives from the moister east. Even many native Rocky Mountain plants have crept down to the plains of Nebraska. Of plants indigenous to the State 2000 species have been collected; among these, 1671 species are flowering plants. The Composite are represented by the largest number of species, there being 244 within the State. The sedges are represcnted by 151 species, though there are comparatively few individuals. The grasses are the leading vegetable forms in the number of individuals, though as yet only 147 species have been detected. Originally the short buffalo grass (Buchloe dactyloides) was everywhere abundant, but it has almost entirely disappeared from the eastern half of the State and from large sections in its western portions, the taller blue-joint

(Andropogon fureatus, &c.) grasses taking its place. Nothing can surpass the beauty of the prairies during the summer season when covered with rank. grasses and myriad flowers. Of forest trees 71 species are native. The leading variety in the number of indi- viduals and forests is the cotton-wood (Populus monilifera), which grows luxuriantly on river bottoms and many uplands, The ash-leaved maple, soft maple, elms, various species of ash, lindens, and willows are in various parts of the State about equal in abund- ance. The most valuable tree is the noble black walnut, which is extremely hardy and grows luxuriantly. The red eedar is abun- dant in some sections, and grows well everywhere. Two species of spruce and two of pine are found on tributaries of the Niobrara and Loup, and in the extreme western part of the State. Shrubs are represented by 91 species. Wild fruits abound, among which plums and grapes are most conspicuous, the former represented by three species and an endless number of varieties. The grapes are limited to timber belts, where they sometimes grow so luxuriantly as to make an almost impenetrable thicket of vines. The smaller wild fruits are widely distributed over the State.

Before the advent of the white man Nebraska was a paradise for wild animals,—the buffalo, elk, deer, antelope, beaver, wolves, lynx, foxes, &c. The buffalo has been banished, but the rest are still found in the sparsely settled sections of the State. The bird fauna is well developed, being rieh in genera (156); the species number at least 261. Many species of fish, molluscs, and a few reptiles are present in the streams. During a few years, and notably in 1874, 1876, and 1877, the migrating locust (Caloptenus spretus), whose native habitat is beyond Nebraska, did considerable damage. It does not appear on the average more than once ina decade, and owing to the continually increasing area brought under cultivation the damage from its visitations is continually growing less. Com- paratively little damage has yet been experienced from other insect pests.

No Arehean rocks are found im situ in the State. The Palzozoie system is represented only by rocks of Carboniferous age, which are found in south-eastern Nebraska, and cover an area of about 2500 square miles. These represent only the Upper Carboniferous, and are mainly yellowish micaceous sandstone, drab, greenish, lead-coloured, ash-coloured, and brownish clays,

and indurated, hard, greyish and yellowish limestones. No thick ASE Oo oe %,

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Geological Map of Nebraska,

beds of coal have yet been discovered. The lower coal horizon is about 800 feet below the surface along the Missouri as far south as Richardson county, where the upper strata indicate a possible lower level geologically than is exposed elsewhere in the State. Thin beds of coal, from 6 to 18 inches thick, are found near the surface in Cass, Otoe, Nemaha, Johnson, Pawnee, and Richardson counties; in the last occurs the best coal yet found in the State,

NEBRASKA

At Aspinwall and on the State boundary it is 24 inches thiek in places. In the south-western part of the county a bed occurs from 20 to 28 inches thiek, from whieh at least half a million bushels have been taken within two years to supply local demands. This bed has been traced from east to west about 20 miles, and from north to south 4 miles. The coal is of good quality. On the west side of the Carboniferous formation, and eommencing at the mouth of Salt Creek, is a narrow strip of Permian rocks which on the Kansas line is about 15 miles broad. The rocks are mainly variously-coloured magnesian limestone, full of geode cavities, the entire thickness ranging from 20 to 100 feet. The Jura Trias is entirely wanting in eastern Nebraska. Resting conformably on the Permian are the various strata of the basal members of the Cretaceous system. Variegated clays are overlaid by reddish brown conglomerates and sandstones which form the Dakota group, whose thickness ranges from 20 to 300 feet. Above this group occur blackish and ash-coloured shales ; then a yellowish limestone; then a layer of whitish limestone full of shells called the IJnoceramus bed; and then on top towards north-eastern Nebraska a great thickness of impure chalk rock varying in hne from greyish white to a blueish pink and yellow. These beds constitute the Colorado group, or the Fort Benton and Niobrara groups of Meek and Hayden, and vary in thickness from 100 to 500 feet. Next above oceur the shales containing selenite that constitute the Fort Pierre Cretaceous, which are only found in Nebraska in Holt county and on the upper Republican river. At the close of the Fort Pierre epoch Nebraska was again a dry land surface, and remained so through the Fox Hills (Upper Cretaceons) epoch. In extreme south-western Nebraska a small arca is covered in isolated spots by the shales and sandstones of the Laramie, or transition group between the Cretaccous and Tertiary. No Eocene beds exist in Nebraska. Miocene beds exist in the north-western part of the State, but during this period the remainder of Nebraska continued to be a land surface which supported a gigantic forest vegetation and an abundant mammalian animal life. The deposits in the Miocene section are mainly indurated grits, silicates of lime, sandstones, conglomerates, and tabular limestones. Towards the close of the Miocene a further subsidence of the region of the plains inaugurated the Pliocene epoch. The great lake now extended as far east as Columbus, covering at least three-fifths of the State and an immense

tract outside of its present boundaries. The Pliocene beds are made up of sandstones, conglomerates, marls, and variously-coloured clays. Between the Niobrara and the Loup rivers there are in many places immense quantities of loosely compaeted sands, which some geologists, from the abundance of the fossils, have called the Equus beds. On the Republican river curious beds of flour-like geyserite occur. During Pliocene times this was a great geyser region whose activity commenced in the

| Cretaceous and continued through the Tertiary into the Quaternary.

This flour-like material equals for polishing purposes the best tripoli. The thickness of the Pliocene beds in Nebraska ranges from 10 to 700 feet. There is evidence of increasing cold in the upper deposits of the epoch: warm-tempcrate were gradually dis- placed by cold-temperate vegetable forms. The lake itself was drained before the end of the Pliocene.

The memorials of the Glacial epoch are here undoubted. Along the lower Platte, and on the Missouri wherever hard limestone constitutes the surface rocks, they are worn smooth and crossed by glacial scratehes in a direetion averaging 17° east of south. On the surface rock oceur—(1) blue clay from 1 to 30 feet thiek; (2) modified drift, gravel, and clay from 1 to 9 feet thick; (8) gravel and boulders 1 to 6 feet thiek; (4) oecasionally black soil contain- ing large quantities of silicified wood; (5) gravel, sand, and drift boulders; (6) calcareous sand; (7) loess from 2 to 200 feet thick; (8) black surface soil from 1 to 80 feet thick. On the return of mild conditions at the close of ‘‘the Great Ice Age” a freshwater lake covered much of Nebraska and the adjoining region on the east and south-east. The sediments brought down by the Missouri in the course of ages filled it up. Thus originated the loess deposits which are the source of the great agricultural wealth of the State. The rising of the land or the removal of barriers effected the drainage of the loess lake. Through the old lake bed the present rivers eommeneed to cut channels which at first filled the whole of their present valleys. That the loess was a subaqueous deposit is evident from the vast number of freshwater shells entombed in it. It is composed of 81 per cent. of extremely fine siliceous matter, over 3 per cent. of ferric oxide, 10 per cent. of the carbonates and phosphates of lime, anda small amount of carbonates of magnesia, soda, and potash, clay, and organic matter. It forms one of the

best soils in the world, and can never be exhausted until the hills and valleys of which it is composed are worn away. The loess and alluvium of the river valleys have a larger amount of organic matter combined with them, especially at the top, where the black soil is frequently from 5 to 30 feet thick, than is found on the uplands, where it ranges from 2 to 5 feet. The source of this black soil is the swampy condition that prevailed here towards the elose of the loess age. The rivers often stood long at the same

Agricul- – ture.

Com- munica- tion.

Educa- tion.

Popnla- tion,

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1541, in July of which year the Spanish general and explorer History.

level before the upward movement was resumed, and thus the many terraces were formed that characterize the valleys.

that, as explained above, the soils of the State are among the best in the world, chemical analysis and experience alike confirm. Experience has not yet settled the question whether the alluvium of the valleys or the loess of the uplands is the more valuable. Grasses and corn (maize) are the principal products. Corn, especially, is a rarely failing crop. The root crops that grow in temperate latitudes thrive amazingly. Eastern Nebraska is eminently adapted to the growth of apples, which here attain a size, colour, and flavour rarely equalled elsewhere. Grapes, plums, and cherries do equally well. Peaches, though not so sure as the former, are successfully grown south of the Platte. The strawberry nowhere reaches a better size or more luscious flavour than here. Other small fruits do almost equally well. The spontaneous growth of nutritious grasses, the ease with which cultivated varieties are grown, and the enormous yield of corn render the State peculiarly adapted for the raising of cattle, horses, sheep, and hogs. The stock industry is growing rapidly, and is at present doing most to enrich the

people. No industry promises better results, however, than the planting of new forests, to which many people are devoting themselves with the most gratifying success.

The assessed valuation of the State in 1882 (being only one- third of the real value) was $98,537,475. The eereals produced in 1882 were—wheat, 16,405,500 bushels; maize, 82,995,146 ; oats, 18,487,950; barley, 1,919,880. The following amount of stock was reported (a few counties not being returned):—cattle, 815,988; sheep, 376,257; hogs, 821,049; horses, 282,942; mules, 31,314. Tree culture is reported thus :—fruit trees, 2,038,111; grape vines, 305,389; forest trees, 40,502,584. Many of the lesser products of the State are not included in this statement.

By the completion of the Union Pacifie Railroad in 1869 a high- way was made to the Pacific across Nebraska. The Burlington and Missouri River Railroad, begun in the same year, was coinpleted to its junction with the Union Pacific at Kearney in 1872. It extended its main line during 1882 through the Republican valley to Denver, Colorado. In connexion with both these main lines there are important branches; and in 1883 2000 miles of railway had been constructed in the State. Before the Union Pacific was made, freighting across the plains was a large and profitable business. Omaha was conspicuous for its energy in sccuring this traffic, and grew to be the first city in Nebraska, and has ever since led the State in commerce and in manufacturing enterprises.

A basis for a free school system was laid by Congress in the Act constituting Nebraska a Territory, by which two sections of land (1280 acres) in each township were set aside for this purpose. The State constitution of 1875 provided that all fines, penalties, and licence moneys arising under the general laws of the State should be transferred to the school fund, and that the legislature should provide for the free instruction in the common schools of the State of all persons between the ages of five and twenty-one years. The census of 1880 shows that only 2°5 per cent. of the population of Nebraska over ten years of age are unable to read—a smaller proportion of illiteracy than that of any State in the Union, with one exception (Lowa, 2°4 per cent.).

A State normal school was established at Peru in 1867, and a

State school for the deaf and dumb in Omaha in the same year. The State institution for the blind was established in Nebraska City in 1875; a regular course of study, extending from eight to ten years, is provided. A State university and agricultural college was established in 1869 at Lincoln, a building being erected at a cost of $150,000, and opened in September 1871, when the population of the State was only 133,000. It provides classical, scientific, and literary courses of instruction. Provision has just been made to open a medical department with a three years' course in October 1883. The higher State institutions of learning, as well as the common schools, are open to both sexes, and free. The Insane Hospital was opened at Lincoln in December 1870; the present building, exclusive of the wings approaching completion, cost $165,000. The State penitentiary, established at Lincoln in 1870, was erected at a cost uf $312,000. ' The population of the State in 1880 was 452,402 (249,241 males, 203,161 females). In 1870 it was 122,993; in 1860, 28,846. Of the population in 1880, 95,790 were born in Nebraska, 259,198 in other States of the Union, and 97,414 in other lands—the largest number of immigrants being from Canada, Bohemia, Scandinavia, and Germany. In 1860 the population per square mile was 0°4; in 1870, 1°6; in 1880, 5-9. The population has been increasing so Tapidly since 1880 that the lowest estimates do not make it less than 675,000 by the end of 1883.

The following are the chief towns and their populations in 1880: —Omaha, 30,518; Lincoln (the State capital), 13,088 ; Nebraska City, 4183 ; Plattsmouth, 4175; Beatrice, 3386; Grand Island, 3550 ; and Hastings, 2817. All these towns have greatly increased, Poe them, like Hastings, have doubled their populations

History. —Nebraska was probably first visited by Europeans in

Coronado penetrated from New Mexico to a eountry which he called Quivira, and described as lying about the 40th parallel, and abounding in buffalo, which corresponds with the region of the Platte. It was then occupied by powerful Indian tribes, whose chief ruler was Tatarax. It was subsequently revisited by Padilla, a Franeiscan friar who had accompanied Coronado, and who here ° lost his life. No more records of visits to this region are chronicled for two hundred years. About the middle of the 18th century French missionaries from Canada came to the Missouri, and still later a few traders found their way here. It constituted a portion of the Louisiana territory which was purchased by Jefferson from France in 1803. At that time Indian tribes still occupied the whole region. At some earlier period a more civilized race lived here who made pottery and skilful carvings, built houses and forti- fications, and reared mounds which often contain the ashes of their dead. When Nebraska eame into possession of the United States the Sioux Indians were most numerous. The Pawnees, Otoes, and Omahas were next in numbers and in importance. These power-

-ful tribes have all become reduced in numbers by disease, constant

wars, and privations. The Sioux, who early gained the ascendency over the other tribes, resided in north-eastern Nebraska. The eastern part of the South Platte region was occupied by the Otoes, and the western part by the Pawnees, between which tribes there were constant boundary disputes.

The first settlement by whites was made in 1847 at Bellevue on the Missouri, 9 miles south of Omaha. Here a trading post of the Ameriean Fur Company was conducted by Colonel Peter A. Sarpy, a Frenchman

distinguished by his knowledge of the Indians, his courage, and his enterprise. The Mormon emigration, begun in 1847, traversed several paths, one of which lay through Nebraska, which thus first became generally known throughout the country. During the overland traffic to California that commenced in 1849, depots of supply were established at Bellevue, Plattsmouth, Nebraska City, and in the interior at Fort Kearney.

The Act constituting Nebraska a distinet Territory, and open- ing its lands to settlement, was approved May 30, 1854. Its area then embraced 351,558 square miles, extending from the 40th par- allel to British America on the north, its eastern line connecting the Missouri river on the south-east with the Red River on the north, and its western line being the summit of the Rocky Moun- tains. In 1861 Nebraska was shorn of its extended territory by the cutting off of portions of it to form Dakota and Colorado Territories. In 1863 it was still further redueed by the forma- tion of Idaho Territory. These curtailments left Nebraska a purely prairie State. During the first five years after the organiza- tion of the Territory the settlements rapidly increased along the Missouri. Great numbers who rushed to Pike's Peak in 1859 when the gold excitement was at its height, on their return, disappointed and disgusted, stopped and opencd farms in the State. This had the effect of starting settlements in the interior. The bottom lands of the Missouri and its tributaries had first been occupied, and it was supposed that the uplands were of inferior fertility. Now, liowever, these so-called " bluff lands," composed of loess materials, began to be cultivated, cautiously at first, until experiment proved them to be of the choicest eharacter. Pioneers then began to push out from the rivers, at first only a few miles, but finally wherever lands could be obtained, without regard to the presence or absence of bottom lands. Iu 1863 the Union Pacific Railroad and in 1864 the Burlington and Missouri River Railroad began to sell portions of their lands in Nebraska, received from the general Government ; and this became a most potent factor in turning a tide of emigration into the State.

At the breaking out of the civil war in 1861 the population of the Territory comprised less than 30,000. Yet Nebraska furnished to the Union army during the war 3307 officers and men, includ- ing two companies of scouts, partly composed of Indians.

In 1866 the legislature prepared a constitution for a State government, which a vote of the people confirmed by a small majority, though the opponents of the measure claimed that it was obtained by fraud. The first legislature under the State consti- tution met July 4th, 1866. The bill to admit Nebraska as a State was passed over the president's veto, and proclaimed on March Ist,

1867.

The first capital of Nebraska was at Bellevue. It was removed to Omaha in 1855, where it remained until Nebraska became a State, when it was taken to Lancaster, a town of half a dozen houses, whose name was then changed to Lincoln,—now (1883) grown to be a city of 16,000 inhabitants. The present State eon- stitution was framed in 1875, and was ratified in the same year by the people. The first legislature under the new constitution met in January 1877. The house of representatives consists of eighty-four, and the senate of thirty members; and the legislature meets biennially. (8. A.)

NEBUCHADNEZZAR is the familiar form, transcribed from the Hebrew 788273133, of the name of the great Baby-

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lonian king who carried the Jews captive, and whose reign marks the highest point of the Chaldean empire. Another Biblical form of the word is Nebuchadrezzar (Jer. xlix. 28), and similarly Greek authors write NaBovxodpdcopos. These forms are nearer to the original name as it is found on the cuneiform monuments, viz., Nabu-kudurri-usur, "Nebo, defend the crown." To what has been said of Nebuchadnezzar in the article Bapytonta (vol. iil. p. 188 ; comp. Danret and Isrart) it may be added that a frag- ment of a cylinder with an inscription relating to a war with Egypt in the thirty-seventh year of his reign has been published by Schrader (Aegypt. Ztschr., 1879; K.A.7., 2d ed., p. 363 sq.), that an inscription of Nebuchadnezzar has been observed by Sayce on the north bank of Nahr al-Kalb near Beyrit (Proc. Soc. Bib. Arch., 1881), and that two large inscriptions have also been found by Pognon in Wadi Brissa, near Hermel, in the Lebanon (see Cl. Ganneau in The Times, December 29, 1883).

NEBULA. See Astronomy, vol. ii. p. 820.

NEBULAR THEORY. The nebular theory is a famous hypothesis which has been advanced with the view of accounting for the origin of the solar system. It is emphatically a speculation ; it cannot be demonstrated by observation or established by mathematical calculation. Yet the boldness and the splendour of the nebular theory have always given it a dignity not usually attached to a doctrine which has so little direct evidence in its favour. It will also be admitted that from the very nature of the case a theory of the origin of the solar system must be devoid of direct testimony. All we could expect to find would be features in that system whose existence the theory would account for; or possibly by looking at other systenis we might observe them in phases suggesting the early phases of our own system. It is hard to see what other kind of evidence would be attainable. Now asa matter of fact our system does present many most striking features which could be accounted for by the nebular theory, and the theory also derives as much corroboration from the study of other systems as we could reasonably expect. Hence, as all attainable evidence is on the whole in favour of the nebular theory (though here and there there are exceptional phenomena), astronomers have generally regarded this theory with considerable approval.

There are very remarkable features in the solar system which point unmistakably to some common origin of many of the different bodies which it contains. We must at once put the comets out of view. It does not appear that they bear any testimony on either side of the question. We do not know whether the comets are really indigenous to the solar system or whether they may not be merely imported into the system from the depths of space. Even if the comets be indigenous to the system, they may, as inany suppose, be merely ejections from the sun, or in any case their orbits are exposed to such tremendous perturba- tions from the planets that it is quite unsafe from the present orbit of a comet to attempt any estimate of what that orbit may have been countless agesago. On all these grounds we must put the comets on one side for the present, and discuss the nebular theory without any reference thereto. But even with this omission we still muster in the solar system from two to three hundred bodies, almost every one of which pronounces distinctly, though with varying emphasis, in favour of the

nebular theory. The first great fact to which we refer is the common direction in which the planets revolve around the sun. This is true not only of the great planets Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune; it is also true of the host of more than two hundred small planets. All these bodies perform their revolution in the same direction. It is also extremely

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remarkable that all the great planets and many of the small ones have their orbits very nearly in the same plane, and nearly circularinform. Viewed as a question in prob- abilities, we may ask what the chance is that out of two hundred and fifty bodies revolving around the sun all shall be moving in one direction. If the direction of movement were merely decided by chance, the probability against such an arrangement is of stupendous magnitude. It is represented by the ratio of unity to a number containing about sixty figures, and so we are at once forced to the conclusion that this remarkable feature of the planetary motions must have some physical explanation. Ina minor degree this conclusion is strengthened by observing the satellites. Discarding those of Uranus, in which the orbits of the satellites are highly inclined to the ecliptic, and in which manifestly some exceptional though unknown influences have been at work, we may say that the satellites revolve around the primaries also in the same direction ; while, to make the picture complete, we find that the planets, so far as they can be observed, rotate on their axes in the same manner.

The nebular theory here steps in and offers an explana- tion of this most remarkable uniformity. Laplace supposed that our sun had once a stupendous: nebulous atmosphere which extended so far out as to fill all the space at present occupied by the planets. This gigantic nebulous mass, of which the sun was only the central and somewhat more condensed portion, is supposed to have a niovement of rotation on its axis. There is no difficulty in conceiving how a nebula, quite independently of any internal motion of its parts, shall also have had as a whole a movement of rotation. In fact a little consideration will show from the law of probabilities that it is infinitely probable that such an object should really have some movement

of rotation, no matter by what causes the nebula may have originated. As this vast mass cooled it must by the laws of heat have contracted towards the centre, and as it contracted it must, according to a well-known law of dynamics, rotate more rapidly. The time would then conie when the centrifugal force on the outer parts of the mass would more tlian counterbalance the attraction of the centre, and thus we would have the outer parts left as a ring. The inner portion will still continue to contract, the same process will be repeated, and thus a second ring will be formed. We have thus grounds for believing that the original nebula will separate into a series of rings all revolving in the same direction with a central nebulous mass in the interior. The materials of each ring would continue to cool and to contract until they passed from the gaseous to the liquid condition. If the consolidation took place with compara- tive uniformity we might then anticipate the formation of a vast multitude of small planets such as those we actually do find in the region between the orbit of Mars and that of Jupiter. More usually, however, the ring might be expected not to be uniform, and therefore to condense in sorne parts more rapidly than in others. The effect of such contraction would be to draw into a single mass the materials of the ring, and thus we would have a planet formed, while the satellites of that planet would be developed from the still nascent planet in the same way as the planet itself originated from the sun. In this way we account most simply for the uniformity in the direction in which the planets revolve, and for the mutual proximity of the planes in which their orbits are contained. The rotation of the planets on their axes is also explained, for at the time of the first formation of the planet it must have participated in the rotation of the whole nebula, and by the subsequent contraction of the planet the speed with which the rotation was performed must have been accelerated.

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There is quite a different method of approaching the subject, which leads in a very striking manner to eonclu- sions practically identical with those we have just sketched. We may commence by dealing with the sun as we find it at the present moment, and then reasoning back to what wnust have been the ease in the earlier epochs of the history of our system, ‘The stupendous daily outpour of heat from the sun at the present time is really, when

properly studied, a profound argument in support of the nebular theory. The amount of the sun's heat has been estimated. We receive on the earth less than one two-thousand- millionth part of the whole radiation. It would seem that the greater part of the rest of that torrent flows away to be be lost in space. Now what supplies this heat? We might at first suppose that the sun was really a mightily heated body radiating out its heat as white hot iron does, but this explanation cannot be admitted in face of the

notorious fact that there is no historical evidence that the

sun is growing colder. We have not the slightest reason to think that the radiation from the sun is measurably weaker now than it was a couple of thousand years ago, yet it can be shown that, if the sun were merely radiating heat as simply a hot body, then it would cool some degrees every year, and must have cooled many thousands of degrees within the time covered by historical reeords. We there- fore conclude that the sun has some other source of heat than that due simply to incandescence. We ean also con- ceive that the heat of the sun might be supplied by some- thing analogous to combustion. It would take 20 tons of coal a day burned on each square foot of the sun's surface to supply the daily radiation. Even if the sun were made of one mass of fuel as efficient as coal, that mass must be entirely expended in a few thousand years. We cannot therefore admit that the source of the heat in the sun is to be found in any chemical combination taking place in its mass. Where then can we find an adequate supply of heat? Only one external source can be named : the falling of meteors into the sun must yield some heat just as the flash of a shooting star yields some heat to our atmosphere, but the question is whether the quantity of heat obtainable from the shooting stars is at all adequate for the purpose. It can be shown that unless a quantity of meteors in collective mass equal to our moon were to plunge into the sun every year the supply of heat could not be sustained from this source. Now there is no reason to believe that meteors in anything like this quantity can be supplied to the sun, and therefore we must reject this source as also inadequate.

The truth about the sun's heat appears to be that the sun is really an incandescent body losing heat, but that the operation of cooling is immensely retarded owing to a curious circumstance due jointly to the

stupendous mass of the sun and to a remarkable law of heat. It is of course well known that if energy disappears in one form it feappears in another, and this principle applied to the sun will explain the famous difficulty.

As the sun loses heat it contracts, and every pair of particles in the sun are nearer to each other after the contraction than they were before. The energy due to their separation is thus less in the contracted state than in the original state, and as that energy cannot be lost it must reappear in heat. The sun is thus slowly contract- ing; but as it contracts it gains heat by the operation of the law just referred to, and thus the further cooling and further contraction of the sun is protracted until the additional heat obtained is radiated away. In this way we can reconcile the fact that the sun is certainly losing heat with the fact that the change in temperature has

“ce been large enough to be perceived within historic imes,

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It can be shown that the sun is at present contracting, so that its diameter diminishes four miles every century. This is of course an inappreciable distance when compared with the diameter of the sun, which is nearly a million of miles, but the signifieance for our present purpose depends upon the fact that this contraction is always taking place. A thousand years ago the sun must have had a diameter 40 miles greater than at present, ten thousand years ago that diameter must have been 400 miles more than it is now, and soon. We eannot perhaps assert that the same rate is to be continued for very many centuries, but it is plain that the further we look back into past time the greater must the sun have been.

Dealing then siinply with the laws of nature as we know them, we can see no boundary to the growth of the sun as we look back. We must conceive a time when the sun was swollen to such an extent that it filled up the entire space girdled by the orbit of Mercury. Earlier still the sun must have reached to the Earth. Larlier still the sun must have reached to where Neptune now revolves on the confines of our system, but the mass of the sun could not undergo an expansion so prodigious without being made vastly more rarefied than at present, and hence we are led by this mode of

reasoning to the conception of the primeval nebula from which our system has originated.

Considering that our sun is but a star, or but one of the millions of stars, it becomes a question of great interest to see whether any other systems present indication of a nebulous origin analogous to that which Laplace proposed for the solar system. In one of his most memorable papers, Sir W. Herschel marshals the evidenee which ean be eollected on this point. He arranges in this paper a selection from his observations on the nebulz in such a way as to give great plausibility to his view of the gradual transmutation of nebulze into stars. Herschel begins by showing us that there are regions in the heavens where a faint diffused nebulosity is all that can be detected by the telescope. There are other nebule in which a nucleus ean be just discerned, others again in which the nucleus is easily seen, and still others where the nucleus is a brilliant star-like point. The transition from an object of this kind to a nebulous star is very natural, while the nebulous stars pass into the ordinary stars by a few graduated stages. It is thus possible to enumerate a series of objects beginning at one end with the most diffused nebulosity and ending at the other with an ordinary fixed star or group of stars. Each object in the series differs but slightly from the object just before it and the object just after it. It seemed to Herschel that he was thus able to view the actual changes by which masses of phosphorescent or. glowing vapour became actually eondensed down into stars. The eonden- sation of a nebula could be followed in the same manner as we ean study the growth of the trees in the forest, by comparing the trees of various ages which the forest eon- tains at the same time. In attempting to pronounce on the evidence with regard to Herschel's theory, we must at once admit that the transmutation of a nebula into a star has never been seen. It is indeed very doubtful whether any changes of a nebula have ever been seen which are of the same character as the changes Herschel's theory would require. It seems, however, most likely that the periods of time required for such changes are so stupendous that the changes accomplished in a eentury or two are absolutely inappreciable.

The nebular theory is a noble speculation supported by plausible argument, and the verdict of science on the whole subject eannot be better expressed than in the words of Newcomb :—" At the present time we ean only say

that the nebular hypothesis is indicated by the general tend- encies of the laws of nature, that it has not been proved

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to be inconsistent with any fact, that it is almost a necessary consequence of the only theory by which we can account for the origin and conservation of the sun's heat, but that it rests on the assumption that this conservation is to be explained by the laws of nature as we now see them in operation. Should any one be sceptical as to the sufficiency of these laws to account for the present state of things, science can furnish no evidence strong enough to overthrow his doubts until the sun shall be found growing smaller by actual measurement, or the nebulz be actually seen to condense into stars and systems." (R. 8. B.)

NECHO, the Biblical form (2 Kings xxii. 29; Jerem. xlvi. 2) of the name Neku; see Eeyprt, vol. vii. p. 743, and IsRAEL, vol. xill. p. 416.

NECKER, Jacques (1732-1804), finance minister of Louis XVL, and convener of the states-general of 1789, was born at Geneva in 1732. His father was a native of Ciistrin in Pomerania, and had, after the publication of some works on international law, been elected professor of public law at Geneva. Jacques Necker had been sent to Paris in 1747 to become a clerk in the bank of a friend of his father, M. Vernet. He soon afterwards established, with another Genevese, the famous bank of Thelusson & Necker. Thelusson superintended the bank in London (his grandson was made a peer as Lord Rendlesham), while Necker was managing partner in Paris. Between them the bank prospered, and both partners became very rich. He chiefly occupied himself in his bank, but in 1763 fell in love with Madame de Verméneux, the widow of a French officer. Shecould not make up her mind to marry any one who was not noble, and, while considering his offer, she went on a visit to Geneva, where she met Suzanne Curchod, the daughter of a pastor near Lausanne, to whom Gibbon had been engaged, and took such a fancy to her that she brought her back as her companion to Paris in 1764. There Necker, transferring his love from the widow to the poor Swiss girl, married Suzanne before the end of the year. She was extremely ambitious, and encouraged her husband to try and make himself a public position. He accordingly became a syndic or director of the French

East India Company, and, after showing his financial ability in its management, defended it in an able memoir against the attacks of Morellet in 1769. He had also made interest with the French Government by lending it money, and was appointed resident at Paris by the republic of Geneva. Madame Necker assisted his ambi- tious views by entertaining largely the chief leaders of the political, financial, and literary worlds of Paris, and her Fridays became as greatly frequented as the Mondays of Madame Geofifrin, or the Tuesdays of Madame Helvetius. In 1773 Necker won the prize of the Académie Frangaise for an éloge on Colbert, and in 1775 published his Fssai sur la législation et le commerce des grains, in which he attacked the free-trade policy of Turgot. His wife now believed he could get into office as a great financier, and made him give up his share in the bank, which he trans- ferred to his brother Louis. She was right, and in October 1776 Necker was made finance minister of France, though with the title only of director of the treasury, which, how- ever, he changed in 1777 for that of director-general of the finances. He did great good in regulating the finances by attempting to divide the taille or poll tax more equally, by abolishing the "vingtiéme d'industrie," and establishing "'monts du piété." But his greatest financial measures were his attempt to fund the French debt and his establish- ment of annuities under the guarantee of the state. The operation of funding was too difficult in regard to the com- plicated French debt to be suddenly accomplished, and Necker rather pointed out the right line to be followed than completed the operation. In all this he treated French

finance rather as a banker than as a profound political econoniist, and thus fell far short of Turgot, who was the very greatest economist of his day. Politically he did not do much to stave off the coming Revolution, and his establishment of provincial assemblies in the '' pays d'élec- tion" only tended to keep France disunited. In 1781] he published his famous Compte Rendu, in which he drew the balance sheet of France, and was dismissed from his office, Yet his dismissal was not really due to his book, but to the influence of Marie Antoinette, whose schemes for bene- fiting the Duc de

Guines he had thwarted. In retirement he occupied himself with literature, and with his daughter, Mdlle Necker, who was his only child, and would bea wealthy heiress. He first attempted to procure the young English statesman Mr Pitt for her husband, but eventually chose the Swedish Baron Erik Magnus von Staél-Holstein, on condition that his master made hii Swedish ambassador at Paris. Gustavus III. was quite willing, and in 1786 Mdlle Necker became Madame de Staél. But neither M. nor Madame Necker cared to remain out of office, and in 1787 Necker was banished by "lettre de cachet" 40 leagues from Paris for attacking Calonne. In 1788 the country, which had at the bidding of the literary guests of Madame Necker come to believe that Necker was the only minister who could "stop the deficit," as they said, demanded Necker's recall, and in September 1788 he became once more director-general of the finances. He entered office at a critical moment: Dauphiné was in actual rebellion, and France was crying out for the summons of the states-general. Necker put a stop to the rebellion in Dauphiné by legalizing its assembly, and then set to work to arrange for the summons of the states-general. Throughout the early months of 1789 Necker was regarded as the saviour of France, but his conduct at the meeting of the states-general sufficiently proved that he was not a great statesman, and showed that he regarded the states- general merely as an assembly which should grant money, not organize reforms. The same want of statesmanship appeared in his vacillating conduct with regard to the reunion of the three orders, when he allowed the king to be forced by the assembly instead of taking the lead in ordering the reunion. He was nevertheless regarded as the cause of the Revolution by the court, and on July 11, while at dinner, received the abrupt order to leave France at once. But Necker's dismissal brought about the taking of the Bastille, which induced the king to recall his old minister. His return was an absolute ovation, and he was received with joy in every city he traversed. But at Paris he again proved to be no statesman. In his conceit he believed he could save France alone, and refused to act with Mirabeau or La Fayette. He caused the king's acceptance of the suspensive veto, by which he sacrificed his chief prerogative in September, and destroyed all chance of a strong executive by contriving the decree of November 7, by which the ministry might not be chosen from the assembly. Financially he proved equally incap- able for a time of crisis, and could not understand the need of such extreme measures as the establishment of assignats in order, to keep

the country quiet. His popularity vanished when his only idea was to ask the assembly for new loans, and in September 1790 he resigned his office, unregretted by a single Frenchman. Not without diffi- culty he reached Coppet, near Geneva, an estate he had bought in 1784. Here he occupied himself with literature, but Madame Necker pined for her Paris salon, and died in 1794. He continued to live on at Coppet, under the care of his daughter, Madame de Staél, and his niece, Madame Necker de Saussure, but his time was past, and his books had no political influence. A momentary excitement was caused by the advance of the French armies in 1798, when

he burnt most of his political papers. He died at Coppet in April 1804.

The chief authorities for Necker's life are La Vie privée de M. Necker, by Madame de Staél-Holstein, and the Notice sur la vie de M. Neeker, by Auguste de Staél-Holstein, his grandson, published in the collection of his works edited by the latter in 1833. The bibliography of his works is as follows:—éponse au Mémoire de M. LP Abbé Morellet, 1769; Eloge de J. B. Colbert, 1773; Essai sur la législation ct le eommerce des grains, 1775; Compte rendu au Rot, 1781; De Vadministration des finanecs de la France, 3 vols., 1784; Mémoire en réponse au discours prononeé par M. de Calonne, 1787; De Vimportanee des opinions religicuses, 1788; Sur Padministration de M. Necker, par lui-méme, 1791; Du pouvoir exécutif dans les grands états, 2 vols., 1792; Réflexions sur le proeés de Louis XVI., 1792; Dela Révolution Frangaise, several editions, the last in 4 vols., 1797; Cours dela morale religieuse, 1800; Derniéres vues de politique et de finance, 1802; Manuserits de M. Necker, published by his daughter, 1804 ; Switcs funestes d'wne seule faute, published after his death. Le Salon de Madame Neekcr, by the Vicomte d'Haussonville, 2 vols., 1882, compiled from the papers at Coppet, should also be consulted. (ESM S))

NECROSIS. This word, which has the same meaning as mortification, is now restricted in surgical works to death of bone. It is sometimes used to signify the part which dies; it may, however, with more propriety signify the process, ending in the death of the bone. A severe inflammation, caused by a severe blow, by cold, or by the absorption of various poisons, as mercury and phosphorus, is the general precursor of necrosis. The dead part,

analogous to the slough in the soft tissues, is called a sequestrun or exfoliation. At first it is firmly attached to the living bone around; gradually, however, the dead portion is separated from the living tissue. The process of separation is a slow one. New bone is formed around the sequestrum, which often renders its removal difficult. Asa rule the surgeon waits until the dead part is loose, and then cuts down through the new case and removes the sequestrum. The cavity in which it lay gradually closes, and a useful limb is the result.

NECTAR anp AMBROSIA are the nourishment of the gods in Homer and in Greek literature generally. The gods resemble men in all respects except that they have different food and drink. Usage varies much as to the exact meaning of the two terms. Probably they were not originally distinguished ; but usually both in Homer and in later writers nectar is the drink and ambrosia the food. On the other hand in Aleman nectar is the food, and in Sappho and Anaxandrides ambrosia the drink. Each is used in Homer as an unguent (nectar, Ji. xix. 30; ambrosia, //. xiv. 170). Both are fragrant, and may be used as perfume. The derivation of the word nectar is un- certain; probably vyydéreos is a kindred word. Ambrosia Is derived from éuPBporos, immortal.

NECTARINE, a fruit differing from the peach in having @ smooth or glabrous skin instead of a downy one. The varieties of nectarine, too, have often a distinct flavour from that of the peaches. The common origin of the peach and nectarine is shown, however, by the facts that seeds of the one will often reproduce the other, and that fruits of both kinds have not unfrequently been met with on the same branch. For cultivation see HorTicuULTURE, pol, p. 272.

NEEDLE. The sewing needle is an implement which has been in use from prehistoric times in all places where mankind used the skins of animals or woven fabrics for clothing. Originally the needle was made of fish-bone, bone, or ivory, and its first form was probably a tude eyeless bodkin. Needles of bone continue to this day to be used by uncivilized tribes; but since the time of the discovery of bronze metal needles have been in use i civilized communities. It is on record that needles of Steel were made at

Nuremberg towards the end of the 14th century, and ata later period Spanish needles acquired

wide celebrity. For upwards of two centuries the manu- facture has been established in England,—Redditch in Worcestershire, with several other small towns in Warwick- shire, being the centre of the industry, first planted there by Germans. Originally the trade was domestic in its character, but now it is carried on in large manufactories where mechanical appliances have to a certain extent supplanted handiwork, with much advantage to the health and the wellbeing of the operatives.

The raw material of the manufacture consists of steel wire of fine quality and suitable gauge. The wire is sup- plied in coils of definite weight and diameter, and the first operation consists in cutting the coil with powerful shears. With the aid of a gauge the coil is cut with precision into lengths, each sufficient for two needles. These lengths, having the curvature of the coil and other inequalities, are next straightened. For this purpose a bundle con- taining several thousand lengths is packed within two strong iron rings; the bundle is heated to red heat, and then pressed on an iron plate having two parallel grooves in which the iron rings run. Over this plate the bundle is worked backward and forward by the pressure of an oblong slightly curved iron tool having two longitudinal slits through which the edges of the rings project. Thus by combined pressure and rolling the whole of the lengths quickly become perfectly straight and even. The next operation consists in pointing both ends of the wires, which, being done on a dry grindstone revolving at high speed, is, from the sparks and dust created, very injurious to the operatives. A grinder, holding at one time several dozen wires against the stone with his left hand, and revolving them slightly with his right, will point about 100,000 needlesin a day. He is but imperfectly protected against the deadly dust he produces by a cowl which, partly covering the grindstone, is connected with a pipe through which a strong current of air is drawn, sucking away a large proportion of the dust. For the operation of pointing various machines have been devised and have coine into extensive use, especially in Germany. In general principle these machines consist of a wheel, to the periphery of which the wires to be pointed are held by an india-rubber band. It revolves at right angles to the revolving hollow grindstone, and, bringing each wire in rapid succession at

the proper angle for grinding against the stone, it points three times as many as a skilful grinder. The succeeding series of operations have for their object the eyeing of the needles. As a preliminary to this the oxidized scale at the centre of the wire is ground off, and on the surface so prepared each wire is separately stamped, by means of dies, with the grooved and rounded impres- sion of two needle heads set end toend. Through these stamped heads the eye-holes are next perforated by means of a screw-press working a pair of fine steel punches or prongs. Each wire now forms two needles attached head to head by a broad thin scarf of steel at the point of junc- tion where the metal has been stamped for the head. These double needles, taken to the number of about one hundred, are threaded together with a fine wire passed through the eyes, giving the whole the appearance of a fine close-set comb. Each side is clamped up tightly, and the expansion of the scarf in the centre is removed by a file. The spitted row is now ready to break over into separate needles, and as the point of junction of the two sets of heads is weakened by the stamping process, the rows readily break at that point by bending. These heads are then smoothed and rounded with the file before the clamp is removed, the wire withdrawn, and the separate needles set free. At this stage the needles are hardened and tempered in the usual manner ; that is, they are placed in an iron tray, heated to redness in a muffle furnace, plunged

into an oil bath, then re-heated in the muffle till they assume a straw colour, and gradually cooled. Following the tempering comes the process of scouring and fining or polishing, for which purpose the needles are put up in bundles of several thousands mixed with soft soap, oil, and emery powder, and tied tightly round with a canvas cover. A number of such bundles are laid in the bed of a machine in which by rollers or other devices they are kept rolling backward and forward, so that each individual needle rubs against its neighbours. After sufficient time the bundles are withdrawn, the needles cleaned by wash- ing, dried, and again bundled up as before, but with a mixture containing putty powder in place of emery. The rolling process is continued till the needles acquire a sufficiently polished surface.

The needles are now un- packed, washed in an alkaline solution, and dried in sawdust. From that they are conveyed to trays, where they are brought parallel to each other by a sharp jerking motion. It is next necessary to bring all the heads in one direction, which is dexterously done by a “ header,” who with a cloth finger-stool on the fourth finger presses a lot of needles against that cloth. Points presented adhere, and thus at each operation a number of needles re- main sticking in the finger-stool. While this arrangement is going on, faulty and imperfect needles are picked out. The heads being all now laid in one direction, attention is given to the smoothing and rounding of the eye-holes, a work essential for the prevention of the fraying and break- ing of the thread in sewing. The heads are blued by heating, an operation most neatly and perfectly performed by bringing each head in succession in contact with a gas flame by means of a revolving wheel, against the periphery of which the needles are retained by an elastic band. The needles so blued are strung on a roughened steel wire, over which is spread a fine paste of oil and emery. These wires are suspended between uprights on a frame platform, to which a jerking motion is communicated; thereby an oscillating motion is communicated to the suspended needles, and the gentle friction thus set up between the needle eye and the roughened wire and emery slowly but effectually secures the desired effect. Now it only remains to free the head from the blue colour on a small grind- stone, and give a final polish to the needle on a rapidly revolving buff wheel aided by putty powder. It has of late become a common practice to gild the heads of needles. The variety of needles manufactured for sewing by hand and machine, for packing, for upholstery and leather work, as well as for surgical purposes, is very great, and demands many modifications of processes and appliances. (J. PA.)

NEER, Van Der. Aernout and Eglon van der Neer, father and son, were painters whose lives almost filled the whole of the 17th century.

J. AERNoUT VAN DER NEER, commonly called Aart or Artus, was the contemporary of Albert Cuyp and Hobbema, and so far like the latter that he lived and died in compara- tive obscurity. Houbraken, who knew something of Eglon, was without information as regards his father. He merely noted that Aernout had been steward toa Dutch nobleman, and an amateur painter, before he settled at Amsterdam and acquired skill with his

brush. According to common chronology Aernout was born in 1619 and died in 1691 ; but neither of these statements is supported by any proofs. The earliest pictures in which Aernout coupled his monogram of A. V. and D. N. interlaced with a date are a winter landscape in the collection of Lord Overstone and a sunset in the museum of Gotha. Both pieces were finished, if we grant the genuineness of the inscriptions, in 1643, the year of Eglon's birth at Amsterdam. In 1652 Aernout, still faithful to his old haunts, witnessed the fire which consumed the old town-hall of Amsterdam.

NEE—NEE

He made this accident a subject for two or three pictures in the galleries of Berlin and Copenhagen, probably on commission from merchants of the city of his choice. But, though Amsterdam appears to have been constantly Van der Neer's domicile, he was not so sedentary in his habits as to neglect the rest of Holland. His pictures tell that he was well acquainted with the canals and woods about Haarlem and Leyden, and proofs are at hand to show that he was familiar with the reaches of the Maes and Rhine. Dort, the home of Albert Cuyp, is sometimes found in his pictures, and substantial evidence exists that there were relations of friendship and neighbourhood between the two men, At some period of their lives they laid their hands to the same canvases, on each of which they left their jot mark. On some it was the signature of the name, on others the more indelible signature of style. The partnership may not have been of long duration. It was unequal, and illustrated in a few landscapes only, but these, as well as contemporary works of Cuyp alone, reflect sufficient light on Van der Neer's career. There are land- scapes in the collections of the dukes of Bedford and West-minster, as well as in that of Colonel Neeld, in which Cuyp has represented either the frozen Maes with fishcrmen packing herrings, or the moon reflecting its light on the river's placid waters. These are models after which Van der Neer appears to have worked. His specialties were moonlights and sunsets on canals and estuaries, or winter landscapes with skaters and ball players. The same feeling and sintilar subjects are found in Cuyp and Van der Neer, before and after their partnership. But Cuyp was the leading genius. Van der Neer got assistance from him ; Cuyp expected none from Van der Neer. He carefully enlivened his friend's pictures, when asked to do so, with figures and cattle. It is in pictures jointly produced by both that we

discover Van der Neer’s presence at Dort. We are near Dort in that landscape sunset of the Louvre, in which Cuyp evidently painted the foreground and cows. In the National Gallery Cuyp signs his name on the pail of a milkmaid, whose figure and red skirt he has painted with light effectiveness near the edge of Van der Neer’s landscape. We recognize the partners in a sunset which was exhibited at Manchester when owned by Mr Francis Edwards. Again, a couple of fishermen with a dog, and a sportsman creeping up to surprise some ducks, are Cuyp’s in a capital Van der Neer at the Staedel in Frankfort. Van der Neer has been known to paint a smithy, with ficures alternately lighted by the sun and the blacksmith’s fire (Oppenheim collection at Cologne), but habitually his subjects were the rivers and water-courses of his native country either at sunset or after dark. Sometimes the moon sheds its light on tall trees and gables and wind- mills. His peculiar skill is shown in realizing trans- parence which allows objects —even distant—to appcar in the darkness with varieties of warm brown and steel greys. He cleverly manages reflexions in water, and balances the light on one side of a canal with dark masses of shadow on the other. His greatest subtlety is displayed in combining the lurid glare of fires with the cooler serenity of moonlight. Birger says he inspired Van der Poel with such a love of midnight fires that this unfortunate artist was induced to burn incalculable numbers of cities and hamlets. Another of his fancies is to paint frozen water, and his daylight icescapes with golfers, sleighcrs, and fishermen are as numerous as his moonlights. But he always avoids the impression of frostiness, which is one of his great gifts. His pictures are not scarce. They are less valuable in the market than those of Cuyp or Hobbema ; but, possessing a charm peculiarly their own, they are much sought after by collectors. According to the latest documentary evidence discovered in Holland,

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NEE—NEG old

Aernout van der Neer was living at Amsterdam when he purchased the freedom of the city of Gouda in 1685. He is said to have resided at Rotterdam in 1691. But in 1692 he married a second wife at Gouda; and so the date usually assigned to his death receives correction. Out of about one

hundred and fifty pictures accessible to the public, the choicest selection is in the Hermitage at St Petersburg. In England the largest collector is Sir Richard Wallace. But there are good specimens in numerous English galleries besides.

IL Eaton vAN DER NEER, born at Amsterdam in 16438, died at Diisseldorf on the 3d of May 1703. He was first taught by his father, and then took lessons from Jacob Vanloo, whose chief business then consisted in painting figures in the landscapes of Wynants and Hobbema. When Vanloo went to Paris in 1663 to join the school from which Boucher afterwards came, he was accompanied or followed by Eglon. But, leaving the French capital about 1666, he settled at Rotterdam, where he dwelt for many years. Later on he took up his residence at Brussels, and finally came to Diisseldorf, where he entered the service of the elector-palatine Johann Wilhelm von der Pfalz. In each of the places where he stopped Eglon married, and having had three wives became the father of twenty-five children. A modern French critic has observed that the burden of so large a family was as nothing to Eglon's misfortune in having taught the arts to Van der Werff.

Eglon van der Neer has painted landscapes imitating those of his father, of Berchem and Adam Elsheimer. He frequently put the figures into the town views of Jan van der Heyden in competition with Berchem and Adrian van de Velde. His best works are portraits, in which he occasionally came near Terburg or Metsu in delicacy of touch, De Hooch in effectiveness of lighting, or Mieris in polish of surface. One of his earliest pieces in which the influence of Terburg is apparent is the Lady with the Book, of 1665, which was sold with the Bredel collection in 1875. A young woman in white and red satin at Rotterdam, of 1669, recalls Mieris, whose style also reappears in Eglon's Cleopatra at Buckingham Palace. Two landscapes with Tobit and the Angel, dated 1685 and 1694, in the museums of Berlin and Amsterdam, illus- trate his fashion of setting Scripture scenes in Dutch backgrounds. The most important of his sacred com- positions is the Esther and Ahasuerus, of 1696, in the Uffizi at Florence. But he varied his practice also with arrangements of hunting and hawking parties, pastures and fords, and cavalry skirmishes. The latest of his panels is a mountain landscape of 1702 in the gallery of Augsburg. @. ASC)

NEES VON ESENBECK, Curistian Gorrrriep (1776-1858), botanist and entomologist, was born at Erbach on February 14, 1776, and was educated at Darmstadt and at Jena, where he took the degree of M.D. He spent some time in medical practice in Frankfort-on- the-Main, but in 1818 was appointed professor of botany in Erlangen. Next year he became professor of natural history in Bonn, and in 1831 he was appointed to the chair of botany in the university of Breslau. He enjoyed a high reputation as a lecturer, but had a strong leaning to the transcendental philosophy of nature so much in Yogue in Germany in the earlier part of this century. In 1848 he was elected a member of the German parliament, and became a leader of the party opposed to the Govern- ment, to which he made himself so obnoxious that in 1851 he was deprived of his professorship, and in conse- quence the latter years of his life were spent in great poverty. He died in 1858.

For about forty years he edited the Nova Aeta of the ‘Acad.

Leopold.-Carolina,” and in this important scries of scientific memoirs

several of his own papers were published. His earliest memoirs decal with the ichneumons, and forsome years he continued to write on these insects. He published a Afonographie der Ichnewmone in 2 vols., in 1828; and Hymenopterorum Iehneumonibus afinium Monographiz, in 2 vols., in 1834, Nees von Esenbeck was a prolific writer in various departments of botany, and published the following separate works:—Dve Algen des siissen Wassers nach thren Entwiekel- ungsstifen dargestellt, 1814; Das System der Pilze und Schwimme, 1816; Naturgeschiehte der europdischen Lebermoose, in 4 vols., 1833-38 ; “ Agrostologia Brasiliensis, ” in the Flora Brasiliensis; and a Systema Lawrinearum, 1836. Besides these he wrote numerous monographs in the series above mentioned, also in Flora, in Linnza, and in other scientific German magazines, cither alone or along with other well-known botanists. His best known works are those that deal with the fungi, the Hepatice, and the Glumifere, in all which groups he made valuable additions to knowledge, which have exerted much influence on later investigations.

His brother Theodore (1787-1837), inspector of the botanic gardens at Leyden, and afterwards professor of pharmacy at Bonn, also wrote

numerous papers on botanical subjects, dealing more particularly with medicinal plants and their products.

NEGAPATAM, a town and the chief port of Tanjore district, Madras, India, situated in 10° 45’ 37” N. lat. and 79° 53′ 28” E. long. It forms a single municipality with the adjoining town of Nagur, the joint population in 1881 being 53,855. The port carries on an active trade with Ceylon, Burmah, and the Straits, the imports consisting chiefly of cotton goods and betel-nuts, and the exports of rice and paddy. Negapatam was one of the earliest settlements of the Portuguese on the Coromandel coast.

It was taken by the Dutch in 1660, and by the English in

si,

NEGLIGENCE is in one aspect the correlative of diligence (see DILIGENCE), in another of intention. It is the absence of diligence or the absence of intention. All definitions imply this. Negligence is a term difficult to define for more than one reason. It is used not only to denote a mental state, but the consequences resulting from a mental state. Again, the term bears a somewhat different meaning as applied to civil or criminal liability. “The meaning of negligence, in the common use of language,” says Mr Justice Stephen (//istory of the Criminal Law, vol, ii. p. 123), “is very general and indefinite. It is practically synonymous with heedlessness or carelessness, not taking notice of matters relevant to the business in hand, of which notice might and ought to have been taken. This meaning is no doubt included in the legal sense of the word, but in reference to criminal law the word has also the wider meaning of omitting, for whatever reason, to discharge a legal duty, ¢g., the omission by a medical man to exercise that skill which it is his duty to exercise.” The vagueness of the standard by which negligence is tested is another and more serious practical difficulty. The standard is the average prudent action of the average citizen, and the defendant fails to reach this standard at his peril. This is the standard implied by such definitions as that of the New York Penal Code, “the terms ‘neglect,’ ‘negligence,’ ‘negligent,’ and ‘negligently’. . . . import a want of such attention to the nature or probable consequences of the act or omission as a prudent man ordinarily bestows in acting in his own concerns,” and that of Sirey (Code Pénal, § 319), “the omission or

forgetfulness of a precaution dictated by prudence." 'The connexion between negligence and inten- tion is illustrated by a passage in the judgment of Baron Alderson in Blyth v. The Birmingham Water Works Company (1856). "The definition of negligence," says that learned judge, "'is the omitting to do something that a reasonable man would do, or the doing something that a reasonable man would not do; and an action may be brought if thereby mischief is caused to a third party not intentionally." The intention is of great importance in criminal law. Thus as a general rule it may be said that what is manslaughter where there is negligence becomes

murder where there is intention. But the negligence may in some cases be of such a nature as to lead to the pre- sumption of legal malice. In the same way in cases where the liability is civil it is important to notice that the phenomena of negligence often accord closely with those of intention. Thus in one case Lord Justice James speaks of "wilful negligence which leads the court to conclude that the person is an accomplice in the fraud." The phenomena of negligence and of dishonest intention may be similar to such an extent that the court may regard them as the same, since the legal consequences resulting from them are the same.

It is the general view that there are three degrees of negligence, corresponding to three degrees of diligence. This is illustrated by the case of bailment. Where the bailment is for the benefit of the hailor, the bailee is bound to use only slight diligence, and is liable only for gross negligence; where the bailment is for the benefit of bailor and bailee alike, each is bound to use ordinary diligence, and is liable for ordinary negligence ; where the bailment is for the benefit of the bailee, he is bound to use great diligence, and is liable for slight negligence. The soundness of this position, alleged to be founded cn the Roman law, is open to question. Roman law probably only recognized two degrees of culpa, the term which most nearly approaches negligence. And the term "* eross negligence" has been objected to as misleading (see DiniGENCE). The truth is that it is impossible to make any useful legal distinc- tion of degrees of negligence, when the question of negligence is mainly a question of fact. In English law it is for the jury to say, subject to certain rules of evidence, whether a

particular defendant has in a particular case fallen below the standard of the average citizen. Hach case must depend to a large extent upon its own merits, aided by the consideration of a series of previous cascs in which certain facts have been held by the court to be or not to be prima facie evidence of negligence to go to the jury.

Contributory Negligence.—As a general rule it is a defence to an action that the injury was caused by conduct of the injured person, without which the injury would not have happened. ” But, though a plaintiff may have been guilty of negligence which may have actually contributed to the injury, yet if the defendant could by the exercise of ordinary care and diligence have avoided the mischief the plaintiff’s negligence will not excuse him. Contributory negligence of a person other than the plaintiff is no excuse for the negligence of the defendant execpt in the case of the legal identification of the plaintiff with the negligent third party; ¢9., a passenger in a train of A company is so far identified by the law with his driver that he cannot recover against B company for an injury caused by an accident to which the negligence of A com- pany’s driver contributed. So a child cannot recover for an injury to which the negligence of the adult in charge of the child con- tributed.

Nature of the Remedy.—The person injured may have either a civil or a criminal remedy, or both. In most cases where the act of negligence is criminally punishable, the plaintiff may recover damages in addition. The question as to what amount or kind of negligence will bring a person within the criminal lawis one by no means easy to answer. In certain cases criminal proceedings are authorized by statute, ¢.g., against parish authorities for refusing to call vestries (1 & 2 Will. IV. ¢. 60), and against persons neglecting to transmit election writs (53 Geo. III. ¢. 89). The question of criminal negligence arises most commonly in cases of homicide. The rule as to the functions of the jury cannot be better put than in the words of Mr Justice Stephen, wéi supra :—‘‘in order that negligence may be culpable, it must be of such a nature that the jury think that a person who caused death by it ought to be punished.” The same high authority proceeds to point out that cases of manslaughter by negligence may be imagined in which therc is no carelessness. In one matter the prisoner or defendant in criminal proceedings is under a disadvantage as compared with the defendant in an

action. He cannot, as the latter can, set up contributory negligence as a defence. To this extent only is the criminal remedy wider than the civil. Where the question of contributory negligence does not arise, it may generally be said that, if an indictment will lie for negligence, @ fortior? an action will lie upon the same facts. (J. W.*)

NEGRO (Spanish and Italian Negro, from Latin Viger, black) in anthropology designates the distinctly dark as opposed to the fair, yellow, and brown varieties of man- kind. In this its widest sense it embraces all the dark races, whose original home are the inter-tropical and sub- tropical regions of the eastern hemisphere, stretching roughly from Senegambia, West Africa, to the Fiji Archi- pelago, Pacific Ocean, west and east, and lying north and

south between the extreme parallels of the Philippines and Tasmania, The Negro domain thus originally comprised all Africa south of the Sahara, India south of the Indo- Gangetic plains, Malaysia, and the greater part of Australasia. But this domain has since prehistoric times been intruded upon in the east mainly by peoples of the yellow Mongoloid, in the west mainly by peoples of the fair Caucasic stock. During the early and middle Tertiary epochs it appears also to have been gradually broken into two great divisions—by the subsidence of lands, some suppose, which are now flooded by the waters of the Indian Ocean, and to which Sclater has given the name of Lemuria. To these two great eastern and western geographical divisions now correspond the two great ethnical divisions of the Negro stock—the Papuan or Melanesian of Malaysia and Australasia, and the Negro proper of the African mainland. During the long ages that have elapsed since this separation, the two branches, if originally one, have had time under diverse outward conditions to become differentiated into two sufficiently marked physical types, so that on strictly anthropological as well as geographical grounds it becomes convenient to deal separately with the Papuan and African divisions of the Negro family. The present article is confined to the latter. For the Papuans see New GUINEA,

Soudan (Sudan), the fertile zone stretching from the Sahara towards the equator nearly across the continent, is usually regarded as the true home of the African Negro. But, according to the views recently advanced by

Lepsius, Soudan is rather an intermediate or mixed domain lying between the two Hamitic and Negro ethnical groups, which have respectively occupied northern and southern Africa from the remotest times. Certainly none of the chief native races in Soudan—Mandingo, Joloff, Toucouleur in the west ; Kanembu, Haussa, Kanuri in the centre; Maba in Wadai, Nuba in the Nile valley, least of all the Fulahs of the Chad and Niger basins—can be considered as of pure Negro descent. But the same phenomenon of inter-mixture is presented in the strictly equatorial and south equatorial regions, where the Fans of the Ogoway basin, the Zandey (Niam-Niam), Bongo, Bari, and other Upper- Nilotic tribes, the Waganda of the Victoria Nyanza of the

| extreme east, the Zulu-Kaffres of the extreme south, are all

of Negroid and even sub-Negroid rather than of strictly Negro lineage. Hence the same argument that would exclude Soudan would also exclude the greater part of southern Africa, and we should have to look to the hypo-thetical Lemuria or other now submerged lands for the cradle of the Negro stock. Practically, however, the whole of Africa south of the Sahara must be taken as the original habitat of the race, which is there almost everywhere still found in compact masses, although rarely perhaps abso- lutely free from foreign intermixture.

But wherever found in a comparatively pure state, as on the coast of Guinea,! in the Gaboon, along the lower Zambesi, and in the Benua and Shari basins, the African aborigines present almost a greater uniformity of physical and moral type than any of the other great divisions of mankind. By the nearly unanimous consent of anthro- pologists this type occupies at the same time the lowest position in the evolutionary scale, thus affording the best material for the comparative study of the highest anthro- poids and the human species. The chief points in which the Negro either approaches the Quadrumana or differs most from his own congeners are :—(1) the abnormal length of the arm, which in the erect position sometimes reaches the knee-pan, and which on an average exceeds that of the

1 Here apparently is to be met the most pronounced Negro type proper yet discovered. See the missionary Wilson’s Ethnographic View of Western Africa, New York, 1856, published anonymously.

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Caucasian by about 2 inches; (2) prognathism, or pro- jection of the jaws (index number of facial angle about 70, as compared with the Caucasian 82); (3) weight of brain, as indicating cranial capacity, 35 ounces (highest gorilla 20, average European 45); (4) full black eye, with black iris and yellowish sclerotic coat, a very marked feature; (5) short flat snub nose, deeply depressed at the base or frontal suture, broad at extremity, with dilated nostrils and concave ridge ; (6) thick protruding lips, plainly showing

the inner red surface ; (7) very large zygomatic arches—

high and prominent cheek bones; (8) exceedingly thick cranium, enabling the Negro to butt with the head and resist blows which would inevitably break any ordinary European's skull; (9) correspondingly weak lower limbs, terminating in a broad flat foot with low instep, divergent and somewhat prehensile great toe, and heel projecting backwards ("lark heel"); (10) complexion deep brown or blackish, and in some cases even distinctly black, due not to any special pigment, as is often supposed, but merely to the greater abundance of the colouring matter in the Malpighian mucous membrane between the inner or true skin and the epidermis or scarf skin ;} (11) short, black hair, eccentrically elliptical or almost flat in section, and dis- tinctly woolly, not merely frizzly, as Prichard supposed on insufficient evidence ;? (12) thick epidermis, cool, soft, and velvety to the touch, mostly hairless, and emitting a peculiar rancid odour, compared by Pruner Bey to that of the buck goat; (13) frame of medium height, thrown somewhat out of the perpendicular by the shape of the pelvis, the spine, the backward projection of the head, and the whole anato- mical structure; (14) the cranial sutures, which close much earlier in the Negro than in other races. To this

1 Jt is also noteworthy that the dark colour scems to depend neither on geographical position, the isothermals of greatest heat, nor even altogether on racial purity. The extremes of the chromatic scale are found in juxtaposition throughout the whole Negro domain, in Sene- gambia, the Gaboon, upper Nile basin, lower Congo, Shari valley, Mozambique. In the

last region Froberville determined the presence of thirty-one different shades from dusky or yellow-brown to sooty black. Some of the sub-Negroid and mixed races, such as many Abyssinians, Gallas, Joloffs, and Mandingoes, are quite as black as the darkest full-blood Negro. A general similarity in the outward con- ditions of soil, atmosphere, climate, food charged with an excess of carbon, such as the fruit of the butter-tree, and other undetermined causes have tended to develop a tendency towards dark shades every- where in the Negro domain apart from the bias mainly due to an original strain of black blood. Even the African Arabs are described hy Burckhardt, De Pagés, and other observers as often decidedly black. Waddington mentions more particularly the Shegya Arabs south of Dongola on the White Nile as distinguished by their ‘‘ clear, glossy, jet black” (p. 149). The same expression ‘‘jet black” is applied by Schweinfurth to the Upper-Nilotic Shilluks, Nuers, and Dinkas, while the neighbouring Bongos and Mittus are described as of a ‘‘red- brown” colour ‘‘like the soil upon which they reside” (Heart of Africa, i. p. 261).

- This point has been fully detcrmined by P. A. Brown (Classifica- tion of Mankind by the Hair, &c.), who shows conclusively that, unlike true hair and like true wool, the Negro hair is flat, issues from the epidermis at a right angle, is spirally twisted or crisped, has no central duct, the colouring matter being disseminated through the cortex and intermediate fibres, while the cortex itself is covered with humerous rough, pointed filaments adhering loosely to the shaft; lastly, the Negro pile will felt, like wool, whereas true hair cannot be felted. Observing that the Negro domain is also the habitat of the most anthropoid apes —gorilla and chimpanzee,—and that these bimanous and quadrumanous species are both of a pronounced dolichocephalie type (index nos. 72-75), some anthropologists have suggested the direct deseent of the former from the latter. But against this view may be urged the different texture of the pile, which, although black in both, is woolly in the Negro but true hair in the ape. It may further be noted that in the eastern section of the dark domain, while the Papuan is still black and dolichocephalic, often excessively so, his presumed progenitor the orang-outang is, on the contrary, brachycephalic, with decidedly red hair. Dr Bernard Davis also recognizes brachycephaly in equatorial Africa itself, four out of the eighteen skulls from this region

in his collection being distinctly of the round-headed type, aud Schweinfurth describes the Bongos as ‘‘hardly removed from the lowest grade of brachycephaly” (i. 263).

premature ossification of the skull, preventing all further development of the brain, many pathologists have attributed the inherent mental inferiority of the blacks, an inferiority which is even more marked than their physical differences. Nearly all observers admit that the Negro child is on the whole quite as intelligent as those of other human varieties, but that on arriving at puberty all further progress seems to be arrested. No one has more carefully studied this point than Filippo Manetta, who during a long residence on the plantations of the Southern States of America noted that “ the Negro children were sharp, intelligent, and full of vivacity, but on approaching the adult period a gradual change set in. The intellect seemed to become clouded, animation giving place to a sort of lethargy, briskness yielding to indolence. We must necessarily suppose that the development of the Negro and White proceeds on different lines. While with the latter the volume of the brain grows with the expansion of the brain- pan, in the former the growth of the brain is on the contrary arrested by the premature closing of the cranial sutures and lateral pressure of the frontal bone.” 8

It must at the sanie time be confessed that the question of the mental temperament of the Negro has been greatly complicated by the partisanship of interested advocates on either side. But for this disturbing element it would per- haps be readily admitted that the mental are at least as marked as the physical differences between the dark and other races. And as both are the gradual outcome of external conditions, fixed by heredity, it follows that the attempt to suddenly transform the Negro mind by foreign culture must be, as it has proved to be, as futile as the attempt would be to suddenly transform his physical type. On his moral status, even when removed from the old associations and brought directly under more favourable influences, a lurid light is cast by the report of the Rev. Dr Tucker at the American Church Congress for 1883 on the present condition of the black communities in the Southern States.#

It is more correct to say of the Negro that he is non- moral than immoral. All the social institutions are at the same low level, and throughout the

historic period seem to have made no perceptible advance except under the stimulus of foreign (in recent time notably of Moham- medan) influences. Religion is a system of pure fetichism and worship of ancestry associated with such sanguinary rites as the “customs” of Dahomey and Ashantee, and a universal belief in sorcery. Slavery continues everywhere to prevail, both as a local institution and a branch of the export trade, where not checked by European Governments. Much of the surplus population not thus carried off prob- ably finds its way to the shambles of the native states in the middle Congo basin and other parts where cannibalism is practised, and where human flesh appears to be sold in the open market-place. During its voyage down the Congo the Stanley expedition was attacked at many points

3 La Razza Negra nel suo stato selvaggio, &c., Turin, 1864, p. 20.

4 “¢T know of whole neighbourhoods,” he tells us, ‘‘ where there is not one single Negro couple, whether legally married or not, who are faithful to each other beyond a few weeks. In the midst of a prayer- meeting I have known Negroes steal from each other, and on the way home they will rob any hen-roost that lies conveniently at hand. The most pious Negro that I know is confined in a penitentiary for an atrocions murder, and he persists in saying he can see no offence against God in his crime, though he acknowledges an offence against man.” Mention is further made of Negro missionaries guilty of the grossest immorality, living in open concubinage, addicted to thieving, lying, and every imaginary crime, yet all ‘‘earnest and successful preachers, and wholly unconscious of hypocrisy. Their sins, wniver- sally known, did not diminish their influence with their race. It was impossible to doubt their absolute sincerity.” A much darker picture is presented by the independent Negro commonwealths of Hayti, for eighty years the scene of almost uninterrupted fratricidal strife.

o18 for the avowed purpose of procuring a fresh supply of human food, and from other incidents of modern exploration cannibalism would seem to prevail very generally in the little known equatorial regions of the interior! Political institutions are in a rudimentary state, and where a higher system has been imposed or adopted from the whites, as in Liberia, it does not appear to have materially con- tributed to the improvement of the race. The great bulk of the natives are still in the tribal condition, while in the

kingdoms that have been founded in Guinea and elsewhere the authority of the sovereign is everywhere absolute, and its exercise often marked by the most wanton and atrocious cruelty. The largest and most powerful native state is that of Ulunda, whose present ‘‘ muata yanvo,” or ruler, is the fourteenth in descent from the founder of the dynasty. When visited in 1879 by Dr Buchner, this potentate, to impress his guest with his power, caused one of his subjects to assume the part of a chief just arrived from a remote province of the empire. The sham cortége of soldiers and women advanced to the throne all thickly plastered with mud from head to foot, and the “chief” approaching on all fours deliberately rolled himself in the sand at his majesty’s feet. The administration of justice is regulated, not by any sense of right or wrong, but by the caprice of the king, who is himself often in the power of the navum- bula, or witch-detector. Beyond what has been acquired from without, of letters there is absolutely no knowledge, unless an exception be made in favour of the invention or adaptation of a rude syllabic system some years ago by a native of the Vei tribe. Hence literature is purely oral, and limited to a few tribal legends, some folklore, proverbs, and songs of the simplest kind. The arts also are exclu- sively of an industrial character, and restricted mainly to coarse weaving, pottery, the smelting and working of metals (chiefly copper and iron), agriculture, and grazing. Architecture has no existence, nor are there any monu- mental ruins or stone structures of any sort in the whole of Negroland except those erected in Soudan under Hamitic and Semitic influences. No full-blood Negro has ever been distinguished as a man of science, a poet, or an artist, and the fundamental equality claimed for him by ignorant philanthropists is belied by the whole history of the race throughout the historic period.

On the other hand the native languages, all of which belong to the agglutinating order, are often very highly developed, and the Bantu group especially is characterized by an intricacy of structure and an alliterative phonetic system of an exceedingly delicate type.2 From the wide range of this Bantu speech, which occupies all the southern half of the continent except the Hottentot and Bushman territory in the extreme south-west, Lepsius concludes that it is the original language of the Negro race, and that the numerous linguistic groups of Soudan are merely scattered fragments of that speech or of the Hamitic intruding fromthe north. Thus has been developed his theory of the two ethnical and linguistic stocks originally in

exclusive possession of North and South Africa, and gradually amalgamating in the now diversified intermediate zone of Soudan. But this theory cannot be accepted as at all adequate to explain the present conditions in those regions. It is not by any means certain that the Bantu itself was originally a Negro language atall. There seems, moreover, to be good reason for believing that its present diffusion over South Africa dates from comparatively recent times, and that it is due to the intrusion of foreign con- querors penctrating from the north-east up the Nile valley and through the region of the great lakes into the Congo and Zambesi

basins. Nor is it possible to regard the Mandingo, Vei, Hanssa, Fulah, and many other Sondanese tongues as fragments or off-

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1 Amongst the Niam-Niam ‘‘human fat is universally sold,’’ while *‘the Fan barter their dead among themselves,” and even disinter them to be devoured (Heart of Africa, ii. pp. 18, 19). Still more pronounced is the cannibalism of the Monbuttu, who dry the bodies of the slain in battle for future consumption, and ‘‘drive their prisoners before them, as butchers drive sheep to the shambles, and these are only reserved to fall victims on a later day to their horrible and sickly greediness”’ (70., ii. p. 98).

? For this remarkable linguistic phenomenon see vol, xiii. p. 820.

shoots of Bantu, from which they differ as do from each other.

To Dr Gustav Nachtigal* is due the recent discovery or determination of another independent and widespread linguistic family, which had its original home amongst the Hamitic Teda or northern Tubus of the eastern Sahara, and which, gradually spread- ing southwards, has been imposed through the Dasa or southern Tubus on the Kancmbu and Kanuri of Lake Chad, the Baele of Wanyanga, the Zoghawa of Dar-Fur, and other Negro or Negroid peoples of central and eastern Soudan. The whole of Soudan, or, more correctly, the whole of Central Africa between the equator and the Sahara, is in fact a region of linguistic confusion, such as is elsewhere

found only in Caucasia, Melanesia, the Anamese high- lands, and some parts of America. Several radically distinct stock languages have already been determined, especially in Guinea, Senegambia, and the Chad basin. But many more are known to be current in Adamawa, Bornu, Baghirmi, Wadai, Dar-Fur, the White Nile Valley, while others will doubtless be revealed by the future exploration of the lands watered by the Welle, Aruwimi, Mangala, and other streams flowing either to the Nile, the Congo, or the Shari. Most of them may be properly designated as strictly Negro tongues. But in the north, that is, along the skirt of the Sahara, and in the east, that isin the Blue Nileand Atbara basins, in Kaffa, Galla, and Somaliland, the current speech is mainly Caucasic, and here also the populations are mainly Negroid and sub-Negroid rather than of pure Negro descent. The Caucasic speech again is represented by Hamitic, Tubu, and Semitic groups, all intruders in this Negro domain from prehistoric times except the Semitic Arabic, which dates only from the introduction of Islam. In attempting a complete, however brief, survey of this vast ethnical and linguistic area, account must also be taken of other disturbing elements within the area itself, which are of unknown origin, and whose actual relations to the surrounding Negro masses are still involved in much obscurity. Conspicuous amongst them are the Nubas of the Middle Nile, apparently inter- mediate between the true Negro and the Egyptian Hamite ; the Fulahs of central and west Soudan, who, although now much mixed, seem to have been originally distinct both from the Negro and the Hamite; the Fans, who have in recent times reached the west coast just above the equator, and who are also a clearly non-Negro race ; lastly, the dwarfish Akkas, Obongos, and others, who appear to be scattered over the whole of the continent south of 10° N. lat. Many, perhaps the majority, of the Bantu-speaking southern races —Waswahili of the Zanzibar coast, Waganda and others of the great lacustrine region, Zulu-Kaffres of the south-east, Marutse of the Zambesi, Ovambos of the south-west coast—are also variously affected by foreign elements, some no doubt cither Arab or Hamitic Galla penetrating from the north-east, but others drawn from now long-forgotten sources. Thus the popular idea that Negroland presents a homogeneous ethnical field must be dismissed as absolutely erroneous. It will be safer to say that, while the Negro strain is here everywhere conspicuously present, it has been re- peatedly crossed and re-crossed by diverse interminglings, which began with the first appearance of the Hamite on African soil, and

which have been continued from that vastly remote epoch down to the present time.4

From the subjoined rough scheme of classification of the chief Negro and Negroid races and languages are excluded the above- mentioned Caucasic-speaking Hamites and Semites, who hem in the Negro zone proper by a mighty ethnical barrier stretching almost continuously from the Senegal river through the Sahara, Abyssinia, and Gallaland to the east coast at the equator, From it are also omitted the Hovas, Sakalavas, Betsimisarakas, and other peoples of Madagascar, all of Malagasy (Malayo-Polynesian) speech, as well as the Bosjesman and Hottentot groups of the extreme south-west, as lying beyond the scope of the present survey. er eS = S eS SS

3 Sahara und Sudan, Berlin, 1881, vol. ii. p, 283 sg. See also 'North African Ethnology," by A. H. Keane, in Nature for March

1, 1883.

"In support of this conclusion, which to some may seem over- drawn, appeal might be made to the language of many modern African explorers, one of the most careful of whom thus expresses himself :— '*If we could at once grasp and set before our minds facts that are known (whether as regards language, race, culture, history, or de- velopment) of that vast region comprehended in the name of Africa, we should have before us the witness of an intermingling of races which is beyond all precedent. And yet, bewildering as the prospect would appear, it remains a fact not to be gainsaid, that it is impos- sible for any one to survey the country as a whole without perceiving that high above the multitude of individual differences there is throned a principle of unity, which embraces well nigh all the population" (Schweinfurth, op. cit., i. p. 313). The principle of unity here spoken of is the autochthonous black element, mostly predominant, and everywhere forming the substratum, nearly as far north as the tropic of Cancer,

fundamentally as they

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| Kibokwe, Bailunda, Kibanda, Kisanji, Nano, Sindonga, Ba-Songo,

West Soudan and Guinea.

Mandingan Group: Mande, Kabunga, Landoro, Tene, Ghandi, Susu, Mano, Toma, Gbese, Vei(?). Mainly in South Senegambia and Upper Guinea.

Wolof Group: Joloff, Kayor, Dakar, Baol, Sine, Walo, Bambara (?). Mainly between the Senegal and Gambia rivers.

Felup Group: Felup, Bola, Serere, Filham, Pepel, Diola, Kallum, Biafada, Pajade, Temné, Kissi, Sherbro. Between the Gambia and Sierra Leone.

Liberian Growp : Deh, Queah, Gurrah, Kru, Kondo, Pessa, Golla, Bassa, Kabo, Yedabo, Grebo, Babo, Webo, Tebo, Nyambo. Grain and Ivory coasts.

Ewe Group: Acra (Ga), Fantee, Ashantee, Ffon, Mina, Jeji, Dahoman, Nago, Otyi, Yoruba. Gold and Slave coasts.

Lbo Group: Ibo, Nupe, Miehi, Oru, Wari, Igara, Juku, Kororofa, Ado, Akoto. Binue and lower Niger.

Sonhray: Large, historical nation. buktu to Gando. Distinct speech.

Fulah: Futa-Jallo, Futa-Toro, Jel, Baa, So, Mabube, Laube, Beri. Scnegambia and in scattered groups eastwards to Baghirmi. Distinct speech,

Central Soudan and Chad Basin.

Adamawa Group: Batta, Dama, Fala, Buma, Marga, Holma, Ba, Bula, Kilba, Buza, Mbafu, Kotafa, Woka, Fani, Doga, Longoda. Upper Binue; thence east to Logon.

Tubu Group: Teda, Dasa, Kanembu, Dalatoa, Kanuri, Danawa, Haussa (?), Baele, Bodele, Bulala(?), Kuka(?), Zoghawa. Tibesti, Kanem, Bornu,

Borku, and north Dar-Fur.

Logon Group: Logon, Mandara, Margi, Makari, Moseu, Gamergu, So (extinet), Keribima, Yedina (Buduma), Kuri (Kalea), Bede, Ngisem, Kerrikerri, Babir, Fika. Bornu, lower Shari (between Adamawa and Baghirmi), Chad archipelagoes.

Baghirmi Group: Baghirmi, Somrai, Tummok, Kuang, Busso, Gaberi, Nyillem, Ndamm, Sara, Dekakire, Sokoro, Bua Kullanga, Bua Kuli, Yussiye, Sartia. Lower and middle Shari, east to Runga and Dar- Banda.

Wadat Group: Maba (Kelingen, Kajanga, Malanga, Kuno, Bili, and many other subdivisions), Masalit, Mimi, Marfa, Korunga, Moéwo, Abyi, Kondongo, Kabbaga, Mubi, Marta, Bakka, Birkit, Tala. Wadai and east Dar-Fur.

Middle Niger, from Tim-

East Soudan and Upper Nite.

Dar-Banda Group: Runga, Kredy, Ago, Silla, Bandala, Daggel, Gulla, Fana, Birrimbirri, Seli, Kutingara, Upper Shari, east to Dar-Fertit.

Fur Group: Fur (Forang-bele), Dudunga, Kunjara, Kera, Massabat, Tunjur, Dajo, Berti, Bego, Birguid, Berdtina, Jellaba, Sungor, Mararit, Jebal, Guimir, Kabga. Dar-Fur and Kordofan, between Wadai and White Nile.

Nilotic Group: Shilluk, Nuer, Dinka, Bongo, Jur, Bari, Mittu, Rol, Millow, Agar, Sofi, Lehssi, Ayell, Ayarr, Monbuttu, Janghey, Fallaugh, Miauk, Bonjak, Jibbe, Kunkung, Nikuar, Madi, Loboré, Shuli, Berta, Amam. White Nile and its tributaries, east to Kaffa and Gallaland, south to Uganda.

Zandey (Niam-Niam): Large, compact nation, about the Welle, and reaching southwards probably to the Lualaba.

South Africa—Bantu Family.

Zulu-Kaffre Group: Ama-Zulu, Ama-Khosa, Ama-Fingu, Ma- Tonga, Ama-Zuazi, Ba-Tembu, Matebele, Mazitu, Masai(?). Zulu- land, Natal, Kaffraria,

and in scattcred fragments from the Limpopo north to the great lakes.

Central Group: Be-Chuana, Ba-Suto, Ba-Rolong, Ma-Kololo, Ma-Rotse, Ma-Kalaka (Ma-Nansa), Ma-Laya, Ma-Totola, Ma- Shukulombwe, Ma-Shubia, Ma-Nehoia, Ma-Mbunda, Ba-Libale, Ma-Pingula, Ma-Hes, Ba-Yeiye. Upper Orange river, Transvaal, Lake Ngami, upper and middle Zambesi, and Chobe river.!

Eastern Group : Wa-Swahili, Wa-Pokomo, Wa-Nika, Wa-Kamba, Wa-Sambara, Wa-Zaramo, Achikunda, Ma-Gololo, A-Nyasa, Wa- Yao, Ma-Chinga, A-Ngulu (Walolo), Ma-Kua, Ma-Tumboka, Wa- Jagga, Wa-Segua. East coast from the equator south to Delagoa Bay, and inland to Lake Nyassa.

Equatorial Group: Wa-Ganda, Wa-Nyoro, Wa-Nyamwesi, Wa- Sukuma, Wa-Legga, Wa-Rundi, Wa-Lha, Wa-Fipa, Wa-Bemba, Wa-Bisa, Wa-Rua, Wa-Lunda, Kioko, Wa-Shinsh, Tu-Shinsh, Tu- Shilange, Tu-Ruba, Tu-Kette, Ba-Songe (Ba-Luba), A-Kawanda (Ma-Wanda), Ba-Tetela, Ba-Kuba, Lovalé, Wa-Mangala, Ibonga, Ba-Rumbe, Ba-Bwende. Region of the great lakes, upper and middle Lualaba, south to the Lokinga (Mushinga) range.

Western Group: Ova-Herero, Ova-Mbo, Ova-Quanyama, a re eae

1 The Ma-Kololo, as a distinet people, have been destroyed by the Ma-Rotse; but their language (a mixed Se-Chuana and Se-Suto dialeet) survives as the

lingua Jranca in the Ba-Rotse state, and generally between the Limpopo aud Zambesi (Dr Holub and Pere Depelehin),

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Ma-Tamba, Ma-Yakka, Ba-Kongo, Kimbunda, Ma-Hungo, Shissilongi, Ma-Yombe, Ba-Teke, Obamba, Odumbo, Aduma, Bakota, Mbamba, Ashongo, Apinji, Okanda, Bangwé, Mpongwé, Ba-Kalai, Isubu, Bimbia, Ba-Kwilleh, Dualla, Abo, Wuri, Qua Qua (Ba-Koko), Lungasi, Edea, Bubi (Fernandian). West coast from Damaraland north to Cameroon mountains ; inland to about 20° E. long.?

The total population is vagucly estimated at 130,000,000, to which must be added probably about 20,000,000 full-blood and half-caste Negroes settled either as slaves or the descendants of slaves in various parts of the world, but ehiefly in tropieal and sub-tropical America, Owing to their peculiar qualities, great muscular development, and power of endurance in hot and moist lands, com- bined with a remarkable absence of personal sclf-respect, the African populations have from the remotest times supplied a chief material to the slave markets of the Old and the New World. For thousands of years an incessant stream of black blocd has been directed from the interior to the east coast and thence to Madagascar, Arabia, Persia, and even India, or down the Nile to Egypt and Asia Minor, or across the Sahara to the Barbary Statcs. Sinee the discovery of Ameriea hundreds of thousands have in the same way been shipped from the west coast for the West Indies, New Spain, the British and French plantations, and Brazil. Speaking generally, this black elemcnt has not amalgamated with the populations of the eastern hemisphere, and has conscquently left few traces of its presencc anywhere except in Madagascar, where there may possibly have been an indigenous Negro people before the arrival of the intruding Hovas and other Malay tribes. Nevertheless a strain of Negro blood is apparent, not only amongst the Tuaregs and especially the Tibus of the Sahara, but also in Morocco, South Algeria, Egypt, the low-lying Tehama of the West Arabian sea-board, Makran, and even here and there along the eoast of Malabar and Ceylon. But no statistics are anywhere here available which might throw some light on the proportion of blacks to the surround- ing populations. We read that there may be as many as 100,000 in Moroeco, a large number amongst the Berbers of Wargla (South Algeria) and Tripoli, and so on. It is also evident that a decided majority of the inhabitants of Madagascar must be regarded as of Negroid stock, although no Negro language has held its ground cither there or anywhere beyond the Negro domain proper. a

This is the more surprising that in some parts of Amcrica, notably the West Indian islands, the coloured has actually replaced the indigenous and largely absorbed the white element. Here we are altogether on firmer ground, and fairly accurate returns enable us to form an approximate estimate of the proportion of full-blood and half-caste Negroes in alinost cvery part of the New World. On the other hand, the nomenclature of these mongrels has become so perplexing, and is often applied so irregularly, that it has led to

many misconceptions on this point. Thus the term ‘‘ Creole,” applicable in Mexico only to persons of pure Spanish descent, denotes in Brazil, Peru, and elsewhere the presence of black blood in varying proportions. Of this bewilder- ing nomenclature the chief terms are as under :—

Negro, African, Black: Full-blood Negro, whether born in Africa or of African descent.

Mutlatto : Issue of black and white parents either way—a constant term in America.

Mestizo: Any half-breed, whether of white and Negro parents, or (more commonly in Spanish America) of white and Indian parents.

Creole: Mostly white of pure deseent, but also blacks of pure deseent (Brazil), the issue of whites and Mestizoes (Peru), and Mestizoes generally (Alaska).

Zambo: Any half-breed, but mostly the issue of Negro and Indian parents ; in the United States, Peru, and West Indies of Negro and Mulatto; in St Vincent the half-easte Caribs.

Zambo Preto: Issue of Negro father and Zainba mother (Mexico and elsewhere).

Cholo: Issue of Zamboes (South America).

Pardo: Synonymous with Mulatto (Brazil); any Mestizo (Argen- tine States).

Mamaluco: Any Mestizo, but especially the issuc of whites and Indians (Brazil).

Chino: Negro and Indian half-caste (Mexico, and generally in Spanish America).

Casco: Direct issue of Mulattoes on both sides (South America).

Tente en el Ayrc: Mongrels in whom the white element predomi- nates (South America). E

Cafwso: Issue of Negro and Indian, dark shade and woolly hair predominating (Brazil). .

Caburet : Issue of Negress and Indian (Brazil). ;

Cariboco, Tapanhuna, Xibaro: Loeal Brazilian terms of Tupi origin applied to various crosses between the Negroes and Indians.

2 Intiuders in the northern section of this group are the non-Negro Fans, the Oshyeba of the other natives. There are two main divisions,—Maké-Fan on the left, Mbelé-Fan on the right bank of the Ogoway.

Quarteroon, Quinteroon, Octoroon : Negro and white half-breeds, with fresh infusion of white blood each successive generation. Thus: Quarteroon has oue-fourth, Quinteroon one-eighth, Octoroon one-sixteenth black blood only, the last being searcely distinguish- able from a white.

Before the suppression of the slave trade, during the first half of

the present century, from 60,000 to 70,000 Negroes were annually shipped to America, where their descendants of all shades now number altogether upwards of twelve millions as under :—

| Proportion to the

Coloured Element. Whole Population.

13 per cent.

60,000

In Hayti the Africans have established their political autonomy, here forming two independent states, with total population 820, 000. Elsewhere slavery has been everywhere abolished, except in Brazil, where it is rapidly

becoming extinct. Hence the whole of the coloured population now practically constitutes a class of freed- men, in some places apparently dying out (Central America, Argentine States), in some remaining stationary (Mexico, Peru), but in others increasing rapidly. This is especially the case in the United States, as shown by the subjoined returns for the whole of the present century :—

Proportion to the

Coloured Element. Whole Population.

1800 1,002,000 19 per cent,

19

1820 1,772,000 ° 2 1840 2,874,000 i 1860 4,442.000 ig) RS 1870 4,880,000 isp

1880 6,581,000 13

It is obvious from this table that the Negroes, without any further importations from Africa, are increasing far more rapidly than the native whites, and that they would ultimately become the predominant element in the Southern States but for the con- stant stream of migration flowing from Europe to North America. Owing to this migration they decreased relatively to the rest of the population from 1820 to 1860. But since then they have main- tained their relative proportion in spite of this migration. Recently they have themselves begun to move westwards at the rate of about 50,000 annually. Should the movement continue, an equilibrium may be established, because the rate of mortality gains on the birth-rate according as they move farther from the hot Southern States, where alone the race can expect to establish itself in the republic.

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NEGROPONT. See Evpaa.

NEHEMIAH (4%293), governor of Judea under Artax- erxes Longimanus; see IsRAEz, vol. xiii. p. 418. The book of Nehemiah is really part of the same work with the book of Ezra (¢.v.), though it embodies certain memoirs of Nehemiah in which he writes in the first person. Apart from what is related in this book, we possess no trustworthy information about Nehemiah. Even the legend in 2 Mac. i. 13 that he founded a library containing ancient docu- ments, which is often taken as authentic and as marking an important step in the history of the Old Testament canon (see vol. v. p. 2), is discredited by standing in an epistle of which the manifest aim was to give currency to certain spurious books.

NEISSE, a well-built town and fortress of the first rank in the district of Oppeln, Prussian Silesia, lies at the junce- tion of the Neisse and the Biela, and consists of the town proper on the right bank of the former river and the

Friedrichstadt on the left. Of its nine churches the most interesting is the parish church of St James (J akobikirche), dating mainly from the 12th century, but finished in 1430, The chief secular buildings are the old episcopal residence, the new town-house, the old rathsthurm, 205 feet in height (1499), and the theatre. There are also several schools, convents, and hospitals. The manufactures are unimportant, but a considerable trade is carricd on in agricultural products. In 1880 the town contained 20,507 inhabitants, of whom 15,825 were Roman Catholics. The garrison forms about a fourth of the population.

Neisse, one of the oldest towns in Silesia, is said to have been founded in the 10th century, and afterwards became the eapital of a principality of its own name, which was incorporated with the bishopric of Breslau about the year 1200. Its first walls were erected in 1350, and enabled it to repel an attack of the Hussites in 1428. It was thrice besieged during the Thirty Years' War. The end of the first Silesian war left Neisse in the hands of Frederick the Great, who laid the foundations of its modern fortifications. The town was taken by the French in 1807. Iu addition to its forts, ramparts, and bastions, Neisse ean, at the will of the garrison, be protected by a system of inundation.

NELEUS, a hero of Greek mythology, was son of Poseidon by Tyro, daughter of Salmoneus, to whom the god appeared under the form of the Thessalian river-god Enipeus. The legends connected with him are exceedingly difficult to classify, the events are so unconnected and the scene shifts so rapidly from country to country. Born in Thessaly, where his brother Pelias is king of Ioleus, Neleus becomes king of Pylus in Messenia and the ancestor of a royal family called the Neleidee, who are historically trace- able as the old ruling family in some of the Ionic states in Asia Minor. Tradition uniformly derives the Ionic colonies from the Attic coast, and the presence of the Neleide is explained by the legend that when the Dorians conquered the Peloponnesus the Neleide were driven out and took refuge in Attica, where they at once became kings of the land, and led colonies to the eastern shores of the /figean., This tangle of legends seems to"have as its historical basis the fortunes of an energetic yet wandering race which has left its mark indelibly on the history of every country which it touched. This race was obviously a maritime one, for there is no path

except the sea between the widely separate shores where it can be traced, and its divine ancestor is Poseidon. Neleus was father by Chloris of Nestor, Pero, and other children. Through the contest for the hand of Pero he is connected with the legends of the prophetic race of the Melampodide, who founded the mysteries and expiatory rites and the orgies of Bacchus in Argolis.

NELLORE, a district in Madras presidency, India, lying between 13° 25’ and 15° 55’ N. lat., and between 79° 9’ and 80° 14’ E. long,, bounded on the N. by Kistna district, E. by the Bay of Bengal, §, by North Arcot and Chingleput, and W. by the Eastern Ghats, separating it from Karntl and Cuddapah. The area is 8739 square miles. The district comprises a tract of low-lying land extending from the base of the Eastern Ghats to the sea. Its general aspect is forbidding : the coast-line is a fringe of blown sand through which the waves occasionally break, spreading a salt sterility over the fields. Farther inland the- country begins to rise, but the soil is not naturally fertile, nor are means of irrigation readily at hand. Less than one-third of the total area is cultivated ; the rest is either rocky waste or is covered with low scrub jungle. The chief rivers are the Pennair, Suvarnamukhi, and Gundlakamma. They are not navigable, but are utilized for irrigation purposes, the chief nrigation work being the

anicut across the Pennair. Nellore is, however, very sub- ject both to droughts and to floods. Copper was discovered in the western hills in 1801, but several attempts by European capitalists to work the ore proved unremunera- tive, and the enterprise has been abandoned since 1840. Tron ore is smelted by natives in many places. Nellore, with the other districts of the Carnatic, passed under direct British administration in 1801.

The population of Nellore in 1881 was 1,220,236, including 1,138,031 Hindus and 61,344 Mohammedans, Four Christian missions are established in the district, Roman Catholic, Baptist, Presbyterian, and Lutheran. Among the aboriginal tribes, the Yanadis arc the most numerous. On the island of Sriharikota, from which Madras derives its firewood, they still live in the jungle, and refuse to cultivate the soil or rear cattle. They have adopted some form of Hinduism, but still worship their own demons and bury their

dead. Five towns had in 1881 a popula- tion of over 5000—Nellore (27,505), Ongole (9200), Venkatagiri (7989), Kandukur (6601), and Addanki (6481). The climate is dry, the monthly temperature varying from about 74° F. in December to 90° in May; and the average annual rainfall is 36°53 inches.

In former days Nellore was celebrated for its textile fabrics, but the export has now ceased, though spinning and weaving for local consumption is carried on in many villages. Prior to the opening of the Madras Railway, Nellore formed the high road between tlic interior and the coast. The two principal ports are Kottapatam and Ittamukula, both in the north of the district. Indigo is exported by land to Madras at the ratc of about 800,000 maunds a year. The chicf means of communication is the Great Northern Trunk Road, which runs along the coast to the Bengal frontier. Watcr communication with Madras city is also afforded by the East Coast or Buckingham Canal.

NELSON, a seaport of New Zealand, capital of a pro- vincial district of the same name, prettily situated in 41° 18’S. lat. and 173° 19’ E. long., on the shores of a small harbour at the bottom of Blind Bay on the northern coast of the South Island. It is a diocesan city, and contains several churches and a college. The climate is healthy, and the surrounding scenery very picturesque. The woods and fields in the neigbourhood abound with English song-birds, and the streams are stocked with trout ; while the orchards in the town and suburbs are famous for English kinds of fruit, and hops are extensively cultivated. The industries include brewing, the manufacture of cloth (chiefly a superior kind of tweed), tanning, soap-boiling, candle-making, and the preparation of paint produced from hematite. A railway 23 miles long connects Nelson with Bellgrove, and is in course of extension towards Roundell up the Wai-iti valley. The borough returns one member to the house of representatives, and its local affairs are administered by a mayor and council elected by the ratepayers. The entrance to Nelson harbour is 10 miles south-west of Pepin Island. Six miles from the entrance commences the long and remarkable Boulder Bank, whose southern portion forms the natural breakwater to that anchorage. The population of Nelson in 1881 was 6764 (3261 males and 3503 females).

NELSON, Horatio Netson, Viscount (1758-1805), was a younger son of the Rev. Edmund Nelson, and was born at Barnham, Thorpe, Norfolk, September 29, 1758.

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to him. He was made a post-captain at the age of twenty- one, a promotion due to merit alone, and remarkable in that aristocratic age; and during the next few years he was actively engaged in thie vicissitudes of the American War. It was a period of chequered fortunes as regards the English navy ; its supremacy on the ocean was not yet assured ; and, though Rodney's great victory in 1782 attest- ed the excellence of British seamen, the flag of France was for a time dominant in the West Indies and Indian seas ; the fleets of the French and Spanish monarchies insulted the English coasts for several weeks, and assailed Gibraltar in formidable strength ; and the armed neutrality of the Northern powers threatened England with no ordinary peril. Nelson, however, though his correspondence proves that he followed them with the eye of genius, took no part in these great operations; he was in command only of small vessels, and was chiefly employed in protecting convoys and in chasing cruisers of the same class as his own; and his most notable exploit was a bold descent on the shores of the South American isthmus, in which he gave fresh proofs of his habitual bravery. Yet his reputation as a promising officer was steadily growing during these years; he attracted the attention of every admiral on the different stations on which he served; and King Wilham IV., at this time a midshipman, probably only echoed a general opinion in describing Nelson asa "boy captain with an entliusiasm that showed he was no common being." After the peace of Versailles in 1783, Nelson was in the West Indies for several years; and he gained credit for almost Quixotic zeal, and drew down on himself no little odium, by the efforts he made to prevent smuggling between the new United States and British colonies, and to expose the frauds of the greedy contractors who, especially on the Jamaica station, had been long permitted to plunder the navy. The time was now at hand when the commanding powers of this great seaman were to become manifest. War between England and revolutionary France was declared in the first months of 1793; and Nelson, on the recommendation of Lord Hood—a veteran who held him in high esteem— was made captain of the ''Agamemnon," the first ship

of the line commanded by him. He was despatched under Hood to the Mediterranean; and, though his vessel was one of the worst in the fieet, he performed feats of daring and perfect seamanship which at once marked him out for applause and distinction. With a detachment of sailors who, when led by him, ‘minded shot,” he declared, “as little as peas,” he took a prominent part in the siege of Bastia ; and the capitulation of the place was due, for the most part, to their determined valour. At the siege of Cadiz also, where he lost an eye, he contributed largely to the result, his “‘seamen,” as he reported, having “ fought the guns” with the assistance only of ‘“‘a single artillery- man.” Nelson, however, was greatest on his own element ; and soon after this he for the first time displayed conspicuously, and in a decisive manner, the transcendent gifts which made him pre-eminent. In March 1795 the British fleet, under Admiral Hothami—Lord Hood had by this time been replaced—was partially engaged off the coasts of Italy with a French fleet of superior force; and a French eighty-four, having been dismasted, sheered off, towed by a powerful frigate, and supported by two large ships of the line. The “ Agamemnon,” though only a sixty- four, stood out boldly after the retiring enemy ; and Nelson’s manceuvres were so skilful that he all but destroyed the crippled Frenchman, and kept the whole hostile squadron at bay, without incurring any serious loss. The injured ship, with one of her consorts, was easily captured a few hours afterwards; and, had the admiral followed Nelson’s advice, the whole French fleet would have been brought to action, and have probably met a complete defeat. XVII. — 41

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In the winter of 1795-96 Nelson was employed in cutting off the supplies of the French army on the Italian seaboard ; and, had he been well seconded by the Austrian generals, Napoleon would not have possessed the means of beginning his career of Italian conquest. Soon after this he became a commodore; and before long he had again performed one of those great feats of daring and skill which ordinary commanders would have deemed impossible. Spain, drawn into her old alliance with France, had declared war in 1796; and on 13th February 1797 a Spanish fleet met one of the English, a few miles off Cape St Vincent. Though the enemy had twenty-seven ships of the line, and the British force was only fifteen, its admiral,

Jervis, did not hesitate; and, skilfully employing a well- known manceuvre, he broke the hostile line, cutting off nine ships. The Spanish admiral, however, endeavoured to rejoin this detachment by wheeling round his van; and the evolu- tion might have been successful had not Nelson, placed at the British rear, immediately abandoned his own line, and, disregarding his superior's orders, assailed with his single ship the advancing squadron. This audacious movement threw him in the way of three first and three second rates ; and, though the "Captain" was ably seconded by the three nearest ships of the British line, Nelson was engaged for more than half an hour with a force immeasurably superior to his own. Yet British discipline and valour triumphed ; the Spanish commander drew off beaten, and the "Captain" boarded and took two ships, each larger and more powerful than herself, Nelson leading his exulting crew in person to the ery of "Westminster Abbey or Victory." For this extraordinary passage of arms Nelson received the order of the Bath and was made an admiral, — his splendid success and skilful promptitude having effaced, even in professional minds, his disregard of the rules of the service. During the following months he was engaged in operations against Spain and her colonies; and he lost an arm in an attack on Santa Cruz, a place famous for one of Blake's victories. The time had now arrived when his genius and skill were to appear in full force in an inde- pendent command. In May 1798 he was despatched by Jervis—now Lord St Vincent—to intercept a great French armament, which, under the guidance of Bonaparte, was intended to reach Egypt and to threaten India. His squadron, however, having been crippled in a gale, the hostile fleet escaped from Toulon and reached Alexandria on Ist July, the British admiral, who had made Aboukir on the 28th June, having just missed it. This misadven- ture deceived Nelson, who believed that the enemy was still at sea ; and it was not until he had made a circuit by Crete to the coasts of Sicily, and back again to the shores of Greece, that he heard how the French had made good their landing. He set off from the Gulf of Coron, though his intelligence was a rumour only; and on the Ist August the enemy was descried. His plan of attack was quickly formed, and it was marked by his wonted insight and skill. The French fleet lay in front of the roads of Aboukir, the rear supported by coast batteries, the centre and van more out at sea, but composed of new and formidable ships ; and, as shoals stretched between it and the neighbouring shore, its admiral, Brueys, believed that no foe would

thread the way between and attack from that side. Nelson, however, a dexterous pilot from boyhood, saw that with fine steering the feat was possible; and he directed part of his fleet to assail the enemy to the landward through this intricate passage, while the remaining part assailed from the seaward. As evening fell his preparations were complete ; the shoal stopped only one of the British ships, and before an hour had passed his divided line had encom- passed more than half the French fleet. ‘The issue of the battle was never doubtful ; the French, indeed, fought with

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heroic courage, but their rear and centre, placed between two fires, were gradually overpowered and destroyed ; and their van, at anchor, like all their line, was either unable or perhaps unwilling to make sail and assist their consorts. The flagship of Brueys, the huge “ Orient,” blew up towards midnight in a voleano of flame, and by daybreak on the 2d the victory was complete. Of thirteen French ships two only escaped, and it should be added that the British fleet, though equal in numbers to that of the enemy, was wholly inferior in real force. The British seventy-fours were no match for the new and magnificent French eighties ; and Nelson’s flagship, the ‘‘ Vanguard,” had scarcely more than half the strength of the “ Orient.”

This great victory—perhaps Nelson’s masterpiece— marks a new epoch in British naval history. The superior- ity, indeed, of the English fleets had been proved from the beginning of the war, especially on June 1, 1794, and the Revolution had injured the marine of France. But it was not until the Battle of the Nile—the name given to Nelson’s triumph—that the navy of England attained its complete ascendency, and that it became the terror of even its bravest enemies. This change was due in the main to Nelson, and unquestionably the dread his name inspired was the principal cause that, years afterwards, Napoleon’s plan of invading England failed. From this period, too, the whole naval service, so to speak, was animated by a new spirit, and deeds of daring were done by men of the rising school which the Hawkes and Ansons would have never dreamt of. It is painful to turn from this blaze of glory to notice a dark passage in Nelson’s career. The Battle of the Nile having again combined the Continent against revolutionary France, —for Bonaparte and his army seemed lost,—the court of Naples was

drawn into the war; and, in the struggle that ensued, the king and queen were compelled to take refuge in Palermo. They soon, however, had returned to the capital, Suwaroff having driven the French from Italy ; and they entered Naples on the faith of a treaty, which amnestied their revolted subjects. Nelson, who still held his Mediterranean command, and had taken the royal family under his protection, nevertheless declared the capitulation null, allowed the vindictive creatures of the court to work their will on disarmed enemies, and, hurrying on himself the trial and sentence, gave his sanction to what can be only called the judicial murder of Caraccioli, the admiral of the Neapolitan fleet, who had served in the "rebel" cause only under compulsion, History must severely condemn these acts, but there is reason to believe that they were not caused, as is commonly supposed, by female prompting ; and we must not forget that, in that age, political passion ran furiously high, and often broke down all moral barriers,—that it was the age of the assassinations at Rastadt, of the crime of Vincennes, of the execution of Ney. Nelson remained on his station after this tragedy ; he shared in some of the short-lived triumphs of the allies in 1799-1800, had the satisfaction of hearing of the capture of the two ships which had escaped from Aboukir, and gave effectual aid in the siege of Malta, taken by Bonaparte on his way to Egypt. By the winter of 1800. he was again in England, having received a peerage for the Battle of the Nile, and the well-merited rank of vice- admiral, and greeted by his country with general acclaim. He was called before long to perform another service, in which his great qualities became again manifest. The victory of Marengo, won by Bonaparte after his extraordin- ary return from Egypt, having broken up the coalition against France, and inclined the ezar to a French alliance, the Northern courts, with Denmark at their head, renewed the armed neutrality of 1780; and, in the first months of 1801, a British fleet was fitted out for the Baltic to put an

end to this menacing league. Sir Peter Parker, a cautious veteran, was made chief of this expedition, Nelson being only the second in command, for negotiation was to be tried at first, and for this Nelson had no aptitude; but,

though this arrangement promised well, it did not prove, on the whole, fortunate. The fleet, an extremely powerful armament, had passed the Sound by the 3lst March,— Nelson chafing at the delays of his colleague, and at diplo- matic efforts which, he rightly thought, would give to the Danes what they wanted, time; and by the 7th April it cast anchor in the waters around the Danish capital. The enemy, however, had already prepared the means of making a stern resistance: Copenhagen was covered by strong batteries ; and an imposing array of heavily armed craft, protected by a shoal, as was the case at Aboukir, presented a most formidable line of defence. Nelson, however, declared for an immediate attack ; and on the 2d May the attempt was made, Parker having judiciously left him to act for himself. Nelson's tactics resembled those of the Nile; he closed on his foe by getting within the shoal; but, from the nature of the case, he had not the means of placing the Danes between two fires; he had to deal with forts, not with vessels only ; and his operations were in part unfortunate, for three of his ships at the out- set grounded. The result was that, although his squadron destroyed the first line of the Danish defences, and threatened the capital with ruinous injury, the hostile batteries were not silenced, and Nelson's ships had suffered so much that he readily welcomed the terms of a truce which extricated him from no little danger. Parker, indeed, had been so alarmed at the prospect that. he had actually signalled the fleet to retreat ; but Nelson character- istically refused to obey until something like victory had been attained,—on the whole, certainly, a wise resolve. Nelson was made a viscount for Copenhagen, and the league of the North was soon dissolved, for, though his success had not been perfect, it had taught the enemy a severe lesson. During the summer of 1801 he was engaged in watching the first preparations for a descent on the English coast, already contemplated by Napoleon; and he directed a boat attack on what was ere long to grow into the for- midable and threatening flotilla of Boulogne. The peace of Amiens brought the war to a close; and Nelson stood on a pinnacle of fame, the acknowledged chief of the navy of England. His life, however, had become unhappy, for his private as well as his public character was not, it must be confessed, spotless. He was singularly susceptible to female influences ; and he had formed for some years an erring attachment for Emma, the wife of Sir William Hamilton, ambassador at Naples in 1798. She was an adven- turess of great beauty and parts ; and, though his conduct at Naples does not seem to have been due to her evil counsels, he became

almost her slave in his wild passion; and this had not only led to a separation from his wife, but had given him many wretched moments, and had caused much pain to his aged sovereign. Discredit, however, of this kind could not detract from his splendid services; and on the renewal of the war in 1803 Nelson was appointed to the Mediterranean command. He took up his station off Toulon ; and for nearly two years he kept the French in port, in spite of repeated efforts of escape, and of the vicissitudes of all kinds of weather—an example of endur- ance never equalled. Meanwhile Napoleon had been maturing his deep-laid plan for invading England; the army which afterwards subdued the Continent had been inarshalled along the cliffs of Boulogne; a vast and armed flotilla had been assembled; and the descent was to be covered by an immense fleet, collected from many points of the compass, and concentrated in suitable force in the Channel. A variety of circumstances, however, the prin-

cipal being the timidity of the French admirals, alarmed at the recollections of the Nile, and fearing attempts to break the blockade, delayed the execution of the enemy's design, though certainly it was formidable in the extreme, and was unsuspected until the last moment. At last, at the end of March 1805, the French admiral, Villeneuve, escaped from Toulon,—his mission being to rally a Spanish squadron, to cross the Atlantic and reach the West Indies, and then, returning to the seas of Europe, to liberate the French and Spanish squadrons blockaded at Ferrol, Rochefort, and Brest, and to attain the Channel with a great armada of from fifty to sixty ships of the line. Villeneuve's operations were at first successful: le was at Martinique by the middle of May, having been joined by a fleet from Cadiz; and, though haunted, as it were, by the thought of Nelson, he was in full sail for Europe by the lst June, having as yet completely eluded the enemy. Meantime Nelson had sought for Villeneuve on the Mediterranean for several days; he had been long delayed by contrary winds; and, though he had crossed the Atlantic with extreme rapidity when apprised of the destination of his foe, he had been lured away by a false report to the shores of the South American continent, and he only reached the latitude of Martinique to find that Villeneuve and his fleet were gone. He sailed from Antigua on the 13th June, pursuing with eleven sail a fleet of nineteen or

twenty ; and, as he feared that he might not come up with Villeneuve, he despatched several light craft to warn the Admiralty—though not suspecting Napoleon's design—that a hostile fleet was on the way to Europe. This precaution proved of the highest moment. Nelson missed Villeneuve in the Atlantic wastes, but one of these vessels conveyed his message. Sir Robert Calder, sent off for the purpose, intercepted Villeneuve off the coasts of Spain, and though the action was not decisive the Frenchman was compelled to put into Ferrol, and was thus prevented from making northwards. Before long Nelson, still chasing Villeneuve, but ignorant where his enemy was, had approached Europe and made for England ; and at this intelligence the French admiral sailed from Ferrol southward, and put into Cadiz, completely frustrat- ing his master's projects. The position of affairs had now become clearer,—though Collingwood alone of British seamen had even an inkling of Napoleon's purpose ; and the Admiralty made preparations at once to attack the fleet that had fled into Cadiz. Nelson was placed in supreme command, and he was off Cadiz in the last days of September. His fleet numbered thirty-three or thirty- four sail of the line; that of Villeneuve was of the same force, the Ferrol squadron having joined his own ; but, as Nelson knew that the French chief would not venture to fight on equal terms, he actually sent away seven or eight ships, in order to bring about an engage- ment which, he had resolved, should prove decisive.

By 20th October Villeneuve had put to sea with the combined fleets of France and Spain. He obeyed a peremptory command of Napoleon, who had stigmatized him as a feeble coward ; he left Cadiz trusting to a false report that Nelson had only twenty ships; and yet, with thirty-three, he dreaded a battle. Nelson, eager to decoy the Frenchman out, had kept a considerable distance from land, but the enemy's movements were watched by his frigates, and he was informed of them throughout the night. His plan of attack had been made some time: the ships of the allies being very numerous, he had resolved to break their line at two points; and in this way the results, he believed, of the manceuvre would be more quick and effective. By daybreak on the 21st the fleet of Villeneuve was descried off the Cape of Trafalgar ; and the English fleet was formed into two columns, the northern led

by Nelson in the “ Victory,” the southern under Collingwood in the “ Royal Sovereign.” The wind was light, and there was an ocean swell; Nelson’s ships slowly advanced on the waters ; and, as they approached it, the hostile fleet, the sun shining on the masses of sails, presented a grand and imposing appearance. Villeneuve, a skilful seaman though a timid leader, had arranged his squadrons ably to meet the attack : he had formed them into two parallel lines, the vessels of the second commanding the spaces between the vessels of the first line; and they were thus marshalled in a compact array, each division giving support to the other, and offering a continuous front of fire to the enemy. Deafening cheers broke from the British armament as the celebrated signal flew from the flagship, “England expects every man to do his duty”; andit is said that Villeneuve, as he heard the shouting, exclaimed to his officers that “all was lost.” The southern column came into action towards noon ; and Collingwood first broke the hostile line, pouring a destructive broadside into the “Santa Anna,” and then ranging alongside the “Fougeux.” The “Royal Sovereign,” however, had out-sailed her consorts, and he was surrounded by enemies for many minutes before a friendly ship could come to her aid ; and this circumstance not only proves how absolute had become the confidence of the British chiefs, but how the manceuvre of piercing the line requires a better fleet to have a chance of success. By this time the northern column was engaged ; the “ Victory,” assailed by a tremendous fire, broke through the enemy soon after twelve, making immense havoc in Villeneuve’s flagship, and exchanging broadsides with the “ Redoubt- able” and with the huge “Santissima Trinidad,” by far the largest man-of-war afloat; and here again some moments elapsed before the “Temeraire” gave her partial relief. The action had now become general; and the British ships in the rear came up, reducing the great inferiority in the first attack. Six or seven ships of the enemy’s first line made a stern and noble resist- ance ; but the second line gradually fell to leeward; the van, as at the Nile, scarcely fired a shot; and, divided, scattered, and overpowered at. every point where the defence was maintained, the allied fleet ere long was a mass of fragments, disabled, helpless, and pursued by their conquerors. Nevertheless the victory, splendid as it was, was dearly bought by the loss of the life of the illustrious warrior who had prepared it. A musket ball from the ‘‘Redoubtable’s ” tops

inflicted a mortal wound on Nelson about an hour after the battle began, and he died towards evening to the unspeakable grief of all who witnessed the sorrowful scene in the “ Victory.” He retained, however, his great faculties to the last ; he lived to hear that almost two-thirds of the enemy’s fleet had been destroyed or captured ; and, though he passed away in the prime of manhood, it can hardly be said that his death was prema- ture, for the foes of England had been swept from the ocean. We have indicated Nelson’s undoubted errors ;and he was inferior to several of England’s naval chiefs in political sagacity and calm forethought. But he was the greatest of her commanders at sea ; he was unrivalled, in an event- ful age of war, for resource, daring, professional skill, and the art of winning the hearts of men; and, on the whole, he was beyond comparison the first of the naval worthies of his country. His remains were conveyed to England and interred in St Paul’s Cathedral on January 9, 1806. See The Dispatches and Letters of Nelson, 7 vols., London, 1844- 46; the Life by Clarke and M‘Arthur (1806), and that by Southey (1828); Alison, History of Europe; Thiers, French Revolution and History of the Consulate and the Empire. (W. O. M.) NEMATOIDEA. The name NVematoidea (vio, thread, cidos, form) was first introduced by Rudolphi, but the group had been previously recognized as distinct by Zeder

under the name of Ascarides, They are now by many systematists united with the Acanthocephali to form the order Vemathelminthes.

The Nematoidea possess an elongated and thread-like form (see fig. 1), varying in length from a few lines up to several feet. The body is covered ex- ternally by a chitinous cuticle which is a product of the subjacent epidermic layer; this cuticle is frequently pro- longed into spines and papille, which are especially developed at the anterior end of the body. The mouth opens at one extremity of the body and the anus at or near the other. Beneath the epidermis is a longitudinal layer of muscle-fibres which are separated into four distinct groups by the dorsal, ventral, and lateral areas; these are occupied by a continuation of the epi- dermic layer; in the lateral areas run two thin-walled tubes with clear con- tents, which unite in the anterior part of the body and open by a pore situated on the ventral area,

These vessels are considered to represent the seg- mental organs of other worms. The lateral areas are entirely absent in Gordius. The body cavity is largely occupied by connective tissue, and neither here nor elsewhere are cilia found at any period of development. The alimentary tract consists of a straight tube running from the mouth to the anus without any convolutions ; it is separable into three divisions :— (1) a muscular cesophagus, which is often provided with cuticular teeth ; (2) a cellular intestine ; and (3) a short terminal rectum surrounded by muscu- lar fibres.

A nervous system has been shown to exist In many species, and consists of a pericesophageal ring giving off several nerves which run forwards and backwards along the lateral and median lines. Some of the free-living forms possess eye specks. The sexes are distinct (with the exception of a few forms that are hermaphrodite), and the male is always smaller than the female. The generative organs consist of one or two tubes, in the upper portion of which the ova or spermatozoa are de- veloped, the lower portion serving as an oviduct or vas deferens ; the female generative organs open at the middle of the body, the male close to the posterior extremity into the terminal portion of the alimentary canal; from this cloaca a diverticulum is given off in which are developed one to three chitinous spicules that subserve the function of copulation. The spermatozoa differ from those of other animals in having the form of cells which sometimes per- form amceboid movements. The development is similar to that of the ova, with which they appear to be homologous.

Mode of Life and Metamorphoses.—While the majority of the Nematodes are parasites, there are many that are never at any period of their life parasitic. These free- living forms are found everywhere—in salt and fresh water, in damp earth and moss, and among decaying sub- stances ; they are always minute in size, and like many other lower forms of life, are capable of retaining their vitality for a long period even when dried, which accounts

Fie. 1—Oxryuris (after Galeb, Arch, de Zool, Ezp., 1878). 6b,mouth; e, oesophagus; dd, en- largement of the ceso- phagus, armed with chitinous teeth; 7, in- testine; s, opening of segmental tubes (placed by mistake on the dorsal instead of the ventral surface) ; fe, testes ; cd, vas deferens; sp, cloaca; pa, papille.

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for their wide distribution; this faculty is also possessed by certain of the parasitic Nematodes, especially by those which lead a free existence during a part of their life- cycle. The free-living differ from the majority of the parasitic forms in undergoing no metamorphosis ; they also possess certain structural peculiarities which led Bastian (Trans, Linn, Soc., 1865) to separate them into a distinct family, the Anguzlulide. It is impossible, however, to draw a strict line of demarcation between the free and parasitic species, since—(1) many of the so-called free Nematoidea live in the slime of molluscs (Villot), and are therefore really parasitic ; (2) while certain species belong- ing to the freeliving genus Angwillula are normally parasitic (e.g., A. tritici, which lives encysted in ears of wheat), other species occasionally adopt the parasitic mode of existence, and become encysted in slugs, snails, &c.; (3) it has been experimentally proved that many normally parasitic genera are capable of leading a free existence ;! (4) transitional forms exist which are free at one period of their life and parasitic at another. The parasitic Nematodes include by far the greatest number of the known genera; they are found in nearly all the orders of the animal kingdom, but more especially among the

Tertebrata, and of these the Mammalia are infested by a greater variety than any of the other groups. No less than nineteen distinct species have been described as occurring in man. The Nematode parasites of the Jnvertebrata are usually immature forms which attain their full develop- ment in the body of some vertebrate ; but there are a number of species which in the sexually adult condition are peculiar to the [nvertebrata.?

The Vematoidea contain about as many parasitic species as all the other groups of internal parasites taken together ; they are found in almost all the organs of the body, and by their presence, especially when encysted in the tissues and during their migration from one part of the body to another, give rise to various pathological conditions. Although some attain their full development in the body of a single host—in this respect differing from all other Hntozoa—the majority do not become sexually mature until after their transference from an “intermediate” to a “definitive ” host. This migration is usually accompanied by a more or less complete

metamorphosis, which is, however, not so conspicuous as in most other parasites, ¢.g,, the Z'rematoda. In some cases (many species of Ascaris) the metamorphosis is reduced to a simple process of growth.

The parasitic and free-living Nematodes are connected by transitional forms which are free at one stage of their existence and parasitic at another ; they may be divided into two classes—those that are parasitic in the larval state but free when adult, and those that are free in the larval state but parasitic when adult.

(1) To the first class belong the "'hairworms" Gordius and Mermis. The adult Gordius aquaticus inhabits clear running water; it is a long slender worm often about a foot in length but only

vy inch in diameter. Several individuals are frequently found together twisted into a knot, whenee the name Gordius. The

1 Ercolani successfully cultivated Oxyuris curvula, Strongylus armatus, and other species in damp earth; the free generation was found to differ from the parasitic by its small size, and by the females being ovoviviparous instead of oviparous. To this phenomenon he gave the name of dimorphobiosis.

2 The genera Ascaris, Filaria, Trichosoma are found throughout the Vertebrata, Cucullanus (in the adult condition) only in fishes and Amphibia ; Dochmius, Trichocephalus, Trichina, and Pseudatius live only in the Mammalia, the last-mentioned genus being confined to the order Cetacea ; Strongylus and Physaloptera are peculiar to mammals, birds, and reptiles, while Dispharagus, Syngamus, and Hystrichis are confined to birds. Gordius and Mermis (in the larval state) are with one or two exceptions confined to the /nvertebrata and Spherularia to bees. Oxyuris, though chiefly parasitic in the Mammalia, occurs also in reptiles, Amphibia, and one or two inseets. Dacnitis and Ichthyo- nema are only found in fishes,

larva when first hatched is provided with a number of cephalic hooks by the aid of which it bores its way into the larve of the gnat and other Dipicra ; there it becomes encysted, but con- tinues to move about within the cyst.

The gnat larve are devoured by fish, and the young Gordius is set free and penetrates the mucous membrane of the intestine, where it encysts itself and beeomes quiescent; in this second larval period the eyst differs in character from that formed during the first larval period. In the spring, about six months after the second eneystment, the larva becomes free and finds its way through the alimentary canal to tho exterior ; the eephalic armature disappears, the alimentary canal be- comes rudimentary, and after aequiring sexual organs the larva assumes the character of theadult(Villot). (2)‘To the second elass be-

‘long Dochmius, Strongylus, and many species of Ascaris; the embryo

on leaving the egg lives free in water or damp earth, and resembles very closely the free-living genus Rhabditis. After a longer or shorter period it enters the alimentary canal of its proper host and becomes sexually mature. Ascaris nigrovenosa has a developmental history which is entirely anomalous, passing through two sexual genera- tions which regularly alternate. The worm inhabits the lung of the frog and toad, and is hermaphrodite (Schneider) or partheno- genetie (Leuckart) ; the embryos hatched from the eggs find their way through the lungs into the alimentary canal and thence to the exterior ; in a few days they develop into a sexual Rhabditis, in which the sexes are distinet ; the eggs remain within the uterus, and the young when hatehed break through its walls and live free in the periviseeral cavity of the mother, devouring the organs of the body until only the outer cuticle is left ; this eventually breaks and sets free the young, which are without teeth, and have therefore lost the typical Rhabditis form. They live for some time in water or mud, occasionally entering the bodies of water snails, but under- go no change until they reach the lung ofa frog, when the cyele begins anew. Although several species belonging to the second elass occasionally enter the bodies of water snails and other animals before reaching their definitive host, they undergo no alteration of form in this intermediate host; the case is different, however, in Filaria medinensis, F. bancroftt, and other forms, in which a free larval is followed by a parasitic existence in two distinct hosts, all the changes being accompanied by a metamorphosis. Jlaria medi- nensis—the Guinea worm—is parasitic in the subcutaneous connec- tive tissue of man (oecasionally also in the horse). It is chiefly found in the tropical parts of Asia and Africa, but has

also been met with in South Carolina and several of the West Indian islands. The adult worm, which sometimes reaches a length of 6 feet, has the characters of a female, butis probably hermaphrodite, seeing that no males have ever been discovered. It is viviparous, and the young, which, unlike the parent, are provided with a long tail, live free in water; it was formerly believed from the frequeney with which the legs an@ feet were attacked by this parasite that the embryo entered the skit directly from the water, but it has been proved by Fedsechenko that the larva bores its way into the body of a Cyclops and there undergoes further development. It is probable that the parasite is then transferred to the alimentary canal of man by means of drinking water, and thence makes its way to the sub

cutaneous connective tissue.

The Nematoidea which are parasitic during their whole life may similarly be divided into two classes—those which un- dergo their development in a single host, and those which undergo theirdevelopment in the bodies of twodistinct hosts.

(1) In the former elass the eggs are extruded with the feces, and the young become fully formed within the egg, and when accidentally swal- lowed by their host are liberated by the solvent action of the gastric juice and com- plete their development. This simple type of life history has been experimentally proved by Leuckart to be characteristic of Trichocephalus affinis, Oxyuris ambigua, and other species. (2) The life history of Ollulanus tricuspis is an example of the second class. Ollulanus trt- cuspis is found in the adult state in the ali- mentary canal of the cat; the young worms are hatched in the alimentary canal, and often wander into the body of their host and become encysted in the lungs, liver, and other organs; during the encystment the worm degenerates and loses all trace of strne- ture, This wandering appears to be accidental, and to have nothing to do with the further evolution of the animal which takes place in those embryos which are voided with the ex- erement. Leuckart proved experimentally that these young forms become encysted in the muscles of mice, and the cycle is com- pleted after the mouse is devonred by a cat. The well-known Trichina spiralis (fig. 2) has a life history closely resembling that

Fig. 2.—Trichina en- cysted among mus- cular fibres. After Leuckart.

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of Ollulanus. The adult worm, which is of extremely minute size, the male being only th and the female 4 of an inch in length, inhabits the alimentary canal of man and many other car- nivorous mammalia; the young bore their way into the tissues and become encysted in the muscles—within the muscle-bundles ac- cording to Leuckart, but in the connective tissue between them according to Chatin and others. The co-existence of the asexual encysted form and the sexually mature adult in the same host, ex- ceptionally found in Ollwlanus and other Nematodes, is the rule in Trichina ; many of the embryos, however, are extruded with the feces, and complete the life cycle by reaching the alimentary canal of rats and swine which frequently devour human ordure. Swine become infested with Zrichina in this way and also by eating the dead bodies of rats, and the parasite is conveyed to the body of man along with the flesh of ‘‘ trichinized”’ swine.

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NEMEAN GAMES. See Games, vol. x. p.° 65.

NEMERTINES, or Nemerreans (Wemertea), is the name of a subdivision of worms,! characterized by the ciliation of the skin, by the presence of a retractile pro- boscis, by the simple arrangement of the generative apparatus, and in certain cases by a peculiar pelagic larval stage to which the name " pilidium " has been given. Many of them are long thread-shaped or ribbon-shaped animals, more or less cylindrical in transverse section. Even the comparatively shortest species and genera can always be termed elongate, the broadest and shortest of all being the parasitic Malacobdella and the pelagic Pelagonemertes. There are no exterior appendages of any kind. The colours are often very bright and varied. They live in the sea, some being common amongst the corals and algee, others hiding in the muddy or sandy bottom, and secreting gelatin- ous tubes which ensheath the body along its whole length. Formerly, they were generally arranged amongst the Platyelminthes as a suborder in the order of the Turbel- larians, to which the name of Rhynchoceela was applied, the other suborders being the Dendrocela and the Rhubdocela, With the advance of our knowledge of these lower worms it has been found desirable to separate them from the Turbellarians and to look upon the Nemertea as a separate phylum of Platyelminthes. Lately the interest in their morphology has increased, since it hag been advanced (6, 8)? that certain points in their organization appear to indicate a remote degree of relationship to the ancestral forms which must have preceded the Chordata (to which the vertebrate animals also belong), and that this relationship is closer than that which exists between those Protochordata and any other group of invertebrate animals.

CLASSIFICATION.—The Nemertines are subdivided into three suborders : —Hoplonemertea, Schizonemertea, and Palzonemertea (5). The (1) Hoplonemertea embrace all the species with a stylet in the proboscis, and also Malacobdella, which has an unarmed proboscis, but which, by the details of its organization and its develop- ment, must certainly be placed here (parasitism may be the cause of its incipient degeneration). The special

- Nemertes was a scanymph, daughter of Nereus and Doris. One of the genera was named Vemertes by Cuvier. These figures refer to the bibliography at the end of the article.

characters of this suborder may be gathered from the anatomical descriptions hereafter to be given. In those species of which the embryology has been investigated the development was direct. The more common or more important genera are Amphiporus (A. pulcher, British coasts, Mediterranean ; A. splendidus, Atlantic), which is comparatively short, Nemertes (N. gracilis, Atlantic and Mediterranean; WV. antonina, Mediterranean ; NV. echinoder- ma, Mediterranean), which is long and thread-like, Tetra- stemma, Drepanophorus (with more complicate armature in the proboscis), Akrostomum, Malacobdella. (2) In the Schizonemertea all those genera and species are united which have deep, longitudinal, lateral, cephalic fissures. The development of some (Lineus) is characterized by the so-called larva of Desor, of others (Cerebratulus) by the

Fig. 1.

Fies. 1, 2.—Diagrams of the organs of a Nemertine, fig. 1 from below, fig. 2 from above. m, mouth; div, intestinal diverticula; a, anus; ov, ovaries; n, neph- ridia; Br, brain-lobes; Im, longitudinal nerve stems ; pr, proboscis ; ps, pro- boscidian sheath ; p.o., opening for proboscis.

Fig. 2.

curious and characteristic pilidium-larva. The principal genera are Lineus (L. longissimus, Atlantic ; L. obscurus), Cerebratulus (C. marginatus, C.

bilineatus, both Atlantic and Mediterranean ; CO. urticans, Mediterranean ; C. fascio- latus and aurantiacus, C. hepaticus and dohrnii, Medi- terranean; C', macintoshii, Madeira), Langia (L. formosa), Borlasia (B. elizabeth), (3) Of the Palxonemertea the most typical and most characteristic genera are Carv- nella and Cephalothria, They differ considerably both from Hoplo- and from Schizonemertines, and evidently belong to a lower stage of differentiation. The genera Polva (P. delineata and P. curta, Mediterranean) and Valen- cinta are provisionally arranged in this order because, though less primitive, they are not typical representatives of the other two suborders. The development of these species is not at all, or only very superficially, known. For the further characters of the last two suborders see the anatomical description below.

Another subdivision generally current is that into the Enopla and the Anopla (14). This does not, however, take into sufficient account the primitive and diverging

Ana- tomy.

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characters disclosed by the very important less highly organized genera.

Anatomy.—(a) Proboscis and Proboscidian Sheath.—The organ most characteristic of a Nemertine is without doubt the proboscis. With very few exceptions (Malacobdella, Akrostomum, where it has fused with the mouth to a single exterior opening), there is a terminal opening (subterminal in Valencinia) at the foremost tip of the body, out of which the proboscis is seen shooting backwards and forwards, sometimes with so much force that both its interior attachments are severed and it is entirely expelled from the body. It then often retains its vitality for a long time, apparently crawling about as if it were itself a worm, a phenomenon which is at least partially explained by the extra- ordinary development of nervous tissue, equally distributed all through the walls of the proboscis, | and either united (10) into nu- merous longitudinal nerve-stems | (Drepanophorus, Amphiporus) or | spread out into a uniform and comparatively thick layer (Cere- bratulus, sp.). This very effective and elaborate innervation, which | has been directly traced (6) to the | brain, whence strong nerves (gene- | rally two) enter the

proboscis, renders it exceedingly probable that the most important functions of the proboscis are of a sensi- ferous, tactile nature, a supposi- tion which is again strengthened by the fact that amongst the Rhabdoccel Turbellarians an organ which may be called the forerunner of the Nemertean proboscis has been proved (8) to be the morphological equivalent of the foremost tip of the body, which, as an organ of delicate touch, has acquired the property of folding inwards. In Nemertines the everted proboscis is retracted in the same way as the tip of a glove finger would be if it were pulled backwards by a thread situated in the axis and attached to the tip. The comparison may be car- ¢ ried still further. The // centralthread just alluded | to is represented in the \ Nemertean proboscis by ‘ that portion which is never everted, and the tip of the glove by the boundary between the

N

Pr

Fie, 3.—Anterior portion of the

body of a Nemertine. Br, brain-lobes; WV, lateral nerves; PS, proboseidian sheath; Pr, proboscis; P.o., exterior open- ing through which the probos- eis is everted. Csophagus and mouth shown by dotted lines.

Fig. 4.

Fig. 5. evertible and non-evert- pgs, 4, 5.—Proboscis with stylet, ‘ reserve”

saes, and muscular bulb of a Hoplonemer-

ible portion of the pro- s d tine. Fig. 4 retracted; fig. 5 everted.

boscis—a boundary which in the Hoplonemertini is marked by the presence of a pointed or serrated stylet. This stylet is thus situated terminally when the proboscis has reached its maximum eversion. It adds a decisively aggressive character to an organ the original significance of which, as we have seen, was tactile. This aggressive character has a different aspect in several genera which are destitute of a central stylet, but in which the surface that is turned outwards upon eversion of the proboscis is largely

provided with nematocysts, sending the urticating rods of different sizes in all directions. In others this surface is beset with thick, glandular, adhesive papille.

The comparison with the glove-finger is in so far

insufficient as the greater portion of the non-evertible half of the proboscis is also hollow and clothed by glandular walls. Only at the very hindermost end does it pass into the so-called retractor-muscle (fig. 2), which is attached to the wall of the space (proboscidian sheath) in which the proboscis moves about. This retractor-muscle, indeed, serves to pull back with great rapidity the extruded proboscis, and is aided in its action by the musculature of the head. The extrusion itself depends entirely upon contraction of the muscular walls of the space just mentioned (proboscidian sheath). As it is (1) closed on all sides, and (2) filled with a corpuscular fluid, the contractions alluded to send this fluid to impinge against the anterior portion, where the proboscis, floating in its sheath, is attached with it to the muscular tissue of the head (fig. 3). Partial extrusion lessening the resistance in this region inevitably follows, and when further con- tractions of the walls of the sheath ensue total extrusion is the consequence. It.is worthy of notice that in those Nemertines which make a very free use of their proboscis, and in which it is seen to be continually protruded and retracted, the walls of the proboscidian sheath are enor- mously muscular. On the other hand, they are much less considerably or even insignificantly so in the genera that are known to make a rather sparing use of their proboscis.

The proboscis, which is thus an eminently muscular organ, is composed of two or three, sometimes powerful, layers of muscles—one of longitudinal and one or two of circular fibres. In the posterior retractor the longitudinal fibres become united into one bundle, which, as noticed above, is inserted in the wall of the sheath. At the circular insertion of the proboscis in front of the brain the muscular fibres belonging to the anterior extremity of the body and those connected with the proboscis are very intimately interwoven, forming a strong attachment.

The proboscis broken off and expelled is generally reproduced, the posterior ribbon-like end of this reproduced portion again fusing with the walls of the

sheath (11). There is reason to suppose that, By 4 when a wound is inflicted by the central uy stylet, it is envenomed by the fluid secreted of

in the posterior proboscidian region being at

the same time expelled. A reservoir, a duct,

and a muscular bulb in the region (fig. 4) yg. ¢.—The ar-

where the stylet is attached serve for this pur- mature from : 5 : the proboscis

pose. The significance of two or more (in of Drepano-

Drepanophorus very numerous) small sacs con- P/rus.

taining so-called “reserve” stylets resembling in shape that

of the central dart is insufficiently known.

The proboscidian,.sheath, which by its transverse con- tractions serves to bring about eversion of the proboscis in the way above traced, and the muscular walls of which were similarly noticed, is attached to the musculature of the head just in front of the ganglionic commissures (fig. 3). In nearly all Nemertines it extends backwards as far as the posterior extremity, just above the anus; in Carinella it is limited to the anterior body-region. The corpuscles floating in the fluid it contains are of definite shape, and in Cerebratulus urticans they are deep red from the presence of hemoglobin. Internally the muscular layers are lined by an epithelium. In the posterior portion this epithelium in certain Schizonemertea has a more glandular appearance, and sometimes the interior cavity is obliterated by cell-proliferation in this region. Superiorly the sheath either closely adheres to the muscular body-wall, with which it may even be partly interwoven, or

it hangs freely in the connective tissue which fills the space between the intestine and the muscular body-wall.

(6) Cutaneous System.—Externally in all species a layer of ciliated cells forms the outer investment. In it are,

moreover, enclosed unicellular glands pouring their highly refracting contents, of a more or less rod-like shape, directly to the exterior. They appear to be the principal source of the mucus these animals secrete. In Schizonemertines these elements are separated by a thin homogeneous base- ment membrane (fig. 8) from the following,—that is, from a layer in which longitudinal muscular fibres are largely intermixed with tortuous glands, which by reason of their deeper situation communicate with the exterior by a much longer and generally very narrow duct. The pigment is also principally localized in this layer, although sometimes it is present even deeper down within the musculature. The passage from this tegumentary layer to the subjacent longitudinal muscular one is gradual, no membrane separating them. In Carinella, Cephalothrix, Polia, and the Hoplonemertines the two tegumentary layers with their different glandular elements are fused into one; a thick layer of connective tissue is situated beneath them (instead of between them) and keeps the entire cutaneous system more definitely separate from the muscular (figs. 45’S).

(c) Musculature and Connective Tissue.—The muscular layers by which the body-wall is constituted have been very differently and to some extent confusingly described by the successive authors on Nemertean anatomy. There is sufficient reason for this confusion. The fact is that not only have the larger subdivisions a different arrangement and even number of the muscular layers, but even within the same genus, nay, in the same species, well-marked differences occur. Increase in size appears sometimes to be accompanied by the development of a new layer of fibres, whereas a difference in the method of preparation may give to a layer which appeared homogeneous in one specimen a decidedly fibrous aspect in another. Never- theless there are three principal types under which the different modifications can be arrarfged. One of them is found in the two most

primitively organized genera, Carinella and Cephalothrix, i.e, an outer circular, a longi- tudinal, and an inner circular layer of muscular fibres

Mig? i, Fig. 8. Fig. 9.

Fics. 7-9.—The layers of the body-wall in Carinella (fig. 7), the Hoplonemertea (fig. 8), and the Schizonemertea (fig. 9). ¢, cellular tissue of the integument ; Bm, basement membrane ; circ, 1, outer circular, and Jong, longitudinal layer of muscular tissue; circ. 2, long. 1, additional circular and longitudinal layers of the same; m7, nervous layer,

(fig. 7). The second is common to all the Schizonemer- tines as well as to Polia and Valencinia, and also compre- hends three layers, of which, however, two are longitudinal, viz., the external and the internal one, there being a strong circular layer between them (fig. 9). To the third type all the Hoplonemertea correspond ; their muscular layers are only two, an external circular and an internal longi- tudinal one (fig. 8).

The Schizonemertea thus appear to have developed an extra layer of longitudinal fibres internally to those which they inherited from more primitive ancestors, whereas the Hoplonemertea are no longer in possession of the internal circular layer, but have on the contrary largely developed the external circular one, which has dwindled away in the Schizonemertea. In only one instance has the present writer met with a thin exterior circular layer in a very large specimen of Cerebratulus ; younger specimens of the same species did not show it. It is noticeable that Kefer-

stein (9) also observed four layers similarly arranged in one of the specimens of Cerebratulus which he investi- gated. The situation of the lateral nerve-stems in the different genera with respect to the muscular layers lends definite support to the interpretation of their homologies here given.

In Carinella, Cephalothrix, and Polia, as well as in all Hoplonemertines, the basement membrane of the skin already above alluded to is particularly strong and immedi- ately applied upon the muscular layers. In the Schizo- nemertines there is a layer in which the cutaneous elements are largely represented below the thin basement membrane (fig. 8), between it and the

bulk of the outer longitudinal muscles. The difference in the appearance of the base- ment membrane—sometimes wholly homogeneous, some- times eminently fibrillar—can more especially be observed in differently preserved specimens of the genus Polia.

The connective tissue of the integument and basement membrane imperceptibly merges into that which surrounds the muscular bundles as they are united into denser and definite layers, and this is especially marked in those forms (Akrostomum) where the density of the muscular body- wall has considerably diminished, and the connective tissue has thus become much more prominent. It can then at the same time be observed, too, that the compact mass of connective tissue ("reticulum," Barrois) which lies between the muscular body-wall and the intestine (1) is directly continuous with that in which the muscular layers are imbedded. Nuclei are everywhere present. The omni- presence of this connective tissue excludes the idea of any true body cavity in Nemertines.

In Polia the connective tissue énclosed in the external muscular layer is eminently vacuolar,—all the interme- diate stages between such cells in which the vacuole pre- dominates and the nucleus is peripheral and those in which the granular protoplasm still entirely fills them being moreover present,

In addition to the musculature of the proboscis and proboscidian sheath, longitudinal muscular fibres are found in the walls of the cesophagus, whilst transverse ones are numerous and united into vertical dissepiments between the successive intestinal ceca, thus bringing about a very regular internal metamerization (4). The genital products develop in intermediate spaces similarly limited by these dissepiments and alternating with the digestive caeca.

(2) Nervous System and Sense Organs. —The nervous system of Nemertines presents several interesting peculiarities. As central organs we have to note the brain-lobes and the longitudinal lateral cords which form one continuous unsegmented mass of fibrous aud cellular nerve-tissue. The fibrous nerve-tissue is more dense in the higher differentiated, more loose and spongy in the lower organized forms ; the cellular nerve-tissue is

similarly less compact in the forms that are at the base of the + scale. No ganglionic swellings: © whatever occur in the course of €0 ne

the longitudinal cords. The wl, wl, brain must be looked upon as cont

the anterior thickening of these

cords, and at the same time as pe. pp. t-

the spot where the two halves F ”

rs ap one a nage shear Fies. oh ti and eg lleyii of intercommunicate. This is a Schizonemertine (fig. 10) and a Hoplo- brought about by a double com- nemertine (fig. 11). eo, extcrior opening; missure, of which the ventral u.l., superior brain-lobe; p.l., posterior portion is considerably thicker >rain- lobe.

than the dorsal, and which, together with the brain-lobes, consti- tutes a ring through which both proboscis and proboscidian sheath pass. The brain- lobes are generally four in number, a ventral and a dorsal pair, respectively united together by the above-mentioned commissures, and moreover anteriorly interfusing with cach other, right and left. In Carinella this separation into lobes of the anterior thickenings of the cords has not yet. commenced, the ven- tral commissure at the same time being extremely bulky. There is great probability that the central stems, together with the brain,

must be looked upon as local longitudinal accumulations of nervous tissue in what was in more primitive ancestors a less highly dif- ferentiated nervous plexus, situated in the body-wall in a similar way to that which still is found in the less highly organized Ceelenterates. . Such a nervous plexus indeed occurs in the body- wall of all Schizonemertines (7), sometimes even as a compara- tively thick layer, situated, as are the nerve stems, between the external longitudinal and the circular muscles (fig. 9). In Cari- nella, where the longitudinal nerve-stems are situated exteriorly to the muscular layers, this plexus, although present, is much less , dense, and can

more fitly be compared to a network with wide meshes. In both cases it can be shown to be in immediate continuity with the py coating of nerve-cells forming part of the longitudinal cords. It stretches forward as far as the brain,

LN. 88 and in Carinella is Fig, 12.—The brain of a Nemertine, with its lobes and

commissures. §.¥., nerves to sensory apparatus; P.N., nerves for proboscis; vag, nerves for c@so- phagus; Z.W., lateral nerve stems,

again continued in front of it, whereas in the Schizonemer- tines the innervation of the anterior extremity of the head, in front of the brain, takes the form of more definite and less numer- ous branching stems. ‘The presence of this plexus in connexion with the central stems, sending out nervous filaments amongst the muscles, explains the absence, both in Paleo- and Schizo- nemertines, of separate and distinct peripheral nerve stems spring- ing from the central stems innervating the different organs and body-regions, the only exceptions being the nerves for the pro- boscis, those for the sense organs in the head, and the strong nerve pair (n. vagus) for the esophagus. At the same time it renders more intelligible the extreme sensitivcness of the body- wall of the Nemertines, a local and instantaneous irritation often resulting in spasmodic rupture of the animal at the point touched. r=

In the Hoplonemertea, where the longitudinal stems lie inside the muscular body-wall, definite and metamerically placed nerve branches spring from them and divide dichotomously in the differeut tissues they innervate. A definite plexus can here no longer be traced. In certain Hoplonemertiues the lateral stems have been noticed to unite posteriorly by a terminal commissure, situated above the anus, the whole of the central nervous system being iu this way virtually situated above the intestine. In others there is an approximation of the lateral stems towards the median ventral line (Drepanophorus); in a genus of Schizonemertines (Langia), on the other hand, an arrangement occurs by which the longitudinal stems are no longer lateral, but have more or less approached each other dorsally (6).

In addition to the nerves starting from the brain-lobes just now especially mentioned, there is a double apparatus which can hardly be treated of in conjunction with the sense organs, because its sensory functions have not been sufficiently made out, and which will therefore rather be considered along with the brain and central nervous system. This apparatus is usually known under the name of the lateral organs. To it belong (a) superficial grooves or deeper slits situated on the integument near the tip of the head, (2) nerve lobes in immediate connexion with the nervous tissue of the brain, and © ciliated ducts penetrating into the latter and communicating with the former. Embryology shows that originally these different parts are separately started, and only ultimately become united into one. ‘T’wo lateral outgrowths of the foremost portion of the cesophagus, afterwards becoming constricted off, as well as two ingrowths from the epiblast, contribute towards its formation, at least as far as both Hoplo- and Schizonemertines are concerned. As to the Palwonemertea, their embryology has not yet been studied, and in the most primitive genus, Carinella, we do not find any lateral organs answering to the description above given. What wo do find is a slight transverse furrow on each side of the head, close to the tip, but the most careful examination of sections made through the tissues of the head and brain shows the absence of any further apparatus comparable to that described above. Only in one species, Carinella inexpectata, a step in advance has been made, in so far as in connexion with the furrow just mentioned, which is here also somewhat more complicated in its arrangement, a ciliated tube leads into the brain, there to end blindly amidst the nerve- cells. No other intermediate stages have as yet been noticed between this arrangement and that of the Schizonemertea, in which a separate posterior brain-lobe receives a similar ciliated canal, and in which the esophageal outgrowths have made their appearance and are coalesced with the nerve-tissue in the organ of the adult

animal, The histological elements of this portion remain distinct both by transmitted light and in actual sections.

These posterior brain-lobes, which in all Schizonemertines are in direct continuity of tissue with the upper pair of principal lobes, cease to have this

intimate connexion in the Hoplonemertea ; and, although still constituted of (1) a ciliated duct, opening out exter- nally, (2) nervous tissue surrounding it, and (8) histological ele. ments distinctly different from the nervous, and most probably directly derived from the esophageal outgrowths, they are never- theless here no longer constantly situated behind the upper brain-lobes and directly connected with them, but are found sometimes behind, sometimes beside, and sometimes before the brain-lobes. Furthermore, they are here severed from the principal lobes and connected with them by one or more rather thick strings of nerve- fibres. In some cases, especially when the lobes lie before the brain, their distance from it, as well as the length of these nervous eon- nexions, has considerably increased.

With the significance of these parts we are still insufficiently acquainted. There appear to be analogous organs amongst Platyelminthes, but a careful comparative study is wanted. A partial comparison has been hazarded (8) with the anterior cesophageal outgrowths in Balanoglossus and Amphioxus, and for the Schizonemertines arguments have been adduced (6) to prove that here they have the physiological significance of a special respiratory apparatus for the central nervous tissue, which in all these forms is strongly charged with hemoglobin. The hemoglobin would, by its pre-eminent properties of fixing oxygen, serve to fur- nish the nerve system, which more than any other requires a constant supply, with the necessary oxygen. Such could hardly be obtained in any other way by those worms that have no special respiratory apparatus or delicately ramifying blood-vessels, and that live in mud and under stones, where the natural supply of freshly oxygenated sea-water is practically limited. Whethcr in the Hoplo-nemertines, where the blood fluid is often provided with hemo-globiniferous disks, the chief functions of the side organs may not rather be a sensory one must be further investigated.

The exterior opening of the duct has been several times alluded to. In the Bib plonsensoriiiios it is generally situated towards the middle of a lateral transverse groove on either side of the head, as was noticed for Carinella, and as is also present in fPolia. Generally a row of shorter grooves perpendicular to the first, aud similarly provided with strong cilia, enlarges the surface of these furrows (fig. 14). In Valeneinia there is nothing but a circular opening without furrow. In all Schizonemertines there is on each

side of the head a longitudinal slit of varying 7. : length but ennely considerable depth, Fig. 12, Bige ls. in the bottom of which the dark red brain Fics. 18, eit views is very plainly visiblo by transparency. ke a ‘fg. age These slits are continued into the ciliated ongitudinal slit, and of duct, being at the same time themsclves 4 Hoplonemertine (fig. 14) very strongly eiliated. In life they are iy: So reree Vie ate commonly rhythmically opened and shut ; by a wavy movement. They are the head slits (cephalic fissures, ‘* Kopfspalten”’) so characteristic of this subdivision (figs. 10 and 13).

With respect to the sense organs of the Nemertines, we find that eyes are of rather constant occurrence, although many Schizonemer- tines living in the mud appear to be blind. The more highly organized species have often very numerous eyes (Amphiporus, Drepanophorus), which are provided with a spherical refracting anterior portion, with a cellular ‘‘ vitreous body,” with a layer of delicate radially arranged rods, with an outer sheath of dark pigment, and with a separate nerve-twig each, springing from a common or double pair of branches which leave the brain as n. optiet, for the innervation of the eyes. Besides these more highly differentiated organs of vision, more primitive eyes are present in others down to simple stellate pigment specks without any refracting apparatus. :

Organs of hearing in the form of capsules containing otoliths have only been very rarely observed, apparently only in Hoplonemertea.

As to the organ of touch, the great sensitiveness of the body has already been noticed, as well as the probable primary significance of the proboscis. Small tufts of tactile hairs or papille are some- times observed in small number at the tip of the head (11); some- times longer hairs, apparently rather stiff, are seen on the surface, very sparingly distributed between the cilia, and hitherto only in a very limited number of small specimens. They may perhaps be considered as sensory. ; ; \

(e) Digestive System.—The anterior openiug, the mouth, is situated ventrally, close to the tip of the head and in front of the brain in the Hoplonemertea, somewhat more backward and behind the brain in the other Nemertines. In most Schizonemertines it is found to be an elongated slit with corrugated borders; in the

Hoploncmertines it is smaller and rounded ; in Malacobdella and Akrostomum it, moreover, serves for the extrusion of the proboscis, which emerges by a separate dorsal opening just inside the mouth. The cesophagus is the anterior portion of the digestive canal; its walls are folded longitudinally, comparatively thick, and provided with longitudinal muscular fibres, ‘Two layers are specially obvious in its walls,—the inner layer bordering the lu- men being composed of smaller ciliated cells, the outer thicker one containing numerous granular cells and hav- ing a more glandular character. Outside tho wall of the cesophagus a vascular space has been detected (11) which is in direct continuity with the longitudinal blood-vessels. In cer- tain cases, however, the walls of the cesophagus appear to be very closely applied to the muscular body-wall, and this vas- cular space thereby con- siderably reduced.

The posterior portion of the intestine is speci- ally characterized by the appearance of the intes- tinal diverticula hori- zontally and symmetric- ally placed right and left and opposite to each other. Sometimes this re- gion, into which the ceso- phagus leads, stretches forwards under the cesophagus (Hoplone- mertines) for a certain distance, anteriorly ter- minating by a cul-de- sac. Cases of asym- metry or irregularity in the arrangement of the ceca, though sometimes occurring, are not nor- mal. At the tip of the

Fig. 17. tail, where the growth Fras, 15-17.—Diagrammatic sections to show dis-

position of internal organs in Carinella (Palxo- nemertea), fig. 15, Schizonemertea, fig. 16, and Hoplonemertea,’ fig.‘17. C, cellular portion of integument; B, basement membrane; A, circu- lar muscular layer; A’, longitudinal do.; A”, second circular (in Carinella); A’”’, second longi- tudinal (in Schizonemertea); N, nervous layer ; LN, lateral nerves; PS, cavity of proboscidian sheath (the sheath itself of varying thickness); P, proboscis; J, intestine; ZBv, lateral blood- vessel; D&Bv, dorsal do.; C7, connective tissue.

of the animal takes place, the ceca are al- ways cminently regular. So they are throughout the whole body in most of the Hoplonemertines. In Carinella they are generally deficient and the intestine straight ; in young specimens of this species, however, they occur, though less regular and more in the form of incipient foldings by which the digestive surface is increased. The inner surface of the intestinal ceca is ciliated, the ceca themselves are sometimes—especially in the hindermost portion of the body—of a considerably smaller lumen than the intermediate genital spaces; sometimes, however, the reverse is the case, and in both cases it is the smaller lumen that appears enclosed between and suspended by the transverse fibres constituting the muscular dissepiments above mentioned.

The anus is situated terminally, the muscular body-wall through which the intestine must find its way outwards probably acting in this region the part of a sphincter. The lateral nerve stems mostly terminate on both sides in closest proximity to the anus ; in certain species, however, they interfuse by a transverse connexion above the anus, The longitudinal blood-vessels do the samc. The question has been raised whether the regular intestinal ceca of Nemertines might not be compared with those intestinal diverticula of the embryo Amphioxus which ultimately become the mesoblastic somites of the adult (8). This view would be a further extension of the views concerning the ccelom first propounded by Huzley.

(f) Circulatory Apparatus.—This consists of three longitudinal trunks, a median and two lateral ones. They are in direct con- nexion with each other both at the posterior and at the anterior end of the body. At the posterior end they communicate together by a T-shaped connexion ina simple and uniform way. Anteriorly there is a certain amount of diffcrence in the arrangement. Whereas in the Hoplonemertines an arrangement prevails as represented in

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fig. 18, the lateral stems in the Schizonemertines, while entirely uniform all through the posterior portion of the body, no longer individually exist in the cesophageal region, but

here dissolve themselves into a network of vascu-

lar spaces surrounding this portion of the di-

gestive tract (11). The median dorsal vessel,

however, remains distinct, but instead of con-

tinuing its course beneath the proboscidian

sheath it is first enclosed by the ventral muscu-

lature of this organ, and still farther forwards

it even bulges out longitudinally into the cavity

of the sheath. Anteriorly it finally communi-

cates with the lacune just mentioned, which ; surround the cesophagus, bathe the posterior i een a lobes of the brain, pass through the nerve ring paratus in auntie together with the proboscidian sheath, and are rior body-region of generally continued in front of the brain as a * Woplonemertine. lacunar space in the muscular tissue, one on each side.

Special mention must be made of the delicate transverse vessels regularly connecting the longitudinal and the lateral ones. They are metamerically placed, and belong to the same metamer as the digestive cceca, thus alternating with the generative sacs. The blood fluid does not flow in any definite dircction ; its movements are largely influenced by those of the muscular body-wall. It is colourless, and contains definite corpuscles, which are round or elliptical, and in many Hoplonemertines are coloured red by hemo- globin, being colourless in other species. The circulatory system of Carinella is considerably different, being more lacunar and less restricted to definite vascular channels. Two lateral longitudinal lacune form, so to say, the forerunners of the lateral vessels. A median longitudinal vessel and transverse connecting trunks have not as yet been detected. There are large lacune in the head in front of the ganglia.

(9) Nephridia.—Although these organs were already very well known to Max Schultze (14), their presence in Nemertines was repeatedly and

seriously disputed until Von Kennel (10) definitely proved their existence and gave details concerning their histology. With the exception of a few genera where they have not as yet been discovered (Carinella), one pair of nephridia appears to be very generally present. They essentially consist of a complex coiled tube, one on each side of the cesophagus (fig. 1), communicating with the exterior by a duct piercing the body-wall. The two openings of the nephridia are situated sometimes more towards the ventral, at other times more towards the dorsal side. Even in the larger Schizonemertines these pores are only a few millimetres behind the mouth region. Internal funnel-shaped openings, although sought for, have as yet not been detected. The coiled tubes extend both forwards and backwards of the cxternal opening, by far the greater portion being situated backwards. The anterior coils reach forwards till in the immediate vicinity of the posterior brain-lobes. The coils are tubiform, with an internal lumen, only one layer of rather large cells constituting the walls. These cells are ciliated ; in some transparent species the internal ciliary move- ment can be observed during life. In transverse sections the nephridia can be shown to be generally situated in the region limited by (1) the proboscidian sheath, (2) the upper wall of the intestine, (3) the muscular body-wall. No trace of nephridia is found posterior to the cesophagus.

(h) Generative System.—In the Nemertines the sexes are separate, with only very few exceptions (12) (Tetrastemma hermaphroditica, Marion). The generative products are contained in separate pouches placed metamerically in the way noticed above in treating of the digestive system. They are conveyed outwards along narrow canals, one pair for each metamer piercing the muscular body-wall, and visible on the outside in mature individuals as minute light- coloured specks, The ova and spermatozoa, when mature, present no peculiarities. As the ova are in many species deposited in a gelatinous tube secreted by the body-walls, in which they are arranged (three or more together) in flask-shaped cavities, impreg- nation must probably take place either before or at the very monent of their being deposited. The exact mode has not yet been noticed. Another point not yet sufficiently settled is the oogenesis in Nemertines. In several cases the ova appear to originate directly as the lining of the generative pouches, but the exact part which the mesoblastic connective tissue plays, both with regard

to these pouches and to the generative products themselves, remains yet to be settled.

Prosorhochmus claparedii is a viviparous form.

DEVELOPMENT.—The embryology of the Nemertines offers Develop- Our knowledge of ment.

some very remarkable peculiarities. the development of the most primitive forms is very scanty. Of that of Carinella absolutely nothing is known. On Cephalothriz we have observations, in certain respects con- tradictory. Both Schizo- and Hoplonemertea have been more exhaustively studied, the first, as was noticed above,

being characterized by peculiar larval forms, the second developing without metamorphosis.

The larva of Cerebratulus is called the pilidium. In exterior shape it resembles a helmet with spike and ear- lobes, the spike being a strong and long flagellum or a tuft of long cilia, the ear-lobes lateral ciliated appendages (fig. 19). It encloses the pri- mitive alimentary tract. Two pairs of invaginations of the ~z skin, which originally are % called the prostomial and meta- am ¢ stomial disks, grow round the *” intestine, finally fuse together, and form the skin and muscu- | cee POH Af tho Tabara’ ig rounnieve. 5, bindlet Nemertine, which afterwards © citia or flagellum; o, cesophagus; becomes ciliated, frees itself sh stomarh: ou. ae from the pilidium investment, amnion; pr.d., prostomial disk; and develops into the adult ?%%» metastomial disk. worm without further metamorphosis (2, 13).

The eggs of these species are not enveloped by such massive gelatinous strings as are those of the genus Lineus. In the latter we find the young Nemertines crawling about after a period of from six to eight weeks, and probably feeding upon a portion of this gelatinous substance, which is found to diminish in bulk. In accordance with these more sedentary habits during the first phases of life, the characteristic pilidium larva, which is so

eminently adapted for a pelagic existence, appears to have been reduced to a close-fitting exterior layer of cells, which is stripped off after the definite body-wall of the Nemertine has similarly originated out of four ingrowths from the primary epiblast. To this reduced and sedentary pilidium the name of “larva of Desor” has been given (1).

In the Hoplonemertea, as far as they have been investi- gated, a direct development without metamorphosis has been observed. It appears probable that this is only a further simplification of the more complicated metamor- phosis described above.

As to the development of the different organs, there is still much that remains doubtful. The hypoblast in some forms originates by invagination, in others by delamina- tion. The proboscis is an invagination from the epiblast ; the proboscidian sheath appears in the mesoblast, but is perhaps originally derived from the hypoblast. The origin of the lateral organs has already been noticed ; that of the nerve system is essentially epiblastic.

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NEMESIANUS, a Roman poet who flourished about 283 B.c. His full name was Marcus Aurelius Nemesianus Olympius, and he is called a Carthaginian. He was an admired and popular poet at the court of the Roman emperor Carus. He wrote poems on the arts of fishing and hunting, but only a fragment of the latter, 325 hexameter lines, has been preserved. It is neatly ex- pressed in good Latin. Some other extant fragments are ascribed without good authority to this poet.

LEditio princeps, Venice, 1534. The Cynegetica of Gratius Faliscus and Nemesianus are united in the edition of R. Stern (Halle, 1832), — added to M. Haupt's edition of Ovid's Halieutica (Leipsic,

NEMESIS occasionally appears as a Greek goddess. At Rhamnus in Attica she had a famous temple, and there was an Attic legend that Helen was the daughter of Nemesis. The Attic goddess was perhaps a form of Aphrodite, who sometimes bears the epithet Nemesis. In Smyrna and the neighbouring Temnos we find a pair of goddesses of the name. They are represented on coins of these cities, and it is said that they appeared in a dream to Alexander the Great, bidding him rebuild Smyrna. They are certainly connected with the cultus of Meter Sipylene or Cybele, the tutelary goddess of Smyrna and all the country, round Mount Sipylus. In general Nemesis appears as a personification of that righteous indignation which punishes the arrogant and tyrannical abuse of pro- sperity. Often the idea is carried much further than this; in Herodotus especially the divine Nemesis is offended by all great prosperity among men, quite irrespective of the moral guilt of the persons concerned.

NEMESIUS, a Christian philosopher, author of a treatise On Human Nature, was, according to the title of his book, bishop of Emesa (in Syria); of his life nothing further is known, and even his date is uncertain, but most probably he flourished towards the close of the 4th century. Theologically, and especially as regards his christology, he is usually claimed by the orthodox; but his views as to the pre-existence of the soul and a modified metempsy- chosis are more Platonic than catholic, and his leaning towards

the doctrine of the world's eternity is difficult to reconcile with what, afterwards at least, came to be the teaching of the church. One or two of his physiological expositions have occasionally been quoted, very irrelevantly, to show that Harvey's discovery of the circulation of the blood had been anticipated at that early age. Nemesius is frequently quoted by later writers of the Eastern Church, such as Joh. Damascenus. His writings have sometimes been attributed to Gregory of Nyssa. The editio princeps of the wepi Piccws avOpHrov appeared at Antwerp in 1565; the work has more than once been re-edited and translated.

NENAGH, a market and assize town of county Tipperary, province of Munster, Ireland, is finely situated in a rich though hilly country near the river Nenagh, 29 miles north of Tipperary and 95 south-west of Dublin. The principal buildings are the court-house, the barracks, and the market-house. Of the old castle, "Nenagh Round," dating from the time of King John, there still exists the circular donjon or keep. There are no remains of the hospital founded in 1200 for Austin canons, nor of the Franciscan friary, founded in the reign of Henry III. and one of the richest religious houses in Ireland. The town depends chiefly on agriculture, and there is an important butter and corn market. The population in 1871 was 5696, and in 1881 it was 5422.

Nenagh was one of the ancient manors of the Butlers, who received for it the grant of a fair from Henry VIII. In 1550 the town and friary were burned by O'Carroll. In 1641 the town was taken by Owen Roe O'Nial, but shortly afterwards it was recaptured

by Lord Inchiquin. It surrendered to Ireton in 1651, and was burned by Sarsfield in 1688.

doz

NENNIUS, the supposed author of a [storia Britonum, which, commencing with a description of Britain, gives the mythical origin of the Britons and Scots and an account of the Roman occupation and of the reign of Vortigern, describes the successive settlements of the Saxons, and concludes with a narrative of the twelve battles in which King Arthur, in the 6th century, is said to have defeated the Saxons. The work is evidently the

production of a Cymric or ancient Welsh writer; but the claim of Nennius to be regarded as the author is derived solely from two prologues, where he is described as the disciple of one Elvodugus or Elbotus, whom we may perhaps identify with Elbodus, bishop of North Wales, who died in 809, and whose notable innovation of the introduction of the Roman cycle in keeping Easter ‘“‘ Nennius” appears to have followed. Of the above prologues (which differ considerably) one is preserved in the MS. in the cathedral library at Durham, and in this it is stated that the History was written in the year 858, which year is also spoken of as being the twenty-fourth of the reign of Mervin, king of the Britons. But in the work itself (chap. xvi.) it is stated that between the arrival of the Saxons (assigned in chap. xxxi. to the year 447) and the fourth year of the reign of Mervin, four hundred and twenty-nine years elapsed. Thus the twenty-fourth year of Mervin becomes coincident with the year 896, or thirty-eight years later than the date assigned by the prologue. This discrepancy, taken in con- junction with the following facts, viz., that both the above prologues are much superior in style and diction to the barbarous Latin of the Historia itself, that the MSS. prior to the 13th century are either altogether silent respecting the authorship or ascribe it to Gildas, and that Henry of Huntingdon, in his Historia Anglorum (chap. Xviil.), after quoting verbatim the account above referred to of King Arthur’s battles, expressly speaks of it as taken from Gildas,—has led the most competent critics to con- clude that the real author of the W/istoria Britonum must be looked upon as unknown. The original text is likewise a matter of doubt, the work having evidently been sub- jected to several recensions, in which the earliest version can no longer be traced.

Asan historical composition the Historia Britonum has but little value. M. de la Borderie lays it down as a canon that, when the work is found to contain an unsupported statement, which at the same time does not clash with the authority of Bede, Gildas, or any other received authority, such statement may, after due examination, be acceptcd; but if at variance with those autho- rities, it should be rejected. Much of the narrative, however, is evidently the offspring of invention and imagination; while the Cymric superstition respecting the nrysterious importance attaching to the number three and its multiples induces the writer habitually to represent the more striking events and phenomena as occurring in a succession of triads. The

peculiar value of the Historia con- sists in the illustration it affords of the Welsh mythology and those traditions of the race which took the place of history; it is in fact the earliest collection of those British legends whieh gave birth to the romances of Brut, Merlin, King Arthur, and the whole cyele of epics associated with the Knights of the Round Table. This element is discussed at some length by San Marte (A. Schulz) in the preface to his edition of Gildas and Nennius (Berlin, 1844). The best edition of the text is that edited by the Rev. Joseph Steven- son for the English Historieal Society (1838). The most recent criticism on both the work and the manuseript sources will be found in L' Historia Britonum, by M. de la Borderie (Paris, 1883).

NEOPHYTE (vedduros, "newly planted") was the designation applied to newly baptized persons in the ancient church, These usually wore the white garments which they received at their admission to the church (see Baptism, vol. i. p. 351) during the whole of the following week, but the application of the name did not necessarily cease at the close of that period. A special employment of the word was to denote one who, not having duly passed through the inferior grades, was in view of 1 Tim. iti. 6 considered canonically unfit to be consecrated a bishop.

NEN—NEO

NEOPLATONISM.—WHistorical Position and Signifi- cance,——The political history of the ancient world closes with the formation, under Diocletian and Constantine, of a universal state bearing the cast of Oriental as well as Greeco-Roman civilization. The history of ancient philo- sophy ends in like manner with a universal philosophy which appropriated elements of almost all the earlier systems, and worked up the results of Eastern and Western culture. And, just as the Byzantine Roman empire was at once the supreme effort of the old world and the outcome of its exhaustion, so Neoplatonism is in one aspect the consummation, in another the collapse, of ancient philosophy. Never before in Greek or Roman speculation had the consciousness of man's dignity and superiority to nature found such adequate expression; and never before had real science and pure knowledge been so undervalued and despised by the leaders of culture as they were by the Neoplatonists. Judged from the stand- point of pure

science, or the empirical investigation of the universe, philosophy passed its meridian in Plato and Aristotle, declined in the post-Aristotelian systems, and set in the darkness of Neoplatonism. But, from the religious and moral point of view, it must be affirmed that the ethical “mood” which Neoplatonism endeavoured to create and maintain is the highest and purest ever reached by antiquity. That this attainment should have been made at the expense of science was inevitable. On the level of the polytheistic nature-religions physical science must either subjugate and destroy religion, or be sub- jugated and destroyed by it. Religion and morality, how- ever, are found to be the stronger forces ; and philosophy, standing midway between these and physical science, may waver for a little, but ultimately it yields to the greater power. The conflict with empirical knowledge is ren- dered inevitable by the fact that within the sphere of nature-religion the ethical is itself, without any misgiving, conceived as a higher order of the natural. The higher ““physies”—for as such we must here regard religious ethics—must dislodge the lower, in order to maintain its own ground. Philosophy must cease to exist as science, in order that man’s assertion of the supernatural value of his person and his life may receive full recognition.

It is a proof of the strength of the moral instincts of mankind that the only phase of culture which we can survey in all its stages from beginning to end culminated, not in materialism, but in the boldest idealism. This idealism, however, is also in its way a mark of intellectual bankruptcy. Contempt for reason and science leads in the end to barbarism,—its necessary consequence being the

rudest superstition, and sheer helplessness in the presence —

of all sorts of delusion. As a matter of fact, barbarism did break out after the flower had fallen from Neoplatonism. The philosophers themselves, no doubt, still lived on the knowledge they repudiated ; but the masses were trained to a superstition with which the Christian church, as the executor of Neoplatonism, had to reckon and contend. By a fortunate coincidence, at the very moment when this bankruptcy of the old culture—its reversion to barbarism —must have become apparent, the stage of history was occupied by barbaric peoples, with whom the work of the past thousand years went for nothing. This has obscured the fact, which is nevertheless obvious

enough to a keener scrutiny, that the inner history of antiquity, ending as it did in despair of this world, must in any event have seen a recurrence of barbarism. The present world was a thing that men would neither enjoy nor master nor study. A new world was discovered, for the sake of which every-thing else was abandoned; to make sure of that world insight and intelligence were freely sacrificed ; and, in the light that streamed from beyond, the absurdities of the

present became wisdom, and its wisdom became foolish- ness.

Such is Neoplatonism. The pre-Socratic philosophy took its stand on natural science, to the exclusion of ethics and religion. The systems of Plato and Aristotle sought to adjust the rival claims of physics and ethics (although the supremacy of the latter was already acknowledged) ; but the popular religions were thrown overboard. The post-Aristotelian philosophy in all its branches makes withdrawal from the objective world its starting point. It might seem, indeed, that Stoicism indicates a falling off from Plato and Aristotle towards materialism, but the ethical dualism, which was the ruling tendency of the Stoa, could not long endure its materialistic physics, and took refuge in the metaphysical dualism of the Platonists. But this originated no permanent philosophical creation. From one-sided Platonism issued the various forms of scepticism, the attempt to undermine the trustworthiness of empirical knowledge. Neoplatonism, coming last, has borrowed something from all the schools. First, it stands in the line of post-Aristotelian systems ; it is, in fact, as a subjective philosophy, their logical completion. Secondly, it is founded on scepticism; for it has neither interest in, nor reliance upon, empirical knowledge. Thirdly, it can justly claim the honour of Plato's name, since it expressly goes back to him for its metaphysics, directly combating those of the Stoa. Yet even on this point it has learned something from the Stoics; the Neoplatonic conception of the action of the Deity on the world and of the essence and origin of matter can only be explained by reference to the dynamic pantheism of the Stoa. Fourthly, the study of Aristotle also exercised an influence on Neoplatonism. This appears, not only in its philosophical method, but also —though less prominently—in its meta- physic. And, fifthly, Neoplatonism

adopted the ethics of Stoicism; although it was found necessary to supplement them by a still higher conception of the functions of the spirit.

Thus, with the exception of Epicureanism—which was always treated as the mortal enemy of Neoplatonism— there is no outstanding earlier system which did not con- tribute something to the new philosophy. And yet Neoplatonism cannot be described as an eclectic system, in the ordinary sense of the word. For, in the first place, it is dominated by one all-pervading interest—the reli- gious; and in the second place, it has introduced a new first principle into philosophy, viz. the supra-rational, that which lies beyond reason and beyond reality. This principle is not to be identified with the "idea" of Plato or the "form" of Aristotle. For, as Zeller rightly says, "in Plato and Aristotle the distinction of the sensible from the intelligible is the strongest affirmation of the validity of the thinking process. It is only sense percep- tion, and the existence perceived by the senses, whose relative unreality is presupposed ; of a higher region of spiritual life, lying beyond the notion and beyond thought, there is no hint. In Neoplatonism, on the contrary, it is precisely this 'supra-rational' which is held to be the final goal of all effort and the ultimate ground of all being. Rational cognition is only an intermediate stage between sense perception and supra-rational intuition ; the forms of the intellect are not the highest and ultimate reality, but only the channels through which the activity of the formless primeval being flows into the world. This theory, therefore, proceeds, not merely on the denial of the reality of sensible existence and sensible presentations, but upon absolute doubt—a straining after something behind the sum total of reality. The highest intelligible is not that which constitutes the actual contents of reason, but simply what man postulates and reaches after as the

unknowable ground of his thought." Neoplatonism perceived that neither sense perception nor rational cognition is a sufficient basis or justification for religious ethics; consequently it broke away from rationalistic ethics as decidedly as from utilitarian morality. But, just because it renounced perception and reason, it had to find out a new world and a new spiritual function, in order first to establish the existence of what it desiderated, and

then to realize and describe what it had proved to exist. Man, however, cannot add to his psychological endow- ment. He is hemmed in by walls of iron; and, if he will not allow his thought to be determined by experience, he falls a victim to his imagination. In other words, thought, which will not stop, takes to mythology ; and in the place of reason we have superstition. A dumb astonishment in the presence of the incomprehensible passes for the highest aim of mental activity; arti- ficially excited ecstasies are prized above all the conscious acts of the spirit. Still, as we cannot allow every fancy of the subjective reason to assert itself, we require some new and potent principle to keep the imagination within bounds. This is found in the authority of a sound tradi- tion. Such authority must be superhuman, otherwise it can have no claim on our respect; it must, therefore, be divine. The highest sphere of knowledge—the supra- rational—as well as the very possibility of knowledge, must depend on divine communications, —that is, on revelations. In one word, philosophy as represented by Neoplatonism, its sole interest being a religious interest, and its highest object the supra-rational, must be a philosophy of revela- tion. This is not a prominent feature in Plotinus or his immediate disciples, who still exhibit full confidence in the subjective presuppositions of their philosophy. But the later adherents of the school did not possess this confidence ;! they based their philosophy on revelations of the Deity, and they found these in the religious traditions and rites of all nations. The Stoics had taught them to overstep the political boundaries of states and nationalities, and rise from the Hellenic to a universal human consciousness. Through all history the spirit of God has breathed ; everywhere we discover the traces of His revelation. The older any religious tradition or mode of worship is the more venerable is it, the richer in divine ideas. Hence the ancient religions of the East had a peculiar interest for the Neoplatonist. In the interpre- tation of myths Neoplatonism followed the allegorical method, as practised especially by the Stoa; but the importance it attached to the spiritualized myths was unknown to the Stoic philosophers. The latter inter- preted the myths and were done with them; the later Neoplatonists treated them as the proper material and the secure foundation of philosophy. Neoplatonism claimed to be not merely the absolute philosophy, the keystone of all previous systems, but also the absolute religion, reinvigorating and transforming all previous religions. lit contemplated a restoration of all the religions of antiquity, by allowing each to retain its traditional forms, and at

the same time making each a vehicle for the religious attitude and the religious truth embraced in Neoplatonism ; while every form of ritual was to become a stepping-stone to a high morality worthy of mankind. In short, Neoplatonism seizes on the aspiration of the human soul after a higher life, and treats this psychological fact as the key to the interpretation of the universe. Hence the existing religions, after being refined and spiritualized, were made the basis of philosophy. ee

1 Porphyry wrote a book, wep) rijs é« Aoylav Pirocopias, but this was before he became a pupil of Plotinus; as a philosopher he was independent of the Adyza.

Neoplatonism thus represents a stage in the history of religion; indeed this is precisely where its historical importance lies. In the progress of science and enlighten- ment it has no positive significance, except as a necessary transition which the race had to make in order to get rid of nature-religion, and that undervaluing of the spiritual life which formed an insuperable obstacle to the advance of human knowledge. Neoplatonism, however, failed as signally in its religious enterprise as it did in its philoso- phical. While seeking to perfect ancient philosophy, it really extinguished it; and in like manner its attempted reconstruction of ancient religions only resulted in their destruction. For in requiring these religions to impart certain prescribed religious truths, and to inculcate the highest moral tone, it burdened them with problems to which they were unequal, and under whose weight they were crushed. And further, by inviting them to loosen, though not exactly to dissolve, their political allegiance— the very thing that gave them stability—it removed the foundation on which they rested. But might it not then have placed them on a broader and firmer foundation ? Was not the universal empire of Rome ready at hand, and might not the new religion have stood to it in the same relation of dependence which the earlier religions had held to the smaller nations and states? So one might imagine, but in truth it was no longer possible. It is true that the political and spiritual histories of the peoples on the Mediterranean run in parallel lines, the one leading up to the universal monarchy of Rome, the other leading up to monotheism and universal human morality. But the spiritual

development had shot far ahead of the political ; even the Stoa occupied a height far beyond the reach of anything in the political sphere. It is also true that Neoplatonism sought to come to an understanding with the Byzantine Roman empire; the noble Julian perished in the pursuit of this project. But even before his day the shrewder Neoplatonists had seen that their lofty religious philosophy could not stoop to an alliance with the despotic world-empire, because it could not come in contact with the world at all. To Neoplatonism political affairs are at bottom as indifferent as all other earthly things. The idealism of the new philosophy was too heavenly to be naturalized in a degenerate, tyrannical, and effete institution like the Byzantine empire, which stood more in need of despotic and unscrupulous police officials than of high-minded philosophers. Important and instructive, therefore, as are the attempts made from time to time by the state and by individual philosophers to unite Neoplatonism and the universal monarchy, their failure was a foregone conclusion.

There is one other question which we are called upon to raise here. Why did not Neoplatonism set up an independent religious community? It had entirely remodelled the ancient religions, with a view to their restoration; it had tried to fill the old unsophisticated worships with profound philosophical ideas, and to make them the exponents of pure morality ; why did it not address itself, in the last resort, to the creation of a religious society of its own? Why did it not provide for its mixed multitude of divinities by founding a church, destined to embrace all mankind, in which all the gods of all nations might be worshipped along with the one ineffable Deity 4 Why not? The answer to this question involves the answer to another—Why was Neoplatonism defeated by Christianity? Three essentials of a permanent religious foundation were wanting in Neoplatonism ; they are admirably indicated in Augustine's Confessions (vii. 18-21). First, and chiefly, it wanted a religious founder ; second, it could not tell how the state of inward peace and blessedness could become permanent; third, it had

no means to win those who were not endowed with the speculative faculty. The philosophical discipline which it recommended for the attainment of the highest good was beyond the reach of the masses; and the way by which the masses could attain the highest good was a secret unknown to

Neoplatonism. Thus it remained a school for the “wise and prudent”; and when Julian tried to enlist the sympathies of the common rude man for the doctrines and worship of this school, he was met with scorn and ridicule.

It is not as a philosophy, then, nor as a new religion, that Neoplatonism became a decisive factor in history, but, if one may use the expression, as a “mood.” The instinctive certainty that there is a supreme good, lying beyond empirical experience, and yet not an intellectual good,—this feeling, and the accompanying conviction of the utter vanity of all earthly things, were produced and sustained by Neoplatonism. Only, it could not describe the nature of this highest good; and therefore it had to abandon itself to imagination and esthetic impres- sions. It was driven to explore “mysterious inward paths,” which after all led nowhere. It changed thought into an emotional dream; it plunged into the ocean of sentiment; it treated the old world of fable as the reflexion of a higher reality, and transformed reality into poetry ; and after all these expedients, to borrow a phrase of Augustine’s, it only saw afar off the land of its desire. It dashed this world in pieces, and then had nothing left but an indescribable “something,”—a faint glimmer from some world beyond.

And yet the influence of Neoplatonism on the history of our ethical culture has been, and still is, immeasurable, —not merely because it has refined and strengthened our emotions and susceptibilities, nor merely because it wove the fine veil with which all of us, whether religious or irreligious, cover the Gorgon face of brute reality, but above all because it begot the consciousness that the only blessedness which can satisfy the heart must be sought higher even than the sphere of reason. That man shall not live by bread alone, the world had learned before Neoplatonism ; but Neoplatonism has enforced the deeper truth—a truth which the older philosophy had missed— that man shall not live by knowledge alone. And, besides the propsdeutic importance which thus belongs to it, another fact has to be taken into account in estimating the influence of Neoplatonism. It is to this day the nursery of that whole type of devotion which affects renunciation of the world, which strives after an ideal, without the strength to rise above zsthetic impressions, and is never able to form a clear conception of the object of its own aspiration.

Origin.—As forerunners of Neoplatonism we may regard, on the one hand, those Stoics who accepted the Platonic distinction between the sensible world and the intelligible, and, on the other hand, the so-called Neo-pythagoreans and religious philosophers like Plutarch of Cheeronea and especially Numenius of Apamea. But these cannot be considered the actual progenitors of Neopla- tonism ; their philosophic method is quite elementary as compared with the Neoplatonic, their fundamental principles are uncertain, and unbounded deference is still paid to the authority of Plato. The Jewish and Christian thinkers of the first two centuries approach considerably nearer than Numenius to the later Neoplatonism.! Here we have Philo, to begin with. Philo, who translated the Old Testament religion into the terms of Hellenic thought,

+ The resemblance would probably be still more apparent if we thoroughly understood the development of Christianity at Alexandria in the 2d century; but unfortunately we have only very meagre frag- ments to guide us here.

holds as an inference from his theory of revelation that the divine Supreme Being is “supra-rational,” that He can be reached only through “ecstasy,” and that the oracles of God supply the material of moral and religious knowledge. The religious ethics of Philo—a compound of Stoic, Platonic, and Neopythagorean elements—already bear the peculiar stamp which we recognize in Neopla- tonism. While his system assigns the supremacy to Greek philosophy over the national religion of Israel, it exacts from the former, as a sort of tribute to the latter, the recognition of the elevation of God above the province of reason. The claim of positive religion to be something more than the intellectual apprehension of the reason in the universe is thus acknowledged. Religious syncretism is also a feature of Philo’s system, but it differs essentially from what we find in later Neoplatonism. For Philo pays no respect to any cultus except the Jewish ; and he believed that all the fragments of truth to be found amongst Greeks and Romans had been borrowed from the books of Moses. The earliest Christian philosophers, particularly Justin and Athenagoras, likewise prepared the way for the specu- lations of the Neoplatonists,—partly by their attempts to connect Christianity with Stoicism and Platonism, partly

by their ambition to exhibit Christianity as “ hyper- platonic.” In the introduction to his Dialogue with Trypho, Justin follows a method which bears a striking resemblance to the later method of Neoplatonism: he seeks to base the Christian knowledge of God—that is, the knowledge of the truth —on Platonism, Scepticism, and “ Revelation.” A still more remarkable parallel to the later Neoplatonism is afforded by the Christian Gnostics of Alexandria, especi- ally Valentinus and the followers of Basilides.1 Like the Neoplatonists, the Basilidians believed, not in an emanation from the Godhead, but in a dynamic manifestation of its activity. The same is true of Valentinus, who also placed an unnameable being at the apex of his system, and regarded matter, not asa second principle, but as a product of the one divine principle. It must be added that the dependence of Basilides and Valentinus on Zeno and Plato is beyond dispute. But the method observed by these Gnostics in thinking out the plan and the history of the universe is by no means thoroughgoing. Ancient myths are admitted without undergoing analysis; the most naive realism alternates with daring efforts at spiritualizing. Philosophically considered, therefore, the Gnostic systems are very unlike the rigorous self-consistency of Neoplatonism ; although they certainly contain almost all the elements which enter into the Neoplatonic theory of the universe.

But were the oldest Neoplatonists really acquainted with the speculations of Philo, or Justin, or Valentinus, or Basilides? Did they know the Oriental religions, Judaism and Christianity in particular? And, if so, did they really derive anything from these sources .

To these questions we cannot, unfortunately, give

decided, still less definite and precise, answers. Since

Neoplatonism originated in Alexandria, where Oriental modes of worship were accessible to every one, and since the Jewish philosophy had also taken its place in the literary circles of Alexandria, we may safely assume that even the earliest of the Neoplatonists possessed an acquaintance with Judaism and Christianity. But if we search Plotinus for evidence of any actual influence of

1 The dogmas of the Basilidians, as given by Hippolytus, read almost like passages from Neoplatonic works: ée) obdév Hv, odx BAN, ov« ovata, ode avovctov, odX aTAOdY, ob cUVOeTOY, OdK avdnToY, OdK avalaOnrov, ov kvOpwros. .. . ovx dv eds dvontws, avaiobjtes, &BovAws, admpoaupétws, amalas, averiOvuhtws xécuov OEAnoE Totjoat . . . ottTws ob Sv Qeds érolnoe Kxoopoyv ovn bytTa ef odK tytwv, kataBardsuevos Kal troorhoas omépua Tt bv exov macay év EavT@ Thy Tod Kéopou mavowepulay (Philos., vii. 20 sq.).

Jewish and Christian philosophy, we search in vain ; and the existence of any such influence is all the more unlikely because it is only the later Neoplatonism that offers strik- ing and deep-rooted parallels to Philo and the Gnostics. The Philonic and Gnostic philosophies thus appear to be merely an historical anticipation of the Neoplatonic, without any real connexion. Nor is there anything mysterious in such an anticipation. It simply means that a certain religious and philosophical tendency, which grew up slowly on Greek soil, was already implanted in those who occupied the vantage-ground of a revealed religion of redemption. We have to come down to Jamblichus and his school before we find complete correspondence with the Christian Gnosticism of the 2d century; that is to say, it is only in the 4th century that Greek philosophy in its proper development reaches the stage at which certain Greek philosophers who had embraced Christianity had arrived in the 2d century. The influence of Christianity— whether Gnostic or Catholic—on Neoplatonism was at no time very considerable, although individual Neoplatonists, after Amelius, used Christian texts as oracles, and put on record their admiration for Christ.

History and Doctrines.—The founder of the Neoplatonic school in Alexandria is supposed to have been Ammonius Saccas (0b. c. 245 A.D.), who is said to have been a Christian by birth, and to have relapsed to heathenism. As he has left no written works behind him, it is impos- sible to criticize his teaching. He communicated to his pupils an admiration for Plato, and set them to work at the reconciliation of Plato and Aristotle. The most distinguished of his disciples were Origen the Christian, another Origen—a heathen, Longinus, Herennius, and, the greatest of all, Plotinus.?

The Hnneads of Plotinus are the primary and classical document of Neoplatonism. The doctrine of Plotinus is mysticism, and like all mysticism it consists of two main divisions. The first or theoretical part deals with the high origin of the human soul, and shows how it has departed from its first estate. In the second or practical part the way is pointed out by which the soul may again return to the Eternal and Supreme. Since the soul in its long-ings reaches forth beyond all sensible things, beyond the world of ideas even, it follows that the highest being must be something supra-rational. The system thus embraces three heads—(1) the primeval Being, (2) the ideal world and the soul, (3) the phenomenal world. We may also, however, in accordance with the views of Plotinus, divide thus :—(A) the invisible world—(1) the primeval Being, (2) the ideal world, (3) the soul; (B) the phenomenal world.

The primeval Being is, as opposed to the many, the One; as opposed to the finite, the Infinite, the unlimited. It is the source of all life, and therefore absolute causality and the only real existence. It is, moreover, the Good, in so far as all finite things have their purpose in it, and ought to flow back to it. But one cannot attach moral attributes to the original Being itself, because these would imply limitation. It has no attributes of any kind ; it is being without magnitude, without life, without thought ; in strict propriety, indeed, we ought not to speak of it as existing; it is “above existence,” “above good- ness.” It is also active force without a substratum ; as active force the primeval Being is perpetually producing something else, without alteration, or motion, or diminution of itself. This production is not a physical process, but

2 Born at Lycopolis, in Egypt, in 205, Plotinus laboured from 244 onwards in Rome, where he gained many followers and admirers, amongst others the emperor Gallienus and his consort, and died in Lower Italy in 270. The writings of Plotinus were arranged by his pupil Porphyry, and published in six Enneads.

an emission of force ; and, since the product has real exist- ence only in virtue of the original existence working in it, Neoplatonism may be described as a species of dynamic pantheism. Directly or indirectly,

everything is brought forth by the “One.” In it all things, so far as they have being, are divine, and God is all in all. Derived existence, however, is not like the original Being itself, but is subject to a law of diminishing completeness. It is indeed an image and reflexion of the first Being ; but the further the line of successive projections is prolonged the smaller is its share in the true existence. The totality of being may thus be conceived as a series of concentric circles, fading away towards the verge of non-existence, the force of the original Being in the outermost circle being a vanishing quantity. Each lower stage of being is united with the “One” by all the higher stages, and receives its share of reality only by transmission through them. All derived existence, however, has a drift towards, a longing for, the higher, and bends towards it so far as its nature will permit.

The original Being first of all throws out the nous, which is a perfect image of the One, and the archetype of all existing things. It is at once being and thought, ideal world and idea. As image, the nous corresponds perfectly to the One, but as derived it is entirely different. What Plotinus understands by the nous is the highest sphere accessible to the human mind (kéopos vonrds), and, along with that, pure thought itself.

The image and product of the motionless nous is the soul, which, according to Plotinus is, like the nous, immaterial. Its relation to the nous is the same as that of the nous to the One. It stands between the nous and the phenomenal world, is permeated and illuminated by the former, but is also in contact with the latter. The nous is indivisible ; the soul may preserve its unity and remain in the nous, but at the same time it hag the power of uniting with the corporeal world, and thus being dis- integrated. It therefore occupies an intermediate position. As a single soul (world-soul) it belongs in essence and destination to the intelligible world; but it also embraces innumerable individual souls ; and these can either submit to be ruled by the nous, or turn aside to the sensual, and lose themselves in the finite.

Then the soul, a moving essence, generates the corporeal or phenomenal world. This world ought to be so pervaded by the soul that its various parts should remain in perfect harmony. Plotinus is no dualist, like the Christian Gnostics ; he admires the beauty and splendour of the world. So long as idea governs matter, or the soul governs the body, the world is fair and

good. It is an image—though a shadowy image—of the upper world, and the degrees of better and worse in it are essential to the harmony of the whole. But in the actual phenomenal world unity and harmony are replaced by strife and discord ; the result is a conflict, a becoming and vanishing, an illusive existence. And the reason for this state of things is that bodies rest on a substratum of matter. Matter is the basework of each (7d Bdbos éxderov 7 VAN) 5 it is the dark principle, the indeterminate, that which has no qualities, the yw dv. Destitute of form and idea, it is evil ; as capable of form it is neutral.

The human souls which have descended into corporeality are those which have allowed themselves to be ensnared by sensuality and overpowered by lust. They now seek to cut themselves loose from their true being ; and, striving after independence, they assume a false existence. They must turn back from this; and, since they have not lost their freedom, a conversion is still possible.

Here, then, we enter upon the practical philosophy. Along the same road by which it descended the soul must

retrace its steps back to the supreme Good. It must first of all return to itself. This is accomplished by the practice of virtue, which aims at likeness to God, and leads up to God. In the ethics of Plotinus all the older schemes of virtue are taken over, and arranged in a graduated series. The lowest stage is that of the civil virtues, then follow the purifying, and last of all the divine virtues. The civil virtues merely adorn the life, without elevating the soul. That is the office of the purifying virtues, by which the soul is freed from sensuality, and led back to itself, and thence to the nous. By means of ascetic observances the man becomes once more a spiritual and enduring being, free from all sin. But there is still a higher attainment . it is not enough to be sinless, one must become “God,” This is reached through contemplation of the primeval Being, the One; or, in other words, through an ecstatic approach to it. Thought cannot attain to this, for thought reaches only to the nous, and is itself a kind of motion. Thought is a mere preliminary to communion with God. It is only in a state of perfect passivity and repose that the soul can recognize and touch the primeval Being. Hence

in order to this highest attainment the soul must pass through a spiritual curriculum. Beginning with the contemplation of corporeal things in their multiplicity and harmony, it then retires upon itself and withdraws into the depths of its own being, rising thence to the nous, the world of ideas. But even there it does not find the Highest, the One; it still hears a voice saying, "not we have made ourselves." The last stage is reached when, in the highest tension and concentration, beholding in silence and utter forgetfulness of all things, it is able as it were to lose itself. Then it may see God, the fountain of life, the source of being, the origin of all good, the root of the soul. In that moment it enjoys the highest indescribable bliss ; it is as it were swallowed up of divinity, bathed in the light of eternity.1

Such is the religious philosophy of Plotinus, and for himself personally it sufficed, without the aid of the popular religion or worship. Nevertheless he sought for points of support in these. God is certainly in the truest sense nothing but the primeval Being; but He reveals Himself in a variety of emanations and manifestations. The nous is a sort of second god, the Adyou which are wrapped up in it are gods, the stars are gods, and so on. A rigid monotheism appeared to Plotinus a miserable conception. He gave a meaning to the myths of the popular religions, and he had something to say even for magic, soothsaying, and prayer. In support of image- worship he advanced arguments which were afterwards adopted by the Christian image-worshippers. Still, as compared with the later Neoplatonists, he is comparatively free from crass superstition and wild fanaticism. He is not to be classed amongst the "deceived deceivers," and the restoration of the worship of the old gods was by no means his chief object.

Amongst his pupils, Amelius and Porphyry are the most eminent. Amelius modified the teaching of Plotinus on certain points; and he also put some value on the prologue to the Gospel of John. To Porphyry? belongs the credit of having recast and popularized the system of his master

1 Porphyry tells us that on four occasions during the six years of their intercourse Plotinus attained to this ecstatic union with God.

? Born at Tyre in the year 238. Whether he was for a time a Christian is not certain. From 263 to 268 he was a pupil of Plotinus at Rome. He had previously written the work rep) rs ex Aoylwv piro- gopias, which shows

that he was inclined to base philosophy on revelations, For a couple of years (about 270) he lived in Sicily, where he wrote his fifteen books against the Christians. He then returned to Rome, where he worked as a teacher, edited the works of Plotinus, and wrote a series of treatises of his own. He married in his old age Marcella, a native of Rome, and dicd about the year 303.

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Plotinus. He was no original or productive thinker, but he was a solid and diligent student, distinguished by great learning, by a turn for keen historical and philological criticism, and by an earnest purpose to disseminate the true philosophy of life, to uproot false teaching—especially Christianity, to ennoble men and train them to goodness. That a spirit so free and noble yielded itself up wholly to the philosophy of Plotinus and polytheistic mysticism shows how irresistible was the tendency of the age, and means also that the age had no better thing to offer than religi- ous mysticism. The system of Porphyry is distinguished from that of Plotinus by being still more emphatically practical and religious. The object of philosophy, accord- ing to Porphyry, is the salvation of the soul. The origin and the blame of evil are not in the body, but in the desires of the soul. Hence the strictest asceticism (abstinence from flesh, and wine, and sexual intercourse) is demanded, as well as the knowledge of God. As he advanced in life, Porphyry protested more and more earnestly against the rude faith of the common people and their immoral worships. ‘‘The ordinary conceptions of God are such that it is more impious to share them than it is to slight the images of the gods.” But, outspoken as he was in his criticism of the popular religions, he had no wish to give them up. He stood up for a pure worship of the many gods, and maintained the cause of every old national religion and the ceremonial duties of its adherents. His work Against the Christians was directed, not against Christ, nor even against what he believed to be Christ’s teaching, but against the Christians of his own day and their sacred books, which, according to Porphyry, were the work of deceivers and ignorant people. In his trenchant criticism of the origin of what passed for Christianity in his time, he spoke bitter and severe truths, which have gained for him the reputation of the most rabid and wicked of all the enemies of Christianity. His work was destroyed,! and even the

answers to it (by Methodius, Eusebius, Apollinaris, Philostorgius, &c.) have been lost. But the copious extracts which we find in Lactantius, Augustine, Jerome, Macarius Magnus, and others are sufficient to show how profoundly Porphyry had studied the Christian writings, and how great was his talent for real historical research,

Porphyry marks the transition to a new phase of Neoplatonism, in which it becomes completely subservient to polytheism, and seeks before everything else to protect the Greek and Oriental religions from the formidable assault of Christianity. In the hands of Iampicuus (¢.2.), the pupil of Porphyry (0b. 330), Neoplatonism is changed "from a philosophical theory to a theological doctrine." The distinctive tenets of Iamblichus cannot be accounted for from scientific but only from practical considerations. In order to justify superstition and the ancient forms of worship, philosophy becomes in his hands a theurgy, a knowledge of mysteries, a sort of spiritualism. To this period also belongs a set of " philosophers," with regard to whom it is impossible to say whether they are dupes or impostors —the "decepti deceptores" of whom Augustine speaks. In this philosophy the mystical properties of numbers are a leading feature; absurd and mechanical notions are glossed over with the sheen of sacramental mystery ; myths are explained by pious fancies and fine- sounding pietistic reflexions; miracles, even the most ridiculous, are believed in, and miracles are wrought. The "philosopher " has become a priest of magic, and philosophy a method of incantation. Moreover, in the unbridled exercise of speculation, the number of divine beings was 2 . 2 ee ee ee

? Tt was condemned by an edict of the empcrors Theodosius II. and Valentinian, in the year 448.

increased indefinitely ; and these fantastic accessions to Olympus in the system of Iamblichus show that Greek philosophy is returning to mythology, and that nature- religion is still a power in the world. And yet it is undeniable that the very noblest and choicest minds of the 4th century are to be found in the ranks of the Neoplatonists. So great was the general decline that this Neoplatonic philosophy offered a welcome shelter to many earnest and influential men, in spite of the charlatans and hypocrites who

were gathered under the same roof. On certain points of doctrine, too, the dogmatic of Iamblichus indicates a real advance. Thus his emphatic assertion of the truth that the seat of evil is in the will is noteworthy ; and so also is his repudiation of Plotinus's theory of the divinity of the soul.

The numerous followers of JIamblichus (ARdesius, Chrysanthius, Eusebius, Priscus, Sopater, Sallust, and, most famous of all, Maximus) rendered little service to speculation. Some of them (Themistius in particular) are known as commentators on the older philosophers, and others as the missionaries of mysticism. The work De Mysteriis digyptiorum is the best sample of the views and aims of these philosophers. Their hopes rose high when their protégé, the enthusiastic, noble-minded, but mentally ill-balanced Julian, ascended the imperial throne (361-363). But the emperor himself lived long enough to see that his romantic policy of restoration was to leave no results; and after his early death all hope of extinguishing Christianity was abandoned. |

But undoubtedly the victory of the church in the age of Valentinian and Theodosius had a purifying influence on Neoplatonism. During the struggle for supremacy, the philosophers had been driven to make common cause with everything that was hostile to Christianity. But now Neoplatonism was thrust from the great stage of history. The church and church theology, to whose guidance the masses now surrendered themselves, took in along with them their superstition, their polytheism, their magic, their myths, and all the machinery of religious witchcraft. The more all this settled and established itself—certainly not without opposition—in the church the purer did Neoplatonism become. While maintaining intact its religious attitude and its theory of knowledge, it returned with new zest to scientific studies, especially the study of the old philosophers. If Plato still remains the divine philosopher, yet we can perceive that after the year 400 the writings of Aristotle are increasingly read and valued. In the chief cities of the empire Neoplatonic schools flourished till the beginning of the 5th century; during this period, indeed, they were the training-schools of Christian theologians. At Alexandria the noble Hypatia taught, to whose memory her impassioned disciple Synesius, afterwards a bishop, has reared a splendid monument. But after the beginning of the 5th century the fanaticism of the church could no longer endure the presence of

“heathenism.” The murder of Hypatia was the death of philosophy in Alexandria, although the school there main- tained a lingering existence till the middle of the 6th century. But there was one city of the East which, lying apart from the crowded highways of the world, had sunk to a mere provincial town, and yet possessed associations which the church of the 5th century felt herself power- less to eradicate. In Athens a Neoplatonic school still flourished. ‘There, under the monuments of its glorious past, Hellenism found its last retreat. The school of Athens returned to a stricter philosophical method and the cultivation of scholarship. Still holding by a religious philosophy, it undertook to reduce the whole Greek tradi- tion, as seen in the light of Plotinus, to a comprehensive and closely knit system. Hence the philosophy which

arose at Athens was what may fairly be termed scholasti- cism. For every philosophy is scholastic whose subject- matter is imaginative and mystical, and which handles this subject-matter according to established rules in logical categories and distinctions. Now to these Neoplatonists, the books of Plato, along with certain divine oracles, the Orphic poems, and much more which they assigned to a remote antiquity, were documents of canonical authority ; they were inspired divine writings. Out of these they drew the material of their philosophy, which they then proceeded to elaborate with the appliances of dialectic.

The niost distinguished teachers at Athens were Plutarch (ob. 433), his disciple Syrianus (who did important work as a commentator on Plato and Aristotle, and further deserves mention for his vigorous defence of the freedom of the will), but above all Proclus (411-485). Proclus is the great schoolman of Neoplatonism. It was he who, combining religious ardour with formal acuteness, con- nected the whole mass of traditional lore into a huge system, making good defects, and smoothing away contra- dictions by means of distinctions and speculations. “ It was reserved for Proclus,” says Zeller, “to bring the Neoplatonic philosophy to its formal conclusion by the rigorous consistency of his dialectic, and, keeping in view all the modifications which it had undergone in the course of two centuries, to give

it that form in which it was transferred to Christianity and Mohammedanism in the Middle Ages." Forty-four years after the death of Proclus the school of Athens was closed by Justinian (529 a.p.) ; but it had fulfilled its mission in the work of Proclus, and might with advantage retire from the scene. It had nothing new to say ; it was ripe for the grave, and an honour- able burial awaited it. The works of Proclus, as the last testament of Hellenism to the church and the Middle Ages, exerted an incalculable influence on the next thousand years. They not only formed one of the bridges by which the medieval thinkers got back to Plato and Aristotle ; they determined the scientific method of thirty generations, and they partly created and partly nourished the Christian mysticism of the Middle Ages, both in the East and in the West.

The disciples of Proclus are not eminent (Marinus, Asclepiodotus, Ammonius, Zenodotus, Isidorus, Hegias, Damascius). The last president of the Athenian school was Damascius. When Justinian issued the edict for the suppression of the school, Damascius along with Simplicius (the painstaking commentator of Aristotle) and five other Neoplatonists set out for Persia. They were under the delusion that Persia was the land of the East, the home of wisdom, righteousness, and devotion. Ina few years they came back to the Byzantine empire, sadder and wiser men.

At the beginning of the 6th century Neoplatonism had ceased to exist in the East as an independent philosophy. Almost at the same time, however—and the coincidence is not accidental—it made new conquests in the church theology through the writings of the pseudo-Dionysius. It began to bear fruit in Christian mysticism, and to diffuse a new magical leaven through the worship of the church.

In the West, where philosophical efforts of any kind had been very rare since the 2d century, and where mystical contemplation did not meet with the necessary conditions, Neoplatonism found a congenial soil only in isolated indi- viduals. We know that the rhetorician Marius Victorinus (c. 850) translated certain works of Plotinus, and that his translation had a decisive influence on the spiritual history of Augustine. It may be said that Neoplatonism influenced the West only through the medium of the church theology, or, in some instances, under that disguise. Even Boetius

(it may now be considered certain) was a catholic Christian, although his whole mode of thought was certainly Neo- platonic. His violent death in the year 525 marks the end of independent philosophy in the West. But indeed this last of the Roman philosophers stood quite alone in his century, and the philosophy for which he lived was neither original, nor well-grounded, nor methodically developed.

Neoplatonism and the Theology of the Church.—The question as to the influence of Neoplatonism on the development of Christianity is not easily answered, because it is scarcely possible to get a complete view of their mutual relations. The answer will depend, in the first instance, upon how much is included under the term "Neoplatonism." If Neoplatonism is understood in the widest sense, as the highest and fittest expression of the religious movements at work in the Graeco-Roman empire from the 2d to the 5th century, then it may be regarded as the twin-sister of the church dogmatic which grew up during the same period; the younger sister was brought up by the elder, then rebelled against her, and at last tyrannized over her. The Neoplatonists themselves characterized the theologians of the church as intruders, who had appropriated the Greek philosophy, and spoiled it by the admixture of strange fables. Thus Porphyry says of Origen (Euseb., H. #., vi. 19), "The outer life of Origen was that of a Christian, and contrary to law; but, as far as his views of things and of God are con-cerned, he thought like the Greeks, whose conceptions he overlaid with foreign myths." This verdict of Porphyry's is at all events more just and apt than that of the theologians on the Greek philosophers, when they accused them of having borrowed all their really valuable doctrines from the ancient Christian books. But the important point is that the relationship was acknowledged on both sides. Now, in so far as both Neoplatonism and the church dogmatic set out from the felt need of redemption, in so far as both sought to deliver the soul from sensuality, and recognized man's inability without divine aid—without a revelation—to attain salvation and a sure knowledge of the truth, they are at once most intimately related, and at the same time mutually independent. It must be confessed that when Christianity began to project a theology it was already deeply impregnated by Hellenic influences. But the influence is to be traced, not so much to philosophy, as to the general culture of the time, and the whole set of conditions under which spiritual life was manifested. When Neoplatonism

appeared, the Christian church had already laid down the main positions of her theology; or if not, she worked them out alongside of Neoplatonism — that is not a mere accident—but still independently. It was only by identifying itself with the whole history of Greek philosophy, or by figuring as pure Platonism restored, that Neoplatonism could stigmatize the church theology of Alexandria as a plagiarism from itself. These assumptions, however, were fanciful. Although our sources are unfortunately very imperfect, the theology of the church does not appear to have learned much from Neoplatonism in the 3d century,—partly because the latter had not yet reached the form in which its doctrines could be accepted by the church dogmatic, and partly because theology was otherwise occupied. Her first business was to plant herself firmly on her own territory, to make good her position, and clear away old and objectionable opinions.

‘Origen was quite as independent a thinker as Plotinus;

only, they both drew on the same tradition. From the 4th century downwards, however, the influence of Neoplatonism on the Oriental theologians was of the utmost importance. The church gradually expressed her most peculiar convic- tions in dogmas, which were formulated by philosophical

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methods, but were irreconcilable with Neoplatonism (the Christological dogmas) ; and the farther this process went the more unrestrainedly did theologians resign themselves to the influence of Neoplatonism on all other questions. The doctrines of the incarnation, the resurrection of the flesh, and the creation of the world in time marked the boundary line between the church’s dogmatic and Neo- platonism ; in every other respect, theologians and Neo- platonists drew so closely together that many of them are completely at one. . In fact, there were special cases, like that of Synesius, in which a speculative reconstruction of distinctively Christian doctrines by Christian men was winked at. Ifa book does not happen to touch on any of the above-mentioned doctrines, it may often be doubtful whether the writer is a Christian or a Neoplatonist. In ethical precepts, in directions for right living (that is, asceticism), the two systems approximate more and more closely. But it was here that Neoplatonism finally celebrated its greatest

triumph. It indoctrinated the church with all its mysticism, its mystic exercises, and even its magical cultus as taught by Iamblichus. The works of the pseudo-Dionysius contain a gnosis in which, by means of the teaching of Iamblichus and Proclus, the church's theology is turned into a scholastic mysticism, with directions on matters of practice and ritual. And as these writings were attributed to Dionysius, the disciple of the apostles, the scholastic mysticism which they unfold was regarded as an apostolic, not to say a divine, science. The influence exercised by these writings, first on the East, and then—after the 9th (or 12th) century—on the West, cannot be overestimated. It is impossible to enlarge upon it here; suffice it to say that the mystical and pietistic devotion of our own day, even in the Protestant churches, is nourished on works whose ancestry can be traced, through a series of intermediate links, to the writings of the pseudo-Areopagite.

In the ancient world there was only one Western theologian who came directly under the influence of Neo- platonism ; but that one is Augustine, the most important of them all. It was through Neoplatonism that Augustine got rid of scepticism and the last dregs of Manicheism. In the seventh book of his Confessions he has recorded how much he owed to the perusal of Neoplatonic works. On all the cardinal doctrines—God, matter, the relation of God to the world, freedom, and evil—Augustine retained the impress of Neoplatonism ; at the same time he is the theologian of antiquity who most clearly perceived and most fully stated wherein Neoplatonism and Christianity differ. The best ever written by any church father on this subject is to be found in chaps. ix.—xxi. of the seventh book of the Confessions.

Why Neoplatonism succumbed in the conflict with Christianity is a question which the historians have never satisfactorily answered. As a rule, the problem is not even stated correctly. We have nothing to do here with our own private ideal of Christianity, but solely with catholic Christianity and catholic theology. These are the forces that conquered Neoplatonism, after assimilating nearly everything that it contained. Further, we must consider the arena in which the victory was won. The battlefield was the empire of Constantine and Theodosius. It is only when these and all other circumstances of the case are duly realized that we have a right to inquire

how much the essential doctrines of Christianity contributed to the victory, and what share must be assigned to the organization of the church.

In medizeval theology and philosophy mysticism appears as the powerful opponent of rationalistic dogmatism. The empirical science of the Renaissance and the two following centuries was itself a new development of Platonism and

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Neoplatonism, as opposed to rationalistic dogmatism, with its contempt for experience. Magic, astrology, and alchemy—all the outgrowth of Neoplatonism—gave the first effectual stimulus to the observation of nature, and consequently to natural science, and in this way finally extinguished barren rationalism. Thus in the history of science Neoplatonism has played a part, and rendered services of which Plotinus or Iamblichus or Proclus never dreamt. So true is it that sober history is often stranger and more capricious than all the marvels of legend and romance.

Iiterature.—The best and amplest account of Neoplatonism will be found in Zeller, Die Philosophie der Grieehen, 3d ed., 1881, iii. 2, pp. 419-865. Compare Hegel, Gesch. d. Philos., iii. 3 sq.; Ritter, iv. pp. 571-728; Ritter and Preller, Hist. phil. Gree. et Rom., pp. 631 3sg.; the Histories of Philosophy by Schwegler, Brandis, Brucker, Thilo, Striimpell, Ueberweg (who gives the most complete survey of the literature), Erdmann, Cousin, Prantl, Lewes. See also Vacherot, Hist. de Uécole d' Alexandria, 1846-51; Simon, Hist. de Pécole @ Alexandria, 1845; Steinhart, arts. " Neuplatonismus," '¢Plotin," '" Porphyrius," " Proklus," in Pauly's Realencyklop. d. klass. Alterthwms ; Wageninann, art. " Neuplatonismus," in the second edition of Herzog's Rcalencyklop. f. protest. Theol.; Heintze, Lehre vom Logos, 1872; Richter, Newplatonisehe Studien; Heigl, Der Bericht des Porphyrius tiber Origenes, 1835; Redepenning, Origenes; Dehaut, "ssat historique sur la vie et la doctrine d Ammonius Saceas, 1836; Kirchner, Die Philosophie des Plotin, 1854; Steinhart, De dialectica Plotini ratione (1829), and Meletemata Plotiniana (1840); Neander, "Ueber die welthis- torische Bedeutung des 9. Buchs in der 2. Enneade des Plotinos," in the Abhandl. der Berliner Akademie, 1843; Valentiner, '*Plotin u. s. Enneaden," in the Z'hcol. Stud. w. Kritiken, 1864. For the biography of

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NEOPTOLEMUS was the son of Achilles and Deidamia, one of the daughters of Lycomedes of Scyros, at whose court Achilles was concealed by his mother in female attire to keep him away from the Trojan War. He was brought to Troy in the last year of the war by Ulysses, whom he helped in persuading Philoctetes to come from Lemnos to aid the Grecks, and he was one of the warriors in the wooden horse. It was he who killed Priam during the sack of the city. Apart from these Trojan tales, Neoptolemus is a prominent figure in the

Natural divisions.

legends of Epirus and of Delphi. He was the ancestor of

the Molossian kings, who therefore claimed to be of pure |

Hellenic stock. His grave was at Delphi, and the festival in his honour every eighth year is described in the romance of Heliodorus as one of the most beautiful ceremonies in the Delphic ritual. It was said that he protected the

temple in the Gaulish invasion.

NEPAL, Nepaut, or Nipat, is a small independent state, situated on the north-eastern frontier of Hindustan. It lies between 80° 15’ and 88° 10’ E. long. and 26° 20’ Jts extreme length is about 525 miles, It is

and 30° 10’ N. lat. and in breadth it varies from 90 to 140 miles.

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Scale of English Miles 20 4p 60

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Nepal consists of two very distinct kinds of land :—(1) the terai, or strip of level cultivated and forest land lying along the southern border ; and (2) the

great mountainous tract stretching northwards to Tibet. Along the northern frontier stand many of the highest peaks of the Himalayan range, such as Diwalgiri (26,861 feet), Mutsiputra and Yasa (24,000), Gosain Than (26,000), numerous peaks varying from 20,000 to 24,000 feet, Mount Everest (29,000), and Kinchinjunga (28,156). In clear weather this magnificent snowy range may be seen in an almost continuous line from the top of some of the lower ranges near Kathmandi. South of these are numerous parallel lower ranges, varying from 16,000 to 6000 feet in height, which are broken up at intervals by cross ranges, thus forming a series of glens with a few hill-girt valleys inter- spersed.

These mountain ranges determine the course of the Rivers

rivers, which are divided by the cross ranges into four groups. The first of these extends from Kumaon eastward as far as Diwalgiri, and consists of the affluents of the Kali, Sarju, Kurnali, Eastern Sarju, and Rapti, all of which ultimately form the Gogra or Gogari, and flow into the

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Map of Nepal.

Ganges. The second group, known to the Nepalese as the Sapt Gandaki, rise from the peaks between Diwalgiri and Gosain Than, and unite at Trebéni Ghat to form the Gandak. The third is a group of smaller rivers draining the great valley of Nepal, the valleys of Chitlong, Banépa, and Panouti, and portions of the terai around the Chiriyaghati range of hills) These are the various branches of the Bur Gandak, the lesser Rapti, the Bagmati, and Kumla. Last of this again is the fourth group, known to the Nepalese as the Sapt Kisi, rising from the peaks between Gosain Than and Kinchinjunga, and uniting to form the San Kisi, which falls into the Ganges.

There is thus a natural division of the country into four portions. The most western is the country of the Baisi (or twenty-two) rajas, and contains the towns of Jumla, Doti, and Sulliana. The second is the country of the Chaubisi (or twenty-four) rajas, and contains the towns of Malebum, Palpa, Gorkha, and Noakote. The third is the district containing Nepal proper, with the capital and many large towns to be mentioned afterwards. The fourth is the eastern portion of Nepal, comprising the country of the Kiratis, and many small towns, such as Khatang and Bijapur.

In a country possessing such a range of altitudes the flora and fauna are of course very varied, and the transi- tions from those of tropical to those of temperate and alpine regions are very rapid. For descriptive purposes, Nepal may again be divided into three longitudinal zones. These are—(1) the terai and lower ranges of hills up to 4000 feet in height ; (2) the central ranges and high-lying valleys, up to 10,000 feet ; and (3) the alpine region, from 10,000 to 29,000 feet in height. These zones are not, however, sharply defined, as the climate varies according to the latitude, the height of intermediate ranges, and the depth of the valleys; so that tropical plants and animals are sometimes found far in the interior, and the more northern species descend along the loftier spurs into the southern zones.

The low alluvial land of the terai is well adapted for Flora,

cultivation, and is, so to speak, the granary of Nepal; but owing to scantiness of population and other causes the greater portion of it consists of swamps, jungles, and forests. The productions here are those of British

India,— consisting of cotton, rice, wheat, pulse, sugar-cane, tobacco, opium, indigo,,and the fruits and vegetables familiar in the plains of India. The forests yield a magnificent

Fauna.

Minerals.

Races.

NEPAL

supply of sal, sisi, and other valuable forest trees ; and the jungles abound with acacias, mimosas, cotton tree (Bombax), dik (Butea frondosa), large bamboos, rattans, palms, and numerous ferns and orchids. On the Chiriyaghati range the common Pinus longifolia grows freely. Tea can be grown on the borders of this and the next zone at a height of from 2000 to 4000 feet. The middle zone supplies rice, wheat, maize, barley, oats, ginger, turmeric, chillies, potatoes, Cucurbitacex, pine- apples, and many varieties of European fruits, vegetables, and flowers. The forests contain tree rhododendrons, Pinus longifolia, oaks, chestnuts, walnuts, maples, hill bamboos, wild cherry, pear, allies of the tea plant, paper plants (Daphne), roses, and many other inhabitants of temperate climes, with various orchids, ferns, and wild flowers. In thealpine zone exist Coniferx of many kinds, junipers, yew, box, hollies, birch, dwarf rhododendrons, and the usual alpine flora.

The wild animals follow a similar distribution, and the following typical species may be mentioned. In the lowest zone are found the tiger, leopards, wolves, hyzenas, and jackals, the elephant and rhinoceros, the gaur (Gaveus gaurus), gayal (Gaveus frontalis), wild buffalo or arna, many species of deer, and the black bear (Ursus labiatus). Among the birds are found the pea-fowl, francolins, wild jungle fowl, and the smaller vultures, &c. In the middle zone there are leopards the Himalayan black bear (Ursus tibetanus), the wild dog, cats of many sorts, squirrels, hares, porcupines, the pangolin, and some species of deer and antelope. Among the birds are the larger vultures and eagles, the fowl pheasants (Gallophasis), chukor, hill partridges, &c. In the alpine zone are found the true bear (Ursus isabellinus,

or brown bear), the yak, musk deer, wild goats and sheep, marmots, &c. Among the birds are the eagle-vulture (Gypaetus), the blood pheasant (Ithaginis cruentus), snow pheasant (T'etraogallus hima- layensis), snow partridge (Lerwa nivicola), the horned and crested pheasants, &c. Geese, ducks, waders of all sorts, and other migratory birds are found in abundance in the two lower zones,

The lowest zone in some directions abounds in fossils ; and deposits of lignite, and even of true coal, are met with, the latter notably at a spot south of Palpa. The middle zone is rich in limestone and marbles, and abounds with minerals, such as iron, copper, zinc, lead, and sulphur. Copper is found near the surface in many places, and there are remains of mines both at Markhu and in the great valley of Nepal. Mineral springs, both hot and cold, are numerous. Traces of silver, and also of gold, have been found in the alpine zone.

The races occupying Nepal are very numerous. 'To the north, inhabiting the higher mountains and valleys, dwell the Bhotiyas or Tibetans. To the west lie the Gurungs and Magars. The Murmis, Gorkhalis, and Newars occupy the central parts; and the Kiratis, Limbiis, and Lepchas occupy the eastern districts. Besides these there are many small tribes residing in the terai and some other malarious districts, known as Daris, Bhramus, Kumhas, Manjis, &c., but generally classed together by the Nepalese as Aoulias, or dwellers in the malarious or aoul districts. These are probably descendants of immigrants from the lower castes of Hindus, occupying the borderlands of the terai. Among the forests of the lower eastern region are also to be found some small savage tribes, known as Chépangs and Kusiindas.

All the races except the Gorkhalis and Aoulias are of a decidedly Mongolian appearance, being generally short and robust, and having flat faces, oblique eyes, yellow com- plexions, straight black hair, and comparatively hairless faces, The Newars, according to the Vamedvali or native

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history, trace their descent from the races of Bengal, but this is rendered more than doubtful both by their appear- ance and language. The Gorkhalis (Gorkhas or Ghoor- khas) are descendants of the Brahmans and Rajputs who were driven out of Hindustan by the Moslems, and took refuge in the western hilly lands, where they ultimately became the dominant race. As a rule they still retain traces of their descent in face and figure, though they have become much mixed up with the other races by intermarriage.

The Bhotiyas, Newars, Limbiis, Keratis, and Lepchas are Re. all Buddhists, but their religion has become so mixed up ligions. with Hinduism that it is now hardly recognizable. The Newars have entirely abandoned the monastic institutions of Buddhism, and have in great measure adopted the rules of caste, though even these sit but lightly upon them. They burn their dead, eat the flesh of buffaloes, goats, sheep, ducks, and fowls, and drink beer and spirits. The Gorkhalis, Magars, and Gurungs are Hindus, but the last two are by no means strict in the observance of their religion, though there are some peculiarities which they carefully preserve. Thus, for instance, the Magars will eat pork but not buffalo's flesh, whereas the Gurungs eat the buffalo but not the hog.

The various races have all separate languages, or at Lan- least dialects. The Gdorkhalis use Parbatiya, a modern guages. dialect of Sanskrit, which is also used by the western tribes. The Newars have a distinct language and alphabet, or rather alphabets, for three are known to their pandits, though only one is now in use. Their language greatly resembles the Tibetan, but is now corrupted with many Sanskrit words. The Bhotiyas use the Tibetan language and alphabet.

There are no public schools nor provision for education ; Educa- but the children of all well-to-do people are taught by the tion. family priests or their parents; and some of the higher classes send their children to be educated at Patna, Benares, or Calcutta, so that many of them speak English flucntly. The bulk of the labouring classes is quite illiterate.

The modern literature of the country is undeserving of Litera- notice, being of the most frivolous description ; but Nepal ture. is a perfect storehouse of

ancient Sanskrit literature, and some of the oldest MSS. in that language as yet known to scholars have been found there.

The portion of Nepal, exclusive of the terai, which is Route

open to Europeans is the “valley of Nepal,” containing into the capital of the country, and a few adjacent smaller cual valleys. There is only one means of access used by Europeans, and this indeed isin general resorted to by the natives, as the other routes to the capital are longer and far more difficult. The road runs nearly north from Segowli, passing through the terai and sal forests, to Bichiakori ; then through the beds of mountain streams, through a pass in the Chiriyaghati range, and through another sal forest, to Hetoura; thence by a wide and good road to Bhimphedi at the foot of the Sisaghuri range of hills. So far the route is practicable for carts and baggage animals, but from this point the road is a mere rugged footpath over the mountains, through the Chitlong valley- and over the Chandragiri range. The distance from Segowli to Kathmandii is 90 miles.

The valley in extreme length from east to west is about 20 miles, and in breadth from north to south about 15. The surrounding hills vary in height from 6000 to 9720 feet, the level of the valley itself being about 4500 feet above the sea. Tradition has it that Nepal was once a lake, and appearances are in favour of this view. It is crossed longitudinally by a low limestone range, through which the waters have gradually forced a passage, and in

Climate.

Priests.

Astro- logers.,

Baids.

Diseases.

like manner the collected rivers have escaped at the south- east corner of the valley. The former fissure, at Chowbahal, is said to have been made by Vishnu, and the latter by Bodhisatwa Manjusri.

The surface of the valley consists of a series of table- lands (tars) and wide beds of streams (khélas), with here and there a few well-wooded knolls, generally surmounted by temples.

There are three principal streams, the Bagmati, Vishnu- mati, and Manohra, besides many small tributaries of these. All the rivers rise within the valley, except the Bag- mati, which springs from the northern side of the Seopiiri peak, and enters the valley through a ravine at the north- east corner. They all unite and pass through a long narrow gorge in the limestone range, already mentioned, at Chowbahal, and ultimately escape from the valley at Kotwaldar.

There are three large towns, Kathmandi, the capital, with some 50,000 inhabitants, Patan with about 30,000, and Bhatgion with 30,000 also. The houses are from two to four stories in height, built of brick, and tiled. The windows and balconies are of wood, and are elaborately carved, There are numerous handsome temples in all the towns, the majority of which are pagoda-shaped and built of brick, with roofs of copper, which is sometimes gilt. The streets are narrow, and they, as well as the squares, are all paved with brick or stone. In front of the temples generally stand monoliths surmounted by figures of Garir, or of the founder, made of brass gilt, or sometimes of black stone. Besides these three large towns, there are at least twenty smaller towns, and numerous villages, all of which possess many temples. Some of these, as for instance those of Pashupati, Bodh- natha, and Symbhunatha, are considered of great sanctity. Many thousands of pilgrims come at one festival to worship at Pashupati, and it is there that the dying are brought to be immersed in the Bagmati, the dead are burned, and satis are immolated.

In Nepal, as in India, the year may be divided into the rainy, cold, and hot seasons. The rains begin in June and last till October, but the fall is not so heavy or continuous as in the plains of Hindustan. The cold season extends from the middle of October to the middle of April. During these months the climate is delicions. Hoar-frost and thin ice are common in the moruings,

and the thermometer sometimes falls as low as 25° Fahr., but the days are bright and warm. From Christmas to the end of February there are occasional showers of rain; and snow falls on the sur- rounding low ranges, but is very rarely seen in the valley itsclf. From April to the beginning of the rains is the hot season, but the thermometer seldom reaches 85° in the shade. The result of observations extending over many years gives an average inean temperature of 60° Fahr., and an annual rainfall of abont 60 inches. Violent thunderstorms are not uncommon, and occasionally severe earthquakes occur, as in 1838 and 1866, on the former of which occasions there were great destruction of houses and loss of life in all the large towns.

Where temples are so numerous (there are 2738 shrines in the valley) priests naturally abound, both of the Hindu and Buddhist religions. The festivals too are many in number, and in conse- quence holidays are incessant. The raj gurt, or high priest, is an influential person in the state, a member of council, and has a large income from Government lands as well as from the fines for offences against caste, &. Many other priests, gurus and purohits, have lands assigned to them, and most of the temples have been richly endowed by their founders. Every family of rank has a. special priest, whose office is hereditary.

Astrologers are also numerous, and their services are in constant request. One cannot build a house, set: out on a journey, com- mence a war, or even take a dose of pliysic, without having an auspicious moment selected for him.

All families of good position have at least one baid, or medical man, in constant attendance, and there are also many general practitioners. There are no hospitals nor dispensaries, except the small one attached to the British residency, which is much fre- quented by the poor. The diseases most prevalent in the country are rheumatism, chronic dyspepsia, skin diseases, syphilis, goitre, and leprosy.

In the rains a number of cascs of mild intermittent

fever, diarrhcea, and dysentery are met with. Fever of a severe typhoid type is eommon in the crowded lanes and dirty villages ; and cholera, when it does break out, commits fearful ravages. Smallpox is almost always present, in‘consequence of inoculation being greatly resorted to by the Parbatiyas, whilst the Newars neither vaccinate nor inoculate. Of late years vaccination has been considerably practised by the residency surgeons, especially among the Bhotiyas and the children of the higher ranks,

Much attention is devoted by the Gorkhilis to military matters, and the bulk of that race may be said to be soldiers, The standing army consists of about 16,000 men, divided into twenty-six regiments of infantry and two regiments of artillery. Besides this force there is a reserve, consisting of men who have served for a few years and taken their discharge, but who in case of necessity can be called on again to enter the ranks. The regiments are formed on the European system, and similarly drilled and officered. The arms are various, from the old flint musket to the most modern breech-loading rifle. Each man also carries a bayonet and a kukhri or native knife. The followers of some of the petty hill rajas are still armed with khoras (heavy curved swords) and bows and arrows. The cavalry is on a very small scale, consisting of only about one hundred men, as the country is not suited for horse exercise. The artillery, however, is on a larger scale, consisting of two regiments ; and there is also an attempt at horse artillery. Of late years four mountain batteries drawn by mules have been established. There is a large arsenal well provided with supplies of gunpowder and military stores. There are extensive workshops too, where cannon are east, and rifles and ammunition of all sorts turned out in large quantities. In the last war with Tibet, in 1854, when the resources of the country were strained to the utmost, the field force consisted of 27,000 men, with 29,000 yartially armed coolies and eamp followers, and 390,000 eae baggage coolies. About 7000 fighting men only were left to garrison the country.

While the Gorkhalis are occupied in military affairs, the agricul- ture of the valley is carried on by the Newars. The soil is varied in character, from light micaceous sand to dense ferruginous clay, The whole valley is cultivated and irrigated where practicable, and the slopes of the hills are carefully terraced, so that there is little grazing ground, and few sheep or cattle are kept. There are some milch cows and buffaloes, which are either stall-fed or

grazed in the jungles at the foot of the hills. Animals for consumption and sacri- fice are all imported, and are consnmed as fast as they are brought in. In the cold season the Bhotiyas bring large flocks of sheep and goats laden with bags of borax, salt, and saltpetre. These are sold for consumption, exeept a few that are retained to carry back the bags. These droves are generally accompanied by ponies and some of the large Tibetan dogs. These dogs are powerful, fierce, shaggy animals, about the size of a small Newfoundland dog. Poultry are kept and used by the Newars, especially ducks, the eggs of which are in great demand even among the orthodox Hindus. The crops grown in the valley consist of rice, both the transplanted and the dry-sown or gyah varieties, wheat, pulse, murwah, maize, buck-wheat, chillies, radishes, mustard, garlic, onions, ginger, turmeric, sugar-cane, potatoes, ground nuts, many species of cucumbers and pumpkins, &c. Space will not allow a description to be given of the modes of cultivating these. Nothing but articles of food is allowed to be grown in the valley; hence its capabilities for pro- ducing tea, cotton, and tobacco are unknown. All of these, how- ever, are grown in other districts, both in the hills and the terai. Large cardamoms are extensively grown at the base of the hills, and form an important article of export. The hemp plant (Cannabis indica) grows wild, and is used both for manufactur. iug purposes and for producing the resinous extract and other intoxicating products which are exported. Plants producing dyes, such as madder or manjit, are grown in some places; and drugs, such as chirata and atees, are collected and exported. The better class of soils yields a return of about Rs, 180 per khait, and the poorest about Rs. 90 per khait. From some of the finer soils as many as three crops of various sorts are obtained annually. The land-measures in use aré the jana=75 square yards, 4 janas=1 ropni, 25 ropnis=1 khait, or 7500 square yards.

The Newars are also fond of horticulture. Many European

fruits, flowers, and vegetables have been introduced during the last culture.

fifty years, and grow freely. The country is famous for its oranges and‘pine-apples. Flowers are grown and sold for religious purposes, and even wild flowers are brought into the market and much used by the Newar women in adorning their hair, as well as for offerings at the shrines. Many wild fruits

are collected and sold in the markets. Apples and pears, of English stock, thrive well; apricots and plums are good ; peaches and grapes grow freely and are of large size, but they seldom ripen before the rains begin, when they rot.

Army.

Agricul. ture.

Horti-

All the trade and manufactures of the country are in the hands Trade.

of the Newars, and a few Kashmiris and natives of Hindustan. The trade in European goods is chiefly carricd on by the latter, whilst the Newars deal in corn, oil, salt, tobacco, and articles of domestic manufacture. The trade with India is carried on at

Manu- factures.

Coinage.

Govern- ment.

NP A lL

numerous marts along the frontier, at each of which a customs station is established, and the taxes are collected by a thikadar, or farmer. The Newars also carry on the trade with Tibet, through a colony which has been for many years established at Lhasa. There are two principal .routes to Tibet. One of these runs north-east from Kathmandi to the frontier-station of Kuti or Nilam, crossing the Himalayan range at a height of 14,000 feet; the other passes out of the valley at the north-west corner, and runsat first upwards along the main branch of the Gandak, crossing the Himalayas, near Kirong, at a height of 9000 feet. All goods on these routes are carried on men's backs, except the salt, &c., carried in bags by the Bhotiya sheep and goats. The principal imports from Hindu- stan are raw cotton, cotton goods, woollen goods, silks and velvets, hardware, cutlery, beads, jewels, coral,

saddlery, shoes, guns, gun- powder, vermilion, indigo, lac, tea, betel-nut, spices, paper, sugar, tobacco, oils, sheet copper, goats, cattle, buffaloes; and from Tibet, musk, medicines, yaks' tails, tea, woollen cloth, blankets, borax, salt, saltpetre, paper-plant, honey, wax, sheep, goats, yaks, ponies, silver, gold. The exports to Hindustan include wax, paper-plant, musk, yaks' tails, medicines, cardamoms, borax, sul- phate of copper, brass pots, iron pots, ponies, elephants, hawks, hides and horns (buffalo), rice, ghee, oil seeds, red chillies, madder, potatoes, oranges; and to Tibet, broad cloth, raw cotton, cotton goods, tobacco, sugar, opium, coral, jewels, pearls, spices, betel- nut, copper pots, iron pots, and hardware.

To estimate the exact value of such an extensive trade, passing through so many channels, is almost impossible, especially as the Nepalese are utterly regardless of statistics. Recent estimates, however, value the exports and imports to and from the British provinces at £1,686,000 annually ; and the value of those to and froin Tibet is probably at least half that amount. Duties are levied on exports and imports, which will be noticed under the head of revenue.

The Newars are skilful workmen. Their bricks are excellent, and so also is their pottery, for which certain towns are famous, such as Thémi and Noadkote. As carpenters they excel, though the use of the large saw is still unknown, and planks are cut with chisel and mallet. Some of the wood carvings on the temples and large houses are most artistic in design and bold in execution, though unfortunately they are too often of a most obscene character. The manufactures are few, consisting chiefly of coarse cotton cloths, paper made of the inner bark of the paper-plants (Daphne), bells, brass and iron utensils, weapons, and ornaments of gold and silver.

At one time Nepal supplied Tibet with its silver coinage, but this was abandoned on account of the adulterations introduced by the Nepalese. The ancient coins, specimens of which are still to be met with, were made by hand.! The modern coinage is struck by machinery, a regular mint having been established by Sir Jung Bahadur at Kathmandi.

Gold. Silver. Copper. Value in o Value in Value in | Wee | Anglo-Indian | Nepalese | sngio-indian | Nepalese) aneio-Indian Coin. : Coin. Coin. ie Re At Bs R. A. P Ashraff…) 2 Ripi.. 013 4 Paisa…... 0 0 2 eHtlCser, 2. Mohar

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The gold coinage and the silver rupee are seldom seen, the ordinary

currency consisting of the copper dims and paisa, and the mdhar

orhalf rupee. Besides the machine-made paisa two other kinds are In general use, One, the Bhutwaliya paisa, is made at Teusan in the Palpa district, and consists of a square lump of pure copper with a rough stamp on it. The other, the Lohiya paisa, is also a rough square lump of copper, but is much adulterated with iron. It is chiefly used in the eastern districts. The total coinage in 1875-76 was—silver méhars, Rs. 214,000; Bhutwaliya paisa, Rs, 186,000 ; Lohiya paisa, Rs. 43,000 ; flat paisa, Rs, 123,000.

However fond the Nepalese may be of asserting their independ- ence, there is no doubt that they acknowledge the supremacy of China, as they periodically send an embassy with presents to Peking. The British too have considerable influence with the Government In regard to their foreign relations; but in all matters of domestic policy the Nepalese brook no interference, and they are most jealous of anything that has a tendency to encroach on their inde- pendence.

Theoretically the government of Nepal is a pure despotism, and the raja is paramount. Practically, for the last century, all real power has been in the hands of a prime minister and his faction ; es

1 Some of the more antique are valuable to archeologists and historians on account of the dates and inscriptions. Specimens have been sent to the British Museum, the Fitzwilliam Museum at Cambridge, and to some Continental museums. Most of these have been examined by Mr C. Bendall, and described in his papers on the subjeet.

and much of the modern history of the country consists of accounts of the struggles of the various factions for power. Under the prime minister there is a council, cousisting of the relations of the king, the raj guri, the generals,

and a few other officials known as kajis and sirdars, which is consulted on all important business, and which forms a court of appeal for disputed cases from the courts of law. There are separate civil and criminal courts, but the distinction is not always observed, as difficult eases are often transferred from one to the other.

The old savage code with its ordeals by fire and water, and its punishments by mutilation and torture, was abolished by Sir Jung Bahadur after his return from England. Treason, rebellion, and desertion in time of war are punished by death. Bribery and peculation by public servants are punished by dismissal from office, and a fine with imprisonment, the latter of which may be commuted at the rate of Rs. 5 per meusem. Murder and the killing of cows are capital offences. Manslaughter and maiming cows are punished by imprison- ment for life, and other offences against the person or property by imprisonment or fine. Offences against caste are heavily punished by fine and imprisonment. In some cases all the offender's property is confiscated, and he and his family may even be sold as slaves. Slavery is an institution of the country, and all families of rank possess many slaves, who are employed in domestic and field labour. They are in general well treated, and are carefully protected by law. The price of slaves ranges from Rs. 100 to Rs. 200, There are three large prisons in the valley, one for males and two for females. The prisoners are kept in irons, and employed in public works of various sorts. They are allowed six pice per diem for subsistence at the capital, and five pice in other districts. There are no bankruptcy laws, and the liability of a debtor descends from father to son. The marriage laws are somewhat peculiar. Among the Gorkhilis of course the laws resemble those of other Hindus as regards the marriage of widows, polygamy, sati (suttee), &c. An offend- ing wife is imprisoned for life, and her paramour, after his guilt has been proved before the law courts, is cut down in public by the injured husband. The culprit gets a start of a few yards and runs for his life. If he escapes he is free, but in general he is tripped up by the onlookers and his fate is certain, as the husband is entitled to strike thrice with his kukhri. Among some of the hill tribes polyandry is still practised, and the Bhotiyas seem to regard the marriage tie with perfect indifference. Among the Newars, every girl, while still an infant, is married with much ceremony to a bél fruit, which is then thrown into some sacred stream. As the fate of the fruit is un- known, a Newarin is supposed never to become a widow. At the

age of puberty a husband is selected, but the woman can at any moment divorce herself by placing a betel-nut under her husband's pillow and taking her departure. Adultery is therefore but slightly punished. The woman is merely divorced, and her paramour has to make good to the husband the expenses incurred at the marriage. A Newéarin on the death of her husband may, ifshe chooses, become a sati, but the privilege is very seldom taken advantage of.

The revenue of Nepal is about ninety-six lakhs of rupees, 7.¢., £9,600,000. The chief sources of it are the land-tax, customs, mines, forests, and monopolies. About 10 per cent. of the terai lands, and 20 per cent. of the hill lands, are private property. Some lands were assigned by the Gorkhali rajas to Brahmans, soldiers, and others, and these are untaxed. Others, which were the gifts of the old Newar kings, pay from 4 to 8 annas per bigah, All such grants of laud, however, are subject to a heavy fine on the coronation ofa new raja. Land which does not produce rice is lightly taxed, but in the valley of Nepal, and wherever rice is grown, the Government tax or rent is one half of the produce of the land. 'Waste lands, when brought into cultivation, arc rent free for ten years, after which for five years the tax is only 4 annas per bigah, and the cultivator receives one-tenth of the cleared land rent free for his life. A con- siderable revenue in the shape of royalty is obtained from mines of copper, iron, &c. The taxes on merchandise amount to from 12 to 14 per cent. on the value of the goods carried to and from British India, and from 5 to 6 per cent. is charged on goods exported to Tibet. The revenue, when collected by the various stbas, is trans- mitted under an cscort to the Government treasury, and at the end of the year the surplusis deposited in the Mul Dhukati,.or Govern-

ment cellars, whence it is never withdrawn except in great emer-

gencies. A ycarly surplus has been accumulating in this manner for many ycars,

There are three principal eras in use in Nepal. The Samvat of Vikramaditya commences fifty-seven years before the Chistian era, the Saka era of Sadlivahana begins seventy-eight years after the Christian era, and the Nepalese Samvat dates from October 880 A.D. 'The Sri-Harsha and Kaligat eras are also sometimes used. The measurement of time is regulated by a

copper vessel with a small hole in the bottom, which is floated on water and fills and sinks sixty times a day. Each time it sinks a gong or ghari is struck, in progressive numbers from dawn to noon ; after

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noon the first ghari struck indicates the number of gharis which remain of the day till sunset. Day is considered to begin when the tiles on a house can be counted, or when the hairs on the back of a man's hand can be discerned against the sky. Sixty bipalis=1 pala; 60 palas=1 ghari or 24 minutes; 60 gharis=1 day of 24 hours.

Nepal and the somewhat similar country of Kashmir are peculiar among the Hindu states of India in possessing an historical literature. The Nepalese Vamgavalt professes to start from a very early period in the Satya Yuga, when the present valley was still a lake. The earlier portion of it is devoted to the Satya and Tréta Yugas, and contains inythological tales and traditions having reference to various sacred localities in the country. During these two Yugas, and also the Dwapur Yuga, the Vamedvali deals in round numbers of thousands of years,

In the beginning of the Kali Yuga, the Gupta dynasty is said to have been founded by Né-Muni, from whom the country takes its name of Nepal. Lists are then given of the various dynasties, with the lengths of the reigns of the rajas. The dynasties mentioned are the Gupta, Ahir, Kirati, Somavanshi, Suryavanshi, Thakuri or Rajput, Vaishya Thakuri, second Rajput, and Karna- taki dynasties. The country was then invaded by Mukunda- séna, and after his expulsion various Vaishya Thakuri dynasties are said to have held the throne for a period of 225 years. The chronology of the Vamgdvali up to this period is very confused and inaccurate; and, though the accounts of the various invasions and internal struggles, mixed up as they are with grotesque legends and tales, may be interesting and amusing, they can

hardly be considered authentic. Some of the names of the rajas, and the dates of their reigns, have been determined by coins, the colophons of old MSS., and certain inscriptions on the temples and ancient buildings. For instance, Ancu- varma, of the Thakuri dynasty, reigned about 633 A.p., as he is mentioned by the Chinese traveller Hwen Tsang, who visited Nepal. His name too is found in an inscription still extant. In like manner it is ascertained from MSS. that Rudra-déva-Varma was reigning in 1008; Lakshmikama-déva from 1015 to 1040; Padma-déva, of the Vaishya Thakuri dynasty, in 1065; Mana- déva, of the second Rajput dynasty, in 1139; Ananta-Malla, 1286-13802; Harisinha-déva, 13824; Jayastithi-Malla, 1385-1391. Much information as to the chronology of the various dynasties can be obtained from the catalogue of the Cambridge MSS. com- piled by Mr Cecil Bendall, M.A., and also from his papers on the ancient coins of the country. Inscriptions too have been edited by Professor Bihler in the Indian Antiquary, vol. ix. Detailed lists of the rajas are to be found in Kirkpatrick's Account of Nepal, in Hodgson's Hssays, Prinsep's papers in the Asiatic Socicty's Journal, and Wright's History of Nepal.

The records begin to be more accurate from the time of the in- vasion and conquest of the country by Harisinha-déva, the raja of Simraungarh, 1324. This raja was driven from Simraungarh by Tughlak Shah of Delhi, but seems to have found little difficulty in the conquest of Nepal. There were only four rajds of this Ayodhya dynasty, aud thenthe throne was occupied by Jayabhadra- Malla, a descendant of Abhaya-Malla, one of the Rajput dynasty, who reigned in the 13th century. There were eight rajas of this dynasty. The seventh, Jayastithi-Malla, who reigned for forty- threc years (1386-1429), appears to have done much in forming codes of laws, and introducing caste and its rules among the Newars. In the reign of the eighth raja, Yaksha-Malla, the kingdom was divided into four separate states,—namely, Banépa, Bhatgion or Bhaktapur, Kantipur or Kathmandi, and Lalitapur or Patan. There was only one raja of Banépa, who died without issue. The Malla dynasty in the other three branches continued in power up to the conquest of the country by the Gorkhilis in 1768.

The Gérkhalis (Ghorkhas or Ghoorkas) claim descent from the rajas of Chitaurgarh, in Rajputana, near Tonk. They were driven out of their own country by the victorious Moslems, and took refuge in the hilly districts

about Kumaon, whence they gradually pushed their way eastwards to Lamjung, Gorkha, Noakote, and ultimately to the valley of Nepal, and as far as Sikhim.

Prithiwi-narayana Sah came to the throne in 1742. From an early period he seems to have devoted all his energies to the con- quest of Nepal, but it took him upwards of twenty-five years to accomplish his object. During the early part of the 18th century Nepal was visited by Italian missionaries, who founded a mission at Patan, which appears to have been in a flourishing state at the time of the Gérkhali invasion. Father Giuseppe has given a short account of the conquest in vol. ii, of the Astatic Rescarches, the details of which are fully corroborated by the Vamedvalt. Strange to say, that work contains no reference whatever to the presence of Christians in the country. Prithiwi-narayana entered Kathmandi in 1768, and in the course of the following year also conquered Patan and Bhatgion. In the final struggle, which took place at Bhatgaon, Jayaprakdsa (the raja of Kathmandi) was wounded, and shortly afterwards he dicd at Pashipati. Ranjit-Malla, the aged raja of Bhatgion, was allowed to retire to Benares, where he ended his days. Téj Narsinha, the raja of Patan, was kept in confine-

ment tillhisdeath. During the latter years of the war Jayaprakasa applied to the British for assistance, and a small force, under Captain Kinloch, was scnt into the tcrai in 1765, but it was repulsed by the Gorkhas.

Prithiwi-narayana diedin 1774. He left two sons, Pratapa-sinha Sah and Bahadur Sah. The former succeeded his father, but died in 1777, leaving an infant son, Rana Bahadur Sah. On the death of Pratapa-sinha, his brother, who had been in exile, returned to Nepal and became regent. The mother of the infant king, how- ever, was opposed to him, and he had again to flee to Bettiah, where he remained till the death of the rani, when he again became regent, and continued so till 1795. During this time the Gorkhas were busily annexing all the neighbouring petty statcs, so that in 1790 their territories extended from Bhutan to Kashmir, and from Tibet to the British provinces. At length, in 1790, they invaded Tibet, and were at first successful; but they were thus brought into contact with the Chinese, who in 1791 sent a large

force to invade Nepal. In 1792 the Chinese advanced as far as Noakote, and there dictated terms to the Nepalese.

In 1791 the Gorkhas had entered into a commercial treaty with the British, and hence, when hard pressed, they applied for assistance against the Chinese to Lord Cornwallis. In consequence of this Colonel Kirkpatrick was despatched to Nepal, and reached Noakote in the spring of 1792, but not till after peace had been concluded. One result of this embassy was the ratification of another commercial treaty on 1st March 1792.

In 1795 Rana Bahadur removed his uncle, Bahadur Sah, from the regency, and two years subsequently put him to death. From this time up to 1799 the king, who seems to have been insane, per- petrated the most barbarous outrages, till at length his conduct became so intolerable that he was forced to abdicate in favour of his son, Girvan-yuddha Vikrama Sah, who was still an infant. Rana Bahadur once again recovered the throne in 1804, but was assassinated in 1805.

In October 1801 another treaty was signed by the British and Nepalese authorities, and Captain W. D. Knox was appointed resident at the Nepalese court, which he reached in April 1802. He soon became dissatisfied with the conduct of the Nepalese, and he was withdrawn in 1803. From this time the Nepalese carried on a system of encroachment and outrage on the frontier, which led to a declaration of war by the British in November 1814. At first the British attacks were directed against the western portion of the Nepalese territory, and under Generals Marly, Wood, and Gillespie several disasters were met with. General Gillespie himsclf was killed while leading an assault on a small fort called Kalunga. General Ochterlony was more successful, and the Gorkhas were driven beyond the Kali river, and began to negotiate for peace. Arms, however, were soon taken up again, and Ochterlony, who was put in command, in January 1816, advanced directly on the capital in the line of the route that is now in use. He soon fought his way as far as Mukwanpur, and the Nepalese sued for peace.

From this time the records for many years furnish little of interest except a history of struggles for office between the Thapa and Panre factions, and futile attempts at forming combinations with other states in Hindustan against the British.

In 1817 Dr Wallich visited Nepal, and pursued his botanical researches for a year.

In 1839 Bhimaséna's enemies succeeded in driving him from power, and he committed suicide, or was murdered, in prison. The Kala Panré faction then came into power, and there were frequent grave disputes with the British. War, however, was averted by the exertions of the resident, Mr B. H. Hodgson.

In 1843 Matabar Singh, the nephew of Bhimaséna, returned from exile, soon got into favour at court, and, as a necessary conse- quence, speedily effected the destruction of his old enemies the Kala Panrés, who were seized and executed in May 1843. At this time mention begins to be made of a nephew of Matabar Singh, Jung Bahadur, the eldest of a band of seven brothers, sons of a kaji or state official. He rose rapidly in the army and in favour at the court, especially with one of the ranis, who was of a most intrigu- ing disposition. In 1844 he was a colonel in the army, and Matabar Singh expressed some alarm at his growing influence to Sir Henry (then Major) Lawrence, the resident at the time. This alarm proved well founded, for on the 18th of May 1845 Jung Bahadur effected the murder of his uncle, and immediately thereafter, with the aid of the rani, took a prominent part in the government. After a short but turbulent interval of intrigue, Jung Bahadur determined to get rid of his enemies at one fell swoop, and most thoroughly carried out his design by what is known as the Kot massacre, on the 15th September 1846. From that time till the day of his death Jung Bahadur was in reality the ruler of Nepal. His old friend, the intriguing rani, was banished, and all posts of any

consequence in the state were filled by Jung, his brothers, and other relatives. In 1850, finding himself sccurely seated in power, Jung Bahadur paid a visit to England, which made a great impression on his acute intellect, and ever after le professed and proved himself to be a staunch friend of the British. On his return in 1851, he at once devoted himself to reforming the administration of the country. Every department in the state

in turn felt the benefit of his resolute will, and, whatever may have been the means by which he gaincd power, it must be allowed that he exercised it so as to prove himsclf the greatest benefactor his country has ever possessed. In 1853 a treaty for the extradition of eriminals was proposed, but it was not ratified till February 1855. In 1854 the Nepalese entered into a war with Tibet, which lasted with varying success till March 1856, when peace was concluded on terms very favourable to Nepal.

In June 1857 intelligence of the mutiny of the native troops in

Ilindustan reached Nepal, and produced much excitement. Jung Bahadur, in spite of great opposition, stood firm as a friend of the British. Ou the 26th June 4000 troops were sent off to assist, and these rendered good service in the campaign against the mutineers. Jung himself followed on the 10th of 'December, with a force of 8000 men, 500 artillerymen and 24 guns, but some- what late to be of much use. Many of the mutineers and rcbels, including the infamous Nana Sahib, took refuge in the Nepalese tcrai, and it was not till the end of 1859 that they were finally swept out of the country. The Nana was said to have died of fever in the terai, along with several others of the rebel leaders, and it is probable that this was the case, although for many years tales were circulated of his being still alive, and of his having been seen in various parts of Nepal and British India. His wives and a few attendants resided for many years near Kathmandi.

In return for the aid afforded to the British, Jung Bahadur was well rewarded. He was ereated a G.C.B., and in 1873 a G.C.S.1., honours of which he was not a little proud. The troops employed received food and pay from the day of leaving Kathmandi; hand-

some donations were given to those severely wounded, and to the |

relatives of the killed; great quantities of muskets and rifles were presented to the Nepalese Government; and, to crown all, a large portion of the terai was restored to Nepal. This ground contains most valuable sal and sist forests, and yields a revenue of several lakhs of rupecs yearly.

From the termination of the mutiny Nepalese history has been uneventful. The country has becn prosperous, and the relations with the British have

continued to be most friendly. Nevertheless the restrictions on commerce, and the prohibitions against Europeans entering the country, or travelling beyond certain narrow limits, are as rigidly enforced as they were a hundred years ago. Sir Jung Bahadur died suddenly in the terai in 1877. In spite of all the exertions he had made to bring about a better state of things, three of his wives were allowed to immolate themsclves on his funeral pyre. His brother, Sir Ranadip Singh Bahadur, G.C.S.1, succeeded him as prime minister. Shortly after his accession to power a plot was formed against him, but he showed himself as prompt to meet such an emergency as his late brother had been, for nearly forty of the conspirators were seized and executed in a summary manner, and others, who escaped, are now living in exile.

The rajas of the Gérkhali line in Nepal, with dates of accession, are—Prithiwi-narayana Sah (1768), Pratapa-sinha Sah (1774), Rana Bahadur Sah (1777), Girvan-yuddha Vikrama Sah (1799), Rajendra Vikrama Sah (1816), Surendra Vikrama Sah (1847), Prithiwi Vir Vikrama Sah (1881). (D. WR.)

NEPHRITE. See Japs.

NEPOMUK, Sr Joun or. See Joun, vol. xiii. p. 718.

NEPOS, Cornerius, a Roman historian, friend of Catullus, Cicero, and Pomponius Atticus, was probably a native of Verona. Nothing is known of his life, but he is recorded to have written a universal history under the title Chronica, letters to Cicero, and other works, especially a series of biographies styled De Viris Illustribus. It is one of the problems of Latin literature whether or not any of these works have been preserved. There is a series of biographies, chiefly of Greek generals, first printed at Venice in 1471 under the title Mmilii Probi de Vita Excellentiwm. Other later editions bear slightly varying titles, and add the lives of Catoand Atticus, Many MSS. expressly assign the last to Cornelius Nepos, and in 1569 Lambinus, in a famous edition of the Lives, maintained that the whole of them were the work of Nepos. The chief argument in favour of this view is founded on the language, which is a model of chaste, elegant Latinity. The view of Lambinus has been very generally accepted ;

| province of Auvergne.

the only question debated is whether all the lives are in the original condition, or whether some of them have been modified or abridged by Aumilius Probus. The editions of Nepos's Lives are extremely numerous, the book having long been much read in schools.

NEPOS, Junius, the last but one of the Roman emperors of the West, from 474 to 475, was a nephew of that Marcellinus who in the latter half of the 5th century had established a semi-independent principality in Dalmatia. After the death of Olybrius, on October 23, 472, the throne of the West remained for some months vacant, during which Italy was abandoned to lawless barbarians. On the 5th of March 473, the army, at the instigation of Gundobald the Burgundian, who had suc- ceeded to the power and authority of his uncle Ricimer, raised Glycerius, an obscure officer, to the imperial dignity. Meanwhile Leo I., emperor of the East, was discussing with his council the election of a new colleague for the Western empire. At length choice was made of Nepos, who married a niece of the empress Verina. After con- siderable delay he landed in Italy and took Glycerius prisoner at Portus at the mouth of the Tiber in 474. Glycerius, being compelled to enter the church, was appointed bishop of Salona. The only event of the reign of Nepos was the inglorious cession to the Visigoths of the In 475 Orestes, father of Augus- tulus, who afterwards was the last emperor of the West, raised the standard of revolt and marched against Nepos at Ravenna. The emperor fled into Dalmatia, and con- tinued to reside at Salona until his assassination by two of his own officers in 480. There exists some doubt, however, whether his death was, as Gibbon affirms, caused by his former rival, the bishop of Salona.

NEPTUNE, the Roman god of the sea, is probably adopted from Greek religion. The earliest reference to his worship is on the occasion when the Sibylline books included him among the gods to whom the first lecti- sternium was dedicated, 399 B.c, (Livy v.13). In the poets no trait of Neptune occurs that is not directly borrowed from the Greek Poseidon. His festival, Neptunalia, was celebrated on July 23, and his temple stood near the Circus Flaminius. His worship was never popular or widespread in Rome. The god Portunus was thanked for naval victories in earlier times;

but Sextus Pompey called him- self son of Neptune, and Agrippa dedicated to Neptune a temple in the Campus Martius in honour of the naval victory of Actium.

NERAC, a town of France, formerly the capital of the duchy of Albret, is situated in the department of Lot-et- Garonne, on both banks of the Bayse, a navigable tributary of the Garonne, 16 miles west-south-west of Agen. It is a pretty and flourishing little place of 4803 inhabitants (1881; commune 7384), with cloth factories, cork-works, and a number of flour-mills; the ruins of its castle are entered in the Government list of historical monuments ; and in the old royal park (La Garenne) it has one of the finest promenades of the south of France.

Roman ruins of hot baths, villas, &c., discovered at Neérac in 1831-33 show that the site must have been occupied in the 3d cen- tury. In 1250 a Benedictine monastery was established, and in 1306 the lords of Albret expelled the monks and began to build a eastle for themselves, which gradually grew into an imposing edifice. Here Marguerite d'Angouléme held court as queen of Navarre, and gathered round her the Protestant literati of her time, Beza, Marot, &c.; here Henry IV. spent a large part of his yonth ; and here Catherine de' Medici in 1579 held a conference with the Protestant leaders. The town was dismantled in 1622 by Louis XIII. because it had sided with the Protcstant party.

NERBUDDA (properly NarpapA), one of the great rivers of India, traditionally regarded as the boundary between Hindustan proper and the Deccan. It rises on the summit of Amarkantak hill in Rewah state, in 22°

41' N. lat., 89° 41' E. long,, and after a westward course of 800 miles through the Central Provinces and Guzerat, falls into the sea in 21° 38' N. lat., 72° 0' 30" E. long,, in the Bombay district of Broach. During its passage through the Central Provinces several falls interrupt its course, the principal of which are a series of glittering cascades and rapids for some hundreds of feet down the heights of Amarkantak, and the well-known falls

of the ‘“ Marble rocks” 9 miles below Jabalpur. After leaving the Central Provinces, the river widens out in the fertile district of Broach, with an average breadth of from half a mile to a mile. Below Broach city it forms an estuary which is 13 miles broad where it enters the Gulf of Cambay. The Nerbudda is nowhere utilized for irrigation, and navigation is confined to the lower section. In the rainy season boats of considerable size sail about 60 miles above Broach city. Sea-going ships of about 70 tons frequent the port of Broach, but they are entirely dependent on the tide. In sanctity the Nerbudda ranks only second to the Ganges among the rivers of India, and along its whole course are special places of pilgrimage. The most meritorious act that a pilgrim can perform is to walk from the sea to the source of the river and back along the opposite bank. This pilgrimage is chiefly undertaken by devotees from Guzerat and the Deccan, and takes from one to two years to accomplish,

NEREUS, the old man of the sea, as his name (comp. va, modern Greek vepd, water) denotes, was described in Greek legend as full of wisdom and knowledge, friéndly to men, but requiring compulsion before he reveals to them all that he knows. The struggle in which Heracles wrestles and overcomes him is a favourite subject of early Greek art; Heracles, the representative of toiling active man, bends to do his will even the. power of the sea, aAtos yépuv. The fifty daughters of Nereus, the Nereids, are personifications of the smiling, quiet sea with all the gifts which it offers to men. None of the Nereids have any individual character except Thetis, Amphitrite, and Galatea. Thetis and Amphitrite are the queen or mistress of the sea in the legend of different localities; Galatea is a Sicilian figure, who plays with and deludes her rustic lover of the shore, Polyphemus. It is impossible to treat in brief of the religious conceptions on which the mythology of Nereus is founded, or of the connexion between the early representations of Nereus and Heracles and similar subjects in pre-Hellenic art.

NERI, Purr (1515-1595). Filippo Neri, one of the most remarkable and individual figures amongst the ecclesiastics of the 16th century, was born at Florence, July 21, 1515, the youngest child of Francesco Neri, a lawyer of that city, and his wife Lucrezia Soldi, a woman of higher birth than her husband, and descended from a family whose members had held important

public offices in the time of the republic. They were both devout persons, and Francesco was accustomed to intercourse with the monastic bodies in Florence, notably with the Dominicans. The child was carefully brought up, and displayed from infancy a winning, gentle, intelligent, playful, and yet obedient disposition, which earned him the title of the "good Pippo" (on Pippo) amongst his young com- panions. He received almost his earliest teachings from the friars at San Marco, the famous Dominican monastery in Florence, and was accustomed in after life to ascribe most of his progress to the teaching of two amongst them, Zenobio de' Medici and Servanzio Mini. When he was about sixteen years old, a fire destroyed nearly all his father's property, and it became therefore expedient to seek some means of recruiting the family fortunes. His father's brother Romolo, a merchant at San Germano, a Neapolitan town in the Terra di Lavoro, near the base of

Monte Cassino, was wealthy and childless, and to him Philip was sent in 1531, to assist him in his business, and with the hope that he might inherit his possessions. So far as gaining Romolo's confidence and affection, the plan was entirely successful, but it was thwarted by Philip's own resolve to adopt the ecclesiastical calling, a determination at which he arrived in the course of frequent visits to a solitary chapel on a rock overlooking the Bay of Gaeta. In 1533 he left San Germano, and betook himself to Rome, where he found shelter, food, and protection in the house of a Florentine gentleman named Galeotto Caccia, to whose two children he became tutor, continuing in that post for several years, and pursuing his own studies independently, while also practising habitual austerities, and beginning those labours amongst the sick and poor which gained him in later life the title of " Apostle of Rome," besides paying niglitly visits for prayer and medita- tions to the basilican churches of the city, and to the catacombs. In 1538 he entered on that course of home mission work which was the distinguishing characteristic of his life, and which bears in much of its method a curious resemblance to the manner in which Socrates was accustomed to set the Athenians thinking, in that he traversed the city, seizing opportunities of entering into conversation with persons of all ranks, and of leading them on, now with playful irony, now with searching questions, and again with words of wise and kindly counsel, to consider the topics he desired to set before them.

In 1548 he founded the celebrated confraternity of the Santissima Trinit' de' Pellegrini e de' Convalescente, whose primary object is to minister to the needs of the thousands of poor pilgrims accustomed to flock to Rome, especially in years of jubilee, and also to relieve the patients discharged from hospitals, but still too weak for labour. In 1551 he passed through all the minor orders, and was ordained deacon, and finally priest on May 23. He settled down, with some companions, at the hospital of San Girolamo della Carita, and while there tentatively began, in 1556, the institute with which his name is more especially connected, that of the Oratory, after a plan he had formed of proceeding as a missionary to India was abandoned at the instance of shrewd advisers, who saw that there was abundant work to be done in Rome, and that he was the man to doit. The scheme of the Oratory at first was no more than a series of evening meetings in his own room, at which there were prayers, hymns, readings from Scripture, from the fathers, and from the J/artyrology, followed by a lecture, or by discussion of some religious question proposed for consideration. It afterwards was developed further, and the members of the society were employed in various kinds of mission work throughout Rome, notably in preaching sermons in different churches every evening, a wholly novel agency at that time. In 1564 the Florentines, who regarded themselves as having a special claim upon him as their fellow-citizen, requested him to leave San Girolamo, and to take the oversight of their peculiar church in Rome, San Giovanni dei Fiorentini, then newly built. He was at first reluctant, but the pope (Pius IV.) was induced to enjoin him to accept, permitting him, however, to retain the charge of San Girolamo, where the exercises of the Oratory were still kept up. At this time the new society included amongst its members Ceesar Baronius the ecclesiastical historian, Tarrugi, afterwards archbishop of Avignon, and Paravicini, all three subsequently cardinals, and also Gallonius, author of a well- known work on the Sufferings of the Martyrs, Ancina, Bordoni, and other men of ability and distinction.

The Florentines, however, built in 1574 a large oratory or mission-room for the society contiguous to San Giovanni, in order to save them the fatigue of the daily

journey to and from San Girolamo, and to provide a more convenient place of assembly, and the headquarters were transferred thither. As the community grew, and its mission work extended, the need of having a church entirely its own, and not subject to other claims, as were San Girolamo and San Giovanni, made itself felt, and the offer of the small parish church of Santa Maria in Vallicella, conveniently situated in the middle of Rome, was made and accepted. The building, however, as not large enough for their purpose, was pulled down, and a splendid church erected on the site. It was immediately after taking possession of their new quarters that Filippo Neri formally organized, under permission of a bull dated July 15, 1575, a community of secular priests, entitled the Congregation of the Oratory. The new church was consecrated early in 1577, and the clergy of the new society at once resigned the charge of San Giovanni dei Fiorentini, but Neri himself did not migrate from San Girolamo till 1583, and then only in virtue of an injunction of the pope that he, as the superior, should reside at the chief house of his congrega- tion. He was at first elected for a term of three years (as is usual in modern societies), but in 1587 was nominated superior for life. He was, however, entirely free from personal ambition, and had no desire to be general over a number of dependent houses, so that he desired that all congregations formed on his model outside Rome should be autonomous, governing themselves, and without endeavour- ing to retain control over any new colonies they ,might themselves send out,—a regulation afterwards formally confirmed by a brief of Gregory XV. in 1622. Much as he mingled with society, and with persons of importance in church and state, his single interference in political inatters was in 1593, when his persuasions induced the pope, Clement VIII, to withdraw the excommunication and anathema of Henry IV. of France, and the refusal to receive his ambassador, even though the king had formally abjured Calvinism. Neri saw that the pope's attitude was more than likely to drive Henry to a relapse, and probably to rekindle the civil war in France, and directed Baronius, then the pope's confessor, to refuse him absolution, and to resign his office of confessor, unless he would withdraw the anathema. Clement yielded at once, though the whole college of cardinals had supported his policy ; and Henry, who did not learn the facts till several years afterwards, testified lively gratitude for the timely and politic inter- vention. Neri continued in the government of the Oratory until his death, which took place on May 26, 1595, in the eightieth year of

his age. There are many anecdotes told of him which attest his possession of a playful humour, united with shrewd mother-wit, often urging him to acts with a ludicrous aspect, but which were well calculated to serve his purpose of divesting religion of the hyper- professional garb it wore in his day, and bringing it within the area of ordinary lay experience. This, rather than the atmosphere of supernaturalism with which he is surrounded in the various biographies of him which have appeared, and that to a much greater degree than is common in similar writings, is the true key to his popu-larity, and to the fact that his name figures often in the folk-lore of the Roman poor, whom he loved so well and served so long. He was beatificd by Paul V. in 1600, and canonized by Gregory XV. in 1622.

"Practical commonplaceness," to cite the words of Frederick William Faber in his panegyric of Philip Neri, was the special mark which distinguishes his form of ascetic piety from the types accredited before his day. " He looked like other men… . he was emphatically a modern gentleman, of scrupulous courtesy, sport- lve gaiety, acquainted with what was going on in the world, taking areal interest in it, giving and getting information, very neatly dressed, with a shrewd common sense always alive about him, in a

modern room with modern furniture, plain, it is true, but with no marks of poverty about it,—in a word, with all the ease, the

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gracefulness, the polish of a modern gentleman of good birth, considerable accomplishments, and a very various information." Accordingly, he was ready to meet the needs of his day to an extent and in a manner which even the versatile Jesuits, who niuch desired to enlist him in their company, did not rival; and, though an Italian priest and head of a new religious order, his genius was entirely nnmonastic and unmedieval ; he was the active promoter of vernacular services, frequent and popular preaching, unconventional prayer, and unsystematized, albeit fervent, private subjective devotion.

Philip Neri was not a reformer, save in the sense that in the active discharge of pastoral work he laboured to reform individuals. He had no difficulties in respect of the teaching and practice of his church, being in truth an ardent

Ultramontane in doctrine, as was all but inevitable in his time and circumstances, and his great merit was the instinctive tact which showed him that the system of monasticism could never be the leaven of secular life, but that something more homely, simple, and everyday in character was needed for the new time.

Accordingly, the institute he founded is of the least conventional nature, rather resembling a residential clerical club than a monastery of the older type, and its rules would have appeared incredibly lax, nay, its religious character alinost doubtful, to a Bruno, a Stephen Harding, a Francis, or a Dominic. It admits only priests aged at least thirty-six, or ecclesiastics who have completed their studies, and are ready for ordination. The mem- bers live in community, and each pays his own expenses, having the usufruct of his private means,—a startling innovation on the monastic vow of poverty. They have indeed a common table, but it is kept up preciscly as a regimental mess, by monthly payments from each member. Nothing is provided by the society except the bare lodging, and the fees of a visiting physician. Everything else —clothing, books, furniture, mcdicines—must be defrayed at the private charges of each member. There are no vows, and every member of the society is at liberty to withdraw when he pleases, and to take his property with him. The government, strikingly unlike the Jesuit autocracy, is of a republican form; and the superior, though first in honour, has to take his turn in discharging all the duties which come to each priest of the society in the order of his seniority, including that of waiting at table, which is not entrusted in the Oratory to lay brothers, according to the practice in most other communities. Four deputies assist the superior in the government, and all publie acts are decided by a majority of votes of the whole congregation, in which the superior has no casting voice. To be chosen superior, fifteen years of membership are requisite as a qualification, and the office is tenable, as all the others, for but three years at a time. No one can vote till he has been three years in the society; the deliberative voice is not obtained before the eleventh year. Each house can call its superior to account, can depose, and can restore him, without appeal to any external authority, although the bishop of the diocese in which any house of the Oratory is established is its ordinary and immediate superior, though without power to interfere with the rule. Their churches are non-parochial, and they can perform such rites as baptisms, marriages, &c., only by

permission of the parish priest, who is entitled to receive all fecs due in respect of these ministrations. The Oratory chiefly spread in Italy, but a branch established in Paris by Cardinal de Bérulle in 1611 had a great success and a distinguished history. It fell in the crash of the Revolution, but was revived by Pére Pététot, curé of St Roch, in 1852; while an English house, founded in 1847, is cclebrated as the place at which Cardinal Newman fixed his abode after his submission to the Roman Catholic Church. The socicty has never thriven in Germany, though a few houses have been founded there, in Munich and Vienna.

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NERO (37-68 a.p.), Roman emperor, the only child of Cn. Domitius Ahenobarbus and the younger Agrippina, was born at Antium on December 15, 37 a.p., nine months after the death of the emperor Tiberius. Though on both his father's and his mother's side he came of the blood of Augustus, and the astrologers are said to have predicted that he would one day be emperor, the circumstances of his early life gave little presage of his future eminence. His father Domitius, at best a violent, pleasure-sceking noble, died when Nero was scarcely three years old. In the previous year (39 a.p.) his mother had been banislied by order of her brother the emperor Caligula on a charge of treasonable conspiracy, and Nero, thus early deprived

of both parents, found a bare shelter in the house of his aunt Domitia, where two slaves, a barber and a dancer, commenced the training of the future

emperor. With the death of Caligula in 41 a.p. his prospects improved, for Agrippina was recalled from exile by her uncle, the new emperor Claudius, and resumed the charge of her young son. Nero's history during the next thirteen years is summed up in the determined struggle carried on by his mother to win for him the throne which it had been predicted should be his. The fight was a hard one. Messalina, Claudius's wife, was all powerful with her husband, and her son Britannicus was by common consent regarded as the next in succession. But on the other hand Claudius was weak and easily led, and Agrippina daringly aspired to supplant Messalina in his affections. To outweigh Britannicus's claims as the son of the reigning emperor, she relied on the double prestige which attached to her own son, as being at once the grandson of the popular favourite Germanicus and the lineal descendant of Augustus himself. Above all, she may well have put confidence in her own great abilities, indomitable will, and untiring energy, and in her readiness to sacrifice everything, even her personal honour, for the attainment of the end she had in view. Her first decisive success was gained in 48 by the dis- grace and execution of Messalina. In 49 followed her own marriage with her uncle Claudius, and her recognition as his consort in the government of the empire! She now freely used her ascendency to advance the interests of her son. The Roman populace already looked with favour on the grandson of Germanicus, but in 50 his claims obtained a more formal recognition from Claudius him- self, and the young Domitius was adopted by the emperor under the title of Nero Claudius Ceesar Drusus Germanicus.2 Agrippina's next step was to provide for her son the train- ing needed to fit him for the brilliant future which seemed opening before him. The philosopher L. Annus Seneca was recalled from exile and appointed tutor to the young prince. On December 15, 51, Nero completed his fourteenth year, and Agrippina, in view of Claudius's failing health, determined to delay no longer his adoption

of the toga virilis. The occasion was celebrated in a

manner which seemed to place Nero's prospects of succes- sion beyond the reach of doubt. He was introduced to the senate by Claudius himself. The proconsular imperium and the title of "princeps juventutis" were conferred upon him. He was specially admitted as an extraordinary member of the great priestly colleges, and his name was included by the Arval Brethren in

their prayers for the safety of the emperor and his house. Largesses and dona- tions delighted the populace and the soldiery, and at the games in the circus Nero's appearance in triumphal dress contrasted significantly with the simple toga preetexta worn by Britannicus. During the next two years Agrippina followed up this great success with her usual energy. Britannicus's leading partisans were banished or put to death, and the all-important command of the preetorian guard was transferred to Afranius Burrus, formerly a tutor of Nero's, and devoted to his service. Nero himself was put prominently forward whenever occasion offered. The petitions addressed to the senate by the town of Bononia and by the communities of Rhodes and Ilium were grace- fully supported by him in Latin and Greek speeches, and during Claudius's absence in 52 at the Latin festival it was Nero who, as prefect of the city, administered justice in the forum to crowds of suitors. Early in 53 his marriage with Claudius's daughter, the ill-fated Octavia, drew still closer the ties which connected him with the

1 Tac., Ann., xii. 26, 36; see also Schiller, Vero, 67. * Tac., Ann., xii. 26; Zonaras, xi. 10. 3 Tac., Ann., xii. 41.

imperial house, and now nothing but Claudius's death seemed wanting to secure his final triumph. This event, which could not in the course of nature be long delayed, Agrippina determined to hasten, and the absence, through illness, of the emperor's trusted freedman Narcissus, favoured her schemes. On October 13, 54, Claudius died, poisoned, as all our authorities declare, by the orders of his unscrupulous wife. For some hours the fact of his death was concealed, but at noon the gates of the palace were thrown open, and Nero was presented to the soldiers on guard as their new sovereign. From the steps of the palace he proceeded to the pretorian camp to receive the salutations of the troops, and thence to the senate-house, where he was fully and promptly invested with all the honours, titles, and powers of emperor.

Agrippina's bold stroke had been completely successful. Its suddenness had disarmed opposition: only a few voices were raised for Britannicus; nor is there any doubt that Rome was prepared to welcome the new emperor with genuine enthusiasm. To his descent from Germanicus and from Augustus he owed a prestige which was strengthened by the general belief in his own good qualities. He was young, generous, and genial. His abilities, really

consider- able, were skilfully assisted and magnified by Seneca's ready dexterity, while the existence of his worse qualities—his childish vanity, ungovernable selfishness, and savage temper —was as yet unsuspected by all but those immediately about him. His first acts confirmed tle favourable impres- sions thus produced. With graceful modesty he declined the venerable title of "pater patria." The memory of Claudius, and that of his own father Domitius were duly honoured. The senate listened with delight to his promises to rule according to the maxims of Augustus, and to avoid the errors and abuses which had multiplied under the rule at once lax and arbitrary of his predecessor, while his un- failing clemency, liberality, and affability were the talk of Rome. Much no doubt of the credit of all this is due to Seneca, and his faithful ally Burrus. Seneca had seen from the first that the real danger with Nero lay in the savage vehemence of his passions, and he made it his chief aim to stave off by every means in his power the dreaded outbreak of "the wild beast" element in his pupil's nature. He indulged him to the full in all his tastes, smoothed away opposition, and, while relieving him as far as possible of the more irksome duties of government, gave him every facility for easily winning the applause he craved for by acts of generosity which cost him little. Nor is it certain that any other policy would have succeeded better with a nature like Nero's, which had never known training or restraint, and now revelled with childish delight in the consciousness of absolute power. Provided only that the wild beast did not taste blood, it mattered little if respectable society was scandalized at the sight of an emperor whose chief delight was in pursuits hitherto left to Greek slaves and freedmen. At any rate the policy succeeded for the time. During the first five years of his reign, the golden '"'quinquennium Neronis," little occurred to damp the hopes excited by his behaviour on succeeding to the throne. His clemency of temper was unabated. His promises of constitutional moderation were amply fulfilled, and the senate found itself free to discuss and even to decide important administrative questions. Abuses were remedied, the provincials protected from oppression, and the burdens of taxation lightened. On the frontiers, thanks chiefly to Corbulo's energy and skill, no disaster occurred serious enough to shake the general confidence in the government, and even the murder of Britannicus seems. to have been

easily pardoned at the time as a necessary measure of self-

4 Tac., Ann., xii. 96; Suet., Nero, 8.

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defence. But Seneca's fears of what the consequences would be, should Nero's sleeping passions once be roused, were fully verified by the result, and he seems to have seen all along from what quarter danger was to be apprehended. Agrippina's imperious temper and insatiable love of power made it certain that she would not willingly abandon her ascendency over her son, and it was scarcely less certain that her efforts to retain it would bring her into collision with his ungovernable self-will. At the same time the success of Seneca's own management of Nero largely depended on his being able gradually to emancipate the emperor from his mother's control. During the first few months of Nero's reign the chances of such an emancipation seemed remote, for he not only treated his mother with elaborate respect, but consulted her on all affairs of state. In 55, however, Seneca found a powerful ally in Nero's passion for the beautiful freedwoman Acte, a passion which he deliber- ately encouraged for his own purposes. Agrippina's in- jured pride provoked her to angry remonstrances, which served only to irritate her wayward son, and the caresses by which she endeavoured to repair her mistake equally failed in their object. Furious at her discomfiture, she rashly tried intimidation, and threatened to espouse the cause of the injured Britannicus. But her threats only served to show that her son, if once his will was crossed, or his fears aroused, could be as unscrupulous and head- strong ashis mother. Britannicus was poisoned as he sat at table. Agrippina, however, still persisted. She attempted to win over Nero's neglected wife Octavia, and to form a party of her own within the court. Nero replied by dis- missing her guards, and placing herself in a sort of honourable confinement.! This second defeat seems to have decided Agrippina to acquiesce in her deposition from the leading position she had filled since 49. During nearly three years she disappears from the history, and with her retirement things again for the time went smoothly. In 58, however, fresh cause for anxiety appeared. For the second time Nero was enslaved by the charms of a mistress. But Poppza Sabina, the new favourite, was a woman of a very different stamp from her predecessor. High-born, wealthy, and accomplished, she had no mind to be merely the emperor's plaything. She was resolved to be his wife, and with consummate skill she

set herself at once to remove the obstacles which stood in her way. Her first object was the final ruin of Agrippina. By taunts and caresses she drove her weak and passionate lover into a frenzy of fear and baulked desire. She taught him easily enough to hate and dislike his mother as an irksome check on his freedom of action, and as dangerous to his personal safety. To get rid of her, no matter how, became his one object, and the diabolical ingenuity of Anicetus, a freedman, and now prefect of the fleet at Misenum, devised a means of doing so without unnecessary scandal. Agrippina was invited to Bais, and after an affectionate reception by her son, was conducted on board a vessel so constructed as, at a given signal, to fall to pieces and precipitate its passengers into the waters of the lake. But the manceuvre failed. Agrippina saved herself by swimming to the shore, and at once wrote to her son, announcing her escape, and affecting entire ignorance of the plot against her. The news filled Nero with conster- nation, but once again Anicetus came to his rescue. A body of soldiers under his command surrounded Agrippina's villa, and murdered her in her own chamber.2 The deed done, Nero was for the moment horrorstruck at the enormity of the crime, and terrified at its possible conse- quences to himself. But a six months' residence in Campania, and the congratulations which poured in upon

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him from the neighbouring towns, where the report had been officially spread that Agrippina had fallen a victim to her own treacherous designs upon the emperor's life, gradually restored his courage. In September 59 'he re-entered Rome amid universal rejoicing, fully resolved upon enjoying his dearly bought freedom. A prolonged carnival followed, in which Nero revelled in the public gratification of the tastes which he had hitherto ventured to indulge only in comparative privacy. Chariot races, musical and dramatic exhibitions, games in the Greek fashion, rapidly succeeded each other. In all the emperor was a prominent figure, and the fashionable world of Rome, willingly or unwillingly, followed the imperial example. These revels, however, extravagant as they were, at least involved no bloodshed, and were humanizing and civilized compared with the orthodox Roman

gladiatorial shows. A far more serious result of the death of Agrippina was the

|.growing influence over Nero of Poppsea and her friends;

and in 62 their influence was fatally strengthened by the removal of the trusty advisers who had hitherto stood by the emperor's side. Burrus died early in that year, it was said from the effects of poison, and his death was imme- diately followed by the retirement of Seneca from a position which he felt to be no longer tenable. Their place was filled by Poppzea, and by the infamous Tigellinus, whose sympathy with Nero's sensual tastes had gained him the command of the praetorian guards in succession to Burrus. The two now set themselves to attain a complete mastery over the emperor. 'The haunting fear of conspiracy, which had unnerved stronger Casars before him, was skilfully used to direct Nero's fierce suspicions against possible opponents. Cornelius Sulla, who had been banished to Massilia in 58, was put to death on the ground that his residence in Gaul was likely to arouse disaffection in that province, and a similar charge proved fatal to Rubellius Plautus, who had for two years been living in retirement in Asia.3 Nero's taste for blood thus whetted, a more illustrious victim was next found in the person of the unhappy Octavia. At the instigation of Poppsa she was first divorced and then banished to the island of Pandateria, where a few days later she was barbarously murdered. Poppeea's triumph was now complete. She was formally married to Nero; her head appeared on the coins side. by side with his; and her statues were erected in the public places of Rome.

This series of crimes, in spite of the unvarying applause which still greeted all Nero's acts, had excited gloomy forebodings of coming evil, and the general uneasiness was increased by the events which followed. In 63 the partial destruction of Pompeii by an earthquake, and the news of the evacuation of Armenia by the Roman legions, seemed to confirm the belief that the blessing of the gods was no longer with the emperor. A far deeper and more last- ing impression was produced by the great fire in Rome, an event which more than almost any other has thrown a lurid light round Nero's reign. The fire broke out on the night of July 18, 64, among the wooden booths at the south-east end of the Circus Maximus. Thence in one

direction it rapidly spread over the Palatine and Velia up to the low cliffs of the Esquiline, and in another it laid waste the Aventine, the Forum Boarium, and Velabrum till it reached the Tiber and the solid barrier of the Servian wall. After burning fiercely for six days, and when its fury seemed to have exhausted itself, it suddenly started afresh in the northern quarter of the city, and desolated the two regions of the Circus Flaminius and the Via Lata. By the time that it was finally quenched only four of the fourteen regiones remained untouched ; three had been

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utterly destroyed, and seven reduced to ruins. The con- flagration is said by all authorities later than Tacitus to have been deliberately caused by Nero himself. But Tacitus, though he mentions rumours to that effect, declares that its origin was uncertain, and his descrip- tion of Nero's energetic conduct at the time justifies us in acquitting the emperor of so reckless a piece of incendiar- ism. By Nero's orders, the open spaces in the Campus Martius were utilized to give shelter to the homeless crowds, provisions were brought up from Ostia, and the price of corn lowered. In rebuilding the city every pre- caution was taken against the recurrence of such a calamity. Broad regular streets replaced the narrow winding alleys. The new houses were limited in' height, built partly of hard stone, and protected by open spaces and colonnades. The water supply, lastly, was carefully regulated. But there is nevertheless no doubt that this great disaster told against Nero in the popular mind. It was regarded as a direct manifestation of the wrath of the gods, even

by those who did not share the current suspicions of |

the emperor's guilt. This impression no religious cere- monies, nor even the execution of a number of Christians, hastily pitched upon as convenient scapegoats, could altogether dispel. Nero, however, undeterred by fore- bodings and rumours, proceeded with the congenial work of repairing the damage inflicted by the flames. In addi- tion to the rebuilding of the streets, he gratified his love of magnificence by the erection of a splendid palace for himself. The wonders of his "golden house" were remembered and talked

of long after its partial demolition by Vespasian. It stretched from the Palatine across the low ground, afterwards occupied by the Colosseum, to the Esquiline. Its walls blazed with gold and precious stones ; masterpieces of art from Greece adorned its walls; but most marvellous of all were the grounds in which it stood, with their meadows and lakes, their shady woods, and their distant views. To defray the enormous cost, Italy and the provinces, says Tacitus, were ransacked, and in Asia and Achaia especially the rapacity of the imperial commissioners recalled the days of Mummiusand of Sulla.? It was the first occasion on which the provincials had suffered from Nero's rule, and the discontent it caused helped to weaken his hold over them at the very moment when the growing discontent in Rome was gathering to a head. For early in 65 Nero was panic-stricken amid his pleasures by the discovery of a formidable conspiracy against his life and rule. Such conspiracies, prompted partly by the ambition of powerful nobles and partly by their personal fears, had been of frequent occurrence in the history of the Czesars, and now Nero's recent excesses, and his declining popularity, seemed to promise well for the success of the plot. Among the conspirators were many who held important posts, or belonged to the innermost circle of Nero's friends, such as Feenius Rufus, Tigellinus's colleague in the prefecture of the pretorian guards, Plautius Lateranus, one of the consuls elect, the poet Lucan, and, lastly, not a few of the tribunes and centurions of the preetorian guard itself. Their chosen leader, whom they destined to succeed Nero, was C. Calpurnius Piso, a handsome, wealthy, and popular noble, and a boon com- panion of Nero himself. The plan was that Nero should be murdered when he appeared as usual at the games in the circus, but the design was frustrated by the treachery of a freedman Milichus, who, tempted by the hope of a large reward, disclosed the whole plot to the emperor. In a frenzy of sudden terror Nero struck right and left among

1 Tac., Ann., xv. 88; Suet., Nero, 38; Dio Cass., lxii. 16; Pliny, Nv, xvii. 5.

2 Tac, Ann., xv. 42; Suet., Mero, 81; ef. Friedlander, Sidten- geschichte, iti. 67-69.

the ranks of the conspirators. Piso was put to death in his own house; and his fall was rapidly followed by the execution of Fenius Rufus, Lucan, and

many of their less prominent accomplices. Even Seneca himself, though there seems to have been no evidence of his complicity, could not escape the frantic suspiciousness of the emperor, stimulated as it may have been in his case by the jealousy of Tigellinus and Poppza. The order for his death reached him in his country house near Rome, and he met his fate with dignity and courage. For the moment Nero felt safe ; but, though largesses and thanksgivings celebrated the suppression of the conspiracy, and the dazzling round of games and shows was renewed with even increased

splendour, the effects of the shock were visible in the long.

and dreary list of victims who during the next few months were sacrificed to his restless fears and savage resentment. Conspicuous among them was Petus Thrasea, whose irreconcilable non-conformity and unbending virtue had long made him distasteful to Nero, and who was now suspected, possibly with reason, of sympathy with the con- spirators. The death of Poppza in the autumn of 65 was probably not lamented by any one but her husband, but the general gloom was deepened by a pestilence, caused, it seems, by the overcrowding at the time of the fire, which decimated the population of the capital. Early, however, in the summer of 66, the visit of the Parthian prince Tiridates to Italy seemed to shed a ray of light over the in- creasing darkness of Nero's last years. Corbulo had settled matters satisfactorily in Armenia. The Parthians were grati- fied by the elevation to the Armenian throne of their king's brother, and Tiridates, in return, consented to receive his crown from the hands of the Roman emperor. In royal state he travelled to Italy, and at Rome the ceremony of investiture was performed with the utmost splendour. Delighted with this tribute to his greatness, Nero for a moment dreamt of rivalling Alexander, and winning fame as a conqueror. Expeditions were talked of to the shores of the Caspian Sea and against the remote Ethiopians, but Nero was no soldier, and he quickly turned to a more congenial field for triumph. He had long panted for an opportunity of displaying his varied artistic gifts before a worthier and more sympathetic audience than could be found in Rome. With this view he had already, in 64, appeared on the stage before the half-Greek public of Naples. But his mind was now set on challenging the applause of the Greeks themselves in the ancient home of art. Towards the end of 66 he arrived in Greece, accompanied by a motley following of

soldiers, courtiers, musicians, and dancers, determined to forget for a time Rome and the irksome affairs of Rome with its conspiracies and intrigues. No episode in Nero's reign has afforded such plentiful material for the imagination of subsequent

writers as his visit to Greece ; but, when every allowance –

is made for exaggeration and sheer invention, it must still be confessed that the spectacle presented was unique.® The emperor appeared there professedly as merely an enthusiastic worshipper of Greek art, and a humble candidate for the suffrages of Greek judges. At each of the great festivals, which to please him were for once crowded into a single year, he entered in regular form for the various competitions, scrupulously conformed to the tradition and rules of the arena, and awaited in nervous suspense the verdict of the umpires. The dexterous Greeks, flattered by his genuine enthusiasm, humoured him to the top of his bent. Everywhere the imperial competitor was victorious. Crowns were showered upon him, and crowded audiences importuned him to display his talents. The delighted emperor protested that only

3 Suet., Mero, 19-24; Dio Cass., Mpit., xiii. 8-16.

the Greeks were fit to hear him, and their ready com- plaisance was rewarded when he left by the bestowal of immunity from the land tax on the whole province, and the gift of the Roman franchise to his appreciative judges, while as a more splendid and lasting memorial of his visit, he planned and actually commenced the cutting of a canal through the Isthmus of Corinth. If we may believe report, Nero found time in the intervals of his artistic triumphs for more vicious excesses. The stories of his mock marriage with Sporus, his execution of wealthy Greeks for the sake of their money, and his wholesale plundering of the temples were evidently part of the accepted tradition about hini in the time of Suetonius, and are at least credible. Far more certainly true is his ungrateful treatment of Domitius Corbulo, who, when he landed at Cenchrez, fresh from his successes in Armenia, was met by an order for his instant execution, and at once put an end to his own life.

But while Nero was revelling in Greece the dissatisfac- tion with his rule, and the fear and abhorrence excited by his crimes, were rapidly taking the shape of a resolute determination to get rid of hin. That movements in this direction were on foot in Rome may be safely inferred from the urgency with which the imperial freedman Helius insisted upon Nero's return to Italy; but far more scrious than any amount of intrigue in Rome was the disaffection which now showed itself in the rich and warlike provinces of the west. In northern Gaul, early in 68, the standard of revolt was raised by Julius Vindex, governor of Gallia Lugdunensis, and himself the head of an ancient and noble Celtic family. South of the Pyrenees, P. Sulpicius Galba, governor of Hispania Tarraconensis, and Poppeea's former husband, Marcus Salvius Otho, governor of Lusitania, followed Vindex's example. At first, however, fortune seemed to favour Nero. It is very probable that Vindex had other aims in view than the deposition of Nero and the substitution of a fresh emperor in his place, and that the liberation of northern Gaul from Roman rule was part of his plan.! If this was so, it is easy to understand both the enthusiasm with which the chiefs of northern Gaul rallied to the standard of a leader belonging to their own race, and the opposition which Vindex encountered from the Roman colony of Lugdunum, and from the Roman legions on the Rhine. For it is certain that the latter at any rate were not animated by loyalty to Nero. They encountered Vindex and his Celtic levies at Vesontium (Besangon), and in the battle which followed Vindex was defeated and slain. But the next step of the victorious legionaries was to break the statues of Nero and offer the imperial purple to their own commander Verginius Rufus ; and the latter, though he declined their offer, appealed to them to declare for the senate and people of Rome. 'Meanwhile in Spain Galba had been saluted imperator by his legions, had accepted the title, and was already on his march towards Italy. On the road the news met him that Vindex had been crushed by the army of the Rhine, and for the moment he resolved to abandon his attempt in despair, and even thought of suicide. Had Nero acted with energy he might still have checked the revolt. But he did nothing. He had reluctantly left Greece early in 68, but returned to Italy only to renew his revels. When on March 19 the news reached him at Naples of the rising in Gaul, he allowed a week to elapse before he could tear himself away from his pleasures. When he did at last re-enter Rome, he contented himself

with the empty form of proscribing Vindex, and setting a price on his head. In April the announcement that Spain also had revolted,

1 Suet., Nero, 40; Dio Cass., Epit., xiii. 22; Plut., Galba, 4; of. also Schiller's Vero, pp. 261 sqg.; Mommisen in Hermes, xiii. 90.

and that the legions in Germany had declared for a republic, terrified him into something like energy. But it was too late. The news from the provinces fanned into flame the smouldering disaffection in Rome. During the next few weeks the senate almost openly intrigued against him, and the populace, once so lavish of their applause, were silent or hostile. Every day brought fresh instances of desertion, and the fidelity of the preetorian sentinels was more than doubtful. When finally even the palace guards forsook their posts, Nero despairingly stole out of Rome to seek shelter in a freedman's villa some four miles off. In this hiding-place he heard of the senate's proclamation of Galba as emperor, and of the sentence of death passed on himself. On the approach of the horsemen sent to drag him to execution, he collected sufficient courage to save himself by suicide from this final ignominy, and the soldiers arrived only to find the emperor in the agonies of death. Nero died on June 9, 68, in the thirty-first year of his age and the fourteenth of his reign, and his remains were deposited by the faithful hands of Acte in the family tomb of the Domitii on the Pincian Hill. With his death ended the line of the Czesars, and Roman imperialism entered upon a new phase. His statues were broken, his name everywhere erased, and his golden house demolished ; yet, in spite of all, no Roman emperor has left a deeper mark upon subsequent tradition. His brief career, with its splendid opening and its tragic close, its fantastic revels and frightful disasters, acquired a firm hold over the imagination of succeeding generations. The Roman populace continued for a long time to reverence his memory as that of an open-handed patron, and in Greece the recollections of his magnificence, and his enthusiasm for art, were still fresh when the traveller Pausanias visited the country a century later. The belief that he had not really died, but would return again to confound his foes, was long prevalent, not only in the remoter provinces, but even in Rome itself; and more than one pretender was able to collect a following by assum- ing

the name of the last of the race of Augustus. More lasting still in its effects was the implacable hatred cherished towards his memory by those who had suffered from his cruelties. Roman literature, faithfully reflecting the sentiments of the aristocratic salons of the capital, while it almost canonized those who had been his victims, fully avenged their wrongs by painting Nero as a monster of wickedness. In Christian tradition he appears in an even more terrible character, as the mystic Antichrist, who was destined to come once again to trouble the saints. Even in the Middle Ages, Nero is still the very incarnation of splendid iniquity, while the belief lingered obstinatcly that he had only disappeared for a time, and as late as the 11th century his restless spirit was supposed to haunt the slopes of the Pincian Hill.

The chief ancient authorities for Nero's life and reign are Tacitus (Annals, xiii.-xvi.), Suetonius, Dio Cassius (Zpit., 1xi., Ixii., lxiii.), and Zonaras (Adnn., xi.). The most important modern works are Merivale's History of the Romans under the Empire; H. Schiller's Nero, and his Geschichte d. Kaiserzeit; Lehmann, Claudius und Nero. (CHa)

NERTCHINSK, a district town of eastern Siberia, situated in the government of Transbaikalia, 178 miles to the east of Tchita, on the left bank of the Nertcha, 3 miles from its junction with the Shilka. It is badly built of wood, and its lower part frequently suffers from inunda- tions. The 4000 inhabitants support themselves mainly by agriculture, tobacco-growing, and cattle breeding ; a few merchants also carry on an active trade in furs and cattle, in brick-tea from China, and manufactured wares from Russia,—Nertchinsk being the trading centre for all that part of Dahouria which is situated on the eastern slope of the Stanovoy ridge.

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The fort of Nertchinsk dates from 1654, and the town was founded in 1658 by Pashkoff, who in that year opened direct com- munication between the Russian settlements in Transbaikalia and those on the Amur which had been founded by Cossacks and fur- traders coming from the Yakutsk region. The mutual help thus given proved, however, insufficient, and two years after the fall of Albazin—the chief Russian fort on the Amur—the Russian envoy Golovin, meeting at Nertchinsk the Chinese envoys, who were supported by

a strong military force encamped on the banks of the Shilka, signed in 1689 the well-known “treaty of Nertchinsk,” which stopped for two centuries the further advance of Russians into the basin of the Amur. Nertchinsk, which in the following year received municipal institutions and was more strongly fortified, soon became the chief centre for the trade with China. The open-ing of the western route through Mongolia, by Urga, and the establishment of a custom-house at Kiachta in 1728, diverted this trade into a new channel; so that towards the end of the 18th eentury Nertchinsk lost its commiercial importance; but it acquired a new consequence from the influx of immigrants, mostly exiles, into eastern Transbaikalia, the discovery of rich mines, and the arrival of great numbers of convicts. It ultimately became the chief town of Transbaikalia, and in 1812 was transferred from the banks of the Shilka to its present site, on account of the floods. After the foundation, in 1851, of Tchita, the present capital of Transbaikalia, it was reduced to the rank of a district town, and is now rapidly falling into decay.

NERTCHINSK (in full Nertcuinsxry ZAvop), a town and silver-mine situated in the government of Transbaikalia, 185 miles E.S.E. of the Nertchinsk noticed above (with which it is very often confounded), on the Algacha river, a few miles above its junction with the Argun. It lies in a narrow valley between barren mountains, and consists of town, silver-mine, and village, with an aggregate of 5000 inhabitants. It is much better built than any of the district towns of eastern Siberia, and its shops carry on an active trade. It hasa chemical laboratory supported by the crown for mining purposes, and a first-class meteoro- logical observatory (51° 18’ N. lat., 119° 37’ E. long,, 2450 feet above the sea-level), where meteorological and magnetical observations have been made every hour since 1842. The average yearly temperature, calculated from twenty-six years’ observations, is 24°°8 F. Nertchinskiy Zavod is the chief town and administrative centre of the

Nertcuinsk Minine District, an area of more than 2700 square miles, extending for nearly 270 miles from north to south, and comprising all the silver-mines and gold-fields situated between the Shilka and the Argun, together with a few on the left bank of the Shilka. It is traversed by several parallel chains of mountains which run from south-west to north-east, having their base on the eastern Transbaikalian plateau, while their summits

rise to about 4500 feet. These are intersected by a com- plicated system of deep, narrow valleys, densely wooded, with a few expansions along the larger rivers, where the inhabitants with difficulty raise some rye and wheat. The mountains, so far as they have been geologically explored, consist of crystalline slates and limestones—probably Upper Silurian and Devonian—interspersed with granite, syenite, and diorite ; they contain rich ores of silver, lead, tin, and iron, while the diluvial and alluvial valley for- mations contain rich auriferous sands. Several of the villages that have sprung up around the silver-mines are more populous than the district towns of eastern Siberia.

The Nertchinsk silver mines began to be wrought in 1704, but during the first half of the 18th century their yearly production did not exceed 700 Tb. From 1765 to 1777 the annual average was 64 cwts.; and the total amount for the first hundred and fifty years (1704-1854) amounted to 8600 cwts. The lead was mostly neglected on account of the difficulties of transport, but its production is at present on the increase, and recently reached about 2000 ewts. Gold was first discovered in 1830, and between 1850 and 1854 no less than 131 ewts. of gold dust were obtained, but this fell to 24°3 ewts. in 1860. In 1864, private gold mining having been permitted in the western parts of the district, a large

number of auriferous beds were discovered, and the production greatly increased. Until 1863 all the labour in the silver and gold

mines of the district was performed by serfs, who were the property |

of the emperor, and by eonvicts, numbering usually nearly four thousand. The serfdom was partially abolished in 1851, and finally in 1863, when a great number of mines were abandoned by the crown.

NERVA (32-98 4.D.), Roman emperor from 96 to 98, was called to the throne on the murder of Domitian (Sep- tember 18, 96; Suet., Dom. 17; Corp. Inscr. Lat., vi. 472). His full name was Marcus Cocceius Nerva (Henzen, 5435), and his family, though of no great antiquity, had attained to considerable distinction under the emperors. The M. Cocceius Nerva who

was consul in 36 B.c. was prob- ably his great-grandfather. His grandfather of the same name (consul c. 22 A.D.) was a lawyer of high reputation and an intimate friend of the emperor Tiberius (Tac., Ann., iv. 58, vi. 26; Front., De Aquad., 102). His father is usually identified with the ‘“ Nerva filius ” who is mentioned in the Digest as a prominent jurist, and who was possibly consul in 40 a.p. Of his mother a single inscription tells us that she was Sergia Plautilla, daughter of Leenas (Orelli, iD) =

: erva must have been bornin 32 a.p., for he was sixty- four years old at the time of his accession in 96 A.D. In early manhood he had been on friendly terms with Nero, whose taste for versification he shared (Martial, viii. 70; Pliny, Zp., v, 3), and by whom, in 65, he was decorated with the “insignia triumphalia” (Tac., dnn., xv. 72). He had been preetor (766) and twice consul, in 71 with the emperor Vespasian for colleague (Orelli, 1634), and again in 90 with Domitian. Towards the close of the latter’s reign he is said to have excited suspicion and to have been banished to Tarentum on a charge of conspiracy (Dio Cass., Lipit., xvii. 15; Philostr., Apoll. Tyan., vii. 8). He is described as a quiet, kindly, dignified man, honest of pur- pose, but unfitted by age and temperament, as well as by feeble health, to bear the weight of empire. Nevertheless his selection by Domitian’s murderers as that prince’s successor seems to have been generally approved, and his short rule, in spite of occasional exhibitions of weakness, justified the choice. His accession brought a welcome relief froni the terrible strain of the last few years. The reign of terror was at an end and liberty restored. The new emperor recalled those who had been exiled by Domitian ; what remained of their confiscated property was restored to them, and a stop was put to the vexatious prosecutions which Domitian had encouraged. But the popular feeling demanded more than this. The countless informers of all classes who had thriven under the previous régime now found themselves swept away, to borrow Pliny’s metaphor (Pliny, Paneg,, 35), by a hurricane of revengeful fury, which threatened to become as dangerous in its indiscriminate ravages as the system it attacked. It was finally checked by Nerva, who was stung into action by the sarcastic remark of the consul Fronto that, ‘‘ bad as it was to have an emperor who allowed no one to do any- thing, it was worse to have one who allowed every one to do everything” (Dio Cass., Hpit., Ixviii. 1).

Nerva seems to have followed the custom established by his predecessors of announcing at the outset the general lines of his future policy. Domitian had been arbitrary and high-handed, and had heaped favours on the soldiery while humiliating the senate; Nerva naturally enough assuined the opposite attitude, and showed himself anxious in every way to respect the traditional privileges of the senate, and such maxims of constitutional government as still survived. He pledged himself to put no senator to death. His chosen councillors in all affairs of state were senators, and the hearing of claims against the fiscus was taken from the imperial procuratores and entrusted to the more impartial jurisdiction of a pretor and a court of "'judices" (Dio Cass., Epit., Ixviii. 2; Digest, i. 2,2; Pliny,

Paneg,, 36). It was thus, as Pliny magniloquently says, that Nerva united the "principate" with "freedom."

No one probably expected from Nerva a vigorous administration either at home or abroad. But he seems to have set himself honestly enough to carry through such reforms as were either suggested by his own benevolent inclinations, or imperatively demanded by the necessities of the moment. The economical condition of Italy evidently excited his alarm and sympathy. The last men- tion of a "lex agraria" in Roman history is connected with his name, though how far the measure was strictly speaking a "law" is uncertain. Under the provisions of this "lex," large tracts of land were bought up and allotted to poor citizens. The cost was defrayed partly from the imperial treasury, but partly also from Nerva's private resources, and the execution of the scheme was entrusted to commissioners (Dig., xlvii. 21, 3; Dio Cass., Hpit., Ixviil. 9; Pliny, Zp., vii. 31; Corp. Inser. Lat., vi. 1548). This agrarian law was probably as shortlived in its effects as preceding ones had been, but a reform more lasting in its results was the provision of a regular maintenance at the public cost for the children of poor parents in the towns of Italy (Aur. Vict., Zp., 24), the provision being presuin- ably secured by imposing a yearly charge for this purpose on state and municipal lands. On coins of the year 97 Nerva is represented seated upon his curule 'chair and stretching out a helping right hand toa boy anda

girl. The legend on the coins is “tutela Italie” (Eckhel, vi. 408 ; Marquardt, Staatsverwaltung, ii. 138, note 6). Private individuals were also encouraged to follow the imperial example; and among those who responded was the younger Pliny, whose charitable institution in his own town of Comum seems to have followed directly on that of the emperor himself (Hermes, iii. 101; Pliny, Zp. ad 7., 8). In the hands of Trajan, Hadrian, and the Antonines, Nerva’s example bore fruit in the institution of the “‘alimentationes,” the most genuinely charitable institution of the pagan world. These measures Nerva supplemented by others which aimed at lightening the financial burdens which already weighed heavily on the declining industry of Italy. The cost of maintaining the imperial postal system was transferred to the “fiscus,” from the same source apparently money was found for repairing the public roads and aqueducts, and lastly the lucrative but unpopular succession duty ‘“ vicesima hereditatum,” was so readjusted as to remove the grosser abuses connected with it (Pliny, Paneg,, 37). Atthe same time Nerva did his best to reduce the overgrown expenditure of the state (Pliny, Ep., ii. 1). A commission was appointed to consider the best modes of retrenchment, and the outlay on shows and games was cut down to the lowest possible point. It was these efforts which earned for him the epithet “ frugalissi- mus” (Pliny, Paneg,, 51). Nerva seems nevertheless to have soon wearied of the uncongenial task of governing, and his anxiety to be rid of it was quickened by the dis- covery that not even his blameless life and mild rule protected him against intrigue and disaffection. arly, apparently, in 97 he detected a conspiracy against his life headed by L. Calpurnius Crassus, but he contented himself with a hint to the conspirators that their designs were known, and with banishing Crassus to Tarentum. This ill-judged lenity provoked a few months later an intolerable insult to his dignity. The pretorian guards had keenly resented the murder of their patron Domitian, and now, at the instigation of one of their two prefects, Casperius /Mlianus, whom Nerva had retained in office, they imperiously demanded the execution of Domitian’s murderers, the chamberlain Parthenius, and Petronius Secundus, A#lianus’s colleague. Nerva vainly strove to save, even at the risk of his own life, the men who had

raised him to power, but the soldiers, disregarding his protests, brutally murdered the unfortunate men, and finally foreed Nerva to propose a vote of thanks for the deed (Dio Cass., £pit., Ixviii. 4; Aur. Vict., Hp., 24). This crowning humiliation convinced Nerva of the necessity of placing the reins of government in stronger hands than his own. Following the precedent set by Augustus, Galba, and Vespasian, he resolved to adopt as his colleague and destined successor a younger and more vigorous man, and his choice fell upon M. Ulpius Trajanus, already well known as a distinguished soldier, and at the time in command of the legions on the Rhine. In October 97, in the temple of Jupiter on the Capitol, Trajan was formally adopted as his son, and declared his colleague in the government of the empire (Pliny, Paneg,, 8). For three months Nerva ruled jointly with Trajan (Aur. Vict., Ep., 24); but on January 27, 98, he died somewhat suddenly. He was buried in the sepulchre of Augustus, and divine honours were paid him by his successor. The verdict of history upon his reign is best expressed in his own words,—‘‘I have done nothing which should prevent me from laying down my power, and living in safety as a private man.” In the Rome of to-day the memory of Nerva is still preserved by the ruined temple in the Via Alessandrina (il Colonacce) which marks the site of the Forum begun by Domitian, but which Nerva completed and dedicated (Suet., Dom., 5; Aur. Vict., 12). Authorities. —Dio Cass., Epit., Ixviii. 1-4; Aurelius Victor, 12, and Kpit., 24; Zonaras, xi. 20; compare also Pliny, Hpistole and Panegyricus ; Tillemont, Histoire des Empereurs Romains ; Merivale, History of the Romans under the Empire ; H. Schiller, Geschichte ad. Kaiserzett. (ERE) NERVAL. See Gtrarp DE NERVAL, vol. x. p. 441. NERVOUS SYSTEM. See Piystonoey. NESSELRODE, Cuartes Ropert (1780-1862), long foreign minister of Russia, was born at Lisbon, where his father was Russian ambassador, in December 1780. Like so many other Russian statesmen and soldiers, he was sprung from German ancestors settled in Livonia. He entered early upon a diplomatic career, and at the age of twenty-five was attached to the Russian embassy in Paris. When the alliance of Tilsit was breaking down, Nesselrode was recalled to St Petersburg, and during the events that followed Napoleon’s invasion of Russia he rose high in the favour of the czar Alexander. From the time when Romanzoff, the advocate of a peace-policy, was dismissed, Nesselrode was employed in all the great diplomatic trans- actions of his master. He was present, though not asa plenipotentiary, at the congress of

Prague, and signed the treaty of Chaumont, in which the allies pledged themselves to continue the struggle against Napoleon, if necessary, for twenty years. In the negotiations as to the future of France, both in 1814 and 1815, he seems to have encouraged the czar in his policy of moderation. At the congress of Vienna his duties were shared by Capodistrias, and a certain rivalry existed then and afterwards between the two statesmen. In Capodistrias the czar found more sympathy both with his own earlier liberal tendencies and with his religious sentimentality. In the subsequent con- gresses of Troppau and Laibach, when Metternich, as the champion of European conservatism, set himself to repress any sympathies that the czar might have for constitutional rule in Naples and for Greek independence, it was with Nesselrode that he allied himself; Capodistrias, a Greek and a man of more modern ideas, was now treated as a dangerous person, and ultimately had to retire from office. Nesselrode followed the fluctuating and reactionary course of the czar's thoughts, and remained in favour till the death of Alexander in 1825. Nicholas kept him in office, and Nesselrode now promptly adapted himself to the more vigorous policy that suited his new master, especially

in Eastern affairs. He conducted the diplomacy of Russia throughout the contention which led to the war of 1828 and to the peace of Adrianople. Years passed by, and he grew old in office, pursuing with patience and discretion the ends which Russian statesmanship has always set before itself. Belonging rather to the cautious than the adventurous school of politicians, and attaching great value to the support of the German powers, he viewed with no great pleasure the approach of the Crimean war. He continued in office, however, until its close ; and it is remarkable that a man who was at the head of Russian diplomacy during the conflict with Napoleon I. should have lived to conclude the peace of Paris under Alexander II. in 1856. He died in 1862, still retaining the office of chancellor of Russia, though he had ceased to hold the ministry of foreign affairs.

NESTOR, the old warrior of the Jlad, the wise councillor of the Greek leaders, was the son of Neleus and Chloris. He succeeded his father as king of Pylus. In the Iliad he is represented as too old to be of use in battle, but always ready to give advice and counsel to the younger warriors, and to entertain them with long accounts of his own exploits in his youth, According to Homer, he had ruled over three generations of men, and was wise as the immortal gods. In the Odyssey he is described as still ruling over Pylus, where he is visited by Telemachus. There is no real connexion between the legends of Nestor and those of Neleus; but, as the former belonged to Pylus, the legend is bound to place him in genealogical relation with the representative king of the land.

NESTOR (ce. 1056-c. 1114), the patriarch of Russian literature, concerning whom, however, we have but little information, except that he was a monk of the Pestcherski cloister of Kieff from 1073. The only other fact of his life told us is that he was commissioned with two other monks to find the relics of St Theodosius, a mission which he suc- ceeded in fulfilling. His history begins with the deluge, as those of most chroniclers of the time did. He appears to have been acquainted with the Byzantine historians ; he makes use especially of John Malala and George Armatolus. He also had in all probability other Slavonic chronicles to compile from, which are now lost. The labours of the Byzantine annalists, some of which were translated into Paleo-Slavonic, would stimulate the production of such works. Of course there are many legends mixed up with Nestor's Chronicle; the style is occasionally so poetical that we may easily fancy that he has incorporated élini which are now lost. The early part is rich in these quaint stories, among which may be cited the arrival of the three Varangian brothers, the founding of Kieff, the murder of Askold and Dir, the death of Oleg, who was killed by a serpent concealed in the skeleton of his horse, and the vengeance taken by Olga, the wife of Igor, on the Drevlians, who had murdered her husband. The account of the labours of Cyril and Methodius among the Slavs is also given in a very interesting manner, and to Nestor we owe the tale of the summary way in which Vladimir suppressed the worship of Peroun and other idols at Kieff. As an eye-witness he could only describe the reigns of Vsevolod and Sviatopolk (1078-1112), but he gathered many in- teresting details from the lips of old men, two of whom are especially mentioned, Giourata Rogovich, an inhabitant of Novgorod,

who furnished him with information concern- ing the north of Russia, Petchora, and other places, and Jan, a man ninety years of age, who died in 1106, and was son of Vishata the waywode of Yaroslavl and grand- son of Ostromir the Posadnik, for whom the Codex was written. Besides the historical portion, many of the ethnological details given by Nestor of the various races of the Slavs are of the highest value ;

This interesting work has come down to us in several manuscripts, but unfortunately no contemporary ones, the oldest being the so- called Lavrientski of the 14th century (1877). It was named after the monk Lavrentii, who copied it out for Dimitri Constantinovich, the prince of Souzdal. The work, as contained in this manuscript, has had many additions made to it from previous and contempo- rary chronicles, such as those of Volinia and Novgorod. Solovieff, the Russian historian, justly remarks that Nestor cannot be strictly called the earliest Russian chronicler, but he is the first writer who took anything like a national point of view in his his- tory, the others being merely local writers. The language of his work, as shown in the earliest manuscripts just mentioned, is Palwo-Slavonic with many Russisms. It has formed the subject of a valuable monograph by Professor Miklosieh.

Nestor's Chronicle has been translated into Polish, Bohemian, German, and Freneh, but no version has appeared in our own lan- guage. Besides his historical work, Nestor was also the author of the Lives of Boris and Gleb, the martyrs, and of the St Theodosius previously mentioned. In recent times the genuineness of his Chronicle has been attacked by Ilovaiski and others, but the accusa- tions have hardly been considered serious in Russia, and have been completely refuted, if they nceded refutation, by Pogodin. The body of the ancient chronicler may still be seen among the relics preserved in the Pestcherski monastery at Kieff. His work is of primary importance for the study of early Russian history, and, although devoid of literary merit in the strictest sense of the term, is not without its amusing and well-told episodes of a somewhat Herodotean character.

NESTOR, the name applied to a small but remarkable group of Parrots peculiar to the New Zealand Subregion, of which the type is the Psittacus meridionalis of Gmelin, founded on a species described by Latham (Gen.

Synopsis, i. p. 264), and subsequently termed by him P. nestor, in allusion to its hoary head, but now usually known as Westor meridionalis, the "Kaka" of the Maories and English settlers in New Zealand, in some parts of which it was, and even yet may be, very abundant, though its numbers are fast decreasing. Forster, who accompanied Cook in his second voyage, described it in his MSS. in 1773, naming it P. hypopolius, and found it in both the principal islands. The general colour of the Kaka is olive-brown, nearly all the feathers being tipped with a darker shade, so as to give a scaly appearance to the body. The crown is light grey, the ear-coverts and nape purplish-bronze, and the rump and abdomen of a more or less deep crimson- red; but much variation is presented in the extent and tinge of the last colour, which often becomes orange and sometimes bright yellow. The Kaka is about the size of a Crow; buta larger species, generally resembling it, though having its plumage varied with blue and green, the Westor notabilis of Gould, was discovered in 1856 by Mr Walter Mantell, in the higher mountain ranges of the Middle Island. This is the " Kea" of the Maories, and has of late incurred the enmity of colonists by developing, they say, when pressed by hunger in winter, an extraordinary habit of assaulting sheep, picking holes with its powerful beak in their side, wounding the intestines, and so causing the animals' death. The lacerations are said to be made so uniformly in one place as to suggest deliberate design ; but the bird's intent has yet to be investigated, though it is admittedly an eater of carrion in addition to its ordinary food, which, like that of the Kaka, consists of fruits, seeds, and the grubs of wood-destroying insects, the last being obtained by stripping the bark from trees infested by them. The amount of injury the Kea inflicts on flock-masters, as always happens in similar cases, has doubtless been much exaggerated, for Dr Menzies states that on one "run," where the loss was unusually large, the proportion of sheep attacked was about one in three hundred, and that those pasturing below the elevation of 2000 feet are seldom disturbed.

On the discovery of Norfolk Island (10th October 1774) a Parrot, thought by Forster to be specifically identical with the Kaghaa (as he wrote the name) of New Zealand, —though his son (Voyage, ii. p. 446) remarked that it was

‘infinitely brighter coloured,”—was found in its hitherto untrodden woods. Among the drawings of Bauer, the artist who accompanied Robert Brown and Flinders, is one of a Nestor marked ‘“ Norfolk Isl. 19 Jan. 1805,” on which Herr von Pelzeln in 1860 founded his J. norfolcensis. Meanwhile Latham, in 1822, had described, as distinct species, two specimens evidently of the genus Nestor, one said, but doubtless erroneously, to inhabit New South Wales, and the other from Norfolk Island. In 1836 Gould described an example, without any locality, in the museum of the Zoological Society, as Plyctolophus productus, and when some time after he was in Australia, he found that the home of this species, which he then recognized asa Vestor, was Phillip Island, a very small adjunct of Norfolk Island, and not more than five miles distant from it. Whether the birds of the two islands were specifically distinct or not we shall perhaps never know, since they are all extinct (see Brrps, vol. iii. p. 735), and no specimen undoubtedly from Norfolk Island seems to have been preserved; while, now that we are aware of the great diversity in colour, size, and particularly in the form of the beak, to which the New-Zealand members of the genus are subject, it would be unsafe to regard as specific the differences pointed out by Herr von Pelzeln from Bauer’s drawing. The Phillip-Island Nestor may be distinguished from both of the New-Zealand species by its somewhat smaller size, orange throat, straw-coloured breast, and the generally lighter shade of its tints.

The position of the genus Westor in the Order Psittaci must be regarded as uncertain. Garrod removes it altogether from the neighbourhood of the Lories (Proc. Zool. Society, 1874, p. 597), to which indeed the structure of its tongue, as previously shewn by him (op. cit., 1872, p. 789), indicates only a superficial resemblance. Like so many other New-Zealand forms, Vestor seems to be isolated, and may fairly be deemed to represent a separate Family—Nestoride—a view which is fully justified by a cursory examination of its osteology, though this has hitherto been only imperfectly described and figured (kyton, Osteol. Avium, p. 72; A. B. Meyer, Abbild. von Vogel-Skeletten, p. 18, pl. 23).

Further knowledge of this very interesting form may be facili- tated by the following references to the Z’ransactions and Proceed- ings of the New Zealand Institute, ii. pp. 64, 65, 387; iii. pp. 45-52, fee 0; Vp. 207; vi. pp.

114, 128; ix, p. 340; x. p. 192; xi, p. 377; and of course to Mr Buller's Birds of New Zealand. (A. N.)

NESTORIUS anp NESTORIANS. Nestorius, patri- arch of Constantinople from 428 to 431, was a native of Germanicia, at the foot of Mount Taurus, in Syria. The ycar of his birth is unknown. At an early age he was sent for his education to Antioch, where it is probable, though not certain, that Theodore of Mopsuestia was for some time his master. As monk in the neighbouring monastery of Kuprepius, and afterwards as presbyter, he became cele- brated in the diocese for his asceticism, his orthodoxy, and his eloquence ; hostile critics, such as Socrates, allege that his arrogance and vanity were hardly less conspicuous. On the death of Sisinnius, patriarch of Constantinople (December 427), Theodosius II., indifferent to or possibly perplexed by the various claims of the local clergy, appointed the distinguished preacher of Antioch to the vacant sec. The consecration took place on April 10, 428, and then, or almost immediately afterwards, in what is said to have been his first patriarchal sermon, Nestorius exhorted the emperor in the famous words—" Purge me, O Cesar, the earth of herctics, and I in return will give thee heaven, Stand by me in putting down the heretics and I will stand by thee in putting down the Persians." In the spirit of this utterance, steps were at once instituted by the new prelate (Socrates says five days after his consecra- tion) to suppress the assemblies of the Arians ; these, by a

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stroke of policy which seems to have been as successful as it was bold, anticipated his action by themselves setting fire to their meeting-house, Nestorius being forthwith nick- named "the incendiary." The Novatians and the Quarto- decimans were the next objects of his orthodox zeal,—a zeal which in the case of the former at least was reinforced, according to Socrates, by his envy of their bishop ; and it led to serious and fatal disturbances at Sardis and Miletus. The toleration the followers of Macedonius had long enjoyed was also rudely broken, the (foreign) Pelagians alone finding any favour. While these repress- ive measures were being carried on outside the pale of the catholic church, equal care was taken to instruct the faithful in such points of orthodoxy as their spiritual

head conceived to be the most important or the most in danger. One of these was that involved in the practice, now grown almost universal, of bestowing the epithet Q@cordxos, “Mother of God,” upon Mary the mother of Jesus. In the school of Antioch the impropriety of the expression had long before been pointed out, by Theodore of Mopsuestia, among others, in terms precisely similar to those after- wards attributed to Nestorius. From Antioch Nestorius had brought along with him to Constantinople a co- presbyter named Anastasius, who enjoyed his confidence and is called by Theophanes his “syncellus.” This Ana- stasius, in a pulpit oration which the patriarch himself is said to have prepared for him, caused great scandal to the partisans of the Marian cultus then beginning by saying, “Let no one call Mary the mother of God, for Mary was a human being; and that God should be born of a human being is impossible.” The opposition, which was led by one Eusebius, a “ scholasticus” or pleader who afterwards became bishop of Dorylzeum, chose to construe this utter- ance as a denial of the divinity of Christ, and so violent did the dispute upon it become that Nestorius judged it necessary to silence the remonstrauts by force ; an over- zealous monk who had withstood him to his face was scourged and sent into exile, while many of the mob who sympathized were also punished with the lash. The exact chronological order of the recorded incidents in this stage of the controversy is somewhat difficult to determine, but an important part in it was taken by Proclus, bishop of Cyzicus, who, preaching in the cathedral before the patriarch, and at his invitation (429), on one of the festivals of the Virgin, asserted so firmly the propriety of the disputed epithet that Nestorius was constrained to rise and reply.1 Dorotheus, bishop of Marcianopolis, on the other hand, anathematized from the same pulpit all who persisted in using the expression; his audience retorted by uproariously leaving the church, while a large body of clergy and laity formally withdrew from communion with Nestorius, whose friend Dorotheus was.

Matters were soon ripe for foreign intervention, and the notorious Cyrit (g.v.) of Alexandria, in whom the antagonism between the Alexandrian and Antiochene schools of theology, as well as the perhaps inevitable jealousy between the patriarchate of St Mark and that of Constantinople, found an exponent of unexampled deternti- nation and unscrupulosity, did not fail to make use of the opportunity. He stirred up his own clergy, he wrote to encourage the dissidents at Constantinople, and he addressed himself to the

sister and wife of the emperor (Theodosius himself being known to be still favourable to Nestorius). Nestorius himself, on the other hand, having occasion to write to Pope Celestine I. about the Pelagians (whom he was not inclined to regard as heretical), gave from his own point of view an account: of the disputes

1 The substance of this discourse has been preserved in a Latin translation by Marius Mercator, which is given in Galland's Biblioth, Patr., vol. viil

which had recently arisen within his patriarchate. This implied appeal, however, was the reverse of successful, for the pope, in a synod which met in 430, decided in favour of the epithet @cordéxos, and bade Nestorius retract his erroneous teaching, on pain of instant excommunication, at the same time entrusting the exccution of this decision to the patriarch of Alexandria. On hearing from Rome, Cyril at once held a synod and drew up a doctrinal formula for Nestorius to sign, and also twelve anathemas covering the various points of the Nestorian dogmatic. Nestorius, instead of yielding to the combined pressure of his two great rivals, merely replied by a counter excommunication.

In this situation of affairs the demand for a general council became irresistible, and accordingly Theodosius and Valentinian IIT. issued letters summoning the metro- politans of the catholic church to meet at Ephesus at Whitsuntide 431, each bringing with him some able suffragans. Nestorius, with sixteen bishops and a large following of armed men, was among the first to arrive ; soon afterwards came Cyril with fifty bishops. Juvenal of Jerusalem and Flavian of Thessalonica were some days late. It was then announced that John of Antioch had been delayed on his journey and could not appear for some days; he, however, is stated to have written politely requesting that the opening of the synod should not be delayed on his account. Cyril and his friends accordingly assembled in the church of the Theotokos on the 22d of June, and summoned Nestorius before them to give an account of his doctrines. The reply they received was that he would appear as soon as all the bishops were assembled ; and at the same time the imperial commis- sioner, Candidian, presented himself in person and formally protested against the opening of the synod. Notwith- standing

these circumstances, Cyril and the one hundred and fifty-nine bishops who were with him proceeded to read the imperial letter of convocation, and afterwards the letters which had passed between Nestorius and his adversary. Almost immediately the entire assembly with one voice cried out anathema on the impious Nestorius and his impious doctrines, and after various extracts from the writings of church fathers had been read the decree of his exclusion from the episcopate and from all priestly communion was solemnly read and signed by all present, whose numbers had by this time swelled to one hundred and ninety-eight. When the decision was known the populace, who had been eagerly waiting from early morning till night to hear the result, accompanied the members with torches and censers to their lodgings, and there was a general illumination of the city. A few days afterwards (June 26 or 27) John of Antioch arrived, and efforts were made by both parties to gain his ear; whether inclined or not to the cause of his former co-presbyter, he was naturally excited by the precipitancy with which Cyril had acted, and at a "conciliabulum " of forty-three bishops held in his lodgings shortly after his arrival he was induced by Candidian, the friend of Nestorius, to depose the bishops of Alexandria and Ephesus on the spot. The efforts, how- ever, to give effect to this act on the following Sunday were frustrated by the zeal of the Ephesian mob. Meanwhile a letter was received from the emperor declaring invalid the session at which Nestorius had been deposed unheard ; numerous sessions and counter-sessions were afterwards held, the conflicting parties at the samc time exerting them- selves to the utmost to secure an effective superiority at court. In the end Theodosius decided to confirm the depositions which had been pronounced on both sides, and Cyril and Memnon as well as Nestorius were by his orders laid under arrest. Representatives from each side were now summoned before him to Chalcedon, and at last, yielding to the sense of the evident majority, he gave a

decision in favour of the '" orthodox," and the council of Ephesus was dissolved. Maximian, one of the Con- stantinopolitan clergy, a native of Rome, was promoted to the vacant see, and Nestorius was henceforward represented in the city of his former patriarchate only by one small congregation, which also a short time afterwards became extinct. The commotion which had been thus raised did not so easily subside in the more

eastern section of the church ; the Antiochenes continued to maintain for a considerable time an attitude of antagonism towards Cyril and his creed, and were not pacified until an understanding was reached in 433 on the basis of a new formula involving some material concessious by him. The union even then met with resistance from a number of bishops, who, rather than accede to it, submitted to deposition and expulsion from their sees; and it was not until these had all died out that, as the result of stringent imperial edicts, Nestorianism may be said to have become extinct through- out the Roman empire. Their school at Edessa was closed by Zeno in 489. As for Nestorius himself, immediately after his deposition he withdrew into private life in his old monastery of Euprepius, Antioch, until 435, when the emperor ordered his banishment to Petra in Arabia. A second decree, it would seem, sent him to Oasis, probably the city of the Great Oasis, in Upper Egypt, where he was still living in 439, at the time when Socrates wrote his Church History. The invasions of savage tribes compelled him to seek refuge in the Thebaid, where, however, the governor caused him to be dragged to Elephantis and sub- sequently to Panopolis. The time, place, and circum- stances of his death are unknown; but zeal for theological truth and retributive justice has led at least one historian to exercise his invention in providing a fit end for the friendless heretic. The followers of Nestorius found tolera- tion under the rulers of Persia, from which empire they gradually spread into India and even into Arabia and China. They also succeeded in securing a foothold among the Tartars. Their patriarch had his sec for a consider- able time at Seleucia-Ctesiphon, afterwards in Baghdad, and then in Alkésh. In the 13th century he is said to have had twenty-five metropolitans underhim. The sect was almost extirpated by Timur.

What is teclinically and conventionally mcant in dogmatic theo- logy by ‘‘the Nestorian heresy” has been briefly indicated elsewhere (vol. xiii. p. 671). As Eutychianism is the doctrine that the God- man has only one nature, so Nestorianism is the doctrine that He has two complete persons. So far as Nestorius himself is concerned, however, it 1s certain that he never formulated any such doctrine ; nor does any recorded utterance of his, however casual, come so near the heresy called by his name as Cyril’s deliberately framed third anathema (that regarding the ‘‘ physical union” of the two hypostases or natures) approaches Eutychianism. It must be remembered that Nestorins was as orthodox at all events as Athanasius on

the subject of the incarnation, and sincerely, even fanatically, held every article of the Nicene creed. Hefele him- self, one of the most recent as well as most learned and acute of Cyril's partisans, is compelled to admit that Nestorius accurately held the duality of the two natures and the integrity of each, was equally explicitly opposed to Arianism and Apollinarianism, and was perfectly correct in his assertion that the Godhead can neither be born nor suffer ; all that he can allege against him is that ''the fear of the communicatio idiomatuwm pursued him like a spectre." But in reality the question raised by Nestorius was not one as to the communicatio idiomatum, but simply as to the proprieties of language. He did not refuse to speak of Mary as being the mother of Christ or as being the mother of Emmanuel, but he thought it improper to speak of her as the mother of God. And there is at least this to be said for him that even the most zealous desire to frustrate the Arian had never made ita part of orthodoxy to speak of David as @eordrwp or of James as ddeApd0cos. The secret of the enthusiasm of the masses for the analogous expression Theotokos is to be sought not so much in the Nicene doctrine of the incarna- nation as in the recent growth in the popular mind of notions as to the dignity of the Virgin Mary, which were entirely unheard of (except in heretical circles) for nearly three centuries of the Christian era (see MARY, vol. xv. p. 590-1). (J. 8, BL.)

NESTORIUS

Mopern NesTor1aAns.—The remnants of the Aramean Nestorians are to be found in diminishing numbers partly on Turkish, partly on Persian territory. Since the close of the 17th century the Roman Catholic mission, with its headquarters at Aleppo, has, through the powerful sup- port of the French consuls, met with great success among the Nestorians, and has formed the converts into the so- called Chaldeans, or Nestorians connected with the Roman Catholic Church. Those Nestorians who still adhere to their ancient creed are settled on Turkish soil mainly in the wild and inaccessible regions of eastern Kurdistan, and on Persian soil in the highly fertile plain to the west of the Lake of Urmia. In the former district Nestorians have lived along with the uncivilized Kurds (Iranians) from a very early period, and their numbers have probably been increased by immigrants driven from the lowlands of the Euphrates and Tigris by Moslem persecution. 'Till quite

recently they have maintained there a comparative inde- pendence in spite of the perpetual hostility of the Kurds. In those districts where the Kurds are numerically superior they have the ascendency over the scattered Nestorian com- munities; but there were formerly districts mainly or, as in the case of Tiyari (Tyari), almost completely occupied by Nestorians, and in these the Kurds were the subject race. As in those regions the conditions of life are the same for both, there is little difference between Christians and Mohammedans ; the Nestorians wear nearly the same garb as their Kurd neighbours, the most noteworthy article being the breeches. The mountain Nestorians have generally striped jackets and felt caps, and frequently a staff (the stony mountain roads being mere footpaths, or at best only available for mules). Stock-breeding is the chief occupation ; and in summer the herds are taken up to the higher regions, where, however, sheep and goats are exposed to the attacks of wild animals, especially bears and wolves. The alpine character of some of those dis- tricts has been greatly admired by the few travellers who, in spite of risks from brigands, have ventured to visit them. In certain valleys, as, for instance, in that of the Zab, there is luxuriant vegetation: the chief trees are the willow and the poplar; rice is cultivated, though at the risk of intermittent fever. To avoid the mosquitoes the people spend the summer nights in the open air on the top of a scaffolding of poles. Their ordinary houses are generally very wretched, often consisting of but a single room, and sometimes even being formed underground, after a fashion that becomes common in Armenia. Besides making most of their own utensils, the mountaineers work certain copper and sulphur mines, and earn a little money by gathering gall-nuts. Their basket-work, for which the district of Tchelu is particularly famous, deserves to be specially mentioned; travelling basketmakers from this region are to be found in all parts of western Asia. The montaineers do a good deal of hand-spinning and stocking-working, even their priests engaging in these forms of industry as well as in tillage. Wooden spoons are made in the mountains. The people as a rule are very poor; many of them migrate for a time (to Mesopotamia for the most part), but come back with their petty gains to their homes, to which they are much attached. This applies, however, only to certain districts; from the central highlands of Tiy4ri, for instance, emigration is rare. ‘The supply of food in the mountains.is very meagre; wheat does not thrive well, and the people depend on millet-bread, roasted meal, and dried mulberries. Great labour

has to be expended in carrying soil up to the ter- races which they cultivate on the mountain sides. Milk and its preparations are largely used; and bee-keeping receives some attention. The hospitality of the moun- taineers stands high; they willingly share their last morsel

with a stranger. Intellectually they are not unlike the Kurds: the latter are proverbially stupid, and these Nes- torians also are reproached not only with ignorance but with lack of capacity. The clergy, ignorant to an extra-ordinary degree, live a miserable life, and give themselves little concern about the education of their flocks. They receive, however, no small respect from their people, who also show a touching and reverential attachment to their creed. Even the churches are objects of peculiar devotion. The accusation sometimes brought against the mountain Nestorians that they resemble the Kurds in a tendency to raiding and brigandage is not altogether without founda- tion; but this may be at once explained and excused by the fact that they live in the midst of a hostile and rapacious population, from whose attacks they can defend themselves only by reprisals. In warlike courage they are not behind the Kurds. Among both races the women, judged by Oriental standards, occupy a high position. The moun- tain Nestorians are governed by hereditary village sheikhs called meliks (“kings”; compare the “kings” of the Canaanites). Great influence is possessed by the patriarch residing at Kotchannes near Julamerg, who always bears the name of Mar Shimun (z.e., Lord Simeon); the civil jurisdiction over the independent tribes is in his hands. The patriarchal dignity is hereditary in one family; the woman destined to be the mother of the future patriarch must refrain during her pregnancy from eating flesh, a dict which is absolutely forbidden to the patriarch himself. It may sometimes happen that the patriarch resorts to ecclesiastical excommunication against those who have opposed him in secular affairs; but the Nestorians are quite contented under their theocratic government, and have always shown a strong feeling of independence. Things went hard with them in 1846, when their inde- pendence was destroyed. In concert with the Turkish pasha in Mosul, to whom the freedom of the mountaineers was a perpetual offence, three powerful Kurdish chieftains (of whom Nurulla of Revandiz and Bedr Khan of Buhtan have attained unenviable

celebrity) decided to make a common attack upon the Christians. Taken completely by surprise, and basely deserted by their patriarch, these could offer but a feeble resistance; their property was pillaged, and more than 10,000 of their number were massacred. On a small scale similar proceedings are repeated from time to time; and the Turkish Government not only remains powerless to prevent them, but if any advantage accrues to itself looks on with malignant ap- proval. Frequently the Kurdish beys make raids with comparative impunity even in the richer lowland regions, as, for example, to Azerbijan in 1882.

The Nestorians on Persian territory (in Azerbijan) live, even the few who inhabit the mountains, under essentially different conditions; the greater proportion, however, dwell on the rich and fruitful plain which lies round the city of Urmia (Urmi). The date of their settlement in this district is not known, but Urmia is mentioned as early as 1111 as the see of a Nestorian bishop. Nestorians from the mountains may have gradually advanced east- wards into the plain, where they found more favourable conditions of life. If not particularly healthy, it is abundantly watered, and the fruit which it produces in profusion forms their principal means of subsistence. Even here, indeed, they are subject to poverty, for the soil belongs in great part to Mohammedan proprictors. Catholic missions have had some success among them, and there is a Chaldzan bishopric at Khosrava; but since 1831 the field has been more especially worked by the American Board, which has sought to accomplish its purpose by utilizing through the clergy the actually existing church, and by founding schools and introducing

the press. In education a decided improvement may be observed. Formerly out of two hundred Nestorians hardly one could read and write; the proportion is now much higher. The development of the moral and religious char- acter of the people is, however, a difficult task; partly on account of their pride in their old church and old beliefs, and partly because, to some extent through Persian influence, their morale has undergone great degradation. Volatile, sensuous, intemperate, and full of all kinds of superstition, while they are certainly more talented and sharper-witted than their brethren among the mountains, they are also much less truthful and

trustworthy. As their garb is similar to that of the Persians, so also are many of their manners and customs. Many intelligent countenances are to be found among them. It has even been asserted that these are of the Jewish type, and some travellers have proposed an identification of the Nestorians with the lost tribes of Israel. The ethnographic arguments in favour of this Jewish connexion are, however, of no value; for many of the individual characteristics in which the Nestorians agree with the ancient Jews are common to all Oriental nations ; and, what is of more importance, the type itself is not the Jewish one. The Nestorians have round heads, and frequently light hair and hazel eyes. Among the mountain Nestorians the complexion is usually a ruddy brown. That through all the centuries of nominal Moham- medan domination the national type should have been preserved must be ascribed exclusively to their isolated situation. They still speak Aramean (Syriac); but their dialect is not a lineal descendant of the classical and literary language. In the mountains most of the Nestorians understand Kurdish, and in the low country of Azerbijan Turkish ; and both languages have exercised a great influence on their native tongue. The low-country dialect has greatly suffered from phonetic decay; that of the mountaineers preserves many of the older forms, and is pronounced with greater correctness. The Nestorians, it may be added, call themselves in their own language Surayi, and do not recognize the designation Nestorians bestowed upon them by people of other creeds. The patriarch bears the title of patriarch of the Chaldeans, The Nestorians have a number of peculiar customs and manners. Their marriage ceremonies are very interesting, as also are some of their other festivals, during which, at least in the Urmia plain, there is always plenty of danc- ing, drinking, and in the end fighting. The mountain Nestorians more particularly are fond of hunting and hawking. One custom may be mentioned as peculiarly Kuropean ; not only do they kiss the hands of their clergy, but they lift their caps to them—a mark of respect nowhere else in use in the East. Blood-revenge is in full vogue both in mountains and lowlands; but there are asylums for homicides. Pork is never eaten. As to creed, the Nestorians are strongly opposed to image worship, have no auricular confession, know nothing of a purgatory, and allow their priests to marry. The Lord’s Supper is a kind of magical ceremony with them, and several curious customs are connected with its observance. As a matter of course their peculiarities are better

preserved in places like Urmia on the one side or the mountain district of Tiy4ri on the other, where they live together in considerable numbers.

In regard to the total numerical strength of the Nestorians, authorities differ greatly. Perkins spoke of 140,000, and assigned 50,000 to Tiyari alone. The most trustworthy data are probably those of Badger, based, in the main, on information furnished by the patriarch, but with the nnmber of families reduced one-third throughout (the figures given having, in some instances, been seen to be greatly cxaggcrated), The total number of families being 11,378, it may be estimated that the individuals amount to about 70,000. In the following table the cnnmeration of families as 4500 in Nos. 7 and 8 is purely approximate.

Dioceses, ee, Bishops. Priests.' Churches. | Families. T, (ARG asta ncsseaeendsencssesccxcoeevers 1 0 9 13 249 2. Berwari…. 1 0 18 20 348 Gs TTD ccopsamannencaes 0 2 16 23 220 4. Central Kurdistan. 0 0 62 75 2,778 5. Tkhoma, Tchelu, &e.. 1 0 24 37 IS) 6; (Gawans QC, esescastarscerecesceessee 1 0 18 34 1,082 Us TIONG pee npboreoonntaeononeoose fale WOBBLE es aR eetremonsocedsoctnenoe } : – . = 4,500 9. New and NUdGsi..sescesees 0 0 'if 9 222) rf 7 188 249 11,378

The first-named diocese is the most southerly; it embraces the districts of Akra, Zebur, Mezuriye, and Jebel Gara to the north of Mosul. It is there more especially that, since the date of the collection of the figures given above, there have probably been accessions to the Chaldean Church. The second diocese, compris- ing Berwari, Nerwi, and Snpna, lics to the north of the first, and nearer the mountains; the third, farther to the west and north- west, is mainly occupied by independent Kurds, and is still practi- cally unexplored ; the fourth, directly subject to the patriarch, contains, besides the county of Tiyari (upper and lower), almost exclusively inhabited by Nestorians, Ashitha to the west, and Kotchannes, Diz, &c., to the north. North-castward towards the Persian frontier lies the sixth diocesc, including, in addition to Gawar, Albak and some other small isolated parishes; to the north of Tiyari is the (ninth) diocese of Lewun and Nudes (Nurduz?), and to the cast (fifth diocese) two leading districts of the Tkhoma mountains and the inhospitable Tchelu, along with Bar, Rekan, and

Tchall. The seventh diocese, called also Be Shems-ud-din, lies to the east of Tchelu, and includes also Baradost, as well as Tergawer, Marjaver, &c., within Persian territory.

See G. P. Badger, The Nestorians and thetr Rituals, 2 vols., London, 1852; J. Perkins, A Residence of Eight Years in Persia among the Nestortan Christians,

Andover, 1843; Asahel Grant, The Nestorians or the Lost Tribes, 2d ed., London, 1843; and also compare Layard's WVineveh and Ritter's Asia. (A. 80.)

NESTS. See Birps, vol. iii. p. 771.

NET. A net consists of a fabric of thread, twine, or cord, the intersections of which are firmly knotted so as to form meshes or interspaces of fixed dimensions,—the meshes being usually lozenges of uniform size. The art of netting is intimately related to weaving, knitting, plaiting, and pillow-lace and machine-lace making, from all of which, however, it is distinguished by the knotting of the inter- sections of the cord. It is one of the most ancient and uni- versal of arts, having been in all times commonly practised among the rudest and most primitive tribes, to whom the net is of great importance in hunting and fishing.

Net-making, as a modern industry, is principally con- cerned with the manufacture of the numerous forms of net used in fisheries, but netting is also largely employed for many and varied purposes, as for catching game and birds, for the temporary division of fields, for protecting fruit in gardens, for collecting insects, for hammocks, and ship use, for screens and other furniture purposes, for ladies' hair, house bags, &c. While to a large extent net-making con- tinues to be a handicraft, since the early part of the 19th century numerous forms of machine have been invented for netting, and several of these have been successfully introduced on a large scale in factories for the manufacture of fishing nets. Such fishing nets were formerly made principally from hemp fibre—technically called "twine"; but since the adaptation of machinery to net-making cotton has been increasingly used. Cotton nets, being more flexible and lighter than those

made of twine, are much more easily handled and. stowed, and in practice they are rapidly superseding all others.

The forms of fishing nets vary according to the manner in which they are intended to act. This is either by entangling the fish in their complicated folds, as in the trammel ; receiving them into pockets, as in the trawl; suspending them by the body in the meshes, as in the mackerel-net ; imprisoning them within their labyrinth- like chambers, as in the stake-net; or drawing them to shore, as in the seine (See FisHertes, vol. ix. p. 247). The parts of a net are the head or upper margin, along which the corks are strung upon a rope called the head

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NET

rope; the foot is the opposite or lower margin, which carries the foot-rope, on which in many cases leaden plummets are made fast. The meshes are the squares composing the net. The width of a net is expressed by the term "over"; e.g., a day-net is three fathoms long and one over or wide. The lever is the first row of a net. There are also accrues, false meshes, or quarterings, which are loops inserted in any given row, by which the number of meshes is increased. To bread or breathe a net is to make a net. Dead netting is a piece without either accrues or stole (stolen) meshes, which last means that a mesh is taken away by netting into two meshes of the preceding row at once.

Hand-Netting. —Net-making as a handicraft is a simple and easily acquired art; the labour is not hard; and the implements and materials are easily obtained and inexpen- sive, while a little practice in meshing is suffieient to develop wonderful dexterity of movement. The tools used in netting are the needle, an instrnment for holding and netting the material; it is made with aneye EH, atongue T, and a fork F (fig. 1).

The twine is wound on it by being passed

alternately between the fork and round

the tongue, so that the turns of the

string lie parallel to the length of the

needle, and are kept on by the tongue

and fork. A spool or mesh-pin is a piece

of wood on which the loops are formed

(round, as in fig. 2, or flat, as in fig. 3),

the circumference or the spool determin-

ing the size of the loops. Each loop con- {f=

tains two sides of the square mesh ; ciel fore, supposing that it be required to . 7 vs make E ohes t inch square,—that is, P81. Fig. 2. Pig: 8. measuring 1 inch from. knot to knot,—a spool 2 inches in eir- cumference must be used. Large meshes may be formed by giving the twine two or more turns round the spool, as occasion may require; or the spool may bo made flat, and of a suffieient width, having a portion cut away to admit the finger and thumb to grasp it con- veniently (fig. 3). The method of making the hand-knot in nets known as the fisher- man's knot is : more easily acquired by example than described in writing. Fig. 4 shows the course of the twine in forming a single knot. From the last-formed knot the twine passes over the front of the mesh-pin h, and is caught behind by the little finger of the left hand, forming the loop s, thence it passes to the front and is caught at d by the left thnmb, then through the loops s and m as indicated, after which the twine is released by the thumb and the knot is drawn "taut" or tight. Fig. 5 shows the form of

Fig. 4. the fisherman's knot, and fig. 6 is a bend knot used for uniting two ends of twine.

Machine-Netting.—So long ago as 1778 a netting-machine was patented by William Horton, William Ross, Thomas Davies,

and John Golby. From that time till the end of the 18th century several other patents for similar machines m were seeured in Great Britain, but there is no evidence that any of them Was praetically successful. In 1802 the French Govern- ment, through the Société @Eneouragement pour l'In- dustrie Nationale, offercd a reward of 10,000 franes

Fig. 5.

Fig. 6. to the person who should invent an automatic machine for net-

making. The reward attracted the attention of Jacquard, who submitted a model of a machine which was brought under the

notice of Napoleon I. and Carnot. Jacquard was summoned to Paris by the emperor, who, with foreible if profane point, asked of the inventor—‘‘ Are you the,man who pretends to do what God Almighty cannot—tie a knot in a stretched string ?” Jacquard’s niodel, which is incomplete, was deposited in the Conservatoire des Arts et Métiers ; it was awarded a prize, and he himself received an appointment in the Conservatoire, where he was not long in perfecting his famous Jacquard attachment to the common loom. In 1806 M. Buron of Bourgthéronlde (Eure) submitted to the Société d’Encouragement a model of a netting-machine for which he was awarded a gold medal. His model is also deposited in the Conser- vatoire. Meantime attention continued to be given to the problem in the United Kingdom, and the first to succeed practically in inventing an efficient machine and in establishing the industry of machine net-making was Mr James Paterson of Musselburgh. Paterson, originally a cooper, served in the army through the Peninsular war, and was discharged after the battle of Waterloo. From his early days he had devoted his mind to the invention of a net-making machine, and on his retirement from the army he set himself to earry out his purpose. After much labour he succeeded, and established a machine net factory in Musselburgh about 1820. The early form of machine was, however, imperfect, the knots it formed slipped readily, and, there being much prejudice against machine nets, the demand for his mannfactures was small. Mr Walter Ritchie, a native of Musselburgh, devised a method for forming the ordinary hand-knot on the machine nets, and the machine, so improved, and patented in July 1835, beeaine the foundation of an extensive and flourishing industry. Paterson’s factory about 1849 passed into the hands of Messrs J. & W. Stuart, by whom the machine and processes have been still further developed and perfected.

The mechanism of the Paterson net-loom or machine is complex, and not to be understood without elaborate diagrams or actual inspection. It eonsists of an arrangement of hooks, needles, and sinkers, one of each being required for every mesh in the breadth being made. The needles hold the meshes, while the hooks seize the lower part of each and twist it intoa loop. Through the series of loops so formed a steel wire is shot, carrying with it twine for

the next range of loops. This twine the sinkers successively catch and depress sufficiently to form the two sides and loop of the next mesh to be formed. The knot formed by threading the loops is now tightened up, the last formed mesh is freed from the sinkers and transferred to the hooks, and the process of looping, threading, and knotting thus continues.

Another form of efficient net-loom, working on a principle dis- tinct from that of Paterson, was invented and patented in France by M. Onésiphore Peequeur in uy 1840, and again in France and in the United Kingdom in 1849. The machine of Pec- queur was improved on by many subsequent inventors ; and especially the additions made by MM. Bandouin and Jouannin, patented in the United Kingdom in 1861, greatly perfected its principle. In this machine. separate threads or cords running longi- tudinally for each division of the mesh are employed, as will be seen from fig. 7, whieh represents a section of the net with the knots loose to show their strueture. It will also be observed that the alternate threads @ and 3 are differently

Fig. 7.

disposed—the @ series being drawn into simple loops over and

through which the threads of the 6 series have to pass. On the machine the a series of threads are arrangcd vertically, while the b series are placed horizontally in thin lenticular spools, Over the horizontal b serics is a range of hooks equal in number with the threads, and set so that they seize the b threads, raise them, and give them a donble twist, thus forming a row of open loops. The — loops are then depressed, and, seizing the vertical @ threads, draw them ‘ crotchet-like through the } loops into loops sufficiently long and open to pass right over the spools containing the 0 threads (fig. 8), after which it only remains to tighten the threads and the mesh is complete. The machines work well with steam-power; and each requires only one female attendant. : d

Bobbin Net, which is the foundation of machine-made lace, is made by the intertwisting—not knotting—of contiguous threads (see LACE, vol. xiv. p. 185),

Wire-netting, which is in extensive demand for garden use, poultry coops, and numerous like purposes, is also a twisted struc- ture made principally by machine pogver. The chief centre of wire-net making is Warrington in Lancashire. (J. PA.)

NETHERLANDS, Kinepom or tHE. See HoLbLanp.

NETSCHER, Gaspar (1639-1684), portrait and genre painter, was born at Heidelberg in 1639. His father died when he was two years of age, and his mother, fleeing from the dangers of a civil war, carried him to Arnheim, where he was adopted and educated by a benevolent physician named Tullekens. At first he was destined for the profession of his patron, but his great aptitude for painting soon caused the plan of his future career to be altered. He was placed under an artist named De Koster, and, having also studied under Terburg, he set out for Italy to complete his education there, Marrying, how- ever, at Liége, he proceeded no farther. He settled at Bordeaux, and toiled hard to earn a livelihood by painting fancy subjects. But those small cabinet pictures which are now so highly valued on account of their exquisite finish brought but a small remuneration; and, after re- moving to the Hague, he turned his attention to portrait- painting. In this branch of his art he was more successful. He was patronized by William ITIL, and his earnings soon became so considerable that he was enabled at times to gratify his own taste and fancy by depicting musical and conversational pieces. It was in these that Netscher's genius was first fully displayed. The choice of these subjects, and the habit of introducing female figures, dressed in rich, glossy satins, were imitated from Terburg .; they possess easy yet delicate pencilling, brilliant and correct colouring, and pleasing light and shade; but fre- quently their refinement passes into weakness, and they err through over-finish. The painter soon attracted notice, and was rapidly gaining both fame and wealth, when he was cut off in 1684 at the premature age of forty-five.

The paintings of Netscher are rare. The most extensive col- lection of them, numbcring eight subjects, is at Dresden; and examples may be studied in the Louvre, in the galleries of Florence, the Hague, Cassel, Copenhagen, and St Petersburg, in the London National Gallery, and in the Bridgewater,

Ashburton, and Apsley House collections. The style of Netscher was imitated

by his two sons Theodore and Constantine; but these, though meritorious painters, were far inferior to their father.

NETTLE is the vernacular equivalent of the Latin Urtica, which again gives its name to the Urticacex. The species of Urtica are herbs covered with stinging hairs, and with unisexual flowers on the same or on different plants. The male flowers consist of a perianth of four greenish seg- ments enclosing as many stamens, which latter, when freed from the restraint exercised upon them by the perianth- segments while still in the bud, suddenly uncoil themselves, and in so doing liberate the pollen. The female perianth is similar, but encloses only a single seed-vessel with a solitary seed. The stinging hairs consist, at the base, ofa bulbous reservoir filled with acrid fluid, and prolonged into a long slender tube, the extremity of which is finely pointed. By means of this point the hair penetrates the skin and discharges its irritant contents beneath the surface. Some tropical species of Urtica produce a fluid of such potency that the most serious consequences ensue from coming into contact with the plant. Nettle tops, or the very young shoots of the nettle, may be used as a vegetable like spinach ; but from the abundance of crystals (cystolithes) they contain they are apt to be gritty, though esteemed for their antiscorbutic properties. The fibre furnished by the stems of several species is, however, of more economic importance, being used for the purpose of cordage or paper-making. Three species of nettle are wild in the British Isles, although from their general presence in the neighbourhood of houses, or in spots where house refuse is deposited, it has been suggested that they are

not really natives, a supposition that to some extent receives countenance from the circumstance that the young shoots are very sensitive to frost. In any case they follow man in his migrations, and by their presence usually indicate a soil rich in nitrogen. The trailing subterranean root-stock renders the common nettle somewhat difficult of extirpa- tion.

NETTLERASH, or Urticaria, a disorder of the skin characterized by an eruption resembling the effect pro. duced by the sting of a nettle, namely, raised red or red and white patches occurring in parts or over the whole of

the surface of the body, and attended with great itching and irritation. It may beacute orchronic. In the former variety the attack appears to be connected with digestive derangements, and often comes on after indulgence in certain articles of diet, particularly various kinds of fruit, shell-fish, cheese, pastry, &c., also occasionally from the use of certain drugs, such as henbane, copaiba, cubebs, turpentine, &c. There is at first considerable feverishness and constitutional disturbance, together with sickness and faintness, which either precede or accompany the appear- ance of the rash. The eruption may appear on any part of the body, but is most common on the face and trunk, In the former position it causes swelling and disfigurement while it lasts, and is apt to excite alarm in persons unacquainted with its nature. The attack may pass off in a few hours, or may last for several days, the eruption continuing to come out in successive patches. The chronic variety consists in an eruption similar to that above described, but lasting with interruptions for a length of time often extending to months or years. This form of the disease occurs independently of errors in diet, and is not attended with the feverish symptoms characterizing the acute attack. It is probably connected with consti- tutional conditions, and is occasionally observed in the gouty. As regards treatment, the acute variety generally yields quickly to a purgative and the use of some antacid, such as magnesia or liquor potassee. The local irritation is allayed by sponging with a warm alkaline solution (soda, potash, or ammonia), or a solution of acetate of lead. In the chronic form, in addition to these remedies, any constitutional morbid condition will demand special atten- tion.

NETTLE TREE is the name applied to certain trees of the genus Celtis, and belonging to the family Urticacez. The best-known species have usually obliquely ovate, or lanceolate leaves, serrate at the edge, and marked by three prominent nerves. The flowers are inconspicuous, usually hermaphrodite, with a 4- or 5-parted perianth, as many stamens, a hairy disk, and a 1-celled ovary with a 2-parted style. The fruit is succulent like a little drupe, a character which serves to separate the genus alike from the nettles and the elms, to both of which it is closely allied. The wood of Celtis australis of southern Europe (also cultivated in England) is made use of for a variety of purposes, while the leaves serve as forage. An oil for burning is extracted from the seed of Celtis occidentalis. A North-American species is used for like purposes. Celtis australis was one of those to which the term “

lotus ” was applied by Dioscorides and the older authors, its berries or drupes having a sweet pleasant taste.

NEU-BRANDENBURG, a flourishing town in Mecklen- burg-Strelitz, Germany, situated on a small lake called the Tollenser-See, about 60 miles to the west of Stettin. It is still partly surrounded with walls, and possesses four interesting old Gothic gates, dating from 1304. The principal buildings are the Marienkirche, a Gothic building of the 14th century, the synagogue, the town-house, and the gymnasium. Iron-founding, machine-making, wool- spinning, and the making of paper, tobacco, and musical

instruments are carried on here, and the trade in wool and agricultural products is very considerable. The horse fair is also important. Neu-Brandenburg was founded in 1248, and has belonged to Mecklenburg since 1292. The popula- tion in 1880 was 8406.

NEUBURG, a small town of Bavaria, in the district of Schwaben und Neuburg, is pleasantly situated on the Danube, and in 1880 contained 7690 inhabitants, three- fourths of whom are Roman Catholics. It is a place of very ancient origin, but is chiefly noteworthy from the fact that for three centuries (1503-1802) it was the capital of the independent duchy of Pfalz-Neuburg. The most important building is the old ducal chateau, the handsomest part of which is in the Renaissance style of the 16th century.

NEUCHATEL, or Neurcnren (Germ., Vewendurg), a canton of Switzerland, consisting of a section of the Jura system (see JURA) between the Doubs valley and the Lake of Neuchatel, lies between 46° 50’ and 47° 10’ N. lat. and 6° 25’ and 7° 5’ E. long. It is bounded on the N.E. and E. by Bern, on the S.E. by its lake, which separates it from Freiburg and Vaud, on the 8. by Vaud, and on the W. and N.W. by France (department of Doubs). The greatest length is about 30 miles, the average breadth 11, and the area 312 square miles. It consists for the most part of the longitudinal ridges and valleys character- istic of the Jura mountains, which here have an average elevation of over 3000 feet, and reach their highest point in the Creux du Vent (4900 feet). The drainage is divided by the Thiéle or Zihl, which flows into the Aar, and by the Doubs, the former receiving by far the larger

portion. The lowest part of the canton, stretching along the shore of the lake, and known by the name of Vignobles, has, as the name implies, the vine for its characteristic growth. It extends from about 1425 to upwards of 1800 feet above the level of the sea. An intermediate region represented by the Val de Travers and the Val de Ruz, ranging from 1800 to about 2700 feet in height, produces cereals (only a fifth, however, of the total required by the population). The higher valleys are occupied by meadow and forest. About one-fifth of the total area of the canton is under wood, and nearly a fourth is ranked as un- productive. The geological structure is explained under Jura. The most valuable mineral product of the canton is asphalt, of which there is a large and rich deposit in the Val de Travers, from which upwards of 2000 tons are annually taken (see vol. ii. p. 716). The wine of the Vignobles (both sparkling and still) is plentiful and has a good reputation, being exported in large quantities. On the mountain pasture lands large herds of cattle are reared ; in 1876 the number was 19,469, and there were besides 3009 horses, 3433 pigs, 3586 sheep, 2853 goats, and 4723 beehives. Absinthe is manufactured in the Val de Travers, and exported to the extent of 200,000 bottles annually ; lace is also largely made, especially in that valley, but the characteristic industry of the canton is that of watchmaking In all its branches, carried on chiefly in and around the lofty and secluded villages of Chaux-de-Fonds and Le Locle. The former, which is upwards of 3200 feet above the level of the sea, had a population of 22,456 in 1880, the latter (upwards of 3000 above sea-level) had 10,464,— the annual value of the total production of watches exceed- ing £1,000,000. The population of the canton in 1880 was 103,732 (50,169 males). The proportion of Pro- testants to Catholics is nearly 8 to 1; there are also a small number of Jews. The language of three-fourths of the inhabitants is French.

The territory of NeuehAtel was inhabited during the Roman period by the Gallic Sequani. It is nota gain mentioned in history

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until the beginning of the 11th century, when it passed from Burgundy to the German empire. In 1288 it was given by Rudolph of Hapsburg to John II. of Chalons, with the title of count. In 1444 the count of Neuchatel joined

the Swiss league against Austria, and ever afterwards enjoycd Swiss protection. In the beginning of the 16th century the eountship passed to the house of Orleans- Longucville, and in 1579, being conjoined with the countship of Valendis, it became a principality, which in the beginning of the 18th century was inherited by Frederick I. of Prussia (his claims being preferred by the people over those of numerous other candi- dates). In 1806, after the treaty of Tilsit, it was given by Napoleon to Marshal Berthier, but it was restored to Prussia in 1814, though Neuchatel was at the same time recognized as holding a place in the Swiss eonfederaey, being the only nou-republican eanton. In 1848 a republican constitution was established, the king of Prussia protesting ; and in 1856 an attempt was made by a royalist party to re-establish monarchy, but without success. The ultimate result of the negotiations which ensued was that, by a treaty at Paris in 1857, an amnesty was granted to the insurgents, and the king of Prussia resigned all claim to sovereignty while still retaining the right to bear the title of prince of Neuchitel. Neucuiren, the capital of the above canton, stands near the north end of the lake, at the mouth of the Seyon, partly on low alluvial ground and partly on the slope of the Jura. The castle (whence the name Neocomum, Neoburgum, Novum Castrum), which is situated on an eminence, is a considerable building, now occupied by the Government offices. It was formerly the residence of the princes of Neuchatel, and the most ancient portion, recently restored, dates from the Burgundian period. Near it is the Temple du Haut, a church dating from the 12th century ; it contains a handsome monument (1372) to Count Louis of Neuchatel, and a memorial stone to the Reformer Farel, who frequently laboured here. His statue in front was erected in 1875. On the lake stands the gymnasium or college, containing a library, an archeological museum, and a valuable natural history collection founded by Agassiz. The town also possesses a picture gallery, a good observatory, and considerable charitable institutions, mostly due to the munificence of private citizens,—the municipal hospital, founded by David de Pury, whose statue stands in the Place Pury, and the Pourtalés hospital, founded by M. Pourtalés. The Préfargier lunatic asylum, presented to the canton in 1844 by M. de Meuron, is situated 3 miles to the west of the town. Neuchatel has a considerable trade in the products of the canton, the chief items being wine, watches, lace, and liqueurs. It has railway communication by Yverdon with Lausanne and Pontarlier, by Bienne with Basel, by Chaux-de-Fonds with Locle and also with Basel, and

by the Val de Travers with Pontarlier. The population in 1880 was 15,612. NEUCHATEL, Tur Laxz of, along with the connected lakes of Morat and Bienne, is the modern representative of the large body of water which at one time occupied the whole lower valley of the Aar. It is 25 miles in length, at its broadest part it measures 6 miles, its maximum depth is 500 feet, and the area is 92 square miles. The Thiéle (Germ., Zihl), which flows into it at the south-west angle, rises in the heights above La Sarraz close to the edge of the Geneva basin; the Broye, which joins it on the north-east, comes from the Lake of Morat (Lacus Aventicensis). It is also fed by the Reuse, which drains the Val de Travers, and by the Seyon from the Val de Ruz (Rudolfsthal). It drains by the Thiéle into the Lake of Bienne and thence into the Aar. Its elevation above sea- level, lowered 7 feet bya recent enlargement of the outlet, is 1424 feet. The north-west shore is cultivated and populous, but the opposite bank is rocky, overgrown with wood, and comparatively thinly peopled. The scenery, though pleasing, cannot compare with that of the more famous Swiss lakes. Besides Neuchatel, the principal towns upon its banks are Estavayer and Yverdon—the ancient Eburodunum or Ebredunum, from which came its Roman name (Lacus Eburodunensis). It abounds in fish; XVII. — 46

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and a considerable traffic, by steam and otherwise, is borne by its waters. It is subject to violent westerly storms. Interesting remains of ancient lake dwellings have been discovered at Estavayer and Cortaillod.

NEUHAUSEL (in Hungarian, Hrsek-Ujvdr), a town of Hungary, in the district of Neutra, is situated on the river Neutra and on the railway from Pressburg to Pesth, about 60 miles from each of these towns. It was formerly a strong fortress, and played an important part in the wars with the Turks, and in the risings of Bethlen Gabor and Prince Rakoczky, but the works were razed in 1724. Its inhabitants, numbering 10,584 at the census of 1880, are partly of Slovak origin, and are occupied with agricul- ture, vine-growing, and cloth-weaving. Important cattle and horse markets are held here.

NEUHOF, Turopor, Baron von (c. 1690-1756), who fora short time was nominally king of Corsica as Theodore I., was the son of a Westphalian noble, and was born at Metz about 1690. His father, an officer in the French service, had won the special favour of the duchess of Orleans, and on his death in 1695 his son and daughter were taken under her protection. The young baron was thus early initiated into the usages of courts, and received a thorough training in all the accomplishments best fitted to gain him influence with the great. Losses in play having compelled him to leave Paris, he entered the service of Charles XII. of Sweden, by whom he was sent on a secret diplomatic mission in connexion with a project for the restoration of the Stuarts. In connexion with the same intrigue he was also resident for a short time in London. In 1718 he came to Spain, where, obtaining the favour of the duke of Ripperda, he received the commission of colonel, and married Lady Sarsfield, one of the maids of honour of the queen. Finding his position at the court insecure, he made his escape with his wife's jewels. After various adventures he came in 1732 to Florence as representative of the emperor Charles VI. Having here made the acquaintance of several Corsican patriots, he succeeded by expressing strong sympathy with their cause, and promis- ing to gain assistance for them in their resistance to the Genoese, in being accepted as a candidate for the Corsican throne. After fruitless endeavours to intercst various European sovereigns in their behalf, he made his way to the dey of Tunis. From him he obtained a shipload of supplics and ammunition, with which he landed at Corsica on the 14th March 1736. He was received with the utmost enthusiasm, and in the following April was crowned king as Theodore I. By the help of a body-guard of 400 men, and the lavish distribution of new titles, he succeeded for some time in retaining his position, but failing in an effort to capture Bastia from the Genoese, he at the end of eight months resigned his power into the hands of a council of regency, and left the island with the view of arousing sympathy in behalf of his oppressed subjects. Making his way finally to Amsterdam, he was thrown into prison by some of his old creditors, but, succeeding in satisfying their demands, he appeared before Corsica in September 1738 with a considerable supply of provisions and war matériel, only to find it under the power of the French, who had become allies of the Genoese. After the departure of the French in 1743 he endeavoured to re- establish his authority, but found the faction against him so strong that he was soon compelled again to leave Corsica,

and went to England, where he suffered several years imprisonment in the King's Bench prison at the instance of his Dutch creditors. Through the efforts of Horace Walpole a subscription was raised in his behalf, and, an understanding having been arrived at with his creditors, he obtained his freedom in 1756. He died 11th December of the same year.

Neuhof's son, who entered the service of the duke of Wiirtemberg, published an aecount of his father's life under the title Mémoires pour servir & Uhistoire de Corse, 1768, See also Filippini, Histoire des Révolutions de V'Lle de Corse et de ?Elévation de Théodore J. sur le Tréne de cet Etat, The Hague, 1738; D'Argenteourt, De Gekroonde Moff of Theodorus op Stelten (Utreeht, 1739), and De Dwaalende Moff of Verfolg van Theodorus op Stelten (Deventer, 1740); A General Account of the Island of Corsica, with authentic Memoirs of Baron de Neuhoff, London, 18389; History of Theodore L., King of Corstea, London, 1848; Varnhagen von Ense, Jio-graphische Denkmale, part i.

NEUILLY-SUR-SEINE, a town of France, at the head of a canton in the arrondissement of St Denis (department of Seine), lies between the line of the Paris fortifications, the Bois de Boulogne, the right bank of the Seine, and the village of Levallois-Perret, which was formerly included within its limits. It is only 34 miles from the centre of Paris by the road to St Germain (a continuation in the form of a boulevard of the middle avenue of the Champs Elysées), and is practically a mere suburb; but its broad drives and leafy gardens make it a favourite resort for invalids and city people who wish to enjoy a little country air. Unlike St Denis and Clichy, Neuilly has no large manufactories: convents, boarding-schools, maisons de sant¢, laundries, &c., give character to the place, which also contains establishments connected with Paris houses for the manufacture of preserved meats, patent leather, colours, chemicals. The population is 25,235.

A castle at Neuilly, built by the eount of Argenson in the 18th century, ultimately beeame the property and favourite residence of the duke of Orleans (Louis Philippe), the birthplaee of nearly all his ehildren, and the seene of the offer of the erown in 1830. The buildings, whieh eomprised 30 state apartinents, aceommodation for 500 attendants, and stabling for 200

horses, were pillaged and burned by the mob in 1848. The park which extended from the fortifieations to the river, as well as the neighbouring park of Villiers (also belonging to the prinees of Orleans), was broken up into building lots, and is now oeeupied by a large number of small middle-elass houses and a few fine villas. Within the line of the fortifications, but on Neuilly soil, stands the chapel of St Terdin- and ereeted in the Byzantine style on the spot where the duke of Orleans died July 13th, 1842, from the results of a earriage aeeident. The stained glass windows were made at Sevres after designs by Ingres; the dueal eenotaph, designed by Ary Seheffer, was seulptured by M. de Triquety; and the ehapel farther eontains a '* Descent from the Cross," by the last-named artist, a pieture by Jacquand, representing the royal family gathered round the dying prinee, and an angel exeeuted in Carrara marble by the princess Marie his sister. The eastle of Bagatelle, once the property of the count of Artois, now belongs to Sir Riehard Wallace.

NEUMANN, Cart Frrieprico (1798-1870), the well- known Orientalist, was born of Jewish parents at Reich- mansdorf near Bamberg, on the 22d December 1798. He began life in a merchant's office at Frankfort, but finding commerce unsuited to his taste he resigned his desk, and in 1816 entered as a student at the university of Heidelberg. From thence he went to Munich, where, under the influence of the liberal opinions which were fast gaining possession of his mind, he deserted his hereditary faith for the Lutheran communion. Once morc he sought another alma mater, and finally completed his studies at Gottingen. In 1822 he was appointed to a professorship in a gymnasium at Spires, but the same freedom of thought which had led him to leave the religion of his fathers brought him into conflict with the authorities of that institution, who, believing the religious tendency of his

historical teaching to be heterodox, dismissed him from .

his office. About this time he appears to have entered on the serious study of Armenian, and in 1827 we find him at Venice devoting himself to that language under the guidance of the monks of the monastery of San Lazaro. In the following year he visited Paris for the purpose of pursuing a more

general study of the Oriental languages, among which Chinese had for hima special attraction. It was not, however, until he reached London in 1829 that

he first contemplated visiting China, a project which in 1830 he carried into execution. While in that country he gathered together a library of 10,000 volumes, consist- ing of works in all departments of literature, and he also purchased a collection of works in 2400 volumes for the royal library at Berlin. On his return to Europe in 1831 he presented the 10,000 volumes to the royal library at Munich, and was most appropriately installed by the Government as curator of his gift, as well as professor of Chinese at the university. His lectures at this period of his career were no less conspicuous for the deep and wide knowledge they displayed of the languages and history of the East than for the zeal for social progress which was apparent in them. During the disturbed years which preceded the revolutionary period of 1848 the natural tendency of his mind placed him in the fore front among the “friends of the people,” and when the outbreak came he was elected a member of the Bavarian Provisional Parliament. The prominent position thus accorded to him cost him his professorship when four years afterwards the royalists found themselves sufficiently powerful to make such reprisals. He, however, still remained at Munich pursuing his favourite studies until 1864, when he removed to Berlin, where he died on the 17th March

1870.

Among the best known works of this indefatigable student are his Pilgerfahrten buddhistischer Priester aus China und Indien, Leipsic, 1883; Jlémoire sur la vie et les ouvrages de David, philosophe arménien du cingquiéme sitele de notre ére, Paris, 1829 ; Geschichte des Englisch-Chinesischen Kricges, Leipsic, 1846; Supplement to Bitrck’s Marco Polo, Leipsic, 1846; Geschichte des Englischen Reiches in Asien, 2 vols., Leipsic, 1857 ; Ostasiatische Geschichte vom ersten Chinesischen Krieg bis 2. den Vertrdégen in Peking, 1840-60, Leipsic, 1861 ; translations from Armenian of the History of Vartan by Eliseus (London, 1830), and of Vahram’s Chronicle of the Armenian Kingdom in Cilicia (London, 1831); from the Chinese of the Catechism of the Shamans (London, 1831), and of

the History of the Pirates who infested the Chinese Scas from 1807 to 1810 (London, 1831); and from the Italian of the Versuch einer Geschichte der armenischen Literatur (Leipsic, 1833). Besides these works he published Lelrsaal des Mittelreiches, 1836 ; his Asiatische Studien, 1837 ; Die Volker des siidlichen Russlands in threr geschichtlichen Entwickelang, 1847, for the last of which papers he gained a prize from the French Institute.

NEU-MUNSTER, a town of Prussia, in the province of Schleswig-Holstein, district of Kiel, lies on both banks of the small river Schale, in the basin of the Stor. It is the centre of the railway system of Holstein, and after Altona the most important industrial town in the province, containing upwards of seventy cloth-factories, besides manufactories of cotton, wadding, carpets, paper, and bonbons. Its trade is also brisk. The name is derived from an Augustine monastery, founded by Vicelin, and mentioned as “Novum Monasterium” in a document of 1136. Its industrial importance began in the 17th century, when the cloth-workers of Segeberg, a town to the south-east, migrated to it. In 1880 it contained 11,623 inhabitants, almost exclusively Protestant.

NEUNKIRCHEN, or Oser-NEUNKIRCHEN, a small manufacturing town of Prussia, in the district of Treves and circle of Ottweiler, is situated on the Blies, 12 miles to the north-west of Saarbriicken. The principal industrial establishment is a huge iron-foundry, employing upwards of 2000 hands, and producing about 80,000 tons of manu- factured iron per annum; but there are also boiler- works, soap manufactories, and a brewery. It lies in an important coal-basin, in which about 4 niillion tons of coals, worth £1,500,000, are raised annually. The 14,647 inhabitants (1880) consist of Protestants and Roman Catholics in almost equal proportions.

NEURALGIA, literally nerve pain, is a term which is frequently employed both technically and popularly in a Somewhat loose manner, to describe pains the origin of

which is not clearly traceable. In its strict sense it denotes the existence of pain in some portion or through- out the whole of the distribution of a nerve without any distinctly recognizable structural change in the nerve or nerve

centres. This strict definition, if adhered to, how- ever, would not be applicable to a large number of cases of neuralgia; for it is well known that in not a few instances the pain is connected with some source of irrita- tion, by pressure or otherwise, in the course of the affected nerve ; and hence the word is generally used to indicate pain affecting a particular nerve or its branches from any cause. There are few ailments which give rise to greater human suffering than neuralgia, and some of the chief causes concerned in its production, or the conditions most frequently found associated with it, may be briefly alluded to.

It may be stated generally that neuralgia rarely occurs in the midst of good health. On the contrary its exist- ence usually betokens a depressed or enfeebled state. Constitutional conditions inherited or acquired are among the most powerful of the predisposing influences in the production of neuralgia. Thus it is often found to affect the hereditarily rheumatic or gouty. In weakened con- ditions of the system from improper or insufficient food, or as a result of any drain upon the body, or in anemia from any cause, and in certain disease poisons, such as syphilis or malaria, neuralgia is a frequent concomitant. Further, any strain upon the nervous system, such as mental overwork or anxiety, is a predisposing cause of recognized potency. Among the exciting causes of an attack of neuralgia by far the most common is exposure to cold and damp, which seems to excite irritation in a nerve already predisposed to suffer. But irritation may be pro- duced by numerous other causes besides this,—such as a decayed tooth, diseased bone, local inflammations in which nerves are implicated, by some source of pressure upon a nerve trunk, or by swelling of its sheath in its passage through a bony canal or at its exit upon the surface. Further, there would appear to be causes of a reflex character which are capable of setting up neuralgia at a distance, such as intestinal or uterine derangements. The practical importance of ascertaining the probable nature of the cause is obvious.

The pain of neuralgia is generally localized, but may come to extend beyond the immediate area of its first occurrence, It is usually of paroxysmal character, and not unfrequently periodic, occurring at a certain time of the day or night. It varies in intensity, being often of the most agonizing character, or less severe and more of a tingling kind. Various

forms of perverted nerve function may be found co-existing with or following neuralgia. Thus there may be hyperesthesia, anzesthesia, paralysis, or alterations of nutrition, such as wasting of muscles, whitening of the hair, &c. Attacks of neuralgia are liable to recur, particularly when the general health is low, and some persons unhappily continue to suffer from occasional attacks during the greater part of their lifetime.

The nature of the disease and its manifestations will be best understood by a reference to the forms in which neuralgia most commonly shows itself. These are facial neuralgia or tic douloureux, migraine (hemicrania or brow ague), intercostal neuralgia, and sciatica. Other forms, such as those affecting the neck, arm, &c., are described, but they are of less frequent occurrence.

Facial neuralgia, or tic douloureux, is one of the most common forms of neuralgia, and one of the most severe. It affects the great nerve of sensation of the face (fifth nerve), and may occur in one or more of the three divisions in which the nerve is distributed. It is usually confined to one side. Females suffer, on the whole,

more frequently than males, and adults or young persons more than children or the aged. Among the more prominent conditions asso-

ciated with it may be mentioned a low state of health as a result of previous disease, any drain upon the system (such as excessive menstruation, over-lactation, &c.), and, very specially, over-exertion of body or mind and mental anxiety. It is occasionally associated with epilepsy (Trousseau). The attack is often precipitated by the irritation of a decayed tooth or by exposure to cold air. When the first or upper division of the nerve is involved, the pain is mostly felt in the forehead and side of the head. It is usually of an in- tensely sharp, cutting, or burning character, either constant or with exacerbations, and often periodic, returning at a certain hour each day while the attack continues. Occasionally the paroxysms are of extreme violence, and are brought on by the slightest provoca- tion, such as a draught of cool air. The skin over the affected part is often red and swollen, and, even after the attack has abated, feels stiff and tender to the touch. In

this, as in all forms of neuralgia, there are certain localities where the pain is more intense, these ‘‘painful points,” as they are called, being for the most part in those places where the branches of the nerves emerge from bony eanals or pierce the fascia to ramify in the skin. Hence, in this form, the greater severity of the pain above the eye- brow and along the side of the nose. ‘There is also pain in the eyelid, redness of the eye, and flow of tears. When the second division of the nerve is affected the pain is chiefly in the cheek and upper jaw, the painful points being immediately below the lower eyelid, over the cheek bone, and about the upper lip. When the third division of the nerve suffers the pain affects the lower jaw, and the chief painful points are in front of the ear and about the ehin. As a result of this malady important nutritive disturbances may appear in the affected area, such as thickening of the tissues, falling out or blanching of hair, &c., as well as various alterations of sensibility. Attacks of tic douloureux, extremely distressing as they are, may recur oceasionally for years; and, although, by depriving the sufferer of sleep and interfering with the taking of food, they may in some measure impair the health, they rarely appear to lead to any scrious results.

Hemicrania, migraine, brow-ague, and sick headache are various terms employed to describe what appears to be another form of neuralgia, notwithstanding the opinion of some that it is a different kind of disease. The causes giving rise to it appear to be similar to those which bring about any of the forms of neuralgia. In some instances it would seem to be hereditary. It most frequently affects females, and generally occurs in carly life, tending to disappear as age advances, An attack may come on suddenly, but, in general, begins by a dull aching pain in the brow or temple, which steadily increases in severity and extent, but remains usually limited to one side of the head. It attains at times an extreme degree of violence, and is apt to be aggravated by movement, loud noises, or bright light. Accompanying the pain there is more or less of nausea, and when the attack reaches its height vomiting may occur, after which relief comes, especially if sleep supervene. An attack of this kind may last for a few hours or for a whole day, and after it is over the patient feels comparatively well. It may recur periodically, or, as is more common, at irregular intervals. During the paroxysms, or even preceding them, certain sensory disturbanees may be experienced, more especially affections of vision, such

as ocular spectra, hemiopia, diplopia, &c.; and there is also apt to be considerable mental depression.

Iniercostal neuralgia is pain affeeting the nerves which emerge from the spinal cord and run along the spaces between the ribs to the front of the body. This form of neuralgia affects the left side more than the right, is much more common in women than in men, and oceurs generally in enfeebled states of health, I+ might be mistaken for pleurisy or some inflammatory affection of the lungs; but the absence of any chest symptoms, its occurrence independently of the aets of respiration, and other considerations well establish the distinction. ~The specially painful points are ehiefly at the commencement of the nerve as it issues from the spinal canal, and at the extremities towards the front of the body, where it breaks up into filaments which ramify in the skin. This form of neuralgia is occasionally the preeursor of an attack of shingles (Herpes zoster) as well as a result of it.

Seiatica is another of the more eommon forms of neuralgia. It affects the great seiatie nerve which emerges from the pelvis and runs down the leg to the foot. It is in most instances traceable to exposure to cold or damp, to overuse of the limbs in walking, &c.; but there are many other possible causes, Any source of pressure upon the nerve within the pelvis, such as may be produced by a tumour or even by constipation of the bowels, may excite an attack of sciatica, It is often connected with a rheumatic or gouty con- stitution. In general the nerve of one side only is affected. The pain which is felt at first a little behind the hip-joint steadily increases in severity and extends along the course of the nerve and its branches in many instances as far as the toes. The specially painful points are about the knee and ankle joints ; besides which a feeling of numbness is experienced throughout the whole limb. In severe cases all movement of the limb aggravates the pain, and the patient is obliged to remain in bed. In prolonged attacks the

limb may waste and be drawn up and fixed in one position. Attacks of sciatica are often attended with great suffering, and are apt to be very intractable to treatment.

In the treatment of all forms of neuralgia it is of first importance to ascertain if possible whether any constitu- tional morbid condition is associated with the malady, for otherwise the most powerful and approved remedies will often fail. Thus, if evidence of rheumatism, gout, anzemia, &c., be present, treatment appropriatc to these conditions must be employed.

Of means available for the relief of the pain the number is so great that any detailed statement would be impossible in a general notice like the present. Only the more approved and potent remedial measures can be alluded to. The internal administration of narcotics and sedatives often succeeds in quelling the attack and procuring sleep. Among these the various preparations of opium, belladonna, henbane, chloral, croton-chloral, bromide of potassium, the bromide and chloride of ammonium, aconite, gelsemium, &ec., are most commonly employed ; but to many of them, such as opium and chloral, there exists the serious objec- tion of the risk of the acquisition of the habit of indulgence in them.

When the attack is periodic the administration of a large dose of quinine two or three hours previous to the usual time of the seizure will often mitigate, and may even pre- vent, the paroxysm. In migraine, caffein and its prepara- tions are recommended. Many topical applications are of great efficacy. The various liniments or ointments con- taining the preparations of opium, belladonna, or aconite rubbed into the aficcted part will often soothe the most severe local pain. An excellent sedative application is a lotion composed of equal parts of camphor and chloral painted or gently rubbed over the painful area, In many cases relief may be obtained by the hypodermic injection of morphia or atropia, by acupuncture, by blisters, or by counter-irritation with the button cautery.

The plan at one time resorted to of dividing or excising a portion of the affected nerve is now seldom employed, but the operation of nerve-stretching has been recently introduced, and in some forms of neuralgia, notably sciatica, is sometimes successful. It consists in cutting down upon and exposing the nerve, and in seizing hold and drawing upon it so as to stretch it. Such an opera- tion is obviously justifiable only in cases wherc other less severc measures have failed to give relief. The cmploy- ment of

electricity, either in the form of faradization or galvanism, has much to recommend it, and in long continued and intractable forms of neuralgia proves in many instances eminently serviceable. (J. 0, A.)

NEUROPTERA. See Inszots, vol. xiii. p. 151.

NEU-RUPPIN, the chief town of a circle in the district of Potsdam and province of Brandenburg, Prussia, lies on the west bank of a small lake (the Ruppiner See), 37 miles to the north-west of Berlin. The town, which was rebuilt after a destructive fire in 1787, contains three Protestant churches, a small' Roman Catholic church, and various educational and benevolent institutions. Its inhabitants are employed in the manufacture of cloth, starch, and machinery, iron-founding, and lithography. In 1880 they numbered 13,985. Important cattle and horse fairs are held here. The small town of Alt-Ruppin lies at the north end of the lake, and about 10 miles to the north is the chateau of Rheinsberg, where Frederick the Great spent his youth.

NEU-SANDEG, or Nzv-Sannzz (Polish, Vout Sécz), the chief town of a district in western Galicia, lies on the river Dunajec, about 45 miles to the south-east of Cracow. It contains a medieval chateau, a Gothic church of 1448, a Protestant church, a gymnasium, and several benevolent

institutions. In Alt-Sandec, a little to the south, at the confluence of the Poprad and Dunajec, is an old convent of Clarissine nuns, formerly one of the wealthiest in Poland. Sandec was founded by Wenzel, king of Poland and Bohemia, in 1294. It contains (1880) 11,185 inhabi- tants, most of whom are Protestants.

NEUSATZ (Hungarian, Uj Vidék; Servian, Nowisad), a royal free town of Hungary, in the province of Bacs, and the seat of a Greek non-united bishop, lies on the left bank of the Danube, opposite Peterwardein, with which it is connected by a bridge of boats. It is about 150 miles to the south of Pesth and 50 miles above Belgrade. The town is well built, and contains ten churches (Greek, Roman Catholic, and Protestant), a synagogue, a gymnasium, and a real-school. It is a steamboat station, and carries on a brisk trade in grain and fruit with Germany and Turkey. Nearly one half of

its 21,325 inhabitants (1880) are Serbs, the other half being made up of Magyars, Germans, and Jews; and it has recently become a sort of religious and literary centre for the Serbs of Hungary. Neusatz was founded in the middle of the 18th century, and was almost totally destroyed in 1849, when the insurgents made an ineffectual resistance here to the imperial troops under Jellachich. In the vicinity are the remains of an extensive Roman entrenchment.

NEUSOHL (Hungarian, Bestercze-Bdnya; Slavonic, Banska Bystrica), an ancient mining town of Hungary, the capital and see of the district of Sohl, is prettily situated at the confluence of the Gran and the Bistritz, in a fertile valley enclosed by lofty hills, 85 miles to the north of Pesth. It isa well-built town, with five suburbs, and contains a Roman Catholic cathedral, an imposing Protestant church, an old castle, two gymnasia, an episcopal seminary, a normal school, and several charitable institutions. The offices of the mining and other authorities of the district are large and handsome buildings. In 1880 Neusohl contained 7160 inhabitants, of mixed Magyar, Slavonic, and German descent. They are employed chiefly in the copper, lead, and silver mines of the vicinity, and in the various metallurgical occupations to which these give rise; but they also manufacture cloth, dye-stuffs, paper, beetroot sugar, &c. Mining has been carried on here since the 8th century, and has been pro- secuted with especial energy since the immigration of German miners in the 11th and 13th centuries. Neusohl was made a royal free town in 1255.

NEUSS, a busy manufacturing town. of Rhenish Prussia, lies 4 miles to the west of Diisseldorf and 14 miles from the west bank of the Rhine, with which it is con- nected by the Erft canal, uniting the Rhine and the Meuse. The chief building in the town is the church of St Quirinus, a remarkably fine example of the transition from the Round to the Pointed style; and there are four other Roman Catholic churches, a Protestant church, a gymnasium (containing a collection of Roman antiquities), and two lunatic asylums established in old convents. The site formerly occupied by fortifications is now laid out as a promenade encircling the town. Neuss is the chief place in the Rhenish province for the production of oil and meal, and it also carries on the manufacture of woollen stuffs, white goods, and paper, brick-making, iron-founding, and other industries too numerous to specify. Its

markets for cereals are among the most important in Prussia, and it is also the centre of a brisk trade in cattle, coals, building materials, and the products of its various manufactories. In 1880 it contained 17,495 inhabitants, of whom 16,077 were Roman Catholics.

Neuss, the Novestum of the Romans, frequently mentioned by Tacitus, formerly lay close to the Rhine, and was the natural centre of the district of which Diisseldorf has become the chief town,

Drusus, brother of the emperor Tiberius, threw a bridge across the IKhine here, and his name is preserved in the Drususthor, the lower half of which is of Roman masonry. In 1474-75 Charles the Bold of Burgundy besieged the town in vain for eleven weeks, during which he lost 10,000 men; but it was taken and sacked by Alexander Farnese in 1586.

NEUSTADT (Polish, Prudnik), a manufacturing town of Prussian Silesia, in the district of Oppelu, is situated on the river Prudnik or Prudnitz, 60 miles to the south-east of Breslau. It contains three Roman Catholic churches, a Protestant church, and a gymnasium. The chief industries are tanning, dyeing, and the manufacture of damask, table-linen, ticking, and woollen stuffs. In 1880 the population was 14,292, including 12,300 Roman Catholics. In 1745, 1760, and 1779 engagements between the Austrians and Prussians took place near Neustadt, which on the last occasion was bombarded and set on fire.

NEUSTADT, or Wiener-NEUSTADT, an important manufacturing town in Lower Austria, is situated between the Fischa and the Leitha, close to the Hungarian frontier, and 25 miles to the south of Vienna. It was almost entirely rebuilt after a destructive fire in 1834, and ranks among the handsomest provincial towns in Austria. Its ancient gates, walls, and towers have disappeared, but it still possesses a few medizeval edifices, the most important of which is the old castle of the dukes of Babenberg, founded in the 12th century, and converted by Maria Theresa into a military academy (400 to 500 pupils). The Gothic chapel contains the remains of the emperor Maximilian I., who was born here in 1459. The parish church, with its two lofty towers, is substantially a Romanesque building of the 13th century, but

the choir and transepts are Gothic additions of a later date. The late Gothic church of the old Cistercian abbey contains a handsome monument in memory of Eleonora of Portugal (d. 1467), consort of the emperor Frederick IV. The town-house is also a noteworthy building. The educa- tional and charitable institutions include a gymnasium, a real-school, a normal seminary, industrial, commercial, and musical schools, and three hospitals. The chief industrial establishment is an engine-factory, employing 2500 hands, and turning out 150 to 200 locomotives annually; but manufactures of cotton, silk, velvet, pottery, and paper, sugar-refining, and tanning are also extensively carried on. 'Trade is also brisk, and is facilitated by a canal connecting the town with Vienna, and used chiefly for the transport of coal and timber. The population in 1880 was 23,468, nearly all Roman Catholics.

Neustadt was founded in 1192, and was a favourite residence of numerous Austrian sovereigns, acquiring the title of the ''ever- faithful town" (die allezett getreue Stadt) from its unfailing loyalty. In 1246 it was the scene of a victory of the Hungarians over the Austrians ; and in 1486 it was taken by Matthew Corvinus, king of Hungary, who, however, restored it to Maximilian I. four years later. In 1529 and 1683 it was besieged by the Turks. It was at Neustadt that the emperor Rudolf IJ. granted to the Bohemian Protestants, in 1609, the '* Majestatsbrief," or patent of equal rights, the revocation of which helped to precipitate the Thirty Years' War. Compare Boheim, Chronik von Wiener-Neustadt.

NEUSTADT-AN-DER-HAARDT, a small manufactur- ing town in the Bavarian Palatinate, is picturesquely situated at the base of the Haardt mountains and the mouth of the valley of the Speyerbach, 14 miles to the east of Spires and the Rhine. The Protestant abbey- church, a fine Gothic edifice of 1354-1489, contains the tombs of several Counts Palatine. The other noteworthy buildings are the handsome Roman Catholic church, a modern Gothic structure ; the Saalbau, a large edifice for balls and concerts; the town-house, formerly a Jesuit college ; the old Latin school; the real-school; and the hospital. The chief industries are paper-making, straw-plaiting, distilling, and the manufacture of cloth, gold and silver plate, furniture, starch, and hats. A brisk trade is

carricd on in wood, grain, fruits, and wine, all of which | affluent of the Oder, about 70 miles to the north-east of

are produced extensively in the vicinity. Neustadt, which received its municipal charter in 1275, now contains (1880) 11,411 inhabitants, of whom 6987 are Protestants and 4028 Roman Catholics.

visitors.

NEUSTADT-EBERSWALDE, now officially named EBERSWALDE simply, is a manufacturing town of Prussia, province of Brandenburg, situated 28 miles to the north- west of Berlin, on a canal connecting the Oder and the Havel. It possesses a mineral spring, which has lately attracted numerous summer visitors, but its chief import- ance arises from its various industries, which include iron- founding and the making of horseshoe nails, roofing material (Dachpappe, a kind of thick pasteboard), and bricks. A considerable trade is carried on in grain, wood, and coals. In the immediate vicinity are one of the chief brass-foundries in Germany and an extensive Government paper-mill, in which the paper for the notes of the national bank (Jeeichsbank) is manufactured. The town contains no noteworthy buildings except the large lunatic asylum for the province, and the school of forestry, which is attended by students from all parts of Germany. There are two Protestant churches, a Roman Catholic church, and a synagogue. In 1880 the population was 11,524, including 436 Roman Catholics and 171 Jews.

Neustadt-Eberswalde received its municipal charter in 1237, and was taken and sacked during the Thirty Years' War. In 1747 Frederick the Great brought a colony of Thuringian entlers to the town, but this branch of industry has entirely died out. About 4 miles to the north lies the old Cistercian monastery of Chorin, the fine Gothic church of which contains the tombs of several iargraves of Brandenburg.

NEU-STETTIN, a inanufacturing town of Prussia, in the province of Pomerania and district of Késlin, lies on the small Streitzig lake, 90 miles to the north-east of Stettin. Its industries are iron-founding, dyeing, brewing, and the manufacture of machinery and matches. The inhabitants also practise cattle-rearing and agriculture, and carry on a trade in grain, timber, and spirits. Neu-Stettin was founded in 1312, and contains (1880) 8604 inhabi- tants, the bulk of whom are Lutherans and Irvingites. It is the seat of a gymnasium.

NEU-STRELITZ, the capital of the grand-duchy of Mecklenburg-Strelitz, is charmingly situated between two small lakes, 60 miles to the north of Berlin. It igs well

which converge on a spacious market-place, adorned with a statue of Duke George (d. 1860). The ducal residence is a handsome edifice in a pseudo-Classical style, with a

library of 70,000 volumes, and collections of coins and |

antiquities. Attached to it are a fine garden and park. The other chief buildings are the three churches, the Carolinum (a large hospital), the town-house, the barracks, the gymnasium, and the real-school. In 1880 the town contained 9407 inhabitants, chiefly Protestants. They are supported partly by ministering to the wants of the court, and partly by the manufacture of iron wares, machinery, cloth, pottery, oil, and mineral waters. Its trade, chicfly in corn, meal, and timber, is facilitated by a canal connect- ing the town with the Havel and the Elbe.

About 14 miles to the south lies Alt-Strelitz, the old capital of the duchy, a small town with (1880) 3336 inhabitants, employed in the manufacture of tobacco, leather, wax candles, and wadding. Neu-Strelitz was not founded till 1733. In the vicinity is the

chateau of Hohen-Zieritz, where Queen Louise of Prussia died in

1810.

NEUSTRIA. See Francs, vol. ix. p. 530. NEU-TITSCHEIN (Czech, Novy Jicin), a small but thriving town of Moravia, is picturesquely situated on an

It is one of the centres | of the Rhenish ““grape-cure,” which attracts numerous |

Brinn. It is the chief place in the Kuhlandchen, a fertile valley peopled by German settlers, who rear cattle and cultivate flax. At Neu-Titschein manufactures of woollen cloth, flannel, hats, carriages, and tobacco are carried on ; and it is also the centre of a brisk trade. The town was founded in 1311. It contains (1880) 10,274 inhabitants, almost entirely of German descent.

NEUTRA (Hungarian, Vyitra), the chief town of a district and bishopric of the same name in Hungary, is situated on the river Neutra, 90 miles to the east of Vienna. It lies partly on the slope of a hill, which is strongly fortified, and crowned with the episcopal chateau and the ancient and modern cathedrals. The town also con- tains three convents, a theological seminary, a gymnasium, and two hospitals, and carries on manufactures of vinegar, spirits, and liqueurs. Its grain-markets are important. Neutra has lagged far behind most Hungarian towns in the march of improvement, and a recent visitor describes its internal economy as on a par with that of Bokhara and other towns in Central Asia. The population in 1880 was

8650.

Neutra is one of the oldest towns in Hungary, and is said to have been the seat of a bishop in the 4th century, when in possession of

the Marcomanni. The present and historically authenticated line of bisliops dates from 1130.

NEUTRALITY. See Internationa Law, vol. xiii. p. 195, and Sa Laws.

NEUWIED, the chief town of a circle in the district of Coblentz, Rhenish Prussia, and the capital of the mediatized countship of Wied, is pleasantly situated on the right bank of the Rhine, 8 miles below Coblentz. The principal edifice in the well-built town is the handsome chateau of the

princes of Wied, containing a collection of Roman antiquities, most of which were found in the neighbour- hood. The inhabitants—including Lutherans, Roman Catholics, Moravian Brethren, Baptists, and Jews—are noted for their industry. The chief products are starch and sugar made from potatoes, tobacco and cigars, chicory, and enamelled-tin wares. A brisk trade is carried on both by rail and river. In the vicinity are several large iron- foundries. Population in 1880, 9656. The schools of Neuwied enjoy a high reputation, and attract numerous pupils from England.

Neuwied was founded by Count Frederick of Wied in 1683, on the site of a village destroyed during the Thirty Years' War, and

ee é idly i ased owing to the toleration ¢ ded to all religi and regularly built in the form of a star, the eight rays of | hic we. toc. 6

sects without distinction. Among those who sought refuge here was a colony of Moravian BRETHREN (¢.v.), who now number 500 to 600 souls, and occupy a separate quarter of the town, where they carry on manufactures of porcelain stoves and deerskin gloves. Near Neuwied one of the largest Roman castles on the Rhine has been excavated, yielding numerous interesting antiquities. In 1797 the French, under General Hoche, defeated the Austrians near Neuwied,—thcir first decisive success in the revolutionary wars. NEVA, a river of Russia which carries off into the Gulf of Finland the waters of Lakes Ladoga, Onega, and Ilmen and many smaller basins. It issues from the south-west corner of Lake Ladoga in two channels which form the island of Oriekhoff, and are obstructed by sandstone reefs, so that the better of the two has a depth of only from 7 to 16 feet in its fairway. A little farther down it becomes completely navigable, and in the neighbourhood of the island of St Nicholas it attains a breadth of 4200 feet; but between the village of Ostrovkoff and that of Ust- Tosnui (Tosna-mouth) it passes over a limestone bed which, lying only from 2 to 12 feet below the surface, produces a series of rapids, and reduces the width of the river to from 1050 to 840 and that of the navigable passage to from 350 to 175 feet. From Ust-Tosnui downwards there is no further obstacle. Nine or ten miles from its outfall the

outlying spur of the Carpathians, on the Titsch, an | Tiver enters St Petersburg, and then 5 or 6 miles lower down

breaks up into the Great Neva (850 to 1700 feet wide), the Little Neva (945 to 1365), and the Great Nevka (280 to 1205), this last, two miles farther on, sending off the Little Nevka (370 to 1129). In front of the delta are sandbanks and rocks which prevent the passage of vessels except by five narrow channels, of which the best has a depth of 7 to 20 feet. The most of its alluvial burden being deposited in the lakes, the Neva takes a long time to alter its channels or extend its delta: an accession of 1570 acres was all that was registered between 1718 and 1834. According to Destrem the current above the delta is 114,659,529 cubic feet per minute, a mass of water greater than that of the Rhone or the Rhine. The ordinary rise and fall of the river 1s comparatively slight, but when the west wind blows steadily for a long time, or when Lake Ladoga sends down its vast accumulations of block-ice, inunda- tions of a dangerous kind occur. In 1824 and 1879 the former cause produced a rise of more than 12 feet. According to observations extending from 1703 to 1879, the mean day of the freezing of the Neva is November 25, the earliest October 28 (1805), the latest (not quite certain) January 9 (1711), and the next latest December 26 (1826). The mean day of opening is April 21, the earliest March 18 (1822), and the latest May 12 (1810). The mean number of days open is 218, the least 172 (1852), the greatest 279 (1822).

NEVADA, one of the most western of the States of the American Union, was formed from a portion of the territory acquired by the United States from Mexico by the treaty of Guadalupe Hidalgo. The boundary line commences in the centre of the Colorado river, where the 35th parallel of north latitude crosses that stream (near Fort Mojave) ; thence it runs in a direct north-westerly line to the point where the 39th parallel of north latitude intersects the 120th degree of longitude west from Greenwich (near the centre of Lake Tahoe), thence north on that meridian to the 42d parallel of latitude, thence east on that parallel to the 37th meridian west of Washington, thence south on that meridian to the Colorado river and down that stream to the place of beginning, enclosing an area of 110,700 square miles. The State is bounded on the 8. and W. by California, N. by Oregon

and Idaho, and E. by Utah and Arizona. At the time of the discovery of the silver mines (1858-59) what is now the State of Nevada was a part of Utah. By Act of Congress of March 2, 1861, Nevada became a Territory ; and, with a modification of its bound- aries, it was admitted as a State on October 31, 1864.

By the upheaval in past ages of the Rocky Mountains and the Sierra Nevada, there was enclosed an ancient sea, several hundred thousand square miles in extent. The draining off and evaporation of the waters so enclosed left an immense plateau, having a general elevation of 4000 to 6000 feet above the present sea-level. Although this table- land is spoken of as a "basin," yet throughout its whole extent it is traversed by ranges of mountains rising from 1000 to 8000 feet above the general surface, and having the same northward and southward trend as the Sierra Nevada and the Rocky Mountains. The surface of the country as a whole presents a very barren, rocky, and mountainous appearance, yet between the parallel ranges are valleys from 5 to 20 miles in width, all having about the same altitude above the sea. Where traversed by rivers or creeks these contain considerable areas of arable land, the amounts usually being proportionate to the size of the streams. They are timberless, except for a few cotton-wood trees found along the rivers. Upon the mountains the quantity of timber depends upon the altitude. The lower ranges are bare, or contain only a scanty growth of pifion, cedar, or mountain mahogany, of very little economic importance. Several of the higher

ranges contain small bodies of valuable timber, while the eastern slope of the Sierra Nevada is well-clothed with forests of conifers, which have proved of inestimable value to the people of the State.

The river system is peculiar, only two of the streams of the State finding their way to the sea: the Owyhee, which rises in the northern part, empties into the Snake, and thence passes through the Columbia river to the Pacific Ocean ; and the Colorado river, on the southern bound- ary, flows into the Gulf of California. All the other streams either sink in the sand of the interior valleys or terminate in lakes that have no outlet. The Humboldt river, about 300 miles long, empties into Humboldt Lake or "Sink";

Truckee river, which drains Lakes Tahoe and Donner (in the Sierra Nevada), after a course of 125 milcs, falls into Pyramid and Winnemucca Lakes. Walker river, 100 miles long, rises in the Sierra and discharges into Walker Lake; Carson river, 180 miles long, also rises in the Sierra Nevada, and empties into the “Sink of the Carson” or Carson Lake. Reese river rises in the Toyabe Range (within the basin region), and after a course of about 150 miles disappears in the sand; Quinn river, in the northern part of the State, after a course of 80 miles, similarly disappears in the soil; the Amargosa (bitter) river, in the southern part of the State, is 150 miles long, and, after sinking and rising several times, finally loses itself in the sands of Death Valley just over the line in California. Such of the creeks as are not tributaries of the rivers either sink in the sandy plains or end in small pools. Most of the lakes are merely sinks for the scanty streams. Of these, as already mentioned, are Humboldt, Pyramid, Winnemucca, Walker, and Carson Lakes, which, with the beautiful Lake Tahoe in the Sierra Nevada, com- plete the enumeration of the bodies of water of any con- siderable magnitude in the State. In many places on the sides of the mountain ranges are to be seen well-defined water-lines of the ancient sea or of extinct lakes, indicating a far greater extension of water surface and a much moister climate than at present. Hot springs, many of which have medicinal virtues, are found in all parts of Nevada. The most noted are the Steamboat Springs, in Washoe Valley, on the line of the Virginia and Truckee Railroad.

The climate of Nevada is characterized primarily by its extreme aridity. The air currents from the Pacific are thoroughly drained of their moisture before reaching the borders of the Great Basin, and pass over it as dry winds. In the southern part of the State, wherc the elevation above sea is least and the temperature highest, the rain- fall averages not more than 5 inches per annum, while evaporation is extremely rapid. In the northern part the rainfall is greater, averaging not far from 15 inches in many localities. Nowhere, however, is it sufficient for the needs of agriculture, and consequently irrigation has to be universally resorted to. The mean annual temperature in the habitable portions of the State ranges from 70° Fahr. in the south to 45° in the north. This, however, expresses but a part of the conditions of temperature. The range between summer and winter, and between day and night, is very great. At several meteorological stations in the State the maximum temperature is quoted at from 100° to 111° Fahr.,

while the minimum temperature ranges as low as —23° Fahr. The temperature varies greatly according to altitude. In the lower valleys snow seldom les more than a day or two in winter. The weather in winter as a rule is dry, bright, and pleasant. In summer the nights are everywhere delightfully cool.

Rivers, lakes, and. springs.

Climate.

The fauna of the State is poor, and illustrates, with Fauna

the flora, the aridity of the climate. and rabbits are perhaps the most abundant animals, as they certainly are the most characteristic. In the more

Coyotes, badgers, 24

ora.

Geology.

Minerals,

Agricul- «ture.

northern valleys are to be found, in the winter, herds of antelope, and occasionally a few deer and elk. In the Sierra, except where driven away by the encroachments of civilization, large game, consisting of elk, deer, and black and grizzly bears, are still to be found in greater or less abundance. The flora is also scanty, and is characterized by Artemisia, so that Nevada is often nicknamed the “Sage-brush ” State. In the southern valleys even this fails, and the sterility is relieved by little save Yucca and various species of Cactus. In the northern valleys, and particularly upon the lower mountains and hills, the bunch grasses replace Artemisia to a considerable extent, although not sufficiently to give the interest of meat-production great prominence in the State.

Nevada offers an attractive field of study for the geologist, not only ou account of its great wealth of precious metals, but because of the great complexity of geological phenomena there presented. The valleys are everywhere covered to a great depth with most recent deposits, out of which rise the ranges, as long, narrow islands from the sea. These ranges bring to the surface rocks of all the geologic ages, even to the Azoic, while here and there are intrusions of volcanic rock. In the north-western part of the State the great lava field of southern Oregon has overflowed the State boundary, and extends over a considerable area.

The State is rich in mineral productions of all kinds. Silver is, however, the leading mineral product, and the mines of the Comstock at Virginia City and Gold Hill have been among the richest in the world. Since the discovery in 1859 these mines have yielded over $200,000,000 in silver and gold, and the product of the whole State hitherto has been about $300,000,000. Two mines alone on the Comstock, the California and the Consolidated Virginia (known as the bonanza mines), have yielded over $130,000, 000 in silver and gold,—the bullion of the Comstock being about one-third gold and two-thirds silver. The rich deposits of the vein, known as ‘‘bonanzas,” have, however, now been ex- hausted as far as discovered, and since 1880 the yield from the Comstock lode has been light. Explorations, however, are actively continued. In the Yellow Jack and Belcher mines the workings have reached a depth of 3000 feet, and in the Ophir and Mexican mines they are drifting at a point 3100 feet below the surface, the greatest depth to which mining operations have been carried any- where on the American continent. At these great depths the lode is found to diminish neither in width nor strength of formation. The heat of the rock is intense in these levels, and it is possible for men to work only for very short periods, requiring frequent shifts. The Sutro tunnel, over 20,000 feet in length, drains all the leading mines of the lode to a depth of 1600 feet, thus saving much pump- ing. There are millions of tons of low-grade ore in the many inines of the Comstock which will be mined at no distant day, but which cannot be profitably worked at the present high rates of wages (miners get $4 per day) and great cost of transportation and reduction. In the eastern part of the State, at Eureka and several other points, are mines which produce smelting ores con- taining too much lead to be worked by mill process, as are the free chloride and sulphuret ores of the Comstock. Many

of these ‘*base metal veins,” as they are called by the miners, are very rich in silver, have been profitably worked for several years, and are still yielding well. The mineral production of Nevada for the year 1882 was reported by Wells, Fargo, & Co. to be:—gold dust and bullion, $752,506; silver bullion, $6,588,028; ores and base bullion, $3, 022,847—imaking a total of $10,368,376. All the interior ranges of mountains in the State contain veins producing gold, silver, copper, lead, and antimony in paying quantities, but as yet little mining has been done except for gold and silver. The many rich mines of copper have scarcely been touched. Besides the metals mentioned, there are found within the borders of Nevada iron, platinum, zinc, nickel, cobalt, quicksilver, lignite, gypsum, kaolin, beds of pure sulphur, and in the plains and marshes deposits of pure salt, carbonate of soda, borax, nitrate of potash, and other minerals of a similar nature.

While Nevada is not a country to attract the farmer, there is still a considerable amount of arable land within its borders. At present there are under cultivation only about 344,423 acres, Wherever water for irrigation can be procured good crops of most kinds of grain, hay, and vegetables may be grown. It has been estimated that by a full utilization of the streams for irrigation possibly 8 per cent. of the area of the State can be bronght into cultivation ; of this (some 2,000,000 acres) only about one-sixth has as yet been reduced to the service of man. It is not probable, however, that Nevada will ever attain to a high rank as an agricul- tural State. The principal products during the census year 1880 were—barley, 518,470 bushels; oats, 186,860 bushels; wheat, 69,298 bushels ; wool, 655,012 tb; hay, 95,853 tons; and potatoes,

302,143 bushels. The grazing interest is not, and probably never will be, a very extensive onc. The following figures give the amount of live stock in the State :—horses, 32,087 ; cattle, 172,212; sheep, 188,695.

The manufacturing interests of Nevada are not extensive, and Manu- are confined mainly to the smelting and reduction of ores. facture, There are several railroads. The Central Pacifie crosses the Rail. whole State, and has within its limits a length of 452 miles; the ways, Virginia and Truckee runs from Reno, on the Central Pacific, through Carson to Virginia City, and is 52 mileslong; the Carson and Colorado leaves the Virginia and Truckee

near Virginia City, and running southward through the State taps a rich and extensive mineral and agricultural region. his road is now completed to Benton, California, 193 miles, and will eventually connect with the Southern Pacific at Mojave, California. The Nevada Central, 93 miles in length, connects the towns of Austin and Battle Mountain ; and the Eureka and Palisade, 20 miles long, connects the places named. There are several shorter lines completed, and a

considerable number projected.

There are in the State 185 common schools, 12 high schools, and Educa- a State nniversity at the town of Elko. In all the large towns are tion. churches of the leading religious denominations, and many of the Churches, church edifices are fine and costly structures. Thirty-seven news- News- papers are published, the majority being dailies. papers.

The returns of the tenth census place the assessed valuation of Property, the real estate of Nevada at $17,941,080, and the personal property at $11,350,429, a total of $29,291,459. The true valuation is estimated at $69,000,000 in 1880.

The State government is similar to that of the majority of the Govern- western States. Nevada has two representatives in the United ment, States senate and one in the house of representatives.

The first settlement in Nevada was made at Genoa, at the foot History, of the Sierra Nevada, in 1850, though as carly as 1848 the Mormons, travelling between Salt Lake and California, had established a temporary camp at that place. The Mormons made two or three small settlements in the valleys along the base of the Sierra, and until 1859, when the silver mines of the Comstock were discovered, they were the principal white inhabitants. The discovery of silver caused great crowds of miners of all nationalities to pour over the Sierra Nevada from California, and in that year and 1860 several towns were laid out and rapidly built up. In a few years new mineral belts were discovered to the eastward, and soon there were founded many interior towns and camps.

In 1870 the population was 42,491. In 1880 it had increased to Popula-

62,266 (1 to 13 square miles), a gain of 46°5 per cent. In 1888 tion, it had not greatly increased over the number in 1880. The population shows a great disproportion of males, as is every- where the case on the frontier, especially ina mining region. Of the total number 42,019 were males and 20,247 females. There was also a disproportionately large number of the foreign born, 36,613 being natives and 25,653 foreigners. With the Pacific coast States, Nevada has received a comparatively large accession of Chinese, these numbering 5416, or more than one-eighth of the whole population of the State. The main body of the population is con- gregated in the extreme western portion of the State, in Storey and the adjacent counties. A second but much smaller body of popu- lation is abont Eureka. The balance is dispersed very sparsely. The population of the principal towns in 1880 was as follows :— Carson City, the capital of the State, 4229; Eurcka, 4207; Virginia City, 10,917; Gold Hill, 4531; Reno, 1802. The population is now (1883) about the same for all these towns except Reno, which has probably 3000 inhabitants. There are several other towns and camps containing from 300 to 1000 inhabitants. There are com- paratively few Indians in the State, and these, known as Pah Utes or Diggers and Shoshones, are theoretically upon reservations in the western part. Their number is estimated by the Indian office at 3377. ‘They are, as a class, both mentally and physically below the average of the North American tribes. (W. WR.)

NEVERS, ~~a city of France, chief town of the depart~~ ment of Niévre, and formerly capital of the countship of Nevers or Nivernais, is picturesquely situated at a height of 656 feet above the sea, on a hill commanding the right bank of the Loire at the confluence of the Niévre, 158 miles south-south-east of Paris by the railway to Nimes. It is the see of a bishop, and has a fine cathedral, which, dating from the 12th and 14th centuries, but at present (1883) undergoing a complete restoration, is mainly not- able for the fact that there is an apse above the crypt and another at the opposite end of the building. To the north of the nave rises a massive but highly-decorated tower. Of higher architectural interest as a remarkable specimen of the Romanesque style of Auvergne is the church of St Etienne, consecrated at the close of the 11th

century, and belonging to an abbey affiliated to Cluny. The ducal palace at Nevers (now occupied by the courts of justice and a ceramic museum) was built in 1475 by J. de Clamecy, count of Nevers, and is one of the principal feudal edifices in central France. A middle tower, con- taining the great staircase, has its windows adorned by sculptures relating to the history of the house of Cleves. In front of the palace lies a wide open space with a fine view over the valley of the Loire. The Porte de Croux, dating from the end of the 14th century, is the only remnant of the old fortifications ; it now contains a collec- tion of sculptured stones and some Roman antiquities. The modern triumphal arch (18th century), the town- house and library, the almshouses, and the mother-house of the Nevers sisters of charity may also be mentioned. The Loire is crossed by a fine stone bridge of fifteen arches, and a cast-iron railway bridge. Up to 1880 there was at Nevers a navy cannon foundry which, furnished with eight blast-furnaces capable of melting 40 tons at once, used to turn out 250 pieces per annum. It has now been com- bined with the foundry at Ruelle (Charente); and the works are transformed into a practical school for such branches as boiler-making and engine-fitting. The town also contains private engineering establishments, potteries and porcelain works, chemical works, pit-cable factories, file-works, oil-works, tanneries, and wool-spinning iaills. Commercially it has the advantage of being a large railway junction, communicating with Paris and Orleans by Gien, with Bourges, Moulins, and Dijon by Chagny, and with Auxerre by Clamecy. Population in 1881, 23,846.

Noviodunum, or (later) Nevirnum, derived its name from two Cel- tic words nov, a river, and dun, a hill. The quantities of medals and other Roman antiquities found on the site indicate the import- auce of the place at the time when Czsar chose it as a military depot for com, money, and hostages. It had counts of its own as carly as 987, and obtained a charter in 1194. Subject for a time to the dukes of Burgundy, it next passed to the German house of Cleves. In 1588 Francis I. erected the Nivernais into a ducal peerage, which, beeoming in 1565 the property of the Gonzaga of Mantua, was purchased from them by Cardinal Mazarin, and remained in his family till the Revolution. For a short time in the 14th century the town was the seat of a university, afterwards transferred to Orleans.

NEVIANSK (Neviansxiy, or NEIVINSKIY Zavop), a town of Russia, in the government of Perm, 62 mules to the north-north-west of Ekaterinburg, is situated on the eastern slope of the Ural mountains, in the populous valley of the Neiva, surrounded by mountains composed of talc and chlorite schists and granites, in a district very rich in iron and also in auriferous sands. The population in 1881 numbered 13,980 (17,950 with its suburb, the Byngovskiy iron-work), all Great-Russians, and mostly Nonconformists (edinovyertsy), of whom about 3000 are employed at the iron-works, while the others carry on various small trades, such as the manufacture of boxes widely sold in Siberia, small iron-wares, and boots, or engage in agriculture. merchants of the town carry on an active trade, and its fairs are very animated. The iron industry produced in 1879 96,000 ewts. of cast iron and 45,000 cwts. of

ao iron, and the average yearly yield of gold is about 00 tb.

The iron-work at Neviansk is the oldest on the Ural, having been founded in 1699. In 1702 Peter I. presented it to Demidott, with 3,900,000 acres of land around it, of which 522,000 acres, besides 60,000 acres of forest, still belong to the present proprietors of the works, the merchants Yakovleffs. Five iron-mines, seven gold- washings, and two iron-works are its dependencies. Several other important iron-works are situated within short distances of Neviansk, on the Neiva river, and are usually comprised under the sane name of Neivinsk iron-works, the chief being Verkhne-Neivinsk (Upper Neivinsk), situated 14 miles to the south (3960 inhabitants); Neivo-Rudyansk, 8 miles to the south (4020); Petrokamensk, 32 miles to the north-east (2200) ; Neivo-Shaytansk, 8 miles lower down the Neiva (3000) ; and Neivo-Alapaevsk (6000).

The

NEVIS, an island in the Federated Leeward group, British West Indies, in 17° 14’ N. lat. and 62° 33’ W. long,, separated from St Christopher by a shallow strait 2 miles broad at the narrowest. It is a mountain rising gradually to a height of 3200 feet, the lower portion being cultivable; the total area is about 32,000 acres. The climate is healthy, the average height

of the thermometer being 82° Fahr. Discovered by Columbus in 1498, and colonized by the English in 1628, it now forms one pre- sidency with St Christopher, with one legislative council (meeting in St Kitts) of ten official and ten unofficial mem- bers, all nominated by the crown, Nevis sending three of the unofficial members. The revenue in 1882 was £9285, and the expenditure £8465. Its exports of sugar in the four years from 1879 to 1882 respectively were 3500, 1600, 1700, and 4000 tons,—the total exports in 1881 being £38,672, and in 1882 £75,000. The population is 11,864; the capital is Charlestown, on the shore of a wide bay on the south-west side of the island.

NEW ALBANY, a flourishing manufacturing city of the United States, in Floyd county, Indiana, occupies a good position on the left bank of the Ohio, nearly opposite the west end of Louisville, 156 miles below Cincinnati. It is handsomely built, with wide and well-shaded streets, and among its public edifices are a city-hall , a court-house, an opera-house capable of containing 2500 persons, a masonic hall, and an oddfellows' hall. Abundant water- power is obtained from the falls about two miles up the river. Besides the glass-works, which rank as the largest in the United States, the industrial establishments com- prise foundries, pork-packing factories, boatbuilding yards, rolling mills, cotton and woollen mills, and hosiery mills. Laid out in 1813, and incorporated as a city in 1839, New Albany increased its population from 4226 in 1840 to 16,423 in 1880, and is still rapidly growing.

NEWARK (or in full Newarx-upon-TRENT), a muni- cipal and parliamentary borough and market-town of Nottinghamshire, England, is situated in the midst of a flat but highly cultivated country, near the Trent, on the river Devon, and on the Great Northern and Nottingham and Lincoln Railways, 120 miles north of London, and 19 east of Nottingham. By means of a canal 14 miles in length it is connected with the Trent navigation. The town is well built, with wide but irregular streets, which diverge from the market-place. The church of St Mary Magdalene, one of the largest and finest parish churches of England, is specially notable for the beauty of the tower and of the octagonal spire (223 feet high) by which it is surmounted. The central piers of the old church, dating from the 11th or 12th century, still remain, and the lower part of the tower is a fine example of Early

English when at its best. The upper parts of the tower and spire were completed about 1350, the nave between 1384 and 1393, and the chancel in 1489. The sanctuary is bounded on the south and north by two chauntry chapels, the former of which has on one of its panels a remarkable painting from the Dance of Death. There are a few old monuments, and an exceedingly fine brass of the 14th century. The castle, supposed to have been founded by Egbert, king of the West Saxons, was partly rebuilt and greatly extended by Alexander, consecrated bishop of Lincoln in 1123, who established at ita mint. The castle from its position and its great strength was for a long time known as the "key of the North." Of the original Norman stronghold the most important remains are the gate-house and the lofty rectangular tower at the south-west angle. The building geems to have been reconstructed in the early part of the 13th century. In the reign of Edward III. it was used as a state prison. During the civil war it was garrisoned for the king, and endured three sieges. Its dismantling

was commenced 11th May 1646. There isa very beautiful and interesting cross (the "' Beaumond" cross) of the latter part of the 15th century in good preservation in the town. A grammar and song school was founded in the reign of Henry VIII, and endowed by Archdeacon Magnus. The other principal public buildings are the town-hall in the Grecian style (erected in 1774), the corn exchange (1848), the Stock library and Middleton newsroom (1828), the mechanics' institution (1836), the new hospital (1881, a very fine building) Two elegant buildings—a coffee palace and a free library—were given to the town in 1882. By means of the Trent navigation Newark carries on a large trade in coal, corn, and cattle. The manufacture of malt is by far the chief source of wealth in the town. There are iron and brass foundries, boiler-works, agricultural implement manufactories, and breweries. Gypsum and limestone are obtained in the neighbourhood, and plaster of Paris is extensively manufactured. The population of the municipal and parliamentary borough (area 1933 acres) in 1871 was 12,195, which in 1881 had increased to 14,018.

From the large number of Roman remains found in the neigh- bourhood, from traces of ditehes, and from supposed portions of Roman buildings that still exist, some antiquarlans suppose that Newark was an important Roman station built to proteet the navigation of the Trent, and identify it with the British Ael Tavum, the Roman Eltavona, and the Saxon Sidnaecester, whieh was an episcopal see of Mereia. The balance of probability seems, however, to favour the opinion that Sidnacester was situated in Lincolnshire. The first authentic notiee of Newark is during the Saxon heptarchy. The town was partly destroyed by the Danes, but during the reign of Edward the Confessor it was rebuilt. By Leofric, earl of Mereia, the manor of Newark was bestowed upon the monastery of Stow, near Lincoln. The eastle and manor were eonveyed to the erown by Henry Holbeaeh, bishop of Lincoln, in the reign of Edward VI., by whom the town was ineorporated in 1549. It was ereated a mayoralty by Charles II. in 1625. It is supposed to have sent members to parliament in the reign of Edward VI., but it is not known how long the privilege had been in abeyance when it was restored by Charles II. in 1625, from whieh time it has returned two members. Newark is the birthplaee of Bishop Warburton; David Hartley taught in its grammar sehool ; and the first volume of Lord Byron's poems was printed by Ridge, a Newark bookseller.

Of the various histories of Newark the most recent is the beautiful and elabo- rate volume by Cornelius Brown, Annals of Newark-upon-T rent, 1879.

NEWARK, the principal city of the State of New Jersey, United States, is situated in Egsex county, on the west bank of the Passaic river, 4 miles above Newark Bay, and covers an area of about 18 square miles. The original site was a crescent-shaped ridge, or double chain of low hills, extending from north-east to south-west, now much changed by levelling and cutting. The main part of the city is on the lower ground which stretches east and south towards the Newark and Hackensack Meadows (salt marshes). The surface is, in general, well adapted for drainage and sewage. The climate is mild, tempered by the proximity of Newark Bay and the Atlantic (12 miles dis- tant), and the place bears a good reputation for healthfu- ness. The water-supply comes from the Passaic. There are about 130 miles of streets, generally wide and well-shaded, one-fifth of which are

paved. The principal thoroughfare, Broad Street (120 feet wide), is lined throughout a good part of its length with fine old elms, and where not occupied by business premises is fronted by numerous handsome residences. There are several small parks, the principal of which are Military and Washington Parks, bordering on Broad Street. The public buildings are for the most part unsightly and unsuitable; on the other hand, the city is not overburdened by debt or by heavy taxation.

Notwithstanding that the central portion of Newark is but 9 miles distant from the general post-office in New York city,—being considerably nearer that point than are the northern portions of New York city proper—Newark has more the character of an independent city than a

suburb. This it owes in part to its situation within another State, but still more to its independent and dis- tinctive manufacturing interests. Even prior to 1872 it was called “the Birmingham of America.” In that year a very successful exhibition, consisting of the manufac- tures of Newark, greatly stimulated the investment of capital.

The United States census of 1880 gives the following

statistics of manufactures for Newark :-— pr ere ee tee ee ee ee

No. of Capital Wages Total Persons Employed, Indus- ite ad Paid Value of tries, : Annually. Products. | Males.

Females.| Children.

2,649

1,819 | $25,679,885 | $13,171,339 | $69,252,705 | 22,151| 5,246

The principal industries are—jewellery, tanning and currying, celluloid (a substitute for ivory, coral, &c.) and celluloid goods, hat-making, boot and shoe making, trunk and valise making, saddlery hardware, harness-making, breweries (mostly lager beer) and malt-houses, building, carriage and waggon making, clothing, chemical works, cigar and tobacco factories, edge tools, hammers, «c., cabinetmaking, and iron and steel works. There

are algo large cotton, woollen, and silk-thread factories, and an ex- tensive sewing-machine factory, together employing about 3000 hands.

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The shipping facilities of Newark are abundant, and four great trunk lines of railroad—the Pennsylvania, the New York, Lake Erie, and Western, the Delaware, Lacka- wanna, and Western, and the Central Railroad of New Jersey (Reading Railroad)—give ready communication with all parts of the United States, and with the steam- ship lines at Jersey City and in New York. Newark is intersected by the Morris Canal, and has considerable coasting trade by way of the Passaic river. The city has 112 churches and missions :—Presbyterian, 23; Reformed Presbyterian, 1; United Presbyterian, 1 ; Congregational, 2; Reformed Dutch, 9; Baptist, 13; Episcopal, 12; Episcopal Reformed, 1; Methodist, 22; Lutheran, 4; Roman Catholic, 11; Jewish synagogues, 3; besides Bethel, Universalist, Unitarian, Independent Catholic, and

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other independent churches. It has an admirable free public school system. There are three well-appointed hospitals. The city has six daily newspapers, four English and two German, besides two Sunday morning newspapers and a weekly German paper.

In 1810 the population of Newark was 6000 ; in 1836, when the town became a city, it was 19,732; in 1840 it was 17,290, shortly after which began a stream of immigration which has continucd almost uninterruptedly since. In 1850 the population had more than doubled, reaching 38,894 ; in 1860 it was 71,941, having again almost doubled ; during the next decade, including the period of the civil war, it increased to 105,059, and it hassince grown in like ratio, being 186,508 in 1880. This had risen to 145,000 (esti- mated) in 1883. In 1880 there were 17,628 persons of German, 18,451 of Irish, 4478 of English, and 1090 of Scotch birth, together with Italians,

French, Swedes, Swiss, and other nationalities in numbers which bring the total of foreign-born population up to 40,330. Those of German and Irish birth, together with their children (minors) born within the United States, constitute fully three-fifths of the entire population.

History.—On or about May 17, 1666—the exact date cannot be determined—there anchored in the Passaic river, opposite what is now Newark, a small vessel from Milford, Connecticut, having 2n board a company of thirty persons, Puritans, who had come to form a new settlement in the New Jersey wilderness. Before the landing was completed, the Hackensack Indians demanded compensation from the new comers, which they finally received. The price then paid for the land upon which Newark and the adjacent towns and villages of Essex county arc built being ‘‘ fifty double hands of powder, one hundred bars of lead, twenty axes, twenty coats, ten guns, twenty pistols, ten kettles, ten swords, four blankets, four barrels of beer, ten pairs of breeches, fifty knives, twenty horses, eighteen hundred and fifty fathoms of wampum, two ankers of liquor (or something equivalent), and three troopers’ coats.” Subse- quently another vessel arrived from Connecticut containing a some- what larger party, but both together numbered, all told, less than seventy persons. Their chief desire was to establish a community whose spiritual and temporal affairs would be controlled and directed ‘‘according to God and a godly government.” Their pastor was Abraham Pierson, originally from Newark-on-Trent, in whose honour the name of the settlement was changed from Milford to Newark. The town was laid out in lots, and everything was ordered and governed mainly according to Mosaic law. The fore- most among the settlers was Captain Robert Treat, a brave, resolute, wise, and kindly man, who, after remaining long enough to see the new settlement fairly established, returned to Connecticut, and became governor of the colony. He had previously been deputy- governor for thirty-two years. The dream of Pierson and his Puri- tan followers was not realized. Before many years the Mosaic bars had to be removed one by one, and gradually the townspeople broadened their ideas of government. But even to this day, despite the cosmopolitan character of the population, the old Puritan leaven is still at work, largely leavening the whole lump.

The first occurrence of special interest in the history of the town after its settlement was a schism in the old church. Colonel Josiah Ogden, a rich and influential member, and a man of strong individuality, saved his wheat one dry Sunday, in a wet season. He maintained that it was a work of necessity ; the church declared it to be a violation of God's law. The immediate result was the withdrawal of Ogden and his followers, and the founding of the first Episcopal or Church of England Society in Newark, —Trinity Church. The affair led also to an exacerbating controversy which lasted from 1784 until long after the Revolutionary war which closed in 1788. Newark was, from 1748 to 1756, the seat of the college of New Jersey, thereafter permanently established at Princeton, founded by the Rev. Aaron Burr, father of the more celebrated American of the same name ; the latter was born in Newark. During the war of Independence, the great majority of the thousand inhabitants of Newark sided with the Americans; the town: suffered severely from the ravages of the British and marauding parties of American loyalists; on the other hand the American revolutionists drove out all loyalists, and confiscated their property. After the war, manufactures began to prosper, and have continued to do so ever Since.. At one time chair-making was carried on extensively, and it is stated that among those who worked at it in Newark was the famous Talleyrand.

NEWARK, a city of the United States, capital of Licking county, Ohio, is situated on the Licking river and on the Ohio and Erie Canal, and is 33 miles from Columbus by the railway to Pittsburg. It is a flourishing agricultural and industrial centre, with extensive railway shops, foundries, and manufactories of glass, paper, steam-engines, and agricultural implements; and sandstone quarries and

coal-mines are worked in the neighbourhood. Some of the most extensive and interesting of the earth-work remains of the prehistoric inhabitants of North America are found here, The population was 3654 in 1850, 6698 in 1870, and 9602 in 1880.

NEWARK, Davin Lest, Lorp (1601-1682), a cele- brated Scottish military character during the civil war, was born in 1601, the fifth son of Patrick Leslie of Pitcairley, commendator of Lindores, and Lady Jane Stuart, daughter of the first earl of Orkney. In his early life he served in the armies

of Gustavus Adolphus, where he rose to the rank of colonel of horse. On his return he was appointed major-general in the army that was sent into England under the earl of Leven to assist the Parliament. This army engaged the Royalists under Prince Rupert at Marston Moor, and totally defeated them, in July 1644. When Scotland after the battle of Kilsyth was at the mercy of Montrose and his army, Leslie was recalled from England in 1645, and made lieutenant-general of horse. In Sep- tember he defeated Montrose at Philiphaugh near Selkirk, with great loss, and was rewarded by the committee of estates for this service with a present of 50,000 merks and a gold chain. He completely suppressed the civil war in Seotland in 1647, was declared lieutenant-general of the forces, and, in addition to his pay as colonel, had a pension of £1000 a month settled on him. Leslie then returned to England, and was present at the siege of Newark. On his return to Scotland he reduced several of the Highland clans that supported the cause of the king. In 1649 he purchased the lands of Abercrombie and St Monance, Fife- shire. In 1650 he was sent against Montrose, whom he made prisoner; and on the resignation of the earl of Leven he was appointed to the chief command of the army raised on behalf of Charles II. He baffled the forces of Cromwell, who was then invading Scotland, by shutting him up in Dunbar, and would have cut off his whole army, but, yielding to the advice of the church and state committee, he rashly left his commanding position on the Doon Hill, and was signally defeated on the 3d September 1650. After various skirmishes Leslie afterwards accompanied Charles to Wor- cester, where he was lieutenant-general under the king, who commanded in person. On the defeat of the royal army, Leslie, intercepted in his retreat through Yorkshire, was committed to the Tower, where he remained till the Restoration in 1660. He was fined £4000 by Cromwell's "Act of Grace" in 1654. He was in 1661 created Lord Newark, and received a pension of £500 per annum. He died in 1682. The title became extinct in 1790.

NEW BEDFORD, a city and port of entry of the United States, one of the capitals of Bristol county, Massachusetts, stretches for several miles along the west side of the estuary of the Acushnet river, which opens into Buzzard Bay, and forms an excellent harbour. It is 56 miles almost due south of Boston by the Old Colony Railroad. Of the fact that it has been for a long time one of the wealthiest cities in the State New Bedford affords abundant

indications in the character both of its private residences and of its public enterprises and numerous charitable institutions. Among the more conspicuous build- ings are the city-hall, constructed of granite in 1839, the custom-house (1836) also of granite, the almshouse (1846), and the public library. This last was erected in 1857 at a cost of $45,000, the city having taken over the “Social Library,” founded in 1803; in 1863 the development of the institution and the cause of liberal education generally were stimulated by a bequest of $100,000 from Miss Sylvia A. Howland, The same lady left a similar sum for the construction of water-works; and in 1867-69 a total of about $1,000,000 was spent in connecting the city with a reservoir for 300,000,000 gallons supplied by the upper

part of the Acushnet river. French Avenue, the favourite promenade, was laid out by the municipality in 1853; it runs 4 miles round the shore of Clark’s Point at the mouth of the river, where the United States erected a granite fort in 1860-64. Since the decline of Nantucket New Bed- ford has been the great seat of the United States whale fishery; in 1854, when this enterprise was at its best, the New Bedford district possessed 410 whalers with a burden of 132,966 tons, but owing to the civil war and other influences (especially the immense production of petroleum) the number was by 1883 reduced to 95.. The manufactories of the city, which on the other hand have been increasing in importance, produce cotton goods (460,000 spindles), woollen goods, silver-plated and iron wares, drills for metal- workers, copper sheathings, Prussian blue, paraffin and other candles, glass, cordage, shoes, &c., the total value in 1880 being $8,880,384. The population was 21,320 in 1870, and 26,845 in 1880.

New Bedford (Acushnet of the Indians) was settled by Quakers in 1664, but it did not receive its present name till about 1765. Previous to 1787 it formed part of the ‘‘ town” of Dartmouth. The city charter dates from 1847. In 1778, in revenge for the use of its harbour as a rendezvous of privateers who had been driven from other ports, the shipping and wharves of New Bedford were burned by the British. Not many of the privateers, however, belonged to the town, most of the inhabitants at that time being Quakers.

NEW BERNE, or NEwsery, a city of the United States, the capital of Craven county, North Carolina, and the port of entry of the district of Pamlico, is situated at the meeting of the Neuse and the Trent, on the Atlantic and North Carolina Railroad, 107 miles south-east of Raleigh. Vessels drawing 84 feet can reach the wharves at mean water-level, and steamers run regularly to New York, Baltimore, and Norfolk. Cotton, lumber, naval stores, fish, rice, corn, and early vegetables for the northern markets are the chief articles of trade. Tobacco factories, turpentine distilleries, candy factories, lumber mills, a wooden-plate factory, a cotton-seed-oil factory, a rice mill, and a cigar factory are the most noteworthy of the industrial establishments in the city. The population was 5849 in 1850, and 6443 in 1880. Founded by Swiss ‘settlers in 1701, New Berne continued to be the capital of the pro- vince of North Carolina till 1793. It was captured by Burnside in 1862, and suffered from fire.

NEW BRIGHTON, a post-village of the United States, in Richmond county, New York, is situated at the north- eastern corner of Staten Island, 6 miles south-west of New York, with which it is connected by ferry. Best known as the seat of the Sailors’ Snug Harbour, a fine building fronting the Kill von Kull, which was founded in 1831 for aged and disabled seamen of the port of New York, New Brighton also contains an asylum for destitute children of seamen, one of the largest dyeing and printing establish- ments in the United States, a silk-printing factory, a paper- hanging factory, &c., as well as many residences belonging to New York men of business. The population in 1880 was 12,679.

NEW BRITAIN, a city of the United States, in Hartford county, Connecticut, 10 miles south-west of Hartford by the New York and New England Railroad. It is the seat of the State normal school (the new building erected in 1881 cost $90,000), and has a public park of 74 acres, a public library, and a good water-supply from a reservoir 200 feet above the level of the streets. The principal manufactures are bronze goods, locks, buiiders’ hardware, cutlery, knit woollen goods, carpenters’ tools, and jewellery. In 1870 the population was 9480; in 1880, 13,979. Elihu Burritt was born at New Britain in 1811.

NEW BRITAIN (Brrara) anp NEW IRELAND, two Polynesian islands, about 340 miles by 23, and 240 by 22

respectively, are separated from the south-east extremity

of New Guinea by a strait, first ascertained to be such by Dampier, 52 miles wide (see Plate VI.). They form together a sort of horse-shoe, divided in the middle by St George's Channel, some 20 miles wide, which in 1878 was half choked, temporarily, by pumice from a neigh- bouring volcano. In this channel lies the Duke of York group, fourteen small, well-wooded, fertile islands, with steep cliffs and narrow fringing reefs. A Wesleyan mission and some German and other traders are settled here and on the adjacent part of New Britain. The coasts of New Britain are in some parts precipitous; in others the mountains lie farther inland, and the coast is flat and bordered by fringing reefs. The west coast of New Ireland is generally precipitous, and crowned by a table-land which falls away towards the east. The north coasts of New Britain and the adjacent islands are studded with active volcanoes rising to 4000 feet, and at both ends of the island these are on a very grand scale. The scenery and vegetation are varied and luxuriant, with abundant wood and water. In New Ireland images, apparently represent- ing deceased relations, like the karwars of New Guinea, are made of a rock indistinguishable from pure chalk, which is said to exist nowhere else in the Pacific. These are deposited in buildings set apart for them. There are also peculiar wooden masks, worn at stated inter-tribal meetings and dances, and composite wooden images in which the human figure, male or female, is surrounded by those of the snake, fish, owl, tern, é&c.

The people of New Britain, especially. towards the west, resemble those of eastern New Guinea, height about 5 feet 6 inches, with matted curly hair; the women appear stunted and oppressed. They are a finer race than those farther east in Duke of York and New Ireland, who, ex- cepting an evidently Polynesian colony on the south coast

of New Ireland, rather resemble the Solomon Islanders. –

Both are thorough cannibals.. Their weapons are clubs (stone-headed in New Britain), spears, tomahawks, and slings. They perform complicated surgical operations with an obsidian knife or a shark's tooth. They construct

in- genious fishing weirs.. The villages are clean and well- kept, the houses varying from miserable huts 8 by 5 feet without furniture to neat well-built semicircular houses, the roof extending to the ground behind, with front of wicker work, leaving a space for the door. The common dead are buried or exposed to sharks on the reefs; bodies of chiefs are exposed in the fork of a tree. Girls for some time before puberty are confined in cages of pandanus leaves about 4 feet diameter, possibly to fatten them, an old Polynesian custom. Justice is executed, and tabus, feasts, taxes, &c., arranged, by a mysterious disguised figure, the “duk-duk.” Only the chief and those who have been initiated on payment of a heavy fee know who or what he is. Women and children are forbidden to look on him. The custom, perhaps, points to a time when. there was a priesthood, aiding the chief to rule the people. The population is divided into two exogamous classes. The children belong to the class of the mother, and when the father dies go to her village for support, the land and fruit trees in each district being divided between the two classes. Compare the Polynesian custom “tamaha” (the Fijian ‘‘vasu”), which gives certain privileges to a sister’s children. There are several dialects, the construc: tion resembling Fijian, as in the pronominal suffixes. in singular, triad, and plural; the numerals, however, are Polynesian in character.

See Wilfrid Powell, Wanderings in a Wild Country, and paper in Roy. Geog. Soe. Proceedings, 1881; Rev. G. Brown in Roy. Geog. Soe. Journal, 1877, and Proceedings, 1881; Verhandlungen der Ges. j. Erdkunde zu Berlin, x., Nos. 5 and 6.

Plate IV.

- by Quebec; N.

the Bay of Chaleur.

NEW BRUNSWICK

NEW BRUNSWICK, a province of Canada, in British North America, lying between 45° 5’ and 48° 40’ N. lat. and 63° 50’ and 68° W. long. It is bounded on the N.W. by the Bay of. Chaleur; E. by the Gulf of St Lawrence and Northumberland Strait, which separates ‘+t from Prince Edward Island;

8. by a portion of Nova Scotia, Chignecto Bay, and the Bay of Fundy; and on the W. by the State of Maine. Its length from north to south is 230 miles, its greatest breadth 190 miles, and it has a seaboard of some 545 miles, interrupted only by the isthmus of Chignecto, which joins the province to Nova Scotia. In shape it is very compact, resembling an irregular quadrangle. Its area is 27,177 square miles.

Physical Featwres.—The surface is generally undulating, but in the northern and north-western sections there are many ranges of hills which rise to a height of from 1200 to 2000 feet, while individual peaks are to be found of even greater altitude. These elevations are an extension of the Appalachian Mountains, and traverse the province from the State of Maine. The scenery is most picturesque and varied, and vast forests abound all through this section of country. The southern region embraces the district along the Bay of Fundy. Its coast is rocky and bold, and interrupted by great ravines. West of the river St John the soil .is fertile and rich, and, though towards the east it is not so deep, there is still a good agricultural country, with many beautiful valleys, grain fields, and forests. Along the shores on the east coast, and for 20 miles inland, the country is flat, and composed of mosses and marshes, but beyond that distance it rises into gently sloping hills, which extend as far as St John.

The whole of New Brunswick is well watered.

“Rivers, bays, and lakes are numerous, and several are

navigable for vessels of large tonnage. The principal rivers are the St John, Miramichi, Restigouche, Saint Croix, Petitcodiac, Richibucto, and Nepisiguit. The St John, which is famous for its scenery, rises in the State of Maine, and is over 450 miles in length. It is navigable for vessels of moderate tonnage from St John on the Bay of Fundy to Fredericton, a distance of about 88 miles, but steamers of light draught ply as far as Woodstock, 65 miles farther, and during the rainy season boats may proceed to Grand Falls, a cataract 70 or 80 feet high, 225 miles from the sea. Above the falls the St John has been navigated by a steamer to the mouth of the Madawaska, 40 miles. The river is an important highway, especially of the lumber traffic. About 9,000,000 acres of New Brunswick, 2,000,000 acres of Quebec, and 6,000,000 acres of Maine lands are drained by it.

Among the many lakes communicating with the St John is Grand Lake, 30 miles long, and varying from 3 to 9 miles in breadth. The Miramichi rises in the county of Carleton, and flows in a north-easterly direction into a bay of the same name. It is 225 miles long, 7 miles wide at its mouth, and navigable

- for large vessels as far as Nelson (46 miles). In the spring

and autumn, when full freshets prevail, small steamers and tow-boats can ply a much greater distance. The branches of the Miramichi drain a fourth of the entire province. An extensive lumber trade is done in this district, and many sawmills are driven by the river. Its fisheries are specially valuable, including salmon, trout, bass, smelt, and lobster. The Restigouche forms the north-east boundary of the province, is 100 miles in length, and discharges into It is composed of five main branches, from which fact it derives its name, signifying in Indian “the river which divides like the hand.” It is a consider- able waterway, 3 miles in width at its mouth, and 9 fathoms indepth. Large vessels may safely navigate it 18 miles from the bay. The main river and its tributaries drain over 4000 square miles of fertile and well-wooded

country. A good deal of lumber is carried on it, and the harbour is secure and safe for ships of ordinary tonnage. The St Croix separates the State of Maine from New Brunswick at its south-west part. Its source is a chain of lakes called the Chiputneticook. The Petitcodiac is navigable for 25 miles for ships, and schooners of 80 tons burden may proceed to the head of the tide, 12 miles farther; it empties into Shepody Bay. The Richibucto discharges into the Gulf of St Lawrence. The Nepisiguit and Tobique (a tributary of the St John) in the north are in much repute among anglers.

The coast-line of New Brunswick is indented with numerous fine bays and harbours. There are few islands. The Bay of Fundy is a huge arm of the sea extending into the land between New Brunswick and Nova Scotia, and terminating in two smaller bays, Chignecto Bay and the Basin of Minas. Its length up to Chignecto Bay is 140 miles, and its extreme breadth 45 miles. It is noted for its high tides, which are influenced by the Gulf Stream, and

rise about 30 feet at St John and 60 feet at the head of Chignecto Bay, rushing into the latter with remarkable force. At Bay Verte, 14 miles distant, the tide rises little more than 4 or 5 feet. The Bay of Chaleur, which presents no impediment to navigation, and has several excel- lent harbours, is over 90 miles in length, and from 20 to 25 miles in breadth. Onits southern side the shores are low, and on the northern bold and precipitous. The other inlets of consequence on the east coast are Miramichi, Richibucto, Buctouche, Cocagne, and Shediac Bays; on the south coast are Passamaquoddy Bay, St John Harbour, and Chignecto Bay.

Geology.—The northern divisions of the province are occupied by metamorphic slates and rocks of Silurian age. The area of the Carboniferous system includes the, greater part of the counties of Westmoreland, Queen's, Sunbury, and Gloucester, a considerable portion of York and Northumberland, and the whole of the county of Kent. The Lower Carboniferous and Devonian systems prevail in the western portion about the head of the Grand Lake and on the river' Canaan. Grey sandstone, shales, and conglomerates predominate. Along the southern coast, from the head of the Bay of Fundy to the State of Maine, there is a belt comprising Laurentian, Huronian, Cambrian, and Silurian rocks. Dr J. W. Dawson says, "' the Carboniferous plain of New Brunswick corresponds to and at its eastern extremity is connected with that of Nova Scotia; and its hilly ranges of altered and igneous rocks form, with those of Nova Scotia, outlying ridges rudely parallel to the great Appalachian breastbone of America, and, like it, descend- ing under the level of newer deposits and of the sea at their northeastern extremities." The Newer Red Sand- stone and Middle Cambrian formations are also to be found in New Brunswick, with trap, limestones, porphyry, granite, syenite, felsites, and gneiss. Many of the strata are rich in fossil remains. The coal-fields of the province occupy an area of over 11,000 square miles. Tron and plumbago or graphite occur in workable quantities, the deposits of the former being extensive and valuable. Manganese abounds and forms an article of export. Gold, in small quantities, is found on the banks of the Shiktehawk, a tributary of the St John. Professor Bailey has dis- covered drift gold on the headwaters of the Tobique and the Miramichi, and at the Grand Falls of the St John, At St Stephen, in Charlotte county, it occurs in quartz veins in micaceous schist, and in the

same neighbourhood in a black plumbaginous slate. Copper, lead, nickel, and zinc, with important deposits of antimony, complete the list of minerals.

Climate-—The climate of New Brunswick is somewhat similar to that of the more southern parts of Quebec. It.

and eels comprise the principal varieties taken. Of recent years the fishing business has been most industriously pursued, and several firms have gone extensively into the eanning of salmon, oysters, and lobsters for export. Fish-breeding establishments are in operation, maintained by the Government of the Dominion. In 1881 there were 205 larger vessels and 4284 boats engaged in the fisheries.

Game, &c.—Game is abundant,—wild ducks, teal, wild geese, partridges, woodcocks, pigeons, plover, snipe, &c., occurring in great quantity. No fewer than 270 varieties of birds have been already discovered, and ornithologists state that that number ean be increased, Of wild animals the principal are the bear, wolf, deer, moose, caribou, lynx, fox, musk-rat, mink, marten, ermine, hare, squirrel, and beaver.

Communication.—Good waggon roads intersect the province wherever therc is a settlement. Telegraphic lines are established throughout the country, and the means of railway communication are excellent. The Inter-Colonial, which is the principal line, runs from St John to Moncton and thence to Halifax, N.S. At Moncton a branch line extends to Shediac, while the main division proceeds in a northerly direction through the counties of West- moreland, Kent, N orthumberland, Gloucester, and Restigouche, crossing the Restigouche river at the valley of the Metapedia, where the scenery is varied and beautiful, ‘and thence ‘to Point Levis opposite the ancient city of Quebec. The head offices are at Moncton. The St John and Maine Railway runs from St John westward to the State of Maine, connecting at Fredericton Junction with the Fredericton Branch Railway, at M‘Adam with the New Brunswick and Canada Railway, and at Bangor (Maine) with all the great railway lines of the United States, The New Brunswick and Canada Railway runs from St Andrews to Woodstock, and has branches to St Stephen and Houlton (Maine). At Woodstock it connects

with a branch of the New Brunswick Railway which runs between Fredericton and Woodstock and Edmundstou, in the new county of Madawaska. The Grand Southern Railway runs from St John to St Stephen, the Albert Railway from Salisbury to Hope- well, the Elgin from Petitcodiac to Elgin, and the St Martins and Upham Railway runs from Hampton to Quaco on the shore of the Bay of Fundy. The total length of the railways now (1883) is abont 1002 miles.

Population.—The province is divided into fifteen counties, viz., Restigouche, Gloucester, N orthumberland, Kent, Westmoreland, Albert, St John, Charlotte, King's, Queen's, Sunbury, York, Carleton, Victoria, and Madawaska, Up to the 31st October 1882 9,937,483 acres were granted by the Government and occupied, leaving 7,455,977 acres still vacant, The population of the province, 285,594 in 1871, was 321,233 (164,119 males, 157,114 females) in 1881. There are two Roman Catholie dioceses, one at St John and the other at Chatham, and one see of the Church of England at Fredericton. The following table shows the religious denominations and the number of their adherents :—

Church of England…....cce..066 AGyaGoN || ACVenbisistcs,cscsseeeeeee ere 738 Church of Rome…. ++ 109,091 |
Universalists…….....ccssessecossees, 375

is subject to pronounced extremes of heat and cold, but is considered healthy, and epidemics are rare. In the interior the thermometer sometimes registers 95° Fahr. in the summer, while in the winter, which begins early in December and lasts until the end of March, the mercury frequently drops as low as 35° below zero. At Fredericton, the capital, the temperature ranges from – 35° to 100°, the mean being about 42°. The winters are severe, and snow falls to a great depth, especially in the north, where also wild and cold winds prevail. In the south the winters are milder and more broken. The most charming season is autumn, and particularly that part of it known as the Indian summer, which lasts about six weeks.

Agriculture, &c.—Vegetation is rapid. A very large portion of the country is well adapted for agriculture, the soil being exceedingly fertile. On the "intervales" or low lands enormous quantities of hay are grown, while the yield on the high lands varies from one to three tons per acre. Wheat, oats,

buckwheat, rye, barley, hemp, and flax yield good crops, and potatoes, turnips, beets, celery, carrots, parsnips, and pease and beans grow well. The principal fruits are apples, plums, cherries, gooseberries, currants, strawberries, and raspberries. A large export trade of recent years has sprung up in the latter fruits. Hay has always been exported from the province to the United States, where it commands good prices. Farming is not prosecuted in New Brunswick to the extent it should be, and the inhabitants fail to raise enough produce to meet their own wants.

The amount of land under crop in 1871 was 7 78,461 acres, and in pasture 385,105 acres. In 1881 these figures were increased to 849, 678 acres under crop and 392,169 in pasture. The crops raised during the latter year were 521,956 bushels of wheat, 84,183 of barley, 3,297,584 of oats, 1,587,223 of buckwheat, 18,157 of corn, 43,121 of pulse, 990,336 of turnips, 6,961,016 of potatoes, 159,043 of other roots, 414,046 tons of hay. The number of horses in 1881 was 52,975; of working oxen, 8812; of horned cattle, 203,748; of sheep, 221,163; and of swine, 53,087. In 1882 760,581 tb of wool and 78,2038 tb of bees' honey were raised.

Commerce.—New Brunswick yanks as one of the most amply wooded countries in the world. Great forests of trees cover an extensive portion of its surface, and lumbering forms one of its chief industries.. The principal trees are pine, hackmatac, spruce, eedar, beech, maple, hemlock, birch, fir, elm, oak, larch, butternut,

ash, poplar, chestnut, and snmach. Thongh lumbering and fishing form the main occupations of the people, many are engaged in

the mining and manufacturing industries. The total value of ee ee Khe anaes aS ta ie a the produce of the forest exported in 1881-82 was $4,724,422; of | Methodists. 34,514 | No creed stated 1,260 the fisheries, $758,251; of the mines, $140,908; of animals and Congregationalists……..6…. Si2aliewe eee 55

A large proportion of the population is composed of emigrants from Great Britain and their descendants. In the northern counties and in the valley of the Madawaska there are many settlements of French Acadians, and in the same localities and along the shores of the St John river there are Indians

belonging to the Malicite, Micmac, and other tribes, numbering in all 1401. During the last forty years these have varied from 1200 to 1400. The tribes, though resembling each other in physique and appcarance, differ very materially in origin and almost wholly in langnage. The ex- tent of land granted to the Indian population by the Government of New Brunswick is 58,662 acres. Within the last six or seven years a most flourishing colony of Danes has been settled in the province,

Administration.—The affairs of the province are administered by a lieutenant-governor (salary $9000) and an executive council composed of six members with portfolios and three without offices or salary, assisted by a legislative assembly of 41 representatives and a legislative council of 18 members, The latter are appointed for life, and the former are elected by the people every four years, The lieutenant-governor is appointed by the governor-general of Canada in ‘council. New Brunswick returns to the Canadian House of Commons 16 members, and 10 senators are appointed by the crown. The public revenue in 1882 was $648,710, and the expenditure $614,236. The principal source of income is the annual subsidy granted to the province, under the terms of the British North America Act of 1867, by the Dominion Government. This subsidy is computed on a fixed rate of 80 cents per head of population ; $50,000 are allowed for government and $150,000 for export duty. In 1882 the amount paid on this basis to New Brunswick was $456,903°20. It will increase until the population reaches 400,000, when the 80 cents will be regularly calculated on

their produce, $321,426; of agricultural produce, $256,994; of manufactures, $365,748. The total value of the exports was $7,474,407, and of the imports $6,707,244. The chief articles of export are fish, timber and lumber, iron, coal, gypsum, manganese, hay, &. The imports embrace wheat and other grain, flour and eorn-meal, salted meats, coffee, tea, sugar, molasses, tobacco, woollen, cotton, and silk goods, fruits, &c.

Industries. —Shipbuilding, which was prosecuted on an extensive scale some twelve or fifteen years ago, has fallen off considerably of

During the ycar 1882 the number of vessels built in New Bruns- Wick was 66, tonnage 16,820. On the 31st December 1882 the vessels registered in

the province and remaining on the registry books of the several ports amounted to 1064, tonnage 308,961, In that year there were engaged in the coasting trade, including steamers and sailing vessels, 4435 craft, representing a tonnage of 415,029. The number of saw-mills in the province is 478, employ- ing 7175 hands. There are also 166 flour and grist mills, and 83 tanneries. Other industries are lime-burning, shingle-making, manufacture of woollen cloth and cotton warps, cheese and butter making, sash, door, and blind factories, iron working, and brick- making, In 1871 the amount of capital invested in industrics was $5,976,176; in 1881 it reached $8, 425,282, 19,922 hands being employed in manufacturing, $3,866,011 paid in wages, and $11,060,842 worth of raw materials consumed. The total value of the articles produced was $18,512,658.

Fisheries.—The chief scats of the fisheries are in the Harbour of St John, on the islands at the mouth of the Bay of Fundy, and on the north shore. Cod, haddock, salmon, trout, sturgeon, holibut white fish, herring, shad, gaspcreaux, smelt, bass, mackerel,

that number. The remainder of the revenue is derived from the sales of erown lands, timber limits, mining licences, fishing licences, fees, and other miscellaneous receipts. ‘The judiciary consists of a supreme court with chief and five puisne judges having law and equity jurisdiction, a court of marriage and divorce, a vice-admiralty court, a court for the trial and punishment of piracy and other offences on the high seas, a probate court, and six county courts. These officers are appointed for life by the federal authorities. The provincial legislature meets at Fredericton, where the Govern- ment offices are situated. The militia of the province consists of an active force of one regiment of cavalry (seven troops), two batteries of field artillery, seven batteries of garrison artillery, one company of engineers, and five battalions of infantry and rifles, in all 140 officers and 1570 non-commissioned officers and men.

Education.—The present school law was passed in 1871. Under its provisions school trustees of each district are eompelled to provide school accommodation for all persons therein between the ages of five and twenty free of charge. In addition to the provincial grant a tax is levied in each

county equal to 30 cents per head, and a large fund sufficient to carry out the law (includ- ing a poll-tax of $1 per head) is raised by the localities. The educational institutions aided by the Government are the university of New Brunswick (founded in 1828 under the title of King's College, and having its seat at Fredericton), a normal or training school for teachers, and a system of common schools ranging from the primary to the grammar or high school department. The eommon schools are non-sectarian and free to all. The province expended for this service in 1882 $166,733. In the summer term of 1881 the number of schools was 1386, of teachers 1453, and of pupils 51,921. During the winter course of 1882 there were 1317 schools at work, taught by 1871 teachers, and attended by 48,805 boys and girls. The total number of pupils in attend- ance at the schools within the year was 64,267. Besides the university at Fredericton there is the Mount Allison Wesleyan College at Sackville. The public charitable institutions receiving aid from the local Government are the Provincial Lunatic Asylum and the City Hospital, St John, and the deaf and dumb school at Fredericton; and the blind school and deaf and dumb asylum at Halifax, N.S., receive an annual grant from the province also. In eonsideration of this the latter admit pupils from New Bruns- wick. The lazaretto for lepers at Tracadie and the marine hospital at St John are maintained by the Dominion.

History.—New Brunswick was settled in the first place by the French in July 1604, and with Nova Scotia belonged to that part of New France called Acadia until 17138, when it passed into the hands of England. A dispute arose between the two powers con- cerning the preeise limits of Acadia, and the question remained a vexed one until the treaty of Paris, 1763, when the whole domain was finally ceded to Great Britain. In 1764 a body of Scottish farmers and labourers arrived in the country and took up their homes in the Miramichi and other districts. The year 1783 is memorable as the date when the Loyalists landed from the United States and settled in the colony. In the following year Nova Scotia and New Brunswick separated, and they remained distinct provinces until 1867, when they were united with Quebec and Ontario to form the Dominion of Canada. The capital of New Brunswick is Fredericton (population 6218), and St John (26,127) is the chief commercial city, Portland (15,226), formerly a suburb of St John and latterly a town, was erected into a city in April 1888. Other towns are

Moncton (5032), which contains the head offices of the Inter-Colonial Railway and a sugar refinery, Shediac (6227), Dorehester (6582), Chatham (5762), Sackville (4882), Richibucto (4079), St Stephen (2338), Bathurst (4806), St Andrews (2128), St George (8412), Woodstock (1994), Dalhousie (2353).

See Dawson, Acadian Geology, 3d edition, Montreal, 1878; Bailey, Ells, and

Matthew, in Reports of the Geol. Survey of Canada, 1878-79-80; Public Documents of New Brunswick and Canada, 1882. (G. ST.)

NEW BRUNSWICK, a city of the United States, capital of Middlesex county, New Jersey, 31 miles by rail from New York, at the head of navigation of the Raritan river, and the eastern terminus of the Raritan and Delaware Canal. The older portion occupies the low land along the river, and has narrow irregular streets; but the newer districts have spread over the higher grounds behind, and are both well built and well laid out. Conspicuous among the public buildings are Rutgers College and the theological seminary of the Reformed (Dutch) Church. The college was founded in 1770 as Queen's College, and received its present name in honour of Colonel Henry Rutgers (1746-1830) only in 1825. It has a library of 12,000 volumes, and 16 professors and 115 students. The seminary, dating from 1784, consists of eight fine buildings—Hertzog Hall, Suydam Hall, the Gardiner Sage Library (36,000 volumes),

and five professors' residences—and. occupies a good posi- tion to the north of the college. India-rubber goods, hosiery, paperhangings, shoes, and machinery are manufactured on a large scale in the city. The population was 15,058 in 1870, and 17,166 in 1880. Settled in the close of the 17th century, New Brunswick was incorporated in 1736, and had become by 1748 a "pretty little town with four churches and a considerable trade with New York." A city charter was obtained in 1784.

NEWBURG, or NewsunreH, a city of the United States, the capital of Orange county, New York, occupies a com- manding position on the steep

slopes of the west bank of the Hudson, about 60 miles north of New York. It has a large river trade, especially in coal and lumber, contains engine-factories, a cotton-mill, a bleachery, a lawn-mower factory, &c. Hasbrouck House, an old stone mansion which served as Washington's headquarters in 1782-83, has since 1850 been maintained by the State, and contains a considerable collection of historical relics. The popula- tion was 17,014 in 1870, and 18,049 in 1880.

The site of Newburg, then occupied by a clan of the Minsis (Delaware) tribe, was recognized by Hudson in 1607 as a ‘‘ pleasant place to build a town on”; but it was not till 1709 that the Palatine Parish of Quassaic, as it was at first called, was settled by a number of Germans from the Palatinate of the Rhine. In 1752 the name of Newburgh or Newburg was adopted from the likeness which the place bore to Newburgh on the Tay in Scotland. lt was here that Washington rejected the proposal to make him king, thereby checking the incipient mutiny which the anonymous “‘ Newburgh Letters’? were designed to excite, and here the army was disbanded. A city charter was obtained in 1865.

NEWBURY, a municipal borough and market-town of Berkshire, England, near the Hampshire border, is situated on the river Kennet, the Kennet and Avon Canal, and the Great Western Railway, 53 miles west of London and 16 south-west of Reading. The church of St Nicholas, in the Late Perpendicular style, is said to have been mainly built at the expense of John Winchcombe (Jack of Newbury), who sent one hundred of his own weavers fully equipped to Flodden Field. The church was restored in 1867 at a cost of £15,000. It contains a brass of John Winch- combe and Alice his wife (1519). Among other public buildings are the corn exchange (1862), the literary and scientific institution, and the free grammar school. . There are over one hundred almshouses, of which twenty-four are supported by the hospital of St Bartholomew, chartered by King John. Malting is carried on, and there is a con- siderable trade in corn and agricultural produce. Silk, ribbons, and paper are also manufactured. A large wool fair is held in February. The population of the municipal borough, 6602 in 1871, was 10,144 in 1881. In 1878 the area of the borough was extended from 1722 to 1813 acres.

Newbury owes its origin to the Roman station Spinw, now represented by the modern village of Speen. In contradistinction to this village it was named Newbury, that is the new borough or town. By William the Conqueror it was bestowed on Ernulf de Hesdin, and it belonged to the Marshalls of Hampstead-Marshall before it came into the possession of the Cravens. The town was incorporated by Elizabeth in 1596, and the eharter was renewed by James I. and Charles 1]. In the reign of Edward I. it sent

two members to a parliament at Westminster ; and, being a place of considerable trade, it also sent representatives to a great council in the time of Edward III. It then possessed large woollen manu- factures, but the industry is now wholly discontinued. During the civil war two battles were fought near it in 1643 and 1644. In 1645 it was taken by the Parliamentarians, who held possession of it till the elose of the war. A handsome memorial to Lords Falkland, Sutherland, and Carnarvon and other Royalists who fell at Newbury in 1648 has been erected on the battlefield (1878).

NEWBURYPORT, a city and port of entry of the United States, and one of the shire-towns of Essex county, Massachusetts, lies on the right-hand side of the estuary of the Merrimack, and 35 miles by rail north-north-east of Boston. At this point the river is crossed by several

Plate VI.

bridges, one of which, constructed in 1792, was the first suspension bridge in America. The ground on which the city is built rises gradually to a height of about 100 feet ; along the top of the ridge, parallel with the river, runs for a distance of 3 miles High Street, the leading thorough- fare, lined with old-fashioned mansions (Caleb Cushing's, Lord Timothy Dexter's, &c.) ; and at the junction of High Street and State Street is a pond of 34 acres enclosed by a terraced promenade. The streets in general are umbrageous even for an American city, a special endowment having been left for the maintenance of shade trees. Old South (Presbyterian) Church in Federal Street contains a whisper- ing gallery of a very striking kind, and under its pulpit lie the remains of George Whitefield. The free library, founded by Josiah Little in 1854, and endowed by George Peabody, occupies the old Tracy mansion, and contains upwards of 21,000 volumes. Putnam Free School, dating from 1847, with an endowment of $50,000, and the high school for girls, are both institutions of wide reputation (the latter the first of its kind in the States), now consolidated with the high school for boys. The cotton manufacture, introduced in 1836, is the staple of the city, which also, however, contains shoe factories (one of them said to be the largest manufactory of women's shoes in the world), an iron foundry, a distillery, carriage works, hat

factories, &c., and has long been the seat of extensive shipbuild- ing operations (tonnage 4000 in 1882). The harbour (formed by the northern end of Plum Island, which is united to the city by a causeway) is of somewhat difficult access owing to the shifting character of the bar, which becomes altogether impassable during storms from the east. The population of the city was 13,401 in 1860, 12,595 in 1870, and 13,538 in 1880.

Newbury was settled by Thomas Parker's company in 1685, but it was not till 1764 that Newburyport attained independent existence. It had reached a state of great prosperity when in 1811

about 11 acres of its most closely-built portion were destroyed by fire. In 1851 a city charter was obtained.

NEW CALEDONIA, the largest island in the Pacific after New Zealand, about 240 miles long, with an average breadth of 25 miles, lies at the southern extremity of MELANESIA (q.v.), between 20° 10' and 22° 25' S. lat. and between 164° and 167° E. long., and, like all the chief islands of that chain and the chain itself, runs north- west and south-east. It was discovered by Cook in 1774, and was appropriated by the French for a convict settle- ment in 1853. Their capital, Nouméa, with a fine harbour, is near the south end of the island. An almost unbroken barrier reef skirts the west shore at about 5 miles distance; on the east, which is more abrupt and precipitous, it is much interrupted. To the north the reefs continue, marking the former extension of the land, for about 160 miles, ending with the Huon Islands. Hunea, or Isle of Pines, so called from its aralcarias, geologically a continuation of New Caledonia, lies 30 miles from its south-east extremity. It abounded formerly in sandalwood, and consists of a central plateau surrounded by a belt of cultivation, New Caledonia consists essen- tially of confused masses and ranges of mountains, rising at Mount Humboldt to 5380 feet, the plains being chiefly the deltas of rivers. The landscape is rich and beautiful, varied with grand rock scenery, the coast-line being broken by countless streams, often skilfully utilized by the natives for irrigation. The larger rivers in the wet season form impassable morasses. The framework of the island consists chiefly of argillaceous, serpentinous, and mica schists. There are no active volcanoes, but great magnesian eruptions, represented by serpentines, cover the greater part of the surface, especially

in the south- cast,—the extent of sedimentary formations, ranging from Upper Devonian (to which some Carboniferous rocks near

NE W—

N E W

Nouméa apparently belong) to Neocomian, being relatively insignificant. With the serpentines occur masses of red clay from the decomposed rock, and much chromate of iron, which forms the metalliferous black sands of the streams. The famous nickel mines lie in the Kanala district, and extend for some 60 miles along the east coast, the rocks being coated with the green ore (“ garnierite,” a hydrous magnesian silicate impregnated with nickel oxide), which also occurs in pockets, and is extensively worked. There are also mines of copper and cobalt. Gold has only been found in small quantities. In the low-lying districts to the south-east are several lakes and morasses of black mud, and blocks of ironstone so abundant as to affect the compass. In the north-west the rocks (in which quartz replaces the diorite) are not ferruginous, and are less contorted. The hottest and the wettest months are from December to March, but there is usually a fresh trade- wind blowing, and the climate is healthy. There is much less moisture, and the flora is of a less tropical character, than farther north; it has some Polynesian and New Zealand affinities, and on the west coast a partially Australian character; on the higher hills it is stunted ; on the lower, however, there are fine grass lands, and a scattered growth of niaulis (Melaleuca viridifiora), useful for its timber, bark, and cajeput oil. There is a great variety of fine timber trees: those at present most used are the kaurie, houp, and other pines, tamanou (Calo- phyllum montanum), ironwood, acacias, milneas, Cordia Sebestena, cohu, bourao, azou. The bread-fruit, sago, banana, vanilla, ginger, arrowroot, and curcuma grow wild. The cocoa nut, maize, sugar-cane, coffee, cotton, rice, and tobacco (which last does not suffer like other crops from the locusts) do well. The orange, indigo, lucerne, and European vegetables are grown. There are probably no mammals except the rat and Pteropus and other bats. The commonest birds are pigeons (the large notou and other varieties), doves, parrots, kingfishers, and ducks. The kagu (Rhinochetus jubatus), a peculiar “‘wingless” bird, is found here only. Turtle abound on the coast, and fish, of

which some kinds, as the tetrodons (globe-fish), are poisonous, especially at certain seasons.

The population is probably about 30,000, but has diminished greatly since the French occupation. There are two distinct types: one is sub-Papuan, probably aboriginal, dark brown, with black frizzly hair, rounded narrow retreating forehead, high cheek-bones, and flat nose depressed at the root below the prominent brows ; the other, with all these features modified, better-developed physique, and lighter colour, strongly resembles the Polynesian, and is most numerous in the east and south, where most of the upper class belong to it; but the two types intermingle everywhere. The women, though hard worked, are less degraded than is usual among Papuans. Their marriage ceremonies end with a simulated flight and capture. The people are hospitable to strangers, and not quarrelsome among themselves, though fond of war with another tribe, which is declared bya masked messenger, who taking a spear and money with him thrusts the former among the challenged tribe, and then, throwing down the money in atonement of the injury his spear may have done, is allowed to return unharmed. Their weapons are clubs, slings, stone hatchets (resembling the Australian), and spears with a throwing cord. Rows of stones are found commem- orating the numbers of enemics killed and caten in former wars. The French have found them formidable antagonists on many occasions ; the last ‘‘revolt’” was put down after much trouble and bloodshed in 1881. There are various degrees of hereditary chicfships, distinguished by insignia on their houses. As in some other Pacific islands, when a son is born the chicfship passcs to him, but the father continucs to govern as regent. They have strict ideas of property—individual, village, and tribal. The people have to work on the chiefs plantations and fisheries, and also work in parties for cach other, breaking up new land, &c. This often ends in feasting and in dances (pilu pilw), which include allegorical representations of events or ideas.

Their huts are usually beehive-shaped, with a single apartment, low narrow door, and no chimney. he fire inside is their only defence against mosquitoes. The central pole is continued outside, usually by a rude figure surmounted by a long post elaborately decorated, especially in the chiefs’ houses, which far overtop the

others, and have a good deal of grotesque hand carving, something like but inferior to that seen in New Zealand.

The food is chiefly vegetable, so that there is considerable scarcit at certain seasons; but almost anything is eaten, including all sorts of insects, and a steatite earth which contains a little copper. The exception is the lizard and the gecko,! of which they have a superstitious dread.

They believe in the power of spirits to take up their abode in persons or inanimate objects, and employ the aid of the soothsayer in thisand many other emergencies of life. The dead are supposed to go down into the sea at the west end of the island: Cocoa-nut trees, a valuable sacrifice, are cut down on the death of a chief. Like other cannibals, they have a certain knowledge of anatomy and surgery, and also of medicine. Their musie is quite rudimentary, and consists of little else than beating or sounding in time. Their money is made of different sorts of shells, but other articles of value—axes, skins, mats, &c.—are used as mediums of exehange.

The languages of the different tribes are mutually unintelligible. They express abstract ideas imperfectly. Dr Patouillet says that there are several words for eating, each applied to a particular article of food. Their reckoning shows the same peculiarity. The numbers go up to five, and for living objects the word bird is added, for inanimate yam, for large objects ship.2 There are other terms for bundles of sugar-canes, rows (planted) of yams, &e.; and sometimes things are counted by threes. Ten is two fives, 15 three fives, 20 is a ‘‘man” (ten fingers and ten toes), 100 is “five men,” and so on.

The free white population, settlers and miners, numbers about 3000 ; officials and troops, 3000; transportés and déporteés (ordinary and political convicts), with their families, 4000 and 6700 respec- tively. Some of the planters and graziers are fairly prosperous, but the material development of the country does not advance rapidly. There seems a general want of energy, a deficieney of banking faeilities and of roads and means of transport. It is in fact found difficult to work the scttlement both as a free aud as a penal colony. The larger proprietors are free immi- grants, but are being swamped

by the more numerous small ones, who are ‘‘libérés,” holding small concessions, and bound—theore- tically at least—not to leave the country. The déportés and trans- portés are under separate regulations. The latter when well- behaved are hired out to the free settlers at 12 francs a month. The libérés either receive a very small allowance from Government, or are perinitted to take serviee, receiving 30 to 50 francs a month, with their board. The sending out of the families of convicts, with the view to promote settlement, has not answered well. Free concessions are offered with the same object, especially to retired officials and others. Large concessions have also been made to agricultural colonies, which have mostly failed. The agricultural establishments worked by convicts have answered better, the lands belonging partly to colonists, and the convict labourers eventually obtaining a certain status, and permission to marry. Out of a total area of about 1,600,000 hectares, half is unfit for cultivation or pasture. Up to 1877, 130,965 hectares were taken up, and probably half the available land is now taken. The miners in New Cale- donia are ehiefly Anstralians, but out of several hundred concessions of mines, chiefly nickel, only a few have been worked. The inten- tion of the French Government to send yearly to New Caledonia 5000 recidivistes or habitual criminals, to be released after three years’ detention, causes serious uneasiness in Australia.

The trade was valued in 1874 at 13,471,000 frances, the imports being three times the value of the exports, and the greater part

carried in foreign vessels.

Principal Authorities.—Ch. Lemire, La Colonisation Francaise en Nouvelle Calédonie; papers—(geological) by Jules Garnier in Annales des Mines, 1867, and by Herteau, /bid., 1876, and (anthropological) by Dr Bourgarel in J/ém. de la Soc. d’ Anthropologie de Parts, vol.i.; Dr J. Patouillet, Trois ans en Nouvelle Calédonie, (Cie)

NEWCASTLE, or in full, for the sake of distinction, NEWCASTLE-UPON-TYNE, a city (with the constitution of a county), municipal and parliamentary borough, market- town, and seaport in the county of Northuniberland, Eng- land, is situated on the north bank of the river Tyne, 8 miles above its mouth, and on the main line of the North-Eastern Railway, 275 miles north of London and 70 east of Carlisle. Some of the streets in

the older portion of the town along the river side are narrow and steep, and still contain several of the quaint gable-fronted houses of the time of Eliza- beth. The business portions of the town—principally erected from the plans of Richard Grainger—are character- ized generally by spacious streets with imposing buildings and fine shops; and in the northern and western suburbs

1 Fourteen varieties have been found.

2 A similar usage exists in Malay. See paper by Colonel Yule in Jour. Anthrop. Inst., ix. p. 290.

Old

there are numerous terraces and villas inhabited by the wealthier classes. The important town of GATESHEAD (g.v.), on the south side of the river, is connected with Newcastle by three bridges—a high level bridge, an hy- draulic swing bridge, and a suspension bridge. The high level bridge has been already described (see vol. iv. p. 337). The hydraulic swing bridge, on the low level a little farther down the river, was built to replace a stone structure erected in 1781 on the site of a bridge dating from 1250, and destroyed by a floodin 1771. The Roman bridge, the Pons A‘lii, probably built by the emperor Hadrian, is said to have spanned the river at the same point. The hydraulic bridge was begun in 1868, and opened for traffic 15th June 1876, at a cost of about £200,000. It consists of one large centre pier, two mid- stream piers, and two abutments ; and its foundations are iron cylinders resting on the solid rock, 60 feet below the bed of the river. Two spans, which open simultaneously by machines impelled by steam, allow 103 feet of water- way for vessels going up and down the river. About half a mile farther up the stream is the Redheugh bridge, com- menced in 1867, and opened in 1871 at a cost of £40,000. Newcastle is well supplied with public parks and recreation grounds. To the north of the city is the Leazes ornamental park of 35 acres, and beyond this the town moor and racecourse, an extensive common, the survival of the pasture land of the township. Eastward from the town moor is Brandling Park. The picturesque grounds of Armstrong Park to the north-east of the city extend to about 50 acres, the larger half of which was presented by Sir W. G. Armstrong, who also has presented the beauti- fully wooded grounds of Jesmond Dene. Elswick Park in the south-west of the city, extending to 8? acres, and in-

cluding Elswick Hall, was purchased by the corporation and opened as a recreation ground in November 1878. The earliest artificial method of water supply for New- castle was by pipes of elmwood from Heworth and from springs about 3 miles north of thetown. In 1845 a water company was formed to supply the town with water from Whittle Dene. The reservoirs of the company have been extended from time to time, and the water of various other streams utilized to meet the increasing necessities of the town. The gas supply is also in the hands of a company. Of the old walls of the town, which, according to Leland, “for strength and magnificence far surpassed all the walls of the cities of England and of most of the towns of Europe,” and the circuit of which was 2 miles 239 yards, there still remain some towers in good preservation, although the fortifications were allowed to go into dis- repair after the union of Scotland and England. The castle, from which the town takes its name, stood on a slight elevation rising abruptly from the river, and was erected by Henry II. between 1172 and 1177 on the site of an older structure built in 1080 by Robert eldest son of the Conqueror. It was originally the strongest fortress in the north of England, and its keep is now one of the finest specimens of the Norman stronghold remaining in the country. While it was still incomplete, William the Lion was led within its walls after his capture at Alnwick; and within its great hall Baliol, on 26th December 1292, did homage for the crown of Scotland to Edward L The area of the castle within its outer walls and fosse was 3 acres. Fragments of these walls, with the principal entrance or Blackgate (portions of which are, however, of later construc- tion), and the Watergate or southern postern, still remain, but the inner wall surrounding the keep has been entirely removed. The massive keep, with walls 14 feet thick, is in a-state of good preservation, as is also the chapel, a beautiful specimen of the Late Norman style, for some

time used as the cellar of a public house. The castle was

purchased by the corporation in 1809 for £600, and is now under the charge of the Newcastle Society of Antiquaries, who have fitted up a portion of it as an antiquarian museum. Near the castle is St Nicholas church, now forming the cathedral of the diocese of Newcastle (instituted in 1882). The

church, which is principally Decorated, consists of nave, aisles, chancel, and transepts, the total length of the interior from east to west being 245 feet, and the width at the transepts 128 feet. The principal feature of the church is the lantern tower, a later addition and a very fine specimen of Early Perpendicular. The church has been frequently repaired, and underwent extensive renovation (1873-76) at a cost of £30,000. Among other interesting old churches is St Andrew's church, erected in the 11th century, principally Norman, with a low square tower and a peal of six bells. During the siege by the Parliament-

ary army in 1644 it was greatly damaged. St John's church is a stone building of the 14th century with an ancient font. Of the nine conventual buildings at one time existing in Newcastle or its immediate neighbour-hood, a few fragments of the monastery'of the Black Friars still remain, and the chapel of the hospital of St Mary at Jesmond forms a picturesque ruin. a a ;

The most important public buildings are the corporation buildings, including a large public hall, and a corn ex- change, erected (1863) at a cost of £100,000; the guild- hall, originally a hospital called the Maison de Dieu, and afterwards used as "the stately court of merchant ad- venturers," re-erected in 1658; the moot-hall (1810) for the meetings of assizes and sessions and the transaction of county business; the exchange (1860); the central news-room and art gallery (1838); the assembly-rooms

° aA @ \ "EM BRIDGE st.

Plan of Newcastle.

(1774, re-erected 1876); the barracks (1806); the market (1835); the central railway station, opened 1849, at a cost of £130,000; the police courts (1874) ; the general post office (1876); the Wood memorial hall (1870), used for the meetings of the North of England Institute of Engineers; the custom-house ; the theatre royal ; house, with a chapel dating from 1491; and the Bank of England.

The Grey monument in Grey Street, an Ionic column sur- mounted bya statue of Earl Grey, was erected in 1836 to com- memorate the passing of the Reform Bill; the Stephenson monument near the railway station was erected in 1862,

The principal educational establishments are the colleges of medicine and of physical science, affiliated to the university of Durham; the royal free grammar school, founded in 1525, and rebuilt by the town council in 1870 out of the funds of the hospital of St Mary ; the school of science and art in connexion with South Kensington,

Trinity (branch)

opened in 1879; and Allan's endowed schools, founded in 1705, and reorganized by the charity commissioners in 1877. Among the clubs and similar institutions are the Literary and Philosophical Society, founded in 1793, possessing buildings erected in 1825 at a cost of £16,000 ; the Society of Antiquaries, founded in 1813, with a museum in the castle ; the Natural History Society ; the Tyneside Naturalists' Club, established in 1846; the Mechanics' Institution, 1824; the North of England Institute of Mining Engineers, 1852; the Fine Arts Society; the Farmers' Club ; the Northern Counties Club; the Union Club ; and the University Club. There is a public library and news-room, erected at a cost of £20,000. The benevolent institutions include the infirmary (originally founded in 1751 and enlarged in 1801 and 1851), the dispensary (1777), the fever house (1803), the lying-in hospital (1760), the eye infirmary (1822), Trinity alms- houses (1492), the hospital of the Holy Jesus (1682), the

NEWCASTLE

keelmen's hospital (1701), the female penitentiary (1831), the Royal Victoria asylum for the blind (1838), the Northern Counties institution for the deaf and dumb(1839), the Northern Counties female orphan institution, and the Philipson memorial orphanage for boys (1876).

Newcastle owes its prosperity to its convenient situation on a tidal river, and to the immense stores of coal in the neighbourhood, which, besides being largely exported, have stimulated a great variety of industries which

are dependent on their use. It began to export coal about the end of the 13th century, but the trade received a severe check by the Act of Edward I. which made the burning of it in London a capital offence. In the reign of Edward II]. licence was granted to the inhabitants ‘‘to dig coals and stones in the common soil of the town without the walls thereof in the place called the Castle Field and the Forth.” North and South Shields are both important ports at the mouth of the Tyne, and the whole of the river to about 10 miles from its mouth is lined on both sides with quays, shipbuilding yards, chemical works, furnaces, and numerous manufactories. The quay in front of the town, extending from the hydraulic bridge to the Ouseburn, forms a fine thoroughfare of about a mile in length; and by means of dredging a depth of water has been obtained at the shore permitting vessels of large tonnage to approach, although the berths of the ocean steamers are a little farther down the river. The quay is supplied with the most improved mechanical appliances, and by a double line of rails has direct communication with the North-Eastern Railway. :

In 1853 the number of sailing vesscls in the coasting trade that entered with cargocs was 2132 of 164,440 tons, cleared 11,172 of 1,502,813 tons; of steamers—entered 399 of 81,886 tons, cleared 429 of 97,154 tons. In the same year, in the foreign and colonial trade, the entrances with cargoes were 2555 sailing vessels of 350,190 tons, and 70 steamers of 17,248 tons ; the clearances 5396 sailing vessels of 864,291 tons, and 70 steamers of 17,243 tons. In the annual statement of the shipping of the United Kingdom for 1882 the

returns for the coasting trade are not given for Newcastle sep- |

arately; but for the Tyne ports, which include, in addition to Newcastle, North and South Shields, the numbers were—entered with cargoes and in ballast 10,152 of 3,377,108 tons, cleared 8214 of 2,861,248 tons. The following table gives similar details of the

foreign and colonial trade of the Tyne ports for the same year :— Entered.

; British Foreign Total Total Ports. Ships. bs Ships. Finke? Ships, | Tonnage.
Neweastle…….| 2,514 | 1,232,803 | 2,369 | 767,515 | 4,883 | 2,000,318
North Shields…... 426 236,254 437 92,650 863 328,904 South Shields…...

471 297,493 185 81,638 656 379,131 Tyne ports…..... 3,411 | 1,766,550 | 2,991 | 941,803 | 6,402 | 2,708,353

Cleared. British Foreign Total Ships. Tonnage. Ships. Tonnage. Tonnage. Newcastle 2,253,373 | 8,166 | 1,036,721 3,290,094 North Shields ….. 334,077 447 79,042 413,119 South Shields…... 253,150 95 42,632 295,782 Tyne ports 2,840,600 | 3,708 | 1,158,395 | 8,824 | 3,998,995

In 1878 the value of the imports of foreign and colonial merchan- dise for Newcastle was £5,367,931, and for the whole Tyne ports £6,540,859; in 1882 the values were £7,650,085 and £9,028,925 respectively. The value of the exports of the produce of the United Kingdom for Newcastle in 1878 was £3,712,899, and in 1882 £4,597,700,—the value for the whole Tyne ports being £4,128 ,227 in 1878, and £5,337,983 for 1882. Besides coal, which is brought down the river in broad boats called keels, and of which 4,557,277 tons left Newcastle by sea in 1882, the principal exports are coke, iron, machinery, chemicals, alkali, glass, hardware, earthenware, and pig and sheet lead. The imports-include various ores and chemical substances, timber, corn, provisions, and cattle. There is regular steam communication with the principal British ports, the Baltic ports, Norway, Montreal, and New York. The number of vessels built at Newcastle in 1882 for British owners was 75 of 85,121 tons, of which 68 with a tonnage of 82,468 were iron, and 3 with a tonnage of 1785 were steel. In the same year there were built for foreigners 25 ships of 27,102 tons burden. The principal other industrial establishments of the town and neighbourhood are engi- neering and machinery shops, ordnance works, including the well- known Armstrong factory at Elswick, alkali manufactories, sheet and plate glass works, bottle works, stained glass works, potteries for earthenware, coachbuilding yards, hat factories, chemical works, sail, cable, and anchor works, and manufactories of nails, files, and spades and shovels. Within the present century the population of Newcastle has more than quadrupled. In 1781 the houses

o79 numbered 2389, with an estimated population of 80,000. The census of 1801 gave the number of houses as 3141 and the popula- tion as 28,294 ; the numbers in 1821 were 4031 and 35,181; in 1871 they were 16,460 and 128,443; and in 1881 they had increased to 20,264 and 145,359. The

number of males in 1881 was 71,100, and of females 74,259. The area of the municipal and parliamentary borough is 5371 acres.

History.—Newcastle owes its origin to the Pons lit men- tioned above. The most important relics of Roman occupation are a well in the centre of the buildings of the old castle, a mutilated statue of Hercules and a figure of Mercury preserved in the castle, numerous coins, altars, and various specimens of Roman pottery. The foundations of the old Roman bridge, with the remains of the piers, were discovered during the dredging operations after the destruction of the old wooden bridge in 1771. On account of its position as a fortified town affording protection to the inhabitants of the monasteries of Tynemouth, Jarrow, Lindisfarne, and Wear- mouth, Newcastle was known in early times as Monkceastre or Monkchester ; along with these monasteries it was ravaged by the Danes, who massacred the monks and nuns within its walls. After the union of the kingdom under Egbert it continued till the Conquest to be the residence of the earls of Westmoreland and Northumberland. The town was destroyed by William the Con- queror in 1068, after he had defeated Edgar Atheling and Malcolm of Scotland on Gateshead Fell, but in 1080 a fortress was reared at it by Robert Courthose, eldest son of the Conqueror, which, in contradistinction to the old fortress, was named Newcastle, and formed the nucleus of the present town, burgesses being gathered round the fortress to defend the country against the Scots. After the conspiracy of the barons under Earl Mowbray the town was stormed and taken by William Rufus in 1095. After the death of Henry I. it was seized by the Scots under David, and it remained in their possession until 1157, when it was restored by treaty to Henry II., who established at ita mint. The town was, under the three Edwards, the chief rendezvous of troops for the invasion of Scotland. In the reign of Edward I. it was surrounded by walls, after which it withstood attempts of the Scots to capture it in 1322, 1342, and 1889. In 1640 it was taken by the Scottish Covenanters under Leslie, who held it for a year, and are said to have destroyed most of the public documents. After the battle of Marston Moor it was besieged and taken by the Scots in October 1644, from which time it was held by the Parliament till the close of the war. When Charles gave himself up to the Scottish army at Newark-upon-Trent, they took him to Newcastle, where he remained in their hands until, on the 28th January 1647, he was delivered up to the Parliament.

Newcastle is a borough by prescription, and was first incorporated by Henry II. In the reign of Henry III. the government was vested in a mayor chosen by the burgesses, in lieu of a provost appointed by the crown. In 1400 it obtained a charter from Henry IV. constituting it a county in itself, with lord-lieutenant, sheriff, and magistrates of its own. Its privileges were confirmed and extended by Queen Elizabeth in 1589. Though it still retains the constitution of a county, the old corporation was dissolved by the Municipal Act of 1835, and the government vested in a mayor, sixteen aldermen, and forty-eight town councillors. Since 1282 it has returned two members to parliament. The gross estimated rental of the borough in 1871 was £457,868, and the rateable value £402,030; in 1882 these were £803,961 and £714,470.

Among the emineiit persons who have been connected with New- castle are Ridley the martyr, Akenside the poet, Hutton the mathe- matician, Brand the antiquary, Lords Eldon and Stowell, Lord Collingwood, Thomas Bewick, and George and Robert Stephenson.

See Chorographta, or a Survey of Newcasile-upon-Tine, by W.G., 1649, reprinted 1813 and 1818; John Bell, Collections for a History of Newcastle-on-Tyne, 1835;

and Histories of Newcastle-on-Tyne, by Bourne (1786), Brand (1789), and Mac- kenzie (1827).

NEWCASTLE, a city of New South Wales, and the principal seaport on the northern coast, is situated on a steep acclivity rising from the sea, at the mouth of the Hunter river, about 75 miles north of Sydney. It isa well-built town, and most of the streets are paved, and lighted with gas. For the water supply a reservoir has been constructed on Monument Hill capable of holding 500,000 gallons. Among the public buildings the prin- cipal are the court-house, the lunatic asylum, the grammar school, the school of arts (with a library of over 4000 volumes), the Victoria market building, and the custom- house. The harbour, which is defended by a fort, and protected by a breakwater rendering it more easy of access in stormy weather, affords ample accommodation for present requirements, and has a depth at the shores of 23 feet, In 1883 the number of vessels that entered was 945

of 656,906 tons, the number that cleared 1305 of 925,926 tons. There is daily communication with Sydney by two lines of steamers. Besides the agricultural produce of the Hunter river district, the principal export is coal from the extensive mines in the neighbourhood of the town, which give employment to over 5000 men. The industries of the town include copper and iron founding, engineering, carriage building, shipbuilding, and brewing. The popu- lation of the census district in 1881 was 15,595.

The mouth of the Hunter river was discovered in 1797. The station, which for a long time was a convict depdt, was formerly called Port Hunter. In 1821 it became a free settlement, and in 1859 it was erected into a municipality, since which time its progress has been very rapid.

NEW CASTLE, a post-borough of the United States, the capital of Lawrence county, Pennsylvania, 2 miles above the junction of the Shenango and Mahoning (sub- tributaries of the Ohio), and 45 miles north-north-west of Pittsburg. It contains blast furnaces, rolling-mills, iron and brass foundries, tube-works, boiler-works, machine shops, planing-mills, nail factories, glass-works, grist-mills, and breweries. The population. increased from 6164 in 1870 to 8418 in 1880, and was estimated at upwards of 13,000 in 1883.

NEWCASTLE-UNDER-LYME (or Lyn), a municipal and parliamentary borough of Staffordshire, England, is situated on a small stream, the Lyme brook, and near the Grand Trunk Canal, 16 miles north-north-west of Stafford, and 35 south from Manchester. The parish church of St Giles was, with the exception of the old square tower, which dates from the 12th century, rebuilt (1873-76) from the plans of Sir Gilbert Scott, in the Decorated style, at a cost of £15,000. The free grammar school, originally founded in 1602, possesses very large endowments, increased by the amalgamation of various subsequent bequests for educational purposes, and now consists of a high school for boys, a middle school for boys, and Orme’s school for girls. The high school is a fine structure of red brick in the Elizabethan style, erected in 1874 at a cost of £12,000. There are also national and board schools and a school of art. The other principal buildings are the town-hall, recently rebuilt, the covered market (1854), and the

militia barracks. The manufacture of hats was at one time the staple trade, but it has now greatly declined. There are silk, cotton, and paper mills; and tanning, brew- ing, malting, and sugar-refining are also carried on. In the neighbourhood there are large collieries. The popula- tion of the parliamentary borough was 15,948 in 1871, and in 1881 it was 17,493. The municipal borough, which was slightly increased in extent in 1877, had 17,506 inhabitants in 1881.

The town, which was of some importance before the Conquest, derives the name Newcastle from the rebuilding of the castle in the reign of Henry I. The addition Lyme was due to the neigh- bouring exteusive forest of Lyme, which stretched “into Cheshire. The town and manor reverted in 1231 to Henry III. In 1268 the town and castle were bestowed on Simon de Montfort, on whose death they were forfeited to the crown. The town received its first charter from Henry II., and this was extended by Henry III. and Elizabeth. It possessed the privilege of returning two mem- bers to parliament some time before 1352.

NEWCASTLE, Duxes or. Within the space of a century there were no less than four successive creatious of dukes of Newcastle. William Cavendish, nephew of the first earl of Devonshire, was raised to the dignity of duke of N ewcastle-upon-Tyne in 1664. His son and successor Henry died leaving daughters only, and one of these married John Holles, earl of Clare, who was created duke in 1694. This duke died also without male issue in 1711, leaving his estates to his sister’s son Thomas Pelham, who, with other dignities, had the title of duke of Newcastle-upon-Tyne conferred on him in 1715, andeg

second and similar ducal title (that of Newcastle-under- Lyme) in 1757. His first dukedom became extinct at his death, but the second title was granted him with remainder to the earl of Lincoln, at once his nephew and nephew-in-law, whose descendants (Pelham-Clintons) have been dukes of Newcastle-under-Lyme in direct lineal succession down to the present time. Two of the dukes of Newcastle, and one duchess, call for separate notice :—

I. WILLIAM CAVENDISH, DUKE or Newcastix (1592- 1676), son of Sir Charles Cavendish, youngest brother of the first earl of Devonshire, by Catherine, daughter of Cuthbert Lord Ogle, was born in 1592. In his early years he showed little inclination for study, and while at. St John's College, Cambridge, he took "more delight in sports than in learning." At an early age he acquired marvellous proficiency in horsemanship and weapons, ""' which increased much his father's hopes of his future perfections.". His personal beauty and manly . accomplishments gained him special favour at the court of James I., who, when his son Henry in 1610 was created prince of Wales, made Cavendish a knight of the Bath. Ten years afterwards he became Viscount Mansfield and in 1628 earl of Newcastle-upon-Tyne. In 1638 he was appointed by Charles I. governor of Charles, prince of Wales. When the king in 1639 visited Scotland, he was entertained with great splendour by the earl of Newcastle at Welbeck. On the outbreak of the civil war the earl was appointed governor of the town of Newcastle and the four neighbouring counties, and a short time afterwards he was named general of the forces north of the Trent. In this position his energy and circumspection proved invalu- able to the royal cause. For his victory over Fairfax at Adderton Heath, near Bradford, June 30, 1643, he was created marquis. The Parliamentary generals were step by step losing their hold on the north, and were reduced to the hardest straits, when they were relieved by a Scottish army under the earl of Leven. Newcastle had to fall back on York, where he was closely besieged when Prince Rupert hurried to his assistance. Contrary to his advice Prince Rupert risked the battle of Marston Moor, which resulted in the utter rout of the royal forces and the ruin of the king's cause in the north of England. Newcastle, with about eighty gentlemen, retired to the Continent. He returned with Charles IT. at the Restoration, when he was appointed chief justice of the counties north of the Trent, and in 1664 he was created duke. From this time, however, he ceased to take an active part in political life, occupying himself chiefly with literary pursuits and the retrievement of his broken fortunes. He died December

| 25, 1676, and was buried in Westminster Abbey.

Dryden's Even Song is dedicated to Neweastle in very eulogistic terms. The duke, besides publishing 4 New Method and Extra- ordinary Invention to Dress Horses, 1667, which had previously appeared in 1657 in French, was

the author of several comedies, including The Exile (doubtful); The Cowntry Captain, 1649; Variety, 1649; The Humorous Lovers, 1677. He also translated Moliére's L' Etourdi under the title Sir Martin Mar-All. His wife's Life of him is noticed below.

II. Marcarer Lucas, pucHuss or NEWCASTLE (c. 1625-1673), second wife of the duke of Newcastle noticed above, was born about 1625, the youngest daughter of Thomas Lucas of St John's, near Colchester, Essex. She joined the court at Oxford in 1643 as maid of honour to Henrietta Maria, and met there the marquis (afterwards duke) of Newcastle, whom she married at Paris in 1645, after the battle of Marston Moor. Throughout life they continued to cherish a mutual admiration of a very exaggerated character, each regarding the other as en- dowed with transcendent merits both of person and mind. The duchess cultivated literary composition with exuberant fervour, and kept a bevy of maids of honour obliged to

be ready at all hours "'to register her Grace's conceptions." Walpole speaks of her as a "fertile pedant" with an "unbounded passion for scribbling"; and, although giving evidence of learning, ingenuity, and imagination, her writings are fatally marred by a deficiency in judgment and self-restraint.

She is best known by The Life of the Thrice Noble, High, and Puissant Prinee, William Cavendish, Duke, Marquess, and Earl of Neweastle ; written by the Thrice Noble, Illustrious, and Exeellent Prineess, Margaret, Duchess of Neweastle, his Wife, originally printed by A. Maxwell at London in 1667. She also published Philosophical Fanetes, 1653; Poems and Faneies, 1658; The

World's Olio, 1655; Nature's Picture drawn by Fanete's Peneil to.

the Life, which includes an autobiography, 1656; Philosophieal and Physteal Opinions, 1655 ; Orations, 1662; Plays, 1662; Sociable Letters, 1664; Observations wpon Experimental Philosophy, 1666 ; Letters and Poems, 1676. Wer Seleet Poems were edited by Brydges in 1818, and her Autobiography in 1814. The latter, edited by ee was published along with her Life of the Duke of Neweastle in 1872.

III. Tuomas PELHAM HoLLES, DUKE OF NEWCASTLE (1693-1768), who was for thirty years one of the two secretaries of state, and for seven more prime minister, and whose official life extended throughout the Whig supremacy of the 18th century, was the elder son of 'Thomas, first Lord Pelham, by his second wife Lady Grace Holles, younger sister of John Holles, duke of Newcastle- on-Tyne. Born in 1693, he was educated at Westminster and at Clare Hall, Cambridge. In 1711 his uncle the duke of Newcastle died, and left the whole of his vast estates to him. In 1712 he also succeeded his father in his peerage and estates, and in 1714, when he came of age, was one of the greatest landowners in the kingdom. He vigorously sustained the Whig party at Queen Anne's death, and had much influence in making the Londoners accept King George. His services were too great to be neglected, and in 1714 he was created earl of Clare, and in 1715 duke of Newcastle in Northumberland. He also became lord-lieutenant of the counties of Middlesex and Nottingham and a knight of the Garter in 1718, in which year he increased his Whig connexion by marrying Lady Henrietta Godolphin, granddaughter of the great duke of Marlborough. In 1717 he first held political office as lord chamberlain of the household, and in 1724 was chosen by Sir Robert Walpole to be secretary of state in place of Lord Carteret. This office he held continuously for thirty years (1724-1754), and only changed it for the premiership on his brother's death. His long tenure of office has been attributed to his great Whig connexions and his wealth, but some praise must be given to his inexhaust- ible activity and great powers of debate. He was a peculiarly muddle-headed man, and unhappy if he had not more to do than he could possibly manage, but at the same time he was a consummate master of parliamentary tactics, and knew how to manage the Houses of Lords and Commons alike. Lord Hervey compares him with Walpole in 1735, and says—" We have one minister that does everything with the same seeming ease and tran- quillity as if he were doing nothing; we have another that does nothing in the same hurry and agitation as if he did everything." He continued in office on Walpole's fall in 1742, and became more powerful on his younger brother Henry becoming prime minister in 1743. On Henry Pelham's death in March 1754, Newcastle suc- ceeded him as premier ; but people who had been accus- tomed to him as secretary of state would not stand him as premier, and in November 1756 he gave place to the duke of Devonshire. For his long services he was created duke of Newcastle-under-

Lyme, with remainder to the earl of Lincoln, who had married his niece Catherine Pelham. In July 1757 he.again became prime minister —for Pitt, though a great statesman, was a bad party

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leader—on the understanding, according to Horace Walpole, that ‘‘ Mr Pitt does everything, the duke gives everything.” Under this ministry England became famous abroad, but it gradually fell before the young king’s affection for Lord Bute, who, after supplanting Pitt, became prime minister in the room of Newcastle in May 1762. The duke went into strong opposition, and lost his two lord-lieutenaucies for opposing the peace of 1763. In 1765 he became lord privy seal for a few months, but his health was fast giving way, and he died in August 1768. The duke was certainly not a great man, but he must have possessed far more ability than has generally been allowed to have maintained office as long as he did; he was industrious and energetic, and to his credit be it said that the statesman who almost monopolized the patronage of office for half a century twice refused a pension, and finally left office £300,000 poorer than he entered it. j

The best authority for the duke of Newecastle’s life is the Memoirs of the Administration of the Right Hon. H. Pelham, by the

Ven. W. Coxe, 1829. See also the histories of his time, and such books as Lord Hervey’s Memoirs and Horace Walpole’s Letter’s.

NEW-CHWANG, a city of China, in the Manchurian province of Liau-tung (Shing-king or Fing-tien), is situated in 40° 25’ N. lat. and 122° 40’ E. long,, about 35 miles (90 miles by water) from the coast of the Gulf of Liau- tung, on what is now a small branch of the main eastern affluent of the Liau-ho or Sua-muren. The city proper is a comparatively unimportant place with broken-down walls, but it is surrounded by a number of largé and most flourishing suburbs. About the beginning of the present Ta-tsing dynasty (1644) New-chwang was the chief port on the river, but in the reign of Keen-lung, owing mainly to physical changes, it was supplanted by Tien-chwang-tai farther down the stream, and towards the close of the 18th century this had in turn to give place to Ying-tze still nearer the mouth. Jn ignorance of these facts New- chwang (now scarcely to be reached by a

flat-bottomed river boat) was chosen as one of the ports to be opened to foreign trade by the treaty of Tien-tsin ; and, though Ying- tze had of necessity to be adopted as the site of the forcign settlements, Europeans still continue to speak of the port of New-chwang. Ying-tze (otherwise known as Ying-kow, New-kow, and in Mandarin as Muh-kow-ying) lies on the left bank of the Liau-ho on the lowest dry portion of the plain, not much above high-water mark. The British settlement immediately above the town has a river frontage of 1000 yards opposite the deepest of all the reaches, and runs back to the highway leading to New-chwang. Off the mouth of the river there is an extensive bar of hard mud which can only be crossed by certain channels at high tide, when itis covered by from 18 to 20 feet of water ; and the port is altogether closed by ice for four or five months of the year between November and May. But in spite of these drawbacks Ying-tze is the seat of an extensive and growing trade. The staple articles of export are pulse (beans), pulse-cake, and pulse-oil; and pulse-warehouses and pulse-mills are the characteristic buildings of the town. The cake is a popular article of food with the natives of Kwang-tung and Fuh-keen, and is also largely employed for manuring the rice and sugar fields in the neighbourhood of Shanghae, Amoy, Swatow, &e. Other leading articles of export are castor oil, raw silk, ginseng, and samshu,—this last manufactured with great success in the city of New-Chwang, but very badly in Ying-tze. The port was opened to foreign trade in 1858; in 1882 316 vessels (of 152,871 tons) entered. The total value of the trade was £934,374 in 1864, £2,606,134 in 1878, and £1,904,740 in 1882. In 1864 Mr Meadows Taylor estimated the population of Ying-tze as about 80,000, though the mandarins stated it to be 200,000.

Plate V.

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NEWCOMEN, Tuomas, one of the inventors of the steam-engine, was a native of Devonshire, and was born about the middle of the 17th century. While employed as an ironmonger in Dartmouth he corresponded with Robert Hooke about the previous investigations of Papin and the marquis of Worcester as to the applicability of steam- power for the purpose of driving machinery, and in conjunc- tion with Cawley, a glazier in Dartmouth, and

Savary, the manager of a Cornish mine, he ‘obtained in 1705 a patent for a “ fire-engine,” now known as the ‘atmospheric steam-engine,” which was the first piece of mechanism in which steam was used with practical success. He died about 1713. See SrzAM-ENGINE.

NEW ENGLAND is the north-eastern portion of the United States, comprising the six States of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Nhode Island. It formed part of the territory of ‘‘ North Virginia” granted by James I. to the Plymouth Company in 1606 ; and in 1614 the name of New England was be- stowed upon it by Captain John Smith (1579-1631), whose Description of New England appeared at London in 1616.

NEWFOUNDLAND. This island, which is a British colony, lies off the eastern coast of North America, directly across the Gulf of St Lawrence. Its south-western ex- tremity approaches within 50 miles of Cape Breton, while its most easterly projection is only 1640 miles from Valentia, on the coast of Ireland. It is situated between 46° 36’ 50” and 51° 39’ N. lat., and between 52° 37’ and 59° 24’ 50” W. long. Its greatest length, from Cape Ray to Cape Norman, is 317 miles; its greatest breadth, from Cape Spear to Cape Anguille, 316 miles; and the total area about 42,000 square miles. Its figure roughly approaches an equilateral triangle. Two large peninsulas project from the main body of the island. One of these (Petit Nord) points northwards, and is long and narrow. The other is the peninsula of Avalon, pointing south-east, and almost severed from the principal portion of the island, the connexion being a narrow isthmus, in one place but 3 miles in width. On the eastern side of the Avalon peninsula is situated St John’s, the capital. Owing to its extensive frontage on the Atlantic, its numer- ous good harbours, and its proximity to the Banks! and the smaller fishing grounds, Avalon is the most thickly populated and commercially important part of the island.

Physical Features.—The shores of Newfoundland present generally a rock-bound aspect when seen from the ocean, but the line of cliffs (200 to 300 feet in height) is broken by numerous magnificent bays, running in some instances 80 to 90 miles inland, and throwing out smaller arms in all directions, so that, though the circumference of the island, measuring from

headland to headland, is about 1000 miles, the actual length of coast-line is more than ere ee

1 These Banks, which have played such an important part in the

history of the colony, aud are the chief source of its wealth, stretch for about 300 miles in a south-east direction towards the ceutre of the

North Atlantic, and probably at one time formed a part of the North .

American continent. The depths range from 15 to 80 or 90 fathoms. The deposits consist of sand and gravel composed of ancient rocks, and fragments of quartz, mica, hornblende, felspars, and magnetite; along with these are many calcareous fragments of echinoderms, polyzoa, and many foraminifera. In the deeper parts there is sometimes a fine mud containing the above-mentioned minerals and calcareous fragments, and in addition numerous frustules of diatoms. The Banks are swept by the cold Labrador current, and icebergs are frequently stranded upon them. The Gulf Stream passes over their southern portions. These two currents bear along many species of pelagic algze and animals, which supply abundant food to the myriads of echinoderms, molluses, annelids, ccelenterates, and other invertebrates which live at all depths ou the Banks. These invertebrates in turn supply food to the cod and other fishes which are sought for by the fishermen. Sea birds frequent the Banks in great numbers; and, as diving birds are not met with at any great distance from them, the presence of these in the sea gives seamen an indication of the shallower water.

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twice as great. The bays frequently present scenes of much beauty, being studded with islands, and having their shores clad in dark green forests to the water’s edge.

The part of the island nearest the sea consists of a hilly country with eminences of no great elevation. The interior proper consists of an elevated undulating plateau, traversed here and there by ranges of low hills, the

surface being diversified with valleys, woods, lakes, ponds, and marshes. Much of this isa savanna country, sustain- ing vast herds of reindeer. All the great hill ranges take a north-easterly and south-westerly direction, the highest land occurring along the western and southern shores. The principal mountain chain, the Long Range, extends along the western side of the island for nearly its entire length, and has peaks more than 2000 feet high, and parallel to this, but nearer the coast, is the Cape Anguille range. The peninsula of Avalon is very hilly ; but the highest summits do not exceed 1500 feet. The country is remarkable for a number of isolated sharply-peaked summits which rise abruptly here and there from the level plain, and bear the local name of " tolts."

The largest river is the Exploits, 200 miles in length, and having a drainage area of between 3000 and 4000 square miles. It rises in the extreme south-western angle of the island, and flows in a north-easterly direction through Red Indian Lake, terminating in the Bay of Exploits, Notre Dame Bay. The valley through which it flows contains large areas of fertile land, capable of yield- ing crops of all kinds, and in many places is covered with pine forests containing timber of large growth. The next largest river is the Humber, which rises 20 miles inland from Bonne Bay, and after a circuitous course empties itself into Deer Lake, thence flowing into the Bay of Islands. It drains an area of 2000 square miles. The Gander, which rises near the southern coast, and, flowing through Gander Lake, falls into Gander Bay on the east, has a drainage area of 2500 square miles.

One of the most remarkable of the physical features of the island is the immense number of lakes and ponds, which occupy nearly a third of the whole surface. The largest is Grand Lake, 56 miles in length, and covering an area of 192 square miles. It contains an island 22 miles in length and 5 in breadth. Red Indian Lake is 37 miles long and 64 square miles in area ; Gander Lake aud Deer Lake occupy 33 and 24 square miles respec- tively ; Sandy Lake, Victoria, Hind's, Terra Nova, and George IV. Lakes range next in size. The shores of these great lakes, and the fertile valleys through which their rivers flow, are as yet absolute solitudes, the very existence of which was until recently all but unknown.

Of the bays already alluded to, special mention may be made of St Mary's Bay (25 miles wide at the mouth and 35 miles long, with two arms— Salmonier and Colinet— which stretch still farther into the interior), Placentia Bay (55 miles wide at the entrance and 90 miles long), Fortune Bay (25 miles wide and 70 in length, with numerous arms, the chief of which are Bay D'Espoir, Hermitage Bay, and Connaigre Bay). At the entrance of Fortune Bay are the two islands of St Pierre and Miquelon, ceded by treaty to France for the shelter of its fishermen, and now all that remains to France of the vast possessions it once held in North America. Around Bay St George, on the western coast (40 miles wide at the mouth and with a good harbour at its head), are some of the most fertile valleys in the island, with fine forests of timber, and a coal-field of large extent. Bay of Islands has three fine arms running 20 miles inland. It is the seat of a valuable herring fishery. Notre Dame Bay is 50 miles wide at its mouth, and runs inland 70 or 80 miles. On its shores are the now famous copper mines, which are worked with great success.

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Bonavista Bay is of great extent, contains numerous groups of islands, and presents some of the finest scenery in the island. Conception Bay is the most populous and com- mercially important, having on its shores towns and villages containing a population of 42,000. The harbour of St John's is spacious and well sheltered.

Geology.'—All the great ancient rock systems, between the Lower Laurentian and the Coal-measures, are more or less represented at one part or another of Newfoundland.

The Laurentian system has an immense spread in the island. It. constitutes the principal mountain ranges, coming to the surface through the more recent deposits, on the axes of anticlinal lines, or brought up by great disloca- tions, most of which trend nearly parallel with each other in a general bearing of about north-north-east and south- south-west. The Laurentian gneiss of the Long Range, on the western side, extends in a nearly straight course from Cape Ray to the headwaters of the Castor in the great northern peninsula. On the south-western extremity of the island these rocks occupy the coast from Cape Ray to La Poile. They are largely

exhibited on the Grand Lake, running ina spur from the Long Range between it and the Red Indian Lake, and bearing for the south-eastern shores of Hall's Bay. The central portion of the northern peninsula is Laurentian, which also spreads over a wide expanse of country between Grand Lake and the Humber and Exploits rivers, and shows itself on the coast between Canada Bay and White Bay. Another range of Laurentian comes up in the district of Ferryland, and shows itself occasionally on the coast of Conception Bay. Thus more than half the island is Laurentian.

Three-fourths of the peninsula of Avalon are Huronian, a formation which does not extend west of Fortune Bay. The town of St John's and, in fact, nearly all the settle- ments between Fortune Bay and Bonavista Bay are built upon it. Signal Hill, overlooking the harbour of St John's, is capped with the sandstone of this formation. The whole Huronian system is not less than 10,000 feet thick, and has been cut through by denudation to the Laurentian floor. The rocks of the Primordial Silurian age are spread unconformably over the area thus ground down. These evidences of denudation and reconstruction are very clear in Conception Bay, where the rocks of the intermediary system have been ground down to the Laurentian gneiss, and, subsequently, the submarine valley thus formed has been filled up with a new set of sediments, the remains of which are still to be found skirting the shores of the bay and forming the islands in it.

Rocks of the Silurian age are most extensive on the peninsula of Cape St Mary, and around the head of Trinity Bay. These belong to the Primordial Silurian group. The Lower Silurian rocks have a large development, and in them the metallic ores occur which seem destined to render the island a great mining centre. The Lauzon division of the Quebec group, which is the true metalli- ferous zone of North America, has an immense spread in the island. It consists of serpentine rocks associated with dolomites, diorites, &c., and is well known throughout North America to be usually more or less metalliferous. The Newfoundland rocks are no exception, but give evidence of being rich in metallic ores. The Middle Silurian division of rocks is also widely spread; and the most fertile belts of land and the most valuable forests are nearly all situated on the country occupied by this formation. The great valley of the Exploits and Victoria rivers, the valley of the Gander, and several smaller tracts belong to it.

1 The geological survey of the island was commenced in 1864, and has been prosecuted steadily since; the results are embodied in The Geological Survey of Newfoundland, by A. Murray, C. M.G., 1881.

the north-west.

The Carboniferous series occupies a large area on the western side of the island, in the neighbourhood of St George's Bay and Grand Lake. There is also a wider spread of the same series along the valley of the Humber and round the shores of Deer Lake and the eastern half of Grand Lake, and as far as Sandy Lake. "Coal," says Mr Howley, "is known to exist at several places in this series; and seams, apparently of workable thickness, judging from their out-crops, occur on the Middle Barachois and Robinson's Brook, in St George's Bay."

It will thus be seen that the Carboniferous series is confined to the western side, while the middle, eastern, and southern portions are occupied by Silurian, Huronian, and Laurentian formations. From the extent to which the Lauzon division of the Quebec group, the true metalliferous zone of North America, prevails in the island, its yet un- developed mineral wealth must be very great, while it is fitted to sustain a large agricultural population.

Climate.—The climate is more temperate than that of most portions of the neighbouring continent. It is but rarely, and then only for a few hours, that the thermometer sinks below zero in winter, while the summer range rarely exceeds 80° Fahr., and for the most part does not rise above 70°. The Arctic current exerts a chilling influence along the eastern coast, but as a compensation it brings with it the enormous wealth of commercial fishes and seals which has rendered the fisheries the most productive in the world. The Gulf Stream, while it creates fogs, modifies the cold. The salubrity of the climate is evidenced by the robust healthy appearance of the inhabitants. Open fireplaces are sufficient to warm the houses, and free exercise in the open air is attainable at all seasons. The average mean temperature at St John's for eight years ending 1864 was 41°°2 Fahr., the maximum being 83° and the minimum 7°; the average height of the barometer was 29°37

inches.? The average rainfall is 58°30 inches. Winter sets in, as a rule, in the beginning of December, and lasts until the middle of April. Generally the snow lies during this period, and the frost rarely penetrates the ground to a greater depth than a few inches. Spring is sometimes late in arriving, but once vegetation sets in it advances with marvellous rapidity. The autumn is usually very fine, and is often prolonged till November. There is nothing in the climate to interfere with agriculture. Tornadoes are unknown, and thunderstorms are very rare. Fogs, of which so much is said in connexion with the country, are confined to the shores and bays of the south- eastern and southern coasts.

fauna.—Among the well-known wild animals indigenous to the country the caribou or reindeer hold a conspicuous place. They migrate regularly between the south-eastern and north-western portions of the island. The winter months are passed in the south, where ‘‘browse” is plentiful, and the snow is not too deep to prevent them from reaching the lichens ou the lower grounds. In March they begin their spring migration to the barrens and mouutains of In May or June they bring forth their young. As soon as the frosts of October begin to nip the vegetation they turn south. September and October are the best months for stalk- ing. In addition to the caribou, the wolf and black bear are found in the interior; the fox (black, silver, grey, and red), beaver, otter, arctic hare, North-American hare, weasel, bat, rat, mouse, and musquash or musk-rat are numerous. The famous Newfoundland dog is still to be met with, but good specimens are rare, and he appears to thrive bettcr elsewhere. The common dogs are a degene- rate mongrcl race. It is estimated that there are three hundred species of birds in the island, most of them being migratory. Among them may be enumerated the eagle, hawk, owl, wood- pecker, swallow, kingfisher, six species of fiy-catchers and the same number of thrushes, warblers and swallows in great varicty, finches, ravens, jays. The ptarmigan or willow grouse is very abundant, and is the finest game-bird in theisland. The rock ptarmigan is found in the highest and barest mountain ridgcs. The American

2 See Tables of Aqueous Precipitation for Series of Years, collected by the Smithsonian Institution, United States, 1872.

goldcn plover, various species of sandpipers and curlews, the brent goose, ducks, petrels, gulls, and the great northern diver are met with everywhere. The great auk, now extinct, was once found in myriads around the island. The little auk, guillemot, and the razor-billed auk are abundant. No venomous reptiles, toads, or frogs occur. Of molluscous animals the common squid, a cepha- lopod about 6 or 7 inches in length, visits the coasts in immense shoals in August and September, and supplies a valuable bait. A gigantic species of cephalopod was discovered in 1873, which excited much interest among naturalists: the body varies from 7 to 15 feet in length, with a circumference of 5 or 6 feet; from the head ten arms radiate, the two longest (tentacles) being from 24 to 40 feet in length, and covered with suckers at their extremities; the other eight arms vary from 6 to 11 fcet, and on one side are entirely covered with suckers. Professor Verrill, of Yale College, has dis- tinguished two species—one he named Architeuthis Harveyt, after the discoverer, and the other Architeuthis monachus.

Flora.—The pine, spruce, birch, juniper, and larch of the forests of the interior furnish ample materials for a large timber trade as well as for shipbuilding purposes. The white pine grows to the height of 70 or 80 feet in some places, and is 8 or 4 feet in diameter. The mountain ash, balsam poplar, and aspen thrive well. Ever- greens arc in great variety. ‘The berry-bearing plants cover large areas of the island. The maidenhair or capillaire yields a saccha- rine matter which is Insciously sweet. Flowering plants and ferns are in vast varieties, and wild grasses and clover grow luxuriantly. Garden vegetables of all kinds, and strawberries, raspberries, goose- berries, currants, &c., thrive well.

Fisherics.—These constitute the grand staple industry of the country. The most important is that of the cod, which is the most extensive of the kind in the world. During six years from 1877 to 1882 the average annual export of codfish from Newfoundland amounted to 1,326,259 quintals (cwts.). (For earlier statistics see FisHEries, vol. ix. p. 266.) The cod are taken on the shores of the island, on the Banks, and along the coast of Labrador. The Bank fishery is now prosecuted chiefly by the French and by Americans, Newfoundlanders occupying themselves with the shore and Labrador fishery. The aggregate annual catch of cod at present in the North-American waters is estimated at 3,700,000 quintals, say 150,000,000 fish. The value at

$4 a quintal would be $14,800,000. Nearly four-fifths of the entire returns of tlie Newfoundland fisheries arise from the cod fishery.

While the cod fishery docs not show any marked advance in the quantities taken during the last thirty years, the market value of dried codfish has risen more than 50 per cent., and the average value of the exported products of the fishery may be fairly reckoned at $5,500,000 per annum. Adding to this the local consumption, we must place the entire annual value at $6,364,000, or £1,325,834 sterling.

The last census (1874) showed that there were 26,377 able- bodied fishermen in the colony, and. 45,845 persons engaged in catching and curing fish out of a population of 161,374, 1197 vessels of a tonnage of 61,551 tons, 8902 fishing rooms in actual usc, and 18,611 boats employed in the shore fishery. There are now (1883) about 53,000 persons engaged in catching and curing fish out of a population exceeding 180,000. The French Newfoundland fisheries on the Banks and along the shores average from 400,000 to 500,000 quintals,—the number of men employed being 5000 to 6000.

The cod fishery has been prosecuted for about 380 years, but, notwithstanding the cnormous drafts every year, to all appearance the cod are as abundant as ever. Thcy begin to appear on the coasts of the island about the first of June, at which time they move from the deep waters of the coast to the shallower and warmer waters near the shore, for spawning purposes. Their approach is heralded by the caplin, a beautiful little fish about 7 inches in length, vast shoals of which arrive, filling every bay and harbour. The cod follow in their wake, feasting greedily upon the caplin, which supply the best bait. In six weeks the caplin dis- appear, and their place is taken by the squid about the Ist of August. These also supply a valuable bait, and are followed by the herring, which continue till the middle or end of October, when the cod fishery closes, The cod are taken by the hook-and-line, the seine, the cod-net or gill-net, the cod-trap, and the bultow. Newfound- land cxports cod to Brazil, Spain, Portugal, Italy, Great Britain, the West Indics, and the United States. Brazil and Spain are the largest consumers.

Next to the cod fishery in value comes that of the seal, which is not more than eighty years old. At present the average annual value of the seal fishery is about $1,100,000, being an eighth part of the entire exports. ‘The number of men employed is from 8000 to 10,000. Steamers were first used in 1863, and now there are about 25 engaged, some of them from 400 to 500 tons burthen; sailing vessels are rapidly diminishing in numbers. According to law, no sailing vessel can clear for the seal fishery before the 1st of March, and no steamer before the 10th. The young scals are born on the ice from the 15th to the 25th of February, and increase in bulk so rapidly that they are in perfect condition by the 20th March.

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The scals frequenting the coasts of Newfoundland have regular migratory movements. They are found on the ice from the middle of February till May, when they commence their northerly move- ment. In June they are seen in enormous numbers on the Green- land coast, where they spend two or three months. As the early winter sets in they begin their southern migration, keeping ahead of the ice as it forms, and moving towards the coast of Labrador, feeding in its fiords and bays. Reaching the Great Banks by the close of the year, they feed there till the beginning of February, when their northern migration begins, to meet the ice on which their young are to be brought forth and cradled. For more than sixty years they have borne an annual draft of from a quarter to half a million without showing any sensible diminution in their numbers, but the introduction of steam has given increased facilities for following the old seals at a later period of the scason, and for shooting them on the ice,-—a practice which may ultimately lead to their extermination.

There are no finer salmon streains than those of Newfoundland, but no proper measnres have been taken for their preservation, and in consequence such practices as closing the mouths of the rivers with nets at a time when the fish are ascending to spawn, and con- structing weirs, traps, and dams, have been followed to such an extent that in many of the rivers salmon are almost exterminated. The average value of the pickled and fresh salmon exported, during the last ten years, has been about $106,000 per annum. Until recently the chief mode of curing the salmon was salting, In 1842 the

export was 4715 tierces ; in 1871, 3977; in 1880, 6765; in 1881, 3689; and in 1882, 3825 tierccs. The methods of preserving salmon in hermetically sealed tins and of exporting it in ice have been lately introduced with success, Of tinned salmon 34,584 Ib were exported in 1880, 20,000 fb in 1881, and 10,000 1b in 1882, while 68,551 tb of frozen salmon were exportcd in 1881, and 313,000 Ib in 1882.

The chief seats of the herring fishery are Fortune Bay, St Gcorge's Bay, Bay of Islands, Bonne Bay, and the whole coast of Labrador. The finest fish are those taken off Labrador and in the Bay of Islands. The average annual value of herrings exported during the seven years 1877-83 was $358,359. The value of the herrings sold to the French and Americans as bait is about $150,000 per annum. Allowing 73,000 barrels for home comsumption, at $3 per barrel, we have as the total value of the annual catch of herrings $727,359.

Fifty years ago the mackerel, once very abundant, deserted the Newfoundland waters, and have not since reappeared. But few holibut or haddock are taken. Within the last few years the exportation of preserved lobsters has increased rapidly. Lobster factories have been established at various points. In 1881, 1,299,812 tb of prescrved lobsters were exported, and 46,428 tb of frozen lobsters, the total value being $111,408. In 1882 the export was 1,265,224 Ib of preserved lobsters, the value being $105, 432.

Agriculiture.—Up to a comparatively recent period the people of Newfoundland were so exclusively engaged in the fisheries that uo attention was given to agriculture; and persons who were interested in keeping the inhabitants on the sea-coast employed in fishing systematically represented the country as hopelessly barren. That this is not the case has been conclusively proved by the geolo- gical survey. According to its Reports there are in the valleys on the western coast 1320 square miles " perfectly capable of being re- claimed and converted into fairly productive grazing and arable land"; and these valleys are also for the most part well wooded. In the great valleys of the Gander, Gambo, Terra Nova, and Exploits there are 3320 square miles of land suited admirably for settlement. There are also any smaller fertile tracts around the heads of the bays, along the margin of the smaller streams, and in the islands, so that in

all there are 5,000,000 acres of cultivable land. At present these fertile tracts are almost wholly unoccupied, but the railway now being constructed will render them accessible and promote their set- tlement. The last census showed that only 34,2938 acres are actu- ally cultivated, the valuc of the produce being $612,350 per annum.

Minerals. —The first copper mine was opened in 1864, and at the end of 1879 the customs returns showed that copper and nickel ore to the value of £1,000,000 had been exported in the interval. At present Newfoundland stands sixth among the copper-producing countries of the world. The mines are all situated around the shores of the Bay of Notre Dame ; and until the interior is opened by roads and railways this will be the chief scenc of mining euter- prise. From one of these mines—Betts Cove—35,000 tons of ore were taken in 1877. The ore is found in proximity to the serpeu- tine rocks, but more immediately associated with a chloritic slate which occurs both above and below the serpentine. The area of serpentine rocks in the island is estimated at 5097 square miles. Many other minerals besides copper have been found, such as lead (in many places), silver, and magnetic iron ore ; gold was recently discovered in onc locality. In St George's Bay there are large workable seams of coal as yet untouched ; a seam of excellent canne\ coal, 8 feet in thickness, was discovered there many years ago. Mr Jukes estimated the coal basin at 25 miles by 10. Gypsum exists in great abundance in the Carboniferous region, especially at

Codroy and around St George's Bay. Marbles of almost every shade are found on various parts of the eoast ; limestone, granite of the finest quality, roofing slate, and building stones are abundant.

Shipping.—On December 31, 1881, the registered tonnage of the eolony was 1895 vessels, having a tonnage of 89,655 tons. Of these 1866 were sailing vessels and 29 were steamers. In addition, 60 vessels were engaged in the foreign carrying trade whieh, thongh owned in Newfoundland, were registered in Britain. The number of vessels entered at the various ports in 1881 was 1366, of 158,345 tons; the number cleared was 1018, of 132,743 tons. The number of steamers eleared at the various ports in 1881 was 181,

their tonnage 162,285. The total value of exports in 1882 was $8,228,291; of imports, $8,350, 222.

Manufactwres.—These are yet on a limited scale, and are confined to St John's. There are a boot and shoe factory, a woollen faetory, two tobaceo factories, three furniture factories, a rope and cordage faetory, three biseuit factories, a tannery, and soap works.

Population.—The earliest estimate of the resident population of

ewfoundland was made in 1654, when the total amounted to 1750. In 1680 it reached 2280; in 1763, 7000; in 1804, 20,000; in 1832, 60,000; in 1836, 75,094; in 1857, 124,288; in 1869, 146,536; and in 1874, when the last census was taken, the total population was 161,374. It is now (1883) probably 185,000. St John's, the capital, contained a population of 15,000 in 1835, and in 1882 it was elose on 30,000. From 1845 to 1857 the rate of increase for the island was 25 per cent., from 1857 to 1869 184 per cent., and from 1869 to 1874 10 per cent.

The following table shows the numerical strength of the various religious denominations in 1874 :—

@iminCh OfAROMEC….cese0sscscssccerses Gata Wia PRES bybeUIANSsessssseseccssessercreeseste 1,168 Church of England…….-sscseec 59,561 | Congregationalists…….ssssee0 461 Ry ESLEYATIS, cc cresescsseescces cece se oee 35,702 | Baptists and Others……..ccccersceee 165

The Protestant portion of the population are deseendants of English settlers chiefly, and the Roman Catholic portion descend- ants of Irish emigrants.

Edueation is eondueted on the separate or denominational prin- eiple, each religious denomination receiving an amount for its elementary schools and academies proportionate to its numbers. The grant amounts to $93,252 per annum. The total number of seholars in attendance at the schools is 24,971, and the number of sehools 416. There are four academies in St John's, and grammar sehools in some of the larger towns.

Finance.—The revenue is ehiefly derived from duties leviea on imports. These are partly ad valorem and partly specific, but only to a very slight extent differential, the tariff being designed for revenue purposes only, not for proteetion. There are no direct taxes, and no city or town corporations, The expenses connected with the various branches of the public service are all defrayed out of the general revenuc. The taxation in 1882 was only $4°94 per head of a population of 185,368. Within the last twenty years the revenue has more than doubled. In 1860 it amounted to $534,432, and in 1882 to $1,119,385. The consolidated and debenture debt of the colony on December 31, 1881, was $1,351,008. The colony has placed to its credit at 4 per eent. $757,704, being a portion of the fishery award in connexion with the treaty of Washington ; and

‘a sinking fund has been established which in twenty-one years will remove over half the publie debt.

Government.—Newfoundland is a British colony, directly de- pendent on the erown. Representative government and a consti- tution were granted to it in 1832, and ‘‘responsible government ” in 1855. Two legislative chambers were appointed—the house of assembly, to be elected, and the legislative council, to be nominated by the governor in council. This form of government has worked satisfactorily. It eonsists of a governor who is appointed by the crown, and whose term of office is usually about six years ; an executive council chosen by the party commanding a majority in the house of assembly, and consisting of seven members; a legislative council or upper house, of fifteen members, nominated by the governor in council and holding office for life; and a house of assembly of thirty-three members, elected every four years by the votes of the people. There are seventeen electoral districts, The members of the lower house are eleeted by household suffrage. The governor reeeives a salary of $12,000 per annum, paid by the eolony. The supreme court, instituted in 1826, is composed of a chief justice with a salary of $5000 per annum and two assistant judges with salaries of $4000. They are appointed by the crown, and hold their office for life. The jurisdiction of Newfoundland extends over the whole of the Atlantie coast of Labrador.

Roads and Railways.—The first road was made in 1825 (from St John's to Portugal Cove), and about $100,000 per annum are now devoted to making and repairing roads and bridges. At present there are 727 miles of postal roads and 1730 miles of district roads, besides 1200 miles in process of construction. In 1880 Government was authorized by the legislature to raise a loan of £1,000,000 ster- ling, on the credit of the colony, for the purpose of construeting a railway from St John's to Hall's Bay, the centre of the mining

region, with branches to Brigus, Harbour Grace, and Carbonear, the whole length to be 340 miles. At the close of 1882 there were 45 miles open for traffic. This railway, when completed, will tra- verse the great valleys of the Gander and Exploits, and afford aecess to the finest agricultural and timber lands. In 1882 a charter was granted to '' The Great American and European Short Line Railway Company" to construet another line which is to run from a point on the eastern coast to Cape Ray, the object being to shorten the route between Europe and America by crossing Newfoundland. The proposed plan is to place a line of the swiftest steamers between Newfoundland and a port on the Irish coast; the proposed railway across the island would eonvey passengers to Cape Ray, whence a steam-ferry would earry them to Cape North, in the island of Cape Breton, and the railway system of Canada would be reached. The company ealenlate on shortening the time of travel between London and New York by two days.

History.—Newfoundland, the most ancient of Great Britain's immense colonial possessions, was discovered by Joun Cazor (see vol. iv. p. 622) in 1497. Gasper Cortoreal, who ranged the coast of North America in 1500, discovered and named Conception Bay and Portugal Cove in Newfoundland, and established the first regular fisheries on its shores. Seven years after Cabot's dis- eoveries the fishermen of Normandy, Brittany, and the Basque Provinces were engaged in these. In 1517 40 sail of Portu- guese, French, and Spaniards took part in the cod fishery. In 1578, aeeording to Hakluyt, the number of vessels employed in it had inereased to 400, of which only 50 were English, the remainder being French and Spanish. At length, however, England awoke to the importanee of Cabot's

great diseovery, and an attempt was made to plant a colony on the shores of the island. Sir Humphrey Gilbert (see vol. x. p. 591), provided with letters patent from Queen Elizabeth, landed at St John'sin August 1583, and formally took possession of the country in the queen'sname. This first attempt at colonizing was frustrated by the loss of Gilbert soon afterwards at sea. In 1610 James I. granted a patent to Mr Guy, an enterprising Bristol merehant, for ''a plantation " in Newfound- land ; but no marked suecess attended his efforts to found settle- ments. In 1615 Captain Riehard Whitbourne of Exmouth in Devonshire was despatched to Newfoundland by the British Admiralty to establish order and correct abuses which had grown up among the fishermen. On his return in 1622 he wrote a Discourse and Discovery of Newfoundland Trade, which King James, by au order in council, caused to be distributed among the parishes of the kingdom 'for the encouragement of adventurers unto plantation there." A year after the departure of Whitbourne, Sir George Calvert, afterwards Lord Baltimore, obtained a patent conveying to him the lordship of the whole southern peninsula of Newfoundland, and the right of fishing in the surrounding waters. He planted a colony at Ferryland, 40 miles north of Cape Race, where he built a handsome mansion and resided with his family for many years. The French so harassed his settlement by incessant attacks that he at length abandoned it and went to Maryland, where he founded the city of Baltimore.

In 1650, or about a century and a half after its discovery, New- foundland contained only 350 families, or less than 2000 individuals, distributed in fifteen small settlements, chiefly along the eastern shore. These constituted the resident population; but in addition there was a floating population of several thousands who frequented the shores during the summer for the sake of the fisheries, which had now attained very large dimensions. So early as 1626 150 vessels were annually despatched from Devonshire alone ; and the shipowners and traders residing in the west of England sent out their ships and fishing crews early in summer, to prosecute these lucrative fisheries. The fish eaught were salted and dried on shore; and on the approach of winter the fishermen re-embarked for England, earrying with them the products of their labour. Hence it became the interest of these traders and shipowners to diseourage the settlement of the country, in order to retain the exclusive use of the harbours and fishing coves for their

servants, and also a mono- poly of the fisheries. They were able to enlist the British Govern- ment of the day in their project, and stringent laws were passed prohibiting settlement within 6 miles of the shore, forbidding fishermen to remain behind at the close of the fishing season, and rendering it illegal to build or repair a house withont a special licenee. The object of this short-sighted policy, which was per- sisted in for more than a century, was to preserve the island as a fishing station, and the fisheries as nurseries for British seamen.

There was, however, another element which retarded the pro- sperity of the country. The Freneh had early realized the imniense value of the fisheries, and strove long and desperately to obtain possession of the island. Their constant attacks and encroachments harassed the few settlers, and rendered life and property insecure during the long wars between England and Franee. When at length, in 1713, the treaty of Utrecht ended hostilities, it did not deliver Newfoundland from the grasp of France, as it yielded to her the right of catching and drying fish on the western and northern side of the island. Though no territorial rights were conferred on the

French, and the sovereiguty was secured to England, the prac- tical effect was to exclude the inhabitants from the fairest half of the island. Interminable disputes have arisen regarding those treaties, which are not yet settled, and, as a cousequence, the fine lands of western Newfoundland are still untenanted, and the mineral treasures untouched. ;

In spite of the restrictive regulations, the number of the resident population continued to increase. The sturdy settlers clung to the soil, combated the ‘‘adventurers,” as the merchants were called, and after a lengthened conflict obtained frecdom of settlement and relicf from oppression. But the contest was severe and so prolonged that only seventy years have elapsed since the repeal of the last of those laws which prohibited settlement and the cultivation of the soil. The progress of the colony since has been most satisfactory.

The merchant-adventurers strenuously opposed the appointment of a governor; but at length, in 1728, the British, Government appointed Captain Henry Osborne first governor of Newfoundland, with a commission to establish a form of civil government. ‘This constituted a new era in the history of the colony. In 1763 the fixed inhabitants had increased to 8000, while 5000 more were summer residents who returned home each winter. In 1765 the coast of Labrador, from the entrance of Hudson’s Strait to the river St John, opposite the west end of the island of Anticosti, was attached to the governorship of Newfoundland. The popu- lation in 1785 had increased to 10,000. During the wars between England and France which followed the French Revolution, Newfoundland attained great prosperity, as all competitors in the fisheries were swept from the seas, and the markets of Europe were exclusively in the hands of the merchants of the country. The value of fish trebled ; wages rose to a high figure ; and in 1814 no less than 7000 emigrants arrived. The population now num- bered 80,000. In 1832 representative government was granted to the colony, and provision was made for education. In 1846 a terrible fire destroyed three-fourths of St John’s, and with it an enormous amount of property ; but the city rose from its ashes im- proved and beautified. In 1855 the system of responsible govern- ment was inaugurated. In 1858 the first Atlantic cable was landed at Bay of Bull’s Arm, Trinity Bay.

Unproductive fisheries, causing a widespread destitution among the working classes, marked the first eight years of the decade between 1860 and1870. A system of able-bodied pauper relief was initiated to meet the necessities of the case, but was attended with the usual demoralizing results. The necessity of extending the cul- tivation of the soil in order to meet the wants of the growing population was felt more and more as the pressure arising from the failure of the fisheries showed their precarious nature more sensibly. In 1864 copper ore was discovered in the north, and mining opera- tions, furnishing employment for the people, were successfully initiated. In 1869 a series of successful fisheries began, which enabled the Government to terminate the injurious system of able- bodied pauper relief. In 1871 the revenue rose to $831,160. In 1873 direct steam communication with England and America was established.

Authorities —Hakluyt's Chronicles; Captain Richard Whitbourne, 4 Discourse and Discovery of Newfoundland, 1622; Nieholls, Life of Cabot; Anspach, History of Newfoundland; (Chief-Justlee) Reeve, History of the Government of the Island of Newfoundland, 17938; Jukes, Newfoundland, 1841; Sir Richard Bonnyeastle, Newfoundland, 1842; Pedley, History of Newfoundland, 1863; Murray and Howley, Geological Survey of Newfoundiand, 1881; and Harvey and Hatton, Newfoundland, the Oldest British Colony, London, 1883. (M. HH.)

NEW GRANADA. The vast regions of the north-west of South America conquered by Spanish adventurers in the first half of the 16th century received from Quesada, one of the great leaders of the movement, the title of the New Kingdom of Granada. It was not till 1718, however, that the Spanish Government granted the president of the colony, Pedroza y Guerrero, the rank of viceroy ; and at the desire of his successor, Jorge Villalonga, the honour was again withdrawn. In 1739 the New Kingdom of Granada was re-established under a viceroy, whose authority extended over the provinces of Tierra-firma (state of Panama), Cartagena (state of Bolivar), Santa Marta and Riohacha (state of Magdalena), Maracaibo, Caracas, Cumana, and Guiana (republic of Venezuela), Antioquia (state of Antioquia), Pamplona and Socorro (state of Santander), Tunja (state of Boyaca), Santa Fé (state of Cundinamarca), Neyva and Mariquita (state of Tolima), Popayan and Pasto (state of Cauca), and Quito, Cuenca, and Guayaquil (republic of Ecuador). In 1777 the provinces of Maracaibo, Caracas, Cumana, and Guiana were separated from the viceroyalty to form the captaincy- general of Venezuela. For the republic of Colombia (1820-30), the republic of New Granada (1831-61), and

NE W—

NE W the United States of Colombia (1861 to the present time), which have successively taken the place of the

viceroyalty, see Cotomsta (vol. vi. p. 156); and compare Pereira, Les Etats-Unis de Colombie (Paris, 1883).

NEW GUINEA, the largest island in the world (ex- Plate y1

cluding Australia), les immediately north of Australia, between 0° 25’ and 10° 40’S. lat. and between 130° 50’ and 150° 35’ E. long. It is 1490 miles long, with a maximum breadth of 430 miles, its area being about 306,000 square miles.}

Physical Features.—It was probably in Miocene times, if not later, united to Australia; the average depth of Torres Straits, which are 80 miles wide, is only 8 or 9 fathoms, and the maximum 20,—three-fourths of the distance being occupied by coral reefs, a prolongation of the great eastern barrier reef of Australia. At either end of New Guinea a few large islands, with a number of smaller islets, are only separated from the mainland by narrow channels. From difficulties connected with the navigation, the climate, and the people, the coasts are still imperfectly surveyed, while of the interior, relatively to its vast extent, very little is known. At the north-west end the deep M‘Cluer Inlet almost cuts off a great peninsula of some 200 by 115 miles, while this inlet and another farther south almost if not entirely insulate the great tract known as Onin. The south coast, from Cape Bourou westwards, is mostly precipitous, limestone cliffs rising several hundred feet, with dense forest and a moun- tainous country behind. There are occasional tracts of flat swampy ground, and the steep coast-line is be- sides broken by some large rivers, whose banks for some distance inland are usually swampy. Off M‘Cluer Gulf are numbers of curious mushroom-shaped islands with sea-worn bases.

The north coasts are sometimes level, as at parts of Geelvink Bay and the extensive delta of the great Amberno river, at Walckenaar and Humboldt Bays, and farther east towards Cape della Torre, near which, and near Huon Gulf, there are large rivers; otherwise the shores are steep-to, and apparently rising, with promon- tories jutting 20 to 40 miles out, and some good harbours. There is no barrier reef off this coast. High distant mountains are observed at every opening, those towards the east rising in successive and highly fertile terraces to some 13,000 feet. No active volcanoes have as yet been observed on the mainland, but Mr W. Powell reports masses of pumice on the slopes of the Finisterre mountains. Severe earthquakes, too, occur on the north side, and there is a line of volcanic activity parallel to this coast some 20 to 50 miles distant. Near its east end are the D’Entre- casteaux Islands (7000 feet), richly wooded, with rocks of

raised coral and boiling alkaline springs. Cape Bourou appears to be the extremity of the lofty Charles Louis range, over 16,000 feet, the tops of which seem from the distance to be snow-covered. East from Cape Bourou the | mountains recede out of sight, the sea is shallow, and the flat mangrove-covered coast is intersected by creeks and rivers laden with mud, as far as the Gulf of Papua, where Signor D'Albertis reports that he steamed 500 miles up the Fly river, probably one of several channels draining a vast swamp country between the mountains and the sea. He found the tropical forest scenery varied by treeless plains, with isolated hills rising from them, like the islands in the neighbouring Torres Straits from the sea. These tracts are Australian in character. The hills probably escaped the submersion which, besides forming Torres Straits, covered the surrounding country, and thus re- mained as nuclei of an Australian flora,—the plains, on

1 That of Borneo is about 286,000.

again emerging, being occupied, in great measure, by the tropical vegetation from the westward. Beyond Redscar Head in the Gulf of Papua the country again rises, having an Australian appearance,—open grassy hills with scattered timber sloping to the coast, which is here skirted by a barrier reef with occasional openings, affording good shelter to vessels. Inland, densely wooded hills and valleys with rivers and rich cultivable soil are backed by the great Owen Stanley range (13,000 feet), which terminates at the east forks in bluffs 2000 feet high.

Geology. Of the geology of New Guinea little is known. In the north-west the Arfak mountains are mainly granite and gneiss. Near Geelvink Bay dark limestones occur, apparently ancient, and stratified clay slates. Bismuth is found here at Moom. Miosnom island, opposite, is volcanic. Raised coral is frequent on this (north) coast, and the streams bring down pebbles of plutonic rocks and sandstones. Clay ironstone is found at Humboldt Bay, on the river Jakata near M'Cluer Gulf, and at Lakahia Island, and a Tertiary coal (lignite) at Lakahia and in Galewo Strait. On the east side of the Gulf of Papua the coast range is of recent limestone. At Hall Sound calcareous clays from the Lower Miocene con- tain fossil shells identical with those found in Victoria and South Australia. Small fragments and pebbles, sent

from Redscar and Astrolabe Bays (probably coming from the great central range), consisting of mica slate, quartz, sand- stones, greenstones, and jasperoid rocks, are undistinguish- able from those of the Devonian and Silurian series of the gold-fields of New South Wales. A black magnetic-iron sand (with traces of gold) and plumbago are reported from this (south-east) coast. Some of the Torres Straits islands are of raised coral, others of stratified sandstones with huge overlying blocks of the same and conglomerates, others volcanic.

Climate.—The climate of the coast is unhealthy, especi- ally during the transition between the monsoons, which is long and irregular owing to the action of the high mountain ranges on these winds. The heat is tempered by the heavy rainfall, discharged by the north-west mon- soon chiefly in the west and north; the south-east monsoon also is often wet, especially in the east and south districts. Torres Straits are healthier, though the heat is great and the amount of salt in the air is trying to many. From July to September the force of the south-east monsoon there is such that even steamers cannot always face it and the tide together.

Flora. —The flora is mainly that of the Indian Archi- pelago, which predominates even in the islands of Torres Straits; but on the shores of the Gulf of Papua, and inland, Australian vegetation is represented by Eucalyptus, acacias, and Pandanus; and Australian types are found as far north as Humboldt Bay. Over great part of New Guinea dense forests prevail, clothing the mountains to a height of several thousand feet, the timber of enormous height, though the species are fewer than in the great islands of the archipelago. Among them various kinds of Ficus, Casuarina, Araucaria, Dammara, Podocarpus, Calophyllum, Aleurites, Ebenacee, Canarium, Durio, Wormia, and many species of palms. The trees are matted with creepers (Bauhinia, Bignonia, Asclepias, &e.), with a dense undergrowth of brushwood, ferns, and lycopodiums, but their density often makes the herbaceous vegetation poor. Of the smaller growths are great reeds and grasses covering the swamps and open spaces; aloes, aroids, orchids, Scitaminee (ginger, cardamum, «c.), Laurinex, Piperacee (betel and} others, wild and culti- vated), Myrtacex, Vinifere, pine-apple, nutmeg, cotton shrubs, Urticex, Apocynex, Malvacee, Papilionaceer (Butea, Lrythrina, Clitoria, Mimosa, &c.), Justicee, and Begoniz ;

and in the mountains a sub-alpine flora, oaks, rhododen- drons, vacciniums, epilobiums, Umbellifere, &c. Among cultivated plants are the banana, papaya, orange, sugar cane, maize, millet, taro (Arum esculentum), Abelmoschus Mamhot, Jambosa, yams, sweet potato, and pumpkins, and among the Amberbaki the dry rice. The cocoa-palm grows everywhere ; the sago-palm grows wild in abund- ance in the swamps, and in the north-west each hill tribe, apparently to avoid collisions, draws its supplies from a different district of the coast. They have also in the hills a tree called “sali,” with top and pith resembling sago. Tobacco of good quality is brought down from the interior, and an illustrious antiquity is claimed for the plant by a tradition which describes it as the miraculous fruit of a woman named Heva. In some places the kava of the Pacific (Piper methysticum) is used. At Doreh a cotton plant (G@. vitifolium) grows wild, and is also cultivated. fauna.—New Guinea is very poor in Mammalia. According to Mr Wallace (Geographical Distribution of Animals), there are as yct known, besides a peculiar form of pig, some mice, and various Pteropide, four families of marsupials, all Australian, viz., Dasyuride, Peramelide, Macropodide, and Phalangistide, with nine species Among them are a Dendrolagus or tree-kangaroo and several cuscus. There are also two echidnas. The large animals reported by travellers may possibly be gigantic marsupials akin to those found fossil in the Queensland Pleistocene. The wealth and beauty of the avifauna are great. Count Salvadori gives 1028 species, belonging to 321 genera, for the Papuan subregion (i.¢., from the Solomon Islands westwards to, but excluding, Celebes). Of these about 470 are peculiar to New Guinea and the adjacent islands, including Aru. The more numerous and important genera are pre-eminently Australian in character, with many species peculiarly developed. There is also, as might be expected, a considerable number of Malayan forms, some common to the whole region, some only found here and at other far distant spots in it. The most remarkable orders, besides the birds of paradise, which are only found in New Guinea and the neighbouring islands, are the honeysuckers, flycatchers, parrots, kingfishers, and pigeons, all rich in special forms. Birds of prey are rare; vultures, pheasants, woodpeckers, and finches absent. Mr Wallace attributes the unusually large number of “ beauti- ful” birds, 50 per cent. of the whole, to the numbers of parrots, lories, cockatoos, pigeons, and

kingfishers, and to the absence of thrushes, shrikes, warblers, and other dull- coloured groups. Of snakes, which may migrate freely on floating timber, we find out of 24 genera (belonging to 11 families) 6 Oriental, 4 Australian, and only 4 specially Papuan; of lizards 3 families with 24 genera, of which only 3 are peculiarly Oriental, 3 Australian, 6 Papuan. The Amphibia (6 families with 8 genera), for which the salt water is a barrier, have no western aflinities, and those not of wide distribution are almost exclusively Australian,—a fact of obvious geological significance. The Lepidoptera are numerous and singularly beautiful, as are the Coleoptera, which Mr Wallace says often display the metallic lustre characteristic of the plumage of the New Guinea birds.

Population.—The population consists of a great number of isolated tribes, differing much in appearance and language. The level of civilization varies, but seldom reaches even the average Pacific standard.

They have no single name for New Guinea, nor any idea of its extent, only using terms signifying "great land," to distinguish it from the adjacent islands or from Australia.

The name Paptia isa Malayan term signifying frizzled, in reference to the hair; and, as distinguishing the peoples so characterized from the Australians, the term "Papuan" is bysome writers thought more suitable than "Melanesian,"

while equally distinguishing the race from the brown Polynesians, The type of man known as Papuan or Melanesian (see MELaNzsiA) is found here in its greatest purity, and appears to occupy the whole island excepting its east extremity. But among tribes occupying so wide an area, having little intercommunication, and with other races at no great distance, many deviations from the normal type must be expected, and in fact it is not very easy to define this type. Its leading characteristics are— a medium height; fleshy rather than muscular frame ; colour a sooty brown, varying, but decidedly darker than the Malay ; high but narrow and rather retreating fore-

head, with thick brows; nose sometimes flat and wide at—

the nostrils, but oftener hooked and “Jewish,” with depressed point, a feature represented in their karwars or ancestral images ; prognathism general, but not universal ; lips thick and projecting, so as to make the chin seem retreating ; high cheek bones; hair black, frizzly, trained intoa mop. The appearance is thus negroid, and is said to resemble the population of the African coast opposite Aden. But in the Arfak mountains in the north-west, and at points on the west and north coasts and adjacent islands, very degraded and stunted tribes are found, with hardly the elements of social organization (possibly the aboriginal race unmixed with foreign elements), and resembling the Aetas or Negritos of the Philippines, and other kindred tribes in the Malay Archipelago. On the banks of the Fly river D’Albertis observed at least two widely differing types, those on its upper course bearing some resemblance to the tribes of the eastern coast. Here, wedged in among the ruder Papuans, who reappear at the extremity of the peninsula, we find a very different-looking people, whom competent observers, arguing from appearance, language, and customs, assert to be a branch of the fair Polynesian race. But there are obvious signs among them of much admixture of blood; and they or their congeners again may easily have modified their neighbours immedi- ately west of them, just as Malay and other influences have done on the other end of the island. Indeed the greater degree of intelligence and good looks observed at points along the north coast may be due simply to this cause. On the west coasts there is a semi-civilization, due to intercourse with Malays and Bughis, who have settled at various points, and carry on the trade with the neighbour- ing islands, in some of which, while the coast population is Malay or mixed, that of the interior is identical with the people of the mainland. On the west coasts Moham- medan teaching has also some civilizing effect. Many of the tribes at this west end of New Guinea are, at all events in war time, head-hunters, and in the mountains cannibals. Cannibalism in fact is practised here and there throughout New Guinea. Tho frequent hostility and mistrust of strangers are partly due to slave-hunting raids and ill- treatment by traders, but the different tribes vary much in character. Thus in the mountains of the north-west the Karons, a short, hardy, well-built people, cultivate very little, living chiefly on wild plants which their women cook in hollow bamboos, and obtaining what they require from without, as knives, ornaments, é&c.,

either by plunder, or by disposal of slaves or bird skins; while their neighbours the Kebars grow vegetables and very fine tobacco, which they sell to the Amberbaki, a peaceful industrious coast tribe. The mountain tribes are usually despised by their coast neighbours as ruder and more destitute of resources, but when more numerous and fiercer, as in the south of west New Guinea, the tables are turned, and the coast people live in perpetual terror of their neighbours, who plunder and enslave them.

At Humboldt Bay the people, though uncertain, rude, and warlike, are ready to trade, and tribes of a kindred

race are found farther east, at Astrolabe Bay; here the Russian Miklucho Maclay lived among them for some time, and was favourably impressed by them. Still farther east, the plateaus of the Finisterre ranges are highly culti- vated and artificially irrigated by a comparatively fair people. Many tribes in the south-west seen: to be migratory. At Princess Marianne Straits tribes much wilder than those farther west, naked and painted, swarm like monkeys in their trees, the stems of which are submerged at high tide. But the Torres Straits islanders are employed by Europeans in the pearl shell fishery, and are liked as labourers; and in some of the Ké and Aru Islands the Papuan inhabitants form orderly Christian communities. The people of the south-east peninsula seem generally, like the typical Poly- nesian, of a mild, accessible type. Englishmen, wandering inland and losing their way, have been found and brought back by them. Their manners are more courteous, their women better treated, than is usual with Papuans, but they show perhaps less ingenuity and artistic taste. Their children, in the mission schools, show much intelligence.

While tribes allied to the Papuan have been traced through Timor, Flores, and the highlands of the Malay Peninsula to the Deccan of India, these "' Oriental negroes " have many curious resemblances with some East-African tribes. Besides the appearance of the hair, the raised cicatrices, the belief in omens and sorcery, the extraction of diseases in the form of bits of wood or stone, and the practices for testing the courage of youths, they are equally devoid of forethought or ambition, rude, merry, and boisterous, but amenable to discipline, and with decided artistic tastes and faculty.

Several of the above practices are also common to the Australians, who, though generally inferior, have many points of resemblance (osteological and other) with the Papuans. The extinct Tasmanians were more closely allied to the Papuans.

The constitution of society is everywhere simple. Among the more advanced tribes rank is hereditary, otherwise the chiefs generally have but little power, most matters being settled by the assembly, a contrast to the Polynesian respect for birth and hereditary rank. The Papuan's religious institutions are likewise simpler; there is no general object of worship, consequently no regular priesthood ; the institution of tabu is less oppressive, and its sanction less awful, but the transgressor may still have to reckon, not only with the society or individual who imposed it, but also with offended spirits. Almost every crime is condoned by payment. A characteristic example of the feeling of the fair race towards the dark was seen in the contempt shown by the tribes of the south-east towards certain Melanesian teachers introduced by the English missionaries, while others brought from the Polynesian islands were treated with respect.

The Papuan women are, asa rule, more modest than the Poly- nesian.

In western New Guinea, according to the Dutch missionaries, there is a vague notion of a universal spirit, practically represented by several malevolent powers, as Mfanoin, the most powerful, who resides in the woods; Narwoje in the clouds, above the trees, a sort of Erl-K6onig who carries off children ; Faknik in the rocks by the sea, who raises storms. Asa protection against these the people construct —having first with much ceremony chosen a tree for the purpose— certain rude images called karwars, each representing a recently dead progenitor, whose spirit is then invoked to occupy the image and protect them against their enemies and give success to their under- takings. The karwar is about a foot high, with head dispropor- tionately large ; the male figures are sometimes represented with a spear and shield, the female holding a snake. Omens are observed before starting on any expedition; if they are unfavourable the per- son threatened retires, and another day is chosen and the process repeated. They have magicians and rain-makers, and sometimes resort to ordeal to discover a crime. Temples (so-called) are found in the north and west, built like the

houses, but larger, the piles being carved into figures, and the roof-beams and other prominent points decorated with representatious of crocodiles or lizards, coarse human figures, and other grotesque ornamentation; but their use is not clear. Neither temples nor images (except small figures worn as amulets) occur among the people of the south-east, whose religious ideas seem vague and rudimentary ; but they have a great dread of departed spirits, especially those of the hostile inland tribes, and of a being called Vata, who causes diseasc and death.

Religion.

Diseases.

Food,

Clothing.

Orna- ments.

Weapons,

Houses,

NEW G

-The dead are disposed of in various ways. The spirit is supposed not to leave the body immediately, which is either buried for a time and then taken up and the bones cleaned and deposited in or near the dwelling, or it is exposed with the same object on a platform of branches, or dried over a fire, and the mummy kept for a few years. Sometimes the head, oftener the jaw bone, is kept asa relic. Food is placed on a grave,—with an infant a calabash of its mother's milk,—and a path is made to the sea that the spirit may bathe; but the spirits are everywhere dreaded as likely to injure the living. No one likes to go about, or into the water, after dark. Little imitation houses are placed in the woods to allure the spirits away. These dwell chiefly in the moon, and are particularly active at full moon. The houses which they haunt, and beneath or near which their bodies lie buried, are deserted from time to time, especially by a newly-married couple, or by

women before child- birth. Probably the effluvium from the buried corpse produces the feelings of sickness which are supposed to be caused by the spirit's presence, and which subside when they leave the spot.

Feasting and dances take place on the setting up of a karwar, on the return of warlike and other expeditions, at a marriage, birth, change of name, child's first hair-cutting, and also some time after a death.

The chief diseases are skin diseases, with which in some places one-third of the population is affected,—among these a sort of leprosy to which, as well as to a dropsy (beri-beri), Europeans are subject,—catarrhs, boils, syphilis, and intermittent fevers, especi- ally where there is much coral on the coast.

The Papuan varies his vegetable diet with the flesh of the wild pig, wallabi, and other small animals, which are hunted with dogs. Birds are snared or limed. Fish abound at many parts of the coast, and are taken by lines, or speared by torehlight, or netted (the netting pattern is the same as ours); or a river is dammed and the fish stupefied with the root of a milletia. Turtle and dugong are caught. The kima, a great mussel weighing (without shell) 20 to 30 ib, and other shell-fish are eaten, as are also dogs, flying foxes, lizards, beetles, and all kinds of insects, and an edible earth.

'Food is cooked in various ways, being stewed or roasted, or baked with hot stones as in Polynesia. A third part of sea water, which is carried to the interior in hollow bamboos, is added in place of salt, which is also obtained from the ashes of wood saturated by the sea. The sexes generally eat apart.

Their ery scanty clothing is made of the bark of Hibiscus, Broussonetia, and other plants, or of leaves, and in more civilized parts of eotton. Tight belts and armlets of split rattan and fibre are often worn. The people have usually a great dislike to rain, and carry a mat of pandanus leaves as a protection against it.

The chief home-made ornaments are necklaces, armlets, and ear- rings of shells, teeth, or fibre, and cassowary, cockatoo, or bird of paradise feathers, —the last two, or a flower, are worn through the septum of the nose. The hair is frizzed out and decorated variously with flowers, leaves, feathers, and bamboo combs. The fairer tribes at the east end tattoo, no definite

meaning apparently being attached to the pattern, for they welcome suggestions from Manchester. For the women it is simply a decoration. Men are not tattooed till they have killed some one. Raised cicatrieces usually take the place of tattooing with the darker races. Rosenberg says the scars on the breast and arms register the number of sea-voyages made.

The use of the bow and arrow is little known among the eastern tribes. The Papuan bow is rather short, the arrows barbed and tipped with cassowary or human bone. Other weapons are a short dart, a heavy spear and shield, stone clubs and axes. They are mostly ignorant of iron, but work skilfully with their axes of stone or tridacna shell, and bone chisels, cutting down trees 20 inches in diameter. Two man working on a tree trunk, one making a cut with the adze lengthwise and the other chopping off the piece across, will soon hollow out a large canoe. Every man has a stone axe, each village generally owning a large one. Their knives are of oral hardened by fire. In digging they use the pointed stick.

The eastern tribes salute by squeezing simultaneously the nose and stomach, and both there and on the north coast friendship is ratified by sacrificing a dog. In other places they wave green branches, and on the south (Papuan) eoast pour water over their heads, a custom noticed by Cook at Mallicolo (New Hebrides). Among other pets they keep little pigs, which the women suckle.

The Papuan numerals extend usually to 5 only. In Astrolabe Bay the limit is 6; with the more degraded tribes it is 8, or, as in Torres Straits, they have names only for 1 and 2; 3 is2+1.

The houses are mostly (so far as is known) built in Malay fashion on piles, and this not only on the coast but on the hill-sides, though the houses there are smaller. Small houses are also found perched high up in trees as a safeguard against enemies and evil spirits, and possibly malaria; and one or two of these in a village act as its fortress or watch-tower.

The piles support a platform made from old eanoes or branches, the whole covered with a rounded or inverted boat-shaped roof thatched with valm branches, sometimes 500 fect long, and looking

inside, when undivided, like a dark tunnel.! Otherwise the coast houses are 60 to 70 feet long, often more, with a passage down the centre, and the side spaces partitioned off as needed. Hach house has a sort of paterfamilias, the rest of the numerous inhabitants being his relations or slaves. A bridge, when the house is over the water, connects it with the land, and near this is sometimes a small jointure house for widows of former occupants, and a separate one for bachelors or for pregnant women. A veranda towards the sea is usually occupied during the day by the men, and one on the land side by the women. The gable ends are often prolonged upwards and carved, and the houses adorned with drawings of animals, and hung round with weapons, and crocodiles', dogs', and boars' teeth. On the north coast, about Astrolabe Bay, the houses are not built on piles ; the walls, of bamboo or palm branches, are very low, and the projecting roof nearly reaches the ground ; a barrier at the entrance keeps out pigs and dogs. A sort of table or bench stands outside, used by the men only, for meals and for the subsequent siesta.

In cast New Guinea sometimes the houses are two-storied, the lower part being used for stores. The furniture consists of earthen bowls, drinking cups, wooden neeck-rests, spoons, &c., artistically carved, mats, cordage, small plaited baskets and boxes, and various weapons and implements. The pottery is moulded and fire-baked.

West New Guinea exports a certain amount of sago, nutinegs, massoi and pulasaria barks (all wild), birdskins, tripang, tortoise- and pearl-shell, the trade with the Dutch being worth about £20,000 a year. Misol is rich in all these products, and Salawatti in sago. They are sent to Ceram, Ternate, and Macassar in exchange for iron and copper ware, cotton cloths, indigo, knives, mirrors, beads, arrack, &c. The Kéislanders are great boatbuilders. An active trade is carried on between the hill and coast tribes, the former bringing down vegetable produce in exchange for fish and shell ornaments. In the north-west some of the coast villagers spend six months in the forest collecting massoi bark, and live the rest of the year by fishing. Often a village has its special industry, as canoe-building, pottery, or manufacture of shell ornaments, or of the little sticks worn in the septum ofthe nose. Large

trading canoes pass up and down the coast, probably combining a little piracy and kidnapping with other business, The Papuan pirates were formerly dreaded in thesc seas. For trading purposes several large canoes are lashed together, with a platform above and a house at each end united by a palisade. Coasting voyages of several weeks are made in these craft. The canoes vary from the common ‘‘dug-out” to the great war-canoe elaborately carved and ornamented.

Both races show considerable agricultural skill—probably an old Agricul- Asiatic tradition, for the plants cultivated seem mostly Asiatic. ture

In some places the hill-sides are carefully terraced, plantations well kept and fenced, and flowers grown for ornament. Any one may clear and cultivate a piece of land belonging to his tribe, but often after one or two deaths a kampong is deserted, and new forest-land taken up ; on the west coast, where the mainland is too steep for cultivation, the people cross over and cultivate the neigh- bouring uninhabited islands. They have a strong sense of pro- prietorship, even of thie fruit trees in the forest and of the fish in their own streams or on thcir own coast.

History.—The claims to superiority over New Guinea on the part History.

of the rulers of some of the small ncighbouring islands are curious when we compare the extent of their dominions with New Guinea. These claims date at all events from the spread of Islam to the Moluccas at the beginning of the 15th century, and were maintained by the Malay rulers both of Batjan and of Gébe. Latterly they have been exercised by the sultan of Tidore. When the Dutch first came to these seas it was their policy to ally themselves with certain chiefs, and support their claims over various islands, so as to extend their own commercial monopoly ; and they now support the claims (admitted by Great Britain in 1814) of their former rival and ally the sultan of Tidore over both the Raja Ampat (7.¢., the four Papuan kingships, Waigiu, Salawatti, Misol, and Waigamma ”) and certain islands or points on the north-west coast of New Guinea, and the rulers of these places are nominated, on his recommendation, by thc Dutch governor of Ternate, under the titles of rajah, major, singaji, or korano.

Salawatti and till lately Misol have dominated the coasts respec- tively adjacent to them, but certain dues (consisting of sago, massoi bark, occasional slaves, and other produce) are levied in the sultan's name, at irregular intervals, all along the coast for hundreds of miles. These extortions make Islam unpopular, and have retarded progress, for we read in former days of Papuan pirate fleets, and of '*the Papuas"' in league with the Moluccas against the Portuguese. The Dutch, however, in their dealings with the people still find it convenient to use the sultan's name and authority. As his suzerain they claim possession of the west half of New Guinea as far as 140° 47' E., but his claims never cxteuded so far, and their sovereignty is little more than nominal. There is a small coaling station

1 'These large houses, like the custom of head-hunting, are traceable west through Borneo up to the north-east frontier of India, where the custom above- mentioned of exposing the dead also prevails.

2 On Misol island.

at Dorch, in Geelvink Bay, and the Dutch flag is hoisted by many of the coast chiefs, ignorant even of its meaning; all attempts at settlement have been abandoned owing to the bad climate, the difficult navigation, and the constant fighting and laziness of the people,—all this limiting the amount of produce available for trade. The Dutch missionaries,! who have laboured on the shores and islands of Geclvink Bay for many years, have a certain influence, and their schools are well attended, but with no more definite result than a certain softening of manners and slight increase of material prosperity. '

Though probably sighted by A. Dabreu, 1511, New Guinea was apparently first visited either by the Portugucse Don Jorge de Meneses, driven on his way from Goa to Ternate in 1526 to take shelter at 'Isla Versija" (which has been identified with a place Warsia on the N.W. coast, but may possibly be the island of Waigiu), or by the Spaniard Alvaro de Saavedra two ycars later.

By Ortiz de Retez, or Roda, who in 1546 first laid down several points along the north coast, the name of ‘‘New Guinea” was probably given. In that and the two following centuries, though the coasts were visited by many illustrious navigators, as Schouten and Lemaire, Tasman, Dampier, Torres, Bougainville, and Cook, little additional knowledge was gained. This was due first to the difficulties of the navigation, next to the exclusiveness of the Dutch, who, holding the Spice Islands, prevented all access to places east of them, and lastly to the stream of enterprise being latterly diverted to the more temperate regions farther south. The Dutch barrier was broken down by the arrival of Dampier and other ‘‘interlopers” from the east, and of emissaries from the (English) East India Company in search of spice-bearing lands. The voyage of Forrest (1774) in the ‘‘ Tartar galley” of 10 tons, and his account of New Guinea, are still full of interest. New Guinea was actually annexed in 1793 by two commanders in the East India Company’s service, and the island of Manasvari in Geelvink Bay held for some months by their troops. After the peace of 1815 Dutch surveying expeditions to the west coasts became more numerous. Surveys of the east coasts have been made since the visits of D’Entrecasteaux (1793) and D’Urville (1827-40) by Captains Owen Stanley, Yule, Blackwood, and other English officers, the latest being that of Captain Moresby ; and English missionaries and traders are doing around the Gulf of Papua what the Dutch have done at Geelvink Bay. The islands of Torres Straits, which are the headquarters of a valuable pearl- shelland tripang fishery, have all bcen annexed to Queensland, and practically command the few available channels by which ships can

ass.

Latterly the colonial authorities in Australia, alarmed at the prospect of the annexation by some foreign power of territory so near their shores, and also desirous to prevent the abuses that must soon arise from the influx of convicts or of European adventurers under no control, have urged the home Government to annex the east half of New Guinea.

Authorities.—The principal are Von Rosenberg, Der Malayische Archipel; Miller, Nieuw Guinea, ethnogr. en natuurkundig onderzocht, Amsterdam, 1862; Robidé van der Aa, Reizen naar Nederlandsch Nieuw Guinea, 1879;

Moresby, New Guinea and Polynesia; D'AYbertis, New Guinea; Quart. Rev., July 1877 ; Beccari, Malesia (botanical); Kolff's Voyage, translated by Windsor Earl ; Parliamentary Papers, 1876 and 1883; lecture by Prof. W. H. Flower at the Royal Institution, 31st May 1878; A. B. Meyer, ""'Anthrop. Mitthetl. tiber die Papuas von N. G.," in Jour. Anthrop. Inst., 1877-78 ; papers in Cosmos, 1875-77 ; Trans. of Brit, Assoc, 1883; Proc. R. Geog. Soc., March 1884. Cc. T,

NEW HAMPSHIRE, one of the New England States of the American Union, lies between 70° 37' and 72° 37′ W. long., and between 42° 40' and 45° 18' 23" N. lat., and has an area of 9336 square miles. Its boundaries are partly natural. On the W. it is separated from the State of Vermont by Connecticut river; on the N. from the province of Quebec by the natural ridge of the watershed between the St Lawrence and the streams flowing south to the Atlantic ; on the E. from Maine by a straight line from Quebec to the source of Salmon river, thence by this river to the ocean, and south-easterly through the middle of the Isles of Shoals ; the boundary on the S§.E. is the Atlantic : and that on the 8. is a line 24 miles distant from and parallel to the lower Merrimack, until that river changes its course to due north and south, when the line runs magnetic west to Connecticut river. The general shape of the State is nearly that of a right-angled triangle, having the per- pendicular 180 and the hypothenuse 190 miles long. The greatest width is 100 miles, from Chesterfield to the outer- most of the Isles of Shoals.

Physical Features.—The State lies on the Atlantic slope ee ee ae

2 One of these, Mr Van Hasselt, is the chief authority on the languages and customs of west New Guinea,

of the continent, forming part of the elevated belt bordering upon the ocean whichculminates in three mountain districts, viz., Newfoundland, the White Mountains, and the Black Mountains in North Carolina. It is also situated east of the Blue Ridge and its northerly continuation in the New York highlands and the Green Mountain range, both of which are distinct from the true Appalachians—the latter being west of the great Appalachian

limestone valley, and well-shown in the Catskill, Alleghany, and Cumber-land ridges and plateaus. The Atlantic and White Mountain ranges are comparatively short, consisting of obtusely-pointed summits of gneissic or granitic rocks, either arranged en échelon or scattered in irregular groups. The White Mountains group first becomes noticeable in northern Maine, reaching the height of a mile at Mount Katahdin, and continues at less elevation south-westerly to the New Hampshire line, where it rapidly rises to its culmina- tion in Mount Washington (6293 feet). The part of this mountainous area that lies within New Hampshire extends to about 1400 square miles. It is continued south-westerly, much reduced in elevation, beyond Mount Moosilauke, along the highlands separating the tributaries of the Merri- mack and Connecticut rivers, through New Hampshire and Massachusetts intoConnecticut. The distinctive Montalban elevation is limited on the west and on the south by the Connecticut.

The geological reports published in 1878 show four important topographical features :—(1) the mountainous ridge following the eastern rim of the Connecticut river basin along the longest straight line that could be drawn within the State; (2) the elevated White Mountain tract, just north of the middle of the territory ; (3) the comparatively low country between the two elevated districts just noted and the sea—three-fourths of which, away from the foothills, scarcely exceeds 500 feet above the sea-level; (4) a mountainous district north of the White Mountains, occupying Coos county in New Hamp- shire, Essex county in Vermont, and an indefinite region in Maine near the Quebec line. The average elevation of the land in New Hampshire is estimated to be 1200 feet above the sea. Of this more than one-half is situated below 1000 feet, and about one-sixth exceeds 2000 feet, and is comprised in the third area mentioned above. The average height of the Coos and Essex district will be found to exceed 1500 feet. Mount Washington is the only mountain peak exceeding 6000 feet; and eight others are above 5000 feet (Adams, Jefferson, Clay, two Monroes, Madison, Lafayette, and Lincoln).

Climate, Fauna, Flora.—These elevations have produced a marked effect upon the climate and natural products. The greatest annual precipitation is along the Merrimack river, 44 inches near Manchester and 46 above Franklin. It is only 35 inches near the sea-coast, and 40 inches on the upper

Connecticut. The greatest precipitation is therefore on the seaward side of the long mountainous ridge constituting the backbone of the State. The annual isothermal lines vary from 48° Fahr. at Manchester to 40° in Coos county and 25° upon the summit of Mount Washington.

No less than four faunal areas are recognized, known as the Alleghanian, Canadian, Hudsonian, and Labrador. The first enters New Hampshire from the south, and is limited on the north by the line of 600 feet altitude, which 1s not far from the isothermal line of 45° Fahr., or the winter average of 20° Fahr. and the summer average of 65° Fahr. A few distinctive animals are the red-headed woodpecker, humming bird, bobolink, Baltimore oriole, blue jay, the box and painted turtles, and the rattlesnake. Among plants which are employed to determine the northern limit of this district are the hickory or shell bark,

chestnut, mountain laurel or Kalmia, grape, and cran- berry. A few characteristic animals of the Canadian district are the rose-breasted grosbeak, Canada jay, spruce partridge, crossbill, snowbird, caribou, and Canada lynx ; the absence of reptiles is marked. A few of the trees are spruces, balsam fir, canoe birch, and bush maples. This district, comprising the northernmost county, reaches the height of 4000 feet, or the upper limit of trees. The Hud- son district is a region of dwarfed spruces extending above the Canadian upper limit to the 5000 feet line, and limited to the White Mountains. None of the larger animals which flourish about Hudson’s Bay could be expected in such limited and mountainous peaks, so that the proof of the presence of this fauna is afforded by the plentiful distribu- tion of the butterfly known as Brenthis montinus and the grasshopper Pezotettix glacialis. Owing to the small areas occupied by the Hudson and Labrador floras in the White Mountains, botanists have not yet succeeded in separating the plants peculiar to each. Fifty-three species are referred to them, called the sub-alpine and alpine districts, embracing such genera as Arenaria, Geum, Solidago, Potentilla, Nabalus, Cassiope, Rhododendron, Salix, Saxifraga, Diapensia, Carex, Poa, &c. The Labrador fauna is specially characterized by the abundant presence above the 5000 feet line of the butterfly Oenevs semidea. The presence of these faunal

islands in the midst of the Canadian district is accounted for by the greater coldness of the climate in the glacial period. The whole country was then overspread by the peculiar animals and plants of the Arctic regions. As the climate moderated these organisms migrated both northwards and upwards into the higher districts, where they found the conditions favourable to their existence. Those which ascended the mountainous regions soon became separated from their congeners by the warmer temperature of the lowlands, and are now securely imprisoned in these mountain fastnesses.

New Hampshire was originally nearly covered by a dense forest. In 1876 it was estimated that more than one-fourth of the territory was still covered by trees, not of the original growth, but occupying land that had not been cleared. The trees valued for lumber, growing naturally in the forest, are the white, red, and pitch pines, spruces, hemlock, larch, red and sugar maple, beech, birch, red and white oak, chestnut, elm, hickory, poplar, cherry, &c. The pines have been described by the early settlers as commonly exceeding the height of 200 feet. One that was cut upon the Dartmouth College grounds measured 270 feet in length. es

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Geology. —The topography has a less intimate connexion with the geology. The rocks are nearly all crystalline, and show very few peculiarities of sculpturing except the eruptive massive granites. These are more or less conical, like volcanic accumulations of modern times. Examples may be seen in Mount Chocorua, Mount Pequawket, and Mount Moat. At the*base is a coarse porphyritic gneiss, not less than 5000 feet thick. This shows itself prineipally along the Connecticut-Merrimack watershed south of the White Mountains. Next comes a protogene gneiss, saccharoidal and easily crumbling, having the same thickness, and developed most extensively in Cheshire county.

feet thick. Other terranes of related rocks are to be found in Merrimack, Hillsborough, and Rockingham counties. Veins of copper and gold are wrought in the Huronian. Sixth there follows a succession of schists and slates 11,000 feet thick, whose relations are not well established. Scventh isa series of clay slates, aurifer- ous, and 3000 feet thick, referred to the Cambrian. Highth follows a group of mica schists and limestones, known as the Coos group, and the calciferous mica schist, perhaps 7000 or 8000 feet thick. These are claimed as Silurian by some. Ninth, and last, are fossili- ferous beds of undetermined thickness, as much as 1000 feet, in which occur well-defined Pentamerus and Halysites. These show the rock to belong to the Niagara group of the Upper Silurian. The principal localities are at Littleton and Lisbon, at the west base of the White Mountains. The

most natural association of these groups is (1) Laurentian, (2) the Montalban, and (38) Huronian,—all of which are Eozoie, with an aggregate thickness of 40,000 feet. Next would follow the Huronian and indeterminate groups, reaching 23,000 feet, all believed to antedate Paleozoic time. Thirdly there remains the supposed Paleozoic series, 12,000 feet.

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Distribution of the roeks over a large part of New England on a scale of about 100 milestotheinch. For eonvenience they are grouped thus :—(1) granite ; (2) Laurentian of New York, and porphyritie gneiss of New England; (8) the later gneisses—Bethlehem, Lake, and Montalban; (4) Huronian, é&e.; (5) Cambrian and Silurian; (6) Carboniferous ; (7) Triassic; (8) Quaternary.

Few parts of the country display better evidences of the existence of an ice age than New Hampshire. No extensive rock exposures can be found that do not exhibit marks of scarification. Even Mount Washington has been striated, and boulders weighing 90 Tb occur there, which have been brought at least a dozen miles and left 3000 feet higher than their source. The prevailing direction of the striae and transportation of fragments was to the south-east. Local glaciers existed in the decline of the period, leaving well-marked moraines. It was in New Hampshire that the nature of the eskers or kames was first understood in America. A very noted one follows the course of the Connecticut river, from Lyme, N.H., to Windsor, Vt., a distance of 30 miles. The terraces along the Con- necticut, the Merrimack, and other rivers are well shown. Careful measurements indicate that they all slope equally with the descent of the river, and resulted from accumulations of detritus pushed forward when the streams were fed by the waters of the melting ice sheet and stood 200 feet or more higher than at present. .

Minerals occurring in sufficiently large quantities to be the object of mining are gold, silver, copper, zinc, lead, arsenic, tin, iron, bis- muth, manganese, and molybdenum. Articles used for building purposes occurring largely are granite, eoloured porphyries for ornamentation, slate, clays for brick, limestone, and soapstone or steatite. Other useful minerals either obtained directly from the rock or capable of special manufacture are quartz and felspar for glass, mica, plumbago, precious stones, whetstones, copperas, alum, pyrites, titanium, polishing powder, moulding sand, and ochres for paints. There are forty extensive quarries of granite in the State. The stone is very fine grained, of a light grey colour, and is used largely for obelisks in cemetries. The mineral beryl is very

abundant. ring at Grafton.

Crystals weighing 2900 Ib have been described as occur- (C. H. H.)

Population.—The population of New Hampshire in 1880 was 346,991 (170,526 males, 176,465 feinales)—46,294 being of foreign birth. The growth of the population is shown by the following table :—

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- eps Gain per cent. Rank in| = eel Gain percent.) Trion, 1790 | 141,885 aps 10 1840 | 284,574 5°6 22 1800 | 183,858 29°5 11 1850 | 317,976 Wey, 22) 1810 | 214,460 16°6 16 1860 | 326,078 2°5 27 1820 | 244,042 Tesje7e 15 1870 | 318,300 —2°3 31 1830 | 269,328 10°3 18 1880 | 346,991 9 31

The decrease in the decade ending with 1870 was due to the effects of the civil war and to emigration to other States. The latter cause greatly checked the growth of the preceding decade. So constant has it been that 128,505 natives of New Hampshire are resident in other parts of the Union. The density of population is 37°17 to the square mile, but the southern part of the State is more thickly inhabited. The tendency of the population is towards the towns. Of the total increase in the last decade (28,691, of whom 58 per cent. were immigrants), nine towns received 20,649, Manchester alone gaining 9094. Canada supplied the largest number of immigrants

(14,979), and Ireland the next (6544). Since 1850 the native popu- lation has decreased 2866. The number of families in 1880 was 80,286, and the number of births 6141, one to 56°5 of the inhabit- ants, and the deaths 5584. The average size of families was 4°32, the smallest average of any State in the Union, though larger than in a few of the new Territories. It is steadily decreasing, having been 4°41 in 1870, 4°72 in 1860, and 5°15 in 1850. The decrease in the size of the family has been accompanied by an increase in the number of divorces. The tendency of the State legislation for a number of years was to facilitate divorces ; between 1860 and 1870 the number increased (one county not reporting) from 90 to 147, and between 1870 and 1878, in the whole State, from 157 to 240. At the present time public sentiment is setting towards greater stringency of legislation, and has already diminished the number of divorces. The number of paupers in 1880 was 2087.

The cities of largest population in 1880 wcre—Manchester, 32,630; Concord, the State capital, 13,843; Nashua, 13,397; Dover, 11,687 ; Portsmouth, 9690; Keene, 6784; Rochester, 5784; Somersworth, 5586.

Manufactwres.—The principal industry of New Hampshire is manufacturing. In 1880 the number of establishments was 3181, and the invested capital $51,112,263, giving employment to 45,811 operatives, The total annual product was valued at $73,978,028. The most important manufactures, mentioned in the order of the value of their products, were those of cotton and woollen goods, boots and shoes, leather, lumber, mixed textiles, and worsted goods. Other valuable manufactures are hosiery and knitted goods, paper, foundry and machine-shop products, flouring and grist-mill pro- ducts, and malt liquors. ‘There is a large annual cut of logs in the northern part of the State. The total horse-power employed in manufacturing was 87,750, of which water furnished 78°81 per cent. and steam 21°19 per cent. Manchester is the chief manufacturing centre, but large mills are built at Dover, Nashua, and Great Falls. The growth of manufactures in New Hampshire has been steady and constant. The first cotton mill was built in1804. By 1826 there were fifty different buildings for the manufacture of cotton, and about half as many for that of wool. Since 1850 the capital invested in manufacturing has increased nearly 300

per cent., the annual value of materials employed 350 per cent., and the value of products 320 per cent.

Agriculture.—The value of the agricultural productions of the State is about one-fifth of the manufactures. In 1879 it was $13,474,330. The large farms are growing at the expense of small ones. In the decade ending 1880, thc average size decreased from 122 to 116 acres. Within that time the farm acreage increased 115,179 acres, but the improved acreage diminished by 26,375 acres. The value of farms and farming implements remained about the same, but there was a general falling off in the quantity and value of farm productions (decrease about $9,000,000, without allowance for change in currency).

Fisheries.—An effort is being made to stock the inland waters of the State with food and game fish. A hatching house is main- tained from which thousands of fry (black bass, Schoodic salmon, carp, brook trout, and other fish) are distributed to the ponds and streams. The sea fisheries are of slight importance.

Railroads. —The first railroad charter was granted in 1835. Since then the growth of railroads has kept pace with the development of the State, the present mileage (1051) being greater in proportion to population and wealth than in the case of any other New England State. The number of persons employed is 2389. The Mount Washington Railway is one of the triumphs of modern engineering. Extending 23 miles from the base to the summit of Mount Washington, it makes an ascent of 3625 feet. Its maximum gradient

is 1980 fect to the mile, and the sharpest curve has a radius of 497 fect. The peculiarity is a central cog-rail into which plays the cog- driver of the engine, while the weight rests upon two lateral rails.

Finance.—The first bank in New Hampshire was established at Portsmouth in 1792. In 1882 there were under a State charter one bank, with a capital of $50,000, and forty-nine national banks under the National Banking Act. Their capital was $6,080,000; circulation, $5,704,691; surplus, $1,102,631; deposits, $4,859,327 loans and discounts, $8,187,442; dividends (1882),

$447,525 (about 7% per cent. on capital). The first savings bank was established in 1828. They now number sixty-five, with deposits of $36,181,186, by 104,482 depositors. In thirty years the depositors have increased by nearly 90,000, and the average deposit from $127 to $372. Every banking company pays annually to the State a tax of 4 per cent. on its actual capital, and the amount thus paid constitutes a ‘literary fund” for the support of schools. All are under the super- vision of two bank commissioners, whose duty it is to inspect the accounts and securities of each bank at least once each year, and who have power to petition the supreme court against any bank which they think unsound. In 1880 the valuation of the State was $122,733, 124 for real estate, and $42,022,057 for personal property. The taxes asscssed by the State were $395,372, and the local taxes amounted to $2,302,268 (about $7°75 per head). The net State debt was $3,561,200, and the local debt $7,162,970, or taken togcther about $31 per head.

Religion and Education.—The largest religious denomination is the Congregationalist, which has 188 churches, 179 ministers, 20,039 members, and 21,948 in its Sabbath schools. The Methodists have 119 churches, 107 pastors and 63 local preachers, 12,100 members and 1862 probationers, and 13,509 Sabbath school scholars. The Baptists have 80 churches, 90 ministers and 7 licentiates, and 8932 members. The Episcopalians have 28 churches, 32 ministers, and 2062 communicants. The Free-will Baptists have an organization, and there are two societies of Shakers. New Hampshire has always fostered education. In earlier colonial times, when it was united with Massachusetts, the samc laws applied to both, and on becoming a distinct province it placed on its statute book the Massachusetts law requiring townships of 50 householders to provide instruction for their children, and those of 100 householders to set up a grammar school. This law, with slight changes designed to render it more effective, remained in force till after the Revolution. The State con- stitution, adopted in 1784, contained a clause, still in force, making it the duty of ‘‘Icgislators and magistrates to cherish the interests of literature and the sciences, and all seminaries and public schools.” In 1789 the school laws were revised, and towns required to raise for school purposes £4 for every 20s. of their several apportionment of the State tax. This requisition has been gradually increased, until now it is $350 for each dollar of the apportionment. In 1805

the towns were authorized to divide into districts, and cach district was directed to maintain aschool. This system, with modifications, is still in force. Towns are now authorized to abolish districts and form central schools, and to grade them when the attendance exceeds fifty. High schools may be established when there are not less than one hundred school children between the ages of six and sixteen. In 1829 the ‘‘literary fund”’ was divided among the towns accord- ing to the apportionment of the State tax for the support of ‘‘common free schools, or for other purposes of education.” To the tax on bank capital is added one on the savings banks deposits of non-residents. In 1881 it was $26,584. The general supervision and control of the educational intcrests of the State are committed to asuperintendent of public instruction appointed by the governor. The immediate charge of all schools is given to local boards of educa- tion or committces, which, within the requirements of the law, have complete authority to engage teachers and fix their compensation, to regulate the studies and discipline of the schools, and to direct their expenditures. Attendance upon the public school or some reputable private day school for at least twelve weeks in a year is required, except in case of sickness, of all children between the ages of eight and fourtcen. Teachers, except graduates of the normal school, are engaged only after cxamination. The State normal school, established in 1870, and supported by an annual appropriation of $5000, confers upon its graduates the right to teach three or five years in the common schools. The number of schools in 1882 was 2644, including 481 graded and 56 high schools. The number of scholars was 64,349, and in private schools 4275. The schools are supported by the literary fund, the tax required by law, with the additional taxes voted by the towns and a few other taxes. The total amount appropriated for schools in 1882 was $584,527 ‘74. There arc also, existing under special charters, 53 academies and seminaries, many of them endowed, and furnishing a preparatory training for college. They have 161 teachers and 3112 pupils. The largest of these is Phillips Academy at Exeter, founded in 1781. Dartmouth College, the only college in the State, was founded in 1769. It has nearly 7000 graduates, among whom are some of the most noted names in American history. With its academic course are connected a scientific department, a department of civil engineer- ing, the New Hampshire Medical College, and the New Hampshire

College of Agriculture and the Mechanic Arts. The faculty has 36 members, and there are 427 students. Its library contains 63,000 volumes.

Government.—The executive department consists of a governor and five councillors elected biennially by a majority vote, or by the general court whicn there is no popular election. In addition to the nsual powers of the executive, the governor and council have the right of pardon, and appoint all judicial officers, the attorney gencral, notaries, coroners, Judges of probate, and general and field officers of the militia. The legislative department consists of a senate of 24 members, elected by districts, and a house of representatives of 231 members, elected by the towns according to population. They are styled the General Court, and meet biennially in June. The judicial department is a supreme court consisting of a chief justice and six associate justices appointed by the governor, and holding office during good behaviour, or till they reach the age of seventy. Law terms are held twice each year at the capital, by the full bench, and by single justices two or four times yearly in each of the ten counties. This court has civil, criminal, and equity jurisdiction. Exceptions on questions of law, taken at the trial terms, are heard at the law terms, and cases not exceeding $100 in value, or affecting the title to real estatc, niay be tried before referees without jury. Commitments for offences are made by justices of the peace and by police courts. Probate courts are held by the judges of probate in the different counties, but there is a right of appeal to the supreme court.

The enrolled militia under the command of the governor numbers 33,288 men, but the active militia, known as the ‘‘ New Hampshire National Guard,” consists of infantry, cavalry, and a battery, and is formed into a brigade of 1208 men. An annual encampment of not less than four days is held in September.

State Institutions.—There are several institutions under State control. The State’s prisou in 1880 had 151 inmates. The number confined in the county jails was 122. The State reform school for ‘*juvenile and female offenders against the laws’’ was opened in 1858, and has received 1087 boys and girls. The asylum for insane, established in 1838, and partly supported by

the State, had in 1880 285 patients (129 men and 156 women). The total number of insane in the State was 1056.

History.—New Hampshire was unknown to the earliest Kuropean explorers of America, who passed its short sea-coast without observa- tion. The first recorded visit of a white man was that of Martin Pring, who in June 1603 sailed with two small ships into the Pis- cataqua. The French discoverer De Champlain visited it in July 1605, and discovered the Isles of Shoals, but in 1614 Captain John Smith made a more careful examination of this and the contiguous coast. The map which he made was presented to Prince Charles of England, who gave to the whole country the name of New England. In November 1620 James I. chartered the Plymouth Company ‘‘for the planting, ruling, ordcring, aud governing of New England,” which was the territory lying between the 34th and 48th parallels of north latitude. On the Ist of August 1622 this company gave a sub-charter to Sir Fernando Gorges and Captain John Mason of all land lying between the Merrimack and Kennebec rivers and a line supposably 60 miles inland. This was called ‘*Maine,” though from another charter covering about the same territory sometimes spoken of as ‘‘ Laconia.” Under this charter settlements were made in 1623 at the places now known as Ports- mouth and Dover, by companies scnt out by Mason and Gorges. These continucd for several years without enlargement, mere fishing and trading posts; and the next settlements, those at Exetcr and Hampton, were not made till 1638 and 1639. In November 1629 Gorges and Mason divided their grant, and Mason obtained from the Plymouth Company, of which he was then a member, a grant of the land between the Merrimack and the Piscataqua for 60 miles inland. To this tract he gave the name of New Hampshire, from the county of Hampshire, in which he had been a resident. The efforts of Mason, his heirs and assigns, to enforce the proprietary rights of this patent gave rise to litigation that lasted more than a century anda half. The settlers disturbed in their possession resisted his claim, opposing to it the riglits of occupancy and a prior deed of a considerable portion of the same land, said to have been obtained of four Indian sagamores in May 1629 by one Wheelwright, a minister expelled from Boston for errors of doctrine. This deed was probably a forgery, but it was made the basis of resistance to Mason’s grant. Cases arising from the conflict of the two deeds were repeatedly brought before the colonial courts and appealed to England. Conflicting decisions,

resisted when adverse to those in possession, delayed settlement till 1746, when a company purchased the Mason claims, and by refraining from the extreme assertion of their claims brought the quarrel nearly to an cnd, but it did not wholly disappear till it was settled by the legislature in 1787. In 1641 the four New Hampshire settlements, fearful of their weakness, voluntarily petitioned for union with Massachusetts. They were

reccived, and with some towns on the Merrimack formed into a county. This union continued till 1680, when the claim which Massachusetts had put forward for jurisdiction over New Hampshire, by the terms of its charter, was denicd by royal authority, and New Hampshire was declared a separate province with a governor of its own. The province ceased to have a special governor when Joseph Dudley was appointed governor of New England in 1685. In 1691, when Massachusetts regained the charter of which it had been deprived, New Hampshire was anxious to unite with it, and did act with it fora time. It did not, however, cease to be a royal province until the Revolution, having governors of its own, or jointly with Massachusetts and all New England. New Hampshire suffered severely in the French and Indian wars, as its settlements were most exposed to the attacks that came from Canada. It furnished 500 men for the siege of Louisbourg in 1745, of whom 150 were paid by Massachusetts. It sent 500 to the attack on Crown Point in 1755, and raised 2600 in the succceding years of the war. The boundaries of New Hampshire, owing to conflicting eharters given in ignorance of the country, were long a matter of dispute. The claim of Massa- chusetts to its whole territory was not settled, and the southern boundary definitively established, till 1740. In 1749 a controversy arose with New York, which claimed as far east as the Connecticut river, while New Hampshire claimed to extend as far west as did Massachusetts. It was determined in favour of New York in 1764, but not till New Hampshire had chartered 138 towus in the disputed territory. After the Revolution many of these towns attcinpted to unite with those on the western border of New Hampshire into a new State. The bitter quarrel that arose and proceeded almost to bloodshed was settled only by the interposition of congress. The settlement of New Hampshire, which had becn retarded by fears of Indian invasions and questions of jurisdiction,

followed very rapidly after the province was quieted, so that by the outbreak of the Revolu- tion it had 80,000 inhabitants. It took a prominent place in the assertion of American liberty. It was represented in the successive continental congresses by two delegates, who in 1776 subseribed the declaration of independence, and in 1787 contributed to the forma- tion of the constitution. Two New Hampshire regiments took part in the battle of Bunker Hill. The battle of Bennington, that turned the scale of the war, was won by New Hampshire and Vermont troops under the command' of General Stark, who bore a commission from New Hampshire. In the whole war New Hamp- shire furnished 12,497 soldicrs. It was the ninth State to adopt the Federal constitution, June 21, 1788, thus sccuring the success of the Union. Its own provisional government, formed on the retirement of the royal governor in 1775, was replaced by a State constitution in 1784. This was thoroughly revised in 1792, and with minor changes continued till 1877, when another though less radical revision was made. In the war of 1812 the State, though divided on the question of the rights of the States and the general Govern- ment, sent its quota of men. More than 2000 took part in the various battles. In the civil war of 1861-65 New Hampshirc earnestly supported the Union cause. It furnished 18 regiments of infantry, 1 of cavalry, 1 light and 1 heavy battery, and 3 companies of sharpshooters, in all 32,750 men, or about 10 per cent. of the population.

The earlier history of New Hampshire is given in Belknap's History of New Hampshire, and illustrated by a series of Provincial and State Papers. Its later

history is found in Sanborn's History of New Hampshire, and various local histories and official reports. (J. K. L.*)

NEWHAVEN (anciently MerEcHING), a seaport of Sussex, is situated on the English Channel near the mouth of the Ouse, and on a branch of the London, Brighton, and South Coast Railway, 56 miles south from London, 64 miles south of Lewes, and 84 east of Brighton. The village, which is distant about half a mile from the sea, is clean and well built, but is little more than a shipping station, although it possesses a small ship- building yard, flour-mills, and a brewery celebrated for its Tipper ale. The church of St Michael, which has a Norman square embattled tower surmounted by a

spire, was restored in 1854. ‘The cliffs in the neighbourhood of the port are about 200 feet in height, and Castle Hill, formerly a military encampment, is very strongly fortified. A harbour was first granted to Newhaven in 1713, and during the early part of the 18th century it possessed a large shipping trade. This afterwards declined, but within the last forty years has again revived, and it is now one of the principal points of communication between England and France. The roadstead is one of the finest on the whole coast of England. The extensive additions being made to the dock accommodation are expected to give a great impetus to the trade of the port. The

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limits of the port after January 1, 1882, are defined by the Customs Consolidated Act of 1876. The total number of vessels in the foreign and colonial trade in 1882 was—entered 901 of 204,106 tons, cleared 881 of 197,327 tons. In the same year the vessels engaged in the coasting trade were—entered 224 of 36,309 tons, cleared 224 of 35,929 tons. Steamers ply daily to and from Dieppe in connexion with the Western Railway of France. With France there is alsoa large traffic in wines, spirits, silk, and general provisions. The coasting trade consists chiefly of imports of coal and provisions, the exports being principally timber for shipbuilding and flint for the Staffordshire potteries. The population of New- haven (area 906 acres land and 184 acres water and foreshore), 2549 in 1871, had increased in 1881 to 4009.

NEW HAVEN, a city and town of New Haven county, Connecticut, U.S., in 41° 19’ 28” N. lat. and 72° 55’ 19” W. long. (local time 16 minutes before that of Washington), is widely known as the seat of Yale College. The town includes the city and two outlying suburbs— Westville and Fair Haven East. The city occupies an alluvial plain, from 3 to 4 miles in breadth, at the head of New Haven harbour, which is an indentation of the northern shore of Long Island Sound, extending inland about 4 miles, and formed by the confluence of three small rivers

Plan of New Haven.

1. Yale College. | 2, City-Hall. | 3. City Market.

flowing through the township ; the plain is partly enclosed on the east and west by two prominent trap rocks, with precipitous faces towards the city, respectively 360 and 400 feet in height. The mean annual temperature is 49° Fahr. ; and the city ranks among the healthiest in the United States, It is 74 miles north-east from New York, with which it is connected by rail, as well as by daily steamboats ; it has communication by three railway lines with Boston, 120 miles to the north-east, and two other railways have their termini here.

The central and older portion of the city is laid out in regular squares, surrounding a public green of 16 acres, on which stand the three oldest churches and a building formerly used as a State-house; the abundance and beauty of the elms planted about this square and along many of the streets has caused the place to be familiarly known as the “Elm City.” On the squares bordering upon this central park are the interesting grounds and buildings of Yale College, the city-hall and county court-house, the post-office and custom-house, and several churches,

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The college buildings include six dormitories (accommoda- ting about 400) for the undergraduate academical depart- ment, which contains 620 students, under 36 instructors ; and there are thirteen buildings for recitation rooms, labora- tories, museums, library, &c. The handsome buildings of

‘the theological department are in the immediate vicinity.

Other public buildings are—the general hospital and training school for nurses, an armoury, the orphan asylum, the almshouse, the county prison, the halls of the Sheffield Scientific School, the college observatory, and the Connecticut Agricultural Experiment Station. The finest private residences are in the section of the city north of the central square. There are ten smaller squares within the town limits, and two private parks, of 55 and 30 acres respectively, the smaller being the college athletic grounds. A beautiful park of 352 acres (partly in an adjoining town) was opened in 1881; it lies 2 miles to the north-east of the city green. The public buildings

include sixty-one places of worship, of which nineteen belong to the Congregationalists, the only denomination in the town for a century after its settlement ; twelve to the Methodists, first organized here in 1795; eleven to the Protestant Episcopal Church, first organized about 1736 ; seven to the Baptists, who formed a church here in 1816 ; and seven to the Roman Catholics, whose first church was erected in 1834. There are thirty-six public schools ; the expenditure for their maintenance was $368,000 in 1882-83. Twenty-nine schoolhouses owned by the town, with their furniture and grounds, represent an outlay of about $675,000. There are also about twenty private schools, the oldest being the Hopkins Grammar School, founded in 1660.

The harbour, which originally determined the site of the city, and has always been a large factor in its prosperity, is large and safe, though shallow, and is under improvement by the construc- tion of a costly breakwater. Long Wharf, begun in 1682, is 3480 feet in length, the longest pier in the United States. Natural oyster-beds formerly abounded, in the harbour and its tributary streams; and extensive beds are still maintained by planting, which give large returns, and make New Haven the chief centre of the important oyster trade of Connecticut. The harbour is still more valuable in its relation to the extensive manufacturing industries of the vicinity. Within a radius of 20 miles not less than $50,000,000 is employed in the manufacture of hardware, carriages, arms, and wire. Tor this New Haven is the commercial centre, and through its port there annually passes merchandise (largely coal and iron) valued at $175,000,000. The foreign trade is chiefly with the West India Islands and Demerara, and its pro- sperity dates from the latter part of the 18th century. The exports in the thirty-six vessels employed in this branch of trade in 1882 (breadstuffs and live stock) were valued at $3,150,000, the imports (sugar and molasses) at $6,281,000; it should, how- ever, be noted that three-fourths of these imports and exports enter and leave the port of New York, although the capital and management of the trade remain in New Haven. ‘The estimated total value of foreign importations received (in 84 vessels of 18,126 tons) at the port in the year ending June’ 1883 was $1,155,883, the chief articles being sugar.and molasses, salt from the West Indies and Spain (about $100,000), and paper-rags from Alexandria. The value of the foreign exports for the same period, in 42 vessels of 7228 tons, was $670,046, the

largest item being the shipments of the Winchester Repeating Arms Company. For the same year the estimated value of cargoes received from domestic ports (in 2200 steam vessels and 4125 sailing vessels and barges) was $93,963,900. Of these receipts the largest items were—iron, valued at $2,000,000; lumber, $3,000,000, twice as much more being received by railroad; and coal (a rapidly increasing business of recent growth), $3,750,000. The value of shipments to domestic ports was $74,812,000.

In the production of carriages and carriage trimmings, New Haven, which is the chief seat of the trade in New England, employs a capital of perhaps 14 millions dollars; nearly 2000 workmen receive annual wages of about $750,000; and the esti- mated value of the yearly product is $2,240,000. Another import- ant industry is represented by the Winchester Repeating Arms Company, which, with a capital of $1,000,000, employs 1200 hands, and does a business in sporting guns and ammunition of about $2,500,000 a year. Another noticeable manufacture is that of superior blotting paper from cotton waste; blotting paper was made here for the first time in America in 1856. The other

principal manufactures are locks, rubber, clocks, organs, corsets, fish-lines, and paper boxes. ‘There are nine banks of deposit, with an ageregate capital of $4,664,000,.and a circulation of $3,038,940; also three savings banks, with deposits of about $9,000,000. About $225,000 is annually paid in New Haven in fire insurance premiums, for the protection of property valued at upwards of

$25,000,000.

New Haven (Indian name Quinnipiac, meaning ‘‘ long-water land”) was settled in 1638 by nearly three hundred English emi- grants of more than the average wealth and business ability, led by Johu Davenportand Theophilus Eaton, with the design of found- ing a commercial colony to be governed by the laws of the Bible. Davenport, an Oxford graduate, and for fourteen yearsa minister in London, became the pastor of the New Haven church; and Eaton, a successful London merchant, was the first governor of the colony which grew up about the town. The colony (of the same name)

included five other towns, and remained independent until merged, by a charter of Charles 1}. in 1662, in the older colony of Connecti- cut; this result was largely due to the waning prosperity of New Haven (in contrast with Connecticut), and to the prejudice against its more rigidly Puritan tone, as shown, for instance, in its code of laws, and in such ineidents as the shelter given to Whalley and Goffe, two of the regicide judges. In recognition of its former standing, the sessions of the legislature were held alternately here and in Jkartford (the original capital of Connecticut) from 1701 to 1874, From the original territory of the town (about 13 by 18 miles) ten new towns have been wholly or partly taken. New Haven was from the beginning distinguished for its care of public education,—a free school being ordered to be set up as early as 1641, aud the establishment of a college being contemplated in 1648. In 1716 Yale College was removed from Saybrook to New Haven, which had then somewhat under a thousand inhabitants. A period of quiet and regular growth ensued. In 1754 a printing press was set up, and in 1755 the first newspaper published in Con- necticut appeared here. There are now six daily and six weekly papers, besides several college periodicals, The American Journal of Science, founded in 1818 by Professor Silliman, and another review (The New Englander). The Connecticut Academy of Arts and Sciences, incorporated in 1799, and the American Oriental Soeiety, have their libraries here, and publish valuable trans- actions. In the American Revolution the town favoured resistance to the British Government, and in 1779 was invaded by a detach- ment of about 3000 British troops, under General Tyron. In 1784 New Haven received a city charter (the earliest in the State), the territory incorporated having then a population of about 3350. With the close of the Revolutionary War commerce revived and expanded ; aud after the war of 1812 manufactures were intro- duced.

The population nuinbered in 1790, 4510; in 1800, 5157; in 1810, 6967; in 1820, 8327; in 1830, 10,678; in 1840, 14,396; in 1850, 22,529; in 1860, 39,267; in 1870, 50,840; and in 1880, 62,882, of whom 15,668 were born in foreign countries. The city was in 1880 the third place (next to Boston and Providence) in size in New England, and the twenty-sixth in the United States. Since 1880 new territory has been annexed, and the population is estimated in 1883 at nearly 74,000. The real and personal estate of the inhabitants was in 1882 valucd at $48,335,632 (real estate 34 millions,

personalty 14 millions). The net indebtedness of the city (principally contracted in building sewers) was $631,907 at the close of 1882; there was also a debt contracted by the town government of $941,637. The amount appropriated to meet the city expenses for 1883 was $559,435. The city is divided into twelve wards, and is governed by a mayor and twenty-four alder- men (twelve elected yearly) and thirty-six councilmen. The town affairs are controlled by a separate board of seven select men.

For the history of the town see Bacon, Thirteen Historical Discourses, 1839 ;

Atwater, History of the Colony of New Haven, 1881; Papers of the New Haven Colony Historical Society, 3 vols., 1865-82,

NEW HEBRIDES anp SANTA CRUZ. These islands form part of the long chain of groups in the west Pacific known as MELANESIA (q.v.), having the Solomon Islands about 200 miles west and north-west of their northern and New Caledonia at the same distance west of their southern extremity. They extend for about 700 miles between 9° 45’ and 20° 16’ S. lat., and between 165° 40’ and 170° 30’ E. long.,—the Santa Cruz group lying about 100 miles north of the New Hebrides. Excepting the small Torres group in the North New Hebrides, and some other small islands north of Santa Cruz which are all perched on reefs, but without lagoons, all the islands are of volcanic formation, the larger ones lying on both sides of the line of volcanic activity. The largest of them, being thought by its discoverer, Quiros (1606), to be the long-

sought Terra Australis, was named by him Australia del Espiritu Santo. It is 75 by 40 miles; its peaks and mountains have a fine appearance from the sea. Pottery is made here as in Fiji and New Caledonia, the manu- facture being suggested, it is said, by the form and material of the hornet’s nest (Humenes sxanthura). South-east from Espiritu Santo lie Mallicolo (56 by 20 miles), with a fine harbour, and Ambrym (22 by 17 miles), very beautiful, with a great volcano, 2800 feet ; south of this Lopevi, a perfect volcanic cone, also active, rises to 5000 feet. Farther south are Vaté or Sandwich Island (30 by 15 miles), with the very fine harbour of Havannah;

Erromango (30 by 22 iniles; 3000 feet), where sandalwood is still found; Tanna (18 by 10 niiles), contain- ing Yasowa, the largest volcano of the group ; and Aneiteum, the most southerly (2788 feet). Sulphur from the volcanoes is exported, Santa Cruz or Nitendi Island was the scene of Mendaiia's ill-fated attempt in 1595 to found a colony ; and on Vanikoro, south of Santa Cruz, La Pérouse's expedi- tion was lost (1788). Except in the two localities above mentioned, and at Aneiteum, the coasts are almost free from reefs (the subterranean heat being probably fatal to zoophyte life), and the shores rise abruptly from deep water, the hills being densely wooded, and the scenery and vegetation singularly varied and beautiful. The trees— Casuarina, candle nut (Aleurites triloba), kaurie pine (on Tanna), various species of Jicus, Myrtacex, and many others—are magnificent ; the cocoa-nut is not confined to the coast, but grows high up the valleys on the hill-sides, Beautiful crotons and draczenas abound. Besides the breadfruit, sago-palm, banana, sugar, yam, taro, arrowroot, and several forest fruits, the orange, pine-apple, and other imported species flourish; and European vegetables are exported to Sydney. The fibres of various Urticex and Malvacex are used.

No land mammals are known except the rat and Pteropidx. Birds (species) are less numerous than in the Solomon Islands. Pigeons, parrots, ducks, and swallows are common, and a AMegapodius is found. Of fish more than one hundred kinds are known, mostly inferior as food, and some poisonous. Whales and béche-de-mer abound and are fished for. There are two kinds of serpents (harmless), three or four lizards, and two turtles ; locusts, grasshoppers, butterflies, and hornets are numerous.

The population is perhaps 50,000. Isolated Polynesian com- munities occur on the smaller islands ; and on Vate—and perhaps also on Santa Cruz and Vanua Lavu—there is an infusion of Poly- nesian blood, producing a taller, fairer, and less savage population. The people, however, vary on every island. At Aneiteum they are all Christians, and this influence predominates in the neighbouring southern islands of the group; on Vaté and Tanna, too, there are European factories (cotton and copra), but the population is dwindling rapidly. Motu, in the Santa Cruz group, was the late Bishop Patteson's principal island station. The general type is an ugly one: below the middle height, fairer than the typical Papuan, with low receding

foreheads, broad faces, and flat noses. They wear nose- and ear-rings and bracelets of shells, and frequently nothing clse. The men, but not the women, drink kava. They are con- stantly fighting ; their weapons are bows and arrows, often beauti- fully designed, clubs of elaborate patterns, spears, and latterly muskets. ‘heir houses are either the round huts described by Mendafia three hundred years ago, or rectangular with pitched roofs resting on three parallel rows of posts ; in Vaté the reception houses are adorned with festoons of bones and shells. In Aurora the roof is set directly on the ground, with a square doorway 2 feet high in a deep gable at the end. ‘The villages are scrupulously clean and neat, and ornamented with flowering shrubs, crotons, and draceenas. ; ; ;

In character the pcople differ in different islands, but much of their inhospitality and savagery, disastrously shown in the murder of several missionaries, Bishop Patteson, and Captain Goodenough, is traced to the misconduct and cruelty of traders and labour agents, or to revenge for the introduction of epidemic diseases. In some islands there is the objection also found among Malays to mention their names, or as in Australia the name of the mother-, sister-, and daughter-in-law. They are inveterate cannibals, with a few excep-

Plate VILL.

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tions, as at Santa Cruz and Banks’s Islands (North New Hecbridcs). They believe much in sorceries and omens ; but prayer and offerings (usually of shell moncy?) arc addressed mainly to the spirits of the (recently) dead, and there is another class of spirits, called Vui, who are appealed to when incorporate in certain stones or animals; of one or two such the divinity is recognized generally. By the villages a space shadowed by a great banyan tree is often set apart for dances and public meetings. A certain sacredness attaches also sometimes to the Caswarina and the Cycas. An important institu- tion is the club-house, in which there are various grades, whereon a man’s rank and influence mainly depend, his grade being recog- nized cven if he goes to another island where his language is wnin- telligible. In like manner a division into two great exogamous groups prevails, at all events throughout the northern islands. It would therefore seem that the present

diversity of languages in the group must be of relatively recent origin, These languages or dialects are numerous, and mutually unintelligible, but alike as to grammatical construction, and belonging to the Melanesian class.

Principal Authorities —Lieut. A. H. Markham, R.N., in Koy. Geog. Soc. Jour., 1872; Brenehley, Cruise of the Curacoa; Rev. R. H. Codrington, "On Religious Heliefs and Practices in Melanesia," in Jour. Anthrop. Inst., vol. x.; Walter Coote, Wanderings South and East. (Cae)

NEW IRELAND. See New Brirain.

NEW JERSEY. The State of New Jersey, one of the original colonies which formed the United States of America, lies between 38° 55' 39°65 and 41° 21' 19" N. lat., and 73° 53' 51" and 75° 33' 3" W. long,, and is bounded on the E. by the Hudson river, Staten Island Sound, Raritan Bay, and the Atlantic Ocean, on the S. by Delaware Bay, on the W. by the Delaware river, and on the N. by the State of. New York, their common boundary being a straight line from the west bank of the Hudson river in latitude 40° N. toa point on the north bank of the Neversink river at its junction with the Delaware. The extreme length is 1672 miles, and the width ranges from 59 to 32 miles; and the State has an area of 7576 square miles, and is divided into 21 counties and 223 townships.

Physical Features.—New Jersey lies entirely on the Atlantic slope of the United States. In the north and north-west it is traversed by the Appalachian chain; the Red Sandstone belt, intersected by trap dykes, and extend- ing from Massachusetts to South Carolina, occupies the central portion ; and the lower half of the State is a part of the level sandy tract, covered with pine woods, which borders the Atlantic from New York to Florida.

The ridges of the Appalachian chain in New Jersey may be grouped in two main ranges—the Blue or Kittatinny Mountains and the Highland range. The first of these is an almost unbroken ridge from the New York State line to the Delaware Water Gap, and is the highest ground in the State, being at the Water Gap 1479 feet above the sea, and at High Point, near the New York line, 1800 feet high. Its level crest is clothed with forests, but the slopes are to a great extent cultivated. The Highland range, on the other hand, consists of a number of detached ridges, the highest of which is 1488

feet above the sea. These vary greatly in their surfaces ; many admit of culti- vation to the summit, while others are so covered with loose stones or bare rock that cultivation is impossible, The mineral wealth of the range is considerable.

The Red Sandstone central region is traversed by a number of irregularly distributed trap dykes, which are rough and wooded, and rise in the midst of a rich and productive district. These vary much in elevation, the highest being 868 feet. In southern New Jersey there are no rocky emin- ences or elevations worthy of the name of mountains. Its rounded hills are all earthy, and the results of denudation or erosion; the most elevated—the Navesink highlands— are about 400 feet high.

The southern half of the State is a great plain, sloping

gently from its centre towards the Atlantic and the = ee eee

1 ‘ : : , The Cyprea moneta is used here, as in New Caledonia, asa medium of exchange,

NEW—NEW

Delaware, and has been eroded in the Drift period.2 It contains tracts of gravelly loam largely used for market gardens and vineyards. Extensive tidal marshes border the Atlantic and Delaware Bay, to the extent of nearly 300,000 acres. The Delaware river and bay receive all streams flowing from the western half of the State; the Passaic and Raritan are the most considerable rivers entirely within New Jersey. In the north-western part are many beautiful lakes abounding with fish ; the largest is Lake Hopatcong, 53 miles long by 44 to 1} miles wide.

Geology and Minerals.—N early all the geological periods, except the Coal-measures, are represented in the State. It may be stated in a general way that all the stratified formations cross the State from north-east to south-west; that the Highland range, to which they run parallel, is made up of the oldest rocks in the State; that almost all of the Palseozoic rocks, which are next in order, lie on the north-west side of these mountains; that the Triassic rocks lie next to’the mountains on the south-east ; and that the

Tertiary and recent formations are then found in succession towards the south-east. The Azoic rocks occur mainly in the Highland range, and here consist chiefly of syenitic gneiss and white crystalline limestone, the former greatly predominating. This limestone is found chiefly on the north-west border of the gneiss, interstratified with and conformable to it. Magnetic iron ore abounds here, and occurs in beds or veins interposed between the strata of the gneiss. New mines are constantly being discovered, and the supply seems inexhaustible. Graphite is also found and worked. Valuable deposits of zine ore occur in the crystalline limestone, and large quantities of excel- lent lime are made from this rock.4 The Potsdam lime- stone is found in comparatively small quantities, always near the borders of the gneiss and limestone. Magnesian limestone, found between the Highland range and Kitta- tinny Mountains, is extensively used for making lime, and contains hematite iron ore. Hudson River slate (used for roofing and flagging) exists most largely on the south-east slope of the Kittatinny Mountains. Water lime and Lower Helderberg limestone, which produce the Rosendale cements, are found in quantity along the north-west foot of the Kittatinny. Red sandstones and shales underlie the region immediately south-east of the Highland range, extending from the Hudson to the Delaware. They are in regular layers, dipping gently to the north- west, and form an excellent building material. Copper occurs in this formation, and was worked at an early period. To the south-east of the Sandstone formation follow plastic and fire clays, due to the decomposition of a ridge of granite which once formed the eastern edge of the Red Sandstone valley ; these furnish clays of the purest and most refractory kind, suitable for fire-brick ; very pure quartz sand is also found here, to mix with the clay, and kaolin, although not yet of the best quality.6 The greensand, marl, and sand beds occupy a belt some 90 miles long extending from Sandy Hook to the Delaware near

? The glacial action of the Drift period is well marked in the State by strize and by boulders as distant as 100 miles from their original position. In Middlesex county there is a boulder of 250 tons uearly 30 miles from its parent rock, another in West Orange. The western boundary of the great terminal or frontal moraine of the glacial Drift period extends across the State in a gencral north-north-west course from the mouth of the Raritan at Perth Amboy to Morristown, thence northerly to Denville, where the

direction changes to the west as far as the Musconetcong valley, where it again turns and bears west- south-west to the Delaware at Belvidere.

3 932,762 tons were obtained in 1882.

4 40,138 tons were mined in 1882.

5 In 1882 more than 350,000 tons of these clays were worked, from which 150,000,000 red bricks were made, a large number of porous bricks, 80 per cent. of the architectural terra cotta made in the United States, and a very large amount of pottery and stoneware.

NEW JERSEY

Salem. This formation consists of three distinct beds of greensand, each from 12 to 25 feet thick, separated by beds of sand. The marl is clearly of marine origin, con- taining sea shells, bits of coral, sharks' teeth, saurian bones, &e., and makes a good manure. Glassmakers' sand is worked in the southern part of the State! Along the shore is an elevation of only 5 to 10 feet above the sea- level, having good alluvial soil, which must within a com- paratively recent period have been beneath the sea, Since the first settlement of the country, however, the shore has washed away, and there is good reason to believe that a very gradual subsidence is now taking place.? The entire sea-coast is rapidly becoming a continuous line of summer resorts, among which may be enumerated Long Branch, Sea Bright, Spring Lake, and Asbury Park in the northern portion, Atlantic City in the centre, and Cape May in the south. Some of these places, as Atlantic City, are fre- quented even during the winter months.

Commerce and Industry.—Although only the thirty-fifth among the thirty-eight States in area, it is the nineteenth in population, the eighth in the value of property, and twenty-fifth in value of agricultural products, the sixth in manufacturing and mechanical industries, while in some industries, as silk, pottery, and glass, it far exceeds any other State. The output of the non-precious minerals places it seventh in the list of States, it being the fourth among the iron-producing States, and first as to zine ore. It has 1869 miles of railways, or 1 mile to every 4°25 square miles of area, exceeded in this by only one State. The average value of farming lands is considerably

above that of any other State. In 1880 the total number of farms was 34,307, averaging 85 acres, or a total of 2,929,773 acres of farm lands, of whieh 24°4 per cent. were unim- proved. The value of farm lands was $190,895,8383; farming imple- ments and machinery, $6,921,085; live stock, $14,861,412; all farm products, $29,650,756. Among the principal products were—Indian corn, 11,150,705 bushels ; oats, 3,710,573; rye, 949,064 ; wheat, 1,901,739 ; hay, 518,990 tons ; Irish potatoes, 3,563,793 bushels ; sweet potatoes, 2,086,731 bushels ; 86,940 horses ; 9267 mules and asses ; 152,078 milch cows ; 71,808 other cattle; 117,020 sheep ; 219,069 swine ; 9,518,835 Ib butter ; 15,472,783 gallons milk.

Omitting fishery products, gas, petroleum, refining, mining, and quarrying, the following table gives the general condition of the manufacturing interests of the State in the years mentioned :—

No. of Establish- ments,

: Hands Capital. Employed.

Cost of Material.

Wages Paid. Products. $9,364,740 | $22,011,871 | $39.85) 256 16,277,337] 41,429,100 | 76,306,104 32,648,409 | 103,415,245 | 169,237,732 46,083,045} 165,280,179 | 254,375,236 |

4,207 4173 6,636 7,128

$22,293,258 40,521,048 79,606,719 106,226,038

37,830 56,027 75,052 126,038

Among the most important interests for 1880 are those given in the following table:—

2 a

S ry =| co Kind of Industry, | = E Capital. 5 ae — Material. | Products.

eels aan Anthracitefurnaces.| 16 [$6,825,000 938 | $340,035 |$2,341,560 [$3,580,664 Boots and shoes….. 398 1,153,390 | 3,757 | 1,422,681 | 3,069,894 | 5,262,671 Breweries…...00.-+ 48 | 4,250,000} 1,095] 662,886 | 3,179,883 | 5,798,330 Cotton goods,....., 24 | 3,961,145 | 4,836 | 1,309,997 | 1,284,819 | 5,039,519 Drugsandchemicals; 41 | 8,830,750} 1,272} 598,742 | 3,528,204 | 4,993,965

Foundry & machine

shop products….. 188 | 7,481,421 | 8,205 | 3,432,453 | 6,188,852 |11,282,748 Hats and caps…..... 79 | 1,343,900 | 5.567 | 2,113,581 | 2,103,082 } 6,152,447 lron and steel…..... 66 | 9,741,216 | 5,544 | 2,109,740 | 7,564,205 111,837,846 Jewcllery eee} 68 | 2,555,899 | 2,234 |:1,114,946 | 1,967,054 | 4,079,677 Leather 111 | 3,793,796 | 2,688 | 1,479,296 |12,353,017 |15,475,222 Paper mills….. 32 | 1,830,500] 886] 272,936 | 1,286,182 | 2,015,569 Rubber goods…....| 20 1,790,200 | 2,548] 766,523 ; 2,029,415 | 5,212,695 Sewing machines… 8 | 1,152,755 | 3,311| 1,519,947 | 1,484,902 | 4,640,852 Silk and silk goods..| 106 | 6,952,325 |12,549 | 4,177,745 | 9,678,536 {17,122,236 Stone &earthenware| 49 2,057,200 | 3,180} 1,101,511 | 1,030,598 | 2,598,757 Sugar and molasses.| 4 | 2,110,000 697| 476,216)20,794,961 |22,841,258 Woollen goods,.....| 27 | 2,530,125] 3,363) 996,384 | 3,162,955 | 4,984,007

Population.—The population of the State was 211,149 in 1800, 277,426 in 1820, 373,306 in 1840, 672,035 in 1860, 906,096 in pe a a ll ee ae ae i 2

1 Tn the year ending June 1880 27,495 tons were mined, and in that year there were in operation in the State 55 furnaees, eontaining 364 pots, with 3501 work-people, and a produet of $2,810,000; window glass, green glass, and glassware are made. One-third of the produet of green glass in the United States is made by the Jersey works.

- The United States Coast Survey and the New Jersey Geological Survey are engaged on observations to settle this question,

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1870, and 1,131,116 in 1880. The census of 1880 showed 559,922 males and 571,194 females, 1,992,017 white, 38,853 coloured, 172 Chinese, and 74 Indians. The inhabitants of foreign birth numbered 221,700. To cvery square mile of area there were 151°73 inhabi- tants, the State being the third in the Union in respect of density of population.

The largest cities, with population in 1880, are—Ncwark, 186,508; Jersey City, 120,722; Paterson, 51,031; Camden, 41,659; Hoboken, 30,999 ; Trenton (the State capital), 29,910 ; Elizabeth, 28,229; New Brunswick, 17,166 ; Orange, 138,207.

Government.—The executive power is vested in a governor elected by the people for a term of three years ; no one can serve in this capacity two successive terms. The lcgislative power is in the legislature, composed of a scnate and general assembly mect- ing on the second Tuesday of January cach year at Trenton, the capital of the State. A scnator is elected for threc years by each of the twenty-one counties, one-third of the whole number being elected each ycar. The assembly consists of not more than sixty members, clectcd for one year, and apportioned among the counties as nearly as may be according to the number of their inhabitants, with the condition, however, that each county shall at all times be entitled to one member. The principal officers of the Statc are a secretary of state, attorney-general, adjutant-general, and quarter- master-gencral, all appointed by the governor and confirmed by the senate, and a treasurcr and comptroller appointed by the legis- lature in joint meeting. All judges and prosecutors of the pleas are appointed by the governor and confirmed by the senate ; the election system for the judiciary has not yet reached New Jersey.

The judicial power is vested in (1) a court of errors and appeals in the last resort, consisting of the chancellor, the justiccs of the supreme court, and six judges of the court of errors; (2) a court for the trial of impeachments, consisting of the senate; (3) a court of chancery, consisting of the chancellor and two vice- chancellors; (4) a supreme court, consisting of the chief justice and eight associate justices; (5) circuit courts, held in every county by the justices of the supreme court ; (6) an inferior court of the common pleas organized in cach county, and consisting of three judges. In some of the sparsely settled counties the inferior courts are presided over by justices

of the supreme court; in the other counties one of the three judges is a law judge and presides. The court of pardon consists of the governor, the chancellor, and the six lay judges of the court of errors ; a majority of this court, of whom the governor must be one, can remit fines and forfeitures, and grant pardons, after conviction in all cases except impeachnients.

State Institutions.—There are two lunatic asylums,—one near Trenton containing more than 600 patients, the other near Morris- town capable of accommodating 800; the latter is probably unsnr- passed by any similar institution; there are also seven county asylums containing 746 paticnts. An institution for the deaf and dumb, to contain 125 pupils, has been recently established at Trenton; the blind and feeble-minded are placed in suitable establishments in neighbouring States. The home for disabled soldiers, at Newark, accommodates nearly 400 men. The State prison at Trenton contains some 800 convicts, a large part of whom are employed in contract labour to an extent which pays about 54 per cent. of the cost of the institution. A rcformatory school for boys, near Jamesburg, contains about 325 juvenile delinqnents. An industrial schvol for girls, near Trenton, has 30 inmates. The board of health is steadily gaining in importance, and has accomplished much good in spreading uscful information, collecting important vital and health statistics, and investigating matters affecting the public health. The labour bureau has done good service in collecting statistics affecting the questions of labour and capital, in bringing about a better understanding betwecn the two, and in indicating new and profitable avenues for industry. The geological survey, of which the geodetic and topographical surveys have neccssarily formed part, now approaching its close, is one of the most uscful of the State institutions.

Education.—The Agricultural College, attached to Rutgers College at New Brunswick, is supported by the proceeds of certain public lands given by the United States to the State for that purpose. In connexion with this are the college farm and the agricultnral experiment stations, which are doing admirable work in systematic and carefully conducted expcriments (under the chicf of the geological survey) with various fertilizers, and in testing various soils, crops, and methods of agriculture. The public seliools are mainly supported by a State tax of $4 for each child between five and eighteen years of age, amounting in 1882 to $1,322,740, supplemented by

an annual appropriation of $100,000 from the school fund, which latter now amounts to morc than $3,375,000, and is rapidly increasing. Small additional special taxes are also levied in some of the school districts. A normal school has been in successful operation at Trenton for several years, and has nearly 250 pupils. The eollege of New Jersey at Princeton, and its sister theological seminary, although not State institutions, occupy placcs in the very front rank of Amcrican schools of learning.

Finance.—The only State debt is that known as the war debt, amounting at present to less than $1,700,000, and paid off at the rate of $100,000 per annum. The sinking fund for the redemption of this debt is valued at something more than $1,100,000. Inde- pendently of the general State school tax the receipts and expendi- tures for 1882 were $1,104,303°75, distributed as follows:—interest on debt, $90,000; charitable and reformatory, $269,793°19 ; courts, crimes, &c., $274,025 °82 ; State government, $158,171°04; scien- tific, sanitary, &c., $47,880°49 ; military, $70,692°22 ; educational, $33,983°61 ; publication, $105,225°47 ; miscellaneous, $54,531°91. It will thus be seen that the State expended for educational pur- poses $1,356,723°61, as against $1,070,320‘14 for other purposes.

History. —The first settlement within the present State was made in 1617 by the Dutch at Bergen opposite New York. Subsequently Cornelius May, who discovered the Delaware in 1628, built a fort on its banks opposite Philadelphia. During the early colonial period the region was the scene of many petty struggles arising out of the rival efforts of the Dutch, Swedes, and English to establish trading posts and settlements on the river. ‘The Indians among whom these early settlers were thrown were generally divided into small tribes; but in the valley of the upper Delaware were the principal and most populous seats of the Leni Lenape—known by the English as the Delawares, a name still retained by the remnants of this most interesting and once powerful tribe in their new homes west of the Mississippi. On the whole the early intercourse between the whites and Indians was peaceful, but there were occasional collisions, some of a serious nature, too often brought about by the rapacity and bad faith of the

whites. As a rule the title to the Indian lands was purchased, and after the province fell into the hands of the English the gencral policy pursued was one of humanity and good faith. At the time of the English accession it is estimated that the Indians in New Jersey numbered about 2000.

When Charles IT. wrested their North American possessions from the Dutch—in fact before this was accomplished—he granted them in bulk to his brother the duke of York, who in turn granted what is now New Jersey to Lord John Berkeley and Sir George Carteret, the conveyance (June 23, 1664) providing that 'the said tract of land is to be called Nova Cesarea, or New Jcrsey."! The royal grant was of the proprietary character, that is, it not only con- veyed the absolute estate and title to the land, but also the power to govern and rule, and therefore to establish such laws as 'might be thought necessary, provided they were not contrary to but, as near as conveniently might be, agreeable to the laws, statutes, and government of the realm of England." As all these rights and powers were assignable, the duke transferred to Berkeley.and Carteret, not only the lands, but also the power to govern; and they in turn possessed, and finally exercised, the power to assign to others both land and power to govern.

The first general assembly met at Elizabeth, May 26, 1668; another session was held during the same year, but none other for seven years thereafter. In 1672 New Amsterdam and New J ersey Were reconquered by the Dutch, but early in 1673 they reverted to England. | Doubts arising as to the effect of the reconquest upon the validity of the original grant, the duke of York obtained a new grant from the king, and renewed his own to Berkeley and Carteret. Prior to this renewal the two proprietors had agreed to a division of their interests, and in the new grant the portion assigned to Carteret was the region east of a line drawn from

' In compliment to Sir George Cartere against the Long Hr , g t, who had defended the Isle of Jersey

NEW JERSEY

Barnegat Creek to the Rancocus; to Berkeley was assigned the territory west of that linc. In 1676, however, the line of separation was changed by the owners, so that it extended from Little Egg Harbour to a point on the

Delaware in 40° N. lat.; this remained thereafter the boundary between Kast and West Jersey.

Immediately aftcr the reconquest Philip Carteret returned to East Jersey as its governor, and on his arrival in 1674 presented a new charter, less liberal in many respects than the original. Berkeley meanwhile sold West Jersey to a firm of Quakers, who at once proceeded to colonize it, establishing their first settlement at Salem in 1675, and another shortly aftcr at Burlington. For some years great annoyance was experienced both in East and West Jcrsey from the unjust interference of the governor of New York, and of the duke himself, with their internal affairs; these attempts were always met by a firm and spirited resistance, which eventually triumphed. In 1682, soon after Sir George Carteret's death, a society of Quakers under the lead of William Penn, encouraged by their success in West Jersey, purchased from his heirs their rights to Hast Jersey. It will give some idea of the progress already made to state that at this early period (1682) a smelting furnace and forge were in operation in New Jersey, making good iron, and that contemporary documents show that at the same date there were exported 'great plenty of horses, beef, pork, pipe-staves, boards, bread, fiour, wheat, barley, rye, Indian corn, butter, and cheese to Barbados, Jamaica, and other adjacent islands, as also to Portugal, Spain, the Canaries, &c.; whale oil, whale fins, beaver, mink, raccoon, and martin furs to England."

Towards the close of the 17th century the number of proprietors in the two provinces increased so much as to render good government impracticable in consequence of the discord arising from divergent interests and views. The evil became unendurable, and in 1702, by the general consent of the proprietors and people, the former, while retaining all their property rights, surrendered their right of govern- ment to the crown, by whom the two provinces were reunited, and placed under a governor appointed by the sovereign. With him Were associated in the government twelve councillors selected by the crown, and twenty-four assemblymen selected by the freeholders, The sessions of the assembly were at the pleasure of the governor, and its acts subject to the double veto of governor and crown, The governor and council organized the courts of law, determined all salaries, and appointed all civil and military officers.

The population of the two provinces at this period was probably a little more than 15,000. ‘The great majority of the people were Quakers, Presbyterians, and Anabaptists; there were only two Church of England ministers in the province, and their followers were too few and poor to provide churches ; nevertheless the Church of England was now made the established church, and its support provided for. Liberty of conscience was permitted to all except Roman Catholics. Quakers were eligible to office. The governor enjoyed the right of presentation to ecclesiastical benefices.

Lord Cornbury was the first governor appointed under the new arrangement, and the commission and instructions which he re- ceived, the chief points of which have just been given, formed the constitution and government of New Jersey until the declaration of independence, except that New York and New Jersey had the same governor until 1738, after which year each had its own governor, and in New Jersey the council became a separate branch of the legislature, the governor no longer participating in the debates. rom the beginning of Cornbury’s administration to. the Revolution the political history of the province consisted largely of violent contests between the assembly and the governor and his council,—-the latter constantly striving to extend the prerogative and curb the power of the people, and the assembly maintaining a bold and able contest in defence of the principles of liberty. Not- withstanding the large proportion of Quakers among its carly in- habitants, New Jersey never failed to furnish its just quota of men and money for the various American wars waged in the 18th ; century, and its contingent bore a most honourable part in the chief military events of that period. For the campaigns of 1711, 1739, 1746, 1747, and 1748 the province supplied a battalion of 500 men. It was during these last campaigns that the name ‘‘ Jersey Blues,” in vogue since that time, was first applied to the Jersey troops from the colour of their uniform —blue faced with red, grey stockings, and buckskin breeches. They were described at the time as ‘the like- liest well-set men who ever entcred upon a campaign.” When the French war of 1754 broke out Jersey again furnished a battalion of 500 men ; of these one half were captured by Montcalm at Oswego, after a gallant resistance, and the remainder at the surrender of Fort William Henry. But the province at once made good the losses, and maintained as many as 1000 men in 1758, 1759, and 1760, in which last year its contingent took part in the capture of Montreal. In 1761

and 1762 the contingent was 600 men, and again in 1764 for service against the Indians. i

During the years immediately preceding the Revolution New Jersey took an active and leading part in all the discussions and measures growing out of the attempt of parliament to impose stamp duties and taxation upon the colonies without their consent. The

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provinee was ably represented at the various mcetings of the con- tinental congress preeeding and leading to the war of the Revolution, and from the breaking out of hostilities bore more than its full share of the bureens necessary to bring the war to a successful con- elusion. The last provincial assembly was prorogued in December 1775. The provincial congress, elected in aecordanee with the ordinance of the preceding congress, convened in June 1776, and on the 18th of July assumed the title of the ‘‘ convention of the State of New Jersey.” An Act of Assembly of September 1777 sub- stituted the word ‘‘State” for the word ‘‘ Colony” in all cases of writs, commissions, indictments, &e., kc. In the war New Jersey furnished to the “continental line” 10 ,726 men, besides large numbers of militia, and expended for war purposes, on account of the continental government, $5,342,770. Some very important and interesting operations of the war were conducted within the limits of the State; and from its peculiar position New Jersey suffered more from the evils of the war than any of the thirteen colonies, exeept perhaps South Carolina. In the whisky insur- rection of 1794 the State furnished more than 2000 militia, who under Governor Howell formed part of the army in Pennsylvania. In the war of 1812 it furnished nearly 7000 militia, and in the Mexican war three companies of regular infantry and a battalion of volunteers. At the breaking out of the civil war of 1861 the number of men in the State available for military duty was 98,806; and during that war New Jersey organized and maintained 37 regi- ments of infantry, 3 regiments of eavalry, aud 5 batteries. The national guard of the State now consists of 48 eompanies of infantry and 2 Gatling gun companies, numbering 3220 officers and men, thoroughly organized, drilled, and equipped for service.

See Samuel Smnith, History of the Colony of New Jersey to the year 1721, Bur- lington, 1765, republished 1877; Gordon, History of New Jersey to the Adoption of the Federal Constitution, Trenton, 1834; Mulford, Civil and Political History of New Jersey, Camden, 1848; Barber and Howe, Historical Collections; New Jersey Archives, first series; Whitehead, Contributions to the Early IHistory of Perth Amboy, New York, 1856, and Contributions to Fast Jersey History; Win- field, History of Hudson County; Hatfield, History of Elizabeth, New Jersey, 1868. For the geology, Cook, Geology of New Jersey, 1868; and Annual ig ts of the State Geologist of New Jersey. (G. B. M‘C.)

NEW J ERUSALEM CHURCH. See Swepentore.

NEW LONDON, acity and port of entry of the United States, one of the shire towns of New London county, Connecticut, lies on the west bank of the Thames, about 3 miles above its entrance into Long Island Sound. It is the southern terminus of the Central Vermont Railroad, and a station on the New York, New Haven, and Hartford and the New York, Providence, and Boston Railroads, whose trains cross the river by ferry. By rail it is 126 miles from New York and 62 from Providence. Two lines of steamers ply daily to New York. The city is built on a declivity facing the south-east, and from the higher points enjoys fine views over Long Island Sound and the surrounding country. To the south lies Fort Trumbull, having 80 guns and room for 800 men, but too near the city to be a sufficient defence. At Groton Heights on the opposite bank, a small battery occupies the site of Fort Griswold, near which is a granite shaft, 127 feet high, commemorating the massacre of its garrison by Arnold’s troops in 1781. As a fashionable summer resort, rivalling Newport, it is well provided both with private residences and public hotels. The city-hall, the county court-house, and the custom-house are among the most conspicuous buildings. The harbour of New London, the best on Long Island Sound, and one of the best in the world, is 3 miles in extent, and has a depth of from 4 to 7 fathoms; the river is navigable also for 3 miles above the city. The granite wharf, built by the New London Northern (Central Vermont) Railroad, is 1125 feet long, 220 feet wide at the river end, and 150 feet at the shore end. On the east side is a United States navy yard. Asa whale-fishery port New London was from 1840 to 1857 second only to New Bedford. Since the decline of the whale

fishery it has prosecuted the seal fishery (Alaska and New Shetland), and the cod and mackerel fisheries. A woollen mill, a cotton-gin factory, iron foundries, a fruit-canning establishment, and an ex- tensive cracker bakery are the chief manufacturing works in the city. The population was 8991 in 1850, 10,115 in 1860, 9575 in 1870, and 10,537 in 1880. In 1645

John Winthrop the younger settled on what was then |

known as Pequot Harbour, and in 1658 the Connecticut assembly resolved that the "plantation" should bear the name of New London. During the Revolution the har- bour was the headquarters of the Connecticut privateer- ing fleet. In 1781 the city was captured by Benedict Arnold, and, together with Groton, was burned by accident or design.

NEWMARKET, a market-town, partly in Cambridge and partly in Suffolk, and the seat of important races, is situated on the Cambridge and Bury branch of the Great Eastern Railway, 13 miles north-east of Cambridge and 60 north by east of London. The parish church of Saint Mary, an old Gothic building of stone, was recently restored, Newmarket has been celebrated for its races from the time of James I. The house built for this monarch's use during his visit to the races, and enlarged by Charles II., is now partly occupied by a Congregational chapel. The Beacon race-course at Newmarket is about 4 miles long, and is the finest in the world. The town is the chief seat of the Jockey Club, and of the training establishments for races, more than 1000 horses generally occupying the stables at one time. Near the race-course is the Devil's Ditch, consisting of a ditch and mound 4 or 5 miles long and 100 feet broad, with a slope of 50 feet on the south-west side. Roman remains have been found in the neighbourhood. The population of the urban sanitary district (740 acres) in 1871 was 4534, and in 1881 it was 5093.

NEW MEXICO, a Territory of the United States, is Plate IX.

bounded on the N. by Colorado, on the E. by Texas and unorganized 'public lands" adjacent to the Indian Territory, on the 8. by Texas and Mexico, and on the W. by Arizona. It forms nearly a square, being about 335 miles in

width from east to west and 345 miles in length from north to south on the eastern border, which lengthens to 390 miles on the west. As formed originally by the Organic Act of 1850, the Territory embraced Arizona and southern Colorado. In 1854 the “Gadsden Purchase ” from Mexico added a strip along the southern boundary. In 1863 Arizona was detached and made into a separate Territory, and in 1867 the portion of New Mexico north of the 37th parallel was added to Colorado, leaving the Territory with its present boundaries, and an area of 122,460 square miles.

Physical Features.—The whole area is elevated far above the ocean, the table-lands of the north being 6000 to 6500, those of the centre 5000, and those of the south about 4000 feet above sea-level. The fall in the Rio Grande from the Colorado line to that of Mexico is about 3500 feet. The whole except the eastern portion is traversed by mountains, passing from north to south, not continu- ously but in broken ranges, which, for convenience of description, may be divided into three parts. The main range of the Rocky Mountains enters the Territory from the north, the highest peaks being the Costilla (12,615 feet), Taos, Mora (12,020), Truchas (13,150), and Baldy (12,661). This range disappears as a continuous chain near Glorieta. Running east from this as a kind of spur along the Colorado line are the Raton Mountains, the pass in which, south of Trinidad, is 7893 feet high. The railroad crosses this range through a tunnel. Commencing about 20 miles south of Santa Fé, and extending south- wards on the east side of the Rio Grande, is a broken range, known variously in localities from north to south as the Cerrillos, Placer, Sandia, Chilili, Manzana, Jumanes, Oscura, San Andres, and Organ Mountains, ——the last- named crossing into Mexico near El Paso. Nearer to the Rio Grande in Socorro county are the Fra Cristobal and Caballo Mountains. East of the above chain is a series of ranges, generally short, locally known as tle Gallinas,

Jicarilla, Carrizo, Capitan, Sierra Blanca, Sacramento, Hueco, and Guadalupe Mountains. On the west of the io Grande another broken range runs south, commencing at the singularly conspicuous San Antonio mountain, close to the Colorado line, and known in its several parts as the

Petaca, Valles, Nacimiento, Jemez, San Mateo, Ladrones, Oso, Madalena, Socorro, San Mateo (of Socorro), Black Range, Mimbres, and Florida Mountains, the latter extend- ing into Mexico. Still farther to the west, and near the Arizona boundary, yet another series of comparatively short ranges is found, consisting of the Carrizo, Tunicha, and Chusca Mountains, which constitute part of the "great continental divide" separating the waters flowing into the Gulf of Mexico from those running into the Pacific, and more to the south the Zufii, Datil, San Francisco, Escudilla, Tulerosa, Luera, Mogollon, Diablo, Pinos Altos, Burro, Sarampion, Hacha, Perro, Animas, and Peloncillo Moun- tains. These mountains are seamed with great '" cafions," which also penetrate the larger '"'mesas" or table-lands in various places, where in some way the covering of lava which is their usual protection has been removed. Between contiguous ranges or spurs of the same range are fre- quently found "parks" of great beauty and fertility. These specially abound in the western part of Colfax county.

New Mexico, while generally requiring irrigation for its cultivation, is more fully provided with rivers than any of the other mining States or Territories. Its watcrs flow east to the Mississippi, south to the Gulf of Mexico, and west through the Colorado and Gila to the Gulf of California and the Pacific Ocean. The Rio Grande, called also the Rio Bravo del Norte, passcs completely through the centre of the Territory from north to south. It receives many tributaries, the principal being the Santa Fé and Galisteo from the east, and the Chama, Jemez, Puerco, and Alamosa from the west. Its valley is of great fertility, and capable of supporting a large population. The north- eastern part of the Territory, including the greater part of the counties of Colfax, Mora, and San Miguel, is drained by the Canadian or Red River, which flows into the Arkansas. The branches of this stream are very numerous, the principal ones being the Cimarron, Mora, Concha, Pajarito, and Ute. The Pecos rises north-east of Santa Fé, and, flowing south, gives value to a vast belt of land, until it crosses the Texas line and finally joins the Rio Grande itself. Its valley is unsurpassed for fertility and agricultural worth. Among other streams, the Tecolote, Gallinas, Hondo, and Peiiasco are tributaries to it. In the north-west is the Rio San Juan, from which that whole section is called the "San Juan country." It flows west to the Great Colorado, and has as its principal branches in New Mexico the Animas from the north and the Chaco from the south. In the central west are

the headwaters of the Little Colorado, and in the south-west those of the Gila, with the Mimbres, which flows south into Mexico.

Minerals.—In almost all parts of the Territory, except the pastoral plains, the precious metals are found, the mineral extending from the extreme north to the southern boundary. The eastern slope of the Rocky Mountains, in Colfax county, abounds in gold, and Elizabethtown, its chief village, was the scene of great mining prosperity a few years ago. The metal is found in "leads" as well as in extensive "placers." On the opposite side of the range are both gold and silver, and a little farther south, near Picuris, are large deposits of copper. 'Travelling southwards we find various minerals of value in the mountains east of Santa Fé; and the Cerrillos mining district, about 20 miles south of the capital, presents a rich deposit of silver not as yet fully developed. Here

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also are the famous turquoise mines, the largest in America, which played so important a part in the early history of the Territory. To the west in the Nacimiento region is a great body of copper. At the "Old Placers" and "New Placers," in the southern extremity of Santa Fé county, are inexhaustible supplies of placer gold, which were washed for many years by the rude methods of former times, but work here has been suspended pending the completion of extensive works now in progress which will provide a sufficient supply of water for large operations. The Manzana, Ladrone, and Madalena ranges, and, indeed, nearly all the mountains on botli sides of the Rio Grande, contain rich mineral. Silver mines of great value are worked in the Socorro Mountains, directly west of the city of that name. The Black Range country is rich in silver and copper; and the more recent discoveries on the Percha river and at Lake Valley promise to be of extraordinary richness and extent. The vicinity of White Oaks in Lincoln county is specially noted for its free gold, and the San Andres, Caballo, and Organ ranges abound in valuable ores. The greatest development has taken place in Grant county, whose "Santa Rita," " Hanover," and other copper mines are well known; the vicinity of Silver City and Georgetown produce great quantities of silver, while the newer districts in the south-west, in the vicinity of Shakespeare and Lordsburg, are also rich in the last- mentioned

metal. To the north of Silver City are the Mogollon Mountains, where valuable mineral deposits are found. The mines, especially those of silver, were exten- sively worked by the Spaniards down to the year 1680, when the revolt of the Pueblos, caused by the cruel slavery to which they were reduced in working for the precious metals, resulted in the fillmg up and conceal- ment of every mine in the country during the thirteen years of Pueblo control. The shafts of these mines are frequently discovered. Development in recent times has been greatly retarded by Indian occupancy in some sections and their incursions into others; but now that these difficulties have ceased it is very rapidly progressing.

Bituminous coal is found in inexhaustible quantitics in very many sections of the Territory, notably near Raton in Colfax county, along the Galisteo river on the line of the Atlantic and Pacific Railroad, and near the Chama river in the north-west. Anthracite coal of an exceedingly fine quality exists in large amounts near Cerrillos station, being superior to many of the coals of Pennsylvania, and by far the best fuel thus far discovered west of the Mississippi river. Iron is found in many localities, but has not yet been worked, the more valuable metals monopolizing attention. Mica mines of large extent and excellent quality are at Petaca, Mora, near Nambé, and in other localities. Lead abounds in many sections carry- ing silver, and notably in the Cerrillos mines. Plumbago is found in Colfax county ; and cement of a very superior quality is made at Springer. Gypsum, fire-clay, and mineral paints are among the mineral resources of the Territory ; and marbles and other excellent building stones abound.

Mineral springs of various kinds of great excellence are found in different localities. Prominent among them are the Las Vegas hot springs, the Ojo Caliente in Taos county, the Jemez hot springs, and the Hudson springs. These all have special medicinal qualities, and are of high temperature, the Ojo Caliente water being of 114° and the Jemez 168°. ‘There are also important springs south of E] Rancho in Taos county and east of Santa Fé.

Climate.—The climate is dry and the air clear through- out almost the entire year. The temperature at Santa Fé, which is considered to have the best climate in the Territory, is sometimes as low in the winter as at New York, but

the dryness of the atmosphere prevents the cold from being felt to anything like the same extent. The more southerly towns are of course warmer, not only on account of the difference in latitude, but also because of their decreased altitude! The rainy season occupies about a month, varying in time from the middle of July to the iniddle of September, but even then a wholly cloudy day is seldom seen, the mornings being bright, with showers in the afternoon. The comparative death-rate from tubercular diseases in New Mexico is less than anywhere else in the United States, the proportions being—New England 25, Minnesota 14, Southern States 6, New Mexico 3.2 The average rainfall at Santa Fé for eight years (1874-81) was a little less than 144 inches, whereas the average at New York was 43, Boston 45, Philadelphia 44, Washington 37, St Louis 42, and Savannah 48. The mean temperature was 484°. The atmosphere is so clear and pure as to be proverbial. From the first characteristic arises the decep- tion as to distances so generally experienced by strangers ; and the second is evidenced by the fact that everywhere throughout the Territory the natives hang up their meat out-of-doors to dry, and use pieces of it as required, not the slightest taint arising from it during a series of months.

Agriculture, &c.—The greater portion of New Mexico is pastoral, being unfitted for agriculture from lack of water for irrigation. Wherever there is sufficient water either in streams or springs to supply the wants of animals, the grass is amply sufficient to sup- port either cattle or sheep. The Territory abounds in the most nutritious grasses, which retain their virtues during the winter ; and the cliinate is such that shelter is not required other than that afforded by nature, in valleys and woods. The number of sheep is variously estimated from 7,000,000 to 10,000,000, and they are raised in every county. Within the past few years the breed has been much improved by the introduction of merino, Cotswold, and other fine-woolled varieties. The cattle business has reached enormous proportions within a few years, and is steadily advancing in importance. The immense profits reccived have induced the investment of large amounts of capital, and all the desirable ranches are being rapidly taken up and stocked. The business is changing in its character in two ways. Large corporations are taking the place of small owners, and, instead of ranging over the plains, the cattle are now generally

confined to tracts exclu- sively owned or occupied, and fenced. Colfax county alone is thought to contain nearly 100,000 head of cattle, and the number in the whole Territory is very large, and rapidly increasing.

Agriculture is mainly limited to the valleys. Those of the Rio Grande, the Pecos, the Canadian, the San Juan, and their tribu- taries, though generally narrow, contain large areas of arable land of extraordinary fertility. They produce large crops of grain and of most kinds of vegetables, especially onions, beets, turnips, cab- bages, cauliflowers, &c. Potatoes succeed best in the mountainous regions. The Taos valley is an exceptionally fine wheat country, and before the advent of railroads supplied a great part of the Terri- tory with its flour. The Mora valley is also celebrated for its wheat. Itis as a fruit-producing region, however, that a large portion of the irrigated laud in the Territory specially excels. The Rio Grande valley from Embudo to Mesilla is particularly adapted to this purpose. The area of fruit and vine culture is being yearly extended. Pcaches, plums, and apricots come to great perfection in the north, and pears, apples, quinces, cherries, &c., as well as the stone fruits, throughout the middle and southern sections. Grapes flourish from Bernalillo to El Paso, and in some favoured spots like La Joya farther north. The grape principally cultivated is the “ Mission,” which produces excellent wine. Hardy American varieties like the Concord will do well anywhere, and the less hardy European varieties, such as the White Muscat, Flamed Tokay, &c., succeed admirably in the vicinity of Las Cruces. The Pecos valley also produces fruit of extraordinary size and beauty.

The supply of timber, especially of pine, is almost inexhaustible.

1The elevations at sume of the principal points are—Costilla, 7774 feet; Tierra Amarilla, 7455; Glorieta, 7507; Santa Fé, 7044; Fort Wingate, 7087; Taos, 6950; Las Vegas, 6452; Fort Stanton, 5800; ee” 5104; Albuquerque, 4918; Socorro, 4655; Las Cruces,

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2 The army statistics for six years lead to the same result, the ratio of deaths per 1000 from diseases of the respiratory organs being—west coast of

Florida, 6°9; New York, 5°9; New England, 4°8; Great Lakes, 4°5; Texas coast, 4; western Texas, 3°9; East Florida, 2°3 ; New Mexico, 1°38.

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It exists in nearly all the hilly and mountainous parts of the Territory, but is of very superior quality as regards both height and straightness in the vicinity of Tierra Amarilla. Cedar abounds in many localities, and the pifion makes an excellent fuel. Oak, maple, walnut, and ash are found toa more limited extent. The varieties of poplar commonly known as cottonwood and quaking aspen are the most common deciduous trees, and grow in almost all parts of the Territory. Several other native plants are proving of value. The Yucca of different varieties abounds,—Y. jfilamentosa, commonly called amole or soap-weed, covering immense tracts. Experiments have recently been made with a view to utilizing the fibre of the large serrated variety abundant in the south in the manufacture of rope, and the smaller kinds in paper-making, as well as using the root in preparing a substitute for soap, These bid fair to make this very abundant plant of large commercial value. The cafiaigre has long been known to possess powerful tan- ning properties, and recent cxperiments by the department of agriculture and elsewhere have demonstrated its value as a substi- tute for bark and other agents. The plant grows wild over a large extent of country, and its importance in a district producing so many hides and skins can hardly be overestimated.

Government and Administration.—The executive officers are a governor and a secretary. ‘The higher judiciary consists of a chicf justice and two associates, each of whom presides over the courts in one district, all three sitting together as an appellate supreme court in January of each year. The legislature consists of a council of twelve members and a house of representatives of twenty-four, elected by counties biennially. The governor possesses the veto power. The territorial officials are a treasurer, auditor, attorucy- general and two district attorneys, and an adjutant-general. In each county there are a probate judge, sheriff, and other local officers, the chief authority being vested in a board of county com- missioners of three members elected by the people. The counties are divided into precincts, in cach of which there is a justice of the peace and a constable. At present there are twelve counties in the Territory. Public education is in charge of a

board of three school commissioners in each county. A tax of 4 per cent. is levied for the support of public schools. Precincts may become independent school districts at their option.

Population.—The population of the Territory was 91,874 in 1870 and 119,565 in 1880. Since that time it has steadily increased. The capital, Santa Fé, had 6635 inhabitants in 1880.

History.—The first European that traversed the Territory was Cabeza de Vaca (Nufiez), the treasurer of the unfortunate expedition of Panfilo Narvaez to Florida, who, being cast ashore on the coast of Texas, crossed the continent with three companions, and after encountering infinite difficulties and dangers arrived at Spanish settlements near the Gulf of California. On the way he passed through a land of 'fixed habitations," which were evidently the Pueblo towns, followed the Rio Grande for many miles, and on his return to civilization gave such an account of his travels that great interest was excited. In consequence, Coronado, the governor of New Galicia, sent Marcos de Niza, a Franciscan monk, with Stephen, a negro who had been one of Vaca's companions, to reconnoitre the country. They penetrated as far as Zui, then called Cibola, where Stephen was killed; but Marcos made up for the lack of substantial success by the marvellous nature of the report he presented. The next year, 1540, Coronado himself headed an expedition of 300 Spaniards and 800 Indians, and started from Culiacan on Easter Monday. He succeeded in finding Cibola, which he subjugated with the surrounding country, and then proceeded to the province of Tiguex (on the Puerco river). After this expedition several friars at various times entered the country, establishing missions, often at the cost of their lives. Among them one of the most pro- minent was Agustin Ruiz, who was killed in 1581. Almost imme- diately after this came the expedition of Espejo, who was sent by the viceroy to protect the missions. The next expedition of note was that of Ofiate, toward the close of the century, which carried a large number of additional colonists into the Territory. From this time the Spanish population increased rapidly, and mining was extensively engaged in, the natives being reduced to a virtual con- dition of slavery in the mines. In 1680 the Indians, who had long been on the verge of rebellion, revolted, and under the lead of Popé, a chief of large influcnce, marched on Santa Fé, and there besieged Governor Otcrmin

and the Spanish army, who were finally compelled to evacuate the town and retreat to El Paso. For thirteen years the Pueblos continued to control the country, defeating successive Spanish expeditions, until in 1693 Diego de Vargas, the new governor, succeeded in conquering them and a peace was made, one of the terms of which was that there should be no more slavery in the mines. In fact the Indians had filled up all the shafts in the meantime. For over a century afterwards little occurred to disturb the tranquillity of the Territory, cxcept occasional wars with the surrounding savage tribes. In 1804 Lieutenant Pike, exploring the head-waters of the Arkansas, by mistake camped on Mexican soil and was brought into Santa Fé aud sent to Chihuahua as a prisoner, About this time the first

goods were brought across the plains to the New Mexican market, being the commencement of the overland traflic of the Sante Fé ‘‘Trail,’’ which increased yearly in importance until the railroads took the place of the ‘‘ prairie schooner.” In 1820 Mexico became independent, and New Mexico began to be governed by political chiefs instead of Spanish ‘‘ Gobernadores.”

By a change in the constitution in 1835, governors were appointed instead of elected, and Albino Perez was sent from Mexico as the new ruler. This excited much discontent, which was increased by the enactment of a new tax law two years later. About August 1, 1837, a revolutionary movement commenced in the north of the Territory among both Mexicans and Pueblos, hav- ing for its centre the town of Caftada or Santa Cruz. Governor Perez marched to meet the insurgents, but was deserted by nearly all his troops and compelled to fly, and was soon after overtaken and killed near Agua Fria. A number of other prominent officials were also killed ; and on August 10 Jose Gonzalez, a Taos Indian, was installed as governor in the palace. General Manuel Armijo, who had held high positions before, raised troops at Albuquerque to suppress. the revolt, and finally defeated the rebels at Cafiada. The Mexican Government confirmed his acts and appointed him governor, which office he held with some intermissions until the coming of an American army in 1846 under General Kearney, who marched from the

Missouri and took possession of the Territory without bloodshed,—General Armijo retiring southwards. A pro- visional government was established by the Americans, and Charles Bent, an old resident, appointed governor, but he was killed in a revolt in January 1847. The treaty of Guadalupe Hidalgo made New Mexico a part of the United States, and by an Act of Congress of September 9, 1850, it was organized asa Territory with a regular government. Early in 1862 a Confederate army from Texas invaded the country and occupied Santa Fé, March 10; they were defeated, however, at Glorieta on March 28, and evacuated the capital April 8. The people of the Territory were commendably loyal, and supplied 6000 men to the Union army.

The first rail was laid in New Mexico, November 30, 1878, by the Atchison, Topeka, and Santa Fé Railroad, which reached Las Vegas July 1, 1879, Santa Fé February 9, 1880, and connected with the Southern Pacific at Deming March 18, 1881. This, and the con- struction of the Denver and Rio Grande and the Atlantic and Pacific Railroads, have given a great impetus to the Territory. (L. B. P.)

NEW MILLIS, a township of Derbyshire, is situated at the confluence of the rivers Goyt and Kinder, on the borders of Cheshire, 8 miles south-east of Stockport and 7 south-west of Glossop. Its ancient name was Bowden Middle Cale, and formerly it included seven hamlets, but about a century ago three of these were detached, and it now includes only those of Beard, Ollersett, Thornsett, and Whittle. The name New Mills was given to it from a corn-mill erected on the Kinder in the hamlet of Ollersett, and is now specially applied to the group of factories which have grown up round it. Formerly paper and cloth were the staple industries of the district, but now the inhabitants of the various hamlets are occupied chiefly in iron and brass foundries, cotton-mills, and print-works. A public hall was erected in 1871, to which a lofty tower was added in 1875. There are almshouses and other charities. The population of the urban sanitary district (5200 acres) in 1881 was 6552.

NEW ORKNEY. See New Sours Suernanp.

NEW ORLEANS, a city of the United States, situated on the left bank of the Mississippi, 107 miles from its mouth, in that portion of the State of

Louisiana which constitutes the river’s larger delta. This peculiar region 1s an irregular expanse of densely-wooded swamps, wide prairies, and sea-marshes, interlaced by innumerable lakes, streams, and bays, formed by the periodic overflows of the river upon the alluvium of its own deposit, and by remnants of the sea which this natural process of land-making has not yet conquered. It embraces the whole coast of Louisiana on its southern border, and, narrowing rapidly northward, presents a total area of some 20,000 square miles of land and water. Through this region the Mississippi, as in its southward course it reaches the 30th parallel of latitude, turns and runs tortuously eastward a few miles south of and parallel with a chain of these delta lakes—Lake Pontchartrain being the chief—which marks the course of the same river in prehistoric, but not

geologically remote, ages. At the 90th degree of longitude it bends abruptly southward, then as suddenly eastward again, then northward and again eastward, thus portioning off on the low, concave land, which is always highest at the river’s margin, a shallow basin rudely square in shape and not unlike the palm of one’s hand. This deep three- sided bend, some 9 miles in total length, is the harbour of New Orleans, and on the low tract walled in by the dyke or levée that lines its bank, and by a similar defence where Lake Pontchartrain, some 4 to 6 miles to the north- ward, shuts in the fourth side, lies New Orleans, the principal seaport of the Mississippi valley, and a city of 216,000 inhabitants.

The river at this point varies from 1500 to 3000 feet in width, and its broad channel often stretches almost from shore to shore, with a depth varying frequently at short intervals from 60 to more than 200 feet. Around the margins of this fine harbour a line of steamers and ship- ping extends for 7 r= = : —J miles on either shore, FY z= > moored, in the busy [x7 season, from two to five abreast, to the outer end of short, broad, unsheltered wooden wharves that rest on piles driven firmly intothe tenaci- ous clay of the river’s | bed. The speed of }° the current reaches, in times of high water, a rate of 5 milesanhour. Along the immediate front of the city’s principal commercial quarter, this current, losing some of its force by change of direction, deposits its alluvium in such quantities as to produce a constant

encroachment of the shore upon the harbour. At its widest this new land, or batture, with wharves, streets, and warehouses following eagerly after it, has advanced nearly 1500 feet beyond the water-line of a century and a half ago.

New Orleans is emphatically a commercial city. It was its commercial value as the southern gateway of the immense valley behind it, and as the key to the free navigation of that vast natural system of waterways of which the Mississippi is the great main artery that, upon the achievement of American national autonomy, gave a small, poor, and remote Franco-Spanish-American port its political importance, and in 1803 led to its purchase by the United States, and the purchase with it of the entire province of Louisiana, of which it was the capital in embryo; and it is almost solely as the dispenser of the products of this greatest agricultural valley in the world that New Orleans has grown from the wild and indolent little frontier town of 10,000 inhabitants it then was to the dimensions of a great city. Along its winding har- bour front one sees, in the season that follows the harvests of the south and west, the energies and activities of an exporting movement not excelled in volume or value on the American continent save by New York. The levée, the wharves, and the contiguous streets teem with strenuous life, and aré gorged with the raw staples of the countries far and near that lie about the Mississippi and its greater and lesser tributaries,—sugar, molasses, rice, tobacco, Indian corn, pork, staves, whisky, wheat, oats, flour in immense quantities, and, over and above all else, nearly one-fourth of the world's entire supply of cotton. All other movement is subsidiary or insignificant: the import trade is small ;

Environs of New Orleans.

NEW ORLEANS

manufactures are inconsiderable; mining interests are almost unknown. There are no fisheries, no naval construc- tion, no large transit of immigrants, no notable Govern- ment establishments except a branch mint and the custom- house. There are no great educational and scientific institutions or important conservatories of art—only the promising germs of such ; no famous galleries or museums ; no noted monuments; in short, well-nigh none of that multiplicity of pursuits and opportunities that retains

and multiplies rapidly a city's wealth, and makes the inspiring tumult of metropolitan life. On any hand it requires but a, step or two aside from the current of commercial move- ment to carry one into the bowery repose of a huge suburb rather than of a city, or, if of a' city, a city of villas and cottages, of umbrageous gardens, intersected by 470 miles of unpaved streets shaded by forest trees, haunted by song birds, fragrant with a wealth of flowers that never fails a day in the year, and abundant, in season, with fruit—the fig, the plum, the pomegranate, the orange. No other |

large city in America is so laid open to the sunshine and the air. Neither St Louis, nor Chicago, nor Philadelphia, nor New York covers so large a site as New Orleans, whose inhabitants, considerably under a quarter of a million in number, have spread out their town over an area of 155 square miles.?

New Orleans is exceptionally interesting among cities of the United States for the picturesqueness of its older sections, and the language, tastes, and customs of a large portion of its people. Its history is comparatively short ; but it is as sombre and unique as the dark, wet cypress forest draped in long, pendent Spanish moss that once occupied its site, and which still encireles its low horizon. It was founded in 1718 by Jean Baptiste Lemoyne de Bienville, a French Canadian, governor of the French colony which nineteen years earlier had been planted by his brother D'Iberville on the neighbouring shores of the Gulf, along the eastern margin of the Bay of Biloxi. A few years after its founding, and while it was still but little more than a squalid village of deported galley-slaves, trappers, and gold hunters, it was made the capital of that vast Louisiana which loosely comprised the whole Mississippi valley to Canada on the north and without boundary on the west, under the

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Plan of New Orleans.

commercial domain and monopoly of John Law's scheme, so famed in history under the merited nickname of the Mississippi Bubble. The names remaining in vogue in that part of the city still distin- guished as the ''vieux carré," or 'old French quarter," continue to preserve an interesting record of these humble beginnings. The memory of French Bourbon dominion is retained in the titles, and in the foreign aspect as well, of Toulouse, and Orleans, and Du Maine, and Conti, and Bourbon, and Dauphiné, and Chartres Streets ; while even more distinctly the Bourbon of Spain has superimposed his impress on frequent stuccoed wall and iron lattice, huge locks and hinges, arches and gratings, balconies, jalousies, corrugated roofs of tiles, dim corridors, cool pavements, and inner courts brightened with parterres, urns, and basins, statues half hid in roses and vines, and sound of trickling water. There are streets named from his governors, too:—Unzaga, Galvez, Miro, Salcedo, Casa Calvo, Carondelet, and the Baron Carondclet's Baronne. The moated and palisaded boundaries constructed in wild and unsafe days are indicated by the wide, tree-planted, and grassy avenues named respectively from the Canal, the Rampart, and the Esplanade that lay along their course; and the old parade ground in the midst of the carly town's river front, now laid off in flower-beds, white- shelled walks, and shaven shrubbery, and known as Jackson Square, still retains, with that official title, its older name of the

Place d'Armes. In this quaint, sunny, and dusty old garden, surrounded by an unconscious picturesqueness of architecture not seen elsewhere in

America save in one or two remote nooks, by the old cabildo and calaboza, the court-house (once the presbytery of Capuchin friars), the cathedral of St Louis, and the long row of red shops shaded by broad verandas in the streets of St Peter and St Ann,—in this square is commemorated nearly every event in the colonial history of Louisiana. Here in early days were landed those cargoes of French girls supplied each with a chest of clothing by the king, and proudly famed long afterward by their numerous and prosperous descendants as the ‘‘ filles ala cassette ”— the girls with trunks. Here from 1729 to 1739 rallied these motley gatherings of men—white, red, and black—in the buckskin and feathers of the wilderness, the gay colours, gold braid, and ruffles of royal uniforms, and the black nakedness of slavery, that with varying success made ten years’ war against Natchez, Yazoo, Choctaw, and Chickasaw savages. Here in 1765 the people welcomed with tears and open arms their exiled brethren from far

1 This has not been entirely within the boundaries already described. A modern part of the city, of some extent, lies on the right bank of the harbour, opposite these older portions that occupy the river front where it turns from north to east,

Acadia, as thirty-six years before on the same spot they had received the women and children of Fort Rosalie (Natchez), recaptured from the hands of the savages who had massacred their husbands and fathers. Here in 1768, the town being then a place of about 3200 souls, the people within the walls and from the farms and plantations of the surrounding delta mustered under arms almost to a man, repudiated the cession of Louisiana to Spain, and compelled the holder of the Spanish king’s comuinission to leave their town and return to Havana. Here again, in the following year, Don Alexandro O’Reilly landed from a ficet of twenty-four vessels with 2600 Spanish troops and fifty pieces of artillery, and restored the Spanish power by mere terror of such an overwhelming force. Here stood under Spanish sentence and fell under a volley of Spanish musketry the leaders in this the first attempt made in America to overthrow by force of arms the dominion of a European sovereign. It was here, again, that in 1779 the brilliant young Spanish governor Galvez, laying before the people the proposal to head

them in defence of their homes, and intending to lead them against the neighbouring British posts along the shores of the Mississippi and the Gulf of Mexico east of it, was answered by their acclamations, and was followed to repeated and uninterrupted victory. Here, when in 1788 and 1794 the heart of the frail wooden town was plucked out by fire, the houseless sufferers covered the rank sward with booths and tents until that Spanish-American architecture could rise out of the ashes whose brick and stucco and coloured limewashes, and flowery inner courts seen through eovered carriage-ways, and overhanging balconies, and confusion of heights and breadths and shapes, with here and there a palm tree lifting its stately top among them, heavy with yellow dates, still offer to the eye a moss-grown and crumbling picture whose variety and poetry tempts description to repeat itself.

On the 30th of November 1803, in the council hall of the old cabildo that still overlooks the square, the aged governor Salcedo handed the keys of the city back to the representatives of the French Government, the marquis of Casa Calvo declared the people of Louisiana absolved from their allegiance to the Spanish king, and on the flagstaff in the open plaza the yellow flag of Spain came down and the tricolor of France arose in its place. And here, at length, only twenty days afterward, with similar ceremonies, the keys of the city passed from the hands of the French colonial prefect to those of the commissioners for the United States, and through their tears the creoles saw the ensign of the French republic sink and the American flag unfurl over what is to-day, as it was then, the least American of all the cities within the bounds of the American States. A bronze equestrian statue of Andrew Jackson stands in the middle of the ground on the spot where, in January 1815, when he had driven back to its ships from the plains just below the city the bleeding remnant of a formidable British invasion, he passed, amid all the evidences of joy that a delivered city could display— cheers and salvos and rolling drums, arms and banners and maidens' garlands—uuder an arch of triumph and into the cathedral, and so onward in later years to the highest seat in the nation.

At the time (1803) when New Orleans with its 10,000 inhabi- tants, mostly French creoles and their slaves, passed into the political bond of the United States, the prospect of its future com- mercial greatness was not only

appreciated but was exaggerated even by the most sagacious minds; for they regarded it in the light of its remarkable geographical position, and of thosc stirrings of revolution which were beginning to promise the birth of other republics round about the broad circuit of the Mexican Gulf, with maritime powers and commercial energies that must give the position of New Orleans an inestimable value. But, as the future gradually unfolded, on the one hand the provinces that did throw off the Spanish yoke failed persistently to establish internal peace and stability or obtain the confidence of the commercial world, and on the other hand the invention of railway transit revolutionized commeree itself and turned its courses across the natural highways and barriers of the continent; and when, moreover, the pestilenee of yellow fever, the plague of the Gulf, made New Orleans one of its most famous ambuscades, and the provincialism and lethargy of an isolated and indolent civilization allowed this last unfortu- nate condition to remain uncorrected, the limitations to the city's commereial grandeur were distinctly drawn around it, and a port that had promised to become one of the greatest in the world became, even while it was expanding to mctropolitan dimensions, a monument of golden possibilitics dwarfed by unforeseen and over- powering disadvantages.

New Orleans held its highest place on the comparative scale of cities in the United States when, by the census of 1840, only New York, Philadelphia, and Baltimore were greater in population. In the decade that followed, these cities left it far behind and others overtook it and passed it by. In the second decade after the Junction of the great west and the Atlantie seaboard by canals and railways many other conditions came in to the great disadvantage of New Orleans. The development of the carrying trade on the lakes of the far north, the adoption by the world's maritime trade of ships and stcamers drawing too much water to pass the bars at

the mouth of the Mississippi, and in the city the riot made by death, whieh in three years (1853-55) from a population diminished by flight to barely 145,000 carricd off over 35,000 persons, —these things and others combined to impede the town's progress at a period when the growth of

American cities was a marvel of the times, and to reduce her comparative importance in population, wealth, enlightenment, and architectural dignity.

However, turning from these comparisons and contrasting the city only with itself, we see the trading post described by the priest-chronicler Charlevoix in 1721 as a place of a hundred wretched hovels in a malarious wet thicket of willows and dwarf palmettos, infested by serpents and alligators, changed in 1860 to a metropolis whose exports, imports, and domestic receipts aggre- gated $324,000,000. In that year the election of a president from the Republican party was made the occasion of acts that led to war between the Northern and Southern States of the Union. The commerce of New Orleans experienced an early paralysis: the port was soon blockaded by the United States navy; the city fell into the hands of the Federal forces; and its aggrandizement suffered a recoil from which it has taken nearly a quarter of a century to recover. Only in the present year (1883) will its total commerce again distinctly reach the magnitude it enjoyed in 1860. Its wealth in 1882 was $112,000,000. In the present year it is closely csti- mated that 2,000,000 bales of cotton will be received across its levee for shipment to the world's markets. It appears highly prob- able that those drawbacks which have been enumerated have at length expended their power, and that New Orleans now looks out upon a future of more genuine promise than ever before. A system of jetties at the mouth of the Mississippi, built by the distinguished engineer Eads in 1879, has opened the city's deep and spacious harbour to the largest ocean craft. Lines of stcamers to the great ports of Kurope are replacing with their great carrying capacity the light tonnage of other days. An active sanitary system, which grows every year better, gives reasonable promise of immunity from the deadly epidemics of former years; street paving has recom- mienced; the inadequate and superficial drainage is being improved, under the direction of a sanitary association auxiliary to the board of health, a diligent house-to-house inspection is being performed, and the open gutters that are in all the streets are daily flushed during the warm months with water thrown into them by powerful pumps at the river front. The annual mortality-rate of the three years 1879 to 1881 averaged 26°52 per 1000. The old spirit of depend- enee upon natural advantages which once deluded the people of the city is yielding to a more energetic acceptance of the principles of modern commerce, and railway conncxions, near and remote, are increasing year by

year. The immense increase of population and products in that wide south-west that stretches out beyond to the Mexican border offers new accessions of commercial tribute. Mexico holds out fair assurance of a new era of political order and material development ; and within the city's immediate bounds both the convictions of her citizens and the movement of capital are recognizing theoretically and practically the necessity and advan- tage of manufactures. About ten million dollars are at present invested in this direction, and the aggregate is steadily growing.

Within the last two years (1882-83) a new impulse towards arehi- tectural improvement has shown itself, and several edifices of com- paratively imposing character have been erected. Chief among them is the new Cotton Exchange. The small public squares here and there in the city have been laid out in lawns and adorned with fountains ; but, as long as the great body of the people is not sub- jected to the discomforts of pent-up living, the larger reservations of ground intended for public parks are likely to remain as they are, unimproved. Suburban pleasure resorts are few, the principal being two waterside gardens of moderate pretension on the neigh- bouring margin of Lake Ponchartrain.

The creoles of New Orleans and the surrounding delta are a hand- some, graceful, intelligent race, of a decidedly Gallic type, though softened in features, speech, and carriage, and somewhat relaxed in physical and mental energies by the enervating influences that blow from the West Indies and the Spanish Main. Their better class does not offer to the eye that unpleasing evidence of gross admixture of race which distinguishes those Latin-American communities around the borders of the adjacent seas; and the name they have borrowed from those regions does not necessarily imply, any more than it excludes, a departure from a pure double line of Latin descent. They are brave, proud, courteous, slow to offend, quick to resent, gay, fond of pomp, and display an ardent relish for pagcantries of such childish sort as offers a strong hint of their Spanish-American relationship. They are very musical, yet not, as a class, highly trained in music, have some love of the fine arts, but are little acquainted with or interested in its modern devclopments, and are comparatively upproductive of art work. The famous carnival dis- plays of New Orleans are participated in largely by the '"Americain," 7.e., the Anglo-American ; but they mark

one of the victories of Spanish-American over North-American tastes, and probably owe mainly to the ‘‘ Americain” their pretentious dignity and to the creole their more legitimate harlequin frivolity. Out of the simple

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idea of masked revelry in the open streets, as borrowed from the great Italian cities, the American bent for organization appcars to have developed, by a natural growth, the costly fashion of gor- geous torcli-lighted processions of elaborately equipped masques in tableaux drawn on immense cars by teains of eaparisoned mules, and combining to illustrate in a symmetrical whole some theme chosen from the great faiths or literatures of history. This carnival has grown to last two or threc days, during which time its extrava- gances quite engross public attention with an elaborate mock- restoration of the gaudiest Oriental and feudal European life and times; the daily press shows long lists of names of citizens knighted or invested with imaginary dukedoms (at a fixed price); and many thousands of visitors from all parts of America come, or tarry, yearly to see these laborious pomps.

The first settlers of New Orleans were such men as colonies in America were generally made of when planted by royal com- nercial enterprise, and such wives as could be gathered hap-hazard from the ranks of Indian allies, African slave cargoes, and the inmates of French houses of correction. As time passed, gentler and often better blood was infused by the advent of the filles 4 la cassette, by victims of lettres-de-cachet, by the cadets of noble families, holding land grants or military commissions, by Spanish officials glad to strengthen their influence in the colony through matrimonial alliances, and by royalists fleeing the terrors of the French Revolution. The creole civilization that grew from these sources acquired two of its strongest characteristics from the facts, first that it developed under the evil reigns of French and Spanish Bourbons, and second that it was founded on the system of African slavery. The influences of the elimate and landscape were sucli as to emphasize rather than counteract the effects of these conditions; and, when in the year 1809 Napoleon’s wars caused an exodus of West Indian creoles into New Orleans that immediately doubled the town’s population, the place naturally and easily became the one stronghold of

Latin-American ideas in the United States, a harbour of contrabandists, Guadeloupian pirates, and Spanish-American revolutionists and filibusters. Under the glacier-like pressure of Anglo-American immigration, capital, enterprise, and education, this creole civilization has slowly and with stubborn reluctance yielded ground, and is at length fairly beginning to amalgamate with the better social system of the American nation. And yet the creole has stamped his initials upon well-nigh every aspect in the life of the city that has broadened out so widely on every side of his antique town. Some effect, of course, is attributable to those natural surroundings that have so qualified the creole's own Gallic energies. Between the two influences the whiole life of the place shows an apathy of desire, a langour of performance, and an intolerance of all sorts of rigour, that makes it unlike those sister cities from which it is separated both by the eutire breadth and by the peculiar sentiment of that great belt of States which still dis-tinguishes itself, more proudly than profitably, as the South.

Churches, both Catholic and Protestant, are very numerous in New Orleans, though not generally fine or imposing. St Patrick's, however, has a majestic tower; the First Presbyterian cliurch, in Lafayette Square, is a tasteful Gothic structure; and the cathedral of St Louis, the church of the Immaculate Conception, in Baronne Street, and some others have handsome intcriors. The number of private charitable institutions is also large, and their management excellent. Those under municipal control are not nearly so good, but are improving. The system of public education is a large aud excellent one deserving much praise. It embraces the youth both of the white and of the black and mulatto populations, is carried up through a full high-school grade, and is steadily improving. The police force is small, ill-paid, and ineffieicnt, and the whole police system dilapidated and bad.

The coloured population, notwithstanding the presence among it of that noted free quadroon class which has enjoyed a ccrtain legal freedom for many generations, has not greatly improved since the date of emancipation. A conventional system of caste cuts them off from the stimulating hope of attaining social rank, and confines them closely to servile employments. The probability seems to be that their decided elevation must wait upon their acquisition of material wealth, an achievement which the con- ditions mentioned and some inherent deficiencies of the race tend to make

extremcly difficult. Besides the large Anglo-American and creole populations, there are in New Orleans weighty fractions of Irish and Germans and an appreciable number of Italians, Sicilians, and Spaniards. The Babel of tongues in the ‘‘ French Market” immediately below Jackson Square and at the ‘‘ Picayune Tier” Just adjacent is famed as far as the city of which it is a feature. Another noted feature of New Orleans is its cemeteries. Owing to the undrained condition of the subsoil, burials are made entircly above ground, in tombs of stuccoed brick and of granite and marble. Some of these are very elegant and costly, and many of the burial-grounds, with their long alleys of these tombs of diverse designs deeply shaded by avenues of cedars and the Afagnolia grandiflora, possess a severe but emphatic beauty.

The climate is not marked by extremes of heat or cold. The

wide reaches of water and wet lands that lie about the city on every side temper all airs, and the thermometer rarely passes above 95° or below 27°F. The consequent humidity of the atmosphere, however, gives the climate an enervating quality and an apparent warmth and cold beyond the actual temperature. It is rarely invigorat- ing, and during the long summer between June and October is distinctly though not severely debilitating ; but in the absence of epidemic yellow fever, whose visitations are becoming more and more infrequent, there is no ‘‘sickly season”; and those who visit the city between the months of November and June, the term in which the eommercial movement is at its height, may enjoy from its beginning to its end the delights and beauties of a redundant spring time, and find easy entrance into the social gaieties of a high-spirited pleasure-loving people. (G. W. C.) NEW PLYMOUTH, a seaport on the west coast of the North Island of New Zealand, is situated about 20 miles to the north-eastward of Cape Egmont, in 39° 4’ S. lat. and 174° 5’‘E. long. It is the capital of the provincial dis- trict of Taranaki. The position of the town is picturesque, sloping to the ocean in front, and with a background of forest surmounted by the snow-clad cone of Mount Egmont (8000 feet). The settlement was founded in 1841 by the Plymouth Company under the auspices of the New Zealand Company, and chiefly consisted of emigrants from Devon- shire

and Cornwall. The railway to Wellington is rapidly approaching completion. The town has a hospital, several places of worship, and manufactories for coach-building and painting, for furniture, for rope and twine, for tan- ning, and for making brick, tile, and pottery. On the beach at New Plymouth there are extensive deposits of ironsand. New Plymouth returns one member to the house of repre- sentatives, and is a borough with an elective mayor and municipal council. The population in 1883 was about 4000. NEWPORT, a municipal and parliamentary borough of Hampshire, and the county town of the Isle of Wight, is situated near the centre of the island, at the head of the navigation of the Medina river, about 7 miles from the sea at Cowes. Three separate railway lines connect it with Cowes, Ryde, and Ventnor. On account of its central position Newport has since the decay of the more ancient town of Carisbrooke absorbed the principal trade of the island. The church of St Thomas of Canterbury, rebuilt in 1854 in the Decorated style, contains many interesting old monuments; and one by Marochetti to the princess Elizabeth, daughter of Charles I., has been erected by Queen Victoria. Carisbrooke castle is about a mile from the town, and Parkhurst barracks are in the immediate neighbourhood. The guildhall, erected in 1816 from the designs of Nash, includes the town-hall in the upper story with the market-place below. The grammar school (the scene of the negotiations between Charles I. and the Parliament) was founded in 1612, and there is a blue-coat school for girls founded in 1761. A consider- able trade is carried on in timber, malt, wheat, and flour; and Newport is the commercial centre whence the smaller towns of the island are supplied. The boundary of the borough of Newport was defined and extended by the Newport Borough Act, 1876. The population of the municipal borough (area 501 acres) in 1881 was 9357, and of the parliamentary borough (area 410 acres) 9144.

When the lordship of the Isle of Wight passed from the lords of Carisbrooke to Edward I., Newport began to supersede Carisbrooke as the chief town of the island. Camden speaks of it as the principal seaport of the island, ‘‘in times past Medena and Novus Burgus de Meden,” that is, the new borough of Medina. In the 23d of Edward I. it sent two members to parliament, but not again till the 27th of Elizabeth, from which time it enjoyed the privilege without interruption until 1867, when the number of members was reduced to one. The borough was incorporated by James I.

NEWPORT, a seaport, market-town, and municipal and parliamentary borough of Monmouthshire, is situated on the right bank of the Usk, about 4 miles from its confluence with the Bristol Channel, and 12 miles north-east from Cardiff. On the east, north, and west it is finely sheltered

by a line of lofty hills, and the neighbouring scenery is picturesque; but the town is chiefly composed of a mean class of houses, although there are many good villas in the suburbs. The old parish church of St Woollos is one of » the most curious churches in England. Originally it con- sisted only of the present nave,—a fine specimen of grand though perfectly unadorned Romanesque architecture ; but a massive square tower (of the time of Henry III.) and a chancel were subsequently added; a large western lady-chapel is interposed between the nave and the tower. The old castle, built about 1130 by Robert earl of Glou- cester, was a very extensive structure in the Late Perpen- dicular. The two towers and the main central mass still remain; a portion has been converted into a brewery. The old monastery of Friars Preachers (Dominicans or Black Friars) has been entirely rebuilt, and is occupied as a private residence. The other principal public buildings are the spacious Victoria Hall, the Albert Hall, the new town-hall, the market-house, the custom-house, the union workhouse, the infirmary, and the free library and school of art. Newport owes its rapid increase to its situation on a deep and spacious tidal river, which renders it a con- venient outlet for the trade of a very rich mineral district. It is now supplied with very extensive docks and wharves, to which steamers of the largest size can have access at all tides. The old dock of 44 acres, opened in 1842, received in 1858 an addition of 7? acres; and in 1875 the new Alexandra dock of 25 acres was opened, land being re- tained surrounding it to the extent of 400 acres, available for the construction of wharves and warehouses, and for extension of the dock area. There is regular steam com- munication with Bristol, Liverpool, and Ireland. In 1882 the number of vessels in the foreign and colonial trade that entered the port was 1656 of 734,264 tons, the number that cleared 2143 of 1,078,245 tons. In the same year there entered in the coasting trade 8020 vessels of 1,048,626 tons, and cleared 7667 vessels of 700,500 tons. The town possesses large iron foundries and engineering works, and among the other industries the principal are the manufac- ture of

waggons and wheels, patent nails, bolts, and wire. The manufacture of steel in the district is rapidly increasing. Shipbuilding was formerly carried on to a large extent. The building of iron ships has recently been commenced by several firms. The population of the municipal borough, which in 1801 was only 1135, had increased in 1831 to 7062, in 1851 to 20,279, in 1871 to 27,069, and in 1881 to 35,313. The population of the parliamentary borough (area 1690 acres) in 1881 was 38,427. Newport is called Novus Burgus by Giraldus Cambrensis to dis- tinguish it from the old Roman city of Caerleon about 3 miles distant. The town is nowhere mentioned in history before the beginning of the 10th century. Tradition states that Ethelfleda was killed at a great battle at Castell Newydd (Newport), but according to another account the Saxon sovercign slain was Ethelfred. The town received its first charter from Edward IT. It is included in the Monmouth parliamentary district of boroughs.

NEWPORT, a city of the United States, capital of Campbell county, Kentucky, lies on the south bank of the Ohio river, opposite Cincinnati, and separated from Covington by the Licking river. With the larger city it is connected by a road-and-railway pier bridge, and with the lesser by a suspension bridge partly used by a street railway. Practically both Newport and Covington are residental suburbs of Cincinnati, but in the matter of population (20,433 in 1880) Newport ranks third among the cities in the State. The local manufactories comprise rolling-mills, steel-works, iron foundries, watch-case fac- tories, and stove factories. For many years a small garrison of United States soldiers has been stationed here. The first settlement dates from 1791.

NEWPORT a city of the United States, one of the

NEWPORT

capitals of the State of Rhode Island, and among the most fashionable of American watering-places, is situated on the west coast of the island from which the State derives its name, on the isthmus of the southern peninsula. By rail itis 19 miles south-south-west of Fall River, and by steamer 162 miles from New York. In front lies an excellent harbour opening into Narragansett Bay, with a fine anchorage in 30 feet of water between Fort Adams (a nulitary post of great importance) and Goat Island (head- quarters

of the torpedo division of the United States navy), and allowing vessels of 18 feet draught to reach the piers at low water. But it is rather the attractions of the east and south coast that have made the fortunes of the modern city : —First or Easton's Beach, one of the safest for surf- bathing ; Second or Sachuest Beach, exposed to heavier

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Plan of Newport, Rhode Island. 1. Redwood Library, | 3, Trinity Church. 2, Touro Park. 4. State-House,

points of interest are connected with the city by avenues and drives, many of which are lined in whole or in part with villas and cottages; and in fact Newport as a watering-place may be said to comprise the whole of the southern peninsula. In its narrower limits as a city it is a place of no small interest. In Washington Square, the central point of the old town, stand the State-house (dating from 1742), the city-hall (1763), and the opera-house (1867). Trinity Church has an organ presented by Bishop (then Dean) Berkeley, and the first Baptist church dates from 1638. The synagogue, founded in 1762, is the oldest in the United States; it is still used, though there are few Jews in Newport, endowments for keeping it in repair and maintaining services having been left by the brothers Abraham and Judah Touro, the latter of

'whom also gave the city $10,000 towards the purchase of

Touro Park. The Jewish cemetery is the subject of one of Longfellow's best pieces. Redwood Library, established in 1747, has 27,000 volumes; and there is a free people's library with 15,000. Besides the bronze statue of Com- modore M. C. Perry, of Japanese fame, Touro Park con-

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tains an old tower, supported on round arches, which has been one of the greatest antiquarian puzzles in the United States—some considering it a monument of the Norsemen who visited America before Columbus, and others maintaining that it is only an old windmill dating At one time,

previous to the War of Independence, Newport was the seat of great commercial activity, but it now holds a very secondary posi-

from the 17th century.

tion both in trade and manufacturing industry. Its ex- ports and imports in 1882 made a total of only $17,513; and one or two cotton-mills and a brass foundry are almost its only public works. The population of the city was 12,521 in 1870, and 15,693 in 1880.

The harbour of Newport was visited by Verezzani in 1524, and

the first settlement was made in 1639 by a party under the lead of

William Coddington. Rapidly increasing from 4640 inhabitants in 1730 to 12,000 in 1774, the town soon took rank immediately after Boston in the matter of trade. But it suffered severely during the Revolution, being occupied by the British forces from 1776 to 1779, and on their evacuation having its wharves and fortifications destroyed and its library and records carried off. In 1788 Brissot de Warville found houses falling to ruin and grass growing in the public square, and its inhabitants were at that time less than 6000. During the first half of this century the recovery of the city was comparatively slow.

NEW PROVIDENCE. See Banaaras.

NEW ROSS, a market-town and parliamentary borough of Leinster, Ireland, partly in Wexford and partly in Kilkenny, is situated on the acclivity of a hill on the east bank of the Barrow, 2 miles below its junction with the Nore, 85 miles south-south-west of Dublin and 24 west- north-west of Wexford. The Barrow is crossed by an iron bridge, erected at a cost of £50,000, with a swivel pillar in the centre on which a portion of the bridge is turned to admit the passage of vessels. The principal buildings are the tholsel surmounted by turret with clock, the court- house, the fever hospital, Trinity hospital, and the poor- house. There is a brisk trade by means of the Barrow, the principal exports being grain, flour, butter, bacon, and wool. In 1882 the number of vessels that entered the port was 1670 of 260,578 tons, the number that cleared 1635 of 281,101 tons. There is inland

communication for ships by the Nore to Inistiogue, and by the Barrow to St Mullins, while barges can proceed as far as Athy, where the Barrow joins the Grand Canal. New Ross possesses breweries and tanyards. There is a salmon fishery above and below the town. The population of New Ross in 1871 was 6772, and in 1881 it was 6626.

It is stated that St Abban built the abbcy of Rossmactreoin, which gave rise to an ancient city formerly called Rossglas. Aceording to Camden, New Ross was founded by Isabella, daughter of Strongbow and consort of William le Mareschal, afterwards Earl Pembroke. A charter was granted to it by Roger Bigod in the reign of Edward I., which was cxtended by James I. and James II. From 1374 it enjoyed the privilege of returning two members to parliament, but at the Union the number was reduced to one. In 1269 the town was surrounded by walls. The fortresscs were dis- mantled by Cromwell, but some of thcir remains are stil] extant.

NEWRY, a seaport, market-town, and parliamentary borough, partly in Armagh but chiefly in Down, province of Ulster, Ireland, is situated on the Newry navigation at the head of Carlingford Lough, and on two railway lines, 18 miles south-east of Armagh and 63 north of Dublin. The western part, called Ballybot, is connected with the eastern part or old town in Down, situated on the acclivity of a hill, by four stone bridges and a swivel bridge. The more modern streets are wide and well-paved, and there are many handsome houses and shops. The principal build- ings are the infantry barracks, the town-hall, the market- house, the court-house, and the assembly rooms. Newry is one of the most important ports of Ulster, and in con- nexion with several sub-ports farther down the river is the outlet for the trade of a very extensive district. In 1882

the number of vessels that entered the port was 676 of 80,586 tons burden, the number that cleared 654 of 65,262 tons. The principal exports are grain, provisions, eggs, cattle, linen cloth, and flax, and the imports include timber, manufactures, groceries, and provisions. In the neigh- bourhood granite of a fine quality is quarried, and the town possesses rope and sail works, breweries, distilleries, flour- mills, and tanneries. The population of Newry in 1861 was 13,108, which had increased in 1871 to 14,158, and in 1881 to 15,085.

Newry is very ancient. In 1175 an abbey was founded there by Maurice M'Loughlin, king of Ireland, which possessed extensive endowments and privileges. The abbey was converted in 1543 into a collegiate church for secular priests, and was dissolved by Edward VI., who granted it to Sir Nicholas Bagnal, marshal of Ireland. He made it his private residence, and by his enterprise and cnergy laid the foundations of the prosperity of the town. In 1689 Newry was set on fire by the duke of Berwick when in retreat before Schomberg. Charters were granted to the town by James I. and James II. By the charter of James I. it received the privilege of sending two members to parliament, but at the Union it was restricted to one member.

NEW SHOREHAM. See SHOREHAM.

NEW SOUTH SHETLAND, or simply SourH SuHer- LAND, a group of islands on the borders of the Antarctic polar regions, lying about 600 miles south-south-east of Cape Horn, between 61° and 63° 10'S. lat. and between 53° and 63° W. long,, and separated by Bransfield Strait from the region composed of Palmer Land, Trinity Land, Louis Philippe Land, &. The more considerable islands are those of Smith (or James), Jameson (or Low), Snow, Livingston, Deception, Greenwich, Nelson, King George, Elephant, and Clarence. Deception Island is particularly remarkable as of purely volcanic origin. On the south-east side an opening 600 feet wide gives entrance to an internal crater-lake (Port Forster) nearly circular, with a diameter of about five miles and a depth of 97 fathoms. Steam still issues from numerous vents, and hot springs bubble up from beneath the snow-clad surface (HE. N. Kendall in Jour. Roy. Geog. Soc., 1831). Most of the islands are rocky and mountainous, and some of their peaks are between 6000 and 7000 feet in height. Covered with snow for the greater part of the

year, and growing nothing but lichens, mosses, and some scanty grass, the South Shetlands are of interest almost solely as a great haunt of seals, which share possession with albatrosses, penguins, and other sea fowl. The capture of the seals, which began shortly after the islands were rediscovered by Captain William Smith of the brig ‘‘ Wiliam” in 1819, has been carried on to the present time. Dirck Gheritz was prob- ably the first discoverer, in 1598. Edward Bransfield, of the frigate “Andromache,” ascertained the extent of the group in 1820; and Captain Weddell (1820-21), D’Urville (1838), and Wilkes (1839) explored the islands in detail. A smaller group of islands—Coronation Island, Laurie Island, &c.—lying 200 miles east of the South Shetlands, bears the name of New or South Orkney.

NEW SOUTH WALES. This was the name given by Plate X. Captain Cook, in his exploratory voyage in 1770, to the southern portion of the eastern coast of Australia, from some imagined resemblance of its coast-line to that of South Wales. The name was afterwards extended to the eastern half of Australia, but by subsequent subtractions has gradually received a more limited meaning. It is still, however, three times the size of Great Britain and Ireland, and larger than any state in Europe except Russia. The present British colony of New South Wales is bounded by the Pacific Ocean on the E., by Queensland on the N., by South Australia on the W., and by Victoria on the 8. It lies between 28° and 38° S. lat., and 141° and 154° E. long,, extending over about nine degrees of latitude and about twelve and a half degrees of longitude. The coast-line,

which is about 700 miles in length, extends from Cape Howe (37° 30’) at the south-eastern corner of Australia to Point Danger in 28° 7’S. The colony is approximately rectangular in form, with an average depth from the coast of 650 miles and an average width from north to south of 500 miles. The superficial area is estimated at 310,000 square miles, or about one-tenth of the whole of Australia.

Along the seaboard are twenty-two well-defined head- lands or capes and about a score of bays or inlets, to mark which for navigators there are twenty-three lighthouses. There are four very fine natural harbours, viz., Jervis Bay, Port Jackson, Broken Bay, and Port Stephens, and several others

of minor importance. Of these, only Port Jackson, on which is situated the city of Sydney, has attained as yet to commercial importance. The port second in com- mercial importance is Newcastle, at the mouth of the Hunter river, which is the great coal-shipping port of the colony. Secondary harbours, available for coasting steamers, south of Sydney are to be found at Port Hacking, Wollongong, Kiama, Shoalhaven, Bateman's Bay, Ulladulla, Merimbula, and Twofold Bay. To the north of Sydney the secondary ports are at the mouths of the Hawkesbury, the Manning, the Hastings, the Macleay, the Nambucca, the Bellinger, the Clarence, the Richmond, and the Tweed rivers. These are mostly bar harbours, but the Clarence is a noble river, and when the entrance is im- proved will become a great port.

The characteristic natural feature of New South Wales is the great Cordillera range running north and south. The average elevation of this range is about 2500 feet. The highest point, Mount Kosciusko, reaches, however, a height of 7300 feet, about 700 feet below the theoretical line of perpetual snow, yet snow has never more than once wholly disappeared. None of the interior parts of the colony attain to a similar elevation. This range runs generally parallel to the coast, varying from 30 to 140 miles distant, being nearest at the south and receding the farthest at the sources of the Goulburn river, the main tributary of the Hunter. The crest of this range is in some places narrow ; in others it spreads out into a wide table-land. The eastern slopes are somewhat rugged and precipitous, the sandstone especially being deeply fissured by the watercourses; but along the greater part of the coast there is a belt of flat land generally of high fertility. At the outlet of many of the streams descending from the range are large lagoons, sometimes closed against the sea by sandbars, and at other times opened by the force of the outrushing waters. The principal of these are Lake Illawarra and Lake Macquarie, Tuggarah Lake, Lake Myall, Wallis Lake, Watson Taylor Lake, and Queen's Lake. Lake Macquarie, however, is rather a magnificent estuary than a lake, and if the bar at the entrance could be removed would become a commercial port, as the hills at the back are rich incoal. The inland lakes are few and unimportant. They are mostly shallow and occasionally dry. On the western side of the main range the general slope of the country is towards the west, the drainage being into the Murray, the Murrumbidgee, the Lachlan, and the Darling; but the drainage of all of

them unites in the Murray, at the town of Wentworth, near the south-western corner of the colony.

Climate.—The rainfall differs very much in different parts of the colony. It is heaviest on the eastern coast, where the easterly gales break against the main range. Here the average is 40 inches on the south to 65 inches on the north. Sydney, with forty-three years' observation, has a meanof 50 inches. In winter the temperature sometimes falls to the freezing point, and it rises in summer to' 85° or 90° on very hot days. The mean temperature of Sydney is 62°°5. On the table-lands the rainfall is from 20 to 35

inches. In winter the temperature in extreme cases falls 10° or 15° below the freezing point, and in the height of summer it rises to 100° or 105°. The mean temperature may be found from 50° to 60°. On the great western plains the rainfall is much less, falling rapidly as the high land is left to 18 inches, and in the far west to 8 inches. Here the temperature seldom falls more than 6° or 8° below freezing, but in summer it often rises to 110°, and in extreme cases to 120°; and the mean temperatures range from 60° on the south to 68° on the north. Along the coast-line the air is moistand soft; the temperature is mild, the thermometer ranging from 78° in January to 59° in July, and the mean for the year being about 624°. The prevailing wind in summer is from the north-east, though occasionally hot, dry winds come from the north-western interior, which are generally followed by a sudden and violent reaction from the south, known as 'southerly bursters." On such occasions the thermometer will some- times suddenly fall in a few hours 20 or 30 degrees. The violent rainstorms generally come from the east, shifting from north-east to south-east; but, as they are mostly accompanied with a high temperature, their origin is to be looked for towards the north. During the winter months the wind blows mostly from the west. It is a dry wind, and the weather is generally clear, bright, and invigorat- ing. On the table-land the air is much drier than on the coast, the winters are longer and colder, and the summer heat, except in the middle of hot days, much below the coast temperature; and this elevated region is much resorted to by the citizens of Sydney as a summer resort. As the country slopes down towards the west the dryness of the climate increases. Though the heat is sometimes

oppressive, the climate is not unhealthy ; while sheep and cattle are more free from disease here than in moister parts of the colony.

Geology.—The main mountain chain, running north and south, with the eastern portion of the continent generally, must have been submerged during the early Miocene period to the extent of about 4000 feet below its present level, leaving the highest portions of the range standing out as islands, which have probably never wholly been submerged since the commencement of the Mesozoic era, and to this is attributable the survival of the cycads, araucarias, and other ancient vegetable forms which now abound in Australia; the living Ceratodus forsteri of Queensland, and the Marsupialia, also point to the same conclusion. ‘To the westward it throws out many lateral spurs, diminishing gradually in elevation, and determining the basins of the tributaries of the rivers owing westward. The most important of these lateral ranges runs north- westward towards the Darling and beyond to the Barrier Ranges in the north-western part of the colony. The summit of this lateral range has been partly denuded, and it dips towards the plain of the Darling where that river cuts through it. This being the only water channel from all the north-western portion of the colony, all the tributaries of the Darling converge into this depression. This range divides the western portion of the colony into two main basins, the northern of which contains all the affluents of the Darling, and the southern is the Murrum- bidgee basin, with its affluents the Murray and the Lachlan. These basins consist of a large Cretaceous area, which extends away far beyond the western boundary of the colony. The basis of the mountain system of the colony is granite, and the oldest sedimentary deposit rest- ing on it is the Upper Silurian. In the neighbouring colony of Victoria, Lower Silurian fossils are found over a large area west of Melbourne, but in New South Wales nothing has been definitely determined older than the Upper Silurian. Granite has lifted the superincumbent

deposits, penetrated them, and metamorphosed them in various degrees up to a close resemblance to igneous rocks.

The great western plains of the interior are characterized

by isolated rocks, or short ranges, mostly granite, but occasionally trap, long sand ridges, and clay basins. The sand and clay both result from the disintegration of granite and trap, the sand ridges having been wind-blown, and the clay washed into the lower levels. into the yellow clay furnish an almost undrinkable brackish water, from the salts of soda and iron, and occasionally lime, potash, and magnesia, yielded by the felspars.

The Upper Silurian rocks occur frequently, but chiefly on the western watershed of the great dividing range. They consist of conglomerates, sandstones, slates, mud- stones, and limestones, and have a general meridional strike. Devonian rocks are displayed on the western flanks of the Blue Mountains. They include sandstones, con- glomerates, limestones, and shales, related by their fossils to the Silurian beds below and to the Carboniferous beds above. The Carboniferous series is very widely developed. The strata are probably not less than 10,000 feet thick, the lower beds containing both plants and marine fauna.

The Upper Carboniferous series includes the lower Coal-

measures of New South Wales. These are traceable along the coast from 314° to 354°S. The coal-seams are visible

above the sea-level from Coal Cliff, 20 miles south of

Sydney, the seams rising to the southward, and from Lake Macquarie, north of Sydney, the seams rising to the north- ward, ‘The great coal basin extends westward along what seems to have been a depression between the northern and southern elevated portions of the old main range, and, lying under what is now the Blue Mountains, passes up northwards along the western flank of the main range towards the boundary of Queensland. The western edge of the coal basin is not determined. Overlying the coal basin, to the westward of Sydney, is a Mesozoic sandstone formation, 1000 feet thick, while above this, and also inter- mixed with it, lies a shale deposit. All these series have been disturbed by dykes of basalt, diabase, and dolerite. Some of the coal-seams have been tilted by this intrusion ; in other cases the dip has not been changed ; and in some cases the adjacent coal has been charred into coke. Vol- canic disturbance seems to have been very

active during the Tertiary epoch, and the igneous formations occupy about 40,000 square miles.

Minerals.—Commercial mining is at present limited to gold, silver, eopper, tin, coal, and oil shales, The greater portion of the gold hitherto raised has been from alluvial deposits. These are of Permian, Cretaceous, Tertiary, and Quaternary ages, and are derived from the degradation of the older sedimentary rocks of Upper Silurian, Devonian, and Lower Carboniferous ages. The formations in association with which gold has been found are widely scattered over the colony, and are estimated to occupy nearly one-fourth of its area. In the reefs, gold seldom occurs without one or more of the following sulphides :—iron pyrites, galena, mispickel, blende, and copper pyrites. The gold is always more or less alloyed with silver, and there are occasionally traces of copper, iron, osmiridium, and other metals. The greatest depth at which auriferous reefs have been worked is 940 feet at Adelong. The value of the gold raised in the colony up to the end of 1882 was £34,839,847. Silver has been fonnd in several places, but has only been profitably worked at Boorook. The lodes vary in width rom 1 to 3 feet, and are situated in belts of fclspar porphyry, alternated with beds of fossilifcrous shales of the Devonian forma- tion. The value of silver raised to the end of 1882 was £187,429. Copper ore is traceable on the surface in very many places, and the cupriferous formations are already estimated to cover an area cqual to 4,300,000 acres. The value of copper exported to the end of 1882 was £3,538,285. Tin has been profitably worked since 1872, and the value exported to the end of 1882 was £5,173,038. It is nearly all taken from alluvial deposits—in the first instance from the beds of existing creeks, but more recently from the beds of old rivers, sometimes covered by basalt. It is all obtained from the Tertiary and Quaternary drifts, composed of the detritus from the stanniferous granite. The area of stanniferous deposits is estimated at 5,440,000 acres, the principal tin-bearing localities being in the

Many of the wells sunk

high lands of the great dividing chain in the northern and southern districts. The known Coal-measures embrace an area of about 24,000 square miles,

the seams varying from 3 feet to 25 feet in thickness. The seams are mostly horizontal, The dip is usually under 5°. The principal collieries are near Newcastle, and on the Illawarra coast, and at the western foot of the Blue Mountains. The seains worked to the south of Sydney are morc anthracitic than those worked to the north. The value of the coal raised during 1882 was £944,405. What is called, though erroneously, ‘‘kerosene shale” is worked in the west at Hartley and in the south at Joadja Creek. It is really a species of cannel coal. A good illuminating oil is distilled froin it, and it is largely shipped for use in gas-works, a moderate percentage of it greatly improving the quality of the gas. The value of this cannel coal raised up to the end of 1882 was £665,160. Iron exists in abundance, and has been worked at Mittagong and Lithgow Valley, but the colonial cost of labour has made it difficult to compete with English imports. Red and brown ore exists in abundance in the sandstone formation. It contains 55 per cent. of metallic iron. Beds of clayband iron ore are found in the Coal-measures, both on the west of the Blue Mountains and ou the Illawarra coast. Antimony has been found in several places, and has been slightly worked in the Macleay and Armidale districts, where the lodes traverse sedimentary rocks of the Devonian age. Argentiferous lead is found in many places in the Silurian, Devonian, and granite formations, but hitherto the attempts to work it at a profit have been a failure. Bismuth has been found in the tin-bearing rocks, and asbestos in veins in serpentines ; chromic iron and manganese ore have also been found in consider- able quantities. The tin-bearing drifts in the river gravels con- tain precious stones, —the diamond, sapphire, emerald, ruby, opal, amethyst, garnet, chrysolite, topaz, eairmgorm, and onyx having all been found. The colony is well supplied with building stone, eranite, sandstone, flagging, marble, limestone, slate, and fire-clay ; and brick and pottery elays occur in abundance.

Agricultwre.—The fertile soils consist chiefly of the alluvial deposits on the banks of the rivers and the detritus of the igneous rocks. On the rich flats on the banks of the river Hunter, mostly devoted to the growing of lucerne for hay, six cuttings are generally taken off in the year. To the southward of Sydney the coast land is very largely devoted to dairy-farming, the herbage being rich and sweet, especially in localities where there has been any basaltic overflow. The principal supply of butter and cheese for the Sydney market comes from this district. Along the coast to the north- ward of Port

Stephens maize is very largely cultivated for horse- food. The yield in an average scason is about 50 bushels per acre. Sugar has not been commercially succcssful south of Clarence. But on that river, and on the Richmond, and all the way to the border of Queensland, it has proved profitable, and is rapidly extending. Oranges are not cultivated to advantage south of Sydney, but any- where to the northward along the eastern slopes they grow freely. Nearly every description of European fruit is cultivated without difficulty. Tobacco is increasingly grown both on the coast and on the alluvial flats of the western waters. In earlier days wheat was very largely grown upon the coast, but in consequence of the rust this crop has been driven inland on to basaltic areas. The produc- tion of wine is limited only by the demand. Hitherto the prineipal seats of this industry have been in the Hunter river district, where many varieties of light wine are produced, and in the district round Albury, where, in a dry, warm. climate, and from a rich volcanic soil, a strong, full-bodied wine is obtained.

Grazing was the beginning of the industrial life of Australia, and it is still the great source of its wealth. The mildness of the winter allows stock to be pastured out of doors all the year round, and supersedes the necessity of artificial food. The consequence is that the country has been easily and rapidly overspread with sheep and cattle farms, the only natural check being the want of water in the remote parts and the occasional discouragement of poor markets. The speciality of the Australian wool is its fineness, and the small merino sheep are found to be the best-suited to the pasture and the climate. The stock which is now most appre- ciated is that of Australian breeders who have kept their flocks free from intermixture for a long period. The Australian merino has established for itself a separate type. Sheep as a rule are remarkably healthy in the Australian climate. In wet seasons and on stiff land they are liable to fluke and to foot-rot. Scab has occasionally appeared ; but the precautions taken against it now are very strict, and it has not prevailed in the colony sinee 1t was stamped out in 1866. Cattle are liable to pleuro-pneumonia, which is sometimes very destructive. ;

Flora.—The flora of New South Wales, which comprises about 3000 species of plants, exclusive of mosses, lichens, fungi, and sea-weeds, is characterized by many peculiar forms. The great orders of dicotyledonous

plants on the eastern side of the dividing range are respectively Leguminose, Composite, Myrtacex, Proteaceex, Epacridex, and Rutacce, three of which (the Myrtacew, Proteaccex, and Epacridex) include the great majority of the trees and shrubs which differ so essentially from the ordinary European types.

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Amongst the Myrtacew (containing some 140 species) there are plants ranging from the minute Beckia to the gigantic Huealyptus. These, for the most part, have valuable resins and oils, and possess astringent and antiscorbutic properties; the foliage is evergreen, and the flowers vary from white and ycllow to purple and crimson. The forests are principally myrtaceous, some speeies yielding esculent fruits, while the wood aud bark of many are becoming known throughout the world. While in point of utility the Myrtacee stand unrivalled, the Proteacex, by their various flowers, curiously shaped fruits, and harsh foliage, arrest the attention of the observer. 'The far-famed '' wooden pear" (Xylo- melum pyriforme), the gorgeous "' waratah"' (Telopea speciosissima), and species of the hard-fruited Hakea and the variously coloured Grevillea represent this order in the vicinity of Port Jackson. In New South Wales there is only one heath correctly so termed (Gauitheria hispida), and that only on the summits of snowy mountains near the Bellinger, or on the Australian Alps; but the lovely epacrids, which are abundant near Sydney, take the place of heaths, and two of them (Z. purpurascens and E. mierophylla), as if to increase the beauty of their inflorescence, are sometimes found double even in a wild state. In each region, whether alpine, littoral, or beyond the dividing range, epacrids occur in a greater or less degree. The Leguminose and Composite, though nearly cosmo- politan, attain a comparative maximum in New South Wales, the speeies of the former being over 300 and of the latter 250. Of legu- minous plants, the species of Acacia are the most. numerous (about 100), scattered in some places amongst the trees of the forest, and in others forming dense scrubs, Those remarkable for their scented and nseful wood (such as 4. pendula and A. homalophylla—the ''myalls" of the natives) are highly valued. Sturt's desert pea (Clianthus Dampiert), the Moreton Bay

ehestnut (Castanospermum. australe), and the genus Swainsona have acquired a reputation amongst horticulturists. Many of the composites, the largest of which is the musk-tree (Aster argophyllus), are found not only near the coast but on the arid plains of the interior. Although from the frequent occurrence of eertain orders, the flora of New South Wales is somewhat monotonous, yet the vegetation of the southern mountains, of the north-east portion of the colony, and of moist gullies is wonderfully diversified. The alpine plauts of the south, occurring at an elevation of from 4000 to 6000 feet above the level of the sea, show an affinity for the flora of Tasmania, many plants being common to both colonies, whilst ten species at least are identical with those of Europe. In the northern

when droughts prevail and the usual pasture fails, sheep and cattle find sustenance in salsolaceous bushes, the hardy composites, and

tions from female plants alone.

flowers have been found, but fixocarpus cupressiformis, or the ‘“‘native cherry,” is another anomalons shrub, having, properly raised on an obconical pedicel, which becomes thick, red, and eseulent. In most countries the labiates are herbs or under- shrubs, but in New South Wales there is a large genus of the order (Prostanthera) whieh has species of considerable size, abound- ing im scented and volatile oils, and adorned with a profusion of elegant flowers. The Eastern Australia, but the species are very singular. The column in which the stamens and style are blended is remarkable for its

strueture and the elegance of their flowers, whilst the gigantie object of interest from the earliest days of the colony. Of the palms, five Speeies extend to 0 The walking-stick palm (Kentia monostachya) occurs in the north, and Ptyehosperma Cunninghami and Livistona australis extend to IHawarra. Fauna,—As New South Wales has no natural boundary except the Pacific, there are no organic types which characterize this

colony in the same degree as the marsupials, protcads, eucalypts, — and acacias distinguish the Australian region asa whole. In this respect neither

do its northern distriets differ from South Queens- land nor its southern from north-east Victoria, while its west is uniform with the rest of the great continental plain. With this proviso, New South Wales may be justly regarded as the typieal region of East Australia. It is made up of three strips, each a subregion in itself—the coast, the dividing range and its plateaus, and the lower western plains. The coast ranges, bathed by a heated oceanic current, shclter a warm and moist sea margin, in which as far as 34° 40’ S. lat. we find Jungles of palms, figs, nettle- trees, and a host of other sub-tropical plants, haunted by talegallas, fruit pigeons, flying foxes, &.; the table-lands enjoy an essenti- ally temperate climate; and in the plains of the interior the seanty rainfall imposes further restrictions on animal and vegetable life. The indigenous mammals are all marsupial, with the exception of a few bats and rodents, and even among these Hydromys is eculiar. This indicates permanent isolation since Mesozoic time. he dingo was doubtless introduced by man, while whales and seals belong to no coast in particular. The dugong (Halieore) is not found south of Moreton Bay. Many extinct marsupials, be- longing to Australian types, but of gigantic size, as Diprotodon, Nototherium, Thylaeoleo, with huge kangaroos, are found in Pleistocene deposits. With them are associated Thylacinus and Sarcophilus, now restricted to Tasmania. No Didelphys occurs, fossil or recent. COuscus is tropical only. Nor is the singular Dendrolagus, akin to the phalangers rather than the kangaroos, found in Australia, All other genera of marsupials are represented in New South Wales. The flying ’possum (Petaurista), tiger cat (Dasyurus maculatus), wallaroo (Maeropus robustus), &c., are con- fined to the eastern, and Myrmecobius, Cheropus, and Peragalea to the western districts. Of these Thylacoleo is related to the Jurassic Plagiaulax, Myrmecobius to Amphitherium, &c. , the oldest mammals known to paleontology. —Among birds, woodpeckers, vultures, and many other families are unknown ; while honeysuckers (Jfelli- phaga), lyre birds (Menura), cockatoos, rosellas (Platycercus), brush-tongued lories (Trichoglossus), brush turkeys (Afegapodius), emus, jackasses (Dacelo), moreporks (Podargus), magpies (Gymno- rhina), wood swallows (Artamus), crested pigeons, bower birds, and plain turkeys (bustards) give a most distinct character to the avifauna.—Of reptiles, the luth (Dermatochelys) is not uncommon on the coast, while long-necked tortoises (Chelodina) frequent all inland waters. Lizards of the skink, geeko, and agama families are numerous, as Hinwlia, sleeping lizards (Cyelodus), rock

scorpions (Phyliurus), Jew lizards (Grammatophora), and, in the west, stump- tails (Trachydosaurus), which Dampier deelared the ugliest animals on earth. The monitors are represented by the (so-called) iguanas (Hydrosaurus). Crocodiles are absent. Of snakes, the Crotalide are unknown. The Viperide appear by the death adder (Aean- thophis). Sea snakes, as Platurus and Pelamis, occur upon the coast. The harmless colubrines—Tropidonotus, Dendrophis, Dipsas —are known by single species; but the Elapidz, as Diemenia, the black snake (Pseudeehis), and several species of Hoplocephalus, are common and dangerous. Morelia spilotes, the diamond snake, peculiar to the coast, and Jv variegata, the carpet snake, belong to the pythons. No tailed batrachians occur, but there are a few species of frogs, mainly of the genera Linnodynastes, Pseudophryne, Pelodryas, and Hyla (tree-frog).—As to marine fishes and inverte- brates, the region is naturally intermediate between the Indo-Pacific and South Australian districts, partly limited indeed ou the south by the cold waters of Bass's Straits, but quite open to the north; hence the fauna is rich and various. —The number and variety of the insects of New South Wales is well known. The most distinct types arc probably in the Coleoptera, where Carenum, Anoplognathus, Stigmodera, and Amycterus form very important groups in the Carabidx, Lamellicornes, Buprestidx,and Curculionide res pectively. So also Thynnus among the Hymenoptera. Lepidoptera alone are comparatively few, restricted to the coast, and of Indian types. In like manner the land and freshwater molluses, numerous to the north and east, become rarer towards the south and west, Fisheries. —Up to the present time but little enterprise has been displayed in developing the extensive sea-fisheries of the colony. The fish as a rule are shore-fish, and are not commonly met at a greater distance from the coast than 3 or 4 leagues, or in a greater depth of water than 40 fathoms. The line-fish, such as schnappers, teraglin, king-fish, rock cod, morwong, and other forms, are generally found in the neighbourhood of reefs, or rocky patehes off headlands and in offings; while the net-fish, such as mullet (of various kinds), black and silver bream (or tarwhine), whiting, Dlack-fish, gar-fish, flounders, flathead, tailors, and travally, are obtained on inshore beaches or flats of the many inlets and rivers whieh break the coast-line. No gadoids or codfish have as yet been found, nor any larger flat fish than flounders and soles. The chief freshwater fish are the Murray cod and the golden and

common river perch. Freshwater herrings abound in the eastern rivers, also eels, but they are not much sought

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after. Oysters abound in all tidal waters. There appear to be three varieties, the mud oyster, the drift, and the rock or foreshore oyster. The drift and rock oyster are in season all the year round in some fisheries, and in quality almost, if not quite, equal the “natives” of Whitstable. Lobsters also abound on the coast, espe- cially where there is good cover afforded by kelpy rocks. Shrimps are not found, but prawns of large size and excellent quality are abundant.

Commerce.—Sydney, the capital, scated on the magnificent har- bour of Port Jackson, is well posted to gather the commerce of the Southern Pacific, its position corresponding with that of San Francisco on the opposite coast of the Northern Pacific. The fiscal policy of the colony has been generally, though not rigidly, one of free trade, and this has greatly helped to make Sydney the chief emporium of Australasia. The total value of the trade in 1882 was very nearly £38,000,000, the imports exceeding the exports by £4,500,000. The intercolonial trade accounts for about one-third of the imports, and that with the United Kingdom for nearly one- half, the import from foreign states being about one-tenth. The export trade with foreign states is below one-thirteenth of the whole. The great items of export consist of wool, skins, leather, hides, and tallow. To the neighbouring colony of Victoria there is a very large export of sheep and cattle. Next to the produce of the pastoral industry comes the produce of the mining industry, con- sisting of gold, coin, tin, copper, and coal. Other articles are of nuinor importance.

Railways.—These, with one small and detached exception, are entirely in the hands of the Government, and nearly all the capital has been raised in England. They are under the management of a commissioner, subject to the general superintendence of the minis- ter for public works. The whole system is divided into three groups, the southern, the western, and the northern, with their respective branches.

Telegraph and Postal Service.—The telegraph and postal systems are entirely in the hands of the Government. Every important place in the colony is within the range of both services, and New South Wales unites with New Zealand in subsidizing the mail route between Sydney and San Fraucisco.

Banks, —There are thirteen joint-stock banks, five of tliem beiug Anglo-Australian, four intercolonial, with their headquarters in Sydney, three branches of intercolonial banks, having their head- quarters elsewhere, and two belonging exclusively to the colony. In 1882 the average note circulation was about £1,500,000, and the coin and bullion held about £3,000,000. There is a savings bank with its branches, under Government management, besides a savings bank department attached to the post-office, and the total deposits in 1882 amounted to £2,600,000, the depositors numbering over 70,000.

Shipping. —The coasting and intercolonial trade sustains a dozen steamship companies, and the trade of nearly all the great ocean lines of steamers converges at Sydney, where the convenience for eoaling is greatest. Mort's Dock is capable of accommodating most of the large steamers that visit the port. The Government possesses another dock of equal size at Biloela, and is constructing another capable of taking in the largest ironclad. There are several private slips, and repairs of any kind can be executed. The headquarters of the imperial navy are in Port Jackson, where the admiralty has a depot. ;

Administration.—The political constitution of New South Wales is that of a self-governing British colony, and rests on the provisions of the Constitution Act. The governor is appointed by the crown, the term of office being generally for five years, and the salary £7000. The governor is the official medium of communication between the colonial Government and the secretary for the colonies, but at the same time the colony maintains its own agent-general in London, who not only sees to all its commercial business, but communi- cates with the colonial office. In the legislative assembly there are more than one hundred members. The number is not fixed, because the Electoral Act provides that electorates in which the votes have increased beyond a stipulated number shall be per- manently entitled

to additional representation. The principle adopted in distributing the representation is that of equal electoral districts, modified, however, by a preference given to the distant and rural constituencies at the cost of the metropolitan electorates. The suffrage qualification is a residence of six months, or the pos- session of a small landed property. The upper house or legislative council consists exclusively of persons nominated for life by the governor, with the advice of the executive council. The number is not fixed, but it is understood that, except in cascs of emergency, the number shall not exceed one-half of that of the legislative assembly, and that no appointments shall be nade during the sitting of parliament. The parliaments are triennial.

Revenue.—The revenue is officially classed nnder three principal heads, as derived from taxation, from publie services, and from land, of which the first yields the least. This is nearly all derived from the custom-house, and principally from the duties on aleoholic liquors, tobacco in its various forms, and groceries. Stamps and

licences are the only form of direct taxation. The municipal sys- tem, being of voluntury adoption, has been only partially applied, a very large proportion of works of improvement being executed by the general Government. The receipts from land are large; the poliey which shouid regulate the alienation of land is a standing subject of political controversy. At the end of 1882 nearly 36,000,000 acres had been alienatcd, the unsold portion being leased by the Government to graziers.

Education. —The educational system was originally that of subsi- dizing the four principal churches, to which were made grants of land for school purposes, as well as annual endowments. Subsequently a national system in imitation of the Irish system was established, and the two were separately worked by a national board and a de- nominational board respectively. These two boards were abolished in 1866, and a public school board appointed to superintend all schools, both national and denominational. Finally this board was abolished, and in 1880 all primary schools were placed under the immediate control of a minister for education, and it was arranged that grants to denominational schools should cease at the end of

the year 1882. There is one graminar school for boys only in Sydney, sustained by the state, but bya recent Act high schools for both sexes are to be established all over the colony. The university, which was built by the state, and which receives an endowment of £10,000 a year, gives lectures and confers degrees in arts, laws, medicine, and science. Adjoining the university is the Prince Alfred Hospital, the medical teaching in which is partly under the control of the university senate. Attached to the university are three affiliated colleges, one belonging to the Church of England, one to the Chnrch of Rome, and one to the Presbyterian Church. In addition to the examinations for degrees, the senate holds a senior and a junior examination each year for the use of schools for both sexes. Private munificence has supplied many bursaries and scholarships. Mechanics' institutes and schools of art receive an annual subsidy in proportion to their subscriptions, and an extensive scheme for technical classes is being organized.

Population. —The official estimate of the population at the close of 1882 was 817,000. The previous census was taken on April 3, 1881, and the population was then 751,468 (411,149 males and 340,319 females),—an increase since 1871 of 247,487, or 48 per cent. The persons born in the colony numbered 465,559, while 208,512 had come from Great Britain, Ireland, and other British possessions, The Catholics were about two-sevenths of the population, being 207,606 as against 516,512 Protestants. Nearly every religious sect is represented, and the estimated attendance at public worship on Sunday was 221,031. There is no state church.

History.—The early history of New South Wales was for many years that of Australasia, and it has little more interest than what pertains to the philosophy of penal settlements. It was a distant prison maintained at the imperial cost. The commercial epoch began when Captain Macarthur found that the climate was suited to the growth of fine wool. The first sheep came from the Cape, mixed with a few from India. He got together a flock of 1000, and uoticed that even in his mongrel flock careful culling and breeding led to a great improvement in the wool, and this set him on considering the importance of having goodrams. The fortunate arrival in the colony from the Cape of some fine-woolled sheep of the Escurial breed gave him the opportunity of adding three rams and five ewes to his flock,

which he subsequently further improved ona visit to England, by purchasing some of King George III.'s stock at Kew. The stnd flock he thus formed, and which was kept at Camden for fifty years, laid the basis of an expansive industry. From that time the colony had an export. The growth of live stock quickly overtook the demands of the local population for meat, and then another colonist, Mr O'Brien, made the dis- covery that if sheep were worth nothing for meat they were worth something for tallow, and boiling down became the destiny of all the surplus stock. This waste of meat was suddenly stopped when the next great epoch in the history of the colony was opened up by the diseovery of gold. Victoria soon outstripped the mother-colony by its superior attractions in this respect, but New South Wales gained the enormous advantage of having its pastoral industry stimulated and made more profitable. The unoccupied country became worth taking up, till every portion of the territory that was at all occupiable was leased. The political government was at first necessarily a strictly military one, but as the number of the freed men and their children increased, and the number of free scttlers increased also, the demand for some form of representative government arose, and became irresistible. A legislative council was established, partly nominative and partly elective. Coinci- dently with this grew up a demand that transportation should cease, and the agitation on this question has been the only serious con- flict between the colony and the mother-country. It was ended by the mother-country yielding, and transportation was somewhat reluctantly abolished in 1853. At about the same time the mixed legislative council was superseded by the existing parliamentary system of two houses and responsible government, under which the colony has prospered contentedly ever since. | (A. GA.)

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HE authenticated history of newspapers begins in Germany. The earliest plainly periodical collection of the "news of the day," as distinguished from the isolated news-pamphlets (of which there is at least one example of as early a date as 1498, and in Germany alone about eight hundred examples, all dating before 1610, still to be found in existing libraries), is the

/rankfurter Journal, a weekly publication started by Egenolph Emmel in 1615. Antwerp follows, with its Vieuwe Tijdinghen of 1616. Six years later came the establishment in London, by Nathaniel Butter and his partners, of a like paper, under the title of The Weekly News. All of these were the enter- prises of " stationers," undertaken in the ordinary way of their trade, and hawked about the streets by itinerating ""“mercuries." ‘The foundation in Paris, in 1631, of a journal which eventually attained fame as the Gazette de france, and which still exists, had a very different origin and different aims. The scheme of Théophraste Renaudot, a busy projector, unconnected with trade, who in certain points of his character and talent may be described as a born publicist, it appeared under the patronage of Richelieu, in the shape and with the limitations which it pleased the chief statesman of the day to mark out for it.

The history of the "leading article," as a great factor in the shaping of public opinion, begins with Swift, Defoe, Bolingbroke, and Pulteney, in the many newspapers, from The Review and The Examiner to The Craftsman, by which was waged the keen political strife of the years 170440, There is no counterpart to it in France until the Revolution of 1789, nor in Germany until 1796 or 1798. It was a Frenchman who wrote—" Suffer yourself to be blamed, im- prisoned, condemned; suffer yourself even to be hanged ; but publish your opinions. It is not a right; it is a duty." It was in England that the course so pithily de- scribed was actually taken, in the face of fine, imprisonment, and pillory, at a time when in France the public had to depend upon foreign journals illicitly circulated, when its own chief writers resorted to clandestine presses, to paltry disguises, and to very poor subterfuges to escape the responsibilities of avowed authorship, and when in Ger- many there was no political publicity worthy to be named.

When the Mercure de France, after a long period of mediocrity, came into the hands of men of large intellectual faculty, they had the most cogent reasons for exerting their powers upon topics of literature rather than upon themes of politics. True political journalism dates only from the Revolution, and it then had a very brief exist- ence. It occupied a cluster of writers, some of whom have left an enduring mark upon French literature. A term of high aspiration was followed quickly by a much longer term of frantic licence and of literary infamy. Then came the long rule of a despotic

censorship ; and cycles of licence followed by cycles of repression have revolved, with varying periodicity, from that day to this. Germany has to some extent its parallelisms ; but German journal- ism, if it never soared so high, never sank so low, Journalism in Germany has made steady advances onward : and in one grand feature—that of far-gathered informa- tion from foreign countries, not merely of incidents, but of the growth of opinion and the state of social life— the leading newspapers of Germany keep much ahead of their best French contemporaries. In France, too often, the journals that gain the largest circulation are precisely those of most conspicuous frivolity. Sometimes they are much worse than frivolous. In 1871 newspapers Issued from Parisian presses which were as base and as brutal as

those of 1794. In 1870 the democratic Government at Bordeaux issued against journals of high aims and of unspotted integrity, but opposed to its pretensions, edicts as arbitrary as the worst acts in that kind of Napoleon L., and unparalleled in the whole course of the government of Napoleon ITI.

In all the other countries of Europe political journalism, in any characteristic sense, is a thing of the present century, —somewhat earlier in the century in northern Europe, somewhat later in southern. The Ordinarie Post-Tidende of Stockholm dates indeed from 1643, but until very recent times it was a mere news-letter. Denmark had no sort of journal worth remark until the foundation, in 1749, of the Berlingske Tidende, and that too attained to no political rank. The Gazetteof St Petersburg—thepatriarchof Russian newspapers—dates from 16th December 1702, is a Govern- ment organ, and nearly synchronizes with the first success- ful attempt at a newspaper in the British colonies in America. But the Boston Gazette was, in its degree, a better journal in the last century than the Wiedomosti now.

Journalism in Italy begins with the Diario di Roma in 1716, but in politics the press remained a nullity—for all practical purposes—until nearly the middle of the present century, when the newspapers of Sardinia, at the impulse of Cavour, began to foreshadow the approach of the influential Italian press of the present day. In Spain no rudiments of a newspaper press can be found until the last century. As late as in 1826 an inquisitive

American traveller records his inability to lay his hands, during his Peninsular tour, upon more than two Spanish news- papers.

It may be useful to bring these chronological notes of

the origin of journalism into view, at a. glance, conjointly

with the dates of some of the chief existing journals of Europe, by tabulating them thus :—

|

Name. Remarks,

Frankfurter Journal……..| Existing in 1883.

WVUAITIE se scscen

1616 | Antwerp…….. Nieuwe Tijdinghen……..

1622 | London (1)..... WWGOKIVENGWS..:.sscceonnsren asset

1631 | Paris (1)..... Gazette [de Fianee]..... Existing in 1883.

1643 | Stoekholm……) Post [och Inrikes] Tidende Do. do.

1660 | Edinburgh (1)| Mereurius Caledonius…... Ten numbers only published.

1665 | London (2).....| London Gazette……..00008. Existing in 1883.

[Temporarily at Oxford]

1672 | Paris (2).....| Mereure [de Franee]..... Continued till 1853

1690 | Woreester ….. Berrow’s Woreester Jour.| Existing in 1883.

1695 | London (3).....] The Postboy…….0…cscccceee First London daily paper.

1699 | Edinburgh (2)| Edinburgh Gazette…….. Existing in 1883.

1702 | London (4).....] Daily Courant……..6 First sueeessful London daily.

1702 | St Petersburg] St Petersburg Wiedomosti Existing in 1883.

1704 | London (5).....) Defoe's Review of the | Continued till June 1713.

Affairs of State…….. 1704} Boston, Mas-| Boston News-Letter..,.....] Continued until loss of Bos- saehusetts… ton by the British.

1705 | Edinburgh (8).} Edinburgh Courant…….. Existing in 1883.

1711; Dublin (1)..... Dublin Gazette……..068 Do. do.

1712 | Hamburg……. Hamburg Correspondent.. Do. do.

1716 | Rome.,..... Diario di Roma……. Continued fornearly 90 years.

1726?) Madrid (1).....) Gaceta de Madrid…….. Continued until about 1850,

1763 | Dublin (2).....| Freeman's Journal…….. Earliest Irish daily paper.

1772 | London (6).....| The Morning Post…….. Existing in 1883,

1782 | Glasgow (1)...! Glasgow Herald…….. Do. do

1785 | London (7)..... MINE VINES aestesetevesseanevace Known until 1788 as Uni- versal Daily Register

1789) PP ariSh(3);,..... Moniteur Universel…….. Existing in 1883.

1789 | Paris (4).....] Journal des Débats…….. Do. do.

1792 | London (8).....| The Observer…. eee Do. do. (weekly).

1792 | London (9)..... The Courier……. ..| Long the leading London newspaper.

1798 | Leipsie…….| Allgemeine Zeitung……. Existing in 1883.

1817 | Edinburgh (4)| The Seotsman……. Daily from 1855,

1827 | London (10)...} The Standard ……..cse0e- Morning paper from 1857.

1842 | Madrid (2).....| Herald0…..ce.ceccseccoesseoees Chief Spanish journal for many years.

1846 | London (11)...! The Daily NewS……..00.. Existing in 1883.

USAT, | ARGH er ce. eee Tl Risorgimento…….00- Edited by Cavour,

1847 | Florenee……..] HW' Opimtone……0:-.s6:000.0000 Existing in 1883,

1847 | Glasgow (2) ...| North British Daily Mail.. Do. do.

USTON BCT UM. co c.arees Volkszeitting ……0…. | Reputed to have the largest. eireulation in Germany,

1855 | London (12)...) The Daily Telegraph…….! Existing in 1883,

English llews-

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The development of the modern newspaper is due to a union of causes that may well be termed marvellous. A machine that from a web of paper 3 or 4 miles long can, in one hour, print, fold, cut, and deliver 24,000 or 25,000 perfected broadsheets is after all not so great a marvel as is the organizing skill which centralizes in a London office telegraphic communications from every important town in Europe, Asia, America, and Australia, and which then (whilst re-transmitting thither the news of London) dis- tributes those communications—directly or indirectly—to thousands of recipients simultaneously, by day and by night, throughout all Britain. And but for

unusual mental gifts, conjoined with high culture and with great " staying-power," in the editorial rooms, all these marvels of ingenuity—which now combine to develop public opinion on great public interests, and to guide it —would be nothing better than a vast mechanism for making money out of inan's natural aptitude to spend his time either in telling or in hearing some new thing.

Julius Reuter's enterprise grew immediately out of the thoughts of an observant Prussian Government-messenger on the extraordinary excitement of this natural aptitude which he witnessed as caused by the revolutionary move- ments of 1848. In 1849 he established a news-trans- mitting agency in Paris, with all the appliances that were then available. Between Brussels and Aix-la-Chapelle he formed a pigeon-service, connecting it with Paris and with Berlin by telegraph. As the wires extended, he quickly followed them with agency-offices in many parts of the Continent. When he came to London, his progress was for a moment held in check. The editor of Zhe Times listened very courteously to his proposals, but (on that first occasion) ended their interview by saying, " We gene- rally find that we can do our own business better than anybody else can." He went to the office of The Morning Advertiser, which had then the next largest circulation to that of The Times, and had better success.! He entered into an agreement with that and afterwards with other London journals, including The Times, and also with many commercial corporations and firms.

The newspapers, of course, continued to employ their own wires and to extend them, but they found great advantage in the use of Reuter's telegrams as supplemen- tary. Hisenterprise grew apace. Within a few years it is said to have yielded the founder some £25,000 a year. In 1865 it was transferred to a limited company. In 1868 the London Press Association was formed. It contracted with Reuter's company to supply their telegrams exclusively throughout the United Kingdom, London only excepted. The cost yearly to those newspaper proprietors who are members of the association is £294, to non- members £323. In connexion with the intelligence depart- ment of the post-office, the Press Association supplies parliamentary, juridical, and market news. The office of the Association is kept open during twenty-one hours of the twenty-four. The enterprise was organized by Mr John Lovell, now editor of The Liverpool Mercury.

London has now at least nine other press and telegraphic associa- tions ; Paris probably has almost as many.

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THe NEWSPAPERS OF THE UNITED KINGDOM.

The first English journalists were the writers of “ news-

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single letter wrote as many letters as he had customers. Then one more enterprising than the rest established an “intelligence office,” with a staff of clerks, such as Ben Jonson’s Cymbal depicts from the life in Zhe Staple of News, acted in 1625 :— ‘¢This is the outer room where my clerks sit,

And keep their sides, the register in the midst ;

The cxaminer, he sits private there within;

And here I have my scvcral rolls and files

Of news by the alphabet, and all put up

Under their heads.”

Of the earlier news-letters good examples may be seen Early news- in Sir John Fenn’s collection of Paston Letters, and in letters.

Arthur Collins’s Letters and Memorials of State (better known, perhaps, as the Sydney Papers). Of those of later date specimens will be found in Knowler’s Letters and Despatches of Strafford, and in other well-known books. Still later examples, and such as have a very high historical interest, may be seen in abundance amongst the papers collected by the historian Thomas Carte, now pre- served in the Bodleian Library at Oxford. Of these, several series were addressed to the first duke of Ormond, partly by correspondents in England and Ireland, partly by correspondents in Paris; others were addressed to suc- cessive earls of Huntingdon; others, again, to various members of the family of Wharton. And like valuable collections

are to be seen in the library of the British Museum, and in the English Public Record Office. In Edinburgh, the Advocates' Library possesses a series of the 16th century, written by Richard Scudamore to Sir Philip Hoby during his embassy to Vienna.

The MS. news-letters—some of them proceeding from writers of marked ability who had access to official infor- mation, and were able to write with greater freedom and independence of tone than the compilers of the printed news—held their ground, although within narrowing limits, until nearly the middle of the last century. Some of the collections of these "gazettes a-la-main" have for the historian a greater value than any existing printed series of a contemporary gazetteer.

By the pains and critical acumen of the late Mr Thomas Watts, of the British Museum, the obstinate fiction that "for the first printed newspaper mankind are indebted to the wisdom of Elizabeth and the prudence of Burghley " is at length gradually disappearing from current literature, although the old story of the English Mercurie of the Armada year has been many times repeated (even in the latest works on English journalism) since the first publica- tion of his able pamphlet.2 In a later publication,® the game learned bibliographer traced, not less conclusively, this curious fabrication to its author, the second earl of Hardwicke.

Although no genuine newspaper of the 16th century can News pam- be produced, English pamphlets, as well as French, Italian, phlets.

and German, occur with such titles as Wewes from Spaine, and the like. In the early years of the 17th century they became very numerous. In 1614 we find Burton (the author of the Anatomy of Melancholy) pointing a sarcasm against the non-reading habits of "the major part" by adding, "if they read a book at any time… 'tis an English chronicle, Sir Huon of Bordeaux, Amadis de Gaui, dsc., a play-book, or some pamphlet of news." The most eminent purveyors of reading of this sort were Nathaniel Butter, Nicholas Bourne, and Thomas Archer; and by

letters," originally the dependants of great men, each en1-

2 : : , them was issued, in May 1622, the first authentic English First perio-
ployed in keeping his own master or patron well-informed,

papers, : periodical newspaper now known to exist. When these dical news-

during his absence from court, of all that transpired there. The duty grew at length into a calling. The writer had his periodical subscription list, and instead of writing a

1 Mr James Grant has put on record, word for word, the curious conversation that occurred (Jfist. of Newspaper Press, ii. 328 sq.).

news-pamphlets began to be periodicals their periods were Paper.

2 Letter to Antonio Panizzi, on the Reputed Karliest Printed News- paper, ‘* The English Mereurie” of 1588, London, 1839, 8vo.

3‘ Authorship of the fabricated ‘Earliest English Newspaper,’ ” Gent. Mag., n.s., xxxiii. 485-491, 1850.

AMercuries.

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at first irregular. Thus on the Ist of June 1619 Ralph Rounthwaite entered at Stationers’ Hall A Relation of all matters done in Bohemia, Austria, Poland, Sletia, France, &c., that is worthy of relating, since the 2 of March 1618 [1619 n.s.] wntil the 4th of May Again, at the begin- ning of November 1621, Bartholomew Downes and another entered in like manner Zhe certaine and true newes from all parts of Germany and Poland, to this present 20 of October 1621.2. No copy of either of these papers is now, we believe, known to exist. Nor is any copy known of The Courant, or Weekly Newes from foreign parts, of October 9, 1621, mentioned by Mr Nichols. But in May 1622 we arrive at a weekly newspaper which may still be seen in the British Museum. It is entitled “The 23d of May—The Weekly News from Italy, Germany, &c., London, printed by J. D. for Nicholas Bourne and Thomas Archer.” Nathaniel Butter’s name does not occur on this number, but on many subsequent numbers it appears in connexion sometimes with

Bourne's and sometimes with Archer's name ; so that there was probably an eventual partnership in the new undertaking. Butter had published Mewes Jrom Spaine in 1611, and he continued to be a publisher of news until 1641, if not later.4

In The Certain Newes of this Present Week, ending 23d August 1622, the publisher inserted this advertisement :— "Tf any gentleman or other accustomed to buy the weekly relations of newes be desirous to continue the same, let them know that the writer, or transcriber rather, of this newes hath published two former newes ; the one dated the second, the other the thirteenth of August, all which do carry a like title, and have dependence one upon another ; which manner of writing and printing he doth propose to continue weekly, by God's assistance, from the best and most certain intelligence." November 1641 is especially noticeable for the publication, in the form of a newspaper, of the earliest authentic report of the procecdings of parliament. Diurnal Occurrences, or the Heads of several Proceedings in both Houses of Parliament, was usually, notwithstanding its title, a weekly periodical, and it sometimes contained ordinary news in addition to its staple matter. This was followed, within five years, by a long train of newspapers, most of which were published weekly. Those which stand out most saliently from the rest are the Mercurius Britanni- cus, M. Pragmaticus, and M. Poltticus of Marchmont Nedham, and the Mercurius Aulicus of John Birkenhead. Nedham was perhaps both the ablest and the readiest man that had yet tried his hand at a newspaper. He com- menced the Jf. Britannicus on August 22, 1643, zealously advocated in it the cause of the Parliament, and continued its publication until 1647. At that period 'he changed sides, and began to write Wercurius Pragmaticus,

''which, being very witty, satirical against the Presbyterians, and full of loyalty, made him known to, and admired by, the bravadoes and wits of those times. ... Atlength. .. Lenthall and Bradshaw ... persuaded him to change his style onee morc {in favour of] the Independents, then carrying all before them. So that, being bought over, he wrote Merewrius Politicus, so extreme contrary to the former that the generality for a long time. . . could not believe that that 'intelligence' could possibly be written by the same hand that wrote the M. Pragmaticus. . .°. The last [i.c., the Pragmatici] were endeavoured by the parliamenteers to be stifled, but the former, the

Politici, which came out by authority, and flew every week into all parts of the nation for more than ten years, had very great influcnee. . . . He was then [after a fourth “change of style’] the Goliath of the Philistincs, the great

1 Registers of the Stationers’ Company, as printed by Mr Edward Arber, iii. 302.

ED Hithing, thin 23% 3 Literary Anecdotes, iv. 38.

- It is to him that a passage in Fletcher’s Fair Maid of the Inn (act iv. sc. 2) obviously refers :—“ It shall be the ghost of some lying stationer. A spirit shall look as if butter would not melt in his mouth; a new Mercurius Gallo-Belgicus.”’

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champion of the late usurper, whose pen, in comparison of others, was like a weaver’s beam.” ®

Birkenhead’s Jf. Aulicus was also begun in 1643, and continued, although irregularly, until nearly the close of the civil war. According to Wood, Charles I. “appointed him to write the Mercurit Aulicit, which being very pleas- ing to the loyal party, His Majesty recommended him to the [university] electors that they would choose him moral philosophy reader,” which was done accordingly. He was assisted in the composition of Awlicus by George Lord Digby (secretary of state, and afterwards earl of Bristol) and by Dr Peter Heylin. Sir John Birkenhead had con- siderable powers of satire, after a coarse fashion, and was one of the few rough-weather royalists who were permitted to bask in the sunshine of the Restoration.

Under Cromwell, the chief papers were J. Politicus and Intelli- The Public Intelligencer (of which the first number appeared gencers,

on the 8th October 1655). These publications were issued on different days of the week, and at length they became conjointly the foundation of the

present London Gazette. Even at their origin they were in some degree official papers. In 1659 the council of state caused the following announcement to be published :—‘‘ Whereas Marchmont Nedham, the author of the weekly news-books called Mercurius Politicus and The Publique Intelligencer, is, by order of the council of state, discharged from writing or publishing any publique intelligence ; the reader is desired to take notice that, by order of the said council, Giles Dury and Henry Muddiman are authorized henceforth to write and publish the said intelligence, the one upon the Thursday and the other upon the Monday, which they do intend to set out under the titles of The Parliamentary Intellagencer and of Mercurius Publicus.” After the Restora- tion, an office of surveyor of the press was instituted, to which Roger L’Estrange was appointed. The story of his administration of it—for which there are ample materials in the State Papers ®—would be well worth the telling in a befitting place. On him was also conferred, by royal grant —and, as it proved, for only a short period,—“all the sole privilege of writing, printing, and publishing all narratives, advertisements, .mercuries, intelligencers, diurnals, and other books of public intelligence; ... with power to search for and seize unlicensed and treasonable schismatical and scandalous books and papers.” L’Estrange continued the papers above mentioned, but changed their titles to The Intelligencer and The News.

Joseph Williamson (afterwards secretary of statc) was for a time L’Estrange’s assistant in the compilation of The Intelligencer,’ from which he soon withdrew. He organized for himself a far-spread foreign correspondence, and carricd on the business of a news-letter writer on a larger scale than had till then been known. Presently L’Estrange found his own sources of information much abridged. To his application for renewed assistance Williamson replies that he cannot give it, but “will procure for L’Estrange a salary of £100 a year if he will give up his right in the news-book.” 8 The Intelligencer appeals to Lord Arlington, and assures him that the charge of “entertaining spies for information was £500 in the first year.”9 But he has

5 Wood, Athene Oxonienses (by Bliss), iii. 1182. A new Jfer- curius Britannicus appeared in June 1647, but did not long eontinue. Another,

entitled Mf. Britannicus again Alive, was published in May 1648, and the title was often subsequently revived.

6 These materials begin in Domestic Correspondence, Charles IT., Xxxix. 92-95 (Rolls House), and continue at intervals in several sueceeding volumes,

7 This help seems to have been given at the request of Arlington (then Sir H. Bennet) in 1663, State Papers, Domestic, Charles IL., bowbe, INGE Inisy

8 State Papers, Domestic, Charles II., cxxxiv. 108 (Rolls House).

eli, 117.

London Gazette.

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“doubled the size and price of the book, and has brought the profit from £200 to £400 or £500 a year.”! The appeal was in vain. It was resolved to suppress 7’he Intelligencer, and to establish a court newspaper under a new title and new editorship.

At that time the great plague had driven the court to Oxford. The first number of Zhe Oxford Gazette was published on the 14th of November 1665. With the pub- lication of the twenty-fourth number it became Zhe London Gazette. Williamson had the general control of it. For a considerable time Charles Perrot, a member of Oriel College, was the acting editor.? For several years the Gazette was regularly translated into French by one Moranville. During the Stuart reigns generally, its con- tents were very meagre, although in the reign of Anne some improvement is already visible. More than a century

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world-famous ‘‘ Lloyd’s” of commerce—started a thrice-a- week paper, Lloyd’s News, which had but a brief exist- ence in its first shape, but was the precursor of the Lloyd’s Inst of the present day. No. 76 of the original paper contained a paragraph referring to the House of Lords, for the appearance of which a public apology must, the pub- lisher was told, be made. He preferred to discontinue his publication (February 1697). Nearly thirty years afterwards he in part revived it, under the title of Lloyd’s List, —published at first weekly, afterwards twice a week.° This dates from 1726. It is now published daily.

It was in the reign of Queen Anne that the newspaper press first became really eminent for the amount of intel- lectual power and of versatile talent which was employed upon it. It was also in that reign that the press was first fettered by the newspaper stamp. The accession of Anne

after the establishment of the Gazette, we find Secretary Lord Weymouth addressing a circular? to the several secretaries of legation and the British consuls abroad, in

was quickly followed by the appearance of the first success- First ful London daily newspaper, The Daily Courant (1703), London Seven years earlier, in 1695, The Postboy had been started 4aily paper.

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which he says, ‘‘ The writer of the Gazette has represented that the reputation of that paper is greatly lessened, and the sale diminished, from the small portion of foreign news with which it is supplied.” He desires that each of them will send regularly all such articles of foreign intelligence as may appear proper for that paper, ‘“ taking particular care,—as the Gazette isthe only paper of authority printed in this country,—never to send anything concerning the authenticity of which there is the smallest doubt.” From such humble beginnings has arisen the great repertory of State Papers, now so valuable to the writers and to the students of English history. It has appeared twice a week, in a continuous series, for nearly two hundred and twenty years. The Gazette brings to the public an income ex- ceeding £20,000 a year. ‘The editorship is of course a Government appointment, and

it has a salary of £800. The office is now commonly given in reward of distin- guished service upon the ordinary newspaper press.

In November 1675 L'Estrange—not yet tired of journal- ism—commenced The City Mercury, or Advertisements concerning Trade. This he followed up in 1679 by Domestick Intelligence, published gratis for the promoting of Trade. ci

The very day after the departure of James IJ. was marked by the appearance of three newspapers—TZhe Uni- versal Intelligence, The English Courant, and The London Courant. Within a few days more these were followed by The London Mercury, The Orange Gazette, The London Intelligence, The Harlem Currant, and others. The Licens- ing Act, which was in force at the date of the Revolu- tion, expired in 1692, but was continued for a year, after which it finally ceased. On the appearance of a paragraph in The Flying Post of 1st April 1697, which appeared to the House of Commons to attack the credit of the Exchequer Bills, leave was given to bring in a Bill "to prevent the writing, printing, or publishing of any news without licence"; but the Bill was thrown out in an early stage of its progress. That lying Post which gave occasion to this attempt was also noticeable for a new method of printing, which it thus announced to its customers,—" If any gentleman has a mind to oblige his country friend or correspondent with this account of public affairs, he can have it for twopence….ona sheet of fine paper, half of which being left blank, he may thereon write his own affairs, or the material news of the day."

In 1696 Edward Lloyd—the virtual founder of the

1 State Papers, Domestic, Charles II., cxxxv. 24.

2 Anthony Wood, Athenee Oxonienses, sect. '' Perrot."

3 Calendar of Home-Office Papers, 1766-69, p. 483 (1879).

4 A complete set exceeds four hundred volumes, with four volumes of index, and is now of extreme rarity.

as a daily paper, but only four numbers appeared. The Courant was published and edited by the well-known and learned printer Samuel Buckley, who explained to the public that “the author has taken care to be duly fur- nished with all that comes from abroad, in any language. .... At the beginning of each article he will quote the foreign paper from which it is taken, that the public, seeing from what country a piece of news comes, with the allowance of that Government, may be better able to judge of the credibility and fairness of the relation. Nor will he take upon himself to give any comments,... supposing other people to have sense enough to make reflexions for themselves.” Then came, in rapid succes- sion, a crowd of new competitors for public favour, of less frequent publication. The first number of one of these, The Country Gentleman’s Courant (1706), was given away gratuitously, and made a special claim to public favour on the ground that “here the reader is not only diverted with a faithful register of the most remarkable and momentary [z.e., momentous] transactions at home and abroad,... . but also with a geographical description of the most material places mentioned in every article of news, whereby he is freed the trouble of looking into maps.”

On the 19th of February 1704, whilst still imprisoned Defoe’s in Newgate for a political offence, Defoe began his famous “evev.

paper Zhe Review (see DEFOE). At the outset it was pub- lished weekly, afterwards twice, and at length three times a week. It continued substantially in its first form until July 29, 1712; and a complete set is of extreme rarity. From the first page to the last it is characterized by the manly boldness and persistent tenacity with which the almost unaided author utters and defends his opinions on public affairs against a host of able and bitter assailants. Some of the numbers were written during travel, some in Edinburgh. But The Review appeared regularly. When interrupted by the pressure of the Stamp Act, the writer modified the form of his paper, and began a new series (August 2,1712, to June 11, 1713). In those early and monthly supplements of his paper which he entitled “‘ Advice from the Scandalous Club,” and set apart for the discussion of questions of literature and manners, and sometimes of topics of a graver kind, Defoe to some extent anticipated the Z’atler and Spectator. In 1705 he severed those supplements from his chief newspaper, and published them twice a week as

Zhe Lrttle Review. But they soon ceased to appear. Not again to revert to Defoe as an

5 Frederick Martin, History of Lloyd's, 66-77 and 107-120. The great collection of newspapers in the British Museum contains only one number of Lloyd's News; but sixty-nine numbers may be seen in the Bodleian Library. Of the Zis¢, also, no complete series is known to exist ; that in the library of Lloyd's begins with 1740.

Stamp tax of

1712.

English journalist, it may here be added that in May 1716 he began a new monthly paper under an old title, Mercurvus Politicus,.... "by alover of old England." This journal continued to appear until September 1720.

The year 1710 was marked by the appearance of 7'he Examiner, or Remarks upon Papers and Occurrences (No. 1, August 3), of which thirteen numbers appeared by the co-operation of Bolingbroke, Prior, Freind, and King be- fore it was placed under the sole control of Swift. Zhe Whig Examiner, avowedly intended "to censure the writings of others, and to give all persons a rehearing who had suffered under any unjust sentence of Zhe Examiner," followéd on the Ist September, and Zhe Medley three weeks afterwards.

This increasing popularity and influence of the news- paper press could not fail to be distasteful to the Govern- ment of the day. Prosecutions were multiplied, but with small success. At length some busy projector hit upon the expedient of a newspaper tax. The paper which seems to contain the first germ of the plan is still preserved amongst the Treasury papers. It is anonymous and undated, but probably belongs to the year 1711. " There are published weekly," says the writer, "about 44,000 newspapers, viz., Daily Courant, London Post, English Post, London Gazette, Postman, Postboy, Flying Post, Review, and Observator." }

The duty eventually imposed was a halfpenny on papers of half a sheet or less, and a penny on such as ranged from half a sheet toa single sheet (10 Anne, c. xix. § 101), and it came into force on the 19th July 1712. The first results of the tax cannot be more succinctly or more vividly described than in the following characteristic passage of the Journal to Stella (August 7, 1712): "Do you know that Grub Street is dead and gone last week? No more ghosts or murders now for love or money. I plied it close the last fortnight, and published at least seven papers of my own, besides some of other people's ; but now every single half-sheet pays a halfpenny to the queen. The Odservator is fallen ; the JMedleys are jumbled together with the Flying Post; the Examiner is deadly sick; the Spectator keeps up, and doubles its price—I know not how long it will hold. Have you seen the red stamp the papers are marked with? Methinks the stamping ts worth a halfpenny."

Swift's doubt as to the ability of the Spectator to hold out against the tax was justified by its discontinuance in the following year. But the impost which was thus fruit- ful in mischief, by suppressing much good literature, wholly failed in keeping out bad. Some of the worst journals that were already in existence kept their ground, and the number of such ere long increased.2, An enumera- tion of the London papers of 1714 comprises The Daily Courant, The Examiner, The British Merchant, The Lover, The Patriot, The Monitor, The Flying Post, The Postboy, Mercator, The Weekly Pacquet, and Dunton's Ghost. Another enumeration in 1733 includes The Daily Courant, The Craftsman, Fog's Journal, Mist's Journal, The London Journal, The Free Briton, The Grub Street Journal, The Weekly Register, The Universal Spectator, The Auditor, The Weekly Miscellany, The London Crier, Read's Journal, Gidipus or the Postman Remounted, The St James's Post, The London Evening Post, and The London Daily Post. Twenty years later the last-named publication became the well-known Public Advertiser. Part of this increase may fairly be ascribed to political corruption. In 1742 the

1 "* A Proposition to Increase the Revenue of the Stamp-Office," Red- ington, Calendar of Treasury Papers, 1708-14, p. 235. The stamp- office dated from 1694, when the earliest duties on paper and parch- ment were enacted.

? See the Burney collection of newspapers in the British Museum; and Nichols, Literary Anecdotes of the Highteenth Century iv. 33-97.

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ous penalties into signal triumphs. | The North Briton to those of The Examiner, every con- ‘spicuous newspaper prosecution gave tenfold currency to ‘ the doctrines that were assailed.

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committee of the House of Commons appointed to inquire into the political conduct of the earl of Orford reported to the House that during the last ten years of the Walpole ministry there was paid, out of public money, no “less a sum than £50,077, 18s. to authors and printers of news- papers, such as the Free Briton, Daily Courant, Gazetteer, and other political papers.”? But some part of the payment may well have been made for advertisements. Towards the middle of the century the provisions and the penalties of the Stamp Act were made more stringent. Yet the number of newspapers continued to rise. Johnson, writing in 1758, bears testimony to the still growing thirst for news: ‘Journals are daily multiplied, without in- crease of knowledge. The tale of the morning paper is told in the evening, and the narratives of the evening are bought again in the morning. These repetitions, indeed, waste time, but they do not shorten it. The most eager peruser of news is tired before he has completed his labour ; and many a nian who enters the coffee-house in his night- gown and slippers is called away to his shop or his dinner before he has well considered the state of Europe.” Five years before this remark appeared in Zhe Jdler the aggregate number of copies of newspapers annually sold in England, on an average of three years, amounted to 7,411,757. In 1760 it had risen to 9,464,790, and in 1767 to 11,300,980. In 1776 the number of newspapers published in London alone had increased to fifty-three.

When Johnson wrote his sarcastic strictures on the newspapers that were the contemporaries and, in a sense, the rivals of The Idler, the newswriters had fallen below the standard of an earlier day. A generation before, the newspaper was often much more of a political organ than of an industrial venture. All of the many enterprises of Defoe in this field of journalismt

united indeed both characteristics. But if he was a keen tradesman, he was also a passionate politician. And not a few of his fellow- workers in that field were conspicuous as statesmen no less than as journalists. Even less than twenty years before the appearance of Johnson's remarks, men of the mental – calibre of Henry Fielding were still to be found amongst the editors and writers of newspapers. The task had fallen to a different class of men in 1750.

The history of newspapers during the long reign of Press

George III. is a history of criminal prosecutions, in which Deal d ons.

individual writers and editors were repeatedly defeated an severely punished, whilst the press itself derived new strength from the protracted conflict, and turned ignomini- From the days of

In the earlier part of this period men who were mere traders in politics— whose motives were obviously base and their lives contemptible— became for a time powers in the state, able to brave king, legislature, and law courts, by virtue of the simple truth that a free people must have a free press. Yet the policy that had failed in 1763 continued to be clung to in 1819.

One of the minor incidents of the North Briton excite- ment led indirectly to valuable results with reference to the much-vexed question of parliamentary reporting. During the discussions respecting the Middlesex election, Almon, a bookseller, collected from members of the House of Commons some particulars of the debates, and published them in The London Evening Post. The success which attended these reports induced the proprietors of The St James's Chronicle to employ a reporter to collect notes in the lobby and at the coffee-houses. This repeated infrac- tion of the privilege of secret legislation led to the memor-

3 '* Fourth Report of the Committee of Secrecy," &c., in Hansard's Parliamentary History, xii. 814.

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able proceedings of the House of Commons in 1771, with their fierce debates, angry resolutions, and arbitrary im- prisonments,—all resulting, at length, in that tacit con cession of publicity of discussion which in the main, with brief occasional exceptions, has ever since prevailed.

The three metropolitan newspapers which at different periods of this reign stood pre-eminent amongst their com- petitors were The Public Advertiser, The Morning Post, and The Morning Chronicle. The first-named paper owed much of its popularity to the letters of Junius. The Post and the Chronicle were mainly indebted for their success to the personal qualities of individual editors, combined, in both cases, although in very different degree, with a staff of writers endowed with exceptional literary power and marked versatility of talents. The Public Advertiser was first published in 1726, under the title London Daily Post and General Advertiser. In 1738 the first part of the title was dropped, and in 1752 General Advertiser was altered into the name which the letters of Junius made so famous. Many of these had appeared before the smallest perceptible effect was produced on the circu- lation of the paper; but when the " Letter to the King" came out (19th December 1769, almost a year from the beginning of the series) it caused an addition of 1750 copies to the ordinary impression. The effect of subsequent letters was variable ; but when Junius ceased to write the monthly sale of the paper had risen to 83,950. This was in December 1771. Seven years earlier the monthly sale had been but 47,515.1 It now became so valuable a property that shares in it were sold, according to John Nichols, "as regularly as those of the New River Company."2 But the fortunes of the Advertiser declined almost as rapidly as they had risen. It continued to appear until 1798, and then seems to have been amalga- mated with the commercial paper called The Public Ledger (dating from 1759), which still exists as a London daily journal. Actions for libel were brought against the paper

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materials, was sold for £600 to Peter and Daniel Stuart, who quickly raised the position of the Post by enlisting Mackintosh and Coleridge in its service, and also by giving unremitting attention to advertisements and to

the copious supply of incidental news and amusing paragraphs. There has been much controversy about the share which Coleridge had in elevating the Post from obscurity to eminence. That he greatly promoted this result there can be no doubt. His famous "Character of Pitt," published in 1800, was especially successful, and created a demand for the particular number in which it appeared that lasted for weeks, a thing almost without precedent. Coleridge wrote for this paper from 1795 until 1802, and during that period its circulation in ordinary rose from 350 copies, on the average, to 4500. Whatever the amount of rhetorical hyperbole in Fox's saying,—recorded as spoken in the House of Commons,—'" Mr Coleridge's essays in The Morning Post led to the rupture of the treaty of Amiens," it is none the less a striking testimony, not only to Coleridge's powers as a publicist, but to the position which the newspaper press had won, in spite of innumerable obstacles, eighty years ago. The list of his fellow-workers in the Post is a most brilliant and varied one. Besides Mackintosh, Southey, and Arthur Young, it included a galaxy of poets. Many of the lyrics of Moore, many of the social verses of Mackworth Praed, some of the noblest sonnets of Wordsworth, were first published in the columns of the Post. And the story of the paper, in its early days, had tragic as well as poetic episodes. In consequence of offence taken at some of its articles, the editor and pro- prietor, Nicholas Byrne (who succeeded Daniel Stuart), was assaulted and murdered whilst sitting in his office. In later days, but long prior to those of the submarine cable, the Post for a time eclipsed most of its rivals by means of the skilful organization which Lieutenant Waghorn—the pioneer of the overland route to India— gave to its agencies for foreign intelligence.

by Edmund Burke in 1784, and by William Pitt in 1785, Morning and in both suits damages were given. The Morning Chron- Chronicle was begun in 1769. William Woodfall was its

The Times is usually dated from the Ist of January 77. 1788, but was really commenced on the 18th January Times. 1785, under the title of Zhe London Daily Universal

ae printer, reporter, and editor, and continued to conduct it until 1789. James Perry succeeded him as editor, and so continued, with an interval during which the editorship was in the hands of the late Mr Sergeant

Spankie, until his death in 1821. Perry's editorial functions were occasionally discharged in Newgate in consequence of repeated prosecutions for political libel. In 1819 the daily sale reached nearly 4000. It was sold in 1823 to Mr Clement, the purchase-money amounting to £42,000. Mr Clement held it for about eleven years, and then sold it to Sir John Easthope for £16,000. It was then, and until 1843, edited by John Black, who numbered amongst his staff Albany Fonblanque, Charles Dickens, and John Payne Collier. The paper continued to be distinguished by much literary ability, but not by commercial prosperity. In 1849 it became the joint property of the duke of New- castle, Mr Gladstone, and some of their political friends ; and by them, in 1854, it was sold, conditionally, to Mr Serjeant Glover, under whose management it became event- ually the subject of a memorable public scandal in the law courts of France. At length the affairs of the Chronicle were wound up in the Bankruptcy Court of London, after an existence of more than ninety years.

The Morning Post dates from 1772. For some years it was in the hands of Henry Bate (afterwards known as Sir Henry Bate Dudley), and it attained some degree of temporary popularity, though of no very enviable sort. In 1795 the entire copyright, with house and printing

1 These are the figures of Mr W. S. Woodfall, the editor. Literary Anecdotes of the Highteenth Century.

Register, printed logographically. This "word-printing " process had been invented by a printer named Henry Johnson several years before, and found a warm advocate in John Walter, who expounded its peculiarities at great length in No. 510 of his Daily Universal Register. Ina later number he stated, very amusingly, his reasons for adopting that altered title which the enterprise and the ability of his successors have made world-famous.

Within two years Walter had his share in the Georgian persecutions of the press, by successive sentences to three fines and to three several imprisonments in Newgate, chiefly for having stated that the prince of Wales and the dukes of York and Clarence had so misconducted them- selves "as to incur the just disapprobation of his Majesty." In 1803 he transferred the management (together with the joint proprietorship) of the journal to his son, by whom it was carried on with remarkable energy and

consummate tact. To Lord Sidmouth's Government he gave a general but independent support. That of Pitt he opposed, espe- cially on the questions of the Catamaran expedition and the malversations of Lord Melville. This opposition was resented by depriving the elder Walter of the printing for the customs department, by the withdrawal of Govern- ment advertisements from he Times, and also, it is said, by the systematic detention at the outports of the foreign intelligence addressed to its editor. Walter, however, was strong and resolute enough to brave the Government. He organized a better system of news transmission than had ever before existed. He introduced steam-printing, and re- peatedly improved its mechanism ; and, although machines

which print 22,000 sheets in the hour may now seem to | their varied stages of development, must have occasioned

thrust into insignificance a press of which it was at first announced as a notable triumph that the new machine per- formed its task ‘‘ with such a velocity and simultaneousness of movement that no less than 1100 sheets are impressed in one hour,” yet Walter's assertion was none the less true, that The Times of 29th November 1814 “presented to the public the practical result of the greatest improvement con- nected with printing since the discovery of the art itself.”

The effort to secure for The Times the best attainable literary talent in all departments kept at least an equal pace with those which were directed towards the improve- ment of its mechanical resources. And thus it came to pass that a circulation which did not, even in 1815, exceed on the average 5000 copies became, in 1834, 10,000; in 1844, 23,000; in 1851, 40,000; and in 1854, 51,648. In the year last named the average circulation of the other

London dailies was—Morning Advertiser, 7644; Daily News, 4160; Morning Herald, 3712; Morning Chronicle, 2800 ; Morning Post, 2667.

Sir John Stoddart, afterwards governor of Malta, edited The Times for several years prior to 1816. He was suc- ceeded by Thomas Barnes, under whose management the great journal became famous for munificent reward of every kind of efficient service. The energy shown of late in the use of the railway and the telegraphic cable is no more marvellous than was the bringing of important news to London in 1834, at the rate of 15 miles an hour, for 400 miles. Unlike his most distinguished successor in the editorship, Barnes for many years wrote largely in his paper. When his health began to fail the largest share of the editorial work came into the hands of Captain Edward Sterling,—the contributor about a quarter of a century earlier of a noteworthy series of political letters signed "Vetus," the Paris correspondent of Zhe Times in 1814 and subsequent eventful years, and afterwards for many years the most conspicuous among its leader-writers.1 From 1841 to 1877 the chief editor was John Thaddeus Delane. It is known, on the best authority, that "he never was a writer; he never even attempted to write anything, except what he wrote better than most writers could do—reports and letters."2 But without writing, in the literary sense, a wonderful life's work was crowded into those six and thirty years. The result of that labour, combined with the labour of a most brilliant staff of contributors, was to make what already had grown to be the "favourite broadsheet " of the English public into that which is now wont to be described as the "leading journal of the world." Everything that is used in the production of The Times, except the printing paper, is made in its offices. Not only its own " Walter machines " -—able to print and perfect from 22,000 to 24,000 sheets in the hour—but those also which have been supplied to The Scotsman, The Daily News, The Liverpool Post, and The New York Times have been manufactured there. The editor's office in Printing-House Square is now in direct communication by special wires with his branch offices both in Paris and in Berlin. The parliamentary reports are sent to the office from the Houses through the telephone. The shorthand writer extends his notes in the usual way, and reads off the manuscript through the instrument. The recipient dictates the reports to the type setters. The manuscript follows the telephonic report, and the proofs are read by it. These several mechanical triumphs, in dl,

1 See Life of John Sterling, by Carlyle, who says of him at this time -——‘‘The emphatic, big-voiced, always influential and often strongly unreasonable Times newspaper was the express emblem of Edward Sterling. He, more than any other man, .. . was The Times, and thundered through it, to the shaking of the spheres,”

? The Times, 25th November 1879,

a preliminary outlay of at least £100,000. And that such experiments, on any like scale, became possible is due to the growth of advertisements. Of these, the first number of The Times contained fifty-seven, all brief ones. In recent days a number of The Tvmes has occasionally con- tained sixty columns—in one instance, at least, sixty- seven—of advertisements. The rates of charge vary, but upon a rough average it seems probable that the annual revenue from this source alone may considerably exceed £400,000. With such a fund in reserve—apart from the direct product by sale—it becomes easy to understand the otherwise amazing items of outlay known to have been incurred for telegrams, as, for instance, of £800 for reports of the results of the congress of Berlin, when The Times achieved the publication of the treaty almost at the instant of its signature. What the sale of the paper was upon that occasion is not publicly recorded. But when, in December 1861, it published a memoir of the lamented Prince Consort, 91,000 copies were sold. On occasion of the marriage of the prince of Wales a sale of 110,000 copies (at 44d.) was attained.

Of the many curious episodical incidents which occur in the public history of Zhe Times, one only can here be mentioned, In 1840 the Paris correspondent of the paper (Mr O’Reilly) obtained information respecting a gigantic scheme of forgery which had been planned in France, together with particulars of the examination at Antwerp of a minor agent in the conspiracy, who had been there, almost by chance, arrested. All that he could collect on the subject, including the names of the chief conspirators, was published by Zhe Times on the 26th of May in that year, under the heading “Extraordinary and Extensive Forgery and Swindling Conspiracy on the Continent (Private Correspondence).” The project contemplated the almost simultaneous presentation at the chief banking- houses throughout the Continent of forged letters of credit, purporting to be those of Glyn &

Company, to a very large amount ; and its failure appears to have been ina great degree owing to the exertions made, and the responsibility assumed, by Zhe Times. One of the persons implicated brought an action for libel against the printer, which was tried at Croydon in August 1841, with a verdict for the plaintiff, one farthing damages. A subscription towards defraying the heavy expenses (amounting to more than £5000) which Zhe Times had incurred was speedily opened, but the proprietors declined to profit by it; and the sum which had been raised was devoted to the founda- tion of two "Z%mes scholarships," in connexion with Christ's Hospital and the City of London School. Three years afterwards Z'he Times rendered noble public service in a different direction. It used its vast power with vigour—at the expense of materially checking the growth of its own advertisement fund—by denouncing the fraudu- lent schemes which underlay the "railway mania" of 1845.

For a long period after the establishment of The Times, no effort to found a new daily London morning newspaper was ever conspicuously successful. As time went on, many endeavours were made, at an aggregate cost, as respects those only that entirely failed, of at least £80,000.3 A measure of success followed the establishment ieee ann genes a Seniesa rR Hy

3 Conspicuous among these unfruitful attempts were—(1) The New Limes, started by Dr (afterwards Sir J ohn) Stoddart, upon his depar- ture from Printing-House Square; (2) The Representative, established by John Murray, under circumstances which seemed at the outset exceptionally promising; (3) The Constitutional, begun in 1836 and carried on for eight months by a joint-stock company, exception- ally favoured in having for editor and sub-editor Laman Blanchard and Thornton Hunt, with a staff of contributors which included Thackeray, Douglas Jerrold, and Bulwer; (4) The Morning Star, founded in 1856, and kept afloat at a cost (it is credibly reported) of,

Morning Adver- tiser.

Daily News.

Stand- ard,

Daily Tete- graph.

London evening papers.

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(1794) of The Morning Advertiser, under special circum- stances. It was the joint-stock venture of a large society of licensed victuallers, amongst whom subscription to the paper was the condition of membership. For nearly sixty years its circulation lay almost entirely in public-houses and coffee-houses, but amongst them it sold nearly 5000 copies daily, and it yielded a steady profit of about £6000 a year. 'Then, by the ability and enterprise of an experi- enced editor (James Grant), it was within four years raised to a circulation of nearly 8000, and to an aggregate profit of £12,000 a year.

Setting aside mere class-journals like The Financier and The Sportsman, the only existing London morning news- papers which have been founded during the present century are The Daily News (21st January 1846), The Daily Tele- graph (29th June 1855), and The Standard (29th June 1857). The lowest of the three in the point of circulation has attained an average issue of 170,000 copies; the highest has reached (by notarial certificate) to an average of about 242,000. In 1856 no London newspaper of any kind was recorded to have reached a higher average circu- lation than 109,106 copies (attained in 1854 by the weekly News of the World); no daily newspaper had exceeded an average of 51,648 copies (attained in the same year by The Times), its next highest competitor, Zhe Morning Advertiser, reaching an average sale of only 7644 copies.

The Daily News became a penny paper in 1868. The great stride in its circulation did not come until 1870, when lavish use of the electric telegraph, combined with the great powers of a brilliant war correspondent, are said to have lifted the sale in a week from 50,000 copies to

150,000.1

Originally an evening paper, established in 1827 as the express organ of the opponents of the measure for the removal of the Roman Catholic disabilities, The Standard was at first edited by Dr Gifford. From the

beginning it showed marked literary ability, but its commercial success was small. When sold to James Johnson its fortunes rapidly improved. He made it both a morning and even- ing journal, reduced its price to a penny, and gave it a thoroughly good organization. Occasionally, in 1870, the evening sale reached 100,000 copies. In 1882 the aggre- gate circulation, morning and evening, was certified to average 242,062 copies.

The Daily Telegraph was originally founded by Colonel Sleigh, and fora few and unprosperous years was edited by Henry Barnett. It attained no success until a change of ownership placed it under the editorial care of Edward Lawson. In 1882 its certified average daily circulation exceeded 241,900 copies.

London possessed no daily evening paper until 1788, nor did any cvening paper attain an important position until the period of the war with Napoleon, when The Courier (established in 1792) became the newspaper of the day. For a few years its circulation exceeded that of The Times. The average amounted during the last three years of the war to 10,000 copies daily, a circulation not till then known to have been attained by any daily paper. Mack- intosh, Coleridge, and Wordsworth were amongst its stated contributors, Out of an article in Zhe Courier, from the from first to last, some £80,000, until 1870, when it merged in The Daily News; (5) in 1867, The Day, which lived only six weeks; (6) in 1873, The Hour, which had an existence of three years; (7) in 1878, The Daily Express, an almost instant failure, although edited with mueh ability. Against these seven disastrous ventures, extending over nearly the whole of the present century, there are to be set but three successful ones,—disregarding papers of a strietly commercial sort, and also, of eourse, those teeming loeal and suburban journals whieh are chiefly advertising organs, and of which only one, The Clerkenwell Daily Chronicle, has sueceeded in establishing itself as a

London morning paper of the usual type. 1 Hatton, Journalistic London, 1881.

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pen of the last-named, grew the famous pamphlet on the convention of Cintra. Among the successive editors of The Courier were Daniel Stuart, William Mudford, Eugenius Roche, John Galt, James Stuart, and Laman Blanchard. In 1827 one twenty-fourth share in the property is said to have brought 5000 guineas. But changes of editorship and keen competition were fatal to a paper that had rendered brilliant public service in its day, and for a time had headed the newspaper press of London.

The metropolis has now seven evening papers, one of which—T7he Shipping and Mercantile Gazette—is exclusively commercial. Whilst, of the distinctively political morning journals, four are Liberal and only two Conservative, of the six political evening ones, four are Conservative (Globe, dating from 1803; Evening Standard, 1827; St James's Gazette, 1880 ; Hvening News, 1881) and two are Liberal (Pall Mall Gazette, 1865 ; and The Echo, 1868). The last- named was the first London newspaper published at a halfpenny.

The London weekly press has always worn a motley garb. London Weekly publication facilitates the individuality of a journal, both weeklies,

as respects its editorship and as respects the class of readers to which it more especially addresses itself. From the days of Daniel Defoe to those of Albany Fonblanque and Robert Rintoul there have always been newspapers bearing the unmistakable impress of an individual and powerful mind. When to great force of charac- ter in the writer and its natural result, an almost personal intimacy between writer and reader, Governments have been unwise enough to add the strength which inevitably grows out of persecution, the combination might well prove a formidable one. Cobbett's Weekly Register affords perhaps as striking an illustration of journalism in its greatness and in its meanness as could be found throughout its entire annals. And Cobbett's paper has had many successors, some of which, profiting by the marvellous mechanical appliances of the present day, have attained a far wider popular influence than was possessed by the Weekly Register in its most prosperous days.

The Observer dates from 1792, and was conducted by one editor— Mr Doxat—for more than fifty years. It early distanced its com- petitors ; its expenditure was lavish, and its profits large. There is record that the issue of

The Observer which contained a report of the coronation of George IV. (published in two parts, each of them with a fourpenny stamp) attained a circulation of 60,000 copies, and that there was paid to the Govcrnment for that week's issue about £2000 of stamp duty.?

The late well-known Examiner was founded in 1808, and had a career as one of the most prominent organs of the Liberals of nearly seventy years. 'That its literary reputation was great resulted naturally from a succession of such editors as Leigh Hunt, Albany Fonblanque, John Forster, and Professor Henry Morley. It had in its later days a distinguished competitor in the Speetator, founded (July 1828) and for more than thirty years edited by Robert Rintoul.

Strikingly in contrast with newspapers of this class stand two which have much in common besides their identity of title and their extraordinary circulation—Lloyd's Weekly Newspaper and Reynolds's Weekly Newspaper. The former started as an unstamped illustrated journal at a penny in September 1842. In 1843 it was enlarged in size; and the price raised to threepence. Curious ingenuity was shown in advertising it by all sorts of expedients. Amongst others, all the pennies its proprietor could lay his hands on were embossed, by acleverly constructcd machine, with the title and price of the new journal. The Times soon drew attention to this defacement of the queen's coin, and so gave a better advertise- ment still. Fron a weekly sale of 33,000 in 1848 it rose to 170,000 in 1861. In anticipation of the abolition of the paper duty, the price was then reduced toa penny. The circulation became 347,000 in 1863 ; in 1865 it rose to 412,080. The skill of the American machine-makers was now put to a test whieh produced for this paper Hoe's first great web-machine,—adopted immediately after- wards by The Daily Telegraph and The Standard. In 1879 the weekly sale of Lloyd's Newspaper was certified to average 612,902 copies. Reynolds's Weekly Newspaper, which has also a large circu- lation, dates from May 1850.

Of the illustrated papers The Illustrated London News is the oldest, and has the largest circulation (about 95,000). Besides its pictorial merits, it has long been notable for its obituary notices and its abstracts of wills. It was founded in May 1842. The Graphic (commenced in December 1869) has

attained eonsiderable reputation for its literature as well as for its engravings. Zhe Pictorial World dates from March 1874.

2 «The Newspaper Press," in Quarterly Review, October 1880.

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parative daily newspapers was 15; it is still (in 1883) only 18.

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Nearly thirty years ago (in 1855) the total number of oe he

statistics. total number of London newspapers of all kinds increased

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from 89 in 1855 to 386 in 1883. In 1855 the total number of provincial newspapers published throughout the United Kingdom was 560; in 1883 it was 1576. The whole number of daily newspapers in the provinces at the former date was but 13; at the latter it was 162. This vast growth is due in the main to altered legislation rather than to altered economic conditions. Some account must now be given of the Government restrictions on the British newspaper press, commencing with the Stamp Act of

1712.

In 1756 an additional halfpenny was added to the tax of 1712. In 1765 and in 1773 various restrictive regulations were imposed (5 Geo. III. e. 46, and 13 Geo. III. c. 65). In 1789 the three- halfpence was increased to twopence (29 Geo. III. c. 50), in 1797 to twopence-halfpenny (37 Geo. III. e. 90), in 1804 to three- pence-halfpenny (44 Geo. III. c. 98), and in 1815 to fourpence, less a discount of 20 per cent. Penalties of all kinds were also increased, and obstructive regulations were multiplied. In the course of the struggle between this constantly enhanced taxation and the irrepressible desire for cheap newspapers, more than seven hundred prosecutions for publishing unstamped journals were insti- tuted, and more than five hundred persons were imprisoned, some-

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£31,287. In the year ending 9th January 1838—the first complete year of the reduced duty—the number of stamps issned was 53,897,926. The gross amount of duty was reduced to £228,425 (English, £182,998; Scottish, £18,671; Irish, £21,756).

The results of the reduction surpassed all that had been predicted by its promoters. Yet the total abolition came only in 1855. In the year ending 5th January 1855 the number of penny stamps issued to newspapers was 107,052,053, and the gross amount of duty £446,050. The details are as follows :—

[ENGLAND.

Number of Newspapers Stamped.

Penny Stamps issued to News- papers.

Gross Amount of Duty thereon.

Hneland) eecenee

87,930,085 1,107,434 9,112,245 8, 902, 289

412 £366,375 7 1

4,614 6 2 37,967 13 9 37,092 17 5

107,052,058

£446,050 4 5

At the same date the following newspapers (all weekly except The Times and Advertiser) stood highest as regards circulation and consumption of stamps:—

times for considerable periods. As the prosecutions multiplied and

the penalties became more severe, Poor Man's Guardians, Demo- Name and Date of Establishment. Penny Stamps | Average crats, Destructives, and their congeners multiplied also, and their egal Cireulation. revolutionary tendencies increased in a still greater ratio. Blas- : Z

phemy was added to sedition. Penny and halfpenny journals were aap wae ee (1843) by gee ee) cee established which dealt cxclusively with narratives of gross vice and Tits tivsted! Londen Nowe (1849) ees 56 o7 866 | 108/098 crime, and which vied with each other in every kind of artifice to Telovd's WeEklv Newertiner (1842) ce 5.572, 897 107 1 1 inake vice and crime attractive. Between the years 1831 and 1835 Werkl Times (1847). Ns ates 3902169 oie many scores of unstamped newspapers made their appvarance. Ravn ol ds's Wi aldlic. Nicks aper (1850) 9. 496 256 be Papers such as those enumerated above swarmed from presses that M Ue ay ee y 179 * 9° 39278 0 7 644 seemed to rival, in their mysterious itinerancy and sudden vanish- Weekly Di 'i fy ECA Jee ereeeeeeees 1982933 38° 13 ings, the famous Marprelate press of the 16th century. The politi- egg re ape 23 cesses eae, ,1838

cal tone of most of them was fiercely revolutionary. Prosecution followed prosecution; but all failed to suppress the obnoxious publications.

To the late Lord Lytton is due the credit of grappling with this question in the House of Commons in a manner which secured the speedy reduction of the tax from fourpencc to a penny, and paved the way for its subsequent though long-delayed abolition. The reduction to a penny took effect on the 15th September 1836. At that date the number of newspapers stamped in Great Britain and Ireland was about 36,000,000 in the year, and the gross amount of duty upwards of £553,000. Of this sum Enghsh newspapers

paid £473,910, Scottish newspapers £47,999, Irish newspayers

The measure for the final abolition of the stamp tax was substan- tially prepared by Mr Gladstone during his chancellorship of the exchequer in 1854, but was introduced into the House of Commons by his successor in 1855. The second reading was carried by a mnajority of 215 to 161. In the House of Lords uno division took place. To enable the reader to appreciate the legislation of June 1855, we give here the aggregate circulation of

newspapers, as shown by the number of stamps issued and as compared with the growth of population, at various periods during the century pre-ceding the abolition of the stamp duty, and also the figures for the first year after the abolition took efiect.

Tabular View of the Aggregate Issue of Stamped Newspapers from 1753 to 1854.

oF eee

Population, Chief Politieal Events or Topies of the Year. Number of Stamps Issued. Rate of Duty (Net). 1753 | England……. 6,186,366 7AM 1$d. 1760 Li © Seen 6,479,730 ae aus Eugland.«:..... 9,464,790 ¥ 1790 DOP a cicsss ss. 8,540,738 | French Revolution…….....0..0.00- 14,035,639 2d. 1801 | Great Britain…. 10,942,646 | War with Napoleee. 2h. c-cscates…08) 16,085,085 Ne 1806 e Ee a Bos ON ae ee | 20,532,793 3d. 1811 | Great Britain…. 12,596,803 Oo neon ee + Great Britain..{ 24,424,718 Ae HE 2) – mis Defeat of Napeleon:.....0…-.+.0 L 26,308,003 + 1815 cas Waterloo compaiin., ...0….

1834 34,748,922 49

1835 a o = | 35,823,859 1836 Stamp Duty reduced to One Penny 39,423, 200 Tremere SL * 1837 First Year of Penny Stamp……..... 58,897,926 ” 1838 he Se st ‘ Great Britain { 53,680,880 a 1839 oo Ae s CUBIS QRTATION «2… .c…c.cssenes and Ireland. 58,981,078 1841 | United Kingdom 27,036,450 Ss = | 60,759,392 ” ce a te a“ Corn Lawaeidetion®..... } | le = 4 1846 Repeal of the Corn Laws……..... | 83,074,638 , 1847 Hamine ain irate es. << 5..cc.0ecessssceie: 82,380,875 » 1848 European insurrections……..... 86,465,684 » 1849 ae = 4 84,069,472 98 1851 | United Kingdom 27,724,849 sai aC 91,600,000 ” 1854 = Her a Wrartwith@Russta). 2. ..c.c.-sssee-e01 osc 00. OS srs) x – os J \ 39,184,474) Optional Stamp.

1 Inclusive of prices current, trade lists, &c., and of halfpenny stamps for supplements.

ENGLAND. |

It will be observed that for several years in the earlier part of this eentury the aggregate circulation remained very steady—almost stationary—at about 24,000,000 copies, and that, after a gradual increase within a few years to 30,000,000, the politieal excitements of the years 1830-82 raised the aggregate to very nearly 38,000,000. Making allowance for the mere trade-lists, this number came to be more than tripled in 1854.

The number of newspapers established from the early part of 1855, when the repeal of the duty had beeome a certainty, and continuing in existence at the beginning of 1857, amounted to 167, —80 started in 1855, and 27 in 1856; 26 were métropolitan, and

and attained considerable success, chiefly as advertising sheets, and as sometimes the organs, more often the crities, of the loeal vestries and other administrations. There are now (1883) 128 of these local papers. One ofthem, The Clerkenwell News and Daily Chroniele, so prospered in the commercial sense, being crowded with advertise- ments, that it sold for £30,000, and was then transformed into the London Daily Chroniele (28th May 1877). In the hands of its new owner—the proprietor of Lloyd's Weekly News—its eirculation in- creased fivefold within a year. Another conspicuous result of the legislation of 1855 was an enormous iucrease in the number and influence of what are known as ''class papers," and as professional]

81 provincial. Of the latter, the majority belonged to towns which | and trade papers. possessed no newspaper whatever under the Stamp Acts, and the The history of the provincial press of England begins with the Pro- price of nearly one-third of them was but a penny. In some cases, | year 1690, and with a weekly newspaper which still exists, The vineial. however, a portion of these new cheap papers of 1857 was printed | Woreester Postman, now known as Berrow's Worcester Journal. press of in London, usually with pictorial illustrations, and to this was | But the real development of provincial journalism, as a power co- England. added a local supplement containing the news of the district. ordinate with that of London, dates only from 1855 ; although there wo,. The total number of the newspapers published throughout the | were many newspapers issuing from country

presses here and there United Kingdom at the beginning of 1857 was 711. They may be | —at least from the later years of thelastcentury—which were marked classified as follows :— by originality of character and by considerable literary skill. Worcester has now four weekly and two dailynewspapers. Stamford Stamford.

eester.

England g 3 followed next after Worcester by the establishment of its Mereury : 3 sa. in 1695. This also is still published under the title of The Lincoln, Newspapers oi St ee a eee Rutland, and Stamford Mereury. Next to The Stamford Mercury

i Pa a.) 3.) @ see). caine The Norwich Postman, first published in 1706 in small quarto, Norwich. ee ee ee Le aM (cel hl Lal (A and of meagre contents. The stated price of this paper was a Liberal politics……. 40 | 134 7 | 66] 38 4 |9g9| | penny, but its proprietor notified to the public that "'a halfpenny Nimcerdic…-.....8 3| | 1s not refused." 'I'wo other papers were started in Norwieh within Ronucskege… 2 ors., 20 90 5 6| 38 4 1173 a few years afterwards,—The Cowrant in 1712, and The Weekly antral Eee Sg 33 | 131 7 | 30| 35 5 |246| | 2lereury or Protestant's Packet (which still exists) in 1720. Norwich aad ty ate ich, | ee has now seven other weekly and, in addition, two daily papers.

K 2 Nottingham follows in 1710 with its Cowrant, now The Nottingham Notting-

PORE BUDE Ait sca ci Veale Nic Schad Makes Ziewie. and a daily paper. Nottingham has now in all (oem datly ham.

and three weekly newspapers. The Neweastle Courant followed New-

If these newspapers be classified according to their dates of first | in 1711 ; Newcastle has now five weekly and five daily journals. eastle.

— SS

publication, the enumeration will run thus :—

England. ; s a | %

Date of First Publication. Metro-| Pro- By 3 z a ae 2 politan.|vincial.| & | 8 | = |E2! &

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+ 1791 ,, 1800 6 9 3 aie (iy aes

- TOr ,, £810 3 14 S 6 Gi) cc |) oe

re 1811 ,, 1820 2 ly a 6 4 4 | 32

a HS21) 5,- 1830 ih 20 al | 13 3 | 49

ee Iso ,,’ 1840) 18 50 2 1 6 | 19 1/101

Ss Weal”, 1850 27 47 A 29) 27 ||... | tse

= WS5l ,, 854) 10 76 oe ale |e 1 | 116 ln 1855 13 67 4) 21 9 2 1116

as 1856 12 15 2 fi 3 il, ee) POM SOR LM ac. cece iris s oveose ves we oe hee Wdlee: 7 Total number…... 101 B13) | HS AT, ES! lal

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The decrease in the number of newspapers which passed through the post-office in the year 1855 (during exactly one-half of which the eompulsory stamp had been abolished) amounted to about one- fourth of the aggregate number which had been posted in the pre- ceding year. During the six months of the optional stamp the money received for impressed stamps was about £93,000, and that for postage stamps affixed on newspapers about

£25,000. In the year 1856 the number of newspapers which passed through the post-office was nearly 71,000,000,—about three-fourths bearing the impressed stamp and one-fourth franked by the ordinary postage stamps. The total gross revenue was therefore about £295,833. Prior to the abolition of the compulsory stamp the average weight of the newspapers passing through the post-office was three ounces and a half; in 1857 the average weight fell to about two ounces and three quarters. The reduction was due to the increase of the small and eheap papers. It was understood that The Times, at that date, stamped about 40 per cent. of its entire impression, the daily average of which then exceeded 60,000.

Amongst the earliest results of the change in newspaper law made in 1855 was the establishment in quick succession of a series of penny metropolitan local papers, chiefly suburban, of a kind very different from their unstamped forerunners. They spread rapidly,

1 The figures in the table are from the parliamentary returns. Mr Grant (History of the Newspaper Press, vol. ii. p. 321) states the cir- culation for 1831 at 38,649,314 copies, founding upon figures quoted in the House of Commons in 1864 by Mr Edward Baines,

The Courant continues to be the farmers' paper of the north; for almost a hundred and eighty years it has had but seven successive proprietors ; in politics it is independent. The Daily Journal is an organ of the Conservative party, dating as a weekly paper from 1832, asa daily one from 1861. Zhe Chronicle holds a like position

on the Liberal side. The Liverpool Courant dates from May 1712. Liverpool.

It lasted a very short time, and had no successor until May 1756, when The Liverpool Advertiser appeared ; Gore's General Advertiser followed in 1765, and continued until 1870. Liverpool has now (1883) eight daily and five weekly journals. There are, besides, commercial gazettes and a European Times published irregularly. The Hereford Journal dates from 1718, is of Conservative polities, and is noted for its fulness of local reports. The Hereford Times was established in 1832, and claims to be ‘‘the largest newspaper in the world,” containing regularly 112 columns, with

frequent supplements. Its merits are such that it holds its ground at the price of 34d. against a competitor at 2d. and two at 1d. The four papers of Hereford are all weekly.

The Salisbury Postman was the first newspaper started in that Salisbury.

city. It appeared in 1715, and its first number was the earliest first number of a provincial newspaper that the researehes of the committee of the Caxton Centenary of 1877 enabled them to ex- hibit at South Kensington. It was followed by The Salisbury

Journal of 1729, which continues to appear. Bristol journalism Bristol.

began with Felix Farley's Journal in 1715, which merged into The Bristol Times (1735), and both were conjoined with The Bristol Mirror (weekly from 1773) to form The Daily Bristol Times and Mirror of January 1865. In journalism as in much else Bristol contrasts curiously with its northern rival. Liverpool had no really established newspaper until 1756. It now (in 1883) pub- lishes seventeen papers (reckoning those which are printed to aceom- pany the outgoing mails), while Bristol has only seven, including the little visitors' paper of Clifton.

The Kentish Gazette dates from 1717, but was first published Canter- under the title of Kentish Post. Canterbury has now seven papers, bury.

one of which appears twice a week; the others are of weekly issue.

The Leeds Mereury was established in 1718, and, for the purpose Leeds.

of evading the Stamp Act, was made to extend to twelve pages small quarto (or a sheet and a half,—the stamp being then levied only on papers not exceeding a single sheet). Like its contempor- aries it was published weekly, and its price was three-halfpence. In 1729 it was reduced to four pages of larger size, and sold, with a stamp, at twopence. From 1755 to 1766 its publication was sus- pended, but was resumed in January 1767, under the management of James Bowley, who continued to conduct it for twenty-seven years, and raised it to a circulation of 3000. Its price at this time was fourpence. The increase of the stamp duty in 1797 altered its price

to sixpence, and the circulation sank from 3000 to 800. It was purchased in 1801 by Edward Baines, who first began the in- sertion of ‘‘leaders.” It took him three years to obtain a eireu- lation of 1500; but the Merewry afterwards made rapid progress, and became ono of the most important and valuable of the country

Exeter.

Man- chester.

Birming- ham,

Cam- bridge.

Oxford.

Wales.

Aggre- gate for England and Wales.

Scotland.

papers. It is now published both as a daily and asa weekly paper. Leeds has now four dailies and six weeklies.

Journalism in Excter began in the same year as in Leeds, and, somewhat singularly, with three newspapers, all of which in the first year of existence became the subject of debate in parliament. The western capital was then fiercely political. Its journals took the freedom of commenting on proceedings in parliament, and the three editors—those of The Exeter Merewry, The Protestant Merewry, and The Postmaster or Loyal Mercury—were all summoned to the bar of the House of Commons.1 The incident is curious as showing that each of the three represented a rival MS. news- letter writer in London. , eed

The following year (1719) saw the beginnings of journalism in Manchester, originating with The Manchester Weekly Journal, The Manchester Gazette

followed in 1730, and lasted until 1760. Then, in 1762, came Joseph Harrop's Manchester Mercury, which had a stormy life, but continued to appear until 1830. In 1867 Manchester had three daily papers and four weekly ones ; now it has six dailies (two Conservative, two Libcral, and two ncutral) and seven wecklics.

The earliest of the Birmingham newspapers dates from 1741, when Aris's Gazette (still in course of publication) began its career. It seems to have had no competitor, of any lengthened existence, until the establishment in 1836 of The Midland Counties Herald. The daily press of Birmingham begins with the year 1857, and with Zhe Birmingham Post. There are now three daily papers and nine weeklies, exclusive of Zhe Midland Sporting News, pub- lished twice a day, but relating only to its special subject. Of the other papers six are neutral, four Liberal, two Conservative.

The newspapers of Cambridge begin with the Chroniele of 1744, still extant. The Radical Intelligencer of the later years of the last century, conducted by Benjamin Flower, and notable in the history of press prosecutions, is said to have been the first provincial paper in England for which original leading articles on the political topics of the day were written. But it would need a far-reaching ex- amination of scattered collectious and files of newspapers preserved in editorial offices—the collection, large as it is, in the British Museum is quite inadequate to the inquiry—to warrant any absolute assertion on that point.. Cambridge has now three weekly news- papers (one Liberal, one Conservative, one ncutral), exclusive of those university organs which appear only during term. Oxford journalism begins, strictly speaking, with Mercurius Aulicus? (1648, see p. 414, above), but the carliest really local newspaper is Lhe Oxford Journal of 1753, still in existence. The city has in all (exclusive, as above, of university ones) four weekly papers, three of which are Conservative organs.

The earliest existing newspaper of Wales is Zhe North Wales Chronicle, published at Bangor, which began to appear in 1807. The entire newspaper press of the principality numbcred in 1850 nine journals, in 1873 sixty, in 1883 seventy-five. Of these eleven are printed in Welsh ; one of them, Y Llana'r Dywysogacth describes itself as "the only" church and state Welsh

newspaper. Of the English-printed papers, thirteen are described as Conscrva- tive, twenty-seven as Liberal, the remainder as being either "neutral" or "independent" in respect of politics.

The aggregate number of provincial newspapers in England and Wales was in the year 1782, 50; in 1795, 72; im 1846, 228; in 1866, 773; in 1868, 797; in 1870, 848; in 1872, 948; in 1874, 973 ; in 1876, 1047 ; in 1878, 1075; in 1879, 1088: in 1880, 1130 ; in 1881, 1163; in 1883, 1219. In respect of political character the 1163 papers of 1881 have becn approximately classified thus :— Liberal, 385 ; Conservative, 302; neutral or independent, 476.

The first newspaper purporting by its title to be Scottish (The Seotch Iutelligencer,? 7th September 1643) and the first newspaper actually printed in Scotland (Mereurius Politicus, published at Leith in October 1653) were both of English manufacture,—the one being intended to communicate more particularly the affairs of Scotland to the Londoners, the other to keep Cromwell's army well acquainted with the London news. The reprinting of the Politieus was transferred to Edinburgh in November 1654, and it continued to appear (under the altered title Mercwrius Publicus subsequently to April 1660) until the beginning of 1663. Meanwhile an attempt

1 Journals of the House of Commons, xix. 30, 48, 1718.

2 Mr Grant (Newspaper Press, vol. iii. p. 193) says, very singu- larly :—" Though printed in Birkenhead, the Mercurius Aulicus was not published there. It was avowedly printed for a bookseller hear Queen's College, Oxford. ... Unfortunately there are no copies in the British Museum." The set of Mercurius Aulicus in the British Museum is, however, very complete, and has some useful MS. notes of dates, but no mention of any "Birkenhead," except the stout old cavalier Sir John.

3 This was followed by The Seotch Dove, the first number of which is dated "September 30 to October 20, 1643," and by The Scottish Mercury (No. 1, October 5, 1643). In 1648 a Mercurius Seotious and a Afercurius Caledonius were published in London. Zhe Scotch Dove was the only one of these which attained a lengthened existence.

NEWSPAPERS

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by Thomas Sydserfe to establish a really Scottish newspaper, Mercurius Caledonius, had failed after the appearance of ten numbers, the first of which had been published at Edinburgh on the 8th of January 1660. It was not until March 1699 that a Scottish news- paper was firmly established, under the title of The Edinburgh Gazette, by James Watson, a printer of eminent skill in his art.4 Before the close of the ycar The Gazette was transferred to Jolin Reid, by whose family it long continued to be printed. In February 1705 Watson started Zhe Kdinburgh Courant, of which he only published fifty-five numbers. He states it to be his plan to give *‘most of the remarkable foreign news from their prints, and also the home news from the ports of this kingdom, ... now altogether neglected.” The Cowrant appeared thrice a week. Upon complaint being made to the privy council concerning an advertisement inserted after the transfer of the paper to Adam Boig, the new printer presented a supplication to the council in which he expressed his willingness ‘that in all time coming no inland news or advertisements shall be put into the Cowrant, but at the sight and allowance of the clerks of council.” In 1710 the town council authorized Mr Daniel Defoc to print The Edin- burgh Courant in the place of the deceased Adam Boig. Four years earlier the indefatigable pioneer of the Scottish press, James Watson, had begun the Scots Cowrant, which he continued to print until after the year 1718. To these papers were added in October 1708 The Edinburgh Flying Post and in August 1709 The Scots Postman. Five years later this paper appears to have been incor- porated with The Edinburgh Gazette, and the publication ap- peared twice a week, as it still continnes to do in 1883, as the Government gazette for Scotland. Zhe Caledonian Mercury began April 28, 1720. At one period it was published thrice and after- wards twice a weck. Its first proprietor was William Rolland, an advocate, and its first editor Thomas Ruddiman. The property passed to Ruddiman on Rolland’s death in 1729, and remained in his family until 1772. It is curious to notice that in his initiatory number of April 1720, Rolland claimed a right to identify his Afer- cury with that of 1660. This journal, he said in his preface to the public, ‘‘is the oldest [existing] in Great Britain.” And his suc- cessor of the year 1860 followed suit by celebrating

the ‘‘second centenary” of The Caledonian Mercury. He brought out a fac-simile of No. 1 of Mcrewrius Caledonius (January 1660), in its eight pages of small quarto, curiously contrasting with the great donble sheet of the day. But sixty years is a long period of suspended animation, and the connexion of the two newspapers cannot be proved to be more than nominal. The Caledonian Mercury was the first of Scottish journals to give conspicuous place to literature— foreign as well as Scottish. In ‘the ’45” once of its editors, Thomas Ruddiman, junior, virtually sacrificed his life,5 and the other, James Grant, went into exile, for the expression of conscientious political opinion. Its publication ceased after an existence of more than one hundred and forty years.

Notwithstanding the positive assertion® that The Edinburgh Courant and The Edinburgh Evening Courant ‘were entirely different journals, and never had any connexion whatever with each other,” the proprietors of the existing Cowraut assert a substantial identity, and obviously upon better grounds than those for which identity used to be claimed for The Caledonian Mercury with Mer- curtus Caledonius. The grant by the town council of Edinburgh in December 1718 of a licence to James M ‘Ewan to print an Evening Courant three times a week appears to have been really a revival, in altered form, of the original Courant, repeatedly referred to in earlier, but not much earlier, records of the same corporation. So revived, The Evening Cowrant was the first Scottish paper to give foreign intelligence from original sources, instead of repeating the advices sent to London. In 1780 David Ramsay became its pro- prietor. Under his management it is said to have attained the largest Scottish circulation of its day. It was then of neutral politics. Of late years, returning to its original title, and appearing as a daily morning paper, it has ranked as the senior organ of the Conservative party in Scotland.

4 Watson was the printer and editor, but the person licensed was James Donaldson, merchant in Edinburgh (‘ Act in favors of James Donaldson for printing the Gazette,” March 10, 1699, published in Miscellany of the Maitland Club, ii. 232 sq.). Arnot, in his Zistory of Edinburgh, mentions as the second of Edinburgh newspapers— intervening between Mercurius Caledonius and the Gazette—a King- dom’s Intelligencer. But this was a London newspaper, dating from 1662, which may occasionally have been

reprinted in Scotland; no such copies, however, are now known to exist. In like manner The Scottish Mercury, No. 1, May 8, 1692, appears to have been a London newspaper based upon Scottish news-letters, although in an article written in 1848, in the Scottish Journal of Topography, vol. ii. p. 308, it is mentioned ag an Edinburgh newspaper.

> During an imprisonment of six weeks in the Tolbooth of Edin- burgh his health suffered so severely that he died very shortly after his release.

§ Grant, Wistory of the Newspaper Press, 1878, iii. 412,

IRELAND. |

The Edinburgh Weekly Journal dates from 1744, but it only attained celebrity when, almost seventy years afterwards, it became the joint property of Sir Walter Scott and of James Ballantyne. Scott wrote in its columns many characteristic articles. Ballantyne edited it until his death in 1833, and was succeeded in the editor- ship by Thomas Moir. The paper was discontinued about 1840.

The Seotsman was established as a twice-a-week paper in January 1817, and became a daily in June 1855. It has always ranked as the chief organ of the Liberal party in Scotland. The proprietor- ship continues to be in the family of William Ritchie, by whom, in conjunction with Charles Maclaren, the paper was founded. For a short period it was edited by J. R. M‘Culloch, the eminent political economist. He was succeeded by Maclaren, who edited the paper until 1845, and he in turn by Alexander Russel, who coutinued to conduct it with great ability until 1876. In 1854 its average circulation was 3451 copies. In 1859 the first of Hoe’s rotary machines brought into Scotland was erected for The Scotsman, and the productive power was raised from 1500 in the hour to 7500.

The North British Advertiser, founded in 1826, had in 1854 an average circulation of 15,423 cdpies,—the greater part of the issue distributed gratnitously. The Witness began in 1840 as the avowed

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men" in 1768, and its first editor was Dr Lneas. Flood and Grattan were at one time numbered amongst its contributors ; although the latter, at a subsequent period, is reported to have exclaimed in his place in the Irish parliament, 'the Freeman's Journal is a liar, ... a public, pitiful liar." The relations between the journalism and the oratory of Ireland have been not unfrequently of this stormy character. Dublin has now six daily papers and fifteen others, mostly appearing once or twice a week. It had in 1875 eight dailies and seventeen weeklies.

Watcrford possessed a newspaper as early as 1729, entitled The Waterford Flying Post. It professed to contain ''the most material news both foreign and domestic,'' was printed on common writing paper, and published twice a week at the price of a halfpenny. The paper of earliest origin now published in Waterford is The Waterford Chronicle, which dates from 1766. The Belfast News- Letter was started in 1737, and still flourishes.

In all Ireland the number of daily papers was 19 in 1875, and in 1883 only 16. The number issued once or twice a week was in the former year 118, in the latter 131. There are five other news- papers of varying periodicity, making an aggregatc, in 1883, of 152. The total increase since 1862 is 18, the inerease in Scotland during the same period having been 45.

organ of what specdily became the Free Church party in Scotland. In its first prospectus it calls itself The Old Whig. The paper appeared twice a week, and its editor, Hugh Miller, very soon made it famous. In the course of less than sixteen years he wrote about a thousand articles and papers, conspicuous for literary ability, still more so for a wide range of acquirement and of original thought, most ofall for deep conscientiousuess. It survived its first editor's lamented death (1855) only a few years. Edinburgh has now five daily and six weekly papers.

In Glasgow the lead is taken by the Glasgow Herald (Independ- ent), the greatest advertising medium in Scotland. Founded in

The newspaper press of the Isle of Man dates only from 1821. Isle of The island possesses six journals in 1883, one of which, The Jfona Man. Daily

News, appears daily from July to September.

The Gazette de Guernsey—carliest of existing Channel Island Channel newspapers—dates from 1788 ; the Chronique de Jersey from 1814. Islands. Guernsey has in all seven papers, and Jersey eight.

An Act of Parliament of 1869 (82 & 33 Vict. c. 24), entitled British

An Act to Repeal certain Enactments relating to Newspapers," news- simplified the process for discovering the names of proprietors and paper publishers, but until the year next following (1870) the establish- legisla- ment of a newspaper still required compliance with most of the tion.

1782, it has risen gradually to the level of the great metropolitan newspapers. The North British Daily Mail (Liberal), the oldest daily in Scotland, was established in April 1847. George Tromp, its first editor, made it specially famous for the organizing skill with which he brought his intelligence at an unprecedented rate of speed from Carlisle, the nearest point then eonnected with London by railway.! Glasgow has now six daily newspapers and thirtecu of weekly issue.

The earlicst in date of the provincial newspapers of Scotland is The Aberdecn Journal (Couservative), founded as a weekly paper in 1748, and a daily from 1876. The Aberdeen Daily Free Press (Liberal), originally a weekly, dates from 1853. The Dundee Advertiser (Liberal) was established in 1801.

The aggregate number of Scottish journals—metropolitan and provincial together—79 in 1846, had grown in 1866 to 188, in 1876 to 164, and in 1883 to 184. Taken as a whole—in regard as well to literary character and scope as to the specially industrial characteristics of journalism—they occupy at least an equal rank with the best journals of the leading provincial towns of Kugland, whilst the metropolitan press of Scotland ranks exceptionally high. A very large number of the men who have distinguished themselves by their labours on the great newspapers of London, and several who rank as founders of these, began their career, and have left their mark, on the newspapers of Scotland.

Ireland's True Diurnal (1642), Mercurius Hibernicus (1644), The Irish Courant (1690), are all of them London newspapers containing Irish news. The newspaper press of Ireland begins with The Dublin News-Letter of 1685, just at the close of the lien- tenancy of the illustrious duke of Ormond.? Five years later appeared the Dublin Intelligencer (No. 1, September 30, 1690). Both of these were short-lived. Pue's Occurrences followed in 1700,

regulations of the 6 & 7 Will. IV. c. 76. In that year, by the Act 33 & 34 Vict. c. 32, the (until then optional) stamp duties on newspapers were wholly repealed, and their postal transmission became subject only to the regnlations of the post-office. It is now subject, under the Post-Office Act of 1870, to an annual registration with a fee of five shillings, and without such annual registration a newspaper can pass through the post only at the book rate of postage. In 1881 the registration of newspapers in order to the enforcement of responsibility for libel passed to the office of the registrar of joint-stock companies (44 & 45 Vict. c. 60).

Authorities.—Miscellaneous newspapers in the Burney, Stamp-Office, and other collections of the British Museum, and in the Hope collection and miscellaneous colicetion of the Bodleian at Oxford; Nichols, Literary Anecdotes of the Eighteenth Century, iv. 33-97; Returns relating to Newspaper Stamps, 1836-54; Report of the Select Committee on Newspaper Stamps, 1850; Uansard, Parliamentary History of England, 1712-1742, and Debates, Sessions 1835, 1836, 1853, 1854, 1855, 1881, and 1882; First Report of the Commissioners on the Inland Revenue, 1857, 28, exxiv; Andrews, History of British Journalism, 2 vols., 1860; Hunt, The Fourth Estate; Grant, The Newspaper Press, 3 vols., 1871-73; Wm. Lee, Life and Newly Discovered Writings of Daniel Defoe, 3vols.,1869; Coleridge, Biographia Literaria, Supp., 392-395 ; Life of Edward Batnes, 346 sq.; Mitchell, The Newspaper Press Directory, 1846, 1857, 1859 to 1883 inclusive, 26 vols.; Plummer, 'The British Newspaper Press," Companion to the Almanac, 1876 ; Second, Third, and Twenty- eighth Reports of the Postmaster-General, 1856, p. 19, 1857, p. 10 sg., 1882; Scott, Memoirs of Swift, 180 sq.; Alex. Chalmers, articles '' Amhurst," '' Birkcnhead," ""'Heylyn," '' Johnson," ''Needham," &c., in General Biographical Dictionary, 1812-17; Gentleman's Magazine, vol. vii.; "The

Newspaper Press," Quarterly Review, cl. 498-537, October 1880; Hatton, Journalistic London, 1882; Gcorge Chalmers, Life of Ruddiman, part 2, 1794; Bayne, Life and Letters of Hugh Miller, vol. ii.; H. G. Graham, "Russel of the Scotsman," Frasers Magazine, n.s., xxii, 301-317, 1880. Information concerning North of England newspapers has been coutributed by Mr W. Hill, Newcastle-upon-Tyne.

NEWSPAPERS OF FRANCE.

The annals of French journalism begin with the Gazette, Gazette established by Théophraste Renaudot in 1631, under the de patronage of Richelieu, and with his active co-operation, 47"

and lasted for more than fifty years, as the pioncer of the daily press of Ireland. In 1710 or in 1711 (there is some doubt as to the date of the earliest number) The Dublin Gazette began to appear,

and it continues still (1883) as the official organ of the vice-regal government. Falkener's Jowrnal was established in 1728, and also appeared daily. Hsdaile's News-Letter began in 1744, took the title of Sawnders's News-Letter in 1754 (when it appeared three times a week), and became a daily newspaper in 1777. It long possessed the largest circulation ever attained by an Irish daily paper.

The famous Freeman's Journal was long pre-eminent amongst the Dublin papers for ability and vigour. It was established as a daily paper by a committee of the first society of " United Irish-

1 See Motes and Queries, 5th series, vii. 45, viii. 205.

2 The appearance of the earliest of Irish newspapers during the very last year in which that great statesman was in Ireland made it a matter of special interest to the present writer to ascertain if Ormond —who had a keen zest for literature as well as for field sports—had in any way patronized or noticed the new literary venture. But a perusal of some scores of his original letters (now in Oxford), dated in that year, finds no mention of The Dublin News-Letter. Ormond's own collection of " news-letters" in MS. is, it may be added.one of the finest known to exist in the kingdom,

Much of its earliest foreign news came direct from the minister, and not seldom in his own hand. Louis XIII. took a keen, perhaps a somewhat childish, interest in the progress of the infant Gazette, and was a frequent con- tributor, now and then taking his little paragraphs to the printing office himself, and seeing them put into type. Renaudot was born at Loudun in 1584, studied medicine in Paris and at Montpellier, established himself in the capital in 1612, and soon became conspicuous both within and beyond the limits of his profession. Endowed by nature with great energy and versatility, he seems at an early period of his career to have attracted the attention of the great cardinal, and to have obtained permission to establish a sort of general agency office, under the designa-

3 Debates of the Irish House of Commons, 3d March 1789.

tion of “Bureau d’Adresses et de Rencontre.” An enter-.| in 1672, with Thomas Corneille for its sub-editor, it may Mercure

prise like this would, perhaps, naturally suggest to such a mind as Renaudot’s the advantage of following it up by the foundation of a newspaper. According to some French writers, however, the project was formed by Pierre d’Hozier, the genealogist, who carried on an extensive correspondence both at home and abroad, and was thus in a position to give valuable help; according to others by Richelieu himself. Be this as it may, Renaudot put his hand zealously to the work, and brought out his first weekly number in May 1631. So much, at least, may be inferred from the date (4th July 1631) of the sixth number, which was the first dated publication, the five preceding numbers being marked by “signatures” only —A to E. Each number consists of a single sheet (eight pages) in small quarto, and is divided into two parts—the first simply entitled Gazette, the second Mouvelles Ordinaires de Divers Endroits. For this division the

author assigns two reasons—(1) that two persons may thus read his journal at the same time, and (2) that it facilitates a division of the subject-matter—the Nouvelles containing usually intelligence from the northern and western countries, the Gazette from the southern and eastern. He commonly begins with foreign and ends with home news, a method which was long and generally followed, and which still obtains. Once a month he pub- lished a supplement, under the title of Relation des Nouvelles du Monde, recues dans tout le mois. In October 1631 Renaudot obtained letters-patent to himself and his heirs, conferring the exclusive privilege of printing and selling, where and how they might please, "the gazettes, news, and narratives of all that has passed or may pass within and without the kingdom." His assailants were numer- ous, but he steadily pursued his course, and at his death in October 1653 left the Gazette to his sons in flourishing circumstances. In 1752 the title Gazette de France was first used. Under this designation it continued to appear until the 24th August 1848. During the five days which followed that date it was suspended; on the 30th it was resumed as Le Peuple Lrancais, Journal de V Appel @ la Nation, and again modified on the 14th September to L'£toile de la France, Journal des Droits de Tous. On the 25th October it became Gazette de France, Journal de [Appel & la Nation; and under this title it still continues to appear. A complete set extends to upwards of 300 volumes, of which 189 are in quarto and the rest in folio. It scarcely need be added that such a set forms a collection of great value, not only for the history of France, but for that of Europe generally.

Not the least curious nor the least instructive incident in the history of the Gazette de France—a history which abounds both with curiosity and with instruction—is the endeavour which was made by a great French minister, more than a hundred years ago, to make the envoys and consuls of France at foreign courts official members of its literary staff, by calling on them for periodical accounts of the progress of letters and science and of literary and scientific institutions in the several countries to which they were respectively accredited. The approach of 1789 obstructed the good effect of this pregnant scheme.

Loret's rhymed Gazette (1650 to March 1665) will always have interest in the eyes of students who care less for the "dignity" of history than for the

fidelity of its local colouring and the animation of its backgrounds. It were vain to look there for any deep appreciation of the events of those stormy times. But it abounds in vivid portraits of the men and manners of the day. It paints rudely, yet to the life, the Paris of the Fronde, with all its effervescence and depression, its versatility and fickleness, its cowardice and its courage.

Of the Mercure Galant, established by Donneau de Visé

be said that it sought to combine the qualities of the #

Gazettes, both grave and gay. Like the former, it con- 44″

tained the permitted state news and court circulars of the day. Like the latter, it amused its readers with satirical verses, and with sketches of men and manners, which, if not always true, were at least well invented. Reviews and sermons, law pleas and street airs, the last reception at the Academy and the last new fashion of the milliners, all found their ~~place. De Visé carried on his enterprise for more than thirty years, and at his death it was con~~ tinued by Riviére du Fresny. The next editor, Lefévre de Fontenay, altered the title to Nouveau Mercure, which in 1728 was altered to Mercure de France, a designation re- tained, with sight modification, until 1853. The Mercure passed through many hands before it came into those of Panckoucke, at the eve of the Revolution. Amongst its more conspicuous writers, immediately before this change, had been Raynal and Marmontel. The latter, indeed, had for many years been its principal editor, and in his Mémorres has left us a very interesting record of the views and aims which governed him in the performance of an arduous task. And he there narrates the curious fact that it was Madame de Pompadour who contrived the plan of giving pensions to eminent men of letters out of the profits of the Mercwre. To one of Marmontel's pre- decessors the " privilege," or patent, had been worth more than £1000 sterling annually. This revenue was now to be shared amongst several, and to become a means of extending royal " patronage" of literature at a cheap rate. It is to this pension-scheme, too, that we owe the Contes Moraux. Marmontel, who had long before lost his "patent" by an act of high-minded generosity, continued to share in the composition of the literary articles with Chamfort and La Harpe, whilst Mallet du Pan, a far abler writer than either, became the most prominent of

the political writers in the Mercure. In 1789 he contributed a series of remarkable articles on the well-known book of De Lolme; and in the same year he penned some com- ments on the “Declaration of the Rights of Man,” very distasteful to violent men of all parties, but which forcibly illustrate the pregnant truth they begin with :—‘“The gospel las given the simplest, the shortest, and the most comprehensive ‘Declaration of the Rights of Man,’ in saying, ‘Do unto others as you would that they should do unto you.’ All politics hinge upon this.”

In 1790 the sale of the Mercure rose very rapidly. It attained for a time a circulation of 13,000 copies. Mirabeau styled it in debate “the most able of the newspapers.” Great pains were taken for the collection of statistics and state papers, the absence of which from the French news- paper press had helped to depress its credit as compared with the political journalism of England and to some extent of Germany. But, as the Revolution marched on towards a destructive democracy, Mallet du Pan evinced more and more unmistakably his rooted attachment to a constitutional monarchy. And, like so many of his com- patriots, he soon found the tide too strong for him. The political part of the Afercure changed hands, and after the 10th August 1792 its publication was suspended.

All this time the Moniteur (Gazette Nationale, ou le Monitew Momteur Universel) was under the same general manage- Univer-

ment as the Mercure Francais (so the title had been altered

in 1791). The first idea, indeed, of this famous official journal appears to have been Panckoucke’s, but it did not firmly establish itself until he had purchased the Journal de l Assemblée Nationale, and so secured the best report of the debates. The Monitewr, however, kept step with the majority of the assembly, the Mercure with the minority. So marked a contrast between two journals, with one pro-

prietor, gave too favourable a leverage to the republican | John Adamson, 1777-89”), and are usually referred to by

wits not to be tured to good account. Camille Desmoulins | French writers as the Mémoires de Bachaumont.

depicted him as Janus,—one face radiant at the blessings The journalism of the first Revolution has been the News- of coming liberty, the other plunged in grief for the epoch | theme of many bulky volumes, and their number is still P¢Po of

that was rapidly disappearing. on the increase. The recital of the mere titles of the nee

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enhanced. During the later days of the Revolution, and under the imperial rule, its roll of contributors included the names of Geoffroy, Ginguené, Morellet, Lacretelle, Fontanes, and Chateaubriand. ‘The statesman last named brought upon the Afercure another temporary suppression in June 1807 (at which date he was its sole proprietor), by words in true unison with the noblest deed of his chequered career—his retirement, namely, from the imperial service on the day that the news of the execution of the duke of Enghien reached him, being the day after he had been appointed by Napoleon a minister plenipotentiary.

Thus it chanced that alike under the brilliant despotism of Napoleon and under the crapulous malversation of Louis XV. the management of the Merewre was revolutionized for protests which conferred honour upon the journal no less than upon the individual writers who made them. Resumed by other. hands, the Mercure continued to appear until January 1820, when it was again suspended. In the following year it reappeared as Le Mercure de France, au dix-neunéeme siecle, and in February 1853 it finally ceased. A complete set extends to no fewer than 1611 volumes.

Mercure | When resumed, after a very brief interval, the Mercure | newspapers which then appeared throughout France fills Fran- ‘Frangais became again Mercure de France,—its political | more than forty pages of larger dimensions than those wd importance diminished, whilst its literary worth was | which the reader has now before him. It is obvious,

therefore, that a very casual glance at this part of our subject is all that can be given to it here.

When at least one half of the French people was in a ferment of hope or of fear at the approaching convocation of the states-general, most of the existing newspapers were still in a state of torpor. Long paragraphs, for example, about a terrible " wild beast of the Gevaudan "— whether wolf or bear, or as yet nondescript, was uncertain —were still current in the Paris journals at this momentous juncture. Mirabeau was among the foremost to supply the popular want. His Lettres a ses Commettants began on the 2d May 1789, and with the twenty-first number became the Courrier de Provence. Within a week Maret (after- wards duke of Bassano) followed with the Bulletin des Séances de l Assemblée Nationale, and Lehodey with the Journal des Etats Généraux. In June Brissot de Warville began his Patriote Francais, Gorsas published the first number of his Courrier de Versailles in the following month, from which also dates the famous periodical of Prudhomme, Loustalot,'and Tournon, entitled Révolutions de Paris, with its characteristic motto,—" Les grands ne nous paraissent grands que parce que nous sommes a

Journal The only other newspaper of a date anterior to the de Paris. Revolution which needs to be noticed here is the Journal de Paris, which was commenced on New Year's Day of 1777. It had but a feeble infancy, yet lived for half a

genoux; levons nous!" In August 1789 Baudouin began

the Journal des Débats (edited in 1792 by Louvet) and Journal Marat the Ami du Peuple (which at first was called Le #5 Débats Publiciste Parisien). The Moniteur Universel (of which we a a

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century. Its early volumes appear so insipid to a 19th. century reader that he wonders what can have been the cause of its occasional bickerings with the police. Its tameness, however, did not save it from sharing in the "suspensions" of its predecessors. After the Revolution such men as Garat, Condorcet, and Regnaud de St Jean d'Angély appear amongst its

contributors, but those of earlier date were obscure. Its period of highest prosperity may be dated about 1792, when its circulation is said to have exceeded 20,000.

and, if we may judge from the copious specimens of these epistles which yet survive, must also not unfrequently have arisen from lack of official employment, rather than from substantial provocation. Madame Doublet de Persan, the widow of a member of the French board of trade, was a conspicuous purveyor of news of this sort. For nearly forty years daily meetings were held in her house at which the gossip and table-talk of the town were systematically (and literally) registered; and weekly abstracts or epitomes were sent into the country by post. iron, Mirabaud, Faleonet, D'Argental, and, above all, Bachaumont, were prominent members of the "society," and each of them is said to have had his assigned seat beneath his own portrait. The lady's valet-de-chambre appears to have been editor ex officio; and as he occasionally suffered imprisonment, when offensive news-letters had been seized by the police, so responsible a duty was doubtless "considered in the wages." News and anecdotes of all kinds—political and literary, grave, gay, or merely scandalous—were all admitted into the Vouvelles a la Main; and their contents, during a long series of years, form the staple of those Mémoires Secrets pour servir & 0 Histoire dela République des Lettres which extend to thirty-six volumes, have been frequently printed (at first with the false imprint ''Londres:

have spoken already) was first published on the 24th November, although numbers were afterwards printed bearing date from the 5th May, the day on which the states-general first assembled. Camille Desmoulins also commenced his Révolutions de France et de Brabant in November 1789. The Ami du Roi was first published in June 1790, La Quotidienne in September 1792.

Of all these prominent journals the MJoniteur and the Débats alone have survived until now. A few of them lasted until 1794 or 1795; one continued until recently ;

Nouvelles The police adventures of the writers of the MS. news- | but most of them expired either in the autumn of 1792 :., letters, or Nouvelles & la

Main, were still more numerous, | or with the fall of the party of the Gironde in September

1793. In some of these papers the energy for good and for evil of a whole lifetime seems to be compressed into the fugitive writings of a few months. Even the satirical journals which combated the Revolution with shafts of ridicule and wit, keen enough after their kind, but too light to do much damage to men terribly in earnest, abound with matter well deserving the attention of all students desirous of a thorough knowledge of the period.1

The consular Government began its dealings with the press by reducing the number of political papers to thirteen. At this period the number of daily journals had been nineteen, and their aggregate provincial circulation, apart from the Paris sale, 49,313, an average of 2600 each.

Under Napoleon the Monztewr was the only political paper that was really regarded with an eye of favour. Even as respects the nation at large, the monstrous excesses into which the Revolutionary press had plunged left an enduring stigma on the class. When Bertin acquired the Journal des Débats from Baudouin, the printer, for 20,000 francs, he had to vanquish popular indifference on ee, ee

1 We make these remarks after an actual examination—volume by volume—of many hundreds of these ephemeral productions, reckoning those of all kinds, belonging to the Revolutionary period.

Consti- tution- nel,

La Presse and Le Siécle.

the one hand, as well as imperial mistrust on the other. The men he called to his aid were Geoffroy and Fievée ; and by the brilliancy of their talents and the keenness of his own judgment he converted the Débats into a paper having 32,000 subscribers, and producing a profit of 200,000 francs a year.

When the imposition of a special censorship was threatened in 1805, at the instance of Fouché, a remarkable correspondence took place between Fievée and Napoleon himself, in the course of which the emperor wrote that the only means of preserving a news- paper from suspension was “to avoid the publication of any news unfavourable to the Government, until the truth of it is so well established that the publication becomes needless.” The censorship was avoided, but Fievée had to become the responsible editor, and the title was altered to Journal de ? Empire—the imperial critic taking exception to the word Débats as “inconvenient.” The old title was resumed in August 1815. The revolution of July did but enhance the power and the profit of the paper. It has held its course with uniform dignity, as well as with splendid ability, amidst recent perils, and may still be said, in the words which Lamartine applied to it in an earlier day, to have “‘made itself part of French history.”

Shortly before the Journal del Empire became again the Journal des Débats (in 1815), a severance occurred amidst both the writers and subscribers. It led to the foundation of the Constetutionnel, which at first and for a short time bore the title of Z’Indépendant. The former became, for a time, the organ of the royalists par excellence, the latter the leader of the opposition. In 1824, however, both were in conflict with the Government of the day. At that date, in a secret report addressed to the ministry, the aggregate circulation of the opposition press of Paris was stated at 41,330,1 while that of the Government press amounted only to 14,344.?

The rapid rise of the Constitutionnel was due partly to the great ability and influence of Jay, of Etienne, of Béranger, and of Saint Albin (who had been secretary to Carnot in his ministry of 1815), all of whom co-operated in its early editorship, and partly to its sympathy with the popular reverence for the memory of Napoleon, as well as to the vigorous share it took in the famous literary quarrel between the classicists and romanticists (although in that quarrel it took what may now be called the side of the vanquished). Its part in bringing about the revolution of 1830 raised it to the zenith of its fortunes. For a brief period it could boast of 23,000 subscribers at 80 francs a year. But the invasion of cheap newspapers, and that temporary lack of enterprise which so often follows a brilliant success, lowered it with still greater rapidity. When the author of the Mémoires d’un Bourgeois, Dr

Véron, purchased it, the sale had sunk to 3000. Véron gave 100,000 francs for the Juif Errant of Sue, and the Sue fever rewarded him for a while with more than the old circulation. editorship of Césena, Granier de Cassagnac, and La Guéronniére.

The cheap journalism of Paris began in 1836 (Ist J uly) with the journal of Girardin, Za Presse, followed instantly by Le Siécle, under the management of Dutacq, to whom, it is said—not incredibly—the original idea was really due. The first-named journal attained a circulation of 10,000 copies within three months of its commencement, and soon doubled that number. The Siécle prospered even more Pa ee ee eee

1 Le Constitutionnel, 16,250; Journal des Débats, 13,000; La Quotidienne, 5800; Le Courrier Francais, 2975; Journal de Com- merce, 2880; L' Aristarque, 925.

® Journal de Paris, 4175; L' Etoile, 2749; Gazette de France, oa Le Moniteur, 2250; Le Drapeau Blanc, 1900; Le Pilote,

Afterwards the paper passed under the –

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strikingly, and in a few years had reached a circulation (then without precedent in France) of 38,000 copies.

The rapid growth of the newspaper press of Paris under Louis-Philippe will be best appreciated from the fact that, while in 1828 the number of stamps issued was 28 millions, in 1836, 1843, 1845, and 1846-the figures were 42, 61, 65, and 79 millions respectively. At the: last- mentioned date the papers with a circulation of upwards of 10,000 were (besides the Moniteur, of which the circula- tion was chiefly official and gratuitous) as follows :—Ze Stécle, 31,000; La Presse and Le Constitutionnel, between 20,000 and 25,000; Journal des Débats and L' Epoque, between 10,000 and 15,000.

If we now cast a retrospective glance at the general characteristics (1) of the newspaper press of France, and (2) of the legislation con- cerning it, between the respective periods of the devastating revoln- tion of 1793-94 and the scarcely less destructive revolution of 1848, it will be found that the years 1819, 1828, 1830 (July), and 1835 (September) mark epochs full of pregnant teaching upon our sub- ject. We pass over, as already sufficiently indicated, the newspaper licence of the first-named years (1793-94), carried to a pitch which became a disgrace to civilization, and the stern Napoleonic censor- ship which followed it,—also carried to an excess, disgraceful, not, indecd, to civilization, but to the splendid intellect which had once given utterance to the words, ‘‘ Physical discovery is a grand faculty of the human mind, but literature is the mind itself.”

The year 1819 is marked by a virtual cessation of the arbitrary power of suppression lodged till then in the Government, and by the substitution of a graduated system of preliminary bonds and suretyships (‘‘cautionnements’”’) on the one hand, and of strict penalties for convicted press-offences on the other. This initiatory amelioration of 1819 became, in 1828, a measure of substantial yct regulated freedom, which for two years worked, in the main, alike with equity towards the just claims of journalism as a profession and with steady development towards the public of its capabilities as a great factor in the growth of civilization. Those two years were followed by a widely-contrasted period of five years. That was a term of entire liberty often grossly abused, and fitly ending with the just and necessary restrictions of September 1835. But that period of 1830-35 was also signalized by some noble attempts to use the powers of the newspaper press for promoting the highest and the enduring interests of France. Not least memorable amongst these was the joint enterprise of Montalembcrt and Lamennais— soon to be aided by Lacordaire,—when, by the establishment (October 1830) of the newspaper LZ’ Avenir, they claimed for the church of France ‘‘ her just part in the liberties acquired by the country,” and asserted for the sacred symbols of Christianity their lawful place, alike above the tricolor and above the lilies. ‘* Dicu ct la liberté” was the motto which Montalembert chose for his news- paper, as he had chosen it long before for the guiding star of his youthful aspirations. ZL’ Avenir existed only for one year and ono month. It came toits early end from no laek of energy and patience in its writers, but in part from that mission of

the editors to Rome (November 1831) which, at least for a time, necessitated the discon- tinuance of their newspaper. Human regrets had higher than human consolations. ‘‘Ourlabonrs” on L’ Avenir, wrote Montalem- bert, with simple truth, “decided the attitude of Catholics in France and elsewhere, from the time of the July revolution to the time of the second empire.”

There were many other papers, at this time and afterwards, which, like L’ Avenir, were, in their degree, organs of ideas, not speculations of trade. But they cannot be even cnumerated here. No very notable specially religious paper succeeded L’ Avenir until the fonnda- tion in 1843—under widely different auspices, although twice at the outsct the editorship was offered to Lacordaire—of L’ Univers Religieux. That journal was edited, at first, by De Coux, then by Louis Veuillot; it underwent innumerable lawsuits, “warnings,” suppressions, and interdicts, for causes very diverse. Several prelates suppressed L’ Univers Religicux in their respective dioceses, amongst them the great bishop Dupanloup in that of Orleans (1853). Napoleon III. suppressed it in 1861, permitted it to reappear as Le Monde, and suspended it many times afterwards ; but it has survived all its misfortunes and still exists, under its new title. Ze Monde had the curious fate, at one time, of being conducted jointly by the first editor of L’ Avenir, Lamennais, and by George Sand, who had previously figured in the newspaper annals of France as co-foundress of L’Kelaireur de U’Indre, a journal published at Orlcans. The account given by that brilliant writer of her adventures in what was then to her a new department of activity is an instructive one. With that breadth of sympathy which was so characteristic of her, she strove to interest all her friends (however varied in character, as in rank) in the enterprise. There is, perhaps, scarcely anything more amusing in French Journalistic annals than is her (contemporary) account of the first

mecting of the shareholders—at which, she tells us, about five hundred resolutions were moved for the guidance of the editor at his desk. JL’ Eelaireur did not shed its lustre on the department of the Indre for much

length of time. In later days Le Monde, under very various editorships, has amply vindicated the change in its title.

The impulse given to the growth of advertisements in the days which followed July 1830, although trivial in comparison with what British newspaper readers are daily familiar with, became, as the years rolled on, sufficiently developed to induce the formation of a company—in which one of the Lafittcs took part—to farm them, } at a ycarly rent of £12,000 sterling (300,000 frances), so far (at first) as regarded the four leading journals (Débats, Constitutionnel, Siécle, Presse), to which were afterwards added two others (Le Pays and La Patrice), The combination greatly embarrassed advertisers, first, since its great aim was to force them either to advertise in all, whether addressing the classcs intended to be canvassed or not, or clse to pay for each advertisement in a selected newspaper the price of many proffered advertisements in all the papers collectively, and, secondly, because by many repetitions in certain newspapers no additional publicity was really gained, two or three of the favoured journals circulating for the main amongst the same class of buyers. La France was then the newspaper of the Conservative aristocracy of the nation ; Le Monde and the Union more especially addressed the clergy; the Débats and the Temps were the journals of the upper mercantile class, the Stécle and L'Opinion of the lower or shopkeeping class. A man who asked to advertise briefly, in the Siéele, for example, alone, was charged 2 frances for each several insertion. If he went the round of the six, his advertisement cost him only 75 centimes per journal, for ten successive insertions in each of them, all round.

To a great extent, the inundation of newspapers which followed the revolution of February 1848 was but a parody on the revolu- tionary press of 1798. Most of them, of course, had very short lives. When Cavaignac took the helm he suppressed eleven jour- nals, including La Presse and L' Assemblée Nationale. The former had at this period a circulation of nearly 70,000, and its proprietor, in a petition to the National Assembly, declared that it gave sub- sistence to more than one thousand persons, and was worth in the inarket at least 1,500,000 francs. In August the system of sureties was restored. On the 13th June 1849 the president of the republic suspended Le Peuple, La Révolution Démocratique et Sociale, La Vraie République, La Démocratie Pacifique, La Réforme, and La Tribune des Peuples. On July

16, 1850, the assembly passed what is called the ‘‘ Loi Tinguy,” by which the author of every news- paper article on any subject, political, philosophical, or religious, was bound to affix his name to it, on penalty of a fine of 500 francs for the first offence, and of 1000 francs for its repetition. Every false or feigned signature was to be punished by a fine of 1000 francs, ‘‘ together with six months’ imprisonment, both for the author and the editor.” The practical working of this law lay in the creation of a new functionary in the more important newspaper offices, who was called ‘‘sccrétaire de la rédaction,” and was, in fact, the scapegoat ex officto. In February 1852 all the press laws wcre incorporated, with increased stringency, into a ‘‘ Décrct organique sur la presse.”” The stamp duty for each sheet was fixed at 6 centimes, within certain dimensions, and a proportional in- crease in case of excess.

In 1858 the order of the six leading Parisian papers in point of circulation was—(1) Siéele, (2) Presse, (8) Constitutionnel, (4) Patric, (5) Débats, (6) Assemblée Nationale. The number of provincial papers exceeded five hundred. ‘‘ Newspapers, nowadays,” wrote a keenly observant publicist in that year, ‘‘are alinanacs, bulle- tins, advertising mediums, rather than the guides and the centres of opinion.” In 1866 the change had become more marked still. The monctary success of Girardin’s many commiercial speculations in this branch of commerce greatly increased the number of Parisian journals, whilst lowering the status of those of estab- lishedrank. The aggregate daily issue of the Parisian ‘‘ dailies” had increased to about 350,000 copies, but the evening paper, Le Petit Moniteur, alone issued nearly 130,000 of these. The average circu- lation of Le Siécle had fallen from 55,000 to 45,000 copies ; that of La Patrie was reduced by one-half (82,000 to 16,000); that of Le Constitutionnel from 24,000 to 13,000; of L’Opinion Nationale from 18,000 to 15,000; whilst the chief journal of all, —with grand ante- cedents, and with a brilliant history of public service rendered,— had for a time descended, it is said, from 12,000 copies to 9000. And yet almost over the whole of this very period the brilliant ‘‘ Lundis” of Sainte-Beuve were making their punctual appearance in Le Consti- tutiounel, to be presently continued in Le Monitewr and in Le Temps ; and writers like St Mare Girardin, Cuvillier-Fleury, and Prévost-Paradol were constantly writing in the Journal des Débats. Mean- while,

Villemessant and his colleagues were making their for- tunes out of Figaro, and helping to inakc frivolous petty ‘‘ para-

’ Or, to speak more precisely, to farm a certain conspicuous page of each newspaper, in perpetuity.

| graphs” on matters of literature almost everywhere take the place of able and well-claborated articles. Well might Albert Sorel say,” ‘‘Our truimpery newspapers are the newspapers that pay.” And the descent in the sterling characteristics of journalism con- tinued at an increased speed. In 1872 the circulation of Le Petit Journal was 212,500; in June 1877 it reached nearly to 500,000.

No incident in recent newspaper history made more temporary noise than did the strange charges brought in 1867 against the Débais, the Siéele, and L’Opinion Nationale, by M. Kerveguen, member for Toulon, in the French assembly. He charged them collectively with receiving bribes, both from the Government of Prussia and from that of Italy,—upon the faith, as it afterwards appeared, of statements made by another newspaper, not of France but of Belgium, La Finance. An elaborate inquiry, presided over by M. Berryer, pronounced the accusation to be absolutely ground- less, Yet it was soon revived by Le Pays, in the shape of a specitic charge against an individual editor of Le Siécle,—La Varenne. All that was eventually proved, in due course of law, was merely the agency in Paris of La Varenne for the Italian Government, at a time prior to the events of 1866.

In 1874 an elaborate rcturn showed that in thirty-five principal towns of France, comprising a population of 2,566,000, their re- spective journals had an aggregate weckly issue of 2,800,000 copies. The details in round numbers are as follows :—

{ : |.; “aa : ; “News. {Approx “Sews- (Approxin apers eedeel DADCTSEN een Pp lation in heh lation in issue 1874 issued 1874 weekly. . weekly. c LAVOE cocseonoones 426,000 325,000 || Orléans……..... 45,500 50,000

Marseilles……..] 327,000 315,000 |; Angouléme…... 44,000 25,000 Bordeaux……..] 247,000 200,000 || Amiens……..... 42,000 65,000 Lill seenéncononcece 188,600 158,000 || Chalons……..... 41,500 18,000 Montpellier…..| 142,500 57,000 || Besangon…….... 40,500 49,000 Toulouse……..| 135,000 UPD: | BAG Sireaecrnncadee 37,000 26,000 IROIGETS 2. .26.ces 121,500 SOOO || PGRONE ccccesssee <<: 36,500 10,000 [HORE apaneencecs 98,500 109,000 || Perpignan……. 35,000 27,000 IDIOT peemorppccse 87,500 42,000 || Troyes……..... 34,000 38,000 EVGVRO Sse ecce-osese 80,000 87,000 || St Etienne…..... 34,000 111,000 Caene essa. cen 78,500 42000) || INiG@s. .INDICV ie. .scs+ss ee 71,500 53,000 || Rennes……..... 33,500 52,000? Nantes……..... 70,000 118,000 |! Rheims……..... 29,500 72,000 PDOMLUS:. 5 coseissc) sss 61,000 43,000 |} Evreux……..... 29,500 12,000 Le Mans ……..... 57,000 47,000 || Beauvais…….... 28,500 15,000 Clermont- Fer- 54,000 37,000 || Perigueux…….| 28,000 22,000 LED bepenanctepoc Towlony…..22---| 17,000 70,000 TAMBOS<.....0-: 45,500 58,000 || Avesnes……..... 13,000 3,000

In 1878 the total number of journals of all kinds published in France was 2200. Of these 150 were political, strictly speaking, of which Paris published 49. Of Parisian journals other than political there were 1141 (including 71 religious, 104 legal, 153 commercial, 134 technological, 98 scientific and medical, 59 artistic). At that date Figaro had a circulation of about 70,000, Le Petit Journal (at a halfpenny) one of about 650,000.32 At the great show of newspapers of all countries held that year at the International Exhibition of Prague the French newspapers were conspicuous.

The principal Parisian newspapers in 1883 may be classified thus :—

a. Organs of the Legitimists and of the Church of France :— Gazette de France, Le Monde, L' Union, La Defense, La Civilisation, DP Univers.

b. Orleanist organs :—Le Moniteur Universel, Le Constitutionnel, Le Frangais (under the auspices of the Duc de Broglic), Le Soleil.

c. Bonapartist organ:—Le Pays (edited at onetime by Lamartine).

d. Republican organs :—Journal des Débats, Le Temps (the paper of the republican middle classes, and read largely by Protes tants), Le Siéele (now of declining importance, Voltairean in tone), Le XIX. Svrécle (also Voltairean), Le Paix (M. Grévy's paper), La Justice, Paris, La Republique Francaise (founded in 1871 by Gambetta), Le Parlement (founded by Dufaure ; circulation less than that of Za Republique, but political weight considerable).

The law concerning the liberty of the press, of July 29, 1881, abolished suretyship for newspapers, and transferred their registra- tion from the ministry of justice at Paris to the local representa- tive of the attorney-general (Je parquet) in cach town respectively. It made the establishment of a newspaper virtually free, upon legal deposit of two copies, and upon due registration of each newspaper under the simple guarantee of a registered director, French by birth, responsible in case of libel. And it took away the former discretionary power, lodged in the home office, of interdicting the

2 When comparing the French newspaper press as it stood in 1878 with that of Germany, in the Revue des deux Mondes, article ‘‘ La Presse Allemande,” vol. ii. of 1873, p. 715.

3 It is curious to notice the comparatively small sale of the French illustrated papers. In 1880 the sale of L'llustration was only abont 15,000 copies, and that of Le Journal Amusant about twice that number. At the same date the Jdlustrated London News sold 95,000, and the Illustrirte Welt of Stuttgart 107,000.

circulation in France of foreign journals. still prohibit a single number of a newspaper; only the whole

council of ministers, duly convened, can prohibit the circulation

of a foreign newspaper absolutely.}

Authorities.—Hatin, Histoire de la Presse en France, 8 vols., 1860-61; Jules Evrard, " Origines de la Presse en Franee," in Revue Moderne, 1, 721-741, 1869 ; Gallois, Histoire des Journaux et Journalistes de la Revolution, 2 vols.; Mar- inontel, Mémoires, i. 277-291; Morellet, Eloge de Marmoniel, 1], 12; Chateau- briand, Afémoztres d'outre Tombe, iii. § 1, 24 sq., v. 95, and vi. 403, 407 ; Mémoires de Mallet du Pan, i. 29 sqg.; Montalembert, Le Pére Lacordatre, ii, 81, 1881 ; articles '' Baehaumont," " Bertin," '' Donneau," ' Doublet," '" Garat, '* Loret, '*Panckoueke," " Renaudot," in Biographie Universelle; Bulletin du Bibliophile, new series, vii. 855-866; Ste Beuve, Chateaubriand et son Groupe Litteratre, é&e., li, 100; Id., Portraits Littéraires, vy. 147 sq.; Lamartine, Wistotre de la Révolution de 1848; Hatin, Manuel de la liberté de la Presse, 1868, and Nomen- clature des Journauz ; Bibliotheque Impériale—Catalogue de l' Histoire de France, iv. 845-569, 1857; Victor Gébé, Catalogue des Journauz, 1875; "Journalism in France," Quarterly Review, Ixv. 422-468, Marchi 1840; Annuaire Encyclopédique, 1868, 708-709 ; Cochin, Le Comte de Montalembert, 1870; Bibliographie dela France, 'Chronique' (1875, 96; 1876, 74, 75; and 1881, 7); Journal Général de oIm- primerte, 1881, part ii. 201 sg.; Amédée Breton, " Les droits de la Presse," in Revue Moderne, xlii. 721-741, 1867; Vapereau, articles 'De Champagny," "De Coux," "De Falloux,' "E. de Girardin," " Galignani," 'J. Lemoinne, a De Montalembert," "Jules Ferry," "Alphonse Karr," " G. Sand," " Veuillot, &., in Dictionnaire des Contemporatins, various editions; H. Rigault, '' Observations sur les Journaux," in Jour. des Débats, Oetober 28, 1858; G. Sand, Correspond- ance, ii, 288-311, 1882; Sayons, Mémoires et Correspondance de Mallet du Pan, i. 32-35, 84, 86, ii. 368-448; Reinaeh, 'Parisian Newspapers, Nineteenth Century, xii. 347 sq.; various Freneh newspapers, from 1789 onwards, in the library of the Taylor Institution at Oxford.2

NEWSPAPERS OF GERMANY.

Printed newspapers in Germany begin with the Frank- Jurter Journal, established in the year 1615, by Egenolph Emmel, a bookseller of Frankfort-on-Main. In the follow- ing year his example was imitated, doubtless with some improvement, by the foundation of the Frankfurter Ober- postamtszertung,—continued until the year 1866 as Frank- Jurter Postzeitung. Fulda appears to have been the next German town to possess a newspaper, then Hildesheim (1619) and Herford (1630). In the course of the century almost all German cities of the first rank possessed their respective journals. The earliest in Leipsic bears the date 1660. The Rostocker Zeitung was founded in 1710. The Hamburgischer Correspondent dates from 1714, but was originally published under the name of Wolsteinische Zeitungs-Correspondenz, two years earlier, and was almost the only German newspaper which really drew its foreign news from "our own correspondent." Berlin had two papers, those of Voss and of Spener, both of which are still published. They possessed in their earlier career some literary value, but were politically null. Some half- dozen papers which glimmered if the surrounding darkness were the reservoirs whence the rest replenished their little lamps. On the whole, it may be said that the German newspapers were of very small account until after the out- break of the French Revolution. Meanwhile the MS. news-letters, as in earlier days, continued to enjoy a large circulation in Germany. Many came from London. The correspondence, for instance, known under the name of "Mary Pinearis,"—that, apparently, of a French refugee settled in London,—had a great German circulation be- a

1 The history of French journals published abroad is interesting, but is necessarily passed over in these pages. The Annales politiques of Linguet, —for a time of Linguet and Mallet du Pan jointly, —was, from about 1770 to about 1785, almost a power in Europe, in its way. Mallet's own Mercure Britannique, during the eventful years 1798— 1800, was brilliant, sagacious, and honest. When the pen literally fell from his dying hand,—a hand that had kept its integrity under the pains of exile and of bitter poverty, —that pen was taken up (for a short interval) by Malonet. When Napoleon forcibly suppressed, a little later, the Courrier de ? Europe of the count of Montlosier, he offered the deprived editor a pension, which was refused,

until ac- companied by the offer of a post in which the able ininister of Louis XVI. could still work for his country. In ‘our own day, another Courrier de l’Europe has had along and useful existence, and still appears weekly in London.

2 The writer desires to express here, once for all, his deep sense of obligation to the curators of the Taylor Institution at Oxford and to their learned librarian, Dr Krebs, for liberally granting facilities of

access to the store of foreign newspapers with which its library is admirably supplied.

VTEwWs PAPERS

The home minister may

[GERMANY.

tween 1725 and 1735. Another series was edited by the Cologne gazetteer, Jean Ignace de Rodérique, also a French refugee, and remembered as the subject of a character- istic despatch from Frederick II. of Prussia to his envoy in that city, enclosing 100 ducats to be expended in hiring a stout fellow with a cudgel to give a beating to the gazetteer as the punishment of an offensive paragraph.% The money, it seems, was earned, for Rodérique was well-nigh killed. At Berlin itself, Franz Hermann-Ortgies carried on a brisk trade in these news-letters (1728-35), until he too came under displeasure on account of them, was kept in prison several months, and then exiled for life.4 Nor, indeed, can any journal of a high order be mentioned of prior appearance to the Allgemeine Zeitung, founded at Leipsic by the bookseller Cotta (at first under the title of Neueste Weltkunde) in 1798, and which is still at the head of the political press of Germany. Posselt was its first editor, but his want of nerve—and perhaps his weak health—hindered the application of his high powers to political journalism. His articles, too, gave offence to the Austrian court, and the paper had to change both its title and its place of publication. It had been commenced at Tubingen, and removed to Stuttgart; it was now trans- ferred to Ulm, and again to Augsburg. It was Cotta’s aim to make this the organ of statesmen and publicists, to reach the public through the thinkers, to hold an even balance

between the rival parties of the day, and to provide a trustworthy magazine of materials for the historians to come; and, in the course of time, his plan was so worked out as to raise the Allgemeine Zeitung into European fame. Cotta was also the founder, at various periods, of the Morgenblatt, which became famous for its critical ability and tact, of Vesperus, of Das Inland, of Nemesis, of the Oppositionsblatt of Weimar (for a time edited by Bertuch), and even of the Archives Paristennes. His ventures were not, of course, uniformly successful, but it is rare that men of like enterprise have made so few failures. Whilst French influence was dominant in Germany, the German papers were naturally little more than echoes of the Parisian press. But amidst the excite- ments of the " war of liberation" a crowd of new journals appeared. Niebuhr started a Preussischer Correspondent ; Gorres—who in 1798 had founded at Coblentz Das rothe Blatt, soon suppressed by the invading French—under- took the Sheimischer Mercur (January 1814 to J. anuary 1816), which was suppressed by the Prussian Government, under Von Hardenberg. This journal, during its initiatory year, had the honour of being termed by Napoleon—per- haps satirically—'"the fifth power of Europe." Wetzel, somewhat later, founded the P'-dnkischer Mercur, published at Bamberg, and Friedrich Seybold the Neckarzeitung. Some of these journals lasted but two or three years. Most of the survivors fell victims to that resolution of the diet (20th September 1819) which subjected the news- paper press, even of countries where the censorship had been formally abolished, to police superintendence of a very stringent kind,

The aspirations for some measure of freedom which burst forth again under the influences of 1830 led to the establishment of such papers as Siebenpfeiffer's Westbote, Lohbauer's Hochwiichter, Wirth's Deutscher Tribune, EKisen- mann's Baverisches Volksblatt, Der Freisinnige of Rotteck and Welcker, and many more of much freer utterance than had been heard before in Germany. This led, in the ordinary course, to new declarations in the diet

— SS Ee

3 Fr. Kapp, " Berliner geschriebene Zeitungen," in Deutsche Rund- schau, xxi. 107-122, 1879, citing Droysen, Zeitschr. f. preuss. Gesch., xiii. 11. The story, as told by Droysen, is an instructive commentary

on Carlyle's praise of Frederick' * love of the liberty of the press." * Kapp, ut supra.

against the licence and revolutionary tendencies of the press, and to "regulations" of a kind which will be suffi- ciently indicated by the mention of one, in virtue whereof no editor of a suppressed journal could undertake another journal, during the space of five years, within any part of Germany. It need hardly be added that few of the news- papers of 1830 saw the Christmas of 1832. Very gradually some of the older journals—and amongst the number the patriarch of all, the Frankfurter Oberpostamtszeitung— plucked up courage enough to speak out a little ; and some additional newspapers were again attempted. Amongst those which acquired deserved influence were Brockhaus's Deutsche Allgemeine Zeitung, the advocate of free trade

and of a moderate liberalism, and possessing a large circu-—

lation in northern Germany (1837) ; the Deutsche Zeitung, edited by Gervinus, at Heidelberg (July 1847) ; and the Dorfzeitung, published at Hildburghausen. The stirring events of 1848 called forth in Germany, as in so many other countries, a plentiful crop of political instructors of the people, many of whom manifestly lacked even the capacity to learn, and vanished almost as suddenly as they had appeared. But it is undeniable that a marked im- provement in the ability and energy of the German politi- cal press may be dated from this period ; and of late years the press of Germany has gone far towards turning into very grave earnest the ironical words of the first Napoleon.

In 1833 the number of German newspapers of all kinds, popular journals (Volksblatter) included, but without reckoning periodicals devoted to literature or science, amounted to no more than about 335; in 1849 this number had increased to 1551, their geographical distribution being as follows :—Anhalt, 10; Austria (German), 74; Baden, 55; Bavaria, 127; Bremen, 18; Brunswick, 9; Frankfort, 17; Hamburg, 24; Hanover, 32; Hesse-Cassel, 22; Hesse-Darm- stadt, 34; Hesse-Homburg, 4; Hohenzollern, 4; Holstein, 17; Lippe-Detmold, 4; Liibeck, 4; Luxemburg,

4; Mecklenburg, 22; Nassau, 18; Oldenburg, 8; Prussia, 632; Reuss, 11; Saxon Duchies, 44; Saxony, 183; Schaumburg-Lippe, 2; Schleswig, 5 ; Schwartzburg, 12; Waldeck, 2; Wirtemberg, 67. In addition to these, but included in the total of 1551, 77 German newspapers were published in the Swiss cantons, and 14 in the Baltic pro- vinces of Russia. Many of those reckoned in this enumeration soon ccased to appear, but others took their place, and the total in 1855 was estimated at a little above 1600.

In 1879 it was estimated that the total number of newspapers and periodicals published in the German language, in all parts of the world, reached to nearly 5480:—-in Germany proper, 3780; Austria-Hungary, about 700; Switzerland, about 300; Russia, about 50; Great Britain, Netherlands, Belgium, Italy, &c., 40; North America, 600; South America, 9; Africa (Cape Town) 1.1 In Germany, in foreign languages, thcre appeared at the same period—in Polish, 26; Freneh, 17; Danish, 10; Wendish, 6; Lithuanian, 2; English, 2; Hebrew, 4; total, 67.? .

All the leading German papers have daily correspondence from Paris ; in the Cologne Gazctte sometimes five Paris letters may be eet atime. Foreign state papers are largely collected and trans- ated.

The National Zeitung, published at Berlin, holds a conspicuous placc amongst existing German newspapers. Dr Bernhard Wolff, who founded it (also in 1848), continued to be chief editor until his death in 1879. He wasa notable precursor (only a little in advance) in telegraphic enterprise of Julius Reuter ; and, to somc extent, his telegraphic bureau at Berlin may be regarded as the germ at once of the “ Agence Havas” and of “ Reuter’s telegrams.” Like Reuter, he found it expedient, as the affair grew, to turn it over to a company. He did so in 1864, but continued to work the enterprise until 1871. ably that which has the largest circulation of all Germany.

As regards the socialistic press, “ German socialism,” says Sorel, **has turned journalist. publishes 41 political journals, 13 of which are of daily publication. . . . The collective circulation is said to exceed 130,000. The leading paper of this party, Vorwdrts, published at Leipsic, prints about 12,000; Die neue Welt, literary rather than political, is said

1 Lagai, ‘‘Zeitungen und Zeitschriften,” in Pierer’s Univ. Lexicon, 1879. The statisties given by Hubbard (Newspaper Directory of the World, vol. ii. pp. 1899-1563) differ enormously from those given above. But Hubbard mingles the most heterogeneous ‘‘ periodieals ” in one undigested mass with the newspapers whieh are strietly sueh.

2 ¢*Tia Presse Allem. in 1873,” Rev. d. d. Mondes, 1873, ii. 715.

Of strictly political papers, the Volkszeitung is prob-

It has established 14 printing offices, and |

to sell 35,000 copies.”3 . . . Die Zukunft, another of their organs (1848), long edited by Johann Jacoby, was suppressed in 1871, mainly on account of its vigorous protests against the annexation of Alsace- Lorraine.

The total number of political journals of all kinds throughout Germany in 1879 was 2451, of which 640 were avowedly Govern- ment or administrative organs.

Authorities (in addition to those above cited).—Artides ‘‘ Bertueh,” ‘‘ Cotta,” ‘Gorres,” “Huber,” ‘‘ Niebuhr,” ‘Posselt,” &e., in Biographie Universelle; Bluntsehli and others, article ‘‘ Zeitungswesen,” Deutsches Staatswérterbuch, 1870; Vapereau, Dictionnatre des Contemporains, edition of 1880.

NEWSPAPERS OF AUSTRIA-HUNGARY.

At the beginning of 1840 the whole number of Austro- German and Hungarian periodicals, of all sorts, was less than 100, only 22 being (after a fashion) political news- papers ; and of these nearly all drew their materials and their inspiration from the official papers of Vienna (Wiener Zeitung and Oesterreichischer Beobachter). These two were all that appeared in the capital. Agram, Pesth, Pressburg, Lemberg, and Prague had also two each; but no other city had more than a single journal. In 1846 the aggre- gate number of periodicals had grown to 155, of which 46 were political, but

political only in the character of mere conduit-pipes for intelligence "approved of " by the Government. In 1855 the number of political papers published throughout the entire territory under Austrian government, the Italian provinces excepted, was 60.4 In 1873, ten years after the virtual cessation of a strict censorship,° the number of political journals, including all the specifically administrative organs, as well local as gene- ral, was 267, and that of mere advertising papers 42; now, in 1883, the former number is increased to about 280, the latter to about 60. The comparatively brief duration of Austrian-Hungarian newspapers and periodi- cals generally is a characteristic feature. Of 866 journals of all kinds existing at a recent date, 153 had their birth in 1873, 145 others in 1872, 109 in 1871; only 67 dated from the decennium 1851-60, 30 from 1841-50, and there were but 21 with any claim to a date earlier than 1840.

Vienna had in 1883 in all 18 daily newspapers (really sucl1), ten of which range in average circulation from 14,000 to 54,000 copies, and, aceording to the consular returns collected by Hubbard, no less than 488 periodicals of all kinds, and of all periods of issue. Of 1016 journals, classified as to language, 600 appear in German, 170 in Hungarian, 79 in Bohemian, 58 in Polish, 56 in Italian, 22 in Slovenian, 11 in Croatian and Servian, 9 in Ruthenian, 8 in Roumenian, 3 in Hebrew. Budapest elaims to have 229 journals, and Prague 99, counting those of all descriptions. The aggregate

uumber of stamps issued to political journals in 1860 was about 42,100,000; in 1871 it reached nearly 81,000,000.

See Die periodische Presse Ocesterreichs, 1875; Lagai, " Zeitungen und Zeit- schriften," wi sup.; Bluntsehli and others, ' Zeitungswesen," wi sup.

NEWSPAPERS OF OTHER EUROPEAN STATES.

Denmark, Sweden, and Norway.—In Sweden the earliest regular Sweden.

newspaper appears to have been the Ordinarie Post-Tidende of Stockholm, first published in 1648, and continued until 1680, then, after long suspension, revived under the title Post- och Inrikes- Tidning, under which name it is still published daily. Stockholm has also its Aftonbladct. The Post-Tidende was followed by the Svensk Merewrius (1675-88) and the

Latin Relationes Curiose (1682-1701). In 1742 a Swedish newspaper in French (Gazctte Francaise de Stockholm) was commenced, and was followed in

3 Valbert, ‘‘Le parti socialiste en Allemagne,” Rev. d. d. Mondes, 1878, ii. 708.

4 Distributed thus :—-Vienna, 19; Linz, 1; Salzburg, 2; Gratz, 1; Klagenfurt, 1; Laibach, 1; Trieste, 3 (two Italian); Prague, 4 (one Czech); Brunn, 3 (one Czech); Olmiitz, 1; Troppau, 1; Innsbruck, 4; Pesth, 4 (two Magyar); Pressburg, 1; Agram, 2 (one Crotian); Temesvar, 1; Neusatz, 1 (Servian); Hermannstadt, 2 (one Roumanian); Cronstadt, 2 (one Roumanian) ; Lemberg, 2 (one Polish) ; Craeow, 1 (Polish) ; Zara, 3 (one Slavonic and one Italian).

5 What that censorship had been in its palmy days may be sufficiently seen from the one fact that in January 1818 the Rheinischer Merkur, the Nuremberg Concordant, the Neuwied Zeitung, all the papers in Freneh printed in the Netherlands, and all Polish papers whatever were suppressed at a blow.

Denmark.

Iceland.

Norway.

Belgium and Holland.

1772 by the Mercure de Suede, But the press in Sweden had small political influence until 1820, when the Argus was established by Johannsen. The strife between ‘‘classicists” and “‘ romantic- ists” spread itself in Sweden, as in France, from the field of litera- ture into that of politics. Crusenstolpe’s Faderneslandbladet and Hjerta’s Aftonbladet, founded in 1830, were long the most con- spieuous of the Swedish journals,—the former on the side of the royalists, the lattcr on that of the reformers.

Hjerta's paper, in its best days, could boast of a circulation of 5000 copies ; but on the accession of King Oscar it ceased to appear as an opposition organ. Almost every town in the provinces has its paper. The growth of the Swedish press during the present ceutury may be thus briefly epitomized:—

Papers. Papers. Papers. GUM cteccreenete remeeace 25 | 1831. seco OOM PLSDS sceccs secccssecaseseesis 105 SU acco st sexcterescecees ASU USE secs ssscsccescsscex cess M25 SSS ese ccc sence ccaceveses 101 Oo 22. eueauesse ese teesets G25 | WSOD ii rercccescsssseseeees TUS} || kei Obepseoccncconeesensecoo 180

2?

In 1882 the newspapers and ''other journals," according to Hubbard, numbcred 303.

While Denmark, as regards mere néws-journals, followed the example of its rival by publishing an Luropdisehe Zeitung as early as 1663 aud the Danske Merewrius in 1666, the political influence of the press is a newer thing in that country than even in Sweden. Until 1830 Copenhagen had but two papers, and they filled their columns with mild extracts from foreign journals. Real activity in this direction dates but from the establishment of the provincial states in 1834, The oldest existing papcr is the Berlingske Tidende, which dates from 1749, and was at first published in German. It is now a semi-miuisterial journal. The Fadrelandet belongs to the opposition, and in 1848-49 was in a glow of zeal for Scandinavian- ism and " Young Denmark." The total number of political journals in 1849 was 36. Of political and miscellancous journals together there were in 1879, according to Larousse, 207, of which number 97 were published in Copenhagen. Those belonging to the provinces are of small account. 'he American consular returns furnished to Hubbard in 1882 give to Denmark 142 (in the text 61 only, but 81 are added in a supplement apparently printed subsequently to the table) of all kinds. So great is the diversity of the most recent accounts. Iceland has in all 12 journals; 10 of these may fairly be looked upon as newspapers, while 2 are magazines. The 10 inelude two papers printed in Copenhagen for circulation in Iceland.

The earliest Norwegian paper was the Christiania Intelligents- sedler, founded in 1763. Next to this came the Advessceontors Lfterretninger (1765), published at Bergen. Den Constitutionelle was until recently the organ of the Government, and had absorbed an older paper, called Norske Rigstidende. The Morgenblad is now the daily journal of the popular party, and dates from 1819.

See A. Geffroy, " La presse périodique dans les Etats Seandinaves," in Tevue des deux Mondes, 1861, iv. 759-765; Larousse, article " Journal," in Grand Dictionnaire, 1875; Hubbard, ut sup., ii. 1297-1300, 1833-1851, 1921, 2580-2582.

The Netherlands and Belgium.—The Niewwe Tijdinghen of Antwerp, published by Abraham Verhoeven, has been said to date virtually from 1605, in which year a ''licence for the exclusive retailing of news" was accorded to him by the archdukes Albert and Isabella. But the claim is conjectural. No copy of any number of this paper anterior to 1616 is now known to exist. It seems probable that the Gazette Extraordinaris Posttijdinghen, published by Wilhem Verdussen between 1637 and 1644, is a continuation of Verhoeven's paper. But, be this as it may, that of Verdussen was certainly the foundation of the well- a Gazette van Antwerpen, which continued to appear until

Bruges had its Niewwe Tijdinghen uyt verscheyden Quartieren, published (in black letter) by Nicholaes Breyghel. Whicn this paper was commeneed is uncertain, but various numbers of it exist with dates betwecn 1637 and 1645. In one of these (26th July 1644) a Brusselsehe Gazette of the 24th of that month is quoted, apart from which citation no Brussels paper is known of earlier date than 1649. When the first number of Le Courrier véritable des Pays- Bas made its appearance, the publisher (Jcan Mommacrt) prefaced the first number by an address to the reader, in which he says :-— "*T have long endeavoured to meet with somebody who would give employment to my presses in defending truth against the falsehoods which malignity and ignorance send daily abroad. Ihave at length found what I sought, and shall now be able to tell you, weekly, the most important things that are going on in the world." This paper became afterwards the Gazette de Bruxelles, then Gazette des Pays-Bas; aud, under the last-named title, it

continued to appear until 1791. The Annales Politiques of Linguet was one of the most remarkable of the politieal journals of Brussels in the last century. For a time the cditor won the favour of the emperor Joseph 11. by praising his reforms, and the Government subscribed for 1200 copies of his paper at two louis d'ors each a year ; but here, as in almost every other place of residence during his chequered eareer, Linguet at length incurred fine and imprisonment. His Journal was repeatedly suppressed, and as often resumed under many

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modifications of title. It was continucd in France, in Switzerland (at Lansanne), and in England. At onetime it was so popular that a printer in Brusscls regularly and rapidly published a pirated edition of it. For a brief period the publication was resumed at Brussels. A complete set extends to eighteen volumes, and ranges in date from 1780 to 1791.1 Mallet Du Pan was, for a time, a collaborator in the editorship. Linguet died by the guillotine in 1794. Le National was a famous paper for a short period prior to the revolution of 1880. Soon after its cessation—its presses were destroyed by the populace on the 26th August—the official journal, Le Monitewr Belge, was established,—"the ministry decming it in-dispensable to the success of its great political enterprise that a journal should be created which might expound its views, and act daily upon public opinion"; and, on decree of the regency, it was published accordingly. It now claims a circulation of 30,500, and the restored National one of 21,100 copies. But LZ' Etoile outshines both ; according to its publishers, it circulates, on the average, 40,500 copies daily. Hubbard's correspondents assign to Brussels a total of 28 daily newspapers, but this heaps together publications of the most incongruous kind.

The first newspaper published at Ghent, Gazette van Gent, appeared in 1667. Den Vaderlander, begun in October 1829, was, for a long period, one of the most widely circulated of the Flemish journals. La Flandre libérale is now the leading newspaper of Ghent, with a circulation of about 15,000 daily.

The kingdom of the Netherlands has always been rich in news- papers, but they have usually had more weight commercially than politically. Those in most estecm are Het Nicwws van den Dag (about 25,000 copies) and the Allgemeen Handelsblad (both daily) of Amsterdam ; the Haarlemsehe Courant ;2 and the Nederlandsche Staats-Cowrant, and Dagblad van Zuidholland en ’s Gravenhage (originally Jowrnal de la Haye), both printed at the Hague.

See Hatin, Les Gazettes de Hollande, Paris, 1865; Warzéec, Essai Historique et Critique sur les Journauz Belges, Ghent, 1845; Kolb, artiele ‘‘ Linguet,” in Bio- graphie Universelle; Alex. Chalmers, article “ Linguet,” in Gen. Biog. Dict.

Russia, Poland, and Finland.—The earliest gazctte of Moscow Russia. (Moskouskia Wiedomosti) was issued by order of Peter the Great on the 16th December 1702, but no copy is known now to exist of earlicr date than the 2d January following. The whole gazette of the year 1703 was reproduced in facsimile by order of the late Baron de Korff (the able imperial librarian at St Petersburg) in 1855, on occasion of the festival for the 8d century of Moscow university. The existing Wiedomosti datcs only from 1766; its circulation in 1882 has been estimated at 50,000 copies. That of St Petersburg dates from 1718.3 The historian Karainzin estab- lished a short-lived Moscow journal (Moskovski Listok), and after- wards at St Petersburg the once widely-known Russian Courrier de la Europe (1802). The profits of the successful Invalide Russe, established in 1815;by Persorovius, were devoted to the sufferers by the war with France. It continucs to appear, not in its original weekly form, but daily, and is now published in Russian (Russkit Invalid). It is said to have an average circulation of about 7000 copies (1882). It is the organ of the‘‘old Russia” party, and also of the ministry of war. Adding to the distinctively political

‘Journals those of miscellaneous character, the whole number of

newspapers published within the Russian states—Poland and Fin- land excepted—in the year 1835 was 136; in 1858 that number had grown to 179, of which 82 were published in St Petersburg and 15 in Moscow ; 132 were printed in Russian, 3 in Russian and in German, 1 in Russian and in Polish, 28 in German, 8 in French, 3 in English, 1 in Polish, 1 in Lithuanian,

1 in Italian. In 1879, under the more libcral rule of Alexander II., the number of political and miscellaneous journals—if we may trust the native authorities used by Lagai—had grown to 293, and of these 105 were under the dircct influence of the Government. But, in truth, the period of relaxation of censorship, if strictly examined, will be found to have lasted only from 1855 to 1864, when repressive Measures were again and frequently resorted to. Ouly 107 foreign political journals are now authorized to circulate. The total number of licensed foreign periodicals amounts to about 300, and of that number no less than 154 are in German.

Poland in 1830 had 49 newspapers. Fifty years later the Poland, number was still less than 70, of which 54 are in Polish, these numbers including journals of all kinds.

Finland in 1860 had 24 newspapers, half in Swedish, half in Finland. Finnish. In 1863 the number had increascd to 32, in spite of the zealous opposition of Count de Berg, the governor-general, to all discussion of political events and '" subjects which do not concern

1 Collection de Matériaux, &e. [Ribliog. des Journauc}, par M.Df[eschiens], p. 97.

? The late M. Xavier Marmier says in his Letires sur la Hoilande, 'the Haar-lemsche Courant is the senior of all the gazettes of Europe," but in truth it dates only from 1656, seventeen years later than the Tijdinghen uyt verscheyden Quar- tieren, and twenty-five years later than his own familiar Gazette de France,

3 There are now (1883) no less than four St Petersburg gazettes, all dailies, the¥three which are in Russian having an aggregate cireulation of about 16,700, while the one in German (1827) cireulated nearly 15,000 eopies in 1882. Lagai says of the latter:—" Its aim is to restore the state of affairs which existed under Peter the Great."

Italy.

SOUTIIERN EUROPE. |

the people." He was very friendly to jonrnals of gardening and eottage economy, and to magazines of light literature, and did not regard comic papers with anger ee they kept quite clear of polities. The paper which was long the chief Finnish organ, Suometar (founded at Helsingfors in 1847, and circulating to more than 4000 copies), owed much of its popularity to the pains its editors took with their correspondence. The Oulun Wukko-Sanomat (''Uleaborg Daily News") was for a considerable period the most northerly newspaper of the world, with the one exception of the little journal published at Tromsd, in Norway. Uleaborg, with a population of less than 9000, supports 6 periodicals, 4 of which are strictly newspapers.

In 1880 the whole number of newspapers printed within the government of Finland was 46, while the total number of news- papers and journals of all kinds published within the whole Russian empire during the same year was 608. Of these, 417 were printed in the Russian language, 155 of them being official or administra- tive organs ; 54 were printed in Polish, 40 in German, 11 in Lettish,

10 in French, 7 in Esthonian, 3 in Lithuanian.

See Hatin, Bibliographie de la Presse périodique, Introduction, pp. xxix, c; Bibliographie de la France, January 30,1875, "Chronique"; Annuatre de la Presse Russe (for 1880), as quoted in Bibliographie de la France, 1880, "Chron- igque," p. 19; Lagai, article '' Zeitungen," ud sup., 745 sq.; A. Geffroy, '' De la Presse périodique en Finlande," in Revue des deux Mondes, 1860, vi. 771-777; Sampson Low, in Publishers' Circular, 1879, p. 410.

Ttaly.—The Diario di Roma, although dating only from 1716, may claim to have been the patriarch of the Italian press. It lasted for nearly a century anda half. During its later years it wasa daily paper, with a weekly supplement having the somewhat whimsical title Notizie del Giorno. Next to this, we believe, canie the Gazzetta Uffiziale di Napoli, which continues to exist. These and their eongeners were published under a rigid censorship until far into the present century, and exercised little influence of any kind. The first tentative movement towards a free press may, perhaps, be dated from the etfort to establish at Milan, in 1818, under the editorship of Silvio Pellico, the Coneiliatore, in which Simonde de Sismondi, Gonfalonieri, and

Romagnosi were fellow-writers. But tle new journal was suppressed in 1820. The first really effectual effort had to wait for the lapse of nearly thirty years. L'Opinione, which in many respects is the leading journal of Italy, although its circulation is far inferior to that of many of its rivals, was first published in Turin (26th December 1847). It is now published in Rome. It has had, amongst its many editors, Giacomo Durando (a soldier of mark, and twice minister of foreign affairs), Montezenolo, Giovini Bianchi, and Giacomo Dina. At one period it attained, according to credible report, a circulation of 15,000 copies. Its present circulation averages less than the half of that, but few Italian papers are so often met with in other countries. Fewer still are edited with equal ability.

The Gazzetta del Popolo of Turin had in 1855 about 7000 sub-

seribers. In later days its sale has occasionally reached almost 20,090 copies. Hubbard's agents, in 1882, reported its circulation as 8000. 'The Florence Diritto, originally founded at Turin, in 1851,

by Lorenzo Valerio, was edited successively by Macchi, Bargini, and Civinini, and as a radical organ attained great influence. When (under the last-named editor) it displayed a wise moderation in its politics, popularity rapidly declined ; and it has long ceased to appear.

Ponanting journals of all kinds, there were published in Italy in 1836 185 newspapers ; in 1845, 220; in 1856, 311; in 1864, 450;1 in 1875, 479. In 1882 the " periodicals" of all kinds? numbered 1454, distributed as follows :—Piedmont, 155 ; Liguria, 63; Lom- bardy, 291; Venice, 83; the Emilia, &c., 301; Tuscany, 178; Naples, 243; Sicily, 182; Sardinia, 8. The total number of political dailies is 149, of which the Roman district claims 35,3 Naples and Sicily 36, Lonibardy 22. Amidst all the vicissitudes of things political in Italy, the press-law of March 1848 remains substantially and in the main the law of to-day. There is neither stamp, caution-money, nor obligatory signature ; but there are provisions— used with great moderation —for a wise and firm repression of libel. It was in Piedmont that the best portion of the press learned the lesson that its duty is rather to fructify and to expand established institutions than to attack them by sap and mine. By the Police Act of November 1859 the vending of newspapers is made subject to due regulation. And by the constitutional law of Italy (June 1874)

it is made illegal for newspapers to publish reports of eriminal procedure until after the delivery of the verdict or definitive jndgment in each case.

See Statistica Amministrativa del regno d Italia, Rome,1882; Calendario gene- rale, 1876, appendix; Bibliograjia Italiana, 1876-77, section ‘‘Cronaca”; Hatin, Bibliographie de la Presse périodique, supplement; Annuario statistico Italiano, 1881, Introduetion, pp. 149 and 150, 328, 329; Charles de Mazade, ‘‘Les pré- eurseurs Italiens,” in Revue des deux Mondes, 1867, i. 906; André Folliet, “La presse Italienne et sa législation,’ in Revue Moderne, vol. li. pp. 659-693, and vol. lil. pp. 87-118, 1869 ; Cesare Canth, in Bibliograyia Italiana, xiv. 909 sq., 1880.

1 Of these’Turin published 100, Milan 80, Florence 51, Genoa 37.

2 There are no means of separating, with assured accuracy, the newspapers strietly so called from other “ periodicals” under the forms of return employed in the official publications of latest date.

3 The city of Rome itself publishes 18 ; Naples, in 1881, followed elosely with 16.

Spain and Portugal.—In Spain no newspaper of any kind existed Spain.

earlier than the last century. Even during the early years of the present its capital contented itself with a single journal, the Diario de Madrid. The Peninsular War and the establishment of the Cortes gave the first impulse towards something which might be called political journalism, but the change from total repression to absolute freedom was too sudden not to be grossly abused. The Diario de las Cortes, the Semanario Patriotieo (published at Cadiz from 1808 to 1811), and the durora Mallorquina (published at Palma in 1812-13) are the first of the new papers that attained importance. In 1814 the circulation or receipt in Spain of English newspapers was prohibited under penalty of ten years’ imprison- meut.> Most of the native journals fell with the Cortes in 1828. In the following

year Ferdinand decreed the suppression of all the journals except the Diario and the Gageta of Madrid,® the Gacetu de Bayona, and certain provincial papers which dealt exclusively with commercial or scientific subjects. At the close of his reign only three or four papers were published in Madrid. Ten years after- wards there were 40; but the number was far more noticeable than the value. Spanish newspapers have been too often the mere step- ping-stones of political adventurers, and not unfrequently the worst of them appear to have served the turn more completely than the best. Gonzales Bravo attained office mainly by the help of a paper of notorious scurrility,—I Guirigay. His press-law of 1867 introduced a sort of indirect censorship, and a system of ‘‘warnings,” rather clandestine- than avowed; and his former rivals met craft with craft. The Universal and the Correo were successively the organs of José Salamanca. At the end of 1854 the political journals published in Madrid numbered about 40, the most couspicuous being the now defunct Lspatia and El Clamor Publico.

Hubbard’s agents assign to Spain in 1882 220 newspapers of all sorts, of which 58 appear in Madrid. The same authorities assign to El Correo a circnlation of about 10,000 copies, to the Diario de Madrid [? Diario Espaiiol] a circulation of 12,275 copies, and to La Vanguardia Federal one of 16,000 copies ; all these are dailies. To the weekly paper, Correspondencia de Espaiia, they assign an average sale of 42,000 copies. Cadiz has 5 political newspapers, Seville 4, and Barcelona 4.

Portugal in 1882 is credited by the resident American consuls Portugal.

with 179 journals of all kinds and of various periodicity. Of this number 68 appeared in Lisbon. The strictly political daily papers of Lisbon are 6 in number ; those of Oporto 8.

See Ford, Handbook of Spain; S. T. Wallis, Spain, her Institutions and Public Men, 1853, p. 88-95; Charles de Mazade, “La Révolution et la réaction en Espagne,” in Revue des deux Mondes, 1867, v. 501; ‘‘The Newspaper Press of Spain,” in British Quarterly Review, vi. 315-5832; Hubbard, Newspaper Direc- tory, ii. 1852-1857, 1877-1893, 2458-9, and 2587-8.

Switzerland.—In 1873 the total number of political and general Switzer- In 1881 they numbered 342, land.

newspapers in Switzerland was 230. of which 45 may be described as class journals, 297 as political, general, and advertising. Of 226 of the whole number, 53 were of daily issue, 166 appeared twice or thrice a week, and 7 only were of weeklyissue. Of 225 political journals, 185 are classed as ‘‘ Pro- gressist ’ organs, 40 as ‘‘ Conservative.” Zurich claimed 44; Bern, 34; Vaud, 20; Basel, 18; and Geneva, 10. The aggregate average circulation is estimated approximately at 606,000 copies, an average circulation of about 1770 to each newspaper.

A monthly compendium of the news of the day appeared at Rorschach, in the canton of St Gall, as earlyas January 1597. The editor was a German, one Samuel Dilbaum, of Augsburg. He varied his titles, so that his monthly newsbooks, although really consecutive, do not wear the appearance of serial publications. Sometimes he called his issue Historische Relatio, sometimes Beschreibung, sometimes Historische Erzihlung.

See Bicuter, ‘‘ Statistique de la Presse Suisse,” in Journal des Economistes, 1882,

xviii. 134; Weller, Die ersten deutschen Zeitungen, Tiibingen, 1872; of. Lagai, in Pierer, ubt sup.; and Hubbard, ii. 1897-1913, 2458-9, and 2588 (supplement).

Grecee.—The few newspapers that made their sudden appearance Greece.

in Greece during the war of liberation departed as hastily when King Otho brought with him a press-law, one of the provisos of which demanded caution-money by actual deposit. The journal Saviour was established, in 1834, as a Government organ, and was soon followed by Athena as the journal of the opposition. Ten years later 7 distinctively political papers had been established, along with 13 journals of miscellaneous nature. In 1877 there were, of all sorts, 81 journals, of which 77 appeared in Greek, 2 in Greek and French, 2 in French only; 37 of these were printed in Athens, 17 in the Ionian Islands. Of strictly political news- papers there were 12 at

Athens and 3 in the Islands. In 1882 the American consul reported 89 periodicals in all, of which 52 were published at Athens.

See Lagai, in Picrer, ut sup.,745; Iubbard, wt sup., ii. 1779-1781, and 2458-9.

4 Lagai (article “ Zeitungen,” in Pierer’s Universal Lexicon, 1878) cites a Gage- ta de Madrid of 1626, but gives no evidence whatcyer.

5 A contemporary communieation to Gent. Mag., 1xxxiv. part 2, 176.

6 The present Zi Diario Espaiol is a paper of more recent date.

Roumania and Servia.

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Rowmania and Servia.—Bucharest has now 4 daily newspapers (Romanulu, Timpul, Tclegraphulu, Tagblatt), and Galatz one (Vocea Covurlwivlut). Roumania has in all 19 journals, with an estimated average aggregate circulation of 32,700 copies. Servia at the end of 1877 had 19 political journals. The Government organ (Serbske Novine) dates from 1841, the independent journal (Vidov Dan) from 1861, the elerical organ (Pastié) from 1868.

See Lagai, ut sup.; Hubbard, wt sup., ii. 2458 sq.

Turkey.—During the embassy (1795) of Verninac Saint-Maur, envoy of the French republic, a French journal was established at Pera. This, possibly, is the pioneer of all Turkish newspapers. Thirty years later (1825) the Speetateur de l’Orient was founded at Smyrna, also by a Frenchman (Alexander Blacquet ?). It was after- wards published under the titles Cowrricr and Journal de Smyrne, and its latest editor was a third Frenchman, Bousquet des Champs. In like manner, the Afonitewr Ottoman, first of strictly Constan- tinopolitan journals, was founded by the above-

named Blacquet in 1&31. It soon changed its language to Turkish, and was edited by Franceschi. The second Smyrna newspaper, Keho del' Orient, estab- lished in 1838, was transferred to Constantinople in 1846. But not one of these papers has survived until now. In 1876 the total nuinber of journals of all kinds published in the capital was 72 (namely, 20 in French, 16 in Turkish, 13 in Armenian, 12 in Greek, 11 in as many other tongues); in 1877 it was 80. In 1882 the whole number published in all the Turkish dominions, Asiatic as well as European, is reported as 121 of all kinds and of all varieties of periodicity. Among the papers printed in Constantinople are four Bulgarian journals; the stoch no Vreme is edited by an Englishman, Three other official newspapers for Bulgaria are published by the Turkish Government at Rustchuk, Adrianople, and Salonica. The Arabie Jawdib of the notorious and learned Faris al-Shidiak has long been one of the best-known Oriental journals.

See Bibliografia Italiana, 1876, " Cronaca," p. 50; Lagai, ut sup.; Hubbard, ii. 1914-1918, 2458-9, 2588; Zeitung fiir Staatswissenschaft, 1876.

NEWSPAPERS OF INDIA AND CHINA.

India.—¥or a considerable period under the rule of the East India Company, the Indian press was very unimportant both in character and influence. It was permitted to shape its course and to gain a position as it could, under the potent checks of tho deportation power and the libel law, without any direct eensorship. Nor was it found difficult to inflict exemplary punishment on the writers of " offensive paragraphs."

Prior to Lord Wellesley's administration the most considerable newspaper published at Calcutta were The World, The Bengal Journal, The Hurkaru, The Calcutta Gazette (the organ of the Bengal Government), The Telegraph, The Calcutta Courter, The Asiatic Mirror, and The Indian Gazette. Not one of these eight journals has survived, as a substantive publication,! until now. Mr Duane, the editor of the first-named paper, was sent to Europe in 1794 for "an inflammatory address to the army," as was Mr Charles Maclean, four years afterwards, for animadverting in The Telegraph on the official eonduct of a local magistrate. Lord Wellesley was the first governor-general who ereated a censorship (April 1799). His press-code was abolished by the marquis of Hastings in 1818, The power of transporting obnoxious editors

to Europe of course remained. Perhaps the most eonspicuous instance of its exereise was the removal of the editorof The Calcutta Journal (Silk Buckingham), which occurred immediately after Lord Hast- ings's departure from India, and during the government of his temporary successor, Mr John Adam. Buckiugham's departure was followed closely (14th March 1823) by a new licensing Act, far exceeding in stringency that of Lord Wellesley, and (5th April 1823), by au elaborate '' Regulation for preventing the Establish- ment of Printing-Presses without Licence, and for restraining under certain circumstances the Circulation of Printed Books and Papers." The first application of it was to suppress The Calcutta Journal.

In the course of the elaborate inquiry into the administration of India which occupied both Houses of Parliament in 1832, prior to the renewal of the Company's charter, it was stated that there were, besides 5 native journals, 6 European newspapers :—three daily, The Bengal Hurkaru, John Bull, and The Indian Gazette; one published twice a week, The Government Gazette; and two weekly, The Bengal Herald and The Oriental Observer. At this period every paper was published under a licence, revocable at pleasure, with or without previous inquiry or notice. At Madras, on the other hand, the press remained under rigid restriction. The Madras censorship was removed whilst the parliamentary inquiry of 1832 was still pending.

One question only, and that but for a brief interval, disturbed

1 The Hurkaru and The Indian Gazette were long afterwards combined under the new leading title, Indian Daily News (with the old name appended), and the joint publicatlon survives, circulating, in 1882, about 1700 copies. All the Cal- cutta newspapers, properly so called, are comparatively of short duration, and ey o ae ne cae me at present exceeds 2000 copies, and only

— ishman's Overland Mail—attai i i j Atti stk acdeion, attains so high, The sporting journal,

NEWSPAPERS

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Lord William Bentinck's love of free discussion. The too famous '* Half-Batta '? measure led him to think that a resolute persistence in an unwise policy by the home Government against the known convictions of the men actually at the helm in India and an unfettered press were two things that could scarcely co-exist. It was on this occasion that Sir Charles Metcalfe recorded his minute of September 1830, the reasoning of which fully justifies the assertion—''I have, for my own part, always advocated the liberty of the press, believing its benefits to outweigh its mischiefs; and I continue of the same opinion." This opinion was amply carried out in the memorable law (drafted by Macaulay, and enacted by Metcalfe as governor-general in 1835), which totally abrogated the licensing system. It left all men at liberty to express their senti- ments on public affairs, under the legal and moral responsibilities of ordinary life, and remained in force until the outbreak of the mutiny of 1857.

In 1853 Garcin de Tassy, when opening at Paris his annual eourse of Icctures on the Hindustani language, enumerated and gave some interesting details concerning twenty-seven journals (of all sorts) in Hindustani. In 1860 he made mention of seventeen additional ones. Of course the eirculation and the literary merits of all of them are relatively small. One, however, he said, had reached a sale of 4000 copies.?

In 1857 Lord Canning's law, like that of 1823, on which it is closely modelled, absolutely prohibited the keeping or using of printing-presses, types, or other materials for printing, in any part of the territories in the possession and under the government of the East India Company, except with the previous sanction and licence of Government, and also gave full powers for the seizure and prolibition from circulation of all books and papers, whether printed within the Indian territories or elsewhere.

The Act (March 1878) which now regulates the important part of the subject that concerns the vernacular press of India runs thus:—'' Printers or publishers of journals in Oriental languages must, upon demand by the due officer, give bond not to print or publish in such newspapers anything likely to excite feelings of disaffection to the Government or antipathy between persons of different castes or religions, or for purposes of extortion. Notifica- tion of warning is to be made in the official gazette if these regula-

tions be infringed (whether there be bond or not); on repetition, a warrant is to issue for seizure of plant, &c.; if a deposit have been made, forfeiture is to ensue. Provision is made not to exact a deposit if there be an agreement to submit to a Government officer proofs before publication."

The total number of journals of all kinds published within dll the territories of British India was reported by the American eonsular staff in 1882 as 373, with an estimated average ageregate circulation per issue of 288,300 copies. Of these, 43, with an aggregate circulation of 56,650 copies, were published in Calcutta ; 60, with an aggregate circulation of 51,776 copies, at Bombay.

Sce Afinutes of Evidence on the Affairs of the East India Company, February to July 1832, i. 98-101, 166-180 (Company's cdition); Report of the Select Com- mittee of House of Commons on the Affairs, &c., 16th August 1832, 31, 32; Report from Select Committee on the Suppression of the Calcutta Journal, 4th August 1834; Second Report from Select Committee on Indian Territories, 12th May 1853, 64-68; Further Papers on the Mutinies in the East Indies, 1857, No. 5, 89-96 ; Returns relating to the Restriction of the Liberty of the Press in India, 24th August 1857; Selections from the Papers of Lord Metcalfe, 1855, 311 sq.; The Oriental Heraid, 1824, i, 6-77, 123-142, 197-224 ; Letters to the Marquis of Hlastings on the Indian Press, 1824, 61, &c.; Memoirs and Correspondence of the Marquess Wellesley, i. 281, ii. 128 sqg.; Wilson, History of British India, from 1805 to 1835, 1848, iii. 581-585; An Act for the Better Control of Publications in Oriental Languages, March 1878; Hubbard, Directory, ii. 2458 sq.

China.—The Peking Gazette is said, traditionally, to date from China.

the 10th century of the Christian era, but this is unsupported by evidence. The Gazctte consists of three parts:—(1) Kung-men- eh'ae, ''Copy of the Palace Gate," a sort of court circular; (2) Shang-yii, *' Imperial Decrees"; (8) Y'sow-pao, '' Memorials from Officers of State." The answers to the documents printed in (3) sometimes appear subjoined as ''apostils," sometimes as decrees in (2). During part of the last eentury the Gazette was printed in the imperial palace from movable types of copper (probably brought into China by the Jesuits), afterwards from wax tablets, and for the last sixty years from movable types of wood.

Since 1858 several newspapers on the European model have been established in various large mercantile towns of China. The most notable is the Sceng-pao of Shanghai, which circulates throughout many provinees. The Datly Press of Hong-Kong dates from 1860, the North China Herald from 1862. Of all sorts of journals China is credited with 22, of which 14 appear at Hong-Kong, the Gazette only at Peking.

See Sir Rutherford Alcock, "The Peking Gazette," in Fraser's Magazine, February and March 1873; W.F. Mayer, in China Review of 1877; Bibliographie dela France, 1877, pp. 103, 104; Journal des Economistes, xvi. 228, 1881,

2 Some valuable notices of vernacular journals in various tongues have been published from time to time in Triibner's Oriental and American Record.

3 Of the former kind the following is a rccent example, Li-Hung-Chang reports that the leader of the Nien-fei (northern rebels) "did really die by drowning," as lately announced. The emperor apostils, ''I am greatly delighted to hear it."

UNITED STATES. |

NEWSPAPERS OF SouTH AFRICA.

The chief papers of the Cape Colony are The Evening Express (6000) and The Cape Argus (5000). At Pretoria, the eapital of the Transvaal, in 1882, four papers were published—three in Dutch, one in English.

NEWSPAPERS OF THE UNITED STATES.

Boston was the first city of America that possessed a local newspaper ; but the earliest attempt in that direction, made in 1689, and a second attempt, under the title Publick Occurrences, which followed in September 1690, were both suppressed by the Government of Massachusetts. Only one copy of the first and two copies of the second of these two pioneers are now known to exist. One copy of the Publick Occurrences may be seen in the State Paper Department of the Rolls House in London. The other was

recently exhibited at Philadelphia. The paper is a small quarto sheet, one of the four pages of which is blank, while the other three contain a record of passing occurrences, not unlike the contemporary news of the English press ; and there is little in the paper to justify, in any sense, the governor's assertion that "it contained reflexions of a very high nature." Although it purports to be "printed by Richard Pierce for Benjamin Harris," it is probable that the latter was both printer and editor, as he had already been of a London paper (Zhe Post), and was again at a subsequent period. Nearly fourteen years afterwards (April 24, 1704), the first number of Zhe Boston News-Letter was "printed by B. Green, and sold by Nicholas Boone"; but its proprietor and editor—so far as it can be said to have had an editor, for extracts from the London papers were its staple contents—was John Campbell, postmaster of the town. In 1719 he enlarged his paper, in order, as he told his readers, "to make the news newer and more acceptable; . ... whereby that which seem'd old in the former half-sheets becomes new now by the sheet… .. This time twelvemonth we were thirteen months behind with the foreign news beyond Great Britain [or, in other words, the attention of the Bostonian politicians was engrossed on the siege of Belgrade, when their contemporaries in the mother country were intent on the destruction of the Spanish fleet on the coast of Sicily], and now less than five months; so that… . we have retrieved about eight months since January last"; and he encourages his subscribers with the assurance that if they will continue steady "until January next, life per- mitted, they will be accommodated with all the news of Europe… . that are needful to be known in these parts." But Campbell's new plans were soon disturbed by the loss of his office, and the commencement of a new journal by his successor in the postmastership, William Brooker, entitled The Boston Gazette, "published by authority" (No. 1, 21st December 1719). The old journalist had a bitter controversy with his rival, but at the end of the year 1722 relinquished his concern in the paper to Benjamin Green, by whom it was carried on with higher aims and greater success.

Green conducted the paper until his death, at the close of 1733, and was succeeded by his son-in-law, John Draper, who published it until December 1762. By Richard Draper, who followed his father, the title was altered to Massachusetts Gazette and Boston News-Letter; and the maintenance of the British rule against the rising spirit of independence uniformly

characterized his editorship and that of his widow (to whom, at a subsequent period, a pension was granted by the British Government). It was the only paper printed in Boston during the siege, and ceased to appear when the British troops were compelled to evacuate the city.

The Boston Gazette began, as we have seen, in 1719.

James Franklin, elder brother of the celebrated Benjamin Franklin, was its first printer. It lasted until the end of 1754, its editorship usually changing with the change of the postmasters. On the 17th August 1721 James Franklin started The New England Courant, the publica- tion of which ceased in 1727; and two years later Benjamin Franklin established The Pennsylvania Gazette, which he continued weekly until 1765.

To The Boston Gazette and the Courant succeeded The New England Weekly Journal (20th March 1727 ; incor- porated with The Boston Gazette in 1741), and The Weekly Rehearsal (27th September 1731), which became The Boston Evening Post (August 1735), and under that title was for a time the most popular of the Boston newspapers. It aimed at neutrality in politics, and therefore did not survive the exciting events of the spring of 1775. Several minor papers followed, which may be passed over without notice. A new Boston Gazette, which began in April 1755, has, however, claims to be particularized. For a long time it was the main organ of the popular party, and expounded their policy with great ability, and in a dignified temper. Otis, John Adams, Samuel Adams, and Warren were amongst its writers.

The Massachusetts Spy, under the indefatigable editor- ship of the American historian of printing, Isaiah Thomas, did yeoman's service in this struggle, although of a different kind from that of Zhe Boston Gazette. The latter spoke chiefly to the thinkers and natural leaders of the people. The Spy was a light and active skirmisher who engaged his antagonists wherever he met them, and frequently carried the war into the enemy's country. In July 1774, during the operation of the Boston Port Act, and soon

after the landing of four British regiments, it adopted Franklin's odd device, representing Great Britain as a dragon, and the colonies as a snake divided into nine parts with the motto, "join or die." But Boston grew too hot for the patriotic printer, and he had to remove to Worcester on the day of the battle of Lexington. Here the paper continued to be published until 1786,—the lack of the stirrig revolutionary matter being occasionally supplied by the republication in its columns of entire books, such as Robertson's America and Gordon's J/istory of the Revolution. This journal, like so many more, was for a time killed by a tax. The stamp duty imposed in March 1786, though amounting to but two-thirds of a penny, and very speedily repealed, led to the suspension of the Spy until April 1788, At that period it was resumed ; and it still continues, being the oldest newspaper in Massa-chusetts.

The Boston Sentinel is on many grounds a memorable newspaper. It was founded and for nearly forty years edited by Major Bursell, a man who combined ability with singular moderation of temper, and with singular modesty and disinterestedness. He printed the Acts of Congress for a very long time without charge. William Lloyd Garrison's once well-known Boston Liberator was founded on New Year's Day 1831. For a time its editor was also writer, compositor, and pressman. In December of that year the assembly of his State offered a reward of 5000 dollars to any one who would cause him to be apprehended and brought to trial. He continued the paper to the last day of 1861, and lived to witness the abolition of negro slavery.

At the commencement of the struggle for independence in 1775 Massachusetts possessed 7 newspapers, New Hampshire 1 (The New Lampshire Gazette, founded in 1756), Rhode Island 2, and Connecticut 3, —making 13 in all for the New England colonies. Pennsylvania had 8, of which the earliest in date was The American Weekly Mercury (No. 1, 22d December 1719) ; and New York

but 3, the oldest of them being The New York Gazette, the publication of which had commenced on the 16th October 1725. Up to that period (1725) Boston and Philadelphia were the only towns possessing a newspaper throughout America. In the middle and southern colonies there were, in 1775, in the aggregate, 10 journals, of which Maryland, Virginia, and North Carolina possessed each 2, South Carolina 3, and Georgia 1. The total number of the Anglo-American papers was 34, and all of them were of weekly publication.

The New Hampshire Gazette still exists, and is the "father" of the New-England press. In 1810 this State possessed 12 papers; in 1828, 17; in 1840, 27; in 1850, 32,—-viz., 22 described as "political," and 10 as "mis-cellaneous." The earliest paper established in Vermont was The Green Mountain Postboy, first published in April 1781. In 1850 the number of newspapers was 30, 27 of which are described as "political." Maine possessed in 1850 29, 4 of them of daily publication. Rhode Island

had 13, of which 5 were daily; Connecticut had 28, |

including 7 daily papers ; Massachusetts possessed in 1850 no less than 91 newspapers, about two-thirds of them published in Boston. Of the whole number, 22 were of daily and 54 of weekly publication.

Pennsylvania had in 1810 71 newspapers; in 1850, 210, with a collective circulation of 338,336 copies; in 1870, 540, with a circulation of 3,419,765 copies ; and in 1880, 973, with a circulation of 5,031,061 copies.

The Aurora was the most notable of the early Phila- delphia papers, next to Franklin's Gazette. Its hostility to Federalism, and to Washington as the main pillar of the Federalists, was violent. Zhe Daily National Gazette, started in 1820, soon became prominent for its union of literature with politics.

The earliest journal of Maryland was William Parker's Maryland Gazette, established in 1727, when in all America it had but six existing predecessors. Discontinued in 1736, it was revived in 1745 by Jonas Green, to exist to the present day as the flourishing patriarch of American journals. In Maryland there were, at the census of 1850, 40 newspapers ; at that of

1870, 88, with an aggregate circulation of 235,450 copies. In March 1880 its capital, Baltimore, had 4 daily newspapers—a number equal to that of Boston, and surpassed only by Philadelphia, New York, Cincinnati, and Chicago.

New Jersey had no really established newspaper before the Revolution, although the first number of an intended journal was published in 1765, under the title of The Constitutional Gazette, containing matters interesting to Lnberty, but no wise repugnant to Royalty. The earliest regular paper was The New Jersey Gazette, which began in December 1777. New Jersey in 1850 had 45 newspapers ; in 1870, 122.

Virginia, notwithstanding its illustrious precedency,—the province of Raleigh, the cradle of Washington,—possessed neither newspaper nor printing office until 1736, so that (as respects one-half at least of the wish) there was once a prospect that the devout aspiration of Sir William Berkeley might be realized. 'Thank God," said this Virginian governor in 1671, "we have neither free school nor print- ing press, and I hope may not have for a hundred years to come." The earliest journal established in the State was The Virginia Gazette, commenced in 1736. The Ltichmond Inquirer, which started in 1804, early attained a leading position. In 1810 the total number of Virginian papers was 23; in 1828, 37; at the census of 1850, 67; in 1870, 173, with an average total circulation of 198,272 copies. North Carolina had, in 1850, 37 journals, with an aggregate circulation of 25,439 copies ; in 1870 it had 64, with 64,820 ; South Carolina in 1870 had 55, with 80,900 :

APERS5

Georgia 110, with 150,987 of circulation ; Florida 23, with 10,545; Alabama 89, with a circulation of 91,165 copies.

In New York, the Gazette already mentioned was followed by The Weekly Journal (No. 1, 5th November 1733), still memorable for the prosecution for sedition which it entailed on its printer, John Peter Zenger, and for the masterly defence of the accused by Andrew Hamilton. ''The trial of Zenger," said Gouverneur Morris, "was the germ of American freedom." CGaines's New York Mercury was published from 1752 to 1783. Rivington's Royal Gazette was established in 1773, and in the first year of

its existence is said to have attained a circulation of 3600. After the Revolution this paper was continued under the title New York Gazette and Universal Advertiser. The first daily newspaper published in the city or State of New York was The New York Journal and Register, com- menced in 1788. In 1810 the aggregate number of papers published within the State was 66, of which 14 belonged to New York city. Ten years later the city press included 8 daily journals, with an aggregate daily circulation of 10,800 copies. No one paper circulated more than 2000, and but two—TZhe Evening Post and The Commercial Advertiser—attained that number. In 1832 there were 13 daily journals, with a collective daily circulation of 18,200. In 1850 the number of daily papers was 51, with an aggregate annual circulation of 63,928,685.

The penny press of America began in New York, and the pioneer was The Daily Sun (No. 1, 23d September 1833), written, edited, set up, and worked off by Benjamin Franklin Day, a journeyman printer. Its circulation at first was 600 copies ; in 1854 its average issue was 36,525 copies. Its success has been described with sufficient significancy as mainly owing to "' piquant police reports," at least at the outset. It was afterwards reorganized, and made to take a more vigorous political course, chiefly on the Democratic side. Without increasing its size or chang- ing its price, it has thus become one of the most profitable journals in New York. Zhe New York Herald followed in May 1835. Exceptional and eccentric forms of advertisement were persistently used to gain notoriety for the new paper, and its commercial success was great. Within twenty years it had attained a circulation of 36,158 copies,—which was at that date about five times the circulation of any London newspaper, The Times only excepted,—and the issue has since greatly increased. The Herald is said to be still "the most fickle, coarse, and blustering of American papers," but it is none the less conducted with conspicuous skill and enterprise. It often contains several columns of "' exclusive " telegrams, obtained by a lavish outlay. In a single number during 1882, forty columns of original matter appeared. In another number (also of 1882) one hundred columns of advertise- ments appeared, containing nearly 4000 several insertions. The one fact explains the other. James Gordon Bennett, the founder, proprietor, and editor of the Herald, gradually yielded its management in the later years of his life to his only son, of the same name, who succeeded to the absolute control on his

father’s death. The elder Bennett left a large fortune ; and of part of this a noble use was eventu- ally made. Besides the expenditure on the world-famous mission in search of Livingstone, a generous but unfor- tunate Arctic exploration enterprise was fitted out from the same fund. A popular subscription for the relief of the suffering in Ireland was also started with a gift of a

hundred thousand dollars from the Herald. The New

York Tribune was established in 1841 by Horace Greeley, who remained its editor and one of its proprietors until his death, shortly after his defeat for the presidency in 1872. It was also, at the outset, a penny paper, but it differed from its cheap rivals in being a vigorous political pro-

pagandist, and in giving hospitable attention to literature and to novel ideas in social and political economy. Thus it allowed contributors to expound and defend the doctrines of Fourier; it encouraged various efforts at founding associations more or less communistic and educational ; after the failure of the famous Brook Farm experiment, it took the president and three other conspicuous members of that association upon its staff; it was early in giving serious notice to the so-called manifestations of spiritualism ; it advocated co-operation instead of trades unions and strikes as the best remedy for the wrongs or misfortunes of labour ; and it led in the warfare upon slavery through political agencies. The 7’ribune made the first great use of the Atlantic cables for transmitting war correspondence, in its voluminous reports of the Franco-Prussian war. Another of its notable feats was the translation of the “cipher dispatches,” revealing the effort by some of Mr Tilden’s partisans to purchase electoral votes for him, in the disputed presidential election of 1876. Its circulation in 1851 was 19,000 copies, of which somewhat more than half was sold within the limits of the city. It had gained in 1857 a daily circulation of about 29,000 copies, and in addition issued as a weekly paper 163,000 copies, irrespec- tively of certain special issues for California and for Europe. The circulation in both forms is now, in 1883, greatly increased, but there are no quite trustworthy records of the

present issues of the New York press. The New York Times was established by Henry J. Raymond in September 1851; and, though absent at times in the dis- charge of his duties as lieutenant-governor of New York and member of congress, he continued its editor and chief proprietor until his death in June 1869. It was intended to satisfy the wants of those who preferred a journal of the Tribune's general political tendencies and literary character, but with a more moderate and conservative spirit. The Times also began as a cheap paper; and it was successful almost from the first. Its greatest good fortune came after the death of its founder, in its discovery and vigorous exposure of the frauds and robberies committed by the "Tweed Ring," in the municipal government of New York, a work for which it received great praise and profit. These are amongst the prizes of New York journalism. How numerous the blanks are may be inferred from the statement that between the years 1820 and 1850 32 daily newspapers were founded and abandoned.

The prices of the more important New York papers were advanced to three, and finally, during the war of the Rebellion, to four cents. They all came to make regular issues on Sunday also, when the price was generally five cents. In September 1883 the Times suddenly reduced its price from four to two cents. The Herald did the same ; but the 7ribume stopped at three cents, being now the only one of the great morning journals to charge over two cents. There are also several one-cent papers, with considerable circulations. Their inroads upon the larger journals, and that from the World, an eight-page Democratic newspaper sold at two cents, are supposed to have forced the reductions in price above named, which are obviously to make a great change both in the character and prosperity of the press of New York.

The expenditures upon the New York newspapers have greatly increased since 1860. Forty columns of news and editorial comment are often given ina single eight-page paper; extra sheets are frequent, and are always given when advertisements require it. The //erald sometimes prints as many as 32 pages in one issue. Nearly all the news is now received by telegraph, and a large part of it is collected for each paper by its own staff of correspond- ents and reporters. Several papers lease telegraphic wires to Washington for their own use. A large staff of

reporters is also maintained by each for occurrences in and about the city—twenty-five to fifty reporters not being an unusual number for any of the more important journals.

The New York Associated Press is the chief news agency of the American continent. It is a partnership between the Herald, Tribune, Times, Sun, World, Journal of Commerce, and Mail and Express for the collection of such news as its members may wish to use in common, and the sale of it to others. This and the Western Associated Press—an organization of a large number of the more important newspapers of Chicago, Cincinnati, St Louis, and other cities in the Mississippi valley—are now consolidated in a working arrangement, under the man- agement of a permanent joint executive committee, who appoint agents, contract with telegraph companies, dis- tribute the news to the members of the two associations, and sell it to a great number of individual papers and other associations. They transmit proceedings of Congress and the State legislatures, public documents, market news, the dispatches by ocean cables, and, in general, accounts of all public occurrences of interest.

Until the reductions of 1883, the prevailing price for first-class papers, of eight or more pages, was, in New York, four cents; in Chicago, Cincinnati, St Louis, and elsewhere, five cents. The past ten years, however, had been notable for the growth of another class of journals, of about half the size, generally of only four pages, which aimed at a greater condensation of routine news, and often at giving special prominence to “sensations.” These were sold at two cents, and frequently attained great success. The New York Sun, Boston Herald, Philadelphia Times, Chicago Mews, and San Francisco Chronicle were good examples. Equally successful, if generally less sensational, were the Philadelphia Ledger, Baltimore Sun, Washington Star, and San Francisco Call. The wide circulation and handsome profits of this class of journals have developed a considerable reaction against large papers, extreme ful- ness of news detail, and long editorial comment. Most of the newspapers started or projected now are of this two- cent class.

The great distances in the United States, the excellent and cheap telegraphic service, and the facilities afforded by the Associated Press combine to promote the growth of what would be called in England “provincial journals.” Cincinnati, Chicago, and St Louis being each over a day’s and a night’s journey from New York, Boston, or Phila- delphia, are able to build up first-class papers of their own. In Chicago the 7’ribune, Times, and fnter-Ocean are all strong and enterprising eight-page journals, often sending out double or sixteen-page sheets, maintaining large corps of correspondents, and leasing private wires from New York and Washington. Substantially the same may be said of the Commercial Gazette and the Enquirer of Cincinnati, of the Globe-Democrat and the Republican of St Louis, and of the Zimes-Democrat of New Orleans. Some of these papers realize net profits of over a hundred thousand dollars in a single prosperous year.

Nearly every town of 15,000 inhabitants has its own daily paper. Scarcely a “‘ county seat ” in the settled part of the United States is without its weekly paper,—even if the population should be below 1000. In the older counties, villages of a few hundred inhabitants in the “‘ out-townships” are also apt to have a weekly. These are often of the class known as “patent outsides,” for which the first and fourth pages, composed of reprint matter and advertisements, are made up and printed in a central office, doing such work by wholesale for hundreds of papers, while the half-printed shcets are then forwarded to the local office, to be filled out with village news and | advertisements.

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Only one illustrated daily paper is published in America, the Daily Graphic of New York. It prints regularly woodcuts and other engravings on four of its eight pages. The illustrated weeklies are numerous,—the best known in New York being Harper’s Weekly, Harper’s Bazar, and Frank Leshe’s Fllustrated Paper.

Elaborate as are the newspaper returns given in the successive census reports of the United States, they are only to be relied upon for preeise information when liniited to papers of daily issue. The classification of the main returns is headed “pcriods of issue”; and, although there is a subsidiary classification, according to character, this fails to elicit even the

simple distinction between newspapers and magazines. Of the 5871 publications shown by the census of 1870, 4333 are classed as political. The 11,314 of the 1880 census are classified thus :—devoted to news, politics, and family reading, 8863; religious, 5531; agricultural, horticultural, &c, 173; eommerce and trade, 284; finaneial, 25; insurance and railroads, 54; general literature (including magazines), 189; medicine and surgery, 114; law, 45; science and mechanics, 68 ; freemasonry, oddfellowship, temperance, &c., 149; educational, 248 ; children's periodicals, 219; miscellaneous, 330. The Sunday newspapers (included in the above figures) numbered 252. The arrangement

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[UNITED STATES.

is different from that of former returns, and, in this absence of uniformity, we cannot give any precise statement, at once com- parative and detailed, of the progress of American journalism.

Nor will the Directories of the well-known advertising houses of agency—such as thosc of Pettengill and of Hubbard—serve the purpose, for reasous which are thus stated by the able statistician who edited the " Population and Soeial Science Tables" in the census report of 1870. "There are," he writes in his prefatory remarks, "very considcrable numbers of issucs of . . . . shects, intended for distribution at places of public amusement, and a dozen other forms of advertisement, 'more or less disguised under a show of presenting news or criticism' to the public… . . To swamp statistics [of newspapers]. . . by inconsiderately admitting hundreds of . . . advertising sheets, would be undoubtedly an abuse." But shoals of such are recorded in Pettengill's Directory and in Hubbard's Record.

The following figures are from the official returns for 1850, 1870, and 1880. 'Class papers" are included among the newspapers for 1850 and 1870, while the heading in the census tables of 1880 is "newspapers and periodicals." The 1880 returns do not furnish statistics of annual circulation. The aggregate circulation per issue of the 971 dailies in 1880 was 3,566,395, and that of the 10,343 other papers (8633 of which were published weekly and 1167 monthly) 28,213,291.

General Statistics of the Newspaper Press of the United States for 1850, 1870, and 1880 respectively.

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1850. 1870. 1880.

States and Territories.* Aggregate Aggregate Popula- No. of Total No. of Popula- No. of Total No. of Pangiee No. of se Total > News- | Circula- Copies z News-/} Circula- Copics Ag Dail eo Circula- tion : Z tion. 3 . a tion aly | Periodi- aaa papers.| tion. gee papers, tion. Printed * |} Papers eae tion. nnually, Annually. je Mite… le 583,169| 29 | 29,695] 2,501,680|| 626,015| 65 | 170,090| 9,867 680! eaaaae| ia 13 | 6,214.4 2. New : Hampshire 317,076 22 32,186 1,673,672 | 318,300 5 173,919} 7,237,388 || 346/991| 10 87 fats . Vermont… 025,43 30,551] 47 71,390| 4,055.30 2, 4, Massachusetts… 994514] 91 | 229:087| 46,587,800|| 1,457.351| 259 | 1,692‘194 199°691‘966 1 Age 2S wi 2 nes 5. Rhode Island …. 147,545| 13 20,575| 2,476,150|| ‘217:353] 32 82,050 9,781,500 || 276°531 8 44 97-121 6. Connecticut…... 370,792| 28 34.916| 3,499,439 || 539.454| 71 208.725] 17,454,740 || 622‘700} 17 139 237,660 7. New York ee 3,097,394 278 527.195 82,780,095 || 4,382,759| 835 | 7,561,497] 471,741,744 5,082\871) 115 | 1,411 9,374,134 ; TSCY ss… i , 7,047 || ‘906,096 | 122 205,500| 18,625,740 || 1.131116| 27 215 2 9. Pennsylvania… ...| 2,811,786 | 210 | 838,336] 59,717,508 || 3,521951| 540 | 3,419,765! 241‘170,540 4‘982,891| 98 973 5 ee 10. Delaware…..ccccccces.| 915321 8 6,600; 374,400 || ‘125:015| 17 20,860} 1,607,840 || ‘146608| 5 26 “34,495 11 Maryland… ae. Hees 583,034! 40 82,837 | 4,205,324 || 780,804| 88 235,450] 83,497,778 || 934,943| 15 143 414,693 12, —> olumbia…... : pbsst 16 99,787 11,045,336 ; 131,700 2 81,400] 10,092;800 || 177,624| 5 44 213,993 » Virginia… ; ,225,163 1s 14, North Carolina… ‘869,089| 37 25,489| 1,571.414|| 1:071,361| 64 ee pee ieearen i fe 15, South Carolina… 668,507| 29 36,415| 6,451,330 || 705,606] 55 80,9004 8,901,400|| “9951577| 4 81 69°909 16. Georgia …....6.., 906,185} 26 23,946} 2.238.690 || 1,184,109] 110 150,987} —15,539;724|| 1,5421180| 16 200 269,066 M7 Florida… Ripe wi 3,500] 202,800 || “187,748) 23 10,545 649,290 || 969,493] 3 45 27,332 labama…... } 25,336! 2,202‘169|| 996,992! 189 91,165{ 9,198,980 || 1,262,505} 6 125 93, 19. Mississippiessscsccscsssson 606,526] 40 26,380

1,519,024|| 827.999| 111 71,868{ 4,703,336 || 1.131597! 5 123 sl, 20, Louisiana sseccscnsen 517.7621 40 57,522 | 11,691,324|| 726915] 92 84,165| 13,755,690) ‘939:946| 18 112 131,630 21 Texas… eee 212,502 15 9,750 808,800 818,579} 112 55,250} 4,214‘800 || 1,591:749| 30 280 263,289 : as.. 50 205,400 8 56 : 2 : 28. Tennessce…....-...-0 1,002,717] 38 34,757 | 5,642‘510 eee 91 oon one Po ory ieee 1D 193 a obs 24, Kentuckyinevseeceeneene 982.405} 44 56,736} 5,496,288 || 1391011| 89 197,130| 18,270,160 || 1,648,690} 11 205 397,564 25. MiSSOUTiswsseeseesneeene] 682044] 42 48,340| 5,496,280 || 1.721.295! 270 522,866| 47,980,492 || 2‘168,380| 43 530 965,285 26, TMinois..e.. 851,470| 74 52,401 | 3,787,982 || 2,539,891| 505 | 1,722,541] 113,140,499 || 3,077,871| 74 | 1,017 2,491,975 27. Indiana 988,416] 84 47,900} 3,569,324 || 1,680,637| 208 363,542| 28,964,984 || 1.978301] 40 467 “661,111 28, ONO rssreereverv 1,980,329] 198 | 202,785! 23,086,087 || 2,665,260] 395 | 1,388,367] 98‘548°814|| s‘198,062| 56 774 3,093,981 29. Michigan seseicen 397,654| 40 28,993| 2,582,836|| 1,184.059| 211 253,774| 19,686,978 || 11636937} 33 464 “620,974 80, Wisconsin… 305,391] 49 29,236| 2,517,487 || 1.054.670| 190 343,385} 28,762,920 || 113151497; 21 340 436,576 B1. Towa… 192,214] 26 21,350! 1,469,000|/ 1,194090| 233 219,090] 16,403,380 || 1/624615| 30 569 547,340 32. Califor. er 02,597 4 2,000 626,000 560,247 201 491,903 47,472,756 || 864,694] 58 g61 640,026 OE ee Oe : 5 : 3,657,300 |} 174,768] 7 74 85,786 States, &c., formed between i . a % 1850 and 1870, rizona 5S emer 9,658| 1 280 14,560 40,440| 6 17 13,550 35 Colorado er anaaeme 39,867| 14 12,750} 1,190,600 || 194397| 19 87 95,744 36. Dakotteersctresen 14,181 3 1.651 85,904|| 135.177] 9 67 36,943 deh ene : 200,200 32/610 10 5,650 se oe 367,399| 97 96,803| 9,518,176|| 996.096| 26 347 280,729 Ol ehetiee . 439,706 95 110,778 9,543,656 || 780,773} 10 223 229° 074 oo | ee ne ee a : ; 2,860,600 39.159] 4 18 20,827 41. Nebr — ne Bele ace a te ve 122,998 #2 81,600 3,388,500 || 459‘409] 15 189 154,570 ae e ; .,300| 2/572°000 62,266! 14 37 97,745 eee ofl Gets] ao | aetes| ieeeanl| amet 3) | ae 45, Washington… ane “955 o| “ages eee Oe cared ees 23.955| 14 6.785 396,500 75.116] 4 29 16,751 ay | Seoedocccopesescnece ae 9118] 6 1,950 243°300 20,789} 3 11 5,686 motels: -2) eee ce 99 ; “5871 | 75 Ra x ec | 28,112,872} 1,718 | 2,211,512 | 309,863,095 || 38,548,371 | 5,871 | 20,842,475 | 1,508,548,250 || 50,155,783 | 971 11,814 | 31,779,686

- ° : 2 : . . The order of the States is here given as they are enumerated in the official tables of the census of 1850. In recent censuses the States are placed alphabetically.

Of the 11,314 periodicals in 1880, 10,515 were in English, 641 in German, 49 in Danish and Scandinavian, 41 in Freueh, and 26 in Spanish. The number of <¢ journalists" in the United States in 1880 was returned as 12,308 (12,020 males and 288 females).

If we adopt Hubbard's newspaper statistics of 1880 for the United States collectively,—including, as they do, a considerable number of sheets which contain advertisements only, and which therefore are rejected from the official lists adopted by the statists of the census office at Washington, while, on the other hand, trade-

1 Ineluding Methodist, 75: Roman Catholic, 70 i ¢ i : ; Baptist, 63 ; Presbyterian, 42 ; Episeopal, 32; and 'Cunseetarian, " 96. cae ,

journals and class-journals (embraced in the census returns), which contain no ""'news" and no politics, are exeluded,—and add to them the number of newspapers published within the Dominion of Canada, we obtain a grand total for the North American continent, as a whole, of 10,131 ''newspapers" of all sorts. Of these, 899 are published daily, 8428 weekly or twice or thrice a week, and 804 at longer intervals. The aggregate circulation of the whole number amounts to about 20,680,000 copies; and the ageregate annual issue of the whole somewhat-exceeds 1,836,476, 000 copies.

That, on the whole, industrialism has too much over-weighted literature in the development of American journalism is the state- ment of the most observant and thoughtful of American publicists

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and statesmen. It is the shady side of a theme which, in many of its aspects, has much of brightness and of mental energy. The fact was recognized by an eminent judge many ycars ago in the ordinary course of his official duty. 'The copyright law," said Mr Justice Thompson, from the bench of the State of New York, in the cause Clayton v. Stone, ''is an Act for the

encouragement of learning, not of mere industry. A newspaper… is not sucha publication as falls under the protection of the copyright laws."

Sce the different Census Reports of the United States, Washington, 1853, 1872, and 1882-83; Buckingham, Specimens of Newspaper Literature, 2 vols., Boston, 1850; Coggeshall, The Newspaper Record, Philadelphia, 1856; Sparks, Life and Works of Franklin, i. 23, 123, &e.; Life and Works of John Adams, ii. 4053 Proceedings of the New York Historical Society for 1844; Historical Notices of Newspapers published in New Hampshire, in Farmer and Moore's collection, iii. 174 sq.; Frothingham, History of the Siege of Boston, 31 sq.; Minutes of Evidence before the Select Commitiee on Newspaper Stamps (evidence of Mr H. Greeley), pp. 389-395, 438-448; Andrews, History of British Journalism, i. 298- 305, 1859; Hubbard, Record, &c., New Haven, Conn., 1880, and other publica- tions; papers by C. de Varigny, on " American Journalism," in Revue des Deux Mondes, 1877, ii. 118-143; F. Hudson, Journalism in the United States, New York, 1873.

NEWSPAPERS OF BRITISH AMERICA AND CENTRAL AMERICA.

The virtual senior of the Canadian press is the Gazette, still pub- lished at Montreal, which may fairly be considered as the continu- ation (or at least the representative) of the original Gazette, established in that city in January 1765. It is now a daily paper —one of 10 dailics, three of which (La Minerve, Le Nouvel Monde, and L'Evénement) appear in French. There are also 3 weekly papers. Toronto has now 8 daily journals, and Ottawa 4. The Halifax Gazette (pioneer of the Nova Scotia press) was established in January 1751, but it had an existence of less than twenty years. Halifax now publishes 4 daily papers. In all parts of British America, collectively, 67 daily newspapers were published in 1882, with an aggregate circulation of each issuc estimated (by the American consular agents) at 287,788. The total number of jour- nals of all kinds published in the British-American provinces is stated at 624, with an average circulation for each issue of about 2600 copies.

The press of the West Indies begins at Barbados with Keimer's Gazette of 1731, followed by Grenada in 1742. In 1882 there were in the West Indies 47 daily papers with an estimated average circulation, per issue, of 1818

copies. Kingston (in Jamaica), with a population of 38,556, had five daily papers, at the head of which appears The Gleaner (1800 copics). Havana (in Cuba), with a population of about 300,000, has 11 daily papers, of which the four chicf are thus rcported:—Diario de la Marina (cire. ise." La Voz de Cuba (8000), El Triunfo (8000), La Diseusion

(6000).

The principal newspaper of San José, the capital of the republic of Costa Rica (population about 18,000), is The Central American Teporter, a daily journal (circ. 3000). S. Salvador, capital of the republic of that name, has a daily journal, El Boletin Oficial, which circulates 2000 copies.

The city of Mexico (population about 230,000) has 24 daily papers, of which £1 Diario Oficial (4000 copies) and La Patria (5000) are the chief.

NEWSPAPERS OF SOUTH AMERICA.

(1) Brazil.—The chief daily newspaper of Rio de Janeiro is the Journal de Commeretio, which dates from 1828, and has a circulation of about 16,000. The official organ, Gazeta de Noticias, is said to circulate 24,000. The Cruzeiro follows with 12,000, and O Apostolo, the principal organ of the Roman Catholics, with 7000. There are, in all, 8 daily papers. Among the papers of less frequent publication are one in French (established in 1868) and also one in German.

(2) Argentine Republic.—The chief papers of Bucnos Ayres are The Standard and River Plate News (8500) and La Tribuna Nacional (3000).

(3) Chilt.—In Santiago are published #2 Ferro Carril and El Diario Ofieial (5000).

(4) Peru.—Lima, with a population exceeding 100,000, has no journal with a larger circulation than La Patria (2500).

(5) Uruguay.—Montevideo (population 110,000) has 17 daily papers, of which the priucipal are—ZI Ferro Carril (6000), El Siglo (5000), and La Naeion (8000).

(6) Venezwela.—The chief papers of Caracas are El Monitor (7500), La Opinion Nacional (5000), and La Gazeta Oficial (5000).

NEWSPAPERS OF AUSTRALASIA.

(1) New South Wales.—Sydney (population 134,187) has 6 daily newspapers, of which the circulation of the chicf ones, as it is stated by thcir respective publishers, stands thus:—Evening News, of which three or four successive editions arc regularly published, 35,000; The Australian Town and Country Journal, 30,000; The Bulletin, 20,000.

(2) South Australia.—Adelaide (population 82,250) has 4 daily papers.

(83) Victoria.—Melbourne, with a population nearly ninc times

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as large (282,907), has the like number. The publisher of the chief one, The Age, reports its circulation as 44,000.

(4) New Zealand.— Wellington (population about 19,000) has also 4 dailies, of which The New Zealand Times (7000) is the chief.

(5) Tasmania.—Hobart Town, with a population of about 20,000, has 3 dailies. One of these, The Evening Star, circulates 8000 copies.

CoMPARATIVE STATISTICS.

It is almost impossible by any statistical detail to give an idea of the recent advances made—even as regards circulation merely—by the newspaper press; but an outline of the general results reached by three statists, who published their summaries respectively in 1828, 1866, and 1882, may have its utility.

The earliest summary is that of Adrien Balbi. It was published in the Revue Encyclopédique for 1828 (vol. i. pp. 593-603), along with much matter of more than merely statistical interest. The numbers of newspapers published in different countries at that date are given as follows :—France, 490; United Kingdom, 483; Austria, about 80; Prussia, 288; rest of the Germanic

Confedera- tion, 305; Netherlands, 150; Spain, 16; Portugal and the Azores, 17; Denmark, Sweden, and Norway, 161; Russia and Poland, 84. The respective proportions of journals to population were—for Prussia 1 to 41,500, German states 1 to 45,300, United Kingdom 1 to 46,000, France 1 to 64,000, Switzerland 1 to 66,000, Austria 1 to 400,000, Russia 1 to 565,000. Europe had in all 2142 newspapers, America 978, Asia 27, Africa 12, and Oceania 9; total 3168. Of these, 1378 were published in English-speaking countries (800 of them in the United States), having a population of 154 millions, and 1790 in other countries, with a population of 583 millions.

The second summary is-'that given by Eugéne Hatin in an appendix to his very able Bibliothéque de la Presse périodique. His enumeration of newspapers is as follows : —France, 1640; United Kingdom, 1260; Prussia, 700 ; Italy, 500; Austria-Hungary, 365; Switzerland, 300; Belgium, 275 ; Holland, 225; Russia, 200; Spain, 200 ; Sweden and Norway, 150; Denmark, 100; United States, 4000. Here the proportions of papers to population are —Switzerland and United States 1 to 7000, Belgium 1 to 17,000, France and the United Kingdom 1 to 20,000, Prussia 1 to 30,000, Spain 1 to 75,000, Austria 1 to 100,000, Russia 1 to 300,000. Hatin assigns to Europe a total of 7000, to America 5000, and to the rest of the world 250, making in all 12,500.

The third summary is that of Henry Hubbard, published in his Newspaper Directory of the World (New Haven, Connecticut, 1882), a work the value of which is marred by the exclusively commercial spirit that has moulded its compilation, and its want of literary character. Its scope embraces a very considerable number of serial publi- cations which cannot be classed as newspapers. Still—all this being understood—Hubbard's figures, which were collected (chiefly by the American consuls and consular agents in all parts of the world) about 1880, cannot be disregarded. The following are his general results :—

Daily Newspapers. Other Publications.

Estimated Population (1880). Num- | Circulation |.yymper,| Circulation ber. per Issue. per Issue. Europe…..| 301,856,000 | 2,408 15,682,425 | 10,780 |38,901, 400 ae '1,007,128,000| 154] 550,786 3371 257,000 Africa

205,000,000) 25 55,475 125} 167,220 N. Amcrical 76,033,000 | 1,136 | 4,758,223 | 9,656 |22,078,000 S. Amcrical 29,988,000) 208 347,490 427 354, 860 | ustralasia 3,670,000 94 246,850 471 483,000 ictal …..... ‘1,628,175,000 | 4,020 |21,641,199 | 21,746 |57,236, 480

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NEWTON, a city of the United States, in Middlesex county, Massachusetts, about 8 miles west of Boston, on the south bank of the Charles river. It is divided into seven wards, and contains the post-villages of Auburndale, Chestnut Hill, Newton, Newton Centre, Newton Highlands, Newton Lower Falls, Newton Upper Falls, Newtonville, West Newton, and Nonantum. Newton is principally inhabited by Boston merchants, and, each village being a collection of fine residences with beautiful grounds, it has been designated “the Garden City of New England.” The water-power furnished by the river is turned to account by numerous manufactories producing paper, hosiery, dye stuffs, emery paper, ink, soap, shoddy, &c. The first Baptist theological seminary in America was established in Newton Centre in 1826; it is nowa flourishing institu- tion with a library of 15,000 volumes, and five resident professors. Laselle Female Seminary at Auburndale dates from 1851. First settled in 1630, Newton was incorpo- rated as a town in 1679, asa city in 1873. Its population was 3351 in 1840, 8382 in 1860, 12,825 in 1870, and 16,995 in 1880.

NEWTON, Sir Isaac (1642-1727), the greatest of natural philosophers, was born on the 25th of December 1642 (0.s.), at Woolsthorpe, a hamlet in the parish of Colsterworth, Lincolnshire, about 6 miles from Grantham. His father (also Isaac Newton) was the farmer of a small freehold property of his own. He died before his son’s birth, a few months after his marriage to Hannah Ayscough, a daughter of James Ayscough of Market-Overton. When Newton was little more than two years old his mother married Mr Barnabas Smith, rector of the neighbouring parish of North Witham. Of this marriage there was issue, Benjamin, Mary, and Hannah Smith, and to their children Sir Isaac Newton subsequently left the greater part of his property. After having acquired the rudiments of education at two small schools in hamlets in close proximity to Woolsthorpe, Newton was sent at the age of

twelve to the grammar school of Grantham, the head- master of which was Mr Stokes. While attending Grantham school Newton lived in the house of Mr Clark, an apothecary of that town. According to his own con- fession he was far from industrious, and stood very low in his class. An unprovoked attack from the boy next above him led to a fight, in which Newton's pluck gave him the victory. This success seems to have led him to greater exertions in school, and after some time he rose to be the head boy of the school. He cared but little for the ordinary amusements of his schoolfellows, but he displayed very early a taste and an aptitude for mechanical con- trivances. He made windmills, water-clocks, kites, and dials, and he is said to have invented a four-wheeled car- riage which was to be moved by the rider. In 1656 Mr Smith died, and Newton's mother came back with her three children to Woolsthorpe. Newton was then in his fifteenth year, and, as his mother in all probability intended him to be a farmer, he was taken away from school. He was frequently sent on market days to Grantham with an old and trusty servant, who made all the purchases, while Newton spent his time among the books in Mr Clark's house. It soon became apparent to Newton's relatives that they were making a great mistake in attempting to turn him into a farmer, and he was therefore sent back again to school at Grantham. ~ His mother's brother, Mr W. Ayscough, the rector of the next parish, was a graduate of Trinity College, Cambridge, and when he found that Newton's mind was wholly devoted to me- chanical and mathematical problems, he urged upon Mrs Smith the desirability of sending her son to his own college, a proposal to which she was not at all unwilling to give her consent. He was accordingly admitted a member of

Trinity College on June 5, 1661, as a subsizar, and was matriculated on July 8. We have scarcely any informa- tion as to his attainments when he commenced residence, and very little as to his studies at the university before he took the degree of bachelor of arts. It is known that while still at Woolsthorpe Sanderson's Logic, a book which his uncle had given him, had been read by him to such purpose that his tutor at Trinity College excused his attendance at a course of lectures on that subject. Newton tells us himself that, when he had purchased a book on astrology at Stourbridge

fair, a fair held close to Cam- bridge, he was unable, on account of his ignorance of trigonometry, to understand a figure of the heavens which was drawn in this book. He therefore bought an English edition of Euclid with an index of propositions at the end of it, and, having turned to two or three which he thought likely to remove his difficulties, he found them so self-evident that he expressed his astonishment that any one should have taken the trouble to offer demonstrations of them. He therefore put aside Euclid "as a trifling book," and applied himself to the study of Descartes's Geometry. He had some difficulty in mastering this work, but he succeeded in doing so without any assistance. It is reported that in his examination for a scholarship at Trinity, to which he was elected on April 28, 1664, he was examined in Euclid by Dr Barrow, who formed a poor opinion of his knowledge, and that in consequence Newton was led to read the Elements again with care, and thereby to form a more favourable estimate of Euclid's merits. The study of Descartes's Geometry seems to have inspired Newton with a love of the subject, and to have introduced him to the higher mathematics. In a small commonplace book, bearing on the seventh page the date of January 1663-4, there are several articles on angular sections, and the squaring of curves and 'crooked lines that may be squared," several calculations about musical notes, geometrical propositions from Francis Vieta and Schooten, annotations out of Wallis's Arithmetic of Injinites, together with observations on refraction, on the grinding of "spherical optic glasses," on the errors of lenses and the method of rectifying them, and on the extraction of all kinds of roots, particularly those "in affected powers." And in this same commonplace book the following entry made by Newton himself, many years afterwards, gives a further account of the nature of his work during the period when he was an undergraduate :—

'July 4, 1699.—By consulting an account of my expenses at Cambridge, in the years 1663 and 1664, I find that in the year 1664, a little before Christmas, I, being then Senior Sophister, bought Schooten's Miscellanies and Cartes' Geometry (having read this Geometry and Oughtred's Clavis clean over half a year before), and borrowed Wallis's works, and by consequence made these annotations out of Schooten and Wallis, in winter between the years 1664 and 1665. Atsuch time I found the method of Infinite Series ; and in summer 1665, being forced from Cambridge by the

plague, I computed the area of the Hyperbola at Boothby, in Lincolnshire, to two and fifty figures by the same method."

That Newton must have begun early to make careful observations of natural phenomena is sufficiently testified by the following remarks about halos, which appear in his Optics, book ii. part iv. obs. 13:—

"The like Crowns appear sometimes about the moon; for in the beginning of the Year 1664, February 19th, at night, I saw two such Crowns about her. The Diameter of the first or innermost was abont three Degrees, and that of the second about five Degrees and an half. . Next about the moon was a Circle of white, and next about that the inner Crown, which was of a bluish green within next the white, and of a yellow and red without, and next about these Colours were blue and green on the inside of the Outward Crown, and red on the outside of it. At the same time there appear'd a Halo about 22 Degrees 35' distant from the center of the moon. It was elliptical, and its long Diameter was perpendicular to the Horizon, verging below farthest from the moon."

In the month of January 1665 Newton took the degree

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of bachelor of arts. The persons appointed (in conjunction with the proctors, John Slade of Catharine Hall, and Benjamin Pulleyn of Trinity College, Newton's tutor) to examine the questionists were John Eachard of Catharine Hall and Thomas Gipps of Trinity College. It isa curious accident that we have no information about the respective merits of the candidates for a degree in this year, as the "'ordo senioritatis" of the bachelors of arts for the year is omitted in the " Grace Book."

It is supposed that it was in 1665 that the method of fluxions first occurred to Newton's mind. There are several papers still existing in Newton's handwriting bearing dates 1665 and 1666 in which the method is described, in some of which dotted or dashed letters are used to represent fluxions, and in some of which the method is explained without the use of dotted letters.

Both in 1665 and in 1666 Trinity College was dismissed on account of the plague. On each occasion it was agreed, as appears by entries in the ‘‘ Conclusion Book” of the col- lege, bearing dates August 7, 1665, and June 22, 1666, and signed by the master of the college, Dr Pearson, that all fellows and scholars who were dismissed on account of the pestilence be allowed one month’s commons. Newton must have left college before August 1665, as his name does not appear in the list of those who received extra commons on that occasion, and he tells us himself in the extract from his commonplace book already quoted that he was “forced from Cambridge by the plague” in the summer of that year.

Newton was elected a fellow of his college on October 1, 1667. There were nine vacancies, one of which was caused by the death of Cowley in the previous summer, and the nine successful candidates were all of the same academical standing. A few weeks after his election to a fellowship Newton went to Lincolnshire, and did not return to Cambridge till the February following. On the 16th of March 1668 he took his degree of M.A.

During the years 1666 to 1669 Newton’s studies were of a very varied kind. It is known that he purchased prisms and lenses on two or three several occasions, and also chemicals and a furnace, apparently for chemical experiments ; but he also employed part of his time on the theory of fluxions and other branches of pure mathe- matics. He wrote a paper Analysis per Hquationes Numero Terminorum Injfintas, which he put, probably in June 1669, into the hands of Isaac Barrow (then a fellow of Trinity College, and the first occupant of the Lucasian chair of mathematics), at the same time giving him per- mission to communicate the contents to their common friend Mr John Collins, a mathematician of no mean order, and a correspondent of many of the eminent men of his time. Barrow did this on the 31st of July 1669, but kept the name of the author a secret, and merely told Collins that he was a friend staying at Cambridge, who had a powerful genius for such matters, and ex- pressed a hope that the paper would not a little delight him. In a subsequent letter on the 20th of August, Barrow expressed his pleasure at hearing the favourable opinion which Collins had formed of the paper, and added, “the name of the author is Newton, a fellow of our college, and a young man, who is only in his second year since he took the degree of master of arts, and who, with an

unparalleled genius (exzmio quo est acumine), has made very great progress in this branch of mathematics." Shortly afterwards Barrow, who had resolved to devote his attention to theological in preference to mathematical studies, resigned the Lucasian chair, and was instrumental in securing Newton's election as his successor. Newton was elected Lucasian professor on the 29th of October 1669. It was his duty as professor to lecture at least

once &@ week in term time on some portion of geometry, arithmetic, astronomy, geography, optics, statics, or some other mathematical subject, and also for two hours in the week to allow an audience to any student who might cone to consult with the professor on any difficulties he had met with. The subject which Newton chose for his lectures was optics. He gave courses of lectures on this subject, and the success which attended his researches in optics must have been great. The results of his investigations, however, were known only through his own oral lectures, and were not published until he presented an account of them to the Royal Society in the spring of 1672. On December 21, 1671, he was proposed as a candidate for admission into the Royal Society by Dr Seth Ward, bishop of Salisbury, and on January 11, 1672, he was elected a fellow of the Society. At the meeting at which Newton was elected a description of a reflecting telescope which he had invented was read, and "it was ordered that a letter should be written by the secretary to Mr Newton to acquaint him of his election into the Society, and to thank him for the communication of his telescope, and to assure him that the Society would take care that all right should be done him with respect to this invention."

In his reply to the secretary on January 18, 1672, Newton writes :— .

'*T desire that in your next letter you would inform me for what time the society continue their weekly meetings; because, if they continue them for any time, I am purposing them to be considered of and examined an account of a philosophical discovery, which induced me to the making of the said telescope, and which I doubt not but will prove much more grateful than the communication of that instrument, being in my judgment the oddest if not the most

considerable detection which hath hitherto been made into the operations of nature."

The promise here made was fulfilled in a communica- tion which Newton addressed to Oldenburg, the secretary of the Royal Society, on February 6, 1672, and which was read before the Society two days afterwards. The whole is printed in No. 80 of the Philosophical Transactions, and the first part of it has been already printed in the article Lieut, vol. xiv. p. 590. After explaining his discovery of the composition of white light, he proceeds:—

'When I understood this, I left off my aforesaid Glass works; for I saw, that the perfection of Telescopes was hitherto limited, not so much for want of glasses truly figured according to the prescrip- tions of Optick Authors (which all men have hitherto imagined), as because that Light it self is a LHeterogencous mixture of differently refrangible Rays. So that, were a glass so exactly figured as to collect any one sort of rays into one point, it could not collect those also into the same point, which having the same Incidence upon the same Mcdium are apt to suffer a different refraction. Nay, I wondered, that seeing the difference of refrangibility was so great, as I found it, Telescopes should arrive to that perfection they are now at."

He then points out why

'*The object-glass of any Telescope cannot collect all the rays which come from one point of an object, so as to make them con- vene at its focus in less room than in a circular space, whose diameter is the 50th part of the Diameter of its Aperture: which is an irregularity some hundreds of times greater, than a circularly figured Lens, of so small a section as the Object-glasses of long Telescopes are, would cause by the unfitness of its figure, were Light uniform"; and he adds—

'*This made me take reflections into consideration, and finding them regular, so that the Angle of Reflection of all sorts of Rays was equal to their Angle of Incidence; I understood, that by their mediation Optick instruments might be brought to any degree of perfection imaginable, provided a Reflecting substance could be found, which would polish as finely as Glass, and reflect as much light, as glass transmits, and the art of communicating to it a Parabolick figure be also attained. But these seemed

very great difficulties, and I have almost thought them insuperable, when I further considered, that every irregularity in a reflecting super- ficies makes the rays stray 5 or 6 times more out of their due course, than the like irregularities in a refracting one; so that a much greater curiosity would be here requisite, than in figuring glasses for Refraction.

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‘Amidst these thoughts I was forced from Cambridge by the Intervening Plague, and it was more than two years before I pro- ceeded further. But then having thought on a tender way of polishing, proper for metall, whereby, as I imagined, the figure also would be corrected to the last; I began to try, what might be effected in this kind, and by degrees so far perfected an Instrument (in the essential parts of it like that I sent to London), by which I could discern Jupiters 4 Concomitants, and shewed them divers times to two others of my acquaintance. I could also discern the Moon-like phase of Venus, but not very distinctly, nor without some niceness in disposing the Instrument.

‘* From that time I was interrupted till this last Autumn, when I made the other. And as that was sensibly better than the first (especially for Day-Objects), so I doubt not, but they will be still brought to a much greater perfection by their endeavours, who, as you inform me, are taking care about it at London,”

Then, after a remark that microscopes seem as capable

of improvement as telescopes, he adds—

‘*T shall now proceed to acquaint you with another more notable difformity in its Rays, wherein the Origin of Colour is unfolded: Concerning which I shall lay down the Doetrine first, and then, for its examination, give you an instance or two of the Experiments, as a specimen of the rest. ; :

‘*The Doctrine you will find comprehended and illustrated in the following propositions :— athe

“1. As the Rays of light differ in degrees of Refrangibility, so they also differ in their disposition to exhibit this or that particular colour. Colours are not Qualifications of Light, derived from Refrac- tions, or Reflections of natural Bodies (as ’tis generally believed), but original and connate properties, which in divers Rays are divers. Some Rays are disposed to exhibit a red colour and no other; some a yellow and no other, some a green and no other, and so of the rest. Nor are there only Rays proper and particular to the more eminent colours, but even to all their intermediate gradations.

‘2. To the same degree of Refrangibility ever belongs the samc colour, and to the same colour ever belongs the same degree of Refrangibility. The least Refrangible Rays are all disposed to exhibit a Red colour, and eontrarily those Rays, which are disposed to exhibit a Red colour, are all the least Refrangible: So the most refrangible Rays are all disposed to exhibit a deep Violet Colour, and contrarily those which are apt to exhibit such a violet colour are all the most Refrangible.

‘‘And so to all the intermediate colours in a continued series belong intermediate. degrees of refrangibility. And this Analogy ‘twixt colours, and refrangibility is very precise and strict; the Rays always either exactly agreeing in both, or proportionally dis- agreeing in both.

“3, The species of colour, and degree of Refrangibility proper to any particular sort of Rays, is not mutable by Refraction, nor by Reflection from natural bodies, nor by any other cause, that I could yet observe. When any one sort of Rays hath been well parted from those of other kinds, it hath afterwards obstinately retained its colour, notwithstanding my utmost endeavours to change it. I have refracted it with Prismes, and reflected it with Bodies, which in Day-light were of other colours; I have intercepted it with the coloured film of Air interceding two compressed plates of glass, transmitted it through coloured Mediums, and through Mediums irradiated with other sorts of Rays, and diversly terminated it; and yet could never produce any new colour out of it. It would by contracting or dilating become more brisk, or faint, and by the loss of many Rays, in some cases very obscure and dark; but I could never see it changed in speeie.

- Yet seeming transmutations of Colours may be made, where there is any mixture of divers sorts of Rays. For in such mixtures, the component colours appear not, but, by their mutual allaying each other constitute a midling colour.”

Further on, after some remarks on the subject of com- pound colours, he says—

“‘T night add more instances of this nature, but I shall con- clude with this general one, that the Colours of all natural Bodies have no other origin than this, that they are variously qualified to reflect one sort of light in greater plenty then another. And this I have experimented in a dark Room by illuminating those bodies with uncompounded light of divers colours. For by that means any body may be made to appear of any colour. They have there no appropriate colour, but ever appear of the colour of the light cast upon them, but yet with this difference, that they are most brisk and vivid in the light of their own day-light colour. Minium appeareth there of any colour indifferently, with which ‘tis illustrated, but yet most luminous in red, and so Bisc appearcth indifferently of any colour with which ’tis illustrated, but yet most luminous in blew. And therefore minium reflecteth Rays of any colour, but most copiously those indued with red ; and consequently when illustrated with day-light, that is with all sorts of Rays pro- miscuously blended, those qualified with red shall abound most in

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the reflected light, and by their prevalence causc it to appear of that colour. And for the same reason Bise, reflecting blew most copiously, shall appear blew by the excess of those Rays in its reflected light ; and the like of other bodics. And that this is the intire and adequate cause of their colours, is manifest, because they have no power to change or alter the colours of any sort of Rays incident apart, but put on all colours indifferently, with which they are inlightened.

‘* Reviewing what I have written, I see the discourse it self will lead to divers Experiments sufficient for its examination: And therefore I shall not trouble you further, than to describe one of those, which I have already insinuated.

‘In a darkened Room make a hole in the shut of a window, whose diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Suns light: And there place a clear and colourless Prisme, to refract the entring light towards the further part of the Room, which, as I said, will thereby be diffused into an oblong coloured Image. Then place a Lens of about three foot radius (suppose a broad Object-glass of a three foot Telescope), at the distance of about four or five foot from thence, through which all those colours may at once be transmitted, and made by its Refraction to convene at a further distance of about ten or twelve feet. If at that distance you intercept this light with a sheet of white paper, you will see the colours converted into whiteness again by being mingled.

“But it is requisite, that the Prisme aud Lens be placed steddy, and that the paper, on which the colours are cast be moved to and fro; for, by such motion, you will not only find, at what distance the whiteness is most perfect but also see, how the colours gradually convene, and vanish into whiteness, and afterwards having crossed one another in that place where they compound Whiteness, are again dissipated and severed, and in an inverted order retain the same colours, which they had before they entered the composition. You may also see, that, if any of the Colours at the Lens be inter- cepted, the Whiteness will be changed into the other colours. And therefore, that the composition of whiteness be perfect, care must be taken, that none of the colours fall besides the Lens.”

And he concludes his communication with the words—

“This, I conceive, is enough for an Introduction to Experi- ments of this kind: which if any of the R. Society shall be so curious as to prosecute, I should be very glad to be informed with what success: That, if any thing seem to be defective, or to thwart this relation, I may have an opportunity of giving further direction about it, or of acknowledging my errors, if I have committed any.”’

The publication of these discoveries led to a series of controversies which lasted for several years, in which Newton had to contend with the eminent English natural philosopher Hooke, Lucas, mathematical professor at Liége, Linus, a physician in Liége, and many others. Some of his opponents denied the truth of his experiments, refusing to believe in the existence of the

spectrum. Others criticized the experiments, saying that the length of the spectrum was never more than three and a half times the breadth, whereas Newton found it to be five times the breadth. It appears that Newton made the mistake of supposing that all prisms would give a spectrum of exactly the same length ; the objections of his opponents led him to measure carefully the lengths of spectra formed by prisms of different angles and of different refractive indices ; and it seems strange that he was not led thereby to the discovery of the different dispersive powers of different refractive substances.

Newton carried on the discussion with the objectors with great courtesy and patience, but the amount of pain which these perpetual discussions gave to his sensitive mind may be estimated from the fact of his writing on November 18, 1676, to Oldenburg :—

"*I promised to send you an answer to Mr Lucas this next Tuesday, but I find 1 shall scarce finish what I have designed, so as to get a copy taken of it by that time, and therefore I beg your patience a week longer. I see I have made myself a slave to philosophy, but if I get free of Mr Lucas's business, I will resolutely bid adicu to it eternally, excepting what I do for my private satisfaction, or leave to come out after me; for I see a man must either resolve to put out nothing new, or to become a slave to defend it."

It was a fortunate circumstance that these disputes did not so thoroughly damp Newton's ardour as he at the time felt they would. He subsequently published many papers

in the Philosophical Transactions on various parts of the science of optics, and, although some of his views have been found to be erroneous, and are now almost universally rejected, his investigations led to discoveries which are of permanent value. He succeeded in explaining the colour of thin and of thick plates, and the inflexion of light, and he wrote on double refraction, polarization, and binocular vision. He also invented a reflecting sextant for observ- ing the distance between the moon and the fixed stars,— the same in every essential as the instrument which is still in everyday use at sea under the name of Hadley's quadrant. This discovery was communicated by

him to Dr Halley in 1700, but was not published, or communi- cated to the Royal Society, till after Newton's death, when a description of it was found among his papers.

In March 1673 we find Newton taking a somewhat pro- minent part in a dispute in the university. The public oratorship fell vacant, and a contest arose between the heads of the colleges and the members of the senate of the university as to the mode of electing to the office. The heads claimed the right of nominating two persons, one of whom was to be elected by the senate. The senate on the other hand insisted that the proper mode was by an open election. The duke of Buckingham, who was the chancellor of the university, endeavoured to effect a com- promise between the contending parties. He suggested an expedient which, he says, "I hope may for the present satisfy both sides. I propose that the heads may for this time nominate and the body comply, yet interposing (if they think fit) a protestation concerning their plea that this election may not hereafter pass for a decisive pre- cedent in prejudice of their claim," and, " whereas I under- stand that the whole university has chiefly consideration for Dr Paman of St John's and Mr Craven of Trinity College, I do recommend them both to be nominated. For it is very reasonable that in this nomination, before the difference be determined between you, the heads should have regard to the inclination of the body, especially seeing you all agree in two men that are very worthy, and very fit for the place." The heads, notwithstanding this reasonable and conciliatory suggestion of the chancellor, nominated Dr Paman and Mr Ralph Sanderson of St John's, and the next day one hundred and twenty-one members of the senate recorded their votes for Craven and ninety-eight for Paman. On the morning of the election a protest in which Newton's name appeared was read, and entered in the Regent House. But the vice-chancellor admitted Paman the same morning, and so ended the first contest of a non-scientific character in which we find Newton taking part.

On March 8, 1673, Newton wrote to Oldenburg, the secretary of the Royal Society :—

'* Sir, I desire that you will procure that I may be put out from being any longer Fellow of the Royal Society: for though I honour that body, yet since

I see I shall neither profit them, nor (by

reason of this distance) can partake of the advantage of their assemblies, I desire to withdraw."

Oldenburg must have replied to this by an offer to apply to the Society to excuse Newton the weekly payments, as ina letter of Newton's to Oldenburg, dated June 23, 1673, he says, " For your proffer about my quarterly payments, I thank you, but I would not have you trouble yourself to get them excused, if you have not done it already." Nothing further seems to have been done in the matter until January 28, 1675, when Oldenburg informed "the Society that Mr Newton is now in such circumstanccs that he desires to be excused from the weekly payments." Upon this "it was agreed to by the council that he be dispensed with, as several others are." Very soon after this—that is, on February 18, 1675—Newton was formally admitted into the Society. 'The most probable explanation

of the cause why Newton wished to be excused from these payments is to be found in the fact that, as he was not in holy orders, his fellowship at Trinity College would lapse in the autumn of 1675. Itis true that the loss to his income which this would have caused was obviated by a patent from the crown in April 1675, allowing him as Lucasian professor to retain his fellowship without the obligation of taking holy orders. This must have relieved Newton's mind from a great deal of anxiety about pecuniary matters, as we find him so soon after this event as November 1676 subscribing £40 towards the building of the new library of Trinity College.

It is supposed that it was at Woolsthorpe in the summer of 1666 that Newton's thoughts were directed to the subject of gravity. Voltaire is the authority for the well-known anecdote about the apple. He had his information from Newton's favourite niece Catharine Barton, who married Conduitt, a fellow of the Royal Socicty, and one of Newton's intimate friends.' How much truth there is in what is a plausible and a favourite story can never be known, but it is certain that tradition marked a tree as that from which the apple fell, till 1820, when, owing to decay, the tree was cut down and its wood carefully preserved.

Kepler had proved by an elaborate ‘series of measure- ments that each planet revolves in an elliptical orbit round the sun, whose centre occupies one of the foci of the orbit, that the radius vector of each planet drawn from the sun describes equal areas in equal times, and that the squares of the periodic times of the planets are in the same pro- portion as the cubes of their mean distances from the sun. The fact that heavy bodies have always a tendency to fall to the earth, no matter at what height they are placcd above the earth’s surface, seems to have led Newton to conjecture that it was possible that the same tendency to fall to the earth was the cause by which the moon was retained in its orbit round the earth. Newton, by calcu- lating from Kepler’s laws, and supposing the orbits of the planets to be circles round the sun in the centre, had already proved that the force of the sun acting upon the different planets must vary as the inverse square of the distances of the planets from the sun. He therefore was led to inquire whether, if the earth’s attraction extended to the moon, the force at that distance would be of the exact magnitude necessary to retain the moon in its orbit. He found that the moon by her motion in her orbit was deflected from the tangent in every minute of time through a space of thirteen feet. But by observing the distance through which a body would fall in one second of time at the earth’s surface, and by calculating from that on the supposition of the force diminishing in the ratio of the inverse square of the distance, he found that the earth’s attraction at the distance of the moon would draw a body through 15 feet in one minute. A less careful calculator might have been satisfied with the close approximation of these two results ; but Newton, on the contrary, regarded the discrepancy between the results as a proof of the inaccuracy of his conjecture, and ‘‘laid aside at that time any further thoughts of this matter.” The idea thus laid aside was not finally condemned. In 1679 a controversy between Hooke and Newton, about the form of the path of a body falling from a height, taking the motion of the earth round its axis into consideration, led Newton again to revert to his former conjectures on the moon. The measure of the earth, which had hitherto been accepted by gcographers and navigators, was based on the very rough estimate that the length of a degree of latitude of the earth’s surface measured along a meridian was 60 miles. More accurate estimates had been made by Norwood and Snell, and more recently by Picard. At a meeting of

the Royal Society on January 11, 1672, Oldenburg the secretary read a letter from Paris describing the method followed by Picard in measuring a degree, and specifically stating the precise length that he calculated it to be. It is probable that Newton had become acquainted with this measurement of Picard's, and that he was therefore led to make use of it when his thoughts were redirected to the subject. This estimate of the earth's magnitude, giving 69-1 miles to one degree, made the two results, the discrepancy between which Newton had regarded as a disproof of his conjecture, to agree so exactly that he now regarded his conjecture as fully established.

In January 1684 Sir Christopher Wren, Halley, and Hooke were led to discuss the law of gravity, and, although probably they all agreed in the truth of the law of the inverse square, yet this truth was not looked upon as established. It appears that Hooke professed to have a solution of the problem of the path of a body moving round a centre of force attracting as the inverse square of the distance ; but Halley, finding, after a delay of some months, that Hooke "had not been so good as his word" in showing his solution to Wren, started in the month of August 1684 for Cambridge to consult Newton on the subject. Without mentioning the speculations which had been made, he went straight to the point and asked Newton what would be the curve described by a planet round the sun on the assumption that the sun's force diminished as the square of the distance. Newton replied promptly, "an ellipse," and on being questioned by Halley as to the reason for his answer he replied, "'Why, I have calculated it." He could not, however, put his hand upon his calculation, but he promised to send it to Halley. After the latter had left Cambridge, Newton set to work to reproduce the calculation. After making a mistake and producing a different result he corrected his work and obtained his former result.

In the following November Newton redeemed his promise to Halley by sending him, by the hand of Mr Paget, one of the fellows of his own college, and at that time mathe- matical master of Christ's Hospital, a copy of his demon- stration ; and very soon afterwards Halley paid another visit to Cambridge to confer with Newton about the problem ; and on his return

to London on December 10, 1684, he informed the Royal Society "that he had lately seen Mr Newton at Cambridge, who had showed him a curious treatise De Motu," which at Halley's desire he promised to send to the Society to be entered upon their register. 'Mr Halley was desired to put Mr Newton in mind of his promise for the securing this invention to himself, till such time as he could be at leisure to publish it," and Paget was desired to join with Halley in urging Newton to do so. Newton was not slow in responding to the wish of the Society. By the middle of February he had sent his paper to Aston, one of the secretaries of the Society, and in a letter to Aston dated February 23, 1685, we find Newton thanking him for "having entered on the register his notions about motion." Newton adds, "I designed them for you before now, but the examining several things has taken a greater part of my tithe than | expected, and a great deal of it to no purpose. And now I am to go to Lincolnshire for a month or six weeks, Afterwards I intend to finish it as soon as I can con- veniently." This treatise De Motu was the germ of the Principia, and was obviously meant to be a short account of what that work was intended to embrace. It occupies twenty-four octavo pages, and consists of four theorems and seven problems, some of which are identical with some of the most important propositions of the second and third sections of the first book of the Principia.

The years 1685 and 1686 will ever be memorable in the history of science. It was in them that Newton composed

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almost the whole of his great work. During this period Newton had a very extensive correspondence with Flamsteed, who was then the astronomer-royal. Many of the letters are' lost, but it is clear from one of Newton's, dated September 19, 1685, that he had received many useful communications from Flamsteed, and especially regarding Saturn, ''whose orbit, as defined by Kepler," Newton "found too little for the sesquialterate propor- tions." In the other letters written in 1685 and 1686 he applies to Flainsteed for information respecting the orbits of the satellites of Jupiter and Saturn, respecting the rise and fall of the spring and neap tides at the solstices and the equinoxes, respecting the flattening of Jupiter at the poles

(which, if certain, he says, would conduce much to the stating the reasons of the precession of the equinoxes), and respecting the difference between the observed places of Saturn and those computed from Kepler's tables about the time of his conjunction with Jupiter. On this last point the information supplied by Flamsteed was peculiarly gratifying to Newton; and it is obvious from the language of this part of his letter that he had still doubts of the universal application of the sesquialteral proportion. "Your information," he says, 'about the errors of Kepler's tables for Jupiter and Saturn has eased me of several scruples. I was apt to suspect there might be some cause or other unknown to me which might disturb the sesqui- alteral proportions, for the influences of the planets one upon another seemed not great enough, though I imagined Jupiter's influence greater than your numbers determine it. It would add to my satisfaction if you would be pleased to let me know the long diameters of the orbits of Jupiter and Saturn, assigned by yourself and Mr Halley in your new tables, that I may see how the sesquialteral proportion fills the heavens, together with another small proportion which must be allowed for."

Upon Newton's return from Lincolnshire in the begin- ning of April 1685, he seems to have devoted himself to the preparation of his work. In the spring he had determined the attractions of masses, and thus completed the law of universal gravitation. In the summer he had finished the second book of the Principia, the first book being the treatise De Motu, which he had enlarged and completed. Excepting in the correspondence with Flamsteed, to which we have already referred, we hear nothing more of the preparation of the Principia until April 21, 1686, when Halley read to the Royal Society his Discourse concerning Gravity and its Properties, in which he states "that his worthy countryman Mr Isaac Newton has an incomparable treatise of motion almost ready for the press," and that the law of the inverse square "is the principle on which Mr Newton has made out all the phenomena of the celestial motions so easily and naturally, that its truth is past dispute." The intelligence thus given by Halley was speedily confirmed. At the very next meeting of the Society, on April 28, " Dr Vincent presented to the Society a manuscript treatise entitled Philosophiex Naturalis Principia Mathematica, and dedicated to the Society by Mr Isaac Newton." Although this manuscript contained only the first book, yet such was the confidence the Society placed in the author that an order was given "that a letter of

thanks be written to Mr Newton ; and that the printing of his book be referred to the consideration of the council; and that in the meantime the book be put into the hands of Mr Halley, to make a report thereof to the council." Although there could be no doubt as to the intention of this report, yet no step was taken towards the publication of the work. At the next meeting of the Society, on May 19, some dissatisfaction seems to have been expressed at the delay, as it was ordered "that Mr Newton's work should be printed forthwith in quarto, and

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that a letter should be written to him to signify the Society's resolutions, and to desire his opinion as to the print, volume, cuts, and so forth." Three days afterwards, namely, on May 22, Halley communicated the resolution to Newton, and stated to him that the printing was to be at the charge of the Society. At the next meeting of the council, on June 2, it was again ordered "that Mr Newton's book be printed," but, instead of sanctioning the resolution of the general meeting to print it at their charge, they added "that Mr Halley undertake the business of looking after it, and printing it at his own charge, which he engaged to do."

In order to explain to Newton the cause of the delay, Halley in his letter of May 22 alleges that it arose from '"'"the president's attendance on the king, and the absence of the vice-presidents, whom the good weather had drawn out of town"; but there is reason to believe that this was not the true cause, and that the unwillingness of the council to undertake the publication arose from the state of the finances of the Society. Halley certainly deserves the gratitude of posterity for undertaking the publication of the work at a very considerable pecuniary risk to him- self. Halley in his letter to Newton of May 22, found it necessary to inform him of Hooke's conduct when the manuscript of the Principia was presented to the Society. Sir John Hoskyns was in the chair when Dr Vincent presented the manuscript, and passed a high encomium on the novelty and dignity of the subject. Hooke was offended because Sir John did not mention what he had told him of his own discovery. Halley only communicated to Newton the fact "that Hooke had some pretensions to the invention of the rule for the decrease of gravity being reciprocally as the squares of the distances from the centre,"

acknowledging at the same time that, though Newton had the notion from him, ‘yet the demonstration of the curves generated thereby belonged wholly to Newton.” “ How much of this,” Halley adds, ‘is so, you know best, so like- wise what you have to do in this matter; only Mr Hooke seems to expect you should make some mention of him in the preface, which ’tis possible you may see reason to prefix. I must beg your pardon that ’tis I that send you this ungrateful account ; but I thought it my duty to let you know it, so that you might act accordingly, being in mnyself fully satisfied that nothing but the greatest candour imaginable is to be expected from a person who has of all men the least need to borrow reputation.”

In thus appealing to Newton’s candour, Halley obviously wished that some acknowledgment of Hooke should be made. He knew indeed, that before Newton had announced the inverse law Hooke and Wren and himself had spoken of it and discussed it, and therefore justice demanded that, though none of them had given a demonstration of the law, Hooke especially should receive credit for having maintained it as a truth of which he was seeking the demonstration. On June 20, 1686, Newton wrote to Halley the following letter :—

‘Sir,—In order to let you know the case between Mr Hooke and me, I give you an account of what passed between us in our letters, so far as I could remember; for ’tis long since they were writ, and I do not know that I have seen them since. I am almost confident by circumstances, that Sir Chr. Wren knew the duplicate proportion when I gave him a visit; and then Mr Hooke (by his book Cometa written afterwards) will prove the last of us three that knew it. I intended in this letter to let you understand the case fully; but it being a frivolous business, I shall content myself to give you the heads of it in short, viz., that I never extended the duplicate proportion lower than to the superficies of the earth, and before a certain demonstration I found the last year, have suspected it did not reach accurately enough down so low; and therefore in the doctrine of projectiles never used it nor considered the motions of the hcavens; and consequently Mr Hooke could not from my letters, which were about projectiles and the regions descending hence to the centre, conclude me ignorant of the theory of the heavens. That what he told me of the duplicate proportion

was erroneous, uamely, that it reached down from hence to the centre of the earth.

‘‘That it is not candid to require me now to confess myself, in print, then ignorant of the duplicate proportion in the heavens; tor no other reason, but because he had told it me in the case of projectiles, and so upon mistaken grounds accused me of that ignorance. That in my answer to his first letter I refused his correspondence, told him I had laid philosophy aside, sent him only the experiment of projectiles (rather shortly hinted than carefully described), in compliment to sweeten my answer, expected to hear no further from him; could scarce persuade myself to answer his second letter ; did not answer his third, was upon other things; thought no further of philosophical matters than his letters put me upon it, and therefore may be allowed not to have had my thoughts of that kind about me so well at that time. That by the same reason he concludes me then ignorant of the rest of the duplicate proportion, he may as well conclude me ignorant of the rest of that theory I had read before in his books. That in one of my papers writ (I cannot say in what year, but I anf sure some time before I had any correspondence with Mr Oldenburg, and that ’s) above fifteen ycars ago, the proportion of the forces of the planets from the sun, reciprocally duplicate of their distances from him, is expressed, and the proportion of our gravity to the moon’s conatus recedendi a centro terre is calculated, though not accurately enough. That when Hugenius put out his Horol. Oscil., a copy being presented to me, in my letter of thanks to him I gave those rules in the end thereof a particular commendation for their usefulness in Philosophy, and added out of my aforesaid paper an instance of their usefulness, in comparing the forces of the moon from the earth, and earth from the sun; in determining a problem about the moon’s phase, and putting a limit to the sun’s parallax, which shews that I had then my cye upon comparing the forces of the planets arising from their circular motion, and understood it ; so that a while after, when Mr Hooke propounded the problem solemnly, in the end of his attempt to prove the motion of the earth, if I had not known the duplicate proportion before, I could not but have found it now. Between ten and eleven years ago there was an hypothesis of mine registered in your books, wherein I hinted a cause of gravity towards the earth, sun, and

planets, with the dependence of the celestial motions thereon ; in which the proportion of the decrease of gravity from the superficies of the planet (though for brevity's sake not there expressed) can be no other than reciprocally duplicate of the distance from the centre. And I hope I shall not be urged to declare, in print, that I under- stood not the obvious mathematical condition of my own hypo- thesis. But grant I received it afterwards from Mr Hooke, yet have I as great a right to it as to the cllipsis. For as Kepler knew the orb to be not circular but oval, and guessed it to be elliptical, so Mr Hooke, without knowing what I have found ont since his letters to me, can know no more, but that the proportion was duplicate quam proximé at great distances from the centre, and only guessed it to be so accurately, and guessed amiss in extending that proportion down to the very centre, whereas Kepler guessed right at the ellipsis. And so Mr Hooke found less of the proportion than Kepler of the ellipsis.

'¢There is so strong an objection against the accurateness of this proportion, that without my demonstrations, to which Mr Hooke is yet a stranger, it cannot be believed by a judicious philosopher to be any where accurate. And so, in stating this business, I do pretend to have done as much for the proportion as for the ellipsis, and to have as much right to the one from Mr Hooke and all men, as to the other from Kepler; and therefore on this account also he must at least moderate his pretences.

'¢The proof you sent me I like very well. I designed the whole to consist of three books; the second was finished last suininer being short, and only wants transcribing, and drawing the cuts fairly. Some new propositions I have since thought on, which I can as well let alone. The third wants the theory of comets. In autumn last I spent two months in calculations to no purpose for want of a good method, which made me afterwards return to the first book, and enlarge it with divers propositions, some relating to comets, others to other things, found out last winter. The third I now design to suppress. Philosophy is such an impertinently litigious lady, that a man has as good be engaged in lawsuits, as have to do with her. I found it so formerly, and now I am no sooncr come near her again, but she gives me warning. The two first books, without the third, will not so well bear the title of Philosophiz Naturalis Principia Mathematica; and therefore I had altered it to this, De Motu Corporum libri duo. : i

‘*But, upon second thoughts, I retain the former title. “Twill help the sale of the book, which I ought not to diminish now ’tis yours. The articles are, with the largest, to be called by that name; if you please you may change the word to sections, though it be not material. In the first page, I have struck out the words ‘uti posthac doccbitur,’ as referring to the third book; which is all at present, from your affectionate friend, and humble servant,

‘Is. NEWTON.”

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On June 29, 1686, Halley wrote to Newton:—‘‘I am heartily sorry that in this matter, wherein all mankind ought to acknowledge their obligations to you, you should meet with anything that should give you unquiet”; and then, after an account of Hooke’s claim to the discovery as made at a meeting of the Royal Society, in which he says, ‘As to the manner of Mr Hooke’s claiming the discovery, I fear it has been represented in worse colours than it ought ; for he neither made public application to the Society for justice, nor pretended you had all from him,” he concludes :—

‘* But I found that they were all of opinion that nothing thereof appearing in print, nor on the books of the Society, you ought to be cousidered as the inventor. And if in truth he knew it before you, he ought not to blame any but himself for having taken no more care to sccure a discovery, which he puts so much value on. What application he has made in private, I know not; but I am sure that the Society have a very great satisfaction, in the honour you do them, by the dedication of so worthy a treatise. Sir, I must now again beg you, not to let your resentments run so high, as to deprive us of your third book, wherein the application of your mathematical doctrine to the theory of comets and several curious experiments, which, as I guess by what you write, ought to com- pose it, will undoubtedly render it acceptable to thosc, who will call themselves Philosophers without Mathematics, which are much the greater number. Now you approve of the character and paper, I will push on the edition vigorously. I have sometimes had thoughts of having the cuts neatly done in wood, so as to stand in the page with the demonstrations. It will be more convenient, and not much more charge. If it please you to have it so, I will try how well it can be done; otherwise I will have them in somewhat a larger size than those you

have seut up.—I am, Sir, your most affectionate humble servant, KE. HAuLeEy."

On June 30, 1686, the president was desired by the council to license Mr Newton's book, entitled Philosophizx Naturalis Principia Mathematica.

On July 14, 1686, Newton wrote to Halley approving of his proposal to introduce woodeuts among the letter- press, stating clearly the different things which he had from Hooke, and adding, "And now having sincerely told you the case between Mr Hooke and me, I hope I shall be free for the future from the prejudice of his letters. I have considered how best to compose the present dispute, and I think it may be done by the inclosed scholium to the fourth proposition." This scholium was—" The inverse law of gravity holds in all the celestial motions, as was discovered also independently by my countrymen Wren, Hooke, and Halley." After this letter of Newton's the printing of the Principia was commenced, and went on with considerable regularity. The second book, though ready for the press in the autumn of 1686, was not sent to the printers until March 1687. The third book was presented to the Society on April 6, 1687, and the whole work published about midsummer in that year. It was dedicated to the Royal Society, and to it was prefixed a set of Latin hexameters addressed by Halley to the author. The work, as might have been expected, caused a great deal of excitement throughout Europe, and the whole of the impression was very soon sold. In 1691 a copy of the Principia was hardly to be procured.

While Newton was writing the second and third books of the Principia, a very important event occurred at Cambridge which had the effect of bringing him before the public in a new light. James IT. had already, in 1686, in open violation of the law, conferred the deanery of Christ Church at Oxford on John Massey, a person whose sole qualification was that he was a member of the Church of Rome; and the king had boasted to the pope's legate that "what he had done at Oxford would very soon be done at Cambridge." In accordance with this boast, in February 1687, he issued a mandate directing that Father Alban Francis, a Benedictine monk, should be admitted a master of arts of the university of Cambridge, without taking the oaths of allegiance and supremacy. Upon

receiving the mandamus Magdalene

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Dr Pechell, the master of College, who was vice-chancellor, sent a messenger to the duke of Albemarle, the chancellor, to

request him to get the mandamus recalled; and the registrary and the bedells waited upon Francis to offer him instant admission to the degree if only he would take the necessary oaths. inexorable. The court and the university were thus placed in open collision.

Both the king and the monk were

A menacing letter was despatched by Sunderland to shake the firmness of the university ; but, though humble and respectful explanations were returned, the university showed no sign of compliance, nor even of a desire to suggest a compromise. In conse- quence the vice-chancellor and deputies from the senate were summoned to appear before the High Commission Court at Westminister. Newton was one of the eight deputies appointed by the senate for this purpose. The deputies, before starting for London, held a meeting to prepare their case for the court. A compromise which was put forward by one of them was stoutly and success- fully resisted by Newton, and ou April 21 the deputation, with their case carefully prepared, appeared before the court. Jeffreys presided at the board. The deputation appeared as a matter of course before the commissioners, and were dismissed. On April 27 they gave in their plea. On May 7 it was discussed, and feebly defended by the vice-chancellor. The deputies maintained that in the late reign several royal mandates had been withdrawn, and that no degree had ever been conferred without the oaths having been previously taken. Jeffreys spoke with his accus- tomed insolence to the vice-chancellor, silenced the other deputies when they offered to speak, and ordered them out of court. When recalled the deputies were reprimanded, and Pechell was deprived of his office as vice-chancellor, and of his emoluments as master of Magdalene. From the precincts of the High Commission Court Newton returned to Trinity College to complete the Principia.

At the time when Newton was writing the latter part of this great work, he had an extensive correspondence with Halley, a very great part of which is extant. The fol- lowing letter from Halley, dated London, July 5, 1687, announcing the completion of the Principia, is of peculiar interest :—

“T have at length brought your book to an end, and hope it will please you. The last errata came just in time to be inserted. I will present from you the book you desire to the Royal Society, Mr Boyle, Mr Paget, Mr Flamsteed, and if there be any else in town that you design to gratify that way; and 1 have sent you to bestow on your friends in the University 20 copies, which I entreat you to accept. In the same parcel you will receive 40 more, which having no acquaintance in Cambridge, I must entreat you to put into the hands of one or more of your ablest booksellers to dispose of them. I intend the price of them, bound in calves’ leather, and lettered, to be 9 shillings here. Those I send you I value in quires at 6 shillings, to take my money as they are sold, or at 552 for ready, or else at some short time; for I am satisfied there is no dealing in books without interesting the booksellers; and I am contented to let them go halves with me, rather than have your excellent work smothered by their combinations. I hope you will not repent you of the pains you have taken in so laudable a piece, so much to your own and the nation’s credit, but rather, after you shall have a little diverted yourself with other studies, that you will resume those contemplations wherein you had so great suc- cess, and attempt the perfection of the lunar theory, which will be of prodigious use in navigation, as well as of profound and public speculation. Sir, I shall be glad to hear that you have received the books, and to know what farther presents you wish in town, which shall be accordingly done. You will receive a box from me on Thursday next by the waggon, that starts from town to-morrow.”

In 1692 and 1693 Newton seems to have had a serious illness, the nature of which has in late years given rise to very considerable dispute. In a letter dated September 13, 1693, addressed to Mr Pepys, he writes:—

“Some time after Mr Millington had delivered your message, he

| pressed me to see you the next time I went to London. I was

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averse, but upon his pressing consented, before I considered what I did, for I am extremely troubled at the embroilment I am in, and have neither ate nor slept well this twelvemonth, nor have my former consistency of mind. I never designed to get any thing by your interest, nor by King James's favour, but am now sensible that I must withdraw from your acquaintance, and see neither you nor the rest of my friends any more, if I may but have them quietly. I beg your pardon for saying I would see you again, and rest your most humble and obedient servant."

And in a letter written to Locke in reply to one of his about the second edition of his book. and dated October

15, 1693, Newton wrote:—

"The last winter, by sleeping too often by my fire, I got an ill habit of sleeping; and a distemper, which this summer has been epidemical, put me farther out of order, so that when I wrote to you, I had not slept an hour a night for a fortnight together, and for five days together not a wink. I remember I wrote to you, but what I said of your book I remember not. If you please to send me a transcript of that passage, I will give you an account of it if I can."

These letters of Newton are sufficient evidence that he must have been for a very considerable time seriously unwell. The loss of sleep to a person of Newton's temperament, whose mind was never at rest, and at times so wholly engrossed in his scientific pursuits that he even neglected to take food, must necessarily have led to a very great deal of nervous excitability. It is not astonishing that rumours got abroad that there was a danger of his mind giving way, or, according to a report which was believed at the time, that it had actually done so. Mr Pepys must have heard such rumours, as in a letter to his friend Mr Millington, the tutor of Magdalene College at Cambridge, dated September 26, 1693, he wrote :—

'"'T must acknowledge myself not at the ease I would be glad to be at in reference to excellent Mr Newton; concerning whom (methinks) your answer labours under the same kind of restraint which (to tell you the truth) my asking did. For I was loth at first dash to tell you that I had lately received a letter from him so surprising to me for the inconsistency of every

part of it, as to be put into great disorder by it, from the concernment I have for him, lest it should arise from that which of all mankind I should least dread from him and most lament for,—I mean a discomposure in head, or mind, or both. Let me, therefore, beg you, Sir, having now told you the true ground of the trouble I lately gave you, to let me know the very truth of the matter, as far at least as comes within your knowledge. For I own too great an esteem for Mr Newton, as for a public good, to be able to let any doubt in me of this kind concerning him lie a moment uncleared, where I can have any hopes of helping it."

On September 30, 1693, Mr Millington wrote to Mr Pepys that he had been to look for Newton some time

before, but that "he was out of town, and since," he says,

'*T have not seen him, till upon the 28th I met him at Hunting- don, where, upon his own accord, and before I had time to ask him any question, he told me that he had writt to you a very odd letter, at which he was much concerned: added, that it was in a distemper that much scized his head, and that kept him awake for above five nights together, which upon occasion he desired I would represent to you, and beg your pardon, he being very much ashamed he should be so rude to a person for whom he hath so great an honour. He is now very well, and though I fear he is under some small degree of melancholy, yet I think there is no reason to suspect it hath at all touched his understanding, and I hope never will; and so I am sure all ought to wish that love learning or the honour of our nation, which it is a sign how much it is looked after, when such a person as Mr Newton lyes so neglected by those in power. And thus, honoured Sir, I have made you acquainted with all I know of the cause of such inconsist- encys in the letter of so excellent a person; and I hope it will remove the doubts and fears you are, with so much compassion and publickness of spirit, pleased to entertain about Mr Newton, but if I should have been wanting in any thing tending to the more full satisfaction, I shall, upon the least notice, endeavour to amend it with all gratitude and truth."

The illness of Newton was very much exaggerated by foreign contemporary writers. In a manuscript journal of Huygens is to be found an entry :—

‘©29 Maj. 1694.—Narravit mihi D. Colm Scotus virum celeber- rimum ac summum gcometram Is. Neutonum in phrenesin

incidisse abhinc anno ct sex mensibus. An ex nimia studii assiduitate, an dolore infortunii, quod incendio laboratorium

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chymicum et scripta quedam amiserat? Cum ad Archiepiscopum Cantabrigiensem venisset, ea locutum, que alienationem mentis indicarent. Dcinde ab amicis curam ejus susceptam, domoque clauso remedia volenti nolenti adhibita, quibus jam sanitatem recuperavit ut jam rursus librum suum Principiorum Philosophie Mathemati- corum intelligere incipiat.”

Huygens, in a letter dated June 8, 1694, wrote to Leibnitz, “I do not know if you are acquainted with the accident which has happened to the good Mr Newton, namely, that he has had an attack of phrenitis, which lasted eighteen months, and of which they say his friends have cured him by means of remedies, and keeping him shut up.” To which Leibnitz, in a letter dated June 22, replied, “I am very glad that I received information of the cure of Mr Newton at the same time that I first heard of his illness, which doubtless must have been very alarming.”

The active part which Newton had taken in defending the legal privileges of the university against the encroach- ments of the crown had probably at least equal weight with his scientific reputation when his friends chose him as a candidate for a seat in parliament as one of the repre- sentatives of the university. The other candidates were Sir Robert Sawyer and Mr Finch. Sir Robert stood at the head of the poll with 125 votes, Newton next with 122, and Mr Finch was last with 117 votes. Newton retained his seat only about a year, from January 1689 till the dis- solution of the Convention Parliament in February 1690. During this time Newton does not appear to have taken part in any of the debates in the House; but he was not neglectful of his duties as a member. On April 30, 1689, he moved for leave to bring in a Bill to settle the charters and privileges of the university of Cambridge, just as Sir Thomas Clarges did for Oxford at the same time, and he wrote a series of letters to Dr Lovel, the vice-chancellor of the university, on points which affected the interests of the university and its members.

Some of the members of the university who had lately sworn allegiance to James had some difficulty in swearing allegiance to his successor. On February 12, 1689, the day of the coronation of William and Mary, Newton intimated to the vice-chancellor that he would soon receive an order to proclaim them at Cambridge. He enclosed a form of the proclamation, and expressed a hearty "wish that the university would so compose themselves as to perform the solemnity with a reasonable decorum."

During his residence in London Newton had made the acquaintance of John Locke. Locke had taken a very great interest in the new theories of the Principia. He was one of a number of Newton's friends who began to be uneasy and dissatisfied at seeing the most eminent scientific man of his age left to depend upon the meagre emoluments of a college fellowship and a professorship.

At one time Newton's friends had nearly succeeded in getting him appointed provost of King's College, Cambridge, but the college offered a successful resistance on the ground that the appointment would be illegal, as the statutes required that the provost should be in priest's orders. Charles Montague, who was afterwards earl of Halifax, was a fellow of Trinity College, and was a very intimate friend of Newton's ; and it was on his influence that Newton relied in the main for promotion to some post of honour and emolument. His hopes, however, were blighted by long delay. In one of his letters to Locke at the beginning of the year 1692, when Montague, Lord Monmouth, and Locke were exerting themselves to obtain some appointment for him, Newton wrote that he was "fully convinced that Mr Montague, upon an old grudge which he thought had been worn out, was false to him." Newton was now in his fifty-fifth year, and whilst those of his own standing at the university had been appointed

to high posts in church or state, he still remained without any mark of national gratitude. But this blot upon the English name was at last removed by Montague in 1694, when he was appointed chancellor of the exchequer. He had previously consulted Newton upon the subject of the recoinage, and on the opportunity occurring he appointed Newton to the post of warden of the mint. In a letter to Newton announcing the news, Montague writes :—

‘“‘I am very glad that at last I can give you a good proof of my friendship, and the csteem the king has of your merits. Mr Over- ton, the warden of the mint, is made one of the Commissioners of Customs, and the king has promised me to make Mr Newton warden of the mint. The office is the most proper for you. ’Tis the chief office in the mint: ’tis worth five or six hundred pounds per annum, and has not too much business to require more attend- ance than you can spare.”

This letter must have convinced Newton of the sincerity of Montague’s good intentions towards him; we find them living as friends on the most intimate terms until Halifax’s death in 1715.

The chemical and mathematical knowledge of Newton proved of great use in carrying out the recoinage. This was completed in about two years, and such was the zeal and devotion with which Newton discharged the laborious duties of his office that he was in 1697 appointed to the mastership of the mint, a post worth between £1200 and £1500 perannum. While he held the latter office, Newton drew up a very extensive table of assays of foreign coins, and composed an official report on the coinage,

Up to the time of the publication of the Principia in 1687 the method of fluxions which had been invented by Newton, and had been of great assistance to him in his mathematical investigations, was still, except to Newton and his friends, a secret. One of the most important rules of the method forms the second lemma of the second book of the Principia. Though this new and powerful method was of great help to Newton in his work, he did hot exhibit it in the results. He was aware that the well- known geometrical methods of the ancients would clothe his new creations in a garb which would appear less strange and uncouth to those not familiar with the new method. The Principia gives no information on the subject of the notation adopted in the new calculus, and it was not until 1693 that it was communicated to the scientific world in the second volume of Dr Wallis’s works,

Newton’s admirers in Holland had informed Dr Wallis that Newton’s method of fluxions passed there under the name of Leibnitz’s Calculus Differentialis. It was there- fore thought necessary that an early opportunity should be taken of asserting Newton’s claim:to be the inventor of the

method of fluxions, and this was the reason for this method first appearing in Wallis's works. A further account of the method was given in the first edition of Newton's Optics, which appeared in 1704. To this work were added two treatises, entitled Zractatus duo de speciebus et magnitudine Jjigurarum curvilinearum, the one bearing the title Tractatus de Quadratura Curvarum, and the other Enumeratio linearum tertiz ordinis. The first contains an explanation of the doctrine of fluxions, and of its application to the quadrature of curves; the second, a classification of seventy-two curves of the third order, with an account of their properties. The reason for publishing these two tracts in his Optics, from the subsequent editions of which they were omitted, is thus stated in the advertisement :—

'"'In a letter written to M. Leibnitz in the year 1679, and published by Dr Wallis, I mentioned a method by which I had found some general theorems about squaring curvilinear figutes on comparing them with the conic Sections, or other the simplest figures with which they might be compared. And some years ago I lent outa manuscript containing such theorems ; and having since met with some things copied out of it, I have on this occasion made

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it public, prefixing to it an introduction, and joining a Scholium concerning that method. And I have joined with it another small tract concerning the curvilineal figures of the second kind, which was also writtcn many years ago, and made known to some friends, who have solicited the making it public."

In the year 1707 Whiston published the algebraical lectures which Newton had delivered at Cambridge, under the title of Arithmetica Universalis, sive de Compositione et fiesolutione Arithmetica Liber. We are not accurately informed how Whiston obtained possession of this work Z but it is stated by one of the editors of the English edition "that Mr Whiston, thinking it a pity that so noble and useful a work should be doomed to a college confinement, obtained Icave to make it public." It was soon afterwards translated into English by Mr Raphson ; and a second edition of it, with improvements by

the author, was published at London in 1712, by Dr Machin, secretary to the Royal Society. With the view of stimu- lating mathematicians to write annotations on this ad- mirable work, the celebrated ’S Gravesande published a tract, entitled Specimen Commentarii in Arithmeticam Universalem ; and Maclaurin’s Algebra seems to have been drawn up in consequence of this appeal.

In mentioning the mathematical works of our author, we must not omit his solution of the celebrated problems proposed by John Bernoulli and Leibnitz. In June 1696 Bernoulli addressed a letter to the mathematicians of Europe challenging them to solve two problems—(1) to determine the brachistochrone between two given points not in the same vertical line, (2) to determinea curve such that, if a straight line drawn through a fixed point A meet it in two points P,, P,, then AP,™+ AP,™ will be constant. This challenge was first made in the Acta Lipsiensia for June 1696. Six months were allowed by Bernoulli for the solution of the problem, and in the event of none being sent to him he promised to publish his own. The six months elapsed without any solution being produced ; but he received a letter from Leibnitz, stating that he had: “cut the knot of the most beautiful of these problems,” and requesting that the period for their solution should be extended to Christmas next, that the French and Italian mathematicians might have no reason to complain of the shortness of the period. Bernoulli adopted the sugges- tion, and publicly announced the prorogation for the infor- mation of those who might not see the Acta Lipsiensia.

On the 29th January 1696-97 Newton received from France two copies of the printed paper containing the problems, and on the following day he transmitted a solu- tion of them to Montague, then president of the Royal Society. He announced that the curve required in the first problem must be a cycloid, and he gave a method of determining it. He solved also the second problem, and he showed that by the same method other curves might be found which shall cut off three or more segments having the like properties. Solutions were also obtained from Leibnitz and the Marquis de L’Hopital ; and, although that of Newton was anonymous, yet Bernoulli recognized the author in his disguise ; “tanquam,” says he, “ex ungue leonem.”

In the year 1699 Newton’s position as a mathematician and natural philosopher of the first order were recog- nized in a very honourable manner by the French Academy of Sciences. In that year the Academy was remodelled, and eight foreign associates were created. Leibnitz, Guglielmini, Hartsoeker, and Tschirnhausen were appointed on February 4, James Bernoulli and John Bernoulli on February 14, and Newton and Roemer on February 21,

While Newton held the office of warden of the mint, he retained his chair of mathematics at Cambridge, and dis- charged the duties of the post, but shortly after he was

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promoted to the more lucrative office of master of the mint | donnera encore quelque chose sur le mouvement de la lune:

he appointed Whiston his deputy with “the full profits of the place.” Whiston began his astronomical lectures as Newton’s deputy in January 1701. On December 10, 1701, Newton resigned his professorship, thereby at the same time resigning his fellowship at Trinity, which he had held with the Lucasian professorship since 1675 by virtue of the royal mandate. Whiston’s claims to succeed Newton in the Lucasian chair were successfully supported by Newton himself.

On November 26, 1701, Newton was again elected one of the representatives of the university in parliament, but he retained his seat only until the dissolution in the follow- ing July. Newton does not seem to have been a candidate at this election, but at the next dissolution in 1705 he was again a candidate for the representation of the university. He was warmly supported by the residents, but being a Whig in politics he was opposed by the non-residents, and beaten by a large majority.

In the autumn of 1703 Lord Somers retired from the post of president of the Royal Society, and Newton on November 30, 1703, was elected to succeed him. Newton was annually re-elected to this honourable post during the

remainder of his life. He held the office in all twenty-five years, a period in which he has been exceeded by but one other president of the Royal Society, Sir Joseph Banks. As president Newton was brought into close connexion with Prince George of Denmark, the queen's husband, who had been elected a fellow of the Royal Society. The prince had offered, on Newton's recommendation, to be at the expense of printing Flamsteed's observations, and especially his catalogue of the stars. It was natural that the queen should form a high opinion of one whose merits had made such a deep impression on her husband, and she took an early opportunity of publicly showing the respect she had for his geniusand character. In April 1705, when the queen, the prince, and the court were staying at the royal residence at Newmarket, they paid a visit to Cambridge, where they were the guests of Dr Bentley, the master of Trinity. Her Majesty went in state to the Regent House, where a congregation of the senate was held, and a number of honorary degrees conferred. After- wards the queen held a court at Trinity Lodge, where (April 16, 1705) she conferred the order of knighthood upon the most distinguished of her subjects, the noblest knight who ever won his spurs in science, Sir Isaac Newton.

As soon as the first edition of the Principia was pub- lished Newton began to prepare for a second edition. He was anxious to improve the work by additions to the theory of the motion of the moon and the planets. Dr Edleston, in his preface to Newton's correspondence with Cotes, justly remarks :—

"Tf Flamsteed the Astronomer-Royal had cordially cooperated with him in the humble capacity of an observer in the way that Newton pointed out and requested of him (and for his almost unpardonable omission to do so I know of no better apology that can be offered than that he did not understand the real nature and, consequently, the importanee of the researches in which Newton was engaged, his purely empirical and tabular views never having been replaced in his mind by a clear eonception of the Principle of Uni- versal Gravitation), the lunar theory would, if its ereator did not overrate his own powers, have been completely investigated, so far as he could do it, in the first few months of 1695, and a second edition of the Princtpia would probably have followed the execution of the task at no long interval."

Newton, however, could not get the information he wanted from Flamsteed, and after the spring of 1696 his time was much occupied by his duties at the mint. Rumours, however, of his work, and of a new edition, were heard from time totime. In February 1700 Leibnitz writes of Newton, “J’ai appris aussi (je ne scai ot!) qu’il

et on m’a dit aussi qu’il y aura une nouvelle édition de ses principes de la nature.”

Dr Bentley, the master of Trinity College, had for a long time urged Newton to give his consent to the republica- tion of the Principia. In the middle of 1708 Newton’s consent was obtained, but it was not till the spring of 1709 that he was prevailed upon to entrust the superintendence of it toa young mathematician of great promise, Roger Cotes, fellow of Trinity College, who had been recently appointed the first Plumian professor of astronomy and experimental philosophy. On May 21, 1709, after having been that day with Newton, Bentley announced this arrangement to Cotes:—‘‘Sir Isaac Newton,” he said, “will be glad to see you in June, and then put into your hands one part of his book corrected for the press.” About the middle of July Cotes went to London, in the expecta- tion doubtless to bring down with him to Cambridge the corrected portion of the Principia. Although Cotes was impatient to begin his work, it was nearly the end of September before the corrected copy was put into his hands.

During the printing of this edition a correspondence went on continuously between Newton and Cotes. On March 31, 1713, when the edition was nearly ready for

publication, Newton wrote to Cotes :— **T heare that Mr Bernoulli has sent a Paper of 40 pages to be

‘published in the Acta Leipsica relating to what I have written upon

the eurve Lines described by Projectiles in resisting Mediums. And therein he partly makes Observations upon what I have written & partly improves it. To prevent being blamed by him or others for any disingenuity in not acknowledging my oversights or slips in the first edition, I believe it will

not be amiss to print next after the old Prefatio ad Lectorem, the following account of this new Edition.

‘In hac secunda Principiorum Hditione, multa sparsim emen- dantur & nonnulla adjieiuntur. In Libri primi Sect. ii. Inventio virium quibus corpora in Orbibus datis revolvi possint, facilior redditur et amplior. In Libri seeundi Sect. vii. Theoria resisten- tie fluidorum accuratius investigatur & novis experimentis confir- matur. In Libro tertio Theoria Lune & Precessio Hquinoctiorum ex Principiis suis plenius deducuntur, et Theoria Cometarum pluribus ct accuratius computatis Orbium exemplis confirmatur.

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‘*Tf you write any further Preface, I must not see it, for I find that I shall be examined about it. The cuts for y® Comet of 1680 & 1681 are printed off and will be sent to Dr Bently this week by the Carrier.”

Newton’s desire to have no hand in writing the preface seems to have proceeded from a knowledge that Cotes was proposing to allude to the dispute about the invention of fluxions.! At last, about midsummer 1713, was published the long and impatiently expected second edition of the Principia, and on July 27 Newton waited on the queen to present her with a copy of the new edition.

In 1714 the question of finding the longitude at sea, which had been looked upon as an important one for several years, was brought into prominence by a petition presented to the House of Commons by a number of captains of Her Majesty’s ships and merchant ships and of London merchants. This petition set forth “that the discovery of longitude is of such consequence to Great Britain, for safety of the navy, for merchant ships, as well as of improvement of trade, that for want thereof many ships had been retarded in their voyages, and many lost ; but if due encouragement were proposed by the public for such as shall discover the same, some persons would offer themselves to prove the same before the most proper judges.” The petition was referred to a committee of the House, who called witnesses. Newton appeared before

1 For an aceount of the dispute coneerning the rival elaims of Newton and Leibnitz to be eonsidered the inventor of the method of fluxions or the differential ealculus, and an aeeount of the case as ‘drawn up by a committee of the Royal Soeiety in the Commercium Epistolicum, see INFINITESIMAL CALCULUS, vol. xiii. pp. 8-10.

them and gave evidence. the longitude at sea there had been several projects, true in theory but difficult to execute. He mentioned four:— (1) by a watch to keep time exactly, (2) by the eclipses of Jupiter’s satellites, (3) by the place of the moon, (4) by a new method proposed by Mr Ditton. Newton criticized all the methods, pointing out their weak points, and it is due mainly to his evidence that the committee brought in the report which was accepted by the House, and shortly afterwards was converted into a Bill, passed both Houses, and received the royal assent. The report ran ‘that it is the opinion of this committee that a reward be settled by parliament upon such person or persons as shall discover a more certain and practicable method of ascertaining the longitude than any yet in practice; and the said reward be proportioned to the degree of exactness to which the said method shall reach.” For the history of the conse- quences of this report we must refer to the article Navi- GATION, p. 258 sg. of the present volume.

Sir Isaac Newton was a very popular visitor at the court of George I. The princess of Wales, afterwards Queen Caroline, wife of George IT., took every opportunity of con- versing with him. Having one day been told by Sir Isaac that he had composed a new system of chronology while he was still resident at Cambridge, she requested him to give her a copy. He accordingly drew up an abstract of the system from his papers, and sent it to the princess for her own private use; but he afterwards allowed a copy to be made for the Abbé Conti on the express understanding that it should not be communicated to any other person. The abbé, however, unmindful of his promise not to divulge the system, lent his copy to M. Fréret, an antiquary at Paris, who translated it, and endeavoured to refute it. The translation was printed under the title Abrégé de Chronologie de M. le Chevallier Newton, fait par lui-méme et traduit sur le Manuscrit Anglais. Upon receiving a copy

of this work, Sir Isaac Newton printed, in the Phalosophacal Transactions for 1725, a paper entitled Remarks on the observations made on a Chronological Index of Sir Isaac Newton, translated into French by the observator, and published at Paris. In these remarks Sir Isaac charged the abbé with a breach of promise, and gave a triumphant answer to the objections which Fréret had urged against his system. Father Souciet entered the field in defence of Fréret; and in consequence of this contro- versy Sir Isaac was induced to prepare his larger work, which was published in 1728, after his death, and entitled The Chronology of Ancient Kingdoms amended, to which is prefixed a short Chronicle from the First Memory of Kings os Lurope to the Conquest of Persia by Alexander the

‘reat.

From an early period of his life Newton had paid great attention to theological studies, and it is well known that he had begun to study the subject of the prophecies before the year 1690. M. Biot, with a view of showing that his theological writings were the productions of his dotage, has fixed their date between 1712 and 1719. That Newton’s mind was even then quite clear and powerful is sufficiently proved by his ability to attack the most difficult mathe- matical problems with success. For it was in 1716 that Leibnitz, in a letter to the Abbé Conti, proposed a problem for solution “for the purpose of feeling the pulse of the English analysts.” The problem was to find the orthogonal trajectories of a series of curves represented by a single equation. Newton received this problem about 5 o’clock in the afternoon as he was returning from the mint, but, though he was fatigued with business, he solved the problem the same evening,

One of the most remarkable of Sir Isaac’s theological

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He stated that for determining | ruptions of the Scripture, in a letter to a friend. This

friend was Mr Locke, who received the letter in November 1690. Sir Isaac seems to have been then anxious for its publication ; but, as the effect of his argument was to deprive the Trinitarians of two passages in favour of the

Trinity, he became alarmed at the probable consequences of such a step. He therefore requested Locke, who was then going to Holland, to get it translated into French, and published on the Continent. Being prevented from going to Holland, Locke copied the manuscript, and sent it, without Newton's name, to Le Clerc, who received it before the 11th of April 1691. On the 20th of January 1692 Le Clere announced to Locke his intention to publish the pamphlet in Latin ; and, upon the intimation of this to Sir Isaac, he entreated him "to stop the translation and impression as soon as he could, for he designed to suppress them." This was accordingly done; but Le Clerc sent the manuscript to the library of the Remonstrants, and it was afterwards published at London in 1754, under the title of Two Letters from Sir Isaac Newton to M. le Clere. This edition is imperfect, and in many places erroneous. Dr Horsley therefore published a genuine one, which is in the form of a single letter to a friend, and was taken from a manuscript in Sir Isaac's own hand.

Sir Isaac Newton left behind him in manuscript a work entitled Observations on the Prophecies of Daniel and the Apocalypse of St John, which was published in London in 1733, in one volume 4to; another work, entitled Lexicon Propheticum, with a dissertation on the sacred cubit of the Jews, which was printed in 1737; and four letters addressed to Bentley, containing some arguments in proof of a Deity, which were published by Cumberland, a nephew of Bentley, in 1756. Sir Isaac also left a Church LMistory complete, a Listory of the Creation, Paradoxical Questions regarding Athanasius, and many divinity tracts.

Newton devoted much of his time to the study of chemistry ; but the greater number of his experiments still remain in manuscript. His Zabula Quantitatum et Graduum Caloris contains a comparative scale of temperature from that of melting ice to that of a small kitchen fire. He wrote also another chemical paper De Natura Acidorum, which has been published by Dr Horsley. Sir Isaac spent much time in the study of the works ot the alchemists. He had diligently studied the works of Jacob Boehme, and there were found amongst his manuscripts copious abstracts from them in his own handwriting. In the earlier part of his life he and his relation Dr Newton of Grantham had put up furnaces, and had wrought for several months in quest of the philosopher's tincture. Among the manuscripts in the

possession of the earl of Portsmouth there are many sheets in Sir Isaac's hand of Flamsteed's Euplication of Hieroglyphic Figures, and in another hand many sheets of William Yworth's Processus Mysteriti Magni Philosophicus.

In the last few years of his life Newton was troubled with incontinence of urine, which was supposed to be due to stone ; but with care he kept the disease under control. In January 1725 he was seized with a violent cough and inflammation of the lungs, which induced him to reside at Kensington ; and in the following month he had a severe attack of gout, which produced a decided improvement in his general health. His duties at the mint were dis- charged by Mr Conduitt, and he therefore seldom went from home. On the 28th of February 1727, feeling well, he went to London to preside at a meeting of the Royal Society ; but the fatigue which attended this duty brought on a violent return of his former complaint, and he returned to Kensington on the 4th of March, when Dr Mead and Dr Chesselden pronounced his disease to be

productions is his Historical Account of Two Notable Cor- | stone. He endured the sufferings of this complaint with

wonderful patience and meekness. He secmed a little better on the 15th of March, and on the 18th he read the newspapers, and conversed with Dr Mead'; but at 6 o'clock in the evening he became insensible, and continued in that state till Monday the 20th of March 1726-7, when he expired without pain between one and two o'clock in the morning, in the eighty-fifth year of his age. His body was removed to London, and on Tuesday the 28th of March it lay in state in the Jerusalem Chamber, and was thence conveyed to Westminster Abbey, where it was buried. Authorities.—Commercium Epistolicum D. Johannis Collins et aliorum de analyst promota: jussu Soctetatis Regiz in lucem editum, &c., 1712 (2d edition, 1722); H. Pemberton, 4 View of Str Isaac Newton's Philosophy, 1728; ¥. Baily, An Aceount of the Rev. John Flamsteed, the -First Astronomer-Royal, &c., 1835; Whewell's History of the Induetive Sciences, 1837; 8. P. Rigaud, Historical Essay on the First Publication of Sir Isaac Newton's Principia, 1838; Edleston, Correspondence of Sir Isaac Newton and Professor Cotes,

&c., 1850; Sir D. Brewster, Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton, 1855; Lord Brougham and Mr Routh's Analytical View of Sir Isaac Newton's Principia, 1855; Correspondence of Scientific Men of the 17th Century, &c., from the Originals in the Collection of the Earl of Macclesficld, 1841; J. Raphson, History of Fluxions, shewing in a compendious manner the First Rise of and Various Improvements made in that Incompar- able Method, 1715. The collected works of Newton were published in 1779 by Dr Samuel Horsley, ¥F.R.S., under the title Zsaaci New- tont Opera que exstant Onunria. (H. M. T.) NEWTON, Joun (1725-1807), a prominent Evangeli- cal clergyman of the Church of England, and an intimate friend of the poet Cowper, was born in London 24th July 1725. His father, who fora long time was master of a ship in the Mediterranean trade, became in 1748 governor of York Fort, Hudson's Bay, where he died in 1750; his mother, a pious Dissenter, died when he was hardly seven years old. The only time spent by him at school was from his eighth to his tenth year, at Stratford, Essex. When only eleven years of age he joined his father's ship, where he continued to serve under him till' 1742; shortly afterwards he was impressed on board a man-of-war, the "Harwich," where he was made a midshipman. For an attempt to escape while his ship lay off Plymouth he was degraded, and treated with so much severity that when two men from a Guinea ship came aboard the man-of-war off Madeira he was glad to take advantage of the oppor- tunity to exchange into an African trader. At Sierra Leone he left this ship and entered into the service of a slave trader, with whom he remained two years. The hardships he suffered were, however, so severe that he brought them under the notice of his father, by whose directions an English ship called for him in 1747 and brought him to England. Shortly afterwards he became mate on board a Liverpool slave ship, with which he made another voyage to Guinea, returning by the West Indies and Charleston, After his marriage in 1750 he made several similar voyages as master, devoting his leisure time to the im- provement of his education, especially in mathematics, French, and Latin. The state of his health anda grow- ing aversion to the slave trade led him to quit the sea in 1755, when he was appointed tide-surveyor at Liverpool. He now directed his attention to the study of Greek and Hebrew, and in 1758, in consequence of a gradual deepen- ing of his religious convictions which had been going on for years, applied to the archbishop of York for holy orders. This was refused him, but, having had the curacy of Olney offered

to him in April 1764, he was ordained deacon by the bishop of Lincoln, and in June of the following year was ordained priest. About three and a half years after- wards Cowper the poet settledin the parish. An intimate friendship sprung up between them, and they published together the Olney Hymns (1779). They made it a rule to spend four days of the week in one another's company, and were rarely "'seven successive working hours apart."

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In 1779 Newton left Olney to become rector of St Mary Woolnoth, London, where he laboured with unremitting diligence in visiting and preaching till his death, December

31, 1807.

Like Cowper, Newton held strongly Calvinistic views, although his evangelical fervour allied him closely with the sentiments of Wesley and the Methodists. His enduring fame rests on certain of the Olney Hymms, remarkable for vigour, simplicity, and directness of devotional utterance, which have passed into almost universal currency throughout the Reformed ehurches of English speech. His prose works include an Authentic Narrative of some Interesting and Remarkable Particulars in his own Life, a volume of Sermons (1760), Omicron (a series of lettcrs on religion, 1762), Review of Leclesiastical History (1769), and Cardiphonia (1781); but, though once extensively read, they now, with perhaps the exception of the first-named (a well-told narrative of moral and religious conversion), receive but little attention, and indeed have but little title toa per- manent place in religious literature. A Life of Newton by Richard Cecil, first published in 1808, was prefixed to a collected edition of his works which appeared in 6 vols., 1816. Many subsequent editions of his works have been published.

NEWTON ABBOT anp NEWTON BUSHEL, situated respectively in the parishes of Wolborough and Highweek, and separated by the small river Lemon, are generally included under the one name Newton Abbot, a market- town of Devonshire, England, on the Teign, 5 miles south by west of Teignmouth, and 6 north of Torquay. The beauty of the neighbouring scenery and the salubrity of the climate have tended of late years to increase

the demand for residences, while the situation of the town at the head of the Teign navigation enables it to carry ona considerable shipping trade. St Mary's, the parish church of Wolborough, about half a mile south of the town, is in the Perpendicular style, as is also the parish church of Highweek, about a mile to the north-west. A very ex- tensive nunnery, called St Augustine's Priory, was erected near the town in 1861. To the east of the town is Forde House, an Elizabethan structure belonging to the earl of Devon, visited by Charles I. and William of Orange. The other principal buildings are the union workhouse, the town-hall, and the markets. There are two fine public parks, Courtenay Park and Forde Park. The town pos- sesses iron foundries, malt-houses, flour-mills, a tannery, and a brewery. The engine-works of the Great Western Railway have lately been established in the town. Fine potters' clay and pipeclay are obtained in the neighbour- hood, about 6000 tons being exported annually to the potteries. There is a considerable trade in cattle, corn, and agricultural produce. The population of Wolborough with Newton Abbot in 1881 was 7662, and of Highweek

2164.

Probably both Newton Abbot and Newton Bushel were originally included under Nuzetone. Newton Abbot was given to the abbot of Tor by William Lord Brewer, founder of the monastery. Newton Bushel was so called from Robert Bussell or Bushell, foster-child

and kinsman of Theobald de Englishville, who was made lord of the manor by Henry III. in 1246.

NEWTON-LE-WILLOWS, or Newron-1n-MAKERFIELD, a township and urban sanitary district of Lancashire, is situated on a branch of the London and North-Western Railway between Liverpool and Manchester, about 153 miles from each. The original town of Newton consists principally of one broad street, but many new buildings have sprung up in the immediate neighbourhood, especi- ally at Earlestown junction, about half a mile distant. There is a town-hall, a mechanics' institute, and a grammar school. At a short distance from the town is a moated timber-house, and also an ancient barrow of great extent. The Liverpool farm reformatory school is in the neighbour- hood. The industrial establishments include the waggon

factory of the London and North-Western Railway Company (employing about 1000 hands), a large foundry, printing and stationery works, paper-mills, and sugar refineries. Coal abounds in the neighbourhood. ‘The

barony is mentioned as being possessed by Edward the Confessor, but after the Conquest it was given to the Langtons. Near the town a party of Highlanders were in 1648 taken prisoners by Cromwell’s troops, and hanged in an adjoining wood, still called Gallow’s Cross. The town possessed the privilege of returning two members to par- liament from the 5th of Elizabeth, but was disfranchised in 1832. The population of the urban sanitary district in 1871 was 8244, and in 1881 it was 10,580.

NEWTOWN (Welsh, Drefnewydd; ancient name, Llan- far Cedewain), a market-town and parliamentary borough of Montgomeryshire, is situated on both sides of the Severn, 11 miles east-north-east of Llanidloes, and 13 south-south- west of Welshpool. It is a well-built town with wide and regular streets, although some of the houses are of timber. The principal buildings are the public rooms (1835), the infirmary (1867), and the market-hall (1870). Newtown is the principal seat of the Welsh flannel manufacture, to which now has been added that of tweeds and shawls. It joins with Welshpool, Llanfyllin, Montgomery, Llanidloes, and Machynlleth in returning a member to parliament. The population of the urban sanitary district of Newtown and Llanllwchaiarn in 1871 was 5886, and in 1881 it was 7170.

NEWTOWN, a suburban municipal district of Sydney, New South Wales. It consists chiefly of the residences of the better classes, whose business premises are in the city. It possesses a town-hall, a good free library, and a new court-house. There is a public school with an average attendance of about 800. The municipal government was proclaimed 12th December 1862. Newtown is connected with Sydney by railway, tramway, and omnibus. The population in 1881 was 15,828.

NEWTOWNARDS, or Newrownarpss, a market-town, formerly a parliamentary borough, of the county Down, Treland, is beautifully situated near the northern extrem- ity of Lough Strangford, on the Belfast and County Down Railway, 94 miles east of Belfast and 44 south by west of Bangor. The town, which is sheltered by hills on the west and north, is well built, and possesses a fine square, from which the principal streets diverge. There isa court- house and a town-hall. of an ancient cross was erected in 1636. Muslin embroid- ery is the principal industry, a hem-stitching factory affording employment to 500 females. There is also a mill for flaxand hemp yarns. In the neighbourhood there are freestone quarries. The population in 1871 was 9562, and in 1881 it was 8676.

NEW I. New Yorx Srarz.

N*Y YORK, one of the original thirteen United States of America, is situated between 40° 29’ 40” and 45°0’ 2″ N. lat. and between 71° 51’ and 79° 45’ 54’“4 W. long. It is bounded N. by Lake Ontario and the St Lawrence river, which separate it from the province of Ontario; E. by Vermont, Massachusetts, and Connecticut s°S: by*the Atlantic Ocean, New J ersey, and Pennsylvania; and W. by Pennsylvania, Lake Erie, and the N lagara river. Topography.—The State of New York has a triangular outline, with a breadth from east to west of 32646 miles, and from north to south, on the line of the Hudson, of 300 miles. In addition it includes Long Island and Staten Island on the Atlantic coast. Its arca is 49,170 square miles,—47,620 square miles, or 30,476,800 acres, being land, and the remainder portions of the great lakes that border it. The surface is more diversified than that of any other State in the Union. The eastern and southern

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In the market square the pedestal |__tioned, celebrated the beginning of the ycar (nev-ritz) by

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From an early period there were a large number of religious foundations in the district, and the town owes its origin to a Dominican monastery founded in 1244 by Walter de Burgh. The town was forfeited by the O’Neills, and

given to the Hamiltons and Montgomeries, from whom it passed to the marquis of London- derry. It received a charter from James I., and until the Union returned two members to parliament.

NEW YEAR'S DAY. The first day (calends) of January, as marking the beginning of the year, was observed as a public holiday in Rome from at least the time of the Julian reformation of the calendar. Ovid (as., i. 63 sq.) alludes to the abstinence from litigation and strife, the smoking altars, the white-robed processions to the Capitol ; and later writers describe the exchanges of visits, the giving and receiving of presents (strenz), the masquerad- ing, and the feasting with which the day was in their time celebrated throughout the empire. Libanius (c. 346 a.p.) speaks of it as being in his day the one great holiday common to all under the Roman rule. Participation by Christians in the ordinary New Year's Day observances, as well as in the Saturnalia of the preceding month of December, which was from the first discouraged by the church, called forth repeated protests, not only from eminent individuals such as Tertullian (De Jdol., 14), Augustine (Serm. de Kal. Jan.), and Chrysostom (Hom. in Kal.), but also from various provincial synods ; and the sixty-second canon of the Quinisext general council (692) was expressly directed against "the so-called Calends, and Vota, and Brumalia." Christians were expected to spend the day in quiet meditation, reading of scripture, and acts of charity and beneficence. When about the 5th century the 25th of December had gradually become a fixed festival com- memorative of the Nativity, the lst January ultimately also assumed a specially sacred character as the octave of Christmas Day and as the anniversary of the circumcision of our Lord, and'as such it still figures in the calendars of the various branches of the Eastern and of the Western Church, though only as a feast of subordinate importance. The practice of giving and receiving "strene" for luck about the beginning of the year survives in such institu- tions as the French "jour d'étrennes" and the Scottish "Handsel Monday." The Persians also, it may be men-

exchanging presents of eggs. For particulars as to the date of commencement, and also as to the duration, of the year, whether civil or sacred, in various nations and religions, reference may be made to the article CALENDAR. ;

north and west to Lake Ontario. The mountainous belt of the eastern part is cut through by the great water-gap of the Mohawk valley, which once connected the Ontario basin with the trough of the Hudson below the present ocean-level, and is the most interesting and important feature in the topography of the State.

Afountains.—The mountains of New York form three distinct groups. (1) The Adirondacks, a series of short ranges having a north-north-east and south-south-west direction, form the centre of the elevated region of the north-east section of the State. The highest of these is Mount Marcy, 5344 feet, with several associated summits which reach the altitude of 5000 fect. (2) The Cat- skill Mountains, with their foothills, occupy about 500 square miles south of the Mohawk valley and west of the Hudson ; the highest peaks reach an altitude of 4000 fect.

The Helderberg and Shawangunk Mountains are topo-

¢ graphically a portion of the Catskills, the first on the portions are high, and from these the land slopes gently |

north, the second on the south. These all belong to the

Alleghany system, and are connected with the mountains | picturesque falls. Besides the great cataract of Niagara, a of Pennsylvania by the Delaware Mountains, which have | mile wide and 164 feet high, which New York shares with an altitude of from 1600 to 2800 feet. (3) The Highlands | Canada, there are many other falls worthy of mention, as of the Hudson, through which the river passes at West | those of the Genesee at Rochester and Portage, Trenton Point, are the northern continuation of the Blue Ridge of | Falls, the Falls of Ticonderoga, &c. Among the natural Pennsylvania, having an altitude of from 1200 to 1800 | features which distinguish the State its mineral springs feet. The so-called mountains of the central and southern | deserve special mention. Those of Saratoga, Balston, counties are

portions of a high plateau which connects | Sharon, Avon, and Richfield are famous throughout the

‘with the Helderberg and Catskill Mountains on the east. | Union. They differ much in chemical composition and

This is cut by eroded valleys in such a way as to leave | medicinal virtues, but all are popular places of resort, and many elevated points, of which the highest is East Hill in | some have gathered round them towns of considerable size. Otsego county, 2300 feet above the sea. Climate.—In a general way it may be said that the

One of the most peculiar and impressive topographical | climate of New York is typical of that of the northern features is formed by the cliffs of the Palisades, which | United States, a climate of extremes, hot in summer and border the Hudson in Rockland county, and are continu- | cold in winter, and yet healthful, stimulating, and on the ous with those of New Jersey. whole not disagreeable. The average annual temperature

Lakes and Rivers.—Two of the chain of great lakes | is about 47° Fahr., the average maximum of summer heat border the State, Lake Erie and Lake Ontario, con- | 93°, the temperature of 100° being rarely reached, and nected by the Niagara river, on which is the most | 102° the highest maximum record. The minimum tempera- celebrated cataract in the world. Lake Erie gives about | ture is about — 20° Fahr., never attained in the southern 75 miles of coast-line to New York, Lake ges: —] 4…] portion, seldom in the central, but Ontario over 200. The surface level of the Pe Ve ddd, y ; |often passed by four or five de- former is 573 feet above the sea, of the latter |. > § (2 grees in the most northern counties. 245 feet; and this is 606 feet deep. A por- The average rainfall is about 40 tion of the eastern border of New York is inches. Frosts begin from Sep-

tember Ist to October Ist, and end from April lst to May 1st, according to the locality and year. In the Adirondack region the snow- fall is heavy, the winter long and severe. In central New York it is ‘| not uncommon for snow to accumu- late to the depth of 3 or 4 feet, and yet this is not persistent. About ‘| New York city and on Long Island | the snow rarely exceeds a foot in depth, sleighing is always uncertain,

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G and sometimes the ground will be Ze bare for weeks together. Thus it Te. will be seen that the climate of – New York is intermediate in char-

} acter between that of New Eng- land and the Mississippi valley States,—a little milder than the first, severer than the last. The great lakes which border it are | never frozen to their centres, and exert an equalizing influence upon

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Geological Map of New York. formed by Lake Champlain, which lies in the trough between the Adirondacks and the Green Mountains. Within the State the number of lakes is very great. The largest is Lake George, famous for its beautiful scenery. Through the central portion a series of +4 the climate of their shores, peculiar elongated lakes are found which lie with a | ws In the absence of extensive nearly north-and-south bearing on the slope from the | alluvial plains and marshes, there is little malaria, and the southern highlands to the Ontario basin, or the Mohawk | climate is salubrious. About New York city and on Long valley. The largest of these are Cayuga, Seneca, Oneida, | Island the ocean softens the rigours of winter, and through Crooked, Canandaigua, Owasco, and Otsego. These are | the influence of

the Arctic current, which bathes the coast river valleys once occupied and modified by glaciers and | as far south as Cape Hatteras, renders the summer per- dammed up by moraines. The Adirondack region is | ceptibly cooler.

famous for its system of lakes, which are favourite places The local variation of climate within the limits of the of resort for tourists. Among the rivers of New York | State will be best seen by the following table :—

the Hudson is the largest and most beautiful. Formerly it ran several hundred feet below its present level, and oe was the great channel of drainage which led through the | Temp. | Rainfall. Mohawk valley from the interior. Now, by a subsidence | | Moriches, Long Is-| ° ’ fai Feet, Inches. . ; . 2: 21 call eae 4049 | 7286 |Sea-level.| 54:2 54°67 of the continent, it is an arm of the sea, and navigable to | | new york City | 4042 7″ 100 “ete aes Troy, 151 miles from its mouth. The Black River, the ATDAMY:weeseeveesene] 42 40 74 45 150 469 40°61 Mohawk, and the Genesee are all large streams which lie | | Batraio. 2777”) 49.53 78 55 660 46°8 33°84 entirely within the State, while the Alleghany, the Sus- | | Gouverneur…..... oe } Ee = = pes quehanna, and the Delaware rise there, but soon leave | – it to become the great rivers of Pennsylvania. From the | Fauna.—At the advent of the whites the fauna of New

varied topography and the abundant rainfall the number York included all the wild animals which were found

of streams is large, and many of them are marked by | in the north-eastern States of the Union or the adjacent

portions of Canada, but by the cutting off of forests, and the occupation of the surface by farms, the range of the native animals has been greatly reduced, and they have been unceasingly destroyed by man. Formerly the elk, the moose, and the caribou were abundant in the northern part of the State, but are now all exterminated, while the Virginia deer in many localities is still quite plentiful. Of the carnivorous animals, the couguar, the black bear, two species of lynx, the red and grey foxes, the wolf, otter,

fisher, pine marten, mink, and skunk still remain, but the wolf is on the eve of extermination, and the wolverine, never abundant, has perhaps migrated northward. Among the rodents the beaver and variable hare are found, but in small numbers, while rabbits, squirrels, rats, mice, field- mice, &c., are still unpleasantly numerous.

Civilization has made but little difference with the reptiles, birds, and fishes. All the birds indigenous to the eastern portion of the continent may probably at times be found within the State, though their relative numbers are affected by the removal of the forests. Among the reptiles are seventeen species of snakes, three of which, two rattlesnakes and the copperhead, are venomous. The fishes include all the species found in the lower lakes, in the rivers of the temperate portions of the continent, and on the Atlantic coast; and the fisheries constitute an important element in the revenues and subsistence of the people. The streams and lakes of the more elevated portions contain brook trout in abundance; those of the lower levels are well stocked with bass, pickerel, perch, and other game fish. The salmon, which formerly inhabited the Hudson and its tributaries, was long since exterminated; but an effort has been made to restock some of the streams, and, like the German carp recently introduced, it may now be reckoned as an inhabitant of the waters of New York. Some of the interior lakes are stocked with a land-locked salmon, or lake trout, a valuable and interesting fish. The oyster industry of the coast has its chief commercial centre in New York city, and an important fraction of the supply of clams, oysters, lobsters, and sea fish is obtained from the New York coast.

Flora,—Originally the surface of New York was occupied by an almost unbroken forest, and, as a consequence of the general fertility of the soil, its topographical diversity, and the range of latitude and longitude, the flora is rich and varied. About seventy species of trees are known to inhabit the State, and these include all found in the adjacent portions of the Union and Canada. The most abundant are oaks, of which there are fifteen species, but with these mingle five species each of maple, pine, and poplar, four species of hickory, three each of elm, spruce, and ash, two of willow, cherry, magnolia, and pepperidge,

and one each of larch, liriodendron, dogwood, arbor |

vite, balsam, yew, sycamore, honey locust, sweet gum, locust, butternut, black walnut, chestnut, beech, hornbeam, basswood, sassafras, and mulberry. On the summits of the Adirondacks a true alpine vegetation is found, though consisting of but a small number of plants ; several of these exist in no other locality in the United States except the mountain summits of Vermont and New Hampshire. The flowering plants and ferns of New York were studied with much care by the late Dr Torrey, and his report upon them forms two of the series of twenty-three quarto volumes which compose the Report on the Natural History of New York, The flowering plants enumerated by Dr Torrey amount to 1540 species, to which a few additions have since been made. The ferns number fifty-four species — more than are found in any other State; the lower forms of plant life, seaweeds, fungi, lichens, &c., are con- stantly supplying new material, and many years will yet be required for their complete elaboration.

New York

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Geology.—The geological structure of New York is more varied and comprehensive than that of any other State, since it includes, with perhaps the exception of the Jurassic, the entire geological column from the Archean to the Tertiary. A tabular view of the relations of the rocks of New York may be given as follows :—

Alluvium, peat, shell-marl, diatomaceous carth. Quaternary… < Champlain clays.

Glacial deposits. Till, kames, moraines, erraties. ee a (?). Gay Head group.

Tertiary …... } Greensands (?).

Cretaceous…. ¢ Raritan group.

with lignite. Wanting (?). Palisade group. Sandstones, shale, and trap of

Rockland county. Coal-measures, wanting. Monntain limestone, wanting.
Carboniferous { Waverly group, “ White Catskill.”

Catskill group, “ Red Catskill.” | Chemung group. Encrinal limestone.

Marcellus shale.

Hamilton group. Devonian….. Corniferous limestone.

Long and Staten Island clays,

Jurassic.

Triassic…

Gardeau shale. Cashaqua shale Genesee shale. Tully limestone. Hamilton shale. Moscow shale.

Corniferous group. Onondaga limestone. Schoharie grit—passage bed,

Caudagalli grit.

Oriskany sandstone.

(Upper Pentamerus limestone. Scutella limestone. Delthyris limestone.

Lower Pentamerus limestone. Water lime.

(Local.) “ Onondaga salt group.”

Niagara limestone.

Niagara shale.

Clinton limestone.

Clinton shale.

Medina sandstone.

Oneida conglomerate.

Hudson River shales.

Utica shale.

Trenton limestone.

Black River limestone.

Birdseye limestone.

Chazy limestone.

Calciferous sand rock—pass-

age bed.

Potsdam sandstone.

Rossie slate ore and marble.

Troy slates and limestones.

‘* Georgia slates.”

Oriskany group.

Helderberg group.

Upper Silurian

Niagara group.

Medina group.

| Salina group. f

Hudson group.

Lower Trenton group,

Silurian. | Potsdam group. }

Cambrian….. Taconic group.

Huronian….. Wanting (2). St Lawrence marble. Moriah ophiolite. ;
Laurentian.. Adirondack group. ee

Gnciss with magnetite. | Highlands — gnciss maguctite, &e.

The surface exposures of these rocks can be seen at a glance by reference to the accompanying outline map.

The boundaries of the State enclose an area which once formed a part of the eastern declivity of the Archean continent, of which the Canadian and Adirondack high- lands are the most important representatives. These are composed of Laurentian rocks, and are perhaps the oldest portion of the earth's surface. Upon the slope of this old continent the ocean rose and fell in the different geological ages, cutting away the shore by its waves in its advance, and spreading the debris in sheets of sand and gravel—old sea beaches. During long-continued periods of submer- gence organic sediments, composed of the hard parts of marine animals, accumulated over the sea bottom. In the process of emergence the shallowing and retreating sea,

with

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spread over its deep water deposits mixed sediments, the finer wash of the land and organic material, carbonaceous or calcareous. When indurated, these three kinds of de- posits became (1) sandstones or conglomerates, (2) lime- stones, (3) shales or earthy limestones. During the inter- vals of emergence the surface was more or less eroded, and the elevations gave

obliquity to the planes of deposition, so that in each invasion of the sea it deposited its round of sediments unconformably upon the older ones. The repeated submergences which have here left their record did not cover the same area, but overlapped in such a way that the succession of deposits is easily made out,— the different groups which we call geological systems being separable by unconformability along the planes of contact, by lithological characters which are faithful records of conditions of deposition, and by differences exhibited in their fossils, for in the long intervals which separated these inundations the life of sea and land was completely and repeatedly revolutionized.

The processes described above went on through the Cambrian, Silurian, Devonian, and Carboniferous ages, forming on the south shore of the Laurentian continent the most complete and consecutive record of Paleeozoic time of which we have any knowledge. Then the strata along a line passing south-westerly through eastern New York were raised in a series of folds which we call the Alleghany Mountains, and at this time all the interval between the Atlantic and the Mississippi was elevated above the ocean. There it has since remained, the sea rising and falling upon its margin, and leaving its marks, but never sub- merging the interior. The geological record was con- tinued by minor contributions to the land along the Atlantic coast during the Triassic, Cretaceous, Tertiary, and Quaternary ages, and by the grinding and trans- porting action of glaciers which once covered the entire surface of the State.

Previous to the elevation of the Alleghanies the sheets of Paleozoic rocks formed a littoral plain sloping gently southward from the Archean continent. But in the formation of this mountain belt the country traversed by the southern line of the State was left with a surface inclination northward, and between the Alleghanies and the Canadian and Adirondack highlands a broad valley was formed which became the channel of drainage for a great interior area. Through this valley flowed a large river which reached the sea at or near New York island. From the Carboniferous age to the Ice period this was the course of the drainage of the interior, and thus was formed the great water-gap between the Helderberg and Adiron- dack Mountains, the gate of the continent, through which the tide of migration has flowed from the seaboard into the Mississippi valley, and where the

canal and railroad lines have been constructed which are the great arteries of commerce.

During portions of the Tertiary age perhaps the whole, but certainly the eastern margin, of the continent stood many hundred feet above its present level. The drainage of the intcrior flowed freely and rapidly through the channel which has been described, until that part of it which lies within the State was cut below the present sea- level, and the great river, which as a whole has never been named, but of which the Hudson, the Niagara, the Detroit, and the St Mary's are representatives, reached the ocean 80 miles south and cast of New York harbour, for its channel may be traced to that point on the sea bottom, and its mouth was 600 feet below its present one. By a subsequent depression of the land or rise in the ocean-level the sea covered much of its old shore, and filled the channels cut by subaerial erosion ; the Hudson became an arm of the sea, and the labyrinth of tideways was

formed which are such a marked feature of the coast, and such important auxiliaries to New York harbour. During the Ice period important changes were made in the topography of the State,—by local glaciers in its advent and decline, by the great ice sheet at its climax, —the first perhaps increasing topographical variety, the second producing monotony by grinding down and round- ing over asperities, and filling depressions with the debris.

The basins of the great lakes which border New York, —Ontario, Erie, and Champlain,—and of the peculiar elongated lakes of the interior, are largely the work of glaciers, which broadened and perhaps deepened river channels, and dammed them up with moraines. When the glaciers retreated from the area of New York many of the old channels of drainage were left partially or com- pletely filled, and the flow of surface water took in some cases new directions. Among the obstructed channels was that of the Hudson west of Albany, filled by the Ontario glacier. By this cause the great river flowing from the interior was deflected from its ancient course and

found a line of lowest levels leading from the north-east instead of that from the south-east corner of the Ontario valley. In this way the St Lawrence was made the outlet of the interior basin, and the Mohawk dwindled to a local drain- ing stream. Long Island Sound and part of Long Island itself should also be classed among the products of glacial action, the Sound having been scooped out by the great glacier when it left the more resistant ledges of crystalline rocks which occupy south-eastern New York and Con- necticut, and plunged into the softer Cretaceous and Tertiary beds which formed the littoral plain that bordered the continent,—the hills of the island being covered, and in part composed of loose material transported by the glacier and deposited along its edge.

Minerals.—The mineral resources of New York, though less varied than those of some other States, are still of great importance. The most valuable of these are exten- sive deposits of iron ore, viz.:—(1) magnetite, found in great abundance in the Adirondack region, and in Putnam, Orange, and Rockland counties ; (2) hematite, mined in the vicinity of Rossie (St Lawrence county), Clinton (Oneida county), and elsewhere; (3) limonite, largely worked on Staten Island, and at Amenia, Sharon, &c., on the line of the New York and Harlem Railroad; (4) siderite, mined at Hyde Park on the Hudson. The pro- duction of ore from these mines in 1879 was 1,239,759 tons, valued at $3,499,132; and New York is surpassed in the quantity of iron produced by Michigan and Pennsyl- vania only.

The quarries of New York are numerous, and they furnish a great variety of products:—granite in the Adirondacks and along the Hudson; roofing slate in Washington county ; white marble in Westchester and St Lawrence counties; red marble at Warwick, Orange county ; black marble at Glenn's Falls; verde antique at Moriah and Thurman, Sandstone comes from Potsdam, Medina, and various other localities ; shell-limestone from Lockport and Hudson; excellent flagging from Kingston on the Hudson ; and paving stone from the trap of the Palisades. In 1880 the quarries of New York numbered two hundred and fifty-one, and the value of their product was $1,261,495. A large amount of hydraulic cement is supplied from the quarries at Rondout (Ulster county), Manlius (Onondaga county), and Akron near Buffalo; also gypsum from the vicinity of Syracuse. The deposits of these substances are very extensive, and their production could

be increased indefinitely. Another item of importance among the mineral resources of the State is the salt produced from the salt-wells at Syracuse; these have been worked for

many years, and the present annual product is 10,997,408 bushels, having a value of $1,374,666. In south-western New York gas and oil springs are numerous, and at Fredonia the gas has been used in lighting houses for half a century. Recent discoveries show that the petroleum fields of Pennsylvania extend into New York, and it is probable that petroleum will soon claim a place among the mineral products of the State.

The Amboy clays of New Jersey extend across Staten and Long Islands. With further investigation they may prove as valuable in the one State as in the other. (J. 8. N.*)

History.—Recent investigations have added little to the knowledge of the prehistoric period of the territory known as the Middle States. The bias of scientific opinion seems to be that the carthworks, palisades, and piles of stone found in the region bounded by the St Lawrence on the north and watered by the Delaware, the Susquehanna, the Alleghany, and their tributaries are of an origin much more recent than the mound system of the Mississippi and the Ohio, and are the remains of a people intermediate between the aboriginal race and the Indians found on the soil by the first European discoverers and explorers. The latter found the eastern slope of the continent under the domination of the Iroquois tribes. John Smith met with them on the north waters of Chesapeake Bay in 1607, and Hudson found them in 1609 on the banks of the river to which he gave his name. The chief seat of this powerful nation, whose sway was recognized from the St Lawrence to the Tennessee and from the Atlantic to the Mississippi, was in the wide and fertile region of western and northern New York. Forming permanent settlements about the headwaters of the streams which gave them passage to the heart of the country, they organized the political league or confederacy known as the Five Nations. These were the tribes of Mohawks, Onondagas, Cayugas, Scnecas, and Oneidas. They took the name of ‘‘Konoshioni,” or People of the Long House, by which they designated the territory occupied by them, extend- ing west from the

Hudson at Albany to the foot of the great lakes, a distance of about 325 miles. There is a tradition in one of the tribes that the confederation was formed four years before Hudson's arrival, which would fix the date at 1605. On the other hand, a missionary resident among them as early as 1742 was informed by a principal chief that the confederacy was established one age (lifetime) before the white people came into the country, which, in view of the thoroughness of their organizations at the time the whites first came into immediate contact with them, seems not improbable. In 1609 Champlain, while accompallying a war party of Hurons and Algonquins on an expedition against the Iroquois, fell in with the enemy on the lake to which he gave his hame. European firearms, with which the Iroquois then made first acquaintance, turned the scale of victory against them. The interference of the French aroused in the formidable confederacy a spirit of enmity which, relentlessly nourished, finally arrested the progress of French colonization and French power in Canada, and later secured the triumph of the English arms, Pursuing his explo- rations, Champlain in 1615 again accompanied a hostile expedition of his allies, penetrated to the very seat of the Iroquois power, and besieged their fortified village or castle, but was compelled to retreat after an ineffectual attempt to storm or fire the stockade. Thus within a few years after Hudson's voyage the French had discovered the great lakes and explored the river which separate the territories of New York from Canada. The Iroquois sought an alliance with the Dutch as a counterpoise to that of their Algonquin enemies with the French.

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calamity they never recovered. Thcir numbers have been estimated as 25,000 in 1650, and in 1750 about half that number, of whom about 2500 were fighting men. Disregarded in the treaty of 17 83, their political existence terminated, and their lands were ceded to the State with some small reservations. The last official State census (1875) reports the total number of Indians in the State at 5117, chiefly the remains of the Iroquois tribes. Of these 4707 were living on reservations.

At what time, and by whom, the Bay of New York was first visited by European voyagers is still in doubt. Verrazano is claimed to havc entered it with the “Dauphine” in 1524, and Gomez to have sailed along the coast to the latitude of New York in 1525. Of the voyage of Henry Hudson (see Hupson) there is no doubt. Hudson’s report of the picturesque grandeur of the fine harbour and river, of the fertile country on its shores, of the kindly disposition of the Indians, and of the abundance of fur-bearing animals in the interior causcd great excitement in Holland; and the United Netherlands, whose independence had been acknowledged in the spring, asserted their claim to the newly discovered country. In 1610 a vessel was despatched with merchandise suitable for traffic with the savages. The Europeans were well received, and the voyage resulted in profit. Other private ventures followed, and a lucrative trade in pceltry sprung up. In 1613 a few huts were built at the southern point of Manhattan Island, and in 1615 a fortified trading house, to which the name of Fort Nassau was given, was constructed on Castle Island near the present site of Albany, and a factor permanently established there. No effort at colonization was as yct made. Encouraged by the reports of their explorers, the merchants of North Holland formed themsclyves into a company, which on the 11th day of October 1614 received from the states-general a special trading licence in which the name of New Netherland first appears, the association styling itself the United New Netherland Company. In 1618 the fort on Castle Island was abandoned, and in 1622 a new post, Fort Orange (now Albany), was established on the west bank of the river, at the place where, according to tradition, the first formal treaty between the Dutch and the Five Nations was made. On the expiration of the charter of the United Netherland Company (October 1618) a renewal was refused by the states-general, but private ventures were author- ized. The exploration of the coast and rivers was actively continucd, but special charters to the discoverers were persistently refused. On the 3d June 1621 the states-general granted to the West India Company a charter with full powers over New Netherland for a period of twenty-four years. The territory was formally erectcd into a province, and the management of its affairs assigned to the chamber of Amsterdam. In the year 1622 they sent out trading vessels and took formal possession of the country. It was not, however, until the 21st June 1623 that the company, its rules and regulations being formally approved by the states-general, closed their subscription books. Agricultural colonization

had been already begun in the spring of the same year. The ship “ New Netherland,” equipped by the company with thirty families, reached Manhattan early in May; with them went Cornelis Jacobsen May, the first director of New Netherland. May was succeeded in 1624 by William Verhulst. In 1626 the plans for the government of the province by a director and council being perfected by the Amsterdam chamber, Peter Minuit was sent out as director-general. His administration was vigorous and successful. Manhattan Island was purchased of the Indians for the West India Company, and a fort built which was named Fort Amsterdam. The charter of the company provided for a form of feudal colonization under patroons, such colonies to consist of fifty adults, and the lands occupied to tun 16 miles in length on the one side of a navigable river or 8 miles if on both banks, but only so far into the country as the occupiers should push their settlement. The limits of’ the colonies might be increased in proportion to the number of immi- grants. The patroons had special privileges of trade, and magisterial powers ; leet courts were held upon their manors, and later their representatives sat for them in the colonial assembly. Under these favourable conditions the example of Minuit was cagerly followed ; large tracts of land were acquired from the Indians, and settlement made by the new proprietors. The jealousy caused by these purchases and privileges brought about the recall of Minuit. The little colony was annoyed by the encroachments of the English of the New Plymouth colony, and disturbed by the hostilities between the Indian tribes in their immediate neighbourhood. In 1633 Wouter van Twiller succeeded Minuit as director-general, and carried out the policy of commercial monopoly of his principals. The Swedes now began aggressions on the southern border of the Dutch province. Irregularities in administration caused the recall of Van Twiller in 1637, and in 1638 he was succeedcd by William Kieft. During Kieft’s administration, which was arbitrary and ill-advised, the colony was still further molested by its English and Swedish neighbours, while its prosperity was arrested by dissensions between the company and the patroons. The fatal mistake was also made of supplying the Iroquois with fircarms, which completed the estrangement of all the other tribes. A collision occurred, and

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was the beginning of a bloody war which desolated New Netherland for five years. At its close scarcely one hundred men besides traders could be found in Manhattan, and the river settlements were nearly destroyed. This disastrous administration was closed in the summer of 1646 by the appointment of Pcter Stuyvesant, who landed at Manhattan in May of the succceding year. Though of a proud and overbearing temper, and by nature disposed to arbitrary rule, he proved the most satisfactory of the company's administrators. He closed the Indian difficulties, conciliating the fricndly and utterly destroying the hostile tribes. He negotiated a settlement of the boundary disputes with the New England eolonies (treaty of Hartford, 1650). In his relations with his own people he was less fortunate, and by his opposition to their demands for a larger freedom he alienated their affections and prepared them for ready submission to a more generous rule. The province was already shorn of its original limits, by English aggression and Dutch submission, before the consent of the director and council to a general assembly could be had. This, the first popular representa- tive body of the province, met in April 1664. Before the year closed the colony fell an easy conquest to the English. The population of the province was now fully 10,000, that of New Amsterdam 1500 ersons.

: The English Government was hostile to any other occupation of the New World than its own. In 1621 James I. claimed sove- reignty over New Netherland by right of ''occupancy." In 1632 Charles I. reasserted the English title of ''first discovery, occupa- tion, and possession." In 1654 Cromwell ordered an expedition for its conquest, and the New England colonies had engaged thcir support. The treaty with Holland arrested these operations, and recognized the title of the Dutch. In 1664 Charles II. resolved upon a conquest of New Netherland. The immediate excuse was the loss to the revenue of the English colonics by the smuggling practices of their Duteh neighbours. A patent was issued to the duke of York granting to him all the lands and rivers from the west side of the Connecticut river to the east side of Delaware Bay. On the 29th August an English squadron under the direction of Colonel Richard Nicolls, the duke's deputy-governor, appeared off the Nar- rows, and on September 8 New Amsterdam, defenceless against the force, was formally surrendered by Stuyvesant. The

duke's authority was proclaimed, and New Netherland became New York. The name of Fort Orange was changed to Fort Albany, after the second title of the duke. Nicolls proved an admirable ruler, and his successor Francis Lovelace continued his policy, —autocratic government, arbitrary in form but mild in practice. Religious liberty was as large asin England. In 1673 (August 7), war being declared between England and Holland, a Dutch squadron surprised New York, captured the city, and restored the Dutch authority and the names of New Netherland and New Amsterdam. But in July 1674 a treaty of peace restored New York to English rule. A new patent was issued to the duke of York, and Major Edmund Andros was appointed governor. He proved a firm but moderate ruler ; the unsustained charge of maladministration made against him had its source in religious prejudice. In 1683 Thomas Dongan succeeded Andros. The province flourished under his excellent administration. A general assembly, the first under the English rule, met on October 1683, and adopted a charter of libertics which was confirmed by the duke. In August 1684a new covenant was made with the Iroquois, who formally acknowledged the jurisdiction of Great Britain, but not subjection. By the accession of the duke of York to the English throne in 1685 the duchy of New York became a royal province. The charters of the New England colonies were revoked, and together with New York and New Jersey they were consoli- dated into the dominion of New England. Dongan was recalled, and Sir Edmund Andros, who suggested the policy, was commissioned governor-general, He assumed his viceregal authority at New York, August 11, 1688. The English Revolution of 1688 had its faint counterpart in the colonies in an insurrection of the militia, headed by one Jacob Leisler, which was not terminated till the arrival from England in 1691 of a new governor, Sloughtcr, with whose administration what may be called the second period of English rule begins.

The assembly which James had abolished in 1686 was rcestab- lished, and in May declared the rights and privileges of the people, reaffirming the principles of the repealed charter of liberties of October 30, 1683; but religious liberty was curtailed and the Test Act put in force as to Roman Catholics. In 1697 the lords of trade, in a formal report, protested against the Act declaratory of the rights and privileges of the people of the provinee of New York; and the instructions of the king to Lord Bellomont, the newly appointed governor, were sharply restrictive of the rights claimed as to

courts and assemblies. The government was to be ruled as a province by a governor and council,—the governor having power to institute eourts, appoint judges, disburse the revenucs, veto all laws, and prorogue or dissolve the assembly at pleasure. The provincial legal authorities protested at once against this excess of prerogative. Thenceforth the political history of the province records one con- tinued struggle between the royal governors and the general

assembly,—the assembly withholding money grants, and the gover- nors exercising the power to dissolve it at will. The chief concern of the province was the defence of the northern fronticr. The quartering of British troops became a source of constant irritation between the people and the officers, and the need of money by the authoritics caused as severe a struggle between the governors and the assembly. The conquest of Canada in 1763 closed the long contest in which New York troops were constantly engaged. The war left a heavy burden upon Great Britain, a part of which par- liament attempted to shift to the shoulders of the colonies. A general congress of the colonies held in New York in 1765 protested against the Stamp Act and other oppressive ordinances, and they were in part repealed. But parliament maintained the principle upon which the legislation was based, the supremacy of parliament and its right to tax the colonies without their representation or con- sent. In 1769 the total exports of the province amounted to £246,522. During this long political agitation New York, the most English of the colonics in her manners and fecling, was in close har- mony with the Whig leaders of England. She firmly adhered to that principle of the sovereignty of the people which she had inscribed on her ancient charter of liberties. Largely dependent upon ecommerce, she was the first to recommend a non-importation of English merchandise as a measure of retaliation against Great Britain, and she was first also to invite a general congress of all the colonies. On the breaking out of hostilities, New York immedi- ately joincd the patriot cause ; the English authority was overthrown, and the government passed to a provincial congress. In May 1775, Forts Ticonderoga and Crown Point, which eommanded Lakes Champlain and George, and secured the northern frontier, were cap- tured by the Americans. New York city became the headquarters of the

continental army under command of General Washington. On July 9, 1776, the provincial congress reassembled at White Plains, and formally took the name of the representatives of the State of New York. The same day they proclaimed their adhesion to the Declaration of Independence. The defeat of the Americans on Long Island, 27th August 1776, was followed by the abandonment of the city, September 15, the army of Washington retiring to the high ground at the northern end of the island. Next day a conflict took place between the advanced troops where Manhattanville now stands. The movement of Howe to Whitc Plains, and his sub- sequent successful operations, compelled the withdrawal of the Americans to New Jersey. In 1777 the advance of Burgoyne from Canada was checked at Saratoga and his entire army captured; a diversion attempted by St Leger by way of the Mohawk was like- wise unsuccessful. An attempt of Clinton to aid Burgoyne, in which he captured the forts at the entrance to the Hudson Highlands, failed; West Point continued to command the passage of this import- ant line of communication. On April 20,1777, the State assembly adopted the first constitution. General George Clinton was elected governor, and held the office till the closc of the war. In 1779 (July 16) Stony Point was captured by the Americans. In 1780 the failure of Arnold's treason put an end to the schemes of the British to command the river. The only other action of importance on the soil of the State was the punishment of the Indians who had aided Sir John Johnson in his incursions. Sullivan with 3000 men penetrated to the heart of the Seneca country and destroyed the towns. In the summer of 1781 Rochambeau with French troops made a junction with Washington in Westehester county, and New York city was threatened by the allied forces. News of the approach of the ficct of De Grasse to Chesapeake Bay caused a transfer to Virginia of the military operations. On the conelusion of the war New York was evacuated, November 25, 1783. Freed from armed occupation, and its seaport regained, the State made rapid progress. Its natural advantages, which the war disclosed, attracted settlers from other States, and the western lands were quickly taken up. In 1788 (July 26) New York adopted the Federal constitution, became the most important member of the national union, and reccived popularly the name of the Empire State. The scat of government was transferred from New York city to Albany in 1797. The pro- gress of the Statc met with no interruption until the war with Great Britain in 1812, when its northern frontier became the seat of opera- tions by land and water.

The treaty of Ghent put an end to the war, and important schemes for the development of the internal navigation to bring the products of the State to tidal water were rapidly consummated. Steamboat navigation began on the Hudson in 1807, and the canal system was perfected in 1825 in the comple- tion of the Erie Canal, which opened the country from the lakes to the sea. Thisimportant artery of commerce has been recently freed from toll by popular vote. The railroad system is still more perfect : great lines traverse the State from its eastern to its western extremity, and a network of minor lines connects every town and village of any importance in the State with the central artcries. Progress of Settlement.—At the close of the Dutch period the settlement of that part of New Netherland which afterwards became New York was confined to Manhattan, Long, and Staten Islands, and the banks of the Hudson. Westward of these there were small trading stations on the line of the Mohawk and other

water carriages. Early in the last century the admirable natural channel of communication which by the Mohawk river and Wood Creek connects the Hudson with the great lakes attracted immigra- tion. The fertile valley of the Mohawk was the first occupied. A settlement was made there about 1722 bya colony from the Pala- tinate, who constituted almost the entire population until the close of the Revolution. In 1756 there were only ten county divisions in the province, of which but two were west of the Hudson. At the time of the Revolution there were fourteen counties, the most westerly of which lay on the sides of the Mohawk, about 40 miles from Albany. The inhabitants were at this time Dutch, French, English, Scotch, and Irish. The war brought the extreme richness of the western lands to the notice of the troops, and they in turn informed the people. After the war settlements spread with rapidity. The State of New York ceding to Massachusetts about 10,000 square miles of territory, there was before 1800 a large immigration from New England, which extended itself over the interior of the State to its western boundary. This was essentially an agricultural population. The military lands sct apart as bounties during the war, to the amount of 180,000 acres, were rapidly taken up by the immigrants who flowed into the western country like a torrent, opening roads and founding villages and towns. Between 1784 and 1800 two cities,

three large villages, and numerous smaller settlements were founded, and the population of the State doubled in numbers. The foreign immigration of the last forty years has chiefly settled on the lines of the great railroads, which present an almost unbroken chain of industrial cities. Constitution. —The fundamental constitution of the State adopted in 1777 was in its main features after the English model :—a chief executive and two separate Icgislative chambers ; justice adminis- tered through local county courts, a probate judiciary, a high con- mon law tribunal called the supreme court, side by side with a court of chancery; final appellate jurisdiction in law and equity vested in the State senate. This first constitution of the State declared the people to be the only source of political power. The sccret ballot insured the independence of the vote. Religious liberty to all was absolutely secured. In 1821 a new convention greatly simplified the machinery of administration. Under this new constitution the people took to themselves a large part of the powers before delegated to the assembly. The elective frauchise was cxtended by a removal of freehold qualification. In 1846a new constitution made radical changes in the framework of government. The elective franchise was further exteuded by diminution of resid- ence qualification ; elective districts were established on the basis of population, and shifted with the varying censuses. The elective principle, before confined to part of the executive and legislative ‘officers, was applied also to the judiciary. A court of appeals of last resort was instituted. Local tribunals were invested with the powers ~~and jurisdictions of the supreme court of common Iaw and of the court of chancery. The separation of the legal and political depart~~ ments of government was complete. The question was again sub- mitted to the people in 1873, and the elcction of the judiciary main- tained bya large majority. Some slight amendments have been since made. The constitution, as finally matured, completely carries out the principle of a government of the people by its own directly chosen agencies. Elective restrictions upon negrocs and mulattoes were removed by degrees. Slavery was gradually abolished under an Act passed in 1799. In 1811 the only discrimination was the require- ment of a certificate of freedom. The constitution of 1821 imposed both a residence and a freehold qualification, restrictions which remained until removed in 1870 by the fifteenth amendment to the Federal constitution, when suffrage to males became absolutely free in the State. The constitution of 1777 forbade Acts of Attainder after the close of the war, and provided that no Act should

work corruption of blood. Primogeniture and entail were for ever abolished. That of 1846 did away with all feudal tenures of every description. Imprisonment for debt, before limited by statute so far as females were concerned to sums over $50, was entirely abolished in 1831. Married women were secured in their separate rights to real and personal property by statute in 1848, Imprisonment of witnesses was put an end to by Act of 1882. Education.—The grant of the West India Company (1629) to the planters of New Netherland required the establishment of a school and in 1644 the burgomasters of New Amsterdam made a munici- pal provision for school purposes in the colony ; but this proved nominal, and instruction received little attention until after the arrival of Stuyvesant, when an academy and classical school was established (1659). At the conquest in 1664 the English found this institution in high repute, and in addition three public schools and a number of private Dutch schools in the city alone. The academy or Latin school was continued by the English authorities for a few years, but the Dutch schools received no Government contribution. In 1702 a free grammar school was established by Act of Assembly. In 1710 a school was founded by Trinity church, and similar pro- visions by other religious denominations followed. In 1754 King's College (reorganized in 1784 as Columbia) was established by char- ter. Here many of the men who became distinguished in the

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annals of the State received their education. Its departments were fully organized when the Revolution put an cnd to all instruc- tion, and the building beeame a military hospital. The legislature of the State in 1795 granted an appropriation of $50,000 for five years for common school purposes.

Charities. —The public charities were by Act of 1867 placcd under the charge of a board of State commissioncrs of public charities, who are paid expenses but receive no salary. The institutions wholly or chiefly maintained by the State arc—asylums for the insane, incbriate, deaf and dumb, blind, and idiots, and cstablish- ments for reform of juvenile delinquents. In the counties, cities, and towns there are public poorhouses and asylums, besides hospitals, dispensaries, and homes in great variety.

The official report of January 1883 states the expenditures for the fiscal year ending September 30, 1882, for orphan asylums and homes for the friendless, at $4,486,204°21, the total number of persons sup- ported being 46,985,—of these 24,868 remained at the close of the year. The expenditure for hospitals the same yearwas $1,503,283 °68, the number of patients treated 27,850. During the same period the dispensaries treated 276,323 persons, at an cxpenditure of $102,834°20. There were in the several asylums and almshouses, October 1, 1882, 10,443 insane persons. The number of persons supported and temporarily relieved in the county poorhouscs and almshouses during the year cnding November 30, 1882, was 57,895; in the city almshouses 69,875; total 127,770, of whom there remained at that date 16,507. The amount expended for support and relief of the poor and other charities was $4,715,065 62. Com- parison with previous statements shows that there had becn no actual increase in paupcrism in the State in twelve years, and a decrease in proportion to the population. A State board of com- missioners of emigration has until recently had charge of the immi- grants landed at the port of New York. The arrivals in 1882 were 476,086. The expenses of this board were met by a head- money tax, but, the Act under which it was levied having been declared unconstitutional, its functions have virtually ceased.

Correctton.—The superintendent of prisons reported the number of convicts confined 30th September 1882 at 2937, the total ex- penses at $415,662°10, and the earnings at $421,916°95, showing a surplus of $6254°85. The strong and increasing jealousy of artisans has led to an abandonment of some of the most profitable kinds of convict labour.

Wealth and Taxation.—The aggregate assessed valuation of the wealth of the State was in 1882 $2,821,549,963, of which amount $2,482, 012,682 was real and $339,537,281 personal. The amount of taxation was $47,573,820°07, of which $3,757,971°47 was State, $30,429,458°62 county, $10,324,339°16 city, town, and village, equal to 1°709 cents on one dollar ($1) valuation.

Finances.—The fiscal affairs of the State have been managed on correct principles, and its credit has been maintained unimpaired. To this its payment of the interest and principal of its bonds in coin during the

temporary suspensions of specie payment which preceded the civil war and the long national suspension which followed its outbreak greatly contributed. The total funded debt of the State, 30th September 1882, was $6,385,556 °30, over 6 millions of which represents the canal debt. The reccipts of the State treasury during the fiscal year ending at same period were $17,735,761, and the payments $13,898,198 °21, leaving a balance of $3,837,563‘38. The rate of taxation for the year 1882 was fixed at 2°45 mills on the dollar, which is estimated to yield a revenue of $6,820,022-29. The revenues of the canals for the ycar ending September 30, 1882, were $659,970°35, and the expenditure $653,510°01. The canal system is for the future to be maintained by direct taxation.

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1 In 1881-82, of 1723 Indian children of school age reported, 1169 attendcd school. The State pays $8500 for their education.

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Banking.—The bank of New York, chartered in 1791, was the first financial institution incorporated in the State. Banks con- tinued to be ineorporated by special Acts of the legislature until 1838, when a general banking law made the business free to all under certain restrictions. In 1829 a safety fund system was established to secure the circulation of the banks contributing to it, and commissioners were created to apply its provisions, but the unequal operation and insuflicieney of the system brought about its abolition in 1843, and supervision was entrusted to the comp- troller of the State. In 1851 a banking department was created. The Act of the United States of 1865, to provide a national currency, in its requirement of a deposit of United States bonds to secure the circulation issued to the banks by the Government made a radical change in the entire banking system. If the poliey of reduction of the debt of the United States be continued, some other form of security must be deviscd to take the place of the bonds of the United States. In 1867 the State passed an Act enabling national banking associations to become State banking associations. The national tax of 10 per cent. being in effect prohibitory on other than national bank eirculation, the State banks are banks of dis- count and deposit only. On the 16th December 1882 there were seventy-seven banks in operation under this Act.

Their capital was $19,455,700. The mass of the banking business of the State is done by the national banks, of which there were on December 30, 1882, 307, witha capital of $86,313,692. Their deposits at same date were $355,673,215°80, their loans and discounts $336,269,003°87, and their issues of national bank circulation amounted to $45,979,914, secured by United States bonds, deposited with the eomptroller of the currency at Washington, to the amount of $52,217,050. They held in specie $54,186,128°94, and in legal tender notes of the United States $18,192,201. The first bank for savings in the State was incorporated in 1819, since which time these beneficent institutions have vastly increased. On the Ist January 1883 they numbered 127, holding for 1,095,971 depositors the suin of $412,147,213. They are incorporated by special Acts of the legislature, and the provisions for the security of their investment are very stringent. Trust companies, of which there are several, are also incorporated by special Act, and the security of their depositors is guarantced by deposits of public stocks or cash with the banking department of the State. On the Ist October 1882 there were fourteen corporations for the safe keeping and guardianship of personal property, with a capital of $2,676,900.

Agriculture.—New York is the third State of the Union in the number of farms, and second in their value. The total number of acres in farms in 1880 was 23,780,754, of which 17,717,862 acres were improved lands. The number of farms was 241,058, value $1,056,176,741. The live stock included 610,358 horses, 5072 inules and asses, 39,633 working oxen, 1,437,855 milch cows, 862,233 other cattle, 1,715,180 sheep, 751,907-swine. The farm products were—oats, 37,575,506 bushels; Indian corn, 25,690,156 ; wheat, 11,587,766; barley, 7,792,062; rye, 2,634,690; buck-wheat, 4,461,200; potatoes, 33,644,807; hay, 5,240,563 tons; hops, 21,628,931 tb; tobacco, 6,481,431 Ibj; milk (sold or sent to butter aud cheese factories), 231,965,533 gallons ; butter (made on farms), 111,922,423 Ib; cheese (made on farms), 8,362,590 ib; wool, 8,827,195 ib. The estimated value of all farm productions by the census of 1880 was $178,025, 695.

Manufactures.—New York is the first manufacturing State in the Union, and in tlie last decade the value produced has inercased nearly 35 per cent. In 1880 there were in the State 42,739 establishinents, employing a capital

of $514,246,575 and 531,533 hands. The amount paid in wages was $198,634,029; for mate- rials, $679,612,545. The products were valued at $1,080,696,596.

Shipbuilding. —The vessels of all classes built in the State during the fiscal year ending 30th June 1882 numbered 1371, aggregating 282,269 tons. Of these there were 668 sailing vessels of 118,798 tons, 502 steamers of 121,942 tons, 68 canal boats, and 135 barges.

Fisheries.—The chief fishing industry is the taking of menhaden, in value (1880) $1,114,158, and the raising of oysters, value in 1880 $1,577,050, other fisheries $1,689,357. The total number of hands employed in all branches in 1880 was 7266, the amount of capital $2,629,585, and of product $4,380,565; the number of vesscls em- ployed was 541, measuring 11,583 tons, valued at $777,600.

Commerce.—New York, owing to its magnificent seaport and its admirable land and watcr communication, enjoys a large proportion of the national trade. In 1882 the State had in exports and im- ports of merchandize, including specie and bullion, the sum of $894,430,636, or 564 per cent. of the trade of the United States. Of the imports it received and distributed $499, 928,774, and it exported $394,501,862. The amount of internal trade can only be estimated by the value of the tonnage moved. In the year ending 30th September 1882 the arrivals at tide water were 3,068,152 tons, and the internal movement reached 1,361,268, the total value of the property transported being $147,918,907. The freight carried on railroads amounted to 47,350,174 tons, which at the same rate of valuation as that given for canal traffic, $35 per ton, may be set down at $1, 657,256,090, a total value transported of $1,805,174,997.

The value of the freight carried through the Sound, the Hudson river, and the lakes may be estimated at $250,000,000, which would give an aggregate of over $2,000,000,000. Deducting from this gross amount 900 millions, the value of its foreign commerce (imports and exports), the sum of 1000

millions is arrived at as an approximate valuation of the internal trade of the State.

Conveyance.—On the 30th September 1882 there were 326 steam and 81 horse railroads incorporated under the laws of the State. The paid up capital stoek of the stcam roads amountcd to $623,772,211°67 (of which for this State $397,386,453°21), and of the horse roads to $24,068,248°35. The steam roads carried 66,691,562 passengers ; two elevated roads in New York city carried 86,361,029, and the horse roads 277,171,345 passengers. The total of miles of steam roads built and owned by New York companies was 10,058, of whieh 6641 were in New York State. There are twelve canals, of which the Erie is the principal. The total move- ment on all reached 5,467,423 tons in 1882.

Population.—New York has the largest population of any of the States. From official sources the population of the province was given in 1698 at 18,067; in 1708 at 20,665 ; in 1723, 40,564; in 1731, 50,824 ; in 1737, 60,437 ; in 1749, 78,448; in 1756, 96,790; in 1771, 163,337. By the first United States census of 1790 at 340,120; in 1800, 589,051 ; in 1810, 959,049 ; in 1820, 1,372,111; in 1830, 1,918,608; in 1840, 2,428,921; in 1850, 3,097,394; in 1860, 3,880,735 ; in 1870, 4,382,759.

The total population by the census of 1880 was 0,082,871 (2,505,322 males, 2,577,549 females); of these 3,871,492 were native born. The race division was—whitcs, 5,016,022; coloured, 65,104; Chinese and Japanese, 926; Indians, 819.1 There are 59 cities having each a population of over 4000, the principal being New York, 1,206,299; Brooklyn, 566,663; Buffalo, 155,134; Albany, the State capital, 90,758; Rochester, 89,366; Troy, 56,747 ; Syracuse, 51,792; Utica, 33,914; Auburn, 21,924; Oswego, 21,116; Elmira, 20,541; Poughkeepsie, 20,207. There were engaged in agriculture 377,460 persons ; in professional and personal service, 537,897; in trade and transportation, 339,419; and in manufac- tures and mechanieal and mining industries, 629,869. The popu- lation averaged 106°74 persons to the square mile, and occupied 772,512 dwellings. (J. A. S.*)

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NEW YORK, the principal city of the United States in Plates

point of wealth and population, and, next to London, the ae

most important commercial and financial centre in the world, hes mainly on Manhattan Island, which is situ- ated at the upperend of New York Bay, between the Hudson River and East River, on the west and east respec- tively, and the Harlem River and Spuyten Duyvil Creek, small connecting tide-ways which separate it from the mainland on the north-east and north. The legal limits of the municipality also include on the northern side a portion of the mainland which formerly constituted the towns of Morrisania, West Farms, and Kingsbridge, the boundary on the N. being the city of Yonkers and on the E. the Bronx and East Rivers, containing in all 413 square miles, or 26,500 acres, of which Manhattan Island makes 22 square miles, or 14,000 acres. They also con- tain the small islands in the East River and New York Bay known as North Brother's, Ward's, Randall's, Blackwell's, Governor's, Bedloe's, Ellis, and the Oyster Islands. The city-hall stands in 40° 42' 43" N. lat. and 74° 0' 3" W? long,, and is about 18 miles distant from the ocean, which is reached through the upper and lower bay, together constituting a harbour of the first order. The upper bay has an area of 14 square miles and the lower bay of 88 square miles of safe anchorage. The ship channels have from 21 to 32 feet and from 27 to 39 feet of water according to the state of the tide. The Hudson and East Rivers also afford the city 13} square miles of good anchorage. The tide rises and falls on the average 43 inches. Manhattan Island, as well as the adjacent country to the north and east, is composed mainly of rocks, chiefly gneiss and mica schist, with heavy inter-

1 This ineludes only Indians subject to taxation. 2New York is 3° E. of Washington. In time it is 12™ before Washington, 55™ before Chicago, 3414™ before San Francisco, and

4b 56™ after Greenwich. XVIL — 58

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calated beds of coarse-grained dolomitic marble and thinner layers of serpentine. These rocks have been usually sup- posed to be Lower Silurian,

but Professor Newberry holds that they have so great a similarity to some portions of the Laurentian range in Canada that it is difficult to resist the conviction that they are of the same period. The deep troughs through which the Hudson and East Rivers now find their way through New York harbour to the ocean are supposed by the same geologist to have been excavated in the late Tertiary period, in which Manhattan Island and the other islands in New York Bay stood much higher than they do now, when Long Island did not exist, and a great sandy plain extended beyond the Jersey coast some 80 miles seaward. Manhattan Island, for half its length from the southern point, slopes on each side from a central ridge. On the upper half of the island the ground rises precipitously from the Hudson River in a narrow line of hill, which again, on the eastern side, sinks rapidly into a plain bordering on the Harlem and East Rivers, and known as Harlem Flats. The surface is throughout rocky, with the exception of this plain, and levelling on a great scale has been necessary in laying out streets. The district beyond the Harlem river, which extends as far north as the city of Yonkers, is traversed by lines of rocky hill running north and south, and still thickly wooded. The original settlement out of which New York has grown was made on the southernmost point of the island, and it has, since the beginning of the 18th century, spread due north and from river to river.

The street called Broadway runs for nearly 3 miles along the crest of the island, forming for that distance the central thoroughfare from which streets spread with some regularity to the water on each side. The lead- ing thoroughfares originally followed the line of the shore, along which the ear- lest buildings were chiefly erected, the central ridge being the last to be occu- pied, until the city reached what is now knownasWall Street, the site of which was|_|/j/SS marked by a rampart |_|_{ji 77! and stockade extend- | J&Z ing from river toriver |) }f across the island. |!) j: Within this space the | streets were laid out]. either as convenience {ff dictated or as old}\ pathways suggested, without any general =e design or any atten- New York in 1695, tion to symmetry, and were named, for the most part, after prominent settlers. The first regular official survey of the city, tracing the line of the streets, was made in 1656, when Wall Street was its northern limit. In 1807 the present plan of the city was adopted, with its broad longitudinal avenues crossed by side streets at right angles, beginning at a point about two miles from the Battery and running the whole Jength of the

island. The erection of buildings along these streets has led to the levelling of the region below the Central Park, but in the park the varied outline which once characterized the whole island is still retained. The precipitous banks of the Hudson river at the upperend have also compelled a treatment in which the original configuration of the ground is pre-

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served, and the streets and roadways are adapted to it. The city in its growth northward absorbed several suburban villages known as Greenwich, Harlem, Manhattanville, Fort Washington, Morrisania, and Kingsbridge.

General Aspect.—The appearance of New York every- where but in the leading thoroughfares is usually dis- appointing to strangers. The pavement of all the streets, except Broadway and Fifth Avenue, is bad, and the street, cleaning in all but the principal streets is very defective. The lower part of the city, which is the centre of trade, is generally well kept, and contains a large number of im- posing buildings. Wall Street in particular, which is now, after Lombard Street, the most important haunt of moneyed men in the world, has several banks of effective architecture, together with the United States custom-

New York in 1728,

occupied at its upper end by handsome buildings of vast proportions intended for the offices of merchants and bankers. After the city had spread beyond Wall Street, the well-to-do portion ‘of the population and the leading retailers seem to have clung to Broadway as the great line of traffic and trade. For one hundred years the wealthy residents built their houses along it, or, if in the streets running off from it at right angles, as near it as possible ; and the shops followed them up closely. As population grew during this period the private dwellings of the better class simply moved up farther on Broadway and the adjacent streets, leaving the old houses to be converted into shops. The farther from Broadway, and the nearer the river

on either side, the cheaper land was, and the poorer the class of houses which sprang up on it. This fondness for Broadway in a great degree explains the aspect of the city. About a mile and a half from the Battery, or southernmost point of the island, the cross

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streets which up to this line are mostly named after local notables of the colonial period, become designated by numbers, and are separated by equal intervals, known as “blocks,” of which twenty form a mile. Up to Eighth Street, Broadway divides the streets which cross it into east and west. After Highth Street, Fifth Avenue, which begins at a handsome square, known as the Washington Square, lying a short distance west of Broadway, becomes the dividing line, and continues to be so out to the Harlem River, a distance of 8 miles. Broadway at Fourteenth Street runs into Union Square, which contains statues of Washington (equestrian), La Fayette, and Lincoln, and is surrounded by large shops; it then trends westerly to- wards the Hudson River, and thus crosses Fifth Avenue (which runs due north) at Twenty-Third Street, where it enters Madison Square, another open space, on the west side of which are clustered several of the largest hotels in the city. Fifth Avenue has played for the last forty years the same part, as the fashionable street, which Broadway played in the preceding period. It was long the ambition of wealthy men to live in it. It is lined from Washington Square to the Central Park, a distance of 3 miles, with costly houses, mostly of brown stone and red brick, without much architectural pretension, and producing from the preponderance of the brown stone a somewhat monotonous effect, but perhaps unequalled any- where as the indication of private wealth. Fashion has long permitted, and of late has encouraged, resort to the side streets as places of abode, but the rule is neverthe- less tolerably rigid that one must not go beyond Fourth Avenue, two blocks on the east side, or Sixth Avenue, one block on the west side, if one wishes to live in a good quarter. Within the district thus bounded the city presents a clean and orderly appearance, but mainly owing to the exertions of the householders themselves.!

Llarbour Defence.—For this the city depends on forts situated at the western entrance to Long Island Sound, at the Narrows (a passage between

the upper and lower bays), and in the harbour itself. All these are confessedly powerless against a fleet armed with modern ordnance. The forts at the entrance of the Sound are Fort Schuyler, situated on Throgg's Neck, and a fort on Willett's Point on the opposite shore. The defences at the Narrows consist of Forts Wadsworth and Tompkins and several detached batteries on the Staten Island shore, and of Fort Hamilton and several batteries on the opposite Long Island shore. The forts in the bay are small and weak structures, and comprise Fort Columbus, Castle William, and some batteries, all on Governor's Island, and Fort Gibson on

1 When the present street plan was adopted, no arrangement was made for back entrances to the houses as in Boston and Philadelphia, and the consequence is that all ashes and refuse have to be removed by a front door, and are placed in barrels on the sidewalk in the morning to await the arrival of the municipal scavenger carts, which is very uncertain as to time. The streets, consequently, are defaced for half the day by these unsightly accumulations. In the better quarters the inhabitants avoid this by having their refuse removed at their own cost by dustmen who enter the houses for it. They have the streets in front of the houses swept in the same way to make up for the defects of the municipal street cleaning. When we pass out of this favoured region we find the garbage and ashes heaped in front of the doors, and the streets impeded by carts and waggons which their owners, in disregard of the municipal ordinances, are allowed to keep standing out of doors, thus saving themselves the expense of coach-houses. Consequently, all that portion of New York which does not lie within a quarter of a mile of Broadway or Fifth Avenue presents a spectacle of dirt and disorder and bad pavement for which it would be difficult to find a parallel in other great capitals. The fine and well-kept part of the city nowhere touches on the rivers or approaches them, but runs in a long central line north and south, and the river banks are lined by wooden wharves. Some part of this neglect to beautify the city is due to the rapidity of its growth, some to defects in the plan on which itis laid out, but more to the badness of the municipal government.

Ellis Island. Fort La Fayette, made famous during the war of the rebellion as a prison, was destroyed by fire in 1868, and Bedloe's Island, on which stood Fort Wood, is now given up for the reception of Bartholdi's statue of Liberty.

HMistory.—The history of the first Dutch settlements at Manhattan, and of their transference to England, is sketched in the article on New York Srare. Down to the Revolution the history of the city is to all intents and purposes that of the province at large. The population grew slowly but steadily, and so did the trade of the place, —the Dutch language and influence, however, gradually giving way to the English. During the Revolution the city, while containing a large body of loyalists, shared in the main in the feelings and opinions of the rest of the country, but was cut off from active participation in the struggle by being occupied at a very early period of the war by the British troops, and it was the scene of their final departure from American soil on November 25, 1782. Since the Revolution its history has been principally the record of an enormous material growth, the nature and extent of which are described in other parts of this article. It was the capital of the State of New York from 1784 to 1797, though the legislature met several times during this period at Albany and Poughkeepsie. From 1785 to 1790 it was the seat of the general Government, and there the first inauguration of Washington to the presidency occurred on the 30th of April 1789.

Population.—The population of New York, in spite of the great attractions of the site, increased very slowly for the first century after its settlement. When the Revolution began it amounted to less than 22,000, and the city stood far below Boston and Philadelphia in importance. It was, too, dominated to a degree unknown in the other Northern States by the landowners whose estates lined the Hudson as far up as Albany, and who played the leading part in society and politics. The original constitution of colonial society was thoroughly aristocratic, and it was main- tained almost intact until after the Revolution, the large landed estates along the Hudson being still held by the descendants of the original Dutch grantees, and let on tenures which were essentially feudal in their character. In spite of the large influx of settlers from New England and other parts of the country, the Revolution found the Dutch elements in New York society still strong, if

not dominant, and the political ascendency of the terri. torial families on the Hudson on the whole but little diminished. After the Revolution the growth of the city population became more rapid, but it did not reach 100,000 until 1815, nor 160,000 until 1825. From this date it grew by leaps and bounds until it reached, in 1880, 1,206,299,? although a large body of persons whose business lies in New York reside in Brooklyn or Jersey City, on the other side of the East and Hudson Rivers respectively, or in the lesser suburbs, and are not included in the census return, At the end of 1883 the population was estimated at 1,337,325. The impetus which the population received in 1825 was due to the opening of the canal connecting the Hudson with Lake Erie, which made New York the commercial entrepot for a vast and fertile region such as lay behind no other port on the eastern coast. The tendency of foreign trade to con- centrate at New York, which has since reduced many small but once flourishing ports along the Atlantic coast, and has taken away from Boston and Philadelphia a good

2 The following are the numbers given in the different United States census returns:—in 1790, 33,131; in 1800, 60,515; in 1810, 96,373 ; in 1820, 123,706; in 1830, 202,589; in 1840, 312,710; in 1850, 515,547; in 1860, 813,6695 in 1870, 942,292; in 1880,

1,206,299

deal of the chief source of their early prosperity, at once began to show itself, and has apparently lost none of its force since the railways came into use to supplement or supersede the canals.

In considering New York as a commercial port, the popu- lation of several suburbs within 10 or 15 miles radius should be taken along with it. Including only that of Brooklyn (556,663) and of Jersey City (120,722), the total would be 1,883,684. Of the 1,206,299 forming the population of the municipality of New York proper in 1880, 478,670, or nearly one-third, were of foreign birth. Of these 163,482 were Germans and 198,595 Irish, forming together by far the largest and most important part of the foreign element. Of the total population, 336,137 are males above the voting age, and the females exceed the males by about 25,000. In the native Ameri- can

population, amounting to 727,629, there are 647,399 natives of the State of New York, only 80,330 coming from other States. New Jersey furnishes the largest contingent, Pennsylvania, Massachusetts, and Connecticut following next, though every State and Territory in the Union contributes something. There are no means of ascertaining the proportion of the inhabitants born within the city limits ; it is probably smaller than even in London or Paris.

The heterogeneous character of the population, however, so largely composed of persons who come from widely different parts of the globe to seek their fortune, while infusing great energy into commercial and industrial operations, has had an unfortunate effect on the municipal life of the place. It has prevented the growth of a healthy local pride among the successful men of business, many of whom labour with the intention of passing their closing years elsewhere, a sentiment particularly strong among the prosperous New Englanders, whose affections are very apt to be fixed on the place of their birth. The result is that, considering the very large fortunes which have been made in the city during the last century, it has profited but little, compared with others in America, by the gifts or endowments of its wealthy men. The same cause has operated to some extent to prevent hearty co-operation in municipal affairs. The inhabitants of the different nation- alities live much apart, both in politics and in society. The Germans, whose social life is very active, give but little attention to local politics, although they form, owing to their intelligence, order, and industry, a very valuable element in the population. Germans head a good many of the principal banking and commercial houses. A considerable proportion of those settled in New York are skilled artisans; cabinetmaking and upholstering in particular are largely in their hands. They supply also most of the music of the city, do nearly all its brewing and a considerable portion of its baking, and furnish a very large contingent in the work of all the leading manu- factures. They supply comparatively few of the domestics of either sex, or of the manual labourers. Difference of language, combined with the absence of political training at home, keeps the Germans from taking a very active part in politics, except to resist some of the attempts at restrictive legislation directed against their beer drinking and Sunday amusements, which the American temperance advocates frequently make. As a rule it may be said that the prominent Germans in the city, like the Catholic Irish, belong to the Democratic party.

The port of New York is the great gateway for Immigrants coming to the United States. Of the 7,882,783 immigrants who have come to the country from the years 1855 to 1882 inclusive, 5,169,765 have landed at New York city. The largest number landed there in One year was 476,086 in 1882. Germany sends the

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greatest number, Ireland coming next, England third, and Sweden fourth, From 1847 to 1881 inclusive the German immigrants arriving in New York have numbered 2,498,595 ; the Irish, 2,171,982; the English, 834,328 ; and the Swedish, 208,505. The total number of immigrants landed at New York during the years 1858 to 1862 inclu- sive was 404,918 ; from 1863 to 1867 it was 1,009,641; from 1868 to 1872, 1,209,011; from 1873 to 1877, 614,219; in 1878 it was 75,347; in 1879, 135,070; in

1880, 327,371; in 1881, 455,681; in 1882, 476,086; and

in the first six months of 1883 it was 257,635. The Irish emigrants who settle in New York are to a considerable extent a deposit left by the stream of emigration which enters the country at that port. The more energetic and thoughtful, and those who have any money, push on to the west ; the penniless and the shiftless are apt to stay where they land, and furnish the city with most of its unskilled labour, although of late years they have been exposed to considerable competition from Italians, mainly from southern Italy. The resource of a large number of the more pushing is apt to be liquor dealing, which generally brings them influence in ward politics, and secures recognition from the party leaders as a means of communicating with and controlling the rank and file. The great body of the porters and waiters in the hotels and second-class restaurants, of the carters and hackney-coach drivers, a large proportion of the factory workers, and almost the entire body of household servants are Irish also, and for the most part a saving and industrious body.

The social life of New York in the earlier days, and, in fact, down to 1825, took its tone from the landholding aristocracy. Social traditions were,

however, principally Dutch, and were characterized by the simplicity and frugality of that people. As the place grew in wealth and population, the ascendency of the old Dutch families was gradually lost. The successful commercial men who came to New York from all parts of the country became the real local magnates, and business prosperity became the chief sign and cause of social distinction. This state of things still exists. There is no other city in the United States in which money gives a man or woman so much social weight, and in which it exercises so much influence on the manners and amusements, and meets with so little com- petition from literary, artistic, or other eminence. The luxury of domestic life is carried to a degree unequalled in any other city. The entertainments are numerous and costly, and the restaurants, of which Delmonico's is the chief, have achieved a world-wide fame. The number of horses and equipages has greatly increased within twenty years under the stimulus given by the opening of Central Park, the drives of which on fine after- noons in April and May and the early part of June present a scene of great brilliancy. The city is, however, almost completely deserted during the summer months by the wealthy, who fly to country houses along the coast from New Jersey as far up as the province of New Brunswick, or to the mineral springs of Saratoga, or to Europe. Thirty years ago it was the ambition of rich men to own country houses along the Hudson river, the scenery of which possesses great grandeur, but its banks have of late been infested by malaria, and for this and other reasons the tide of fashion has been turned to the seaside, 'and more particularly to Newport in Rhode Island, which is now a city of marine villas. For people of small means New York is slenderly provided with summer entertain- ments, except such as are afforded by the beauty of the suburbs and by the many water-side resorts within easy reach on the Hudson, the New Jersey coast, and Long Island Sound, and especially at Coney Island, which is really a continuation of the sandy beach that extends all

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along the south side of Long Island. Its western extremity is distant from the Battery about 8} miles in a straight line, and its extreme length is about 5 miles. Since 1874, when capitalists suddenly woke up to the capabilities of the spot, a number of favourite resorts have sprung up on the island, with

monster hotels, in one of which as many as four thousand people can dine at once, con- veniences for surf-bathing, and a great variety of amuse- ments. The island is reached by steam and horse cars, by steamboats, and by carriages. The Germans have beer gardens on a grand scale, both on Manhattan Island and elsewhere which they frequent in vast numbers. The Irish organize picnics to groves and woods along the Hudson and Kast Rivers, which are let for that purpose. Excursions by water down the harbour and up Long Island Sound are very numerous. For this species of amusement there are few cities in the world so well situated.

New York has about thirty places of amusement using scenery, not including a few small variety theatres of little importance ; of all these the Metropolitan Opera House is much the largest. Its stage is 96 feet wide, 76 feet deep, and 120 feet high. There are seventeen outside entrances, six of them 10 feet wide; and the whole structure is fire-proof. The chief foyer is 34 feet wide and 82 feet long, with a parlour so connected that the foyer can be used as a lecture-room, the parlour giving place for a stage. The seating capacity of the auditorium is about three thousand. Of the other theatres the largest are Miner's Bowery, Miner's Eighth Avenue, Academy of Music, M'Kee Rankin's, Niblo's, Fourteen Street Theatre (Haverly's), Thalia, Criterion, London, Harrigan and Hart's, Cosmo- politan, Fifth Avenue, Star, Twenty-third Street, Union Square. Beside the theatres there are two fine concert and lecture-rooms—Steinway Hall and Chickering Hall.

The clubs of New York may be divided into two classes, —the political and social, and the purely social. To the former belong the Manhattan and the Union League; to the latter the Century (1847), Harmonie (1852), Knicker- bocker (1871), Lotus (1870), New York, St Nicholas, Union (1836), and University (1865). The Manhattan Club (with some 570 members) is the local club of the Democratic party, founded during the closing years of the civil war, and reorganized in 1877. The Union League Club was founded in 1863, in order to give to the Federal administration during the war the organized support of wealthy and influential men in the city, and it has been ever since the Republican social organization of the city. The Century Club represents literature, art, and the learned professions, and owns a valuable collection of pictures and a well-selected library. All the members of the Harmonie Club speak German. The original plan of the Lotus Club looked

to a membership of literary men and artists, and members of the musical and dramatic pro- fessions,

Edueation.—The Dutch West India Company, which scttled the island of Manhattan, was bound by its charter to provide school- masters as well as ministers for its colonists. The company conse- queutly maintained schools from the beginning, and private schools were also soon established, and drew pupils even from other colonies. When the colony passed into the possession of England, the schools of the city still eontinued in the hands of the Dutch Church and miuisters, and were supported by them, receiving little or no aid from the Government. to hasten the substitution of the English for the Dutch language in the colony led to an attempt by the colonial Government to reserve to itself the appointment of the schoolmasters, but it was not suc- cessful. Down to the middle of the 17th century the bulk of the population remained Dutch, and the support and control of the schools remained with the Dutch Church. The only outward sign of the growth of English influence during this period was the estab- lishment of the still existing Trinity school, in 1710, in connexion with the Anglican Church. About the middle of the century the

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tide of English emigration, which has never since ceased, began to flow in, and English influence in educational matters began to gain the ascendency. In 1754 King’s College, afterwards Columbia College, was established, and, after a short struggle to preserve it from denominational control, became distinctively an Anglican institution. Before the Revolution the English language had practically carried the day, and taken possession of the schools, colleges, and churches ; but the political troubles which preceded the outbreak of the war, and the occupation of the city by the royal army during the war, closed them all, and for nearly ten years sus- pended all educational progress.

It was not until over ten years after the Revolution that the State legislature took any steps for the establishment of a system of popular education in the State at large. But within three years after the peace the beginnings were made in New York in the form which has made the educational history of the city so peculiar, namely, as a charitable organization. In 1785 the Manumission Society established free schools for the poor coloured children of the city, and they were continued under the same auspices until 1794. A Quaker society, known as the ‘‘ Female Association for the Relief of the Poor,” in like manner opened a school for white girls in 1802, and the organization extended its operations and continued them until 1846. It was the means of suggesting the formation in 1805 of the association known as the ‘‘ Free School Society,” and after- wards as the ‘‘ Public School Society,” which has played so im- portant a part in the education in New York. These were both charitable societies, and at first only sought to provide for children unconnected with the churches of various denominations, all of which maintained schools of theirown. Of the Free School Society the mayor, recorder, aldermen, and assistant aldermen were made ex-officio members, and membership was open to all citizens offering contributions to the funds. This socicty was in 1826 converted into a still larger and more powerful one with a new charter, called the Public School Society, which continued to have charge of popular education in the city until 1853. It was supported in part by voluntary contributions, in part by subscriptions from those who desired to share in its management, and in a small degree by a con- tribution from the school fund of the State. For fifty years it may be said to have done all that was done for popular education in New York city, and its existence caused the exemption of the city for nearly thirty years from the operation of the common-school system established in the rest of the State, under which the scliools were managed by trustees clected by the voters of each school district. During its existence 600,000 children passed through its schools, and it expended every year a large and increasing revenue, and when dissolved turned over $600,000 to the city. It gradually became plain, however, that the work of popular education in a large city was too great to be carried on by a charitable association, however able or energetic. In 1842 New York was brought under the system prevailing in the rest of the State, but the Public School Society was permitted to continue its existence and retain control of its own schools. It was found, after a few years’ trial, that the society could not flourish in

competition with the official organiza- tion, and in 1853 it was voluntarily dissolved, and its schools and property handed over to the city authorities, by whom the work of popular education has ever since been carried on.

The municipal board of education was at first composed of repre- sentatives elected by the different wards, but in 1864 the city was divided into school districts of equal school population, each of which sends three commissioners to the board. ‘The ward schools were left in the control of elected trustees, subject only to a some- what ill-defined power of supervision at the hands of a central board. This was found to work so badly, owing to the low character of many of the elected trustees, that in 1873 the whole system was reorganized. The power of appointing the twenty-one commissioners of the board of education, and three inspectors for each of the eight school dis- tricts, was given to the mayor, and to the commissioners the power of appointing five school trustees for cach ward. The commissioners and inspectors hold office for three years, and trustees for five. As an outgrowth of the common-school system there is a normal college for the education of teachers, with a model school connected with it, and also the college of the city of New York, which began in 1848 as a free academy for the advanced pupils who had left the comnion schools. It was empowered to grant degrees in 1854, and was formally converted into a university in 1866.

The total number of scholars attending the city schools in 1882 was 289,917, and the number of professors and teachers employed was 2544. An Act providing for compulsory education was passed by the legislature in 1874, and came into operation in the city in 1875. It compels every person in the control or charge of any children between the ages of eight and fourteen to cause them to attend some public or private school at least fourteen weeks in cael year, eight weeks of which are to be consecutive, or the pupils are to be instructed regularly at home at least fourteen weeks in each year in spelling, reading, writing, English grammar, and arithmetic. The Jaw is enforced in the city by the city superintendent, who has twelve assistants known as “agents of truancy.”

The schools, colleges, ana other institutions not eonnectcd officially with the Government are very numerous, beginning with Columbia College, founded in 1754, and now the oldest university in the State, and the richest in the United States. Though not formally denominational, it is managed chiefly by members of the Protestant Episcopal Church. It has well-equipped law, medical, and mining schools, besidcs its academic department, a library of about 20,000 volumes, and a rapidly growing income from advance of its property in the city. There are also several denominational eolleges belonging to Catholics, which offer a full course from the primary to the most advanced stage ; and two theological seminaries, one the Protestant Episcopal, and the other the Union Theological Seminary, belonging to the Presbyterians. The endowment of the non-sectarian University of the City of New York is small, so that it makes but little figure in the edueational field. ‘There are also numerous medical colleges, and a large number of private schools frequented by children of the wealthier classes. ;

Libraries.—The principal public libraries are the Astor Library, the Mercantile Library, and the New York Society Library, which have been described in vol. xiv. pp. 535, 536. ;

Periodical Press.—There is probably nothing in which New York more nearly occupies the place of a metropolis than in the position of its periodical press towards that of the rest of the country. See NEWSPAPERS, supra, p. 434, The modern American newspaper may indeed be said to have originated in New York, which is naturally the chief centre for foreign news, as well as the chief financial and commereial centre, and the chief entrepot of foreign goods. In fact, as early as 1840 it had become plain that any one proposing to address the whole country through the press could address it more effectively from New York than from any other point. As popula- tion has spread and other cities have grown in wealth and numbers, New York newspapers have of course lost more or less of their early superiority, but they are still more widely read than any others, and absorb more of whatever journalistic talent there may be in the country. In the field of literary and artistic and musical criticism they are exposed to but little eompetition from any quarter. The periodical literature of the city is now very large; there is hardly an interest or shade of opinion, religious or

political, which does not possess a New York organ, as the subjoined table will show:—

Periodicals published in New York City, May 1, 1883.

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Churches, Religion, and Charities.—In the abscuce of official returns as to churehes and religious denominations, the most trustworthy statistics are those of the City Missionary Socicty, which puts the number of places of religious worship in the city, including halls, chapels, and missions, at 489. Of these, 349 are ehurches properly so-called, each with a fixed congregation, and a settled pastor and a building appropriated to its own use. They are divided as follows among the various denominations:— Protes- tant Episcopal, 72; Roman Catholic, 57; Methodist Episcopal, 48; Presbyterian, 41; Baptist, 38; Jewish synagogues, 25; Luthcran, 21; Dutch

Reformed, 20; African Methodist Episcopal, 7; United Presbyterian, 6; Congregational, 5; Universalist, 4; Unitarian, 3; Quakers, 2; ‘‘ miscellaneous,” 23. This last term covers spiri- tualists and radicals of various shades, who, without having any fixed creed, or definite object of worship, meet on Sunday for speculative or ethical discussion.

The Roman Catholic Church lays claim to 500,000 worshippers, or nearly half the population, which is probably a considerable exaggeration, as its hold on the natives is, beyond question, very slight, and the total foreign population of the city does not reach 500,000. The Irish are almost wholly Catholie, as are the majority of the Germans, and nearly all the French, Italians, and other per- sons of foreign birth. The Catholic increase, too, is derived almost

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exclusively from foreign immigration. The pricsts are mainly Irish and German, the higher clergy being almost exclusively Irish eithcr by birth or parentage. There is, too, a considerable Catholic element in social life, composed of the well-to-do French and German and Trish and Spanish, who, however, confine theniselyes very much to the company of persons of their own creed.

All the places of worship in the city of one sort or another, taken together, are supposed to contain 375,000 sittings. The Protestant denominations lay claim to 83,400 communicants and 400,000 attendants or supporters. The value of all the church buildings, including the ground on which they stand, is estimated at $40,000,000. The annual ehurch expenses, including the ministers’ salaries, are supposed to be $3,000,000. There are connected with the churches 418 Sunday schools, with an average attendance of 115,826 pupils. There are also in the city 326 local charitable institutions, of which 261 are Protestant, 38 are Roman Catholic, 18 are Jewish, and the rest are not classified. They disburse annually about $4,000,000. The most remarkable and successful of these charities is undoubtedly the Children’s Aid Society, which was founded in 1853 by Mr Charles Loring Brace, the present secretary, for the purpose of helping friendless street children, especially street boys, both by sending them to the west and by opening schools and lodging-houses for them in the eity. Since it began its work

67,287 children have been, by its agency, sent away from the city to country homes. During the year 1882 the society gave 14,122 boys and girls 230,968 lodgings in its six lodging- houses, of whieh 173,152 were paid for by the lodgers themselves ; and it furnished them with 305,524 meals at low rates or free. The income of the society has risen from $4,732°78 in 1853 to $237,624 in 1882 from subscriptions and endowments.

The richest and most fashionable denomination is the Protestant Episcopal, and it is the one which seenis to grow most by accretion from the native population. On the' other hand, while the Baptists and Methodists lave always flourished in New York, the two denominations which owed thcir origin in the United States ehiefly to New England—the Unitarians and Congregationalists—have never taken deep root in the city.

Municipal Charttics.—The municipal charities are in the hands of a department of the eity government called the Commissioners of Charities and Correction, consisting of three commissioners appointed by the mayor, who have charge of all prisons for persons awaiting trial, of all city hospitals, almshouses, workhouses, and lunatic asylums, and of the penitentiary and city prisons. Most of these institutions are situated on small islands in the East River, known as Blackwell's, Ward's, Randall's, and Hart's Islands, the last-named containing a municipal industrial school.

Two eharities are, however, exempt from the control of the department. One, the House of Refnge on Randall's Island, which is the property of a private corporation that reccives vagrant and disorderly children, aud gets its income partly from the labour of the inmates, partly from the proceeds of theatrical licenees granted by the city, and partly from State grants. The other is the Juvenile Asylum, which also is managed by a private association, and partly supported by State grants. The influence of political partisanship on the appointment of the officers under the control of the department of charities and correction has been found to result in such serious defects of management, as regards the hospitals and charities especially, that a voluntary association, composcd mainly of ladies, and known as the State Charities Aid Association, was formed in New York some years ago, and has obtained from the legislature powers of compulsory inspection. Its volunteer visitors are thus enabled to visit and

examine all the institutions belonging to the city, as well as those of the State at large, and report on their condition both to the public and to the superiors of the officers eriticized. The emigrants, of whom by far the greater por- tion pass through New York, are also placed in charge of Commis- sioners of Emigration, appointed by the mayor, whose duty is to afford all information and assistance which helpless strangers are likely to require on thcir first arrival in a foreign country. Their duties include also the discovery on shipboard, and detention for return to the country of their origin, of all paupers, cripples, and insane persons or others who are likely to become a eharge to the city. These functions are discharged in a huge wooden structure known as Castle Garden, on the southernmost point of Manhattan Island, at the lower end of Broadway. Thcir magni- tude varies from year to year. In 1883 about 405,000 emigrants of all ages and both scxes passed through the hands of the com- missioners,

Government and, Administration.—During the first stage of the colony the government was to all intents and purposes a military one. The governor, or director-general, appointed by the Dutch East India Company, cxereised virtually absolute power, subject, of course, to the distant eontrol of the directors in Holland. In 1652 the town received municipal magistrates appointed for one year by the director-general. They held office at his will, and were liable to have their decisions overruled by him on appeal ; but, subject to these conditions, they possessed the powers and

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exercised the functions of corresponding officers in the Dutch municipalities at home. This form of government continued until after the conquest of the colony by the English, when the so-called ‘‘ Duke’s Laws” were proclaimed, and, on June 12, 1665, all the inhabitants of Manhattan Island were declared a body politie and corporate. The first formal charter, known as the Dongan charter, was bestowed on the city in 1686. The recorder, mayor, aldermen, and assistants were to constitute the body cor- porate, but the mayor, recorder, sheriff, and other superior officers were to be appointed yearly by the lieutenant-governor of the pro- vince, while the aldermen and assistants (who together with the mayor and recorder

constituted the common council) and the petty constables were to be elected by a majority of the freemen and free- holders of each ward. In 1730 the eharter was again amended, and took the form known as the Montgomery charter, reserving the appointment of a mayor and recorder still to the crown, and pro- viding for the annual election by the people of the aldermen and assistants, constables, assessors, and collectors. The frecdom of the city was purchasable from the corporation for five pounds, and was necessary to the pursuit of any trade or handicraft within its limits. This charter continued in force for nearly a century. It was con- firmed by the State constitution of 1777 adopted after the out- break of the Revolution, and again by the revised constitution of 1821, and has furnished, in fact, the framework of the city govern- ment down to the present day. The power which it gave the cor- poration of fixing the price of all articles sold in the city market was exercised till the Revolution. It was not essentially altered until 1831, when among other minor changes the common council was divided into two boards. The appointment of the mayor re- mained in the hands of the governor and council until the Revolu- tion, when it was transferred by the State constitution to the governor and council of appointment which shared with him the appointing power. By the amended State constitution of 1821, the duty of electing the mayor annually was imposed on the eommou council, and so continued until 1834, when provision was made by statute for his election by a vote of the qualified city electors. This charter continued in force without material moditi- cation until 1857.

The revised State constitution of 1846 introduced manhood suffrage, and its effect on the city government during the first ten years gave considerable dissatisfaction. It came into operation simultaneously with a great increase in the stream of foreign immigration, most of which passed through New York on its way westward, but not without leaving behind a sediment, composed of the poorest, the most ignorant, and the most vicious. The result was that a very inferior class of men began to find their way into the mayoralty and the common council. The liquor dealers and others of a similar stamp, whose occupations gave them access to, and influence over, the more ignorant voters, began to assume in- ercasing importance in municipal politics, becoming able to impose conditions on candidates for office and to exercise considerable control over the distribution of

municipal patronage. The police force was gradually converted into a refuge of political partisans, and was employed without scruple in electioneering. Every political department of the city government suffered more or less from the same causes. The great political club known as the Tammany Society, which was formed in 1789 asa non-political patriotic organization, professedly to couuteract the aristocratic tendencies of the Order of the Cincinnati, and which had long been the managing body of the Democratic party in the city, was much strengthened by the increase of the immigrant vote, and its government was also affected for the worse by the same influences to which the city government was exposed. During these years, however, the Republican party, as the opponent of slavery, was slowly rising into prominence in State and Federal politics on the rnins of the old Whig party. By the year 1857 it had gained a majority of the voters of the State outside of the city, secured the eontrol of the State legislature, aud elected a governor. It was not very long in power in the State at large before it determined to take the government of the city of New York, to a certain extent, out of the hands of the local majority by giving portions of it to commissions appointed by the governor. There was perhaps reason enough for the experiment to be found in the condition of the municipal administration, but it was unfortunate that it had to be made by a political party to which the local majority did not belong. This gave it an air of partisanship, and exposed it to the charge of being simply an attempt to put the Republican party in possession of a portion of the city patronage, which it eould not get hold of in any other way, and to punish the city voters for being Democratic and standing by the South in the slavery con- troversy. native-born and the property holders to escape the inevitable

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1 The legal title of the corporation is now the ‘‘ Mayor, Aldermen, and Com- monalty of the City of New York,” and the legislative branch consists of a board of twenty-four aldermen, who constitute the common council, and are clected by a majority vote, onc from each electoral district, within the city limits, which sends a member to the State assembly.

It was in reality, however, an effort on the part of the.

result of a sudden increase in the power of the ignorant and poor in a great commercial city.

Accordingly, in the spring of 1857, the charter was so modified by the legislature as to give the construction of a park, known as the Central Park, for which provision had just been made, to a commission appointed by the governor. The police was in like manner taken out of the hands of tle mayor and given to a similar commission. 'The mayor then in office, Fernando Wood, attempted forcible resistance to this change on the ground that the statute was unconstitutional. He barricaded himself in the city-hall surrounded by his policemen, and had to be ousted and arrested by the aid of the militia. Ever since 1857 interference of the State in the city government has been frequent, and alterations of the charter have been mado or attempted almost every year with the view mainly of effecting a new distribution of the city patronage, sometimes as the result of a change in the majority of the legis- lature, and sometimes as the result of a bargain between the Republican leaders in the legislature aud the Democratic leaders in the city. But the policy of withdrawing or withholding power from the common council has through all these changes been steadily adhered to on both sides, owing to distrust of the persons now usually elected to that body.

During the war, and for scveral years afterwards, the art of managing the city voters of the Democratic party through the political club known as the Tammany Society was continually improved under the leadership of William M. Tweed, who had succecded Fernando Wood as the municipal chief of his party. Before 1870 he had brought the city majority under his control through a very perfect organization, and had filled the mayoralty and all the leading adininistrative offices as well as the common eouncil with his creatures. He thereupon began an elaborate system of plunder, of which the main feature was the presentation of enormous bills for work done on a new court-house then in process of erection by city tradesmen acting as his confederates. To these he paid a portion only of their demands, retaining the balance, which he divided in certain proportions with his principal followers. The total amount taken from the city treasury in this and similar ways was never clearly ascertained, but the city debt, which was apparently a little over $73,000,000 in 1870, was, when the liabilities were

fully ascertained in 1876, found to be nearly $117,000,000. These frauds, which had been long suspected, were finally brought to light by the treachery of one of the con- spirators, who was dissatisfied with his share. But their success and the length of time which had elapsed before their detection were, eonsideriug the very large number of persons who had been made privy to them, and who had been admitted as partners in their results, a remarkable illustration of the perfection to which . the system lad been brought. The overthrow and punishinent of the leading perpetrators of them greatly purified the municipal admiuistration, and lcd to a watchfulness on the part of the public regarding inunicipal affairs which promises, as long as it lasts, to make a repetition of them impossible. In fact, they could not have been perpetrated without a combination which included all the ehief city officers; and this could not have been effected, and as a matter of fact was not effected, without many years of carcful, and, to a certain extent, unobserved preparation. The grcat source of corruption in the city government is the practice of treating places in the municipal service as what are called party "spoils," or, in other words, as rewards for electioneering services. This practice, which has prevailed in the Federal as well as in the State service all over the country, is of older growth in the State of New York than elsewhere, having shown itself there very soon after the Revolution. It has been much weakened, however, in New York by an Act of the legislature, passed in 1873, which forbids the removal of any regular clerk or head of bureau in the service of the city government, except for cause, and after an informal trial. The police and fire departments are protected in a similar way; but this does not relieve the clected officers from the necessity of purchasing their nominations by such promises as still remain in their power to carry out, such as contributions from their salaries, or the filling of vacancies occurring within their departments, or the employment of labourcrs in any public work of which they may have charge. A more recent Act of the legis- lature (1883) prescribes competitive examination as a basis for appointment to all Statc offices, and forbids, under heavy penalties, all assessments on salaries for political purposes ; but its applica- tion to the large cities as regards competitive examinations is left optional with the mayor, and with the heads of certain depart- ments. As the chartcr stands at present, the legislative power of the board of aldermen is restricted to the regulation of the traflie in the streets, the granting of licences to street vendors, the opening of new streets, and

similar matters. Their confirmation is, however, necessary to the mayor's appointment to office. The amount of taxes for each year is fixed by the board called the board of apportionment, composed of the mayor, the comptroller, the president of the board of aldermen, and the president of the department of taxes and assessments, The estimate so made is

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laid before the board of aldermen for their approval, but this is a mere form, for, if the aldermen refuse sueh approval, the board of apportionment disregards the refusal and goes on to levy the taxes, atter having placed on file their reasons for so doing. Moreover, the aldermen are expressly forbidden by the charter to impose taxes, or borrow money, or eontraet debts, or lend the eredit of the eity, or to take or make a lease of any real estate or franchise save at a reasonable rent and for a period not exceeding five years, Taxation.—For purposes of taxation New York is a county as well as a city, the two being conterminous. The city taxes, when settled by the mayor, eomptroller, president of the board of aldermen, and president of the board of assessments and taxes, forming the board of apportionment, are levied by the same officers, forming the board of eounty supervisors, upon all the real and personal property in the county, and in this levy is included the amount needed for State purposes, the city's share of which is settled by a State board. The rule on whieh the New York taxes are levied is that which prevails with but little modification allover

the United States, though applied with much more rigour in some

States than in others, viz., that every speeies of property, visible and invisible, is liable to taxation. In New York city it is the custom of the appraisers to tax land and houses at about two-thirds of their market value. The amount assessed on personal property is generally inereased in successive years, until the owner gainsays the assessor's guess, but his oath is suffieient proof for its reduction. In other words, it may be said that the attempt to tax personal property in the city, except in the case of corporations, has failed. The eity tax levy for 1881 amounted to $31,071,840°19, and the rate of the tax was $2°62 per cent. on the valuation of all kinds of taxable property. There is a steady inerease in the valuation

of land and houses, but a nearly steady deerease in the valuation of personal property.

Courts and Police.—The city has three courts of record, of which two, the superior court and court of eommon pleas, possess con- eurrent jurisdietion with the supreme court of the State in all eases in which the cause of action has arisen within the county, or in which the property or other thing in dispute lies within the county, or in which the defendant is a resident. Eaeh court has six judges, eleeted by popular vote for a term of fourteen years. The supreme court can, however, remove any eause from either of these courts by order on notice, and take jurisdiction of them itself, but in that case the trial must take place in another county. The third, formerly the marine court, now the city court, consists also of six judges. Its jurisdittion, however, is limited to cases not involving more than $2000 dollars in value, and to the enforcement against real estate of mechanics' liens, that is, of liabilities ineurred to contraetors or labourers who have been engaged in the eonstruetion of a house or other work of improvement on land. The only marine causes of which the eourt has cognizance are suits brought by sailors for wages, or by any person for assault and battery or false imprison- ment on board a vessel. Below these are ten district courts which are not eourts of record, and whose jurisdiction only extends to eases not involving over $250. The justiee of each eourt is elected by popular vote, and holds offiee for six years, and must be a member of the bar. Appeals from his deeisions, in eertain cases specified by statute, lie to the eourt of common pleas. The surro- gate, who has charge of the court of probate, is also elected, and holds office for six years.

The criminal courts of the city begin with the court of oyer and terminer, which eonsists of a single judge of the State supreme court belonging to the judieial district within which the city lies, and tries all sueh eases sent to it by the court of general sessions as it thinks proper to try, and is, in fact, intended to furnish relief to the latter. The working eriminal court of the city is the eourt of general sessions, whieh eonsists of the recorder, the city judge, and the judge of the court of general sessions, eaeh of whom tries cases sitting apart ; but an appeal in all capital cases, and in all cases punishable with imprisonment for life, lies from them to the supreme court and court of appeals. All three judges are elected, and hold office for

fourteen years. Below the general sessions there is the court of special sessions, composed of any three police justices, which tries all misdemeanours, unless the defendant prefers to be tried by the court of general sessions, or is sent before that court for trial by the special sessions. The poliee courts are held by eleven police justices possessing the usual Jurisdiction of police magistrates, and appointed by the mayor, subject to the confirmation of the board of aldermen, for a term of ten years.

In addition to the courts of law there is an official arbitrator, appointed by the governor of the State, who, with or without two assessors chosen by the parties to the eontroversy, hears and deeides, on short notice, all disputes between members of the chamber of commerce. His judgments have all the foree of those of the courts of law, and are executed in the same manner, and are rendered without formal pleadings, on the oral or written statements of the litigants, and the submission of the necessary documents.

The police department is in the control of four salaried commis-

sioners, who are nominated by the mayor and confirmed by the aldermen, and hold office for six years, The total force perform- ing actual police duties consists of 2237 patrolmen, 165 roundsmen, 143 sergeants, 78 doormen, 36 captains, 40 deteetive sergeants, 4 inspectors, and 1 superintendent. The expenses of the department for the year ending January 1, 1882, were $3,209,960°65. The eity is divided into thirty-five police precincts, each under the direc- tion of a captain and subordinate officers. There is, in addition, a steamboat squad, whose duties confine them to the piers and the neighbourhood ; a mounted squad, on duty in the uptown avenues; a eentral-offiee squad, on duty at the department headquarters; a special-serviee squad; a deteetive bureau; a sanitary company for the inspeetion of steam-boilers and tenement houses ; four inspec- tion distriets ; and six distriet-court squads.

About half of those arrested for various offences in the city are natives of the United States. The statistics of the poliee courts (including the court of special sessions) show that in the year cnd- ing October 31, 1882, they

disposed of 66,867 prisoners, a decrease of 17,954 as eompared with the year 1874.

The fire department is under control of three salaried fire commis- sioners, who are nominated by the mayor and eonfirmed by the aldermen. The working force of the department consists of 826 uniformed men, who are divided into fifty-one engine companies and nineteen hook-and-ladder companies. The city is thoroughly equipped with a fire-alarm telegraph system. The number of fires in the city in 1883 was 2168, with a loss of $3,517,326. The expenditure of the department in 1883 was $1,464,850. The department has other dutics besides that of extinguishing fires. It has eharge of the bureau which looks after the proper eon- struction of buildings, seeing that they are ereeted in compliance with the Building Act, and that old buildings do not beeome in any way dangerous, and supervises the storage of combustibles and explosive materials.

An adjunct of the fire department, although under entirely inde- pendent control, is the fire-insurance patrol. This is an organiza-

| tion authorized by an Act of the legislature passed in 1865, aud

supported by the fire insurance companies doing business in the city. Its object is not to assist in extinguishing fires, but to remove goods from the burning buildings, and to protect them from damage by water.

Vital Statistics,—The situation of the city, surrounded as it is by tide water, renders the disposition of its sewage easy. This, com- bined with its excellent supply of fresh water, tends to make the city a healthy one. On the other hand its limited area causes an excessive crowding of its inhabitants into tencment houses; and, as a majority of the tenement population is foreign, with little appre- eiation of the value of eleanliness, the death-rate among this elass is very large. This is espeeially true of young children in the very hot months. Quarantine inspection at the mouth of the harbour, and vigilant sanitary inspection throughout the city itself, have been very successful in warding off pestilence. Since 1822 there have not been more than one hundred deaths from yellow fever in any one year. Sinee 1831 there have been six outbreaks of cholera, but only two deaths oceurred from that disease from 1875 to 1882 inelusive.

The sanitary condition of the city is in charge of a board of health, eonsisting of the president of the police board, the health offieer of the port, and two eommissioners of health, one of whom must have been a praetising physieian for not less than five years preceding his appointment. In the health department are two bureaus, one in charge of a sanitary superintendent, and the other in charge of a registrar of records. The board has authority to frame and cnforee a sanitary eode. The death-rate was 26°47 in 1880, 31°08 in 1881, and 29°64 in 1882,

Commerce and Manufactures. —New York owed its first rise in importanee to the excellenee of its situation as a seaport, and in this respeet still maintains its pre-eminence over all Aimerican cities. Nearly 57 per cent. of all the foreign trade of the country passes through its harbour. Its exports during the fiscal year ending June 30, 1882, amounted to $344,503,775 out of a total for the whole eountry of $750,542,257. Its imports during the same period reached $493,060,891 out of a total of $724,639,574, but a very much larger proportion of this trade is done in foreign vessels than formerly. There is no line of steamers to Europe sailing from tho port under the American flag. Its supremacy as a port naturally brought with it supremacy as an entrepdt of foreign goods ; of these New York has been for the last half century the principal distri- buting agency, especially as regards dry goods. Of late this branch of business has to some extent migratcd to Chieago and othcr Western cities, owing to the growth of population west of the Mis- sissippi ; but east of the Alleghanies, and all through the Southern States, the hold of New York on the retail dealers is practically unshaken. New York is also the foremost city of the Union in manufactures, and no other city, except Philadelphia, can make any pretenee of competing with it in this field.

The following table shows the growth of New York's manufac-

, tures since the census of 1860 :—

lorry.

cITy. | j 1880. 1870. 1860. Establishments……..~~...c0.2.r0+c000 11,339 7,624 4,375 Gerri ees ee ose Sine senss see | $181,206,356 | $129,952,262 | $61,212,757 IR fiwarettenial cso eset etces. awe $288,441,691 |~~

$178,696,939 | $90,177,038 iairciSfem POV ECs. .acsccasscen eee 227,352 129,577 ,204 AW DSS esonconcantensocnceraoncrponcensce $97,030,021 $63,824,049 $28,481,915 Value of products. .....-00:e0e $472,926,437 | $332,951,520 | $159,107,369

In number of establishments the boot and shoe industry leads in 1880, the number in this case being 839. Then, in order, come— bakery products, 782 ; cigars, 761; men'sclothing, 736 ; carpenter- ing, 460; printing and publishing, 412; plumbing and gastitting, 401; furniture, 299; painting and paper-hanging, 293; foundry products, 287; jewellery, 240 ; machinery, 240 ; women's clothing, 230; blacksmithing, 205. The whole number of industries enume- rated in the census table is 164. In the value of products, men's clothing leads, the total being $60,798,697. Next in order come— meat packing, $29,297,527 ; printing and publishing, $21,696,354 ; malt liquors, $19,137,882; women's clothing, $18,930,553; cigars, $18,347,108; lard (refined), $14,758,718; foundry products, $14,710,835; sugar and molasses (refined), $11,330,883. Then come furniture, bakery products, machinery, silk and silk goods, boots and shoes, carpentering, musical instruments (pianos and materials), grease and tallow, flouring aud grist-mill products, coffees and spices (roast and ground), marble and stone work, shirts, iron castings, oleomargarine, inillinery and lace goods,

$5,000,000.

Docks.—Until 1870 the docks of the city were not confided to the care of a special department of the city government, and there was no adequate attempt made to put them in practieal and durable shape, and to extend the wharf line. In that year a separate dock department was authorized by the legislature, and it is continued under the present charter. It is in charge of three commissioners, nominated by the mayor and confirmed by the aldermen. They hold office for six years, and receive an annual salary of $3000 each. The bulkhead line of the city from the Battery to Sixty-First Street on the Hudson River, according to the new plan, measures 25,748 feet, and from the Battery to. Fifty-First Street on the East River 27,995 feet. At the Battery a stone pier was completed several years ago. Thisis the only stone pier on the water front. The system which the department is trying to carry out proposes the construction of a new bulkhead wall, first

along the Hudson River front, and eventually along the East River, and the widening of the street along the Hudson River to a width of 250 feet, and of that along the East River to a width of 150 feet in the lower part and of 100 feet in the upper part. A beginning of this work has been made along the Hudson River, but it makes slow progress, partly because the title to the water front in many places is disputed by private individuals, and this results in much tedious litigation. 1t is the intention to give 20 to 25 feet of water at every point along the new bulkhead. This bulkhead is now completed at detached points on the Hudson River, as from West Tenth Street to Canal Street, and from Jay Street to Warren Street, and the work is going on at other points. The allotment of wharfs and places in the harbour to vessels is not done by the dock or any other city depart- ment, but by the captain of the port aud eleven harbour masters, all of whom are nominated by the governor of the State and con- firmed by the State senate. three years, and the harbour masters for two years.

Ferries.—As New York is on all sides surrounded by water, ferry- boats form the principal means of communication between it and the opposite shores, The water-courses of its northern boundary— Harlem River and Spuyten Duyvel Creek—are narrow enough to be bridged ; but, until the opening of the Brooklyn Bridge, steam ferry-boats supplied the only means of communicatiou with New Jersey and Long and Staten Islands. These boats are arranged with cabins for passengers on both sides, and a roadway for horses, waggons, cattle, &c., in the middle. They are worked by the rail-road companies and other private corporations. The principal ferries to New Jersey, running from the Hudson River side, have their piers at the foot ot the following streets :—Liberty, Cortlandt, Barclay, Chambers, Desbrosses, Christopher, Twenty-Third, and Forty- Second. The principal ferries to Brooklyn, running from the East River side, have their piers at. the foot of the following streets :— Whitehall (2), Wall, Fulton, Catharine, Roosevelt, Grand, and Houston. There are also two ferry lines to Staten Island, four to Long Island City, one to Astoria, L.I., one to Blackwell's Island, two to Greenpoint, L.J., and one to Governor's Island. The

3rooklyn ferry-boats leave their piers every ten minutes (and those from Fulton Street every five minutes) during the business hours, lessening their trips afterwards to one every fifteen or twenty minutes. On the New Jersey

side they run at intervals of from ten to thirty minutes. During certain of the busiest hours of the morning and evening the fare for each foot passenger on the leading

Brooklyn ferries is 1 cent ; during the rest of the day it is 2 cents. |

On the New Jersey ferries it is uniformly 3 cents.

The captain of the port holds office for |

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Conveyances.—The rapid growth of the city in a long line to the northward has naturally led to great difficulties of transportation. The old omnibuses began to be supplemented in 1834 on all the leading longitudinal lines of thoroughfare by tramway cars drawu by two horses, but, though running in the most frequented routes at intervals of a minute, they became long ago unequal to the demands on them. As the dwelling houses became farther and farther separated from the business part of the city, the discomfort and delay of this mode of travel, especially in winter weather, grew very serious, and caused a considerable migration to Jersey City and Brooklyn of persons who would have remained on Manhattan Island but for the difficulty of getting to and fro. After a long period of clamorous discontent, the remedy was applied in 1878 by the construction of what is known as the Elevated Railroad, worked by steam locomotives on raised iron trestle work in four of the avenues, the Ninth, Sixth, Third, and Second, and running from the Battery to the Harlem River every three to four minutes, 10 cents being the ordinary fare for the entire distance of 10 miles, but with ‘‘commission” trains at 5 cents between certain hours of the morning and evening, for the accommodation of the working classes, the fare in these having been fixed by the State commission which settled the conditions of the charters. The result has been a very rapid increase of population in tle uppcr end of the island. Public Works.—There are but few public buildings of much architectural pretension. The principal are the city-hall, the

; general post-office, the custom-house, the barge office at the jewellery, all with annual production ranging from $10,000,000 to. }

Battery for the accommodation of passengers landing from steam- ships, the new produce exchange, and the Roman Catholic cathedral in Fifth Avenue. The two great public works of the city are the Croton aqueduct and the suspension bridge, spanning the East River, connecting New York with Brooklyn. The former, which carries the water supply of the city over 40 miles from the Croton Lake in Westchester county, has a eapacity of 115,000,000 gallons daily, and is now delivering 90,000,000 gallons daily. It has for forty years supplied the inhabitants with water with a profusion never seen elsewhere in the modern world, and with little or no restriction on its use. Of late the supply has begun to be inade- quate, and provision has (1883) been made by the legislature for the construction of an additional reservoir and aqueduct.

The Brooklyn Bridge connecting New York with Brooklyn across the East River is much the largest suspension bridge yet constructed, measuring 5989 feet in length, while that at Kieff, the next largest, only measures 2562. The work on it began in 1870, and it was opened for traffic on May 24, 1883. The bridge consists ofa central span 15954 feet in length from tower to tower, two spans of 930 feet each from the towers to the anchorage on either side, and the approaches of ironwork and niasonry, the one on the New York side being 156232 feet, and that on the Brooklyn side 971 feet in length. The towers, between whieh the central span extends, are 276% feet above high water, and rest upon a rock foundation 80 feet below the surfaee of the river and 40 feet below its bed. The cables, four in number, supporting the spans, are 15? inches in diameter, and 37574 feet in length. They rest on movable ‘‘saddles” where they pass over the towers, exerting here a vertical pressure only, the stress (or lengthwise pull) being sustained wholly at the anchor- ages, masses of solid stone masonry weighing 60,000 tons each, and rising 90 feet above the river’sedge. Each cable contains 5282 gal- vanized steel wires in nineteen separate strands, consisting of 278 lengths, each strand having over 200 miles of continuous wire. The wires are laid parallel (not twisted), and packed as closcly as possible, the greatest care being necessary to secure perfect evenness of length, and are covered with an outside spiral wrapping of wire. The defiexion of the cables

between the towers is 128 feet ; the clear height of the bridge above high water is 135 feet in the centre and 118 feet at the towers, giving a free passage to shipping. The width of the bridge is 85 feet, divided between five passage ways. In the eentre is a footway 15% feet wide and raised 12 feet above the other passages, giving an open view on both sides; next this on each side are tracks for cars, worked by cables from a stationary engine at the Brooklyn terminus ; and outside of these are waggon ways 19 feetwide. The entire cost of the bridge, $15,500,000, was borne by the cities of New York and Brooklyn, the latter paying two-thirds.

Hudson River Tunnel,—The width of the Hudson River along the city's front is so great that no engineer has yet proposed to bridge it there ; but an engineering feat almost as difficult is now in progress. This is the excavation of a tunnel beneath the bed of the river large enough to permit the running of steam trains in it. The work is in the hands of private capitalists. The entrance of the tunnel in New York is at the foot of Morton Street ; in Jersey City it is at the foot of Fifteenth Street, near the Hoboken line. Work was begun at the New Jersey entrance in 1874, and at New York entranee several years later. There are in faet to be tivo tunnels, about 25 feet apart, with connexions every 1000 feet. This mode of construction is casier than to make one tunnel of double width. The river from bulkhead to bulkhead at this point measures 5400 feet in width, and each entrance is about 60 feet back from the bulkhead. The tunnels will measure, inside, 17 feet

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Plate XIV,

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in width and 17 fect in height. From Jersey City one tunnel had

been, in August 1882, completed a distance of 1600 feet, and the |

other a distance of 640 feet ; from New York 170 feet of one tunnel

only is completed. Unfinished work has been pushed a considerable | The material through which the | tunnel is cut has made its construction very difficult—on the New |

distance farther on each side.

Jersey side silt, and on the New York side a light sandy soil, through both of which the overlying water percolates freely, and it was necessary to keep this water out of the excavated sections as the work procceded. The plan adopted consisted of the sinking, at each mouth, of a heavy caisson of timber to the required depth. In the river side of this, when it was completed, a hole was cut corre- sponding with the mouth of the tunnel. The caisson was air-tight, and into it the air was pumped until it reached a density sufficient to prevent the entrance of the water. As soon as a short section is excavated it is lined with iron plates firmly braced. The interior of the tunnel will therefore consist of an outer lining of iron, and an inner lining of bricks laid in mortar. Whenever one section is completed an iron bulkhead is moved to its further end, and a new air-tight chamber is formed beyond the bulkhead. The company has met with financial embarrassments, and the work has mean- while been suspended.

Parks, Museums, and Galleries.—The city is well supplied with parks and public gardens. There are in all thirty of these, inelud- ing small open squares. The principal are the Battery, at the southernmost point of Manhattan Island, containing 21 acres; the City-Hall Park, containing 6 ; Washington Square, 8; Union Square, 3}; Tompkins Square, 103; Madison Square, 64; Reservoir Square, 43; Mount Morris Square, 20. The chief is, however, the Central Park, lying nearly in the centre of the island, and contain- ing 843 aeres } it is 24 miles long by half a mile wide. It was laid out in 1858, and is considered a masterpiece of landscape garden- ing. It eontains the building of the Metropolitan Museum of Art, immediately in front of which stands the obelisk brought in 1880 from Alexandria. Outside the Central Park, but within Man- hattan Square, a small addition recently made to it on the west side, stands also the Ameriean Museum of Natural History, which, like the Museum of Art, is the property of a private corporation.

The National Academy of Design, situated at Fourth Avenue and |

Twenty-Third Street, has a frontage of 80 feet anda depth of 98 feet 9 inches. The exterior is Venetian; the material used is grey and white marble and blue stone. The first and second stories con- tain offices, lecture-rooms, and rooms for art schools. On the third are large exhibition rooms, lighted from above. Every year one exhibition of oil paintings and one of water colours are given, and in later years supplementary exhibitions have been added. The art schools are free, and are open to both scxes.

The Metropolitan Museum of Art was chartered by the legisla- ture in 1870. It is managed bya board of officers, comprising the comptroller of the city, the president of the department of public parks, the president of the National Academy of Design, and certain

NEW ZEALAND consists of two large islands, the North Island and the South Island, of another much: smaller one named Stewart Island, and of islets around the coast. the Auckland Islands. to 47° 17’S. lat., and from 166° 26’ to 178° 36’ E. long. The Chatham Islands lie between 43° 25’ and 44° 20’S. lat. and 176° 10’and 177° 15’ W. long,, and are about 365 miles eastward of Cape Palliser, Cook Strait, New Zealand. The Auckland Islands, which are uninhabited, lie between 50° 30’ and 51° §. lat., and 165° 55’ and 166° 15’ E. long. The whole group comprised in the British colony of New Zealand is situated in the South Pacific Ocean, and is nearly antipodal to Great Britain. land is about 100,000 square miles, or one-sixth less than that of Great Britain and Ireland. The area of the North Island is about 44,000 square miles, or 28,000,000 acres ; that of the South Island is about 55,000 square miles, or 36,000,000 acres ; and Stewart Island has about 800 square miles, or 512,000 acres. The Chatham Islands and the Auckland Islands are of inconsiderable dimen- sions. The North and South Islands together extend over twelve degrees of latitude, and vary from 46 miles to 250 miles in breadth, the average breadth being about 140 miles. The North Island is in area about. three- fourths that of England and Wales. The South Island

NEW—

The colony includes also the Chatham Islands and | New Zealand extends from 34° 25’ |

The area of New Zea- | lie chiefly on the western side of the range.

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private citizens who are members of its corporation. The museum building, opened in 1880, was erected by the park department, at a cost of about $500,000, and is situated in the Central Park, near Fifth Avenue and Eighty-Third Street. It measures 218 by 95 feet. The material is red brick with sandstone trimmings. Among its valuable possessions are the Blodgett collection of pictures, the Cesnola collection of articles taken from the Cypriote cities and tombs, two paintings by Rubens, two by Van Dyck, ahd many other works of eminent masters. The museum is open to the public free, on Wednesdays, Thursdays, Fridays, and Saturdays. On the other days an admission fee of 25 cents is charged.

The American Museum of Natural History was incorporated by the legislature in 1869, and its present building was opened in 1877. It is situated in Manhattan Square. The exterior is of red briek with yellow sandstone trimmings. It is four storics high, and each of its halls measures 170 feet in length by 60 in width. It is governed by a board of twenty-five trustees. The building was erected by the park department, which has charge of it and the surrounding grounds. It is open free. Among its possessions are the Veneaux collection of natural-history specimens, the museum of Prince Maximilian of Neuwied, the Elliot collection of the birds of North America, the Jay collection of shells, the James Hall collection of geological specimens of New York State, the Bement specimens of the Stone Age of Denmark, the De Morgan collection of stone implements from the valley of the Somme in France, and the Squire and Davis collection from the Mississippi valley.

The Cooper Institute, or ‘‘ Union for the Advancement of Science and Art,” oecupies a huge brown stone building at the junction of Third and Fourth Avenues, the gift of Peter Cooper, who erected it in 1857 at a cost of over $600,000, and further endowed the union with $200,000 for the support of a library, reading-room, and schools of seience and art, all of which are free, and are largely attended by young men and young women of the working classes. Its evening schools are attended by over 3000 students annually, and in the women’s art school instruction is given gratuitously to 350 pupils yearly. The library contains 15,000 volumes, a notable feature being a complete and fully indexed set of the reports of the United States patent office. The reading-room is supplied with about 300 periodicals and newspapers, and is frequented daily by over 2500 readers. No one instrumentality is doing more than the Cooper Union for the instruction of the working classes in the city.

The principal works relating to New York are—Thomas J. ones, History of New York during the Revolutionary War, 1879: Mrs Lamb, History of the City

| of New York, 1877; Stone, History of the City of New York, 1872; Perge, History

of the City of New York, 1859; Mary L. Booth, History of the City of New York, 1880; Valentine, History of the City of New York, 1853: The City Charter, with Chancellor Kent's notes, 1836; Bourne, History of the Public School Society, 1870; Newberry, Zhe Geological History of New York Island and Harbour, 1878; Dis- turnell, New York as tt was and as it is, 1876; ©. L. Brace, The Dangerous Classes of New York, 3d ed., 1880; The Laws of New York (consolidated), 1882; Boese, Public Education in the City of New York, 1869; Cammann and Camp, The Charities of New York, 1868; Friedrich Kapp, Immigration and the Com- misstoners of Emigration of the State of New York, 1870. (E. L. G.)

is larger; its area is about equal to that of England and Wales.

The mountains in the North Island occupy about one- Moun- tenth of the surface, and are covered with dense forests tains.

containing an almost inexhaustible supply of fine timber. In the northern half the mountains are not so frequent as in other parts, and do not exceed 1500 feet in height, with the exception of a few extinct volcanoes between 2000 and 3000 feet high. In the centre there are some higher volcanic mountains. Tongariro (6500 feet) is occasionally active. Ruapehu (9100 feet) and Mount Egmont (8300 feet) are extinct volcanoes. The main range of the island, beginning to the eastward of these mountains, is at its greatest height 6000 feet. The plains in the North Island Mount Egmont is surrounded by an extensive and very fertile district. Nearly four-fifths of the South Island is occupied by mountains. The greater part of them is open, well grassed, and adapted for pasture. The Southern Alps, as they are called, run close to the west coast the whole length of the island. Mount Cook, the highest peak, is 12,349 feet high, and has many glaciers. Its summit was for the first time reached in March 1882 by the Rev. W. 8. Green, a member of the Alpine Club, and his two Swiss guides, Messrs Kaufmann and Boss. The main range is crossed at intervals by low passes. Extensive agricultural

Rivers.

Lakes.

plains lie on the eastern side. The rugged western slopes are rich in mineral wealth. On the south-western coast there are several fiords or sounds, long, narrow, and deep, surrounded by snow-capped mountains from 5000 to 10,000 feet in height. The scenery, especially in Milford Sound, is sublime.

There are countless running streams of the purest water throughout New Zealand, but not many rivers of depth and size. The Waikato is the chief river in the North Island. Its tortuous course is over 200 miles long, and it is joined by a fine tributary, the Waipa, at Ngaruawahia. The Waikato rises in the central part of the island, and flows into the sea on the west coast south of the Manukau. The Wairoa, discharging itself into Kaipara harbour, is large and deep, and is navigable for vessels of considerable tonnage. In the South Island, the chief river is the Clutha, rising north of Lake Wanaka, and 220 miles in length. It flows into the sea about 50 miles south of Otago Harbour, and a calculation has been made that it discharges 1,088,736 cubic feet of water a minute. Rivers in New Zealand have bars at their mouths, and are, with two or three exceptions, only navigable for small craft. Owing to the height and the preci- pitous nature of the mountain ranges, the rivers, especially in the South Island, are subject to sudden and dangerous floods.

The lakes in New Zealand are a characteristic feature.

“Lake Taupo, in the central part of the North Island, covers

Coast- line,

an area of about 250 square miles. In its neighbourhood, and in a line between it and White Island, in the Bay of Plenty, which is in constant volcanic action, there is the

famous Lake District with its wonderful collection of-

geysers, sulphurous springs, palatial terraces, and lovely natural baths, formed as it were of tinted marble, and full of warm transparent water of a beautiful blue colour. Nor are these waters only astonishing to the sightseer. Their curative properties in cases of rheumatism, scorbutic and tubercular

diseases, cutaneous eruptions, and nervous affec- tions are well established. In the South Island there are numerous lakes, some of them of considerable extent, Lake Wakatipu covering 112 and Lake Te Anau 132 square miles. These and many others embosomed in the Southern Alps are scenes of great natural beauty, abound with objects of interest, and present. strong attractions to the explorer and the tourist.

The coast-line is over 3000 miles. Cook Strait separates the two large islands, and Foveaux Strait separates the South Island from Stewart Island. Both straits greatly facilitate inter-navigation. The coastal features of the northern part of the North Island are remarkable. The waters of Auckland Harbour on the eastern side and of Manukau Harbour on the western side approach each other within a mile. A great number of natural harbours are included between the North Cape and Cape Colville. The harbours on the west coast of the North Island have shift- ing bars at the entrance; but Manukau, Kaipara, and Hokianga are excellently surveyed, and can, with due caution, be safely entered. Inside they are spacious and fine. Auckland and Wellington have excellent natural harbours. The South Island on its north side, from Cape Farewell to Cape Campbell, is indented with numerous good harbours ; and on the eastern coast, Port Lyttelton, Akaroa, Port Chalmers, and the Bluff are all available for large vessels. On the south-western extremity the coast is iron-bound, but there are several deep fiords surrounded by lofty and precipitous mountains. Anchorage can rarely be obtained there, except at the head of remote coves. Northward there is Jackson’s Bay ; and between it and Cape Farewell, a distance of 300 miles, there is an open and exposed coast, with seven or eight small bar river harbours at intervals.

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Stewart Island is only 120 miles in cireumference, and has several excellent harbours on its eastern side. There are some anchorages on the western side, but they are rather exposed to the prevailing westerly winds.

Meteorological statistics are collected at Auckland, Wellington, Christchurch, and Dunedin; and observa- tions of rainfall, temperature, and

wind-direction are re- ceived from thirty other stations. From the data thus obtained an isobaric map and a report are prepared for each day; and weather warnings are telegraphed to any part of the coast when necessary. A system of inter- colonial weather exchanges has been agreed upon, and telegrams are daily exchanged between Sydney and Wellington,

In the Handbook of New Zealand (1883), Dr Hector makes the following observations :—

‘*The climate resembles that of Great Britain, but is more equable, the extremes of daily temperature only varying through- out the year by an average of 20°, whilst London is 7° eolder than the North and 4° eolder than the South Island of New Zealand. The mean annual temperature of the North Island is 57°, and of the South Island 52° that of London and New York being 51°. The mean annual temperature of the different seasons for the whole eolony is in spring 55°, in summer 63°, in autumn 57°, and in winter 48°. The climate on the west eoast of both islands is more equable than on the east, the difference between the average summer and winter temperature being nearly 4° greater on the south-east portion of the North Island and 7° on that of the South Island than on the north-west, on whieh the equatorial winds impinge. This constant wind is the most important feature in the meteorology of New Zealand, and is rendered more striking by eomparing the annual fluctuation of temperature on the opposite seaboards of the South Island, whieh have a greater range of temperature by 18° at Christehurch on the east than at Hokitika on the west.”

Rain is frequent. In the north the greater fall is during winter ; in the south it is more equally distributed throughout the year. There is a much greater rainfall on the west than on the east coast, especially in the South Island. The winter snow-line on the Southern Alps is 3000 feet on the east side, and 3700 feet on the west side. Periods of drought are very rare in New Zealand. Westerly winds prevail in all parts and throughout all seasons. The formation of the land, however, much modifies the winds,

The configuration of New Zealand, and its extension over twelve degrees of latitude, cause considerable variety of climate in different districts. The northern half of the North Island possesses a beautiful climate, and remarkably equable; that of the southern half is more variable. The climate

of the west coast of the South Island is rainy, but temperate and salubrious; that of other parts of the South Island is generally similar to the

English, but warmer in summer and not so cold in winter.

In the North Island, sheep-shearing extends from September to November, and harvesting from November to January. In the South Island, sheep-shearing is from October to January, and harvesting from December to the end of February.

The following details are extracted from meteorological statistics published in the colony :—

Comparative Abstract for 1882 and previous Years.

Temperature. Mean Rain. Degree Baro- of No. of | Stations. meter. | Mean | Mean |Moisture| Total | Days on Mean. in Daily ete Fall in ple Shade. | Range. my Inches, ain 8° | =100). fell. Auckland (1882).....—| 29°965 59°3 13°1 76 45°630 191 ee 18 ee Baise | 99-954 59°4 a 76 43°179 188 Wellington (1882).....| 29°900 | 55°4 | 11-4 77 55-685 | 166 Previous 18 years…...| 29°921 54°8 =e 72 51:790 158 Dunedin (CEE eecatay 30-037 50°9 137 76 41°796 187 Previous 18 years…...| 29°833 | 50-4 74 34:672 | 162

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Geology.

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Average Femperature of Seasons.)

|

’ Stations. Spring. Summer, Autumn. Winter. “1881 : 1882, 1881, 1882, | 1881. 1882. 1881. 1882. Auckland……... 58-0 56°9 | 652 65-4 | 61°9 61°9 | 53-4 52°8 Wellington…..... O44 53°38 | 616 61°55 | 583 57°38 | 49-4 48°8 IDWMedin=....<.s-

~~On the whole, the New Zealand climate is admirably~~

~~suited to Europeans. In the Colonial Office List for 1883 it is stated that, according to the official reports of the medical department, whereas the annual mortality from all diseases out of every 1000 British soldiers quartered in the United Kingdom was 16, it was only 5 out of every 1000 in the troops quartered for more than twenty-five years in New Zealand. The true test of the comparative healthiness of countries is the rate of mortality distributed according to the ages of population ; and different actuarial investi- gations show that this rate is light for New Zealand.~~

~~It is generally supposed that in the course of ages volcanic action has gradually, by an alternate process of subsidence and upheaval, left New Zealand as itis. There are lines of volcanic craters stretching across the North Island,—one at the Bay of Islands, another at Auckland, and a third from Mount Egmont near New Plymouth to White Island, an active volcano in the Bay of Plenty. There are evidences in the South Island of submarine volcanic action. Slight shocks of earthquake are often felt in different parts of New Zealand, but none of great severity has been felt since 1855. During 1882 twenty-eight shocks were recorded, only one being at all severe, while ten were described as **simart," and the other seventeen were slight tremors.~~

~~A description of the general geological structure of the islands, so far as it is at present ascertained, is contained in the sketch geological map of 1883 by Dr Hector, the director of the geological survey of New Zealand, who has kindly allowed an advance proof to be available for this article (see Plate XIV.). The classification adopted in this map is founded on a mass of paleontological data, but, owing to the unavoidable absence hitherto of minute surveys, is merely provisional. The following is an abstract of some of Dr Hector's remarks on this map :—~~

~~The post-Tertiary (Recent) deposits have accumulated with great rapidity in New Zealand, owing to the mountainous character of the country giving to the rivers, even when of large size, the char- acter of torrents which are liable to occasional floods of extreme violence. The Pliocene formation belongs to a period when New Zealand was the mountain range of a greatly extended land area. The Upper Miocene beds are limited in their extent to~~

the southern and eastern districts of the North Island, and in the South Island occur as patches. The New Zealand seas have yielded about 450 species of existing shells, of which 120 have been found in this formation, together with 25 forms which are now extinct. The Lower Miocene represents a period of great depression, and the deposits are remarkable for the absence of evidence of volcanic activity in any part of the region, and for the abundance of marine life. The Upper Eocene is a very marked formation of calcareous sandstone composed of shell fragments with corals and Bryozoa, and is a shallow-water and littoral deposit. Intense volcanic activity prevailed during this period in both islands. In the upper part of the Cretaceo-Tertiary formation occurs the valuable building stone, known commercially as the "Oamaru stone," a calcareous sandstone which is very easily worked, but which hardens when exposed to the weather. The principal coal deposits of New Zealand occur in the Cretaceo-Tertiary formation, but always at the base of the marine beds of the forma- tion, in every locality where they occur. The Lower Greensand, which is confined to a few localities of limited extent, is very ricli in fossils of the genera Belemnites and Trigonia, with a few saurian bones and large chimeroid fishes. It has been found necessary to include in the Trias a thickness of strata which is quite unusual in other parts of the world, but the close connexion which exists throughout, founded both on paleontological and on stratigraphical grounds, and the clearly defined Permian character of the next underlying formation, renders this classification absolutely necessary. Saurian remains are associated with the Permian beds at Mount Potts, which were referred by Dr Hector to Ichthyosaurus in 1871, but subsequently to the genus Eosaurus of Marsh. The further remains obtained of this saurian ave, however, of such gigantic size as compared with the original types found in Nova Scotia, in which the vertebree were 24 inclies in diameter, that the determination may be doubted. The Lower Carboniferous and Upper Devonian forma- tion is of considerable importance from the large share it takes in the structure of the great mountain ranges, and from the occa- sionally great development in it of contemporaneous igneous rocks with which are associated metalliferous deposits. The igneous rocks

' Spring begins with September, summer with December, &c.

(basic volcanic and acidic volcanic) have played an important part in almost every formation in New Zealand, marking great movements of the earth's crust at the different geological periods, while the superficial and later-formed volcanic rocks occupy nearly one-third of the area of the North Island. The geysers and boil- ing springs in the North Island give rise to the formation of siliceous sinter deposits, which must be included as the most purely acidic products of volcanic action, and are due to the decomposition of the older rocks by the action upon them of fresh water ; but in the case of White Island and other localities where the decomposi- tion is brought about by the agency of sea water, the sinter deposits are formed chiefly of sulphate of lime and not silica.

The census of 1881 shows that out of a total population (other than aboriginal) of 489,933 there were 14,273 miners, of whom 12,996 were returned as being engaged in gold mining, and 1087 in coal mining. The principal quartz mines for gold are in the Thames and Coromandel districts near Auckland in the North Island, but several auriferous reefs are extensively worked in the Otago, Westland, and Nelson gold-fields in the South Island. There is good reason to believe that quartz mining in New Zealand is still in its infancy, and that its indefinite extension can be ensured by the judicious application of more capital. Alluvial gold mining chiefly exists in the Otago, Westland, and Nelson districts. Gold drift, as it is called, is found in river-beds and on the sea-coast, where it can be worked with comparative ease, and also in thick deposits of gravel, the working of which requires mechanical water-power, and often large expenditure. The opinion entertained in many quarters that the auriferous resources of New Zealand will soon be exhausted, and that the gold mining industry is approaching a rapid decline, is certainly not based upon fact. There still, it is reliably stated, exist large areas, both in the North and South Islands, that on geological grounds are highly promising for the existence of original or primary auriferous deposits, namely, quartz lodes. With regard to secondary or derived auriferous deposits—namely, gold drift—the more easily and cheaply accessible of them have, no doubt, been worked out, more or less, but the South Island still contains tracts that offer profitable employinent to the miner for generations to come. The total quantity of gold produced in

~~and exported from New Zealand from 1st April 1857 to 31st March 1883 was 10,144,926 ounces, valued at £39,7 47,940. The quantity during the year ended 31st March 1883 was 248, 862 ounces, valued at £994,555. Good coal is obtained in many parts of New Zealand. The number of coal mines in work in 1882 was 104 ; and the output during 1882 was 378,172 tons, being 215,954 tons more than the output in 1878. Silver is chiefly extracted from the gold produced in the Thames district, but other mines containing silver ores have been found. There are many other valuable ores —copper, iron, lead, zinc, antimony, chrome, and manganesc—some of which are being worked. Several fine mineral oils also are obtained. Building stones of various kinds and of excellent quality abound. Marble and cement stones occur in many places. In 1881 there were 127 brick, tile, and pottery manufactories in work ; and their lands, buildings, and machinery were valued at £105,765. There are extensive deposits of iron-sand on the west coast of the North Island.~~

~~The following official table, in Dr Hector's New Zealand Hand. book, classifies the land according to the geological subsoil :—~~

~~North South~~

~~Island. Island. Totals. Sq. miles. | Sq. miles. | Sq. miles. 1, Fluviatile drifts, one-third agricultural… 8,447 6,286 14,733 2. Marine-Tertiary,two-thirds agricultural }~~

~~(thejrest pastoral)... ..0….0…..0 13,898 4,201 Donia) 3. Upper Secondary, coal-bearing, pastoral.. 2,390 2,110 4,500 4, Palzozoic, pastoral …….- s0ccsessesoee 5,437 20,231 25,668 5. Schistose, pastoral 15,308 15,308~~

~~6. 5,978 5,978~~

~~| & 1,150 15,714 55,264 | 100,000~~

~~A study of this table, he adds, shows that 'in the whole colony there are about 12,000,000 acres of land fitted for agriculture, and about 50,000,000 which are better adapted for pasturage; but from these estimates allowance must be made for about 20,000,000 of surface at present covered by forest."~~

~~Dr Hector also reports the prevalence, in the north of Auckland and in the lower part of the Waikato Valley, of light volcanic soil, interspersed with areas of clay marl, which in the natural state is cold and uninviting to the agriculturist, but which under proper drainage and cultivation can be brought to high productiveness, He adds valuable information, in substance as follows, respecting other districts. In Taranaki and Wanganui districts the soil is very rich, and on the surface is formed by the decomposition of calcareous marls intermixed with the debris from the lava streams and tufaceous rocks of the extinct volcanic mountains. The forest growth which generally covers the land proves its productiveness,~~

~~Fauna.~~

~~Flora.~~

~~NEW ZEALAND~~

~~although that growth greatly impedes the progress of settlement. From Lake Taupo towards the Bay of Plenty the surface soil is derived from rocks of a highly siliceous character, and large areas are covered with little else than loose friable pumice-stone. On the eastern side of the slate range which extends through the North Island, the surface is generally formed of clay marl and calcareous rocks ; in the valleys there are shingle deposits from the back ranges, with occasional areas of fertile alluvium of considerable extent. The latter portions of the district are adapted for agricul- ture, and the remainder is very fine pastoral land. In the South Island the chief agricultural areas are in the vicinity of the eastern coast, but there are also small areas fitted for agriculture in the interior in the vicinity of the lake districts. The alluvial soils of the lower part of the Canterbury plains and of Southland are re- markably fertile. Scarcely less important are the low rolling dowus formed by the calcareous rocks of the Tertiary formation which skirt the higher mountain masses, and often are improved by the disintegration of interspersed basaltic rocks. On the western side of the South Island, from the close vicinity of the mountain ranges, there are comparatively small areas of good alluvial soil, but these are made very fertile by the wetness of the climate.~~

~~New Zealand is singular in the absence of all indigenous land mammals except two small kinds of bat, and a rat which has already disappeared. A native dog is supposed to have been intro- duced by the natives on their original migration. There are no snakes. A few lizards are found, but they are harmless, though held in superstitious terror by the natives. A peculiar species of frog exists, butitis very rare. Insect life is not nearly so abundant as in Europe, though bloodthirsty sand-flies swarm on the sea-shore, and mosquitoes in the bush. There are between four and five hnndred species of molluscs. Seals are numerous ou some parts of the coast. New Zealand is also remarkable for its wingless birds, living and extinct. There are four speeies of Apteryx, or Kiwi (q.v.), without wings and tail-feathers, and a little larger than a hen; they have short legs, snipe-bills, and bodies covered with long, brown feathers like lair. the Moa (see Drnornis) has been long extinct. 'The tradition of the natives is that their ancestors found these birds living, and hunted them for food till they exterminated them.?~~

~~The peculiar nature of the New Zealand fauna has given rise to much scientifie speculation, and, in the opinion of able writers, points to a continental period as the condition of the country in remote ages, and to subsequent partial subsidence and partial elevation. The discovery and colonization of the conntry have completely changed the character of its animal life. Captain Cook introduced the English dog and the pig. Colonists have brought all kinds of domestic animals. Game and small birds have been imported and acclimatized; rabbits have become a formidable nuisance in many districts.~~

~~There are about one thousand species of flowering plants, of which about three-fourths are endemic. Most of those not peculiar to the country are Australian ; others are South-American, European, Antarctie ; and some have Polynesian affinities. Ferns and other cryptogamic plants are in great variety and abundance. There are a few indigenous plants and fruits used as food. Phormium tenax, or tlhe New Zealand hemp, is a common and most useful plant. Forests covering from 11,000,000 to 12,000,000 acres are a characteristic feature in New Zealand vegetation. Much of the timber is of great value for building and for constructive works (see vol. ix. p. 407). The area of forest land is rapidly diminishing, and the rate of decrease in some large forests has been estimated at 4 per cent. perannum. The rapid decrease~~

~~is stated to be due to reckless and wasteful consumption of the best timber without regard to the conservation of the young trees, to fires, and to other avoidable causes.~~

~~The following return, compiled from a report, in 1875, by Professor Kirk, F.L.8., on New Zealand timbers, specifies those of great durability, and adapted for general building purposes and for constructive works, &c. :—~~

~~1 In 1880 Messrs S. Grant and J. S. Foster, delegates to New Zealand from the tenant farmers of Lineolnshire, travelled over and inspected the chief agrieultural districts in both islands. Their impression was, as stated in their report, that the soil is, as a rule, mueh lighter than farmers in England are aceustomed to work, and that it does not require half the working that English land does. One double-furrow plough, they say, will turn up about 18 aeres a week. They Saw very little really heavy clay-land in the eolony, and sueh soil, they think, will not be worth eultivating for some time to eome. "The labour required to work it," they write, "is far too great, and there are no frosts in winter sufficient to pulverize it, while it is perfeetly possible to eonsolidate any soil whieh may be a little too light by stoeking it sufficiently heavily." And they add—" But of one thing we are certain, that, whatever the quality of the soil, there were splendid crops on it in almost every part of the eountry that we saw."~~

~~2 Dr Buller, in his Manual of the Birds of New Zealand (1882), gives one hundred and seventy-six speeies, belonging to the Acetpitres, Passeres, Scansores, Columbx, Gallinxw, Struthiones, Gralle, and Anseres. Mr W. T. L. Travers, F.L.S., in a paper read before the Wellington Philosophieal Society, on Oetober 21, 1882, states that out of 88 species 18 are peeuliar to both islands, 8 to both islands and the Chathams, 3 to both islands and the Aucklands, 22 to New Zealand and habitats outside, 9 to the North Island, 16 to the South Island, 6 to the Chathams, 2 to the Aucklands, 1 to the North Island and the Chathams, 2 to the South Island and the Chathams, and 1 to all,~~

~~The gigantic wiugless bird called |~~

~~T Name, Uses. Height and Diameter.~~

~~Kauri (ammara aus-~~

~~Ships, houses, &c. 120 to 160 ft.; 5 to 12 ft.~~

~~tralis). Totara (Podocarpus To- | Piles, sleepers, &c. 40 to 70 ft.; 4 to 6 ft. terra). Matai (Podocarpus spi- | Piles, sleepers, &c. 50 to 70 ft.; 2 to 4 ft. cata). Kawaka (Libocedrus | Feneing, eabinet work. 60 to 100 ft.; 3 to 5 ft. Doniana). Pahautea (ZLibocedrus | Feneing, bridges. 60 to 80 ft.; 2to 3 ft. Bidwillit). Tanekaha (Phyllocladus | Sleepers, planks, bridges. 50 to 60 ft.; 3 ft. (nax.). trichomonoides). Manoao (Dacrydium | Houses, piles. 30 to 40 ft.; very durable. Colensot). Dacrydium westlandi- | Piles, bridges, &c. 40 to 50 ft.; 1 to 2 ft. cum. Dacrydium interme- | Piles, bridges, &c. 40 to 45 ft.; 1 to 2 ft. dium.~~

~~Tawai (Fagus Menztesii). Puriri (Vitex littoralis). Hututawhai (Fagus Susea). Pohutukawa (Metro- sideros tomentosa). Rata (Afetrosideros ro- busta). Rata lucida). Rawiri (Leptospermum ericoides).~~

~~Handsome tree. 40 to 60 ft.; 3 to 5 ft. 60 to 90 ft.5 8 to 8 ft.~~

~~Posts, piles, sleepers.~~

~~Posts, sleepers, bridges.~~

~~Ships, dock gates, &c. Short trunk; massive arms,~~

~~Ships, sleepers. 60 to 100 ft.; 5 to 12 ft.~~

~~(Metresideros | Ships, trucks. 30 to 60 ft.; 2 to 5 ft.~~

~~Wharves, marine works. 40 to 50 ft.; 1 to 2 ft.~~

~~Kowhai (Sophora tet-| Piles, sleepers, raptera).~~ §

~~ao (Olea ape- | Valuable, but little known. | 50 to 70 ft.; 2 to 4 ft. tala).~~

~~Maire-tawhake (Zugenia | Feneing, piles, &c. About 40 ft.; 1 to 2 ft. maire).~~

There are many other kinds of trees which are less durable, but of considerable value. Some have barks largely used for tanning purposes. Kauri gum, a valuable product of the kauri tree, is found in the soil on the sites of old kauri forests, and at the base of growing trees. It is much used in Europe and America asa base, instead of gum mastic, for fine varnishes, and for other pur- | poses. There are now many flourishing plantations of English and foreign trees.

The New Zealand flora, like the fauna, has been cited in support of the theory of the remote continental period. Sir Joseph Hooker, in his Introductory Essay, wrote that the botanical relationship of the New Zealand flora is not to be accounted for by any theory of transport or variation, but that it is agreeable to the hypothesis of all being members of a once more extensive flora, which has been broken up by geological and climatic causes.

cultivations, shows the rapid and continuous development of agri- culture in New Zealand during the last twelve years :—

eres Aeres under | Aeres under all kinds Number i Green and of Crop, ineluding ae ee of Can Other Crops, , Sown Grasses; and of ee *| Holdings. ious excluding | Land broken up, tut DS , Sown Grasscs, | not under Crop.

1872 266,936 | Not given,| 261,210 45,355 1,226,222 1877 398,938 18,750 | 320,011 160,100 2,940,711 18382 500,663 26,298 | 638,910 363,573 5,189,104 1883 509,052 27,352 | 738,822 394,473 + 5,651,255

In 1880 the estimated average produce of wheat per acre was 28 bushels, in 1881 25 bushels, in 1882 224 bushels, and in 1883 264 bushels. The estimated average of oats was 364 bushels to the acre in 1880, 32 bushels in 1881, 224 bushels in 1882, and nearly 33 bushels in 1883. Barley was estimated in 1880 at 304 bushels to the acre, in 1881 at 26, in 1882 at 22}, and in 1883 at 26. Potatoes were estimated to produce 4% tons to the acre in 1880, in 1881 54 tous, in 1882 5 tons 17 ewts., and in 1883 5 tons 2 ewts. The number of horses in 1881 was 161,736, having doubled since 1871. The number of cattle increased during the same ten years from 436,592 to 698,637, and sheep from 9,700,629 to 12,985,085. The yearly production of butter in 1881 was 8, 453,815 tb, and of cheese 3,178,694 Ib. The produce

of wool will be stated in the summary of exports for 1882. Pigs, goats, and poultry abound. ;

Except eels and a few small] fishes of little worth, there are no indigenons fish in the rivers. Dr Hector states that thirty-three kinds of sea fish ave used as food. Among the constant residents on the coast or on parts of it, he names hapuku, tarakihi, trevally, moki, aua, rock eod, wrasse, flounder, snapper, mullet, gurnet, trumpeter, butter fish, and red eod. Of the edible fish irregu- larly visiting the coast, much the largest nnmber come from warmer latitudes, namely, the frost fish, barracouta, Norse mackerel, king fish, dory, waichou, mackerel, and gar fish. He adds that of 140 species of fish found in New Zealand 67 species are believed 1 to be peculiar to New Zealand, 75 are common to Australia and

| 3 Varies from shrub to tree 30 to 40 ft. high, with trunk 1 to 3 ft. diameter.

The following comparative table, which does not include native Agri-

culture.

Fisheries,

Commu- nication.

Trade

Shipping.

Adminis- tration.

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Tasmania, whilst ten are found in New Zealand and other places, but not in the Australian seas. ‘‘ New Zealand ichthyology,” he states, ‘‘ presents a very distinct character, the thorough deeipher- ing of whieh affords a wide field for future observation and scientific investigation.” Oyster fisheries exist, and are protected by law. Cray-fish are in abundance. Whaling formerly flourished on the eoast, but since New Zealand has become a colony whaling stations have disappeared. Whales, however, of valuable

kinds are nume- rous in the adjacent ocean, and a few whaling ships are owned in New Zealand. Efforts have, for several years past, been made by the Government, but chiefly by local acclimatization societics, private and self-supported bodies, to introduce and acclimatize 'European and American edible fish. Ova, in considerable quanti- ties, of British salmon, of Californian salmon, of brown trout, and of American whitefish have been imported, and the fish hatched from them distributed.! No instance of the survival of British salmon has as yet been authenticated ; but three or four eases of grown Californian salmon having been found are reported. The success of brown trout in many streams has been great, and fish of 11, 14, and even 21 Ib weight have been caught. Trout-fishing has becoine a common sport in many places. Salmon trout fry hatched in 1870 spawned in 1875. The Canterbury Acclimatization Society in 1880 liberated nearly 25,000 American whitefish in Lake Coleridge. The acclimatization of other fish has also been successful,

The natural features of the country were, for a long time after its, colonization, a bar to overland internal communication, but good coach roads now traverse the country in every direction, and railways especially have enabled solitudes to be peopled, and wastes to be made productive. The total length of railways opened for traffic in March 1883 was 1443 miles. In the North Island, the chief working lines are—Kaipara to Waikato, 141 miles ; Wellington to Napier, 138 miles open ; Foxton to New Plymouth, 169 miles open ; in the South Island—Hurunui to Bluff, 671 miles, and Invercargill to Kingston, 89 miles. £10,400,000 in round numbers have been expended on opened lines of Government railways from 1870 to March 31, 1883, and the net earnings as a whole were yielding £3, 8s. 10d. per cent. on that expenditure. In addition to road aud railway communieation, intercourse between the chief ports is carricd on two or three times a week by swift and commodious steamers. The telegraph wire runs through every settled district, and is extended to Australia and England.

The following table shows the value of imports and exports for five years respectively :—

Imports, Exports,

1878 £8,755,663 £6,015,700

1879 8,374,585 5,743,126 1880 6,162,011 6,352,692

1s81 7,457,045 6,060.866

: 8,609,270 6,658,008

The total exports for 1882 included the following values :—from mines, £956,803; from fisheries, £5693; from forests, £390,242; animals and animal products, £3,601,242, of which wool alone was £8,118,544; agricultural products, £1,140,839; and colonial manufactures, £96,628. The export of frozen sheep to Europe seems likely to become very valuable. In an able paper on the Public Debt of Australasia, read before the Royal Colonial Insti- tute in London- on November 21, 1882, Sir Francis Dillon Bell, K.C.M.G., agent-general for New Zealand, stated that 5000 frozen sheep had reeently come in good eondition in one lot from New Zealand, that "the meat was readily taken into consumption," and that "the sheep netted 21s. 9d. a-piece, a return eminently satisfactory to their owners, because they would not have sold for more than 12s. in New Zealand."

The total shipping inwards during 1882 was 795 vessels of 461,285 tons, as compared with 765 vessels of 420,134 tons during 1881. The total outwards during 1882 was 764 vessels (486,793 tons) as eompared with 762 vessels (418,487 tons) in 1881. The number of vessels on the New Zealand register, on 31st December 1881, was 572, altogether 72,387 tons, of which 443 (56,751 tons) were sailing vessels and 129 (15,636 tons) were steamers. There were in 1883 twenty-three coastal light-houses, among which six were of the first and twelve of the second order of apparatus.

New Zealand was not eolonized in the ordinary manner around one centre, There were in its early years six distinct settlements—Auckland, Wellington, Nelson, New Plymouth, Canterbury, and Otago—between which communication was for several years irregular and infrequent. To meet their political wants, the Constitution Act of 1852 created them into provinces, with elective councils and superintendents respectively,—subordinated to one colonial legisla- ture. In 1876 the provincial system was abolished by that legisla- ture. The general assembly, as it is called, is

~~convposed of the governor, the legislative council, and the house of representatives.~~

~~2~~

~~1 According to a paper read by Mr W. Arthur before the Otago Institute in 1881, the numbers distributed by the various societies were—British salmon, 4000 ; Californian salmon, 417,000; brown trout, 332,000; salmon trout, 1000; and American whitefish, 34,000.~~

~~NEW ZEALAND~~

~~The governor is appointed by the crown. The legislative council consists of members appointed for life by the governor; the number of legislative councillors in 1883 was 50. The house of representa- tives consists of 95 niembers chosen by the electors. The franchise is manhood suffrage, conditional ou a previous residence in the colony for a year, including six months in the electoral district for which a claim to vote is registered. Every elector is qualified for election. Four members of the house must be Maoris elected by their own race. The duration of the house is for three years, but it is subject to re-election whenever the governor dissolves the genetal assembly, Legislation is subject to disallowance by the erown, but practically that power is seldom if ever exercised. Executive: adininistration is conducted on the principle of English responsible or parliamentary government. Its seat is at Wellington. Local administration is vested in local elective bodies, such as municipal councils, county boards, road boards, and others, with power to levy rates. The eolonial revenue is chiefly derived from customs, stamp duties, property tax, postal and telegraphic serviees, railways, and crown land sales. The proceeds of land sales are applied to surveys and public works. Crown lands are acquired at auction, or by selection, or on deferred payment, or by lease with right to purchase on certain conditions. The price is rarely less than £1 an acre.~~

~~The chief feature of public policy in New Zealand from 1871 to 1883 has been to borrow and expend large sums on railways, immi- gration, main roads, native land-purchases, telegraphs, and other important public works. During that time about £19,000,000 has been expended on those objects collectively, and there are good grounds for the general conclusion that, as a~~

~~whole, this policy of investing loans in large reproductive services has been, and will be, if prudently continued, a substantial success, The gross public debt of the colony on March 31, 1883, was £30,357,111, subject to a deduction of £2,571,829 for accrued sinking funds. The annual charge, including sinking fund, was £1,525,281. The loan of £1,000,000, raised in January 1883, for railways and other works was a 4 per cent. loan inscribed in stock at the Bank of England. Another similar loan was raised in J anuary 1884.~~

~~The New Zealand state has encouraged public thrift by a system of Government life insurance, which is working with remarkable success. On 31st December 1882, when the population may be~~

~~| estimated at 505,000, the total sum assured on 23,489 policies in~~

~~force in both branches (ordinary and industrial) of the department, exclusive of insurance in private offices, was £5,355,900. The Government post-office savings banks, at the end of 1882, had 57,517 open accounts, amounting altogether to £1,470, 950.~~

~~Under the Education Act of 1877 state schoolsare established, in Educa- with certain excep- tion.~~

~~which teaching is free, secular, and compulsory, tions, for children between the ages of seven and thirteen. A capi- tation grant is given for every child in average daily attendance at the schools. Grants are also made for scholarships from primary to secondary schools, for training institutions for teachers, and for school buildings. Large reserves of public lands have been made for primary, secondary, and university education. The progress in the education of children is shown in the census of 1881. In 1874 the number of children attending school was 66°78 per cent. of the population between five and fifteen years; in 1878 it was 73°64 per cent., and in 1881 80°76 per cent. Native schools are also provided by the state in native districts. There are, moreover, industrial schools, orphanages, and an institution for the deaf and dumb. There are several secondary schools with public endow- ments. The university of New Zealand is an examining body, and grants honours, degrees, and scholarships. It is empowered by royal charter to confer degrees entitled to rank and consideration throughout the British dominions,~~

~~as fully as if they were granted by any university in the United Kingdom, It has also the privilege of nominating one of its students in each year for a cadetship at the Royal Military College at Sandhurst. 'The Canterbury College and the Otago University, both academical institutions of a high order, are affiliated to the New Zealand University. Provision made by the legislature in 1882 for a university college at Auck- land has been given practical effect to. The state in no way con- trols or interferes with religious administration. Each denomi- nation attends to the religious instruction of its own adherents. State school-buildings can be used for such instruction on days and at hours other than those fixed by law for ordinary school work ; but no child can be required to attend, except at the wish of its parent or guardian. The average daily attendance of scholars at the state schools throughout the year 1882 was 68,288. In 1881 the number returned as attending private schools was 13,538; Sunday schools, 78,891; and receiving tuition at home, 7348. Exclusive of tion of New Zealand on December 31, 18838, was 515,000. census of 1881 returns the number in April of that year as 489,933 (269,605 males and 220,328 females). The average number of persons to an inhabited dwelling was 5°12. The popu- lation under twenty-one years of age was 258,774, of whom 128,791 were females. The number of those born in the colony was 45°60 per cent. of the whole population ; of those born in England,~~

~~the aboriginal population, the cstimated popula- Popula- The tion.~~

~~History.~~

~~NE Y—~~

~~24°33 per cent. ; in Scotland, 10°77; in Ireland, 10°08; in Wales, 0°40; in Australia and Tasmania, 3°53; in British America, 0°73; in other British possessions, 0°82; in Denmark, Sweden, and Norway, 0°97; in Germany, 0°98; in United States, 0°35; in China, 1:03; and elsewhere, 0°41.~~

~~The excess of immigration over emigration for the ten years 1872-81 was 4973, 8811, 38,106, 25,270, 11,955, 6376, 10,502, 18,723, 7231, and 1616 persons respectively. The great decrease in the last two years is owing to the stoppage, almost wholly, of immigration at public cost.~~

~~The proportionate number in 1881 of occupied European holdings of land, exclusive of crown pastoral leases, classified according to size is as follows: — holdings over 1 acre and up to 10 acres in- clusive, 7680 ; thence up to 50 acres, 6498; to 100, 4462; to 200, 5066 ; to 320, 2453; to 640, 2258; to 1000, 828; to 5000, 1097; to 10,000, 185; to 20,000, 169 ; to 50,000, 111; to 100,000, 18; and above 100,000, 7 ; total, 30,832.~~

~~It has always been difficult to collect the number of the aboriginal population. In 1878 the number returned was 438,595; in 1881 44,097, of whom 19,729 were females. Those residing in the North Island were 22,872 males, and 18,729 females. The apparent increase in 1881 is believed by the registrar-general to be attributable to omissions in 1878. His conclusion is that on the whole there was a decrease from 1878 to 1881. If former estimates, partly conjectural, are at all correct, the decrease during the last forty years has been considerable. The comparatively small pro- portion of females under fifteen years of age to the total population of both sexes in 1881, given as 15°35 per cent., renders future increase improbable. Generally, Maoris are in form middle-sized and well-made. They show great aptitude for European habits. The Maoris are of Polynesian race ; and the probability is that they migrated from the Navigators' Islands to Rarotonga, and thence to New Zealand. Their tradition is that they came originally from '**Hawaiki." This may be the Hawaiian or Sandwich Islands ; but there is also ''Savii," which isa dialectical form of the other name, in the Navigators' Islands. Dr Thomson, in his Story of New Zealand, quotes a Maori tradition, among those published by Sir George Grey, that certain islands, among which it names Rarotonga, Parima, and Manono, are islands near Hawaiki. The natives of Rarotonga state that their ancestors came from Hawaiki; and Pirima and Manono are the native names of two islands in the Navigators' group. The alinost identical languages of the Rarotonga natives and the Maoris, as well as other circumstantial evidence, strengthen the supposition. The distance from Rarotonga is about 3000 miles ; and, with the aid of the trade wind, large canoes could traverse the distance within a month. A comparison of genealogies of Maori chiefs of different tribes shows that about eighteen genera- tions, or probably not much more than five hundred years, have passed since the first migration. The origin and distribution of the Polynesian race cannot be discussed here,~~

~~but there is in some respects a remarkable likeness in the customs, appearance, and character of Maoris and of Malays.~~

~~The Maoris, before their conversion, had no idea of a Supreme Being. Their notion was that all things had been produced by pro- cess of generation from darkness and nothingness. They believed that the spirit survives the body, and retires to some place under the earth, whence it occasionally returns to advise and sometimes punish the living. The Maoris are divided into tribes, which respectively had their chiefs and priests. Land was held by tribal tenure, and small plots were cultivated. Hach tribe had its unwritten laws regarding land, cultivation, and other social matters. ‘“Tapu,”’ or the practice of making certain things sacred, —a rule, the breach of which was severely punished by spirits and men,—was an essential element in their. code of law. Tribes were constantly fighting with each other ; and the chief causcs of strife arose from alleged wrougs to property and person. Cannibalism was practised from vindictive feelings. Slaves were captives in war. The dead bodies of chiefs were put away on stages ; and in course of time the bones were collected and hidden in secret places. The Maoris have a genius for war, and show great ability in building, fortifying, and defending stockailes.~~

~~The Maori language isa Polynesian dialect. It closely approaches that of the Sandwich Islands, of the Navigators’ group, and of Rarotonga. Natives of these mutually understand each other.~~

~~The first European discoverer of New Zealand was Tasman, in 1642, who did not, however, land there. Captain Cook, in 1769, was the first European who set foot on its shores, and he took formal possession of the country for King George III. Cook visited New Zealand several times, and circumnavigated the coasts in the course of his three voyages of discovery, exploring and partly sur- veying the general outline. He introduced several useful animals and plants; and pigs, fowls, potatoes, turnips, and cabbages, first brought by him, increased and multiplied. From the time of Captain Cook’s final departure from New Zealand in 1777 to 1814, little is known of the country, except that, owing to the ferocity and cannibalism of its aborigines, it was a terror to sailors. In 1814~~

~~the Rev. Samuel Marsden, colonial chaplain to the Government of |~~

New South Wales, first established his chureli mission in New Zealand at the Bay of Islands. He was followed by others ; and both Protestant and Roman Catholic missions were formed. In the course of the following thirty years almost the whole native population was converted, nominally at least, to Christianity. There was in after years a considcrable relapse ; but the results of missionary teaching were, as a whole, great and permanent. Cannibalism ceased, and the barbarous nature of the race became softened and capable of civilization. The missionary paved the way for the colonist.

In February 1840 an assemblage of chiefs at the Bay of Islands signed the treaty of Waitangi acknowledging their submission to the queen of England ; and Her Majesty guaranteed their possessions, extended to them her protection, and imparted to them the rights and privileges of British subjects. This treaty was shortly after- wards signed by many other chiefs in other parts of both islands. Cavil as persons may at the treaty, there is no doubt that it is the honourable and equitable agreement on which New Zealand first became a British colony. The leading features of the colonization of the country, so far as the natives are concerned, can only be most briefly summarized here. The rights of the natives to their lands have been fully recognized by the crown; and no land has been alienated from them without their consent except in the case of the confiscated blocks which were taken under the authority of a special law from rebellious tribes. The native title to land has not been eonfined to that in actual use, but has extended over waste territory. The Government and the legislature have always been disposed to consider favourably native interests ; and special action has often been taken for that object. Mistakes have, no donbt, often been made on both sides; and serious disputes have arisen. Native tribes, here and there, have been in active insurrection, but at no time have the natives, as a racc, been arrayed in arms against Britain. A large majority has either been passive or friendly. The most serious disturbances took place in 1863 and 1864. During that time several British regiments and ships of war were, in common with the colonial forces, actively engaged in their sup- pression. No impcrial soldiers have been stationed in New Zealand since 1869. The colony has from that date altogether provided for its internal defence. The present state of native affairs is peaceful, and likely, with

ordinary prudence, to remain so. In many dis- tricts the gradual amalgamation of the two races is hopeful, natives and Europeans co-operating with each other in a common civiliza- tion. (W. GI.)

NEY, Micwen (1769-1815), one of the bravest of Napoleon's marshals, was born at Saarlouis on January 10, 1769. His father, who had been a soldier, gave him a fairly good education, and obtained for him an appoint- ment in some neighbouring mines. But his heart was set on the army, and in 1787 he went to Metz and enlisted in a regiment of hussars. But for the Revolution he could never have become more than a sergeant, but in the new state of things he was elected heutenant, and after- wards (1792) captain of his regiment. He was aide-de- camp to General Lamarque in March 1793, and soon after became lieutenant-colonel, when Kléber perceived his eminent military ability, and made him adjutant- general in August 1794. He was promoted colonel in September, and his merits were so great that Jourdan and Kléber actually quarrelled which should have the advant- age of his services. In February 1795 he might have become general of brigade, but modestly refused the rank, alleging his own unworthiness. He commanded the advanced guard of Kléber at the battle of Altenkirchen, and was made general of brigade on the field of Forchheim. He then commanded the right wing of Hoche's army, and in 1798 took Mannheim. Sent next to Switzerland, he there reorganized Masséna's cavalry, and immensely dis- tinguished himself in Masséna's great campaign, in which he was three times wounded, and after which he was made general of division. In 1799 he commanded on the Rhine, and by his skilful operations obtained the armistice during which the coup d'état of Brumaire took place. In 1801 he was present at Hohenlinden, and in May 1802 he married Mademoiselle Auguié, whom Josephine had chosen for him at Bonaparte's request. He became inspector- general of cavalry, and, after a short residence as minister in Switzerland, commandant of the camp of Montreuil. It was while there that in the name of the army he begged Napoleon to declare himself emperor, and on the establish-

ment of the empire he was made marshal of France and grand cross of the Legion of Honour. In 1805 he com- manded the 6th corps of the grand

~~army, and by his victory at Elchingen, for which he was made duke of Elchingen, secured the surrender of General Mack at Ulm. He was then ordered to the upper Adige, and missed the battle of Austerlitz, but was present at Jena and Eylau, and was so instrumental in winning the battle of Friedland that Napoleon called him the brave des braves, and gave him the grand eagle of the Legion of Honour. In 1808 he was ordered to Spain with the 6th corps, and received the command of Galicia, which he managed to keep in subjec- tion to the French in spite of the mountainous nature of the country. In 1810, in command of a corps d'armée under Masséna, he advanced into Portugal, but he was so disgusted at being under Masséna's command that per- petual quarrels resulted, and not only were the French defeated at Busaco, but Ney, when conducting the last column on the retreat from Torres Vedras, received more than one repulse from Lord Wellington at Pombal, Redinha, and Foz d'Aronce. For his opposition to Masséna Ney was recalled from Spain, but received the command of the 3d corps in the grand army of 1812. At the battle of the Moskva he so distinguished himself that he was made Prince de la Moskowa on the field, and in the disastrous retreat from Moscow it was Ney who com- manded the rear-guard, and kept the relics of the grand army together. He served at Liitzen and Leipsic, and in the last defensive campaign of 1814, and with Macdonald remained faithful to Napoleon to the last. At the Restora- tion he was made a peer, and in 1815 was given the command of the army sent to check Napoleon on escaping from Elba. But the sight of the old colours and of his old master was too much for him, and he led his troops over to Napoleon's side. In the Flemish campaign he fought the battle of Quatre Bras against the English on the same day that Napoleon defeated the Prussians at Ligny, and at Waterloo he commanded in person the last charge of the Old Guard. He made no attempt to leave France, aud was arrested as a traitor; on December 5 he was found guilty of high treason by the House of Peers by 169 votes to 17, and two days later he was shot in the gardens of the Luxembourg. His execution caused a cry of horror ; while no one would have regretted the death of Fouché or many another of the innumerable traitors, it is to be lamented that Ney was chosen to suffer, whose honesty was well known, and had only once failed him.~~

~~The character of Ney was that of a simple soldier; intensely brave, though without the rash impetuosity of a Murat, he was yet as modest as he was~~

brave; as a general his conduct of the two retreats from Portugal and Russia are his chief titles to fame; and, if he was not faithful to the Bourbons, he paid with his life for his defection.

See Mémoires du Maréchal Ney, publiés par sa Jamille, Paris, 1833, which go down to the capitulation of Ulm, and were translated into English in 18383; Vie du Maréchal Ney, Paris, 1816; Histoire complete du proces du Maréchal Ney, 1815, English translation, 1816; A. Delmas, Mémoire sur la révision du proces du Maréchal Ney, 1832; and Military Studics by Marshal Ney written for the use

of his ojicers, translated by C. H. Caunter, with notes by Major A. James, London, 1833.

NIAGARA, a river in North America forming a por- tion of the great lake and river system known as the St LawRENCE (q.v.), flows northward from Lake Erie (573 feet above sea-level) to Lake Ontario, separating the State of New York from the province of Ontario in Canada, and within the 33 miles of its course makes a total descent of 328 feet. On issuing from Lake Erie the river is only about three-fourths of a mile broad, and for the first two miles is somewhat swift ; it then divides and passes round Grand Island, broadens and assumes the tranquillity of a

lake until the commencement of the rapids, where it sud- denly narrows and makes a descent of about 52 feet in the mile before its hurried and troubled waters are precipitated over a lofty chasm forming falls of unexampled grandeur. The breadth of the river immediately be- fore making the leap is 4750 feet, but the centre is occupied by Goat Island, rising about 40 feet above the water, and oc- cupying a breadth of about 1000 feet, a distance of abou

double that distance | 7 from the Canadian Al side, while the length at of the verge line be-) tween the island and the Canadian side is moreover increased by an inward horse- shoe curve. The height of the fall on the American side is about 164 feet, and on the Canadian side about 150 feet; the dis- charge is about 18,000,000 cubic feet per minute. The waters

~~plunge into an abyss about 1000 feet wide, and during the next seven miles make a descent of about 104 feet through a deep ravine with perpendicular banks rising toa height of from 200 to 350 feet, the breadth of the river varying from 250 to 400 yards. Three miles below the great falls the whirlpool rapids are formed by a sudden turn in the channel causing the waters to impinge against the Canadian shore, where they have made a deep indenta- tion, and to rush back to the American side in a great whirl or eddy, rendered more furious by the uneven bed of the river, and the narrow space into which it contracts. After issuing from the gorge at Lewiston the river enters on a tranquil course, which continues to Lake Ontario. The point where thé gorge ceases marks the termination of a table-land in an escarpment facing northwards ; and it has been generally held that the falls were situated here at the time when the river first began to flow, that is, subse- quently to the great Ice Age. Recent study has suggested a much more complicated theory, making a great part of the gorge older than the Ice Age, and thus reducing the period for which the modern river has flowed from several hundred thousands of years to one-tenth of that time. The rate of recession is very uncertain; while it would appear from the best maps that some parts have receded at least 100 feet since 1841, others have remained more or less stationary. At the present site of the falls the edge of the cataract is formed by strata of hard limestone reaching to a depth of about 80 feet; and by the action of the spray the softer shaly strata below have been hollowed out so as to form the "Cave of Winds," which may be entered from the Canadian side. The river is crossed by a suspen- sion bridge for foot passengers, about 250 yards below the falls, and a mile and a half farther down by two railway bridges about a hundred yards apart,—one of which has a carriage way 18 feet below ; the other, a cantilever bridge, completed in December 1883, carries a double line of rails. The name Niagara (''thunder of waters'') is the invention of an Indian tribe who adopted it as their own designation, from the fact that it was descriptive of the remarkable natural phenomenon~~

~~situated within their territory. This tribe, on account of their peace- ful proclivities, were also called the Neuter Nation; but, to avoid~~

~~Niagara River.~~

the fury of the Iroquois, they finally joined them in 1723 against the Hnrons, and from this time they ceased to exist as a separate tribe. The first printed allusion to the cataract is in the record of a voyage by Jacques Cartier in 1535. Its position was first mentioned by Samuel Champlain in a map attached to his voyages published in 1613. The earliest description is that by Fathcr Hennepin, who visited it in 1678, and published an account of it accompanied with a sketch giving a view of a third fall on the north side cansed by the presence of a large rock on-Table Rock. The rock and cascade are mentioned by Kalm the Swedish naturalist, who visited Niagara in 1750, but they had disappeared a few years previously. Some writers indeed mention as many as six falls, and there can at least be no donbt that within the last two hundred years the aspect of

origin, meaning in that language "great eaters," with reference, as is supposed, to their cannibalistic propensities. The most general national name is Zandey (pl. A-Zandey), which seems to be current throughout the eastern Niam- Niam domain, a region estimated by Schweinfurth (11. p. 4) at about 48,000 square miles, with a population of at least two millions. But these by no means constitute a uniform ethnical group, for within this area is the large A-Madi nation,? differing altogether in speech and even in some respects physically from the ordinary Niam-Niam

the falls has been greatly altered. Goat Island extended, up to a comparatively recent period, for about another half mile northerly in a triangular prolongation ; and the number of small islands was perhaps larger than at present. Large masses fell in 1818, 1828, 1843, and 1847, and in June 1850 Table Rock disappeared.

See Sir Charles Lyell, Travels in North America, 1845; George W. Holley, Niagara, 1880; paper by Professor Tyndall on "Niagara" in Macmillan's Maga-

zine, vol. xxviii. (May 1873); paper by G. W. Holley in Scribner's Magazine

~~(August 1876); Dr Julius Pohimann, Life History of the Niagara River, 1883.~~

~~NIAGARA FALLS, a village of Niagara county, New~~

~~York, situated at the Niagara falls, opposite Drummondville (on the Canadian side), and a mile and a half above the contiguous village of Suspension Bridge, formerly Niagara City, which is connected by a suspension bridge with Clifton (on the Canadian side), At Niagara Falls there are grist mills and machine shops. of Niagara Falls was 3320, and that of Suspension Bridge 2476. Both villages are largely frequented by visitors.~~

~~NIAM-NIAM, a numerous and widespread Central~~

~~African race, who were first visited by John Petherick in 1858, and have since been more fully described, especially by Piaggia, Dr Schweinfurth, Dr W. Junker, Potagos, and G. Casati. But none of these explorers have penetrated more than a few miles from the upper Nile and Welle basins into the Niam-Niam domain, which consequently still remains for the most part an unknown land. Its limits are determined on the east by the Bongo and Monbuttu territories, about 28° E. long., and on the north as far as 20° E. long. by Dar-Fertit and Dar-Banda, about 7° N. lat. But in other directions they extend for unknown distances on the south towards the middle Congo, westwards along the Kuta (upper Shari?) probably to the Fan country, which is now known to stretch from the Ogoway basin for a vast space towards the north-east. Nearly the whole of equatorial Africa, from the neighbour- hood of Lake Albert Nyanza to the Atlantic, east and west, and from the Congo to the headwaters of the Shari, south and north, would thus appear to be divided between the two great cannibal nations of the Fans on the west and Niam-Niam on the east. Their common cannibalism, combined with some other characteristics, has suggested a possible ethnical relationship of these two peoples, which, however, has not been confirmed by a close examination of the respective physical types. The Fans, like the Fulahs of Soudan, seem to be fundamentally distinct from the Negro stock, although more or less affected by Negro elements, whereas the Niam-Niam, notwithstanding certain marked peculiarities, cannot be severed ethnically from that connexion.~~

~~Affinities have also been sought for them amongst the~~

~~neighbouring Krej tribes, amongst the Nubas of Kordofan'~~

~~and the Nile, and even amongst the Soudanese Fulahs, but, in the absence of more ample details, any attempt to determine the relations of the Niam-Niam to the surrounding peoples must be regarded as premature.~~

~~The term Niam-Niam, by which they are best known! to the neighbouring populations, appears to be of Dinka~~

~~1 Not exclusively, for they are called Babungera by the Mangbattns (Monbuttus), A-Madyaka by the Dyurs, Mundo or Manyanya by the Bongos, Makkarakka or Kakkaraka by the Mittus. But Niam- Niam, pronounced Gnani-gnam (Ital. gn), has been adopted and gene- ralized by the Soudan and Nubian Mohammedans.~~

~~In 1880 the population~~

~~type. Apart also from numerous tribal divisions, the eastern Niam-Niam proper form three very distinct branches, presenting considerable varieties in appearance, language, usage, and general culture. The bleak, northern highlands bordering east on the Bongos and north on Dar- Fertit are occupied by the Banda Niam-Niam, a rude and savage people, rather of a black-brown than of a red com- plexion, omnivorous in taste, devouring apes, reptiles, insects, and apparently human flesh, practising circumcision, and wearing a broad strip of bast or even mere foliage round the loins. These are succeeded southwards by the more civilized Belanda Niam-Niam, who hold the fertile hilly territory about the headwaters of the Abu-Dinga, Beri, Dembo, and other western tributaries of the White Nile. They are of a very dark red or coppery colour, of middle size, and somewhat regular features, betraying distinctly Negro blood chiefly in their woolly hair and thick lips. Their costume is even more scanty than that of the Banda, but special attention is paid to the hair, which often presents the most elaborate designs, more picturesque than conducive to the comfort of the wearer. They cultivate durrah, maize, sesame, bananas, batatas, and are skilled wood and ivory carvers, and workers in iron, producing knives, spears, chains, bracelets, and other ornaments in this metal, which abounds~~

~~in their country. Very different from either of the foregoing are the so-called "White" Niam-Niam, neighbours of and probably often confounded with the already mentioned A-Madi of the Makua-Welle river basin. The complexion seems to be more of a bronze tint, and they are distinguished from the other branches of the family by their tall stature, sym- metrical figure, long kinky hair and beard, and higher social culture. They wear cotton garments, obtained by barter for ivory, copper, and iron, are fond of music and dancing, occasionally form powerful political states, which, however, are liable to disintegration at the death of the founder,' and in many respects present certain affinities with the Baghirmi and other Negroid peoples of the Chad basin. But so little is yet known of the institutions and internal condition of the Niam-Niam race that these divisions cannot be accepted as finally established. At the same time there can be no doubt at all about the existence of a very distinct Niam-Niam type, which is one of the most marked in the whole of Africa. 'These beings," remarks Schweinfurth, on his first introduction to them,~~

~~2 Visited by Dr W. Junker in 1882-83, and described by him in Petermann's Mittheilungen for May 1883.~~

~~3 About the middle of this century most of the castern Niam-Niam lands appear to have been subject to Yapaty, son of Mabengeh. But after his death they were distributed amongst his seven sons, Renjy, Balia, Perkye, Tombo, Bazimbey, Manuba; and in 1870 there were already fourteen reigning princes of this dynasty, besides several others of doubtful relationship with the line of Mabengeh. In the Niam-Niam districts visited by the traders from Egyptian Soudan there were at that time altogether as many as thirty-five independent chiefs. But reports were current of a very powerful " sultan " named Mofio, whose empire lay some 300 miles farther west. Another large state, founded in the Welle region by Kipa (Kifa), brother of Yapaty, also fell to pieces after his death in 1868. The powerful chiefs Bakangoi and Kanna, visited in 1888 by Casati, are sons of this Kipa, whose grave near Kanna's village is still watched by twenty-five '* vestals," bound, under penalty of death, to keep a fire constantly burning, and to pre- serve their chastity inviolate (Zsploratore, sary 1883).~~

"stood out like creatures of another world . . . a people of a marked and most distinct nationality, and that in Africa and amongst Africans is saying much " (i. p. 487).

Their most salient characteristics appear to be—great space be- tween the orbits, giving them at once a peculiarly savage and frank expression ; very short nose, with correspondingly long upper lip ; woolly hair much longer thau that of any other Negro people; head of @ pronounced brachycephalous type, agreeing in this respect with the Bongos of the White Nile, but differing from the great majority of the other African dark races, who are distinctly dolichocephalic ; features generally round, less prognathous, and altogether more regular than the typical Negro ; ruddy brown or chocolate colour, like that of a cigar, scarcely ever black, but occasionally bronze and even olive (Pctherick) ; symmetrical figures, about the middle size, robust and active. These points seem to indicate a large com- mingling of Negro and foreign elements, but in what proportion and from what source it would be unsafe to conjecture in the absence of trustworthy anthropometrical data. At present all that can be said with any certainty is that the A-Zandey are to be regarded as rather of mixed Negroid than of pure N egro stock.

Their traditions, customs, political and religious institutions, and general culture seem to point at the same conclusion. The savagery of most tribes, their pronounced caunibalism, agricultural and hunting rather than pastoral habits, universal belief in sorcery and fetichism, may be credited to the N egro element, while to foreign influences may be attributed their great intelligence, shown especi- ally in the skilful structure of their dwellings and in the remarkable taste and proficiency displayed in the native industries. Prominent among these are their earthenware vessels of faultless symmetry ; iron-smelting and metal works such as scimitars, knives, and spears; wood carvings such as stools, ben ches, bowls, tobacco pipes of varied and intricate design, and often "admirable works of art" (Schweinfurth). It may also be stated that their reputation for extreme ferocity appears to have been greatly exaggerated by early report, although on the other hand the charge of cannibalism in its very worst forms has been

fully confirmed by the latest Kuropean observers. Nevertheless the A-Zandey, who everywhere present those sharp contrasts of habits and temperament so characteristic of mixed races, are distinguished by some excellent qualities, such as frankness, courage, an instinctive love of art, and abeve all a genuine and lasting affection for their women, such as is betrayed by no other African race. 'A husband will spare no sacrifice to redeem an imprisoned wife; and the N ubians, being acquainted with this, turn it to profitable account in the ivory trade. They are quite aware that whoever possesses a female hostage can obtain oe any compensation from a Niam-niam " (Schweinfurth, i. p. 472).

Beyond a few meagre vocabularies no materials have yet been collected for the study of the Zandey language, which, except in the A-Madi country, appears to be everywhere spoken with con- siderable uniformity in the eastern N iam-niain lands. Its phonetic system, such as initial mb and vowel auslaut, affiliates it, not to the Libyan, as has been asserted, but to the Negro linguistic type. Within this order of speech its pronominal prefix inflexion points to affinity rather with the southern Bantu than with the Soudan group of languages. Thus the personal plural a-, as in A-Zandey, A-Madi, A-Banga, &c., would appear to be identical in origin and meaning with the Bantu wa-, as in Wa-Ganda, Wa-Swaheli, Wa- Zambara, &c. There is also the same dearth of abstract terms, which renders the translation of Scripture into the N. egro tongues such a hopeless task, Compare gumbah, an expression for the deity, really meaning "lightning," with the Chinyanja chuuta=thunder = God (2) and the Zulu Onkulunkulu= great-grandfather, also adopted by the missionaries as the nearest equivalent for the deity in that language.

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" Rundreise in dem siidlichen Niamniam-Lande," in Petermann's Mittheilungen for May 1883, PASH Ke

NIAS ISLAND. See Suararra.

NIBELUNGENLIED, or Nisetuner N6t, a great epic poem written in a Middle High German dialect. The story told in this poem belonged in its primitive form to the whole Teutonic race, and was composed originally of purely mythological elements. It is touched upon in Beowulf, and forms the most important subject of the old Norse poems, in which it is presented in fragments,—the poets having apparently assumed that the tale as a whole was known to every one, and that their hearers would be able to put each incident in its proper place. It is also set forth in the prose Edda and in the Thidrekssaga, which

belongs to the 13th century. The substance of the story in its Norse form is as follows. Beside a waterfall the three Anses—Odin, Loki, and Hénir—see an otter devour- ing a salmon. They kill it, and taking its skin with them seek shelter for the night in the house of Rodmar. He recognizes the skin as that of his son Otter, and demands that as much gold as is necessary to cover it shall be de- livered to him as " wergild." In a net Loki catches the dwarf Andwari in the shape of a pike, and compels hini to pay for his ransom a great treasure, which covers the whole of the skin except one hair. In order to cover this hair Loki takes from the dwarf a magic ring which breeds gold, and Andwari, enraged, curses the hoard. His curse attends it to the last, and begins to operate immediately, for Rodmar, who claims for himself the whole of the "weregild," is slain by his sons, Fafnir and Regin. Fafnir takes possession of the hoard, and in the form of a snake guards it on Glistenheath. Regin, indignant at being deprived of his share, calls to his aid Sigurd, a young hero for whom he makes the sharp sword Gram ; and, armed with Gram, Sigurd goes to Glistenheath and kills Fafnir. While Sigurd is roasting Fafnir's heart, which Regin has cut out, the fat dropping into the fire burns his finger, and putting the hurt part into his mouth, he finds that he has suddenly obtained the power of understanding the language of birds. He thus learns that Regin intends to act treacherously towards him. Sigurd therefore slays Regin, and rides away with the hoard in two bundles on his horse Grani. In a houseona hillhe finds the Walkyrie Brunhild in an enchanted sleep, from which she awakes, and plights her troth to Sigurd, who loves her ardently. Coming to the court of Giuki, a king of the Rhineland, Sigurd forms a friendship with Giuki's sons, Gunnar,

~~Hégni, and Guthorm. Gudrun, Giuki's daughter, being fascinated by the stranger, gives him an enchanted drink which causes him to forget Brunhild, and then he and Gudrun are married. Gunnar wishes to make Brunhild his wife, and asks Sigurd to go with him in quest of her. Flames encompass her tower ; and she will accept as her husband only the hero who shall succeed in riding through them. Gunnar makes the attempt in vain ; but Sigurd, mounted on Grani, has no difficulty in passing to Brun- hild, with whom he exchanges rings, giving her the ring of the dwarf Andwari. Sigurd, however, has assumed the form of Gunnar, and Brunhild supposes that it is by Gunnar she has been won. All of them return to Giuki's court, Sigurd having taken his own form again, and Brunhild having become Gunnar's wife. Here a quarrel breaks out between Brunhild and Gudrun, the former contending that Sigurd's position is inferior to that of her husband, while Gudrun retorts by telling her rival that it was Sigurd who rode through the flames. Brunhild, maddened by jealousy, in- cites Guthorm, Gunnar's brother, to murder Sigurd ; and twice Guthorm glides into Sigurd's chamber to accomplish her will, but departs when he finds Sigurd awake and gazing at him with flashing eyes. The third time Sigurd is asleep, and Guthorm stabs him. Sigurd, before dying, has just strength enough to throw his sword after. the murderer, whom it cuts in two. Brunhild laughs at the desolation she has wrought, but all the time she has loved Sigurd, and she kills herself with the sword that has slain him, and is burned with him on his pyre. By and by Gudrun takes as her second husband Atli, Brunhild's brother, king of the Huns. Ati asks her brothers, Gunnar and Hoégni, to visit him ; and, notwithstanding her warnings, they accept his invitation. He demands of them Sigurd's hoard, which he claims as Gudrun's pro- perty ; but before leaving home they have buried it beneath the Rhine, and they refuse to say where it is con- cealed. After a fierce' contest in which all the followers of~~

~~NIBELUN~~

~~Gunnar and Hiégni fall, Atli renews his demand, promising to spare Gunnar's life if he will reveal the secret. Gunnar declines to do so until he sees the heart of his brother Higni. The heart of a slave is laid before him, but he declares that it cannot be Hégni's, since it quakes. Higni's heart is then cut out, the victim laughing in the midst of his pain; but Gunnar is still resolute, proclaim- ing that he alone knows where the hoard is, and that no~~

one shall share the knowledge with him. His hands being bound, he is put into the court of serpents, where he plays so sweetly on a harp with his toes that he charms all the reptiles except an adder, by which he is stung to death. Gudrun avenges the murder of her brothers by killing the sons she has borne to Atli, and causing him unwittingly to drink their blood and eat their hearts. In the night she kills Atli himself, burns his hall, and leaps into the sea, by the waves of which she is carried to new scenes, where she has adventures not connected with those recorded in the Nibelungentted.

The tale of which this is one version, pieced together from many poetical fragments, assumed different forms until it was put into its final shape in the Nibelungenlied. The heroine of the German poem is Kriemhild, who represents Gudrun. She lives at Worms, the capital of the Burgundian kingdom, with her brothers Gunther, Gernot, and Giselher, of whom the eldest, Gunther, is king of the Burgundians. To Worms comes Siegfried (an older form than Sigurd), the son of Siegemund and Siegelind, the king and queen of the Netherlands. Siegfried possesses the magic hoard, but he does not obtain it as Sigurd obtains it in the Norse form of the tale. He takes it from two princes of Nibelungen-land, to whom it has been bequeathed by their father, King Nibelung. Quarrelling as to their respective shares, they appeal to Siegfried to decide between them; and he, irritated by their unreasonableness, kills them and seizes the treasure, together with the sword Balmung and the Tarnkappe, or cloak of darkness, which renders the wearer invisible and gives him the power of twelve men. Although this is how the hoard comes into his hands, he is still represented as slayng a dragon, in whose blood he bathes, being thus rendered invulnerable except in one spot between the shoulders, on which a leaf falls before the blood is dry. At the Burgundian court Siegfried wins the hand of Kriemhild; but before their marriage he establishes a claim to the gratitude of King Gunther, the lover of Brunhild, the young and stalwart queen of Iceland, who requires that any one wishing to be her husband shall surpass her in three games. Gunther and Siegfried with their followers sail to Iceland ; and with the aid of Siegfried, who during the trial of skill and vigour makes himself invisible by donning the Tarnkappe, Gunther overcomes the powerful maid. On the night of the wedding Brunhild scoffs at Gunther, struggles with him, binds him, and lets him hang on the wall ignominiously until the morning. Next night, with- out the knowledge of Brunhild,

Siegfried goes to the help of his friend, and as a token of his conquest takes her ring and girdle, after which she is incapable of giving Gunther further trouble. Siegfried and Kriemhild then go to the Netherlands, where they live for some years in perfect happiness and with great splendour, the Nibelungen hoard being sufficient to provide them with the means of lavish display. Invited to visit the Burgundian court, they quit Santen, the capital of the Netherlands and Siegfried's birthplace, and, attended by a brilliant retinue, make for Worms. Up to this point the tone of the poem is bright and cheerful; we now begin to see the working of tragic forces which from petty complications lead to strife and disaster. Brunhild, who is of a proud and sullen temper, has always shown bitter animosity towards Siegfried,

Giant i lh D 475

whom she is represented as recognizing when they meet in Iceland. She insults Kriemhild by vaunting the superior greatness of Gunther, and by claiming precedence. Kriemhild resents these pretensions, and in an animated scene before the cathedral of Worms asserts her right to enter first with her attendants. The quarrel becoming furious, Kriemhild pretends that Siegfried had taken an unfair advantage of Brunhild on the night when he had fought with her in her bridal chamber, and produces the girdle and ring (of the seizure of which Brunhild had been unconscious) as evidences of her disgrace. In vain Siegfried tries to restore harmony by rebuking his wife for this malicious invention: Brunhild is too deeply wounded to forgive so bitter a wrong, and meditates a fearful vengeance. At last she decides that Siegfried shall die ; and Hagen, one of Gunther's bravest warriors, under-takes to do her bidding. Inducing Kriemhild to tell him where her husband is vulnerable, he achieves his purpose during a hunting expedition, from which Kriemhild, warned by a dream, has entreated Siegfried to stay away. Kriemhild is overwhelmed with grief and rage, and the rest of the story relates chiefly to her thirst for revenge, and the manner in which she slakes it. For thirteen years she remains quietly at Gunther's court. Then Riidiger, margrave of Bechlaren, appears as the ambassador of Etzel (Attila), king of the Huns, and entreats Kriemhild to be- come Etzel's wife. She consents, and again thirteen years pass without any important incident. At the end of that time Gunther and his followers are invited by Etzel and Kriemhild to the land of the Huns; and, despite super- natural intimations and Hagen's

~~presentiments, they resolve to go. The ultimate result is that in a terrible conflict the Burgundian visitors are destroyed. When all of them have fallen save Gunther and Hagen, these survivors are overcome by Dietrich, a resident at Etzel's court, and delivered by him to Etzel and Kriemhild. The closing scenes are complicated by reference to the hoard of the Nibelungen, which had been taken after Siegfried's death by Gunther as Kriemhild's brother. In virtue of his pos- session of it he and his people are called Nibelungen ; but he possesses it only in name, for Hagen, who had brought it to Worms, fearing that it would work evil, had buried it (as Gunnar and Hégni are represented to have done) beneath the Rhine. Kriemhild commands Hagen to reveal its resting-place, but he answers that he has sworn not to tell the secret as long as the king lives. The head of Gunther being exhibited to him, he still refuses; where- upon, snatching the sword Balmung, which Hagen has used since Siegfried's death, Kriemhild rids herself of her enemy by beheading him. Immediately afterwards she herself is killed by Hildebrand, a Hunnish warrior, who is horrified by her savage cruelty.~~

~~Many elements embodied in the Norse rendering of the primitive tale are retained in the Nibelungenlied ; and, indeed, it is impossible to understand the latter thoroughly without reference to the former. For instance, the recognition of Siegfried by Brunhild in Iceland, and her misery in beholding his happiness with Kriemhild, are unintelligible until we know that Siegfried and Brunhild are supposed to have been lovers before the action of the poem begins. Again, we cease to be puzzled by the malign power of the hoard only when we learn how an evil fatality has been associated with it by the wrath of Andwari. After all, however, the points in which the later version agrees with the earlier one are not more remarkable than those in which they differ. In the Norse poems the only historical character is Atli or Attila; but in the Nibelungenlied Attila (Etzel) is associated with Theodoric the East Goth (Dietrich), while the relations of Gunther to Siegfried seem to be a reminiscence of the absorption~~

~~of the Burgundian kingdom by the Franks. almost all the mythological features of the tale have dis- appeared, ethical influences having become~~

more prominent. The curse on the hoard is little more than a picturesque survival, for although it symbolizes, sometimes very effec- tively, a kind of mysterious fate in the background, the destinies of the various characters would not have been different if it had been altogether omitted. If the characters are less grand, they are more human; and their motives have a closer resemblance to those represented in modern poetry. It is true that Kriemhild works as much desolation as Gudrun, but her cruelty is not so revolting, and it does not spring, like Gudrun's, from passions ex- cited by a blood-feud, but from wounded love.

The Wbelungenlied is composed of stanzas of four lines, the first line rhyming with the second, the third with the fourth. ach line is divided into two parts by the cesura, the first part having four accents, the second part three, except in the last line, where the second part has also four accents. Some of the rhymes indicate poverty of resource, and the diction is very simple ; but the poet displays much artistic skill in the handling of the traditions which it was his task to weave into a continuous narrative. He selects his incidents with fine tact, and almost invariably places them in relations which are fitted to bring out their full significance. Character he is able to conceive powerfully and vividly. Perhaps the only character who loses anything by his mode of treatment is Brunhild, who is certainly far less impressive in the Wibelungenlied than in the Norse poems. Kriemhild, on the other hand, is a splendid creation of imaginative genius. First we see her as a simple maid, gentle and modest ; then her powers are awakened by love; and when the light of her life is suddenly quenched all her tenderness dies. She has then but one end, to avenge her husband's death ; and for its accomplishment she sacrifices everything—repose, the possibilities of new happiness, and at last existence itself. The transitions are startling, but not unnatural in a rude age; and in the earlier stages of Kriemhild's career they are lightly and delicately touched. Towards the close, when her vengeance is being sated, the style is intensely concentrated, vivid, and impassioned ; but the change does not take the reader by surprise, for he is prepared for it even in the brightest scenes of the poem by hints of inevitable ruin. Siegfried is less complex than Kriemhild, but not less poetically presented. He isa flawless hero, strong, brave, loyal, and generous; and it is possible, as some critics suppose, that in the original myth he personified the radiance of summer in conflict with the

approaching gloom of winter. Hagen is as sombre and tragic a figure as Siegfried is bright and genial ; and, notwithstanding his guilt, he commands a certain admiration, for his crimes are only a manifestation of his fidelity to the royal house he serves. Another character wrought with great imaginative power is Riidiger, who was probably introduced into the tale for the first time by the author of the Nibelungenlied. HIs part. is subordinate, but it suffices to evoke the expression of all the most. brilliant and attractive qualities of the age of chivalry.

There are twenty-eight manuscripts of the Nibelungeniied, some of them complete, others in fragments, and they date from the 18th to the 16th century, so that the poem must have been studied until about the time of the Reformation, It had been entirely for- gotten when, in the middle of the 18th century, Bodmer, the Swiss poet and critic, issued some portions of it along with the ‘‘ Klage,” a poem of the same period describing the lamentations at Etzel’s court over the fallen heroes. In 1782 C. H. Myller published the first full edition, using in the latter part Bodmer’s text. Very little attention, however, was given to the recovered epic until the writers of the Romantic school began to interest themselves in

medieval literature, Then the Nibelungenlied was read with enthusiasm ; and in 1807 Von der Hagen provided an improved

NIC—NIC

Moreover, | text with a glossary.

An cpoch in the study of the poem was marked by Lachmann, who in various writings contended that it consisted of twenty ancient ballads, that these ballads had been put together about 1210, that the collector or editor had connected them by stanzas of his own composition, and that in the ancient ballads themselves he had inserted unauthentic verses. Lachmann held that the Munich manuscript (A), which is the shortest, contains the purest text, and that it was extended by the authors of the texts in the St Gall manuscript (B) and the Lassberg manuscript ©. This view guided his labours in preparing his edition of the Nibelungenlied (1826) ; and the theory was for some time generally accepted. Hahn, however, in 1851, and H oltzinann, in 1854, suggested doubts whether the critical canons by which

~~Lachmann had distinguished authentic from unauthentic stanzas were valid ; and Holtzmann sought to prove that ©, the longest manuscript, not A, the shortest, is nearest the original form of the poem. This occasioned an animated controversy, in which many eminent scholars took part. In 1862 Pfeiffer gave a new aspect to the question by maintaining that in the 12th and the eatly part of the 13th century every poet considered ita point of honour to invent a new kind of stanza, and that, as we possess lyrics by the Austrian poet Von Kiirenberg, which are in the same measure as the Nibelungenlied, we are bound to conclude that he was the author of the poem. Developing this hint, Bartsch argues that the Nibelungenlied was written about 1140; that in its original form the lines ended not in rhymes but in assonances ; that about 1170 a younger poet introduced the principle of rhyme, although imper- fectly, into his predecessor's work ; that between 1190 and 1200, when rhyme was considered essential, two poets, independently of one another, completed the transformation which the second poet had begun; and that the work of the one is represented by manu- script C, the work of the other by manuscript B, of which A is an abbreviated form. Bartsch regards B (entitled Nibelunge Nét) as that which approximates most closely to the work of the first poet ; and this he has made the basis of his admirable critica] edition, published separately in two volumes, and in one volume in the series of Deutsche Classiker des Mittelalters. If Bartsch's view be correct, the poem must have been greatly injured by its successive transfor- mations. His theory is supported by the facts that assonances survive in all the manuscripts, and that the rhymes are not nearly so good as might have been expected from the creative energy with which the general scheme of the work is conceive ; The WNibelungenlied has been rendered into modern German, among others, by Simroek, Bartsch, Marbach, and Gerlach. See 11. Fischer, Die Forschungen tiber das Nibelungenlied seit K. Lachmann; and Paul, Zur Nibelungenfrage. A full oo oo résumé of the poem oceurs in the works of T. eG," Vol, Ii.). OL~~

~~NICZAA, or Nick, still called ISNIK, 7.¢., eis Nixatay, was an important town of Asia Minor, in Bithynia, on the lake Ascania. Antigonus built the city on an old deserted site, and soon afterwards Lysimachus changed its name from Antigonia to Nicza, calling it after his wife. Under the Roman empire Nicwa and Nicomedia disputed the title of metropolis of Bithynia.~~

~~After Constantinople became the capital of the empire Niczea grew in importance, and the Byzantine walls, which are still well preserved, are very extensive. On the council held there in 325 a.p. see CrEEDS and Councm. The possession of the city was long disputed between the Greeks and the Turks, It remained an important city for some time after its final incorporation in the Ottoman empire, but has decayed till it is now a poor and insignificant village. Strabo describes the ancient Nicea as built regularly, in the form of a square, with a gate in the middle of. each side. From a monument in the centre of the city all~~

~~'the four gates were visible at the extremities of great~~

~~cross-streets.~~

~~—NICANDER, a Greek poet, physician, and grammarian, succeeded his father Damneus or Xenophanes as heredit- ary priest of Apollo at Clarus, the famous temple in the territory of the Colophonians. Hence he is often called Colophonius. He wrote a great number of works both in prose and verse, of which two are preserved. The longest, Theriaca, is a poem in about 1000 hexameters on the nature of venomous animals and the wounds which they inflict. The other, Alexipharmaca, consists of 600 hexameters treating of poisons and their antidotes. The works of Nicander are praised by Cicero, and frequently quoted by Pliny and other writers. A Greek writer in the~~

~~Plate a, youl. xi.~~

~~Physical features.~~

~~NIC—NIC~~

~~Anthology celebrates the glory of Colophon as birthplace of both Homer and Nicander. The two works preserved do not justify this; they have, as Plutarch says, nothing of poetry about them except the metre, and the style is affected and obscure ; but they contain some interesting information as to ancient belief on the subjects treated. Nicander flourished probably in the 2d century B.c.~~

NICARAGUA, one of the five states of Central America, between 10° 30’ and 15° N. lat. and 88° 11’ and 87° 40’ W. long., forms an irregular equilateral triangle wedged in between Honduras and Costa Rica north and south, with base stretching for 280 miles along the Caribbean Sea from Cape Gracias & Dios southwards to the San Juan delta, and apex at the Coseguina volcano, Gulf of Fonseca, which separates it on the Pacific side from San Salvador. The frontier towards Honduras, as laid down by the treaty of 1870, runs from the Gulf of Fonseca in a north-westerly direction along the Cordillera de Dipilto to 85° W., and thence a little north of and nearly parallel with the Rio Coco (Wanks) to the Atlantic above Cape Gracias & Dios. The still contested Costa Rica frontier may be taken as practically defined by the course of the San Juan river and the south side of Lake Nicaragua to within 14 miles of the Pacific, where it is marked by a conventional line drawn across the isthmus from the mouth of the Sapoa river to Salinas Bay on the Pacific. Within these limits, and including the Reserva Mosquita (Mosquito territory), the state comprises a total area of 58,500 square miles, with a population usually estimated at 400,000, but by the census of 1882 reduced to 275,816, and distributed over ten departments, as under :—

Departments. Population. Chief Towns. | Population. “TRING Seqateosoasqncnene NG sy || TRING Skanecs pecepaonoon 10,000 Granada. .....s.---00: 51,056 | Granada……. 16,000 (2) Managua…….. 105067 |Wlansena……..- 12,000 (2) IL Gyo pnnrapeentecpenasee 23380) || 1b) Sess esonesauenasene | 25,000 Chimandesa ……..- 17,578 | Chinandega…….j 11,000 Nueva-Segovia …… BGO || Oreo coposssssessae 06 :| 8,000 (2) Matagalpa……..+.- 51,699 | Matagalpa…….. | 9,000 Chontales®.....2+s o7e7aee | Wilbertad……..- 5,000(2)| S. Juan del Norte… Tyee |) Cire viOi fills copscence | 2,000 aulleisy lahat) pameeeonoeor 36,000 | Bluefields……..) 1,000

The low. monotonous and swampy Mosquito Coast is broken by the two lagoons of Pearl Cay and Bluefields, and is fringed by a few cays (islets) and reefs, such as Great and Little Corn, Longreef, and Tangweera, which shelter no harbours, and serve only to obstruct the naviga- tion. Here the only port is Greytown (San Juan del Norte), formed by the northern branch

of the San Juan delta, and now nearly choked with sand. But the bold and rocky west coast, which extends for about 200 miles from Coseguina Point to Salinas Bay, although destitute of islands, presents a few convenient harbours, of which the chief are San Juan del Sur, Brito, and especially Realejo, which is designed as the terminus of Captain

Bedford Pim's Transatlantic route, and which Dunlop |

declares to be "as good a port as any in the known world," although of somewhat difficult access.

In Nicaragua the great geographical feature is the remarkable depression stretching for about 300 miles north-west and south-east parallel with the Pacific coast, and transversely to the Central American plateau, which it almost completely interrupts. This depression, which lies at a mean elevation of scarcely 100 feet above the sea, is now flooded by the two great lakes Managua and Nicaragua (Cocibolea), which collect nearly all the drainage

1 The figures given are official, but would appear to be understated. Tt will be observed that the population of the department is in one case closely approached and in two cases is actually exceeded by that of its chief town.

of the western provinces, discharging it through the desaguadero (outlet) of the Rio San Juan to the Atlantic. About midway between Lake Nicaragua and the Caribbean Sea, the San Juan entirely pierces the main chain of the Cordillera de los Andes, which here sweeps round the east side of the lacustrine basin at a mean height of 4000 or 5000 feet northwards to the Honduras highlands. Towards the lakes the descent is very precipitous; but on the opposite side the land falls in broad terraced plateaus down to the Mosquito coast.

Throughout its entire length the depression is traversed by a remarkable volcanic chain of isolated cones, which north of the lakes takes the name of the Maribios, termin- ating in the extreme north-west with Coseguina (4000 feet), and in the extreme south-east with the low wooded archipelagos of

Solentiname and Chichicaste near the head of the desaguadero. Between these two extremes the chief cones, proceeding southwards, are—the Maribios chain, comprising El Viejo (6000 feet), Santa Clara, Telica, Orota, Las Pilas, Axosco, Momotombo (7000 feet, highest point in the state), all crowded close together between the Gulf of Fonseca and Lake Managua; Masaya or Popocatepec and Mombacho (5700 feet), near Granada ; lastly, in Lake Nicaragua the two islands of Zapatera and Ometepec with its twin peaks Ometepec. (4100 feet) and Madera (4190 fect). Several of these are stillactive, or at least quiescent, and in 1835 Coseguina was the scene of one of the most tremendous eruptions on record. The outbreak lasted four days, during which sand fell in Jamaica, Mexico, and Bogota. After a long repose Ometepec also burst into renewed activity on June 19, 1883, when the lavas from a new crater began to overfiow, and continued for seven days to spread in various direc- tions over the whole island. The eruption was accom- panied by incessant rumblings and earthquakes, in conse- quence of which the whole population took refuge on the mainland. Mud, ashes, lavas, and rocks now cover the mountain slopes, which had been under uninterrupted cultivation for many centuries. In the Maribios district also occur several volcanic lakelets, suchas that of Masaya, besides numerous "infernillos," low craters or peaks still emitting sulphurous vapour and smoke, and at night often lighting up the whole land with bluish flames. The malpais, or barren lava-fields, here extend for miles in some directions, and no other region of equal extent probably betrays so many or so marked traces of igneous action as that portion of Nicaragua intervening between its lakes and the Pacific (Squier). Here the departments of Rivas and Granada are traversed by a low range sometimes spoken of as the Coast Range, which seldom rises above 2000 feet, and merges northwards in the magnificent plains of Leon and Conejo, that is, in the northern section of the lacustrine depression. It is crossed by three low and easy passes—at its southern extremity along the Costa Rica frontier, again between the ports of La Virgen on Lake Nicaragua and §. Juan del Sur on the Pacific, and in the north between Lake Managua near Nagarote and Tama- rinda Bay, while it disappears altogether south of Leon, where the depression reaches the coast at Realejo. our alternative routes are thus afforded for the interoceanic canal which is destined one day to connect the two seas through this great depression (see vol. iv. p. 793).

~~No rivers of any size flow westwards to the Pacific, the western provinces discharging, as already stated, mainly through the San Juan emissary to the Caribbean Sea, Yet Lake Managua, which lies 16 feet above Lake Nicaragua, and 150 (?) above sea-level, may now be regarded almost as a land-locked basin. Although nearly 50 miles long by 25 broad, with a nican depth of 30 feet, it seldom sends any overflow through the natural outlet of the Estero~~

~~Geology.~~

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~~Panaloya (Tipitapa)! down to the lower basin. It does not appear to have undergone any perceptible change of level since the conquest ; but some of its former feeders have probably been displaced by the violent earthquakes, of which this region is a chief centre. Thus the present inflow, except during high floods, is mainly carried off by evaporation. But the larger lake continues to receive the important Rio Frio from Costa Rica at its south-eastern extremity, besides numerous perennial streams, especially from the western slopes of the Cordillera de los Andes. Hence there is an abundant discharge through the Rio San Juan, a deep, sluggish stream 128 miles long, from 100 to 400 yards broad, 10 to 20 feet deep, but unfortunately obstructed by five dangerous rapids presenting insuperable obstacles to steam navigation.? The lake itself is the largest fresh-water basin between Michigan and Titicaca, being nearly 100 miles long by 40 broad and 240 feet deep in some places, but shoaling considerably, especially towards the outlet, where it falls to 6 or 8 feet. Under the influence of the intermittent trade winds it rises and falls regularly towards the south side, whence the popular notion that it was a tidal lake. It is also exposed to the dangerous Papagayos tornadoes, caused by the prevailing north-easterly winds meeting opposite currents from the Pacific.~~

~~The little-known region of rugged plateaus and savan- nas occupying fully one-half of the state between the lacustrine depression and the Mosquito Coast is watered by several unnavigable streams, all draining from the Cordilleras eastwards to the Atlantic, and all distinguished by a perplexing nomenclature. The chief are, coming southwards, the Coco (Wanks or Segovia, known in its upper course as the Telpaneca), the Wama (Sisin~~

Creek), the Rio Grande (Great River or Amaltara), the Escondida (Bluefields, Blewfields, Rio del Desastre).

From the general relief of the land, as above set forth, its geological constitution is sufficiently obvious. In the west we have the lavas, tufas, sulphurs, pumice, and other recent volcanic formations of the Maribios system. These are succeeded east of the lacustrine basin by andesite rocks, trachytes, greenstone, and metalliferous porphyries of the Cordilleras, abounding in auriferous and argentiferous quartz, especially in Chontales and the uplands of north- west Segovia. Then come the older plutonic upheavals, crystallized schists, dolerites, d&c., apparently stretching down to the Mosquito Coast region, where they appear to underlie the comparatively modern sedimentary formations and alluvia of the streams flowing eastwards to the Caribbean Sea. The Chontales gold mines, which have been intermittently worked for many years past, lie about midway between the Atlantic and Pacific between 11° and 13° N. lat. and 85° and 86° W. long., and the mining industry is centred chiefly about Libertad, capital of Chontales, and Santo Domingo in the Matagalpa district.

1 According to Baily's survey this emissary is 16 miles long, with a fall of 7 inches per mile, and a depth of 6 to 12 feet during the rains, but at other times often quite dry. Other writers have represented it as completely interrupted by a break or ridge 4 miles wide in the centre, over which no water now ever flows from the upper lake (Boyle, i. p. 249). Frébel also states that since the earthquake of 1835 the channel has been closed, although J. M. Caceres, a native of Nicaragua, positively asserts that the two basins still communicate (Centro-America, Paris, 1880, p. 60).

2 It is often asserted that these rapids were artificially formed by the Spaniards themselves to prevent the buccaneers from penetrating to Lake Nicaragua. But Herrera (Dec. iii., book 2, chap. 3) speaks of the ' 'great rocks and falls" which prevented Cordova, the first circumnavigator of the lake, from descending the San Juan in 1522, On the other hand, the English traveller Gage tells us that in his time (17th century) vessels reached Granada direct from Spain. Nevertheless there can be little doubt that the rapids are natural obstructions, representing all that now remains of the Cordilleras which have at this point been pierced by the San Juan.

~~NECARAGU A~~

~~There is very little gold washing in any of the eastern streams, the metal being found almost exclusively in the quartz lodes, which run generally east and west in closo parallel lines, varying in thickness from 2 or 3 to 20 feet, and in productiveness from a few pennyweights to 2 or 3 ounces per ton. The chief silver mines are those of Matagalpa and Dipilto towards the Honduras frontier, but the total annual yield of the precious metals seldom exceeds £40,000.~~

~~Lying at a mean elevation of 2000 to 3000 fect above Climate. sea-level, the Chontales and Segovian uplands enjoy a mild climate, generally healthy and well-suited for European constitutions. But elsewhere the climate is distinctly tropical, with two seasons—wet from May to November, dry throughout the winter months—and a mean annual temperature of about 80° Fahr., falling to 70° at night and rising to 90° at noon in summer. Nicaragua comes within the zone of the wet north-east trade winds, which sweep inland from the Atlantic, unintercepted by any great elevations till they reach the lofty Ometepec and Madera peaks. Hence the heaviest rainfall occurs along the west side of the lacustrine basin, with an annual mean at Rivas of 102 inches. Elsewhere the summer rainfall is about 90, the winter from 8 to 10 inches, The flat, low- lying Mosquito region being exposed to the inundations of the numerous streams from the Cordilleras, and to the exhalations from the stagnant waters of the coast lagoons, is very malarious, and the fever here endemic is especially fatal to Europeans.~~

~~In the volcanic western provinces the soil is extremely fertile, yielding, where cultivated and irrigated, magnificent crops of sugar, cotton, rice, tobacco, coffee, cocoa, and maize. Much indigo was produced here formerly from an indigenous variety, the Indigofera disperma, L., but this industry has been neglected since the revolu- tion. Sugar yields two or three crops, and maize as many as four, this cereal supplying a chief staple of food. Plantains, bananas, beans, tomatoes, yams, arrowroot, pine-apples, guavas, citrous, and many other tropical fruits are also cultivated, while the exten- sive primeval forests of the central provinces abound in mahogany, cedars, rosewood, ironwood, caoutchouc (ule), gum copal, vanilla, sarsaparilla, logwood, and many other dye-woods, medicinal plants, and~~

~~valuable timbers. Conspicuous amongst the forest trees is the splendid Coyol palm (Cocos butyracea, L.), with feathery leaves 15 to 20 feet long and golden flowers 3 feet, and yielding a sap which when fermented produces the intoxicating chicha or vino de Coyol. In Chontales occurs the remarkable Herrania purpurea, a ** choco- late tree," whose seeds yield a finer-flavoured chocolate than the cocoa itself. The forest growths are on the whole inferior in size to those of corresponding latitudes in the eastern hemisphere ; the tropical vegetation, especially about Nindiri and elsewhere in the west, is unsurpassed for beauty, exuberance, and variety.~~

~~The Nicaraguan fauna differs in few respects from that of the Fauna. other Central-American states. Here the jaguar, puma, and ocelot still infest all the wooded districts, alligators swarin in the lakes and in the San Juan and other rivers, while the vulture, buzzard, toucans, humming birds, and howling monkeys are almost every- where familiar sights. Amongst the endless species of reptiles occur the harmless boba or 'chicken snake," python, and black snake, the venomous corali, taboba, culebra de sangre, and rattlesnake, iguanas of great size, scorpions, edible lizards, and others said to be poisonous (Boyle). Of useful animals by far the most important are the horned cattle, large herds of which are bred on the savannas of the central and northern provinces. Their hides Trade. form one of the staples of the export trade, the other chief items of which are gold and silver bullion, coffee, and gums, amounting to a yearly sum of about £400,000, against £300,000 imports, mainly European and United States manufactured goods.~~

~~From the numerous sepulchral mounds, monumental ruins, and Pre-other remains thickly strewn over Chontales and all the western historic provinces, as well as from the direct statements of the early remains. Spanish writers, it appears that most of Nicaragua was densely peopled at the time of the conquest. In many districts colossal monolithic statues of men and gods, crumbling temples, cairns, and tombs of all sizes are met in every direction, and in some places the inhabitants stil] supply themselves with pottery from the vast quantities of fictile vessels preserved below the surface, or piled up~~

~~Vegeta- tion,~~

3 The exports in 1880 amounted to £411,500, the imports to £295,000. For the same year the revenue was £487,000, the expenditure rather more; the public debt was £700,000.

Popula- tion.

Adminis- tration.

NICARAGUA

in heaps like that of Monte Testaccio near Rome. One explorer speaks of "mountains of earthenware," and another tells us that 'around Libertad the tombs are in thousands, offering every pos- sible variety of form, size, and thickness." Monuments of this sort have been found ranging from 20 to over 170 feet in length and 120 in breadth, built of huge stones piled up 5 feet in thickness, which must have been brought from great distances. Managua appears to have had a population of 40,000; mention is made of other cities four miles in extent ; and when Gil Gonzalez penetrated into the country in 1522 he found in one district a cluster of six consider- able towns all less than two leagues apart. But "a few years of Spanish rule sufficed to turn whole tracts of flourishing country into uninhabited wilds" (H. H. Bancroft), and, after making every allowance for the defective character of the last census returns, the present population of the whole state cannot be estimated at more than 400,000. A calculation based on the partial census of 1846 gave 300,000, of whom about 100,000 were pure-blood Indians, 150,000 half-castes (Mestizoes, Zambos, &c.), 20,000 Negroes, and 30,000 whites. Throughout the present century the whites appear to have shown a general tendency to diminish, and the indigenous element is by some now estimated at fully one half of the whole population.

With the exception of some wild tribes in the interior of Mos- quitia, nearly all the natives are now in a more or less civilized state, and have generally adopted the Spanish language. At the time of the conquest Herrera tells us that five distinct languages were current in Nicaragua :—the Caribisi (Carib) on the east coast, now represented by the Rama, Toaca, Poya, and Waikna (Mosco); the Chontal of Chontales, Segovia, and parts of West Honduras and Salvador, now represented by the Woolwa in Chontales and Mos- quitia; the Chorotegan (Dirian), mainly between Lake Managua and

the Pacific and thence north to Honduras, now extinct; the Orotifian between Lake Nicaragua and the Pacific (department of Rivas) and thence south to the Gulf of Nicoya, Costa Rica, also extinct; the Cholutec (Niquiran), a pure Aztec dialect spoken in the large islands of Lake Nicaragua, and about Masaya, Granada, and other districts, especially along the north-west side of the lake, where it still survives among a few scattered communities. The presence of Aztec settlements in this region, and at one time even amongst the Chontales of the opposite side of the lake, is abundantly established by this survival, by the archeological remains found in the islands and adjacent mainland, and especially by the Aztce geographical nomenclature widely diffused throughout the whole of West Nicara- gua; c.g., Popogatepec = Popocatepetl, the local name of the Masaya volcano; Ometepec or Omctepet=Ometepetl, z.¢., 'Two Peaks," the largest of the islands in Lake Nicaragua; the ending galpa, common in Chontales (Juigalpa, Matagalpa, &c.), which is the Aztec calpa, group of houses, town, from calli, house. The euphonic changes ¢ or ¢ for final é0, g for c, &c., occur even in Mexico itself, and are important as showing that the Cholutecs are comparatively recent intruders from the Anahuac plateau, not the original stock of the Aztec nation, as has been suggested by some ethnologists.?

Besides the Caribisi, or continental Caribs of Herrera, the Mosquito Coast is occupied by other Carib communities, which are descended from the Caribs removed thither from the island of St Vincent by the English in 1796. To these alone the name of Carib is now applied, although they are not pure-blood Indians, but Zambos, in whom the Negro features greatly predominate. The Woolwas of the interior of Mosquitia and Chontales are divided into a great number of tribes collectively known as Bravos, that is, wild or uncivilized, who live chiefly on hunting and fishing, and are prac- tically independent of the Nicaraguan Government. The term Bravo itself is the exact Spanish equivalent of the Aztec Chontal, Chondal, that is, " barbarian," which at the time of the discovery was applied by the Cholutecs to all the tribes dwelling east of the great lakes and on the Cordillera de los Andes as far north as Hon- duras and San Salvador. Here they seem to have supplanted a still more ancient race, who had attained a high state of civilization, as attested by the already-mentioned monuments and stone

~~sculptures of Chontales, which are of a different type both from the Aztec and the Maya-Quiché remains of Yucatan and Guatemala.~~

~~According to the electoral law of 1858 Nicaragua forms a demo- cratic republic modelled on that of the United States, with a legis- lative assembly of eleven members, a senate of ten, and a president elected for four years and assisted by a cabinet of four ministers. The seat of government, formerly Granada and Leon, has since 1858 been Managua on the south-west side of Lake Managua. Although Roman Catholicism is still recognized as the state religion, the free exercise of all others is guaranteed, together with freedom of the press and of education. Public instruction, which is provided~~

1 It should be noted in this connexion that Buschmann has clearly traced a distinct Aztec geographical terminology throughout the whole of Central America from Guatemala top Comayagua in Honduras on the one hand, and on the other through San Salvador and West Nicaragua nearly to the Costa Rica frontier, The Pipil, an Aztec dialect rather more divergent than the Cholutce of Nicaragua, is still current in parts of Guatemala and San Salvador, but no evidence of Aztec settlements has been discovered either in Yucatan or in Costa Rica (Ueber die Aziekischen Ortsnamen, passim).

for by one university, three colleges, two hundred schools, and an annual grant of £10,000, is still in a very backward state. The total attendance at the national schools in 1882 was 5000, or less than 8 per cent. of the whole population. The criminal charges in the saine year were 1938, or 5 per 1000, showing a slight improve- ment on previous years. There are no railways, and very few good roads even between the large towns and seaports.

year Nicaragua joined the Universal Postal Union. The telegraph despatches forwarded through twenty-six offices numbered 81,000; letters and packages of all sorts, 1,119,000.?

First discovered and coasted by Columbus during his fourth and History.

last voyage in 1502, Nicaragua was not regularly explored till 1522, when Gil Gonzalez Davila penetrated from the Gulf of Nicoya to the western provinces and sent his lieutenant Cordova to circumnavigate the great lake. The country takes its name from Nicaragua (also written Micaragua), a powerful Cholutec chief, ruling over most of the land between the lakes and the Pacific, who received Davila in a friendly spirit, and accepted baptism at his hands. Nicaragua's capital seenis to have occupied the site of the present town of Rivas over against Ometepec, and soon afterwards the Spaniards overran the country with great rapidity, both from this centre northwards, and southwards from the Honduras coast. The occupation began with sanguinary conflicts between the two con- tending waves of intrusion, and down to the present day this region has had little respite from external attack and internal convulsions. Granada was founded in 1524 on

the isthmus between the two lakes as the capital of a separate government, which, however, was soon attached as a special intendence to the general captaincy of Guate- mala, comprising the whole of Central America and the present Mexican state of Chiapas. Hence, during the Spanish tenure, the history of Nicaragua is merged in that of the surrounding region. Of its five earliest rulers "the first had been a murderer, the second a murderer and rebel, the third murdered the second, the fourth was a forger, the fifth a murderer and rebel" (Boyle). Then came the hopeless revolts of the Indians against intolerable oppression, the abortive rebellions of Hernandez de Contreras and John Bermejo (Bermudez) against the mother country (1550), the foundation of Leon, future rival of Granada, in 1610, and its sack by Dampier in 1685, and, lastly, the declaration of independence (1821), not definitively acknowledged by Spain till 1850.

In 1823 Nicaragua joined the Federal Union of the five Central American states, which was finally dissolved in 1833. While it: lasted Nicaragua was the scene of continual bloodshed, caused partly by its attempts to secede from the confederacy, partly by its wars with Costa Rica for the possession of the disputed territory of Guanacaste between the great lake and the Gulf of Nicoya, partly also by the bitter rivalries of the cities of Leon and Granada, respective headquarters of the Liberal and Conservative parties. During the brief existence of the Federal Union "no fewer than three hundred and ninety-six persons exercised the supreme power of the republic and the different states' (Dunlop's Report). Since then the independent government of Nicaragua has been distinguished almost beyond all other Spanish-American states by an uninterrupted series of military pronunciamientos, popular revolts, partial or general revolutions, by which the land has been wasted, its former industries destroyed, and the whole people reduced to a state of moral debasemient scarcely elsewhere paralleled in Christendom. Conspicuous amongst the episodes of this sanguinary draina was the filibustering expedition of General Walker, who was at first invited by the democrats of Leon to assist them against the aristocrats of Granada, and who, after seizing the supreme power in 1856, was expelled by the combined forces of the neighbouring states, and on venturing to return was shot at Truxillo on September 25, 1860. A truce to these internecine troubles has been recently brought about by mutual exhaustion; and, should any of the schemes of interoceanic canalization be

~~carried out, it may be hoped that a national revival will take place under more favourable prospects for the future.~~

~~One source of serious embarrassment has been removed by the Mosquito settlement of the Mosquito reserve question. This territory, which reserve.~~

~~stretches along the Caribbean coast from the Sisin Creek to the Rama river (from 10° 30' to 13° N, lat.) and for about 40 miles inland, had enjoyed a semi-independent position under the nominal protection of Great Britain from 1655 to 1850. By the Clayton- Bulwer treaty of 1850, England resigned all claims to the Mosquito Coast, and by the treaty of Managua in 1860 ceded the protectorate absolutely to Nicaragua. The local chief was induced to accept this arrangement on the condition of retaining his administrative functions and receiving a yearly subvention of £1000 from the suzerain state for the ten years ending in 1870. But he died in 1864, and Nicaragua has never recognized his successor. Never- theless the reserve continues to be ruled by a chief elected by the natives, and assisted by an administrative council, which assenibles at Bluefields, capital of the territory.~~

~~2 Oficial Report of the Minister of the Interior on the State of the Republic for the years 1881-82, Managua, 1883.~~

~~But the tele- Tele- graph system (800 miles) was completed in 1882, and in the same graphs.~~

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~~NICASTRO, an episcopal city of Italy in the province of Catanzaro, 16 miles west of Catanzaro and about 6 miles from the Gulf of Sta Eufemia. There are two large~~

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~~| suburbs,—Zangaroma, founded by an Albanian settlement~~

~~in the 15th century, and Bella, dating from 1782,—and the communal population is 14,067 (1881). In the castle of Ferrolito, whose ruins still look down on the city, Frederick I. imprisoned his rebellious son Henry. Nicastro suffered greatly from the earthquake of 1638, which also destroyed the famous Benedictine abbey of Sta Eufemia, about 3 miles to the west.~~

~~NICCOLO PISANO. See Pisano.~~

~~NICE, a city of France, the chief town of the de- partment of Alpes Maritimes, and previous to 1860 the capital of the countship of Nice (Nizza) in the kingdom of Sardinia, is situated in 43° 42’ N. lat. and 7° 16’ E, long., 739 miles by rail from Paris, and occupies a fine position at the mouth of the Paillon (Paglione), a stream (often dried up in summer) which, after a course of 20 miles, enters the northern end of the Baie des Anges. A steep isolated limestone hill, 315 feet in height, running back for some distance from the shore, forms the historical nucleus of the town. Formerly crowned by a castle, which previous to its destruction by the duke of Berwick in 1706 was one of the strongest fortresses on the coast, it is now laid out as a public pleasure-ground, and~~

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~~Plan of Nice.~~

~~planted with aloe, cactus, agave, and palm. Towards its south-west corner stands a tower (Tour Bellanda or Clérissy) dating, it is believed, from the 5th century. The old town stretches along the western base of the hill ; the~~

~~“town of the 18th century” occupies the ground farther west, which slopes gently towards the Paillon; and away to the north-east and north and west beyond the stream~~

~~lie the ever-growing quarters of the modern city. To the |~~

~~east of the hill, and thus out of sight of the more fashion- able districts, the commercial quarter surrounds the port. The whole frontage of Nice is composed of fine embank- ments: the Quai des Ponchettes, constructed in 1770 round the base of the castle hill, is continued westward~~

~~by the Quai du Midi as far as the Pont des Anges, which crosses the mouth of the Paillon; and from the public~~

~~gardens and the municipal casino on the other side of the~~

~~stream the Promenade des Anglais, a boulevard 85 feet wide, extends for more than a mile to the mouth of the Magnan, and is likely to be prolonged to the Var. A pier projecting into the sea from the promenade contains a “crystal palace” and a sea-bathing establishment. The course of the Paillon also is embanked on both sides, and~~

~~| at one part the Place Masséna, one of the largest public Squares in the city, and the principal resort of foreign | Visitors, has been laid out across the stream. Besides a~~

~~Roman Catholic cathedral—Ste Réparate, dating from~~

~~NIC—NIC~~

~~1650—Nice possesses a Russian church, two synagogues, and several Protestant chapels. Architecturally the most remarkable church is Notre Dame, a modern Gothic build- ing with two towers 213 feet high, erected by the town in 1835 to commemorate its preservation from cholera. The secular buildings include the town-house, the prefec- ture, the theatres, the hospitals, the lycée (founded by the Jesuits in the 17th century), the natural history museum, the library (especially rich in theology), and, at some distance from the town, the astronomical and meteorological observatory on~~

~~Mount Gros. The indus- trial establishments comprise perfume factories, distilleries, oil-works, furniture and wood work factories, confectionery works, soaj-works, tanneries, and a national tobacco factory employing several hundred persons. Besides the vine, the trees principally cultivated in the neighbourhood are the olive, the orange, the mulberry, and the carob; and the staple exports are oil, agricultural produce, fruits, and flowers. The harbour, which as yet only covers 10 acres, is being enlarged. In 1881 the population of the city was 54,953, and of the commune 66,279,—an increase respectively of about 9000 and 13,900 since 1872. During winter there is a large proportion of strangers from all parts of the world.~~

~~Protected towards the north by hills which rise stage behind stage to the main ridge of the Alps, Nice is celebrated for the mildness of its climate. The mean tem- perature is 60° Fahr., that of winter being 49°, of spring 56°, of summer ,72°, and of autumn 63°, For a few nights in winter the mercury sinks below freezing point, but snow is practically unknown, falling, on an average, only half a day in the year. The highest reading of the thermometer is rarely above 90°. There are sixty-seven days with rain in the course of the year; but it usually falls in heavy showers which soon leave the sky clear again, though the whole annual amount exceeds 32 inches. Fine days and rainy days are almost equally distributed throughout the different seasons. The winds are very variable, some- times changing several times a day. Apart from the ordinary land and sea breezes, the most frequent is the east wind, which is especially formidable during autumn. The south-west wind is moist and warm; the north-east, which is happily rare, brings storms of hail and even snow in winter. The mistral (from the north-west) and the tramontane (from the north) are generally stopped by the mountains ; but when they do reach the city they raise intolerable dust-storms. For two thousand years the climate of Nice has been considered favourable in chest complaints. Those who are requiring rest, and those suffering from gout, asthma, catarrhs, rachitic affections, scrofula, stone, also experience benefit; but the reverse is the case when heart disease, nervous disorders, or ophthalmia are concerned. Autumn is the best season ; in spring the sudden changes of temperature demand great care. Means of passing the time pleasantly are fairly abundant. The city is at its liveliest during the carnival festivities, in which, as at Rome, battles are waged with sweetmeats and flowers.~~

Nice (Nicza) was founded about two thousand years ago by the Phoceans of Marseilles, and received its name in honour of a victory (vinn) over the neighbouring Ligurians. It soon became one of the busiest trading stations on the Ligurian coast; but as:a city it had an important rival in the town of Cemenclium, which continued to exist till the time of the Lombard invasions, and has left its ruins at Cimiez (Italian, Cemella), 24 miles to the north. In the 7th cen- tury Nice joined the Genoese league formed by the towns of Liguria. In 731 it repulsed the Saracens; but in 859 and 880 they pillaged and burned it, and for the most of the 10th century remnained masters of the surrounding country. During the Middle Ages Nice had its share in the wars and disasters of Italy. As an ally of Pisa it was the enemy of Genoa, and both the king of France and the emperor of Germany endeavoured to subjugate it; but in spite of all it maintained its municipal liberties. In the course of the 13th and 14th centuries it fell

the hands of the counts of Provence; and at length in 1888 it placed itself under the protection of the counts of Savoy. The maritime strength of Nice now rapidly increased till it was able to cope with the Barbary pirates; the fortifications were largely extended and the roads to the city improved. During the struggle between Francis I. and Charles V. great damage was caused by the passage of the armies invading Provence ; pestilence and famine raged in the city for several years. It was in Nice that the two monarchs in 1538 concluded, through the mediation of Paul III., a truce of ten years; and a marble cross set up to commemorate the arrival of the pope still gives its name, Croix de Marbre, to part of the town. In 1543 Nice was attacked by the united forces of Francis I. and Barbarossa; and, though the inhabitants, with admirable courage, repulsed the assault which succeeded the terrible bombardinent, they were ultimately compelled to surrender, and Barbarossa was allowed to pillage the city and to carry off 2500 captives. Pestilence appeared again in 1550 and 1580. In 1600 Nice was taken by the duke of Guise. By opening the ports of the countship to all nations, and proclaiming full freedom of trade, Charles Emmanuel in 1626 gave a great stimulus to the commerce of the city, whose noble families took part in its mereautile enterprises. Captured by Catinat in 1691, Nice was restored to Savoy in 1696; but it was again besieged by the French in 1705, and in the

~~following year its citadel and ram- parts were demolished. The treaty of Utrecht in 1713 once more gave the city back to Savoy; and in the peaceful years which followed the "new town" was built. Fron 1744 till the peace of Aix-la-Chapelle (1748) the French and Spaniards were again in possession. In 1775 the king of Sardinia destroyed all that remained of the ancient liberties of the commune. Conquered in 1792 by the armies of the French Republic, the countship of Nice continned to be part of France till 1814; but after that date it reverted to Sardinia. By a treaty concluded in 1860 between the Sardinian king and Napoleon III. it was again transferred to France, and the cession was ratified by nearly 26,000 electors ont of a total of 30,700. Nicc is the seat of a bishopric, at present dependent on the archbishopric of Aix, and the headquarters of a military division forming part of the corps d'armée of Marseilles.~~

~~Masséna and Garibaldi were natives of the city. See Roubaudi, Vice et ses environs, Turin, 1843; Tisserand, Hist. de la cité de Nice, Nice, 1862; Lacoste, Nice pittoresque et pratique, Nice, 1876.~~

~~NICEPHORUS I., emperor of Constantinople from 802 to 811, born at Seleucia in Pisidia, is alleged on very doubtful authority to have been a descendant of Jaballah, who had been monarch of the small Arabian kingdom of Ghass4n in the time of Heraclius, and for a time had professed the Mohammedan religion. In the reign of Irene he rose to the office of logothetes, or lord high treasurer, and in 802 he was joined by her favourite eunuchs in a plot by which she was dethroned and exiled, while he himself assumed the crown (October 31). Soon after his accession, Bardanes, one of his ablest generals, rose in revolt against him and received much powerful support, including that of Leo the Armenian and Michael the Armorian (names which reappear in history), but the skilful diplomacy of Nicephorus soon brought the rebel to the position of a suppliant, willing to accept the seclusion of a monastery. 'The conspiracy headed by the patrician Arsaber in 808 had a similar issue. In 803 Nicephorus had entered into a treaty with Charlemagne by which the limits of the two empires were amicably fixed, — Venice, Istria, the maritime parts of Dalmatia, and South Italy being assigned to the East, while Rome, Ravenna, and the Pentapolis were recognized as belonging to the West; this treaty was renewed in 810. Shortly after the retirement of Bardanes, who had been appointed to march~~

against the Saracens, Nicephorus in person took the field against Haroun al-Rashid, but sustained a great defeat at Crasus in Phrygia; and subsequent inroads of his conqueror compelled him to sue for peace, which was granted only on condition of an annual tribute of 30,000 pieces of gold, besides three additional pieces (perhaps, as Finlay suggests, medallions of superior size) for himself, and three for his sonStauracius. By the death of Haroun in 809 Nicephorus was left free to turn his attention to the Bulgarians, whose warlike king, Crumn, had begun to harass the empire in the north; but six days after it had

more than onee into | crossed the frontier the powerful Byzantine army was

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attacked in force by night, and Nicephorus, along with six patricians, many officers of high military rank, and a large number of rank and file, was put to the sword. Crumn

is recorded to have made a drinking cup of the emperor's || Zimisces, who immediately succeeded him.

skull. After a brief reign of two months, Stauracius, who had been proclaimed emperor by the soldiers, was deposed by his brother-in-law, Michael Rhangabe. Nicephorus, who "though a brave soldier was essentially a statesman," gave considerable attention to the finance department of the empire, but did not escape the imputation of avarice and oppression. Kcclesiastically his reign is noted for the comparative success with which he asserted the supremacy of the civil power, and gave effective preponderance to imperial over monkish opinion.

NICEPHORUS II. (Phocas), emperor of Constantinople from 963 to 969, was member of a brave Cappadocian family which had previously furnished more than one distinguished general to the empire. He was born about 912, joined the army at an early age, and under Constantine

VII., Porphyrogenitus, attained the high rank of magnus |

~~domesticus, or general of the East (954). In the almost continual struggle with the Saracens which this post implied he sustained severe defeat in 956, but retrieved his fame in 958 and again in 959 in Syria; and in Jily 960 he led the expedition against Crete which compelled Candia to surrender after a siege of ten months, and again brought the whole island under Byzantine rule. The long extinct honours of a triumph were revived to reward him on his return to Constantinople. In 962 he again set out with a large army against Syria; after forcing his way through the narrow passes of Mount Amanus, and compel- ling the principal cities to open their gates, he was pushing on towards the Euphrates when intelligence reached him in 963 that the emperor Romanus IT. had died, leaving the empress Theophano regent for her infant sons. Justly fearing the intrigues of the able minister Joseph Bringas, he returned to Constantinople, after having previously obtained from Theophano and the patriarch Polyeuctes a guarantee for his personal safety ; he then, with the help of the patriarch, procured for himself the supreme com- mand of the army during the minority of the princes, and, after gaining over the officers and soldiers to his interest, consented to allow himself to be proclaimed emperor. He was crowned on August 16, and soon afterwards married Theophano, though the union was discountenanced by the patriarch on the alleged ground of a spiritual affinity. In 964 he resumed the war against the Saracens, and, though compelled to raise the siege of Tarsus, was successful in capturing Adana and Mopsuestia; in the following year Tarsus also was forced to surrender to himself, while Cyprus was reconquered for him by the patrician Nicetas. In 966 and 967 the internal affairs of the empire and threatening troubles in Hungary and Bulgaria detained him in Constantinople; but the spring of 968 saw him once more in the field against the caliph, and Laodicea, Hierapolis, Aleppo, Arca, and Emesa were added to his conquests. In the following year Antioch also fell, in the emperor's absence, into the hands of the patricians Burtzes and Peter, but Nicetas was less successful against Sicily. Meanwhile Nicephorus had not made himself so popular on the throne as in the camp. The heavy imposts he found necessary for the support of his expeditions more than counterbalanced, in public estimation, the glory he gained by them. His retrenchment of court largesses and pensions naturally made him many enemies, and he incurred just odium by employing debased coinage to meet the public debts while continuing to exact money of the old standard in payment of the taxes. An accidental tumult in the hippodrome,~~

which had resulted in the loss of many lives, further increased his unpopularity, and, last

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| of all, his fickle wife joined the number of his enemies

and began to plot his death. He was assassinated in his sleeping apartment on the night of December 10, 969. At the head of the conspirators was his nephew John

NICEPHORUS III. (Botaniates), emperor of Con- stantinople from 1078 to 1081, belonged to a family which claimed descent from the Roman Fabii. He served in the army, and rose to be commander of the forces in Asia. In 1078 he assumed the purple at Nicsea, almost simultaneously with Nicephorus Bryennius (father or uncle of the historian of that name), who had revolted against Michael VII. at Adrianople; the aristocracy and clergy of the capital supported the claims of Botaniates, who was crowned on March 25, 1078. With the able help of Alexius Comnenus, the recalcitrant generals Ursel, Bryennius, and Basilacius were successively driven from the field, but soon afterwards the wakeful jealousy of the

| emperor was turned upon their conqueror, who was com-

pelled to flee the court. Alexius, however, had hold of

the army, and on April 1, 1081, ascended the throne,

Nicephorus being forced to abdicate and become a monk of St Basil. He died in obscurity.

NICEPHORUS BRYENNIUS. See Byzantine His- TORIANS, vol. iv. p. 613.

NICEPHORUS, surnamed Catuisti, the last of the Greek ecclesiastical historians, lived at Constantinople,

—perhaps as a monk in connexion with the church of St

Sophia. He was born about the close of the 13th century, and died not later than 1356. His Historia Ecclesiastica, in eighteen books, brings the narrative down to the death of Phocas in 610; for the first four centuries the author is largely dependent on his predecessors, Eusebius, Socrates, Sozomen, Theodoret, and Evagrius, his additions showing very little critical faculty ; in the later period his labours, based on documents now no longer extant, to which he had free access, though he used them also with small dis- crimination, are much more valuable. A table of contents of other five books, continuing the history to the death of Leo the Philosopher in 911, also exists, but whether the books were ever actually written is doubtful. A Latin translation of the JHistoria of Nicephorus, by Lange, appeared at Basel in 1553; the Greek text was edited for the first time by Fronton le Duc (2 vols. fol., Paris,

1630).

NICEPHORUS GREGORAS. See Byzantine His- TORIANS, vol. iv. p. 613.

NICEPHORUS, one of the Byzantine historians (see vol. iv. p. 614), surnamed PaTRIaARCHA, was patriarch of Constantinople from 806 to 815. He was born about 758; from his father Theodorus, one of the secretaries of the emperor Constantine Copronymus, who for his zeal as an image-worshipper had been scourged and dismissed into exile, he inherited literary talent as well as strong religious convictions. He was present as secretary to the imperial commissaries at that second council of Nice in 787 which witnessed the triumph of his opinions; but court vicissitudes soon afterwards drove him again into private life. In 806 he was suddenly raised by the emperor Nicephorus I. from the condition of a monk to the patriarchate of Constantinople, and this office he held until 815, when he accepted deposition rather than assent to the iconoclastic edict promulgated by Leo the Armenian in the previous year. He retired to the cloister of St Theodore, which he himself had founded, and died there in 828. Nicephorus is the author of a valuable and well- written compendium (Breviarium Historicum) of Byzantine

| history from 602 to 770, first printed at Paris in 1616,

of a much less important Chronologia compendiaria, and of one or two controversial writings against iconoclasm.

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NICHOLAS, Sr, of Myra, according to the Roman breviary (December 6) was a native of Patara in Lycia, and was given to his parents in answer to their prayers. From his earliest infancy he signally displayed the piety for which his whole life was remarkable, on Wednesdays and Fridays regularly refusing to receive nourishment from his nurse except once only, and that after sunset. While still a youth he was deprived of his parents, and the wealth that he thus early inherited he forthwith distributed to the poor. To this period belongs what may be called the characteristic deed of his life,—his secret bestowal of dowries upon the three daughters of a citizen fallen into poverty, who, unable to procure. fit marriages for them, was minded to give them up to a life of shame. Having given himself wholly to God, Nicholas made a pilgrimage to Palestine, and in his voyaging miraculously stilled a storm by his prayers. On his return to his native province he visited Myra, the capital, where, as it fell out, the bishop had just died, and the chapter had been divinely advised to select as his successor a man named Nicholas who should be the first to enter the church next morning. Nicholas, thus plainly indi- cated, was duly consecrated, and displayed throughout his whole term of office every episcopal virtue. Under Maximian and Diocletian he was seized for his constancy, removed far from his diocese, and thrown into prison, where he lay until the days of Constantine, when he returned to Myra. He afterwards attended the council of Nice, and died a natural death not long after his return. His remains were subsequently removed to Bari (Barium) in Apulia. So far the authoritative Roman legend, the documentary evidence for which, however, does not take us farther back than to the 9th century at the earliest (Simeon Metaphrastes). Nicholas is not mentioned among the Nicene fathers by any of the church historians of that or the succeeding century, and the earliest extant trace of his existence is in the fact that a church was dedicated to him in Constantinople by Justinian about the year 560. Before the 12th century his name had become very pro- minent both in the Eastern and in the Western Church, it is difficult to tell precisely why; and to this day he is one of the most popular saints in the orthodox Greek communion. Among the

miracles assigned to him is that of restoring to life three youths who had been murdered and salted down by an innkeeper in whose house they had taken lodging ; thus Nicholas figures as the patron saint not only of poor maidens and of sailors but also of travellers and merchants. Children, and especially schoolboys, are also regarded as being especially under his guardianship, and in Russia and Greece, as wellas throughout the north of Europe, the liberality of Nicholas or Klaus is yearly appealed to by them on the eve of his festival (December 6). His protection is specially invoked against thieves and losses by robbery and violence. It may be well to note that the "Old Nick" belonging to another cycle of legend has no connexion, as has sometimes been supposed, with the subject of the present article, that designation being etymologically connected with such words as Nixie, Nickar, and perhaps even with the river-name Neckar (see Grimm's Deutsche Mythologie).

NICHOLAS I., sometimes called The Great, and certainly the most commanding figure in the series of popes between Gregory I. and Gregory VII., succeeded Benedict III. in April 858. According to the annalist "'he owed his election less to the choice of the clergy than to the presence and favour of the emperor Louis II. and his nobles,'—-who can hardly have foreseen with what ability and persistency the rights of the holy see as supreme arbiter of Christendom were to be asserted even against themselves by the man of their choice. Of the

previous history of Nicholas nothing 1s recorded. His pontificate of nine years and a half was marked by at least three memorable contests which have left their mark in history. The first was that in which he supported the claims of the unjustly degraded patriarch of Constantinople, Ignatius ; the history of the conflict cannot be related here, but two of its incidents, the excommunication of Photius, the rival of Ignatius, by the pope in 863, and the counter-deposition of Nicholas by Photius in 867, were steps of serious moment towards the permanent separation between the Eastern and the Western Church. The second great struggle was that with Lothaire, the king of Lorraine (second son of the emperor Lothaire I., and brother of the emperor Louis II.), about the divorce of his wife Theut- berga or

Thietberga. The king, who desired to marry his mistress Waldrada, had brought a grave charge against the life of his queen before her marriage; with the help of Archbishops Gunther of Cologne and Thietgand of Treves, a confession of guilt had been extorted from Thietberga, and, after the matter had been discussed at more than one synod, that of Aix-la-Chapelle finally authorized Lothaire, on the strength of this confession, to marry again. Nicholas ordered a fresh synod to try the cause over again at Metz in 863; but Lothaire, who was present with his nobles, anew secured a judgment favourable to himself, whereupon the pope not only quashed the whole proceedings, but excommunicated and deposed Gunther and Thietgand, who had been audacious enough to bring to Rome in person the "'libellus" of the synod. The archbishops appealed to Louis IL, then at Benevento, to obtain the withdrawal of their sentence by force; but, although he actually occupied Rome (864), he was unsuccessful in obtaining any concessiou, and had to withdraw to Ravenna. Thietberga herself was now induced to write to the pope a letter in which she declared the invalidity of her own marriage, and urged the cause of Lothaire, but Nicholas, not without reason, refused to accept statements which had too plainly been extorted, and wrote urging her to maintain the truth steadfastly, even to the death if need were, "for, since Christ is the truth, whosoever dies for the truth assuredly dies for Christ." The imminent humiliation of Lothaire was prevented only by the death of Nicholas. The third great ecclesiastical cause which marks this pontificate was that in which the indefeasible right of bishops to appeal to Rome against their metropolitans was successfully maintained in the case of Rothad of Soissons, who had been deposed by Hincmar of Rheims. It was in the course of the controversy with the great and powerful Neustrian archbishop that papal recognition was first given (in 865) to the pseudo-Isidorian decretals, which had probably been brought by Rothad to Rome in the preced- ing year. (For some account of these, see Canon Law, vol. v. p. 17.) At an early period in his reign Nicholas also had occasion to administer discipline to John of Ravenna, who seems to have relied not only on the prestige of his famous see but also on the support of Louis Il. After lying under excommunication for some time he made a full submission. Nicholas was the pope to whom Bogoris, the newly converted king of Bulgaria, addressed himself for practical instruction in some of the difficult moral and social problems which naturally arise during a transition from heathenism to Christianity.

The letter from the holy see in reply to the hundred and six questions and petitions of the barbarian king is perhaps the most in- teresting literary relic of Nicholas I. now extant. He died on November 13, 867, and was succeeded by Hadrian II. NICHOLAS IL, a Burgundian, whose Christian name was Gerard, was archbishop of Florence when he was chosen (December 28, 1058) at that place to succeed Stephen IX. in the papal chair. Some time previously the

old Roman feudatory barons had caused to be consecrated, under the name of Benedict X., John, cardinal bishop of Velletri, who, however, was speedily deposed. The elec- tion of Nicholas had been brought about by Hildebrand (afterwards Gregory VII.), and his whole pontificate derived its character from that master-spirit. Its first act of historical importance was the framing by the second Lateran council (April 1059) of the decree which vested the election of popes in the cardinal bishops in the first instance, the assent of the cardinal priests and deacons being next required, then that of the laity, and finally that of the emperor. It was at the same council that Berengarius of Tours was temporarily induced to admit the doctrine of the corporeal presence in the sacrament. In the following June Nicholas visited Apulia, accepted the submission of the Normans, and removed the ban of excommunication, investing Richard in the principality of Capua and Robert Guiscard in the dukedom of Apulia, Calabria, and Sicily. He died at Florence in June 1061, and was succeeded by Alexander II.

NICHOLAS III. (Giovanni Gaetano), a member of the noble house of Orsini, succeeded John XXI. as pope on November 25, 1277. Though his election was doubtless largely due to family influence, he was also personally a man of good endowments, and the record of his brief pontificate has more than one touch fitted to recall the grander manner of some of the greatest popes. In 1278 he extorted from the newly-elected and insecurely seated Rudolph of Hapsburg an absolute cession of the Romagna and of the exarchate of Ravenna, and in the same year he deprived Charles of Anjou of his vicariate of Tuscany; in the following year he compelled Charles to renounce his dignity of senator of Rome also, declaring himself per- petual senator, and his nephew Orso his vicar. He was understood to be

planning with Rudolph an entirely new distribution of the thrones of the empire, by which the royal dignity was to be conferred on more than one member of the house of Orsini, when a stroke of apoplexy brought his career to a sudden close on August 22, 1280. Towards the beginning of his reign he repaired and strengthened the Lateran palace, and greatly enlarged the Vatican. For his simoniacal nepotism he has been placed by Dante in the third " bolgia" of the eighth circle of hell (Inf., xix. 31 sq.). The successor of Nicholas II]. was Martin IV.

NICHOLAS IV. (Girolamo de Ascoli), pope from February 22, 1288, to April 4, 1292, was born at Ascoli, of humble parentage. At an early age he entered the Franciscan order, of which he rose to be general in 1274, after the death of Bonaventura. It was in this capacity that in 1278 he condemned Roger Bacon to imprisonment on account of his writings. He subsequently became bishop of Preeneste; and he was created cardinal by Nicholas III. Repeated meetings of the conclave upon the death of Honorius IV. resulted, ten months after the vacancy had occurred, in the election of Ascoli, whose first and almost only historical act was to annul the solemn treaty by which Charles the Lame (of Anjou) had obtained from Alphonso III. of Aragon his release from prison,— "'the most monstrous exercise of the absolving power which had ever been advanced in the face of Christendom" (Milman). The revival of the old and expiring enthusiasm of the crusading epoch was a cause he had much at heart ; and it was partly at least with the object of stirring up the Mongols against the hated Saracens that he gave John of Monte Corvino and other members of his order their missions to China. 'The fall of Ptolemais, the last remnant of the Christian dominion in Palestine (1291), greatly affected him, and combined with other disappointments to hasten his death. Celestine V. succeeded.

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NICHOLAS V. (Tommaso Parentucelli), the pope whose name is most intimately associated with the revival of learn- ing, was the son of a physician, and was born at Sarzana, near Spezzia, in 1389. He received a good education at Bologna, became tutor in the Albizzi and Strozzi families at Florence, and ultimately entered into the service of Albergata, bishop of Bologna. He accompanied his patron on several embassies, and gained so

~~high a reputation for diplomatic ability and for learning that shortly after Albergata's death he himself obtained the see of Bologna, was sent by Eugenius IV. on an embassy into Germany, and in December 1446 was madea cardinal. In less than three months he was pope in succession to Eugenius,—a small majority of the electors, indisposed to the strongest candidate, Cardinal Prospero Colonna, having united upon Parentucelli asa man who had made no enemies. His policy as pope seemed clearly marked out for him. The church was reaching the end of a period of strife and schism. The firmness of Eugenius IV. had at length almost beaten down the emperor, the antipope, and the council of Basel ; the wisdom and moderation of Nicholas V. completed the work. Within two years the emperor made peace, the antipope abdicated, and the council dissolved itself. Nicholas hoped for a period of tranquillity, and determined to exhibit the papacy to the world as the protector of art and learning. 'To the demand of Germany for reforma- tion," says Mr Creighton, "he answered by offering culture." He aimed especially at making Rome archi- tecturally a worthy capital of the Christian world: he repaired its fortifications, began the rebuilding of its cathedral, enlarged and adorned its thoroughfares, and traced much of the plan of restoration executed by his successors. But his great glory was his active co-operation in the revival of learning. He collected manuscripts from all quarters, caused them to be multiplied by transcription, commissioned the most competent scholars to translate Greek books into Latin, and gathered around him the most distinguished humanists of his day, Poggio Bracciolini, Valla, Filelfo. Under him the papacy regained much of its former lustre, and till late in his reign his administration was disturbed by no unfortunate events. In January 1453 the conspiracy of Stefano Porcaro was detected on the eve of breaking out. The pope and cardinals were to have been seized, their effects pillaged, and Rome declared a republic. Nicholas was terrified, and showed himself angry and cruel. On May 29 of the same year Constan- tinople was taken by the Turks. The fault was not the pope's, who had ineffectually sent his galleys to the rescue ; yet he could not but feel that a stain had fallen upon his pontificate. He proclaimed a crusade, but this was an undertaking for which he was constitutionally unfit ; he failed to kindle the zeal of others, and many doubted his own. Exhausted by repeated attacks of gout, he died on March 24, 1455. Before his death he summoned the cardinals, and enumerated the good works he had been enabled to perform, "by God's~~

~~blessing of peace and tranquillity in my days." 'These last words sufficiently express the general scope of his policy. He was rather a scholar than an ecclesiastic or a statesman, yet enough of both to perform his part on the world's stage with sufficient credit; it is, however, his principal distinction to have been a learned and art-loving pope, and to have formed that alliance between the papacy and intellectual culture which subsisted for the next hundred years. He was suc- ceeded by Calixtus IIT.~~

~~NICHOLAS V. (Pietro di Corvara), antipope in Italy from 1328 to 1330, during the pontificate of John XXII. at Avignon, was a native of the Abruzzi and a member of the Franciscan order. He owed his nomination to the papacy, and his election (May 12, 1328) by popular~~

~~NICHOLAS~~

~~acclamation, to the influence of the excommunicated emperor Louis the German, on whose head he placed the crown after his own enthronement. After spending four months in Rome he withdrew along with Louis to Viterbo and thence to Pisa; but, on the revolt of that city from Ghibellinism, he was compelled to throw himself on the mercy of John. Carried to Avignon, on making full con- fession and abjuration of his heresies and impieties (September 6, 1330), he was kept in honourable imprison- ment in the papal palace until his death in 1334. NICHOLAS I. (1796-1855), czar of Russia, third son of Paul I., was born at Tsarkoe-Selo on the 25th June 1796. His elder brothers were Alexander and Constantine, of whom the former was twenty years his senior. Their father was murdered in 1801, and Alexander then became emperor. The education of Nicholas was conducted under the care of his mother, a pious but narrow-minded woman. He had not, like his eldest brother, whose education was directed by the empress Catherine, the advantage of associating in early life with men of culture and of modern ideas. Nor was he early introduced either to military or to political life. He was brought up in retirement, and even during the invasion of Russia by Napoleon in 1812 he was not permitted to serve in the army. His tastes, however, were all military, and his favourite studies mathematics and fortification. During the campaign of 1814 in France he was allowed to come to the allied head- quarters, but not to take part in any engagement. He was present during the occupation of Paris in 1815, and in the following~~

year was sent to travel on the Continent and to visit England, where his striking personal appear- ance excited the admiration of Sir Walter Scott. He married in 1817 Louise Charlotte, daughter of Frederick William III, king of Prussia, and this union had for half a century an important effect on the history of Prussia and Germany at large. After his marriage he received a military command from his brother, and from this time forward he gave his utmost attention to the mechanical part of military affairs, rejoicing in the occupations of a drill-sergeant, and identifying himself so completely with his soldiers that civil costume became insupportable to him, even when on visits to sovereigns who, like Queen Victoria, would have preferred to see him in less warlike guise. Alexander having no sons, Constantine was heir to the throne. 'This brutal and ignorant prince had, however, the sense to recognize his own unfitness for the task of governing an empire, and by a secret agreement with the reigning sovereign he renounced his rights in favour of Nicholas. Alexander died on December 1, 1825. Con- stantine, who was in Poland, showed no inclination to prefer his claims; the edict of the late emperor appointing Nicholas his successor was opened, and the younger brother was called by the highest authorities of Russia to assume the crown. He nevertheless refused, and, as it would seem, in perfect sincerity, until Constantine had formally con- firmed his renunciation. The delay led to serious conse- quences. Conspiracies against the late emperor and in favour of a freer government had been formed in the army and among the nobles ; and when the troops at St Peters- burg were called upon to take the oath to Nicholas, revolt broke out. The young czar showed great nerve and courage, but the mutiny was not put down without blood- shed, and the impression which it left on his mind never passed away. Despotic by nature, trained in the midst of the monarchical reaction that followed the French wars, and accustomed to hear the earlier liberal tendencies of his brother Alexander spoken of as mere vagaries that had happily been abandoned, Nicholas saw in the outbreak of his soldiers in 1825 a warning never to relax the grasp of authority. The maintenance of despotic power was

a duty to which he devoted himself with the deepest religious conviction. At the accession of Nicholas, Russia had been for some years on the brink of

~~war with the Porte. Greece was in insurrection, and Russia had its own specific causes of complaint in consequence of the alleged infraction of the privileges of the Danubian pro- vinces guaranteed by the treaty of Bucharest. It had long been the effort of European diplomatists to dissuade Alexander from interfering on behalf of Greece, and to find a peaceful solution for the difficulties in which Russia was more directly concerned. The Greek cause had, however, at length excited so much sympathy that the British Government took advantage of the accession of Nicholas to send the duke of Wellington to St Petersburg to propose some joint action on behalf of Greece. The attempt succeeded : England and Russia undertook to tender their mediation, requiring the sultan to grant the Greeks a modified independence, and the concert was subsequently joined by France. The result of this combination, and of Ottoman obstinacy, was the destruction of the Turkish fleet at Navarino by the allied squadrons, and the establish- ment of Greek independence. This, however, did not terminate the contentions between Turkey and Russia. The Porte itself challenged war, and in 1828 hostilities broke out. Nicholas took part in the first and unsuccess- ful campaign of 1828, but allowed his generals to act by themselves in 1829; and the march of Diebitsch over the Balkans was followed by the peace of Adrianople. A Persian war had already been successfully concluded, and Russia had gained thereby two provinces in the east. The peace of Adrianople gave it only an improved frontier on the eastern shore of the Black Sea. In 1830 the fall of the Bourbons made an end of the friendship which existed between France and Russia, and restored the union between the three despotic courts of St Petersburg, Vienna, and Berlin, which had been framed in 1814 and inter- rupted by the course of Eastern affairs. Nicholas did not refuse to recognize Louis Philippe, but he would never accord him the usual title of Mon Frére, and he lost no opportunity of treating him with contempt. The insurrec- tion of Poland soon followed. Alexander had received the grand-duchy of Warsaw from the congress of Vienna as a separate kingdom, united with Russia only in the person of its ruler; and he had fulfilled his promise of granting it a constitution, and treating it asa distinct nationality. The violation of these rights by the grand-duke Constan- tine, who was governor of Poland, and the virtual establishment of dictatorial rule, caused the insurrection against Nicholas. The Polish leaders sent their demands to St Petersburg; Nicholas replied that he would only answer them with cannon. 'The diet now~~

pronounced his dethronement as king of Poland, and the armed struggle began. It was a long and doubtful one, for Poland had a regular army of its own; but the victory was at length won by Nicholas, and he showed no mercy to his conquered enemy. Poland was made a Russian province ; its liberties were utterly extinguished; its defenders were sent by thousands to Siberia. During the years that followed, the struggle between the sultan and his vassal, Mehemet Ah, pasha of Egypt, brought the Eastern question again to the front of European affairs. The treaty of Unkiar-Skelessi seemed for a moment to have placed Turkey in absolute dependence upon the czar, who guaranteed it his protec- tion against all internal and external enemies ; but France and England now made their influence felt, and the ultimate settlement was the work of all Europe. Nicholas visited England in 1844, and tried, but unsuccessfully, to frame some plan of joint action with that country in view of the possible collapse of the Ottoman empire. The revolutionary spirit which the czar so passionately abhorred

was now about to convulse Europe again. He watched the events of 1848, and strengthened his army. So long as revolution did not approach his own frontiers he was willing to hold his hand; but when Hungary rose against the Hapsburgs and established its national independence he felt that Poland would soon follow its example, and sent his soldiers to crush the Magyar armies which Austria had not been able to subdue. When the victory of despotism was secured, he joined with the Austrian Govern- ment in demanding from the Porte the surrender of the Hungarian leaders who had taken refuge in Turkey. But it was not long permitted to him to play the part of inter- national autocrat. empire, continued up to 1853, brought England and France into the field against him. His armies were defeated at Alma and Inkermann, his fortresses besieged ; and in the bitterness of defeat death came upon him, and carried him from a world where, with the deepest conviction that he was doing God service, he had inflicted so much evil on mankind (February 18, 1855). He died as he had lived, a brave man, and his last words were those of simple prayer. Shortly before his death he is said to have laid two injunc-

tions upon his successor,—to liberate the serfs, and never

~~to grant Poland a constitution. (Cc. A. F~~

~~NICHOLAS or Baset, generally called by his friends the Great Layman or the Great Friend of God, was the founder of a singular widespread association of pious people who, in the age of monastic fraternities, lived in special religious fellowship in a fashion altogether different from the common usage of the time. They did not renounce their property, they took no vows of celibacy or of obedience, but they met together for pious conversa- tion, they corresponded with each other, they had common ideas about conversion, holy living, and Christian faith and duty. They were the Quietists of the 14th century, and called themselves the "Friends of God."~~

~~Nicholas was the son of a rich merchant of Basel, and was born in that town about the year 1308. Left his own master at the age of twenty-four, by the death of his parents, and possessed of considerable wealth, he went out into the world to enjoy life and seek adventures. He became engaged, burgher as he was, to a maiden of noble rank. The night before his betrothal, as he was praying, he had a vision which resulted in his breaking off his marriage, leaving home and friends, and devoting himself to an ascetic life. After some years spent in solitude, severe bodily mortifications, and deep soul struggle, Nicholas gained the religious peace he sought, and from this time devoted himself to turning men around him from sin to God. He did not enter any religious order ; he remained, what he loved to call himself, a layman; he neither preached nor heard confessions, but by means of a singular gift of personal influence he drew round him disciples from all classes of society. His followers did not form themselves into a sect or intoan order. Some of them were priests, monks, and nuns, but some of them lived in the world, were nobles, knights, rich merchants, aud their wives. Their religious opinions were what are commonly called mystical; and indeed all the more notable mystics of the 14th century were under the influence of Nicholas and belonged to the Friends of God. They did not break loose from the outward order of the church; they observed, though with no great scrupulosity, sacraments, fasts, and festivals; but they looked on all such things as unimportant compared with that absolute resignation to the divine will in all things which was their leading principle.~~

~~The most striking event in the life of Nicholas is his meeting, in 1346, with Tauler, the Dominican preacher of Strasburg, which had the result of entirely changing the character of Tauler's religious views and of his preaching.~~

~~His aggressions upon the Ottoman~~

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~~In the society of the Friends of God there came to be a small inner circle of thirteen, who attached themselves to Nicholas, lived in community, and were sent by him on long journeys to maintain communication among the brethren in the different countries of Europe. In 1380, two years after the beginning of the "Great Schism," these thirteen friends met together for the last time, coming from Italy, Hungary, and different parts of Germany. The state of the church at the time seemed to fill them with despair. Nicholas had long, by the many secret means he had at his command, exercised a great though invisible influence on church appointments and ecclesiastical affairs, but now he seemed to feel it hopeless to strive any longer against the increasing wickedness of the times, and he broke up the society he had formed, releasing his followers from their obedience, and went with two friends into Austria. Ten years later one Martin of Mainz, a follower of Nicholas, was burnt as a heretic, and in the act of accusation there are allusions to Nicholas which show that he was still living. But, as he must have been then nearly eighty-five years of age, it cannot have been much later, though the actual date is unknown, when, with two companions, he was burnt asa heretic at Vienna, the chief crime of which he was accused being that "he audaciously affirmed that he was in Christ and Christ in him,"~~

~~Our information about Nicholas comes to us chiefly through Rulmann Merswin, a banker of Strasburg, who with his wife belonged to the Friends of God. Merswin collected many leters and documents relating to the society, and bequeathed them to a convent of the Knights of St John which he founded in Stras- burg. They lay hid for centurics, while the memory of Nicholas perished ; even his name was forgotten, and medimwval students were aware only of a mysterious presence who was sometimes~~

~~referred to as "the Great Friend of God." At last Professor C. Schmidt discovered the documents in the library of the university,~~

~~| and was able to identify Nicholas with Tauler's mysterious visitor~~

~~and with the Great Layman.~~

~~See Carl Schmidt, Nicolaus von Basel, Leben und Wirken, Vienna, 1866; Die Gottesfreunde im vierzehnten Jahrhundert, Jena, 1854; and Miss Winkworth, History and Life of Johann Tauler, London, 1857.~~

~~NICHOLS, Joun (1745-1826), a printer, ranks among the most industrious and voluminous of English antiquaries and collectors. He was editor of the Gentleman's Magazine for nearly half a century, from 1778 till his death, and, partly in his magazine and partly in his numerous volumes of Anecdotes and Illustrations, made invaluable contributions to the personal history of English men of letters in the 18th century. The project of compiling these volumes grew gradually out of his business as a printer. Born in London in 1745, he had been the apprentice and successor of Bowyer, a learned and accomplished printer, a graduate of Cambridge, who had printed for many distinguished men ; and on the death of this revered master, in 1778, he issued a brief memoir. This he afterwards expanded into biographical and literary anecdotes of Mr Bowyer and his friends; and, materials accumulating upon him, he expanded his design into a sort of anecdotical literary history of the century, many important letters being placed at his disposal. Large as this work is, it formed but a small part of the indefatigable collector's activity, of which a full account is given in a memoir by Chalmers accompanying the extension of the Jilustrations by Mr J. B. Nichols. One of his favourite works was an antiquarian history of the town and county of Leicester ; and another, on which he himself set great value, a collec- tion of documents illustrating the manners and expenses of ancient times in England. He produced six volumes concerning the progresses, processions, and festivities of Elizabeth and James. In the days of his apprenticeship he wrote and published two volumes of poetry, but had the good sense to throw his genial energies afterwards into other channels. Vol. xcvi. of the Gentleman's Magazine~~

~~contains @ portrait of him at the age of eighty and several | in their gift.~~

~~well-earned tributes to the worth of his busy and fruitful life. He died November 26, 1826.~~

~~NICHOLSON, Wiiu1am (1753-1815), a writer on natural philosophy, was born in London in 1753, and after leaving school made two voyages as midshipman in the East India service. He subsequently entered an attorney's office, but, having become acquainted, in 1775, with Wedgwood, he resided for some years at Amsterdam as agent for the sale of pottery. On his return to England he was induced by Holcroft to devote himself to the com- position of light literature for periodicals, assisting that writer also with some of his plays and novels. Such work was little in accordance, however, with his scientific tastes, and he employed himself on the preparation of An Intro- duction to Natural Philosophy, which was published in 1781, and was at once successful. A translation of Voltaire's Elements of the Newtonian Philosophy soon followed, and he now entirely devoted himself to scientific pursuits and philosophical journalism. In 1784 he was appointed secretary to the general chamber of manu- facturers of Great Britain, and he was also connected with the society for the encouragement of naval architecture, established in 1791. Besides his literary labours, he bestowed much attention upon the construction of various machines for comb-cutting, file-making, cylinder printing, &c.; he also invented an aerometer. In 1800 he com- menced in London a course of public lectures on natural philosophy and chemistry, and about this period he made the discovery of the decomposition of water by the agency of galvanism, which was said to be the foundation of Sir Humphrey Davy's discoveries in the decomposition of the alkalins. In 1797 the Journal of Natural Philosophy, Chemistry, and the Arts, generally known as Nicholson's Journal, the earliest work of the kind in Great Britain, was begun ; it was carried on till 1814, During the later years of his life Nicholson's attention was chiefly directed to engineering works at Portsmouth, at Gosport, and in Southwark ; these with his other employments placed him in an affluent position, which, however, from domestic and other causes, he was unable to maintain. He died in poverty in 1815.~~

~~“A memoir was written by his son long after his death, but it never was published. Besides considerable contributions to the Philosophical Transactions, Nicholson wrote translations of Four- croy’s Chemistry (1787) and Chaptal’s Chemistry (1788), First Prin- ciples of Chemistry (1788), and a Chemical Dictionary; he also edited the British Encyclopedia, or Dictionary of Arts and Sciences, 6 vols. 8vo, London, 1809.~~

~~NICHOLSON, Witt1am (1784-1844), portrait-painter, was born at Newcastle-on-Tyne in 1784. Having settled in Edinburgh, he became, along with Thomas Hamilton the architect, one of the founders and most vigorous pro- moters of the Scottish Academy, of which in 1826 he was appointed the first secretary, a position which he held for about seven years. He is known by his life-sized portraits in oils, and still more favourably by his very delicate and faithful likenesses in water-colours. In 1818 he published a series of etchings entitled Portraits of Distinguished Living Characters of Scotland. They are executed in an effective and painter-like fashion, mainly from the artist’s own water-colours, and include portraits of Sir Walter Scott, Lord Jeffrey, Robert Burns, and Professor Wilson. Nicholson died at Edinburgh on August 16, 1844.~~

~~NICIAS was the leader of the aristocratic party at Athens and one of the foremost figures in Athenian history during the Peloponnesian War. Although he opposed the democratic tendencies which gave the tone to Attic politics at this time, his high character for piety and honesty, combined with his wealth and influence, gained the con- fidence of the people, and raised him to the highest offices~~

~~His abilities were not equal to the duties he was called on to perform, and in the severe trial of the Sicilian expedition his conduct showed such timidity in critical situations, such wavering in the general plans of warfare, such obstinacy in details where piety or supersti- tion were concerned, that the disastrous end of the siege of Syracuse must be mainly laid to his charge. It is unnecessary here to write his life, a task which would be almost equivalent to writing the history of Athens for a number of years. See GREECE, vol. xi. p. 102.~~

NICKEL, a chemical term, designating a metallic element which was discovered by Cronsted in 1751. In 1754 he succeeded in isolating it (in an impure state), and found it to be a "halbmetall" (semi-metal). After- wards finding it to be present largely in "kupfer-nickel,") he borrowed from that mineral the name for his new element.

Nickel (Ni) is one of the less abundant of elements. It is contained in the sun's atmosphere and in all meteoric iron. Of nickel minerals the following are of metallurgic importance :—nickel-blende, NS; arsenical nickel glance, Ni(As.§),; niccolo-cobaltic pyrites, (Ni, Co, Fe),§, ; garnierite, 5(Ni, Mg)O.4810,+3H,O. Almost invari- ably part of the nickel is replaced by cobalt, and not unfrequently part of the arsenic by antimony, or occasion- ally bismuth. Nickel ores are in general complex mixtures of one or more of these minerals, with sometimes very large proportions of copper, iron, and other foreign metallic ores and gangue. The metallurgy of nickel accordingly is a complex subject which cannot be fully treated here.

As an example of a sulphurcous ore may be quoted that niccolo- cupreous pyrites which is being worked at Dillenburg in Nassau. The process employed is closely analogous to the old process of copper-smelting as explained in METALLURGY (vol. xvi. p. 61). The fully refined mat (" Concentrations-Stein ") consists of 85 per cent. of nickel, 43 of copper, 2 of iron, and 20 of sulphur. The article METALLURGY (ut sup.), under arsenides, describes a process which, when applied to arseniferous cobalt and nickel ores, yields the cobalt as sinalt, the nickel as part of a "'speis" (an alloy of arsenides). The same process serves occasionally for (so to say) collecting small proportions of nickel diffused throughout oxidized ores, the arsenic requisite being introduced in the form of native arsenide of iron.

If au arseniferous ore contains copper, the proccss sometimes is modified by addition of iron pyrites or some other sulphureous material, and so conducted that, in addition to a nickelous speis, acupreous mat is produced. The speis and mat donot mix, but form separate layers, the mat, as the lighter of the two, going to the top.

All sulphureous, arsenical, or poor oxidized nickel ores are being wrouglit by methods analogous to the above, in so far at least as they all aim, in the first instance, at the production of a speis or mat from which the metal has

to be extracted by subsequent operations. Direct methods are being used only in conjunction with one kind of ore, namely, that rich oxidized nickel ore which was discovered in New Caledonia about 1875, and has since been imported into Europe in large and yearly increasing quantities. It occurs in veins within serpentine, and consists of garnierite mixed with more or less of oxide of iron, chrome-iron ore, and a little black oxide of cobalt. It is valuable chiefly through its absolute freedom from arsenic and sulphides. Most of the ore goes to France, where it is worked chiefly by two firms. Christofie at St Denis treats the ore with hydrochloric acid, and from the solution recovers the metal by methods analogous to those customarily employed in con- nexion with speis and mats. Garnier, at the Septémes Works near Marseilles, makes straight for the metal. The powdered ore, after mechanical purification (by such methods as are explained in Merauiurey, vol. xvi. p. 59), is mixed with charcoal and fluor-spar (or other flux) and worked into a paste with coal-tar, which is then shaped into bricks or walnut-sized stones. The ore thus prepared is then manipulated pretty much in the same way as an iron ore is for the production of pig-iron. The furnaces used are about 13 feet high, and worked with cold wind. Garnier in this manner produces three kinds of metal :—(1) an almost pure carbide of nickel, which needs only be decarbonized to be converted into pure metal; (2) an alloy of the carbides of nickel and iron; and (3), from mixtures of nickel and iron ore, a nickeliferous pig-iron which,

1 Said to be originally a term of contempt—"goblin copper," mean- ing a tricky ore, which promises copper but does not yield it.

when refined and puddled, yields a very superior kind of wrought iron, harder and less liable to oxidation than the ordinary metal.

Extraction of Metal from Mats and Speises.—The first step as a rule is a roasting process, which, in the case of a speis, yields an arseui- ferous mixture of oxides; a mat, in general, passes into a mixture of oxide, sulphate, and unchanged sulphide. Either roasted material is easily disintegrated by being treated with aqueous muriatic or sulphuric acid, with formation of a solution of nickel- salt, contaminated, in general, with arsenic, antimony, bismuth, copper, iron, cobalt, and zinc, which must be

removed by suitable analytical methods. But, as we have no space to consider this problem in its general form, we will assume antimony, bismuth, and zinc to beabsent. If, in this case, the iron predominates sufficiently over the arsenic, these two can both be removed at one stroke by evaporating the solution to dryness and calcining the residue at the lowest sufficient temperature; the iron-salt only is reduced to an insoluble basic salt (of Fe,0,), which includes all the arsenic, so that by redissolving in water and passing the liquor through a filter press we obtain a solution which, by theory, is free of iron and arsenic. Practically, however, a trace of iron remains, and must be removed by precipitation with carbonate of line in the cold and filtration. A repetition of the same process at about 60° C. elimi- nates the copper, so that only the cobalt is left, which, however, is no impurity metallurgically, and consequently may be suffered to remain, but, if present in sufficient quantity, must be recovered for its own sake. This is effected by addition of bleaching powder and gentle heating. If care be taken to let a little of the cobalt escape, the rest goes down as black peroxide, Co,03, sufficiently pure for its ordinary applications. From the filtered nickel solution the metal is precipitated, by addition of milk-of-lime, as a green hydrated oxide, which is collected and washed in a filter press. The precipitate, being inconveniently gelatinous and bulky, is next rendered compact by a gentle calcination, and, if it is, as usual, contaminated with sulphate of lime, is freed from this impurity by judicious washing with highly dilute muriatic acid or otherwise. The purified oxide then, either by mere pressure or with the help of starch or other plastifying material, is shaped into little cubes of about one centimetre's side, embedded in charcoal dust within graphite or fire-clay crucibles and heated in a fire. A dull red heat suffices for the mere reduction of the oxide to metal ; but a strong red heat is applied in order to cause the nickel cubes to sinter together and become fast and compact. No degree of red heat will fuse them unless they are contaminated with copper. There is no need to explain how, with cupriferous leys, the process has to be modified to lead ultimately to a fused regulus of copper- nickel available for the preparation of german silver. From a copper-free liquor, provided only it contains its iron all as ferric salt, a pure nickel precipitate can be obtained at once by addi- tion of oxalic acid. The (green) oxalate of nickel precipitate need only be washed, dried, and ignited to be converted into a pure (but partially oxidized) metal. This process has actually been applied, at least

~~experimentally, in the working of the New Caledonian ore, with this modification, however, that the oxalic acid was recovered by boiling the oxalate of nickel with carbonate of potash, and precipitating the acid by milk-of-lime from the alkaline solution.~~

~~Ordinary cube-nickel contains from 94 to 99 per cent. of real nickel. The purest commercial metal is that extracted from the New Caledonian ore; it often contains only a fraction of a per cent. of impurities. The present writer has no information regarding the mechanical characters of such highly-refined New Caledonian metal. The best com- mercial cube-nickel (although it may contain less than 1 per cent. of impurities) is always utterly devoid" of plasticity ; it breaks under the hammer, although the pure metal, as was shown as early as 1804 by Richter, and confirmed by Deville in 1856, is highly ductile and tenacious. To obtain the pure metal, the best laboratory method is to prepare pure oxalate and heat it intensely in a close crucible made of quicklime, when it is obtained as an almost silver-white regulus, which has all the ductility and malleability of the best wrought iron combined with one and a half times the breaking strain and greater hardness. It is attracted by the magnet. Its specific gravity is 8-279 for ingot, and 8°666 (Richter) for the forged metal. It can be welded at a red heat like wrought iron, which it exceeds in relative infusibility. It does not tarnish even on long exposure to the air. Sulphuretted hydrogen does not blacken it. Liquid water, even in the presence of air, has no action upon it. Aqueous non-oxidizing acids act upon it as they do on~~

~~iron, but more slowly. Nitric acid and aqua regia dissolve it as nitrate Ni(NO,), and chloride NiCl, respectively. When heated strongly in air it is gradually oxidized ; it decomposes steam, slowly, at a red heat. In brief, it unites in itself all the virtues of iron with some of the characteristics of the noble metals, and yet its application in the mechanical arts was never thought of until Fleitmann in 1879 made a most remarkable observation. Finding that even the purest nickel which he could produce on a manufacturing scale was brittle, he attributed this defect not to the traces of metallic impurities still present in it but to occluded carbonic oxide, and tried to remove this by addition of magnesium to the molten metal. He suc-~~

ceeded beyond expectation: one-eighth of a per cent. of magnesium added to the metal (in an atmosphere of carbonic acid) before pouring imparted to it all the plasticity of the pure metal! Fleitmann also found that the thus purified nickel could be permanently welded on wrought iron, and that a combination plate thus produced could be rolled out into the thinnest sheet without breach of continuity. Since that time his firm (Fleitmann & Witte of Iserlohn) have made a business of the manu- facture of cooking utensils and other useful articles out of such nickel-plated iron. Physiological experiments on a dog, instituted at the instance of the firm, showed that the metal is innocuous. Cobalt, as Fleitmann found, behaves in every respect like nickel, and even exceeds it in whiteness and brilliancy.2. The writer has for more than a year been in the habit of using a nickel basin (supplied by Messrs Johnson & Matthey of London) for operations with caustic-alkali lye, and finds it to work admirably—better, in fact, than a silver one.

Nickel Electroplating.—This art, invented by Bottcher about 1848, has developed into an important industry, especially in the United States. The best kind of solution to use is one of the double sul- phate of nickel and ammonia, which should be saturated at 25° and used in conjunction with a plate of nickel as positive electrode.

Alloys.—Nickel alloys were used practically long before Cronsted's discovery of the metal. GERMAN SILVER (g.v.), long known to the Chinese as '' Pack Tong," 4.¢., '' white copper," consists of nickel, copper, and zinc united in varying propottions,—3 of copper, 1 of zinc, and 1 of nickel is said to give the most silver-like alloy. An alloy of '' german" with real silver has lately been introduced as "'tiers-argent"; it consists of silver 27°6, copper 59°0, zine 9°6, nickel 3°4 per cent. In the United States, in Belgium, and in Germany, an alloy of 1 of nickel with 3 of copper serves for the making of minor coins. All these alloys are non-magnetic.

' Salts.—For nickel salts sce CHEMISTRY and chemical hand- ooks.

Analysis,—Nickel-salts, as a rule, and their solutions more gene- rally, exhibit a green colour. Sulphuretted hydrogen does not precipitate the metal from solutions containing free mineral acid. Sulphide of ammonium, from neutral or alkaline solutions, precipi- tates a black sulphide which, like sulphide of cobalt, when once produced is almost insoluble in dilute cold

hydrochloric acid, and has the specific property of being very appreciably soluble in a mixture of yellow (é.c., ordinary) sulphide of ammonium and free ammonia, forming a dark coffee-brown solution. Unlike iron-salts, nickel-salts are not oxidized into sesquioxide (analogous to Fe,03) salts by nitric acid orchlorine. Carbonate of baryta, which readily precipitates oxide of iron (Fe,O3) and alumina, does not precipitate nickel from its solutions in the cold. By means of these reactions nickel is easily distinguished and separated from all other metals except cobalt. To test a nickel solution for cobalt, add excess of nitrite of potassium and acidify with acetic acid. Cobalt, if present, comes down gradually as " Fischer's salt," a double nitrite of Co.03 and K,0O.

The atomic weight of nickel, according to the latest determina- tions, is identical with that of cobalt :—Ni(=Co) =58'6, O being 16.

Karmarsch and Heeren's Technisches Worterbuch gives a very full account of the metallurgy of nickel, quite up to date (1883). (W. D.) a ee eS

1 It is perhaps well to repeat a warning given by Fleitmann, that the introduction of the magnesium, if not very cautiously done in the absence of air, leads to violent explosions.

2 It is only fair to state that as early as the Universal Exhibition of Vienna in 1873 the American Wharton exhibited vessels of pure forged nickel, prepared from the spongy metal by strong compression under a steam hammer at a red heat.

NIC—NIC

NICOBARS, a cluster of eight large and twelve small islands in the Bay of Bengal, lying to the south of the Andamans, between 6° 40' and 9° 20' N. lat. and between 93° and 94° E. long., with a population in 1881, exclu- sive of aborigines, of 308. The largest island, the Great Nicobar, is about 30 miles in length and from 12 to 15 in breadth. Many of the islands are hilly, with peaks of con- siderable height ; others are flat and covered with forests of cocoa-nut trees. Allare well wooded. Tropical fruits grow in abundance, and yams of fine quality and size. The Nicobar swallow is the builder of the edible bird's nest, which, together with trepang (béche-de-mer), cocoa-nuts,

~~tortoiseshell, and ambergris, forms the whole export of the islands. Agriculture is quite unknown. 'Trade is carried on by barter with the crews of English, native, and Malay vessels. The inhabitants, a race of savages with Malay- like features, had an evil reputation for piracy, and murder of the crews of vessels visiting the island or ship- wrecked upon them. An inquiry by the Government of India into a case of this sort in 1869 led to the annexa- tion of the whole archipelago, the administration being placed under the superintendent of the Andaman Islands.~~

~~NICOL, Witu1am, the inventor of the invaluable polarizing prism (Lieut, vol. xiv. p. 612), was born about 1768, and died at Edinburgh in September 1851. Nothing is known of his early history, beyond the fact that, after amassing a small competence as an itinerant popular lecturer on various parts of natural philosophy, he settled in Edinburgh to live a very retired life in the society of his apparatus alone. Besides the invention of his prism (of which we are told that he himself did not understand the mode of action), he devoted himself chiefly to the examination of fluid-filled cavities in crystals, and of the microscopic structure of various kinds of fossil wood. In the preparation of the sections of wood he introduced improvements of the utmost value. Before his time only the roughest slices were employed. His skill asa working lapidary was very great; and he executed a number of lenses of garnet and other precious stones, which he pre- ferred to the achromatic microscopes of the time. The majority of the few, though important, papers which he published are to be found in the old and new Edinburgh Philosophical Journal.~~

~~NICOLAI, Curistopx Frieprich (1733-1811), a German author and bookseller, was born on the 18th of March 1733, at Berlin, where his father was a bookseller. He was educated at a real-school in Berlin, and in 1749 went to Frankfort-on-the-Oder to learn his father's business. In 1752 he returned to Berlin, and soon began to take part in current literary controversy. At that time the leaders of critical opinion in Germany were Gottsched and Bodmer. In 1755 Nicolai issued a book, Briefe tiber den jetugen Zustand der schénen Wissenschaften, in which he tried to show that each of these writers was in his own way narrow and intolerant. This work secured for the author the friendship of Lessing, whose power as a critic was then beginning to be recognized. In 1757 Nicolai devoted himself~~

exclusively to literature; but next year, after the death of his brother, who had continued the elder Nicolai's business, he found it necessary to resume the life of a bookseller. He did not, however, abandon his literary labours. In association with his friend Moses Mendelssohn he had established, in 1757, the periodical called Bibliothek der schinen Wissenschaften, and this he conducted until 1760. From 1761 to 1766 he contributed to the Briefe, die neueste Literatur betrefend ; but it was Lessing's work that made this series famous. For many years (from 1765 to 1791) Nicolai edited the Allgemeine deutsche Bibliothek, a periodical which served as the organ of the so-called popular philosophers, who warred against authority in

religion and against what they conceived to be extravagance in literature. The new niovement of ideas represented by Herder, Goethe, Schiller, Kant, and Fichte he was in- capable of understanding, and he made himself ridiculous by foolish misrepresentation of theiraims. Of Nicolai's inde- pendent writings, perhaps the only one of permanent value is his Anekdoten von Lriedrich II, His romances are forgotten, although Leben und Meinungen des LHerrn Magisters Sebaldus Nothanker had a certain reputation in its day. His Beschreibung einer Reise durch Deutschland und die Schweiz was attacked by many writers, and it proved that in middle life he had become in a new way not less bigoted than the authors whose bigotry he had spent much of his time in exposing. Nicolai died on the 8th of January 1811. He wrote an Autohiography, which was published in 1806. See Nicolad's Leben und litera- rischer Nachlass, by Géckingk (1820).

NICOLAIEFF. See NIKo.alerr.

NICOLAS, Sir Nicworas Harris (1799-1848), English antiquary, was born 10th March 1799, the fourth son of John Harris Nicolas of East Looe in Cornwall, whose Breton ancestors had settled there on the revocation of the edict of Nantes. He entered the navy in 1808, and was promoted lieutenant in 1815. At the close of the war he retired from the service and began to study for the bar. He was called at the Inner Temple in 1825, but his business as a barrister was chiefly confined to the claims of peerage before the House of Lords, his special genealogical knowledge rendering his assistance in such cases invaluable. On genealogical questions and those

connected with the descent of ancient families his researches have thrown much important light. Of works on these subjects he published a considerable number, the most useful being Wotetia Historica (1824 ; expanded in 1835 for " Lardner's Cabinet Cyclopedia" into Chronology of History), Synopsis of the Peerage of England (2 vols., 1825), and Testamenta Vetusta (2 vols., 1826). Nicholas wrote a number of valu- able biographical notices for Pickering's Aldine edition of the poets, among others those of Chaucer, Surrey, Wyatt, Collins, Cowper, Thomson, Burns, and Kirke White. His "Lives of Isaak Walton and Charles Cotton," prefixed to Pickering's edition of the Complete Angler, are also the fruit of independent and original research. The service of Nicolas in the royal navy seems to have left an impress on his mind which his antiquarian studies tended rather to deepen than obliterate; and it is where his passion for antiquarian research was exercised in illustrating the historic glories of England and the heroic deeds of famous individuals that he found the most congenial scope for his powers. His magnum opus is his {1tstory of the Orders of Knighthood of the British Empire (4 vols., 1841-42). For his previous researches into the history of the orders he was, in 1831, made a knight of the Hanoverian Guelphic order and in 1832 chancellor of the Ionian order of St Michael and St George, and in 1840 he was advanced to the grade of the Grand Cross. In his later years Nicolas was occupied chiefly with works connected with the naval achievements of England. He published Dispatches and Letters of Admiral Lord Viscount Nelson (7 vols., 1844-46); and he was engaged until a few days before his death in editing the papers of Sir Hudson Lowe. He died at Cape Curé,

near Boulogne, August 3, 1848. os

Sir Harris Nicolas left an unfinished History of the British Navy, in 2 vols. He became a member of the council of the Society of Antiquaries in 1826, but on account of a controversy with the other members in regard to the management of its affairs he withdrew in 1828. Besides exposing in various pamphlets what he regarded as serious defects in its management, he made frequent reference to them in the Retrospective Review, of which he was joint-editor. He also instituted an inquiry into the proceedings of the Record Com- mission, the publications of which he regarded as not commensurate in value with the money expendedon them. But, although, owing

to the warmth of his feelings and his keen interest in his subject, Nicolas was apt to involve himself in keen controversy, he never cherished personal animosity, and his motives were otherwise above suspicion. A complete list of the writings of Nicolas will be found in the Gentleman's Magazine for October 1848.

NICOLE, Prerre (1625-1695), one of the most distin- guished of the Port-Royalists, a scholar of great excellence, and, according to Bayle (who had no particular reason for praising him), "one of the best writers in Europe," was born at Chartres in 1625. Like his friend Pascal he was a precocious boy, though his precocity showed itself in classics and in miscellaneous reading, not in mathematics, and it was when he was transferred from his native town to Paris to finish his education that the rising school of Port Royal fixed its attention upon him. At an early age he was made a master in the Port Royal school, where his special department was classical instruction, though he is said to have taken no small part in the famous Art de Penser or Port Royal logic. He shared in the history of the school, and with the exception of Arnauld and Pascal may be said to have been its most accomplished member. Not a little of the materials of the Provinciales is said to be due to him, and at the completion of Pascal's great work he translated it into Latin. One of the most virtuous men in France, he was a favourite of the notorious duchess of Longueville for politico-theological reasons, and he was the immediate master of Racine. This latter circumstance brought about an incident thoroughly dis- creditable to the dramatist. Nicole was the author of certain Lettres sur les Visionnatres or & un Visionnaire, as they are most frequently cited. The actual title of the collected work is Les Imaginaires et les Visionnaires (1667). In these he had attacked Desmarets de Saint Sorlin, and with the excessive puritanism which characterized his sect had reflected on fiction and the drama generally. Racine, without a shadow of personal provocation, replied in two letters of great asperity, of which the first was actually published, and the second only delayed (it was published after its author's death) owing to the judicious counsel of Boileau. But Nicole made no reply, and indeed public

~~opinion condemned Racine without hesitation. Nicole, who, owing to the theological disputes in which he was concerned, had never fully taken orders, and who had been compelled at one time to leave France, devoted himself in his later years chiefly to moral philosophy. The first volume of his Hssais de Morale appeared in 1671, and the rest of his life was chiefly occupied on this book, though he wrote many others. He was warmly admired by many of the best judges among his contemporaries, Madame de Sévigné deserving especial mention, and numerous selec- tions of his ethical works have appeared in recent times. Modern opinion hardly recognizes in Nicole the right to hold the place close to Pascal which his own time accorded to him. His style is clear, simple, and correct, but a little flat and monotonous; his thought sensible, just, and charitable, but somewhat destitute of depth, subtlety, and originality. He was certainly one of the best men of his time, but as certainly not one of the greatest ; and his reputation was due first to his scholarship, secondly to his moderation. He died of apoplexy, November 16, 1605; and had latterly somewhat separated himself from the Jansenists. Numerous stories are told of his personal timidity and unreadiness in oral argument. It does not appear that his works (by far the most important of which is the already-mentioned Hssais de Morale, Paris, 1671, sq.) were ever collected.~~

~~NICOMEDES L., son of Zipcetes, succeeded his father as king of Bithynia in 278 B.c. He enlarged and consoli- dated the kingdom, which had been founded by his father in 288, and founded the great city of. Nicomedia as the capital.~~

~~NIC—NIC~~

~~Antioclius of Syria, and invited the Gauls under Leonnorius and Lutarius to cross into Asia Minor and help him against his foreign and domestic enemies. His reign seems to have been long, prosperous, and uneventful; the year of his death is unknown,~~

~~NICOMEDES IL., fourth in descent from the preced- ing, was son of Prusias II. He was so popular with the people that his father became jealous and sent him to Rome. Here he was so much favoured by the senate that Prusias sent an ambassador, Menas, to Rome, giving him secret orders to assassinate Nicomedes. Menas revealed the plot, and persuaded the prince~~

~~to rebel against his father. Supported by Attalus IL, king of Pergamum, he was completely successful, and ordered his father to be slain before the altar of Zeus in Nicomedia. Nicomedes reigned from 149 to 91 3.c., and during his long reign adhered steadily to the Romanalliance. He made himself for a time master of Paphlagonia, and married Laodice, widow of Ariarathes VI., in order to have a claim on her deceased husband's kingdom of Cappadocia.~~

~~NICOMEDES IIL, son and successor of the preced- ing. His brother Socrates contested the kingdom with him, relying on the alliance of the great Mithradates. Nicomedes was established on the throne by Roman help in 90 B.c., but expelled by Mithradates in 88, after a great defeat in Paphlagonia. In 84 he was restored by the Romans. In 81 Julius Cesar, sent to him by his com- mander, became so intimate with him as to give rise to great calumnies at home. He died in 74 Bo., and be- qeathed his kingdom to the Romans.~~

~~NICOMEDIA, a town at the head of the Sinus Astacenus, which opens on the Propontis, was built in 264 B.C. by Nicomedes I., king of Bithynia, and has ever since been one of the chief towns in this part of Asia Minor. It still retains the ancient name under the form Ismid, and it is the terminus of a short railway. Its situation made it a convenient centre of government. It was the metropolis of Bithynia under the Roman empire (see Nica); Diocletian made it the capital of the East, and fixed his court there. It retained its importance even after Constantinople was founded, for the roads from all parts of Asia Minor to the capital converge at Nicomedia.~~

~~NICOPOLI. See Nixopor.~~

~~NICOPOLIS, or Actia Nicopomis, an ancient city of Epirus, founded 31 B.c. by Octavian in memory of his victory over Antony and Cleopatra at Actium. The colony, composed of settlers from a great many of the towns of the neighbouring countries (Ambracia, Anactorium, Calydon, Argos Amphilochicum, Leucas, &c.), proved highly successful, and the city was considered the capital of southern Epirus and Acarnania, and obtained the right of sending five representatives to the Amphictyonic council. On the spot where Octavian's own tent had been pitched he erected a sanctuary to Neptune adorned with the beaks of the captured galleys; and in further celebra- tion of his victory he instituted the so-called Actian games in~~

~~honour of Apollo Actius. The city was restored by the emperor Julian, and again after the Gothic invasion by Justinian ; but in the course of the Middle Ages it was supplanted by the town of Prevesa. The ruins of Nicopolis, now known as Paleoprevesa (Old Prevesa), lie about 3 miles north of that city, on a small bay of the Gulf of Arta (Sinus Ambracius) at the narrowest part of the isthmus of the peninsula which separates the gulf from the Ionian Sea. Besides the acropolis, the most con- spicuous objects are two theatres (the larger with twenty- seven rows of seats) and an aqueduct which brought water to the town from a distance of 27 miles. See Wolfe in Jour. Roy. Geog. Soc., 1833; Leake, Northern Greece ;~~

~~He was for some time engaged in war with | Bursian, Geog. von Griechenland.~~

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~~Nicopolis was also the name of (1) a city in Cappadocia in the | valley of the Lycus, founded by Pompey on the spot where he defeated Mithradates; (2) a city in Egypt, founded by Octavian 24 B.c. to commemorate his final victory over Antony; and (3) acity in Thrace at the junction of the Iatrus with the Danube, founded by Trajan in memory of his victory over the Dacians (Nikup).°~~

~~NICOSIA is the name in common use, though originally a mere corruption of the Greek name Lefkosia, for the capital of Cyprus. It is situated in the midst of the great plain of the Mesaria, which traverses the island from sea to sea, and is nearly equidistant from the Gulf of Morphu at one end and that of Famagosta at the other. Though the name of Lefkosia (Aevxwoia) is undoubtedly Greek, it is not found in the ancient geography of the island ; and, though the discovery of some ancient tombs in the immediate neighbourhood prove that the site was inhabited in very early times, no mention is found of it before the reign of Constantine, by whom it was fortified with a circuit of walls, which continued to exist down to the time of the Venetians. It became the capital of the island under the kings of the Lusignan dynasty, who were the rulers of Cyprus from 1192 to 1489,—an advantage which it probably owed to its inland, and somewhat central, situation, though in other respects its position affords few advantages. It stands in a barren and treeless plain, on the banks of the river Pedias, which~~

~~is, however, a mere shingly bed during the greater part of the year, and the town is dependent for its supply of water upon an aqueduct by which it is conveyed from the neighbouring hills. Like many other Oriental towns, Nicosia has rather an imposing effect from a distance, in consequence especially of its lofty walls, built by the Venetians to replace the previously existing circuit, which remain unbroken to the present day. Above these towers the beautiful Gothic cathedral, now converted into amosque. But the interior of the city is a mere labyrinth of narrow streets, and presents an aspect of great decay. The population, which was previously estimated at 16,000, was found by an actual census, taken in 1879, to amount to only 11,197 souls, of whom 5628 were Mohammedans and 5251 Greeks. Since the occupation of Cyprus by the English, some improvements have been introduced at Nicosia, which still continues to be the capital of the island, and the residence of the British commissioner, as well as of the Greek archbishop. A new carriage road has also been constructed from thence to Larnaca, which is becoming a place of considerable trade. But the natural disadvan- tages of its situation will probably prevent Nicosia from ever rising again to an important town. At the present day it is worthless as a fortress, on account of its being completely commanded from the neighbouring heights.~~

~~NICOSIA, a city of Italy in the province of Catania in Sicily, about 50 miles west of Catania, near the rise of the Seminato. It is a picturesque medizval-looking place, with a cathedral in the Norman style, a communal library, mineral wells, and a trade in grain, wine, and oil. The population of the commune was 14,731 in 1861 and 15,460 in 1881; that of the town was 14,508 in 1871.~~

~~Nicosia probably represents the ancient Herbita, which gallantly maintained its independence against Dionysius of Syracuse. De- stroyed by the Saracens, the city was restored by the Normans, and the Lombard colony introduced by Roger is said to have ae trace in the popular speech. The bishopric dates from~~

~~NICOTINE. See Tosacco.~~

~~NIEBUHR, Bartuorp Grore (1776-1831), the his- torian of ancient Rome, was the son of Karsten Niebuhr, noticed below, and was born at~~

Copenhagen on August 27,1776. His family was of Hanoverian extraction. In his infancy his father removed to Meldorf in South Ditmarsh, where he had received a Government appoint- ment, and devoted his leisure to the instruction of his |

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son. From the earliest age young Niebuhr manifested extraordinary precocity, and especial interest in history and politics. From 1794 to 1796, being already a finished classical scholar and acquainted with several modern lauguages, he studied at the university of Kiel, applying himself to mathematics, logic, philosophy, and other studies previously neglected. He there formed the most important friendship of his life, that with Madame Hensler, the widowed daughter-in-law of one of the professors, and a woman of unusual strength of character, six years older than himself. He also made the acquaintance of her sister, Amelie Behrens, whom he subsequently married. After quitting the university he became private secretary to Count Schimmelmann, Danish minister of finance, but finding that the post did not allow him sufficient leisure for study, he quitted it for an appointment at the royal library. He shortly afterwards travelled in Great Britain, and spent a year at Edinburgh studying agriculture and physical science. His observations on England and Scotland, conveyed in letters to his betrothed, are exceed- ingly interesting ; but he failed to obtain that confidence in the capacity of an educated community for self-government which residence in a free country might have been expected to bestow, and which would have saved him much sorrow, and most of his errors in practical politics. He says, nevertheless, "my early residence in England gave me one important key to Roman history. It is necessary to know civil life by personal observation in order to understand such states as those of antiquity. I never could have understood a number of things in the history of Rome without having observed England." He also acquired in Scotland a feeling for nature, in which he had previously been remarkably deficient. In 1799 he returned to Denmark, where he was soon appointed assessor in the East India department of the Board of Trade, and secretary for the affairs of the Danish consulates in Barbary. In 1800 he married and settled at Copenhagen. In 1804 he became chief director of the National Bank, but in September 1806, after negotiations which had extended over more than a

~~year, quitted this for a similar appoint- ment in Prussia. The step was a false one as concerned his personal interests, and not highly creditable to his patriotism as a Danish subject; but it is not to be regretted, since, without the release from' public life which it ulti- mately occasioned, we should not have possessed his oman Llistory.~~

~~He arrived in Prussia on the eve of the catastrophe of Jena, and shared to the full all the disasters and miseries which overwhelmed the monarchy, He accompanied the fugitive Government to Kénigsberg, where he rendered considerable service in the commissariat, and was after- wards still more useful as commissioner of the national debt, and by his opposition to ill-considered schemes of taxation. He was also for a short time Prussian minister in Holland, where he endeavoured without success to con- tracta loan. The extreme sensitiveness of his temperament, however, disqualified him for politics; he proved impractic- able in his relations with Hardenberg and other ministers, and in 1810 retired for a time from public life, accepting the more congenial appointment of royal historiographer and professor at the university of Berlin. He commenced his lectures with a course on the history of Rome. The enthusiastic reception these experienced filled him with delight. He recognized that he had found his vocation, and henceforth regarded the history of Rome from the earliest age to Augustus as the task of his life. The first two volumes, based upon his lectures, were published in 1812, but attracted little attention at the time owing to the absorbing interest of political events. In 1813 Niebuhr's own attention was diverted from history by~~

~~the uprising of the German people against Napoleon ; he entered the landwehr, and ineffectually sought admission into the regular army. He edited for a short time a patriotic journal, The Prussian Correspondent, joined the headquarters of the allied sovereigns, and witnessed the battle of Bautzen, and was subsequently employed in some minor negotiations. In 1815 he lost his father, whose life he subsequently wrote; and in July his beloved wife, whose health had long been declining, expired, enjoining him to finish his History. He next accepted the post of ambassador at Rome, which he probably thought would assist his historical labours, and departed~~

to assume that office in July 1816. On his way he discovered in the cathedral library of Verona the long-lost Institutes of Gaius, afterwards edited by Savigny, to whom he communicated the discovery under the impression that he had found a portion of Ulpian. Before his departure for Rome he had married his wife's niece, an amiable young person, but inferior intellectually to his first wife, and almost equally delicate in constitution. Although devoted to him, she could in no way replace her predecessor. Nor was he happy in other respects. He disliked the Italians, and found himself unable to proceed as he wished with his History. These causes, acting upon a naturally querulous and despondent temper, produced a general dissatisfaction and discouragement which coloured all his views of human affairs, and deprived the world of the benefit that it might have received from the observations of one endowed with such profound insight and such noble sympathies. While his distrust made him ungenerous to those who were con- tending for a better order of things, his appreciation of the lessons of history withheld him equally from siding with the reactionary party. His position in his latter years was hence one of great isolation, not uncheered, however, by the sympathy of friends and disciples such as Savigny and Bunsen. During his residence in Rome he discovered and published fragments of Cicero and Livy, aided Cardinal Mai in his edition of Cicero De Republica, and shared in framing the plan of Bunsen and Platner's great work on the topography of ancient Rome, to which he contributed several chapters. He also, on a journey home from Ttaly, deciphered in a palimpsest at St Gall the fragments of Flavius Merobaudes, a Roman poet of the 5th century. In 1823 he resigned the embassy and established himself at Bonn, where the remainder of his life was spent, with the exception of some visits to Berlin as councillor of state. He here rewrote and republished (1827-28) the first two volumes of his /Tistory, and composed a third volume, bringing the narrative down to the end of the First Punic War, which he did not hiniself entirely complete, but which, with the help of a fragment written in 1811, was edited after his death by Professor Classen. He also assisted in Bekker's edition of the Byzantine historians, and delivered courses of lectures on ancient history, ethnography, and geography, and on the French Revolution, which were published from notes after his death. In February 1830 his house was burned down, but the greater part of his books and manuscripts were saved. The revolution of July in the same year was a terrible blow to him, and filled him with the

most dismal anticipations of the future of Europe. He died on J anuary 2, 1831, from a chill taken in coming home from a news-room where he had been eagerly studying the trial of the ministers of Charles X. His wife survived him only nine days. He left several children by her ; his first marriage had been childless.

Niebuhr's great work counts among epoch-making histories both as marking an era in the study of its special subject, aud for its momentous influence on the general conception of history. 'The

main results," says Dr Schmitz, "arrived at by the inquiries of Niebuhr, such as his views of the ancient population of Rome,

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| the origin of the plebs, the relation between the patricians and

plebeians, the real nature of the ager pubiicus, and many other points of interest, have been acknowledged by all his successors." Other alleged discoveries, such as the construction of early Roman history out of still carlier ballads, have not been equally fortunate s but if every positive conclusion of Niebuhr's had been refuted, his claim to be considered the first who dealt with the ancient history of Rome in a scientific spirit would remain unimpaired, and the new principles introduced by him into historical research would lose nothing of their importance. He suggested, though he did not elaborate, the theory of the myth, so potent an instrument for good and ill in modern historical criticism. He brought in infer- ence to supply the place of discredited tradition, and showed the possibility of writing history in the absence of original records. By his theory of the disputes between the patricians and plebeians arising from original differences of race he drew attention to the immense importance of ethnological distinctions, and con- tributed to the revival of these divergences as factors in modern history. More than all, perhaps, since his conception of ancient Roman story made laws and manners of more account than shadowy lawgivers, he undesignedly influenced history by popu- larizing that conception of it which lays stress on institutions, tendencies, and social traits to the neglect of individuals. History, so treated, always inclines to degenerate into mere disquisition ; and if Niebuhr were weighed in the

scales of Livy it might be questioned whether he could even claim to rank among historians. That his rank should be so high is a proof of the extension which the defini- tion of history has received in ourday. An historian should beforo all things tell a story. Niebuhr is often engaged in proving that there is no story to tell, The peculiar character of his work is incidentally expressed by himself. ‘‘That,” he says, ‘‘ which would be harmonious in a national and poetical historian would be out of tune in a work written more than eighteen hundred years later by a foreigner and a critic. His task is to restore the ancient tradition.” He is not, that is to say, an historian but an historical critic. It would therefore be unjust to try him by the standard of great artists in history like Gibbon, eminent in narrative, in character-painting, in historical grouping and light and shade. His intense admiration for Livy proves how greatly he himself valued such accomplishments, but he makes no attempt to emulate them. Such an endeavour could have had no place in the treat- ment of early Roman history according to the principle he had prescribed for himself ; and it is perhaps fortunate for his fame that the pen dropped from his hand as he was slowly emerging from the regions of historic twilight into a clear day where the actions of statesmen and generals are no longer a matter of uncertainty, and only require to be interpreted by their motives. There are indeed in the latter pages of his history evidences of deep human sympathy, and a capacity for viewing men and things in the concrete, as, for instance, in his treatment of Pyrrhus; but this tendency is continually checked and controlled by his propensity to analytical criticism. Had his work been carried down, as he designed, to the period of Augustus, he would have given a masterly study of such episodes as the legislation of the Gracchi, he would have thrown the clearest light on the constitutional questions between Cesar and his adversaries, he would now and then have illuminated the character of a great man by a flash of inspiration ; but as a whole his history would have lacked life, colour, and movement. It must be added that, if his style is not precisely inelegant, even the refined literary skill of his English translators has failed to render it attractive. Whence, then, is this history not merely valuable, but delightful? The answer must be from its freshness, its elation of real or supposed discovery, the impression it conveys of actual contact with a great body of new and unsuspected truth. We seem to be at once learning and unlearning ; we sce many new things, and old things as we never saw them before. It is an intellectual

emancipation, momentous for the world and the individual, even if particular conclusions should prove to be hasty, and particular details inaccurate. In this sense Niebuhr was justified in his proud assumption that ‘‘the discovery of no ancient historian would have taught the world so much as my work.” His further prediction “that all that may hereafter come to light from ancient and uncorrupted sources will only tend to confirm or develop the principles I have advanced” has not received equal confirmation. The theory on which he laid so much stress of the derivation of ancient Roman history from popular ballads has been refuted by Sir George Lewis, and now finds little acceptance. The general scepticism as to the credibility of ancient history implied in his method went too far, and has been succeeded by a legitimate reaction fortified by such practical arguments as the recent archeological discoveries at Ilion and Mycenz, and more lately at Samos, in the deserts of Moab, and even on the confines of Ethiopia. Writing, it is evident, was more ancient and more practised ; oral tradition was more disciplined (as might have been inferred from a memorable passage in Plato’s Timwus); there was more even of a judicial and critical spirit in antiquity than was surmised by Niebuhr. The testimony of Xanthus to the Lydian origin of

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the Etruscans, so summarily set aside by him, would now be con- sidered strong prima facie evidence. Yet, after every deduction, Dr Leonhard Schmitz, prefacing the English translation of the Roman History by Mommsen which has for readers of general culti- vation superseded Niebuhr, is able to say of the latter, ‘‘The main pillars of his grand structure are still unshaken.” The endowments which enabled him to achieve so much in the absence of so many of the historian’s most essential gifts may be character- ized as learning, memory, sagacity, imagination. His erudition is marvellous for a man so much engaged in public affairs, and the perfect ease with which it is wielded is even more rare and admir- able. This facility was greatly assisted by the prodigious memory which remembered things not only in themselves but in their relations to other things, and hence would often quite unexpectedly bring one circumstance to bear upon the interpretation of another. Niebuhr’s sagacity is considerably overestimated when it is spoken of as “divination”; this dangerous term,

however, may be service- able in expressing his faculty for remote inference, and for detect- ing how much may be implied in a statement, an allusion, or an omission previously disregarded. It must be confessed that this faculty was sometimes perverted by a tendency to paradox, particularly observable in some of his minor speculations, such as his disquisitions on the dates of Quintus Curtius and Petronius. Imagination, nevertheless, was Niebuhr's most signal endowment, — not the historical imagination that reanimates actors departed from the world's theatre, but the critical imagination that makes past social conditions living and real. In the pourtrayal of men Niebuhr's touch is uncertain, but his treatment of institutions is an actual contact. Everything becomes alive to him, and to the reader's elation at finding himself thus apparently introduced to realities where he had looked only for abstractions must be ascribed much of the overwhelming influence and success of a work so deficient in the ordinary attractions of history.

Niebuhr's other works are interesting, but would not of them- selves have made a great reputation. The notes of his Bonn lectures on ancient history and geography disappointed expectation, but expectation had been pitched unreasonably high. They were not finished compositions, and could not be more than useful and suggestive commonplace books. A detailed examination of their obiter dicta by the light of recent discovery and more exact research would be highly interesting. His' lectures on the French Revolu-

tion, delivered in 1825, though well worth hearing, were not worth |

publishing, especially as the editor cannot vouch fortheir verbal or even their substantial fidelity. The Kicine Schriften include many valuable essays. His letters form one of the most interesting collections of correspondence extant, alike for the multiplicity of important subjects treated in them, and their revelation of the writer in all his strength and weakness. The luminous profundity of his remarks is frequently startling. Like Coleridge he seems to have an intuitive faculty for descending below the apparent surface of things, while he is no more successful than Coleridge in applying this gift to the appreciation of the practical problems of his own age. There is hardly another book from which it would be

~~possible to select more entirely perverse and erroneous views respecting human society in general, and more admirable observations on individual men and things. A selection of remarks and aphorisms, both from his correspondence and his historical writings, would be a compilation of great value.~~

~~Niebuhr's personal character was in most respects exceedingly attractive. His heart was kind and his affections were strong ; he was magnanimous and disinterested, simple and honest. He hada kindling sympathy with everything lofty and generous, and framed his own conduct upon the highest principles. His chief defect was an over-sensitiveness leading to peevish and unreasonable behaviour in his private and official relations, to hasty and unbalanced judg- ments of persons and things that had given him annoyance, and to a despondency and discouragement which have frustrated the great good he might have effected as a critic of public affairs from the point of view of a lofty morality. His imagination sometimes usurps the functions of his judgment, and his sagacity is traversed by a vein of paradox. In this, as in many other features of his intellectual character, he strikingly resembles Bentley, but his moral constitution is totally dissimilar.~~

~~The principal authority for Niebuhr's life is the Lebensnachrichten, prepared by Madame Hensler in 1838, and consisting mainly of correspondence linked by a brief biographical narrative. In the English translation by Miss Winkworth (1852) a great part of the correspondence is omitted, but the narrative is rendered more full, especially as concerns Niebuhr's participation in public affairs. 1t also contains interesting communications from Bunsen and Professor Loebell, and select translations from the Kleine Schriften. The reminiscences of Francis Licber (London, 1835) convey a pleasing view of Niebuhi's character, and prescrve passages of his conversation when ambassador at Rome. The first edition of his Roman History was translated into English by F. A. Walter (1827), but was immediately superseded by the translation of the second edition by Julius Hare and Connop Thirwall, completed by Dr William Smith and Dr Leonhard Schmitz (last edition, London, 1847-51). The History has been dis-~~

cussed and criticized in a great number of publications, the most important of |

which, perhaps, is Sir George Cornwall Lewis's Essay on the Credibility of the Early Roman History. The Lectures on Ancient History have been translated

by Dr Schmitz (London, 1852-53). (R. G.)

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NIEBUHR, Karsten (1733-1815), Eastern traveller, was born at Liidingworth, Lauenburg, on the southern border of Holstein, March 17, 1733, the son of a small farmer. He had little elementary education, and for several years of his youth had to do the work of a peasant. His bent was towards mathematics, and he managed to obtain some lessons in surveying. It was while he was working at this subject that one of his teachers, in 1760, proposed to him to join the expedition which was being sent out by Frederick V. of Denmark for the scientific exploration of Egypt, Arabia, and Syria. To qualify himself for the work of surveyor and geographer, he studied hard at mathematics for a year and a half before the expedition set out, and also managed to acquire some knowledge of Arabic. The expedition sailed in January 1761, and, landing at Alexandria, ascended the Nile and devoted some time to an examination of the pyramids and of the hieroglyphic writings of Egypt. Proceeding to Suez, Niebuhr made a visit to Mount Sinai, and in October 1762 the expedition sailed from Suez to Jiddah, journeying thence overland to Mocha. Here in May 1768 the philologist of the expedition, Van Haven, died, and was followed shortly after by the naturalist Forskal. San'a, the capital of Yemen, was visited, but the remaining members of the expedition suffered so much from the climate or from the mode of life that they returned to Mocha. Niebulir seems to have saved his own life and restored his health by adopting the native habits as to dress and food. From Mocha the ship was taken to Bombay, the artist of the expedition dying on the passage, and the surgeon soon after landing. Niebuhr was now left alone, the only surviving member of the expedition. He stayed fourteen months at Bombay, and then returned home by Muscat, Bushire, Shiraz, and Persepolis, visited the ruins of Babylon, and thence went to Baghdad, Mosul, and Aleppo. After a visit to Cyprus he made a

tour through Palestine, crossing Mount Taurus to Brussa, reaching Constantinople in February 1767, and Copenhagen in the following November. On his return Niebuhr at once set himself to the task of preparing the records of the expedition. His first volume, Beschreibung von Arabien, was published at Copenhagen in 1772, the Danish Government defraying the expenses of the abundant illustrations. This was followed in 1774-78 by other two volumes, Leisebeschreibung von Arabien und anderen umliegenden Ldndern. The fourth volume was not pub- lished till long after his death, in 1837, under the editor- ship of Niebuhr's daughter. He also undertook the task of bringing out the work of his friend Forskal, the naturalist of the expedition, under the titles of Descriptiones Animalium, Flora Aigyptiaco-Arabica, and [cones Rerum Naturalium (Copenhagen, 1775-76). To a German periodical, the Deutsches Museum, Niebuhr contributed papers on the interior of Africa, the political and military condition of the Turkish empire, and other subjects. He married in 1773, and for some years held a post in the Danish military service which enabled him to reside at Copenhagen. In 1778, however, he accepted a position in the civil service of Holstein, and went to reside at Meldorf, where he died, April 26, 1815.

Niebuhr was in no sense a genius nor even a man of many accomplishments, but he was one of the best scientific travellers that ever lived. He was well equipped for the partieular service which he had to perform in connexion with the Eastern expedi- tion; above all, he was an accurate and careful observer, had the instincts of the scholar, was animated by a high moral purpose, and was rigorously conscientious and anxiously truthful in recording the results of his observation. His works have long been classical, and even now must be consulted by any one who desires to have the most trustworthy accounts, not only of the gcography, but of

the people, the antiquitics, and the archeology of much of the | district of Arabia which he traversed. His narratives are simple,

and he himself is kept almost entirely in the background. He was |

a genuine peasant in many respects to the end of his life, having many of the peasant's virtues as well as failings.

Freneli and Dutch translations of his narratives were published during his lifetime, and a condensed English translation, by Robert Heron, of the first three volumes in Edinburgh, 1792. His distinguished son Barthold published a short Life at Kielin 1817; an English version was issued in 1838 in the Lives of Eminent Men, published by the Society for the Diffusion of Useful Knowledge.

NIELLO (Italian form of Latin nigellum, diminutive

of mger, "black"; late Greek, peAavdv), a method of |

producing delicate and minute decoration on a polished

metal surface by incised lines filled in with a black |

metallic amalgam. In some cases it is very difficult to distinguish niello from black enamel 3 but the black sub- stance differs from true enamel in being metallic, not vitreous. Our knowledge of the process and materials employed in niello-work is derived mainly from four writers, —Eraclius the Roman (a writer probably of the 11th century), Theophilus the monk, who wrote in the 12th or 13th century,! and, in the 16th century, Ben. Cellini? and Giorgio Vasari.2 These, with the exception of Eraclius, whose account is slightly different, agree closely in their description of the process. The design was cut with a sharp graving tool on the smooth surface of the metal, which was usually silver, but occasionally- gold or even bronze. An alloy was formed of two parts silver, one-third copper, and one-sixth lead ; to this mixture, while fluid in the crucible, powdered sulphur in excess was added ; and the brittle amalgam, when cold, was finely pounded, and sealed up in large quills for future use. A solution of borax to act as a flux was brushed over the metal plate and thoroughly worked into its incised lines. powdered amalgam was then shaken out of the quills on to the plate, so as to completely cover all the engraved pattern, The plate was now carefully heated over a charcoal fire, fresh amalgam being added, as the powder fused, upon any defective places. When the powder had become thoroughly liquid, so as to fill all the lines, the plate was allowed to cool, and the whole

~~surface was scraped, so as to remove the superfluous niello, leaving only what had sunk into and filled up the engraved pattern. Last of all the nielloed plate was very highly polished, till it presented the appearance of a smooth metal surface enriched with a delicate design in fine grey-black lines, This process was chiefly used for silver work, on account of the vivid contrast between the whiteness of the silver and the darkness of the niello. As the slightest scratch upon the metal received the niello, and became a distinct black line, ornament of the most minute and refined description could easily be produced.~~

~~The earliest specimens of niello now existing belong to the Roman period. Two fine examples are in the British Museum. One is a bronze statuette of a Roman general, nearly 2 feet high, found at Barking Hall in Suffolk. The dress and armour have patterns partly inlaid in silver and partly in niello. The dark tint of the bronze rather prevents the niello from showing out distinctly. This statuette is apparently a work of the st century.¢ The other example is not earlier than the 4th century. Itisa silver casket or lady's toilet box, in which were found an ampulla and other small objects, enriched with niello- work.~~

~~From Roman times till the end of the 16th century the art of working in niello seems to have been constantly practised in some part at least of Europe, while in Russia and India it has survived down to the present day. From the 6th to the 12th century an enormous number of most massive and splendid works in the precious metals were~~

~~1 Div. Art. Sched. , iii. 27-29 (see Hendrie's edition, 1847).~~

~~2 Trattato dell' Orejiceria. ' 8 Vre Arti del Disegno, * See Soc. Ant. Vet. Mon., iv., pls. 11-15.~~

~~> See Visconti, Una Antica Argentaria, Rome, 1793.~~

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~~produced at Byzantium or under Byzantine influence, many of which were largely decorated with niello ; the silver dome of the baldacchino over the high altar of §. Sophia was probably one of the most important of these. Niello is frequently mentioned in the inventories of the treasures belonging to the great basilicas of Rome and Byzantium. The Pala d'Oro at S. Mark's, Venice, 10th century (see Mrrar-Work), owes much of its refined beauty to niello patterns in the borders. This art was also practised by Bernward, artist-bishop of Hildesheim (0b. 1023) ; a fine silver paten, decorated with figures in niello, attributed to his hand, still exists among the many rich treasures in the church of Hanover Palace, Other nielli, probably the work of the same bishop, are preserved in the cathedral of Hildesheim. In France too, judging both from existing specimens of ecclesiastical plate and many records preserved in church inventories, this mode of decoration must have been frequently applied all through the Middle Ages : especially fine examples once existed at Notre Dame, Paris, and at Cluny, where the columns of the sanctuary were covered with plates of silver in the 11th century, each plate being richly ornamented with designs in niello. Among the early Teutonic and Celtic races, especially from the 8th to the 11th centuries, both in Britain and other countries, niello was frequently used to decorate the very beautiful personal ornaments of which SQ many specimens enrich the museums of Europe. The British Museum possesses a fine fibula of silver decor- ated with a simple pattern in niello and thin plates of Tepoussé gold. This, though very similar in design to many fibule from Scandinavia and Britain, was found in a tomb at Kertch (Panticapeum).6 Several interesting gold rings of Saxon workmanship have been found at different times, on which the owner's name and ornamental patterns are formed in gold with a background of niello, One with the name of Ethelwulf, king of Wessex (836-838), is now in the British Museum (see figure). Another in the South Kensington #ay~~

~~Museum has the name of Alhstan, Be -eare pp who was bishop of Sherborne from~~

~~823 to 867. The metal-workers of Treland, whose skill was quite un- [eg > rivalled, practised largely the art of ee niello from the 10th to the 12th cen- Gold and Niello Ring. tury, and possibly even earlier. Fine croziers, shrines, fibule, and other objects of Irish workmanship, most skil- fully enriched~~

with elaborate niello-work, exist in consider- able numbers. From the 13th to the 16th century but little niello-work appears to have been produced in England. Two specimens have been found, one at Matlask, N orfolk, and the other at Devizes, which from the character of the design appear to be English. They are both of gold, and seem to be the covering plates of small pendent reliquaries, about an inch long, dating about the end of the 15th century, One has a crucifix between St John the Baptist and a bishop; the other, that found at Devizes, has the two latter figures, but no crucifix.? It is, however, in Italy that the art of niello-work was brought to greatest perfection. During the whole medieval period it was much used to decorate church plate, silver altar-frontals, and the like. The magnificent frontals of Pistoia cathedral and the Florence baptistery are notable instances of this,8 During the 15th century, especially at Florence, the art of niello-work was practised by almost all the great artist-

§ See Antiquities of Kertch, pl. v. 7 See Proc. Norfolk Archeo. Soc., iii. p. 97. 8 See METAL-Work ; and Gori, Thesaurus Veterum Diptychorum,

vol. iii, Florence, 1759.

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goldsmiths of that period. ~Apart from the beauty of the works they produced, this art had a special importance and interest from its having led the way to the invention of printing from engravings on imetal plates. For the description of how this happened see ENGRAVING, vol. vill. p. 439. Vasari's account of this invention, given in his lives of Pollajuolo and Maso Finiguerra (Vite det Pittori e Scultort), is very interesting, but he is probably wrong in asserting that Maso was the first worker in niello who took proofs or impressions of his plates. The most important work of this sort by Maso Finiguerra, described at length by Vasari, still exists in the Opera del Duomo at Florence. It is a pax with a very rich and delicate niello picture of the coronation of the virgin ; the composi- tion is very full, and the work almost microscopic in minuteness ; it was made in 1452. Impressions from it are preserved in the British Museum, the Louvre, and other collections. Among the many great Italian artists who were also niellists occur the

~~names of Brunelleschi, Ant. Pollajuolo, Baccio Baldini, Francia, Pellegrino da Cesena, Cellini, Caradosso, and Foppa. Some fine speci- mens signed by Francia are preserved in the Bargello at Florence. The British Museum, the Louvre, the Berlin Museum, and the royal gallery of Vienna are especially rich both in nielli and in sulphur and paper impressions. The British Museum also possesses the finest existing example of 15th-century German niello. It is a silver beaker, covered with graceful scroll-work, forming medal- lions, in which are figures of cupids employed in various occupations ;! it is a very remarkable piece of silver-work, both for design and beauty of execution. The art of niello-work is still practised with considerable skill both in Russia and in various parts of India. The " bidri work," so called from Bedar in Hyderabad, is a variety of niello, in which the pattern shows as silver on a niello ground. The modern revival of the art in Paris has been hitherto very unsuccessful.~~

~~Literature. —The Archeological Journal (vol. xix. p. 323) has an excellent monograph on the subject, see also vol. xii. p. 79 and vol. iv. p. 247; Archxologia, vol. xxxi. p. 404; Merrifield, Ancient Practice of Painting, vol. i., 1849 (gives MSS. of Eraclius and other early writers); Catalogue of Museum of Royal Irish Academy; Les Nielles & la Cath. d' Aix-la-Chapelle, Paris, 1859; Alvin, Nielles de la Bibliotheque roy. de Belgique, 1857; Duchesne, Nielles des Orfévres Florentins, 1826; Passavant, Le Peiutre- graveur, 1860-64; Ottley, History of Engraving (1816) and Collection of Fae-similes of Prints (1826); Cicognara, Storia della Seultura (iii. p. 168, Prato, 1823) and Storta della Calcogvafia, (Prato, 1831); Lanzi, Storia Pittorica, ep. i. sec. iii., 1809; Baldi- nucci, Professort del Disegno (1681-1728) and L' Arte di Intagliare iw Rame (1686); Zani, Origine dell' Incisione in Kame, 1802; Labarte, Arts of the Middle Ages, 1855; Texier, Dictionnaire de VOrfévrerie, p. 1822, Paris, 1857; Bartsch, Le Peiutre-graveur, vol. xiii. pp. 1-35; Rumohr, Untersuchung der Griinde fiir die Anuahme, &c., Leipsic, 1841; and Lessing, Collectaneen zur Litter- atur (vol. xii. art. " Niellum"'). (J. My)~~

~~NIEMCEWICZ, Jurtan Ursin (1757-1841), was born in 1757 in Lithuania. In the earlier part of his life he acted as adjutant to Kosciusko, was taken prisoner with him at the fatal battle of Maciejowice (1794), and shared his~~

~~captivity at St Petersburg. On his release he travelled for some time in America, where he married. He died as an emigrant at Paris in 1841.~~

~~Niemcewicz tried many styles of composition. He wrote comedies (one of which, The Return of the Deputy, enjoyed a great reputation), tragedies, and a novel, John of Tenczyn, in the style of Scott, which gives a vigorous picture of old Polish days. He was also the author of a Iistory of the Reign of Sigismund III. Perhaps, how- ever, he is now best remembered by his Historical Songs, a series of lyrical compositions in which the chief heroes of~~

~~1 It is well illustrated in Shaw's Dresses and Decorations of the Middle Ages, vol. ii., 1858.~~

~~Polish history are introduced. The poet dwells with delight upon the golden age of Sigismund I., and the reigns of Stephen Bathori and Sobieski. With the last of these, as with the fall of Polish grandeur, the collection closes, one piece only being added by way of supplement, entitled "The Funeral of Prince Joseph Poniatowski," the marshal of Napoleon, drowned in the Elster in 1813 after the battle of Leipsic. Niemcewicz also translated a great deal from the English, among other poems Pope's Rape of the Lock and Gray's Hlegy. His reputation has somewhat waned since his death. He has been eclipsed in modern times by the genius of Mickiewicz, to say nothing of Slowacki and Krasinski, all poets of much greater calibre. Perhaps some of the enthusiasm which his writings once kindled may have been due to his being a patriot and a man of action during the death-struggles of his unfortunate country.~~

~~NIEPCE, JosepH NictpHore (1765-1833), one of the inventors of photography, was born at Chalon-sur-Saéne on March 7, 1765. His father, a "conseiller du roi," was in good circumstances, and young Niepce, who was of a meditative and poetical temperament, showed no eagerness to choose a profession. In 1792, however, he entered the army as a sub-lieutenant, and in the following year he saw active service in Italy. Tl-health and failing eyesight compelled him to resign his commission before he had risen above the rank of lieutenant; but in 1795 he was nominated "administrateur" of the district of Nice, and he held the post until 1801. Returning in that year to his birthplace, he gave himself along with his brother to mechanical and~~

chemical researches; and in 1811 he directed his attention to the rising art of lithography. In 1813 the idea of obtaining sun pictures first suggested itself to him in this connexion ; the history of the subsc- quent development of the conception will be found under DacueRReE (vol. vi. p. 761) and PHorocrapuy. Niepce died at Gras, his property near Chalon, on July 3, 1833. A nephew, Claude Félix Abel Niepce de Saint-Victor (1805-1870), served with destinction in the army, and also made important contributions towards the advance- ment of the art of photography (actinescence) ; he pub- lished Recherches photographiques (Paris, 1855) and T'raité pratique de gravure héliographique (Paris, 1866).

NIEVRE, a central department of France, formed out of the old province of Nivernais with a small portion of the Orléanais, lies between 46° 40' and 47° 35' N. lat. and between 2° 50' and 4° 12' E. long., and is bounded N.W. by Loiret, N. by Yonne, N.E. by Céte d'Or, E. and 8.E. by Sadne-et-Loire, 8.W. and W. by Allier, and W. by Cher. It belongs partly to the basin of the Loire, partly to that of the Seine. Towards the west its limits are marked by the Allier-Loire valley,—the Loire striking across the south- west corner of the department by Decize and Nevers and then continuing the line of its great affluent the Allier northwards by Fourchambault, La Charité, Pouilly, and Cosne. Secondary feeders of the Loire are the Niévre, which gives its name to the department, and the Aron, whose valley is traversed by the Nivernais Canal. The largest Seinc tributary in Niévre is the Yonne, which rises in the south- east, passes by Clamecy, and carries along with it the northern part of the Nivernais Canal. The Cure, the principal affluent of the Yonne (with which, however, it does not unite till after it has left the department), is the outlet of a lake, Lac des Settons, which serves as a reservoir for the practical regulation of the river. The watershed between the two river systems runs, like the general slope of the department, from south-east to north-west,—the highest summits belonging to the Morvan, an uplift of granite, porphyry, and gneiss, which extends into Saéne-et-Loirc, Cote d'Or, and Yonne. Here stands

Mount Préneley (2790 feet), the highest point in Niévre ; and 7 or 8 miles north-north-west, at an altitude of nearly 2000 feet, is Chateau-Chinon, the

highest town in the department. The lowest level in the department is 443 feet, at the exit of the Loire. Niévre is divided by the line of the canal into two distinct geological districts : to the east the old crystalline rocks of the Morvan, to the west the Jurassic limestones. Both are partly covered by extensive stretches of woodland. Morvan (‘Black Forest ”) is one of the most picturesque portions of France ; and the western district, known as the “Bon Pays,” is one of its finest pastoral areas, terminating towards the Loire in hills generally clad with vines. Owing to its greater eleva-

tion and the retention of the rain-water on its hard surface.

in the shape of ponds and streams, Morvan shows a mean temperature 6° Fabr. lower than that of the western district, which, in the valley of the Loire, is almost identical with that of Paris (52° Fahr.). At Nevers the annual rainfall amounts to only 18 inches; but in Morvan it is about

three times as great.

The area of the department is 2631 square miles, one-half being arable land, a third woods, and a tenth pasture, while 42 square miles are oceupied by vines. The live stock numbers 20,000 horses (mainly of Morvan breed, small but hardy and strong), 500 mules, 7000 asses, 146,100 eattle (generally of Nivernais-Charolais breeds), 210,000 sheep, 70,000 swine, 5700 goats; and there are 18,600 bee- hives. In 1880 the department produced 2,984,000 bushels of wheat, and about the same quantity of oats; barley, 1,122,000 bushels ; rye, 521,000; buckwheat, 211,000 ; potatoes, 4,620,000 ; besides beetroot (86,108 tons), pulse, maize, hemp, colza, fruits. The vintage of 1881 yielded 5,304,816 gallons of wine,—the best being the white wines of Pouilly, a locality which besides sends a great quantity of its grapes to Paris for table use. The Nidvre forests, consisting of oak, becch, hornbeam, and elm, supply about three-fifths of the firewood required for the Parisian market, The coal-field of Decize, with its seven seams making a total thickness of 40 feet, yielded 200,000 tons in 1882. Fine build- ing stone, a little white marble, saudstone, millstones, granite, and kaolinic sands are all worked in the department. The best- known mineral springs are those of Pougues and St Honoré,— the former chalybeate and the latter sulphurous, as at Eaux Bonnes in the Pyrenees. Of the iron-works for which Niavre is famous, the most important are those of FouRCHAMBAULT

(9.v.); employing more than 2000 workmen, and manufacturing into bridges, building frames, rails, wheels, &c., the product of 40,000 tons of ore. At Imphy the staple is rails and Bessemer steel. The Government works of La Chaussade at Guérigny employ 1300 workmen, and make armour-plates and the materials required in iron shipbuilding ; wood charcoal is used, which explains the selection for this industry of a department so well supplied with timber. There are besides in the department minor foundries and forges, manufactories of agricultural implements and hardware, potteries, tile-works, chemical works, paper-mills, and wool-mills, as well as numerous tanneries, breweries, and oil works (colza, poppy, and hemp). In the Morvan district a large part of the population is engaged in the timber industry; the logs carried down by the streams to Clamecy are then collected into rafts or put into boats. Besides firewood and charcoal Nidvre exports cattle; but it has to import cereals. A great deal of the traiffic is by water; the canal along the left bank of the Loire runs through the department for 38 miles, and the Nivernais Canal (from Decize to Clamecy and so to the Yonne) for 47 miles. The total length of the railways is 145 miles. The population of the department was 347,576 in 1881. Niévre is divided into 4 arrondissements, 25 cantons, 313 com- munes. It forms the diocese of Nevers, and part of the districts dependent on the corps d'armée and the court of appeal of Bourges, The chief towns of the arrondissements are Nevers, Chateau Chinon (2613 inhabitants), Clamecy (5536), and Cosne (7401). Other places of note are La Charité (4826), with an old church of the order of Cluny; Decize (4927), with an old church and interesting ruins; and St Pierre le Moutier (3080), having an old Cluniac monastery.

NIEZHIN, Niesty, or NyYxzuin, a district town of Russia, situated in the government of Tchernigoff, 50 miles south-east of that town, on the railway between Kursk and Kieff. The old town is built on the left bank of the (canal- ized) river Oster, and its suburbs, Novoye Myesto and Magherki, on the right. It has an old cathedral, two Greek churches, one Catholic church, a synagogue, and two monas- teries. The high school (lyceum of Bezborodko) formerly

had 200 students, but now only from 30 to 40, since its

~~transformation into a philological institute. The 23,000 inhabitants are mostly Little Russians and Jews (about 3000) ; there are also some 400 Greeks, descendants of those who immigrated in the 17th century, at the invita- tion of Bogdan Khmelnitski, and have since then consti- tuted a privileged trading corporation. About 7000 of the population of Niezhin are engaged in agriculture, in market gardening, and especially in the cultivation and preparation of tobacco. Cast-iron wares and agricultural implements are manufactured, but not extensively ; candle- making and tanning are also carried on. In the district there are several distilleries, producing about 160,000 gallons of wine-spirit. The commerce of Niezhin, which formerly was very prosperous, has fallen off since the opening of the Black Sea ports. Its merchants, however, especially the Greeks, still carry on an active trade in tobacco, which is exported from Niezhin to the amount of nearly 200,000 ewts., in all kinds of manufactured wares, in cattle, in wine-spirit, and also in preserved fruits and vegetables, which are a kind of specialty with the citizens.~~

~~The date of the foundation of Niezhin is unknown, but Unyezh, which is supposed to have been its former name, is mentioned as early as 1147. At that time it belonged to the principality of Tchernigoff; afterwards it fell under the rule of Poland. lt was ceded to Russia about 1500, but became again a Polish pos- session after the treaty of Deulin. In 1649, after the revolt of Little Russia and its liberation from the Polish rule, Niezhiw was the chief town of one of the most important Cossack regiments. lt was annexed to Russia in 1664. In the 18th century it was a flourishing commercial city, owing to its situation on the highways from Kietf to Moscow and from Tchernigoff to Poltava, and to the Greek merchants who kept up commercial relations with Turkey, Italy, and Austria.~~

~~NIGER, one of the most famous of African rivers, has its headwaters on the north side of the mountains (known as Kong Mountains and by various other local names) which run parallel with the coast of Upper Guinea and Sierra Leone ata distance of about 200 miles, flows north- eastward as far as 17° 30’ N. lat. and the meridian of Greenwich, and then turning south-eastward reaches the Gulf of Guinea after a total course of about 2600 miles. The main stream bears in different districts a great variety of names —Joliba (Dholiba or Dialiba), Kworra (Quorra), Mayo, Kaki ’n ruwa, &c.;~~

~~and the same is true of the great eastern confluent the Benue; Shary or Tchadda,! (For other synonyms see Baikie, Warr. of an Expl. Voyage, p. 426.) It will be convenient to retain the established European name for the whole river system, and to call the main stream the Kworra and the confluent the Benue.~~

~~Of the many headwaters which go to form the upper Kworra, the Tamincono, Falico, and Tembi are the most important ; and, as the largest of these, the Tembi, rises in the Loma Mountains in 8° 36' N. lat. and 10° 33' W. long,, this may be considered the true position of the long-sought source of the Niger. The Falico rises in 8° 45' N. lat. and 10° 25' W. long.; the Tamincono, of much less significance, about 60 miles farther north. A narrow watershed separates these headstreams from the head- Streams of the Rokelle, which flows west through Sierra Leone. At Farannah (now destroyed), in 10° N. lat., the river is about 100 yards wide, and taking its Mandingo name of Joliba (or Great River) bends eastwards. From the source of the Tembi to Kuruassa, where Caillié crossed in June 1825, and found it 9 feet deep, the course of the river (nearly 300 miles) has not been followed by any European ; but the general character of the next 60 or 70 miles, down to Bora, is known because Caillié's route skirted the eastern bank. Below that point there is another unexplored stretch. At Bammako, after the junc- tion of the Milo, the Bafing or Bafi (Black River), the Fan-~~

~~1 These last two names really belong to another river which dis- charges into Lake Chad, Tehad, or Tsad,~~

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~~dube, &c., the depth is 6 feet, witha breadth of 1300 feet. About 7 or 8 miles farther down the Sotuba rocks mark the end of what may be regarded as the upper Kworra. Even in this section the stream is probably navigable in small boats all the way from the union of the headstreams to Sotuba. From Bammako begins a more rapid deflexion towards the east, and it is not till the Mahel Balevel, a very important tributary, joins in that a more directly northward direction is resumed. For several hundred miles below this confluence the Kworra shows a great tendency to split into different channels, often enclosing extensive tracts of country in their meshes, and turning whole provinces into a perfect labyrinth of creeks, back- waters, and lagoons. Kabara, the port of Timbuktu, is situated on one of the secondary branches ; but the main channel, at no great distance, is about a mile across. At times the river rises so that boats can approach the walls of the city proper; and in 1640 an exceptional inundation turned the central and lowest quarter into a lake. The swamps and side-creeks continue to the east of Timbuktu, and, though at Bamba (130 miles) the river is shut in by steep banks and narrows to 600 or 700 yards, it again spreads out for some distance farther down. At Tahont 'n eggish (Entrance Rock), however, a great change is observed, the banks beginning to be rocky and the channel definite; and at Tosaye the width is reduced to not more than 150 yards, and the depth is enor- mously increased. At Burrum the valley again widens out to about 3 miles, and tracts of level ground, swamps, or sandy downs skirt the river on both sides.~~

~~In 7° 50'N. lat. and 6° 45' E. long., the Kworra is joined.~~

~~by the Benue or Binue ("" Mother of Waters" in the Batta tongue). This magnificent confluent rises in Adamaua a little to the north of Ngaundere (Ngamdere of the Houssas), about 7° 10' N. lat. and 13° 20' E. long., at a height of between 3000 and 5000 feet above the sea, and in the early part of its course it is separated by a narrow water- parting from the headstreams of the Logone or Serbewel, which probably flows eastward to Lake Chad. For the first 100 miles of its course it remains a rocky mountain~~

stream, but after the junction (at about 800 feet above the sea) of the Mayo Kebbi (itself probably navigable to Dawa in the Tuburi country, and there possibly forming a bifurcation between the basins of the Niger and Lake Tchad) it takes a western direction and becomes navigable for boats drawing 4 feet of water. For some 40 miles below Ribago (Rebom)—the farthest point reached by exploration upward—the Benue has an average width of 180 to 200 yards, and flows with a strong steady current, although a broad strip of country on each side is swampy or submerged. Below the junction of the Faro the width increases to 1000 or 1500 yards, and, though it narrows at the somewhat dangerous rapids of Rumde Gilla to 150 or 180, it soon expands again. It flows onwards with com- paratively unobstructed current through a beautiful country, its valley marked out for the most part by ranges of hills, and its banks diversified with forests, villages, and cultivated tracts. (See Crowther in Proc. oy. Geog. Soc., 1877; Hutchinson, Jbid., 1880; Flegel in Petermann's Mitth., 1880.)

At their confluence the Kworra is about ? mile broad and the Benue rather more than a mile. The united stream is like a lake about 2 miles in width, dotted with islands and sandbanks; and the peninsula at the junction is low, swampy, and intersected by numerous channels. From this point the course of the Niger is well known. As far south as Iddah or Idah, a town on the east bank, it rushes through a deep valley cut between the hills, the sandstone cliffs at some places rising 150 feet high. Between Iddah and Onitsha (destroyed by British gunboats in 1879), 80 miles, the banks are lower and the country flatter, and to the south of Onitsha the whole land is laid under water during the annual floods. From this point, consequently, may be said to begin the great delta of the Niger, which, extending along the coast for about 120 miles, and 140 or 150 miles inland, forms one of the most remarkable of all the swampy regions of Africa. 'The river soon breaks up into an intricate network of channels, dividing and subdividing, and intercrossing not only with each other but with the branches of other streams that drain the neighbouring coast, so that it is practically impossible to say where the Niger delta ends and another river system begins. West- wards the anastomosis probably extends to the lagoons at Lagos, and eastwards to the Old Calabar or Cross River. Hitherto the channel almost regularly followed is the Rio Nun, a direct continuation of the line of the undivided river. From the sea the only indication of a river mouth is a break

in the dark green mangroves which here universally fringe the coast. The crossing of the bar requires considerable care, and at ebb tide the outward current runs 53 knots perhour. For the first 20 miles (or as far as Sunday Island, the limit of the sea tide in the dry season), dense lines of mangroves 40, 50, or 60 feet in height shut in the channel, so that nothing is visible save a narrow strip of sky overhead ; then palm and other trees begin to appear, and the widening river has regular banks ; and before long little villages and plantations of plantains and sugar-cane show that even in this region of miasma and mud human beings find means to exist.

As the Kworra and the Benue have quite different gathering grounds they are not in flood at the same time. The upper Kworra rises in June as the result of the tropieal rains, and deereases in December, its breadth at Turella expanding from between 2000 and 2500 feet to not less than 14 miles. The middle Kworra, how- ever, reaches its maximum near Timbuktu only in Jannary; in February and March it sinks slowly above the narrows of Tinsherifen (Tosaye), and more rapidly below them, the level being kept up by supplies from backwaters and lakes; and by April there is a deerease of about 5 feet. In August the channel near Timbuktu is again

navigable owing to rain in the Wangara highlands. The Benue reaches its greatest height in August or September, begins to fall

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in October, falls rapidly in November, and slowly in the next three months, and reaches its lowest in March and April, when it is ford- able in many places, has no perceptible flow, and at the conflucnce begins to be covered with the water-weed Pistia Stratiotes. The flood rises with great rapidity, and reaches 50, 60, or even 75 feet above the low-water mark. The two confluents being so unlike, the united Niger differs from each under the influence of the other. Here the river is at its lowest in April and May; in June it is sub- ject to great fluctuations; about the middle of August it usually ae to rise; and its maximum is reached in September. In October it sinks, often rapidly. A slight rise in January, known as the yangbe, is

~~occasioned by water from the Kworra. — Between high and low water-mark the difference is as much as 35 feet.~~

~~As a highway of commerce the Niger has been little used, trad- ing steamers having mainly confined their operations to the river below the confluence. But since 1857 the area of supply has been considerably extended, the quantity of goods (chiefly oil and shea butter) collected has greatly increased, and steamers five or six times the size of the vessels formerly used have been introduced. The delta region has become more populous, and trading posts more frequent. The Church Missionary Society, which, except the British Government, has done more than any other agency for opening up the lower Niger, has stations at four places on the coast, at Osamare (120 miles inland), Onitsha (20 miles farther), Lokoja (90 miles), Kipo Hill, Egan (90 miles), Shonga (94 miles farther, and only 12 or 15 short of Rabba). Lokoja is near the site of the experimental] farm maintained by the Government for some years from 1841.~~

~~Pliny mentions a river Nigris of the same nature with the Nile separating Africa and Ethiopia, and forming the boundary of Geetulia; and it is not improbable that this is, in fact, the same with the modern Niger. In Ptolemy, too, appears along with Gir a certain Nigir (Nfyerp) as one of the largest rivers of the interior ; but so vague is his description that, while D'Anville and Leake strongly maintain that this, also, is the Niger, Walckenaer and Vivien St Martin insist on the negative view, and Mr Bunbury is almost inclined to follow them. When the Arabian geographers became acquainted with the river near Timbuktu they called it the Nile of the Negroes, and down to the present century European authorities (such as Jackson in his Empire of Morocco, 1800) fought zealously for the identity of this Nile with the river of Egypt.~~

~~The following dates show the progressive exploration of the river. 1788. Formation of the African Association in England. 1795. Mungo Park (African Association) saw the Niger near Sego " glittering in the morning sun as broad as the Thames at West- minster, and flowing slowly to the eastward." In this first expedition he went down the river as far as Sella and up as far as Bammako; in his second he sailed down to Bussa, where he was drowned. Park adopted the opinion that the Niger and the Congo were~~

one. Major Peddie's expedition to the Niger, and Tuckey's expedition to the Congo, threw no light on the relation of the rivers. 1802. Reichard, a German, suggested that the Rio Formoso was the mouth of the Niger. 1822. Laing learned that the sources of the Niger lay not far from Sulima. 1826. Caillié sailed down the river from Jenne to the port of Timbuktu. Clapperton and Richard Lander visited Bussa. 1830. Richard and John Lander passed down from Yauri to the mouth of the Rio Nun, thus sctttling the doubt as to the outlet of the river. 1832. Macgregor Laird established the African Steamship Company, and Richard Lander and Oldfield (as members of its first expedition) ascended the Niger to Rabba and the Benue (or, as it was then called, the Shary or Tchadda) as far as 'Dagbo (80 miles). 1840, Consul Beecroft ascended beyond Rabba in the " Ethiope." 1841. An expedition, consisting of three steamers of the royal navy, under Captain (afterwards Admiral) H. D. Trotter, went up to Egga (Egam), but was forced to return owing to sickness and mortality. 1851. Barth crossed the Benue at the junction of the Faro, and conjectured it to be the upper part of the Tchadda. 1854. Barth sailed down from Saraiyamo to Kabara (port of Timbuktu), and then skirted the left bank to Bornu and the right thence to Say. The 'Pleiad" expedition (Baikie, Crowther, D. J. May) advanced up the Benue 400 miles to Dulti or Jin. 1857-59. Expe- dition (Baikie, Glover, &c.) up to Bussa; steamer ** Dayspring " wrecked on a rock above Rabba. Mission stations founded at Onitsha, Gbebc, and Rabba. 1864. Crowther made bishop of the Niger. 1877. Rev. Henry Johnson journeyed up the river to Bida. 1879. " Henry Venn," steamer (Ashkroft, Kirk, Flegel), passed up the Benue to Gurua (145 miles beyond Jin), and her boats 8 miles farther to Rebom or Ribago. Zweifel and Moustier, sent out by M. Verminck, a Marseilles merchant, discovered the sources of the Falico, &. 1880-81. Flegel went up from Rabba to Gompa.

Besides the reports of expeditions published by Laird and Oldfield, Allen, Baikie, Crowther, &c., see Barth's Travels, vols. iv. and v., and his paper in Z. fir allg. Erdkunde, Berlin, 1863; Cole, Life on the Niger; Crowther, The Gospel on the Niger; The Church Missionary Intelligencer; Mittheilungen der Afrikan. Ges. in Deutschland, 1882 and 1883; and llutchinson's paper in Jour. of Soc. of Arts, 1880. dl. A. W.)

NIG—NIG

~~NIGER, C. PEscenntus, governor of Syria under the emperor Commodus, and one of the rivals of Septimius Severus for the succession after the murder of Pertinax, belonged to an Aquinum family of equestrian rank, and owed his promotion to the Syrian command not only to the interest of Narcissus, the favourite of Commodus, but also to his known merits as a soldier. He was saluted emperor by the troops at Antioch as soon as the death of Pertinax became known, in the spring of 193 4.pD., but he unaccountably delayed marching on Rome until he learned that Severus had assumed the offensive. He now strongly garrisoned Byzantium as well as the principal towns of Asia Minor, but after his legate A'milianus had been defeated and slain near Cyzicus he himself was driven from Nica and decisively routed, with great slaughter, in the neighbourhood of the Cilician Gates. Having failed in an effort to escape towards the Euphrates, he was brought back and put to death in 194.~~

~~NIGHTINGALE (Anglo-Saxon, Wthtegale, literally "singer of the night"), the bird justly celebrated beyond all others by European writers for the admirable vocal powers which, during some weeks after its return from its winter-quarters in the south, it exercises at all hours of the day and night. The song itself is indescribable, though several attempts, from the time of Aristophanes to the present, have been made to express in syllables the sound of its many notes; and its effects on those that hear it depend so much on their personal disposition as to be as varied as are itstones. 'To some they suggest melancholy ; and many poets have descanted on the bird (which they nearly always make of the feminine gender) leaning its breast against a thorn and pouring forth its melody in anguish. It is accordingly to be observed that the cock alone sings, and that there is no reason to suppose that the cause and intent of his song, unsurpassed though it be, differ in any respect from those of other birds' songs (see Brrbs, vol. iil. p. 770). Sadness, therefore, is certainly the last impelling sentiment that can be properly assigned in this case. In great contrast to the Nightingale's pre-eminent voice is the inconspicuous coloration of its plumage, which is alike in both sexes, and is of a reddish- brown above and dull greyish-white beneath, the breast being rather darker, and the rufous tail shewing the only bright tint. The range of this bird in Europe has already been so fully described (Birps, vol. iii. p. 756, 757) as to render a further account of it needless. The Nightingale reaches its English home about the middle of~~

~~April,! the males (as is usual among migratory birds) arriving some days before the females ; and, often stopping on their way, letting their song be heard in places they do not habitually frequent, pass to their proper breeding-quarters. At this time they run very great danger from birdcatchers, for their capture is effected with facility, and it is painful to add that of those then caught nine-tenths are said to die within a month. Fortunately for the species, it receives great protection from the practice of game-preserving, which guards from intrusion so many of the localities it affects, and there is probably no country in which the Nightingale breeds more abundantly and in greater security than in England. On the cocks being joined by their partners, the work for which the long and hazardous journey of both has been undertaken is speedily begun, and before long the nest is completed. This is of a rather uncommon kind, being placed on or near the ground, the outworks~~

- ~~Poets and novelists are apt to command at will the song of this bird, irrespective of season. If the appearance of truth is to be regarded, it is dangerous to introduce a Nightingale as singing in England before the 15th of April or after the 15th of June. The a Nightingale " of newspaper paragraphs is generally a Song-~~

~~rush.~~

~~NIG—NITI~~

~~499~~

~~consisting chiefly of a great number of dead leaves | The flowers are succeeded by ovate scarlet berries, which~~

~~ingeniously applied together so that-the plane of each is mostly vertical. In the midst of the mass is wrought a deep cup-like hollow, neatly lined with fibrous roots, but the whole is so loosely constructed, and depends for lateral support so much on the stems of the plants, among which~~

~~it is generally built, that a very slight touch disturbs its |~~

~~beautiful arrangement. Herein from four to six eggs of a deep olive colour are duly laid, and the young hatched. If the latter be taken when nearly fit to fly from the nest, they can with proper care be reared by hand, and this is the only justifiable mode of proceeding for those who wish to keep this fine songster in confinement, as, if the birds survive their first moult, they may live for some years in a cage, and the cocks will in due time exercise their full vocal powers. The nestling plumage of the Nightingale differs much from that of the adult, the feathers above being tipped with a buff spot, just as in the young of the Redbreast, Hedge-Sparrow, and Redstart, thereby shewing the natural affinity of all these forms. Towards the end of summer the Nightingale disappears, and but little has been observed of it in its winter-retreats, which are presumably in the interior of Africa. One of the few records of it at that season proves that it visits the Gold Coast (Jbis, 1872, p. 291).~~

~~The Nightingale is the Motacilla luscinia in part of Linneus, and the Daulias luscinia of some modern ornithologists. In the east of Europe a second species occurs which was not discriminated by Linneus, though long known to German bird-fanciers as the Sprosser. This, the Sylvia philomela or Daulias philomela of many scientific writers, isa somewhat larger bird, which fact, and the presence of some faint spots on its breast, have caused it to receive the English name of Thrush-Nightin- gale. Its westward range appears to be limited to the valley of the Rhine, and the statement that it has occurred in England is erroneous. Its song is louder than that of the true Nightingale, but not so sweet in tone or so varied in note. The name Nightingale has been vaguely applied to several other birds. The so-called " Virginian Nightin- gale" is a species of GrosBEAk (vol. xi. p. 205), and the REDWING (q.v.), strangely enough, has been often spoken of as the "Swedish Nightingale."~~

~~The Nightingale holds a place in classical mythology. Procne and Philomela were the daughters of Pandion, king of Attica, who in return for warlike aid rendered him by Tereus, king of Daulis in Thrace, gave him the first-named in marriage. Tereus, however, being enamoured of her sister, feigned that his wife was dead, and induced Philomela to take her place. On her discovering the truth, he cut out her tongue to hinder her from revealing his deceit; but she depicted her sad story on a robe which she sent to Procne;~~

~~and the two sisters then contrived a horrible revenge for the infidelity of Tereus, by killing and serving to him at table his son Itys. Thereupon the gods interposed, changing Tereus into a Hoopoe, Procne into a Swallow, and Philomela into a Nightingale, while Itys was restored to life as a Pheasant, and Pandion (who had died of grief at his daughters' dishonour) as a bird-of-prey (see OSPREY). The fable has several variants. Ovid's version may bce seen in the 6th Book of his Metamorphoses (lines 412-676). (A. N.)~~

~~NIGHTSHADK, a general term for the genus of plants known to botanists as Solanum. The species to which the name of Nightshade is commonly given in England is the Solanum Dulcamara, IL., which is also called the Bittersweet or Woody Nightshade. It is a common plant in damp hedgebanks and thickets, scrambling over under- wood and hedges. It has slender slightly woody stems, with alternate lanceolate leaves more or less cordate and auriculate at the base. The flowers are arranged in droop- ing cymes, and resemble those of the potato in shape, although much smaller. The corolla is rotate, of a lilac- blue colour with a green spot at the base of each segment, and is furnished with yellow sessile anthers united at their margins so as to form a cone in the centre of the corolla.~~

~~in large doses appear to be poisonous or, to say the least, dangerous to children, cases of poisoning by them having occurred. The plant derives its names of bittersweet and Dulcamara from the fact that its taste is at first pleasantly sweet and then bitter. The young stems collected in autumn have been used in medicine as an alterative in rheumatism and certain skin diseases, but are little used at the present time except by homceopaths, by whom Dulcamara is given as an anticatarrhal remedy in all symptoms produced by cold arising from exposure to damp. It owes its medicinal activity to a bitter principle yield- ing by decomposition sugar and the alkaloid " solania," C,,;Hg9NO,,. This principle has been found in small quan- tity in the leaves, stalks, and berries. Dzulcamara also con- tains another glucoside "dulcamarin," C,.H,,0,9, which when boiled with dilute acid splits up into sugar and "dul- camaretin," C,)H,,O,. Solania appears to exert a depres- sant action on the vagus nerve and an excitant action on the medulla oblongata. The term Deadly Nightshade is often erroneously applied to this plant, and the popular usage has even been confirmed by so~~

eminent a botanist as Bentham (Handbook of the British Flora, p. 384, 1858). It is generally accepted, however, that the deadly night- shade is Atropa Belladonna, L. (see vol. iii. p. 543).

Solanum Dulcamara is subject to the same parasitic fungus (Peronospora infestans) as the potato, and may serve as a medium for communicating the spores to the potato if not removed from the hedges of the fields where potatoes are grown.

The Garden Nightshade, Solanum nigrum, L., differs from 8S. Dulcamara in having white flowers in small umbels and globose black berries. It is a common weed in gardens and waste places, growing about 12 or 18 inches high, and has ovate, entire or sinuate-dentate leaves. Two varieties of the plant, one with red and the other with yellow berries, are sometimes met with, but are compara- tively rare. The berries have been known to produce poisonous effects when eaten by children, and owe their properties to the presence of solania. They are, however, said to be eaten without inconvenience in British Kaffraria, and in Réunion and Mauritius the leaves are eaten like spinach ; their innocuousness in these cases may, however, be due to the poisonous principle being removed or decom- posed by the process of cooking.

The name of nightshade is applied to plants of different genera in other countries. American Nightshade is a species of Phytolacca; the Three-leaved Nightshade is a Trillium ; the Malabar Nightshade is a Basella; the Bastard Nightshade is a Riwina; and the Enchanter's Nightshade is Circea lutetiana. The last-named is not known to possess any poisonous property, and the name seems to have been given to it in the first place in mistake for a species of Mandragora (see MANDRAKE).

NIGRITIA. See Soupan.

NIIGATA, a city of Japan, with a population of about 34,000, the chief town of the province of Echigo, and one of the ports open to foreign trade since 1869, lies in 37° 57' N. lat. and 139° E. long., on the west coast of the island of Nippon, on a narrow strip of sandy ground between the left bank of the Shinano and the sea, which though quite at hand is shut out from view by a low range of sandhills. It occupies an area of rather more than

one square mile, and consists of five long parallel streets intersected by cross-streets, which in most cases have canals running down the middle and communi- cating with the river, so that the internal traffic of the city is mainly carried on by water. The houses are usually built with gables to the street, and roofs and verandas project so as to keep the windows and footpaths from

being blocked up by the heavy winter snows. In August 1880 nearly half of the town was destroyed by fire; but in the following year most of the public buildings were restored. The college, founded in 1870, was handed over to the authorities in 1878 (with an English department, an engineering school, a geological museum, and various laboratories) ; and the large hospital was rebuilt on a more spacious scale and in European style in 1878. There are large public gardens in the city; many of the canals are bordered with trees; and an air of tidiness and comfort prevails throughout the un-Europeanized quarters. Niigata has a greater junk traffic than any other town on the west coast of Japan, but it has been found quite unsuited in its present state for foreign commerce. The mouth of the river is obstructed by a bar with only 12 feet of water at high tide, and in autumn and winter the squalls are so violent that only very powerful steamers can safely anchor in the bay. Ebisuminato, on the island of Sado, has been opened as a supplementary harbour of refuge but not as a trading port. The shore of the Shinano has already been improved up to the town ; and when the Government has constructed the new harbour and breakwater planned in 1880 Niigata will doubtless become a very flourishing commercial centre, as it is the natural outlet of a large and populous province, producing rice, tea, coal, petroleum, copper, silver, and gold. Almost all the foreign trade of the place has passed into the hands of the Japanese since the Mitsubishi Company began to call at the port. In 1879 thirty-six of their vessels entered, with a total burden of 29,361 tons. In 1878 there were only twenty foreigners in the city, and these mostly in Government employment or agents of mission societies. The Edinburgh Medical Mission has maintained a valuable hospital and dispensary since 1875. During winter Niigata suffers from a terribly severe climate, and the people go “about in wadded clothes with only their eyes exposed.”

~~See Bird, Unbeaten Tracks in Japan, for many picturesque details.~~

~~NIJAR, a town of Spain, in the province of Almeria, 14 miles to the east-north-east of that town, occupies an exposed site on the southern slope of the Sierra Alhamilla. It has dye-works, and manufactures woollen stuffs and pottery; trade is carried on in the products of these industries, as well as in corn, cattle, barilla, and fine potter's clay procured in the neighbourhood. The popula- tion of the ayuntamiento in 1877 was 13,661.~~

~~NIJNE-TAGHILSK, currently known as Tacum, a town and iron-work of Russia, situated in the govern- ment of Perm and district of Verkhoturie, 100 miles to the south-east of the district town. It occupies an advantageous position in a longitudinal valley on the eastern slope of the Ural Mountains, within a few miles of the place where the Taghil, cutting through the eastern wall of the valley, escapes to the lowlands to join the Tura, a tributary of the Tobol. The southern part of this valley is occupied by the upper Taghil, and its continuation towards the north by the upper Tura, from which it is separated by a low watershed ; it is dotted with numer- ous iron-works, and is now connected by railway (the first in Siberia) with Perm and Ekaterinburg (88 miles distant). The town was founded in 1725 by the well-known Russian miner Demidoff, and is still the property of his family. The river, which above the iron-work ex- pands into a small lake, supplies the iron-work with motive power, driving no less than twenty-seven water-wheels, while there are several steam-engines. Nijne-Taghilsk is a central foundry for a number of iron-mines and eleven other works scattered in the valley of the Taghil and its tributary, the Salda, the aggregate production of which in 1879 amounted to 749,000 cwts. of cast iron and 280,000 cwts.~~

~~of wrought iron (547,500 cwts. of iron and iron-ware, worth 6,000,000 roubles, in 1881). About 360 Ib of gold, 2500 tb of platinum, and 11,600 cwts. of copper are also annually mined at Nijne-Taghilsk. The town has several educational institutions both primary and secondary, the latter including a technical school and a school for girls. It has a very animated appearance during its weekly fairs, and, being the chief corn-market for the supply of nearly all the iron-works of the district of Verkhoturie, carries on a brisk corn trade, which the railway has further developed. The inhabitants~~

~~also make wooden boxes and trays which are sent to the fairs of Irbit and Nijni-Novgorod. The population, including that of the Vyiski iron-work, situ- ated close at hand, exceeds 30,000, all Great-Russians, and chiefly Nonconformists.~~

~~NIJNE-TCHIRSKAYA, a Cossack village, or stanitsa, of Russia, chief town of the Second Don district of the Don Cossack government, is situated on the right bank of the Don, at its junction with the Tchir, 25 miles below the Kalatch station of the Volga and Don Railway, and is the chief point for corn and linseed from the basin of the middle Don. Its 14,000 inhabitants (with the 11,000 of Verkne-Tchirskaya, 2 miles distant) are mostly engaged in agriculture and cattle-raising, favoured by the extensive landholdings (about 700,000 acres) belonging to the Cossacks of both stanitsas. The hills above the village are covered for several miles with rich gardens and vine-yards. Besides the trade in grain and linseed, a consider- able business is done in cattle, wool, and salt. Manufac- tures, as among the Don Cossacks generally, are very limited, being confined to tanning, brick-making, and candle- making. The place is in regular steamboat communica- tion with Novotcherkassk and Taganrog.~~

~~NIJNL-LOMOFF, a district town of Russia, in the government of Penza, 69 miles west-north-west from the capital of the government, on the Lomoff; the railway from Penza to Tula passes within 17 miles. It was founded as a south-eastern frontier fort in 1636, in a country of moderate fertility, and has but slowly developed. It has now 19,000 inhabitants, who support themselves chiefly by agriculture and gardening. The merchants carry on trade in grain, wine-spirit, hempseed oil, leather, woollen goods, and a variety of wooden wares (cars, sledges, wheels, and so on), largely manufactured in the southern and wooded part of the district. The yearly fair is of some importance as regards corn and cattle. The town and the district have also a few distilleries, manufactures of woollen cloth and potash, oil-works, and potteries.~~

~~NIJNI-NOVGOROD, or Nisnxry-Novcorop, a govern- ment of Central Russia, bounded by Vladimir on the W., by Yaroslaff and Vyatka on the N. and N.E., by Kazan and Simbirsk on the E., and by Penza and Tamboff on the S., with an area of 19,800 square miles, two-thirds being on the right~~

~~and the rest on the left bank of the Volga. The smaller portion, with the exception of the better- drained lands close to the river, is a low flat marshy district, covered with thick forests and sandy hills, and is but thinly peopled. The space between the Oka and Volga is also flat and covered with forests, but offers some- what greater advantages to the settler. The best part of the government is that to the east of the Oka; it is hilly, traversed by deep ravines, and better drained, and has patches of fertile black earth in the south. Geologically, Nijni-Novgorod belongs chiefly to the Permian system ; the Carboniferous appears only in the lowest formations, and the Permian limestones are covered with a stratum 450 feet in thickness, of variegated marls, formerly con- sidered as Permian, but now supposed to be Triassic. It is watered by the Volga with its tributaries, the Kerjenetz and Vetluga on the left, and the Sura (with the Piana)~~

~~NIJNI-NOVGOROD~~

~~and Oka on the right. These and their numerous tributaries offer great facilities both for navigation and for the transit of timber. Very numerous lakes dot the government, especially in the north; and one-third of its entire surface is still covered with forests, which occupy nearly the whole of the Zavoljie (to the north of the Volga), and extend without a break for 50 and 80 miles to the west and south-west. The climate is severe, especially in the Zavoljie, where the average yearly temperature is 5°°6 Fahr. lower than at Nijni. The population in 1880 reached 1,376,000; they are mostly Great-Russians, Mordvinians (50,600), and Tartars (42,650); the Tcheremisses numbered 5630, and the Jews about 1500. Of the total, 1,266,550 belong to the Greek Church, 63,850 (probably much understated) are registered as Old Believers and Raskolniks, 42,650 are Mohammedans, 750 Protestants, and 740 Catholics. The urban population is only 101,000. The yearly increase of the population is estimated at 0°43 per cent., and the mortality at 47 per 1000.~~

~~The chief occupation of the inhabitants is agriculture, but only 38 per cent. of the area is under crops. Cattle breeding is falling off rapidly, and in 1880 there were only 229,000 horses (as against 326,000 in 1848 and 264,006 in 1865), 232,000 horned cattle, 444,000 sheep (585,000 in 1865), and 74,000 pigs. Kitchen- gardens are a source of income in several districts.~~

Agriculture, on the whole, has to contend with great difficulties on account of the climate, the soil, and the small ——~— allotments of land. A variety of petty trades carried on by the peasantry FSS have accordingly developed in the vil- lages; of these cutlery is the chief, no less than 6000 families being engaged in that industry at Pavlovo and B& Vorsma. In other parts of the govern- [| ment the peasants make felt and woollen wares, leather wares and harness, iron- wire aud sieves, &c.; each village has its own specialty, being renowned for its felt shoes, or for its gloves, its fine scales, and so on. The chief occupa- tion, however, is the inanufacture of wooden wares, — sledges, wheels, dishes and spoons, window frames, boxes, &c., —which are exported in large quantities to the governments of the lower Volga, and even to Bokhara and Persia. The manufactures are rapidly developing. In 1880 there were 465 factories (prin- cipally machine-works, steam flour: |., mills, iron and steel works, naphtha distilleries, cutlery and copper works, — tanneries, and rope-works), employing about 20,000 work-people, and producing goods to the value of more than 15,000,000 roubles (8,840,000 in 1876); the productiou of the distilleries amounted to 4,540,000. The building of boats and steamers is also a considerable source of income. A very large proportion of the population fails to find the means of self-support within the province, and every year no fewer than 100,000 to 117,000 persons leave their villages aud go in search of labour as far as St Petersburg and Astrakhan. Trade in corn, salt, timber, leather, iron, and all kinds of manufactured ware is well developed in all towns of the government, and there are important fairs at several places. The educational institutions are few, and, on the whole, except among the Raskolniks, education stands at a very low level. The government is divided into eleven districts, having as their chief towns Nijni-Novgorod (50,000 inhabitants), Ardatoff (3500), Arzamas (10,500), Balakhna (4000), Gorbatoff (3000), Knyaghinin (2500), Lukoyanoff (10,000), Makarieff (2000), Seme- noft (3000), Sergach (4000), and Vasilsursk (8000). The other towns are Perevoz (1000) and Pochinki (7500); the two villages Pavlovo (about 10,000) and Vorsma (4000) are important manu- facturing centres. ;

Nusn1-Noveorop, or simply Nisn1 or Nisnry, capital of the above government, is situated at the confluence of the Oka and Volga, 276 miles by rail to the east of Moscow. It occupies a most advantageous position on

the great artery of Russian trade, at a place where the manufactured and agricultural products of the basin of the Oka meet

with the metal wares from that of the Kama, the corn and

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salt brought from the south-eastern provinces, the produce of the Caspian fisheries, and the various wares imported from Siberia, Central Asia, Caucasus, and Persia. It has thus become the seat of the great Makarievskaya fair, and one of the chief commercial centres of Russia. Its importance has still further increased during the last twenty years in consequence of the growth of manufactures in the Oka basin, the rapid development of steamboat traffic on the Volga and its tributaries, the extension of the Russian railway system, and the opening of Central Asia for trade. Nijni-Novgorod consists of three parts:— the upper city, including the Kremlin ; the lower town, or Nijni Bazaar ; and "the Fair," with the suburb Kunavina. The upper city covers three hills, which rise as steep crags to a height of 400 feet (490 feet above sea-level) on the right banks of both the Oka and the Volga. The Kremlin, or old fort, occupies one of these hills facing the Volga. It was erected in the beginning of the 16th century, on the site of the old palisaded fort, and has a wall 2300 yards long, with eleven towers; it contains the law- courts, the governor's residence, the arsenal, barracks, the military gymnasium of Count Arakchéeff, transferred from Novgorod, and two cathedrals, Preobrajenski and Arkhangelski. These

were erected in 1225 and 1222 respectively, and have been rebuilt more than once; the present structures, in somewhat poor taste, date from

Scale of 1 English Mile

= |\e Plan of Nijni-Novgorod.

1834 and 1732. The Preobrajenski cathedral, however, retains several relics of the past, such as a holy picture of 1380, and a Bible of 1404; Minin, the hero of Nijni, lies buried there. The Kremlin is adorned with a square, containing a monument to Minin and Pojarsky erected in 1826, and pretty boulevards have been laid out along its lower wall. The view from the Kremlin of the broad Volga, with its low-lying and far-spreading left bank, is very charming. The Pechorsky monastery, close by, is archeeologically interesting; it was built in the first half of the 16th century,—instead of the old monastery founded in 1330 and destroyed by a land-slip,—and has several antiquities and a library with very valuable MSS. Another monastery, contemporary with the foundation of Nijni, that of Blagovyeschensk, is situated on the right bank of the Oka. Its old churches have been destroyed by fire, but it has a very ancient holy picture—probably the oldest in Russia—dating from 933, which attracts many pilgrims. Besides the Kremlin, the upper town contains the best streets and public buildings. Five descents lead from it to the lower town, which covers the alluvial terrace, 30 to 35 feet in height, on the banks of the Oka and Volga, and is the centre of a very lively

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traffic. Its embankments are covered with storehouses, and during the fair great quantities of merchandise are un- loaded there : hills of salt surround the salt-harbour on the Oka ; farther down are seen the extensive storehouses and heaps of grain of the corn-harbour ; then comes the steam-boat quay on the Volga, opposite the Kremlin, and still farther to the east the timber-harbour. The fair is held on the flat sandy tongue of land between the Oka and the Volga, connected with the town only by a bridge of boats, 1500 yards long, which is dismounted in winter. The shops of the fair, more than 3000 in number, built of stone in regular rows, are surrounded by a canal, and cover half a square mile. A complete town has sprung up around them,

~~whilst the sandy banks are occupied by storehouses. The Siberian harbour during the fair has a special interest on account of its accumulations of tea boxes and temporary shelters where the different kinds of tea are tried and valued by tasters. The point of the peninsula is occupied by the storehouses of the steamboat companies, while metal wares and corn are discharged on a long island of the Oka, at the iron-harbour and Grebnovskaya harbour. An island in the Volga is the place where various kinds of rough wares are landed. An immense cathedral has been recently erected to the north of the fair, on a site which is often flooded. The railway from Moscow has its terminus close to the fair buildings, to the south of which is the suburb Kunavina, widely known throughout the East as a place for amusements of the lowest kind during the fair.~~

~~Nijni-Novgorod is well supplied with drinking-water by springs which flow from beneath the Triassic marls of which its hills are constituted. The water is collected in a basin on the banks of the Volga and pumped to the upper town (114,000 gallons per day). The climate of Nijni is harsh and continental, the yearly average temperature being 39° Fahr. (10°°6 in January and 64° in July), and the extreme thermometric readings — 40° and 104° Fahr.~~

~~The town has a scttled population of 50,000 inhabitants, rising to 250,000 or perhaps to 300,000 during the fair. The inhabitants are nearly all Great-Russians, and many of them are Nonconfor- mists. The mortality exceeds the birth-rate. The ednca tional institutions, which are few, include, besides the military school, one college (gymnasium) for boys and one for girls, a technical school, a theological seminary, two schools for sons and daughters of the clergy, and a dozen primary schools. The aggregate number of scholars being 3000, nearly 8000 children receive no public instruc- tion. There is a small public library, and a single periodical — The Exchange News; the five printing offices are employed almost exclusively by the public institutions. Of late the statistical com- mittee has issued a most valuable publication, the Nijegorodskiy Sbornik, containing all kinds of statistical, ethnographical, and archeological information abont the government.~~

The mannfactures are unimportant, but on the increase. The 'steam flour-mills, iron and machine works, manufactories of ropes and candles, distilleries, and potteries have an aggregate production of nearly £250,000 per year. Shipbuilding, especially for the transport of naphtha on the Caspian Sea, and also steam- boat building, have recently advanced considerably. Nijni is the chief station of the Volga steamboat traffic. The first steamer on the Volga made its appearance in 1821, but it was not till 1845 that steam navigation began to assume large proportions. In 1846 the whole traffic, carried on by nearly 1000 boats and 200 larger boats moved by horse-power, did not exceed 1,000,000 tons ; it is now estimated at 2,500,000 tons, worth £3,000,000, and the nuinber of steamers on the Volga alone is about 500. The head offices of the chief companies are at Nijni. The merchants also carry on a brisk trade, valued (apart from that of the fair) at more than £2,000,000 (20,000,000 roubles) of purchases and £1,800,000 of sales; the chief items are corn (from £200,000 to £500,000), salt, iron, tea, fish, groceries, and manufactured goods. The annual budget of Nijni is under £20,000.

The chief importance of Nijni is due to its fair, which is held from Angust 5th to Scptember 15th. From remote antiquity Russian merchants were wont to meet-in summer with those from the East at different places on the Volga, between the mouths of the Oka and Kama,—the fair changing its site with the increasing or decreasing power of the nationalities which struggled for the possession of the middle Volga. Bulgary, or Bakhrimovo, Nijni-

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Novgorod, Kazan, and Vasilsursk have successively been its seat since the 10th century. From 1624 its seat was long at the Jeltovodski monastery, 55 miles below. Nijni, close to Makarieff, whence its present name. The situation, however, being in many ways inconvenient, and a conflagration having destroyed the shops at Makarieff, the fair was transferred in 1817 to its present seat at Nijni. The first fair held here showed a large increase of arrivals, which reached the value of 27,000,000 roubles, and this fignre has steadily increased, reaching an average of 168,628,600 roubles in 1871-75, and 200,446,000 roubles in 1880. 'The value of the

| merchandise unsold usually varies from 15 to 25 millions (31

~~millions in 1880). The goods chiefly dealt in are cotton, woollen, linen, and silk stuffs (35 to 88 per cent. of the whole), iron and iron wares, furs and skins, pottery, salt, corn, fish, wine, and all kinds of manufactured goods. The Russian goods constitute four- fifths of the whole trade; those brought from Asia—tea (imported via Kiachta, Canton, and Suez), raw cotton and silk, leather wares, madder, and various manufactured wares—do not exceed 10 or 11 percent. Manufactured wares, groceries, and wines are the goods principally imported from western Europe.~~

~~The above figures, however, convey but a very imperfect idea of the total business transacted at the fair, which has been estimated at 371,013,911 roubles in 1880 (320,532,700 in 1876), and in reality stands ata much higher figure. Twenty-five years ago, the Russian manufacturers depending chiefly on the barter-trade in tea at Kiachta, their production was regulated principally by the prices of tea established at the fair; but now cotton takes the lead, and the extension to be given each year to the mills of central Russia is determined at the fair by the price of raw cotton imported from Asia, by that of madder, and by the results of the year's crop which become known during the fair. The same holds good with regard to all other stuffs, the prices of wool (provisionally established at the earlier fairs of south-western Russia) being ultimately settled at Nijni, as well as those of raw silk. The whole of the iron production of the Ural depends also on the same fair. The "caravans" of boats laden with iron-ware, starting from the Ural works in the spring, reach Nijni in August, after a stay at the fair of Laisheff, which supplies the lower Volga; and the purchases of iron made at Nijni for Asia aud middle Russia determine the amount of credit that will be granted for the next year's business to the owners of the iron-works, on which credit most of them eutirely depend. The fair thus influences directly all the leading branches of Russian manufacture. It exercises a yet greater in- fluence on the corn and salt trades throughout Russia, and still more on the whole of the trade in Siberia and Turkestan, both depending entirely on the conditions of credit that the Siberian and Turkestan merchants obtain at the fair.~~

~~The Makarievskaya fair attracts therefore no fewer than 200,000 people from all parts of Russia, and partly from Asia. The 3000 shops of the Gostinoy Dvor being insufficient for all the merchandise, other 3000 shops~~

are erected on a field close by, whilst the quays are covered for 10 miles with heaps of ware and temporary shelters. The Oka and Volga are literally covered with thousands of boats of all descriptions; thonsands of bargemen swarm in the dirticst holes, spreading epidemics ; whilst the lowest amusements are earried on in the houses of Kunavina. The fair is under the con- trol of a special committee, who raise more than 400,000 roubles for shop rents.

Two other fairs of some importance are held at Nijni,—one for the trade in wooden wares is held on the ice of the Oka, and another, in June, for the trade in horses.

History.—The confluence of the Oka and the Volga, inhabited in the 10th century by numerous Mordvinian tribes, began to be coveted by the Russians as soon as they had occupied the upper Volga, and as early as the 11th century they had established a fort, Gorodctz, 20 miles above the mouth of the Oka. In 1221 the people of Suzdal, under Yuri Vsevolodovich, erected a fort on the hill now occupied by the Kremlin of Nijni, and gave it the name of Novgrad Nizovskiya Zemli (new town of the lowland). Until the beginning of the 14th century Nijni-Novgorod, which grew rapidly as the Russians colonized the banks of the Oka, remained a sub-town of Suzdal ; it enjoyed, however, almost complete independence, being ruled by its popular assembly. In the 14th century, until 1890, it elected its own princes. Ill pro- tected by its palisaded walls, it was plundered in 1377 and 1878 by the Tartars, supported by the Mordvinians. In 1390 Prince Vasili of Moscow, in alliance with the khan Toktamish, took Nijni and established his own governors there; in 1412 it was definitely annexed to Moscow, becoming a stronghold for the further advance of that principality towards the east. It was fortified in 1508-11, and was able to repel the Tartars in 1518, 1520, and 1536. The second half of the 16th century was for Nijni a period of peaceful and rapid development. It became a depét for all merchandise brought from the south-east, and even English merchants established warehouses there. With the fall of Kazan, and the opening of the free navigation on the Volga, it became also the starting place for the " caravan" of boats yearly

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sent to the lower Volga under the protection of a military force ; whilst the thick forests of the neighbourhood favoured the develop- ment of shipbuilding. In 1606-11 the trading classes of Nijni took an active part in the expeditions against the revolted serfs, and it was a Nijni dealer in cattle, Kozma Minin Sukhoruki, who took the initiative in sending an army for the delivery of Moscow from the Poles. During the 17th century the country around Nijni becanie the seat of a vigorous religious agitation, and in its forests the Raskolniks spread hundreds of their monasteries and communities, those of the Kerjenets playing an important part in the history of Russian Nonconformity even to our own day.

Nijni-Novgorod had at one time two academies, Greek and Slavonic, and took some part in the literary movement of the end of the last century; its theatre also had some importance in the history of the Russian stage, Itis the birthplace of Kulibin and Dobroluboff. (P. A. K.)

NIKKO; one of the chief religious centres of Japan, is beautifully situated on the Nikko Zan (Mountains of the Sun's Brightness) in Tochigi ken (province of Shimotsuke), about 92 miles north-north-west of Tokio (Yedo) by the ordinary route wa Utsunomiya. The town is properly called Hachi-ishi, but this name is very little used in com- parison with that of the shrines. A Shinté temple seems to have existed at Nikko from time immemorial, and in 767 its first Buddhist temple was founded by Shé-dé Shé-nin (the subject of many strange legendary adventures) ; but the main celebrity of the place is due to the sepulchres and sanctuaries of Iyeyasu and Iyemitsu, the first and third shéguns of the Tokugawa dynasty. Iyeyasu was buried with amazing pomp in 1617, and Iyemitsu, his grandson, was slain in 1650 while visiting his tomb. From 1644 to 1868 the "abbots" of Nikko were always princes of the imperial blood ; thirteen of them are buried within the sacred grounds. Though the magnificent abbots' residence was destroyed by fire in 1871, and the temples have lost most of their ritual and much of their material splendour, enough remains to astonish by excellence and bewilder by variety of decorative detail. Of the numerous structures which cluster round the shrine of Iyeyasu, it is sufficient to mention the cylindrical copper column, 42 feet high, adorned at the top with a series of six lotus flowers, from the petals of which hang small bells; a five-storied pagoda, 104 feet high, with the animals of the duodenary cycle running

~~round the base ; the gate of the Two Kings, with its figures of unicorns, tapirs, elephants, and tree-peonies; the vermilion-coloured timber enclosure to which this gate gives entrance, with three great storehouses, a sumptuous stable for the sacred horses, and a finely fashioned granite cistern for holy water; and the Yo-mei gate, which with the contiguous cloister is covered with the most elaborate carving, and gives access to the court in the midst of which stands the last and most sacred enclosure. This, known as the Tamagaki, isa quadrangle of gilt trellis-work 50 yards square; within it stands the "chapel" or oratory (or rather a series of chapels, though the inmost is kept closed), in the decoration of which gilding and black lacquer have been lavishly employed. The tomb of Iyeyasu lies apart from all this magnificence two hundred and forty steps higher up the hills, in the shadow of tall cryptomerias—a single light-coloured bronze urn or casket standing on a circular base of three steps with a stone table in front on which rest a censer, a lotus-cluster, anda stork with a candlestick in its mouth,—the whole enclosed by a high stone wall. Somewhat similar are the tomb of Iyemitsu and its surroundings; and though the art dis- played is of an inferior character, the profusion of buildings and embellishments is even more perplexing. Hotoké Iwa, the hill on which the tomb stands, is completely covered to the summit with trees of various tints.~~

~~See Satow and Hawes, Guwide-book to Japan, 1881; Bird, Unbeaten Tracks in Japan, 1880.~~

~~NIKOLAIEFF, the chief naval station of Russia on the Black Sea, is situated in the government of Kherson, 41~~

~~miles north-west of the government capital. It stands most advantageously a little above the junction of the Ingul with the Bug, at the head of the liman, or estuary, of the Bug, and is the natural outlet for the basin of that river. The estuary, which is 23 miles long, enters that of the Dnieper; and Nikolaieff, 42 miles distant from the Black Sea, thus combines the advantages of a good seaport with those ofan inland town. The entrance to the double estuary of the Bug and Dnieper is protected by the fortress of Otchakoff and by the fort of Kinburn, erected on a narrow headland opposite, while several forts sur- round Nikolaieff on both sides of the Bug~~

~~and protect it from an attack by land. The town, which occupies two flat peninsulas between the Bug and the Ingul, extends up the banks of the latter, while its suburbs spread still farther into the steppe, the whole covering an area of 6 square miles. Immense unoccupied spaces separate the houses, which are mostly one-storied, and border on spacious streets. The bank of the Ingul is taken up with shipbuilding yards, docks, slips, and various workshops of the admiralty for the construction of armour-plates, guns, boilers, &c. On the river there is a floating dock for armoured ships, but Nikolaieff has this drawback that fully armoured ships are unable to pass the bar, which is only 18 to 21 feet deep. Before the Crimean War the activity of the dockyards was very great, ships of 130 guns being built in them; the suburbs—which belong to the admiralty—were bound to supply the necessary hands to the number of 3000 every day, and all the inhabitants had to perform compulsory service. Special bodies of militarily organized workmen were trained in shipbuilding, and thus Nikolaieff became a great school for all branches of navigation and naval architecture. The population, numbering 35,000, was mainly dependent on these sources ; but when the activity of the admiralty was brought to a stop for fourteen years by the treaty of Paris the inhabitants had to seek other means of support. By a branch of the Balta-Krementchug Railway, starting from Znamenka (147 miles), Nikolaieff has been brought into connexion with the Russian railway system, and its grain exports now equal those of Riga, while it is the chief market for a region comprising the governments of Kher- son, Poltava, Kharkoff, Ekaterinoslaff, and parts of Kieff and Podolia. In 1878 it reached the maximum of 2,665,000 quarters (9,660,000 cwts. in 1881). Large storehouses, capable of holding 2,000,000 quarters, stand close to the commercial port, two miles distant from the town, at Popova Balka on the Bug. The export of timber, skins, tallow, and cattle is steadily increasing. The population, which is growing rapidly, now amounts, including the suburbs, to upwards of 70,000 (45 per cent. of them mili- tary, and 7000 Jews). The sanitary conditions are bad, and the mortality reaches 40 per thousand. The educational institutions of Nikolaieff are more numerous and better than in many capitals of Russian governments. They include a gymnasium, an artillery school, and a dozen schools for boys and girls, an astronomical and meteoro- logical observatory (46° 58’ N. lat. and 31° 38’ E. long.), four museums and libraries, and a hydrographical insti- tute. Among the public buildings, the cathedral, which contains some good~~

Italian pictures, the theatre, the admiralty and several other state buildings are worthy of mention. The manufactures in the hands of private individuals include a shipbuilding yard and several tallow-melting houses and tobacco works. Since 1870 the Nikolaieff admiralty has resumed activity, especially in the construction of armoured ships and torpedo boats, though not to such an extent as before the Crimean War. Though a district town of the government of Kherson, Nikolaieff is under an independent military governor.

The remains of the well-known Greek colony Olbia have been | Mennonites, who prosecute agriculture extensively. The

discovered close to the confluence of the Ingul with the Bug at the Sto-Moghily (Hundred Graves). In medieval times the country was under the Lithuanians, and subsequently under the Zaporogian Cossacks. Russian colonists settled in the locality about the end of the last century, and after the fall of Otchakoff Prince Potem- kin established a wharf on the Ingul which received the naine of Nikolaieff. The further devclopment of the town is duc almost entirely to the efforts of the Russian Government to make it an important naval station.

NIKOLAIEVSK, a district town of Russia, in the government of Samara, on the right bank of the Irghiz, lies 48 miles from the Volga and 109 miles to the south-west of Samara. Its 10,000 inhabitants are mostly Raskolniks, or of the "United Church," and about 2000 Tartars occupy a separate part of the town. The chief occupation of the Russian and Tartar inhabitants is agriculture and cattle-breeding, in the products of which the merchants carry on a lively trade. The industries (tallow-melting and tanning) are unimportant. The fertility of the soil in the district favours commerce, as well as the development of large villages, many of which—Poganovka (6000 inhabitants), Ekaterinstadt (5000), Porubejka (5000), and several others—are more important and wealthier than many district towns of Russia. The famous Irghiz monasteries of the Raskolniks occur along the

~~Irghiz in the same district, whilst the left bank of the Volga is studded with rich German colonies.~~

~~Under the name of Metchetnoye, Nikolaievsk was founded in 1762, by Raskolniks who had fled to Poland and returned when Catherine II. undertook to grant them religious freedom. The monasteries which were founded at the same time became the refuge of numerous runaway serfs, and so the focus of the dis- turbances which broke out in 1778. In 1828 serious prosecu- tions began, with the result that the monasteries were closed with the exception of three, which were handed over in 1829 and 1836 to the United Church by order of Government. In 1835 the name of Metchetnoye was changed to Nikolaievsk.~~

~~For Nikolaievsk-on-the-Amur, a town of Eastern Siberia, on the left bank of the estuary of the Amur, 23 miles from the Gulf of Amur, see MARITIME PRovINcE, vol. xv. p. 548.~~

~~NIKOLAIEVSKAYA SLOBODA, a village of Russia, in the government of Astrakhan and district of Tsareff, 3 miles from the Volga, on its left bank, opposite Kamuishin. It dates from about the end of the last century, when a number of Little-Russians settled here for the transport of salt from Lake Elton. Although still but a village, it has about 30,000 inhabitants, and is one of the chief centres on the lower Volga for the trade in corn and salt,~~

~~NIKOPOL, a town of Russia, in the government and district of Ekaterinoslaff, on the right bank of the Dnieper, 76 miles to the south-south-west of Ekaterinoslaff. The town, formerly called Nikitin Rog, occupies an elongated peninsula between two branches of the Dnieper, at a point where its banks are covered on both sides and to a con- siderable distance with marshes, and has been for many centuries one of the places where the middle Dnieper could most conveniently be crossed. The old " setcha," or fortified camp, of the Zaporogian Cossacks had its seat a little above. Numbers of graves around it recall the battles which were fought for the possession of this im- portant strategic point. One of them, close to the town, "the Great Grave" (Tolstaya Moghila), contained, along with other Scythian antiquities, the well-known precious vase representing the capture of wild horses, Even now Nikopol, which is situated on the highway from Ekaterinoslaff to Kherson, is also the point where the "salt-highway" of the~~

Chumaks (Little-Russian carriers of salt) to the Crimea crosses the Dnieper. A wharf for the building of trading ships navigating the estuary of the Dnieper has been established at Nikopol, and it is still one of the chief places on the lower Dnieper for the export of corn, linseed, tallow, and wool. Its 10,000 inhabitants are Little-Russians, Jews, and

trade in wheat, hemp, tallow, and wool is important in connexion with the export trade of Nikolaieff and Odessa.

NIKOPOLL, or Nicoport (Turkish, Vighebolu or Nebul), a city of Bulgaria, the chief town of a circle in the district of Plevna (Plyeven), is picturesquely situated on the south bank of the Danube, at the confluence of the Osma. According to the census of 1881 it had only 4652 inhabitants, but previous to its destruction by the Russians in 1877 they numbered about 10,000, and: as a military post the town has for centuries been of con- siderable importance. A ruined castle still dominates the place, and fortifications stretch down to the river.

Nikopoli occupies the site of the ancient Asaimus, but by some medieval confusion bears the name of Nicopolis ad Istrum, which was founded by Trajan several miles down the river, at the inflow of the Iatrus or Yantra, at the spot still called Nikup. The following are the chief points in the modern history of the place :— capture of the fortress by Sigismund of Hungary in 1892 and 1395 ; defeat of Sigismund and his hosts in 1896 by Bajazet; siege of the town by Uladislaus of Hungary in 1444; defeat of the Turks by Bathori in 1595 and by Michael of Wallachia in 1598 ; occupation of the fortress by the Russians in 1810 ; destruction of the Turkish flotilla and storming of the Turkish camp by Govaroff in 1829;

and the capture and burning of the town by the Russians under Kriidener on 15th June 1877.

NILE. This mighty river, which after a course of Plate 3370 miles pours into the Mediterranean a low-water XV-'

current of 61,500 cubic feet per second, has its cradle in

~~the Victoria Nyanza, an enormous lake in Central Africa Victoria where the line of the equator is crossed by 32°, 33°, Nyanza.~~

~~and 34° of E. long,, somewhere about 4000 feet above the sea. The Victoria Nyanza? measures 230 miles from north to south and 220 from east to west. Its coast-line, which is very irregular, cannot be less than 2000 miles ; its water area is estimated at 27,000 miles, and its very islands have an aggregate area of 1400 square miles. The physical features of the shores vary greatly from district to district.? At the south-east corner is Speke Gulf, about 60 miles long, formed partly by a deep indentation of the mainland and partly by the peninsular island of Ukerewe, which is separated from the mainland by Rugisi or Rugeshi Strait, a narrow and shallow channel about # mile long, overgrown with rushes, papyrus, and a fine network of grass whicli undulates beneath the foot. Bukindo is the chief village on the island, which forms the territory of a separate ruler. Its inhabitants murdered Lieutenant G. Shergold Smith, R.N., and Mr O'Neill, members of the 1876-77 expedition of the Church Missionary Society. To the north of Ukerewe lies Ukara, for the most part barren, and with two rugged hills rising 200 or 300 feet. The natives average less than 5 feet in height (Wilson and Felkin, i. pp. 99-101). Along the south and south-west coasts is a whole series of islands—notably Komeh, Mysomel, Bumbireh, and Bukerebe or Alice Island; but of much more importance is the great Sesse Archipelago off the coasts of western Uganda. At first entered on our maps as a single great island, it has turned out to be (according to King Mtesa's possibly somewhat exaggerated statement) a cluster of four hundred mostly inhabited islands, some of the largest being 10 to 15 miles in length and 3 to 4 miles in breadth. Clothed as they generally are with forest, and fringed along the shore with papyrus or low jungle, they often present scenes of the richest tropical luxuriance. Along the east half of the northern coast are a number of~~

~~1 Plate XV. shows the river system south of the Tropic of Cancer. For the Egyptian portion see Plate VI., vol. vii.~~

~~2 Nyanza means water or lake. Other names are—Nyanza Kerewe (Linaut), Neraa Bali (Baker), Luero lo Luta Nzige, i.e., 'white with dead locusts"~~

(Speke), Bahari ya Pila or ‘Second Lake” and Bahari ya Ukara (of the Sawahili), and Sea of Ukerewe (of the Arabs).

3 A description will be found in Wilson and Felkin, Uganda and the Egyptian Soudan, vol. i. p. 250-54.

Ripon Falls,

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considerable islands such as Usuguru, and, at the head of Napoleon Channel, Uvuma, famous for the canoe contest waged between its inhabitants and King Mtesa of Uganda, of which Mr Stanley was spectator. Ugingo, on the east coast, is a large island separated like Ukerewe by a narrow channel from the mainlaid. Though when its extent is taken into account Victoria Nyanza may be described as shallow in contrast to such basins as those of Tanganyika, the depth, especially on the eastern side, appears to be very considerable, Stanley giving 275 and even 580 feet not far from the shore. Of the affluents of the lake a few only require to be mentioned. The Shimiyu, which falls into the south side of Speke Gulf, was described by Stanley (March 1875) as a magnificent flood a mile wide receiving the waters of the Monangah, the Luwamberri, and the Duma, and having a course of 300 miles. If this were the case it would take the southmost point of the Nile system as far at least as between 4° and 5° S. lat. But when Lieutenant Shergold Smith saw the Shimiyu in 1876 he found it a comparatively insignificant stream, and if the altitudes observed by Smith and Pearson be correct it cannot be the recipient of the Luwamberri and the Monangah. Instead of the Shimiyu, either the Wami (or Kiye) or the Muinguira (Isanga or Isanda), both of which flow into Jordans Creek,! may be the southmost feeder of the Nile. Of much more importance as a tributary than any of these is the Kagera (of the Waganda), otherwise known as the Kitangule, Kitangure (Burton), Tengure (Grant), or Alexandra Nile (Stanley), a river 450 feet wide and 85 feet deep at its mouth, with a strong current, apparently pouring into the lake more water than is carried off by the Nile. It may be navigated for about 50 miles, and is believed to have its sources between 200 and 300 miles to the south-west. There are several lakes along its course—Lake Windermere, Lake Thema, and the larger Lake Alexandra not yet reached by Europeans.

~~The leading fact in regard to the position of Victoria Nyanza in the general hydrography of Central Africa is that by none of its affluents is it connected with any of the other great "equatorial" lakes. Tanganyika? lies in a trough about 1400 feet lower. Between the Victoria and Lake Nyassa (Zambesi system) there is a stretch of 500 miles; and, though a large lake, part of which Stanley saw in 1876, and named Gulf Beatrice, lies to the west, it forms in all probability a distinct basin.~~

~~In 1875 Stanley proved that the only outflow from Victoria Nyanza was by the Ripon Falls on the north side of the lake. These falls (named after Earl de Grey and Ripon, president of the Royal Geographical Society in 1859) were discovered July 28, 1862, by Captain Speke, but from native accounts he was led to believe that other streams (such as the Luajerri) issued from the lake. The Nile, as it dropsabout 12 feet over the rocks, hasa breadth of 400 to 500 feet, divided into several sections by a number of wooded isles. For the next 300 miles the Victoria Nile or Somerset River, as this section is called, has all the character of a mountain stream racing swiftly along a rocky channel often walled in by cliffs (at times 180 feet high) and broken by picturesque islands and countless rapids. At first for 117 miles its course is north-north- west, but reaching the Khor Kafu (on which Mruli stands), about 1° 38' N. lat. and 32° 20' E. long,, it takes the north-east direction of this channel, and it is not till 2° N. lat. that it again turns north-west towards the Albert Nyanza. About 52 miles below the Ripon Falls, Long, who in 1874 boated from Urondogani to Foweira, describes himself as having passed through a lake 20 to 25 miles~~

~~1 Named not after the Jordan, but after Speke's country-house, Jordans, in Somersetshire. 2 Tanganyika level is 2610 feet according to Joseph Thomson.~~

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~~broad ; but this expanse, which appears in text-books and maps (sometimes as two lakes, Kaja and Ibrahim Lakes), may have been the result of a mere temporary overflow. At~~

~~| Karuma, below Foweira, the river falls over a wall-like~~

ledge of rock 5 feet high which extends right across its bed. But the great feature of the Victoria Nile is the Murchison Fall, about 2° 18’ N. lat. and 31° 50’ E. long.,, where the river rages furiously through a rock-bound pass, and plunges at one leap of about 120 feet into a gloomy abyss. Below this point, continuing between steep forest- covered hills, it gradually calms down into a stream so slow and steady that at certain seasons it is only from the scarcely perceptible drifting of the little green water-plants, called Pistia Stratiotes,? that the flow can be observed. About 20 or 25 miles below the fall it enters the north end of the Albert Nyanza.

This lake* was first reached by Baker on March 14, 1864, near Vacovia on the east coast, a small village of fisher- men and salt-makers. From a granitic cliff 1500 feet above the water he looked out over a boundless horizon on the south and south-west, and towards the west descried. at a distance of 50 or 60 miles, blue mountains about 7000 feet high. The Albert Nyanza was consequently entered on his map as a vast lake extending from 2° §. lat. to 2° 50’ N. lat., or a distance of about 380 miles. But the circumnavigation of the lake by Gessi Pasha (1876), Mason Bey, and Dr Emin Bey leaves no doubt that its real dimensions are—length 97 miles, average breadth 22 miles, and area about 2000 square miles. ‘The western shore is in its northern half overhung by lofty and precipitous mountains, but farther south is formed by a wide forest-clad plain. At the south end the water is very shallow and encumbered by a vast stretch of ambatch forest. Instead of the lake being, as Baker contended, one of the great sources of the Nile, its functions are those of a large backwater. Of course a considerable amount of drainage must reach it from the surrounding high grounds, though the lakeward slopes are not very extensive; but none of its tributaries appear to be of much importance as feeders of the main stream. Along the western shore the depth is from 15 to 20 feet.

Escaping by an island-studded channel from the north- west corner of the Albert Nyanza, the Nile, which now takes the name of Bahr al-Jebel, or River of the Mountains, continues to flow in a general northward direction. From Magungo to Dufile (Dufli), 128 miles, its course is wonder- fully smooth, and formsa series of lake-like reaches. Below Dufile the high lands close in upon the river, which, from a width of a mile at Dufile, narrows to 400 or 500 yards, and rushes through a gorge. Near Mugi (50 miles below

~~Dufile) are the formidable Yarborah rapids. From Kiri (Kerrie)—an Egyptian fort on an eminence 1500 feet highon the left bank—the river is again navigable, but flows with so strong a current that Mr Felkin's boat took only three and a half hours to reach Bedden, a distance of some 30 miles. At Bedden a line of hills runs right athwart the channel, which is divided by an island of great beauty. An iron rope ferry was established by Gordon at this point, and without it the river could not be crossed. Between Bedden and Rejaf (12 miles) the hills give place to park-like plains dotted with large trees. About 15 miles below Rejaf, Gondokoro is passed on the right hand, and there the traveller may still see the ruins of the old mission church, the earthworks of Baker's camp,~~

~~3 Pistia Stratiotes is characteristic of the Bahr al-Jebel. It is found drifting far down the White Nile, but, according to Steudner, does not occur in the Bahr al-Ghazal.~~

~~4 Otherwise known 'as the Mwutan Nzige (Locust Lake) and the Luta Nzige (Dead Locust).~~

~~5 The descriptive phrase "blue mountains" has since been converted into a geographical name, "Blue Mountains."~~

~~XV—Ge~~

~~Murchi- son Fall.~~

~~Albert Nyanza.~~

~~Bahr al-Jebel.~~

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~~and the lemon grove from which the fruit has been distri- buted throughout the equatorial provinces. At this point the river, about 656 feet wide, is divided by a large island. Eight miles farther down lies Lado (often spelled Lardo) on the left bank, a well-built Egyptian town with houses of burnt brick and a considerable area of cultivated land watered by shaddifs. With the hill to the west of Lado, variously called Nyerkani and Luyola, the~~

mountainous region ends, and the river enters on a vast plain. The aftluents which it has hitherto received are for the most part short and individually insignificant 4idérs (temporary streams), but two at least deserve a few words of descrip- tion. The Unyama, joining the river opposite J. Kuku or Neri, 10 miles below Dufile, is a perennial stream rising in the prairies between Fatiko and Unyoro, and winding through a lovely country for about 80 miles. The Asua (Atza of the Madi), whose mouth is 20 miles farther down on the same side, is about 120 paces broad, and flows through a rocky bed 15 feetdeep. As it receives nearly the whole drainage of the Madi and Shua countries and various districts farther east, it becomes in the rainy season a deep and furious torrent. The Atabbi or Atappi (the main drain of the western face of the Shuli mountains) reaches the Asua a short distance above the mouth.

The great plain which the Nile enters below Lado, about 5° N. lat., slopes so gradually towards the north that the river falls only 300 feet in a stretch of more than 650 miles between Gondokoro and Khartoum. As the river has gradually raised the level of both bed and banks, an overflow takes place, and lagoons or side channels (mayés) are formed wherever the bank breaks down; and as these, from their position, naturally act as settling-ponds they get rapidly silted up.

Up to about 7° 25’ N. lat., in spite of this condition of things, the Nile maintains a fairly definite course, with a considerable depth of water in its main current, but at this point it splits up into two branches as if to form a delta. The left branch, which retains the name Bahr al-Jebel, but which may be conveniently distinguished by the Denka name of Kir, continues in the line of the river, and the right branch, or Bahr al-Zerdf (Giraffe River), tends rather more towards the east. After flowing respectively about 160 and 140 miles, they reach the Bahr al-Ghazal, slowly gliding east with a slight deflexion to the south. The whole region is a vast expanse of low swampy lands crossed by secondary channels, and flooded for many miles in the rainy season. At the junction of the Bahr al-Ghazdl and the Kir the perma- nently submerged area is usually named Lake No on our maps, but the Arabs simply call it the confluence—Mokren al-Bohur. The scenes presented by this portion of the Nile are of the most peculiar description. The dark and ill-smelling water shows no sign of motion. On all sides

stretch monotonous reaches of omm sif (i.e., woolly) grass (Vossia procera) and papyrus, rising 20 or 30 feet above the water so as often to close the view like a stone wall ; the level of the plain is broken only at intervals by little mounds of earth, tenanted for the most part by white ants, and covered with a clump of brushwood or trees;! the moisture in the air is so excessive that gunpowder left in the guns overnight is reduced to a paste; mosquitoes and other swamp flies swarm in myriads. And yet touches of beauty are not wanting. Water-lilies (Nymphea stellata and Nymphea Lotus)—white, blue, and crimson—often adorn the surface of the stream ; multitudes of water-fowl, from the familiar Egyptian duck and the pelican to the rare and odd-looking Balzniceps rex (abu markub), breed

1 The ordinary theory is that these mounds are hills constructed by

the white ants; but Marno considers them as more probably portions which have resisted the general process of degradation,

NILE

among the reeds, and at night the scene is lit up bya very firmament of fire-flies.

Previous to 1863 both the Kir and the Bahr al-Zeraf had White But when the Nile.

been navigable within the memory of man. Tinné expedition passed down the river in March of that year, the White Nile, the united current of the Bahr al- Jebel and the Bahr al-Ghazal, was found to be blocked by an accumulation of vegetable flotsam, and it cost the crew two days' hard labour to take their vessel through a channel partially cleared by their predecessors. The obstruction rapidly increased, and thirty vessels had to be employed for five weeks to open a permanent passage. In 1865 Baker found a dam about # of a mile wide already overgrown with reeds and grass so as to form a continuation of the surrounding country. Matters went from bad to worse, and the White Nile, the Kir, and tle Bahr al-Zeraf were all rendered impassable till, in 1874, Ismael Ayub Pasha cleared the main route by the White Nile and the Kir. But in 1878 again the whole Nile rose to an unusual height (the banks at Lado, 15 to 20 feet above the niean level, were

~~overflowed), and enormous quan- titles of vegetable debris were carried off by the current. A formation of bars on an unprecedented scale was the result, and communication between the upper and lower Nile was not restored till 1880.~~

~~If the Kir and the White Nile, with their comparatively strong current, were thus obstructed, it was natural that the more sluggish Bahr al-Ghazal should contain more extensive though less compact accumulations. In 1881 Gessi Pasha spent three and a half months on a part of the voyage usually performed in five hours, and lost half of his men by starvation. Between the mouths of the Kir and Bahr al-'Arab there were twenty distinct dams.?~~

~~Sir Samuel Baker asserted in 1874 that from the equator to the Mediterranean not a drop of water reached the Nile from the west,—the Bahr al-Ghazal being only a channel of stagnant pools and marshes (Proc. Roy. Geog. Soc., 1873-74, p. 148). But if their total contri- bution be of little moment in comparison with that of their eastern rivals, the western affluents are exceedingly numerous, and drain a wide extent of country. Their relative importance has been shown by Schweinfurth, Junker, Emin Bey, &c. One or two—the Rodi (Lau) and the Rohl—join the Bahr al-Jebel in its passage through the plain, but by far the greater number converge to the Bahr al-Ghazal. At its lowest state, just before the com- mencement of the rains, this river had in 1881 a depth varying from 20 to 25 feet, though in many places no per- ceptible current. It is generally navigable to Meshrat-el- Rek, about 200 or 220 miles above the mouth of the Kir, and in the rainy season even small steamers may ascend its tributary, the Dyur or Jur, as faras Wau. In exceptionally dry seasons the channel at Meshrat-el-Rek is so utterly desiccated that drinking-water can be obtained only by digging. One of the main feeders of the Bahr al-Ghazal is the Bahr al-'Arab, which is formed by the drainage of southern Darfur, has a breadth—about 10° 20' N. lat. and 25° 20' E. long. (before it receives any of its right hand affluents)—of 360 feet and a depth (in Decem- ber) of 4 feet, and never quite dries up even in the heat of summer (Felkin, Uganda, ii. 239). This is the only con- siderable accession from the north: the rest of the affluents, an almost countless host if all the small headstreams be~~

~~included, have their rise in the range of mountainous~~

~~country which stretches, from the Blue Mountains of the Albert Nyanza and their southern continuation, in a general north-east direction as far as 25° or 26° E. long,, and forms the watershed between the Nile basin and those~~

~~= See E. Marno, "Die Sumpfregion des dquat. Nilsystems," in Pet. Afitth., 1881, and another paper in 1882. :~~

~~Blue Nile.~~

~~and sonietimes high banks.~~

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~~probably of Lake Chad and the Congo. Flowingin many cases for 400 or 500 miles, these streams in the upper part of their course are of considerable volume and of much importance in the economy of the countries which they traverse.~~

~~About 95 miles below the junction of the Kir, and 30 below that of the Bahr al-Zerdf, the White Nile receives its first great affluent from the east. The Sobdat, as it is called, has its headwaters (largely unexplored) distributed over a wide area—the southmost rising possibly as far south as 4° N. lat. in the hilly country of Atuka, the eastmost in Kaffa, and the northmost about 9° in the Berta mountains! On one of them there is probably a consider- able lake: first inserted as Baro Lake on our maps by Petermann on the report of a slave dealer, it was expunged by Matteucci; but Schuver clainis to have seen it from the mountains to the north, and proposes to call it Haarlem Lake. The Sobdt proper is navigable from June to November as far as Nasser (180 miles), an Egyptian port established by Gordon in 1874, and even, it is said, for three days farther, though it divides into four branches a short distance above this point. Junker, who visited Nasser * in 1876, found the river 15 to 20 feet deep, flow- ing at the rate of 80 paces per minute between banks high enough to prevent any general inundation. At the mouth of the Sobat there is an Egyptian post of the same name (see Zeitschr. der Ges. f. Hrdk., Berlin, 1877).~~

~~The northward progress of the White Nile for the next 300 miles is through a great plain stretching from the spurs of the Abyssinian highlands in the~~

~~east to the hilly districts of Takalla and Kordofan in the west, and con- sisting almost exclusively of red and other sandstone, often flat as a pavement. Escaping from the swampy region, the river again forms a well-marked channel, with regular Throughout the whole dis- tance indicated a striking confirmation of Baer's law is afforded,—the fairway or deeper side of the stream gene- rally keeping to the eastern shore. About 60 miles below the Sobat mouth lies (on the right bank) Fashoda, an Egyptain town founded in 1867 on the site of Denab, the old "capital" of the Shilluks. In the neighbourhood of Mahadat Abu Zaid (about 13° 5' N. lat.) begin the Sunt Islands, so called from the Arab name for the Acacia nilotica, a tree characteristic of the White Nile.~~

~~At Khartoum (Khartum), in 15° 37' N. lat., the White Nile is joined by its greatest eastern confluent the Blue Nile? (Bahr el-Azrak). This river has its head reservoir in Lake Tana (Tsana), which is so situated that the lines of 12° N. lat. and 37° 2' E. long. cut it into four nearly equal portions. The height of the lake is 5658 feet (Rohlfs).~~

~~From east to west the breadth is about 40 miles, and —~~

~~the area is estimated at 2980 square miles. Between Dega and Zegi a depth of 236 feet has been found, and between Korata and Zegi 219. The Blue Nile, or Abai as it is called in Abyssinia, rises on the northward slopes of a cluster of mountains (Mount Gesh, &c.) about 11° N. lat., and flowing northwards enters Lake Tana near the south- west corner, to issue again at no great distance. Of the multitudinous ramifications by which the Abai and its tributaries drain a large part of the Abyssinian plateau, a better idea will be obtained from the map than from any description. From east and south and north the mountain~~

~~1 The connexion of the Godjeb or Orno with the Sobat, first sug- gested by Beke in 1841, and strongly opposed by Von Kloden, is still matter of doubt.~~

~~2 Naser, locus ubi torrentes fluunt in alveum.~~

~~3 At Khartoum the water of the one river has a milky-limy appear- ance, that of the other is clear and blue, except when in flood, when it gains a reddish-yellow from its alluvial burden.~~

~~4 Lake Tana has been explored by Bruce, Blanc, De Cosson, Piaggia, Steeker, &c.~~

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~~| streams pour down into the river,—its eastmost tributary probably rising east of Magdala, and its southmost between 8° and 9° N. lat. At Fazokl or Famaka, 11° 17' N. lat., it begins to escape from the mountains; about 130 miles farther down, after passing Rosaires and Karkoj on the right and Sennaar on the left, it is joined by the Dinder ; and 35 miles more bring it to the confluence of the Rahad (Ra'ad) and the town of Abu Haraz. Beyond this point it flows through the most fertile portion of the Egyptian Soudan, the plain on the left hand more especially being a great grain-growing district. The total length of the Abai or Blue Nile may be estimated at 960 miles.~~

~~On the north-west side of the mountains which enclose Atbara.~~

~~Lake Tana are some of the headwaters of the Atbara, another important tributary of the Nile; but it does not reach the main stream till about 17° 41' N. lat., or 200 miles below Khartoum. Its principal branch, the Settit or Takazze, has a course of about 420 miles through the Abyssinian plateau before it joins or (more strictly) is joined by the river which gives its name to the united stream. The Khor-el-Gash, or Mareb, though a consider- able river in its upper regions, reaches the Atbara (and thus the Nile, of which it is the northmost affluent) only during a heavy rainy season (see James, Wald Tribes of the Soudan, 1883). A large number of these eastern tributaries are mountain torrents, of enormous volume and impetuosity during the rains, and for a short time afterwards, but rapidly dwindling again into mere threads of water or chains of pools, and leaving the rocks and sand of their deep-cut channels as dry and parched as the surrounding desert. No one who has read it will easily forget Sir Samuel Baker's graphic account of the deep pool in the bed of the Atbara into which the fishes, tortoises, crocodiles, and hippopo- tami from a long reach of the river had gradually been crowded as the water disappeared, and of the sudden release effected by the return of the rainy season. A more recent~~

~~traveller, Herr Schuver, had a similar experience on the Tumat, the southern tributary of the Blue Nile.®~~

~~After receiving the Atbara the Nile continues for 650 miles through the Nubian desert, where the volume of the river suffers continual diminution from the ex- treme dryness of the air, without being recruited by a single drop of water. Between Berber (an important town on the right bank 30 miles below the Atbara) and Wady Halfa (about 600 miles) rapids and cataracts follow at intervals. The highest of these, the fifth cataract of the Nile, is situated about 40 miles below Berber, the fourth, 170 miles farther down, below Shitab, the third, 230 miles farther, at Hannek, and the second just above Wady Halfa. At Assuan (200 miles lower) are the first cataracts. Beyond that point the river flows through the wonderful valley which has already been described in the article Eeypr.~~

~~Reduced to its simplest expression, the Nile system may be said to consist of a great steady flowing river fed by the rains of the tropies, controlled by the existenee of a vast head reservoir and several areas of repose, and annually flooded by the aceession of a great body of water with which its eastern tributaries are flushed. The following details will enable the reader to estimate the hydro- graphie value of the different portions:'—~~

~~Victoria Nyanza lies in a zone where rain falls all the year round. At Kagei (south shore) the lake was seen by Mr Wilson in 1877 to be slowly rising in the middle of February, and it had attained its maximum (2 feet) about the middle of May, ten days after the rain had ceased. The total rainfall of this zone is not excessive. Speke's estimate of 49 inches is confirmed by Mr Wilson's much longer experience. In Uganda there are two maximum periods— March to May, and September to November.~~

~~The Assua is important from 15th April to 15th November.~~

~~The Bahr al-Jebel, at Gondokoro, begins to rise in April, and~~

~~5 Baker, Abyssinian Tributaries of the Nile. 6 See Petermann's Mittheilungen, 1883; Erg.-Ieft, No, 72. 7 Cf. Keith Johnston, Africa, Appendix.~~

gradually attains a maximum of 44 feet, the river being then 6 to 10 feet deep.

On the Kir the rainy season lasts from the first week of March to the close of October; but the 100 inches of rainfall goes largely to flood the swamps. ;

The Bahr al-Ghazdl is at its lowest in March, and begins to rise soon after.

The Sobdt is full from June to December.

The White Nile, at Khartoum, begins to rise in May, but only gains 2 or 3 feet till July or August, Its maximum (6 feet) is reached in September. Linant Bey estimated its volume at low level as 10,488 cubic feet, and in flood as 213,450.

The Blue Nile, at Khartoum, begins to rise in July, and reaches its maximum (174 feet) by August 20. Its rise is much more rapid than its decline ; it takes eighty days to lose the gain achicved in fifty-one. Linant Bey estimated its volume at low level as 5615 cubic feet, and in flood as 220,620. At Famaka it grows turbid about 20th May. Pies

The Atbara, for 150 miles above its junction with the Nilc, is perfectly dry from March to June.

As a waterway leading into the heart of Africa, the Nile at first sight might appear to be of more importance than it is, Steamers, it is true, as well as sailing craft, can pass up from Egypt as far as Bedden, a distance of 2900 miles ; but even at the period of high water (June to August) the ascent of the cataracts between Wady Halfa and Berber is so dangerous for vessels of any size that the river-route is scldom followed throughout. From Wady Halfa the traveller may proceed by camel to El Ordeh (New Dongola), thence take boat to El Dabbeh or to Old Dongola, and again proceed by land either to Berber, Shendy, or Khartoum. Or, instead, he may leave the river at Korosko, and strike through the Nubian desert direct to Berber. From Berber, which is also the terminus of a route often used from Souakim

~~(Suakin) on the Red Sea, steamers ply up the river, but it sometimes takes nineteen days to reach Khartoum. The difficulties of navigating the Kir have already been described. Above Bedden the steamer again finds a free course from Dufile to the neighbourhood of the Murchison Fall; but the route to Victoria Nyanza is again overland from Magungo. It is found 'more expeditious to come to the equatorial regions from the east coast than up the Nile valley.~~

~~For the botanical aspects of the Nile valley the reader is referred to Schweinfurth's papers (Petermann's Mittheilungen, 1868); for the general zoology to Heuglin's sketch (did., 1869); and for an account of the fish fauna to Dr Giinther's appendix to Mr and Mrs Petherick's Travels in Central Africa (1869).~~

~~The ancients knew little of the course of the Nile above MERrorE (q.v.). Juba, in his Libyca, quoted by Pliny, makes the Nile rise in western Mauretania, not far from the ocean, in a lake pre- senting characteristic Nile fauna, then pass underground for several days' journey to a similar lake in Mauretania Cesariensis, again continue underground for twenty days' journey to the source called Nigris on the borders of Africa and Ethiopia, and thence flow through Ethiopia as the Astapus. This tissue of invention re- ceived strange favour in the eyes of many subsequent geographers, and actually left its traces in some of our maps down to a com- paratively modern time. Strabo, who ascended the river as far as Syene, states that very early investigators had connected the in- undation of the lower Nile with summer rains on the far south- ern mountains, and that their theory had been confirmed by the observations of travellers under the Ptolemies. Nero despatched two centurions on an expedition for the express purpose of explor- ing the Nile, and Seneca informs us that they reached a marshy impassable region, which may be easily identified with the country of the White Nile above the mouth of the Sobat. To what they re- ferred when they reported a great mass of water falling from between two rocks is not so readily determined. By the time of Ptolemy in- formation had somewhat accumulated. Two streams, he says, issu- ing from two lakes! (one in 6° and the other in 7° S. lat.), unite in 2° N. lat. to make the Nile which in 12° N. lat. receives the Astapus, a river flowing from Lake Coloe (on the equator). Thus it would appear that he had heard vaguely about the lakes which we~~

~~know as Victoria Nyanza, Albert Nyanza, and Tana. His two southern lakes, he conceived, were fed by the melting of snows on a range of moun- tains running east and west for upwards of 500 miles—the Moun- tains of the Moon, +d ris ceAhvns bpos, Lunxw Montes. To this opinion he was probably led by hearsay about the snow-clad summits of Kilimanjaro and Kenia. On all the subsequent history of the geography of the Nile Ptolemy's theory had an enormous influence. Medieval maps and descriptions, both European and Arabian, reproduce the Mountains of the Moon and the equatorial lakes with a variety of probable or impossible modifications, Even Speke congratulated himself on identifying the old Ptolemean range with the high lands to the north of Tanganyika, and connected the name with that of Unyamwezi, the " country of the moon."~~

~~1 The two lakes afterwards received the names Lake of Crocodiles and Lake of Cataracts.~~

~~NIL—NIL~~

~~Attacking the lake region from the east coast, the Portuguese ex- plorers gained a good deal of information which found its way into such maps as those of Pigafctta (1580); but it was not till the present century that the geography of those parts was placed on the basis of fully accepted observations. On November 14, 1770, Bruce reached Lake Tana, and considering, as he did, that the Bluc Nile was the main branch, very fairly claimed for himself the honour of being the discoverer of the long-sought caput Nili.~~

~~The following are a few of the chief dates in the progress of knowledge since 1800 in regard to the river system:—~~

~~1807. Completion of Jacotin's Atlas de l' Egypte (surveys from the Mediterranean to Assuan). 1814. Burckhardt goes up the Nile, partly by land, as far as Shendi, crosses to the Atbara, and skirts the east side to Gos Rajeb. 1819. Cailliaud is the first to visit Meroe. 1820. Steamers first ascend the cataracts to Korosko. 1822. Cailliaud and Letorzec ascend the Blue Nile with Ibrahim Pasha's military expedition as far as Fazokl. 1827. Linant Bey ascends White Nile 182 geographical miles to Al Ais, in 13° 43' N, lat. Prokesch von Osten surveys the Nile between Assnan and Wady~~

Halfa. 1839. Mehemet Ali sends up White Nile an expedition,

usually known as the First Egyptian Expedition, under Selim Bim- bashi, which (28th January 1840) reaches an island Badelik, in 6° 30’ N. lat., but adds little information. Thibaut (Ibrahim Effendi) was a member of this expedition. 1840-41. A second Egyptian expedition (D’Arnaud, Sabatier, Werne) reaches island of Janker near Gon- dokoro, about 4° 42’ N. lat. 1841-42. Third Egyptian expedition (Selim Bimbashi, D’Arnaud, Sabatier, Thibaut). 1845. Brun- Rollet founds trading post not far from subsequent site of Heili- genkreuz. 1846. First steamboat on White Nile. 1849. Baron Von Miiller surveys the Nile from Handak to Ambakol in province of Dongola. 1850. Knoblecher (of Austrian mission) reached Log- wek. 1855. Rcbmann (missionary at Kisulutini, north-west of Mombasa) sends home map showing Lake Ukerewe, extending from 0° 30’ N. lat. to 18° 30’S. lat. 1858. Speke, twenty marches north of Kazeh, where he had left Burton, reaches shore of Victoria Ny- anza. 1859. Miani reaches mouth of Unyama. 1860. Pruyssenaere starts from Khartoum up the White Nile. 1862. Speke reaches Ripon Falls. Stcudner passes down the Ra‘ad and Blue Nile to Khartoum. The Tinné expedition goes five hours’ journey beyond Gondokoro on the White Nile. 1864. Sir Samuel Baker reaches Albert Nyanza. Petherick closes a long series of wanderings in the White Nile and Bahr al-Ghazal districts. 1868-71. Schweinfurth explores the western affluents of White Nile. 1871-73. Baker in the White Nile region. 1874. Watson and Chippendall survey the river from Khartoum to Rejaf, and J. Kemp from Rejaf to Dufile. 1875. Stanley circumnavigates Victoria Nyanza. 1877. First voyage across Victoria Nyanza by Rev. C. T. Wilson and Lieutenant Shergold Smith. 1881-82. Schuver in the source- district of the Tumat. (H, A. W.)

NILGIRI, a petty state in Orissa, Bengal, India, bounded on the N. and W. by Morbhanj state and on the S. and E. by Balasor district, with an area 278 square miles, of which only one-third is under cultivation, Valuable quarries of black stone are worked, from which cups, bowls, platters, &c., are made. The population in 1881 was 50,972.

NILGIRI HILLS, or NerteuErry Hix, a district and range of mountains in the Madras presidency, India, lying between 11° 12’ and 11° 37’ N. lat. and

between 76° 18’ and 77° 5’ E. long., and bounded on the N. by Mysore, E. by Coimbatore, 8. by Coimbatore and Malabar, and W. by Malabar. The district until recently consisted exclusively of a mountain plateau lying at an average elevation of 6500 feet, with an area of about 725 square miles. In 1873 this was increased by the addition of the Ochterlony valley in the south-east Waindd, and again, in 1877, by other portions of the Wainad, making a total area of 957 square miles. The administrative headquarters is at Utakamand, which is also the summer capital of the Government of Madras. The summit of the Nilgiri Hills is an undulating plateau, frequently breaking into lofty ridges and steep rocky eminences. The descent to the plains is sudden and abrupt, the average fall from the crest to the general level below being about 6000 feet, save on the north, where the base of the mountains rests upon the elevated land of Waindd and Mysore, standing between 2000 and 3000 feet above sea-level. The Ochterlony valley and Wainad country consist of a series of broken valleys, once forest- clad throughout, but now studded with coffee-gardens,

NIM—NIM

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The highest mountain peaks are—Dodabetta, 8760 feet ; Kudiakad, 8502; Bevoibetta, 8488; Makurti, 8402; Davarsolabetta, 8380 ; Kunda, 8353; Kundamoge, 7816 ; Utakamand, 7361; Tambrabetta, 7292 ; Hokabetta, 7267. Thereare six well-known passes or ghdts by which the district communicates with the neighbouring provinces, viz., the Kuntir, Segtr, Gudalur, Sispéra, Kotdgiri, and Sundapatti, the first three of which are practicable to wheeled traffic. The chief rivers are the Moydr, Paikara, and Calicut, none of which are navigable within the district. The only lake of note is an artificial one, Utakamand (7220 feet above sea-level), which is nearly 2 miles long. The forests consist of fine timber trees, such as sdl (Shorea robusta), kino (Pterocarpus Marsupium), jack (Artocarpus integrifolia), blackwood (Dalbergia latifolia), and teak. Eucalyptus and Australian wattle have been extensively planted in the higher grounds of the Waindd. The hills were first explored by British officers in 1814, and in 1821 the first English house was built on the plateau.

The population of the district in 1881 was 91,034. The only town with more than 5000 inhabitants is Utakamand, with a popula- tion of 12,335. The most interesting of the hill tribes are the Todas, who regard themselves as autochthonous. They are a tall, well- proportioned, and athletic race, but indolent and dirty. Their sole occupation is cattle herding and dairy work. They practise poly- andry, a woman marrying all the brothers of a family. In religion they follow a species of Hinduism, and also worship their dairy buffaloes. The race seems to be gradually dying out, and in 1881 only numbered 675. The most numerous as well as the most wealthy and civilized of the hill tribes are the Badagas. They are occupied in agriculture, dress after the fashion of the natives of the plains, and are fond of ornaments. They profess Hinduism, and in 1881 numbered 24,130. The Kotas, another hill tribe (1065 in 1881), follow agriculture and various handicrafts. They perform menial offices for the Todas and Badagas, and, like the latter, pay a gudu to the Todas. They worship "ideal" gods, which are not represented by any image. The Kurumbas, or shepherds (3185 in 1881), are the most uncivilized of the hill tribes, and officiate as priests to the Badagas. Besides cultivating on a small scale, they collect various sorts of jungle produce, which they barter on the plains for grain and cloth. The Irulas (946 in 1881) live on the lowest slopes and forests, extending from the base of the Nilgiris to the plains. They are an idle and dissolute tribe, although in plysique adapted to hard manual labour.

The ordinary crops grown on the Nilgiri Hills include wheat, barley, and other cereals, oilseeds, and nearly every variety of English vegetables and fruits. The commercially important pro- ducts are coffee, tea, and cinchona. Coffee cultivation was introduced about 1844. One of its chief seats is the beautiful Ochterlony valley. The Madras Government commenced the experimental cultivation of cinchona on the Nilgiris in 1860, and in 1882 the receipts therefrom amounted to over £50,000. Several private cinchona gardens have been laid out, owing to the success of the Government experiment. There are 190 miles of road, bridged and available for wheeled traffic. The climate of the Nilgiri Hills is almost unrivalled for equability of temperature. The average is 58° F.

NIMAR, a district in the Central Provinces, India, lying between 21° 4' and 22° 26' N. lat. and between 75° 50' and 77° 1' E. long,, and bounded on the

N. and W. by Dhar and Indore states, S. by Khandesh and West Berar, and E. by Hoshangabad. 'The area is 3340 square miles, of which only 659 are under cultivation. The population in 188] was 231,341 (embracing 199,454 Hindus, 24,426 Mohammedans, 5282 aborigines,—the most numerous tribe of these being the Bhils). Khandwa town is the administrative headquarters. The district consists of two portions of the Nerbudda and Tapti valleys, separated by a range of hills, a section of the Sdtpura range, about 15 miles in breadth. On the highest peak, about 850 feet above the plain and 1800 above sea-level, stands the fortress of Asirgarh, commanding a pass which has for centuries been the chief highway between Upper India and the Deccan. The district con- tains extensive forests, but the only tract reserved by Government is the Pundsa forest, which extends for about 120 miles along the south bank of the Nerbudda, and

contains very fine young teak, besides sdj (Terminalia tomentosa) and anjan (Hardwickia binata) of great size. The only towns with a population exceeding 5000, in 1881, were Khandwa, the district capital (15,142), and Burhanpur (30,017). The principal line of road is that from Khandwa to Indore. The Great Indian Peninsular Railway traverses the district.

NIMEGUEN, Nimwecen, or Nymrcen (Dutch, W¢jme- gen), probably the oldest of all the cities of the Netherlands, is situated in the province of Guelderland, on the south bank of the Waal, 80 miles from the sea and 17 miles north-west of Cleves. Built partly on a row of five hills—Hessenberg or Hezelberg, Marienberg, Gruitberg, Klokken- berg, and Hunnenberg or Hoenderberg—so that stairs are necessary to lead to the higher portions, Nimeguen stands out with a boldness quite unusual in a Dutch town. Till past the middle of the present century it was strongly fortified, its old walls, erected in 1447, having been strengthened from time to time with extensive bastions and outworks. The beautiful park—the Valkhof—at the east end of the town is the site of Charlemagne's palace, which was still habitable in 1787, but, being greatly damaged during the French bombardment of 1794, was in 1796 sold for what it would bring. Two portions were fortunately preserved,—the vault of a chapel (" Pagan's Chapel"), with two white marble Corinthian pillars, and an octagonal baptistery ("Roman Chapel").

~~Near the Valkhof stands a lofty tower, the Belvidere, erected by the duke of Alva. The great church (St Stephen's), which forms one of the most striking features in the general view of the town, was originally built between 1254 and 1273, but in its present condition dates mainly from the 15th and 16th centuries. The immense nave is roofed with circular vaulting and supported by thirty-five slender pulars. In the choir is the monument of Catherine of Bourbon (1469), wife of Adolphus, duke of Guelderland. The town-house, built in 1554, is adorned with medallions representing the kings and emperors who had been bene- factors of Nimeguen, and contains the great hall in which the treaty of 1678 was concluded. On the ground-floor is a cumbrous and strong safe in which the town's charters from that of Henry IV. in 1230 were preserved with the most jealous care, the garrison being called out and the gates closed when it was necessary to consult any of them. Other buildings of note are the theatre (1838-39), the old burghers' almshouse, the Protestant hospital (1849), and the Roman Catholic or Canisius hospital (1866). Between 1656 and 1679 Nimeguen was the seat of a university ; it has now nothing higher thana gymnasium. 'Tools, gold and silver work, leather, furniture, tobacco, &ec., are the chief products of the local industry ; and a good deal of traffic is carried on both by means of the river and (since 1865) the railway. The population of the town in 1870 was 19,196 ; that of the commune increased from 22,929 (15,984 Roman Catholics, 5806 Dutch Reformed, 408 Jews) in 1875 to 24,984 in 1879.~~

~~The name Nimeguen appears for the first time as Noviomagum in the Tabula Pcutingeriana, but several antiquaries seek to identify the town with the Oppidum Batavorum of Tacitus, Charlemagne's palace continued to be the temporary residence of kings and em- perors for many generations. Prince Henry, son of Conrad II. (1026), and the emperor Henry IV. (1164) were both born within its walls. In 1247-48 William, king of the Romans, pawned the town to Reinald of Guelders, but in 1316 the people refused to remain under his authority. The Burgundians, who entered after a four weeks' sicge in 1478, were expelled in 1477. In 1494 the arch- duke Maximilian was successfully repulsed. The duke of Alva, with ten companies of Spanish soldiers, took possession in 1568 ; but in 1579 Nimeguen joined the Union. In 1584 the duke of Parma's attempt to recover the town proved a failure; next year, the people having expelled the states garrison, he was successful ; and, Martin Schenk having lost his life in a~~

rash coup de main in 1589, the Spaniards werc left in possession till 1591. Between 1672

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and 1674 the town was held by the French; they attacked it again in 1703 without success, got easy possession of it in 1794, and remained till 1814.

NIMES, or Nismss, a city of France, chief town of the department of Gard, a bishop's see and seat of a court of appeal, lies 450 miles south-south-east of Paris by the Clermont-Ferrand Railway, and 80 miles north-west of Marseilles. The importance of the place is due to its central position between the Rhone, the Cevennes, and the sea, to the richness of the surrounding district, which before the ravages of the Phylloxera was clothed with vines, to its commerce and industry, and lastly to its archeological treasures. No town in France can show so many remains of the Roman period. The amphitheatre is still in a good state of preservation. Occupied during the . Middle Ages by a special quarter, with even a church of its own, it was cleared in 1809, and since then has been well kept in repair. It is built of large stones without mortar. In form it is elliptical, measuring 437} by 332} feet externally ; the arena is 327 by 222 feet. The elevation (70 feet in all) consists of a ground story of 60 arches, an upper story of 60 arches, and an attic with consoles pierced with holes for supporting the velariwm or awning. There

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'Plan of Nimes.

are four main gates, one at each of the cardinal points ; and no fewer than one hundred and twenty-four doorways gave exit from the tiers of the amphitheatre to the inner galleries. Originally designed for gladiatorial shows, or stag or boar hunts, the area has in recent times been sometimes used for bull-fights. The celebrated Maison Carrée, a temple in the style of the Parthenon, but on a smaller scale, 82 feet long by 40 wide, is one of the finest monuments of the Roman period, and probably dates from the time of the Antonines. It contains a collection of antique sculptures and inscriptions. The temple of Diana,—possibly a building connected with the neighbouring baths,—is now overgrown with fig trees and climbing plants, but preserves a few fragments of statues and some rustic columns. The Tour Magne (Turris Magna), situated on the highest point in the city, 375 feet above sea-level, is still 92 feet in height, and was formerly a third higher. Admittedly the oldest monu- ment of Nimes, it has been variously regarded as an old signal tower, a treasure-house, or the tomb of a Greek family settled in Gaul along with the earliest Phoenician

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colonists. Attached to the ramparts erected by Augustus, and turned into a fortress in the Middle Ages by the counts of Toulouse, the Tour Magne was restored about 1840. From the top there is a magnificent view extending from Canigou at the east end of the Pyrenees to Mont Ventoux, an outpost of the Alps; northward it takes in the vine- and olive-clad Garrigues and the Cevennes, eastward the valley of the Rhone and the Vaucluse and Alpine ranges, and southward the Mediterranean and the Aigues Mortes ramparts. Near the Tour Magne has been discovered the reservoir from which the water conveyed by the Pont du Gard was distributed throughout the city. Two gates, that of Augustus dating from 16 B.c., and the Porte de France, both semicircular arches, are preserved as historical. monuments. Many of the finest buildings known to have existed have disappeared. When it still possessed its capitol, the temple of Augustus, the basilica of Plotina erected under Hadrian, the temple of Apollo, the hot baths, the theatre, the circus, constructed in the reign ot Nero, the Campus Martius, and the fortifications built by Augustus, Nimes must have been one of the richest of the Roman

cities of Gaul. The cathedral (St Castor), occupy- ing, it is believed, the site of the temple of Augustus, is partly Roman and partly Gothic in style. It contains the tombs of Fléchier and Cardinal de Bernis. The church of St Paul, a modern Romanesque building, is adorned with frescos by Flandrin; St Baudile (modern Gothic) is of note for the two stone spires which adorn its facade; and the court-house has a fine Corinthian colonnade and a pediment. Other buildings and in- stitutions of note are the hospitals, the barracks, the old citadel (dating from 1687, and now used as a central house of detention), the picture gallery in the old lycée, the public library (50,000 volumes), and the museum of natural history.

The esplanade in front of the court-house has in the centre a handsome fountain with five marble statues by Pradier. The Fountain Gardens, in the north-west of the town, owe their peculiar character as well as their name to a spring of water which after heavy rains is copious enough not only to fill the ornamental basins (constructed in the 18th century with balustrades and statues on ancient foundations) but also to form a considerable stream. Neither the spring, however, nor the Vistre into which it

| discharges, is sufficient for the wants of the city, and water

has consequently been brought from the Rhone, a distance of 17 miles. A beautiful avenue, the Cours Neuf, runs south for nearly a mile from the middle walk of the garden.

At the close of the Middle Ages the industries of Nimes were raised to a state of great prosperity by a colony from Lombardy and Tuscany ; and, though the plague, the wars of religion, and the revocation of the edict of Nantes were all sufficiently disastrous in their effects, before the Revolution about half of the whole community, or from 10,000 to 12,000 persons, had come to be engaged in manufactures. Since then, however, the numbers of this class have hardly increased, while the population of the city has been doubled. The silk manufacture (reeling, spinning, weaving) no longer occupies all hands. Uphol- stery materials (which have almost displaced shawls), carpets, handkerchiefs, tapes, braidings, hosiery, leather, clothes, and boots and shoes are also produced ; and, coal being worked in the neighbourhood, a number of found-

ries have been established. Nimes is, besides, one of the

great southern markets for wine and brandy, silks and cocoons ; and there isa good trade in grain, groceries, and colonial wares. 'The population of the city in 188] was 61,210; that of the commune was 62,394 in 1871, and 63,552 in 1881.

NIM—NIN

Nemausus, the ancient Nimes, derived its name from the saered wood in which the Volee Arecomici (who of their own accord sur- rendered to the Romans in 121 B.c.) were wont to hold their assemblies. Constituted a colony of veterans by Augustus, and endowed with numerous privileges, it built a temple and struck a medal in honour of its founder. The medal, which afterwards furnished the type for the coat of arms granted to the town by Francis I., bears on one side the heads of Cesar Augustus and Vipsanius Agrippa (the former crowned with laurel), while on the other there is a crocodile chained to a palm-tree, with the legend Cot. Nem. It was Agrippa who built the public baths at Nimes, the temple of Diana, and the aqueduct of the Pont du Gard. The city-walls, erected by Augustus, were nearly 4 miles in circuit, 30 feet high, and 10 feet broad, flanked by ninety towers, and pierced by ten gates. Hadrian on his way back from Britain erected at Nimes two memorials of his benefactress Plotina. In the very height of its prosperity the city was ravaged by the Vandals; the Visigoths followed, and turned the amphitheatre into a stronghold, which at a later date was set on fire along with the gates of the city when Charles Martel drove out the Saracens. Nimes became a republic under the protection of Pippin the Short ; and in 1185 it passed to the counts of Toulouse, who restored its prosperity and enclosed it with ramparts whose enceinte, less extensive than that of Augustus, may still be traced in the boulevards of the present day. The city took part in the crusade against the Albigenses in 1207. Under Louis VIII. it received a royal garrison into its amphitheatre ; under Louis XI. it was captured by the duke of Burgundy, and in 1420 was recovered by the dauphin (Charles VII.). On a visit to Nimes Francis I. enriched it with a university and a school of arts. By 1558 about three-fourths of the inhabitants had become Protestant, and the city suffered greatly during the religious wars. From the accession of Henry IV. till the revocation of the

edict of Nantes (1685) the Protestant community devoted itself to active industry ; but after that disastrous event great nunibers went into exile or joined the Camisards. Louis XIV. built a fortress (1687) to keep in check the disturbances caused by the rival religious parties. Nimes passed unhurt through the storms of the Revolution; but in 1815 Trestaillon and his bandit followers pillaged and burned and plundered and massacred the Bonapartists and Protestants. Since then the city has remainced divided into two strongly-marked factions—Catholics and Protestants ; happily, however, there has been no repetition of such scenes. Domitius Afer (Quintilian's master), Jacques Saurin the Protestant divine, Nicot the introducer of tobacco into France, Séguier the archelogist, Guizot, and Reboul (the Provencal poet whose statue adorns the Promenade de la Fontaine) are among the celebrated natives of Nimes.

NIMROD (NeBpwd, LXX.), apart from the mere mention of his name in Micah v. 5 (A.V., v. 6), occurs only once in Scripture, namely, in Gen. x. 8-12 (1 Chron. i. 10), where, in a Jehovistic portion of the genealogy of the nations there given, we are told that "Cush begat Nimrod, who was the first mighty one in the earth (he was a mighty hunter before Jehovah, wherefore it is said—A mighty hunter before Jehovah even as Nimrod), and the beginning of his kingdom was Babel, and Erech and Accad, and Calneh in the land of Shinar. Out of that land he went forth into Asshur! and builded Nineveh," &c. Just as Enos was the first to call upon the name of Jehovah, and Noah the first to plant vines, so is Nimrod the first mighty ruler in the earth, and as such at the same time a mighty hunter before Jehovah, after the manner of the Oriental sovereigns of old. By the Hebrews the Assyrio-Baby- lonian empire was at all periods regarded as the prototype of the worldly power; and it is of this kingdom that Nimrod here figures as the founder—not in its prehistorical but in its historical form as actually subsisting at the time of the writer. This is apparent, not only from the general character of the genealogical table, but also from the enumeration of the cities in the land of Shinar and Asshur. As founder of the kingdom, Nimrod represents both kingdom and people ; the genealogy knows no distinction between the hero and the nation,—the latter is the family of the former. When, therefore, Nimrod is said to be descended from Cush, the mighty nation of Asshur and Babel (which in Gen. x. 22 is regarded as belonging to

1 Not ‘out of that land went forth Asshur”; for the ‘‘ beginning” of his kingdom demands a continuation, and Asshur is called Nimrod’s land in Micah v. 5.

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Shem) is also by the Jehovist assigned to Cush. Shem for him seems to have a very narrow meaning, expressing merely the contrast between the Hebrew lords and their Canaanite subjects; Cush, on the other hand (like “Ivdcu with the Greeks), is a very comprehensive and vague word, which does not readily admit of clear geographical or ethnological definition, and therefore also cannot be brought into contrast with Shem if Shem be used in its modern application as indicating race. A god spoken of as ‘Marri with his hounds” was still worshipped in Harran after the introduction of Christianity (Assem., Bibl, Or., i. 327); that this Marri is akin to Nimrod is suggested on the one hand by his hounds and on the other by the etymology of the two names derived from the synonymous roots mry and mrd. Nimrod looks like a Syriac imperfect of the root mrd, in which case it would seem to follow that the legend arose among the Syrians, the next neighbours of the Babylonians and Assyrians, and from them had passed over to the Hebrews. Then, further, Nimrod may be a modification of the name Merodach, the Babylonian chief god, the final syllable -ach being dropped.? To the later Jews Babylon was the complete embodiment of the enmity of the heathen world against the kingdom of God, and the idea they formed of Nimrod was influenced by this view. The arrogance of his character, which seemed to be implied in his very name, was conceived of as defiance of God, and he became a heaven-storming Titan. As such he built the tower of Babel, and as such was he identified with the giant in bonds in the constellation of Orion. Jewish legend made choice of Abraham to be his antithesis, the representative of God’s kingdom over against the heathen autocrat. Nimrod cast the bold confessor of the true God into the fire of the Chaldeans (Ur Kasdim), whence, according to Gen. xv, 7, Isa. xxix. 22, Jehovah delivered him.? The Jewish material was afterwards treated by Mohammed and the Arabian theologians, who mixed it up with other elements. Compare Philo, De Gigantibus, sec. 15 (Mang., p. 272); Jos., Ant., 1. 4, 2; 6, 2; Chron. Pasch., p. 36 (Cedren., p. 14); Jerome and Jonathan on Gen. xi. 28 ; Tabari, i. pp. 319-325. (J. WE.) NINEVEH

(Hebrew 3°), in classical authors Nivos, Ninus; LXX., Nwev; Jerome, Niniue), the famous capital of the Assyrian empire, called Ninua or Nina on the monuments. Though the city appears to have been entirely destroyed in the fall of the empire 4 the name of Nineveh (Syriac, Vinwe ; Arabic, Ninawd, Niinawd) con- tinued, even in the Middle Ages, to be applied to a site opposite Mosul on the east bank of the Tigris, where gigantic tells or artificial mounds, and the traces of an ancient city wall, bore evident witness of fallen greatness.® The walls enclose an irregular trapezium, stretching in length about 2} miles along the Tigris, which protected the city on the west. The greatest breadth is over a mile. The most elaborate defences, consisting of outworks and moats that can still be traced, were on the southern half of the east side, for the deep sluggish Khausar, which

2 Compare the converse gaAwyx, LXX., in 1 Chron. v. 26 for bp,

3 Beer, Leben Abrahams (1859), p. 1 sg. Compare Dan. iii., whence the confusion of Nimrod with Nebuchadnezzar by the Arabs.

4 It is generally agreed, and the description hardly leaves a doubt, that the ruins of Mespila‘and Larissa described by Xenophon, Anaod., iii, 4, 7 sq., are Kuyunjik and Nimrid respectively. In this case we can be certain that there was no inhabited city on the spot at the time of the march of the Greeks with Cyrus. Comp. Strabo xvi. p. 245.

5 The references collected by Tuch, De Nino Urbe, Leipsic, 1845, are copious, but might easily be added to. Ibn Jubair, p. 287 sq., who as usual is pillaged by Ibn Batuta, ii. 187, gives a good descrip- tion of the ruins and of the great shrine of Jonah as they were in the 12th century. The name Ninawa was not appropriated to the ruins, but was applied to the Rustak (fields and hamlets) that stood on the site (BelAdhori, p. 331; Ibn Haukal, p. 145; Yakut, ii. 694).

8 A change in the bed of the stream has left a space between the wall and the present channel of the Tigris.

protects the northern half of this face, then bends round towards the -Tigris and flows through the middle of the town, so as to leave the south-east of the city more open to attack than any other part. The principal ruin mounds within the walls are that of Kuyunjik, north of the Khausar, and that ° ; G

of the prophet Jonah (Nebi Yu- nus) south of that stream. Thelatter is the traditional } site of Jonah's preaching, and is FQ crowned by an ancient and fam- ous Mohammedan shrine. The sys- tematic explora- tion of these ruins is mainly due to Layard (1845- 46), whose work has been con- tinued by subse- quent diggers. These researches leave no doubt Fie. 1.—Country round Nineveh.

as to the correctness of the local tradition. Not only have magnificent remains of Assyrian architecture and sculpture been laid bare, but the accompanying cuneiform inscriptions throw much light on the history of the city

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~~Fic. 2.—Ruins of Nineveh.~~

~~and its buildmgs. The mound of Kuyiunjik covers palaces of Sennacherib and Assurbanipal,! that of Jonah a second palace of Sennacherib and one of Esarhaddon. Of other remains, the most striking is the gateway near the centre of the north wall, consisting of two halls, 70 feet by 23, the entrance to which towards the town was flanked by colossal man-headed bulls and winged human figures. For the structure and art of the palaces see vol. ii. p. 397 and vol. iii. p. 189. EE ES Ee ene ee Wn ne 1 In this palace is the famous library chamber from which Layard~~

~~and George Smith brought the tablets now in the British Museum, containing the account of the deluge.~~

~~NINEVEH~~

~~Nineveh proper was only one of a group of cities and royal residences whose ruins still mark the plain between the Tigris, the Great Zdb, and the Khazir. The chief of these are at Khorsdbad or Khurustabad, five hours by caravan north-east of Mosul, on a tributary of the Khausar, and at Nimrtd, on the left bank of the Tigris, eight caravan hours (18 miles) south-east from Kuyunjik. The former site was mainly explored by the Frenchmen~~

Botta and Place. The city was almost square, each face of the wall a little more thana mile in length. The vast T-shaped palace of Sargon (722-705 B.c.), whose name the town bore (Dur-Sarrukin), stood near the northern angle. Its main frontage was nearly a quarter of a mile long ; it had thirty-one courts and more than two hundred apartments.?

The ruins of Nimrud, identical with the ruin Athtr of Arabic geographers (Yakut, s.ow. "Athur," "Salamiya"), and first excavated by Layard, represent the ancient city of Kalhu, the Biblical Calah. The enclosure, protected on the west by the old bed of the Tigris, is, according to Layard's measurements, a quadrangle of 2331 yards by 2095 at the widest part, and was surrounded by walls with towers and moats. 'The chief architectural remains belong to a group of palaces and temples which occupied the south-west quarter of the city. The principal palace (north-west palace) was built by Assur-nasir-pal (885-860 B.c.), and beside it he raised a temple with a great tower (falsely called the tomb of Sardanapalus) built in narrowing stages. The so-called central palace is that of his son Shalmaneser IL.; the unfinished south-west palace was the work of Esar-haddon. Of the so-called south-east palace the chief part is really a temple of Nebo; a statue of the god from this temple is in the British Museum.

The main points in the history of these three great cities which are held to be established by monumental evidence are these. The ancient capital of Assyria was Assur (Kal'a Sherkat) on the Tigris, 50 miles south of Mosul. Assur-nasir-pal transferred the residence to Calah, a city which he tells us upon an inscription had been originally founded by Shalmaneser I. (c. 1300 B.c.), but had subse- quently fallen into decay. Calah seems to have been the chief seat of the kings till Sargon the captor of Samaria founded his residence at Khorsabad ; the glory of Ninevch proper begins with Sennacherib, but the city existed earlier, for his inscribed bricks represent him. only as rebuilder of the walls. It is even averred that kings of the 19th and 15th centuries B.c. built temples at Nineveh, but the remoter dates of Assyrian history must be received with caution.? From the time of Sennacherib down to the fall of the capital and empire—an event the date of which is still uncertain, the ancient accounts varying between 626 and 608 B.c.—Nineveh proper, that is, the city on the Tigris and Khausar, appears to have been the chief seat of empire. But when the book of Jonah speaks of

~~Nineveh as a city of three days' journey, or when Ctesias in Diodorus ii. 3 describes its circuit as 480 stadia, it is plain that these conceptions imply an extension of the name to the whole group of cities between the Tigris and the Zab. In this connexion the words of Gen. x. 11 sg, are remarkable; for, on the most natural view, the clause " this is the great city " applies not to Resen alone but to the four cities of Nineveh, Rehoboth Ir, Calah, and Resen. Rehoboth Ir and Resen are still untraced ; the Syriac tradition which connects the latter with Résh 'Aina, that is, with Khorsabad, does not agree with the text, which says expressly that Resen was between Nineveh and Calah, and indeed the verses in Genesis appear to be older than the foundation of the city of Sargon. The description would suit the mound of Salaniiya a little above Nimrid, but in fact the whole district is studded with ruins.~~

~~See the works of Layard, Botta and Flandin, V. Place, Oppert (Expédition en Mesopotamie}, and G. Smith (Assyrian Discoveries). For the ruins and their exploration, Tuch's Commentatio, above cited, gives all that was known before the explorations; Schrader, Keilinsch. u. A. T. gives the bearing of recent dis- coveries on the Biblical records. See also, in general, the article BABYLONIA, vel, iii. p. 183 sg. CW. R. 8.)~~

~~® There is some evidence that Syriac tradition connected these ruins With the name of Sargon ; though our authority Yakut, in giving the alleged old name of Khurustabad, has corrupted Sarghin into Sar'in, by writing ¢ for =}, Another Syriac tradition connects Khurusta-~~

~~bad with Resen, finding the name Resen in the neighbouring Ras al-'Ain (Résh "Aina). See Hoffmann, Syrische Acten, p. 183.~~

~~8 The legend of Ninus and Semiramis in classical authors appears to be of late origin and quite unhistorical. Ninus is merely the eponym hero of Nineveh.~~

~~NIN—NIO~~

~~NING-PO, or Nrvc-Po-Foo (i.e., City of the Hospitable Waves), a great city of China, one of the five seaports thrown open to foreign trade in 1842 by the treaty of Nanking, and the principal emporium of the province of~~

~~Chekeang, stands in a fine plain bounded by mountains towards the west, on the left bank of the Takia or Ning-po river, about 16 miles from its mouth, in 29° 51' N. lat. and 121° 39' E. long. It is surrounded by a fine old wall, 25 feet high and 16 feet broad, pierced by six gates and two passages for ships in its circuit of 4 to 5 miles. Just within the walls there is a considerable belt of open ground, and in many places the ramparts are thickly covered with jasmine and honeysuckle. In ascending the river a stranger's eye is first caught by the numerous huge ice- houses with high thatched roofs and by a tall white tower — the Tien-fung-tah or Ning-po pagoda or obelisk — which rises to a height of 160 feet, and has fourteen stories and seven tiers of windows, but has unfortunately been stripped of its galleries and otherwise damaged. Another striking structure in the heart of the city is the Drum Tower, dating from before the 15th century. As is natural in a place long celebrated for its religious and educational pre-eminence, there is no lack of temples, monasteries, and colleges, but few of these are of any architectural signifi- cance. Brick is the ordinary building material, and the dwelling-houses are mostly of one story. Silks, cottons, carpets, furniture, white-wood carvings, and straw hats are the chief products of the local industry. Large salt-works are carried on in the vicinity, and thousands of fishermen are engaged, mainly between April and July, in catching the cuttlefish. In spite of the powerful competition of Shanghai, Ning-po has a valuable foreign trade. It is regu- larly visited by the vessels of the China Navigation Company and the Chinese Merchants Steam Navigation Company. From 216,191 register tons in 1873 the tonnage of the port had increased to 303,109 in 1880, — British shipping having advanced from 18,592 tons to 86,175, and Chinese shipping from 17,972 to 209,487, though on the other hand the American total had sunk from 170,351 to 2100. The principal import is opium, £982,507 being the average value of the annual quantity between 1876 and 1880. Lead for packing tea was formerly a leading item, but it now enters mainly by other ports. Straw or grass hats, straw mats, samshu (from the Shaou-hing district), Chinese drugs, vegetable tallow, and fish are among the chief exports ; in 1877 (the maximum year) the hats num- bered 13,724,822, though in 1863 they had only amounted to 40,000, and the mats, mainly despatched to South China, average from 500,000 to 1,000,000. After the storming of Chinhai — the fortified town at the mouth of the river — on October 10, 1841, the British forces quietly took possession of Ning-po on~~

the 12th. In 1864 the Taipings held the town for six months. Missions are main- tained in Ning-po by the Romish Church, by the Church Missionary Society (1848), the American Presbyterians, the Reformed Wesleyans, the China Inland Mission (1857), &c. A mission hospital was instituted in 1843. The population of the city and suburbs is estimated at from 400,000 to

500,000.

NINIAN (Nuryianus or Nyyias), St, was, according to the earliest account of him we possess,—that of Bede (H. E., iii. 4),—a bishop of the nation of the Britons who had been trained at Rome in the doctrine and discipline of the Western Church, and who built at Leukopibia (a town of Ptolemy's Novante, on the west side of Wigtown Bay, the modern Whithorn) a stone church, called Candida Casa, dedicated to St Martin of Tours. He is said to have converted the Picts to the south of the Grampians. An old Irish account mentions that he spent his last years in Ireland, where he founded a church in Leinster called

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Cluain Conaire ; he was 'afterwards commemorated there under the name of Monenn ("Nenn" being simply "Ninian" with the Irish mo, or "my," prefixed). There is some evidence that the founding of Candida Casa took place in the year of the death of Martin of Tours (397). The date of Ninian's own death is unknown; he is com- memorated in the Roman martyrology on September 16. See Skene, Celtic Scotland, vol. ii. A Life of St Numan, compiled in the 12th century by St Ailred of Rievaux, and edited by the late Bishop Forbes, is given in the fifth volume of The Historians of Scotland, Edinburgh, 1874.

NIOBE is a figure who appears in the legends of many parts of Greece, especially Thebes, Argos, and the Hermus valley. Proud of her numerous family, she scoffed at Leto as the mother of only two children. Apollo and Artemis, the children of Leto, slew all her children with their arrows; and Niobe, after vainly trying to defend them, wept over them till she became a rock which still weeps incessantly. It is probable that this tale was in its simplest form a myth of the annual destruction of the bloom of earth by the

~~shafts of the cruel sun-god, and that Niobe was a form of the mother-goddess, the goddess of all earthly life, whose progeny is thus slain every summer. The tragedians read in this tale a moralized myth of the instability of human bliss: Niobe became a representative of human nature, ever liable to become proud in prosperity and to forget the submission and respect due to the gods. In this form the legend has found permanent acceptance in literature and art. The metamorphosis of Niobe was adopted from the local legends of the Smyrna district ; here it is probable that Niobe was originally a title of the Meter Sipylene, the deity worshipped all round the sacred mountain of Sipylus. An archaic figure of the goddess, carved in the northern side of the mountain near Magnesia, gave rise to the tales current in this district, that Niobe had thrown herself down from the rock, or that she had been turned into stone. It seems necessary to distinguish from this archaic figure, which is still visible, the ‘‘ Niobe ” described by Pausanias and Quintus Smyrnzus, both natives of the district. This was an appearance assumed by a cliff in Sipylus when seen from a distance and from the proper point of view. In these later writers the genuine old local legend had been replaced by a new form, founded on the myth as developed by the tragedians; the archaic figure carved in the cliff was known by the natives to be an image of the mother-goddess, whom they worshipped there year by year. But, as with every other point in the legend in its most developed form, the natives had a local representative of the Niobe, the weeping rock, which they saw in the heart of Sipylus.~~

~~On the myth of Niobe and its artistic representation, especially on the famous group thought to be the work of Praxiteles or Scopas, copies of most of the figures in which are preserved at Florence, see Stark, Niobe wnd die Niobiden. On the ‘‘Niobe” in Mount Sipylus, see Hirschfield in Curtius, Bettrdge zur Gesch. u. Topogr. Klcinasiens; Stark, Nach dem griechischen Orient; Ramsay, ‘‘Sipy- los and Cybele,” in Journal of Hellenic Studies, 1882.~~

~~NIOBIUM, a very rare chemical element which was discovered by H. Rose in 1846 as a component of the columbite of Bodenmais. In it, as also in tantalite, pyrochlore, yttro-tantalite, and a few other rare minerals, it is constantly associated with tantalum, which was dis- covered byEkkeberg in 1802. Both metals, with vanadium, form a kind of appendage to the~~

nitrogen group of elements. Like these they are capable of forming acid pentoxides and corresponding chlorides and oxychlorides. The oxy-chlorides and oxyfluorides, NbOCI, and NbOF,, were origin- ally thought by Rose to be peculiar (unmixed) chlorides and fluorides of niobium, until Blomstrand ascertained their true nature. The atomic weights of the two elements are Ta = 182 and Nb=94.

XVII. —65

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NIORT, a city of France, chief town of the department of Deux Sévres, distant 255 miles south-west of Paris by the railway to Poitiers and La Rochelle (here crossed by the line from Angers to Angouléme), is situated at the head of navigation of the Sévre Niortaise, partly in the valley and partly on the slopes of the enclosing hills. The tower of the church of Notre Dame (16th century) has a spire 246 feet high, with bell-turrets adorned with statues of the evangelists, and at the base a richly-decorated dais in the Renaissance style; and the north doorway shows a balustrade, whose balusters form the inscription, O Mater Dei, memento mei. There is a fine window in the apse of St André, and St Hilaire contains some beautiful frescos. Of the old castle, whose site is partly occupied by the pre- fecture, there still remains the donjon—two large square towers, flanked by several of smaller dimensions. Built, it is said, by Henry IL. of England or Richard Coeur de Lion, the south tower contains four vaulted chambers one above the other, and the platform on the top affords a fine view of the public garden (one of the most picturesque in France) and the valley of the Sévre. The old town-house (now used as "justice de paix") is known as the Aliénor or Eléonore palace, after Eléonore of Guienne 3 near it is a Renaissance belfry. The convent of the Oratorians is occupied by a public library (30,000 volumes), a picture gallery, and museums of geology and antiquities—the last containing plaster copies of all objects of interest in the ancient monuments of the surrounding country. Niort further possesses extensive barracks, several hospitals, and a lycée named after Fontanes, grandmaster of the imperial university, who was born in the town. The house is still shown in which Madame de Maintenon was born while her father was imprisoned in the donjon. Tanning, currying, shammy-dressing,

~~glove-making, and hair-working are the staple industries of Noirt, —gloves alone giving employment to about one thousand workmen, and brush-making, hair-working, and allied industries to nearly as many.~~

~~Up to the 7th century the Niort plain formed part of the Gulf of Poitou; and the mouth of the Sévre lay at the foot of the hills now occupied by the town which grew up round the castle erected by Henry Plantagenet in 1155. The place was captured by Louis VIII. in 1224. By the peace of Brétigny it was ceded to the English ; but its inhabitants revolted against the Black Prince, and most of them were massacred when his troops recovered the town by assault. In 1369 Duguesclin obtained possession by a stratagem. Protes-tantism made numerous proselytes at Niort, and Coligni made him- self master of the town, which successfully resisted the Catholic forces after the battle of Jarnac, but surrendered without striking a blow after that of Moncontour. Henry IV. rescued it from the League. It suffered severely by the revocation of the edict of Nantes.~~

~~NIPPON. See Japan, vol. xiii. p. 569.~~

~~NISH, Niscu, or Nissa, the ancient Naissus, a city of the Balkan peninsula, which at one time was the capital of Servia, and after being the chief town of a Turkish eyalet in the vilayet of the Danube, and (1877) of the new vilayet of Kossovo, was again in 1878 restored to Servia, where it is now the administrative centre of a circle con- taining a population of 117,000. The town isa thriving place of 12,800 inhabitants, the see of a Greek bishop, the headquarters of a militia corps, and an important centre in the Servian railway system. It is situated at the east end of a plain, and is traversed by the Nishava, a tributary of the Morava and sub-tributary of the Danube. Fortifi- cations on the heights, buildings well massed together, numerous minarets, and abundant foliage in the suburbs render the outward appearance of the town both pleasant~~

~~and imposing ; but the interior, with its narrow and ill-kept streets, is utterly disappointing. About a quarter of an hour to the north of the citadel is the Voinik (war) hill, where the Turkish army encamped in 1689.~~

Naissus, best known as the birthplace of Constantine the Great, was destroyed by Attila, but restored by Justinian. The chief facts in the history of the modern town are its capture by the Turks in 1375 and by John Hunyady in 1443; the victory of Louis of Baden over the Turks in 1689; the recovery by the Turks in 1690; the capture by the Austrians and the subsequent surrender by General Dochat in 1737; and finally the siege by the Servians in 1809. On this last occasion Stephen Singelitch blew up his redoubt, to the destruction at once of his Turkish assailants and himself.

NISHAPUR, or NusHiptr (Arabic, Naisdbir), the most important city of Khordsin in the Middle Ages, but now much decayed. The second element of the name is

that of the traditional founder Shahpuhr or Sapor. Some accounts name the first, others the second Sapor.! The older name of the town or district was Abrashahr. The

importance of the place under the Sasanians was in part religious; one of the three holiest fire-temples was in its neighbourhood.? Nishdpur under the Moslems contained a large Arab element; it became the capital of Khorasan, and greatly increased in prosperity, under the almost independent princes of the house of Tahir (820-873 a.p.). Istakhri describes it as a well-fortified town, a league square, with a great export of cotton goods and raw silk. In the decline of the empire the city had much to suffer from the Turkomans, whose raids have in modern times destroyed the prosperity of this whole region. In 1153 it was utterly ruined by the Ghuzz Turkomans, but soon rose again, because, as Yakut remarks, its position gave it command of the entire caravan trade with the East. It was again taken and razed to the ground by the Mongols in 1221, but a century later Ibn Batuta found the city again flourishing, with four colleges, numerous students, and an export of silk-stuffs to India. Nishapur was famous for its fruits and gardens, which gave it the epithet of "little Damascus."

The surname of Naisaburi connects with the city a number of learned men, including 'Omar Kuayyam (q.v.), the Hafiz Abu 'Ali (0b. 960), the Koran commentator Ahmed al-Tha'labi (0b. 1035), his disciple Wahidi, author of the famous Asbdd nozil al-Ko'rdn (ob. 1076), and the disciple of the latter,

Maidani, the author of the a, collection of Arabic proverbs. See further Kazwini, ii. 317 sq.

NISIBIS, a once famous city and fortress, situated in 37° N, lat. and 41° 20' 10" E. long,, in the north of Mesopotamia, near the point where the Jaghjagha leaves the mountains by a narrow defile. The modern Nasibin consists of some two hundred wretched huts, mainly inhabited by Jews, who pay tribute to the Shammar Bedouins. The neighbourhood, we are informed by Arab writers, was at one time richly wooded. The locality is at present somewhat marshy and unhealthy. The number of dangerous scorpicns is specially noticeable. According to Yakut the legend is that Persian scorpions were thrown into the place when it was besieged by Anushirwan. The church of St James, belonging to a small community of Jacobite Christians, and a 'few pillars and blocks of masonry are the only remains of the former greatness of the town.

The site of Nisibis, on the great military and commercial route betwecn the Tigris and the Mediterranean, and commanding alike the mountain country to the north and the then fertile plain to the south, gave it an in:portance which began during the Assyrian period and continued under the Seleucide (see MESOPOTAMIA, Vol. xvi. p. 48). From 149 B.c. to 14 A.p. Nisibis was the residence of the kings of

Armenia, and it was there that Tigranes had his treasure-houses, The place afterwards figured frequently as a strong froutier fortress a ee—E—E

' Spiegel, Hranische Alterthumskunde, iii. 254; Noldcke, Gesch. der Perser . . . aus Tabari, p. 59. The first syllable of the name appears to be Wév, '* good" (Noldeke, J.¢.).

® Hoffmann, Syr. Akten pers. Martyrer, p. 290 sq.

NIS—NIT

in the wars of the Romans and the Parthians, its brick walls being unusually thick and its citadel very strong. Ceded to the Parthians by Hadrian, it became a Roman colony (Septimia Colonia Nisibis) under Septimius

Severus. It was heroically defended against Sapor II., who unsuccessfully besieged it thrice. In the peace made by Jovian, however, it passed into the hands of the Persians, who established a strong colony there. Nisibis early became the seat of a Jacobite bishop and of a Nestorian metropolitan, and under the Arabs (when it continued to flourish and becanie the centre of the district of Diyar Rebi‘a) the population of the town and neighbour- hood was still mostly Christian, and included numerous monasteries. According to Ibn Haukal the taxes and dues derived from the town and district of Nisibin in 358 A.H. (969 A.p.) amounted to five million dirhems and 32,000 dinars. Arab geographers and travellers of the Middle Ages speak in high terms of the gardens of Nisibis, and the magnificent returns obtained by the agriculturist. According to Mukaddasi (ob. 1024), acorns, preserved fruits, and manufactured articles such as carriages, inkstands, &., were exported. A change for the worse soon afterwards set in. The town was so heavily burdened with taxes by the Hamdanid princes living at Mosul that the Arab tribe of the Banu Habib, although blood relations of the Tlamdanids, migrated in a body into Byzantine territory, where they were well received, accepted Christianity, attracted other emigrants from Nisibis, and at last began to avenge themselves by yearly raids upon their old home. Ibn Haukal goes on to say that jinally the Hamdanid Nasir ad-Daule took possession of the town, confiscated the estates of those who had emigrated, and compelled those who remained to substitute corn for their profitable fruit crops. This made a final end of the prosperity of Nisibis; the surrounding district, no longer protected against the incursions of nomad tribes, ceased to be cultivated and became the wilderness which it continues to be to this day.

NISI PRIUS. For the history and meaning of this term in English law see Assizz. Asa rule actions only are tried at nisi prius, and a judge is said to sit at nisz prius when he sits alone, usually in the Queen’s Bench Division, for the trial of actions. The trial at nso prius was formerly by jury, unless with consent of the parties, but since the rules of the Supreme Court of 1883 the ordinary trial at nisi prius is without a jury in all but some specially excepted cases, chiefly of torts where the damages are unliquidated. Besides actions, indictments or informations may be tried at nzsi prius, but only before a jury, the change in the law above-mentioned not extend- ing to such cases. The indictment or information is generally renioved from the

ordinary forum by certiorart, and the trial takes place in the Queen's Bench Division or at assizes before a special or a common jury (see JURY). The removal may be at the instance of the crown, the prosecutor, or the accused. Misdemeanours are removed more often than felonies. The most usual grounds of removal are that difficult questions of law are likely to arise, that local prejudice has been excited, or that the case is quasi-civil, as non-repair of a bridge or obstruction of a highway. It is noticeable that criminal cases tried at nisi prius take their place in the nist prius list and not with other criminal cases. Where the proceedings are by indictment at assizes, sentence may be passed either at the assizes or in the Queen's Bench Division ; where by infor- mation, only the latter course is available.

Nist Prius Record was before the Judicature Acts the name of the formal copy of proceedings showing the history of the case up to the time of trial. After the trial it was endorsed with the postea, show- ing the result of the trial, and delivered by the officer of the court to the successful party, whose possession of the postea was his title tojudgment. Since the Judicature Acts there is no nist prius record in civil actions, the nearest approach to it being the deposit of copies of the pleadings for the use of the judge, and there is no postea, the certificate of the associate or master as to the result of the trial superseding it. In crown practice, the class of practice under which criminal proceedings at nist prius fall, the nisi prius record still exists, crown practice being specially excepted from the operation of the Judicature Acts.

NISSA. See NisuH.

NITRATES, NITRE, NITRIC ACID. See Nrrrocey.

NITROGEN is a chemical element which, on account of its abundance in nature and its relations to life, is of great importance. About three-fourths of the mass of the

old

atmosphere consists of elementary nitrogen; and, as an essential component of all albumenoids, the element per- vades the whole of the animal and vegetable kingdom. Nitrogen minerals are scarce (almost the only ones are

Chili saltpetre and native nitre), but traces of the two nitrogen compounds, ammonia and nitric acid, are diffused through- out all soils, besides existing in the atmosphere.

Elementary nitrogen exists only in the one form of nitrogen gas (N,=1 molecule), which is easily extracted from the atmosphere. Though resembling air in its general properties, it is easily distinguished from it by its not supporting combustion. According to Regnault, its specific gravity is 09703 times that of pure, dry air; and one litre, measured at ¢ C. and P millimetres pressure (strictly speaking the pressure exerted by a column of mercury of 0° C. and the height P, at latitude 45° and sea- level) is W grammes, where

e W=0°45043 5 — For sea-level and lat. 55° 54' (Edinburgh or Glasgow) the constant is 0°45090; for lat. 51° 32' (London), 0°45072.

According to Dittmar (Reports on the Challenger Lape- dition) 1000 volumes of pure water, when shaken with excess of gas at ¢° C. and "one atmosphere's pressure," absorb 8 volumes of the gas measured at 0° and the same pressure,— having for the temperatures given the fol- lowing values : —

ee B=24°40

die 208

17°65 14°95

Nitrogen is a permanent gas in this sense that no amount of pressure will liquefy it at any temperature lying above the "critical point" of*-123°°8 C. At or a little below this temperature 42 atmospheres reduce it to a liquid (Sarrau).

Chemically, nitrogen gas is characterized by perfect inertness towards all ordinary reagents under ordinary conditions. But at certain higher temperatures boron, magnesium, vanadium, and titanium combine with it directly into nitrides. Nitrogen is capable even of uniting with ordinary oxygen. A mixture of the two gases, it is true, remains unchanged whien

exposed en masse to any tem- perature, but when it is subjected to a succession of electric sparks a small proportion of the two gases, no doubt through local dissociation into isolated atoms N and O, does unite into nitric oxide, NO, which then combines with more oxygen into red fumes of peroxide, N,O,.

The part which the nitrogen gas in the atmosphere plays in the economy of nature is as yeta mystery. It certainly is not susceptible of being taken up directly by the plants and utilized in their synthesis of nitrogenous compounds. It plays no active part in the processes of combustion and of animal respiration ; in either it appears to act only as an inert diluent of the oxygen.

In the case of respiration, however, this particular diluent seems to be essential; no animal could live healthily for any considerable period of time in pure oxygen, and we know of no other diluent which could be substituted for the nitrogen without producing poisonous effects. Besides, there can be no doubt that atmospheric nitrogen, in an indirect way, contributes towards the building up of nitrogenous organic matter. Every process of ordinary combustion probably, and every electric dis- charge in the atmosphere certainly, induces the formation of some nitric acid, which by combining with the atmo- spheric ammonia becomes nitrate of ammonia, and from certain experiments of Schénbein's it would appear that nitrogen gas and water are capable of uniting directly into nitrite of ammonia (N, + 2H,O =NO,.NH,), which, sup-

30° 13°90

016

posing it to be produced in the atmosphere, would promptly be oxidized into nitrate. The nitrate produced by either process is carried down by the rain and conveyed to the roots of the plants, which assimilate it as part of their nitrogenous organic matter. However small the scale may appear on which these processes of atmospheric nitrifica- tion go on when measured by the mass of nitrogen which remains unchanged, as this mass is immense, their absolute effect must be very considerable, and may form an important item in the economy of nature.

~~The compounds of nitrogen may be arranged under the heads of ammonia, nitrates, nitro-compounds, organic nitrogen compounds, and cyanides. As all the several classes and their most important members are treated of under CHemistry (vol. v. p. 509-514), we confine our- selves here, in the main, to supplementing that article by such details as are of practical or general scientific interest.~~

~~Ammonia.~~

~~This, the only known compound of hydrogen with nitro- gen, is a gas of the molecular formula NH,. The most convenient process for the preparation of the pure gas is to mix powdered sal-ammoniac with powdered quicklime in a flask and to heat the mixture in a sand-bath. Torrents of ammonia come off, which must be dried by passing it through a closely packed column of solid caustic potash or soda (chloride of calcium absorbs the gas chemically) and collected over mercury, as the gas dissolves most abundantly in water. In addition to what has been said under CuEmistry of the properties of ammonia, it may here be mentioned that, though uninflammable in air, it burns brilliantly in oxygen, and that it is liable to the following peculiar kind of oxidation. Pour some strong liquor ammoniz into a large flask, so as to produce a moist mixture of the gas and of air, and suspend in this atmo- sphere a recently ignited spiral of thin platinum wire. The wire continues glowing and the flask soon fills with dense white fumes of nitrite and nitrate of am- monia, formed according to equation: 2N H, + (40 or 30) =H,0+NO,H.NH, or NO,H.N H;. The platinum suffers no permanent change; its mode of action probably consists in this that it alternately absorbs (z.e., combines with) oxygen and hands it over to the ammonia. In any case the reaction is interesting as throwing some light upon the process of nitrification (vide infra).~~

~~Aqueous ammonia (liquor ammoniz), being in constant requisition as a reagent, and also used in medicine and in the arts, is being manufactured industrially. Fresenius recommends the following process. A cast-iron pot, fitted up as a retort, is charged with alternate layers of slaked lime (10 kilos of quicklime plus 4 kilos of water) and a powdered and sifted mixture of 6°5 kilos of chloride and 3°95 kilos of sulphate of ammonium. Eight litres of water are then added and well incorporated with the solids. The retort is~~

now closed, and the outlet-tube joined on to the lower end of an inverted condenser, the upper end of which communicates with a set of Woulfe's bottles charged with water. The ammonia is driven off by judicious application of heat, the inverted condenser serving to make the gas relatively dry before being absorbed. In this operation the tubes conveying the gas to the water must go to the bottom of the bottles, as the solution produced is lighter than pure water ; and, of course, the bottles must be kept cool by immersion in a cold water-bath, The strength of aqueous ammonia, for commercial purposes, is readily ascer- tained by means of an hydrometer ranging from 0°85 to 1-0 specific gravity. The relation between specific gravity S at 14° C. (water of 14°=1) and percentage of ammonia

NH, (p), according to experiments by Carius, is as follows :—

NITROGEN

Nat oy s Pp s p ae

36 "8844 25 9106 10 "9593

35 "8856 20 "9251 9 '9631 84 *8868 15 "9414 8 "9670 33 *8907 14 "9449 7 '9709 32 *8929 13 9484 6 '9749 | 31 "8953 12 9520 5 9790 |} 30 8976 11 9556

Aqueous ammonia is generally sent out as "liquor fortissimus" of 80 to 35 per cent. For ordinary labora- tory purposes it is usually diluted down to 9 to 10 per cent. This explains the discontinuities in the table.

Two natural sources of ammonia are at present in industrial use. (1) The gaseous exhalations of volcanoes always include ammonia, hydrochloric acid, and sulphurous acid, of which the first two are formed no doubt by the action of steam on deposits of nitrides and chlorides in the interior of the earth. This explains the existence in the fumaroles (smoke-holes), and in the clefts of the lava of Vesuvius, Hecla, and other volcanoes, of deposits of (chiefly) sal-ammoniac. This volcanic ammonia salt is highly valued as a material for the preparation of pure liquor ammoniz ; but its supply hardly comes up to the demands of even this small industry. (2) More important are the masses of ammonia formed in the processes of putrefaction which

are going on constantly in nature, and of which a mere fraction would satisfy all the demands of industry, if the recovery of such ammonia were not, as a rule, beset with insuperable difficulties. Thus, for instance, all the immense mass of the ammonia of the sewage of our large cities must be allowed to go to waste because we have no economical method for its extraction. Urine, when undiluted, is an easily handled raw material, and in former times actually formed the principal source of ammonia. Human urine contains from 2 to 3 per cent. of urea, or carbamide as it is called in systematic chemistry, because it is the anhydride of carbonate of ammonia. When urine putrefies, this carbamide takes up the ele- ments of water and becomes carbonate of ammonia, CO. (N,H,) + 2H,0 =CO,(NH,).. A prompter mode of conversion is to evaporate the urine with a small propor- tion of vitriol, and heat the residue to near the boiling- point of the acid, when the nitrogen of the urea passes at once into the form of sulphate of ammonia. This latter process would apply also to the urine of horses and cattle, which, instead of urea, contains hippuric acid, a compound which, when taken conjointly with water, contains the elements of ammonia and benzoic and acetic acids. At the present time urine plays hardly any part in the ammonia industry ; but it may be mentioned that the produce of the urinals of Glasgow is, or lately was, wrought for car- bonate of ammonia.

Preparation of Ammonia Jrom Nitrogenous Organic Matter.— All such matter when subjected to dry distillation gives up part of its nitrogen as ammonia, of which 'the greater part condenses with the vapour of water produced, and is thus obtained as part of the aqueous portion of the ''tar.'' Large quantities of such tar- water are being produced incidentally in the manufacture of coal- gas, and it is this material which at present forms the principal

ig for the industrial production of ammonia and ammonia salts.

It may also be mentioned that the tar-water obtained as a bye- product in the distillation of shale for the production of paraffin oil is rich in ammonia, and has long come to be worked up for sulphate like gas-liquors.

Crude tar-water contains about 1 per cent. of ammonia (more or less according to the quality of coal used, and the way it has been manipulated), mostly in the form of carbonate, part as cyanide, sulphocyanate, and

sulphide of ammonium; and this ammonia, of course, is associated with traces of hydrocarbons and other organic matter dissolved, or suspended, in the liquor. In some establish- ments the ammonia is extracted directly in the form of liquor ammoniz. The lHquoris run into a large iron boiler, and after addition of some ferrous and ferric salt (for fixing the sulphur of the

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sulphide as FeS, and the cyanogen of the cyanide as prussiate, (NC),Fe. (NH,);), mixed with slaked- lime and distilled. The vapours if condensed as they come off, would yield a very dilute liquor contaminated largely with volatile carbon compounds. To obtain a relatively pure gas, the vapour is subjected to a succession of partial condensations by making it pass through the several com- partments of an iron apparatus, similar in its action to the "*Coffey's still" which is used for the strengthening and refining of alcoholic liquors (see DisTILLATION, vol. vii. p. 265). The almost pure gas which leaves the last condenser is passed into a mass of water contained in a refrigerated close lead vessel, and thus converted into liquor ammoniz of the requisite strength. In the majority of large establishments, however, the ammonia is converted into sulphate, for which purpose it need not be so elaborately purified. The ammoniaca] vapour obtained from the crude liquor by simple distillation, or by distillation with lime from out of a steam-boiler, is passed into a quantity of chamber-acid con- tained in a leaden tank, until the acid is almost but not quite neutralized. An excess of alkali would induce the formation of sulphide of iron. from the sulphide of ammonium in the vapour and the traces of iron-salt adventitiously present, and lead toa discolora- tion of the salt. Matters are generally arranged so that the bulk of the sulphate formed crystallizes out, on cooling, in the form of a granular magma, which is allowed to drain and to dry, and either sold as it is, or first purified by recrystallization. The pure salt, (NH,),SO,, forms anhydrous, colourless, transparent crystals, iso- morphous with those of the corresponding potash salt, and, like it, belonging to the rhombic system ; even when produced on a large scale they are generally of small dimensions ; when allowed to grow, they assume forms which strikingly remind one of sugar-candy, although the latter is clino-rhombic. The salt is insoluble in alcohol, like most sulphates,—100 parts of water at 0°, 20°, 100° C. dissolve 71:0, 76°83, 97°5 parts of salt. The solution is neutral to litmus.

‘The salt readily unites with another equivalent of sul- phuric acid into crystallizable acid sulphate, SO,. (NH,). H, soluble in alcohol. The neutral salt melts at 140° C. Above 280° it emits ammonia and leaves acid salt, which latter then breaks up with formation of acid sulphiteSO,(NH,)H,, nitrogen, and water. Ata red heat it breaks up into sulphur, nitrogen, and water: (NH,).SO,= S+N,+4H,0.

Of other ammonia salts only the hydrochloride and the carbon- ates are industrially important.

The hydrochloride, HCl. NH,=NH,Cl, better known as sal- ammoniac (see vol. i. p. 741-2), is made sometimes by sublimation of a mixture of the sulphate with common salt, but it is more con- veniently produced direct from gas-liquor ammonia by passing it into muriatic acid until the latter is almost neutralized. The liquor, when sufficiently concentrated by evaporation, deposits, on cooling, part of its salt in feathery crystals, which are customarily purificd by sublimation. The subliming apparatus consists of two parts, —(1) a hemispherical stoneware basin placed within a close fitting iron one, or an enamelled iron basin, and (2) a hemispherical lead or stoneware lid, or dome, placed on the top of the basin and cemented on to prevent leakage. The dome has a small aperture in the top which remains open to preclude accumulation of pressure. The carefully dried crystallized salt is pressed into the basin, and, after the lid has been fitted on, is exposed to a long- lasting moderate heat. The salt volatilizes (mostly in the form of a mixed vapour of the two componcnts, which reunite on cooling), and condenses in the dome in the form ofa characteristically fibrous and tough crust. The salt readily dissolves in water, with consider- able absorption of heat; 30 parts of salt with 100 parts of water at 13°°3 give a mixture of the temperature of —5°°1 C. One hundred parts of water at 0°, 10°, 110° dissolve 28°4, 32°8, 77-2 parts of the sult. From its hot saturated solution it crystallizes on cooling in feathery groups of colourless needles. By slow evaporation of the solution it is possible to produce well-developed crystals which belong to the regular system, but look irregular on account of the predontinance of the (hemihcdric) faces of the trapezohedron.

Of the carbonates of ammonia thcre are a large number, and their chemistry still lacks definiteness. The normalsalt CO,(NH,). is so unstable that it can

hardly be said to exist. The acid salt CO,(NH,)H is easily produced by passing carbonic acid into a saturated solution of the commercial salt, when it comes down as a crystalline precipitate. The commercial salt (important as a medicinal agent and asa chemical reagent) is obtained by subliming a mixture of sal-ammoniac and chalk from an iron retort pro- vided with a lead dome and receiver. It forms hard fibrous crusts or cakes, smelling strongly of ammonia. The salt has a variable composition, The greater part, as a rule, consists of "sesqui- carbonate," 2(NH,),0 . 3CO,+ H,O = (NH,),.CO, + 2(NH,) . HCOs. But it also contains carbamate of ammonia,

NH 5 co O—(NH,) = CO2+2N Hg,

as obtainable by the direct union of carbonic anhydride and ammonia.

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Of the several ammonia compounds which we have referred to, the sulphate is by far the most important in an industrial sense. Immense quantities of the crude salt are being used as a manure — the German sugar-beet growers alone consume a considerable fraction of the British produce—while to the technical chemist gencrally it serves as the most convenient starting-point for the manufacture of ammonia, or of other ammonia salts.?

In the mode of distilling coal customarily carried on in gas works, only about one-third of the nitrogen is obtained as ammonia in the tar-water, the remaining two-thirds being lost by evaporation into the air, or remaining in the coke in the carbide form. What used to go into the gas is now mostly recovered by efficient scrubbers. But the more efficient condensation of the ammonia actually formed is a matter of chemical engineering which cannot be more than touched on here. According to Bilbey the nitrogen of the coke can be recovered, partly at least, by distilling it at a very high temperature in a current of steam. Bilbey's process, however, has hitherto failed practically to give satisfaction, because the intense heat required means a great expense for fuel, and destroys the retorts at an alarming rate. The analytical chemist has no difficulty in extracting the whole of the nitrogen in a given sample of coal as ammonia by mixing it with soda-lime and heating the mixture in a combustion-tube to redness, and possibly the technical chemist will one day bring this process into a remunera- tive form.

What, however, is meanwhile more easy of attainment is the recovery of the large quantities of ammonia which are being produced in the mannfacture of coke and in iron smelting (as far as carried out with coal), and which hitherto have been allowed to go to waste. Quite a number of chemists and engineers have tried their hands at this problem. The apparatus proposed, generally speaking, all come to this, that the coal-smoke produced in the furnace, instead of being allowed to have its own way, is sucked out by exhausters, made to pass through refrigerators to deposit at least part of its tar aud ammonia water, and the uncondensed combustible gases are led away to be used as fuel for steam-boilers, or, what in the case of coking is far better, led back to the coke oven and consumed there to increase the tempcraturc, and thus improve the qualities of both coke and tar. The very high tem- perature of the oven or furnace smoke throws great difficulties in the way of a perfect condensation of the ammonia. These, in a Scottish iron-work, have been turned most ingeniously by mixing the smoke with the sulphureous vapour formed by the roasting of pyritic shale or coal, wherebу the ammonia is converted into sulphite and sulphate, which can easily be condensed in even hot water.

Should it not be possible to produce ammonia synthetically from atmospheric nitrogen? This question is still waiting for an industrial solution ; scientifically it may be answered in more than one way. Magnesium, boron, and a number of other solid and non-volatile elementary substances, when kept in nitrogen gas at the proper temperature, unite with the nitrogen into solid non- volatile nitrides ; and these, when heated in steam, yield ammonia and the corresponding oxide. Thus we have 3Mg+N,=—N.Mg, and N.Mg,+3H,0=2NH;+38Mg0O. Unfortunately the reagents are all expensive, and there is no economical method for their regeneration. The following method is not subject to this one objection. A mixture of baryta or carbonate of baryta with char- coal, when heated intensely in nitrogen gas, yields cyanide of barium, Ba(NC),, and this salt when heated in steam gives off ammonia while earbouate of baryta is left, which latter can be nsed for starting de novo, BaN,C,4H,O0O=2NH, BaCO,+CO +4 Hy. Where this process fails we are unable to say; what we do know is that nobody has as yet succeeded in working it profitably even as a means for obtaining cyanides, whose value, per unit of nitrogen, is higher than that of ammonia.

Nitrates.

Nitrates (the generic term for nitric acid, HNOg, and its salts) are produced naturally by the electric discharges in the atmo- sphere, and in the processes of ‘‘ nitrification,” a fernientative oxidation which always sets in when moist nitrogenous animal or vegetable matter is left to itself in the presence of air and some basic substance (see FERMENTATION, Vol. ix. p. 98). This process in former times used to be carried out for the production of saltpetre, but as an industrial operation is now obsolete. The deposits of native nitre in India and clsewhcre which nature has produced for us by the same method are, of course, still being utilized as far as they go. But they amount to very little compared with the immense masses of native nitrate of soda which exist in South America, and which, at present, constitute by far the most im- portant raw material for the nitrate industry.

This native nitrate of soda forms part of a salty carth known to

1 For the ammonia process of soda-ash manufacture, which, after having been asleep industrially for some thirty years, was brouglit into a remunerative form by Solvay and Mond, and is now gradually, but surely, taking the place of the old Leblane process, see SODIUM.

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the natives as caliche or terra salitrosa, which abounds especially in the district of Atacama and the Peruvian province of Tarapaca. The caliche there lies from ‘25 to 1°5 metres deep, and stretches over a distance of forty leagues ; it is covered by a layer, froma half to two metres thick, ofa hard conglomerate of sand, felspar, phosphates, and other mineral matters, which is designated ‘‘Jostra.” ‘In other places the caliche forms part of a sandy deposit which some- times comes to the surface and never goes down to a depth beyond 2‘6 metres. The caliche contains from 48 to 75 per cent. of nitrate of soda and from 20 to 40 per cent. of common salt, which are associated with various minor saline components, including lodate of soda, and more or less of insoluble mineral, and also some organic inatter, guano amongst other things, which suggests the idea that the nitrate was formed by the nitrification of this kind of excre- mental matter. The caliche is worked up zn Joco for crude nitrate of soda; by extracting the salts with hot

water, allowing the suspended earth to settle, and then transferring the clarified liquor, first to a eistern where it deposits part of its chloride of sodium at a high temperature, and then to another where, on cooling, it yields a crop of erystals of purified nitrate. The nitre thus refined is imported chiefly from Valparaiso, whence the name of " Chili saltpetre." The mother-liquors used until a few years ago to be thrown away, but are now being utilized for the extraction of their iodine, which, although little in a relative sense, on account of the large masses of raw inaterial wrought, amounts to a good deal absolutely, as is illustrated by the fact that Peruvian iodine has put an end to the kelp industry in Scotland. Chemically pure uitrate of soda can be obtained by repeated recrystallization of Chili saltpetre or by synthesis from pure nitric acid and pure car- bonate of soda. It forms colourless transparent rhombohedra, like those of Iceland spar, only the angles are more nearly equal to right angles, so that the crystals look like cubes. Hence the name of cubic saltpetre, which is sometimes given to the salt. One hundred parts of water at 0°, 20°, 50°, 100°, 110° C. dissolve 72:9, 87°5, 112, 180, 200 parts of the salt; at 120°, the boiling-point of the saturated solution, 216 parts. It fuses at 330° C. (Carnelley) ; at higher temperatures it loses oxygen (more readily than the corresponding potash salt) with formation of nitrite NO,Na, which, at very high temperatures, is reduced ultimately to a mixture of peroxide, Na,O,, and oxide, Na,0. Industrially the salt is important as being the raw matcrial for the manufacture of uitrie acid and of nitrate of potash.

Nitrate of potash (saltpetrc), which forms the predominating component of gunpowder, occurs native in India and other parts of the world, and such native nitre has only to be purified by erystallization to beeome fit for the market. But the bulk of what occurs in commerce is made by double decomposition of Chili saltpetre with (a) caustic potash, (0) carbonate of potash, or © ehloride of potassium, which processes yield (a) caustic soda, (b) carbonate of soda, (c) common salt as bye-products. The third form (c) of the method is most largely wrought, the necessary supplies of chcap chloride of potassium being furnished by the works at the Stassfurt deposits. The two raw materials are analysed, and quantities corresponding to NaNO,=85 of nitrate of soda and KC]=74°5 parts of chloride of potassium respectively are dissolved together in an iron basin in the least quantity of hot water. The solution is boiled down to 1°5 specific gravity

(hot), when the common salt formed gradually crystallizes out. It is fished out, allowed to drain, and the runningsare returned to the basin. The highly concentrated mother-liquor is allowed to cool with frequent agitation, so that the saltpetre, which crystallizes and assumes the form of a "meal," is more readily freed from mother-liquor, by judicious washing with cold water. The crude saltpetre which is thus obtained is reerystallized until it is almost chemically pure, because an even slightly contaminated salt is unfit for gunpowder making. Nitrate of potash is isomorphous with the soda salt in this sense that it is possible to obtain it in the form of rhombohedra s but these rhombohedra have no great stability, and under ordinary conditions the salt always assumes the form of long six-sided prisms of the right-rhombic system. It is far less soluble in water than nitrate of soda, and, unlike it, is absolutely non-hygroscopic. One hundred parts of water at 0°, 10°, 20°, 50°, 80°, 100°C. dissolve 13}. 21°1, 31°2, 86, 172, 247 parts of salt. The boiling fully saturated solution is at 114°, and contains 327 parts of salt per 100 of water (Mulder). It fuses at 352° C. (Carnelley) into a colourless liquid, which freezcs into a hard compact mass exhibiting a coarse, fibrous fracture if the salt is pure. In an impure salt this structure be-comes the less distinct the greater the proportion of impurities; with a saltpetre which contains 3°5 per cent. of common salt, the fibres appear only at the edges of the surface of fracture. This is the basis of a now almost forgotten test for purity, and explains that to the present day the term ''refraction" is used to designate the sum total of impurities contained in 100 parts of nitre analysed. When heated sufficiently beyond its fusing point it decomposes similarly to nitrate of soda, only it gives up its oxygen far less readily. A mixture of nitre with charcoal, sulphur, or other com-bnstible matter, when kindled, burns off with explosive violence.

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Hence its application for the manufacture of gunpowder and in pyrotechnics, and its use in the laboratory as a powerful oxidizing agent in operations of the dry way. –

Nitric Acid, HNO, (see CuEMistRY, p. 511 sq.), is prepared from nitrate of potash or soda by distillation with sulphuric acid, The scientific chemist prefers the potash salt because it is more easily purified ; the manufacturer

uscs nitrate of soda because it is cheaper and a lower temperature and a less excess of oil of vitriol (over and above 1H,SO, for 2RNO,) suffice for its successful con- version into acid. Jor manufacturing purposes the distillation is effected from out of horizontal cylindrical or deep hemispherical retorts made of cast iron (a material which is far less attacked by the acids than one miglit be inclined to think). The retort com- municates with a series of Woulfe's bottles made of stoneware, which are sometimes provided with taps for letting off the distillate. The retort, after having been charged and eonnected with the receivers, is heated over a naked fire until all the acid is driven off, and nothing but a (more or less acid) sulphate of soda is left. The details of the manufacture vary according to the kind of acid which is intended to be produced. If the manufacture of ordinary aqua-fortis (of 1°3 to 14 specific gravity) is aimed at the receivers are charged with the proper proportion of water, and less than 1H,S80, may be used for the decomposition of 1NO,Na, because the per- oxide of nitrogen from the dissociated part of thc acid, by the action of the water and the air in the receivers, is to a great extent recon- verted into nitric acid. The preparation of acid of highest strength demands the full equivalent of vitriol. But even then the product, apart from the contents of the first few condenser bottles nearest to the retort, is strongly contaminated with dissolved peroxide, which imparts to the acid a deep red colour. This impurity can be brought down to about 2 per cent. by blowing air through the gently heated acid, which carries away the peroxide as a vapour. T'o utilize the latter, the mixture is made to ascend through a tower filled with coke kept moist by a constant rain of water running downwards against the stream of acid fumes. Water alone would convert two-thirds of the nitrogen into nitric acid, thus: —3N. 204 (aqua)=2NO(2N,0,+aqua); but by the coopcration of the oxygen of the air a larger proportion of acid is being regenerated as aquafortis of about 1°83 specific gravity. Two kinds of acid are chiefly being produced, viz., (1) full-strength fuming acid of 1°5 to 1°52 specific gravity at 15° C., which is largely used (in the tar-colour industry for the making of nitro-bodies, and also for the manu- facture of gun-cotton and nitroglycerin), and (2) aquafortis of 1°35 to 1°42 specific gravity, for the charging of batteries, and as a re- agent generally. Either acid is sold in two qualities,—as colour-less acid relatively free of peroxide of nitrogen, and as red acid charged with it, which admixture is not always an impurity in a technical sense, but desired for certain purposes to be present. Most commercial acid is

contaminated with chlorine and sulphuric acid, which can both be removed by fractional distillation—most easily from the strongest acid. The chlorine accumulates in the first runnings ; the sulphuric acid remains in the retort, if the dis- tillation be stopped in time.

For most purposes the strength of an acid can be determined with sufficient accuracy by means of a hydrometer.

The following table gives the relation between the perecntages p of HNO, and the specific gravity S according to Kolb :—

Sat 0°C. S at 15° C. Dp Sat o°c. S at 15°C.

100 1°559 1°530 30 1-200 1-185 90 1°522 1-495 20 1°132 1-120 80 1-484 1°460 15 1-099 1°089 70 1-444 1°423 10 1-070 1-060 60 1°393 1°374 5 1-031 1-029 50 1°334 1317 0 1-000 1-000

40 1-267 1-251

Regarding the reactions of nitric acid with elementary substances and with inorganic compounds generally, see CHEMISTRY (wt sap. pp: 511-514). The general effect of the treatment of an organic substance with aquafortis is that the acid is reduced to lower oxides of nitrogen and water, while the organic substance undergoes some kind of oxidation, which sometimes assumes the character of a com- bustion. With regard to the more immediately formed oxidation products it is difficult to speak in gencral terms; suffice it to say that, according to Carius, all organic substances when heated with nitric acid in sealed-up tubes to 150° to 300° C. are burned com- pletely into carbonic acid, water, and nitrogen or nitrogen oxides. Any other element that may be present passes into its highest state of oxidation: sulphur, for instance, becomes sulphuric acid; phos- phorus, phosphoric, &c. Very remarkable is the action of real nitric acid, when employed in the cold, and under conditions pre- cluding the accumulation of water or lower oxides of nitrogen. The acid then, if it acts at all, unites with the respective substances, with elimination of water and formation from the body B of a pro- duct B+nHNO,-nH,0 or B+nNO,-nH. These nitro-bodies, as they are sometimes called, divide themselves into two

classes: — (1) nitric esters, t.c., real nitrates formed from alcohols, which term

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must be understood here to include glycerin, sugar, mannite, cellu- lose, and many other OH-compounds not usually called alcohols (in these the group NO,. O stands where the OH was in the original substance); and (2) nitro-bodies proper, in which the NO,-group has taken the place of an H which was combined directly with carbon. An example is the nitrobenzol, CgH, (NO,), produced from benzol, C,H,;.H. When such a (true) nitro-body is treated with nascent hydrogen, the NO, as a rule goes out and is replaced by an amidogen NH,; thus C,H,(NO,) becomes C,H;(NH.), amido-benzol or aniline. The nitric esters, In the circumstances, yield up their NO, as ammonia.

For other metallic nitrates, see under the respective metals. For nitric esters, see METHYL, GUN-CoTTON, aud NITROGLYCERIN. For nitric anhydride (N,O;), peroxide of nitrogen (N04), nitrous acid (N,O3), nitric oxide (NO), nitrous oxide (NO, laughing-gas), also chloride of nitrosyle (aqua regia), see CHEMISTRY, p. 511 sq.

Nitrogenous Carbon Compounds.

Of this very numerous family we can only name a few of the more important groups and explain their genetic relations. Cyanides, compounds of the radical (NC),! are important to us here chiefly as a link between the two elements on the one hand and nitrogenous organic bodies proper on the other. Hydrocyanic acid, NCH, can be produced synthetically in a number of ways; we may, for instance, synthesize cyanide of barium, BaN,C,, as shown above, and decompose it by sulphuric acid. A more direct method is to first combine carbon with hydrogen into acetylene and then to subject a mixture of this and nitrogen gas to a spark-current, when hydrocyanic acid is produced, thus: —C,H,+N,=2HNC.

Alkylamines.—When hydrogen is generated within an acidified solution of hydrocyanic acid by means of zinc, the cyanide, by taking over four atoms of hydrogen, passes into (a salt of) methyl- amine, NCH+4H=NH,.CH;. It is

explained under Metiyi how this base may be utilized for the production of methyl- alcohol, and thus, indirectly, of iodide of methyl and of acetonitrile (pseudo-cyanide of methyl, NC.CH,). This shows the possibility of producing from hydrocyanic acid, in the first instance di- and tri-methylamine, and, more indirectly, the whole series of alkyla- mines (NH,R, NHR,, NR,; where R=CH,, CH,+CH,=C,H,, C,H,;+CH,=C3H,, &c.). Closely allied to these alkylamines are the diamines, derived from the bromides of the olcfines, CpHen, as the former are from those, or the iodides, of the alcohol-radicals CH;, C,H,, &c. To ethylamine, for instance, corresponds ethy- lene-diamine, C,H,(NH,)o.

Acid-amides are bodies related to acids, as alkylamines are to alcohols. Thus, for instance,

C,H,;NH, corresponds to [CH,. COJNH,. Ethylamine. Acctamide. Polybasic acids form each a series of amides. Thus succinic acid, C,H,(COOH),, forms two amides, viz., COOH CONH, C,H, CONH, and C,H, CONH,"

Succinamic acid. Succinamide. All acid-amides are the anhydridss of corresponding ammonia salts, and can be produced from these by actual dehydration ; there is no need of explaining by an equation what is so clearly seen in tlie formule. The two succinamides just named, and all analogous '¢ amides," are susceptible of further lehydration: thus

= 3 CO[OH]

succinamic acid, CHC COW nT) Z by losing the bracketed OH and H becomes

succinimid, CH. Go (NH);

C(O| N|H,]

and succinamide, C,H, c joni Cig a 2

similarly becomes succino-nitrile, CHC GN .

Acid-amides must not be mixed up with amido-acids.

Amido-acids have their (NH,) within the specific, not in the generic, radical. Thus, acetic acid, CH,COOH, by chlorination, becomes chloracetic acid, CH,C]. COOH, and this chloro-acid again gives up its chlorine to ammonia and to caustic potash, and receives back NH, in the one case and OH in the other, becoming

CH,(NH,). COOH and CH,(OH). COOH Amido-acetic acid. Oxy-acetic or glycollic acid. respectively. The latter forms an amide, CH,(OH)CO.NH,, as acetic acid does, and this amide, as is easily seen, is isomeric with amido-acetic acid, either being oxy-acetic minus OH plus NH,; but

1 See Cnoemistry. Some of the more important cyanides will be discussed under Prussic Aci.

the two differ widely from each other. The amide, when treated with aqueous potash, yields ammonia and glycollate of potash, tho amido-acid water and amido-acetate of potash. The substanco asparagine, which is contained in so many vegetable juices, and often appears as a decomposition product of albumenoids, is an amide and an amido-acid in one, being amido-succinamic acid.

COOH CO. NH CoH COOH CEM.) CO!0H™:

Succinic acid. Asparagine,

With the so-called aromatic bodies a very general method for producing amido-bodies is first to prepare a nitro-body and then reduce it by naseent hydrogen. Thus, for instanee, we can convert nitrobenzol, C,H;..NO,, above referred to, into amido-benzol, C,H,.NH,. We shall use this body as an example to explain the general mode of formation of a most interesting group of nitro- genous compounds which at present play a great part in the colour industry.

Diazo-bodies.—All NH, compounds, when treated with water and nitrous acid, virtually NO.OH=43(N,0,+H,0), yield the corresponding hydroxyl (OH) compounds, with joint elimination of the nitrogen of substance and reagent as nitrogen gas. Thus we

have—C,H; NH, + OH . NO = C,H, . OH + H,0 + N;. Aniline.

Phenol.

This is quite a general reaction ; but in the case of aromatic amines the reaction takes a different turn, if, instead of the free amine, we use one of its salts, and, in a relative sense at least, exclude water asamedium. In the case of nitrate of aniline, for instance, the two atoms of oxygen in the nitrous acid combine with all the hydrogen of the generic radicals, while all the rest unites into diazo-benzol :—HNO,. C,H;. NH,+ NO. OH=2H,0 + C,H,—N—N—NO,.

Nitrate of diazo-benzol.

And similarly in similar cases. Diazo-benzol has a great tendency to give off the nitrogen gas N, which isvisiblein its formula. We need only treat it with water and it yields what nitrous acid water would have given at once :—

C,H; N—=N—NO,+H.OH=HNO;+N,+C,H,. OH. There is something between the nitrates of ainido and of diazo- benzol, which, it is true, has only a theoretical existence in this case, but can be realized in other analogous cases.

Nitroso-bodies.—Kthylamine, under the action of water and nitrous acid, yields alcohol, C,H,.OH, as aniline yields phenol, and other monamines yield their alcohols. With diethylamine this reaction cannot take place; what does take place is that the NO of the nitrous acid expels and takes the place of the one loose H in the amine, and forms nitroso-diethyline :—

N.H.(C,H;),+NO. OH-H. OH+N. (NO). (C,H;)o. Nitroso-diethyline.

Hydrazines.—This nitroso-diethyline is a liquid boiling at 177°, devoid of alkaline properties. When treated with zinc-dust and acetic acid it yields a basic substance diethyl-hydrazine, which contains NH, in lieu of the NO of the nitroso-body.

N. (NO)(C,H;), N . (NH,)(C,H5)o. Nitroso-diethyline. Diethyl-hydrazine. This hydrazine is only one of a large genus, representatives of which are also obtainable from diazo-bodies by nascent hydrogen. Example— C,H, N —N—(HSO,) + 4H =H,S0,+C,H,—NH. (NH,). Sulphate of diazo-benzol. Phenyl-hydrazine.

Ureids are a class of bodies which are related to urea as amido-

bodies are toammonia. Thus

NH, (NH,)' (2NH,)" NH; correspond to a ary QvHy co NE CO } ND co< Hy Urea. Urea radicals,

We satisfy ourselves with quoting two ureids derived from oxalic

acid,C00€ Off . Just as we have two ammonia derivatives,

OH NH C,0, NTE Oxamie acid. Oxamide. so there exist two urea-derivatives

OH NH] C205 <INH. NH,co] #4 OR CO |.

Oxalurie acid. Parabanie acid.

The urea radicals are enclosed in square brackets. These are two

examples of a large family of bodies interesting on account of their

close relationship to uric acid, a constant component of urine, Creatine is a crystalline base which was discovered by Liebig

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in the juice of flesh. Volhard prepared it synthetically by the successive realization of the following two reactions :—

(1) CH,Cl. COOH + NH,CH,~HCl+CH,. NH(CH,). COOH ; Chloracetic acid. Methylamine. Methyl-amido-acetic acid. (sarkosine). (2) CH, .

NH(CH,). COOH +(CN)NH,= Sarkosine, Cyanamide. gy |) 2NTI8 NHC | N(CH): (GH, COOH]. Creatine.

Betaine and Neurine, two bases derived from trimethylamine, are of great physiological importance. Neurine

(CHs);—N—(OH)

CH. CH,

was discovered by Liebreich as one of the congeners of a complex substance contained in the brain. By oxidation it is converted

into betaine (CH;),—N ——— CH,.CO.0O

which Scheibler discovered in the juice of the sugar-beet. Both bases can be produced synthetically,—the betaine by first unit- ing trimethylamine with chloracetic acid into 'a chloride, CICH,.COOH + N(CHs)3, and then replacing the Cl by OH by means of oxide of silver and water. The hydroxide

CH N—[OH]C GH boorH]

formed spontaneously loses the bracketed [OH] and [H] as water, and becomes trimethyl-glycocoll, which is betaine.

Native Alkaloids.—These may be divided into (1) bodies consisting of carbon, nitrogen, and hydrogen only, generally volatile liquids (of which nicotine may be quoted as an example); and (2) such as contain oxygen in addition to the three elements named (quinine, morphia, strychnine, &c.). The more important of these bases are noticed in separate articles,

The Albumenoids.—This class comprises those substances known as albumin, fibrin, casein, &c., which, conjointly with carbo- hydrates and fats respectively may be said toform the basis of vegetable and animal life. They consequently are the most important of all nitrogenous carbon compounds; but unfortunately we know little of their chemical constitution. They are all solids containing 53 to 547 per cent. of carbon, 7°1 to 7°2 of hydrogen,

~~15°6 to 15°8 of nitrogen, and 1°7 to 1°8 of sulphur. Glutin and chondrin (glue) are closely allied to them. See the special articles,~~

~~Analysis,~~

~~In regard to general methods for the determination (or detection) of the element, sce CHEMIsTRY, vol. v. p- 546-7. But it may be added that the method there given as that of Dumas, for combustible carbon compounds, can be made to apply to metallic nitrates by simply substituting finely divided metallic copper for the oxide of copper as a burning agent, and that Varrentrapp and Will's method applics)as it stands to metallic nitrides and amides, to metallic cyanides, and to all metal-amines, We confine ourselves here to the more important methods for the detection of certain classes of nitrogen compounds.~~

~~1. Ammonia-salts and most acid-amides and amin-acids, when treated with aqueous potash, give off their nitrogen as ammonia gas, which, if sufficient in quantity, is easily detected by (a) its pungent smell, () its action on turmeric or red-litmus paper, (c) its forming~~

~~) : the vapours of ammonia be too highly attenuated to be thus identified, condense~~

~~them in dilute muriatic acid, and to the distillate obtained (after neutralization of the free acid by potash or soda) apply ''Nessler's reagent"' (a solution of the salt HgII,.2KI in aqueous caustic potash or soda; see Mercury, vol. xvi. p- 384). The least trace of ammonia, if present, assumes the form of iodide of mercur- ammonium, which, if too little to come down as a precipitate, will announce itself by imparting to the liquid an intense brown or yellow colour. One-hundredth of a milligram of ammonia dif-fused throughout 50 c.c. of liquid (i¢., five million times ity weight) can thus be detected with unerving certainty.~~

~~2. Nitrous and Nitric Acid.—We assume the acids to be given as solutions of their alkaline salts, and may well do so because other metallic salts of either acid can easily be brought into this form by suitable operations. A solution of 'alkaline nitrite, when mixed with aqueous sulphuric acid, gives off brown fumes (of NO, and N,0,) if it is sufficiently concentrated. In more~~

dilute solutions the liberated nitrous acid breaks up into nitric acid and nitric oxide gas, which latter forms brown fumes (of N,O,) as soon as it

comes into contact with the air. In still more dilute solutions tho liberated nitrous acid remains undecomposed, but is readily detected by a sufficiency of a strong solution of ferrous sulphate or chloride, which reagents liberate nitric oxide from it and dissolve it with formation of an inky-black solution. This is the most character- istic and a highly delicate test. But in the latter respect it is far surpassed by ‘‘Gries’s reagent,”—a solution of sulphate of meta- diamido-benzol in dilute sulphuric acid. When this solution is added to even the most dilute solution of nitrous acid, a yellow coloration is developed which attains its maximum of intensity after about fifteen minutes standing. This test is fully as delicate as Nessler’s for ammonia.

A nitrate solution, when mixed with aqueous sulphuric acid or that acid and ferrous salt, exhibits no visible change. But when tlic solution is mixed with its own volume of (concentrated) oil of vitriol, so as to not only liberate but also dehydrate the nitric acid, and a strong solution of ferrous sulphate is cautiously poured on the top of the mixture, nitric oxide is eliminated which dissolves in,

and strikes an inky-black colour with, the ferrous salt layer. This is the test for nitrates.

When a solution containing nitrates or nitrites is distilled with concentrated caustic potash or soda and aluminium foil or zinc- foil and iron filings (or any metal or combination which, with the pure alkali-solution, would give off hydrogen), the nitrogen is gradually eliminated as ammonia, which can be condensed, and, however little it may amount to, detected by Nessler’s reagent, as above explained. (W. D.)

NITROGLYCERIN (synonymes. Glonoin, Glonoin Oil, Dynamites, Blasting Gelatin), C;H;N;0, = C,H,(NO,).05, was discovered by Sobrero in 1846, and soon afterwards was more thoroughly investigated by Railton and by De Vrij. It is formed by the action of concentrated nitric acid, in the presence of strong sulphuric acid, upon gly- cerin at a low temperature, and

~~may be readily prepared upon a small scale by dropping the glycerin into the mixed acids, the mixture being kept artificially cooled, and afterwards poured into a large volume of water. The nitroglycerin then separates as a heavy liquid (sp. gr. 1°6), generally pale yellow, but quite colourless when pure. It is inodorous, and has a sweet pungent aromatic flavour; if it be touched with the tongue or even brought into contact with the skin severe headache ensues, but this effect does not recur after a while with those who habitually handle it, nor is their health premanently injured by working with it. Nitroglycerin is applied medicinally, in very minute doses, in cases of heart disease, but if taken even in small quantities it operates as a violent irritant poison. If a thin layer be spread upon a hard surface and struck sharply with a hammer it explodes violently ; under favourable conditions it is more sensitive to explo- sion by a blow than even mercuric fulminate, It freezes (or crystallizes, in six-sided prisms) at about 40° F., and slowly liquefies again at 50°. When frozen it is less sensitive to explosion; in the United States, where nitro- glycerin is extensively used, as such, in mining operations, it is transported in the frozen state for greater safety. Under some circumstances, however, the readiness with which nitroglycerin and its preparations freeze is a source of danger; they have generally to be thawed, by applying heat, before use in cold weather or after they have been frozen for some time, and disastrous explosions have re- sulted from this being carelessly done. Nitroglycerin is very slightly soluble in water, but is readily taken up by many solvents, especially by methyl-alcohol or wood-spirit. This solution being non-explosive, in the early days of application of nitroglycerin it was transported in that form ; but if the spirit became weakened by evapora- tion, an explosive layer of nitroglycerin containing some spirit would separate, and, in cool weather, nitroglycerin would crystallize out of the solution. The dangers attend- ing the use of nitroglycerin were therefore not much diminished by the use of the solvent.~~

~~Unless very carefully freed from acid and from unstable impurities, nitroglycerin will decompose more or less rapidly, especially in warm climates, and the heat developed~~

~~by the chemical change may lead to spontaneous explosions. But, when manufactured and purified according to the system originated and developed by Nobel, the liquid is possessed of great stability.~~

~~The first attempts to utilize the explosive power of nitroglycerin were made by Nobel in 1863; they were only partially successful until the plan, first applied by General Pictot in 1854, of develop- ing the force of gunpowder in the most rapid mannrr and to the maximum extent, through the agency of an initiative detonation (see ** Detonation," art. EXPLOSIVES, vol. viii.), was applied by Nobel to the explosion of nitroglycerin. Even then, however, the liquid nature of the substance, though advantageous in one or two direc- tions, constituted a serious obstacle to its safe transport and storage and to its efficient employment; it was therefore not until Nobel hit upon the expedient of producing plastic solid preparations by mixing the liquid with solid substances, in a fine state of division, capable of absorbing and retaining considerable quantities of it, that the future of nitroglycerin as one of the most effective and convenient blasting agents was secured. Charcoal was the first absorbent used ; eventually the siliceous (infusorial) earth known as "' kieselguhr" was selected by Nobel as the best material for pro- ducing DYNAMITE (q.v.), as it absorbs, after calcination, from three to four times its weight of nitroglycerin, and does not part with it easily when the mixture is submitted to pressure or frequent altera- tions of temperature. For work requiring the greatest sharpness and violence of action, the so- called No. 1 dynamite, consisting of about 75 parts of nitroglycerin and 25 parts of kieselguhr, is by far the most extensively used; other inert absorbents have been used at times, and numerous other less violent forms of dynamite (Dynamitis & base action) are prepared by impregnating mixtures of oxidizable substances and oxidizing agents (e.g., of nitrates and charcoal or carbonaceous bodies) with smaller proportions of nitro- glycerin, or by using imperfectly nitrified wood-fibre, or other forms of cellulose, as the absorbent. Lithofracteur, dualin, glyoxilin, potentitc, atlas- dynamite, lignin-dynamite, are examples. The last- named was employed by the Fenians in the attempted outrages in Glasgow and London in 1883. The only inert absorbent of nitro- glycerin which compares in efficiency with kieselguhr is magnesia alba, which is extensively used for making dynamite in California. The appheation of nitroglycerin-preparations to industrial pur- poses, especially for mining, tunnelling, aud blasting work in~~

which great cleaving and shattering effects arc desired, has developed very rapidly since 1867. Thus, in that year 11 tons were produced at the various works with which Nobel is associated ; in 1870 the yield had increased to 424 tons, in 1877 to 5500 tons, and in 1882 to 9500 tons, while considerable quantities are now manufactured independently of Nobel.

The most recent and most perfect form in which nitroglycerin is now used is called blasting gelatin. This material, also invented by Nobel, is composed of the liqnid and of a small proportion of so-called nitro-cotton, which consists chiefly of those products of the action of nitric acid on cellulose which are intermediate between collodion-cotton and gun-cotton (trinitro-cellulose, &c.). If the

'liquid is gently heated together with 5 to 7 per cent. of the finely-divided nitro-cotton, and the mixture kept stirred, the two gelatinize together, producing a translucent, plastic, and tenacious inass, which becomes hard when cooled to the freezing point of nitroglycerin, and may be kept iu water for any length of time without an appreciable separation of nitroglycerin. When properly prepared, blasting gelatin is less sensitive to detonation than dynamite ; and, while its action as an explosive is somewhat iore gradual, it is considerably superior to dynamite in explosive power, and even slightly more powerful than pure nitroglycerin, the reason being that the latter contains somewhat more oxygen than is required for the complete oxidation of the carbou and hydrogen, and that this excess is utilized in supplying the deficiency of oxygen existing in the feebly explosive uitro-cotton. Blasting gelatin is rapidly replacing dynamite in some of its applications, and is already extcnsively manufactured in different countrics. (F. A. A.)

NITZSCH, Karz Immanven (1787-1868), theologian, was born at the small Saxon town of Borna on September 21,1787. His father, Karl Ludwig Nitzsch, who at that time was pastor and superintendent in Borna, and afterwards became professor at Wittenberg, has also left a name of some distinction in the theological world by a number of writings, among which may be mentioned a work entitled De discrimine revelationis imperatorixe et didactice prolusiones academice (2 vols., 1830). Karl Immanuel, after receiving his elementary education at home, was sent to Schulpforta in

1803, whence he pro- ceeded to the university of Wittenberg in 1806. In 1809 he graduated, when the subject of his thesis was De

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| evangeliorum apocryphorum in explicandis canonicis usu et

abusu, and in the following year he "'habilitated" with a dissertation De testamentis patriarcharum, libro veteris testamenti pseudepigrapho. Uaving been ordained deacon in 1811, he showed remarkable energy and zeal during the bombardment and siege of the city in 1813; and in 1817 he was appointed one of the preceptors in the preachers' seminary which had been established after the suppression of the university. From 1820 to 1822 he was superintendent in Kemberg, and in the latter year he was appointed professor ordinarius of systematic and practical theology at Bonn. Here he remained until called to succeed Marheineke at Berlin in 1847; subsequently he became university preacher, provost of St Nicolai (in 1855), and member of the supreme council of the church, in which last capacity he was one of the ablest and most active promoters of the Evangelical Union. He died on August 21, 1868.

His principal works are System der Christlichen Lehre (1829, 6th ed. 1851), Praktische Theologie (1847-60, 2d. ed. 1863-68), Akadc- mische Vortrdge tiber Christliche Glaubenslehrc (1858), and several series of Predigtcn. His Protestantische Bcantwortung, a reply to the Symbolik of Mohler, which originally appeared in the Studien uw. Kritiken, nay also be mentioned. Nitzsch, whose work in dog- matic theology has been already charactcrized (see vol. vii. p. 342), still stands out as one of the ablest and most genial and accoin- plished representatives of the '' Vermittelungstheologie" (media- tion theology), or what may be called the broad evangelical school of modern Gerinany.—Gregor Wilhelm Nitzsch (1790-1861), brother of Karl Immanuel, chose philology as his province, and held pro- fessorships of ancient literature successively at Kiel (from 1827) and at Leipsic (1852). He published various works, chiefly connected with the elucidation of the Homeric pocms.

NIVELLES (Flem., Vyvel), a manufacturing town of South Brabant, Belgium, stands on the Thines, a small sub-tributary of the Scheldt, 18

miles by rail to the south of Brussels. The Romanesque church of St Gertrude, dating from the 11th century, is interesting, but the exterior suffered defacement in the 18th century, and the restoration of the tower, which suffered from fire in 1859, has not been successful. The treasury contains some valuable works of art. Nivelles has manufactures of woollen, cotton, linen, and paper, as well as a railway loco- motive and carriage work, and does a considerable trade in corn and live stock, especially swine. The town owes its origin to a convent founded in 645 by Ida or Ita, the wife of Pippin of Landen. The population was 9825 in 1876, but is said to have been much larger in the 16th century.

NIZAMI (1141-1203). Shaikh NizAmi or Nizdm-uddin Abt Mohammed Ilyas bin Yusuf, the unrivalled master of the romantic epopee in Persia, who ranks in poetical genius as next to Firdausi, was born 535 a.n. (1141 a.p.). His native place, or at any rate the abode of his father, was in the hills of Kumm, but as he spent almost all his days in Ganjah in Arran (the present Elisabethpol) he is generally known as Nizami of Ganjah or Ganjawi. The early death of his parents, which illustrated to him in the most forcible manner the unstableness of all human existence, threw a gloom over his whole life, and fostered in him that earnest piety and fervent love for solitude and meditation which have left numerous traces in his poetical writings, and served him throughout his literary career as a powerful antidote against the enticing favours of princely courts, for which he, unlike most of his contemporaries, never sacrificed a tittle of his self-esteem. The religious atmosphere of Ganjah, besides, was most favourable to such a state of mind ; the inhabitants, being zealous Sununites, allowed nobody to dwell among them who did not come up to their standard of orthodoxy, and it is therefore not sur- prising to find that Nizimi abandoned himself at an early age to astern ascetic life, as full of intolerance to others as dry and unprofitable to himself. He was rescued at last from this monkish idleness by his inborn genius,

which, not being able to give free vent to its poetical inspirations under the crushing weight of bigotry, claimed a greater share in the legitimate

enjoyments of life and the appreciation of the beauties of nature, as well as a more enlightened faith of tolerance, benevolence, and liberality. The first poetical work in which Nizdmi embodied his thoughts on God and man, and all the experiences he had gained, was necessarily of a didactic character, and very appropriately styled Mukhzan-ulasrdr, or "Storehouse of Mysteries," as it bears the unmistakable stamp of Sufic speculations (compare HAriz, vol. xi. p. 368). It shows, moreover, a strong resemblance to Nasir Khosrau's ethical poems and Sandi's Hadikat-ulhakikat, or "Garden of Truth." The date of composition, which varies in the different copies from 552 to 582 a.n., must be fixed in 574 or 575 (1178-79 a.v.), as the author states himself in the prologue that he was forty years old when he wrote it, and the prince to whom he dedicated it—complying so far with the usual custom of his time—was Fakhr- uddin Bahramshah, the ruler of the principality of Arzanjan, who died after a very long reign 622 a.4. Although the Makhzan is mainly devoted to philosophic meditations, the propensity of Nizdm{f's genius to purely epic poetry, which was soon to assert itself in a more independent form, makes itself felt even here, all the twenty chapters being interspersed with short tales illustrative of the maxims set forth in each. His claim to the title of the foremost Persian romanticist he fully established only a year or two after the Makhzan by the publication of his first epic masterpiece Khosrau and Shirin, composed, according to the oldest copies, in 576 A.n. (1180 a.p.). As in all his following epopees the subject was taken from what pious Moslems call the time of "heathendom,"— here, for instance, from the old Sassdnian story of Shah Khosrau Parwiz, his love affairs with the princess Shirin of Armenia, his jealousy against the architect Ferhad, for some time his successful rival, of whom he got rid at last by a very ingenious trick, and his final reconciliation and marriage with Shirin ; andit is a noteworthy fact that the once so devout Nizdmi never chose a strictly Mohammedan legend for his works of fiction. Nothing could prove better the complete revolution in his views, not only on religion, but also on art. He felt, no doubt, that the object of epic poetry was not to teach moral lessons or doctrines of faith, but to depict the good and bad tend- encies of the human mind, the struggles and passions of men ; and indeed in the whole range of Persian literature only Firdaust and Fakhr-uddin Asad Jorjani, the author of the older epopee Wis and Rémin (about the middle of the 11th century), can compete with Nizdim{ in the wonderful delineation of character and the brilliant paint-

ing of human affections, especially of the joys and sorrows of a loving and beloved heart.

Khosrau and Shirin was inscribed to the reigning atabeg of Azerbaijan, Abi Jafar Mohammed Pahlawan, and his brother Kizil-Arslan, who, soon after his accession to the throne in 582 a.x., showed his gratitude to the poet by summoning him to his court, loading him with honours, and bestowing upon him the revenue of two villages, Hamd and Nijin. Nizdm{ accepted the royal gift, but his resolve to keep aloof from a servile court-life was not shaken by it, and he forthwith returned to his quiet retreat. Mean- while his genius had not been dormant, and two years after his reception at court, in 584 a.n. (1188 a.p.), he completed his Diwdn, or collection of kasidas and ghazals (mostly of an ethical and parenetic character), which are said to have numbered 20,000 distichs, although the few copies which have come to us contain only a very small number of verses. About the same time he commenced, at the desire of the ruler of the neighbouring Shirwén, his

second romantic poem, the famous Bedouin love-story of Laila and Majnin, which has so many points in common with Ariosto's Orlando Furioso, and finished it in the short space of four months. A more heroic subject, and the only one in which he made a certain attempt to rival Firdausf, was selected by our poet for his third epopee, the Iskandarndma, or "Book of Alexander," also called Sharafndma or Iqbdlnéma-i-Iskandari (" The Fortunes of Alexander "), which is split into two divisions, The first or semi-historical part shows us Alexander the Great as the conqueror of the world, while the second, of a more ethical tendency, describes him in the character of a prophet and philosopher, and narrates his second tour through the world and his adventures in the west, south, east, and north. There are frequent Sufic allegories, just as in the Makhzan ; and quite imbued with pantheistic ideas is, for instance, the final episode of the first part, the mysterious expedition of Alexander to the fountain of life in the land of darkness.! As for the date of composition, itis evident, from the conflicting statements in the different MSS., that there must have been an earlier and a later recension, the former belonging to 587-589 a.n., and dedicated to the prince of Mosul, 'Izz-uddin Masud, the latter made for the atdbeg Nusrat-

uddin Abu Bakr of Tabriz after 593 A.H., since we find init a mention of NizAm{'s last romance Haft Patkar, or the "Seven Beauties," which comprises seven tales related by the seven favourite wives of the Sassinian king Bahramgur. In this poem, which was written 593 a.n., at the request of Nur-uddin Arslén of Mosul, the son and successor of the above-mentioned 'Izz- uddin, Nizimi returned once more from his excursion into the field of heroic deeds to his old favourite domain of romantic fiction, and added a fresh leaf to the laurel crown of immortal fame with which the unanimous consent of Eastern and Western critics has adorned his venerable head. The most interesting of the seven tales is the fourth, the story of the Russian princess, in which we recognize at once the prototype of Gozzi's well-known Turandot, which was afterwards adapted by Schiller for the German stage. The five mathnawis, from the Makhzan to the Haft Patkar, form Nizdmi's so-called " Quintuple " (Khamsah) or "Five Treasures" (Panj Ganj), and have been taken as pattern by all the later epic poets in the Persian, Turkish, Chaghatdi, and Hindustani languages. Nizdmi died at Ganjah in his sixty-fourth year, 599 a.n. (1203 a.p.).

The fullest account of Nizdmi is given in Dr W. Bacher's Niedmt's Leben und Werke (Leipsic, 1871 ; English translation by S. Robinson, London, 1878, reprinted in the same author's Persian Poetry for English Readers, 1883, pp. 103-244). All the-errors of detail in Bacher's work have been corrected by Dr Rieu in his Catalogue of the Persian MSS. in the British Museum, vol. ii., 1881, p. 563 sq.

Principal Editions.—The whole Khamsah (lithographed, Bom- bay, 1834 and 1838 ; Teheran, 1845) ; Makhzan-ulasrdr (edited by N. Bland, London, 1844; lithographed, Cawnpore, 1869; English translation in MS. by Hatton Hindley, in the British Museum Add. 6961); Khosrau and Shirin (lithographed, Lahore, 1871; Ger- man translation by Hammer in Shéirin, ein persisches romantisches Gedicht, Leipsic, 1809); Laila and Majnin (lithographed, Lucknow, 1879; English translation by J. Atkinson, London, 1836); Haft Paikur (lithographed, Bombay, 1849 ; Lucknow, 1873 ; the fourth tale in German by F. von Erdmann, Behramgur und die russische Fitrstentochter, Kasan, 1844) ; Iskandarnéma, first part, with coin- mentary (Calentta, 1812 and 1825 ; text alone, Calcutta, 1853; lithographed with marginal notes, Lucknow, 1865; Bombay, 1861 and 1875; English

translation by H. Wilberforce Clarke, London, 1881; compare also Erdmann, De Expeditione Russorum Berdaam versus, Kasan, 1826, and Charmoy, Expédition d' Aléxandre contre les Russes, St Petersburg, 1829); IJskandarndma-t-Bahrt, sccond part, edited by Dr Sprenger (Calcutta, 1852 and 1869). (H. E.)

NIZAM'S DOMINIONS. See HYDERABAD, Vol. xii. p. 428.

—1 Compare Dr Ethé's essay, "* Alexander's Zug zum Lebensquell," in Siizungsber. d. bayerisch. Akad., 1871, pp. 343-405.

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NOA—NOA

NOAH (M3, Née, Moe) is, according to the book of Genesis, the son of Lamech, and the second father of mankind after the deluge. His name, which is of obscure origin, is connected in Gen. v. 29 with a play on the word 0M) (nahem), to comfort. The story of the flood, the two elements of which the extant narrative is com- posed, and the parallel traditions of other nations, par- ticularly of the Babylonians, have been spoken of in the article DELUGE. 'The earlier narrative does not mention the point at which Noah left the ark, and it is doubtful if Gen. xi. 1 sg.,, which seems to be a fragment of a still older tradition, and which makes mankind disperse from Babylonia, originally stood in any connexion with the story of Noah and the flood. The later priestly (or, as it used to be called, Elohistic) narrative names the mountains of Ararat, 2.e., one of the mountains of the land of Ararat, as the place where the ark rested. The identification of this mountain with the Ararat of modern maps (M. Masis) is tolerably old ; Jerome (on Isa. xxxviil. 38) already places the land of Ararat in this quarter; but a more ancient Jewish tradition, which remained alive throughout the Middle Ages, seeks Ararat in the land of Kardu, 7.e., the mountains of the Kurds east of the Tigris (comp. ARARAT). From the Bible it is only certain (Isa. xxxvii. 38; Jer. li. 27) that the kingdom of Ararat was a remote northern district. After describ- ing the covenant which God made with Noah on leaving the ark (Gen. ix. 1-17) the priestly narrative has nothing further to tell of the patriarch's life; but an older frag- ment (Gen. ix. 20-27) makes him plant a vineyard and drink of the wine with consequences which lead him to

pronounce a blessing on Shem and Japheth and a curse of slavery on Canaan. The story seems to require, for clear- ness, the omission of the words " Ham, the father of" in verse 22; and if this be so we find that in one tradition the sons of Noah are Shem, Japheth, and Canaan. So taken, the names of the three sons would represent three elements, not in the population of the world, but in that of Palestine. Shem, in Hebrew, means name, and "sons of name," as opposed to "sons of no name" (Job xxx. 8, A. V., "sons of base men"), would naturally denote the Hebrew pure-blooded aristocracy, in antithesis to the subject aborigines (Canaan). Wellhausen, to whom this ingenious theory is due, would further identify Japheth in this passage with the Philistines ; Budde thinks rather of the Pheenicians. That the divisions Shem, Ham, and Japheth had not always one fixed sense is clear from Gen. x., where two distinct schemes of classification have been mixed up with such results as that Sheba and Havilah appear under Ham at ver. 7, and under Shem in ver. 28 sg. The one division appears to be mainly geographical, and is preserved complete, vers. 2-7, 20-23, 31; it bears the marks of the priestly narrator, and was not written before the exile. On the other hand, vers. 8-19, 25-30 belong to the older narrative, and are frag- ments of a classification seemingly more ethnographical in character.

NOAILLES. This great French family took its name from the castle of Noailles, in the territory of Ayen, be- tween Brives and Turenne in the Limousin, and dated its nobility from the 11th century. It did not obtain more than local and provincial fame until the 16th century, when its head, ANTOINE de Noailles (1504-1562), became admiral of France, and was ambassador in England during three important years, 1553-1556, durmg which he main- tained a gallant but unsuccessful rivalry with the Spanish ambassador, Simon Renard. Henri (1554-1623), son of Antoine, was a commander in the religious wars, and was made comte d'Ayen by Henry IV. in 1593. The grandson of the first count played an important part in the Fronde

and the early years of the reign of Louis XIV., became a captain-general of the newly-won province of Roussillon, and in 1663 was made duc d'Ayen, and peer of France. The sons of the first duke raised the family to its

~~greatest fame, and occupied very important positions in the later years of the reign of Louis XIV. The elder son, ANNE JuLEs (1650-1708), was one of the chief generals of France towards the end of the reign of Louis, and, after raising the regiment of Noailles in 1689, he commanded in chief in Spain during the war of the Spanish succession, and was made marshal of France in 1693. The younger son, Louis ANTOoINE (1651-1729), took orders, and rose to the most important position of the church in France when he was made archbishop of Paris in 1695. He held this high dignity for more than thirty years, until his death in 1729 ; he was nade a cardinal in 1700. These two distinguished brothers had made their family the most famous in France, with the exception of the Rohans, and the name occurs with almost confusing reiteration throughout the 18th century. ADRIEN Maurice (1678-1766), the third duke, was also a soldier, and learned war under his father in Spain. He served in all the most important wars of the reign of Louis XV. in Italy and Germany, and became the second maréchal de Noailles in 1734. His last command in the war of the Austrian succession was not a successful one, for he was beaten by the English at the battle of Dettingen in 1743. Two sons of the third duke also attained the rank of marshal of France. The elder, Louis (1713-1793), who bore the title of duc d'Ayen till his father's death in 1766, when he became duc de Noailles, served in most of the wars of the 18th century without particular distinction, but was nevertheless made a marshal of France, as the maréchal de Noailles, in 1775. He refused to emigrate during the Revolution, but escaped the fate of most noblemen by dying in August 1793, before the Terror reached its height. On the 4th Thermidor, just before the fall of Robespierre, the aged duchesse de Noailles was executed with her daughter-in-law, the duchesse d'Ayen, and her granddaughter, the vicomtesse de Noailles. JEAN Pauu Francois (1739-1824), the fifth duke, was, like his family, in the army, but his heart was bent on scientific pursuits, and for his eminence as a chemist he was elected a member of the Academy of Sciences in 1777. He became duc d'Ayen in 1766 on his grandfather's death, and duc de Noailles on his father's in 1793. Having emigrated in 1792, he lived in Switzerland until the restoration in 1814, when he took his seat asa peer of France. He had no son, but several daughters, one of whom married*La Fayette, and another her cousin, the vicomte de Noailles. He was succeeded as duc de Noailles by his grand-nephew, PauL (b. 1802), who has won some reputation as an author, and~~

who became a member of the French Academy in the place of Chateaubriand in 1849. The grandfather of Paul de Noailles, and brother of the fifth duke, Emmanurt Marie Louis (1743-1822), marquis de Noailles, was a distin- guished diplomatist of the 18th century: he was ambassador at Amsterdam from 1770-1776, at London 1776-1783, and

at Vienna 1783-1792; and, like his brother, he survived

the Revolution, and lived to see the Restoration.

One other branch of the family deserves notice. PHILIPPE (1715- 1794), comte de Noailles, was a younger brother of the fourth duke, and amore distinguished soldier than his brother. He served at Minden and in other campaigns, and was made a marshal on the same day as his brother, under the title of maréchal de Mouchy. He was long in great favour at court, and his wife was first lady of honour to Marie Antoinette, and was nicknamed by her Madame Ktiquette. This court favour brought down punishment in the days of the Revolution, and the old marshal and his wife were guillotined on the 27th June 1794. His two sons, the prince de Poix and the vicomte de Noailles, were both members of the Constituent Assembly. The prince de Poix, who was a captain of the body guards, sat on the right of the assembly, aud emigrated in 1792, but, surviving the

Bibliothéque Universelle of Geneva. It is worthy of note that for the measurement of currents he seems to have pre- ferred the use of his “rings” to the use of the galvanometer.

NOBILITY. To form a true understanding of what is strictly implied in the word “ nobility ” it is needful to distinguish its meaning from that of several words with which it is likely to be confounded. In England nobility is apt to be confounded with the peculiar institution of the British peerage. Yet nobility, in some shape or another, has existed in most places and times of the world’s history, while the British peerage is an institution purely local, and one which has actually hindered the existence of a nobility in the sense which the word bears in most other countries. Nor is nobility the same thing as aristocracy. This last is a word which is often greatly abused ; but,

whenever it is used with any regard to its true meaning, it is a word strictly political, implying a particular form of government. But nobility is not neces- sarily a political term; the distinction which it implies may be accompanied by political privileges or it may not. Again, it is sometimes thought that both nobility and aristocracy are in some special way connected with kingly government. To not a few it would seem a contra- diction to speak of nobility or aristocracy in a republic. Yet, though many republics have eschewed nobility, there is nothing in a republican, or even in a democratic, form of government inconsistent with the existence of nobility ; and it is only in a republic that aristocracy, in the strict sense of the word, can exist. Aristocracy implies the existence of nobility ; but nobility does not imply aris- tocracy ; it may exist under any form of government. The peerage, as it exists in the three British kingdoms, is something which is altogether peculiar to the three British kingdoms, and which has nothing in the least degree like it elsewhere.

Nobility, then, in the strict sense of the word, is the Defni- hereditary handing on from generation to generation of tion. some acknowledged pre-eminence, a pre-eminence founded on hereditary succession, and on nothing else. Such nobility may be immemorial or it may not. There may or there may not be a power vested somewhere of con- ferring nobility; but it is essential to the true idea of nobility that, when once acquired, it shall go on for ever to all the descendants—or, more commonly, only to all the descendants in the male line—of the person first ennobled or first recorded as noble. The pre-eminence so handed on may be of any kind, from substantial political power to mere social respect and precedence. It does not seem necessary that it should be formally enacted by law if it is universally acknowledged by usage. It may be marked by titles or it may not. It is hardly needful to prove that nobility does not imply wealth, though nobility without wealth runs some risk of being forgotten. This definition seems to take in all the kinds of nobility which have existed in different times and places. They have differed widely in the origin of the noble class and in the amount of privilege implied in membership of it; but they all | agree in the transmission of some privilege or other to all the descendants, or to all the male descendants, of the first noble.

~~In strictness nobility and gentry are the same thing. Nobility This fact is overshadowed in England, partly by the and habitual use of the word "gentleman " in various secondary Sut. uses, partly by the prevalent confusion between nobility and peerage. But that they are the same is proved by the use of the French word gentulhomme, a word which has pretty well passed out of modern use, but which, as long as It remained in use, never lost its true meaning. There Were very wide distinctions within the French noblesse, but they all formed one privileged class as distinguished~~

~~Revolution, he returned to Parisin 1814, and was made a lieutenant-general. Lovis Marte (1756-1804), vicomte de Noailles, was the second son of the maréchal de Mouchy, and the most distinguished of all his family. He served brilliantly under his brother-in-law La Fayette in America, and was the officer who concluded the capitu- lation of Yorktown. He was elected to the states-general in 1789, and at once showed his enthusiasm for liberty. He began the famous "orgie," as Mirabeau called it, on 4th August, when all privi- leges were abolished, and with d'Aiguillon proposed the abolition of titles and liveries in June 1790. When the Revolution became more pronounced he emigrated to America, and became a partner in Bingham's bank at Philadelphia. He was very successful, and might have lived happily had he not accepted a command against the English in San Domingo, under Rochambeau. He made a brilliant defence of the mole St Nicholas, and escaped witli the garrison to Cuba; but in making for Havana his ship was attacked by an English frigate, and after a long engagemeuit he was severely wounded, and died of his wounds on 9th January 1804. The whole family of Noailles had not a more brilliant representative than the friend of La Fayette, Louis, vicomte de Noailles.~~

~~NOAKHALL, or Noaconzy, a district in the lieutenant-governorship of Bengal, India, lying between 22° 22' and 23° 17' N. lat. and 90° 43' and 91° E. long, bounded on the N. by Tipperah, on the E. by Hill Tipperah state and Chittagong, on the S. by the Bay of Bengal, and on the W. by the main stream of «the Meghna, with an area of 1641 square miles, consists of an alluvial tract of main- land, together with several islands at the mouth of the Meghné. In general, each homestead is surrounded by a thick grove of betel and cocoa-nut palms, and in the north- western tracts dense forests of~~

~~betel-nut palms extend for miles. The district is very fertile; and, with the exception of some sandbanks and recent accretions, every part of it is under continuous cultivation. The process of alluvion is gradually but steadily going on, the mainland extending seawards. Wild animals and small game are numerous.~~

~~The population of the district was 820,772 in 1881, of whom 608,592 were Mohammedans. The district contains no town exceed- ing 5000 inhabitants. Sudharam, the civil station, is little more than a large village, with a populatioh (in 1872) of 4752. Rice forms the great staple of cultivation ; and rice, betel-nuts, and cocoa-nuts are exported. Nodkhali is peculiarly liable to destructive floods from the sea, generally caused by southerly gales or cyclones occur- ring at the time when the Meghna is swollen by heavy rains, and at flood-tides, — the tidal bore being somctimes 20 feet high, and moving at the rate of 15 milesan hour. The cyclone and storm-wave of 3lst October 1876 was terribly disastrous, sweeping over the whole delta of the Meghnd. The loss of human life was esti- mated at 100,000.~~

~~The Mohammedan population of the islands at the mouth of the Meghna practised piracy up to a comparatively recent date, and at the beginning of the 17th century Portuguese pirates, under Sebastian Gonzales, occupied Sandwip. They were ultimately reduced to subjection by Shaista Khdn, the governor of Bengal, about the middle of the century ; and their descendants have gradually sunk to the level of the natives surrounding them, whose dress, customs, and language they have, for the most part, adopted. They are Christians, and retain the old Portuguese names. About 1756 the East India Company established factories in Noakhali and Tipperah, the ruins of some of which still remain.~~

~~NOBILL, Leoproxpo (17 84-1834), was in youth an officer of artillery, but afterwards became professor of physics in the archducal museum at Florence, the old habitat of the Accademia del Cimento. His most valuable contributions to science consist in the suggestion of the astatic combina- tion of two needles, by which the sensibility of a galvano- meter is so greatly increased, and in the invention of the so-called thermo-multiplier or thermo-electric pile. His own experimental work with these instruments~~

~~was soon eclipsed by the brilliant applications made of them by Melloni and Forbes. He also discovered the exquisitely coloured transparent films of metal deposited by electro- chemical processes, which from their common form are usually known as Nobili's rings. Guebhard has lately im- proved the process for producing them. Nobili has left a large number of theoretical writings, chiefly on magnetism, light, and electricity, most of which are to be found in the~~

~~Roman Populus,~~

~~–~~

~~NOBEL ITY~~

~~from the roturier. Here, then, is a nobility in the strictest sense. If there is no such class in England, it is simply because the class which answers to it has never been able to keep any universally acknowledged privileges. The word " gentleman " has lost its original meaning in a variety of other uses, while the word "nobleman " has come to be confined to members of the peerage and a few of their immediate descendants.~~

~~That the English peerage does not answer to the true idea of a nobility will be seen with a very little thought. There is no handing on of privilege or pre-eminence to perpetual generations. The peer holds a great position, endowed with substantial powers and privileges, and those powers and privileges are handed on by hereditary suc- cession. But they are handed on only to one member of the family at a time. The peer's children, in some cases his grandchildren, have titles and precedence, but they have no substantial privileges. His remoter descendants have no advantage of any kind over other people, except their chance of succeeding to the peerage. The remote descendant of a duke, even though he may chance to be heir presumptive to the dukedom, is in no way distinguished from any other gentleman; it is even possible that he may not hold the social rank of gentleman. This is not nobility in the true sense; it is not nobility as nobility was understood either in the French kingdom or in the Venetian commonwealth.~~

Nobility thus implies the vesting of some hereditary privilege or advantage in certain families, without decid- ing in what such privilege or advantage consists. Its nature may differ widely according to the causes which have led to the establishment of the distinction between family and family in each particular case. The way in which nobility has arisen in different times and places is very various, and there are several nations whose history will supply us with examples of a nobility of one kind giving way to a nobility of another kind. The history of the Roman commonwealth illustrates this perhaps better than any other. What we may call the nobility of earlier occupation makes way for the nobility of office. Our first glimpses of authentic Roman history set before us two orders in the same state, one of which is distinguished from the other by many exclusive privileges. The privi- leged order—the populus, patres, patricians—has all the characteristics which we commonly expect to find ina privi- leged order. It is a minority, a minority strictly marked out by birth from other members of the commonwealth, a minority which seems further, though this point is less clearly marked, to have had on the whole the advantage in point of wealth. When we are first entitled to speak with any kind of certainty, the non-privileged class possess a certain share in the election of magistrates and the making of laws. But the privileged class alone are eligible to the greatest offices of the state ; they have in their hands the exclusive control of the national religion ; they have the exclusive enjoyment of the common land of the state,—in Teutonic phrase, the folkland. A little research shows that the origin of these privileges was a very simple one. Those who appear in later times as a privileged order among the people had once been the whole people. The patricians, patres, housefathers, goodmen—so lowly is the origin of that proud name—were once the whole Roman people, the original inhabitants of the Roman hills. They were the true populus Romanus, alongside of whom grew up a secondary Roman people, the plebs or commons. As new settlers came, as the people of conquered towns were moved to Rome, as the character of Romans was granted to some allies and forced upon some enemies, this plebs, sharing some but not all of the rights of citizens, became a non-privileged order alongside of a privileged order. As

~~the non-privileged order increased in numbers, while the privileged order, as every exclusive hereditary body must do, lessened, the larger body gradually put on the char- acter of the nation at large, while the smaller body put on the character of a nobility. But their position as a nobility or privileged class arose solely because a class with inferior rights to their own grew up around them. They were not a nobility or a privileged class as long as there was no less privileged class to distinguish them from. commonwealth in which they bore rule an aristocracy ; but they were a democracy among themselves.~~

~~Their exclusive possession of power made the~~

~~We see indeed faint traces of distinction among the patricians themselves, which may lead us to guess that the equality of all patricians may have been won by struggles of unre- corded days, not unlike those which in recorded days brought about the equality of patrician and plebeian. But at this we can only guess. The Roman patricians, the true Roman populus, appear at our first sight of them as a body democratic in its own constitution, but standing out as an order marked by very substantial privileges indeed from the other body, the plebs, also democratic in its own constitution, but in every point of honour and power the marked inferior of the populus.~~

~~The old people of Rome thus grew, or rather shrank Patri- up, into a nobility by the growth of a new people by "2s their side which they declined to admit to a share in their rights, powers, and possessions. A series of struggles raised this new people, the plebs, to a level with the old people, the populus. The gradual character of the process is not the least instructive part of it. There are two marked stages in the struggle. In the first the plebeians strive to obtain relief from laws and customs which were actually oppressive to them, while they were profitable to the patricians. When this relief has been gained by a series of enactments, a second struggle follows, in which the plebeians win political equality with the patricians. In this second struggle, too, the ground is won bit by bit. No general law was ever passed to abolish the privileges of the patricians; still less was any law ever passed to abolish the distinction between patrician and plebeian. All that was done was done step by step. First, marriage between the two orders was legalized. Then one law admitted plebeians to one office, another law to~~

~~another. Admission to military command was won first, then admis- sion to civil jurisdiction; a share in religious functions was won last of all. And some offices, chiefly those reli- gious offices which carried no political power with them, always remained the exclusive property of the patricians, because no special law was ever passed to throw them open to plebeians. In this gradual way every practical advantage on the part of the patricians was taken away. But the result did not lead to the abolition of all dis- tinctions between the orders. Patricians and plebeians went on as orders defined by law, till the distinction died out in the confusion of things under the empire, till at last the word "patrician" took quite a new meaning. The distinction, in truth, went on till the advantage turned to the side of the plebeians. Both consuls might be plebeians, both could not be patricians; a patrician could not wield the great powers vested in the tribunes of the commons. These were greater advantages than the exclusive patrician possession of the offices of interrex, rex sacrorum, and the higher flamens. And, as the old distinction survived in law and religion after all substantial privileges were abo- lished, so presently a new distinction arose of which law and religion knew nothing, but which became in practice nearly as marked and quite as important as the older one.~~

~~This was the growth of the new nobility of Rome, that body, partly patrician, partly plebeian, to which the name~~

~~New nobility.~~

~~526~~

~~nobilitas strictly belongs in Roman history. This new nobility gradually became as well marked and as exclusive as the old patriciate. But it differed from the old patriciate in this, that, while the privileges of the old patriciate rested on law, or perhaps rather on immemorial custom, the privileges of the new nobility rested wholly on a sentiment of which men could remember the beginning. Or it would be more accurate to say that the new nobility had really no privileges at all. Its members had no legal advantages over other citizens, They were a social caste, which strove to keep, and which largely succeeded in keeping, all high offices and political power in its own hands. Such privileges, even of an honorary kind, as the nobles did enjoy by law belonged to them, not as nobles, but a$ senators and senators' sons. Yet practically the new nobility was a privileged class ; it felt itself to be so, and it was felt to be so by others. This nobility consisted of all those who, as descendants of curule magistrates, had the jus imaginum,—that is, who could point to forefathers ennobled by office. That is to say, it consisted of the remains of the old patriciate, together with those plebeian families any members of which had been chosen to curule Offices. These were naturally those families which had been patrician in some other Italian city, but which were plebeian at Rome. Many of them equalled the patricians in wealth and antiquity of descent, and as soon as inter- marriage was allowed they became in all things their social equals. The practical result of the Licinian reform was that the great plebeian families became, for all practical purposes, patrician. They separated themselves from the mass of the plebeians to form a single body with the sur- viving patricians. Just as the old patricians had striven to keep plebeians out of high Offices, so now the new nobles, patrician and plebeian alike, strove to keep "new men," men who had not the jus imaginum, out of high office. But there was still the difference that in the old state of things the plebeian was shut out by law, while in the new state of things no law shut out the new man. It needed a change in the constitution to give the consul- ship to Lucius Sextius; it needed only union and energy in the electors to give it to Caius Marius.~~

~~The Roman case is often misunderstood, because the later Roman writers did not fully understand the case them- selves. Livy could never get rid of the idea that the old struggle between patrician and plebeian was something like the struggle between the nobility and the people at large in the later days of the commonwealth, In a cer- tain sense he knew better; at any rate, he often repeats the words of those who knew better; but the general impression given by his story is that the plebeians were a low mob and their leaders factious and interested ring- leaders of a mob. The case is again often misunderstood because the words " patrician" and "plebeian," like so many other technical Roman and Greek words, have come in modern language to be used in a way quite unlike their original sense. The word "'plebeian," in its strict sense, is no more contemptuous than the word commoner in England. The plebs, like the English commons, contained families differing widely in rank and social position, among them those families which, as soon as an artificial barrier broke down, joined with the patricians to form the new nobility. The whole lesson is lost if the words "patrician " and " plebeian " are used in any but their strict sense. The Catuli and Metelli, among the proudest nobles of Rome, were plebeians, and as such could not have been chosen to the purely patrician office of interrex, or flamen of Jupiter. Yet even in good writers on Roman history the words " patrician " and « plebeian " are often misapplied by being transferred to the later disputes at Rome, in which they are quite out of place.~~

~~Athenian eviraTpioa t,~~

~~hand on many of them~~

~~N-OSn fo tt oy~~

~~We may now compare the history of nobility at Rome Compari- the most famous city- son be- Thus at Athens its history is in its tween~~

~~with its history in some other of commonwealths, main outlines very much the same as its history at Rome up to a certain point, while there is nothing at Athens which at all answers to the later course of things at Rome. At Athens, as at Rome, an old patriciate, a nobility of older settlement, a nobility which had once been the whole people, was gradually shorn of all~~

exclusive privilege, and driven to share equal rights with a new people which had grown up around it. The reform of Clisthenes answers in a general way to the reform of Licinius, though the different circumstances of the two cities hinder us from carrying out the parallel into detail. But both at Rome and at Athens we see, at a stage earlier than the final reform, an attempt to set up a standard of wealth, either instead of or along- side of the older standard of birth. This same general idea comes out both in the constitution of Servius and in the constitution of Solon, though the application of the principle is different in the two cases, Servius made voting power depend on income ; by Solon the same rule was applied to qualification for office. By this change power is not granted to every citizen, but it is put within the reach of every citizen. No man can change his fore- fathers, but the poor man may haply become richer. The who were thus gradually brought down from their privileged position, seem to have been quite as proud and exclusive as the Roman patricians ; but when they lost their privileges they lost them far more thoroughly, and they did not, as at Rome, practically to a new nobility, of which they formed part, though not the whole. While at Rome the distinction of patrician and plebeian was never wiped out, while it remained to the last a legal distinction even when practical privilege had turned the other way, at Athens, after the democracy had reached its full growth, the dis- tinction seems to have had no legal existence whatever.

At Rome down to the last it made a difference whether the

candidate for office was patrician or plebeian, though the difference was in later times commonly to the advantage of the plebeian. At Athens, at any rate after Aristides, the eupatrid was neither better nor worse off than another man.

But, what is of far greater importance, there never arose at Athens any body of men which at all answered to the nobilitas of Rome. We see at Athens strong signs of social distinctions, even at a late period of the democracy ; we see that, though the people might be led by the low- born demagogue—using that-word in its strictand not neces- sarily dishonourable meaning—their votes most commonly fell on men of ancient descent. We see that men of birth and wealth often allowed themselves a strange licence in dealing

~~with their low-born fellow-citizens, But we see no sign of the growth of a body made up of patricians and leading plebeians who contrived to keep office to themselves by a social tradition only less strong than positive law. We have at Athens the exact parallel to the state of things when Appius Claudius shrank from the thought of the consulship of Caius Licinius ; we have no exact parallel to the state of things when Quintus Metellus shrank from the thought of the consulship of Caius Marius. The cause of the difference seems to be that, while the origin of the patriciate was exactly the same at Rome and at Athens, the origin of the commons was different. The four Ionic tribes at Athens seem to have answered very closely to the three patrician tribes at Rome ; but the Athenian demos grew up in a different way from the Roman plebs. If we could believe that the Athenian demos arose out of the union of the other Attic towns with Athens, this would be an exact analogy to the origin of the Roman plebs ; the evrratpisae would be the Athenians and the demos the~~

~~Sparta.~~

~~NOBILITY~~

~~Atticans (Arrixot). But from such glimpses of early Attic history as we can get the union of the Attic towns would seem to have been completed before the constitu- tional struggle began. That union would answer rather to the union of the three patrician tribes of Rome. Such hints as we have, while they set before us, just as at Rome, a state of things in which small landed proprietors are burthened with debt, also set before us the Attic demos as, largely at least, a body of various origins which had grown up in the city. Clisthenes, for instance, enfran- chised many slaves and strangers, a course which certainly formed no part of the platform of Licinius, and which reminds us rather of Cneus Flavius somewhat later. On the whole it seems most likely that, while the kernel of the Roman plebs was rural or belonged to the small towns admitted to the Roman franchise, the Attic demos, largely at least, though doubtless not wholly, arose out of the mixed settlers who had come together in the city, answer- ing to the perorxox of later times. If so, there would be no place in Athens for those great plebeian houses, once patri- cian in some other commonwealth, out of which the later Roman nobilitas was so largely formed. =~~

~~Thus the history of nobility at Athens supplies a close analogy to the earlier stages of its history at Rome, but it has nothing answering to its later stages. At Sparta we have a third instance of a people shrinking up into a nobility, but it is a people whose position differs altogether from anything either at Rome or at Athens. Sparta is the best case of a nobility of conquest. This is true, whether we look on the zrepiotxor as Achaians or as Dorians, or as belonging some to one race and some to the other. In any case the Spartans form a ruling body, and a body whose privileged position in the land is owing to conquest. The Spartans answer to the patricians, the zepiocxor to the plebs ; the helots are below the position of plebs or demos. The only difference is that, probably owing to the fact that the distinction was due to conquest, the local char- acter of the distinction lived on much longer than it did at Rome. We hardly look on the Spartans as a nobility among the other Lacedemonians ; Sparta rather is a ruling city bearing sway over the other Lacedemonian towns. But this is exactly what the original Roman patricians, the settlers on the three oldest hills, were in the beginning. The so-called cities (rdéAes) of the wepiouxor answered pretty well to the local plebeian tribes ; the difference is that the wepiouor never became a united corporate body like the Roman plebs. Sparta to the last remained what Rome was at the beginning, a city with a populus (Sjpos) but no plebs. And, as at Rome in early times, there were at Sparta distinctions within the populus; there were dpovor and tropeioves, like the majores and mznores gentes at Rome. Only at Rome, where there was a plebs to be striven against, these distinctions seem to have had a tend- ency to die out, while at Sparta they seem to have had a tendency to widen. The Spartan patriciate could afford to disfranchise some of its own members.~~

~~The other old Greek cities, as well as those of medieval Italy and Germany, would supply us with endless exam- ples of the various ways in which privileged orders arose. Venice, a city not exactly belonging to any of these classes, essentially a city of the Eastern empire and not of the Western, gives us an example than which none is more instructive. The renowned patriciate of Venice was as far removed as might be from the character either of a~~

~~out any parallel to the earlier. Athens has Fabii and Claudii, but no Catuli or Metelli; Venice has Catuli and — Metelli, but no Fabii or Claudii.~~

~~In one point, however, the Venetian nobility differed Venice.~~

~~from either the older or the newer nobility of Rome, and also from the older nobilities of the medizval Italian cities. Nowhere else did nobility so distinctly rise out of wealth, and that wealth gained by commerce. In the original island territory of Venice there could be no such thing as landed property. The agricultural plebeian of old Rome and the feudal noble of contemporary Europe were both of them at Venice impossible characters. The Venetian nobility is an example of a nobility which gradually arose out of the mass of the people as certain families step by step drew all political power into their own hands. The plebs did not gather round the patres, neither were they conquered by the patres; the patres were developed by natural selection out of the plebs, or, more strictly, out of the ancient populus. The com- mune of Venice, the ancient style of the commonwealth, changed into the seigniory of Venice. Political power was~~

~~'gradually confined to those whose forefathers had held~~

~~political power. This was what the later nobility of Rome was always striving at, and what they did to a great extent practically establish. But, as the exclusive privileges of the nobility were never recognized by any legal or formal act, men like Caius Marius would ever and anon thrust themselves in, The privileges which the Venetian nobility took to themselves were established by acts which, if not legal, were at least formal. The Roman nobility, resting wholly on sufferance, was overthrown by the ambition of one of its own members. The Venetian nobility, resting also in its beginnings on sufferance, but on sufferance which silently obtained the force of law, lasted as long as Venice remained a separate state.~~

~~The hereditary oligarchy of Venice was established by a series of changes which took place between the years 1297 and 1319. All of them together really go to make up the "Shutting of the Great Council," a name which is formally given to the act of the first of those years. In 1172 the Great Council began as an elective body; it gradually ousted the popular assembly from all prac- tical power. It was, as might be looked for, commonly filled~~

by members of distinguished families, descendants of ancient magistrates, who were already beginning to be looked on as noble. The series of revolutions already spoken of first made descent from former councillors a necessary qualification for election to the council; then election was abolished, and the council consisted of all descendants of its existing members who had reached the age of twenty-five. Thus the optimates of Venice did what the optimates of Rome strove to do: they esta- blished a nobility whose one qualification was descent from those who had held office in past times. This is what the nobility of office, if left unchecked, naturally grows into. But the particular way in which oligarchy was finally established at Venice had some singular results. Some of the great families which were already looked on as noble were not represented in the council at the time of the shutting .; of others some branches were represented and others not. These families and branches of families, however noble they might be in descent, were thus shut out from all the political privileges of nobility. When one branch of a family was admitted and one shut out we have

an analogy to the patrician and plebeian Claudii, though the The distinction had come about in quite another way. And Roman in the Great Council itself we have the lively image of the C“”™ 5 : and the aristocratic popular assembly of Rome, the assembly of Groat the populus, that of the cwriz, where every man of patri- Council

cian birth had his place. The two institutions are the of Venice.

nobility of conquest.or of a nobility of older settlement. Nor was it strictly a nobility of office, though it had more in common with that than with either of the other two. As Athens supplies us with a parallel to the older nobility of Rome without any parallel to the later, so Venice sup- plies us with a parallel to the later nobility of Rome with-

The Nobility of Venice an Aris- tocracy.

Civic aristo- eracies.

same, only the way in which they came about is exactly opposite. The assembly of curi# at Rome, originally the democratic assembly of the original people, first grew into an aristocratic assembly, and then died out alto- gether as a new Roman people, with its own assembly, grew up by its side. It was a primitive institution which gradually changed its character by force of circumstances. It died out, supplanted by other and newer powers, when it became altogether unsuited to the times. The Great Council of Venice was anything but a primitive institu- tion ; it was the artificial institution of a late age, which grew at the expense of earlier institutions, of the prince on the one side and of the people on the other. But the two different roads led to the same result. The Great Council of Venice, the curiz of Rome, were each of them the assembly of a privileged class, an assembly in which every member of that class had a right to a place, an assembly which might be called popular as far as the privileged class was concerned, though rigidly oligarchic as regarded the excluded classes. But, close as the likeness is, it is merely a superficial likeness, because it is the result of opposite causes working in opposite directions. It is like two men who are both for a moment in the same place, though their faces are turned in opposite ways. If the later nobilitas of Rome had established an assembly in which every one who had the jus imaginum had a vote and none other, that would have been a real parallel to the shutting of the Venetian Great Council ; for it would have come about through the working of causes which are essentially the same.

The nobility which was thus formed at Venice is the very model of a civic nobility, a nobility which is also an aristocracy. In a monarchy, despotic or constitutional, there cannot in strictness be an aristocracy, because the whole political power cannot be vested in the noble class. But in the Venetian commonwealth the nobility was a real aristocracy. All political power was vested in the noble class ; the prince sank to a magistrate, keeping only some of the outward forms of sovereignty; the mass of the people were shut out altogether. And, if no govern- ment on earth ever fully carried out the literal meaning of aristocracy as the rule of the best, these civic nobilities come nearer to it than any other form of government. They do really seem to engender a kind of hereditary capa- city in their members. Less favourable than either mon- archy or democracy to the growth of occasional great men, they are more favourable than either to the constant

~~supply of a succession of able men, qualified to carry on the work of government. Their weak point lies in their necessary conservatism; they cannot advance and adapt themselves to changed circumstances, as either monarchy or democracy can. When, therefore, their goodness is gone, their corruption becomes worse than the corruption of either of the other forms of government.~~

~~All this is signally shown in the history both of Venice and of other aristocratic cities. But we are concerned with them now only as instances of one form of nobility. The civic aristocracies did not all arise in the same way. Venice is the best type of one way in which they rose ; but it is by no means the only way. In not a few of the Italian cities nobility had an origin and ran a course quite unlike the origin and the course which were its lot at Venice. The nobles of many cities were simply the nobles of the surrounding country changed, sometimes greatly against their will, into citizens. Such a nobility differed far more widely from either the Roman or the Venetian patriciate than they differed from one another, It wanted the element of legality, or at least of formality, which distinguished both these bodies. The privileges of the Roman patriciate, whatever we may call them, were~~

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~~not usurpations; and, if we call the privileges of the Venetian nobility usurpations, they were stealthy and peaceful usurpations, founded on something other than mere violence. But in many Italian cities the position of the nobles, if it did not begin in violence, was main- tained by violence, and was often overthrown by violence. They remained, in short, as unruly and isolated within the walls of the cities as they had ever been without. A nobility of this kind often gave way to a democracy which either proved as turbulent as itself, or else grew into an oligarchy ruling under democratic forms. Thus at Flor- ence the old nobles became the opposite to a privileged class. The process which at Rome gradually gave the plebeian a political advantage over the patrician was carried at Florence to a far greater length at a single blow. The whole noble order was disfranchised; to be noble was equivalent to being shut out from public office. But something like a new nobility presently grew up among the commons themselves; there were~~

popolani grossi at Florence just as there were noble plebeians at Rome. Only the Roman commons, great and small, never shut out the patricians from office ; they were satisfied to share office with them. In short, the shutting out of the old no- bility was, if not the formation of a new nobility, at least the formation of a new privileged class. For a certain class of citizens to be condemned, by virtue of their birth, to political disfranchisement is as flatly against every principle of democracy as for a certain class of citizens to enjoy exclusive rights by reason of birth. The Florentine demo- cracy was, in truth, rather to be called an oligarchy, if we accept the best definition of democracy (see Thucydides, vi. 39), namely, that it is the rule of the whole, while oligarchy is the rule of a part only.

It is in these aristocratic cities, of which Venice was the most fully developed model, that we can best see what nobility really is. Itis in these only that we can see nobility in its purest form—nobility to which no man can rise and from which no man can come down except by the will of the noble class itself. In a monarchy, where the king can ennoble, this ideal cannot be kept. Nor could it be kept in the later nobility of Rome. The new man had much to strive against, but he could sometimes thrust himself through, and when he did his descendants had their jus tmaginum, But at Venice neither prince nor people could open the door of the Great Council; only the Great Council itself could do that. That in the better times of the aristocracy nobility was not uncommonly granted to worthy persons, that in its worse times it was more commonly sold to unworthy persons, was the affair of the aristocratic body itself. That body, at all events, could not be degraded save by its own act. But these grants and sales led to distinctions within the ranks of the noble order, like those of which we get faint glimpses among the Roman patricians. The ducal dignity rarely passed out of a circle of specially old and distinguished families. But this has often been the case with the high magis- tracies of commonwealths whose constitutions were purely democratic.

From this purest type of nobility, as seen in the aristo- Rural cratic commonwealths, we may pass to nobility as seen in Nobility.

States of greater extent—that is, for the most part in mon- archies. There are two marked differences between the two. They are differences which seem

~~to be inherent in the difference between a republic and a monarchy, but which it would be truer to say are inherent in the differ- ence between a body of men packed close together within the walls of a city and a body of men—if we can call them a body—scattered over a wide territory. The member of a civic nobility is more than a member of an order; he is a member of a corporation ; he has no powers, he has hardly~~

~~Nobili- ties in early Western Europe.~~

~~mot eh I TY~~

~~any being, apart from the body of which he is a member. He has a vote in making the laws or in choosing those who make them; but when they are made he is, if any- thing, more strictly bound by them than the citizen of the non-privileged order. To be a fraction of the corporate sovereign, if it had its gains, had also its disadvantages ; the Venetian noble was fettered by burthens, restrictions, and suspicions from which the Venetian citizen was free. The noble of the large country, on the other hand, the rural noble, as he commonly will be, is a member of an order, but he is hardly a member of a corporation; he is isolated ; he acts apart from the rest of the body and wins powers for himself apart from the rest of the body. He shows a tendency—a tendency whose growth will be more or less checked according to the strength of the central power—to grow into something of a lord or even a prince on his own account, a growth which may advance to the scale of a German elector or stop at that of an English lord of a manor. Now many of these tendencies were carried into those Italian cities where the civic nobility was a half-tamed country nobility ; but they have no place in the true civic aristocracies. Let us take one typical example. In many parts of western Europe the right of private war long remained the privilege of every noble, as it had once been the privilege of every freeman. And in some Italian cities, the right, or at least the privilege, of private war was continued within the city walls. But no power of imagination can conceive an acknowledged right of private war in Rome, Venice, or Bern.~~

~~'The other point of difference is that, whatever we take for the origin and the definition of nobility, in most countries it became something that could be given from outside, without the need of any consent on the part of the noble class itself. In other words, the king or other prince can ennoble. We~~

have seen how much this takes away from the true notion of nobility as understood in the aristocratic commonwealths. The nobility is no longer all-powerful; it may be con- strained to admit within its own body members for whose presence it has no wish. Where this power exists the nobility is no longer in any strictness an aristocracy ; it may have great privileges, great influence, even great legal powers, but it is not the real ruling body, like the true aristocracy of Venice.

In the modern states of western Europe the existing nobility seems to have for the most part had its origin in personal service to the prince. And this nobility by personal service seems commonly to have supplanted an older nobility, the origin of which was, in some cases at least, strictly immemorial. Of this process in England, the substitution of the later nobility of the thegns for the older nobility of the ecorls, something has already been said in the article ENGLAND (vol. vili. pp. 274-5). Now the analogy between this change and the change from the Roman patriciate to the later Roman nobilitas is obvious. In both cases the older nobility gives way to a newer; and in both cases the newer nobility was a nobility of office. Under a kingly government office bestowed by the sove- reign holds the same place which office bestowed by the people holds in a popular government. This new nobility of office supplanted, or perhaps rather absorbed, the older nobility, just as the later nobilitas of Rome supplanted or absorbed the old patriciate. In our first glimpse of Teutonic institutions, as given us by Tacitus, this older nobility appears as strictly immemorial (see Waitz, Deutsche Verfassungsgeschichte, i. 185 sq.), and its immemorial character appears also in the well-known legend in the Rigsmal-saga of the separate creation of jarl, karl, and thrall. These represent the three classes of mankind according to old Teutonic ideas—the noble, the simple free- man, and the bondman. The kingly house, where there

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is one, is not a distinct class; it is simply the noblest of the noble. For, as almost everywhere else, this Teutonic nobility admits of degrees, though it is yet harder to say in what the degrees of nobility consisted than to say in what nobility consisted itself. The older nobility is independent of the possession of land ; it is independent of office about the sovereign ; it is

hard to say what were the powers and privileges attached to it; but of its existence there is no doubt. But in no part of Europe can the existing nobility trace itself to this immemorial nobility of primitive days ; the nobility of medizeval and modern days springs from the later nobility of office. The nobles of modern Europe are rather thegnas than eorlas. The eorl of the old system would doubtless commonly become a thegn under the new, as the Roman patrician took his place in the new nobilitas; but others could take their place there also. The Old-English laws point out ways by which the churl might rise to thegn's rank, and in the centuries during which the change went on we find mention—complaining mention—both in England and elsewhere, at the court of Charles the Simple and at the court of thelred, of the rise of new men to posts of authority. The story that Earl Godwine himself was of churlish birth, whether true or false, marks the possibility of such a rise. A still wilder tale spoke of Hugh Capet as the son of a butcher of Paris. Stories like these prove even more than the real rise of Hagano and Eadric.

In England the nobility of the thegns was to a great England.

extent personally displaced, so to speak, by the results of the Norman Conquest. But the idea of nobility did not greatly change. The English thegn sometimes yielded to, sometimes changed into, the Norman baron, using that word in its widest sense, without any violent alteration in his position. The notion of holding land of the king became more prominent than the notion of personal ser- vice done to the king; but, as the land was held by the tenure of personal service, the actual relation hardly changed. But the connexion between nobility and the holding of land comes out in the practice by which the lord so constantly took the name of his lordship. It is in this way that the prefixes de and von, descriptions in themselves essentially local, have become in other lands badges of nobility. This notion has died out in England by the dropping of the preposition; but it long lived on wherever Latin or French was used. And before long nobility won for itself a distinguishing outward badge. The device of hereditary coat-armour, a growth of the 12th century, did much to define and mark out the noble class throughout Europe. As it could be acquired by grant of the sovereign, and as, when once acquired, it went on from generation to generation, it answers exactly to the jus imaginum at Rome, the hereditary badge of

nobility con- ferred by the election of the people. Those who possessed the right of coat-armour by immemorial use, or by grant in regular form, formed the class of nobility or gentry,— words which, it must again be remembered, are strictly of the same meaning. They held whatever privileges or advantages have attached in different times and places to the rank of nobility or gentry. In England indeed a variety of causes hindered nobility or gentry from ever obtaining the importance which they obtained, for instance, in France. But perhaps no cause was more important than the growth of the peerage (see Preracs). That institution at once set up a new standard of nobility, a new form of the nobility of office. The peer—in strictness, the peer in his own person only, not even his children—became the only noble ; the ideas of nobility and gentry thus became divorced in a way in which they are not in any other coun- try. Those who would elsewhere have been counted as the nobility, the bearers of coat-armour by good right, were XVII. — 67

France.

Poland.

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hindered from forming a class holding any substantial pri- vilege. In a word, the growth of the peerage hindered the existence in England of any nobility in the Continental sense of the word. The esquires, knights, lesser barons, even the remote descendants of peers, that is, the noblesse of other countries, in England remained gentlemen, but not noble- men,—simple commoners, that is, without legal advantage over their fellow-commoners who had no jus imaginum to boast of. There can be no doubt that the class in England which answers to the noblesse of other lands is the class that bears coat-armour, the gentry strictly so called. Had they been able to establish and to maintain any kind of privilege, even that of mere honorary preced- ence, they would exactly answer to Continental nobility. That coat-armour has been lavishly granted and often assumed without right, that the word "gentleman" has acquired various secondary senses, proves nothing; that is the natural result of a state of things in which the status of gentry carries with it no legal advantage, and yet is eagerly sought after on social grounds. If coat-armour, and thereby the rank of gentry, has been lavishly

~~granted, some may think that the rank of peerage has often been lavishly granted also. In short, there is no real nobility in England ; for the class which answers to foreign nobility has so long ceased to have any practical privileges that it has long ceased to be looked on as a nobility, and the word nobility has been transferred to another class which has nothing answering to it out of the three British king- doms. This last class in strictness takes in only the peers personally ; at the outside it cannot be stretched beyond those of their children and grandchildren who bear the courtesy titles of lord and lady.~~

~~No attempt has been here made to trace out the history of nobility in the various countries and, we must add, cities of Europe. All that has been attempted has been to point out some general truths, and to refer to some specially striking instances. Once more, it must be borne in mind that, while it is essential to the idea of nobility that it should carry with it some hereditary privilege, the nature and extent of that privilege may vary endlessly. In the last century the nobility of France and the nobility of Poland alike answered to the very strictest definition of nobility ; but the political positions of the two were as broadly contrasted as the positions of any two classes of men could be. The nobility of France, keeping the most oppressive social and personal privileges, had been shorn of all political and even administrative power ; the tyrants of the people were the slaves of the king. In Poland sixty thousand gentlemen, rich and poor, famous and obscure, but all alike gentlemen, rode out to choose a king by a unanimous vote, and to bind him when chosen by such conditions as they thought good. Those sixty thousand, like the populus of Rome, formed a narrow oligarchy as regarded the rest of the nation, but a wild democracy among themselves. Poland, in short, came nearer than any kingdom or country of large extent to the nature of an aristocracy, as we have seen aristocracy in the aristocratic cities. The chief power of the state was placed neither in the prince nor in the nation at large ; it was held by anoble class. The kingly power in Poland, like the ducal power at Venice, had been so narrowed that Poland, though she still kept a king, called herself a republic no less than Venice. And whatever was taken from the king went to the gain of the noble order. But the nobility of a large country, even though used to act politically as an order, could never put on that orderly and legal character which distinguishes the true civic patriciates. It never could come so nearly as a~~

civic patriciate could to being something like the rule of the best in any sense of those words.

NOC—NOC

The tendency of modern times has been towards the breaking down of formal hereditary privileges. In modern commonwealths, above all, they have been thought to be essentially inconsistent with republican institutions. The truth of the matter is rather that the circumstances of most modern commonwealths have been unfavourable to the preservation, and still more to the growth, of privi- leged bodies. Where they existed, as in Switzerland, théy have been overthrown. Where they did not exist, as in America, everything has made it more and more impossible that they should arise. And, as modern changes have commonly attacked the power both of kings and of nobles, the common notion has come that king- ship and nobility have some necessary connexion. It has seemed as if any form of nobility was inconsistent with a republican form of government, while nobility, in some shape or other, has cone to be looked on as a natural, if not a necessary, appendage to a monarchy. And as far as regards the social side of kingship this is true. A court seems more natural where a chain of degrees leads gradually up from the lowest subject to the throne than when all beneath the throne are nearly on a level. And from one point of view, that from which the kingly house is but the noblest of the noble, kingship and nobility are closely allied. But in the more strictly political view monarchy and nobility are strongly opposed. Even the modified form of absolute monarchy which has existed in some Western countries, while it preserves, perhaps even strengthens, the social position of a nobility, destroys its political power. Under the fully-developed despotisms of the East a real nobility is impossible ; the prince raises and thrusts down as he pleases. It is only in a common- wealth that a nobility can really rule; that is, it is only in @ commonwealth that the nobility can really be an aristocracy. And even in a democratic commonwealth the sentiment of nobility may exist, though all legal privi- lege has been abolished or has never existed. That is to say, traditional feeling may give the members of certain families a strong preference, to say the least, in election to office. We have seen that this was the case at Athens; it was largely the case in the democratic cantons of Switzerland ; indeed the nobility of Rome itself; after the privileges of the

patricians were abolished, rested on no other foundation. It is important to bring these historical facts into notice, as they are likely to be con- fused or forgotten among modern practical tendencies the other way. (E. A. F.)

NOCERA INFERIORE, formerly Nocera pEr PAGANt, a city of Italy in the province of Salerno at the foot of Monte Albino, 22$ miles east-south-east of Naples on the railway to Salerno, which lies only 10 or 11 miles distant. In 1881 it had a communal population of 15,858, that of the town was 12,830; but the interest of the place is almost exclu- sively historical.

Nuceria Alfaterna, first mentioned as assisting the Samnites in 315 B.c., was a few years later (808) besieged and captured by Fabius. In 216 Hannibal completely destroyed the city and dis- persed its inhabitants; but the town, having been repeopled at some unknown date, appears again asa flourishing municipium in the time of Cicero. In 73 3.c. it was plundered by Spartacus, and under Augustus it received a Roman colony (Nuceria Constautia), afterwards recruited by Nero. At an early date the city became an episcopal see, and in the 12th century it sided with Innocent II. against Roger of Sicily, and suffered severely for its choice. A colony of Saracens introduced by Frederick II. probably gave rise to the epithet by which it was so long distinguished, as well as to the town of Pagani, which lies about a mile to the west. In 1885 Pope Urban VI. was besieged in the castle by Charles of Durazzo. Nocera was the birthplace of Solimena the painter ; and in the list of its bishops appears the name of Paulus Jovius.

Nocera Inferiore must not be confounded with Nocera Umbria (the ancient Nuceria Camellaria), an old episcopal city 14 milcs from Foligno.

NOD—NOT

NODDY, the name applied, originally by sailors, to a sea-bird from its showing so little fear of man as to be accounted stupid. It is the Sterna stolida of Linnzus, and the Anous stolidus of modern ornithology, having the figure of a TERN (q.v.), and belonging to the sub-family Sternine, but is heavier in flight, with shorter wings and the tail less deeply forked. The plumage is of a uniform sooty hue, excepting the crown of the head, which is light grey. The Noddy is very generally distributed through- out the tropical or nearly tropical oceans, but occasionally wanders into colder

~~climates, and has been met with even in the Irish Sea. It breeds, often in astounding numbers, on low cays and coral-islets, commonly making a shallow nest of sea-weed or small twigs, which may be placed on the ground, on a tuft of grass, or in the fork of a tree, while sometimes it lays its eggs on a bare rock. Mr Saunders (Proc. Zool. Society, 1876, pp. 669-672) admits four other species of the genus :—Anous tenuirostris, supposed to be confined to the southern part of the Indian Ocean, from Madagascar to West Australia ; A. melanogenys, often con- founded with the last, but having nearly as wide a range as the first; and A. lewcocapillus, hitherto known only from Torres Strait and the Southern Pacific. These three have much resemblance to A. stolidus, but are smaller in size, and the two latter have the crown white instead of grey. The fourth species, A. caruleus (with which he in- cludes the A. cinereus of some authors), differs not incon- siderably, being of a dove-colour, lighter on the head and darker on the back, the wings bearing a narrow white bar, with their quill-feathers blackish-brown, while the feet are reddish and the webs yellow. Three more species—A. superciliosus from the Caribbean Sea and Gulf of Mexico, A. plumbeigularis from the Red Sea, and A. galapagensis from the Galapagos —have been added by Mr. Sharpe (Philos. Transactions, clxviii. pp. 468, 469), who also con- siders (Proc. Zool. Society, 1878, p. 272) A. cinereus of the Eastern Pacific to be distinct from A. cexruleus of Australia and the Western Pacific. (A. N.)~~

~~NODIER, Cuarues (c. 1780-1844), a writer of greater intrinsic merit and more importance in the history of French literature than is generally recognized, was born at Besangon somewhat less than ten years before the outbreak of the Revolution, but the exact date is strangely uncertain. Besancon for the place and the 29th of April for the day of the month appear to be agreed upon, but the year is some- times given as 1780, sometimes as 1781, and sometimes as 1783. The earliest seems the most probable. His father was a lawyer of some distinction and had been a teacher of law, and after the outbreak of the Revolution he was appointed mayor of Besangon and consequently chief police magistrate. He seems, from some euphemistic expressions of his friends, to have rather lent himself as an instrument to the tyranny of the Jacobins than to have shared their principles ; but his son was for a time an ardent citizen, and is said to have been a club member when he could at the most have been twelve years~~

~~old. His education in these troublesome times was necessarily haphazard, but appears to have been sufficient. His love of books began very early, and he combined with it, what is not perhaps very often character- istic of the bibliophile proper, a strong interest in natural science. The dates of his early life are given very sparingly, and the chief authority for the details of it is his own Souvenirs, a not very trustworthy source. Having obtained and then lost the post of librarian in his native town, he went to Paris and plunged into literature. He had pub- lished a dissertation on the antennze in insects as early as 1798 at Besancon. Entomology continued to bea favourite study with him, but he varied it with philology and pure literature—Le Peintre de Salzbourg dates from this early period—and even political writing. A "skit" on Napoleon~~

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~~in 1803 got him into trouble, which was not very serious. He was obliged, or thought himself obliged, to quit Paris, and for some years lived a very unsettled life at Besancon, Déle (where he married), and other places. In 1811 he appears at Laibach in the singular character of editor of a polyglot journal, the Jllyrian Telegraph, published in French, German, Italian, and Slav. Then he returned to Paris, and the restoration found him, or made him, an ardent royalist. Literary and journalistic work of all kinds filled up his time, until in 1823 he was appointed to the librarian- ship of the Bibliotheque de |'Arsenal. He was not dis- turbed in this post by the revolution of July, but, on the contrary, was elected a member of the Academy in 1833, and made a member of the Legion of Honour in 1843, a year beforehis death, which happened on 27th January 1844. These twenty years at the arsenal were by far the most im- portant and fruitful of Nodier's life. He had much of the Bohemian in his composition, and the wandering and un- settled life that he had led was more favourable to the cultivation of this feature of his character than to the pro- duction of solid work. His post at the arsenal was not very lucrative, and even after his appointment his way of life is said by some chroniclers not to have been extraordinarily regular. But he had the advantage of a settled home in which to collect rare books (for which he had a real vocation), and to study them ; and, what was of still more importance, he was able to supply a centre and rallying place to a knot of young literary men of greater individual talent than him- self—~~

~~the so-called Romantics of 1830—and to colour their tastes and work very decidedly with his own predilections. Much older than most of them, possessing a literary reputa- tion already formed, though resting on no single work of great importance, with very decided idiosyncrasies and a considerable power of personally influencing his associates, Nodier must be credited with no small part in the making of the men of 1830.~~

~~His own literary work is abundant, but much of it is obsolete, much more mere miscellanies, much injured by hasty production, and some, it is said, is not due to himself. His best and most characteristic work, some of which is exquisite in its kind, consists partly of short tales of a more or less fantastic character, partly of nondescript articles, half bibliographic, half narrative, the nearest analogue to which in English is to be found in some of the papers of De Quincey. The best examples of the latter are to be found in the volume entitled Mélanges tirés d'wne Petite Bibliothéque, pub- lished in 1829 and afterwards continued. Of his tales the best are Smarra (1821), Histoire du Roi de Bohéme et de ses sept Chateaux (1830), La Fée aux Miettes (1832), Inés de las Sierras (1887), Légende de Seur Béatrix (1838), together with some fairy stories published in the year of his death, and Franciscus Colwmna, which appeared after it. The Sowvenirs de Jewnesse (1882), already referred to, are in- teresting but untrustworthy, and the Dictionnaire Universel de la Langue Francaise (1823), a book of considerable merit, which, in the days before Littré, was one of the most useful of its kind, is said to have been not wholly or mainly Nodier's. His chief tales are acces- sible in three or four volumes of the Bibliothéque Charpentier, and the best yield to few things in French for charm of style and especi- ally for the rendering of fantastic and picturesque sentiment, but they are very unequal. There is a so-called collection of Gwvres Completes, in 12 vols., 1882, but at that time much of the author's best work had not appeared, and it included but a part of what was actually published.~~

~~NOETUS, a presbyter of the church of Asia Minor about 230 A.D., was a native of Smyrna, where (or perhaps in Ephesus) he became a prominent representative of the particular type of Christology which is now technically called modalistic monarchianism (see vol. xvi. p. 719). His views, which led to his excommunication frem the Asiatic church, are known to us~~

chiefly through the con- troversial writings of Hippolytus, his contemporary.

NOIRMOUTIER, an island of France belonging to the department of Vendée, and protecting the Bay of Bourgneuf on the south-west. Between the island and the mainland is a sandbank laid bare at low water, and crossed by an embankment and carriage road, which is continually kept

in good repair. It was not till about 1766 that people found they could walk across to the island, which hes from north-north-west to south-south-east, and is 11 miles long, its breadth varying from 1 mile in the south part to 3 or 4 miles in the north. It appears to be formed of alluvial deposits gradually accumulated round a rock of no great size situated at the meeting-place of the Gascony and Brittany currents. The area now amounts to 18 square miles, of which about a sixth part is occupied by dunes. The total population was 7726 in 1881. There are two communes: Noirmoutier and Barbatre. The former has about 2029 of its 5908 inhabitants gathered together in a little town with narrow and winding streets. Its castle was once the residence of the abbot of Her. In the church there is a crypt of the 11th century. A mile to the north of the town les a pleasant watering-place, rendered pictur- esque by the La Chaise woods (evergreen oaks and pines), and a grand confusion of rocks, among which the sea has scooped out many a delightful little beach.

A dolmen, several menhirs, and the ruins of a Gallo-Roman villa with its hot baths show that the island must have been occu- pied at an early date; but the first fact in its recorded history is the foundation of the Benedictine monastery of Her by St Philibert about 680. From this monastery the name Noirmoutier (Moustier) is derived, It had already attained to great prosperity when it was pillaged by the Normans in 825 and 848. In 1205 the abbey of Notre Dame la Blanche was built at the north extremity of the island to take the place of a Cistercian convent established in the

le du Pilier, at that time attached to Noirmoutier by a dyke. This abbey was ruined by the Protestants in 1562. In 1676 the island was captured by the Dutch. Having been seized by Charette dur- ing the war of Vendée, it was

~~recovered by the republican general, Haxo, who caused the Vendean leader, d'Elbée, to be shot.~~

~~NOLA, a city of Italy in the province of Caserta (Terra di Lavoro), is pleasantly situated on the plain between Mount Vesuvius and the Apennines, 14 miles east-north- east of Naples on the road to Avellino, and 203 miles south-west of Cancello on the railway to the same town. The more conspicuous buildings are the ancient Gothic cathedral (restored in 1866), with its lofty tower rebuilt since the fire of 1860, the cavalry barracks, the ex-convent of the Capuchins at a little distance from the city, and the seminary in which is preserved the famous Oscan inscrip- tion known as the Cippus Abellanus (from Abella). Tivo fairs are held in Nola, on 14th June and 12th November ; and the 26th of July is devoted to a great festival in honour of St Paulinus, one of the early bishops of the city. The population of the city was 10,771 in 1871, and 8489 in 1881; that of the commune 11,395 in 1871, and 11,931 in 1881.~~

~~Nola (N&da) was one of the oldest cities of Campania. At the time when it sent assistance to N. eapolis against the Roman inya- sion (328 B.c.) it was probably occupied by Oscans in alliance with the Samnites ; but it had evidently passed through an Etruscan period, and had possibly received a Greek colony from Chalcis. The Romans made themselves masters of Nola in 313 8.c. In the Second Punie War it thrice bade defiance to Hannibal ; but in the Social War it was betrayed into the hands of the Samnites, who kept possession till Marius, with whom they had sided, was defeated by Sulla. Whatever punishment Sulla may have inflicted, Nola "remained a municipium, with its own institutions and the use of the Oscan language." Ata later date it became a Roman colony. Marcus Agrippa and Augustus died at Nola. Sacked by Genseric in 455, and by the Saracens in 806 and 904, captured by Manfred in the 13th ceutury, and damaged by earthquakes in the 15th and 16th, Nola lost much of its importance. The remains of two great amphitheatres deseribed by Ambrosio Leone in the first part of the 16th century were used by Carlo Caraffa and Orso Orsini in 1664 to build their palaces in Naples and Nola. Giordano Bruno and the sculptor Giovanni Marliano were natives of the city; and some of the latter's works are preserved in the cathedral.~~

NOLLEKENS, Josepn (1737-1823), sculptor, was born I1th August 1737 in London, where his father, a native of Antwerp, the "old Nollekens" of Horace Walpole, was a painter of some repute. In his thirteenth year he entered the studio of the sculptor Scheemakers, and practised

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drawing and modelling with great assiduity, ultimately gaining various prizes offered by the Society of Arts. In 1760 he went to Rome, and he executed a marble bas- relief, Timoclea before Alexander, which obtained a prize of fifty guineas from that society in 1762. Remunerative commissions began to come in, Garrick and Sterne being among the first English visitors who sat to him for busts ; among his larger pieces belonging to this early period perhaps the most important is the Mercury and Venus chiding Cupid. Having returned to England in 1770, he was admitted an associate of the Royal Academy in 1771, and elected a member in the following year. By this time he had become known to George HL, whose bust he shortly afterwards executed, and henceforward, until about 1816, he was continually and very profitably employed as the most fashionable portrait sculptor of his day. His busts were on all hands acknowledged to be excellent likenesses, and there was generally a softness in the expression and a gracefulness in the handling which never failed to please. He himself thought highly of his early portrait of Sterne. Among many others may be specially named those of Pitt, Fox, the prince of Wales (afterwards George IV.), Canning, Perceval, Benjamin West, and Lords Castlereagh, Aberdeen, Erskine, Egre- mont, and Liverpool. He also found leisure to elaborate a number of marble groups and statues, amongst which may be mentioned those of Bacchus, Venus taking off her Sandal, Hope leaning on an Urn, J uno, Petus and Arria, Cupid and Psyche, and (his own favourite performance) Venus anointing Herself; all, however, although remarkable for delicacy of workmanship, are deficient in vigour and originality, and the drapery is pecuharly weak. The most prominent personal character- istic of Nollekens seems to have been his frugality, which ultimately developed into absolute miserliness. He died in London on 23d April 1823, leaving, it is said, a fortune of some £200,000.

NOLLE PROSEQUI (sometimes shortened into nol. pros.) is a technical term of English law, the meaning of which varies as it is used with reference to civil or criminal cases. In civil cases it applies only to actions in the Queen's Bench Division, and there signifies a formal under- taking by the plaintiff that he will proceed no further with the action (se wlterius nolle prosequr). The more modern practice in such cases is to proceed by way of discontinuance. In: proceedings either by indictment or by information, a nolle prosegur or stay of proceedings may be entered by the attorney-general. The nolle prosequi is a matter purely for his discretion, and will not be granted unless very good ground be shown for his interference. The object of it generally is to obtain a stay of proceedings against an accomplice in order to procure his evidence. This object is, however, more usually effected by the prosecution offer- ing no evidence and the judge directing an acquittal.

In America the term bears the same meaning as in England, with one exception. The attorney-general has not the same discretion with which English law invests him. Although in some States the prosecuting officer, may enter a nolle prosequi at his discretion, in others the leave of the court must be obtained.

NOLLET, Juan Anvorns, French physicist, was born at Pimpréz (now in Oise) on 19th November 1700, and died at Paris in 1770. He was of peasant origin, and was educated for the church, entering holy orders and ulti- mately attaining the rank of abbé; but his tastes all lay in the direction of experimental research, especially on the subject of electricity (see vol. viii. p. 6). In 1734 he was admitted a member of the London Royal Society, four years later he entered the Academy of Sciences at Paris, and in 1753 he was appointed to the newly-instituted

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chair of experimental physics in the Collége de Navarre. Nollet's strength lay in popular exposition rather than in profound investigation, but he cannot be denied the credit of having greatly helped by his influence and example the cause of electrical science.

NOMANSLAND. See Karrraria, vol. xiii. p. 817.

NOMINALISM. See Scuonastic PHILOSOPHY.

NONCONFORMITY, Law rexatine to. The history of the gradual relief of nonconformists in England from their disabilities will be found under ENGLAND, and under the heads of the various denominations, e.g., BAPTISTS, INDEPENDENTS, METHODISM, QUAKERS, &c. See also Oatus. It is proposed here to note simply the present legal aspects of nonconformity apart from its history, that is, the matters in which the law as to nonconformists still differs from that applicable to members of the Church of England. The differences may be conveniently grouped under six heads.

(1) Judicial notice. The courts, both temporal and spiritual, take judicial notice of the tenets and authorities of the Church of England, the crown being head of the law and of the church. Where the tenets and authorities of a nonconformist body come in question, they must be proved by evidence. By Lord Lyndhurst's Act, 7 and 8 Vict., c. 45, where no particular religious doctrine or mode of worship has been prescribed by the deed or instrument of trust the usage of the congregation for twenty-five years is to be taken as conclusive evidence of the doctrine and worship which may be properly observed in such meeting-houses. (2) Tribunal. Offences against the law ecclesiastical (not being crimes) committed by clergy of the Church of England as a rule come by letters of re- quest from the bishop of the diocese before the Arches Court of Canterbury or the Chancery Court of York (of both of which the same person is now judge). Similar matters arising in noncon- formist bodies can only be tried by the ordinary secular courts, and generally depend upon the question whether a minister has done any act which is not in accordance with the rules governing the par- ticular body of which he is a minister. A nonconformist body is in law nothing more than a voluntary association, whose members may enforce discipline by any tribunal assented to by them, but must be subject in the last degree to the courts of the realm. Brawling in a church by a person in holy orders is an offence within the Church Discipline Act, 8 and 4 Vict., c. 86, and falls under the cognizance of the spiritual courts ; similar conduct by a nonconformist minister in his own place of worship can only be punished as an offence under 9 and 10 Vict., c. 59. (8) Status of ministers. A noncon- formist minister is not in holy orders, and his chapel is not a con- secrated

building. His status is, however, recognized to a limited extent. By the Toleration Act, 1 Will. and M., c. 18, a minister, preacher, or teacher of a nonconformist congregation is exempt froin certain parochial offices, as that of churchwarden. He is also exempt from serving in the militia or on a jury. These privileges only attach where the place of worship of which he is a minister has been duly registered, 18 and 19 Vict., c. 81, unless in the case of bodies subject to special legislation, as Quakers. Registration is not required in the ease of consecrated buildings. By 45 and 46 Vict., c. 50, s. 12, a nonconformist minister eannot be elected an alderman or councillor. He cannot take a degree in divinity at Oxford, Cambridge, or Durham, 34 and 35 Vict., c. 26, and so is debarred from holding any professorship of divinity in those universities. (4) Marriage. Marriage by a person in holy orders was probably necessary at common law, at any rate from the Reformation up to 1836. (See Marrrace.) And from the date of Lord Hardwicke's Marriage Act, 26 Geo. II., c. 88 (1758), up to 1836 the ceremony must have been performed in a consecrated building. The first Act of Parliament that relieved dissenters (other than Jews and Quakers) from these restrictions was the Marriage Act of 1836, 6 and 7 Will. IV., ¢. 85. Since that Act the eeremony of marriage may be performed in a nonconformist place of worship, but it must be after due notice to the superintendent registrar and in his presence or in that of a registrar, and the build- ing must be one that is duly certified for marriages. These pre- liminaries (except the first, and that only where the marriage is not by banns, licence, or special licence) are not necessary where the marriage takes place in a church. Marriage by banns, licence, or special licence cannot take place except inachurch. (5) Burial. By the Burial Laws Amendment Act, 1880, 48 and 44 Vict., c. 41, burial may take place in a churchyard without the rites of the Church of England. But in such a case notice must be given in a specified form, which is unnecessary where the burial service is conducted by a clergyman of the Church of England. (6) Parish ofices. By 1 Will. and M., c. 18, s. 5, a dissenter chosen church- warden and scrupling to take the oaths may execute his office by

deputy. His acceptance of office is made optional by the Act; there is nothing to prevent his discharging it if he see fit todo so. This seems to be

~~still the law, although a declaration was substituted for the oath by 5 and 6 Will IV., c. 62, s. 9.~~

~~The Colonies.—In crown colonies ecclesiastical jurisdiction may be conferred by the sole authority of the crown. In colonies which have parliamentary representation the crown cannot give to a metropolitan bishop jurisdiction or coercive legal authority over suffragan bishops or over any other person. In colonies of the former kind the Church of England may still preserve the privileges which attach to her in the mother country; in colonies of the latter kind she is in the same position as any other religious body, simply a voluntary association. Since the Irish Church Act, 1869, 32 and 33 Vict., c. 42, the Church of Ireland has been practically in the same position as the Church of England in colonies which have representative government.~~

~~NONJURORS in English history are the small minority of the beneficed clergy who incurred the penalties of sus- pension and deprivation for refusing to swear allegiance to William and Mary in 1689, The party, which was headed by Archbishop Sancroft and Bishop Ken, with five other members of the episcopal bench, included such men as Jeremy Collier, George Hickes, William Sherlock, Charles Leslie, and Henry Dodwell. See ENGLAND, vol. vi. p. 378.~~

~~NONNUS, Greek epic poet, author of the Dionysiaca, was a native of Panopolis in the Egyptian Thebaid. He can scarcely have been earlier than the 5th century of our era, but probably wrote in the first half of it, as his versi- fication is imitated by Proclus, who was born 412 a.pD, Nothing is known of his personal history, but his extensive mythological erudition almost proves him to have been a grammarian. His principal work, the Dionystaca, an epic in forty-eight books on the history of Bacchus, is a vast storehouse of legendary fable, embellished, especially in the long episode of Bacchus's Indian expedition, with not a little of the poet's own invention, From one point of view it may be described as the swan-song of the ancient mythology ; its spirit, at the same time, is anything but Hellenic. In its vast and formless luxuriance, its beau- tiful but artificial versification, its delineation of action and passion to the entire neglect of character, it resembles the colossal epics of India, while its glittering but too often frigid~~

~~conceits bring it near to the Italian bastard epic of Marino and his school. Like his countryman and near contemporary Claudian, Nonnus is a writer of copious learning and still more copious fancy, eminent in inven- tion, in description, and in melody, whose faults may be charged upon his age, while his merits are his own. This is more particularly the case with the author of the Dionysiaca, whose reforms in versification originated with himself, while they were accepted by all succeeding poets. In his hands, says Hermann, the Homeric hexameter, greatly corrupted by time and licence, though losing some- thing of its dignity, recovered its elegance and harmony, and was framed to so strict a pattern that no one ignorant of prosody could henceforth attempt to write an epic. His influence on the vocabulary of his successors was likewise very considerable. We also possess under his name a paraphrase of the Gospel of St Jolin, which is chiefly interesting as apparently indicating that, notwith- standing his mythological lore, Nonnus conformed to Christianity. The style is not inferior to that of his epic, but, employed in embellishing the simple narrative of the evangelist, it produces an impression of extreme bombast and want of taste.~~

~~The first edition of Nonnus was published by Falkenburg at Antwerp in 1569 from a MS. procured at Taranto by Sambucus, an Hungarian. The standard edition is Graefe's (Leipsic, 1819-26) ; but the most useful is that by Count de Marcellus (Paris, 1856), accompanied by valuable notes and prolegomena, and a French prose translation. The analyses by Ouvaroff (St Petersburg, 1817) and Koehler (Halle, 1853) are useful aids to the study of so long and intricate a poem. The paraphrase on St John is edited~~

~~D034 by Passow (1834), by Marcellus (1861), and in Migne's Patrologia.~~

~~For Nonnus's metrical innovations see Hermann, Orphica, pp. 869-691; and Lehrs, Quastiones Hpice.~~

~~NONPAREIL, the name under which, from its sup- posed matchless beauty, a little cage-bird, chiefly imported from New Orleans, has long been known to English dealers (cf. Edwards, Gleanings, i. p. 132). It is the Emberiza ciris of Linnzus, and the Cyanospiza cirts of most recent ornithologists, belonging to a small group, which, in the present state of knowledge, cannot with certainty be referred either to the Buntings or to the Finches, while~~

some authors have regarded it as a TANAGER (g.v.). The cock has the head, neck, and lesser wing-coverts bright blue, the upper part of the back yellow, deepening into green, and the lower parts generally, together with the rump, bright scarlet, tinged on the latter with purple. This gorgeous colouring is not assumed until the bird is at least two years old. The hen is green above and yellow beneath ; and the younger cocks present an appearance intermediate between the adults of both sexes. The species, which is often also called the Painted Bunting, after wintering in Central America or Mexico, arrives in the southern States of the American Union in April, but does not ordinarily proceed to the northward of South Carolina. In Louisiana, where it is generally known to the French-speaking inhabitants as the Pape—as it was to the Spaniards of Florida as the Mariposa pintada (painted butterfly)—it is said to be very abundant; and on its appearance in spring advantage is, or was, taken of the pugnacious disposition of the males (which so often accompanies a brilliant sexually-distinct plumage) to cap- ture them alive in great numbers by means of the stuffed skin of one so placed in connexion with a cage-trap that they instantly fall into the latter on attacking what they conceive to be a rival. In this way many thousands are said to have been taken formerly. The prisoner usually reconciles himself to his fate, and in a few days will utter his sprightly though not very powerful song ; and, if pro- vided with a mate and proper accommodation, will breed and rear a family in confinement. Belonging to the same genus as the Nonpareil is the Indigo-bird, Cyanospiza cyanea, which, as a summer visitant, is widely diffused from the Missouri to the Atlantic, and extends into the provinces of Ontario and New Brunswick, being every- where regarded with favour. Though wanting most of the bright hues of its congener, the Indigo-bird has yet much beauty, the adult cock being nearly all over of a deep blue, changing, according to the light, to green. The hen is brown above and ochreous-white beneath. This species is represented in the western part of the con- tinent by the Lazuli-Finch, C. amena, the male of which has the upper parts greenish-blue, the wings barred with white, a pectoral band of light chestnut extending to the flanks on each side, and the lower parts white. Of the three remaining species of the genus, C. versicolor shows in the male a plumage beautifully varied with brownish- red, violet, and blue; C. leclanchert is bluish-green above and yellow beneath, with an orange breast ; while C. rositex, though quite distinct, comes nearest in coloration to C. curtis,

~~‘These three have a more southern range than the other three ; but the first of them is believed occasionally to cross the Mexican frontier into the United States. None of the species of Cyanospiza are thought to occur further south than the isthmus of Panama. (A. N.)~~

~~NONSUIT (i.¢., non suit, he does not pursue) is the name given to a judgment whereby an issue is determined against the plaintiff. It was a term peculiar to the English com- mon-law courts before the Judicature Acts, and was simply the expression of the opinion of the court that, apart from the merits, the plaintiff’s case was incomplete. It did not~~

~~and Maubeuge.~~

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~~in any way act as a bar to his bringing another action for the same cause. It might be entered either at the wish of the plaintiff himself (to whom it was of course much more beneficial than judgment for the defendant) or by direction of the court against the will of the plaintiff. The matter now is of no great importance, for, although judgment of nonsuit still exists, it has, since the Judicature Acts, the: same effect as a judgment on the merits, unless the court otherwise directs. This effect of a nonsuit was specially provided for by the rules of the Supreme Court of 1875. The rules of 1883 do not deal with nonsuit, but no doubt the practice which has existed between 1875 and 1883 will still be followed.~~

~~NOODT, GerwarD (1647-1725), a celebrated jurist, was born at Nimeguen in 1647. He began his studies in his native town, continued them at Leyden and Utrecht, and finished them at Franeker, where he took his doctor’s degree in law. After passing through successive grades of promotion he was ultimately appointed to a law chair at Leyden. It was in the character of a writer on juris- prudence, however, that he acquired his reputation. His Latin style, modelled after the best writers, was pure and precise ; he had, for his time, an intimate acquaintance with the laws, manners, and customs of ancient Rome; his speculations were guided by a simple desire for truth, and his political opinions animated by a spirit of unusual toler- ation. His numerous works, as they successively appeared, soon rose to the rank of standard authorities. Two of his political treatises were translated into~~

~~French by Barbey- rac, and appeared at Amsterdam in 1707 and 1714, under the respective titles of Pouvoir des Souverains and Liberté de Conscience ; and his jurisprudential writings, to which he was still adding when cut off in 1725, were held in high estimation, not in Holland only, but also in Germany and Scotland, till quite the end of last century. The first, edition of his collected works was published at Leyden in 1724, and the last in 1767. That of 1735 and those sub- sequent contain a life of the author by Barbeyrac.~~

~~NORD, the most northern of the departments of France, formed out of Flanders, French Hainault, and the district of Cambrais (Cambrésis), lies between 50° and 51° 6' N. lat., and between 2° 5' and 4° 15' E. long., but in such a way that, while it has a length from south-east to north-west of 112 miles, its breadth is nowhere more than 40 miles, and contracts to 4 at the point where it is crossed by the Lys. Bounded N.W. and N. for 21 miles by the North Sea, it has the Belgian provinces of West Flanders and Hainault on the N.E. and E., the departments of Aisne and Somme on the §., and that of Pas-de-Calais on the W. The Flanders portion to the west of the Scheldt is very flat, the hill at Cassel, only 575 feet high, rising like a mountain, and looking north towards Dunkirk over a stretch of 155 square miles of richly fertile lowlands, which about a thousand years ago were still covered by the sea. To the south-east of the Scheldt the country has the char- acter of the neighbouring district of Ardennes, is better wooded, and contains the highest point in the department (875 feet). The greater part of Nord is in the Scheldt basin, but certain portions belong to those of the Sambre (Meuse), the Oise (Seine), and the little coast-streams the Aa and the Yser. The Scheldt, flowing by Cambrai, Bouchain, Valenciennes, and Condé, receives the Scarpe, which touches Douai, Marchiennes, and St Amand. The Lys, which does not join the Scheldt till it has entered Belgium, passes Armentitres, and receives the Deule, on which Lille is situated. The Sambre passes Landrecies The Aa falls into the port at Gravelines. The climate of Nord is colder than that of France in**

general, the mean temperature being 49° or 50° Falir. The rainfall is 12 inches at Dunkirk and a little more

at Lille. In the arrondissement of Avesnes, rain is more abundant, and cold more severe. In population (1,603,259 inhabitants in 1881) and in agricultural and industrial im- portance Nord is second only to the department of the Seine.

Of the total area (2193 square miles), two-thirds are arable, one- sixth under pasture, and one-eleventh consists of forest. The live- stock comprises 93,000 horses, asses, and mules, 240,000 cattle, 125,000 sheep, 78,000 pigs, 29,000 goats, and 75,000 dogs. The grain crops yield about 19,250,000 bushels, potatoes about half as much. Beetroot, flax, tobacco, chicory, colza, rape-seed, and hops are all of importance. The natural pastures support a good breed of Flemish cows. Stone, marble, clay, and sand are obtained in the department ; but its mineral wealth lies rather in its coal-pits, for the most part belonging to the Anzin Company, which employs 20,000 workmen, and raises 34 million tons per annum. Tron mines also are worked in the arrondissement of Avesnes. The best mineral waters are those of St Amand. There are numerous foun- dries, rolling-mills, steel-works, file-works, agricultural implement factories, and engineering works. More than 240,000 tons of pig- iron and 279,000 tons of malleable iron, cast iron, rails, sheet-iron, and Bessemer steel were produced in 1881. Copper foundries and zinc rolling-mills also exist. Spinning is more extensively prose- cuted in Nord than in any other department, Lille and its suburbs being the principal seat of the industry. About 12,000 persons are employed in flax and tow spinning, 8000 in cotton spinning, and 4000 to 5000 in the manufacture of sewing-thread. Roubaix and Tourcoing spin wool, cotton, and silk. Jute spinning employs more than 20,000 bobbins at Dunkirk. In Roubaix alone there are upwards of 300 weaving factories; carpets (Toureoing and Roubaix), linen (Armentiéres), ribbons, damask, muslins, tulles, laces, &c., are all largely manufactured, and there are also sugar- factories, distilleries, oil-works (scattered throughout the depart- nent), 1000 breweries, glass-works, soap-works, dye-works. The ex- ports of the department comprise corn, fruit, .cggs, vegetables, and butter to England, oil-cake, linseed, oils, colza seed. Consuming 4,500,000 tons of coal, it has to supplement its own production by importing from Pas de Calais, Belgium, or England. Most of the foreign trade passes through Dunkirk, a much larger port than Gravelines. Abundant means of transit exist throughout the department. The total length

of the navigable rivers and canals is 325 miles, and railways to a total length of 450 miles have been constructed between all the most important localities.

Nord forms the archiepiscopal diocese of Cambrai, is comprised in the first or Lille region of corps d'armée, and depends on the court of appeal at Douai. It is divided into seven arrondissements (Avesnes, Cambrai, Douai, Dunkirk, Hazebrouck, Lille, and Valen- ciennes), 61 cantons, and 663 communes. The number of com- munes of importance especially for their industries is very large—St Amand les Eaux (11,184 inhabitants), with mineral waters and an old abbey; Anzin (10,048), near Valenciennes; Armentiéres (25,089); Bailleul (12,712), with antiquities; Bavai (1863), the ancient Bagacum; Bergues (5385), with its old fortifications and a splendid belfry of the 16th century ; Bouvines (565), with an obelisk in memory of the victory of Philip Augustus in 1214 ; Cassel (4276) ; Le Cateau Cambrésis (9564) ; Condé (4621), a fortified town with coal-mines ; Cysoing (3160), with a monument of the battle of Fon- tenoy (1745); Denain (17,202), with coal-pits, iron-works, and a monument of Villars's victory (1712); Fourmies (15,052), with spinning and weaving of woollen goods; Gravelines (8416) ; and Landrecies, a garrison town on the Sambre.

NORDERNEY (:.c., northern island), the most import- ant of the fringe of sand-islands along the coast of East Friesland, belongs to the Prussian province of Hanover. It is 8 miles long and about 1 mile broad, and supports a seafaring and fishing population of (1880) 2114 souls, of genuine old Frisian stock. The village at the south-west end of the island is one of the most popular sea-bath- ing places in Germany, and is visited annually by 9000 visitors, for whose accommodation numerous hotels and lodging-houses have been built. On the south side rises a lighthouse 175 feet high. At low tide Norderney may be reached from the mainland by driving or walking.

NORDHAUSEN, a flourishing town in Prussian Saxony, in the district of Erfurt, is situated on the Zorge, at the south base of the Harz mountains, and at the west end of the Goldene Aue (Golden Plain), a fruitful valley watered by the Helme. It is built partly on the slope of the mountains and partly on

the plain, and the upper and lower parts of the town are connected by flights of steps. Among the churches the most noteworthy are the cathedral,

a late Gothic edifice with a Romanesque crypt, and tlie

church of St Blasius, containing two pictures by Lucas Cranach. Near the medizval town-house stands a Roland's column, the ancient symbol of free commercial intercourse and civic liberty. The chief importance of the place arises from its distilleries, which yearly produce about 8,000,000 gallons of brandy. The breweries are also important, and there are manufactures of leather, tobacco, cotton and linen goods, carpets, chicory, and chemicals. Nordhausen is sometimes called the Cincinnati of Germany on account of its extensive export trade in pork, corned beef, ham, and sausages. In 1880 it contained 26,198 inhabitants, of whom 23,943 were Protestants, 1255 Roman Catholics, and 494 Jews.

Nordhausen, one of the oldest towns in North Germany, was surrounded with walls in the 10th century, and is spoken of as a free imperial town in 1220. Several diets, tournaments, and assemblies of princes were held here during the 12th, 13th, and 14th eenturies. It appears to have usually placed itself under the pro- tection of a prince of the empire, and in 1697 we find the elector of Brandenburg selected for this purpose. It was annexed to Prussia in 1803 and again finally in 1815, having in the interim belonged to the kingdom of Westphalia.

NORDLINGEN, a town of West Bavaria in the district of Schwaben und Neuburg, is situated on the Eger, 40 miles to the north of Augsburg. It was formerly an imperial town, with an independent territory of 35 square miles in extent, and is still surrounded with walls and towers. The most interesting buildings are the Gothic Haupt- kirche and the late Gothic town-house, both of which con- tain paintings by Schaufelein, who was a native of Nord- lingen. There are here manufactures of carpets (sold as Tyrolese carpets), linen and woollen goods, and agricul- tural implements ; and a brisk trade is carried on in geese, goose feathers, cattle, and grain. In 1880 the population was 7837, including 6990 Protestants.

~~From 898, when we first find it mentioned, down to 1215 Nord- lingen was subject to the bishop of Ratisbon ; but soon after the latter date it acquired the freedom of theempire. It was annexed to Bavaria in 1803. Two battles were fought near Nordlingen during the Thirty Years' War, in the former of which (1634) the Swedes sustained their first defeat on German soil, losing 12,000 men. A full account of these battles is given by Colonel Malleson in the Army and Navy Magazine, November 1883.~~

~~NORFOLK, an eastern maritime county of England, Plate is bounded N. and E. by the North Sea, S.E. and 8. by XVI~~

~~Suffolk, S.W. by Cambridge, and W. by Lincoln. It is of an irregular oval form, its greatest length east and west being 67 miles, and its greatest breadth about 42 miles. The area is 1,356,173 acres, or 2119 square miles.~~

~~Coast-line.—Nearly two-thirds of the boundary of the county is formed by tidal water. There are few bays or inlets, and on the northern coast no river mouths. For the most part the coast-line is flat. and low, and has been greatly encroached on by the sea, several villages having been engulfed since the time of William the Conqueror. From the mouth of the Yare to Happisburgh the shore is low and sandy and is skirted by sandbanks. Thence for 20 miles it is formed of cliffs consisting of clay and masses of embedded rocks, the average height being about 50 feet, although in some cases an altitude of 200 feet is reached. 'These cliffs are succeeded by a low shingly or sandy coast stretching as far as St Edmund's Point. The shores of the Wash are formed of mudbanks, whicli are left dry at low water. West of Lynn a considerable extent of land has within recent years been reclaimed from the sea, and farther south an old Roman embankment stretches into Lincolnshire. At various points off the coast there are submarine forests, especially in Brancaster Bay and in the neighbourhood of Cromer and Happisburgh. Fossilized remains of large mammals are sometimes dragged up by the nets of fishermen, and mammoth tusks measur- ing from 6 to 9 feet have been found at Knole Sand off Happisburgh.~~

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~~Surface and Greology.—The surface is principally an undulating plain with rising grounds skirting the river valleys and low chalk downs in the north~~

~~and north-west. On the west along the Cambridgeshire border there is a stretch of fen land extending from Welney and Hilgay fen to the Wash. The watershed is nearly in the centre of the county. The principal rivers are the Yare, in the east, with its tributaries, the Bure, the Wensum, and the Waveney ; and the Ouse, in the west, with its tributaries, the Little Ouse, the Wissey, and the Nar. The Yare and its tributaries frequently expand near the sea into broads or meres, covered for the most part by sedges and bulrushes, which afford shelter for a great variety of water-fowl, including the water-hen, wild duck, heron, bittern, king- fisher, mallard, snipe, and teal. The Yare is navigable for small vessels as far as Norwich, the Waveney to Beccles, and the Bure to Aylsham. The Ouse is tidal to Denver, and its tributaries are all to some extent navigable.~~

~~Nearly the whole of Norfolk is occupied by chalk, but on account of drift deposits it forms a comparatively small proportion of its surface. It exists in three forms: chalk marl, which forms part of Hunstanton cliff; lower or hard chalk, much used in west Norfolk for the construction of cottages ; and upper chalk, or chalk with flint, which con- stitutes the bulk of the formation. The other members of the Cretaceous system in Norfolk are gault and lower greensand, which crop out beneath the chalk to the west of the county, and are succeeded by the Kimmeridge clay of oolitic age, which stretches along the coast of the Wash from Hunstanton to King's Lynn, and south nearly to Downham. The Tertiary formation is represented by bands of sand, clay, and shingle in the neighbourhood of Norwich, which contain a fine series of fossils. The drift deposits include the lower glacial beds in the north-east, stretching south to the Yare and Wensum, the middle glacial beds in the neighbourhood of Yarmouth, and the upper glacial beds, consisting of boulder clay, occupying the centre, south, and south-west of the county. A considerable extent of surface is covered by valley gravels. In west Norfolk they occupy sometimes the old beds of rivers which flowed nearly at right angles to those of the present day. In these gravels many flint implements have been found. The fen beds in the south-west were at one time nearly all under water, but this has been carried off by a system of drainage first begun in the reign of Charles I.~~

~~The county is not rich in minerals. It is supposed that beds of coal may probably exist at a depth of 1500 feet. Lime and chalk for building are~~

plentiful. Potter's clay and good brick earth are obtained. In the fen dis- trict there is still a supply of peat. Marl is found in the valley of the Bure, and sand suitable for the manufacture of glass in the neighbourhood of Snettisham.

Climate and Agriculture.—On account of the exposed position of the coast to east and north-east winds, the climate, especially in winter and early spring, is much colder than in the adjacent counties. The air is, however, generally dry, and unhealthy fogs are not common, except in the marshy districts. Norfolk contains a greater variety of soil than any other county in England. In the north and west the soil is generally chalky ; towards the south- east it is a light sand, assuming occasionally the form of blowing sand, but elsewhere capable of cultivation and of average fertility. In the centre and east the prevailing soil is loam of a very varying quality, elnefly light and work- able, but sometimes composed of stiff chalky boulder clay. Alluvial clays and loams occur on the borders of Lincolnshire and Cambridgeshire, and stretch along the river valleys. The marsh lands along the coast are so subject to inunda- tion as to make cultivation difficult ; they afford, however, capital pasturage for stock.

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Notwithstanding the natural defects of soil, farming is in a very advanced condition, and, by means of draining, subsoil ploughing, skilful rotation, and the liberal use of artificial manures and feeding stuffs, excellent crops are raised in many districts of the county. The farms are for the most part large and the farm buildings superior. The prevailing system of tenure in west Norfolk is by leases ranging from seven to twenty-one years; in other parts of the county yearly agreements mostly prevail. Accord- ing to the agricultural returns of 1883, the area of cultiva- tion was 1,087,270 acres,—a percentage of about 80 of the total area. Corn crops occupied 438,273 acres, green crops 202,060, rotation grasses 166,891, permanent pasture 264,938, and fallow 15,051. About seven-eighths of the area under corn crops is occupied by wheat and barley, the areas of the two being pretty nearly equal, 179,270 acres and 196,483 acres respectively in 1883, while oats occupied only 32,307 acres. As much attention is paid to the graz- ing of cattle and to the rearing and fattening of sheep, turnips and swedes are

~~extensively grown — occupying 135,116 acres in 1883—while mangolds occupied 46,442 acres, and vetches 11,868 acres, but potatoes only 5269 acres,~~

~~The number of horses in 1883 was 62,613, of which 44,232 were used solely for agricultural purposes. Cattle in the same year numbered 117,497, of which 29,040 were cows and heifers in milk or in calf. Large numbers of lean cattle, principally Irish shorthorns, are brought into the county mainly for winter grazing. The old Norfolk polled stock has been recently revived and is now recog- nized as a distinct breed. Good pasture lands are found in many districts of the county, especially along the river- beds and in the neighbourhood of the fens. Sheep in 1883 numbered 559,146, and pigs 111,349.~~

~~According to the latest return the total number of proprietors in the county was 26,648, possessing 1,234,884 acres, yielding an annual rental of £2,403,795. The estimated extent of common or waste lands possessed by no owner was 12,870 acres. Of the owners 16,552, or about 60 per cent., possessed less than one acre. Eleven proprietors possessed upwards of 10,000 acres—viz., earl of Leices- ter, 43,025; Marquis Townshend, 18,130; marquis of Cholmondeley, 16,995; Rev. H. Lombe, 13,832; Lord Hastings, 12,738; earl of Orford, 12,341; Lord Walsingham, 11,983; Lord Suffield, 11,829; Sir Thomas Hare, 11,033; earl of Kimberley, 10,801 ; Anthony Hainond, 10,039.~~

~~Manufactures.—At an early period Norfolk was one of the princi- pal seats of the cloth trade in England, worsted deriving its name from having been first manufactured at Worstead. The weaving of silk and wool is still carried on at Norwich and also shawl weaving, although the staple trade of the town is now boots and shoes. Silk is also manufactured at Yarmoutli, Wymondham, and North Walsham. Flour-mills are numerous all over the county, and there are agricultural implement works at Norwich, Lynn, Thetford, East Harling, North Walsham, Walsingham, and Kast Dereham. Lime- burning, brick- making, tanning, malting, and brewing are carried on in various districts. The extensive mustard and starch works of Colman & Co. are at Norwich. One of the chief hindrances to the commercial progress of the county is the dangerous nature of the sea-coast, and its unsuitability~~

~~for the formation of harbours. A large trade is carried on, however, at Yarmouth, which is the outlet for the produce of a very extensive district. The other principal port is Lynn, and there is a small trade at Burnham, Cromer, and Wells. The exports are chiefly agri- cultural produce, fish, and manufactured goods, and the imports timber, oil-cake, and provisions. Yarmouth possesses one of the most important herring-fisheries in England.~~

~~Railways.—The county is intersected in all directions by lines of the Great Eastern Railway, and more recently by the Eastern and Midland Railway.~~

~~Administration and Population.—Norfolk comprises 38 hundreds, the city of Norwich (87,842), the municipal borough of King's Lynn (18,539), the principal part (37,151) of Great Yarmouth (46,159), and the principal part (3228) of Thetford (4032), both of which extend into Suffolk. There are also seven urban sanitary districts—Diss (3846), Downham Market (2633), East Dereham (5640), North Walsham (3234), Swaffham (3643), Thetford (4032), and Wells (2645). The county has one court of quarter-sessions and is divided into twenty-five petty and special sessional divisions.~~

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~~The city of Norwich and the boroughs of King's Lynn and Great Yarmouth have their own police. One parish, a part of a parish, and a part of an ecclesiastical district are in the diocese of Ely, a part of a parish in the diocese of Lincoln, and the rest of the county in the diocese of Norwich. The county contains 736 parishes, with parts of nine others. For parliamentary purposes it is divided into North Norfolk, South Norfolk, and West Norfolk, each division returning two members; and two members are also returned for the parliamentary boroughs of Norwich city in the southern division and of King's Lynn in the western division. The population in 1801 was 273,371, which in 1821 had increased to 344,365, in 1851 to 442,714, in 1871 had decreased to 488,656, and in 1881 had risen again to 444,749, of whom 215,266 were males and 229,483 females. The number of inhabited houses in 1881 was 100,372, and the average number of persons to the acre 0°33.~~

~~History and Antiquities.—At the Roman conquest Norfolk was inhabited by the Cenomanni, a tribe of the Iceni. The numerous groups of pits on the~~

heaths and along the coast, such as "Grimes Graves" near Weeting and the "shrieking pits" on Aylmerton heath, appear to have been ancient villages. The whole of the district was brought to own allegiance to the Romans during the campaign of Aulus Plautius; but on account of the indignities offered to their queen, Boadicea, the Iceni revolted, and, joining with the Trinobantes, seized Camulodwnum (Colchester), an import- aut Roman colony, massacring every Roman on whom they could lay hands. The Romans had their revenge shortly afterwards in a battle (62 .c.) in which the power of the Britons was finally completely crushed. The name of the tribe was retained in the Ineehilde Way, an old British road passing westward from the Norfolk coast, which was utilized by the Romans. The county was traversed by four other Roman roads, and was the seat of five principal Roman stations Brannodunum (Braneaster), Garianonum (Caistor, near Yarmouth), Venta Icenorwm (Caistor, St Edmund), Sitomagus (Thetford), and Ad-Tuam (Tasburgh). Coins and other remains have been found at all these places. In the Teutonic settlement Norfolk was oceupied by the Angles, and in 870 the kingdom of East Anglia fell in turn before the Danes (see vol. viii. p. 284). New ravages were com- mitted by the Danes from time to time; and in 1004 Sweyn brought his fleet up the river to Norwich, which he plundered and burned. After the Norman Conquest Ralph de Waher or Guader was created earl of Norfolk, but on his rebellion in 1057 the estates and title were conferred on Roger Bigod. Subsequently the title was in disuse, but it was at length revived and bestowed on Thomas Plantagenet, fifth son of Edward I. During a vacancy in the earldom John le Littester, a dyer, rose in rebellion and joined the commons under Wat Tyler. After the suppression of the rebellion the earldom with the title duke of Norfolk was bestowed on the * Mowbray family, who held it till the latter part of the 15th century, when it passed by marriage to the Howards. The duke of Norfolk still exercises a peculiar and permanent jurisdiction, and appoints two coroners for his liberties.

There are few or no traces of Saxon architecture in the county, unless the towers of Dunham-Magna and Newton-by-Castleacre be assigned to this period. The round towers which are specially characteristic of the district are probably Norman. Although there are several fine specimens of Norman architeeture in the county in addition to Norwich cathedral, and a few good examples of Early English, the majority of the churehes are Decorated or

Perpendicu- lar, or a mixture of both styles. The most notable features of the churches are the flint and stone panels, the fine rood-loft screens, and the numerous brasses. Norfolk possessed an unusually large number of monastic foundations, but of these the remains are few and comparatively unimportant. The cathedral-church of Norwich was originally connected with a very richly-endowed Benedictine monastery. A foundation of nearly equal importance was that of Augustinian canons at Walsingham, where there are remains of the church, the refectory, and a Perpendicular gateway. The other principal remains are those at Bacton, Beeston, Binham, Carrow, Castleacre, Thetford, and Wymondham. Ofthe old Norman keeps there are entrenchments and remains of the building at Castleacre, while Castle Rising is still a magnificent ruin, aud Norwich Castle has been restored. Among the more interesting old mansions are the halls of Hunstanton, Oxborough, Blickling, Heydon, and Bar- ningham. The larger mansions, such as Sandringham, Holkham, Rainham, Cossey, Gunton, Houghton, and Shadwell, are, however, of comparatively modern date. Among the eminent persons con- nected with Norfolk are Sir Edward Coke, Lord Cranworth, John Skelton, the earl of Surrey, Sir Thomas Browne, Sir Thomas Gresham, Roger L'Estrange, Horace Walpole, Tom Paine, Theodore Hooke, Mrs Opie, Porson, Harriet Martineau, Bulwer Lytton, Elizabeth Fry, Fowell Buxton, Sir Francis Palgrave, Sir Cloudesley Shovell, Lord Nelson.

See Blomefield, An Essay towards a Topographical History of the County of Norfolk (5 vols., 1739-1775) ; Chambers, General History of the County of Norfolk (11 vols., 1805-1810); White, History of Norfolk (new ed., 1883) ; J. O. Halliwell, Norfolk Anthology (1852); Norfolk Antiquarian Miscellany, edited by W. Rye; and Davies, Norfolk Broads and Rivers, 1883.

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NORFOLK, a city and port of entry of the United States in Norfolk county, Virginia, opposite Portsmouth, on the north bank of Elizabeth river, an arm of Chesa- peake Bay. It is the terminus of the Norfolk and Western Railroad (408 miles) and the Norfolk Southern Railroad (74 miles), has easy access to the Norfolk and Princess Anne Canal, the Dismal Swamp Canal (from Elizabeth City to the Pasquotank river), and the Albemarle and Chesapeake

Canal, navigable for vessels of 500 tons, and is connected by regular lines of steamers with Richmond, Baltimore, Philadelphia, and New York. The city lies low, and is somewhat irregular in its arrangement, but the streets are generally wide. The city hall, with a cupola 110 feet high, the custom-house and post-office, the Norfolk academy, the masonic temple, the mechanics' hall, and some of the banks are the most conspicuous of the secular buildings. Apart from its naval yard, one of the largest in the United States, Norfolk has but few manu- facturing establishments, but it carries on a large trade in cotton, fruits, vegetables, and oysters for the northern markets, as well as in maize, wheat, and sugar. Though the harbour has 20 feet of water at high tide, the fairway up to the city is narrow. The population was 14,620 in 1860, 19,229 in 1870, and 21,966 in 1880.

Founded in 1705, Norfolk was incorporated as a borough in 1736, and as a city in 1845. In 1776 it was burned by the British. At the opening of the Civil War it was the chief naval depot of the Confederates, but at an early date in the contest the vessels and

yard were destroyed, and in May 1862 the town was oceupied by the Federal forces.

NORFOLK ISLAND, with the much smaller Nepean Island and Phillip Island, lies about 29° 3' 8. lat. and 167° 58' E. long, 400 miles north-north-west of New Zealand, on a submarine tableland extending 18 miles to the north, and 25 miles to the south, with an average breadth of 18 miles. Measuring about 6 miles in length from north-west to south-east, Norfolk Island has an area of 8607 acres, or 134 square miles. The breakers of the Pacific beating on its high cliff-bound coast render it diffi cult or even impossible to land except at two places, and even there not without danger. With a general elevation of 400 feet above the sea the surface of the island rises in the north- west into Mount Pitt, whose double summit is 1050 feet in height. The soil, of decom- posed basalt, is well watered and wonderfully fertile.

Barnabas, founded by Bishop Patteson, where 150 Mela-

nesian boys and girls receive education.

The following are the main facts in the history of Norfolk Island. 1774. Island discovered by Captain Cook. 1788. Taken possession of by Philip G. King of the "Stirling" and twenty-four convicts from New South Wales. 1805. Settlement abandoned by order issued in 1803. 1826. Island made penal settlement for New South Wales convicts. 1842. Island transferred from New South Wales to Tasinania. , er 194 take the place of the convicts. 1867. Melanesian mission station settled at St Barnabas. 1882. Memorial church to Bishop Patteson erected at a cost of £5000, the windows being designed by Burne Jones and executed by W. Morris.

NORICUM was the ancient name of the country south of the Danube, around the rivers Inn and Drave, and ex- tending on the south to the banks of the Save. The original population appears to have been Illyrian, but in the great emigration of the Gauls the country was occu- pied by a Celtic people, Taurisci or Norici. The latter name seems to be derived from their town of Noreia, now Neumarkt. The country is mountainous, and the soil poor, but it is rich in iron, and has always been one of the great European centres of the trade. A great part of the Roman weapons were made of Noric steel. The country was conquered by the Romans under Tiberius and Drusus in 15 B.c., but for a time retained its old constitution and the name of Regnum Noricum. See Austria, Bavaria, CARINTHIA, &c.

NORMANBY, Constantine Henry Purprs, Marquis or (1797-1863), bore an eminent, though not a leading, part in some of the greatest movements of this century. As governor of Jamaica he had charge of the distribution of the huge compensation to owners upon the abolition of slavery in the West Indies ; it fell to him as lord-lieutenant of Ireland to give effect to the Catholic Emancipation Act; he was English ambassador at Paris during the revolution of 1848, and minister in Tuscany in the years immediately preceding the struggle for Italian unity. The son of the first earl Mulgrave, and born 15th May 1797, he passed through Harrowand Trinity College, Cambridge, and sat for the family borough of Scarborough as soon as he attained his majority. But, speaking in favour of Catholic emanci- pation, and dissenting in other points from the family politics, he thought proper to

resign his seat, and went to live in Italy for some two years. Returning in 1822, he was elected for Higham Ferrers, and made a considerable reputation by political pamphlets and by his speeches in the House. He was returned for Malton at the general elec- tion of 1826, and enrolled himself among the supporters of Canning. Previous to this, in 1825, he made his appear- ance as a novelist with Matilda ; and three years later, in 1828, he produced another, Yes and No. Of the brilliant band of fashionable novelists who started up as by a common impulse in those years, including Ward, Lister, Bulwer, Disraeli, Lord Normanby was probably the least impressive ; yet his Matilda ran through four editions in a year. There is a certain stiffness in the construction of his novels, as if he were either deficient in the story-teller's vivacity and fertility or, oppressed by his own sense of dignity, over-fastidious in his theory of composition. The novels are comparatively short, and move forward steadily to tragic catastrophes that present themselves ahead from a very early stage in the journey. The moral is so obtru- sive that they may almost be called sermons in disguise. Especially is this true of Yes and Wo, in which two oppo- site types of character, the man who says "Yes" with too great facility, and the man who says "No" with too great obstinacy and suspiciousness, are very skilfully con- trasted. It was chiefly character that he aimed at, as became a statesman, and his characters were drawn with fulness and keen insight, though not without too much appearance of labour.

1856. Pitcairn Islanders to the number of

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A speech put into the mouth of one of his characters

expresses very fairly Lord Normanby's political creed, a creed not uncommon among the aristocracy at the time of

the Reform Bill: "I can't help thinking it but befits a gentleman to move methodically forward with the main body of the age in its regular march of mind, neither seeking foolish forlorn hopes in advance, nor lagging dis- gracefully in the rear." Acting on this principle, Lord Normanby reached the zenith of his career between the age of thirty and forty ; after that he began to lag and to decline in political reputation. He succeeded his father as Earl

Mulgrave in 1831, was sent out as captain- general and governor of Jamaica in the same year, and, in spite of certain defects of manner, gained such credit as an administrator that he was appointed lord-lieutenant of Ireland in 1835, It is significant of the reputation he then held that his appointment was received with enthusiasm as the beginning of a new order in Ireland ; and during his three years of office, one of the most peaceful periods in the history of Ireland, great improvements were made. It is disputed how much was due to him and how much to his subordinate Thomas Drummond. He was created marquis of Normanby in 1838, and held successively the offices of colonial secretary and home secretary in the last years of Lord Melbourne's ministry. From 1846 to 1852 he was ambassador at Paris, and from 1854 to 1858 minister at Florence. He died in London, 28th July 1863. The publication in 1857 of a journal kept in Paris during the stormy times of 1848 (A Year of Revolutions) brought him into violent controversy with Louis Blanc on questions of fact as well as of policy; and his controversies with Lord Palmerston and Mr Gladstone, after his retire- ment from the public service, on questions of French and Italian policy, showed him to have fallen behind "the regular march of the mind" of his age.

NORMANDY (Zerra Northmannorum, Northmannia, Normannia, Normendie, Normandie) is the name which was given to part of northern Gaul in consequence of its occupation in the early part of the 10th century by the Northmen, whose name was on Gaulish soil gradually changed into Normans. Till that time the land which has ever since borne the name of Normandy had no distinct name, nor any separate political being. In ecclesiastical geography it answers very nearly, but not quite exactly, Geogra- to the province of Rouen. This includes the archdiocese phical of Rouen and the six suffragan dioceses of Evreux, Lisieux, ee Séez, Bayeux, Coutances, and Avranches. Politically it — was, at the time of the Scandinavian settlement, part of the great duchy of France, of which it took in nearly the whole of the sea-coast. The name "Neustria" is sometimes used as equivalent to Normandy ; but of the old Neustria Normandy formed only a small part. As France was cut off from Neustria, so Normandy was cut off from France,

Normandy, in its widest extent, reached on the eastern side to the rivers Eu and Epte, of which the Eu empties itself into the English Channel near the

~~town of that nanie, while the Epte flows in the opposite direction and joins the Seine near Vernon. These streams form the boundary during nearly, but not quite, the whole of their course. Along the Epte the boundary of the duchy forsakes that of the ecclesiastical province, as the diocese of Rouen stretched a considerable way on the French side of that river. To the west Normandy is parted from Britanny by the border stream of Couésnon, but the shape of the coast makes the actual frontier very small. To the south the boundary of Normandy towards the duchy of France and the great counties which were parted off from it mainly followed the ecclesiastical frontier. But the diocese of Séez stretched beyond the duchy, while the conquests of William I. added to Normandy part of the diocese of Le Mans, and therefore~~

~~Sea- board.~~

~~Towns.~~

~~Modern divisions.~~

~~Early Seandi- navian settle- ments.~~

~~NORM~~

~~of the province of Tours. The land thus marked out took in the districts of Caux, Talou, Rouen, Evreux, Lisieux, Bayeux (Bessin), Avranches, and Coutances (Cotentin, pagus Constantinus), with the greater part of the Hiesmois and about half the Vexin. 'This last was often a disputed ground between Normandy and France.~~

~~But the main feature of the country is its sea-coast and its great river. A glance at the map (Plate XIII, vol. ix.) will show that the coast of Normandy, long as it seems, is little more than the mouth of the Seine. To the west that mouth is guarded by the peninsula of Coutances, the Danish land which, it has been remarked, is the only peninsula in Europe, besides the older Danish land, which points to the north. To the west this peninsula presents a bold front to the Atlantic, forming with the Breton coast a bay in which lie the Norman islands, Jersey, Guernsey, Alderney, Sark, and some smaller ones. Normandy, in fact, was the seaboard of France in the strict sense, the coast lying between Britanny on the one side and Flanders on the~~

other. It is that part of the Continent which lies most directly opposite Britain. The Norman duchy, in short, as long as it had an independent being, was inter- posed between England and France ; and in that position lies thé key to its whole history.

The chief city of the duchy was always the ecclesiastical metropolis of Rouen (Rothomagus), the great city of the lower Seine. It is to be noticed that Rouen, like the cities of southern Gaul, keeps its own local name and has not taken the name of atribe. Evreux, Séez, Bayeux, Lisieux, Avranches, preserve tribe names. The name Constantia or Coutances belongs of course to the later Roman nomen- clature of imperial times. Other towns which figure in Norman history, as Caen, Falaise, Alengon, are of later origin. Havre de Grace dates only from the 16th century, long after the loss of Norman independence.

In the divisions of modern France, Normandy answers to the departments of Lower Seine (cap. Rouen), Eure (cap. Evreux), Orne (cap. Alengon), Calvados (cap. Caen), Manche (cap. St Lo), and to the modern dioceses of Rouen, Evreux, Séez, Bayeux, and Coutances. The boundaries of Rouen and Evreux have been changed ; Lisieux has been joined to Bayeux, and Avranches to Coutances. The archbishop of Rouen still keeps the title of primate of Normandy; otherwise the name of the duchy has gone out of formal use.

It must be remembered that the land to which the Northmen thus permanently gave their name was only one of several Scandinavian settlements in Gaul, though it was the greatest and the only lasting one. Nor was the whole of the land which became the Norman duchy occupied at once. The whole second half of the 9th century was largely taken up in both Gaul and Britain with Scandinavian inroads, which in both countries led to important Scandinavian settlements. Settlement in Britain came first, and the great settlement in Gaul seems to have been made after its model. By the peace of Wedmore, Ailfred found his own West-Saxon kingdom untouched and indeed enlarged. But a large part of England, over which he claimed at most a vague external supremacy, was left to the Danish invaders. Their king embraced Christianity, and, like his English predecessors, accepted a formal West-Saxon supremacy. A variety of later

~~causes made the history of the Scandinavian settle- ment in England to differ widely from that of the Scandi- navian settlement in Gaul; but in their beginnings the two are exactly alike. The smaller Scandinavian settle- ments, those of Hasting at Chartres, of Ragnald at the mouth of the Loire, had no historical importance. The settlement of Rolf at Rouen grew into the duchy of Normandy. The treaty of Clair-on-Epte followed the model~~

~~of that of Wedmore. The Scandinavian invader embraced Christianity, and he became the man of the king of the Western kingdom. But he received no part of the king's immediate territory. His settlement was made wholly at the cost of the duke of the French. The only difference was that the duke of the French still went on reigning at Paris, though no longer at Rouen, while the English dynasties of Mercia, East Anglia, and Deira came alto- gether to an end. But the two settlements are exactly alike in this, that the converted Northman becomes the man of the king, though the settlement is not made at the cost of the king's immediate dominions. In both cases the king is strengthened, though in different ways. The West-Saxon king received an actual increase of im- mediate territory in the shape of that part of Mercia which formed the lordship of Aithelred and Aithelfled. The Carolingian king received no increase of territory, but his position was distinctly bettered when the great and threatening duchy of France was split into the two rival duchies of France and Normandy. That Normandy was cut off from France in the strict sense, from the duchy of the house of Paris, is a point in its history which must always be remembered. It is the key to that abiding rivalry between France and Normandy which was inherent in the position and history of the two lands. No moment- ary policy on the part of their rulers could ever get over it. It lived on in truth to become no unimportant element in the general history of Europe. The close connexion which arose between Normandy and England handed on to England the inheritance of rivalry which had first begun between France and Normandy, an inheritance which England kept in its fulness for ages after its separation from Normandy. It is likely enough—con- sidering the position of the two kingdoms, we may call it certain—that, had a separate state of Normandy never existed, a rivalry between England and France would have arisen out~~

~~of some other cause. Asa matter of fact, it was out of the older rivalry between France and Normandy that it did arise.~~

~~The settlement of Clair-on-Epte and the beginning of Settle- the Norman state are commonly placed in the year 912. There seems some reason to think that it may have hap- pened a few years later. There is no thoroughly trust- worthy account. The writers in the Western kingdom plainly say as little as they can about the matter ; they disliked the very name of the "pirates," as the Normans are called by Richer of Rheims down to the end of the century and beyond it. The earliest writer on the Norman side is Dudo, dean of St Quentin, who wrote late in the century, a rhetorical writer of the courtly school. But there is no doubt that the chief of the Scandinavian set- tlers was Rolf (in various spellings), known in Latin as Rolf. Rollo and in French as Rou, a viking leader to whom many earlier exploits, real or mythical, are attributed.~~

~~He received, as a grant from Charles the Simple, king of Carolingia or the Western kingdom, a tract of land of which Rouen was the centre and head, a tract certainly stretching as far as the Epte to the east, most likely stretching as far as the Dive to the west. It is an im- portant part of the case that, though the land was cut off from the duchy of France, yet the grant was a grant from the king and not from the duke of the French, and that the king and not the duke received Rolf's homage. The two princes were presently at war, Robert, duke of the French, having been elected as opposition-king in 922. Rolf seems to have stuck faithfully to his own lord, King Charles, alike against Robert and against Robert's son Hugh, called the Great, and the king, Rudolf of Burgundy, whom Hugh set up. The Normans were thus at war with France almost from the moment of their settlement,~~

~~Epte,~~

~~ment of Clair-on-~~

~~Land and people of Nor- mandy.~~

~~and they were rewarded by a further acquisition of terri- tory at the expense of the French duchy, namely, the Bessin or land of Bayeux. France was now nearly or wholly cut off from the sea. The Norman princes further claimed, by virtue of these early grants, a supremacy over both Britanny and Maine, which they were never able fully or lastingly to enforce.~~

~~Of the nature of the settlement made by the Northmen in the part of Gaul which they changed from France to Normandy we can judge only by the results. The new state for a while had no recognized territorial name. To the end of the century it is simply "Terra Northman- norum." ''Northmannia," a name which with Einhard meant Denmark, which in Adam of Bremen commonly means Norway, becomes, in the shapes of "' Nortmannia," "Normannia," "Normendie," and the like, fully estab- lished in the next century as the name of the Norman land in Gaul. In English chronicles it appears as " Ricar- des land," from the princes of that name; it is not "Nor- mandi," "Normandie," '' Normandig," "Normandige," till after the Norman Conquest. The chief again has no cer- tain titles ; at Rheims he was " princeps Northmannorum," or, more heartily, "dux piratarum." In the next century he becomes regularly "dux" or "comes Normannorum aa that is, he was "dux" as regards the Norman people, "comes" as regards his overlord the Western king. The people become definitely "Normanni," "Normend." It is not easy to say to what extent the Scandinavian settlers became mingled with the earlier occupiers of the land, or again how far those earlier inhabitants were of Frankish and how far of Celtic descent. It is plain that the land was parted out among Scandinavian landowners very much as in the Danish districts of England, and many places, just as in those districts, keep the name of the first Scandinavian lord. And it can hardly fail that, after the long harryings which went before the actual settlement, the population of the lands which lay open to the Northmen must have become scanty, and many parts are likely to have been quite forsaken. On the other hand, it is certain that before the end of the 10th century there was an Oppressed peas- antry in the land, and it is hardly likely that descendants of the original conquerors could have sunk so low in so short~~

~~'atime. The actual tillers of the soil were most likely to~~

~~a great extent descendants of the earlier inhabitants; that is, they would belong to the same mixed nationality as the people of the duchy from which Normandy had been cut off, to that mixture of Celtic, Latin, and Teutonic elements which has formed the modern Frenchman. Yet in Normandy, as elsewhere, the tendency would come in which makes the actual cultivators of the soil sink rather than rise, and it is by no means unlikely that the later peasantry of Normandy were largely the descendants of the Scandinavian conquerors. Anyhow, a nobility gradually sprang up among the Normans themselves, consisting chiefly, it would seem, of those who could claim any kind of kindred or affinity, legitimate or illegitimate, with the ducal house. Some of the greatest Norman houses sprang from kinsfolk of wives or mistresses of the dukes who were themselves of very lowly degree. This is always likely to happen when a nobility is first forming. Early in the 11th century the order of " gentlemen " as a sepa- rate class seems to be forming as something new. By the time of the conquest of England the distinction seems to have been fully established.~~

~~The Norman, with the softened form of his name, is distinguished from the Northman by his adoption of the French language and the Christian religion. In the case of Rolf himself, as in the case of Guthrum, his baptism formed one of the terms of the agreement. The convert took the name of Robert, from the duke of the French,~~

~~who acted as his godfather ; but, as in other cases of baptized Danes, he was still always spoken of by his earlier name. Whether Rolf himself learned French we are not told ; his language at the time of his homage is spoken of as English. This doubtless means any Low-Dutch or Scandinavian tongue, as opposed alike to High-Dutch and to French. Among his followers the twofold change took place with very different degrees of speed in different parts of the duchy. At Rouen and Evreux and in the eastern part gener- ally, the first grant to Rolf, the change seems to have been very speedy. In some other parts circumstances made it much slower. Thus, at Bayeux it would seem that an earlier Saxon colony coalesced with the Scandinavians ' at all events, a Teutonic tongue of some kind lived on there long after Rouen had come to speak no tongue but French. In the Cotentin, a still later~~

~~acquisition, both the Northern speech and the Northern creed were kept up by fresh settlements from Scandinavia. The result was a wide distinction between the eastern and the western, the French and the Scandinavian, parts of the duchy, which led to important political consequences as late as the reign of the Conqueror.~~

~~The Cotentin, with its appendage of the Channel Islands, William seems not to have been added to the land of the Northmen Long- till after the accession of its second duke, William surnamed SW: Longsword, about 927. Whether Rolf died, or abdicated, or was killed in battle, and the exact date of his son's accession, do not seem clearly fixed. The certain point is that William became the man of King Charles in 927 j and that he refused all allegiance to the rival king, Rudolf of Burgundy, as long as Charles lived. His own reign lasted till 943. It is one of the most confused periods in the history of Gaul, and a good deal of the confusion is owing to the shifting policy or caprice of William himself.~~

~~He changed sides more than once in the struggles between Lewis, the Carolingian king at Laon, and the more power-~~

~~ful Duke Hugh of Paris. At last, there can be little doubt, he was murdered by the practice of Count Arnulf~~

~~of Flanders. In Normandy itself the history and effects The of his reign are more marked. We see the struggle Heathen between the heathen or Danish party and the Christian, pre which may be also called the French, party. By this must Panty, be understood the party of the French speech and French civilization, not at all a party in the political interest of France. Its policy was to make Normandy a Christian and French-speaking state, an independent member of the Western kingdom, alongside of France and Flanders. The two parties are distinctly marked as geographical. The first years of William's reign are marked by a revolt of the heathen party, who demand the cession of the lands west~~

~~of the Risle. The Christian and French-speaking duke might reign in the region which had adopted his creed and tongue ; the western Normandy should forma separate State, heathen and Scandinavian. Though all this rests~~

~~on the not very high authority of Dudo, it bears the stamp~~

~~of truth ; it falls in with facts earlier and later 3; it is not the kind of story to grow up in the hands of a rhetorical panegyrist. William, successful over the rebels, appears~~

~~as a Christian, not without fits of special devotion, and~~

~~as anxious to take his place among the great princes of the Carolingian kingdom, notwithstanding the reproach~~

~~of pirate origin that still cleaves to him. Yet he does not show himself the enemy of the other side. Himself speaking both tongues, he has his son Richard sent to Bayeux to gain a fuller mastery of the Northern speech, and he seems even to have admitted fresh settlement from the North in the western part of the duchy. The deep and clearly intentional darkness in which contemporary writers~~

~~at Rheims leave the Norman history of this period makes any minute knowledge of this reign quite hopeless. But~~

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~~we may safely set it down as a time of struggle between the two elements in the land, a time in which things, on the whole, tended to the strengthening of the Christian, French, eastern element,—the influence of Rouen and not that of Bayeux.~~

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~~the making of a nation. And in the making of that nation the Norman duchy had no small share. The close union between Normandy and France which had been brought about by Hugh the Great had a double result. It made Normandy French; in the end it made Gaul French. Up~~

~~Richard It was the long reign of William's son, Richard the | to this time Carolingia had been a kingdom of many nations — pes Fearless, which~~

~~finally settled the position of Normandy | and languages. The kings of Laon were still German ; earless.~~

~~and which had no small influence on the position of France. We must always remember that Normandy and France were alike vassal states of the Western kingdom, the kingdom of the Carolingian king at Laon, a king who, in all but the moral influence of his kingly dignity, was a prince of far smaller power than either of his mighty vassals. Normandy, rent away from France, bound by direct homage to the king at Laon, had hitherto been on the whole an ally of the king who dwelled beyond the dominions of the duke. The fifty years of Richard's reign changed all this. For the events of its early days we are not left wholly to Dudo; the writers at Rheims tell us enough to show that the division between the heathen and the Christian Normans was still strongly marked. The heathen party, strengthened by a new band of settlers from the North, got hold of the young Richard and persuaded or compelled him to fall back to his heathen worship. Richard was the son of William by a Breton mother, one who stood to his father in that doubtful relation which was called the Danish marriage, and who might be spoken of as wife or concubine at pleasure. At Rheims she bore the harsher name ; yet it is a matter of avowed record that her son was received as his father's successor by King Lewis. But the young duke — it is hard not to give him the title, though it is perhaps~~

~~they relied on German memories, on the slight German element still left in their kingdom, on the support of the German king beyond the Rhine. The great county of Flanders, stretching much further to the south than the present use of that name, was a land of the Nether-Dutch speech. The Bretons in the extreme west kept the Celtic tongue which they had brought over from the greater Britain. The lands south of the Loire, nominally part of the kingdom, but seldom playing any part in its history, kept their own variety of the Romance speech, and a national spirit altogether distinct from anything in northern Gaul. Most central of all lay the duchy of France, the land of which Paris was the centre and the cradle, the land of the new-born French speech and French nationality. The supremacy of Gaul was not likely to fall either to its Celtic or to its Nether-Dutch element; it might well fall either to its High-Dutch, its French, or its Aqui- tanian element. The close alliance between Hugh and Richard, between France and Normandy,~~

~~determined to which element it should fall. Had Normandy remained Scandinavian, France, hemmed in between Teutonic Laon and Teutonic Rouen, might never have reached to the head- ship of Gaul. But Richard's French alliance settled the question between French and Scandinavian in Normandy.~~

~~Normandy, itself become French, turned the balance in Nor- favour of the French element; it ruled that France should mandy be the head power of Gaul, that the duke of the French pene~~

~~premature—was presently got hold of by the heathen party, who were just then strengthened by a fresh settlement from the North. The Christians sought help both at Laon~~

~~French.~~

~~and at Paris; king and duke entered the land, seemingly in concert, in two successive years (943, 944). The heathens were defeated; the king occupied Rouen and the whole Norman land, doubtless with the intention of keeping it. Nothing could better suit the king of Laon than to rule at Rouen as well, and to hem in the duke of Paris on both sides. 'The Norman writers tell a romantic tale of the escape of young Richard from captivity at Laon. What is more certain is that Normandy soon rose against Lewis, and that, by the help of a Danish leader, in whom the Normans see the famous king Harold Blaatand, the king was defeated and made a prisoner. The policy of Hugh of France now obtains possession of Lewis and a commendation of Richard to himself. Lewis was released on surrendering Laon; his kingdom was cut down to Compidgne. In 946, in alliance with the Eastern king Otto, the future emperor, Lewis invaded France and Normandy, but the forces of the two kings failed before both Paris and Rouen.~~

~~These events fixed the position of the Norman duchy for some time. It is not clear whether Richard, along with the other princes, renewed his homage to Lewis; it seems certain that he became the man of the duke of the French. Things are thus turned about; Rouen, lately friendly to Laon and hostile to Paris, is now friendly to Paris and hostile to Laon. Normandy is the faithful and powerful ally of France under its successive dukes, Hugh the Great and Hugh Capet. The Norman duke is the son-in-law of the elder,~~

~~the brother-in-law of the younger, of the French princes. It does not appear that Richard ever did homage to King Lothair, the successor of Lewis ; he once at least,~~

~~and the king of the French should be the same person. The first creation of Normandy, a power shorn off from France and shutting out Paris and the whole duchy from the sea, had been a frightful blow to the French power. But the loss was more than made up when the policy of Hugh the Great won back as an ally what he had lost as a ruler, when he was chosen king by the help of the Norman duke, and when his election as king meant the final estab- lishment of France as the leading state of Gaul, of French as its leading speech, of Paris as its ruling city.~~

~~This good understanding between France and Normandy, at all events between the kings of the French and the dukes of the Normans, lasted through the reign of Richard the Fearless, through the reigns of the second and third Richard and that of Robert, till the accession of Robert's son, William the Bastard, afterwards known as the Con- queror and the Great, in 1035. The duke is now the most faithful and the most cherished vassal of the king. His vassalage is not doubtful. If Richard the Fearless, after the recovery of his duchy, no longer acknowledged the supremacy of King Lewis of Laon, he had cordially com- mended himself to Duke Hugh of Paris. When the second Hugh became king, it would have been a mere question of words whether the homage of the Norman vassal was due to the French lord in his kingly or in his ducal char- acter. More than once during this period the Norman dukes appear as the powerful helpers of the Parisian kings. They date their charters by the years of the kings, and recite the consent of their lords to their grants and other acts. All thisis to be carefully noticed, because at a later period of Norman history, the period when Norman history~~

~~France, in 961, appeared in arms against him. At last, in 987, | ismost closely connected with English history, all isdifferent. ~~ of came the change which united the duchy of France with the Yet English dealings both with France and Normandy Ul.~~

~~Western kingdom. Hugh of Paris was chosen to succeed to the crown of the last Lewis of Laon. This revolution, so often mistaken for a mere change of~~

dynasty, was in fact

began early. In the disputes of the early days of Lewis, his uncles Aithelstan and Eadmund successively interfered on his behalf, and, so far as France and Normandy were

Richard theGood.

the enemies of Lewis, this was English interference directed against both Normandy and France. But direct dealings between England and Normandy begin at a later time, in the latter days of Richard the Fearless.

Richard the Fearless died in 996, known to the last at Rheims only as duke of the pirates. Yet he had made his duchy Christian and French. It might be too much to say that every trace even of heathen worship, much less of Danish speech, had died out from the lands of Bayeux and Coutances. The speech at least, we may be sure, lingered some time longer, the more so as we hear of fresh Danish settlements in the latter days of Richard. And, even if speech as well as creed died out, the two left behind them the tradition of local distinction and local enmity between the eastern and the western parts of the duchy. The true Normandy, the land which was still in some measure Teutonic, began on the left bank of the Dive. But Nor- mandy as a state was Christian and French. The French speech of Rouen gradually supplanted the Danish speech of Bayeux. Yet, as commonly happens in such cases, a few Teutonic words, chiefly words of seafaring life, now crept into the Romance tongue of northern Gaul, in addition to the far greater infusion which had found its way in ages before as a result of the Frankish conquest. In Normandy itself the local nomenclature became Teutonic to an ex- tent which makes itself felt on the map. Scandinavian endings like toft and by live on in the shape of té¢ and boewf, and they are constantly coupled, like the by of Lincolnshire and the ton of Pembrokeshire, with the names of Scandinavian settlers. Even in the most French part of the duchy, some places, like Caudebec and Dieppe — the cold beck and the deeps — keep Teutonic names under a very slight disguise. And the Conqueror's own Falaise, bearing a name which has passed into the general voca- bulary of

~~the French tongue, is simply the Teutonic Fals, whether the name dates from Frankish or from Norman settlement.~~

~~Of one effect of the reign of Richard the Fearless we get a picture in the peasant revolt (which has been already spoken of) which marked the beginning of the reign of his son Richard the Good (997). A peasant revolt implies masters, and harsh masters. It is hard to say how far the distinction of oppressor and oppressed coin- cided with distinction of race ; but it is certain that the movement had some special and promising features. The peasants of Normandy set up a commune—or something to which later writers gave a name which became afterwards so well known—more than sixty years before the burghers of Le Mans did the like. We seem to be reading the history of Friesland or of the Three Lands rather than that of any part of the Western kingdom. But the revolt was fully and harshly put down, and the rule of the " gentlemen " was made safe. It is noticed that Richard the Good would have none but gentlemen about him. This seems to mark the final establishment in N ormandy, as in other lands, of the new nobility, the nobility of office, or rather the nobility of kindred to the sovereign. We soon begin to trace the history of the great Norman families, only one or two of which can be seen, and that dimly, before Richard the Good. It illustrates the origin of Norman nobility that Rudolf of Ivry, who put down the revolt, was the duke's uncle, but only because his father,~~

~~NOR 2 AN DY~~

~~a miller, had married the cast-off wife or mistress of~~

~~William Longsword. So at least the story goes, and a~~

~~story of this kind is sure to have this kind of truth ; such~~

~~a rise as it describes was possible and likely. After all, it may be that the revolt was not a mere failure. Villainage~~

~~in Normandy was both lighter and died out earlier than~~

~~in most parts of France.~~

~~The thirty years of the reign of Richard the Good con-~~

~~tinue the period of unbroken friendship between Normandy and France, and also between Normandy and Britanny. But we find the Norman duke warring, sometimes on his own account, sometimes as the ally of the French king, with his neighbour of Chartres, and in the more distant lands of the ducal and even the royal Burgundy. His relations with the North and with England are of more consequence. Richard is charged with bringing two heathen sea-kings, one of whom is said to have been afterwards the famous Saint Olaf, as helpers against Chartres; we hear also of a second quarrel with Aithelred, and even of an English invasion of the Cotentin. It is more certain that in 1002 Aithelred married Richard's sister Emma, a marriage which may be set down as the first link in the chain of events which led to the Norman conquest of England. Eleven years later, when Aithelred was driven from his kingdom, he found shelter with his wife and her children at the court of his brother-in-law. Soon after Althelred's death and Cnut's establishment in England, Emma married Cnut. Unbroken peace reigned between Cnut and Richard, and Emma's children by thelred, Alfred and Eadward and their sister Godgifu, were brought up at the court of their Norman uncle,—another stage in the drama of the Norman Conquest.~~

~~The short reign of Richard's son Richard (1026-1028) Robert,~~

~~was marked only by disputes between the duke and his father of brother Robert, count of Hiesmes, who presently succeeded the Con- to the duchy. He too maintained the French alliance, 2°°"°" and restored King Henry to his crown when he was driven from it by his stepmother Constance. But friendly relations both with Britanny and England now ceased. Robert seems to have married and put away Estrith, the sister of Cnut, either before her marriage with Earl Ulf or more likely after his death. This led to a quarrel between Robert and Cnut, and to an attempted invasion of England on behalf of the banished Aithelings, the sons of Aithelred and Emma. Robert at last made the pil- grimage to Jerusalem, and died on his way back in 1035. He had already made the great men of N: ormandy swear to the succession of his natural son William, born to him of Herleva of Falaise before his accession to the duchy. William the Bastard, one day to be the Conqueror, was about eight years of age at the death of his father.~~

~~There can be no doubt that the succession of William Succes- was most unwillingly accepted. It was the acceptance of sion of one who was at once bastard and minor. The law of W#Jiam. hereditary succession was nowhere very distinctly defined ; but it is clear that the notion of some kind of hereditary succession, as distinguished from election even within a particular family, had made much greater advances in Normandy than it had in England. No princes were more lax as to marriage than the Norman dukes; both William Longsword and Richard the Fearless were thie offspring of unions which were very doubtful in the eye of the church, and Richard the Good and the other children of Richard the Fearless were legitimated only by the after- marriage of their parents. But the son of Robert and Herleva was pre-eminently the Bastard ; there was no pre- tence of marriage of any kind. He was accepted, so far~~

~~as he was accepted, simply because there was no candidate whose right was so distinctly better than his as to unite~~

~~the whole country on his behalf. Of the other members~~

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~~of the ducal kindred, some were themselves of doubtful legitimacy, while others could claim only through the female line. The result was that the minority of William was a time of utter anarchy, of plots, rebellions, public and private crimes of every kind, but that the young duke was never altogether set aside for any other claimant. And now for the first time since the very earliest days of the Norman state we find France unfriendly. The whole relations between the two powers change from the time of William's accession. It could not be in the beginning the personal act of the boy William himself. But the fact that William came to the duchy as a child had very likely a good deal to do with the change. The alliance had never been a natural one; it had been alliance between prince and prince rather than between people and people, and now, during William's minority, there was no prince in Normandy ready to do to the ruler of France such good service as had been done by earlier Norman princes. While the princes were personal friends circumstances might make it convenient to forget that Normandy was a land lopped away from France; as soon as those circumstances had passed away the French kings and the French people~~

again remembered that Rouen barred the way between Paris and the sea. For a while each power stood in need of the other. Normandy owed to France its introduction into the Christian and Romance-speaking world. France owed to Normandy its new position among the powers of Gaul. As the remembrance of these benefits on each side passed away, the far more natural feeling of rivalry and dislike showed itself again. After the accession of William there still are periods of friendship between France and Normandy ; but they alternate with more marked periods of enmity. The steady and faithful alliance is at an end ; it is significant that the name of the French king disappears from the charters of the Conqueror. If an immediate occasion of quarrel was at any time needed, it could always be found in the disputed frontier of the Vexin, the border district between Rouen and Paris. Old grievances are rubbed up again. Norman pride tells the tale of the Nor- man settlement, of the humiliation of the dukes and kings of Francia. French enmity finds scornful epithets for the intruders who had cut off so goodly a land and so great a city from French dominion.

The first sign of this revival of the older and more natural feeling was shown when King Henry took advan- tage of the weakness of Normandy to advance his fortune at its expense. From this time the relations between king and duke are, among a good many shiftings, more often hostile than friendly. It was also during William's minority that the attempt of the Htheling lfred on the English crown took place. He went with Norman com- panions, and in some accounts the enterprise swells into a Norman invasion. At all events, it marks another step towards a greater Norman invasion.

The ill feeling towards William finally broke out when he had reached an age to act for himself. This was in 1047, and the movement is one of special interest and importance, as bringing out more strongly than anything else the long-abiding distinction between the two parts of the duchy. Eastern or French Normandy, the land of Rouen and Evreux, clave to William; western or Teu- tonic Normandy, the land of Bayeux and Coutances, rose against him. The stirrer up of strife was Guy of Brionne, son of Reginald, count of the Burgundian pala- tinate, by a daughter of Richard the Good. The plan seemingly was that Guy should supplant William in the eastern district, and should leave the barons of the west to themselves. William asked and

obtained help of his lord, the king of the French. It is not easy to see why Henry, who had hitherto acted an unfriendly part towards

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Normandy and who before long acted it again, should

have stepped in, when the dismemberment of the duchy

would seem to have been just what he would have wished. However this may be, the rebels were overthrown in the Estab- fight of Val-és-dunes by the joint forces of king and lishment duke; the power of William over his duchy was fully of ime established ; and, though a difference may to this day be pumice seen between the two parts of Normandy, they never

again appeared in open strife against one another.

That part of the reign of William which comes between

the battle of Val-és-dunes and the invasion of England was the great day of Normandy as a wholly distinct and prac- tically independent power. Under the wise and vigorous rule of its great duke the duchy became one of the most flourishing parts of Gaul and of Europe. We can now for the first time call up a fairly distinct picture of the coun- try. The great Norman families, many of whom after- wards won a second establishment in England, now stand out distinctly. They are wealthy and powerful, but under William's rule they are made to feel that they have a master. Many of them, as we have seen, were the duke's kinsfolk ; some were favourites of his own advancing. The counts of Eu and of Evreux, the lords of Beaumont, Grantmesnil, and Conches, the viscounts of Avranches and Saint-Sauveur, stand out among many others. Greater than all was the mighty house that was formed by the union of the houses of Montgomery and Belléme, a house holding lands both of Normandy and of France, and rank- ing rather with princes than with ordinary nobles. Of those raised by William himself, we see his personal favourite William Fitz-Osbern of Breteuil, and his half-brother Robert, to whom he gave the county of Mortain, while his other half-brother Odo held the bishopric of Bayeux. These were the sons of Herleva by her husband Herlwin of Conteville, whom she married after the death of Duke Robert. That side of the feudal theory by which the noble holds of the prince and does military service for the lands which he holds was never better carried out than it was in Normandy under William. But under him the great lords were not only vassals but sub- jects. The reign of law was enforced ; the towns grew and trade flourished; the settlement of foreigners was encouraged ; Duke William in his own duchy showed all the great qualities which enabled him to become the conqueror and the ruler of England, without that darker side of his character which necessarily followed on his position as conqueror.

Nowhere do these qualities stand out more clearly than His in his dealings with the church. William was neither the Dealings enemy nor the slave of the ecclesiastical power. He held the oe ue supremacy over the spiritual estate with a firm hand. He had the great advantage that the prelates of Normandy were his vassals and subjects, holding their temporal estates of him and not of a king or emperor beyond his dominions. He was advocate of all his own churches ; he bestowed them at his will, and held firmly to

the right of investiture. But he was a church-reformer in the best sense. He chose the best men from all lands for the bishoprics and abbeys in his gift. Among those whom he promoted and befriended are the great naines of Lanfranc and Anselm. Up to this time the Norman bishoprics had been used as provisions for cadets and kinsmen of the ducal family, a custom of which the promotion of his own half-brother Odo during his minority was one of the last and most scandalous examples. Devout and strict in his own life, William backed up every effort for the enforcement of discipline and the improvement of morals. His reign was the great time for the foundation of the Norman monasteries. Some, as Jumidges, Cerisy, Bernay, Mont St Michel, are of older date ; but now every noble became the founder of

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a monastic house. The duke's own foundation of St Ste- phen's at Caen was among the foremost. In short, during the reign of William Normandy was looked on as an eccle- siastical paradise. It is certain that in no part of Europe was law, temporal and ecclesiastical, more strictly enforced.

This time was also a time of wars, during which the borders of the duchy were enlarged. or a short time the friendship with France went on. William repaid the king's help at Val-és-dunes by help in his wars with Geoffrey of Anjou. This led to a long rivalry between Anjou and Normandy, which largely took the shape of a struggle for the county of Maine, which lay between the two. As early as 1048 William extended his frontier in that direction ; in 1063 he obtained possession of Le Mans and the whole county. Meanwhile he had two wars with France. Henry encouraged Norman rebels, and twice, in 1054 and 1058, he invaded Normandy, each time to suffer defeat. At the time of the invasion of England Normandy was strength- ened by the weakness of its neighbours. The crown of France had passed to the minor Philip, and Anjou was divided and torn in pieces by civil disputes. The duchy, under its great duke, was at the very height of its power, prosperity, and renown when the duke of the Normans won himself a higher title.

The conquest of England by William had no direct effect of Nor- on the internal condition of Normandy; but it altogether ee-changed the position of the duchy asa European power. Conquest Save for three short intervals, it

never was again a wholly of Eng- distinct power with a prince to itself. So far its position land. may be said to have been lowered; but, on the other hand,

it became part of a power far greater than the single duchy of Normandy had ever been. For a while England in some sort followed Normandy ; the common sovereign of the two lands could use the strength of England for Nor- man purposes. Then, under the Angevin house, Normandy and England alike became parts of one of those motley dominions, like that of Burgundy under the Valois dukes or of Austria in yet later times, in which a crowd of sepa- rate states are brought together without any tie but that of a common ruler. The result was that Normandy, after handing on to England its tradition of enmity towards France, itself fell back into its old union with France. And it must not be forgotten that Normandy after the Conquest of England was in itself much less strong than Normandy before the Conquest of England. A great part of the goodness, so to speak, of the land had crossed the sea into the conquered kingdom.

The rule of King William in his duchy was on the whole less prosperous than that of Duke William had been. His later years were clouded by revolts and occasional defeats. Maine revolted in 1073, and one stage of the revolt is memorable, because William had to strive, not with a rival prince, but with a commonwealth. Le Mans set up the first commune north of the Loire. But city and county were won back, largely by the work of Englishmen, whom the Conqueror, after overthrowing their own freedom, used to put down freedom elsewhere. In 1076 he was defeated in an attempt on Dol by the forces of Britanny and France. The next year followed the revolt of his own son Robert, and a border warfare on the frontier of Mortagne. In 1083 a single castle in Maine, that of Sainte-Susanne, suc- cessfully withstood him for three years. In 1087 the old dispute with France about the Vexin again arose, and cost William his life at Mantes. But, though this is a different picture from the uninterrupted success of the earlier part of his reign, there is no reason to think that the general peace and prosperity of the duchy was at all disturbed. The fighting was wholly on the borders, and it must have done much less damage to the country at large than the two French invasions of the earlier period.

~~Wars.~~

~~Position~~

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~~With the death of the Conqueror the most flourishing Anarchy~~

~~state in western Europe became the most wretched. after ‘ William’s successor Robert was incapable of government. ae The land fell back into the same kind of anarchy which ; had been during William’s minority. It was torn in pieces by private wars. More remarkable was the attempt of the city of Rouen to claim the position of a separate commonwealth; as Le Mans had done some years before. Some parts of the duchy were saved from anarchy by dis- memberments which transferred them to other rulers. Robert sold the Cotentin to his brother Henry, by whom it was lost and recovered more than once. His other brother, King William of England, in two invasions occupied a large part of the country. Maine revolted again, but the commune of Le Mans was not restored ; independent counts ruled once more. At last in 1097 Robert went with the crusade, and mortgaged the whole duchy to William, who occupied the country and restored some kind of order. He recovered and lost Maine more than once in warfare with its count, Helias. The death of William Rufus in 1100 again separated Normandy, England, and Maine. Robert came back to Normandy, but his misgovernment again raised up enemies against him. Henry invaded Normandy, and by the battle of Tinchebrai in 1106 the kingdom and the duchy were again united. It seems that Henry scrupled to take the title of duke while Robert lived, and he lived a captive in England till a year before the death of Henry himself in 1135. But Henry was none the less the ruler of Normandy, and he made the Normans pledge themselves to the succession of his children.~~

~~It was now no longer the duke of the Normans who Underthe reigned in England, but the king of the English who Norman reigned in Normandy. England, deeply influenced and eee changed as she had been by the Norman Conquest, had ona now, under the English-born Henry, recovered her position as a power. Men at the time looked on Normandy as conquered by England, and saw in Henry’s victory on Norman ground the reversal of~~

~~his father's victory on English ground forty years before. And there was a sense in which this was true, even though Henry's foreign policy was directed far more to Norman than to English objects. England as a power was far greater than Normandy, and it was growing less and less Norman. It was as king of the English that the sovereign of N ormandy appeared to the world at large. And under his rule the advantage which an island has over a continental dominion was plainly shown. The two great Norman rulers of the day, Henry of England and Roger of Sicily, each kept his island king-dom in perfect peace, and used his continental territory as a battle-ground. Henry's Norman rule was for many years disturbed by the claims of his nephew William, the son of Robert, whose side was taken both by several foreign princes and by a rebellious party in the duchy. Another cause of dispute was found in the affairs of another nephew, Theo- bald count of Chartres, son of Henry's sister Adela. Out of these questions several wars arose between Henry and Lewis VI. of France (1109-1137), supported commonly by the successive counts of Flanders, among whom William, the son of Robert, himself appears, as he held that county for a short time before his death (1127-1128). But there were intervals of peace. The treaty of Gisors in 1113 reads almost as if Lewis, in ceding to Normandy the border- land of Belléme, ceded with it all rights of superiority over the duchy. Yet in 1120 Henry found it convenient to make his son William, who had in 1115 received the hom- age of the Normans as his successor, himself do homage to the French overlord. William died almost directly after-wards in the White Ship, and in 1126 Henry procured the assent of his nobles to the succession of his daughter Matilda as lady of England and Normandy. She was~~

~~Mora AN DY~~

~~now the childless widow of the emperor Henry V., who had been a firm ally of his father-in-law. The next year Henry married his daughter to Geoffrey Plantagenet, son of Falk, count of Anjou and Maine. Anjou, whose counts had been such dangerous neighbours to Normandy, was thus to be united to the duchy and to the kingdom. These schemes in the end took effect. On Henry's death in 1135 the claims of Matilda were cast aside; the rule of a woman was too great a novelty for either kingdom or duchy. England chose Henry's nephew Stephen, the younger brother of Theobald of Chartres.~~

~~Normandy inclined to Theobald himself, but accepted the choice of England. The legitimate male line of the Conqueror was now extinct, and the stronger feeling with regard to legiti- mate birth which had grown up within the last hundred years hindered any such succession as that of the Conqueror himself. In earlier times Robert of Caen, Henry's natural son, renowned in England as earl of Gloucester, would have been a more obvious choice than either Matilda or Stephen, Now he could only assert the rights of his sister, and so plunge England into anarchy. The strife, which in England took a shape for which civil war is far too good a name, took in Normandy the less frightful shape of foreign invasion and conquest. Stephen's claim was from the first disputed in arms by Matilda's husband Geoffrey. Stephen showed himself in Normandy only for a moment in 1137, when his son Eustace did homage to King Lewis. Geoffrey gradually possessed himself of Normandy, partly by French and Flemish help (1139-1145). Five years afterwards he resigned the duchy to his son Henry, who the next year succeeded his father in Anjou and Maine. The next year 1152) he married Eleanor, the divorced wife of Lewis VII. 1137-1180), in her own right countess of Poitou and duchess of Aquitaine. By the union of all these territories a dominion was formed unlike anything which had been seen before in Gaul, but which, as has been remarked already, has had its parallel in later times. Duke Henry, in right of his father, his mother, and his wife, gathered together a crowd of dominions which made him far more powerful than his lord, the king of the French. But there was no connexion between the several duchies and counties that he held beyond the fact that he held them. And when presently the duke became a king the lack of unity became greater still. By the agreement which settled the strife of Stephen and Matilda, the crown of England passed at the death of Stephen to the son of Matilda. In 1154 began the memorable thirty-five years' reign of Henry I. of England. But the king of England was also himself duke of Normandy, count of Anjou, Maine, and Touraine, and in his wife's name count of Poitou and duke of Aqui- taine. During his reign and that of his eldest son the connexion between England and the Continent was at once closer and wider than it ever was before or after.~~

~~With the formation of the great Angevin dominion, the being of Normandy as a separate power comes to an end, The mere union with England had not that effect in any- thing like the same degree. While the same man was~~

of Norman princes, happened also to be king of the island kingdom. After all, a conquest of England by Normandy or of Normandy by England was a less grievance than a conquest of Normandy by Anjou. Normans and Angevins hated one another with the hatred of neighbours ; nothing could be so utterly offensive to all Norman national feeling as the triumphant entry of Geoffrey into Rouen. Each accession which the Angevin prince made to his dominions made matters worse. Normandy became more and more a simple unit in the long roll-call of the possessions of its sovereign, and a unit marked out in a special way. It was not, like England, the possession which gave its ruler his rank among princes. It was not, like Anjou, the home of his direct forefathers. It was not, like Maine, the land of his own birth. What marked it out from his other possessions was that, while he had received all the rest by some form or other of peaceful succession, Normandy alone was a conquered land.

It is not likely that the rule of its Angevin dukes ever called forth much loyalty in the Norman duchy. There was no sign of open discontent, and Henry and Richard were not princes to be lightly thrown aside. The real greatness of the father, the shadowy glory of the son, went for something, even with subjects who had no special love for them or their house. On the death of Richard in 1199 the succession of John was admitted in Normandy, as in England, without dispute. To bring this about it was perhaps reason enough that Anjou took the side of Arthur. But John's victory at Mirabeau put an end to any hope of a division of the dominions of the Angevin house. And when Arthur, in the expressive phrase of Roger of Wen- dover, "vanished," when the French king took on himself

the part of his avenger and declared John to have forfeited Forfeited all fiefs that he held of the French crown, there was no toFrance.

zeal in Normandy to withstand French invasion. The king-duke, to be sure, himself showed as little zeal as any man; but the Normans of an earlier day, with or without the help of their prince, would assuredly have made a stouter resistance than the subjects of John made to Philip Augustus. With wonderful speed (1203-1204) Continental Normandy passed away from an Angevin duke to a French king. One was as much and as little a stranger as

the other ; anda union with the dominions of the Continental overlord might seen: less ignominious than the position of one among many Continental provinces of the island king.

The whole duchy, however, was not lost. The mainland passed to the king of the French ; the islands still clave to their duke. Guernsey, Jersey, Alderney, and their smaller fellows have ever since remained possessions of the kings of England, but forming no part of their kingdom. They still keep their own language, constitution, and laws, and they have never been incorporated with the United King- dom. It is somewhat singular that the kings of England, still holding as they did part of the Norman duchy, should have so soon given up their Norman title. This was done when the treaty of Xaintes (Saintes) between Henry IIL. and Saint Lewis was finally carried out in 1259.

king of the English and duke of the Normans, but had no dominions beyond his kingdom and duchy, there was nothing in the relation to wound Norman national pride. The common sovereign took his highest title from England ; but his policy was apt to be directed at least as much by

Normandy now ceases for a while to have a distinct Hands history. But its earlier history largely influences the " fg

6 : England history which was to come. England, as England, had 4) Quar no real quarrel with France ; but the abiding quarrel be- rel with

tween France and Normandy had drawn England within France.

Norman as by English interests, and the men of Normandy could not forget that England was the conquest of their fathers. And, if English feeling could from one side look on Normandy as a conquered land and on Tinchebrai as the reversal of Senlac, it was equally easy to look on Tinche- brai as a strife between Norman and Norman, in which it was a mere accident that the chosen chief of one and the stronger Norman party, himself the son of the greatest

its range. The kings and the people of England, used to fight with France in a Norman quarrel, kept on the feeling of rivalry towards France, even after

Normandy itself had gone over to the other side. The fact that the English kings kept Aquitaine after the loss of Nor- mandy—for the inheritance of Eleanor was not forfeited by the crime of her son—was the immediate occasion of many of the later disputes between England and France. XVII. —69

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But the traditional feeling was handed on from the days when Englishmen and Normans. fought side by side against I'renchmen. In Normandy itself the memory of the connexion with England soon died out. We read, and it seems strange as we read, of the quarrel which, in the days of Edward I., arose between the crowns of England and France out of the disputes between Norman subjects of France and Gascon subjects of England. But the national feeling of the English towards France was none the less an inheritance handed on from the Norman fights of Varaville and Noyon.

From the time of John's forfeiture Normandy ccased to be a separate state. It was a dominion of the king of France, though often granted out as a separate apanage to members of the royal family. The land fell back upon its natural geographical position as the northern seaboard of France, though now the seaboard of a France that had been vastly enlarged since the land of the Northmen had been cut off from the old French:duchy. The value of such a province to the kingdom was beyond words; but it was now simply a province of France, keeping much that was characteristic, holding to a strongly-marked pro- vincial life, but not parted off by any distinction that can be called national. One cause of the ease with which the land went back to its old position in the days before Rolf doubtless was that so much of the national strength had been used up in the settlements in England and Sicily. The life of the Normans as a people—though a people, strictly so called, they hardly formed—is very far from being shut up within the duchy of Normandy.

Still, the union between Normandy and France—at all events, the possession of Normandy by the French kings of the house of Paris—was not to be altogether unbroken, The duchy was for a while to go back again to the descend- ants of its ancient dukes. The Normans had forgotten their connexion with England, but it was not always for- gotten by English kings

~~and statesmen. The remarkable thing is that the thought of reunion does not show itself till a much later time, when the immediate tradition must have passed away. In the two great English invasions of France Normandy plays an important part; but it does not appear that the descendants of Rolf and William were any more welcome in their ancestral duchy than in other parts of the French dominion. But Normandy holds quite a different position in the two great parts of the Hundred Years' War. Under Edward IIL. it was often the scene of war, because geographical causes naturally made it so 3 but it was so only as any other part of France might happen to be. The war of Crécy and Poitiers was not in any special way a war for Normandy. Edward was rather a French prince claiming the crown of France than an English king seeking the aggrandizement of his kingdom. When the settlement of Bretigny was made Normandy was not among the lands that were given up to England. It was otherwise with Henry V. He was before all things an English king bent on extending the power of England. If he wished to make Continental conquests, Normandy, both from geographical position and from historical associations, —associations which became keener in some sort as they grew more distant,—was the land which before all others invited his ambition. His war with F rance, his formal union of the crowns of England and F rance, were, We may be sure, only means towards his real design, the annexa- tion of Normandy to the crown of England. In every negotiation he was ready to waive his claim to the French crown ; he always insisted on the cession of the Norman duchy in full sovereignty. His war was before all things a war for Normandy. In his serious invasion of 1417 to be distinguished from the earlier military promenade which led to the fight of Agincourt—he gave himself out,~~

~~though he gave himself out in vain, as the lawful duke~~

~~of the duchy. He thoroughly subdued the duchy as his Recon- first work, and from 1418 to 1450 Normandy again became quest by~~

~~a possession of the English crown. The treaty of Troyes, in its 17th clause, speaks of Normandy as a land conquered from the kingdom of France, yet as actually being at the time a separate possession of the king of England, a land which, by the 21st clause, he was bound, on succeeding to the kingdom of France, to reunite with that kingdom. By that treaty England~~

~~and France were to be united on the same terms as Sweden and Norway, Hungary and Austria, in later times ; but by this clause Normandy is to be part of the kingdom of France, neither part of the kingdom of England nor a separate possession of the common king. Henry never succeeded to the crown of France; he died heir and regent of that kingdom. Normandy therefore was not reunited to I'rance, and Henry, on his deathbed, revealed the object of his whole career. He was prepared for the loss of France, but not for the loss of Normandy. Things might take their course in other ways, but the guardians of his child were to conclude no peace with Charles of France unless Normandy was ceded to the crown of England in full sovereignty. Henry VI. succeeded to both king- doms ; he uses the style of both, and never uses the style of the Norman duchy ; yet in documents of his time the duchy is in a marked way distinguished from the kingdom of France. Such phrases as "oure saide royaurne of Fraunce and oure saide duchie of Normandie" are common. In the journal of the embassy in 1445,) ""Guyenne et Nor- mandie et les autres terres esquelles les rois Dangleterre avoient droit avant la question de la couronne "are pointedly distinguished from the lands which were held or claimed by the English kings only by virtue of their claim to the French crown. That Henry V.'s object, the lasting union of England and Normandy, would have been no gain to England needs no proof; but there can be little doubt that the thirty years of English occupation were a gain to Normandy. As far as was possible in a time of war—yet war between France and England was a less evil than war between Burgundians and Armagnacs—King Henry and John duke of Bedford secured to their conquest a far better administration and more of general wellbeing than it had had or than it had again under French rule. But by this time Normans had become Frenchmen. The best English rule was but the rule of a stranger, and the land willingly went back to that dominion of the house of Paris from which it had twice been cut off, at times five hundred years apart.~~

~~From this time the history of Normandy is simply part of the history of France. It is the record of such events in French history, some of the most important events in later French history among them, as took place within the bounds of Normandy. The duchy still kept a certain separate being, and its people still kept a large measure of separate feeling. Philip of Comines remarks that the Normans were always best pleased to have a duke of their~~

~~own. But such a duke of Normandy, son or brother of the reigning king of France, holding a mere apanage and not a sovereign fief, remained a French subject, and had not the same independent position as a duke of Burgundy or Britanny. Philip of Comines further remarks on the wealth of the duchy—the fruit possibly in some measure of the administration of King Henry and Duke John. Normandy brought in a third of the whole income of the French crown. 'To this day Normandy is easily seen, by those who look below the surface, to be in many things a Separate land from France ; compared with southern Gaul, it has much in common with England. But the history a-ee-ee~~

~~1 Stevenson's Letters and Papers of Henry the Sixth, i. 129.~~

~~of Normandy as a European power ends with the Angevin conquest in the 12th century. Since then it has never stood alone, even as it might still be said to stand alone under the Conqueror and under Henry I. The question from that time was whether Normandy should be a de- pendency of England or an integral part of France. The latter was in every way the more natural condition. The reunion under Henry V. was a striving against manifest destiny. It shows what a great man can do and what he cannot. BE. A. F. NORMANS is the softened form of the word " North- man," applied first to the people of Scandinavia in general, and afterwards specially to the people of Norway. In the form of "Norman" (Northmannus, Normannus, Ne ormand) it is the name of those colonists from Scandinavia who settled themselves in Gaul, who founded the Norman duchy, who adopted the French tongue and French manners, and who from their new home set forth on new errands of conquest, chiefly in the British Islands and in southern Italy and Sicily. From one point of view the expeditions of the Normans may be looked on as continuations of the expedi- tions of the Northmen. As the name is etymologically the same, so the people are by descent the same, and they are still led by the old spirit of war and adventure. But in the view of general history Normans and Northmen niust be carefully distinguished. The change in the name is the sign of a thorough change, if not in the people themselves, yet in their historical position. Their national character remains largely the same; but they have adopted a new religion, a new~~

~~language, a new system of law and society, new thoughts and feelings on all matters. Like as the Norman still is to the Northman, the effects of a settlement of Normans are utterly different from the effects of a settlement of Northmen. There can be no doubt that the establishment of the Norman power in England was, like the establishment of the Danish power, greatly helped by the essential kindred of Normans, Danes, and English. But it was helped only silently. To all outward appear- ance the Norman conquest of England was an event of an altogether different character from the Danish conquest. The one was a conquest by a people whose tongue and institutions were still palpably akin to those of the English. The other was a conquest by a people whose tongue and institutions were palpably different from those of the English. The Norman settlers in England felt no com- munity with the earlier Danish settlers in England. In fact the Normans met with the steadiest resistance in a part of England which was largely Danish. But the effect of real, though unacknowledged, kindred had none the less an important practical effect. There can be no doubt that this hidden working of kindred between conquerors and conquered in England, as compared with the utter lack of all fellowship between conquerors and conquered in Sicily, was one cause out of several which made so wide a difference between the Norman conquest of England and the Norman conquest of Sicily. These two conquests, wrought in the great island of the Ocean and in the great island of the Mediterranean, were the main works of the Normans after they had fully put on the character of a Christian and French-speaking people, in other words, after they had changed from Northmen into Normans. The English and the Sicilian settlements form the main Norman history of the 11th century. The 10th century is the time of the settlement of the North- men in Gaul, and of the change in religion and language of which the softening of the name is the outward sign. By the end of it, any traces of heathen faith, and even of Scandinavian speech, must have been niere survivals. The new creed, the new speech, the new social system, had taken such deep root that the descendants of the Scandi-~~

~~navian settlers were better fitted to be the armed mission- aries of all these things than the neighbours from whom they had borrowed their new possessions. With the zeal Character of new converts they set forth on their~~

new errand very of the much in the spirit of their heathen forefathers. If Britain Nenmans: and Sicily were the greatest fields of their enterprise, they were very far from being the only fields. The same spirit of enterprise which brought the Northmen into Gaul seems to carry the Normans out of Gaul into every corner of the world. Their character is well painted by a contemporary historian of their exploits.! He sets the Normans before us as a race specially marked by cunning, despising their own inheritance in the hope of winning a greater, eager after both gain and dominion, given to imitation of all kinds, holding a certain mean between lavishness and greedi- ness—that is, perhaps uniting, as they certainly did, these two seemingly opposite qualities. Their chief men, he adds, were specially lavish through their desire of good report. They were moreover a race skilful in flattery, given to the study of eloquence, so that the very boys were orators, a race altogether unbridled unless held firmly down by the yoke of justice. They were enduring of toil, hunger, and cold whenever fortune laid it on them, given to hunting and hawking, delighting in the pleasure of horses, and of all the weapons and garb of war. Several of these features stand out veryclearlyin Norman history. The cunning of the Nor- mans is plain enough ; so is their impatience of restraint, unless held down by a strong master. Love of imitation isalso marked. Little of original invention can be traced to any strictly Norman source; but no people were ever more eager to adopt from other nations, to take into their service and friendship. from any quarter men of learning and skill and eminence of every kind. To this quality is perhaps to be attributed the fact that a people who did so much, who settled and conquered in so large a part of Europe, has practically vanished from the face of the earth. If Normans, as Normans, now exist anywhere, it is cer- tainly only in that insular fragment of the ancient duchy which still cleaves to the successor of its ancient dukes. Elsewhere, as the settlers in Gaul became French, the emi- grants from Gaul became English, Irish, Scottish, and what- ever we are to call the present inhabitants of Sicily and southern Italy. Everywhere they gradually lost themselves among the people whom they conquered ; they adopted the language and the national feelings of the lands in which they settled; but at the same time they often modified, often strengthened, the national usages and national life of the various nations in which they were finally merged.

But Geoffrey hardly did justice to the Normans if he Their meant to imply that they were simple imitators of others. faculty of Their position was very like that of the Saracens. Hasty oil writers who forget the existence of the eastern Rome are : apt to claim for the Saracens of Baghdad, or more commonly for those of Cordova, a monopoly of science and art at some time not very clearly defined by dates. In so doing they slur over the real position and the real merit of the Saracens with regard to science and art. In neither de- partment did any Saracen, strictly speaking, invent any- thing ; but they learned much both from Constantinople

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1 Geoffrey Malaterra, i. 3—" Est quippe gens astutissima, injuriarnm ultrix, spe alias plus Inerandi, patrios agros vilipendens, quexstus et dominationis avida, eujuslibet rei simulatrix, inter largitatem et avari- tiam quoddam medium habens. Principes vero delectatione bone fame largissimi, gens adulari sciens, eloquentiis in studiis inserviens in tantum, ut etiam ipsos pueros quasi rhetores attendas, que quidem, nisi jugo justitiee prematur, effrenatissima est; laboris, inedix, algoris, ubi fortuna expedit, patiens, venationi aeeipitrum exereitio inserviens. Equorum, eeterorumque militie instrumentorum, et vestium luxuria deleetatur. Ex nomine itaque suo terre nomen indiderunt. North quippe Angliea lingua aquilonaris plaga dicitur. Et qnia ipsi ab aquilone venerant terram ipsam etiam Normanniam appellarunt."

Enter- prise,

Litigious- ness,

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and from Persia, and what they learned they largely deve-

loped and improved. The Normans did just the same.

They adopted the French tongue, and were presently among the first to practise and spread abroad its literature. They adopted the growing feudal

doctrines of France, and worked them, both in Normandy and in England, into a harmoni- ous system. From northern Italy, as it would seem, they

adopted a style of architecture which grew in their hands,

both in Normandy and in England, into a marked and liv-

ing form of art. Settled in Gaul, the Scandinavian from a seafaring man became a landsman. Even in land-warfare he cast aside the weapons of his forefathers; but he soon learned to handle the weapons of his new land with greater prowess than they had ever been handled before. He welcomed the lore of every stranger. Lanfranc brought law and discipline ; Anselm brought theology and philo- sophy. The gifts of each were adopted and bore fruit on both sides of the Channel. And no people ever better knew how to be all things to all men. The Norman power in England was founded on full and speedy union with the one nation among whom they found themselves. The Norman power in Sicily was founded on a strong distinction between the ruling people and the many nations which they kept in peace and prosperity by not throwing in their lot with any one among them.

The quality which Geoffrey Malaterra expresses by the word "'effrenatissima" is also clearly marked in Norman history. It is, in fact, the groundwork of the historic Norman character. It takes in one case the form of cease- less enterprise, in another the form of that lawlessness which ever broke out, both in Normandy and in every other country settled by Normans, when the hand of a strong ruler was wanting. But it was balanced by another quality which Geoffrey does not speak of, one which is not really inconsistent with the other, one which is very promi- nent in the Norman character, and which is, no less than the other, a direct heritage from their Scandinavian fore- fathers. This is the excessive litigiousness, the fondness for law, legal forms, legal processes, which has ever been characteristic of the people. If the Norman was a born soldier, he was also a born lawyer. Randolf Flambard, working together the detached feudal usages of earlier times into a compact and logical system of feudal law, was as characteristic a type of the people as any warrior in the Conqueror's following. He was the organizer of an endless official army, of an elaborate technical system of adminis- tration, which had nothing like it in England

~~before, but which grew up to perfection under Norman rulers. But nothing so well illustrates this formal side of the Norman character as the whole position of the Conqueror himself. His claim to the crown of England is something without earlier precedent, something as far as possible removed from the open violence of aggressors who have no pretexts with which to disguise their aggression. It rested on a mass of legal assumptions and subtleties, fallacious indeed, but ingenious, and, as the result proved, effective. His whole system of government, his confiscations, his grants, all that he did, was a logical deduction from one or two legal principles, arbitrary certainly in their conception, but strictly carried out to their results. Even Norman law- lessness in some sort took a legal shape. In the worst days of anarclry, in the minority of William or under the no-reign of Robert, the robber-baron could commonly give elaborate reasons for every act of wrong that he did.~~

~~It is perhaps less wonderful that this characteristic should have been left out in a picture of the Normans in Apulia and Sicily than if it had been left out ina picture of the Normans in Normandy and England. The circumstances of their Apulian and Sicilian conquests certainly did not tend to bring out this feature of their character so strongly~~

~~NORMANS~~

~~as it was brought out by the circumstances of their Eng- lish conquest. Possibly the same cause may have kept the chronicler from enlarging on their religious charac- ter; yet in Sicily at least they might pass for crusaders, Crusaders in fact they were before crusades were preached. Norman warriors had long before helped the Christians of Spain in their warfare with the Saracens of the Peninsula, and in Sicily it was from the same enemy that they won the great Mediterranean island. Others had done a kin- dred work in a more distant field as helpers of the Eastern emperors against the Turks of Asia. All these might pass for religious wars, and they might really be so 3 it needed greater ingenuity to set forth the invasion of England as a missionary enterprise designed for the spiritual good of the benighted islanders. The Norman, a strict observer Observ- of forms in all matters, attended to the forms of religion ance of with special care. No people were more bountiful to Be ecclesiastical bodies on both sides of the~~

Channel 3 the i foundation of a Benedictine monastery in the 11th cen- tury, of a Cistercian monastery in the 12th, seemed almost a matter of course on the part of a Norman baron. The Conqueror beyond doubt sincerely aimed at being a reli- gious reformer both in his duchy and in his kingdom, while it is needless to say that his immediate successor was exceptionally ungodly, whether among Normans or among other men. But among their countrymen generally strict attendance to religious observances, a wide bounty to religious foundations, may be set down as national characteristics. On the other hand, none were less in- clined to submit to encroachments on the part of the ecclesiastical power, the Conqueror himself least of all.

We thus see in the Scandinavian settlers in Gaul, after they had put on the outward garb of their adopted country, a people restless and enterprising above all others, adopt- ing and spreading abroad all that they could make their own in their new land and everywhere else,—a people in many ways highly gifted, greatly affecting and modifying at the time every land in which they settled, but, wherever they settled, gradually losing themselves among the people of the land. The Norman, as a visible element in the country, has vanished from England, and he has vanished from Sicily. The circumstances of his settlement in his The Con- two great fields of conquest were widely different ; his quest of position when he was fully established in his two insular i realms was widely different; but the end has been the of Sicily same in both cases. Neither island has for ages been in com- any sense a Norman land, and the tongue which the pared. Norman brought with him into both has not for ages been spoken in either. Norman influence has been far stronger in England than in Sicily, and signs of Norman presence are far more easily recognized. But the Norman, as a distinct people, is as little to be seen in the one island asin the other. His disappearance in both cases is an illus- tration of one of the features which we have spoken of in the Norman character, the tendency which in fact made Normans out of Northmen, the tendency to adopt the language and manners of the people among whom they found themselves. But, as far as outward circumstances are concerned, we may say that the same effect has been brought about by different and almost Opposite causes. The whole circumstances of the conquest of England con- strained the conquerors to become Englishmen in order to establish themselves in the conquered land.

~~In William's theory, the forcible conquest of England by strangers was an untoward accident. The lawful heir of the English crown was driven against his will to win his rights by force from outside. But he none the less held his crown as an English king succeeding according to English law. Moreover every Norman to whom he granted lands and offices held them by English law in a much truer sense~~

~~NORMANS~~

~~than the king held his; he was deemed to step into the exact position of his English predecessor, whatever that might be. This legal theory worked together with other causes to wipe out all practical distinction between the conquerors and the conquered in a wonderfully short time. By the end of the 12th century the Normans in England might fairly pass as Englishmen, and they had largely adopted the use of the English language. The fashion-able use of French for nearly two centuries longer was far more a French fashion than a Norman tradition. When the tradition of speaking French had all but died out, the practice was revived by fashion. Still the tradition had its effect. The fashion could hardly have taken root except in a land where the tradition had gone before it.~~

~~The Normans in England therefore became Englishmen, because there was an English nation into which they could be absorbed. The Normans in Sicily could hardly be said to become Sicilians, for there assuredly was no Sicilian nation for them to be absorbed into. While the Normans in England were lost among the people of the land, the Normans in Sicily were lost among their fellow-settlers in the land. The Normans who came into Sicily must have been much less purely Norman than the Normans who came into England. The army of Duke William was un- doubtedly very far from being wholly made up of Normans, but it was a Norman army; the element which was not Norman, though considerable, was exceptional. But we may doubt whether the Norman invaders of Sicily were Norman in much more than being commanded by Norman leaders. They were almost as little entitled to be called pure Scandinavians as the Saracens whom they found in the island were entitled to be called pure Arabs. The conquest of England was made directly from Normandy, by the reign- ing duke, in a comparatively short time, while the conquest of Sicily grew out of the earlier and far more~~

gradual con- quest of Apulia and Calabria by private men. The Norman settlements at Aversa and Capua were the work of adven- turers, making their own fortunes, and gathering round them followers from all quarters. They fought simply for their own hands, and took what they could by the right of the stronger. They started with no such claim as Duke William put forth to justify his invasion of England ; their only show of legal right was the papal grant of conquests that were already made. The conquest of Apulia, won bit by bit in many years of what we can only call free- booting, was not a national Norman enterprise like the conquest of England, and the settlement to which it led could not be a national Norman settlement in the same sense. The Sicilian enterprise had in some respects another character. By the time it began the freebooters had grown into princes. Sicily was won by a duke of Apulia and a count of Sicily. Still there was a wide dif- ference between the duke of the Normans and the duke of Apulia, between an hereditary prince of a hundred and fifty years' standing and an adventurer who had carved out his duchy for himself. And, besides this, warfare in Sicily brought in higher motives and objects. Though crusades had not yet been preached, the strife with the Mussulman at once brought in the crusading element; to the Christian people of the island they were in many cases real deliverers ; still, the actual process by which Sicily was won was not so very different from that by which Apulia had been won. Duke William was undisputed master of England at the end of five years ; it took Count Roger thirty years to make himself undisputed master of Sicily. The one claimed an existing kingdom, and obtained full possession of it in a comparatively short time; the other formed for himself a dominion bit by bit, which rose to the rank of a kingdom in the next generation. When Count Roger at last found himself lord of the whole island, he found himself lord of

men of various creeds and tongues, of whom his own Nor- man followers were but one class out of several. And the circumstances of his conquest were such that the true Nor- mans among his following could not possibly lose them- selves among the existing inhabitants of the island, while everything tended to make them lose themselves among their fellow-

adventurers of other races, among whom, by the time the conquest was ended, they could hardly have been even a dominant element.

As far then as concerned the lands in which the settle- ments were made, the difference lay in this, that, as has been already said, while there was an English nation, there was

no Sicilian nation. The characteristic point of Norman rule Elements

in Sicily is that it is the rule of princes who were foreign of to all the inhabitants of the island, but who were not more foreign to the inhabitants of the island than different classes of them were to one another. The Norman con- queror found in Sicily a Christian and Greek-speaking people and a Mussulman and Arabic-speaking people. The relations between the two differed widely in different parts of the island, according to the way in which the Saracens had become possessed of different towns and districts. In one place the Christians were in utter bondage, in another they were simply tributary ; still, everywhere the Mussul- man Saracen formed the ruling class, the Christian Greek formed the subject class. We speak of the Saracen very much as we speak of the Norman ; for of the Mussulman masters of Sicily very many must have been only artificial Arabs, Africans who had adopted the creed, language, and manners of Arabia. In each case the Arab or the Norman was the kernel, the centre round which all other elements gathered and which gave its character to the whole. Besides these two main races, Greek and Saracen, others came in through the Norman invasion itself. There were the conquerors themselves ; there were the Italians, in Sicily known as Lombards, who followed in their wake ; there were also the Jews, whom they may have found in the island, or who may

have followed the Norman into Sicily, as they certainly — followed him into England. The special character of Norman rule in Sicily was that all these various races flourished, each in its own fashion, each keeping its own creed, tongue, and manners, under the protection of a common sovereign, who belonged to none of them, but who did impartial justice to all. Such a state of things might seem degradation to the Mussulman, but it was deliver- ance to the native Christian, while to settlers of every kind from outside it was an opening such as they could hardly find elsewhere. But the growth of a united Sicilian nation was impossible; the usual style to express

the inhabitants of the island is “omnes” or “ universi Siciliz populi.” In the end something like a Sicilian nation did arise ; but it arose rather by the dying out of several of the elements in the country, the Norman element among them, than by any such fusion as took place in England. That is, as has been already said, the Norman as such has vanished in two different ways. In England the Nor- man duke came in as a foreign intruder, without a native supporter to establish his rule over a single nation in its own land. He could not profess to be, as the count of Sicily could honestly profess to be, a deliverer to a large part of the people of the land. But, coming in by a title which professed to be founded on English law, establish- ing his followers by grants which professed no less to be founded on English law, he planted a dynasty, and estab- lished a dominant order, which could not fail to become English. The Normans in England did not die out ; they were merged in the existing nation. The Normans in Sicily, so far as they did not die out, were merged, not in a Sicilian nation, for that did not exist, but in the common mass of settlers of Latin speech and rite, as dis-

tinguished from the older inhabitants, Greek and Saracen. The Norman conquest of England was at the moment a curse ; the Norman conquest of Sicily was at the moment a blessing. But the gradual and indirect results of the Norman conquest of England are easily to be seen to this day, and they have been largely, though indirectly, results for good. Its chief result has been, not so much to create anything new as at once to modify and to strengthen what was old, to call up older institutions to a new life under other forms. But whatever it has done it has done silently ; there has not been at any time any violent change of one set of institutions for another. In Sicily and southern Italy there is hardly any visible Norman influence, except the great historic fact which we may call the creation of Sicily and southern Italy in their modern sense. The coming of the Norman ruled that these lands should be neither Saracen nor Greek, nor yet Italian in the same sense as northern Italy, but that they should politically belong to the same group of states as the kingdoms and principalities of feudal Europe. William assuredly did not create the kingdom of England ; Roger assuredly did

~~create the kingdom of Sicily. And yet, notwithstanding all this, and partly because of all this, real and distinct Norman influence has been far more extensive and far more abiding in England than it has been in Sicily.~~

~~In Sicily then the circumstances of the conquest led the Norman settlers to remain far more distinct from the older races of the land than they did in England, and in the end to lose themselves, not in those older races of the land, but in the settlers of other races who accompanied and followed them. So far as there ever was a Sicilian nation at all, it might be said to be called into being by the emperor-king Frederick II. In his day a Latin element finally triumphed ; but it was not a Norman or French- speaking element of any kind. The speech of the Lom- bards at last got the better of Greek, Arabic, and French ; how far its ascendency can have been built on any survival of an earlier Latin speech which had lived on alongside of Greek and Arabic this is not the place to inquire.~~

~~The use of language and nomenclature during the time of Norman rule in the two countries forms a remarkable contrast, and illustrates the circumstances of the two as they have just been sketched. The chroniclers of the conquest of Apulia and Sicily use the Norman name in every page as the name of the followers of the conquerors from Hauteville. It was the natural name for a body of men who must, by the time the conquest of Sicily was over, lave been very mixed, but whose kernel was Nor- man, whose strength and feelings and traditions all came froma Norman source. But if we turn to Hugo Falcandus, the historian of Sicily in the 12th century, the Norman name is hardly found, unless when it is used historically to point out (as in Muratori, vii. 260) that the royal house of Sicily was of Norman descent. Of the various " Sicilize populi," we hear of Greeks, Saracens, Lombards, sometimes of Franci, for by that time there were many French- speaking settlers in Sicily who were not of Norman descent. There is a distinction between Christians and Saracens ; among Christians there seems to be again a distinction between Greeks and Latins, though perhaps without any distinct use of the Latin name; there is again a further distinction between "Lombardi" and "Franci" 3 but Nor- mans, as a separate class, do not appear. In England there is no room for such subtleties. The narratives of the con- quest of England use both the Norman and the French names to express the followers of William. In the English~~

~~chronicles “French” is the only name used. It appears also in the Bayeux Tapestry, and it is the only word used when any legal distinction had to be drawn between classes of men in the English kingdom. “Franci” and “ Angli”~~

~~NORG ANS~~

~~are often opposed in Domesday and other documents, and the formula went on in charters long after all real distinction had passed away. That is to say, there were several purposes for which it was convenient to distinguish “English ” and “French ”—the last name taking in all the followers of~~

~~the Conqueror; there were no purposes for which there~~

~~was any need to distinguish Normans as such, either from the general mass of the people or from others who spoke the French tongue. We can see also that, though several languages were in use in England during the time of Nor- man rule, yet England was not a land of many languages in the same sense in which Sicily was. In the 12th cen- tury three languages were certainly spoken in London; yet London could not call itself the “ city of threefold speech,” as Palermo did. English, French, Latin, were all in use in England ; but the distinction was rather that they were used for three different purposes than that they were used by three distinct races or even classes. No doubt there was a class that knew only English ; there may have been a much smaller class that knew only French ; any man who pretended to high cultivation would speak all as a matter of course ; Bishop Gilbert Foliot, for instance, was eloquent in all three. But in Sicily we see the quite different phenomenon of three, four, five classes of men living side by side, each keeping its own nationality and speaking its own tongue. Ifa man of one people knew the speech of any of the others, he knewit strictly as a foreign language. Before the Norman Conquest England had two official tongues ; documents were drawn up sometimes in English, sometimes in Latin, now and then in both. And the same usage went onafter the Conquest; the useof English becomes gradually rarer, and dies out under the first Angevins, but it is in favour of Latin that it dies out. French, the language which the Normans brought with them, did not become an official language in England till after strictly Norman rule had passed away. French documents are unknown till the days of French fashion had come in, that is,~~

~~till deep in the 13th century. So it was in Sicily also; of all the tongues of Sicily French was the most needful in the king's court ("'Francorum lingua que maxime necessaria esset in curia," says Hugo Falcandus, 321); but it was not an official tongue. The three tongues of Palermo are Greek, Arabic, and Latin. King Roger's clock is commemorated in all three. Documents were drawn up in such and so many of these tongues as was convenient for the parties con- cerned ; not a few private documents add a fourth tongue, and are drawn up in Greek, Arabic, Latin, and Hebrew. In neither case is the actual speech of the conquerors one of the tongues in formal use. French, as a separate tongue from Latin, already existed as a literary speech, and no people had done more than the Normans to Spread it as a literary speech, in both prose and verse. But neither in England nor in Sicily did official formalism acknow- ledge even French, much less Italian, as a fit tongue for solemn documents. In England, English, French, Latin, were the three tongues of a single nation ; they were its vulgar, its courtly, and its learned speeches, of which three the courtly was fast giving way to the vulgar. In Sicily, Greek, Arabic, Latin and its children, were the tongues of distinct nations; French might be the politest speech, but neither Greek nor Arabic could be set down asa vulgar tongue, Arabic even less than Greek,~~

~~The different positions then which the conquering Nor- Normans man took in his two great conquests of England and of Sicily in Scot- amply illustrate the way in which. he could adapt limself #4, to any circumstances in which he found himself, the way in which he could adopt whatever suited his purpose in the institutions of any other people, the way in which he commonly lost his national being in that of some other people. From England moreover he spread into Scotland,~~

~~Wales,~~

~~Treland.~~

~~Norman architec- ture in England and in Sicily.~~

~~VORMANS~~

~~Wales, and Ireland, and in each land his settlement put~~

on a somewhat different character, according to the circum- stances of the land. In Scotland he was not a conqueror, but a mere visitor, and oddly enough he came as a visitor along with those whom he had himself overcome in England. Both Normans and English came to Scotland in crowds in the days of Margaret, Edgar, and David, and Scottish national feeling sometimes rose up against them. In Scot- land again the Norman settlers were lost in the mixed nationality of the country, but not till they had modified many things in the same way in which they modified things in England. 'They gave Scotland nobles and even kings ; Bruce and Balliol were both of the truest Norman descent; the true Norman descent of Comyn might be doubted, but he was of the stock of the Francigenz of the Conquest. In Wales the Norman came as a conqueror, more strictly a conqueror than in England ; he could not claim Welsh crowns or Welsh estates under any fiction of Welsh law. The Norman settler in Wales therefore did not to any perceptible extent become a Welshman ; the existing relations of England and Wales were such that he in the end became an Englishman, but he seems not un- naturally to have been somewhat slower in so doing in Wales than he was in England. At least Giraldus Cam- brensis, the Norman Welshman or Welsh Norman, was certainly more alive to the distinction between Normans and English than any other of his contemporaries. In Ireland the Norman was more purely a conqueror than anywhere else; but in Ireland his power of adaptation caused him to sink in a way in which he sank nowhere else. While some of the Norman settlers in Ireland went to swell the mass of the English of the Pale, others threw in their lot with the native Irish, and became, in the well-known saying, Hibernis ipsis Hibermores.

There is yet one point in which we may profitably go back to our comparison between England and Sicily. Both countries are rich in works of architecture raised during the time of Norman rule. And the buildings of both lands throw an instructive light on the Norman national character, as we have described it. Few buildings, at least few buildings raised in any reasonable style of architecture which makes use of the arched construction, can be less like one another than the buildings of the Nor- man kings in England and the buildings of the Norman kings in Sicily. In Sicily the Normans found the two most outwardly civilized of the nations of Europe, the two which had as yet carried the arts to the highest pitch. The Greek had

created the column ; the Roman had developed it; the Roman Greek or Greek Roman had taught the column to bear the cupola; the Saracen had taught it to bear arches of his own favourite pointed shape. Out of these elements the Saracens of Sicily had formed a noble and beautiful style, grand and simple in its construction, rich and graceful in its characteristic detail. With the Saracen and the Greek to his subjects, the Norman had really no need to innovate; he had simply to bid the men of the land to go on working for him instead of for any other. The palaces and churches of the Norman kings at Palermo and Monreale and Cefalu and Messina are in style simply Saracenic; they were most likely the work of Saracen builders; they were beyond doubt built after Saracenic models. In these buildings, as in those of Aquitaine, the pointed arch is the surest sign of Saracenic influence ; it must never be looked on as marking the approach of the Gothic of the North. With that form of art the pointed style of Sicily has nothing in common. A Sicilian church has nothing in common with a French or an English church ; it is sometimes purely Oriental, sometimes a basilica with pointed arches. But, if the Saracen gave the lines of the building, the Greek gave the mosaic decorations of its

dol

walls. In such a case the ruling people, rather the ruling dynasty, had really nothing to add to what they found ready for them. 'They had simply to make Saracen and Greek work in partnership. In England, on the other hand, the Normans did really bring in a new style of their own, their own form of Romanesque, differing widely in- deed from the Saracenic style of Sicily. This Norman form of Romanesque most likely had its origin in the Lombard buildings of northern Italy. But it took firm root on Norman soil; it made its way to England at an early stage of its growth, and from that time it went on developing and improving on both sides of the Channel till the artistic revolution came by which, throughout northern Europe, the Romanesque styles gave way to the Gothic. Thus the history of architecture in England dur- ing the 11th and 12th centuries is a very different story from the history of the art in Sicily during the same time. There were no Greeks or Saracens in England ; there was no Greek or Saracen skill. England indeed had, possibly in a somewhat ruder form, the earlier style of Romanesque once common to England with Italy, Gaul, and Germany. To

~~this style it is no wonder that the Normans preferred their own, and that style therefore supplanted the older one. A comparison of Norman buildings in England and in Normandy will show that the Norman style in England really was affected by the earlier style of England ; but the modification was very slight, and it in no way affected the general character of the style. Thus, while the institutions of England in the 12th century were English with very con- siderable Norman modifications, the architecture of England in that century was Norman with a very slight English modi- fication. The difference then is plain. Where, as in Sicily, the Normans felt that they could not improve, they simply adopted the style of the country. Where, as in England, they felt that they could improve, they substituted for the style of the country their own style,—that is, a style which they had not created but which they had adopted, which they had made thoroughly their own, and which they went on improving in England no less than in Normandy. That is, the discerning Norman, as ever, adapted himself, but adapted himself in an intelligent way, to the circumstances of each land in which he found himself. And this comes out the more clearly if we compare Norman work in England and in Sicily with Norman work in at least some parts of Apulia. At Bari, Trani, and Bitonto we see a style in which Italian and strictly Norman elements are really mingled. The great churches of those cities are wholly unlike those of Sicily ; but, while some features show us that we are in Italy, while some features even savour of the Saracen, others distinctly carry us away to Caen and Peterborough. It is plain that the Norman settlers in Apulia were not so deeply impressed with the local style as they were in Sicily, while they thought much more of it than they thought of the local style of England. In each of the three cases there is adaptation, but the amount of adapta- tion differs in each case according to local circumstances. In Normandy itself, after the separation from England, architecture becomes French, but it is French of a remark- ably good type. 'The buildings of the latest French style keep a certain purity and sobriety in Normandy which they do not keep elsewhere.~~

~~Of all the points here insisted on that which it is most necessary to bear in mind is the Norman power of adapta- tion to circumstances, the gift which in the end destroyed the race as a separate race. English history is utterly misconceived if it is thought that an acknowledged dis- tinction between Normans and English went on, perhaps into the 14th century, perhaps into~~

the 17th. Long before the earlier of those dates the Norman in England had done his work ; he had unwittingly done much to preserve and

strengthen the national life of a really kindred people, and, that work done, he had lost himself in the greater mass of that kindred people. In Sicily his work, far more brilliant, far more beneficent at the time, could not be so lasting. The Norman princes made Sicily a kingdom; they ruled it for a season better than any other kingdom was ruled ; but they could not make it a Norman kingdom, nor could they themselves become national Sicilian kings. The king- dom that they founded has now vanished from among the kingdoms of the earth, because it was only a kingdom and not anation. In every other way the Norman has vanished from Sicily as though he had never been. His very works of building are hardly witnesses to his presence, because, without external evidence, we should never have taken them to be‘his. In Sicily, in short, he gave a few genera- tions of unusual peace and prosperity to several nations living side by side, and then he, so to speak, went his way from a land in which he had a work to do, but in which he never was really at home. In England he made himself, though by rougher means, more truly at home among unac- knowledged kinsmen. When in outward show he seemed to work the unmaking of a nation he was in truth giving no small help towards its second making. (ear. NORMANTON, a township in the West Riding of Yorkshire, is situated on the Calder river, and on several railway lines, 3 miles (by rail) north-east of Wakefield and 24 south-south-west of York. The church of All Saints, an ancient stone structure in the Norman and Perpen- dicular styles, with a square tower rebuilt in 1717, contains a number of interesting monuments. The grammar school was founded about the end of the 16th century. Traces still remain of a moat surrounding the town and connected with a Roman encampment which at one time occupied its site. A mound in the neighbourhood called Haw Hill is supposed to be a barrow. There are numerous collieries in the neighbourhood. The population of the urban sani- tary district (1227 acres) in 1871 was 3448, and in 1881 it was 8038. The parish of Normanton (2517 acres) in- cludes three townships,—Normanton, Snydale, and New- land. Altofts (1698 acres), where Sir Martin Frobisher resided, was made into a separate parish in 1879. NORRIS, Joun (1657-1711), the disciple of Plato

~~and Malebranche, was born in 1657 at Collingbourne-Kingston in Wiltshire, where his father was then incumbent. He was educated at Winchester School, and entered at Exeter College, Oxford, in 1676. In 1680 he took his degree and was elected to a fellowship at All Souls' College. He first made himself known in the university, Anthony Wood tells us, by a translation of Robert Waryng's philosophi- cal poem, Hffigies Amoris, entitled The Picture of Love Unveiled. This appeared in 1682, and was followed in 1683 by his first original work, An Idea of Happiness. With Plato, he places the highest happiness or fruition of the soul in the contemplative love of God—" that primitive and original Beauty, Perfection, and Harmony." Norris's poems, mostly composed about this time, are, in the main, expressions of his habitual mood of devout but somewhat abstract contemplation. They have little poetic richness, but their grave style is often not without impressiveness, and works itself out at intervals into a felicitous stanza or a memorable line.~~

~~tractate aimed at the Calvinistic dissenters. All through his life his intense intellectual activity seemed to make it almost a necessity for him to mingle in whatever contro- versy was going on. But philosophy and philosophical theology formed his central interest. Malebranche's Recherche de la Vérité, which had appeared in 1674, made an easy conquest of the Oxford fellow, to whom its doc- trine appeared no@ more than the consistent and clarified modern expression of that Platonized Christianity which met him alike in St John, in Plotinus, and in Augustine, the father whom he "loved to speak after." Perhaps it would be more correct to say that Norris reads his favourite authors in the light of the theory derived from Malebranche. It is at least doubtful whether he would have reached any definiteness of philosophic theory for himself without thc aid of the French thinker. He makes no secret of his discipleship. Malebranche, he says, "is indeed the great Galileo of the intellectual world. He has given us the point of view, and, whatever further detections are made, it must be through his telescope." Norris's readings in modern philosophy were not confined, however, to Male- branche ; he had studied the works of Descartes himself, and most of what had been written for and against Cartesianism on the Continent. Of English thinkers, More and Cudworth, the so-called~~

Cambridge Platonists, had influenced him most ; and in 1685 his study of their works had ripened into a correspondence with the former. After More's death Norris published the correspondence between them as an appendix to his Platonically conceived essay on The Theory and Regulation of Love (1688).

Some time before this Norris had taken orders, and in 1689, on being presented to the living of Newton St Loe, in Somersetshire, he married, and resigned his fellowship. In the same year he published Reason and Religion, the first of his riper works. The Reflections upon the Conduct of Human Life, which he wrote (also in 1689) "by way of letter to an excellent lady, the Lady Masham," did not advance his interests in that quarter ; for the lady, whose eyes were only weak, was nettled at being set down in the preface as blind. In 1690 Norris published a volume of | Discourses upon the Beatitudes, which proved decidedly popular, and induced the author to follow it up by three more volumes of Practical Discourses between 1690 and 1698. The year 1690 is memorable as the year of the publication of Locke's Hssay, and the book came into Norris's hands just as his volume of Discourses was passing through the press. He at once appreciated its importance, but its whole temper was alien from the modes of thought in which he had been reared, and its main conclusions moved him to keen dissent. He hastened to 'review " it in an appendix to his sermons. These Cursory Reflections constitute Norris the first critic of the Hssay; and they anticipate some of the arguments that have since been persistently urged against Locke from the transcendental side. Though holding to the "grey-headed, venerable doctrine" of innate ideas as little as Locke himself, Norris finds the criticism in the first book of the Lssay entirely inconclusive, and points out its inconsistency with Locke's own doctrine of evident or intuitively perceived truths. He also suggests the possibility of subconscious ideation, on which Leibnitz laid so much stress in the same con- nexion. He next complains that Locke neglects to tell us "what kind of things these ideas are which are let in at the gate of the senses." In other words, while giving a metaphorical account of how we come by our ideas, Locke leaves unconsidered the intellectual nature of the ideas or of thought in itself. Unless we come to some conclu- sion on this point, Norris argues, we have little chance of being right in our theory of how ideas 'come to be united to our mind." He also puts his finger upon the weakness

of Locke's doctrine of nominal essences, showing how it ignores the relation of the human mind to objective truth, and instancing mathematical figures as a case " where the nominal essence and the real essence are all one."

In 1691 Norris was transferred to Bemerton, a pleasant rural charge near Salisbury, where George Herbert had been parish priest in the earlier part of the century. A few miles distant is Langford Magna, where from 1704 onwards Norris had a congenial metaphysical neighbour in the person of Arthur Collier, the future author of Clavis Universalis. The remaining twenty years of Norris's life

were spent at Bemerton, the flight of time marked only by — the works that still came in rapid succession from his pen. In 1691-92 he was engaged in controversy with his old enemies the "Separatists," and with the Quakers, his Malebranchian theory of the divine illumination having been confounded by some with the Quaker doctrine of the light within. In 1697 he wrote An Account of Reason and Faith, one of the best of the many answers to Toland's Christianity not Mysterious. Norris adopts the distinction between things contrary to reason and things above reason, and maintains that the human mind is not the measure of truth. In 1701 appeared the first volume of the systematic philosophical work by which he is remembered, An Essay towards the Theory of the Ideal or Intelligible World. The first volume treats the intelligible world absolutely ; the second, which appeared in 1704, considers it in relation to human understanding. In 1708 Norris wrote A Phalo- sophical Discourse concerning the Natural Immortality of the Soul, defending that doctrine against the assaults of Dodwell. But after the completion of his magnum opus his appearances in print became less frequent. His health was not robust, and perhaps he was a little disappointed at his failure to reach the larger public. Norris died in 1711 at the comparatively early age of 54.

It will hardly be claimed for Norris that he was either an original thinker or a master of style. As Molyneux writes to Locke, he is "overrun with Malebranche and Plato ;" his philosophy is hardly more than an English version of Malebranche, enriched by wide reading of " Platonic" thinkers

~~of every age and country. His style is too scholastic and self-involved. Nevertheless he was an acute and strenuous thinker. His Theory of the Intelligible World isan attempt to explain the objective nature of truth, which he blamed Locke for leaving out of regard. By the intelligible world Norris understands the system of ideas eternally existent in the mind of God, according to which the material creation was formed. This ideal system he identifies with the Logos—the second person of the Trinity, the light that lighteth every man that cometh into the world. For it is these ideas and their relations that are alone the object-matter of science ; whenever we know, it is because they are present to our mind ; or, as Malebranche says, we see all things in God. Matcrial things are wholly dark to us, except so far as the fact of their existence is revealed in sensation. The matter which we say that we know is the idea of matter, and belongs, like other ideas, to the intelligible world. When stripped of its semi-mythical form of statement, Norris's emphatic assertion of the ideal nature of thought and its complcte distinction from sense as such may be seen to contain an important truth. He stands some- what aside from the main course of English philosophical thought. But, as the disciple and correspondent of More, he is, ina sense, the heir of the Cambridge Platonists, while, as the first critic of Locke's Essay, he may be said to open the protest of the church against the implicit tendencies of that work. He occupies a place, there- fore, in the succession of churchly and mystical thinkers of whom Coleridge is the last eminent example. (A. SE.)~~

~~NORRISTOWN, a borough of the United States, capi- tal of Montgomery county, Pennsylvania, lies on the north bank of the Schuylkill river, opposite Bridgeport (with which it is connected by two bridges), and 16 miles north- west of Philadelphia by the Germantown and Norristown branch of the Philadelphia and Reading Railroad. It is a well-built and pleasant town, and contains blast-furnaces and rolling-mills, wool and cotton mills, glass-works, an oil refinery, and various other manufacturing establishments, considerably indebted for their success to the water-power~~

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~~of the Schuylkill river. The hospital for the insane of the south-eastern district of Pennsylvania is situated here. The most conspicuous buildings~~

are the marble county court- house (1855), the music-hall, and the jail. The population was 6024 in 1850, 8848 in 1860, 10,753 in 1870, and 13,063 in 1880. The town occupies the site of the old Swedes' Ford, and owes its name to Isaac Norris, who purchased the ground from William Penn. It was incor- porated as a borough in 1812, and enlarged in 1853.

NORRKOPING, the " Manchester of Scandinavia," a town of Sweden in the province of Ostergotland, 113 miles south-west of Stockholm by rail, situated on both banks of the Motala, the wide and rapid emissary of Lake Wetter, and not far from the head of Bravik Fjord. The river, which here forms the two islands of Laksholm and Brux- holm, is spanned by a number of bridges. Having been burned by the Russians in 1719 and visited by further con- flagrations in 1812, 1822, and 1826, the whole town, since rebuilt, has quite a modern appearance, with wide and regu- lar streets. Among the more conspicuous buildings are St Olaf's church (erected by Gustavus Adolphus in 1616, and rebuilt after 1765-67) ; St Hedwig's, built by the German colony in 1670 ; the town-house, dating froni the beginning of the 19th century; the theatre, the Gustavus orphanage, and the palatial high school (1868). The industrial im- portance of Norrköping has steadily increased from the close of the 18th century Woollen cloth is the great staple (thirty-three factories in 1876), but cotton goods, paper, sugar, flour, tobacco and snuff, soap, starch, &c., are also manufactured. Steamers, gun-boats, and ironclads, as well as smaller craft, are constructed in the ship-yards on the lower Motala. At the close of the 17th century Norr- köping was a place of from 5000 to 6000 inhabitants ; after the Russian invasion it sank to 2600, but afterwards gradually rose, until in 1861 the total amounted to 20,828, and in 1878 to 27,410.

A bull of Pope Lucius III. shows that Norrköping existed in 1185. Margaret held a meeting of the states in the town in 1404. Its fortress, known as Knippingsberg, was destroyed in 1567. At the meeting of the states in 1604 Duke Charles assumed the Swed- ish crown, as Charles IX.; and not long afterwards Duke John of Ostergétland introduced German craftsmen into Norrköping, and thus originated its industrial activity. Under Charles XII. the town suffered not only from war but from pestilence, —2700 of its inhabitants perishing in 1710-11.

NORTH, Lorp (1732-1792). Frederick North, second earl of Guilford, but better known by his courtesy title of Lord North, was prime minister of England during the important years of the American War. The only son, by his first marriage, of Francis, seventh Lord North (grandson of Lord Keeper North), who was created earl of Guilford in 1752, Frederick was born on 13th April 1732, and after being educated at Eton and Christ Church, Oxford, was sent to make the grand tour of the Continent. On his return he was, though only twenty- two years of age, at once elected M.P. for Banbury, of which town his father was high steward; and he sat for the same town in parliament for nearly forty years. In 1759 he was chosen by the duke of Newcastle to be a lord of the treasury, and continued in the same office under Lord Bute and George Grenville till 1765. He had shown himself such a ready debater that on the fall of the first Rockingham ministry in 1766 he was sworn of the privy council, and made paymaster-general by the duke of Grafton. His reputation for ability grew so high that in December 1767, on the death of the brilliant Charles Townshend, he was made chancellor of the exchequer. His popularity with both the House of Commons and the people continued to increase, for his good temper was never ruffled, and his quiet humour perpetually displayed; and, when the retirement of the

duke of Grafton was necessitated by the hatred he inspired and the attacks of Junius, no better successor could be found for the premiership than the chancellor of the exchequer. Lord North succeeded the duke in March 1770, and continued in office for twelve of the most event- ful years in English history. George III. had at last overthrown the ascendency of the great Whig families, under which he had so long groaned, and determined to govern as well as rule. govern by obtaining a majority in parliament to carry out his wishes, and this he had at last obtained by a great expenditure of money in buying seats, and by a careful exercise of his patronage. But in addition to a majority he must have a minister who would consent to act as his licutenant, and such a minister he found in Lord North. How a man of undoubted ability such as Lord North was

could allow himself to be thus used as a mere instrument cannot be explained; but the confidential tone of the king's letters seems to show that there was an unusual intimacy between them, which may account for North's compliance. The path of the minister in parliament was

a hard one ; he had to-defend measures which he had not

designed, and of which he had not approved, and this too in a House of Commons in which all the oratorica] ability

of Burke and Fox was against him, and when he had only the purchased help of Thurlow and Wedderburne to aid him. The most important events of his ministry were

those of the American War of Independence. He cannot

be accused of causing it, but one of his first acts was the

retention of the tea-duty, and he it was also who intro-

duced the Boston Port Bill in 1774. When the war had broken out he earnestly counselled peace, and it was only the earnest solicitations of the king not to leave his sove- reign again at the mercy of the Whigs that induced him to defend a war which from 1779 he knew to be both hope-less and impolitic. At last, in March 17 82, he insisted on resigning after the news of Cornwallis's surrender at York- town, and no man left office more blithely. He had been well rewarded for his assistance to the king: his children had good sinecures; his half -brother, Brownlow North, was bishop of Winchester; he himself was charicellor of the university of Oxford, lord-lieutenant of the county of Somerset, and had finally been made a knight of the Garter, an honour which has only been conferred on three other members of the House of Commons, Sir R. Walpole, Lord Castlereagh, and Lord Palmerston, Lord North did not remain long out of office, but in April 1783 formed his famous coalition with his old subordinate, Fox, and became secretary of state with him under the nominal premiership of the duke of Portland, He was probably urged to this coalition with his old opponent by a desire to show that he could act independently of the king, and was not a mere royal mouthpiece. The coalition minis- try went out of

~~office on Fox's India Bill in December 17 83, and Lord North, who was losing his sight, then finally gave up political ambition. He played, when quite blind, a somewhat important part in the debates on the Regency Bill in 1789, and in the next year succeeded his father as earl of Guilford. He did not long survive his elevation, and died peacefully on 5th August 1792:~~

~~It is impossible to consider Lord North a great statesman, but he was a most good-tempered and humorous member of the House of Commons. In a time of unexampled party feeling he won the esteem and almost the love of his most bitter opponents. Burke finely sums up his character in his Letter to a Noble Lord: 'He was @ man of admirable parts, of gencral knowledge, of a versatile understanding, fitted for every sort of business ; of infinite wit and pleasantry, of a delightful temper, and with a mind most dis- interested. But it would be only to degrade myself," he continues, ""by a weak adulation, and not to honour the memory of a great~~

~~man, to deny that he wanted something of the vigilance and spirit of command which the times required,"~~

~~He knew that he could only~~

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~~For Lord North's administration, by far the best authority is The Correspond- ence of George III. with Lord North, edited by W. Bodhain Downe, 2 vols., 1867. The histories of the period may also be consulted, particularly Lord Mahon's History of England from 1713 to 1788, Sir T. B. May's Constitutional History of England from the reign of George III., and Lord Brougham's admirable sketch in his Statesmen of the Reign of George FII.~~

~~NORTH, Str Duptey (1641-1691), political economist, was third son of Dudley, fourth Lord N orth, who pub- lished, besides other things, Passages relating to the Long Parliament, of which he had himself been a member. He was born 16th May 1641. In his early years he was carried off by Gipsies antl recovered with some difficulty by his family,—an incident curiously similar to that which befell Adam Smith in his infancy. He entered the mer- cantile profession, engaged in foreign trade, especially~~

with Turkey, and spent a number of years at Constan- tinople and Smyrna. Some notices of the manners and customs of the East were printed from his papers by his brother. Having returned to London with a consider- able fortune, he continued to prosecute trade with the Levant. His ability and knowledge of commerce attracted the attention of the Government, and he was further recommended by the influence of his brother Lord Guil- ford. During the Tory reaction under Charles IT. he was a pliant instrument in the hands of the court, and was one of the sheriffs forced on the city of London with an express view to securing verdicts for the crown in the state trials of the period. He obtained the honour of knighthood, and was appointed a commissioner of customs, afterwards of the treasury, and again of the customs. Having been elected a member of parliament under James IL, "he took," says Roger North, "the place of manager for the crown in all matters of revenue." After the Re- volution he was called to account for his alleged uncon- stitutional proceedings in his office of 'sheriff, and did not show much highmindedness in his defence. He died 31st December 1691.

The work by which he has obtained an honourable place in the history of political economy is his Discourses upon Trade, principally directed to the cases of the interest, coin- age, clipping and increase of money. This tract was pub- lished anonymously in 1691. It is supposed that for some unknown reason it was suppressed soon after its appearance ; however this may be, it became very scarce, so that, in his brother's words, "it hath been ever since utterly sunk, and a copy not to be had for money." It does not seem to have been much noticed on its publication, or used by subse- quent writers. A copy was purchased at the sale of the Rev. Rogers Ruding, author of a work on the coinage, and from this a gentleman of Edinburgh printed some copies for distribution. Other copies of the original impression were afterwards discovered, and from them J. R. M'Culloch edited the tract in the Select Collection of Early English Lracts on Commerce printed by the Political Economy Club of London in 1856. North is named by Roscher as one of that "great triumvirate" which in the 17th century raised the English school of economists to the foremost place in Europe, the other members of the group being Locke and Petty. His tract, Roscher further remarks, reads like a chapter of the Wealth of Nations, It does, indeed, in a very remarkable manner anticipate the doc- trines of Adam Smith and the later free-trade school. Its author was quite free from the errors and prejudices of

the mercantilism which was dominant in his day, and which had misled on some subjects even so able a writer as Child, against whom, though without naming him, North's arguments on the legal limitation of the rate of interest appear to be in part directed. At the end of the preface to the Discourses are brought together a number of propo- sitions, embodying the author's views, which he announces as "paradoxes, no less strange to most men than true in themselves." They are so remarkable for the time at

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included in Adams township, was 10,191 in 1880. About a mile to the east of the village the Hudson's Brook is arched over for a considerable distance by a romantic cave from 30 to 60 feet in height. spent the summer of 1838 at North Adams, gives a fine description of the spot.

which they appeared, more than eighty years before Smith's eat work, that they deserve to be quoted in full.

"That the whole world as to trade is but as one nation or people, and therein nations are as persons. That the loss of a trade with one nation is not that only, separately considered, but so much of the trade of the world rescinded and lost, for all is eombined together. That there can be no trade unprofitable to the public, for, if any prove so, men leave it off; and wherever the traders thrive, the publie, of which they are a part, thrive also. That to foree men to deal in any preseribed manner may profit such as happen to serve them ; but the public gains not, beeause it is taking from one sub- ject to give to another. That no laws ean set prices in trade, the vates of which must and will make themselves ; but, when sueh laws do happen to lay any hold, it is so much impediment to trade, and therefore prejudicial. That money is a merehandise, whereof there may be a glut as well as a scarcity, and that even to an inconvenience. 'That a people cannot want money to serve the ordinary dealing, and more than enough they will not have. That no man shall be the richer for the making much money, nor have any part of it, but as he buys it for an equivalent price. That the free coinage is a perpetual motion found out whereby to melt and coin without ceasing, and so to feed goldsmiths and coiners at the public charge. That debasing the coin is defrauding one another, and to the public there is no sort of advantage from it, for that admits no character, or value, but

~~intrinsic. That the sinking money by alloy or weight is all one. That exchange and ready money are the same, nothing but carriage and re-carriage being saved, 'That money exported in trade is an increase to the wealth of the nation, but spent in war and payments abroad is so much impoverishment.. In short, that all favour to one trade or interest against another is an abuse, and cuts so much of profit from the public." The tract closes with these weighty words: 'No people ever yet grew rich by policies ; but it is peace, industry, and free- dom that bring trade and wealth, and nothing else."~~

~~NORTH, Rocer (1650-1733), in writing his Bxamen of Kennet's History of England, and the "Lives" of his brothers, Lord Keeper Guilford, Sir Dudley North, and John, master of Trinity College, Cambridge, became one of the original authorities for the political and social his- tory of the reigns of Charles II. and James II. Hewasa weak man, a humble worshipper of his elder brothers, and especially of the lord keeper, by whose politic energy the family of North had been raised from a very decayed condition ; but the simplicity of his prejudices and the laborious minuteness of his details, notwithstanding the forensic pedantry of his style, give his writings some value. Whatever his great brother did he thought both right and noteworthy ; hence he is a useful contributor to the moral history of the period.~~

~~NORTH, Siz Tuomas, son of Edward North, first Baron North of Kirtling, is memorable as the author of the English version of Plutarch's Lives that supplied Shake- speare with materials for his classical plays. Materials for a biographical notice are extremely scanty ; and neither the exact date of his birth nor that of his death is known. His literary career was long, for he was living in decayed old age in 1603 when a third edition of his Plutarch was published, with a supplement of other translated biogra- phies. His first appearance in literature was in 1557, when Wayland published for him a translation of Guevara's Diall of Princes, a compendium of moral counsels pleasantly interwoven with incidents in the life of Marcus Aurelius. The English of this work is one of the earliest specimens of the more ornate, copious, and pointed style for which educated young Englishmen had acquired a taste in their Continental travels and studies, and which such fashion- able tutors as Ascham and Wilson inculeated by both pre- cept and~~

example. North translated from a French copy of Guevara. ‘The first edition of his Plutarch, translated from the French of Amyot, appeared in 1579.

NORTH ADAMS, a township, manufacturing village, and important railway junction of the United States in Berkshire county, Massachusetts, on the Hoosac river, 143 miles from Boston by the Troy and Boston Railroad. Cotton and wool-weaving and shoemaking are the leading industries. The population of the township, formerly

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Nathaniel Hawthorne, who

NORTHALLERTON, a market town and parliamentary

borough in the North Riding of Yorkshire, is situated on a small stream, the Sun Beck, a tributary of the Wiske,

and on the North-Eastern Railway, about 40 miles north of Leeds and 17 north of Ripon. It consists principally of a long and wide street running north and south. The church of All Saints is a large cruciform structure in the Early English and Perpendicular styles, with a square tower 80 feet in height rising from the centre. There is a grammar school of royal foundation. Among the chari- ties are a hospital founded in 1476 by Richard Moore and a cottage hospital opened in 1877. A town-hall was erected in 1874. There are no traces of the fortified palace of the bishops of Durham, of the White Friars monastery founded in 1354, or of the Austin priory founded in 1341. The town possesses a manufactory of brattice cloth. The population of the parliamentary borough in 1871 (10,381 acres) was 4961, and in 1881 it was 5445. The popula- tion of the urban sanitary district (3650 acres) in the same years was 3164 and 3692 respectively.

Northallerton is supposed to have been a Roman station and subsequently a Saxon burgh. In Domesday it is called Alvertune and Alreton. The prefix “ North ” was added to distinguish it from Allerton Mauleverer. Near it took place (22d August 1138) the Battle of the Standard, wen the Scots under King David were defeated by the English with a loss of 12,000 men. The town was given by William Rufus to the bishops of Durham. The demoli-

tion of their palace was ordered by Henry II. In 1818 the Scots under Robert Bruce plundered the town. It was occupied by Charles I. during the Civil War, and in 1745 the English army encamped on Castlehill above it.

NORTHAMPTON, an inland county of England, is Plate bounded N. by Lincoln, N.W. by Rutland and Leicester, XVH. W. by Warwick, 8.W. and 8. by Oxford, S.E. by Bucking- ham, and E. by Bedford, Huntingdon, and Cambridge. It has an area of 629,912 acres, or about 952 square miles. Its greatest length from north-east to south-west is about 70 miles; in breadth it varies from 7 to 26 miles. The surface is hilly and undulating, but the hills are for the most part small and rounded and the undulations monotonous, notwithstanding that the country is richly cultivated and in some parts finely wooded. The highest summits are Albury (804 feet) and Naseby (697 feet). In the western and south-western districts the scenery be- comes almost picturesque, and in the centre and east, where greater monotony prevails, numerous fine trees add a pleas- ing aspect of richness. For a long period Northampton has been famed for its ash trees, and there are also some very old oaks, as well as a few fine avenues of elm. The north-eastern extremity belongs to the great fen district. The county forms the principal watershed of central Eng- land, nearly all the more important rivers of this region having their sources within its boundaries. The Avon with a westward course forms for some distance the northern boundary of the county, till near Lilbourne it passes in- to Warwickshire. The Nene passes southward through Northampton, whence it takes an easterly course, skirting the eastern boundary of the county. The Welland flows in an easterly direction, forming the boundary of the county with Leicester, Rutland, and Lincoln, The Cherwell, after passing into Oxfordshire, forms for a considerable distance the southernmost portion of the western boundary with that county ; the Leam forms a portion of the boundary with Warwickshire. The Ouse, which rises near Brackley, soon afterwards leaves the county, but again touches it near Stony Stratford, separating it for some distance

from Buckingham. The Grand Junction Canal, which is connected with the Oxford Canal, enters the county at Braunston on the borders of Warwickshire and passes by Daventry and Blisworth into Buckinghamshire,

a branch connecting it with Northampton. The Grand Union Canal unites with the Grand Junction near Daventry and runs north until it joins the Leicester Canal at Foxton, branches passing to Welford and Market Harborough.

Geology.—Lias forms the foundation of N orthampton-

shire, and above it rest the Oolite formations which crop to the surface throughout the greater part of the county. Lias prevails as the surface formation in the west and north-west. Its total thickness is about 800 feet, the Lower Lias clays which stretch in from Warwickshire having a thickness of 500 to 600 feet, the Middle Lias or marlstone of about 30 feet, and the Upper Lias clays, which form numerous outliers scattered over the marl-

stone plateau and also appear along the beds of several of

the streams, a thickness of from 150 to 200 feet. Imme- diately above the lias come the inferior Oolite beds of Northamptonshire sand, which reach their greatest thick- ness in the neighbourhood of Northampton. The sandstone is strongly impregnated with oxide of iron, supposed to have been deposited by the percolations of water through the stone. Brown hematite iron is also found at Adding- ton. The iron of Northamptonshire was made use of by the Romans, but the rise of the modern industry dates from about 1850. In 1881 iron was worked at thirty different places in the county, the total quantity obtained being 1,270,544 tons with an estimated value of £176,427. About one-fourth is smelted in the district, but the greater quantity is sent raw to Merthyr-Tydfil and Staffordshire. East and north-east of the county sandstone is largely quarried for building purposes, and is both easily worked and richly coloured. It is highly fossiliferous, containing many species not known in other districts. The upper division consists of a nearly white silicious sandstone frequently intercalated with clay. Above the sandstone rest beds of Lincolnshire limestone, and, where it is absent, a sandy clay. The slopes of the hills are frequently capped with cornbrash, sometimes overlaid with Oxford clay. Various isolated portions are covered with drift deposits. Where sandstone and limestone join the clay numerous springs occur, the proximity to which has in many cases determined the sites of villages and towns,

Sot and Agriculture.—The climate of N orthamptonshire is mild and genial, while the absence of lofty hills renders it much drier than many other inland districts. The prevailing soil is a rich brown but light and crumbling mould, sometimes with a rocky subsoil. The richest soil is the black mould of the fen district, which is specially suited for grass, as are all the heavier soils, N early all the land is capable of cultivation, although there is some stiff wet soil on the slopes of the hills. In 1883 there were 559,536 acres, or about 88 per cent. of the total area under culti- vation, of which no fewer than 304,654 acres were under permanent pasture, many of the heavier soils having been laid down during the past few years. Leases are the exception, and on this account grass land is more'in re- quest than arable. The farms in general are not large. Isolated houses are rare, both farmers and labourers living for the most part in villages. The farm buildings are thus frequently inconveniently situated as well as badly con- structed, although improvements in both respects are being introduced. The usual rotation of crops is fallow, wheat, beans, and oats on heavy soils; but on the lighter soils wheat, pease or barley, with clover and roots, on a four or five years' rotation is the system generally adopted. Fre- quently the land is left three years in grass. Of the 158,445 acres under corn crops in 1883, 59,613 were under

wheat, 50,866 under barley or bere, 24,914 under oats, 16,770 beans, and 6121 pease. Green crops occupied only 38,143 acres, 23,923 of these being under turnips and swedes, 4894 under mangolds, and only 2520 under pota- toes. Clover occupied 34,137 acres, and fallow 24,157. Horses in 1883 numbered 21,901, of which 16,209 were used solely for agricultural purposes. Cattle numbered 117,790, of which 26,036 were cows and heifers in milk or in calf, the fattening of cattle being the chief occupa- tion of the Northamptonshire farmer. The favourite stock for breeding purjoses is the shorthorn, which has now almost entirely superseded the longhorn ; but the most common custom is to buy in Hereford, Scotch, Welsh, and Irish cattle in the spring and fatten them off the rich pasture with or without artificial food, a few being retained and fed up for the Christmas market. In autumn addi- tional cattle are bought in to eat the coarse grass off the pastures, and these are usually retained during winter. Sheep in 1883 numbered 413,075, of which 255,737 were one year old and above. The most common breed on the rich pastures is the improved Leicester, which is preferred on account of

~~its length of wool; but the Southdown, on account of its superior flesh, is also largely kept.~~

~~According to the latest returns the land was divided among 14,665 proprietors, possessing 592,771 acres, with a gross estimated rental of £1,637,370, an average of about £2 15s. 3d per acre. Of the owners 10,010, or about 79 per cent., possessed less than one acre each ; 83 proprietors possessed between 2000 and 5000 acres, 11 between 5000 and 10,000, and the following over 10,000 each :— Hon. G. W. Fitzwilliam, 18,116 ; duke of Buccleuch, 17,965; Earl Spencer, 17,031; Lord Overstone, 15,046; and the marquis of Exeter, 13,546.~~

~~Manufactures.—The. iron industry is of great importance, and, though only a small proportion of the metal is smelted in the county, the number of furnaces in blast is increasing. The staple and the only manufacture of importance is that of boots and shoes, which is chiefly carried on in Northampton and the towns and villages in the centre of the county and alone the eastern border.~~

~~Railways.—The main lines of the London and North-Western, the Great Northern, and the Midland Railways pass through portions of the county, and branch lines traverse it in all directions.~~

~~Administration and Population.—In Domesday Northampton is mentioned as containing 30 hundreds, but it then included a considerable part of Rutlandshire. These divisions were first re- duced to 28, and in the reign of Henry II. to 20, their present number. The county includes the municipal boroughs of Daventry (3859) and Northampton (51,881); the principal part (20,128) of the city of Peterborough, which was incorporated under the Muni- cipal Act in 1874 ; part (1171) of the borough of Stamford, of which the greater part is in Lincolnshire ; part (2412) of the borough of Banbury, the greater part of which is in Oxfordshire ; the borough of Higham-Ferrcrs (1468); and the urban sanitary districts of Hard- ingstone (4866), Kettering (11,095), Oundle (11,196), and Welling. borough (13,794). Before the Reform Act of 1832 Northampton- shire sent nine members to parliament, two for the shire, two each for the city of Peterborough and the boroughs of Northampton and Brackley, and one for the borough of Higham-Ferrers. By that Act the number was fixed at eight, Brackley and Higham- Ferrers being~~

disfranchised, while the county was formed into two divisions, a northern and a southern, each returning two members. There are two courts of quarter-sessions, one for the county and the other for the liberty or soke of Peterborough, and nine petty and special sessional divisions, exclusive of the liberty of Peterborough. The boroughs of Northampton and Stamford have commissions of the peace and separate courts of quarter-sessions. The boroughs of Daventry and Higham-Ferrers form parts of the petty and special sessional divisions of Daventry and Wellingborough, the county justices having concurrent jurisdiction. The county contains 344 civil parishes, with parts of four others. It is almost entirely in the diocese of Peterborough. The population of Northamptonshire in 1801 was 181,757, which in 1821 had increased to 162,483, in 1871 to 248,891, and in 1881 to 272,555 (185,662 males and 186,893 females), The number of inhabited houses in 1881 was 57,540, and the average number of persons to.an acre 0°48.

History and Antiquities. —The Coritani, who at the time of the Roman invasion inhabited N orthamptonshire, are supposed to have been dependent on the Iceni. Of this period the only remains are a few traces of camps and earthworks, the principal being those at Borough Hill near Daventry, where some rude pottery of supposed British origin has been discovered ; at Arbury Hill near Staverton ; and at Rockingham, on the site of the present old castle. Under

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the Romans Northamptonshire formed part of Flavia Cesariensis. It was crossed by two great Roman roads, the Watling Street and the Ermine Street: the former entered the county near Stony Stratford and passed by Towcester and Weedon to Lilbourne, where it crossed the Avon; the latter crossed over from Castor near Peterborough into Lincolnshire. From the large number of remains discovered within its limits Northamptonshire would appear to have been very extensively occupied by the Romans. The principal Roman stations. within its limits were Irchester, on the north side

of the Nene, where numerous pieces of pottery, coins, and slabs with inscriptions have been found ; Castor, the seat of a celebrated Roman pottery, the extent of which and the finish of whose workman- ship are attested by the tesselated pavements and other relics, as well as by the kilns for bricks and earthenware, that have been dug up ; Benaventa, supposed to be Borough Hill, where excavations have brought to Tight traces of very extensive buildings ; Lactodurum, supposed to be Towcester, where, however, very few Roman remains are now visible ; Isannavatia, probably at Burnt Walls, a large field covered with remains of Roman buildings; and Tripontium, sup- posed to be Lilbourne, where there are traces of camps on both sides of the river. There were also encampments at Arbury Hill, Barrow Hill, Castle Dykes, Chesterton, Guilsborough, Hunsborough, Rains-borough, Sulgrave, and Wallow Bank, besides numerous small camps and posts at other places, especially along the valley of the Nene, which is thickly strewn with tesselated pavements and other remains.

Northampton formed part of Middle Anglia, and was included in the Saxon kingdom of Mercia. In the time of Tostig, and according to some at an earlier period, it was attached to Northumberland, and formed no part of Mercia. When the Northumbrians in 1065 rebelled against Tostig and chose Morkere for their earl they marched southwards.to Northampton, where they were met by Harold and received from him the confirmation of Morkere in the earldom ; but the shires of Northampton and Huntingdon were detached from it, and bestowed on Siward's.young son Waltheof, who became earl of Northampton and Huntingdon. After the Conquest the district became, on account of its extensive forest, a favourite resort of the kings of England, who occupied the castles of Northampton and Rockingham. During the Civil War Northamptonshire was the scene of many skirmishes in addition to the great fight at Naseby, while the battle of Edgehill took place on its borders.

Although Northamptonshire was rich in monastic foundations, remains, except of the abbey-church of Peterborough, afterwards the cathedral, are of small importance, the principal being the foundation and parts of the walls of St James's Abbey at Duston near Northampton, part of the church of the Cistercian abbey of Pipewell near Daventry and of the Cluniac priory at Daventry, and the priory church at Ashby. At Geddington, and also at

~~Northampton, there is an Eleanor cross in good preservation, For the architecture of its churches Northampton holds a place scarcely inferior to any other English county. 'To the Saxon period belong the tower of Earls Barton church, which stands on an eminence, probably the mound of an old English strong-house ; the tower and other portions of Brigstock ; the ground plan and other portions of Wittering ; the remarkable tower of Barnack ; and Brixworth church, constructed in part of Roman materials, and supposed to include part of a Roman basilica. Of Norman, besides the cathe- dral of Peterborough, the finest examples are St Peter's and St Sepulchre's, Northampton, and the tower of Castor. Higham-Ferrers, formerly a collegiate church, Early English and Decorated, is one of the most remarkable churches in the county, both on account of the beauty of its architecture and the number of monuments and brassesit contains. Of the other churches, most of them represent- ing more than one style of architecture, Early English, Decorated, and Perpendicular, the standard of excellence is generally so high that it is impossible to select a few for special notice in preference to others.~~

~~The last surviving fragments of the enclosing wall of Northampton,~~

~~Castle were only demolished in 1878. A gateway at Rockingham, and earthworks at Higham-Ferrers and Brackley are worthy of men- tion. Some castellated ruins remain of Fotheringhay Castle, which was founded soon after the Conquest by Simon de St Liz, was rebuilt by Edmund, son of Edward III., and for many years was a favourite residence of the princes of the house of York. To it Mary Queen of Scots was removed in September 1586, and it was the scenc of her trial in the October following, and of her execution, 8th February 1587. The current statement that the castle was razed by James 1. after his accession to the English throne is a mistake, but it was allowed to go to decay, and its materials were gradually used for other buildings. Barnwell Castle, founded by William the Con- queror, and an interesting example of the defensive construction of the period, is still a fine ruin, which includes four of the round towers and an imposing gateway. Holdenby Manor House, where Sir Christopher Hatton was born, and where Charles I. was staying when he was carried away by Cornet Joyce, has been demolished. Among the ancient mansion-houses are Castle Ashby, the seat of the Comptons, the oldest portion belonging to the reign~~

of Henry VIIL. ; Althorp, the seat of the Spencers, of various dates ; Drayton House,

of the time of Henry V1. ; the vast pile of Burghley House, founded by Lord Burghley, but more than once altered and enlarged ; and Kirby Hall, built by Sir Christopher Hatton.

There are histories of Northamptonshire by Norden (written 1610, pub. 1720), Bridges (1746, 1791), Baker (vol. i. 1822, 2 parts of vol. ii. 1841), and Whellan (1849, 2d edition 1874). See also Sternberg, The Dialect and Folklore of North- amptonshire (1851); Architectural Notices of the Churches in the Archdeaconry of Northampton (1848-49); Hudson, Brasses of Northamptonshire (1853); and North, Church Bells of Northamptonshire (1878).

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NoRTHAMPTON, a municipal and parliamentary borough, and the county town of Northamptonshire, is situated on the slope and summit of an eminence rising above the river Nene, on the main line of the London and North- Western Company, on several branch railway lines, and on a branch canal connecting it with the Grand Junction Canal, 65 miles north-north-west from London. hs divided into four nearly equal parts by two main streets, each about a mile in length, running north and south and east and west, and crossing each other at right angles. In the centre of the town there is a very spacious market square, with a fine drinking fountain, erected in 1860 on the site of the old cross, destroyed by the fire of 1675 which levelled a great part of the town. The older houses are substantially built of stone, the newer ones of brick with stone facings. Formerly there were seven

parish churches, but of these only four now remain, All All

Plan of Northampton.

church of St Giles's was originally a cruciform structure of the beginning of the 12th century, but has been greatly changed, and, besides a fine Norman doorway, contains specimens of Early English, Decorated, and

Perpendicular. St Peter's, near the ancient castle, is supposed to be of the same date with it, and its interior is a fine specimen of Norman architecture. St Sepulchre's, one of the four round churches still remaining in England, is supposed to have been built by the Knights Templars at the close of the 11th century. The Roman Catholic cathedral, in the Gothic style, was founded in 1844, and greatly enlarged in 1863. Among the educational establishments are a free grammar school (1552), a Government school of art (1871), and a blue- coat school, in addition to charity, church, and school-board schools. The charitable foundations comprise St John's Hospital, founded in the 12th century ; St Thomas Hospital, founded 1450, in honour of Thomas Becket ; the general

infirmary (1747), the general lunatic asylum (1837), the union workhouse (1837), and the Royal Victoria Dispens- ary (1844). Among the public buildings are the town-hall in the Gothic style (1864), the county-hall in the Grecian, the corn exchange buildings in the Italian, the county jail, the borough jail, the barracks, and the theatre. There isa fine public promenade, and a racecourse with an area of 117 acres. A new cattle market was opened in 1873. Northampton is unrivalled in England for the manufac- ture of boots and shoes. There are also currying works, breweries, maltings, iron-foundries, flour and paper mills, and brick and tile works. The population of the muni- cipal borough (area 1342 acres) in 1801 was 7020, which in 1831 had increased to 15,357, in 1851 to 26,658, in 1871 to 41,168, and in 1881 to 51,881, of whom 25,249 were males and 26,632 females. The parliamentary borough was enlarged in 1868 to 2046 acres, and the population in 1871 was 45,080, which in 1881 had in- creased to 57,544,

There is a tradition that Northampton was founded by Belinus, a British king, while according to some it is of Roman origin. Neither of these suppositions is supported by any tangible evidence. In the Saxon Chronicle it is called Hamptune. From 917 to 921 it was in possession of the Danes, and in 1010 was nearly wholly de- stroyed by Sweyn. Aftcr the Norman Conquest it was defended by embattled walls, bastion towers, and a strong fortress. North- ampton has been more than once the scenc of a parliament. The priory of St Andrew, founded before the Norman Conquest, was rebuilt

~~by Simon de St Liz, and was of very great extent. During the Civil War the town was fortified for the Parliament. The borough received its charter of incorporation from Henry IL, which was subsequently extended by the 36 of George III., and this con- tinued to be the governing charter until the passing of the Muni- cipal Act of 1835, when the government was vested in a mayor, six aldermen, and eighteen councillors, the town being divided into three wards. Northampton has returned two members to parlia- ment since the time of Edward I,~~

~~NORTHAMPTON, a. city of the United States, the county seat of Hampshire county, Massachusetts, is situated on the west side of the Connecticut river, 17 miles by rail north of Springfield, and is connected with Hadley by a bridge 1230 feet long. The village of North- ampton hes in rich alluvial meadow-land, about a mile from the bank of the river, and with its semi-rural streets and venerable trees has the reputation of being one of the prettiest villages in New England. Of note among its buildings are Smith College (1871; endowment, $500,000) for the higher education of women, the free pubhe library (18,000 volumes) and memorial hall, the Clarke institution for deaf-mutes (1867 ; endowment, $300,000) on rising ground to the west, and the State lunatic asylum (1858; 460 patients). A tramway runs 3 miles to Florence, a manufacturing village producing sewing-machines, silk goods, paper, &c. The population of the township was 5278 in 1850, 6788 in 1860, 10,160 in 1870, and 12,172 in 1880.~~

~~Nonotuck, bought from the Indians in 1653, became the village of Northampton in 1654, and was incorporated as a city in 1883.~~

~~Jonathan Edwards was pastor from 1727 to 1750, and David'~~

~~Brainerd died under his roof in 1747, Timothy Dwight, Arthur, Benjamin, and Lewis Tappan, and W. D. Whitney were born at Northampton.~~

~~NORTHAMPTON, Henry Howarp, EArt or (c, 1539- 1614), the second son of the earl of Surrey, the poet, born about 1539, was restored in blood by the first parliament of Ehzabeth. He bore a high character for learning, but during the greater part of Elizabeth's reign he remained in obscurity, sharing the fortunes of his family. Towards the end of the century he attached himself first to Essex and afterwards to Cecil, and took part in the secret~~

cor- respondence of the latter with J ames VI. of Scotland. When James became king of England, Lord Henry Howard at once sprang into favour. Though a Catholic in princi- ple, he was ready to attend the Protestant service to please

the king, and it is probable that he was one of the few who, in consideration of the services which they were able to render, were authorized by the authorities of that church to take this course. He was a good flatterer, and in 1603 he became a privy councillor. In 1604 he was made lord warden of the Cinque Ports and earl of North. ampton. In 1608 he became lord privy seal, and in 1612 one of the commissioners of the treasury,

In politics he gave his support to the Spanish alliance and to the toleration of the Catholics, believing, as was said by a Catholic agent, that the restoration of the Catho- he religion in England was the only bulwark against Puri- tan democracy. After the signature of the treaty with Spain in 1604 he accepted a pension from the king of Spain. After Salisbury's death in 1612 he won over Carr, who was then earl of Rochester, to his interests by coun- tenancing the favourite's intimacy with his great-niece, Lady Essex, and by supporting the divorce which made a marriage possible between them. Rochester, who soon became earl of Somerset, placed himself completely at Northampton's service in supporting an alliance with Spain. Northampton died in 1614, before the detection of the murder of Overbury, which brought about the fall of Somerset, and ultimately the exclusion from office of the Howard family.

NORTHAMPTON, Spencer Compton, EArt or (1601- 1643), born in 1601, was the son of the Lord Compton who obtained a large fortune by his wife, the daughter of Sir John Spencer, the rich lord mayor, and who was created earl of Northampton in 1618. The young Lord Compton accompanied Prince Charles to Spain in 1623. He suc- ceeded to the earldom in 1630. Though he sometimes appeared at court ceremonies, he preferred a home life. In the Civil War he took the king's side, opposing Lord Brook in Warwickshire in 1642, and taking part in the battle of Edgehill. When Banbury was taken he was placed in command of the garrison, and was active on the Royalist side in Staffordshire and N orthamptonshire, as well

as in his own county of Warwick. On 19th March 1643 he was dismounted in the fight at Hopton Heath near Stafford. His life was offered to him, but he answered that "he scorned to take quarter from such base rogues and rebels as they were," and was immediately slain.

NORTH BIERLEY, an urban sanitary district in the West Riding of Yorkshire, England, about 2 miles south of Bradford, includes the villages of Bierley Lane, Wibsey, and Low Moor, and other smaller hamlets, There are extensive collieries in the district as well as blast and puddling furnaces and rolling-mills, the ironworks at Low Moor employing between 3000 and 4000 persons. The church of the Holy Trinity at Low Moor was erected in 1606 in the Early English style, but has undergone restora- tion. The manor of North Bierley originally belonged to the Swillingtons of Swillington, who were strong adherents of the house of Lancaster. The population of the urban sanitary district (area 4309 acres) in 1871 was 18,616, and in 1881 it was 20,935; that of the township of North Bierley (area 3342 acres) in the same years was 14,433 and 15,620.

NORTH CAROLINA, one of the original thirteen States Plate that formed the American Union, is situated on the Atlantic XVIII. seaboard between 33° 50' and 36° 33' N. lat. and between 75° 27′ and 84° 20' W. long. It stretches 500 miles east and west across the entire breadth of the Atlantic slope of the Appalachians in a long narrow rudely triangular belt, its western extremity, less than 20 miles wide, resting on the highest plateau and summits of that continental system of mountains, while its eastern end spreads out to a breadth of 200 miles in a low, level, and gently undulating plain on the Atlantic coast, with a curving shore-line of more

mMORTH CAROLIRA

than 300 miles. Its area is 52,286 square miles, of which 3620 are covered by water.

Physical Features.—The western section is a rugged mountainous plateau ; it forms a narrow, irregular, much indented trough, lying between the bifurcating chains of the western and dominant arm of the southern prolonga- tion of the Appalachians,—the Smoky Mountains and the Blue Ridge,—the former being the western boundary of the State. The length of

~~this plateau from north-east to south- west is more than 200 miles, its breadth 15 to 50 miles, and its area nearly 6000 square miles. The Smoky chain has a general elevation of from 5000 to 6000 feet, rising in many summits to 6500 feet and upwards, but is broken down by half a dozen deep water-gaps or cafions to the level of 2000 and even 1200 feet. The Blue Ridge, which constitutes the eastern boundary of the plateau, is a very sinuous and angular and straggling mountain chain, with a general elevation of from 3000 to 4000 feet and upwards, a few of its higher summits, about midway in the State, reaching nearly 6000 feet.~~

~~These two bounding chains are connected by many north and south cross-chains, of equal elevation with themselves, or greater, and separated by deep valleys. On one of these cross-chains, called the Black Mountains, is Mitchell's Peak, the highest point east of the Mississippi, its altitude being 6688 feet (400 feet above Mount Washington in New Hampshire), The cross-valleys or river-basins have an altitude of from 2000 to 3000 feet, with smaller benches and marginal plateaus of from 3500 to 4000 feet. Seen from the east or Atlantic side, the Blue Ridge appears as a steep, ragged, and broken escarpment, springing suddenly 2000 to 3000 feet above the Piedmont plateau at its base. This plateau has along its western margin an altitude of 1200 to 1500 feet above sea-level, and is mountainous, with high and precipitous spurs projected eastward and southward from the Blue Ridge.~~

~~This middle region of the State is a country of hills and valleys and rolling uplands, its prominent topographical features being a succession of broad-backed swells with eastward or south-eastward trends, constituting the water- sheds between a number of large rivers, which take their rise in the Piedmont or on the flanks of the Blue Ridge, and reach the Atlantic through a system of wide valleys, 300 to 500 feet below the intervening divides. The area of this region is about 20,000 square miles ; its alti- tude, descending gradually from 1000 to about 200 feet, averages about 650 feet. Eastward, to the sea, lics a great champaign, 100 to 120 miles wide, and 20,000 square miles in area. The surface is generally quite level, but in places undulating and hilly towards the western border, especially near the larger rivers. Towards the coast it is diversified by numerous and extensive sounds, bays, rivers, lakes, marshes, swamps, and islands, the whole surface for 50 miles~~

inland from Hatteras and the eastern shore being less than 20 feet above sea-level. The sea is walled off from this low-lying territory by a-long linear chain of sand- islands or dunes, ranging from 75 to 100 feet and upwards in height, and separated in half a score places by inlets which connect the sounds with the ocean.

Rivers and Drainage.—The features above described give the main outlines of the drainage system, the Blue Ridge being obviously the chief factor. The streams which rise east of that chain empty into the Atlantic, either directly through the territory of this State or by crossing also that of South Carolina ; those which rise west of it seek the Mississippi and the Gulf of Mexico, partly by way of the Tennessee, many of whose chief affluents have cut their

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way in a north-westerly course across the mountain plateau and through the Smoky range, and partly by way of the Ohio, leaving the plateau in a north-easterly direction and reaching that river by the Kanawha through Virginia. Several of the most considerable rivers take their rise in the midland region. The numerous rivers of the eastern section, as they approach the sounds and the sea, broaden into bays of 2, 3, and 5 miles width, through which the movement of the tide is felt to a distance of 50 and 60 miles inland, and many of them are navigable for more than a hundred miles to the lower falls near the western border of the alluvial region.

Climate.—In climate North Car@lina resembles France and Italy. The position of the eastern end on the Atlantic and its projection southward beyond the parallel of 34’, together with the near approach of the Gulf Stream, give this part of the State a sub-tropical climate, its isotherm (66°) being that of the southern half of the Gulf States and of Nicolosi in Sicily, while the great elevation and inland recession of the western section bring its climate to that of the cold temperate zone, the isotherm for the higher plateaus (51°) being that of New England and Upper Canada. The average annual mean temperature of the State is 59°; for the eastern region it is 61°, for the middle 58°, and for the mountainous region 52°. The summer temperature is, for the State 77°, and for the several regions respectively 79°, 77°, 70° ; and the winter temper- ature, 43° for the State, and for the

regions named 46°, 44°, 38°. During a recent winter of unusual severity the thermometer several times indicated 30° and 40° below zero in Michigan and New England, while in North Carolina 10° above zero was reached but once. The aver- age of the minimum temperature for the State is 15°, for the middle region 13°, and for the west 8°; a record of 10° is rarely made east of the Blue Ridge, or of 0° west of it. The mean annual rainfall is nearly double that of England and France, the average for the State being 52 inches, and for the east, middle, and west respectively 60, 45, 58 inches. This precipitation is distributed nearly uniformly through the different seasons, with a slight pre- ponderance in the amount of summer rain and a corre- spondingly less quantity in the autumn. Notwithstanding this large amount of rainfall, the tables of humidity show that the climate is as dry as that of France; and the cultivation of the vine, cotton, silk, &c., furnishes the strongest practical proof of the fact. The prevalent winds are westerly, south-west winds being more common in the east, north-west winds in the middle, and west winds in the mountain region. The rain-bearing winds are mostly from the west and south-west, but the winter rains often come from the north-east. Situated westward of the track of the Atlantic cyclones, and sheltered by high mountains and by distance from the western tornado, the State enjoys almost complete immunity from these destructive visita- tions. The climate is favourable to human health, except in limited malarial tracts in the lowlands on some of the rivers. The death-rate for this State is less than the aver- age for the United States, and one of the two areas where consumption is unknown is found here. :

Geology.—The geological structure of the State is very simple; the formations are arranged quite regularly in zones parallel to the Appalachian axis and the Atlantic coast, and belong almost entirely to two horizons, the: Archean (or Azoic) and the Tertiary. The rocks of the several subdivisions of the former, the Laurentian, Montal- ban, Huronian, &c., occupy the western and middle regions and succeed each other in broad terranes, consisting of granites, gneisses, and schists, separated by narrow belts of quartzites, limestones, sandstones, and slates. The dip of these rocks is almost uniformly eastward and generally at a

high angle. Across the middle of the State lies an exten- sive zone, 20 to 40 miles wide, of the Archean slates, with a predominance of chlorite and felsite slates, schists, clay slates, and shales, with steep westerly dips. This is

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(TRIAssic)

SLATES 3 GNEISSES

Geological Map of North Carolina.

succeeded in the region of Raleigh by another terrane of gneisses and schists about 20 miles wide, inclined eastward at high angles and disappearing southward and eastward under the Tertiary formation, and giving place in turn, farther eastward, to an equal breadth of slates and felsites, with occasional bosses of granite), which are only seen where they have been uncovered in the beds and blufis of the larger rivers. The whole eastern region is mantled over with a thin covering of Tertiary rocks. These consist of sands, gravels, and clays, and of shingle beds and earths rudely stratified, towards the western border. . The thick- ness of this formation ranges from a few feet to 25 and 50 feet, occasionally reaching 100 and 200 feet. Through- out the eastern and larger part of the division, in the ravines and in the beds and banks of the streams, are numerous outcrops of Middle Tertiary marls, Lower Ter- tiary shell-limestones, and coarse chalk beds. And in the southern half of this section, in the river beds and near the water-line of their banks, the Cretaceous formation appears in beds of half-compacted greensand, occasionally filled with shells. Overlying the Tertiary are sporadic ‘ patches of Quaternary clays, gravels, and shingle beds, the latter chiefly near the great channel ways of the rivers, where they sometimes reach a thickness of 30 and 50 feet. The Mesozoic formation is represented by two long narrow trough-like terranes of Triassic sandstones, conglomerates, clay slates, and shales, with bituminous coal. One of these, 5 to 6 miles wide with a south-easterly dip of 10° to 20°, enters the State from South Carolina a few miles west of the Pedee river and, passing within 10 miles (west) of Raleigh, disappears within 15 miles of the Virginia line ; the other, about 40 miles long and 2 to 4 miles wide, lies along the valley of

the Dan river, nearly east and west in direction and near the Virginia line. These beds have a north-westerly dip of 30° to 70°. The rocks of these two belts have a thickness of several thousand feet and are evidently the remnant fringes of a broad, flat anticlinal which has suffered extensive erosion. These two outcrops converge in the direction of the Richmond coal-beds, and were no doubt once continuous with them and with the Mesozoic of New Jersey and Connecticut. The former of these belts carries a 6-foot seam of bituminous, the other a 3-foot seam of semi-bituminous coal. Both are of good quality, but have been little worked. The Palzozoic rocks are entirely wanting, and the Primordial cross the State line from Tennessee only in a few places along the Smoky Mountains. Minerals.—In consequence of the wide distribution of the older rocks there is a notable abundance and variety of minerals. More than 180 species have been discovered, some of great rarity; and one of them has recently yielded to science two new metallic chemical elements. Nearly a score different species of gems have been found, including the diamond, ruby, sapphire, emerald, beryl, lazulite, amethyst, garnet, agate, and zircon. There occur also many minerals having special applications in the use-

ful arts, viz. mica, corundum, asbestos, baryte, chromic iron, garnet, zircon, kaolin, black oxide of manganese, talc, pyrophyllite, &c. Mica is found in large veins or dykes in all the terranes of Montalban gneisses, but the most extensive and valuable mines are found in the mountain region, where workable veins are numerous and extensive and the sheets of mica of unusual size and excellence. Corundum is about as widely distributed as mica, and occurs in the same series of rocks, as well as in some of the slate belts. 'The chief sources of supply of both corun- dum and mica for the arts, in the United States and in Europe, are the deposits of the mountains of this State. In this region are also numerous beds of white and variously-coloured marbles. Building stones of every variety are found in nearly all the sections, and whetstone, millstone, and grindstone grits, as well as potter's clay and fire- clay; and in the seaboard section are immense beds of peat. Iron, copper, and gold ores are coextensive with the outcrops of the metamorphic rocks. Several parallel ranges of magnetic and hematite iron-ore beds cross the State in a north-east direction, in both the middle and the

~~mountain regions. These ores are of a high grade and are in great demand at the Bessemer furnaces in Pennsyl- vania and elsewhere. Beds of limonite are numerous and extensive in all parts of the State. Blackband ore is associated with the coal, and spathic ore occurs as the gangue of several copper and gold mines in the middle region. Iron for domestic consumption has been manu- factured for a hundred years.in the middle region and half as long in the other sections. Gold occurs in both placers and veins from Halifax county on the upper margin of the eastern champaign, within 110 miles of the sea-coast, through all the intermediate sections to Cherokee county in the extreme south-west. The more extensive and pro- ductive deposits are found in the midland region in the southern half of the great slate belt, and in the central part of the Piedmont region among the foot hills and spurs of the mountains. These placers consist of coarse shingle in the beds of the streams and the bordering level bottoms ; climbing the slopes and benches of the hills adjacent, they pass insensibly from half-stratified shingle, gravel, and sand beds into unstratified earths with mingled fragments of stone. These deposits cover several hundred square miles of territory, and are of Quaternary or more recent age. Compared with those of California, they are of very slight thickness, generally not above 5 or 10 to 20 feet, and only occasionally reaching 40 and 50 feet. The most important and valuable vein mines are also found in the midland region. One of these, the Gold Hill mine near Salisbury, has been wrought to a depth of 750 feet, and its total produce exceeds two million dollars of bullion. In the same section are several noted silver mines,—Silver Hill, Silver Valley, and others. Many of the gold veins of the midland region carry also copper ores, and there are numerous copper veins in various parts of the middle and western regions. The more common ore is chal- copyrite, but there are also important lodes of grey copper.~~

~~Soils.—The soils of the eastern region are transported sands, gravels, and clays, of Tertiary and Quaternary origin, the assorted detritus of the abraded hills of the metamorphic rocksin the midland country to the westward. The upland soils of the region (the com- mon characteristic cotton soils) are generally sands and loams of moderate fertility, with here and there considerable areas in long narrow ridges or oval patches called pine barrens, that are very sandy and sterile. Between these, on the benches and lower levels, stretch wide and fertile alluvial tracts, especially along the~~

borders of the streams and the shores of the sounds and bays. On the flattish swells between the lower reaches of the great bay-like rivers and around the margins of the lakes, as well as along the borders of many of the crecks, are extensive tracts of swampy lands with a black peaty soil of great depth and inexhaustible fertility. These soils resemble those of the prairies of the north-western States, but contain a larger percentage of organic matter, and are more produc-

tive and more durable, producing 50 to 60 bushels of corn (maize) to the acre for a hundred years in succession without rotation and without manure. In the middle and western regions of the State the soils are of every variety of texture and composition and of every grade of fertility. They may be generally described as clayey, sandy, and gravelly loams ; but there is a considerable proportion of clay soils, not only in the alluvions of the numerous creek and river bottoms, which are commonly of this description, but on the uplands as well ; these are the more productive and durable. There are no prairie lands in the State, and the highest and ruggedest mountains are covered with"soil and forests to their summits.

Forests. —The whole area of the State was originally forest-covered, and about two-thirds of it is still in the primitive condition, except that the woods are much denser in consequence of the cessation of the annual burnings by which the Indians kept down the brush and preserved them in an open park-like condition. The great variety of soils, together with the wide range of climate, gives rise to a remarkably rich and varied flora. While the higher mountains of the western section are covered with forests of spruces and firs and other trees common to Canada and the lake States, the seaboard section borrows from the Gulf States their live oak aud long-leaf pine, their magnolias and palmettos. Of twenty-two species of oak found in the United States east of the Rocky Mountains, nineteen occur here; of eight pines, all are found in one section or another; of five maples, all; of nine hickories, six; of seven magnolias, all ; of five birches, three; andsoon. And nearly every one of the twenty kinds of timber used in New York ship- yards is found here. There are three well-marked and broadly-distinguished forest regions in the State, corresponding to the three

~~geographical divisions. Pines, chiefly the species australis and txda, constitute the characteristic feature of the eastern forests, giving place in the lower swampy tracts, especially in the seaboard section, to the cypress and juniper. Oaks predominate in the middle and western regions, but the mountain forests contain oak, chestnut, hemlock, and white pine. The oaks, however, are also found in some of their species as a subordinate constituent of the forests throughout the eastern region, and several species of pine (chiefly P. mitis) are frequently mingled with the oaks to the western ex- tremity of the State. The chestnut (Castanea vesew) is very abun- dant, and, reaching a diameter of 8 to 10 feet and a height of 80 and 100 feet, often constitutes extensive forests throughont the mountains. The poplar (Liriodendron tulipifera) is found in all the sections, but is most abundant in the western, where it equals the chestnut in dimensions. Hickories are distributed throughout the State wherever the soil is above average quality. This timber exceeds all the others in weight and strength. The total number of species of trees found in the State is 112, and there are just twice as many of shrubs, many of them 20 feet and upwards in height, which together give these forests everywhere an aspect of wonderful richness and variety, " comparing favourably with almost any portion of the tropics." 1 Among the trees are many valuable and popular cabinet woods, such as the walnut, holly, cherry, ash, cedar, birds-eye-maple, sycamore, &c. These forests are rapidly increasing in value as those of the northern States disappear and as the demand for timber increases.~~

~~Population.—In 1790, at the first United States census, the population was 390,000. In 1860, the year before the beginning of the Civil War, it had risen to 992,622, of whom 361,522 were coloured. In 1870 it was 1,071,361, an increase during this decade of less than 8 percent. In 1880 it was 1,899,750 (531,277 coloured, and 1280 Indians). The foreign-born population numbered but 3742. The increase during the ten years 1870-80 was 30°6 per cent.; the number of persons to the square mile was 29. The people of this State are among the most rural in the United States. The largest city does not contain 20,000 people, and only four exceed 4000, viz., Wilmington, 17,350; Raleigh, 9265; Charlotte, 7094; New Berne, 6448.~~

~~Industries. Agricultural pursuits engage three-fourths of the in- habitants, cotton and rice being staple products of the east, and hay, live stock,~~

buckwheat, and other north-temperate zone products, of the mountain region ; in one section or another may be found every agricultural product grown between the great lakes and the Gulf, except the orange. Indian corn occupies the largest acreage, and this and the other cereals are common to all sections. Cotton ig raised in two-thirds of the counties. It is the chief market crop of the eastern and of the southern half of the middle region. The limit of cotton culture has extended northward 20 to 50 miles in the last fifteen ycars, and the produce has increased nearly threefold. In the northern half of the middle and Piedmont districts tobacco replaces cotton as the market crop. Within ten years its culture has extended into a large portion of the mountain region. The northern tier of counties, next to the Virginia border, is known as the Bright Tobacco Belt, — the larger part of the ycllow or gold-leaf tobacco of commerce being produced in this narrow zone. This crop has also largely increased in the last ten years. The cultivation

1 See Dr Cooper, in 'Forests and Forest Trees of North America," Smithsonian Report, 1858.

of the vine is also increasing in all sections of the State. Accord- ing to Humboldt's thermal criteria the whole State lies within the zone most favourable to this industry. His conclusions are con- firmed by experience in every part of the State, and by the fact that several of the most popular grapes have originated here, such as the Catawba, Isabella, and Scuppernong,

The following table gives the principal crops and their relative amounts at the two last enumerations : —

1870. 1880.

TM TAMICOLT 55/4 /<.0.62.0) s1rsierer0.0:e 18,454,215 28,019,839 bushels. Wheat 2,859,879 3,397,393, Oats 3,220,105 3,838,068 ,, IV) ao oe odes 00 DECEnteTD 852,006 285.160 ie Potatoes, Irish……. 788,808 722,773 ys

.. SWECb 55. cccccccee 3,071,840 4,576,148, RICE MRc reise telscs hicie es cities 2,059,281 5,609,191 pounds. MoDewuote 6c cake oisoweeae 11,150,087 26,986,213 —,, Cotione oe oes. o. Mewnsies melageGRh 389,598 bales.

The total number of farms in 1880 was 157,609 ; the average size 142 acres.

Mining and other Industries. —These, although of verysubordinate intcrest, have long given occupation to a small portion of the popu- lation. Gold was first discovered in 1819, and between that date and 1850 hundreds of gold and copper mines were opened in the middle and western sections, and many thousands of the population were occupied in these industries. The total product of the gold mines between those dates is estimated at about $10,000,000. In the last few years mining industries have received a new impulse. Iron ores are mined on a considerable scale for export, many new gold and copper mines have been opened, and the amount of the output of the various mining industries is increasing very notably. Mica mining began fifteen years ago in the mountain region, and has grown to considerable importance, much the larger part of this material found in commerce being produced here. The annual yield is about 40,000 Ib, and is continually increasing.

The fisheries of the eastern rivers and sounds are large and profit- able, and give employment to several thousand people. And in this region the getting of lumber, both in the pine forests and in the cypress and juniper swamps, has been an important source of profit since its first settlement.

The manufactures of North Carolina occupy a very subordinate place, and are mainly domestic and auxiliary to the one dominant agricultural intcrest. The value of the total annual output, as given by the census of 1880, is $20,095,037. Of this sum $2,554,482 is derived from the manufacture of cotton goods, $2,215,154 from that of tobacco, $1,758,488 from turpentine and tar.

Railroads and Waterways.—In ten years the number of miles of railroad has been nearly doubled and is now within a few score miles of 2000. There are 1000 miles of waterways open to steamboat navigation, including rivers,

bays, sounds, and canals, forming a nexus of lines of communication extending over the whole eastern and seaboard region and connecting with the various ports along the coast from Wilmington to Norfolk in Virginia.

Government, Taxes, Education.—The executive power is vested in a governor, lieutenant-governor, secretary of state, auditor, trea- surer, superintendent of public instruction, and attorney-general, who are elected by ballot and hold office four years. The legisla- tive power is vested in a general assembly, which consists of a senate of 50 members and a house of representatives of 120 members, who are elected for two years and hold biennial sessions. The judicial power is vested in a supreme court, superior courts, and courts of justices of the peace. The supreme court consists of a chief justice and two associate justices. The State is divided into nine judicial districts, and there is one superior court judge to each. The judges of the supreme and superior courts are elected by popular vote for a term of eight years. 'I'he justices of the peace, who administer the law in the counties, are appointed by the legislature. A capitation tax, which may not exceed $2, is levied for the support of a system of education. Other State taxes are levied ad valorem, and amount at present to 25 cents on each $100 worth of property, and this on a very low valuation. The public debt is $5,706,616. The total assessed valuation of property is $156,100,202; the real value is about $800,000,000. A system of public schools is cstablished by law and supported by funds derived from State taxes, and increased by county and municipal levies. The schools are required to be kept open four months in the year. The reccipts of the school fund for 1880 were $553,464.

History.—The coast of North Carolina was the scene of the first effort of the English to colonize America. In the years 1585 to 1587 Sir Walter Raleigh despatched hither five fleets in succession, and planted three small colonies, which disappeared one after the other and left no trace. In consequence of these failurcs, due in large measure to the peculiar conformation of this diflicult coast and the want of good harbourage, the next expedition, twenty years later, was directed to strike the coast farther north, about the mouth of the James river, where the first permanent settlement was effected ; and no further attempt at direct colonization from Europe was made for three quarters of a century. Thus, instead of being the first of the American colonies in point of time, the colony of

Carolina came very near being the last. The southern bound- ary of the colony of Virginia was the parallel of 36° 30’ N. lat., although the whole contiuent was still called by that name, and all the country south of this limit to the Gulf was granted by Charles II. in 1663 and 1665 to a company of English noblemen styled the lords proprietors, with full powers of colonization and government. In this territory, called Carolina in compliment to the royal grantor, the colony of Carolina was planted by them under a new form of colonial government called the proprietary government, consist- ing of a governor appointed by themselves, a legislative assembly elected by the freeholders, and a council of twelve, six appointed by the governor and six by the assembly. Colonists were eagerly solicited for the new ‘‘ plantations” by liberal grants of lands, and by a guarantee of full religious liberty and of exemption from taxa- tion except with the consent of the legislature. These favourable terms were so much in contrast with the state of things in some of the other colonies, especially in Virginia, where tithes were rigor- ously exacted for the support of the Established Church, dissent punished as a crime, and laws enacted which allowed only the alternatives of conforinity or enforced exile, that the new colony soon received a large accession of Quakers and other Dissenters. In 1669 the first legislative assembly met, and a new and remarkably liberal government was successfully organized. The next year an attempt was made to introduce a new system of government and form of social order called the Fundamental Constitutions, drawn up by the celebrated. philosopher John Locke at the request of the lords pro- prietors ; but this and several subsequent attempts were so stoutly resisted by the colonists that the absurd and tyrannous scheme was formally abandoned in 1698. And so strong was the spirit of liberty that one of the lords proprietors who had been sent over as governor was deposed and exiled for extortion, and another governor with his council was imprisoned for misgovernment and infringement of the guaranteed rights of the colony, a new governor and legislature elected, and the government carried on for two years by the colonists themselves. In 1729 the proprietary was replaced by the royal authority, the form of government remaining unchanged. At this date also

the territory of Carolina was formally divided into the two colonies of North and South Carolina. The population at this time, estimated at 13,000, was mostly limited to the seaboard region, within 50 miles of the coast. Ten years later a great tide of emigra- tion set in upon the interior and midland country, both from the older settlements to the north, especially from Virginia and Pennsyl- vania, and from the British Islands and the continent of Europe ; so that in less than forty years the population wanted little of 300,000, and at the beginning of the revolution of 1776 a continuous chain of settlements extended from the sea-coast to the mountains. The new-comers were generally of the best class of immigrants, Scotch, Scotch-Irish, English, Swiss, Germans, and Dutch. They were Presbyterians, Moravians, Lutherans, Huguenots, and Quakers. Devoted to liberty and impatient of tyranny and of privilege, these people were attracted to the colony not alone or chiefly by the fame of its broad aud fertile ‘‘ mesopotamias” and its salubrious climate, but above all else by the liberal and popular form of its govern- ment, especially by its freedom of religion. When attempts were made, as they frequently were, in violation of guaranteed rights, to establish the English Church and collect church rates, they were everywhere met with stubborn and not always passive resistance. The execution of the famous Stamp Act in 1766 was forcibly re- sisted, and the royal vessel bringing the obnoxious papers was not even allowed to enter port. Extortion practised by the officers of the crown in some of the interior counties led to repeated remon- strances and appeals for redress to the governor and afterwards to parliament, and finally ended in 1771 in insurrection and open war. The controversy culminated in the battle of Alamance, in which the recusants were defeated by Governor Tryon. And thus, in one way and another, a spirit of suspicion or resentment, of irri- tation or open hostility, was constantly kept alive in the colony. This spirit found expression in the famous Mecklenburg resolu- tions adopted by the Scotch-Irish settlers about Charlotte in May 1775, in which ‘‘all laws and commissions by authority of king and parliament” are declared to be annulled and vacated, and a new government was organized for the county recognizing only the authority of the provincial congress. Thus North Carolina was fully ripe for measures of open and combined resistance when move- ments were begun towards a union of the colonies for this purpose, and was the first of all the colonies to instruct its delegates to the continental congress to vote for formal independence of the British crown. Early in 1776 the militia of the

colony met and defeated on the lower Cape Fear river a body of 1500 British troops under skilful officers, directed by the royal governor and supported by a British fleet of thirty sail off the port of Wilmington. The colony furnished its full quota of troops to the continental armies north and south, and lost most heavily in the fall of Charleston. But beyond this, situated far from the seat of war and weakened by the pressure of several recent settlements of adherents of the British crown, the colony did not bear a conspicuous part in the revolution until in the later campaigns, during the closing years of the war, its

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| territory became the theatre of the conflict.

The defeat and capture of an important detachment of Cornwallis's army under Fergusou at King's Mountain in 1780 by a sudden gathering of untrained backwoodsmen and hunters, chiefly from the mountain settlements, checked the victorious march of the British ; and a similar volunteer gathering of her yeomanry from all the surrounding region at the battle of Guilford Court House in 1781 contributed largely to give the victory of Cornwallis the character of a defeat, and forced his speedy retreat to the coast and ultimately to Yorktown for the final catastrophe.

On the formation of the Federal Union, North Carolina, having had abundant and long experience of usurpation and misgovern- ment, did not make haste to enter the new compact, but moved with slow and cautious steps, and was one of the last of the colonies to adopt the constitution. At the breaking out of the war between the States in 1861, North Carolina, strongly averse to secession, sought by every means to avert the conflict, remaining unmoved after all the surrounding States had seceded, and was forced into the struggle last of all the Southern States, and when there remained only the alternative of a choice of sides. Being near the seat of war and yet for the most part outside of it, the State contributed more largely to the commissary supplies of the Confederacy, and also sent into the field a larger number of troops and lost more men in battle than any other State, her soldiers having a conspicuous share in all the great battles from Bull Run to Petersburg. Since the close of the war, which left her utterly bankrupt, North Carolina has entered on a career of prosperity

~~unexampled in her previous history. Population has increased far more rapidly than at any previous period, the number of miles of railroad has been doubled, the area of land under cultivation enlarged, agriculture improved in its methods and results, and industries diversified to an extent and with a rapidity never known before. (WiC. KS)~~

~~NORTHCOTE, James (1746-1831), historical and por- trait painter, was born at Plymouth on the 22d October 1746. Though he early showed an inclination for art, his father, a poor watchmaker of the town, insisted that he should be bound with himself for an apprenticeship of seven years. During his spare hours the boy was dili- gent with brush and pencil, and on the expiry of the term, in 1769, he started as a portrait painter. Four years later he went to London, and was admitted as a pupil into the studio and house of Reynolds, who had been the object of his warmest admiration from early boyhood. At the same time he studied from the round and the life in the Academy schools, making, it would seem, rather slow pro- gress in the technical processes of art. In 1775 he left Reynolds, and about two years later, having acquired the requisite funds by portrait-painting in Devonshire, he set out for Italy. There he remained for three years, study- ing the portraits of Titian, looking, as he tells us, twice at Michelangelo for every time he looked at Raphael, and forming the resolution that in the future he would paint portraits for bread and historical subjects for fame. On his return to England he revisited his native county, and then settled in London, where Opie and Fuseli were his rivals. He was elected associate of the Academy in 1786, and full academician in the following spring. The Young Princes murdered in the Tower, his first 1mportant histori- cal work, dates from 1786, and it was followed by the Burial of the Princes in the Tower, both paintings, along with seven others, being executed for the Shakespeare gallery of Alderman Boydell. The Death of Wat Tyler, now in the Guildhall, was exhibited in 1787 ; and shortly afterwards Northcote began a set of ten subjects, entitled the Modest Girl and the Wanton, which were completed and engraved in 1796. They were suggested by the Pamela of Richardson and the Idle and Industrious Apprentices of Hogarth,—a painter for whom Northcote rofessed little admiration. The series was popular at the time, but neither in truth of dramatic conception nor in technical qualities does it approach the parallel works of the older master. Among the productions of Northcote's later years are the Entombment and~~

the Agony in the Garden, besides many portraits, and several animal sub-jects, like the Leopards, the Dog and Heron, and the Lion, which were more successful than the artist's efforts

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in the higher departments of art, as was indicated by Fuseli's caustic remark on examining the Angel opposing Balaam—-"' Northcote, you are an angel at an ass, but an ass at an angel." The works of the artist number about two thousand. By unwearied diligence, combined with extreme frugality, he was enabled to accumulate, before his death on 13th July 1831, a fortune of £40,000.

His works possess a certain dignity, and they tell their story clearly ; but they are marred by defective drawing and dull colour- ing, and by the gross anachronisms and inconsistencies in costume common to the historical painters of the period. Northcote was emulous of fame as an author, and his first essays in literature were contributions to The Artist, edited by Mr Prince Hoare. In 1813 he embodied his recollections of his old master in a Life of Reynolds. His Fables—the first series published in 1828, the second posthu- mously in 1833—were illustrated with woodcuts by Harvey from Northcote's own designs. In the production of his Life of Titian, his last work, which appeared in 1830, he was assisted by William Hazlitt, who previously, in 1826, had given to the public in the New Monthly Magazine his recollections of Northcote's pungent and cynical '' conversations," the bitter personalities of which caused much trouble to the painter and his friends.

NORTHFLEET, a village and urban sanitary district in the county of Kent, forming part of the parliamentary borough of Gravesend, is situated on the Thames and the North Kent Railway, 20 miles east of London and 2 west of Gravesend. The church of St Botolph, chiefly in the Later Decorated style, dates from the middle of the 13th century ; but the nave is of later date, and the old tower, having fallen down, was rebuilt in 1628. The church con-tains a brass of the 14th century and other interesting monuments. The nave and chancel have undergone modern restoration. Huggens College, with residences for forty decayed gentry, was established in 1847. A factory club for the use of those engaged in the chemical works was opened in 1878.

Besides chemical manufac- tures there are chalk, lime, cement, and brick works, and a large shipbuilding yard. Rosherville pleasure-gardens are in the neighbourhood. The population of the urban sanitary district (3934 acres) in 1871 was 6515 and in 1881 it was 8790.

NORTH SEA. The North Sea or German Ocean lies between Great Britain and the continent of Europe. It communicates with the North Atlantic by the Straits of Dover in the south, and by the Pentland Firth and the various openings between the Orkney and Shetland Islands in the north. Between the Shetlands and Nor- way it passes by a wide opening into the sub-polar basin, now generally known as the Norwecian Sza (g.v.), of which indeed it may be regarded as a southern extension. It has communication with the Baltic by the Skagerrack and the Cattegat. The shores of the North Sea have from the earliest times been inhabited by brave and hardy races of men famous for their maritime exploits; and at the present day it is surrounded by many of the most prosper- ous and enterprising commercial nations, and is, in conse- quence, one of the most important highways of the world. Its fisheries give employment to thousands of persons, and are the most valuable that exist. Lighthouses are situated on nearly every available point where they are required, and there are numerous light-ships along the coasts.

The North Sea lies between the parallels of 51° and 61° N. lat. and 2° 30' W. and 8° E. long,, its greatest length being about 600 miles, its breadth (from St Abb's Head to the shores of Denmark) 360 miles, and its area about 140,000 square miles. It may be said to be without islands if we except the Orkneys, the Shetlands, and those islands which are situated along the coasts. Its coasts present considerable variety in appearance and geological formation. Scandinavia, composed of ancient rocks, is elevated, deeply indented by fjords, and skirted with num- erous islands. The coasts of Britain are bold and rocky in

the north, while towards the south they present a succes- sion of low rocky or chalky cliffs and sandy beaches. Den- mark, Germany, Holland, and Belgium have low shores, composed of recent formations, and deeply indented. Many parts of Holland and Belgium are indeed below the level of the sea, and are protected from inundation by artificial dykes and extensive natural sand dunes. The sea has repeatedly broken through these artificial and natural barriers and submerged large tracts of country. The Dollart Zee and the Zuyder Zee were formed in this way in 1277 and 1282. Some of the most important rivers of Europe enter the North Sea, as the Elbe, Weser, Ems, Rhine, Scheldt, Thames, Humber, Tyne, Tweed, Forth, and Tay. If we include the Baltic, which enters into it, we may regard the North Sea as receiving the drainage of about one-fourth of the European continent.

Its greatest depth is in a deep gully following closely the trend of the southern portion of the Scandinavian pen- insula, where soundings of 160, 200, 300, and 400 fathoms are common. It has been suggested that this deep gully, which extends into the Skagerrack, may have been the bed of ariver at a time when the continent of Europe stood at a higher level, and that the Elbe and some of the other rivers now entering the Balticand North Sea may have united and flowed into the Norwegian basin of the Atlantic through this depression. With the exception of this gully the depth of the North Sea is less than 100 fathoms. It is to be noticed, however, that the bottom of the whole basin is very irregular. The southern half is the shallower, and, generally speaking, the depths in this portion are greater on the eastern and western sides than in the centre, where the Dogger Bank is situated. On this bank the depth is from 8 to 16 fathoms, whereas in the ‘Silver Pit ” immedi- ately to the south there is a depth of 45 fathoms. Similar irregularities are met with in various other parts of this sea- bed, and are called by the fishermen “ pits” and “banks,” with various distinguishing names. In the northern half the depth gradually increases towards the north, until a depth of 2000 fathoms is reached in the Norwegian Sea. It is probable that these irregularities met with in the bottom of the North Sea are chiefly due to the moraines and detrital matter left by the great glacier which filled it during the Glacial period. There are besides a great number of shoals and sandbanks lying along the coasts of Holland, Belgium, France, and Britain, which assume the form of ridges

~~running in a direction nearly parallel to the shores, and consist of sand and detrital matter brought down by rivers and arranged apparently by tide streams. The deposits vary considerably in their composition. In the shallow parts a sand predominates, composed of frag- ments of quartz, felspars, micas, hornblende, augite, mag- netite, and calcareous fragments consisting of triturated pieces of mollusc shells, Echinoderms, Polyzoa, Alcyonarian spicules, calcareous Algæ,and many Foraminifera. In the deeper water we generally find a mud or clay composed of the above-mentioned mineral and organic fragments, with the addition of fine argillaceous matter, very minute mineral particles, and Diatom frustules. In some places we have stones and gravel, and indeed stones may be met with in all the varieties of deposit.~~

~~Fogs, mists, and rain occur at all seasons. The winds are variable, the moisture-laden winds from the south-west being the most prevalent, and storms are frequent. The currents depend chiefly upon the direction of the winds, and the navigation is most difficult. The great tidal wave from the Atlantic on reaching the British Islands breaks into two portions, one passing through the Straits of Dover and the other round the north of Scotland into the North Sea. These two portions meeting produce nodal lines, where they partially neutralize each other, for instance in~~

~~the Straits of Dover, and less distinctly in lines stretching from the Wash and Moray Firth to the north of Denmark. The North Sea lies between the January isotherms of 31° and 40°, and the July isotherms of 55° and 65° Fahr., so that the difference between the mean winter and summer temperature is about 24°. The temperature of the surface water ranges in January between 39° and 45° Fahr., and in July between 53° and 63°. Hence the contrast between the temperature of the water and that of the air is greater in winter than in summer, and indeed except during the warmest months the air is colder than the water. In the southern part of the North Sea, south of the Dogger Bank, where the sea is comparatively shallow, there is in summer only a difference of a degree or so between the surface and the bottom water, the bottom water being a little the colder. The difference is greatest in the hollows like the "Silver Pit," where the depth reaches 45 fathoms. The tempera- ture along the British coast appears to be~~

in summer about 3° colder both at the surface and at the bottom than along the coast of Denmark. We have no very reliable informa- tion as to the temperature of the water at different depths during the winter months, but we know it takes a very long time before the cooling of the surface water affects the temperature at the depth of a few fathoms, therefore it is most probable that the water at the bottom in the southern part of the sea is much warmer than the surface or intermediate water, and this is likely to be the case especially in the "pits" where the depth is greatest. This is very probably the chief reason why such large catches of soles and other fish are made in these " pits" during very cold winters.

North of the Dogger Bank there is a very considerable difference of temperature between the surface and the bot- tom water in summer. Off Aberdeen there is a difference of

: 11°, the surface temperature in summer being 56° Fahr. i Surface ;

cone

Fig. 1.—Distribution of temperature in the Faroe Channel.

and the bottom 45°, while in the Norwegian gully there is a difference of 17°. Farther north in the Norwegian Sea, at a depth of 300 or 400 fathoms, the water is below : 32° Fahr. all the year round. The specific gravity ranges

55°

>t Ff. Urtie".

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Fig. 2,—Section showing distribution of temperature in summer in the North Sea along a meridian line.

between 1:0249 and 1:0270, the saltest water being found at the bottom in the Norwegian gully. The lightest water is found in the Skagerrack where the Baltic water enters the North Sea, and in the southern half of the sea where the Continental rivers discharge their waters.

The North Sea has an abundant flora. Algz in great abundance and variety grow on all the shores and in all the

shallower waters, while a few species are found at depths of even 50 and 100 fathoms. The surface and subsurface waters swarm with Diatoms, Peridinias, Coccospheres, and other minute Alge. It is a matter of observation that where there is a low specific gravity, indicating a mixture of fresh with salt water, there is usually a great abundance of Diatomacez in the surface waters. This is

the case in bays and estuaries, and in the arctic and antarctic

regions, where melting ice lowers the specific gravity. The North Sea has all the characteristic features of a great bay, and has a great abundance of plant life. Its surface or intermediate waters are at times quite discoloured by the enormous abundance of Diatoms or Peridinias which are met with in vast floating banks. The cause of the rapid and great development of these minute organisms at particular times and places appears to depend on physical conditions which are not at present understood. With such a vast food supply it is not surprising that a prolific fauna swarms in the North Sea. Everywhere on the bottom we find Foraminifera, Sponges, Coelenterates, Echinoderms, Worms, Polyzoa, Tunicata, Molluscs, Crustacea, and Fishes. At all depths in the intermediate water we find Protozoa, Medusz, Copepods, Amphipods, Schizopods, Sagitta, and various other pelagic animals, together with a great abun- dance of the larvee of animals living on the bottom. The invertebrates living on the bottom and in the water at various depths, in their adult as well as in their larval stages, supply food for those fishes which are so much de- sired for the table. Most valuable food fisk, as the cod, haddock, herring, sprat, holibut, sole, coal-fish, and many others, frequent the North Sea, and are captured in great numbers by the fishermen of all the nations occupying the seaboard. There are also important fisheries for crusta- ceans such as lobsters, crabs, prawns, and shrimps, and for molluses such as oysters, mussels, whelks, and periwinkles. Whales and porpoises are numerous, and sea-birds are found in vast numbers on the islands along the shores. The annual value of the North Sea fisheries of various kinds is enormous. In a recent lecture the duke of Edin- burgh estimated that the labours of British fishermen supplied

annually "fish food amounting to about 615,000 tons weight, which at £12 per ton represents a money value of £7,380,000." By far the larger part of this comes from the North Sea. If we consider that these waters are also fished by Norwegians, Danes, Germans, Dutchmen, Belgians, and Frenchmen, we may form some idea of its fertility. It is very probable that the annual value of all the fisheries exceeds £25,000,000.

No systematic investigation of the North Sea has yet been undertaken, and in consequence our knowledge is in many respects very meagre. This is all the more astonishing when we remember the value of the fisheries and the enterprise of the nations engaging in them. The Admiralty employed a ship for several seasons to examine the currents and tides; the results are published in the North Sea pilot and admiralty tide tables. The German ship " Pom- merania "' was engaged during the year 1872 in examining the North Sea. See Die Expedition zur physicalisch-chemischen und biologischen Untersuchung der Nordsee im Sommer 1872 (Berlin, 1875). (J. MU.)

NORTHUMBERLAND, the northernmost county of Plate England, is of a somewhat triangular form, roughly re- XIX.

sembling that of England itself. It lies between 54° 47' and 55° 46' N. lat. and 1° 25' and 2° 41' W. long,, and is in its extremes about 70 miles long and 53 broad. Its area is 2016 square miles, ranking it fifth among English counties. Northumberland lies entirely on the easterly slope of the country. Its boundaries are the German Ocean, Scotland, and the counties of Cumberland and Durham. In physical aspect it is a tumbled incline of fells and ridges, intersected by valleys and subsiding eastwards from the hill-borders of Scotland and Cumberland into lessening undulations and a shelving coast. The Cheviot range (separating Northumberland from Scotland) is divided by

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nature into two groups. What may be called the northern Cheviots are green hills of conical and high-arched forms, finely grouped, with the peat-capped Cheviot itself (2676 feet) at their centre, deep steep glens radiating into all parts of their mass, and generally more or less of hollow and enclosed

ground separating them from the slopes at their base. The southern Cheviots (south-westwards from Thirl- moor) are the highest part of the county,—moory hills, lower and more confluent, and sometimes curiously equal-topped. On the Cumberland side of the county these watershed heights sink into a monotonous rolling tract, separated only by the river Irthing from the "wastes" of Bewcastle. They again swell up in the south-west towards Killhope Law (2208 feet) and the Pennine range. Few eminences break the general incline, which stretches in a far-spread billdwy sea of confluent hills that for six months of the year mingle their browns, russets, and duns in a pattern of Oriental richness, and at all times communicate a fine sense of altitude and expanse. The Simonside Hills (1447 feet) form one not very conspicuous exception. The configuration of much of these uplandshas a certain linearity in its details due to groups and ranges of ridges, crags, and terrace-like tiers, picturesquely termed " edges" (escarp- ments) by the country folk, and generally facing the interior, like broad ends of wedges. The line of pillared crags and prow-like headlands between the North and South Tynes along the verge of which the Romans carried their wall is a fine specimen. Passing eastwards from the uplands we exchange the moors for enclosed grounds, " drystone " walls for hedgerows, rare sprinklings of birch for a sufficiently ' varied wooding, and towards the south-east we approach the smoke of the coal-field and the roar of the Tyne.

The chief rivers and valleys are the Derwent, the Irthing, the Tyne (with its North and South branches, the Allendales, and Redesdale), the Wansbeck with its twin the Font, the Coquet, the Alne, the Till with its feeders the Breamish, Glen, and College, and the Tweed. The Tyne is the "coaly Tyne" only from Wylam downwards. For 19 miles (its tidal portion) it has been dredged into a small estuary,—"a river of coal, iron, and chemicals." The rivers and streains in general are greatly diversified with numbers of rocky gorges and rich "denes." The deepest glen-scenery is at the head of the Breamish and College burns ; and the North Tyne gathers its waters from surrounding moorlands into a vale of surpassing beauty.

The coast is a succession of sands, flat tidal rocks, and low cliffs. Its bays are edged by blown sandhills; its borders are severely wind-swept. Several islands lie over against it. Holy Island, the classic Lindisfarne, 1051 acres in extent, but half "links" and sandbanks, is annexed to the mainland and

~~accessible to conveyances every tide. The Farne Islands area group of rocky islets farther south, —the scene of many saintly austerities, and of the nobler devotion of Grace Darling.~~

~~Geology.—The core of the county, in a geological aspect, is the northern Cheviots from Redesdale head nearly to the Tweed. Its oldest rocks are gritty and slaty beds of Silurian age, about the head of the rivers Rede and Coquet and near the Breamish south of Ingram,—a part of the great Silurian mass of the southern uplands of Scot- land. Even before the times of the Old Red Sandstone these rocks had been crushed and folded, upraised into a continental land, and much wasted. The largest hollows in that ancient continent held the great lakes in which the "Old Red" was deposited. Volcanic activity near one of the lake-group (now to be known as Lake Cheviot) resulted in the felspathic porphyrites passing into the syenites and granites that form the mass of the northern Cheviots.~~

~~Round this core there now lie relays of Carboniferous strata dipping east and south, much faulted and repeated~~

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~~in places, but passing into Coal-measures and Magnesian Limestone in the south-eastern part of the county. The dawn of the Carboniferous ages saw the volcanic piles of the Cheviots becoming shapeless with waste. Then ensued a general settling down of the land, the gathering of a long series of deposits around its subsiding borders, the burying of Cheviot-land, and the gradual formation of the whole great succession of the Carboniferous system. The builders thereof were three. After every sufficient subsidence the limestone sea that covered Derbyshire sent incursions of marine life northwards ; the waste of the land in the north then spread out in sheets of sand and silt; and over the mud-flats thus prepared came slow migrations of dense plant-growth. Limestones, sandstones, shales, and coals were the result ; and the whole system now consists of—(1) the Carboniferous Limestone series in three divisions, first detected by the accurate eye of George Tate of Alnwick ; (2) the Millstone Grit ; and (3) the Coal-measures. Lowest in Northumberland lies Tate's Tuedian group, the first envelope of sinking Cheviot-land. Some reddish shore-like conglomerates lie in places at its base, as at Roddam Dene ; its shales are often tinged with~~

distemper greens ; its coals are scarcely worthy of the name; its limestones are thin, except near Rothbury ; and its marine fossils are few and incursive. The Tuedian group is overlaid by the Carbon- aceous group; its shales are carbonaceous-grey, its coals, though mostly small, very numerous, its limestones often plant-limestones, and its calcareous matter much diffused. Upon this lies the Calcareous group ; its lime occurs in well-individualized marine beds, cropping up to the surface in green-vested strips; its fossils are found in recurrent cycles, with the limestones and coals forming their extremes. These three groups now range round the northern Cheviots in curved belts broadening southwards, and occupy nearly all the rolling ground between the Tweed and the South Tyne, the sandstones forming the chief eminences. The middle division becomes thinner and more like the Coal- measures in passing northwards, and the upper division, thinning also, loses many of its limestones. The Millstone Grit is a characterless succession of grits and shales. The Coal-measures possess the same zone-like arrangement that prevails in the Limestone series, but are without limestones. They also are divided, very artificially, into three groups. The lowest, from the Brockwell seam downwards, has some traces of Gannister beds, and its coal-seams are but thin. The famous Hutton collection of plants was made chiefly from the roof-shales of two seams,—the Bensham and the Low Main. The unique Atthey collection of fishes and Amphibia comes from the latter. The Coal-measures lie along the coast in a long triangle, of which the base, at the Tyne, is produced westwards on to the moors south of that river, where it is wedged against lower beds on the south bya fault. The strata within the triangle give signs of departing from the easterly dip that has brought them where they are, and along a line between its apex (near Amble) and an easterly point in its base (near Jarrow) they turn up north-eastwards, promising coal-crops under the sea.

The top of the Coal-measures is wanting. After a slight tilting of the strata and the denudation that removed it, the Permian rocks were deposited, consisting of Magnesian Limestone, -a thin fish-bed below it, and yellow sands and some Red Sandstone (with plants of Coal-measure species) at the base. These rocks are now all but removed. They form Tynemouth rock, and lie notched-in against the 90- fathom dyke at Cullercoates, and again are touched (the base only) at Seaton Sluice. No higher strata have been pre- served. The chief faults of the county extend across it. Its igneous

rocks, other than the Cheviot porphyrites and a few contemporaneous traps in the lowest Carboniferous, are all intrusive. An irregular sheet of basalt forced between

planes of bedding (perhaps at the close of the Carbon- iferous period) forms the crag-making line of the Great Whinsill, which, with many shifts, breaks, and gaps, ex- tends from Greenhead near Gilsland to the Kyloe Hills. Numbers of basalt dykes cross the county, and were prob- ably connected with the plateau of Miocene volcanic rocks in the Hebrides. Everywhere the Glacial period has left rocks rounded and scored, and rock-fragments from far and near rubbed up into boulder-clay. The glaciers at first held with the valleys, but as the ice-inundation grew they spread out into one sheet,—the Cheviot tops, heavily ice-capped, alone rising above it. Two great currents met in con- fluence around these hills,—one from across the western watershed, the other skirting the coast from the north. Boulders from Galloway, Criffel, the English lake district, and other places adjacent, and from the Lammermuirs and Berwickshire, lie in their track. Of moraines there are only a few towards the hills. The "great submergence" has left no unequivocal signs of its presence. Glaciated shell-fragments have been detected at Tynemouth. Lami- nated brick clays occur among the boulder-clays. Sheets and mounds of gravel of the nature of kames exist here and there on the low grounds, and stretch in a chain over the low watershed between Haltwhistle and Gilsland, sparsely dotting also some more upland valleys. An upper boulder-clay, containing flints, skirts the coast.

The older valleys are all pre-Glacial, and may date from the Miocene period. They are much choked up with Glacial deposits, and lie so deep below the surface that, if they were cleared-out arms of the sea, one of them, 140 feet deep at Newcastle, would extend for miles inland. After the departure of the glaciers the streams here and there wandered into new positions, and hence arises a great variety of smooth slope and rocky gorge. In the open country atmospheric waste has hollowed out the shales at their outcrops, leaving the sandstones, d&c., as protruding "edges," roughened here and there into crags. In the lower grounds, where this surface-dissection first began, the "edges" have much run together; on the heights,

whose turn came last, they are often prominent and crest-like, but have glacier-rounded brows. Many old tarns are now sheeted over with peat. The sloping peat-fields are often the sites of straggling birch-woods, now buried.

Minerals, &c.—The main portion of the great northern coal-field that extends into Northumberland is an uneven triangle, with its base stretching 14 miles inland from the mouth of the Tyne, and its apex on the coast 24 miles northwards. There are eighteen or twenty seams of work- able thickness, all of them of varieties known as bituminous or "caking" coal, amounting in the aggregate to nearly 60 feet in thickness, The familiar "Wallsend" was the product of a seam now worked out (the High Main), and its name has sunk into a trade term. The Low Main or Hutton seam ranks first in thickness and value ; it runs nearly through the whole length of the northern coal-field, and yields at one point or another the best description of three varieties of coal, viz., household, gas, and steam coals, —in Northum- berland chiefly steam coal. The seams below it, including five seams averaging about a yard in thickness, are still unworked at Newcastle. The best coking coals are fur- nished from the lower seams. Three little coal-basins lie against a fault on the moors south of the Tyne. In the Limestone series there also exist coal-seams of some value, worked here and there, generally singly and for land sale purposes. The Scremerston lower coals, eight of which are workable seams with an aggregate thickness of 23 feet, form a little coal-field in the Carbonaceous group in the north of the county. Numberless little seams are dug into by farmers and shepherds for their own use, chiefly in the same group in the southern half of the county,

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According to the mineral statistics the output of coal from the 176 collieries worked in Northumberland in 1882 was 14,518,789 tons, as against 36,299,597 tons from the whole coal-field, and 156,499,977 tons from the United Kingdom. The net quantity of coal in Northumberland available for the future was estimated before the Coal Commission in 1870 as 2,576,000,000 tons, besides 403,000,000 tons under the sea within 2 miles

of land. About 350 millions of tons have since been realized. The rate of production is increasing annually.

The "lead-measures" in Northumberland chiefly lie in South Tynedale and Allendale, and belong to the Upper Limestone series or Yoredale rocks. From these lead- mines in 1882 there were raised 6817 tons of ore, having a value of £54,719. The product of the ore was 5252 tons of lead and 9547 ounces of silver. The industry has recently suffered from the effects of foreign competition.

The Cleveland ironstone and cheap foreign import have repressed iron-mining in Northumberland. Anabundance of nodular calcareous ironstone in the Upper Limestone series awaits future development. For many years a shale bed at Redesdale furnished Sir W. G. Armstrong with some of his best materials, but it was abandoned in 1877.

Among other mineral products are building freestones in profusion ; millstone grits, not at all restricted to the strata bearing the name ; fireclays, chiefly of value among the Coal-measures ; brick clays from glacial beds; and disin- tegrated shales. The Whinsill yields hard paving-stones and kerbstones ; Newcastle grindstones, from a hard sand- stone near the town, are as familiar as " Wallsend" ; and limekilns are numerous in the broad belt occupied by the upper limestones. The uplands are rich in springs issuing from the sandstones and limestones. Chalybeate springs or "red wells" abound; "sulphur wells" (sulphuretted hydrogen) are by no means rare.

Natural History.—The fauna and flora of the county have been worked out with a care and completeness chiefly due to the Naturalists' Field Clubs of Tyneside and Ber- wickshire. The catalogue of plants in Northumberland (with Durham) contains 936 species out of the 1425 of the British list, Ireland excluded. The facies of the flora is intermediate between the northern and southern types of the island. Forty-six species enter Northumberland from the south which do not reach Scotland. There is a distinct preponderance of damp-loving kinds. No plants are restricted to the county. Numerous aliens, enume- rated as 117 species, grow upon the large ballast-hills beside the Tyne and elsewhere, and there are 87 other "casual introductions." The cloudberry ripens on most of the watershed hills above 1250 feet.

~~The richness of bird-life in the county is accounted for by the situation of the coast in a frequented track of migration to and from the north, and by the diversity of its own phy- sical features. Of the entire catalogue of British birds, in all about 395 species, two-thirds (267) have been metgn Northumberland and Durham, 91 of which are residents, 40 spring and autumn migrants thatcome to nest,54 autumn and winter visitants, and 79 casual visitants. Moorfowl abound on the fells, though less numerously than of old.~~

~~Among the larger fauna of the county are the half-wild white cattle of Chillingham Park, the representatives, ac- cording to the best authorities, of the aboriginal cattle of the British forests, and degenerated descendants of the great Urus, or Bos primigenius.~~

~~Climate.—The climate is bracing and healthy. In spring east winds prevail over the whole county. The lambing season in the higher uplands is fixed for the latter half of April, and is even then often too early. In summer and autumn west winds are general. The mean temperature in the shade at Alnwick and North Shields in the winter and summer quarters of the year, dur ing four years of observation, was as follows :—Alnwick, summer~~

~~52°°9, winter 38°°9; North Shields, summer 55°-1, winter 39°°0. At Greenwich during the same years it stood as—summer 59°°9, winter 39°°4. The rainfall gradually increases as the country rises from the coast. The average rainfall during the six years 1877-82 was :—at Tynemouth (65 feet above the sea), 27°78 inches; in New- castle (105 feet), 30°28 inches; near Belford (240 feet), 30°41 inches; near Haltwhistle (380 feet), 40°41 inches; near Rothbury (400 feet), 37°50 inches; at Allenheads (1853 feet), 47°65 inches; and at Broadstruther (1672 feet), about five miles north of the Cheviot, 60°93 inches. East winds, in summer, bring rain to the interior. The smell from the coal-field, the lighter grime of which is detected as far as Cumberland, is taken by the shepherd for a sign of wet.~~

~~Governmental and Lcclesiastical Divisions.—Northumberland comprises the nine wards (answering to hundreds and wapentakes) of Bamburgh, Glendale, Coquetdale, Morpeth, Tynedale, Castle, Norhamshire,~~

Islandshire, and Bedlingtonshire. The last three formed detached portions of Durham until 1844. It contains 76 mother-parishes and 162 benefices, together forming (with Alston and Nenthead in Cumberland) the diocese of Newcastle, erected in 1882. There are 541 civil parishes in which poor-rate is separately levied. The county has one court of quarter-sessions, is divided into 13 petty and special sessional divisions, and for par- liamentary purposes into a northern and a southern division, each of which returns two members. Berwick-upon-Tweed (which has been joined to this county for election purposes) and Newcastle- npou-Tyne have separate courts of quarter-sessions and commissions of the peace, and, together with Morpeth and Tynemouth, the latter of which has also a commission of the peace, are municipal and parliamentary boroughs. Berwick and Newcastle each return two members, and Morpeth and Tynemouth each one.

Population and People. —The population in 1881 numbered 434,086 persons, 215,882 males and 218,204 females, —showing an increase since 1871 of 47,440 persons, and of 256,008 since the first census in 1801. The average number of persons to an acre was 0°34, and of acres to a person 2°97. The number of inhabited houses was 70,682. The population of its chief towns was as follows :—Newcastle-upon-Tyne, 145,359 (or with Gateshead upon the Durham side, 211,162) ; North Shields and Tynemouth, 44,118 ; Berwick-on-Tweed, 13,998 ; Alnwick, 7440; Morpeth, 6946; and Hexham, 5919. The Tyne ports are rapidly becoming one continu- ous town. Walker had a population of 9522 persons, Wallsend 6515, and Willington Quay 5105. Persons engaged as miners or in mine service numbered 21,607, of whom 20,752 were coal-miners. Persons engaged in agriculture numbered 18,901.

In physique the Northwmnbriau is stalwart and robust, and seldom corpulent. The people have mostly grey eyes, brown hair, and good complexions. 'lhe inhabitants of the fishing villages appear to be Scandinavian ; and parts of the county probably contain some admixture of the old Brit-Celt, and a trace of the Gipsy blood of the Faas of Yetholm. The natives have fine characteristics: they are clean, thrifty, and plodding, honest and sincere, shrewd, and very independent. Their virtues lie rather in solidity than in aspiration.

Northumbrian speech is characterized by a ‘‘rough vibration of the soft palate” or pharynx in pronouncing the letter 7, well known as the burr, a peculiarity extending to the town and liberties of Berwick, and absent only in a narrow strip along the north-west. Over the southern part of the county there is the same duplication of vowel-sounds, such as ‘‘ pedl” for ** pool,” that is met in the English countiesadjacent. Many charming Old-English forms of speech strike the ear, such as ‘‘ to butch a beef,” 7.¢., to kill a bullock, and curious inversions, such as ‘‘they not can help.” There is the Old-English distinction in the use of ‘‘ thou” to familiars and ‘‘ ye” to superiors.

Ownership of Land.—According to the Owners of Land Returns 1873, the distribution of land-property in Northumberland was as follows:—there were 22 proprietors of more than 10,000 acres ; of 100 and less than 1000, 507; of 10 and less than 100, 771; of 1 and less than 10, 820; and of less than 1, 10,036. The gross estimated rental was £2,144,743. Six proprietors held lands exceeding 20,000 acres. The duke of Northumberland, the largest land-proprietor in England, held 181,616 acres ; the earl of Tankerville, Chilling- ham Park, held 28,930; Sir John Swinburne of Capheaton, 28,057; Walter C. Selby of Biddlestone, 25,327; Sir W. C. Trevelyan (now Sir Charles) of Wallington, 21,342; and the lords of the Admiralty, who held the old Derwentwater estate, 20,642. The mansions and parks attached to these estates are all beautiful or interesting. Biddlestone is uplying, but in some respects is the original of Scott’s Osbaldistone Hall.

Agriculture, &c.—More than half ofthe county is pastoral. South of the river Coquet there is a single broad tract of cultivation towards the coast that sends lessening strips up the valleys into the interior. From the Coquet uorthwards another breadth of enclosed ground stretches almost continuously along the base of the Cheviot hills. In the basin of the Till it becomes eminently fertile, and towards the Tweed the two breadths unite. In the porphyritic Cheviots the lower hills show a great extent of sound surface and good grass. The average hill-farms support about one sheep to two acres. A coarser pasturage covers the Carboniferous hills, and the propor-

~~tion of stock to surface is somewhat less. Their highest fells are a rough-and-tumble of bogs, hags, and sandstone scars, with many acres dangerous to shcep and worth less thau nothing to the farmer. The lower uplands are a patchwork of coarse grasses (mown by "the muirmen" into "bent-hay"') and heather, or, in the popu- lar terms, heather and " white ground," for it is blanched for eight months in the year. Heather is the natural cover of the sandstones (which form most of the eminences) and of the sandy glacier-débris near them. The limestone crops are bright green strips or gairs. Sheets of boulder-clay are common on the eastern sides of emi- nences, in the valleys, and on the low grounds. On the uplands they grow bents ; lower down they are apt to be cold and strong, but are much relieved by patches and inworkings of gravel, especially north of the Wansbeck. The prevalent stream-alluvium is sandy loam, with a tincture of peat. The arable regions are very variable. Changes of soil are probably as numerous as fields. Fencing has now reached the watershed tracts; draining is following; but there is room to doubt whether the latter will be altogether an unmixed good. The peat mosses act retentively, like sponges, softening the air, nourishing the early-springing deer-grass and cotton-grass, and preventing precipitation of drainage on the rivers, which are now more liable to floods than formerly.~~

~~Northumberland contains 1,290,312 acres. In the Agricultural Returns for 1883 the cultivated area of the county stands as 712,615 acres, exclusive of orchards and market gardens, embracing—corn crops, 126,439 acres (wheat 19,980, barley 40,696, and oats 58,989); green crops, 55,202 acres (turnips and swedes 46,066, and potatoes 5384); clover, sanfoins, and grasses under rotation, 84,562 acres ; per- mauent pasture not under rotation, exclusive of heath or mountain land, 431,031 acres. Of orchards there were 184 acres; of market gardens, 659; of nursery gardens, 81; and of woods(in 1881), 39,977. Since 1866 55,626 acres have been reclaimed from mountain land. The corn area has meanwhile diminished by 27,277 acres, and turnip-culture has not increased; but. the permanent pastures are more extensive by nearly one-fourth, or 101,207 acres. The turnip-culture of the northern parts of the county takes rank with the best districts in Scotland. A five- or four-course shift is the usual rotation.~~

~~By the census of live-stock (1883) the returns are as follows :— horses and ponies, 18,147, including 13,538 used for agricultural purposes ; cattle, 93,550, of which 21,930 were in milk or in calf; sheep, 880, 230, including 336,702 under one year old ; pigs, exclusive of those kept in towns and by cottagers, 14,883. The sheep, which are celebrated, fall into three groups. The half-breds—crosses between the Leicester (or Shropshire) and Cheviot breeds—occupy the lower enclosed grounds, the pure Cheviots are on the uplands, and the hardier blackfaced breeds lie out on the exposed heathery heights. The cattle are chiefly shorthorns and Galloways.~~

~~The size of the agricultural holdings was returned in 1875 and 1880. Holdings of 50 acres and under numbered in these years 3070 and 3329 respectively ; of 100 to 300 acres, 1813 and 1273; of 1000 acres and upwards, 38 and 36. Leases of fourteen and nineteen years " usually without compensation clauses, and more or less restricted as to cropping," have hitherto been in fashion. In the large part of the county owned by the duke of Northumberland (nearly one-seventh of the whole) there obtains a system of yearly agreements, except in the case of hill-pastures. In the recent uncer- tain years annual arrangements have been more in favour generally. Large farms have now much absorbed the smaller holdings of earlier times. In Allendale the mining population includes many small occupiers, and the commons are still unbroken. In other parts of the county the commons have mostly been divided. Between 1702 and 1877 commons to the number of 59, and with an aggregate extent of 194,917 acres, are known to have been enclosed. There is no authentic account of the unenclosed remainder.~~

~~The management of many Northumbrian farms is excellent, 'far in advance of ordinary practice." Wages are high, but " the cost per acre of labour does not exceed and is often much lower than that of districts where wages are from 25 to 40 per cent. lower. This is attributable to (1) the superior quality of the labour, both physical and moral, (2) the extensive use of women-workers (the employment of whom is not found to be demoralizing when properly safe-guarded), and (3) more systematic and economical manage-ment" (Coleman, Report, Royal Commission, 1882).~~

The practice of paying wages in kind has passed greatly into disuse. Some of the shepherds still receive "stock-wages," being allowed to keep forty or fifty sheep and several cows on their employers' farms in lieu of pay. This arrangement, which makes them really copartners, has probably done much to render them the singularly fine class of men they are.

Manufactures, &c.—The manufactures of this county chiefly come from the Tyne, which is a region of ironworks, blast -furnaces, shipbuilding-yards, ropeworks, coke-ovens, alkali-works, and manu- factories of glass, pottery, and fire-bricks, from Newcastle to the sea (see NEWCASTLE). There is great activity in all trades con- cerned in pit-sinking and mine-working. In the other parts of the county there are a few small cloth-iills, a manufactory of

NORTH UE

potteries, and numbers of small brick

568:

tan-gloves at Hexham, some aud tile works. ;

Fisheries.—The Tyne is the most productive salmon-netting river from a commercial point of view in England and Wales. The richness of its fisheries is mentioned in the time of Henry I. Ac- cording to Professor Huxley's report, the estimated catch in 1882 was 41,110 salmon and 10,336 salmon-trout. The salmon catch has doubled within the last four years, and is not known to have been exceeded except in three abnormal years, 1871-73. The fish taken by the Berwick Salmon Fishery Company in 1882 were 8808 salmon, 3104 grilse, and 12,390 trout. Bull-trout abound in the Coquet. The sea- fisheries include herrings, whitefish, and some crabs and lobsters. In 1872 the number of boats employed was 1163, chiefly cobles. Beyond Holy Island the boats and fishing are essentially Scotch. e

Antiquities, &c.—The pre-Roman antiquities of Northumberland are camps, cairns, standing-stones (both monoliths and fragment- ary circles), sculptures on rock, hand-made pottery, and weapons, ornaments, &c., of stone, bronze, iron, jet, glass, and gold. The camps are entrenched

~~enclosures rudely rounded or quadrate, with their main entrances and those of the hut-circles, or foundations of huts, always facing sunrise. They differ from the camps of the Romans in their want of symmetry, and in an absence of plan in distribution, due to the desultory clan-warfare of their inhabitants. The primitive village of Greaves Ash near the Breamish, the strong defensive earthwork at Elsdon, and the camps at Old Bewick, Lordenshaw near Rothbury, and Warden Hill near Hexham are a few instances from among the great numbers that are preserved on the eminences girdling the northern Cheviots and on the lower untilled grounds. Traces of occupation by Romans, Saxons, and marauders of later times sometimes mingle with the remains of the original occupants. The sculptured cups and circles, now familiar to antiquaries, were first brought into observation at Rowtin Linn near Ford in 1852. Numerous instances and varied designs have since been found, both on ‘‘fast” rock and on slabs associated with burials. The uplands are dotted with round barrows and cairns containing cists and interments, sometimes cremated, some- times inhumed, and in some instances both together. The county scarcely affords material as yet for a separation into periods of stone, bronze, aud iron. The older interments are associated only with stone, but not necessarily precedent to bronze ; in the “‘ late Celtic” or ‘early iron” ages all three were in use together.~~

~~In Roman military antiquities this is the premier county of Britain. For the great wall between the Tyne and the Solway, see HADRIAN’S WALL. The Roman road from London nearly bi- sects the county, and still goes familiarly under the name of ‘‘ the Watling Street.” It passes numbers of quadrangular camps, three of which were permanent stations. Its eastern branch, the Devil’s Causeway, leaves it near the Tyne for Berwick. In the south-west of the county lay the Maiden Way, making for Liddisdale. Coal, iron, and lead appear to have been worked by the Romans. Numer- ous heaps of heavy iron slag, mingled with charcoal, are the sites of little ‘‘bloomeries” on the uplands. They may be of different ages, from that of the Britons downwards.~~

~~Of Anglo-Saxon buildings the Danes left almost nothing. The crypt of Wilfrid’s abbey of St Andrew at Hexham is one undoubted remnant; portions of several other churches are very doubtfully pre-Norman. Some thousand Saxon styeas found buried at Hex- ham, the “fridstool” there, and~~

~~an ornate cross now shared be- tween Rothbury and Newcastle are the other principal vestiges of Saxon times. 'The Black Dyke, a bank and ditch crossing the line of the Roman wall about three miles east of the Irthing, is supposed by some antiquaries to be the continuation of the Catrail at Peel Fell ; the latter was the probable boundary-fence between the Saxon Ber- nicia and the British Strathclyde.~~

~~The ecclesiastical architecture of the county suffered greatly at the hands of the Scots. Nota few of the churches were massive~~

~~Lindisfarne Priory, the oldest monastic ruin in the county, dates from 1098.~~

~~Hexham Abbey Church (early 12th century), raised |~~

~~over the crypt of Wilfrid's cathedral, has been termed a **text-book |~~

~~of Early English architecture ;" it lacks the nave, destroyed by the Scots under Wallace. and has been well restored. Hulne Abbey, now surrounded by the sylvan loveliness of the Alnwick demesnes, was the first Carmelite monastery in Britain. Besides these there are fragments of New- minster Abbey (1189), Alnwick Abbey (1147), and others. An exquisitely graceful fragment of Tynemouth church is associated with some remains of the older priory. Among churches ought first to be named St Nicholas's, Newcastle (1350), the prototype of St Giles's, Edinburgh, and now the cathedral-church of the new diocese. There is a massive Norman church at Norham, and other Norman and Early English churches at Mitford, Bamburgh, Wark- worth, Alnwick (St towers. its heavy semicircular girders, is said to be now unique.~~

~~"Tt may be said of the houses of the gentry herein," writes old~~

~~| which under the Of Brinkburn Priory the church remains, |~~

~~'1879.~~

~~ke ants of Egbert of Wessex structures, tower-like in strength, and fit to defend on occasion. | S~~

~~BERLAN D-~~

~~Fuller, “ ‘quot mansiones, tot munitiones,’ as being all castles or castle-like.” Except a few dwellings of the 16th century in New- castle, and some mansions built after the Union, the older houses are all castles. A survey of 1460 inentions thirty-seven castles and seventy-eight towers in Northumberland, not probably including all the bastle-houses or small peels of the yeomen. At the Conquest Bamburgh, the seat of the Saxon kings, was the only fortress north of York. Norham Castle was built in 1121. None of the baronial castles are older than the time of Henry I. A grass mound repre-sents Wark Castle. Alnwick Castle is an array of walls and towers covering about five acres. The interior was restored in Italian palace style by the late Duke Algernon. Warkworth, Prudhoe, and Dunstanburgh castles are fine groups of ruins. Dilston Castle has still its romantic memories of the carl of Derwentwatcr. Bel- say, Haughton, Featherstone, and Chipchase castles are joincd with modern mansions. ‘The peel-towers of Elsdon, Whitton (Rothbury), and Embleton were used as fortified rectory-houses. Seaton Delaval was the work of Vanbrugh.~~

~~The place-names of the county may be viewed as its etymological antiquities. The Danish test-word by we find to be absent. Saxon tons, hams, cleughs (clefts or ravines), and various patronymics are met with in great numbers ; and the Gaelic knock (hill) and Cymric caer, dwr (water), eefn (ridge), bryn (brow), &c., mingle with the Saxon. Many curiosities of nomenclature exist, some strange, some expressive, ¢.g., Blink-bonny, Blaw-wearie, Skirl-naked.~~

~~A few gleanings of folk-lore still remain for the discriminating collector. The virtues of certain holy wells in ailments or barren- ness and of a south-running stream in sickness, the powcrs of lrish men and cattle over ae and snake-bites, and the growing of boulders in the earth like bulbs are still latently believed in by many ; and there‘is a general aversion to burying on the sunless side of the churchyard, which is left to suicides and unchristened infants.~~

~~The literary antiqnities are the Border ballads.“ I never heard the old song of Percy and Douglas, that I found not my heart more moved than with a trumpet” (Sir Philip Sidney).~~

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NORTHUMBERLAND, Kinepom or. The history of Anglo-Saxon England is the history, not of a heptarchy of independent and equal or nearly equal kingdoms united by any kind of federal bond, but of the rise and progress of the kingdom of Northumberland from the end of the 6th to the middle of the 8th century under Ethelfrith and the descendants of Edwin of Deira, the predominance of Mercia during the latter half of the 8th century under Offa, and the gradual union of England under the descend- between the close of the 8th century and the Norman Conquest. The present article is chiefly concerned with the first of these periods chrono- logically, and geographically with the portion of Britain Northumbrian kings at the time of their greatest power extended from the Humber to the Forth, and was

bounded on the east by the German Ocean and on the west by an irregular and gradually receding line, at times overstepped, of the country more or less mount-

‘ ainous retained by the Celts of Strathclyde and Cumbria

between the Clyde and the Mersey (see Plate it, vol: viii.). The first settlements of the Angles in these regions and the foundation of the kingdoms of Bernicia

Michael’s), &c., most of them with square | and Deira have been spoken of in vol. viii. p. 270.

The stone roof of the little church at Bellingham, with | z : somewhat modified; the former kingdom corresponded

Bernicia and Deira were Celtic names, Bryneich and Deifr,

generally with the modern counties of Durham and

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Northumberland and the Lothians, the latter with York- shire, and when the two became united in one kingdom it received the name of Northumberland.

The history of Bernicia between the establishment of Ida as its king and the reign of his grandson Ethelfrith (592-617), and of Deira prior to the reign of Edwin (616- 633), the son of Ailla, is obscure. The skilful piecing together of the notices of Nennius, Bede, and the early English chroniclers by Palgrave, Lappenberg, Skene, and others cannot be regarded as a completely successful re- construction of the chronology of the Northumbrian kings. The chief difficulty, though only one of many, is that six of twelve sons of Ida are said to have reigned in Bernicia from his death (559) to the accession of Ethelfrith, his grandson (592 or 594), a period of only thirty-three or thirty-five years, which, though not quite incredible, ap- pears short in comparison with the parallel reigns of Aula of Deira (559-588) and his son Edwin (616-633), while their names and order of

~~succession do not agree in the earliest authorities. Another is that Bebba, the British princess from whom Bamburgh, the chief fortress of Bernicia, was named, was according to the Saxon Chronicle wife of Ida, but according to Nennius of Ethelfrith. Whatever may be the truth as to the earlier history, more light dawns with Ethelfrith, in whose reign the attempt to unite Bernicia and Deira commenced. 'The most powerful and covetous of glory of kings," as he is called by .Bede, Ethelfrith "wasted the race of the Britons more than all the chiefs of the Angles, and made more land than any of them subject to or inhabited by Angles, exterminating or sub- duing the indigenous tribes" (Bede, i. 34). By one of these victories, that of Catraeth ? (596), commemorated in the verse of Aneurin, he overcame the Britons, who were driven back into Cumbria, and by another at Degsastan (?Dawston in Liddisdale) over Aidan, king of the Scots of Dalriada, in 603, he put a stop to incursions of the Scots down to Bede's own day. A third victory at Caerleon (Chester on the Dee) 613%, followed by the slaughter of the monks of Bangor, marks the fact that the Northum- brian Angles were still heathens fighting against Christian Celts. It was these successes that led to the extension of Northumberland to the borders of Cumberland and West- mareland, and the first permanent inclusion of part at least of the district between the Tweed and the Forth in the kingdom of the northern Angles. Ethelfrith married a sister of Edwin and daughter of Ailla of Deira, and after Aflla's death, during the minority of Edwin, seized Deira, over which he reigned for twelve years. The young Edwin took refuge first amongst the Britons and afterwards with Redwald, king of East Anglia, who re- stored him to his kingdom by the defeat and death of Ethelfrith at a battle on the Idle, a tributary of the Trent, in 617. This turn of fortune drove Eanfrid, Oswald, and Oswy, the sons of Ethelfrith, into exile amongst the northern Celts, and Edwin, like Ethelfrith, ruled over the whole Angles north of the Humber to the Forth ; for, whether Edinburgh was his foundation or a fortress of the Celts (Dunedin), the tradition which linked its modern name with his can scarcely be without meaning. Through his example the Angles were converted to Christianity by Paulinus, a monk sent from Canterbury with letters from Boniface V. to the king and his wife Ethelberga, the daughter of Ethelbert of Kent. The story of the origin of the Northumbrian Church, with its inci- dents of the destruction of the idols by the heathen arch- priest Coifi, the speeches at the council of the witan which decided in favour of the new faith, the host of catechumens eager for~~

baptism in the nearest rivers, the Glen in Bernicia, the Swale in Deira, and the Trent in the country of the Lindissi, the erection of a stone church

dedicated to St Peter at York surrounding the wooden oratory in which Edwin had himself been baptized, after- wards itself enclosed in the minster, forms one of the most vivid passages of Bede. As the scene of these incidents was his native country, and their time about half a century before his birth, there is no reason to doubt the substan- tial truth of a narrative derived at first, or at furthest at second hand.

'Deda, a priest of Bardney, a man of singular veracity," he mentions in one place, "told me that one of the oldest persons (in the province of the Lindissi, modern Lincoln) had informed him that he himself had been baptized by Paulinus at noon in the pre- sence of Edwin, with a great multitude of the people, in the river Trent . . . he was also wont to describe the personal appearance of Paulinus, tall of stature, a little stooping, his hair black, his visage meagre, his nose very slender and aquiline, his aspect both venerable and majestic."

The same historian testifies to the dignity of Edwin's reign, shown by the "tufa," or standard of feathers on a spear-head, borne before him in war and peace. A woman with a new-born child might walk through his dominion without harm, and cups were provided at the springs on the wayside for travellers. Such a time was fitted for the reception of the new religion of peace, but Edwin's days ended in war, and he perished at Heathfield (Hatfield in Yorkshire) in a battle against the heathen host led by Penda, king of Mercia, and the British King Ceadwalla (633). His death permitted the return of the sons of Ethelfrith. The eldest, Eanfrid, who is supposed to have been in exile amongst the Picts, obtained Bernicia, while Deira fell to Osric, the son of his uncle Alfric. Eanfrid, who relapsed to paganism, held his kingdom only a year; and in 634 Ceadwalla defeated Osric at York, and killed by treachery Eanfrid, who had made overtures of peace. Eanfrid's brother Oswald recovered both Bernicia and Deira by the great victory of Heavenfield near Hexham in 635. 'The most Christian king of the Northumbrians," as Bede emphatically calls him, Oswald restored Christianity throughout his whole territory, but under the monastic form he

had learnt during his exile in Iona, and with the usages as to Easter and the tonsure which distinguished the Celtic from the Roman Church. At his request Aidan, a monk of Jona, came to instruct the Angles in the Chris- tian faith, and was in 634 or 635 consecrated as bishop of Lindisfarne, the Holy Island, which became the Iona of the eastern coast.

The powerful and wise rule of Oswald not only reunited Bernicia and Deira, but subjected races of all the four lan- guages (for we may be sure Bede's expression ""'all the nations of the four languages " is an hyperbole), the Britons, the Picts, the Scots, and the Angles, to his dominion.

In 642 he fell in a battle against Penda of Mercia at Maserfield, which, whether it be the place of that name now called Winwick in Lancashire or Oswestry (Oswald's tree) in Shropshire, shows that he' was still further enlarg- ing his realm. His successor Oswy revenged his death by the defeat and death of Penda at the river Winwaed, now Winmore, near Leeds (655), which resulted in the conversion of Mercia. In his reign Wilfrid, an energetic and ambitious monk, persuaded the Northumbrians at the council of Whitby to conform to the Roman usage as to Easter and the tonsure, and Colman, the third Celtic bishop of Lindis- farne, returned to Iona with the Scottish monks and the relics of Aidan. The successful advocate of the Roman rites became bishop of York, with a diocese including all Northumberland and the Pictish subjects of Oswy, thus completing the scheme of Gregory I. and Augustine for the ecclesiastical organization of England.

On the death of Oswy in 670 the Picts revolted, but his son Egfrid succeeded in quelling the revolt and in extending his father's kingdom both against the Mercians

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on his southern and the Pictish kings on his northern |

border. In 684, tempted by his good fortune, he sent his general Berct to ravage Ireland, then, says Bede, a peace- ful and friendly country, which

implies that his dominions had now touched some parts of the western shores, and next year he himself invaded the territory of the northern Picts, where he was defeated and slain by their king Bredei or Brude at Nechtan's Mere (Dunnichen? in Forfarshire) in 685. The result was that not only the Picts recovered their own land and ceased to pay tribute, but some of the Britons also became independent. The Northumbrian Church under the able leadership of Wilfrid shared in the extension of the kingdom, and it also shared in its repulse. A bishopric established under Trumwine at Abercorn in Linlithgowshire, in the country of the Angles, but close to the arm of the sea dividing the Angles and the Picts (Bede, iv. 26), had to be abandoned. The Forth was destined to be the limit of Northumbrian sovereignty to the north. Shortly before the close of this reign a dispute between the king and Wilfrid led to the division of the diocese of York into two bishoprics—York, of which Bosa was made bishop, and that of Lindisfarne or Hexham, whose first bishop was Eata. A new bishopric was erected for the district of the Lindissi (Lincoln), who had been conquered by Egfrid. To this or the next reign belong the earliest fragmentary memorials of the Northumbrian or Northern English dialect which have come down to our time—the Runic inscription of the crosses at Ruthwell and perhaps those at Thornhill in Dumfriesshire and at Bewcastle in Cumberland. It was during the same period that CapMon a a monk of Whitby, the earliest English poet, died 680), and Breve (q.v.), the monk of Wearmouth and Yarrow, the earliest English historian, except the anony- mous authors of the A.S. Chronicle, Aldhelm, and Eddi, the writer of Wilfrid's life, was born (672 or 674). To their influence, and to the learned—which succeeded the warlike—epoch of Northumberland during the next century down to the death of Alcuin of York in 804, may be ascribed the fact that, while Saxon Wessex became the dominant state, the language and the land south of the Forth received from the Angles the name of English and England. Egfrid was succeeded by his brother Aldfrid, an ille- gitimate son of Oswy (685-705), who "retrieved," in the words of Bede, "the ruined state of the kingdom, though within narrower bounds." It was in his reign that Cuth- bert, a monk of Melrose, which had been founded by Bishop Eata, became bishop of Lindisfarne. His preaching commenced the Christianization of the country between the Forth and the Tweed, and his fame quickly gathering a legendary halo of miracles led to his being adopted as the patron saint of Durham and the north of England, as well as of southern Scotland. While no serious attempt was

~~made to regain the lost territory in the country of the Northern Picts, Egfrid, his son Osred (705-716), and Osred's successors, Coenred (716-718), Osric (718-729), and Ceolwulf (729-737), some of whom were descendants of a different branch of the family of Ida, gradually extended the limits of their kingdom to the west, and, following the coast, established themselves in Galloway and as far as Cunningham (Bede, v. 12), the northern district of modern Ayrshire. Shortly before 731, when Bede concluded his history, an Anglian see had been created at Whithorn (Candida Casa) in Galloway, of which Pechthelm was the first bishop, and which lasted till 803. The last of the important kings of Northumberland,~~

~~defeating the Britons in Kyle, and, in alliance with Angus Macfergus, king of the Picts, took Allclyd (Dumbarton), the chief town or fortress of the Strathclyde Britons, in 756. These were uncertain conquests.~~

~~| passage of the 4.8. Chronicle :~~

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~~The epoch of Northumbrian greatness closes with Oswy. It is significant that two of the last-named kings, Ceolwulf and Eadbert, resigned the crown for the tonsure. External circumstances combined with the enervation of the royal race to produce the decline of Northumberland. Its southern neighbour, Mercia, was ruled by two powerful kings,—Ethelbald, who ravaged Northumberland m Toi, and after his death the great Offa (757-796), the con- temporary of Charlemagne; while a series of Northum- brian kings, of whom we know little save the names and the dates of their mostly violent deaths—Oswulf (758), Ethelwald (765), Alchred (774), Ethelred (779), Alfwold (788), Osred (792), another Ethelred (796), whose wife, Ethelfreda, was a daughter of Offa—wasted in intestine struggles the kingdom of their predecessors. ;~~

~~On its northern boundary a vigorous line of Pictish kings, beginning with Angus Macfergus (731-761), the ally of Eadbert against the Britons of Strathclyde, whose chief seat was Scone, threatened, and there is no doubt often passed, the boundary of the Forth, but the Angles retained Lothian during the 8th and the first half of the 9th cen- tury, and it was not till a century after the union of the Scots and Picts under Kenneth Macalpine~~

(844), in the reign of Indulph (954-962), that Edinburgh became Scot- tish instead of Northumbrian ground. In 793 the heathen Northmen signalized the commencement of the attacks which were for several centuries to vex the coast of Britain by the sack of Lindisfarne, and in the following year of Yarrow. Though this descent was repelled, the Danish vikings with increased numbers renewed their raids in the following century. Before its close the southern half of Northumberland had received a large infusion of Danish population. Their distant kinship in race and not so dis- tant likeness of language favoured their settlement in the territory of the Angles. With the close of the 8th century the history of the kingdom of Northumberland practically ends, though a few names of kings of pure Anglian race are recorded in the 9th century.

It may be convenient to trace the subsequent fate of this king-

dom and its parts. In 827 Eadred, king of Northumberland, sub- mitted to Egbert, the founder of the greatness of Wessex, and agreed to pay tribute in order to stay the progress of that kingdom at the Humber.

In 875 the Danish host, now too large for and weary of mere raids, divided itself between Guthorm, who led his division against southern England, where its final repulse by Alfred made him the hero of his race, while Healfdene, with no Alfred amongst the Angles to oppose him, conquered Northumberland and settled his followers on the east coast, throughout the whole of ancient Deira, the southern part of ancient Bernicia, and as far west as the central districts of Anglian Cumberland. Wherever the "by" replaced the older name or gave a new name to the settlement, wherever the "+" still lingers instead of "the" as the article, linguistic scholars see certain marks of Danish occupation. This occupation retarded the northern advance of the Wessex kings, the descendants of Alfred, and a century elapsed before Edward the Elder in 924 received again at Bakewell in Derbyshire the homage of the Northum- prians, as Egbert in 827 is said to have done almost at the same point, whose position on the extreme southern border of Northum- berland is significant. This homage is recorded in the contested 'And then chose him for father and lord the king of the Scots and the whole nation of the Scots

'and Regnwald and the sons of Eadulf and all those who dwell

in Northumbria, as well Angles as Danes, Northmen, and others." But the dispute as to the precise nature and extent of the sub- mission does not concern the present subject so much as the evi- dence it affords of the mixed population of Northumberland, and of the absence of any prominent sovereign of the whole country whose name could be mentioned by the Chronicle. In the reign of Athel-

| on the son of Edward the Elder, the great mieten ad : | burgh (937), by which he defeated the united forces of Olaf Cuaran, Eadbert (737-758), pushed his arms as far as the Clyde, | Pa ee

the son of Sitric, the Danish king or earl, his father-in-law Con- stantine, king of the Scots, another Olaf, the son of Godfry, king of the Irish Danes, and the British prince of Cumbria, made the conquest of Northumberland south of the Solway and the Tweed more of a reality. Norse mercenaries under Egil, the hero of the Icelandic saga, fought in the army of Athelstan, and a few years

later the aid of Eric Blood-Axe, son of Harold the Fairhaired, had to be purchased by giving him the rule over Northumberland, which he was intended, but was unable, to hold as a barrier against the Scots and Danes. The conquest of the Northumbrian Danes was only completed in 954, when Eadred, the third son of Edward the Elder, who was king of Wessex, was able to substitute Oswulf, an earl of his own choice, for their last king, Eric, who is called by the English chroniclers simply "the son of Harold," and is supposed by Adam of Breimen to have been the son of Harold (Blue-tooth), king of Denmark, but by the best modern writers to be Eric Blood-Axe, who had returned to Northumberland and was slain at Stanemoor (954).! Eadgar (959-975), the successor of Eadred, divided Northumberland into two earldoms, which answered roughly to the ancient Deira and Bernicia, but probably more nearly to the modern county of York, of which Oslac was earl, and modern Northumberland and Durham, which Oswulf retained. The dis- memberment of the ancient kingdom had commenced in the earlier reign of Edmund, who in 945 ceded Cumbria to Malcolm I. of Scot- land on condition that he should be "his fellow-worker both by land and sea," a

~~remarkable expression in the A.S. Chronicle, indicating alliance rather than homage.~~

~~Lothian was either ceded between 970 and 975 by Eadgar to Kenneth, the son of Malcolm I., upon condition that it should retain its Anglian speech and customs, which is the account given by John of Wallingford, or conquered by the defeat of Eadulf Cudel, its ruler in the time of Canute, by Malcolm II. at the battle of Carham in 1018, as is stated by Simeon of Durham. It secms not impossible that both statements may be true, and that an earlier almost compulsory union was followed by a morc complete annexation. For England was already threatened by the last and most formidable invasion of the Danes, which was to end in its con- quest by Canute (1017). This conquest for a brief space included not only Northumberland but Scotland (1031-35). In the confused period between the Danish and the Norman conquests of England, the succession of the Northumbrian earls appears to have been this. The two earldonis of Oslac and Oswulf had been united under Wal- theof (975), who was deposed by Aithelred in favour of Waltheof's son Uhtred (1000). Uhtred defeated the Scots near Durham, and received the hand of Algifa, Athelred's daughter. He submitted to Canute, but was slain soon after his submission by a private enemy, and Eric, the husband of Canute's sister Gytha, became earl, though the northern portion of his earldom was left to the charge of Eadulf Cudel, a brother of Uhtred, whose signal defeat at Carham, we have seen, finally united Lothian to Scotland. Two obscure sons of Eadulf, Ealred and a second Eadulf, afterwards appear as earls in Bernicia in the time of Hardicanute. Both were assassinated, the latter by Siward the Strong, a Danish follower of Canute, who married a daughter of Ealred, and in 1041 reigned over all Northumberland. He was the famous earl in the narrative of whose exploits it is diffieult to separate legend from history, but to the latter apparently belongs his allianee with Malcolm Canmore, and the aid he gave in recovering his father's kingdom from Maebeth, the representative of the Celtic party in Scotland. On his death in 1055, Edward the Confessor appointed Tostig, one of the sons of Godwin, earl of Northumberland, including the detached shires of Northampton and Huntingdon. Deposed by the Northumbrians, he took refuge with his brother-in-law, the Flemish Baldwin, at Bruges. After taking part in the early designs of William the Conqueror against England, he joined in the expedition of Harold Hardrada~~

~~against his brother Harold, and was slain at Stamfordbridge (25th September 1066). After the Conquest Yorkshire was incorporated in England. Morkere the son of /Elfgar earl of Mercia, and Copsige, a thane who had acted as deputy of Tostig, still retained the northern districts, and, though they submitted to William, the subjugation was almost nominal. Northumberland, Cumberland, Westmorcland, and Durham were not sufficiently subdued to be included in the Domesday survey, though some parts of southern Westmoreland and Cumberland are contained in the description of the West Riding of Yorkshire, and parts of Lancashire in that of Cheshire. Frequent risings and constant changes of its earls prove the difficulty which the Norman kings experienced in governing the unruly northern province: Robert of Comines was slain at Durham in 1069; Cospatric was deprived for rebellion in 1070; Waltheof, who also rebelled, was executed in 1076; Walcher, who held it along with the bishopric of Durham, was murdered in 1080; Alberic resigned the dignity in 1085, and was succeeded by Robert de Moubray, after whose for- feiture in 1095 Northumberland was united by Rufus to the crown. In the reign of Henry II. the earldom was conferred on Henry, earl of Huntingdon, the son of David I. of Scotland ; after his death it was surrendered in 1154 by Maleolm IV., but its possession was always coveted and sometimes almost obtained by the Scottish kings, until the final result of the wars of the Plantagenets was to leave Scotland independent, but to fix its boundaries north of the~~

~~1 See Munch, Chronicle of Man, p. 29; and Vigfusson, Corpus Poeticum Boreale, i. p. 259, ii. p. 494 (Oxford, 1883).~~

~~Tweed, the Cheviots, and the Solway. Richard II. in 1377 regranted the earldom to Henry Percy, and the memory of its former inde- pendence probably prompted the ambition of the earls of this powerful house, which played so great a part in English history in~~

~~the 15th and 16th centuries (see PERcy).~~

~~To sum up the results of a somewhat complex and here necessarily compressed history. The ancient kingdom of Northumberland, formed by the union of all the north- eastern part of Britain between the Humber and the Forth under the Anglian kings, and the more or less complete conquest of the British or Cymric western part between the Mersey and the Clyde,~~

was ruled by the Anglian kings from the middle of the 6th to the 9th century. A great portion of it was resettled by the Danes towards the close of that century. It was conquered by the West-Saxon kings in the 10th century, but they had to allow its Danish earls to remain its real governors until shortly before the Norman Conquest, and before its close, or in the beginning of the 11th century, to cede the northern part of Cumbria and the northern part of Bernicia beyond the Tweed to the Scottish kings. Of their dominions the former, Gallo- way (the shires of Wigtown, Kirkcudbright, and part of Dumfries), became for a time an outlying district, but after David I. an integral part, though it retained for some time longer its Celtic speech and customs, while the latter, Lothian, preserving its Anglian speech and customs, became the seat of the court and the source of the civilization of Scotland. The portion of the Northumbrian kingdom which remained English was divided into the shire of York, the earldom or county of Northumberland in the modern sense, and the later counties of Cumberland, Westmore- land, and part of Lancashire. The preponderating influence in government as in language passed during the Middle Ages, and still continues to belong, to southern England, which possesses the capital London, its greatest river the Thames, and its most fertile lands. The discovery of the coal and ironstone, the sinews of manufactures, in the North, and the later development of the Mersey, the Clyde, the Humber, the Tyne, and the Forth, as the channels of commerce in modern times, have revived the iniportance of the districts comprised within the ancient kingdom of Northumberland. Whatever may be its future, its earliest history forms a memorable chapter in that of Great Britain.

Of original authorities the Anglo-Saxon Chronicle and Bede are the most important, but the former was written in Wessex, and magnifies the West-Saxon kings. After Bede, Simeon of Durham is the most trustworthy English chronicler of nortltern affairs. Eddi's Life of Wilfrid and Bede's Life of Cuthbert are of value for the history of the church. The Chronicles of the Picts and Scots, edited by Mr Skene for the record series of the Lord Clerk Register, Adamnan's Life of Columba, and the Seottish Chronicles of Fordun and Wynton, supplement, unfortunately in a fragmentary manner, the English writers. Some additional information may be antici- pated from the cdition of the passages in the Norse sagas bear- ing upon English history to be published in the English series of chronicles and memorials. The best

modern writers to consult for Northumbrian history are Lappenberg, History of the Angio- Saxons (1880); Skene, History of Celtie Scotland, vol. i. (1876) ; Robertson, Seotland wader her Early Kings; Freeman, History of the Norman Conquest, and Old English History for Children (1869); and J. R. Green's The Making of England. (4a. M.)

NORTH-WESTERN PROVINCES, Tue, a lieutenant- governorship of British India, lying between 23° 51' and 31° 5' N. lat. and between 77° 3' and 84° 43' E. long., is bounded on the N. by Tibet, on the N.E. by Nepal and Oudh, on the S. by the Chutid Nagpur districts of Bengal, Rewah, the Bundelkhand states, and the Central Provinces, and on the W. by Gwalior, Rajputana, and the Punjab, with an area under British administration of 81,858 square miles. The administrative headquarters and seat of the heutenant-governor are at Allahabad.

Physical Aspects—The North-Western Provinces occupy, roughly speaking, the upper basin of the Ganges and the Jumna. The province of OUDH (q.v.) has since 1877 been

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under the administrative charge of the lieutenant-governor at Allahabad, but in respect of its land and courts it still remains a distinct chief-commissionership. With this ex- ception, the North-Western Provinces include the whole upper portion of the Gangetic basin from the Himalayas and the Punjab plain to the Vindhydn plateau and the low-lying rice-fields of Bengal. Taken as a whole, the lieutenant-governorship consists of the richest wheat-bear- ing country in India. It contains many of the most famous cities of Indian history and is studded with thriving villages, interspersed at distances with large commercial towns. Except during the hot months, when the crops are off the fields, the general aspect is that of a verdant and welltilled but monotonous plain, merging into hilly or mountainous country at the extreme northern and southern edges of the basin.

The extreme north-western or Himalayan region comprises the native state of GarhwéAl, with the British districts of Dehra Dun, Garhwal, and Kumaéun. The economic value of this mountainous tract is confined to the

growth of tea in Kumaun and the export of forest produce. South of the Himalayas, from which it is separated by valleys or diins, is the Siwdlik range, which slopes down to the fruit- ful plain of the Doab (two waters), a large irregular horn- shaped tongue of land enclosed between the Ganges and Jumna. The great boundary rivers flow through low-lying valleys fertilized by their overflow or percolation, while a high bank leads up to the central upland, which, though naturally dry and unproductive except where irrigated by wells, has been transformed into an almost unbroken sheet of cultivation by various canals and their distributaries. This favoured inter-fluvial region may be fitly regarded as the granary of upper India. North of the Ganges, and enclosed between that river and the Himalayas and Oudh, lies the triangular plain of Rohilkhand. This tract presents the same general features as the Gangetic valley, varied by the damp and pestilential submontane region of the Tarai on the north-east, at the foot of the Kumaun hills. South of the Jumna is the poor and backward region of Bundel-khand, comprising the districts of Jalaun, Jhansi, Lalitpur, Hamirpur, and Banda, besides several petty native states under the administrative control of the Government of India. The soil is generally rocky and unfertile, and the population impoverished, scanty, and ignorant. The south- ernmost portion of Bundelkhand is much cut up by spurs of sandstone and granite hills, running down from the Vind- hyan system; but the northern half near the Jumna has a somewhat richer soil, and comes nearer in character to the plain of the Dodb. Below the junction of the Ganges and the Jumna at Allah4bad the country begins to assume the appearance of the Bengal plains, and also once more expands northwards to the foot of the Nepél Himalayas. This tract consists of three portions, separated by the Ganges and the Gogra. The division south of the Ganges comprises portions of Allahabéd, Benares, and Ghazipur, together with the whole of Mirz4pur, and in general features somewhat resembles Bundelkhand, but the lowlands along the river bank are more fertile. The triangular tract between the Ganges and the Gogra and the boundary of Oudh is the most fertile corner of the Gangetic plain, and contains the densest population. It comprises part of Allahabad, Jaunpur, parts of Benares and Ghazipur, and the whole of Azamgarh. The trans-Gogra region, com- prising Basti and Gorakhpur districts, presents a wilder, submontane appearance. But even here cultivation has widely extended, and the general aspect is that of a well-tilled and verdant plain.

Besides the three great rivers—the Ganges, Jumna, and Gogra—there are the following secondary streams, each with numerous minor tributaries :—the East and West Kali

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and the Hindan flow through the Dodb; the Chambal intersects the trans-Jumna tract; in Bundelkhand the principal streams are the Betwaé and the Ken; the Rdém- ganga, rising in Garhwal, pursues a very tortuous course through Rohilkhand; the Gumti enters the Provinces from Oudh, and flows past Jaunpur to join the Ganges ; the trans-Gogra region is divided into two nearly equal parts by the Rapti. All the drainage of the country falls directly or indirectly into the Ganges.

Climate, &c.—The climate of the North-Western Provinces as a whole may be classed as hot and dry. The Himalayan districts are, of course, cool, and have a much greater rainfall than the plains. They are succeeded by a broad submontane belt, the Tarai, which is rendered moist by the mountain torrents, and is covered by forest from end to end. This region bears a singularly bad reputation as the most unhealthy in all India, and in many parts only the acclimatized aborigines can withstand its deadly malaria. The plain country is generally warm and dry, the heat becoming more op-pressive as the general level of the country sinks towards Allahabad and Benares, or among the hills of Bundelkhand. The monthly temperature of twelve stations in 1881-82 was as follows :—maxi- mum, 112° Fahr.; minimum, 40°71 Fahr.; general mean, 77°°8 Fahr. The maximum was 82° at Chakrata in Dehra Din, 109° in Meerut, 114° in Allahabad, and 116° in Jhansi; the minimum was 28° at Chakrata, 35° at Meerut, 41° at Allahabad, and 44° at Jhansi. The general mean was 57°°7 at Chakrata, 76°°8 at Meerut, 78°°4 at Allahabad, 78°°8 at Benares, and 79°°1 at Jhansi. The total rain- fall during the same year amounted to 54°03 inches at Chakrata, 97°49 at Dehra, 29°63 at Meerut, 35°48 at Bareli, 34°01 at Allaha- bad, 33°77 at Benares, and 52°62 at Jhansi. The chief discase is fever, to which a large proportion of deaths are due.

Population.—The North-Western Provinces contain a denser population than any country of Europe, excepting Belgium and England. The census of 1881 rcturned the population of the Brit-

; i ; Division, District. “Area. POP” | pivision.| District, | Area, Popula- Meerut | DelraDin 1193} 144,070 |) Jhansi ../ Jaliun ..!1469| 418,142 Sahdran- | 2221} 979,544 Jhansi ..| 1567] 333,227 pur Lalitpur..| 1947] 249,088 Muzaffar- | 1656] 758,444 || Allahé- | Cawnpur | 2370! 1,181,396 nagar bad Fatehpur |1639| 683,745 Meerut ..! 2379 | 1,313,137 Banda….] 3061 698,608 Buland- {1915} 924,822 Allahabad | 2833 | 1,474,106 shahr Hamirpur | 2288 | 507,387 Aligarh ..| 1955 | 1,021,187 Jaunpur. .| 1554 | 1,209,663 Rohil- | Bijnaur ../1868| 721,450 || Benares | Azamgarh ! 2147 | 1,604,654 khand | Murdda- | 2282 | 1,155,173 ! Mirzapur | 5224 | 1,136,796 bad Benares ..| 998] 892,684 Budaun .| 2002] 906,451 Ghazipur | 1478 | 1,014,099 | Bareli ….| 1614 | 1,030,936 Gorakh | 4598 | 2,617,120 | Shahja- 1746 | 856,946 pur hanpur | Basti ….| 2753 | 1,630,612 Pilibhit ..| 1372 451,601 Ballia ….] 1144 924,763 Agra ..’ Muttra ..| 1453] 671,690 || Kuinaun | Almora ../6000] 498,641 Agra ….| 1850] 974,656 |) Garhwal..| 5500] 345,629 Farrukha-|1719| 907,608 Tarai ….) 938} 206,993 bad Garhwal or Tehri 4180 | 199,836 Mainpuri’ | 1697 | 801,216 | (native state) Etawah ..| 1694} 722,371} Rampur (native 945 | 541,914 Etah ….| 1739 756,523 | state)

Mohammedans muster strongest in the northern divisions of Meerut and Rohilkhand, where they number 2,327,620. In Benares, Allahabad, Agra, and Kumaun divisions they form a percentage respectively of 10°7, 9°5, 8°7, and 8°4 of the popula- tion. Many of the descendants of converts forced to embrace Islam at the sword’s point retain several Hindu customs and adhere to purely Hindu observances and ceremonies.

Most of the people are gathered into small villages. There are, however, no fewer than 238 towns with a population exceeding 5000, and containing an aggregate of 3,513,107 inhabitants. No other part of India contains so large a proportion of celebrated cities, though recent changes have made over Delhi, the most famous of all, to the adjacent province of the Punjab. Thirteen towns contained in 1872 a population exceeding 50,000—namely, (1) Benares, 199,700; (2) Agra, 160,203; (3) Cawnpur, 155,444; (4) Allahabad, 148,547; (5) Bareli (Bareilly), 113,417; (6) Meernt, 99,565; (7) Shahjahanpur, 74,830; (8) Murddabad, 67,387; (9) Farrukhabad, 62,437 ; (10) Kofl (Algarh), 61,730 ; (11) Saharan- pur, 59,194; (12) Gorakhpur,

57,922 ; and (18) Mirzapur, 56,378. Eighteen towns contain a population of between 20,000 and 50,000.

"The other places of interest in the provinces are—the hill sanataria

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of Naini Tal, Mastiri (Mussooree), and Landaur, the sacred town of Hardwar, the ruined sites of Kanauj and Hastinapur, the deserted Mughal capital of Fatehpur Sikri, and the ancient temples and fortresses of Mahoba and Kalinjar. Most of the great towns lie along the banks of the Ganges and the Jumna.

Agriculture.—Of a total area of 81,858 square miles, 38,169 were returned as under cultivation in 1881-82. Eleven great canal irri- gation works have been undertaken by Government :—(1) Ganges Canal, (2) Eastern Jumna Canal, (3) Agra Canal, (4) Din Canals, (5) Rohilkhand Canals, (6) Bijnaur Canals, (7) Bundelkhand Lakes, (8) Lower Ganges Canal, (9) Bundelkhand survey, (10) Sardah Canal survey, and (11) Betwa Canal. The total area irrigated in 1881-82 by Government works amounted to 1,395,217 acres. There are two principal harvests, in autumn and spring. The great agricultural staple is wheat. The chief commercial crops include indigo, cotton, sugar, oil-seeds, and opium. The cultivation of tea is confined to the submontanc districts of Kumdaun, Garhwal, and Dehra Din. The produce is chiefly manufactured into green tea, which finds a ready sale across the frontier in Central Asia, and is also exported to England. Rice and sugar-cane grow chiefly in the river valleys or in irrigated fields ; wheat is raised on the uplands by the aid of canals and wells ; millets and cotton grow on the drier soils, while tobacco, vegetables, and other richer crops occupy manured plots in the neighbourhood of villages. The three principal recognized tenures are—(1) zaminddri, in which the whole land is held and managed in common, the rents and profits of the entire estate being thrown into a common stock and divided among the shareholders ; (2) pattidart, in which the lands are held severally by the different proprietors, all of whom are jointly responsible for the Government revenue ; (3) bhdydchéra, in which portions of the soil are held severally, while other portions may be held in common, with joint responsibility for the Government demand. In the hill tracts the peasantry are well off and independent ; in the more

~~favoured plain districts they are in fairly comfortable circumstances; but in Bundelkhand they still suffer from the effects of former misrule and from the effects of recent famines.~~

~~Commerce and Trade ; Communication, d&c.—The exports of the North-Western Provinces are principally confined to its raw agri- cultural produce—wheat, oil-seeds, cotton, indigo, sugar, molasses, timber and forest produce, dye-stufls, ghi, opium, and tobacco. The imports consist mainly of Manchester piece-goods, metal-work, manufactured wares, salt, and European goods. The principal manufactures are sugar, indigo, and coarse cotton cloth. Orna- mental metal-work is made at Benares. The only factories on the English model are the Elgin and Muir cotton mills at Cawnpur, the Shahjahanpur rum distillery, and breweries at Mastiri and Néini Tal. The largest and most valuable portion of the trade of the Pro- vinces is now conducted by rail direct with Calcutta, but the great waterways of the Ganges and Jumna still carry a large part of the heavy traffic. The Gogra forms the main channel for the grain and cotton of Gorakhpur, Basti, and Azamgarh, and for the forest pro- duce of Nepal. The lines of railway are the East Indian, which enters the North-Western Provinces from Bengal, and has its ter- minus at Delhi; the Sind, Punjab, and Delhi line ; the Oudh and Rohilkhand Railway; and the Rajputana State Railway, connecting Agra with Bhartpur. The great trunk road traverses the heart of the Provinces.~~

~~Administration.—The North-Western Provinces are under the administrative charge of a lieutenant-governor, who resides at Alla- habad. The total revenue (including that of Oudh) in 1881-82 amounted to £9,075,727, and the expenditure to £4,362,274. The chief item of receipt is the land-tax, which produced during the same year £5,751,104. Education is making steady progress throughout the central Gangetic plain, though still very backward in the Himalayan districts, in Bundelkhand, and in the remoter parts of Rohilkhand and the trans-Gogra tract. The total number of colleges and schools in the North-Western Provinces in 1881-82 was 5063, with a roll of 170,966 pupils, of whom 142,190 were Hindus and 24,437 Mohammedans. The principal institutions for higher English education are the Muir Central College at Allahabad, and the Government and Church Missionary Society's Colleges at Agra. The Benares College gives high~~

Sanskrit education, while Delhi College, just beyond the borders, gives instruction in Arabic and Persian. Primary education is afforded by a complete system of village schools, the Provinces being divided into three circles of inspection, and elementary instruction is now brought within easy reach of all who choose to avail themselves of it.

History.—The traditions of the Mahdbhdrata cluster round the city of Hastinapur in Meerut district, which, with Indraprastha, whose shapeless ruins are still to be seen near Delhi, formed the re- spective capitals of the Pandavas and Kauravas, The earliest empire in this part of India, however, of which any certain monuments re- main was that of the Buddhist dynasty of Magadha, which attained its greatest development under Asoka (see vol. xii. p. 784 sq.).

Continuous history begins with the Mohammedan invasion of Mahmud of Ghazni, who sacked the sacred cities of Kanauj and Muttra in 1017 a.p. Mohanuned Ghori, however, was the real

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founder of the Moslem power in Hindustan. In 1193 the seat of the Moslem empire was fixed at Delhi, where it remained, with few intermissions, till the British conquest.

The British first came into connexion with the North-Western Provinces as they advanced along the valley of the Ganges from Bengal. In 1768 the nawab wazir of Oudh, with the phantom emperor Shah Alam, invaded Bengal. They received a crushing defeat at Baxar, and the emperor, with Balwant Sinh, r4jé of Benares, joined the British camp. In 1775 the nawédb of Oudh, Asaf-ud-daula, ceded Benares, Jaunpur, and Ghazipur to the British, retaining Allahabad and Korah, which had been taken from the emperor in the previous year, when the British sold them to Oudh.

The nawab wazir, having agreed to pay a subsidy for the English troops maintained for his aid, and being always in arrear, signed in 1801 the treaty of Lucknow, by which he made over to the British the whole of his Oudh dominions in the Doab, together with Rohilkhand. For Lord Lake's campaign in 1808 against Sindhia, which brought the whole remaining

~~portion of the North-Western Provinces under British rule, see vol. xii. p. 804. The Himalayan districts of Kumaun and Garhwal were not acquired until after the Gurkha war of 1814-15, while the Delhi territory remained the personal apanage of the Mughal royal family until 1832, when it passed to the direct government of the East India Company.~~

~~The first half-century of the British occupation was a period of peacefwl progress. The Dodb especially rose into a great agricul- tural and commercial tract, filled with new and growing cities, such as Cawnpur, Meerut, Aligarh, Rurki (Roorkee), and Sahdran- pur. This peaceful period was interrupted by the mutiny of 1857, which first broke out in the North-Western Provinces, and pro- duced more disastrous effects in this tract than in any other part of India. Since the repression of the rebellion the principal event of importance in the Provinces has been the rapid development of the railway system, which is revolutionizing the commercial condition of the country and throwing open fresh outlets for its agricultural wealth. The outlying chief-commissionership of Oudh was placed under the administration of the lieutenant-governor of the North-Western Provinces from January 1877. CW. Weeki.)~~

~~NORTH-WEST TERRITORY was at first the vague general designation of all that portion of British North America which lay to the north-west of the provinces of the St Lawrence basin. In the British North America Act of 1867 provision was made for the eventual admission into the Dominion of Canada of Rupert's Land and the North- Western Territory. When, in 1869-70, the territories of the Hudson's Bay Company (Rupert's Land, &c.) were incorporated with Canada, the province of Manitoba was formed out of the district lying between 49° and 50° 30' N. lat. and between 96° and 99° W. long,, and "any por- tion of Rupert's Land and the North-West Territory out- side" of those limits was to be governed by the lieutenant- governor of Manitoba under the name of the North-West Territories. In 1876 the district of Keewatin (or Kewatin) was constituted; in 1881 the limits of Manitoba were shifted north to 52° 30' and west to 101° 20'; and in 1882 the four new districts of Assiniboia, Saskatchewan, Alberta, and Athabasca were organized. (1) Keewatin (395,000 square miles) lies due north of Manitoba, and extends as far as Boothia,on the Arctic Ocean, (2) Assiniboia (about 95,000 square miles) lies west of Manitoba between 101° 20' W. long, and~~

the line dividing the 10th and 11th ranges of townships of the Lands System Survey, and is bounded northward by the 9th correction line (near 52° N, lat.). It contains Fort Pelly, Fort Ellice, Qu'Appelle, and Regina (on the Canadian Pacific Railroad), the last of which has been chosen as the future capital of the province. (3) Saskatchewan (about 114,000 square miles) lies north of Assiniboia, and extends north to the 18th correction line (about 54° N. lat.) and east to the Nelson river and Lake Winnipeg. It contains Battleford, Carleton, Prince Albert. (4) Alberta (100,000 square miles) is all the country due west of Assiniboia and Saskatchewan as far as the boundary of British Columbia. (5) Athabasca (122,000 square miles) is the country due north of Alberta as far as the 32d correc- tion line (about 60° N. lat.). The term North-West Terri- tories is now used to indicate, not only the unorganized region to the north-west, but all the unorganized region of British North America, inclusive even of Labrador.

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NORTHWICH, a market town of Cheshire, England, is situated at the confluence of the rivers Weaver and Dane, near the Trent and Mersey Canal, and near the main line of the London and North-Western Railway in the Chester branch of the Cheshire lines, 18 miles north-east of Ches- ter and 22 south-west from Manchester. The streets are narrow and irregular, and many of the houses are screwed and bolted together to keep them secure from subsidences arising from the dissolving of the salt strata (180 feet in thickness), caused by the pumping of brine for the pur- pose of evaporation. Among the public buildings are the market-house, the drill-hall, and the Victoria club. Salt springs in Northwich were known to the Romans. By the Britons it was called the Black Salt Town. The substratum of rock-salt upon which the town rests was first discovered in 1670. It consists of two beds, a lower and an upper, which lie horizontally, the lower about 330 feet from the surface. In the lower stratum there exist several mines in the neighbourhood of the town. From two of these, each 40 acres in extent, the rock-salt is pro- duced. The average quantity of salt exported from the town annually amounts to over 500,000 tons. Many of the inhabitants are engaged in building flat boats to convey the salt to Liverpool; and shipbuilding, rope and sail making, brick making, iron and brass founding, and tanning are also carried on. One mile from the town the

river Weaver trustees have constructed an hydraulic lift to connect their navigation with the Trent and Mer- sey Canal on the higher level. By the river vessels of 500 tons burden can approach the town. The population of the urban sanitary district (area 1920 acres) in 1881 was 12,246.

At the time of the Norman survey Northwich constituted part of the demesne of the earls of Chester. In the reign of Richard III. it passed to the crown, and afterwards was granted to the Derby family, who sold it a century ago; in recent years the manor was acquired by the local board by purchase. The town in

1643 was fortified by the Parliament, was taken by the Royalists, but was retaken by the Parliamentarians.

NORTON, Hon. Mrs Caro.ing ExizaBetu (1808-1877), afterwards Lady Stirling-Maxwell, ranks high among the women of letters of the 19th century. She was born in 1808. One of the three beautiful granddaughters of Sheridan, daughters of his son Thomas, "three Graces" of London society in the reign of George IV., she showed literary ambition and faculty before she was out of her teens. Her first publication, made at the age of seventeen, was a merry satire, Zhe Dandies' Rout, illustrated by herself, full of girlish high spirits and wit. The preference shown for mournful and tender themes in her subsequent writings is in strange contrast with this opening jew desprit. Her first essay in serious verse was made in 1829 with The Sorrows of Rosalie, the next in 1831 with The Undying One, a version of the legend of the Wandering Jew. Fluent melody of versification, richness and felicity of language, great tenderness of sentiment, and rhetorical luxuriance of illustration showed that she had inherited no small portion of her grandfather's genius, and brought her at once into fame. Her portrait appeared in Fraser's Magazne in 1831 as that of " the leader of the female band." Curiously enough, the author of the accompanying notice describes her as " happy in all the appliances of wealth and fame," and asks, "Of a life like hers what can be told?" at the very time when, according to her own subsequent account, she was "learning the law respecting women, piecemeal, by suffering from every one of its defects of protection." She had made an unfortunate marriage in 1827 with the Hon. George Norton, brother of Lord Grantley ; then, after three years of protests on her part and

~~good promises on his, she had taken the decisive step of leaving his house for her sister's, had "condoned" on~~

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~~further good promises, and had returned, to find matters worse. The husband's unmanly persecutions culminated in 1836 in an action brought against Lord Melbourne for seduction of his wife, which the jury decided against Mr Norton's claims without leaving the box. Mrs Norton made her own unhappy experience a plea for addressing to the queen in 1855 an eloquent letter on the law concern- ing divorce, and her writings had considerable influence in ripening opinion for recent changes in the legal status of married women. During the reign of William IV., Mrs Norton was at the height of her literary reputation, con- tributing many criticisms, sketches, tales, and songs to various periodicals and annuals, and using pencil as well as pen. She was not a mere writer of elegant trifles ; she was one of the priestesses of the "'reforming" spirit ; she appeared at her best in such works as A Votce from the Factories (1836), a most eloquent and rousing condemna- tion of child labour. In a similar vein of warm sympathy with the unfortunate, she addressed a poem in 1845 to the prince of Wales, exhorting this Child of the Islands to use his power for social reforms. Aunt Carry's Ballads, dedicated to her nephews and nieces, are written with playful tenderness and grace of the most charming kind. Later in life she produced three novels, Stuart of Dunleath (1851), Lost and Saved (1863), and Old Sir Douglas (1868). All three are written with great power and freshness of style, enthusiastic facility in the exposure of social impostures and in the exhibition of ideals of generous conduct. Her heroines are too painfully tried by calami- tous misunderstandings and injuries, especially Eleanor Raymond, the heroine of the first, whose long series of misfortunes finds hardly any relief from childhood till death. This may have been due to the writer's moral pur- pose, originating in her own bitter experience, of cham- pioning the wrongs of her sex; but it is a singular fact, pointing to temperament as the cause, that Johnson made the same complaint about the novel of her great-grand- mother, Frances Sheridan. Mrs Norton's last poem was the Lady of La Garaye (1861), her last publication the half humorous, half heroic story of The Rose of Jericho in 1870. She died on the 14th of~~

June 1877. Mr Norton died in 1875; and Mrs. Norton in the last year of her life was married to Sir W. Stirling-Maxwell.

NORWALK, a township of the United States, in Fair- field county, Connecticut, on Long Island Sound, 43 miles north-east of New York, at the terminus of the Danbury and Norwalk Railroad. It contains the borough of Nor- walk, dating from 1836, and the city of South Norwalk, incorporated in 1870, the population of township, borough, and city in 1880 being respectively 13,956, 5308, and 3726. Vessels drawing 6 feet of water ascend the Nor- walk river at low tide, and there is regular steamboat communication with New York. The shallo6w waters of the bay at the mouth of the river form a good locality for oyster-culture, and about three hundred families in South Norwalk are engaged in this industry. Locks, knobs (of New Jersey clay), and iron bolts and screws are manufac- tured in the township on a very extensive scale ; and there are also iron-foundries, shipyards, flour-mills, planing-mills, felt factories, hat factories, carriage-works, shoe factories, &c. Norwalk was settled about 1640 and incorporated as a town in 1653. The settlement was burned by Governor Tryon's Hessians in 1779.

NORWALK, a post-village of the United States, capital of Huron county, Ohio, 58 miles east of Toledo by the Lake Shore and Michigan Southern Railway and also on the Wheeling and Lake Erie Railroad, is a flourishing little place of 5704 inhabitants (1880), containing planing- mills, grist-mills, manufactories of sewing-machines, organs, carpet-sweepers, and shoes, and breweries.

Plate Xx.

Configu- ration.

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Part I.—GEoGRAPHY.

ORWAY comprises the western and northern divi- sions of the Scandinavian peninsula. It is bounded N. by the Arctic Ocean, W. by the Norwegian Sea and the North Sea, 8. by the Skagerrak, and E. by Sweden, Finland, and Russia. It lies between 57° 59' (Lindesnes, or The Naze) and 71° 11' (Knivskjerodden, close to the North Cape) N. lat. and 4° 30'5 (Utver, off Sogne Fjord) and 31° 12'5 (René, adjacent to Vardo) E. long. The length of the coast-line, exclusive of fjords, bays, and islands, is 3018 miles, and the area 122,780 square miles. The country, which has its greatest breadth, 280 miles, at the 61st parallel of latitude, is comparatively narrow, measur- ing only 70 miles across between the 64th and the 68th parallels.

The Scandinavian peninsula constitutes for the most part a rocky region, of which the loftiest tracts lie on the Norwegian side. The interior of Finmark, the most northerly district of Norway, has no considerable heights ; but the frontier between Sweden and Norway, from Tromsé stift (69° N. lat.) to the southern part of Throndhjem stift (63° N, lat.), is marked by a continuous mountain range, called Kjélen (the keel), which, geologically, extends in lower levels still farther south as the frontier between the two countries. In this range are specially conspicuous the alpine regions occupying the interior of Troms6 stift, with peaks reaching a maximum altitude of 5475 feet,—the ice- clad tract of Sulitjelma east of Salten Fjord (6178 feet), the heights east of Throndhjem Fjord (4560 feet), and those east of Roros (4680 feet). From this region the loftiest line of the rocky mass takes a direction bearing west-south- west, under the name of the Dovre Fjeld, commencing with a plateau only 2000 feet high, but rising farther west into mountainous tracts like those of Snehetten, whose summit (7566 feet) was long regarded as the highest in Norway, Rundane (6930 feet), the Jotun Fjelde, where the loftiest peak of Norway, or indeed of northern Europe, occurs (Galdhépiggen, 8400 feet), and terminating at its western extremity, north of Sogne Fjord, in the snow-field known as Justedalsbre, where Lodalskaupen reaches the height of 6790 feet. From the Jotun Fjelde the ridge extends southwards, under the name of the Lang Fjelde, comprising the Fille Fjeld (Suletind, 5807 feet; Jokuleggen, 6247 feet), the Hemsedal Fjeld, Hallingskarvet (6430 feet), Hallingjékelen (6539 feet), Hardangervidden (Haarteigen, 6063 feet), and is gradually lost in more moderate eleva- tions towards the extreme south of the country. Thus a

glance at the map will show that the ridge of highest points which traverses the Scandinavian peninsula runs almost parallel to the west coast of Norway, and that the

lines retain on the whole this relative position in their.

various deviations. The narrower part of the mountain mass occurs on the side of the ridge facing the Norwegian Sea, the broader part on that facing the Baltic and its arms. In the latter direction, 7.c., eastward, the surface of the country presents a comparatively uniform slope, alike in Sweden and in the part of Norway lying south of the Dovre Fjeld and east of the Lang Fjelde. West of the ridge, on the other hand, the rocky mass maintains on the whole a higher elevation, sinking comparatively slowly and here and there in ledges towards the sea, so that in various localities its final descent to the ocean is exceedingly abrupt, or it terminates in lofty precipitous islands.

In Norway the mountainous region constitutes chiefly |

a vast plateau extending well-nigh over the whole country,

the general outline of which has been noted above. From this tableland rise the summits of the mountains, and the rocky mass itself is intersected by wide fissures, forming valleys, lakes, and fjords. The roads across the mountain ridge traverse the valleys, and hence can afford no standard by which to measure its height. Its elevation is estimated at from 2000 to 4000 feet in different localities. From the position of this mountain ridge it naturally follows that the longest valleys and the longest rivers are found in the "east country," ¢.¢., the part of Norway lying to the east of the Lang Fjelde and south of the Dovre Fjeld, - whereas on the west coast the valleys are invariably short, and many of the fissures are occupied by deep fjords pene- trating far into the interior. Such parts of the country as may justly be entitled plains (as, for instance, Romerike in east Norway, and Lister and Jederen on the south-west coast) are exceedingly limited as to both number and ex- tent. tances, and even then only exceptionally by large vessels. It is only in those comparatively frequent cases where the rivers expand into lakes that they can, strictly speaking, be navigated by ships. On the other hand, the water- falls in Norway are exceedingly numerous, and many of

them remarkable for their height, body of water, and great beauty. The most important rivers are enumerated below.

(1) The Klar Elv flows from Femundsé into Sweden. (2) The Tista (7 miles) flows through Femsé and thence into the sea at Fre- derikshald. (3) The Glommen, the largest river in the Scandinavian peninsula (850 miles), rises in Sondre (South) Throndhjem amt, north of Roros, flows through Osterdal, and disembogues by two arms into the Skagerrak at Frederikstad. It is navigable for large ships 7 miles from its mouth up to Sarpsborg, where it forms the celebrated Sarpfos (69 feet). The Glommen has numerous tributaries, of which the most considerable is the Vormen, flowing out of Lake Mjosen. (4) The Gudbrand Laagen (50 miles), rising in

| Lesjeskogen Vand (a lake with two outlets) on the Dovre Fjeld and

flowing through Gudbrandsdal, forms Lake Losna and falls into Lake Mjosen at Lillehammer. (5) The Drams Elv (163 miles, reckoned from the source of the Begna), the outlet of Lake Tyri- fjord, falls at Drammen into Drammen Fjord, an arm of Christiania Fjord. The chief tributaries of the Drams Elv are the Rands Elv, which flows through Rands Fjord; the Begna (87 miles), which rises in the Fille Fjeld and passes through Valders; and the Hallingdal Elv (113 miles), which has its source in Halling- skarvet and flows through Hallingdal and Lake Kroéderen. The two first of these tributary streams unite at Honefos, at the northern extremity of Lake Tyrifjord. (6) The Nummedal Laagen (143 miles) rises in the mountain lake Normands Laagen on Hardanger- vidden (Waste of Hardanger), flows through Nummedal, passes the mining town of Kongsberg, and falls into the Skagerrak at Laurvik. (7) The Skien Elv (126 miles) receives the drainage of eastern Thelemark and falls at Skien into Skien Fjord. (8) The Nisser Elv (112 miles), from Nisser Vand, falls into the sea at Arendal. (9) The Topdal Elv (84 miles) rises in western Thelemark and disembogues at Christiansand. (10) The Otteren (140 miles) flows through Seetersdal, where it expands into several lakes, and falls at Christiansand into the Skagerrak. (11) The Mandal Elv (85 miles) reaches the Skagerrak at Mandal. (12) The Sire-aa (84 miles) traverses Siredal, forms Siredal Vand, and disembogues into the North Sea. (13) The Bjoreia (22 miles) rises on Hardanger- | vidden, forms the celebrated Voringfos (474 feet high), and

~~dis- charges itself inté Hardanger Fjord. (14) The Rauma (36 miles), from Lesjeskogen Vand, flows through Romsdal and has its outlet at Veblungsnes into Romsdal Fjord. (15) The Driva (70 miles), from Snehetten on the north side of the Dovre Fjeld, flows through Drivdal and disembogues into Sundal Fjord. (16) The Orkla (98 miles), flowing from Opdal through Orkedal, discharges itself into Throndhjem Fjord. (17) The Gula (78 miles), rises in close proxi- mity to the springs of the Glommen and flows through Guldal to Throndhjem Fjord near the embouchure of the Orkla. (18) The Nea (70 miles), from Selbusjé, the river on which Throndhjem is situated, forms the Lerfos. (19) The Namsen Elv (85 miles) flows through Namdal and enters Namsen Fjord at Namsos. (20) The | Ros Elv (16 miles), the outlet of Ros Vand, falls into Ranen Fjord. | (21) The Ranen Elv (42 miles), from the frontier range, disem-~~

~~Hence the rivers are navigable only for short dis- Rivers.~~

~~Lakes.~~

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~~bogues into Ranen Fjord. (22) The Salten Elv (438 miles) falls into Salten Fjord. (28) The Maals Elv (74 miles) flows into Malangen Fjord. (24) The Skibotten Elv (43 miles) falls into Lyngen Fjord. (25) The Reisen Elv (70 miles), from the Swedish — Norwegian frontier, disembogues into Reisen Fjord. (26) The Alten Elv (98 miles), from the Finmark plateau, flows past Kautokeino and falls into Alten Fjord ; it is navigable with boats for a considerable dis- tance. (27) The Tana Elv (175 miles), which constitutes through- out a great part of its course the frontier between Norway and Finland, disembogues into Tana Fjord; it also is navigable with boats for a considerable distance. (28) The Neiden Elv (50 miles) is in south Varanger. (29) The Pasvik Elv (77 miles), which for part of its course constitutes the Russian frontier, drains the great Enare Lake and flows into Kloster Fjord, an arm of Varanger Fjord. (30) The Jakobs Elv (15 miles), the last frontier river bordering on Russia, disembogues close to King Oscar II.'s Chapel.~~

~~The fresh-water lakes of Norway must, as already stated, be generally regarded as mere river expansions. Hence they are, as a rule, long and narrow, and, to judge from the~~

~~soundings hitherto made, exceedingly deep.~~

~~The most important are ;—Fzmundso in Osterdal, 35 miles long, 2300 feet above the sea; Oieren (Glommen); Mjésen, the largest inland lake of Norway, 57 miles long, with a surface-area of 200 square miles, 400 feet above the sea, and 1483 feet in depth, the bottom being 1083 feet beneath the level of the North Sea ; Rands- fjord, 43 miles long; Tyrifjord, comparatively quadrangular in form; Kréderen (the Hallingdal Elv), Nordsjo, Hiterdal Vand, Tinsjé, Siljord Vand, Bandak Vand, Nisser Vand, in Thelemark ; Bygdin, Gjende, 3314 feet above the sea; Vinster Vandene (Jotun Fyelde), Hornindal Vand (in Nordfjord), Selbusjo (Throndhjem), Ros Vand, possibly the largest inland lake of Norway next to Mjosen, and by comparison of a somewhat more quadrangular form, in Helgeland; and Alte Vand (Tromsé stift). A map of Norway on a large scale shows a prodigious number of smaller sheets of water, more particularly in Christiansand stift. The total surface- area of all the fresh-water lakes of Norway is estimated at 2930 square miles, or 2°38 per cent. of the area of the land.~~

~~Southen The numerous and in many cases very extensive fjords,~~

~~coast.~~

~~Western coast.~~

~~as well as the height and contour of the country, give to the different parts of the coast of Norway a remarkably varied character. For long distances the mainland does not come into direct contact with the sea, girdled as it is by a belt of islands, holms, and skerries, more or less thickly set, which forms the so-called "skjeergaard " (fence of skerries) or outer coast. Between this wall of islets and the mainland, accordingly, extends a connected series of sounds—'"leder" (roads), as they are called—of the greatest importance for coastal navigation, since they admit of the employment of smaller and weaker vessels. The whole of the coast from Svinesund, the terminal point of the southern frontier towards Sweden, as far as Lister, is comparatively low. Of its most noteworthy fjords the first in order is that of Christiania, 90 miles long from south to north, or from the Ferder lighthouse to Chris- tiania. Here, at its head, it forms Bunde Fjord, extending north to south ; and some distance down Drammen Fjord. Farther~~

west comes Langesund Fjord, which enters Skien Fjord in a northerly direction. The remaining fjords on this tract of the coast are of minor importance. Of islands must be mentioned those in close proximity to Christiania : —Jeléen, in the vicinity of Moss; the Hvaléer, off the eastern shore of Christiania Fjord ; Néteré and Tjomé, off the western shore ; Jomfruland, in the vicinity of Krageré; and Troméen, near Arendal. The navigable roads or sounds on this part of the coast are not strictly connected, though comparatively considerable in extent. Open tracts, un-protected by a belt of islets and skerries, occur at the mouth of Langesund Fjord, and along the coast westwards from Lindesnes. At Lister the coast begins to rise, and continues to do so as far as the flats of Jeederen, where the land has a gentle slope towards the interior of the country. This tract, with the sole exception of Egeréen, has no girdle of skerries, nor is it anywhere intersected by any considerable fjords.

From Bukken Fjord, however, which lies fully exposed to the sea, the "skjergaard," in a stricter sense, com-

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mences, to continue almost uninterruptedly along the whole west coast. Bukken Fjord sends off several arms, the principal of which are Stavanger Fjord and Lyse Fjord, the latter noted for its great narrowness and its lofty precipitous walls. The roads or navigable sounds between Bukken Fjord and Bergen are open to the sea at the mouths of the larger fjords only. Of such the most noteworthy is Hardanger Fjord, which, beginning at Bom-melen and piercing the country for 80 miles in a north- easterly direction, sends off several arms. That nearest the head is the picturesque Sor Fjord, lying north and south. From Bergen northwards to Cape Stad there is, if the mouths of the fjords be excepted, a well-protected "led" or road. At the 61st parallel of latitude we have the longest fjord of Norway, Sogne Fjord, which penetrates 100 miles into the country, everywhere shut in by high and precipitous rocky walls. Northwards, its chief arms are Fjerland Fjord, Sogndal Fjord, and Lyster Fjord; east- wards, Aardal Fjord and Leirdal Fjord; southwards, Aurland Fjord, together with Neré Fjord, the grandest of them all. Off the north shore of Sogne Fjord we have the most westerly

~~islands of Norway, viz., Utveer, and farther north the lofty islands of Alden, Kinn, Batalden, and Skorpen. Here Dals Fjord and Forde Fjord, and farther north Nord Fjord, of very considerable extent, penetrate into the country. Off Nord Fjord lies the island of Bre- mangerland, with a mountain summit, the Hornelen, rising to the height of 2940 feet. The land at Stad projécts into the sea without any belt of islets ; the protecting fence, however, soon recommences farther towards the north-east. * On this part of the coast, that of Romsdal, several large fjords penetrate deep into the country, such as Stor Fjord in Séndmére, with numerous arms, the most important being Hjérund Fjord and Sunelv Fjord, Romsdal Fjord, Sundal Fjord, and Surendal Fjord. To an exposed tract of coast, Hustadviken, south of Christiansund, succeeds Throndhjem Led (Throndhjem Road), shut off from the sea by the large low islands of Smolen and Hiteren, the latter of which is the largest island in southern Norway. From Throndhjem Led the broad and extensive Throndhjem Fjord stretches in several directions, first south-east- wards, then eastwards, and finally north-eastwards, for about 80 miles into the country, as far as Stenkjer on Beitstad Fjord.~~

~~North of Throndhjem Fjord an outer coast with a navi- gable "road" extends almost unbroken to the North Cape. Among other fjords in Nordre Throndhjem amt Folden Fjord and Namsen Fjord must be mentioned; off the latter, the low-lying group of islands bearing the name of Vigten project far into the sea, surrounded, as in the case of Smélen and Hiteren, by an extremely shoaly ""skjzergaard," which stretches right up to Vest Fjord, and renders an approach to land very difficult and dangerous. The coast of Nordland is distinguished by a chain of lofty picturesque islands, as Torghatten, with its natural tunnel, 400 feet above the sea, which runs from south-west to north-east for a length of 520 feet, Veegé, Dénnesé, Lovunden, Treenan, Hestmandé, Luré, Fuglé, and Landegode. The mainland, too, exhibits magnificent mountain summits, viz., the Seven Sisters on Alstenden, Strandtinderne, and the snow-field Svartisen. The fjords, though not so long as in southern Norway, are still of very considerable size, as, for example, Bindal Fjord, Vel Fjord, Vefsen Fjord, Ranen Fjord, Salten Fjord, Folden Fjord, Tys Fjord, and Ofoten Fjord. Off Salten are the well-known Lofoten Islands, skirting westerly the broad arm of the sea called Vest Fjord, which termi- nates in Ofoten Fjord. The Lofotens consist of a chain of islands separated from each other by broader~~

and narrower channels. The mountains on the outermost group are not particularly high—indeed the principal island, Rést, is

Northern distance to the Swedish frontier is only 6 miles.

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remarkably low; but otherwise the islands exhibit a chain of granite peaks to be counted in hundreds, strangely charac- teristic with their jagged, fantastic outlines, and towering to a height of from 2000 to 3500 feet above the level of the sea. This truly alpine scenery is rendered the more imposing in character by the fact of its rising directly from the sea. The Lofotens are connected on the north with the group of islands called Vesteraalen, which, in their south- ern parts, fully equal the Lofotens in grandeur. Within these groups of islands lies the largest island in Norway, Hind6en (area, 865 square miles), with the lofty peak, Mosadlen. From the innermost creek of Ofoten Fjord the North

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ous, being nowhcre broken by channels through which ice-cold water from the depth of the Polar Sea would otherwise find a passage to the "sejlled" or navigable roads along the coast, and to the deep fjords that penetrate so far into the country. The Norwegian fjords have as a rule the remarkable characteristic that the bottom for great distances lies deeper, and in some eases very considerably deeper, than the surface of the coastal banks ; thus, for example, the Norwegian Channel is upwards of 400 fathoms deep in the Skagerrak, Stavanger Fjord has a depth of 380 fathoms, Hardanger Fjord 355, Sogne Fjord 670, Nord Fjord 340, Throndhjem Fjord 300, Rancn Fjord 235, Vest Fjord 340, Alten Fjord 225, and Varanger Fjord 230. These maximum depths occur in many cases at a great distance from the sca.

For our knowledge of the geology of Norway we are Geology.

chiefly indebted to the results brought to light by the

fjords of Hindéen, in Troms6 amt, there is also a chain of large | Royal Norwegian Geological Survey, under the direction a as, islands, as Senjen, Kvalé, Ringvasé, and others. Of large | of Professor Kjerulf. To the geologist Norway presents ~ fjords may be mentioned Malangen Fjord, Bals Fjord, Ulfs | @ region of the highest interest, alike from the structure

Fjord, Lyngen Fjord, as also Kveenang Fjord, with the grand | of the country itself and from the fact of the rock-surface scenery of the Kvenang peaks. In Finmark, the large | almost everywhere lying bare and being intersected by coast islands Séré, Stjerné, Seiland, Kvalé, Ingé, Mageré | natural profiles of valleys and ravines. Extensive tracts extend to the North Cape ; but here the © skjergaard," or consist of the Archean formation, with its strata of gneiss, Arehzan outer coast, comes abruptly to an end. The coast of east | hornblende schist, and quartz,—the first of these forming forma- Finmark presents a totally different character: flat mount- | the lower, the last the upper section, both of great depth, 4. ain wastes descend precipitously to the ocean without any | The beds are generally folded, and in part vertical. This islands beyond, save Vardé, with two low islets at the | formation occurs particularly in Romsdal, in the vicinity farthest eastern extremity of Norway. The fjords of Fin- | of Arendal, east of Christiania Fjord (gneiss), in Thele- mark are broad and long, as Alten Fjord, Porsanger Fjord, | mark, Hallingdal, Nordfjord (quartz), along the shores Laxe Fjord, Tana Fjord, all extending southwards, and of Sogne Fjord, throughout the inner tracts of east Fin- Varanger Fjord, which takes a westerly direction. The | mark. Above this formation is the Sparagmite, chiefly farther east one proceeds the lower does the country be- | consisting of fragmentary rocks in thick strata, with felspar come; the sharp peaks disappear and give way to a low- | embedded. The lowest beds are grey and red Sparagniite, lying, monotonous landscape on the north side of Varanger | partly accompanied by deep masses of conglomerate. To Fjord ; the south side, however, exhibits a more varied | this formation belongs the blue quartz, widely distributed aspect, especially where, between the tributary fjords, | throughout central Norway, as also subordinate green and several islands occur. 'The total area of the islands of | black clay schist and black limestones. In the latter, which Norway amounts to 8460 square miles. constitute the upper part of the formation, the Primordial

Sea-bed — The form of the sea-bed off the shores of Norway has been inves- | Zone, we meet with the first traces of animal life—the oldest

tigated, partly by the Coast Survey and partly by the Norwegian North Atlantic Expedition, 1876-78. (See NorrH Sea aud Nor- WEGIAN SEA.) The hundred-fathom line of the North Sea extends west of the British Islands, and north of Shetland towards Norway, off Cape Stad. But the bank bounded by this line does not fully reach the Norwegian coast. From off Stad (62° N. lat.) a depres- sion in the sea-bed, called the Norwegian Channel, stretches along the west and south eoasts of Norway, southward and eastward, almost to Christiania Fjord and the Cattegat. The deepest part of this channel, upwards of 400 fathoms, extends through the Ska- gerrak between Arendal in Norway and the Scaw. Off Lister the depth is 200 fathoms, and off Bommelen, the shallowest part, 120 fathoms. Thence it incrcases in a northerly direction, reaching 200 fathoms off Sogne Fjord, after which the channel finds an outlet into the deep basin of the Norwegian Sea. The breadth of the Nor- wegian Channel, computing by the hundred-fathom line, is from 50 to 70 miles ; it is narrowest in the southernmost part, off Lindesnes. Its walls shelve gradually down on either side, and the bottom is comparatively wide and flat. The bank extending between the coast and the inner slope of the channel is exceedingly narrow, being only from 7 to 10 miles broad. The Norwegian Channel thus constitutes a definite boundary between the plateau of the North Sea, with the countries rising from it, and the land of Norway. North of Stad occurs an expansion of the Norwegian coastal bank. Its outcr slope rapidly descends towards the deep basin of the Nor- wegian Sea. Whilc the hundred-fathom line keeps comparatively close to the Norwegian coast as far as the Russian frontier—off the Lofotcns only does it extend a little more than 40 miles from land—the two-hundred-fathom line, which, off Romsdal, at Storeggen, runs at a distance of 40 miles from the shore, takes a northward direction, the coast, on the other hand, deflecting towards the north- east and north-north-east. Accordingly the distance between them continues to increase till, off the coast of Helgeland, it reaches 130 miles. Off the Lofotens and Vesteraalen it again approaches the land, at its nearest point—off Andenes in Vesteraalen—being scarcely 10 miles distant. North of Vesteraalen, the two-hundred-fathom line, or the edge of the coastal bank, makes another bend towards the north, and draws off from the coast of Norway. 'The Barents Sea, which

bounds Norway on the north, is a comparatively shallow ocean tract, the greater part of its bed ranging between 100 and 200 fathoms below the surface. Norway is thus encompassed by a series of rampart-like coastal banks, in the strictest sense continu-

trilobites. The Sparagmite formation extends throughout a great part of central Norway, Osterdal, Gudbrandsdal, Land. In other parts the Primordial Zone is met with immediately above the Archzean rocks. Then succeeds the

Silurian system, also of wide extent, occurring in a series Silurian Charac- System.

of beds distinctly marked off by their fossils. teristic strata in this system are the orthoceratite limestone with graptolithic schist (Lower Silurian), next lime sand- stone, pentamerous limestone, coral limestone, along with other strata, such as red clay schist, limestones, and marl slate (Upper Silurian). The Silurian beds are almost every- where greatly bent, compressed, and dislocated ; the strike is in the great majority of cases from south-west to north- east. At and around Christiania, in the tracts bordering on Lake Mjésen and Skien Fjord, the Silurian beds occur without being metamorphosed, except locally at their con- tact with eruptive rocks. In the environs of Bergen, the outer part of Hardanger Fjord, the Hardanger Waste, in Sondre Throndhjem amt we meet with regionally metamorphic schists and limestones containing Silurian fossils. In the medial of the three sections of the Throng- hjem schist8 occur Upper Silurian fossils. The Silurian system in Norway extends in the direction of south-west to north-east, straight across the southern part of the country, from Hardanger Fjord to some distance east of Throndhjem Fjord, as also from Skien Fjord to Lake Mjésen. Above the Silurian system is found, in various localities, more particularly west of Christiania Fjord, a sandstone formation, to some extent along with conglo- merates, of which the geological age remains uncertain, no fossils having as yet been found init. With this forma- tion the series of stratified rocks in southern Norway may be said to terminate, since the next fossil-bearing strata are diluvian, containing Pleistocene animal remains. ; AVII. — 73

Local forma- tions.

~~Eruptive rocks,—granite. .~~

~~Minerals.~~

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~~In various parts of the country we meet with extensive and highly-remarkable beds, geologically established with special local designations, and which, on the discovery of fossils indicating the sections, will, no doubt, at some later period be classed under the names given to the great and generally accepted formations with more precision than is possible at present. Such are, farthest north, the Gaisa series and the Raipas series in Finmark ; in the Throng- hjem region, the older of the Throndhjem schists, con- glomerate and the sandstone series, and the Gula schists ; in central Norway, environing the Jotun Fjelde, the alpine quartz. Of Mesozoic beds (Oxford clay) a few only still remain on the island of Andé in Vesteraalen ; they consist of sandstone, coal, and oil-shale, with embedded Jurassic fossils.~~

~~The eruptive rocks—granite, syenite, porphyry, gabbro, norite, serpentine, greenstone, é&c.—have broken through the beds of the various formations in a variety of ways, at one time as vast masses in continuous streains, at another time as isolated dome-like summits or simply cutting up- wards as dykes. Old granite occurs in Christiansand stift, 'Thelemark, the Hardanger Waste, where it extends over ex- tensive tracts and at its boundaries is seen to break through the Archean formation, sending off multitudinous coarse-grained dykes, as also on the east side of the mouth of Christiania Fjord, in Aadal and in Hedal, south of Valders, and in Osterdal. Very extensive tracts of granite are met with along the coast of Romsdal and in Nordre Throndhjem amt, where the coast, called Fosen, exhibits its charac- teristic rounded forms. Up through Nordland we pass numerous granite tracts of considerable extent. The whole of the Lofotens and Vesteraalen, together with all the outer- most islets, holms, and skerries along the coast of Nordland, consist exclusively of granite. The interior of Finmark also has very large granite tracts. Extensive masses of post-Silurian granite and syenite, as also of porphyry in sheets, occur to the west and north of Christiania Fjord ; it is at the borders of these masses that the Silurian sys- tem here becomes prominent. The largest tract of gabbro is that of the Jotun~~

Fjelde ; this rock is also met with extensively in Throndhjem stift and in Tromso stift. Norite occurs chiefly near Sogne Fjord and at Egersund. Serpentine, in tracts of very considerable extent, is met with principally throughout Throndhjem stift. Dykes of post-Silurian porphyry, but more especially of greenstone, pierce in large numbers the Silurian system of eastern Norway ; similar dykes, however, are also seen here and there throughout the country traversing both schist and granite.

Notwithstanding its great abundance of rocks, Norway cannot be said to be rich in valuable ores or minerals. Thus, for example, true coal does not occur ; Jurassic has been found on Andéen, but only in seams extremely limited in extent. Gold is met with very sparingly in veins of quartz at Eidsvold, in the rivers of Finmark, and along with silver in the Kongsberg mines. The latter metal is found as native silver in veins of calcareous spar at Kongs- berg, where the state owns a silver mine of considerable value. Copper occurs in numerous localities, as Thelemark, Réros in the Throndhjem district, many parts of the west coast, more especially at Vigsnees on Karméen, and in north- ern Norway at Kaafjord in Alten. Nickel is produced in some parts from sulphuretted iron ore, particularly on the island of Senjen in Tromsé amt. Iron ores are met with in southern Norway, particularly along the coast near Arendal. According to the geological survey, the presence of ore is intimately connected with the eruptive rocks, at the limits of which they are accordingly to be looked for, both in the Archean and in the later formations; thus on the confines of the oldest granite we find alike iron and

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copper ore ; on those of gabbro, sulphuretted iron ore con- taining nickel and apatite.

Volcanoes, ina strict sense, and their subsequent results, such as hot springs, have not been met with in Norway.

The portion of the earth’s crust now visible in Norway has Geo- obviously in the lapse of time undergone very great changes with logical respect to the

position of its Both the oldest formation and the later systems are almost every- where greatly bent, compressed, and distorted,—and also denuded, and their parts forcibly dislocated, alike as regards situation and relative height. Formations that in the interior lie at a height of several thousand feet arc on the coast found level with the surface of the sea. Strata resting on the summits bordering a lake or the shores of a fjord are again seen on islands in such lakes or fjords, and level with the surface of the latter. One side of a valley ex- hibits a profile which, in regard to the height of the various strata, differs materially from the profile of the opposite side. The whole rocky sheet is cut up in varions directions, and the several laminz are uow sunk bencath, now raised above, those adjoining them. These dislocations have been occasioned by fissures, which in many places can be pointed out, and the number of such provable faults of dislocation increases almost every year. The direction of the fissures is manifestly of the greatest assistance in indicating the form exhibited by the surface of the country. The subsidence be- tween two fissures produces a valley, a fjord, its rise on the other hand a height, a promontory. Professor Kjerulf has succeeded in showing that the entire system embracing the valleys and fjords of southern Norway may be casily referred to four principal directions, corresponding very uearly to the four quarters of the globe, round which the principal directions of the valleys and fjords are found grouped with predominant frequency. The same applies to northern Norway, and can also be shown to distinguish the fjords of Spitz- bergen, Iceland, and Greenland; the same directions are again met with in the lines of the Icelandic volcanoes, springs, lava-dykes, and volcanic eruptions.

Vestiges left by the ice age are very conspicuous and varied Influence

throughout Norway. The rock-surface exhibits almost everywhere, of the and more especially when sheltered by loose snuperincumbent layers, ice age. a ground, polished, and striated aspect ; up toa height of 4000 to

5000 feet the striation runs in the direction of the valleys, or from

the lofty inland tracts, towards the sea. Bonlders of foreign origin

are found scattered over the mountains, in the fields, and in the

loose layers covering the surface ; their origin can often be deter- mined with certainty. Old moraines, consisting of gravel-walls lying transversely to the direction of the stri, indicate by their position the fronts of the ancient glaciers, and by their numerous

serial lines an equal number of breaks in the retreat of the ice into

the country. Layers of clay and banks of mussel-shells, in which

are embedded the remains of arctic marine animals, indicate the sedimentary deposit of the material carricd down by the rivers of

the ancient glaciers to the sea.

At the present day perpetual snow is found in Norway only in Snow-elevated localities. The most celebrated masses are the following— masses. (1) the Justedalsbre, between Sogne Fjord and Nord Fjord. It occupies an area of 580 square miles, reaches an altitude of 5000 feet, descends with its snow-cap to between 4000 and 4500 feet, and sends off numerous glaciers on cither side; several of these extend very nearly down to the sea, as the Boiumbre in Fjerland, in Sogn,

426 fect above the sca ; the largest of the Justedal glaciers is the Nigardsbre. (2) The Folgefon, between Hardanger Fjord (Sor Fjord) and Aakre Fjord, with an area of 108 square miles aud an altitude of 5270 feet. It sends off only three glaciers. (8) Hallingskarvet. (4) The snow-ficlds of the Jotun Fjelde, east of Sogne Fjord. (5) The snow-fields of Snehetten. (6) The Store Borge Fjeld in Helgeland. (7) Svartisen, the largest snow-field but one in Norway, between Ranen Fjord and Salten Fjord in Nordland. It sends off a number of glaciers, some of which reach almost to the séa-levcl at the heads of the fjords. (8) The Suli- tjelma snow- field, east of Salten Fjord, on the Swedish frontier. (9) The Jéknl Fjeld, between Kveenang Fjord and Ox Fjord, on the boundary of Finmark. It sends off magnificent glaciers towards the sea. Onc of these, in Jékel Fjord, a branch of Kvenang Fjord, extends down to the water's edge, so that fragments of its ice fall into the fjord and float as small icebergs on the surface, the sole instance of the kind in Norway. (10) Seiland snow-field, ou the island of Seiland, near Hammerfest, the most northerly névé in Europe. 'The limit of perpetual

~~snow in Norway is estimated at 3080 feet on the island of Seiland, 5150 feet on the Dovre Fjeld, : from 4100 to 4900 feet on the Jotun Fjelde, from 3100 to 4100 feet on the Justedal snow-fields, and from 3100 to 4100 feet on the Folgefon.~~

~~Traces of relative changes of level between land and sea are Marine observed in numerous localities. he highest marine terraces (in terraces, which the remains of marine animals have been found) are met beach- with in the east part of the country and near Throndhjem at 600 lines. feet above the sea-level; at the heads of the fjords on the west coast~~

~~parts, their level, and their surface. changes.~~

~~Tempera- ture.~~

~~NO RK~~

~~they lie lower. This obviously proves these districts, at the termina- tion of the ice age, while the glaciers were still in process of melting, to have been relatively lower than at present. And we have further indication of the fact that the interior lay higher during the ice age in the "giant kettles" occurring near the level of the sea, since these are believed to have been formed at the foot of cataracts in the glaciers, the substratum of which must, of course, have been above the level of the sea. Along the whole coast, in numerous localities, from Séndhordland (between Stavanger Fjord and Hardanger Fjord) nearly to the North Cape, and along the fjords, are found ancient beach-lines cut out in the solid rock. Their real significance as sea-level marks is shown by their perfectly horizontal direction, by their extending in several localities on the same level as the most elevated of the marine terraces (¢.g., that of Throndhjem), by the circumstance that in other places they run in a line continuous with the surface of adjoining terraces, and finally by the sea- wrought caverns found on the same level. It is in northern Nor- way especially that beach-lines largely occur. In several localities there are two parallel lines, the one above the other. Throughout extensive tracts these lines can be referred to particular levels, thus indicating a pause in the rise of the land that afforded sufficient time for the action of the sea, or pointing to the presence of certain climatic influences favourable to this production periodically alter- nating with unfavourable intervals. No change of level in the Norwegian coast within recent years can be scientifically shown. Earthquakes are of rare occurrence in Norway.~~

~~The following is a summary of the results arrived at by the Norwegian Meteorological Institute (1867-83). The number of stations is from forty to fifty. The coldest parts of Norway, where the mean annual temperature is below 32° Fahr., are the highest regions of the country and the interior of Finmark (Karasjok, 26°:4); on the sea-shore it is only at Varanger Fjord that it falls below 32°. The highest mean annual temperature (44°:6) is that of Skudes- nes ; and the outer coastal margin from the mouth of Sogne Fjord to Lindesnzes has a mean annual temperature of 44°. The interior of southern Norway and that of Finmark have the longest winter (200 days with a mean annual tempera- ture of under 32°) and the lowest winter~~

temperature, the mean temperature of the coldest day being under 14°. From the interior districts towards the coast the climate becomes everywhere milder in winter. From Lindesnzs an exceed- ingly narrow strip of land stretches along the west coast northwards right to the mouth of Throndhjem Fjord where the lowest mean temperature of any day exceeds 32°. Rést, the outermost of the Lofoten Islands, belongs to this strip of coast (32°°9 in January). The January isotherm for 32° reaches beyond Tromsé up to the 70th parallel of latitude; on the one side it extends down to the southern coast of {celand, on the other to the alpine districts of Norway. In January the interior of Finmark has a temperature of 2°-5, central Norway, at an altitude of 1600 feet, 11°°3. The winter isotherms follow the contours of the coast and lie very close together. The summer is hottest in south-eastern Norway (Christiania, July, 61°°9); next come Hardanger (July, 58° °3) and Sogn (Sogndal, July, 60° 3). Karasjok has in July a mean temperature of 57°°2. On the coast the summer is colder than some distance inland ; it is coldest on the Finmark coast (Vardé, July, 47°-7) and in the lofty inland tracts (Roros, 52°, 2000 feet above the sea). The interior of Finmark has a higher tempera- ture (upwards of 57°) than any part of the outermost coastal margin as far south as Jeederen (59° N. lat.). The temperature in July (50°‘2) at the North Cape (71° N. lat.) is the same as in the southern part of Iceland (63° to 64° N. lat.). The isotherm for 52° passes through the Lofotens (68° N. lat.) and the Shetland Isles (62° N. lat.) ; that for 56° extends from Jederen straight across the North Sea to the northern part of Scotland. On re- ducing the temperature to the sea-level we get for the south-eastern part of Norway a maximum of heat exceed- ing 60°. The interior having a warm summer and a cold winter, and the coast a cool summer and a mild winter, the annual range of temperature is greatest throughout the inland regions (55° in Finmark, 45° in central Nor-

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way) and least on the coast—from Lindesnes to Vardo. In Osterdal and the interior of Finmark the mercury sometimes freezes (— 40°). Along the outermost line of coast, from Romsdal to Jederen, the mercury never sinks below 12°. At Karasjok a temperature of — 58° has been observed. The

highest known readings are those observed at Christiania (90°) and in Finmark (96° in the vicinity of Varanger Fjord). Throughout a tract extend-ing straight across the country near the 65th parallel of latitude the maximum temperature does not reach that observed in the south-east and in Finmark. Along the coast the highest temperature is from 77° to 79°, and on the outermost skerries it hardly reaches 75°. The diurnal range of the temperature of the air is greatest in the south-east (Christiania, 15° in July, 3° in January), least on the coast (only 5° in July). In Finmark it is inappreciable during the dark season, when the sun is below the horizon throughout the twenty-four hours. At Vardé it is 5° in July. In spring the heat everywhere makes its way from the coast towards the interior of the country (in Finmark from north to south); in autumn the cold passes from the interior towards the sea (in Finmark from south to north). The thermic anomaly is in Nor- way during the winter months always positive; along the west coast it reaches as much as 36° in January, and off the Lofotens amounts to even 43°, the highest value it anywhere attains on the globe ; even in central Norway it is +11° in January. In July it is greatest in Lapland, viz., +9°. Along anarrow strip of the south-western coast of Norway it is negative in the month of July, though hardly — 2°; hence this strip of coast is comprised in the negative thermic anomaly of the North Atlantic during

. summer. The tension of vapour is at all seasons of the year greatest Relative

on the coast and least in the interior of the country. hwnmid-

The relative humidity is greatest on the coast of Finmark '-

(82 per cent. per annum). Leirdal in Sogn, which lies under the lee of the Justedalsbra, has an annual relative humidity of only 65 per cent. In winter it is greatest in the cold tracts of the interior (85 per cent.) and least on the west coast (70 per cent.) ; in summer it is greatest on the coast (upwards of 80 per cent.) and least in the interior (Christiania, 60 per cent.). On the driest days it can sink as low as 20 or even 12 per cent.

Just as the isotherms exhibit a tendency to follow the Isobars.

contours of the coast, so likewise do the isobars. In the mean for the year there is a maximum of pressure (reduced to the level of the sea and to the gravity at 45° lat.) in south-eastern Norway comprised within the isobar for 29°88 inches. The isobar for 29°84 inches extends from the north of Scotland over Bergen, Dovre, Throndhjem, and parallel with the coast of Nordland to Lapland. The isobar for 29°80 inches passes across Shetland and the coasts of Romsdal, Nordland, and Finmark to the south side of Varanger Fjord. The isobar for 29°76 inches passes a little to the north of the Faroe Islands, across the Lofotens, and along the Finmark coast to Vardé. Out in the Norwegian Sea there is a minimum pressure of air (29°72 inches), with its longitudinal axis stretching from south-west to north-east, between Iceland and Nor- way; it extends into the Barents Sea, between Beeren Eiland, Novaya Zemlya, and Finmark. In January the normal isobars take approximately the same course. Cen- tral Norway has a maximum of 29°97 inches. The isobar for 29°80 inches extends from the north coast of Ireland across Scotland to Stad and Lapland; that for 29°60 inches passes from the Faroe Islands towards the north- east, off the coast of Norway. The least pressure of air in January is at the North Cape (29°64 inches). A mini- mum occurs east of Iceland (29°45 inches, a still lower

Winds,

580

(29-37 inches) west of Iceland, and another not quite so low in the Barents Sea to the north-east of the North Cape (29°56 inches). In July there is a minimum of pressure (29°80 inches) over central Norway (61° N. lat.). Along the part of the country adjoining the coastal region we have a maximum zone with a pressure of 29°85. In the sea between Iceland and Norway a trifling minimum (29°76 inches) occurs. It is obvious that the distribution of pressure must be regulated by that of temperature,—a maximum pressure of air over the colder, a minimum over the warmer localities.

As a consequence of this normal distribution of the press- ure of the air the prevailing winds in winter blow from the land to the sea, with a deviation to the right. These are accordingly north-easterly along the Skagerrak, southerly along the west coast, south-westerly in northern Norway. They

are for the most part cold winds, and cool down the surface of the sea throughout the nearest tracts. In summer sea-winds prevail; they blow along the land with the land to the left, more especially in southern Norway, where the coast of the Skagerrak has south-westerly, Lindesnees westerly, and the west coast northerly winds. In northern Norway the prevailing summer winds are northerly. The winds blowing along the coast, in one direc- tion or another, up or down, are twice as numerous as those blowing across it, from the land or the sea. In accordance with the greater value of the normal gradient in winter than

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[CLIMATE.

fall on the coast in all months of the year from the North Cape to the Lofotens. The amount of precipitation is greatest on the coast, between Sogne Fjord and Stad, where it amounts to 77 inches. West of a line from the coast of Romsdal to Christiansand it is above 40 inches. In the Lofotens it reaches 45 inches. Throughout the south-east and in Finmark it falls as low as 12 inches. In the former region, however, exceptions occur; thus, for example, a short distance north of Christiania the annual rainfall is 40 inches, whereas in the city itself it amounts to only 26 inches. In the south-east the amount of precipitation is greatest during the months of July and August, on the west coast late in autumn or in the beginning of winter. The amount of precipitation is least in spring. Thunderstorms are not very frequent in Norway.

with southerly to south-westerly winds or (especially throughout the interior) on very hot days. In winter the heavy gales from the west and south-west on the west coast are often accompanied with thunder and lightning of an exceedingly dangerous character, the clouds hanging very low. Not less than a hundred churches in Norway have been struck and destroyed by lightning during the last 150 years, and of these not less than forty on the coast, in the winter thunderstorms, as far north as the Lofotens. At the North Cape, too, thunderstorms occur in winter.

They Thunder- occur chiefly in summer, either during rainy weather and storms.

~~in summer, the force of the wind on the coast is greatest in winter ; during that season it rarely ceases to blow on the coast ; but the number of calm days is very considerable~~

~~The mild climate Norway enjoys must be chiefly ascribed to the Tempera- high temperature of the water that laves her shores. (See Non- ture of WEGIAN SEA.) The fjords are filled with the heated water of the water in Atlantic, which in their deepest parts exhibits a constant tem- fjords.~~

~~Clouds.~~

~~in the interior of the country in and around the locality of the maximum barometric pressure. In summer calm weather is comparatively frequent on the coast (maximum zone of pressure), but not to the same extent in the interior. Upon the whole, the force of the wind on the coast is at all seasons of the year much greater than in the inland tracts. Storms are frequent on the coast (30 stormy days a year), rare in the interior (4 stormy days a year). Their most fre- quent direction is the sameas that of the prevailing winds, viz., for the whole country on an average from the south- west, then from the west and the north-west. They are most frequent in winter, particularly during December and January (4 a month), rarest in summer (hardly 1 a month).~~

~~The amount of cloud in Norway is on the whole con- siderable. The coast of Finmark has the largest proportion (upwards of 3 cloudy days to 1 clear day). In the interior of the country the amount of cloud approximates 50 per cent: The summer months are somewhat clearer than those of winter.~~

~~perature as high as, in the north even higher than, the mean annual temperature of the air, representing an amount of heat which during the coldest of winters can be reduced only to a slight extent. Thus in the depths of the Skagerrak channel the tempera- ture is 42°, that of Sogne Fjord is 48°7, of Throndhjem Fjord 42°°8, of Ranen Fjord 40°°6, of Salten Fjord 38°71, of Vest Fjord 42°°8, of Alten Fjord 39°-2, aud of Varanger Fjord 37° °6. Where the tem- perature at a depth of 100 to 200 fathoins is above 32° the water does not freeze; hence the open coasts and fjords of Norway. It is only in the innermost and more continentally situated arms of fjords into which rivers discmbogue, as also along shallow stretches of coast—the~~

coast of Lister, for example—that the sea is found to freeze in winters of exceptional severity. The cold prevailing land-winds in winter cool the surface of the sea on the coasts; therefore the surface-temperature increases outwards to- wards a thermal axis extending off the coast of Norway, and the isotherms of the sea-surface assume the same linguiform shape as those of the air. In winter the surface of the sea on the coast has a higher temperature than the air. The surplus heat is in January 4° at the Skagerrak, 10° at the North Cape. In summer the surface of the sea is in part very slightly colder than the air. Thus upon the whole the sea exerts a direct influcnce in raising the temperature of the air; and the prevailing direction of the wind from the south-west tends to diffuse this heated air over the nearest

Fog.gs : inland tracts, in particular those of the west coast. In summer

i aa 2 og frequent ye, ae see =. . d the coast Norway is indebted, as regards climate, to the long days which, by

eos ied arin te Malan de n the south-east reason of her high northern latitude, she enjoys. ‘The heated water

part of the country the reverse is the case. In winter a | on the banks and in the fjords having during winter rendered im-

frosty fog hangs over the inner extremities of the fjords | possible the formation of ice on the coast, and thus provided against

when the cold is severe and the wind blows out from the | #8Y Waste during summer of solar energy in a melting process, the

land over the open water of the fjord sun can freely exert his beneficent influence, working, so to speak,

;. . eae well-nigh—in Finmark actually—without intermission throughout Rain. The number of days with rain or snow is upon the whole | the short period of vegetation.

~~greatest on the coast, from Jeederen to Vardé, least in the south-east part of the country. At the North Cape, in the Lofotens, along the west coast between Stad and Sogne Fjord, precipitation occurs on as many as 200 days of the year. On the Dovre Fjeld and on the coast bordering the Skagerrak the number of rainy days amounts to about 100 a year. The number of days with snow is least at Lister, increasing from 20 a year in that locality to 50 on the coast of Nordland in the vicinity of Throndhjem Fjord, on the Dovre Fjeld, and in Christiania, to 90 at Andenzs and Vardé, and to 100 at the North Cape. From Vardé to Andenzs, on the Dovre chain, and in the high mountain tracts snow occurs more frequently than rain. Snow can~~

~~The current sets as a rule along the Norwegian coast from the mouth of Christiania Fjord, passing round Lindesnes and thence on to the North Cape and the Russian frontier. In the Skagerrak the water is much less salt than on the west coast, being mixed with fresh water from the great rivers in the south-east part of the country, and those emptying into the Baltic. The tidal water is scarcely appreciable east of Lindesnes ; its height increases, how-ever, rapidly northwards (Lindesnes 1 foot, Stavanger 8 feet, Bergen 4 feet, Throndhjem 8 feet, Hammerfest and Vardoé 9 feet). In narrow sounds the tidal current is often exceedingly strong ; the following are examples—the Moskenstrém or Malstrom in the Lofotens, the Saltstrém at Bodé, the Rystrém at Tromso.~~

~~The forest growth of Norway consists chiefly of pine and fir, Flora.~~

~~which clothe the slopes of the mountain valleys, especially in southern Norway (as those of the Glommen and its tributaries, those of the Drammen, Laurvik, Skien, Arendal, and Christiansand~~

~~Fauna.~~

~~—of European carnivoree—the bear, the lynx, and the wolf.~~

~~FLORA AND FAUNA. |~~

~~districts, and those drained by the rivers disemboguing at Fre- derikshald). Extensive forests of Coniferous trees are also found in Throndlijem stift and the amt of Nordland. The Coniferous woods of Bergen and Tromsé stifts~~

~~consist—with a solitary excep- tion—of fir alone. The extreme limit of the fir belt in southern Norway is from 2200 to 3000 feet above the sea; throughout the Throndhjem region, from 1600 to 2000 feet; at Talvik in Alten (70° N. lat.) it docs not exceed 700 feet. With the sole exception of the birch, none of the foliferous trees indigenous to the country form woods of great extent. The birch, reaching higher up the mountain sides than do any of the Conifers, forms a belt above them, which is, however, exceedingly narrow in southern Norway. Next come the dwarf birch (Betwla nana) and various species of willows, and, last of all, between this and the snow-limit, the lichen belt. But the line of demarcation between this region and the willow belt is not distinctly traceable, the dwarf birch and some few of the willows—more especially the creeping rotundi- folious varieties (Salix herbacea or polaris)—extending occasionally to the very edge of the snow-fields. Other plants also, such as the snow ranunculus, the Alpine heather, and numerous mountain plants, many of them distinguished by their beautiful flowers, grow abundantly here. The region of the Dovre is especially note- worthy, as the tract in which the alpine flora of Northern Europe is found in greatest variety, and within comparatively narrow limits. In the fertile and less elevated districts of Norway the forest growth, apart from Conifers, includes the ash, elm, lime, oak, beech, and black alder. The aspen, white alder, mountain ash, and bird cherry thrive at a considerable elevation, and are occasionally found even in the birch zone. The oak still grows abundantly on the south-eastern coast, from Jarlsberg-Laurvik amt to Christian- sand, but is nowhere found in extensive forests. The only locality in which the beech can be said to thrive is Jarlsberg-Laurvik amt.~~

~~The vast fir and pine forests are still the haunts of the largest The numbers of the last-mentioned, however, have, in southern Norway, been steadily and one may almost say unaccountably decreasing during the last twenty years; and the wolf may be now regarded as the most rare of all Norwegian beasts of prey. In Finmark it still abounds, constituting the worst enemy to the herds of reindeer. The bear also is less frequently met with, a fact to be accounted for by the immense quantities of timber felled of late throughout the country. The animal is most numerous now in Throndhjem, Nordland, and Romsdal amts; it occurs with com- parative frequency in the amts of Bratsberg, Ncdenxs, Buskerud, Hedemark, and Christian, and is not absolutely rare in Nordre Bergenhus amt. About 150 are annually killed~~

~~throughout Nor- way ; in 1849 the number was twice as great. The lynx does not appear to have suffered any diminution within the last twenty years ; as many as 120 are aunually killed. Nordre Throndhjem amt would appear to be its northern limit. This animal is most destructive to hares and all kinds of feathered game. In the great forests—cspecially where the soil is marshy, and there is a mingled growth of ash, mountain ash, and willow (Salix caprea)—the elk occurs, and indeed appears to be increasing in numbers in some places, notwithstanding the vast quantities of timber felled, a fact chiefly attributable doubtless to the rapid decrease of its worst enemies, the wolf and the bear. It is most numerous in Hedemark and Buskerud, and in some parts of Akershus and Smaalenene, though considerable nuinbers have been met with of late throughout Nordre Throndhjem amt; in a westerly direction it has penetrated as far as Nedenes amt. The elk is not found in the west of Norway, but its place is partially taken by the red deer, which selects as its haunts the largest of the wooded islands on the coast and the numerous semi-insular projections of the mainland. It is most abundant on the island of Hiteren, at the mouth of Throndhjem Fjord. The wild desolate wastes of the fields are the home of the glutton and the reindeer, the lemming and the polar fox. Large herds of reindeer still roam throughout the alpine region of the fjelds between eastern and western Nor- way, and on the Dovre mountains, the Rundanc, and the high- lands between Gudbrandsdal and Osterdal, and Gudbrandsdal and Valders ; but this noble animal has hecome scarcer of late years, owing chiefly to the numbers killed by peasant hunters, who fire their rifles into the midst of the herd, sometimes maiming at a shot half-a-dozen animals, which they cannot hope to secure, and whicli afterwards become the prey of the glutton. In some years, and in certain localities, the lemming makes its appearance in countless multitudes, to be attacked by its numcrous enemies, particularly birds of prey, among which are the snowy and the short-eared owl; the common kestrel too, and the rough-legged buzzard, are scen in large numbers at such times, sweeping over the wastes of the fjelds. The lemming has an enemy among ruminants even, the reindeer crushing it with a stroke of his cloven hoof for the sake of the vegetable matter it contains. Hares are found all over the country np to the snow-limit. In Finmark occur several specics of small inammals of Russian origin.~~

~~The sea that washes the shores of Norway abounds in fish; and~~

hence the coast, with its numberless islands, holms, and skerries, is a favourite haunt for such birds and mammals as prey upon fishes and other marine animals. When the herring approaches the coast to spawn, it is hotly pursued by the whale ; and in Finmark when shoals of capelan make for the coast in spring, accompanied by cod, which gorge themselves with this their favourite food, the fin- whale (Balznoptera musculus) and the blue-whale (Balanoptera sibbaldi) are also exceedingly numerous, and their presence has given rise to a most important branch of the fishing industry. The waters of the fjords, and the holms and islets of the coast, abound in the spotted seal (Phoca vitulina), and the Phoca barbata is not uncommon in some localities on the outerniost skerries.

Feathered game—capercally, black-cock, hazel grouse—is still Avi- abundant in the forests, though less plentiful now than formerly, fauna.

owing to the reckless manner in which they have been destroyed by amateur sportsmen. The woodcock is distributed pretty equally over the whole country ; besides the lynx, it has enemies in the marten, fox, and weasel, the birds of prey most destructive to it being the sparrow-hawk and the great eagle owl. The finest ptar- migan are found in the birch region of the fjelds; but in southern Norway they often prefer the more elevated tracts of the willow zone during summer, though even then they are most abundant in the birch zone. The "rype" must be regarded as the most important of Norwegian game birds, on account of its numbers no less than of its flavour. It is extensively snared in winter, and of late years dogs have been used to hunt it. On the numerous islands lying off the northern coast, where the vegetation is strikingly similar to that of the birch belt and willow region of the fjelds, ptarmigan are plentiful. The treeless island of Smolen, in the bailiwick of Nordmére, where they occur in great num- bers, is the most southerly of the insular localities they fre- quent. The marshy tracts of the fjelds are the breeding-grounds of numerous varieties of fen-fowl, the lapwing (Charadrius apri- ciarius) and the dotterel plover (Charadrius morinellus) occurring in great numbers. The double snipe and the teal, which also breed in the willow belt, are frequently shot by sportsmen when

in pursuit of ptarmigan. In the numerous mountain tarns various species of divers are met with, for instance the Fuligula marila and the Fuligula clangula, The partridge, which has strayed across from

| Sweden, is now pretty evenly distributed throughout the amts of

Akershus, Buskerud, Hedemark, and Christian; but in severe winters, when the fall of snow is exceptionally heavy, nearly every bird perishes, and several years elapse before the stock is recruited by immigration from the neighbouring kingdom. Almost every species of sea-fowl occurring in northern Europe that prey upon fish is found along the coasts, some of them breeding together in countless thousands in certain localities. The coast north of Stad is their chief haunt. The so-called "fugleberge" (bird cliffs) are chiefly frequented by the Mormon fratereula, the flesh, eggs, and feathers of which provide the owners of these preserves with some of the chief necessaries of life. The great black-banded loom occurs in tarns and mountain-lakes all over the country.

Of the various species of freshwater fish the Salmonide# are beyond Fish.

comparison the most important to the inhabitants. In the more extensive of the lakes, which are generally of great depth, trout attain almost the size of salmon, weighing up to 30 Ib. In some lakes the red charr attains a weight of 12 tb, as does also the Fin- mark variety of this fish, which, in common with the sea-trout, remains during most of the year in deep sea-water, ascending the rivers in the spawning season only. Mountain-trout are found to thrive best in certain lakes and tarns within the birch and willow belts ; but, owing to the abundance of food they can obtain, do not readily take the fly, hence they must be fished for with live bait or netted. Asa rule, however, the great mountain-lakes yield excellent sport to the angler. The Mjésen abounds in grayling and charr ; there is good grayling fishing too in the Tyrifjord and Randsfjord. Next to these species the perch, pike, bream, and eel are found in greatest numbers ; but the eel is met with almost exclusively in a few rivers of southern Norway. Norway, notwith- standing the great number of its rivers which empty their waters into the sea, will not, owing to their inaccessible character, bear comparison with Great Britain or Ireland as a salmon-producing country. The most destructive

encmies of freshwater fish in Nor- way are the otter, the loom, the duck, and the osprey.

The sea being very deep, both in the fjords and off the coast, such fishes and marine animals as affect great depths are there abundant. Some species are of great economic importance. On the banks off the coast of Finmark, at a depth of 150 to 200 fathoms, large num- bers of the Greenland shark (Scymnis glacialis) are annually cap- tured, their livers yielding a large quantity of oil. During the first half of the present century the sun fish, or basking shark (Selache maxima), abounded on the coast, its capture forming an important branch of the fishing industry. It is now but rarely met with ; and the fishery has been discontinued. No species of fish can compare in point of importance with the herring and the cod, which, taken in immense quantities on the western coast, consti- tute one of the chief sources of national wealth.

Popula- tion.

Agricul- ture.

Fisheries.

Manufac- tures.

Mines.

Com- meree,

582

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Part II.—SrTatTISTICs.

The population of Norway on the 31st of December 1882 was 1,913,000, of whom 1,509,000 were living in the country districts, and 404,000 in the towns. Subjoined are the figures for each of the eighteen counties (amter) into which the kingdom is divided :—

Smisglenene: 2.2… 020—6-- 114,000 | Stavanger …….----+— 118,000 UNIONISTS) « < ci c'cisvcicielerecicicice 100,000 | Sondre Bergenhus ..... 121,000 (se eaate Shon sn oocec oenSS 104,000 | Nordre Bergenhus ..... 88,000 Jarlsberg and Laurvik ... 92,000| Romsdal .....+++--- 125,000 IBGRES MONO... «cic cer sicisioice ie 87,000 | Séndre Throndhjem ……. 123,000 Hedemark……..123,000 | Nordre Throndhjem ……. 84,000 (WWE Abcocsoopeconors 113,000 | Nordland .. Ac . 116,000 INGUIGMECS) scuciscieleteicicelois w\es) 79,000 | Tromso ……..— 60,000 Lister and Mandal …….. 77,000 | Finmark saeco ld)

Of the towns the following seven had the largest population (Christiania and Bergen being each a separate amt) :—Christiania, 119,407 ; Bergen, 43,026 ; Throndhjem (1875), 22,152; Stavanger (1879), 28,500; Drammen, 19,582 ; Christiansand, 12,282; and Christiansund, 9025.

Norway isthe most sparsely-populated country in Europe, having an average of about eighteen persons to the square mile. The dis- tribution is very unequal: the greatest density is in Christiania stift, which eoutains about seven-twentieths of the whole popula- tion in seven-hundredths of the total area of the country. The density is relatively great along the coast. The districts which lie more than 600 to 700 feet above the sea are comparatively sparsely peopled. Notwithstanding the great emigration to America and Australia which has taken place in recent years, the population of the country has steadily advanced. About 1660 it numbered only 300,000, while at the beginning of the present century it was 800,000.

According to the returns completed in 1875, the owners of real property in the rural districts numbered 173,183, the total value of their properties being stated at £42,390,000. 24,713 English square miles of the southern stifts are estimated to be under wood, while the whole arable land of the country in 1875 amounted to 738 square miles, with a production valued at £2,794,000. At the same date the live stock included 151,903 horses, 1,016,617 eattle, 1,686,306 sheep, 322,861 goats, 101,020 pigs, and 96,567 reindeer.

The fisheries form one of the most important sourees of the national wealth. In 1881 they employed upwards of 120,000 men, and the aggregate profits were estimated at about £1,111,000. The principal are the eod fisheries,

~~along the inner coasts of the Lofoten Islands, where, in 1881, 26,850 meu on 6153 boats caught 28,400,000 fish, valued at £312,400. In the same year the cod fishery in Finmark yielded about 13,000,000 fish, at a value of £131,000 ; those on the coast of Séndmére produced only one-fourth of this amount. Next come the herring fisheries, which in 1881 yielded 2,412,630 bushels, valued at about £277,800. 6,165,000 mackerel (£42,700) were also taken. The summer fisheries of coal-fish, ling, salmon, trout, lobsters, and oysters at the same time gave a total of £222,200.~~

~~Manufacturing establishments in 1878 numbered 2628, employing an aggregate of 41,391 hands. The leading place here is taken by the saw-mills, of which there were 112 driven by steam (3402 hands) and 630 by water (4274 hands). Next come 551 cotton-mills (2037 workmen), 199 brick-works (3540 workmen), 123 eod-liver- oil works (598 workmen), 112 shipbuilding yards (2388 workmen), and 27 wood-fibre factories (805 workmen).~~

~~Mines are a considerable source of wealth to the eountry, their production in 1879 being estimated at £202,200. To this sum must be added £11,310 for apatite, £6150 for felspar, and £24,360 as the value of hewn stone exported in that year. The most import- ant mines are:—the silver mines at Kongsberg, which in 1879 produeed 9415 tb of silver, and a surplus of £3750 ; the eopper works at Roros, producing 6880 tons, valued at £17,800 ; the copper pyrite mines at Vigsnes, with a production of 39,898 tons, and a value of £69,440; the niekel-works at Senjen in Nordland, which yielded 3828 tons, valued at £5000; the iron-works of Nes and Egeland, which produeed 2400 tons, at a value of £1050 ; and the iron-works of Holden, with 5660 tons, worth £2500. It must, how- ever, be mentioned that the production of the mines since 1879 has been diminishing.~~

~~The foreign trade of Norway is steadily increasing. Its aggregate value in 1882 was estimated at £15,724,500 (imports, £8,916,700 ; exports, £6,807,800). The principal imports were :—eorn, 1,100,000 quarters, £1,836,650 ; beef and pork, £202,660 ; butter, £310,570 ; colonial wares, £894,950; and manufactured goods, £1,305,560. Among the exports the leading place is taken by timber (£2,549,450), of which the greater part was sent to England. 'The fishery pro- ducts sent abroad were valued at~~

~~£1,444,450, and the metals at £117,450. The port of Christiania has the largest trade, the imports in 1882 having been worth £4,082,800, and the exports £1,409,200 ; next to Christiania come Bergen and Throndhjem. The mereantile marine of Norway some years ago passed through a period of stagnation, but revived somewhat in 1880 and 1881. At the elose of the latter year it eonsisted of 7977 vessels (7618 sailing vessels and 359 steamers), with an aggregate tonnage of 1,520,407. The gross freight earned was £5,021,200, of which not less than~~

~~NORWAY~~

~~[POPULATION AND INDUSTRY.~~

~~£3,969,500 were derived from the earrying trade. The largest shipping ports are those of Stavanger (669 vessels, 120,017 tons), Arendal (412 vessels, 171,858 tons), Bergen (348 vessels, 84,870 tons), Christiania (318 vessels, 105,193 tons), and Drammen (281 vessels, 85,028 tons).~~

~~The Norwegian railways have a total length of 973 English miles. Railways.~~

~~(1) From Christiania along the eastern coast of Christiania Fjord to the Swedish frontier (Smaalensbanen), including the inner or eastern line between the station of Ski and the town of Sarpsborg, 156 miles. (2) The Trunk Railway (Hovedbanen), between Chris- tiania and Eidsvold by Lake Mjosen, 42 miles. (3) From Lillestrom on the Trunk Railway to the Swedish frontier (Kongsvingerbanen), 71 miles. (4) From Eidsvold to Hamar (Hedemarksbanen), 36 miles. (5) From Hamar to Throndhjem (Rérosbanen), consisting of four administratively separate sections—Hamar to Grundset, 24 miles; Grundset to Rena, 16 miles; Rena to Stéren, 199 miles ; aud Stéren to Throndhjem, 31 miles. (6) From Throndhjem to the Swedish frontier (Merakerbanen), 63 miles. (7) From Chris- tiania to Drammen, 33 miles. (8) From Drammen along the west- ern coast of Christiania Fjord to Skien (Grevskabsbanen), with a branch line from Skopum, 98 miles. (9) From Drammen to Randsfjord Lake (including branch lines from Hougsund to Kongs- berg and from Vikersund to Lake Kréderen), 89 miles. (10) From Stavanger to Egersund (Jederbanen), 47 miles. (11) From Bergen to Vossevangen, 67 miles. The first three are~~

~~commonly called the eastern railways (Ostbanerne), (5) and (6) the northern (Nord- banerne), and the last three the western (Vestbanerue).~~

~~With improved means of communication the Norwegian post- Post- In 1882 there were Office.~~

~~office has made corresponding advances. forwarded a total of 18,990,100 letters, of which 11,749,600 were inland, and 2,240,400 were sent abroad ; 2,728,800 letters were in the same period reecived from foreign countries. 'The Government telegraphs had at the close of 1882 a line length of 47,065 miles, with a wire length of 85,485 miles. The telegrams transmitted in that year reached a total of 880,876. :~~

~~As regards primary edueation Norway takes a leading place Educa- In the country districts 207,922 tion.~~

~~among the states of Europe. children were instructed in 6408 schools by 3374 teachers and 108 preceptresses in 1878; in the same year 40,826 children in the towns were instrueted by 372 teachers and 367 preceptresses in 144 schools. There are, besides, 147 citizen-schools, middle-schools, and higher-schools, with a staff in 1878 of 824 teachers and 466 pre- eeptresses ; the scholars numbered 16,800 (9150 boys and 7650 girls). The university, that of Christiania, has 50 professors and 1000 students.~~

~~Service in the army or navy, without the right of providing a Army substitute, is obligatory on all males who have completed their and twenty- third year; the only exemptions are in favour of eeclesiasti- navy.~~

~~eal functionaries, pilots, and the inhabitants of Finmark. To the navy are drafted all conscripts who have made a voyage to foreign parts of at least twelve months, all conscripts from Nordland and Tromsé, and a certain number of those from southern Norway who are accustomed to the sea. The army is made up of the troops of the line, the landvern, and the landstorm ; the term of service is seven years in the line, and three in the landvern. The land- storm consists of every man eapable of bearing arms, under fifty years of age, who does not belong to the line or the landvern. The troops of the line in continuous service number 1850 non- commissioned officers and men, and consist partly of volunteers ; the other troops of the line in time of~~

~~peace are called out for drill only in summer. For infantry recruits the minimum period of drill is forty-two days, for cavalry and artillery ninety days ; for those who have passed out of that category it is only twenty-four days. The military schools are at Christiania. The average annual conscription is 6800 men. The total establishment of the army on 30th June 1878 was 68,809 men, viz., infantry 60,672 (48,275 combatants), cavalry 2735 (1848 combatants), artillery 5150 (2867 combatants). The commissioned officers numbered 703. The numbers on a peace footing were :—for the line 15,878 (war complement 3203), for the reserve 17,089, for the landvern 12,846. There were also 532 musicians.~~

~~The navy is manned in part by volunteers. The term of service is from the age of twenty-two to that of thirty-five. The schools for naval instruction are at Horten, where also is the chief royal dockyard. The fleet consists of two wooden steam frigates, two wooden steam corvettes, four monitors, two first-class gunboats, several second and third class gunboats, two training ships, and some transports. There is also a torpedo service.~~

~~The constitution of Norway primarily rests on the "fundamental Consti- law," or grundlov, which was promulgated at Eidsvold on the 17th tution.~~

~~of May 1814, and afterwards, on the union with Sweden, agreed to, with slight modifications, in Christiania on the 4th of November in the same year. To this must be added the Swedish succession ordinance of the 26th of September 1810, accepted by Norway in November 1814, and the rigsact, or charter of union, of 1815. By the first-mentioned Norway is a free, independent, indivisible kingdom, united with Sweden under the same king. The form of~~

~~Non WwW A 583~~

~~nor.' The towns of Christiania and Bergen form counties by them- Adminis- selves. The dioceses are Christiania, Hamar, Christiansand, Bergen, trative Throndhjem, and Tromsé. Christiania stift embraces the counties divisions of Smaalenene, Akershus, Buskerud, part of Bratsberg, Jarlsberg and~~

~~and Laurvik; Hamar those of Hedemark and Christian ; Chris- officers.~~

CONSTITUTION. |

government is a limited monarcliy, and the throne is hereditary in the male line. Evangelical Lutheranism is the established religion. In their foreign relations the two kingdoms are regarded as one. The one cannot make war without the other, and there is a common diplomatic corps, which is controlled by the ministry of foreign affairs

in Stockholm. In all other respects each kingdom is regarded as

tiansand those of Bratsberg (part of), Nedenes, Lister and Mandal,

Execu- sovereign and independent. The executive is vested in the king, | Stavanger; Bergen, besides Sondre and Nordre Bergenhus, takes in

tive. who comes of age when he is eighteen. His person is inviolable, | part of Romsdal ; Throndhjem the rest of Romsdal, with Séndre and all responsibility for his official acts rests with the council of | and Nordre Throndhjem; Tromsé the three northern counties. state. This body consists of two ministers, and at least seven (at | Each diocese is divided into deaneries (provstier), each under a present nine) councillors, chosen by the king from among the | dean, who is elected by the clergy of the district concerned ; each citizens, of at least thirty years of age. One minister and two | amt is divided into bailiwicks (fogderier), each presided over by councillors must always be with the king when he is not in Norway. | a sheriff or foged, appointed by the king to watch over the main- The others form, under the presidency of the remaining minister, or | tenance of the law, carry out judgments, and collect taxes and cus- of the viceroy if there be one, the Government in Christiania; its | toms. In each town similar functions are assigned to the byfoged authority is decisive, except in cases reserved for the king, when it | or town sheriff, who, however, has a more extended authority. only advises. As viceroy in Norway the king can nominate only | The sheriff in the country has generally in each parish a substitute the crown prince. Formerly the Government in Christiania was | or lensmand. 1n the larger towns there are additional officers presided over by a governor, but this office was never filled after | charged with municipal and police affairs. As regards courts of 1855, and in 18/3 it was abolished (on the accession of Oscar II.). | justice, only the supreme court and the

rigsret, already spoken of, Each of the seven councillors has charge of one of the seven state | are fixed by the constitution. Couris of first instance are held in departments (finance, justice, home affairs, church, war, navy and | the towns by the sheriff and in the country by district judges, who post-office, and audit). The king can declare war and conclude | travel on circuit twice or thrice a year. rom the inferior courts peace, make alliances and treaties, and has the supreme command of | cases are in second instance carried on appeal to the superior dio- army and navy ; but for offensive war the consent of parliament is | cesan courts, of which there are four—one at Christiania (in two necessary. The king appoints to all public offices, and can dismiss | divisions), one at Christiansand, one at Bergen, and one at Throndat pleasure his council of state and other Government functionaries, | hjem. From these courts cases relating to values of more than 400 the highest officials of church and state, the heads of the army, | crowns (about £22) and criminal cases proceed to the supreme court and the commandants of fortresses. He can also issue provisional | of the kingdom, which, according to the fundamental law, is com- ordinances relating to trade, taxation, industry, and legal procedure, | posed of a president (justitiarius) and at least six assessors. 'The provided they are not contrary to the fundamental law of the | municipal court of Christiania consists of a president and seven country and the laws agreed upon by parliament; these ordinances | assessors; from this court there is direct appeal to the supreme are in force till next meeting of parliament. court of the kingdom. ;

Legis- While the king has thus the exccutive power, the right of legis- The kingdom of Norway has its own national flag, red, divided National

lature, lation and taxation is exercised by the people through their repre- | by a dark-blue, white-bordered cross into four parts. In the flag, sentatives in the parliament or storthing, which statedly meets in | upper square, next to the staff, the union mark is placed. The

Christiania in the beginning of February every year. The king can, however, when circumstances require it, summon an extraor- dinary storthing. The elections are for a period of three years. The number of members is, by a law passed in 1878, fixed at 114,— 38 from the towns and 76 from the country. 'he members are not chosen directly, but by electors nominated by

the voters. Several little towns are grouped into one electoral district. In the country there is an elector for cvery hundred voters in the parish (herred). The electors afterwards meet in each county, and choose the number of members fixed by law. Only citizens who have the right to vote are eligible, and they must, moreover, be at least thirty years of age and have been ten years settled in the country. iivery Norwegian citizen, not being a criminal or in foreign service, is entitled to votc, if he has passed his twenty-fifth year, has been settled in the country five years, and has certain property qualifica- tions—a public appointment, ownership or tenancy of land, or, in towns, ownership of property worth at least 600 crowns (about £38). Immediately after the opening of parliament one-fourth of its members are elected to constitute the "upper house" or lagthing.; the remaining three-fourths form the lower house or odelsthing. In practice this means a division between the legislative and the con- trolling powers of parliament. Every bill or proposed enactment must be introduced either by a member or by Government through a councillor in the odelsthing. If it passes it is sent to the upper house, and if carried there also the royal assent gives it the force of law. If rejected by the upper house it goes back, with or without remark, to the lowcr house, where it is again discussed. If again car- ried it is sent once more to the upper house, and if it fails to obtain the requisite majority of votcs the whole parliament now meets, and two-thirds decide the motion. To give legal sanction to a resolu- tion of parliament thus carried the royal assent is still required. The royal veto in ordinary questions is not absolute ; a resolution passed unchanged by three successive regular parliaments becomes law tpso facto; but it is otherwise where alterations in the funda- mental law are involved. Parliament also fixes taxation, its enact- inents with regard to which continue in force only until the Ist of July of the year in which the next ordinary parliament meets. Parliament alone has control of the members of the council, of the supreme court of justice, and of its own members ; for crimes in their public capacity these can be put on their trial at the instance of the lower house before the supreme court of the kingdom (rigs- retten), which is composed of the supreme court of justice and the upper house of parliament. The proceedings of parliament and of its divisions are carried on, when not otherwise determined by special vote, with open doors, and published. The members of the council are not allowed to take part in the proceedings. By the fundamental law Norwegians only, with a few exceptions, are eligible for public

appointments. ; cme Administratively Norway is divided into six dioceses (stifter), with a bishop at the head of each, and into eighteen counties (amter) under the civil administration of an amtmand or gover-

Norwegian escutcheon is a crowned golden lion on a red field, armed with the battle-axe of the tutelary saint, St Olaf. " (H. MO.—H. RA.—O. A. 0.)

Part HT.—History.

The early history of Norway is exceedingly obscure. The scanty allusions to Scandinavia and its inhabitants which we find in the classical writers refer to the inhabit- ants of Denmark and of the south of Sweden. The first mention of names which can be identified with any cer- tainty as those of known Norwegian tribes is found in Jordanes, a writer of the 6th century. The traditions of the earlier times which are preserved in Norse literature can scarcely be said to afford any sure ground for history, for whatever truth may be in them seems to be almost hopelessly concealed beneath an overgrowth of mythological and genealogical legend. It is, however, certain that the first settlers after the nomad tribes of Lapps or Finns, whose traces are still found far south of their present limits, were the ancestors of the present inhabitants,—Ger- manic tribes closely akin to the Danes, Swedes, and Goths.

The time of their immigration is unknown, but is conjec- Early tured with probability to have been at the latest not immi-

long after the commencement of the present era. The way by which they came has been the subject of a lengthened controversy. Munch and his school held that the first proper Norwegian settlements took place in the north, and spread thence down the western coast and the centre of the country. Later historians incline to the more probable theory that the country was settled by immigra- tion from the south. To some extent the theory of a northern immigration derived its vitality from a view of early Norwegian history which is now generally rejected. Until recently the collection of old Norse poetry which passed under the name of the Hddas was regarded not merely as the peculiar inheritance of the Norse branch of the Scandinavian family but as the oldest and most primi- tive relic of Germanic mythology and legend. It fell in

1 This territorial division is the only one which has been known in Norway since that into "fylkis," which had become antiquated even in the days of Harold Haarfager. These fylkis were more numerous than the present amter.

Early viking expedi- tions.

naturally with this view to regard the Norse people as leaving their primitive home at a later time, and as travel- ling by a different route from the rest of their kin. And plausible arguments could also be drawn from archeology. There is a well-marked distinction between the older and younger iron ages in Scandinavia. The older age, which is more fully developed in Denmark and the southern part of the Scandinavian peninsula, is marked by greater refine- ment of workmanship, and is more under the influence of southern art. The younger age, which is best marked in Norway and in Sweden proper, is rougher, and has more the appearance of an independent growth. It seemed natural, therefore, to regard the comparatively sudden transition to the more recent archeological period as evi- dence that the land had been occupied by a new people, closely akin indeed to the earlier inhabitants of the south, but which had come fresh from the common home and had not been subjected to the same influences. For various reasons, however, this more recent period cannot well be put farther back than the end of the 7th century, a date which brings the supposed northern immigration so near historic times that if it had taken place it must have been distinctly commemorated in tradition ; and, at the same time, it is now generally admitted that even the oldest of the Eddic poems must be referred to a period close to or within the limits of authentic history. In all probability, therefore, we may regard the change of custom and the rise of the earliest poetry as marking a period of development and expansion which affected all the Scandi- navian peoples, but which, we may well suppose, presented peculiarly individual characteristics in the isolated districts of Norway.

Towards the end of the 8th century we first hear of that phase of history which made the Scandinavian peoples well known during the next two hundred years to the nations of north-western Europe. In 787, if we may trust a record of later date, the ships of the Northern sea rovers first

~~appeared on the English coast, and in 793 and 794 they plundered Lindisfarne and Monkwearmouth. Thence- forward we find them in continually increasing numbers on the coasts of Scotland and Ireland, in England and France, and on the southern coasts of the North Sea, isolated ex- peditions going as far as Spain and the Mediterranean. It is not easy to determine the share taken by the Danes and Norwegians respectively in these earlier expeditions, for the contemporary chroniclers confounded them under common names. But the geographical relations of the two peoples naturally led them into different tracks. The coasts which lay nearest to the Danes were those of the southern shores of the North Sea and the English Channel ; but the nearest way for the Norsemen of western Norway lay straight across to the Shetlands and Orkneys and thence south along the Scottish coasts. It seems probable, therefore, that the first expeditions which ravaged the coast of Northumberland, and which swept down by the Hebrides to Ireland, and thence in some instances to the more southern coasts of France, before Flanders and the northern coasts of France began to suffer, started from the western coasts of Norway. Some years later, when the Danish expeditions become numerous and powerful, they fall with heaviest force on Flanders, England, and France. Of course, when the rovers increased in number and their excursions became wider, we find these kindred peoples in the same countries and joining in common ex- peditions. At an early period they come into collision in Treland. Northumberland seems for a while to have been almost common ground, and Rollo, the chief who completed the permanent settlement in Normandy, is generally ad- mitted to have been a Norseman, although the point is contested by Danish writers. But on the whole it was~~

~~nN OR Ww Be~~

~~| HISTORY.~~

~~in the north and west that the Norse vikings had their chief haunts and formed their settlements. At first even the largest viking expedition had no further aim than plunder : they simply devastated the coasts on which they landed and returned with their booty to their native country, or sold it in foreign parts; but after a time we find them making permanent settlements, either attracted by the richer countries or driven from their own by the~~

pressure of population or by political reverses. In the middle of the 9th century the Norse kingdom of Dublin was founded. In the latter half of the century the Danes, with a possible admixture of Norsemen, had obtained a permanent footing in England. Towards the end of the century the Scottish islands, which had hitherto formed a temporary refuge and starting-poimt for vikings, were occupied by permanent Norse settlers, and the colonization of Iceland was comnienced.

Before the end of the 9th century we know comparatively little of the internal condition of Norway. 'The land is divided into fylkis, which in point of relative size answer roughly to the English shire. The word is connected etymologically with "folk," and seems to indicate that the fylki was originally a district peopled by a subdivision of the race. In the case of many of the fylkis this is borne out by the formation of the individual name, while in others the name seems to have applied directly to the district itself. There seems to have been an early union between some of these fylkis, having laws and customs of their own. The Zgil's Saga tells us that Gula-thing was originally constituted from Horda-fylki, Sygna-fylki, and Firda-fylki ; and this seems confirmed by the three twelves which form so conspicuous an element in the Icelandic law courts. In this case Horda-fylki may give us the name of the race by which that part of the country was originally settled, while the others are simply names of dis- tricts subsequently occupied by the same tribe. At a later time the whole country was divided into great districts, each with a common thing and a body of law of its own. These law districts, which corresponded to natural divisions of Norway of considerable importance in its history, were the district of the Frosta-thing, which comprehended the northern fylkis as far south as Sogne Fjord ; that of the Gula-thing, which comprehended the south-western fylkis ; and that of the Uplands and Vik, which included all the country south and east of the central mountain chain, and which had in old times its only common meeting-place in the Eidsifia-thing, but from which at a later time the Vik district with its Borgar-thing was separated. Within the fylki we find a minor subdivision called the herad, at the head of which stood the hersir, who held his office by hereditary right, and who, like the Icelandic godi, pre- sided over the civil and religious affairs of the district. At the head of each fylki stood as a rule the king, though occasionally we find more than one king in a fylki, or more than one fylki under the rule of a king. In at

least one district of the country, also, the chief power is in the hands of a race of jarls, a title which in later times was conferred by the kings, but which at this early period, although in- ferior to that of king, does not appear to be necessarily subordinate. It is difficult to define precisely the positior of these petty kings. They seem to have represented the fylki in external affairs and to have been its leaders in war, but their power depended greatly on their personal qualities and the extent of their private possessions. That they had no very deep hold is clear from the readiness with which they disappear after the union of the kingdom. But both in fylki and herad every matter of importance was deter- mined at the thing, the meeting of the free people. In some respects the condition of the people in Norway differed materially from that of other Germanic peoples at a similar

Primitive territorial divisions.

stage of development. Owing probably to the nature of the country, we find no trace of the village community which has played so important a part in kindred races, As far back as we can go the ground was owned by indi- vidual proprietors, who partly held it in their own use and partly let it out to men who were practically their depend- ents. These proprietors, with the hersir families at their head, formed something closely resembling a landed aristo- cracy. The most powerful members of the class, distin- guished by their descent, possessions, and personal qualities, scarcely acknowledged a superior. They were surrounded by a band of dependents trained to arms, and were accus- tomed to foreign expeditions, which increased their wealth, power, and warlike habits. Nor did the law of equal succession which at all times prevailed in Norway at all break up the power of these great families. The more common practice seems to have been, not to divide the lands, but to give the younger and more restless members their share of the inheritance in movable goods and let them seek a settlement for themselves. After the lands were settled such a practice must eminently have tended to increase the readiness to undertake foreign expeditions, while at the same time the wealth and power acquired in these expeditions fostered the increase of powerful families at home.

~~About the end of the 9th century Norway first became a united kingdom, and from that time we have a compara- tively full and authentic record of its history. On the west side of the Vik, the present Christiania Fjord, lay a~~

~~Vestfjold small district called Vestfjold, ruled over by arace of kings~~

~~kings,~~

~~Harold Fairhair,~~

~~descended, according toa not very trustworthy legend, from the Swedish Upsala kings. The whole country round the Vik stood, as might be expected from its situation, in closer relation to Denmark and Sweden than the rest of Norway did. According to one version of history the Vest- fjold kings occupied for a short time the Danish throne, while according to another they were tributaries of Den- mark. There was a well-known trading-place within their territory ; and probably at an early time they shared ex- tensively in the traffic of the neighbouring seas and in the expeditions of the Danes. The first clearly discernible figure amongst these Vestfjold kings is Halfdan the Black, who, partly by family connexions and partly by conquest, included within his kingdom the country around the head of the Vik, and thence inland to Lake Mjésen. Halfdan died at a comparatively early age, leaving a son, Harold, who afterwards bore the famous name of Harold Fairhair, and who, according to the commonly received story, suc- ceeded his father in 860, being then ten years of age. Mr Vigfusson contends, however, with considerable prob- ability, that Harold's reign, as well as the colonization of Iceland, has been antedated by nearly thirty years, and it seems, to say the least, improbable that the events during the first ten years of his accession could have taken place in his early youth. But, setting aside the question of chronology, the story of Harold's reign, as given in Norse history, appears to be substantially trustworthy. After obtaining a firm hold on his father's dominions, he went north through Gudbrandsdal and descended upon thecountry of Throndhjem, which he speedily brought to subjection ; and in the three or four subsequent years he had subdued the whole country as far south as Sogne Fjord. He ap- pears to have received material assistance from two great chiefs, Earl Hakon, whose descendants are conspicuous in subsequent history as the Hlada jarls, and Earl Rognwald of Meeri, the ancestor of the dukes of Normandy and the~~

Orkney earls. The country south of Sogne Fjord was still unsubdued, nor was its conquest apparently attempted for some years later. It was the most warlike part of Norway, and from it probably issued the greater part of

the Norwegian viking expeditions, which were now in their fullest vigour. The western chiefs appear at length to have taken the initiative, and to have gathered together a great force, summoning aid apparently even from their kinsmen beyond the western sea. Harold sailed south to meet them, and a fierce battle took place at Hatfrs Fjord, near Stavanger, in which he gained a complete victory ; the hostile force was entirely broken, and from this time his rule over all Norway appears to have been undisputed. Every man was forced to own him as master; new taxes and obligations were imposed ; the fylkis were put under the rule of earls, and the hersirs became or were replaced by the king's lendermenn,—a title which becomes familiar in subsequent history. These lendermenn, however, must not be mistaken for an official nobility deriving their main strength from the king. They became the king's men, bound to support him and to follow him in war, and they received lands from him in return, from which they derived their name ; but they were still for a long time merely the old hersirs under another name, powerful local chiefs who were ready at any moment, if the occasion seemed to require it, to lead against the king their dependents and the free proprietors by whom they were surrounded. But many of the leading men refused to live in Norway upon these terms. They sailed with their families and depend- ents, some of them to Iceland, but many more to the Scot- tish islands, which had long been a favourite resort of the western Norwegians ; and thence for years they kept up a series of raids upon Norway. Harold for a while endeavoured to encounter them on the Norway coast, but finding this interminable he at last crossed the sea with a great force and fell upon the vikings from the northern islands as far south as Man. Orkney, and probably the Hebrides, were placed under Norwegian earls, and from this time we hear comparatively little of marauding ex- peditions from these islands to Norway. Many of those driven out in this western expedition settled ultimately in Iceland, the colonization of which was completed

during Harold’s reign (see IckLAND). Harold in his later years divided his kingdom among his sons, giving a predomi- nance among them to his favourite Erik Blood-axe. He died at an advanced age c. 933 a.p.

On Harold’s death Erik attempted to make himself sole king of Norway, and defeated and slew two of his brothers to whom vassal kingdoms had been assigned by their father ; but his tyrannical and unpopular character fostered the reaction which naturally set in against the strong rule of

Harold. Hakon, a younger son of Harold, who was brought Hakon, up at the English court, and was afterwards known as 8° of

Athelstan’s foster-son, was sent for from England. He was presented by Earl Sigurd, the son of Earl Hakon (Harold’s early supporter), at a great thing at Throndhjem, and there, after promising that he would restore the old rights which his father had taken away, he was accepted asking. In the words of the saga, the tidings flew through the land like fire in dry grass that the Throndhjem people had taken to themselves a king like in all things to Harold Fairhair, except that Harold had enslaved and oppressed all the people in the land, while this Hakon wished good to every one and offered back the odal rights which Harold had taken away. The people flocked to him from all sides, and Erik soon found himself compelled to leave the country, and sailed west to the Orkneys. Hakon’s reign was true to the promise of its commencement. In the Uplands and in Vik he left his kinsmen in possession of the vassal kingdoms ; Ear] Sigurd ruled under him in the north, and the rest of the kingdom he took into his own hand. The landowners were freed from the burdens and vassalage of Harold’s days, although some of the least oppressive taxes appear to have been continued, and the Gula-thing and XVII. — 74

Erik Blood- axe,

Karl Hakon the Great.

Olaf Tryggva- son.

Frosta-thing were reorganized, with probably several amendments on their respective laws, and were extended to their later boundaries. In one respect Hakon was not in accord with his subjects. He had been brought up as a Christian at Athelstan's court, and attempted to intro- duce Christianity into the land; but in this attempt he signally failed, and at one time seems nearly to have broken with his people in consequence. On the whole, however, Norway enjoyed under Hakon internal peace. The troubles which beset his reign, more especially towards its close, arose from Denmark and the sons of Erik Blood-axe.

It is not easy to trace Erik's career after he fled to the Orkneys. According to the Norse sources, he received Northumberland from Athelstan as a vassal kingdom not long after leaving Norway. In the English sources we find him represented as holding Northumberland not under but in opposition to the English king. It is probable enough that he may have held it in both relations ; but, however that may be; he certainly ruled for a time at York, and fell in England c. 952. At the time of his death his wife Gunhild went to the Orkneys with her children and thence to Denmark. She was a famous character in the history of the time, and to her the Norse tradition attributes much of the evil that appears in the career of her husband and children. According to one account she was the sister of Harold Bluetooth, but it is scarcely credible that the rela- tionship between two such well-known figures in the 10th century should be unknown to the principal Norse writers. The favourable reception which she and her children met with in Denmark is sufficiently accounted for by Erik's own Danish descent, and the relations which then existed between Denmark and Norway. Shortly after their arrival in Denmark Erik's sons commenced a series of expeditions against Norway which lasted during the rest of Hakon's reign; at last, after gaining many victories over the in- vaders, Hakon was taken by surprise and slain c. 961.

On Hakon's death the sons of Erik, with Harold, after- wards called Greyfell, at their head, got possession of the western part of Norway, but Vik and the Uplands remained under their former kings, and Earl Sigurd still kept firm hold of the Throndhjem country. Earl Sigurd was treacher- ously slain, and was succeeded by his son, Earl Hakon the Great ; and for many years afterwards the history of the country is a series of struggles

between the sons of Erik and Hakon, mixed up with occasional interferences from Den- mark. At length Harold Greyfell was slain in Denmark, and Hakon succeeded with the help of the Danes in driving the sons of Erik out of the country. For a time he remained in nominal dependence on Denmark, but this was soon shaken off, and in the latter part of his life Hakon, though he never assumed the title of king, ruled in entire independence over the whole north and west of Norway. Latterly he excited animosity by some reckless outrages on the feelings of the people ; a rising took place against him in the Throndhjem country, in which he was slain c. 995, and at the very time of the rising Olaf Tryggvason landed in Norway.

Olaf was a great-grandson of Harold Fairhair. His father, Tryggve, had been treacherously slain by the sons of Erik, and his mother had with difficulty escaped with him, After some strange adventures the boy was received and brought up at the court at Novgorod, and then in his early youth took to a viking life. He soon became a famous leader, and plundered far and wide. In 991 we hear of him in England as one of the chiefs who fought the battle of Maldon, and he appears there again in 994, He sailed on his Norwegian expedition from Ireland, and found the whole country well disposed to receive him as king. Olaf's short reign of five years was chiefly occupied with his efforts to Christianize the country. He had been baptized

|.youth in foreign expeditions. When about nineteen he

some time during his English expedition, and had taken up Christianity in a more serious manner than was gener- ally the case with the Northern converts of his class, who as a rule submitted to baptism as a convenient or neces- sary transaction. Olaf's Christianity does not appear to have been of a very deep or enlightened type, but he was thoroughly in earnest about it, and set himself to enforce its supremacy with the whole energy of his character. And in an incredibly short time, if he had not exactly succeeded in making his subjects Christian, he had at least made it very unsafe for them to be anything else. By force, or gifts, or persuasion, or even by torture if necessary—for his anger was sometimes cruel enough—he had soon scarcely left a man of note unbaptized in Nor- way. Even Iceland was persuaded to accept the faith by his energetic handling of the Icelanders at his court. Of course this wholesale conversion was of a very nominal

~~character, and even Olaf himself always appears to be little more than a loyal and devoted heathen vassal of the new faith. Perhaps the strangest thing is not merely that he attained his end so rapidly, but that he did so without rousing and alienating the people. His splendid personal appearance, his wonderful strength and skill in arms, his inexhaustible courage and energy, and the frank chivalrous nature—bright and joyous when in quiet, but capable of terrible passion when enraged—seem to have overawed and attracted every one at the time, and have made him since the favourite hero of Norse history. In the fifth year of his reign (c. 1001) Olaf undertook an expedition to the Baltic, and a league was formed against him by the kings of Denmark and Sweden, and by Earl Erik, the son of Hakon, who had fled into Sweden after his father's death. Olaf went with a powerful fleet, he himself commanding his great ship the "Long Serpent," the largest and best manned that had ever sailed from Norway. His foes lay in wait for him on his return under Swold, an island off the German coast which cannot now be identified, and there took place the most famous and picturesque battle in Norse history. Olaf's ships were induced by treachery to pass by the island behind which the forces of his ene- mies lay, while the hostile chiefs watched them as they sailed by. At last when all were gone on their way to Norway but the few ships which with Olaf himself brought up the rear, the enemy rowed out and fell upon them. Olaf bound his ships together with the "Long Serpent" in the centre, and his foes surrounded him on all sides. One after another the ships were taken and cleared of men, and at last the crew of the "Long Serpent" were left alone, under a shower of spears and arrows, with the whole enemy around them and with fresh men continually attempting their decks. The saga tells us that Olaf's men grew so mad with rage that they leaped at the ships that surrounded them, not seeing that they were often so far off, so that they fell into the sea and perished. At length almost none were left, and Olaf leaped over- board in his armour. His people at home could scarce believe that he could have perished, and for many years stories were circulated that he had been seen in foreign countries ; but, however that may be, says the chronicler, Olaf Tryggvason came back no more to his kingdom in Norway.~~

~~The two kings and Earl Erik divided Norway among them, but in reality the greater part of the country was held by Earl Erik and his brother Earl Svend, under a little more than nominal vassalage. In the south some of the districts~~

were more directly dependent on Denmark and Sweden. Fourteen years afterwards another descendant of Harold Fairhair appeared in the country. Olaf, son of Saint Harold Grinske, had, like most of his race, spent his early Olaf.

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came back to Norway with a small band of well-tried men, and went first to his kinsmen in the Uplands, where some of the small kings of Harold's race still remained in a not very close dependence on Denmark. Erik was by this time dead ; Olaf succeeded in driving Svend out of the land, and became in a short time more thoroughly king of all Norway than any one had been since Harold Fairhair. He rebuilt Nidaros (the modern Throndhjem), which had been founded by Olaf Tryggvason, and which may be called henceforward the capital of Norway. Like Olaf Tryggvason, he was a zealous adherent of Christianity, and, as soon as he was firmly settled, proceeded to enforce it on his subjects. The previous conversion of the land had been superficial, so that, except in the parts of the country which came most into relations with foreign countries, the old religion had still a strong hold, and in some districts was predominant. Under Olaf heathen worship was suppressed with the utmost severity, and Christianity may be said to have become the professed religion of the land. Olaf's rule was firm and powerful. Equal justice was dealt out, as far as practicable, to every one, often in a summary fashion. The great families had flourished under the earls, and seem to hawe been almost wholly independent within their own districts, but, as they one after the other came into collision with the king, they had to yield. Olaf was in many ways a greater man than Olaf Tryggvason: his aims were higher, and he understood them more thoroughly ; but he lacked some of the gifts of his brilliant predecessor. Olaf Tryggvason was the very incarnation of the old popular ideal, and, had the times been favourable, might well enough have passed into tradition, Christianity and all, as one of the

"sir who had come back again to earth. But the other In 1035 Magnus, Olaf's son, who had remained in Russia, Magnus, Olaf was in some ways a new force in Norway. He was | was sent for by some of the leading men,

and was readily ae a aiming at a united Christian kingdom under a strong | accepted as king. Magnus, or rather the chiefs in his Gai.

central power, and these ideas, in so far as they were intelligible, were repugnant to the Norse chiefs. And, besides, his character was somewhat still and reserved, not always destitute even of traits of cunning, so that altogether, though every one was forced to respect his courage and ability, and his own followers were devotedly attached to him, most of the Norwegian chiefs never wholly under- stood or trusted him. In one way or another he incurred

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of Canute, made Norway bitterly regret the loss of Olaf. The resentments which had been awakened by his stern, just rule passed out of sight, and men only remembered his great qualities, and that in his time the land was free from foreign interference. His devoted adherence to Christianity, especially in his later days, gave a definite direction to these reminiscences; he was regarded as a martyr and saint, and miracles were reported to have been wrought by him even under the very nose of his Danish successor. Olaf was rightly regarded as the patron saint of the new Christian monarchy. It was he who not only had Christianized the land, but had for the first time thoroughly united the kingdom. His reign had given rise to a feeling of unitedness and independent existence which the country never had before and never afterwards wholly lost. For nearly a century afterwards Norway was ruled in internal peace by the kings of his race. The church was organized and became powerful. The private viking ex- peditions gradually ceased, for it began to be considered a scandal to plunder in Christian lands ; and possibly also the practice grew more dangerous. Swein Asleifson, in the middle of the 12th century, is the last recorded viking of the old type, and he dwelt in the Orkneys. At the same time several of the kings made greater foreign expe- ditions, which probably afforded a sufficient vent for their more restless subjects. The central authority of the king grew stronger and more stable. His court and personal following were better organized. The lendermenn, although still remaining chiefs of the landed aristocracy, ceased to exercise the same

~~semi-independent power in their own districts, and came into closer relations with the king and court.~~

~~name, for he was still very young at the time, had settled the quarrel with Denmark by coming to an agreement with Hardicanute, that when one died the other should succeed to his crown. In 1042 Hardicanute died, and Magnus peacefully took possession of his kingdom. But troubles soon arose from Svend Estridsen, nephew of Canute the Great, who attempted to seize Denmark, and who had entered into terms with a formidable Norse ally. Harold,~~

~~the enmity of many of the most powerful men in the west and north, and he had a dangerous foreign enemy. Canute was at the height of his power, had claims, he~~

~~Sigurd's son, known sometimes as Hardrada (hard coun- Harold sel), the half-brother of Olaf, was one of the last and most ed famous of the great viking chiefs. His father was a small ™°*~~

~~thought, upon Norway, and was, moreover, deeply irri- tated by an expedition which Olaf had made upon Den- mark along with the king of Sweden. He had con- nexions with many of the chiefs, which he fostered as much as possible, and in 1028 he came with a great force to Norway; Olaf could make no head against him, and was compelled to fly to Russia. But after a while Olaf heard that there was for a time no ruler in Norway, and re- solved to attempt to win back his kingdom. He obtained assistance in Sweden, gathered his friends from Norway, and then went over the mountains into the Throndhjem country. The chiefs who were most bitterly opposed to him drew together a great force and met him at Stikkle- stad, and there, when only thirty-five years old, he was defeated and slain in August 1030. There is a singular change to be observed in the narrative of this latter part of Olaf's life. He seems to have become more devoted to Christianity, and in every way more thoughtful and gentle. The stories about him look as if his adversities had forced him to take a retrospect of his life and prepare for a new career; and if he had been the victor at Stikklestad it is hard to say what influence he might not have exercised~~

~~Upland king of Harold Fairhair's race; he had fought when a boy at Stikklestad, had gone to the East and taken service with the Greek emperor, and was now come back to the North with great wealth and fame. Fora short time he entered into league with Svend, but an arrangement was soon brought about by which he and Magnus were made friends, and Harold became joint king of Norway. Magnus died in the following year (1047), leaving Den- mark to Svend and Norway to Harold; Harold was not, however, inclined to relinquish Denmark, and wasted it year after year by terrible incursions; at last he under- took a more formidable task, and fell in England in 1066 with the very flower of Norway at the battle of Stamford Bridge.~~

~~Harold's son, Olaf Kyrre (the quiet), ruled Norway in Olaf peace for twenty-seven years, a peace which may in some Kyrre.~~

~~respects have been due to the way in which the country had been drained of its hottest blood by Harold's expedi- tions. During this reign the country attained considerable prosperity, trade increased, and, among other merchant towns, Bergen, which soon attained the first place, was~~

~~founded. But Olaf's son Magnus (known sometimes as Magnus Magnus Barefoot), who succeeded his father in 1093, reigned Barefoot. in a manner more like his grandfather. He was continu-~~

~~upon subsequent history. A short experience of Danish rule under Svend, the son~~

~~Eystein and Sigurd Jorsala- fari.~~

~~Period of~~

~~anarchy.~~

~~Magnus, son of Erling Skakke.~~

~~The Bir- kebeinar.~~

~~Sverri.~~

ally occupied in foreign expeditions, and at last fell in Ireland in 1103.

The three sons of Magnus succeeded to the kingdom at his death. One of them died in youth, but Sigurd and Eystein reigned long together, Eystein being a king like Olaf Kyrre, while Sigurd inherited to the full the warlike qualities of his family. The great external event of the reign is Sigurd's expedition to the East, from which he gained the name of Jorsalafari (the traveller to J erusalem). The account given by the saga of the origin of that expe- dition is characteristic and probably enough true. Many men had already been to Jerusalem and to Constantinople, and there they had got renown, and had all kinds of news to tell when they came home, and those who had taken service at Constantinople had the best luck in the way of gain; so the people bade one of the kings undertake the expedition. Sigurd went with a great force, fought many battles by the way, gained much plunder in heathen lands, and visited Jerusalem and Constantinople. Sigurd survived Eystein, and died in 1130. In his last year he showed traces of insanity. He was the last true representative of Harold Fairhair's great race, and with him the classical period of Norwegian history may almost be said to come to an end.

With the death of Sigurd commences a long period of internal strife. His son Magnus was forced to share the sovereignty with a colleague, Harold Gilchrist, who pro- fessed to be a natural son of Magnus Barefoot, and who in a short time succeeded in deposing his colleague. Harold was slain in 1136 byanother pretender. Parties had formed themselves amongst the lendermenn aristocracy, who took as their nominal heads the sons and grandsons of Harold Gilchrist, often mere children ; the church hierarchy, now growing powerful, interfered in the struggle, and the whole land was divided by bitter feuds. The disorganization of the country was shown by the appearance of bands of armed disorderly men, generally at first on the Swedish frontier. Unity at last seemed likely to be secured by an innovation in the succession. A powerful chief named Erling Skakke managed to get his son Magnus, who by his mother's side was a grandson of Sigurd Jorsalafari, accepted as king, first by the leading party and then practically by the whole country. He came to terms with the hierarchy ; an agree- ment

was entered into in 1164, by which various privileges were secured to the church, and a definite rule of succession was adopted. The kingdom was to be held as a fief of St Olaf, and the church dignitaries were to have a powerful voice in the succession. In return for these concessions Magnus was solemnly crowned by the archbishop of Throndhjem, and his defective claim was thus strengthened by a new form of legitimation.

There seemed every reason to suppose that the kingdom would now rest firmly on the united support of the aristo- cracy and the church, but in reality the basis proved to be an insecure one. The aristocracy stood no longer as formerly in close connexion with the mass of the free people, and they had not yet become welded together in a separate organized order. One of the troops of adven- turers which had appeared in the previous state of con- fusion, and had been the followers of one of the various claimants to the throne, was known as the Birkebeinar. They were on the verge of extinction when they secured a leader of no common type. Sverri was a Faroe Islander. He seems to have been well enough aware himself that he had no claims to royal birth, but he gave himself out as the son of Sigurd, the son of Harold Gilchrist, and as such was accepted by the Birkebeinar. In a little while it became clear that his talents for command were of the first order, and the little troop of disorderly men became in his hands a disciplined military force. A fierce struggle

ensued with Magnus, who in the end was defeated and slain in 1184 at Fimreite on Nord Fjord. Sverri became king, and represented himself as maintaining the old law of succession and the old order of things as against the arrangement of 1164. But in reality his reign was the commencement of a new phase. The older kings were within very narrow limits absolute, and claimed the king- dom as an odal right ; but they were confronted and con- trolled by the mass of free landowners under their local aristocratic chiefs. A change had gradually taken place, and it seemed as if a separate aristocracy were to detach themselves from the people, and, with the help of the church, take the administration into their own hands. Sverri struck the hardest blows at both. He effectually prevented the formation of a powerful

nobility, and he wholly repudiated the domination of the church. He had hammered out for himself a theory of church and state not unlike that of Henry VIIL, and held that the king derived his title from God, and was entitled to an equal supremacy over both. The church retaliated by excom- munication, for which, however, Sverri and his followers cared nothing, and by which their position does not seem

to have been in the least affected. New officials appear

in the administration of local affairs who were appointed and directly controlled by the king, and if his plans had been fully carried out it seems likely that the whole power would have been centralized under his hands. He had to fight, however, for his kingdom to the very end, and at his death in 1202 it seemed doubtful what turn affairs would take.

The party strife continued with scarcely an intermission until long after Sverri's death. The party of the Birke- beinar, however, kept well together and were on the whole the stronger. Their rivals had their chief seat in the south, and were closely connected with Denmark. At last Hakon, a grandson of Sverri, was placed on the throne in 1217, and in 1240 the last of the rival claimants to the throne fell, and the whole country was once more at peace under one king. The stormy times of Norway's history appear suddenly to pass away, and the stillness that ensues is likened by one of its historians to "the stillness on a battlefield after the battle." Hakon died in 1263. There are only two external events of note in his long reign. The one is the acquisition of Iceland, which, like the parent country, had been thoroughly worn out by the struggles of its chiefs. The other is Hakon's Scotch expedition in 1261; which was put an end to by a storm and by the not very important battle of Largs, and which showed con- clusively how much the seamanship and fighting power of Norway had declined. Hakon's son Magnus surrendered the Hebrides to Scotland by the treaty of Perth in 1268. There is some dispute whether or not this was done under condition of a tribute, but there seems to be no doubt that the tribute, if due, was at all events never paid. Magnus was known by the surname of Lagabetr (law reformer), a designation which indicates the chief work of his reign. The great changes that had taken place during the long period of the civil wars must have rendered some alteration of the old law imperatively necessary ;

~~and, while something had been done in Hakon's reign, the work was completed under Magnus. In place of the old provincial laws a new law book was prepared for the whole kingdom, compiled from the older laws with the changes that seemed necessary. Many of these changes relate to customs and rights which had their origin in heathen times. Others show the altered relation of classes. A conspicuous feature is the new importance of the king's officials and the increased power and position of the king himself. Magnus died in 1280 and was succeeded by~~

~~Hakon, grandson of Sverri.~~

~~Magnus Laga- beetr.~~

~~Erik, son of~~

~~his son Erik, whose only child, the Maid of Norway, Magnus.~~

~~Hakon, son of Magnus, abolishes the Len- dermenn.~~

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~~perished at sea when on her way to Scotland. In 1299 Erik died and was succeeded by his brother Hakon, who died in 1319, and whose only daughter carried the Norwegian crown into the Swedish line. During the reign of Hakon the lendermenn, who had so long been conspicuous in Norse history, finally disappeared. Hakon abolished them by a decree, without apparently even con- sulting his council, and without encountering the slightest resistance. They do not even reappear in the minority which followed, and which must have afforded them a very favourable opportunity of recovering their power. They occupied, in truth, an anomalous and untenable position.~~

~~They had long ceased, as we have seen, to be the chiefs~~

~~Union with Swedish crown.~~

~~Union with Denmark.~~

~~Reverts to Sweden,~~

~~and representatives of the free landowners, and they had failed to assert themselves as a separate power by the side of the king. Under Magnus Lagabetr they had acquired the title of barons, but even under long minorities they never got any real hold of power. The king was too strong for them after they had lost their old position, and he preferred ruling through officers of his own who were wholly dependent on him. Neither was there any room for the growth of a nobility of another type. On the one hand the position of the king was too absolute, and on the other hand the people were too firmly rooted in their old traditional independence. The mass of the small landowners, among whom the greater families, by the partition of their domains, gradually sank back, were ready to obey the king and his officers ; but they were not the material on which an intermediate power could be rested. They admitted that the king had an odal right to his kingdom and a definite claim for services and pay- ments, but in the same way they themselves had an im- memorial odal right to their lands. The situation of Norway during the Middle Ages might be shortly described as an absolute monarchy resting almost directly on one of the most democratic states of society in Europe. Titles appear, but they represent little or nothing. The ruling officials or deputies of the king are occasionally oppressive, but there is no permanent subjection to them.~~

~~From the time of the union with the Swedish crown the history of Norway is bound up with that of the other Scandinavian countries. With Sweden she entered the Calmar union in 1397, but when that union was broken in the beginning of the 16th-century she remained with Den- mark, and during the whole time of union can scarcely be said to have had a history of her own. The Danish kings were accepted in Norway with only an occasional show of dissent and resistance. One of her oldest and most famous colonies, the Orkney and Shetland Islands, was in 1468 given in pledge, never to be redeemed, to the Scottish king by Christian I. The commercial towns fell under the iron rule of the Hanseatic League and all the old enterprise seemed to have perished. Intellectual life appeared to fall as low ascommercial prosperity. The vigorous Norse- Icelandic literature was supplanted after the time of Hakon Magnusson by versions of foreign legends and history, but even that disappeared, and, as the manuscript copies grew scarcer, it appears as if for a while the Nor- wegians had ceased to read as well as to write. The Re- formation spread more slowly into~~

Norway than into the other Scandinavian countries, and had to be encouraged by the Danish kings by methods not altogether dissimilar to those by which Christianity had at first been introduced. But better times began to dawn during last century. Re- strictions were removed from lands and the administration was improved. The material prosperity of the country rapidly increased and a new life began to appear.

By the terms of the peace of Kiel (14th January 1814) Norway was to be transferred from Denmark to Sweden. The Norwegians were at first inclined to resist this, but

their means of resistance were small and the Swedes offered liberal terms. In the same year the constitution was solemnly ratified, and Charles XIII. was taken as king. Since then the country has been peaceful and prosperous. The only serious political troubles have been those arising from the question whether the king has an absolute veto upon alteration of the fundamental law of the kingdom.

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Part IV.—LITERATURE.

~~The literature of Norway bears something of the same relation to that of Denmark that American literature bears to English. In each case the development and separation of a dependency have produced a desire on the part of persons speaking the mother-tongue for a literature that shall ex- press the local emotions and conditions of the new nation. Two notable events led to the foundation of Norwegian literature : the one was the creation of the university of Christiania in 1811, and the other was the separation of Norway from Denmark in 1814. These events were the signals for intellectual and political independence. Before this time Norwegian writers had been content, as a rule, to publish their works at Copenhagen, which was the metropolis of the realm ; they had now a capital of their own in Christiania. The great distinction, however, between Norway and America was that the former was sufficiently ancient and sufficiently neighbouring to contribute to the glory of Denmark a great many young men who quitted the colonial and narrow circle into which they were born, and became to all intents and purposes Danish writers. The first name on the annals of Danish literature, Peder Clausson, is that of a Norwegian; and if all Norse writers were removed from that roll, the list would be poorer by some of its most illustrious names, by Holberg, Tullin, Wessel, Treschow, Steffens, and Hauch.~~

~~We must first examine what was done in Norway itself during the colonial period. The first book printed in the country was an almanac, brought out in Christiania in 1643 by a wandering printer named Tyge Nielsen, who brought his types from Copenhagen. But the first press set up definitely in Norway was that of Valentin Kuhn, brought over from Germany in 1650 by the theologian Christian Stephensen Bang (1580-1678) to help in the circulation of his numerous tracts. Bang's Christianix Stads Beskrifuelse, 1651, is the first book published in Norway. The name which next detains us is that of Christen Jensen (d. 1653), a priest who collected a small glossary or glosebog of the local dialects, and which was published in 1656. Gerhard Milzow (1629-1688), the author of a Presbyterologia Norwegica, 1679, was also a Norse priest. The earliest Norwegian writer of any original merit was Dorthe Engelbrechtsdatter (1634-1716), afterwards the wife of the pastor Ambrosius Hardenbech (see vol. vili. p. 214). She is the author of several volumes of religious poetry, of a very lacrymose and lamentable order, which have enjoyed great popu- larity down to the present day. The~~

hymn-writer Johan Brunsmann (1637-1707), though a Norseman by birth, belongs by education and temper entirely to Denmark. Not so-Peder Dass (1647-1708) (see vol. vi. p. 831), the

most original writer whom Norway produced and retained at home during the colonial period. Another priest, Jonas Ramus (1649-1718), wrote two important posthumous works in prose, Worriges Kongers Historie (History of the Norse Kings) in 1719, and Worriges Beskrivelse, 1735. The celebrated missionary to Greenland, Hans Egede (1686- 1758), wrote several works on his experiences in that country. Peder Hersleb (1689-1757) was the compiler of some popular treatises of Lutheran theology. Frederik Nannestad, bishop of Throndhjem (1693-1774), deserves mention as the founder of the periodical press in Norway, having started a weekly gazette in 1760. The missionary Knud Leem (1697-1774) published a number of philo- logical and topographical works regarding the Lapps of Finmark, one at least of which, his Beskrivelse over [in- markens Lapper, 1767, still possesses considerable interest. The famous Erik Pontoppidan (1698-1764) cannot be re- garded as a Norwegian, for he did not leave Denmark until he was made bishop of Bergen, at the age of forty-nine. On the other hand the far more famous Baron Ludvig Holberg (1684-1754), the chief of Danish writers, belongs to Denmark by everything but birth, having left Norway in childhood.

A few Norsemen of the beginning of the 18th century distinguished themselves, chiefly in science. Of these Johan Ernst Gunnerus (1718-1773), bishop of Throndhjem, was the most eminent ; he was the first man who gave close attention to the Norwegian flora. He founded the Norwegian Royal Society of Sciences in 1760, in unison with his friends Gerhard Schéning (1722-1780) the his- torian and Hans Strém (1726-1797) the zoologist. Of these three friends Schéning deserves the greatest promi- nence in this place, because he wrote more in Danish and less in Latin than the other two. In belles-lettres Norway began to show vitality only when the century had reached its half-way point. Peder Christofer Stenersen (1723-1776), a writer of occasional verses, merely led the way for Christian Braumann Tullin (1728-1765), a lyrical poet of exquisite genius, whose

~~talent is claimed by Den- mark as one of the jewels in the crown of her literature, but who must be mentioned here, because his poetry was not only mainly composed in Christiania, but breathes a local spirit. He has been called the Father of Danish lyrical verse. From Tullin's day for about thirty years Denmark was principally supplied with poets from Norway. That portion of the chronicle of Danish literature which extends between the great names of Evald and Baggesen presents us with hardly a single figure which is not that of a Norseman. The director of the Danish national theatre in 1771 was a Norwegian, Niels Krog Bredal (1733-1778), who was the first to write lyrical dramas in Danish, and who exercised wide influence. A Norwegian, Johan Nor- dah] Brun (1745-1816), was the principal tragedian of the time, in the French taste. It was a Norwegian, J. H. Wessel (1742-1785), who laughed this taste out of fashion. In 1772 the Norwegian poets were so strong in Copen- hagen that they formed a Norske Selskab (Norwegian Society), which exercised a tyranny over contemporary letters which was only shaken when Baggesen appeared. Among the leading writers of this period we can but just mention, besides those above named, Claus Frimann (1746- 1829), Peter Harboe Frimann (1752-1839), Claus Fasting (1746-1791), Johan Wibe (1748-1782), Edvard Storm (1749-1794), C. H. Pram (1756-1821), Jonas Rein (1760- 1821), Jens Zetlitz (1761-1821), and Lyder Christian Sagen (1771-1850), all of whom, though Norwegians by birth, find their place in the annals of Danish literature. To these poets must be added the philosophers Niels Treschow (1751-1833) and Henrik Steffens (1773-1845), and in later times the poet Johannes Carsten Hauch (1790-~~

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~~1872). There is no example of a writer of importance, born in Norway since 1800, who is counted among Danish authors.~~

~~The first form which Norwegian literature took as an independent thing was what was called "Syttendemai- Poesi," or poetry of the seventeenth of May, that being the day on which Norway obtained her independence and pro- claimed her king. Three poets, called the Trefoil, came forward as the inaugurators of Norwegian thought in 1814. Of these Conrad Nicolai~~

Schwach (1793-1860) was the least remarkable. Henrik Anker Bjerregaard (1792- 1842), born in the same hamlet of Ringsaker as Schwach, had a much brighter and more varied talent. His poems, collected at Christiania in 1829, contain some charming studies from nature. He brought out a tragedy of Mag- nus Barfods Sénner (Magnus Barefoot's Sons) and a lyrical drama, Ljeldeventyret (The Adventure in the Mountains), 1828. The third member of the Trefoil, Mauritz Chris- topher Hansen (1794-1842), was a laborious and fecund worker in many fields. His novels, of which Ottar de Bretagne, 1819, was the earliest, were much esteemed in their day, and after Hansen's death were collected and edited, with a memoir by Schwach. Hansen's Poems, printed at Christiania in 1816, were among the earliest publications of a liberated Norway, but were preceded by a volume of Smaadigte (Short Poems) by all three poets, edited by Schwach in 1815, as a semi-political manifesto. These writers, of no great genius in themselves, did much by their industry and patriotism to form a basis for Nor- wegian literature to be built upon. They wrote, however, on national themes without much knowledge, and in com- plete bondage to the conventional forms in vogue in Copenhagen in their youth.

The creator of Norwegian literature, however, was the poet Henrik Arnold Wergeland (1808-1845), a man of great genius and enthusiasm, who contrived within the limits of a life as short as Byron's to concentrate the labours of a dozen ordinary men of letters. He held views in most respects similar to those pronounced by Rousseau and Shelley; he never ceased to preach the dignity of man, the worth of liberty to the individual and of independence to the nation, and the relation of republican politics to a sound form of literature. His own ideal of literature, however, was at first anything but sound. He was the eldest son of Professor Nikolai Wergeland (1780- 1848), who had been one of the constitutional assembly who proclaimed the independence of Norway in 1814 at Eidsvold. Nikolai was himself pastor of Hidsvold, and the poet was thus brought up in the very holy of holies of Norwegian patriotism. His earliest efforts in literature were wild and formless. He was full of imagination, but without taste or knowledge. He published poetical farces under the pseudonym of '"Siful Sifadda," trifles unworthy of attention. These were followed, in 1828, by Sinclazr's Death, an unsuccessful tragedy; and in 1829 by a volume of lyrical and patriotic poems, which attracted the liveliest attention to his

~~name. At the age of twenty-one he became a power in literature,—nay more, an influence in the state. But these writings were coldly received by connoisseurs, and a monster epic, Skabelsen, Mennesket, og Mesias (Creation, Man, and Messiah), which followed in 1830, showed no improvement in style. From 1831 to 1835 Wergeland was submitted to severe satirical attacks from Welhaven and others, and his style became improved in every respect. His popularity waned as his poetry im- proved, and in 1840 he found himself a really great poet, but an exile from political influence. His Jan van Huy- sums Blomsterstykke (J. van Huysum's Flower-piece), 1840, Svalen (The Swallow), 1841, Jéden (The Jew), 1842, Jédinden (The Jewess), 1844, and Den Hngelske Lods~~

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~~(The English Pilot), 1844, form a series of narrative poems in short lyrical metres which remain the most in- teresting and important of their kind in Norwegian litera- ture. He was less successful in other branches of letters; in the drama, neither his Campbellerne (The Campbells), 1837, Venetianerne (The Venetians), 1843, nor Sdkadetterne (The Cadets), 1848, has achieved any lasting success, while his elaborate contribution to political history, Norges Konstitutions Historie, 1841-43, is forgotten. The poems of his last five years, however, enjoy as true a popularity as ever, and are not likely to lose it. The only influence which Wergeland, in spite of his genius, has had on Nor- wegian literature is the removal of traditions and the release of style in various directions. His obscurity and extravagance have stood in the way of his teaching, and his only disciples in poetry have been Sylvester Sivertson (1809-1847), a journalist of talent whose verses were col- lected in 1848, and Christian Monsen (1815-1852).~~

~~A far more wholesome and constructive influence was that of Johann Sebastian Cammermeyer Welhaven (1807- 1873), who was first brought to the surface by the con- servative reaction in 1830 against the extravagance of the radical party. His first publications were polemical, and were mainly directed against Wergeland. A savage attack on Henrik Wergeland's Poetry, published in 1832, caused a great sensation, and produced an angry pamphlet in reply from the father, Nikolai Wergeland. 'The con- troversy became the main topic of the day, and in 1834 Welhaven pushed it into a~~

wider arena by the publication of his beautiful cycle of satirical sonnets called Worges Dexmring (The Dawn of Norway), in which he preached a full conservative gospel. Norway has not followed Wel- haven in politics, but it certainly has in literature. The salutary character of his advice was instantly felt by the younger men of letters. As a poet and as a critic he continued to do admirable work. He published volumes of lyrical and romantic poems in 1839, 1845, 1848, 1851, and 1860 ; and he enriched the language by two excellent critical studies, one on Holberg, 1854, and the other on EHvald and the Norwegian Club, 1863. His collected works appeared in eight volumes in 1867-68. He was assisted in his controversy with Wergeland by Henrik Hermann Foss (1790-1853), author of Tidsnornerne (The Norns of the Age), 1835, and other verses.

Andreas Munch (b. 1811), the oldest now-living Norwegian author of any repute, has been one of the most rapid and industrious of poetical writers. He took no part in the feud between Werge- land and Welhaven, but addicted himself to the study of Danish models independently of either. He published a series of poems and dramas, one of which latter, Kong Sverres Ungdom, 1837, attracted some notice, without securing much position. His popu- larity commenced with the appearance of his Poems Old and New in 1848, and has only lately begun to decline. Andreas Munch makes little or no appeal to the highest poetical susceptibilities ; his work is melodious, facile, and graceful, but without depth of feeling or artistic beauty. His highest level as a poet was reached by his epic called Kongedatterens Brudefart (The Bridal Journey of the King's Daughter), 1861. 'T'wo of his historical dramas have enjoyed a popularity greatly in excess of their merit ; these are Solomon de Caus, 1854, and Lord William Russell, 1857. Munch published a fragment of an autobiography in 1874, with the title of Barndoms- og Ungdoms-minder (Memoirs of Childhood and Youth).

A group of minor poetical writers may now be considered. Magnus Brostrup Landstad (1802-1881) was born on Maaso, an island in the vicinity of the North Cape, and therefore in higher latitudes than any other man of letters. He was a hymmn-writer of merit, and he was the first to collect, in 1853, the Norske Follce- viser, or Norwegian folk-songs. Landstad was ordered by the Government to prepare an official national hymn-book, which was brought out in 1861. Peter Andreas Jensen (1812-

1867) published volumes of lyrical poetry, mostly to edification, in 1838, 1849, 1855, and 1861, and two dramas. He was also the author of a novel, Hn Erindring (A Souvenir), in 1857. Aasmund Olafsen Vinje (1818-1870) was a peasant of remarkable talent, who was the principal leader of the movement known as the " maalstrev," an

effort to distinguish Norwegian from Danish literature by the adop- tion of a peasant dialect, or rather a new language arbitrarily formed on a collation of the various dialects. Vinje wrote a volume of lyrics, which he published in 1864, and a narrative poem, Storegut (Big Lad), 1866, entirely in this fictitious language, and he even went so far as to issue in it a newspaper, Délen ('Ihe Dalesman), which appeared from 1858 to Vinje's death in 1870. In these efforts he was supported by Ivar Aagen, to whom we shall return, and by Kristoffer Jansen (b. 1841), now the only remaining "'maalstreever," who resides in the United States, and who is the author of various important works,—an historical tragedy, Jon Arason, 1867 ; several novels, —Fraa Bygdom, 1865 ; Torgrim, 1872; Fra Dansketidi, 1875 ; Han og Ho, 1878; and Austanfyre Sol og Vestanfyre Maane (East of the Sun and West of the Moon), 1879; besides a powerful but morbid drama in the ordinary language of Norway, Ln Kvindeskjebne (A Woman's Fate), 1879. Superior to all the preceding in the quality of his lyrical writing was the late bishop of Christiansand, Jérgen Moe (1813-1882), author of three little volumes of exquisite verses, published in 1850, 1851, and 1853. He is, however, better known by his labours in compara- tive mythology, in conjunction with P. C. Asbjérnsen.

The mixture of such opposite elements as the wild genius of Wergeland and the cold critical judgment of Welhaven would seem to have formed a singularly happy basis for the writers of the next generation to build a literature upon. The now-living poets of Norway may hold their own without fear of too severe a rivalry, not merely with those of Denmark and Sweden, whom they easily excel, but with those of the great powers. There can be no reason- able question that Ibsen and Bjornson are the two most original figures of their generation in the Teutonic world of imagination.

~~But their energy, and that of their companions, has been almost entirely confined to two fields,;—the drama and the novel. The narrative and epical forms of poetry, and even the lyric in its more ambitious directions, have not flourished in the modern Norwegian school. The most conspicuous name in Norwegian literature is that of Henrik Ibsen (b. 1828). His early efforts were not remark- able, and to this day he has not succceded in any field but the drama, where he isa master. His first tragedy, Catzlina, 1850, was a work of little importance. It was not until 1856 that he came forward with a romantic drama, Gildet paa Solhaug (The Feast at Solhaug), in which an individual style was noticcable. Two successive tragedies, Fru Inger til Osteraad, 1857, and Hermaendene paa Helgeland (The Warriors on Helgeland), 1858, displayed a sudden development of power. In 1863, at last, he wrote an his- torical tragedy, Kongsenunerne (The Pretenders), which is a work of maturer genius. He had by this time, however, been drawn into a new channel. In 1862 he began his series of lyrico-satirical dramas on modern Norwegian life with his Kjwrlighedens Komedie (Love's Comedy), a brilliant study, which was succeeded by two masterpieces of a similar kind, Brand in 1866, and Peer Gynt in 1867. These were long dramas, written entirely in octosylabic rhyming verse. In De Unges Forbwnd (The Young Men's League), 1869, which was a political satire of much force, he abandoncd verse, and has since written all his dramas in prose. In 1871 he collected his lyrical poems, and in 1873 he published Kejser og Galilwer (Emperor and Galilean), a double drama of portentous size, on the career of Julian the Apostate. Since that time he has published, about once in every two years, satirical comedies of great pungency and wit, laying bare some sore of modern social life among his countrymen,—Samfundets Stotter (The Pillars of Society), in 1877; Hi Dukkehjem (A Doll's House, or Nora), in 1879; Gengangere (Ghosts), in 1881; and En Folkefiende (Au Enemy to the People), in 1883. The last of these is a humorous apology for the poet's severity as a satirist, which in his latest works has seemed excessive even to his greatest admirers. He has lived in voluntary exile from Norway since 1864.~~

~~It has been a misfortune to Bjornstjerne Bjéruson (b. 1832) that he was born four years later than Ibsen, with whose powers his might else be more exactly matched. It is possible that in some respects his mind is more richly endowed than Ibsen's, and it would seem to be more versatile ; the elder~~

poet, however, is the superior artist, and has his qualities under more severe control. Bjornson has made several false starts ; Ibsen scarcely one. ‘The first successes of Bjoruson were made in the field of the novel, where he adapted from the German school of ‘“‘ dorfgeschichten,” a species of realistic and yet romantic tale of life among the peasants in the mountains, which was singularly charming and attractive. Of these the two first, Synnéve Solbakken, 1857, and Arne, 1858, were among the best, and made his name famous. His ambition, however, was to excel in dramatic writing, and after three comparative failures— Halte Hulda (Halting Hulda), 1858 ; dfellem Slagene (Between the Battles), 1859 ; and Kong Sverre (King Sverre), 1861—he made a great success with his heroic trilogy of Sigurd Slembe in 1862. In the meantime small sketches of peasant life, and the exquisite little story called En Glad Gut (A Merry Lad), had supported his repu- tation. In 1863 he brought out a tragedy of Maria Stuart 7 Skot- land, and in 1865 a little comedy De Nygifte (The Newly-married

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Couple), which enjoyed an overwhelming success. Another story, Fiskerjenten (The Fisher-Girl), in 1868, was found less fresh and unaffected than his early stories, and he returned to his charming pristine manner in Brudeslaaten, 1873. Since that year he has published but one novel, Magnhtld, 1877, and a slight study of Italian life, Kapiejn Mansana, 1879, neither quite worthy of his genius. All his other productions have been dramatic. Fired with emulation for Ibsen, he has written Sigurd Jorsalfar, in 18738, an historical saga-drama, and a series of satirical comedies,—En Fallit (A Bankruptcy), 1875, an admirable piece ; Redaktéren (The Editor), 1875 ; Kongen (The King), 1877, a political manifesto in four acts ; Leonarda, 1879; Det ny System (The New System), 1879 ; En Handske (A Glove), 1883 ; and Over .divne (Beyond his Reach), 1883,—the last a very singular study of epileptic hysteria as a fac- tor in religious enthusiasm. Bjornson is a republican of the most advanced order, and his views are pushed forward too crudely for artistic effect in several of his later works.

Two writers of novels who owe much to the example of Ibsen and Bjornson are Jonas Lie (b. 1883) and Alexander Kielland (b. 1849). Lie was late in developing his talent, and has lost much time in wavering between the

~~sentimental and the realistic schools of treatment. He has finally thrown in his cause with the latter in his last novel Livs- Slaven, 1883. His best books have been stories of seafaring life—Den Fremsynte (The Man with the Second Sight), 1870; Tremasteren Fremtiden (The Threemaster '' Future B): 1872; Lodsen og hans Hustru (The Pilot and his Wifc), 1874 ; and Rutland, 1880. His tales of town-life—Zhomas Ross, 1878, and 'Adam Schrider, 1879—have less of the novelist's illusion. Kielland may prove to possess a stronger talent than Lie; his progress has been more rapid and steady, and he has a clearer idea of what he wishes to do. He began by being strongly influenced by Zola in his Garman og Worse, 1879, and his Arbeidsfolk (Working People), 1880. His latest works have shown steady improvemeut in style and a growing independence of French models. From this, the youngest of distinguished Norwegian writers, we may turn back to a few older names which close the list of novelists. Nicolai Ramm Ostgaard (1812-1873) to some extent preceded Bjornson in his graceful romance En Fjeldbygd (A Monntain Parish), in 1852. Frithjof Foss, who wrote under the pseudonym of Israél Dehn (b. 1830), attracted notice by a series of no less than seven separate stories published between 1862 and 1864, but has been silent since. The two most important women-novelists have been Jacobine Camilla Collett (b. 1813), a cousin of the poet Wergeland, author of Amimandens Ditire (The Governor's Daughters), 1855, an excellent novel, and many other volumes ; and Anna Magdalene Thorescn (b. 1819), a Dane by birth, author of a series of novels.~~

~~'The labours of Peter Christen Asbjornsen (b. 1812), in conjunction with Bishop Moe, in the collection of the old Norse folk-tales, de- mand prominent recognition in any skctch of Norwegian literature. Before they were twenty years of age these friends began to write down the stories of the peasants. In 1888 Asbjérnsen first made public some of the results of his investigations in a little publication for children called Nor. Not until 1842 did the first authorized edition of the Norske Folkeeventyr see the light. It was followed in 1845 by Huldreeventyr, or stories about the fairies or sirens which haunt the mountain dairies, by Asbjérnsen alone. Of these a second series appeared in 1848, and in 1871 a new series was published again by Asbjorusen alone of the Folkeeventyr. It was from minstrels, boatmen, vagabonds, and paupers that the best stories were collected, and it is a significant fact that most of these professional reciters are now dead. Had~~

~~Asbjornsen and Moe neglected the duty of preserving the ancient legends, they would now, in all probability, be entirely lost. What has been done by Asbjornsen for the peasant-stories has been done for the dialects in which they were composed by Ivar Aasen (b. 1813). Since 1850~~

~~he has received a pension from the state to enable him to study the peasant-patois, and his great dictionary, Norsk Ordbog, first printed in 1858, and his other linguistic publications have been the result. He is the creator of the artificial language, the " maal," which Vinje, K. Jansen, and others have written in; and he has published in it a valuable collection of proverbs, 1851.~~

~~The principal historian of Norway has been Peter Andreas Munch (1810-1863), whose multifarious writings include a grammar of Old Norse, 1847 ; a collection of Norwegian laws until the year 1387, 1846-49 ; a study of Runic inscriptions, 1848 ; a history and de- scription of Norway during the Middle Ages, 1849 ; and a history of the Norwegian people, in 8 vols., 1852-63; Jakob Aall (1773-1844) was associated with Munch in this work. Jakob Rudolf Keyser (1803-1864) performed services scarcely less important in printing and annotating the most important documents dealing with the medieval history of Norway. Carl Richard Unger (b. 1817) has taken part in the same work and edited Morkinskinna in 1867. Sophus Bugge (b. 1838) is a leading philologist of a younger school, and Oluf Rygh (b. 1838) has contributed to the archeological part of history. The modern language of Norway found an admirable grammarian in Jakob Olaus Lokke (1829-1881). A careful historian and ethnographer was Ludvig Kristensen Daa (1809-1877). Ludvig Daae (b. 1834) has written the history of Christiania, and has traced the chronicles of Norway during the Danish possession. Bernt Moe (1814-1850) was a careful biographer of the heroes of Eidsvold. Eilert Lund Sundt (1817-1875) published some very curious and valuable works on the condition of the poorer classes in Norway. Professor J. A. Friis (b. 1821) has published the folk-lore of the Lapps in a series of very curious and valuable volumes.~~

~~In jurisprudence the principal Norwegian authorities are Anton Martin Schweigaard (1808-1870) and Frederik Stang (b. 1808). Peter Carl Lasson~~

~~(1798-1873) and Ulrik Anton Motzfelt (d. 1865) were the lights of an earlier generation. In medical science, the great writer of the beginning of the century was Michael Skjel- derup (1769-1852), who was succeeded by Frederik Holst (b. 1791). . Daniel Cornelius Danielsen (b. 1815) is a prominent dermatologist ; but probably the most eminent of recent physiologists in Norway is Carl Wilhelm Boeck (b. 1808). The elder brother of the last- mentioned, Christian Peter Bianco Boeck (1798-1877), also demands recognition as a medical writer. Christopher Hansteen (1784-1873) was prominent in several branches of mathematical and chemical literature, and was mt a of mathematics at the university for nearly sixty years. Michael Sars (b. 1805) has obtained a European reputation through his investigations in invertebrate zoology. He has been assisted by his son Georg Ossian Sars (b. 1887). Balta- zar Michael Keilhau (1797-1858) and Theodor Kjerulf (b. 1825) have been the leading Norwegian geologists. Mathias Numsen Blytt (1789-1862) represents the section of botany. His Norges Flora, part of which was published in 1861, was left incomplete at his death. Niels Henrik Abel (1802-1829) was a mathematician of extraordinary promisc ; Ole Jakob Broch (b. 1818) must be men- tioned in the same connexion. Marcus Jakob Monrad (b. 1816), an Hegelian, is the most prominent philosophical writer of modern Norway. Among theological writers may be mentioned Hans Nielsen Hauge (1771-1824), author of the sect which bears his name; Svend Borchman Hersleb (1784-1836) ; Stener Johannes Stenersen (1789-1835) ; Wilhelm Andreas Wexels (1797-1866), a writer of extraordinary popularity ; and Carl Paul Caspari (b. 1814),~~

~~the learned professor of theology in the university of Christiania. No very recent compendium of Norwegian literature exists. La Norvége Litiératre, by Paul Botten-Hansen (1824-1869), is an admirable piece of biblio- graphy so far as it reaches, put comes down no farther than 1866. Professor L. Dietrichson published in 1866 the first and only part of an Omrids af den Norske Poesis Historie (Outline of the History of Norwegian Poetry). J. B. Halvorsen is now publishing a Norsk Forfatier-Lexikon, 1814-1880 (Norwegian Dictionary of Authors); this promises to be a very valuable work, but has not as yet proceeded beyond the letter B. In English see the earlier chapters of Gosse's Northern Studies (1879 ; 2d edition, 1882). (BE. W. G.)~~

NORWEGIAN SEA. The sub-polar regions of the Atlantic lying between the Scandinavian peninsula and Greenland have been in recent years carefully investigated by Norwegian expeditions under Professors Mohn and Sars ; and, as the sea immediately to the west of Norway has not hitherto been known by any distinctive name, Mohn has proposed the name of "Norwegian Sea,"—a suggestion which has been now generally adopted. The Norwegian Sea, therefore, includes the whole of the region between Greenland and Norway, a portion of which, to the north- west of the island of Jan Mayen, is sometimes known as the Greenland Sea. The Norwegian Sea is a well- marked basin cut off from the Atlantic by submarine ridges connecting the north of Scotland, the Faroe Islands, Ice- land, and Greenland. On the summit of these ridges

there is an average depth of about 250 fathoms. Between Spitzbergen and Lapland there is a wide opening into the Barents Sea, where the depth is from 100 to 200 fathoms. Between Spitzbergen and Greenland a wide and deep open- ing extends into the frozen Arctic Ocean, with a depth of 9500 fathoms. 'The surrounding land is almost everywhere high, rugged, deeply indented with fjords, and skirted with outlying islands, which are mostly composed of stratified rocks and ancient geological formations. Jan Mayen, situ- ated near the centre of the basin, Iceland, and the Faroe Islands are of volcanic origin.

The marked peculiarity of the Norwegian Sea is the striking contrast in the climate of its eastern and western portions. If we draw a line from the east side of Iceland to the south end of Spitzbergen we have, generally speaking,

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on the west of this line a sea covered with ice during the whole of the year, throughout nearly its entire extent. It is only rarely that the east coast of Greenland can be ap- proached through the lanes and openings formed in the ice, An arctic current passes southward along the coast of Greenland, carrying with it vast fields of hummocky ice, and enters the North Atlantic through the straits which separate Iceland from the coast of Greenland. To the eastward of this line we have a sea free from ice throughout the year. A warm current—the so-called ex- tension of the Gulf Stream—passes between the coasts of Scotland and Iceland, and carries a large amount of

~~heat to the shores of Norway and Lapland,' rendering them relatively mild and habitable. The prevailing wind over the western part of the Norwegian Sea is from the north- east, while that over the eastern is from the south-west, in each case corresponding with the direction of the ocean currents. With respect to the relations of the barometric minimum to the prevailing winds and currents see MErEor- OLOGY, vol. xvi. p. 139.~~

~~In March and April a very extensive seal fishery is carried on to the north and east of Jan Mayen along the edge of the ice-fields,—as many as 300,000 young seals having been captured in one season. Large numbers of polar bears are at this time noticed in the neighbourhood of the seal rook-erles, and are captured on the ice at great distances from land, Later in the season there is a right whale fishery to the north and west of the island of Jan Mayen, A large number of small vessels from Hammerfest and Lapland ports visit the coasts of Spitzbergen each season to collect eider-down, and to engage in the walrus and shark fisheries. Narwhals (Monodon) are also captured along the edge of the ice-floes. Guillemots, little auks, gulls, and other sea-birds are found in vast numbers near the coast of Spitzbergen and along the edge of the pack-ice. Along the coast of Nor- way there are valuable cod, mackerel, herring, and lobster fisheries. The Norwegian Sea has a depth almost rivalling that of the great Atlantic and Pacific Oceans, that of the whole of the central parts exceeding 1000 fathoms, while to the south-east of Jan Mayen there is a depth of 2000 fathoms, and off Spitzbergen of 2500 fathoms.~~

~~The bottom in the western portion is composed of a~~

- ~~mixture of mud and stones formed from the detrital matter~~

~~carried from the land by floating ice, and containing not more than 5 or 6 per cent. of carbonate of lime. In the deeper parts of the eastern portion we have a fine mud or clay containing sometimes 50 per cent. of carbonate of lime, and a total absence of the ice-borne stones and gravel so abundant in the western portion. The carbonate of lime consists chiefly of the shells of Globigerina which have fallen from the surface, and some other species of Fora- minifera (the most frequent of which is Biloculina) which live on the bottom. In some places this deposit approaches in character the G'lobigerina ooze or mud of the Atlantic, but is very poor in pelagic shells~~

when compared with the deposits in lower latitudes. The pelagic Foraminifera and Pteropod shells so abundant in tropical parts of the Gulf Stream are killed off and fall to the bottom as they are carried into the colder areas of the North Atlantic. The upper layer of this deposit is of a brownish colour, and is less compact and contains more lime than the deeper layers, which have a blue or greyish colour. In this respect it agrees with the deposits found at similar depths around all continental shores. The deposits along the Norwegian coast, in depths less than 1000 fathoms, consist chiefly of detrital matter from the shores, the mineral particles consisting of quartz, felspars, mica, hornblende, magnetite, and fragments of rocks, Around Jan Mayen and Iceland the deposits consist largely of volcanic sand. In all the deposits there are many Diatom frustules.

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The isotherms of the. atmosphere receive a very remarkable de- flexion to the north along the coast of Norway, as may be seen by reference to the article METEOROLOGY, figs. 8-11 (vol. xvi. pp. 138, 135, 136). A similar remarkable deflexion takes place with the isotherms of the ocean, showing the temperature of the sea surface, In January the warmest water is found at a distance of over 100 miles from the coast, and ranges from 46° Fahr. in the south. to 36° Fahr. in the north. In July and August the warmest water is found close along the shore, the range being from 60° Fahr. in the south to 47° Fahr. in the north. This is due to the cooling effect of the

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Map of Norwegian Sea.

~~In the western part of the Norwegian Sea ice-cold water is found at the surface~~

~~land in winter and its warming effect in summer.~~

~~throughout the year. The deeper parts are wholly filled with ice- cold water, this temperature being met with off the coast of N orway at a depth of 400 or 600 fathoms. The remarkably mild and genial temperature of Norway, considering its latitude, is to be accounted for (1) by the warm current from the south which flows north- wards over the banks and fills up the deep fjords beyond with water of a relatively high temperature ; (2) by the banks which extend along its shores with a depth of between 100 and 200 fathoms, — sometimes stretching out several hundred miles from the land and thus keeping the ice-cold water of the basin out of the deep bays and fjords. The water at the bottom of the deep fjords usually ranges from 40° Fahr. to 43° Fahr, throughout the year. In summer the surface is warmer than the bottom water in these fjords, but in winter it is several degrees colder (see Norway, p- 580). The bottom water in the fjords is not affected by the cold of winter or heat of summer, owing to the great depth in connexion with the slow rate at which changes of temperature are communicated through the water. The specific gravity ranges from 1°0265 along the coast of Norway to 1-0250 among the ice-floes off the coast of Greenland.~~

~~The narrow and deep channel running between the Faroe Islands and the north of Scotland must be specially referred to on account of the deep-sea investigations which have been there carried on. Indeed the widespread interest taken at the present time in the deep sea arose in a great degree from the interesting discoveries made in this channel by Dr Carpenter and Wyville Thomson in 1868 and 1869, in H.M.S. “ Porcupine” and’ “ Lightning.” Two areas were found, one having at the bottom a temperature of 30° Fahr. and the other a temperature of 45° Fahr, The faunas in the two~~

areas were likewise characterized by remarkable differences. There appears to have been no suspicion that a submarine ridge separated the bottom water of the one area from that of the other. The re- searches carried on in H.M.S. ‘‘Challenger” showed that in all cases there were indications of submarine ridges separating areas 1n which a difference of temperature was found at the bottom. In the years 1880 and 1882 this channel was again investigated by H.M.S. *« Knight Errant ” and ‘‘ Triton.” A ridge, now called the Wyville Thomson ridge, was discovered running in a north-north-west direc- tion from the north of Scotland to the Faroe banks, and separating the warm and cold areas. The average depth on this ridge is 250 fathoms, but there is a small saddle-back in the northern portion of it with a depth of a little over 300 fathoms. Ice-cold water was traced to the top of this ridge, and through the saddle-back to the south-west margin. Here the cold water is met by the warm current passing to the north-east, a mixture takes place, and the whole flows towards the north-east. No true ice-cold current appears to pass into the Atlantic through the Faroe channel (see the map). That the ridge is swept by strong tidal currents as well as by the steady flow to the north-east is shown by the fact that no fine deposit is allowed to accumulate on it, and by the particles of sand and gravel from the ridge which are spread over the sea- bottom to the north-east. Over the ridge large smooths and well- ings up of water take place at certain times as the great tidal wave passes through this channel into the North Sea. The top of the ridge, which is about 5 miles wide, is covered with gravel and rocks, many of them rolled and glaciated, consisting of granite, gneiss, mica-schists, sandstone, limestone, diorites, &c. On both sides of the ridge a mud is found containing Foraminifera shells, Diatoms, and minute mineral fragments, such as quartz, mica, hornblende, augite, felspars, magnetite, glauconite, &c. Mineral particles from the ridge are much more numerous and larger in the cold than in the warm area, thus indicating the direction in which the currents sweep. The stones resemble those of the Orkneys, and were most probably carried to their present position by glaciers or icebergs during the Glacial period. Since temperature is the most important factor in the distribution of marine specics it is not astonishing to find a considerable difference in the fauna on each side of the ridge. Mr Murray states that in the ‘‘ Knight Errant” dredgings, of seventy-one species from the warm area and forty-seven from the cold area, the depths being about the same and the distance only about 40 miles apart, there were only two common to both

~~areas. The animals from the cold area are chiefly arctic forms, and re-semble closely those from similar depths off the east coast of North America, while those from the warm area have a southern and abyssal character. We have indeed in the Faroe channel a curious mixture of arctic, abyssal, and modified British faunas, the distribution and limits of which have not yet been worked out. A thorough investigation of this channel in its hydrographical and biological relations is still a great desideratum.~~

~~The Norwegian Sea exhibits an abundant pelagic fauna and flora. The warm water of the Gulf Stream very frequently brings to the coasts of Norway animals usually met with only at lower latitudes. Diatoms and other minute Algæ are found in vast banks, especially in the neighbourhood of the melting ice, giving the water a peculiar green colour. This green-coloured water is re- garded by the whalers as one of the best indications of good fishing grounds. Entomostraca, Meduse, Ctenophora, Siphonophora, Pteropods, and Radiolarians are also to be found in great abundance on the whaling grounds. The deep-sea dredgings of the Norwegians do not show such an abundant or rich fauna as is met with at similar depths in more southern latitudes.~~

~~See Wyville Thomson, The Depths of the Sea (2d ed., London, 1874); "Pre- liminary Report of the Scientific Exploration of the Deep Sea in H.M. Survey- ing-vessel 'Porcupine' during the Summer of 1869, conducted by Dr Carpenter, Mr J. Gwyn Jeffreys, and Professor Wyville Thomson," in Proc. Roy. Soc., vol. xviii. p. 397 (1870); The Norwegian North-Atlantic Expedition (1876-78), by Professors Mohn, Sars, and others; 'Exploration of the Faroe Channel during the Summer of 1880, in H.M.'s hired ship 'Knight Errant,' by Staff-Commander Tizard, R.N., and John Murray, with subsidiary reports by various scientific men," in Proc. Roy. Soc. Edin., vol. xi. p. 638 (1882); and "Remarks on the Soundings and Temperatures obtained in the Faroe Channel during the Summer of 1882," by Staff-Commander T. 11. Tizard, R.N., in Proc. Roy. Soc., vol. xxxv. p. 202 (1883). (J. MU.)~~

~~NORWICH, a city of England, the capital of Norfolk, a county of itself and a municipal and parliamentary borough, stands mainly on the right bank of the winding Wensum, a little above its confluence with the Yare, by rail~~

being 20 miles west of Yarmouth, 684 north-east of Cambridge, and 114 north-north-east of London. The municipal and parliamentary boundaries enclose an area of 7472 acres ; but the ancient walls (1294-1342), some portions of which remain, with their twelve gate-houses—the last demolished in 1808—were only 4 miles in circuit. Those narrow limits were long ago outgrown, for Evelyn writes in 1671 that "the suburbs are large, the prospects

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sweete, with other amenities, not omitting the flower- gardens, in which all the inhabitants excel." Beneath the low chalky heights of Mousehold Heath, once wooded now heathery, lies antique Norwich. ''A fine old city, truly," to quote George Borrow, "view it from whatever side you will; but it shows best from the east, where the ground, bold and elevated, overlooks the fair fertile valley in which it stands. At the foot of the heights flows the narrow and deep river, with an antique bridge [Bishop's Bridge, 1295] communicating with a long and narrow suburb, flanked on either side by rich meadows of brightest green, beyond which spreads the city; the fine old city, perhaps the most curious specimen extant of the genuine old English town."

In 1094 the seat of the East Anglian bishopric was re- moved by Bishop Herbert de Lozinga or Lorraine from Thetford to Norwich, where in 1096 he laid the foundation of the cathedral, and dedicated it to the Holy Trinity in 1101, establishing at the same time a Benedictine monas- tery. As completed by his successor before the middle of the 12th century the cathedral in style was purely Norman ; and it still retains its original Norman plan to a much greater degree than any other English example of equal magnitude. True, changes and additions were made from time to time in the successive styles—the Early English lady chapel (demolished about 1580) belonging to the middle of the 13th century, the mixed Decorated and Perpendicular spire to the 14th, the west front and porch and the lierne stone vaulting of the nave, with its elabo- rate 328 bosses, to the 15th, and to the 16th the vaulting of the transepts and Bishop Nix's chantry, whilst the fine cloisters, 175 feet square, 12 feet wide, with 45 windows, in style

mainly Decorated, were begun in 1297 and not completed till 1430. The following are the dimen- sions in feet of the cathedral :—total length, 407 ; length of nave, 204; length of transepts, 178 ; breadth of nave and aisles, 72; total height of spire, 315 (in England ex- ceeded by Salisbury only) ; height of tower, 140,%, ; height of nave, 694; height of choir, 834. The chief entrance on the west is a Perpendicular archway, above which is an immense window filled with poor modern stained glass. The nave within is grand and imposing, divided by four- teen semicircular arches of great depth and solidity, whose massive piers are in two instances ornamented with spiral mouldings. The triforium is composed of similar arches. The side aisles are low, their vaultings plain. The choir, extending westward some way beyond the crossing, is of unusual length, and terminates in an apse, with the only fragment of an ancient episcopal chair that has been allowed to remain in situ. The oak stalls and musereres are very richly carved. A curious quatrefoil, opening on the north side of the presbytery, beneath the confessio or relic chapel, deserves mention. There are but two mionu- mental effigies—one of Bishop Coldwell (c. 1499), the other of Bishop Bathurst (1837) by Chantrey. Mural monu- ments are plentiful. Sir William Boleyn, great-grandfather of Queen Elizabeth, is buried on the south side of the presbytery, in the midst of which stood the tomb of Bishop Herbert, the founder. Of three circular apsidal chapels two remain; and in one—the Jesus chapel—the ancient colouring has lately been renewed, this being part of a series of restorations carried out at great cost since 1801. Two richly-sculptured gateways lead to the cathedral—the Erpingham gate (1420) and the Ethelbert gateway (c. 1300). The bishop's palace and the deanery are buildings of high antiquity, but both have undergone many alterations. The latter has a well-restored chapel. A beautiful Early Decorated ruin in the palace garden, known as " Bishop Salmon's gateway," is supposed to have been the porch to the great hall (c. 1319). The grammar-school is a Decorated

NORWICH

edifice of c. 1316, originally a chapel, with a "carnary " or crypt below. Among its scholars have been Coke, Lord Nelson, Rajah Brooke, and George Borrow. St Andrew's Hall (124 by 64 feet) is the seven-bayed nave of the Black Friars' church, rebuilt with the aid of the Erpinghams between

1440 and 1470. A splendid specimen of Perpen- dicular work, with its twenty-eight clerestory windows and chestnut hammer-beam roof, it has served since the Re- formation as a public hall, in which from 1824 have been held the triennial musical festivals, second only in date and in fame equal to those of Birmingham. It was restored in 1863. The guildhall, on the site of an earlier tolbooth, is a fine flint Perpendicular structure of 1408-13; one of its rooms, the mayor's council-chamber, fitted up with furniture of the time of Henry VIIL., is an interesting specimen of a court of justice of that period. Of forty-three churches — Perpendicular flint- work, mostly of the 15th century—St Peter Man- croft, restored in 1880- 83, is by many esteemed the finest parish church in England. Measuring 212 by 70 feet, it has a richly-ornamented tower and fléche, 148 feet high, with a matchless peal of twelve sweet bells,a long light clerestory of thirty- four windows, a beauti- ful carved-oak roof, a remarkable font cover, and the tomb of Sir Thomas Browne. St Andrew, St Stephen, St Michael Coslany, St John Maddermarket, St Lawrence, and St Giles —the last with a tower 126 feet high—are also noticeable. A new Ro- man Catholic church, | about to be built at the cost of the duke of Nor- | folk, will be much the | largest and finest of a

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agricultural implements are also made in large quantities. There is one daily paper, and eight others are published weekly. The corporation consists of a mayor, deputy mayor, and sheriff (elected annually), sixteen aldermen, and forty-eight councillors ; and the city has sent two members to parliament since the reign of Edward I. The population has been successively (1801) 36,882, (1831) 61,110, (1871) 80,386, (1881) 87,842—males 40,288, females 47,554 —in 20,764 houses (1881).

Norwich seems to have been the Caer-Gwent of the Britons, the Venta Icenorum of the Romans; and its name of Nord-wic, or ''north-town," which first appears in the Saxon Chronicle under date 1004, is thought to refer to the large and perfect Roman camp of Caister, 3 miles to the south, which by earlier antiquaries was itself identified with Venta Icenorwm, and by tradition is said to have been ''a city when Norwich was none, for

Norwich was built of Caister stone." A Saxon ""burh" appears to have stood at Norwich in 767, but the present castle was probably built or rebuilt

in the reign of Rufus. Only a al its keep remains, which,

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crowning the summit of a

steep mound, has been

adapted to prison purposes.

Frequently sacked by the

| Norsemen, Norwich was

Guthrum's headquarters in 878, in 1004 eters by Sweyn, and in 1017 was SaneaTe Sree Canute's residence. In % D Domesday the city is de- a scribed as having 1320 bur- a gesses with their families, 25 parish churches, and be- tween 800 and 900 acres of land. Ralph de Guaer in 1075, rebelling against the Conqueror, defended the castle unsuccessfully ; in | 1122 Henry I. gave Nor- '| wich a charter containing the same franchise as that of London, and the govern- ment of the city was then separated from that of the castle, the chief magistrate being styled Prepositus or '| provost. In the same reign a colony of Flemish weavers introduced the woollen manufacture at Worstead, about 13 miles from Nor- wich ; and a second colony settled at Norwich itself under Edward III., when the city was made a staple town for the counties of Norfolk and Suffolk. The dauphin plundered and burned. the city in 1216; and in 1272 the priory was burnt in a riot between the monks and thecitizens. The

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ist places of worship.

The museum (1839) has collections of fossils and birds (especially Faptores). It houses the literary institution (1822 ; 26,000 vols.), as also archeological, medical, art, and meteorological societies. Ad- joining it is the free library (1857; 8000 vols.). These two buildings mark the site of the 17th-century palace of the dukes of Norfolk, said to have been the largest town-house in the kingdom out of London. The public library (1784; 50,000 vols.) in 1885 was transferred to its present quarters, a handsome building with Doric portico. The Norfolk and Norwich Hospital, first built in 1772, and rebuilt in 1879-83, is in the Queen Anne style, and on the pavilion system, with 220 beds. Other buildings are the lunatic asylum (1877-80 ; accommodation, 300), the workhouse (1858-60 ; accommodation, 1057), Jenny Lind Infirmary for sick children (1853), St Giles's or the old men's hospital (1249), Doughty's Hospital (1687), an asylum and school for the indigent blind (1805), the cavalry barracks (1791), the drill hall (1866), the agricultural hall (1882 ; 175 by 108 feet), the corn exchange (1861 ; 125 by 81 feet), the post-office (1865), and the theatre (1826). The cemetery (1856 ; 43 acres) has four mortuary chapels and a striking soldiers' monument (1878).

The textile manufactures of Norwich, once so important, have declined ; and now its great industrial establishments are a mustard and starch works employing upwards of 2000 hands, three or four large breweries, and ironworks. Boots, clothing, vinegar, and

Plan of Norwich.

'black death " of 1848-49 cut off two-thirds of the inhabitants, and in 1881 the Norfolk Levellers, under John le Littester, did much damage ; but by 1408 the city had sufficiently recovered to be honoured with a charter, under which it might elect a mayor and two sheriffs. In 1422 the doctrines of the Reformation made their appearance in Norwich; and several persons were executed as Wickliffites or Lollards. Among the list of martyrs is the

name of Thomas Bilney, who was burned in 1531. In 1549 the city was the scene of an insurrection which grew out of the enclosure of commons, and was headed by Robert Kett alias Knight, a tanner. Norwich, in common with all Nor- folk and Suffolk, warmly espoused the cause of the Reformation ; and under Elizabeth the burnings of Roman Catholics rivalled the flames which Protestants had fed in former reigns, whilst martyrdoms for heresy of doctrine even among Protestants themselves were far from uncommon. In 1582 the city contained 5000 Dutch and Walloons, Protestant refwigces from the Low Countries, who did much to foster manufactures. During the Commonwealth the city was put in defence against the royal cause and the castle was forti- fied for the service of Cromwell. But at the Restoration Norwich was amongst the earliest to do homage to Charles. In June 1660 the fee-farm of the city was resigned to him, with a present of £1000 in gold ; and in 1663 the charter of the city was renewed and en- larged. In 1701 the art of printing, which had been introduced in 1570 but discontinued for many years, was revived, and news-

papers began to be printed. The famous ‘‘Norwich school” of landscape painting flourished during the first half of the present century, the principal artists being Crome, Cotman, Stark, and Vincent. Distinguished natives were John Kaye or Caius, Arcli- bishop Parker, Robert Greene, Thomas Legge, Bishop Cosin, Bishop Pearson, ‘Old Crome,” William Taylor, Amelia Opie, Harriet Mar-

tineau, and Dr Crotch, whilst among residents the best known have been Sir Thomas Erpingham, Bishop Hall, and Sir Thomas Browne.

See A. D. Bayne, Norwich, its Political, Religious, and Municipal History (1868); Dean Goulburn, Sculptures in the Roof of Norwich Cathedral, with a History of the See (1876); Jarrold, Handbook to the City of Norwich (1883); and other works cited under NoRFOLK. (F. H. G.)

NORWICH, a city of the United States, one of the county seats of New London county, Connecticut, lies 16 miles from Long Island Sound at the junction of the Yantic and the Shetucket to form the Thames, and 13 miles

~~north of New London by the New London Northern Railroad. The greater part of the city is built on rising ground between the valleys of the confluent streams, and with its white and handsome houses has a highly pictur- esque effect. Besides the court-house (1873), used for county, township, and city affairs, the more conspicuous edifices are the free academy (1856), the Park Church (Con- gregational), and Christ Church (Episcopalian). Among the numerous industrial establishments settled at Norwich, on account of the abundant water-power in the district, are cotton, wool, paper and rolling mills (all on a very large scale), as well as factories for firearms, printing-presses, water-wheels, locks, stoves, belts, bolts, wood-type, carriages, &c. Steamers ply daily between the city and New York, and there is a thriving trade in coal, lumber, and general goods. The population of the town was 14,048 in 1860, 16,653 in 1870, and that of the city 15,112 (of the town 21,143) in 1880.~~

~~In 1659 the Indian chief Uncas, whose grave may still be seen in the old Indian burying-ground, sold the site of Norwich to~~

~~Major John Mason and a body of thirty-four settlers. The incor- poration of the city dates from 1784.~~

~~NORWOOD, a large suburban district of London, county of Surrey, is situated in a hilly and finely-wooded district about 1 mile south-west of Dulwich and 4 south of Lambeth. It is divided into Upper, Lower, and South Norwood, all consisting principally of villa residences and detached houses inhabited by the better classes. Alms- houses for the poor of St Saviour's, Southwark, were opened at South Norwood in 1863, a Jewish convalescent home in 1869, and the royal normal college and academy of music for the blind at Upper Norwood in 1872. There is also a Catholic convent and orphanage of the Faithful Virgin. Red pottery ware is manufactured in the neigh- bourhood. Norwood received its name from an old forest of oak trees. Near it is Gipsy Hill, where at one time dwelt the celebrated Margaret Finch, who died in 1740 at the age of 109, and to whom a monument has been erected in Beckenham churchyard. The population of Norwood (area 1009 acres) in 1871 was 12,536, and in 1881 it was 19,017.~~

NORWOOD, a municipal suburb of Adelaide, South Australia, is situated. about 2 miles north-east of the centre of the city, with which it is connected by a tram- way. It possesses a post and telegraph office, a mechanics' institute, and a branch of the bank of Adelaide. Nor- wood along with Kensington forms a municipality, with an area of 14 square miles and a population in 1881 of

10,087.

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NOSSL-BE, an island off Passandava Bay, on the north- west coast of Madagascar, in 13° 23'S. lat. and 45° 59' E. long,, is situated 149 miles from Mayotte, and governed, along with the smaller island of Nossi-komba, by a French

commandant subordinate to the governor of Mayotte.

Nossi-bé is of volcanic formation, the north and south parts of older, the central part of more modern date. Be-

sides a number of true volcanic craters of no great height (the culminating point of the island is only 1486 feet above the sea), M. Velain found a great many crater-lakes or circular troughs level with the ground—the result, prob- ably, of subterranean explosions which did not last long enough to allow the lava to reach the surface (see Nature, March 1877, p. 417). Nossi-bé has an area of 481,840 acres (nearly 750 square miles), of which not more than 1800 or 2000 acres are planted with sugar-cane, coffee, ce. Trade is mainly carried on with Madagascar, though a few vessels come directly from Zanzibar or Bombay. In 1878 the value of the imports was 1,470,449 francs, that of the exports 2,092,385. The population, consisting mainly of Sakalavas, varies considerably in number. Hellville, the European chief town (so called after De Hell, governor of Réunion at the time of the French annexation), had in 1878 from 1200 to 1500 inhabitants and the rest of the island about 6000.

In 1837 Tsiomeika, queen of the Sakalavas, was expelled by the Hovas and fled to Nossi-bé and Nossi-komba. Failing to obtain assistance from the imam of Muscat, she accepted French protec- tion. In 1849 a vigorous attempt was made to expel the French. See Von Jedina in Revue géogr. internat., 1877.

NOSTRADAMUS (1503-1566), the assumed name of MicurL pE NotrEepAME, a French astrologer, who was descended from a family of Jewish origin, and was born at St Remi in Provence 13th December 1503. After completing a course of study in humanity and philosophy at Avignon, he entered the school of medicine at Mont- pellier, where he eventually took the degree of doctor of medicine in 1529. Shortly afterwards he settled at Agen, and in 1544 he established himself at Salon near Aix in Provence. Both at Aix and at Lyons he acquired great distinction byhis devoted and skilful labours during terrible outbreaks of the plague, and he was already well known before he appeared in the character of a seer, In 1555 he published at Lyons a book of rhymed prophecies under the title of Centuries, which secured him the notice of the superstitious Catherine de' Medici of France ; and in 1558 he published a second and enlarged edition with a dedica- tion to the king. The seeming fulfilment of some of his predictions greatly increased his influence, and Charles IX. named him his physician in ordinary. THe died 2d July 1566.

The Centurics of Nostradamus have been frequently reprinted, and have been made the subject of many commentaries. In 1781 they were condemned by the papal court, being supposed to con- tain a prediction of the fall of the papacy. Nostradamus was the author of a number of smaller treatises. Sec especially Bareste, Nostradanvwus (Paris, 1840).

NOTARY or Notary Pustic. In Roman law the nota- rius was originally a slave or freedman who took notes (note) of judicial proceedings in shorthand or cipher. The notary of modern law corresponds rather to the tabellio or tabularius of Roman law than to the noturivs. In the canon law the notary'was a person of great importance, and it was a maxim of that law that his evidence was worth that of two unskilled witnesses.

In most European countries he still holds something of his old position under the canon law. In France, for instance, a document attested by a

notary is said to be "legalized," a term much too strong to express the effect of such attestation in England, where the notary public, in spite of his name, is not recognized as a public officer to such a degree as the notary in other countries. The office of notary in England is a very ancient one. It is mentioned in statute law as early as the Statute of Pro- visors, 25 Edward II. stat. 4. The English notary is a skilled person, nominated since 25 Henry VIII. c. 21 by the archbishop of Canterbury through the master of the facul- ties (now the judge of the provincial courts of Canterbury and York), in order to secure evidence as to the attesta-

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tion of important documents. tical courts must be notaries.

The office is still nominally an ecclesiastical one, though its duties are mainly of a secular character. "The general functions of a notary consist in receiving all acts and con- tracts which must or are wished to be clothed with an authentic form ; in conferring on such documents the re- quired authenticity; in establishing their date; in preserv- ing originals or minutes of them which, when prepared in the style and with the seal of the notary, obtain the name of original acts; and in giving authentic copies of such acts" (Brooke, On the Office of a Notary, chap. iii.). The act of a notary in authenticating or certifying a document is technically called a "notarial act." In most countries the notarial act is received in evidence as a semi-judicial matter, and the certificate of a notary is probative of the facts certified. But English law does not recognize the notarial act to this extent. An English court will, in certain cases, take judicial notice of the seal of a notary, but not that the facts that he has certified are true, except in the case of a bill of exchange protested abroad.

The most important part of an English notary's duty at the present day is the noting and protest of foreign bills of exchange in case of non-acceptance or non-payment. This must be done by a notary in order that the holder may recover, He also prepares ship protests and protests of other kinds relating to mercantile matters. The office of notary is now usually, though not necessarily, held by a solicitor. In London he must be free of the Scriveners' Company. The principal statutes relating to English notaries are 25 Henry

VIII. c. 21; 41 George III. c. 79; 3 and 4 William IV. c. 70; 6 and 7 Vict. c. 90.

In Scotland, before the reign of James III., papal and imperial notaries practised until the third parliament of that king, held at Edinburgh on the 29th November 1469, when an Act was passed declaring that notaries should be made by the king. It would appear, however, that for some time afterwards there were in Scot- land two kinds of notaries, clerical and legal, —the instruments taken by the latter bearing faith in civil matters. In 1551 an Act was passed directing sheriffs to bring or send both kinds of notaries to the lords of session to be examined; and ina subsequent statute, passed in 1555, it was ordained that no notary, "by whatsoever power he be created," should use the office "except he first present himself to the said lords, showing his creation, and be admitted by them thereto." It does not appear that this statute vested the right of making notaries in the court of session ; but in 1563 it was by law declared that no person should take on him the office, under the pain of death, unless created by the sovereigu's special letters, and thereafter examined and admitted by the lords of session. Since then the court of session has in Seotland excreised full and exclusive authority on the admission of notaries in all legal matters, spiritual and temporal. The position of notaries in Scotland is somewhat higher than it is in England. Certain facts connected with the title to land must be authenticated by notarial instrument, 21 and 22 Vict. c. 76. A notary may exe- cute a deed for a person unable to write, 37 and 38 Vict. c. 94, s. 41. The parish clergyman has notarial powers to the extent of executing a will, —a relic of the old ecclesiastical position of notaries.

In America the duties of a notary vary in different States. 'They are generally as follows :—to protest bills of exchange and draw up acts of honour; to authenticate and certify copies of documents ; to receive the affidavits of mariners and draw up protests relating to the same; to attest deeds and other instruments ; and to admini- ster oaths " (Bouvier, Law Dictionary).

NOTICE. The primary meaning of notice is know- ledge (notitia), as in "judicial notice ;" thence it comes to signify the means of bringing to knowledge, as in "notice to quit;" at last it may be used even for the actual

~~writing by which notice is given. The most important legal uses of the word are judicial notice and the equitable doctrine of notice. Judicial notice is the recognition by courts of justice of certain facts or events without proof. Thus in England the courts take judicial notice of the existence of states and sovereigns recognized by the sovereign of England, of the dates of the calendar, the date and place~~

~~All registrars of ecclesias-~~

~~of the sittings of the legislature, &c. The equitable doc- trine of notice, so called because it was a doctrine formerly peculiar to the courts of equity, is that a person who purchases an estate, although for valuable consideration, after notice of a prior equitable right, will not be enabled by getting in the legal estate to defeat that right. On the other hand, a purchaser for valuable consideration without notice of an adverse title is as a rule protected in his enjoyment of the property. Other common uses of the word are notice to quit, notice of dishonour, notice of action (generally necessary in case of a breach of duty~~

~~created by statute), notice of trial, notice in lieu of~~

~~service of a writ (where the defendant is a foreigner out of the jurisdiction), notice to produce, &c. Notice may be either express or constructive. The latter is where knowledge of a fact is presumed from the circumstances of the case, ¢.g., notice to a solicitor is usually constructive notice to the client. Notice may be either oral or written. It is usually advisable to give written notice even where oral evidence is sufficient in law, as in the case of notice to quit. The American use of notice is practically the same as in England.~~

~~NOTKER, a name of somewhat frequent occurrence in the ecclesiastical history of the Middle Ages. Among those by whom it was borne two are specially distinguished. Norker Batputus (c. 840-912) was a native of northern Switzerland, and, having become a monk of the monastery of St Gall, hcld the position of "magister" in its school for many years. He was canonized in 1513. Balbulus compiled a martyrology and was the author of other works, but is mentioned principally in connexion with his services to~~

~~church music and with the "sequences" of which he was the composer. See Hymns, vol. xii. p. 583. Norker Laseo, also a monk of St Gall, died on 29th June 1022. His translations of the Old Testament Psalms, the De Consolatione of Boetius, the Categories of Aristotle, and some other works into Old High German are of con- siderable philological interest. See vol. x. p. 517.~~

~~NOTO,a city of Italy, in the province of Syracuse (Sicily), 24 miles south-west of Syracuse by road on the way to Modica, Built on a new site after the earthquake of 1693, it is laid out in modern style, and contains a number of handsome mansions belonging to the provincial aristocracy. The population of the city was 15,925 in 1881; that of the commune, 16,590 in 1871, reached 18,239 in 1881.~~

~~Netum or Neetum (Néyrov) was one of the cities left to Hiero of Syracuse by the treaty of 263 B.c. Like Messina and Tauro- menium (Taormina) it was a federata civitas in the time of Cicero, and at a later date it still enjoyed the rare privileges of a Latin town. Under the Saracens it was a place of importance and gave its name to one of the divisions of the island, Val di Noto. It was one of the last of the towns of Sicily to surrender to Roger the Norman. In 1837 it was made capital of the province instead of Syracuse, but this dig- nity was restored to the larger city by the new Italian parliament.~~

~~NOTTINGHAM or Norts, an inland county of England, Plate is bounded N. by Yorkshire and Lincolnshire, W. by XX1~~

~~Derbyshire, 8. by Leicestershire, and E. by Lincolnshire. It is of an irregular oval shape, its length from north to south being about 50 miles, and its greatest breadth from east to west about 25 miles. The area is 527,752 acres, or nearly 825 square miles.~~

~~The surface, though for the most part low, generally presents a pleasant diversity of hill and dale. The northern part is included in the great plain of York, and in the extreme north there is some extent of marshes. The valley of the lower Trent and that of the Idle are also very flat. In the south-west, between Nottingham and Warsop, the undulations swell into considerable elevations, reaching near Mansfield a height of about 600 feet. This district~~

includes Sherwood Forest, of which, in 1609, there were 44,839 acres enclosed, 9486 woods, and 35,080 waste.

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Some portions of it are still retained in their original con- dition, and there are several very old oaks. The county generally is finely wooded, although to the east of the valley of the Soar there is a considerable stretch of wolds. The principal rivers are the Trent, the Erewash, the Soar, and the Idle. The Trent, which enters the county near Thrumpton, where it receives the Erewash from the north and the Soar from the south, flows north-east past Notting- ham and Newark, where it takes a more northerly direction, forming the northern part of the eastern boundary of the county till it reaches the Isle of Axholm (Lincolnshire). The Soar forms for a short distance the boundary with

Leicester, and the Erewash the boundary with Derby. |

The Idle, which is formed of several streams near Sher- wood Forest, flows northwards to Bawtry, and then turns eastward to the Trent. The Idle has been made navigable from Bawtry to the Trent. There are also several canals.

Geology and Minerals—The oldest rocks of the county are the Coal-measures, which, forming part of the Yorkshire, Nottingham, and Derby coalfield, stretch in from Derby, occupying principally the district west of a line drawn from Nottingham to Kirkby, although coal is obtainable below the other rocks as far east as Lincolnshire, at a depth of probably less than 4000 feet. The principal workable seams are the Top Hard, the Deep Soft, the Deep Hard, and the Kilbourne coal. In 1881 there were thirty-nine collieries, producing together 4,758,060 tons. Ironstone is found, but not in sufficient quantities to make its work- ing profitable. The Coal-measures are bounded by a narrow strip of Permian rocks, consisting chiefly of magnesian limestone, which is overlaid by the Middle Permian marls and sandstones. Red and white sandstone, freestone, and magnesian limestone are quarried in the neighbourhood of Mansfield. The lower beds of the limestone are made use of for paving-stones. The remainder of the county is occupied chiefly by the New Red Sandstone. The higher ridge between the

~~Idle and the Trent is occupied by the Upper Keuper marls and sandstones. Lias occurs south- east from Cropwell to the neighbourhood of Newark. Along the valleys and on the tops of the hills there is generally a coating of drift. The banks of the Trent are occupied by river gravels, and along the Idle there is a large deposit of mud as well as of gypsum, the latter being dug for manure and for plastering and floors. Valuable beds of gypsum also occur in various parts of south Not- tinghamshire.~~

~~Agriculture.—As the higher regions of Derby and York- shire attract the rain-clouds, the climate of Nottingham is much above the average in dryness, and on that account crops ripen nearly as early as in the southern counties. The soil of about one-half the county is gravel and sand, including Sherwood Forest, where it inclines to sterility, and the valley of the Trent, where there is a rich vegetable mould on a stratum of sand or gravel. The land along the banks of the Trent is equally suitable for crops and pasture. The farms generally are of moderate size, the great majority being under 300 acres. Most of the immediate occupants are tenants-at-will. Considerable improvements have taken place in the farm buildings and cottages, most of them being now built of brick and tile. According to the agricultural returns for 1883, there were 454,217 acres, or nearly nine-tenths, of the total area under crops. Corn crops occupied 142,305 acres, of which 51,250 were under wheat, 47,479 under barley or bere, and 27,090 under oats. Green crops occupied 50,151 acres, 34,925 of these being occupied by turnips and swedes, 6613 by potatoes, and 4685 by vetches. As many as 185,060 acres were in permanent pasture, while 54,684 were under clover, and 21,956 fallow. A common custom is to fallow the arable land once in three years.~~

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~~There were 1806 acres under orchards, 685 under market gardens, 146 of nursery grounds, and 26,387 of woods. The soil in many places is supposed to be specially suited for apples and pears, but, although they are grown in con- siderable quantities, there are not many orchards of large size. Hops were at one time extensively grown in the clay districts, which produce stronger plants, though less rild in flavour, than are grown in Kent and Sussex, but in 1883 they occupied only 33 acres. The total number of horses~~

~~in 1883 was 20,511, of which 15,191 were used solely for agricultural purposes. Cattle numbered 76,229, of which 24,822 were cows and heifers in milk or in calf. Shorthorns are the favourite breed. Dairy farming is pretty common. Sheep numbered 211,893 and pigs 30,371. The old forest breed of sheep is almost extinct,~~

~~Leicesters and various crosses being common.~~

~~According to the latest return there were 14,519 proprietors, pos- sessing 507,337 acres with a gross annual rental of £1,560,853, or an average of about £3, 2s. per acre. The estimated extent of com- mons and waste lands is 1450 acres. Of the owners, 9891, or about sixty-eight per cent., possessed less than one acre, twenty-six pos- sessed between 2000 and 5000 acres, nine between 5000 and 10,000 acres, and the following six above 10,000 acres each, viz., duke of Portland, 35,209; duke of Newcastle, 34,468 ; Earl Manvers, 26,460 ; Henry Savile, 17,821 ; Lord Middleton, 14,185 ; Earl Howe, 11,601.~~

~~Manufactures.—Nottinghamshire has for more than a century been the ceutre of the hosiery trade of England, and it is now equally famous for its lace manufactures. Besides the numerous silk-mills and worsted-mills, there are also cotton-mills, bleach works, sailcloth works, paper works, iron- and brass-foundries, engineering-shops, chemical works, malt works, tanneries, and breweries.~~

~~Railways.—The county is traversed in various directions by branches of the Midland, the Great Northern, the Manchester, Shet- field, and Lincoln, and the London and North-Western Railways.~~

~~Administration and Population.—Nottinghamshire comprises six wapentakes—Bassetlaw, Broxtow, Bingham, Newark, Rushcliffe, and Thurgarton; and the municipal boroughs of East Retford (population 9748), Newark (14,018), and Nottingham (186,575). In addition to these three boroughs there are eleven urban sanitary districts, viz., Arnold (5745), Beeston (4479), Heanor (6822), Hucknall Torkard (10,023), Hucknall-under-Huthwaite (2028), Ilkeston (14,122), Mansfield (13,653), Mansfield Woodhouse (2618), Sutton in Ashfield (8523), Warsop (1329), and Worksop (11,625). The county has one court of quarter-sessions, and is~~

divided into seven petty and special sessional divisions. The boroughs of Newark and Nottingham have commissions of the peace and separate courts of quarter-sessions, and the borough of East Retford has a commission of the peace. Before the Reform Bill of 1882 the county sent eight members to parliament, and it now returns ten. For parliamentary purposes it is divided into North Nottinghan- shire and South Nottinghamshire, each returning two members, as does also each of the boroughs of Nottingham, Newark, and East Retford. The parliamentary borough of East Retford has an area of 207,906 acres, including, in addition to the municipal borough, the wapentake of Bassetlaw ; on the other hand, the parliamentary borough of Nottingham is now less extensive than the municipal borough. Nottinghamshire is in the province of York, and was almost entirely in the diocese of Lincoln, but an Act of 1878 has provided for the formation of the new diocese of Southwell, which comprises Derbyshire and Nottinghamshire. The county forms an archdeaconry with ten deaneries, comprising 273 civil parishes, townships, or places, and parts of five others. The population, which in 1801 was 140,350, had increascd in 1821 to 186,878, in 1851 to 270,427, in 1871 to 319,758, and in 1881 to 391,815, of whom 190,778 were males and 201,037 females. The number of inhabited houses was 82, 435, and the average number of persons to an acre 0°74.

History and Antiquities.—There is some probability that the numerous caves in Nottinghamshire were occupied by the early inhabitants, but there are no architectural remains which can be proved of earlier date than the Roman invasion. The ancient Fosse Way entered the county from Leicester near Willoughby-on-the- Wolds, where Roman coins and other remains have been found, and proceeded by East Bridgford—supposed by some to be the Roman Margidunum—and Newark, entering Lincoln near South Scarle. Several Roman roads crossed it in various directions. A camp on Holly Hill near Arnold is supposed to have been a central Roman station, and Nottingham may possibly occupy the site of Causennis. Broughton and Attenborough werealso Roman stations ; near Mansfield have been discovered the remains of a Roman villa, and a variety of relics have been found near Newstead and in other places. The remains of an ancient fortress at Brent's Hill near Barton are supposed to be those of a British camp, although it also

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~~At Oxton there |~~

~~in all probability was occupied by the Romans. is a tumulus where coins with ashes have been discovered. Few or no events of historical importance took place within Nottingham. shire during the early centuries of the present era with the excep- tion of the defeat of Alfred the Great at Nottingham Castle in 868. During the 10th century it was frequently invaded by the Danes, whose predominance in it is sufficiently attested by the retention of such suffixes in the proper names as ‘‘beck,” ‘‘holme,” ‘‘thwaite,” ‘‘thorpe,” and “by.” in Nottingham were given to Roger de Buseli, and 55 to William de Peverel, who received the title of earl of Nottingham, and had an honour court, which still exists, for the recovery of debts and damages. The county was the frequent scene of contests during the reigns of the early Norman sovereigns, and it occupied a conspicuous position during the parliamentary wars, the castles of Newark and Nottingham being more than once besieged and taken by each of the parties. Legend speaks of the county as the chief scene of the adventures of the fa- mous outlaw Robin Hood, and at the verge of Sher- wood Forest there exists a curious amphitheatre called Robin Hood’s Hill.~~

~~At the dissolution of the monasteries there were no fewer than forty religious houses in Nottingham- shire, eight of them in the neighbourhood of the town of Nottingham, including a cell, three hospitals, a house dedicated to St Se- pulchre, and monasteries of Grey Friars and White Friars. There were hos- pitals at Bawtry, Blyth, Bradebusk near Gonal- stone, Newark, Southwell, and Stoke; colleges at Bingham, Clifton, Rud- dington, Sibthorpe, South- wall and Tuxford; a Benedictine priory at Blyth, and a nunnery of the same order at Wall- ingwells ; Premonstraten- sian abbeys at Broadholme and Welbeck ; a Carthu- sian priory at Beauvale; Austin abbeysat Newstead and Radford, and Austin priories at Felley, Newark, Shelford, and Thurgarton ; a Cluniac monastery at Lenton, a Gilbertine priory at Mattersey, and a Cis- tercian abbey at Rufford. The only important monastic remains are those at Newstead, but the building has been partly transformed into a mansion-house, which was formerly the a oe of Lord Byron. There are also traces of monastic ruins at Beauvale,~~

Mattersey, Radford, and Thur- garton. The finest parish church in the county is that of Newark. The churches of St Mary, Nottingham, and of Southwell were collegiate churches; the latter contains examples of Norman and the former of Early English. Balderton, Bawtry, Hoveringham, Mansfield, and Worksop are also partly Norman, and Coddington, Hawton, and Upton St Feter near Southwell Early English. Of the old castles, Nottinghain and Newark are the only ones of which there are remains, but there are several interesting old mansions, such as Kingshaugh, Scrooby, Shelford, and Southwell.

For the town and county of Nottingham see Domesday Book relating to Nottingham ; Thoroton, Antiquities of Nottinghamshire (1677) ; Deering, Notting- hamia vetus et nova (1751); Throsby, History of Nottingham (1795); Bailey, Annals of Nottinghamshire (1856); Wylie, Old and New Nottingham (1858, 1865); Felkin, History of Machine-wrought Hosiery (1867); J. H. Brown, Historical

Sketch of Nottingham Castle (1878); Thomas Chambers Hine, Nottingham, its Castle (1876 ; supp., 1879); Briscoe, Old Nottinghamshire (1881),

NorTriINGHAM, a municipal and parliamentary borough of England, a county in itself and the chief town of Nottinghamshire, is finely situated on an acclivity of a rock rising above the Trent and on several railway lines, 128 miles north-north-west of London and 15} east of Derby. It is connected both with the Midland and Great Northern railway systems, while by means of the Trent, the Gran- tham Canal, and the Nottingham, Cromford, and Erewash Canal it has convenient water-communication with the

At the Conquest 174 manors |

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counties of Lincoln, Leicester, Stafford, and Derby. To- wards the north the town is sheltered by a chain of hills, but fine and varied views are commanded towards the south. In the neighbourhood there are many picturesque walks, and the corporation has laid out and ornamented

a picturesque arboretum. Though the older streets are

narrow and irregular, the rapid increase of the town has almost completely altered its character in this respect, most of the new streets being spacious, and some of them con- taining fine ranges of buildings. A new bridge across the Trent was opened in 1871. Nottingham possesses one of the largest market-places in England, its total area being about 5} acres. Shortly after the Conquest a wall was built across the market, dividing it into two parts—the

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Plan of Nottingham.

Norman and the Saxon. There are three old parish churches—St Mary's Church, a fine cruciform structure, lately restored, now entirely in the Perpendicular style, and possessing a fine tower rising from the centre in two stages, crowned with battlements and pinnacles ; St Peter's, which was nearly all rebuilt in the Perpendicular style in the 15th century, and has been enlarged at different times ; St Nicholas, a plain building in red brick with stone facings, erected in 1676. There are numerous fine modern churches, but special mention may be made of the Roman Catholic cathedral of St Barnabas, in the Early English style, by Pugin, erected in 1842-44. Among the secular buildings are the exchange hall which is now used as the town-council chamber; the town or guild hall (rebuilt 1741), a plain stuccoed building; the municipal offices (formerly the post-office, 1848), in the classic style, with a Doric portico; the corn exchange; the county hall; the new post-office, erected in 1868 in the Italian style; the people's hall (1854) ; the Albert Hall, for concerts (1876), a Gothic building with a tower; and the masonic hall (1880). For the Midland Counties Art Museum a lease has been obtained by the corporation of the castle build- ings for 500 years, and the exhibition was opened by the prince of Wales in 1878. The town also possesses a free

museum of natural history, a mechanics' institute, and a free public library with nearly 40,000 volumes. Among the educational establishments the principal are Uni- versity College, for which a splendid range of buildings was opened in 1881; the free grammar school, founded in

1513, for some time in disuse, but revived in 1807, and now, since its removal in 1868 to new buildings, known as the High School; the Nottingham High School for girls ; the blue-coat school, founded in 1723 ; the people's college, founded in 1846 for children of the working classes, and now under the direction of the Board as a middle-class school; the Congregational institute for the education of students, chiefly for evangelistic and mission work ; and the Nottingham school of art, for which a fine building was erected in 1865 in the Italian style, and which is attended by over 500 students. There are a large number of bene- volent institutions, including the general hospital, founded in 1781, and possessing an endowment of over £26,000, the garden hospital, the children's hospital, the nursing institution, the Nottingham and Midland eye infirmary, the dispensary, the lunatic hospital, the lunatic asylum for Nottinghamshire, the Nottingham borough asylum, the Midland institution for the blind, the homes for aged poor, incurable orphans, and deserted infants, and the hospital for women. There are also a large number of almshouses and other charities.

Nottingham has been a manufacturing town for more than 600 years, and towards the close of the last century became an import- ant seat of the stocking trade. It was here that Richard Arkwright in 1769 erected his first spinning frame, and here also Hargreaves had the year previously removed with his spinning jenny after his machine had been destroyed by a mob at Blackburn. While Leicester became the centre of woollen hosiery, Nottingham has devoted itself chiefly to cotton, silk, and merino hosiery. Up to 1815 point lace was also an important manufacture. In 1808 and 1809 John Heathcoat of Nottingham obtained patents for machines for making bobbin net, which inaugurated a new era in the lace manufacture. Besides hosiery and bobbin net lace manu- facture, the industries include bleaching, the dyeing, spinning, and twisting of silk, the spinning of cotton and

~~woollen yarn, tanning, engineering, and brewing. There is also an extensive trade in malt.~~

~~The population increased from 31,638 in 1801 to 79,604 in 1851, to 86,621 in 1871, and to 111,648 in 1881, of whom 51,892 were males and 59,756 females, Up to 1877 the municipal and parlia- mentary limits were coextensive, but in that year the municipal limits were increased from 1996 to 9960 acres, with a population in 1881 of 186,575, of whom 87,633 were males and 98,942 females. The number of inhabited houses in the parliamentary area in 1881 was 23,128, while 915 were uninhabited and 318 building. In the municipal area there were 38,548 inhabited houses, 1429 unill- habited, and 767 building.~~

~~Nottingham, or Snotingaham, is supposed to have been a Celtic settlement. It first became important in the 9th century. For some time after Alfred's defeat in 868 the town was in the hands of the Danes, and constituted one of their five boroughs, but it was restored and repeopled by Edward the Elder, who erected a portion of the town wall, rebuilt the castle, and threw a bridge over the Trent (920-4). The growing importance of Nottingham is evidenced by the fact that Athelstan, the successor of Edward the Elder, established there a royal mint. In 1013 the town submitted to Sweyn. After the Conquest Nottingham Castle was rebuilt to over- awe the people north of the Trent, its governorship being bestowed on William de Peverel, reputed natural son of the Conqueror. And it was whilst residing in it that Roger Mortimer, earl of March, and Isabella, widow of Edward II., were seized in the dead of night by Edward III. in 1330. Parliaments were held at Nottingham in 1334, 1337, aud 1357, and it was the scene of the conference of the judges with Richard II. in August 1387. Several important persons have been imprisoned in the castle, among others David II. of Scot- land. Edward IV. assembled his troops at Nottingham in 1461 ; and it was the headquarters of Richard ITI. before the battle of Bosworth in 1485. In 1642 Charles I. finally broke with the Parlia- ment by setting up his standard at Nottingham, and during the ensuing civil war the castle was held by each of the two parties more than once. In 1644 it was dismantled by Cromwell's orders ; but in 1674-79 it was re-erected in the Palladian style by the duke of Newcastle. During the Reform riot in 1831 it was partly de- stroyed by fire. The town received a charter from Henry II. con- firming privileges~~

~~granted to it by Henry I. In the reign of Henry VI. it was constituted a county under the title of ‘‘the town and~~

~~James II., but restored by William ITI.~~

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~~county of the town of Nottingham.” A surreptitious surrender of its charter was obtained by Charles II., but he was persuaded sub-~~

~~sequently to grant it a new one. This charter was withdrawn by~~

~~Since the reign of Edward I. Nottingham has returned two members to parliament. In 1870 it was made the scat of a suffragan bishop in the diocese of Lincoln.~~

~~‘NOTTINGHAM, Earis or. I. Heneace Frvcu (1621- 1682), first earl, lord chancellor of England, was descended from an old family, many of whose members had attained to high legal eminence, and was the eldest son of Sir Heneage Finch, recorder of London, by his first wife Frances, daughter of Sir Edmund Bell of Beaupré Hall, Norfolk. In the register of Oxford university he is. entered as born in Kent, 23d December 1621, and probably his native place was Eastwell in that county. He was educated at Westminster and at Christ Church, Oxford, where he remained till he became a member of the Inner Temple in 1638. He was called to the bar in 1645, and soon obtained a lucrative practice, acquiring from his persuasive powers the titles of “the silver-tongued lawyer” and “the English Cicero,” and from his graceful action that of the “English Roscius.” He was chosen a member of the convention parliament of April 1660, and shortly afterwards was appointed solicitor-general, being created a baronet the day after he was knighted. In May of the following. year he was chosen to represent the university of Oxford, and in 1665 the university created hima D.C.L. In 1670 he became attorney-general, and in 1675 lord chancellor. He died in Great Queen Street, Lincoln’s Inn Fields, 18th December 1682, and was buried in the church of Ravenstone in Bucks.~~

~~The contemporaries of Lord Chancellor Nottingham of both sides of politics agree in their high estimate of his integrity, moderation, and~~

~~eloquence, while his abilities as a lawyer are sufficiently attested by the fact that he is still spoken of as ‘‘ the father of equity.” His most important contribution to the statute book is “‘The Statute of Frauds.” While attorney-general he superintended the edition of Sir Henry Hobart’s Reports, 1671. He also published Several Speeches and Discourses in the Tryal of the Judges of King Charles L., 1660; Speeches to both Houses of Parliament, 1679; Speech at the Sentence of Viscownt Stafford, 1680. He left Chancery Reports in MS., and notes on Coke’s Jnstitutes.~~

~~See Burnet, History of His Own Time (1724-34) ; Wood, Athenee Oxoniensis (1691); Horace Walpole, Royal and Noble Authors (1758); Lord Campbell, Lives of the Lord Chancellors (1649); Foss, Judges of England (1848-64) ; and Black- stone, Commentaries,~~

~~II. Danren Frou (1647-1730), second earl, son of the preceding, entered parliament for Lichfield in 1679. He was one of the privy councillors who in 1685 signed the order for the proclamation of the duke of York, but during the whole of the reign of James II. he kept away from the court. At the last moment he hesitated to join in the invitation to William of Orange, and after the abdication of James II. he was the leader of the party who were in favour of a regency. He declined the office of lord chan- cellor under William and Mary, but accepted that of secretary of state, retaining it till December 1693. Under Anne he in 1702 again accepted the same office in the ministry of Godolphin, but finally retired in 1704. On the accession of George I. he was made president of the council, but in 1716 he finally withdrew from office. He succeeded to the earldom of Winchelsea 9th September 1729, and died 1st January 1730.~~

~~NOVALIS. See HaRDENBERG, vol. xi. p. 472. ;~~

~~NOVARA, a city of Italy, the chief town of a province, stands between the Agogna and the Terdoppio on a hill 545 feet above sea-level in the plain between the Sessia and the Po. It is an important railway junction, 30 miles west of Milan, on the main line from Turin to Venice, which there connects with the continuation of the St Gotthard line and the Simplon route, as well as with a line to Alessandria and Genoa. Previous to 1830 Novara was still surrounded by its old Spanish ramparts, which were entered by only four gates, and gave the place a~~

~~Plate IV.~~

~~'pronounced against the followers of Fra Dolcino.~~

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~~heavy appearance from the outside; it is now an open modern-looking town. Part of the old citadel is used as a prison. Of the churches it is enough to mention the cathedral, originally dating from 400, but (with the excep- tion of the octagonal dome-roofed baptistery, separated from the west end by an atrium) rebuilt in the Roman- esque style between 1860 and 1870 after designs by Antonelli; the church of 8. Gaudenzio (so called after Bishop Gaudentius (0b. 417), who is buried under the high altar), rebuilt by Pellegrino Pellegrini Tibaldi, with its strange tower, more than 269 feet high; and San Pietro del Rosario, in which the papal anathema was The city also contains handsome market-buildings erected in 1817-42, a large hospital originally dating from the 9th century, a court-house constructed in 1346, a muni- cipal library of 30,000 volumes (located in the market-buildings), a theatre, a statue of Cavour by Dini (1863), and another of Charles Albert. Besides being the largest grain market in the north-west of Italy, Novara trades in silk, linen, &c., and manufactures cotton, waxcloth, pot- tery, and starch. The communal population was 20016 in 1871, and 33,077 in 1881; that of the city was 15,232 (or, with its suburbs, S. Martino, 8. Andrea, 8. Agabio, Bicocea, and Torrion, 26,206) in 1881.~~

~~Novara, the ancient Novaria, according to Pliny of Gaulish, according to Cato of Ligurian origin, was a municipal city of some importance during the Roman empire. Dismantled in 386 by Maximus for siding with his rival Valentinian, it was restored by Theodosius ; but it was afterwards ravaged by Radagaisus (405) and Attila (452), A dukedom of Novara was constituted by the Lom- bards, a countship by Charlemagne. In 1110 the city was taken and burned by the emperor Henry V. Before the close of the 12th century it accepted the protection of Milan, and thus passed into the hands first of the Visconti and secondly of the Sforzas. In 1706 the city, which had long before been ceded by Maria Visconti to Amadeus VIII. of Savoy, was occupied by the Savoy troops. At the peace of Utrecht it passed to the house of Austria along with the duchy of Milan; but, having been occupied by Charles Emmanuel in 1734, it was granted to him in the~~

following year. Under the French it was the chief town of the department of Agogna. Restored to Savoy in 1814, it was in 1821 the scene of the defeat of the Piedinontese by the Austrians, and in 1849 of the more disastrous battle which led to the abdication of Charles Albert and an Austrian occupancy of the city. Natives of Novara are C. Albucius Silus (ancient rhetorician) and Gaudenzio Ferrari (many of whose works are preserved in the city); and Peter Lombard was born at Lumello in the neighbourhood. The chapel-mastershi has been held by some of the greatest Italian musicians, Paganini, Mercadante, La Coccia, &c.

NOVA SCOTIA, originally Acadia, a province of the Dominion of Canada, lies between 43° 25’ and 47° N. lat. and 59° 40’ and 66° 25’ W. long., and is composed of the peninsula proper and the adjoining island of Carr Breton (q.v.), Which is separated from the mainland by the Gut of Canso. It is bounded on the N. by Northumberland Strait (which divides it from Prince Edward Island) and the Gulf of St Lawrence, N.E., S.E., and §. by the Atlantic Ocean, and W. by the Bay of Fundy and New Brunswick, being connected with the latter province by a narrow isthmus 134 miles wide. The extreme length from south-west to morth-east is 350 miles, the breadth 120 miles, and the area 20,907 square miles (13,382,003 acres).

Physical Features.—The province is intersected by chains of lofty hills, in most instances running parallel with the coast-line. The Cobequid Mountains, stretching in a long line from east to west and terminating in Cape Chignecto, form the chief ridge, Several of the elevations are as high as 1100 feet, and are cultivable almost to their summits. Lying on each side of this range are two ex- tensive tracts of arable land which yield profitable crops. A. sharply-outlined ridge of precipices runs for 130 miles along the Bay of Fundy from Briar Island at the farthest extremity of Digby Neck to Capes Split and Blomidon.

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Here and there masses of trap rocks, averaging from 200 to 600 feet in height and crowded with stunted firs, over- hang the coasts. Beyond them lies the garden of Nova Scotia, the valley of the Annapolis, full of varied scenery, and unrivalled for its fruit, flowers, and cereals. The general slope of the country is south-easterly, in which direction there are several chains

~~of lakes, the source of many rivers and streams of moderate length. The south- eastern coast is remarkable for its harbours, twelve of which are capable of affording shelter to ships of the line, while between Canso and Halifax, a distance of 110 miles, there are fourteen ports which possess ample accommo- dation for merchantmen of average size. The principal inlets are Bay Verte, Tatamagouche, and St George's Bay in Northumberland Strait ; Chedabucto Bay at the head of the Gut of Canso; Halifax Harbour, Margaret's and Mahone Bays on the south-east coast ; St Mary's Bay on the south-west; Annapolis Basin, Minas Basin and Channel, and Cobequid Bay on the west. Of these the most remarkable is Minas Basin, the eastern arm of the Bay of Fundy ; it penetrates some 60 miles inland, and terminates in Cobequid Bay, where the tides rush in with savage impetuosity, rising sometimes as high as 60 feet, while on the opposite coast, in Halifax Harbour, the spring tides scarcely exceed 7 or 8 feet. The principal inlets in Cape Breton are Aspy Bay, St Anne's Bay, Sydney Harbour, Miré Bay, and St Peter's Bay. All along the coast of Nova Scotia there are many small islands, the south-east shore being literally studded with them. The chief are Caribou and Pictou in Northumber- land Strait; St Paul, Scatari, and Isle Madame off the coast of Cape Breton. Sable, a dangerous and sandy island, almost barren, lies 150 miles east of Halifax, and has long been noted as the scene of fearful shipwrecks. Its length is 25 miles by about 14 miles in breadth, the eastern end being in 43° 59' N. lat. and 59° 45' W. long. An effective humane establishment is maintained on this island by the provincial Government. Other islands are Cape Sable, Seal, and Mud in the south, and Long Island at the entrance of St Mary's Bay. The principal capes (apart from those of Cape Breton) are Malagash, John, and St George on the northern coast ; Porcupine, Canso, Sambro Head,. Pennant Point, Crown Point, and La Have on the south-east ; Sable on the south; St Mary, Split, Chignecto, and Blomidon on the west. The interior of the country is traversed and watered by many rivers and lakes, which cover an estimated area of 3000 square miles. The rivers are, with few exceptions, navigable for coasting vessels for distances averaging from 2 to 20 miles. The principal are the Annapolis, Avon, Shubenacadie, East, Middle, and West, St Mary's, Musquodoboit, La Have, Mersey. The Annapolis river, which is navigable for a long distance, takes its rise in King's county, flows be- tween the North and South Mountains through a fertile tract of territory and discharges into Annapolis Bay. The~~

Shubenacadie flows from the Grand Lake in Halifax county, receives the waters of ten other streams, and, after winding through Hants county, empties itself into Minas Basin. It is navigable for craft of large size, and its

'banks are rich in forest trees. The East, West, and Middle

rivers, also navigable for similar vessels, discharge into Pictou Harbour. The La Have empties into the Atlantic, the Avon into the Bay of Fundy, and the Mersey into Liverpool Harbour. The Medway, Shelburne, Clyde, Tusket, St Mary's, and several others have their sources in the numerous lakes which lie in the interior. The largest of the latter is Lake Rossignol, situated in Queen's county, and more than 20 miles long. Ship Harbour Lake, 15 miles in length, and Grand Lake are in Halifax county, College Lake is in the eastern part of XVII. — 76

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the peninsula. The Bras d'Or Lake (Cape Breton) may be best described as an imprisoned sea. It is 50 miles long and of great depth, bordered by the counties of Victoria, Inverness, Richmond, and Cape Breton ; it is full of fish, and expands into several streams and bays, each of which affords excellent sport to the angler.

Geology.—The Lower Cambrian runs along the whole extent of the Atlantic seaboard in one uninterrupted line. To the north of this stretches an extensive district coin- posed of rocks of Upper Silurian and probably others of Lower Silurian age. Along the section on the south coast of the Bay of Fundy, and at Minas Basin and Channel, is to be found the New Red Sandstone formation. Grey granite, gneiss, and mica-slate prevail along the shore. Trap rocks, often embedded in clay-slate, abound in several sections of the province, and the newer Red Sandstone prevails in the western division. There are vast Carboniferous beds, occupying a large area, and forming a source of great wealth to the inhabitants. Millstone grit, the gypsiferous series, limestones, slates, the metamorphic series, the Huronian, d&c., are also to be noted. The Carboniferous plain of New Brunswick is connected with that of Nova Scotia at its eastern extremity. The coal-fields of the latter are especially valuable and productive. They are situated in Cape Breton, Cumberland, Pictou, Inverness, and Rich- mond counties. In

~~1882 there were twenty-one collieries in operation, which produced 1,365,811 tons of coal, consumed principally in Quebec, New Brunswick, New- foundland, Prince Edward Island, and the United States. About 4235 persons are employed in this industry. The coal is bituminous and very rich in quality. In the Carboniferous areas there are immense deposits of pyro-schist or bituminous shale, "capable," says Dawson, "of yielding as much as 63 gallons of oil, or 7500 feet of illuminating gas per ton. Owing to the great cheapness of petroleum little attention has been paid to these shales for some years, but it is likely that they will before long again be in demand."~~

~~Gold is found in workable quantities, the production in 1882 being 14,107 ounces. The gold district includes Caribou, Gay's River, Montagu, Oldham, Renfrew, Sher- brooke, Stormont, Tangier, Uniacke, Waverley, Wine Harbour, and unproclaimed,—thirty mines in all. Iron ore abounds also in profitable quantities, and of excellent quality ; the production in 1882 was 42,135 tons. Other minerals, such as manganese ore, gypsum, barytes, &c., abound. A fair business is annually done in coke, fire- clay, building-stone, and grindstones. Some veins of copper, silver, lead, and galena, especially rich in quality, exist. There are many curious and beautiful fossils, besides amethysts, agates, chalcedonies, jaspers, cairngorms, &c.~~

~~Climate and Vegetation.—The climate of Nova Scotia somewhat resembles that of New Brunswick. There are extremes of heat and cold, and sudden changes of tempera- ture, varying Sometimes in one day as much as 50°. Con- sidering its northern latitude, it is remarkably temperate on the whole. The extreme of cold is about 20° below zero in the depth of winter, and the greatest heat is 98°. The climate varies in the different counties, those in the west averaging from 6° to 8° Fahr. warmer than those in the east. The coldest period is from the end of December to the first week in March, during which the weather is tolerably uniform. The spring is usually brief and chilly, but the autumn, which is the most favoured season of the year, is delightfully pleasant. Vegetation develops rapidly. At certain times dense fogs line the banks along the Atlantic coast, but they are not considered unhealthy.~~

Nova Scotia is a valuable agricultural country ; wheat, oats, rye, barley, buckwheat, Indian corn, potatoes, tur-

high lands are as productive as the intervales. produce in 1881 was of barley, 47,567 of rye, buckwheat, 37,220 of pease and beans, 8128 of grass and

in the sister province. birch, maple, hemlock, yield of timber is very great, amounting in value to $1,587,941.

thelist. At factory in Halifax.

weonping paper, machinery, nails, gunpowde

N@VA SCOTIA

nips, beets, tomatoes, &c., grow in abundance, while apples, pears, plums, berries, gooseberries, perfection. air in some districts. of commerce, and quantities have been exported to Eng-

cherries, strawberries, raspberries, cran- currants, and other fruits ripen to Even grapes and peaches grow in the open The Nova Scotia apple is an article

land. ‘The orchards of Annapolis and King’s counties ex- tend along the roadsides for upwards of 50 miles. The soil is of various degrees of fertility. The intervale lands,

which form an extensive part of the country, are rich, and yield largely. The uplands, lying between the hilly

sections and the rivers, are of moderate capacity. The The 529,251 bushels of wheat, 228,748 1,873,113 of oats, 339,718 of

clover seeds, 7,378,387 of potatoes, 1,006,711 of turnips, 326,143 of other roots, and 597,731 tons of hay. Of live

stock there were 57,167 horses, 33,275 working oxen,

137,639 milch cows, 154,689 other horned cattle, 377,801

sheep, and 47,256 swine.

The forests of Nova Scotia are extensive and valuable, the principal trees found in New Brunswick also growing They are chicfly pine, oak, tamarack, spruce, butternut, ash, &c. The the shipments in 1881

Industrics, Commerce, d&e.—Nova Scotia is not strong as a manu- facturing country, but every year some new industries are added to yresent there are two sugar-refineries and a cotton- Coarse "homespuns," coarse flannels, bed- linen, blankets, carpets, and tweeds are made in considerable quantities. Tanning is extensively carried on, and there are several factories where household and other furniture, agricultural imple- nents, boots and shoes, saddlery, harness, tobacco, printing and pails and wooden ware, fuse r, carriages, and sleighs, &c., are made. In 1881 the province contained 1190 saw-mnills, 263 grist-mills, 151 tanneries, 68 carding and weaving establishments, 8 breweries, and various other manufactories ; 217,481 tb of maple sugar were produced. The value of the boots and shoes manufactured was $754,128, of iron smelted $720,000, and of sugar refined $1,702,000. 'The ex- ports of mining produce amounted to $676,078, of agricultural products to $830,804, of manufactures to $487,508, and of animals and their produce to $836,052. The total exports were $9,217,295 and the total imports $8,701,589. Shipbuilding is extensively carried on. In 1882 there were 122 vessels built, tonnage 31,361 ; and 174 vessels of all classes were registered. In the same year 6615 craft, representing a tonnage of 709,167, were engaged in the coasting trade. The total number on the registry books of the province was 3026, tonnage 546,778.

Next to Newfoundland, Nova Scotia possesses the largest and most valuable fisheries in British North Aimerica. Along the entire coast, extending over 1000 miles, food fish of almost every descrip- tion (salmon, trout, cod, holibut, haddock, bass, mackerel, herring, shad, lobsters, &c.) may be taken. Immense quantities of these are shipped to the West Indies, the United States, various ports in Canada ; and of late years several varieties have been welcomed in British markets. In 1882 fish to the value of $4,437,364 were exported. About 19,000 men are employed in this industry.

Most of the principal birds of North America are to be found in Nova Scotia, and the game of the country includes moose, caribou, duck, teal, geese, woodcock, partridge, snipe, plover, &c. The game laws are very strict, and are rigidly enforced. The wild animals remaining in the province are bears, wolves, foxes, wild-cats, and a few others.

Communication.—Nova Scotia is well furnished with railways, there being nearly 600 miles in operation at the present time. The Intercolonial runs from Halifax to Amherst, 138 miles, and thence to St John, N.B., and Quebec. There are two canals in the province, one from Halifax to Cobequid Bay, and the other, the St Peter's, con- necting St Peter's Bay on the southern side of Cape Breton with the Bras d'Or Lake. The roads of Nova Scotia are exceedingly good and well maintained. Telegraphic lines are established nearly all over the province, and connect with the United States system.

Government, Finance, d&c.—The executive authority is in the hands of a lieutenant-governor and a council of eight members, four with portfolios and four without. Thirty-eight representatives are elected every four years to the house of assembly, and twenty legislative councillors are appointed for life by the local govern-

ment. The lieutenant-governor is appointed by the governor- general of Canada in council. The system of administration is known as responsible government. The province returns twenty- one members to the Dominion House of Comnions, and ten senators are appointed by the crown to the senate of Canada. They hold their positions for life. The province has the right to make its own civil laws, but in all criminal cases the form which obtains in all the courts is the criminal law of the Dominion. 'The judiciary consists of a chief justice, an equity judge, and five puisne judges, a supreme court having law and equity jurisdiction throughout the province, a vice-admiralty court, and a court of marriage and divorce. In each county there is a court of probate. There are also seven county court judges.

Nova Scotia forms the ninth military district in the militia of Canada. The established strength of the active force by arms is composed of 1 troop of

cavalry, 1 field battery of artillery, 17 bat- teries of garrison artillery, 9 battalions of infantry and rifles; total, 318 officers, and 3638 non-commissioned officers and men. The period of service in time of peace is three years. British regiments of the line are also stationed at Halifax.

The public revenue of the province is a little more than half a niillion dollars annually, and the expenditure is about the same. The chief source of revenue is the yearly subsidy granted to the province by the Dominion, under the terms of the British North America Act of 1867. In 1882 it amounted to $380,000. The remainder of the revenue is dcrived from the sales of wild lands, royalties from mines, miscellaneous fees, marriage and other licences.

Religion, Education, &c.—There are two Roinan Catholic dioceses in Nova Scotia—the archdiocese of Halifax and the diocese of Arichat ; the clergy of the two combined number 76. A Church of England sce was established at Halifax in 1787 ; the bishop, who has jurisdiction in Prince Edward Island also, has under him an archdeacon and 85 clergymen. The synod of the maritime provinces in connexion with the Presbyterian Church in Canada includes 101 ministers in Nova Scotia. The Methodist Church has 100 clergymen and supernumeraries, and the Baptist denomination has 104. The following table shows the number of the adherents of the various bodies :—

Church of England ..... 60,255 Tiatheransin.clesee ented ac seicine 5,639 Church of Rome .. .117,487 AA ENISUST: asso cs.scjecireu sic etic ce 1,536 Presbyterians … 112,488 Other denominations ..... 8,331 Baptists .....005 … 83,761 URS oceania coca cnerne merpane 1g) MMC CNOOISUS 5… cinvcviee se siecle 50,811 Nolereed'stateds:....<..2.4. 02 1,618 Ofmio religion: fs. secan.- ss) 121 — — Congregationalists ..... 3,506 | Mota ere cycvs sec cetnc oe 440,572

The free-school system is in operation, the whole community paying for its maintenance. The total Government expenditure for this service in 1882 was $173,877 ; the local expenditure, county fund, was $106,948; the total expenditure for public schools amounted to $571,389. In this year there were 1910 schools in operation, taught by 1975 teachers, and attended by 81,196 pupils. Besides the public schools and academies, there are a model

~~and a normal school, several couvents, and six colleges, viz., Dalhousie College and University, St Mary's (R.C.) College, the Presbyterian College, Acadia College (Baptist) at Wolfville, St Francis (R.C.) Col- lege at Antigonish, and King's College and University (Episcopal) at Windsor, which was founded in 1787.~~

~~The public charitable institutions receiving aid from the province are the insane asylum, poor's asylum and provincial city hospital, blind asylum, transient poor and visiting dispensary, and the deaf and dumb asylum, which is also helped by the New Brunswick Government. Several other institutions are maintained by societies and the benevolence of private individuals.~~

~~Population.—The province is divided into eighteen counties (including Cape Breton), as follows (1881) :—~~

~~Counties. Pop. Capitals. || Counties. Pop. Capitals. Halifax ….} 67,917 | Halifax. ; Cuinberland | 27,368 | Amherst. Lunenburg ..} 28,583 | Lunenburg. Colchester ..| 26,720 | Truro. Queen's ….{ 10,577 | Liverpool. Pictow cae ee 35,535 | Pictou.~~

~~Shelburne ..} 14,913 | Shelburne. Antigonish ..} 18,060 | Antigonish.~~

~~Yarmouth ..| 21,284 ; Yarmouth. Guysborough } 17,808 | Guysborough. Dicey… fers = 19,881 } Digby. Inverness ..| 25,651 | Port Hood. Annapolis ..} 20,498 | Annapolis, Richinond ..} 15,121 | Arichat. IRIN EES) cre cre 23,469 | Kentville. : Cape Breton | 31,258 | Sydney. FEVENTU GSW «sa su0 23,359 | Windsor, | Victoria …{ 12,470 | Baddeck.~~

~~The total population was 440,572, including 220,538 males and 220,034 females. In 1871 the population was 387,800. There are 2125 Indians in Nova Scotia, principally Malicites and Micmacs. The inhabitants consist chiefly of Scotch, English, Irish, American, German, Acadian French, Dutch, freed negroes, of whom there are 7062, and various other nationalities.~~

~~Besides Halifax, the capital, of which the population in 1881 was 36,100, the chief towns are Pictou (3403), New Glasgow (2595), Sidney (Sydney),~~

C.B. (3667), North Sydney (5484), Yarmouth (6280), Liverpool (3000), and Lunenburg (4007). Windsor (3019), possessing one of the principal colleges in the province, is also the

centre of a large trade in gypsum. Annapolis, formerly Port Royal, Truro, Amherst, Antigonish, and Pugwash are also rising and thriving towns.

History.—Nova Scotia was first visited by the Cabots in 1497, but it was 1604 before any attempt at colonization by Europeans was made. This was the expedition headed by De Monts, a Freuch- man, which tried to form settlements at Port Royal, St Croix, and elsewhere, and endured severe hardships until 1614, when the English colonists of Virginia made a descent upon them, claimed the terri- tory in right of the discovery by the Cabots, and expelled them from the soil. In 1621 Sir William Alexander obtainced a grant of the whole peninsula, and it was named in the patent Nova Scotia instead of Acadia, the old name given the colony by the French. Alexander intended to colonize the country on an extensive scale, but the attempt was frustrated (1623) by the French. During the reign of Charles I. the Nova Scotia baronets were created, and their patents ratificd in parliament. Their number was not to exceed 150, and in exchange for their titles and grants of land they agreed to con- tribute aid to the settlement. Cromwell despatched a strong force to the possession in 1654. In 1667 it was ceded by the treaty of Breda to the crown of France. But the restless English colonists, unmindful of treaty obligations, attacked the French from time to time at various points, until in 1713 the latter relinquished all claim to the country. England neglected it until 1749, when, the designs of the French again becoming marked, the Government inade strenuous exertions to induce British settlers to go there. More than 4000 emigrants with their families sailed for the colony ; and Halifax was founded. But the French settlers, who enjoyed privi- leges as neutrals, still embraced a considcrable portion of the population, and, with their allies the Indians, proved exceedingly troublesome to the English. They were finally expelled; and in 1758 a constitution was granted to Nova Scotia. By the treaty of Paris in 1763 France resigned all pretension to the country. In 1784 New Brunswick and Cape Breton were separated front Nova Scotia ; but in 1819 the two latter divisions were reunited, and in 1867 they became part of the Dominion of Canada.

~~See Campbell, Nova Scotia in its Historical, Mercantile, and Industrial Rela- tions (Montreal, 1873); Dawson, Acadian Geology (Montreal, 1878); Fletcher in Report of the Geological Survey of Canada (1879-80); Pub. Docs, 'Nova Scotia aud Dominion of Canada (1882-83)." (G. ST.)~~

~~NOVATIANUS, Roman presbyter, and one of the earliest antipopes, founder of the sect of the Novatiani or Novatians, was born about the beginning of the 3d century. On the authority of Philostorgius (1. Z., viii. 15), he has often been called a native of Phrygia, but perhaps the historian intended by this nothing more than to indicate the Montanistic complexion of Novatian's creed. Of the facts of his life very little is known, and that only from his opponents. His conversion is said to have taken place after an intense mental struggle; he was baptized by sprinkling, and without episcopal confirmation, when on a sick-bed in hourly expectation of death; and on his re- covery his Christianity retained all the stern and gloomy character of its earliest stages. He was ordained to the priesthood at Rome by Fabian, or perhaps by an earlier bishop ; and during the Decian persecution he maintained very strenuously the severer view of the church's disci- plinary function, which would have excluded for ever from ecclesiastical communion all those (lapsi) who after baptism had ever sacrificed to idols,—a view which had frequently found expression within the church previously, and which had indeed been the occasion of the schism of Hippolytus. Bishop Fabian suffered martyrdom in January 250, and, when Cornelius was elected his successor in March or April 251, Novatian objected to the new bishop on account of his known laxity on the above-mentioned point of disci- pline, and allowed himself to be consecrated bishop by the minority who shared his views. He and his followers were excommunicated by the synod held at Rome in October of the same year. He is said by Socrates (H/. E., iv. 28) to have suffered martyrdom under the emperor Valerian. After his death the Novatians, in spite of much opposition, increased, and spread rapidly to almost every province of the empire ; they called themselves kaapot, or Puritans, and insisted on rebaptizing their converts from the Catholic view. The eighth canon of the council of Nice provides in a spirit of considerable liberality for the readmission of the clergy of the xa@apot to the Catholic~~

Church, and the sect finally disappeared some two centuries after its origin. Novatian has sometimes been confounded with his contemporary Novatus, a Carthaginian presbyter, who held similar views.

Novatian was the first Roman Christian who wrote to any con- siderable extent in Latin. Of his numerous writings three are extant: (1) a letter written in the name of the Roman clergy to Cyprian in 250; (2) a treatise in thirty-one chapters, De Triniiate ; (3) a letter written at the request of the Roman laity, De Cibis Judaicis. They are well-arranged compositions, written In an elegant and vigorous style. The best editions are by Welchman (Oxford, 1724) and by Jackson (London, 1728) ; they are translated in vol. ii. of Cyprian's works in the Ante-Nicene Theol. Libr, (Edin- burgh, 1869). The Novatian controversy can be advantageously studied in the Epistles of Cyprian.

NOVATION isa term derived from the Roman law, in which novatio was of three kinds—substitution of a new debtor (expromissio or delegatio), of a new creditor (cessio nominum vel actionum), or of a new contract. In English law the term (though it occurs as early as Bracton) is scarcely yet naturalized, the substitution of anew debtor or creditor being generally called an assignment, and of a new contract a merger. It is doubtful, however, whether merger applies except where the substituted contract is one of a higher nature, as where a contract under seal supersedes a simple contract. Where one contract is re- placed by another, it is of course necessary that the new contract should be a valid contract, founded upon sufficient consideration (see Contract). The extinction of the previous contract is sufficient consideration. The question whether there is a novation most frequently arises in the course of dealing between a customer and a new partner- ship, and on the assignment of the business of a life assurance company with reference to the assent of the policyholders to the transfer of their policies. The points on which novation turns are whether the new firm or com- pany has assumed the liability of the old, and whether the creditor has consented to accept the liability of the new debtors and discharge the old. The question is one of fact in each case. See especially 35 and 36 Vict. c. 41, s. 7, where the word "novations" occurs in the marginal note to the section, and so has quasi-statutory sanction. Scotch law seems to be more stringent than English law in the application of the doctrine of

novation, and to need stronger evidence of the creditor's consent to the transfer of liability. In American law, as in English, the term is something of a novelty, except in Louisiana, the only State where the civil law prevails.

NOVA ZEMBLA, or, more correctly, NovAYA ZEMLYA (i.e. "New Land"), is a large island, surrounded by many small ones, situated in the ARcTIc OcEAN (see vol. ii., plate xxvi.), and belonging to the Russian empire. It lies be- tween 70° 30' and 77° N. lat. and between 52° and 69° E. long., in the shape of an elongated crescent 600 miles in length, with an average width of 60 miles, and an esti- mated area of 40,000 square miles, separating the Kara Sea on the east from that part of the Arctic Ocean which is often called Barents's Sea. The north-eastern extre- mity of Novaya Zemlya lies a little to the west of the meridian of the peninsula of Yalmal, from the extremity of which it is only 160 miles distant. Its southern part, bending towards the south-east, appears as a continuation of the Vaigatch (Vaygach) Island, from which it is sepa- rated by the Kara Strait, 30 miles in width,—the island itself being separated from the continent by the narrow Ugrian Strait, only 7 miles broad. Novaya Zemlya is cut through about the middle by a narrow winding channel, the Matotchkin (Matochkin) Shar, which also connects the Arctic Ocean with the Kara Sea.

While the eastern coast runs as a regular curve, with deeper indentations only in its middle, the western is deeply indented by numerous and in some cases fjord-like

lat.; Méller Bay,

NOV—NOV

bays, studded, like the rest of the coast, with many islands. Amongst the principal on the western coast are several parallel fjords at the southern extremity and the wide bay of Sakhanikha. bounded on the north by Cape Podrezoff, which forms the southern extre- pee

mityof Gusinaya |

Zemlya or Goose

~~Then farther north is the Kostin Shar,~~

~~Land, in 72° N.~~

~~40 miles wide, between Goose Land and Britvin Promontory, has several fjord-like bays, with good anchorages. A broad — — indent- ation between Britvin and Suk- hoi Nos Promon- tories, which has received the general name of Marquis de Traversé Bay, includes several bays with good anchorages for larger — vessels. Several other large and deep bays follow until Admiralty Penin- sula (75° N. lat.) is .reached ; of these the chief are Krestovaya and Mashigin. on, Nordenskjéld's Bay is worthy of notice. Orography and Geology. — The interior of Novaya Zemlya is almost unknown ; still, the broad features of its structure can be inferred from data obtained at various points on the coast. Two orographical regions must be distinguished. The first of these, south of lat. 72°, appearing as a continua- tion of the Pay-Kho mountains, is a plateau of moderate height, with several low parallel ridges (2000 feet) running north-west, and separated by level valleys dotted with numerous lakes. It consists of gneisses and clay-slates, with layers of augitic porphyry (north of Kostin Shar), and thick beds of Silurian and perhaps Devonian limestones, continued on Vaigatch Island, where they are partially covered with Carboniferous deposits. On the north- west it terminates in the low plateau (300 to 400 feet) of Goose Land. The middle and northern parts of Novaya Zemlya, on the other hand, form an alpine region with isolated peaks and a complicated system of spurs and deep valleys, extending even under the sea. Instead of being, as it has been frequently described, a single chain running in the main direction of the island closer to its western coast, it appears to be rather a system of shorter chains running due north-east, and disposed in échelons displaced east- wards as they advance towards the north. They terminate seawards in several promontories having the same direc- tion; but the difference of the geological structure on the two sides of the Matotchkin Shar would suggest that it is rather a combination of two longitudinal valleys connected by a transverse cleft than one transverse valley. The highest parts of the alpine region (the Mitusheff Kamei, 3200 feet ; Wilezek, 3900 feet; and other peaks to the west rising perhaps to 4000 and 4650 feet) are in the neighbourhood of this channel; south of the eastern en-~~

~~Map of Nova Zembla.~~

~~Farther~~

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~~trance is a peak about 5000 feet in height. Farther north the region sinks much lower, while that part of northern Novaya Zemlya which bends eastward seems to consist of a more massive swelling of land, covered with an immense ice-sheet descending north and south to the sea-coast. The whole of the alpine region is covered with fields of snow descending in broad strips along the slopes of the isolated peaks, and feeding glaciers in the deeper valleys.~~

~~The geological structure of the central region is of the most varied description. The primary rocks which appear at Mitusheff Kameii are overlaid with thick beds of quartz- ites and clay-slates containing sulphite of iron, with sub- ordinate layers of talc or mica slate, and thinner beds of fossiliferous limestone, Silurian or Devonian. More recent clay-slates and marls belonging to the middle Jurassic occur in the western coast-region about Matotchkin Shar. About 74° N. lat. the crags of the eastern coast are composed of grey sandstone, while in 76° Barents's Islands, and possibly a much greater part of the northern coast, show Carboni- ferous strata. 'Traces of Eocene deposits, produced under a warmer climate, which are so widely developed in other parts of the polar basin, have not yet been discovered on Novaya Zemlya. During the Glacial period its glaciers were much larger than at present, whilst during a later portion of the Quaternary period (to judge by the marine fossils found as high as 300 feet above the sea) Novaya Zemlya, like the whole of the arctic coast of Russia, was submerged for several hundred feet. At present it appears to partake of the movement of upheaval common to the whole of northern Russia.~~

~~Climate.—Though inilder than that of north-eastern Siberia, the climate of Novaya Zemlya is colder even than that of Spitzbergen. The average temperature about the Matotchkin Shar has been found from three years' observations to be 17° Fahr., and it decreases towards the south, being only 14°°9 at Kamenka (70° 35' N.). At Shallow Bay, in 73° 55', it has been found to be 19°°6. In the middle parts of the western coast the average~~

~~temperature of the winter is — 4°; that of the summer at Matotchkin Shar is 36°°5, — that is, lower than at Boothia Felix, or Melville Island. On the western coast also warm west winds bring considerable moisture, which is condensed by the mountains, and thus a cloudy sky inter- cepts the already scanty sunlight. On the eastern coast the summer temperature is less still, the average for the year being probably 2° Fahr. lower than that of corresponding latitudes of the western coast. The coastsof Novaya Zemlya are less icebound than might be supposed owing to the influence of a warm current which flows along the coast on the north-west, and which may be considered as a continuation of the Gulf Stream. 'There are years in which the island can be circunnavigated without difficulty. The southern shores, besides experiencing the cold influence of the Kara Sea, are washed by a cold current which issues from Kara Strait and flows northwards along the south-western coast.~~

~~Flora.—Grass does not grow to any extent except in Goose Land, where the soil is covered with finer débris. Elsewhere even the leaved lichens are precarious, though the leather lichens flourish, especially the Vermicaria geographia. Of Phanerogams, only the Dryas octopetala covers small areas of the débris, and is interspersed with isolated Cochlcaria, Stercocaulon paschale, and Papaver nudi- caule, Silene acaulis, Saxifraga oppositifolia, Arenaria rubella, five or six species of Draba, as well as the Dryas octopetala and Myosotis, are found where the débris permits. Where a layer of thinner clay has been deposited in sheltered places, the surface is covered with Platypetalum purpurascens, Saxifrage, and Draba alpina ; and a carpet of mossces allows the Salix polaris to develop its two dwarf leaflets and its catkins. Wherea thin sheet of humus, fertilized by lemmings, has accumulated in the course of ages, the Rhodiola rosea, the Krigon uniflorum, a Ranuneulus nivalis, or an Oxyria reniformis make their appearance, with here and there a Vaceinium (which, however, never flowers). Even where a carpet of plants has developed under specially favourable circumstances, they do not dare raise their stems more than a few inches, and their brilliant flowers spring direct from the soil, concealing the developed leaflets, whilst their horizontally-spread roots grow out of proportion ; only the Salix lanata rises to 7 or 8 inches, send- ing out roots 1 inch thick and 10 to 12 feet long. understands how these plants propagate ; vegetation seems to be maintained, at least partially, by seeds bronght by~~

birds or by currents. All this, of course, applies only to the better-known neighbourhoods of Matotchkin and Kostin Straits; north of 74° N.

One hardly

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but very few species have been found at all (Saxifraga oppositi- folia, Papaver nudicaule, Draba alpina, and Oxyria digyna). In all, the phanerogamic flora of Novaya Zemlya and Vaigatch now numbers 185 species, of which 30 have not yet been found on the main island, but may yet be discovered in its southern part. Of the total, 131 are Dicotyledons. As to the much -discussed genetic connexions of the Novaya Zemlya flora, it appears, according to M. Kjellmann's researches, that it belongs to the Asiatic arctic region rather than to the Europcan. Eleven species are what Hooker and Grisebach regard as old glacial, 56 are purely alpine, and 6 have been found in other alpine regions of Europe ; 36 non-alpine species belong to the flora of middle Europe, 41 to the Scandinavian flora, and only 16 to that of arctic Russia, whilst 29 have not been found in Europe at all. Altogether, 156 species are European (132 from arctic Europe), and 177 Asiatic (164 from arctic Asia), whilst 11 are wanting in both arctic Europe and Asia.

auna.—The desolate interior of Novaya Zemlya shows hardly a trace of animal life, save perchance a solitary vagrant bird, a few lemmings, an ice-fox, a brown or white bear, and at times immigrant reindeer. Even insects are few ; the very mosquitoes of the tundras are wanting, and only a solitary bee flies among the scanty flowers. The sea-coast, however, is occupied by countless nuinbers of birds, which come from the south for the breeding season, and at certain parts of the sea-coast the rocks are covered with millions of Uria troile, and the air is resonant with their cries, while numberless flocks of ducks, geese, and swans swarm every summer on the valleys and lakes of the southern part of the island. Whales, walruses, seals, and dolphins are still abundant. Only two species of fish are of any importance,—the goltzy (Salmo alpinus) in the western rivers, and the omud (Salmo omul) in the eastern.

~~The following is a list of the land mammals (some of them not satisfactorily determined) :—Ursus arctos and maritimus, Rangifer tarandus (Pallas), Vulpes vulgaris and lagopus, Canis lupus, Cuni- culus torquatus (Pallas), perhaps Mus grenlandica, or Myodes obensis. The birds are :—Stryx nictea, Falco buteo, 7 'ringa maritima, Plectrophanes nivalis, Otocorys alpestris, and Strepsilas ecollaris, all endemic ; many species of ducks, Harclda glacialis being the most common, Somatcria spectabilis and mollissima in company with the Ccphus Mandtii ; several species of geese and swans (Cygnus musicus included) ; as also Larus glaueus, Uria troile, U. bruen-nichti, and Alea ptetorhina. The marine mammals are :—the walrus, Odobenus rosmarus ; seals, Phoea vitulina, P. leporina, P. grenlandiea (O. Miller) in the Kara Sea, P. barbata (2); and dolphins, Delphinus Orca and D. delphis (2).~~

~~The numbers of sea mammals in the sea around Novaya Zemlya and the vast quantities of birds attracted Russian hunters as soon as they became acquainted with the northern Ural, and even in the 16th century they had extended their huts (stanovishteha) to the extreme north of the island. Many of them wintered for several consecutive years on Novaya Zemlya without suffering great losses from scurvy ; but no inhabitants have ever tried to establish themselves permanently on the island. The hunters were very often extremely successful ; but the industry has always been sub- ject to great vicissitudes. During the last twenty-five years the Archangel aud Kola hunters have but rarely visited Novaya Zemlya ; on the other hand, both it and the Kara Sea are now more and more visited by Norwegians. A few Samoyede families, recently settled by the Russian Government at Karmakuly, have remained there for several consecutive years, living chiefly by hunting the reindeer which abound on the eastern coast, and of which two varieties are distinguished, one like that of Spitzbergen.~~

~~History.—Novaya Zemlya seems to have been known to Nov- gorod hunters in the 11th century ; but its geographical discovery was four centuries later, at the time of the great movement for the discovery of the north-eastern passage. In 1553 Sir Hugh Willoughby sighted what was probably Goose Land; Chancellor penetrated into the White Sea. In 1556 Burrough reached the southern extremity of the island (the first western European to do so). William Barents touched the island (1594) at Sukhoi~~

Nos (73° 46'), and followed the coast northward to the Orange Islands and south- ward to the Kostin Shar. Rumours of silver ore having been found induced the Russian Government to send out expeditions to the island during the second half of the 18th century. Yushkoff visited it in 1757 ; and in 1760 Savva Loshkin cruised along all the eastern coast, spent two winters there, and in the next year, after having reaclicd Cape Begehrte (Begheerte), returned along the western coast, thus accomplishing the first cireumnavigation ; but the valuable records of his voyage in Russian archives have been lost. In 1768 Rozmysloff reached Goose Land and penetrated into the Kara Sea by the Matotchkin Shar, where he spent the winter ; in the following year he pursued the exploration of the Kara Sea, but was compelled to return and abandon his ship. Pospeloff investigated the alleged discovery of silver at Silver Bay in 1806. The first real scientific information about the island is due to the expeditions of Count Litke in 1821, 1822, 1828, and 1824, Nearly the whole of the western coast as far as Cape Nassau, as well

as the Matotchkin channel, was visited and mapped during these expeditions, and abundance of most valuable scientific information obtained. In 1832 Pakhtusoff mapped the eastern eoast as far as Matotchkin Shar; and in 1835 Pakhtusoff and Tsivolka mapped the coast as far as 74° 24'. The next expedition was that of Karl Baer in 1838, whose matchless deseriptions still are the most valuable of all our sources of information about this region.

A new cra of scientific exploration of Novaya Zemlya and of the neighbouring seas begins in 1868. The measurements of temperature made in that year by Bessels and by Dufferin between Bear Island and Novaya Zenilya, and partly those made by Yar- jinsky in his dredgings off the Murman coast, established the existence of a warm current crossing Barents's Sea, and led to the publieation of Petermann's remarkable treatise on the Gulf Stream. The existenee of the warm current was further confirmed by the measurements of Yarjinsky in 1869, by Maydell and Middendortf in 1871, and by the more reeent and closer investigations of And- reeff in 1880-82. On the other side, since 1868 the Norwegian sea-

hunters, availing themselves of the suggestions of Mohn, Nordenskjold, and Petermann, have brought in most valuable geographical information. In 1870 Johannesen penetrated as far cast as 79° E. long.,, in 76° 13’ N. lat., and afterwards accomplished the second circumnavigation of Novaya Zemlya. The measure- ments of Johannesen, Ulve, Mack, Torkildsen, Qvale, and Nedrevaag enabled the first map of the Kara Sea worthy of the name, as also of northern Novaya Zemlya, to be drawn up. These and subsequent explorations led the way for Nordenskjild’s famous voyages (see Potar Recions). Two recent undertakings must be mentioned, however, — the establishment of a permanent station on Novaya Zemlya, the wintering at Karmakuly of Lieutenant Tyaghin, and the crossing of the island in 1878 by M. Grinevetskiy from Karma- kuly to the eastern coast ; and the last Dutch expedition of the ‘“‘Dijmphna,” which, along with the steamer ‘¢ Varna,” wintered in the Kara Sca. (Pras kK.)

NOVEL. See RoMANCE.

NOVELLO, Vincent (1781-1861), an artist whose efforts to diffuse an increased taste for classical music in England fifty years ago have been crowned with perma- nent success, was born in London 6th September 1781. He was organist at different times of the Sardinian, Spanish, and Portuguese chapels, and of St Mary’s chapel, Moorfields. He was an original member of the Phil- harmonic Society, of the Classical Harmonists, and of the Choral Harmonists. He composed an immense quantity of sacred music, much of which is still deservedly popular ; but his great work lay in the introduction to England of unknown compositions by the great masters. The Masses of Haydn and Mozart were absolutely unknown in England until he edited them, as were also the works of Palestrina, the treasures of the Fitzwilliam Museum, and innumerable great compositions now well known to every one. To his zeal is due the store of sacred music published, first by his son, and then by Novello, Ewer, and Co. ; and it is not too much to say that benefit is still derived from the impulse given to English taste by these publications. Novello died at Nice on 9th August 1861.

NOVEMBER (or Novembris, sc. mensis, from novem), the ninth month of the old Roman year, which began with March. By the Julian arrangement, according to which the year began with 1st January, November, while

~~retain- ing its old name, became the eleventh month and had thirty days assigned to it. The 11th of November was held to mark the beginning of winter (hiemis initium); the sacred banquet called "epulum Jovis" took place on the 13th. The principal November festivals in the calendar of the Roman Church are :—All Saints' Day on the Ist, All Souls' on the 2d, St Martin's on the 11th, the Presenta- tion of the Virgin on the 21st, St Cecilia's on the 22d, St Catherine's on the 25th, and St Andrew's on the 30th. St Hubert is commemorated on the 3d. In the English calendar All Saints' and St Andrew's are the only feasts retained, and the " Papists' Conspiracy," for which a par- ticular service is appointed, is commemorated on the 5th. The eve of St Andrew's is a fast. The Anglo-Saxon name of November was Blotmonath (blood month), the latter name probably alluding to the custom of slaughtering~~

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~~cattle about Martinmas for winter consumption. In the calendar of the first French republic November reappeared partly as Brumaire and partly as Frimaire.~~

~~NOVERRE, JEAN Grorces (1727-1810), an artist to whom the action and music of the modern ballet may almost be said to owe their existence, was born in Paris 29th April 1727. He first performed at Fontainebleau in 1743, and in 1747 composed his first ballet for the Opéra Comique. In 1755 he was invited by Garrick to London, where he remained two years. Between 1758 and 1760 he produced several ballets at Lyons, and pub- lished his Lettres sur la Danse et les Ballets. He was next engaged by the duke of Wiirtemberg, and afterwards by the empress Maria Theresa, for whom he wrote many celebrated works at Vienna. In 1775 he was appointed Maitre des Ballets at the Académie ; this post he retained until the Revolution reduced him to poverty, which he en- dured with dignity until his death, at St Germain, in 1810.~~

~~Noverre's life-work consisted in the reduction of the ballet to an artistic and consistent form by aid of intelligible pantomime, appropriate action, correct costume, and, above all, music well adapted to the sentiment and situations of the drama ; and it is to his efforts in these several directions that the~~

~~modern ballet owes the high esteem in which it has so long been held in Paris and elsewhere.~~

~~NOVGOROD, a government of north-western Russia, bounded on the W. and N. by St Petersburg and Olonetz, on the 8.E. by Vologda, Yaroslavl, and Tver, and on the S.W. by Pskov, has an extreme length from south-west to north-east of 400 miles, and an area of 47,240 square miles. Its southern part is occupied by the Valdai or Alaun plateau, which has the highest elevations of middle Russia (800 to 1000 feet), and contains the sources of all the great rivers of the country. It is deeply furrowed by valleys with abrupt slopes, which give it the aspect of a highland region, and descends rapidly towards the valley of Lake Ilmen in the west, which is only 107 feet above the sea-level. The north-eastern part of the government belongs to the lake district of north-western Russia. This tract, gently sloping towards Lakes Ladoga and Onega in the north, is covered with innumerable sheets of water, of which Byelo-ozero (White Lake) and Vozhe are the largest, while more than 3000 smaller ones are figured on the maps. Immense marshes, relics of former lakes, covered with thin forests of birch and elm, occupy the flat depressions and cover more than one-sixth of the government; several of them have an area of from 300 to 450 square miles. In summer they are quite impassable; they admit of being crossed only when frozen. Six centuries ago they were even less accessible, and were perhaps the best protection Novgorod possessed against its enemies ; but the slow upheaval of north-western Russia, going on at a rate of three or more feet per century, powerfully contri- buted towards the drainage of the country, as the rivers more deeply excavated their gently-sloping beds. Of recent years artificial drainage has been carried out on a large scale. The forests still occupy more than two-thirds of the government.~~

~~Geologically, Novgorod exhibits in the west vast beds of Devonian limestones and sandstones; these are else- where overlaid with Carboniferous limestone, dolomite, sandstones, and marls. The Devonian gives rise to salt- springs, especially at Staraya Russa, and contains iron-ores, while the later formation has coal strata of inferior quality. The whole is covered with a thick sheet of boulder-clay, very often arranged in ridges or asar, the bottom moraine of the north European ice-sheet of the Glacial period. Numerous remains of the neolithic stone age are found, especially~~

around the deposits of extinct lakes. The numerous rivers of Novgorod are distributed between the Arctic Ocean, Baltic Sea, and Caspian Sea basins; the last

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two basins are further connected by the Mariinsk, Tikhvin, and Vyshnii-Volocliok canals, while the Alexander-von- Wiirtemberg canal connects the tributaries of the White Sea with those of the Baltic. The chief river is the Volkhoff, which flows from Lake Ilmen into Lake Ladoga. Other navigable rivers are the Syas, also flowing into Lake Ladoga, and the Sheksna and the Mologa, tributaries of the Volga. A brisk traffic is steadily carried by the Nov- gorod rivers, as all boats from-the Volga to St Petersburg pass through this government, while the goods embarked within the province itself amount to more than 7,000,000 ewts., worth from 6,000,000 to 7,000,000 roubles.

The climate is very harsh, the yearly average temperature at Novgorod being only 38°°8 Fahr. (14°°5 in January, 62°°5 in July). The severe climate, the marshy or stony soil, and the want of graz- ing-grounds render agriculture unprotitable ; though it is carried on everywhere, only rye, oats, barley, and somc tobacco arc raised, and this to so small an amount that nearly 1,000,000 quarters of grain have to be imported every year. Neither gardening nor the raising of cattle is very flourishing ; in 1877 there were only 212,000 horses, 364,000 cattle, and 253,000 sheep. A number of petty trades are successfully carried on in the villages, all kinds of wooden wares being made and exported ; the preparation of timber, pitch, tar, and charcoal is general, and shipbuilding is widely diffused in several districts. The fisheries on the great lakes are valued at 170,000 roubles annually, and, owing to the proximity of the capital, hunting is still profitable. But the greater number of the inhabitants are dependent on the river-boat traffic ; and nearly one- fourth of the able-bodied male population are driven in search of work to other parts of Russia. The Novgorod carpenters and masons still maintain their old-established renown. The industrial estab- lishments are few ; in 1879 they numbered 245 (steam flour-mills, distilleries, paper-mills, glass-works, and saw-mills), employing about 4500 hands, and turned out an aggregate production worth 6,313,000 roubles.

~~Trade, which is animated in several towns and at several points of the river-system, is chiefly in grain and timber, and in manufactures and grocery wares from St Petershurg. The fairs are numerous, and several of them (Kirilovsk monastery, Staraya Russa, and Tcherepovets) show considerable returns. The inhabitants are almost exclusively Great Russians, but they are distinguished by some historians from the Great Russians of the basin of the Oka, as showing some remote affinities with the Little Russians. They be-long mostly to the Greek Church, but there are many Noncon- formists. Lutherans and Catholics number respectively 4000 and 2000. Novgorod, apart from the usual schools and gymnasiums, is better provided with educational institutions than many other governments of Russia, and, through the successful efforts of its zemstvo, primary education is more widely diffused in the villages. The government is but thinly inhabited, the population (1,011,500 in 1870) being only 1,090,000 in 1884. The chief towns. of the eleven districts are :—Novgorod, Borovichi (10,000 inhabitants), Byelozersk (6000), Tcherepovets (3600), Demiansk (1500), Kiriloff (3200), Krestsy (3200), Staraya Russa (6000), Ustyuzhna (7000), and Valdai (3800).~~

~~NOVGOROD, capital of the above government, is situ- ated 119 miles to the south of St Petersburg, on the low flat banks of the Volkhoff, some two miles below the point where it leaves Lake Ilmen. The present town is but a poor survival of the wealthy city of medieval times. It consists of a kremlin (old fortress) and of the city, which stands on both banks of the river, here connected by a hand- some bridge. The kremlin was much enlarged in 1044, and again in 1116. Its stone walls, originally palisades, were begun in 1302, and much extended and embellished in 1490. It is very spacious, and formerly a great number of churches and shops with wide squares stood within the enclosure. Its valuable historical monuments include the cathedral of St Sophia, begun in 1045 by an architect from Constantinople to take the place of the original wooden structure (989), destroyed by fire in that year. Some changes were made in the walls in 1688 and 1692, and the windows were enlarged, but otherwise (notwithstanding several fires) the building remains unaltered. It contains many highly-prized relics. Another ancient building in the kremlin is Yaroslaff's Tower, in the square where the Novgorod wyetche (common council) met, and which still bears the name~~

of “the court of Yaroslaff”; the tower was the gridnitsa or chancellery of the secretaries of the wyetche.

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Several other remarkable monuments of Russian architect- ure still exist at Novgorcd, such as the church of St Nicholas, erected in 1135, and churches of the 14th and 15th centuries. Within the town itself there are four monasteries and couvents; and the large number in the immediate neighbourhood shows the great extension the city formerly had. A monument to commemorate the thousandth anniversary of the foundation of the Russian state (the calling in of the Varangians by Novgorod in 862) was erected in 1864. It consists of a large globe on a massive pedestal, surrounded by numerous statues com- memorating the leading events of Russian history. Another monument commemorates the campaign of 1812. On the whole, apart from its old churches and some portions of its walls, Novgorod has nothing to recall the leading part it has played in the history of Russia. Since the diversion from it of the great commercial highways of north-western Russia its commercial influence has been very limited. Its merchants still send tiniber, grain, and hay to St Peters- burg; but the total production of its manufacturing estab- lishments—paper-mills, flour-mills, saw-mills, glass-works, brick-works, match-works, and distilleries—does not reach 1,000,000 roubles. A trunk railway, 45 miles long, con- nects the city with Tchudovo on the Moscow and St Petersburg Railway. The population is 17,500.

The date at which the Slavonians on their northward advance first erected forts on the Volkhoff (where it leaves Lake Ilmen and where it flows into Lake Ladoga) is unknown. That situated ona low terrace close by Lake Ilmen was soon abandoned, and Novgorod or “ New-town ” arose on another which extended a mile lower on both banks of theriver. The older fort (Gorodische) still existed in the 13th century. It is certain that, even in the 9th century, the new city on the Volkhoff, whilst maintaining close relations with Kieff, already exercised a kind of supremacy over the other towns of the lake region, when its inhabitants in 862 invited the Varan- gians to the defence of the Russian towns of the north. Down to the end of the 10th century Novgorod was in some sort dependent on Kieff; yet it must

~~have maintained its internal autonomy, for in 997 its inhabitants obtained from their own Prince Yaroslaff a charter which granted them self-government, a jurisdiction of their own, and the rule of their proper vyetche. For five centuries this charter continued to be regarded as the chief written testimony of the independence of Novgorod, and was ever resorted to in the struggles with the princes. From the end of the 10th century the princes of Novgorod, chosen either from the sons of the great princes of Kieff (until 1136) or from some other branch of the family of Rurik, were always elected by the vyetche, and swore to maintain the free institutions of the town; but they were only its military defenders. Their delegates were merely assessors in the courts which levied the fixed taxes meant to defray the maintenance of the military force raised by the prince. The vyetche expelled the princes as soon as they provoked discontent. Their election was often a subject of dispute between the wealthier merchants and landowners and the poorer classes ; and Novgorod, which was dependent for its corn supply upon the land of Suzdal, was sometimes compelled to accept a prince from the Suzdal branch instead of from that of Kieff, which was more popular among the poorer classes. After 1270 the city often refused to have princes at all, and the elected mayor (posadnik) was the representative of the executive in its limited attributes. Novgorod in its transactions with other cities took the name of "Sovereign Great Novgorod" (Gospodin Velikii Novgorod). The Suprenie power and the supreme jurisdiction were in the hands of the vyetche, whose resolutions were carefully inscribed by its secre- taries (diaki). The city, which had a population of more than 80,000, was divided into sections (kontsy), radiating from its centre, and corresponding to some extent to the prevailing occupations of the inhabitants ; each constituted a distinct commune which enjoyed a large share of independence. The kontsy were subdivided into streets (wlitsy), which also corresponded to the prevailing occupa- tions of their inhabitants (artisans or merchants), and each of which was quite independent with regard to its own affairs, such as the election of priests, the maintenance of order, jurisdiction in inferior matters, trade, food supply, &c.~~

~~Trade was carried on by corporations which embodied, not only the merchants proper or gost, but also the poorer classes ; in fact, it was the chief source of income, and, owing to the existence of numerous trading~~

corporations, everybody was enabled to participate in itmore or less. Novgorod, owing to its very advantagcous posi- tion, made great advances in trade. By the Volkhoff and the Neva it had direct communication with the Hanseatic and Scandinavian cities. The Dnieper brought it into connexion with the Bosphorus,

and it was intermediary in the trade of Constantinople with northern Europe. The rich gifts offered by the corporations to the churches of Novgorod are a present testimony of the aneient wealth of the city.

The Novgorod ukshuyniki (who often associated robbery with trade) at an early date penetrated to the shores of the White Sea, hunted on Novaya Zemlya in the 11th century, colonized the basins of the northern Dwina, deseended the Volga, and, as early as the 14th eentury, extended their dominions over the "Ugra," beyond the Ural, into Siberia. The Zavolotchie, or the basin of the northern Dwina, was early colonized, and forts were erected to maintain the dominions, while two great colonies, Vyatka and Vologda, organized on the same republican principles as the metropolis, favoured the further colouization of north-eastern Russia.

At the same tine a number of flourishing minor towns (prigorody), such as Novyi Torg (Torzhok), Novaya Ladoga, Pskov, and many others, arose in the lake region. Pskov soon became quite inde- pendent of the metropolis, and had a history of its own ; the others enjoyed a large measure of independence, still figuring, however, as subordinate towns in all those circumstances which implied a com- mon action of the whole region. Several contemporary testimonies state the population of Novgorod in the 14th century to have reached 400,000, and add that the pestilences of 1467, 1508, and 1533 carried off no fewer than 134,000 persons. 'These figures, however, seem to relate rather to the Ilmen region; but it may be safely admitted that, before the visitations referred to, the city, with the suburbs, had a population of nearly 100,000.

Throughout its history Novgorod has had to sustain many con-

tests. Its struggle against the Suzdal region began as early as the 12th century. In the following century it had to contend with the Swedes and the Germans, who were animated not only by the desire of territorial extension throughout the lake region but also by the spirit of religious proselytism. The advances of both were checked by the battles at Ladoga and Pskov in 1240 and 1242. Protected as it was by its marshes, Novgorod escaped the Mongol invasion, and was able to repel the attacks of the princes of Moscow by whom the Mongols were supported ; but it was compelled to pay a tribute, which soon became a tribute to Moscow (end of the 14th century). It also successfully resisted the attacks of Tver, and aided Moscow in its struggle against this powerful neighbour, but it soon itself experienced the power of the growing Moscow state. The first serious invasion of its independence, in 1332, was turned back only with the aid of the Lithuanians. Buta severe blow was inflicted In 1456 by the Great Prince of Moscow, Vasilii Temnyi, who, taking advantage of the internal troubles of the city, and finding supporters among the Novgorod boyars, succeeded in im- peng a heavy tribute. Ivan III. took possession of the Zavo- otchie colonies and the Perm region, and began two bloody wars, during which Novgorod fought for its liberty under the leadership of Martha Posadnitsa. In 1475 Ivan III. entered Novgorod, abol- ished its charters, and carried away 1000 of the wealthier families, substituting for them families from Moscow ; the old free city now recognized his sovereignty. A century later Ivan IV. (the Terrible) abolished the last vestige of the independence of the city. Hav- ing learned of the existence of a party favourable to Lithuania, he took the field in 1570, and entered Novgorod (much weakened by the recent pestilences) without opposition. His followers seized nearly all the heads of monasteries and beat them to death with sticks. Ata given signal a general pillage began: the shops were destroyed, the mcrehandize thrown out, the wealthier of the mer- chants and clergy killed and thrown into the Volkhoff, whilst other plundering parties burned and pillaged all stores in the villages. No less than 15,000 men, women, and children were kiHed at Novgorod alone (60,000 according to some authorities). A. famine ensued, and the district of Novgorod fell into utter destitution. Thousands of families were transported to Moscow, Nijni-Novgorod, and other towns of the principality

of Moscow. In the beginning of the 17th century Novgorod was taken and held for seven years by the Swedes; and in the 18th century the founda- tion of St Petersburg ultimately destroyed its trade. Its position, however, on the water highway from the Volga to St Petersburg, and on the trunk road from Moscow to the eapital, still gave it some commercial importance ; but even this was brought to an end by the opening of the Vishera canal and the Nicholas Railway, which passes 45 miles to the east of Novgorod. (PAs)

NOVI, or (to distinguish it from Novi di Modena, &c.) Novi Licurg, a city of Italy, in the province of Alessan- dria (Piedmont), at the foot of the Apennines and on the edge of a fertile plain, about 20 miles south of the river Po. It is of importance mainly as the meeting-place of the railways from Alessandria, Genoa, and Piacenza, and is one of the leading seats of the silk industry in Italy. The ruins of its ancient castle, its collegiate church, the Piazza del Duomo with its central marble fountain, and some of the picturesque old palaces of the Genoese nobility are

the chief objects of interest, though the city also possesses its theatres, public library, antiquarian museum, literary academy, &c.

The population of the city was 9917 in 1881; that of the commune 11,445 in 1861, and 13,783 in 1881.

Novi begins to appear as Corte Nova in the 10th century, and in the Middle Ages it was a frequent object of dispute between Tortona, Milan, Pavia, and Genoa. In 1480 Nicolao Ghirardengo, a native of the town, set up his printing-press within its walls. In August 1799 was fought the great battle of Novi, in which the French under Joubert were defeated by the Russians under Suwaroff, and in November of the same year there was a lesser conflict, in which the French proved victorious over the Austrians.

NOVIBAZAR, NovipazaR, or YENIPAZAR (i.e, New Market), on the Rashka, a tributary of the Ibar and subtributary of the Danube, is the chief town of a sanjak in the Turkish vilayet of Bosnia (formerly of Kossovo), which was occupied by Austria-Hungary in 1879 in accordance with the terms of the treaty of Berlin. Owing to the configuration of the country it is

~~a point of great strategical importance, commanding the lines of communi-cation between Bosnia and Rumelia, and between Servia and Montenegro. The site was formerly occupied by the old Servian town of Rassia mentioned by Byzantine writers in the 9th century. In the neighbourhood is the old church of St Peter and St Paul, the metropolitan church of the bishopric of Rassia, in which Stephen Nemanya passed from the Roman to the Greek Church in 1143. According to Dr Blau, the sanjak hada male population of 83,983 in 1871, that of the town is estimated at from 9000 to 12,000.~~

~~NOVO-BAYAZET, or Novum Bayazer, a town of trans-Caucasian Russia, at the head of a district (area 2390 square miles, population 67,800) in the Erivan government, 60 miles east-north-east of Erivan, and about 4 east of Goktchi Lake, lies 5870 feet above the sea on the rocky ravine of the Kavar-tchai. An Armenian village which had stood here from an carly date was destroyed by Nadir Shah of Persia in 1736, and it was not till the Turkish war of 1828-29 that the site was again occupied by Armenian refugees from the Turkish town of Bayazet or Bayazid. The name Novuii Bayazet was adopted at the organization of the Erivan government in 1850. From 4518 in 1865 the population had increased by 1873 to 5363, still mainly Armenians. There are seventeen villages in the district, each with more than 1000 inhabitants.~~

~~NOVOGEORGIEVSK, a town, and a fortress of Russia. (1) The former, usually known under the name of Kriloff, in the government of Kherson, district of Alexandriya, stands at the junction of the Tyasmin with the Dnieper, 9 miles to the north-west of the Krementchug railway station. Its fort was erected by the Poles in 1615 to protect the passage across the Dnieper, and to guard the steppe on the left bank of the river. The 10,500 inhabit- ants of Kriloff now carry on a lively trade in timber, grain, and cattle, and have a few flour-mills and candle- works. (2) NovocrorcizevsK or Moptin is a first-class fortress of Russia in Poland, at the junction of the Nareff with the Vistula, 19 miles to the north-west of Warsaw. It constitutes the right flank of the line of defence of the Vistula against attack from the west, the centre of this line being at Warsaw, and the left flank at Ivangorod ; 12,000 men are needed for its defence, and the fortifica- tions can shelter~~

~~from 48,000 to 50,000 men. The small town of Novoye Myesto, opposite the fortress, has 5500 inhabitants.~~

~~NOVOMOSKOVSK, a district town of Russia, in the government of Ekaterinoslaff, 19 miles to the north-east of the capital of the province. Including several villages which have been incorporated with it, it extends for nearly 7 miles along the right bank of the Samara, a tributary~~

~~of the Dnieper. In the 17th century the site was occupied by several villages of the Zaporog Cossacks, which were known under the name of Samartchik, and derived their wealth from valuable fisheries. In 1687 Prince Golitzyn founded here the Ust-Samara fort, which was destroyed after the treaty of the Pruth ; it was rebuilt again in 1736, and the settlement of Novoselitsy established, which re- ceived a municipal constitution about the end of the last century. The very fertile surrounding country was rapidly colonized, and now has several villages each of more than 5000 and one above 10,000 inhabitants. The population of Novomoskovsk, which numbers 11,000, is chiefly engaged in agricultural pursuits. Some are employed in tanneries, and there is also some trade in horses, cattle, tallow, skins, tar, and pitch. As many as 150,000 head of cattle change hands at the yearly fair. In the immediate neigh- bourhood is the Samarsko-Nikolaevskii monastery, which is visited by many pilgrims.~~

~~NOVOTCHERKASSK, capital of the province of the Don Cossacks, is situated 737 miles south-south-east from Moscow, and 40 miles from the sea of Azoff. It was founded in 1805, when the inhabitants of the Tcherkassk stanitsa (now Old Tcherkassk) were compelled to leave their abodes on the banks of the Don on account of the frequent in- undations. They were settled on a hill, 300 feet above the low plain, at the junction of the Don with the Aksai, and it was the intention of the authorities to create there, around the chief town of the Don Cossacks, a large agri- cultural colony ; but the want of drinking water proved a great obstacle, and it was decided to transfer Novotcher- kassk to another site, when Nicholas I. after a visit in 1837, ordered that it should remain where it was. In 1863 a water-supply was obtained by the construction of an aqueduct 18 miles long, with a steam-engine pumping 325,000 gallons per day. In the following year the~~

town was brought into railway communication with Voronesh and Rostoff, from which last it is 32 miles distant. It is finely situated, and an extensive view over the low prairies of the Don is obtained from the top of the hill. The town has a public garden, a theatre, a clubhouse, and is adorned by the palace and gardens of the ataman of the Cossacks, and by a monument to Platoff. The educational institutions include a gymnasium for boys, and another for girls, besides several lower schools. Since the introduction of a water-supply and the construction of a branch rail- way line to the Grushevskiya coal-mines, Novotcherkassk has been developing rapidly ; wide suburbs extend to the south-west, and the right bank of the Aksai is dotted with the villas of the Cossack officials. Manufactures, how- ever, make but slow progress ; there are only a few candle- works, brick-works, distilleries, tobacco-works, and manu- factories of champagne, with an aggregate production in 1879 of 240,000 roubles (out of a total for all the province of 1,909,000 roubles). An active trade is carried on in corn, wine, and timber (exports), and manufactures and grocery wares (imports). There are two fairs of some local importance. The population of the town is 34,000.

NOWGONG or Ndocdon, a district in the chief-com- missionership of Assam, India, lying between 25° 45’ and 26° 40’ N. lat. and 92° and 93° 50‘ E. long., is bounded on the N. by the Brahmaputra, separating it from Darrang, KE. and S. by Stbsdgar and the Nagdé and Khasi Hills. The district, which has an area of 3417 square miles, con- sists of a wide plain much overgrown with jungle and cane- brakes, intersected by numerous offshoots and tributaries of the Brahmaputra, and dotted with shallow marshes. It is estimated that about a hundred minor streams become navigable in the rainy season. The Mikir Hills cover an area of about 65 miles by 35 in the south of the district ; the highest peak is about 3500 feet. The slopes are very

steep, and are covered with dense forest.

The Kamakhyaé, Hills area small range near the bank of the Brahmaputra,

~~about 1500 feet high. On the summit of the highest peak is a celebrated temple of Kamakhyd, the local goddess of~~

~~love, where three annual festivals are held, attended by crowds of pilgrims from all parts of the country. Only~~

~~about one-ninth of the area of the district has been as yet brought under cultivation. abound.~~

~~Wild beasts of all kinds~~

~~The population in 1881 was 310,579, of whom about 12,000 were~~

~~Mohammedans and the rest mainly aborigines or semi-Hinduized aborigines and Hindus in about equal proportions.~~

~~The great bulk of the aborigines consists of the cognate tribes of Mikirs, Lalangs,~~

~~and Cacharis. The population of the town of N owgong was only~~

~~4200 in 1881.~~

~~The staple crop is rice. Tea cultivation and manufacture are carried on by means of European capital and under European supervision. The principal means of communication are afforded by the rivers. The chief road, that from N. owgong town to Gauhati in Kamrip, runs for 44 miles through the district, but is un- bridged. Re climate of Nowgong is extremely unhealthy.~~

~~NOY, Wiutr1AM (1577-1634), attorney-general, was born, it is believed, on the family estate of Pendrea in Bur- yan, Cornwall, in 1577, his father belonging to a family whose pedigree is included in the visitation of Cornwall in 1620. He matriculated at Exeter College, Oxford, 27th April 1593, and looked back upon his academical life with such affection that, twenty years later, when the privileges of that institution were invaded by Lord Petre, he pleaded its cause gratuitously and successfully. His legal career began at Lincoln's Inn, and throughout life he was a diligent student of the grounds and precedents on which English law is based. From 1603~~

~~until his death he was elected, with one exception, to each parliament, sitting invariably for a constituency of his native county. or several years his sympathies were in antagonism to the wishes of the court, so that his historical knowledge was freely laid at the service of the opposition. Every commission that was appointed numbered Noy among its members, and even those who were opposed to him in politics acknowledged his learning. A few years before his death he was drawn over to the side of the court, and in October 1631 he was created attorney-general, but was never knighted. It was through his advice that the impost of ship-money was levied, and popular feeling vented its rage against him for its disastrous revival. Noy had long been a martyr to disease of the stone, and his death occurred, under circum- stances of great agony, 9th August 1634; two days later he was buried at New Brentford church. Though he was of a reserved, almost morose disposition, and after his change of principles had little regard for the feelings of his old friends, many acts of kindness which he showed can be gleaned from the literature of his time. His prin- cipal works, On the grounds and maxims of the laws of this kingdom (1641) and The compleat lawyer (1661), went through many editions. Further particulars concerning him and his children may be found collected in Davies Gulbert's Cornavall, iii. 143-60, and in the Bibliotheca Cor- nubrensis, vols. i. and iii.~~

~~NOYON, a city of France, department of Oise, 67 miles north-north-east of Paris by the railway to Brussels, is built at the foot and on the slopes of a hill, and traversed by a small stream, the Verse, which joins the Oise a mile farther down. The old cathedral of Notre Dame, con- structed during the latter half of the 12th century, is a fine example of the mixture of Romanesque and Gothic architecture. In plan it is a Latin cross, with a total length from east to west of 343 feet, and from north to south of 66. The west front has a porch, added in the 14th century, and two unfinished towers, their upper por- tions dating from the 13th century ; its decorations have been greatly mutilated. The nave (167 feet long and 66~~

~~See Plate~~

broad) consists of eleven bays, including those of the west front, which, in the interior, forms a kind of transept. In the windows of the aisles, the arches of the triforium, and the windows of the clerestory the round type is main- tained; but double Pointed arches appear in the lower gallery ; and the vaults of the roof, originally six-ribbed, were rebuilt after the fire of 1293 in the prevailing Poimted style. Side chapels were added in the north aisle in the 14th century and in the south aisle in the 15th and the 16th, one of the latter (15th) is especially rich in decora- tions. The flying buttresses of the building are at present (1884) being restored in the style of the 12th century. From the north-west corner of the nave runs the western gallery of a fine cloister, erected in 1230 ; and next to the cloister is the chapter-house of the same date, with its entrance adorned with statues of the bishops and other sculpture. The bishops' tombs within the cathedral were destroyed during the Revolution. The chapel of the bishops' palace is an example of the Early Pointed style ; the second bishops' palace is a brick and stone structure in the Renaissance style; the canons' library was built of wood in the 15th century; and the town-house (Gothic and Renaissance) dates from 1485-1523, Among the town manuscripts is the Red Book or communal charter of Noyon. Remains of the Roman walls may be traced in the founda- tions of various houses. Noyon has a good trade, and contains large sugar-refineries, chemical-works, tanneries, and cotton-spinning mills. The population of the com- mune and that of the city were respectively 6268 and 5236 in 1872, and 6252 and 5780 in 1881.

Noyon, the ancient Noviomagus Veromanduorum, was Christian- ized by St Quentin at the close of the 3d century ; and in 531 St Medard, bishop of the district of Vermandois, transferred his see thither from St Quentin. The episcopate of St Eligius (640-648), the burial of Chilperic II., the coronation of Pippin the Short in 752, and on the same occasion the coronation of his infant son Carloman with the title of king of Noyon, the coronation of Charlemagne in 771, the plunder of the town by the Normans in 859 and 880, the ex- pulsion of the castellan by the inhabitants, and in 997 the recog- nition of the overlordship of the count of Flanders are the chief points in the history of Noyon down to the 10th century. In the {1th the city, passing under the French crown, became one of the ceclesiastical peerages of the kingdom ; and at the beginning of the 12th century it easily obtained a communal charter through the favour of its bishops. The extent of the

bishopric was considerably curtailed in 1135 by the breaking off of the diocese of Tournay. Noyon was ravaged by the English and the Burgundians during the Hundred Years' War. In 1516 truce was signed at Noyon by Francis I. and Charles V. The city was captured by the Spaniards in 1552, and afterwards by the Leaguers, who were expelled in 1594 by Henry IV. It lost its bishopric in 1791, and is at present only the chief town ofa canton in the arrondissement of Compiégne. Calvin was born at Noyon in 1509.

See Le Vasseur, Annales de Pfiglise Cathédrale de Noyon, 1633; Lafons de Melicocq, Rech. hist. sur Noyon, 1889; Barthélemy, Monogr. de lV Eglise Notre

Dame de Noyon; Vitet, Mongr. de UV Eglise de N. D. de Noyon, 1845; and Moet de la Forte Maison, Antiquités de Noyon (1845).

NUBIA, a country of north-east Africa, bounded on

XV. (andthe N. by Egypt, on the 8. by Abyssinia, Senaar, and

Plate II.

vol, i.)

' Kordofan, and on the E. and W. by the Red Sea and the Libyan Desert respectively. It thus comprises the whole of the Nile valley, from Assuan (Oswan, Syene) near the first cataract southwards to Khartum (Khartoum) at the confluence of the White and the Blue Niles, stretching in this direction for about 560 miles between 16° and 24° N. lat., and for nearly the same distance east and west between 31° and 39° E. long. But Nubia has at no time formed a strictly political, ethnical, or even administrative expression. Unless it can be identified with the Nob or Nub— that is, "Gold"— region of the hieroglyphic records, the term was unknown to the ancients, by whom everything south of Egypt was vaguely called Ethiopia, the land of the dark races. It is first associated historically, not with any definite geographical region, but with the Nobate, a negro people removed by Diocletian from the western oasis to the Nile valley above Egypt (Dodecaschœnus), whence

the turbulent Blemmyes had recently been driven east- wards. From Nuba, the Arabic form of the name of this people, comes the modern Nubia, a term about the precise meaning of which no two writers are of accord. Locally it is restricted to a comparatively small district, the Wady al-Nuba, reaching from Sebu‘ along the Nile southwards to the north frontier of Dongola. Officially it finds no recognition as an administrative division of the khedive’s possessions, the region commonly understood by Nubia, as above roughly defined, being completely absorbed for administrative purposes, partly in the government of Upper Egypt, but mainly in that of Egyptian or Eastern Sudan (Soudan).! Within these two governments it com- prises the whole of the four mudirfehs (provinces) of Berber, Také, Dongola (Donkola), and Sudkin (more correctly Sawdkin), besides parts of Massowah, Kharttim, and Esneh (Upper Egypt), with a total area of about 345,000 square miles, and a population vaguely estimated (1878, 1882) at from 1,000,000 to 1,500,000.

But, apart from political and ethnical considerations, Nubia is physically a sufficiently intelligible expression. Merging westwards in the sands of the Libyan desert, and limited eastwards by the Red Sea, it comprises the whole of the rugged and mainly arid steppes and plateaus through which the united White and Blue Niles, after their junction at Khartim, force their way down to Upper Egypt. In this section, which may be regarded as the upper course of the Nile proper, there occurs a continuous series of slight falls and rapids, including all the historical “ six cataracts,” beginning a few miles below Khartum (the sixth at J. Garri), and terminating at Phile, close to the Egyptian frontier. Between these extreme points the

total fall in a distance of 1150 miles is about 760 feet

(from 1160 feet above sea-level at Khartim to 400 at Phils), Here the river describes two great bends, the

first, from Kharttim to Merawi (Napata) below the fourth

cataract, comprising the Bahivida desert on the west, the second, thence to Egypt, comprising the Nubian desert on the east,—the two roughly

corresponding to the conven- tional divisions of Upper and Lower Nubia respectively. Throughout the whole of this section the Nile receives no affluents on its left bank, and on its right one only, the Atbara, which joins it from Abyssinia just above Al- Meshérif (Berber). Hence all Nubia west of the Nile, and most of the region east of the Nile—that is, from the Atbara confluence to Egypt—are mainly arid wastes, rocky in the east, sandy in the west, relieved on both sides by some grassy steppe lands, and by a few small oases. Of the Nubian, which is sometimes called the Korosko, desert, and the northern section of which is named from its nomad Bish4ri inhabitants, the prevailing features are bare or scrubby sandstone plains broken by moderately high rugged granite hills and ranges, such as the J. Jerfa, J. Elbe', J. Kawewad, and J. Shikr, and intersected in many places by numerous small "khérs" or wadies running in various directions across the plateau. The wells and oases occur- ring along these depressions afford the only means of com- munication across this region, as well as in the more sandy Bahitda wilderness on the opposite side of the Nile. Thus are formed all the great caravan routes, of which the most important are—(1) from Derr and Korosko across the Ababdeh country by the Hurat wells southwards to Abu Hamid, 230 miles, shorter by about one-third than the long and difficult water journey between these two points ; (2) from Ambukél to Khartim, which describes an are of 200 miles to the southern curve enclosing the Bahiida desert; (3) from Berber eastwards to the Red Sea at Sudkin, 280 miles, difficult, with little fodder and rare

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1 See Behm in Bevilkerung der Erde for July 1882.

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wells, but of vital strategic and commercial importance as affording the most direct access from the coast to the in- terior, and the shortest highway from the Nile to Suakin, the only outport of Nubia; (4) a better but much longer route from Tokar below Sudkin by the Khér Barka south- wards to Kassala on the Mareb, a tributary of the Atbara, and thence through the Shukurieh country westwards to Khartim. This route, which has been recently explored by G. Casati,! traverses the province of Taka, the most fertile and productive region in the whole of Nubia. Taka, being well

~~watered by the Atbara, Mareb, and other streams from Abyssinia, is a true African tropical land, covered in some places with dense forest, in others with extensive pastures and arable tracts. Hence this route has lately been proposed in preference to that from Sudkin to Berber for the projected line of railway from the coast to the interior.~~

~~Besides Téké the only other fertile and permanently inhabitable region is the valley of the Nile itself. But this valley, expanding above Kharttim into open alluvial plains, is in Nubia proper confined mainly to very narrow limits, with a mean breadth of scarcely more than half a mile (Burckhardt), The river is here almost everywhere hemmed in between granite and sandstone hills, which approach at some points to the very banks, at others run transversely to it, thus giving rise to the continuous wind- ings and rapids which characterize its course throughout Nubia. Nor does the Nile now flood its banks to the same extent as formerly in this region, as appears from the "nilometer" discovered by Lepsius. But it is a mistake to suppose, as is often stated, that no rising takes place.~~

~~In Také much humus and alluvial soil overlie the older crystalline beds and later sedimentary rocks. Elsewhere throughout Nubia these rocks are now mostly denuded, and consist mainly of new sandstones, with large masses of granite, porphyry, and trachyte cropping out in many places. The extensive syenite range on the Egyptian frontier is pierced for 80 miles by the Nile, and runs thence interspersed with sandstones eastwards to the Red Sea, where it forms the bold headland of Ras Bends, pro- jecting round the Gulf of Berenice. Westwards the same system develops the J. Kukur, beyond which it extends to about 25° E. long. in the direction of the Libyan desert. Higher up, at the second or "Great" cataract of Wady Halfa, the sandstone is broken through by huge masses of granite and diorite rising 500 feet above the river-bed. Still farther south sandstones also prevail throughout Dongola, where the Nile presents the aspect of a mountain stream rushing for 250 miles over rapids. At Batn-al- Hajar the granite hills attain an altitude of 2000 feet above the river, and in this district the sandstone mostly disappears under the eruptive basalts, trachytes, diorites, phonoliths, and large beds of shale.~~

None of the porphyries appear to be metalliferous, and the only gold mines hitherto discovered are those in the east about Mount Elbe‘, which were worked by the ancient Egyptians, and even during medieval times, but which are now abandoned, although apparently not yet quite exhausted (Linant de Bellefonds). This auriferous district of Nob or Nub, which according to some authorities has given its name to the whole country, lies close to the Red Sea in 22° N., nearly opposite Jidda. The only other minerals of economic importance are salt and alum, occur- ring at various points on the plateaus. The granites and syenites afford magnificent building materials, largely utilized by the ancient Egyptians.

The greater part of the land lies almost within the rain- less zone, for the tropical rains are now arrested about the

1 Esploratore for August 1883, and Boll. Ital. Geogr. Soc., July 1883, p. 538.

latitude of Khartim (Petherick), beyond which point very little moisture is precipitated in any part of the Nile basin. Hence the Nubian climate, while intensely hot (108° to 114° Fahr. in the shade in May on the eastern plateau) is excessively dry and not unhealthy. The plague, formerly endemic in Egypt, never originates in Nubia 3 nor does the cholera penetrate up the Nile valley beyond Wady Halfé. North of this point, however, the riverain parts are often rendered dangerous, especially to strangers, by the exhalations from the stagnant pools left after the subsi- dence of the Nile waters. It is noteworthy that here the right bank being periodically flooded is much more fertile than the left, although all the finest ruins lie on the left side. The contrast is probably due to the Libyan sands continually moving eastward and encroaching on the narrow arable zone along the great artery.

Except in Taka, the natural flora is very poor, all the arable dis- tricts being required for the cultivation of useful plants. Amongst these the most important are the dém palm, durra (Sorghum vulgare), of which several varietics have the stalk from 7 to 10 feet high, maize, dokhn (panicum), barley, lentils, tobacco, beans, and melons. Cotton and the vine flourish in several places, and the dates of Ibrym and Sokkot are much prized. The

~~banks of the Nile are often fringed with the mimosa ; senna abounds in moist, the tama- rind in sandy places ; several varieties of gum trees occur in the south, and symka is common, its seed yielding oil, its leaves good camel fodder.~~

~~Wild animals are rare except in the Takd forests, where the elephant, lion, panther, rhinoceros, giraffe, hyena, and wild boar are met with. The crocodile and hippopotamus infest all the streams : many species of large and small snakes occur, but few are poisonous ; the stork, wild goose, partridge, ibis, are amongst the chief repre- sentatives of the local avifauna. There is a good breed of horses ; the camel and ass are used as mounts, the ox and buffalo (not numerous) as pack animals and in irrigation, of which there are two methods (as in Egypt),—the sdkiya, worked by oxen and liable to a tax of £3, and the shaduf, a hand lever and bucket, rated at 380s. (Petherick).~~

~~The population being almost exclusively agricultural and pastoral, the Rdgetries are unimportant, and limited mainly to coarse cottons and woollens, pottery, and household utensils made of the date tree. The exports also are confined to senna, some grain, leeches, musk, and honey. But although the local traffic is small there is a very large transit trade, carried on chiefly by caravans between Central Africa and Egypt. In this way considerable quantities of ivory, gold dust, ostrich feathers, and slaves have from the remotest times been brought down from the interior through Nubia to the seaports on the Mediterranean and the Red Sea. Of late years the slave trade had been almost entirely suppressed.~~

~~Few ethnological questions are beset with greater difficulties than those connected with the origin and affinities of the Nubian race ; and, although much light has recently been thrown on the subject by Lepsius in the learned introduction to his Nubische Grammatik, there are several points which still remain matter of conjecture. As an ethnical expression the term Nuba or Nubian itself has become equivocal. Rejected by the presumable descendants of Diocletian's Nobate, who now call themselves Berber, Barabira, it has become synonymous in the Nile valley with '*slave," or "Negro slave." This is due to the large number of slaves drawn by the Arab dealers in recent times from the Nuba tribes of Kor- dofan, who appear to~~

constitute the original stock of the race. On the other hand, the expression has never at any time been applied to all the inhabitants of the region we now call Nubia. At present this region is occupied by peoples of three distinct stocks—the com- paratively recent Semitic Arab intruders, mainly in Upper Nubia ; the Hamitic Ababdeh and Beja (Bisharin), everywhere between the Nile and the Red Sea ; and the Negro or Negroid Nubas (Bardbira), in Lower Nubia, where they are now almost exclusively confined to the banks of the Nilc, from Assuan southwards to Dongola.

That these Nilotic Nubas are closely allicd to those of Kordofan may now be regarded as placed beyond reasonable doubt. And, as the latter are admittedly of Negro stock and speech, it follows that the former also, hitherto affiliated by some to the Fulahs of west Sudan, by others to the Hamitic Beja, must henceforth be regarded as essentially a Negro people. But, whereas the Kordofan Nubas have preserved their racial purity, those of the Nile, while preserving their Negro speech intact, have in their new homes become physi- cally modified, mainly by the admixture first of Hamitic (Beja), then of Semitic (Arab), and even of European blood. Ethnologically the modern Nubians are therefore to be considered as a very mixed people, forming the transition between the three great Hamitic, Semitic, and Negro branches of the human family who converge in the Nile basin. Their ultimate affiliation to the last-named rather

than to either of the two others is determined partly by their physical appearance, which is still fundamentally of a Negro type, and partly by their language, which differs dialectically only from the Negro speech of the Kordofan Nubas. aay :

This conclusion, based on physical and linguistic grounds, 1s fully confirmed by what is known of the earliest migrations and history of the Nilotic peoples. The first inhabitants of the region beyond Egypt appear to have been the Uaua, whose name occurs in an inscription on a tomb at Memphis of the Vith Dynasty (about 2500 B.c.), and again constantly in subsequent inscriptions down to the time of the Ptolemies, as the leading Negro race to the south of Syene. It thus appears that throughout the historic period down to the arrival of the Romans the Nile above Egypt was

~~occu- pied by a Negro people. Egyptian monuments are found as far south as Mount Barkal (Napata), but no Egyptian settlements beyond Syene. Hence these Uaua Negroes probably remained unaffected, or very slightly affected, by foreign elements until about the 3d century of our era, when their domain began to be encroached upon from the east by the Hamitic Blemmyes, who have been clearly identified with the present Beja or Bisharin of the Nubian desert. It was owing to the incessant raids of these troublesome marauders that Diocletian withdrew the Roman garrisons above the cataracts, and called in the warlike Nobatz to protect the Egyptian frontier from their attacks. These Negro Nobate, originally from Kordofan, as is now evident, had advanced to the Great Oasis of Khargeh in Upper Egypt, whence they passed into the Nile valley between the cataracts. Here they absorbed the older Uaua of kindred stock, and ultimately came to terms with the Blemmyes. The two races even became intermingled, and, making common cause against the Romans, were defeated by Maximinus in 451 (Priscus). Thus were the Nilotic Nubas in the first instance affected by Hamitic elements.~~

~~Then came the conversion (545) of this new Negroid race to Christianity, and the growth of the Nubian political power in the upper Nile basin. Silko, founder of the famous Christian kingdom of Dongola, so named from its capital, called himself king of the Nobads and of all Ethiopians, that is, of the Nilotic Nubas and Hamitic Blemmyes. But the latter remaining pagan were soon after driven from the Nile valley eastwards to the kindred Mega- bares, Memnons, and other Hamitic nomads, who, with the Troglo- dytes, had from time immemorial held the whole steppe region between the Nile and the Red Sea from Axum to Egypt. Here their most collective name was Bugaite (Bovyaeral), as appears from the Axumite inscription, whence the forms Buja, Beja, which occur in the oldest Arab records, and by which they are still known.~~

~~Soon after overrunning Egypt (689) the Arabs themselves pene- trated into Lower Nubia, where the two Jawdabareh and Al- Gharbiya tribes became powerful, and amalgamated with the Nubas of that district. But their further progress was long arrested by the Dongolawi kings, who even reduced them for a short time. At length, however, after flourishing for 700 years, this native Christian state was in the 14th century overthrown by the Arabs,~~

aided by a detachment of Bosnians sent from Turkey by Sultan Selim (Burckhardt), These Bosnians (Kalaji, as they called themselves) also settled in the country and intermarried with the Arabs and Nubians, their descendants still holding sundry tracts between Assuan and Derr. Hence it is that the Nubians of this dis- trict, fairest of all the race, still claim Arab and Osmanli (Bosnian) descent. And thus were the Nilotic Nubas affected in the second instance by Semitic and European elements.

Nevertheless the type remains essentially Negro, being character- ized by a very dark complexion, varying from a mahogany brown and deep bronze to an almost black shade, with tumid lips, large black animated eyes, dolichocephalous head (index Nos. 73, 72), hair often woolly or strongly frizzled, and scant beard worn under the chin like the figures of the fugitives (Uaua ?) in the battle- pieces sculptured on the walls of the Egyptian temples. At the same time, the nose is much larger and the zygomatic arches less prominent than in the full-blood Negro. The features are at times almost quite regular, with a decidedly Egyptian cast (Lepsius) ; and the Nilotic Nubians are on the whole a strong muscular people, essentially agricultural, more warlike and energetic than the Egyptians, whom they also greatly excel in moral qualities. Many find employment as artisans, small dealers, porters, and soldiers in Egypt, where they are usually noted for their honesty, and frank and cheerful temperament. Since the overthrow of the native Christian state all have become Mohammedans, but not of a fana- tical type. Although a native of Dongola, the present (1884) Mahdi has found his chief support, not amongst his countrymen, but amongst the more recently converted Kordofan Negroes and the nomad Arabs and Beja. Nor do they appear at any time to have displayed a love of letters, and it remains uncertain whether to the Nubians or to their Hamitic neighbours are to be attributed the numerous still undeciphered rock inscriptions occurring along the Nile valley from Phile to Khartim. On the other hand, the colossal ruins reaching as far south as Meroe date almost exclu- sively from the Egyptian period.

The Nuba language itself does not appear to have ever been cul-

tivated, or even committed to writing until recently, although

Eutychius of Alexandria (930) includes the ‘‘Nubi” among the

six kinds of writing which he mentions in a somewhat doubtful

passage as current amongst the Hamitic peoples. There is no pre- sent native literature, and most of the men speak Arabic as well as their mother tongue, which is very sonorous and expressive. Its distinctly Negro character is betrayed in the complete absence of grammatical gender, in its primitive vowel-system and highly- developed process of consonantal assimilation, softening all harsh combinations, lastly, in the peculiar infix 7 inserted between the

verbal root and the plural pronominal object, asin at tokki-j-ir = I

shake them. Asin Bantu, the verb presents a multiplicity of forms,

including one present, three past and future tenses, with personal endings complete, passive, interrogative, conditional, elective, nega- tive, and otherr forms, each with its proper participial inflexions.

In Lepsius’s grammar the verbal paradigm fills altogether 110 pages.

Of the Nilotic as distinguished from the Kordofan branch of the Nuba language there are three distinct dialects current from Assuan ” along the Nile southwards to Meroe, as under :—

I. NortHern: Dialect of Bant Kenz or Mattokki, from the first cataract to Sebi‘ and Wady al-‘Arab, probably dating from the Diocletian period.

II, Centrrau: The Mahat or Marist, from Korosko to Wady Halfa (second cataract). Here the natives are called Saidokki, in contradistinction to the northern Mattokki.

III. SourHerN: Dongolawi, throughout the province of Dongola from the second cataract to J. Déja near Meroe, on the northern frontier of the Arab district of Dar-Shdaikiya (Sheghya). By the Mahasi people it is called Biderin Bannid, “‘ language of the poor,” or, collectively with the Kenz, Oshkirin Bannid, ‘‘ language of slaves.”

~~The northern and southern varieties are closely related to each other, differing considerably from the central, which shows more marked affinities with the Kordofan Nuba, possibly because the Saidokki people are later arrivals from Kordofan.~~

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~~Senaar und Taka, &c., Stuttgart, 1851; G. Melly, Khartoun and the Niles London, 1851. (A. H. K.)~~

~~NUGEENAH. See Nacina.~~

~~NUGENT, Rozert (d. 1788), who ultimately became Earl Nugent, was a native of Westmeath in Ireland, and a Roman Catholic, tersely described by Richard Glover as "a jovial and voluptuous Irishman who had left Popery for the Protestant religion, money, and widows." His change of religion took place at a very early period in life ; the widow whom he married in 1736 was a daughter of Craggs, the postmaster-general, and a lady who had already been twice given in marriage. Her property comprised the borough of St Mawes in Cornwall, and Nugent naturally sat for that constituency from 1741 to 1754, after which date he represented Bristol until 1774, when he returned to his old love. At first he was numbered among the ad- herents of the little court of "only Fred," but with his usual skill he made his peace with the ministry of George II. at the right moment. A speaker of great liveliness joined to good sense—Horace Walpole said that he seemed now and then on the precipice of absurdity, but that he kept clear of it—his support of the ministry was so useful that he became in 1767 Viscount~~

Clare, and in 1776 Earl Nugent, both Irish peerages. He died 13th October 1788.

Lord Nugent was the author of some poetical productions, several of which are preserved in the second volume of Dodsley's Collections. One of these pieces, an ode to William Pulteney, in which he com- bined a description of his own change of religion with compliments on Pulteney's attempts ''to prop a nation's frame,"" was much ad- mired at the time, and fragments of itare still quoted. A haunch of venison which Lord Clare sent to his fellow-countryman and fellow-poet Goldsmith gave rise to one of the most spirited poetic epistles in the language.

NUISANCE, in English law, is either public or. private. A public or common nuisance is defined by Mr Justice Stephen as "an act not warranted by law, or an omission to discharge a legal duty, which act or omission obstructs or causes inconvenience or damage to the public in the

exercise of rights common to all Her Majesty's subjects " (Digest of the Criminal Law, p. 120). A common nui- sance is punishable as a misdemeanour at common law, where no special provision is made by statute. In modern times many of the old common law nuisances have been the subject of legislation. For instance, under the Public Health Act, 1875, many nuisances are punishable by im- position of a penalty after summary conviction, and local authorities are empowered to take measures for their sup- pression. The same Act, 38 and 39 Vict. c. 55, in s. 16 gives a definition of nuisances for the purposes of the Act. In some cases the common law and statutory remedy appear to be concurrent. It is no defence for a master or employer that a nuisance is caused by the acts of his 'servants, if such acts are within the scope of their employ- ment, even though such acts are done without his know- ledge and contrary to his orders. Nor is it a defence that the nuisance has been in existence for a great length of time, for no lapse of time will legitimate a public nuisance. Examples of public nuisances are the obstruction of high- ways, bridges, and navigable rivers, the keeping of dis- orderly houses and gaming houses, and the carrying on of offensive trades.

~~A private nuisance is an act or omission which causes inconvenience or damage to a private person, and is left to be redressed by action. It is not easy to define what amount of infringement of the rights of property will give a right of action. » There must be some sensible diminution of these rights affecting the value or convenience of the property. "The real question in all the cases is the question of fact, whether the annoyance is such as materially to interfere with the ordinary comfort of human existence " (Lord Romilly in Crump v. Lambert, 1867). A private nuisance, differing in this respect from a public nuisance, may be legalized by uninterrupted use for twenty years. It used to be thought that, if a man knew there was a nuisance and went and lived near it, he could not recover, because, it was said, it is he that goes to the nuisance and not the nuisance to him. But such is not the law now. In such a case the newcomer has his civil remedy if the nuisance has not existed for twenty years, and of course his remedy at criminal law irrespective of time if the nuisance be public.~~

~~The remedy for a public nuisance is by information, indictment, summary procedure, or abatement. An information lies in cases of great public importance, such as the obstruction of a navigable river by piers. In some matters the law allows the party to take the remedy into his own hands and to "'abate" the nuisance. Thus, if a gate be placed across a highway, any person lawfully using the highway may remove the obstruction, provided that no breach of the peace is caused thereby. The remedy for a private nuisance is by mandamus, injunction, action for damages, or abate- ment. An action lies in every case for a private nuisance ; it also lies where the nuisance is public, provided that the plaintiff can prove that he has sustained some special injury. In such a case the civil is in addition to the criminal remedy. In abating a private nuisance, care must be taken not to do more damage than is neces- sary for the removal of the nuisance.~~

~~In Scotland there is no recognized distinction between public and private nuisances. The law as to what constitutes a nuisance is substantially the same as in England. A list of statutory nui- sances will be found in the Public Health (Scotland) Act, 1867, 30 and 31 Vict. c. 101, s. 16. It resembles, but is not quite coincident with, the list in the English Public Health Act. The remedy for nuisance is by interdict or action.~~

The American law on the subject is practically the same as the English law.

NUKHA, a town of Russia in the Caucasian govern- ment of Elizabethpol (formerly of Baku), and previous to 1819 the capital of the khanate of Sheki, lies 173 miles east-south-east of Tiflis, at the foot of the main chain of the Caucasus, the cupola of the church in the fortress being 2454 feet above the sea-level in 41° 12’ 18” N. lat. and 47° 12’ 7” E. long. The fortress is a four-cornered

enclosure 3000 feet in circumference, erected by Hosein Khan in 1765, and contains the palace, built somewhat later in the original Persian style under the shadow of a splendid group of plane trees. The town contains four churches and thirty-one mosques. Most of its 3000 houses are built of mud and roofed with reed-thatch, which is well suited for the breeding of silkworms, but apt to catch fire. In 1861 the number of silk-winding establish- ments was fifty, one of them with hundreds of basins in the European style, and worked by steam ; but owing to the ravages of gattine the silk industry has greatly declined since 1864, At that time the trade of the town amounted to from two to three million roubles. In connexion with the silkworm plantation of Tsar-Abat (more than a mile long by 14 furlongs broad, and enclosed by a stone wall) there was a Government school of sericulture up to 1863. The population of Nukha was 22,618 in 1861, and 20,917 in 1873 (mainly Tatars, but 3500 Armenians). Besides the town there were in the district (1442 square miles) twenty- one villages each with more than 1000 inhabitants.

Nukha was a mere village up to the middle of the 18th century, when it was chosen by Hajji Tchelyabi, the founder of the khanate of Sheki, as his residence. The Russian occupation dates from 1807, though the annexation was not completed till 1819.

NUMANTIA, a town in Hispania Tarraconensis, of great natural strength, is famous for the memorable siege by the Romans under Scipio Africanus the younger. -The siege began in 134 B.c.; the city was defended with the utmost bravery and tenacity, but after enduring the last extreme of famine the Spaniards were forced to surrender at discretion in 133. The inhabitants

were sold as slaves and the town levelled to the ground. The victor was honoured with the title Numantinus by his countrymen. The site of Numantia is to be sought at or near the modern village of Puente de Garray, about four miles to the north of the town of Soria (Old Castile).

NUMA POMPILIUS, the second of the legendary kings of Rome, was a Sabine, a native of Cures; his father's name was Pompo and his wife was daughter of Tatius, the Sabine colleague of Romulus. His election, which was made by the Roman people and ratified by the senate, took place at the close of a year's interregnum, during which the sovereignty had been exercised by the members of the senate in rotation. He is represented as having been a quiet unambitious man (Tacita was his favourite muse) ; but even the ancients perceived the difficulty of making him a disciple of Pythagoras of Samos. His peaceful reign of forty-three years was marked by the creation of many of the most characteristic institutions of Rome ; it was he who set up the worship of the god Terminus, appointed the festival of Fides, built the temple of Janus, reorganized the calendar, fixed days of business and days of cessation therefrom, instituted the flamens of Mars and Quirinus, the virgins of Vesta, the salii, the fetiales, the pontifices ; in a word, the city which had been founded by means of violence and arms he succeeded in " founding anew upon principles of justice, law, and morality." He derived his inspiration from Egeria or AXgeria, his spouse, whom he used to meet unattended in the grove of the Camenz, where a perennial spring gushed from a dark recess, He was above eighty when he died of a gentle decline. His daughter Pompilia, wife of the pontifex Numa Marcius, was the mother of Ancus Marcius. Livy (xl. 29) tells a curious story of the finding at the foot of the Janiculum in 181 3.c. of two stone chests, with inscriptions in Greek and Latin, one purporting to con- tain the body of Numa and the other his books. The first when opened was found to be empty, but the second con- tained fourteen books relating to philosophy and pontifical law, which, being perceived to have "a tendency to under-

mine the established system of religion," were forthwith publicly burned.

NUMBERS, Boor or. See PENTATEUCH.

~~NUMBERS, Partition or. This subject, created by Euler, though relating essentially to positive integer numbers, is scarcely regarded as a part of the Theory of Numbers. We consider in it a number as made up by the~~

~~addition of other numbers: thus the partitions of the suc- cessive numbers 1, 2, 3, 4, 5, 6, &c., are as follows :—~~

~~1;~~

~~Be, 13~~

~~3, 21, 111;~~

~~4, 81, 22, 211, 1111;~~

~~5, 41, 32, 311, 221, 2111, 11111;~~

~~6, 51, 42, 411, 38, 321, 3111, 222, 2211, 21111, 111111.~~

~~These are formed each from the preceding ones ; thus, to form the partitions of 6 we take first 6; secondly, 5 pre- fixed to each of the partitions of 1 (that is, 51); thirdly, 4 prefixed to each of the partitions of 2 (that is, 42, 411); fourthly, 3 prefixed to each of the partitions of 3 (that is, 33, 321, 3111); fifthly, 2 prefixed, not to each of the partitions of 4, but only to those partitions which begin with a number not exceeding 2 (that is, 222, 2211, 21111); and lastly, 1 prefixed to all the partitions of 5 which begin with a number not exceeding 1 (that is, 111111); and so in other cases.~~

~~The method gives all the partitions of a number, but we may consider different classes of partitions: the par- titions into a given number of parts, or into not more than a given number of parts; or the partitions into given parts, either with repetitions or without repetitions, de. It is possible, for any particular class of partitions, to obtain~~

~~- methods more or less easy for the formation of the parti- tions either of a given number or of the successive numbers 1, 2, 3, &c. And of course in any case, having obtained the partitions, we can count them and so obtain the number of partitions.~~

~~Another method is by Arbogast's rule of the last and the last but one; in fact, taking the value of a to be unity, and, understanding this letter in each term, the rule gives b; ¢, B2; d, be, B; e@, bd, c, bc, bt, &c., which, if 6, ¢, d, ¢, c&c., denote 1, 2, 3, 4, &c., respectively, are the partitions of 1, 2, 3, 4, &c., respectively.~~

~~An important notion is that of conjugate partitions. a, ul and summing the columns instead of the lines, we obtain the conjugate partition 2211; evidently, starting from 2211, the conjugate partition is 42. If we form all the partitions of 6 into not more than three parts, these — ' 6, 51, 42, 33, 411, 321, 222, and the con- ie ee | LTD 201s 2211, 922, S111, s2i3s; where no part is greater than 3; and so in general we have the theorem, the number of partitions of into not more than & parts is equal to the number of partitions of n with no part greater than k.~~

~~We have for the number of partitions an analytical theory depending on generating functions; thus for the partitions of a number with the parts 1, 2, 3, 4, 5, &c., without repetitions, writing down the product~~

~~L+a.l-a?.lta3.1+a4…, =1ltoetar+203…Ner.., it is clear that, if a%, w®, aY,...are terms of the series x, x*, o8,..for which a+B+y+..=~%, then we have in the development of the product a term x", and hence that in the term Wz" of the product the coefficient WV is equal to the number of partitions of 2 with the parts 1, 2, 3,.., without repetitions ; or say that the product is the gener- ating function (G. F.) for the number of such partitions. And so in other cases we obtain a generating function.~~

~~Thus a partition of 6 is 42; writing this in the form~~

~~NUM—NUM~~

~~Thus for the function~~

~~1~~

~~1l-x%.1l—-2?.1-2%... observing that any factor 1/l—2 is=1+a'a"..., we see that in the term Vz" the coefficient is equal to the number of partitions of », with the parts 1, 2, 3,.., with repetitions.~~

Introducing another letter z, and considering the function l+az. ltatz. l+ae…,=l+2 (w@tart..)...Marmt.., we see that in the term Vxz”z* of the development the co- efficient WV is equal to the number of partitions of x into & parts, with the parts 1, 2, 3, 4,..., without repetitions.

And similarly, considering the function I

,=l+aet2ett+.. Nat...,

aS — ae ae =1+2 (e+ a+ oe Ne ee + Nanak + ee

we see that in the term Vx”z* of the development the co- efficient WV is equal to the number of partitions of » into k parts, with the parts 1, 2, 3, 4,..., with repetitions. We have such analytical formulz as i 200 Pac

= SE i oe ane which lead to theorems in the Partition of Numbers. A remarkable theorem is

L-av.l—2?.1-28.l-at.. =l-w—22t+a5tal—g—ol+...,

where the only terms are those with an exponent }(3n7?2), and for each such pair of terms the coefficient is (~)”1. The formula shows that except for numbers of the form 1(3n?+:n) the number of partitions without repetitions into an odd number of parts is equal to the number of partitions without repetitions into an even number of parts, whereas for the excepted numbers these numbers differ by unity. Thus for the number 11, which is not an excepted number, the two sets of partitions are

11, 821, 781, 641, 682, 542 10.1, 92, 83, 74, 65, 5321,

in each set 6. We have 1-2. 1+”. 142%. 1l+at.1408…=1; or, as this may be written, L+a.l+2?.1+et.1+08…= = =1+a+e7+e+...,

showing that a number can always be made up, and in one way only, with the parts 1, 2, 4, 8,... The product on the left-hand side may be taken to & terms only, thus if k=4, we have

1-16

l+a.1l+2?.1+a4.1+28, = ee =ltatae?... +05;

that is, any number from 1 to 15 can be made up, and in one way only, with the parts 1, 2, 4, 8; and similarly any number from 1 to 2*—1 can be made up, and in one way only, with the parts 1, 2, 4,..2*-1. A like formula is 1-23 1-2 1-27 lee' 2 1 1-2 ®.1-8° .1 ° 2 1-2″ a 1-a? that is, attita. ee tl+ae. c+ lee oo M41 te" =e Ope-™ fite…fe° ta",

showing that any number from —40 to+40 can be made up, and that in one way only, with the parts 1, 3, 9, 27 taken positively or negatively; and so in general any number from — 4(3*—1) to +4(3*—1) can be made up, and that in one way only, with the parts 1, 3, 9,..3*-! taken positively or negatively. (A. ©.)

NUMBERS, Turory or. The Theory of Numbers, or higher arithmetic, otherwise arithmology, is a subject which, originating with Euclid, has in modern times, in the hands of Legendre, Gauss, Lejeune-Dirichlet, Kummer, Kronecker, and others, been developed into a most exten- sive and interesting branch of mathematics. We distin- guish between the ordinary (or say the simplex) theory and the various complex theories.

NUMBERS

In the ordinary theory we have, in the first instance,

positive integer numbers, the unit or unity 1, and the other We introduce the zero 0, which

numbers 2, 3, 4, 5, &c. is a number sui generis, and the negative numbers — ap

—2, —3, —4, &c., and we have thus the more general notion of integer numbers, 0, +1, +2, £3, &c. 3; +land

~l are units or unities. The sum of any two or more numbers is a number; conversely, any number is a sum of two or more parts; but even when the parts are positive a number cannot be, in a determinate manner, represented as a sum of parts. The product of two or more numbers is a number ; but

(disregarding the unities +1, — 1, which may be introduced as factors at pleasure) it is not con- versely true that every number is a product of numbers. A number such as 2, 3, 5, 7, 11, &¢., which is not a product of numbers, is said to be a prime number ; and a number which is not prime is said to be composite. A number other than zero is thus either prime or composite ; and we have the theorem that every composite number is, in a deter- minate way, a product of prime factors.

We have complex theories in which all the foregoing notions (integer, unity, zero, prime, composite) occur ; that which first presented itself was the theory with the unit 7 (#= —1); we have here complex numbers, a + 02, where a and 6 are in the before-mentioned (ordinary) sense positive or negative integers, not excluding zero; we have the zero 0, = 0 + 0%, and the four units 1, —1, 1, — 1. A number other than zero is here either prime or else composite ; for instance, 3, 7, 11, are prime numbers, and 5, =(2+7)(2 —2), 9,=3. 3, 13, =(3 + 2%)(3 — 22), are com- posite numbers (generally any positive real prime of the form 4n+3 is prime, but any positive real prime of the form 4n+ 1 isa sum of two squares, and is thus composite). And disregarding unit factors we have, as in the ordinary theory, the theorem that every composite number is; Im 4 determinate way, a product of prime factors.

There is, in like manner, a complex theory involving the cube roots of unity —if a be an imaginary cube root of unity (a?+a+1=0), then the integers of this theory are a+ba (a and 6 real positive or negative inte- gers, including zero)—a complex theory with the fifth roots of unity—if a be an imaginary fifth root of unity (at+a3+a?+a+1=0), then the integers of the theory are a-+ba+ca*+da3 (a, b, ¢, d, real positive or negative integers, including zero); and so on for the roots of the orders 7, 11, 13, 17,19. In all these theories, or at any rate for the orders 3, 5, 7 (see No. 37, post), we have the foregoing theorem: disregarding unit factors, a number other than zero is either prime or composite, and every composite number is, in a determinate way, a product of prime factors. But coming to the 23d roots of unity the theorem ceases to be true. Observe that it is a particular case of the theorem that, if Y be a prime number, any integer power of WV has for factors only the lower powers of V,— for instance, V?= V.N*; there is no other decomposition N®=AB. Thisis obviouslytrue in the ordinarytheory, and it

is true in the complex theories preceding those for the 3d, 5th, and 7th roots of unity, and probably in those for the other roots preceding the 23d roots; but it is not true in the theory for the 23d roots of unity. We have, for instance, 47, a number not decomposable into factors, but 473, = AB, isa product of twonumbers each of the forma + ba +... + ka2l (aa 23d root). The theorem recovers its validity by the introduc- tion into the theory of Kummer's notion of an ideal number.

The complex theories above referred to would be more accurately described as theories for the complex numbers involving the periods of the roots of unity: the units are the roots either of the equation x?~1+%?-?...42+1=0

p-l

(p a prime number) or of any equation x * +..4+1=0

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belonging to a factor of the function of the order p-1(n particular, this may be the quadric equation for the periods each of $(p-1) roots); they are the theories which were first and have been most completely considered, and which led to the notion of an ideal number. Buta yet higher generalization which has been made is to consider the complex theory, the units whereof are the roots of any given irreducible equation which hag integer numbers for its coefficients.

There is another complex theory the relation of which to the foregoing is not very obvious, viz., Galois's theory of the numbers composed with the imaginary roots of an irreducible congruence, F(a) = 0 (modulus a prime number

p); the nature of this will be indicated in the sequel,

In any theory, ordinary or complex, we have a first part, which has been termed (but the name seems hardly wide enough) the theory of congruences; a second part, the theory of homogeneous forms (this includes in particular the theory of the binary quadratic-forms (a, 8, c)(2, yyy; and a

~~third part, comprising those miscellaneous investiga- tions which do not come properly under either of the fore- going heads.~~

~~Ordinary Theory, First Part.~~

~~1, We are concerned with the integer numbers 0, +1, +2, +3, &c., or in the first place with the positive integer numbers 1, 2, 3, 4, 5, 6, &c. Some of these, 1, 2, 3, 5, 7, &c., are prime, others, 4, = 22, 6, =2. 3, &c., are composite ; and we have the fundamental theorem that a composite number is expressible, and that in one way only, as a pro- duct of prime factors, W=a%b8cY…(a, b, ¢,.. primes other than 1; a, B, y,.. positive integers).~~

~~Gauss makes the proof to depend on the following steps : (1) the product of two numbers each smaller than a given prime number is not divisible by this number ; (2) if neither of two numbers is divisible by a given prime number the product is not so divisible ; (3) the like as regards three or more numbers ; (4) a composite number cannot be resolved into factors in more than one way.~~

~~2. Proofs will in general be onlyindicated or be altogether omitted, but, as a specimen of the reasoning in regard to whole numbers, the proofs of these fundamental propositions are given at length. (1) Let p be the prime number, aa number less than p, and if possible let there be a number 6 less than p, and such that ab is divisible by p; it is further assumed that b is the only number, or, if there is more than one, then that 6 is the least number having the property in question ; 6 is greater than 1, for a being less than p is not divisible by p. Now p asa prime number is not divisible by b, but must lie between two consecutive multiples mb and (m+ 1)b of &. Hence, ab being divisible by p, mab is also divisible by p; moreover, ap is divisible byp, and hence the difference of these numbers, = a(p — mb), must also be divisible by p, or, writing p — mb =0', we have ab' divisible by p, where 0' is less than 6; so that b is not the least number for which ab is divisible by p. (2) If a andb are neither of them divisible by p, then a divided by p leaves a remainder a which is less than p, say we have a= mp +a 5 and similarly 6 divided by p leaves a remainder 8 which is less than p, say we have b=np+f; then~~

ab=(mp +a)(np +), =(mnp+na+mp) p+aB, and af is not divisible by p, therefore ad is not divisible by p. (3) The like proof applies to the product of three or more factors a, b, c,... (4) Suppose that the number WN, =a%bBey … (a, b, ¢,... prime numbers other than 1), is decomposable in some other way into prime factors : we can have no prime factor p, other than a, 8, ¢,..., for no such number can divide a%b8cY…; and we must have each of the numbers a, b,c,..., for if any one

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of them, suppose a, were wanting, the number V would not be divisible by a. Hence the new decomposition if it exists must be a decomposition V= at bP'cy' ...; and here, if any two corresponding indices, say 4, o', are different from each other, then one of them, suppose a, is the greater, and we have V+p* =68c7 …= at'-4 DB'cY'. That is, we have the number V/+p* expressed in two different ways as a product, the number a being a factor in the one case, but not a factor in the other case. Thus the two exponents cannot be unequal, that is, we must have a=a', and similarly we have B=', y=y', .. .; that is, there is only the original decomposition V= abbey …

3. The only numbers divisible by a number V = ab8c7. . are the numbers a" b?'cv'.., where each exponent a' is equal to or greater than the corresponding exponent a. And conversely the only numbers which divide WV are those of the form a*bcV…, where each index a' is at most equal to the corresponding index a; and in particular each or any of the indices a may be =0. Again, the least common multiple of two numbers W=a%b8cy . . and WM =a'b8'ev … is a'b8"cy"..., where each index a" is equal to the largest of the corresponding indices a, « ;— observe that any one or more of the indices a, P, y,.., a', B', y',..., may be =0, so that the theorem extends to the case where either of the numbers J, WV', has prime factors which are not factors of the other number. And so the greatest common measure of two numbers V=abPcY .. and W' =a b8'o"... is a*"08'c"..., where each index a" is equal to the least of the corresponding indices a and a'.

4, The divisors of W=a%b8cY.. are the several ternis of the product (l+a..+a%(1+6..+08)\(l+c..+c%), where unity and the number J itself are reckoned each of them as a divisor. Hence the number of divisors is =(4+1) (6+1)(y+1)..., and the sum of the divisors is (att1 1b +1 — 1eyt1-1)..

~~- (a—1)(6-1)(e-1).. ;~~

~~5. In N=a%bSev.. the number of integers less than V and prime to it is $(J), -¥(1 — =) (a — i) € — *) ce To find the numbers in question write down the series of numbers 1, 2, 3,... 17; strike out all the numbers divisible by a, then those divisible by 6, then those divisible by c.., and so on; there will remain only the numbers prime to NV. For actually finding the numbers we may of course in striking out those divisible by 6 disregard the numbers already struck out as divisible by a, and in striking out with respect to c disregard the numbers already struck out as divisible by a or 6, and so on; but in order to count the remaining numbers it is more convenient to ignore the previous strikings out. Suppose, for a moment, there are only two prime factors a and 0, then the number of~~

~~terms struck out as divisible by a is=W. Ze and the a~~

~~number of terms struck out as divisible by 6 is= WN. es but then each term divisible by a will have been twice struck~~

~~out; the number of these is = Nop and thus the number~~

~~of the remaining terms is V (1 — sata): which is a~~

~~1 1 ae.~~

~~=N (a — “) (a = i) . By treating in like manner the case of three or more prime factors a, b, ¢,.. we arrive at the general theorem. The formula gives aly — ll {viz., N=1, there is no factor 1 -3); and it is necessary to~~

~~consider $(1) as being =1. The explanation is that $(1)~~

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~~properly denotes the number of integers not greater than N and prime to it ; so that in VW=1 we have 1 an integer not: greater than WV and prime to it; but im every other case the two definitions agree.~~

~~6. If WV, WW’, are numbers prime to each other then d(VN’)=¢(N)¢(N), and so also for any number~~

of numbers having no common divisor; in particular

b(a%bBer . .) = h(a) P(bP)h(c7) .. .; (a4) = a% (a — *), and the theorem is at once verified. We have V=2¢(J'), where the summation extends to all the divisors WV' of N, unity and the number JW itself being included; thus 15 = $(15) + $(5) + $(3) + P(1), =8 +4424 1.

7. The prime factor of the binomial function 7%—1 is (e™=))@—1)... ~ (aNla—(eX 1)... of the degree ¢(V); say this is called [7-1], and we have aN—1=TH [a — 1], where the product extends to all the divisors WV' of WV, unity and the number J included. For instance

[e¥-1]= and we have (a!5 — 1) = [ae — 1] [a> — 1] (a? -1][% — 1], =(8— a?.. —at+1)(et+ a +22+04+1)(e+e+1)(%-1).

8. Congruence to a given modulus. A number # is congruent to 0, to the modulus V, «=0 (mod. WN), when z is divisible by V; two numbers 2, y are congruent to the modulus VW, z=y (mod.), when their difference a—y divides by N, or, what is the same thing, if —-y=0 (mod. WV). Observe that, if #y=0 (mod. 1), and x be prime to V, then y=0 (mod. J).

9. Residues to a given modulus. For a given modulus N we can always find, and that in an infinity of ways, a set of V numbers, say WV residues, such that every number whatever is, to the modulus J, congruent to one and only one of these residues. For instance, the residues may be 0, 1, 2, 3,...W—1 (the residue of a given number is here simply the positive remainder of the number when divided by WV); or, WV being odd, the system may be

0, £1, £2,.. +4(N-1),

, @ rational and integral function

(#5—1)(%-1)

A = — — y = ~~ 5 es pees e+e—atte—aetl1;

and JV even, 0, £1, £2,.. $3(N-2), +N.

~~10. Prime residues to a given modulus. Considering only the numbers which are prime to a given modulus J, we have here a set of ¢(V) numbers, say ¢(V) prime residues, such that every number prime to J is, to the modulus WV, congruent to one and only one of these prime residues. For instance the prime residues may be the numbers less than WV and prime to it. In particular, if V is a prime number 7p, then the residues may be the p—1l numbers, 1, 2, 3,...p9—1.~~

~~Tn all that follows the letter .y, in the absence of any statement to the contrary, will be used to denote an odd prime other than unity. A theorem for p may hold good for the even prime 2, but it is in general easy to see whether this is so or not.~~

~~11. Fermat's theorem, #?-!1—-1=0 (mod. p). The gener- alized theorem is ##%)-1=0 (mod. WY). The proof of the generalized theorem is as easy as that of the original theorem. Consider the series of the ¢(¥) numbers a, 6, c,... each less than WV and prime to it; let x be any number prime to J, then each of the numbers wa, x0, xe, . . is prime to V, and no two of them are congruent to the modulus J, that is, we cannot have #(a—6)=0 (mod. 1); in fact, z is prime to WN, and the difference a—6 of two positive numbers each less than WV will be less than J. Hence the numbers xa, xb, xc,...are in a different order congruent to the numbers a, 6, ¢,...3; and multiplying to- gether the numbers of each set we have z?™abc..=abc..~~

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~~(mod. JV), or, since a, 0, ¢,.. are each prime to WV, and therefore also the product abc..is prime to WV, we have #P™) = 1, or say eP)—1=0 (mod. J).~~

~~In particular, if V be a prime number =p, then 4(W) is =p—1, and the theorem is #?-!-1=0 (mod. p), x being now any number not divisible by p.~~

~~12. The general congruence f(x)=0 (mod. p). f(x) is written to denote a rational and integral function with integer coefficients which may without loss of generality be taken to be each of them less than p; it is assumed that the coefficient of the highest power of x is not=0,. If there is for « an integer value a such that f(a) =0 (mod. Pp, throughout), then a is said to be a root of the congru- ence~~

f(x) =0 ; we may, it is clear, for a substitute any value whatever a′=a+kp, or say any value a′ which is=a, but such value ’ is considered not as a different root but as the same root of the congruence. We have thus S(a)=0; and therefore f(x) = f(x) -—f(a), = («-a) J\(x), where J\(z) is a function of like form with f(x), that is, with integer coefficients, but of the next inferior order n—1. Suppose there is another root b of the congruence, that is, an integer value 6 such that /(b)=0; we have then (b-a)7,(6) = 0, and b-a is not =0 (for then 6 would be the same root as a). Hence J,(6) = 0, and flat) = (wa) (F(x)—F,(0)}, = (ea) («—8) f(a), where

o(#) is an integral function such as f(x), but of the order n—2; and so on, that is, if there exist » different (non-congruent) roots of the congruence J© = 0, then J(«)=A(e- me—b)...(@—k), and the congruence may be written A(w—a)(a—6)..(e-k)=0. And this cannot be satisfied by any other value 7; for if so we should have A(l—a)(t—b)... (¢—k)=0, that is, some one of the con- gruences (1—a)=0, &c., would have to be satisfied, and / would be the same as one of the roots a, b, c,...%. That is, a congruence of the order z cannot have more than n roots, and if it have precisely » roots a, b, c,..k, then the form is f(x) = A(x—a)(a—6)...(a—k), =0.

Observe that a congruence may have equal roots, viz., if the form be /(«) = A(a—a)*(«—b)8…,=0, then the roots a, 6,..are to be counted a times, @ times, .. . respect- ively ; but clearly the whole number of roots a+f+.. is at most =n.

It is hardly necessary to remark that this theory of a congruence of the order n is precisely analogous to that. of an equation of the order », when only real roots are attended to. The theory of the imaginary roots of a congruence will be considered further on (see No. 41).

13, The linear congruence az=c(mod. 6). This is equivalent to the indeterminate equation ax+by=c; if a and 6 are not prime to each other, but have a greatest commou measure g, this must also divide c; supposing the division performed, the equation becomes a’x+b’y=c, where a’ and 0’ are prime to each other, or, what is the same thing, we have the congruence a’z=c’ (mod. 0’). This can always be solved, for, if we consider the 0’ numbers 0, 1, 2,...6’-1, one and only one of these will be=c’ (mod. 0’),

Multiplying these by any number a’ prime to 0’, and taking the remainders in regard to 6’, we reproduce in a different order the same series of numbers 0,1, 2,...6’—1; that is, in the series a’, 2a’,... (0-1) a’ there will be one and only one term=c’ (mod. 0’), or, calling the term in question a, we have «=a. as the solution of the congruence wx=c’ (mod. b’); a’a—c’ is then a multiple of 0’, say it is= — 0’B, and the corresponding value of yis y=. We may for a write a+ mb’, m being any positive or negative integer, not excluding zero (but, as already remarked, this is not considered as a distinct solution of the congruence) ; the corresponding value of y is clearly = 8 — ma’.

The value of x can be found by a process similar to that for finding the greatest common measure of the two

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numbers a’ and c’; this is what is really done in the appa- rently tentative process which at once presents itself for small numbers, thus 6z=9 (mod. 35), we have 36x = 54, or, rejecting multiples of 35, +=19, or, if we please, x= 35m+19,

In particular, we can always find a number & such that w&=1 (mod. 0’) ; and we have then w=c’£ as the solution of the congruence a’x=c’. The value of & may be written

f= = (mod. 6’), where = stands for that integer value

€ which satisfies the original congruence a’§=1 (mod. 6’);

and the value of « may then be written # = ——— (mod. 0’). a

Another solution of the linear congruence is given in No. 21. 14, Wilson’s theorem, 1.2.3…p—-1+1=0 (mod. p). It has been seen that for any prime number p the con- gruence «?-!—]1=0 (mod. p) of the order p—1 has the p-1 roots 1, 2,...7-—1; we have therefore a?-1 1=(4-1)(v-2)...(e-p—1), or, comparing the terms independent of x, it appears that 1.2.3…p—-1= =— 1,thatis, 1.2:3…9—1+41 = 0 (mod. p), -—the required theorem. For

instance, where p=5, then 1,2.3.4+1=0 (mod. 5), and where »=7, then 1.2.3.4.5.6 +1 = 0 (mod. 7).

15. A proof on wholly different principles may be given. Suppose, to fix the ideas, »= 7; consider on a circle 7 points, the summits of a regular heptagon, and join these in any mauner so as to form a heptagon; the whole number of heptagons is 3.1.2.3.4.5.6. Now of these we have (7 — 1),=3, which are regular heptagons (convex or stellated) ; the number of remaining heptagons must be divisible by 7, for with any one such heptagon we con- nect the 6 heptagons which can be obtained from it by making it rotate through successive angles of 7 360°. That is, 3.1.2.3.4.5.6-3(7—1)=0 (mod. 7), whence 1.2.3.4.5.6-7+41=0, or finally 1.2.3.4.5.6+1=0 (mod. 7). It is clear that the proof applies without altera- tion to the case of any prime number p. aaa

If p is not a prime number, then 1.2.3…p—-1=0 (mod. p); hence the theorem shows directly whether a number p is or is not a prime number; but it is not of any practical utility for this purpose.

16. Prime roots of a prime number—application to the binomial equation x? -1=0. Take, for instance, aI By what precedes we have

28 — 1 =[x8- 1].[a — 1].[a2 -1][e—1), = (a? -2+1)(e?+a4+1)(e+1)(a-1); and we have a — 1 = (–1)(« — 2)(— 8)(a ~ 4)(% — 5)(a—6) (mod. 7) ; whence also

(a? — + 1)(a®+a+41)(+1)(% — 1) = (x — 1)(— 2)(— 8)(a— 4)(a — 5) (a — 6). These two decompositions must agree together, and we in fact have 5 x? —~x+1= (x—8)(x—-5), a + 2+ 1 = (x — 2)(x— 8), e+l=x“-6,%-l=2-1. In particular, we thus have 3, 5, as the roots of the con- gruence «*— x2+1=0, that is, [~®- 1]=0, and these roots 3, 5, are not the roots of any other of the congruences {#®-—1]=0, [z?-1]=0, [x-1]=0; that is, writing a=3 or 5 in the series of numbers a, a’, a3, a4, a5, a, we have a® as the first term which is=1 (mod. 7); the series in fact are By 9, 27, 81, 248, 729 =8, 2,6, @ 5a

5, 25, 125, 625, 3125, 15625=5, 4, 6, 2, 3, 1

And so in general the congruence «?1—1=0 (mod. p) has the p—1 real roots 1, 2, 3,...%—1, hence the con gruence [x?-1~1]=0, which is of the order ¢(p—1), has this number $(p — 1) of real roots ; and, calling any one of XVII. — 78

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these g, then in the series of powers g, 9', 9,--- Guar, the first term which is = 1 (mod. 7) is g?1, that is, we have I Ps Pro GP =1, 2, 3,...p—1 in a different order. Any such number g is said to be a prime root of p, and the number of prime roots is ¢(p—1), the number of in tegers less than and prime to p — 1.

The notion of a prime root was applied by Gauss to the solution of the binomial equation «? — 1=0, or, what is the same thing, to the question of the division of the circle (Kreistheilung), see Equation, Nos. 30 and 31 (vol. viil., p. 507); and, as remarked in the introduction to the pre- sent article, the roots or periods of roots of this equation present themselves as the units of a complex theory in the Theory of Numbers.

17. Any number z less than p is=g™, and, if m is not prime to p—1, but has with it a greatest common measure e, suppose m= ke, p—1=ef, then

cag, efagf= gh@-Y=1,

that is, a/=1; and it is easily seen that in the series of powers 2, x,...a, we have afas the first term which is =1 (mod. p). A number =g", where m is not prime to p-1, is thus not a prime root; and it further appears that, g being any particular prime root, the ¢(p— 1) prime roots are=the numbers g™, where m is any number less than p—land prime toit. Thus in the foregoing example p=, where the prime roots were 3 and 5, the integers less than 6 and prime to it are 1, 5; and we in fact have 5 = 35 and 3=5° (mod. 7).

18. Integers belonging to a given exponent ; index of a number. If, as before, p—1=ef, that is, if f be a sub- multiple of p—1, then any integer x such that #/ is the lowest power of x which is=1 (mod. p) is said to belong to the exponent f. The number of residues, or terms of the series 1, 2, 3,...2—1, which belong to the exponent f is $(f), the number of integers less than

~~f and prime to it; these are the roots of the congruence [zf—1]=0 of the order $(f). It is hardly necessary to remark that the prime roots belong to the exponent p — 1.~~

~~A number x«=g” is said to have the index m; observe the distinction between the two terms exponent and index; and further that the index is dependent on the selected prime root g.~~

~~19. Special forms of composite modulus. If instead of a prime modulus p we have a modulus p” which is the power of an odd prime, or a modulus 2p or 2p™ which is twice an odd prime or a power of an odd prime, then there is a theory analogous to that of prime roots, viz., the numbers less than the modulus and prime to it are congruent to successive powers of a prime root g; thus, if p™ = 8”, we have 2, 4, 8, 16, 32, 64=2, 4, 8, 7, 5, 1 (mod. 9), and if 2p™=2.3?, we have 5, 25, 125, 625, 3125, 15625=5, 7, 11,~~

~~13, 17, 1 (mod. 18). As regards the even prime 2 and its powers—for the modu- lus 2 or 4 the theory of prime roots does not come into existence, and for the higher powers it is not applicable ; thus with modulus =8 the numbers less than 8 and prime to it are 1, 3, 5, 7; and we have 3?=5?=72=1 (mod. 8).~~

~~20. Composite modulus W=a%bbcy . . . —no prime roots—irregularity. In the general case of a composite modulus it has been seen that, if x is any number less than WV and prime to it, then «®@%)-1=0 (mod. J). But (except in the above-mentioned cases p™, 2p™, 2 or 4) there is not any number a such that a?) is the first power of a which is=1; there is always some submultiple~~

~~eel a eis 1=54(¥) such that a‘ is the first power which is =1.~~

~~For instance, say VW = 24, $(17) =8, then the numbers less than 24 and prime to it are 1,5,7, 11, 13,17,19,23; and we have 11=1, 52=72=13? =172=19=232=1 (mod. 24),~~

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~~that is, 1 has the exponent 1, but all the other numbers have the exponent 2. So again where VY =48, the 16 numbers less then 48 and prime to it have, 1 the exponent 1, and 7, 13, 17, 23, 25, 31, 35, 41, 47 each the exponent 2, and the remaining numbers 5, 11, 19, 29, 37, 43 each the ex- ponent 4. We cannot in this case by means of any single root or of any two roots express all the numbers, but we can by means of three roots, for instance, 5, 7, 13, express all the numbers less than 48 and prime to it; the numbers are in fact =5% 7P137, where a=0, 1, 2, or 3, and f and y each = 0 or 1.~~

~~[Comparing with the theorem for a prime number p, where the several numbers 1, 2,3, ...7—1, are expressed by means of a single prime root, = g*, where a = 0, 1, 2,...p—1, we have the analogue of a case presenting itself in the theory of quadratic forms,—the "irregularity" of a deter- minant (post, No. 31); the difference is that here (the law being known, V= a composite number) the case is not re- garded as an irregular one, while the irregular determinants do not present themselves according to any apparent law.|~~

~~21. Maximum indicator—application to solution of a linear congruence. In the case 1 =48 it was seen that the exponents were 1, 2, 4, the largest exponent 4 being divisible by each of the others, and this property is a general one, viz., if W=abPcY.. in the series of expo- nents ¢ (or, as Cauchy calls them, indicators) of the numbers less than V and prime to it, the largest exponent J is a multiple of each of the other exponents, and this largest exponent Cauchy calls the maximum indicator ; the maxi- mum indicator J is thus a submultiple of (1), and it is the smallest number such that for every number 2 less than WV and prime to it we have #!—1=0(mod. WV). The values of J have been tabulated from V=2to 1000. Reverting to the linear congruence ax = (mod. 0), where a and 0 are prime to each other, then, if J is the maximum indicator for the modulus 2, we have a/=1, and hence it at once appears that the solution of the con- gruence is x=ca!-1,~~

~~22. Residues of powers for an odd prime modulus. For the modulus p, if g be a prime root, then every num- ber not divisible by p is = one of the series of numbers 959°, ...g®-1; and, if & be any positive number prime to p—1, then raising each of these to the power & we re- produce in a different order the same series of numbers 9,9°,+—g27}, which numbers are in a different~~

order =1,2,....p—1, that is, the residue of a Ath power may be any number whatever of the series 1, 2,...p—1.

But, if £ is not prime to p — 1, say their greatest common measure is e, and that we have p—1=ef, k=me, then for any number not divisible by p the kth power is =one of the series of f numbers g*, 9%,....g”.; there are thus

ii only f, =e —1), out of the p — 1 numbers 1, 2,3,....p— 1,

which are residues of a kth power.

23. Quadratic residues for an odd prime modulus. In particular, if /=2, then e=2, f=4(p—1), and the square of every number not divisible by p is=one of the 3(p — 1) numbers g’,. g4,...g?~1; that is, there are only 4(p—-1) numbers out of the series 1, 2, 3,...2—1 which are resi- dues of a square number, or say quadratic residues, and the remaining }(p—1) numbers are said to be quadratic non-residues of the modulus p,—we may say simply, resi- dues and non-residues. But this result can be obtained more easily without the aid of the theory of prime roots. Every number not divisible by p is, to the modulus p,= one of the series of numbers +1, £2, +3,..+4(p-1); hence every square number is=one of the series of num- bers 12, 22, 32,.. 4(p—1)?; and thus the p—1 numbers

1, 2, 3,....p—1, are one-half of them residues and the

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other half non-residues of p. Thus in the case p=11 every number not divisible by 11 is, to this modulus, =one of the series +1, +2, +3, +4, 45; whence the square of any such number is = one of the series 1, 4, 9, 16, 25, or say the series 1, 4, 9, 5, 3; that is, we have residues |, 3, 455,—. : . 9. non-residues |. 2, . a Ghainecs . dO | : Calling as usual the residues a and the non-residues 6, we

— i il : have in this case Ti (2b- 2a) = Ti (33 — 22), =1, a posi-

tive integer ; this is a property true for any prime number of the form 4n+3, but for a prime number of the form 4n+1 we have 2b—2a=0; the

demonstration belongs to a higher part of the theory.

It is easily shown that the product of two residues or of two non-residues is a residue; but the product of a residue and a non-residue is a non-residue.

24, The law of reciprocity—Legendre's symbol. The question presents itself, given that P is a residue or a non-residue of @, can we thence infer whether Q is a residue or a non-residue of P? In particular, if P, Q, are the odd primes p, g, for instance, given that 13 = R(17), can we thence infer that 17 = R(13), or that 17 = WR(13) % The answer is contained in the following theorem : if p, g, are odd primes each or one of them of the form 4n+1, then p, g, are each of them a residue or each of them a non-residue of the other ; but, if p, g, are each of them of the form 4n + 3, then according as p is a residue or a non- residue of g we have g a non-residue or a residue of p.

The theorem is conveniently expressed by means of Legendre's symbol, viz., p being a positive odd prime, and (any positive or negative number not divisible by p,

then (2) denotes+ 1 or—1 according as @ is or is not

a residue of p; if, as before, g is (as p) a positive odd prime, then the foregoing theorem is

(2X f=

The denominator symbol may be negative, say it is —p,

we then have as a definition (5) = (2) observe that SO.; Q me A (=) is not = &) —and we have further the theorems

-1\ ,f@-D (2\, 8e-D (ee at " Ga a viz., — 1 is a residue or a non-residue of p according as p=lor=3 (mod. 4), and 2 is a residue or a non-residue of p according as p=1 or 7, or=3 or 5 (mod. 8). If, as definitions, (a = +1 and (4) = +1, these may be

written

(GME)=ak? aa (2)(Z) =a”

We have also, what is in fact a theorem given at the end

of No. 23, QQ) (2\(2 (Pp a p \ Pp) The further definition is sometimes convenient— (2) =o, when p divides Q. The law of reciprocity as contained in the theorem

(2X 4)=-atm

is a fundamental theorem in the whole theory; it was enunciated by Legendre, but first proved by Gauss, who gave no less than six demonstrations of it.

25. Jacobi’s generalized (a, Jacobi defined this as follows: the symbol (wee -), where p, p’, p”,.. are positive odd primes equal or unequal, and Q is any

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positive or negative odd number prime to pp’p” ... , denotes +1 or—1 according to the definition

(sqhr-)=(2(8X8)—

the symbols on the right-hand side being Legendre’s symbols ; but the definition may be regarded as extending to the case where Q is not prime to pp’p”..., then we have Q divisible by some factor p, and by the definition of Legendre’s symbol in this case we have (2) = 0; hence in the case in question of Q not being prime to pp’p”.. the value of Jacobi’s symbol is = 0.

We may further extend the definition of the symbol to the case where the numerator and the denominator of the symbol are both or one of them even, and present the definition in thé most general form, as follows: suppose that, p, p’, p”,... being positive or negative even or odd primes, equal or unequal, and similarly g, q’, q’,... being positive or negative even or odd primes, equal or unequal, we have P=pp’p”... and Q=qq’q”..., then the symbol

(3) will denote +1, —1, or 0, according to the definition

(9) SENG) EXE

the symbols on the right hand being Legendre's symbols. If P and @ are not prime to each other, then for some pair of factors p and g we have p= +4, and the corre-

sponding Legendrian symbol (4) is=0, whence in this

case (-7) = 0.

It is important to remark that ($ =+1 is not a sufficient condition in order that Q may be a residue of P; if P= 2¢pp'p"..,-p,p',p", .. being positive odd primes, then, in order that @ may be a residue of P, it must be a residue of each of the prime factors p, p', p",.., that is, we must have (2) = +1, (5) =+1, (5) =+1,... as many

\p P p equations as there are unequal factors p, p', p",..of the modulus P.

Ordinary Theory, Second Part,—Theory of Forms.

26. Binary quadratic (or quadric) forms—transforma-

tion and equivalence. We consider a form ax" + bay +cy?, =(a, b, c)(x, y)*,

or when, as usual, only the coefficients are attended to, =(a, b,c). The coefficients (a, 6, c) and the variables («, y) are taken to be positive or negative integers, not excluding zero. The discriminant ac — 0? taken negatively, that is, 6? —ac, is said to be the determinant of the form, and we thus distinguish between forms of a positive and of a negative determinant.

Considering new variables, ax+ By, yx + Sy, where a, B, y, 5, are positive or negative integers, not excluding zero, we have identically a

(a, b, c)(ax+ By, yet dy)? =(a', 0', c')(x, y)*,

where a'=(a, 6, c)(a, y)*, =a? + 2bay +cy?, b= (a, b, c)(a, y)(B, 5), =aaB+b(ad + By)+cy6, ce' =(a, 8, c)(B, 5)*, = a8? + 2686 + cd? ;

and thence b — ac' =(ad — By)? (6? — ac).

The form (a’, 0’, c’) is in this case said to be contained in the form (a, }; c); and a condition for this is obviously that the determinant D’ of the contained form shall’ be equal to the determinant D of the containing form multi- plied by a square number ; in particular, the determinants must be of the same sign. If the determinants are equal, then (a6 — By)?=1, that is, a8 —By=+1. Assuming in this case that the transformation exists, and writing a8 — By =«, and writing also

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1 U , ipl /, xe’ =axn+ By, eS (6ar’ — By’), = a’a’ + B’y’, then conversely 1 oy. gy SUPPOSE, y! =ya+t by y= = (-ye’ tay’), =x +5Y’s

where a’, f’, y’, & are integers ; and we have, moreover, i 1 a8! — By’ = (a8 — By), = =e

that is, a’s’ — B’y’ = + lor — 1 according as a8 — Byis = +1 or—1. The two forms (a, 6, c), (a’, 0, c’) are in this case said to be equivalent, and to be, in regard to the particular transformation, equivalent properly or improperly accord- ing as a5 — By(=a‘8 — f’y’)is =+lor=—1. We have, therefore, as a condition for the equivalence of two forms, that their determinants shall be equal; but this is not a suffi- cient condition. It is to be remarked also that two forms of the same determinant may be equivalent properly and also improperly; there may exist a transformation for which aS — By is= +1, and also a transformation for which aS- By is =—1. But this is only the case when each of the forms is improperly equivalent to itself; for instance, a form x2 — Dy’, which remains unaltered by the change «, y, into z, —y (that is, a, B, y, ‘=1, 0, 0, —1, and therefore aS — By = — 1), is a form improperly equiva- lent to itself, A form improperly equivalent to itself is said to bean ambiguous form. In what follows, equivalent means always properly equivalent.

27. Forms for a given determinant—classes, &c. In the case where D, =0? —ac, is a square the form (a, 6, c)(x, y)? is a product of two rational factors; this case may be ex- cluded from consideration, and we thus assume that the determinant D is either negative, or, being positive, that it is not a square. The forms (a, 6, c) of a given positive or negative determinant are each of them equivalent to some one out of a finite number of non-

equivalent forms which may be considered as representing so many distinct classes. For instance, every form of the determinant — 1 is equivalent to (1,0,1), that is, given any form (a, b, c) for which b?-ac = —1, it is possible to find integer values a, 8, y, 6, such that ad-By=+1, and (a, b, c)(aa + By, yx + Sy)? = (1, 0, 1)(*, y)?, that is, = x? + 97. Or, to take a less simple example, every form of the deter- minant — 35 is equivalent to one of the following forms: (1, 0635), (6, -, 7), (S21, 12), (4 es) 3), (6, 1, 6); for the first six forms the numbers a, 20, c have no common factor, and these are said to be properly primitive forms, or to belong to the properly primitive order ; for the last two forms the numbers a, 6, c have no common factor, but, and ¢ being each even, the numbers a, 26, c have a common factor 2, and these are said to be improperly primitive forms, or to belong to the improperly primitive order. The properly primitive forms are thus the six forms (1, 0, 35), (5, 0, 7), (3, +1, 12), (4, £1, 18); or we may say that there are represented hereby six properly primitive classes. Derived forms, or forms which belong to a derived order, present themselves in the case of a determinant D having a square factor or factors, and it is not necessary to consider them here.

It is not proposed to give here the rules for the deter- mination of the system of non-equivalent forms; it will be enough to state that this depends on the determination in the first instance of a system of reduced forms, that is, forms for which the coefficients a, 6, c, taken positively satisfy certain numerical inequalities admitting only of a finite number of solutions. In the case of a negative de- terminant the reduced forms are no two of them equivalent, and we thus have the required system of non-equivalent forms ; in the case of a positive determinant, the reduced forms group themselves together in periods in such wise that the forms belonging to a period are equivalent to each other, and the required system of non-equivalent forms is

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obtained by selecting one form out of each such period. The principal difference in the theory of the two cases of a positive and a negative determinant consists in these periods ; the system of non-equivalent forms once arrived at, the two theories are nearly identical.

~~28. Characters of a form or class—division into genera. Attending only to the properly primitive forms—for in- stance, those mentioned above for the determinant — 35 — the form (1, 0, 35) represents only numbers f which are residues of 5, and also residues of 7; we have, in fact, f=a + 35y*, =22 (mod. 5), and also=x?(mod.7). Using~~

~~the Legendrian symbols (5) and (2), we say that the~~

~~form (1, 0, 35) has the characters (5), (Z) =++4, Each of the other forms has in like manner a determinate character + or — in regard to a and also in regard to (2) ; and it is found that for each of them the characters are + + or else — — (that is, they are never + — or — +).~~

~~We, in fact, have :~~

~~(5)(4)~~

~~(Oo) of ae~~

~~(4,1, 9) Ae~~

~~(oe~~

~~(3, + 1, 12)~~

~~and we thus arrange the six forms into genera, viz., we have three forms belonging to the genus (5); (7) =++, and three to the genus (5); (7) = — —, these char- acters + + and — — of genera being one-half of all the combinations + +, — —, + —, — +.~~

~~The like theory applies to any other negative or positive determinant; the several characters have reference in some cases not only to the odd prime factors of D but also to the numbers 4 and 8, that is, there is occasion to consider~~

~~(=*) ,=(- ie and 2 4(f?-1) 7 (5), =(1) , and there are various cases to be con~~

~~Gf,~~

~~sidered according to the form of D in regard to its simple and squared factors respectively ; but in every case there are certain combinations of characters (in number one-half of all the combinations) which correspond to genera, and the properly primitive forms belong to different genera accordingly, the number of forms being the same in each genus.~~

~~The form (1, 0,D) has the characters all +, and this is said to be the principal form, and the genus containing it the principal genus. For a given determinant, the characters of two genera may be compounded together according to the ordinary rule of signs, giving the char acters of a new genus; in particular, if the characters of a genus are compounded with themselves, then we have the characters of the principal genus.~~

~~29. Composition of quadratic forms. Considering X, Y, as given lineo-linear functions of (#, y), (#', y'), defined by the equations :~~

~~X= porn' + prey' + py' + psyy's~~

~~Y= qopeu! + qyeey! + gaye + g3yy's the coefficients 7; Py, Po Ps Yor Uv Ya Ys May be so con- nected with the coefficients (A, B, C), (a, 8, c), (a, &, ¢'), of three quadratic forms as to give rise to the identity~~

~~(A, B, OVX, Y)2=(, 6, e)(a, y)?. (a, OY, ca', y's~~

~~and, this being so, the form (A, B, C) is said to be com- pounded of the two forms (a, 0, c) and (a', 0', c'), the order of composition being indifferent.~~

~~also the Legendrian symbols~~

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~~The necessary and sufficient condition in order that it may be possible to compound together two given forms~~

~~(a, 6, c), (a', 6', c'), is that their determinants shall be to each other in the proportion of two square numbers; in particular, the two forms may have the same determinant D ; and when this is so the compound form (4, B, C) will also have the same determinant D. The rules for this composition of~~

~~two forms of the same determinant have been (as part of the general theory) investigated and established. The forms compounded of equivalent forms are equivalent to each other; we thus in effect compound classes, viz., considering any two classes, the composition of their representative forms gives a form which is the representative of a new class, and the composition of any two forms belonging to the two classes respectively gives a form belonging to the new class. But, this once under- stood, it is more simple to speak of the composition of forms, that is, of the forms belonging to the finite system of representative forms for a given determinant; and it will be enough to consider the properly primitive forms.~~

~~30. The principal form (1, 0, D) compounded with any other form (a, 6, c) gives rise to this same form (Ca earale the principal form is on this account denoted by 1, viz, denoting the other form by 4, and expressing composition in like manner with multiplication, we have1.¢=¢. The form may be compounded with itself, giving a form denoted by $7; compounding this again with ¢, we have a form denoted by ¢°; and soon. Since the whole number of forms is finite we must in this manner arrive at the principal form, say we have ¢”= 1, » being the least expo- nent for which this equation is satisfied. In particular, if the form ¢ belong to the principal genus, then the forms ¢*, $,...¢”-1 will all belong to the principal genus, or the principal genus will include the forms 1, ¢, ¢%,... 6-1, the powers of a form ¢ having the exponent n.~~

~~31. Regular and irregular determinants. The principal genus may consist of such a series of forms, and the deter- minant is then said to be regular ; in particular, for a nega- tive determinant D,= — 1 to — 1000, the determinant is always regular except in the thirteen cases — D = 243, 307,~~

~~339, 459, 576, 580, 675, 755, 820, 884, 891, 900, 974~~

~~(and, Perott, in Crelle, vol. xev., 1883, except also for — D=468, 931); the determinant is here said to be ir- regular. Thus for each of the values — D = 576,580,820, 900, the principal genus consists of four forms, not 1, 4, ¢, 4°, where #*=1, but 1, $,),,, $4, where ¢?=1, ¢,2=1, and therefore also ($¢,)? = 1.~~

Compounding together any two forms, we have a form with the characters compounded of the characters of the two forms ; and in particular, combining a form with itself, we have a form with the characters of the principal form. Or, what is the same thing, any two genera compounded together give rise to a determinate genus, viz., the genus having the characters compounded of the characters of the two genera ; and any genus compounded with itself gives rise to the principal genus.

Considering any regular determinant, suppose that there is more than one genus, and that the number of forms in each genus is=n; then, except in the case n= 2, it can be shown that there are always forms having the exponent 2n. For instance, in the case D = — 35 we have two genera each of three forms ; there will be a form g having the exponent 6, —g°=1; and the forms are 1, g, g?, g3, g4, g°, where 1, 9', g', belong to the principal genus, and g, g?, 9°, to the other genus. The characters refer to (5); (7); and

the forms are

a atare (ip 0, 35) 1 pee) (3, re AL, 12) g GL oe (5, 0, 7) 9 ae lp 9) gf (3, a 12) re

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An instance of the case n=1 is D= —2 1, there are here four genera each of a single form 1, c, C, CC, where c? = 1, c7=1; an instance of the case n=2 is D= — 88, there

are here two genera each of two forms l, c, and Crees, where c?= 1, c,?=1, thus there is here no form having the exponent 2n. (See Cayley, Tables, dc., in Crelle, vol. lx., 1862, pp. 357-372.) We may have Qk+1 genera each of m forms, viz., such a system may be represented by al ae oes ee, es relies e)(1, ¢;) toe cl; C1); where O91, ct=1, ¢42=1, ... @,.1=1; there is no peculiarity in the form ¢, we may instead of it take any form such as c¢, cc,¢, &c., for each of these is like ¢, a form belonging to the exponent 2n, and such that the even powers give the principal genus.

32. Ternary and higher quadratic forms—cubic forms, &c. The theory of the ternary quadratic forms

(a, 6, c, a', B', c')(a, y, 2)®, =aa* + by? + cx? + Qa'yx + QW'ex + 2c ; or when only the coefficients are attended to & Ht ay

2

has been studied in a very complete manner 3 and those of the quaternary and higher quadratic forms have also been studied ; in particular the forms 22+ 2+ 2%, a2 + 242242 composed of three or four squares ; and the like forms with five, six, seven, and eight squares. The binary cubic forms (a, , ¢, d(x, y)8, = ax + 3bx2y + 3cay? + dy?, or when only the coefficients are attended to (a, 6, c, d), have also been considered, though the higher binary forms have been scarcely considered at all. The special ternary cubic forms ax? + by? + ca + Gleyz have been considered. Special forms of the degree » with n variables, the products of linear factors, present themselves in the theory of the division of the circle (the Kreistheilung) and of the complex numbers connected therewith ; but it can hardly be said that these have been studied as a part of the general theory of forms.

Complex Theories.

33, The complex theory which first presented itself is that of the numbers a+¢ composed with the imaginary i, = / — 1; here if aand bare ordinary, or say simplex posi- tive or negative integers, including zero, we regard a + 67 as an integer number, or saysimply as a number in this complex theory. We have here a zero 0 (a=0, =0) and the units 1, 7, — 1, —2, or as these may be written 1, ¢, 22, 23 (¢4=1); the numbers a + 01, a — b¢, are said to be conjugate numbers, and their product (a+ 0i)(a — 61), =a? +62, is the norm of each of them. And so the norm of the real number a is =a', and that of the pure imaginary number 07 is = 62, Denoting the norm by the letter V, V(a+b7) =a? +62,

Any simplex prime number, =1 (mod. 4), is the sum of two squares a*+ 6%, for instance 13=9-+4, and it is thus a product (a= 07)(a — b2), that is, it is not a prime number in the present theory, but each of these factors (or say any number @+ 62, where a?+6? is a prime number in the simplex theory) is a prime; and any simplex prime number, = 3 (mod. 4), is also a prime in the present theory. The number 2, = (1 +7)(1—2), is not a prime, but the

factors 1+7, 1-7 are each of them prime; these last differ only by a unit factor <—1 +7=7(1-72)—so that 2,= —7(1+7)3, contains a square factor.

In the simplex theory we have numbers, for instance 5, — 5, differing from each other only by a unit factor, but we can out of these select one, say the positive number, and attend by preference to this number of the pair. It is in this way—viz., by restricting a, 6, c,... to denote terms of the series 2, 3, 5, 7, .. . of positive primes other than unity— that we are enabled to make the definite statement, a posi- tive number J is, and that in one way only, = a%dPc . .. ; if V be a positive or negative number, then the theorem of

course is, V is, and that in one way only, =(—1)”a*6Be7. .,

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where m=O, or 1, and a, 6,c,.. 4, B, y,. are as before. To obtain a like definite statement in the present theory we require to distinguish between the four numbers a+bi, —a—bi, —b+a, b— ai, which differ from each other only by a unit factor—1,7. Consider a number a 07 where a and 8 are the one of them odd and the other even (a and 6 may be either of them =0, the other is then odd), every prime number a+ bi other than +1 +z is necessarily of this form, for if a@ and b were both even the number would be divisible by 2, or say by (1 +2)?, and if a and 6 were both odd it would be divisible by 1+7; then of the four associated numbers a+b:-—a—li, b+az, b— az, there is one and only one, a+¢, such that 6 is even and a+b—1 is evenly even; or say one and only one which is =1 (mod. 2(1+2)). We distinguish such one of the four num bers from the other three and call it a priomary number ; the units +1, +2, and the numbers +1+7 are none of them primary numbers. We have then the theorem, a number WV is in one way only =#””(1 +7)” A*B8 .., where m=0, 1, 2, or 3, 2 is =0 or a positive integer, A, B,... are primary primes, a, 8,... positive integers. Here? is a unit of the theory, 1 +7 is a special prime having reference to the number 2, but which might, by an extension of the definition, be called a primary prime, and so reckoned as one of the numbers A, B,...; the theorem stated broadly still is that the number J is, and that in one way only, a product of prime factors, but the foregoing complete state- ment shows the precise sense in which this theorem must be understood. A like explanation is required in other complex theories; we have to select out of each set of primes differing

only by unit factors some one number as a primary prime, and the general theorem then is that every number WV is, and that in one way only, =P. A*BSC7V…, where P is a product of unities, and A, B, C,..are primary primes.

34, We have in the simplex theory (ante, No. 10) the theorem that, » being an odd prime, there exists a system of p—1 residues, that is, that any number not divisible by p is, to the modulus p, congruent to one, and only one, of the p — 1 numbers 1, 2, 3,...—1. The analogous theorem in the complex theory is that for any prime number »p other than +1+¢ there exists a system of M(p)-1 residues, that is, that every number not divisible by p is, to the modulus p, congruent to one of these V(p)—1 numbers.

But p may be a real prime such as 3, or a complex prime such as 3+22; and the system of residues presents itself naturally under very different forms in the two cases respectively. Thus in the case p= 3, (3) =9, the residues may be taken to be ,

eo

4, 147, 247, 2, 1422, 242%,

being in number &(3)-1=8. And for p=3+ 2%, N(3 + 27) =13, they may be taken to be the system of residues of 13 in the simplex theory, viz., the real numbers ee. eae 12. We have in fact 5 +¢= (2 + 32)(1 —2), that is, 5+7¢=0 (mod. 2+ 32), and consequently a+ 6¢=a-— 5b, a real number which, when a+ 07 is not divisible by 3 + 22, may have any one of the foregoing values 1, 2, 3,...12.

‘ Taking then any number «# not divisible by p, the V(p)-1 residues each multiplied by # are, to the modulus p, congruent to the series of residues in a different order ; and we thus have,—say this is Fermat’s theorem for the complex theory—aMv)-1]=0 (mod. p), with all its con- sequences, in particular the theory of prime roots.

In the case of a complex modulus such as 3+ 22, the theory is hardly to be distinguished from its analogue in the ordinary theorem ; a prime root is=2, and the series of powers is 2, 4, 8, 3, 6, 12, 11, 9, 5, 10, 7, 1, for the

modulus 3+ 2¢ as for the modulus 13. But for a real prime such as 3 the prime root isa complex number; taking

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it to be =2+7, we have (2+7)§—1=0 (mod. 3), and the series of powers in fact is 2 7, ¢, 2 22, 2, 1 + 22, 22, 1+, 1, viz., we thus have the system of residues (mod. 3).

We have in like manner a theory of quadratic residues ;

a Legendrian symbol G2 (which, if p, g, are uneven

primes not necessarily primary but subject to the condition that their imaginary parts are even, denotes +1 or —1 according as p#a-1) is =1 or = —1 (mod. gq), so that

&] = +2 or =i according as p is or is not a residue

of q), a law of reciprocity expressed by the very simple

form of equation [P] = [.g.pe and generally a system g P

of properties such as that which exists in the simplex theory.

The theory of quadratic forms (a, 6, c) has been studied in this complex theory ; the results correspond to those of the simplex theory.

35. The complex theory with the imaginary cube root of unity has also been studied ; the imaginary element is here y, =4(-1+ Vv —3), a root of the equation y?+y+1=0; the form of the complex number is thus a+by, where a and 6 are any positive or negative integers, including zero. The conjugate number is a+by?,=a-—b-—by, and the product (a+by)(a+ by'), =a?-— ab+0?, is the norm of each of the factors a+ by, a+ by. The whole theory corresponds very closely to, but is somewhat more simple than, that of the complex numbers a + 0.

36. The last-mentioned theory is a particular case of the complex theory for the imaginary Ath roots of unity, » being an odd prime. Here a is determined by the equation

— = i that is, as-1+a%-24 … +a+1=0, and the'

-1

form of thecomplexnumberis/(a), =a + ba+ca2…-+ha~*, where a, 6, c,...&, are any positive or negative integers, including zero. We have A-—1 conjugate forms, viz., F(a), f(a2),.... f(a*—1), and the product of these is the norm of each of thefactors N/(a), = Vf(a?),... = Nf(a—}), Taking g any prime root of A, g-!-1=0 (mod. A), the roots a, a2,...a*—1, may be arranged in the order

a, 09, a9,...a9%-*; and we have thence a grouping of the

roots in periods, viz., if A—1 be in any manner whatever

expressed as a product of two factors, A-1=ef, we may with the A—1 roots form e periods 7, 7,,...e-1, each of froots. For instance \=13; a prime root is g = 2, and

X\—1=ef=3.4; then the three periods each of four roots

are

Mae +eb+al+a5, m=a?+a+all+ ql, Mg=at+aS+a? +07,

So also if ef =2.6 then the 2 periods each of 6 roots are M=e at eta? +a? +al0, m=e+ao+a8+4+al+ar+a7;

and so in other cases. In particular, if f=1 and conse-

quently e=A-1, the e periods each of f roots are in fact

the single roots a, a9,... 7 We may in place of the original form of the complex number | fla)=atbatca2…+had-2,

~~consider the new form f(y)=an+6n,...+l), _,, which when f=1 is equivalent to the original form, but in any other case denotes a special form of complex number ; instead of A—1 we have only e conjugate numbers, and the product of these e numbers may be regarded as the norm of f(7).~~

~~37. The theory for the roots a includes as part of itself the theory for the periods corresponding to every decom- position whatever 4 — 1=ef of A—1 into two factors, but~~

~~NU wa Bek RS~~

~~each of these may be treated apart from the others as a theory complete in itself. In particular, a simple case is that of the half-periods e=2, f=4(A — 1); and, inasmuch as the characteristic phenomenon of ideal numbers presents itself in this theory of the half-periods (first for the value A= 23), it will be sufficient, by way of illustration of the general theory, to consider only this more special and far easier theory ; we may even assume A = 23.1~~

~~For the case in question, 4 — 1 =ef = 2. 4(X- 1), we have the two periods 19, 7,, each of 4(A—1) roots; from the expressions for 4, 7,, in terms of the roots we obtain at once 7)+%,=—1, and with a little more difficulty om = —4(A—1) or #(A+1) according as X is =1 or 3 (mod, 4), that is, in the two cases respectively ae are the roots of the equation 4?+7-—4(A—1)=0, and 7? +n+4(A+1)=0. And this equation once obtained there is no longer any occasion to consider the original equation of the order A—1, but the theory is that of the complex numbers ay) +by,, or if we please a+b, composed with the roots of this quadric equation,—say the complex numbers a+ by, where aand 6 are any positive or negative integer numbers, including zero. In the case A=23 the quadric equation is 7?+7+6=0. We have N(a+ by) =(a + by)(a + bn.) = a2 — ab +4(A + 1)0?; and for 4=23 this is V(a+6n)=a2- ab+66% It may be remarked that there is a connexion with the theory of the quadratic forms of the determinant — 23, viz., there are here the three improperly primitive forms (2, 1, 12), (4, 1, 6), (4, —1, 6), 23 being the smallest prime number for which there exists more than one improperly primitive form.~~

~~38. Considering then the case A = 23, we have No: My» the~~

roots of the equation 7?+7+6=0; and a real number P.

is composite when it is=(a+by)(a+bn,), =a? — ab + 622, viz., if 4P=(2a—6)?+ 2302, Hence no number, and in particular no positive real prime P, can be composite unless it is a (quadratic) residue of 23; the residues of 23 are 1, 2, 3, 4,6, 8, 9, 12, 13, 16, 18; and we have thus, for instance, 5, 7, 11, as numbers which are not composite, while 2, 3, 13, are numbers which are not by the condition precluded from being composite: they are not, according to the foregoing signification of the word, composite (for 8, 12, 52, are none of them of the form x? + 23y?), but some such numbers, residues that is of 23, are composite, for instance 59, = (5— 2n))(5—2y,). And we have an indi- cation, so to speak, of the composite nature of all such num- bers ; take for instance 13, we have (yn —4)(n+5)= — 2.13, where 13 does not divide either 7 — 4 or 7 +5, and we are led to conceive it as the product of two ideal factors, one of them dividing y — 4, the other dividing 7+5. It appears, moreover, that a power 13? is in fact composite, viz., we have 138= (31 —12y,)(81-12n,), (2197 =961 +3724 864): and writing 13=

1 Tn the theory of the roots a, ideal numbers do not present them- selves for the values \=38, 5, or 7; they do for the value A=23. It is stated in Smith's "Report on the Theory of Numbers," Brit. Assoc. Report for 1860, p. 136, that "for the intermediate cases A=11, 18, 17, and 19, it is uncertain whether they do or do not present them- selves." The writer is not aware whether this question has been settled ; but in Reuschle's Zafeln, 1875, no ideal factors present them- selves for these values of); and it is easy to see that in the theory of the half-periods the ideal factors first present themselves for the value \=23. It may be remarked that the solution of the question depends on the determination of a system of fundamental units for the values in question X=11, 18, 17, and 19; the theory of the units in the several complex theories is an important and difficult part of the theory, not presenting itself in the theory of the half-periods, which is alone attended to in the text.

every positive real prime which is a residue of 23 is thus a product of two factors ideal or actual. And, reverting to the equation (y—4)(7+5)= —2.13,

or as this.may be written

(m — 4)(m+5)= — X/1= 19 8/1 =m, 8/31—12y, 2/31 124, we have (, — 4)? and (1 — 1))(31 — 12) each = 14 + 55m, or say

m-t= x/1—% 8/31 —12%;

and similarly

m+5=- A/1—m, 8/31—12m,, so that we verify that y, — 4, 7, +5, do thus in fact each of them contain an ideal factor of 13.

39. We have 2= 71 — No x = M1 Viz., the ideal multi- plier ./I— renders actual one of the ideal factors /1=n, of 2, and it is found that this same ideal multi-

plier /1—%) renders actual one of the two ideal factors of any other decomposable number 3, 13, &c.,

M1 = 2g T= m9=14%, 9/381= 12m T= m= — 5-9, &e. Similarly the conjugate multiplier "1 — n, renders actual the other ideal factor of any number 2, 3, 13, &e. We have thus two classes, or, reckoning also actual numbers, three classes of prime numbers, viz., (1) ideal primes rendered actual by the multiplier ./1—%, (2) ideal primes rendered actual by the multiplier 4/1 —7,, (3) actual primes. This is a general property in the several complex theories ; there is always a finite number of classes of ideal numbers, distinguished according to the multipliers by which they are rendered actual; the actual numbers form a " principal" class.

40. General theory of congruences—irreducible func- tions. In the complex theory relating to the roots of the equation 77+7+6=0 there has just been occasion to consider the equation (7 — 4)(y+5)= — 2.13, or say the congruence (7 —4)(7+5)=0 (mod. 13); in this form the relation 1?+7+6=0 is presupposed, but if, dropping this equation, 7 be regarded as arbitrary, then there is the congruence 7?+7+6=(7-—4)(n+5) (mod. 13). For a different modulus, for instance 11, there is not any such congruence exhibiting a decomposition of 7?+%+6 into factors. The function 7?+7+6 is irreducible, that is, it is not a product of factors with integer coefficients; in respect of

the modulus 13 it becomes reducible, that is, it breaks up into factors having integer coefficients, while for the modulus 11 it continues irreducible. And there is a like general theory in regard to any rational and integral function /(#) with integer coefficients; such function, assumed to be irreducible, may for a given prime modulus p continue irreducible, that is, it may not admit of any decomposition into factors with integer coefficients ; or it may become reducible, that is, admit of a decomposition F(a) = $(a)¥(a)x(a) .. (mod. p). And, when this is so, it is thus a product, in one way only, of factors (2), ¥(a), x(#),.., which are each of them irreducible in re- gard to the same modulus p; any such factor may be a linear function of x, and as such irreducible ; or it may be an irreducible function of the second or any higher degree. It is hardly necessary to remark that in this theory func- tions which are congruent to the modulus p are regarded as identical, and that in the expression of /'(#) an irre- ducible function $(#) may present itself either as a simple factor, or as a multiple factor, with any exponent. The decomposition is analogous to that of a number into its prime factors; and the whole theory of the rational and integral function /'("") in regard to the modulus p is in many respects analogous to that of a prime number re- garded asa modulus. The theory has also been studied where the modulus is a power 7".

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41, The congruence -imaginaries of Galois. If F(#) be an irreducible function to a given prime modulus p, this implies that there is no integer value of x satisfying the congruence F(x) = 0 (mod. p); we assume such a value and call it z, that is, we assume /'(7) =0 (mod. Pp); the step is exactly analogous to that by which, starting from the notion of a real root, we introduce into algebra the ordinary imaginary i= " —1. For instance, w— a+s3 is an irreducible function to the modulus 7, there is no integer solution of the congruence 2?—2+3=0 (mod. 7). Assuming a solution 7 such that 1+3=0 (mod. 7), we have, always to this modulus, 7?=7 3, and thence 23, a4, d&c., each of them equal to a linear function of 7. We consider the numbers of the form a+ i, where a and 6 are ordinary integers which may be regarded as having each of them the values 0, 1, 2, 3, 4,5, or 6; there are thus 7?,=49, such numbers, or, excluding zero, 48 numbers ; and it is easy to verify that these are in fact the numbers i, 2%... 1, #8, =1, that is, we have

~~i a prime root of the congruence a“8—1=0(mod. 7). The irreducible function may be of the third or any higher degree ; thus for the same modulus 7 there is the cubic function 2? — «+2, giving rise to a theory of the numbers of the form a+ bi + ci, where 7 is a congruence-imaginary such that 2? -7+2=0 (mod. 7); and instead of 7 the modulus may be any other odd prime p.~~

~~Ordinary Theory, Third Part.~~

~~42, In what precedes no mention has been made of the so-called Pellian equation «?— Dy*=1 (where D is a given positive number), and of the allied equations x? — Dy? = — iF or=+4, The equations with the sign + have always a series of solutions, those with the sign — only for certain values of D; in every case where the solutions exist a least solution is obtainable by a process depending on the expression of /D as a continued fraction, and from this least solution the whole series of solutions can be obtained without difficulty. The equations are very interesting, as well for their own sakes as in connexion with the theory of the binary quadratic forms of a positive non-square determinant.~~

~~43. The theory of the expression of a number as a sum of squares or polygonal numbers has been developed apart from the general theory of the binary, ternary, and other quadratic formstowhich it might be considered as belonging. The theorem for two squares, that every prime number of the form 42+ 1 is, and that in one way only, a sum of two squares, is a fundamental theorem in relation to the com- plex numbers a+0¢. A sum of two squares multiplied by a sum of two squares is always a sum of two squares, and hence it appears that every number of the form 2%(4n + 1) is (in general in a variety of ways) a sum of two squares.~~

~~Every number of the form 42+ 2 or 8x+3 is a sum of three squares ; even in the case of a prime number 82+ 3 there is in general more than one decomposition, thus 59 =25 42549 and=49+9+1. Since a sum of three squares into a sum of three squares is not a sum of three squares, it is not enough to prove the theorem in regard to the primes of the form 82+ 3.~~

~~Every prime number is (in general in more than one way) a sum of four squares; and therefore every number is (in general in more than one way) a~~

sum of four squares, for a sum of four squares into a sum of four squares is always a sum of four squares.

Every number is (in general in several ways) a sum of m+2 (m+2)gonal numbers, that is, of numbers of the form 4m(x?—x)+a; and of these m—2 may be at pleasure equal to 0 or 1; in particular, every number is a sum of three triangular numbers (a theorem of Fermat's).

The theorems in regard to three triangular numbers and

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to four square numbers are exhibited by certain remark- able identities in the Theory of Elliptic Functions ; and generally there is in this subject a great mass of formulee connected with the theory of the representation of numbers by quadratic forms. The various theorems in regard to the number of representations of a number as the sum of a definite number of squares cannot be here referred to.

44, The equation «+ =z, where A is any positive integer greater than 2, is not resoluble in whole numbers (a theorem of Fermat's). The general proof depends on the theory of the complex numbers composed of the Ath roots of unity, and presents very great difficulty ; in parti- cular, distinctions arise according as the number A does or does not divide certain of Bernoulli's numbers.

45. Lejeune-Dirichlet employs for the determination of the number of quadratic forms of a given positive or nega- tive determinant a remarkable method depending on the summation of a series =f-%, where the index s is greater than but indefinitely near to unity.

46. Very remarkable formule have been given by Legendre, Tchebycheff, and Riemann for the approximate determination of the number of prime numbers less than a given large number x. Factor tables have been formed for the first nine million numbers, and the number of primes counted for successive intervals of 50,000 ; and these are found to agree very closely with the numbers calculated from the approximate formule. Legendre's expression

zi log 2 — A' different from unity ; Tchebycheff's depends on the log- arithm-integral li(z); and Riemann's, which is the most accurate, but is of a much more complicated form, con- tains a series of terms depending on the same integral.

The classical works on the Theory of Numbers are Legendre, Théorie des Nombres, 1st ed. 1798, 3d ed. 1880; Gauss, Disquisi- tiones Arithmetice, Brunswick, 1801 (reprinted in the collected works, vol. i, Gottingen, 1863; French trans., under the title

Recherches Arithmétiques, by Poullet-Delisle, Paris, 1807); and Lejeune-Dirichlet, Vorlesungen tber Zahlentheorie, 3d ed., with

extensive and valuable additions by Dedekind, Brunswick, 1879-81. We have by the late Prof. H. J. 8. Smith the extremely valuable series of "Reports on the Theory of Numbers," Parts I. to VI., British Association Reports, 1859-62, 1864-65, which, with his own original researches, will be printed in the collected works now in course of publication by the Clarendon Press. Sce also Cayley, "Report of the Mathematical Tables Committce," Brit. Assoc. Re- port, 1875, pp. 305-306, for list of tables relating to the Theory of Numbers, and Mr. J. W. L. Glaisher's introduction to the actor Table for the Sixth Million, London, 1883, in regard to the approxi- mate formule for the number of prime numbers. (A. C.)

NUMENIUS, one of the so-called Neo-Pythagoreans, and a forerunner of the Neo-Platonists, was a native of Apamea in Syria, and flourished during the latter half of the second Christian century. He was a somewhat volu- minous writer in philosophy and philosophical biography, but all that is known of his opinions is found in passing references by Clement of Alexandria, Origen, Eusebius, and one or two of the Neo-Platonists. He seems to have taken Pythagoras as his highest authcrity, and at the same time to have been unaware of any discrepancy be- tween his own views and those of Plato, whom he further described as an " Atticizing Moses," and as deriving all his knowledge, like Pythagoras, from the East. He held a kind of trinity, the members of which he designated as mdémmos, ékyovos, and dmdéyovos respectively,—the first being the supreme deity, or pure vots, the second the demiurge, and the third the world.

~~NUMERALS. The use of visible signs to represent numbers and aid reckoning is not only older than writing but older than the development of numerical language on the denary system ; we count by tens because our ancestors counted on their fingers and named numbers accordingly. So used, the fingers are really numerals, that is, visible~~

~~is of the form where A is a constant not very~~

~~NUMERALS~~

~~numerical signs ; and in antiquity the practice of counting by these natural signs prevailed in all classes of society. Even at this day if a Wallachian peasant wants to multiply 8 by 9 he effects this by making the fingers of each hand, counting from the thumb, represent the numbers from 6 to 10 consecutively. He therefore sets his question by stretching out the ring finger of the right hand and the middle finger of the left. He then counts that in the direction from the thumb there is one more finger on the right hand and two on the left. Multiplying 1 by 2 he gets 2 as the units of the product sought. Again the out- stretched fingers are respectively the third and fourth from the thumb ; adding 3 and 4 he gets 7 for the tens of the product. By this rule he does not need to know the multiplication table above 4 times 4. In the later times of antiquity the finger symbols were developed into a system capable of expressing all numbers below 10,000. The left hand was held up flat with the fingers together. The units from 1 to 9 were expressed by various positions of the third, fourth, and fifth fingers alone, one or more of these being either closed on the palm or simply bent at the middle joint, according to the number meant. The thumb and index were thus left free to express the tens by a variety of relative positions, ¢.g., for 30 their points were brought together and stretched forward ; for 50 the thumb was bent like the Greek I' and brought against the ball of the index. The same set of signs if executed with the thumb and index of the right hand meant hundreds instead of tens, and the unit signs if performed on the right hand meant thousands.!~~

~~The fingers serve to express numbers, but to make a permanent note of numbers some kind of mark or tally is needed. Thus the Romans kept count of years by yearly driving a nail into the temple of Minerva. The nail in this case is a sort of hieroglyphic, and in all systems of hieroglyphics signs for~~

numbers naturally occur. A single stroke is the obvious representation of unity ; higher numbers are indicated by groups of strokes. But when the strokes become many they are confusing, and so a new sign must be introduced, perhaps for 5, at any rate for 10, 100, 1000, and so forth. Intermediate numbers are ex- pressed by the addition of symbols, as in the Roman system CCXxxvi = 236. This simplest way of writing numbers is well seen in the Babylonian inscriptions, where all numbers from 1 to 99 are got by repetition of the vertical arrow- head Y= 1, and a barbed sign ¢=10. But the most inter- esting case is the Egyptian, because from its hieratic form sprang the Phoenician numerals, and from them' in turn those of Palmyra and the Syrians, as illustrated in table 1. Two things are to be noted in this table—first, the way in which groups of units come to be joined by a cross line, and then run together into a single symbol, and, further, the substitution in the hundreds of a principle of multipli- cation for the mere addition of symbols. The same thing appears in Babylonia, where a smaller number put to the right of the sign for 100 (Y~) is to be added to it, but put to the left gives the number of hundreds. Thus

for a thousand, a myriad, 100,000 (a frog), a million (a nan with arms stretched out in admiration), and even for ten millions. –

Alphabetic writing did not do away with the use of numerical symbols, which were more perspicuous and com- pendious than words written at length. But the letters "1 The system is described by Nicolaus Rhabda of Smyrna (8th century A.D.), ap. N. Caussinus, De eloquentia sacra et humana, Paris, 1636. Bede gives essentially the same system, and it has survived in the East to the present day ; see especially Rédiger, " Ueber die im Orient gebriiuchliche Fingersprache, &c.," D. Af. G., 1845, and Palmer in Journ. of Philology, ii. 247 sqq.

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of the alphabet themselves came to be used as numerals. One way of doing this was to use the initial letter of the name of a number as its sign. This was the old Greek notation, said to go back to the time of Solon, and usually named after the grammarian Herodian, who described it about 200 a.v. I stood for 1, II for do, & for 10, H for 100, X for 1000, and M for 10,000; H with A in its bosom was 50, with H in its bosom it was 500.

Another way of using the alphabet depended on the fixed order of its letters. The simplest application of this principle is to use consecutive letters for consecutive numbers. Thus the 24 letters of the Ionic alphabet stood for the numbers 1 to 24, as we still see in the letters attached to the books of the Iliad. Another way common to the Greeks, Hebrews, and Syrians, and which in Greece gradually displaced the

Syriac. Palmyrene. Pheenician. — Hieratic. — Hieroglyphic. ta iy fil er} i c Wy Hy yy fi 2 1) Ii (| ie in| 3 eel Vit | 4 mn} 4 ==) fe Nill fl) HM} 5 ——— g tI Ce in| 6 = Ny \ HHH 7U min} 7 Pia NY Wun | Ba MN} 8 fp MNS MYM | QOD Mn} 9 DA | 7 — 9| AKX N| 10 We j= {I BN 1a) aa r=! ms} mmm— s| 8S} mma! a9 ° 3 0 3g ~ NN | 20 jo 13 = \YA INN] 92 we 2 =H % ANN! 30 co AD AW end NANN]| 40 7. 7788 hy 5 annnn| so ooo 832 hed +4) — nnannn; ¢o 7° ?| “B85 | WHY 2] Ann Anan] 70 oc00) =2838| AYYY #4) annnannnt! so J — -78328 | ~HYAH 24; nannannann!] 90 Cd PHY Pl lol N J 92 | 100 Cl ny (ey ten a ?? | 200 Cc} > o PPP | 300

Table 1.

Herodian numbers, was to make the first nine letters stand for the units and the rest for the tens and hundreds. With the old Semitic alphabet of 22 letters this system broke down at n=400, and the higher hundreds had to be got by juxtaposition ; but when the Hebrew square character got the distinct final forms 4, B,], 5, y these served for the hundreds from 500 to 900. The Greeks with their larger alphabet required but three supplemental signs, which they got by keeping for this purpose two old Pheenician letters which were not used in writing (F or s=1=6, and 9 = P=90), and by adding sampi 7» for 900.2

2 The Arabs, who quite changed the order of the alphabet and extended it to twenty-eight letters, kept the original values of the old letters (putting G» for D and ¢4 for v’), while the hundreds from 500 to 1000 were expressed by the new letters in order from & to é. In the time of Caliph Walid (705-715 a.p.) the Arabs had as yet no signs of numeration.

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~~Among the Greeks the first certain use of this system seems to be on coins of Ptolemy II. The first trace of it on Semitic ground is on Jewish coins of the Has- moneans. It is the foundation of gematria as we find it in Jewish books and in the apocalyptic number of the beast (IDP j71) = 666). gematria is; the name is borrowed from the Greek.~~

~~The most familiar case of the use of letters as numerals is the Roman system. Here C is the initial of centum and M of mille; but instead of these signs we find older~~

~~forms, consisting of a circle divided vertically for 1000 and horizontally, ©, or in the cognate Etruscan system divided into quadrants, , for 100. From the sign for 1000, still sometimes roughly shown in print as C19, comes D, the half of the symbol for half the number ; and the older forms of L, viz., L or J, suggest that this also was once half of the (Etruscan A) is half of xX, which The system, therefore, is hardly alphabetic in origin, though the idea has been thrown out that the signs for 10, 50, and 100 were originally the~~

~~hundred symbol. So V itself is not a true Roman letter.~~

~~Greek X, W, &, which were not used in writing Latin.! When high numbers had to be expressed systems such~~

~~as we have described became very cumbrous, and in alpha-~~

~~betic systems it became inevitable to introduce a principle of periodicity, by which, for example, the signs for 1, 2, 3,~~

~~&c., might be used with a difference to express the same~~

~~number of thousands. Language itself suggested this~~

~~principle, and so we find in Hebrew Sor in Greek a= 1000. So further BMv, BM., or simply B.=20,000 (2 myriads). If now the larger were always written to the left of the smaller elements of a number the diacritic mark could be dispensed with in such a case as Boda (instead of ora) = 2831, for here it was plain that B= 2000, not 9, since otherwise it would not have preceded = 800. We have here the germ of the very important notion that~~

the value of a symbol may be periodic and defined by its position, The same idea had appeared much earlier among the Babylonians, who reckoned by powers of 60, calling 60 a soss and 60 sixties a sar. On the tablets of Senkerah a list of squares and cubes is given on this principle, and here the square of 59 is written 58°1—that 1S, 58 × 60+1; and the cube of 30 is 7°30—that is, 7 sar+ 30 soss=7 × 6024+ 30×60. Here again we have value by position ; but, as there is no zero, it is left to the judgment of the reader to know which power of 60 is meant in each case. The sexagesimal system, long specially associated with astronomy, has left a trace in our division of the hour and of the circle, but as language goes by powers of 10 it is practically very inconvenient for most purposes of reckon- ing. The Greek mathematicians used a sort of decimal system ; thus Archimedes was able to solve his problem of stating a number greater than that of the grains of sand which would fill the sphere of the fixed stars by dividing numbers into octades, the unit of the second octade being 10° and of the third 10°. So too Apollonius of Perga teaches multiplication by regarding 7 as the pythmen of 70, 700, and so forth. One must then find successively the product of the several pythmens of the multiplier and the multipli- cand, noticing in each case what are tens, what hundreds, and so on, and adding the results. The want of a sign for zero made it impossible mechanically to distinguish the tens, hundreds, &c., as we now do. : Very early, however, a mechanical contrivance, the abacus, had been introduced for keeping numbers of different de- nominations apart. This was a table with compartments or columns for counters, each column representing a dif- ferent value to be given to a counter placed on it. This might be used either for concrete arithmetic—say with

1 See further Fabretti, Paldéographische Studien.

But we do not know how old

columns for pence, shillings, and pounds ; or for abstract reckoning—say with the Babylonian sexagesimal system. An old Greek abacus found at Salamis has columns which, taken from right to left, give a counter the

~~value of 1, 10, 100, 1000 drachms, and finally of 1 talent (6000 drachms) respectively. An abacus on the decimal system might be ruled on paper or on a board strewed with fine sand, and was then a first step to the decimal system. Two important steps, however, were still lacking; the first was to use instead of counters distinctive marks (ciphers) for the digits from one to nine; the second and more import- ant was to get a sign for zero, so that the columns might be dispensed with, and the denomination of each cipher seen at once by counting the number of digits following it. These two steps taken, we have at once the modern so-called Arabic numerals and the possibility of modern arithmetic ; but the invention of the ciphers and zero came but slowly, and their history is a most obscure problem.~~

~~What is quite certain is that our present decimal system, in its complete form, with the zero which enables us to do without the ruled columns of the abacus, is of Indian origin, From the Indians it passed to the Arabians, probably along with the astronomical tables brought to Baghdad by an Indian ambassador in 773 a.p. At all events the system was explained in Arabic in the early part of the 9th century by the famous Abu Ja'far Mohammed al-Kharizmi, and from that time continued to spread, though at first slowly, through the Arabian world.~~

~~In Europe the complete system with the zero was derived from the Arabs in the 12th century, and the arithmetic based on this system was known by the name of algoritmus, algorithm. This barbarous word is nothing more than a transcription of Al-Kharizmi, as was conjectured by Reinaud, and has become plain since the publication of a unique Cambridge MS. containing a Latin translation—perhaps by Adelhard of Bath—of the lost arithmetical treatise of the Arabian mathematician.? The arithmetical methods of Khdrizmi were simplified by later Eastern writers, and these simpler methods were introduced to Europe by Leonardo of Pisa in the West and Maximus Planudes in the East. The term zero appears to come from the Arabic sifr through the form zephyro used by Leonardo.~~

~~Thus far recent inquirers are agreed. The disputed points are—(1) the origin and age of the Indian system, and (2) whether or not a less developed Indian system, without the zero but with the nine other ciphers used on an abacus, entered Europe before the rise of~~

Islam, and prepared the way for a complete decimal notation. (1) The use of numerals in India can be followed back to the

> hae fue ae ge OO NéndGhat(Indian)3 — = = ¥ nae | u | oe five — —-£= 4+ £4 eID Y F Devandgari 5 +X "ee8 & Me Ce 39 Eastem Arabice «=| 2 3 § 8B Y VY 4 9 0 Ghobar? l Ute ¥Y 64 Y Jo Boetius8 i a = 2 Gg B zt 8 2

Nana Ghat inscriptions, supposed to date from the early part of the 3d century B.c. These are signs for units, tens, and hundreds, as in the other old systems we have dealt with. Like the Indian alphabet, they are probably derived from abroad, but, as in the case

-2 Published by Boncompagni in Trattati d' Aritmetica, Rome, 1857.

3 From Sir E. C. Bayley's paper in J. R. A. S., 1882.

4 From Burnell's South Indian Paleography, 1874.

5 Of the 10th century. (From Burnell, op. cit.)

6 Of the 10th century; from a MS. written at Shirdz. Woepcke, Mémoire sur la propagation des chiffres Indiens.)

7 From a MS. at Paris. (From Woepcke, op. cit.)

8 Erlangen (Altdorf) MS. (From Woepcke, op. cit.)

(From

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of the alphabet, their origin is obscure. The forms of the later Indian nuinerals for the nine digits appear to be clearly derived from the earlier system. In table 2 the first two lines give forms earlier than the introduction of the system of position, while the Devanagari in the third line was used with a zero and position value. The ''cave" numerals were employed during the first centuries of the Christian era. The earliest known example of a date written on the modern system is of 738 A.D., while the old system is found in use as late as the early part of the 7th century (Bayley). On the other

~~hand, there is some evidence that a system of value by position was known to Sanskrit writers on arithmetic in the 6th Christian century. These writers, however, do not use ciphers, but symbolical words and letters, so that it is not quite clear whether they refer to a system which had a zero, or to a system worked on an abacus, where the zcro is represented bya blank column. Therc is no proof as yet for the use of any system of position in India before the 6th century, and nothing beyond conjecture can be offered as to its origin.~~

~~(2) In Europe, before the introduction of the algorithm or full Indo-Arabic system with the zero, we find a transition system in which calculations were made on the decimal system with an abacus, but instead of unit counters there were placed in the columns ciphers, with values from one to nine, and of forms that are at bottom the Indian forms and agree most nearly with the numerals used by the Arabs of Africa and Spain. For among the Arabs themselves there were varieties in the forms of the Indian numeral, and in particular an eastern and a western type. The latter is called ghobar (dust), a name which seems to connect it with the use of a sand-spread tablet for calculation. The abacus with ciphers instead of counters was used at Rheims about 970-980 by Gerbert, who afterwards was pope under the title of Sylvester II., and it became well known in the 11th century. Where did Gerbert learn the use of the abacus with ciphers? There is no direct evidence as to this, for the story in William of Malmesbury, that he stole it from an Arab in Spain, is generally given up as fabulous. On the other hand, no evidence is offered for an earlier use of the abacus with ciphers, except a passage describing the system in the Geometria ascribed to Boetius. If this book is genuine the Indian numerals were known in Europe and applied to the abacus in the 5th century, and Gerbert only revived the long- forgotten system. On this view we have to explain how Boctius got the ciphers. The Geometria ascribes the system to the ‘ Pytha- gorici ”—1.e., the Neo-Pythagoreans—and it has been thought pos- sible that the Indian forms for the numerals reached Alexandria, along with the cruder form of value by position involved in the use of the abacus without a zero, before direct communication be- tween Europe and India ceased, which it did about the 4th century A.D. It is then further conjectured by Woepcke that the ghobar numerals of the western Arabs were by them borrowed from the system of Boctius before the full Indian method with the zero reached them; and thus~~

~~the resemblance between these forms and those in MSS. of Boetius, which are essentially the same as in other MSS. of the 11th century, would be explained. This view, however, presents great difficulties, of which the total dis- appearance of all trace of the system between Boetius and Gerbert is only one. We have no proof that the Indians ever used such an abacus, or that they had value by position at so early a date as is required, and the ghobar numerals are too similar to those of the eastern Arabs to make it very credible that the two systems had been separated for centuries. The genuineness of the Geometria is still ably maintained by Cantor, but it has been attacked on other grounds than that of the passage about the abacus; and on the whole it is still an open question whether the abacus with ciphers is not the outcome of an carly imperfect knowledge of the Arabic system, Gerbert or some other having got the signs and a gencral idea of value by position without having an explanation of the zero.~~

~~See Cantor, Geschichte der Mathematik, vol. i., Leipsic, 1880, as the most recent general account of the subject ; also Chasles, papers in the Comptes Rendus, 1843; Friedlein, Die Zahlzeichen und das elementare Rechnen der Griechen und Rémer, &c., 1869; Woepcke, Sur lVintroduction de larithmétique Indien en occident, Rome, 1859, and Memoire sur la propagation des chiffres Indiens, Paris, 1863. For the palzographiy of the Indian nuimcrals see Burnell, Elements of S. Indian Palxography, 1874; and Sir E. C. Bayley in J. R. A. S., 1882, 1883. For Boetius compare Friedlein's edition of his arithmetic and geoinetry, Leipsic, 1867, and Weissenborn in Zeitsch. Math. Phys., xxiv. Other references to the copious literature will be found in Cantor and Friedlein, who also discuss the subject of the notation for fractions, which cannot be cntered on here. For systems passed over here, see Pihan, Exposé des signes de numération usités chez les peuples orientauz, Paris, 1860. (QW. R-8.)~~

~~NUMERIANUS, M. Auretius, Roman emperor, accom- panied his father, the emperor Carus, on the Persian expedition beyond the Tigris, and along with his absent brother, Carinus, was proclaimed emperor on the death of the former (December 283). Having resolved to abandon the campaign, he was returning towards Europe when he mysteriously died before Chalcedon was reached, eight months afterwards. Arrius Aper, prefect of the pretorians,~~

his father-in-law, suspected of having murdered him, was hastily stabbed by Diocletian, his successor. Numerianus is represented as having been a man of considerable literary attainments, as well as of singular gentleness, amiability, and purity.

NUMIDIA was the name given to a large tract of country in the north of Africa, extending along the Medi- terranean Sea from the confines of Mauretania to those of the Roman province of Africa. The term was, however, employed in very different senses, and within very different limits, at different periods of time. When Carthage was at the height of its power, and the Romans first came into contact with the nations of northern Africa, the name of Numidia was applied to the whole country from the river Mulucha (now called the Muliya), about 100 miles west of Oran, to the frontier of the Carthaginian territory, which nearly coincided with the modern regency of Tunis. It is in this sense that the term is employed by Polybius, and all succeeding historians down to the close of the Roman republic. The Numidians, as thus defined, were divided into two great tribes, the Massyli on the east, and the Masszsyli on the west,—the limit between the two territories being the river Ampsaga, which enters the sea to the west of the remarkable promontory called Tretum, now known as the Seven Capes. At the time of the Second Punic War the eastern tribe was under the government of Masinissa, who took part with the Romans in the contest, while his rival Syphax, king of the Massesylians, supported the cause of the Carthaginians. In consequence of this, after the close of the war, Syphax's dominions were forfeited, and united with those of Masi- nissa, who now ruled the whole Numidian people from the frontier of Mauretania to the boundary of the Cartha- ginian territory. That monarch, who attained to a great age, retained the whole of these extensive dominions till his death in 148 B.c., as was the case also with his son and successor Micipsa; but after the death of the latter in 118, the ambition of his nephew JucurrHa (¢.v.) in- volved him in a war with Rome, which ended in his defeat and death in 106.

Numidia was not, however, incorporated with the Roman empire until a later period. After the death of Jugurtha the western portion of his

dominions was added to those of Bocchus, king of Mauretania, while the remainder con- tinued to be governed by native princes until the civil war between Cesar and Pompey, in which Juba, then king of Numidia, having espoused the cause of the latter, and supported Scipio and Cato in Africa, was defeated by Ceesar, and put an end to his own life (46 B.c.). Numidia, in the more restricted sense which it had now acquired, became for a short time a Roman province, but in the settle- ment of affairs after the battle of Actium (30) it was restored to Juba IT., son of the preceding monarch, who had acquired the favour of Augustus. A few years later, however, Juba was transferred to the throne of Mauretania, including the whole western portion of the ancient Numi- dian monarchy as far as the river Ampsaga, while the Roman province of Numidia, which was now definitely constituted, comprised only the tract between that river and the Tusca, which formed the western limit of the Roman province of Africa. But though thus restricted in extent—-so as nearly to correspond with the modern French province of Constantine, while the kingdom of Numidia in the wider sense had included the whole of Algeria—the Roman province of Numidia attained a high degree of pros- perity and civilization, and was studded with numerous towns, the importance of which is attested by inscriptions still extant, as well as by the massive remains of their ancient monuments and works of public utility. This period of prosperity continued to be favoured by unbroken

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peace for more than four centuries, until the invasion of the Vandals in 428 a.p. reduced it to a condition of gradual decay; and the invasion of the Arabs in the 8th century again brought desolation upon the land, which was aggravated by continual misgovernment until the conquest of Algeria by the French within the present century.

~~The physical character of the country has been already described in the article AtcErRia. It may be briefly observed that the whole tract of northern Africa from the river Mulucha to the frontiers of the regency of Tunis may be divided into three parallel zones or regions : the Tell, or fertile district near the sea, the broad inland plateaus beyond it, and the Sahara, or barren region to the south of these uplands, sloping thence down to the great desert which is generally known by that name. The central upland tract assumes a more rugged and moun- tainous character in the eastern district, which formed the Roman province of Numidia, and now constitutes the French province of Constantine. But this elevated region breaks down abruptly towards the east, where it sends out only a few offshoots into the plains of Tunis, as well as to the south where it faces the wide expanse of the Sahara. It is here that is situated the mountain group called the Aures (the Mons Aurasius of Procopius), of which the highest summit, called by the Arabs Jebel Chellia, attains to an elevation of 7580 feet.~~

~~The name of the Numidians appears to have been nothing more than a Latinized form of the Greek term Nomades, vaguely applied by them to the wandering tribes of northern Africa. It could never have had any~~

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ethnographical signification ; and there can be no doubt that the people thus designated were merely a portion of the great Berber race, which extended in ancient times from the shores of the Atlantic to the confines of Egypt, and which still, under the name of Kabyles, forms a por- tion of the population of both Algeria and Tunis. The Geetulians, who at the same period occupied the southern slopes of the mountains towards the Sahara, appear to have stood in much the same relation to the Numidians that the tribes called Tuaricks or Tuareg do at the present day to the comparatively civilized Kabyles of Algeria. But the Roman authority over these wanderers of the desert was of a very precarious character, and a line of outposts near the foot of the mountain range formed the limit of their practical dominion towards the south.

The chief towns of Numidia under the Romans were :—Cirta, the capital, in the interior, subsequently called Constantina, which name it still retains; Rusicada, on the coast, serving as its port, on the site now occupied by Philippeville ; and east of it the more important city of Hippo Regius (well known as the see of the celebrated Augustine), near the modern Bona. South of Cirta, in the interior, were Theveste (now Tebessa) and Lambesa (now Lambessa), with extensive Roman remains. But there were not less than ten towns with the title of "colonize," and in the 5th century the Votetva cnumerates no less than 123 episcopal sees.

For details concerning the condition of Numidia as a Roman province, see Corp. Inser. Lat., vol. viii. (1881). A more popular account will be found in the Algérie Romaine of G. Boissiere (2 vols 8vo, Paris, 1883). (iE: plein)

NUMISMATICS

HE science of numismatics treats of coins and medals.

It acquaints us with the metals used in their com-

position, their various inscriptions and devices, their

mechanical execution and artistic merit. It tells us of

the different denominations of coins, their relation to one another, and the laws by which they were regulated.

The earliest known coins were issued by the Grecks in the 7th century before the Christian era. By the 4th century the whole civilized world used money, each state generally having its proper coinage. This has continued to be the case to the present time ; so that now there are few nations without a metal currency of their own, and of these but a small proportion are wholly unacquainted with the use of coins. The number of varieties of coins and medals of which specimens are preserved in collec- tions may be estimated at not less than several hundred thousand ; and future discoveries will probably greatly in- crease thissum. A series of monuments of such length and completeness affords, as might be expected, very import- ant illustration to history and to kindred branches of knowledge. This is, indeed, the real value of numismatics, and the student will do well to keep it constantly before him.

Coins, although they confirm history, rarely correct it, and never very greatly. The earliest belong to a time and to nations as to which we are not otherwise wholly ignorant, and they do not afford us that precise information which would fill in any important details of the meagre sketch of contemporary history. We gain from them scarcely any direct historical information, except that certain cities or princes issued money. When in later times the devices and inscriptions of the coins give more detailed information, history is far fuller and clearer, so that the numismatic evidence is rarely more than corroborative. There are, indeed, some remarkable exceptions to this rule; as in the

case of the Bactrian coins, which have supplied the outlines of a portion of history which was otherwise almost wholly lost. The value of the corroborative evidence afforded by coins must not, however, be overlooked. It chiefly relates to chronology, although it also adds to our knowledge of the pedigrees of royal houses. But perhaps the most interesting manner in which coins and medals illustrate history is in their bearing contemporary, or nearly con- temporary, portraits of the most famous kings and captains, from the time of the first successors of Alexander the Great, to the present

~~age, whereas pictures do not afford portraits in any number before the latter part of the Middle Ages ; and works of sculpture, although occupying in this respect the same place as coins in the last-mentioned period and under the Roman empire, are neither so numerous nor so authentic. There is no more delightful companion in historical reading than a cabinet of coins and medals. The strength and energy of Alexander, the ferocity of Mithradates, the philosophic calmness of Antoninus, the obstinate ferocity of Nero, and the brutality of Caracalla are as plain on the coins as in the pages of history. The numismatic portraits of the time following the founding of Constantinople have less individuality ; but after the revival of art they recover that quality, and maintain it to our own day, although executed in very different styles from those of antiquity. From this last class we can form a series of portraits more complete and not less interesting than that of the ancient period.~~

~~While coins and medals thus illustrate the events of Mytho- history, they have an equally direct bearing on the belief logy.~~

~~of the nations by which they were issued ; and in this reference lies no small part of their value in connexion with history. The mythology of the Greeks,*not having been fixed in sacred writings, nor regulated by a dominant priesthood, but having grown out of the different beliefs~~

~~Geo- graphy.~~

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~~of various tribes and isolated settlements, and having been~~

~~allowed to form itself comparatively without check, can~~

~~scarcely be learned from ancient books. Their writers give us but a partial or special view of it, and modern authors, in their attempts to systematize, have often but increased the confusion. The Greek coins, whether of kings or cities, until the death of Alexander, bear sacred subjects only. Afterwards, on the regal coins, the king's head usually occupies the obverse~~

~~and a sacred subject is placed on the reverse. The coins of Greek cities under the em- pire have usually an imperial portrait and a reverse type usually mythological. The whole class thus affords us invaluable evidence for the reconstruction of Greek mytho- logy. We have nowhere else so complete a series of the different types under which the divinities were represented. There are in modern galleries very few statues of Greek divinities, including such as were intended for architectural decoration, which are in good style, fairly preserved, and untouched by modern restorers. If to these we add reliefs of the same class, and the best Graeco-Roman copies, we can scarcely form a complete series of the various repre- sentations of these divinities. The coins, however, supply us with the series we desire, and we may select types which are not merely of good work, but of the finest. The mythology of ancient Italy, as distinct from that of the Greek colonies of Italy, is not so fully illustrated by the coins of the country, because these are for the most part of Greek design. There are, however, some remarkable exceptions, especially in the money of the Roman common- wealth, the greater number of the types of which are of a local character, including many that refer to the myths and traditions of the earliest days of the city. The coins of the empire are especially important, as bearing representa- tions of those personifications of an allegorical character to which the influence of philosophy gave great prominence in Roman mythology.~~

~~Coins are scarcely less valuable in relation to geography than to history. The position of towns on the sea or on rivers, the race of their inhabitants, and many similar particulars are positively fixed on numismatic evidence. The information that coins convey as to the details of the history of towns and countries has a necessary connexion with geography, as has also their illustration of local forms of worship. The representations of natural productions on ancient money are of special importance, and afford assistance to the lexicographer. This is particularly the case with the Greek coins, on which these objects are frequently portrayed with great fidelity. We must recollect, however, that the nomenclature of the ancients was vague, and frequently comprised very different objects under one appellation, and that therefore we may find very different representations corresponding to the same name.~~

The art of sculpture, of which coin-engraving is the off- spring, receives the greatest illustration from numismatics. Not only is the memory of lost statues preserved to us in the designs of ancient coins, but those of Greece afford admirable examples of that skill by which her sculptors attained their great renown. The excellence of the designs of very many Greek coins struck during the period of the best art is indeed so great that, were it not for their smallness, they would form the finest series of art-studies in the world. The Roman coins, though at no time to be compared to the purest Greek, yet represent worthily the Grzco-Roman art of the empire. From the accession of Augustus to the death of Commodus they are often fully equal to the best Graeco-Roman statues. This may be said, for instance, of the dupondii struck in honour of Livia by Tiberius and by the younger Drusus, of the sestertii of Agrippina, and of the gold coins of Antoninus Pius and

the two Faustinas, all which present portraits of remark- able beauty and excellence. The medizval Italian medals are scarcely less useful as records of the progress and char- acteristics of art, and, placed by the side of the Greek and Roman coins, complete the most remarkable comparative series of monuments illustrating the history of the great schools of art that can be brought together. ‘ Ancient coins throw as great light upon the architecture as upon the sculpture of the nations by which they were struck. Under the empire, the Roman coins issued at the city very fre- quently bear representations of important edifices, The Greek imperial coins struck in the provinces present similar types, representing the most famous temples and other structures of their cities, of the form of some of which we should otherwise have been wholly ignorant. The little- known art of painting among the ancients does not re- ceive so much illustration from the coins. The best Greek pieces are of too severe a style to admit of an approach to pictorial treatment, although we perceive such a tendency in the works of important schools, and during the period of decline. The Roman coins sometimes present groups which have a very pictorial character, traceable to the tendency of the sculpture of the period ; this is principally about the time of the Antonines. They are, however, never so pictorial in treatment as the medixval Italian medals. The art of gem-engraving among the ancients is perhaps most nearly connected with their coinage. The subjects of coins

~~and gems are so similar and so similarly treated that the authenticity of gems, that most difficult of archeological questions, receives the greatest aid from the study of coins.~~

~~After what has been said it is not necessary to do more Litera- than mention how greatly the study of coins tends to ture. illustrate the contemporary literature of the nations which issued them. Not only the historians, but the philosophers and the poets, are constantly illustrated by the money of their times. This was perceived at the revival of letters : and during the last two centuries coins were very fre- quently engraved in the larger editions of the classics. A want of technical numismatic knowledge in the editors, and the carelessness of the artists, combined to deprive these illustrations of much of their value. Probably in part on this account, but chiefly in consequence of the change from historical to textual criticism, ancient coins have been little used in this manner by the new school. This neglect is being remedied, although the full value of coins and medals in illustration of the literature of modern as well as of ancient times is not as yet suffi- ciently perceived.~~

~~The science of numismatics is of comparatively recent Origin origin, The ancients do not seem to have formed collec- of the tions, although they appear to have occasionally preserved 8“ie2c% individual specimens for their beauty. Petrarch has the credit of having been the first collector; but it is prob- able that in his time ancient coins were already attract- ing no little notice. The importance of the study of all coins has since been by degrees more and more recognized, and at present no branch of the pursuit is left wholly unexplored.~~

~~Besides its bearing upon the history, the religion, the Practical manners, and the arts of the nations which have used money, use. the science of numismatics has a special modern use in relation to art. Displaying the various styles of art pre- valent in different ages, coins supply us with abundant means for promoting the advancement of art among our- selves. If the study of many schools be at all tinies of advantage, it is especially so when there is little originality in the world. Its least value is to point out the want of artistic merit and historical commemoration in modern coins, and to suggest that modern medals should be exe-~~

cuted after some study of the rules which controlled the

great works of former times.—

Definitions.—The following are the most necessary numismatic definitions.

1. A coin isa piece of metal of a fixed weight, stamped by author- ity of government, and employed as a circulating medium."

2. A medal is a piece, having no place in the currency, struck to commemorate some event or person. Medals are frequently com- prised with coins in descriptions that apply to both equally ; thus, in the subsequent definitions, by the term coins, coins aud medals must generally be understood. ; :

8. The coinage of a country is usually divided into the classes of gold, silver, and bronze (copper), for which the abbreviations AY, At, and Ai are employed in catalogues. In each class are comprised, not only the coins of the metal from which it takes its name, with no more than a necessary or inseparable proportion of alloy, but coins of other metallic substances, usually base, and always com- pound, which were generally struck in the place of the purer pieces. The principal metallic substances thus used were electrum for gold, billon for silver, brass for copper, and potin for silver and copper.

ae Electrum (#exrpov, jrexrpos), a compound metallic substance, consisting of gold with a considerable alloy of silver. Pliny makes the proportion to have been four parts of gold to one of silver.? The material of early coins of Asia Minor struck in the cities of the western coast is the ancient electrum. It appears here to have at first consisted of three parts of gold to one of silver; but after- wards the proportion of silver was increased, though perhaps not everywhere. Gold largely alloyed with silver, not struck by the ancient Greeks or their neighbours, should be termed pale gold, as in the case of some of the late Byzatitine coins.

5. Billon, a term applied to the base metal of some Roman coins, and also to that of some medieval and modern coins. It is silver with a great proportion

~~of alloy. When the base silver coins are replaced by copper washed with silver the term billon becomes in- appropriate,~~

~~6. Brass, a compound metallic substance employed forcoins. It may be used as an equivalent to the orichaleum of the Romans, a fine kind of brass of which the sestertii and dupondii were struck, but it is commonly applied indiscriminately to the whole of their copper currency.~~

~~7. Potin, a term applied to the base metal of which some ancient coins are composed. It is softer than billon.~~

~~8. Various other metallic substances have been used in coinage. The so-called "glass coins" of the Arabs are merely coin-weights.~~

~~9. The forms of coins have greatly varied in different countries and at different periods. The usual form in both ancient and modern times has been circular, and generally of no great thickness.~~

~~10. Coins are usually measured by Mionnet's scale, from which the greatest dimension is taken, or, when they are square, the greatest dimension in two directions. This is, however, a very unsatisfactory scale, as its divisions are of an arbitrary character, and the instruments for applying it are such as make exactness scarcely possible. A gauge graduated to inches and decimal parts of an inch or to millimétres is far more satisfactory.~~

~~11. The weight of a coin is of great importance, both in deter- mining its genuineness and in distinguishing its identity. To ascertain exact weight even to the tenth of a grain is therefore necessary, and this cau only be done by the careful use of excellent scales.~~

~~12. The specific gravity of a coin may be of use in determining the metals in its composition.~~

~~13. Whatever representations or characters are borne by a coin constitute its type. The subject of each side is also called a type, and, when there is not only a device but an inscription, the latter~~

1 This definition excludes, on the one hand, paper currencies and their equivalents among barbarous nations, such as cowries, because they are neither of metal nor of fixed weight, although either stamped or sanctioned by authority, and, on the other hand, modes of keeping metal in weight, like the so-called Celtic ‘‘ring-money,” because they are not stamped, although perhaps sanctioned by authority. The latter has attracted so much attention that it must not be passed by without some further notice. There seems to be no reasonable doubt that the Celtic gold rings all weigh multiples of the same unit, but very seldom multiples of one another. From their form it is probable that most of them were used as ornaments, and as such they would probably have been generally made to weigh an exact weight without fractions, on the same principle that the ancients frequently avoided fractions of their measures in architecture. They belong to a time anterior to the introduction of money among the Celts, or before its general use, and one, therefore, at which precious metal must have been weighed when employed in barter. Hence an additional reason, and prob- ably the main one, why their weight is always some multiple of the same unit. Ina primitive state of society in the present day a woman often wears her dowry in coins as ornaments ; and thus these Celtic rings may have been both ornaments and substitutes for money.

2 Hist. Nat., xxxiii. 23; comp. xxxvii. 11. Pliny distinguishes two kinds of ‘‘‘electron,”— amber, and this metallic substance. In Greek poetry the name seems to apply to both, but it is generally difficult to decide which is meant in any particular case. Sophocles, however, where he mentions T4760 Zdpdewy

HAextpov, . . . Kal rov “Ivdtxov xpvoov” (Ant. 1037-39), can scarcely be doubted to refer to the metallic electrum. : ‘

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may be excluded from the term. This last is the general use. No distinct rule has been laid down as to what makes a difference of type, but it may be considered to be an essential difference, how- ever slight.

~~14. A difference too small to constitute a new type makes a variety.~~

~~15. A coin is a duplicate of another when it agrees with it in all particulars but those of exact'size and weight. Strictly speak- ing, ancient coins are rarely, if ever, duplicates, except when struck from the same die.~~

~~16. Of the two sides of a coin, that is called. the obverse which bears the more important device or inscription. In early Greek coins it is the convex side; in Greek and Roman imperial it is the side bearing the head ; in medieval and modern that bearing the royal effigy, or the king's name, or the name of the city ; and in Oriental that on which the inscription begins. The other side is called the reverse.~~

~~17. The field of a coin is the space unoccupied by the prin- cipal devices or inscriptions. Any detached independent device or character is said to be in the field, except when it occupies the exergue.~~

~~18. The exergue is that part of the reverse of a coin which is below the main device, and distinctly separated from it; it often bears a secondary inscription. Thus, the well-known inscription CONOB occupies the exergue of the late Roman and early Byzan- tine gold coins.~~

~~19. The edge of a coin is the surface of its thickness.~~

~~20. By the inscription or inscriptions of a coin all the letters it bears are intended ; an inscription is either principal or secondary.~~

~~21. In describing coins the terms right and left mean the right and left of the spectator, not the heraldic and military right and left, or those of the coin.~~

~~22. A bust is the representation of the head and neck ; it is com- monly used of such as show at least the collar-bone, other busts being called heads.~~

~~28. A head properly means the representation of a head alone, without any part of the neck, but it is also commonly used when any part of the neck above the collar-bone is shown. The present article follows custom in the use of the terms bust and head.~~

~~24. A bust or head is either facing, usually three-quarter face, or in profile, in which latter case it is described as to right or to left. Two busts may be placed in various relative positions which cannot be described in English without circumlocution.~~

~~25. A bust wearing a laurel-wreath is said to be lawreate.~~

~~26. A bust bound with a regal fillet (diadem) is called diademed.~~

~~27. A bust of which the neck is clothed is said to be draped.~~

~~28. An object in the field of a coin which is neither a letter nor a monogram is usually called a symbol. This term is, however, only applicable when such an object is evidently the badge of a town or individual. The term adjunct, which is sometimes em- ployed instead of symbol, is manifestly incorrect.~~

~~29. A mint-mark is a difference placed by the authorities of the mint upon all money struck by them, or upon each new die or separate issue.~~

~~30. A coin is said to be surfrappé when it has been struck on an older coin, of which the types are not altogether obliterated.~~

~~31. A dowble-struck coin is one in which the die or dies have shifted so as to cause a double impression.~~

~~82. A coin which presents two obverse types, or two reverse types, or of which the types of the obverse and reverse do not correspond, is called a mule ; it is the result of mistake or caprice.~~

~~Arrangement of Coins.—No uniform system has as yet been applied to the arrangement of all coins. It is usual to separate them into the three great classes of ancient coins (comprising Greek and Roman), mediszval and modern, and Oriental coins. The de- tails of these classes have been differently treated, both generally and specially. The arrangement of the Greek series has been first geographical, under countries and towns, and then chronological, for a further division; that of the Roman series, chronological, without reference to geography ; that of the medieval and~~

modern, the same as the Greek ; and that of the Oriental, like the Greek, but unsystematically,—a treatment inadmissible except in the case of a single empire. Then, again, some numismatists have sepa- rated each denomination or each metal, or have separated the denominations of one metal and not ofanother. There has been no general and comprehensive system, constructed upou reasonable principles, and applicable to every branch of this complicated science. Without laying down a system of rules, or criticizing former modes of arrangement, we offer the following as a classifica- tion which is uniform without being servile.

1. Greek Coins.—All coins of Greeks, or barbarians who adopted Greek money, struck before the Roman rule or under it, but with- out imperial effigies. The countries and their provinces are placed in a geographical order from west to east, according to the system of Eckhel, with the cities in alphabetical order under the provinces, and the kings in chronological order. The civic coins usually pre- cede the regal, as being the more important. The coins are further

arranged chronologically, the civic commencing with the oldest and ending with those bearing the effigies of Roman emperors. The gold coins of each period take precedence of the silver and the silver of the copper. The larger denominations in each metal are placed before the smaller. Coins of the same denomination and

They are flat and broad, but thin, and generally have on the ob- verse the portrait of a Roman emperor. It may be observed that the common division of Greek coins is into autonomous and im- perial, the former comprising all execpt those of the Roman period which have the effigies of emperors.

period are arranged in the alphabetical order of the magistrates' names, or the letters, &c., that they bear. 2. Loman Coins.—All coins issued by the Roman commonwealth

~~The different monetary systems of the Greeks grew out of the use Mone- of different standards of weight; in other words, their coins were tary sys- divisions of various talents. To investigate the origin of these tems.~~

~~and empire, whether struck at Rome or in the provinces. The arrangement is chronological, or, where this is better, under geo- graphical divisions.~~

~~3. Medixval and Modern Coins of Europe.—aAll coins issued by Christian European states, their branches and colonies, from the fall of the empire of the West to the present day. This class is arranged in a geographical and chronological order, as similar as possible to that of the Greek class, with the important exception of the Byzantine coins and the coins following Byzantine systems, which occupy the first place. The reason for this deviation is that the Byzantine money may be regarded not only as the principal source of medieval coinage but as the most complete and important medieval series, extending as it does without a break throughout the Middle Ages: The regal coins usually precede the civic ones, as being the more important ; and the medals of each sovereign or city follow the coins.~~

~~4. Oriental Coins.—All coins bearing inscriptions in Eastern languages, excepting those of the Jews, Phcenicians, and Cartha- ginians, which are classed with the Greek coins from their close connexion with them. These coins should be arranged under~~

~~monetary systems would demand a complete examination of Greek metrology, which could not be attempted in the present article. It will be well, however, to state in a few words the theory of Dr Brandis, at once the latest and the most satisfactory, though it cannot be said to completely solve the hard series of problems which the documents set before us.~~

~~The source of the Greek systems of weight has been referred to Babylonia, no link having been established with the different metrology of Egypt, a circumstance which may make us pause before finally accepting the results of the inquiry. The Babylonian weights had a twofold form,—the heavy talent, sometimes called the Assyrian, and the light talent, sometimes called the Baby- lonian. The heavy talent is the double of the light. Their weights and those of their divisions are thus stated by Dr Brandis on the evidence of~~

~~the inscribed weights found at Nimrid, the ancient Calah, in Assyria (see NINEVEH), which are now in the British Museum. The result is approximately true, but it has been shown by a careful reweighing of the objects that the maximuin weights rise somewhat higher and the minimum fall somewhat lower than is indicated in the table.~~

~~the following divisions: Ancient Persian, Arab, Modern Persian, Grammes. Grains.~~

~~Indian, Chinese, and coins of the far Kast. . Heavy Talent 60,600 =936,000; known range 62,400 to 57,600 grammes. This method of arrangement will be found to be as uniform as ae 1,010 a afm; én) ee is oo ae~~

~~it can be made, without being absolutely mechanical. It differs in | . ,# Mina 1683 = 260; ,, " 17°33 ,, 16s,~~

~~some important particulars from most or all of those which have ape ee ar = er voee se . 7 '~~

~~previously obtained ; but these very differences are the result of dy Mina 8-415= 130; ,, — 8°66 ,, AS 96~~

~~the consideration of a complete collection, and have therefore an inductive origin. A general uniformity is no slight gain, and may well reconcile us to some partial defects. These defects may be remedied in large collections by the use of "cross-references " from one cabinet to another, and by the formation of independent series to illustrate the general one. A series illustrative of Greek art, and another of Greco-Roman, might be formed. A series of portraits, and another of reverse types, would be equally valuable. Others might be made to show the changes of the coinage in relation to the condition of a state, with careful indications of the weight and composition of the examples, and others to illustrate the history of a particular country or city. Thus, the Byzantine copper coinage exhibits the success or disaster of the imperial arms, and the financial state of the empire in its fluctuations, while nothing can be more interesting than to see at one view the numismatic history of a great city. We have coins of Rome under the commonwealth and the empire, under the Ostrogoths, the Byzantines, the medieval senate, and the popes. The series of London would be not the least~~

curious. It would begin with the Roman coins issued by the mint of Londinium at the time of Diocletian and his colleagues, comprising those of the usurpers Carausius and Allectus; then, having not long after ceased for a time, it would recommence with the Saxon pennies, including a specimen of those of King Alfred,. which have for their reverse type the monogram of the city's name; and, continuing through the medieval period, it would conclude with modern tokens and medals, among the latter of which might be placed a copy of that famous one of the first Napoleon, with the inscription "Frappée a Londres," which was intended to commemorate the success of the Boulogne expedition.

I.—GREEK COINS.

The heavy talent is supposed to have found its way to Greece by sea from the Pheenician coast-towns, the light talent by land through Lydia. In adopting the Babylonian weights the Phe- uicians and Greeks made an important deviation. They accepted the sixtieth of the mina as their shekel or stater, but allowed only fifty instead of sixty of these units to their mina, retaining the sexagesimal division in counting sixty mine to the talent. Thus the Phoenician and Greek talents contained 3000 shekels or staters, not 3600 sixtieths of the mina.

Two talents thus arose,—that by which the earliest Phocaic gold money was struck, derived from the heavy Babylonian, with a stater having a maximum weight of 256 grains, and the Euboic talent, derived from the light Babylonian, with a stater of 130 grains or a little more. The Phocaic was a modification of the Babylonian heavy talent, the Euboic of the light, each having the same stater as the parent weight, but a lower talent. The relation of gold to silver in the earliest days of coined money, about 700 3.0., and for long after, was 13} to 1 ; consequently it was inconvenient to use the same standard for the two metals. Two systems for silver money are supposed to have arisen from this necessity, and it is here that the most brilliant but least conclusive part of the theory of Dr Brandis begins. The sixtieth of the heavy Babylonian mina weighed 260 grains, its sixtieth again weighed 4°3 ; this multiplied by 13°3 gives us the Pheenician drachm of 57 grains, introduced into Greece, and the basis of the so-called Greeco-Asiatic or Phe- nician silver standard. Four of these drachms produced the Phe-

nician stater at its maximum of 230 grains. Thus fifteen staters were equal to one gold sixtieth (230 × 15+-134=2583, nearly 260). Dr Brandis therefore calls this the fifteen-stater system. The Lydians, on the other hand, are supposed to have originated a silver stater by multiplying the sixtieth of the light mina, 180 grains, by 13°3 and

General There are some matters relating to Greek coius in general | dividing this by ten, so as to obtain a silver stater of about 170 charac- which may be properly considered before they are described in | grains, current long after in Asia Minor. Ten of these staters would ter. geographical order. These are their general character, the chief | thus be equal to one gold sixtieth. This, therefore, is called the

denominations, with the different talents of which they were the divisions, their devices and inscriptions, their art, and the mode of striking.

The period during which Greek coins were issued was probably not much less than a thousand years, commencing about the

ten-stater system. The monetary standards of the Greeks (expressed in grains) may be referred to the two original talents in the following manner : —

Heavy TALENT.

paar : Normal, Actual.

begi eps of the 7th century B.C. and generally ending at the Phocaic talent…….. 780,000 768,000 ; used for gold in Asia Minor.

death of Gallienus (268 a.p.). If classed with reference only to Pheenician 690,000 660,000; ,,, gold and silver.

their form, fabric, and general appearance they are of three prin- Macedonian . 7 » 3 on Silver,

cipal types,—the archaic Greek, the ordinary Greek, and the Greco- pel ” 3 1 gold and silver. : : : Aiginetic …….. f 582,000; ,, silver.

Roman. The coins of the first class are of silver, electrum, and 2 .

sometimes gold. They are thick lumps of an irregular round : oy ae ee ee

form, bearing on the obverse a device, with in some cases an accom- toe. oem eerie

panying inscription, and on the reverse a square or oblong incuse { Attic 20.22.02… cc… 22222..408,000; 5, gold and silver.

stamp (quadratum ineuswm), usually divided in a rude manner. 2 (CH aMVHEN shaacocooscosunnoc 270,000 ; silver.

The coins of the second class are of gold, electrum, silver, and bronze. They are much thinner than those of the preceding class, and usually have a convex obverse and a slightly concave or flat reverse. The obverse ordinarily bears a head in bold relief. The coins of the third class are, with very few exceptions, of bronze.

The following table exhibits the weights of the principal denomi- Denomi- The Corinthian talent is excluded nations.

nations of the Greek systeins. as simply a differently divided variety of the Attic, the Rhodian as a degraded Attic. In the subsequent account of Greek money the metrology of each class will be carefully noted.

Types.

Classes.

Types of

632

| Attic. figinetic. | Phoenician. | Persic. |

Grains Grains. Grains. Grains. |

Distater or Tetradrachm…. 270 an 224 354 | Stater or Didrachm …….. 135 194 112 rig Hemistater or Drachm 67°5 97 56 88 Bhindior TRetrobol …. ese… 45° a 3t 59 Bourth om Triobol! ……2 sae. 83°75 48 28 44 Sixth or Diobol …….. | 22°5 32 18 29 Kighth or Triheniiobol…… i 16°8 24 14 22 Twelfth or OBol. ….. ssseeees : 11°25 16 9 14

The Rhodian drachm weighed 60 grains. The Babylonian weight is somewhat lower than the Persic, and it wants the distater. The term stater is usually applied to the didrachm, but also to the tetradrachm, and at Cyrene to the drachm.!

The bronze standards have been less fully discussed. Some notice of them will be given under different geographical heads.

In the types of Greek coins (using the term in its restricted sense) the first intention of the designers was to indicate the city or state by which the money was issued. The necessity for dis- tinctive devices was most strongly felt in the earlier days of the art, when the obverse of a coin alone bore a design, and, if any inscription, only the first letter, or the first few letters, of the name of the people by whom it was issued. The motive which dictated the kind of type to be selected was undoubtedly a religious one.2 There are some isolated instances in which the religious character of a type is doubtful; but these, if proved, would be only exceptions to a general rule. The piety of that age adopted religious devices, and for a long time it was held to be impious to substitute any other representations for them. To the same cause may, perhaps, be partly aseribed the preference on the most ancient coins for devices of a symbolieal character to actual representations of divinities, although the difficulty of portraying the human form in the infancy of art must have had considerable influence in this direction.

Greek coins, if arranged according to their types, fall into three classes: (1) eivic coins, and regal without portraits of sovereigns ; (2) regal coins bearing portraits; and (3) Greco-Roman coins, whether with imperial heads or not. The coins of the first class have either a device on the obverse and the quadratum incuswm on the reverse, or two devices; and these last are again either independent of each other, though connected by being both local, or—and this is more common—that on the reverse is a kind of complement of that on the obverse. It will be best first to describe the

character of the principal kinds of types of the first class, and then to notice their relation. It must be noted that a head or bust is usually an obverse type, and a figure or group a reverse one, and that, when there is a head on both obverse and reverse, that on the former is usually larger than the other, and represents the personage locally considered to be the more important of the two. We must constantly bear in mind that these types are religious and local if we would understand their meaning. ‘‘I do not believe,” Burgon says, “ that the types of coins are, on any occa- sion, original compositions, but always copied (from the earliest to the lowest times) from some sacred publicmonument. Thus, when we find what is called a Beeotian buckler on coins, we are not to look upon the representation as a Beotian buckler, but as the buckler of some Beotian hero well known to the ancient inhabitants of that country, and accounted to be sacred by them. In like manner, when we find Minerva represented on coins we are not to under- stand the type as a Minerva, but the Minerva of that place; and, in some cases which might be brought forward, the individual statucs which are represented on coins, or ancient copies, will be found to exist. The only example of originality of composition apparent on coins is where types have been doubled or halved, to express similar modifieations of value.”

In the following list the types of Greek coins of cities, and of

eivie,&c., kings, not having regal portraits, are classed in a systematic order,

coins.

without reference to their relative antiquity.

1. Head or figure of a divinity worshipped at the town, or by the people, which issued the coin, as the head of Pallas on coins of Athens, and the figure of Heracles on coins of Beotian Thebes. Groups are rare until the period of Greco-Roman coinage.

2. Sacred natural or artificial objects,—(a) animal sacred to a divinity of the place, as the owl (Athens) and the tortoise (Aigina); (6) sacred tree or plant, as the silphium (Cyrene) and the olive- branch (Athens); (c) arms or implements of divinities, as the arms of Heracles (Erythra), the tongs of Vulean (Aisernia).

It is difficult to connect many objects comprised in this class with local divinities. The reason of this appears to be that the Hellenes, wherever they colonized, and nowhere more than in Greece, found an earlier system of low nature-worship, and en-

1 This information on Greek weights and coinages is wholly derived from Mr B. V. Head's published statements of Dr Brandis's results (Nwmismata Orientalia, " Lydia," 1877, pp.1sq.; Num. Chron., 1875, pp. 245 sq.; Proceedings of Institute of Bankers, 1879; Guide to the Coins of the Ancients, 1881). The writer is, however, responsible for the doubts expressed as to Dr Brandis's theory.

2 See Burgon, in Numismatic Journal, vol. i. pp. 97 sq.

NUQt sw A FP O*s

[GREEK COINS.

deavoured to incorporate it into their own more intellectual mythology, sometimes with but partial success.

3. Head or figure of a local genius, —(a) river-god, as the Gelas (Gela); (2) nymph of a lake, as Camarina (Camarina); (c) nymph of a fountain, as Arethusa (Syracuse).

4, Head or figure of a fabulous personage or half-human monster, as a Gorgon (Neapolis Macedoni), the Minotaur (Cnossus).

5. Fabulous animal, as Pegasus (Corinth),a griffin (Panticapseum), the Chimera (Sicyon).

6. Head or figure of a hero or founder, as Ulysses (Ithaca), the Lesser Ajax (Locri Opuntii) , Taras, founder of Tarentum (Tarentum).

7. Objects connected with heroes, —animal connected with local hero, as the Calydonian boar or his jaw-bone (Aitolians). Arms of heroes also occur as types, but their attribution to particular personages is difficult or impossible.

8. Celebrated real or traditional sacred localities, as mountains on which divinities are seated, the labyrinth (Cnossus).

9. Representations connected with the public religious festivals and contests, as a chariot victorious at the Olympic games (Syracuse).

The relation of the types of the obverse and reverse of a coin is a matter requiring careful consideration, since they frequently illustrate one another. As we have before observed, this relation is either that of two independent objects, which are connected only by their reference to the same place, or the one is a kind of complement of the other. Among coins illustrating the former class we may instance the beautiful silver didrachms of Camarina, having on the obverse the head of the river-god Hipparis and on the reverse the nymph of the lake carried over its waters by a swan,' and those of Sicyon, having on the obverse the Chimera and on. the reverse a dove. The latter class is capable of being separated into several divisions. When the head of a divinity occurs on the obverse of a coin, the reverse is occupied by an object or objects sacred to that divinity. Thus the common Athenian tetradrachms have on the one side the head of Pallas and on the other an owl and an olive- branch; the tetradrachms of the Chalcidians in Macedonia have the head of Apollo and the lyre ; and the copper coins of Erythre have the head of Heracles and his weapons. The same is the case with subjects relating to the heroes: thus there are drachms of the Aitolian League which have on the obverse the head of Atalanta and on the reverse the Calydonian boar, or his jaw-bone and the spear-head with which he was killed. In the same manner the coins of Cnossus, with the Minotaur on the obverse, have on the reverse a plan of the Labyrinth. Besides the two team devices there are often others of less importance, which, although always sacred, and sometimes symbols of local divinities, are generally indicative of the position of the town, or have some reference to the families of magistrates who used them as badges. Thus, for example, besides such representations as the olive-branch sacred to Pallas on the Athenian tetradraechms, as a kind of second device dolphins are frequently secn on coins of maritime places; and almost every series exhibits many symbols which can only be the badges of the magistrates with whose names they occur. Regal coins of this class, except Alexander's, usually bear types of a local character, owing to the small extent of most of the kingdoms, which were rather the

~~territories of a city than considerable states at the period when these coins were issued.~~

~~The second great class—that of coins of kings bearing portraits—Regal, Religious feeling affords the with por- clue to the long exclusion of regal portraits,—the feeling that it traits.~~

~~is necessarily separate from the first.~~

~~would be profane for a mortal to take a place always assigned hitherto to the immortals. Were there any doubt of this, it would be removed by the character of the earliest Greek regal portrait, that of Alexander, which occurs on coins of Lysimachus. This is not the representation of a living personage, but of one who was not only dead but had received a kind of apotheosis, and who, having been already called the son of Zeus Ammon while living, had been treated as a divinity after his death. He is therefore portrayed as a young Zeus Ammon. Probably, however, Alexander would not have been able, even when dead, thus to usurp the place of a divinity upon the coins, had not the Greeks become accustomed to the Oriental " worship " of the sovereign, which he adopted. This innovation rapidly produced a complete change ; every king of the houses which were raised on the ruins of the Greek empire could place his portrait on the money which he issued, and few neglected to do so, while the sovereigns of Egypt and Syria even assumed divine titles.~~

~~The reign of Alexander produced another great change in Greek coinage, very different from that we have noticed. He suppressed the local types almost throughout his empire, and compelled the towns to issue his own money, with some slight difference for mutual distinction. His successors followed the same policy ; and thus the coins of this period have a new character. ~ The obverses of regal coins with portraits have the head of the sovereign, which in some fewinstances gives place to that of his own or his country's tutelary divinity, while figures of the latter sort almost exclusively occupy the reverses. Small symbols, letters, and monograms on the reverses distinguish the towns in this class.~~

~~Greco- toman.~~

Tnscrip- tions.

GRECO-ROMAN COINS. |

The Greco-Roman coins begin, at different periods, with the seizure by Rome of the territories of the Greek states. They are almost all bronze ; and those in that metal are the most character- istic and important. In their types we see a further departure from the religious intention of those of earlier times in the rare admission of representations, not only of eminent persons who had received some kind of apotheosis, such as great poets, but also of others who, although famous, were not, and in some cases probably could not have been, so honoured. We also observe on these coins many types of an allegorical character.

The following principal kinds of types may be specified, in addi- tion to those of the two previous elasses. (1) Head or figure of a famous personage who either had received a kind of apotheosis, as Homer (Smyrna), or had not been so honoured, as Herodotus (Halicarnassus) and Lais (Corinth). (2) Pictorial representations, always of a sacred character, although occasionally bordering on caricature. We may instance, as of the latter sort, a very remark- able type representing Pallas playing on the double pipe and seeing her distorted facc reflected in the water, while Marsyas gazcs at her from a rock,—a subject illustrating the myth of the invention of that instrument (Apamea Phrygia). (3) Allegorical types, as Hope, &c., on the coins of Alexandria of Egypt, and many other towns. These were of Greek origin, and owed their popularity to the sculpture executed by Greeks under the empire ; but the feeling which rendered sucli subjects prominent was not that of true Greek art, and they are essentially characteristic of the New Attic school which attained its height at Rome under the early emperors. Of this kind of type we must again speak in noticing the Roman eoinage.

Those types which were common to this and the older classes were also much developed in their subjects. Thus, for instance, groups frequently took the place of single figures ; and the repre- sentations of sacred localities acquired a great prominence, the most eommon being of buildings, which are generally temples. In the architectural types a tendency to pictorial representation is evident in the eonstant endeavours to depict edifices in perspective.

~~There is a class of coins which is always considered as part of the Greco-Roman, although in some respects distinct. This is the colonial series, struck in Roman colonize, and having almost always Latin inscriptions. As, however, these colonise were towns in all parts of the empire, from Emerita in Spain (Merida) to Niniva Claudiopolis (Nineveh) in Assyria, in the midst of a Greek popula- tion and often of Greek origin, their coins help to complete the series of civic money, and, as we might expect, do not very markedly differ from the proper Greek imperial coins except in having Latin inscriptions and showing a preference for Roman types.~~

~~We have now to speak of the meaning of the inscriptions of Greek coins. These are either principal or secondary; but the former are always intended when inscriptions are mentioned with- out qualification, since the secondary ones are non-essential. The inscription of civic money is almost always the name of the people by which it was issued, in the genitive plural, as AOBHNAION on coins of the Athenians, SYPAKOSION on coins of the Syracusans. The inscription of regal money is the name, or name and title, of the sovereign in the genitive,as AAERANAPOY, or BAZIAEQS AAEBRANAPOY, on coins of Alexander the Great. This genitive form implies a nominative understood, which has been generally sup- posed to be véuoua, money." There are four instances in which a nominative of this kind occurs in coins, PANOZ EMI SHMA, "¢T am the badge of Phanes," on an archaic coin of Halicarnassus; TOPTYNOS TO HTAIMA, "the struck" money of Gortys, if the form suggested by M. Frangois Lenormant be admissible, on an archaic coin of Gortys; and ZEYOA KOMMA, "'the stamp" or 'coin of Seuthes," as well as 2EYOA APTYPION, the "silver piece" or ''money of Seuthes." The balance preponderates in favour of the idea that such a word as véucoua, or the more definite term for a piece of gold (xpuaois), silver (dpy'pov), or copper (xaxots), was intended. Yet the instances are not sufficient to establish the case. Besides their disagreement, it must be remem- bered that the coins of Phanes and Gortys belong to the infaney of money in Asia Minor and Crete, and that Seuthes was a semi-barbar- ous chieftain. Any one familiar with Greek epigraphy will see the danger of resting on such evidence. In the eighth edition of the Encyclopedia Britannica a different explanation was offered on the authority of the late Mr Burgon, who generously communicated it to the writer. He supposed the inscription to relate to the type, and that the~~

nominative understood is the name of that type. It should be remarked that the type of the reverse of a civic coin is usually a complement of that of the obverse, and that the converse may be inferred of regal coins; there is thus in general virtually but one type, that of the tutelary divinity or sacred symbol of the city or sovereign. Athenian coins with the inscription AOH[NAION] have as their obverse type the head of Athene ; the meaning of the inscription, according to Burgon's explanation, would be, not "' the money of the Athenians," but " Athene of the Athenians." When the name of the divinity represented is written, the nominative understood is supplied. Thus on coins of Syracuse, with the

head of Arethusa as the obverse type, we read APEOOZA— rev.) ZYPAKOZSION, "Arethusa of the § racusans," and on others with the head of Zeus, ZEYS EAEY@EPIOS. =YPAKOSION, "Zeus the giver of liberty of the Syracusans." There are instances in which the names of the divinity and of the people occur together, as EIPHNH AOKPON, "Irene of the Locrians," on a coin of the Locri Epizephyrii, the obverse having the head and name of ZEY, as though the sense were Zeus (and) Irene of the Locrians. In the case of regal coins Burgon's theory cannot be applied in strictness, In most cases we could supply the name of the divinity represented on the reverse, as, for the gold staters of Alexander, [NIKH] AAEZANAPOY, and for the silver, [ZEY>] AAEZANAPOY;; but when the type, as of almost all the Ptole- maic coins, is a symbol, in this case the eagle, some modification is needed. If we suppose that the nominative, understood when none is expressed, or implied when a divinity is named, is some word expressing the idea conveyed by the badge, as Zeus by the eagle, we shall probably be not far from the truth. The secondary inscriptions either describe secondary types, as AQAA, "rewards," accompanying the representation of the arms given to the victor in the exergues of Syracusan decadrachms,! or are the names of magistrates or other officers, or in regal coins those of cities, or are those of the engravers of the dies, of whom sometimes two were employed, one for the obverse and the other for the reverse, or are dates. These inscriptions are often but

abbreviations or monograms, especially when they indicate cities on the regal coins.

The importance of Greek coins as illustrating the character of Art of contemporary art cannot be easily overrated. They are beyond all coins,

other monuments the grammar of Greek art. Their geographical and historical range is only limited by Greek history and the Greek world; as a series they may be called complete ; in quality they are usually worthy of a place beside contemporary sculpture, having indeed a more uniform merit; they are sometimes the work of great artists, and there is no question of their authenticity, nor have they suffered from the injurious hand of the restorer. 'Thus they tell us what other monuments leave untold, filling up gaps in the sequence of works of art, and revealing local schools known from them alone.

The art of coins belongs to the province of relief, which lies between the domains of sculpture and of painting, partaking of the character of both, but most influenced by that which was dominant in each age. Thus in antiquity relief mainly shows the rule of sculpture, in the Renaissance that of painting.

Sculpture best represents character (4@os), painting expression (ra dy). Character is the permanent aspect of the face and figure as denoting the dominant quality. Thus a great statue may be not unfairly described by a single epithet. Expression is the transient but intense effect of some sudden feeling. 'A single figure in a painting' requires a fuller description than a statue ; the char- acter is seen beneath the expression. Seulpture aims at embodying the ideal, and when it represents the real it must show the fulness of all qualities and even of all potentialities. Repose is the con- dition of sculpture. Painting having for its purpose the repre- sentation of light (colour), and the effects of light in bodies, can only deal with the circumstances of the moment. Movement is implied in painting.? Sculpture that is pictorial and painting that is sculpturesque belong to the decline of art. Expression of a supreme kind is, however, found in sculpture of high quality, especi- ally in that kind of relief which lies nearest to sculpture, alto- rilievo ; and character is seen in noble portraits which endeavour to represent the man in his completeness. But such sculpture is properly in

groups and such painting in the single form. The group suggests the treatment of painting, the single form in pictorial art that of sculpture. Relief, as intermediate between sculpture and painting, admits separately of movement and the momentary action, but the movement must be of the most dignified and rhythm. ical kind, otherwise it will need colour to counteract confusion by a higher harmony, and the momentary action must be of supreme importance. Observe the dignity and rhythm of the Panathenaic frieze of the Parthenon, the want of colour in the Amazon frieze of the Mausoleum, contrasting it with the noble fragmentary chariot frieze, and the supreme moment chosen in the metopes of the Parthenon.

Relief is usually divided into three kinds, low, middle, and high (basso-, mezzo-, and alto-rilievo), and it is convenient to retain these terms while adimitting that they are only roughly correct. Work to be viewed in a feeble light and from a distance must have clearness in the most necessary outlines, and that simplicity which equally marks the Panathenaic frieze. It admits of simple and generalmovement. This is low relief, and must not be too much raised from the background. HIgh relief differs from sculpture in the round in that it is not necessarily detached from the back- ground, nor usually of the full depth of true proportion, and in

1 It is scarcely to be doubted that the arms on the Syracusan decadrachms represent a reward given to an Olympic competitor or competitors on return- ing home.

2 On the whole subject ef. C. O. Miiller, Archdologie der Kunst, §§ 25-27.

consisting of groups to be seen from a distance, so simply treated as to be free from confusion due to the shadows upon them, and not to cast shadows. It should thus be simple in the forms. It admits of expression of

the highest kind, which is almost suggested by the relation of the figures which constitute a group, but it does not allow movement. Middle relief, inasmuch as it is used for objects to be seen near, is delicate in its outlines and nay be elaborate in its details. The sculptured columns of the temple of Artemis at Ephesus show the delicacy of the method and coins and gems its delight in elaboration. All coins should be treated in this manner, and it is usual in the entire range of those of the Greeks, although the influence of sculpture on relief of other kinds is con- stantly traceable.

It may be expected that Greek coins will bear the impress of the sister arts of sculpture and painting, filling up the gaps in the sequence of examples of the art of which we have remains, telling us somewhat of that which has but a written tradition. Our first duty is to endeavour to place the Jocuments in the best order, separating the geographical from the historical indications, first examining the evidence of local schools, then those of the suc- cession of styles. It is from coinsalone that we can discover the existence of great local schools, reflecting the character of the differ- ent branches of the Hellenic race. In tracing the changes in these schools we gain a great addition to our ideas of the successive styles, and can detect new examples of those which owe their fame to the leading masters. But in dealing with works in relief we have the advantage due to their intermediate character. In our larger geographical horizon we can trace the character of the successive styles, not of sculpture only, but also of sculpture and painting.

Greek coins clearly indicate three great schools, each with its subordinate groups. The school of central Greece holds the first place, including the northern group centred in Thrace and Mace- donia, and the southern in the Peloponnesus, with the outlying special schools of Crete and Cyrene. The Jonian school has its northern group, Ionia, Mysia, and Aolis, and its southern, Rhodes and Caria. Beyond these are certain barbarous and semi-barbarous groups, of which the most important is that of eastern Asia Minor, Persia, and Pheenicia, with Cyprus. The school of the West com- prises the two groups of Italy and Sicily.

The whole duration of the schools is limited, by the repulse of the Persians and the accession of Alexander, from 480 to 332 B.C. Before this age all is archaic, and it is hard to trace local character- istics. After it, the

~~centralizing policy of the sovereigns and the fall of the free cities destroyed local art. In certain cultivated centres under enlightened kings a local art arose, but it speedily became general, and we have thus to think of a succession of styles during the rest of the life of Greek art. The century and a half of the local schools is significantly the great age of this art.~~

~~In the study of each school we have first to determine its char- acter, and then to look in its successive phases for the influence of the great masters of style. Two dangers must be avoided. We must not too sharply divide the sculptors and the painters as if they always were true to the special functions of their arts. It is well to bear in mind that the earliest great painter, Polygnotus, was a por- trayer of character, kadds 70oypdgos, 7Ocxds, as Aristotle calls him, whereas the latest great sculptors represented expression. Thus sculpture first weighed down the balance, afterwards painting; but it must be remembered that relief can be truer to painting than sculpture in the round, which is more limited by the conditions of the material and mechanical necessities. Our second danger is due to the ease with which local qualities may be ascribed to the in- fluence of a leading style. It is also to be borne in mind that the movement of art in coins was during one period slower than in sculpture,—hence an influence more general than particular. Phidias and Myron do not make their mark so much as Polyclitus. In all cases the direct influence of great masters is to be looked for later than their age. The style of their time is prevalent in the coins, their actual works do not produce imitations till later, and as this is so we must regard the reflexions as influenced by the atmosphere in which they were produced. A Hera of the age of Polyclitus may be truer to the style of this artist than a later one which was produeed under the influence of his famous statue.~~

~~The school of central Greece in its southern group, comprehending Attica, is remarkable for its widespread extent. It has its colonies in Magna Grecia at Thurium, an Athenian foundation, probably at Terina, and in Macedonia at Amphipolis and Chalcidice under Athenian rule. It alone shows instances comparable to the works of Phidias, though its most numerous fine works are of the age of Polyclitus and that of Praxiteles and Scopas. Its qualities may be seen by comparison of the same subjects as treated by the other schools and groups. The earliest works are marked more than any others by~~

the qualities of high promise which characterized the Aiginetan marbles,—the same dignified self-restraint and calm simplicity. Next we perceive a series strong in style, and showing that lofty dignity, that reposeful embodiment of character, which are the stamp of the works of Phidias and his contemporaries. The subjects are more remarkable for fidelity, breadth, and boldness

NOM TSM A Tor ©

[LocAL SCHOOLS,

than for delicacy of execution or elaboration of ornament. Every subject is ideal, even the portrayal of animal form. Thus the char-

acter shows us what divinity is intended and the ideality what

is intended by the representation of beast or bird. From these works we pass to those which reflect the style of the time of Praxiteles and Scopas, when the influence of painting began to be felt, and art inclined towards feeling and descended to sentiment. Still, to the last, character rules these coins, and the chief difference we see is in the increased love of beauty for its own sake and the fondness for representing movement, not to the exclusion of repose, but by its side. In other respects there is little change except in the finer execution and more ornamental quality of the work. Even when the greatest achievement of the Sicilian school, the head of Persephone on the decadrachms of Syracuse, is copied by the Locrians and 'the Messenians, the superior quality. of the school of Greece asserts itself, and the copy is better than the original: there is less artifice and more breadth. The northern group is at first ruder, in the age of Phidias severer, and afterwards it merges into the greater softness of its southern rival. If it copies, as Larissa may copy Syracuse and Neapolis in Campania, it again asserts its superior simplicity, and we prefer the copy to the original.

The Ionian school lacks the sequence which the rest of the Greek Ionia,

world affords. It is broken by the baneful influence of the Persian dominion, and consequently the best works belong to the earliest and latest part of the period. 'The earliest coins, of the A'ginetan age, present nothing special; the

~~later, of the time of Praxiteles and Scopas, comprise works not inferior to those of central Greece, and remarkable, like the Western and the Cretan, as the sole records of a school otherwise unknown. 'They are markedly characterized by the qualities of the style of feeling, that of Praxiteles and Scopas ; but more than this, they are the expression of that style in pictorial form. They represent expression, and they treat it as it could not be treated in sculpture in the round, portraying locks streaming in the air and flowing draperies. At the same time, they are true to the highest qualities of art. Each divinity is at once recognized. Persephone has not the maidenly sweetness she wears in Hellas, but the melancholy foresight of her fate; she has not the character but the expression of the goddess. It must be remembered that, while Hellas produced the great sculptors, western Asia Minor bred the great painters after Polygnotus, himself a sculptor in painting rather than a painter. In the native land of Zeuxis, Parrhasius, and Apelles we see the evidence of the rule of painting. The execution of even the smallest works of this school is marked by the subtlest modulations of form, and here again we see the quality of the painter, who, having to represent solid objects on a plane, must have the highest knowledge of anatomy. 'The power of ex- pression and the knowledge of what underlies the surface of the face are carried even in the smallest works just alluded to, as the Cyzicene hecte, to a degree of excellence which baffles modern critical power. The technical skill is inferior to that of the West, yet the skill in modelling is far greater, and has no parallel in the medallic work of any other time or country.~~

~~The school of the West, if we except such outlying examples of The the art of Hellas as those of Thurium and Terina, has its highest West.~~

~~expression in Italy, its most characteristic in Sicily. It has distinctive qualities throughout the age. Even in the earlier period we trace a striving after beauty and a delicacy of finish, with a weakness of purpose, that mark the school with an influence increasing to a time long after the extinction of its rivals. We trace neither clearness of character nor force of expression. The Persephone of Syracuse is merely a beautiful girl. More than this, her beauty is shown off by the portrayal of the artifices of civilized life, emphasized by tricks of style. At the same time there is a knowledge of the capacity of the materials and the form of the coin, and a masterly power of~~

finish, on the whole a com- pleteness of technical skill which is unequalled. The result in the lower subjects is splendid, if wanting in variety, but in the higher we miss the noble achievements of the greater schools. So far there is a general agreement in the northern and southern groups. Yet the Italian shows a nobler and simpler style, with some affinity to that of central Greece, which we look for in vain in Sicily, though we are dazzled by the rich beauty of the magnificent series of coins which marks her wealthiest age. Sicilian art has this apparent advantage, that the great cities, save Syracuse, perished in the Carthaginian invasion, or under the tyranny of the elder Dionysius. Thus we have no important works save of Syracuse during the second half of our period, and cannot judge fully to what this school would have fallen. The key to this exceptional development of Greek art is fonnd in the absence of sculptors or painters in the West, except only Pythagoras of Rhegium at the very beginning of the age, whose influence is thought to be trace- able on the money of his native town.. The Western art is that of engravers accustomed to minute and. decorative work, uninfluenced by sculpture or painting. Their designs will not bear enlargement, which only enhances the charm of those of the other leading schools. Those of the great Syracusan decadrachms are small ; those of the minute hecte of Cyzicus are large.

HISPANIA. |

Crete. The most important of the lesser schools is the Cretan. Crete,

retaining the primitive life of older Hellas, was never truly civilized,

but enjoyed to the last the privileges and exhibited the faults of

an undeveloped condition. Producing in the age of high art neither sculptor nor painter of renown, the Cretans, to judge from their coins, were copyists of nature or art. At first rude, their work acquires excelleuce in design, but never in execution. While we see their poor reproductions of the designs of the Peloponnesus, we are amazed by their skill in portraying nature. Their gods are seated in trees with a background of foliage. Their bulls are sketched as they wandered in the meadows. All fitness for the mode of relief, as well as for the material and the shape of the coin, is entirely ignored. Hence a delight in foreshortening, and a free choice of subject with

~~no reference to the circle in which it must be figured. In spite, however, of their skill, the Cretans never attempted the three-quarter face, which is at once the best suited to the surface of a coin and the most trying to the skill of the artist. Yet their work is delightfully fresh, as if done in the open air. There is no idealism, but much life and movement. In a word, the school is naturalistic and picturesque. Its works are of the highest value in the study of Greek art, but as examples of the application of that art to coins they are to be used with caution. Nowhere else do we see the artist so freely copying nature and art, nowhere so unshackled by academic rules, nowhere so little aware of the limitation of his province.~~

~~It is important to study the mode in which Greek money was coined, because the forms of the pieces thus receive explanation, and true coins are discriminated from such modern falsifications as have been struck, and in some degree from those which have been cast. Our direct information on the subject is extremely scanty, but we are enabled by careful inference to obtain a very near approximation to the truth on all the most important points.~~

~~The only single ancient Greek die of the authenticity of which we are persuaded was seen by Burgon in the East. He de- scribed it, from recollection, as a piece of copper or bell-metal, in the shape of a truncated cone, flat at the top and bottom, about 34 inches in height, and from about 3 inches in diameter at the bottom to 2 at the top. In the upper surface was cut the die for the reverse of a tetradrachm of a Seleucid king of Syria, with the type of Apollo seated on the omphalos. There appears to have~~

~~. been no trace of any method of fitting this to the die of the obverse. From the appearance which the coins present, it 'may be inferred that the Greeks placed a ball of metal, carefully adjusted to the proper weight, and cold, between two dies, and then struck the upper die a powerful blow with a very heavy hammer. 'There was no collar to give the coins an exactly circular form. The dies must have been of hard metal, though softer than modern ones. Some Greek coins have been found of the same die, but such as the writer has seen did not present any evidence as to the wear to which their dies had been subjected. The Roman coins appear to have been struck in the same manner, but with a more careful adjustment of the two sides, yet~~

~~without a collar. Their dics, although hard, must have been, like the Greek dies, softer than those of the moderns, since, in the case of coins from the same die, we can trace the increase of imperfections through wear, and this notwithstand- ing the short period for which each die was used and the relatively few coins struck from it. In the case of Greek coins, there is similar evidence, in the great number which have bad or imperfect impressions, although not worn, since all these can scarcely owe their inferiority to insufficient force having been used in striking them. Some few Greek and Roman coins were cast and not struck ; others were first cast to give them their general form, and then struck. Both cases, however, form very rare exceptions, and are confined to particular groups of coins and not to isolated examples.~~

~~Greek We may now pass on to notice the Greek coinage of each country,~~

~~coinage following Eckhel's arrangement. The series begins with Spain,~~

~~of the far Gaul, and Britain, constituting the only great class of barbarous~~

~~West. Greek coinage. It must not be supposed that the money of the whole class is of one general character ; on the contrary, it has very many divisions, distinguished by marked peculiarities ; it has, however, everywhere one common characteristic, — its devices are corrupt copies of those of Greek or Roman coins. The car- liest of these barbarous coinages begin with the best imitations of the gold and silver money of Philip II. of Macedon. They probably first appeared to the north of his kingdom, but the gold soon spread as far as Gaul, and even found their way into southern Britain, by which time the original types had almost disappeared through successive degradations. Next in order of time are the silver imitations of Roman family coins, the victoriati and denarii of the commonwealth, which began in Spain and passed into Gaul and Britain, being current in those countries with the gold money of Greek origin. The copper money of Spain follows the imitated silver types ; that of Gaul and Britain, though showing Roman influence, is more original. It is useless to attempt a very minute classification of the subjects of these barbarous types, since the eats by whom they were executed did not properly understand them.~~

~~Mode of coining.~~

Side by side with these large coinages we find Greek money of colonies in Gaul and Spain, and a far ampler issue of Phoenician coins by the Carthaginian kings and cities of the Peninsula. The coinage of Hispania, corresponding to the modern Spain and Spain. Portugal, was issued during a period of about four centuries, closing in 41 4.p. There are four classes of money, which in the order of their relative antiquity are Greek, of two groups, Carthaginian, Romano-Iberian, and Latin. The first or older group of Greek money belongs to the widespread currency which reveals the inari- time power of the Ionians of Phocea. It consists of fractions of the drachm of the Phocean standard, from the diobol or third downwards. Its later pieces are of the Phocean colony of Emporie, founded by the earlier settlement of Massilia. Nextin order and in part contemporary, beginning before the middle of the 4th ceutury B.c., come the drachms of Emporie, which betray the influence of Siculo-Punic art. Their standard is probably Carthaginian. Of the neighbouring Rhoda, a Rhodian colony, there is similar money. Carthaginian coins of Spain begin in the same period with the issues of the great colony of Gades, following the same weights as the Emporian drachms. These are followed by the issues of the Barcides from 234 to 210 B.c., with Carthaginian types and of Pheenician weight, struck of six denominations, from the hexadrachm to the hemidrachm. Sefior Zobel de Zangréniz has classed them to Spain, on the grounds of provenance and the possession of the silver mines by the Barcide kings, against Miiller, who attri- butes them to Africa. The types are Carthaginian, and present some interesting subjects. The true Iberian currency begins not long after the Punic. The later drachms of Emporie, ultimately following the weight of the contemporary Roman denarius, have Iberian legends, and form the centre of a group of imitations issued by neighbouring native tribes with their distinctive in- scriptions. This coinage ceased when the Roman province was formed in 206 B.c. A little before this date the Romans had begun to introduce Latin money ; about this time, however, they took the backward step of permitting native coinages of Latin weight. Probably they found that native legends and types were more welcome to their subjects than those of Rome. Consequently this coinage of Spain

~~under the republic, which lasted until 133 3.c., may be almost considered national. The two provinces Hispania Citerior and Hispania Ulterior have this marked difference: the coins of the nearer province, of silver and bronze, have always Iberian inscriptions on the reverse, and are clearly under distinct Roman regulation ; those of the farther are apparently of independent origin, and consequently bear Iberian, Pheenician, Libyo-Pheenician, and Latin legends, but they are of bronze alone. The interest of these coins lies, mainly in their historical and geographical information. They bear the names of tribes, often the same as those of the town of mintage. The art is poor, and lacks the quaint originality and decorative quality of that of Gaul. Ultimately the native money was wholly Latinized (133 3B.c.), though political circumstances for a time renewed it under Sertorius (80-72 3B.c.) in the modified form ofa bilingual currency. The purely Latin issues of the two provinces, and under the empire more largely (from 27 B.c.) of the three, Tarra- conensis, Betica, and Lusitania, present little of interest. They closed in the reign of Caligula (37-41 a.p.), though in later times purely Roman money in gold and silver was issued at different times in Hispania down to the establishment of the Visigothic kingdom.~~

~~The imperial money of Hispania introduces us to one of the two great classes of provincial coins under the empire ; the larger of these was the Greek imperial, bearing Greek inscriptions, the smaller the Roman colonial, with Latin inscriptions, deriving its name from the circumstance that among Greek-speaking nations the colonia were distinguished by the use of the Latin language on their money. In the comage of Hispania, issued by a nation adopting Latin for official use, the aspect of the coinage is colonial, though it was not wholly issued by colonies. Many of the Spanish towns belong to the kin- dred class of municipia; others are neither colonize nor municipia. In Hispania the obverse of the coin bears, as usual in the colonial class, the head of the emperor or of some imperial personage, the reverse a subject proper to the town. The priest gniding a plough drawn by a yoke of oxen is peculiarly proper toa colonia, as portray- ing the ceremony of describing the walls of the city, so also an ox, with the same reference, the altar of the imperial founder, or, as connected with his cultus, a temple, probably in some cases that of Roma and Augustus. Other types, however, portray the old temples in restored Roman shapes, or indicate directly by fishes, ears of corn, and more rarely bunches of grapes, the products of the~~

~~country, not, as in Greek cities, those products in relation to religion. Some original and grotesque types have a markedly local character.~~

~~-The money of Augusta Emerita (Merida) in Lusitania, a colony of~~

~~pensioners (emeriti), is specially interesting, including as it does the silver issues of P. Carisius, the legatus of Augustus.~~

~~The coinage commonly called that of Gaul belongs to the people The more properly than to the country ; for it comprehends pieces issued Gauls, by the Gauls or other barbarians from the borders of Macedonia and Illyricum to the English Channel and the Bay of Biscay, through Pannonia, part of Germany, Helvctia, and Gaul. It in-~~

~~Massilia.~~

~~Gaul.~~

~~Britain.~~

~~636~~

~~fluenced the money of northern Italy, and, crossing the Channel, produced that of Britain, which has its own distinctive features. Four classes of coinage are found in these vast limits. Arranging them by date, they are the money of the Greek colony of Massilia and her dependencies, that of the Gauls and other barbarians of central and western Europe, those which can be classed to the tribes and chiefs of Gaul, and the imperial coinage of that country. The coins here attributed to the Gauls and other barbarians arc by some numismatists classed to Pannonia. It is quite true that the silver money of this class is not found in Gaul, but in the case of the gold it is impossible to draw a distinct geographical line. Further, no nation is so likely to have struck the bulk of these pieces as the plunderers of the Greek cities; at the same time, there are Thracian and other barbarous mintages which are not Gaulish. The gold money cannot be limited to any one country ; it is common to all, having evidently spread as a safe commercial medium ; the silver, on the other hand, remained limited to the neighbourhood of the Macedonian territory. Thus, though we may separate certain eastern issues,~~

~~the general designation of the whole group as issued by the Ganls and other barbarians is safest, so long as the great class of gold remains common to the whole region, and even in some varieties to Britain apart from the true British coinage—unless, indeed, its presence there is due to commerce.~~

~~The great mart of Massilia (Marseilles), founded about 600 B.c. by the Phoczans, was the centre of the Greek settlements of Gaul and northern Spain. Emporie was her colony, with other nearer towns of inferior fame. Yet Massilia always held the first place, as is proved by the abundance of her money. At first it consisted of Phoeean obols, part of the widespread Western currency alrcady noticed in speaking of Emporie. These were succeeded by Attic drachms, some of which, about Philip of Macedon's time, are beau- tiful in style and execution. Their obverse type is the head of Artemis, crowned with olive, at once marking the sacred tree, which had grown from a branch carricd by the colonists, so tradition said, with a statue of the goddess, from Ephesus, and proclaiming the value of the olive-groves of Massilia. On the reverse we note the Asiatic lion, common to it and the last colony of Phocza, the Italian Velia in Lucania.~~

~~The coinage of the Gauls clearly had its origin in their predatory incursions into Greece. They there found the money of Philip and Alexander still the great currency. Civilized enough to convert their spoil from metal into money, they speedily coined gold and silver, of which the earliest examples imitate, often with no small intelligence, the gold staters or didrachms of Philip and the silver staters or tetradrachms of Alexander. From the greater rarity of Alexandrine types in silver and their absence in gold, it may be conjectured that the earliest issues were struck in Philip's reign, though the mass of the coinage must be later. The money of Gallia before the complete Roman conquest, to which it may be anterior in its commencement by half a century, belongs in the gold to degraded types of the earlier widespread currency. The undoubted gold and electrum of this class, identified as bearing regal or geo- graphical names, are extremely limited. By far the most interesting coin of the group is the gold coin which bears the name at full length of the brave and unfortunate Vercingetorix. The silver money is comparatively common. The name of the Helvetian prince Orgetorix is likewise traced on Gaulish coins, on which it appears allied.with those of native chiefs, and in a special coinage of his own, remarkable for the~~

characteristic Swiss type of the bear. The bronze money of Gaul is still more abundant than the silver, and has a special interest from its characteristic types. The Roman coins recall those of Hispania, but are limited to a few colonise. They range in date from Antony and Augustus to Claudius. The principal issues are the well-known money of Lugdunum (Lyons) and Nemausus (Nimes). Those of Lugdunum may have been struck in a district around the city; the type of the famous altar of Lyons, that of Roma and Augustus, is worthy of note. The type of Nemausus, commemorating the conquest of Egypt in the crocodile and palm, is further remarkable as sometimes struck in the shape of the hind-leg of a deer, and is therefore called the pied de biche.

The ancient coinage of Britain is the child of that of Gaul, retain- ing the marks of its parentage, yet with characters of its own due to independent growth. Money first came in trade by the easiest sea-passage, and, once established in Kent, gradually spread north and west, until the age of the earlier Roman wars, when it was issued in Yorkshire, probably in Lincolnshire, and in a territory of which the northern limits are marked by the counties of Norfolk, Cambridge, Huntingdon, Bedford, Buckingham, Oxford, Gloucester, and Somerset, The oldest coins are gold imitations of Philip's staters, which, whether struck in Gaul or Britain, had a circulation on the British side of the Channel. They are the prototypes of all latermoney. From a carcful comparison of their weights with those of later coins, and from a study of the gradual degradation of the types, Evans places the origin of the coinage between 200 and 150 B.c. Its close may be placed about the middle of the 1st cen- tury A.D. The inscribed coins occupy the last century of this period, being contemporary with uninscribed ones. The uninscribed coins

are of gold, silver, bronze, and tin, the gold being by far the most common. There is small variety in the types, nearly allin gold and silver, and some in copper, presenting in more or less degraded form the original Gaulish type for gold. It may be suspected that all new types and the extremely barbarous descendant of the tin series are of the age of the inscribed coins, or but little

~~earlier. The Channel Islands are remarkable for a peculiar coinage of billon, a very base silver, presenting the usual types modified by Gaulish grotesqueness. The place of this group in the British series is merely accidental ; in character as in geography it is Gaulish.~~

~~The inscribed coins are evidently in most cases of chiefs, though it is certain that one town (Verulainium) and some tribes had the right of striking money. The most interesting coins are those of known chiefs and their families—of Commius, probably the active prince mentioned by Cesar, of Dubnovellaunus, mentioned in the famous Ancyra inscription, which has been called the will of Augustus, and most of all the large and interesting series of Cuno- belinus, Shakespeare's Cymbeline, his brother Epaticcus, and his father Tasciovanus. It is evident from the coins and historical evidence collected by Evans that Tasciovanus had a long reign. His chief town, as we learn from his money, was Verulamium. His coins are in three metals, repeat the traditional types, and present new ones, some showing a distinctly Roman influence. The money of Epaticcus is seanty, but that of Cunobelinus, with Camulodunum (Colchester) for his chief town, iseven more abundant than his father's, indicating a second long reign, and having the same general charac- teristics. The gold shows a modification of the traditional type, the silver and bronze the free action of Roman influence and a remark- able progress in art. With the death of this prince not long before 43 A.D. British coinage probably ceases, none being known of his sons, Adminius, Togodumnus, and the more famous Caractacus, though the coins of the Iceni may have continued as late as 50 A.D.1~~

~~The ancient coins of Italy occupy the next place. to have been struck during a period of more than 500 years, the oldest being probably of the beginning of the 6th century B.c., and the latest somewhat anterior to the time of Julius Cesar. The larger number, however, are of the age before the great extension of Roman power, which soon Iced to the use of Roman money almost throughout Italy. There are two great classes, which may be called the proper Italian and the Greco-Italian ; but many coins cannot be referred to either, since they present peculiarities of both. The proper Italian coins are of gold, silver, and bronze. Of these, the gold coins are extremely rare, and can never have been struck in any large numbers. The silver are comparatively common, but the bronze are very numerous and~~

characteristic. Some of the silver coins have an incuse device on the reverse, which is almost always a repetition of that on the obverse; they are of Greek cities, but their fabric is peculiar to Italy. There are also a few with a design on the obverse and a perfectly plain reverse. The most remarkable bronze coins of this class are of the kind called es grave, some of which were the early proper coinage of Rome, although others are known to have been struck by other Italian cities, These are very thick coins, some of which are of great size, while most have a rude appearance. The designs of the Italian coins are generally, if not always, of Greek origin, although the influence of

'the native mythology may be sometimes traced. The inscriptions

are in Latin, Oscan, or Etruscan, and follow a native orthography ; sometimes on the earlier coins they are retrograde. The art of this class is generally poor, or even barbarous. The denominations are common to Greek money, except in the case of the bronze, which follows a native system. Of this system the early proper Roman coins afford the best known examples. The Greco-Italian coins are of gold, silver, and bronze. 'The silver and bronze are very common, and the gold comparatively so, although struck by few states or cities. In form the silver and bronze coins are thicker than those of Greece of the same period, but there is not the same difference in the gold. The designs are of Greek origin, although here, as in the proper Italian coins, but less markedly, native influence can be detected. This influence is evident in the frequent occurrence of types symbolically representing rivers, showing a bias towards the old nature-worship, and still more in the use of Latin inscriptions, with half-Italian forms of the letters on coins otherwise Greek. Of the best art of ancient Italian money we have already spoken, and we shall have occasion to mention some of its most beautiful examples. The denomi- nations of the gold and silver coins are unquestionably derived from those of Greece, according to the weight of the Attic talent, the heaviest, gold piece being the stater or 3000th part of that talent ; in silver there are few tetradrachms, the didrachms are extremely common, and smaller denominations are usually not rare. We thus learn that the silver currency was chiefly of didrachms, smaller pieces being less used, and larger ones scarcely used at all. It is important here to notice that the interchange of the native or Italian bronze

coinage with the Greek silver coinage led to a double standard, silver and bronze. The bronze standard, as might be suspected, was of Itahan origin, the silver of foreign introduction.

1 This summary is from Evans's Coins of the Ancient Britons, London, 1864.

They appear Italy.

Greek towns of Italy.

ITALY. |

The peculiarity of the Italian bronze is that in its oldest cast form it was of such weight as to show the absence in some parts of the country of silver equivalents. It was long after silver had been introduced everywhere, with struck bronze equivalents, before the heavy coinage (zs grave) went out of circulation. The silver money is at first remarkable for the evidence it affords of its ex- traneous character in presenting two standards. Afterwards it be- comes equivalent to the bronze, or supphes equivalent picces, and is quite regular. 'The original condition of the Italian currencies is best illustrated by the money of Etruria about 300 B.c. Etruria, be it remembered, was an carly goal of Oriental commerce by sea. At the great mart of Populonia, and in the country round, we find not only silver coins of two different foreign standards, the Attic and the so-called Persic, but also cast ws grave and later struck bronze pieces issued before the cast money had fallen into disuse. Without discussing the origin of these various currencies it is enough to note that they bear witness to the effects of a widely- spread conimerce, and show that here was the meeting-point of the native system and of foreign ones.

In Italy the es grave long ruled. Originally it was libral, the principal coin being the as, nominally of the weight of a Roman libra or pound. In the coinage of Rome the as does not seem to have ever exceeded the weight of ten ounces, or ten-twelfths of its proper weight. On the other hand, the es grave of Etruria is occasionally heavier. 'The Romans made the quarter denarius, called the sestertius, the silver equivalent of the libral as; the carliest weight of this coin was about 17156 grs.; and, the value of silver to

~~bronze being as 1 to 250, we thus obtain 4290, or about ten libral ounces, as the original weight of the libral as. The suc- cessive reductions of the as belong to Roman numismatics, and it is only necessary here to add that they affected the local bronze coinages as Italy fell under the rule of the republic. The silver coinages, on the other hand, survived for a longer time throughout the Greek cities. Their coin corresponding to the sestertius, as the equivalent of the libral as, was the Attic diobolon, which, originally of 22°5 grs., was at ouce reduced to about 18, and of course reduced the didrachm at the same time, which, really Attic, became appa- rently Pheenician ; it was the principal silver coin of the cities of Magna Grecia. The purely Italian currency rules in northern and middle Italy. The great Greek coinages are of the wealthy marts which dotted the coasts of Campania, Calabria, Lucania, and the Bruttii. Similarly we find Etruscan inscriptions on the coins of Etruria, and Oscan on those of middle and lower Italy, where they are eclipsed in number and style by the Greek issues.~~

~~Beginning in the north of Italy, the first coins that strike us are those of Populonia in Etruria. The silver money of this place is generally of the peculiar fabric in which the reverse is left perfectly plain. The es grave of upper and middle Italy is of great import- ance. It presents the great oblong masses of uncertain weight, multiples of the as, which wear an aspect of great antiquity, though the elephant on one shows us that they were cast after the wars of Pyrrhus. Latium is particularly rich, even when we exclude the coinage of Rome (to be treated later). Samnium shows us a curious revival of native silver money after the local coinage of the Italian towns had been almost abolished by Rome. It was the result of the Social or Marsic War of the confederate tribes, who struck for Italy against the Roman supremacy during the years between 90 and 88 B.c. The coins present the head of Italia, and reverse types of which the most striking are warriors, varying in number, taking an oath over a sacrificial pig, and a bull for Italy goring the pro- strate wolf of Rome. The inscriptions are Oscan or Latin.~~

~~Certain of the Greek towns of Italy deserve special mention for the splendour of their coinage,—beautiful in style and delicate in execution. In Campania (leaving the Romano- Campanian for later notice) the two most interesting currencies are of Cume and Neapolis, the modern Naples. Cume~~

presents silver money of the archaic and the early fine style, in which last we first observe the peculiar naiveté of westcrn Greek art before it had attained elabora- tion. The abundant silver coins of Neapolis are of the early and the late fine periods and of the decline. The types are usually the head of the siren Parthenope, more rarely Hera and Pallas, favourite goddesses of the Greeks of Italy ; the reverse presents the man-headed bull common on Campanian money, here not a river- god as in Sicily, but the tauromorphous Dionysus. The bronze money is of good style, and age has beautified it with the rich blue or green patina due to the sulphurous soil. When we reach Calabria the Greek money startles us in astonishing wealth of beauty in the currency of the opulent and luxurious mart of Tarentum, second only to Syracuse in the whole West, of all the main periods of art, and including in the age of its greatest prosperity and its fall (the time of the contest with Rome) the most abundant gold issues of any Greek city. The gold money of Tarentum is a delight to the eye, with the varied beauty of its gem-like types, which, while they show the gem-engraver's art, prove the medallist's know- ledge of the rich but opaque metallic material. Several heads of divinities adorn these coins, and the chief reverse typcs relate to the legendary founder, Taras, son of Poseidon. Always a youth,

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he appears as a charioteer, perhaps as a horseman, and riding on a dolphin, ——the familiar Tarentine type. 'The most remarkable sub- ject represents him with outstretched arms running to Poseidon seated ona chair. The silver coinage is chiefly of Attic didrachms, of low weight to admit the interchange of their sixth, the diobol, with the Roman libral as. The prevalent type is Taras seated on a dolphin ; in earlier money the type is single, and repeated incuse on the reverse ; afterwards this subject occupies the reverse, and, itself a charming composition, is delightfully varied. On the early fine coins the people or deinos, personified generally as a youth, often holding a spindle, occupies the obverse, but gives place to a horse- man in various attitudes, giving great scope to the engraver's skill ; probably he is Taras himself, save when he is a full-grown warrior. These representations illustrate the famed horsemanship of the Tar- entines, and

~~refer to contests and games which were probably local. Heraclea in Lucania shows us didrachms of the fine age, with heads of Pallas and subjects connected with Heracles: the coutest with the Nemean lion is most skilfully treated, and the series is very char- acteristic of the gem-engraver's art. The powerful city of Meta- pontum begins with early coins having the incuse reverse, and then displays a long series stretching down to the decline of art. The constant type, which recurs with the heraldic instinct of the West, is the ear of bearded wheat, reminding us of the ''golden harvest" (xpvoobv Oépos) which the Metapontines dedicated at Delphi. Like the Tarentine badge, it first occupies the obverse, then the reverse, balanced by a charming series of heads of divinitics. Persephone is the most appropriate counterpart ; we also note heads of Con- cordia ('Ouévoa) and Hygieia, marked by an ingenuous grace peculiar to the early fine work of the Western school, of Leucippus the founder as a helmeted warrior (occurring on a rare tetradrachm and the usual didrachms), and many other types of unusual variety and originality of conception.~~

~~The ancient Sybaris, famous for her luxury, has left archaic coins ; she was destroyed by Croton in 510 3.c., restored for a time, and then became an Athenian colony, speedily receiving the name of Thurium about 448 B.c. The result of the support of Athens in the days of Pericles was the issuc of a splendid series of coins, Not only is the face of the coin occupied by the head of Pallas, and the great currency, as at Athens, of tetradrachms, but the severe beauty of the style points to the direct influence of the art of central Greece. 'The head of Pallas is covered by a helmet adorned with a splendid figure of the sea-monster Scylla. The reverse shows a bull butting (Oovpios), in a strikingly ideal form. Probably the obverse type affords the nearest reflexion of the masterpiece of Phidias, or at least the closest following of his style. The finest coins are unsigned tetradrachins, but didrachms of cognate style give the beginning of the name of the engraver ®. He reappears at Terina (of which town presently).~~

~~Velia, the last colony of Phocea, whose citizens sailed away to the far west rather than submit to the Persian tyrant (544 B.c.), shows coins from its foundation. The pieces of fine work witness to an Asiatic origin in the types of the lion, devouring the stag or as a single device, while the obverse displays the head of Pallas somuch in favour in Magna Grecia. 'The style,~~

which lacks strength but not beauty, is Italian, and we see no trace of the pictorial qualities of Ionian art, which indeed had not taken its mature form when the exiles left the mother country.

The Bruttii are the first native Italians whom we find striking a fair Greek coinage. Their gold and silver is of late style, the gold presenting the head of Poseidon and Amphitrite on a sea-horse, the silver the head of Amphitrite and the figure of Poscidon, both with other subjects. Caulonia has early coins running down to the early fine period, mythologically interesting in type, and the later with a beautifully-designed stag on the reverse. Jl'or Croton the ruling type is the tripod. The eagle occurs on the obverse and the tripod on the reverse. The bird of Zeus is inferior to that at Agrigentum, as this again is inferior to the cagle of Elis. We note also beautiful types of Heracles seated, one of marvellously delicate work, on the reverse of which Apollo aims an arrow at the Python from behind his tripod,—a remarkable composition. The other Heracles types form a most interesting series of recollections, "'memory sketches," of a famous statue, the pose of which recalls the so-called Theseus of the Parthenon, while the obverse presents the head of the Hera Lacinia worshipped on the promontory close by. The latest coins, like the parallel ones of Metapontum, are weak and pretty. The money of the Locri Epizephyrii affords two curious types of reverse, Eirene seated, of fine style, with the legend EIPHNH AOKPON, and the later yet more remarkable subject of Roma seated while Pistis crowns her, the legend being POQMA TITZTIS AOKPOQN. The historical reference is as yet un- discovered. There are beautiful coins of the little-known town of Pandosia, bearing the head of the nymph Pandosia(?); the reverse has the river Crathis, a splendid head of the Lacinian Hera, and Pan, being signed by an engraver who may be the saine as the ® of Thurium, though the style is different and the execution gem-like.

Rhegium was closely connected with Messenc in Sicily opposite, and thus the great Sicilian currency of tetradrachms prevails.

Bicily.

Anaxilaus, tyrant of Rhegium from 494 to 476 B.c., early in his rule acquired Messene through Samian adventurers. The coins of both towns at first present Samian types, and then, the Samians having been expelled, Anaxilaus commemorates his Olympic vic- tory in the mule-car. As this race only lasted from 500 to 448 B.C., its occurrence here, represented only in the style of the earliest quarter of the 5th century, is historically valuable. The same type appears at Messene and lasts longer. In botli cases the reverse bears a running hare, a symbol of Pan.

The little-known town of Terina is illustrious as having produced a series of silver didrachms which, on the whole, is the most beautiful in Italy. The obverse has the head of a goddess, who is portrayed winged on the reverse, —a wonderfully fine subject, well conceived and inost delicately executed in a variety of different attitudes, some recalling the Nices which adorn the balustrade of the temple of Wingless Victory at Athens. Very curiously, the money of Terina begins with an archaic coin which bears on the reverse the named figure of Wingless Victory, surrounded by the olive-wreath. Does all this indicate a religious connexion with Athens? Though the Athenian temple was not built till half a century or more after the date of the earlier coin, we may well think that the worship was of older date. The artist of the later coins, who signs ®, is clearly the ® of Thurium, Athenian in style if not in nationality, and perhaps he had seen the sculptures at Athens. At Terina he rules art; at Thurium he is one of several engravers; at Heraclea and Neapolis he merely introduces the stronger style ; perhaps he appears once more executing a master- piece at Pandosia. He must have had a long life and wide renown. It is significant that at Terina the later coins have a merit most unusual in the West. 2

The coinage of Sicily is Greek. The Hellenic and Carthaginian colonies of the coast left the barbarous natives undisturbed in the inland country, and both issued Greek money, the Punic with a tincture of Pheenicjan style. The coinage ranges from the 6th cen- tury B.c. until the subjugation of the island by the Romans, after which a few cities struck colonial or imperial coins for a short space. The marked periods are those of the preponderance of Syracuse from 480 to 212 B.c., interrupted by the great Carthaginian wars, which were fatal to the cities of the southern coast. The coinage isin gold, mainly issued at Syracuse, in silver, and in bronze. The standard is Attic,

~~except the earliest money of the Chalcidian colonies Himera, Messene, and Naxos, which follows the AAginetan weight. The metrology of Sicily-has a distinct relation to that of Italy. Here also there is a.double standard, silver and bronze, and in consequence an intrusive silvgMpoin, differing but little from the obol, weighing 13°5 instead of 1°25 grs., the silver equivalent of the bronze litra, whose name it borrows. g The litra in bronze was the Sicilian ponnd, equal to half an "Att® mina, and to two-thirds of the Roman libra or pound. So important was the litra in Sicily that the silver litra supplanted the obol, and the didrachm was sometimes called a stater of ten litre, the decadrachm a piece of fifty litre, pentecontalitron. The leading coin is the tetradrachm, not, as in Italy, the didrachin.~~

~~The Sicilian money is of extremely careful artistic work, not un- frequently even in the case of bronze allowing for a more rapid execution of the die; and the highest technical excellence is attained. The art is that of the southern branch of the great Western school, generally more skilful than the art of southern Italy, but less varied. The earlier fine work has a naive beauty peculiar to the West and al- most confined to Sicily ; all that follows is evidently gem-engravers' work. These coins are remarkable for the frequency of artists' signatures, which for the short period of highest skill are almost universal on the larger silver money of Syracuse, and occur less frequently on that of the other great cities. "As in Italy, the decline is more rapid than elsewhere in the Greek world, in consequence of the inherent weakness of the style; but it is in part due to the calamities of the island, as of lower Italy.~~

~~The fame won by the tyranni and other leading aristocrats of Sicily in the great national contests of Hellas, in the race with the quadriga, the mule-car, and the horse, led to the introduction and supremacy of types commemorating these victories, probably in most cases those achieved at Olympia. That these victories are intended is shown principally by the mode in which a chariot is portrayed at the critical moment of passing the turning — post, by the occurrence of the turning-post itself, by the correspondence of the cities issuing the type with those commemorated by Pindar, in whose Olympic Odes the six victories in the chariot-race are all won by Sicilians, and by the direct evidence of Aristotle (ap. Poll., v. 75) that Anaxilaus of Rhegium recorded on his coins his Olympic victory with~~

the mule-car. It is obvious that no success could be So appropriately figured on the coinage. The religious idea was maintained ; the charioteer or the horseman was not the victor, but at the same time the renown of the city was indissolubly connected with the citizen who won it. Hence these types are confined to states ruled by tyranni or oligarchies ; outside Sicily they are only found at Rhegium when it was closely connected with Sicily, at Cyrene, and in the money of Philip II. of Macedon. The horseman

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[SICILY.

is not a frequent type ; the mule-car is limited to Messene (and Rhegium); but the quadriga becomes the stereotyped subject for the reverse of the great Sicilian tetradrachms,—the bulk of the coiage,—and only escapes heraldic sameness by a charming variety in the details. In the age of finest art a divinity of the city takes, in Homeric guise, the place of the charioteer, or Nice herself so wins the victory ; commonly she hovers above about to crown the charioteer. Yet more interesting are the types connected with nature-worship, especially those portraying river-gods in the form of a man-headed bull, or a youth with the budding horns of a calf, or in the shape of a dog, where Pheenician influence is found, and also the subjects of the nymphs of fountains. . These types occur on either side of the coin. 'The obverse of all is usually held by the head of a divinity, Persephone and Pallas taking the first place.

The leading position which Syracuse held in the island makes it Syra- proper to notice her splendid currency first, the finest for knowledge cuse.

of the materials, for skill in suitably filling the space, and for deli- cacy of execution in the whole range of Greek money, though we iniss the noble simplicity of Greece, the strong feeling of western Asia Minor, and the simple picturesqueness of Crete. 'These larger qualities are sacrificed to am excess of richness and even to tricks of art. Yet the beauty of the coins and their complcteness,—the artist having satisfied his intention, command our admiration; and our interest is raised by the story they tell of the vicissitudes of the great city of the West, the mother of liberty and the slave of tyrants, great in commerce, rich, luxurious, loving the arts, yet able to

~~defend herself even under base rulers against all the power of Carthage and of Athens. Syracuse was founded in 734 8.0. by Archias of Corinth, an origin which, remembered on both sides, served her well in later history. In the 6th century, under the oligarchy of the Geomori, she issued her most archaic silver money, which, primitive as it is, gives promise of the care of the later coinage, aud begins the agonistic types, thus indicating some early victory at a great Hellenic contest. Gelon, tyrant of Gela, won the chariot race at Olympia in 488 B.c., secured Syracuse in 485 B.c., and, when the Carthaginians, probably by agreement with Xerxes, invaded Sicily, utterly routed them at the great battle of Himera (480 B.c.), the Salamis of the West. These events find their record in the issue and subjects of his Syracusan money, which, however, was struck, as usual in that age, in the name of the people. The chariot type is varied, for Nice appears hovering above the vic- torious charioteer, about to crown the horses, and the coins issued after the great battle show the lion of Libya bencath the car in the exergue (Head, Syracuse, 9). These last pieces are fixed in date by the famous story how Gelon's wife Demarete, having gained favour- able terms for the vanquished Carthaginians, was presented by them with a hundred talents of gold, by means of which she coined the great silver pieces of fifty litre or ten drachms, which were called after her demaretia. They bear the head of Nice, or it may be Pallas, crowned with olive, and the quadriga and lion. The battle of Himera and the death of Gelon (478 B.c.) fix the date of these remarkable coins, which close the archaic series of Syracuse and give usa fixed point in Greek art, at about 479 B.c. There is a touch of Egyptian in their style which makes us think that Syracuse may have been influenced through Naucratis.~~

~~Hieron (478-467 8.c.), the brother and successor of Gelon, con- tinues the same types, alluding, as Head well remarks (loc. ctt.), to his great victory over the Etruscans off Cume (474 B.c.), by the marine monster in the exergue of the reverse which denotes the vanquished maritime power. It is to be noted that as Gelon intro- duces the Nice in the chariot type, so in the horseman type we now~~

~~- first see Nice crowning the rider. Gelon had won an Olympic victory~~

~~in the four-horse contest, Hieron in the horse-race, though he also won with the four horses in the Pythian games. With Hieron's money we say farewell to archaic art. The female heads on the obverse now have the eye in profile and show beauty and variety, and the horses are even exceptionally represented in rapid action. With the short rule of Thrasybulus, the last brother of the house, it came to an end, and the age of the democracy (466-406 B.c.) began. The victories by land and sea of Gelon and Hieron had established the power of the city on a sure basis, and fifty years of prosperity followed. To the earlier part of this age belong the beautiful transitional coins in which the female heads are marked. by a youthful simplicity of beauty combined with fanciful and even fantastic treatment of the hair; the reverses remain extremely severe. Towards the close of this age there are very fine works, the first signed coins, with the old dignity yet with greater freedom of style, the horses of the quadriga in rapid movement. The contest with Athens and the victory of Syracuse (415-412 B.c.) seem to have given the impulse of which we here see the effect. To the democracy also belong the earliest gold and bronze pieces.~~

~~The tyranny of Dionysius and his successors (406-345 B. c.) is the age of the most splendid Syracusan coins, and that which shows the distinct beginning of decline. The wealth and rosperity of Diony- sius led to the issue of the magnificent decadrachms, commonly but erroneously called medallions, with the heads of Persephone and Arethusa and the victorious chariot, as well as a variety of~~

~~Other cities of Sicily.~~

~~SICILY.~~ |

~~signed tetradrachms. The tyrant, defeated at Olympia by a com- bination, seems to commemorate on these coins the victory he could have won, and this explanation appears to be confirmed by such indications, never all combined, as the fallen turning-post, the broken rein, and the affrighted charioteer. The Dionysian dynasty closed in nine years of anarchy, until Syracuse appealed to Corinth,~~

~~and Timoleon was sent to restore order (344 B.c.). The triumph of~~

~~this public-spirited statesman is witnessed by various changes in the coinage. The chief silver piece is now a didrachm of Corinthian type, corresponding in weight to the tridrachm of Corinth, and with the same types, the head of Pallas and the Pegasus; the smaller coins present some Corinthian subjects. The democracy was over- thrown in 317 B.c. aud the city seized by Agathocles (317-289 B.c.), the worst of the tyrants of Syracuse. In the course of his reign he adopted the royal style, and his coins, a reflexion of earlier work, give his name first without and then with the title king,—a double innovation. The tyrant Hicetas (287-278 B.c.), and the next ruler, Pyrrhus king of Epirus (278-276 B.c.), continue the coinage, Pyrrhus issuing money in the name of the Syracusans and also striking his own pieces. The departure of Pyrrhus led to the establishment by a native, the second Hieron, of a dynasty which, so long as he ruled (276-216 B.c.), restored the ancient prosperity and preponderance of the rule of his namesake. At first content with inscribing his name alone, he soon not only takes the title of king, conferred on him in the early years of his reign, but also places his portrait on the money. Of his time is the beautiful portrait of Queen Philistis, supposed to be his consort. The heads have merit, but the reverse has become merely heraldic. The money of the short reign of Hieronymus (216-215 z.c.) and of the brief democracy which fell before the Romans (215-212 B.c.) close the independent series of this great city. But her name still appears in bronze money issued after the conquest.~~

~~Taking the rest of the money of Sicily in alphabetical order, we first note a very fine bronze coin bearing a beautiful female head, perhaps that of Sicilia, crowned with myrtle, and a lyre, the date of which is later than Timoleon's Syracusan issues, on one of which it is restruck. This coin is conjecturally attributed to Adranum. AStna, better known as Catana, is represented by a unique tetradrachm, with a wonderful head of Silenus, and Zeus as the god of the volcano hard by enthroned and hurling a thunder-bolt. 'The first great town is Agrigentum, represented by archaic, transitional, and fine coins, the fine series ending with the over- throw of the city by the Carthaginians in 406 B.¢.,—a blow from which it never recovered. The usual types are the eagle and the crab, but in the age of finest art we see two eagles devouring a hare, and a victorious chariot ; these occur in the rare decadrachm and the tetradrachms. The eagle is superior to that of Croton, inferior to that of Elis. Is it a sea-eagle, while the~~

Olympian bird is the golden cagle? Many of the bronze coins are of good work. The type most worthy of note is the head of a river-god, with the name Acragas, which was that of the stream of the town, and on the reverse an eagle standing on an Jonic capital, the Olympic turning- post. The success of Agrigentum at the games is attested by Pindar, while Virgil (4in., tii. 704), Gratius (Cyneg,, 526), and Silius Italicus mention its ancient renown for horses. The lofty site (arduus Acragas), overlooking the sca and on the bank of the stream of the same name, makes the eagles, the crab, and the river appropriate devices, showing that Greek types have a local fitness, while chosen with a religious intention.

The money of Camarina is of especial beauty and interest. The fifth of Pindar's Olympic Odes, to Psaumnis the Camarinzan, affords an excellent commentary upon it. The earliest coin we know is a didrachm of about this time, whereas there are many pieces of from fifty to a hundred years earlier of most of the other important cities of Sicily. Camarina, however, was then but lately inhabited (véoucov édpav), having been recently twice devastated by the Syracusans. This piece has on the obverse a helmet upon a round shield and on the reverse a pair of greaves, between which is a dwarf palm (Chamexrops humilis). The arms are those of some divinity or hero ; the palm may represent the sacred grove (@\cos ayvév) in which the temple of the chief divinity probably stood. This piece is followed by tetradrachms and didrachins of the best period, most beautiful in style, and varying a little from difference of age. The tetradrachms bear on the obverse the head of Heracles in the lion's skin, and on the reverse Pallas as a victor at the Olympic games in a quadriga. It was Pallas, protector of the city (roAcdoxe Taddds), whose sacred grove was made more illustrious by the success of Psaumis. The didrachms have on the obverse the head of a river-god, portrayed as a young man with small horns and with wet hair. Of the two rivers of Camarina, the Oanus and the Hipparis, the Hipparis is here represented, for in one case the name is given on the coin. Pindar seems to show the same preference, for, while he merely mentions the Oanus (rorapdv . . . "Qavov), he speaks of the sacred channels by which the Hipparis watered the city (ceuvods dxerods, "Immapis ofa dpdeorparéy). Ou thé reverse the nymph Camarina ('OQkeavod Ov-yarep

.. Kayaplya) is seen carried across her lake (éyywpiay . Aiuvay) by a swan swimming with expanded wings, while she aids

it by spreading her veil in the manner of a sail. Some of these didrachms have on either side, around the chief device, fresh-water fishes. The series of Catana comprises fine archaic tetradrachms and others of the time of the best art. The archaic tetradrachms have the types of a river in the form of a man-headed bull and of the figure of Nice. The head of Apollo succeeds, with for reverse the victorious quadriga, in one case passing the turning-post, an Ionic column.

Gela is represented by coins of which the archaic tetradrachms must be especially mentioned. They have on the obverse the fore- part of the river-god Gelas, whence the city took its name. The Gelas is represented as a bull, having the face of a bearded man. On the reverse is a victorious quadriga at the Olympic games, in some examples represented passing an Ionic column, as on coins of Catana. A tetradrachm of the later period of the age of good art has types of the head of the Gelas as a young man horned, surrounded by three fishes, and on the reverse Nice in a biga with a wreath above. The money of Himera is of great interest. The oldest didrachms of Himera, which probably began in the 6th century B.c., bear on the obverse a cock and on the reverse an incuse pattern. They are succeeded by transitional tetradrachms, which bear on the one side a victorious quadriga and on the other a nymph sacrificing, near whom a little Silenus stands under the stream of a fountain issuing from a lion's head in a wall. Leontini is represented by tetradrachms with the head of Apollo and the victorious car, which gives place to a lion's head. The series of Messene begins, when the town was called Zancle, or, as it is written upon the coins, Dancle, with early drachms or smaller pieces of the /Kginetan weight, and of very archaic work. On the obverse is a dolphin, and around it a sickle, and on the reverse is a shell in the midst of an incuse pattern. The place is said to have received its name on account of the resemblance of the harbour to a sickle (fd-y«ov or fayKAn). Next to these first coins of Zancle may be placed, as the oldest piece of the Attic weight, a tetradrachm with the

~~Samian types, a lion's scalp on one side and.on the other the head of a bull, and bearing the inscription MEXSENION. This coin was doubtless struck during the rule of the Samians, who took the place about 494 B.c., at the instigation of Anaxilaus tyrant of Rhegium, by whom they were subsequently expelled (Thucyd., vi. 4). The next pieces are the earliest of those which have on the obverse the mule-car and on the reverse a running hare, like the contemporary coins of Rhegium, with the same devices and equally of the rule of Anaxilaus. These types cease at Rhegium, though they continue at Messene, some of the tetradrachms bearing them being of the age of fine art. When the town had been seized by the Mamertini, money was struck with their name, thus borne by the later coins, which are of bronze. They are good, but not of the best style. Naxos is represented by handsome transitional tetra- drachms and others of the fine period, and by smaller silver pieces, chiefly of the earlier time.~~

~~There are some coins of the city of Panormus, but most of those which have been classed to it are of the Carthaginians, issued both — in Sicily and in Africa. Nothing is more probable than that many of these pieces were struck at Panormus, but there is no sure means of distinguishing any such, and, if there were, the mere fact of their having been issued at the place would not justify us in classing them to it. Segesta is represented by coins of the archaic and of the good period. We first notice the head of the nymph Segesta and a hound, probably a river-god, then the same type for obverse associated with a young hunter accompanied by two hounds,—a charming composition. Another interesting type is a victorious car driven by Persephone, who carries ears of corn.~~

~~In the series of the city of Selinus the first coins are didrachms, bearing on the obverse a leaf and on the reverse an incuse square. The city and the river of the same name no doubt derived their name from the plant oé\wov, the leaf of which must be here in- tended. There is some difficulty as to its identification; the plant sacred at Selinus appears to be, as Colonel Leake stpposes, wild celery (Apium graveolens) ; but it does not follow that the "selinon " with which the victors at the Isthmian and Nemean games were crowned was really the same species. Tetradraclims and didrachms of transitional and of good art have devices of more than usual interest. The obverse exhibits a river-god, sometimes the Sclinus, sometimes the Hypsas,~~

sacrificing at the altar of Aisculapius, while on the didrachm a wading-bird is sometimes seen behind him, as if departing. This subject appears to allude to the draining of the pestiferous marshes. The reverse of the tetradrachms generally shows a quadriga in which Apollo stands drawing his bow, while Artemis 1s charioteer. The reference must be equally to the driving away of the pestilence.

We have still to mention the main characteristics of the true Siculo- Siculo-Punic coins, that is, those actually struck by the Cartha- Punic ginians in Sicily. A careful examination shows that the Punic money. money must be separated into three distinct divisions—the coinage of the Carthaginians in Africa, in Sicily, andin Spain. The Sicilian coins are adjusted to the Attic talent, like those of the Greek cities of the island, and show Greek style modified by barbarian influence. The known towns are Solus, Motya, Panormus (?), and Heraclea

The Tauric Cherson- ese, &c.

Thracc.

640

Minoa. The leading types are imitated from Syracusan money. This series must not be confounded with the large Attic issues of Carthage, which are distinguished by special types not found in Sicilian money, such as the horse's head and the palm-tree ; the head of Persephone links these coins with the true Siculo-Punic.

The islands near Sicily issued coins which belong to the Cartha- ginian series, except Lipara, of which there is heavy bronze inoney on the Sicilian system, having on the obverse a head of Hephestus, or sometimes a figure of the same divinity seated, holding a hammer and a vase, which he seems to have just formed.

In the Tauric Chersonese there are interesting coins, in the three metals, of the city of Panticapaum, the modern Kertch. Their obverse usually bears the head of Pan and their reverse a griffin and other subjects ; some are of fine Greek style. The money of Sarmatia, of Dacia, and of npper and lower

~~Meesia is chiefly bronze of the Greco-Roman class. In Sarmatia we may notice the autono- nous and imperial pieces of Olbia, and in Dacia the series bearing the name of the province. The Roman colonia Viminacium in upper Mesia is represented by numerous coins of a late time. Of Istrus, in lower Moesia, there are drachms having a strange type on the obverse, representing two beardless heads, those of the Dioscuri, side by side, the one upright and the other upside down ; on the reverse is an eagle devouring a fish. The style of these coins, it may be noticed, is in general fair, though it sometimes approaches to barbarism. There are abundant Greek imperial coins of Marcianopolis and Nicopolis, while Tomi is represented in this class as well as by autonomous money.~~

~~The coins of Thrace are of high interest. Here and in Macedonia we observe the early efforts of barbarous tribes to coin the produce of their silver mines, and the splendid issues of the Greek colonies ; and we see in the weights the influence of the Asiatic Greeks, the Athenians, and the Persians. The oldest coins are of the 5th century B.C., aud there are others of all subsequent times, both while the country was independent and while it was subject to the Romans, until the cessation of Greek coinage. Some of the best period are of the highest artistie merit. So long as they maintain any general distinctive peculiarities of fabric and design, that is, from their commencement until the age of Philip, the Thracian coins resemble those of Macedonia. The money of Abdera com- prises tetradrachms and smaller coins of the periods of archaic and tine art, all but the latest of the Phcenician standard, ultimately superseded by the Persic. The principal type is a seated griffin. The reverse type, an incuse square, has at first four divisions, but in the age of the finest art contains a variety of beautiful subjects. Juus is remarkable for the great beauty of some of its coins. These are tetradrachms of Attic weight, of the late archaic and best ages. The interesting turning-point from growth to maturity is seen in a vigorous head of Hermes in profile, wearing the petasus. A little later is the splendid series of facing heads, the broad, severe, and sculptural treatment of which is truly admirable, and far superior to the more showy handling of the same subject in later drachms. A goat is the reverse type of the larger coins. The money of the city of Byzantium begins with coins on the Persic standard of good style, having on the obverse a bull above a dolphin and on the reverse an incuse square of four divisions, and closes with the series of bronze coins~~

issued under the empire. The Roman colonia of Deultum and the city of Hadrianopolis deserve a passing notice. Of Maronea, anciently famous for its wine, there is an interesting series beginning with small archaic coins. After these we notice fine tetradrachms of Phoenician weight, having on the obverse a prancing horse and on the reverse a vine within a square. The standard changes to Persic, of which there is a beautiful series of didrachms. Then the series is interrupted by the rule of the Macedonian kings, and resumed in a barbarous coinage of the native Thracians, issued in the second and first centuries before the Christian era, consisting of spread Attic tetradrachms with the types of the head of beardless Dionysus crowned with ivy and on the other side his figure. The Greek imperial coins of Pautalia and Perinthus are worthy of notice. Among those of the latter town we may mention fine pieces of Antoninus Pius and Severus, and large coins, commonly called medallions, of Caracalla and other emperors. 'The money of the imperial class issued by Philippo- polis, Serdica, and Trajanopolis should also be noticed. In the Thracian Chersonese the most important series is one of small autonomous silver pieces, probably of the town of Cardia. There is a limited but highly interesting gronp of coins of Thracian kings and dynasts. The earliest are of kings of the Odryse, including Seuthes I., who began to reign in 424 B.c., and whose money bears the two remarkable inscriptions EEYOA—KOMMA and ZEYOA APILYPION. It closeswith the issues of Roman vassals ; they begin with Coson, who puts on his gold staters the type of the Junia family, the first consul between his lictors, marking his allegiance to Brutus, and an eagle. Lysimachus, commonly classed as king of Thrace, belongs to the group of Alexander's western successors. Among the islands of Thrace, Imbros with its trace of Pelasgic worship, and, equally with Lemnos, showing evidence of Athenian dominion, and Samothrace with the Asiatic worship of Cybele

NUMISMATICs

—activity.

| THRACE.

yield in interest to Thasos. Here a long and remarkable cur- rency begins with very early Persic didrachms, the obverse type a centaur carrying a nymph, the reverse an incuse square of four divisions. Under the Athenian

supremacy we see a decline of weight, and in style the attainment of high excellence. The design of the obverse now reminds us of the work of Alcamenes at Olympia, grand in spite of careless execution. After this we observe coins of Pheenician weight, bearing for their obverse types the head of Dionysus. These are of the best period of art, and some tetra- drachms are among the very finest Greek coins. The head of Dionysus is treated in a sculptural style that is remarkably broad and grand. The massive, powerful features, and the formal hair, nearly falling to the neck in regular curls like those of the full beard, are relieved by a broad wreath of ivy-leaves, designed with great delicacy and simplicity. The reverse bears a Heracles kneel- ing on one knee and discharging his bow,—a subject powerfully treated. Of a far later period there are large tetradrachms, much resembling those of Maronea, with the same type of the beardless Dionysus, but on the reverse Heracles. There are coins of Peonian kings, which are chiefly silver, and have a resemblance to those of the Macedonian sovereigns, although they are somewhat barbarous. They range from 359 to 286 B.c.

The money of Macedonia both civic and regal is of great variety Mace-

and interest. end of the 6th century B.c. The old pieces are of silver, bronze having come into use a century later, and gold about the middle of the 4th century p.c. The character of the coinage resembles that of Thrace ; the carliest pieces are of the Pheenician, Babylonic, and Attic standards, the heavier form of the Babylonic, the Persic, appearing later. The most remarkable denominations are the Pheenician octadrachms and dodecadrachms. The largest coins are of the time of Alexander I. and somewhat earlier, and indicate the metallic wealth of the country more than its commercial Philip II. adopted for gold money, which he was the first Macedonian king to issue, the Attic weight, striking staters on that system, while he maintained the Pheenician standard for his silver comage. Alexander the Great made the weight of the gold and silver moncy the same by employing the Attic system for both ; and from his time no coins of kings of Macedonia in these metals were struck on any other system. The series of Roman Macedonia begins with coins of the ‘‘regions’’ issued by permission of the senate and bearing the name of the Macedonians, from 158 to 146 B.o. ; others follow of the Roman province. The coinage of Acanthus comprises fine archaic tetradrachms of Attic weight and others of

~~Pheenician weight and very vigorous in style, of the commcnce- ment of the period of good art. The type of their obverse is a lion seizing a bull. The money of Mneia is chiefly interesting from its bearing the head of the hero Aineas; and on one extraordinary coin of archaic fabric, an Attic tetradrachm, the subject is the hero carrying Anchises from Troy, preceded by Creusa carrying Ascanius ; this is in date before 500 B.c., and is preserved in the Berlin Museum. The town of Amphipolis is represented by a long series. There are Phoenician tetradrachms having on the obverse a head of Apollo, facing, sometimes in a splendid style, which recalls the art of the immediate successors of Phidias, as seen, for instance, in the famous bronze female head in the British Museum. The reverse type is a flaming torch in an incuse square. 'There are also many Greek imperial bronze pieces of this city. The territory of Chalcidice is eminent for the excellence of some of its silver coins. These are Phcenician tetradrachms of the best period struck by the Chalcidian League (392-379 8.c., and later), Olynthus being probably the mint. The obverse bears the head of Apollo in profile crowned with laurel. It is in very high relief and treated with great simplicity, though not with the severity of somewhat earlier pieces. The delicacy of the features is balanced by the simple treatment of the hair and the broad wreath of laurel. On the reverse isa lyre. There is an early series of coins of Lete. Some are of a remote date and none later than about the time of Alexander I. The obverse type is a satyr with a nymph, and on the reverse is an incuse square divided fourfold, first diagonally and then in squares. Mende has money of Attic weight, the types being con- nected with Silenus, who on a tetradrachm of fine art is portrayed reclining, a wine-vase in his hand, on the back of an ass; the reverse bears a vine. Of Neapolis (Datenon) there are early coins with the Gorgon's head and the incuse square, which changes, as at. Lete, and in the period of fine art gives way to a charming head of Nice crowned with olive. There is a very early Attic tetradrachm of Olynthus, with a quadriga, and an eagle within a double square, the only coin, save Philip's gold and silver and the money of Cyrene, which repeats the idea of the great Sicilian currencies, the record of Olympic victory. Orthagoria, better known as Aristotle's birthplace Stageira, has a few remarkable coins of good art and a peculiar style. The coins of Philippi in the three metals are mainly of the time of Philip II., who, having found a rich gold mine near Crenides, changed its name to~~

~~Philippi. The gold coins are Attic staters, the silver pieces of the Pheenician or Macedonian weight, like Philip's own money. All bear the head of young~~

~~It begins at an early time, probably towards the donia.~~

~~Kings of Mace- donia.~~

~~MACEDONIA. |~~

~~Heracles in a lion's skin, and a tripod. Imperial pieces were struck by the city as a colonia. There isa long series of Thessalonica, beginning with Greek bronze coins, the latest of which are asses with on the obverse the Roman head of Janus in strange combination with a Greek inscription. Then follow pieces of imperial time and others with imperial effigies. Uranopolis has a few coins with very curious astronomical types, probably issued by the eccentric Alex- archus, brother of Cassander. The issues of the Thraco-Macedonians are extremely interesting. They are all just anterior UO, OH ihe may be contemporary with, Alexander I. of Macedon. The leading coins are octadrachms of the Phenician standard. They have usually but one type, the reverse bearing a quadripartite incuse square. Their sudden appearance and heavy weight are due to the working of the silver mines on the border of Macedonia and Thrace. The usual types are a warrior leading a horse or a yoke of oxen. The coins bear the names of the Bisalte, Getas king of the Edoni (whose only two coins, differing dialectically in their inscriptions, were found in the Tigris in 1818, and are now in the British Museum), the Orrescii, and other tribes. Besides these there arc very curious Pheenician dodecadrachms of an unknown tribe, bearing the un- usual type of an ox-car, in which is a figure seated, and on the reverse a triquetra.~~

~~The oldest coins of the Macedonian kings are of Alexander I., from 498 to 454 B.c., the contemporary of Xerxes. These are Phoenician octadrachms, having on the obverse a hero by the side of a horse, and coins of a lower denomination with the same or a similar type. The money of Alexander's successors illustrates the movement of art, but it is not until the reign of Philip II. that we have an abundant coinage. He first strikes gold pieces, chiefly Attic didrachms, from the produce of his mine near Philippi. They are of fair but somewhat careless style, and bear on the obverse the head of Ares. On the reverse is a victorious Olympic biga. These coins were~~

afterwards known as @:Aurmetou and the gold money of Alexander as ’A\e£avdpetox—appellations which robably did not include larger or smaller pieces. Horace calls the gold coins of Philip “‘ Philips” (‘‘regale nomisma Philippos,” Epist. ii. 1, 232), The silver coinage of Philip is mainly composed of tetradrachms of the Pheenician talent. Their type of obverse is a head of Zeus, and of reverse either a mounted hero wearing a causia or a victor in the horse-race with a palm,—these last coins being the best of Philip’s, although the horse is clumsy.

The coinage of Alexander the Great, both in the number of the cities where it was issued and in its abundance, excels all other Greek regal money ; but its art is, without being despicable, far below excellence. The types are not remarkable in themselves, and there is a great sameness characterizing the entire series. The system of both gold and silver is Attic. The gold coins are distaters or gold tetradrachms, staters or didrachms, hemistaters or drachms, with their half or a smaller denomination. The types of the distaters or staters, which last were the most common pieces, are for the obverse the head of Pallas and for the reverse Nice bearing a trophy-stand. The largest silver piece is the decadrachm, which is of extreme rarity. The types of the tetradrachms and most of the lower coins are on the obverse the head of Heracles in the lion’s skin and on the reverse Zeus seated, bearing on his hand an cagle. The head has been supposed to be that of Alexander, but this is not the case, although there may be some assimilation to his portrait. The great currency was of tetradrachms. The coinage was struck in different cities, distinguished by proper symbols and monograms. The classification of the series is difficult, but is gradually advancing. The bronze money is not remarkable.

The coinage of Alexander is followed by that of Philip Arrhidzus, with the same types in gold and silver. That of Alexander IV. was alone issued by Ptolemy I. In these coins the types of Alexander were modified. Meanwhile Seleucus, Lysimachus, and Antigonus, king of Asia, struck Alexander’s money with their own names, and the tetradrachms of Macedonia were generally of this kind until the time of Philip V. The same coinage, marked by a large flat form, was reissued later by the cities of western Asia, when the Romans, after the battle of Magnesia in 190 B.c., restored the liberties which Alexander had granted. The series of Alexandrine money is

~~interrupted by various small coinages and the later issues of Lysimachus, king of Thrace, with the first Greek regal portrait, the head of Alexander with the ram's horn, as the son of Zeus Ammon, sometimes a work worthy of Lysippus and an excellent indication of his style. The reverse has a figure of Pallas holding a little Nice. The coins of Demetrius I. (Poliorcetes) comprise fine tetradrachms, some of the types of which have an historic reference. They bear either on the obverse his portrait with a bull's horn and on the reverse a figure of Poseidon, or on the one side a winged female figure (Nice or Fame) on the prow of a galley, blowing a trumpet, and on the other Poseidon striking with his trident. The latter types cannot be doubted to relate to the great naval victory which Demetrius gained over Ptolemy. The tetradrachms of Antigonus I. (Gonatas), which are of inferior style and work to those of Demetrius, have types which appear to refer in like manner to the great event of his time.~~

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~~The obverse type is a Macedonian buckler with the head of Pan in the midst, and the reverse type Pallas Promachus. The head of Pan isssupposed to have been taken as a device in consequence of the panic which led to the discomfiture of the Gauls at Delphi. The money of Demetrius IT. is unimportant, but Antigonus Doson is represented by tetradrachms with the head of Poseidon, and Apollo seated on a galley. The tetradrachins of Philip V. have on the obverse a head in the helmet of Perseus, representing Philip in the character of that hero, or else the hero himself, perhaps assimi- lated to the king. The reverse bearsa club. Other tetradrachms and smaller coins have a simple portrait of Philip. The tetra- drachms of Perseus are of fair style, considering the time at which they were struck. They bear on the one side the king's head and on the other an eagle on a thunderbolt.~~

~~The coin systems of northern Greece, Thessaly, Epirus, Acarnania, and Atolia present certain difficultics which if we consider them as originally figinetan, modified in the west by Corinthian, and later by Roman, influence. The coinage of Thessaly presents very few specimens of a remote period, while pieces of the best time are numerous. These are in general re- markably like the finest coins of Sicily and Italy, although the~~

~~style is simpler. The prevalence of the horse and horseman is significant. The money of the Thessalian Confederacy, being of late date (196-146 B.c.), is of little interest. The commonest types are the head of Zeus crowned with oak and the Thessalian Pallas Itonia in a fighting attitude. The coinage is resumed in imperial times. Of the town of Gomphi or Philippopolis there is a beautiful drachm, having on the obverse a female head, facing, which is prob- ably that of a nymph as the city. The coins of Lamia are also to be noticed for their beauty. The drachms bear the head of Lamia, the mistress of Demetrius Poliorcetes, and young Heracles, who probably represents Demetrius. The series of Larissa begins with archaic pieces and some of the early period of good art, but some- times of rather coarse execution. "The small silver pieces have very interesting reverse types relating to the nymph of the fount- ain, and to be compared for mutual illustration with the didrachms of Terina and with some of thosc of Elis. These are followed by coins of fine work. The usual obverse type is the head of Larissa, the nymph of the fountain, facing, and on the reverse is generally a horse, either free or drinking. The head is treated in a very rich manner, like that of the fountain-nymph Arethusa, facin g, on tetra-drachms of Syracuse ; indeed, the resemblance to the Sicilian type is most remarkable. If it be a copy, it is simpler and bolder than the original. The bronze money is also good. The coins of Phar- salus and Phere are also worthy of note. Of the tyrants of Phere Alexander is represented by coins.~~

~~The coinage of Illyria is usually of inferior or rude art; the pieces Illyria.~~

~~are Aiginetic, ultimately changing to Attic. Of Apollonia there is a large series. The earliest have the Corcyrean types of the cow and the calf and the floral pattern ; the latest, usually, the head of Apollo and three nymphs dancing round a fire, the outer ones holding torches. Dyrrachium, which never bears on its coins the mote famous name of Epidamnus, is represented by an important series. First there are Aiginetan didrachms with Corcyreean types. These are succeeded by tridrachms with Corinthian types, and, of course, on the Attic standard; and then the old types are resumed, but apparently without a return to the former weight. Dyrrachium, it must be remembered, was founded partly by Corcyrean and partly by Corinthian colonists.~~

~~The coins of Epirus are of higher interest and beauty than those Epirus.~~

~~of Illyria. Of the. Epirots there are bronze coins of the regal period, and both silver and bronze of the republic (238-168 B.c.), with the heads of the Dodonzan Zeus and Dione, together or apart. The city of Ambracia is represented by beautiful silver pieces, with on the one side a veiled female head and on the other a kind of obelisk. The series of Greek imperial money of Nicopolis must also be mentioned. The coinage known to us of the kings of Epirus begins under Alexander I. His coins have been found in the three metals, but they are rare. It is probable that both gold and silver were struck in Italy while he was in that country. 'The coins of Pyrrhus in all metals are of high interest, and remarkable for their beauty, though the style is usually florid. There can be little doubt that they were for the most part struck in Italy and Sicily, at Tarentum and Syracuse. The tetradrachm has for the type of the obverse a head of the Dodonzean Zeus crowned with oak and for that of the reverse Dione seated. A fine didrachm bears on the obverse a head of Achilles helmeted, with for the reverse Thetis on a sea-horse carrying the shield of her son. Among the copper coins of Pyrrhus we must remark the beautiful ones with the portrait of his mother Phthia.~~

~~The coinage of the island of Corcyra begins with very early di- Corcyra.~~

~~drachms and drachms of the 6th century. The types are the~~

~~cow suckling the calf and the floral pattern, as at Dyrrachium.~~

~~These leading subjects are varied in later times by others illustrating~~

~~the Corinthian origin of the nation, its maritime power, and the~~

~~fame of its wine. Not the least curious are the bronze pieces with~~

~~galleys bearing their names, as Strength, Freedom, Glory, Orderly XVII. — 81~~

~~Corcyra, Thes- disappear saly.~~

~~Aear- nania.~~

~~AXtolia.~~

~~Locris.~~

~~Phocis.~~

~~Beeotia.~~

~~Attica,~~

~~Government, Chace, Corcyra, Comus, Cypris, Victor of People, Victory, Youth, Pallas, Foremost, Preserver, Fame, Light-bearer. The abundant bronze series goes on under the emperors.~~

~~The coins of Acarnania are not remarkable for beauty or for variety in their types. The money of several cities in the 4th century B.c. is that of Corinthian colonies. We must mention that of the Acarnanian League (229-168 B.c.), which bears the head of the Achelous as'a man-headed bull and the seated Apollo Actius. Of Leucas there are silver coins and an abundant series in bronze.~~

~~In AXtolia the gold and silver coins of the AEtolian League have some merit (279-168 B.c.). The gold pieces have on the obverse the head of Pallas or that of Heracles in the lion's skin and on the reverse Aitolia personified, seated on Gaulish"and Macedonian shields,—a curious historical type. These subjects reeur, with others indicating the hunter-life of the population, on the silver money ; of especial interest is the head of Atalanta and the Caly- donian boar, and the spear-head with which he was slain, in both silver and bronze. On some of the copper the spear-head and the jaw-bonce of the boar are seen.~~

~~The coinage of Loeris, Phocis, and Beeotia is entirely on the figinetie standard. The coins of the Loeri Epienemidii are mainly didrachms, struck at Opus, with the head of Persephone and the figure of the Lesser Ajax ina fighting attitude, sometimes acecom- panied by his name. 'These coins were struck between 869 and 338 B.C., and are remarkable for the manner~~

~~in which a Syracusan head is copied, and, as appears in other cases in Thessaly and elsewhere, not weakened but presented in a stronger and purer form. So much higher was the conception of art in Hellas than in the West.~~

~~The money of Phocis begins at a very early age, perhaps the 7th century B.c., and extends in silver down to the conquest by Philip (346 B.c.). The prevalent types area bull's head and that of a goddess or nymph. Delphi, geographically included in Phocis, strikes very remarkable money, wholly distinct in types from the Phocian. The principal subjects are heads of rams and goats, the symbols of Apollo as a pastoral divinity, a dolphin (Apollo Delphinius), the omphalos and tripod, and a negro's head, which has not been satisfactorily explained. The Amphietyonic Council struck beautiful didrachms, probably on the occasion of Philip's presidency (346 B.c.), with the head of Demeter, and the Delphian Apollo seated on the omphalos. Under Hadrian and the Antonines there is an imperial coinage of Delphi, some pieces bearing the representation of the temple of Apollo, on one type the letter E SUP ay eee the columns of the face, representing the mystic Delphic EI, on which Plutarch wrote a treatise.~~

~~The coinage of Beeotia is chiefly of a period anterior to the reign of Alexander, under whom the political importance of Thebes and the whole country came to an end. The main characteristic of the money is the almost exclusive use of the Bcotian shield as the obverse type, marking the federal character of the issues. These were struck by various cities, or by Thebes as ruling the League. The earliest pieces are drachms, presumably of Thebes, and cer- tainly of Haliartus and Tanagra, issued between 600 and 550 B.c. These are followed by didrachms of the same and other cities until the time of the Persian War. The result of the unpatriotic policy of Thebes and most of the towns of Beeotia was the degradation of the leading city, and the coins reveal the curious fact that Tanagra then became the centre of the League-coinage. We now notice the abandonment of the old incuse reverse and the adoption of regular types, the wheel at Tanagra and the amphora at Thebes. These types increase and indicate several cities during the short period of Athenian influence (456-446 3.c.). The democratic institutions were next overthrown, and Thebes became again the head of Beotia, and struck alone and in her own name, not in that of the League. To the earlier part of this period belong splendid didrachms with reverse types chiefly~~

~~representing Heracles, subsequently varied by heads of Dionysus in a series only less fine. With the peace of Antalcidas (387 B.c.) Thebes lost her power, the League was dis- solved, and the other Beotian cities issued a coinage of some merit. In 379 B.c. Thebes became the chief state in Greece, and the patri- otic policy of Pelopidas and Epaminondas is shown in the issue of the Beeotian coins at the great city without any name but that of a magistrate. Among those which occur is EILAM or EILAMI, who can scarcely be any other than the illustrious general. The battle of Cheeronea (388 B.c.), swiftly followed by the destruction of Thebes, closes the historic coinage, save only for the appearance of new League-money of Attic weight, with the head of Zeus and the figure of Poseidon, issued between 288 and 244 B.c. (On the whole subject see Head's Coinage of Beotia.)~~

~~In Attica the great series of Athens is dominant, Eleusis alonc in that country having issued an unimportant bronze coinage of good style while Athens was independent. The Athenian money begins with the issues which were struck under Solon's monetary law, practically adopting the Euboic standard instead of the figi- netic, by which the Attie weights were divided into the commer- celal and the monetary. The monetary standard beeame so famous through the widespread traffic of Athens as to give the name Attic to all subsequent measures which followed it except the~~

~~but among distant barbarians, so that imitations reach us from the~~

~~Corinthian, and the term Euboic gradually fell into disuse. The earliest coins are tetradrachms of full weight (270 grains), with an extremely archaic head of Athene helmeted to the right, and within an incuse square an owl to the right with the letters AOE. These may be early in the 6th century B.c. Soon afterwards a sprig of olive appears in the upper left corner of the square. The coins of the age of the Persian War have olive-leaves forming an upright wreath on the helmet of Athene. To this period belongs the decadrachm with the owl facing, its wings open. In the same age a erescent is added—symbol of the lunar character of the goddess—between the olive-sprig and the owl. These types continue during the period of fine art, with slight modifica- tion and the abandonment of the ineuse square, but with no mark of the splendour of Athens as the centre of Greek sculpture. No doubt commercial reasons dictated this conservative policy,~~

which makes the coinage of Athens a disappointment in numisniatics. Her money was precious for its purity not only in the Greek world

Punjab and from southern Arabia, and any change would have injured their wide reception. There are many divisions of silver coinage with the types a little varied, and some different ones; and during the age of supremacy gold was issued in small quantities and bronze introduced. The Maccdonian empire put an end to the autonomy of Athens, and when the money is again issued it is of a wholly new style and the types are modified. The great scries of spread tetradrachms may be dated from the accession of Philip V. (220 B.c.), and lasted until the capture of the city by Sulla (86 B.c.). The obverse type is a head of Athene with a richly-adorned helmet, unquestionably borrowed from the famous statue by Phidias in ivory and gold, but a poor shadow of that splendid original, and an owl on an amphora within an olive-wreath. The earliest coins have the monograms of two magistrates, the later the names of two who are annual, and one changing abont every month, but ultimately dropped. The occurrence in these of the names of Antiochus IV. (Epiphanes), before he came to the throne, of Mithradates VI. and his creature Aristion, helps to fix the dates. The abundance of this money shows the great commercial importance of Athens in these later times. Remarkable bronze coins of a later age bear two representations of the Acropolis and the great edifices. Both have on the obverse a head of Minerva. The reverse of one represents the Acropolis, with the grotto of Pan, the statue of Pallas Pro- machus, the Parthenon, and the Propylwa, with the steps leading up to the latter. The reverse of the other shows the theatre of Dionysus, above which are caverns in the rock, and higher still the Parthenon and the Propylea. There are also Greek imperial pieces of Megara.

The money of the islaud of Aigina is of especial interest, since Augina. with it Greek coinage is said to have originated. ‘he story is that, at a time when Algina was a dependency of Argos, Phidon king of Argos struck the first Greek money there, probably in the seventh century B.c. It is said that previously silver was formed into spikes (68eNoxot), of which six made a handful (dpaxu%), and that thus the name of the drachm and its sixth, the obolus, originated : but this account may be an invention of later times. There can be no doubt, however, that the earliest Aginetan coins are of

~~extreme antiquity. The weight is of course on the Mginetic standard. The oldest pieces are very primitive didrachms, bearing on the obverse a turtle and on the reverse a rude incuse stamp. Afterwards the stamp becomes less rude, and later has a peculiar shape. There are some coins of the early part of the fine period of excellent work. The great currency,was of didrachms. The bronze coins are not remarkable, but some appear to be of an earlier time than most Greek pieces in this metal.~~

~~The series of Achaia begins under the Achzean League, some time Achaia. after 330 B.c., when we first find coins of the Achwans, with no distinction of cities,—a purely federal coinage. The silver coins, like the later ones, are either Attic tetrobols or Mginetic hemi- drachms. Then follows the money of the ten cities of the Old League, beginning about 280 8.c.—Dyme, Patre, Tritea, Phare, fEgium, Bura, Ceryneia, Leontium, AMigira, and Pellene. In 251 B.c. Sicyon, Corinth, and Megara added their strength to the little alliance ; the towns of Arcadia and Argolis followed, then Sparta, Messene, and Elis. The type of the silver is the head of Zeus Homagyrius, the reverse with the monogram of the Acheans in a laurel-wreath. After the earliest money the reverse bears the sym- bols or monograms of the cities which struck. The oldest bronze repeats the silver types ; the rest bears a standing Zeus and a seated Demeter, with the name of the city at full length.~~

~~Corinth is represented by a very large series of coins, the weight Corinth. of which is always on the Corinthian standard, equivalent to Attic but differently divided,—the Corinthian tridrachm, the chief coin, corresponding to the Attic didrachm. The oldest pieces, of the 6th century B.c., bear on the obverse Pegasus with the letter 9, koppa, the initial of the name of Corinth, and on the reverse an incuse pattern. In course of time the head of Athene in an incuse square oecupies the reverse. The incuse square disappears, as generally elsewhere, in the early period of fine art. Of the age of the excel-~~

~~Elis.~~

~~Cephal- lenia, &c.~~

~~Messene.~~

lence and decline of art we find beautiful work, though generally wanting in the severity of the highest Greek art. Pegasus is ordi- narily seen galloping, but sometimes standing or drinking, the koppa is usually retained, and the helmet of Athene, always Corinthian, is sometimes bound with an olive-wreath. The smaller coins have the same reverse, but on the obverse a charming series of types, principally female heads, mostly representing Aphrodite. There are some drachms with Bellerophon in a combatant attitude mounted on Pegasus on the one side and the Chimera on the other. The autonomous bronze money is poor, but often of fair work, and interesting, especially when the type rclates to the myth of Bel- lerophon. Under the Romans this city was made a colonia ; and we have a large and interesting series of the bronze coins struck by it as such, including the remarkable type of the tomb of Lais. The colonies of Corinth form a long and important series, struck by Acarnanian towns with Corcyra, and in the west by Locri Epizephyrii in Italy and Syracuse. They range from the time of Timoleon, about 340 B.c., to the age of the earlier successors of Alexander, perhaps having ended in the time of Pyrrhus, probably shortly after 295 B.c. The colonies broke loose from Corinth and struck their own money, retaining the old types for commercial purposes, and Syracuse and Locri found it advisable to follow the same course, which in the case of Syracuse was not uninfluenced by gratitude to the mother-city and her noble citizen Timoleon. ‘he coins are distinguished by the absence of the koppa and bear the names or monograms of the cities.

There are bronze coins of Patra as an important Roman colonia, and silver and bronze money of Phlius, both of the period of good art. The coinage of Sicyon, on the Aginetic standard dominant in the rest of the Peloponnesus, is disappointing for a famous artistic centre. It begins shortly before the period of fine art ; in that age the silver is abundant and well executed, but the lcading types, the Chimera and the flying dove within an olive-wreath, are wearying in their repetition, and good work could not make the Chimera an agreeable subject. Small coins with types of Apollo are the only subjects which suggest the designs of the great school of Sicyon.

~~The money of Elis, or the Eleans, is inferior to none in the Greek world in its art, which reaches the highest level of dignified restraint, and in the variety of its types, which are suggested by a few subjects. The leading types are connected, as we might expect, with the worship of Zeus and Hera and Nice, the divinities of the great Panhellenic contest at Olympia. The prevalent repre- sentations are the eagle and the winged thunderbolt of Zeus, the head of Hera, and the figure of Nice. The series begins early in the 5th century B.c. with coins, some of which are didrachms (Aginetic), having as subjects an eagle carrying a serpent or a hare and on the reverse a thunderbolt or Nice bearing a wreath,—archaic types which in their vigour promise the excellence of later days. From 471 to 421 B.c., while Elis was allied with the Spartans, such types continue ; the eagle and Nice (sometimes seated) are both treated with great force and beauty, and the subject of seated Zeus is re- markable for its dignity. The Argive alliance (421-400 B.c.) seems marked by the pre-eminence given to Hera, whose head may suggest the famous statue of Polyclitus at Argos. This alliance broken, the old types recur. Magnificent eagles, some admirably designed on a shield, and eagles' heads, the seated Nice, and fantastically varied thunderbolts mark this age. The types of an eagle struggling with a serpent and an eagle's head are marked with the letters AA. Professor Gardner has conjectured that they may be the work of the great sculptor Deedalus of Sicyon, who at this very time produced a trophy for the Eleans at Olympia. The political events of the age do not seem any longer to affect the coinage. Thus the return of the heads of Hera has no historical significance that we can trace. They are remarkable for their beauty, which is still severe, while around there are marks of the luxurious style of decline, and here the cagle-types have lost their vigour. The age of Philip is soon reached, and shows a marked decline in the coinage. It closes with imperial money, some types of which have a local interest, notably two of Hadrian bearing the head and figure of Zeus, copied from the famous statue by Phidias, of which the earlier currency appears to present no reflexion.'——~~

~~Cephallenia gives us the early silver coins of Cranii, the money of Pale, of charming style, with the figure of Cephalus on the reverse, and that of Same, all cities of this island. Of the island of Zacyn- thus there are silver pieces, usually of rather coarse work, but sometimes of the style of the best~~

Cephallenian money. The coins of Ithaca are of bronze. They are of interest on account of their common obverse type, which is a head of Ulysses.

Returning to the mainland, we first notice the money of Messene, or the Messenians. The earliest coin isa splendid Mginetic didrachm having on the obverse a head of Persephone, and excels in design the similar subjects on the money of Syracuse, from which it must have been copied, for it is of about the time of Epaminondas. Still more than the Locrian type this shows the purer style of Greece, which, copying Syracusan work, raised its character.

1 See Professor Gardner's Elis, on the whole subject.

reverse is a figure of Zeus Ithomatas. The other silver coins are of about the period of the Achean League. The bronze money is plentiful, but not interesting. Lacedemon, as we might have ex- pected, has uo early coins, the silver money being, like so much of that of the Greek cities, of the age of the Achwan League. Among the types of the autonomous bronze pieces may be noticed the head of the Spartan lawgiver Lycurgns, with hisname. The series of Argos in Argolis begins with coins of an early period.. The standard is Aiginetic. The first pieces are the drachm with a wolf on the obverse, and on the reverse A, the initial letter of the name of the people, in an incuse square ; the hemidrachm, with the forepart of a wolf; and the diobolon, with a wolf's head. Among coins of the period of good art we must especially notice those which have for the obverse type the head of Hera wearing a stephanos,—a design which is not equal to that of the coins of Elis, the style being either careless or not so simple. The reverse type of one of these coins, a drachm, represents Diomedes stealthily advancing with the palladium in his left hand and a short sword in his right. Of the town of Treezen there are silver coins of the best period of art.

Of the money of Arcadia some pieces are doubtless among Arcadia.

~~the most ancient struck by the Greeks; and the types of these and later coins are often connected with the remarkable myths of this primeval part of Hellas, showing particularly the remains of its old nature-worship. The first series to be noticed is that of the Arcadian League ; it begins about 500 B.c. with hemidrachms having the type of Zeus Lycus seated, the eagle represented as if flying from his hand, and a female head. Of a later time, from the age of Epaminondas, there are coins with the head of Zeus, and Pan seated on the Arcadian Olympus, a series of which the didrachms are very fine. The coins of Herea begin deep in the 6th century B.C. The earliest have for obverse type the veiled head of Hera, and on the reverse the beginning of the name of the town, sometimes between wavy ornaments. The antiquity of Mantinea is in like manner attested by its money. The silver coins of a very early time have on the obverse a bear, representing Callisto the mother of Arcas, who was worshipped here, and on the reverse the letters MA, or three acorns, in an incuse square. Later coins, especially the bronze, have subjects connected with the worship of Poseidon at this inland town. The silver money of Megalopolis is important for art, as we know the city to have been founded in 370 B.c. The types are the same as those of the Arcadians of the same period, the headsof Zeus and of Pan. The silver coins of Pheneus must be noticed as being of fine work. The didrachms of the age of Epaminondas have Fitead of Persephone, and Hermes carrying the child Arcas. The obverse type is interesting as a copy, improved on the original, of the Syracusan subject, as in Locris and Messene. As in Locris, the merit is in the greater force and simplicity of the face, here most snecessful, the hair being treated more after the Syracusan manner than after that of the Messenians, who simplified the whole subject. The finest coin attributed to Stymphalus isa magnificent didrachm of the age of Epaminondas, with a head of the local Artemis laureate, and Heracles striking with his club, no doubt a subject connected with the Stymphalian birds. The smaller silver coins have on the one side a head of Heracles and on the other the head and neck of a Stymphalian bird, most resembling those of a vulture. There were representations of these birds in the temple of Artemis. The series of Tegea is not important, but two of the reverse types of its bronze coins are interesting as relating to the story that Athene gave a jar containing the hair of Medusa to her priestess Sterope, daughter of Cepheus, in order that she might terrify the Argives should they~~

~~attack Tegea in the absence of Cepheus, when Heracles desired his aid in an expedition against Sparta.~~

~~The peculiar position of Crete and her long isolation from the Crete~~

~~political, artistic, and literary movements of Hellas have been already touched on. Itis not until the age when the Macedonians and the Achean League are striving for the leadership of Hellas that Crete appears in the field of history, but then only as the battle-ground of rival powers. The most remarkable influence of this age was when Athens, by the diplomacy of Cephisodorus, succeeded about 200 B.c. in drawing the Cretans into a great league against Philip V. of Macedon. That this project took actual shape is proved by the issue at all the chief mints of the island of tetradrachms with the well- known types of Athens, to be distinguished from the Atticizing types of other cities at thistime. In the meanwhile the inborn love of adventure in her youth had been satisfied by hired service to the surrounding kingdoms, and hence grew a piratical instinct which ultimately cost the Cretans their freedom at the hand of Rome. The oldest coins are probably of about 500 x.¢., but few cities seem to have issued many until a hundred years later. Then there is a great outburst of coinage, sometimes beautiful, sometimes barbarously careless, which lasts until Alexander's commercial policy is seen in the appearance of his money with Cretan symbols in lieu of the old autonomous money. As Alexander's successors grew weak and no one of them could control Crete, the old rights were restored and the Cretan cities again coin their own types until the Roman conquest (67 or 66 B.c.). The chief issue is of silver : bronze is less abundant ; and gold is unknown. The Cretan types~~

~~have a markedly local character, yet they copy in some instances other coinages. The chief divinities on the picces are Zeus, Hera, Poscidon, Heracles, and Britomartis, and the leading myths are those of Minos, the story of the Minotaur and the labyrinth being prominent, and also that of Europa. There is frequent reference to nature-worship as in Sicily, yet with a distinctive preference for trees, the forms of which, however, lend themselves readily to the free represeutation of Cretan art, which may in part explain their prominence. The weight is at first Aginetic, falling almost~~

~~to Attic; and in the resumption of the coinage after Alexander's time it is Attic. :~~

~~Of the island in general there are Roman silver coins of the earlier emperors, some of which are of fine work for the period. The inscriptions are in Latin, or partly in Latin and partly in Greek. In the autonomous civic series there are didrachms ot Aptera. The obverse bears a female head wearing a stephane and the reverse a warrior before a sacred tree. Of Chersonesus, the port of Lyctus, called on the coins Chersonasus, there are di- drachms of coarse style, mainly copied from the splendid piecc of Stymphalus in Arcadia, The head of Artemis is here appropriated to Artemis Britomartis, who had a temple at the place, and the reverse of Heracles striking with his club is varied by the sub- stitution of the figure of Apollo seated. The silver money of Cnossus is of great interest. The oldest coins are archaic in style, and may be as early in date as the expedition of Xerxes, They bear the figure of the Minotaur as a bull-headed man, kneeling on one knee, and a meander-pattcrn, in one case enclosing a star (the sun), in another a female head (Ariadne?). The antiquity of these coins disproves the supposition that the Cretan labyrinth at Cnossus was an invention of the later poets. Of the early time of good art there are didrachms of Cnossus with the head of Perse- phone and an unknown divinity, and the labyrinthine pattern enclosing the sun or the moon or a bull's head for the Minotaur, and at length becoming a regular maze. To this time belongs the wonderful coin in the Berlin Museum with Minos seated, his name in the field, and the head of Persephone within the meander-pattern. In the later age of fine art a head of Hera wearing a stephanos occupies the obverse of didrachms and drachms, and the reverse has a maze through which the way may be clearly traced. The head is closely copied from the same type of Argos, and despite its beauty shows a distinct inferiority, unlike the copies of Syracuse by artists of the mainland. This series closes with Alexander's empire, and the native coinage disappears until the league of Cephisodorus revives it with the Athenian tetradrachm of Attic weight, bearing the name of the Cnossians. It is of inferior style, and is followed by base coins with heads of Minos and Apollo, and the Labyrinth, either square as before or in a new circular form, which is interesting as showing it was a mere matter of tradition. There are interesting coins of Cydonia, some of them of beautiful style and work. One~~

~~is remarkably like a coin of Aptera, and bears an engraver's name, Neuantus,—a point showing the im- portance attached by the Cretans to the designs of their money. The head is that of a Menad, and the reverse has a figure of the traditional founder Cydon, stringing his bow. The style is good, but the execution poor, A drachm presents a most beautiful repetition of the subject of Cydon. Gortys, or Gortyna, is repre- sented by most remarkable coins, which generally allude to the myth of Europa. Didrachms of archaic style have on the obverse Europa carried by the bull and on the reverse the lion's scalp. These pieces are followed by a remarkably fine class of spread didrachms ; the best are of about 400 B.c. 'They have on the obverse Europa seated in a pensive attitude on the trunk of a tree, doubt- less the sacred plane at Gortyna, mentioned by Pliny, which was said never to shed its leaves, and on the reverse a bull suddenly turning his head as if stung by a fly. Nothing in Greek art exceeds the skill and beauty of these designs. The truth with which the tree is sketched, one engraver even indicating the letters cut by visitors in the trunk, and the graceful position of the forlorn Europa are as much to be admired as the fidelity with which the bull is drawn, even when foreshortened, sharply turning his head, with his tongue out and his tail raised. These designs, beautiful in them- selves, are strikingly deficient in fitness, and afford equally strong illustrations of the excellencies and of the one great fault of the art of Cretan coins. Many pieces of the same class are of rude execu- tion. There is a tetradrachm of the Athenian group having the symbol of a butting bull. Later silver coins have the head of Minos. The coins of Hierapytna are remarkable for bearing the representation of a date-palm. Of Itanus there are remarkable coins, the earlier, some of which are of good style, with the subject of a Tritonian sea-god (Glaucus?) and two sea-nonsters, changed for a head of Athene and an eagle, the Triton frequently appearing in the field as asymbol. Lyctus, on the coins Lyttus, is represented by strangely rude pieces, with the types of a flying cagle and a boar's head which is curiously foreshortened. The coins of Phestus form a most interesting series. Among the didrachms are some of ad- mirable work, with on the obverse Heracles slaying the Hydra with his club and on the reverse a bull. Others have on the obverse~~

~~Heracles seated on the ground, resting. Another noticeable obverse type is the beardless Zeus seated in a tree, with his Cretan name LEAXANOS, where the LE stands for the digamma. On his knee is a cock in the attitude~~

~~of crowing, showing that he was a god of the dawn. The most remarkable coins of Phestus are, however, those that bear representations of Talus, the man of brass, said to have been made by Hephestus or Dedalus. One of these is a di- drachm, on which he is portrayed as a winged youth, naked, bear- ing in each hand a stone, and in a combatant attitude. This figure is accompanied by his name. A similar design is seen ona bronze coin. The reader will recollect that Apollonius Rhodius (Argonaut., iv. 1638 sq.) relates that Talus prevented the Argo- nauts from landing in Crete by hurling stones at them, until he was destroyed by the artifice of Medea.~~

~~The important town of Polyrrhenium, or Polyrrhenia (but one p on the coins), is represented by carefully-executed coins with a head of Zeus and a bull's head. A later piece has a remarkable obverse type, a whiskered head of Apollo, probably a Macedonian sovereign in that character. This is of Attic weight. Presus has on its earlier coins the Gorgon's head and an archer, or an archer and an eagle ; later, Zeus seated, and, after the Cretan fashion, fore- shortened. The coins of Priansus comprise didrachms of an unusual style and type, a head of a goddess or nymph, the hair, bound by narrow bands crossed diagonally, filling the large field. Priansus also shows the remarkable type of Persephone seated beside a date-palm, placing her right hand on the head of a serpent, in reference to the myth of the birth of Zagreus. As usual, the figure is foreshortened. The reverse has a standing figure of Poseidon. Rhaucus has Poseidon beside his horse. The rare didrachm of Sybrittia, or Sybrita, may fitly close the series ; the obverse has a charming subject, Dionysus seated on a running panther, and the reverse Hermes drawing on his right buskin,—a delightful figure. Another beautiful type is a seated Dionysus.~~

~~The coinage of Eubœa is all on the native standard, of which the Eubœa. Attic was a variety. It includes some of the very earliest Greek money. The older coins comprise tetradrachms, didrachms, and smaller pieces; the later are uniformly tetrobols. The pieces which bear the name of the Eubœans date from the fine period to the fall of Hellenic liberty, the silver lasting only to Alexander's time. They bear the head of a nymph and that of anox. One variety is very beautiful. The great cities have a far more interest- ing series. Carystus begins in the time of the Persian War with the type of the cow and calf, as in Corcyra, and its special badge is the cock. Chalcis, the~~

mother of Western colonies, has already in the 6th century a long series with the wheel-type and an incuse diagonally divided, and later, a nymph's head and an eagle devouring aserpent. TEretria begins as early as Chalcis, but the obverse type is the Gorgon's head. This is succeeded by the same type and a panther's head, and fine late archaic coins bear the cow and the cuttle-fish. Of Histiza the usual type is the head of a Menad and a female figure seated on the stern of a galley.

Among the other islands classed after Euboea, Amorgos must not Cyclades be passed by, as a bronze coin of Agiale, one of its towns, preseuts and Spo- the curious type of a cupping-glass. The silver money of Carthea rades, and Coressus in Ceos is extremely old, beginning in each case in the 6th century and ending early in the 4th. The weight is Agine- tic, and there are didrachms and smaller coins. The usual types of { Carthea are an amphora and then a bunch of grapes; that of Coressus is a cuttle-fish and dolphin. Naxos is represented by early Aginetic didrachms and coins of the fine period, the latter being chiefly bronze pieces of remarkably delicate and good work. The types are Dionysiac. Of Paros there are early Aiginetic didrachnis with the type of a kneeling goat and beneath a dolphin. Of the third and second centuries B.c. there are Attic didrachms with a head, possibly of Artemis, at first of a charming style, and a goat on the reverse. 'There are very archaic AXginetic didrachms of Siphnos. Some of the bronze pieces are of the best period and very fine. Of Tenos there are silver coins of the age of the kings. The head of the bearded Ammon occurs on tetradrachms following the Attic standard, and on smaller pieces that of the younger Ammon, both heads laureate as well as horned ; the reverse type is Poseidon. {

The coinage of Asia begins with that of Asia Minor. It falls Asia into certain great classes—first, the ancient gold and electrum, Minor. Lydian and Greek, in time succeeded by electrum or gold and silver, all struck in the west and mainly on the coast. Then the Persian dominion appears in the silver money of the satraps, : circulating with the gold and silver of Persia, and the Greek . money is limited to a few cities of the coast, none save the elec- trum of the great mint of Cyzicus uninterrupted by the barbarian.

~~With the decay of the barbarian empire the renewed life of the Greek cities is witnessed by a beautiful coinage along the coast from the Propontis to Cilicia. On Alexander's conquest autonomy is granted to the much-enduring Hellenic communities, and is again interrupted, but only partially, by the rule of his successors, for there was no time at which Asia Minor was wholly parcelled out among the kings, Greek or native. The Romans, after the battle of Magnesia (190 B.c.), repeated Alexander's policy so far as the cities~~

~~Oldest coinage.~~

~~- way into the currencies, but was as yet limited to Samos.~~

~~Bos- porus, Colchis, Pontus.~~

~~Paphla- gonia,~~

~~ASIA MINOR. |~~

~~of the western coast were concerned, and there is a fresh outburst of coinage, which, in remembrance, follows the well-known types of Alexander. When the province of Asia was constituted and the neighbouring states fell one by one under Roman rule, the auto- nomy of the great cities was generally reduced to a shadow. Still the abundant issues of imperial coinage, if devoid of high merit, are the best in style of late Greek coins, and for mythology the richest in illustration.~~

~~The oldest money is the electrum of Lydia, which spread in 'very early times along the western coast. This coinage, dating from the 7th century B.c., has an equal claim with the Aiginetic silver to be the oldest of all money. Probably the two currencies arose at the same period, and by interchange became the recognized cur- rency of the primeval marts; otherwise we can scarcely explain the absence of Asiatic silver, though it is easy to explain that of European electrum or gold. The electrum of the coins is gold—the precious metal washed down by the Pactolus—with a native alloy of a fourth part of silver. Its durability recommended it to the Lydians, and it had the advantage of exchanging decimally with gold, then in the ratio 13°3 to silver. Bat this commercial advan- tage allowed the issue of~~

~~electrum coins on silver standards, while it was natural to coin them on those of gold; hence a variety of weight-systems perplexing to the metrologist. The first coins were undoubtedly struck by a Lydian king, probably as early as about 700 B.c. They follow the Babylonic silver standard. The ob- verse is plain and merely marked with lines, the original rough surface of the die, while the reverse has three depressions, an ob- long one flanked by two squares. Later the same people issued money on the Pheenician silver standard. This double currency, as Head suggests, was probably intended for circulation in the interior and in the coast towns to the west, the Babylonic weight being that of the land trade, the Pheenician that of the commerce by sea. Ultimately Croesus abandoned electrum, and, reducing the Pheenician weight by one-fourth, the proportion of silver in the electrum, he produced a Babylonic gold stater, and again by simi- larly reducing the Babylonic weight he obtained a Euboic gold stater. His silver was Babylonic only, the silver stater exchanging as the tenth of the Euboic gold stater. These results are ex. plained by the metrological data given earlier in this article. The Greek marts of the western coast were not long in imitating the example of Lydia ; hence a series of early electrum staters, on the Pheenician weight, of Miletus, Ephesus, Cyme, Chios, Clazomene, Lampsacus, Abydos, and Samos, with smaller pieces which add other mints to the list. The Euboic weight naturally found its Phocea, Teos, and Cyzicus, with other towns, followed from a very early period the Phocaic standard, which for practical purposes may be called the double of the Euboic. Consequently their stater was twice as heavy as the Euboic gold stater. They alone before Croesus issued gold money, which was superseded at Phocwa and Cyzicus by electrum. This is the main outline of the native coinage of Asia Minor before the Persian conquest. Its later history will appear under the several great towns, the money of Persia being treated in a subsequent place.~~

~~The first countries of Asia Minor are Bosporus and Colchis, the coins of the cities of which are few and unimportant. The auto- nomous coinages of the cities of Pontus are more numerous, but none of them are archaic or deserve to be characterized as fine. There are also imperial pieces. The bronze coins are sometimes large and often thick. The only place meriting a special notice is Amisus, which almost alone of the cities of Pontus seems to have issued autonomous silver money. This is continued under the emperors in~~

the form of Roman denarii and larger pieces. The common sub- jects of the bronze money of this place relate to the myth of Perseus and Medusa, a favourite one in this country.

The regal coins are of the old kingdoms of Pontus and of the Cimmerian Bosporus, of the two united as the state of Bosporus and Pontus under Mithradates VI. (the Great), and as reconstituted by the Romans when Polemon I. and II. still held the kingdom of Mithradates, which was afterwards divided into the province of Pontus and the kingdom of Bosporus. The early coinage of the kingdom of Bosporus is of little interest. Of that of Pontus there are tetradrachms, two of which, of Mithradates IV. and Pharnaces I., are remarkable for the unflinching realism with which their barbarian type of features is preserved. Mithradates VI. king of Bosporus and Pontus, is represented by gold statcrs and tetra- drachms. The portrait on the best of these is fine despite its dramatic quality, characteristic of the later schools of Asia Minor. The kings of Bosporus struck a long series of coins for the first three centuries after the Christian cra. Their gold money is gradu- ally depreciated and becomes elcctrum, and ultimately billon and bronze. They bear the heads of the king and the emperor and are dated by the Pontic era. ; ; >

In Paphlagonia we must specially notice the coins of the cities Amastris and Sinope. The silver pieces of the former place bear a youthful head in a laureate Phrygian cap, probably representing Men or Lunus,—Amastris, the foundress, being seated on the reverse.

On the late bronze money the bust of Homer occurs. There are

also bronze coins of the imperial class. The silver pieces of Sinope are plentiful. The types are the head of the nymph Sinope and, as at Istrus, an eagle preying ona dolphin. Bithynia is represented Bithy- by a more important series. Of the province generally there are nia, Roman silver medallions of the weight of cistophori (to be presently described), with Latin inscriptions, and imperial bronze pieces with Greek inscriptions.

There is a long series of imperial bronze of Apamea as aecolonia. The ordinary silver coins of Chalcedon strikingly resemble on both sides those of Byzantium, a circum- stance confirmatory of the statement that the two cities were colonized at nearly the same time from Megara. Of Cius, also « called Prusias ad Mare, there are gold staters and smaller imperial silver pieces. Hadriani and Hadrianutherze issued imperial bronze money. Of Heraclea there are silver coins of good style ; these are of the Persic standard. The obverse type is a head of Heracles, either bearded or beardless, in the lion's skin ; the most interesting reverse type is a female head wearing a tiara on which are three turrets, probably that of the town personified, Of the tyrants of Heraclea there are silver coins of Clearchus, of Timotheus and Dionysius ruling together, and of Dionysius ruling alone. Of the imperial class there is a large series of Nicwa, and there are many coins of Nicomedia. The series of Bithynia closes with the money of its kings, consisting of Attic tetradrachms and bronze pieces. The tetradrachms bearing the name of Prusias are of Prusias I. and IJ. The bronze coins with the same name, some of which are fine, cannot be otherwise classed than to Prusias I. or IL. , since we do not know by which of the two they were issued. Of N icomedes II. and III. there are only tetradrachms,

The fine Greek coinage of Asia may be considered to begin with Cyzicus. Mysia. Cyzicus is in numismatics a most important city. The famous electrum Cyzicene staters were struck here for nearly a cen- tury, from 478 to 387 B.c., as Head conclusively argues (Nam. Chron., 1876, p. 277). During that whole period they were not only the leading gold coinage in Asia Minor but the chief currency in that metal for the cities on both shores of the f£gean ; for it must be remembered that their alloy of silver was not allowed any value, | The actual weight is of the Phocaic standard, just over 248 grains, so as to be equivalent to a Babylonic gold stater. The division was the hecta or sixth. The abundance of the staters and hectx: and the variety of their types, which usually are common to both denomi- nations, led some numismatists to suppose that Cyzicus was a cen- tral mint striking for neighbouring cities their own coinage, but our present knowledge of the types of these cities shows that this was not the case. But it is certain that the staters of Cyzicus served as gold for other great marts which struck little or no money in that metal, and contented themselves with issuing the hecta; hence an instinct that they were striking for the use of others may have led

~~the Cyzicene moneyers to use great freedom in the choice of subjects. Many they invented and some they borrowed, retaining for themselves the distinctive badge of the tunny-fish beneath the type. This type occupied the obverse of the coin, while the reverse was invariably the quadripartite incuse square in four planes of the so-called mill-sail pattern. The coins are very thick and the edges are rude. The art is frequently of great beauty, though sometimes careless. After the earlier examples it shows the dominant influence of painting, being characterized by flowing lines and an intensity of expression in some of the finest examples, and always recalling painting or relief rather than sculpture in the round. The subjects are heads, figures, groups, and animals. The silver coinage of Cyzicus is distinctly local. "It comprises beautiful tetradrachms of the Rhodian standard. The obverse bears a head of Persephone with a veil on the back, wound round her head, and a wreath of ears of corn. This is an example of the best Greek art, equally simple, delicate, and graccful, and in the expressive style of the Ionian school. Above the head is the inscription ZOTEIPA, which may be compared with KOPH ZOTHIPA KYZIKHNOQN, on a late copper coin, accompanying a head which is probably that of the younger Faustina in the character of Per- sephone. The reverse type of the finest tetradrachms is a lion's head in profile above a fish. Both late autonomous and imperial coins in bronze are well executed and full of interest, the two classes running parallel under the earlier emperors.~~

~~Lampsacus is represented by a long series of coins. There are Lamp- archaic and fine silver coins with a janiform female head, and on sacus. the reverse that of Athene in a Corinthian helmet, besides a few of other types. Contemporary with the later silver are electrum staters of Rhodian weight with a half-Pegasus and peculiar quad- ripartite incuse square. These are succeeded by splendid gold staters with various types of obverse and the half-Pegasus on the reverse. The most remarkable type is a bearded head with streaming hair in a conical cap, bound with a wreath, singularly pictorial in treatment as well as in expression, and roughly executed as if by a great artist unused to medal work. In contrast to this is a most carefully executed head of a Menad with goat's ear, still markedly in a painter's style. This head is in repose; that of another Mwnad with human ear is marked by its expression of~~

Per- gamum.

The Troad.

Afolis.

Lesbos.

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frenzy. Of Parium there are very early silver coins, interrupted and resumed in the period of good art. The leading type is the Gorgon's head. — The money of the great city of Pergamus or Pergamum 1s chiefly of a late time. i " the good period, the former being very rare ; the leading type is an archaic figure of Pallas. The silver coinage is next supplied by the money of the kings of Pergamum, followed by cistophori, which began mnder the kingdom. The bronze pieces of the city are numer- ous, both autonomous and imperial, the two classes overlapping, and there are medallions of the emperors. Asculapius is especially prominent under the Roman rule. The chief coins of the kings are Attic tetradrachms, with on the obverse a laureate head, supposed to be that of Philetxrus, the founder of

the state, and on the reverse a seated Athene, the common type of

Lysimachus, from whom Phileterus revolted. This type is but twice varied by the heads of later kings. The inscription is always SLAETAIPOY, a monogram somctimes indicating the name of the king by whom the coin was issued. The absence of the regal style is noticeable, and, though in the usual type the diadem is generally shown as wound round the laurel-wreath, it does not always appear. There are also unimportant bronze coins of the kings. The cisto- phorus was so called from its obverse type, the cista mystica, a basket from which a serpent issues, the whole enclosed in an ivy-wreath. The reverse type represents two serpents, and between them usually a bow-case. The half and the quarter of the cistophorus have on one side a bunch of grapes on a leaf or leaves of the vine, and the elnb with the lion's skin of Heracles within an ivy-wreath. They were tetradrachms equal in weight to three Attic drachms or three denarii, and the half and the quarter would be exchangeable with Roman coins, three quinarii and a quinarius

~~and sestertius respectively. These coins became abundant when the kingdom of Pergamum was transformed into the province of Asia, and are struck at its chief cities, Pergamnm, Parium, Adramyttium, Thyatira, Sardis, Smyrna, Ephesus, Tralles, Nysa, Laodicea, and Apamea. They have at first the names of Greek magistrates, afterwards coupled with those of Roman proconsuls or propretors. The silver medal- lions of Asia, the successors of the cistophori, range from Mark Antony to Hadrian and Sabina. They bear no names of cities, but some may be attributed by their references to local forms of worship. The obverse bears an imperial head, the reverse a type either Greek or Roman. The art is the best of this age, more deli- cate in design and execntion than that of any other pieces, the Roman medallions excepted.~~

~~The coinage of the Troad is interesting from its traditional allusions to the Trojan War. Of Abydos there is a fine gold stater, with the unusual subject of Nice sacrificing a ram, and the eagle, which is the most constant type of the silver money, —a series chiefly notice- able for the coarse style and bad fabric of the late Attic tetradrachms. One of the few imperial coins commemorates the legend of Hero and Leander. The late tetradrachms of Alexandria Troas bear the head of Apollo Smintheus, and on the reverse his figure armed with a bow; the inscription is ATTOAAQNOS ZMIOEQE AAEZ- ANAPEQN. There is a long series of the town as a colonia, of extremely poor work. Dardanus has remarkable silver coins, both early and fine. Ilium Novum strikes late Attic tetradrachms with a head of Athene, and on the reverse the same goddess carrying spear and distaff, with the inscription AODHNAZ IATAAOZ. On the autonomous and imperial bronze we notice incidents of the tale of Troy, as Hector in his car, or slaying Patroclus, or fighting .; the other side, for this coin is autonomous, shows the wolf and twins, and again the flight of Aineas. Of Scepsis, which is said to have been the capital of a Dardanian kingdom for a long period between the fall of Troy and the age of Alexander, there are early silver coins, and some of its bronze money is of good style. The island of Tenedos is represented by very carly coins, and others of the fine and late periods. The usual obverse type of all the silver pieces is a Janus- like combination of two heads, probably those of a Zeus and a Hera; and the reverse type of all but the oldest is a two-headed axe,~~

~~In Aolis the most noteworthy coins are the late tetradrachms of Cyme and Myrina, both of the time of decline, yet with a certain strength which relieves them from the general weakness of the work of that age. Cyme has the head of the Amazon Cyme, and a horse within a laurel-wreath; Myrina, a head of Apollo and his figure with Instral branch and patera. The rest of the coins of these and other towns are bronze, autonomous and impcrial.~~

~~Lesbos is remarkable for having coined in base as well as pure silver, its early billon coins being peculiar to the island, and not easily classed to the cities like the silver. They are of various weights, as if the alloy had not been reckoned at first, but afterwards admitted, unlike the electrum of the coast, in which the silver was always excluded from the value. Methymna has very interesting archaic silver coins, with the boar and the head of Athene, her helmet adorned with a Pegasus rising above her forehead. There are later coins of about 400 B.c. and about Alexander's time. The types are the head of Athene and the lyre. The weight is Attic. Of Mytilene there are few coins until late in the Persian dominion.~~

~~NUMISMATICe~~

~~There are, indeed, small gold and silver pieces of~~

~~The local worship of~~

~~[ASIA MINOR.~~

~~The types are the head of Apollo and the lyre. The style is fine for the period, with the strongly expressive quality that marks the contemporary western Asiatic currencies, and the execution is care- ful. There is a long and important series of the imperial time, including very interesting commemorative coins, some probably of persons of legend as Nausicaa, or of remote history as Sappho, others of benefactors of the city as Theophanes the friend of Pompey, from whom he obtained for this his native place the privileges of a free city. The usual style for these persons is hero or heroine, but Theo- phanes is called a god, and Archedamis, probably his wife, a goddess.~~

~~The money of Ionia is abundant and beautiful. the first city of interest. Here we observe a very early tetradrachm of Attic weight with the types of a lion gnawing his prey, and the forepart of a winged sow. Drachms and smaller coins follow with the forepart of the sow and an incuse. Then there is the break frequently noticeable in Asia Minor, and the coinage begins anew with splendid coins of the age before Alexander, having for types the head of Apollo, three-quarter face, and aswan. The chief pieces, the gold drachm and a half or octobol, and the silver stater or tetra- drachm, present two types of the head of Apollo, very grand on the gold and the silver, with the signature of Theodotus, the only known Asiatic engraver, and richly beautiful on the other silver piece. These coins are marked by the intense expression of the school of western Asia Minor. Colophon has a very early Attic didrachm, followed by transitional Persic coins with the head of Apollo and the lyre, next the common break, during which the famous pieces with a regal portrait, to be noticed under Persia, were probably issued, and then, about Alexander's time, an over- refined repetition of the earlier type.~~

~~The money of Ephesus is historically interesting, but very dis- Ephesus.~~

~~appointing in its art, which is limited by the small range of subjects and their lack of beauty. The leading type is the bee; later the stag and the head of Artemis appear. Thus the subjects relate to the worship of the famous shrine. The oldest coins are electrum and silver, both on the Phcenician standard. The type is a bee and the reverse is incuse. The silver coinage continues with the same types, unbroken by the Persian dominion, until in 394 B.c. a remark- able new coin appears. When Conon and Pharnabazus defeated the Lacedemonian fleet and liberated the Greek cities of Asia from Spartan tyranny a federal coinage was issued by Rhodes, Cnidus, Samos, and Ephesus, with their proper types on the reverse, but on the obverse the infant Heracles strangling two serpents ; these are Rhodian tridrachms. About this time the Rhodian standard was introduced, and a series of tetradrachms began with the bee, having for reverse the forepart of a stag looking back, and behind him a date-palm. This type continues till 301 B.c. on the Rhodian standard, which is then abandoned, and the Attic supersedes it for ashort time. Bronze now begins. The head of Artemis asa Greek goddess next occupies the obverse, and the mint of Ephesus also issues~~

tetradrachms of Lysimachus. He subsequently gave the city the name of Arsinoe, his wife, and a few coins record this short-lived change. The next coins repcat the head of Artemis, and the fore- part of the stag and the palm-tree again occupy the reverse. The head is specially beautiful, and the whole coin of most careful work. The Ptolemaic rule is commemorated by the splendid octadrachm of Queen Berenice II. struck here. At this time the Attic standard was abandoned, and the Rhodian, then very popular in the com- merce of the eastern Mediterranean, was adopted. The city after- wards fell into the hands of Antiochus III. About this time Alexandrine tetradrachms were here minted ; it would seem most reasonable to date them from the peace of 189 3.c., when the Romans endeavoured to conciliate the cities of the coast, but | there are reasons for supposing that they began earlier with a monetary alliance between Ephesus and the great Phcenician mart Aradus. The Attic weight was thus restored, and there is a long issue of drachms on that standard, with the types of the bee, and the stag standing on the nearer side of the palm-tree. To the same age belong the Ephesian tetradrachms of the kings of Pergamum, to whose territory the Romans had assigned Ephesus, and undated cis- tophori. Whenin 133 3.c. the Roman people inherited the kingdom of Pergamum, an issue of dated cistophori began at Ephesus, which was the chief city of the Roman province of Asia, This is not interrupted by the revolt, when Ephesus took the side of Mithra- dates (87-84 B.c.), which, however, is marked by a series of gold" Attic didrachms anda solitary coin of strange weight, which may be a half-aureus issued by Sulla (84 B.c.), as Mommsen ingeniously supposes. The Roman rule is next marked by the issue of procon- sular cistophori. After the disturbance caused by the civil wars these cease, and there are only bronze pieces, which we may sup- pose to be of the latest days of the republic. The impcrial money follows, of far higher interest than the autonomous. There are many representations of the temples of the city, including that of the famous shrine of Artemis, which shows the bands of sculpture on the columns, as well as many other remarkable subjects, parti- cularly the Zeus of rain seated on Mount Prion, a shower falling from his left hand, while below are seen the temple of Artemis and the river-god Caster ; on another coin the strange Asiatic figure

Clazomene is Ionia.

~~Miletus.~~

~~Smyrna,~~

~~Teos.~~

~~Chios.~~

~~Samos.~~

~~Caria,~~

~~ASIA MINOR. |~~

~~of the goddess, frequent in this series, stands between the personified rivers Caster and Cenchrius (see Head's Ephesus).~~

~~Erythre has fine coins, mainly transitional, with a horseman about to mount his steed, and a flower. These are Persic, and after a long pause there is a series of Rhodian weight of about Alexander's age, and later, having Attic types connected with Heracles. The series of autonomous bronze is large. The money of the Ionian Magnesia begins with the issue of Themistocles, when he was dynast under Persian protection. In the decline of the Oriental power the city strikes her own money, with the types of an armed horseman and a humped bull butting, surrounded by the labyrinth pattern which symbolizes the river Meander. The weight is Persic. After along pause we observe the currency recommencing with spread tetradrachms of the decline of art, more delicately executed than those of Cyme and Myrina, with a bust of Artemis and a figure of Apollo standing on a meander and leaning against a lofty tripod, the whole in a laurel-wreath. The great city of Miletus is dis- appointing in itsmoney. The period of its highest prosperity is too early for an abundant coinage, yet in the oldest electrum issues we see the lion of Miletus. It is not, however, until the confederacy with Athens after the battle of Mycale that there is a common silver coinage, with the lion's head and a star, of Attic weight. Later money with the same types seems to show the influence of the Carian princes. It closes with beautiful coins bearing the head of Apollo facing and the lion looking back at a star, with the inscrip- tion ET AIAYMON IEPH, showing, whatever be the word~~

~~under- stood, that this was the "sacred" money of the famous temple at Didyma. Next come fine coins of about Alexander's time, differing from the last in having the head in profile. The weight is equally Phenician. The types continue through a series of various stand- ards with very rare Attic gold staters. Phocea is represented by two very interesting currencies: an electrum series of hecte like that of Cyzicus, but of inferior purity, characterized by a seal, the badge of the town, beneath the type; and also a widespread early silver coinage, apparently common to the Western colonies of the city. The autonomous money is wholly anterior to the Persian conquest. Smyrna first strikes late Attic tetradrachms, with the turreted head of Cybele or the city or the Amazon Smyrna, and an oak-wreath sometimes enclosing a lion. A rare silver coin presents on the reverse the seated figure of Homer, also occurring in the autonomous bronze, of which there is very much, partly of imperial time as well as a long series of imperial bronze. Among the bronze coins we notice those with the head of Mithradates. The earlier imperial coins are of delicate work. Those of the young Vespasian are historically interesting.~~

~~Of Teos there are early Mginetic didrachms, bearing on the one side a seated griffin with curled wings and on the other a quadri- partite incuse square. These ceased at the moment when the popu- lation left the town, destroyed by the Persians, and fled to Abdera, where we recognize their type on the coinage of the time. There are much later coins of less importance.~~

~~Chios and Samos, islands of Ionia, are represented by interesting currencies. Chios struck electrum and abundant silver. The type was a seated sphinx with curled wing, and before it stands an amphora, above which is a bunch of grapes; the reverse has a quadripartite incuse. The coins begin before the Persian conquest (490 B.c.), and are first archaic and then of fine style. There is apparently a gap in the later Persian period. Afterwards there is a cessation of money until Sulla's time, when silver is again struck and bronze seems to begin.~~

~~The coinage of Samos is artistically disappointing, but as a whole has many claims to interest. The earliest money must have in- cluded electrum, but we are unable to discriminate between the rival claims of Lesbos and~~

Samos; some pieces, however, cannot reasonably be doubted to belong toSamos. The silver begins before 494 B.c., when history comes to our aid to make a marked division. The types are the well-known lion's scalp and bull's head, of Oriental origin, both probably connected with the worship of Hera. They are continued in the next period, and the Athenian conquest (489 B.c.) is only marked by the introduction of the olive-spray as a constant symbol on the reverse and the more important change from degraded Pheenician to Attic weight. Notwithstand- ing the regularity of their coin type, the Samians, having joined the anti-Laconian alliance after Conon's victory in 394 3.c., struck the coin with Heracles strangling the serpents already noticed under Ephesus ; the Rhodian weight is thus introduced. We next notice an Alexandrine tetradrachm of the class of those issued after the battle of Magnesia. There is nothing further of interest until the long series of imperial money, which, though wanting in beauty of style, is not without interesting types. Of the mythological subjects the most remarkable is the Asiatic figure of the Samian Hera, which clearly associates her with the group of divinities to which the Ephesian Artemis belongs. Very noticeable also are the representations of Pythagoras, seated or standing, touching a globe with a wand (see Professor Gardner's Samos).

The money of Caria does not present any one great series, Auto- nomous silver coins are not numerous except at Cnidus, and rarely

of good style. Antiochia has late Attic silver pieces ; as this city was founded by Antiochus I., its coinage is important as fixing the date of similar money of Miletus. There are imperial coins of this town, and of Aphrodisias, worthy of notice. Cnidus is repre- sented at first by archaic coins going down to about 480 3.c. Their weight is Mginetic, and the types are a lion's head and the head of Aphrodite. There are, after a break, coins of Rhodian weight, about 400 B.c., others preceding Alexander, and others, again, after hisage. An imperial coin represents the famous statue of Aphrodite by Praxiteles. Of Halicarnassus there are small silver pieces of

~~the age of good art, and others of subsequent times, including that of the Carian kings, and the silver money continues after Alexander. Among the imperial types the head of Herodotus is noteworthy. There is late silver money of Iasus with the head of Apollo, and~~

~~a youth swimming beside a dolphin around which his arm is thrown.~~

~~It is interesting to compare this type with the similar subjects of Tarentum. Idyma has silver pieces of fine style on which the head of Apollo is absolutely facing, as sometimes at Catana in Sicily ; the reverse type is a fig-leaf. Myndus on its late silver perhaps shows in the head-dress of Isis a trace of the Ptolemaic occupation.~~

~~Taba has also late silver ; and of Termera we have the rare coin of its tyraut Tymncs, dating about the middle of the 5th century and struck on the Persic system.~~

~~The Carian kings prove their wealth by their series of coins, which bear the names of Mausolus, Hidrieus, and Pixodarus,~~

~~Artemisia, the widow of Mausolus, being absent. The weight is~~

~~Rhodian ; the types are the three-quarter head of Apollo, and Zeus Labrandcus standing, holding the labrys or two-headed axe. Mau- solus strikes tetradrachms, Pixodarus gold of Attic weight. His silver is the best in the scries, and clearly shows the Ionian style in its quality of expression.~~

~~Calymna heads the islands of Caria.~~

~~curious archaic Persian double drachms bearing a barbarous hel- and Cos. meted male head and on the reverse a lyre incuse. Later there are coins of about 400 B.c. The series of Cos begins with small archaic pieces, the type a crab and the reverse incuse. Next come fine coins of transitional style and Attic weight, with the types of a discobolus before a tripod, and a crab. he wrestlers of Aspendus may be compared with the remarkable obverse type. The common break then interrupts the issue, and a new coinage occurs before the time of Alexander. The weight is Rhodian, the types the head of Heracles and the crab, After Alexander there is another currency which~~

ceases about 200 B.c. It is resumed later with the new types of the head of Aisculapius and his serpent. This continues in Roman times. The bronze of that age comprises a coin with the head of Hippocrates and on the reverse the staff of Xenophon's head likewise occurs, and the portrait of Nicias tyrant in Cos (c. 50 B.c.) on his bronze. Imperial money ends the series. Of the island of Megiste there are charming little silver pieces of about 400 B.c. with Rhodian types, the head of Helios in profile and the rose.

The island of Rhodes, great in commerce and art, has a rich Rhodes. series of coins. The want of variety in the types—at the city of Rhodes almost limited to the head of Helios and the rose—is dis- appointing, but happily the principal subject could not fail to illus- trate the movements of art, one of which had here its centre, and the continuity of the money affords valuable metrological evidence.

The city of Rhodes was founded ¢. 408 B.c. on the abandonment by their inhabitants of the three chief towns of the island, Camirus, Ialysus, and Lindus. The money of Camirus seems to begin before 480 B.c. The type is the fig-leaf, the weight Aiginctic, later degraded or changed to Persic. The coins of Ialysus, of the 5th century, follow the Rhodian standard. Their types are the forepart of a winged boar and an eagle's head of a vulturine type. The money of Lindus, apparently before 480 3.c., is of Phoenician weight, with the type ofa lion's head. The people of the new city of Rhodes adopted another standard, the Attic, and very shortly abandoned it, except for gold money, using instead that peculiar weight which has been called Rhodian but may better be considered to be heavy Pheenician ; this they retained until the last years of their independ- ent coinage, when they resumed the Attic. The types are the three- quarter face of Helios and the rose. The first series was issued from the building of Rhodes to 304 B.c., the chief coins being the gold stater and the silver tetradrachm. There isa grandeur and noble outlook in the countenance of Helios which well befits his character, but the pictorial style is evident in the form of the hair and the expression, which, with all its reserve, has a dramatic quality. From 304 to 186 B.c. there isa change of type, and the head of Helios is radiate. The profile head which now also occurs, and the constant pictorial handling of the hair, not, as before, in its outlines only, but also in its masses, show the qualities of Lysippus. It is perplexing to note that the standard of weight is

~~below that of those coins which Ptolemy I. struck for Alexander 1V. on the Rhodian weight ; but this difficulty disappears if we regard the standard as Phenician, and both the Rhodians and Ptolemy as borrowers. The Alexandrine tetradrachms, which were issued after the battle of Magnesia, find a place in the Rhodian mintage.~~

~~Its money begins with Calymna~~

~~Lycia.~~

~~Pamphy- lia.~~

~~Pisidia, &c.~~

~~Cilicia.~~

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~~Small coins follow this currency. In 166 B.c. favourable political circumstances cause a new issue of money. The Attic gold staters of this age have a strikingly dramatic style, pointing to the great local school; the silver, with the head of Helios in profile,—in the gold it is three-quarter face,—is still marked by careful execution. In the latest coins, from 88 to 43 B.c., the Attic standard, now universal, whether the chief coin was called drachm or denarius, again appears. During the age after Alexander there is an abundant bronze coin- age, with some pieces of unusual size. The series closes with a few imperial coins ranging from Nerva to Marcus Aurelius. ;~~

~~The early coinage of Lycia introduces us at once into a region of Asiatic mythology, art, and language, raising many questions as yet without an answer. The standard of the oldest coins is Persic, and it falls perhaps under Athenian influence, until it becomes equivalent with the Attic. The Lycian character belongs to the primitive alphabets of Asia Minor, which combine with archaic Greek forms others which are unknown to the Greek alphabet, and it expresses a native language as yet but imperfectly understood. 'he art is stiff and delights in animal forms, some- times of monstrous types, which recall the designs of Phcenicia and Assyria. The most remarkable symbol is the so-called triquetra, an object resembling a ring, to which three or four~~

hooks are attached. It is supposed to be a solar symbol like the swastika. The oldest money, probably dating from about 480 Bc., has a boar or his fore-part and an incuse. 'his is succeeded by a series in which the hooked ring is the usual reverse type. It bears Lycian inscriptions, which may usually denote tribes ; one certainly indi- cates the town of Tlos. — This coinage probably reaches as late as Alexander's time. It is followed by silver and bronze money of the Lycian League before Augustus and under his reign, but ceasing in that of Claudius,—the usual types of the chief silver piece, a hemidrachm, being the head of Apollo and the lyre. Besides this general currency there are some special ones of towns not in the League. The imperial money rarely goes beyond the reign of Augustus, and is resumed during that of Gordian III. There isa remarkable coin of Myra of this emperor, showing the goddess of the city, of a type like the Ephesian Artemis, in a tree; two woodcutters, each armed with a double axe, hew at the trunk, from which two serpents rise as if to protect it and aid the goddess. Phaselis is an exceptional town, for it has early Greek coins, the leading type being a galley.

The coinage of Pamphylia offers some examples of good art dis- tinctly marked by the Asiatic formality. Aspendus shows a remark- able series of Persic didrachms, extending from about 480 B.c. to Alexander's time. The oldest coins have the types of a warrior and the triskelion or three legs, more familiarly associated with Sicily ; it is probably a solar symbol. One has an extraordinary reverse type, in which the triskelion is engraved upon an advancing lion, also held to have a solar meaning. These coins are followed by a long series with the types of two wrestlers engaged and a slinger. The main legend is almost always in the Pamphylian character and language. There are also very curious imperial types. The money of Perga is very interesting. It begins in archaic style, and is resumed after the age of Alexander with Greek types of the Artemis of Perga. Her figure in a remarkable Asiatic form occurs in the long imperial series. Bronze coins earlier in date than the silver money with the Greek types have the Pamphylian title of the goddess, read by W. M. Ramsay (Hellenic Journad), FANAZZA> IIPHITA®, "of the queen of Perga." Side has at first Persic didrachms of about 480 B.c., their types the pome- granate and dolphin and mystical eye, or pomegranate and dol- phin and head of Athene ; then there are satrapal money of about 400 B.c. and late Attic tetradrachms, their types

being the head of Athene and Nice, of about the first century B.c., for they are imitated by Amyntas, king of Galatia.

The money of Pisidia is chiefly imperial. There is a long series of this class of the colonia Antiochia. The autonomous coins of Selge have the wrestlers and the slinger of Aspendus in inferior and even barbarous copies. Of Isauria and Lycaonia a few cities strike coins of imperial class or time.

Cilicia, a coastland, is numismatically of high interest. Celen- deris, a colony of Samos, has archaic coins of Aginetic weight, their type a goat, the reverse being incuse. These arc followed by a splendid coinage of transitional and fine art, with a horseman seated sideways on the obverse and on the reverse a goat kneeling on one knee. The latest, about 400 B.o., are free from stiffness, and the horseman may be favourably compared with the similar types of Tarentum. The weight is the Persic didrachm. Mallus has a most interesting series of silver coins, some with curious Asiatic types. Of Nagidus there are Persic didrachms of good style, one interesting type being Aphrodite seated, before whom Eros flies crowning her, with, on the other side, a standing Dionysus. Soli has silver coins of the same weight, the types being the head of Athene, one variety imitated from remote Velia, and a bunch of grapes; they are anterior to Alexander. The coinage of Tarsus begins with rough and thick tetradrachms of Attic weight, evidently issued soon after Alexander's reign, and for no long time subse-

quently. The types are the Baal of Tarsus and a lion. 'The auto- nomous bronze of the Seleucid age shows the remarkable subject of the pyre of Sandan, the local form of Heracles; and there is a long and curious imperial series.

The coinage of the great island of Cyprus is, as we might expect Cyprus.

from its monuments, almost exclusively non-Hellenic in character. The weight-system, except of gold, which is Attic, is Pérsic, save only in the later coins of the kings of Salamis, who strike on the reduced Rhodian

~~standard. The art is usually very stiff down to about 400 B.c., with types of Egypto-Phcenician or Pheenician or of Greek origin. The inscriptions are in the Cyprian character, belonging to the intcresting group of alphabets of Asia Minor, of which the Lycian and Pamphylian are instances. The character has been read, and the attributions of the coins are thus taking shape. The prevalent types are animals or their heads, the chief subjects being the bull, eagle, sheep, lion, the lion seizing the stag, the deer, and the mythical sphinx. The divinities we can recog- nize are Aphrodite, Heracles, Athene, Hermes, and Zeus Ammon. But the most curious mythological types are a goddess carried by a bull or by a ram, in both cases probably Astarte, the Phcenician Aphrodite. The most remarkable symbol is the well-known Egyp- tian sign of life. The coins appear to have been struck by kings until before the age of Alexander, when civic money appears. There are two well-defined currencies, that of the kings of Salamis,~~

~~who claimed a Greek origin, and that of the Pheenician dynasty of~~

~~Citium. The coins of the Salaminian line are in silver and gold. The earlier have Cyprian, the later Greek inscriptions, the types generally being native, though after a time under Hellenic influ- ence. They are of Evagoras I., Nicocles, Evagoras II., Pnytagoras, and Nicocreon, and the coinage is closed by Menelaus, brother of Ptolemy I., who, of course, does not take the regal title. The kings of Citium from 448 to 332 3B.c., Baalmelek, Azbaal, Melekiaton, and Pumiaton, strike silver and in one case gold, their general types being Heracles, and the lion seizing the stag. Bronze begins soon after 400 B.c., and of the same age there are autonomous pieces, one of Paphos in silver, and several of Salamis in bronze. There is Greek imperial money from Augustus to Caracalla, The most remarkable type is the temple at Paphos, represeuted as a structure of two stories with wings. Within the central portion is the sacred stone, in front a semicircular court.~~

~~The earliest coinage of Lydia is no doubt that of the kings, already described. 'The next currency must have been of Persian darics (gold) and drachms (silver), followed by that of Alexander, the Seleucids, and the Attalids of Pergamum, and then by the cistophori of the province of Asia. There is an abundant bronze coinage of the cities, autonomous from the formation of the province, and of imperial time, but mostly of the imperial~~

~~class. The largest curren- cies are of Magnesia, Philadelphia, Sardis, Thyatira; and Tralles. The art is not remarkable, though good for the period, and the types are mostly Greek.~~

~~The coinage of Phrygia has the same general characteristics as Phrygia,~~

~~that of Lydia. Among noteworthy types must be noticed Men or Lunus, the Phrygian moon-god, and the legendary Minos. There are curious types of Apamea, surnamed Kibotos or the Ark, and more anciently Celene. One of Severus represents the legend of the invention of the double pipe, a type already described. Of the same and later emperors are coins bearing the famous type of the ark of Noah and the name NOE. The town of Cibyra is remark- able for a silver coinage, of which the large pieces have the weight of cistophori. They are of the first century B.c., and were prob- ably struck by one or more tyrants of the four confederate cities of which Cibyra was the head, a state which came to an end 84 B.C.~~

~~Galatia has little to offer of interest. perial coins for the province, and there is imperial money of Ancyra and Pessinus, besides other series of less importance. The only remarkable regal issue is that of Amyntas, Strabo's contemporary, who struck tetradrachms, imitating the late money of Side.~~

~~With the coinage of Cappadocia we bid farewell to Greek art and Cappa- enter on thedomain of Oriental conventionalism, succeeded by inferior docia,&c.~~

~~Roman design coarsely executed. There isone large imperial series, that of Cesarea, which numismatists have unduly increased by the introduction of many uncertain coins, all of which cannot even be proved to be Asiatic. The issues range from Tiberius to Gordian III., and are in silver and bronze. The most common type is the sacred Mount Argeus, on which a statue is sometimes seen,—a remarkable type curiously varied. There are scanty issues of a few other towns. There is an interesting series of coins of the kings of Cappadocia, who struck Attic drachms, and far more rarely tetra- drachms. The usual names are Ariarathes and Ariobarzanes, the first being that of the old line who claimed descent from one of the Persian chiefs who slew the Magian. The earliest coins are of Aria- rathes IV. (220-163 n.c.). The rare tetradrachms of Orophernes, a successful claimant in the next~~

reign, bear a fine portrait. There are also tetradrachms of Ariarathes V. and of another king of the same name, a son of Mithradates of Pontus, put by him on the Cappadocian throne. The coins of Archelaus, the last king set up

Lydia.

Trajan issued bronze im- Galatia.

Syria.

Comma- gene,

SYRIA. |

by Antony, havea good head on the obverse. Of Armenia there are a few silver and bronze coins of late sovereigns.

The great series of Syrian money begins with bronze coins of Trajan, struck, according to his custom, for the province. From these we pass to the money of the Seleucid kings of Syria, only rivalled for length and abundance by that of the Ptolemies, which it excels in its series of portraits, though it is far inferior in its gold money and wants the large and well-executed bronze pieces which make the Egyptian currency complete. The gold of the Seleucids is scarce, and their main coinage is a splendid series of tetradrachms bearing the portraits of the successive sovereigns. The reverse types are varied for the class of regal money. The execution of the portraits is good, and forms the best continuous history of portraiture for the third and second centurics before our era, 'The reverses are far less careful. The weight is Attic, but the cities of Phoenicia were ultimately allowed to strike on their own standard. Seleucus I. began by striking gold staters and tetra- drachms with the types of Alexander the Great. The same king, like his contemporaries, then took his own types: for gold staters, his head with a bull's horn, and on the reverse a horse's head with bull's horns ; for tetradrachms, Alexander's head in a helmet of hide with bull's horn and lion's skin, and Nice crowning a trophy, or the head of Zeus, and Athene fighting in a car drawn by four or two elephants with bull's horns. The Zeus and elephant-car type is remarkable for presenting in some cases the names of Seleucus I. and his son Antiochus I. as colleagues, Antiochus I., like his

~~father, first struck tetradrachms with Alexandrine types, and then with his own head, Heracles seated and Apollo on the omphalos occupy- ing the reverse. The portrait of Antiochus has a characteristic realism, though marked by the deep recession of the eye which is a characteristic of the school of Lysippus. The tetradrachms assigned to Antiochus II., Seleucus II., Antiochus Hierax (a doubt- ful attribution), Seleucus III.,and young Antiochus his son are not specially noteworthy. Antiochus III. is represented by a fine and interesting series. He alone of the Seleucids seems to have struck the great octadrachm in gold in rivalry of the Ptolemies. His por- trait is vigorous, and the elephant which varies the seated Apollo on the reverse of his silver tetradrachms relieves the heraldic dry- uess of that type. There are rare copper coins of the rebel satraps Molon and Acheus. The regal series is continued under Seleucus IV., and again becomes interesting with the money of Antiochus IV. (Epiphanes). His portrait is extremely characteristic, marked by the mad obstinacy which is the key to the tyrant's history. The most remarkable coin is a tetradrachm with the head of Antiochus in the character of Zeus, an instance of audacity un- exampled in coinage. In his time mints became numerous in the bronze coinage, and there is a remarkable series in that metal with Ptolemaic types, marking his short-lived usurpation in Egypt. Passing by his son Antiochus V., we note a great change in the coinage of Demetrius I. 'he silver tetradrachms now bear both mints and dates, a custom that generally prevails henceforward. In one type the heads of Demetrius and Queen Laodice occur side by side. One of these coins in the British Museum is struck on a tetradrachm of Timarchus, the revolted satrap of Babylon, who takes the style '' Great King." With Alexander I. (Balas) Tyre and Sidon begin to strike royal tetradrachms on their own Pheenician weight. The money of Demetrius II. follows, then that of the young Antiochus VI., with the most carefully executed portrait in the whole series, which, despite its weakness, has a certain charm of sweetness that marks it asa new type in art. The saine artist's hand seems apparent in the fine portrait of the cruel usurper Tryphon, whose features have a beauty of expression that must surely be ideal, and also in the picturesque spiked Macedonian helmet with a goat's horn and cheek-picce which occupies the reverse, ou which is written after '' King Tryphon" the strange title ' auto- crator." Antiochus VII. continues the series with, amongst other coins, the solitary bronze piece of Jerusalem, bearing the lily and the Seleucid anchor. On his money of Tarsus we note~~

the first appearance of the pyre of the local Oriental divinity. The restored Demetrius II. now reappears, the Pheenician money with his beard- less head, the rest usually with the beard he had grown in his Parthian captivity. Alexander II. (Zebina) follows, and then Cleopatra, widow of Demetrius II., Alexander I., and Antiochus VII., next appears as colleague of her son Antiochus VIII. Her coarse features are in keeping with the vileness of her character. Antiochus VIII. alone amid the subsequent Seleucids has an interesting coinage, and the empire closes with the coarse money of the Armenian Tigranes, his portrait with the lofty native tiara, and for reverse Antioch seated, the Orontes swimming at her feet.

There is a copper coinage of the cities of Commagene, Samosata, and Zeugma, and less important mints. The money of Samosata is of the time of the kings of Commagene and also imperial, this showing the type of the city derived from the famous statue of Antioch. The series of Zeugma is imperial, and has the subject of a temple on a mountain. The money of the kings of Commagene is in bronze, of late date, and not of much interest.

Cyrrhestica has brouze coins of a few cities, nearly all imperial, Cyrrhes- The last bear the tica.

the chief mints being Cyrrhus and Hierapolis. inscription OKAX ZYPLAZ TEPOIOAITON, and have figures of the goddess seated on a throne flanked by lions or riding on a lion, thus directly connecting her with Cybele.

Of Chalcidene there are bronze coins of Chalcis and of the Chalci- tetrarchs, and Palmyrene shows only the small bronze pieces of dene, &c.

Palmyra, the money of Zenobia and the family of Odenatlus being found in the scries of Alexandria.

Seleucis and Pieria, the brother states (on the coins AAEA®QN AHMOQN), have bronze coins, dated (149-147 B.c.) and undated. But the bulk of the money of this territory is of the great city of Antioch on the

Orontes. Alexandria in quantity, is of far less interest from the want of variety in the types, but it is curious chronologically. The coinage is both autonomous bronze before and of Roman times, and imperial base metal and bronze. The base metal money is at first of debased silver, then of potin, and at last of bronze washed with silver. The imperial bronze coins have at the same time both Greek and Latin inscriptions, the last with 8.C. Trajan combines the Greek inscription with the Latin $.C., aud when the city had been made a colonia by Caracalla this is indicated in Greek inscriptions from Elagabalus downwards. No less than four eras are used. The era of the Seleucids, the dates being from 97 to 37 B.c., occurs on the autonomous money ; so also the Pharsalian era, from 38 to 22 B.c., and on imperial coins as late as Titus; the Actian era on autono- mous coins, from 6 Bc. to 138 A.D., continuing under the early emperors ; and the Cesarian era on the autonomous class, from 55 to 158 A.D. The mass of imperial coins and all after Titus are dated by the tribunitian years of the emperors. The leading types are the figure of Antioch seated, the river Orontes swimming at her feet, from the famous statue by Eutychides, and the eagle on a thunderbolt, a palm in front. Under Hadrian the eagle is repre- sented carrying an ox's leg, a reference to the story of the foundation of the city when an eagle carried off part of the sacrifice and de- posited it on the site which was consequently chosen. There are few other types. The art is rude, though certain base metal coins show a largeness and decision in the heads, while wanting Hellenic refinement. The imperial series is very full and has an historical value as showing what emperors ruled Syria. It includes money of Sulpicius Antoninus, the Uranius Antoninus of Roman gold also struck in Syria. The series ends with Valerian, though it begins anew in the Roman provincial money of the reform of Diocletian, to be noticed later.

Of Apamea there are bronze coins of the age of the Selcucids, Apamea, the elephant type which occurs being appropriate. At Emesa in the &c.

bronze imperial money Sulpicius Antoninus reappears, one of his coins having for reverse the characteristically Syrian type of a sacred conical stone in a temple. The money of Gabala is autono- mous and imperial, with, in this class, curious mythological types. Laodicea has an important series. It begins with Phenician tetra- drachms and bronze money of the later Seleucids. The tetradrachms have a turreted and veiled female bust of the

~~city, a favourite Syrian and Pheenician type. These autonomous coins are followed by an imperial coinage like that of Antioch ; from Caracalla downwards Laodicea is a colonia; the inscriptions become Latin, then, very strangely, Greek on the obverse of the coins and Latin on the reverse. Seleucia has a similar autonomous and imperial currency, but does not become a colonia. There is a curious type of an apparently open shrine of Zeus Casius containing a sacred stone.~~

~~In Ceele-Syria there is bronze of Damascus, late autonomous and Cele- The imperial money of Syria.~~

~~imperial; the city becomes a colonia. Heliopolis, a colonia, shows a great temple in perspective, another temple containing an ear of corn as the central object of worship, and a view of the Acropolis with the great temple upon it, and steps leading up the rock.~~

~~The coinage of Pheenicia is a large and highly interesting series. Pheeni- The antonomous money is here important, and indicates the cia.~~

~~ancient wealth of the great marts of the coast. The earliest coins were struck during and shortly after the Persian rule, and the most important classes have not been certainly fixed. It is therefore needful to speak of them before describing the attributed money of the cities. These coins are of Phoenician weight, except one class, which follows the Persie standard. The great currency is of silver octadrachms. The types, limited in number, are Oriental in character ; the leading one is the war-galley ; the king of Persia also occurs, and the fish-god Dagon. The art is hard, but hasa force that reminds us of archaic Greek; it is, however, Oriental. The inscriptions are in the Pheenician character. Three great classes are distinguished. Octadrachms range from about 400 B.c. to Alexander's time. The types are a war-galley in full sail and the king in a car ; then for the obverse the war-galley beneath the walls of a fort, and below two lions. Didrachms with a similar obverse have for reverse the king slaying a lion. Octadrachms follow with the war-galley and the king in his car apparently followed by a vassal, These coins have been assigned to Sidon. A series of tetradrachms is of less importance. The obverse has a~~

~~This long series, second only to that of Antioch.~~

~~NUS sa A TICs~~

~~The independent Jewish coinage begins with the famous shekels. Jewish They have been assigned to various periods, but the preponderance coinage.~~

~~650~~

~~dolphin or the king as an archer on a sea-horse, the reverse an owl with the Egyptian symbols of sovereignty, the crook with the flail~~

~~| PALESTINE.~~

~~Sidon. The undoubted money of Sidon begins with Alexandrine gold and | as both types of year 1 have an inscription modified on the coins silver, dated shortly after the king's reign. This was followed by | of years 2 to 5. There are bronze ''half-shekels" and '' quarter- other Alexandrine money, interrupted by that of Ptolemy II., | shekels" of the year 4. These maybe later. The certain coins of Arsinoe II., and Ptolemy III. Ptolemy LV. also struck here and | the successors of Simon are small bronze pieces of John Hyrcanus, Antiochus [V. in bronze ; and later Seleucids issued tetradrachms | of Judas Aristobulus, of Alexander Jannzeus, who strikes bilingual from 151 to1143B.c. The era of the autonomy of Sidon was 111 B.c. | Hebrew and Greek and also Hebrew coins, showing his native name There are tetradrachms dated by this reckoning with the head of | to have been Jonathan, and of Antigonus, who has the Hebrew the city and an eagle on a rudder, across him a palm. In the | name Mattathiah. The Maccabean coinage is followed by that of bronze we observe the type of Europa carried by the bull. Some | the Herodian family, equally of bronze, the two most important issues pieces of this class have Phcenician as well as Greek inscriptions. | being those of Herod the Great and Herod Agrippa II. The money The imperial money shows a curious shrine on wheels. In the | of the procurators of Judea, in part parallel with the Herodian, time of Elagabalus Sidon is characterized as a colonia. The type | is of small'bronze coins, struck between 6-7 A.D. and 58-59 A.p., the of a temple of Astarte as a local Aphrodite is worth notice. The | latest period of their administration being as yet unrepresented. series closes with Julia Mesa. Tripolis has an~~

~~interesting but | These are followed by two important classes, the money of the first limited autonomous and impcrial series. The worship of the | revolt (66-70 A.p.) and that of the second (suppressed 185 A.D.). Dioscuri is here associated with Asiatic religion. Architecturally | Both risings caused the issue of native silver coinage, some of which these coins are highly curious. may be assigned with certainty to each, while the assignment of~~

~~Tyre, The early money that can be classed with eertainty to Tyre | others is doubtful. Of the first revolt are silver and bronze pieces exhibits similar historical vicissitudes to that of Sidon. Before she | with the name of Eleazar the priest, silver of Simon, and large gained her independence the Seleucids struck here from 149 to 125 | and smaller bronze pieces with the name of Simon the prince of B.c., and in that very year the autonomous era begins. The tetra- | Israel. Of the second revolt are restruck denarii with the name of drachms dated by this cra bear the head of the Tyrian Heracles in | Simon, which appears to have been that of the leader surnamed a Greek form, and the eagle on a rudder, across him the palm. The | Bar-cochab or Bar-coziba. Of the first or.second revolt are shekels latest coin of this series known to us is a didrachm of 66 4.p. There | with the name of Simon, the obverse type a gate of the temple, is also autonomous bronze. The imperial class begins with Severus, | and on the reverse a bundle of branches and a citron, symbols of the and under him the constitution of the colonia is shown; but the | feast of tabernacles. Though these differ, it is rash to assign one most interesting type is a serpent coiled round an egg, between a | variety to the carlier and another to the later revolt. Besides this date-palm (the phoenix or trec of Phcenicia) and a murex, the shell | native currency there are coins struck in Palestine by Vespasian, which produced the Tyrian purple. The series ends with Gallienus. | Titus, and Domitian. (See Madden's Jewish Coinage, new ed.)~~

~~Aradus has Alexandrine coins, and acquired its independence in 258 Of Roman Arabia there are bronze imperial coins of Bostra and Arabia,~~

~~B.c. From this date it struck, first its chief coins with Alexandrine | less important mints. In Mesopotamia the colonia of Carrhe Assyria,~~

~~types, then drachms with the types of Ephesus, the bee, and the stag | deserves notice, and the city of Edessa, which issues imperial Baby-~~

~~on this side of the date-palm, and lastly tetradrachms with the bust | money as a colonia, and has a series of coins of its kings, striking lonia.~~

~~of the city and Niee holding an aplustre and a palm within a wreath. | with Roman emperors in silver and bronze. Curiously, this and~~

~~These are of heavy Pheenician weight. The imperial coinage ranges | the colonial issue are long contemporary. The colonial coinages of~~

~~from Tiberius to Gordian III. Nisibis and of Rhesena, which became a colonia, close the group. Palestine. In Galilee there are a few autonomous and imperial coins of | Assyria is remarkable for the imperial money of the ancient city~~

~~across it. These are after 400 B.c. and have been given to Tyre, but the Egyptian influenee would perhaps suggest some town nearer the southern border of Palestine. A third class of money of the same age is of Persic weight. The earliest pieces have a head sup- posed to be of Melkarth and a war-galley, the later examples bearing dates. The dated series continues, but the obverse type changes to Dagon. Theseare assigned to Aradus. The series bearing the names or symbols of cities would not be difficult to elass were it not for their constant interruption by Ptolemaic and Seleucid coins and by the issue of Alexandrine tetradraehms. Berytus has bronze, both autonomous and of the city asa colonia. The types of interest are the founding of the colonia, Poseidon, not always of a purely Greek type, Poseidon and the nymph Berytus, the temple of the saine divinity, and the eight Pheenician gods or Cabiri.. To Byblus we may class with certainty a Pheenician currency, that of the native kings from about 400 B.c. to Alexander'sage. The imperial coinage presents a very curious perspective representation of a temple in Greco-Pheenician style, with a conical edifice in the eourt. Czesarea ad Libanum shows in its imperial money a strange type of Elagabalus, a half-figure of the Syrian goddess in a shrine. She wears a eap like a papyrus head and is enwrapped in shapeless drapery. The shrine is of Egyptian style, and a sceptre with a bird upon it is beside the goddess. Marathus has a very fine Phee- nieian tetradrachm of 226 B.c., with the head of the city turreted and a youth holding an aplustre and seated on bucklers. This is a work of Greek design and style, as is also a small coin~~

of the year following with the head of Queen Berenice II., then reigning. The copper is dated from 198 to 153 B.o.

Ptolemais, which was a great mint under the earlier Ptolemies ; and other towns are represented. In Perza there is an imperial series of Gadara. Samaria has money of Cexsarea, both autonomous and imperial, the last for the most part colonial, and also imperial of Neapolis, among the types of which occurs the interesting subject of Mount Gerizim surmounted by the Samaritan temple. The coinage of Judea is an interesting series. The money of Jerusalcin is of high interest, and more extensive than appears at first sight. Here was struck the coin of Antiochus VII., with the native lily as a type, the series of the Maccabean princes, that of the Roman procurators, and the bronze coius countermarked by the tenth legion, quartered by Titus in the ruins of the city. One of these bears the remarkable symbol of a pig. After the reduction of Judea in the reign of Hadrian, Jerusalem was rebuilt as a colonia with the name "lia Capitolina. The earliest coin commemorates the foundation. The coinage lasts as late as Hostilian. Ascalon strikes autonomous silver and bronze, including remarkable tetradrachms with the por- traits of Ptolemy Auletes, of his elder son Ptolemy XIV., and of his daughter Cleopatra. There is also money of Gaza of some import- ance, and of Joppa, both previously mints of the earlier Ptolenties.

of evidence would class them to Simon Maccabeus, to whom the right of coining was granted by Antiochus VII. The series is of shekels and half-shekels, of the weight of Phceenician tetradrachms and didrachms. The obverse of the shekel bears the inscription "the shekel of Isracl," and for type the pot of manna, or it may be a sacred vessel of the temple, above which is the initial of the word year, and the letter indicating the year of issue. The reverse reads " Jerusalem the Holy," and the type is a flowering branch, either Aaron's rod that budded ora native lily. The half-shekel differs in having the inscription "half-shekel" on the obverse. The types are markedly peculiar ; the obverse inscription is equally so, for the regular formula of the neighbouring cities would give nothing but the name of the city ; but the reverse inscription is like that of Tyre and Sidon, for instance, "of Tyre sacred and inviolable," of Sidon the same. This agreement is confirmatory of the assign- ment to Simon Maccabeus. This coinage bears the dates of years 1, 2, 3, 4 (rare), and 5 (one specimen only). 'There is

~~great diffi- culty as to the date. It may be reckoned from the beginning of Simon's actual rule (142 B.c.), or from that of his official rule, which is stated to have been used by the Jews as an era (141 8.c.), or from the decree of Antiochus VII. granting him the right of coinage (c. 140-139 B.c.). On the whole, the evidence in favour of the oflicial date is best. Any one of the three modes of dating would allow five annual issues. 'There is another explanation which must not be hastily dismissed. It may be that the computation is by sab- batical years, and the fact that there are two types of year 1 lends some colour to this supposition, though if it be admitted there would be a gap of six years between the first and second issues,~~

~~of Nineveh, which appears as a colonia with the name Niniva Claudiopolis. The money of Babylon struck by the usurpers Molon and Timarchus has been noticed under the Seleucids.~~

~~The coins of Africa are far less numerous than those of the other two continents, as Greek, Pheenician, and Roman civilization never penetrated beyond Egypt and the northern coast to the west. The series of Egypt is first in geographical order. been here assigned of a date anterior to Alexander. The old Egyptians kept their gold, electrum, and silver in rings, and weighed them to ascertain the value. During the Persian rule the Persian money must have been current, and the satrap Aryandes is said to have issued a coinage of silver under Darius I. In the papyri of this age the argenteus of the temple of Ptah is mentioned, and this has been thought to be a coin of Persian type generally assigned to Pheenicia. (Revillout, in Revue Eqyptologique.) With Alexander a regular Greek coinage must have begun, and some of his coins may be of Egyptian mints. With Ptolemy [. the great Ptolemaic currency begins which lasted for three centuries. The characteristics of this coinage are its splendid series of gold pieces and the size of the bronze money. The execution of the earlier heads~~

~~As yet no coins have Egypt.~~

~~EGYPT. |~~

~~is good; afterwards they become coarse and careless. At first the fine pieces were issued by the Pheenician, Cyprian, and other foreign mints, the Egyptian work being usuallyinferior. While the Seleucids were still striking~~

~~good coins, the Ptoleimies allowed their money to fall into barbarism in Egypt and even in Cyprus. 'he obverse type is a royal head, that of Ptolemy I. being the ordinary silver type, while that of Arsinoe II. was long but not uninterruptedly continued on the gold. 'The head of Zeus Ammon is most usual on the bronze coinage. A type once adopted was usually retained. Thus Ptolemy I., Arsinoe II., Ptolemy IV., Cleopatra I., have a kind of commemoration in the coinage on the analogy of the priesthoods established in honour of each royal pair. The almost universal type of reverse of all metals is the Ptolemaic badge, the cagle on the thunderbolt, which, in spite of variety, is always heraldic. For art and iconography this series is far inferior to that of the Seleu- cids. The weight after the carlier part of the reign of Ptolemy I. is Pheenician for gold and silver and either Attic or Egyptian for the bronze. The chief coins are octadrachms in gold and tetradrachms in silver, besides the abundant bronze money. Ptolemy I. appears to have issued his money while regent for Philip Arrhideus ; it only differs in the royal name from that of Alexander ; but as yet it has not been possible to separate Ptolemy's coinage from that of the other generals. He then struck money for Alexander IV. on the Attic standard with the head of Alexander the Great, with the horn of Ammon in the elephant's skin and Alexander's reverse. He soon adopted a new reverse, that of Pallas Promachus, and next lowered the coins to the Rhodian standard. This money ho continued to strike after the young king's death until he himself took the royal title, when he issued his own money, his portrait on the one side and the cagle and thunderbolt with his name as king on the other, and adopted the Phenician standard. This typein silver, with the inscription " Ptolemy the king," is thenceforward the regular cur- rency. He also issued pentadrachms in gold, and he or his successor octadrachms in silver. Ptolemy II. (Philadelphus), the richest of the family, continued his father's coinage, and, having acquired the cities of Phcenicia, struck money there with his father's title Soter, while the Egyptian coinage merely bore the title of king: the one was a commemorative coinage, the other, though bearing the portrait of Ptolemy I., was issued in the name of the reigning sovereign. Phil- adelphus probably began the issue of the gold octadrachms with the busts of Ptolemy I. and Berenice I., Ptolemy II. and Arsinoe II., and certainly struck beautiful octadrachms in gold and decadrachms in silver of Arsinoe II., the gold being long afterwards continued. The Pheenician octadrachms and tetradrachms are dated by the king's reign. Philadelphus~~

also began the great bronze issues of the system which includes the largest coin, sometimes exceeding 1400 grains in weight. Ptolemy III. (Euergetes I.) continued his father's coinages, after a while abandoning the dates in Pheenicia. He also struck fine gold octadrachms with his own portrait. His queen Berenice II., striking in her own right as heiress of the Cyrenaica and also as consort, but with the royal title only given to heiresses in the Ptolemaic line, issued a beautiful currency with her portrait, both octadrachms and decadrachms like those of Arsinoe, and a coinage for the Cyrenaica of peculiar divisions. Under Ptolemy IY. (Philopator) the coinage in its scantiness bears witness to the decline of the state, but the gold octadrachms are continued with his portrait and that of Arsinoe III. Ptolemy VY. (Epiphanes) still strikes octadrachms with his portrait, and begins the continuous series of the tetradrachms of the threc great cities of Cyprus, which, bearing regnal years, afford invaluable aid in the classing of his and the later coinages. Among thc money of the regency of Cleo- patra I. must be noticed a copper coin with her portrait. Contem- poraneously with it begins the series of Ptolemy VI. (Philometor), broken by the invasion of Antiochus IV. (Epiphanes). This and the moncy of Philometor's brother and successor Ptolemy Physcon are only remarkable for the many dates they bear, and so with the coin- age of succeeding kings, all showing a gradual degradation of art and ultimately a great debasement in metal. In the latest series, the money of the famous Cleopatra VII., it is interesting to note the Egyptian variety of her head, also occurring on Greek im- perial money and on that of Ascalon. In Egypt we have the best executed and one of the youngest portraits, and it shows that her face was marked by strong characteristics of acuteness and mobility rather than of beauty.

Under the Roman rule the imperial money of Alexandria, the coinage of the province of Egypt, is the most remarkable in its class for its extent and the interest and variety of its types; and it deserves a more careful study than it has received. It begins under Augustus and ends with the usurper or patriot Achilleus, called on his money Domitius Domitianus, overthrown by Diocletian, thus lasting longer than Greek imperial money elsewhere. In the earlier period there are potin coins continuing the base tetradrachms struck by Auletes, and bronze money of several sizes. The types are very various, and may be broadly divided into Greek, Graeco-Roman, and Greco-Egyptian. The Greco-Roman types have the closest analogy to those of

Rome herself ; the Greco-Egyptian are of high interest as a special class illustrative of the latest phase of Egyptian mythology.

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These native types do not immediately appear, but from the time of Domitian they are of great frequeucy. The money of Trajan, Hadrian, and Antoninus Pius is abundant and interesting. A coin of Antoninus, dated in his sixth year, records the beginning of a new Sothiac cycle of 1460 years, which happened in the emperor's second year (139 a.p.). The reverse type isa crested crane, the Egyptian bennu or phenix, with a kind of radiate nimbus round its head, and the inscription AION. Under Claudius II. (Gothicus) and thenceforward there is but a single kind of coin of bronze washed with silver. In this series we note the money of Zenobia, and of the sons of Odenathus, Vabalathus and Athenodorus.

Coins of the nomes of Egypt were struck only by Trajan, Hadrian, and Antoninus Pius. Their metal is bronze, and they are of different sizes. They were struck at the metropolis of each nome, and their types relate to the local worship, and so illustrate the Egyptian religion under a form modified by Greek influence. The inscrip- tions are the names of the nomes. There is an exceptional coin of the town of Pelusium.

Passing by the unimportant coinage of the Libyans, we reach the Cyrene.

interesting series of the Cyrenaica, the one truly Greek currency of Africa. 1t begins under the line of Battus (640-450 3.c.), and reaches to the Roman rule as far as the reign of Augustus. There are coins without the name of any city, which we may consider to be of the Cyrenaica generally, and others of Cyrene, Barca, Euesperides, and smaller towns. The weight of the gold always, and of the silver until some date not long after 450 B.c., is Attic; afterwards it is Phoenician, of the Samian variety. The ruling types are the silphium plant and its fruit, and the head of Zeus Ammon, first bearded then beardless. The art is vigorous, and in the transitional and fine period has the best Greek qualities. It is clearly an out- lying branch of the school of central Greece. The oldest coins are of the class which is without

the name of any city. So archaic are they that they may vie in antiquity with the first issues of Lydia and of Mgina, and date in the 7th century B.c. The money of Cyrene begins later, it may be a little before the fall of the kings in 450 B.c. It comprises a fine gold series of Attic staters with the types of the Olympian Zeus, more rarely Zeus Ammon, and a victorious quadriga. Barca hasa smaller coinage than Cyrene. It comprises a wonderful tetradrachm (Pheenician), with the head of Ammon bearded, boldly represented, absolutely full face, and three silphiums joined, between their heads an owl, a chameleon, and a jerboa. The money of Euesperides is less important. The Ptole- maic currency of the Cyrenaica has been already noticed.

Syrtica and Byzacena offer little of interest. Their coins are late bronze, first with Punic inscriptions, then in imperial times with Latin and Punic or Latin. Latin and Greek are used in the same coins at Leptis Minor in Byzacena.

In Zeugitana the great currency of Carthage is the last repre- Carthage.

sentative of Greek money, for, despite its Orientalism, its origin is Hellenic, and of this origin it is at first not unworthy. Its range in time is from about 400 B.c. to the fall of Carthage in 146 B.c. The earliest coins are Attic tetradrachms of the class usually called Siculo- Punic. It has been usual to consider these coins as having been wholly struck by the Carthaginians in Sicily, like the undoubted Sicilian money of their settlements there and those absolute imi- tations of Syracusan money which may be as reasonably classed to the island. But those who insist on the attribution of the whole so-called Siculo-Punic class to Sicily leave Carthage without any but a provincial coinage for at least half a century. It is far more reasonable to infer that the earliest coinage of Carthage was struck for the whole dominion, that with purely Sicilian types being limited to Sicily. The next issues are of gold and electrum and silver, degenerating into potin. The weights are extremely difficult. In the silver money the Phcenician standard is almost universal, and we note the drachm, didrachm, tetradrachm, hexadrachm, octa- drachm, decadrachm, and dodecadrachm. Coins are also found which appear to follow the Persic standard, unless they are octobols and their doubles. While the silver is thus explicable, the gold and electrum

~~money is very puzzling, and its very varying weights can only be explained by the theory that silver was the standard, and gold was constantly fluctuating in its relation. The earlier types are the horse or half-horse crowned by Nice and the date- palm, the head of Persephone and the horse and palm-tree, a female head in a cap, in splendid style, and a lion and a palm, and a head of young Heracles and a horse's head witha palm. It will be noted that the horse and the palm-tree are most constant. On the later coins the obverse is uniformly occupied by the head of Persephone and the reverse by the horse, sometimes with the palm, the horse's head and Pegasus being rare varieties. The bronze money imitates the later silver. The few inscriptions are extremely difficult. One that seems certain is NWN Np, the "new city," Carthage. The art of the earlier coins is sometimes purely Greek of Sicilian style. There is even in the best class a curious tendency to exaggeration, which gradually develops itself and finally becomes very barbarous. Roman Carthage has a bronze coinage which is insignificant. There are a few other towns which issued money with Roman legends, Utica, however, having first Punic and then~~

~~Numidia.~~

~~Oldest Roman money.~~

~~Gold and silver.~~

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~~Latin inscriptions. The denarii of Clodius Macer, who revolted in 68 A.D., are curiously illustrative of his policy, which was to restore the Roman republic.~~

~~The cities of Numidia have Punic inscriptions, and there are interesting coins of Juba I., his denarii presenting his portrait of a characteristic Libyan type. Of Mauretania there are civic coins, chiefly using Punic characters, and an interesting regal series, mainly denarii, of Bogud II., Juba IJ. with his consort Cleopatra, daughter of Mark Antony and the famous Egyptian queen, and of Ptolemy their son, the last of the great family of the kings of Egypt.~~

JI].—Romawn Corns.

The Roman coinage is of two great classes,—the republican, commonly called the family coinage, and the imperial ; the first lasted from the origin of money at Rome to the reform of Augustus in 16 B.c., and the second from this date to the fall of the Western empire in 476 A.D. The origin of the republican coinage is one of the hardest problems in archeology. The evidence of the money is at variance with that of the ancient writers, and in setting these aside we are at variance with the best authorities of our time ; but the general principles. of criticism must be maintained here as in other matters of early Roman story.

The oldest money of Rome was of bronze, and it is stated that it was first cast as ws rude. This statement is confirmed by the dis- covery of shapeless masses of bronze, evidently broken off from large quadrilateral masses, and then rendered of a roughly uniform weight. To the «s rude succeeded the ws signatwm, the stamped bronze. This step is attributed to Servius Tullius by ancient authority; it is said that he adopted the types of a sheep, ox, or pig; and large masses of bronze have been found which present animal types, in- cluding the pig. These are held to represent the coinage tradition- ally attributed to the regal age, though it is admitted that they are for the most part contemporary with the first circular money, the libral, the origin of which Mommsen dates about 450 n.c, All the masses, however, which bear a distinct type are clearly later than 300 B.c., as is proved by their style; and in the case of the elephant type we are forced, by the first appearance of the animal in Italy under Pyrrhus, to adopt a still later date. Moreover, the date of 450 n.c. is too early for the origin of circular money ; con- sequently the idea of any trace of the supposed regal coinage must be abandoned, though the late ingot may be descended from a currency intermediate between the zs rude and the libral circular money. The first regular Roman coinage consists of a series of cast pieces, the as of a pound weight, libral, and its chief divisions, the semis (half), triens (third), quadrans (fourth), sextans (sixth), and uncia (twelfth). The as was not cast of full weight ; the older specimens usually weigh from 11 to 9 uncie, on an average 10. The origin of this system is assigned by Mommsen to the decemvirs, on the ground of their legal institution, and particularly from the condition in the Lex Julia Papiria (430 n.c.) that fines should not be paid in cattle but in money.

Admitting the law to be correctly stated in its original form, it proves no more than that money was current in Rome. The libral coinage cannot, either in style or in types, possibly be much anterior to 350 B.c. It is easy to mistake barbarism for archaism, but a practised eye will sco that the types of these coins do not present a trace of archaisin, and are imitations of the types which originated in the latter part of the 5th century, and were in fashion in the fourth. The heads of Jupiter and the beardless Hercules are of this class. We must therefore suppose

that the fines were paid in metal by weight or in Greek money, °

which if it was bronze no doubt was also weighed.

At first there was no corresponding gold or silver, but the pound of bronze was held to be equal to a scruple of silver. Campanian gold and silver money with the name of the Romans or Rome was next struck to supply the want. The silver is of Greek weight, with types usually connected with Roman legend. Froin one of the earlier reverses being distinctly borrowed from the moncy of the Syracusan tyrant Agathocles, who began to reigu in 317 3B.c., we cannot date the first issue before about 300 3.c. The scanty gold in two or three groups is evidently of later dates ; it presents great metrological difficulties. The libral as fell in course of time from a weight of 10 to one of 8 uncie, and was at length reduced toa weight of 4, or that of a triens, and thus became triental. This is shown by the colonial coins of Italy to have occurred about 269 B.C., probably in that very year, when the silver coinage of Rome began. The dupondius (2 asses), tressis (3), and decussis (10) were now issued at Rome, also the semuncia (3 oz.) and the quadruncia (t 0z.). Casting was ultimately abandoned and all coins struck, and by about 254 B.c., or soon after, the triental system became sextantal ; the multiples of the as and divisions of the uncia now cease. The silver coinage was first issued in 269 B.c.; it consisted of the denarius of 4 scruples or 72 grains (72 denarii being struck to the pound), the quinarius of 2 scruples, and the sestertius of 1. As the old as libralis was equal to 24 triental asses, the new sestertius was equal to the as libralis ; as the coin was still in circulation this was inevitable, and the words sestertius and ces grave are uscd synony- mously. The relative value of silver to bronze being thus main-

~~tained, the silver sestertius was exchanged for the old as of 10 uncie, which was a real coin, whereas the new as of 4 uncie (tri- ental) was a mere token. The value in the bronze, X, was inscribed on the denarii instead of IV. The bronze money soon became a token currency. The victoriatus was issued in 228 B.c., not much after the denarius; it was of 3 scruples, or three-fourths of the heavier coin, and was intended to serve in the provinces for the Illyrian drachms of light Attic weight ; it could passat Rome. The first purely Roman gold money is that of Sulla, probably struck in Greece. Julius Cesar struck similar coins in 49 3.c. To Octavian is due the settlement of the gold coinage. In 217 B.c. the standard was reduced ; the denarius was struck at 80 to the pound, aud the as became uncial. The denarius remained stationary for nearly three centuries, and its purity was maintained. The fate of the divisions of the denarius is too complicated to be here noticed, but it may be remarked that in 104 B.c. the quinarius appeared with the type of the victoriatus, which had disappeared, but with its own mark Q. When the as fell from sextantal to uncial, the value changed from one-tenth to one-sixteenth of the denarius, but, as troops were still paid at 10 asses to the denarius, the X almost always appears as the mark of value on the silver piece. By this reduction the relation of silver to bronze fell to less than half the original value still current in accounts, and became 1 to 112. Thus the bronze money represented more than double its metal value. In 89 B.c. the semuncial as was introduced, and from 80 B.c. bronze coinage ceased until Augustus issued his new currency in that metal.~~

~~The Roman coinage was struck both in the city and elsewhere. Types. Consequently the Roman, Italian, and other issues must be care- fully discriminated. In the city the right of striking was dele- gated to the monetary triumvirs, who could coin individually or together, but asa rule they acted independently. The earlier bronze and silver coins have fixed types. The obverse types are—for the as the head of Janus Bifrons, for the semis that of Jupiter, the triens Pallas, the quadrans Hercules, the sextans Mercury, and the uncia Roma. The reverse type is always a prow. The marks of value are—for the as I, for the semis 8, and a certain number of balls equivalent to the value in ounces for the lower denominations.~~

~~The original types of the denarius were for the obverse the head of Roma with a winged helmet and the mark of value X behind, and for the reverse~~

~~the Dioscuri on horseback charging. In 100 Bc. a new type is introduced for the obverse, and a new reverse appears a century earlier, but the great abundance of types dates from 93 B.C. These are so characteristic that it is necessary to notice them particularly. The primary religious motive is to be traced in them as in the types of Greek money, but their having been selected to distinguish families instead of cities or peoples gives them a char- acter of their own. It is this character which ultimately rendered the introduction of contemporary portraits almost a matter of course. The subject of the obverse is usually the head of a divinity, or a personification, or a traditional or an historical personage, ultimately one living, and the reverse bears a mythological, syin- ? bolical, traditional, or historical subject.~~

~~The following are the chief classes to which the types may be reduced. :—~~

~~1. Head or figure of a divinity worshipped at Rome ; as head of Jupiter (fam. Petillia), figures of the Dioscuri (Junia) or of a divinity worshipped by the family or individual striking the coin, as head of Neptune (Pompeia, coin of Sextus Pompeius).~~

~~2. Sacred natural or artificial object ; as pontifical implements (Antonia). This class is not large ; sacred animals rarely occur.~~

~~3. Head or figure of a personification of a country or town ; as heads of Hispania (Carisia), Roma (Julia), Alexandria (Amilia),~~

~~4. Head or figure of an allegorical personage ; as heads of Pavor : (Hostilia), Pallor (id.), Honos and Virtus (Fufia, Mucia).~~

~~5. Fabulous monster ; as Scylla (Pompeia).~~

~~6. Head or figure of an ancestral personage ; as head of Numa (Calpurnia), Ancus Marcius (Marcia).~~

~~7. Events connected with ancestors ; as figure of Marcus Lepidus, as TVTOR REG{[IS], crowning Ptolemy Epiphanes (Aimilia).~~

8. Places connected with historical exploits, and of a votive character ; as pharos of Messene (Pompeia, of Sextus, probably) commemorating the sea-fight off Messene, 38 3.c.).

9. Symbolical representations of contemporary events; as a general welcomed on landing by a country or city (Minatia).

10. Heads of living personages exercising dictatorial power, or in very high authority ; as head of Sulla (Cornelia).

11. Representations connected with military matters ; as legion- ary standards (Antonia).

Besides the principal designs there are symbols and numerals, generally to be regarded as having been indicative of successive : issues from the mint. The inscriptions, which are in the nomina- tive, are usually on the obverse the name of the personage repre- sented and on the reverse the name of the person who issued the coin; the latter sometimes occurs on the obverse. Some of the most curious types strikingly illustrate Roman instinct. Being the choice of a multitude of persons of different families, they have an individuality lacking to the money of the Greek cities, which

Augustus.

IMPERIAL ROMAN. |

gave little choice to the coining authority or to the artist, and to the Greek royal coinages, which slipped speedily into heraldry. The family coins show a delight in recording the achievements of the house, and sometimes are so personal as to rank with modern medals, the spirit of which is even outdone in such a subject as Sulla's dream. With the Greeks the historical sense is latent until the age of the kings, and then does not pass beyond portraiture and at first a scanty symbolical commemoration of events; with the Romans, even before portraits are introduced, the desire to record events is intensely strong. Thus we have not only such legendary subjects as the rape of the Sabines and Tarpeia crushed beneath the bucklers, which may be classed with the Greek mythi- cal types, but also past historical events, as Marcus Amilius Lepidus crowning, Ptolemy Epiphanes, to whom he was

governor, and Paullus Mumilius raising a trophy, while Perseus, king of Macedon, and his two children stand before him, and also events of the present, as the reverse type of Brutus, the cap of liberty between two daggers with the inscription EID MAR, and on a piece of Sextus Pompey the pharos of Messene above a Roman galley and for reverse Scylla striking with a rudder. The special mythology and superstition of Rome is not less fully illustrated, as well as the coming in of Greek ideas, in such a manner that many types thoroughly Greek alternate with purely Roman ones. The art of the republican coins reflects that of contemporary Greek money, but is never equal to the better style of the late Hellenic issues.

The history of the imperial coinage is full of metrological diffi- culties. These arise from the conditions fixed by Augustus (16-15 B.C.), by which the emperor alone coined gold and silver, the senate alone bronze. Consequently the senate was wholly at the mercy of the emperor. Augustus struck the aureus at 40 to the pound, equal to 25 denarii at 84 to the pound. He introduced a new bronze coinage in two metals, the sestertius of 4 asses and dupondius of 2, both in fine yellow bronze (orichalcum), and the as semis and quadrans in common red bronze. The finer coins were struck on the standard of the as of a quarter of an uncia, the inferior ones on that of the half uncia. This gives the following proportionate values :—

coinage, which had long been quite irregular in weight, reduced the chief gold piece to yd of the pound, and issued the solidus, a piece destined to play a great part in commercial history. It was never lowered in weight, though many centuries later it was debased, long after it had become the parent of the gold coinages of Westerns and Kasterns alike throughout the civilized world. The index LX XII is sometimes found on the first solidi; and after 367 a.p., when the edict of Constantine was renewed, the Greek equivalent OB was constantly used. Under Constantius II. (360 A.p.) and Julian the silver denarius or argenteus was suppressed, and the siliqua of z{zth of the pound took its place. 'The follis having been withdrawn by Arcadius and Honorius, was reissued a century later by Zeno, with XL to

~~indicate the value of 40 denarii. It will be seen that a fuller system of bronze was originated by Ana- stasius, the Byzantine emperor.~~

~~Under Augustus the Roman monetary system became the official Provin- standard of the empire, and uo local mint could exist without the cial Thus the Greek imperial money is strictly mints.~~

~~imperial licence. Roman money coined in the provinces, with the legends and types of the towns. Many cities were allowed to strike bronze, several silver, and one, Cesarea in Cappadocia, gold. The silver becomes limited about Nero's time, but lasts under the Antonines. A fter- wards there are a few currencies of base metal. The bronze in- creased in mints and quantity in the second century, but, through the dcbasement of the Roman silver, one city after another ceased to strike about the middle of the third. Only Alexandria and Antioch survived by following the tactics of Rome with their own base metal coins. Purely Roman gold and silver was coined in certain of the provinces, in Spain and Gaul, and at the cities of Antioch and Ephesus. When the base silver had driven the Greek imperial bronze out of circulation, Gallienus established local mints which struck in pure Roman types. Diocletian increased the number of these mints, which lasted until the fall of the empire of the West, and in the Kast longer. These mints were, with others added later, Londinium (or Augusta), Camulodunum, Treviri, Lugdunum, Arc- late (or Constantina), Ambianum, Tarraco, Carthago, Roma, Ostia, Aquileia, Mediolanum, Siscia, Serdica, Sirmium, Thessalonica, Con- stantinopolis, Heraclea, Nicomedia, Cyzicus, Antiochia (ultimately~~

~~eos cae ee so Theapolis), and Alexandria. A few were speedily abandoned. 1 7 98 56 The obverse type of the imperial coins is the portrait of an Types 1 9 imperial personage, emperor, empress, or Cesar. It begins under and~~

~~The as is nearly equal in size and weight to the dupondius, but is distinguished by its metal and inferior fabric. All the bronze bears the letters 8.C., senatus consulto. Emperors not acknowledged by the senate are without bronzc money ; thus we have no specimens of Otho or Pescennius Niger.~~

~~Julius Cesar, though the republican money goes on under Augustus, inscrip- in whose reign the privileges of the moneyers ceased. The type tions.~~

~~only varies in the treatment of the head or bust, — if male, laureate, radiate, or bare; if female, sometimes veiled, but usnally bare. The reverse types of the pagan period are mythological of divinities, allegorical of personifications, historical of the acts of the emperors.~~

~~Changes Neroreduced the aureus to ¢,th of the pound, and the denarius to | Thus the coins of Hadrian, besides bearing the figures of the chief under gth, its purity being officially redneed. Under Trajan there was a | divinities of Rome, commemorate by allegorical representations of later em- further debasement of the denarius. Marcus Aurelius fixed the | countries or cities the emperor's progresses, and by actual repre- perors. aureus, which had recovered its weight, at qsth of the pound; the | sentations his architectural works. The inscriptions are either~~

~~denarius had already been further debased, and under Septimius Severus it was half alloy. Caracalla introduced a new coin, called after him the argenteus Antoninianus. It was struck at 7th to ath of the pound, and seems to have been originally a double denarius struck on a lower standard. The characteristic of this coin is that the head of the emperor is radiate as Sol, that of the empress on a crescent as Luna. Under Elagabalus the taxes were paid in gold alone ; this was ruinous, for the treasury paid in debased silver at nominal value, which had to be used to purchase gold by the taxpayer at real value. Under Severus Alexander there was the latest large issue of denarii and sestertii. 'The senate made another effort to continue a bronze currency by striking under Philip the large bronze quinarius or Philippus ereus, while the base metal argenteus had become a piece of bronze washed with silver. At length in the time of Gallienus the argenteus contained no silver whatever. Aurelian (270-275 a.D.) attempted a reform of the coinage by which the previous coin was reduced from its nominal to its intrinsic value. The coins were now of tinned bronze and marked with their real value, 20 or 21 denarii of account, the signs X XI, KA (Greek), and XX being used as indexes of value. These coins replace at once the base silver and the bronze, which now disappear. The moneying right of the senate had become illusory by the deprecia- tion of silver, which had ceased to have~~

~~any real value. Aurelian entircly suppressed this right ; Tacitus and Florian restored it for a~~

~~simply descriptive, such as the emperor's names and titles in the nominative on the obverse, or partly on the obverse and partly on the reverse, and the name of the subject on the reverse; or else they are dedicatory, the imperial names and titles being given on the obverse in the dative and the name of the type on the reverse. Sometimes the reverse bears a directly dedicatory inscrip- tion tothe emperor. The inscriptions on the carlier imperial coins from Tiberius to Severus Alexander are generally chronological, usually giving the current or last consulship of the empcror and his tribunitian year. In the latter part of the third century the mints are indicated by abbreviations in the exergue of the reverse, with also the number of the issue. There are sometimes signs of value in the field of the reverse. These characteristics apply to the pagan empire ; under the Christian empire there are modifica- tions, mainly in the character of the reverse types. These are generally allegorical and free from pagan intention, though their source is pagan, as in the common types of Victory. Purely Christ- ian types are rare. The most remarkable is the Christian mono- gram formed of the Greek letters XP. The inscriptions are simpler, and in the reverses necessarily show the same change as the types. Of great interest is the inscription HOC SIGNO VICTOR ERIS, on coins dating not long after the victory of Constantine over Licinius. There is some variety in both types and inscriptions, but little that is absolutely new.~~

~~few ycars, after which the 8.C. disappears from the coinage. The reform of Aurelian caused an outbreak at Rome which was of a serious character, but it was maintained by him and by Tacitus.~~

~~The art of Roman imperial coins, although far inferior to that Art of | of Greek, is well worthy of study in its best ages, for its intrinsic imperial | merit, for its illustration of contemporary sculpture, and on account coins.~~

~~Aurelian also suppressed all local mints but Alexandria. the work of Diocletian to restore the issue of relatively pure money in the three metals. Before 293 a.p. the coinage of silver recom- mences with the denarius of the standard of Nero, ;/;th of the pound, marked with the figures XCVI. Between 296 and 301 a.p. two tinned bronze coins were struck, the follis~~

~~and the centenionalis. The follis was marked X-XI, like the similar but very much smaller coin of Aurelian. The denarius was the unit of reckoning. Constantine, probably in 312 a.p., desiring to rectify the gold~~

~~It was |~~

~~of the influence it exercised on medieval and modern art. These coins were first designed under the revival of Greek art, during the influence of the New Attic school. The Romans had properly no art of their own. Their greatest temples and the statues of their gods were copies or imitations by Greeks of Greek originals, besides such earlier statues as were brought from Greece. The Greeks who were first called in to work for their masters were the artists of a school which was emphatically imitative, not in any way inventive, and their successors were debased by the false taste of their patrons.~~

~~Byzan- tine em- pire.~~

~~654 NUMISMATICS5 [BYZANTINE.~~

~~There is a marked inferiority in the Roman coinage to the Greco- Asiatic work of the same times. With a tendency to follow the dramatic styles, the artists who worked at Rome had power enough to produce fine and highly characteristic portraits, of which the famous bust, miscalled Clytie, is the most striking example. Thus, though the grandeur and the purity of design and execution of the older masters are gone, we have in their place a strikingly faithful portraiture, which is deeply gratifying to the historical sense. The best age is the Augustan, which may be said to last through the rule of the Claudian emperors, and is decidedly under New Attic influence. This is succeeded by the second, that of the Antonines, from Trajan to Commodus. The Augustan work is larger and more refined, that of the Antonines more elaborate and laborious. Then follows a swift decline, with a temporary revival in the age of Diocletian and Constantine, when an attempt, neces- sarily weak, was made to improve the art of the coins; thence- forward it slowly declined. In the Augustan age two manners may be recognized, the Greek and the Greco-Roman, the one repeating earlier works, the other portraying living persons and events. Under the Antonines we notice, as a distinct reaction against the poor idealism of the age, which~~

~~even occasionally endeavoured to treat portraits in an ideal style, a vigorous realism which looks like the actual parent of the Italian Renaissance in its classical phase. Midway between these stands the realistic style of the age. Among the finest examples of art in the Roman coinage are the portraits of Livia as Pietas, Justitia, and Salus, and that of the elder Agrip- pina. For stern realism the head of Nero is most remarkable, the growth of whose bad passions may be seen in the increasing brutality of his features and expression. The medallion series is full of charming subjects, though when they have been treated by Greek artists of earlier ages the contrast is trying .; the most satisfactory are the representations of older statues; the purely new composi- tions are either poor inventions, or have a theatrical air that removes them from the province of good art.~~

~~III.—Mzpiavau AND MopErn Corns oF EUROPE.~~

~~The period of the medieval and modern coins of Europe must be considered to begin about the time of the fall of the Western empire, so that its length to the present day is about 1400 years. It is impossible to separate the medieval and modern coins, either in the entire class, because the time of change varies, or in each group, since there are usually pieces indicative of transition which display characteristics of both periods. The clearest division of the subject is to place the Byzantine coinage first, then to notice the characteristics of its descendants, and lastly to sketch the monetary history of each country.~~

~~The Byzantine moncy is usually held to begin in the reign of Anastasius (491-518 4.p.), The coinage is always in the three metals, but the silver money is rare, and was probably struck in small quantities. Atfirst both the gold and the silver are fine, but towards the close ofthe empire they are much alloyed. The gold coin is the solidus of Constantine, with its half and its third, the so-called semissis and tremissis. The chief silver coin was the miliarision, of a lower weiglit than the solidus, and its half, the keration. Heraclius, in 615 A.D., coined a larger piece, the hexagram, weighing 105 grains. This coin was discontinued, and afterwards the miliarision and keration were coined until the conquest of Constantinople by the Latins. The silver money of the restored Greek empire is obscure. In 498 Anastasius introduced a new copper coinage, bearing on the reverse, at and~~

~~about his time, the following indexes of value as the main type: M, K, I, E, A, I, B, and A, or 40 nummi, 20, 10, 5, 4, 3, 2, and 1. These coins bear beneath the indexes the abbreviated name of the place of issue. Justinian I. added the regnal year in 538 A.D., his twelfth year. The money of this class presents extraordinary variations of weight, which indicate the condition of the imperial finances. The Alexandrian coins of this class begin under Anastasius and end with the capture of the city by the Arabs. They have two denominations, iB and §, or 12 and 6, and there is an isolated variety of Justinian with AI (33). The Alexandrian bronze never lost its weight, while that of the cm- pire generally fell, and thus some of the pieces of Heraclius, while associated with his sons Heraclius Constantinus and Heracleonas, have the double index IB and M. The Vandals of Carthage had a peculiar double system of their own with the indexes XLII, XX, XII, and III. Under Basil I. the bronze money appears to have been reformed, but the absence of indexcs of value makes the whole later history of the coinage in this metal very difficult. There was one curious change in the aspect of the money. Early in the 11th century the solidus begins to assume a cup-shaped form, and this subsequently became the shape of the whole coinage except the smaller bronze pieces. These novel coins are called nummi scyphati. The types, except when they refer simply to the sovereign, are of a religious, and consequently of a Christian character. This feeling increases to the last. Thus, on the obverse of the earlier coins the emperors are represented alone, but from about the 10th century they are generally portrayed as aided or supported by some sacred personage or saint. On the reverses of the oldest coins we~~

~~have such types as a Victory holding a cross, but on those of later ones a represeutation of Our Saviour or of the Virgin Mary. Sub- sequently some allegorical religious types are introduced, as that of the Virgin Mary supporting the walls of Constantinople. The principal inscriptions for a long period almost invariably relate to the sovereign, and express his name and titles. The secondary inscriptions of the earlier coins indicate the town at which the piece was struck, and, in the case of the larger bronze pieces, the year of the emperor's reign is also given. From about the 10th century there are generally two principal inscriptions, the one relating to the emperor and the other to the sacred figure of the reverse, in the form of a prayer. The secondary inscriptions at the same time are descriptive, and are merely~~

abbreviations of the names or titles of the sacred personages near the represcnta- tions of whom they are placed. From the time of Alexius I. (Comnenus) the principal inscriptions are almost disused, and descriptive ones alone given. These are nearly always abbre- Viations, like the secondary ones of the earlier period. The lan- guage of the inscriptions was at first Latin with a partial use of Greek; about the time of Heraclins Greek began to take its place on a rude class of coins, probably local; by the 9th century Greek inscriptions occur in the regular coinage ; and at the time of Alexius I. Latin wholly disappears. The Greek inscriptions are remarkable for their orthography, which indicates the changes of the language. Of the art of these coins little need be said. It has its importance in illustrating contemporary ecclesiastical art in the West, but is generally inferior to it both in design and in execution.

Besides the regular series of the Byzantine empire, in which we Cognate include the money assigned to the Latin emperors of Constantinople, groups. there are several cognate groups connected with it, either because of their similarity, or because the sovereigns were of the imperial houses. There are the coinages of the barbarians to be next noticed, and the money of the emperors of Nicea, of Thessalonica, and of Trebizond. The last group consists of small silver pieces, which were prized for their purity ; they were called Comnenian aspers (dopa Kouvyjvara), the princes of Trebizond having sprung from the illustrious family of the Comneni.

The coinage of the other states of Christian Europe will be best Periods

understood if we view it generally in successive periods, afterwards of other more particularly describing the currencies of the chief countries. Euro- The periods have been well defined as—(1) transitionary period, pean from Roman to true medieval coinage, from the fall of Rome (476) coinage. to the accession of Charlemagne (768) ; (2) true medieval age, dur- ing which the Carlovingian money was the currency of western Europe, from Charlemagne to the fall of the Swabian house (1268) ; (3) carly Renaissance, from the striking of the florin in Florence (1252) to the classical Renaissance (1450); (4) the classical Renais- sance, from 1450 to 1600 ; (5) the modern period. (C. F. Keary in the Antiquary, 1883.)

1. The Roman money was adopted and imitated by the barbarian Transi- conquerors of the empire. They struck in gold, silver, and bronze, tional ; gold being the favourite metal. The names of the kings soon appear upon the silver and bronze, but the gold money is at first a copy of the Byzantine, then monograms of kings appear, and at last their names in full save when the money in the Frankish series is of civic issues. The currencies of this period are those of the Ostrogoths in Italy, the Vandals in Africa, the Visigoths'in Spain, the Franks in Gaul, and the Lombards in Italy. The most im- portant coinages of this age are of gold.

2. The inconvenience of gold money when it represents a very Media-

large value in the necessaries of life must have caused its abandon- val ; ment and the substitution of silver by the Carlovingians. The denier (denarius) or penny of about 24 grains was at first practically the sole coin. The solidus in gold was struck but very rarely, perhaps as a kind of proof of the right of coining. The Byzantine solidus or bezant was used and probably the equivalent Arab gold. The Arab silver piece, the dirhem, was almost exactly the double of the denier, and seems to have been widely current in the north. The new coinage spread from France, where it was first royal and then royal and feudal, to Germany, Italy, where the Byzantine types did not wholly disappear, England, Scandinavia, Castile, and Aragon. In Germany and France feudal money was soon issued, and in Italy towns and ecclesiastical foundations largely acquired the right of coinage from the empire, which was elsewhere rare. The consequence of the extended right of coinage was a deprecia- tion in weight, and in the middle of the 12th century the one-sided pennies called bracteates appeared in Germany, which were so thin that they could only be stamped on one side. The types of this whole second coinage are new, except when the bust of the emperor is engraved. The most usual are the cross; and the church asa temple also appears, ultimately taking the form of a Gothic build- ing. There are also sacred figures, and more rarely heads in the later age.

3. The true herald of the Renaissance was the emperor Frederick II. Of early In restoring the gold coinage, however, he followed in the steps of Renais- the Norman dukes of Apulia. With a large Arab population, these sance ;

FRANCE. |

princes had found it convenient to continue the Oriental gold money of the country, part of the great currency at that time of all the western Moslems, and Roger II. also struck Latin coins of his own as DVX APVLIAE, the first ducats. Frederick II., continuing the Arab coinage, also struck his own Roman gold money, solidi and half solidi, with his bust as emperor of the Romans, Cwesar Augustus, and on the reverse the imperial eagle. But the calami- ties which overwhelmed the Swabian house and threw back the Renaissance deprived this effort of any weight, and it was left to tke great republics to carry out the idea of a worthy coinage,—a necessity of their large commercial schemes. The famous gold florin was first issued in 1252. The obverse type is the standing figure of St John the Baptist, the reverse bears the lily of Florence. The weight was about 54 grains, but the breadth of the coin and the beauty of the work gave it dignity. The commercial greatness of Florence and the purity of the florin caused the issue of similar coins in almost all parts of Europe. Venice was not long in striking (in 1280) a gold coin of the same weight as the florin, but with the types of a standing figure of Christ, and the doge receiving the gonfalon at the hands of St Mark. It was first called the ducat, the name it always bears in its inscription ; later it is known as the zecchino or sequin. Though not so largely imitated as the florin, the extreme purity of the sequin was unquestioncd toa time within the memory of living persons. Genoa likewise had a great gold currency, and the other Italian states struck in this metal. It is significant of the power of the Italian republics that the later Mameluke sultans of Egypt found it convenicnt or necessary for their position between Europe and India to adopt the weight of the florin and sequin for their gold money. Many varieties of gold money appear in course of time in France, England, and toa less extent in other countries. The nced for a heavier silver coinage caused the issue of the large denier (grossus denarius), afterwards called the gros and groat. This coin appears in the 14th century, and at the same time the large German bracteates are issued. The types are now very various and distinctly worthy of the art of the time, which as yet is purely decorative and conventional, so that portraits are not possible. The religions intention also is gradu- ally giving way to the desire to produce a beautiful result, and the symbol of the cross is varied to suit the decorative needs of the coin. Heraldic subjects also appear, and in the shield, which is frequently a reverse type, we see the origin of the usual modern

a finer style but one especially adapted to coins or medals. The object which the artists strove to attain was to present a portrait or to commemorate an action in the best manner possible, without losing sight of the fitness of the designs to the form and use of the piece on which they were to be placed. For the successful attain- ment of this purpose the style of the later pre-Raphaelites was eminently suited. Its general love of truth, symmetrical group- ing, hard drapery, and severely faithful portraiture were qualities especially fitted to produce a fine portrait and a good medal. It is to be noted that their idea of portraiture did not depend on such a feeling for beauty as influenced the Greeks. Rather did it set upon it the moral attainments and capabilities of the subject. The German art, a product of engravers in metal, is really goldsmith's work, except in Albert Diirer's case. Thus it is not so suitable to numismatic designs. The portraits of the German coins and medals are sometimes even more characteristic than those of the Italian, and the groups often show great vigour ; but both are less appropriate. They display also too great a profusion of detail, by which the effect of the boldness of the outlines is frequently lost ; yet they have much originality and vigour, and will reward an attentive study. Both these schools, but especially the Italian,; afford the best foundation for a truly excellent modern medallic art. The finest coins and medals of Italy and Germany have an object similar to that which it is sought to fulfil in the English, and their nearness in time makes many details entirely appropriate. Thus, without blindly imitating them, modern artists may derive from them the greatest aid.

There are some delicately beautiful Italian medals of the 16th century, too closely imitated from the Roman style.

It is not intended here to enter in any detail into the various divisions of the subject already treated in its main outlines. The questions that would require consideration are of too complicated and technical a nature to be illustrated within reasonable limits : the principal matters of inquiry may, however, be indicated.

~~The money of the Iberian Peninsula begins with the Visigothic Portu-~~
~~series, which consists of gold pieces. The money of Portugal is gal. regal,~~
~~and not of great interest except as affording indications of the wealth and~~
~~commercial activity of the state in the early part of the 18th century. The~~
~~coinage of Spain is almost without excep- Spain.~~

~~reverse of the most important coins.~~

~~4, 5. With the classical Renaissance we find ourselves in the eal Re-~~
~~presence of modern ideas. The elaborate systems of coinage of the naiss-~~
~~various states of Europe are soon to begin, and the prevalence of a ane, and~~
~~general currency to become for the time impossible. Silver money~~

~~Of classi-~~

~~Modern. now gains new importance with the issue of the thaler or dollar in~~

~~Germany, in 1515. This great coin speedily became the chief Euro- pean~~
~~piece in its metal, but as it was coined of various weights and varying purity~~
~~it failed to acquire the general charaeter of the denier. 'The style of this age~~
~~is at first excellent. The medals gayc the tone to the coinage. Art had wholly~~
~~thrown off the rules of the age before and attained the faculty of portraiture~~
~~and the power of sunply representing objects of nature and art. Great~~
~~masters now executed medals and even coins, but speedily this work~~
~~became a mere inatter of commerce, and by the beginning of the modern~~
~~period it was fast falling into the poverty and barbarism in which it has ever~~
~~since remained. The details of the numismatics of these two periods belong~~
~~to the notices of the money of the several countries.~~

~~Moneyof A word must be added on money of account. While the denier~~
~~aeeount. was the chief and practically the sole coin, the solidus passed from~~

~~Art.~~

~~use as a foreign piece into a money of account. The solidus was the German~~
~~schilling (shilling), which contained usually 12 deniers. As there were 20~~
~~shillings to the pound of silver, we obtain the reekoning by £s. d., libri,~~

~~solidi, and denarii. The pound as a weight contained 12 ounces, and its two-thirds was the German mark of 8 ounces.~~

~~It would be interesting, did space permit, to notice fully the art of this entire class, to examine its growth, and to trace its decline, but, as with that of Greek and Roman coins, we must mainly limit ourselves to the best period. This is a spaec of about a hundred and fifty years, the age of the classical Renaissance, from the middle of the 15th century to the close of the 16th. The finest works are limited to the first half century of this period, from a little before 1450 to about 1500, in Italy, and for as long a time, beginning and ending somewhat later, in Germany. 'The artists were then greater than afterwards, and medal-making had not degenerated into a trade; but with the larger production of the period following the work was more mechanical, and so fell into the hands of inferior men. The medals of this first period may not unworthily be placed by the side of its sculpture and its painting. Not only have some of its medallists taken honourable places in a list where there was no room for ignoble names, but to design medals was not thought an unworthy occupation for the most famous artists. There are, as we should expect, two principal schools, the Italian and the German. The former attained a higher excellence, as possessing not merely.~~

~~tion regal, but a more curious class than that of Portugal. The coins of the early contemporary kingdoms, such as those of Aragon, and of Castile and Leon, are especially worthy of examination. We may mention as of a very peculiar character a large gold piece in the coinage of the latter state, called the Dobla de la Vanda, from its bearing the shield of the famous order of knighthood of the Vanda or Band. Of this there are examples assigned to John I. (1379-90) and John II. (1406-54). The money of the sole monarchy is less worthy of notice. The city of Barcelona is represented by coins bearing the names of various kings. The medals of Spain are not important.~~

~~The coinage of France forms a large series. It begins with the France.~~

~~money of the Merovingian dynasty. 'This consists almost wholly of gold pieccs, imitated from those of the late Roman and Byzan- tine rulers, as already mentioned, the commonest denomination being the tremissis, or third part of the son d'or (solidus). The coins are rare, and bear cither the names of a king and a city or of a moneyer,and acity. They are barbarous in~~

their art. Under the princes of the Carlovingian dynasty the principal coins are deniers, and after a time oboles also, gold money being extremely rare. They bear the name of the king and that of the city where they were struck, and have a more original character than the carlier pieces, although they are still barbarous. The moncy of the Capetian house begins with coins like those of the line preceding it. By degrees the coinage improves. In the 13th century gold pieces were issued. There are several denominations of these and of silver coins, but to some different names are applied for various types with the same weight, as the denier Parists of Paris, and the denier Tournots of Tours, both of base metal. At the time of Philip VI. the coins are fine. The modern coinage may be con- sidered to begin under Henry II., whose portrait is of good work. During this period there is no very remarkable feature in the current money, except the occurrence in the 17th century of the pieces of the sort termed pied fort, which we must regard as a kind of pattern. The scignorial coins of France during the Middle Ages are important. The medals are far more interesting than the modern coins. Their interest begins in the age of the last Valois kings and Henri IV.; there is a long and historically important series of Lonis XIV., and another of a new artistic character under the first republic and the reign of Napoleon I. Almost every great event, from the beginning of the power of that cmperor until his

England,

fall, is commemorated in this last series, unequalled in its class for | include works by Warin, the Simons, and the Roettiers, besides the

completeness. The designs, notwithstanding their false classical style and that manncrism which appears to be essential to modern French art, are executed with great care and skill.

The English coinage begins with two uncertain classes, which, wherever struck, certainly formed the currency of the country during the interval from the departure of the Romans, about 450 A.D., until the issue of money with royal names by the Saxon kings, towards the end of the 8th century. One of these classes con- sists of imitations of the latest Roman copper money, and

the other of the small silver pieces to which the name of sccattas is applied, having rude types which are sometimes of Roman origin, but some- times original, and occasionally with Runic inscriptions. The former were first issued and then the latter. The regular coinage begins no doubt under the so-called Heptarchy. There is moncy of the king- doms of Mercia, Kent, the East Angles, and Northumbria. The chief coins are silver pennies, but sceattas also occur; and of Northumbria there are stycas, which are pieces of a base metal in the composition of which copper is the largest ingredient. The most interesting coins of this group are those of Offa, king of Mercia ; these are silver pennies, remarkable for their quaint designs and their relatively careful execution. Of this period, but extending into the earlier part of that of the sole monarchs, there are coins issued by the archbishops of Canterbury and York. The money of the sole monarchs, whether Saxons or Danes, is strictly a continuation of that of the Heptarchy ; it consists almost wholly of silver pennies, which latterly were cut into halves and quarters to form halfpennies and farthings. Under the Normans and earlier Plantagenets the same coinage continues ; but under Edward III. there is regular gold money, of which the chief piece is the noble of six shillings and eightpence ; and the silver groat now appears. The obvcrse type of the noble, representing the king in a ship, probably com- memoratcs Edward's victory over the French fleet off Sluys in 1340. At this time there is a visible improvement in the art of the coin- age, which moves with the succession of styles until the close of the Tudor age. Of Henry VIII. we have gold and silver coins of most existing denominations, as well as of earlier ones long since abandoned. The finest piece is the sovereign, a large flat coin of gold, bearing on its obverse the figure of the king (whence its name) on his throne. The reign of Queen Elizabeth marks the transition from the Gothic to the modern style and the introduction of the new mnethod of coining with the use of the mill. The coinage of Charles I. presents great varieties owing to the civil war. The scarcity of gold in the royal treasury during the troubles induced the king to coin twenty- and ten-shilling pieces of silver, in addition to the crowns and sinallcr denominations. One of the most remark- able of his pieces is a crown struck at Oxford. It bears on the obverse the king on horseback, with a representation of the town beneath the horse, and on the reverse the heads of the " Oxford Declaration." Of equal interest are the siege-pieces of many castles famous in the annals of those days. The coinage of the Common- wealth is of a plainncss proper to the principles of

those who sanc- tioned it. The great Protector, however, caused money to be designed of his own bearing his head. It is not certain that this was ever sent forth, and it is therefore put in the class of patterns. Simon, the chief of English medallists, designed the coins which are unequalled in the whole series for the vigour of the portrait (a worthy presentment of the head of Cromwell) and the beauty and fitness of every portion of the work. Henceforward there is a decline in the coinage, although skill is perceived in the portrait of William III., whose grand features could scarcely have failed to stimulate an artist to more than a common effort. Queen Anne's money is also worthy of note, on account of the attempt, on Dean Swift's suggestion, to commemorate current history on the copper coinage, which led to the issue of the famous farthings. These have been the cause of an extraordinary delusion, to the effect that a very small number (some say three) of these pieces were struck, and that their value is a thousand pounds each, instead of usually some shillings. In consequence many imitations have been forged, and such are constantly brought to collectors by unfortunate labourers and the like, who imagine that they possess the greatest numis- matic treasure in the world. After this there is little to remark, except the baseness of the art of the coins under the first three Georges, until the genius of Pistrucci gave a worthier form to the currency. Besides the regal coinage there is scarcely any baronial money, the class being represented by a few pieces, generally struck by personages of the royal house, and all belonging to the period of the close of the Norman line and the beginning of the Plantagenet.

The English medals are far more interesting for their bearing on events than as works of art. The best are almost all by foreigners, but the fine pieces of the Simons form notable exceptions. The medals of the Tudors are good in style, and show some excellent portraits, in particular those by Trezzo and Stephen of Holland. There is one of Mary Queen of Scots by Primavera, representing her in middle life, which is perhaps her most characteristic portrait. Elizabeth's are of historical importance, and the same is the case with the richer series of the Stuart period, often of fine style. These

excellent coin engravers Briot and Rawlins. The most curious pieces are those popular issues relating to current events, such as the so-called " Popish plot." From this time there are no works deserving notice except

military and naval medals, the historical interest of which makes some amends for their poverty of design and execution. The English tokens form a curious class. They are of two periods: the earlier, which are generally of copper, were issued at the middle of the 17th century and somewhat later; the later, which are mainly of copper, were struck during the scarcity of the royal coinage in this metal at the end of the last century, and during the earlier years of the present century. Both were chiefly coined by tradesmen, and bear their names. The colonial money of England was until lately unimportant, but now it is not unworthy of the wealth and activity of the dependencies. The money struck by the English kings for their French dominions forms a peculiar class, mainly French in its character, termed the Anglo- Gallic. This may be used to fill some gaps in the regal series of England ; for instance, it supplies us with money of Richard I., of whom no English coins bearing his name are known.

The coinage of Scotland is allied to that of England, although Scot-

generally ruder ; but it seems to have been more influenced in the land. early period from England, and towards its close from France. The oldest pieces are silver pennies or sterlings, resembling the contemporary English money, of the beginning of the 12th century. In the 15th and 16th centuries there is an important coinage, both in gold and silver, not the least interesting pieces being those of Queen Mary, many of which bear her portrait. The indifferent execution of the coins of this period is traceable to the disturbed state of the kingdom.

The money of Ireland is more scanty and of less importance than Ireland. that of Scotland. The pieces most worthy of notice are the silver pennies of the early Danish kings. Of later times there is little that is interesting, except the forced currency of James IJ. during his attempt to maintain himself in the island.

Belgium occupies the next place in our arrangement. Its coin- Belgium

age comprises many pieces struck by foreign rulers, and has little and of an independent character in either the regal or the seignorial class. Holland. It closely resembles the money of France and Germany. The series of Holland is similar in character until the period of the revolt of the provinces. The

medals are highly interesting, more especially those which were struck by the Protestants in commemoration of current events. Most of these are of silver, but a few are in gold. There is also a remarkable series of bronze medallets or jettons, which form a continuous commentary on history during the 16th and early part of the 17th centuries. Both are interesting, as largely illustrating not only local events but also those of the chief Euro- pean states. Such are the i recording the raising of the siege of Leyden, likened to the destruction of Sennacherib's army, the assassination of William the Silent, and the discomfiture of the Armada, affording striking indications of the zeal, the piety, and the confidence in the right which built up the great political struc- ture of the Dutch republic. After this time the medals lose much of their interest.

The money of Switzerland illustrates the varying fortunes of Switzer- this central state, and the gradual growth of the stronghold of land. European freedom. First we have the gold money of the Frankish kings, among whose mints Basel, Lausanne, St Maurice, Sitten (Sion), and Zurich already appear. The silver deniers, which Charle- magne made the coinage of the empire, are issued by fewer mints ; the dukes of Swabia struck coins in Switzerland, and the empire granted during the 10th and to the 13th century the right of coinage to various ecclesiastical foundations, bishoprics, and abbeys. Bern and Zofingen were allowed mints by the emperor Frederick II., and the civic coinage of Switzerland then began in the period of the bracteates. Other towns gained the same right, as well as the counts of Kyburg, Hapsburg, &c. The 14th century witnessed the | rise of the Swiss confederation, and by degrees the cantons struck their own money. These, together with the coins of some few sees and abbacies, form the bulk of Swiss money of the medizval and modern periods. The separate cantonal coinage, interrupted by the French occupation, was finally suppressed in 1848, when a uni- form currency was adopted by the whole republic. The monetary systems of the cantonal and ecclesiastical mints were extremely com- plicated. This was partly due to the variety of coins, partly to the debasement practised by the ecclesiastical mints. Geneva had a peculiar systein of her own.

The most interesting coinages are thosc of Basel (the see, can- ton, and city), Bern, a large series, the see of Chur, the abbey of St Gallen, the great

~~issue of Geneva (the bishopric, the city, and the canton), the see of Lausanne, Lucerne, the Forest Cantons, the bishopric of Sitten, and the long currency of Zurich. Some of the earlier large coins of the Middle Ages, particularly thalers, are interesting for their bold work and their sacred and heraldic sub- jects. Throughout the Swiss series we are awakened to a higher than archeological sentiment by the traditions and records of two great periods, the age when the Irish missionaries planted the~~

~~Modern~~

~~ITALY. |~~

~~faith in the wild valleys of the Alps, and the days when the cantons fought for freedom and smote their powerful oppressors on every side. The medals of Switzerland are mostly of modern times, and lack beauty and historical value.~~

~~Italy, with Sicily, has peculiarfeatures. Here the barbaric coinages~~

~~Italy and were mixed with the Byzantine issues which marked the recovery~~

~~Sicily.~~

~~of the Eastern empire, and left a lasting influence in the north at Venice, and in the south at Beneventum. Later the Arab conquest left its mark in the curious Oriental coinages of the Normans of Sicily and the emperor. Frederick II., mixed after his fashion with Latin coinage. The earliest money is that of the barbarians, Ostro- goths and Lombards, and local Byzantine issues in Sicily. This 1s followed by the deniers of Charlemagne and his successors, sup- planted by the gold currencies of the Normans and Frederick II. The age of the free cities is marked by the great coinages of Florence, Venice, and Genoa, while the Angevin and Aragonese princes coined in the south, and the popes began to issue a regular currency of their own at Rome. The Italian princes of the next period coined in Savoy, and at Florence, Modena, Mantua, and other cities, while Rome and the foreign rulers of the south continued their mintages, Venice and Genoa of the republics alone surviving. The Italian monetary systems have already been touched on in the introductory notice. For art the series is invaluable. First~~

~~in Italy the revival influenced the coins, and in them every step of advance found its record, The Italian medals are without rivals in the works of modern times.~~

~~Following the geographical order which is best suited to the Italian coinage, we first notice the money of Savoy, which is in- ferior in art to that of the rest of the country. It begins in early times, and merges in the class of the Sardinian kingdom, which becomes the kingdom of Italy. Genoa is the first of the great re- publics. She struck gold money from the time of the general origin of civic coinage in that metal; these arc ducats and their divisions, and after a time their multiples also. In the 17th cen- tury there are very large silver pieces. In the money of Mantua there first oceur really fine coins of Gianfrancesco III. (1484-1519) and Vincenzo IT. (1626-1627), these last splendid examples of the late Renaissance, in large pieces of gold and silver; the portrait is fine, and the hound on the reverse a powerful design. The vicissi- tudes of the story of Milan find their record in no less than nine groups of money—Carlovingian deniers, money of the republic, then imperial again, next of the Visconti family, succeeded by that of the Sforza line, next of Louis XIL of France, of the re- stored Sforza, of Charles V. by Spanish right and his successors of Spain, and lastly of Austria. There are extremely fine coins of the 15th century, showing great beauty in their portraits. The money of Florence is disappointing in its art. The Athens of the Middle Ages had the same reason as her prototype to preserve as faithfully as might be the types and aspect of her most famous coin, the gold florin, and thus those who expect to see in this series the story of Italian art will be much disappointed. The silver florin was first struck in 1181. It is heavier than the denier, weighing about 27 grains, and bears the lily of Florence and the bust of St John the Baptist. These are thenceforward the leading types, the flower never changing, but the representation of the saint being varied. On the gold florin the Baptist is represented standing, while in the contemporary silver florins he is seated. In the 14th century the arms of a moneyer appear in the field, two such offieers having had the right of striking yearly, each for six months. The coins of the duchy from 1532, in spite of their new types, are not a fine series ; the best are those of Alessandro, designed by Cellini.~~

Venice as a mint even surpasses Florence in conservatism, and, the early style being distinctly Byzantine, this is the more striking in a great artistic city. We find Venice as an imperial mint issuing Carlovingian deniers, but the doges begin to coin, placing their own names on their currency, in the 12th century. The most famous silver coin, the matapane, was first struck in the brilliant time of Enrico Dandolo (1192-1205). This coin is a grossus weighing about 33 grains, with on the obverse St Mark giving the standard or gonfalon to the doge, both figures standing, and on the reverse the seated figure of the Saviour. The famous Venetian zecchino or sequin, the rival of the florin of Florence, appears to have been first issued under Giovanni Dandolo (1280-1289). On the obverse St Mark gives the gonfalon to the kneeling doge, and on the reverse is a standing figure of the Saviour within an oval nimbus. The matapane slightly changes after the second third of the 14th century, and at its close becomes a new coin, the grossetto. Niccolo Trono (1471-1473) introduces his portrait on most of his coins, but this custom is not continued. By the latest part of the 15th century large silver coins appear. The archaic style changes in the begin- ning of the 16th century, but there is no later movement. The large silver pieces increase in size, and large gold is also struck ; the last doge, Ludovico Manin (1788-1797), issued the 100-sequin piece in gold, a monstrous coin, worth over £40. The doges of Venice issued a peculiar silver token or medallet, the osella, five of which they annually presented to every member of the Great Council. Antonio Grimani instituted this custom in 1521, and it

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lasted to the end of the republic. Two dogaressas struck similar medallets. Their types are usually allegorical ; some are comme- morative. Asa class they resemble the Dutch copper jettons, but are less historieal and hence less interesting.

The series of the coins of Rome is rather of historical than of artistie merit. The popes begin to strike money with Adrian I, (772-794 A.D.), whose deniers are ina Byzantino-Lombard style that charac- terizes the coinage of

Beneventum. Before the papal coinage closes the senate asserts the right toa mint. We then see on the silver the styleof thesenate and Roman people, and ROMA CAPUT MUNDI. Some coins have the figures of St Paul and St Peter, others Rome seated anda lion. Charles of Anjou, king of Sicily, strikes as a senator. The gold ducat of abont 1300 imitates the types of the Venetian sequin, St Peter here gives the gonfalon to a kneeling senator. The arms of the imoneying senator next appear in the field. There are small copper pieces of the famous tribune Rienzi. The papal coinage is resumed at Avignon; and Urban V., on his return to Rome, takes the sole right of the mint. The subsequent coins, though they have an interest from their bearing on the history of art, are disappointing in style. There is indeed a silver coin of Julius II. struck at Bologna and attributed to Francia, with a very fine portrait. We have beautiful gold coins of Giovanni Benti- voglio, lord of Bologna, who employed Francia at his mint, and we know that the artist remained at his post after Julius II. had taken the city, There are also pieces of Clement VIL. by Cellini, vigorous in design but careless in execution. The papal portraits are highly characteristic and interesting. It is, however, in the fine series of papal medals that we find a worthier artistic record.

The coinage of Sicily, afterwards that of the Two Sicilies, or Naples and Sicily, begins with the Normans, Theirs is a curiously mixed series. The gold money is almost wholly Arabic, though Roger II. struck the Latin ducat, the earliest of its class ; the silver is Arabic, except the great Latin scyphati of Roger II. with Roger ITI. ; the copper is both Latin and Arabic. The gold series of the emperor Frederick IJ. shows the first sentiment of reviving classi- cal art, its work being far in advance of the age. These are Latin coins ; he also struck small Arabic pieces in gold. Under Conrad, Conradin, and Manfred there is an insignificant coinage, copper only, but with Charles of Anjou (1266-1285) the gold money in purely medizval style is very beautiful, quite equal to that of his brother St Louis of France. After this time there is a great issue of gigliati, silver coins with for reverse a cross fleurdelisée cantoned with fleurs-de-lis, These coins acquired a great reputation in the Levant, and were even struck by the emirs of Asia Minor. With Alphonso, the founder of the Aragonese line, we note the old style of the coins, which are in singular contrast to his fine medals. Good portraiture begins on the money of Ferdinand I., his successor. The later coinage is interesting only for its illustration of the vary- ing fortunes of the Two

Sicilies. There is a curious early gold coinage of the Lombard dukes of Beneventum, which follows the Byzantine type.

Italian medals are next in merit to the works of the Greek die- Italian engravers. Their true beginning and highest excellence are under medals. Vittore Pisano, the Veronese painter, who worked from 1439 to 1449. They are of two classes, the finer and more original, struck in the 15th century, and the more classical of the 16th, after which the style declines rapidly. In spite of classical influence, the earlier medals are independent works, marked by simple vigorous truth- fulness. The designs are skilful and the portraits strongly charac- teristic, but deficient in beanty. As the art became popular the execution of medals passed into the hands of inferior artists, and by degrees striking became usual for the smaller pieces ; at the same time, a slavish imitation of thc classical style weakened or destroyed originality and stamped the works with the feebleness of coples. Yet the delicacy of design and technical skill of these later medals often give them an undeniable charm. The great medallists of the first age are Pisano, Matteo de' Pasti, Enzola, Boldu, Sperandio, Gentile Bellini, Bertoldo, Gambello, Filippino Lippi, and Francesco Francia, who in style belongs to the next age, in which must be mentioned Pomedello, Benvenuto Cellini, Leone Leoni, Giovanni Cavino ''the Paduan," Pastorino of Siena, Giacomo da Trezzo, and Pietro Paolo Galeotto, called Romano. Among the most important works are all the medals of Pisano, particularly those of Alphonso the Magnanimous, with the reverses of the boar-hunt and the eagle and lesser birds of prey, those of Sigismondo di Malatesta, his brother surnamed Novello, Lionelle d'Este, John VIII. (Paleeologus), Nicolo Piccinino, Inigo d'Avalos (marquis of Pescara), Gianfrancesco di Gonzaga (marquis of Mantua), Ludovieo III. of the same family, the great humanist Vittorino da Feltre, and of the artist himself, a portrait eminently witnessing his fidelity to nature. He is great in portraiture, great in composition and design, and marvellously skilful in depicting animals. Pisano alone represents the moral qualities of his subjeet in their highest expression and even capa- bility. That he has high ideal power is seen at once if we compare with his portrait Pasti's inferior though powerful head of Sigis- mondo di Malatesta. Pasti's medal of Isotta, wife of Sigismondo, is also noteworthy ; likewise Gentile Bellini's head of Mehemet

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Germany.

German medals,

Norway,

Denmark .

and Sweden.

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II., the conqueror of Constantinople, —interesting works, lacking Pisano's technical skill. In the later age Cavino executed a wonderful series of imitations of Roman sestertii, which have been frequently mistaken for originals. In art these Italian works fre- quently surpass the originals in spite of a degree of weakness in- separable from copies. A comparison of the Italian with the Roman pieces is thus most instructive. The works of Pastorino of Siena are especially charming. Historically the Italian medals supply the defects of the coinages of Florence and Rome, and in a less degree of Venice. The papal series is invaluable as a continuous chronicle of art. : ,

The money of Germany is like that of Italy far too various for it to be possible here to do more than sketch some of its main features. he metrological systems are Merovingian, Carlovingian, that of the bracteates, and those of the later medieval and modern issues in a complicated form. There are several classes, the coinages of the emperors, the electors, the smaller lords, the religious houses, and the free towns. The art is behind that of Italy in time, and on the whole far inferior to it in merit. Some of the later medieval examples are of good style, and the Renaissance is ushered in by some beautiful pieces. Yet other coins of this very time are surprisingly barbarous, and there is an immediate decline in the better works. The imperial money, even when limited to what is strictly German by the exclusion of the issues of the French and Italian mints, forms a large series. It begins with the deniers of Charlemagne ; and, except the solidus of Louis

I., for a long time there is no gold. The true bracteates begin under Frederick I. ; the money of Frederick II. is chiefly of Sicily and Italy, and his gold Sicilian coins do not belong to the German series. Under the house of Austria there are fine dollars of Maximilian I., and a splendid double dollar on which the emperor appearsasa horseman. It is after this time that art declines. Passing in review the currencies of the chief states, we are arrested by the historical dollars of Louis I., king of Bavaria, which have the merit of an excellent purpose. The series of Brandenburg, ultimately merging in that of Prussia, is not note- worthy but for some fine early medals. Brunswick shows the ex- ceptional great mining-thalers, generally spread coins, multiples of the dollar 14, 2, 8, 4, 5,8, and 10. Cologne has a representative series. Striking under the Merovingian kings and the Carlovingian emperors, it continued an imperial mint until the reign of Otho IV. (1198-1218). The archbishops began to coin under Bruno (953-965), aud only ceased in 1801. The city had also the right of coinage after the emperors ceased to exereise it, but her money is unim- portant. The wealthy mart of Hamburg is chiefly remarkable for the great gold pieces of the 16th and 17th centuries, of the weight of 24, 5, and 10 ducats, with the types of the city and the fleet and allegorical subjects. The city of Magdeburg shows a varicty of bracteates. Mainz has the same features as Cologne, Merovingian and Carlovingian money, the imperial mint going on to the reign of Sigismund, who granted the city the right of coinage in 1420, so that a few civic coins were issued before the privilege was sur- rendered to the archbishops in 1462. The archbishops have a series of coins from 1021 to 1818. These comprise remarkable large bracteates of the 12th century, with curious ecclesiastical types, combining figures of saints and prelates with architectural detail. Of Nuremberg there is a long gold series, but the artistic fame of the city is not supported by her coinage. The electors palatine have a series in which we note the florin of Rupert IV. (1356-1390), followed by ducats. .The money of the archbishops of Salzburg comprises some early pieces, but ranges mostly from the end of the 15th century, and is strong in gold. The Saxon lines are well represented. They begin with large bracteates of the 12th or 13th century, but the most interesting coins are of the age of the Reformation, bad in style and execution, but bearing characteristic portraits. The grandmasters of the Teutonic Order struck money second in importance to that of the knights of St John issued at Rhodes and Malta. The archbishops of Treves coined

similar issues to those of their brethren of Cologne and Mainz to the year 1803.

The German medals stand in importance next to those of Italy. They have this distinctive peculiarity of origin, that their first artists, instead of being, as in Italy, painters or sculptors, were gold- smiths, the craftsmen of Nuremberg and Augsburg. Consequently minute work and love of chasing make them technically inferior as medals to the Italian works, though these qualities are balanced by great vigour and truthfulness. Later in origin than the rival school, the German dates from the early part of the 16th century. Albert Diirer is the greatest medallist, and his medals are wholly superior to those of a mere worker in metal. Heinrich Reitz is next in merit. The portrait of Albert Diirer's father by the artist, and a female bust in very low relief, are of high excellence. For historical interest the heads of Luther, Erasmus, Charles V., Maxi- milian and Mary of Burgundy are very noteworthy. The subject of German medals has not yet been sufficiently studied.

The coins of the Scandinavian states, Norway, Denmark, and Sweden, are almost wholly regal, there being few ecclesiastical and civic pieces. The origin of the types is clearly English and due to the Danish conquest of England. The Norwegian series

begins with the pennies of Harold Hardrada, slain at Stamford Bridge ; there are next bracteates, and then coins of the Danish kings. The money of Denmark begins with pennies of Cnut (Canute), which are like his English mintage ; so also are those of Hardi- canute, but Magnus and Svend Estridsen have some very Byzantine obverse types, which is curious in connexion with the relations of the Norsemen to the Byzantine emperors. Later coins are of German types and barbarous work. A good medisval style begins with Erik of Pomerania. Later coins are not remarkable. Sweden has very few early coins, their denominations being the penny and the bracteate. There are good medieval coins of Albert of Mecklen- burg (1863-1387). The money of Gustavus Adolphus is historically interesting. Under Charles XII. there is highly curious money of necessity. The daler is struck as a small copper coin, sometimes plated. The types include the Roman divinities. At the same – time and later there was a large issue of enormous

~~plates of copper, stamped with their full value in silver money as a countermark.~~

~~The Russian coinage begins in the 15th century. It consists of Russia,~~

~~very curious little silver pieces struck under Byzantine influence. Poland, Gold is common in the reign of Peter the Great and of fair style, and though the silver is at first of the old barbarous type. Nicholas Hungary. introduced a platinum coinage of about two-fifths the value of gold. The series of Poland begins in the 11th century with bracteates. There is a regular coinage from Uladislaus Jagello (1382-1434). The town of Dantzic, while part of the kingdom, is remarkable for the issue of large gold pieces with the kings' portraits and civic reverses, the most important being of the 16th and 17th centuries. Hungary has its own coinage from Stephen I. (1000-1038). Under Charles Robert of Anjou (1308-1342) the florin is introduced, and appears also with the type varied asa ducat. The money of the illustrious John Hunyady as regent is of high interest. The abund- ance of gold about this time and onwards shows the metallic wealth of the land. The Hungarian nioney of the house of Austria presents no noteworthy features. The coinage of the Transylvanian princes of the 16th and 17th centuries is chiefly of ducats, witnessing, like the Hungarian, to the wealth of the soil. There are early coins of the patriarchate of Aquileia and of the kingdom of Servia, now revived after four centuries and a half of subjugation, whence the only interest of the modern money as well as of that of Roumania and Greece.~~

~~There is a most interesting class of coins struck during the Crusa- Middle Ages within the limits of the present Turkish empire, ders. the money of the Crusaders and other Latin princes of the East.~~

~~The multitude of states thus designated have been classed by Schlumberger, the authority on the subject, in the following order,~~

~~the chief divisions of which are here given :—first group, princi- palities of Syria and Palestine, counts of Edessa, princes of Antioch,~~

~~kings of Jerusalem, counts of Tripoli, fiefs of Jerusalem, crusaders~~

who struck imitations of Arab coins, kings of Cyprus, lords of Rhodes, grandmasters of the order of St John at Rhodes, to which

may be added the later grandmasters at Malta; second group,

Latin emperors of Constantinople, Frankish princes and lords of Greece and the Archipelago whose power was due to the crusade

of 1204, such as the princes of Achaia, the dukes of Athens, Neapolitan kings who struck money for their Eastern possessions,

Latin lords of the Archipelago, the Genoese at Chios, the Gattilusi

at Mytilene, the Genoese colonies, the Venetian colonies, the Turko-

man emirs of western Asia Minor who struck Latin coins. The / most important currencies are the copper of the counts of Edessa,

the billon and copper of the princes of Antioch and the kings of Jerusalem, the silver and copper of the counts of Tripoli, and the

gold imitations of Arab dinars, the currency in that metal of the

crusaders of Palestine. These Bisantit Sarracenati, or Saracen |

bezants, are at first imitations of Fatimite dinars, known to have

been struck by Venetian moneyers at Acre, and probably at Tyre

and Tripoli also. After these coins had been current for nearly a century and a half they were forbidden on account of their Moham- medan aspect by Pope Innocent IV. The Venetians then issued

gold and silver coins with the same aspect but with Christian in- scriptions. The kings of Cyprus issued a really good coinage in

the three metals and in billon. The last money of the kingdom is

the fixed currency of the gallant Bragadin during the war which

lost the island to the republic. The coinage of the order of St John : begins on the conquest of the island of Rhodes and the suppression

of the Templars; the earliest coins known are of Foulques de Villaret, the first grandmaster at Rhodes in the earliest years of the

14th century, and the last of the Rhodian series are of Villiers de l'Isle-Adam, the gallant defender of the island who was forced to capitulate to the Turks and sail for a new home in 1528. The coin-

age is of fine gold, silver, billon, and copper. On the establishment

of the order at Malta in 1530 it is resumed there till the capture of

the island by the French at the close of last century ; it has little interest except as showing the wealth of the order. The other currencies of the crusaders, notwithstanding their great historical interest, are far less remarkable numismatically. f

Of the money of America little need be said here. Neither the Americ®

coinages of the Spanish and Portuguese dependencies, and of the

Ancient Persia.

ANCIENT PERSIA. |

states which succeeded them, nor those of the English colonies and of the United States, present much that is worthy of note. In style they all resemble those of the parent countrics, but, originating in the decline of art, they are inferior in style and work. They are most remarkable in the south for the abundance of gold and silver. The chief coin is the dollar. Some coins are of historical interest, and there are a few rarities, such as the colonial money of Lord Baltimore struck for Maryland, the pine-tree coins of Massa- chusetts, and the hog-money of Bermuda.

IV.—ORIENTAL Corns.

~~Oriental coins may: be best classed as ancient Persian, Arab, modern Persian and Afghan, Indian, and Chinese, and other issues of the far Kast. The first place is held by the money of the old Persian empire, the Parthians, and the Sasanians. The conquests of the Arabs introduce a new currency, carried on by the Moslem inheritors of their empire. The modern Persian and Afghan money, though of Arab origin, is distinguished by thc use of the Persian language with Arabic. The Indian currencies, though Greek, Sanskrit, Arab, and Persian in their inscriptions, must be grouped together on account of their mutual dependence. They rise with the Bactrian kings, whose Greek types are gradually debascd by the Indo-Scythians and Guptas ; these are followed by a group of currencies with Sanskrit legends ; next follow the money of Arab conquerors and the great series of the Pathans of Delhi and sub- sidiary dynasties, with Arabic inscriptions; the main series is con- tinucd in the currency of the Moguls, who largely use Persian, and the last series is closed by local currencies mainly with Sanskrit or Arabic legends. The Chinese coinages form the source and centre of the group of the far East, which, however, includes certain ex- ceptional issues. The order throughout is historical, each empire or kingdom being followed by the smaller states into which it broke up, and then by the larger ones which were formed by the union of these fragments.~~

~~The Persian coinage was originated by Darius I. (Hystaspis) about the time that he organized the empire in satrapies (516 B.c.). The regular taxation thus introduced made a uniform coinage necessary. Avoiding the complex gold system of Crcesus, which was intended to accommodate the Greek cities in commercial relation with Lydia, Darius chose two weights, the gold stater of Croesus of 126 grains and the silver drachm of 84. He raised the weight of both, the gold to about 130 grains and the silver to 86. Thus one gold piece was equal to twenty silver. The gold coin was called the daric, the silver the siglus. The metal was very pure, especially that of the daric. Thus not only were the Lydian gold and silver coins of inferior weight thrown out of circulation, but the Persian gold, from its purity, became dominant, and was the chief gold currency of the ancient world so long as the empire lasted. he issuing of gold was a royal prerogative. Silver money was coined not only by the king but in the provinces by satraps, who used local types, and by tributary states. The following classes must be distinguished : (1) regal, (2) provincial with regal types, (8) satrapal, (4) of~~

tribu- tary states. The art of Persian coins varies according to the locality, from the beautiful work of the west coast of Asia Minor to the more formal style of Cilicia and the thoroughly hieratic stiffness of Pheenicia and Persia.

The regal coinage is of darics and double darics in gold and of sigli in silver. The obverse type is the king as an archer, the reverse an irregular oblong incuse. The darics show differences of style, and must extend through the whole period of the empire. The sigli no doubt run parallel with them. Both these denomina- tions are uninscribed. The double darics are of late style, and nearly all bear either Greek letters or monograms or symbols, some- times both. They are undoubtedly of the last age of the empire or subsequent to its fall.

The provincial coins with regal types appear to be mostly Pheenician ; the most important classes have been already noticed. But they also occur beyond this territory, as at Mallus in Cilicia, where the Persian regal archer is combined with the reverse of Heracles straugling the Nemean lion, with the inscription MAA.

The satrapal coinage is very important and interesting. It belongs mainly to Cilicia. The most remarkable series is that with a bearded head wearing a tiara, with various reverses, certainly struck at Colophon, Cyzicus, and Lampsacus, and in one instance bearing the name of the satrap Pharnabazus, but usually the word “king” inGreek, The coin of Colophon shows a splendid portrait, one of the finest instances of Ionian work. It has been held to represent Artaxerxes IJ. (Mnemon), but has been lately assigned to Pharnabazus on the ground that the head-dress is not the proper regal kidaris. This isan objection, yet it seems inconceivable that the king of Persia would have countenanced the issue of the portrait of a satrap at a time when no Greek dynast dared to place his head on his own coinage. Of other satrapal issues those of Datamcs, of Tiribazus, and Cilician issues, struck at Tarsus, are specially note- worthy. Their inscriptions are Aramaic.

The coinages of the tributary states have been in part noticed in

Oils Aer ecs

~~their geographical order ; it is difficult to separate them from the provincial issues with regal types.~~

~~The conquest of Alexander did not wholly destroy the independ- Par- Within less than a century the warlike Parthians, thians.~~

~~ence of Persia. once subjects of Persia, revolted (249-8 B.C.) against the Seleucids and formed a kingdom which speedily became an empire, ultimately the one successful rivalof Rome. Their money is Greek in standard and inscriptions, as well as in the origin of types. The coins are silver, following the Attic weight, the chief piece being the drachm, though the tetradrachm is not infrequent; there are also bronze coins, but none in gold are known. The drachm has the head of the king on the obverse, diademed or with a regal head-dress, and on the reverse the founder Arsaces seated, holding a strung bow, the later tetradrachms varying this uniformity. Every kind is styled Arsaces, to which many of the later sovereigns add their proper names. The inscriptions are usually long, reaching a climax in such as BASIAEQS BASIAEON APZAKOY METAAOY AIKAIOY ETHSANOYS OEOY EYITIATOPOS SIAEAAH- NOZ of the 11th Arsacid, Mithradates III., where we see the double influence of Persian and Seleucid styles and the desire to conciliate the Greek cities. Very noticeable are the coins which bear the portraits of Phraataces (14th king) and his mother, the Italian slave Musa, with the title queen (OEAXD OYPANIAS MOYEH> BAZIAIZ2H2).~~

~~The Persian line of the Sasanians arose about 220 a.p., and Sasan- wrested the empire from the Parthians in 226-7, under the leadership ians.~~

~~of Ardashir or Artaxerxes. This dynasty issued a national and thus Oriental coinage in gold and silver. "The denominations follow the Roman system, and there are but two coins, equivalent to the aureus or solidus and the denarius. The obverse has the king's bust, usually wearing a very large and elaborate head-dress, varied with each sovereign, and on the reverse the sacred fire-altar, ordi- narily flanked by the king and a priest. The attachment which Ardashir, the founder, bore to Zoroastrianism established this national reverse type, which endured through the four hundred years of the sovereignty of his line. The inscriptions are Pahlavi.~~

The Arab coinage forms the most important Oriental group. It Caliph- has a duration of twelve centuries and a half, and at its widest ates.

geographical extension was coined from Morocco to the borders of China. When the Arabs made their great conquests money be- came a necessity. They first adopted in the East imitations of the current Persian silver pieces of the last Sasanians, but in Syria and Palestine of the Byzantine copper, in Africa of the gold of the same currency. Of these early coins the Sasanian imitations are very curious with Pahlavi inscriptions and shorter ones in Arabic (Cufic). The regular coinage with purely Moslem inscriptions begins with the issue of a silver coin at Basrah, in 40 a.u., by the caliph 'Ali; after subsequent efforts thus to replace the Sasanian currency, the orthodox mintage was finally established, in 76 A.u., by 'Abd al-Melik. The names of the denominations and the weight of that of gold arc plainly indicative of Byzantine influence. There were three coins. The dinar of gold took its name from the aureus or denarius aureus, of which the solidus must have been held to be the representative, for the weight of the Arab coin, 66 grains and a fraction, is clearly derived from the Byzantine gold piece. The dirhem of silver is in name a revival of the Greek drachm ; it weighs at most 45 grains and a fraction. The copper piece is the fels, taking its name from the follis of the Greek empire. Commercially the gold easily exchanged, and the silver soon passed as the double of the Carlovingian denier. For long these were the only coins issued, except, and this but rarely, half and quarter dinars. There are properly no types. There was indeed an attempt in the early Byzantino-Arab money to represent the caliph, and in the course of ages we shall observe some deviations from the general practice of Islam, particularly in the coinage of the atabegs and in Mohammedan coinages not of the Arab group, the modern Persian and that of the Moguls of Delhi. The inscriptions are uniformly religious, save in some Tatar coinages and that of the Turks. In general the coins are for the first five centuries of their issue remark- ably uniform in fabric and general appearance. They are always flat. and generally thin. The whole of both sides of the coins is occu- pied by inscriptions in the formal Cufic character, usually arranged horizontally in the area with a single or double band around. Towards the fall of the caliphate a new type of coin begins, mainly differing in the greater size of the pieces. There are new multiples of the dinar and ultimately of the dirhem, and the silver pieces frequently have their inscriptions within and

around a square, a form also uscd for gold. The Cufic character becomes highly ornamental, and speedily gives way to the flexuous naskhi of modern writing. The inscriptions are religious, with the addition of the year by the era of the Flight, the month sometimes being added, and the mint occurs uniformly on silver and copper, but does not appear on the gold until after the fall of the Omayyad dynasty. Subsequently the official name of the caliph occurs. The religious part of the inscriptions is various, the most usual formulz being the profession of the Moslem faith: ‘‘There is no deity but God ; Mohammed is the apostle of God,” to which the Shi’ites or

Omay- yads,

‘Abba- sids.

followers of ‘Ali in Persia aud Africa add ‘‘‘Ali is the friend of God.” The Moorish coins give long formule and religious citations and ejaculations, and they, like the money of the Pathans of Delhi of the Indian class, have occasionally admonitions urging or suggest- ing the purer use of wealth. As Arab and other dynasties arose from the dismemberment of the caliphate, the names of kings occur, but for eenturies they continued to respect the authority of their religious chief by coining in his name, even in the case of the shadowy ‘Abbasids of Egypt, adding their own names even when at war with the caliph, as though they were mere provincial governors. After the fall of the caliphate nine new denominations came in, chiefly of heavier weight than the dirhem and dinar, but the influence of the commercial states of Italy made the later Egyptian Mamelukes, the Turks, and the later Moors adopt the gold sequin. In more modern times the dollar found its way into the Moslem coinage of the states bordering on the Mediterranean. It can be readily seen that Arab coins have no art in the same sense as those of the Greeks. The beautiful inscriptions and the arabesque devices of the pieces of the close of the Middle Ages have, however, a distinct artistic merit.

The Omayyad coins owe their only historical value to the evidence which the silver affords of the extent of the empire at different times. The first separation of that empire dates from the overthrow of this dynasty by the ‘Abbasids, speedily followed by the formation of the rival Omayyad

caliphate of the West with its capital at Cordova. The ‘Abbasid money has the same interest as that which it suc- ceeded, but its information is fuller. Towards tlic fall of the line it becomes very handsome in the great coins, which arc multiples of the dinar. The Spanish Omayyads struck silver almost exclu- sively. Their rise was followed by that of various lesser lines — the Edrisids (A) and Aghlabids (4 chiefly) in western Africa, the Beni Tulin (4), and, after a short interval, the Ikhshidids (47), both of Turkish origin, in Egypt. Meanwhile a new caliphate arose in western Africa which subducd Egypt, the Fatimite of the line of ‘Ali, and for a while the allegiancc of the Moslems was divided between three rival lines, the Omayyads of Spain, the Fatimites of Africa, and the ‘Abbasids of Baghdad. The Fatimites introduced a new type of dinar, with the inscriptions in concentric circles, and struck Tittle but gold. In the interim the Persians, who had long exercised a growing influence at the court of Baghdad, revived their power in a succession of dynasties which acknowledged the supremacy of the caliphate of Baghdad, but were virtually inde- pendent. These were the Tahirids, Saffarids, Samanids, Ziyarids, and Buweyhids, who mostly struck silver, but the last gold also. As the Persians had supplanted the Arabs, so they were in turn forced to give place to the Turks. The Ghaznawids formed a

owerful kingdom in Afghanistan (47, AX), aud the Seljuks estab- fished an empire (4), which divided into several kingdoms, occupy- ing the best part of the East. Of these dynastics the Seljuks of Rum or Asia Minor first strike a modern type of Arab coinage (M&). The Seljuk dominions separated into many small states, the central ruled by atabegs or generals, and the similar Turkoman Urtukees. The atabcg money and that of the Turks of the house of Urtuk are mainly large copper pieces bearing on one side a figure borrowed from Greek, Roman, Byzantine, and other sources. They form a most remarkable innovation. In the same age the great but short-lived empire of Kharezm arose in the far East. The first caliphate to disappear was that of Spain, which broke up into small dynasties, some claiming the prerogative of the caliphates. They chiefly struck base silver (billon) coins. The Christian kings gradually overthrew most of these lines. In the meantime various Berber families had gained power in western Africa and the Murabits (Almoravids) and Muwahhids (Almohadis) crossed the straits and restored the Moslem power in Spain. They struck gold money of fine

~~work, and that of the later Muwahhids is remarkable for its size aud thinness. At the fall of the Muwahhids the only powerful kingdom remaining was the Arab house of Granada, which, sup- ported by the Berbers of Africa, lingered on until the days of Fer- dinand and Isabella. The Fatimite dynasty was supplanted by the Kurdish line of the Eiyubis, the family of Saladin, who ruled Egypt, Syria, and Mesopotamia, with a number of vassal states, some governed by princes of their own family, some by the older lines of the atabeg class which they allowed to survive. In Egypt the Eiyubi coinage is of gold, elsewhere of silver and copper. 'The caliphate of Baghdad, which latterly was almost limited to that town, though its abundant heavy gold coinage at this very time indicates great wealth, was overthrown by the new power of the Mongols (1263 a.p.), who established a group of empires and kingdoms, comprising the whole Eastern world eastward of the Euphrates and thence extending northward and reaching into Europe. The most important of these states for their money are that of the Mongols of Persia, founded by Hulagu, the conqueror of Baghdad, and that of the khans of the Golden Horde. Both struck silver, but there is also gold coinage of the Mongols of Persia, who more frequently use the Mongol character for their names and titles than is done under the kindred line. The power of the Mongols was held in check by the Mameluke kings of Egypt,~~

~~slave-princes, who struck money in the three metals. The Mongol power waned, but was revived by Timur, who during his rule (1397) recovered all that had been lost. He and his successors struck silver, copper, and brass money. The Turks, whose power had been gradually growing, after a desperate struggle with Timur, gradually absorbed the whole Mohammedan world west of the Tigris, except only Morocco, where they had but a momentary dominion. Their money, of gold, silver, base metal, and bronze, is devoid of historical interest. In Tunis and Moroceo a group of Berber lines long maintained themsclves, but at length only one survived, that of the sherifs of Morocco, claiming Arab descent, now ruling as the sole independent Moslem dynasty of northern Africa. Its recent coinage is singularly barbarous. It may be remarked that Tunis and Egypt have long coined Turkish money in their own mints, the more western state latterly adding the name of its hereditary prince to that of the sultan.~~

~~The coins of the shahs of Persia have their origin with Isma'il Persia. (1502). They are struck in the three metals, and are remarkable for the elegance of their inscriptions, sometimes in flowing Arabic, sometimes in the still more flexuous native character. The in- scriptions are at first Arabic; after a time the religious formule are in this language and the royal legend in Persian, usually as a poetical distich. The Persian series is also remarkable for the autonomous issucs of its cities in copper, the obverse bearing some type, usually an animal. The coins of the Afghans form a class resembling in inscriptions those of the Persians, and equally using Persian distichs. They commence with Ahmad Shah Durani.~~

~~The Indian series begins with the money of the Greek kings of India. western India, commonly known as Bactrian,—a misnomer, only the earlier sovereigns having ruled Bactria. Between Alexander's money and the Greco-Indian series there is a curious class, the very rare gold and silver of Andragoras, dynast of Parthia, and the silver of an Indian prince, Sophytes. The Greco-Indian weight is at first Attic; coins are struck of gold, silver, bronze, and rarely nickel. The gold stater is limited to the earlier kings; the silver tetradrachm is struck at first with divisions; the Persic didrachm and drachm ultimately supersede it ; the bronze is either round or of the square form peculiar to India. The types are Greek and very various. 'The inscriptions are at first Greek, but at an early time a native Indian inscription appears as a concession ; it occupies the reverse of bronze, and in time of silver money, and gives a translation of the Greek inscription. The character used is of two Indian alphabets, the common one being styled Bactrian Pali. Diodotus, the first Graeco-Indian king, revolted against the Syrian ruler about 250 B.c. ; his money is Greek in its art. Under Euthydemus I., the next king, begins that peculiar style which gives these coins their special interest. It is realistic and vigorous, In portraiture reminding us of the best Italian medals. This is in part due to the leading away of the artists from Greek models to portray another race, for the heads are unmistakably Indian ; but it is also significant of an innate strength not to be traced in the portraits of the Ptolemies and the Seleucids. Here we plainly see the first impulse of Greece in the formation of Indian art, after it had been influenced by working in a new atmosphere. The portrait of Demetrius in an elephant's skin is very remarkable, and should be compared with the wholly ideal treatment of that of Alexander on the coins~~

of Alexander IV. struck in Egypt. After one reign later the order of kings becomes obscure, but the style gives the relative ages of groups, which must be the money of con- temporary lines. Agathocles is noticeable for having struck com- memorative coius of Alexander the Great, Diodotus, and Euthy- demus I. Another characteristic portrait is that of Antimachus in the petasus or Greek hat. Eucratides struck the only Greek gold medal known to us, the great piece weighing twenty staters, now in the French cabinet. The later Greek money is of less interest ; it cnds with Hermeus, perhaps about 508.c. Then follows a group of dynasts with barbarous names, who adhere more or less closely to Greek originals. A Parthian class breaks in in consequence of the conquests of Mithradates I. The Indo-Scythian class, which | is of much interest, is fixed approximately to periods by finds | in which aurei occur ranging from the earlicr Roman emperors to the Antonines. This coinage is of gold and bronze, silver being | almost unknown. The weights are Roman. The types are usually

the figure or the bust of the king, and on the reverse a divinity. The inscriptions are first Greek and the ordinary Indian of the Greco- Indian coins, then, strangely, Greek only, barbarous enough. Cad- phiscs strikes the double aureus and the aureus. Under Canerces and his successors we notice aurei with an uncommon variety of divini- ties of Indian, Persian, Greek, and Roman mythology, as well as Buddha. The Gupta series is contemporary with the Indo-Scythian. It was struck in Kanauj, in the centre of northern India. It isa remarkable gold coinage, good and debased, as well as bronze. The mythological types are Indian alone, interesting and in good native style, which now first appears on coins in a pure form. The inscriptions are in Sanskrit letters. There is a series of silver coins struck in Cacch (Cutch) by the Sah kings of Saurastran ; they are derived from the later money of the Greco-Indian class. The

China.

INDIA, CHINA. |

types are royal portraits and Buddhist emblems, &c., of no great interest.

Quite as early as the invasion of Alexander, if not earlier, is a most curious class of square silver and bronze coins, punch-marked with a variety of

~~devices, which circulated in northern India, and Poh originated the square bronze coinage of the Greco-Indian~~

~~ings.~~

~~The Arabs in the first days of conquest had subdued Sind, and founded an independent state on the banks of the Indus ; but it is hard to subdue India from this direction, and the strangers decayed and disappeared. The Pathan kings came of the Ghuri stock which rose on the ruins of the empire of Ghazneh. Mohammad ibn Sam made Delhi his capital, and here he and his successors, Pathans or slave-kings, ruled in great splendour, latterly rivalled by a line of Pathans of Bengal. Of the Pathans of Delhi we have an abundant coinage, the principal picces being the gold mohur of about 168 grains, and the silver rupee of about the same weight, besides many pieces of bronze, and at one period of base metal. The coins are large and thick, with the profession of Islam or the style of the caliph on one side, on the other the name and titles of the reigning king. Mohammad ibn Taghlak struck coins with a great variety of in- scriptions, some in the name of the shadowy 'Abbasid caliphs of Egypt, whose successors were for a time similarly honoured by later sovereigns. Towards the close of the rule of the Pathans several dynasties arose in central and southern India and struck similar money, the kings of Guzerat, of Malwa, and of the Deccan. The Pathan lines closed with Shér Shah, an Afghan, the last ruler of Bengal. Babar, the Turki, of the family of Timur, seeking a king- dom, adventured on the conquest of Hindustan; and after long wars with Shér Shah, carried on by Babar's son Humayun, the famous Shah Akbar, grandson of the invader, was at length peaceably settled on the throne of Delhi, and he and his successors, the so-called Moguls of Delhi, practically subducd the whole of India. They retained the existing standard, but used the Arabic and Persian languages like the shahs of Persia. Akbar (1556) issucd a splendid coinage in gold and silver, far more elegant than that of the Pathans, but the inoney of his son, Jahangir, is still more remarkable. He issucd the famous zodiacal mohurs and rupees, as well as those astonishing Bacchanalian mohurs on which he is represented holding the wine- cup. Scarcely less strange is the money of the beautiful queen Nur- Jahan. Under Shah Jahan there is a visible falling away in the merit of the coins, and an ordinary modern style is rcached in the reign of Aurungzeb. To the close of the rule~~

~~of Shah 'Alam, the last Mogul who actually reigned, gold and silver money is abundant. Latterly, native states coin with Arabic and also with Sanskrit inscriptions. The most important are the kings of Oude, the nizams of the Deccan, and the kings of Mysore, besides the maha- rajas of Indore and the kings of Nepal. The coinage of Tipu Sultan (Tippu Sahib) is extremely curious from his innovations in the calendar. Besides these there area multitude of small states. Most of the Indian princes acknowledged the emperor of Delhi, but some struck independently. At last the English coinage of India has swept away nearly all these moneys, though some native states still issue their own, while those under English protection occasionally acknowledge on their coins the supremacy of the queen as empress.~~

~~It is not yet possible to give a full summary of the strange coinages of China and the farther Kast, the published rescarches having been generally uncritical and unsupported by the examination of native literary sources. Thus only some general facts may be safcly stated.~~

~~The money of China, more certainly than the square punch- marked coinage of India, may claim an origin independent of the Lydian and Greek issues. The oldest specimens may be assigned to the 6th century before our era, a time at which the existing coins of other nations could scarcely have been known in the far East ; nor is there any connexion in form, type, or metal with the other currencies. Like nearly all subsequent Chinese money, the carliest is of bronze and cast. The shapes of the coins are most eccentric, representing knives, and, in De la Couperie's opinion, mining-tools. To these succeed the well-known round pieces with a square hole in the centre for the purpose of stringing them together, the coins to which the name "cash" is applied by Europeans. The value of these coins depended on the weight, which is inscribed upon them. We must, however, bear in mind that we have frequently to deal with a merely conventional weight and value due to financial schemes. Thus the inscription always records official value, but not always true weight or true value. There is no type whatever, but always an inscription on one or both sides. The occurrence of an occasional symbol cannot be held to bea deviation from this rule. The main inscription is usually placed opposite the four sides of the central square on the~~

~~obverse. As a rule this inscription at its fullest gives the emperor's official name during life, and the value~~

~~NUMMULITE. See Foraminirera, vol. ix. p. 380.~~

~~NUN. See Monacuism, vol. xvi. p. 698.~~

~~NUNCIO, or Nuntius Apostouicus. See LEGATE, vol. xiv. p. 412.~~

~~of the coin and an indication of its authoritative exactness. When a reverse inscription is introduced, it gives the value of the coin. The inscriptions are in Chinese characters of different kinds, and under the present dynasty Manchu has also been employed. Some coins bear indications of mints. The most interesting Chinese coins are those of small rival dynasties and of rebels, the study of which is important for the elucidation of the obscurities of the history of the country. The Chinese medals are talismans, usually larger than the coins, and bear both subjects and inscriptions. They are distributed by Taouist and Buddhist priests of temples. The money of Corea and Annam is similar to that of China, and Chinese coins were long the currency of Java, which more recently has issued the money of its Mohammedan princes.~~

~~The empire of Japan shows in its coinage that Chinese source Japail.~~

~~modified by the influence of native independence which marks all its institutions. Thus, while the copper currency closely resembles that of China, there is also a gold and silver coinage. The gold consists of plates of the form of a flattened oval with large inscrip- tions in indian ink painted on the surface, and small contermarks punched intoit. The "cobang," which is the largest coin, was chiefly used for presents by the Japanese princes. Its intrinsic value is~~

~~'about £25. 'There are several lesser denominations in gold, anda~~

series of silver pieces, the larger ingots, used as presents to in- feriors, and the smaller, which are sometimes of a long rectangular shape, more properly a silvercurrency. There are also temple medals of a magical character like those already noticed as cast in China.

BisiioGRaPuy. Periodicals: Numismatic Chronicle, London; Zeitschrift fiir Ela Berlin; Numismatische Zeitschrift, Vienna; Revue Numismatique,

'aris.

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Notwithstanding the general books covering many sections for which no special works are indicated, it will be felt that this list is very deficient. This is partly due to the multitude of essays in various periodicals, but mainly to the neglect of certain branches of the subject and to the want of full catalogues of the great collections of Europe. (R. 8. P.)

NUNEATON, a market-town of Warwickshire, England, is situated near the Leicestershire border, on a branch of the river Anker, on the Coventry Canal, and on three railway lines, 97 miles north-west of London, and 22 east

of Birmingham. It consists principally of one long street with a cross street leading to the market-place. The church of St Nicholas isa large and handsome structure in various styles of architecture, and consists of nave, chancel, and aisles, with a square embattled tower having pinnacles at the angles. It contains several interesting monuments. The new church of St Mary the Virgin was erected in 1877 on the ruins of the old priory. A free grammar- school was founded in the reign of Edward VI., and an English free school for the instruction of forty boys and thirty girls by Richard Smith in 1712. A library and reading-room was established in 1851, and a literary institute in 1865. The ribbon industry is of less import- ance than formerly, but there are ironworks, cotton, hat, elastic, and worsted factories, currieries, and tanneries. Nuneaton derives its name from a priory of nuns founded here in 1150. In the reign of Henry IIL. a weekly market was granted to the prioress. The population of the urban sanitary district (area 6021 acres) in 1871 was 7399, and in 1881 it was 8465.

NUNEZ or Nontus, Pepro, Portuguese cosmographer, was born at Alcacer do Sal in 1492, and died at Coimbra, where he was professor of

mathematics, in 1577. He published several works, including a copiously-annotated translation of portions of Ptolemy (1537), and a treatise in two books, De arte atque ratione navigandi (1546). See NAVIGATION.

NUNEZ CABEZA DE VACA, Atvaro (c. 1490-1564), Spanish explorer, was the lieutenant of Pamfilo Narvaez (supr. p. 234) in the expedition which sailed from Spain in 1527; when Narvaez was lost in the Gulf of Mexico, Cabeza de Vaca succeeded in reaching the mainland some- where to the west of the mouths of the Mississippi, and, striking inland with three companions, succeeded, after long wandering and incredible hardship, in reaching the Pacific coast in 1536. Returning to Spain in 1537, he was ap- pointed " adelantado" or administrator of the province of Rio de la Plata in 1540. Sailing from Cadiz in the end of that year, after touching at Cananea (Brazil), he landed at the island of St Catharine in the end of March 1541. Leaving his ships to proceed to Buenos Ayres, he set out in November with about 150 men to find his way overland to Ascension (Asuncion) for the relief of his countrymen there. After an interesting journey through the country of the Guaranis, the little band reached their destination in the following year. After various successes in war and diplomacy, in his dealings with the Indians, Nufiez quar- relled with his countryman Domingo de Irala, whose jealousy he had excited, and the final result was that he was sent home under arrest in 1544, and banished to Africa by the council of the Indies. Eight years afterwards he was recalled, and appointed to a judgeship in Seville, where he died in 1564.

The Naufragios (" Shipwrecks") of Cabeza de Vaca, which re- late to the Florida expedition and his journey through what is now New Mexico, appeared at Valladolid in 1544; the work has frequently been reprinted, and an annotated English translation was published by Buckingham Smith in 1851. His Comentarios

chronicle the events of the South American expedition. Both works occur in Barcia's Hist. Prim. d. 1. Ind. Occ.

NUREMBERG (in German, WViirnberg), the second town of Bavaria in size and the first in commercial importance, is situated in the district of Middle Franconia, in a sandy but well-cultivated plain, 95 miles to the north-west of Munich. It is divided by the small river Pegnitz into two parts,

~~called respectively the Lorenzerseite and the Sebalderseite, after the two principal churches.~~

~~Formerly among the richest and most influential of the free imperial towns, Nuremberg is one of the few cities of Europe that have retained their medieval aspect sub- stantially unimpaired. It is still surrounded with its~~

~~ancient feudal walls and moat, though of late several breaches have had to be made to meet the exigencies of modern traffic. Of the 365 towers which formerly strengthened the walls, nearly 100 are still im situ, and a few of the interesting old gateways have also been preserved. Most of the streets are narrow and crooked, and the majority of the houses have their gables turned towards the street. The general type of architecture is Gothic, but the rich details, which are lavished with especial freedom in the interior courts, are usually borrowed from the Renaissance. Most of the private dwellings date from the 16th century, and there are almost none of earlier date than the 15th century. A praiseworthy desire to maintain the quaint picturesqueness of the town has induced most of the builders of new houses to imitate the lofty peaked gables, oriel windows, and red-tiled roofs of the older dwellings ; and it is easy for the visitor to Nuremberg to~~

~~*Plan of Nuremberg. 1. Church of St Sebald. 8. Town House. a*~~

~~*Museum. 2. Library. 4. Church of Our Lady. 6. Church of St Lawrence.*~~

~~*fancy himself carried back to the Middle Ages. Altogether it is difficult to conceive of a more piquant contrast than that afforded by the two chief towns of Bavaria—Munich, stamped with the brand-new impress of the 19th century, and Nuremberg, presenting a faithful picture of a well-to- do town of 300 years ago.*~~

~~A good survey of this interesting town may be obtained from the old burg or castle, picturesquely perched on the top of a rock on the north side of the town. It is supposed to have been founded by the emperor Conrad II. about the year 1024, and dates in its present form mainly from the reign of Frederick Barbarossa (c. 1158). It was restored in careful harmony with its original appearance in 1854-56, and part of the interior is fitted up as a residence for the royal family. The two Late Romanesque chapels, one above the other, are interesting ; the lower was the burial-place of the burggraves. Among the in- struments of torture preserved in the castle is the famous "Tron Virgin" of Nuremberg. In the court is a linden tree said to be over 700 years old. The castle of Nurem- berg was a favourite residence of the emperors of Germany, and the imperial regalia were kept here from 1424 to 1806.~~

~~Nuremberg contains numerous interesting churches, the finest of which are those of St Lawrence, St Sebald, and Our Lady, three Gothic edifices of the 13-15th centuries. All three are notable for their elaborately-carved doorways, in which free play has been given to the exuberant fancy of the Gothic style, and all three enshrine valuable treasures of art. In the church of St Lawrence, the largest of the three, is the masterpiece of the sculptor~~

~~Adam Krafft, consisting of a ciborium or receptacle for the host, in the form of a florid Gothic spire 65 feet high ; the carving of this work is exquisitely minute and delicate. In front of the altar hangs a curious piece of wood-carving by Veit Stoss, representing the Salutation. The shrine of St Sebald, in the church of St Sebald, consisting of a bronze sarcophagus and canopy, in the richest Gothic style, adorned with numerous statues and reliefs, is looked upon as one of the greatest achievements of German art. It was executed by Peter Vischer, the celebrated artist in bronze, who was occupied on the work for thirteen years (1506-19) and has here shown himself no unworthy rival of Lorenzo Ghiberti. The church of Our Lady possesses some fine old stained glass windows and some paintings by Wohlgemuth. The Aegidienkirche, a building of last century, contains a good altarpiece by Van Dyck.~~

The town-house, an edifice in the Italian style, erected in 1616-19, contains frescos by Diirer and a curious stucco relief of a tournament held at Nuremberg in 1446. The new law courts, the hospitals, and the barracks are also imposing structures, but the most interesting secular build- ings in the town are the houses of the old patrician families, already referred to. Among the most characteristic of these are the old residence of the counts of Nassau, and the houses of the Tucher, Funk, and Peller families. A special interest attaches to the dwellings of Albert Diirer, Hans Sachs, the cobbler-poet, and Johann Palm, the patriotic bookseller who was shot by order of Napoleon in 1806. Statues of Diirer, Sachs, and Melanchthon (the reputed founder of the grammar-school) have been erected ; and the streets are further embellished with several fount- ains, the most noteworthy of which are the Schone Brunnen, in the form of a large Gothic pyramid, adorned with statues (1385-96) and the Ga&nseminnchen or goose-mannikin, a clever little figure by Labenwolf. On the way to the cemetery of St John, which contains the graves of Diirer, Sachs, Behaim, and other Nuremberg worthies, are Krafft's Stations, seven pillars bearing stone reliefs of the Passion, and ranked among the finest works of the well- known sculptor.

The charitable, educational, scientific, and artistic insti- tutions of Nuremberg are on a scale worthy of its ancient dignity. The Germanic National Museum, established in an old Carthusian monastery, has one of the most important historical collections in Germany. It includes a picture-gallery with works by Holbein, Diirer, Wohlgemuth, é&c. The Bavarian Industrial Museum is also a very creditable institution. The municipal library contains about 800 manuscripts and 50,000 printed books, some of which are of great rarity.

Though not of so great relative importance as of yore, Nurem- berg still occupies a high place among the industrial and commercial centres of Europe. The principal manufactures are lead pencils, colours, gold and silver wire, gold and silver foil, railway plant, tobacco, playing-cards, and lastly the ‘“‘ Dutch” toys and fancy articles in metal, carved wood, ivory, &c., which are collectively known as “Nuremberg wares.” A great proportion of the toys exported from Nuremberg are really made by the peasants of Thuringia. The pencil manufactory of Faber, the railway works

of the Nuremberg Company, and Zeltner's ultramarine factory are among the most important of their class in Europe. Large quan- tities of Nuremberg manufactures are sent to India and America, the exports to the United States alone being valued at £800,000 in 1882. Brewing, lithography, and map-publishing are also exten- sively carried on. Nuremberg is the chief market on the Continent for hops, and in 1882 the "turn over" in the trade in this article was £4,000,000. The bronze foundry established by Professor Burgschmiet, and now carried on by Professor Lenz, produces numerous admirable and important castings ; and in the artistic handicrafts generally Nuremberg artisans are honourably distin- guished. In addition to numerous railways, trade is facilitated by the Ludwig canal, connecting the Danube and the Main. The railway from Nuremberg to Firth was the first in Germany.

Nuremberg's money-market is also of some importance. ; The population of Nuremberg at the height of its prosperity has

been estimated at as high a figure as 150,000, but there seems good reason to believe that it did not exceed 40,000 to 50,000 souls. In 1818 it had sunk to 27,000, but since then it has steadily in- creased. At the census of 1880 the town contained 99,519 inhabit- ants, 76,886 of whom were Protestants, 19,143 Roman Catholies, and 3032 Jews. According to a local estimate the population had risen to 103,255 at the beginning of 1883. Several of the patrician families of Nuremberg can trace their descent in a direct line for four or five centuries, and stil] occupy the houses built by their forefathers. A few of them are said to possess very complete and interesting domestic archives.

History.—The first authentic mention of Nuremberg, which seems to have been called into existence by the foundation of the castle, occurs in a document of 1050; and about the same period it received from Henry III. permission to establish a mint, a market, and a custom-housc, It is said to have been destroyed by the emperor Henry VY. in 1105, but if this was the case the town must have been very speedily rebuilt, as in 1127 we find the emperor Lothair taking it from the duke of Swabia and assigning it to Henry the Proud, duke of Bavaria. We now first hear of an imperial officer styled

the burggrave of Nuremberg, who, however, seems to have been merely the military governor of the castle, and to have exercised no sway over the citizens. This office came into the hands of the counts of Hohenzollern at the beginning of the 18th century, and ‘ burggrave of Nuremberg” is still one of the titles of their descendant, the emperor of Germany. The government of the town was vested in the patrician families, who, contrary to the usual course of events in the free towns, succeeded in perma- nently excluding the civic guilds from all share of municipal power. Conrad III. (1188-1152) reunited Nuremberg to the empire, and for the next three or four centuries the town was specially favoured by the German monarchs, who frequently resided and held diets here. In 1219 Frederick II. conferred upon it the rights of a free imperial town, and in 1355 it witnessed the promulgation of the famous “Golden Bull” of Charles IV, At the beginning of the 15th century the burggraves of Nuremberg, who had in the meantime raised themselves to the rank of princes of the empire; were invested with the margraviate of Brandenburg, and sold the castle of Nuremberg to the town. They, however, reserved certain rights, which resulted in keenly-contested feuds between the burghers and the margraves Albert Achilles (1449), Frederick (1502), and Albert Alcibiades (1552),

The quarrel with the margraves, however, did not interfere with the growth of the town’s prosperity, which reached its acme in the 16th century. Like Augsburg, Nuremberg attained great wealth as an intermediary between Italy and the East on the one hand, and northern Europe on the other. Its manufactures were so well known that it passed into a proverb —“Nuremberg’s hand goes through every land.” Its citizens lived in such luxury that Aineas Sylvius (Pope Pius II., 1405-1464) has left it on record that a simple burgher of Nuremberg was better lodged than the king of Scotland. The town had gradually extended its sway over a terri- tory nearly 500 square miles in extent, and was able to furnish the emperor Maximilian with a contingent of 6000 troops. But perhaps the great glory of Nuremberg lies in its claim to be the principal font of German art. Its important architectural features have already been described. The love of its citizens for sculpture is abundantly manifest in the statues and carvings on their houses. Adam Krafft (c. 1455-1507), Veit Stoss (c. 1450-1532), and Peter Vischer (c. 1455-1529) form a trinity of sculptors of which any city might be proud. In painting Nuremberg is not less prominent, as the names

of Wohlgemuth (1484-1519) and Albert Diirer (1471- 1528) sufficiently indicate. In the decorative arts the Nuremberg handicraftsman attained great perfection in ministering to the luxurious tastes of the burghers, and a large proportion of the old German furniture, silver-plate, stoves, and the like, which we now admire in industrial museums, was made in Nuremberg workshops. Wenzel Jamnitzer (1508-1585), the worker in silver, is perhaps eminent enough to be added to the above list of artists. Its place in literary history—by no means an unimportant one—Nuremberg owes to Hans Sachs (1494-1576) and the other meistersiinger. A final proof of the vigorous vitality of Nuremberg at this period may be found in the numerous inventions of its inhabitants, which include watches (at first called "Nuremberg eggs"), the air-gun, gun-locks, the terrestrial and celestial globes, the composition now called brass, and the art of wire-drawing.

Nuremberg was the first of the imperial towns to throw in its lot with the Reformation (in 1525), and it embraced Protestantism with its wonted vigour. Its name is associated with a peace con- cluded between Charles V. and the Protestants in 1532. The first blew to its prosperity was the discovery of the sea-route to India in 1497 ; and the second was inflicted by the Thirty Years' War, during which Gustavus Adolphus was besieged here in an entrenched camp by Wallenstein. During the eight or ten weeks that the blockade lasted no fewer than 10,000 inhabitants of Nuremberg are said to have died of want or disease. The downfall of the town was accelerated by the illiberal and short-sighted policy of

its patrician rulers ; and the French Revolution reduced it to such a degree that in 1796 it offered itself and its territories to the king of Prussia on condition that he would pay its debts (9,000,000 guldens). Prussia, however, refused the offer. In 1803 Nuremberg was allowed to maintain its nominal position as a free city, but in 1806 it was annexed to Bavaria. During this century its progress has been one of uninterrupted prosperity, and it is now the chief commercial town in South Germany.

Authorities.—Priem, Geschichte der Stadt Niirnberg (1874); Daniel, Handbuch der Geographie (new ed., 1881); Jahresbericht der Handels- und Gewerbekammer Sir Mittelfranken, 1882; Schrag, Newester Weqweiser

durch die Stadt Niirnberg (13th ed., 1883). Various illustrated works on the artists and art-treasures of Nuremberg have been published by Schrag of Nuremberg. (J. F. M.)

NURSIA. See Sasrnzs.

NUT. The term nut is applied to that class of fruit which consists generally of a single kernel enclosed in a hard shell. Botanically speaking, nuts are one-celled fruits with hardened pericarps, more or less enveloped in a cupule or cup, formed by the aggregation of the bracts. In com- merce, however, the term has a wider application and em- braces many fruits having hard woody indehiscent shells or coverings without reference to their enclosed seeds or kernels, besides leguminous pods, and even tuberous roots. A great number of nuts enter into commerce for various purposes, principally as articles of food or sources of oil, and for several ornamental and useful purposes. For the most part the edible nuts are very rich in oil, with only a small percentage of the other carbohydrates, starch, sugar, &c., and they also contain a large proportion of nitrogenous constituents. Thus possessing rich nutrient principles in a highly-concentrated form, nuts are by themselves rather difficult of digestion, and the liability of many of them to become rancid is also a source of danger and a hindrance to their free use. Oleaginous nuts used for food are like-wise employed more or less as sources of oil, but on the other hand there are many oil-nuts of commercial import- ance not embraced in the list of edible nuts. The follow- ing is an alphabetical enumeration of the more important nuts, and of products passing under that name, used either as articles of food or as sources of oil :—

Name. Source. Locality. Remarks, Almond ..... Amygdalus communis,|$. Europe....| Food, oil. See vol. var. B., dulcis . p. 595. Almond (bitter)| Amygdalus communis, seuss Oil. See vol. i. p. var, A., amara 595. PATSTIULU oss arte oie Tubers of Bunium fleauo-| Great Britain | Food. swum and other species Bamnbarra Voandzeia subterranea ..| W. Africa....| Food. ground nut Ben nut ..... Moringa pterygosperma |B. Indies ....| Oil. See Orts. Bitter nut .|Carya amara (swamp|N. America ..| See Hickory, vol. hickory) xi. p. 790. Brazil nut .| Bertholletia excelsa ..... 8. America ..| Food, oil. See vol. iv. p. 241, Bread nut .»| Brosimum Alicastrum ..| W.

Indies …. sod. ets i Souari | Caryocar nuciferwm ….|Guiana …... Food. nu Cahoun nut ..) Attalea Cohune …..... Honduras… ..| Oil. Candle nut ….) Alewrites triloba…..... 8. Sea Islands| Oil. See Orzs. Cashew nut ….) Anacardiwm occidentale |W. Indies .. ..| Food, oil. See vol. Veep. Lios Chestnut …... Castanea vescn……..... 8. Europe…. Hood. See vol. v.

. 608.

Cob, filbert, or | Corylus Avellana …... England, ee Haze, vol. xi, hazel Spain p. 548, Cob nut of Ja-|Omphalea diandra…... W. Indies ….| Food. maica Cocoa nut -| Cocos nucifera ……..... E. Indies ….| Food, oil. See vol. vi. p. 103. Cola nut …... Cola acuminata …..... W. Africa ….| Food. Dika nut …... Irvingia Barteri…..... W. Africa ….| Food, oil. Gingko nut ….| Salisburia adiantifolia..|Japan …... Food, oil.

Ground nut ….| Arachis hypogea…..... FPYOpIGSIs. ous See Grounp Nut, : vol. xi. p. 221. Hickory nut ..|Caryaalba ……..... N. America ..| See Hickory, vol.

xi. p. 790. Hogmut) ...0.. Carya porcina …..... ..|N, America .. Rian: by animals. Mocker nut….| Carya tomentosa …..... N. America ..| See Hickory, vol. xi. p. 790. Moreton Bay Castanospermum australe | Australia …. Boca! chestnut Nutmeg …... Myristica moschata ….| EB. Indies …. Spice. See NutMEc. | Nutmeg (wild) | Myristica — M. tom-| Tropies …... Spice. See NutMEc. : entosa, &¢. Olivesnutine ee Elexocarpus Ganitrus, &c.| BE. Indies ….| Food. Palm nut…... Elais guineensis …..... W. Africa….| Oil. See Pau. Pecan nut | Carya oliveformis …... N. America ..| Food, oil. See Hick ORY, Vol. xi. p. 790. Pekea nut -| Caryocar butyrosum ….|Guiana …... Food. ‘ iis

NU R—NUT

Name. Source. Locality. Remarks. Physic nut ….| Curcas purgans …..... Tropical Oil. See Orts. America Pine nut …... Pinus Pinea, &e. Food, Pistachio nut ..| Pistachia vera……... ..| Food. Quandang nut..| Fusanus acuminatus ….| Australia ….) Food. Ravensara nut | Agathophyllum aromati- | Madagascar ..} Spice. cum Rush nut…... Cyperus esculentus …...

~~8. Europe…./ Food. Sapucaya nut ..| Lecythis Ollaria …..... Brazil, cssiesese Food.~~

~~Tahiti chestnut Walnuts… Water chestnut~~

~~8. Sea Islands | Food. .... + e| Asia, Europe | Food, oil. Food.~~

~~Inocarpus edulis Juglans regia .. Various species of T'rapa| Kashmir, &c.~~

~~There remain to be enumerated a number of nuts of commercial value for turnery and ornamental purposes, for medicinal use, and for several miscellaneous applications in the arts. These include :—~~

~~Name. Source. Loeality. Remarks. Betel nut …... Areca Catecht …..... E. Indies ….) See vol. iii. p. 616. Bladder nut ..| Staphylea pinnata …... Cent. Europe | Necklaces. Boomah nut ..| Pycnocoma macrophylla | Africa …... Tanning.~~

~~Bonduc nut ….| Gwilandina Bonduc ….| India.…..... Medicine, beads.~~

~~Clearing nut ..| Strychnos potatorum ….|India.…..... Clearing water.~~

~~Coquilla nut ..| Attalea funifera …..... Brazil …... Turnery.~~

~~Corozo nut or | Phytelephas macrocarpa | Brazil …... See vol. xiii. p. 524,~~

~~vegetable ivory~~

~~Cumara nut ..| Dipterix odorata.…..... Brazil 26)... 3 Perfume.~~

~~Grugru nut ….) Acrocomia sclerocarpa ..|S8. America ..| Beads.~~

~~Horse chestnut | Zsculus Hippocastanwm | Europe …... Starch. See vol. y. p. 608.~~

~~Marking nut ..| Semecarpus Anacardiwm | EB. Indies …. Marking ink and varnish,~~

~~Nut galls …...| Quercus infectoria …... Levant …... Dyeing and ink making, See GALLS, vol. x. p.~~

~~45,~~

~~Poison nut ….|Strychnos Nua-Vomica ..|B. Indies ….] Medicine. See Nux VoMIca.~~

~~Sassafras nut ..| Nectandra Puchury ….|8. America ..| Aromatic.~~

~~Snake nut ….| Ophiocaryon paradoxum |8. America .. Curiosity.~~

~~Soap nut …... Sapindus Saponaria ….| W. Indies…. Bia orna- mental.~~

~~The application of the term nut to many of these pro- ducts is purely arbitrary, and it is obvious that numerous other bodies not known commercially as nuts might with equal propriety be included in the list. Most of the nuts of real commercial importance are or will be separately noticed, and here further allusion is only made to a few which form current articles of commerce, not otherwise treated of.~~

~~The Bread nut of Jamaica is the fruit of a lofty tree, Brosmum Alicastrum, It is about an inch in diameter, and encloses a single seed, which, roasted or boiled, is a pleasant and nutritious article of food.~~

~~The Souari or Surahwa nut, called also the "Butter nut of Demerara," and by fruiterers the "Suwarrow nut," is the fruit of Caryocar nuciferum (Rhizobolacex), a native of the forests of Guiana, growing 80 feet in height. This is perhaps the finest of all the fruits called nuts. The kernel is large, soft, and even sweeter than the almond, which it somewhat resembles in taste. The few that are imported come from Demerara, and are about the size of an egg, somewhat kidney-shaped, of a rich reddish-brown colour, and covered with large rounded tubercles.~~

~~The Pekea nut, similar in appearance and properties, is the produce of Caryocar butyrosum, growing in the same regions of tropical America.~~

~~The Jamaica Cob nut is the produce of a euphorbiaceous tree, Omphalea diandra, the seeds of which resemble in taste the ordinary cob or hazel nut. The seed, however, contains a deleterious embryo, which must not be eaten.~~

~~Cola, Kola, or Goora nuts are the produce of Cola acuminata (Sterculiacex), a tree native of tropical Africa, now introduced into the West Indies and South America. The nuts form an important article of commerce through- out Central Africa, being used over a wide area as a kind of stimulant condiment. The nuts, of which there are numerous varieties, are found to contain a notable propor- tion of theine, as much as 2°13 per cent., besides theobro- mine and other important food-constituents, to which~~

~~circumstances, doubtless, their valuable properties are due.~~

~~Coquilla nuts, the large seeds of the palm, Attalea Junifera, the piassaba of Brazil, are highly valued for turnery purposes. They have an elongated oval form, 3 to 4 inches in length, and being intensely hard they take a fine polish, displaying a richly-streaked brown colour.~~

~~The Marking nut, Semecarpus Anacardium, is a fruit closely allied in its source and properties to the Casnzw Nor (q.v.). The marking nut is a native of the East Indies, where the extremely acrid juice of the shell of the fruit in its unripe state is mixed with quicklime, and used as a marking-ink. . The juice also possesses medicinal vir- tues as an external application, and when dry it is the basis of a valuable caulking material and black varnish. The seeds are edible, and the source of a useful oil.~~

~~Physic nuts are the produce of the euphorbiaceous tree, Curcas purgans, whence a valuable oil, having similar purgative properties to castor oil, is obtained. The plant is a native of South America; but is now found through- out all tropical countries.~~

~~Pine nuts are the seeds of several species of Pinus, eaten in the countries of their growth, and also serving to some extent as sources of oil. Of these the most important are the Stone Pine, Pinus Pinea, of Italy and the Mediter- ranean coasts, and the Russian Stone Pine, Pinus Cembra. The Pinus~~

Sabiniana of California and P. Gerardiana of the Himalayas similarly yield edible seeds. 'These seeds possess a pleasant, slightly resinous flavour.

The Pistachio nut is the fruit of Pistacia vera, L. (Anacardiacer). Tt is a native of Syria. Although a remarkably delicious nut and much prized by the Greeks and other Eastern nations, it is not well known in Britain. It is not so large as a hazel nut, but is rather longer and much thinner, and the shell is covered with a somewhat wrinkled skin, The small nut of Pistacia Lentiscus, L., not larger than a cherry stone, is also occasionally imported from Smyrna, Constantinople, and Greece.

Ravensara nuts, the fruit of Agathophyllum aromaticum (Lauracex), a native of Madagascar, is used as a spice under the name of the Madagascar clove nutmeg.

The Sapucaya nut, a Brazilian fruit, is seen occasionally in fruit-shops. It is produced bya large tree, Lecythis Ollaria, or "'Cannon-ball tree." Its specific name is taken from the large urn-shaped capsules, called "monkey-pots" by the inhabitants, which contain the nuts. The sapucaya nut has a sweet flavour, resembling the almond, and if better known would be highly appreciated. It is, how- ever, scarce, as the monkeys and other wild animals are said to be particularly fond of it. This nut, which is of a rich amber-brown, is not unlike the Brazil nut, but it has a smooth shell furrowed with deep longitudinal wrinkles.

Soap nuts are the fruits of various species of Sapindus, especially S. Saponaria, natives of tropical regions, They are so called because their rind or outer covering contains a principle, saponine, which lathers in water, and so is useful in washing. 'The pods of Acacia concinna, a native of India, possess the same properties, and are also known as soap nuts. (J. PA.)

NUTATION. See Asrronomy, vol. ii. pp. 794-5.

NUTCRACKER, the name given by Edwards in 1758 (Gleanings, No. 240) to a bird which had hitherto borne no English appellation, though described in 1544 by Turner, who, meeting with it in the Rheetic Alps, where it was called '"'Nousbrecher" (hodie "Nussbrecher"), translated that

term into Latin as Vucifraga. In 1555 Gesner figured it and conferred upon it another designation, Caryocatactes, It is the Corvus caryocatactes of Linnzeus and the Nucr- Jraga caryocatactes of modern ornithology. Willughby and Ray obtained it on the road from Vienna to Venice as

they crossed what must have been the Sémmerring Pass, 26th September 1663. The first known to have occurred in Britain was, according to Pennant, shot at Mostyn in Flintshire, 5th October 1753, and about fifteen more examples have since been procured, and others seen, in the island. In further continuation of the particulars already given (Crow, vol. vi. p. 618), it may here be stated that a careful monograph of the species by the Ritter Victor von T'schusi-Schmidhoffen was printed at Dresden in 1874 with the title of Der Lannenheher, which is one of its many German names. Contrary to what was for many years believed, the nest of the Nutcracker seems to be in- variably built on the bough of a tree, some 20 feet from the ground, and is a comparatively large structure of sticks, lined with grass. The eggs are of a very pale bluish-green, sometimes nearly spotless, but usually more or less freckled with pale olive or ash-colour, The chief food of the Nutcracker, though it at times searches for insects on the ground, appears to be the seeds of various conifers, which it extracts as it holds the cones in its foot, and it has been questioned whether the bird has the faculty of cracking nuts—properly so called—with its bill, though that can be used with much force and, at least in confinement, with no little ingenuity. The old supposi- tion that the Nutcrackers had any affinity to the Wood- peckers (Picidx) or were intermediate in position between them and the Crows (Corvidx) is now known to be wholly erroneous, for they undoubtedly belong to the latter Family. (A. N.) NUTHIATCH, in older English Nurwacx, from its habit of hacking or chipping nuts, which it cleverly fixes, as though in a vice, in a chink or crevice of the bark of a tree, and then hammers them with the point of its bill till the shell is broken. This bird was long thought to be the Sttta europxa of Linneus; but that is now admitted to be the northern form, with the lower parts white, and its buff-breasted representative in central, southern, and western Europe, including England, is known as Sttta cesta. It is not found in Ireland, and in Scotland its appearance is merely accidental. Without being very plentiful anywhere, it is generally distributed

in suitable localities throughout its range—those localities being such as afford it a sufficient supply of food, consisting during the greater part of the year of insects, which it diligently seeks on the boles and larger limbs of old trees; but in autumn and winter it feeds on nuts, beech-mast, the stones of yew-berries, and hard seeds. Being of a bold disposi- tion, and the trees favouring its mode of life often grow- ing near houses, it will become on slight encouragement familiar with men; and its neat attire of ash-grey and warm buff, together with its sprightly gestures, render it an attractive visitor. It generally makes its nest in a hollow branch, plastering up the opening with clay, leaving only a circular hole just large enough to afford entrance and exit; and the interior contains a bed of dry leaves or the filmy flakes of the inner bark of a fir or cedar, on which the eggs are laid. In the Levant occurs another species, S. syriaca, with somewhat different habits, as it haunts rocks rather than trees; and four or five representatives of the Euro. pean arboreal species have their respective ranges from Asia Minor to the HImalayas and Northern China. North Aimerica possesses nearly as any ; but, curiously enough, the geographical difference of coloration is just the reverse of what it is in Europe—the species with a deep rufous breast, S. canadensis, being that which has the most north. ern range, while the white-bellied S. carolinensis, with its western form, S. aculeata, inhabits more southern latitudes. The Ethiopian Region seems to have no representative of the group, unless it be the HWypositta corallirostris—of Madagascar. Callisitta and Dendrophila are nearly allied XVII. — 84

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genera, inhabiting the Indian Region, and remarkable for their beautiful blue plumage ; but some doubt may for the present be entertained as to the affinity of the Australian Sittella, with four or five species, found in one or another part of that continent, which doubt is increased by the late Mr Forbes's discovery (Proc. Zool. Soctety, 1882, pp. 569-571) that the genera Acanthisitta and Xenicus, pecu- liar to New Zealand, and hitherto generally placed in the Family Sittide, belong really to the Mesomyodian group and are therefore far removed from it. The unquestioned members of the Sittidx seem to be intermediate between the Paride and the Certhiidx, and some authors comprehend them in either one or the other of those groups. (A. N.) NUTMEG. The spice known in commerce under this name is the kernel of

the seed of Myristica fragrans, Houtt., a dicecious evergreen tree, about 50 to 60 feet high, found wild in the Banda Islands and a few of the neighbouring islands, extending to New Guinea but not to the Philip- pines. Nutmeg yj and mace are al- most exclusively obtained from the ji Banda Islands, al- "Vai though the culti- vation has been attempted with varying success in Singapore, Penang, Bengal, Réunion, Brazil, French Guiana, and the West In- dies. The trees yield fruit in eight years after sowing 'the seed, reach their prime in twenty-five years, and bear for sixty years or longer. Almost the whole surface of the Banda Islands is planted with nut- meg trees, which thrive under the shade of the lofty Canarium commune. The light volcanic soil, shade, and excessive moisture of these islands, where it rains more or less during the whole year, seem exactly to suit the requirements of the nutmeg tree. In Bencoolen the tree bears all the year round, but the chief harvest takes place in the later months of the year, and a smaller one in April, May, and June. In the Banda Islands the fruits are collected in small neatly-made oval baskets at the end of a bamboo, which prevents bruising, the baskets being open for half their length on one side and furnished with a couple of small prongs projecting from the top, by which the fruit-stalk is broken, the fruit falling into the basket. The ripe fruit is about 2 inches in diameter, of a rounded pear-shape, and when mature splits into two halves, ex- posing a crimson arillus surrounding a single seed. When the fruit is collected the pericarp is first removed; then the arillus is carefully stripped off and dried, in which state it forms the mace of commerce. The seed consists of a thin hard testa or shell enclosing a kernel, which, when dried, is the nutmeg. To prepare the nutmegs for use, the seed enclosing the kernel is dried at a gentle heat in a drying-house over a smouldering fire for about two months, the seeds being turned every second or third day. When thoroughly dried the shells are broken with a wooden mallet or flat board and the nutmegs picked out

Flowers, Fruit, and Seed of Nutmeg.

and sorted, the smaller and inferior ones being reserved for the expression of the fixed oil which they contain, and which forms the so-called oil of mace.

The dried nutmegs are then rubbed over with dry sifted lime. The process of liming, which originated at the time when the Dutch held a monopoly of the trade, was com- menced with the view of preventing the germination of the seeds, which were formerly immersed for three months in milk of lime for this purpose, and a preference is still manifested in some countries for nutmegs so prepared. It has, however, been shown that this treatment is by no means necessary, since exposure to the sun for a week destroys the vitality of the kernel. Nor is the dry liming process needful, for nutmegs keep well in their natural shell, in which form they are usually exported to China. -The weight of the shells, however, adds one-third to the cost of freight, hence this plan is not generally adopted. Penang nutmegs are never limed. The entire fruit preserved in syrup is used as a sweetmeat in the Dutch East Indies.

"Oil of mace," or nutmeg butter, is a solid fatty substance of a reddish-brown colour, obtained by grinding the refuse nutmegs to a fine powder, enclosing it in bags and steaming it over large cauldrons for five or six hours, and then com- pressing it while still warm between powerful wedges, the brownish fluid which flows out being afterwards allowed to solidify. Nutmegs yield about one-fourth of their weight of this substance. It is partly dissolved by cold alcohol, the remainder being soluble in ether. The latter portion, about 10 per cent. of the weight of the nutmegs, consists chiefly of myristin, which is a compound of myristic acid, C,,H.,0,, with glycerin. The fat which is soluble in alcohol appears to consist, according to Schmidt and Roemer (Arch. Pharm. [3], xxi. pp. 34-48), of free myristic and stearic acids ; the brown colouring matter has not been satisfactorily investigated. Nutmeg butter yields on dis- tillation with water a volatile oil to the extent of about 6 per cent., consisting almost entirely of a hydrocarbon called myristicene, C,)H,,, boiling at 165° C. It is accom- panied by a small quantity of an oxygenated oil, myristicol, isomeric with carvol, but differing from it in not forming a crystalline compound with hydrosulphuric acid. Mace con- tains a similar volatile oil, macene, boiling at 160° C., which is said by Cloéz to differ from that of nutmegs in yielding a solid compound when treated with hydrochloric acid gas.

The annual imports of nutmegs to the United Kingdom amount to from 400,000 to 800,000 ib, each ib consisting of about 110 fair-sized nutmegs,

~~and of mace from 60,000 to 80,000 Ib per annum. The former are valued at from three to five shillings per tb, and mace at from one to three shillings per Ib.1 Long, wild, or male nutmegs, the produce of J. tomentosa and M. fatua, are sometimes imported in small quantities. Several species of AMyristica yield fatty oils, which form commercial products, but none of these are remarkable for fragrance.~~

~~The name nutmeg is also applied to other fruits or seeds in different countries. The Jamaica or calabash nutmeg is derived from Monodora Myristica, the Brazilian from Crypto- carya moschata, the Peruvian from Laurelia sempervirens, the New Holland or plume nutmeg from Atherosperma moschata, the Madagascar orclove nutmeg from Agathophyllum aroma- tecum, and the Californian or stinking nutmeg from Torreya myristica. The cotyledons of Nectandra Puchury were at one time offered in England as nutmegs.~~

~~Seemann, in Hooker's Journ. Bot., 1852, p. 83; Collingwood, Journ, Lin. Soc. Bot., 1869, p. 45; Lumsdaine, Pharm. Journ. [1], xi. p. 516; Wallace, Malay Archipelago, i. p. 452, 1869 ; Bickmore, Travels in E. Indian Archipelago, 1868, p. 225; Pharmacographia (2d. ed.), p. 502; Journ. Pharm. Soc. [3], xiii. p. 304.~~

~~1 This spice seems to be an especial favourite with the people of the United States, since the export to that country exceeds that to all Europe combined.~~

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~~WUPRIT EON~~

~~BY the term nutrition, employed in its widest sense,~~

~~is understood the process, or rather the assemblage of processes, concerned in the maintenance and repair of the living body as a whole, or of its constituent parts or organs. The term has, however, usually been limited in~~

~~systematic treatises on physiology to a study, mainly |~~

statistical, of the relations which exist between a living being and the medium which it inhabits, embracing a determination of the gains and losses of the organism under the different conditions to which it may be exposed. Such a statistical study has already been pursued in the article Dietetics, and we shall therefore in the present article, restricting our attention to the animal kingdom, consider nutrition in the more general sense above referred to, including—(1) a study of the function of digestion ; (2) a sketch of the processes concerned in

the absorption of matter into the blood ; (3) an account of |

the chemical processes which have their seat in the tissues and organs of the body ; (4) an account of the processes

whereby redundant matters, or such as are the products of |

waste, are removed from the animal economy ; (5) a refer- ence to the transformations of energy which are associated with the'exchange of the matters of the body ; (6) a brief reference to the processes of growth, decay, and death. With the exception of the chemical processes concerned in respiration, which will be treated of at length under

that head, this article will therefore include a short dis- |

cussion of the chemical operations of the body generally, and particularly as they are exemplified in the case of man,

General Introductory Considerations.—There is no con- ception which we can form in reference to a living being, however rudimentary its structure, which is so general as the following :—a living animal, so long as it manifests those attributes which characterize it as living, is the seat of continual transformations of potential into kinetic energy.

Such transformations are connected with oxidation of organic matters which, primarily derived from the vegetable kingdom, have been assimiluted, i.e., have been converted into the substance of the animal, and are effected through the agency of oxygen gas introduced into the body in the process of respiration. The act of living is an act of com- bustion in

which the animal body actually burns, and the energy at the disposal of the body, and which is employed in raising its temperature or effecting the movements which are essential to its continued life, is energy which was potential in the organic constituents burned. The main products of the combustion of the body are carbonic acid and water, besides certain other less 'completely oxidized substances, which are the analogues of the sooty and tarry products of combustion in a furnace. Of these products some, as carbonic acid and a part of the water formed, are removed from the body almost as soon as they are formed, while others are thrown off at intervals.

It follows from what has been stated that the act of living necessarily implies not only transformation of energy but actual waste of the matter of the body, and that if an animal is continuously to manifest the pheno- mena of life it must be supplied with oxidizable organic matter to take the place of that which has been oxidized. Accordingly, animal life is impossible unless the creature, besides receiving continual supplies of oxygen gas, receives at intervals supplies of food. The food of an animal con- sists (1) of oxidizable organic matters which, although they inay have been derived in part or wholly from some other animal body, have primarily been built up through the instrumentality of vegetable organisms,—these organic

matters, including large quantities of water, which form an important part of the substance of the body, and the presence in and passage of which through the organism is essential to the physical processes which have their seatin it,

In brief, the animal body is the seat of processes of dis- integration associated with the manifestation of kinetic energy, and of processes of integration in which oxidizable matters take the place of the oxidized constituents, If life is to continue, in a sense, indefinitely it is essential that the processes of integration and disintegration should balance, 7.¢., that the receipts of the body in assimilable oxidizable matter should balance the expenditure of the body both in matter and energy. There are, it will be

| observed, very close analogies between an animal and

such a mechanism as a steam-engine, the energy at the disposal of both being primarily derived from the oxida- tion of combustible matters. Some

of the most salient points of difference must, however, not be lost sight of. (1) The waste of the essential parts of such a machine as a steam-engine is insignificant, and bears no definite rela-

| tion to the work done. The kinetic energy of the machine | is primarily due to oxidation processes taking place in the

furnace, and in no respect to changes in the substance of the machine. The animal, on the other hand, wastes con-

| tinuously in all its parts and organs, and much of its energy

is derived immediately from material which has becoine part and parcel of the various mechanisms. (2) Any sub- stance capable of being rapidly oxidized (burned), and thus of generating heat, may be used as fuel for a steam- engine, provided its combustion admits of being conducted with safety in its furnace, whilst the substances which can form the food of animals belong to a limited number of groups, which include but a comparatively small number of bodies. The constituents of food have not only to supply energy to the body, but they must further be cap- able of prior conversion into the very substance of the animal body, into its very "flesh and blood."

Moreover, the constituents of food must be free from all traces of the peculiar substances which we term "poisons," and which by their presence have the power of impairing and arresting the action of various organs of the body.

I.—Function or DIGESTION.

Hunger and Thirst.—These terms are used to express peculiar sensations which are produced by and give ex- pression to general wants of the system, satisfied respect- ively by the ingestion of organic solids containing sub- stances capable of acting as food, and by water or liquids and solids containing water.

Hunger is a peculiarly indefinite sensation of craving or want which is referred to the stomach, but with which is often combined, always indeed in

its most pronounced stages, a general feeling of weakness or faintness. The earliest stages are unattended with suffering, and, leading the animal to wish and seek for food, are characterized as "appetite for food." Hunger is normally appeased by the introduction of solid or semi-solid nutriment into the stomach, and it is probable that the almost immediate alleviation of the sensation under these circumstances is in part due to a local influence, perhaps connected with a free secretion of gastric juice. Essentially, however, the sensation of hunger is a mere local expression of a general want, and this local expression ceases when the want is satisfied, even though only liquid and no solid food is introduced into the stomach, or even though no food be introduced into the stomach, the needs of the economy :

matters belong to a few well-defined groups ; (2) of mineral | being satisfied by the introduction of food through other

channels, as, for example, when food which admits of being readily absorbed is injected into the large intestine.

Thirst is a peculiar sensation of dryness and heat local- ized in the tongue and throat. Although thirst may be artificially produced by drying, as by the passage of a cur- rent of air over the mucous membrane of the above parts, normally it depends upon an impoverishment of the system in water. And, when this impoverishment ceases, in which- ever way this be effected, the sensation likewise ceases. The injection of water into the blood, the stomach, or the large intestine appeases thirst, though no fluid is brought in contact with the part to which the sensation is referred.

The sensations the causes of which we have briefly attempted to trace lead us, or when urgent compel us, to take food and drink into the mouth. Once in the mouth, the entrance to the alimentary canal, the food begins to undergo a series of processes, the object of which is to extract from it as much as possible of its nutritive con- stituents. It cannot be sufficiently emphasized that food in the alimentary canal is, strictly speaking, outside the confines of the body; as much so as the fly grasped in the leaves of the insectivorous Dionea is outside of the plant itself. 'The mechanical and chemical processes to which the food is subjected in the stomach and

intestines are pro- cesses which have their seat and conditions outside the body which it is destined to nourish, though unquestion- ably the body is no passive agent, and innumerable glands have to come into action in order to supply the chemical agents which shall dissolve and render assimilable those constituents of the food which are capable of being ab- sorbed into the organism, and of forming part and parcel of its substance.

Structure of the Organs of Digestion in Relation to their Function.—The processes to which the food is subjected, though manifold, are divisible into two great groups: (1) the food must be subjected to the action of certain juices which dissolve insoluble alimentary matters, and modify these no less than certain of the soluble alimentary sub- stances ; and (2) it must be mechanically mixed with those juices, and propelled more or less slowly from beginning to end of the alimentary canal. In accordance with this twofold function the alimentary canal is divisible into two distinct but intercalated anatomical tubes,—(1) an internal tube of mucous membrane, and (2), investing this closely, an external muscular tube.

The musculo-membranous double tube thus formed is not, indeed, regularly tubular throughout. At the beginning it forms the irre- gular cavity of the mouth, which contains the tongue aud the mas- ticatory teeth. Thence it passes through the fawces and beneath the pendulous wela and soft palate into the pharynx. Afterwards it proceeds as a regular tube, the esophagus, or gullet, until the level of the diaphragm is reached,—the muscular partition be- tween the thorax and the abdomen. Having passed through this structure, the narrow tube of the cesophagus suddenly dilates at the cardiac orifice into the bag called the stomach, at the further or pyloric orifice of which the tube resumes its narrow uniform calibre, and forms successively the duodenum, the jejunwm, and the tlewm,— parts of the small intestine, of which, in man, the duodenum takes up twelve fingers' breadth, the ileum the lower three-fifths, and the jejunum the remainder of the total length of 20 feet. The small intestine diminishes somewhat in calibre from duodenum to ileum, and at the lower end of the latter opens suddenly into the much wider large intestine, which it joins, not at the extreme end, which is a cul-de-sac, the caput cexcwm colt, but at a point a little lower down. The margins of the aperture by which the small opens into the large intestine point or project into the latter in such a manner that,

while they readily permit the passage of matters from small to large intestine, any backward movement of the contents of the large intestine would have the effect of compressing the lips of the opening and closing it; this arrangement constitutes the so-called ilio-cacal valve. Connected with the caput cxwcum coli is a small diverticulum like a narrow glove finger, called the vermiform appendage. The first and greater part of the large intestine is known as the colon, the last as the rectwm. The total length is from 5 to 6 feet. Its lower orifice is called the anus.

Both muscular and membranous (mucous) tubes are continuous

from mouth to anus, and at these, the superior and inferior orifices, the mucous membrane which constitutes what we have hitherto termed the membranous tube is continuous with the skin which covers the general surface of the body. This mucous membranc is covered throughout at its free surface by an epithelium, and gives lodgment to glands, whose characters differ in different parts of the tube in accordance with the function of the part. Below the epithelium is a connective tissue analogous to the cwtts vera of the skin, which in parts has the character of ordinary fibro- areolar tissue, but in all parts from the stomach downwards has the character of so-called adenoid connective tissue, as it is found in the follicles of lymphatic glands. Its meshes support a rich supply of fine blood-vessels,lymph- atic vessels, and doubtless also & of delicate nervous filaments. Besides these elements there are found numerous small bundles, or in parts even sheets, of in- voluntary muscular fibres, which probably give to the mucous membrane the power of limited self-contraction, of such a nature as to further the flux and- reflux of fluids in the myriad lymphatic vessels of the part, and perhaps to influence in no small Neston the outpouring of the secretion of cer- tain of the glands. To the fairly continuous tract or sheet of in- voluntary muscle which lies at the base or deepest part of the mucous membrane or mucosa the term of musculartS mucosa (tunica) is Fic. 1.—Divisions of the Alimentary

applied. Canal. M, mouth; Ph, pharynx; Cs,

In addition to the glands which lieembeddedinand open upon the surface of the mucous membrane of the alimentary canal, others of larger size and not

~~in immediate relation with its walls communi- cate with the interior of the tube by ducts which open into it, and~~

~~cesophagus; 8, stomach; D, duo- denum; J, jejunum; I, ileum; AV, appendix vermiformis; AC, ascend- ing colon; HF, hepatic flexure; TC, transverse colon; SF, splenic flexure; DC, descending colon; Sg, sigmoid flexure ; R, rectuin; L, larynx; e, Eus- tachian tube; G, gall-bladder; H, hepatic duct; DC', common bile-~~

~~duct; P, pancreatic duct. (From~~

~~Turner's Anatomy, fig. 177.)~~

~~which pour into it their secre- tion ; such glands are the salivary glands, the pancreas, and the liver.~~

~~The muscular tube in the greater part of its extent consists of two layers of involuntary, non-striated, pale, muscular fibres,—an inner layer whose fibres encircle the tube, and an outer one whose fibres ruu parallel to the long axis of the tube. But this is not the arrangement of every part. There is an apparent rather than a real exception in the stomach, where some layers of fibres of the circular coat course over the dilated walls of the alimentary tube in an oblique direction, giving rise to an oblique layer. In the cesophagus or gullet, besides the typical circular and longitudinal layers, there is at the upper part a second longitudinal layer which takes up a position internal to—that is, nearer the mucous mem- brane thau—the circular layers. In the upper part of the gullet also the muscular fibres are not unstriped, but, although certainly involuntary, are striated like voluntary muscles.~~

~~In the mouth the muscular tube is most irregular and most defective, for the mucosa is in parts directly applied to the bony boundaries, as over the hard palate and gums ; in another part it invests the muscular prominence of the tongue ; whilst in other regions it lies upon the constrictors of the pharynx and the inner aspect of certain other muscles, as those of the cheeks, lips, and floor of the mouth. The membranous tube is united to the mus- cular tube by a loose layer of connective tissue containing many blood-vessels~~

and lymphatic vessels and nerves for the supply of the mucosa ; it is often called the submucosa.

The mucous membrane is the seat of various secreting glands, which lie embedded in its substance and open upon its surface,— simple or branched tubular recesses running through the depth of the layer, lined by epithelium, continuous with, though not always resembling, that of the surface, and opening at the surface by minute pores. In the mouth, pharynx, and cesophagus those form the acinows or racemose glands, which, according to certain sub- ordinate features which they present, and also according to certain of the characters of the fluids which they secrete, are separated into mucous and serous glands. In the stomach they are represented

: NUTRITION

by the simple or branched tubular gastric glands. In the duo- denum we find them as simple tubular deep sockets, the glands or crypts of Lieberkiihn, and also as the compound acinous glands of Brunner, which dip below the level of the mucosa and lie in the submucosa. In the jejunum, ileum, and large intestine they appear again as the crypts or follicles of Lieberkiihn.

The membranous tube is not everywhere exactly concentric and conterminous with the muscular tube. In the mouth and pharynx it is almost entirely so, but at the gullet the muscular tube so tightly encloses the membranous that the latter is forced into longitudinal plications to find room for itself. In the stomach the membranous layer is raised into ridges or rwgx, which intersect and give the surface a honeycomb-like aspect. In the upper part of the small intestine the membranous tube is raised into deep annular or, more correctly, crescentic folds, running across the direction of the gut like incomplete diaphragms, or a series of membranous ledges ; these are the valvulw conniventes. In the colon the two tubes are so disposed as to form a regular series of saccules or pouches, adding largely to the capacity of the gut. All these foldings greatly increase the superficies of the membranous tube. A further enlargement is effected in the small intestine in an ex- ceedingly interesting fashion ; the surface of the mucosa is thickly studded with innumerable fine short projections resembling the pile of velvet. These are invested by surface epithelium, and amongst them,

~~at their feet, open the before-mentioned crypts of Lieberkiihn, They are the so-called vild¢, Each contains a lymph- atic vessel, blood-vyessels, and involuntary muscular fibres, all sup- ported by adenoid connective tissue like that of the mucosa below ; the lymphatic is in the axis of the villus, the muscles form the next layer, and the blood-vessels lie immediately beneath the epithelium. When the muscular layer of the villus contracts it must of necessity compress the lymph-vessel, whilst causing no impediment to the flow of blood.~~

~~We have described the mucosa of the stomach and intestines as containing a framework of adenoid reticular tissue like the tissue of lymphatic follicles. It is, indeed, identical with this, —a net- work of branched cells with oval nuclei, the meshes of which are crowded with lymph-corpuscles with round nuclei. At certain points in the intestines the adenoid tissue of the mucosa presents local nodular enlargements; the mucosa at these points becomes so much thicker that it swells up at the free surface beneath the epithelium into rounded eminences about as large as millet-seeds or the heads of small pins ; and at the under surface of the mucosa it dips into the submncous tissue in a similar manner. At the base of this nodule of adenoid tissue in the submucosa there is usually a network of wide, thin-walled, lymphatic vessels. Many of these rounded masses are scattered irregularly over the small and large intestines as the solitary follicles or glands, but at the lower end of the ileum they form little colonies, often covering an area an inch or more in length, situated at that part of the intestine which is remote from the attachment of the mesentery. They then con- stitute the so-called Peyer's patches.~~

~~Nodular adenoid masses are, however, not limited to the adenoid mucosa of the intestines. They are occasionally, though rarely, found in the stomach ; they exist beneath the mucous membrane of the tongue, and a colony of them forms the mass of the tonsil on each side, —the almond-shaped body situated between the posterior and anterior pillars of the fauces.~~

~~The intrinsic nerves of the alimentary tube consist of two sys- tems of nervous networks with ganglion-cells lying at the nodes ; one is found in the submucous layer (plewus of Meissner), the other lies between the~~

longitudinal and circular muscles (plewus of Aucr- bach, or plexus myentericus).

The whole of the intestines, and the stomach as well, are stis- tained in the abdominal cavity by sheets of delicate membrane, formed by folds of peritoneum, and called, in the case of the intes- tinal portion of the tube, the mesentery. Between the layers of the mesentery run the vessels and nerves for the supply of the bowel. In addition to blood-vessels there are numerous thin-walled lymph- atic vessels called dacteals, which are fed by the rich network of lymphatic vessels of the mucosa and submucosa, and which run in the mesentery to the back of the abdominal cavity. Here they are collected into a large lymphatic reservoir, the receptaculum chyli, from which a duct, the thoracic duct, proceeds along the side of the vertebral column to open into the venous system at the junction of the subclavian and jngular veins on the left side of the neck, The lacteal and lymphatic vessels, whose course has been briefly sketched, are interrupted at many points by the presence of lymph- atic glands. These may be simply regarded as labyrinthine sys- tems of vessels into which the simple afferent lymphatic or lacteal vessels open, and each of which is surrounded and penetrated by adenoid connective tissue, like that of the intestinal mucosa. After a meal the lacteal vessels are filled with a milky fluid, the chyle. They were discovered by Aselli in the year 1626.

It must not be thought that the glands of the mucous membrane of the alimentary canal are alone engaged in the preparation of the solvent digestive fluids. Other organs there are lying away from

the alimentary canal which pour their secretions into it by ducts at various points. In the neighbourhood of the mouth there are three pairs of salivary glands. The parotid glands lie outside the cheek over the lower jaw, just in front of the meatus of the car. The ducts of this pair course along the cheeks and pierce them opposite the second upper molar tooth on each side; these are the two ducts of Stenson. A second pair of glands, the submawillary, lies be- neath the ramus of the lower jaw and beneath the floor of the mouth ; their ducts run forward to open beneath the tongue ; these are the ducts of Whar- ton. The third pair, the sublingual, lies on the floor of the mouth,

beneath the mucous membrane anterior to the openings of the ducts of Wharton. The ducts of these glands are numer- ous and open by many apertures on the floor of the mouth, some opening into the ducts of Wharton. These constitute the ducts of Rivinus. About three or four inches below the pylorus the dnets of two large glands open into the small intestine by a common orifice ; these are the ducts of Wirsung, or panereatic ducts, from the pancreas on the left, and the (4 common bile-duct from the liver on "4 the right.

Movements of the Alimentary Canal.— When food isintroduced into the mouth it is submitted Fic. 2.—Nutritive System of Dog, to the operation of mastication, @ SS°Pnasus or gullet; B, lungs;

5s ; C, vena cava; D, liver; E, sto- The incisors or cutting teeth mach; F, spleen; G, receptacu- me ie B 5 lun chyli; H, pancreas; I, duo- divide it into portions of suitable en: Fag of biliary : aha and hepatic ducts; jejunuin ; size, which are thrust under the Pheu: Mt eweum ; Ny colon: broad faces of the molar or grind- 0, rectum pom ee D ss supra-renal capsules above ; ing teeth by the alternate move- urinary bladder; 8, thoracic duct; ments of tongue and cheeks, 1, parotid gland; 2 salivary ; : gland of neck; 3, subinaxillary Softer portions of food are and other, salivary glands; 4, . jugular and subclavian veins; 5 crushed between tongue and hard Jse¥lar and thymus and thyroid palate, especially such as are gaads; 6, entrance of thoracic ken f. best id en ten uct into left subclavian vein, ta en tor t elr Sapl proper 1€S8 near epee 2 a . ma | 1 rags 8, right auricle ; 9, left ventricle : t please the palate and - oe 10, right ventricle 3 11, gall-blad- the flow of saliva. Mastication der; 19, vena porta 3 18, anes. . enteric glands; 1 ymphatic consists of movements of the vessels ; 15, lacteal vessels ; 16, lower jaw upon the upper, viz., — of the portal vein ; 17, . ureters. (1) vertical movements brought "°*"S about by the temporal and the internal pterygoid and masseter muscles on the one hand, and by the digastric, mylo-hyoid, and other depressor muscles attached to the lower jaw on the other ; (2) horizontal movements, for- wards and backwards, effected by the external pterygoid muscles ; when one of these muscles alone contracts, the forward movement of the chin is changed toa forward and lateral movement by the rotation of the jaw around the opposite condyle as a pivot; after being moved forward the jaw is retracted by the horizontal fibres of the

temporal muscle ; (3) grinding movements effected by a combina- tion of the various muscles already mentioned.

That the tongue and cheeks are not frequently nipped be- tween the teeth is an indication of the perfect co-ordination of a very complex series of movements. The controlling sensations are chiefly conveyed along the fibres of the fifth cranial nerve. The motor fibres of the same nerve supply the chief but not all the muscles of mastication.

After the food has been reduced to a proper consistency by the combined influence of the mechanical movements of the jaws, tongue, and cheeks, and the action of the saliva, it is rolled into a mass or bolus ready for swallow- ing. The bolus is pushed on the dorsum of the tongue, which is hollowed into a shallow trough to receive it. It is easy to conceive how this shape of the tongue is brought about when we consider that the tongue is provided with vertical fibres, with horizontal antero-posterior fibres, and

with horizontal lateral fibres, in addition to its extrinsic muscles. The tip of the tongue is then raised against the hard palate in such a manner as to form an angle in which the bolus lies. By the approximation of the tongue to the palate the angle is lessened and the bolus is, in consequence, driven backwards. This constitutes the first stage in the act of swallowing, and is a voluntary act. At the end of the first stage the morsel of food has passed beyond the level of the anterior pillars of the fauces. The acts of the second stage are very complicated, and prob- ably are entirely involuntary. The posterior pillars of the fauces approach one another in the middle line, and the uvula falls into the space left between them. The fleshy curtain thus extemporized is then drawn up towards the hind wall of the pharynx, which is drawn a little forwards and upwards to meet it. Thus the passage into the nose is completely shut. Meanwhile the vocal cords of the larynx draw near to one another ; the epiglottis is pushed backwards over the larynx, and the whole larynx is drawn suddenly upwards and forwards beneath the root of the tongue. In this manner the entrance into the respiratory passages is protected. Finally, the anterior pillars of the fauces are made to meet over the tongue in order to pre- vent the regurgitation of the food. There is but one way open to the bolus; the sudden drawing forward of the larynx and

~~the base of the tongue in fact "cuts the ground" from under the ball of food, which thereupon falls into the grasp of the "constrictors" and enters upon the third and final stage in the act of deglutition. This, even more certainly than the second stage, is purely involuntary. The constrictors contract from above down- wards and force the morsel of food into the upper portion of the esophagus. Once in the gullet, the mass of food is driven downwards by the so-called " peristaltic" move- ments of the tube—the circular fibres contract one after another from above downwards, lessening the calibre of the tube in successive stages, whilst the longitudinal fibres seem to have the function of drawing the tube over the bolus as a stocking is drawn over the foot.~~

~~Deglutition is a reflex act, in so far as it is involuntary, the centre for which lies in the medulla oblongata; de- struction of this centre implies incapacity to swallow. The centre, though normally under the influence of the higher centres, may, however, act quite independently of these, as is evidenced by the fact that animals in which the cerebral hemispheres were absent have occasionally sur- vived for a short time, and have still been able to suck and swallow. Although the excised gullet often exhibits a true peristalsis, which doubtless depends upon a local nervous mechanism, the normal movements in the body seem to be regulated from the medulla oblongata.~~

~~At the entrance of the stomach the food meets the barrier opposed by the contracted cardiac orifice; the contraction must be overcome before the food can gain admittance. The relaxation is certainly an active process under the control of the medulla oblongata through the vagus nerve, since section of the vagi causes a block to the progress of food from the cesophagus into the stomach.~~

~~In the stomach the food is detained for a period which varies very greatly with its digestibility, but which in the human subject is not often longer than four or five hours. It is subjected to a rubbing and rolling action of the stomach-walls and a modified peristalsis, which causes the food to move slowly from the cardiac orifice along the greater curvature to the pylorus, whence it returns along the small curvature to the cardiac end again. The gastric movements are slight at first, but gradually increase in vigour. The pylorus is tightly closed at the beginning of a meal, but becomes more and~~

more relaxed as digestion proceeds, so that, whilst at first only the finer parts of the

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gastric contents can pass, afterwards the coarser parts and even solid lumps of imperfectly-digested aliments are permitted to escape into the duodenum. We possess little accurate knowledge as to the nervous mechanism of the stomach. Are the movements caused immediately by the local nervous ganglia situated in its walls? Or does the impulse to move descend directly from the encephalic centre along the pneumogastric nerves? All that we know is (1) that movements of an excised stomach are induced with great difficulty, (2) that stimulation of the vagus will often cause movements of the stomach, and (3) that sec- tion of the vagi impedes the passage of food out of the stomach. The movements of the stomach have been said to cease altogether during sleep.

When the gastric contents, to which the term chyme is often applied, pass through the pylorus into the duodenum, they begin to move onward by the pure peristaltic action of the small intestines. The powerful annular fibres con- tract one after another, driving the food onward, as water may be squeezed along an india-rubber tube by the com- pression of the hand, The longitudinal fibres contract in such a manner that the intestine is drawn over the advanc- ing mass. The movements always occur (in health at least) in a direction from the stomach to the ileo-cecal valve; here they stop and never pass as a continuous wave to the large intestine.

Peristalsis may be exhibited by an excised intestine in- dependently of any extrinsic nervous apparatus. Stimu- lation of the vagus nerve, as a rule, excites the intestinal movements, while excitation of the splanchnic nerves tends to still them. When the blood stagnates in the intestinal vessels active peristalsis ensues. As the splanchnic nerves are also the vaso-motor nerves of the intestines, excitation of them produces constriction of the blood-vessels and com- parative bloodlessness.

After passing through the ileo-czecal valve the intes- tinal contents, which have been very greatly diminished in amount owing to the process of absorption that has gone on, quickly assume the characteristic appearance

~~of feces. The undigested and insoluble parts of the food, mixed with mucus, with epithelial débris, and with some sub- stances derived from the secretions of the alimentary canal, notably with some biliary products, must be cast out ; this is effected by the act of defecation. The anus is normally kept firmly closed by the contraction of two sphincter muscles,—the external, which is one of the skeletal muscles, and the internal, which is formed by a special development of the lowest rings of the circular layer of muscles of the intestine. In the act of defecation these sphincters are relaxed, while the contraction of the rectum forces its contents downwards. The levatores ani are brought into play by the will and exert an action similar to that previously referred to as performed by the longi- tudinal fibres of the intestine. Of special influence in aiding the expulsion of the contents of the bowel is the contraction of the abdominal muscles which follows a pre- liminary fixation of the diaphragm by a deep inspiration.~~

~~The act of defecation is essentially a reflex act. The centre which presides over the sphincters of the anus lies in the lumbar portion of the spinal cord. This centre is under the control of the brain, under the influence of which its activity is either increased or inhibited.~~

~~Vomiting, or the ejection of the contents of the stomach through the mouth, is an act of considerable complexity ; (1) the cardiac orifice of the stomach is relaxed or, to be accurate, thrown open by the operation of some reflex nervous mechanism with which the vagus is connected ; (2) contraction of the muscular coat of the stomach ocenrs; (8) the abdominal walls are powerfully compressed, and the diaphragm is at the same time strongly fixed by closure of the glottis. As concurrent phenomena in ordinary vomiting may~~

~~be mentioned the sense of nausea and the free flow of saliva which . occurs during and indeed before the act.~~

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~~Vomiting may, within certain limits, be inhibited by taking a series of deep and rapid inspirations at a time when the sense of nausea is becoming unbearable.~~

~~*True vomiting seems to be impossible without the aid of the abdominal muscles, as, for example, when the abdomen is laid open. In such conditions emctics cause active opening of the car- diac orifice and movements of the stomach-walls, but not the full and free expulsion of the contents. Vomiting is usually a reflex act, the centre for which lies in the medulla oblongata near the centre for respiration, though it is reasonable to suppose that it may occur not only as a reflex act but as a result of direct stimula- tion of the ccutre or centres associated with it.*~~

~~*Secretions of the Alimentary Canal.—Production of the Alimentary Juices, —We have described the movements of the alimentary tube by which the food is triturated and agitated, and finally propelled from mouth to anus. One object of these movements is to mix together the food and certain solvent juices which are poured upon the food at various points. We have now to give an account of these juices and their properties. They are produced in, or by the agency of, the epithelium cells lining the interior of glands which are either situated in the walls of the alimentary canal or which empty their secretion into it. Though these cells derive the materials necessary to their metabolic activity from the blood, the substances which they elaborate and which are characteristic of the secre- tions that they help to form are not found in the blood, but are products of the activity of the protoplasm of the cells themselves. The act of secretion is a function of the living cell, and not a mere act of filtration or diffusion through the vascular walls to the cell-substance. It often involves the elaboration of entirely new substances. The act of secretion is, or may be, under the control of the nervous system; it may be started, inhibited, and the products of the secretion may be variously modified, by the stimulation of distant nerves. In some glands cer- tainly, and possibly in all, the elaboration of the specific secretion of the gland takes place in two well-defined stages, and the two stages are indicated by differences in the anatomical appearances of the gland-cells.*~~

~~*The characteristic constituents of the several juices which are specially concerned in the chemical changes of the alimentary canal are certain so-called "unorganized " ferments, which we shall, following the suggestion of Kiihne, denominate enzymes, Like all ferments, these are capable, under suitable circumstances, of initiating specific changes in certain bodies with*~~

which they are brought into contact, changes which may be incommen- surably great when contrasted with the magnitude of the mass of the ferment engaged. 'Unorganized " or, as they have also been called, "unformed" ferments differ, how- ever, from the "organized" or "formed" in that, whilst they are the products of the activity of living cells, when once formed they cease to be living, are unconnected with any organized form, and have no power of reproduction or increase.

The enzymes for the most part exert their action un- impaired in the presence of certain bodies which kill the great majority of organized ferments ; thus salicylic acid does not hinder peptic and tryptic digestion, whilst it prevents the putrefactive changes which are very apt to occur in the latter case, and which are connected with the developinent of organized ferments. Certain enzymes, as the diastatic ferment of saliva and pancreatic juice, are, however, destroyed by salicylic acid.

As will be shown in detail in the sequel, the secreting cells of glands which produce enzymes exhibit marked differences corresponding to different states of activity. In the case of the secreting cells of the pancreas the cells appear to produce and store up for a time a body, a zymogen, from which subsequently the tryptic enzyme trypsin is set free. The progress of research may perhaps

establish the existence of zymogens corresponding to the other enzymes.

Usually the glandular organs which produce the aliment- ary Juices contain stored up within them their character- istic enzymes, which may be extracted by digesting the comminuted organ in water, or still better in glycerin, which dissolves them nearly all, and furnishes solutions which preserve their activity long unimpaired, Enzymes are all insoluble in strong alcohol, so that the tissues from which they are to be extracted may be first de- hydrated by digestion in absolute alcohol and afterwards extracted with glycerin. Solutions of enzymes are rendered inactive by boiling or by exposure to a temperature above 70° ©. The principal enzymes of the alimentary canal belong either to the group of proteolytic or to that of diastatie or amylolytic ferments: the enzymes of the first group (pepsin and

~~trypsin) dissolve proteids and effect their more or less perfect decomposition ; the enzymes of the second class (as ptyalin and the diastatic ferment of the pancreas) dissolve starch and produce from it a series of bodies which will be discussed in reference to the action of saliva on starch,~~

~~Besides the proteolytic and amylolytic ferments, there occur in the alimentary canal a curdling ferment, an inverting ferment, and perhaps a fut-decomposing ferment.~~

~~All enzymes exert a more energetic action at a moder- ately high than at a low temperature, though the influence of a rise in temperature is more marked in some cases than in others. The reaction of the medium in which they are placed influences remarkably the activity of cer- tain enzymes ; thus pepsin, the proteolytic ferment of the stomach, is inactive in neutral or alkaline solutions, the pre- sence of a free acid being essential to its activity, whilst trypsin, the proteolytic ferment of the pancreas, acts with feebleness in solutions which are neutral or faintly acid, since it needs for the full exercise of its powers a decidedly alkaline medium. 'The enzymes appear to possess the power of rapidly inducing, at the temperature of the animal body, in bodies subjected to them similar chemical operations to those which can be brought about with great slowness by prolonged heating with dilute mineral acids, or by the prolonged action of boiling water or superheated steam. These operations are of the nature of hydrolytic decomposi- tions, that is to say, such as are connected with the union of the elements of water with the decomposing body.~~

~~Salivary Glands and Secretion of Saliva.—There are no secreting glands in the body which have been sub- jected to so elaborate a study as the salivary glands, whether we consider their structure or the circumstances which influence or accompany the act of secretion. We shall therefore give the results of researches on these glands at much greater length than those referring to the other glands concerned in the preparation of the aliment- ary juices.~~

~~As has been already said, the saliva is secreted by several glands of which the ducts pour their secretion into the cavity of the mouth, where it is mingled and constitutes the "mixed saliva." The chief of these glands are~~

the parotid, the submaxillary, and the sublingual glands, though their secretion is mixed with that of small glands (mucous and serous) scattered through the mucous membrane of the mouth and tongue, which are included under the term "buccal" glands.

The salivary glands all belong to the group of acinous or compound racemose glands. According to the researches of Heidenhain, they may, however, be divided into two groups, which he has denominated serous or albuminous and mucous glands, according to the structure of the cells of their acini, their chemical characters, and the nature of the secretion which they elaborate.

To the group of serous glands belong the parotid of man and the majority of animals, the submaxillary gland of the rabbit, and some of the glands of the tongue; to that of mucous glands belong the submaxillary and sublingual glands in most animals, some of the glands of the tongue, and the cesophageal glands. Glands belonging to the former of these classes secrete a fluid containing some, though it may be only a small quantity, of a proteid coagul- able by heat, and resembling, if not identical with, serum- albumin ; the mucous glands, on the other hand, as their name implies, secrete a liquid free from albumin, but con- taining more or less mucin.

In the serous glands the epithelium lining the acini is composed of comparatively small, rounded, or polygonal cells, of which the outlines are not very distinct until acted upon by certain reagents. No cell-wall is present ; the protoplasm, which is not coloured by carmine, presents many dark granules, and surrounds an irregularly saccular or rounded nucleus which is coloured by carmine.

In the mucous glands the characteristic (mucous) cells of the alveoli are large and clear, very faintly granular, with a rounded or oval nucleus near their periphery sur- rounded by a trace of protoplasm. They possess a cell-wall, and a strongly refracting process which springs from the cell in the neighbourhood of the nucleus.

~~In addition to the characteristic mucous cells there are found in the alveoli of most mucous salivary glands when examined in a state of rest, situated at some parts of the periphery, #.e., lying more internal than, or nearer to, the membrana propria than the mucous cells, half-moon-shaped aggregations of small cells, possessed of a round nucleus easily stained with carmine, and containing albumin ; to these aggregations the term of demilunes or lunule of Gianuzzi has been applied. In some cases we find alveoli in which these small cells are not arranged in demilunes, but form a row of cells lying external to the mucous cells, and completely encircling them (see fig. 3).~~

~~As has been said, in certain mucous glands the mucous cells are supplemented by the cells of the demilunes, though there are other mucous glands, as those of the tongue, where the typical mucous cells alone occur, There are glands, and the submaxillary of man is an example, which are termed mixed glands, inasmuch as some of the acini have all the characters of serous, others of mucous glands. The submaxillary gland of the guinea-pig possesses, accord- ing to Klein, a structure undistinguishable from that of the pancreas.~~

~~We shall not enter, in this place, into a detailed descrip- tion of the innervation of any one of the salivary glands, but shall confine ourselves to the following statements.~~

~~Each salivary gland is supplied by at least three classes of fibres, viz., secretory, vaso-constrictor, and vaso-dilator fibres, of which the first and the third are conveyed to the glands in branches of cerebral nerves ; these are, the chorda tympani for the submaxillary and sublingual, and the auriculo-temporal (which, however, derives them through communications with the otic ganglion from the glosso- pharyngeal nerve) for the parotid. The second class, the vaso-constrictor or vaso-motor fibres, run in sympathetic trunks. When, therefore, one of the cranial branches supplying a gland is stimulated there occur two acts, viz., secretion and simultaneous dilatation of blood-vessels ; that these two acts are not absolutely interdependent is proved by the fact that certain drugs paralyse the one set of fibres, but leave the other intact. When, on the other hand, the sympathetic filaments supplying the gland are stimulated, the blood-vessels~~

of the gland contract, and there is produced a small quantity of saliva differing in physical characters and chemical composition from that obtained under the circumstances first referred to, Accord-

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ing to Heidenhain, however, in each of the two kinds of nerves supplying a salivary gland there exist, besides the vascular nerve-fibres, secretory and trophic fibres, though the number of one or other of these classes may be insigni- ficant,—the secretory predominating in the cranial nerve branches, the trophic in the sympathetic. Stimulation of secretory fibres leads, according to Heidenhain, to an

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increased flow of water, stimulation of the trophic to an increased secretion of specific substances and to an in- creased production of protoplasm.

When a salivary gland passes from the state of rest into that of activity it is at once the seat of an increased blood flow, which is associated with the dilatation of the blood- vessels of the organ. Under these circumstances, the blood leaving the gland presents a florid arterial colour, instead of the venous colour which characterizes the blood of the organ when at rest. This vascular dilatation is explained by the coming into action of the before-mentioned vaso- dilator fibres ; it is independent of the act of secretion.

As was shown in a now classical investigation of Ludwig, when the salivary glands are thrown into activity there is arise in temperature, so that the temperature of the saliva leaving the submaxillary gland may exceed by 1° °5 C. that of the blood flowing to the gland. This rise in temperature cannot be explained by a study of the chemical characters of the salivary secretion, but is doubtless the result of the increased metabolic changes which necessarily accompany the act of secretion in the gland-cells, and which chiefly affect their protoplasm.

~~*That the secretion of saliva (and indeed secretion in general) is not a mere act of filtration was proved by Carl Ludwig when he showed that saliva can be secreted*~~

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~~*by a gland though the pressure within it is many times higher than that of the blood circulating through the On many grounds it may be positively asserted thatthe secreting cells are the primary*~~

~~*arteries which supply it.*~~

~~*agents in the withdrawal from the blood of the water necessary for the secretion, though the exact nature of the process is yet unknown; similarly, on the grounds stated below, we know that within the protoplasm of the gland- cells are formed the characteristic soluble constituents of the secretion.*~~

~~*The researches made during the last few years by Heiden- hain, and fully confirmed by a large number of observers, have demonstrated that in the salivary glands, as indeed in all secreting glands, structural and perfectly obvious microscopic changes occur, which stand in close relation to the different conditions of functional activity.*~~

~~*The resting gland-cell is large, but possesses compara- tively little protoplasm, and therefore comparatively little matter which can be stained by colouring bodies, especially by carmine ; it contains instead a store of material which has been elaborated in, or at the expense of, the protoplasm. This material does not constitute the specific matter of the secretion, but is its antecedent. That it differs chemically in the case of the mucous glands is proved by the fact cited by Heidenhain, and discovered by Watney and Klein, viz., that, whilst mucin is stained by hematoxylin, its antecedent (mucigen) is not affected by that colouring matter ; in all other respects the two bodies are identical. When, however, a gland passes into a state of activity, as, for example, by the irritation of its so-called secretory (trophic?) nerves, the gland-cells undergo the following changes, which may proceed simultaneously though not necessarily so:—the stored-up matter previously referred to is converted into soluble constituents of the*~~

~~secretion, and at the same time there occurs a growth of the proto- plasm of the cells, at the expense doubtless of the richer supply of lymph which during the secretory act bathes the gland;~~

~~The period of activity in so far as the gland-cell is |~~

~~concerned is indeed a period of removal of ready-made constituents of secretion, in some cases, as in the mucus- bearing cells of the mucous glands, a period of destruc- tion of cells laden with such constituents; but at the same time in all cases a period in which the protoplasmic constituents of the cells generally increase, and active pro- liferation of secreting cells occurs.~~

~~Whilst we have in a few sentences sketched the general characters of the changes which glands undergo during secretion, our picture is wanting in all details, and the reader is referred for further information to works on histology and physiology.~~

~~Glands of the Stomach and Secretion of Gastric Juice,— In vol. vii. p. 225 a brief description has been given of two kinds of glands which are found embedded in the mucous membrane of the stomach, and which are concerned in the preparation of the secretion of this organ, the so-called gastric juice. 'The first kind of glands, the "mucous glands of the stomach," so called from their having been formerly erroneously supposed to be engaged in the secre- tion of mucus only, are situated chiefly at the pyloric end (figs. 4, 5) of the stomach. The second kind, the so- called "peptic glands," owe their name to the view that they alone secreted the digestive gastric juice, and are found in most animals in the mucous membrane of other parts of the stomach than the pylorus. The pyloric glands are tubular glands, simple or compound, composed of a basement membrane lined by two kinds of epithelium- cells, (1) cylindrical epithelium-cells confined to the neck of the gland, (2) cylindrical or cubical epithelium-cells lining the part of the tube below the neck, and which,~~

~~though not very different in form from the cells of the neck, possess an entirely different function. The peptic glands of the older writers, now~~

usually called " glands of the fundus," present three varieties of epithelium cells. Their "neck" is lined by cylindrical epithelium similar to that of the neck of the pyloric glands. The deeper part of the glands is lined by small cubical "central " cells, below which and interposed between them and the base ment membrane is a discon- tinuous layer of large ovoid "border " cells, the so-called "peptic cells" of older writers.

During active digestion the cubical cells of both py- loric glands and glands of

s Fig. 5. Fie. 4.—Pyloric Gland, from a section of the Dog's stomach (Ebstein). m,

mouth; n, neck; tr, deep portion of a tubule cut transversely, Quain's Anatomy, fig. 515.)

Fig. 5.—Cardiac Gland, from the Dog's stomach (Klein and Noble Smith). Highly magnified. , base or fundus of a tubule; d, duct or mouth of gland; ¢, central cells; p, parietal cells. (From Quain's Anatomy, fig. 517.)

the fundus become swollen and granular ; after a period of

rest they return to their original size and assume a com-

paratively clear appearance. 'The ovoid cells also swell during digestion, but in other respects remain unchanged.

When the stomach is inactive, i.e. in the fasting con- dition, its mucous membrane is pale and the organ contains no fluid; the mucous membrane in the pyloric region presents an alkaline reaction. When, however, food enters the stomach, or the mucous membrane . is subjected to mechanical stimulation, an acid juice, the so-called gastric juice, is poured out, the act of secretion being accompanied by a reddening of the mucous membrane.

Evidence appears to be most conclusive in support of the view that the three kinds of epithelium-cells found in the stomach and its glands possess entirely separate func- tions. The epithelium-cells which line the interior of the stomach, and which, like those of the neck of both kinds of glands, are

cylindrical in shape, appear to be mucus- forming cells. The cubical cells which are found in the deeper parts of the pyloric glands appear functionally to be identical with the central cells of the glands of the fundus, both being engaged in forming the chief ferment of the gastric juice, viz., pepsin, whilst the ovoid cells of the glands of the fundus are the sole elaborators of the acid of the gastric juice. The glands which possess these

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acid-forming cells have of late been termed (Langley) oxyntic glands (d£veuw, to render acid).

No accurate estimate can be formed of the amount of gastric juice secreted during twenty-four hours. It has been calculated to be between 20 and 30 pints.

Secretion of the gastric juice may occur after all the nerves going to the stomach have been divided, though it is for a time arrested after division of the pneumogastric nerves. It is probable that the process of gastric digestion is essentially under the control of an intrinsic nervous mechanism situated in the mucous membrane, though this is normally influenced by the higher nerve centres.

Liver and Secretion of Bile.—The structure of the liver has already been sufficiently described (vol. vii. p. 229 sq.), and need not be further alluded to in this place. The secretion of the liver, the bile, is being continually formed, though not always at the same rate. In animals possessed of a gall-bladder it is stored in the intervals of digestion in this reservoir. When food is taken into the stomach the bile begins to be secreted in larger quantities, the maximum being reached about six hours after the meal. 'As the so-called acid "chyme," to be afterwards referred to, passes the opening of the bile-duct in the duodenum, it is probable that a stream of bile is poured upon it by the reflex contraction of the gall-bladder. During the time when bile is being secreted much heat is evolved in the liver. The bile, as will be

shown in the sequel, should be looked upon as a liquid containing only certain, for the most part useless, by-products resulting from great chemical operations going on in the liver. Little is known as yet of the exact changes which occur in the liver-cells during activity, nor of the manner in which the nervous system influences the secretion of bile.

Pancreas and the Secretion of Pancreatic Juice.—The pan creas possesses a structure which presents great resemblance to that of serous salivary glands, and its alkaline secretion was until lately looked upon as closely resembling the saliva.

The secreting cells of the pancreas, which differ but little microscopically from those of such a salivary gland as the parotid, exhibit very marked differences, which correspond to different states of functional acti- vity. During a period of glandular reposethe cells con- tain innumerable granules, which are congregated atthat side of the cell which lies towards the centre of the acini (fig. 6, B). The A B outer or peripheral Frc. 6.—Pancreas of Rabbit. A, during rest; B, in

. activity. a, inner granular zone; 0, outer trans- ah ma of ed ah parent zone; ¢, lumen; d, indentation at junction—the smaller par

of two cells. (From Foster's Physiology, fig. 43.) of the resting cell—is clear. After a period of glandular activity the granular half of each cell is found to have diminished greatly (fig. 6, A); the whole cell is clear and distinctly smaller than before, and its behaviour towards colouring matters is very different. The pancreas, when perfectly fresh and just removed from the yet warm body of an animal which is killed, does not contain, ready formed, all ferments which will in the sequel be referred to as characterizing the pancreatic juice. If we treat the gland, for instance, with glycerin, which possesses the power of extracting and dissolving all the ferments, we fail to obtain a solution which possesses the power of digesting proteids ; but, instead, we find a substance in the solution from which, by the addition of a little acetic acid, the pro- teolytic ferment may be formed.

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The cells of the pancreas thus elaborate a substance which is the antecedent of the proteolytic ferment, and which yields it when it passes into the pancreatic ducts ; it is customary to speak of this body as zymogen or ferment- former, because it gives rise to one of the chief enzymes or ferments of the juice. The secretion of pancreatic fluid is slight except during digestion. After the taking of a full meal the secretion is suddenly exalted, reaching its maxi- mum two or three hours afterwards. The secretion then diminishes until a period which extends from the fifth to the seventh hours, when a rise occurs, which lasts to between the ninth and eleventh hours after food. The secretion then gradually sinks, until it absolutely ceases. Stimulation of the gastric mucous membrane starts the secretion of pancreatic juice ; it is arrested during nausea and vomiting, as also when the central end of the divided pneumogastric is stimulated.

Intestinal Glands and their Secretion.—The mucous mem- brane of both the small and the large intestine contains embedded in its substance innumerable simple tubular glands, the so-called crypts or glands of Lieberkithn, which are lined by a single layer of cylindrical epithelium con- tinuous with and resembling that covering the exposed surface of the intestine. Very little is known as to the function of these glands, whose office is probably widely different in different sections of the intestinal tube, particu- larly in the large as distinguished from the small intestine. We do know that the epithelium-cells of these glands are capable of forming mucus, and that in the small intes- tine they are doubtless the source whence is derived the so-called intestinal juice or "succus entericus" which is poured into the intestine in large quantities under par- ticular circumstances, as, for instance, when all the nerves supplying the gut are divided.

Physical and Chemical Properties of the Several Alimentary Tunes.

The mixed saliva of man is, when perfectly fresh, a clear, transparent, viscid liquid, which, on microscopic exa- mination, is found to contain cells of squamous epithelium derived from the mouth, besides certain globular cells derived from the salivary glands and called "salivary cor- puscles." Its reaction is alkaline; it has a specific gravity of about 1°003, and contains about five or six parts per thousand of solid matters. Its solid constituents

consist (1) — of certain saline matters transuded from the blood and, in addition, of a small quantity of a soluble sulphocyancde, detected by the reddish tinge caused by the addition of solution of ferric chloride to the saliva; (2) small quantities of soluble proteids, coagulable by heat ; (3) mucin, to which saliva owes its viscidity, and which is thrown down when the liquid is acidulated with acetic acid ; (4) a ferment or enzyme called ptyalin, salivary diastase, or the diastatic ferment of saliva, The last-mentioned is the most import- ant constituent. It possesses the power of rapidly render- ing cooked starch soluble, though its action on raw starch is but very slight. — Not only does it dissolve starch, but it progressively decomposes the complex starch molecules into isomeric bodies of less complexity. Starch has a chemical composition which may be represented by the empirical formula (C,,H,,0,»),, the exact value of m being yet a matter of doubt. The salivary diastase, under suitable conditions, as has been said, first converts insoluble into soluble starch (hence it is sometimes termed an amylolytic ferment) which, it has been surmised, probably has the composition (C,,H,)0,9);9 This soluble starch, like the insoluble body, gives a beautiful blue colour with iodine. By the further action of the ferment the soluble starch yields a series of dextrins which are isomeric with starch, though they possess smaller molecular weights and differ-

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ent reactions, and at the same time a sugar which, from its identity with that which is produced in the process of malting of barley, is called "maltose," and which, though possessing many of the reactions of grape-sugar, is an isomer of cane-sugar ; when crystallized it has the com- position C,,H,,0,, + H,0.

The changes which are brought about by the action of the salivary ferment on the starchy constituents of food are hastened by a temperature near that of the mammalian body. Boiling destroys the diastatic power, as also does the presence of strong acids or alkalies. A very feeble acid reaction does not absolutely stop the characteristic action.

~~*Whilst the saliva of man and some few animals possesses*~~

~~*the remarkable diastatic ferment just referred to, this is*~~

~~*absent from the saliva of the majority of animals, so that we are forced to conclude that the saliva is an alimentary juice which subserves mechanical rather than essential chemical functions.*~~

~~*Gastric Juice.—This is a thin colourless or straw-coloured liquid of strongly acid reaction, and of a mawkish taste. Its specific gravity varies between 1:001 and 1:010, and it contains from 4 to 1 per cent. of solid matters.*~~

~~*The gastric juice contains (1) free hydrochloric acid, (2) certain mineral matters, and (3) a ferment or enzyme called pepsin. It has been much disputed whether the gastric juice contains the hydrochloric acid in a free con- dition, but the question may be considered to have been settled in the affirmative by many facts, amongst which one of the most striking is that the gastric juice behaves towards certain organic colouring matters as only liquids do which contain free mineral acids. The pepsin, which has never been separated in a pure condition, is soluble in water, weak spirit, and glycerin, and confers upon all these solvents its characteristic property, viz., that of dissolving, in the presence of a dilute free acid, 'and at a suitable tempera- ture, insoluble proteids, and of converting these into soluble and diffusible modifications termed peptones. Peptones differ from other albuminous or proteid bodies in their greater diffusibility, as well as in their much higher solubility in pure water. They are not coagulated by heat or by nitric acid, and are not thrown down by many mineral salts which precipitate other soluble proteids.*~~

~~*Gelatin under the same conditions is converted into an ungelatinizable modification, the so-called gelatin-peptone. Boiling destroys the activity of solutions of pepsin. If their reaction ceases to be acid, and, further, if the acid reaction be not due to a free acid, no action is exerted upon proteids. A temperature approximately the same as that of the mammalian body is that most favourable to gastric digestion, 'The accumulation of the products of*~~

gastric digestion, viz., peptones, hinders the continued activity of the juice. Pepsin, though probably containing nitrogen, is not a proteid body.

In addition to pepsin the gastric juice contains an entirely independent ferment which is called the "'curdling ferment" or the "rennet ferment," because of its power of rapidly inducing at the temperature of the body the coagulation of the casein of milk, which it converts into cheese. Un- like pepsin, this ferment will act in solutions which contain no trace of free acid.

The following table (Hermann) shows the average com- position of the gastric juice of man, the dog, and the sheep.

Man. | Dog. Sheep. v. ee, 994°4|978°1 971-2| 986-1 PIV GROGMEOTIC ACIC. ...,.0ssse0eeneseee0e 0-2) 3:3 Brew yoo) Organic constituents (pepsin, we.)...| 38924 Wink, eS) eae Mineral matters v.sceesscsessseeeeeseseees i 22, 65 oa So

Bile.—Bile is a bitter liquid of golden-red colour in man and carnivorous animals, but green in herbivorous animals. It is commonly viscid owing to admixture with mucus derived from the walls of the gall-bladder and hepatic ducts. Its reaction is neutral or faintly alkaline. It contains about 14 per cent. of solid constituents. (1) It includes the sodium salts of certain so-called bile-acids, which in man are glycocholic and taurocholic acids. The former has the formula C,,H,,NO,, and is readily decom- posed into glycin, C,H,NO,, and an acid termed cholic acid, C,,H,,O; ; the latter has the formula C,,H,,NSO., and can be split up into a base called taurin, C, »H,NSO,, and into cholicacid. (2) It contains bile- colouring matters, of which the chief 1s a red one termed bilirubin, C,,H,,.N.O3, with which is closely connected the green colouring matter of the bile of herbivores, termed biliviridin, C,,H,,.N.O, ; bilirubin is unquestionably derived from the decomposition of the blood-colouring matter or hemoglobin. (8) It has fats, and a body called cholesterin, which belongs to the class of alcohols and has the composition C,,H,,O+H,O. (4) It includes saline matters which are rich in sodium salts. Whilst the bile-acids and the bile-colouring matters are formed in the liver itself, the cholesterin of the bile is probably derived entirely from the blood, which obtains it from the nervous organs, in the white matter of which it is abundantly present.

The proportion of the constituents of the bile present in this liquid is shown by the following analyses.

Composition of Human Bile.

a) | @Q) A ett Shea tne pnt deilei ais apieauahtadtdanengatee sv ounmmea esse 860°0 | 822°7 | Sodium glycocholate and taurocholate ……..666 102°0 | 107°9 LMPCIN AUS COLOUTING IMAGUELS \sscniconcssressaceenssons 266; 22°1 Gere em ion ca vaccasacacseenaiadtceas ons goecavcavessaathees 16 | 4v.g Hat ivenirahenspan (MIC CID MIM.:..c.cet-ceeccereenerccren ss 3°2 | Wis OPE UAES iiiluciiceubass ax Socaveaagras-craacas aeoseat | 65| 10°8

The amount of bile secreted by man has been estimated at from about 136 grains to about 309 grains per kilo- gramme (2°20 tb) of body-weight ; but in certain cases, through abnormal circumstances, the total amount of bile secreted in twenty-four hours has been found to be less than this, viz., to vary between about 16 and 21 oz.

The action of the bile in digestion, it must be admitted, seems trifling and out of proportion to the size of the gland and the amount of the secretion. It is a weak solvent for fats; it has the power of emulsifying fats, especially, perhaps, when added to the pancreatic juice ; and it may help the passage of fat through animal mem- branes. At least it is certain that, when filter-paper is wetted with bile, oils filter through it more readily than when it is wetted with water. The most important use of the bile is, however, as an adjuvant to pancreatic digestion. The pancreatic juice, as will be stated more particularly below, contains a ferment which is either a proteid body or inseparably connected with a proteid body. Strangely, though this ferment possesses the power of dissolving proteids under suitable circumstances, in the presence of pepsin and any free acid it is itself destroyed. It would then be acted upon by the pepsin passing ito the duodenum from the stomach if the conditions were favourable. To prevent this untoward accident the alkaline bile is poured over the acid contents of the stomach as they pass the duo- denum ; these are neutralized, and a precipitate is thrown down which mechanically entangles the pepsin that may be in the mixture. Although the definable uses of the bile are small, the part which it plays in the economy is of essential importance. Animals

whose bile is allowed to escape externally soon grow lean and ill-conditioned. The

fat which should be absorbed in the alimentary canal remains in part in the feces, which acquire a peculiar putrescent odour.

Pancreatic Juice.—If we except the gastric juice, the chemical action exerted by the pancreatic juice is the most potent and useful of any of the digestive secretions.

When freshly secreted and perfectly normal, the pan- "creatic juice is a clear viscid liquid of strongly alkaline reaction and highly coagulable by heat. Its solid con- stituents may reach the proportion of 10 per cent.

It contains (1) water, (2) various albuminous bodies which cause the liquid to be coagulable by heat, and of which one is intimately connected, or indeed perhaps identical, with the ferment trypsin, (3) a number of ferments, (4) traces of products of digestion, as leucin and tyrosin, (5) salts. The ferments of the pancreatic juice are the following :—(1) a proteolytic ferment termed trypsin, (2) a diastatic ferment, (3) a ferment which acts on fats, (4) a curdling ferment (').

The first-named ferment, unlike pepsin, which is quite inactive under this condition, acts most energetically in solutions which contain a free alkali or an alkaline carbon- ate, although it possesses some action when the reaction is neutral or even faintly acid. Like pepsin, trypsin dis- solves insoluble proteids and converts them into peptones ; it possesses, however, an activity which surpasses that of pepsin, inasmuch as it splits up certain of the peptones formed into simpler bodies, such as leucin, C,H,,NO,, and tyrosin, C,H,,NO,, the former of which is an organic body allied to the fatty acid group, and the latter to the aroma- tic group. According to the views of Kiiline, the molecule of an albuminous or proteid body is capable of being broken up under the influences of such ferments as pepsin and trypsin into the allied bodies of smaller molecular weight, the peptones, which, though possessing general and common reactions, may by their behaviour towards certain chemical agents as well as towards ferments be sub- divided into

~~two groups, a hemi-group and an anti-group. Kiihne believes that both pepsin and trypsin decompose the proteids with the production of so-called hemi-peptones and anti-peptones, and that, whilst neither pepsin nor trypsin can further decompose anti-peptones, trypsin possesses the power of splitting up hemi-peptones into simpler bodies.~~

~~The amylolytic or diastatic ferment of the pancreatic juice resembles that of the saliva in its action. Whilst the saliva of most animals contains no such ferment, the pancreatic juice of all animals is very rich in diastatic ferment, so that the action of the pancreatic juice on starch is much greater than that of saliva.~~

~~Thefat-decomposing ferment—sometimes, though errone- ously, called the 'emulsifying ferment "—of the pancreas is present in exceedingly small quantity and is very readily destroyed, so that its existence has sometimes, though erroneously, been denied. It breaks up the neutral fats in part into their respective fatty acids and glycerin. This slight acidification unquestionably facilitates the formation of an emulsion of the remaining fats.~~

~~All these ferments are influenced by temperature in nearly the same manner as the ferments of saliva and gastric juice. Boiling destroys them absolutely, cold retards their activity, the body temperature is very favour- able to them. The most suitable medium for them is the alkaline juice in which they occur, and the alkalinity of which is due to sodium carbonate.~~

~~The following is an analysis of the pancreatic juice of the dog :—~~

~~WY arer CiIe OG OWES) xc. saevesavasendoedurvmesee sam 900°8 OURS oresaccenetess eae Peat asaitin Simei ohatetap sented ieee 99-2 Organic matters es… 1s eteace es soeunesoeeere eee 90°4 TilippanicwMAPbELS…….. 00… ..-20.cessescegcuPeneerense 8°8~~

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~~Intestinal Juice.—This juice, which is also called not unfrequently by its Latin name succus entericus, is a thin, yellowish, alkaline, albuminous liquid of specific gravity 1°01, concerning which we possess very little~~

~~*certain in- formation. It has been said to act upon fibrin alone of the albuminous bodies; it not only contains a small quantity of a diastatic ferment but probably also a so- called inverting ferment, possessing the power of converting cane-sugar into grape-sugar.*~~

~~*Fate of Food-Stuffs in the Alimentary Canal.—The food which is introduced into the mouth is an exceedingly complex substance. Leaving out of account those sub- stances which are insoluble and incapable of absorption, and which are also not amenable to the influences of the digestive juices, we may classify the true food-stuffs as follows.*~~

~~*(1) Albuminous matters, including (a) the true proteids, such as albumen of egg, casein of milk, myosin of muscle, fibrin of blood, &c., and (b) the albwminoid bodies, such as gelatin from tendons and bones, chondrin from cartilages, and elastin from various elastic structures ; (2) hydrocarbons or fats, of which those chiefly used for food are stearin, olein, and palmitin; (3) carbohydrates ; (4) the various inorganic salts; (5) water. The third group includes the amyloids or starch-like bodies, the saccharoses like cane-sugar, the glucoses like the grape-sugar and fruit-sugar found in honey and in ripe fruits, the sugar of milk, &c. In addition to these may be mentioned allied bodies, cellulose, pectin, arabin, mucilage, &c., which in some animals, or in some conditions, are certainly digest- ible. In a subdivision of the same group we may place the various vegetable acids, lactic, acetic, citric, malic, &c., which are essentially foods.*~~

~~*It may be premised that the fate which befalls a given example of ingested food does not depend solely upon the theoretical power of the digestive juices to act upon it. Thus digestible food may be imperfectly digested owing to being passed into the stomach in lumps and masses, which the juices cannot permeate and the stomach cannot crush; or starch may be so incorporated and en- capsuled with fat that the saliva and even the pancreatic juice may fail to reach it; or digestion from one cause or another may be so prolonged that fermentative changes, to which most samples of food are inevitably liable from containing organized ferments or '" germs," may have time to begin and to alter materially the sequence of events. Hence we shall feel no surprise that much food escapes altogether the action of digestion. The most perfect and economical feeding is that in*~~

which the least quantity of food is passed through the alimentary canal unchanged. When, however, the just quantity is taken, and the digest- ive organs are sound, the following is the order of the changes which occur.

Food placed in the mouth at once excites the flow of mixed saliva and mucus. Solid food is broken up, rubbed together with the juices of the mouth and entangled air-bubbles, and rolled into a slimy bolus. Soluble con- stituents of it thus have an opportunity of becoming dis- solved at once; sugar, dextrin, vegetable acids, and many inorganic salts would, in part at least, pass into solution in the mixed saliva. The process of mastication, besides triturating the food and mixing it with the alkaline saliva, permits it to become raised nearly to the body-temperature, in which condition the dextrin and the starches readily fall a prey to the ptyalin, and begin to be converted into dextrins and maltose. This change is very rapidly effected — it begins instantly if the starch is already boiled; so that, unless the food is "bolted," a considerable quantity of soluble dextrin and sugar is formed before the bolus is swallowed. The act of deglutition passes the softened bolus into the stomach, where already a certain quantity of acid gastric juice is ready to receive it. The presence of food in the stomach is a greater stimulus to the gastric flow than its presence in the mouth: the juice is more rapidly secreted, but still it is comparatively poor in pepsin

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and still more so in free acid; but after a time, as more food is added, and as the first-coming food begins to be dissolved and absorbed, the proportion of pepsin is in- creased. The movements of the stomach mix intimately the acid juice and the alkaline food; the first effect of this is a neutralization of the mass, but, as the secretion of juice goes on for some time after the last portion of an ordinary meal has been swallowed, the mass becomes more and more acid. The amylolytic action of the swallowed saliva is gradually checked, and the still unchanged starch remains unchanged so long as it lingers in the stomach. Such saline and other dissolved matters as are still soluble in slightly acid solutions remain dissolved, and, with the water which is swallowed, may pass at once into the blood-vessels by absorption. Other salts, as the carbonates and phosphates of the alkaline earths, become dissolved in the presence of an

acid. The gelatigenous tissues—con- nective tissue holding together in its meshes fibres of muscle, globules of fat, strands of nerve, &c.—are dissolved. The skins or pellicles of the fat-vesicles suffer the same fate. The elastic sarcolemma is now thought to be similarly affected. Asa consequence the proteid and fatty portions of the organs referred to escape and fall into smaller fragments. Muscular fibres readily split into fibrille and disks, and are then in the very best physical condition for the free play of the gastric juice. The fat escapes, flows together to form larger globules, but is otherwise unchanged, Cane-sugar, which is of no use to the organism until it is converted into maltose or glucose, finds in some slight degree the condition for this conversion in the com- bined action of the gastric juice and the gastric mucus, although we are still in great doubt as to where the greatest conversion takes place. The all-important change which the food undergoes in the stomach is, however, the change of its proteid element into the more diffusible form of peptones, about which it will be enough to say that it is not a mere solution of proteid in a dilute acid, although this may be the first step in the operation, but probably a decomposition of the original proteid molecule. The obvious effect of gastric digestion is to reduce the food toa grey pulpy mass called chyme, in which condition it passes into the duodenum along with more refractory or less perfectly digested portions of food such as may still remain in the stomach at the end of the normal period of gastric digestion. The presence of food in the stomach, as has been re- marked, is of itself a stimulus to the secretion of bile and pancreatic fluid ; by the time, therefore, that the chyme passes into the duodenum, a considerable quantity of the fresh juices is prepared for it. Not only so; the contact of the acid chyme with the duodenal membrane at once brings on a reflex contraction of the ducts and gall-bladder of the liver, by which a sharp stream of alkaline fluid is at once poured out, wherewith the chyme is drenched. So far as the mixture is made perfect and the point of neutraliza- tion is reached, a precipitate of parapeptones and peptones is formed, carrying down with it the active pepsin. But the acidity of the chyme is not at once overcome ; not until the middle of the small intestine is reached does the acid reaction entirely disappear; and we may therefore assume that a kind of exotic gastric digestion may go on in the parts of chyme which still remain acid. But when- ever the reaction ceases to be strongly acid the pancreatic juice takes up the work of digestion. Proteids are changed into soluble peptones, and the conversion of starch into dextrin

~~and maltose begins again with redoubled vigour. Fats are seized upon, resolved into glycerin and their fatty acids, and emulsified both by bile and by pancreatic fluid. The resulting fatty acids combine with the alkalies of the mass to form soaps, which in turn aid the process of emulsification. The chyme, which, from being grey, be-~~

~~came of a golden-orange colour when saturated with bile, acquires a decidedly cream-like appearance from the emul- sion that is formed.~~

~~It is still an interesting question whether pancreatic proteolysis ever, in health, goes beyond the formation of peptones, as it may certainly do in artificial digestion in the laboratory. Some leucin and tyrosin undoubtedly appear in the small intestine ; but, inasmuch as they are bodies which, if formed, would be rapidly absorbed, it is im- possible to say whether any considerable amount of proteid matter suffers this fate, or whether leucin and tyrosin are formed, as it were, accidentally, from the too long staying of an excess of proteid in the alimentary canal. Leucin and tyrosin are never found in the feeces,~~

~~As the remnant of food passes down the intestine, changes allied to putrefaction invariably occur. Lactic acid is always to be detected in the small intestine, and the amount of it increases as the ileo-cecal valve is approached. Possibly the butyric acid fermentation likewise occurs as a constant, if not an essential, phenomenon of intestinal digestion. At least the gases of the small intestine always contain a small amount of hydrogen; but if we are to gauge the butyric acid fermentation by the amount of hydrogen detected, we must assume it to be of very small proportions. We are so ignorant of the nature of the enteric or intestinal juice that we need not here speculate as to the changes in the remnant of food which the addi- tion of it may bring about. Let it suffice to say that the intestinal contents pass through the ileo-cecal valve with none of the odour and little of the appearance of fecal matter. While in the large intestine they become reduced in bulk, and approach a solid consistency by the abstrac- tion of water from them. Their reaction becomes distinctly acid once more ; but now, from inward processes of putre- faction and fermentation which were started already in the small intestine, putrefactive gases may arise, light~~

car- buretted hydrogen, carbonic acid, sulphuretted hydrogen, . nitrogen, and hydrogen. The feces themselves are com- monly acid ; besides the indigestible parts of food, such as horny matter and cellulose (the denser sorts at least), and the undigested but digestible overplus of starch, proteid, &ec., they contain derivatives from the bile which cause the characteristic colour, and some final decomposition products of elements of food, such as indol.

IT.—ABsorPTION oF NUTRITIVE MATTERS INTO THE Boop.

The complex processes of digestion result in the conver- sion of insoluble and indiffusible food-stuffs into soluble and diffusible sugars and peptones. These, with the soluble saline matters, the finely-divided or emulsified fats and water, are (if we except the small quantity of soaps formed in the course of pancreatic digestion, and the small amount of soluble leucin and tyrosin evolved in the same process) the only contents of the alimentary canal capable of entering the organism from the outer world. They are not indeed the only soluble and absorbable bodies in the intestine ; a large part of the digestive juices themselves are reabsorbed, and may possibly do duty over again in their respective secretions. But these are not foods. How, it may now be asked, do these soluble or finely-divided substances pass the confines of the body? From what has already been said about the organs of digestion it will be evident that, from the stomach downwards, the alimentary cavity is separated from an infinite number of thin-walled vessels by a delicate layer of columnar epithelium and a filmy basement membrane. There seems at first sight to be no difficulty in understanding how water and dissolved and diffusible matters may pass these barriers with the greatest readiness by physical processes of diffusion which

are so simply imitated in the laboratory. We know also that, in fact, solutions do with the greatest ease and rapid- ity pass through such a membrane as the conjunctiva, by the readiness with which the pupil may be dilated on putting a drop of atropinized fluid beneath the eyelid. But it is by no means clear that the process is so simple in the living intestine. A fresh specimen of epithelium scraped from the interior of the mouth of a pig may be bathed in a solution of colouring matter and yet admit no trace of the

colour into the substance of its cells so long as they remain alive. It is only when they cease to be living protoplasm that the physical processes of diffusion come into play and that the cell-substance takes up the colour. Guided by this simple observation we shall hesitate to assume, because we have water containing soluble sugars, salts, and peptones on one side of the epithelium of the alimentary tract, while on the other we have fluids differently constituted, that therefore we must needs have a process of transfusion tending to the passage of the dis- 'solved substances from one side to the other. This "absorption" of matters, even simple saline solutions, at the surface of the intestine may be, and most probably is, a vital operation. Be the nature of the process what it may, it is easy to conceive how fluids at least arrive at the interior of the blood and the lymph capillaries of the alimentary mucous membranes. The case of the particles of emulsified fat presents more difficulty ; but even here there are only two possibilities open to us. Either the fine globules pass through the columnar cells, or they pass between them; if they pass through them they must traverse the thick striated inelastic end of the cells in a manner which it is somewhat difficult for us to picture; if they only pass between the cells it is difficult to explain why so many of the acutest observers have described the occur- rence of fat-particles within the epithelial cells of recent preparations of intestinal mucous membranes.

Once through the epithelial layer the absorbed matters pass into the blood-vessels or the lymphatics in some way the details of which are as yet mere matters of speculation. The axial lymphatic vessels of the villi—the so-called lacteal radicles—have a special interest, since villi are pre-eminently the absorbent rootlets of the body. As soon as they become filled, the layer of muscular fibres investing them contracts and empties the contents of the lacteal towards the deeper vessels of the mucosa. The subsequent expansion of the radicle will evidently favour the refilling of it.

It is very disputable where absorption takes place. The filtrate obtained from the contents of, the stomach yields very little peptones, the inference being that much has already become absorbed by the gastric capillaries, hemic or lymphatic. There seems to be no reason why water, salines, and dissolved sugars should not also be taken up at the same place. In the large intestine water at least is absorbed, for the contents become drier as they

~~pass along the bowel. But it is the small intestine chiefly which is the scene of most extensive absorption of digested products; here fats are demonstrably taken into the organ- ism ; and here, doubtless, more than elsewhere, peptones, sugars, and other soluble bodies suffer the same fate.~~

~~Blood-vessels and lymph-vessels are both sharers of the work, though to what extent each is employed is a matter of surmise rather than of observation. The lacteals cer- tainly absorb the largest part of the fat, though, as the relative amount of fat in the portal vein increases after a meal, fat must also be absorbed by the blood-capillaries. The material absorbed into the portal vein is at once submitted to the smaller circulation of the liver and the activity of the liver-cells ; that absorbed into the lacteals traverses many lymphatic glands before it reaches the~~

~~thoracic duct and the general circulation at the root of the neck. Thus in both ways of absorption the raw material is immediately passed into certain organs before it reaches the common stock of blood. That changes are effected in the constitution of the just-received food-stuffs during their stay in these organs there is every reason to bélieve ; for, on the one hand, the blood issuing from the liver in the hepatic veins differs from the blood entering it by the portal vein ; and, on the other, the contents of the thoracic duct differ from the contents of vessels nearer the absorbent radicles, as, for example, the contents of the mesenteric lacteals. The nature of these changes must be discussed in the next section.~~

~~TIJ].—CHEMICAL PROCESSES IN THE TISSUES AND ORGANS OF THE Bopy.~~

~~While it is probable that the liver modifies the recently- digested raw material of food before it reaches the common stock of the blood, it is quite unknown what (or, indeed, if any) difference exists between the action of the liver on blood laden with raw material immediately after a meal and its action on blood traversing its capillaries during a fast. Does the liver exert an action on recently-imported fat, peptones, and sugar in any sense different from the action it exerts on fatty, albuminous, and sugary matters as they exist in the common stock of blood? Or—which is the same question—do the fats, albuminous matters, and sugars of the portal blood differ at all from the fats, albuminous matters, and sugars of ordinary blood? While~~

~~this question remains unanswered it will be well to consider the liver as like any other tissue drawing on the common source of nutriment, the blood, for its own particular pur- poses, and not as an organ akin to the special digestive organs, devoted to the elaboration of food for the benefit of the other tissues.~~

~~It need not be so, however, with the lymphatic struc- tures with which the chyle of the lacteals comes into con- tact before it is poured into the blood. Chyle from the thoracic duct at its entrance into the veins is of course mixed with the general lymph of the body,—the juice of the tissues which is collected in the lymph-vessels and carried back to the blood. It is a milky fluid which coagulates on standing, the clot of which after some time becomes tinted red at the surface from the presence of immature red corpuscles. The coagulum consists of fibrin~~

~~resembling that of the blood. Other constituents of chyle—~~

~~are white corpuscles, oil-globules coated with albuminous matter, t.e., emulsified, and exceedingly fine fatty granules usually spoken of as the "molecular basis of chyle." Chyle obtained from vessels nearer the intestines has very little fibrin, very few white corpuscles, and no red cor- puscles, It is probable, therefore, that the raw matters of digested food are undergoing a process of manufacture into blood during their passage through the lymphatic glands to reach the thoracic duct.~~

~~When once they arrive at the blood, the imported mate- rials of food are lost beyond our power to follow them individually. The question now becomes one of the inter- changes between the blood generally and the tissues. That such an interchange occurs there can be no doubt; for if all food be withheld from an animal the tissues rapidly grow less in quantity, while the blood maintains a fairly constant composition. If such an animal be fed, the tissues regain their former weight, and may even store up an overplus of matters, while again the blood remains of approximately constant composition. The tissues can both take away from the blood and give to the blood such matters as are necessary. But the matters taken from the blood are not in the same form as the matters given up to the blood. When blood is made to circulate through living tissues of~~

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whatever kind the blood entering the tissue always has a different composition from the blood which leaves it. The tissues, therefore, are laboratories in which materials abstracted from the blood are transformed. To these chemical operations of transformation which occur in living tissues the term "metabolic" has been applied, a term first used by Schwann, and happily reintroduced by Michael Foster.

What now becomes of the products of the metabolic activity of the tissues? We have hitherto considered the tissues as taking matter from the blood, changing the form of it, and giving it back to the blood ; but this is far from being the true account of the process. It does indeed represent all that we know of the metabolism of many tissues. In muscle, for example, matters are drawn from the blood, converted to other shapes within the tissue, and sooner or later cast out into the blood-current again. The same may be said of nerve-tissue and possibly of some other tissues. In secreting glands the case is different. Some only of the products of tissue-metabolism are returned to the blood; others are poured into the ducts of the glands as the glandular secretion, and so leave the body altogether. This happens, for example, in the digestive glands, the milk-glands, and the kidneys. In a third order of tissues the case is different again, for liere some of the products of metabolism may be retained in the tissue for an indefinite time. This occurs in certain tissues which have been called storage tissues, and of which fat is a typical example. Lastly, the liver is a complex organ whose metabolic products are disposed of in all three ways,—part being cast at once into the blood, part being accumulated in the tissue itself as glycogen and passing into the blood at intervals as the body needs it, and a third part being poured into the biliary ducts in order that it may escape into the intestine. It will be well, therefore, to recognize three methods of the disposal of metabolic products, and to classify the tissues accordingly.

Metabolism of Muscular Tissue.—To arrive at a know- ledge of the chemico-vital changes occurring in any tissue we must compare the matters entering the tissue with the matters issuing from it. It is only from such a compari- son that we can infer the changes which go on within the tissue. In the case of muscle there is yet another method by which we can obtain

inferences as to the nature of the metabolic changes. We have reason to believe that the tissue-changes of active muscles are simply the exaggerated form of changes which constantly occur. If we may assume this, a comparison of the chemical composition of muscle before and after a period of activity will help us to a knowledge of the changes that occur in muscular action, and, by implication, a knowledge also of the com- mon metabolic changes of the tissue. Nowa comparison of muscle before and after action shows that during activity the quantity of CO, becomes very largely increased ; at the same time the muscle becomes of acid reaction from the development of lactic acid; the amount of bodies soluble in water decreases, while the amount of bodies soluble in alcohol increases; the amount of glycogen decreases, while that of sugar increases ; and, finally, bodies develop which have a strong affinity for oxygen. If we compare the matters entering and issuing from muscular tissue we shall find that muscle gives up much CO, during activity, that the issuing blood is rich in reducing substances, and that it acquires sarcolactic acid. The circumstance of most importance in this comparison is that carbon dioxide is liberated in large amount without the immediate inter- action of oxygen; the CO, is produced from some body in the muscle which already contains within itself the O necessary for its formation. The fact of next importance is the absence of all indications of a large expenditure of

nitrogen. Relying on these discoveries, physiologists have supposed that the metabolic changes of muscle follow some such course as the following. Non-nitrogenous organic material, along with oxygen, is absorbed into the tissue from the blood. In the tissue-cells it is elaborated with nitrogenous matter already in the tissue into a complex body called inogene substance, containing a nitrogenous factor linked to carbon, hydrogen, and oxygen. During the life of the tissue, and to a much greater extent during muscular activity, this inogene substance is split up into a nitrogenous portion and a non-nitrogenous portion, of which the former is retained in the tissue to be again worked up into inogene substance, while the latter is resolved into more stable bodies which escape. The full number of the effete bodies is not at present known to us; it doubtless includes more than carbon dioxide and

~~sarcolactic acid, but these are the only bodies whose existence has been definitely determined.~~

~~Metabolism of Glandular Organs.—Of late years very much light has been shed on the processes of gland- ular cells, but it has been chiefly on their anatomical aspect. We know very little, indeed, of the nature of the chemical changes going on within the glandular cells, because, although we can ascertain approximately the com- position of those products of the changes which escape into the glandular duct, we as yet know so little of those products which escape into the blood. We know, how- ever, that mucin is capable of being formed in the interior of epithelial cells out of some non-mucous antecedent. We also have some reason for supposing that the gastric glandular cells—the border-cells—select phosphate of sodium and sodium chloride from the blood, and these bodies have been shown to be capable of interacting in such a way as to yield free hydrochloric acid. In the secretion of milk it is tolerably certain that the fat and the casein are both formed out of proteid matter within the glandular cells. Even the milk-sugar has been thought to be elaborated out of some non-saccharine substance, or even out of some substance that is not a carbohydrate. In the case of the pancreas we know nothing of the actual chemical decompositions that occur, but we do know that they occur in two well-marked stages. In the first a body is formed which is stored in the gland-cells, as the inogene substance is supposed to be stored in muscle; in the second this body is resolved into other but still complex bodies, of which the trypsin ferment of the secretion is one. Among the glandular organs we may mention the kidney, respecting whose secretive activity it is far from certain that it entirely consists of physical filtration or powers of mere selection. No doubt many of the con- stituents of urine are simply filtered off from the blood, while others are undoubtedly abstracted owing to some peculiar attraction which the renal cells exert upon them. But there is some reason to think that others may be formed within the kidney-tissues as products of cell-meta- bolism. As yet we have no definite knowledge concerning the nature of the metabolic changes.~~

~~Metabolism in the Storage Tissues.—Of these the first that we shall describe is adipose tissue or fat. Fat appears to be accumulated in ordinary connective-tissue corpuscles. What metabolic changes occur in connective-~~

tissue cor- puscles which are not accumulating fat we do not know ; but under certain conditions of overfeeding the metabolism is so varied that fat is deposited within the cell. At first it appears in the form of fine granules ; these soon coalesce to globules, which afterwards enlarge by the confluence of granules subsequently formed. The exact changes of which this fat is the outcome, or one of the products, are entirely obscure. It is enough if we can establish the probability that fat may be derived from the proteid proto-

plasmic matter of the fat-cell. We are not here guided, as in the case of muscle, by analysis of the blood approach- ing the adipose tissue and the blood leaving it. Never- theless, there is little doubt that fat may be derived from the proteid elements of food through the activity of living tissue-cells. That proteid matter readily lends itself to a decomposition of which fat is one product is seen in the formation of fat-like "adipocere" in the nitrogenous tissues of dead bodies which have been for some time buried or immersed in water; and it is likewise seen in the process of "ripening" in cheese, in which the fat increases while the albuminous matter diminishes. But in addition to these general facts, suggestive though they are, there are not wanting proofs of a more particular kind that fat may result from proteid decompositions. If dogs are fed on starch and fat with no proteid food at all, the carbon stored up in the body can all be accounted for by reference to the fat of the food and the proteid matter of the body which, in the state of starvation, came to be disintegrated. In many other cases it seems clear that the fat stored up by animals during fattening unquestionably comes in part from the nitrogenous matters of food. But a considera- tion of the relative amount of carbon and nitrogen con- tained in proteids and in urea, which is the final product of the oxidation of proteid matter, would alone lead us strongly to suspect such an origin of fat. If all its nitrogen reappeared in the form of urea, 300 grains of protéid would give rise to 100 grains of urea. But 100 grains of urea contain but 20 grains of carbon, whereas 300 grains of proteid matter yield 159 grains of carbon. What has become of the deficit of carbon? If it has not been burnt off as carbon dioxide, it must remain within the body in some non-nitrogenous form.

If fat may be derived from proteids in the body, it is now equallycertain that in some animals at least fat may come from carbohydrates of the food. Lawes and Gilbert have conclusively shown that as much as 40 per cent. of the stored-up fat in well-fattened pigs could not possibly have come from the nitrogenous parts of the food, and that it must have been derived from the carbohydrates.

All these facts render it very probable that the fat- forming tissues pick out from the blood albuminous or non-nitrogenous matter, transform it, retain the fatty element and discharge the rest. But it must not be for- gotten that fat of food may, on finding itself in the blood, be taken up by appropriate tissue-cells and stored up without undergoing further change. Even this, although it seems so probable, may not at once be assumed to occur in such a simple manner. It is true that, if an animal be fed on fat resembling the fat of its own tissues, it might be assumed that the fat which it stores is simply absorbed by the tissue-corpuscles as an amœba absorbs its food. But if this were really the manner of the process we should expect that allied fats substituted for the natural fat would be equally well taken up and stored. 'This, how- ever, is not at all the case. Dogs fed on a mixture of palmitin and olein, but no stearin, are found on analysis to have stearin in their body-fat; just as dogs fed on palmitin and stearin, but no olein, are found to have an abundance of olein stored up. And, even when fed on spermaceti, a dog was found to present mere traces of it in the fat accumulated in its tissues during the experiment. In short, all facts go to show that the accumulation of fat does not take place without some display of formative or transformative energy.

The last tissue whose metabolism we shall discuss is the hepatic tissue of the liver. Hitherto we have considered the liver as a digestive gland secreting the bile for the purposes of digestion ; but the liver has other functions which overshadow entirely its function as a digestive organ.

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It seems to have the power of accumulating amyloid material very much as adipose tissue accumulates fat. It would probably be a mistake to regard these two functions of the liver as altogether independent of one another, although it is necessary to state that a direct dependence has not yet been

established. There can, however, be little doubt that the hepatic tissue draws to itself a variety of matters from the blood flowing into it by the portal vein and hepatic artery, and elaborates these constituents into various products, some of which escape into the blood again, others of which appear as the bile, while a third order remain in store within the substance of the liver. But, although these products are probably associated more or less intimately in their origin, they have, in the natural development of physiology, been studied independently of one another for the most part.

If an animal be richly fed on starchy or saccharine food it is found, within a short time of the digestion of the food, that the liver contains a large quantity of a starchy body called glycogen (CgH, 05), In order to obtain glycogen from liver-substance it is necessary to make usc of the tissue of an animal just killed, for the starchy body undergoes an extremely rapid post-mortem con- version into a sugar. Liver taken quickly from the still warm body of a rabbit is rapidly divided into small pieces and plunged at once into briskly boiling water. The high temperature prevents the post-mortem change and leaves the glycogen in a condition to be separated. The pieces of liver may then be pounded with sand and water, and the mixture acidulated and filtered. From the filtrate the glycogen may be precipitated by alcohol, and the preci- pitate may be purified by boiling in caustic potash and afterwards neutralizing and reprecipitating with alcohol. Or the albuminous matters may be thrown down by a solution of mercuric iodide in iodide of potassium before precipitating the glycogen with alcohol. Glycogen so prepared is a white amorphous powder resembling starch in chemical composition ; it is colourless and tasteless. Its aqueous solution is milky, and generally opalescent. ¥

Other tissues and organs besides the liver have been found to contain glycogen. For example, muscles contain some glycogen, which diminishes during muscular activity, while it has been de- tected in the tissues of embryos and of young animals, as well as in newly-formed pathological growths.

There can be little doubt that glycogen is manufactured mainly out of carbohydrates conveyed to it in the portal vein. Ifa rabbit be starved for some days, the whole of the glycogen disappears from the liver ; but the

store is at once, in the course of a few hours, replenished if starch or sugar of whatever sort (cane, grape, or milk) be introduced into the alimentary canal. The metabolic a of the liver-cells in respect of glycogen-production are not,

owever, limited to starches or sugars, If glycerin be injected into the intestines the amount of glycogen in the liver is at once in- creased. But some preparation of the glycerin is necessary before the liver-cells are able to appropriate it; and this preparation is accomplished in the true digestive organs, since glycerin introduced into the blood by subcutaneous injection does not bring about any increase in the glycogen of the liver. Even albuminous bodies, such as fibrin and albumin, freed from all trace of amyloid matter, seem in the case of carnivorous animals to yield glycogen in the laboratory of the hepatic tissue. The same may be said of gelatin. Now it is easy to form a chemical conception of the manner in which such a body as grape-sugar leads to the storing of glycogen, for the dehydration of the sugar would be all the change required for the conversion. But we can at present form no picture of the operation in the case of glycerin at of the albuminous matters ; and the fact that these substances also are amenable to the liver- cells should make us hesitate to assume at once that in the case of sugar the process is the simple one of dehydration. We must wait for further light to be shed upon the interdependence of what we may for the moment call the biliary metabolism and the glycogenic metabolism of liver-cell before we speculate as to the exact nature of the changes.

The liver has, beyond a doubt, the faculty of manufacturing an

'amyloid body out of various raw matters brought within the range

of its activity, and of storing it up for future use. The use to which it is put has been the subject of much speculation and experimental inquiry. The ainyloid matter when drawn upon may leave the liver in the form in which it exists there, or it may be converted into some other modification and afterwards trans- ferred to the blood. 'The fact that other tissues besides the liver contain glycogen, and the fact that some, as muscle, seem to make use of glycogen in the act of contraction, have been thought to support the hypothesis that the glycogen is conveyed by the blood to their tissues and then consumed. According to this theory the

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hepatic metabolism ends in the production of glycogen, which merely waits to be cast out into the blood-current at the call of the body generally. Against this hypothesis, as a complete ex- planation of the use of liver-glycogen, it may be urged that the glycogen of muscle at least disappears on starvation long before the store of glycogen in the liver has been used up. Moreover, the glycogen of muscle is by no means invariably present, and is certainly not indispensable to the activity of the tissue. We may therefore conclude that the use of glycogen by the tissues (when we judge of it by the case of muscle) is not constant enough or important enough to account for the large store of glycogen in the liver. But, ifthe hepatic glycogen does not leave the liver as such, it must undergo some other change in the liver ; and the circum- stance above referred to, that glycogen so readily becomes converted into sugar post mortem, at once leads us to inquire whether a similar conversion is not normally effected during life. The inquiry be- comes of especial value when we remember that the blood contains a constant proportion of sugar in its composition, which argues such a constancy of supply as could not be due to the direct importation of sugar during the irregular periods of the daily meals. As the amount of sugar in the blood is constant, the periodic introduction of carbohydrate into the organism must be followed by some temporary storing of it in some organ from which it may be constantly, and without intermission, doled out. Now the body contains in many parts the means of the conversion of starches into sugar. The salivary or pancreatic juices with the utmost readiness at the body-temperature change glycogen into a sugar. Many tissues, as well as blood, are said to effect the same conver- sion, although it is denied that the blood does so unless the blood- corpuscles have been first destroyed. The liver itself, as we have already seen, may bring about the same change, at least after death ; but the activity of the converting substance may be prevented by subjecting it to a temperature of boiling water. If the liver con- tain the ferment-like body during life, unless its activity be restrained in some way or other, the glycogen which is formed in the liver will be speedily changed into sugar. In regard to the existence of this starch-converting body it is significant that, while it certainly may arise

~~in the blood when the blood-corpuscles are destroyed, the liver is known to be the seat of an extensive destruc- tion of blood-corpuscles. Considerations of this sort, however, are of little cogency ; it would bea strong presumption of the existence of the ferment in question if sugar could be proved to be normally present in the hepatic tissue during life, but the experimental proof of this is beset by great difficulties, and discordant results have been obtained by the different observers. Claude Bernard, to whose researches we owe so mnuch of our knowledge on this interesting question, detected small but perceptible quantities of sugar in quite fresh liver-substance ; but other observers, among whom Dr Pavy is to be reckoned the first, have failed to find even a trace. Further, Bernard was able to make out a decided differ- ence between the amount of sugar contained in the portal vein and the hepatic vein respectively when there was no starch or sugar in the food to load the portal vein. In such circumstances the blood issuing from the liver by the hepatic vein was found to contain a small quantity of sugar in excess of the blood entering the portal vessels. The most accurate and reliable investigations have, how- ever, conclusively proved that this difference does not exist. The matter, therefore, still awaits some crucial test not yet devised. In the meantime we may accept the hypothesis of a conversion of liver-glycogen into soluble sugar as one which, however probable, is not supported by sufficient evidence. Amongst those who have rejected this hypothesis some have had recourse to other assump- tions to account for the fate of glycogen in the body ; and it has been suggested that glycogen undergoes conversion into fat either in the liver itself or partly there and partly in some other tissue. This suggestion has little direct evidence to support it. It is true that animals, especially the pig, have the power of storing up fat in their bodies which they cannot have obtained otherwise than from the carbohydraceous constituents of .their food. It is also true that the hepatic tissue is often found to contain fat in con- siderable quantities. But it is easy to see how these facts admit of simple explanation without assuming a conversion of glycogen into fat within the liver-cells. The chemical nature of such a con- version is difficult to unagine ; but it would be rash to assume that the metabolic powers of animal protoplasm are not sufficient to accomplish it.**

~~With regard to the metabolism of liver-tissue which leads to the production of bile we possess but little direct knowledge. The secretion of bile is not a~~

mere act of filtration of already-formed matters from the blood ; but we have at present no conception of the chemical changes which occur in the interior of the liver-cells in the elabora- tion of bile. There is strong reason to think that the bile-pigments are derived from the colouring matter of

blood, not only from the circumstance of the large destruc- tion of blood-corpuscles which takes place in the liver but also from the resemblance or identity of bilirubin and heematoidin, a body derived from extravasated blood. A large number of facts point very clearly to the conclu- sions (1) that the liver is an organ in which chemical changes of great magnitude and importance have their seat, (2) that their operation consists in great part in decomposition of proteids.

The high temperature of the blood which leaves the liver, and which is the hottest blood of the body, is the chief proof of the correctness of the first of these con- clusions, whilst the second rests upon many considerations. The bile-acids unquestionably do not exist in the blood, but are the results of proteid metabolism within the liver-cells. There are strong grounds for believing that urea, CH,N,O,, as well as uric acid, has its principal origin in the liver, which is equivalent to localizing the chief seat of proteid metabolism in this organ.

Diabetes.—In connexion with the glycogenic function of the liver it is necessary to refer to a disease which is of special interest to physiologists, from the ease with which the symptoms may be artificially reproduced. The disease itself may be defined as the appearance of large quantities of sugar in the urine, while the total amount of the urine excreted is also increased. Now diabetes of a temporary nature may be produced in animals in a variety of ways. If certain fibres of the medulla oblongata near what is known as the vaso-motor centre be divided, as they may be by means of a special instrument, without producing any serious abnormal motor or sensory symptoms, there follows very speedily the excretion of large quantities of sugar in the urine. It is evident that this result is due in some way to an abnormal influence of the nervous system. The path by which the abnormal influence is trans- mitted has been carefully traced down the spinal cord to the first thoracic sympathetic ganglion ; if this path be interrupted at any point symptoms follow similar to those caused by the

local injury to the medulla oblongata. The circumstance that interruption of this nervous pathway at any point causes the appearance of sugar in the urine at once leads to the suspicion that the escape of sugar is not directly caused by the shock of the operation or injury. We are rather brought to the conclusion that the natural absence of sugar from the urine is due to a restraining influence of the nervous system acting continually in a manner to be discussed hereafter, and that the division of the path by which the continual restraint is exercised merely intercepts the inhibitory influence. This is confirmed by the observation that the medulla is in communica- tion with certain afferent nerves, through which also the restraint may beremoved. These nerves are the vagi ; division of them leads to a transieut appearance of sugar iu small amount in the urine ; but stimulation of their cerebral ends brings about the escape of sugar toa remarkable degree. This clearly can only be due to an inhibition by afferent nerves very similar to the inhibition of the heart which follows stimulation of the cerebral end of the abdominal sympathetic nerve in the frog.

The intercepting of this hypothetical restraint by the anatomical section of nerves is not the only way of artificially bringing about diabetes. Sugar may appear in the urine during the action of curare and after a suitable dose of morphia, and also after the injection of dilute saline solutions into the blood-vessels. The probable relationship of these various methods of causing diabetes will be referred to later.

There can be no question that diabetes is a disease affecting the glycogenic function of the liver. In many cases of natural or pathological diabetes, if all carbohydrates be withheld from the patient, the urine becomes free or almost free from sugar; and in like manner, if an animal be starved until there is every reason to suppose that its liver has become free from glycogen, and after- wards it be subjected to the operation for producing artificial diabetes, no sugar appears in the urine. Similarly, if an animal be drugged with arsenic, which leads to a rapid loss of all the glycogen of the liver, and afterwards poisoned with curare, the latter drug no longer brings about diabetes. In short, if the liver contains no glycogen no sugar can appear in the urine. This being so, in what special way is the glycogenic function modified in diabetes ? If we assume that the function of the liver is to seize upon all sugar passing along the portal veins from the intestinal

canal and store it up as glycogen, in order that it may be piecemeal returned to the blood to be burnt off in distant organs, we can easily review the various conceivable ways in which diabetes might be caused. It must, in the first place, be premised that the blood is unable to contain more than a certain percentage of sugar. When this per- centage is overtopped the excess of sugar escapes in the urine. Of

this there is direct experimental proof in the facts that if sugar be slowly injected into the jugular vein, no escape of it by the kidneys takes place, because the organism can make use of a small excess of sugar ; but if it be injected quickly diabetes ensues from the too rapid accumulation of it in the blood. Accepting this, we can readily see that diabetes might be caused (1) by the failure of the liver to pick out the sugar in the portal vein in order to store it, (2) by an unusually large escape of glycogen from the liver in the form of sugar, (3) by the failure of the distant organs whose func- tion it is to burn off the daily quantum of sugar.

It is not improbable that there may be different sorts of diabetes arising from different causes. Thus it has been said that the diabetes of curare-poisoning appears even when the liver has previously been emptied of glycogen by starving the animal. When we reflect that muscles are the organs especially affected by curare, the fact Gf it be a fact) just mentioned at once suggests that the sugar which appears in the urine during curare-poisoning is duc to some defect in the muscular tissue, in consequence of which the glycogen normally used up by it fails to be used and passes back into the blood. Further, the failure of glycogen-using organs may be due to no disqualification of theirs for the work of utilizing normal glycogen, but to some abnormal constitution of the glycogen (or the sugar) offered to them. Again, the diabetes caused by copious injection of dilute saline solutions into the blood-vessels may be due to the large destruction of blood-corpuscles which follows such in- jections, and the consequent production of a large quantity of the starch-converting substance which is known to arise in the disin- tegration of blood-cells. But the common form of artificial diabetes—'puncture diabetes," as it is sometimes called—the

diabetes of anatomical nervous lesions, is undoubtedly due to defects in the hepatic apparatus brought about by the injury. Thus the puncture of the medulla oblongata is of no avail to cause diabetes if the liver has first been deprived of its glycogen by starving the animal experimented upon. It is, however, far from necessary to suppose that the puncture diabetes is due to any incapacity of the liver- cells for their usual metabolic changes; this may be the cause of some kinds of pathological diabetes, but it is almost certainly not the cause of the traumatic variety, and for the following reason. If sugar be freely administered to an animal in which the diabetic nervous lesion has been established, although it is impossible to load the liver with glycogen as, in such conditions, it would become loaded during health, yet a certain amount of glycogen does become stored in the liver. The liver seems still to possess the power of converting the sugar of food into a store of starch, but not the ful- ness of opportunity which it has in health.

The conditions which deprive the liver of the opportunity of storing glycogen are to be sought in an altered vaso-motor mechan- ism. The circumstance that the " diabetic centre" in the medulla coincides with part of the general vaso-motor centre at once leads to the vaso-motor theory of diabetes ; but it may be admitted that this consideration is almost the strongest support of the theory. How a vaso-motor paralysis brings about diabetes we have as yet no clear picture. Verhaps it is by permitting such a rapid current of blood through the vessels that there is not time enough for the usual transmutations. If we may assume this to be the method by which diabetes is produced, then the vaso-motor theory receives much support from the following consideration. Inasmuch as diabetes is caused by a local (hepatic) dilatation of blood-vessels leading to a superabundant torrent of blood, if means be taken to provide other channels for the blood and so relieve the superabund- ance, diabetes should be prevented. This may be done by dividing the splanchnic nerves and dilating the enormous vascular tracts of the abdominal organs. In these circumstances the diabetic puncture makes but a trivial change in the circulation of the liver compared with that which it makes when the blood-pressure is normal; and, as might have been foretold from the vaso-motor theory, no diabetes follows. If diabetes from nervous lesions is a vaso-inotor phenomenon, other forms of artificial diabetes are not so. Arsenic and antimony seem to destroy the

power of the hepatic cells to manufacture glycogen; sugar ingested with the food passes, in consequence of the failure, directly into the blood and out of it into the urine. Ligature of the bile-duct also rapidly leads to profound disorganization of the hepatic tissues, in conse- quence of which imported sugar passes the portal system unheeded and escapes by the kidneys.

Metabolism of the Blood.cWe have hitherto regarded the blood as subordinately related to the great processes of the body, as playing the mechanical part of a carrier, and as if it had no direct interest in the metabolic opera- tions themselves ; the reader, however, need scarcely be re- minded that, but for the respiratory exchanges between the blood on the one hand and the anatomical elements of the tissues on the other, all metabolic processes would be im- possible. In the article Rusprration, and in treating

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the particular section "the respiration of the tissues," the influence of those exchanges on metabolism will be care- fully considered.

The older physiologists regarded the blood as the very seat of the chemical changes of the body,—a view which is almost entirely opposed to that which we now hold, and which is disproved by many facts.

We have little or no evidence that the blood exhibits transformations of matter such as we have been discussing in the case of the tissues generally. There are few such transformations known to us in which carbonic acid is not one of the most abundant end-products of the change, and therefore, when we find that blood removed from contact with the tissues and freed from carbon dioxide produces very little of this body, although an abundance of oxygen be supplied to it, we have the right to suspect strongly that it is due to the absence of any active metabolism.

It is not certain that blood (or lymph), without the intervention of some other tissue, has even the power of converting non-coagulating albumins fresh from the digest- ive organs into the characteristic fibrin-formers. It is true that when lactate or caprate of soda is injected into the blood of an animal it is readily oxidized; but this may easily be due to the operation of

some organ through which the blood passes, and which finds the bodies referred to suitable to its own metabolic processes ; and this view of the case is further strengthened when we find that formiate of sodium, which also is a readily oxidized body, passes through the same ordeal unchanged.

Nevertheless, the blood is to a certain extent an active living tissue. The white corpuscles, at least, are definite living structures whose life-history, could we but decipher it, would be found to be a history of constant metabolic processes. Towards these elements of the blood the fluid plasma must behave as towards any other tissue-element, supplying them with raw material, and receiving from them the end-products of their internal chemical decom- position ; and therefore the blood, as a whole, must be classed among the metabolic tissues. The production of the anatomical elements of the blood does not concern us here ; it may suffice to say that the white cells are added to the blood or lymph from certain structures of which the spleen, thymus body, lymphatic glands, and mucosa of the alimentary canal are the chief, and that probably the red corpuscles are developed from the white ones. It may also be pointed out that there are certain parts of the body—e.g., the spleen, liver, marrow of bones, &c.—where there is evidence to show that red corpuscles undergo rapid and wholesale destruction, either for the production of some secretion, or possibly because the corpuscles have become old and unfit for work, and their invaluable con- stituent, iron, is wanted for younger and more active corpuscles.

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The blood, as has been more than once said, is subject to continual additions and subtractions on the part of the tissues. The subtractions effected by the tissues are made good in part by the importation of fresh material of food from the alimentary canal. The analogous counterbalanc- ing operations which serve to check the accumulation of used-up tissue-substance in the blood take place in certain organs called excretory. Ina strict sense, all organs which cast out material from the body are excretory ; the digestive glands, for example, pour their secretions into the aliment- ary canal, i.¢., outside the strict limits of the body. But so much of their constituents are reabsorbed before the alimentary canal is traversed that

they may, for practical purposes, be regarded as never having left the body. Even the constituents of tears, when these do not fall over the

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cheeks or escape at the nose, are reabsorbed from the nasal mucous membrane. With respect to the alimentary secre- tion, it is merely a small proportion of the bile which remains in the feces that is to be regarded as truly excretory in the sense of being utterly lost to the organism. If excreta are those substances which the body rejects utterly, then we may reckon as excreta (1) the urine, (2) the sweat and oily secretions of the skin, (3) the milk, (4) certain elements of bile contained in the faeces, (5) the gaseous and watery losses at the lungs, (6) the exuvi- ated horny scales of skin and nails and hair, (7) the pro- ducts of the generative organs, but not those constituents of feeces which are but the undigested remains of food. Among these (if we except the milk and the generative secretions whose elaboration is so peculiar and exceptional) the urine and the excretory products of the lungs and skin are those of paramount importance. The excretion from the lungs will be treated under RESPIRATION ; we shall therefore here concern ourselves with the excretion of kidneys and skin.

Kidneys and their Excretion.—Urine is a clear amber- coloured fluid, somewhat acid in reaction, with a peculiar aromatic odour and bitter saline taste. Its specific gravity varies, consistently with health, within wide limits, being affected very greatly (a) by the quantity of liquid consumed by the individual in a given time, (6) by the greater or less activity of the secretion of sweat. Whilst the average specific gravity may be stated to be about 1-020, it is often temporarily much lower and occasionally considerably higher. Asarule the specific gravity is higher in summer than in winter. The average quantity of urine passed by a healthy adult may be reckoned at 52 fluid ounces, though it is affected by the same causes as those which

influence the specific gravity no less than by individual

peculiarity and other circumstances.

The urine is essentially a watery solution of certain organic matters, of which much the most abundant and important is urea, and of mineral salts,

of which the most abundant is common salt (sodium chloride).

Urea.—A well-nourished man passes, on an average, about 33° grammes (500 grains) of urea in twenty-four hours. This body, which has the composition CH,N,O, is looked upon by chemists as carbamide, 7.¢., it is the amide of carbonic acid, and on this view may be written CO(NH,),. It is isomeric with ammonium cyanate. This body represents the chief product of the metamorphosis of albuminous or proteid substances in the body.

Even during starvation the destruction of proteid matter continues, and the amount of urea may reach about 230 to 310 grains. The quantity is, however, specially and directly affected by the amount of proteid matter contained in the food; so that, for instance, by consuming a sufficient quantity of meat certain persons have excreted as much as 1540 grains of urea. The excretion of urea, which is a measure of the metamorphosis of proteids in the body, is not, as was formerly supposed, directly influenced by the amount of mechanical work done by the body, the greater activity of the muscles not being necessarily accompanied by their greater waste ; indzrectly, however, the excretion of urea is increased by bodily exertion, inasmuch as man and other animals appear instinctively to desire and to need a larger quantity of proteid food when much work is to be done than when the body is comparatively at rest.

It was formerly believed that urea was a direct result of the oxidation of proteids in the body. The view actually held is, that it is the product of a synthesis occurring in the body in which a body or bodies resulting from the oxidation of the proteids take part. It has recently been shown that when salts of ammonia are introduced into the system the nitrogen of the ammonia is excreted

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as urea; in this case it is obvious that a synthesis must have occurred in which the ammoniacal salt introduced has taken a part no less than some other body. It has, for instance, been surmised that in the oxidation of the proteid molecule cyanic acid arises, and that in the presence of ammonia ammonium cyanate is formed, which in the organism, as outside, may be changed into urea ; or, again, that cyanic acid is formed, which, uniting

~~with the elements of water, gives rise to urea, carbonic acid being separated in the reaction.~~

~~Uric acid combined with bases exists in small quantities in the urine of man, about 7 to 10 grains being passed by an adult in twenty-four hours, though individual peculiarities appear to affect ina remarkable manner the excretion of this constituent (maxi- mum limits of quantity °3086 to 15°48 grains). In some animals, as in snakes and birds, uric acid and its salts represent the chief nitrogenous excretory product, i.e, take the place of the urea of the urine of man and carnivorous animals.~~

~~Uric acid has the composition C;H,N,0;. Its constitution is yet involved in great doubt, in spite of the most profound and ex- tensive researches which have been made on its more or less imme- diate relations, and in spite of the fact that its synthesis has recently been effected. It may be looked upon in all probability as a derivative of cyanic acid, CNOH, and glycocin, C,H;NO,, and there are many facts which seem conclusively to show that in the system it does not arise directly from a decomposition of proteids, but is the result of a synthesis in which derivatives of these bodies take a part.~~

~~Xanthin, CsH4N,O., hypoxanthin, Cs;H,N,O, and guanin, C;H;H;O, are immediate derivatives of uric acid, of which the first is a constant constituent of urine, and the second occurs in certain states of disease.~~

~~Hippuric acid, C,Hy,NO., benzo-amido-acetic acid, is present in small quantities in the urine of man (about 15 grains a day), but is the chief nitrogenous constituent of the urine of herbivorous animals, It is formed whenever benzoic acid, or a body which can yield benzoic acid in the organism, is ingested.~~

~~In addition to the organic matters already enumerated the urine contains small quantities of other bodies, amongst which may be mentioned (1) colouring matters, of which one alone is known with any degree of accuracy, and is termed wrobilin, a derivative proxi- mately of the biliary colouring matters, and more remotely of the blood-colouring matter, and (2) minute traces of ferments.~~

As has already been said, the chief salt of the urine is common salt ; there are, however, also excreted in the urine considerable quantities of phosphates and sulphates. The two latter salts re- present in part similar salts introduced as such into the system, but in part they are the products of oxidation of organic bodies which contain sulphur and phosphorus respectively ; to the former belong the proteids, to the latter certain phosphorus- containing fatty bodies of great complexity, which occur widely diffused throughout the body, but particularly in the white matter of the great nerve-centres and in the nerves.

The changes which urine undergoes after it is passed may be briefly referred to. The faint acid reaction proper to freshly-drawn urine is increased, probably in consequence of an acid-fermentation process started by the mucus accidentally present. The visible effect of this is the deposit of acid urates or free uric acid. Ina short time, especially if the urine be kept at a warm temperature, the acid-fermentation is overwhelmed by a fermentation for which organic germs are needed, and which leads to the resolution of urea into carbonate of ammonia. The reaction becomes alkaline, and the smell stronglyammoniacal. Precipitates of ammonia, urate, and ammonio-magnesian phosphate are deposited, the odour becomes putrefactive and multitudes of micro-organisms develop whose germs have been derived from the surrounding air.

Kidney.—The urine is excreted continuously in the kidneys, two organs situated at the back of the abdominal cavity. The fluid is continuously poured by two ducts called wreters into a common reservoir situated in the pelvis, and known as the urinary bladder. From this reservoir the urine is intermittently ejected by the urethra. The two kidneys never secrete symmetrically ; they exhibit an alternation of vascular and secretory activity. Similar variations have been observed in the different portions of one kidney,—first one and then another region of the kidney will be found to be in full activity. Nevertheless, when one kidney is extirpated or unfitted for its function, the other may be capable of the whole work of excretion.

The excretory portion of the kidney, like the secretory

portion of all glandular organs, consists of tubes of base- ment membrane lined with cells of peculiar attributes and surrounded by capillaries for blood and lymph, which allow their fluids to come into close communication with the secreting cells. The complex disposition of the tubes, of which there are hundreds in each kidney, has been traced after an infinite amount of patient research. An account of the arrangement of the tubuli uriniferi falls beyond the scope of the present article.

Excretion of Urine—A review of the constituents of the urme discloses that the function of the kidneys is to separate from the blood chiefly (1) nitrogenous crystalline bodies which are undoubtedly the end-products of the oxidation of nitrogenous bodies, and (2) inorganic salts and water. We have now to describe the probable manner in which this separation is effected. Ever since the whole course and form of the renal tubules became mapped out, and the existence of a double system of capillaries was established, it has been the habit of physiologists to regard the excretion of urine as a twofold operation. Sir William Bowman, so long ago as 1842, in the course of a histo- logical investigation of the structure of the kidney, came to the conclusion that the watery portions of the urine are excreted in the capsule, while the solid parts are removed from the blood surrounding the lower parts of the renal tubule. Ludwig, about the same time, advanced the theory that the whole of the urine is separated from the blood in the glomeruli, but that it is separated in an extremely watery condition, the object of the complicated renal tubules being to permit of the reabsorption of the water, and to bring the urine into a suitable state of concentration for removal from the body. The progress of investigation has completely vindicated the theory proposed by Bowman, which now rests not merely on inference from anatomical structure, but upon a sound basis of physiological facts.

Not only is the process twofold in respect of the two classes of constituents secreted; it may be twofold also in respect of the processes of the act. There is at least much reason for thinking that the water is separated from the blood mainly, though not entirely, by a physical pro- cess of filtration, while some, if not all, of the specific elements of the urine are secreted by a peculiar selective or elaborative action of living epithelial cells. The reason for supposing that the excretion of water is mainly a pro- cess of filtration is

the simple one that the flow of urine seems, in a general way, to obey the same laws of pressure as the flow of water through a filter. For example, what- ever tends to increase the blood-pressure in the branches of the renal artery tends to increase the flow of urine in a given time. If the heart beats more quickly than usual more urine is excreted. If cold contracts the superficial vessels of the skin, and drives a larger quantity of blood upon the kidney, or if the same result ensues from moderate stimulation of the splanchnic nerves, the blood-pressure in the renal artery becomes raised, and an enlarged secretion follows. If the spinal cord be divided in the lower part of the cervical region, the great fall of blood-pressure which results is associated with suppression of the excre- tion of urine. Further, if the pressure in the ureters be allowed to reach the value of 10 to 40 mm. (3937 to 15748 inches) of mercury the transfusion of fluid from the blood is prevented. Now the blood-pressure in the renal artery is about 120 to 140 mm. (4°7244 to 5:5118 inches) of mercury. Secretion stops, therefore, long before the pressure in the glandular ducts reaches that of the glandular vessels,—a relationship between pressure and secretion the very reverse of that which obtains in the case of the salivary gland. These facts sufficiently justify the conclusion that the secretion of water in the kidney is a process of filtration. But there are other facts which

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demand the assumption that even the separation of water is in part an act of living protoplasm. The free inges- tion of water by drinking is one of the most certain ways of producing a copious flow of urine; and yet there is no evidence to show that in most cases this effect is brought about by a raising of the blood-pressure. On the contrary, if one animal be bled into the veins of another there is no increase produced in the amount of urine excreted, and it is difficult to imagine that the blood- pressure may be more easily raised by the drinking of water, however freely, than by introducing into the blood- vessels of one animal the quantity of blood proper to two. In such cases we must assume that the outflow of water from the blood is due to the activity of living cells aiding the normal influence of pressure.

While the secretion of water cannot wholly be ascribed to physical processes, there is no doubt that the secretion of some other bodies is a

selective act of living protoplasm taking place independently of, or it may be in opposition to, physical processes. The first substance whose secretion was experimentally proved to be due to the renal epithe- lium was sulphindigotate of soda, or indigo-carmine. If this substance be injected into the blood-vessels of an animal in which the blood-pressure has been so far lowered by division of the spinal cord below the medulla that the flow of urine has stopped altogether, it can be traced in a short time into the epithelium of the renal tubules, and through them into the lumen of the duct. The absence of the usual flow of water has left the granules stranded at the place where they entered the renal system of tubes. No trace of the substance was found by the original ob- server, Heidenhain, in the glomeruli or capsules; but it may be stated that later experimenters have succeeded, by injecting the drug freely and pursuing it over longer inter- vals, in tracing it into the glomerular cells also.

Sulphindigotate of soda is not a normal constituent of the urine ; but there is little doubt that what happens in the case of this body happens also in the case of some of the usual constituents. Thus, uric acid has been detected within the epithelium of the renal tubules; and by a com- paratively new and beautiful observation it is placed beyond doubt that urea also enters the secretion at the same cells rather than through the glomeruli. This proof was rendered practicable by the discovery that in the frog the kidney is supplied with blood from two separate and distinct sources. The renal artery supplies the glomeruli with blood, while the so-called renal portal vein, a branch from the femoral vein which runs along the outer border of the kidney, supplies the capillary network surrounding the uriniferous tubules. If the renal artery be tied and the blood-supply shut off from the glomeruli, sugar when introduced into the circulation is not excreted with urine, although it readily is when the vascular supply of the kid- ney is untouched. But in the same circumstances, when the action of the glomeruli is eliminated, urea is readily excreted. Urea and sugar are therefore removed from the blood by different organs; or at least the renal epithelium of the tubules can excrete urea, although it cannot excrete sugar. At the same time that urea is being excreted a copious flow of water is determined, which most presum- ably escapes at the point where the urea is excreted. This fact is significant when we remember that ligature of the renal artery usually stops the flow of water, and that sul- phindigotate of soda injected

into the circulation when the glomeruli are tied out of it may be traced into the same epithelium, but gives rise to no flow into the bladder.

The renal epithelium, then, has the power of attracting to itself and removing from the blood certain elements which the latter already contains. It may now be asked whether the kidney has the power of elaborating any of

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the components of its excretion from antecedent forms | '5 fatty acids (formic, acetic, butyric, &c., but not lactic),

which it obtains from the blood. In other words, is the kidney a simple separating or straining mechanism, or are the constituents of the urine, like the constituents of bile or saliva, elaborated in the course of metabolic changes going on within the secreting epithelium ?

This question has already been touched in discussing the metabolism of liver-cells. There is little doubt that the kidney exhibits some metabolic activity. Inasmuch as the blood of herbivorous animals contains no trace of hippuric acid, this must presumably be formed within the kidney. If blood containing sodium benzoate and glyco- cin be passed through the vessels of a fresh kidney, hippuric acid arises. The kidney, therefore, must be assumed to be capable of elaborating hippuric acid out of simpler antecedent forms. But it is not certain that it has any further power. With regard to urea, it appears cer- tain that the activity of the kidney is confined to strain- ing it off from the blood. Normal blood contains about 1 part of urea in 4000, while the blood of the renal vein contains less than this. Urea, therefore, is separated from the blood in the kidney. If the kidneys be extirpated, or if their blood-vessels be ligatured so as to exclude them from the circulation, or if the ureters be tied (the effect of which is speedily to unfit the kidney-epithelium for the work of excretion), then the amount of urea increases in the blood up to 1 part in 300 or 400, while much urea is voided in the fluids ejected from the stomach and intestines during such experiments. Similar experiments in birds have led to similar results in the case of uric acid. All these facts point to the conclusion that urea and the allied bodies in urine

are derived proximately from the blood rather than elaborated in the kidney itself. We are there- fore justified in regarding the kidneys as almost exclusively an apparatus for purifying the blood from the injurious pro- ducts of the cell-metabolism of other organs and tissues.

Excretions of the Sweat-Glands.—The second great ex- cretory system is that of the skin, which supplements in important particulars the excretory functions of the kidneys. This function of the skin is effected in great measure by certain glands, called sweat-glands, opening on the sur- face of the skin. There are, indeed, other glands besides the sweat-glands connected with the skin, viz., the sebaceous glands, which open chiefly into the sacs of hair-follicles and secrete an oily material which keeps the surface of the skin supple and water-tight. The sebaceous secretion resembles in its formation the secretion of milk. Inasmuch as it is not reabsorbed, it is a true excretion; but there is reason to believe that the material removed from the blood is elaborated out of complex fat-yielding molecules con- tained in the blood very much as the milk is secreted. We know very little either of the nature of the bodies ex- creted or of the processes of their formation. The chief excretory products of the skin are furnished by the sweat- glands, and constitute sweat. In addition, however, there is constantly being thrown off from the skin a certain quantity of carbonic acid.

Nature of Sweat.—It is impossible to collect sweat for analysis under perfectly normal conditions; either the body must be subjected to great heat to adduce a copious flow, or a part of the body must be enclosed in an air-tight bag of india-rubber. In both cases the conditions are abnormal. So far as can be ascertained, sweat is a colourless clear fluid of acid reaction and characteristic odour. The odour varies with the part of the skin from which the sweat is obtained. It consists of water con- taining 1°81 per cent. of solids. The solids are (1) sodium chloride and other inorganic salts, (2) urea and other nitrogenous bodies, (3) fats and cholesterin (which are not altogether due to contamination with sebaceous matter),

(5) a trace of pigment. In addition to these bodies the skin excretes a small amount of carbon dioxide. Although the excretion of the skin is small in amount (if we except the water), if the escape of it be prevented by

~~varnishing the skin death very quickly ensues. This is probably due to the retention of some poisonous substance, the nature and production of which are very little understood.~~

~~In concluding these remarks on excretory organs it may be pointed out that the lungs (looked at as excretory organs), the kidneys, and the skin are all engaged in the great task of ridding the system of its superfluous matters, and that each supplements the action of the others. The lungs are the great excretors of carbonic acid, which is the chief oxidation product of the body, though they share with the kidneys and skin the task of getting rid of water. The kidneys have thrown upon them the task of removing from the system nearly the whole of the nitrogenous waste products and the superabundant salts, besides being the greatest excretors of water. The skin, on the other hand, looked upon as an excretory organ, is second in import- ance to the kidneys as a remover of water, and comes next to the lungs in separating carbonic acid. The skin, it must be remembered, however, has many functions besides those of an excretory organ, for, besides being an organ of sense, it takes the chief part in regulating the temperature of the animal body.~~

~~V.—TRANSFORMATIONS OF ENERGY ASSOCIATED WITH THE EXCHANGE OF THE MATTERS OF THE Bopy.~~

~~The chemical changes which occur in all the tissues and organs of the body are, it has been stated, in the main, processes of oxidation, in which energy that was potential in the organic compounds and the oxygen that takes part in them become in great part kinetic. This energy takes the form of mechanical work and heat; the mechanical work is in part expended within the body itself and ultimately takes the form of heat; in part, however, it is expended upon the objects of the external world, and, though even then ultimately transformed into heat, this is not heat which is available for the purposes of the body. There can be no doubt, however, that a large portion of the total heat evolved in the body is the immediate result of chemical operations, and has not in the first instance taken the form of mechanical work.~~

~~In the article Dietetics (¢.v.) attention has been drawn to the amount of energy which is stored up in the organic matters constituting the food of~~

animals, and which can approximately be estimated by determining the amount of heat which the organic matters evolve when burned in a calorimeter. An approximate estimate is thus formed of the energy which is at the disposal of the animal or man whose diet is subjected to study. Thus it has been calculated that the available energy derived from the oxida- tion of the organic matters of the food of a well-fed man amounts to about 2,700,000 units of heat, the unit chosen being the amount required to heat 1 gramme of water 1° C. When the man is doing no external work this energy is dis- sipated from the body almost entirely as heat, and, accord- ing to the calculations of Helmholtz, the losses of heat are approximately distributed as follows :—

(ihe ae Percentage of

Employed in raising the temperature of Heat, total Heat rabies nent into the Ellneiinty pease GAUTIE) Wr onenscbenernareetee acter cae ereeeet 70,157 2°6

Employed in warming inspired air…… 70,032 2°6

Employed in bringing about the vaporiza- tion of water in the lungs…… 397,536 147

Lost by radiation, conduction, and evapora- tion from Thepekatisens sieves: sektec ss cee 2,162,275 80°1

2,700,000 100-0

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The total income and expenditure of energy of an average man in twenty-four hours is thus calculated to correspond to the amount of heat required to raise 595 tbs of water from the temperature of melting ice to that of boiling water.

Where, it will be asked, does this transformation of energy chiefly have its seat? The answer to this question is that it is firstly in the muscles, then in the glands of the body. At all times, whether in rest or activity, heat is

~~*evolved, but the quantity increases in the case both of glands and of muscles as they pass from the former into the latter condition. In the resting body, it has been remarked, the losses of energy are represented by the loss of heat, for the mechanical work done within it takes the form of heat within the body itself. It is difficult, nay, impossible, to calculate the amount of energy which in the first instance takes the form of mechanical work in the body, and which is always transformed into heat. The case of the heart is one in which, however, an approximate calculation can be made. Upon fairly reliable data it has been calculated that the work expended by the heart of a man in twenty- four hours amounts to not less than 627,768 foot-pounds, an amount of work which is equivalent to nearly 45 pound- units of heat, and which represents the energy evolved as heat in the complete combustion of about 386 grains of carbon.*~~

~~*These calculations enable one to form some idea of the magnitude of the nutritive processes which have their seat in the muscular substance of the heart; and to a less degree the same is the case with all the other muscles which are engaged in so-called opus vitale, that is, in the performance of internal work absolutely essential to the continuance of the life of the organism.*~~

~~*The proportion of the total energy of the body which takes the form of mechanical work varies within very wide limits. Assuming that the conversion of potential into kinetic energy in equal times were a constant quantity, it would follow that all external work done diminished the amount of heat set free from the body. To a certain extent it is probable that such a relation exists. It is, however, to be remembered that when external work has to be done there is invariably an increased consumption of organic constituents of food, and therefore an increased store of available energy. The working animal consumes more O and produces more CO, than the resting animal. Different animals, like steam-engines of different construction, vary in the proportion borne by the external work they are capable of performing to the total energy which becomes kinetic. Experiments made with the separate muscles of animals, no less than observations on the relation between the external mechanical work done by and the total heat evolved in the body of animals, have, however, shown that animals are more economical machines than the most perfect steam-*~~

engines. Whilst the latter cannot convert more than one-eighth of their available energy into work, the animal may yield as much as one-fifth of its energy in the form of available external work.

VI.—Growtn, DEcay, anD DEATH.

In the adult body in a state of health the income of matter balances as nearly as possible the expenditure, and therefore the weight of the body and its dimensions remain nearly constant, and the same is approximately true of the different organs and tissues which compose the body, as well as of the anatomical elements which enter into their formation. Even when the conditions to which the organ- ism is subjected undergo great variations—as, for instance, when from a state of rest it passes into a state of great activity, or when the temperature of the medium which it inhabits undergoes great changes—and when, to meet

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these variations in external circumstances, the rate of the exchanges of matter has to undergo great fluctuations, the weight of the body remains nearly constant. his remarkable result is one which doubtless depends upon a great many factors which are for the most part hidden from us.

In the growing body matters are, however, very different ; in it normally the income must be always so much in excess of the expenditure that an accumulation of capital may occur, and that the body may increase in weight and in dimensions. The growing body is always the seat of a more active exchange of matter than the fully-developed body, ze. weight for weight, it requires more food and oxidizes it more rapidly.

The increase of weight and of dimensions occurs in part by addition of matter to, and increase in weight and in dimensions of, individual organs and their constituent anatomical elements; in part, however, it is due to an actual multiplication of anatomical elements occurring at a rate which greatly exceeds that which occurs in the adult body. To what an extent this multiplication occurs and how it gradually diminishes is evident when we

reflect that the whole organism was originally derived from a single cell, the ovum.

Upon what depends this tendency to multiplication of anatomical elements, and this tendency to increase in size of individual anatomical elements or of organs, until a certain approximate limit has been attained, is absolutely unknown. We know to a certain extent that the process of growth depends upon and is influenced by certain cir- cumstances, as amount of food, temperature, blood-supply to the particular organ, and so on, but yet the knowledge is wanting which would tell us why, when a certain limit has been attained, the processes of income and expendi- ture balance and growth ceases.

That the nervous system has a great influence upon nutrition and therefore upon growth is certainly known, and in great measure explicable. By its control over the blood-supply to organs and tissues the nervous system exerts a remarkable influence, as well as by its relations more or less direct upon the anatomical elements through nerve-fibres, which, inasmuch as they appear to influence in a direct manner the nutrition of anatomical elements, have been surmised to exist, and have received the name of "trophic fibres." Yet, even apart from the influence exerted by the nervous system, it appears to be a property of individual anatomical elements that, consistently with health, they shall only develop at a certain rate and attain a certain maguitude,

Scarcely less mysterious than the primary causes of growth is the fact that every organism having arrived at maturity remains in a state of apparent structural and functional integrity for a term which possesses an approxi- mately constant mean value for each species, and then sooner or later necessarily passes into a condition of gradually lessening efficiency, which ultimately terminates in death, Were the animal organism a machine undergoing a constant though very slow process of waste, its decay and ultimately its death would be more obvious than they actually are. The organism, however, differs from the machine in that its matter is continually the seat of change, and that during long periods (i.e., during healthy adult life) the processes of gain and loss of matter appear to be going on with perfect evenness and equality. Why, then, the ultimate deteriora- tion

resulting in waste and then in death? The answer is that the organ as a whole unquestionably does suffer by work, and, though at first the degree of impairment is so slow as to be imperceptible, it doubtless is a continuous process.

A general impairment of the mechanism of the body as

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it passes from the age of mature or adult life into old age is evidenced (1) by a diminished rate in the exchange of matter of the body ; (2) by a diminished power manifested by the organism as a whole, as well as by each of its individual organs, to accomplish work ; (3) by a general loss of weight of the body and of its essential tissues and organs, though the weight of the body as a whole may increase by the development and storage of fat ; (4) by a tendency to structural change of organs or parts of organs whose proper function is essential to life, as, for example, of the circulatory, respiratory, and nervous apparatuses ; (5) by a readiness to be injuriously affected by external circumstances, which at an earlier period produce no ob- vious effect upon the body or only temporary impairment of its functions. The gradual and general deterioration of the organism thus evidenced is usually interrupted by the supervention of some process impairing so greatly the functions of a vital organ that the organ ism as a whole

ceases to perform the functions which characterize it as |-

living, and death results. Whatever the remote cause of death, the proximate cause is in every case an arrest of the circulation of the blood, putting an end to the exchanges of matter and energy which are the most characteristic of the accompaniments of life. (A. G.*)

NUTTALL, THomas (1786-1859), botanist and orni- thologist in the United States of America, where he lived and worked from 1808 until 1842, was born at Settle in Yorkshire in 1786, and spent some years as a journeyman printer in England. Soon after going to the United States he was induced by Professor Barton to apply himself to the study of the plants of that region; and in pursuance of his investigations he undertook many long and arduous

~~as well as dangerous journeys, usually spending the summers in the field and the winters in working out the materials accumulated during his expeditions, In 1822 he was appointed curator of the botanic gardens of Harvard university, but continued his explorations, and in 1834 crossed the continent to the Pacific Ocean, and visited the Sandwich Islands. Some property having been left him in England on condition of his residing on it during part of each year, he left America in 1842, and did not again revisit it, except for a short time in 1852. He died at St Helen's, Lancashire, 10th September 1859.~~

~~Almost the whole of his scientific work was done in the States, and his published works appeared there. The more important of these are, The Genera of North American Plants, and a Catalogue of the Species for the year 1817, 2 vols. (1818) ; Journal of Travels into the Arkansas Territory during the year 1819 (1821); The North American Sylva, 3 vols. (1842-1849) ; Manual of the Ornithology of the United States and of Canada (1834 and 1840) ; and numerous papers on similar subjects in the various American scientific periodicals.~~

~~NUX VOMICA, a poisonous drug, consisting of the seed of Strychnos Nux-Vomica, L., a tree indigenous to most parts of India, and found also in Burmah, Siam, Cochin China, and northern Australia. The tree, which belongs to the natural order Loganiacez, is of moderate size, with a short, thick, often crooked stem, and ovate entire leaves, marked with 5 or 6 or 7 veins radiating from the base of the leaf. The flowers are small, greenish-white, and tubular, and are arranged in terminal corymbs. The fruit is of the size of a small orange, and has a thin hard shell, enclosing a bitter, gelatinous, white pulp, in which from 1 to 5 seeds are vertically embedded. The seed is disk-shaped, rather less than 1 inch in diameter, and about 4 inch in thickness, slightly depressed towards the centre, and in some varieties furnished with an acute keel-like ridge at the margin. This is particularly the case with the seeds imported from Bombay and collected in that province. Those imported from Madras and Cochin China have usually a rounded margin (Pharm. Journ. [3], xii. p.~~

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1053). The acute margin is considered in commerce indi- cative of superior quality, seeds so characterized yielding the largest quantity of the active principles. The external surface of the seed is of a greyish-green colour and satiny appearance, due to a coating of appressed silky hairs. The interior of the seed consists chiefly of horny albumen, which is easily divided along its outer edge into two halves by a

Flowers, Fruit, and Seed of Nux Vomica.

fissure, in which lies the embryo. The latter is about three-tenths of an inch long, having a pair of heart-shaped membranous cotyledons,

The drug owes its poisonous property chiefly to the alkaloids strychnia and brucia, the mixed alkaloids found in the seed being in the proportion of about 1 per cent. of the former to 2 per cent. of the latter. These alkaloids occur in the seeds in combination with a probably complex body which has been named strychnic or igasuric acid. Brucia is distinguished from strychnia by giving a red colour when moistened with strong nitric acid, and by being soluble in 150 parts of boiling water, while strychnia requires 2500 parts for its solution. It is remarkable that although the pulp contains strychnia it is not poisonous to birds, being eaten by the hornbill, Buceros malabaricus, and other species. Parasitic plants of the natural order Loranthacee, when growing on Strychnos Nux-Vomica, acquire the poisonous properties of the latter.

Nux Vomica seeds are imported into Great Britain from Bombay, Madras, and Cochin China to the average extent of about 200 tons per annum, valued at £1600.

NYANZA. For Albert Nyanza and Victoria Nyanza, see NILE, supr. pp. 504, 505.

NYASSA, Laker. See ZAmBzst.

NYBORG, a town and seaport of Denmark on the east side of the island of Fiinen, 28} miles by rail east of Odense, and the point from which the steam-packets cross the Great Belt to Korsér in Zealand. The fortress, built by Christian IV. and Frederick III, was dismantled in 1869, and the ruins of

the castle are now used as a prison. From 4812 in 1870 the population increased to 5402 by 1880.

As early as the 12th century the town was founded and a castle erected on Knudshoved (Canute's Head) by Knud, nephew of Walde- mar the Great ; and from the 18th to the 15th century Nyborg was one of the most important places in Denmark, a seat of the royal eourt, and a frequent meeting-place of the estates. In 1531 the

people of Liibeek took the town by storm. In 1658 it surrendered to the Swedes ; but Peter Bredal, icebound in the harbour, held

them at bay till he was able to make his escape. By the defeat of the Swedes under the walls of the fortress in 1659 the country was freed from their dominion. In 1808 the marquis La Romana, who with a body of Spanish troops garrisoned the fortress for France, revolted from his allegiance and held out till he and a portion of his men got off with the English fleet.

NYIREGYHAZA, a town of Hungary, in the district of Szaboles, is situated at the junction of the river Theiss and the railways of the north-east of Hungary, 30 miles to the north of Debreczin. It contains four churches, a gymnasium, and a mineral bath. The inhabitants of the town, who numbered 24,102 in 1880, are engaged in agriculture, wine-growing, and the manufacture of soda, matches, and saltpetre. The annual fairs are largely fre- quented. A little to the north-west is the famous wine- producing district of Tokay, which yields about 18 million gallons of wine annually, including 3 or 4 million gallons of genuine Tokay.

NYKOPING, a city of Sweden, the chief town of the province of Nyképing (Sédermanland), is situated on both banks of a stream which unites Lakes Yngaren, Tisaren, &c., with By Fjord, and so with the Baltic. Connected by a branch line with the railway from Stockholm to the Norwegian frontier, it lies about 100 miles by rail south- west of Stockholm. The ruins of its once famous castle, the governor's residence, the churches of St Nicholas and All Saints, the town-house (1662), and the hospital are the more noteworthy buildings. The population was 4825 in 1862, 4813 in 1880.

Nyképing (7.¢, New-Market, Latinized as Nicopia) begins to ap- pear as a regular town with churches and monasteries early in the 13th century. Its castle was the seat of the kings of Soderman- land, and after those of Stockholm and Calmar was the strongest in Sweden. The death of Waldemar in 1298, the starving to death of Dukes Waldemar and Eric in 1318, the marriage and the deaths both of Charles IX. and his consort Christina of Holstein, the birth of their daughter Princess Catherine, and in 1622 the birth of her son Charles X. are the main incidents of which it was the scene. Burned down in 1665 and again damaged by fire in 1719, it still remained the seat of the provincial authorities till 1760. The town was burned by Albert of Mecklenburg's party in ed an accidental conflagration in 1665, and by the Russians in '

NYLGHAU, or Ni-@at, one of the largest of the antelopes, a handsome and graceful animal, with short, straight, erect horns, pointed and turned slightly forwards at the tips, and present in the male only (see Plate IL, vol. ii.). It has a short erect mane, and the male has also a tuft of hair upon the throat. When adult the sexes are very different in colour, the male being generally of a dark iron-grey or slate colour, approaching black on the head and legs, while the female and young are of a bright light- brown or fawn colour. In both male and female at all ages the lips, chin, and under-parts as well as two trans- verse stripes on the inner sides of the ears and rings on the fetlocks are white, and the mane and tip of the tail black. The horns are black, and from 8 to 9 inches long. The male stands about 4 feet 4 inches high at the shoulder, the female is smaller. The tail is 18 to 21 inches in length.

The nylghau is one of the few true antelopes occurring in India, and is peculiar to that country, being found from near the foot of the HImalayas to the south of Mysore, though rare to the north of the Ganges and also in the extreme south. It is most abundant in central India, and does not occur in Assam or the countries to the east of the Bay of Bengal. It frequents forests and low jungles, though often found in tolerably open plains, associating in small herds. One, or very often two, young are pro- duced at a birth, and when caught early they are readily tamed. They are often kept in captivity in the mena- geries of the native princes, and also in Europe, but the temper of the old males is uncertain. When fighting

they drop on their knees, and then, advancing in this position until within convenient distance, make a sudden spring, butting with their horns with great force.

The first description of this animal, accompanied by a rude figure, was given by Dr Parsons in a paper entitled " An Account of a Quadruped brought from Bengal, and now to be seen in London," published in the Philosophical Transactions for 1745. No name was assigned to it, but the author identified it with an animal called '"' Biggel," seen in the stables of the viceroy of Goa by John Albert de Mandelsloe in his voyage through the Indies in 1638. In 1767 and the following years several living specimens were sent to England, from which Dr William Hunter drew up an excellent account of the characters of the male, female, and young, and of their habits in captivity, which, with a very spirited figure by Stubbs (often since copied), was published in the Philosophical Trans- actions for 1770. Dr Hunter was apparently unaware of Parsons's paper, and gives the animal the native name of "Nyl-ghan," signifying in Persian "blue bull." On Parsons's description Pallas founded his Antilope tragocamclus (Spicilegia Zoologica, i. p. 9, 1767), which was therefore its earliest specific name, though others have been used in later times, especially 4. picta, given by Pallas (Spicilegia, xii. p. 14, 1777) to the animal described by Hunter under the supposition that it was a different species. It has also had several generic names, Boselaphus, Damalis, Portax, &c., the first-named being the one to which preference is now usually given.

NYMPH. The belief that the nature which surrounds mankind—the woods, the springs, the hills—is full of a life resembling, yet different from, human life is universal in a primitive stage of thought. At Psophis in Arcadia a row of tall cypress trees was called ai rdpOevor, the damsels. In other places the name xépar was used, but the general term for the spirits who dwell in external nature was vipdar, All three words have the same meaning. There is a close relation between the souls of dead men and the life of nature; the Nymphs often play the part of death and carry away human beings to dwell with them. This idea appears in a slightly different form when heroes and favoured mortals live in communion with them. The connexion of a human being with a Nymph has something unnatural about it, and almost always brings some disaster on the mortal. Yet another form of the idea appears in

the word vupddAnrros ; he whose mind the Nymphs take possession of loses his human wit and becomes mad, but has wisdom more than human. The worship of the Nymphs was practised throughout the classical period in places where they seemed to have chosen a home for themselves, in shady groves and beside springs of clear water. It retained its primitive simplicity. No temple, no statue, no priest was needed; the offer- ings of a rural people were placed on the simple altar. The cultus is therefore not often mentioned in literature ; but it appears to have been closely connected with the household life of the people, and to have had a strong hold on them. Among the ceremonies of marriage an acknowledgment of the power of the Nymphs was in- cluded. The bride, herself a viudy, was sprinkled with water from the fresh spring of the Nymphs, or she went to bathe in the spring.

The Nymphs, the ever-youthful spirits of nature, pro- tected and nourished children (xovporpd¢dot) ; they were themselves often, especially in Asia Minor, the mothers of the heroes of the land. In the Troad, Hermes and the Sileni sport with them in the mountain caves. Their life was long, according to Hesiod 9720 times that of man; it was a common belief that they were born and died along with the trees of the forest. It was usual to distinguish Nymphs of the rivers and fountains, Naiads, from those of the forests and mountains, Dryads, Hama- dryads, Oreades; but they were all Kotpar Avds, the maidens of heaven, or, in more anthropomorphic language, the daughters of Zeus. The worship of the Nymphs became more fashionable in later time, and shrines of Nymphs (vvpdaia) were built even in cities.

O

The history of the symbol O is parallel to that of . E. Each represents several sounds which are dis- tinguished habitually in speech without any difficulty, but for which, owing to the imperfection of the English alpha- bet, there are no separate symbols. Probably the confusion is worst in English ; but French and Italian also have more sounds for each of these symbols than can be properly included under them, and so they distinguish these some- times by diacritical marks, as 0 or 6, and sometimes they do not distinguish at all.

The different sounds which O is used to denote in English lie, with one exception, on the line between the pure a-sound and the pure u-sound. We have already seen that e denotes several different sounds on the other line—that between pure a and pure 7%. The difference be- tween the sounds on these two lines is this. In the a—7 line only the tongue is employed ; it is raised more and more for each successive sound. But in the a—wz line the tongue is not the only agent; the cavity of the mouth is also contracted, so that the passage is narrowed, and the lip-aperture is lessened more and more for each sound ; in technical phrase the lips are "rounded," so that for the aperture is the smallest possible to allow of the utter- ance of a true vowel, hence the great ease with which the u-sound passes into a w, in which there is friction caused by the still greater closing of the lips, and therefore we have a consonant not a vowel sound.

The following different sounds—-denoted by O in English—are readily discriminated. Beginning from the a-end of the line, we come first to the sounds heard in "not" and in "lord"; for both of these the back of the tongue is much depressed and the lips are only slightly rounded. 'The difference between the two sounds consists in this—for the first the back of the tongue is more con- vex than for the second ; the passage is therefore some- what narrowed, and the two corresponding sounds are therefore (here and in all the other similar pairs) known technically as "narrow" and "wide," or as "open" and "close." The narrow sound is written by o in English when 7 or / follows, and the wide is written aw as in "law," or au as in " Paul," or even a as in "pall." The next pair may be exemplified by "pole" and "pour," narrow and wide respectively ; for these the tongue is higher and the rounding greater. Here again several digraphs represent the same sound, as in " foal," '" soul," "hoe," "grow." Next the doubled o is generally used to represent the last sound in the scale, the close w, for which the. tongue is highest and the "rounding" greatest, as in "pool"; but in "rule" and others the same symbol is used for this sound as would be used in other European languages. Lastly—the exception mentioned above—o is one of the symbols employed to denote the neutral vowel, as in "son," as well as w in "sun" and a in " final."

The modified German o—written 6 or oe—is a sound unknown in English. It is produced by putting the tongue into the position for the sound denoted

by a in "fate" or ein "'féte ""—a middle sound in the line between aand t —and then by rounding the lips. It thus com- bines the specialities of the two scales of vowel-sound—the 2-scale and the w-scale.

In Italian there are an "open" o (marked 6) and a "close" o (marked 6). The "open" o corresponds to the open or wide sound described above. The "close" o is not quite the same as the "narrow" o of English, but comes a little nearer to wu.

?

In the form of the symbol there is no recorded variation, except that in old Latin it was sometimes square, as ©. In Greek two symbols were employed —O and Q2—for short and long o respectively. But it is not improbable that the second of these denoted at first not merely long 0 but a more open sound, more near to the sound of "law" in English,

OAJACA, or Oaxaca, the chief town of the province of the same name in Mexico, lies 1600 feet above the sea in a beautiful valley on the left bank of the Atoyac, or Rio Verde, which reaches the Pacific after a course of about 170 miles. The city is surrounded by luxuriant gardens, orchards, and cochineal plantations; its streets are wide and regular, and among its public buildings are the cathedral, the bishop's palace (fashioned after the type of a similar ancient edifice at Mitla), and the Dominican monastery and church. Chocolate, cigars, cotton-cloth, wax candles, &c., are manufactured. The population was 26,228 in 1877. The city, which dates from 1522, was visited by a severe earthquake in 1870.

OAK (Anglo-Saxon, de or ec), a word found, vari- ously modified, in all Germanic languages, and applied to plants of the genus Quercus, a well-marked section of the natural order Corylacex (Cupulifere of De Candolle), in- cluding some of the most important timber trees of the north temperate zone. All the species are arborescent or shrubby, varying in size from the most stately of forest trees to the dwarfish bush. Monecious, and bearing their male flowers in catkins, they-are readily distinguished from the rest of the Cupuliferous family by their peculiar fruit, an acorn or nut, enclosed at the base in a woody cup, formed by the consolidation of numerous involucral bracts developed beneath the fertile flower, simultaneously with

~~a cup-like expansion of the thalamus, to which the bracteal scales are more or less adherent. The ovary, three-celled at first, but becoming one-celled and one-seeded by abortion, is closely invested by the perianth, toothed on~~

~~Fic. 1.—Inflorescence of Oak. a, b, ¢, Quercus Robur. (From Behrens, Allge- meine Botanik, pp. 209, 210.) d, e, Q. sessiliflora (Smith); half natural size. (From Kotschy, Die Hichen Europa's, Vienna, 1862, plate xxxii.)~~

~~the margin, and adherent below; the male flowers are in~~

~~small clusters on the usually slender and pendent stalk,~~

~~forming an interrupted catkin ; the stamens vary from six to twelve. The alternate leaves are more or less deeply sinuated or cut in most of the species, but in some of the deciduous and many of the evergreen kinds are nearly or quite entire on the margin. The oaks are widely distri- buted over the temperate parts of Europe, Asia, North~~

~~Africa, and North America. In the western hemisphere~~

~~they range along the Mexican highlands and the Andes far~~

~~into the tropics, while in the Old World the genus, well XVII.—87~~

~~represented in the Himalayas and the hills of China, exists likewise in the peninsula of Malacca, in Java, and in some other islands of the archipelago, several species occur- ring in the Moluccas and Borneo. On the mountains of Europe and North America they grow only at moderate elevations, and none approach the arctic circle. The mul- titude of species and the many intermediate forms render their exact limitation difficult, but those presenting suffi- ciently marked characters to justify specific rank probably approach 300 in number.~~

~~The well-known Q. Robur, one of the most valued of the genus, and the most celebrated in history and myth, may be taken as a type of the oaks with~~

sinuated leaves. Though known in England, where it is the only indigenous species, as the British oak, it is a native of most of the milder parts of Europe, extending from the shores of the Atlantic to the Ural; its most northern limit is attained in Norway, where it is found wild up to lat. 63°, and near the Lindesnees forms woods of some extent, the trees occa- sionally acquiring a considerable size. In western Russia it flourishes in lat. 60°, but on the slope of the Ural the 56th parallel is about its utmost range. Its northern limit

nearly coincides with that of successful wheat cultivation.

Southwards it extends to Sardinia, Sicily, and the Morea. In Asia it is found on the Caucasus, but does not pass the Ural ridge into Siberia, In Britain and in most of its Con- tinental habitats two varieties exist, regarded by many as distinct species: one, Q. pedunculata, has the acorns, gen- erally two or more together, on long stalks, and the leaves nearly sessile; while in the other, Q. sessiijlora, the fruit is without or with a very short peduncle, and the leaves are furnished with well-developed petioles. But, though the extreme forms of these varieties are very dissimilar, in- numerable modifications are found between them; hence it is more convenient to regard them as at most sub-species of Q. Robur. The British oak is one of the largest trees of the genus, though old specimens are often more remark- able for the great size of the trunk and main boughs than for very lofty growth. The spreading branches have a tend- ency to assume a tortuous form, owing to the central shoots becoming abortive, and the growth thus being continued laterally, causing a zigzag development, more exaggerated in old trees and those standing in exposed situations ; to this peculiarity the picturesque aspect of ancient oaks is

Fic. 2.—Q. pedunculata ; halfnatural size. (From Kotschy, op. cit., plate XxVii.)

largely due. When standing in dense woods the trees are rather straight and formal in early growth, especially the sessile-fruited kinds, and the gnarled character tradi- tionally assigned to the oak applies chiefly to its advanced age. The broad deeply-sinuated leaves with blunt rounded

lobes are of a peculiar yellowish colour when the buds unfold in May, but assume a more decided green towards midsummer, and eventually become rather dark in tint; they do not change to their brown autumnal hue until late in October, and on brushwood and saplings the withered foliage is often retained until the spring. The catkins appear soon after the young leaves, usually in England towards the end of May ; the acorns, oblong in form, are in shallow cups with short, scarcely projecting scales ; the fruit is shed the first autumn, often before the foliage changes. Vast oak forests still covered the greater part of Eng- land and central Europe in the earlier historic period ; and, though they have been gradually cleared in the pro- gress of cultivation, oak is yet the prevailing tree in most of the woods of France, Germany, and southern Russia, while in England the coppices and the few fragments of natural forest yet left are mainly composed of this species. The pedunculated variety is most abundant in the southern and midland counties, the sessile-fruited kinds in the northern parts and in Wales, especially in upland districts; the straighter growth and abundant acorns of this sub- species have led to its extensive introduction into planta- tions. The name of "durmast" oak, originally given to a dark-fruited variety of Q. sessiliflora in the New Forest, has been adopted by foresters as a general term for this kind of oak; it seems to be the most prevalent form in Germany and in the south of Europe. A variety of the sessile oak with sweet acorns appears to be the Q. Hsculus of some writers. Many of the ancient oaks that reniain in England may date from Saxon times, and some perhaps from an earlier period ; the growth of trees after the trunk has become hollow is extremely slow, and the age of such venerable giants only matter of vague surmise. The cele- brated Newland oak in Gloucestershire, known for cen- turies as "the great oak," was by the latest measurement 474 feet in girth at 5 feet from the ground. The Cow- thorpe oak, standing (a ruin) near Wetherby in Yorkshire, at the same height measures 38} feet, and seems to have been of no smaller dimensions when described by Evelyn two centuries ago; like most of the giant oaks of Britain, it is of the pedunculate variety.. The preservation of these old trees has been in past times largely due to the survival of the reverence in which the oak was held by Celt and Saxon,—a feeling which seems to have been shared by several Aryan races. The great regard paid to the oak probably originated in the value attached to its timber and fruit; the largest and most durable of European trees, its wood was looked upon as the most precious produce of the forest. With both

Greek and Roman it was the favourite timber for house, bridge, and ship building; and the furrowed columns with spreading base that upheld their stone-built temples of historic age seem to indicate the oak-trunk as their archaic prototype. The tree was not in less esteem among the Teutonic nations; the long ships of the Northmen were hewn from the same "heart of oak" of which the war-ships of England were until lately con- structed. The Anglo-Saxons employed oak timber not only for their dwellings and their fleets but occasionally for more sacred architecture,—the church till recently standing at Greenstead in Essex, and supposed to have been erected in the 10th century, was wholly formed of oak trunks roughly squared. The few ancient timber mansions still existing in England are generally built entirely of oak, which in many cases remains sound after the lapse of several hundred years, sometimes outlasting the brick and stone with which the structures have been repaired. The great oak woods that in early days covered the larger part of Britain had in Tudor times become so reduced that an Act was passed in the reign of Henry VIII. to enforce their preservation, and by the end of the 16th century oak plant-

ing became common. At present large quantities of timber are still obtained from hedgerows and copsewoods ; but, although some attempts have been made to renew the royal forests, much of the oak timber employed in Britain is im- ported from abroad. Many of the Continental woods are failing to produce their former supply ; the large quantity still obtained from the port of Memel, and formerly drawn from Prussia and nearer Poland, is now brought thither from the distant forests of the Dnieper and the Don.

The wood of the British oak, when grown in perfection, is the most valuable produced in temperate climates, The heart-wood varies in colour from dark brown to pale yellowish-brown ; hard, close-grained, and little liable to split accidentally, it is, for a hard wood, easy to work. Under water it excels most woods in durability, and none stand better alternate exposure to drought and moisture, while under cover it is nearly indestructible as long as dry-rot is prevented by free admission of air. Its weight varies from 48 to about 55 Ib the cubic foot, but in very hard slowly-grown trunks sometimes

approaches 60 tb. The sap-wood is lighter and much more perishable, but is of value for many purposes of rural economy. 'The relative

»/ BS. DM, % y < if Wy \

Fia, 3.—Q. sessiliflora ; half natural size, (From Kotschy, op. cit., plate xxxii.)

qualities of the two varieties have been the frequent sub- ject of debate, the balance of practical testimony seeming to establish the superiority of Q. pedunculata as far as durability in water is concerned ; but when grown under favourable circumstances the sessile oak is certainly equally lasting if kept dry. The wood of the durmast oak is commonly heavier and of a darker colour, hence the other is sometimes called by woodmen the white oak, and in France is known as the "chéne'blanc." The oak of Britain is still in great demand for the construction of merchant shipping, though teak has become in some measure its substitute, and foreign oak of various quality and origin largely takes its place. Its great abundance of curved trunks and boughs rendered the oak peculiarly valuable to the shipwright when the process of bending timber artificially was less understood ; the curved pieces are still useful for knees. The younger oaks are employed by the carpenter, wheelwright, waggon-builder, and for innumerable purposes by the country artisan. The most durable of fences are those formed of small oaks, split lengthwise by the wedge into thin boards. The finely- grained heart-wood is sought by the cabinetmaker for the manufacture of furniture, and high prices are often given for the gnarled and knotted portions of slowly-grown trees, to be sawn into veneers. Oak was formerly largely used by wood-carvers, and is still in some demand for those artists, being harder and more durable than lime and other woods that yield more readily to the sculptor's tool. Oak

was thus applied at a very early date; the shrine of Edward the Confessor, still existing in the abbey at West- minster, sound after the lapse of 800 years, 1s of dark- coloured oak-wood. The wood, of unknown age, found submerged in peat-bogs, and of a black hue, is largely used in decorative art under the name of " bog-oak."

The oak grows most luxuriantly on deep strong clays, calcareous marl, or stiff loam, but will flourish in nearly any deep well-drained soil, excepting peat or loose sand ; in marshy or moist places the tree may grow well for a time, but the timber, is rarely sound ; on hard rocky ground and exposed hillsides the growth is extremely slow and the trees small, but the wood is generally very hard and durable. The oak will not bear exposure to the full force of the sea gale, though in ravines and on sheltered slopes oak woods sometimes extend nearly to the shore. The cultivation of this tree in Europe forms one of the most important branches of the forester's art, It is frequently raised at once by sowing the acorns on the ground where the trees are required, the fruit being gathered in the autumn as soon as shed, and perfectly ripe seeds. selected ; but the risk of destruction by mice and other vermin is so great that transplanting from a nursery-bed is in most cases to be preferred. The acorns should be sown in November on well-prepared ground, and covered to a depth of 1} or 2 inches; the seeds germinate in the spring, and the seedlings are usually transplanted when one or two years old to nursery-beds, where they are allowed to grow from two to four years, till required for the plantation. Some authorities recommend the tap-roots to be cut in the second year, with the view of increasing the ball of fibre ; but, if the trees are removed from the seed- bed sufficiently early, the root is best left to its natural development. The oak requires shelter in the early stages of growth ; in England the Scotch pine is thought best for this purpose, though Norway spruce answers as well on suitable ground, and larch and other trees are sometimes substituted. The conifers are allowed to grow to a height of from 3 to 5 feet before the young oaks are planted, and are gradually thinned out as the latter increase in size. The distance between the oaks depends upon the growth intended before thinning the young wood ; usually they are placed from 8 to 12 feet apart, and the superabundant trees cut out as they begin to interfere with each other. The lower branches often require removal, to ensure the formation of a tall straight trunk, and this operation should be performed before the superfluous shoots get too large, or the timber will be injured ; but, as with all trees, un- necessary pruning should be avoided, as every branch removed lessens the vigour of growth. Where artificial copsewood is the object, hazel, hornbeam, and other bushes may be planted between the oaks ; but, when large timber is required, the trees are best without undergrowth.

~~The oak, after the trunk is felled, throws up shoots from the cut stump more surely and abundantly than most trees ; hence it is well adapted for the formation of brush- wood, of which great quantities are employed in Britain for the manufacture of crates and hoops, and for many other uses. Where the underwood consists mainly of oak it is generally cut once in twenty years, but in some places fifteen years are thought sufficient, while on poor land thirty years are sometimes allowed to intervene between the cuttings. Oak coppices are generally cut in the spring, because the bark is then more readily separated, and large timber trees are very often felled at the same period 3 but winter felling is probably best when sound heart-wood is the chief thing in view. The growth of the oak is slow, though it varies greatly in different trees; Loudon states that an oak, raised from the acorn in a garden at Sheffield Place, Sussex, became in seventy years 12 feet in circum-~~

~~ference; but the increase of the trunk is usually very much slower, and when grown for large timber oak can rarely be profitably felled till the first century of its growth is com- pleted. The tree will continue to form wood for 150 or 200 years before showing any symptoms of decay. As firewood oak holds a high position, though in Germany it is considered inferior to beech for that purpose. It makes excellent charcoal, especially for metallurgic pro- cesses; the Sussex iron, formerly regarded as the best produced in Britain, was smelted with oak charcoal from the great woods of the adjacent Weald, until they became so thinned that the precious fuel was no longer obtainable.~~

~~An important product of oak woods is the bark that from a remote period has been the chief tanning material of Europe. The most valuable kind is that obtained from young trees of twenty to thirty years' growth, but the trunks and boughs of timber trees also furnish a large supply ; it is separated from the tree most easily when the sap is rising in the spring. It is then carefully dried by the free action of the air, and when dry built into long narrow stacks until needed for use. The value of oak bark depends upon the amount of tannin contained in it, which . varies much, depending not only on the growth of the tree but on the care bestowed on the preparation of the bark itself, as it soon ferments and spoils by exposure to~~

wet, while too much sun-heat is injurious. That obtained from the sessile-fruited oak is richer in tannic acid than that yielded by Q. pedunculata, and the bark of trees growing in the open is more valuable than the produce of the dense forest or coppice. The bark of young oak branches has been employed in medicine from the days of Dioscorides, and is occasionally used in modern practice, chiefly as an astringent : in decoction it is given as a gargle for throat affections depending on relaxation, and is administered in dysenteric hemorrhages and some forms of diarrhœa ; it was regarded by the practitioners of a former age as useful in consumption, a disease from which tanners are said to be nearly exempt. Poultices made of the crushed or pow- dered bark have been used with advantage where astringent external applications are indicated ; as a tonic it has in modern medicine given place to other remedial agents. The astringent principle is a peculiar kind of tannic acid, called by chemists querct-tanmc, which, yielding more stable compounds with gelatine than other forms, gives oak bark its high value to the tanner. According to Neubauer, the bark of young oaks contains from 7 to 10 per cent. of this principle ; im old trees the proportion is much less.

The acorns of the oak possess a considerable economic importance as food for swine. In the Saxon period the 'mast " seems to have been regarded as the most valuable produce of an oak wood ; nor was its use always confined to the support of the herds, for in time of dearth acorns were boiled and eaten by the poor as a substitute for bread both in England and France, as the sweeter produce of Q. Esculus is still employed in southern Europe. Large herds of swine in all the great oak woods of Germany depend for their autumn maintenance on acorns; and in the remaining royal forests of England the inhabitants of the neighbouring villages yet claim their ancient right of "pannage," turning their hogs into the woods in October and November. Some trees of the sessile-fruited oak bear sweet acorns in Britain, and several varieties were valued by the ancient Italians for their edible fruit. A peculiar kind of sugar called quercite exists in all acorns. A bitter principle to which the name of quercin has been applied by Gerber, its discoverer, has also been detected in the acorn of the common oak; the nutritive portion seems chiefly a form of starch. A spirit has been distilled from acorns in process of germination, when the saccharine principle is most abundant.

oA IN

The British oak grows well in the northern and middle States of America; and, from the superiority of the wood to that of Q. alba and its more abundant production of acorns, it will probably be much planted as the natural forests are destroyed. The young trees require protection from storms and late frosts even more than in England ; the red pine of the north-eastern States, Pinus resinosa, answers well as a nurse, but the pitch pine and other species may be employed. In the southern parts of Australia and in New Zealand the tree seems to flourish as well as in its native home.

The oak in Europe is liable to injury from a great variety of insect enemies: the young wood is attacked by the larvee of the small stag-beetle and several other Coleoptera, and those of the wood-leopard moth, goat moth, and other Lepidoptera feed upon it occasionally ; the foliage is de- voured by innumerable larve ; indeed, it has been stated that half the plant-eating insects of England prey more or less upon the oak, and in some seasons it is difficult to find a leaf perfectly free from their depredations. The young shoots are chosen by many species of Cynipide and their allies as a receptacle for their eggs, giving rise to a variety of gall-like excrescences, from which few oak trees are quite free.

Of the European timber trees of the genus, the next in importance to the British oak is Q. Cerris, the Turkey oak of the nurserymen. This is a fine species, having when young straighter branches than Q. Robur, but in old age the boughs generally curve downwards, and the tree acquires a wide spreading head; the bark is dark brown, becoming grey and furrowed in large trees; the foliage varies much, but in the prevailing kinds the leaves are very deeply sinuated, with pointed, often irregular lobes, the footstalks short, and furnished at the base with long linear stipules that do not fall with the leaf, but remain attached to the bud till the following spring, giving a marked feature to the young shoots. The large sessile acorns are longer than those of Q. Robur, and are dark- brown when ripe ; the hemispherical cups are covered with long, narrow, almost bristly scales, giving them a mossy aspect; the fruit ripens the first autumn. The foliage in some of the numerous varieties is almost evergreen, and in Britain is retained long after the autumnal withering.

This oak abounds all over the Turkish peninsula, and forms a large portion of the vast forests that clothe the slopes of the Taurus ranges and the south shores of the Black Sea; it is likewise common in Italy and Sardinia, and occurs in the south of France and also in Hungary. It was introduced into England by Miller about 1735, and is now common in parks and plantations, where it seems to flourish in nearly all soils) The Turkey oak in southern England grows twice as fast as Q. Robur ; in the mild climate of Devonshire. and Cornwall it has reached a height of 100 feet and a diameter of 4 feet in eighty years, which is about the limit of its profitable growth for timber. The wood is hard, heavy, and of fine grain, quite equal to the best British oak for indoor use, but of very variable durability where exposed to weather. The ships of Greece and Turkey are largely built of it, but it has not always proved satisfactory in English dockyards. The heart-wood is dark in colour, takes a fine. polish, and from the prominence of the med- ullary rays is valuable to the furniture maker ; it weighs from 40 to 50 ib the cubic foot. The comparatively rapid growth of the tree is its great recommendation to the planter; it is best raised from acorns sown on the spot, as they are very bitter and little liable to the attacks of vermin; the tree sends down a long tap- root, which should be curtailed by cutting or early transplanting, if the young trees are to be removed. It seems peculiarly adapted for the mild moist climate of Ireland. It succeeds in many parts of the United States, but is less hardy than the native species. It would appear well fitted for New Zealand planting. Acorns are pro- duced on the Turkey oak in great abundance in some seasons, but in cold wet years do not always ripen in Britain ; notwithstanding their bitterness they are greedily eaten by swine. Some southern varieties of this tree bear acorns comparatively sweet, and they are sometimes eaten after being roasted, in which process the tannic acid is partly destroyed. Dalechamps says that some of the esculent acorns of southern Europe occasionally prove unwholesome, causing effects resembling those of poisoning by Loliwm temulentum.

~~In North America, where the species of oak are very numerous, the most important member of the group is Q. alba, the white oak, abounding all over the eastern districts of the continent from Lake Winnipeg and the St Lawrence countries to the shores of the Mexican Gulf. In aspect it more nearly resembles Q. Robur than any other species, forming a thick trunk with spreading base and, when~~

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~~growing in glades or other open places, huge spreading boughs, less twisted and gnarled than those of the English oak and covered with a whitish bark that givesa marked character to the trec. The leaves are large, often irregular in form, usually with a few deep lobes dilated at the end; they are of a bright light green on the upper surface, but whitish beneath; they turn to a vio- let tint in au- tumn. The egg — shaped acorns are placed singly ortwo together oushortstalks; they are in most years sparingly pro- duced, but are occasionally borne in some abundance. On rich loams and the alluvial soils of river- valleys, when~~

~~well drained, Fic. 4.—Q. alba pinnatifida; one-third natural size, (From the treeattains Michaux, Histoire des chénes de 1 Amérique.)~~

~~a large size, often rivalling the giant oaks of Europe ; trunks of 3 or 4 feet in diameter are frequently found, and sometimes these dimensions are greatly exceeded. The wood is variable in quality and, though hard in texture, is less durable than the best oak of British growth ; the heart-wood is of a light reddish brown varying to an olive tint ; a Canadian specimen weighs 523 tb the cubic foot. In the States it is largely used in shipbuilding, for house timber, and many other purposes ; wheels and the frames of waggons and sleighs as well as casks are often made of it; large quantities are exported to England from Canada. The young-wood is very strong, flexible, and elastic; it is split into thin strips, to be made into baskets. The large roots, often presenting a very fine grain and taking a good polish, are sought for by the cabinetmaker. The bark is inferior to that of many oaks, "The acorns are sweet, and were formerly eaten by the Red Men, but are too scantily produced in most seasons to be of much economic importance. White oaks have often been planted in England, but the trees do not grow as~~

~~fast as in their native land, while the wood is inferior. According to some American authorities, the timber of Q. alba is of better quality in the southern and middle States than in Canada and New England.~~

~~Q. obtusiloba, the post oak of the backwoodsman, a smaller tree with rough leaves and notched upper lobes, produces an abundance of acorns and good timber, said to be more durable than that of the white oak.~~

~~The pin oak, sometimes called the " over-cup " oak, Q. macrocarpa, is remarkable for its large acorns, the cups bordered on the edge by a fringe of long narrow scales ; the leaves are very large, some- times from 10 inches to a foot in length, with very deep lobes at the lower part, but dilated widely at the apex, and there notched. The tree is not of large growth, but its tough wood is useful for bolts and trenails ; it is sometimes called the "' burr-oak."~~

~~The true over-cup oak, Q. lyrata, is a large tree, chiefly found on swampy land in the southern States; the lyrate leaves are dilated at the end; the globose acorns are nearly covered by the tuberculated cups.~~

~~In the woods of Oregon, from the Columbia river southwards, an oak is found bearing some resemblance to the British oak in foliage and in its thick trunk and widely-spreading boughs, but the bark is white as in Q. alba; it is Q. Garryana, the western oak of Nuttall. This tree acquires large dimensions, the trunk being often from 4 to 6 feet in diameter; the wood appears to be good, but experience has scarcely tested its durability ; the acorns are produced in great quantity, and are used by the Indians as food.~~

~~The red oak, Q. rubra, has thin large leaves on long petioles, the lobes very long and acute, the points almost bristly ; they are pink when they first expand in spring, but become of a bright glossy green when full-grown ; in autumn they change to the deep purple- red which gives the tree its name. Common throughout the northern and middle States and Canada, the red oak attains a large size only on good soils ; the wood is of little value, being coarse and porous, but it is largely used for cask-staves; the bark is a valuable tanning material. ;~~

~~A species nearly allied is the scarlet oak, Q. coccinea, often~~

confounded with the red oak, but with larger leaves, with long lobes ending in several acute points; they change to a brilliant scarlet with the first October frosts, giving one of the most striking

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Fia. 5.—Q. rubra; one-fourth natural size, (From Michaux, op cit. plate xxv).

of the various glowing tints that render the American forests so beautiful in autumn. The trunk, though often of considerable size, yields but an indifferent wood, employed for similar purposes to that of Q. rubra ; the bark is one of the best tanning materials of the country. Both these oaks grow well in British plantations, where their bright autumn foliage, though seldom so decided in tint as in their native woods, gives them a certain picturesque value.

Nearly akin to these are several other forms of little but botanical interest ; not far removed is the black or dyer's oak, Q. tinctoria, a large and handsome species, with a trunk sometimes 4 feet in diameter, not uncommon in most forests east of the Mississippi, especially in somewhat upland districts. The leaves are frequently irregular in outline, the lobes rather short and blunt, widening towards the end, but with setaceous points; the acorns are nearly globular. The wood is coarsely grained, as in all the red-oak group, but harder and more durable than that of Q. rubra, and is often employed for building and for flour-barrels and cask-staves. The bark, very dark externally, is an excellent tanning substance ; the inner layers form the quercitron of commerce, used by dyers for communicating to fabrics various tints of yellow, and, with iron salts, yielding a series of brown and drab hues; the colouring property depends on a crystalline principle called quercitrin, of which it should contain about 8 per cent. The cut-leaved oaks are represented in eastern Asia by several species, of which Q. mongolica is widely spread over Dahouria, north China, and the adjacent countries; one of the Chinese silkworms is said to feed on the leaves, =.

The chestnut oaks of America represent a section distin- guished by the merely serrated leaves, with parallel veins running to the end of the serratures. @Q. Prinus, a beau- tiful tree of large growth, and its sub-

~~species Q. castanea and Q. montana, yield timber little inferior to white oak. Q. Chinquapin or prinoides, a dwarf variety, often only a foot in height, forms dense miniature thickets on the barren uplands of Kansas and Missouri, and affords abundant sweet acorns; the tree is called by the hunters of the plains the "shin-oak."~~

~~Evergreen oaks with entire leaves are represented in North America by Q. virens, the live oak of the southern States ; more or less abundant on the Atlantic coasts of Carolina and Florida, its true home is the country around the 4 Mexican Gulf, where it rarely grows more than 50 or 60 miles inland. The oval leaves are dark-green above, and whitish with stellate hairs beneath, the margin entire and slightly recurved. The live oak is one of the most valu- able timber trees of the genus, the wood —~~

~~being extremely durable, both exposed { to air and under water; heavy and a . ; close-grained, it is perhaps the best of spit er Nar bd the American oaks for shipbuilding, Kotschy, op. cit., plate x1.)~~

~~and is invaluable for water-wheels and mill-work. Live oaks grow but slowly, and few large trees are left in the settled districts ; but when standing in open places the trunk sometimes attains a great size, and an old tree, with its far-spreading boughs, often clothed with the beard-like "Spanish moss," has a peculiarly~~

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~~venerable aspect. One growing at Grove Creek, near Charleston, is said to have attained a girth of 45 feet at the ground ; trees of 12 feet in circumference were formerly not unfrequent. The stalked oblong acorns in elongated cups are pleasant in taste, and were eaten by the Indians of Texas. The tree in England is scareely hardy, though it will grow freely in some sheltered places. Many varieties of Q. virens are found in the Mexican isthmus.~~

~~The evergreen oak of southern Europe is Q. Jdex, usually a smaller tree, frequently of rather shrub-like appearance, with abundant glossy dark-~~

green leaves, generally ovate in shape and more or less prickly at the margin, but sometimes with the edges entire ; the

Fic. 7.—Q. Ilex (L.); half natural size. (From Kotschy, op. cit. plate xxxviii.)

under surface is hoary ; the acorns are oblong on short stalks. The ilex, sometimes called by gardeners the "holm oak" from its resemblance to the holly, abounds in all the Mediterranean countries, showing a partiality for the sea air. The stem sometimes grows 80 or 90 feet in height, and old specimens are occasionally of large diameter ; but it does not often reach a great size. In its native lands it attains a vast age; Pliny attributes to several trees then growing in Rome a greater antiquity than the city itself. The wood is very heavy and hard, weighing 70 tb the cubic foot; the colour is dark brown ; it is used in Spain and Italy for furniture, and in the former country for firewood and charcoal. In Britain the evergreen oak is quite hardy in ordinary winters, and is useful to the ornamental planter from its capacity for resisting the sea

les ; but it generally remains of small size. . Ballota, an allied orm, abundant in Morocco, bears large edible acorns, which form an article of trade with Spain ; an oil, resembling that of the olive, is obtained from them by expression. . Gramuntia, another allied species, also furnishes a fruit which, after acquiring sweetness by keeping, is eaten by the Spaniards.

In America several oaks exist with narrow lanceolate leaves, from which characteristic they are known as 'willow oaks." @. Phellos, a rather ce large tree found on swampy land in the southern States, is the most important of this group; its timber is of indif- ferent quality.

The cork oak, Q. Suber, has been de- scribed in a preced- ing article (Corx). In Spain the wood is of some value, being hard and close-grained, and the inner bark is<@™ used for tanning. From its rugged silvery bark and Fic. 8,—Q. Vallonea; half natural size. (From Kotschy, dark-green foliage, op. cit., plate vii.)

' it is a handsome tree, quite hardy in Cornwall and Devonshire, where it has grown to a large size.

The valonia of commerce, one of the richest of tanning materials, is the acorn of Q. Zgilops, a fine species indigenous to Greece and the coasts of the Levant, and sometimes called the "Oak of Bashan." The very large acorns are remarkable for their thick cups with long reflexed scales ; the leaves are large, oblong, with

deep serratures terminating in a bristle-like point. The cups are the most valuable portion of the valonia, abounding in tannic acid ; immature acorns are sometimes exported under the name of "eamatina." The allied Q. Vallonea likewise yields valonia.

Some oaks are of indirect importance from products formed by their insect enemies. Of these the Aleppo gall (see GaLis) is yielded by Q. infectoria. . coccifera, a small bush growing in Spain and many countries around the Mediterranean, furnishes the kermes dye (KERMES). Q. persica, or according to some Q. mannifera, attacked by a kind of Coccus, yields a sweet exudation which the Kurds eollect and use as manna, or asa substitute for honey or sugar in various confections (see MANNA). (C. P. J.)

OAKAPPLE, or Oakeatt. See GALts, vol. x. p. 45.

OAKLAND, a city of the United States, in Alameda county, California, lies opposite San Francisco, of which it is practically a residential suburb, on the eastern shore of San Francisco Bay, at the terminus of the Central Pacific Railroad. Its beautiful situation, its shady streets, and the excellent quality of its buildings make it a distinctly attractive place. A branch of the bay, dividing the city into East and West Oakland, forms a good harbour, but is obstructed by a bar. The railway pier, 2 miles long, con- tains a number of warehouses and is traversed by a broad carriage road. Among the local industrial establishments are flour-mills, planing-mills, potteries, tanneries, and a jute-factory turning out 5,000,000 sacks per annum. Oakland, deriving its name from a grove of oaks in the midst of which it was built, was incorporated as a city in 1854. Its population was 1549 in 1860, 10,500 in 1870, and 34,555 in 1880.

OAKUM is a preparation of tarred fibre used in ship- building, for caulking or packing joints of timbers in wood vessels and the deck planking of iron and steel ships. Oakum is made by preference from old tarry ropes and

cordage of vessels, its teasing and preparation being a common penal occupation in prisons.

OAMARU, a municipal borough on the coast of Otago, New Zealand (South Island), 73 miles by rail north from Dunedin, and in 45° 5'§. lat. and 171° 2' E. long., isa thriv- ing seaport. It is the outlet of the largest agricultural district in New Zealand, and comprises land of exceptional fertility. It is on the main railway between Christchurch and Dunedin, and is connected by branch lines with fertile inland districts. A breakwater and mole, constructed of blocks of concrete like those used at Port Said in Egypt, en- close a large and commodious basin in what was an open roadstead ; and the harbour, when completed, will be one of the safest in the colony, and capable of accommodat- ing very large ships. Steamers run three or four times a week between Oamaru and Dunedin. The town is well supplied with gas and water, and is built of white Oamaru limestone, an excellent building-stone abundant in the district. The population in 1881 was 5791; and the capital value of the rateable property in 1883 was £810,428.

Coal is obtained at the entrance of Shag Valley, 40 miles to

the south. The district is famed for its stock, and the fine quality of its grain, which is often equal to that of South Australia ; also for the character of the English grasses laid down there, which flourish in a rich black loam on a limestone formation. The local industries comprise flour- mills, an elevator in connexion with storing grain, a woollen factory, the Oamaru stone company, a boot and shoe factory, a meat-preserving factory, breweries, and a bacon-curing factory. There are several public buildings, including a grammar school, a hospital, an athenzeum, and a public hall.

OAR-FISH, a fish of the family of ribbon-fishes (Trachypteridx), to which great interest is attached no less on account of the extraordinary shape of its body than of its internal organization, which is unmistakably that of a deep-sea fish. As in the other members of this family, the body is much elongated and compressed, sword-shaped ;

but in the oar-fish this character is excessive, the length

of the body being about fifteen times its depth. The head likewise is compressed, short, resembling in its form that of a herring ; the eye is large ; the mouth is small, and provided

with very feeble teeth. A long many-rayed dorsal fin, of

which the very long anterior rays form a kind of high crest, extends from the top of the head to the end of the tail; the anal and perhaps the caudal fins are absent ; but the ventrals (and by this the oar-fish is distinguished from

Oar-fish.

the other ribbon-fishes) are developed into a pair of long filaments, which terminate in a paddle-shaped extremity, but are too flexible to assist in locomotion. The whole body is covered with a layer of silvery epidermoid sub- stance, which easily comes off and adheres to other objects.

Oar-fishes are the largest deep-sea fishes known, the majority of the specimens observed measuring 12 feet in length ; but some are recorded to have exceeded 20 feet. Their range in the great depths of the ocean seems to extend over all seas, from the North Sea to the South Atlantic, from Mauritius and Japan to the coasts of New Zealand. But, however numerous they may be in the depths which are their home, it is only by rare accident that specimens reach the surface; and of these a very small proportion only have come under the observation of naturalists, and been actually recorded. Thus from the coasts of Great Britain only about twenty captures are known in the long space of a century and a half, and not more than thirteen from those of Norway. Oar-fishes have been considered by naturalists to have given rise to some of the tales of "sea-serpents," but their size as well as the facility with which they are secured when observed render this solution of the question of the existence of such a creature improbable. When they rise to the surface of the water they are either dead or in a helpless and dying condition. The ligaments and tissues by which the bones and muscles were held together whilst the fish lived under the immense pressure of great depths have then become loosened and torn by the expansion of the internal gases ; and it is only with difficulty that the specimens can be taken entire out of the water, and preserved afterwards, Every specimen found has been more or less mutilated ; and especially the terminal portion of the tail,

which seems to end in a delicate tapering filament, has never been per- fect ;—it is perhaps usually lost as a useless appendage at a much earlier period of the life of the fish.

OASES. Throughout the great belt of desert extending from the west coast of Africa to central Asia, various fer- tile tracts occur, clothed with vegetation and watered by springs, to which the name oases has been applied. Those which are best known are met with in the central and eastern portions of the Great Sahara and in the Libyan Desert. In that region they consist generally of deep de- pressions or valleys, locally termed "'wadis," where the water comes to the surface in natural springs, or where it may be procured by sinking wells. Under the influence of these beneficent springs vegetation bursts forth and covers a more or less extensive area, which becomes a halting-place for travellers in the desert, and frequently supports a con- siderable population. Many of the oases are situated in the mountainous regions, where the ground is sufficiently

elevated to precipitate the moisture in the atmosphere, The rain which falls, however, is rapidly absorbed by the rocks or sandy soil, and much of it collects in depressions at no great depth from the surface. The Arabs have long been in the habit of tapping these subterranean waters by sinking wells, a copious supply being usually obtained at depths varying down to 200 fathoms. Indeed, so rapidly does the water ascend when the aqueous strata are pierced in certain localities that the well-sinkers are sometimes suffocated ere they reach the surface. In the Algerian Sahara a large number of artesian wells have been sunk by the French, resulting in the formation of oases, which have to some extent affected the habits of the native tribes by inducing them to become cultivators of these fertile tracts. It is evident, therefore, that, notwithstand- ing the arid climate which prevails generally throughout the African deserts, a tolerably plentiful supply of water can be obtained by artificial means at various points. The springs, being essential to the very existence of the oases, are naturally guarded with care so as to prevent the sands encroaching on them. Should they cease to flow, the decay of the vegetation rapidly ensues and the oases disappear. Another characteristic feature of these fertile tracts is the palm-

tree forests, which are admirably adapted to such unfavourable conditions. The date and the dim palm are the commonest species met with in the forests ; they are highly prized by reason of the produce which they yield to the cultivators of the soil and the shelter which they afford from the scorching sun. Indeed, so service- able are they that in some cases the Arabs artificially create an oasis with the aid of a few palm trees by digging holes deep enough to allow the roots to pierce the aqueous strata,

From the accounts given by various travellers it would appear that, while the larger oases cover extensive tracts, the smaller ones are liable to be effaced by drifting sand. As an example of one of the largest, Air or Asben may be mentioned, which measures 180 miles from north to south. Such extensive fertile tracts are dotted over with villages, whose inhabitants carry on the cultivation of the soil and export various articles of produce. By means of irrigation different cereals are successfully cultivated, such as barley, rice, and millet.

In the western Sahara the chief oases are :—(1) Tuat, about 1000 miles to the south-west of Tripoli, the principal town being In- salah (‘Ain Salah) ; (2) Taudeni, south-west of Tudt ; (3) “Arawan, south of Taudeni and north of Timbuktu ; and (4) Walata, south- west of ‘Arawan. In the eastern portion of the Great Desert the important oases are :—(1) Fezzan, the capital of which is Morzuk, lying to the south-south-east of Tripoli; (2) Ghaddmes, north-west of Fezzan ; (3) Tibesti, south of Fezzan ; (4) Bilma,west-south-west of Tibesti; and (5) Air or Asben, west from Bilma and north-west from Lake Tchad. The last is perhaps one of the most remarkable oases in the African desert, forming a tableland whose average elevation is 2000 feet, with peaks rising to a height of 5000 feet. Heavy tropical rains are precipitated by this lofty plateau, and hence the valleys are clothed with vegetation. This oasis is richly cultivated, producing barley, maize, and millet. The capital is Agades, a town with 7000 inhabitants, which is situated on the caravan route between Morzik and Sokoto, and constitutes one of the important centres of trade in central Africa.

In the Libyan Desert the chief. oases are :—(1) Khargeh or Kharija (the outer oases), sometimes termed the oasis magna, about 120 miles to the

west of Thebes; (2) Dakhel or Dakhila (the inner oases), Situated to the west of Khargeh ; (3) Farafreh (Fardfira), north-west of Dakhel ; (4) Bahriya (northern), to the north of Fara- freh ; (5) Siwa (the famous oasis of Jupiter Ammon), at the northern limits of the Libyan Desert ; and (6) the Kufra group, south-west of Siwa. Perhaps the most fertile of these tracts is Dakhel, which was first made known to Europeans in 1819 by Sir A. Edmonstone. The chief produce consists of dates, rice, olives, and apricots, but durra, barley, lemons, citrons, and figs also grow on the rich soil of this oasis. It contains eleven villages, the total population being estimated at 6000.

Similar fertile tracts, though of smaller extent, occur in Arabia and in that part of Persia lying tothe west of the Salt Desert. In

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central Asia the great desert of Gobi, ranging from Turkestan to Manchuria, is interspersed with a few oases, the chief one being Kami, which is characterized by a rich growth of vegetation.

OAT, Avena sativa, L., one of about forty species mostly dispersed through the temperate regions of the Old World. It belongs to the tribe Avenex of the order Graminex or Grasses. The spikelets form a loose panicle, familiar in the cultivated oat, the flowering glume having its dorsal rib prolonged into an awn, which is in some species twisted and bent near the base. ;

The origin of the cultivated oat is generally believed to be A. fatua, L., or 'wild oat." Prof. J. Buckman suc- ceeded in raising "the potato-oat type" and "the white Tartarian oat" from grain of this species.1 Mr A. Stephen Wilson, however, thinks that as yet there is no real proof of this relationship, be- F'l cause his own cultivation of the wild oat made no difference upon it;? but there appears to be a great tendency in the oat to de- generate on stiff clay soils into "weed oats," a fact which may perhaps ac- count for this divergence of opinion. Lindley had previously suggested that the cultivated oat was a domesticated variety of some wild species, and that it might not improb- ably be referred to A. f strigosa, Schreb., "the # bristle-pointed oat," which is the origin of the Scotch oat, according to Buck- man. The white and black varieties of this species, Mr Wilson ob- Fy serves, were

cultivated in Fic. 1.—Panicle of A. fatua, var. sativa. England and Scotland Cietaseae from remote times, and "are frequently mentioned in Rogers' History of Agriculture and Prices… and they are still grown as a crop in Orkney and Shetland."* Both these species are found in Europe, North Africa, Siberia, and north-west India. The "naked oat," A. nuda, L., is probably only a race of A. sativa ;> it was found by Bunge in waste ground about Pekin. "According to Lindley,"

Fig. 3.

Fic. 2.—Spikelet of A. fatwa, var. sativa; with two fertile florets, and one ter- minal, rudimentary. (After Nees.) ;

Fia. 8.—Spikelet of Wild Oat, A. fatua; glumes hairy and long-pointed ; awn

twisted at base. (After Buckman.)

writes Mr Wilson,® "the naked oat is the pilcorn of the old agriculture, and we see from Rogers' that it was in

Science and Practice of Farm Cultivation, p. 172 (1865). A Bushel of Corn, p. 145. 3 Op. cit., p. 145. Hooker's Students' Flora, p. 466 (1870).

De Candolle, Géographie Botanique, ii. p. 941.

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& Op. cit., p. 146. ? Rarer Kinds of Grain, vol. ii. p. 178.

OAT—OAT

cultivation in England in the 13th century." Both this and the "' common otes," A. vesca, are described by Gerard.§ Parkinson tells us that in his time [early in the 17th century] the naked oat was sown in sundry places, but "nothing so frequent" as the common sort. The chief differences between A. fatua and A. f., var. sativa, accord- ing to Buckman,' are, that in the former the chaff-scales which adhere to the grain are thick and hairy, and in the latter they are not so coarse and are hairless. The wild oat,

moreover, has a long stiff awn, usually twisted near the base. In the cultivated oat it may be wanting, and if present it is not so stiff and is seldom bent. The grain is very small and worthless in the one, but larger and full in the other. Mr Wilson adds that in the point of attach- ment "in the wild oat the hanger terminates in a little oval spatula, . . . forming a kind of ball-and-socket connexion. . . . In the cultivated oat the continuity of the vascular tissue in the hanger is not broken off by any point of the kind." 10 There are now many varieties of the cultivated oat. With regard to the antiquity of the oat, De Candolle observes that it was not cultivated by the Hebrews, the Egyptians, the ancient Greeks, and the Romans.' Central Europe appears to be the locality where it was cultivated earliest, at least in Europe, for grains have been found among the remains of the Swiss lake-dwellings perhaps not earlier than the bronze age,!® while Pliny alludes to bread made of it by the ancient Germans. Pickering also re- cords Galen's observations (De Alim, Fac., i. 14), that it was abundant in Asia Minor, especially Mysia, where it was made into bread as well as given to horses ; he also states that ten varieties were introduced by Mohammed Ali into Egypt for fodder, and that it was seen by Bruce wild in Abyssinia, sometimes tall enough to conceal horse and rider (Grev.). And he adds that eastward from Syria it is called "'sulu" by the Tatars, and was observed by Kaempfer and others in Japan ; that it was brought over by colonists, and is now cultivated in north-east America; and that it has now become naturalized in parts of South America.

Besides the use of the straw when cut up and mixed with other food for fodder, the oat grain constitutes an important food for both man and beast. Being cultivated best in comparatively low temperatures, it has long formed the staple food for Scotland, north England, and Derbyshire, as well as for Germany, wherever wheat does not flourish. It is extensively grown in all the northern States of the American Union, and in New England its production largely exceeds that of wheat. The oat grain (excepting the naked oat), like that of barley, is closely invested by the husk. "This latter is used both in Scotland and Wales for the preparation of a kind of porridge . . . called sowans and sucan."1® Oatmeal is made from the kiln-dried grain from which the husks have been removed ; and the form of the food is the well-known " porridge." In Ireland it is mixed with Indian-corn meal and is called "stirabout." Groats or grits are the whole kernel from which the

~~husk is removed. Their use is for gruel, which used to be consumed as an ordinary drink in the 17th century at the coffee-houses in London. The meal can be baked into "cake" or biscuit, as the Passover-cake of the Jews ; but it cannot be made into loaves in consequence of the great difficulty in rupturing the starch grains, unless the tempera- ture be raised to a considerable height. With regard to the nutri- tive value. of oatmeal, as compared with that of wheat flour, it contains a higher percentage of albuminoids than any other grain, viz., 12°6—that of wheat being 10°8—and less of starch, 58°4, as against 66°83 in wheat. It has rather more sugar, viz., 5°4—wheat having 4°2—and a good deal more fat, viz., 5°6, as against 2°0 in flour. Lastly, salts amount to 3°0 per cent. in oat, but are only 1°7 in wheat. Its nutritive value, therefore, is higher than that of ordinary seconds flour." (G. H.)~~

~~8 Herball, p. 68 (1597). 10 Op. cit., p. 148. 1. See Wilson, op. cit., p. 141; AGRICULTURE, Vol. i. pp. 359, 360 ; and Morton's Cyclopedia of Agriculture, s.v. 12 Op. cit., ii. p. 988, with reff. Pickering, Chron. Hist. of Pl., p. 451. HLN., xviii. 17. 15 Op, cit., p. 341. E. Smith, Foods, p. 167. Letheby, Lectures on Food, pp. 6, 7 (1870).~~

~~9 Op. cit., p. 169.~~

~~OATES~~

~~OATES, Trrus (c. 1650 to 1705), was, according to one account, the son of an Anabaptist preacher, chaplain to Pride, and, according to another, of Samuel, the rector of All Saints' Church, Hastings. He was admitted on 11th June 1665 to Merchant Taylors', having, according to one authority, been previously at Oakham. There he remained a year, more or less, "and seems afterwards to have gone to Sedlescombe school in Sussex, from whence he passed to Caius College, Cambridge, on 29th June 1667, and was admitted a sizar of St John's, 2d February 1668/9, aged 18." Upon very doubtful authority he is stated to have been also at Westminster School before going to the uni- versity. On leaving the university he apparently took Anglican orders, and officiated in several parishes, Hastings among them. Having brought malicious charges in which his evidence was rejected, he narrowly escaped prose- cution for perjury. He next obtained a chaplaincy in the navy, from which he appears to have been speedily dismissed for bad~~

conduct and with the reputation of worse. He now, it is said, applied for help to Dr Tonge, rector of St Michael's in Wood Street, an honest half-crazy ian, who even then was exciting people's minds by giving out quarterly "treatises in print to alarm and awake his majesty's subjects." Oates offered his help, and it was arranged that he should pretend to be a Roman Catholic so as the better to unearth the Jesuit plots which possessed Tonge's brain (Lingard). Accordingly he was received into the church by one Berry, himself an apostate, and entered the Jesuit College of Valladolid as Brother Ambrose. Hence he was soon expelled. In October 1677 he made a second application, and was admitted to St Omer on 10th Decem- ber. So scandalous, however, was his conduct that he was finally dismissed in 1678. Returning in June 1678 to Tonge, he set himself to forge a plot by piecing together things true and false, or true facts falsely interpreted, and by inventing treasonable letters and accounts of prepara- tions for military action. The whole story was written by Oates in Greek characters, copied into English by Tonge, and finally told to one of Charles IT.'s confidential servants named Kirkby (Lingard). Kirkby having given the king his information, Oates was sent for (13th August), and in a private interview gave details, in forty-three articles, of the plot and the persons who had engaged to assassinate Charles. The general improbability of the story was so manifest, and the discrepancies were so glaring, that neither then nor at any subsequent time did Charles express any- thing but amused incredulity. To bolster up the case a fresh packet of five forged letters was concocted (31st August); but the forgery was transparent, and even Sir William Jones, the attorney-general, though a violent upholder of the plot, dared not produce them as evidence.

Oates now (6th September) made an affidavit before Sir Edmondbury Godfrey to an improved edition of his story, in eighty-one articles. Among the persons named was Coleman, secretary to the duchess of York, whom Godfrey knew, and to whom he sent word of the charges. Coleman in turn informed the duke, and he, since the immediate exposure of the plot was of the utmost consequence to him, induced Charles to compel Oates to appear (28th September) before the privy council. Here Oates. delivered himself of a story the falsehood of which was so obvious that the king was able to expose him by a few simple questions. At this moment an accident most fortunate for Oates took place. Amongst the papers seized at his request

were Coleman's, and in them were found copies of letters written by the latter to Pére la Chaise, suggesting that Louis should furnish him with money, which he would use in the French and Catholic interest among members of parliament. Among them, too, were these passages: "Success will give the greatest blow to the Protestant religion that it has re-

ceived since its-birth"; 'we have here a mighty work upon our hands, no less. than the conversion of three kingdoms, and by that perhaps the utter subduing of a pestilent heresy, which has so long domineered over great part of the northern world." The credit of Oates was thus, in the eyes of the people, re-established, and Coleman and others named were imprisoned. Charles was anxious for his brother's sake to bring the matter to a conclusion, but he dared not appear to stifle the plot; so, when starting for Newmarket, he left orders with Danby that he should finish the investigation at once. But Danby purposely delayed ; an impeachment was hanging over his head, and anything which took men's minds off that was welcome. Possibly, too, he was sincerely desirous of frustrating Charles's Catholic sympathies and secret dealings with France. Shaftesbury, with very different views, was eager in his patronage of the plot and its founder.

On 12th October occurred the murder of Godfrey, and the excitement was at its highest pitch. That Oates could ever have induced any one to believe in his tales is incred- ible to one who does not recollect the victories of Catholic France, the relaxing of the penal laws, the activity of the Jesuits, the fear of a standing army and of James, the agitation of the opposition led by Shaftesbury, and the ignorance and apprehension of the designs of the court. On 21st October parliament met, and, though Charles in his speech had barely alluded to the plot, all other business was put aside and Oates was called before the House. Here he gave details of a pretended apportioning by Oliva, the general of the Jesuit order, of all the chief posts to leading Roman Catholics in the country. The proceedings which followed are best read in the parlia- mentary history. A new witness was wanted to support Oates's story, and in November Bedloe came forward. At first he remembered little; by degrees he remembered everything that was wanted. Not even so, however, did their witness agree together, so, as a bold stroke,

Oates, with great circumstantiality, accused the queen before Charles of high treason. Charles both disbelieved and exposed him, whereupon Oates carried his tale before the House of Commons. The Commons voted for the queen's removal from court, but, the Lords refusing to concur, the matter dropped. It was not, however, until 18th July 1679 that the slaughter of Jesuits and other Roman Catholics upon Oates's testimony and that of his accomplices was to some extent checked. Sir George Wakeman, the queen's physician, was accused of purposing to poison the king, and the queen was named as being concerned in the plot. The | refusals of Charles to credit or to countenance the attacks on his wife are the most creditable episodes in his life. Scroggs had intimation that he was to be lenient. Sir Philip Lloyd proved Oates to have perjured himself in open court, and Wakeman was acquitted. On 26th June 1680, upon Oates's testimony, the duke of York was pre- sented as a recusant at Westminster, and in November the informer gave evidence in the trial of Strafford. But the panic had now worn itself out, and the importance of Oates rapidly declined ; so much so that after the dissolu- tion in 1682 he was no more heard of during Charles's reign, but enjoyed his pension of £600 or £900, it is un- certain which, in quiet. Shortly before the death of Charles, James brought, and won, a civil action against Oates, with damages of £100,000; in default of payment Oates was taken to prison; while there he was indicted for perjury, and was tried in May 1685, soon after the acces- sion of James II. He was convicted, and received an awful sentence, the execution of which was expected to kill him, and which was rigorously carried out; but to the astonishment of all he survived.

Oates was in prison for three and a half years.

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Upon

the flight of James, and during the excitement against the Catholics, he partially gained his liberty, and brought an appeal against his sentence before the Lords, who, while admitting the sentence to be unjust, confirmed it by a majority of thirty-five to twenty-three. The Commons, however,

~~passed a bill annulling the sentence ; and a con- ference was held in which the Lords, while again acknow- ledging that legally they were wrong, adhered to their former determination. The matter was finally settled by Oates receiving a royal pardon, with a salary of £300 a year. In November 1689 he was again seen in West- minster Hall, when Peterborough, Salisbury, and others were impeached. In 1690, finding that there was no hope of preferment in the English Church, he became a Baptist, but in less than a year was ejected from their body. In 1691 he became acquainted with William Fuller, whom he induced to forge another plot, though not with the success he had himself attained. He appears to have lived after this chiefly in retirement, though we read in Evelyn that in 1696 he dedicated to William a book against James. He died 13th July 1705.~~

~~Authorities. — Oates's, Dangerfield's, and Bedloe's Narratives ; State Trials; Journals of Houses of Parliament; North's Examen ; the various memoirs and diaries of the period ; Fuller's Narrative ; Dryden's Absalom and Achitophel ; Burnet's History ; Narcissus Luttrell's Relation. Lingard gives an exhaustive and trustworthy account of the Popish terror and its victims; and the chief inci- dents in Oates's career are graphically described by Macaulay. On~~

~~the question of the place of his education see Notes and Queries, 22d December 1883. (O. A.)~~

~~OATH, Anglo-Saxon adh, a word found throughout the Teutonic languages (Gothic aiths, modern German ed), but without ascertainable etymology. The verb to swear is also Old Teutonic (Gothic svaran, modern German schworen); this word, too, is not clear in original meaning, but is in some way connected with the notion of answering, —indeed it still forms part of the word answer, Anglo-Saxon and-swarian; it has been suggested that the swearer answered by word or gesture to a solemn formula or act. Among other terms in this connexion, the Latin jurare, whence English law has such derivatives as jury, seems grounded on the metaphorical idea of binding (root ju, as in jungo) ; the similar idea of a bond or restraint may perhaps be traced in the Greek épxos. It may be worth notice that the Latin sacramentum (whence modern French serment) does not really imply the sacredness of an oath, but had its origin in the money paid into ceurt in a~~

~~Roman lawsuit, the loser forfeiting his pledge, which went to pay for the public rites (sacra); thence the word passed to signify other solemn pledges, such as military and judicial oaths.~~

~~The subject of oaths and swearing, difficult in itself, has been made more obscure by the unsatisfactory methods employed by most writers on it. This is not due to want of ability in the writers themselves, among whom are included such men as Calvin and Paley, but to their not having followed their subject on the lines of historical development ; on the contrary, the usual plan has been to accommodate to modern views, and discuss with modern arguments, an institution which originated in an early stage of knowledge, and has been confused by the changes it has undergone while being carried on into the midst of new ideas. The student who finds, by consulting modern theo- logical and legal authorities, how indefinite are their views of the binding operation of an oath and the consequences of breaking it (apart from prosecution for perjury) will understand that its meaning must be sought, not among those who now administer and take it, but in the history of older states of culture in which it arose. The very formula, 'so help you God," by which legal oaths are administered in England, has not for ages had any precise signification.~~

~~An oath may be defined as an asseveration or promise~~

~~made under non-human penalty or sanction. Writers, viewing the subject among civilized nations only, have sometimes defined the oath as an appeal toa deity. It will be seen, however, by some following examples, that the harm or penalty consequent on perjury may be considered to result directly, without any spirit or deity being men- tioned ; indeed it is not unlikely that these mere direct curses invoked on himself by the sWearer may be more primitive than the invocation of divinities to punish. Oaths scarcely belong to the lowest or savage level of life, unless when rude tribes may have learned them from more civilized neighbours. Their original appearance may rather have been in a somewhat higher barbaric stage of~~

~~society, where legal forms had already come into use, and.~~

~~oaths were needed as a means of strengthening testimony or promise. Examples of the simplest kind of curse-oath may be seen among the Nagas~~

of Assam, where two nien will lay hold of a dog or a fowl by head and feet, which is then chopped in two with a single blow of the dao, this

being emblematic of the fate expected to befall the perjurer.

Or a man will stand within a circle of rope, with the im- plication that if he breaks his vow he may rot as a rope does, or he will take hold of the barrel of a gun, a spear- head, or a tiger's tooth, and solemnly declare, "If I do not faithfully perform this my promise, may I fall by this!" (Butler in Journ. Asiatic Soc. Bengal, 1875, p. 316). Another stage in the history of oaths is that in which the swearer calls on some fierce beast to punish him if he lies, believing that it has the intelligence to know what he says and the power to interfere in his affairs. In Siberia, in lawsuits between Russians and the wild Ostyaks, it is described as customary to bring into court the head of a bear, the Ostyak making the gesture of eating, and calling on the bear to devour him in like manner if he does not tell the truth (Erman, 7ravels in Siberia, vol. i. p. 492, London, 1848). Similar oaths are still sworn on the head or skin of a tiger by the Santals and other indigenous tribes of India. To modern views, a bear or a tiger seems at any rate a more rational being to appeal to than a river or the sun, but in the earlier stage of nature-religion these and other great objects of nature are regarded as animate and personal. The prevalence of river-worship is seen in the extent to which in the old and modern world oaths by rivers are most sacred. In earlier ages men swore inviolably by Styx or Tiber, and to this day an oath on water of the Ganges is to the Hindu the most binding of pledges, for the goddess will take awful vengeance on the children of the perjurer In New Guinea certain tribes are reported to swear by the sun, or a mountain, or a weapon, that the sun may burn them, or the mountain crush them, or the weapon wound them if they forswear themselves. The Tunguz brandishes a knife before the sun, saying, "If I lie may the sun plunge sickness into my entrails like this knife." The natural transition from swearing by these great objects of nature to invoking gods conceived in human form is well shown in the treaty-oath between the Macedonians and the Carthaginians recorded by Polybius (vii. 9); here the sun and moon and earth, the rivers and meadows and waters, are invoked side by side with Zeus and Hera and Apollo, and the gods of the Carthaginians. The heaven-god, able to smite the perjurer with his lightning, was invoked by the Romans, when a hog was slain with

~~the sacred flint representing the thunderbolt, with the invocation to Jove so to smite the Roman people if they broke the oath (Liv., i. 24; Polyb., iii. 25). Another form of this Aryan rite was preserved by the old Slavonic nation of Prussia, where a man would lay his right hand on his own neck and his left on the holy oak, saying, '"'May Perkun (the thunder- god) destroy me!" The oaths of the lower culture show~~

~~Om~~

~~a remarkable difference from those of later stages. In the apparently primitive forms the curse on the perjurer is to take effect in this world, as when an African negro swears by his head or limbs, which will wither if he lies; this kind of oath by the swearer's body is still found in both the Eastern and the Western worlds, and generally with the same implication of evil to fall on the part sworn by. But as nations became more observant, experience must have shown that bears and tigers were as apt to kill truth-tellers as perjurers, and that even the lightning- flash falls without moral discrimination. In the Clouds of Aristophanes, indeed, men have come openly to ridicule such beliefs, the Socrates of the play pointing out that notorious perjurers go unharmed, while Zeus hurls his bolts at his own temple, and the tall oaks, as if an oak- tree could perjure itself. The doctrine of miraculous earthly retribution on the perjurer lasted on in legend, as where Eusebius relates how three villains conspired to bring a false accusation against Narcissus, bishop of Jeru- salem, which accusation they confirmed by solemn oath before the church, one wishing that if he swore falsely he might perish by fire, one that he might die of the pesti- lence, one that he might lose his eyes; a spark no man knew from whence burned to ashes the first perjurer's house and all within, the second was consumed by the plague from head to foot, whereupon the third confessed the crime with tears so copious that he lost his sight (Euseb., Z/ist. Eccl. vi. 9). Asa general rule, however, the supernatural retribution on perjury has been transferred from the present world to the regions beyond the grave, as is evident from any collection of customary oaths. A single instance will show at once the combination of retributions in and after the present life, and the tendency to heap up remote penalties in the vain hope of securing present honesty. The Siamese Buddhist in his oath, not content to call down on himself various kinds of death if he breaks it, desires that he may afterwards be cast into~~

hell to go through innumerable tortures, among them to carry water over the flames in a wicker basket to assuage the thirst of the infernal judge, then that he may migrate into the body of a slave for as many years as there are grains of sand in four seas, and after this that he may be born a beast through five hundred generations and an hermaphrodite five hundred more.

The forms of oath belonging to all nations and ages, various as they are in detail, come under a few general heads. It may be first observed that gestures such as grasping hands, or putting one hand between the hands of another in token of homage, are sometimes treated as of the nature of oaths, but wrongly so, they being rather of the nature of ceremonies of compact. The Hebrew practice of putting the hand under another's thigh is usually reckoned among oath-rites, but it may have been merely a ceremony of covenant (Gen. xxiv. 2, xlvii. 29 ;* see Joseph., Ant., 1.16). Even the covenant among many ancient and modern nations by the parties mixing their blood or drinking one another's is in itself only a solemn rite of union, not an oath proper, unless some such cere- mony is introduced as dipping weapons into the blood, as in the form among the ancient Scythians (Herod., iv. 70) ; this, by bringing in the idea of death befalling the cove- nant-breaker, converts the proceeding into an oath of the strongest kind. The custom of swearing by weapons, though frequent in the world, is far from consistent in meaning. It may signify, in cases such as those just mentioned, that the swearer if forsworn is to die by such a weapon; or the warrior may appeal to his weapon as a powerful or divine object, as Parthenopzeus swears by his spear that he will level to the ground the walls of

Thebes (4Eschyl., Sept. contra Theb., 530; see the custom |!

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of the Quadi in Ammian. Marcellin., xvii.) ; or the weapon may be a divine emblem, as when the Scythians swore by the wind and the sword as denoting life and death (Lucian, Toxaris, 38). Oaths by weapons lasted into the Christian period ; for instance, the Lombards swore lesser oaths by consecrated weapons and greater on the Gospels (see Ducange, s.v. "' Juramenta super arma"; Grimm, Deutsche Rechtsalterth., p. 896). Stretching forth the hand towards the object or deity sworn by is a natural

gesture, well shown in the oath of Agamemnon, who with uplifted hands (Avi yefpas dvaoydv) takes Heaven to witness with Sun and Earth and the Erinnyes who below the earth wreak vengeance on the perjurer (Homer, Ji, xix. 254; see also Pindar, Olymp., vii. 120). The gesture of lift- ing the hand towards heaven was also an Israelite form of oath: Abraham says, "I have lifted up my hand to Jehovah," while Jehovah Ilimself is represented as so swearing, "For I lift up My hand to heaven, and say, I live for ever" (Gen. xiv. 22; Deut. xxxii. 40; see Dan. xi. 7; Rev. x. 5). This gesture established itself in Christendom, and has continued to modern times. In England, for example, in the parliament at Shrewsbury in 1398, when the Lords took an oath on the cross of Canterbury never to suffer the transactions of that parlia- ment to be changed, the members of the Commons held up their hands to signify their taking upon themselves the same oath (J. E. Tyler, Oaths, p. 99). In France a juror takes oath by raising his hand, saying, "Je jure!" The Scottish judicial oath is taken by the witness holding up his right hand uncovered, and repeating after the ushers" I swear by Almighty God, and as I shall answer to God at the great day of judgment, that I will," é&c. In the ancient world sacrifice often formed part of the ceremony of the oath; typical examples may be found in the Homeric poems, as in Agameminon's oath already mentioned, or the compact between the Greeks and Tro- jans (1, iii. 276), where wine is poured out in libation, with prayer to Zeus and the immortal gods that the perjurer's brains shall, like the wine, be poured on the ground ; the rite thus passes into a symbolic curse-oath of the ordinary barbaric type. Connected with such sacri- ficial oaths is the practice of laying the hand on the victim or the altar, or touching the image of the god. A classic instance is in a comedy of Plautus (udens, v. 2, 45), where Gripus says, "Tange aram hanc Veneris," and Labrax answers "Tango" (Greek instance, Thucyd., v. 47 ; see Justin, xxiv. 2). Thus Livy (xxi. 1) introduces the phrase "touching the sacred objects" (tactis sacris) into the picturesque story of Hannibal's oath. Details of the old Scandinavian oath have been preserved in Iceland in the Landnamabék (Islendinga Ségur, Copenhagen, 1843): a bracelet (baugr) of two rings or more was to be kept on the altar in every head court, which the godi or priest should wear at all law-things held by him, and should redden in the blood of the bullock sacrificed, the witness pronouncing the remarkable formula: "Name I to witness that I take oath by the ring, law-oath, so help me Frey, and Niord, and almighty Thor," (hialpi mer svi Freyr, ok Nidrdr,

ok hinn almattki Ass), &c. This was doubtless the great oath on the holy ring or bracelet which the Danes swore to King Alfred to quit his king- dom ("on tham halgan beage," Anglo-Sax. Chron. ; "in eorum armilla sacra," Ethelwerd, Chron., iv.). An oath, though not necessarily expressed in words, is usually so. In the Homeric instances the prayer which constitutes the oath has a somewhat conventional form, and in the classical ages we find well-marked formulas. These are often refer- ences to deities, as "'by Zeus!" "TI call Zeus to witness"

'(vat pa Aia ; iorw Zeds); "by the immortal gods!" "I call

to witness the ashes of my ancestors" (per deos immor-

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tales; testor majorum cineres). Sometimes a curse is invoked on himself by the swearer, that he may perish if he fail to keep his oath, as "the gods destroy me," "let me perish if," &c. (dii me perdant; dispeream si). An important class of Roman oaths invokes the deity to favour or preserve the swearer in so far as he shall fulfil his promise— "as the gods may preserve me," "as I wish the gods to be propitious to me" (me ita di servent ; ita deos mihi velim propitios). The best Roman collection is to be found in the old work of Brissonius, De Formulis et Solemnibus Populi Romani Verbis, Paris, 1583. Biblical examples of these classes of oaths are "as the Lord liveth" (1 Sam. xiv. 39, and elsewhere), "so do God to me, and more also" (2 Sam. iii. 35, and elsewhere).

The history of oaths in the early Christian ages opens a controversy which to this day has not been closed. Under Christ's injunction, 'Swear not at all" (Matt. v. 34; also James v. 12), many Christians seem at first to have shrunk from taking oaths, and, though after a time the usual customs of judicial and even colloquial oaths came to prevail among them, the writings of the Fathers show efforts to resist the practice. Chrysostom perhaps goes furthest in inveighing against this "snare of Satan": "Do as you choose; I lay it down as a law that there be no swearing at all. If any bid you swear, tell him, Christ has spoken, and I do not swear" (Homil. ix. in Act. Apostol.; see a collection of patristic passages in Sixt. Senens., Bibliothec. Sanct., vi. adnot. 26). The line mostly taken by influential teachers,

~~*however, was that swearing should indeed be avoided as much as possible from its leading to perjury, but that the passages forbid- ding it only applied to superfluous or trifling oaths, or those sworn by created objects, such as heaven or earth or one's own head. On the other hand, they argued that judicial and other serious swearing could not have been forbidden, seeing that Paul in his epistles repeatedly introduces oaths (2 Cor. i. 23; Phil. i. 8; Gal. i. 20). Thus Athanasius writes: "TI stretch out my hand, and as I have learned of the apostle, I call God to witness on my soul" (Apol. ad Imp. Const.; see Augustine, De Mend., 28; Epist., cl., iii. 9; cL, iv. 250; Lnarr. in Psalm. \xxxviii. (4); Serm., 307, 319). This argument is the more forcible from Paul's expressions being actually oaths in accepted forms, and it has also been fairly adduced that Christ, by answering to the adjuration of the high priest, took the judicial oath in solemn form (Matt. xxvi. 63). The passages here referred to will give an idea of the theological grounds on which in more modern times Anabaptists, Mennonites, and Quakers have refused to take even judicial oaths, while, on the other hand, the laws of Christendom from early ages have been only directed against such swearing as was considered profane or otherwise improper, and against perjury. Thus from the 3d or 4th century we find oaths taking much the same place in Christian as in non-Christian society. In the 4th century the Christian military oath by God, Christ, the HIoly Spirit, and the majesty of the emperor is recorded by Vegetius (Ret Milt. Inst., ii. 5). Constan- tine's laws required every witness in a cause to take oath ; this is confirmed in Justinian's code, which even in somé cases requires also the parties and advocates to be sworn (Cod. Theod., xi. 39; Justin. Cod., iv. 20, 59). Bishops and clergy were called upon to take oath in ordination, monastic vows, and other ecclesiastical matters (see de- tails in Bingham, Antig. of Chr. Church, xvi. 7). By the Middle Ages oaths had increased and multiplied in Christendom far beyond the practice of any other age or religion. The Reformation made no change in principle, as 1s seen, for instance, in Art. xxxix. of the church of England: '" As we confess that vain and rash swearing is forbidden Christian men by our Lord Jesus Christ, and*~~

~~*Oe i a*~~

~~*James HIs apostle, so we judge, that Christian Religion doth not prohibit, but that a man may swear when the Magistrate requireth, in a cause of faith*~~

~~and charity, so it be done according to the Prophet's teaching, in justice, judgement, and truth." But about this time began a legal reformation, which has for reasons of public policy con- tinually reduced the number of oaths required to be taken, and apparently tends toward their total abolition.~~

~~The history of swearing in early Christendom would lead us to expect that the forms used would be adopted with more or less modification from Hebrew or Roman sources, as indeed proves to be the case. The oath introduced in the body of one of Constantine's laws—" As the Most High Divinity may ever be propitious to me" (Ita mihi summa Divinitas semper propitia sit)—follows an old Roman form. The Roman oath by the genius of the emperor being objected to by Christians as recognizing a demon, they swore by his safety (Tertull., Apol., 32). The gesture of holding up the hand in swearing has been already spoken of. The Christian oath on a copy of the Gospels seems derived from the late Jewish oath taken holding in the hand the scroll of the law (or the phylacteries), a ceremony itself possibly adapted from Roman custom (see treatise "Shebuoth" in Gemara). Among the various mentions of the oath on the Gospels in early Christian writers is that characteristic passage of Chrysostom in a sermon to the people of Antioch: " But do thou, if nothing else, at least reverence the very book thou holdest forth to be sworn by, open the Gospel thou takest in thy hands to administer the oath, and, hearing what Christ therein saith of oaths, tremble and desist " (Serm. ad Pop. Antioch., Homil. xv.). The usual mode was to lay the hand on the Gospel, as is often stated in the records, and was kept up to a modern date in the oath in the university of Oxford, "tactis sacrosanctis Evangeliis" ; the practice of kissing the book, which has now almost superseded it in England, appears in the Middle Ages (J. E. Tyler, Oaths, pp. 119, 151). The book was often laid on the altar, or (after the manner of ancient Rome) the swearer laid his hand on the altar itself, or looked towards it; above all, it became customary to touch relics of saints on the altar, a ceremony of which the typical instance is seen in the representation of Harold's oath in the Bayeux tapestry. Other objects, as the cross, the bishop's crosier, &c., were sworn by (see Ducange, s.v. "Jurare"). An oath ratified by contact or inspection of a sacred object was called a "corporal" or bodily oath, as distinguished from a merely spoken or written oath ; this is well seen in an old English coronation oath, "so~~

~~helpe me God, and these holy euan- gelists by me bodily touched vppon this hooly awter." The English word signifying the "sacred object " on which oath is taken is halidome (Anglo-Saxon, hdligdém ; German, hetligthuwm); the halidome on which oaths are now sworn in England is a copy of the New Testament. Jews are sworn on the Old Testament; the sacred books of other religions are used in like manner, a Mohammedan swearing on the Koran, a Hindu on the Vedas.~~

~~Among the oath-formulas used in Christendom, that taken by provincial governors under Justinian is typical of one class: "I swear by God Almighty, and His only begotten Son our Lord Jesus Christ, and the Holy Ghost, and the Most Holy Glorious Mother of God and ever Virgin Mary, and by the Four Gospels which I hold in my hand, and by the Holy Archangels Michael and Gabriel," &c. The famous oath of the kings Louis and Charles at Strasburg in 842 (a.D.) runs: " By God's love and the Christian people and our common salvation, as God shall give me knowledge and power," &c. Earlier than this, as in the oath of fealty in the capitularies of Charle- magne in 802, is found the familiar form "'Sic me adjuvet~~

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~~Deus," closely corresponding to above-mentioned formulas of pre-Christian Rome. This became widely spread in Kurope, appearing in Old French "Si m'ait Dex," German "So mir Gott helfe," English "So help me God." A re- markable point in its history is its occurrence in the "So help me Frey," &c., of the old Scandinavian ring-oath already described. Among the curiosities of the subject are quaint oaths of kings and other great personages: William Rufus swore "by that and that" (per hoc et per hoc); William the Conqueror "by the splendour of God," John "by God's teeth"; other phrases are given in Ducange (Z.c.), as "per omnes gentes," "per coronam," "par la sainte figure de Dieu," "par la mort Dieu," «ec.~~

~~Profane swearing, the trifling or colloquial use of sacred oaths, is not without historical interest, formulas used being apt to keep up traces of old manners and extinct religions. Thus the early Christians were reproved for continuing to say "mehercle /" some of them not knowing that they were swearing by Hercules (Tertull., De Idol., 20). Oaths by deities of pre-~~

Christian Europe lasted into the modern world, as when a few generations ago Swedish peasants might be heard to swear, "Odin take me if it is not true!" (Hylten-Cavallius, Warend och Wirdarne, vol. i, p. 228). The thunder-god holds his place still in vulgar German exclamations, such as "Donner!" (Grimm, Deutsche Mythologie, pp. 10, 166). The affected revival of classical deities in Italy in the Middle Ages still lingers in such forms as "per Bacco!" "cospetto di Bacco!" (by Bacchus! face of Bacchus!). In France the concluding oath of the last paragraph has dwindled into "mordieu!" or "morbleu !" much as in England the old oaths by God's body and wounds became converted into "'oddsbodikins!" and " zounds!"

The oaths now administered among civilized nations are chiefly intended for maintaining governments and securing the perform- ance of public business. They fall under the headings of political, ecclesiastical, and legal. In England the coronation oath is to be administered by one of the archbishops or bishops in the presénce of all the people, who, on their parts, reciprocally take the oath of allegiance to the crown.

The archbishop or bishop shall say: " Will you solemnly promise and swear to govern the people of this kingdom of England and the dominions thereto be- longing according to the statutes in parliament agreed on, and the laws and customs of the same?" The king or queen shall say: 'I solemnly promise so to do." Archbp. or bp. ' Will you to your power cause law and justice, in mercy, to be executed in all your judgements?" XK. or Q. 'I will." Archbp, or bp. '* Will you, to the utmost of your power, maintain the laws of God, the true profession of the Gospel, and the Protestant reformed religion established by the law? And will you promise unto the bishops and clergy of this nation, and to the churches committed to their charge, all such rights and privileges as by law do or shall appertain unto them, or any of them?" K.orQ. "All this I promise to do." After this the king or queen, laying his or her hand upon the holy Gospels, shall say: 'The things which I have here before promised I will perform and keep; so help me God," and then shall kiss the book.*

The chief officers of state take an "official" oath well and truly to serve his (or her) majesty. Special oaths are taken by privy councillors, archbishops

~~and bishops, peers, baronets and knights, recruits, and others. The old oath of allegiance, as administered (says Blackstone) upwards of 600 years, contained a promise "to be true and faithful to the king and his heirs, and truth and faith to bear of life and linib and terrene honour, and not to know or hear of any ill or damage intended him without defending him there-from " (Blackstone, Commentaries, book i. chap. x.). In the reign of William III. it was replaced by a shorter form, and in the present reign stands: "I do swear that I will be faithful and bear true allegiance to Her Majesty Queen Victoria, her heirs and successors, according to law." Statutes of Charles II. and George I. enacted that no member should vote or sit in either house of parliament without having taken the several oaths of allegiance, supremacy, and abjuration. The oath of supremacy in the reign of William III. was: "I A B doe swear that I doe from my heart abhorr detest and abjure as impious and hereticall this damnable doctrine and position that princes excommunicated or deprived by the Pope or any authority of the see of Rome may be deposed or murdered by their subjects or any other whatsoever. And I doe declare that no forreigne prince person prelate state or potentate hath or ought to have any jurisdiction power superiority preeminence or authoritie ecclesiastical or spiritual] within this realme. Soe," &. The oath of abjuration introduced in the time of William III. recognizes the king's rights, engages the juror to support him and disclose all traitorous conspiracies against him, promises to maintain the Hanoverian Protestant succession, and expressly renounces any claim of the descendants of the late Pretender. This oath was not~~

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~~only taken by persons in office, but might be tendered by two justices to any person suspected of disaffection. In modern times a single parliamentary oath was substituted for the three, and this was altered to enable Roman Catholics to take it, and Jews were enabled to sit in parliament by being allowed to omit the words "on the true faith of a Christian." In its present form the parliamentary oath consists of an oath of allegiance and a promise to maintain the succession to the crown as limited and settled in the reign of William III. The "judicial" oath taken by judges of the Court of Appeal or of the HIgh Court of Justice, and by justices of the peace, is "'to do right to all manner of people after the laws and usages of this realm, without fear or~~

*favour, affection or ill-will." Jurors are sworn, whence indeed their name (juratores) ; in felonies the oath administered is: "You shall well and truly try and true deliverance make between our sovereign lady the Queen and the prisoner at the bar whom you shall have in charge, and a true verdict give according to the evidence." In misdemeanours the form is: " Well and truly try the issue joined between our sovereign lady the Queen and the defendant, and a true verdict," &c. The oath of the jurors in the Scottish criminal courts is: 'You [the jury collectively] swear in the name of Almighty God and as you shall answer to God at the great day of judgment that you will truth say and no truth conceal in so far as you are to pass upon this assize."' The oldest trace of this form of oath in Scotland is in Reg. maj., i. cap. 11, copied from Glenville, which points to an origin in the Norman inquest or "recognition." In the ancient custom of compurgation, once prevalent in Europe, the accused's oath was supported by the oaths of a number of helpers or compurgators who swore to their belief in its validity. A remnant of it lasted on till the 17th century in the "ex officio " oath of a clergyman cited before the ecclesiastical court for misconduct, who might be required to call his neighbours as compurgators to swear to their belief in his inno- cence. Thejusjurandum or decisory oath of Roman law, which was of greater authority than res judicata (Digest xii. 2, 2), is still repre- sented in modern law by the serment décisoire of the Code Civil, and the "rceference to the oath of the party" of Scotch law (see the case of Longworth v. Yelverton, in Law Reports, 1 Scotch Appeals, 218). Such an oath is final and conclusive. It has something in common with the old "wager of law" in England, abolished by 3and 4 William IV. c. 42,s. 18, in so far as it makes an oath the jinis litiwm. The decisory oath was formerly used in the ecclesiastical courts (Burn, Eccl. Law, s.v. '*Oaths"). It seems to be still used in admiralty cases in Massachusetts (Dunlop, Adm. Pr., 290). Witnesses are sworn: '* The evidence you shall give… shall be the truth, the whole truth, and nothing but the truth. So," &c. Where a witness is sworn on the wir dire, the oath is: " You shall true answer make to all such questions as the court shall demand of you. So help you God." As to wit- nesses of religions other than Christian, an oath is to be adminis- tered to them in such form and with such ceremonies as they may declare to be binding. The great number of oaths formerly required have been much reduced by modern legislation, in many cases a voluntary declaration before a justice, notary, &c., being substituted. Many alterations of the*

English law as to oaths have been made of late years in relief of those conscientiously objecting. Quakers, Moravians, and Separatists are allowed to make affirmation, whether as witnesses or on other occasions, where an oath was formerly required. Thus a Quaker in the witness-box affirms by answering "Yea!" and when taking his seat in parliament substitutes for "swear" the words 'solemnly, sincerely, and truly declare and affirm," and omits "So help me God." The Evidence Further Amendment Act, 1869 (82 and 83 Vict. c. 68, s. 4), allowing affirma- tions in place of oaths in certain cases in judicial proceedings, is by the Evidence Amendment Act, 1870 (33 and 34 Vict. c. 49), extended to proceedings before all persons having authority to administer oaths. It was specially intended to meet the case of an arbitrator. But the right to affirm in lieu of taking the parlia- mentary oath has been held not to apply to the case of avowed atheists, as appears from the case of Mr Charles Bradlaugh, elected member for Northampton, but not permitted to take the affirmation and sit (1883 ; see Clarke v. Bradlaugh, 7 Q. B. D. 38). False witness given under affirmation is punishable as perjury. Profane swearing and cursing is punishable by law, any labourer, sailor, or soldier being liable to forfeit 1s., every other person under the de- gree of a gentleman 2s., and every gentleman or person of superior rank 5s., to the poor of the parish.

The administering or taking of certain oaths is criminal in English and Scotch law. It is a felony punishable by penal servi- tude for life (a) to administer or cause to be administered or aid or assist at the administering of any oath or engagement purporting or intending to bind the person taking the same to commit treason or murder or any felony which on the 12th of July 1812 was punishable with death ; (6) to take any such oath or engagement, not being compelled thereto (52 George III. c. 104,81). Itisa felony punishable with penal servitude for seven years (a) to administer or cause to be administered or aid or assist at or be present and consenting to the administering or taking of any oath

or engagement purporting or intending to bind the person tak- ing the same to engage in any mutinous or seditious purpose ; to disturb the public peace; to be of any association, society, or confederacy formed for any such

purpose ; to obey the orders or commands of any committee or body of men not lawfully consti- tuted, or of any leader or commander, or other person not having authority by law for that purpose ; not to inform or give evidence against any associate, confederate, or other person ; not to reveal or discover any unlawful combination or confederacy or any illegal act done or to be done, or any illegal oath or engagement which may have been administered or tendered to or taken by any person, or the import of any such oath or engagement ; (0) to take any such oath or engagement, not being compelled thereto (37 George IIL c. 123, s. 1), Compulsion is no defence unless the person taking the oath or engagement within fourteen days (in the case of oaths falling under 52 George III. c. 104) or within four days if not

prevented by actual force or sickness, and then within four days

after the cessation of the hindrance produced by such force or sick- ness (in the case of oaths falling under 37 George III. ¢. 128), declares the circumstances of the administration of the oath by information on oath before a justice of the peace or a secretary of state or the privy council, or, if on active service, to his command- ing officer. The Draft Criminal Code proposes to incorporate these provisions with little alteration. The Irish Act (50 George III. c. 102) is more stringent than 37 George III. c. 123, as the person administering the oath is punishable with penal servitude for life, the person taking the oath is punishable as in England and Scot- land. A club or society in which members are required or per- mitted to take au unlawful oath is unlawful, and the members may be proceeded against either summarily or by indictment (39 George III. c. 79, 57 George III. c. 19). The latter statute, as appears from the preamble, was specially aimed at the corresponding societies which existed in Great Britain at the time of the French Revolution.

Politicians and moralists have placed much reliance on oaths as a practical security. It has been held, as Lycur- gus the orator said to the Athenians, that "an oath is the bond that keeps the state together" (Lycurg., Leocr., 80; see Montesquieu, Spirit of Laws). Thus modern law- books quote from the leading case of Omychund »v. Barker : 'No country can subsist a twelvemonth where an oath is thought not binding ; for the want of it must

~~necessarily dissolve society." On the other hand, wherever the belief in supernatural interference becomes weakened, and oaths are taken with solemn form but secret contempt or open ridicule, they become a serious moral scandal, as had already begun to happen in classical times. The yet more disastrous effect of the practice of swearing is the public inference that, if a man has to swear in order to be believed, he need not speak the truth when not under oath. The early Christian fathers were alive to this depreciation of ordinary truthfulness by the practice of swearing, and opposed, though unavailingly, the system of oaths which more and more pervaded public business. How in the course of the Middle Ages oaths were multiplied is best seen by examining a collection of formulas such as the Book of Oaths (London, 1649), which range from the coronation oath to the oaths sworn by such as valuers of cloths and the city scavengers.! Oaths of allegiance and other official oaths are still taken throughout Europe, but experience shows that in times of revolution they are violated with little scruple, and in the case of the United Kingdom it is doubtful whether they have any more prac- tical value than, if so much as, simple declarations. The question of legal oaths is more difficult. On the one hand, it is admitted that they do induce witnesses, especially the ignorant and superstitious, to give evidence more truth- fully than they would do on eyen solemn declaration. On the other hand, all who practise in courts of justice declare that a large proportion of the evidence given under oath is knowingly false, and that such perjury is perceptibly detrimental to public morals. The lowering of truth in ordinary intercourse, which follows from the requirement of swearing as a confirmation in public matters, femains~~

~~1 As to reform of the excessive multiplication of oaths see Paley, Moral Philosophy, book iii. part i. chap. 16; and J. E. Tyler, Oaths.~~

~~much as it was in ancient times. One noteworthy point is that an effect is now produced by oaths foreign to their proper purpose, which is to use the sanction of religion for the enforcement of obligations; now, however, the oath has passed into a sanction of the religion, so that an oath taken in legal form is construed as a confession of faith in Chris- tianity, or at least in the existence of God. — (E. B. T.)~~

~~OBADIAH (7°12), OPserov, ABdiov, Abdias) is a name pretty frequent in the Old Testament, meaning " servant" or worshipper "of Jehovah." It is synonymous with Abdi and Abdeel, and of a type common in Semitic proper names; compare the Arabic 'Abdallah, Taimallat, 'Abd Manat, &c., the Hebrew Obed Edom, and many Pheenician forms. The name of Obadiah is prefixed to the fourth and shortest book of the minor prophets, and as no date or other historical note is added it is not surprising that an early Hebrew tradition recorded by Jerome (Comm. in Ob.) identified the prophet with the best-known Obadiah of the historical books, the protector of the prophets in the reign of Ahab (1 Kings xviii.). His tomb was shown in Samaria with those of Elisha and John the Baptist, and the Epitaphium Paulx describes the wild performances, analogous to those of modern dervishes, that took place before these shrines.~~

~~Tt is now agreed on all hands that it is vain to connect Obadiah the prophet with any other Obadiah of the Old Testament, and that our only clue to the date and compo- sition of the book lies in internal evidence. The prophecy is directed against Edom. Jehovah has sent a messenger forth among the nations to stir them up to battle against the proud inhabitants of Mount Seir, to bring them down from the rocky fastnesses which they deem impregnable. Edom shall be not only plundered but utterly undone and expelled from his borders, and this he shall suffer (through his own folly) at the hand of trusted allies (vers. 1-9), The cause of this judgment is his cruelty to his brother Jacob. In the day of Jerusalem's overthrow the Edomites rejoiced over the calamity, grasped at a share of the spoil, lay in wait to cut off the fugitives (vers. 10-14). But now the day of Jehovah is near upon all nations, Esau and all the heathen shall drink full retribution for their banquet of carnage and plunder on Jehovah's holy mountain. A rescued Israel shall dwell in Mount Zion inrestored holiness ; the house of Jacob shall regain their old possessions ; Edom shall be burned up before them as chaff before the flame ; they shall spread over all Canaan, over the mountain of Esau and the south of Judah as well as over Gilead and the Philistine and Pheenician coast. The victorious Israel- ites shall come up on Mount Zion to rule the mountain of Esau, and the kingdom shall be Jehovah's (vers. 15-21).~~

~~In vers. 10-14 the expositor finds sure foothold. The calamity of Jerusalem can only be the sack of the city by Nebuchadnezzar ; the malevolence and cruelty of Edom on this occasion are characterized in similar terms by several writers of the exile, but by none with the same circumstance and vividness of detail as here (Ezek. xxv. 8, 12 sg. xxxv.; Lam. iv. 21; Psalm cxxxvii.). It is impossible to doubt that these verses were written under the lively and recent impression of the events to which they refer ; to regard them as predictive (Caspari, Pusey, &c.) is to misuriderstand the whole character of prophetic foresight, and to ascribe them with Hitzig to the Persian or Greek period is equally unreasonable. The opening verses of the prophecy, on the other hand, present a real difficulty. Obad. 1-6, 8 agree so closely and in part verbally with Jer. xlix. 14-16, 9, 10, 7 that the two passages can- not be independent; nor does it seem possible that Obadiah quotes from Jeremiah, for Obad. 1-8 is a well- connected whole, while the parallel verses in Jeremiah appear in different order, interspersed with other matter,~~

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~~and in a much less lucid connexion. In Jeremiah the picture is vague, and Edom's unwisdom (ver. 7) stands without proof. In Obadiah the conception is quite de- finite. Edom is attacked by his own allies, and his folly appears in that he exposes himself to such treachery. Again, the probability that the passage in Jeremiah incor- porates disjointed fragments of an older oracle is greatly increased by the fact that the prophecy against Moab in the preceding chapter uses, in the same way, Isa. xv., xvi., and the prophecy of Balaam. In spite of the objections of Blau (4. D. WM. G., xx. 173 sq.) there is no good reason to doubt that the prophecy against Edom ascribed to Jere- miah is really from his pen ; it is earlier than the fall of Jerusalem,! and is one of a circle of prophecies in which Nebuchadnezzar (the lion ascending from Jordan, ver. 19) appears as the instrument of divine judgment on the nations, This being so, it seems necessary to conclude, with Ewald (Propheten, i. 489 sq.), Graf (Jeremia, p. 558 sq.), and others, that Jeremiah and our book of Obadiah alike quote from an older oracle. Ewald supposes that the treacherous allies of Edom are the Arameans and the time that of Ahaz (2 Kings xvi. 6); but the tone of the prophecy seems rather to refer it to a later date, when Edom had been for some time independent and~~

~~powerful ; and it is not improbable that in Obad. 1-8 we have the first mention of that advance of the Arabs upon the lands east of Palestine which is referred to also in Ezek. xxv. (comp. Moas, vol. xvi. p. 535). That the book of Obadiah, short as it is, is a complex document might have been suspected, apart from Jer. xlix., from an apparent change of view between vers. 1-9 and vers. 15 sg. In the former verses Esau is destroyed by his allies, and they occupy his territory, but in the latter he perishes with the other heathen in the day of universal retribution, he disappears before the victorious advance of Israel, and the southern Judeans occupy his land.~~

~~The eschatology of Obadiah contains little that is pecu- liar. The conceptions of the "rescued ones" (mpd), of the sanctity of Zion, of the kingship of Jehovah, are the com- mon property of the prophets from the time of Isaiah. The restoration of the old borders of Israel and the conquest of Edom and the Philistines are ideas as old as Amos ix., Isa. xi. 14; but the older prophets more often represent this conquest as a suzerainty of Israel over its neighbours, as in the days of David, while in Obadiah, as in other later books, the intensified antithesis—religious as well as political—hbetween Judali and the surrounding heathen finds its expression in the idea of a consuming judgment on the latter,—the great "day of Jehovah." This view is not, however, original in Obadiah ; it is already expressed in Zephaniah. Between Joel and Obadiah there are points of material and verbal agreement, so close as to imply that Joel used the earlier book (Joel iii. 19,—Ob. 10, 14; Joel iii. 3,—Ob. 11; Joel ii. 32, ii, 17,—Ob. 17). Another charac- teristic common to Obadiah with the latest prophets is that, while he uses the words house of Jacob and house of Joseph, the northern tribes have become to him a mere name; the~~

~~restoration he thinks of is a restoration of the kingdom of.~~

~~Jerusalem, and even Gilead is to be occupied not by Joseph but by Benjamin.~~

~~An indication of the place where Obadiah wrote seems to lie in ver. 20, where he speaks of " the exiles in this 97." The word as pointed has been variously explained to mean " bulwark" or "army"; it may also be read as "sand" or "sea-coast"" (Ewald), but, as the text of the verse is not sound and cannot be translated without some correction, it is unsafe to build on~~

~~this obscure allu- sion. Thc prominence given to Edom, and the fact that Chaldea is not mentioned at all, make it probable that the book was not written in Babylonia. The same verse speaks of exiles in Sepharad.~~

~~1 In ver. 12 " have assuredly drunken" should be " shall assuredly drink,"~~

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~~Sepharad is probably Sardis, the Gparda of Darius in the Behistun inscription. Many of the Jews were doubtless sold as slaves by Nebuchadnezzar. Lydia was a great slave-market, and Asia Minor was a chief seat of the Diaspora at an early date (comp. Gutschmidt, Neue Beitrdge, p. 77), so that this identification does not supply ground for Hitzig's argument that Obadiah was written in the Greek period, when we read of many Jews being transplanted to Asia Minor (Jos., Ant., xii. 3). Schrader, however CEG EE 116 sy.; K.A.T., 446), thinks of a Shaparda mentioned by Sargon, and lying in south-west Media.~~

~~Literature.—The commentaries on the minor prophets (see Hosea); Jager, Ueber das Zeitalter Obadia's, Titbingen, 1837; Caspari, Der Pr. Obadia, 1842; Delitzsch in Z. f. Luth. Th., 1851. A fuller list is given by Reuss, Gesch. des A.T. (1881), p. 449. (W. R. 8.)~~

~~OBAN, a seaport town and parliamentary burgh of the Western Highlands of Scotland, is situated in Argyllshire, 70¢ miles north-west of Callander by rail, and 96 from Glasgow. It lies along a deep and sheltered bay in the Firth of Lorn opposite the island of Kerrera, and its villas are scattered over the hill-slopes behind. The public build- ings comprise six churches, a court-house, four banks, a high school, and a large number of hotels. There are no manu- factures except the distilling of whisky ; but eleven fairs for cattle, sheep, horses, &c., are annually held in the town. A considerable trade is carried on in connexion with the fisheries, particularly in herrings. Oban is an important centre of the Highland tourist traffic. The rental of the burgh increased from £1719 in 1847 to £7160 in 1864, and upwards of £20,000 in 1882; and the population, which was only 1480 in 1831 and 2413 in 1871, reached 3991 in 1881, or, within the extended area, 4330.~~

A Renfrew trading company erected what was practically the first house in Oban in 1713; a custom-house was built in 1763; in 1786 the hamlet was made a Government fishing-station ; in 1791 a plan was drawn up for laying out a large village ; and in 1796 the Stevensons started a shipbuilding-yard, which remained in opera- tion for about thirty years. Made a burgh of barony in 1811, Oban became a parliamentary burgh in 1832, and adopted the Lindsay Act in 1862.

OBELISK. See ALExanprta, vol. i. p. 495; Arcut- TECTURE, vol. ii. p. 390; and Eeyprv, vol. vii. pp. 768, 778. The obelisk known as "Cleopatra's Needle," re- ferred to in vol. i. p. 495 as having been offered to the English Government by Mehemet Ali, but declined, has since been brought to London, and placed on the Thames Embankment in 1878. The other was conveyed to the United States and erected in Central Park, New York, in

1880.

OBERAMMERGAU, a small village in the mountain valley of the Ammer, in Upper Bavaria, lies 2760 feet above the sea, and about 45 miles to the south-west of Munich. In 1880 it contained 1349 inhabitants, who were mainly engaged in making toys and in carving cruci- fixes, images of saints, and rosaries. Many of the houses are adorned with quaint frescos of Biblical subjects. The interest of Oberaminergau to the outer world is derived from the Passion Plays which are performed here by the villagers at intervals of ten years (the last in 1880), and are now attended by many thousands of European and American visitors.

The Oberammergau Passion Play, or dramatic representation of the sufferings of Christ, is not a survival of a medieval mystery or miracle-play, but took its rise from a vow made by the inhabitants in 1638, with the hope of staying a plague then raging. The original text and arrangements were probably made by the monks of Ettal, a monastcry a little higher up the valley ; but they were carefully remodelled by the parish priest at the beginning of the present century, when the Oberammergau play obtained exemp- tion from the general suppression of such performances by the Bavarian Government. The music was composed by Rochus Dedler, schoolmaster of the parish in 1814. The performances take place on the Sundays of summer, in a large open-air theatre holding 6000 persons, and

each lasts about nine hours, with a short intermission at noon. Each scene from the history of Christ is prefaced by a tableau of typical import from the Old Testament. About 700 actors are required, all belonging to the village. The proceeds of the performances are devoted to the good of the com-

munity, after defrayal of the costs and payment of a small remu—

neration to the actors. The villagers regard the Passion Play as a solemn act of religions worship, and the performances are charac- terized by the greatest reverence. The principal parts are usually hereditary in certain families, and are assigned with regard to moral character as well as dramatic ability. It is considered a disgrace not to be allowed to take part in the play, and the part of Christ is looked upon as one of the greatest of earthly honours. In the years intervening. between the representations the villagers are carefully drilled in dramatic performances by their pastor, and most witnesses agree in rating very highly the results produced by the combined religious fervour and artistic instinct of these Alpine

peasants. It is to be feared, however, that the concourse of.

fashionable visitors who now flock to the performance will gradu- ally have the effect of impairing its genuineness and simplicity.

Edward Devrient (in 1850) was among the first to direct general attention to Oberammergau ; and numerous German monographs have since appeared on the same subject. A short notice of the play is also given by Hase, Das Geistliche Schauspiel (Hngl. tr. by A. W. Jackson, 1880). English accounts of the per- formances have been given by Blackburn (new ed., 1880), MacColl (reprinted from the Times, 1880), Molloy (1880), Oxenham (1880), and others. An English version of the text of the Passion Play has been published by E. Childe (1880). Articles on the subject have also appeared in the following magazines =—Cen- tury, 1883; Blackwood's, vol. evii.; Contemporary, vol. xviii.; Macmillan's, vol. ii.; Harper's, vols. xlii. and xliii.; Once a Week, vol. xxiii.

~~OBERHAUSEN, a Prussian town of recent origin, in the province of the Rhine, is situated 5 miles from the east bank of that river and 20 miles to the north of Diissel- dorf. Its importance is due to the fact of its being one of the busiest railway junctions in Germany, and to the ex- tensive coal-pits in the vicinity. The town also possesses iron-works, rolling-mills, zinc smelting-works, railway work- shops, and manufactures of wire-rope, glass, porcelain, and soap. The annual export of coals is estimated at about 700,000 tons. The first houses of Oberhausen were built in 1845, and it received its municipal charter in 1875. In 1880 it contained 16,680 inhabitants, of whom 12,079 were Roman Catholics.~~

~~OBERLIN, a village of the United States, in Russia township, Lorain county, Ohio, 35 miles west-south-west of Cleveland by the Lake Shore and Michigan Railway, has a population of 3242 (1880), and is well known as the seat of Oberlin College. This institution for liberal education, open to all irrespective of sex or colour, was founded in 1833 by the Rev. John J. Shipherd and Philo P. Stewart, and named in honour of J. F. Oberlin; by the year 1835 it comprised a theological seminary, a college proper, a ladies' department, and a preparatory school; and since then a conservatory of music has been added. In 1883 nine distinct buildings were occupied by the various sections ; the total number of teachers was 73, and of pupils 1474 (698 male, 776 female, 78 coloured), and the library contained 20,000 volumes.~~

~~OBERLIN, Jean Fripsric (1740-1826), pastor and philanthropist, was the son of a teacher, and was born 31st August 1740 at Strasburg, where he studied theology. In 1766 he became Protestant pastor of Waldbach, a remote and poverty-stricken region in the Steinthal (Ban de la Roche) in Alsace. At once he set himself to better the material equally with the spiritual condition of the inhabit- ants. He began by constructing roads through the valley and erecting bridges, inciting the peasantry to the enterprise by himself taking a mattock and commencing operations. His example proved equally effectual in introducing an improved system of agriculture, with the result that the sterile Waldbach soon "began to blossom as the rose." Substantial cottages were erected, various industrial arts were introduced, and activity and comfort began to prevail in homes formerly tenanted by listless and ignoble poverty. Regarding the intellectual~~

~~needs of his parishioners Oberlin was also keenly solicitous. He founded an itinerant library, originated infant schools—the first that have existed—and established an ordinary school at each of the five villages in the parish. In the work of education he received great assistance from Louise Scheppler, who lived in his house in the capacity of servant and housekeeper. By his unselfish~~

~~devotion to their interests Oberlin won so entirely the confidence of his parishioners that he was consulted in the most minute domestic affairs, and his word became the recognized unwritten law of the district. He died 1st June 1826, and was interred with great manifestations of honour and affection at the village of Fouday. Since his death the Steinthal has suffered no interruption to its prosperity. When he began his labours its inhabitants did not number more than 500 ; in the beginning of the century they had increased to about 3000; and now they are supposed to number about 6000.~~

~~Among the numerous narratives of the labours of Oberlin mention may be made of Sims, Brief Memorials of Oberlin, London, 1830 ; Memoirs of Oberlin, with a short notice of Lowisa Scheppler, London, 1838, 2d ed. 1852; H. Ware, Biography of Oberlin, Boston, 1845 ; Spach, Oberlin le pastewr, Strasburg, 1865, 2d ed. 1868 ; Riff, Dret Bilder wus dem Leben von Papa Oberlin, Strasburg, 1880; and Butler, Life of J. F. Oberlin, 1882. The collected writings of Oberlin were published by Burkhardt at Stuttgart in 1843, in 4 vols.~~

~~OBERLIN, Jirumie Jaques (1735-1806), archeologist, brother of Jean Frédéric Oberlin noticed above, was born at Strasburg 8th August 1735. While studying theology at the university he devoted special attention to Biblical archeology. In 1755 he was chosen professor at the gymnasium of his native town, in 1763 librarian to the university, in 1770 professor of rhetoric, and in 1782 of logic and metaphysics. Oberlin published several manuals on archeology and ancient geography, and made frequent excursions into different provinces of France to investigate antiquarian remains and study provincial dialects, the result appearing in Essai sur le patois Lorrain, 1775; Dissertations sur les Minnesingers, 1782-89 ; and Observa- tions concernant le patois et les mours des gens de la cam- pagne,~~

~~1791. He also published several editions of Latin authors. He died 10th October 1806.~~

~~OBERON (Auberon, Alberon), king of the fairies, husband of Titania, first appears in literature as protector of the hero in Huon de Bordeaux, a chanson de geste, dating from about the 12th century (see FRanc#, vol. ix. p. 638). The name corresponds to the German Alberich or Elferich (elf-king). The fairy element in the legend of Huon has been treated in modern times by Wieland in the poem, and by Weber in the opera, of Oberon ; and the story of the elf-king's quarrel with Titania, as every one knows, supplies an important motif in Shakespeare's Mrdsummer Night's Dream.~~

~~OBESITY. See CorPuLENce, vol. vi. p. 435.~~

~~OBI. See Srperta.~~

~~OBLIGATION, in law, is a term derived from the Roman law, in which obligatio signified a tie of law (wn- culum juris) whereby one person is bound to perform or forbear some act for another. The obligatio of Roman law arose either from voluntary acts or from circumstances to which legal consequences were annexed. In the former case it was said to arise ex contractu, from contract, in the latter quasi ex contractu, ex delicto, or quasi ex delicto,—that is to say, from tort, or from acts or omissions to which the law practically attached the same results as it did to contract or tort. Obligatio was used to denote either end of the legal chain that bound the parties, the right of the party who could compel fulfilment of the obligatio, the creditor, or the duty of the party who could be compelled to fulfilment, the debitor. In English law obligation has only the latter sense. Creditor and debtor have also lost their Roman law signification ; they have been narrowed to mean the parties where the obligation is the payment of a sum of money. In English law obligation is used in at least four senses—(1) any duty imposed by law; (2) the special duty created by a vinculum juris ; (3) not the duty, but the evidence of the duty,—that is to say, an instrument under seal, otherwise called a bond; (4) the~~

~~OB O—~~

operative part of a bond. The third use of the word is chiefly confined to the older writers. Simplex and duplex oblagatio were the old names for what are now more com- monly called a single and a double or conditional bond. The party bound is still called the obligor, the party in whose favour the bond is made the obligee. The fourth like the third, is a use scarcely found except in the older

writers. The word "bond" is of course a mere translation of obligatio. Obligations may be either perfect or im- perfect. A perfect obligation is one which is directly

enforceable by legal proceedings; an imperfect or moral obligation (the naturals obligatio of Roman law) is one in which the wnculum juris is In some respects incomplete, so that it cannot be directly enforced, though it is not entirely destitute of legal effect. A perfect obligation may become imperfect by lapse of time or other means, and, conversely, an imperfect obligation may under certain circumstances become perfect. Thus a debt may be barred by the Statute of Limitations and so cease to be enforceable. The obligation, however, remains, though imperfect, for if there be a subsequent acknowledgment by the debtor, the debt revives, and the imperfect obligation becomes again perfect. At one period there was some doubt among English lawyers whether a moral obligation could be regarded as sufficient consideration for a contract; it has now, however, been long decided that it cannot be so regarded.

The Scotch law as to obligations closely follows the Roman. As in English law, the term obligation is used to express the instru- ment itself by which the obligation is imposed. The bond or uni- lateral obligation of Scotch law is a simple coutract to pay the sum borrowed, &c., with interest. The English bond is generally a con- tract to pay double the sum of the debt, with a condition that the bond is to be void if the debt be paid by a certain day. In Scotch law gratuitous obligations rank in competition with the claims of creditors ; in English law a voluntary bond, though effectual against – the grantor, cannot be set up against creditors. Bonds in Scotland which are heritable securities still rank as immovables for certain purposes, though they have been made movables as regards the succession of the

creditor, unless executors are expressly excluded (31 and 32 Vict. c. 101, s. 117).

American law is in general agreement with English, except in the case of Louisiana, where the terms obligor and obligee are used in as wide a sense as the debitor and creditor of Roman Jaw. By art. 8522 of the Louisiana civil code obligor or debtor means the person who has engaged to perform some obligation, obligee or creditor the person in favour of whom some obligation is contracted, whether such obligation be to pay money or to do or not to do something. The term obligation is important in America from its use in art. i. s. 10 of the constitution of the United States, " No State shall pass any law. . . impairing the obligation of contracts." This does not affect the power of Congress to pass sucha law. Con- tracts between private individuals are of course within the provision. So. are private conveyances, charters of private corporations, and statutory and other grants by a State. On the other hand, marriage and divorce, and arrangements which are political in their nature, such as charters of municipal corporations, licences to carry on particular trades, or regulations of police, are not within the pro- vision. In order to fall within it, the law must act upon the terms of the agreement, and not merely upon the mode of pro- cedure. If it act not upon the terms but upon the remedy, it im- pairs the obligation if it purport to be retrospective, but it is valid so far as it applies to subsequent contracts.

OBOE, or Havutrsoy. The oboe is an instrument con- taining a conical column of air, which is set in vibration by means of a double-tongued reed. A series of holes pierced in the side of the pipe permits the instrumentalist to progressively shorten the column by the successive opening of the lateral holes, and thus produce a series of fundamental sounds, the scale of which, in the primitive instruments without keys, does not exceed the extent of an octave. All wind instruments with a conical column of air, whatever may be the mode by which that is set in inotion, are subject to the laws of vibration of open pipes, according to which, by a stronger pressure in blowing, the oboe reproduces each of its fundamental sounds in the octave higher, and thus acquires a scale of two octaves, which, partially chromatic in the old instruments, has be-

come completely chromatic by the adoption of keys. This extension of compass is further augmented in modern in- struments, in the grave sounds by keys permitting lengthen- ings of the primitive column of air, and in the acute by the employment of other partial sounds than the first of the harmonic series. In the present day the mean chro matic extent of the oboe is comprised between the notes

= and == be :

The double reed is the most simple, as it is probably the oldest, of all reed contrivances. It is sufficient to flatten the end of a wheat straw to constitute an apparatus cap- able of setting in vibration by the breath the column of air contained in the rudimentary tube; the invention of this reed is certainly due to chance. An apparatus for sonorous disturbance thus found, it was easy to improve it: for the wheat stalk a reed stalk was substituted, and in the extremity of its pipe another reed stalk much shorter in length was inserted, pared and flattened at the end; and then came the lateral holes, probably another discovery of the great inventor chance. For the reed tube a wooden one was substituted, still preserving the reed tongue, and it is in this form, after having played an im- portant part amongst the sonorous contrivances of antiquity, that we find the ancestor of the oboe playing a part no less important in the 16th century, in which it formed the interesting families of the cormornes, the corthols, and the cervelas. All these families have disappeared in the instru- mental combinations of Europe, but they are still to be found in Eastern wind instruments, such as the Caucasian salamourt, the Chinese kwantze, and the hitshiriki of Japan. It is important to remark that the column of air ina cylin- drical pipe, disturbed by any reed, submits to the laws of vibration of stopped pipes; accordingly, to produce a sound of a given pitch, the pipe must be theoretically half as short as an open pipe would be to obtain a note of the same pitch. Moreover, open pipes under an increasing pressure of blowing, produce, in subdividing the air column, the harmonics according to the arithmetical progression 2, 3, 4, 5, &c., while the stopped pipes can only produce the odd harmonics in the series. In other words, the conical pipe reproduces its fundamental sounds in the interval of the octave, the cylindrical in that of

the twelfth. A double reed associated with a cylindrical pipe can only be used for columns of air of small diameter. Practice has demonstrated that the reed stalk of which the tongue reed is made should not be of narrower internal diameter than the pipe containing the column of air it is to act upon. By the flattening necessary to form the tongues of a double reed, it must be tolerably large, from which it happens that its proper sound is relatively grave, and will only agree with instruments not above the region of the male voice. It must be remembered that the reproduction of fundamental sounds in the twelfth is only possible by an artifice of modern invention. But it is evident that chance has again intervened to show that a very small double reed can set in vibration columns of air of considerable diameter, provided that the column becomes gradually narrower towards its superior extremity where it receives the reed, so as to terminate in a diameter equivalent to that of the reed itself. It is impossible to say when it was that man first employed the phenomena of double reeds and conical pipes, but the knowledge of them must at least have been later than that of the cylindrical pipe, which we may regard as directly furnished by nature. That antiquity made use of them, however, has been proved by M. Gevaert in his admirable Histoire de la musique dans Vantiquité ; but this learned author shows that the double-reed pipes held but

an insignificant place in the instrumental music of ancient Greece and Rome.

The instrument we call oboe appears for the first time in Sebastian Virdung's Musica getutscht und auszgezogen (1511). It there bears the name of schalmey, and is already combined with an instrument of similar construction called bombardt. This beginning of the oboe family suggests the possibility of Virdung's schalmey having existed in the Middle Ages. Where, when, and how it was introduced into western Europe is at present unknown, but the zamr-al- kebir still used in Moslem countries is practically identical with it, a circumstance which suggests the possibility of its having been brought into Europe by the crusaders. —

~~The manufacture of musical instruments could not remain unaffected by the great artistic movement known as the Renaissance ; accordingly, we find them not only improved and purified in form in the 16th century, but also ranged in complete families from the soprano to the bass. Pree- torius, in his Syntagma Musicum (1615-20), gives us the full nomenclature of the family with which we are con- cerned, composed of the following individuals.~~

~~(1) The little schalmey, he says, rarely employed ; it measured about 17 inches in length, and had six lateral~~

~~holes. Its deepest note was 6] (2)~~

~~The discant schalmey (fig. 1), the primitive type of the modern oboe; its length was about 26~~

~~inches, and its deepest note == (8)~~

~~The alto pommer (fig. 2), 304 inches long, with~~

~~its deepest note S2— . (4) The tenor pommer (fig. 3), measuring about 4 feet 4 inches; besides the six lateral holes of the preced- 7 ing numbers there were four keys which gave the grave —~~

~~notes Sa (5) The bass pommer, hav- ing a length of nearly 6 feet, and six lateral holes and four keys which gave @: =~~

~~SS + + (6) The great double quint pommer, measuring about 9 feet 8 inches in length;~~

~~the four keys permitted the production of the notes~~

~~=a These be se 3 instruments, and. especially numbers (2), (3), (4), and (5), occupied an important place on the Continent in the in- strumental combinations of the last three centuries. The following illustration (fig. 4), borrowed from a picture,~~

~~Fia. 1 Fie. 2. BIG S:~~

painted in 1610 by Van ee ee aie ait r- : . - The discan e alto he tenor Alsloot, represents six musi Schalmey. Pessoa: Sater,

cians playing the following instruments indicated in the order of their position in the picture : a bass oboe, bent over and become the bassoon, an alto pommer, a cornet (German ‘“‘zinke”’), a discant schalmey, a second alto pommer, and a trombone.?

The 17th century brought no great changes in the con- struction of the four smaller instruments of the family.

1 This picture, belonging to the National Museum of Madrid, repre- sents a procession of all the religious orders in the city of Antwerp on the festival of the Virgin of the Rosary.

? For further details see Mahillon’s catalogue of the Musée du Con- servatoire royal de musique de Bruxelles.

O i

Of much extended use in France, they were there called “haulx bois,” or “haultbois,” to distinguish them from the two larger instruments which were designated by the

ALSLOOT: [616 –

words “gros bois.” Haultbois became hautbois in French, and oboe in English, German, and Italian; and this word is now used to distinguish the present smaller instrument of the family.

The little schalmey and tenor pommer seem to have dis- appeared in the 17th century; it is the discant schalmey and the alto pommer which by improvement have become two important elements in modern instrumentation. The oboe, as such, was employed for the first time in 1671, in the orchestra of the Paris opera in Pomone by Cam-

bert. The first two keys, ., date from the end of the 17th century. In 1727 Gerhard Hoffmann of Ras-

~~tenberg added the keys oa t=], A Parisian maker,~~

~~Delusse, furnished, at the end of the 18th century, much appreciated improvements in the boring of the instrument. The Méthode of Sellner, published at Vienna in 1825,~~

~~allows nine keys, = = , and~~

~~one which, when opened, established a loop or ventral seg- ment of- vibration in the column of air, facilitating the production of sounds in the octave higher. Triebert of Paris owes his great reputation to the numerous improve- ments he introduced in the construction of the oboe.~~

~~The alto pommer became but slowly transformed : it was Oboe di called in French "hautbois de chasse," in Italian 'oboe caccia.~~

~~di caccia." In the 18th century we find it more elegant in form, but with all the defects of the primitive instru- ment. The idea of bending the instrument into a half circular form to facilitate the handling is attributed to an oboist of Bergamo, one Jean Perlendis, who was estab- lished at Strasburg about 1760. The fact of the instru- ment's resembling a kind of hunting-horn used at that time in England probably gained for it the name of "corno~~

~~inglese," which it still retains ("cor anglais" in French). Cor The first employment of it in the orchestra is referred to anglais.~~

~~Gluck, who had two "cors anglais " in his Alceste, as played at Vienna in 1767. But it was not until 1808 that the cor anglais was first heard in the Paris opera; it was played by the oboist Vogt in Alexandre chez Apelle by Catel. The improvements in manufacture of this instrument closely followed those introduced in the oboe. The 18th century produced an intermediate oboe between (2) and (3), which was called "hautbois d'amour," and was frequently employed by J.S. Bach. It wasa third lower than the ordinary oboe, and fell into disuse after the death of the great German composer. It has been resuscitated by the firm of C.~~

~~Fagott.~~

Bassoon.

OBOE

Mahillon of Brussels, and reconstructed with the improve- ments of modern manufacture.

After the 16th century we find the instruments which were designated by the name of "' gros bois," the (5) and (6) of Pre- torius, transformed into shorter instruments, the fagott and contra- fagott ; so called because the column of air, the same as in the pommer, was formed of two conical tubes which communicated with the lower part of the instrument, and were pierced in a single piece of wood. It is probably owing to the aspect of this double pipe that the satirical name of fagot was given, preserved in Italian as fagotto, and in German as fagott. A canon of Ferrara named Afranio has been cited as the author of the transformation, about 1539, of the bass pommer, but Count Valdrighi, the curator of the Estense library,! and Wasielewski,? who has reproduced the draw- ing of Afranio's invention, deprive him of the merit of the innova- tion. The fagottino is transformed in the same fashion.

Sigismund Scheitzer of Nuremberg acquired a great reputation in the 16th century for making the " basson," a French word sub- stituted for the old fagot, and adopted in England as bassoon. His

instrument had only two keys, We cannot tell

when the bassoon gained its present form, but it was probably at the end of the 17th century. It was made in exactly the same style as the fagottino represented in fig. 5. It appeared for the first time

Fic, 5.

—The Fagottino, at the beginning of the 17th century.

in the orchestra with the oboe in Pomone (1671). It had three keys

*then, a The BD key rendering a lengthening bw **

of the instrument necessary, we may suppose it took its modern

form at that epoch. The fourth key, — —¦ j, dates from

1751. The bassoon appears with four keys in the HIneyclopédie of Diderot and D'Alembert (Paris, 1751-65). The number of keys increased by the beginning of the present century to eight, viz.,

ge, and two keys to facilitate the pro- ad duction of acute harmonics. It has since been improved by Almen- rider in Germany, Savari, and more recently Triebert and Goumas, Paris, and C. Mahillon, Brussels,

The reform in the construction of the flute due to Theobald Boehm of Munich about 1840, a reform which principally consisted in the rational division of the tube by the position of the lateral holes, prompted Triebert to try to adapt the innovation to the oboes and bassoons; but he failed, because the application of it denaturalized the timbre of the instruments, which it was necessary, before all things, to preserve. But his efforts did not remain sterile. In 1856 a French bandmaster, M. Sarrus, thought out the construc- tion of a family of brass instruments with conical tubes pierced at regular distances, which, diminishing the length of the air column, has rendered a series of fundamental sounds easy,—more equal and free in timbre than that of the oboe family. Gautrot of Paris realized tle inventor's idea, and, under the name of "sarrusophones,"

has created a complete family, from the sopranino in ED to the con-

trabass in B>, of which his firm preserves the monopoly.

In 1868 the firm of C. Mahillon, Brussels, produced a reed con- trabass of metal, destined to replace the old contrabassoon of wood, since much used in orchestras and military bands. The first idea of this instrument goes back to 1839, and is attributed to Schéll- nast and Son of Pressburg. It is a conical brass tube of very large proportions, with lateral holes placed as theory demands, in geo- metrical relation, with a diameter almost equal to the section of the tube at the point where the hole is cut. From this it results that for each sound one key only is required, and the seventeen keys give the player almost the facility ofa keyboard. The com-

~~pass written for this contrabass is comprised between 4~~

~~Ce £ and aa but sounds an octave lower.~~

~~1 Musurgiana, IJ phagotus @ Afranio. 2 Geschichte der Instrumentalmusik im 16en Jahrhundert.~~

~~707~~

~~We now turn to another kind of reed and its association with Clarinet,~~

~~two kinds of cylindrical and conical pipes,—the beating reed, which is formed of a single tongue, and engenders vibrations in the column of air to which it is applied by the contact of the tongue with the frame of a groove to which it is adapted. The beating reed,~~

~~; though not having the extreme antiquity of the double reed,~~

was used at a very early period, for we find it applied to the chalumeaus of ancient Egypt, still in use under the name of arghoul, to the Greek auloi, and the Roman tibiw.? The beating reed is a piece of reed growth, closed at the upper end by the natural knot, beneath which a tongue is partly detached by a longitudinal slit. We do not see the probable operation of chance so clearly here as in the double reed. It may have been the inconvenience resulting from the employment of double-tongued reeds of large dimensions to make cylindrical pipes of a certain diameter speak that urged the invention of a more commodious substitute. With double auloi it would have been almost im- possible to blow two double reeds at one time, while, on the contrary, it is easy to sound two pipes furnished with beating reeds introduced simultaneously into the player's mouth. Such as these are the actual Egyptian arghoul and zummédrah. It is in the beating reed and cylindrical tube, a combination bequeathed to us by remote antiquity, that we find the principle of one of the leading instruments of the modern orchestra, the clarinet or clarionet.

The European chalumeau of the Middle Ages, in English '"shawm," differed but little from the ancient Egyptian chalumeau: its tube was of wood, and the upper part of the tube communicated with the bore by an opening made laterally and longitudinally, on the edges of which the reed-tongue was bound by repeated turns of string. Neither in the Middle Ages nor in the 16th century do we find the chalumeau much employed. Pretorius, who in his Theatrum instrumentorum has given exact drawings of the instru- ments he knew, does not cite the chalumeau. But there exists in the fine collection of the Liceo Musicale at Bologna a double chalu- meau of wood covered with leather, the make of which takes it back to the 16th century. Drawings of this instrument occur in the Encyclopédie of Diderot and D'Alembert, and in the Muzykaal Kunstwoordenboek of J. Verschure-Reynvaan (Amsterdam, 1795). The chalumeau was pierced with eight holes and with two keys, and produced the folloving series of fundamental sounds —

0 12 8 4 5 6 7 8 key key

The present writer has had the good fortune to find quite re- cently two examples in the National Museum at Munich, and has been kindly

~~authorized by Herr von Hefner-Alteneck, director of the museum, to reproduce them for the museum of the conserva- toire at Brussels. For one of these see fig. 6. It is from this reproduction that he has been enabled to deterinine the exact nature of the improvement of the chalumeau, about 1690, by Christopher Denner of Nuremberg, an improvement which has gained for him the reputation of having invented the clarinet. Every clarinet player knows. that it is sufficient for one of the upper keys not to we close the hole for it to produce, instead of the fundamental sound, the interval of the twelfth above it,—in other words, the second partial. This phenomenon is easily explained: the communication between the external air and the upper part of the air-column in the instrument forms a ventral segment or loop of vibration and forces the column to divide, and, as a cylindrical pipe affected by a reed sounds harmonically after the manner of stopped pipes, the possible par- tial after the fundamental is naturally the second. 'This pheno- menon must have struck Denner, and have suggested to him the idea of obtaining the same result according to a regular manner and at the will of the executant. He arrived at it by raising a little the key governed by the thumb of the left hand, which~~

~~when opened conjointly with the A key produced the BD of the chalumeau. This change of position of the key did not hinder the production of the Bb, but doubled at one stroke the extent of compass of the instrument in giving it the following notes—~~

~~Fic. 6.—The Chalumeau.~~

~~eee eS Ss == This was Denner's in- 012 8 45 67 8&key~~

~~vention; he did not invent the clarinet, but he was the first to make use of the artifice already referred to which permits instru- ments of cylindrical bore to produce fundamental sounds and their twelfths.~~

~~3 FP. A. Gevaert, Histoire de la musique dans [antiquité.~~

~~Basset horn.~~

~~Clarinet d'amour~~

Saxo- phone.

708. O'BR—OBS

About the middle of last century the clarinet was lengthened

and a key was added, =| which filled the vacant space

oe between the two registers. Two new keys were also added,

| oe it is said, by Barthold Fritz of Brunswick (0d. io te

Fic. 7.—The Clarinet.

1766). The sixth key, = — c=] is attributed to the clarinetist

Lefebvre, Paris, about 1791. In 1810 Ivan Muller carried the num- ber of keys up to thirteen, in which state the instrument has come to us, and is the system most employed. It has been improved by the Belgian makers, Bachmann, the elder Sax, C. Mahillon, and Albert, who have collectively established the reputation of Belgian clarinets. In Paris, Lefebvre, Buffet-Crampon, and his successor Goumas—in London, Rudall, Bose, and Carte, justly own a high position among famous clarinet-makers. 'The firm of C. Mahillon, Brussels, have in-

vented the mechanism with double effect known by the name of OF key. Invented in 1862, itis now universally adopted. In 1842 the Parisian maker Buffet, advised by a professor named Klosé, adopted from Boehm's flute the invention of movable rings. HIs clarinet has consequently been ranked as of Boehm's system, although the lateral division of the tube does not follow that which that clever maker applied to his flute. The clarinet was first employed in a theatre in 1751, in the pastoral by Rameau entitled Acante et Céphise. The imperfections of the instrument at that time obliged them to be made in nearly every key. To avoid the burden of this the 18th-century players varied the key of their instruments by added joints. About the middle of the 18th century the clarinet was introduced in military music and by degrees sup- planted the oboe. The instruments used at first were in C and F. About 1815 they were replaced by the BD and Eb clarinets. Besides

~~*the high clarinets, the basset horn (Italian, corno di bas- setto) was soon known in Germany ; a clarinet in F with the grave*~~

~~*fifth of the one in C, it was made to descend easily to =*~~

~~*a with the help of supplementary keys, and to diminish the length of the tube it was bent back upon itself in the part nearest to the bell, —the curve being enclosed in a kind of box which concealed the artifice. The invention of the basset horn is attributed toa Bavarian maker at Passau, who was living about 1770, but whose name is now unknown. Obtaining the improvements given to it by Theodore Lotz of Pressburg in 1782, and Ivan Muller in 1812, and those of contemporary makers, the basset horn has become the*~~

~~*beautiful alto clarinet which is generally used in the key of Eb.*~~

~~*It would appear that the first idea of the bass clarinet emanated from Henri Greuser of Dresden, who made the first one in 1793. It was not used in the orchestra until 1836, when Meyerbeer made magnificent employment of it in the Huguenots.*~~

~~*The almost forgotten clarinet d'amour was made in G and F, the fourth and fifth below the clarinet in C. It differed from other clarinets in the bell, which, retracted in the lower part, affected ae pear-shaped contour that distinguishes the modern cor anglais.*~~

~~*A few words remain to be said about the combination of the beating reed with a conical tube, which goes no farther back than the beginning of this century. A fagottino in F, called " dolcino," was at that time used, the air-column of which was more decidedly*~~

~~*conical than that of the fagottino properly so called. The double reed was replaced in it by a beating reed attached to a mouthpiece like that of the clarinet but smaller. This instrument seems not to have had success. But the most important combination of beating reed and conical tube was accomplished in 1846 by Adolphe Sax, a Belgian established in Paris, who invented the family of saxophones. This instrument is a brass tube pierced to produce the following*~~

~~Oe Se~~

~~Poy S495 O- F S$ MO Ag 18, Ae aS In virtue of the principle previously explained, the saxophone 'foctaves," and, setting out from the fourth fundamental, each note can be reproduced in the next upper octave by the help of two keys successively employed, which, by opening, form a loop. Four more keys disposed at the upper end permit the production of~~

~~2 te 2 &~~

~~= which completes the compass of the saxo- phone. Four instruments of the saxophone family are now used, viz., the soprano in Bb, a major second below the note written ; the alto in ED, a fifth below the soprano ; the tenor in BD, an octave~~

~~below the soprano ; and the baritone in ED, an octave below the alto. These instruments fill an important place in the military music of France and Belgium. The brilliant success which Ambroise Thomas has achieved by using the beautiful tone of the alto saxo- phone in the ghost scene in Hamlet is well known. CV; M,): 2~~

~~O'BRIEN, Witt1am SmirH (1803-1864), the head of the 'Young Ireland" party, was born on 17th October 1803, and received his education at Harrow and at Cam- bridge. HIe entered parliament in 1826 as member for Ennis, and from 1835 to 1848 represented the county of Limerick. Although he spoke in 1828 in favour of Catholic emancipation, he for many years continued to differ on other points from the general policy of O'Connell. HIe, however, opposed the Irish Arms Act of 1843, and in January 1844 became an active member of the Repeal Association. Though he was destitute of oratorical gifts, his chivalrous devotion to the welfare of his country secured him enthusiastic attachment as a popular leader. In July 1846 he with the "Young Ireland" party left the Repeal Association, and in the beginning of 1847 he established the Irish Confederation. The French Revolution of 1848 stimulated his hopes of success, and incited him to more extreme efforts against the English rule. In May 1848 he was tried at Dublin for sedition, but the jury disagreed. In the following July he established a war directory, and attempted to make a rising among the peasantry of Ballin- garry, but although he was at first joined by a large~~

~~following the movement wanted cohesion, and the vacil- lating crowd dispersed as soon as news reached them of the approach of the dragoons. O'Brien was arrested at Thurles, tried, and sentenced to death. The sentence was commuted to transportation for life. In July 1854 he received his liberty on condition of never revisiting the United King- dom ; and in May 1856 he obtained a full pardon. Hence- forth he kept aloof from all political movements. In 1856 he published Principles of Government, or Meditations in Exile. He died at Bangor, North Wales, 18th June~~

~~1864~~,

~~OBSERVATORY~~

~~P to a comparatively recent date an "observatory" was a place exclusively devoted to the taking of astronomical observations, although frequently a rough account of the weather was kept. When the progress of terrestrial magnetism and meteorology began to make regular observations necessary, the duty of taking these was often thrown on astronomical observatories, although in some cases separate institutions were created for the purpose. Of late years, as the work to be done in astro-~~

~~nomical observatories is increasing, there seems to be a general tendency to have the magnetical and meteoro- logical observations taken in separate establishments ; but, as the exclusively magnetical or meteorological observa- tories now existing are generally very small institutions and of recent creation, the astronomical observatories will be chiefly considered in this article.~~

~~Up to about 300 B.c. it can scarcely be said that an observatory existed anywhere, as the crude observations~~

~~Or SHR VY ATO RY~~

~~of the heavens then taken were only made by individuals and at intervals, employing the simplest possible appara- tuses. But, when philosophical speculation had exhausted its resources, and an accumulation of facts was found to be necessary before the knowledge of the construction of the universe could advance farther, the first observatory was founded at~~

Alexandria, and continued in activity for about four hundred years, or until the middle or end of the 2d century of the Christian era. It was here that Hipparchus, the founder of modern astronomy, by repeat- ing observations made by his predecessors, discovered the precession of the equinoxes, and investigated with consi- derable success the motions of the sun, moon, and planets. His work was continued by more or less distinguished astronomers, until Ptolemy (in the 2d century 4.p.) gave the astronomy of Alexandria its final development. When science again began to be cultivated after the dark ages which followed, we find several observatories founded by Arabian princes; first one at Baghdad (and possibly one at Damascus), built by the caliph Al-Mamun early in the 9th century, then one on the Mokattam near Cairo, built for Ibn Yunis by the caliph Hakim (about 1000 s.p.), where the Hakimite tables of the sun, moon, and planets were constructed. The Mongol khans followed the ex- ample; thus arose the splendid observatory at Merdgha in the north-west of Persia, founded about 1260 a.p. by Hulagu Khan, where Nasir al-din Tusi constructed the Ilohkhanic tables; and in the 15th century the observa- tory at Samarkand was founded by Ulug Begh, and served not only in the construction of new planetary tables but also in the formation of a new catalogue of stars.

With the commencement of scientific studies in Europe in the 15th century the necessity of astronomical ob- servations became at once felt, as they afforded the only hope of improving the theory of the motions of the celestial bodies. Although astronomy was taught in all univer- sities, the taking of observations was for two hundred years left to private individuals. The first observatory in Europe was erected at Nuremberg in 1472 by a wealthy citizen, Bernhard Walther, who for some years enjoyed the co-operation of the celebrated astronomer Regiomontanus. At this observatory, where the work was continued till the founder's death in 1504, many new methods of observing were invented, so that the revival of practical astronomy may be dated from its foundation. The two celebrated observatories of the 16th century, Tycho Brahe's on the Danish island of Huen (in activity from 1576 to 1597) and that of Landgrave William IV. at Cassel (1561-97), made a complete revolution in the art of observing. While the credit of having vastly improved the astronomical in- struments perhaps should be divided equally between Tycho Brahe and the landgrave's astronomer Biirgi, the former may claim the honour of having been the first

to see the necessity of carrying on for a number of years an extensive and carefully-planned series of observations with various instruments, worked by himself and a staff of assistants. In this respect his observatory (Uraniburgum) resembles our modern larger institutions more closely than do many observatories of much more recent date. The mighty impulse which Tycho Brahe gave to practical astro- nomy at last installed this science at the universities, among which those of Leyden and Copenhagen were the first to found observatories. We still find a large private observa- tory in the middle of the 17th century, that of Johannes Hevelius at Dantzic, but the foundation of the royal observatories at Paris and Greenwich and of numerous university observatories shows how rapidly the importance of observations had become recognized by governments and public bodies, and it is not until within the last hundred years that the development of various new branches of

astronomy has enabled private observers to compete with public institutions.

The instruments employed in observatories have of course changed considerably during the last two hundred years. When the first royal observatories were founded, the principal instruments were the mural quadrant for measuring meridian zenith distances of stars, and the sextant for measuring distances of stars inter se, with a view of determining their difference of right ascension by a simple calculation. These instruments were intro- duced by Tycho Brahe, but were subsequently much im- proved by the addition of telescopes and micrometers. When the law of gravitation was discovered it became necessary to test the correctness of the theoretical con-

clusions drawn from it as to the motions within the solar

system, and this necessarily added to the importance of observations. By degrees, as theory progressed, it made greater demands for the accuracy of observations, and accordingly the instruments had to be improved. The transit instrument superseded the sextant and offered the advantage of furnishing the difference of right ascension directly ; the clocks and

~~chronometers were greatly im- proved ; and lastly astronomers began early in the 19th century to treat their instruments, not as faultless appara- tuses but as imperfect ones, whose errors of construction had to be detected, studied, and taken into account before the results of observations could be used to test the theory. This century has also witnessed the combination of the transit instrument and the mural quadrant or circle in one instrument,—the transit or meridian circle.~~

~~While the necessity of following the sun, moon, and planets as regularly as possible increased the daily work of observatories, other branches of astronomy were opened and demanded other observations. Hitherto observations of the "fixed stars" had been supposed to be of little importance beyond fixing points of comparison for obser- vations of the movable bodies. But when many of the fixed stars were found to be endowed with "proper motion," it became necessary to include them among the objects of constant attention, and in their turn the hitherto totally neglected telescopic stars had to be observed with precision, when they were required as comparison stars for comets or minor planets. Thus the field of work for meridian instru- ments became very considerably enlarged.~~

~~In addition to this, the increase of optical power of tele- scopes revealed hitherto unknown objects—double stars and nebulze—and brought the study of the physical con- stitution of the heavenly bodies within the range of obser- vatory work. Researches connected with these matters were, however, for a number of years cliiefly left to amateur observers, and it is only within the last fifty years that many public observatories have taken up this kind of work. The application of spectrum analysis, photo- graphy, photometry, &c., in astronomy has still more increased the number and variety of observations to be made, so that it has now become necessary for most observatories to devote themselves to one or two special fields of work.~~

~~It would be difficult to arrange the existing observatories into classes either according to the work pursued in them or their organization, as the work in many cases at different times has been directed to different objects, while the organization depends mostly on national and local circum- stances. As already alluded to above, one of the principal characteristics of the larger~~

observatories of the present day is the distribution of the work among a number of assistants under the general superintendence of a director. This applies principally to the great observatories, where the sun, moon, planets, and a limited number of fixed stars are without interruption being observed, but even among

these institutions hardly two are conducted on the same principles. Thus in Greenwich the instruments and ob- servations are all treated according to strict rules laid down by the astronomer-royal, while in Washington or Pulkowa each astronomer has to a certain extent his choice as to the treatment of the instrument and arrangement of the observations. The same is the case with the smaller institutions, in most of which these arrangements vary very much with change of personnel.

The way in which the results of observations are pub- lished depends principally on the size of the institutions. The larger observatories issue their " Annals " or " Observa- tions " as separate periodically-published volumes, while the smaller ones chiefly depend on scientific journals to lay their results before the public, naturally less fully as to details. Among these journals the principal are :—Berliner Astronomisches Jahrbuch (for the years 1776 to 1829), Monatliche Correspondenz (edited by Von Zach, 28 vols., 1800-13), Astronomische Nachrichten (founded 1821; 107 vols. in 4to, still appearing with two vols. per annum), Memoirs of the Royal Astronomical Society (47 vols. 4to, from 1822), and Monthly Notices of the Royal Astronomical Society (44 vols. 8vo, from 1827).

Subjoined is a catalogue of public and private observa- tories now in activity or which have existed within the last hundred years.

Great BRITAIN AND IRELAND.

A. Public Observatories.

Greenwich, royal observatory, lat. + 51° 28' 38"°4. Founded in 1675 for the promotion of astronomy and navigation. The observations have therefore from the first been principally intended to determine the positions

of standard stars, the sun and planets, and above all to follow the motion of the moon with as little interruption as possible, both on and outside the meridian. Since 1873 spectro- scopic observations and a daily photographic record of sun-spots have been taken. The observatory is under the direction of the astronomer-royal ; and from the time of its first astronomer, F'lam- steed, the institution has always maintained its place in the fore- most rank of observatories. Thus the observations of Bradley (0d. 1762) form the foundation of modern stellar astronomy ; but it was especially during the directorship of Airy (1835-81) that the observa- tory rose to its present high state of efficiency. There are now a chief assistant, eight assistants, and a staff of computers employed. The principal instruments now in use are :—a meridian circle by Simms (and Ransomes and May as engineers), erected in 1850, having a circle of 6-feet diameter and a telescope of 8-inches aperture ; a large chronograph (1854) ; an altazimuth by Simms and Ransomes and May, for observations of the moon, erected in 1847, with 3- feet circles and 4-inch telescope ; an equatorial refractor by the same makers (O.G. 12°8 inches, by Merz), mounted in the " English" manner with long polar axis, chiefly used for spectroscopic work ; photoheliograph by Dallmeyer of 4-inches aperture, smaller equatorials, clocks, &c. The standard '"'motor clock" is the centre of a system of electrically-controlled clocks scattered over many provincial towns in the three kingdoms. The magnetical and meteorological department was founded in 1888 ; it contains a complete set of instruments giving continuous photographic records of magnetic declination, horizontal and vertical force, barometric pressure, dry and wet bulb thermometers, &c. The Observations are published with all details from 1750, beginning with 1836 in annual bulky 4to volumes; special results—e.g., five Star Catalogues, Neduetions of Lunar and Planetary Observations—are published in separate volumes.

Oxford, Radcliffe Observatory, lat. + 51° 45' 36-0, long. 025™ 25-6 W. Founded in 1771 by the Radcliffe trustees at the instance of Pro- fessor Hornsby. Observations were regularly made, but none were published until Manuel J. Johnson was appointed Radcliffe observer in 1839, when systematic observations were commenced with an 8-feet transit instrument by Bird (1773) and a 6-feet mural circle by Jones (1836). Johnson was succeeded in 1860 by Rev. R. Main, who died in 1878, and was followed in

~~1879 by E. J. Stone. Helio- meter (74 inch) by Repsold (1849) ; meridian circle by Troughton and Simms, mounted in 1861, formerly belonging to Mr Carrington, self-recording meteorological instruments. The staff now consists of three assistants. Besides the annual 8vo volumes of Observations (from 1840), two catalogues of respectively 6317 and 2386 stars, chiefly circumpolar (1860 and 1870) have been published.~~

~~Oxford, university observatory, lat. + 51° 45’ 342, long. 0h5™ 0s4W. Finished in 1875; is under the Savilian professor of astronomy ;~~

~~CBSE RVaA POR F~~

~~there are two assistants. 124-inch equatorial refractor by Grubb, and a 13-inch reflector made and presented by Mr De La Rue. The former is used for micrometer work (chiefly on clusters of stars) and photometric observations ; the latter for taking lunar photo- graphs, by means of which the director, Professor Pritchard, has investigated the libration of the moon. No. 1 of Astronomical Observations (8vo) was published in 1878.~~

~~Cambridge, lat. + 52° 12’ 51”°6, long. 02 Om 228°8 E. Founded by the’university senate in 1820. Directors: G. 3B. Airy, 1828 to 1835; J. Challis, to 1861; J. C. Adams. Chiefly devoted to meridian work,—up to 1870 with a 5-inch transit by Dollond and a mural circle by Jones; a new meridian circle by Simms, of 8-inches aperture and 8-feet circles, was then erected, and is being used for determining the places of all the stars down to 9°0 mag. between + 25° and + 380° decl. The “Northumberland equatorial” was mounted in the “ English” fashion in 1838; the object-glass by Cauchoix is of 114-inches-aperture and 19-feet focal length. The Observations from 1828 to 1865 are published in 21 4to volumes.~~

~~Durham, lat. + 54° 46’ 6-2, long. 02 6™ 198-8 W. Founded in 1841, principally by private subscription; is under the direction of the professor of mathematics and astronomy in the university. There is a small meridian circle by Simms, and an equatorial refractor by Fraunhofer of 64-inches aperture, with which minor planets, comets, and double stars have been observed. The results from the years 1846-52 have been published in 2 8vo volumes.~~

Liverpool (Bidston near Birkenhead), lat. + 58° 24' 4", long. Oh 12m 178-2 W. Founded in 1838 by the municipal council ; transferred in 1856 to the Docks and Harbour Board ; moved to Birkenhead in 1867. Specially intended for testing the rates of chronometers under different temperatures. Transit instrument by Troughton and Simms, and an 8-inch equatorial by Merz.

Kew (Richmond), lat. + 51° 28' 6", long. 02 1™ 1581 W. The central meteorological observatory of the United Kingdom, with self-registering meteorological and magnetical instruments. Estab- lished in 1842 under the auspices of the British Association, after- wards transferred to the Royal Society. A photoheliograph was employed at Mr De La Rue's expense to take daily sun-pictures from 1863 to 1872.

Edinburgh, voyal observatory, lat. + 55° 57' 2372, long. 0b 12m 438-0 W. Founded in 1811 by subscription ; the building on the Calton Hill erected in 1818. In 1834 the founders handed over the administration to the Government, and in 1846 the owner- ship was similarly transferred. Since 1834 the observatory has been under the direction of the astronomer-royal for Scotland, who is also professor of practical astronomy in the university ; there are two assistants. Professor T. Henderson (1833 to 1845) commenced extensive meridian observations of fixed stars, since continued by his successor, C. Piazzi Smyth. The mural circle of 6-feet diameter and 8-feet transit are now out of date. A reflector of 2-feet aperture by Grubb (silver on glass) was erected in 1872, but, has never been

uite finished nor come into use. Observations with deep-soil thermometers have been carried on since 1837, and delicate spectro- scopic investigations made by the present astronomer, partly abroad. Observations and results have been published in 14 4to volumes,

Glasgow, lat. + 55° 52' 42"°8, long. 0b 17™ 108°6 W. Organ- ized in 1840 by subscription, aided by subsidies from the university and the state ; is under the professor of astronomy. Meridian circle by Ertel with 42-inch circles, and telescope of 6-inches aper- ture ; equatorial of 9-inches aperture. A catalogue of 6415 stars from meridian observations made since 1860 was published in 1883 by the present director, R. Grant. The

~~observatory was (1868-83) one of the seven first-class meteorological stations.~~

~~Dublin, situated about 4 miles north-west of Dublin at Dunsink, lat. + 58° 23' 13"°0, long. 0b 25™ 218 W. Belongs to the univer- sity ; erected in 1785; is under the direction of the " Andrews professor of astronomy and royal astronomer of Ireland." There is one assistant. In 1808 a reversible meridian circle by Ramsden and Berge of 8-feet diameter was put up, with which Brinkley observed assiduously till 1827, though of his results those relating to stellar parallax were affected by certain instrumental errors which rendered them of novalue. Sir W. R. Hamilton (1827-65) devoted himself exclusively to mathematics. In 1868 was crected an equatorial refractor, object-glass of 11$-inches aperture by Cauchoix (formerly belonging to and given by Sir J. South), which has been used by Briinnow and his successor R. S. Ball (since 1874) for researches on stellar parallax. A meridian circle by Pistor and Martins of 6°4-inches aperture was mounted in 1873 and a large chronograph in 1882; they are used for observing stars possessing special interest (red stars, stars with proper motion, &c.). Astro- nomical Observations and Researches made at Dunsink, parts 1-5, 4to, 1870-84.~~

~~Armagh, lat. + 54° 21' 12°7, long. 02 26™ 358-5 W. Founded and endowed by Archbishop Robinson in 1791. Possessed very few instruments until the observatory was enlarged by Archbishop Lord John Beresford in 1827, when a mural circle and a transit by Jones were provided, with which T. R. Robinson (director from 1823 to 1882) observed the stars contained in the catalogue of 5345~~

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~~stars published in 1859. With the mural circle, to which had been added a 7-inch telescope by T. Grubb (in 1862), about 3000 stars have been observed since 1864, and these are now (1884) ready for press. There is also a 15-inch reflector. Armagh was (1868-83) one of the seven first-class meteorological observatories.~~

~~Cork, observatory of Queen's College, lat. + 51° 58' 30", long. 0b 33m 58s W. Erected in 1878 at the expense of Mr Crawford of Cork ; 8-inch~~

~~refractor, 4-inch siderostat and transit circle, by Grubb. Managed by the professor of natural philosophy.~~

~~B. Private Observatories now existing.~~

~~Mr J. G. Barclay's observatory, Leyton, Essex, lat. + 51° 34' 34", long. 02 0™ 08-9 W. In activity since 1862 ; 10-inch refractor by Cooke; chiefly devoted to double stars ; small transit circle. Four parts of Observations have been published (4to, 1863-77).~~

~~Mr A. A. Common's observatory, Ealing, London, W. Silvered- glass reficctor of 36-inches aperture (mirror by Calver, mounting by the owner), erected in 1879; chiefly used for celestial photo- graphy. Also 18-inch silvered-glass reflector erected in 1876.~~

~~Colonel Cooper's observatory, Markree Castle, Sligo, lreland, lat. 54° 10' 31"°8, long. Oh 33m 484 W. Founded by the late E. J. Cooper, who in 1834 erected an equatorial refractor of 13°3-inches aperture (glass by Cauchoix). In addition to numerous other observations this instrument was from 1848 to 1856 used for determining the approximate places of 60,000 stars near the ecliptic (Markree Catalogue, 4 vols. 8vo, 1852-56). The obser- vatory was restored in 1874, and the refractor has since been used for double-star observations. Therc is also a transit circle by Ertel.~~

~~Earl of Crawford's observatory, Dun Eclit, Aberdeenshire, lat. + 57° 9' 36", long. 02 9m 40s W. Founded in 1872; is one of the best-equipped observatories existing; has 15-inch equatorial refractor by Grubb, large chronograph (driven by same clock as the refractor), 12-inch silvered reflector by Browning, two 6-inch and several smaller refractors, meridian circle by Simms similar to the one at Cambridge, numerous spectroscopes and minor in- struments, also a large library, and a collection of physical instru- ments. Cometary and spectroscopic observations and reduction of the observations made by the Venus expedition to Mauritius in 1874 have hitherto principally occupied the staff. Three 4to volumes of Publications and very frequent Dun Eeht Circulars, distributing news of discoveries (chiefly relating to comets), have been issued.~~

~~*Mr E. Crossley's observatory, Bermerside, Halifax, Yorkshire. Equatorial refractor by Cooke of 9°3-inches aperture, crected in 1871, chiefly used for observations of double stars.*~~

~~*Dr W. Huggins's observatory, Upper Tulsc Hill, London, lat. +51° 26' 47", long. 02 0™ 278-7 W. Founded in 1856; furnished with an 8-inch refractor (glass by Clark, mounting by Cooke). In 1870 was erected an equatorial mounting which could carry either a 15-inch refractor or a Cassegrain reflector of 18-inches aperture, both made by Grubb for the Royal Society ; mounting improved in 1882 to carry both instruments simultaneously. With these Dr Huggins has made his well-known spectroscopic observations and photographs of stellar spectra, the solar corona, &c., the results being published from time to time in the Philosophical Trans- actions.*~~

~~*Mr G. Knott's observatory, Cuckfield, Sussex (from 1860 to 1873 at Woodcroft, lat. + 51° 0' 41", long. 0h 0™ 34s W., sinee then at 'Knowles Lodge, Cuckfield). 7°3-inch refractor by Clark, used for observing double stars and variable stars,*~~

~~*Mr kh. S. Newall's observatory, Gateshead, Newcastle-on-Tyne. A refractor of 25-inches aperture by Cooke was mounted in 1870, but appears to have been little used.*~~

~~*Earl of Rosse's observatory, Birr Castle, King's county, Ireland, lat. + 58° 5' 47", long. 0b 31™ 408-9 W. In 1839 the late carl made and mounted a reficctor of 3-feet aperture (remounted as equatorial in 1876), and in 1845 he completed the celebrated reflector of 6-feet aperture and 54-feet focal length. These instruments, particularly the latter, were used from 1848 to 1878 for observations of nebule, and revealed many new features in these bodies ; results published in the Phil. Trans. for 1844, 1850, 1861, 1868, and collected systema- tically in the Z'rans. Roy. Dubl. Soe., 1879-80. Experiments were made by the present earl to determine the amount of heat radiated from the moon (Phil. T'rans., 1873).*~~

~~*Rugby School (Temple Observatory). Founded in 1872 in memory of the bishop of Exeter ; with 84-inch equatorial refractor by Clark, used for observations of double stars and of stellar spectra.*~~

Stonyhurst College observatory, Lancashire, lat. + 58° 50’ 40”, long. 0 9™ 528-7 W. An 8-inch equatorial refractor by Troughton and Simms, mounted in 1867, used for spectroscopic and micrometric observations; a complete set of self-recording magnetic instruments. From 1868 to 1888 the observatory was one of the seven first-class meteorological stations. ;

Colonel Tomline’s observatory, at Orwell Park, Ipswich, lat. + 52°0' 33”, long. 0b 4™ 558-8 E. Founded in 1874; hasa 10-inch refractor by Merz, used for observations of comcts.

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Owing to the limited space at our disposal we are obliged to pass over several smaller private observatories,

C. Private Observatories now discontinued.

Mr Bishop’s observatory, South Villa, Regent’s Park, London, lat. + 51° 31’ 29”°9, long. 02 0™ 378-1 W. In activity from 1836 to 1861, then removed to Twickenham, and discontinued in 1874 ; has a 7-inch refractor by Dollond, with which Mr Hind discovered ten minor plariets and several comets, and constructed maps of stars near the ecliptic.

Mr R. C. Carrington’s observatory, Redhill, lat. + 51° 14’ 25”3, long. 02 0™ 4183 W. Lstablished in 1854; hasa 44-inch refractor, and transit circle of 5-inch aperture (now at Radcliffe Observa- tory). With the latter a catalogue of the positions of 3735 stars within 9° of the pole, with the former regular observations of sun- spots, were made from 1853 to 1861.

Rev. W. R. Dawes’s observatory, first at Ormskirk (1830-39), lat. + 53° 34’ 18”, long. 0b 11™ 368 W. ; afterwards at Cranbrook, Kent (1844-50), lat. + 51° 6’ 31’, long. 02 2™ 108-8 E. ; then at Wateringbury, near Maidstone, lat. + 51° 15’ 12”, long. 02 1™ 395°8 E., till 1857 ; and finally at Hopefield, Haddenham, lat. + 51° 45’ 54”, long. 0 3™ 438-4 W., till Mr Dawes’s death in 1868. Possessed at first only small instruments, then successively a 6-inch refractor by Merz, a 74-inch and an 8}-inch refractor by Clark, and an 8-inch refractor by Cooke, with all of which a great many

~~*measures of double stars were made, which were published in the Afemoirs of the Royal Astronomical Society.*~~

~~*Mr De La Rue's observatory,Cranford, Middlesex, lat. + 51°28' 578, long. 08 1™ 378-5 W. Established in 1857; with 13-inch reflector, de- voted to solar and lunar photography. The Kew photoheliograph was employed here from 1858 to 1863 to take daily photographs of the sun, The reflector was presented to the Oxford observatory in 1874.*~~

~~*Mr Isaae Fletcher's observatory, Tarnbank, Cumberland, lat. + 54° 39' 13"°7, long. 0h 18m 448-5 W. Established in 1847; in 1859 a 93-inch refractor by Cooke was mounted and used for observing double stars.*~~

~~*Mr Groombridge's observatory, Blackheath, lat. + 51° 28' 2"°7, long. 02 0™ 08-6 EK. In 1806 Mr Groombridge obtained a new transit circle of 4-feet diameter by Troughton, with which he up to 1816 observed stars within 50° of the pole. The resulting catalogue of 4243 stars was published in 1838.*~~

~~*Sir William and Sir John Hersehel's observatory at Slough near Windsor, lat. + 51° 30' 20', long. 0b 2m 24s W. William Herschel settled at Datchet in 1782, and at Slough in 1786, and erected several 20-feet reflectors (of 18-inches aperture), and in 1789 his 40-feet reflector of 4-feet aperture. The latter was comparatively little used (two satellites of Saturn were discovered with it), while the former served to discover about 2500 nebule and clusters, 800 double stars, and two satellites.of Uranus, as also to make the innumerable other observations which have made the name of Herschel so celebrated. Sir J. Herschel used a 20-feet reficctor at Slough from 1825 to 1833, and from 1834 to 1838 at the Cape of Good Hope, to examine the nebule and double stars of the whole of the visible heavens, discovering 2100 new nebule and 5500 new double stars.*~~

~~*fev. T. J. Hussey's observatory, Hayes, Kent, lat. + 51° 22' 38", long. 02 0™ 38-6 E. In activity from about 1825 for about twelve years ; 63-inch refractor by Fraunhofer, used for making one of the star maps published by the Berlin Academy, also small transit circle by Simms.*~~

~~Mr Lassell's observatory, from about 1820 to 1861 at Starfield near Liverpool, lat. + 58° 25' 28', long. 0b 11™ 38-7 W.; contained reflectors of 9 and 24 inches aperture; employed for observations of the satellites of Saturn, Uranus, and Neptune, and of nebule. The 2-feet reflector was used at Malta in 1852-58, and a 4-feet reflector was mounted in 1861, also at Malta, and used till 1864 for observa- tions of satellites and nebule. The eighth satellite of Saturn, the two inner satellites of Uranus, and the satellite of Neptune were discovered at Starfield by Mr Lassell.~~

~~Dr Lee's observatory, Hartwell, Bucks, lat. + 51° 48' 36", long. 0b 3m 248-3 W. In 1836 Dr Lee came into possession of Captain Smyth's 6-inch refractor, and mounted it at Hartwell House, where it continued to be occasionally employed for double-star observa- tions and other work up to about 1864.~~

~~Captain Smyth's observatory, Bedford, lat. + 52° 8' 27'-6, long. ob 1m 5250 W. In 1830 Captain (afterwards Admiral) Smyth erected a 6-inch refractor by Tulley, and observed the double stars and nebuls contained in his " Bedford Catalogue" (1844), forming vol. ii. of his Cyele of Celestial Objects.~~

~~Sir James South's observatory, from 1816 to 1824 at Blackman Street, Southwark, long. 02 0™ 218-8 W. Here South took transit observations of the sun, and he and J. Herschel measured double stars, in 1821-23. In 1826 South erected an observatory at Camp- den Hill, Kensington, lat. + 51° 30' 12", long. 0h 0™ 468:8 W., and procured a 12-inch objcct-glass from Cauchoix. As Troughton, however, failed to make a satisfactory mounting, the glass was~~

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~~never used until after it had been presented to Dublin university in 1862.~~

~~Lord Wrottesley's observatory, from 1829 to 1841 at Blackheath, lat. + 51° 28' 2", long. 02 0m 28-7 E., where a catalogue of the right ascensions of 1818 stars was formed from observations with a transit instrument by Jones. In 1842 a new observatory was built at Wrottesley Hall, lat. + 52° 37' 2'°3, long. Ob 8m 538°6 W., where the transit and a 73-inch refractor~~

~~by Dollond were mounted. Observations were here made of double stars, and for testing J. Herschel's method of finding the annual parallax of stars.~~

~~FRANCE.~~

~~Paris, national observatory, lat. + 48° 50' 11"-8, long. 02 9™ 208°9 E. Founded in 1667, when the construction of a large and monu- mental building was commenced by the architect Perrault. J. D. Cassini's observations made the institution for some time the most celebrated observatory existing, but later the activity declined, although several eminent men, as Bouvard and Arago, have held the post of director. Since 1854, when Leverrier assumed the directorship, the observations have been conducted with more regu- larity, and, together with a number of most important theoretical works, published in the Annals (35 volumes of Observations, 16 of Memoirs). The observations are now chiefly taken in order to re- determine the positions of Lalande's 50,000 stars. The principal instruments now in use are:—a meridian circle by Secretan and Kichens, with an object-glass of 9°5-inches aperture and 12-feet focal length, another by Eichens (given by M. Bischoffsheim) of 7°5-inches aperture and 7-feet focal length, a 15-inch equatorial refractor by Lerebours and Briinner, a 12-inch equatorial refractor by Secretan and Eichens, two refractors of 9°5-inches aperture, &c. A refractor of 29-inches aperture by Martin is being mounted. A silvered glass reflector of 4-feet aperture was mounted in 1875, but has never been used. Thc meteorological bureau was after Leverrier's death (1877) separated from the observatory.~~

~~In addition to this national observatory there were during the latter half of last century several minor observatories in Paris, which only lasted for some years. Among these were the observa- tory at Collége Mazarin, lat. + 48° 51' 29", where Lacaille observed from 1746 to 1750, and from 1754 to 1762, and the observatory at the Keole Militaire, lat. + 48° 51' 5", built in 1768 and furnished with an 8-feet mural quadrant by Bird, with which D'Agelet observed telescopic stars (1782-85), and which was afterwards (1789- 1801), under Lalande's direction, employed for observing more than 50,000 stars, published in the Histoire Céleste (1801).~~

~~Meudon, close to Paris. Founded in 1875; devoted to physical astronomy, and especially to celestial photography, under the direc- tion of J. Janssen.~~

Montsouris, situated in the Montsouris Park, south of Paris, lat. + 48° 49' 18", long. 0h 9m 205-7 E. Founded in 1875 for the train- ing of naval officers.

Lyons, old observatory in lat. 45° 45' 46", long. 02 19™ 18° E., at the Jesuit college. A new observatory was erected in 1877 at St Génis-Laval, at some distance from the city. 'Transit circle by Eichens (2-feet circles, 6-inch O.G.), 6-inch refractor by Briinner.

Marseilles, lat. 43° 18' 19-1, long. 0 21™ 348-8 E. Originally belonging to the Jesuits, taken over by the ministry of the navy in 1749. It was here that Pons made his numerous discoveries of comets. A new building was erected in 1869; 94-inch equatorial refractor, reflector of 32-inches aperture and 16-feet focal length. The present director, Stephan, has discovered and micrometrically measured several hundred very faint nebulz.

Toulouse, lat. 43° 36' 477-0, long. 02 5™ 518-0 E, Erected in 1840 (Darquier had observed at the Lyceum towards the end of last century); restored a few years ago, when an equatorial refractor by Briinner was procured.

Nice, founded and endowed by M. Bischoffsheim for the Bureau de Longitude (1880), situated at Mont Gros, north-east of Nice. Is being furnished with first-class instruments, among which are a refractor of 80-inches aperture by Henry Brothers (mounting by Kichens), a meridian circle by Briinner of 8-inches aperture, and large spectroscopes, &c.

GERMANY.

Altona, lat. + 58° 32' 45"°8, long. 02 39™ 468°1 E. Founded in

1823 by the Danish Government to assist in the geodetic operations |

in Holstein. A meridian circle by Reichenbach (of 4-inches aper- ture and 3-feet circle) and several theodolites were procured, to which, in 1858, was added a 44-inch equatorial by Repsold. The observatory is best known by the fact that the Astronomische Nachrichten, the principal astronomical

~~journal, was published here from 1821 (by Schumacher up to 1850, by Peters from 1854). The observatory was moved to Kiel in 1872.~~

~~Berlin, royal observatory, lat. + 52° 30' 16"°7, long. 08 53™ 345-9 E. Was erected in 1705 as part of the building of the Academy of Sciences (lat. + 52° 31' 12"°5, long. 0b 58™ 35s E.), a very unsuit- able locality. After the death of Bode in 1826, who had founded the Astronomisches Jahrbuch (from 1776), a new observatory was built in the southern part of the city under the direction of Encke,~~

~~finished in 1835. With the observatory is now connected a com- puting office, where the Jahrbuch is edited. The instruments now in use are:—an equatorial refractor by Utzschneider and Fraun- hofer, of 9-inches aperture and 14-feet focal length (with which Neptune was found in 1846 in the place indicated by Leverrier ; used at present for observations of minor planets), a meridian circle by Pistor and Martins of 4-inches aperture (lately used by Auwers to observe stars between + 15° and +25° decl.), another by the same makers of 7-inches aperture, now used to observe stars between +25° and +30° decl.~~

~~Bonn, university observatory, lat. + 50° 43' 4570, long. Oh 28m 2383 BE. Finished in 1845 (a temporary observatory had been used by Argelander from 1841 to observe stars from + 45° to + 80° decl.) ; meridian circle by Pistor of 44-inches aperture, helio- meter by Merz of 6-inches aperture. The former was used by Argelander for observing stars between — 15° and — 31° decl., aud afterwards for determining 33,000 places of stars in the northern heavens. The observatory is chiefly known by the zone observa- tions, made from 1852 to 1859 with a small comet-seeker, on which Argelander's great atlas of 324,198 stars between the North Pole and —2° decl. is founded; many other investigations on proper motions, variable stars, &., were also made by Argelander. The zone work is now being continued with a 6-inch refractor from —2° to —81° decl. by the present director, Schonfeld, who had already, with Kriiger, assisted Argelander in the northern zones. With the meridian circle stars between +40° and +50° decl. are now being observed. A new meridian circle of 6-inches aperture by Repsold has recently been mounted. Seven 4to volumes of Observations have been published.~~

~~Bothkamp, Herr von Biilow's observatory, lat. 54° 12' 96, long. Qh 40m 308°8 E. Situated a few miles from Kiel, founded in 1870, the principal instrument being an equatorial refractor of 11-inches aperture by Schréder, with spectroscopic and photographic appli- ances, with which Dr Vogel obtained valuable results from 1871-74, published in three 4to parts of Beobachtwngen. The observations have only quite recently been recommenced.~~

~~Bremen. Inthe third story of his house in Sandstrasse, Olbers (died 1840) had his observatory, lat. 58° 4' 38", long. 02 85m 10s E. ; though the principal instrument was only a 33-inch refractor by Dollond, many comets and the planets Pallas and Vesta were dis- covered and observed here.~~

~~Breslau, lat. + 51° 6' 56"“1, long. 1» 8™ 98-1 E. In a small and unsuitable locality, where a few small instruments are placed.~~

~~Dresden, Baron von Engelhardt's observatory, lat. + 51° 2' 16"°8, long. 0b 54™ 5488 E. A 12-inch equatorial refractor by Grubb (mounted 1880), used for observations of comets and double stars.~~

~~Diisseldorf (Bilk, originally a suburb, now part of the city),~~

~~lat. + 51° 12' 25", long. 0 27™ 58°5 E. Founded and endowed by~~

~~Professor Benzenberg (died 1846); best known by the discovery of twenty-one minor planets by R. Luther ; the principal instrument is a 44-inch refractor.~~

~~Gotha. In 1791 an observatory was founded by Duke Ernest II. at Seeberg, lat. + 50° 56' 5"-2, long. 0h 42™ 5588 E., on a hill a few miles from Gotha, the chief instrument being a large transit instru- ment by Ramsden. 'Through the labours, principally theoretical, of the successive directors, Zach, Lindenau, Encke, and Hansen, the institution ranked with the first observatories, but the distance from Gotha and the decay of the buildings made it necessary to build a new observatory at Gotha in 1857, lat. + 50° 56' 37°, long. 0h 42™ 5085 E. This observatory received the instruments. from Seeberg, including a small transit circle by Ertel (made in 1824), also a new equatorial by Repsold of 43-inches aperture.~~

~~Géttingen, university observatory, lat. + 51° 31’ 477-9, long. 0b 39m 468-5 E. An observatory had existed here during the 18th century, where Tobias Mayer worked. In 1811 a new building was constructed. Besides his mathematical works, Gauss found time to engage in important geodetic and maguetic observations. In 1867-69 a catalogue of stars between the equator and — 2° decl. was made by Copeland and Borgen. The principal instruments. are a meridian circle by Repsold (44-inches aperture), another by Reichenbach (44-inches), several refractors from 3 to 5 inches aper- ture, &c.~~

~~Hamburg, lat. + 58° 38’ 7-0, long. 02 89™ 588-7 EK. Built in the year 1825. With a meridian circle of 4-inches aperture by Repsold, C. Riimker observed the places of 12,000 stars. An equa- torial refractor of 10-inches aperture was mounted in 1868, used for observations of star-clusters, comets, and minor planets.~~

~~Kiel, royal observatory, lat. + 54° 20’ 29”°7, long. Oh 40™ 358°8 E. Contains the instruments removed from Altona in 1872, also an 8-inch refractor by Steinheil. The office of the Astronomische~~

~~Nachrichten has been here since 1872.~~

~~Kénigsberg, university observatory, lat. + 54° 42’ 50-6, long. 1h 21 588-9 E, Built 1813; Bessel was the director till his death in 1846, and nearly’all his celebrated investigations were carried out here, c.g., observations of fundamental stars, zone observations of stars from —15° to +45° decl., researches on refraction, helio- nietric observations, by which the annual parallax of the star 61~~

~~OBSERVATORY~~

~~Cygni was first determined, &c., published in the first 21 volumes of the Beobachtungen auf der k. Sternwarte zu Kénigsberg. The instruments are a meridian circle by Reichenbach and Ertel, of 4-inches aperture (mounted 1819), another of the same dimensions by Repsold (1841), a 6-inch heliometer by Utzschneider (1829), &c.~~

Leipsie, university observatory lat. + 51° 20’ 2075, long. Ob 49m 308-2 E. Erected 1787-90 on the “Pleissenburg” ; possessed only small instruments, the largest being a 44-inch refractor by Fraunhofer (1830) with which from 1848 D’Arrest observed minor planets, comets, and nebule. In 1861 a new observatory was erected under the direction of Bruhns, lat. + 51° 20’ 6”°3, long. oh 49m 348-0 E., with a refractor of 84-inches aperture by Steinheil and a meridian circle by Pistor and Martins of 6°3-inches aperture mounted. The former is used for observing double stars, nebulz, and comets, the latter for observing stars between +5° and +15° decl. In 1881 Dr Engelmann mounted an 8-inch equatorial re- fractor by Clark and Repsold in a small private observatory close to the university observatory.

Lilienthal, near Bremen, lat. + 58° 8’ 25’, long. 04 36™ 1s E, J. H. Schréter’s private observatory ; from 1779 to 1813. Con- tained a number of reflectors by Herschel and Schrader, the largest being of 27-feet focal length and 20-inches aperture (movable round the eye-piece), used for physical observations, chiefly of planets. Destroyed during the war in 1818; the instruments (which had been bought by the Government in 1800) were, for the greater part, sent to the Gottingen observatory.

Mannheim, lat. + 49° 29’ 10:9, long. 02 33" 508-5 E. Built in 1772; except C. Mayer’s observations of distant companions to bright stars, very few observations were published until the observa- tory was restored in 1860, when a 6-iuch refractor by Steinheil was procured, with which Schénfeld determined the positions of 500 nebule. In 1879 the observatory was moved to Karlsruhe.

Munich, at Bogenhausen, royal observatory, lat. + 48° 8’ 457°5, long. 02 46m 265-1 E. Founded in 1809; a meridian circle by Reichenbach was mounted in 1824, an 11-inch equatorial refractor by Fraunhofer in 1835. The former was used from 1840 for zone observations (about 80,000) of telescopic stars, the resulting 34,000 places of which were published in six catalogues; the latter was for some years used by Lamont for observing satellites and nebule. Afterwards Lamont chiefly devoted his attention to terrestrial inagnetism.*

Potsdam, lat. + 52° 22’ 56”, long. 02 52m 178 E. “ Astrophysical observatory,” founded in 1874, devoted to spectroscopic, photo- graphic,

~~and other physical observations. An equatorial refractor by Schroder of 11}-inches aperture, another by Grubb of 8-inches aperture, spectroscopes, photometers, &c. Results are published in 4to volumes,~~

~~Spires, observatory of the lyceum, lat. + 49° 18' 56', long. Oh 33m 45s°5 i.., established in 1827. With a meridian circle by Ertel, Schwerd observed in 1827-29 the positions of circumpolar stars. Discontinued many years ago.~~

~~Strasburg, university observatory, lat. + 48° 34' 597-7, long. 0h 31™ 45-7. Finished in 1881 (observations made in a temporary observatory from 1872) ; an 18-inch equatorial refractor by Merz; altazimuth of 5}-inches aperture, meridian circle of 64-inclies aper- ture, and a 63-inch orbit sweeper, all by Repsold.~~

~~Wilhelmshafen (Prussia), naval observatory, lat. + 58° 31' 52:2, long. 0 32™ 358-2 E.; situated on the Jahde to the north of Olden- burg. Founded in 1874; meridian circle by Repsold of 44-inches aperture, and meteorological, magnetical, and tide-registering instruments,~~

~~AUSTRIA-HUNGARY.~~

~~Vienna, imperial and royal observatory, lat. + 48° 12' 355, long. 1h 6m 318:7 E. On the university building an observatory was founded in 1756. Owing to the unsuitable locality and the want of instruments, very few observations of value were taken until the observatory was rebuilt in 1826, when some better instruments were procured, especially a meridian circle of 4-inches aperture, and a 6-inch refractor by Fraunhofer (mounted in 1832), used for observations of planets and comets. The Annalen commenced to appear in 1821; besides observations made at Vienna, they have contained Piazzi's original observations and Oeltzen's catalogue of stars between + - 45° and + 80° decl. from Argelander's observa- tions. From 1874 to 1879 a large and magnificent building (with four domes, the central one being 45 feet in diameter) was erected at Wiahring, north-west of the city, lat. + 48° 13' 557-4, long. 1h 5m 218-5 E. In addition to the old instruments, two equatorial refractors were erected, one by Clark of 113-inches aperture, another by Grubb of 27-inches aperture (mounted 1882),~~

~~Vienna (Josephstadt), private observatory of Th. von Oppolzer, lat. + 48° 12’ 53”°8, long. 1) 5™ 258-3 E. Established in 1865 ; 5-inch refractor by Merz, 4-inch meridian circle. ;~~

~~Prague, university observatory, lat. + 50° 5’ 18-8, long. 0h 57m 418-4 KE. Founded in 1751 at the Collegium Clementinum, on a high tower. Very few astronomical observations have been taken here; at present only magnetic and meteorological work is~~

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~~attended to, asa 6-inch refractor by Steinheil and a 4-inch meridian circle cannot be mounted for want of a proper locality.~~

~~Senftenberg (in the east of Bohemia), lat. + 50° 5’ 55”, long. 1h 5m 51s EK. Baron von Senftenberg’s observatory ; established in 1844. Observations of comets and planets made with small instruments till the owner’s death (1858).~~

~~Olmiitz, lat. + 49° 35’ 40”, long. 189m 08 E. Herr von Unkrechts- berg’s observatory ; 5-inch refractor by Merz. Julius Schmidt observed planets and comets from 1852 to 1858.~~

~~Kremsmiinster (Upper Austria), lat. + 48° 37 23”°8, long. Ob 56™ 328:2 E. Founded in 1748 at the gymnasium of the Bene- dictines. 3-inch meridian circle (mounted in 1827), used for observ- ing minor planets; 54-inch refractor (mounted in 1856), used for comets and minor planets.~~

~~Pola (sea-coast, Austria), naval observatory, lat. + 44° 51’ 49”, long. Oh 55m 238-5 E. Founded in 1871; meridian circle of 6-inches aperture by Simms, 6-inch refractor by Steinheil, mag- netic and meteorological instruments. Twenty-eight minor planets were discovered here from 1874 to 1880 by J. Palisa.~~

~~Cracow, university observatory, lat. + 50° 3/ 50” 0, 15 19m 515-1 FE. Possesses only small instruments.~~

~~Budapest (Ofen), royal observatory. Founded 1777 ; a new build- ing was erected in 1818, and new instruments (a 6-inch refractor by Fraunhofer and a meridian circle by Reichenbach) provided, with which comets and planets were observed. N othing has been heard of this observatory for the last fifty years.~~

~~O'Gyalla (near Komorn, Hungary), lat. +47° 52' 43-4, long. 1h 12m 458-6 KE, Nicolas de Konkoly's observatory. Established in 1871, rebuilt and enlarged in 1876, devoted to spectroscopy and physical astronomy generally ; there is a large workshop attached. A 10-inch silvered glass reflector by Browning was in use up to 1881, when it was disposed of and a 10-inch equatorial refractor (O.G. by Merz) mounted in its place; also a 6-inch refractor by Merz, and many spectroscopes and minor instruments. Results are published in 4to volumes.~~

~~Kaloeza (south of Budapest), lat. + 46° 31', long. 1» 15m + Ff, Observatory of the Jesuit college, founded in 1878 by Cardinal Haynald ; 7-inch refractor by Merz.~~

~~Herény (Vas, Hungary), lat. + 47° 16' 37", long. 1) 6m 248-7 I, K. and A. von Gothard's observatory. Founded in 1881; 10-inch reflector by Browning.~~

~~long.~~

~~SWITZERLAND.~~

~~Zurich, lat. + 47° 22' 40-0, long. 04 34m 128°6 E. An observa- tory existed since 1759 ; handed over to the Polytechnic School in 1855 ; new building erected in 1868. A 6-inch refractor by Merz and Kern, two transit instruments, &c. Sun-spots are regularly observed, but the institution is chiefly devoted to educational purposes.~~

~~Neuehdtel, lat. + 46° 59' 51"°0, long. 0b 27™ 508-2 E. Erected in 1858 ; meridian circle of 4}-inches aperture by Ertel.~~

~~Geneva, lat. + 46° 11' 58"'8, long. 0b 24™ 368°8 E. Founded in 1773 ; a new building erected in 1830. The observatory has been the centre of the~~

~~*important geodetic operations carried on in Switzer- land since 1861. A 10-inch refractor (O.G. by Merz) was presented by the director Plantamour in 1880.*~~

~~*SPAIN AND PORTUGAL.*~~

~~*Aludrid, royal observatory, lat. + 40°24'29"°7, long, 0b 14m 458-4 W. Observations are made of comets, sun-spots, &c., with an equatorial by Merz.*~~

~~*Cadiz, naval observatory, at San Fernando, lat. + 86° 27' 41°, long. 02 24m 498-6 W. Founded in 1797. ;*~~

~~*Lusbon, royal observatory, lat. + 38° 42' 31"°3, long. 0h 36™ 448-7 W. A large refractor was mounted in 1863.*~~

~~*Coimbra, university observatory, lat. + 40° 12' 25':8, long. 0h 33m 3455 W. Founded 1792. An astronomical ephemeris has been published from 1804.*~~

~~*Treny.*~~

~~*Turin, university observatory, lat. + 45° 4'6", long. 0b 30™ 488°4 FE. Founded in 1790 by the Acadeiny of Science ; rebuilt in 1820 on a tower of the Palazzo Madama, where a meridian circle by Reichen- bach of 4-inches aperture was mounted ; handed over to the uni- versity in 18665.*~~

~~*Milan, originally observatory of Brera College, now royal observatory of Brera, lat. + 45° 27' 59"-2, long. 0b 36m 468-1 E. Founded in 1763. The publication of an annual ephemeris from 1775 to 1875 and important theoretical works absorbed most of the time of the directors Oriani and Carlini, and the instruments were rather insufficient. In 1875 an 8-inch refractor by Merz was mouuted, with which Schiaparelli has made valuable observations of Mars. An 18-inch refractor has been ordered from Merz.*~~

~~*Padua, university observatory, lat. + 45° 24' 275, long. Ob 47m 298-0 E. Founded in 1761. In 1837 a meridian circle by Starke of 4-inches aperture*~~

was mounted, with which stars from Bessel's zones were re-observed ; the results were published in five

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catalogues. A 44-inch refractor by Merz and Starke (1858) has served to observe comets, spectra of solar prominences, &c.

G@allarate, near Lago Maggiore, from 1860 to 1879, Baron Dembowski's observatory. From 1852 to 1859 Baron Dembowski had observed double stars at Naples with a 5-inch dialyte by Plossl, and a small transit circle by Starke. From 1860 he used a 7 -inch refractor by Merz. :

Modena, university observatory, lat. + 44° 38' 52"°8, long. oh 43m 4958 FE, Founded in 1819. There is a meridian circle by Reichenbach, but very little astronomical work has been done.

Bologna, university observatory, lat. + 44° 29' 47°70, long. Oh 45m 948-5 KE. Founded in 1724 on a tower of the university building. Ephemerides were published from 1715 to 1836, but observations have only been made occasionally. A 3inch meri dian circle was mounted in 1846. :

Florence. In 1774 a muscum of science and natural history was established, part of which was used as an observatory, lat. + 48° 46' 4-1, long. Oh 45m 18°5 E. Very few observations were made; only Donati's discoveries of six comets and his early observa- tions of star-spectra deserve to be noticed. A new observatory was finished in 1872 at Arcetri, but is very badly built, so that two fine refractors by Amici of 11- and 94-inches aperture (the niountings unfinished) can only find limited application.

Rome, observatory of the Roman College, lat. + 41° 53' 63) OU long. 0b 49m 548-7 EF, Established in 1787. Little was done until De Vico became director in 1838, when numerous observations of satellites, comets, &c., were commenced with a 63-inch refractor by Cauchoix. In 1853 a new observatory was erected on the unfinished piles of the church of St Ignatius, and furnished with a 9-inch refractor by Merz, a meridian circle by Ertel of

33-inches aperture (in use from 1842), a 38-inch refractor for observing sun-spots, &c. With these instruments, to which were later added powerful spec- troscopes, Secchi has made a great many observations, chiefly relating to spectrum analysis and physical astronomy.

Rome, observatory of the Capitol, lat. + 41° 53' 33"°6. Estab- lished in 1848; belongs to the university ; small transit circle and a 43-inch refractor by Merz. The latter is used by Respighi for observations of solar prominences.

Naples, royal observatory, situated at Capo di Monte, lat. +40° 51' 45'°4, long. 0b 57™ 08:9 E. Erected in 1812-19 (an observ- atory commenced in 1790 at the Royal Museum had been left un- finished) ; furnished with a number of instruments, among which a 4-inch meridian circle and two repeating circles by Reichenbach, a 64-inch equatorial by Reichenbach and Fraunhofer, &c. Very little was done until De Gasparis entered the observatory, where he has discovered nine minor planets and made other observations, partly with a 6-inch Merz refractor.

Palermo, royal observatory, lat. +88° 6' 44", long. 0 53™ 258-0 E. Erected in 1790 on a tower of the royal palace. 'The principal in- struments were a reversible vertical circle by Ramsden of 5-feet dia- meter, with a 3-inch telescope, and a transit instrument of 3-inches aperture. With these Piazzi observed the stars contained in his celebrated Catalogue of 7641 Stars (1814); this work led him to the discovery of the first minor planet, Ceres, on 1st January 1801. The activity was revived in 1857, when a meridian circle by Pistor and Martins of 5-inches aperture was mounted and a 93-inch re- fractor ordered from Merz. The latter has been used by Tacchini for spectroscopic work, chiefly on the sun.

Etna. Jn 1879-80 an observatory was built at the "Casa deg!' Inglesi," 9650 feet above the sea. During the summer months a 12-inch object-glass by Merz is to be used here for solar observa- tions, while there is to be a duplicate mounting for it at Catania for use during the winter.

: GREECE.

Athens, lat. + 37° 58’ 20”, long. 15 34™ 558:‘7 E. Commenced in 1845 ; founded by Baron Sina. There isa refractor of 64-inches aperture, which has been used by Julius Schmidt (died 1884) for observations of the physical appearance of the moon, planets, and comets.

RvssIiA.

St Petersburg, observatory of the Academy of Sciences, lat. + 59° 56’ 29”°7, long. 24 1m 138-5 K. Founded in 1725, restored in 1803 ; meridian circle by Ertel and other instruments. A small university observatory was founded in 1880.

Pulkowa, Nicholas Central Observatory, lat. + 59° 46’ 187:7 long. 2% 1 185-7 E. Finished in 1839. ‘Was under the direction of F. G. W. Struve till 1861, since then of his son O. Struve ; the staff consists now of the director, four astronomers, four assistants, two computers, anda secretary. The principal instruments are:—a transit instrument by Ertel of 6-inches aperture and 84-feet focal length ; a vertical circle by Ertel of 6-inches aperture and 64-feet focal length (the circle of 34-fect diameter has been redivided by Repsold),—these two instruments have been used for determining standard places of stars for the epochs 1845 and 1865; a meridian circle by Repsold (6-inches aperture, 4-fcet circles), used since 1841 to observe all stars north of—15° decl. down to the 6th mag., and

all others observed by Bradley ; a prime vertical transit by Rep- sold with 64-inches aperture, used for determining the coustant of aberration ; a 74-inch heliometer by Merz, which has been very little used ; an equatorial refractor by Merz of 22-feet focal length and 14‘9-inches aperture (remounted by Repsold in 1880), which has been used incessantly by O. Struve since 1841 to observe double stars. A 30-inch refractor is now in process of construction, the object-glass being made by Clark, the mounting by Repsold. In addition to numerous memoirs and papers by the various astro- nomers, published by the Academy of St Petersburg, the Pulkowa Observations are published in large 4to volumes (10 vols. published up to 1883).

Abo (Finland), university observatory, lat. + 60° 26’ 56”’‘8, long. 1h g9m gs-3 E. Founded in 1819. With the meridian circle by Reichenbach of 4-

~~inches aperture, Argclander observed the 560 stars (chiefly stars with proper motion) contained in the Abo catalogue. In consequence of a great fire in 1827 the university and observatory were moved to Helsingfors.~~

~~Helsingfors (Finland), university observatory, lat. + 60° 9' 43"°3, long. 1539™ 498-2 E. Erected in 1832-35 ; furnished with a 63-inch refractor and the instrnments from Abo, including a transit instru- ment by Fraunhofer of 54-inches aperture. With the last-named instrument, furnished with a divided arc, Kriiger has observed the stars between + 55° and + 65° decl.~~

~~Dorpat, university observatory, lat. + 58° 22' 47"°1, long. 1» 46m 5386 EK. Founded in 1808; from 1814 under the direc- tion of F. G. W. Struve. With a meridian circle by Reichenbach observations were made from 1822 to 1843 of 2874 stars, chiefly double stars (Struve's Positiones mediw, 1852), while the 93-inch refractor by Fraunhofer was used from 1824 to 1837 for measuring double stars (AMensure mierometriex, 1837, also Catalogus novus stel- larum dupliciwm, 1827). Dorpat was also the centre of important geodetic works. Midler, who succeeded Struve in 1840, continued the observations of double stars. The meridian circle has been used since 1870 for observations of stars between + 70° and + 75° decl.~~

~~Vilna, lat. + 54° 41' 0", long. 12 41™ 1189 EK. Founded in 1753. From time to time observations of planets have been made with a 6-inch refractor (Merz, 1845) and minor instruments. Of late years the observatory has been devoted to astronomical physics ; a photo- heliograph was in operation from 1869 to 1876.~~

~~Warsaw, university observatory, lat. + 52° 13' 57, long. 1h24m7s-4E, Erected in 1820-24 ; meridian circle by Reichenbach, 6-inch refractor by Merz.~~

~~Plonsk (Poland), Dr Jedrzejewicz's observatory, lat. + 52° 37'38"'8, long. 1» 22m 4s EK, Established in 1875; a 63-inch refractor by Steinheil is being used for observations of double stars.~~

~~Moseow, university observatory, lat. + 55° 45' 19":8, long. 9h 30m 178'0 E, An observatory was built in 1825-32; the present building was erected~~

~~about 1850. There is a 10°7-inch refractor by Merz (used for observations of planets and comets and spectroscopic observations of the sun), a meridian circle by Repsold of 5°3-inches aperture, &c. The Annals, published since 1874, contain many researches on the nature of comets by the director, Bredichin.~~

~~Kasan, university observatory, lat. + 55° 47’ 247-2, long. 3h 16m 288-9 E. Founded in 1814, restored in 1842; 10-inch re- fractor by Merz, meridian circle by Repsold.~~

~~Kharkoff, lat. + 50° 0’ 10”°2, long. 25 24m 548-7 E.~~

~~Kieff,university observatory, lat. + 50° 27’11“‘1, long, 24 2™ 08°6 I. Erected in the years 1840-45; has a 9-inch refractor, a meridian circle, and smaller instruments.~~

~~Odessa, university observatory, lat. + 46° 28’ 367°2, long. gh 3m 9s-4 E. Recently established ; 5-inch refractor by Steinheil.~~

~~Nikolaief’, naval observatory, lat. + 46° 58’ 20°, long. gh 7m 548°] E, Erected in 1824; meridian circle by Ertel with 4-inches aperture, 94-inch refractor by Repsold.~~

~~Tiflis, Founded in 1863 to assist the geodetic operations in the Caucasian provinces.~~

~~Swepgen, Norway, AND DENMARK.~~

~~Stockholm, lat. + 59° 20’ 33”°2, long. 12 12™ 1480 E., is under the Academy of Sciences. Founded in 1750; is best known by Wargentin’s observations of Jupiter’s satellites, carried on for many years, Meridian circle by Ertel of 43-inches aperture, 7 inch equa torial refractor by Repsold ; the latter is now being employed by Gyldén for researches on the annual parallax of bright stars.~~

~~Upsala, university observatory, lat. + 59° 51’ 31“‘5, long. 1h 10™ 308-6 E. Founded in 1730, but very little was done until the observatory acquired~~

~~a 9-inch refractor by Steinheil, which has been used by the present director, Schultz, for micrometric observa- tions of 500 nebule.~~

~~Lund, university observatory, lat. + 55° 41' 52"0, long. Oh 52m 458-0 E. Built in 1866 (an observatory had existed since about 1760, but only with very small instruments) ; 94-inch equa- torial refractor, object-glass by Merz, used for observations of double stars and minor planets ; meridian circle by Repsold of 6}-inches aperture, used for observing stars between + 35° and + 40° decl.~~

~~Christiania, university observatory, lat. + 59° 54' 4877, long.~~

~~Oph y ATOR ¥~~

~~Oh 42m 5386 KE. Erected in 1831; meridian circle by Ertel of 4-inches aperture, now used to observe stars between + 65° and + 70° decl.; a 43-inch equatorial by Repsold, and a 7-inch re- fractor by Merz; magnetical instruments (which were extensively used by the first director, Hansteen).~~

~~Copenhagen, university observatory, lat. 55° 40' 58"-0, long. 0b 50™ 198°8 K. Founded in 1641 on the top of a high tower ; the locality was so very unsuitable that Romer (the inventor of the transit instrument and modern equatorial, died 1710) established his own observatory at Vridlosemagle, at some distance from the city. The observatory on the tower was burned in 1728, restored in 1741 and 1780. A new observatory was erected in 1861, lat. +55° 41' 18"°6, long. 02 50m 198-2 EK. It is furnished with an equa- torial refractor by Merz of 11-inches aperture, with which D' Arrest made observations of 1900 nebule ; a meridian circle by Pistor and Martins of 44-inches aperture, with which Schjelerup observed 10,000 stars between +15° and — 15° deck. ; and a meridian transit instrument of 64-inches aperture, intended for zone observations of very faint stars.~~

~~HoLuANpD AND BELGIUM.~~

~~Leyden, university observatory, lat. + 52° 9' 20', long. 0h17™ 568-2 E. Founded already in 1682, but the instruments were always very small, and hardly any observations were taken until Kaiser became director in 1837. A 6-inch refractor by Merz was now provided, and in 1858-60 a new~~

~~*observatory was erected, and furnished with a 7-inch refractor by Merz and a meridian circle by Pistor and Martins of 6°8-inches aperture. These instruments have since been in constant use, the refractor for measures with a double- image micrometer, the meridian circle principally for observations of stars between + 30° and + 85° decl., and of southern standard stars. There is a large collection of minor instruments and appa- ratuses for special researches. Annalen der Sternwarte in Leyden appear in 4to volnines.*~~

~~*Utrecht, university observatory, lat. + 52° 5' 10°°5, long. Oh 20™ 318'7 KE. Seems to have existed already during the 18th century ; a new building was erected in 1855, but there are only small instruments, except a 10-inch object-glass by Steinheil on Ganss's plan, which seems to be a failure.*~~

~~*Lrussels, royal observatory, lat. + 50° 51' 107, long. 0h 172856 EK. Erected in 1829-34. A transit instrament by Gam bey and a mural circle by Troughton have been used for observations of stars having proper motion, but the institution was while under the direction of Quetelet chiefly devoted to physics and meteorology. In 1877 a 6-inch refractor by Merz was mounted, and a meridian circle by Repsold and a 15-inch refractor by Cooke have been inounted in a temporary manner, pending the erection of a new observatory at some distance from the city. The Annales de U Observatoire de Bruxelles (28 vols. 4to) contain, besides the obser- vations, many investigations on special subjects.*~~

~~*UNITED STATES.*~~

~~*Albany (New York), Dudley Observatory, lat. + 42° 39' 497°5, long. 45 54m 598-2 W. Erected in 1851-56 by subscription ; equa- torial refractor by Fitz of 13-inches aperture, meridian circle by Pistor and Martins of 8-inches aperture, now used for observing stars between + 1° and + 5° decl., transit instrument of 6°4-inches aper- ture by the same makers.*~~

~~*Allegheny (Pennsylvania), lat. + 40° 27'41"°6, long. 5220 28-9 W. Founded in 1860 in connexion with the university; 13-inch equatorial refractor by Fitz (improved by Clark), mounted in 1867 ; several spectroscopes and other instruments for researches on solar energy.*~~

Tevet (Massachusetts), lat. + 42° 22’157°6, long. 4850™ 78-3 W. Founded in 1857 as an annex to the college; 7}-inch refractor by Clark.

Annapolis (Maryland), lat. + 38° 58’ 53”°5, long. 52 5™ 5685 W. U.S. Naval Academy observatory, used for instruction only ; 4-inch meridian circle by Repsold, 74-inch refractor by Clark, and smaller instruments.

Ann Arbor (Michigan), lat. +42° 16’ 48”°0, long. 58 34m55s-2 W. Belongs to the university of Michigan ; erected in 1854; meridian circle by Pistor and Martins of 64-inches aperture, 125-inch equa- torial refractor by Fitz. The observatory is known by the works of the successive directors, Brinmnow and Watson ; the latter dis- covered twenty-one minor planets here.

Cambridge (Massachusetts), Harvard College observatory, lat. + 42° 29' 48”°3, long. 4h 44m 318:0 W. Erected in 1839. Equa- torial refractor of 15-inches aperture by Merz, with which W. C, Bond discovered a satellite of Saturn (Hyperion) in 1848, and which was afterwards used by G. P. Bond to observe the nebula of Orion, — it is now employed by Pickering for extensive photometric observa- tions of fixed stars and satcllites ; a meridian circle by Troughton and Simms with 8inches aperture, mounted in 1870, used for obser vations of standard stars and stars between + 50° and + 55° decl. The Annals of the observatory (13 vols. 4to) form one of the most important collections of astronomical researches. Since 1877 the

means of the institution have been increased by public subscription, and a large staff of assistants has since been actively employed on photomctric and meridian work.

Chieago (Illinois), Dearboru Observatory, lat. + 41° 50’ 1-0, long. 5h 50m 268‘8 W. Attached to the university ; founded by sub- scription in 1862. The principal instrument is an 184-inch equa- torial refractor by Clark (mounted in 1864, but not used till 187 Dy with which Burnham has continued his observations and discoverics of donble stars, eommenced with a 6-inch refractor. There is also a 6-inch meridian circle by Repsold.

~~Cincinnati (Ohio), lat. + 39° 6' 26'°5, long. 54 37m 588-9 W. In 1842 an observatory was founded by subscription, and furnished with an equatorial refractor of 11}-inches aperture by Merz. In 1873 the observatory was removed toa distance from the city, to Mount Lookout, lat. + 39° 8' 35"°5, long. 54 37m 415-4 W. 'The refractor has been almost exclusively devoted to observations of double stars (Publications of the Cincinnati Observatory, 5 parts, 8vo).~~

~~Clinton (New York), Litchfield Observatory of Hamilton College, lat. + 43° 3'17"-0, long. 58 1™ 378-4 W. Erected by subscription, 1852-55 ; equatorial refractor of 134 inches by Spencer, employed by C. H. F. Peters for construction of celestial charts (Nos. 1-20 published in 1882), in the course of which work he has discovered forty-one minor planets. :~~

~~Georgetown (District of Columbia), college observatory, lat. +38° 54' 262, long. 54 8m 188-3 W. Erected in 1844; 6-inch re- fractor and small meridian circle, both by Simms.~~

~~Glasgow (Missonri), Morrison Observatory, lat. + 39° 16' 168, long. 62 11™ 188-0 W. Founded in 1876; attached to the univer- sity ; 124-inch equatorial refractor by Clark, used for observations of comets, planets, and double stars; meridian circle by Simms of 6-inches aperture.~~

~~Hanover (New Hampshire), Dartmouth College observatory, lat. + 43° 42' 15", long. 42 49m 85:0 W. Founded in 1853; 9inch equatorial by Clark, used by C. A. Young (up to 1878) for spectro scopic observatious of the sun ; meridiau circle by Simms of 4-inches aperture.~~

~~Hastings (New York), Prof. Henry Draper's observatory, lat. + 40° 59' 25", long. 4 55m 2987 W. Built in 1860; 28-inch re- flector by the owner, 11-inch refractor (with photographic lens) by Clark, both used np to the owner's death (1882) for celestial and spectrum photography. 'The first photograph of the nebula of Orion was taken here in 1880.~~

~~Madison (Wisconsin), Washburn Observatory, lat. + 48° 4' 36"°7, long. 55 57m 378°9 W. Erected at the expense of Governor Wash- burn in 1878 ; belongs to the university. Meridian circle by Repsol of 4°8-inches aperture,~~

~~15}-inch equatorial refractor by Clark, used for observations of nebula and double stars. Publications in 8vo volumes,~~

~~Mount Hamilton (California), Lick Observatory of the university of California, lat. + 37° 21' 3", long. 8h 6™ 268:7 W., about 4250 feet above sea-level. Is being erected in pursuance of the will of the late James Lick, and is to contain a 36-inch refractor by Clark. The suitability of the site was tested in 1879 by Burnham, who observed for some weeks with his 6-inch refractor, A 12-inch re- fractor and a 5-inch photoheliograph were used for observing the transit of Venus in 1882.~~

~~New Haven (Connecticut), Winchester Observatory of Yale College, lat. + 41° 18' 36"°5, long, 42 51™ 428°2 W. An observatory had existed since 1830, possessing among other instruments a 9-inch refractor by Clark and a meridian circle by Ertel. In 1880 a bureau for verifying chronometers and thermometers was estab- lished, and in 1881 the observatory was rebuilt, and furnished with a 6-inch heliometer by Repsold, and an 8-inch equatorial refractor by Grubb.~~

~~New York, L. M. Rutherfurd's observatory, lat. + 40° 48' 48"°5, long. 45 55m 5686 W. 18-inch refractor by Rutherfurd and Fitz, used for celestial photography.~~

~~Northfield (Minnesota), Carleton College observatory, lat. + 44° 27' 40"°8, long. 62 12™ 358-9 W. Erected in 1878 ; 84-inch refractor by Clark.~~

~~Princeton (New Jersey). Attached to the college are two observatories, — the "J. C. Green School of Science observatory," lat. + 40° 20' 57°°8, long. 45 58m 378-6 W., erected in 1877, and furnished with a 94-inch refractor by Clark; and the Halsted ob- servatory, in which a 23-inch refractor by Clark was mounted in~~

~~1883.~~

~~Rochester (New York), Warner Observatory, lat. + 48° 8' 15", long. 55 11™ 203 W. Erected by H. H. Warner in 1879-80; has a 16-inch refractor by Clark.~~

~~Washington (D.C.), U.S. naval observatory, lat. + 38° 53’ 38”°8, long. 55 8m 128-1 W. Observations were commenced in a temporary observatory in 1838 ; the naval observatory was organized in 1842 ; observations commenced in 1845. For some years a large amount of zone observations were taken with three meridian instruments, but as Manry, who held the office of superintendent from 1844 to 1861, devoted himself exclusively to meteorology, the astronomical work was considered of less importance. Since 1861 the observa-~~

~~tions have again been published in annual 4to volumes, the appendices to which contain many important memoirs by the five astronomers attached to the institution. In addition to these and the super- intendent (a naval officer) there are three assistants. The instru- ments are :—a mural circle by Troughton and Simms of 4 inches ; » transit instrument by Ertel of 5-3-inches aperture,—these two instruments have been used to observe a catalogue of 11,000 fixed stars ; a 9°6-inch equatorial refractor by Merz, used for observing minor planets and comets; a meridian circle by Pistor and Martins of 8°5-inches aperture, mounted in 1865, and used for observing standard stars and planets; a 26-inch equatorial refractor by Clark, mounted in 1873, and used for observations of satellites and difficult double stars,—with this instrument Hall discovered the satellites of Mars in 1877. A new observatory is now being built, the former locality being too near the Potomac river.~~

~~Wiiliamstown (Massachusetts), lat. + 42° 42’ 49”, long. 4h 59m 338-5 W. Founded in 1836; 74-inch refractor by Clark ; meridian circle of 44-inches aperture by Repsold, mounted in~~

~~1882.~~

~~MEXxICco.~~

~~Chapultepee (about 2 miles south-west of Mexico), national observatory, lat. + 19° 25’ 17°5, long. 6» 36™ 388:2 W. Erected in 1877-80; a 15-inch equatorial refractor by Grubb was procured in 1882; there is also an altazimuth by Simms, &c. In 1883 the observatory was moved to Tacubaya.~~

SovutH AMERICA.

Santiago (Chili), national observatory, lat. — 33° 26’ 42”°0, long. 4h 49m 498-4 W. In 1849 the U.S. Government sent an astronomical expedition to Chili to observe Venus and Mars, in order to deter- inine the solar parallax. When the expedition returned in 1852, the Government of Chili bought all the instruments—a 6-inch meridian circle by Pistor and Martins, a 64-inch refractor by Fitz, &c. Meridian observations of southern stars, observations of Mars in opposition, of the parallax of a Centauri, &c., were carried on by Moesta till 1863 (from 1860 in a new observatory). Since the retirement of Moesta very little has been heard of the institution, although it soon after received a 94-inch refractor by Merz and Rep- sold. ‘Two volumes of Observations have been published.

Lima (Peru). In 1866 a meridian circle of 7-inches aperture and 2 104-inch refractor were procured from HIchens, but we are not aware of any astronomical work having been done at Lima.

Rio de Janeiro (Brazil), imperial observatory, lat. — 22° 54’ 23”°8, long. 2452 418-4 W. Founded in 1845; no work done until 1871. The principal instruments are a meridian circle by Dollond, an altazimuth, a 94-inch refractor by Henry, &c. A Budlletin was com- menced in 1881,

Cordova (Argentine Republic), national observatory, lat. — 81° 25’ 15’‘4, long. 4h 16™ 4581 W. rected in 1871, under the direction of B. A. Gould, who has here constructed his Urano- metria Argentina, an atlas of all the stars visible to the naked eye from the south pole to +10° decl., with their apparent magnitudes. With a meridian circle by Repsold of 5-inches aperture 105 000 zone observations of stars between — 23° and — 80° decl. have been unade, while an 11-inch refractor by Fitz, with photographic object- glass, has been employed for taking photographs of southern star- clusters. The results are being published in 4to volumes.

AFRICA.

*Cape of Good Hope, royal observatory, lat. — 33° 56’ 3”*4, long. 1h 13™ 558°0 E. Founded in 1820; erected in 1825-29, about 34 miles from Cape Town. Observations were commenced by Fallows in 1829 with a transit*

instrument by Dollond of 5-inches aperture and a mural circle by Jones. After the death of Fallows (1881), T. Ifenderson observed from 1832-33, chiefly the moon and Mars for determining their parallaxes, and a Centauri for annual parallax. Ife was succeeded as "His Majesty's astronomer" by Thomas Maclear, who undertook to verify and extend the arc of meridian measured by Lacaille in 1751-53, which work occupied the observa- tory staff for a number of years. The results of the meridian observations were therefore first published by Maclear's successors in the form of three star catalogues for 1840, 1850, and 1860. In 1849 a 7-inch equatorial refractor by Merz was mounted, and in 1855 a new meridian circle, a facsimile of the one at Greenwich, superseded the older instruments. With the equatorial comets, occultations of stars, &c., were observed. Maclear was succeeded by E. J. Stone (1870 to 1879), who, in addition to bringing out much of his predecessor's work, devoted himself and the staff to observations of stars, embodied in a catalogue of 12,441 stars for the epoch 1880. Under the present astronomer, D. Gill, standard stars between the equator and — 28° decl., as also stars suitable for investigations on refraction, are observed, while a 4-inch heliometer by Repsold is privately employed by the astronomer for researches on annual parallax.

Besides the observatory of Laeadlle in Cape Town, already men- tioned (lat. — 33° 55' 16'°1, long. 14 138™ 418 E.), another temporary observatory, at Feldhausen, lat. — 33° 58' 56"°6, long. 11 13™ 515 E.,

6 miles from Cape Town, deserves to be mentioned. It was here that Sir John Herschel observed nebule and double stars from 1834 to 1838 with a reflector of 184-inches aperture ; the results were pub- lished in a large 4to volume in 1847.

Durban (Natal). Erected in 1882; 8-inch equatorial refractor by Grubb.

Algiers (Algeria), national observatory, lat. + 36° 45' 2"°7, long. oh 12m 118-4 WW. Recently founded.

St Helena, lat. — 15° 55' 26"°0, long. 02 22™ 548-6 W. Erected in 1829, with a transit instrument and mural circle; M. Johnson observed the places of 606 southern stars from 1829 to 1833.

INDIA.

Madras, Government observatory, lat. + 13° 4’ 8”‘1, long. 5h 20m 598‘4 EK. In operation since the beginning of this century. In 1831 a transit instrument and a mural circle, both of 3inches aperture, by Dollond were mounted, and with these T. G. Taylor observed 11,000 stars, published in a large Catalogue (1845) ; a Sub sidiary Catalogue of 1440 stars appeared in 1854. Taylor’s successor, Jacob, chiefly devoted himself to double stars. A meridian circle by Simms was mounted in 1858, and in 1865 an 8-inch equatorial refractor, also by Simms, was put up, and the observations have been vigorously continued under the direction of Pogson. Eight volumes in 4to of Observations were published from 1832 to 1854. In a small private observatory at Madras, E. B. Powell observed double stars with a 4-inch refractor by Simms from 1858.

LIucknow, An observatory was founded by the king of Oude, and observations were made with a transit instrument and mural circle by Major Wilcox from 1841 till his death in 1848. Both eae and manuscripts were destroyed during the mutiny in

1857.

Trivandrum, lat. + 8° 30’ 32”, long. 52 7™ 598 E. Founded by the rajah of Travancore in 1836, and furnished with a 5-inch re- fractor and a transit instrument by Dollond, and two mural circles by Jones and Simms. The building was badly constructed, and the instruments could not be properly placed, so that no astronomical work could be done, but valuable magnetical and meteorological observations were made by J. A. Broun from 1852 to 1863.

CHINA.

Peking. The Jesuit missionaries under Verbiest erected in 1673 uew instruments in the old observatory built in 1279 by Ko Show King. Observations were made and published at least up to 1770. The Russian embassy now maintains a meteorological observatory at Peking.

~~Long Kong. In 1888 the colonial Government established an observatory, furnished with a 6-inch refractor, a small transit instrument, and full equipment of magnetical and meteorological instruments.~~

~~TURKESTAN.~~

~~Tashkend. Founded in 1874 to assist in the geodetic operations of the Russian general staff; 6-inch refractor and meridian circle by Repsold.~~

~~AUSTRALIA,~~

~~Paramatta(New South Wales), lat. — 33° 48'50", long. 10h 4m 65-3 E. Erected by Sir Thomas Macdougall Brisbane, in 1821; handed over to the New South Wales Government in 1826 ; furnished with a transit instrument and a mural circle by Troughton, with which observations of southern stars were made by C. Riimker and Dunlop in the years 1822 to 1826, and from which a catalogue of 7385 stars was deduced (1835). The value of this catalogue is, however, lessened by instrumental imperfections. Observations were also made of comets, double stars, and nebule. From about 1835 no observa- tions seem to have been made; the observatory was abolished in~~

~~1855.~~

~~Sydney (NewSouth Wales), lat. — 38°51' 41"°1, long. 108 4™50s°6 E. Founded in 1855; furnished with the instruments from Para- matta, and a very inferior meridian circle by Jones (improved by Simms). In 1861 a 74-inch refractor by Merz, and in 1874 an 114-inch equatorial refractor by Schroder were mounted, and have been regularly used for observations of double stars. In 1879 a meridian circle by Simms of 6-inches aperture was acquired.~~

~~Windsor (New South Wales),lat. — 33°36' 28''9,long.103™ 218-7 E. Private observatory of MrJ. Tebbutt, who has devoted himself since 1861 to discoveries and observations of comets, using a 43-inch refractor by Cooke.~~

~~Melbourne (Victoria), lat. —37° 52' 7:2, long. 95 39™ 388°8 E. Founded in 1853 at Williamstown. In 1861 a meridian circle by Simms of 5-inches~~

~~aperture was mounted, but in 1868 the observa- tory was moved to Melbourne, lat. — 37° 49’ 58”°4, long. 9239™ 545‘8 E. The instrumental equipment was further increased by “ the great Melbourne telescope,” a Cassegrain reflector, equatorially mounted, of 4-feet aperture and 20-feet focal length, made by Th. Grubb and erected in 1869, since when it has been used for observations of nebule and lunar photography ; there is also an 8-inch refractor by Cooke, used for observations of comets, &c. The results of the meridian work from 1861 to 1875 are published in five 8vo volumes,~~

~~OBS—OCC~~

~~and a First Melbourne Catalogue of 1227 stars was published in~~

~~1874.~~

~~Adelaide (South Australia), lat. — 34°55’ 33’°8, long, 92 14m 218-3 EB.~~

~~Abo, 714.~~

~~Adelaide, 717.~~

~~Albany, 715.~~

~~Algiers, 716.~~

~~Allegheny, 715.~~

~~Altona, 712.~~

~~Amherst, 715.~~

~~Annapolis, 715.~~

~~Ann Arbor, 715.~~

~~Armagh, 710.~~

~~Athens, 714.~~

~~*Bedford (Smyth), 711.*~~

~~*Berlin, 712.*~~

~~*Berinerside*~~

~~*711.*~~

~~*Birr Castle (Rosse), 711.*~~

~~*Blackheath (Groom- bridge), 711.*~~

~~*a ai (Wrottesley),*~~

~~*12.*~~

~~*Bologna, 714.*~~

~~*Bonn, 712.*~~

~~*Bothkamp, 712.*~~

~~*Bremen, 712.*~~

~~*Breslau, 712.*~~

~~*(Crossley),*~~

~~*Cambridge, U.S., 715.*~~

~~*Cape of Good Hope, 716.*~~

~~*Chapultepec, 716.*~~

~~*Chicago, 715.*~~

~~*Christiania, 714.*~~

~~*Cincinnati, 715.*~~

~~*Clinton, 715.*~~

~~*Coimbra, 713.*~~

~~*Copenhagen, 715.*~~

~~*Cordova, 716.*~~

~~*Cork, 711.*~~

~~*Cracow, 713.*~~

~~*Cranbrook (Dawes), 711.*~~

~~*Cranford (De La Rue),*~~

~~*711.*~~

~~*Cuckfield (Knott), 711.*~~

~~*Dorpat, 714..*~~

~~*Dresden, 712.*~~

~~*Dublin, 710,*~~

~~*Dun Echt (Crawford),711.*~~

~~*Durban, 716.*~~

~~*Durham, 710.*~~

~~*Diisseldorf, 712.*~~

~~*Ealing (Cominon), 711.*~~

~~*Edinburgh, 710.*~~

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~~*In operation since 1861 ; has been gradually improved, and contains now an 8-inch equatorial by Cooke, and a transit circle has been*~~

~~*ordered.*~~

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OBSIDIAN, a volcanic glass, said to have been named after its discoverer Obsidius. It is usually of black, brown, or grey colour, and in some varieties banded or striated. The colour is generally due not so much to the vitreous mass itself as to the presence of minute foreign bodies or micro- lites, which in some cases appear to be incipient crystals. of felspar, while in others they probably-consist of such minerals as augite, hornblende, biotite, and magnetite. These microscopic enclosures are occasionally arranged in curved lines, producing beautiful examples of fluidal struc- ture (see Gronoey, vol. x. p. 280, fig. 2). Spherulites are not uncommon in obsidian, and are sometimes sufii- ciently large to impart a distinctly globular structure to the stone. Other varieties are rich in microscopic pores, or may even present to the naked eye a vesicular texture. It is notable that certain kinds of obsidian possess a peculiar metallic sheen, which has been attributed by Professor Zirkel to the presence of minute ovoid enclosures, and not to a porous structure, as had been previously suspected. There can be no doubt that obsidian has been formed by the rapid cooling of a felspathic lava. It is found chiefly in Iceland, the Lipari Islands, Melos and other isles of the Greek archipelago, the Caucasus, Siberia, Mexico, Peru, and New Zealand.

Obsidian breaks with a beautifully conchoidal fracture, yielding sharp-edged fragments, which have been largely used in various parts of the world as arrow-points, spear- heads, and rude knives. For these purposes it was exten- sively employed, under the name of ztztlz, by the ancient Mexicans, who quarried it at the Cerro de las Navajas, or " Hill of Knives," near the head-waters of the Great Barauca. Obsidian has also been used as a mirror,—a purpose for which its strong lustre has recommended it. By the ancient Greeks and Romans it was worked as a gem-stone ; and, in consequence of its having been often imitated in black glass, there arose among collectors of gems in the last century the curious practice of calling all antique pastes "obsidians." Even at the present day the bottle-green varieties of obsidian are occasionally cut and polished as ornamental stones. They bear some re- semblance to peridotes and tourmalines, but are deficient in hardness. ;

OCCAM, Wixt1am oF (d. ¢. 1349), the great English schoolman (Doctor invincibilis), was born in the village of Ockham in the county of Surrey in

~~the end of the 13th~~

~~century. Scarcely any traces of his early life remain. Un- attested tradition says that the Franciscans persuaded him while yet a boy to enter their order, sent him to Oxford to Merton College, and to Paris, where he was first the pupil, then the successful rival, of the celebrated John Duns Scotus. He was at the height of his fame as a lecturer in the university of Paris when the famous quarrel arose between Philip the Fair and Pope Boniface VIII., but it does not appear that he took any part in the strife. He probably left France about 1314, and there are obscure traces of his presence in Germany, in Italy, and in England during the following seven years. We only know that in 1322 he appeared as the provincial of England at the celebrated assembly of the Franciscan order at Perugia, and that there he headed the revolt of the Franciscans against Pope John XXII. His share in this revolt and his writings to justify his position gave rise to his trial for heresy before the bishops of Ferrara and Bologna, which resulted in his imprisonment for seventeen weeks in the dungeons of the papal palace at Avignon. He and his companions—Michael of Cesena, general of the order, and Bonagratia—managed to escape, and found their way to Munich, where they formed the most conspicuous members of that band of Franciscans who aided Louis of Bavaria in his long contest with the papal curia. "Defend me with the sword and I will defend you with the pen," was Occam's proposal to Louis ; and from their haven of refuge at Munich the recusant Franciscans sent forth books and pamphlets refuting the extravagant pretensions of papal authority. Michael of Cesena died in 1342, and Occam, who had received from him the official seal of the order, was recognized as general by his party. The date of his death and the place of his burial are both uncertain. He probably died at Munich in 1349, and was buried in the graveyard of the Franciscan convent. Some writers assert that he was reconciled to Rome, and in proof of submission sent the official seal to William Farinerius, who had been ap- pointed general of the order by the pope; others declare that, like Cesena and Bonagratia, he died excommunicate,~~

~~William of Occam was the most prominent intellectual leader in an age which witnessed the disintegration of the~~

1 The famous Disputatio super Potestate Prelatis Ecclesiv, atque Principibus Terrarum commissa, which belongs to this controversy, and has been commonly attributed to Occam, was probably written by Peter Dubois, a Parisian lawyer.

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old scholastic realism, the rise of the theological scepticism of the later Middle Ages, the great contest between pope and emperor which laid the foundations of modern theories of government, and the quarrel between the Roman curia and the Franciscans which showed the long-concealed antagonism between the theories of Hildebrand and Francis of Assisi; and he shared in all these movements.

The common account of his philosophical position, that he reintroduced nominalism, which had been in decadence since the days of Roscellinus and Abelard, by teaching that universals were only flatus vocis, is scarcely correct. The expression is nowhere found in his writings. He revived nominalism by collecting and uniting isolated opinions upon the meaning of universals into a compact system, and popularized his views by associating them with the logical principles which were in his day commonly taught in the universities. He linked the doctrines of nominalism on to the principles of the logic of Psellus, which had been intro- duced into the West in the Swmmule of Peter of Spain, and made them intelligible to common understandings. His philosophical teaching contains little that was new ; and all the details of nominalism had been taught by writers who preceded him. The problem of medizval philosophy, however differently stated, was the same question which faces modern thinkers. How comes it that things which are seen as separate individual objects can be thought of in classes, and so science created? What underlies the possibility of using common nouns when everything appre- hended by the senses is a separate subsisting phenomenon ? Realism solved the problem by supposing something i rerum natura which actually corresponded to the class, and whose proper name was the common noun ; nominalisin explained that the logical faculties of the mind grouped individuals by its own powers, and that universals were creations of the mind which thought. The three chief positions in the nominalist solution of the possibility of a common knowledge were all the

~~common property of scho- lastic thinkers before Occam's day. It had been currently taught (by Aigidius and by Antonius Andreas) that the principal use of universals, whatever they were in them- selves, was to serve as logical predicates, and in this way bring a variety of subjects together, or, in other words, group individual things ina class. Many of the schoolmen (Walter Burleigh, Durandus, &c.) declared that this logical function of universals was the one thing about them that deserved notice and constituted their essential nature. Durandus and others had asserted that all that universals did was in this logical fashion to bring together several 'individual objects in such a way that they could be denoted by the same common term. These propositions really ex- haust the essential doctrines of nominalism, and they were all stated and were the common property of scholastic philosophy before Occam's time. What he did was to make nominalism simpler by introducing a way of putting the theory suggested by the Byzantine logic. Psellus and his followers explained many difficulties in logic by showing that in speech words were used like the figures of arithmetic or the signs of algebra. There is no reason why z should mean four sheep except the will of the algebraist who starts with that assumption. In the same way, there is no reason why the word "triangle" should stand for the thought it expresses, or the thought for the infinitude of individual triangles ; but by swppositio the one is used for the other, and we can reason with word or thought just as the algebraist can do with his signs. Universals, said Occam, bore the same relation to the infinite number of individuals that signs do to the things signified. The universal, be it a thought or a word, is nothing but a sign which by suppo- sitio is beforehand taken to denote a number of individual things, and is thus the common noun denoting them all.~~

~~This way of explaining community of knowledge and of defending nominalism went a good deal deeper, and became a theory of knowledge which led Occam into what was called theological scepticism. Most of the adherents of the mystical schools of the Middle Ages held that the doc- trines of the church were isolated truths, each of which was to be received by a species of enthusiastic intuition, and were incapable either of systematic arrangement in a body of divinity or of being intelligibly comprehended by the mind. Before Occam appeared, mystics taught a theory of theological scepticism which declared that the truths of the~~

~~Christian faith were to be taken on trust, although the reason might find logical flaws in each one of them. Occam made this theological scepticism almost a commonplace by basing it on his theory of knowledge. All knowledge, he taught, contained a double inadequacy, which arose from the needs of thinking and of expressing thought in language. Words were but signs, inadequate representations of the thoughts they stood for, and the thoughts themselves were inadequate symbols used by sup- positio instead of the individual objects which they repre- sented. The real individual thing was apprehended by a vis inturtiva, in sense, Vision, or touch, &c., but, when the mind begins to think or to argue, error may creep in, for thoughts are inadequate expressions, stereotyped aspects, and words are only signs of signs. Theological knowledge is like all other knowledge, theological argumentation has the inadequacy that belongs to every process of thought. The Centilogium Theologicum usually appended to Occam's Commentary on the Sentences of Peter the Lombard contains a consistent application of this theory of knowledge to theo- logical dogmas, every one of which is shown to be irrational, but at the same time true in the vision of faith. The most interesting application of his method, however, is to be found in the Z'ractatus de Sacramento Altaris, in which, while accepting as a matter of faith the medizeval doctrine of the real presence, Occam shows that a much more rational theory might be propounded, and actually sets forth a theory of the Eucharist which was afterwards adopted almost verbatim by Luther, and which is now known as consubstantiation.~~

~~Occam was best known during his lifetime and in the succeeding centuries for the part he took in the prolonged contest between Louis of Bavaria and the papal curia. Louis had been legadly elected emperor of Germany, but the pope, who claimed that his power to crown gave him the right to veto any election, refused to acknowledge Louis, and espoused the cause of his rival. The contest was prolonged during more than a quarter of a century, and its interest lies chiefly in the writings of a group of men who, sheltered at Munich, published their views on the relations between civil and religious authority, and on the rights of nations. 'The most remarkable of the many publications which this controversy called forth was undoubtedly the Defensor Pacis of Marsilius of Padua, which appeared in 1324 or 1326, and which was the pre- diction of the modern, as Dante's De Monarchia (1311- 13) was the epitaph of the medizval state. Occam published several~~

~~treatises in which, while he confines him- self more to the details of the controversy going on before him, there are evident traces of sympathy with the opin- ions of Marsilius. Pope Clement VI. has left on record that Marsilius "was taught his errors by and got them from" William of Occam; if this be true, the Italian jurist must have had private intercourse with the great English schoolman, for all Occam's genuine writings on the contro- versy appeared after the Defensor Pacis. In the Opus nonaginta dierum (1330-33), and in its successors, the Tractatus de dogmatibus Johannis XXII, papx (1333-34), the Compendium errorum Johannis XXII, pape (1335-38),~~

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~~and in the Defensorium contra errores Johannis XXII. papx | far~~

~~(1335-39), Occam only incidentally expounds his views as a publicist ; the books are mainly, some of them entirely, theological, but they served the purpose of the emperor and of his party, because they cut at the root of the spirit- ual as well as of the temporal supremacy of the pope. In his writing Super potestate summi pontificis octo questio- num decisiones (1339-42) Occam attacks the temporal supremacy of the pope, insists on the independence of kingly authority, which he maintains is as much an ordi- nance of God as is spiritual rule, and discusses what is meant by the state. His views on the independence of civil rule were even more decidedly expressed in the Zractatus de jurisdictione imperatoris in causis matrimonialibus, in which, in spite of the medizval idea that matrimony is a sacrament, he demands that it belongs to the civil power to decide cases of affinity and to state the prohibited de- grees. His last work, De Electione Caroli VI, restates his opinions upon temporal authority and adds little that is new.~~

~~In all his writings against Pope John XXII. Occam inveighs against the pope's opinions and decisions on the value of the life of poverty in the practice of religion. The Compendium errorum selects four papal constitutions which involved a declaration against evangelical poverty, and insists that they are full of heresy. Occam was a sin- cere Franciscan, and believed with his master that salvation was won through rigid imitation of Jesus in His poverty and obedience, and up to his days it had always been~~

~~pos- sible for Franciscans to follow the rules of their founder within his order. But Pope John XXII. took advantage of a dispute between the more zealous Franciscans and others who had departed from the strict rule of their founder to condemn the doctrine of evangelical poverty, and to excommunicate. those who held it. This made many Franciscans question whether, when the pope set his opinion against that of Francis their founder, the pope could be infallible; and some of them were so convinced of the necessity of evangelical poverty for a truly Christian life that they denounced the pope when he refused them leave to practise it as Antichrist, or the being who stood between Christians and the means of holy living. After Occam's days the opinions of Francis prevailed in many quarters, but the genuine Franciscans had no place within the church. They were Fraticelli, Beghards, Lollards, or other confraternities unrecognized by the church, and in steady opposition to her government.~~

~~There is no good monograph on Occam. For an account of his logic, see Prantl, Geschichte der Logik (1855-70); for his philosophy, see Stock), Geschichte der Philosophie des Mittclalters (1864-66), vol. ii.; for his publicist writings, see Riezler, Die literarischen Wider- sacher der Pépste zur Zeit Ludwig des Baiers (1874). See also Lindsay's article on "Occam and his connexion with the Reforma- tion," in the Brit. Quart. Review, July 1872. (1, BL Ls)~~

~~OCEAN. See Sza.~~

~~OCEANIA. See Potynesta.~~

~~OCELOT. The smaller spotted or striped species of the genus I'elis (see MamMaLta, vol. xv. p. 435), of both the Old and the New World, are commonly called tiger-cats. Of these, one of the best-known and beautifully marked forms, peculiar to the American continent, has received the name of Ocelot (Felis pardalis), though zoologists are still un- decided whether under this designation several distinct species have not been included, or whether all the ocelots are to be referred to a single species showing great indivi- dual or racial variation. Their fur has always a tawny yellow or reddish-grey ground colour, and is marked with black spots, aggregated in streaks and blotches, or in elon- gated rings enclosing an area which is~~

rather darker than the general ground colour. They range through the wooded parts of tropical America, ffOm Arkansas in the north as

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south as Paraguay, and in their habits resemble the

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Ocelot.

other smaller members of the cat tribe, being ready climbers and exceedingly bloodthirsty.

OCHINO, Brrnarpino (1487-1564), Italian Reformer, was born at Siena in 1487. At an early age he entered the order of Observantine Friars, and rose to be its general, but, craving a stricter rule, transferred himself in 1534 to the newly-founded order of Capuchins. He had already become famous for zeal and eloquence, and was the intimate friend of the noble Spaniard Juan de Valdés, of Bembo, Vittoria Colonna, Pietro Martire, Carnesecchi, and others destined to incur the suspicion of heresy, either from the moderation of their characters or from the evangelical tincture of their theology. In 1538 he was elected vicar- general of his order ; in 1539, urged by Bembo, he visited Venice and delivered a remarkable course of sermons, show- ing a decided tendency to the doctrine of justification by faith, which appears still more evidently in his dialogues published the same year. He was suspected and denounced, but nothing ensued until the establishment of the Inquisi- tion in Rome in June 1542, at the instigation of the austere zealot Caraffa. Ochino almost immediately received a cita- tion to Rome, and set out to obey it about the middle of August. According to his own statement, he was deterred from presenting himself at Rome by the warnings of Cardinal Contarini, whom he found at Bologna, dying of poison administered by the reactionary party. He turned aside to Florence, and after some hesitation escaped across. the Alps to Geneva. He was cordially received by Calvin, and published within two years several volumes of Prediche, controversial tracts rather than sermons, explaining and vindicating his change of religion. He also addressed replies to Vittoria Colonna, Tolomei, and other Italian sympathizers who were reluctant to go

to the same length as himself. His own breach with the Roman Church was decisive and irreparable, and illustrated the justice of Luther's description of justification by faith alone as the articulus stantis vel cadentis ecclesix, the vital point whose: acceptance or rejection drew everything else along with it. In 1545 he became minister of the Italian Protestant congregation at Augsburg, which he was compelled to. forsake when, in January 1547, the city was occupied by the imperial forces. He found an asylum in England, where he was made a prebendary of Canterbury, received a pension from Edward VI.'s privy purse, and composed his capital work, the Tragedy. This remarkable performance, originally written in Latin, is extant only in the translation

of Bishop Ponet, a splendid specimen of nervous English. The conception is highly dramatic; the form is that of a series of dialogues. Lucifer, enraged at the spread of Christ's kingdom, convokes the fiends in council, and re- solves to set up the pope as Antichrist. The state, repre- sented by the emperor Phocas, is persuaded to connive at the pope's assumption of spiritual authority ; the other churches are intimidated into acquiescence ; Lucifer's pro- jects seem fully accomplished, when Heaven raises up Henry VIIL and his son for their overthrow. The conception bears a remarkable resemblance to that of Paradise Lost ; and it is nearly certain that Milton, whose sympathies with the Italian Reformation were so strong, must have been acquainted with it. Several of Ochino's Prediche were also translated into English by a lady, Anna Cook, after- wards wife of Sir Nicholas Bacon; and he published numerous controversial treatises on the Continent. In 1553 the accession of Mary drove him from England, He became pastor of the Italian congregation at Zurich, com- posed principally of refugees from Locarno, and continued to write books which, repeating the history of his early works, gave increasing evidence of his alienation from the strict orthodoxy around him. The most important of these was the Labyrinth, a discussion of the freedom of the will, covertly assailing the Calvinistic doctrine of predestination. In 1563 the long-gathering storm of obloquy burst upon the occasion of the publication of his Thirty Dialogues, in one of which his adversaries maintained that he had justi- fied polygamy under colour of a pretended refutation. His dialogues on divorce and the Trinity

were also obnoxious. No explanation was allowed. Ochino was banished from Zurich, and, after being refused a shelter by other Protestant cities, directed his steps towards Poland, at that time the most tolerant state in Europe. He had not resided there long when an edict appeared banishing all foreign dis- sidents. ~Flying from the country, he encountered the plague at Pinczoff; three of his four children were carried off; and he himself, worn out: by misfortune, expired in solitude and obscurity at Schlakau in Moravia, about the end of 1564. His reputation among Protestants was at the time so bad that he was charged with the author- ship of the treatise De tribus Impostoribus, as well as with having carried his alleged approval of polygamy into practice. It was reserved for his recent biographer Dr Benrath to justify him, and to represent him as a fervent evangelist and at the same time asa speculative thinker with a passion for free inquiry, always learning and unlearning and arguing out difficult questions with himself in his dialogues, frequently without attaining to any absolute conviction. The general tendency of his mind, neverthe- less, was counter to tradition, and he is remarkable as resuming in his individual history all the phases of Pro- testant theology from Luther to Socinus. He is especially interesting to Englishmen for his residence in England, and the probable influence of more than one of his writings upon Milton.

All attainable information respecting Ochino is collected in Dr Benrath's excellent German biography, translated into English by Miss Helen Zimmern, with a preface by the Rev. W. Arthur, London, 1876. (R. G.)

OCHRE. See PIicMENTs.

OCKLEY, Staon (1678-1720), Orientalist, was born at Exeter in 1678. He was educated at Queens' College, Cambridge, and graduated B.A. in 1697, M.A. in 1701, and B.D. in 1710; he became fellow of Jesus College and vicar of Swavesey, and in 1711 was chosen Arabic pro- fessor of the university. He hada large family, and his latter days were embittered by pecuniary embarrassments, which form the subject of a chapter in D'Israeli's Calamities of Authors. The preface to the second volume of his History of the Saracens is dated from Cambridge castle,

where he lay a prisoner for debt. He died in the year 1720. His chief work is The History of the Saracens, in 2 vols. 8vo, 1708-18, which long enjoyed a

~~great reputa- tion; unfortunately Ockley took as his main authority a MS. in the Bodleian of Pseudo-Wakidi's Futtéh al-Sham, which is rather historical romance than history.~~

~~O'CLERY, Micuaezt (born ¢. 1575). See Centric Lrrer- ATURE, vol. v. p. 307.~~

~~O'CONNELL, Dante (1775-1847), born on 6th August, 1775, near Cahirciveen, a small town in Kerry, Ireland, was sprung from a race the heads of which had been Celtic chiefs, had lost their lands in the wars of Ireland, and had felt the full weight of the harsh penal code which long held the Catholic Irish down. His ancestors in the 18th century had sent recruits to the famous brigade of Trish exiles in the service of France, and those who remained at home either lived as tenants on the possessions of which they had once been lords, or gradually made money by smug- gling, a very general calling in that wild region. Thus he inherited from his earliest years, with certain traditions of birth, and high station, a strong dislike of British rule in Treland and of the dominant owners of the soil, a firm attachment to his proscribed faith, and habitual skill in evading the law; and these influences may be traced in his subsequent career. O'Connell learned the rudiments at a school in Cork, one of the first which the state in those evil days allowed to be opened fcr Catholic teach- ing; anda few years afterwards he became a student, as was customary with Irish youths of his class, in the colleges of St Omer and Douai. His great abilities, it is said, were there perceived by the principals, and their peculiar training undoubtedly left a permanent mark on his mind and nature, for the casuistry and the diction of the Romish priesthood distinctly appear in his speeches and writings, and he had much of the ecclesiastic in his manners and bearing. These years, too, in France had, in another way, a decided effect in forming his judgment on political questions of high moment. He was an eye-witness on more than one occasion of the folly and excesses of the French Revolution; and these scenes not only increased his love for his church, but strongly impressed him with that dread of anarchy, of popular movements ending in blood- shed, and of communistic and socialistic views which characterized him in after life. To these experiences, too, we may partly ascribe the reverence for law, for the rights of property, and for the monarchical form of government which he appears to have sincerely felt;**

and, demagogue as he became in a certain sense, they gave his mind a deep Conservative tinge. In 1798 he was called to the bar of Ireland, and though, as professing a still degraded creed, he was shut out from the chance of promotion, though he could not even obtain a silk gown, and though, what was of more importance, he was subjected in a variety of ways to caste hostility, he rose before long to the very highest eminence among contemporary lawyers and advocates. This position was in the main due toa dexterity in con- ducting causes, and especially in examining witnesses, in which he had no rival at the Irish bar, and here his pro- found sagacity, observant cunning, and intuitive knowledge of the native character enabled him to accomplish wonders, even at the present day not wholly forgotten. He was, however, a thorough lawyer besides, inferior in scientific learning to two or three of his most conspicuous rivals, but well read in every department of law, and especially a master in all that relates to crintinal and constitutional jurisprudence. As an advocate, too, he stood in the very highest rank ; in mere oratory he was surpassed by Plun- ket, and in rhetorical gifts by Bushe, the only speakers to be named with him in his best days at the Irish bar ; but his style, if not of the most perfect kind, and often

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disfigured by decided faults, was marked by a peculiar subtlety and manly power, and produced great and striking effects. On the whole, in the art of winning over juries he had scarcely an equal in the law courts.

To understand, however, O'Connell's greatness we must look to the field of Irish politics. From early manhood he had turned his mind to the condition of Ireland and the mass of her people. The worst severities of the penal code had been, in a certain measure, relaxed, but the Catholics were still in a state of vassalage, and they were still pariahs compared with the Protestants. The rebellion of 1798 and the union had dashed the hopes of the Catholic leaders, and their prospects of success seemed very remote when, in the first years of the present century, the still unknown lawyer took up their cause. Up to this juncture the question had been in the hands of Grattan and other Protestants, and of a small knot of Catholic nobles and prelates ; but their efforts had not accomplished much, and they aimed only

~~at a kind of compromise, which, while conceding their principal claims, would have placed their church in subjection to the state. O'Connell inaugurated a different policy, and had soon given the Catholic movement an energy it had not before possessed. Himself a Catholic of birth and genius, unfairly kept back in the race of life, he devoted his heart and soul to the cause, and his character and antecedents made him the champion who ultimately assured its triumph. Having no sympathy with the rule of "the Saxon," he saw clearly how weak was the hold of the Government and the Pro- testant caste on the vast mass of the Catholic nation ; having a firm faith in the influence of his church, he per- ceived that it might be made an instrument of immense political power in Ireland ; and, having attained a mastery over the lawyer's craft, he knew how a great popular movement might be so conducted as to elude the law and yet be in the highest degree formidable. With these convictions, he formed the bold design of combining the Irish Catholic millions, under the superintendence of the native priesthood, into a vast league against the existing order of things, and of wresting the concession of the Catholic claims from every opposing party in the state by an agitation, continually kept up, and embracing almost the whole of the people, but maintained within constitu- tional limits, though menacing and shaking the frame of society. He gradually succeeded in carrying out his pur- pose : Catholic associations, at first small, but slowly assum- ing larger proportions, were formed in different parts of the country ; attempts of the Government and of the local authorities to put them down were skilfully baffled by legal devices of many kinds; and at last, after a conflict of years, all Catholic Ireland was arrayed to a man in an organization of enormous power, that demanded its rights with no uncertain voice. O'Connell, having long before attained an undisputed and easy ascendency, stood at the head of this great national movement ; but it will be observed that, having been controlled from first to last by himself and the priesthood, it had little in common with the mob rule and violence which he had never ceased to regard with aversion. His election for Clare in 1828 proved the forerunner of the inevitable change, and the Catholic claims were granted the next year, to the intense regret of the Protestant Irish, by a Government avowedly hostile to the last, but unable to withstand the overwhelming pressure of a people united to insist on justice. The result, unquestionably, was almost wholly due to the energy and genius of a single man, though the Catholic question would have been settled, in all~~

~~probability, in the course of time ; and it must be added that O'Connell's triumph, which showed what agitation. could effect in Ireland, was far from doing his country unmixed good.~~

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~~O'Connell joined the Whigs on entering parliament, and gave effective aid to the cause of reform. The agitation, however, on the Catholic question had quickened the sense of the wrongs of Ireland, and the Irish Catholics were engaged ere long in a crusade against tithes and the established church, the most offensive symbols of their inferiority in the state. It may be questioned whether O'Connell was not rather led than a leader in this; the movement, at least, passed beyond his control, and the country for many months was terrorized by scenes of appalling crime and bloodshed. Lord Grey, very properly, proposed measures of repression to put this anarchy down, and O'Connell opposed them with extreme vehemence, a seeming departure from his avowed principles, but natural in the case of a popular tribune. This caused a breach between him and the Whigs; but he gradually returned to his allegiance to them when they practically abolished Irish tithes, cut down the revenues of the established church, and endeavoured to secularize the surplus. By this time O'Connell had attained a position of great emi- nence in the House of Commons: as a debater he stood in the very first rank, though he had entered St Stephen's after fifty ; and his oratory, massive and strong in argu- ment, although too often scurrilous and coarse, and marred by a bearing in which cringing flattery and rude bullying were strangely blended, made a powerful, if not a pleasing, impression. O'Connell steadily supported Lord Melbourne's Government, gave it valuable aid in its general measures, and repeatedly expressed his cordial approval of its policy in advancing Irish Catholics to places of trust and power in the state, though personally he refused a high judicial office. These were not the least useful years of his life, and they clearly brought out the real character and tend- encies of his views on politics. Though a strict adherent of the creed of Rome, he was a Liberal, nay a Radical, as regards measures for the vindication of human liberty, and he sincerely advocated the rights of conscience, the emancipation of the slave, and freedom of trade. But his rooted aversion to the democratic theories imported from France, which were gradually winning their way into Eng- land, only grew~~

stronger with advancing age; he denounced Chartism in unmeasured terms ; the sovereign had no more loyal subject ; and if, as became him, he often condenmned the tyranny of bad Continental Governinents, he reverenced the constitution and laws of England interpreted in a gener- ous spirit. His conservatism, however, was most apparent in his'antipathy to socialistic doctrines and his tenacious regard for the claims of property. He actually opposed the Irish Poor Law, as encouraging a communistic spirit; he declared a movement against rent a crime ; and, though he had a strong sympathy with the Irish peasant, and advo- cated a reform of his precarious tenure, it is difficult to imagine that he could have approved the cardinal principle of the Irish Land Act, the judicial adjustment of rent by the state.

O'Connell changed his policy as regards Ireland when Peel became minister in 1841. He declared that a Tory régime in his country was incompatible with good govern- ment, and he began an agitation for the repeal of the union. One of his motives in taking this course no doubt was a strong personal dislike of Peel, with whom he had often been in collision, and who had singled him out in 1829 for what must be called a marked affront. O'Connell, nevertheless, was sincere and even consistent in his con- duct : he had denounced the union in early manhood as an obstacle to the Catholic cause ; he had spoken against the measure in parliament ; he believed that the claims of Ireland were set aside or slighted in what he deemed an alien assembly ; and, though he had ceased for some years to demand repeal, and regarded it as rather a means

than an end, he was throughout life an avowed repealer. It should be observed, however, that in his judgment the repeal of the union would not weaken the real bond be- tween Great Britain and Ireland ; and he had nothing in common with the rebellious faction who, at a later period, openly declared for the separation of the two countries by force. The organization which had effected such mar- vellous results in 1828-29 was recreated for the new pro- ject. Enormous meetings, convened by the priesthood, and directed or controlled by O'Connell, assembled in 1842-43, and probably nine-tenths of the Irish Catholics were unanimous in the cry for repeal.

O'Connell seems to have thought success certain ; but he had not perceived the essential difference between his earlier agitation and this. The enlightened opinion of the three kingdoms for the most part approved the Catholic claims, and as cer- tainly it condemned repeal. After some hesitation Peel resolved to put down the repeal movement. A vast in- tended meeting was proclaimed unlawful, and O'Connell was arrested and held to bail, with ten or twelve of his principal followers. He was convicted after the trials that followed, but they were not good specimens of equal justice, and the sentence was reversed by the House of Lords, with the approbation of competent judges. The spell, however, of O'Connell's power had vanished ; his health had suffered much from a short confinement ; he was verging upon his seventieth year; and he was alarmed and pained by the growth of a party in the repeal ranks who scoffed at his views, and advocated the revolutionary doctrines which he had always feared and abhorred. Before long famine had fallen on the land, and under this visitation the repeal movement, already paralysed, wholly collapsed. O'Connell died soon afterwards, on 15th May 1847, at Genoa, whilst on his way to Rome, profoundly afflicted by his country's misery, and by the failure of his late high hopes, yet soothed in dying by sincere sympathy, felt throughout Ireland and largely in Europe, and expressed even by political foes. He was a remarkable man in every sense of the word ; Catholic Ireland calls him her "Liberator" still; and history will say of him that, with some failings, he had many and great gifts, that he was an orator of a high order, and that, agitator as he was, he possessed the wisdom, the caution, and the tact of a real statesman. O'Connell married in 1802 his cousin Mary O'Connell, by whom he had three daughters and four sons. Of the latter, all have at one time or another had seats in parliament. (w. 0. M.)

O'CONNOR, Frarcus Epwarp (1796-1855), Chartist leader, was born in 1796, and entered parliament as member for the county of Cork in 1832. Though a zealous supporter of repeal, he endeavoured to supplant O'Connell as the leader of the party, an attempt which aroused against him the popular antipathy of the Irish. When, therefore, in 1834 he was unseated on petition, he resolved to go to England,where he established the Worthern Star newspaper, and became a vehement advocate of the Chartist movement. In 1847 he was returned for Notting- ham, and in 1848 he presided at a Chartist demonstration in London, which caused great alarm.

(See CHARTISM, vol. v. p. 434.) The eccentricity and extravagance which had characterized his opinions from the beginning of his career gradually became more marked until they developed into insanity. He began to conduct himself in a strange and disorderly manner in the House of Commons, and in 1853 he was found to be of unsound mind by a commis- sion of lunacy. He died at London 30th August 1855, and was buried in Kensal Green cemetery.

OCTAVIA. (1.) Octavia, daughter of Caius Octavius, preetor, 61 B.c., and sister of the emperor Augustus, was married to C. Marcellus, one of the bitterest enemies of Julius Cesar. In 41 her husband died, and she was

married immediately to Antony, with the design of secur- ing peace between her brother and her new husband. Her beauty and her high character are praised in the warmest terms by all authorities, and at first Antony devoted him- self to her, and seemed to have forgotten his jealousy of her brother and his old love for Cleopatra. But his affec- tion for his wife was not strong enough to counterbalance the feelings that weighed against it. In the year 36 he went off to the Parthian war and to meet Cleopatra, and, when in the following year Octavia brought out troops and money to him,.he refused to see her and bade her go back to Rome. She sent the money to him and returned

'to his house, where she educated his son by a former wife

along with her own children. In 32 Antony formally divorced her, but she always protected his children, even those of Cleopatra. She died 11 3B.c., and was buried with the highest honours by the state. (2.) Octavia, daughter of the emperor Claudius, was married in her twelfth year to NzRo (q.v.). A Latin tragedy on her fate is attributed, though wrongly, to Seneca.

OCTOBER, the eighth month of the old Roman year, which began in spring. By the Julian arrangement, while retaining its old name, it became the tenth month, and had thirty-one days assigned to it. The meditrinalia, when a libation of new wine was made in honour of Meditrina, were celebrated on the 11th, the faunalia on the 13th, and the equiria, when the "equus October" was sacrificed to Mars in the Campus Martius, on the 15th. The principal ecclesiastical feasts in October are those of St Luke on the 18th

~~and of St Simon and St Jude on the 28th. By the Slavs this is called "yellow month," from the fading of the leaf; to the Anglo-Saxons it was known as Winter- fylleth, because at this full moon (fylleth) winter was supposed to begin. It corresponds partly to the Vendé- miaire and partly to the Brumaire of the first French republic.~~

~~OCTOPUS. See Currierisy, vol. vi. p. 735; and Mo.iusca, vol. xvi. p. 669 sq.~~

~~OCYDROME, a word formed from Ocydromus, meaning " swift-runner," and suggested by Wagler in 1830 as a generic term for the New-Zealand bird called in the then unpublished manuscripts of the elder Forster Rallus troglo- dytes, and so designated in 1788 by Gmelin, who knew of it through Latham's English description. Wagler's sug- gestion has since been generally adopted, and the genus Ocydromus is accepted by most ornithologists as a valid group of Rallide ; but the number of species it contains is admittedly doubtful, owing to the variability in size and pluinage which they exhibit, and their correct nomencla- ture must for the present be considered uncertain. Mr Buller in his Birds of New Zealand identifies the " Wood- hen," observed in great abundance on the shores of Dusky Bay in 1773 by Cook and his companions on his second voyage, with the Gallirallus fuscus described and figured by Du Bus in 1847, and accordingly calls it O. fuscus ; but it cannot be questioned that the species from this locality—which appears to have a somewhat limited range in the Middle Island,! and never to be met with far from the sea-coast, where it lives wholly on crustaceans and other marine animals—is identical with that of the older authors just mentioned. In 1786 Sparrman, who had also been of Cook's company, figured and described as Rallus australis a bird which, though said by him to be that of the southern coast of New Zealand, differs so much from the &. troglo- dytes as to compel a belief in its specific distinctness ; and~~

~~1 Tt also occurs in Stewart Island, and singularly enough on the more distant group known as the Snares. The Gallirallus brachy- pterus of Lafresnaye, of which the typical (and unique ?) specimen from an unknown locality is in the Caen Museum, has also been referred to this species, but the propriety of the act may be doubted.~~

~~indeed his species has generally been identified with the common ‘“ Weeka” of the Maories of the Middle Island, which can scarcely be the case if his statement is abso- lutely true, since the latter does not appear to reach so far to the southward, or to affect the sea-shore. It may there- fore be fairly inferred that his subject was obtained from some other locality. The North Island of New Zealand has what is allowed to be a third species, to which the name of Ocydromus earli is attached, and this was formerly very plentiful; but “its numbers are rapidly decreasing, and there is every chance of its soon being as extinct as is the species which tenanted Norfolk Island on its discovery by Cook in 1774, and was doubtless distinct from all the rest, but no specimen of it is known to exist in any museum.! Another species, O. sylvestris, smaller and lighter in colour than any of the rest, was found in 1869 to linger yet in Lord Howe’s Island (Proc. Zool. Society, 1869, p. 472, pl. xxxv.). Somewhat differing from Ocydromus, but appa- rently very nearly allied to it, is a little bird peculiar, it is believed, to the Chatham Islands (bis, 1872, p. 247), and now regarded by Captain Hutton as the type of a genus Cabalus under the name of C. modestus, while other natu- ralists consider it to be the young of the rare Rallus dieffen- bacht. So far the distribution of the Ocydromine form is wholly in accordance with that of most others characteristic of the New-Zealand sub-region; but a curious exception is asserted to have been found in the Gallirallus lafresnay- anus of New Caledonia, which, though presenting some structural differences, has been referred to the genus Ocydromus.~~

~~The chief interest attaching to the Ocydromes is their inability to use in flight the wings with which they are furnished, and hence an extreme probability of the form becoming wholly extinct in ashort time. Of this inability there are other instances among the Rallidz (see Moor- HEN, vol. xvi. p. 808); but here we have coupled with it the curious fact that in the skeleton the angle which the scapula makes with the coracoid is greater than a right angle, a peculiarity shared only, so far as is known, among the Carinate by the Dodo. The Ocydromes are birds of dull plumage, and mostly of retiring habits, though the common species is said to show great boldness towards man, and, from the accounts of Cook and the younger Forster, the birds seen by them displayed little fear. It is also declared that they will interbreed with common poultry, and more than one writer vouches for the truth of this extraordinary statement. It is to be hoped that~~

the naturalists of New Zealand will not allow the form to become extinct if any effectual means can be taken to per- petuate it ; but, should that fate be inevitable, it at least behoves the present generation to see that every possible piece of information concerning the birds be recorded, and every possible preparation illustrating their structure be made, while yet there is time ; for, though much has been written on the subject, it is obvious from one of the latest papers (Z'rans. New Zealand Institute, x. p. 213) that there is still more to be learned, some of which may throw further light on the affinities of the birds of the extinct genus Aptornis. (A. N.)

ODDFELLOWS, a name adopted by the members of certain social institutions having mystic signs of recogni-

1 As before stated (Nestor, p. 354 ante), the younger Forster remarked that the birds of Norfolk Island, though believed by the other naturalists of Cook's ship to be generally the same as those of New Zealand, were distinguished by their brighter colouring. There can now be little doubt that all the land-birds were specifically distinct. It seems to be just possible that Sparrman's R. australis, which cannot be very confidently referrel] to any known species of Ocydromus, may have been from Norfolk Island ; but there is little probability of the point ever being determined, though it seems to be worth the atten- tion of ornithologists.

tion, initiatory rites and ceremonies, and various grades of dignity and honour. The objects the associations have in view are purely social and benevolent ; the sphere of their operations is confined wholly to their own members, and secrecy is enjoined in regard to all benevolent acts. As in the case of most other institutions of a similar kind, a claim of venerable antiquity has been set up for the order of Oddfellows,—the most common account of its origin ascribing it to the Jewish legion under Titus, who, it is asserted, received from that emperor its first charter written on a golden tablet. Statements even more im- probable and fantastic have been made regarding its foundation, but Oddfellows themselves now generally admit that the institution cannot be traced to an earlier period than the first half of the 18th century, and explain the name as adopted at a time when the severance into sects and classes was so wide that persons aiming at social

~~union and mutual help were a marked exception to the general rule. Mention is made by Defoe of the society of Oddfellows, but the oldest lodge of which the name has been handed down is the Loyal Aristarcus, No. 9, which met in 1745 "at the Oakley Arms, Borough of Southwark ; Globe Tavern, Hatton Garden; or the Boar's Head in Smithfield, as the noble master may direct." The earliest lodges were supported by each member and visitor paying a penny to the secretary on entering the lodge, and special sums were voted to any brother in need. If out of work he was supplied with a card and funds to reach the next lodge, and he went from lodge to lodge until he found employment. Now there is a regular system of periodical dues and collections, with occasional fees proportioned to the dignities or degrees conferred in the lodges. At first each lodge was practically independent of the others, and had its own special rules and government, but a close bond of unity gradually grew up between the large majority of the lodges until they adopted a definite common ritual and became confederated under the name of the Patriotic Order. Towards the end of the century many of the lodges were broken up by State prosecutions on the suspi- cion that their purposes were "seditious," but the society, changing its name and location, continued to exist in a sort of moribund condition, as the Union Order of Oddfellows, until in 1809 several of the members endeavoured to resuscitate its dormant energies. Finding, however, that it was impossible to excite an interest in anything higher than convivial meetings, they in 1813, at a convention in Manchester, formally seceded from the Union Order and formed the Independent Order of Oddfellows, Manchester Unity, which increased with enormous rapidity, and now overshadows all the minor societies in England. Accord- ing to the Oddfellows' Magazine for October 1883, the membership of the order in 1834 was 32,832, which in 1837 had increased to 80,570 and in 1845 to 239,374, while in January 1883 the numbers had risen to 565,368, the lodges amounting to 4251. In 1881 the receipts were £761,695, the payments £531,335, and the capital £5,291,891. In 1850 the society was legalized and recog- nized by the state in a corporate capacity. The Oddfellows' Magazne, issued by the society, and up to October 1883 published quarterly, now appears monthly. In England there are a large number of minor orders of Oddfellows, which either existed before the Manchester Unity, have seceded from it, or have had an independent origin. Among them are the Ancient Independent Order or Kent Unity, Woolwich,~~

1805, revived 1861; the Nottingham Ancient Imperial Order, 1812; the London Unity, 1820;

| the Boston Unity, 1832; the Kingston Unity, 1840; the

Norfolk and Norwich Unity, 1849; and the Derby Mid- land United Order, 1856. : Oddfellowship was introduced into the United States

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~~from the Manchester Unity in 1819, and the grand lodge of Maryland and the United States was constituted 22d February 1821. At first the progress of the order was slow, but, as may be supposed from the social characteristics and proclivities of the Americans, as soon as it had gained a firm hold its principles spread with great rapidity, and it now rivals in membership and influence the Manchester Unity, from which it severed its connexion in 1842. In 1843 it issued a dispensation for opening the Prince of Wales Lodge No. 1 at Montreal, Canada. The American society, including Canada and the United States, has its headquarters at Baltimore. In 1882 the membership was said to be 500,000, the income 6,000,000 dollars, and the annual sum disbursed for the relief of members of the order 2,000,000 dollars. Organizations, connected either with the United States or England, have been founded in Germany, Switzerland, Gibraltar and Malta, Australia, New Zealand, the Fiji Islands, the Hawaiian Islanas, South Africa, South America, the West Indies, and Barbados.~~

~~The rules of the different societies, various song-books, and a number of minor books on Oddfellowship have been published, but the most complete and trustworthy account of the institution is that in The Complete Manual of Oddfellowship, its History, Prin- ciples, Ceremonies, and Symbolism, privately printed, 1879.~~

~~ODENATHUS, or Opnamnatuus ('Odaivafos, n3"N), prince of Palmyra. See PaAtMyra and PrrsiA.~~

~~ODENSE, a city of Denmark, the chief town of the province of the same name, forming the northern part of the island of Fiinen (Fyen), lies about 4 miles from Odense Fjord on the Odense Aa, the main portion on the north side of the stream and the modern Albani quarter on the south side. It is a station on the railway route between Copenhagen and western Denmark, and a ship canal 10 feet deep constructed in 1796-1804 affords direct communication with the sea. St Canute's Church, formerly connected with the great Benedictine monastery of the same name, is one of the largest and finest edifices of its kind in Denmark. It is constructed of brick in a pure Gothic style. Originally dating from 1081-93, it was rebuilt in the 13th century, and has been restored since 1864. Under the altar lies Canute, the patron saint of Denmark, who intended to dispute with William of Nor-~~

mandy the possession of England, but was slain in an insurrection at Odense in 1086; Kings John and Christ- ian Il. are also buried within the walls. Our Lady's Church, built in the 13th century and restored in 1851-52 and again in 1864, contains a fine carved altar-piece by Claus Berg of Liibeck. Odense castle was erected by Frederick IV., who died there in 1730. The provincial infirmary (1862), the new post-office, the Franciscan hospital, presented to Fiinen in 1539 by King Christian IIL, Frederick VITI.'s foundation (1862), the episcopal library (25,000 volumes), and Karen Brahe's library may also be mentioned. As an industrial town Odense has made great progress since the middle of the century ; besides a large number of breweries and distilleries, it contains glove-fac- tories, match works, mineral-water works, tobacco-factories, chemical works, &c. The population was 5782 in 1801, 11,122 in 1850, 16,970 in 1870, and 20,804 in 1880.

—Odense, or Odinsey, originally Odinsoe, i.¢., Odin's sanctuary, is one of the oldest, as it has long been one of the most import- ant, citiesof Scandinavia. St Canute's shrine was a great resort of pilgrims throughout the Middle Ages. In the 16th century the town was the meeting-place of several parliaments, and down to 1805 it was the seat of the provincial assembly of Finen. It was the first place in Denmark to introduce gas-light (in the close of 1853). Haus Andersen was born in Odense, and Kingo, the Danish hymn- writer, was bishop of the diocese. Paludan-Miiller, a native of the

neighbouring town of Kjerteminde, was educated in the Odense

cathedral school. ODER (Latin, Viadrus; Slavonic, Vjodr), one of the principal rivers of Germany, rises on the Odergebirge in

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the Moravian tableland, in 49° 43' N. lat. and 17° 35' E. long., at a height of 1950 feet above the sea, and 14 miles to the east of Olmiitz. Itis 550 miles long from its source to its mouth in the Baltic Sea, and drains an area of about 50,000 square miles. The first 45 miles of its course lie within Moravia; for the next 15 it forms the frontier be- tween Prussian and Austrian Silesia ; while the remaining 490 miles belong to Prussia, where it

traverses the provinces of Silesia, Brandenburg, and Pomerania. It flows at first towards the south-east, but on quitting Austria turnstowards the north-west, maintaining this direction as far as Frank- fort, beyond which its general course is nearly due north. As far as the frontier the Oder flows through a well-defined valley, but, after passing through the gap between the Moravian mountains and the Carpathians and entering the Silesian plain, its valley is wide and shallow and its banks generally low. In its lower course it is divided into numer- ous branches, forming a large quantity of islands. The main channel follows the left side of the valley and finally expands into the Pommersche or Stettiner Haff, which is connected with the sea by three arms, the Peene, the Swine, and the Dievenow, forming the islands of Usedom and Wollin. The Swine, in the middle, is the main channel for navigation. The chief tributaries of the Oder on the left bank are the Oppa, Glatz Neisse, Katzbach, Bober, and Lausitz Neisse ; on the right bank the Malapane, Bartsch, Faule Obra, and Warthe. Of these the only one of im- portance for navigation is the Warthe, which through the Netze is brought into communication with the Vistula. The Oder is also connected by canals with the Havel and the Spree. The most important towns on its banks are Ratibor, Oppeln, Brieg, Breslau, Glogau, Frankfort, Ciistrin, and Stettin, with the seaport of Swinemiinde at its mouth. Glogau and Ciistrin are strongly fortified, and Swinemtinde is also defended by a few forts.

The navigation of the Oder is rendered somewhat difficult by the rapid fall of its upper course, amounting above Brieg to 2 feet per mile, and by the enormous quautities of débris brought into it by its numerous mountain tributaries. The German authorities, how- ever, have been unwearied in their efforts to improve the channel, and have now succeeded in securing a minimum depth of 3 feet at low water throughout almost the whole of the Prussian part of the river. Their most important undertaking was the diversion of the river into a newand straight channel in the Oderbruch below Frank- fort, by which an extensive detour was cut off and a large tract of swampy country brouglit under cultivation. The Oder at present begins to be navigable for barges at Ratibor, where it is about 100 feet wide, but the navigable channel will probably soon extend up- wards to Oderberg. Sea-going vessels cannot go beyond Stettin. A second Oder-Spree canal, leaving the Oder opposite the mouth of the Warthe and joining

the Spree near Berlin, has been determined on; and a canal connecting the Oder and the Danube has also been planned. The traffic on the Oder, which is steadily increasing, is mainly concerned with agricultural produce and timber. Some idea of its extent may be gathered from the fact that 280 river-steamers and 2800 other vessels passed through the Oderbruch (up and down) in 1881 with cargoes amounting in all to 166,500 tons. The river is here about 750 feet wide and 8 feet deep. The fishing is important, particularly in the neighbourhood of Stettin.

Those interested in river navigation or engineering may be referred to the following works : Becker, Zur Kenniniss der Oder und thres Fldchengebiets (1868) ;

"Die Deutschen Wasserstrassen " in the Statistik des Deutschen Reiches for 1874 5 Haase, Regulation der deutschen Hauptstrome (Breslau, 1880).

ODESSA, one of the most important seaports of Russia, ranks in the empire by its population (225,000) and foreign trade after St Petersburg, Moscow, and Warsaw. It is situated in 46° 28' N. lat. and 30° 44' E. long., on the southern shore of a semicircular bay, at the north-western angle of the Black Sea, and is 933 miles distant from Moscow and 403 miles from Kieff. Odessa is the proper seaport for the basins of two great rivers of Russia, the Dnieper, with its tributary the Bug, and the Dniester ; the entrances to the mouths of both these offering many difficulties for navigation, trade has from the remotest antiquity selected this spot, which is situated half-way between the estuaries, while the flat ground of the neighbouring steppe allows

ODESSA

easy communication with the lower parts of both rivers. The dimans or lagoons of Haji-bey and Kuyalnik, which penetrate far inland from the neighbourhood of Odessa, are separated from the sea by flat sandy isthmuses. The bay of Odessa, which has an area of 14 square miles and a depth of 30 feet, with a soft bottom, is a dangerous anchorage on account of its exposure to easterly winds. The ships lie, therefore, in two harbours, both protected by moles,—the "quarantine harbour," from 4 to 21 feet deep, and the so-called "practical harbour," for coasting vessels, with a

maximum depth of 11 feet. A new one, 1100 yards long and 660 yards wide, was constructed a few years ago. The harbours freeze for a few days in winter, as also does the bay itself occasionally, navigation being interrupted every year for an average of sixteen days. Odessa experiences the influence of the continental

climate of the neighbouring steppes; its winters are cold (the average temperature for January being 23°°2, and the isotherm for the entire season that of Kénigsberg), its summers are hot (72°°8 in July), and the yearly average

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Plan of Odessa.

temperature is 48°°5. The rainfall is scanty (ninety-two rainy days, with 14 inches of rain per annum); and one of the plagues of the city is the chalky dust, which is raised in clouds by the strong winds to which it is exposed. The city is built on a terrace from 100 to 150 feet in height, which descends by steep crags to the sea, and on the other side is continuous with the level of the steppe, which is covered with a layer of "black earth"; the subsoil consists of clay, gravel, and a soft Tertiary sandstone, which is used for building, but readily disintegrates under atmospheric agencies, Catacombs whence this sandstone has been taken extend underneath the town and the suburbs, not without some danger to the buildings. The water-supply is inade- quate. Drinking-water was formerly shipped from the Crimea, and the poorer classes had to supply themselves from cisterns and bad wells. An aqueduct, 27 miles long, now brings water from Mayaki on the Dniester.

The general aspect of Odessa is that of a wealthy west-

'| the number exceeds 225,000.

~~European city. Its chief embankment, bordered with tall and handsome houses, forms a fine promenade; a superb flight of steps descends to the sea from its central square, which is adorned with a statue of Richelieu. The central parts of the city have broad streets and squares, bordered with fine buildings and mansions in the Italian style, and with good shops. But even on the best streets poor houses surrounded with open yards occur side by side with richly- decorated palaces; and in close association with elegant carriages and rich dresses one sees the open car of the peasant and the dirty dress of the Jew or the Bulgarian. The cathedral, finished in 1849, can accommodate 5000 persons ; it contains the tomb of Count Worontzoff, a former governor-general, who contributed much towards the de- velopment and embellishment of the city. The " Palais Royal," with its parterre and fountains, and the spacious public park are fine pleasure-grounds, whilst in the ravines that descend to the sea the dirty houses of the poorer classes are massed. 'The shore is occupied by immense granaries, some of which look like palaces, and large storehouses take up a broad space in the west of the city. Odessa, which has a circumference of 6 miles, consists of the city proper, containing the old fort (now a quarantine establishment) and surrounded by a boulevard, where was formerly a wall marking the limits of the free port, of the suburbs Novaya and Peresyp, extending northward along the lower shore of the bay, and of Moldavanka to the south-west. A number of villas and cottages surround the city; the German**

colonies Liebenthal and Lustdorf are bathing-places.

Odessa is the real capital, intellectual and commercial, of the so-called Novorossia, which includes the governments of Bessarabia and Kherson. In the official subdivision of Russia it is only the chief town of the district of the same name in the government of Kherson. It constitutes at the same time an independent " muni- cipal district" or captaincy (gradonachalstvo), which covers 182 square miles and includes a dozen villages, some of which have from 2000 to 3000 inhabitants. Odessa, like St Petersburg and Moscow, received in 1863 a new municipal constitution, with an elective mayor, municipal assembly, and executive council. It is also the chief town of the Novorossian educational district, and has a university, which replaced Richelieu Lyceum in 1865, and now has about 400 students. The young scieutific society at the university is very active in investigating the

natural history of southern Russia and of the Black Sea, and has already published some valuable Transactions. There are also an historical society with a museum containing rich collections from the Hellenic, Genoese, Venetian, and Mongolo-Tatar periods of the history of the Black Sea coast, a society of agriculture, a public library, and many educational institutions.

The population of Odessa is rapidly increasing. In 1814, twenty years after its foundation, it had 25,000 inhabitants; this figure steadily grew in succeeding years, Worontzoff allowing all sorts of people, runaway serfs included, to settle in the steppes of Bess- arabia and Kherson, while at the same time the privileges of a free port, granted in 1817 and abolished only in 1857, attracted great numbers of merchants of all nationalities. In 1850 Odessa had 100,000 inhabitants, 185,000 in 1873, and at present (1884) Of these the great majority are Great Russians and Little Russians ; but there are also large numbers of Jews (67,000, exclusive of Karaites, against 50,000 in 1873), as well as of Italians, Greeks, Germans, and French (to which nation- alities the chief merchants belong), as also of Roumanians, Ser- vians, Bulgarians, Tatars, Armenians, Lazes, Georgians, &c. These nationalities do not live in perfect harmony, and the continual commercial antagonism between the Greeks and the Jews often leads to scenes of disorder. A numerous floating' population of labourers, attracted at eertain periods by pressing work in the port, aud afterwards left unemployed owing to the enormous fluctuations in the corn trade, is one of the features of Odessa. It is estimated that there are no less than 35,000 people living from hand to mouth in the utmost misery, partly in the extensive labyrinth of the catacombs beneath the city. —

The leading occupations of the inhabitants are connected with exporting, shipping, and manufactures. These latter have extended rapidly within the last twenty years, but their aggregate produc- tion (in the gradonachalstvo of Odessa) does not exeeed 20,000,000 roubles (about £2,000,000). To this total the principal items are contributed by the steam flour-inills (about £650,000 in 1879), the manufacture of tobacco (£200,000) and of machinery (£200,000), after which come tanneries, soap-works, chemical-works, biscuit-

factories, rope-works, and carriage-works. The foreign trade, chiefly in corn, has immensely increased of late, since Odessa was brought into railway communication with central Russia. Grain was exported in 1880 to the amount of 1,040,400 quarters (2,445,120 quarters in 1878). This figure is subject, however, to great fluctuations. The' other articles of export are flour, wool, tallow, hides, cattle (about 140,000 head), soap, ropes, and spirits, the value of the aggregate amount of exports reaching 42,000,000 roubles in 1880, against 65,000,000 roubles in 1879, and 85,815, 000 in 1878. 'The chief articles of import are tea (£1,600,000 in 1881), coffee, rice, cotton, tobacco, coal, oil, leather, paper, fruits, wine, and all kinds of manufactured ware, for an aggregate sum of 47,775,000 roubles in 1880. Odessa also carries on a brisk trade with other seaports of Russia, and, besides the 1508 ships (282 Russian and 650 English) engaged in foreign trade which entered the port of Odessa in 1879, it was visited by 2700 coasting vessels. Odessa is in regular steam communication with all the chief ports of the Black Sea and the Mediterranean, as also with London. The Russian Navigation Company sends its steamers by the Snez Canal to Chinese, Indian, and Russian Pacific ports, and has a numerous fleet on the Dnieper, Dniester, and Bug. The commercial fleet of Odessa in 1880 numbered 101 steamers (44,000 tons) and 178 sailing ships (19,800 tons). Thé total revenue of the town in 1882 was 1,938,000 roubles, and the expenditure 1,883,000 roubles, —the chief items being, for charitable institutions 434,000 roubles, for the army 213,000, for administration and police 309,000, and for public instruction 138,000.

History.—The bay of Odessa was colonized by Greeks at a very early period, and their ports—Istrianorum Portus and Isiacorum Portus on the shores of the bay, and Odessus and the modern Skopeli at the mouth of the Tiligul diman—carried on a lively trade with the neighbouring steppes. These towns disappeared in the 3d and Ath centuries, leaving nothing but heaps of ruins ; and for ten cen- turies thenceforward no settlements in these tracts are mentioned. All that is known is that in the 6th century the space between the mouths of the Dnieper aud the Duiester was oceupied by the Antes, and in the 9th century by the Tivertsy, both of Slavonian origin. In the 14th century this region belonged to the Lithuanians, and in 1396 Olgerd defeated in battle three Tatar chiefs, one of whom, Bek- Haji, had reeently founded, at the place now occupied by Odessa, a fort which

received his namie. The Lithuanians, and subsequently the Poles, kept the country under their dominion until the 16th century, when it was seized by the Tatars, who still permitted, how- ever, the Lithuanians to gather salt in the neighbouring lakes. Later on the Turks left a garrison at Haji-bey, and founded in 1764 the fortress Yanidunia. In 1769 the Zaporog Cossacks made a raid on Haji-bey and burned its suburbs, but could not take the fort ; and, after the destruction of the Zaporojskaya Sech, the runaway Zapo- rogians settled close by Haji-bey in what is now the " quarantine ravine." In 1787 the Cossack leader Chepega again attacked Haji- bey and burned all its storehouses, and two years later the Russians, under the French captain De Ribas, took the fortress by assault. In 1791 Haji-bey and the Otchakoff region were conceded to Russia. De Ribas and the French engineer Voland were entrusted in 1794 with the erection of a town and the construction of a port at Haji- bey ; the former was allowed to distribute about 100,000 acres of land freely to new settlers, and two years later Haji-bey, renamed Odessa, had 3153 permanent inhabitants, besides the military, and was visited by 86 foreign vessels. In 1803 Odessa became the chief town of a separate municipal district or eaptaincy, the first captain being the duke of Richelieu, who did very much for the development of the young city and its improvement as a seaport. In 1824 Odessa beeame the seat of the governors-general of Novorossia and Bessarabia. Since that time it has steadily increased its foreign trade and extended its commercial relations. In 1866 it was brought into railway connexion with Kieff and Kharkoff via Balta, and with Jassy in Roumania. (CEPAT HS) 2

ODEY POOR, or Uparrur. v. p. 768.

ODIN, or Wopan. See GERMANY, vol. x. p. 474, and MyrTHotocy, above, p. 156.

ODOACER, or Opovacar (c. 434-493), the first bar- barian ruler of Italy on the downfall of the Western empire, was born in the district bordering on the middle Danube about the year 434. In this district the once rich and fertile provinces of Noricum and Pannonia were being torn piecemeal from the Roman empire by a crowd of German tribes, among whom we discern four, who seem to have hovered over the Danube from Passau to Pesth, namely, the Rugii, Scyrri, Turcilingi, and Heruli. With all of these Odoacer

was connected by his subsequent career, and all seem, more or less, to have claimed him as

See CoutTia Nagpur, vol.

belonging to them by birth; the evidence slightly pre- ponderates in favour of his descent from the Scyrri.

His father was Aidico or Idico, a name which suggests Edeco the Hun, who was suborned by the Byzantine court to plot the assassination of his master Attila. There are, however, some strong arguments against this identification. A certain Edica, chief of the Scyrri, of whom Jordanes speaks as defeated by the Ostrogoths, may more probably have been the father of Odoacer, though even in this theory there are some difficulties, chiefly connected with the low estate in which he appears before us in the next scene of his life, when as a tall young recruit for the Roman armies, dressed in a sordid vesture of skins, on his way to Italy, he enters the cell of Severinus, a noted hermit-saint of Noricum, to ask his blessing. The saint had an inward premonition of his future greatness, and in blessing him said, "Fare onward into Italy. Thou who art now clothed in vile raiment wilt soon give precious gifts unto many."

Odoacer was probably about thirty years of age when he thus left his country and entered the imperial service. By the year 472 he had risen to some eminence, since it is expressly recorded that he sided with the patrician Ricimer in his quarrel with the emperor Anthemius. In the year 475, by one of the endless revolutions which marked the close of the Western empire, the emperor Nepos was driven into exile, and the successful rebel Orestes was enabled to array in the purple his son, a hand- some boy of fourteen or fifteen, who was named Romulus after his grandfather, and nicknamed Augustulus, from his inability to play the part of the great Augustus. Before this puppet emperor had been a year on the throne the barbarian mercenaries, who were chiefly drawn from the Danubian tribes before mentioned, rose in mutiny, demand- ing to be made proprietors of one-third of the soil of Italy. To this request Orestes returned a peremptory negative. Odoacer now offered his fellow-soldiers to obtain

for them all that they desired if they would seat him on the throne. On the 23d August 476 he was proclaimed king; five days later Orestes was made prisoner at Placentia and be- headed ; and on the 4th September his brother Paulus was defeated and slain in the pine-wood near Ravenna. Rome at once accepted the new ruler. Augustulus was compelled to descend from the throne, but his life was spared.

Odoacer was forty-two years of age when he thus be- came chief ruler of Italy, and he reigned thirteen years with undisputed sway. Our information as to this period is very slender, but we can perceive that the administra- tion was conducted as much as possible on the lines of the old imperial government. The settlement of the barbarian soldiers on the lands of Italy probably affected the great landowners rather than the labouring class. To the herd of colont and serv, by whom in their various degrees the land was actually cultivated, it probably made little differ- ence, except as a matter of sentiment, whether the master whom they served called himself Roman or Rugian. We have one most interesting example, though in a small way, of such a transfer of land with its appurtenant slaves and cattle, in the donation made by Odoacer himself to his faithful follower Pierius.1 Few things bring more vividly before the reader the continuity of legal and social life in the midst of the tremendous ethnical changes of the 5th century than the perusal of such a record.

The same fact, from a slightly different point of view, is illustrated by the curious history (recorded by Malchus) of the embassies to Constantinople. The dethroned emperor Nepos sent ambassadors (in 477 or 478) to Zeno emperor

1 Published in Marini's Papirt Diplomatici (Rome, 1815, Nos, 82 and 83) and in Spangenberg's Juris Romani Tabulx (Leipsie, 1822, pp. 164-173), and well worthy of careful study.

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of the East, begging his aid in the reconquest of Italy. These ambassadors met a deputation from the Roman senate, sent nominally by the command of Augustulus, really no doubt by that of Odoacer, the purport of whose commission was that they did not need a separate emperor. One was

sufficient to defend the borders of either realm. The senate had chosen Odoacer, whose knowledge of military affairs and whose statesmanship admirably fitted him for preserving order in that part of the world, and they therefore prayed Zeno to confer upon him the dignity of patrician, and entrust the "diocese" of Italy to his care. Zeno returned a harsh answer to the senate, requiring them to return to their allegiance to Nepos. In fact, how- ever, he did nothing for the fallen emperor, but accepted the new order of things, and even addressed Odoacer as patrician. On the other hand, the latter sent the orna- ments of empire, the diadem and purple robe, to Con- stantinople as an acknowledgment of the fact that he did not claim supreme power. Our information as to the actual title assumed by the new ruler is somewhat confused. He does not appear to have called himself king of Italy. His kingship seems to have marked only his relation to his Teutonic followers, among whom he was "king of the Turcilingi," "king of the Heruli," and so forth, according to the nationality with which he was dealing. By the Roman inhabitants of Italy he was addressed as "'dominus noster," but his right to exercise power would in their eyes rest, in theory, on his recognition as patricius by the Byzantine Augustus. At the same time, he marked his own high pretensions by assuming the prefix Flavius, a reminiscence of the early emperors, to which the barbarian rulers of realms formed out of the Roman state seem to have been peculiarly partial. His internal administration was probably, upon the whole, wise and moderate, though we hear some complaints of financial oppression, and he may be looked upon as a not altogether unworthy pre- decessor of Theodoric.

In the history of the papacy Odoacer figures as the author of a decree promulgated at the election of Felix IT. in 483, forbidding the pope to alienate any of the lands or ornaments of the Roman Church, and threatening any pope who should infringe this edict with anathema. This decree, a strange one to proceed from an Arian sovereign, was

probably suggested by some of the Roman counsellors of

the king, and seems to have been accepted at the time with- out protest. It was, however, loudly condemned in a synod held by Pope Symmachus (502) as an unwarrantable inter- ference of the civil power with the concerns of the church. The chief events in the foreign policy of Odoacer were his

Dalmatian and Rugian wars. In the year 480 the ex-emperor Nepos, who ruled Dalmatia, was traitorously assassinated in Diocletian's palace at Spalato by the counts Viator and Ovida. In the following year Odoacer invaded Dalmatia, slew the murderer Ovida, and reannexed Dal- matia to the Western state. In 487 he appeared as an invader in his own native Danubian lands. War broke out between him and Feletheus, king of the Rugians. Odoacer entered the Rugian territory, defeated Feletheus, and carried him and "his noxious wife" Gisa prisoners to Ravenna. In the following year Frederick, son of the captive king, endeavoured to raise again the fallen fortunes of his house, but was defeated by Onulf, brother of Odoacer, and, being forced to flee, took refuge at the court of Theo- doric the Ostrogoth, at Sistova on the lower Danube. This Rugian war was probably an indirect cause of the fall of Odoacer. His increasing power rendered him too formid- able to the Byzantine court, with whom his relations had for some time been growing less friendly. At the same time, Zeno was embarrassed by the formidable neighbour- hood of Theodoric and his Ostrogothic warriors, who were

almost equally burdensome as enemies or as allies. In these circumstances arose the plan of Theodorie's invasion of Italy, a plan by whom originated it would be difficult to say. Whether the land when conquered was to be held by the Ostrogoth in full sovereignty, or administered by him as lieutenant of Zeno, is a point upon which our infor- mation is ainbiguous, and which was perhaps intentionally left vague by the two contracting parties, whose chief anxiety was not to see one another's faces again, The details of the Ostrogothic invasion of Italy belong properly to the life of Theodoric. It is sufficient to state here that he entered Italy in August 489, defeated Odoacer at the Isontius (Isonzo) on the 28th of August, and at Verona on the 30th of September. Odoacer then shut himself up in Ravenna, and there maintained himself for four years, with one brief gleam of success, during which he emerged from his hiding-place and fought the battle of the Addua (11th August 490), in which he was again defeated. A sally from Ravenna (10th July 491) was again the occasion of a murderous defeat. At length, the famine in Ravenna having become almost intolerable, and the Goths despair- ing of ever taking the city by assault, negotiations were opened for

~~a compromise (25th February 493). John, archbishop of Ravenna, acted as mediator. It was stipu- lated that Ravenna should be surrendered, that Odoacer's life should be spared, and that he and Theodoric should be recognized as joint rulers of the Roman state, The arrangement was evidently a precarious one, and was soon terminated by the treachery of Theodoric. He invited his rival to a banquet in the palace of the Lauretum on the 15th of March, and there slew him with his own hand. " Where is God?" cried Odoacer when he perceived the ambush into which he had fallen. "Thus didst thou deal with my kinsmen," shouted Theodoric, and clove his rival with the broadsword from shoulder to flank, Onulf, the brother of the murdered king, was shot down while attempting to escape through the palace garden, and Thelan, his son, was not long after put to death by order of the conqueror. 'Thus perished the whole race of Odoacer. Literature.—The chief authorities for the life of Odoacer are the so-called "Anonymus Valesii," generally printed at the end of Ammianus Marcellinus ; the Life of Severinus, by Eugippius ; the chroniclers, Cassiodorus and '"Cuspiniani Anonymus" (both in Roncalli's collection) ; and the Byzantine historians, Malchus and John of Antioch. A fragment of the latter historian, unknown when Gibbon wrote, is to be found in the fifth volume of Miiller's Fragmenta Historicorum Grecorum. Among modern students, Pallmann (Geschichte der Volkerwanderung, vol. il.) has investi- gated the history of Odoacer the most thoroughly. (TH) O'DONNELL. (1) Henry Joszpy (1769-1834), count of La Bisbal, a native of Spain, was descended from the O'Donnells who left Ireland after the battle of the Boyne ;) he early entered the Spanish army, and in 1810 became general, receiving a command in Catalonia, where in that year he earned his title and the rank of field-marshal. Henry Joseph afterwards held posts of great responsibility under Ferdinand VII., whom he served on the whole with constancy ; the events of 1823 compelled his flight into France, where he was interned at Limoges, and where he died in 1834. (2) Leoporp (1809-1867), Duke of Tetuan, Spanish general and statesman, the second son of Henry Joseph O'Donnell, was born at Santa Cruz, Teneriffe, on 12th January 1809. He fought in the army of Queen Christina, where he attained the rank of general of division; and in 1840 he accompanied the queen into exile. He failed in an attempt to effect a rising in her favour at Pamplona in 1841, but took a more successful part in the movement which led to the overthrow and exile of Espartero~~

1 A branch of the family settled in Austria, and General Karl O'Donnell, count of Tyrconnel (1715-1771), held important commands during the Seven Years' War. The name of a descendant figures in the history of the Italian and Hungarian campaigns of 1848 and 1849,

in 1843. From 1844 to 1848 he served the new Govern- ment in Cuba; after his return he entered the senate. In 1854 he became war minister under Espartero, and in 1856 he plotted successfully against his chief, becoming head of the cabinet from the July revolution until October. This rank he again reached in July 1858 ; and in December 1859 he took command of the expedition to Morocco, and received the title of duke after the surrender of Tetuan. Quitting office in 1863, he again resumed it in June 1865, but was compelled to resign in favour of Narvaez in 1866. He died at Bayonne on 5th November 1867.

ODORIC (c. 1286-1331), styled of Pordenone, one of the notable travellers to the farther East in the Middle Ages, and a Beatus of the Roman Church, was born at Villa Nuova, a hamlet near the town of Pordenone in Friuli, in or about 1286, and, according to ecclesiastical biographers, in early years took the vows of the Franciscan order and joined their convent at Udine, the capital of Friuli. Under Cura (vol. v. p. 628) the remarkable opening of communication, both commercial and ecclesi- astical, with that country during the first half of the 14th century has been spoken of. There had arisen also during the latter half of the 13th century an energetic missionary action, extending all over the East, on the part of both the new orders of Preaching and Minorite (or Dominican and Franciscan) Friars, and houses of those orders, of the last especially, became established in Persia, in what is now southern Russia, in Tartary, and in China.

Friar Odoric was despatched to the East about 1316-18, and did not return till near 1330, but, as regards inter- mediate dates, all that we can deduce from his narrative or other evidence is that he was in western India soon after 1321, and that he spent three years in China between 1322 and 1327. His route to the East lay by Constan- tinople and Trebizond to Erzeroum, and thence to Tabriz and Sultdniya, in all of which places the order had houses. From Sultdniya he proceeded by Kashin and Yezd, and turning

thence followed a somewhat devious route by Persepolis, Shirdz, and Baghdad to the Persian Gulf. At Ormuz he embarked for India, landing at Tana, still the chief station of the island of Salsette, and which was then one of the chief ports of western India. At this city four brethren of his order, three of them Italians and the fourth a Georgian, had shortly before met death at the hands of the Mohammedan governor, who held the place under the dominion of the sovereign of Delhi (then Ghaids- suddin Tughlak). The bones of the martyred friars had been collected by Friar Jordanus of Severac, a Dominican, who carried them to Supera—the Suppara of the ancient geographers, near the modern Bassein, about 26 miles north of Bombay—and buried them there. Odoric tells that he disinterred these relics and carried them with him on his farther travels. In the course of these he visited Malabar, touching at Pandardni (20 miles north of Calicut),

at Cranganore, and at Quilon, proceeding thence, apparently, :

to Ceylon and to the shrine of St Thomas at Mailapur near Madras. From India he sailed in a Chinese junk to Sumatra, visiting various ports on the northern coast of that island, then Java, the coast (it would seem) of Borneo, Champa (South Cochin China), and Canton, at that time known to western Asiatics as Chin-Kaldn or Great China (Mahdchin). Thence he went on to the great ports of Fuh- keen, at one of which, Zayton or Chwanchow (see Curn- CHEW, vol. v. p. 673), he found two houses of his order ; in one of these he deposited the bones of the brethren who had suffered in India. From Fu-chau he struck across the mountains into Che-keang and visited Hang-chow, then renowned under the name of Cansay ("'King-sze," or royal residence) as one of the greatest cities in the world, of the splendours of which Marco Polo, Ibn Batuta, and others

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have given such notable details. Passing northward by Nan-king and crossing the Great Kiang, Odoric embarked on the Great Canal and travelled to CamBatuc or Peking, where he remained for three years, attached, no doubt, to one of the churches founded by Archbishop John of Monte Corvino, at this time in extreme old age. Turning west- ward in the neighbourhood of the Great Wall and through Shensi, the adventurous traveller entered Tibet, and appears to have visited Lhasa. But no distinct

~~indication of his homeward route is given, though it may be gathered from fragmentary notices that he passed through Khorasan, and so probably by Tabriz to Europe, reaching Venice in the end of 1329 or beginning of 1330. During a part at least~~

~~of these long journeys the companion of Odoric was Friar ; James, an Irishman, as appears from a record in the public books of Udine, showing that shortly after Odoric's death a present of two marks was made to this Irish friar, Socto beati Odorict, amore Dei et Odorici. Shortly after his return Odoric betook himself to the Minorite house attached to St Antony's at Padua, and it was there that in May 1330 he related the story of his travels, which was taken down in homely Latin by Friar William of Solagna. Travelling towards the papal court at Avignon, Odoric fell ill at Pisa, and, turning back to Udine, the capital of his native province, died in the convent there, 14th January 1331. The fame of his vast journeys appears to have made a much greater impression on the laity of his native territory than on his Franciscan brethren. The latter were about to bury him without delay or ceremony, but the "gastald ' or chief magistrate of the city interfered and appointed a public funeral ; rumours of his wondrous travels, and of posthumous miracles were diffused, and excitement spread like wildfire over Friuli and Carniola; the ceremony had to be deferred more than once, and at last took place in presence of the patriarch of Aquileia and all the local dignitaries. The sanctity of Odoric was now fully recog- nized, and was taken up at last by his own community,~~

~~who employed an eminent preacher to declaim to the people the history and pious deeds of this brother, whom~~

~~they probably had regarded till now only as an eccentric, who told questionable stories about the Grand Cham and islands of the anthropophagi. Popular acclamation made him an object of devotion, the municipality erected a noble shrine for his body, his fame as saint and traveller had spread far and wide before the middle of the century, but it was not till four centuries later (1755) that the papal authority formally sanctioned his beatification. A bust of Odoric was set up at Pordenone in 1881.~~

The numerous MSS. of Odoric's narrative that have come down to our time (upwards of forty are known), and chiefly from the 14th century, show how speedily and widely it acquired popularity. It does not deserve the charge of general mendacity brought against it by some, though the language of other writers, who have spoken of the traveller as a man of learning, is still more injudicious. Like most of the medizval travellers, he is indiscriminating in accepting strange tales ; but, whilst some of these are the habitual stories of the age, many particulars which he relates attest the genuine char- acter of the narrative, and some of those which Tiraboschi and others have condemned as mendacions interpolations are the very seals of truth. Odoric's credit was not benefited by the liberties which Sir John Mandeville took with it. The substance of that knight's alleged travels in India and Cathay is stolen in bulk from Odoric, though largely amplified with fables from other sources and from his own invention, and garnished with his own unusually clear astronomical notions. We may indicate a few passages which stamp Odoric as a genuine and original traveller. He is the first European who distinctly mentions the name of Sumatra. The cannibalism and community of wives which he attributes to certain races of that island do certainly belong to it, or to islands closely adjoining. His description of sago in the archipelago is not free from errors, but they are the errors of an eye-witness. In China his mention of Canton by the name of Chin-Kalan, his description of the custom of fishing with tame cormorants, of the habit of let- ting the finger-nails grow extravagantly, and of the compression of women's feet, as well as of the division of the empire into twelve

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provinces, with four chief ministers, are all peculiar to him among the travellers of that age ; Marco Polo omits them all.

The narrative was first printed at Pesaro in 1513, in what A postolo Zeno calls lingua incul/a e rozza, probably, therefore, in a Venetian dialect. Ramiusio's collection first contains it in the 2d vol. of the 2d edition (1574), in which are given two versions, differing curiously from one another, but without any prefatory matter or explanation. Another (Latin) version is given in the Acta Sanctorum (Bollandist) under 14th January. 'The curious discussion before the papal court respecting the beatification of Odoric

forms a kind of blue- book issued ex typographia rev. cameree apostoliex, Rome, 1755. Pro- fessor Kunstmann of Munich devoted one of his valuable papers to Odoric's narrative (Histor. -Polit. Blattern von Phillips und Gérres, vol. xxxviii.). The collection called Cathay and the Way Thither, by Colonel Yule (Hak. Soc., 1866), contains a careful translation and commentary, &c. A new edition in Italian has been recently issued in Italy, but it is not of value. (Gal, SG)

ODYSSEUS is of all the Greek heroes the most typical representative of the Greek race. The quality on which he prides himself (Od., ix. 19) is his cunning and ready wit ; his inventive genius never fails in the greatest danger. But his cunning is not of the narrow kind that is incom- patible with real wisdom ; he is not troubled by scruples, but he uses nobly and liberally a power that he has acquired by craft; he is fond of adventure and yet full of prudence, very cautious and yet in case of need brave. {t is a character that in the hands of Homer is very fine, but which in those of almost all other writers becomes repulsive. He was son of Laertes and Anticleia, and king of Ithaca, a small rocky island on the western side of Greece. He married Penelope, but very soon after his marriage he was summoned to the Trojan war. Unwill- ing to go, he feigned madness, yoked an ox and a horse together, but Palamedes discovered his deceit by means of his care for his infant child Telemachus ; afterwards Odysseus revenged himself by compassing the death of Palamedes. Obliged to go to the war, he distinguished himself as the wisest councillor of the Greeks, and finally, the capture of Troy, which the bravery of Achilles could not accomplish, was attained by Odysseus's stratagem of the wooden horse. After the death of Achilles the Grecks adjudged his armour to Odysseus as the man who had done most to make the war successful. When Troy was captured he set sail for Ithaca, but was carried by un- favourable winds to the coast of Africa. After encountering many adventures in all parts of the unknown seas, among the lotus-eaters and the Cyclopes, in the isles of AZolus and Circe and the perils of Scylla and Charybdis, among the Lestrygons, and even in the world of the dead, having lost all his ships and companions, he barely escaped with his own life to the island of Calypso, where he was detained eight years, an unwilling lover of the beautiful nymph. Then at the command of Zeus he was sent homewards, but was again wrecked on the island of Phzacia, whence he was conveyed to Ithaca in one of the

wondrous Pheacian ships. Here he found that a host of suitors, taking advantage of the youth of his son Telemachus, were wasting his property and trying to force Penelope to marry one of them. The stratagems and disguises by which he with a few faithful friends slew the suitors are described at length in the Odyssey.

There is no doubt that the personality of Odysseus developed out of some germ in primitive religious myth : but it is almost hopeless to seek for the early form, so completely has it been transformed. In many heroes of poetry and mythology the chief interest lies in tracing the growth of the conception from the divine form of early religion to the Greek hero of poetry; but in the case of Odysseus the supreme interest attaches to the perfect form as it appears in Homer, the typical representative of the old sailor-race whose adventurous voyages educated and moulded the Hellenic race. The period when the char- acter of Odysseus grew among the Ionian bards was when

the Ionian ships were beginning to penetrate to the farthest shores of the Black Sea, and to the western side of Italy, but when Egypt had not yet been freely opened to foreign intercourse by Psammetichus and his successors. The tale of Odysseus gives us the form in which the voyages, the perils, the strange races of foreign lands, and the rich spoils of the sailors were mirrored in the minds of the nation and sung by its poets.

GECOLAMPADIUS,! Jonn (1482-1531), was born at Weinsberg, a small town in the north of the modern king- dom of Wiirtemberg, but then belonging to the Palatinate. He went to school at Weinsberg and Heilbronn, and when twelve years old entered the university of Heidelberg, where he took his bachelor's degree in 1501. He seems at first to have intended to study for the profession of law, and went to Bologna, but soon returned to Heidelberg and betook himself to theology. He became a zealous student of the new learning and passed from the study of Greek to that of Hebrew. He went from Heidelberg to Tiibin- gen, and thence to Stuttgart, making the acquaintance of Erasmus, Hedio, and Reuchlin, and after some earlier essays in preaching became pastor at Basel in 1515, serving under Christopher von Uttenheim, the evangelical bishop of Basel. From the beginning the sermons of (icolampadius had "Christ the crucified" as their

theme, and his first reformatory zeal showed itself in a protest against the introduction of legends of the saints into Easter sermons. While in Basel, preaching did not absorb all his energies ; he was in daily intercourse with learned friends at the university, and pursued his literary researches and humanist studies. In 1518 he published his Greek Grammar. The same year he was asked to become pastor in the high church in Augsburg. Germany was then ablaze with the questions raised by Luther's theses, and his introduction into this new world seems to have compelled Cicolampa- dius to severe self-examination, which ended in his enter- ing a convent and becoming a monk. A short experience sufficed to convince him that the monkish was not the ideal Christian life (amisi monachum, invent Christianum), for in the beginning of 1522 he became private chaplain to the famous Franz von Sickingen. He left his service in the end of the same year and returned to Basel. Zwingli's famous disputation at Zurich (in 1523) fired the minds of many in Switzerland, and among others stirred CZcolam- padius to make a more decided stand for reformation. He began to imitate Zwingli and preach Reformed doctrine. To his surprise he found that the humanists of the university did not countenance him in his zeal for evangelical truth. When "disputations" were held, they prohibited the students and teachers from attending. After more than a year of earnest preaching, after four public disputations had been held, in which the popular verdict had been given in favour of CEcolampadius and his friends, the authorities of Basel began to see the necessity of some reformation. They began with the convents, and Cicolampadius was able to refrain in public worship on certain festival days from some practices he believed to be superstitious. Basel was slow to accept the Reformation; the news of the Peasants' War and the inroads of Anabaptists prevented progress; but at last, in 1525, it seemed as if the authorities were resolved to listen to schemes for restoring the purity of worship and teaching. In the midst of these hopes and difficulties CGicolampadius married, in the beginning of 1528, Wilibrandis Rosenblatt, the widow of Ludwig Keller, who proved to be non rixosa vel garrula vel vaga, he says, and made him a good wife. After his death she married Capito, and, when Capito died, Bucer. She died in 1564. In 1528 the mass and image worship were at

1 Hussgen or Heussgen, changed to Hausschein, and then into the Greek equivalent. XVII. — 92

last abolished by authority, and Gécolampadius's five years' struggle was ended. He lived on, growing in influence in Basel and throughout south Germany, three years longer, and died in November 1531.

Ccolampadius was not a great theologian, like Luther, Zwingli, or Calvin, and yet he was a trusted theological leader. With Zwingli he represented the Swiss views at the unfortunate con- ference at Marburg, and had proved himself, by his defence of Zwingli's doctrine of the Lord's Supper against both Brenz and Luther, an able controversialist. He was a man of very wide sym- pathies. His readincss to sympathize with the early Reformatory movements in France and his eager welcome of the Waldenses were of great value to the Swiss Church.

Compare Herzog, Leben Joh. Gicolampads u. die Reformation der Kirche zu

Basel, 1843; Hagenbach, Johann Zicolampad u. Oswald Myconius, die Reformatoren Busels, 1859.

OEDENBURG (Hungarian, Sopron), one of the oldest and most prepossessing towns in Hungary, the chief place of a district of its own name, lies 3 miles to the west of the Lake of Neusiedl and 35 miles to the south-south-east of Vienna. It possesses several churches (one of which was built with the contents of a Turkish military chest found buried here), three convents, a Protestant lyceum with a theological department, a Roman Catholic gymnasium, several other schools and charitable institutions, a museum, and a theatre. The inhabitants, most of whom are of German descent, are mainly engaged in making wine, of which the district yields a quality little inferior to Tokay. The crystallized fruits of Oedenburg form a well-known article of commerce ; and a trade in grain and manufactures of beetroot-sugar, starch, and cloth are also carried on. Large cattle-markets are held here. The population in 1880 was 23,222.

Oedenburg, the Roman station Sopronium, was created a royal free town in the 11th century in return for help afforded to the king of Hungary against the Bulgarians. In 1619 it was pillaged by Bethlen Gabor. Ata diet held here

~~in 1681 the Hungarian Pro- testants presented the so-called " Oedenburg Articles," claiming the~~

~~restitution of their churches and estates. 'The province of Oedenburg is rich in corn, fruit, cattle, and coal.~~

~~CiDIPUS, a Theban hero, is placed by genealogists among the descendants of Cadmus. His father Laius ordered him to be exposed as soon as he was born; he grew up ignorant of his parentage, and meeting his father once in a narrow way he quarrelled with him and slew him. The country was ravaged by a monster, the Sphinx ; Cidipus by his cunning solved the riddle that the Sphinx proposed to its victims, freed the country, and married his own mother, Jocaste, or, as Homer calls her, Epicaste. In the Odyssey it is said that the gods disclosed the impiety. Epicaste hanged herself, and CEdipus lived as king in Thebes tormented by the Erinnyes of his mother. In the tragic poets the tale takes a different form. Cidipus ful- fils an ancient prophecy in killing his father ; he is the blind instrument in the hands of fate. The further treat- ment of the tale by A®schylus is unknown. Sophocles describes in his @dipus the King how Cidipus was re- solved to pursue to the end the mystery of the death of Laius, and thus unravelled the dark tale, and in horror put out his own eyes. The sequel of the tale is told in Gdipus at Colonus. Banished from the land by his sons, he is tended by the loving care of his daughters. He comes to Attica and dies in the grove of the Eumenides at Colonus, in his death welcomed and pardoned by the fate which had pursued him throughout his life. This view of the myth, which reads in it a parable of the mystery of life, of the overwhelming might of fate and the weakness of man, of the final reconciliation of discord in death, is due to the tragic poets, is unknown in the epic poets, and is still more foreign to the primitive mythic form, where CEdipus and his father embody the vicissitudes of the annual life of nature: the son, the young year, slays his father, the old year, is wedded to his own mother, but finally loses his eyes, his light, and his life. The winter~~

~~king is a god who slays his own father ; this is a trait that occurs time after time in mythology. OEHLENSCHLAGER, Apam Gorrios (1779-1850), the greatest of modern Danish poets, was born in Vesterbro, a suburb of~~

Copenhagen, on the 14th of November 1779. His father, a Schleswiger by birth, was at that time organist to, and later on became keeper of, the royal palace of Fred- eriksberg ; he was a very brisk and cheerful man. The poet's mother, on the other hand, who was partly German by extraction, suffered from depressed spirits, which after- wards deepened into melancholy madness. Adam and his sister Sofia were allowed their own way throughout their childhood, and were taught nothing, except to read and write, until their twelfth year. At the age of nine Adam began to make fluent verses. Three years later, while walking in Frederiksberg Gardens, he attracted the notice of the poet Edvard Storm, and the result of the conversa- tion was that he received a nomination to the college called "Posterity's High School," an important institution of which Storm was the principal. Storm himself taught the class of Scandinavian mythology, and thus Oehlenschliger received his earliest bias towards the poetical religion of his ancestors. Most other branches of study the boy con- tinued to neglect, and thought most about the romances and dramas which he proposed to write. He was confirmed in 1795, and was to have been apprenticed to a tradesman in Copenhagen. To his great delight there was a hitch in the preliminaries, and he returned to his father's house. He now, in his eighteenth year, suddenly took up study with great zeal, but soon again abandoned his books for the stage, where a small position was offered him. In 1797 he actually made his appearance on the boards in several successive parts, but soon discovered that he pos- sessed no real histrionic talent, even though he was trained by the great actor Michael Rosing. The brothers Oersted, the eminent savants, with whom he had formed an in- timacy fruitful of profit to him, persuaded him to quit the stage, and in 1800 he entered the university of Copenhagen as a student. He was doomed, however, to disturbance in his studies, first from the death of his mother, next from his inveterate tendency towards poetry, and finally from the attack of the English upon Copenhagen in April 1801, which, however, inspired a dramatic sketch which is the first thing of the kind by Oehlenschlager that we possess. His promise was already widely felt, and, even in 1800, Baggesen, in departing for Germany, had publicly invested the youth with the laurel that he himself was resigning. It was in the summer of 1802, when Oehlenschliger had an old Scandinavian romance, as well as a volume of lyrics, in the press, that the young Norse philosopher, Henrik Steffens, came back to Copenhagen after a long visit to Schelling in Germany full of new

romantic ideas. His lectures at the university, in which Goethe and Schiller were for the first time revealed to the Danish public, created a great sensation. Steffens and Oehlenschlager met one day at Dreier's Club, and after a conversation of sixteen hours, which has become famous in the history of anecdote, the latter went home, suppressed his two coming volumes, and wrote at a sitting his splendid poem Guldhornene, in a manner totally new to Danish literature. The result of his new enthusiasm speedily showed itself in a somewhat hasty volume of poems, published in 1803, now chiefly remembered as containing the lovely piece called Sanct-Hansaften-Spil. The next two years saw the production of several exquisite works, in particular Thors Reise til Jotunheim, the charming poem in hexameters called Langelandsreisen, and the be- witching piece of fantasy Aladdin's Lampe. At the age of twenty-six Oehlenschliger was now universally recognized, even by the opponents of the romantic revival, as the lead- ing poet of Denmark. He found no difficulty in obtaining

a grant for foreign travel from the Government, and he left his native country for the first time, joining Steffens at Halle in August 1805. Here he wrote the first of his great historical tragedies, [akon Jarl, which he sent off to Copenhagen, and then proceeded for the winter months to Berlin, where he associated with Humboldt, Fichte, and the leading men of the day. In the spring of 1806 he went on to Weimar, where he spent several months in daily intercourse with Goethe. The autumn of the same year he spent with Tieck in Dresden, and proceeded in Decem- ber to Paris. Here he resided eighteen months and wrote his three famous masterpieces, Baldur hin Gode, Palnatoke (1807), and Axel og Valborg (1808). In July 1808 he left Paris and spent the autumn and winter in Switzerland as the guest of Madame de Staél-Holstein at Coppet, in the 'midst of her famous circle of wits. In the spring of 1809 Oehlenschliger went to Rome to visit Thorwaldsen, and in his house wrote his tragedy of Correggio, in German ; he translated this into Danish the following year. After an absence of nearly five years he hurriedly returned to Den- mark in the spring of 1810, partly to take the chair of zsthetics at the university of Copenhagen, partly to marry the sister-in-law of Rahbek, to whom he had been long betrothed. His first course of lectures dealt with his Danish predecessor Evald, the second with

Schiller. From this time forward his literary activity became very great ; in 1811 he published the Oriental tale of Ali og Gulhyndi, and in 1812 the last of his great tragedies, Starkodder. From 1814 to 1819 he, or rather his admirers, were engaged in a long and angry controversy with Baggesen, who repre- sented the old didactic school, This contest seems to have disturbed the peace of Oehlenschlager's mind, and to have undermined his genius. His talent may be said to have culminated in the glorious cycle of verse-romances called Helge, published in 1814, The tragedy of Lagbarth og Signe, 1815, showed a distinct falling-off in style. In 1817 he went back to Paris, and published Hroars Saga and the tragedy of Fostbridrene. In 1818 he was again in Copen- hagen, and wrote the idyll of Den lille Hyrdedreng and the Kddaic cycle called Nordens Guder. His next productions were the tragedies of Hrik og Abel (1820) and Veringerne i Miklagaard (1826), and the epic of Lrolf Krake (1829). It was in the last-mentioned year that, being in Sweden, Oehlenschliger was publicly crowned with laurel in front of the high altar in Lund cathedral by Bishop Esaias Tegnér, as the "Scandinavian King of Song." His last volumes were Tordenskjold (1833), Dronning Margrethe (1833), Sokrates (1835), Olaf den Hellige (1836), Knud den Store (1838), Dina (1842), Erik Glipping (1843), and Kiartan og Gudrun (1847), none of which, with the ex- ception, perhaps, of Dina, can in any way be said to be worthy of his early reputation. On his seventieth birthday, 14th November 1849, a public festival was arranged in his honour, and he was decorated by the king of Denmark under circumstances of great pomp. Just two months later, on the 20th of January 1850, he sank, conscious to the last, and was buried in the cemetery of Frederiksberg.

With the exception of Holberg, there has Leen no Danish writer who has exercised so wide an influence as Oehlenschliger. His great work was to awaken in the breasts of his countrymen an enthusiasin for the poetry and religion of their ancestors, and this he performed to so complete an extent that his name remains to this day synonymous with Scandinavian romance. He supplied his countrymen with romantic tragedies at the very moment when all eyes were turned to the stage, and when the old-fashioned pieces were felt to be inadequate. His plays, partly, no doubt, in consequence of his own early familiarity with acting, fulfilled the stage-requirements of the day, and were popular beyond all expectation. Several of them still keep the

~~stage in spite of their rhetoric. The earliest are the best,—Oehlenschliger's dramatic masterpiece being, without doubt, his first tragedy, Hakon Jarl. In his poems and plays alike his style is limpid, elevated, profuse ; his flight is sustained at a high pitch without visible excitement.~~

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~~His fluent tenderness and romantic zest have been the secrets of his extreme popularity. Although his inspiration came from Germany, he is not much like a German poet, except when he is consciously following Goethe ; his analogy is much rather to be found among the English poets, hiscontemporaries. Hismission towardsantiquity reminds us of Scott, but he is, as a poet, a better artist than Scott ; he has sometimes touches of exquisite diction and of overwrought sensibility which recall] Coleridge to us. In his wide ambition and profuseness he possessed some characteristics of Southey, although his style has far more vitality. With all his faults he was a very great writer, one of the principal pioneers of the romantic move- ment in Europe, and he will probably not cease to retain the posi- tion which he won so easily at the summit of the Scandinavian Parnassus, (E. W. G.)~~

~~OELS, the chief town of a circle in Prussian Silesia, and the capital of a mediatized principality of its own name, lies in a sandy plain on the Oelsa, 18 miles to the north- east of Breslau. The prince's chateau, dating from 1558, contains a good library and a collection of pictures. The Schlosskirche was originally built about 980. The other buildings are unimportant. The inhabitants, numbering 10,157 in 1880, are chiefly engaged in making shoes and growing vegetables for sale at Breslau. There is also a manufactory of agricultural implements, and a trade is carried on in grain and flax.~~

~~The town of Oels was founded about 940, and appears as the capital of an independent principality at the beginning of the 14th century. The principality, with an area of 750 square miles and about 150,000 inhabitants, passed through various hands and was finally inherited by the ducal family of Brunswick in 1792. The present proprietor is the reigning duke of Brunswick,~~

~~See W. Hausler, Geschichte des Fiirstenthums Oels (Breslau, 1888),~~

~~CGaNANTHIIC ACID anp ETHIER. Liebig and Pelouze, by distilling large quantities of wine, obtained from the very last fractions of the distillate an oil which in a very high degree exhibited the generic smell common to all wines,—the smell which a small remnant of any kind of wine left in an open bottle exhibits after the '" bouquet " is gone. They recognized the oil as the ethyl-ether of a particular acid of the composition (C,,H,,0;)H,, which they called "cenanthic acid." An oil similar to Liebig and Pelouze's cenanthic ether was isolated by Wohler from quince-peel. Liebig and Pelouze's results were called in question by Delfis, who by experiments of his own arrived at the result that their cenanthic acid is identical with pelargonic, CyH,,O,.H, which latter is known as a com- ponent of the volatile oil of Pelargoniwm roseum. A. Fischer examined an " cenanthic ether" manufactured by Lichtenberger at Hambach in the Rhenish Palatinate, and found it to be a mixture of the ethyl-ethers of caprylic and capric acids, C,H,,O, and C,,H,)O,, and fatty acids higher than capric. The general impression amongst chemical wine-specialists seems to be that Liebig and Pelouze's cenanthic acid was a mixture of capric, caprylic, and other fatty acids. The notion of cenanthic acid must not be — mixed up with that of cenanthylic acid, C,H,,0,.H, the acid of primary heptyl-alcohol, C,H,,O. The aldehyde C,H,,0, intermediate between the two, is procured by the destructive distillation of castor oil, and from it the acid is easily prepared by oxidation with dilute chromic acid,~~

~~GiNOMAUS was king of Olympia, where his wooden house was still shown in the Altis, the sacred precinct, when Pausanias visited it. It was fated that he should be slain by the husband of his daughter Hippodamia. His father, the god Ares-Hippios, gave him winged horses swift as the wind, and he promised his daughter to the man who could outstrip him in the chariot race ; those suitors who were beaten died by his hand. Pelops, by the treachery of Myrtilus, the charioteer of Ginomaus, won the race and married Hippodamia. Pelops is conceived as a stranger from Asia Minor, and Ginomaus is obviously the repre- sentative of a race of Ares-worshippers who weretconquered by, or amalgamated with, an immigrant race, who brought~~

with them the new religion of Zeus, but who kept up the old worship of Ares in the country where they settled. OESEL, one of the largest islands in the Baltic, form- ing with Abro, Mohn, Runo, &c., a district of the Russian government of Livonia, lies across the mouth of the Gulf of Riga, between 57° 55' and 58° 40' N. lat., has a length from. south by west to north by east of about 45 miles, and according to Strelbitsky contains an area of 1010 square miles. It is separated from Courland to the south by the Strait of Dosmesnes, from the island of Dagé to the north by the Séla Sound, and from the smaller island of Mohn on the north-east by the Little Sound. Its undulat- ing surface, well watered by numerous streams, and con- sisting mainly of clay and disintegrated limestone, is largely occupied by woodland and pasture, but also allows the cul- tivation of considerable quantities of grain, flax, hemp, and potatoes. The coasts are bold and steep, and, especially towards the north and west, form precipitous limestone cliffs. Like those of Shetland, the Oesel ponies are prized for their smallness. The population, numbering 50,566 in 1870, is mainly Protestant in creed, and, with the exception of the nobility, the clergy, and some of the townsfolk, Esthonian by race. The chief town, Arensburg (Esthonian, Kurre Saare), on the south coast at the mouth of the Peddus, is a place of from 3000 to 4000 inhabitants, with two churches (a Greek and a Lutheran), two hospitals, an orphanage, and a trade in grain, potatoes, whisky, and fish. Oesel at an early period belonged to the Teutonic knights, and was goveruced by its bishops till 1561, when it passed into the hands of the Danes. By them it was surrendered to the Swedes by the peace of Broémsebro (1645), aud, along with Livonia, it was united

to Russia in 1721. Arensburg, dating as a castle from the 14th century, became a town in 1563.

CTA. See THESSALY.

OFEN. See Bupa, vol. iv. p. 423.

OFFENBACH, the principal manufacturing town in the grand duchy of Hesse-Darmstadt, lies on the left bank of the Main, 5 miles above Frankfort. The most inter- esting building in the town is the old

Renaissance chAteau of the counts of Isenburg, while the most conspicuous modern edifices are the five churches, the synagogue, the new residence of the Isenburg family, and the town-hall. The manufactures of Offenbach are of the most varied description, including carriages, machinery, hardwares, chemicals, aniline dyes, soap, perfumery, candles, chicory, gingerbread, tobacco and cigars, shoes, hats, felt goods, wax-cloth, paper, varnish, white lead, types, canvas, and woollen cloth. Its characteristic industry, however, is the manufacture of portfolios, pocket-books, albums, and other fancy goods in leather, which are largely exported to England, the United States, and other countries, The population in 1880 was 28,449, including 17,566 Pro- testants and 8782 Roman Catholics,

The earliest mention of Offenbach is in a documeut of 970. In 1486 it came into the possession of the imperial counts of Isenburg, and in 1816, on their mediatization, was assigned to HIesse. It owes its prosperity partly to the fact that it became the residence of the Isenburg family in 1685, but mainly to the industry of the

French Protestant refugees who settled here at the end of the 17th and the beginning of the 18th century.

OFFENBACH, Jacquxs (1819-1880), the inventor of the latest form of the modern opéra bouffe, was born at Cologne, of Jewish parents, 21st June 1819. HIs talent for music was developed at a very early age; and in 1833 he was sent to Paris to study the violoncello at the conservatoire, where, under the care of Professor Vaslin, he became a fairly good performer, notwithstand- ing his utter want of that earnestness which alone can make a true artist. In 1834 he was admitted into the orchestra of the Opéra Comique as a "ripieno" violon- cellist ; and here his unrivalled tact and natural quickness of perception enabled him to acquire an amount of experl-

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ence which he was not slow to turn to profitable account. HIs next appointment was that of conductor at the Thédtre Frangais, where, in 1848, he made his first success as a com- poser in the ' Chanson de Fortunio," in Alfred de Musset's play Le Chandelier. From this time forward his life be-

came a ceaseless struggle for the attainnient of popularity. HIs power of production was inexhaustible ; and, since he was ready to repeat himself without scruple whenever it answered his purpose to do so, the demand upon his ideas was invariably met with a rapidity which fairly astonished both theatrical managers and the general public. HIs first complete work, Pepito, was produced at the Opéra Comique in 1853. This was soon followed by a crowd of dramatic trifles, which daily gained in favour with Parisian audiences, and eventually effected a complete revolution in the popular taste of the period. Encouraged by these early successes, Offenbach now boldly undertook the deli- cate task of entirely remodelling both the form and the style of the light musical pieces which have so long been welcomed with acclamation by the frequenters of the smaller theatres in Paris. With this purpose in view he obtained a lease of the Théatre Comte in the Passage Choiseul, re-opened it under the title of the Bouffes Parisiens, and night after night attracted crowded audiences by a succession of brilliant trifles which never failed to make their mark, though not one of them pos- sessed substance enough to enable it to retain its vitality after the appearance of its successor upon the stage. Be- ginning with Les Deuw Aveugles and Le Violoneux, the series was continued with almost unexampled rapidity, until, in 1867—twelve years after the opening of the theatre—its triumph culminated in La Grande Duchesse de Gérolstein, perhaps the most popular opéra bouffe that ever was written, not excepting even his Orphée aux Enfers, produced in 1858. From this time forward the success of Offenbach's pieces became an absolute certainty. HIe never failed. Without a trace of true genius or a thought of re- verence for art, he possessed a talent so brilliant and a facility of invention so prolific that, in place of following the public taste, as he had so cleverly done at the outset of his career, he was able to lead it whither he would; and the new form of opéra bouffe, which he had gradually endowed with as much consistency as it was capable of assuming, was accepted as the only one worth cultivating. That it should live is simply impossible. It has, indeed, found iniitators in Lecocq and other aspirants of a younger generation; and some of these have attained successes not much less brilliant than those of Offenbach himself. But to be really enduring an art-form must be based upon some stronger principle than a mere desire for the attainment of popular favour; and so far is this from being the case with what is now universally accepted as the genuine opéra bouffe that it would be

impossible to strain the point so far as to admit its connexion with any form of art whatever. But no artistic consideration dimmed the brilliancy of Offenbach's success. His theatre continued to flourish, and his works found their way to every town in Europe in which a theatre existed. Their want of refinement formed no obstacle to their popularity, and perhaps even contributed to it. In twenty-five years he produced no less than sixty-nine complete dramatic works, some of which were in three or even in four acts. Among the latest of these were Le Docteur Ox, founded on a story by Jules Verne, and La Botte au Lait, both produced in 1877, and, though not among his brightest triumphs, sufficiently successful to show that the reign of his popularity has not yet come to an end. Offenbach died in 1880.

OGAM. See Centric Lireratur, vol. v. p. 306.

OGDEN, a flourishing city of the United States, in

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Weber county, Utah, 37 miles by rail north of Salt Lake City, at the confluence of the Weber and Ogden rivers. It is one of the most important railway junctions of the Western States; the Union Pacific, the Central Pacific, and the Utah Central Railroads, as well as a line which will ultimately joi the Northern Pacific at Garrison, all meet at this point. The ground-plan of the city is spacious, the drainage good, and the climate exceedingly healthy. In manufactures and general industry it bids fair to rival Salt Lake City. Conspicuous among its buildings are the court-house with its white cupola, and the central school, which is one of the best in Utah. The popula- tion was 3127 in 1870, and 6069 in 1880.

OGDENSBURG, a city and port of entry of the United States, in St Lawrence county, New York, on the St Lawrence river, at the mouth of the Oswegatchie, 72 miles below Lake Ontario. It is an important railway junction (the terminus of the Ogdensburg and Lake Champlain, the Utica and Black River, and the Rome, Watertown, and Ogdensburg Railroads), and the headquarters of the Northern Transportation Company's line of steamers; and ferry steamers connect it with Prescott on the Canadian side of the river. Ogdensburg is regularly laid out, and shade- trees are so numerous that it is popularly called "' Maple City." Among its buildings

that used by the United States post-office and courts and the great Roman Catholic church of St Jean Baptiste are of some note. A very ex- tensive trade is carried on in timber and flour. The popu- lation was 7409 in 1860, 10,076 in 1870, and 10,341 in

1880.

The site of Ogdensburg was first occupied by the Indian settle- ment of La Presentation founded by Abbé Piquet for the Christian converts of the Five Nations. Garrisoned by the British in 1776, the fort continued to be held by them after the revolution till 1796 (Jay's treaty). In 1812 it was attacked and in 1813 captured by a British force ; and again in 1838, having become a rallying point for the Canadian malcontents under Von "Schultze, it was regularly besieged and taken. The village was incorporated in 1817, and named after Samuel Ogden, the proprietor. 'The city charter 'dates from 1868.

OGLETHORPE, Jamzs Epwarp (1696 1785), general, the founder of the State of Georgia, was born in London 21st December 1696, the son of Sir Theophilus Ogle thorpe of Godalming, "Surrey. He entered Corpus Christi College, Oxford, in 1714, but in the same year joined the army of Prince Eugéne. Through the recommendation of the duke of Marlborough he became aide-de-camp to the prince, and he served with distinction in the campaign against the Turks, 1716-17, more especially at the siege and capture of Belgrade. After his return to England he was in 1722 chosen member of parliament for Hazlemere. He devoted much attention to the improvement of the circumstances of poor debtors in London prisons; and for the purpose of providing an asylum for persons who had become insolvent, and for oppressed Protestants on the Continent, he projected the settlement of a colony in 'America between Carolina and Florida.

OGOWAY, or OcowE (Ogooawai, Ogobat), a river of West Africa which falls into the Atlantic in the neigh- bourhood of 1° S. lat., or 400 miles north of the mouth of the Congo. The extent of its delta (70 to 80 miles from north to south), and the immense volume of water which it brings down when in flood, gave origin to the belief that it must either be a bifurcation of the Congo or one of the

leading arteries of the continent. The former view was set aside by the fact that the two rivers did not rise at the same season of the year; but so recently as 1876 Czerny advocated the identity of the Ogoway with Schwein- furth's famous Uelle (Welle), with Nachtigal's Bahr-Kuta, and with Barth's river of Kubanda, thus taking it right across to the neighbourhood of the Nile basin. It appears, however, that the head-streams of the Ogoway rise in the hilly country about 200 or 300 miles from the coast of the Atlantic (though the actual course of the river is 500 to 600 miles), and its extraordinary volume is to be explained by their draining an extensive tract on both sides of the equator which is deluged with tropical rains. Savorgnan de Brazza claims to have reached (1882) the sources of the river in a rugged, sandy, and almost treeless plateau, which forms the watershed between its basin and that of the Congo, whose main stream is only 140 miles distant. Cutting its way athwart the gneiss and schists of the various ranges of the Sierra Complida, the main stream of the Ogoway (often called the Okanda from one of the tribes on its banks) is interrupted with cataracts and rapids (at Fare, 26 feet, and Dume, for example) till within a comparatively short distance from the confluence with its principal left-hand affluent, the Ngunie, in 0° 35' S. lat. and 10° 25' E. long. Even in the upper part of its course, however, it often attains a great width, and below this confluence it spreads out into an average of 8000 feet, at the same time showing a tendency to split into a number of secondary channels, some of which connect it on the north with the great Ajingo Lake, and on the south with the still larger Jonanga Lake. The northmost branch of the delta—the Nazareth river, which falls into Nazareth Bay to the north of Cape Lopez—has in the driest period of the year a depth of from 20 to 30 feet, and its water is drinkable even at flood-tide. The southern arms discharge into the extensive Cama or Nkomi Lagoon and the Rio Fernéo Vaz. With the exception of the Ngunie, which has been ascended 40 miles as far as the Samba falls, the affluents of the Ogoway—the Passa, Lolo, Shebe, Ivindo, Ofue, &c.—are but very partially known ; and some of those from the north may prove to have a longer course than is at present supposed. The Ogoway rises in March and April, and again in October and No- vember ; it is navigable for steamers in its low-water con- dition as far as the junction of the Ngunie.

~~Though Bowditch called attention in 1817 to the exist- ence of the river, it was not till 1857-59 that its explora- tion was begun by Du Chaillu. It has since been made known by the labours of Serval and Griffon du Ballay, R. B. N. Walker, Aymés, the marquis de Compiégne, A. Marche, Oskar Lenz, and Savorgnan de Brazza. English and German factories were founded about 1868 at Adelina Longa (Adafilinaftlonga), and at Franceville, a station of the International African Association, in 1880.~~

~~See Petermann's Mittheil., 1872, pp. 5- 10; 1875, pp. 121-130; 1879, pp. 103-108 ; and 1883, pp. ne 184, with map; Proc. LR. G. Soc., 1873 (Walker's narrative) ; Bull, de la Soc. de Géogr., Paris, 1877 ; Zeitsch. der Ges. f. Erdk., Berlin, 1875 and 1876 (the former Lenz's narrative, the latter a résumé of the course of discovery by Czerny).~~

~~OGYGES, in the legends of Attica and Beeotia, was an early king in whose reign a great flood had overwhelmed the land. A similar legend was current in Phrygia, where the flood was said to have taken place in the reign of Nannacus. No facts are known connecting Ogyges with any religious cultus in Greece, and it is highly probable that the tale was of Oriental origin, introduced into this district of Greece by foreign colonists or traders. The Gephyrzi, who emigrated from Beeotia into Attica, and who are said by Herodotus to have been of Phoenician origin, may have brought the story of the flood with them.~~

~~Plate XXII.~~

~~In the peribolos of Zeus on the banks of the Ilyssus at Athens a hole was shown through which the waters of the flood had run off, and where religious rites were regularly performed, but this hole was associated rather with Deu- ealion than with Ogyges.~~

~~OHIO, the third of the States of the American Union in point of wealth and population, is situated between 38° 27' and 41° 57' N. lat. and between 80° 34' and 84° 49' W. long., and is bounded on the N. by Michigan and Lake Erie, on the E. by Pennsylvania, on the E. and S$. by the Ohio river, which separates it from the States of West Virginia and Kentucky, and on the W. by~~

~~Indiana. The greatest length from north to south is about 210 miles, the greatest breadth from east to west about 225 miles and the area 40,760 square miles.~~

~~Physical Features.—The surface consists of an undulat- ing plain, generally ranging in elevation between 1550 and 430 feet above sea-level, the portions below 500 feet or above 1400 being comparatively insignificant. The largest connected areas of high land extend from east to west across the central and northern central districts. In some limited districts of central Ohio, especially along the ridge of high land just referred to, and also in a few thousand square miles of north-western Ohio, the natural drainage is somewhat sluggish, and, while the land is covered with its original forest growth, it inclines to swampy conditions; but when the forests are removed and the waterways opened most of it becomes arable, and all of it can be made so without excessive outlay by means of open ditches.~~

~~The chief feature in the topography of Ohio is the water- shed, which extends across the State from north-east to south-west, and divides its surface into two unequal slopes, the northern, which is much the smaller, sending its waters into Lake Erie and the Gulf of St Lawrence, while the drainage of the other is to the Gulf of Mexico by the Ohio river. The average height of the ridge is about 1100 feet, but it is cut by several gaps, in which the elevation is reduced to about 950 feet. The relief of the State is chiefly due to erosive agencies. The entire drain- age area of such a river as, for example, the Muskingum or the Scioto, may be conceived as originally a plain, all portions of which were at approximately the same elevation above the sea. Across this area one main furrow has been drawn, deepening and widening as it advances, and a countless number of narrower and shallower valleys are tributary to it. Fragments of the old plain still remain in the isolated "hills" or tablelands that bound the valleys, and which, though often separated by intervals of miles, still answer to each other with perfect correspondence of altitude and stratification. They rise to a maximum height of 600 feet above the river-channels in the main valleys.~~

~~Geology.—The rocky floor is entirely composed of un- altered stratified rocks of Paleozoic age. Not a single trap dyke or volcanic vent intersects~~

them, and not a trace of igneous metamorphism is shown in any portion of their extent. These strata are disposed in plains so nearly horizontal that the dip is nowhere heavy enough to be safely determined by a clinometer. Not only are sharp flexures wanting, but faults deserving the name are found in but a single corner of a single county. A few low folds, one of which is of preponderating importance, traverse the State and redeem its surface from geological monotony. The only structural irregularity is an occasional case of overlap, but even this is seldom of such a character as to interfere with the easy reading of the record. The aggre- gate thickness of the entire series will reach 5000 feet if the maximum of each stratum is taken into the account, but if the average measurements are used the thickness does not exceed 3500 feet. The main elements of the scale,

OHI—OHTI

which extends from the Lower Silurian (upper portion) to the Upper Coal-measures inclusive, are given below, and

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Geological Map of Ohio.

the geological sketch-map shows how the surface of the State is distributed among the principal formations.

Feet.

OE a 0—300 . Upper barren measures ……:..000c008 300 Upper productive Coal-measures …… 200 Lower barren measures ……000.000. 500 >Carboniferous. Lower productive Coal-measures (includ-

ing Conglomerate group of Penna) ... 500 Maxvillo LAMCBENE oo i… ccc. sc ciecdoess 25 A cntauk WaWGrly BION se. nics. siaee veaiyieccesat¥ee 500 = Ohio Black Shale (including Cleveland,

Erie, and Huron Shales) 300

(Maximum 1500) Devonian.

poe aU ee 25 Corniferous Limestone .....0000 75 Lower Helderberg Limestone ..... 50 Niagafa, Lamestone' 66.600 ecasecs caesssves 150 rae Mhows og ee ee ee 50 Upper Silurian.

Clinton Limestone

Cincinnati group Lower Silurian.

The Cincinnati group, which constitntes the surface rock for about 4000 square miles in the 'south-western corner of the State, consists of alternating layers of blue limestone and calcareous shale, both of which contain great numbers of admirably-preserved fossils. The group is undoubtedly equivalent in part to the Hudson River group of the general scale, and by some geologists the name is counted a synonym, but it has not been proved that the Lower Silurian deposits of south-western Ohio can be definitely correlated with the subdivisions of the series in New York. The formation everywhere yields a cheap and excellent supply of building stone, which is also burned into a dark lime, valued for its hydraulic properties. The shales contain notable quantities of alkalis and phosphates, and the soils into which they very readily weather are proverbial for their fertility. The water-supply of the formation is poor, or rather wanting, the impervious shales refusing admission to the rainfall.

The Cincinnati axis, a low fold which traverses the State from south — west to north-east, constitutes its most infinential geologi- eal feature. It entered Ohio from Kentucky at the close of Lower Silurian time, and gradually extended itself to the northward, until it had converted the western half of the State into dry land. It has left a clear record of its successive stages in the strata which compose it. It did not advance steadily and equally, and the occa- sional relapses which it experienced have given rise to cases of over-lap. It has a low, flat summit, and, on account of the soluble and easily-eroded materials of which it consists, it has suffered more from denuding agencies than the Upper Silurian strata that enclose

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~~OVE EO~~

~~it, and consequently is now cut down to a lower level than they. In other words, the axis has been converted into a basin.~~

~~The Clinton Limestone generally rises in a terrace-like outcrop around the margin of the eroded Cincinnati beds, and its base is marked by the finest line of springs in the State. In its most characteristic pliases it is a crystalline limestone that takes a good polish. In very many localities it yields small quantities of petro- leunm, which seems to be indigenous. The supply is too limited to be valuable.~~

~~The Niagara group, also of Upper Silurian age, is of much greater thickness and of proportionally greater economic and scientific importance than the Clinton limestone. As at the Falls, it here consists of a stratuin of shale overlain by a massive limestone. It forms the surface rock for about 3000 square miles, but through much of this area it is concealed by heavy beds of Glacial Drift, by which its importance as a factor in the topography and the eco- nomic geology of the district is much reduced. In composition the limestone is almost a typical dolomite, but it is still fossiliferous, the fossils occurring as internal casts. It contains a large and in- teresting fauna. From near the base of the Niagara beds the 'Dayton " stone, one of the most valuable building stones of the State, is derived. The formation yields excellent building stones at other horizons also, and its upper beds furnish lime.~~

~~The Lower Helderberg Limestone occupies even a wider area as a surface formation than the last-named, but is largely covered with Drift deposits. There are whole counties of which it is known to constitute the rocky floor, in which it does not once rise to the surface. It is seen to the best advantage in the north of High- land county, where it yields a remarkably even-bedded building stone, Like the Niagara Limestone, it is a dolomite in composi- tion. It is poor in fossils, but the few that it contains are highly characteristic.~~

~~The transition from Upper Silurian to Devonian time which is made in ascending to the next stratum in the scale, the Corniferous Limestone, is accomplished without any structural break or irregu- larity, but there is an abrupt lithological change, the latter stratum being a true carbonate of lime, and an abundant and pronounced Devonian fauna appears in its very lowest beds. 'The Corniferous Limestone forms a narrow belt on each side of the axis, from central Ohio northward, but by the overlap of the next succeeding formations it is entirely lost in southern Ohio. Even where it constitutes the highest bedded rock it is largely obscured by Drift deposits. At Kelly's Island, Sandusky, Marion, Delaware, and Columbus it is largely worked for building stone, lime, and fur- nace flux. The earliest vertebrate remains of the Ohio scale are found in this stratum. The box-like skull of a large ganoid fish, Macropetalichthys sullivanti, Newberry, occurs near the base of the series, and the teeth and bones of other ganoids aud selachians are frequently met with in the higher beds. In the State quarries at Columbus these remains constitute a veritable bone bed, a layer 4 to 6 inches in thickness being in large part composed of them.~~

~~A heavy deposit of black shale, the Ohio Shale of the table, and the Huron shale of Newberry, directly overlies the Corniferous Limestone in northern and central Ohio, and extends across the State from north to south. It is composed of two black shales, the Cleveland and the Huron, including a blue shale, the Erie, be- tween them. The latter is 1200 feet thick in north-eastern Ohio, but rapidly wedges out as it is followed westward to the axis, and the Cleveland and Huron seem here to be welded into one mass. The black shale contains an average of 8 or 10 per cent. of bituminous matter, a chief source of which is found in a resinous disk of microscopic size that exists in the shale in immense num- bers, which Dawson has named Sporangites huronensis. Apart from this minute form the shale is almost barren of fossils, but a few have been discovered iu it, mostly at the ceutres of the great concretions which it contains. The gigantic placoderm, Dinichthys herzeri, Newberry, was first found in these concretions. Though dating back almost to the first appearance of fishes, Newberry has shown that its nearest relationship is with the Lepidosiren of the present day, which zoologists unite in counting as the highest of the entire class. The shale is undoubtedly the source of the natural gas and petroleum of north-eastern Ohio.~~

The Waverly group, which occupies about 7000 square miles of the surface of the State, is in all respects an important formation. It consists of the Bedford shale, the Berea grit, the Berea shale, the Cuyahoga shale, and the Logan group. The Berea grit has unusual geological interest. Its outcrop is a shore-linc across the entire State, and it marks with perfect distinctness the eastern limit of the Cincinnati axis at this date. It is everywhere a quarry stonc. The Berea stone and the Amherst stone of northern Ohio and the original Waverly stone of the lower Scioto valley belong to this horizon. In strength, dnrability, beauty, and the economy with which they can be worked, they stand at the head of the building stones of the State, the value of the annual products of these quarries exceeding $1,000,000. 'The stone is distributed as far cast as the seaboard, and as far west as Duluth. Some of it

has even found market in England. The Berea grit is the reservoir

of the gas and oil distilled from the underlying shales, and it is also the great source of salt water for Ohio. Another building stone of great excellence and beauty comes from the base of the Cuyahoga shale in southern Ohio,—the Buena Vista stonc of the Ohio valley.!

The Carboniferous Conglomerate and the Coal-measures have an aggregate thickness of at least 1500 feet, and cover more than 10,000 square miles of the surface of Ohio. The beds of coal, iron- ore, fire-clay, limestone, and cement rock that they contain render insignificaut the contributions made by all other formations to tho mineral wealth of the State. The Lower Coal-measures, which are here made to include the Conglomerate group of coals of Pennsy)l- vania, contain the seams of coal enumerated below, whiich are dis- tributed through 500 to 800 feet of strata. The names of the scams that are used in the Pennsylvania scale are adopted here.

13. Upper Freeport coal …….. THONGS -Brookvilles coale… .casss.c a 6 12. Lower Freeport ,, ... 10 | 5 Tionesta PRS coc naiet tere 5 11. (Upper Kittanning) ,, ... 4° Wpper NMETCEN, 5). canccucesseaad 4 10. Middle Kittanning ,, ... 9 | 3. Lower Mercer,, ...: 3 9. Lower Kittanning ,,

..... Sez QuakcertGwi 4,0 so. csc sce ee ok 2 8. Clarion Upper 7 t ae Saronicoal 4, 3… .scesesses 1 7. Clarion Lower Sseelieace =

All these coals belong to the bituminous division, Thus far

they are almost entirely worked in level free mines, and very little is taken from seams less than 3 feet in general thickness. The average thickness in the important fields is 5 feet, and the maximum (a small area of a single district) 13 feet. All of the seams enumerated above arc worked, but they have very uncqual values. The Middle Kittanning seam is by far the first. The Upper Freeport rauks next in value. The Sharon coal is the most valuable in proportion to its area, furnishing, in fact, the standard of comparison for the open-burning coals of the entire Alleghany field. Both it and the Middle Kittauning seam are used in the raw state in the manufacture of iron, a fact which sufficiently attests their purity and general excellence. In the remaining divi- sions of the Coal-measures there are 10 or 12 additional seams that are of workable thickness at some of the localities in which they occur, but, with one notable exception, these seams are less steady and reliable than those of the lower measures. 'The exception is the Pittsburg coal, which is, all things considered, the most im- portant seam of the entire coal-field to which it belongs. It is especially valued as a gas coal, and for the production of steam. Its northern outcrop passes through niue counties, with an approxi- mate length of 175 miles, not counting the sinuosities. The area commonly assigned to it in Ohio exceeds 3000 square miles, but the seam has been proved for only a small fraction of the area claimed. In the production of bituminous coal in the United States Ohio ranked third in 1880, the output for that year being about 6,000,000 tons, but the production is rapidly increasing, and the State inspector of mines reckoned the output in 1882 at 8,000,000 tons.

Iron ore is worked at many horizons in the Coal-measures, in seams ranging from 6 inches to 19 feet in thickness. The char- coal iron of the Hanging Rock district of southern Ohio is chiefly applied to the highest uses, as the manufacture of car-wheels and castings for agricultural and other machinery. Of the 99 fur- nace-stacks that now stand in Ohio, almost all depend in part, and about half depend entirely, on native ore. The amount mined annually exceeds 500,000 tons. In iron and steel industries

Ohio ranks next to Pennsylvania, the value of the annual product being $35,000,000. The clays of the Coal-measures are the basis of a large and rapidly growing manufacture of stonc and earthen ware. Ohio now produces one-third of the total product of the United States. In connexion with the salt production, which is large, about half of the bromine of the world is produced in Ohio. The brine of the Tuscarawas valley yields nearly 1 lb of bromine to 1 barrel of salt.

Three-fourths of Ohio are covered with the various deposits of the Drift period, which consists of " till" or boulder clay, and of the stratified sands and clays ofthe later stages of the period. These deposits sometimes have a thickness of 300 feet,—their average in north-western Ohio being not less than 50, and in central Ohio not less than 25 feet. In the regions which they cover they exercise a controlling influence upon the relief, drainage, soils, and water- supply. They have filled the valleys of earlier drainage systems, and in many cases have obliterated all traces of their existence. The till is filled with boulders of northern origin derived from the highlands of Canada and from intervening districts. Blocks of large size are sometimes found, some of them showing 2000 cubic feet above ground. In many instances they can be referred by their mineralogical characters to particular localities, or even to particu- lar ledges, from a score of miles to 400 milesdistant. The stratified Drift contains vast accumulations of sand, gravel, and clay, all of great economic value. Brick clays of good quality are everywhere accessible. The terminal moraine that forms the boundary of the

1 In the total value of quarry products Ohio ranks first among the States, more than $2,500,000 being reported in the census of 1880.

Glacial deposits is not in all cases as conspicuous as in the States to the east of Ohio, but even where it is least distinct soil and vegetation unite to mark the limit of glacial advance very plainly. The moraine passes through the counties of Columbiana, Stark, Wayne, Richland, Holmes, Licking, Fairfield, Ross, Highland, Adams, and Brown, as recently determined by Professor G. F. Wright.

~~Soils, Forests.—The division of the State into a drift- covered and driftless region coincides with the most im- portant division of the soils. Below the line of the ter- minal moraine these are "native," or, in other words, they are derived from the rocks that underlie them, or that rise above them in the boundaries of the valleys and uplands. They consequently share the varying constitution of these rocks, and are characterized by considerable inequality and by abrupt changes. All are fairly productive, and some, especially those derived from the abundant and easily- soluble limestones of the Upper Coal-measures, are not surpassed in fertility by any soils of the State. Large tracts of these excellent native soils are found in Belmont, Monroe, Noble, and Morgan counties. Among the thinner and less productive soils, which occupy but a small area, are those derived from the Devonian shales. They are, however, well adapted to forest and fruit production. The chestnut and the chestnut oak, both valuable timber-trees, are partial to them, and vineyards and orchards thrive remarkably. The native soils of the Waverly group and of the Lower Coal-measures agree in general characters. They are especially adapted to forest growth, reaching the highest standard in quality of timber product. When these lands are brought under the exhaustive tillage that has mainly prevailed in Ohio thus far, they do not hold out well, but the farmer who raises cattle and sheep, keeps to a rotation between grass and small grains, and does not neglect fruit can do well upon them. The cheap lands of Ohio are found in this belt. The other great division of the soils of Ohio—viz., the Drift soils—are by far the most import- ant, alike from their greater area and their intrinsic excel- lence. Formed by the commingling of the Glacial waste of all the formations to the north of them, over which the ice has passed, they always possess considerable variety of**

~~composition, but still in many cases they are' strongly |~~

~~coloured by the formation underneath them. When any stratum of uniform composition has a broad outcrop across the line of Glacial advance, the Drift beds that cover its southern portions will be found to have been derived in large part from the formation itself, and will thus resemble native or sedentary soils. Western Ohio is underlain with Silurian limestones, and the Drift is consequently limestone Drift. The soil is so thoroughly that of limestone land that tobacco, a crop which rarely leaves native limestone~~

~~soils, is grown successfully in several counties of western Ohio, 100 miles or more north of the terminal moraine. The native forests of the Drift regions were, without exception, hard-wood forests, the leading species being oaks, maples, hickories, the walnut, beech, and elm. The walnut, sugar maple, and white hickory are limited to warm, well-drained limestone land ; the white oak charac- terizes the upland clays, while the red maple, the elin, and several of the oaks stand for the regions of sluggish drainage. 'This noble growth is rapidly disappearing, but several million acres still remain.~~

~~Climate.—There is a difference of at least 40° Fahr. be- tween the average summer and winter temperatures. A central east-and-west belt of the: State is bounded by the annual isotherms of 51° and 52°, the average winter tem- perature being 30° and the average summer temperature 73°. Southern Ohio has a mean annual temperature of 54°, and northern Ohio 49°. The annual range is not less than 100°, and sometimes 130°, the extreme of summer heat reaching 100° in the shade, while 'cold waves" in winter~~

~~may depress the mercury to 30° below zero, Extreme changes are liable to occur in the course of a few hours, especially in winter, when the return trades are violently displaced by north-west winds. In such cases the tem- perature sometimes falls 60° Fahr. in twenty-four hours ; changes of 20° or 30° in a day are not unusual. Still the climate proves itself excellently adapted to the finer growths of vegetation, while its effects on human life and on the domestic animals favour a symmetrical development and a high degree of vigour. The rainfall varies between an average of 46 inches in the Ohio valley and an average of 32 inches on the shore of Lake Erie (spring 10 to 12 inches, summer 10 to 14 inches, autumn 8 to 10 inches, winter 7 to 10 inches). The annual range is considerable. In some years there is an insufficient supply and in some there is a troublesome excess, but disastrous droughts on the large scale are unknown, and disastrous floods are rare.1 The vast body of water in Lake Erie favourably modifies the climate of the northern margin of the State. The belt immediately adjoining is famous for the fruits that it produces. Extensive vineyards and orchards have been planted along the shore and on the islands adjacent, and have proved very~~

successful. The Catawba wine here grown ranks first among the native wines of eastern North America. Melons of excellent quality are raised in almost every section of the State. The peach is the least certain of all the fruits that are largely cultivated ; there is rarely, however, a complete failure on the uplands of southern Ohio. The winters of Ohio are very variable. Snow seldom remains for thirty days at a time over the State at large, but an ice crop rarely fails in northern Ohio, and not oftener than once in three or four years in other por- tions of the State. In the southern counties cattle, sheep, and horses often thrive on pasture grounds through the entire winter.

Population.—The following table gives the population from 1840 to 1880 :
—

i Density

POPULATION. — – per sq. Total Males. | Females. | mile. 1840 1,519,467 784,100 735,367 37°3 1850 1,980,329 1,016,808 963, 521 48°6 1860 ABR) at 1,190,162 1,149,349 57 °4 1870 | 2,665,260 1,337,550 1,827,710 | 6573 1880 3,198,062 | 1,613,936 | 1,584,126 | 78°5

In 1880 the coloured population numbered 24 per cent. of the whole, and the foreign-born 124 per cent. (from Germany 6 per cent., and from the United Kingdom 44 per cent.).

Agriculture.—This is the leading industry, employing in 1880 397,495 persons, or about two-fifths of the total number reported as engaged in occupations of all sorts. In 1881 nearly 50,000,000 bushels of wheat and nearly 112,000,000 bushels of Indian corn were produced, the total production of cereals in the State for that year being 188,933,067 bushels, an average of sixty bushels to each inhabitant. The reported orchard products of the year would furnish ten bushels of fruit to each inhabitant, and the dairy products an average of 26 tb. The domes- tic animals reach a total of 10,000,000. In number and quality of thorough-bred cattle Ohio is scarcely second to any State; in the average of its herds it ranks second to

1 Quite recently, however, the Ohio river has twice attained a height. unprecedented in its former recorded history. In February 1883 the water

rose to a height of 66 feet 4 inches, and in February 1884 to. 71 feet 02 inch above the channel bar at Cincinnati, the last rise being nearly 7 feet in excess of the highest mark recorded previous to 1883. These great floods covered the sites of large and prosperous towns,

swept away hundreds of dwellings, and inflicted deplorable losses on the residents in the great valley.

Or. eo

Illinois alone. The sheep-growing counties are supplied with the best breeds of sheep, and the wool of south-eastern Ohio has long been famous for unusual strength of fibre. The annual production of wool exceeds 20,000,000 ib, Ohio holding the first rank in this respect among the States of the Union. In the origination of agricultural machinery Ohio has taken a leading part, and in the present manufacture it easily holds the first rank, the value of the annual product exceeding $15,500,000, or one-fourth of the entire product of the United States. The average yield of wheat in the State has been doubled within the last ten years through the use of artificial fertilizers and improved methods of cultivation. An efficient system of crop reports is carried on by a State board of agriculture, and thorough control of the artificial manures sold in the State is maintained by constantly repeated chemical analyses. A State meteorological bureau also renders special service to the agricultural interest.

Manufactures, Towns and Cities—The manufactured products of the State, according to the census of 1880, have more than twice the value of the farm products, reaching an aggregate of nearly $350,000,000. As a necessary result of the recent development of mining and manufacturing in Ohio, its cities and villages are gaining rapidly in population and wealth. Cincinnati, the largest city of the State and the eighth in the Union, had a popu- lation of 255,139 by the census of 1880. The same census credits it with about 30 per cent. of the manufactures of the State, but the reports of its chamber of commerce give it a much greater total than the census tables. Cleve- land, the second city of Ohio and the eleventh of the United States, had 160,146 inhabitants, Columbus, the State capital, 51,647, and Toledo 50,137. Dayton (38,678) and Springfield (20,730) in south-western Ohio, Youngs- town (15,435), Akron (16,512), and Canton (12,258) in the north-eastern

~~quarter of the State, and Zanesville (18,113) in the central district are all thriving and ener- getic cities.~~

~~Government and Administration.—All legislative power is vested in a general assembly consisting of a senate and house of representa- tives. Senators and representatives are elected biennially. The executive department consists of a governor, a lieutenant-governor, a secretary of state, a treasurer, and an attorney-general, all elected for a term of two years, with an auditor, elected for four years. The supreme executive power is vested in the governor, who is com- mander-in-chief of the militia, and may grant reprieves and pardons, The lieutenant-governor is president of the senate. There is also elected triennially a State commissioner of common schools. For the control and superintendence of all public works a board of public works is created, consisting of three members, each elected for three years. There arc appointed by the governor, by and with the consent of the senate, a cominissioner of railroads and telegraphs for two years, a superintendent of insurance for three years, an inspector of mines for four years, a commissioner of statistics of labour for two years ; also a supervisor of public printing, a State librarian, an inspector of leaf tobacco, and a State inspector of oils for two years each, and three commissioners of fisheries for three years each. To investigate the whole system of public charities and the correctional and penal institutions of the State, eight per- sons, four from each of the leading politieal parties, are appointed by the governor for four years each to constitute a board of State charities. The judicial power is vested in a supreme court, district courts, common pleas courts, probate courts, and justices of the peace; and the legislature may create courts inferior to the supreme court in one or more counties. The supreme court consists of five judges, elected for five years each. There are nine common pleas districts with three judges each, holding office for five years ; each district is divided into three parts, with one judge (and more if the legisla- ture so provide) for each part. The district court is composed of the judges of the common pleas district together with one of the supreme court judges, any three forming a quorum. The original jurisdiction of the district court is concurrent with that of the supreme court ; each county has a probate court for probate and testamentary matters. Townships are supplied with justices of the peace. All judges and justices are elected by the~~

~~people. Clerks of the courts are elected by the people also. The State is divided~~

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~~into two United States districts, a northern and a southern. Each district is divided into an eastern and western division. All elec- tions are by ballot, and every sane male citizen, twenty-one years old and a resident of the State for one year next preceding elec-~~

~~tion, may vote. Education is provided tor by taxation and funds arising from the sale of public lands. The insane, blind, and deaf and dumb are supported by the State. A sinking fund, sufficient for discharging annually the interest of the public debt and not less than $100,000 of the principal thereof, is provided from the proceeds of the public works, sale of canal, school, and ministerial lands, and taxation. The State at present is represented in the Congress of the United States by two senators and twenty-one representatives. The legislature of the State is empowered to lay off new or change existing counties. The electors in each county elect three commissioners, for three years each, who constitute the county board. They have the care of the county property, fix the taxes, regulate roads, and provide for idiots, lunatics, and~~

~~paupers. The other officers are three infirmary directors, an auditor,~~

~~a secretary of the commissioners, a recorder, a surveyor, a clerk of the court of common pleas, who is also clerk of the district court,~~

~~each elected for three years ; also a treasurer, a sheriff, a coroner,~~

~~and a prosecuting attorney, each elected for two years. Ina county that has in it a city of over 180,000 population there is a board of control, consisting of five members, each elected for three years,~~

~~which has a final action and jurisdiction in all matters involving expenditure of money. Each county must contain at least 400- square miles of territory. Counties are subdivided into townships,~~

the power to do which resides in the county commissioners. Each

township must contain at least 22 square miles, and be at least one election precinct. The officers are three trustees, a clerk, a treasurer,

such constables as the trustees may designate, and an assessor,

elected annually. The trustees oversee elections, provide for the repairing of roads, make regulations preventing the spread of diseases, provide for cemeteries and libraries if the voters deter-

mine to have them, and afford relief to the poor.

Education.—The Continental Congress in 1785, in an ordinance for the survey of the lands north-west of the Ohio, reserved lot number 16 in every township, equivalent to one-thirty-sixth of the township, for the support of public schools. These provisions did not apply to the Virginia military and Connecticut reserves, equal in area to about one-fourth of the entire State, nor to the United States military reservation, embracing nearly 4000 square miles. The convention that framed the State constitution in 1802 requested and obtained of Congress a concession of one-thirty-sixth of the lands in the Virginia and United States military reservations, and a like proportion for education in the Connecticut reserve,—a portion of the latter, however, being set apart in the United States military reservation, the remainder from the public lands in the north- western part of the State (1834). Prior to 1827 the only revenues obtained from such lands were of the nature of rents, and were wholly inadequate. In the year named a law was passed providing for the sale of the school lands, other laws also being enacted for the establishment of a fund for the support of common schools. The result of the sales is somewhat disappointing, since the en- tire proceeds realized up to 15th November 1882 amount to but $3,686,511°56. This is known as the common school irreducible fund. The State early undertook to supplement the revenue thus acquired by a general tax ; the present law provides for a tax of one mill on the dollar. Opportunity for special levies was given as early as 1821 to district officers. At present the law authorizes every board of education to determine the amount of tax to be levied as a contingent fund for all school expenses, not exceeding seven mills on the dollar. As early as 1827 the legislature adopted the policy of making offenders against

the laws contribute to the support of the schools by appropriating fines collected to the school funds. This policy still continues. The receipts for school purposes in 1882 exceed $12,000,000 :—

Miateyhax: Clem) itess siecrecsece ese cseiecie cise «crete $1,589,263 °51

Interest on irreducible fund, 1881 ……. 229,692 °71 From rents and interest due for sale of lands…. 20,739°23 PAMANCEONMNANG ISS, vic. .-oe ccissusee see e+ ce oe 3,472,577 °04 From interest and rent of lands, 1882 ……. 250,431°94 ibeeei eres, GEDA co nae aannocooennee menanens 6,168,036°89 ROBO L DOM S LSS Beer asars acs'e ccarcrerPeieisyeve eee arsicrealeye 510,646°81

Of 1,081,321 young persons of school age 751,101 are enrolled and 483,232 are in daily attendance. The school sessions average 31 weeks in the year, and 24,135 teachers are employed; the illiterates above ten years of age form only 4 per cent. of the total population. The total expenses for the common schools in 1882 were $8,820,914 °95. r

Higher education was not neglected by the first settlers of the State. In the Ohio Company's purchase two entire townships were granted, upon which the Ohio university was established. In the Symmes's purchase a township of land was granted, which when located served as the foundation for the Miami university. There are now 62 such institutions for learning in the State, em- ploying 457 teachers, having 11,314 students, receiving $411,309 and expending $405,573, with a property valued at $6,203,691.

XVII.—93

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Of these, 25 are enabled by their charters to confer collegiate degrees. Among the oldest and most prominent of the colleges are Antioch, Denison, Kenyon, Marietta, Oberlin, Ohio Wesleyan, Otterbein, St Xavier's, Western Reserve, and Wittenberg ; of those more recently founded three deserve special mention, viz., the university of Cincinnati, the Case School of Applied Science at Cleveland, and the Ohio State university at Columbus. The first two are founded upon private munificence, and each is entering

upon a career of great promise. The third, established upon a gift of public lands from the general Government, is specially charged with instruction in the sciences relating to agriculture and the mechanic arts, and is also required to include military training. In addition, therefore, to the ordinary courses of an American college, this institution is obliged to provide full facilities in applied science, aud the State makes use of its faculty and equipment for all its official scientific work. The chemical work of the State Board of Agriculture and also of the State Geological Survey is performed here. The Agricultural Experiment Station and the State Meteoro- logical Bureau are both at the university.

Finance.—The receipts of the Ohio treasury for 1882 were $6,270,396°22, and the disbursements $5,630,219°29. The funded State debt at 15th November 1882 was $4,901,665, all at 4 per cent., and the irreducible debt (trust) was $4,393,014°71, making a total State debt of $9,294,679°71, while the municipal and local debts amount to $45,766,351°22, making a total public debt of $55,061,030°93. The value of the realty was $1,116,681,655, and personalty $518,229,079, or a total valuation of $1,634,910,734. The State tax paid was $4,735,748, while the total tax was $30,618,785. Banks numbered 413, with a capital stock of $38, 452,855°30 ; 189 were national, with a stock of $31, 464,000, valued at $1,133,792°40. There were 6189 miles of railway,— receipts $46, 759,399, expenditure $32, 063, 654.

History.—Ohio was discovered by La Salle, probably as early as 1670, and the French took formal possession of the whole north- west in 1671. In 1749 all English settlers were warned by the French commandant at Detroit to retire from the region north of the Ohio. The settlements had been made under the third charter granted by King James I. to Virginia (12th March 1611), which ceded to the colony all of the present State of Ohio lying south of 41° N. lat., and that granted by Charles II. to Connecticut (23d April 1662), which ceded to the colony all the territory of the present State lying north of 41° N. lat. The conflicting claims were set at rest by the treaty of Paris in 1763, by which France surrendered to Great Britain all her lands in the north and west as far as the Mississippi. During the progress of the American Revolution, and while the States were struggling to form a union on the basis of the articles of confederation submitted for ratifica- tion in

1777, a controversy arose as to the rae ownership of unoccupied lands. The States appealed to their charters, as did Virginia and Connecticut, for their title to the lands north-west of the Ohio. The opposing States claimed that the unoccupied lands, though charter lands, should be surrendered for the common bene- fit, to become the property of the new union. The controversy was settled in some cases, as in that of New York, by the abandon- ment of all claims by the State ; in others, among them Virginia and Connecticut, compromises were entered into by which the States made large reservations in the acts of surrender. Virginia reserved for military bounty lands about 3,710,000 acres, lying between the Scioto and Little Miami rivers, and bounded on the south by the Ohio river. Connecticut reserved as a foundation for her school fund a tract extending 120 miles westward of the Pennsylvania line, bounded on the south by 41° N. lat., and by the Connecticut line on the north. The land area extended to about 3,667,000 acres. In 1800 Connecticut surrendered all juris- dictional right over these lands to the United States.

Among the last and most important acts of the Congress of the old confederation was its passing the ordinance of 1787, providing a government for the territory north-west of the Ohio. The ordinance is a remarkable document in many particulars, and especially for the clause in its sixth article, which reads: "There shall be neither slavery nor involuntary servitude in said territory, otherwise than in the punishment of crimes, whereof the party shall have been duly convicted,"'—a clause which, after appearing in many State documents, at last became the property of the nation when it was adopted as the thirteenth amendment of the constitution of the United States. The passing of the ordinance was closely connected with the purchase of a million and a half of acres upon the Ohio, and in the Muskingum valley, by the Ohio Company. On 9th July 1788 General St Clair, the governor, and his associates, Judges Parsons, Varnum, and Symmes, formally established the government of the Territory at Marietta, the newly-formed settle- ment of the company, situated on the Ohio at the mouth of the Muskingum, and named after Marie Antoinette. The next con- siderable purchase of land was made by Judge Symmes, who secured upwards of 311,000 acres on the Ohio, between the Great and Little Miami rivers. The site of Cincinnati was purchased from J udge Symmes by Mathias Denman of New J ersey, whose surveys

marked out in the winter of 1788-89 the town that has since grown to be the leading city of the State. Two expeditions sent against hostile Indians at the head-waters of the Miamis in 1790 and 1791 resulted in such disastrous failure that the settlers began to despair of protection. However, in 1794 General Wayne won a decisive victory over the united tribes near the rapids of the Maumee, and at the treaty of Greenville, contracted a year later with eleven chiefs, secured peace. As a result, the rapid immigration which followed enabled the residents of the Territory to avail themselves of the provisions of the ordinance in organizing a representative government for the Territory by electing a legislature, which held its first session in Cincinnati 24th September 1799. By authority of Congress a convention which met at Chillicothe in November 1802 drafted and on the 29th day of the month signed and ratified for the people the first constitution of Ohio. Several stipulations relative to school lands were made by the convention in the consti- tution submitted to Congress, which were conceded, and the State was adinitted 19th February 1803 as the fourth under the constitution of the United States, and the seventeenth in the roll of the States. Chillicothe, which in 1800 had been made the seat of government for the North-West Territory, continued to be the capital of the State until 1810, when the Government removed to Zancsville for two years. Returning to Chillicothe, it chose Columbus in 1816 as the permanent capital of the State. :

In 1821 a movement for internal improvements was inaugurated, which culminated in the construction of a canal from the Ohio to Lake Erie through the valleys of the Scioto and the Muskingum, and another from Cincinnati to Dayton. Fortunately the movement for common schools began at the same period. The canals set free the locked-up produce of the interior, and the State entered upon a new life. The completion of the Cumberland road in 1825, as far as Wheeling on the Ohio, gave the State an outlet to the sea- board. While the canals were yet incomplete the construction of railroads was undertaken. The Mad River and Lake Erie Railroad from Dayton to Sandusky was the first, being chartered in 1832 and actively begun in 1835. In 1852 three through lines had been opened across the State ; and its whole social and economic history thenceforward assumed a

~~new character. Since 1840 Ohio has been the third State in the Union in point of population.~~

~~The present constitution of the State is the result of a revision of that of 1802 by a convention which assembled in Columbus 6th May 1850, and sat during part of its session at Cincinnati. It completed its work 10th March 1851, and the people ratified the revised constitution 17th June 1851. A second convention of revision was assembled in Columbus 14th May 1873, which, like its predecessor, sat also in Cincinnati. The constitution submitted, practically a new one, was rejected by the people at the October election of 1874. (EK. O.—J. T. S.)~~

~~OHIO RIVER. See Mississrprt, vol. xvi. p. 518.~~

~~OHM, Grore Simon (1781-1854), was born at Erlangen in 1781 and educated at the university there. He became professor of mathematics in the Jesuits' college at Cologne in 1817 and in the polytechnic school of Nuremberg in 1833, and in 1852 professor of experimental physics in the university of Munich. He died 6th July 1854.~~

~~His writings are numerous, but, with one important exception, not of the first order. The exception is his pamphlet published in Berlin in 1827, with the title Die galvanische Kette mathematisch bearbeitet. This work, the germs of which had appeared during the two preceding years in the journals of Schweigger and Poggendorff, has exerted most important influence on the whole development of the theory and applications of current electricity. Now- adays "Ohm's Law," as it is called, in which all that is most valuable in the pamphlet is summarized, is as universally known as anything in physics. It may be doubted whether Ohm's investigation could have been made but for the magnificent work of Fourier on the Conduction of Heat. In fact, the equation for the propagation of electricity formed on Ohm's principles is identical with that of Fourier for the propagation of heat; and if, in Fourier's solution of any problem of heat-conduction, we change the word "temperature" to "potential" and write "electric current" instead of "flux of heat," we have the solution of a corresponding problem of electric conduction. The basis of Fourier's work, without which even his splendid mathe- matical powers would have been of~~

no avail, was his clear conception and definition of conductivity. But this involves an assumption, undoubtedly true for small temperature-

OIL—

gradients, but still an assumption, viz., that, all else being the same, the flux of heat is strictly proportional to the gradient of temperature. An exactly similar assumption is made in the statement of Ohm's law, z.¢., that, other things being alike, the strength of the current is at each point proportional to the gradient of potential. It happens, however, that with our modern methods it is much more easy to test the accuracy of the assumption in the case of electricity than in that of heat; and it has accordingly been shown by Maxwell and Chrystal that Ohm's law is true, within the limits of experimental error, even when the currents are so powerful as almost to fuse the conduct- ing wire. The value of Ohm's work was but imperfectly recognized until it was stamped by the award of the Cop- ley medal of the Royal Society in 1841.

OIL-CAKE. The solid compressed mass remaining after the expression of oil from the many oil-yielding seeds, nuts, &c., forms a material of considerable commercial importance. Tt retains after the most perfect treatment by pressure no inconsiderable portion of oil, with practically the whole of the albuminous matter, sugar, mucilage, and the starchy components of the seeds, &c., thus forming in most cases a concentrated nutritious food for cattle and sheep, specially valuable for fattening store animals for the market. The only commercial cakes which are unfit for animal food are such as contain purgative or other active principles, as, for example, the cakes of castor-oil seed, croton seed, purging- nut seed, and mustard seed. The most valuable and at the same time the most abundantly produced feeding-cake is that obtained from ordinary LINSEED (q.v.). Next in value is the cake yielded by rape seed, but its wholesomeness is frequently marred by the presence of a large proportion of acrid mustard seed ; the best is that yielded by the German green rape seed (Brassica rapa oleifera). Cotton-seed cake is also a feeding stuff of considerable importance. It is prepared in two forms, either as decorticated cake, in which the husks of the cotton seed are removed previous to the expression of the oil, or as undecorticated cake, which may contain as much as 40 to 50

per cent. of indigestible woody husk. Among other cakes useful for feeding purposes may be enumerated ground-nut cake from Arachis hypogea, palm-kernel cake from the seeds of the oil palm, sesame or til cake from the seed of Sesa- mum orientale, and hemp cake from the seed of Cannabis sativa. The following table indicates the average composi- tion of a few of the principal commercial cakes.

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Oil-cake should be thoroughly dried by exposure before beitig packed or stored, otherwise it is apt to heat, and turn sour and mouldy, in which condition it becomes injurious to cattle. The cake also made from rancid seed is fre- quently deleterious, and so disagreeable in taste as to be refused by animals. Oil-cakes of high value are subject to adulteration; and compounds of varying composition are prepared and sold under commercial brands simply as feeding cake or mixed cake with no indication of their component materials. These are usually largely intermixed with bran, husks, ground rice, and maize siftings, &c.

OIL 739

OIL CITY, a city of the United States, in Venango

county, Pennsylvania, at the junction of Oil Creek with

the Allegheny river, lies 132 miles north-north-east of Pitts-

burg by the Allegheny Valley Railroad, in the heart of the Venango petroleum district, and possesses the principal oil

exchange of the world, the transactions in 1883 alnounting to 1,129,199,500 barrels, valued at $1,209,654,064. The business part of the city is on the low ground north of the river, the residences occupying the south side and the high bluffs on the north side. Besides manufactories con- nected with the oil industry, the city has machine-shops, foundries, flour- mills, and breweries. Founded in 1860, and partially destroyed by flood in 1865 and by flood and fire in 1866, Oil City was incorporated as a city in 1871. Its population was 7315 in 1880, and now (1884) is esti- mated at 10,000.

OILS. The term oil is a generic expression under which are included several extensive series of bodies of diverse chemical character and physical properties. In its most comprehensive ordinary acceptation the word embraces the hard solid odourless waxes, tallows, and fats, the viscid fluid fixed oils, the odorous essential oils, and the solid, fluid, and volatile hydrocarbons obtained in nature or by destructive distillation. Further, in former days, when substances were principally classified by obvious physical characteristics, the word applied to various substances which, beyond an oily consistency, possess no other pro- perties in common with ordinary oils. Thus we have still in common use for sulphuric acid the term "oil of vitriol," a substance which, it need hardly be said, is widely different from any oil. Leaving out of account bodies of this nature, the remaining diverse bodies have in common the char- acters that they are compounds consisting principally, in some cases exclusively, of carbon and hydrogen, that they are mostly insoluble in water, and that they are all readily inflammable. The mineral hydrocarbons obtained either in nature or by destructive distillation do not come within the range of this article (see NAPHTHA, PARAFFIN, PETRO- LEUM), which is restricted to the series of neutral bodies formed naturally within animal or vegetable organisms. These bodies are divided into two well-defined groups—the fixed oils and fats, and the essential or volatile oils.

FIxEep OILS.

The fixed or fatty oils, although varying considerably in external appearance, form in reality a well-defined and homogeneous group of substances having great similarity of chemical composition. They appear to

be essential con- stituents of the most highly-organized forms of animal and vegetable life, being found in plants chiefly in the seed, and in animals chiefly enclosed in the cellular tissue and in special body cavities, but some proportion of fatty matter is found in almost all tissues and organs. Although oils and fats are universally distributed and perform most important functions in animal and vegetable life, those used for technical purposes are not drawn from any very great number of sources; and many bodies might be uti- lized for the production of oil which at present are not so employed.

As found in commerce, oils possess a faint characteristic taste, a slight odour, and some amount of colour, generally brownish yellow. These characteristics, however, are due to certain impurities ; in a really pure condition most oils have scarcely any characteristic taste, odour, colour, or physiological influence. In a few cases only they have special properties which appear to be inseparable char- acteristics, such as the purgative principle of castor oil, croton oil, and some others. At the ordinary tempera- tures most vegetable oils are fluid, but a few, produced especially by tropical plants, such as palm oil, cocoa butter,

Chinese tallow, &c., are solid fats. Animal fats are for the most part solid, the oils of marine animals and neat's-foot oil being important exceptions. The various solid fats differ greatly in consistency, and the hardness of individual samples is largely affected by the nature of the food and by the health of the animal yielding them, and by some other circumstances. The relative fluidity or solidity of the various oils and fats depends on the proportions of the three principal constituents of all oils—olein, stearin, and palmitin, The fluid oils contain olein in larger proportion, that body being itself liquid at ordinary temperatures, while solid stearin and palmitin predominate in the hard fats. The viscosity of the fluid oils also ranges between wide limits. The rate of flow of an oil, which is a matter of considerable importance in several industrial applica- tions, is estimated by coniparison with the standard rate at which water of the same temperature flows through an aperture of fixed dimensions. The most viscid of the fluid oils is castor oil, which at a temperature of 15° C. is more than two hundred

times thicker or more slow-flowing than water. Olive oil at the same temperature is more than twenty times thicker, and linseed and hemp oils, though among the most limpid of fixed oils, still flow about ten times as slowly as water.

Oils communicate to paper and like substances a stain which remains an irremovable translucent grease spot. They are almost entirely insoluble in water, and, except- ing croton and castor oils, in cold alcohol, but in boiling alcohol they dissolve more freely, and they are perfectly soluble in ether, bisulphide of carbon, chloroform, benzol, and light petroleum spirit, In their pure condition they are neutral bodies, but, on their becoming rancid, free fattyacids are developed which give them an acid reaction. Exposed to air they absorb oxygen freely, and the class containing linoleic acid, known as drying oils, of which linseed oil is the type, thereby harden into a solid translucent semi- elastic caoutchouc-like body, a property of the utmost value in the arts. When they are exposed in thin layers over a great surface the absorption of oxygen proceeds with such energy that heat is evolved sufficient to produce spontane- ous combustion, a circumstance frequently exemplified in the heating and igniting of heaps of oily cotton waste. The non-drying oils also on exposure to air thicken and become greasy ; they acquire the peculiar disagreeable smell and acrid taste known as rancidity, owing to a kind of fer- mentation being set up in them through the agency of Impurities, whereby the fixed fatty acids they contain are decomposed, and odorous volatile fatty acids formed by oxidation at their expense.

The specific gravity of all oils is lower than that of water, ranging from ‘900 in the case of cocoa butter to ‘970, the specific gravity of castor oil. Most fluid oils have @ specific gravity between ‘915 and -930. The specific gravity of oils varies with the temperature far more than 1s the case with water. It is found that for each degree Centigrade rise of temperature whale oil increases in volume 1 per 1000, rape oil 0°89, and olive oil 0°83.

When a solid fat is heated slowly till it melts and is allowed gradually to cool, it remains fluid till it falls con-

siderably under the temperature at which it melted, and

~~at the moment of solidification there is a sensible increase in its temperature. Butter, for example, melts at 30° to 31°5 C., but does not resolidify till it falls to 19° or 20° C. These phenomena have been investigated in the case of the pure fats stearin and palmitin by Duffy (Chem. Soc. Qu. J., v. 197), who finds that these bodies undergo with great readiness three isomeric modifications, each having a dis- tinct melting point widely apart from each other (stearin from beef giving 51°, 63°, and 67 *), the solidifying point being slightly under the lowest of the three. The freezing~~

~~Ol Ls~~

~~point of the ordinary fluid oils ranges down to from — 27° to — 28° C. for hemp oil, nut oil, and linseed oil, while olive oil solidifies at +2° to 4° C. Fluid oils heated to from 280° to 300° C., and solid fats to from 300° to 325° C., undergo destructive distillation, resolving into a mixture of rich inflammable gases and a peculiarly irritating acrid vapour, acrolein.~~

~~Oils and fats are compounds of carbon, hydrogen, and oxygen, in proportions ranging, as a rule, for carbon be- tween 76 and 80 per cent., hydrogen from 11 to 13 per cent., and oxygen from 10 to 12 percent. Their proximate constitution was first demonstrated by Chevreul, who in- deed, in the great series of classical researches embodied in his Lecherches sur les corps gras @origine animale (1823), established the modern chemistry of oils.~~

The phenomena of saponification, as exemplified on a great scale in the important industry of soap-making, furnished the key for discovering the intimate constitution of oils. Oils and fats treated with alkalis, alkaline earths, and basic metallic oxides in presence of water undergo decomposition and enter new combinations. A soap is formed by the union of the alkaline body with acid con- stituents of the oil, known as fatty acids, and the sweet body, glycerin, is liberated. The saponification of stearin with sodic hydrate, for example, may be thus represented :—

(CygH,0) \ 3Na | 9 3CysHe50 OH," | Cay | n+ ON Vie et Or OEE boy,

Sodic Stearate of hydrate. sodium (soap).

'By heating oil with steam under a pressure of from 10 to 12 atmospheres, or with water superheated to about 220° C., the oil is decomposed into free fatty acid and glycerin. Thus, again taking the simple fat stearin, we have : —

——e wt CO} 0,43#20= Sua | 04+ OF | Oy Water.

In the above reactions it will be observed that three molecules of water are required for the formation of free stearic acid and glycerin from one molecule of stearin, and to that extent the resulting pro- ducts are heavier than the original. Reading the equation in the inverse manner we find the formation of stearin takes place by the substitution of the three acid residues of stearic acid C,,H,;0 for the three hydroxyls H.O in the molecule of glycerin. No fat or oil is found in nature consisting of a single chemical fat such as stearin alone. All are mixtures of at least two and for the most part three or more simple fats or glycerides of fatty acids closely allied in nature and constitution. Thesc glycerides or combinations of glycerin and fatty acids are in their chemical relations ethers. Glycerin itself is a triatomic alcohol, and bears to the fatty acids and re- sulting ethers the same relation which a basic substance bears to an acid and to the salt which results from their combination, In all natural fats glycerin combines, as in stearin, by having substi- tuted for its three replaceable hydrogen atoms three equivalents of fatty acids, whence the natural simple fats are all triacid com-

~~potitide —tristearin ase | O,, tripalmitin Cae at O~~

~~Stearin. Glycerin.~~

~~Stearin. Stearic acid. Glycerin.~~

~~triolein aa | Op &c., though commonly called stearin,~~

~~palmitin, and en &c. (For further information as to the con- stitution of glycerides see GLYCERIN, vol. x. p. 697.) The three simple fats above named form by far the largest and most important constituents of all oils and fats, the only others which bulk largely being the glycerides of linoleic acid in drying oils, and of physetoleic acid characteristic of marine oils. The number of fatty acids found combined with glycerin in oils is, however, vety considerable. They constitute members of homologous series, the first or stearic series of which possess the common formula C,,H,,0, Belonging to it are the following :—~~

~~Boiling and | Substances in which chiefly~~

~~Melting point. found. AGehiCwn nse Co Hy O2 118° C. Butter fat. Butyile feeeneee Cy Hg Og 156° C. Butter fat. Caprorc ee. cae Cg Hy202 194° C. Cocoa-nut oil, butter fat. Capnylice eres | Cg Hyg02 . 239° Cocoa-nut oil, butter fat. CHDHG sdoapsencn CioH2902 | Melt. pt. 39° | Cocoa-nut oil, butter fat. LENO .ceoadonac C9H2402 », 436; Cocoa-nut oil, bayberry oil. Myristic …..... | Cy4Hog02 $ 53°°8| Oil of mace, &c. Palmitic …..... CigH3902 i 62° | Lard, palm oil, &c. ISUCCLEICS 5 Aemgionae CigH3g02 . 69°‘2| Tallow, &c. | Arachidie -| Ca9H 4902 a 75° | Ground nut oil. IBGHEMICH Ac sna. Co2H 4409 64 75° | Ben oil. WenOMe = 3… 02) Co7H5409 a 78° | Beeswax. MGUSSICN 2.8. 42.) | CspHg002 i 88° | Beeswax.~~

~~eS~~

~~O1LS~~

~~Another, the oleic series, contains two atoms less of hydrogen than the allied stearic series, having the general formula C,,H,,, -0.. To it belong the~~

following :—

Boiling and | Substances in which chiefly

Melting point. found. CNOEONIC Tai… <<< C4 Hg Og | Boil. pt. 72° | Croton oil. Hypogeic or CigH39O2 | Melt. pt. 84° | Earth-nut oil and whale oils. Physetoleic OVEIC, ooo eccs sac CigH3402 coud Most fats and fluid oils. HBTUSBIC) — ocauiiee Coo 4209 of 83° | Rape and mustard oils.

To these there remain to be.added, not members of either series, two important fatty acids, —linoleic acid, C,gH,,0., characteristic of linseed oil and other drying oils, and ricinoleic acid CjgH3,03, the chief product of the saponification of castor oil. Among saponifiable bodies the true waxes are distinguished from other solid fats by containing no glycerin. They are principally ethers of the higher monatomic solid alcohols—cetylic and ceryliec alcoliol, &c. Thus spermaceti, the solid wax obtained from the head matter of the

sperm whale, is a cetyl palmitate oun? bo. Certain of the

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vegetable waxes—c.g., Japanese wax—contain some proportion of glycerides. Extraction of Ol.

The ordinary method for separating vegetable oils and fats from the nuts, seeds, &c., of which they form con- stituent parts is by pressure, with or without the assistance of heat. They are also obtained by the agency of solvents, principally by the use of bisulphide of carbon and the light petroleum spirit benzin, these being methods of pro- duction of comparatively recent introduction. Animal oils and fats are principally isolated by simple melting or "rendering" by heat. The degrees of heat and pressure necessary for separating the several fats vary very much with the fluidity of the oils themselves, the proportion in which they are present in the substances, and the nature and consistence of the associated materials. Sperm oil is indeed obtained direct in its fluid condition from the head of the sperm whale. Virgin olive oil is obtained with the gentlest pressure, and

palm oil and several other vegetable fats and waxes are liberated by the agency of boiling water.

Vegetable Oil Pressing.—Pliny describes in detail the apparatus and processes used for obtaining olive oil among his Roman contemporaries, by which it appears that they derived a knowledge of the screw press from the Greeks, and applied it to the pressure of oil from pulped olives. In the East, where vegetable oil forms a most important article for food and for other personal and domestic purposes, various ingenious applications of lever presses and of combined lever and wedge presses have been in use from the earliest times. The Chinese employ the same series of operations which are followed in the most advanced oil mills of modern times, viz., bruising and reducing the seeds to meal under an edge-stone, heating the meal in an open pan, and pressing out the oil in a wedge press in which the wedges are driven home by hand hammers. The apparatus used in Europe in modern times for the extrac- tion of oil by pressure consists of forms of the screw press, the Dutch or stamper press, and the hydraulic press. With the screw press, even of the most improved form, the amount of pressure practically obtainable is limited from the failure of its parts under the severe inelastic strain which can be put on it. It is on this account only used in the pressure of olives and of animal fats, where the power necessary is not great. The Dutch or stamper press, which has played an important part in the oil industry, was invented, as its name indicates, in Holland in the 17th century. The invention of the hydraulic press in 1795 effected the greatest revolution in the oil industry, bringing a new, easily controlled, and almost unlimited source of power into play, and on the great scale that apparatus has

practically superseded all other means of pressing. The sequence of operationsin treating oil-seeds for the separation of their contained oils is ordinarily as follows :—(1) the crushing and

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grinding of the seed or other substance, (2) heating the oleaginous meal so prepared, and (3) expression of the oil by mechanical power.

~~*Grinding.—As a preliminary operation oil-seeds are freed from dust, sand, and other impurities by sifting in an inclined revolving cylinder or screening machine, covered with woven wire having meshes varying according to the size and nature of the seed operated upon. In earlier times the seeds were pounded to meal by means of stamper mills. These consisted of a series of heavy wooden stampers or pestles made to rise and fall by the action of cams or wypers fixed on a revolving shaft, a pair of such stampers falling alternately with heavy force into an egg-shaped mortar about two-thirds filled with seed. As the process proceeded the material became heated, and from time to time had to be sprinkled with water. Stampers are now seen only in smal] old-fashioned establish- ments. Ina modern oil-mill the screened seed is passed through crushing rollers to bruise or open the husk. The crushing rollcrs consist of a pair of cast-iron rollers horizontally mounted, commonly of unequal size, the larger being 4 feet in diameter, while the smaller is about 1 foot. The larger roller is revolved by power and the smaller moves by simple friction against the other. Between these rollers the seed is fed by a hopper, and in passing through it is bruised and broken and so prepared for the thorough grinding it receives under the revolving edge-stones to which it next passes. These are a pair of circular stones having a diameter of about 7 feet with a thickness at their running edge of 16 inches, each weighing from 24 to 34 tons. They are made of very compact limestone, granite, or fine-grained sandstone, and are mounted ona vertical driving shaft, to which they are attached by a horizontal axle pass- ing through their centre. They revolve on a bed of similar hard compact stone, and the compound rubbing and bruising effect of their rotary motion quickly reduces the bruised seeds to a fine meal. The stones are provided with sweepers, which in their revolution bring the material pressed out towards the side again into their path, and there is a separate sweeper for clearing out the finished meal from the bed of the machine by way of a slide or door provided in the side. The edge-stones revolve about twenty times per minute, and a charge of seed which is slightly moistened during the process is sufficiently ground on an average in about twenty-five minutes.*~~

~~*Heating.—In dealing with certain oils which are easily separated, and especially with oils used in cookery and otherwise consumed, where it is desirable to preserve the pleasant, bland, and faint fruity or nutty taste, the*~~

ground oleaginous meal is taken direct to the press and pressed for cold-drawn or virgin oil. The cake from such cold pressing, as it still retains a large proportion of oil, is subse- quently broken up, reduced to meal, and heated ; after which it is again subjected to pressure to obtain a further flow of oil. Ordin- arily, however, the meal is artificially heated previous to any pressure, and it depends greatly on the nature of the seed and the individual manufacturer's method of working whether the material is fully pressed at first or twice submitted to the operation. The warming of the seed meal renders the contained oil more fluid and conse- quently more readily separable with moderate pressure. It also enables the oil-presser to obtain a larger proportion of the contained oil, coagulates and holds back the albuminous constituents of the seeds, and similarly dries'and retains mucilaginous matter. On the other hand, oil from heated meal usually is more highly coloured and harsher to the taste than cold-drawn oil; and the quality is seriously deteriorated if by chance the heat applied should exceed at most 80° C. The heat is applied either in open shallow iron kettles or pans heated over a direct fire or through a sand-bath ; but preferably, and now generally, the meal is heated by steam circulating freely between the casings of a jacketed or double-walled pan or pans. Mechanical stirrers are kept in continuous rotation within the pan, to ensure a uniform warming effect throughout the mass. A highly-approved and convenient form of heating apparatus consists of a double steam kettle, one pan being placed above the other, each steam-jacketed and provided with mechanical stirrers. In this machine the heating action is continuous. The meal is first heated for ten or fifteen minutes in the upper pan, which is closed over with a sheet-iron cover, after which a slide in the bottom of the pan is opened and the charge is shot down into the lower pan, where it is raised to the full heat, while the upper pan is again re- charged and worked up. When fully heated in the lower pan the charge is swept out at a door in the side of the pan by the action of the mechanical stirrers, and falling into a funnel is passed in measured quantities direct into bags, and without delay prepared for and placed in the press. The kettles are of a capacity sufficient to heat seed for charging three single presses at each operation. form of heating kettle is also now in use in which the object is effected by direct injection of steam into the mass, whereby the meal is not only heated but a beneficial amount of moisture is distributed throughout the material. In mills of the most recent construction such steam kettles are used in connexion with an im-

~~proved form of crushing rollers,—employment of edge-mills being dispensed with. These rollers consist of a series of four or five chilled iron or steel cylinders mounted in vertical order like the bowls of~~

~~a calender. The seeds pass in succession 'between the first and second rollers in the series, then between the second and third, and so on till they are delivered by the lowest, sufficiently bruised, crushed, and ground.~~

~~Pressing.—With the least possible delay the meal is transferred from the heating kettles, so that the oil may be pressed out while the material still retains its heat. Measured quantities, say 10 to 12 tb of meal, are filled into woollen bags of strong, thick texture, sufficiently open and porous to allow free flow of the expressed oil, yet having consistency enough to resist rupture by the enormous pressure to which it is subjected. Each bag is further placed within "hairs," thick mats of horse-hair bound with leather. In some methods of working press-cloths—not bags—are used ; and the con- struction of recent presses is such as to dispense altogether with the use of bags or other coverings. The essentials of proper oil-pressing are a slowly accumulating pressure, so that the liberated oil may have time to flow out and escape, a pressure that increases in pro- portion as the resistance of the materials increases, and that main- tains itself as the volume of material decreases through the escape of the oil. These essentials the Dutch or stamper press and the hydraulic press fulfil perfectly, and the prevalence of hydraulic pressure over the other and older method is only due to the greater convenience and ultimate economy of the power. Previous to the early years of the present century the Dutch press was almost ex- clusively employed in Europe for pressing oil-seeds. It consists of two principal parts, an oblong rectangular box with an arrangement of plates, blocks, and wedges, and over it a framework with heavy stampers, the fall of which produces the pressure. The press box is made either of cast-iron or, according to the older method, of strongly-bound oaken planks. At each extremity of the box there is placed a bag of oil-meal between two perforated iron plates, under which are a perforated bottom and channels for conducting away the expressed oil. Next are inserted filling-up pieces of wood, two of which—the speering-blocks—are oblique or bevelled on one**

face, forming ways for the two wedges which press against them. Be- tween the speering-blocks, and separated also by a filling piece, are inserted the two wedges, one being the ordinary or driving wedge by which the pressure is applied to the seed-bags, and the other an inverted or spring wedge, which is only driven down to loosen and free the various parts when the pressing operation is complete. The sob which drives home the ordinary wedge is a heavy log of wood about 16 feet long by 8 inches square, and it falls about fif- teen times a minute through a maximum distance of 22 inches by the action of a pair of cams or wypers fixed on a revolving shaft. As soon as the pressure is complete the stamper suspended over the inverted wedge is brought into action, aaa by a single heavy blow knocking the wedge out of its key-like position it frees the Various parts of the apparatus for the removal of the pressed cakes. In a double stamper press about 12 cwt. of finished cake is made per day. Since the introduction of the Bramah press, numerous modifications have been invented with the special object of improv- ig its convenience as an oil-press. The various forms devised for oil-extracting may be comprehended under standing or vertical

where great pressures are not essential, isa drum or box press, so called because on the platen are placed two circular metal tubs, one within the other, the inner perforated throughout for the escape of the oil. At the top of the press is secured a strong metal plate or table the same diameter as the inner box, and the seed is pressed by the working up of the ram carrying the box against the surface of this table. Within the perforated box the seed-bags are deposited with metal plates between them. Experience, however, has demon-

The final pressure applied in ordinary practice on the seed-trays in an hydraulic press is equal to a weight of about 300 tons. "This weight is allowed to remain on for seven minutes, and the whole operation of charging, pressing, and emptying a press may be finished in ten minutes. A Blundell double press is capable of working off about 5 cwt. of seed per hour. A form of press of the most recent and improved construction, called the ' pack press," dispenses with bags, seed-boxes, and hair-mats, Consolidated cakes of seed enclosed in press-cloths to the number of sixteen for one charge are simply placed between corrugated plates. To enable the press to be charged with sufficient rapidity, and to allow the

large number of bags to occupy as small a vertical space as practicable when placed in the press, a moulding or form machine, such as was invented by John Bennie of Glasgow and patented in October 1880, or a similar machine, worked on a modified principle, patented by Francis Virtue, is employed. In these machines, by mechanical contrivances, the measured quantity of heated meal is placed in a trapeziform tray

enclosed in a cloth and submitted to a pressure which reduces the thickness of the mass from about 3 inches to a little more than 1 inch and forms it into a solid cake, in which state it packs in small space in the press. The whole time occupied in filling and forming a cake and placing it in the press is not more than a quarter of a minute, and a set of three pack presses in a day of ten hours will work off nearly 9 tons of seed, yielding in the case of linseed about 108 cwt. of cake, and 54 cwt. of oil. It is claimed for the pack press that it extracts a much larger proportion of oil than that worked with seed-boxes.

Horizontal presses are not much in favour in the United Kingdom, but in many Continental mills where two pressings are the rule a set of horizontal presses are kept for the first operation.

The oil, during the process of pressure, works its way from the centre to the edge of the cake, whence it exudes. For this reason an oblong form is the most favourable for the easy separation of the oil, and the trapeziform shape oil-cakes usually present has been selected on account of the wedge-like steadiness the mass has under pressure, and the readiness with which the entire cake frees itself once it is moved the smallest distance from the thin end of the box or tray in which it is pressed. The edges to which the oil is pressed almost invariably retain a considerable proportion of oil. They are pared off, and the parings are returned to the edge-stones to be ground up and again pressed with fresh meal. The oil from the presses flows into the receiver tanks placed under the level of the floor, from which it is pumped into the storage tanks, where it is permitted to settle and clarify. After mechanical impurities and water, &c., have separated themselves, the oil is in some cases ready for the market, but for the most part it has to undergo a process of refining.

Extraction by Solvents.—The only method of obtaining vegetable oils which has come into practical competition with pressing is that in which the solvents bisulphide of carbon (CS,), the light spirit of petroleum, and common ether are used. In ordinary pressing about 10 per cent. of oil remains in the finished cake, while by means of solvents practically the whole of the oil may be separated. Solvents might therefore be used for extracting that remaining percentage of oil from any oil-cake were such desirable, or they can be employed for treating fresh unpressed seed. Asa matter of fact, it is desirable to leave a proportion of oil in the cake which is used for feeding purposes, because its food valne depends to no small extent on the oil it contains, and the perfect separation of oil in the solvent process is a drawback, on account of the poverty in fatty matter of the exhausted meal.

Extraction by the agency of bisulphide of carbon was first intro- duced in 1848 by Jesse Fisher of Birmingham. Twelve years later a patent was secured by E. Deiss of Brunswick, but for several years afterwards the process made litile advance. The colour of the oil produced was high, and its taste sharp; it retained traces of sulphur, which showed themselves disagreeably in the smell of soaps made from it, and in the blackening of paints in which it was used ; and the meal left by the process was so tainted with evil-smelling car- bon bisulphide that cattle would not taste it. These drawbacks have now been perfectly surmounted, and the process appears likely to come into extended use on the Continent.

The seed for treatment with bisulphide of carbon is prepared as for pressing, except that it is not reduced to a fine meal, which would prevent the percolation of the solvent freely through the mass. It is only bruised and placed in a series of four or five up- right cylinders, which are hermetically closed and provided with a complicated arrangement of pipes leading to and from each other in various ways,—all being controlled by stop-cocks. Into the first cylinder A bisulphide of carbon is admitted from an overhead reservoir, till the whole mass is saturated with the fluid. After allowing the bisulphide to act on the contents of the cylinder for about fifteen minutes, communication between cylinders A and B is opened, the fluid from A passss into B, and a fresh supply of bisulphide comes from the reservoir into A. Again, after the lapse of fifteen minutes, the pipe leading into cylinder C

~~is opened, and the fluid contents of B enter C. B is filled from A, which again is replenished from the reservoir. The extraction thus goes on, pure bisulphide of carbon always entering the weakest, most nearly exhausted cylinder, and passing on with gradually increasing per- centage of oil to cylinders having more and more oil in their con- tents, till at the end, in the most recently charged cylinder the bisulphide is fully saturated with oil and passes off to the distil- ling apparatus, where the oil and the bisulphide are separated. When the contents of a cylinder have been fully extracted that vessel is isolated from the others, the remaining bisulphide of car- bon is forced out by the admission of compressed air, and there- after steam is run through the exhausted meal till not a trace of the solvent remains. The bisulphide, boiling at 46° C., is easily separated from the oil by simple distillation, and the last traces of the sulphur compound are removed by blowing steam through the oil in the distilling apparatus. Careful provision is made for the prevention of cscape and for the recovery aud proper storing of the bisulphide of carbon in use.~~

~~Ot Aas~~

~~In addition to the use of bisulphide of carbon claimed under his patent of 1855 (English patent 1856), E. Deiss enumerates as solvents chloroform, ether, and benzin or benzol. In 1863 an English patent was secured by Messrs Richardson, Lundy, and Irvine for obtaining oil from crushed seeds, or from refuse pressed cake, by the solvent action of " volatile hydrocarbons from petro- leum, earth oils, asphaltum oil, coal oil, or shale oil, such hydro- carbons being required to be volatile under 212° Fahr." Since that time the development of the American petroleum industry and improvements in the apparatus employed have raised this system of extraction to the rank of a competing practical method of oil production. The most approved apparatus for this method of ex- traction at present in use is that of Vohl. In the separation of oil from oil-seeds by means of light petroleum spirit heat is required. Vohl uses a light petroleum spirit boiling at not more than 60° C., which he calls canadol, and by a very ingenious arrangement of ex- tractors, boiling and collecting kettle, and condenser, all brought into connexion by a system of pipes, he percolates the crushed seed in the extractor cylinders with heated canadol, which passes down into the kettle laden with extracted oil. Here the volatile canadol is distilled off~~

~~by steam heat, and passes into the condenser, whence it again goes into the extractors, still further exhausting the seed and carrying an, additional portion of fixed oil into the kettle. In this way the original charge of canadol keeps circulat- ing till it completely exhausts the charge of seed in the extractors. The canadol is then distilled off from the fixed oil collected in the kettle, the condensed spirit going this time into a separate receiver, and finally the oil is perfectly freed from canadol by having steam blown through it. As pure petroleum spirit extracts neither resinous nor gummy matters from the oil-seed, and moreover takes up little or uo colouring matter, the oil obtained by this solvent is remarkably pure, and the process is quite adapted for extracting even the oils used for food and for pharmaceutical purposes. The extraction of oils by means of ether, although presenting many advantages, has never been successfully undertaken on a com- mercial scale, chiefly through the apparently insurmountable waste of the costly menstruum.~~

~~Refining.—The refining of vegetable oils is generally carried on as a separate industry. A kind of clarification of an expressed oil takes place by simple settling in oil-tanks, but the action is too tedious and the result too imperfect for practical purposes. The all but universal method of oil-refining now practised was invented and patented by Charles Gower in 1792. It consists of treating the oil with a small percentage of sulphuric acid, which, owing to the avidity with which it takes wp water, acts on the suspended impurities by depriving them of the water they contain, and then carbonizes the substances themselves, which precipitate in dark- coloured flocky masses. To a certain extent also the acid influences the oil itself, liberating fatty acids and combining with the freed glycerin ; and these new products remain dissolved in the oil. It is thus of great importance to use no more than that proportion of sulphuric acid which is capable of separating the impurities. The ordinary operations of refining are briefly as follows. The oil is placed in a large tank, within which is a coil of pipe for heating by steam. When the oil is sufficiently hot, sulphuric acid is slowly added to the extent of from } to 14 per cent. of commercial acid, according to the nature and impurities of the oil. After the con- tents of the tank have been in vigorous agitation for about an hour, it is left at rest for about five hours to allow the charred impurities to collect and precipitate. The oil is then conveyed into a washing vat, where it is mixed with about 20 per cent. of~~

boiling water, with the addition of a little soda, and kept briskly stirred for an hour. From this the mixture passes to clearing tanks, in which the oil is allowed to rest about a week in order to thoroughly separate the remaining water. 'The addition of about 5 per cent. of common salt, by increasing the specific gravity of the water, considerably hastens this separation. Finally the oil is passed through a filter composed of alternate layers of tow, dried moss, canvas, and similar porous substances. Numerous modifica- tions of the above scquence and other processes of refining have been introduced, and more or less adopted. One of the best distinct processes is that of Bareswil, which consists in heating the oil and adding to it 2 to 3 per cent. of caustic soda. Thereby a corresponding proportion of soap is formed, which, rising to the surface as a strong frothing scum, brings with it the impurities which are rendered insoluble. The scum is subsequently allowed to precipitate, in doing which it perfectly clarifies the oil. The coagulum so formed is used as a lubricant. Rudolph von Wagner proposed the use of concentrated chloride of zinc, instead of sul- phuric acid, in refining ; and various other mineral acids as well as salts and tannin have also been suggested and tried. The most recent process of refining, and certainly the simplest and most cx- peditious if experience demonstrates its sufficiency, is that intro- duced by Mayer of the Hernalser Actien-Oelfabrik. It consists simply in submitting oil direct from the press to the action of a centrifugal machine. Thereby the albuminoid, mucilaginous, and other impurities are driven against the sides of the drum, on which

they deposit as a solid coating, leaving the oil pure and clear. The effect is, of course, due to the difference in density between the oil and its suspended impurities.

Animal Fat Rendering.—The animal fats, butter only excepted, are liberated from the cells in which the fatty matter is enclosed by the agency of heat alone. The heat applied melts the fat, and by thereby causing its expansion as well as by acting on the moisture in the tissue it bursts the cell membrane and allows the liquid fat to flow together. The process is a noxious and disagreeable one owing to the intolerable stench given off by the putrefying animal matter while under the influence of heat ; and it is

~~practically im- possible to have the fatty matter heated on a large scale in its pure and sweet condition. It becomes an object of importance, therefore, to prevent the escape of such disagreeable fumes into the air, and the apparatus used is principally modified with that view. The simplest method of tallow-rendering consists in cutting the fatty matter by hand or machine into small fragments, which are placed in a copper vessel, with a small quantity of water, over an open fire. While the fire is applied the mass is kept stirring, and gradually the oil exudes and collects as the membraneous matter—greaves or cracklings—becomes shrunken and shrivelled. The fat is then ladled out of the boiler and strained through a sieve or filter, and the greaves, placed in a hair or woollen bag, are submitted to press- ure, by which a further portion of tallow is separated. The pressed greaves are useful for dog's food or for feeding swine, &c., or they may be still a source of tallow, which can be obtained by treating them with bisulphide of carbon or with petroleum spirit. An im- proved method of rendering tallow consists in crushing the suet under a pair of edge-stones, whereby the cells are ruptured, and heating ihe product over an open fire with about one-fifth part of water acidified with from two to seven parts of strong sulphuric acid added in the boiler. The means, however, of most effectually separating animal fat and at the same time avoiding the pollution of the air consists in the use of air-tight cylinders or kettles heated by steam. According to certain methods of working, superheated steam is forced into the kettle and acts direct on the shred suet, &c. ; in other cases the steam circulates in a coiled pipe within the vessel ; and a third way consists in the usc of steam-jacketed rendering vessels. Strained tallow, however prepared, is further purified or refined before using by melting and thorough washing with hot water, after which it is allowed to cool slowly, so as to throw down impurities with the separating water. The same cffect is also pro- duced by blowing steam through molten tallow (comp. Larp, vol. xiv. p. 312).~~

~~Classification and Enumeration of Ouls and Fats.~~

~~There is no strictly systematic plan upon which oils and fats can be satisfactorily classified and arranged. The scheme which follows brings the various commercial pro- ducts into convenient groups, the distinctions of which are of prominent importance.~~

I. Fluid Oils. a. Non-drying or greasy oils, containing chiefly olein. b. Drying oils, containing linolein. c. Fish or train oils, containing physetolein. Il. fats and Waxes. a. Solid glycerides, principally palmitin and stearin. b. Non-glycerides or waxes.

In a pure condition the non-drying oils undergo little change through the influence of the atmosphere, but by degrees a process of slow fermentation is set up by the agency of the natural impurities they contain, developing an offensive rancid smell, and rendering the oils thick and greasy. Even in very thin layers, however, they never dry. Under the influence of nitrous acid and mercuric nitrate the olein of non-drying oils undergoes a molecular change into elaidin, and the oil becomes solid. Castor oil, the characteristic glyceride of which is ricinolein, occupies an intermediate position between drying and non-drying oils. The influence of nitrous acid on ricinolein changes the molecular constitution of the body forming ricinclaidin, with simultaneous solidification, as in the case of olein. The drying oils are those which contain as principal con- stituents linolein or analogous glycerides. They absorb oxygen from the atmosphere with much rapidity, giving off at the same time carbonic acid and water, whereby the composition of the oil is modified, the proportion of oxygen much increased, and the physical properties of the oils changed. 'They do not solidify under the influence of nitrous acid. The fish oils do not dry on exposure to the

air, but they thicken and present physical features inter- mediate between drying and non-drying oils.

The following list embraces the whole of the oils, fats, and waxes ordinarily met with in commerce. Such of them as are of considerable importance are indicated by an asterisk, and notices of these will follow or be found under their own headings, or under the name of the pro- ducing material. The oils, &c., of local, limited, or other- wise minor lmportance are marked with an obelisk.

1. Non-DRyiIne OILs.

~~4. VEGETABLE Fars.~~

~~Yield Specific~~

~~Name of Oil. Source. Per Gravity. Principal Use. cent. *Ground-nut | Arachis hypogwa ….| 38-50] 0°918 | Food; soap. Joicial GaccoonD Moringa pterygo- | 30-35 | 0°912 | Perfumery; personal. sperma *Almond .| Amygdalus-communis | 45-55 | 0°915 ve HECACH serstejels Amygdalus persica ..) 32-85] 0°916 Perfumery; medicine. ¦Plum-kernel | Prunus domestica ….| 25-30 | 0°9127 : tCherry-ker- | Prunus Cerasus…... 25-30 | 0°923 | Food; burning; soap. nel tApple-seed | Pyrus Malus …..... 12-15 Food ; burning. tQuince…...} Cydonia vulgaris ….| 15 Bo Food. tCashew ….| Anacardiwm occiden- | 40-50| 0°916 | Food. tale ¦Spindle-tree | Huonymus ewropwus | 28-29 | 0:938 | Burning; surgery. tHorse-chest- | 4isculus Hippocas- | 6-8 | 0°927 | Medicine. nut tanum *Cotton-seed | Gossypium sp. ..... 15-20 | 0°9306 | Soap and lubricant. Tea-seed ….| Camellia theifera ….| 30-85} 0°927 | General use in China. Brazil-nut ..| Bertholletia excelsa ..| 60-67 | 0°9185 | Food. tJungle-al- | Terminalia Catappa..| 28 | 0°918 | Food. mond CO Zama Brassica campestris ..| 35-45 | 0°9150 | Lighting. BRapeN «cctnie Brassica campestris, | 30-40 | 0°9139 | Lightingand lubricant. var. Napus *Mustard ….| Brassica sp. ..... 15-25 | 0°917 | Soap-making. Radish-seed | Raphanus sativus ….| 45-50 | 0°917 | Food. *Sesaine or | Sesamum orientale 50-66 | 0°9235 | Food ; soap-making. Gingelly Mie accor Olea europea …... 80-50 | 0°91 Food ; burning, &c. Beech-nut ..| Fagus sylvatica …... 20 | 0°9225 | Food ; burning. Hazel-nut ..| Corylus Avellana ….| 50-60} 0°9243 ee >, perfumery ; urning. MIZE, 0s os Zea Mays (germ) ....| 15 | 0°9215 | Burning; wool; oiling. ¦Cyperus-root] Cyperus esculentus 20 | 0°924 | Food. *Castor …...| Ricinus communis 50-60 | 0°9667 Medicines soap ; lubri- cant. *Croton…...| Croton Tigliwm…... 30-40 | 0°942 | Medicine. Purging-nut | Jatropha Curcas 30-40 | 0°915 | Medicine; soap; lubri- : A cant. Animal Oils— *Neat's – foot se 0915 Sheep's 3 0°9175 |) Fine machinery oil. EVOTEE) 2512/2 SNE ee 0°913 THO ocineteers Yellow of eggs …... 10-13 ae~~

~~2. Drytne OILs.~~

*Candle-nut | Alewrites triloba ….| 55-60 | 0°940 | Burning; paint; soap. NVCOM) . . nares Alewrites cordata ….| 85-41 ne Varnish and paint. +tGrape-seed..| Vitis vinifera …... 10-20 | 0°9202 | Food ; burning; soap. *Linseed ….| Linum usttatissimum | 20-83 | 0:9350 | Paint; varnish; lino-leum, &c. Pumpkin- Cucurbita Pepo …... 20-25 | 0°9231 | Food; burning seed Koeme…... Telfairia pedata 38 ae Food. *German se- | Camelina sativa ….| 25-28 | 0°9228 | Burning; soap ° same tCress-seed Lepidium sativum.…| 50-60 | 0924 | Burning; soap. *Poppy ….....| Papaver somniferum. .| 50-60 | 0°9250 | Food ; paints ; soap. + Mexican Argemone mexicana ..| 25-80} 0°919 | Burning; medicine. poppy tWeld-seed ..| Reseda Luteola …... 30 | 0°9058 | Burning; paints. +Belladonna | Atropa Belladonna ..\ .. 0:925 | Food; burning. Le a Nicotiana Tabacum ..| 30-32 | 0-9232 | Burning. see *Sunflower ..| Helianthus annuus ..| 28-30 | 0:9260 | Food ; paints; soap. *Madia ….....| Madia sativa …..... 35-40 | 0°9286 | Burning; soap; lubri- cant. PINTECT) 6060s Guwizotia oleifera, ...| 40-45 | 0°9242 | Soap ; lubricant. *Safflower….| Carthamus tinctorius | 30-35 oe Food ; burning. *Hemp ….....| Cannabis sativa…... 80-35 | 0°9276 | Lubricant; varnish. PNAC veins. oc6 Juglans regia …..... 40-50 | 0°9250 | Food ; oil-painting. +Pine-tree.…| Pinus sylvestris…... 25-30 | 0°9312 | Paints and varnishes. tRed ae Pinus Abies …..... 25-30 | 0°9288 | Paints and varnishes. see 3. TRAIN AND FisH OILs. Walrus .| Trichecus rosmarus .. 09250 |) Burning; lubricant; a Mecaessart Various species…... 58 currying leather, &c. orpoise ….| Delphinus phocena .. 0°9220 'ami . * 'le- ; ns turning ; lubricant ; Bottle-nose he aed globi 0°9180 fibre dressing, &c. 2 *Sperm .| Physeter macro- 0°910 | Lubricant. cephalus PAVING Songs Various species…... ne Burning; lubricant, &c. Sod. whens Livers of Gadus mor- 0°925 rhua, &c. (| Medicinal; currying Shak 2… 2. Livers of Squalus, 0:875 leather. : various species HTS lie eatesesst ates Varioustish ~..... Burning ; lubricant.*

*Yeeld|| a. : Name of Oil. Source. ae cay Principal Use. tDika butter | Irvingia Bartert ….| 60-65] 0°820 | Food; candles; soap. tJavaahnond | Canariwm commune..| 40 ms Food. oil *Chinese ve- | Stillingia sebifera ….| 20-30} 0°918 | Candles; soap. getable tal- low Pekea butter | Pekea butyrosa …... An Food. Soap-tree oil | Sapindusemarginatus| 30 Soap-making. Carapa oil ..| Carapa guyanensis ..| 60-70 a Soap; medicine. Piney tallow | Vateria indica …... ae 0°9150 | Candles. Borneo tal- | Hopea*

*macrophylla .. ee Mee low *Cocoa butter | Theobroma Cacao …..| .. tCokum but- | Garcinia indica…... 10 ter ; tChaulmoo- {| Gynocardia odorata ..| 50 Medicine. gra oil *Oil of mace | Myristica moschata ..| 20-23 | 0-990 Medicine ; perfumery. tOtoba butter] Myristica Otoba…... Sie a oe tal- | Myristica Becuhyba . ; Medicine ; candles. ow *Shea butter | Bassia Parkii…..... 40 | 0°953 | Candles; medicine. *Ghee butter | Bassia butyracea …..| .. Ae Food ; medicine. ee but- | Bassia latifolia …... 35-40 | 0°972 | Soap; candles. er tBayberry oil | Lawrus nobilis …... Veterinary medicine. tAvocado oil | Persea gratissima …. as Soap, *Palm oil …..} El@is guineensis …..] .. 0°945 | Soap and candles. *Palm-seed oil) Elais guineensis …..| 45-60] 0°952 | Soap and candles. *Cocoa-nut oil} Cocos nucifera …... AG 56 Soap and candles, ; 5. ANIMAL Fats. ya C2) if eames Sus scrofa domestica. . 0°940 | Food; candles; lubri- cant. Horse fat ..| Equus caballus …... Ai Currying:; lubricant. *Butter…...| Milk of Ruminants .. ; si Food. *Tallow (ox)..| Bos tawrus ……..... 0°920 | Soap; candles; lubri- cant. Beef marrow | Bos taurus ……..... 16 Pomade. *Tallow QUUSIOTHES: . wove cas 0°913 | Food; soap; candles. (sheep) Goose fat ..| Anas anser……..... Pomade. 6. WAXES. a. Vegetable— * Japanese Rhus succedanea …7| .. 1006 | Candles. wax Ocuba wax..| Myristica Ocuba we 0920 | Candles. Cow-tree wax) Galactodendron amer-| .. nid Candles. icanum Myrtle-berry) Myrica cerifera…... 20-25 | 1:005 | Candles. wax Carnahuba | Corypha cerifera 0‘995 | Candles. wax Palin tree | Ceroxylon andicola .. 0:995 | Candles, wax b. Animal— *Beeswax …..| Apis mellifera, &c. . 0°963 | Candles, &c. *Insect wax ..| Coccus ceriferus…... 0970 | Candles, &c. *Spermaceti..| Physeter macro 0°943 | Candles; surgery.*

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Oil Testing.—The presence of mineral oils in any fixed oil is easily detected by the process of saponification, as well as by a peculiar fluorescence they impart to the mixture. In the saponi- fication test the oil is made into a soap, with either soda or potash, the product mixed with sand, and the whole treated with light solvent petroleum spirit, which extracts the mineral oil. The in- crease in quantity of solution over the solvent used is the measure of the proportion of adulterants in the oil. Smell, taste, specific gravity, and viscosity, all to a certain extent give indications of the nature of an oil. The elaidin proof—that is, the solidification or non-solidification of an oil under

the influence of nitrous acid, and the length of time required for solidifying when such a change ensues—is a valuable indication of the nature of an oil ; and siniilar trustworthy conclusions may be drawn by observing the heat de- veloped by mixing one part of sulphuric acid with three parts of the oil to be tested, a test first suggested by Maumené, and elabo- rated by Fehling. The colour reactions which result from treat- ment with acids of different strengths, mixed acids and alkalis, &c., are the most important tests. The following tabular statement of several such tests is extracted from Schaedler's Technologie der Fette und Oele (Berlin, 1883). The first column shows the colour reactions produced by nitric acid of sp. gr. 1°18 to 1°20 on equal proportions of oil ; the second the effect of fuming nitric acid of sp. gr. 1°40 to 1°45 on four or five times the amount of oil; the third the colour reaction from the use of sulphuric acid of sp. gr. 1°60 to 1°70; and the fourth the effect of a diluted mixture of nitric acid and sulphuric acid on equal volume of oils. In the fifth column is given in hours the time a non-drying oil takes to solidify under the influence of nitrous acid, after which comes the appearance of emulsions formed by treatment with alkaline leys of 1°33 sp. gr. The last two columns are devoted to the effects produced by a solu-

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tion of chloride of zinc and of hydrochloric acid with the addition of about 2 per cent. of sugar.

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Indies and Italy, olive oil from Italy, the south of France, and Mediterranean ports generally. Palm oil is received exclusively from the west coast of Africa, and cocoa-nut oil from the East Indies and Ceylon. Of seeds imported as sources of oil, linseed is principally derived from the East Indies and Russia, cotton seed from Egypt, and rape from Russia and the East Indies. The following table, from the Board of Trade Returns, gives the imports and exports of oils and fats into the United Kingdom for 1882 :—

Imports. EXPORTS. Quantities. Value. Quantities. Value. 1. Orns AND Fats, . Fish, train or blubber 14,303 tuns | £420,466 1,624 tuns | £49,082 Sperm or head matter 1,642 tuns 111,197 119 tuns 9,053 BAINITINED Ns

cievereicisre vit 67,877 cwts. 157,617 9,988 cwts. 25,714 (CIS) wane OnemoIne 163,970 cwts. 264,551 24,288 cwts. 40,057 WOCOR=NU sce. oa 133,782 cwts. 210,054 134,368 cwts. 205,788 (OUR: one pomOnpeneos 23,450 tuns 947,154 3,668 tuns 166,693 PEC EUT IMs os) sirevensysvere tetera" 813,870 cwts. | 1,240,866 428,162 cwts.| 642,203 sted) Senyeweedencer 14,507 tuns 476,807 1,162 tuns 37,279 Unenumerated…... aoe 116,229 = 20,175 10.2900 WR on omoben 667,153 cwts. | 1,866,360 43,682 cwts.{ 127,258 Tallow and stearin 1,116,581 cwts. | 2,252,517 218,852 cwts.} 428,460 WGK © alot cotecinelines COU uss 129,926 16,441 cwts. 55,074 Butter and butterine | 2,169,717 cwts. | 11,350,909 85,249 cwts.| 478,963 Oil (not essential or ; 14,041,900 galls. | 1,444,071 medicinal) Produce of the United Grease, tallow, and Kingdom. 239,710 cwts.| 372,229 animal fat 2. Ort SEgps, &¢. JED CGY = 00 eee 2,483,132 qrs. 5,245,513 6,050 qrs. 13,179 Rape …..| 548,806 qrs. | 1,032,829 41,782 qrs. | 100,895 (CORT) nee See 209,689 tons | 1,562,852 64 tons 543 Nuts and kernels 57,962 tons 726,428 27,606 tons 330, 877 Oil seeds unenumer- 120,963 qrs. 262,029 90,280 qrs. 201,543 ated Oil-seed cake …... 190,427 tons | 1,460,378 2,246 tons 14,732

Subjoined are notices of various oils and fats of considerable com- mercial importance to which special articles are not devoted in other parts of this work. In several cases notices of oils will be found under special headings, incorporated with descriptions of other products of the plants and animals whence they are obtained. Here drying and non-drying oils are dealt with together in alpha-

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betical order, after which vegetable fats and animal oils and fats are noticed in groups. ;

1. Liquid Vegetable Oils.—Almond oil, the produce of both the sweet and the bitter almond, is a pale straw-coloured oil, having a pleasant nutty taste and sometimes—when pressed from bitter almonds—an odour of the essential oil of bitter almonds. The oil consists almost entirely of olein, remains fluid to ~15° C., and solidifies at 20°C. It is used in food, and in medicine is employed as a demulcent and mild laxative ; but the readiness with which it becomes rancid interferes with, its free use in these capacities.

It produces a fine firm soap, and is also largely used by perfumers. The oil ismuch adulterated with the allied peach-kernel oil, and sesame oil, nut oil, &c. It is chiefly expressed in England from almonds imported from the Mediterranean and the East Indies. Peach-kernel owl (from Amygdalus persica), Apricot oil (from Prunus armeniaea), Plum oil (from P. domestica), and Cherry oil (from the kernels of species of Cerasus) are a series of oils allied both in sources and properties frequently mixed with or sold as almond oil. Ben oil 1s obtained from the seeds of Moringa pterygosperma and M. aptera, trees native of Egypt, Syria, and the East Indies, and cultivated in America. The oil, cold-drawn, is clear, bland, and odourless, with little tendency to rancidity, but the product of final hot press- ing is coloured, and has a bitter taste and purgative properties. The oil contains, in addition to palmitin, stearin, and olein, the glycerides of behenic acid C,,H4,0,, and myristic acid C,,H,0, Ben oil is used by ra for obtaining essential oils by enfleurage, as a hair oil and ointment, as a salad oil in the West Indies, and as a lubricant for watches and small machinery. It is, however, princi- pally consumed in the regions of its production. Candle-nut oil is obtained from the nuts of Alewrites triloba, a tree native of the South Sea Islands, but grown also generally throughout tropical countries. The nuts are about the size of a horse-chestnut, with kernels which yield as much as from 60 to 66 per cent. of oil. The name given to these fruits is due to the fact that they are used in the Sandwich Islands, spitted on a stick, as lamps or candles, in which condition they burn with a clear steady light. The oil, cold-pressed, is a clear, almost colourless, rather viscid fluid, witha pleasant taste and smell, and medicinal properties akin to those of castor oil. HIot-pressed, it has a brown colour and a rather disagreeable odour and taste. It contains glycerides of linoleic acid and myristic acid in addition to those of palmitic acid and oleic acid, and possesses strong drying properties which make it useful for varnishes, and otherwise as a substitute for linseed oil; it is also an excellent illuminant and a valuable soap-making inaterial. On account of the cheapness of linseed oil, and the superior value of linseed cake, candle-nut oil does not find a very extensive market in Europe, but it is the basis of an industry of some importance in tle South Sea Islands, whence a large quantity of the oil is annually exported to the west coast of America. The nuts of Aleurites cordata yield Wood oil, a power- fully drying oil, of much importance in China and Japan for use as a natural varnish and in medicine. It does not

enter into Western commerce. Cotton-séed oil, obtained from the decorticated seed of the varieties of cultivated cotton, is now, on account of the enormous extent of its production, one of the most important of the fluid vegetable oils. Its preparation is quite a recent industry, dating only from 1852, when the first importation of the material was inade from Egypt. Since that period the trade has developed with extraordinary rapidity. Egyptian seed, containing about 25 per cent. of oil, is chiefly pressed in European countries (England, France, Germany); the American seed pressed in the United States shows not more than 20 per cent. of oil. The oil as expressed

**has a dark-brown turbid appearance, owing to the presence of a resin with albuminous impurities, and in the early days of the industry much difficulty was experienced in refining the product sufficiently for commercial purposes. It is now purified by as far as possible coagulating and separating the impurities by treatment with boiling water and steam. After the coagulum so formed has precipitated and been separated, the oil is treated with weak alka- line ley, briskly agitated, and allowed to settle, when the coloured resinous matter goes to the bottom; over that comes a proportion of saponified oil, and the clear refined oil forms the upper portion. The refined oil has a clear straw-yellow colour, a taint earthy odour, and a pleasant nut-like flavour. It consists entirely of a mixture of palmitin and olein, the former beginning to solidify and separate out between 12° C. and 6° C. There is no doubt that cotton-seed oil is very extensively and generally used to adulterate other and more costly oils, especially olive oil. It also is largely used in soap-making, and it constitutes a principal ingredient in compound lubricating oils. The quantity of cotton seed available for pressing annually is estimated to be not less than 800,000 tons, from which about 120,000 tons of oil and 250,000 tons of oil-cake may be produced. German Sesame or Cameline oilis procured from the small yellow or ruddy seeds of the cruciferous plant called Gold of Pleasure, Camelina sativa (Myagrum sativum, Linn.). The oil has a golden-yellow colour, a distinctive smell, and a somewhat sharp taste. In addition to other glycerides it contains that of erucasic acid, and of some analogue of linoleic acid. The oil dries*

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only slowly on exposure to the air, and its chief applications are found in soap-making and for burning in lamps. It is principally produced and consumed in Germany and Russia. Grape-seed oil is used in the south of Germany and north of Italy for food and for burning in lamps. The seeds yield from 10 to 20 per cent. of a pleasant browuish-yellow very fiuid oil, which dries very slowly on exposure to the air. Growund-nut oil (sce Ground Not) is an excellent edible oil, largely used as a substitute for olive oil, and to no small extent passing into consumption either separately or mixed with olive oil under the name of the latter. The inferior hot-pressed qualities are employed in soap-making, being a principal staple of the soap industry of Marseilles, into which city not less than from 700,000 to 800,000 tons of the nuts are annually im- ported from West Africa. Madia oil is obtained from the fruit of Madia sativa, a plant native of Chili, but introduced into Europe within this century on account of its oil-yielding propcerties. The seeds contain from 85 to 40 per cent. of a dark-yellow oil, of peculiar smell and mild taste, which has a tendency to become rancid. It has only faint drying properties, and occupies a place intermediate between drying and non-drying oils. When cold-pressed, madia oil may be used for food purposes, but it is principally consumed in lamps, or employed as a lubricant and in soap-making. Maize oil is a product of the seed-germs, which, in the preparation of maize meal and starch and fermented and distilled liquors from maize, have to be removed as carrying in them a disagreeable acrid substance. The germ contains about 15 per cent. of a clear golden- yellow oil, useful for burning, or oiling wool, and for lubricating machinery. Niger oil is the produce of the seeds (properly achenes) of Guizotia oleifera, a plant native of the east coast of Africa, but cultivated throughout India and to some extent in Germany. The fruits, which are small, tooth-like in form, and shining black in colour, contain from 40 to 45 per cent. of oil, which first came into the English market about 1851. The oil is limpid, clear, pale-yellow in colour, with a pleasant nutty mild flavour. It possesses little drying property, and is not fitted for use either in paints or varnishes. It is much used in India—in the Deccan especially—as a substitute for ghee with the poorer sections of the population, and in other parts of the country both as a culinary oil and for burning. In Western countries niger oil is principally employed in soap-making and as a lubricant. Nut oil is the produce in

Europe of the nuts of the walnut tree, Juglans regia, andin America a similar oil is obtained from hickory nuts, Carya alba. The Euro- pean walnut kernels yield from 40 to 50 per cent. ofa fine limpid oil, which when cold-pressed is almost colourless, with a sweet nutty taste and pleasant odour, but the hot-pressed oil has a greenish- yellow colour and a rather sharp taste. Nut oil consists in large proportion of linolein, with olein and the glycerides of myristic and lauric acid. It is one of the most fluid of all oils, and, as it possesses with colourlessness strong drying properties, it is much valued by artists for oil-painting ; it also yields a fine transparent varnish. In the hilly districts of northern India and Persia—the native regions of the walnut—the oil is used for culinary purposes and for lighting. Several closely-allied nuts, both in Europe and in America, yield oil similar in quality to that of the walnut. Para-nut or Brazil-nut oil, yielded by the kernels of Bertholletia excelsa, is employed in South America as a food-oil and for soap- making. To a limited extent it is also pressed in Eugland and Germany from nuts which become unfit for table use. The oil be- comes rapidly rancid. Sapueaia oil, yielded by Lecythis ollaria, also a South-American tree, allied to the Bertholletia, is analogous in properties and uses. Pine oils are got from the seeds of various

species of pine and fir trees containing some proportion of resinous"

matter ; they have a turpentine odour and possess powerful drying properties. They are useful for mixing painters' colours, for making varnishes, and for burning in lamps. Poppy oil is yielded by the seeds of the opium poppy (see Opium). In the valley of the Ganges, the great region of opium culture, the poppy seed is con- sumed as an article of food by the native population, and is their principal source of oil. The exceedingly minute seeds contain as much as 60 per cent. of a fine transparent, nearly colourless limpid oil, of pleasant taste and faint characteristic odour. The qualities obtained by cold and hot pressing respectively are distinguished from each other, the former being an esteemed salad oil, while the latter, of yellow colour, sharp taste, and linseed-oil-like odour, is used for soap-making, &c. Poppy oil consists principally of the glyceride of linoleic acid, linolein, and has therefore powerful drying properties, on which account it is much used by artists. To some extent the finer qualities are used for adulterating olive oil. Purging-nut oil is obtained from the seeds of

Jatropha Cureas, a small tree native of India, but cultivated in tropical countries. It is a violent purgative, and contains, like castor oil, ricinoleic acid. It is comparatively limpid and odourless, and forms an excellent lamp oil. It is also used in the soap trade and as a lubricant. Saffower oil is yielded by the seeds (achenes) of the composite plant Carthamus tinetorius, which coutain from 80 to 35 per cent. of a light-yellow clear limpid oil. It is extensively used in Egypt, the East Indies, and China (where the plant is cultivated as

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a source of the dye-stuff safflower), its principal applications being for culinary purposes and burning, and also as an ointment in para- lytic affections and ulcers. A thick sticky charred oil is obtained from the seed in India by a process partly of burning and partly of distillation. The dark fluid so obtained is used by the native agriculturist for greasing leather-work exposed to the action of water. Sesame or Gingelly oil, one of the most highly esteemed of vege- table oils, is the produce of Sesamus orientale. The plant is grown especially in India as an annual; it ripens in about three months, and two crops are reaped yearly. 'The seeds are very small, weigh-ing not more than one-tenth of a grain, and they vary in colour from a dirty white through brown to nearly black. They are highly oleaginous, containing as much as from 50 to 56 per cent. of a clear limpid oil of a pale-yellow colour, inodorous, bland and sweet of taste, and not liable to rancidity. It consists of about three parts of olein to one part of stearin and palmitin, with a small propor- tion of the glyceride of myristic acid ; and it does not solidify till it reaches 5° C. Both seed and oil are of much importance in the East Indies and China as food substances. 'The seed itself is used directly as food ; the oil comes next to cocoa-nut fat in the variety and extent of its applications for food, personal use, and soap- making ; and the pressed cake is even an article of food among the poorer classes. As a salad oil the cold-pressed qualities are in every respect equal to the finest olive oil, its mild piquancy of taste causing it to be preferred by many. Indeed sesame oil may be used with advantage for every purpose to which olive oil is applied, excepting, probably, the Turkey-red dyeing, and it is in extensive consumption in food, lighting, soap-making, and as a lubricant. The oil is the subject of much adulteration, especially with the cheaper

ground-nut oil. It can by itself, or as an adulterant of olive oil, be readily recognized by a peculiar green coloration it takes when shaken up with mixed sulphuric and nitric acids, a reaction peculiar to sesame oil. Sesame seed is principally crushed at Marseilles and Trieste, to which ports it comes partly from the Levant, but more largely from the East Indies and Java. The quantity of seed imported into France alone yearly is not less than from 70,000 to 80,000 tons. Sunflower oil isa clear pale-yellow limpid oil, with scarcely any smell and a mild pleasant character- istic taste, obtained from the so-called seeds (achenes) of the sun- flower plant, Helianthus annuus, which yield when freed from their husk about 30 per cent. of the oil. It contains glycerides of acids allied to linoleic acid, and possessing certain drying properties. It is of much importance in tlie east of Russia as an article of food, the sunflower being extensively cultivated in the government of Saratoff solely for its oil seed. ea-seed oil is a commercial pro- duct in China, where itis used for food, lighting, and soap-making. It is said to yield a fine hard soap. The oil contains 75 per cent. of olein and 25 parts of stearin, has a yellow colour, and is destitute of taste and smell.

2. Vegetable Fats.—Among the numerous solid oils of the vege- table kingdom only a very few occupy a place of great importance in Western commerce. Those which hold a foremost position—palm oil, palm-nut oil, and cocoa-nut oil—are referred to under their proper headings. Of the others the following enter more or less into general commerce. Dika butter is a solid fat yielded by the drupes of Irvingia Barteri, a tree native of the Gaboon coast of Africa. The kernels are bruised and pounded into a cake, which is used by the natives for food as dika bread, and they contain more than 60 per cent. of solid oil, which can be separated either by boil- ing or by pressure with heat. It consists principally of glycerides of lauric and myristic acids, with only a little palmitin. Dika fat is used in soap and candle making. Chinese tallow is a white hard fat formed on the surface of the seeds of the tallow tree, Siillingia sebifera, native of China, but introduced into the North-West Provinces of India. The tallow is in China separated by steaming the seeds till they become soft, beating with stone mallets, and straining the mass through hot sieves. The fat melts at 44°‘5 C., and consists principally of palmitin with only a little olein. Chinese tallow has long been valued in China for makiug candles used in Buddhist

worship, and it is now an article in English commerce, being imported for candle arid soap making. The seeds themselves, after separation of the fat, yield an oil fluid at ordinary temperatures. Carapa (or Crab-wood) oil is a soft white fat obtained from the seeds of Carapa guyanensis, a tree native of Brazil and Guiana and of the west coast of Africa. A similar fat is also ex-pressed from the seeds of the allied C. moluccensis, from the coasts of India and Ceylon. 'The fat has a slightly aromatic odour and a powerfully bitter taste, said to be due to the presence of strychnine. It is imported into the European markets for soap-making, and in its native regions it possesses a great reputation as an ointment in rheumatic affections. Piney tallow is a hard solid fat obtained from the seeds of the Indian copal tree, Vateria indica. The substance hasa feeble but pleasant smell, and a slightly yellow colour ; it melts at 36°°5 C., and consists of three parts palmitin and one part olein. It is prized for candle-making on account of the pleasant odour given off by the glowing wick. Cokwm butter is a solid white or greenish-yellow, pleasant-smelling, rather friable fat obtained from

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the seeds of Garcinia indica, a tree native of western India. It contains, besides stearin and olein, the glyceride of myristic acid, and various free fatty acids of the volatile class. It is principally used in India to adulterate ghee, and for various medicinal uses ; but it is described as forming an excellent substitute for spermaceti and to beapplicable for soap-making. The seeds of Gareinia pietoria and other allied species yield a similar fat. O22 of maee is the solid oil obtained from the Nurmsc (q.v.). Shea butter, the fat of the seeds of the tropical African tree Bassia Parkit, is at ordinary tempera- tures of a buttery consistency, with a dirty or greenish-white colour and a pleasant aromatic odour and taste. It consists principally of stearin and olein, and isan important article of food in the basin of the Niger and the adjoining regions. In European commerce it is employed for soap and candle making and in the preparation of pomades. Ghee or Indian butter, the solid fat obtained from the seeds of Bassia butyracea, an allied tree native of the sub- Himalayan ranges of northern India, is a most important food substance among the natives of the North-West Provinces, possess- ing a delicate white colour, the consistency of lard, and a pleasant odour and taste. In the hot climate of India it will keep many months

without acquiring bad odour or taste, on which account it is highly valued not only for food but also as an ointment, when perfumed, by the wealthier classes. It makes excellent soap and candles. Mahwa butter, obtained from the seeds of Bassia latifolia; a tree cultivated generally throughout India, is used as a substitute for or as an adulterant of ghee. It possesses a greenish-yellow tinge, and becomes rancid more readily than genuine ghee. The fat is imported into England for soap and candle making. The seeds of Bassia longifolia and B. elliptiea, natives of India, yield similar fats. Bayberry oil is the fat obtained from the seeds of the common bay or sweet laurel. It possesses a buttery granular consistence, a yellowish-green colour, a strong aromatie flavour, and a sharp bitter taste, due to the presence of an aromatie oil. It is pressed from the seeds principally in the south of Europe, Switzerland, and Holland, and finds its chief application in veterinary practice. Avocado oil is the produce of the fruit of the avocado pear tree, Persea gratissima, an edible fruit, native of the West Indies, but transported to other tropical regions. The fat consists of 80 per cent. of olein and 70 per cent. of lauro-stearin and palinitin, and is largely used in America for soap-making, In addition to the cocoa-nut palm and the oil palm, a large number of trees belonging to the same order, Palmacex, yield useful fats, which, however, are little known in ordinary commeree.

3. Animal Otls.—The only liquid animal oil of considerable importance other than the marine oils is Neat's-foot oil, a prepara- tion from the feet of the common ox. For obtaining it the feet are split up and boiled in water over an open fire, or, preferably, treated with superheated steam in a closed cylinder. 'The oil is skimmed from the surface of the decoction, and after some time it deposits a thick greasy fat, from which the liquid portion is sepa- rated. Neat's-foot oil has a brownish colour and a mild animal taste and odour, and does not readily become rancid. It is very valuable for watchmakers' purposes, and for oiling fine machinery generally, and is in great demand in eonnexion with the tools and machines of engineers. It is much adulterated, generally with fish oils. A large quantity of ox-foot oil is Prepated in and exported from the River Plate region in South America. Sheep's-foot oil and Horse-foot oil are made to a limited extent, and sold as neat's- foot oil. gg oil is obtained as a by-product of the preparation of egg albumen from the yolk or yellow of hens' and ducks' eggs. It is extracted either by pressure or by ether from the hard-boiled yolks, and has a fine

brownish-yellow colour and a mild taste, except when extracted by ether, which brings with it a disagreeable fatty constituent. It is now being used to a considerable extent in place of olive oil in the manufacture of chamois or shamoy leather. The Seal oil of commerce is obtained from the bodies of nearly thirty species of SEAL (q.v.). The blubber or fat consists of a layer of variable thickness lying between the skin and the muscular tissue. Skin and blubber are first removed together from the carcases of the animals, and when the products are landed the fat is removed from the skin and reduced to oil, either by slow maceration and exudation in large vats or by rendering with steam. When heaped up in great wooden vats the mere pressure of the mass causes a flow at first of a fine clear oil, which is saved as a separate commer- cial quality known as "'pale seal." Fermentation and putrefaction meantime progress in the mass, which begins to give off an almost unbearable stench, and the exuding oil gradually assumes a dark-brown colour, with a disagreeable animal odour and taste. By degrees the exudation of oil ceases, and finally the remaining oil is obtained by boiling up the mass with fatty muscular scraps, the product of which also forms a separate class of seal oil. he oil rendered by the action of steam heat on the fat has the advantage of being promptly obtained, free from the disagreeable odour of the greater portion of the seal oil obtained in open vats. According to its quality seal oil varies in specific gravity from 0°915 to 0°930; at a temperature of 5° C. a proportion of stearin solidifies out, and at — 2° to — 8° C, it entirely solidifies. In chemical composition it

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consists principally of a glyceride of physetoleic acid with propor- tions of the glycerides of stearic acid, palmitic acid, a little oleic acid, and traces of some of the volatile acids. The oil is only very slightly soluble in alcohol, a circumstance which affords a means of detecting adulterations. It is used for the various purposes to which the allied whale oils are applied ; regarding these see WHALE. Shark oil, obtained from the liver of various species of shark, is analogous in properties and applications to Cop- Liver O1n (q.v.). Shark oil is distinguished from all others by its low specific gravity, which ranges from 0°870 to 0°880. It contains, but in different proportions, the same constituents as cod-liver oil ; particularly it is rich in iodine ; and it possesses a peculiar, highly- disagreeable odour and a very

~~acrid taste. Under the name of Fish oil may be embraced the oil obtainable by boiling from the refuse of various fish as well as from the entire fish which may for any reason be unfit or not applicable for human food. Such oils have a fishy odour and taste, a brownish colour, and a specific gra- vity ranging from 0°925 to 0930. The most important of these products is Menhaden oil, obtained from the MENHADEN (g.v.) on the west coast of North America.~~

~~4, Animal Fats.—The few solid animal fats which enter into commerce are articles of such importance that they have special articles devoted to them (see LARD, vol. xiv. p. 312, and TALLow), or of so little consequence that they do not demand special notice. Bear's grease, beef marrow, and goose fat are highly valued for use in pomades for the hair, but comparatively little of what passes under these. names is obtained from the sources to which they are attributed.~~

~~5. Wasxes.—The waxes of both animal and vegetable kingdoms will be dealt with under the heading Wax.~~

~~ESssENTIAL OILs.~~

~~The essential or volatile oils constitute a very extensive class of bodies which possess in a concentrated form the odour characteristic of the plants or vegetable substances whence they are obtained. The oils are usually contained in special cells, glands, cavities, or canals within the plants, either in a separate condition or intermixed with resinous substances, and in the latter case the mixtures form oleo- resins, balsams, or resins, according as the product is viscid or solid and hard. A few do not exist ready formed in the plants whence they are obtained, but result from chemical change of inodorous principles,—examples of this class being oil of bitter almonds and essential oil of mustard, Essential oils are for the most part insoluble, or only with difficulty and sparingly soluble, in water ; but in alcohol, ether, the fatty oils, and mineral oils they dissolve freely. They ignite with great ease, and burn with a fierce smoky flame, depositing a large amount of carbon. In many important respects they differ from the fatty oils: they are not oleaginous to the touch, and make no permanent grease spot; they distil at various tempera- tures unchanged ; they have an~~

aromatic smell and hot burning taste ; and in chemical constitution they present no relationship to the fats and oils.

Crude essential oils are at ordinary temperatures nearly all limpid liquids, but some are viscid ; and the essential oil or otto of roses is solid. Many on exposure to low temperatures separate into two portions, one solid, called "stearoptene," the other liquid, called "'eleeoptene." The essential oils possess high refractive power. Their influ- ence on the plane of polarized light is various: some rotate to the right, others give left-handed rotation, while with several no effect is visible. In their fresh condition many are colourless, but some are yellow or brown, others be- come brown by exposure, and in exceptional instances oils are green or blue in colour. They are all powerfully acted on by oxygen, which affects their colour, consistency, odour, and constitution. In specific gravity they range from about 0°850 to 1142, most of them being specifically lighter than water, and averaging 0°90. In chemical con- stitution the essential oils are diverse, but they are invari- ably rich in carbon. They consist, first and principally, of hydrocarbons, associated with which generally are, secondly, oxygenated compounds, sometimes the product of oxidation of the hydrocarbons, although in many

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instances there is no obvious relation between the bodies. A third class of essential oils, limited in number, consists of those into the composition of which sulphur enters. Of the hydrocarbons which constitute the principal pro- portion of essential oils terpene, C,)H,,, is the most im- portant. 'Terpene is the chief constituent of the various kinds of oil of turpentine ; and a hydrocarbon of precisely the same composition is contained in the oils of bergamot, orange, and other species of C7trus, and in a great number of other essential oils. But although agreeing in chemical formula these terpenes differ considerably in physical pro- perties, such as specific gravity, boiling point, and rotatory influence on the plane of polarization. Under the name of terpenes are also included two series of hydrocarbons, polymeric with the C,,H,, series, having respectively the formule C,,H,, and Cy)H,. The former of these, C,;Ho,, is of comparatively frequent occurrence, being found in the essential oils of cloves, cubebs, patchouli,

~~and several others. The terpenes of formula C,)H,,, by their oxida- tion in presence of water, give off indirectly peroxide of hydrogen, H,O,, and yield cymene, C,)H,,, a hydrocarbon found naturally in the essential oils of cumin, thyme, and some others. The property of evolving peroxide of hydro- gen, possessed by cymene in common with terpene, explains the well-known oxidizing and antiseptic influence of com- mon turpentine oil, and has been turned to account in the preparation called "sanitas," a disinfectant and antisep- tic agent, consisting of an aqueous solution of oxidized turpentine oil prepared by blowing air into a mixture of turpentine oil and water. The oxygenated bodies in essential oils when formed by direct oxidation of the hydro- carbon generally have feebly acid properties developing through viscid oleo-resins and balsams into solid resins. The oxygenated compounds are very varied in their consti- tution, some being of the nature of acids or aldehydes, while others exhibit the characters of alcohols or of ethers. The most characteristic oxygenated compounds in essential oils are camphors, the type of which is common or Japan camphor, C,,H,,O. Compounds isomeric with common camphor occur in the volatile oil of Pyrethrum parthenium, wormwood, mint, and other labiate plants, and in chamomile and galbanum. Camphors isomeric with Borneo camphor, C,)H,,O, are found in coriander oil, cajeput oil, and Indian geranium oil. Isomeric camphors having the formula C,,H,,O0 form the menthol of peppermint and the euca- lyptol of Lucalyptus Globulus, and patchouli camphor has the composition C,,H,,O. The other oxygenated bodies in crude essential oils mostly ally themselves with compounds of the aromatic series, so called on account of the large proportion of its members that are represented by natural products obtained in essential oils, balsams, and resins. The essential oils which contain sulphur, of which the allyl sulphide, C,H), or oil of garlic is a type, have generally a pungent, penetrating, and disagreeable odour.~~

~~The essential oils are obtained from their sources in four principal ways,—by distillation, by expression, by enfieurage or absorption, and by maceration. The process of distillation is the most important, and is applicable to a large number of substances owing to the ease with which essential oils distil unchanged. Their general insolu- bility in water is turned to account in the process, the odoriferous materials being placed in a simple still with a small quantity of water, the steam from which carries~~

over with it the vapour of the essential oil. In distilling from certain bodies it is necessary to cohobate or return into the still the first distillate, and that opera- tion may require to be repeated more than once before the raw material is quite exhausted. Again, in dealing with some substances, solutions of common salt or of chloride of calcium must be used in place of pure water, and these, by raising the boiling point, send over the vapour more richly laden with essential oil. After con- densation and resting a sufficient time, the distillate separates into two portions, the oil floating or sinking according to its specific gravity. The process of capression is applicable to the obtaining of the essential oils which reside in the rind of the orange, lemon, and other citric fruits. HInflewrage is a method by which the odours

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of several substances are dealt with. The aroma in sucli eases is present toa small extent, and is too tender and liable to loss and deterioration to permit of being separated by way of distillation. The process consists of exposing the flowers in contact with purified lard or with fine olive oil in suitable frames, whereby the fatty substances take up and become impregnated with the essential oil. The pro- cess is principally employed in preparing pomades and perfumed oils (see PERFUMERY), as is also the analogous method of maceration, which consists in extracting the aromatic principles by macerating the raw materials in heated oil or molten fat, whereby the essential oils dissolve out into the fat. By subsequently digesting the im- pregnated fats and oils prepared either by enfleurage or maceration with spirit 60° over proof the essential oils are obtained as alcoholic essences, in which form they are much used for perfumery and flavour- ing purposes, &c. Alcoholic solutions of essential oils prepared by macerating the raw materials in alcohol also form a part of the tinctures of pharmacy.

Essential oils have a wide range of uses, of which the principal are their various applications in perfumery. Next to that in many ways they play an important part in connexion with food. The value of flavouring herbs, condiments, and spices is due in largest measure to the essential oils they contain; and, further, the com- mercial value of tea, coffee, wine, and other beverages is largely dependent on the delicate aroma which they owe to

minute quan- tities of such oils. For the flavouring of liqueurs, of aerated beverages, and of other drinks essential oils are extensively used, and their employment is not less considerable in the manufacture of confectionery and in the preparation of many dietetic articles. In the cheaper kinds of confectionery a large quantity of artificial oils called fruit essences are now employed, although the flavours as such are distinctly crude, and the wholesomeness of the prepara- tions is more than doubtful. The acetate of amyl gives an imitation jargonelle-pear flavour ; valerate of amyl yields apple flavour ; a mix- ture of butyrate of ethyl and butyrate of propyl gives the so-called pine-apple flavour. Formic ether has a peach-like odour, and is used for flavouring factitious rum, and there are numerous other artificial compounds used in flavouring and in perfumery. Many of the essential oils form most important medicinal agents. In the arts the cheaper oils, such as oil of turpentine, are used in the manufacture of varnishes; the redueing influence of the oil of cloves is utilized in the silvering of mirror glass; and oils of tur- pentine, lavender, and spike are used as vehicles for painting, more particularly for the painting of pottery and glass. —

The essentials oils are subject to extensive adulteration. The presence of fatty oil is easily detected by the formation of a per- manent grease spot on paper on whieh the suspeeted mixture is dropped. The admixture of fixed oil may also be demonstrated by distillation, when the volatile portion goes over, leaving the fatty oil, or by treatment of the suspected sample with strong spirit, which dissolves out the essential oil, and leaves the fatty oil as a separate layer. The presence of spirit of wine in an essential oil may be readily proved by shaking up a speeimen of the oil with a measured quantity of water in a graduated glass. If the oil is pure there will be little or no change in the volume of the water layer after the complete separation of the oil and water by repose ; but if, on the other hand, the oil has been mixed with spirit, the water will have extracted the spirit and deereased the apparent amount of essential oil, and increased the watery layer in propor- tion to the extent of the falsification. In dealing with very small samples a test by sight is obviously inapplicable, and in such eases the existence of alcoliol in the watery solution may be demonstrated by the molybdenum test. This consists of treating a drop or two of water separated from the oil under examination with a solution of molybdic acid in ten parts of sulphuric aeid. If the water contains alcohol, a characteristie intense blue reaction at

once exhibits itself. The behaviour of essential oils towards alcohol is also made the basis of a test of their purity. The test is effected by mixing the essential oil with two volumes of absolute alcohol, and there- after observing the volume of diluted alcohol sp. gr. 0°889 required to render the clear solution opalescent. The falsification of a costly essential oil with one of inferior value is a fraud which can only be detected with much difficulty. In practice a fair estimate of the purity of an essential oil and of its individual character may be made by some experience of its smell as rubbed on the hands ; colour, boiling point, specific gravity, and other physical properties may also be usefully observed in aiding to form an estimate of the genuineness and value of a sample. Colour tests with various reagents are also used for the identification of the various essential oils. Among these are Frohde's test (a solution of molybdate of sodium in sulphuric acid), sulphuric acid itself, fuming mitric acid, alcoholic solution of hydrochloric acid and picric acid, &c.

In the following list the essential oils ordinarily met with in commerce, with their sources, general applications whether in medicine, in perfumery, in the arts, or as flavouring materials, and some of their physical properties, are tabulated. The specific gravities and power of turning the plane of polarization, given for a column 10 inches long, are extracted from Dr Gladstone's paper

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on Essential Oils (Jowr. Chem. Soc., new ser., vol. ii., 1864). Such of the oils as are of sufficient importance are separately noticed in their proper places.

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F Rotation . sieti oy . or acolumn) Princip: ppli- Name of Oil. Source. Sp. gr. (Meas mater long. Aniseed ……. Pimpinella anisatum) 09852 — Vl Med., flavouring. Australian sas- | Atherosperma 'mos- | 1°0425 + 7° Medicine. safras chata 13oN Oe oeeree Laurus nobilis *S808 — & Med. Bergamot…... Citrus Bergamia….| °8825 + 23° Med., perf., flav. Birch-bark ….| Betula alba …….. 9005 + 38° serie Bitteralmonds | Amygdalus commu- Be as Med., flav. nis, Var. Amara Buchu leaves ..; Barosma species…. be Med.

Cajeput…….. Melaleuca Cajuputi 9203 0° Med. CmlaIns) 6 «6 6 Acorus Calamus ….| °9388 + 43°°5 osnn Caraway …... Carum Carui …... “8845 + 63° Med., flav. Cardamoms….| Amomum species oe on, Med., flav. Cascarilla…... Croton Eluteria ….| °8956 + 26° Ames CPC Eip Saaeeane Cinnamomum Cassia} 1:0297 0° Med., perf., flav. (OGLE ane eerste | Juniperus virgini-| 9622 + 3° Perf. + ana WEdrat 000% +s Citrus medica …... “8584 +156° Perf. Chamoinile «| Matricaria Chamo- sé a Med. milla Citronella…... | Andropogon Nardus} 8908 – 4 Perf. CLOMESI ss: 0:5 ‘ Caryophyllus aroma- | 1:0475 – £ Med., perf., flav., ticus arts. Copaiba …... Copaifera officinalis 878 or Med. Coriander…... ! Coriandrum sativum | °87‘75 + 21°? Med., flav. C@ubeDS 22.0: 005 Piper Cubeba …... “9414 oe Med. Cumin’... ... wee) Cuminum Cyminum me i Med., flav. 1000 Aaeeeeee | Anethum graveolens | °8922 +206° Med., flav. ID1GIeRe aaenos Sambucus nigra ….} °8584 + 14°°5 stieee HBS O Lies… «/ale ie o= Claviceps purpurea oe ae Med. Eucalyptus ….| Hucalyptus species..| °8812 – 136° Med., flav., arts. Remme lars ssi is | Feniculum vulgare Sp at Med., flav. Bee nubis aeence Allium sativum …. ae ae Med. GINGED scion. oe | Zingiber officinale .. Ae aH Med., flav. Indian geranium Andropogon Schen-} 9043 – £ Med., perf. anthus Jasmine …... Jasminwm species .. iis ae aoe Ahouath ese Saeaaioc Juniperus communis fe Be Med. Lavender…... | Lavandula vera ….| *8903 — 20° Med., arts. MGGMION oes es .| Citrus Limonum….| *8498 +164 Med., perf., flav. Lemon-grass ..! Andropogon citratus| °8932 – 38° ee TEMES ss ss sie | Citrus Limetta…... Gc te Med., flay. Marjoram…... | Origanum Majorana ne Be Med., flav. Melaleuca ….’ Alelaleuca ericifolia 9030 + 26° Med. IMB bees eteniate | Mentha viridis . “9342 -116° Med., flav. Mustard …...., Brassica Vigra… .. + + ae me Med. Myrrh ….....| Balsamodendron 1:0189 — 136° Med. Myrrha Myrtle ….. ..+| Myrtus communis . 8911 + 21° Med. INGTON! 0.51 0% Citrus vulgaris ….| *8789 + 15° Med., perf., flav. Nutmeg …... Myristica moschata 8826 + 44° Med., flav. Orange-peel….| Citrus vulgaris . 8509 + 32°? | Med., perf., flav. Orange-peel oltree 8864 +216° aoe (Florence) PAMBISYine.< 6-50 Apium Petroselinum| °9926 = 9° Flav. Patchouli…... Pogostemon Patchouli] °9554 ae Perf. Pennyroyal….| Mentha Pulegium .. oe ao Med Peppermint….| Mentha Piperita….| *9028 – 72° Med., perf., flav. Petitgrain .| Citrus vulgaris ….) ‘8765 + 26° erf. Pimento …... Eugenia Pimenta ..| 1°037 50 Med., flav. MOR Aaoonooone Rosa damascena ….| *8912 – 7° Med., perf., flav. Rosemary ; ine officin- | ‘9080 + 17° Med.,

*perf. alis Rosewood .| Convolvulus scopa-| 9064 — 16° Perf. rius PEUG Sirs jos ateiaterrias Ruta graveolens …. at se Med. BAGS occ cae cee Salvia officinalis …. a ay Med., flav. Sandalwood ..| Santalum album….| *9750 — 50° Med., perf. Sassafras …... Sassafras officinalis | 1:090 : Med., perf., flav. SEAN Waemamancic Juniperus Sabina .. aS ¢ Med. Spearmint ….| Mentha viridis ….| 914 ae Med., perf., flav. SPIKer a… sense Lavandula Spica ae = Med., arts. Star anise…... Illicium anisatum .. ste a Med., flav. ABV MNO... ore eee Thymus vulgaris….| *8848 oe Med., perf. Turpentine ….| Pinus species …... 'S727 = ie Med., arts. Valerian. ..... Valeriana officinalis ne aa Med. ' Verbena …... Aloysia citriodora ..| *8812 — & Perf. Vetivert …... Andropogon muri-| 1:007 ue Perf. catus Wintergreen .. Cn aaa procum- | 1°1423 + 3 Med. ens Wormwood ….| Artemisia Absinth-| 9122 Med., fiav.*

Apart from the oil of turpentine, commerce in essential oils is

limited as regards bulk, although the value of the various articles is considerable. The cultivation of plants for their odoriferous principles and the extraction of essential oils are characteristic industries of Grasse, Nice, and Cannes, in the south of Francee. About Mitcham in Surrey, and in Herefordshire and Bedfordshire, several plants, principally lavender and other labiates, are largely cultivated as sources of essential oils ; but the localities whence the greater bulk of oils are drawn are widespread and as numerous as are the materials themselves. (Qi, TRANS) OISE, a department of northern France, three-fourths of

which belonged to Ile-de-France, and the rest to Picardy,

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is situated between 49° 4' and 49° 46' N. lat. and 1° 40' and 3° 10' E. long., and is bounded on the N. by Somme, on the E. by Aisne, on the 8. by Seine-et-Marne and Seine- et-Oise, and on the W. by Eure and Seine-Inférieure. Its greatest length is 75 miles from north-west to south- east, whilst its breadth from north to south varies from 30 to 44 miles. The department is a moderately elevated plateau with pleasant valleys and fine forests, such as those of Compitgne, Ermenonville, Chantilly, and Hallatte, all in the south. It belongs almost entirely to the basin of the Seine, —the

Somme and the Bresle, which flow into the English Channel, draining but a small area. The most important river is the Oise, which flows through a broad and fertile valley from north-east to south-west, past the towns of Noyon, Compiégne, Pont St Maxence, and Creil. On its right it receives the Bréche and the Thérain, and on its left the Aisne, which brings down a larger volume of water than the Oise itself, the Authonne, remarkable for the clearness and copiousness of the springs from which it rises, and the Nonette, which irrigates the valley of Senlis and Chantilly. The Ourcq, a tributary of the Marne, in the south-east, and the Epte, a tributary of the Seine, in the west, also in part belong to the department. These streanis are separated by ranges of slight elevation or by isolated hills, the highest point (770 feet) being in the ridge of Bray, which stretches from Dieppe to Précy-sur- Oise. The lowest point is at the mouth of the Oise, only 66 feet above sea-level. Although the rainfall is under the average of France, several of the valleys are, owing to their nearness to the sea and the large extent of forests, moist and marshy. The climate is very variable, but the range of temperature is moderate. The population was 404,555 in 1881.

The area of Oise is 2260 square miles, of which four-fifths are arable, one-sixth woods, and one-twentieth pasture-lands. There are 54,000 horses, 5000 asses or mules, 111,000 head of cattle, 517,000 sheep (yielding in 1878 3,700,000 Ib of wool), 44,000 pigs, 7000 goats, and 29,000 beehives. In 1882 the produce amounted to 911,335 quarters of wheat, 123,460 of rye, 1,031,700 of oats, with large quantities of beetroot, potatoes, and fodder, besides barley, meslin, buckwheat, colza, hemp, flax, &c. Vegetables, fruits, and milk are supplied to Paris ; and wine and cider (6,646,919 gallons in 1882) are made, the latter being the drink principally consumed in the department. Industrial pursuits engage more than 160,000 of the population. A number are employed in quarrying building stone, in digging potter's clay and sand for glass-making, and in cutting turf. There are 697 steam and several hydraulic mills. The forges of Montataire near Creil employ 2000 workmen ; but agricultural implements, metal utensils, optical glasses, paper, pasteboard, and various kinds of toys and small wares in bone, horn, mother-of-pearl, and ivory are made in the small workshops which are common everywhere. Chantilly employs 2000 women in making the lace for which it is famous. Beauvais, the chief town, besides its clock-making industry, has a national carpet factory, which rivals that of

Gobelins at Paris. There are in the department forty-five woollen-mills with 54,000 spindles, and nine cotton-mills with 28,000; and the making of cauvas, woollen fabrics, blankets, hosiery, boots and shoes, revolvers, &c., is also . carried on, as well as boatbuilding. Sugar is extensively made from beetroot, and the manufactures of pottery, porcelain, and glass are also considerable. Commerce is greatly facilitated by the Oise and the Aisne, and by the lateral canal of the former. There are more than 400 miles of railway ; and the roads are numerous and good. Oise contains four arrondissements—Beauvais, Clermont, Compiégne, Senlis—37 cantons, and 701 communes. It constitutes the diocese of Beauvais. The principal towns are Beauvais (popu- lation 17,516), Compiégne (13,567), Senlis (6870), Clermont (5628), Noyon (5780), Creil (7099), an important railway centre, with earthenware manufactures, and Montataire (5385).

OKEN, Lorenz (1779-1851). Under this name the great naturalist of the transcendental or deductive school is commonly known; but his real name was Lorenz Ockenfuss, under which he was baptized at Bohlsbach, Baden, being born in that small Swabian village on the lst of August 1779. As Ockenfuss he was entered at the natural history and medical classes in the university

of Wiirzburg, whence he proceeded to that of Gottingen,

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where he became a privat-docent, and abridged his name to Oken. As Lorenz Oken he published in 1802 his small work entitled Grundriss der Naturphilosophie, der Theorve der Sinne, und der darauf gegriindeten Classification der Tluere, the first of the series of works which placed him at the head of the "natur-philosophie" or physio- philosophical school of Germany. In it he extended to physical science the philosophical principles which Kant had applied to mental and moral science. Oken had, however, in this application been preceded by Fichte, who, acknowledging that the materials for a universal science had been discovered by Kant, declared that nothing more was needed than a systematic co-ordination of these materials ; and this task Fichte undertook in his famous Doctrine of Science (Wissenschaftslehre), the aim of which was to construct a priori all knowledge. In this attempt, however, Fichte did little more than indicate the

~~path ; it was reserved for Schelling fairly to enter upon it, and for Oken, following him, to explore its mazes yet farther, and to produce a systematic plan of the country so surveyed.~~

~~In the Grundriss der Naturphilosophie of 1802 Oken sketched the outlines of the scheme he afterwards devoted himself to perfect. The position he advanced in that re- markable work, and to which he ever after professed ad- herence, is this,—"that the animal classes are virtually nothing else than a representation of the sense-organs, and that they must be arranged in accordance with them." Agreeably with this idea, Oken contends that there are only five animal classes :—(1) the Dermatozoa, or Inverte- brates ; (2) the Glossozoa, or Fishes, as being those animals in which a true tongue makes, for the first time, its appear- ance ; (3) the Lhinozoa, or Reptiles, wherein the nose opens for the first time into the mouth and inhales air; (4) the Otozoa, or Birds, in which the ear for the first time opens externally ; and (5) the Ophthalmozoa, or Mammals, in which all the organs of sense are present and complete, the eyes being movable and covered with two lids.~~

~~In 1805 Oken made another characteristic advance in the application of the a priori principle, by a book on generation (Die Zeugung, Frankfort), wherein he main- tained the proposition that "all organic beings originate from and consist of vesicles or cells. These vesicles, when singly detached and regarded in their original process of production, are the infusorial mass or protoplasma (ur- schleim) whence all larger organisms fashion themselves or are evolved. Their production is therefore nothing else than a regular agelomeration of Infusoria,—not, of course, of species already elaborated or perfect, but of mucous vesicles or points in general, which first form themselves by their union or combination into particular species." This doctrine is strikingly analogous to the generalized results of the ablest microscopical observations on the de- velopment of animal and vegetable tissues which have been prosecuted of late years.~~

~~One year after the production of this remarkable treatise, Oken advanced another step in the development of his system, and in a volume published in 1806, in which Kieser assisted him, entitled Bedtrdge zur vergleichenden Zoologie, Anatomie, und Physiologie, he demonstrated that the intestines~~

originate from the umbilical vesicle, and that this corresponds to the vitellus or yolk-bag. Caspar Fried- rich Wolff had previously proved this fact in the chick (Theoria Generationis, 1774), but he did not see its applica- tion as evidence of a general law. Oken showed the im- portance of the discovery as an illustration of his system. In the same work Oken described and recalled attention to the corpora Wolffiana, or "primordial kidneys," as they are now termed and recognized.

The reputation of the young privat-docent of Gottingen had meanwhile reached the ear of Goethe, and in 1807

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Oken was invited to fill the office of professor extraordi- narius of the medical sciences in the university of Jena. He accepted the call, and selected for the subject of his inaugural discourse his ideas on the "'Signification of the Bones of the Skull," based upon a discovery he had made in the previous year. This famous lecture was delivered in the presence of Goethe, as privy-councillor and rector of the university, and was published in the same year, with the title, Ueber die Bedeutung der Schddelknochen.

With regard to the origin of the idea, Oken narrates in his Isis that, walkmg one autumn day in 1806 in the Harz forest, he stumbled upon the blanched skull of a deer, picked up the partially dislocated bones, and con- templated them for a while, when the truth flashed across his mind, and he exclaimed, "It is a vertebral column !" At a meeting of the German naturalists held at Jena some years afterwards Professor Kieser gave an account of Oken's discovery in the presence of the grand-duke, which account is printed in the Zageblatt, or "proceedings," of that meeting. The professor states that Oken communi- cated to him his discovery when journeying in 1806 to the island of Wangeroog. On their return to Gittingen Oken explained his ideas by reference to the skull of a turtle in Kieser's collection, which he disarticulated for that purpose with his own hands. "It is with the greatest pleasure," writes Kieser, 'that I am able to show here the same skull, after having it thirty years in my collection. The single bones of the skull are marked by Oken's own handwriting, which may be so easily known." There was a cause, as we shall presently see, for this circumstantial testimony.

~~Oken, having delivered and printed his introductory lec- ture in 1807, informs us (Jsts, No. 7) that he presented copies to Goethe and to other members of the grand-duke's Government. "Goethe was so pleased with my discovery as to invite me to stay with him during the Easter week of 1808 in his house at Weimar, which invitation I accepted."~~

~~The range of Oken's lectures at Jena was a wide one, and they were highly esteemed. They embraced the sub- jects of natural philosophy, general natural history, zoology, comparative anatomy, the physiology of man, of animals, and of plants. The spirit with which he grappled with the vast scope of science is characteristically illustrated in his essay Ueber das Universum als Fortsetzung des Sinnensys- tems, 1808. In this work he lays it down that "organism is none other than a combination of all the universe's activities within a single individual body." This doctrine led him to the conviction that "world and organism are one in kind, and do not stand merely in harmony with each other."~~

~~In the same year he published his Erste Ideen zur Theorie des Lichts, &c., in which he advanced the propo- sition that "light could be nothing but a polar tension of the ether, evoked by a central body in antagonism with the planets, and heat was none other than a motion of this ether,"—a sort of vague anticipation of the doctrine of the "correlation of physical forces."~~

~~In 1809 Oken extended his system to the mineral world, arranging the ores, not according to the metals, but agree- ably to their combinations with oxygen, acids, and sulphur. In 1810 he summed up his views on organic and inorganic natures into one compendious system. The first edition of the Lehrbuch der Naturphilosophie appeared in that and the following years, in which he sought to bring his different doctrines into mutual connexion, and to "show that the mineral, vegetable, and animal kingdoms are not to be arranged arbitrarily in accordance with single and isolated characters, but to be based upon the cardinal organs or anatomical systems, from which a firmly established number of classes would necessarily be evolved ; that each class,~~

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~~moreover, takes its starting-point from below, and conse- quently that all of them pass parallel to each other ;" and that, 'as in chemistry, where the combinations follow a definite numerical law, so also in anatomy the organs, in physiology the functions, and in natural history the classes, families, and even genera of minerals, plants, and animals present a similar arithmetical ratio."~~

~~The Lehrbuch procured for Oken the title of Hofrath, or court-councillor. In 1812 he was appointed ordinary professor of the natural sciences.~~

~~In 1816 he commenced the publication of his well-known periodical, entitled Jsvs, eine encyclopddische Zeitschrift, vorziighich fiir Naturgeschichte, vergleichende Anatomie, und Physiologie. In this journal appeared essays and notices not only on the natural sciences but on other subjects of interest ; poetry, and even comments on the politics of other German states, were occasionally admitted. This led to representations and remonstrances from the Governments criticized or impugned, and the court of Weimar called upon Oken either to suppress the Zsis or resign his professor- ship. He chose the latter alternative. The publication of the Isis at Weimar was prohibited. Oken made arrange- ments for its issue at Rudolstadt, and this continued unin- terruptedly until the year 1848.~~

~~The independent spirit manifested by Oken excited his courtly enemies to harsher measures. An accusation was preferred against him as a member of a forbidden "secret democratic society" ; he stood his trial and was acquitted. He thereupon retired for a while into private life, occupying himself with the editorship of the Zs¢s and with a series of natural-history manuals in which he considered that he had arranged for the first time the genera and species in accordance with the only true or physio-philosophical principles, stating briefly everything of vital importance respecting them, and maintaining that it was the first attempt to frame a truly scientific history of nature.~~

~~In 1821 Oken promulgated in his Jss the first idea of the annual general meetings of the German naturalists and medical practitioners, which happy idea was realized in the following year, when the first meeting was held at Leipsic. They have been continued ever since in Germany ; and similar annual scientific gatherings have been origin- ated in other countries. The~~

~~British Association for the Advancement of Science was at the outset avowedly organ- ized after the German or Okenian model.~~

~~In 1828 Oken resumed his original humble duties as privat-docent in the newly-established university of Munich, and soon afterwards he was appointed ordinary professor in the same university. In 1832, on the proposal by the Bavarian Government to transfer him to a professor- ship in a provincial university of the state, he resigned his appointments and left the kingdom.~~

~~Switzerland has the honour of affording the final place of refuge, with means of an independent pursuit of science, to this philosophic and patriotic naturalist. Oken was appointed in 1833 to the professorship of natural history in the then recently-established university of Zurich. There he continued to reside, fulfilling his professional duties and promoting the progress of his favourite sciences, until his death in the seventy-second year of his age (11th August~~

~~1851).~~

~~All Oken's writings are eminently deductive illustrations of a foregone and assumed principle, which, with other philosophers of the transcendental school, he deemed equal to the explanation of all the mysteries of nature. According to him, the head was a repetition of the trunk—a kind of second trunk, with its limbs and other appendages ; this sum of his observations and comparisons —few of which he ever gave in detail—ought always to be borne in mind in comparing the share taken by Oken in homological anatomy with the progress made by other cultivators of that philo-~~

~~sophical branch of the science. The idea of the analogy between the skull, or parts of the skull,~~

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~~and the vertebral column had been previously propounded and ventilated in their lectures by Autenreith and Kielmeyer, and in the writings of J. P. Frank. By Oken it was applied chiefly in illustration of the mystical system of Schelling—the " all-in-all" and "all-in-every-part." From the earliest to~~

~~the latest of Oken's writings on the subject, "' the head is a repetition of the whole trunk with all its systems: the brain is the spinal cord; the cranium is the vertebral column; the mouth is intestine and abdomen ; the nose is the lungs and thorax ; the jaws are the limbs ; and the teeth the claws or nails." Spix, in his folio Cephalogenesis (1818), richly illustrated comparative craniology, but presented the facts under the same transcendental guise ; and Cuvier ably availed him- self of the extravagances of these disciples of Schelling to cast ridi- cule on the whole inquiry into those higher relations of parts to the archetype which Professor Owen has called "general homologies."~~

~~The vertebral theory of the skull had practically disappeared from anatomical science when the labours of Cuvier drew to their close. In Owen's Arehetype and Homologies of the Vertebrate Skele- ton the idea was not only revived but worked out for the first time inductively, and the theory rightly stated, as follows :—"The head is not a virtual equivalent of the trunk, but is only a portion, 7.e., certain modified segments, of the whole body. The jaws are the 'hemal arches' of the first two segments ; they are not limbs of the head" (p. 176).~~

~~Vaguely and strangely, however, as Oken had blended the idea with his @ priort conception of the nature of the head, the chance of appropriating it seems to have overcome the moral sense of Goethe,—unless indeed the poet deceived himself. Comparative osteology had early attracted Goethe's attention. In 1786 he published at Jena his essay Ueber den Zwischenkieferknochen des Menschen und der Thiere, showing that the intermaxillary bone existed in man as well as in brutes. But not a word in this essay gives the remotest hint of his having then possessed the idea of the vertebral analogies of the skull. In 1820, in his Morphologie, he first publicly stated that thirty years before the date of that publi- cation he liad discovered the secret relationship between the verte- bree and the bones of the head, and that he had always continued to meditate on this subject. The circumstances under which the poet, in 1820, narrates having become inspired with the original idea are suspiciously analogous to those described by Oken in 1807, as producing the same effect on his mind. A bleached skull is accidentally discovered in both instances : in Oken's it~~

~~was that of a deer in the Harz forest ; in Goethe's it was that of a sheep picked up on the shores of the Lido, at Venice.~~

~~It may be assumed that Oken, when a privat-docent at Gottingen in 1806, knew nothing of this unpublished idea or discovery of Goethe, and that Goethe first became aware that Oken had the idea of the vertebral relations of the skull when he listened to the intro- ductory discourse in which the young professor, invited by the poet to Jena, selected this very idea for its subject. It is incredible that Oken, had he adopted the idea from Goethe, or been aware of an anticipation by him, should have omitted to acknowledge the source—should not rather have eagerly embraced so appropriate an opportunity of doing graceful homage to the originality and genius of his patron.~~

~~The anatomist having lectured for an hour plainly unconscious of any such anticipation, it seems hardly less incredible that the poet should not have mentioned to the young lecturer his previous conception of the vertebro-cranial theory, and the singular coinci- dence of the accidental circumstance which he subsequently alleged to have produced that discovery. On the contrary, Goethe permits Oken to publish his famous lecture, with the same unconscious- ness of any anticipation as when he delivered it ; and Oken, in the same state of belief, transmits a copy to Goethe, who thereupon honours the professor with special marks of attention and an invita- tion to his house. No hint of any claim of the host is given to the guest ; no word of reclamation in any shape appears for some years. In Goethe's Tages- und Jahres-Hefte, he refers to two friends, Reimer and Voigt, as being cognizant in 1807 of his theory. Why did not one or other of these make known to Oken that he had been so anticipated? "I told my friends to keep quiet," writes Goethe in 1825! Spix, in the meanwhile, in 1815, contributes his share to the development of Oken's idea in his Cephalogenesis. Ulrich follows in 1816 with his Schildkrotenschddel ; next appears the contribution, in 1818, by Bojanus, to the vertebral theory of the skull, amplified in the Paragon to that anatomist's admirable Anatome Testudinis Europex (1821). And now for the first time, in 1818, Bojanus, visiting some friends at Weimar, there hears the rumour that his friend Oken had been anticipated by the great poet. He communicates it to Oken, who, like an honest man, at once published the statement made by Goethe's~~

friends in the Jsts of that year, offering no reflexion on the poet, but restricting him- self to a detailed and interesting account of the circumstances under which he himself had been led independently to make his discovery, when wandering in 1806 through the Harz. It was enough for him thus to vindicate his own claims ; he abstains from any comment reflecting on Goethe, and maintained the same blame-

less silence when Goethe ventured for the first time to claim for himself, in 1820, the merit of having entertained the same idea, or made the discovery, thirty years previously.

The German naturalists held their annual meeting at Jena in 1836, and there Kieser publicly bore testimony, from personal know- ledge, to the circumstances and dates of Oken's discovery. How- ever, in the edition of Hegel's works by Michelet, Berlin, 1842, there appeared the following paragraph :—"The type-bone is the dorsal vertebra, provided inwards with a hole and outwards with processes, every bone being only a modification of it. This idea originated with Goethe, who worked it out in a treatise written in 1785, and published it in his Morphologic, 1820, p. 162. Oken, to whom the treatise was communicated, has pretended that the idea was his own property, and has reaped the honour of it." 'This accusa- tion again called out Oken, who thoroughly refuted it in an able, circumstantial, and temperate statement, in part vil. of the Isis, 1847. Goethe's osteological essay of 1785, the only one he printed in that century, is on a different subject. In the Morphologie of 1820-24 Goethe distinctly declares that he had never published his ideas on the vertebral theory of the skull. He could not, therefore, have sent any such essay to Oken before the year 1807. Oken, in reference to his previous endurance of Goethe's pretensions, states that, "being well aware that his fellow-labourers in natural science thoroughly appreciated the true state of the case, he confided in quiet silence in their judgment. Meckel, Spix, Ulrich, Bojanus, Carus, Cuvier, Geoffroy St Hilaire, Albers, Straus-Durckheim, Owen, Kieser, and Lichtenstein had recorded their judgment in his favour and against Goethe. But upon the appearance of the new assault in Michelet's edition of Hegel he could no longer remain silent."

~~Oken's bold axiom that heat is but a mode of motion of light, and the idea broached in his essay on generation (1805) that "all the parts of higher animals are made up of an aggregate of Infusoria or animated globular monads," are both of the same order as his proposition of the head being a repetition of the trunk, with its vertebre and limbs. Science would have profited no more from the one idea without the subsequent experimental discoveries of Oersted and Faraday, or from the other without the microscopical observations of Brown, Schleiden, and Schwann, than from the third notion without the inductive demonstration of the segmental constitution of the skull by Owen. It is questionable, indeed, whether in either case the discoverers of the true theories were excited to their labours, or in any way influenced, by the a priori guesses of Oken ; more probable is it that the requisite researches and genuine deductions therefrom were the results of the correlated fitness of the stage of the science and the gifts of its true cultivators at such particular stage.~~

~~Oken's real claims to the support and gratitude of naturalists rest on his appreciation of the true relations of natural history to intellectual progress, of its superior teachings to the mere utilitarian~~

~~applications of observed facts, of its intrinsic dignity as a science. The following is a list of Oken's principal works :—Grundriss der Natur-philosophie, der Theorie der Sinne, und der darauf gegrtindeten Classification der Thiere (1802); Die Zeugung (1805); Abriss der Biologie (1805); Beitrage zur vergleichenden Zoologie, Anatomie, und Physiologie (along with Kieser, 1806-7) ; Ueber die Bedeutung der Schddelknochen (1807); Ueber das Universum als Fortsetz- ang des Sinnensystems (1808); Erste Ideen zur Theorie des Lichts, der Finsterniss, der Farben, und der Wirme (1808); Grundzeichnung des natiirlichen Systems der Erze (1809); Ueber den Werth der Naturgeschichte (1809); Lehrbuch der Natur-philosophie (1809-11, 24 ed. 1831, 8d ed. 1843; Eng. tr., Elements of Physio- philosophy, 1847); Lehrbuch der Natwrgeschichte (1813, 1815, 1825); Handbuch der Naturgeschichte zum Gebrauch bei Vorlesungen (1816-20); Naturgeschichte fir Schulen (1821); Esquisse d'un Systeme d Anatomie, de Physiologie, et d' Histoire Naturelle (1812); Allgemeine Naturgeschichte (1833-42, 14 vols.). He also con- tributed a large number of papers to the Isis and other journals. (RB~~

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~~OLAND, or OELAND, next to Gottland, the largest of the islands belonging to Sweden, stretches for 85 miles along the east coast of the southern extremity of that country, from which it is separated by the Calmar Sound, about 5 miles broad at the narrowest point, and not more than 10 fathoms deep in the central portion. Its greatest breadth does not exceed 8 or 9 miles, and its area is estimated at 510 square miles. Consisting for the most part of Silu- rian limestone, and thus forming a striking contrast to the mainland with its granite and gneiss, Oland is further re- markable on account of the peculiarities of its structure. Down the west side for a considerable distance runs a limestone ridge, rising usually in terraces, but at times in steep cliffs, to an extreme height of 200 feet; and along the east side there is a parallel ridge of sand (resting on limestone), never exceeding 90 feet. These ridges, known as the Western and Eastern Landtborgar, are connected to- wards the north and the south by belts of sand and heath ; and the hollow between them is occupied by a desolate and~~

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~~almost barren tract: the southern portion or Allvar (form- ing fully half of the southern part of the island) presents a surface of bare red limestone scored by superficial cracks and unfathomed fissures, and calcined by the heat refracted from the surrounding heights; and the northern portion is covered at best with a copse of hazel bushes. Outside the ridges, however, Oland has quite a different aspect,— the hillsides being not unfrequently adorned with clumps of trees, and the narrow strip of alluvial coast-land with its cornfields and villages and church towers presenting an appearance of fruitfulness and prosperity. There are only a few small streams in the island; and only one lake, Hornsjé, about 3 miles long, deserves to be mentioned. Of the fir woods which once clothed a considerable area in the north the Boda crown-park is the only remnant. Grain, sandstone, and alum are exported from the island,— the alum mines at South (Sddra) Mockleby being in fact the most extensive in Sweden, and~~

~~*furnishing 7000 tons per annum. The only town is Borgholm, on the west coast, with one of the finest castle-ruins in Sweden. The town was founded only in 1817, and has not more than 800 or 900 inhabitants; but the castle, dating at' least from the 13th century, was long one of the strongest fortresses and afterwards one of the most stately palaces in the country. The island, which bears the title of a countship, was joined in 1824 to the province of Calmar. Its inhabitants, formerly styled Oningar, and showing con- siderable diversity of origin in the matter of speech, local customs, and physical appearance, numbered 22,820 in 1805, 37,270 in 1865, and 37,975 in 1874.*~~

~~*From the raid of Ragnar Lodbrok's sons in 775 Oland is frequently mentioned in Scandinavian history, and especially as a battle- ground in the wars between Denmark and the northern kingdoms. In the Middle Ages it formed a separate legislative and administra- tive unity. See Linne, Olandska och Gothlandska Resa (1741); Marryat, One, Year in Sweden (Lond., 1862) ; Andersson, Botaniska Resa genom Oland (1865).*~~

~~*OLAUS MAGNUS or MAGNT (Magnus, 2.e., Store, being the family name, and not a personal epithet) was born in 1490 and died at Rome in 1558. Like his elder brother, Johannes Magnus, he obtained several ecclesiastical prefer- ments (a canonry at Upsala and at Linköping), and was employed on various diplomatic services; but on the success of the Reformation in Sweden his attachment to the old church led him to accompany his brother into exile. Settling at Rome, he ultimately became his brother's successor in the titular archbishopric of Upsala. Olaus Magnus is best remembered as the author of Historia de Gentibus Septentrionalibus (Rome, 1555), a work which long remained for the rest of Europe the chief authority on Swedish matters and is still a valuable repertory of much curious information in regard to Scandinavian customs and*~~

~~*folk-lore.*~~

~~*OLBERS, Hervrice Witnetm Marratas (1758-1840), a distinguished astronomer, was born 11th October 1758 at Arbergen, a village near Bremen, where his father was minister. He studied medicine at Géttingen, 1777-80, attending at the same time Kaestner's mathematical course ; and in 1779, while watching by the sick-bed of a fellow- student, he devised a*~~

~~method of calculating cometary orbits which made an epoch in the treatment of the sub- ject, and is still extensively used (see Comer, vol. vi. p. 182). The treatise containing this important invention was made public by Baron von Zach under the title Ueber die leichteste und bequemste Methode die Bahn eines Cometen zu berechnen (Weimar, 1797).~~

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~~part of each night (he never slept more than four hours) was meantime devoted to astronomy, the upper portion of his house being fitted up as an observatory. He paid special attention to comets, and that of 1815 (period seventy-four years) bears his name in commemoration of its detection by him. He also took a leading part in the discovery of the minor planets, re-identified Ceres on the~~

~~anniversary of its discovery by Piazzi, 1st January 1802,~~

~~and detected Pallas on the 28th of March following. His bold hypothesis of their origin by the disruption of a~~

~~prunitive large planet (Monatliche Correspondenz, vol. vi. p.~~

~~88), although now discarded, received strong confirmation~~

~~from the finding of Juno by Harding, 2d September 1804,~~

~~and of Vesta by himself, 29th March 1807, in the precise regions of Cetus and Virgo where the nodes of such sup- posed planetary fragments should be situated. Olbers was deputed by his fellow-citizens to assist at the baptism of the king of Rome, 9th June 1811, and he was a member After sonie years of suffering from asthma, he died 2d March 1840, at the He was twice married, and one son~~

~~of the corps législatif in Paris 1812-13.~~

~~age of eighty-one. survived him.~~

~~Notices of his life and works will be found in Liographische~~

Skizzen verstorbener Bremischer Aerzte, by Dr G. Barkhusen(Bremen, 1844); Allgemeine geographische Ephemeriden, vol. iv. p. 283, 1799 ; Nouvelle Biographie Générale ; Abstracts Phil. Trans., vol. iv. p. 268, 1843 ; Astronomische Nachrichten, vol. xxii. p. 265, also appended to A. Erman's Briefwechsel zwischen Olbers und Bessel (2 vols. Leipsic, 1852). A list of Olbers's extremely interesting contribu- tions to scientific periodicals is given at p. xxxv. of the 3d ed. of his Leichteste Methode, and his unique collection of works relating to comets now forms part of the Pulkowa library.

OLBIA, Oxzroporis, or BorysTHEnis, in the south of Russia, on the right bank of the Borysthenes, near its mouth, was a colony of Miletus, 655 B.c. It was the great station for the trade with the interior, and a wealthy city from a very early time. Inscriptions, published in the Corpus Inscr, Grexe., vol. ii, especially the famous decree in honour of Protogenes, throw much light on its internal history in the few centuries before and after the Christian era, They show it as a Greek city, maintaining its inde- pendence with difficulty against the barbarians who con- tinually threatened it; but the Greek life and the Greek names gradually gave place to Scythian, the city was finally merged in the surrounding tribes, and its civilization and importance disappeared. It is a commonplace among archeologists to speak of the trade-route which led across country to the northern sea from Olbia, and a find of archaic Greek coins in Prussia is appealed to as a proof ; but it has recently been proved that this find of coins was an imposture. Though it is probable that such trade- routes did exist at an early time, it is highly improbable that Greek traders used them. The natives brought down their goods to the Greek colonies, and the trade was there conducted, not by money, but rather by barter. The most interesting point about the religion of Olbia is the cult of Achilles Pontarches, the Ruler of the Sea, a deity who was extensively worshipped along the northern coast of the Black Sea. He was evidently a

god of the native races, in whom some analogy of name or character made the Greeks recognize their hero Achilles. Hence arose the legend, known already to Pindar, that Achilles lived on in the White Isle in the Black Sea, a god surrounded by the other heroes. Olbia was destroyed by the Getz about 70-60 B.c., but revived, and was a flourishing city when Dio Chrysostom visited it about 100 a.p.

OLDBURY, a township of Worcestershire, England, comprising the two parishes of Oldbury and Langley, is situated on the Birmingham Canal and on the London and North-Western and Great-Western Railways, 5 miles west of Birmingham and 3 east of Dudley. Coal, iron, and limestone abound in the neighbourhood, and the town

possesses chemical works, railway-carriage works, iron, edgetool, nail, and steel works, maltings, corn-mills, brick and tile kilns, and a manufactory of glass shades. There are no public buildings of importance. The population of the urban sanitary district (1678 acres) in 1871 was 16,410, and in 1881 it was 18,841.

OLDCASTLE, Sir Joun (d. 1417), who had married Johanna, heiress of the noble family of Cobham, and in her right sat in the House of Lords as Lord Cobham, was a nobleman who at once enjoyed the personal friendship of Henry IV. and was a professed follower of Wickliffe and an adherent of Lollardy. His reputation both as soldier and as statesman stood so high that he was selected by the king to command the English auxiliaries sent by Henry to assist the duke of Burgundy in 1411; and his.known friendship for the poor preachers and his maintenance of the popular religious cause gained him the title of "the good Lord Cobham." On the death of the earl of Salisbury in one of the revolts against the house of Lancaster, Old- castle became the recognized leader of the Lollards ; his castle of Cowling became their headquarters ; he sheltered their preachers, and openly defied the prohibitions and pro- clamations of the bishops. He publicly professed his faith in the principal Lollard doctrines and refused to believe what the church taught on the eucharist, penance, the power of the keys, image-worship, and pilgrimages. The house of Lancaster had secured the throne by making promises to the people and to the nobles, and had won the

~~support of the church by promising to put down heresy. This had set the Lollards in opposition to the new dynasty, and their discontent was increased by the ecclesiastical measures of the king. See Lornarps. In consequence Lollardy remained a constant source of danger during the reign of Henry IV., giving strength to more than one re- bellion, and Henry V., on his accession in 1413, determined to extirpate the heresy. While Henry IV. lived Oldcastle was protected, but in the year of the king's death he was accused in convocation of heresy and of harbouring the poor preachers. Henry V. did all in his power to protect him, laboured to make him give up his opinions, but, finding him inflexible, forbade him to appear at court, and permitted the bishops to proceed against him. A citation was served on him. He refused to receive it. It was accordingly posted on the doors of Rochester Castle. He refused to obey it, was excommunicated, seized, and examined, when he boldly confessed his opinions, and was imprisoned in the Tower, forty days being given him to recant. He made his escape, and his freedom was the signal for a Lollard revolt. The preachers and their followers met in St Giles's fields, and only the vigilance of the king prevented a rising. The enactments against Lollardy became even more severe than formerly. Magis- trates were directed to seize suspected heretics and to hand them over to the bishops for trial ; and a conviction was punished by death and forfeiture of goods. Oldcastle for some years eluded the vigilance of his enemies, but in 1417 he was seized while in hiding in Wales, taken to London, and burned. His execution was peculiarly barbarous. He was suspended from a gallows by an iron chain, a fire was kindled beneath him, and he was slowly burned to death.~~

~~In Mr Wright's collection of political songs there are one or two ballads on Sir John Oldcastle, alluding in no very complimentary terms to his Lollardism. Henry's victories had raised the war-spirit of the English people, and it was thought disgraceful that a knight and a gentleman who in his earlier days had gained the reputation of being a skilful soldier should be associated with people many of whom professed to believe that all wars were sinful. This popular contempt has perhaps led to the idea ably advocated by Mr Gairdner~~

~~that Shakespeare's character of Sir John Falstaff was meant to represent Sir John Oldcastle.~~

~~Compare Lechler's Johann Wiclif, vol. ii. ch. iii. ; Gairdner and Spedding,~~

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~~Studies in English History, ch. iii.~~

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~~OLD CATHOLICS, the self-assumed name of a new party in religious Christendom, which, like the Reformers .of the 16th century, has for its avowed aim the restoration of the ancient standard of Christian belief and practice ; but, while the Reformers took for their model the supposed doctrines and institutions of the apostolic age, the Old Catholics have agreed to accept the decrees of the first seven general councils (down to the second of Nicxa, 787 A.D.) as authoritative and binding on the church at large. Like the Reformation, Old Catholicism may be said to have had its representatives within the Roman Church long before its formal organization; but the immediate occasion of the movement arose out of the assembling of the cecumenical council at Rome in 1869 by Pope Pius IX. That pontiff had previously given indications of a tendency towards a reactionary policy which contrasted strongly with the liberal measures which characterized his earlier career. Of such indications the dogma of the Immaculate Conception (8th December 1854) and the "Syllabus" of 1864 were the most notable instances. The "Syllabus" was a formal repudiation of the chief doctrines and theories which during the preceding twenty years had been put forward by writers of various schools of thought, but representing opinions unfavourable to the teachings of Catholicism or the claims of the Papacy; and speculations which called in question the existence of a Divine Being were condemned in the same category with views inimical to the temporal power of the Roman curia. It was for the purpose of giving more emphatic recognition and sanction to the tenets of the "Syllabus" that the cecu- menical council of 1869 was professedly convened, and the announcement that such a solemn expression of the convictions of the church at large was thus to be invited was hailed by the organs of the Catholic press through- out Europe with unqualified approval. Not until the council was on the eve of assembling did it become vaguely rumoured that among the doctrines which would be brought forward for its acceptance and ratification was that of the Papal Infallibility. The mere~~

~~report was, however, looked upon as a matter of such grave import that Prince Hohen- lohe, the chief minister of Bavaria, was induced to use the most strenuous exertions to prevail upon the Catholic powers to combine to prevent the promulgation of such a dogma, but without success.~~

~~The council which assembled at Rome (8th December 1869) was more deserving of the name of "cecumenical" than any which had ever before obeyed the behest of em- peror or pope, being attended by delegates from nearly all parts of the world. It included 49 cardinals, 9 patriarchs of the Eastern communion, 4 primates, 121 archbishops, 479 bishops, and 52 abbots and other monastic dignitaries. The total number on the day of opening was 719, increased by the 15th of January to 744. As a representative body it was, however, very unequally composed, the numerous holders of Italian bishoprics (many of which are of but small extent) constituting a large majority of the entire number. A proposal to rectify this practical inequality by dividing the whole council into eight or six sections represent- ing national elements was summarily rejected. On the other hand, the superiority of the minority in learning and reputation was obvious. It included such names as Schwarzenberg, Mathieu, Darboy, Rauscher, Simor, Ginoulhiac, MacHale, Dupanloup, Ketteler, Strossmayer, Clifford, Kenrick, Maret, and Hefele ; while in the long list of those who eventually recorded their placets in favour of the new decree scarcely a name of real eminence appears. Dr Déllinger, the foremost scholar of Catholic Germany, was not among the "fathers" of the council, but his disapproval of the new dogma was notorious, as also was that of the Comte de Montalembert in France. After~~

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~~protracted sittings, extending over seven months, and characterized mainly by a series of discreditable man- ceuvres designed to break the firm phalanx of the minority, who could only record their protests and utter eloquent remonstrances, the Constitutio (as it was termed) was finally laid before the council, and carried with eighty-eight dissentients, while ninety-one abstained altogether from recording any vote. The supremacy of the Roman pontiff over even an cecumenical council was thus declared in terms more explicit and emphatic than had ever before been employed (Friedrich,~~

Documenta, ii. 316), while the new dogma was enunciated in the following terms :— 'We teach and define . . . that the Roman pontiff, when he speaks ex cathedra, that is, when in discharge of his office of Pastor and Doctor of all Christians he defines, in virtue of his supreme apostolic authority, a doctrine of faith or morals to be held by the Universal Church, is endowed with the divine assistance promised to him in Blessed Peter, with that infallibility with which our divine Redeemer willed that the church should be furnished in defining doctrine of faith or morals, and, therefore, that such

definitions of the Roman pontiff are irreformable of themselves and not in virtue of the consent of the church." :

When the above dogma was promulgated in its entirety (18th July 1870) in the presence of 535 fathers, only two dissentient votes were recorded. The rest of the minority had decided on quitting Rome before the final event, a resolution confirmed by the oppressive heat of the weather and the threatening aspect of the political horizon. It has since been asserted on good authority that the action of the Papal party was largely influenced by the empress of France and her advisers ; and it cannot be doubted that at Rome, not less than in Paris, it was ardently hoped that this bold proclamation of Ultramontanist doctrine would have been followed by the triumph of the French arms over those of Prussia.

The conduct of the different members of the opposition on their return to the isolation of their respective dioceses can only be described as a series of pitiable tergiversations. The "sacrificio dell' intelletto," as it was termed, was the plausible maxim adopted by one and all. Seventeen of the German bishops almost immediately receded from the position they had taken up at Rome and gave in their assent to the dogma, publishing at the same time a pastoral letter in which they sought to justify their change of sentiment on the ground of expediency in relation to the interests of the church (Michelis, Der neue Fuldaer Hurten- brief, 1870). Their example was followed by all the other bishops of Germany as well as by those of Bavaria. Dar- boy and Dupanloup in France adopted a like course and took with them the entire body of the Gallican clergy. Each bishop demanded in turn the same submission from the clergy of his diocese, the alternative being suspension

~~from pastoral functions, to be followed by deprivation of office. It may be urged as some extenuation of this general abandonment of a great principle, that those who had refused to subscribe to the dogma received but lan- guid support, and in some cases direct discouragement, from their respective Governments. The submission of the illustrious Hefele was generally attributed to the influence exerted by the court of Wiirtemberg.~~

~~The universities, being less directly under the control of the church, were prepared to show a bolder front. Dr von Schulte, professor at Prague, was one of the first to publish a formal protest. A meeting of Catholic professors and distinguished scholars convened at Nuremberg (August 1870) recorded a like dissent, and resolved on the adoption of measures for bringing about the assembling of a really free council north of the Alps. The "Appel aux Evéques Catholiques" of M. Hyacinthe Loyson (better known as "Father Hyacinthe"), after referring to the overthrow of "the two despotisms," "the empire of the Napoleons and the temporal power of the popes," appealed to the Catholic~~

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~~bishops throughout the world to put an end to the schism by declaring whether the recent decrees were or were not binding on the faith of the church. This appeal, on its appearance in La Laberta early in 1871, was suppressed by the order of the king of Italy. On the 28th of March Dr Déllinger, in a letter of some length, set forth the reasons which compelled him also to withhold his submission alike as "a Christian, a theologian, an historical student, and a citizen." The publication of this letter was shortly followed by a sentence of excommunication pronounced against Dr Déllinger and Professor Friedrich, and read to the different congregations from the pulpits of Munich. The professors of the university, on the other hand, had shortly before evinced their resolution of affording Dr Déllinger all the moral support in their power by an ad- dress (3d April 1871) in which they denounced the Vatican decrees with unsparing severity, declaring that, at the very time when the German people had "won for themselves the post of honour on the battlefield among the nations of the earth," the German bishops had stooped to the dishon- ouring task of 'forcing consciences in the service of an unchristian tyranny, of reducing~~

~~many pious and upright men to distress and want, and of persecuting those who had but stood steadfast in their allegiance to the ancient faith" (Friedberg, Aktenstiicke z. ersten Vaticanischen Concul, p. 187). An address to the king, drawn up a few days later, received the signatures of 12,000 Catholics. The refusal of the rites of the church to one of the signataries, Dr Zenger, when on his deathbed, elicited strong expressions of disapproval; and when, shortly after, it became neces- sary to fill up by election six vacancies in the council of the university, the feeling of the electors was indicated by the return of candidates who were all distinguished by their avowed dissent from the new decrees. In the follow- ing September the demand for another and a free council was responded to by the assembling of such a congress at Munich. It was composed of nearly 500 delegates, con- vened from almost all parts of the world ; but the Teutonic element was now as manifestly predominant as the Latin element had been at Rome. 'The proceedings were pre- sided over by Professor von Schulte, and lasted three days. Among those who took a prominent part in the delibera- tions were Landammann Keller, Windscheid, Déllinger, Reinkens, Maassen (professor of the canon law at Vienna), Friedrich, and Huber. The arrangements finally agreed upon were mainly provisional ; but one of the resolutions plainly declared that it was desirable if possible to effect a reunion with the Oriental Greek and Russian Churches, and also to arrive at an "understanding" with the Pro- testant and Episcopal communions.~~

~~In the following year lectures were delivered at Munich by various supporters of the new movement, and the learning and oratorical powers of Reinkens were displayed with marked effect. In France the adhesion of the abbé Michaud to the cause attracted considerable interest, not only from his reputation as a preacher, but also from the notable step in advance made by his declaration that, inas- much as the adoption of the stand-point of the Tridentine canons would render reunion with the Lutheran and the Reformed Churches impossible, the wisest course would be to insist on nothing more with respect to doctrinal belief than was embodied in the canons of the first seven cecumenical councils. The approximation which took place in the same year between the Old Catholics, as they now began to be termed, and the historical little Church of Utrecht must not be left unnoticed. Dr Dollinger, in delivering his inaugural address as rector of the university of Munich, expressed his conviction that theology had received a~~

fresh impulse and that the religious history of Europe was entering upon a new phase.

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Othercircumstances contributed toinvest Old Catholicism with additional importance in the eyes of mere observers. It was evident that the relations between the Roman curia and the Prussian Government were becoming extremely strained. In February 1872 appeared the first measures of the Falk ministry, having for their object the control of the influence of the clergy in the schools; and when Cardinal Hohenlohe presented himself at Rome in the following May the world was startled at the refusal of Pius IX. to receive the accredited minister of the Prussian court. In the same year two humble parish priests, Renftle of Mering in Bavaria and Tangermann of Unkel in the Rhineland, set an example of independence by refusing to accept the decrees. The former, driven from his parish church, was followed by the majority of his congregation, who, in spite of every discouragement, con- tinued faithful to him; and for years after, as successive members were removed by death, the crosses over their graves recorded that they had died "true to their ancient belief." Tangermann, the poet, expelled in like manner from his parish by the archbishop of Cologne, before long found himself the minister of a much larger congregation in the episcopal city itself. These examples exercised no little influence, and congregations of Old Catholics were shortly after formed at numerous towns and villages in Bavaria, Baden, Prussia, German Switzerland, and even in Austria. At Warnsdorf in Bohemia a congregation was collected which still represents one of the most important centres of the movement. In September the second con- gress was held at Cologne. It was attended by some 500 delegates or visitors from all parts of Europe, and the English Church was represented by the bishops of Ely and Lincoln and other distinguished members. The general scope of the proceedings was the formation of a more definite organization ; and the question of reunion with other churches was again a prominent topic of discussion. Among those present was the late Dean Stanley, and the striking accounts which he forwarded to The Times of the

whole congress did much to awaken in England a more widely-extended interest in the movement.

In the month of May in the following year (1873) the celebrated Falk laws were enacted, whereby the articles 15 and 18 of the Prussian constitution were modified, so as to legalize a systematic state supervision over the educa- tion of the clergy of all denominations, and also over the appointment and dismissal of all ministers of religion. The measure, which at the time was interpreted as what Prince Bismarck afterwards openly declared it to have been, viz., a direct response to the Vatican decrees, inspired the Old Catholics with a not unreasonable expectation that the moral support of the Government would henceforth be enlisted on their side. On the 11th of August Dr Reinkens, having been duly elected bishop of the new community, received his consecration at Rotterdam, as ‘“‘ missionary-bishop of Germany,” at the hands of Bishop Heykamp of Deventer. The archbishop of Utrecht, on whom it would otherwise have devolved to perform the ceremony, had died somewhat suddenly a few days before, and the Ultramontanists did not scruple to interpret the event as a sign of the divine displeasure. In the mean- time the extension of the movement in Switzerland had been proceeding rapidly, and it was resolved that Constance should be elected as the centre for the third congress. The proceedings occupied three days (12th to 14th September), and were of an animated and interesting character,—the intelligence that the Prussian Government had resolved on recognizing the election of Bishop Reinkens contributing not a little to inspirit those who were present. English and American theologians, of widely different schools, listened to the discussions with sympathizing apprecia-

tion, and even bore a part. The subjects which chiefly occupied the consideration of the assembly were the insti- tution of a synod as the legislative and executive organ of the church, and schemes of reunion with the Greek, the African, and the Protestant communions. The unanimity which prevailed was remarkable, and not less so were the indications that the breach between the Papacy and Old Catholicism had become decisive and final. On the 20th of September the election of Bishop Reinkens was

formally recognized by the German Government, and on the 7th of October he took the oath of allegiance to the king.

The following year (1874) was marked by the assembling of both a synod and a conference at Bonn, and of a congress at Freiburg in the Breisgau. The acts of the synod were mainly directed to modifications of the Roman discipline and the removal of prevalent abuses. At the congress Bishop Reinkens spoke in hopeful terms of the results of his observations during a recent missionary tour through- out Germany. The conference, held on the 14th, 15th, and 16th of September, had for its special object the discussion of the early confessions as a basis of agreement, though not necessarily of fusion, between the different communions above-named, 'The meetings, presided over by Dr Dollinger with an ability and tact which excited general admiration, successively took into consideration the /tlioque, the sacra- ments, the canon of Scripture, the episcopal succession in the English Church, the confessional, indulgences, prayers for the dead, and the eucharist. Some divergence of views inevitably disclosed itself in the course of the discussions, but the same conciliatory tone and feeling marked the close as well as the commencement of the proceedings, and by both the English and the Continental religious press the final results were hailed as eminently auspicious. As the direct results of these deliberations it has since been decided to abolish compulsory confession and fasting, to employ the vernacular in public worship, to recognize the marriage of priests as lawful, and to allow them to administer in their churches the communion in both kinds to members of the Anglican persuasion.

Since 1874 Old Catholicism has found new adherents in other lands,—in Austria, in Italy, and in Mexico; but the controversial spirit which in past history has either broken up such organizations or largely impaired their efficiency has also marred the success of this interesting movement. In Switzerland, where important conferences were success- ively convened (at Solothurn in 1871, at Olten in 1872, 1873, and 1874), the unanimity of the "Christian Catholics," as they preferred to call themselves, seemed at one time in danger of being shipwrecked on the question of episco- pacy. It was not until 18th September 1876 that the conflict of opinions was so far composed as to allow of the consecration of Bishop Herzog by Bishop Reinkens, The reforms introduced by M. Hyacinthe Loyson in his church at

Geneva have received only a partial assent from the general body. Among the more practical results of his example is to be reckoned, however, the fact that in French Switzerland nearly all the clergy, in German Switzerland about one half, are now married men. But the congrega- tions, which in 1876 had reached the number of fifty-five, have dwindled to thirty-five. The number of children in the different schools is stated to be somewhat under 4000 (Nippold, Handbuch der neuesten Kirchengeschichte, ii. 466-

478).

In Germany, since the year 1878, the position of the Old Catholics has been one of considerable difficulty. While their representatives have scrupulously abstained from any course of action which could tend to embarrass the Government in its political contests, the most influential organs of that Government have systematically decried the movement and have undisguisedly aimed at its complete

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| extinction. This change of policy is mainly due to the altered relations with the papal court. The present pontiff, skilfully ignoring the original and genuine causes in which Old Catholicism took its rise, has sought to represent its leaders as actuated by revolutionary designs and aiming at the subversion of existing institutions, while the Papacy itself has been described as the chief bulwark against social democracy and nihilistic tendencies. The Prussian Government has responded by a series of concessions to the Roman Catholic clergy, while the favour once shown to the seceding party is at an end. Bishop Reinkens himself, though he still receives a salary from the state, no longer draws it under the head of expenditure for Catholic worship. In Bavaria Professor Friedrich has been constrained to transfer his services from the theolo- gical to the philosophical faculty at Munich, and the little Old Catholic congregation has been deprived of its church. Huber's valuable literary powers have been lost to the cause by his premature decease. In France the place of M. Michaud, who has been appointed professor in the university of Bern, is in some measure filled by the return of Father Hyacinthe from Geneva. Under

such conditions the continued progress of the party and even its existence are obviously seriously imperilled. But, even if, like the Albigenses, the Lollards, and other similar movements to which the assumptions of the Papacy have at different times given rise, Old Catholicism should be destined to extinction, it will not the less have left on permanent record an ex- ample of loyalty to conscientious convictions the influence of which will long survive.

Authorities.—The literature of the subject is now voluminous, but the following are among the best sources of information. (a) As regards the proceedings at the Vatican Council and the more immediate results of the decrees : Friedberg (Dr Emil), Sammlung der Aktenstiieke zum ersten Vatieanischen Coneil mit einem Grundrisse der Geschichte desselben, 1872; Friedrich (Dr J.), Tagebuch wihrend. des Vatieanischen Coneils gefiihrt, 2d ed., 1873; Id., Le Conetle du Vatican, Brussels, 1871; Id., Gesch. des Vatikanischen Konzils, vol.i., 1877; Frommann (Theodor), Gesch. u. Kritik d. Vatieanisehen Coneils von 1869 und 1870, Gotha, 1872; Janus, Der LPapst und das Coneil, 1869 (a reprint of articles in the Augsburg Allgem. Zeitung); An Inside View of the Vatiean Counei1 (Archbishop Kenrick's Speech, edited by L. W. Bacon), New York ; Catholie Reform, by Father Hyacinthe, with preface by Dean Stanley, 1874 ; Quirinus, Rémische Briefe vom Coneil, 1870, of which an English translation has also appeared ; Von Schulte (Dr J. F.), Conetlien, Ptipste, und Bisehife, 1871. (b) The proceedings of the successive congresses will be best studied in the Stenographischer Berichte, published at Munich, Cologne, Constance, &c. ; those of the con- gress of Constance were summarized in an English form, with other elucidatory matter, by Professor John Mayor. (ce) For the questions involved in the consecration of Bishop Reinkens: Rechtsqutachten tiber die Frage der Anerkennung des altkatholisehen Bischofe Dr Reinkens in Bayern, Munich, 1874; Friedberg (Dr Emil), Der Staat und d. Bisehofswahlen in Deutschland, Leipsic, 1874; Von Sybel (F.), Das altkatholische Bisthum und das Verm égen d. rémiseh-katholisehen Kirehengesellsehaften in Preussen, Bonn, 1874. (d) Reinkens's own speeches and pastorals, some of which have been translated into English, give his personal views and experiences ; the Life of Huber has been written and published by Eberhard Stirngiebl ; and the persecutions to which the Old Catholic clergy have been exposed have been set forth in a

pamphlet by Professor John Mayor, Facts and Doewments, London, 1875. (e) An out- line of the whole movement from its first commencement to the year 1875 will be found in The New Reformation, by "Theodorus" (J. Bass Mullinger); and an excellent résumé of the main facts in the history of the movement in each European country, as connected with other developments of liberal thought, and with political history, is given in the second volume of Dr F. Nippold's Handbuch der neuesten Kirchengesehiehte, vol. ii., 1883. (f) The recognized organ of the movement, the Deutscher Merkur (formerly the Rheiniseher Merkur), is still published weekly by P. Neusser of Bonn. (J. B. M.)

OLDENBURG, a grand-duchy of Germany, with an area of 2480 square miles, consists of three widely separated portions of territory,—(1) the duchy of Oldenburg, (2) the

principality of Liibeck, and (3) the principality of Birken-

feld. It ranks tenth among the states of the German

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empire and has one vote in the federal council and three inembers in the reichstag.

I. The duchy of Oldenburg, comprising fully four-fifths of the entire area and population, lies between 52° 29' and 53° 44'N. lat. and 7° 37' and 8° 40' E. long., and is bounded on the N. by the German Ocean and on the other three sides by Hanover, with the exception of a small strip on the east, where it is conterminous with the territory of the free city of Bremen. It forms part of the north-western German plain defined by the Weser and the Ems, and, except on the south, where the Dammergebirge attain a height of 300 feet, it is almost entirely flat, with a slight inclina- tion towards the sea. In respect of its soil it is divided broadly into two parts,—the higher and inland-lying "Qeest," consisting of sandy plains intermixed with ex- tensive heaths and moors, and the "marsh lands" along the coast, consisting of rich but somewhat swampy alluvial soil. The latter, which compose about one-fifth of the duchy, are protected against the inroads of the sea by dykes as in Holland; and beyond these are the so-called "'watten," generally

covered at high tide, but at many points being gradually reclaimed. The climate is temperate and humid; the mean temperature of the coldest month at the town of Oldenburg is 26° Fahr., of the warmest 66°. Storms are numerous and somewhat violent, owing to the almost entire absence of trees; and fogs and ague are pre- valent in the marsh lands. The chief rivers are the Hunte, flowing into the Weser, and the Hase and Leda draining into the Ems. The Weser itself forms the eastern boundary for 42 miles, and internal navigation is greatly facilitated by a new canal, passing through the heart of the duchy and connecting the Hunte and the Ems. On the north there are several small coast streams conducted through the dykes by sluices, the only one of importance being the Jade, which empties itself into the Jadebusen, a deep gulf affording admirable accommodation for shipping. The duchy also contains numerous small lakes, the chief of which is the Diimmer See in the south-east corner, measur- ing 4 miles in length by 2} in width. About 30 per cent. of the area of the duchy is under cultivation and 17 per cent. under pasture and meadows, while the rest consists mainly of moor and heath. The forests occupy a very small proportion of the whole, but there are some very fine old oaks. In the Geest the principal crops are rye, oats, potatoes, and buckwheat, for which the heath is sometimes prepared by burning. Large tracts of moorland are, how- ever, useful only as producing an abundant supply of turf and peat for fuel, or as affording a scanty subsistence to the flocks of small coarse-woolled Oldenburg sheep. The rich soil of the marsh lands produces good crops of wheat, oats, rye, hemp, and rape, but is especially adapted for grazing. The fat cattle and horses raised on it are highly esteemed throughout Germany, and the former are exported in large numbers to England. Bee-keeping is also much in vogue on the moors. The live stock of Oldenburg forms a great part of its wealth, and the ratio of cattle, sheep, and horses to the population is one of the highest among the German states. There are few large estates, and the ground is mostly in the hands of small farmers, who enjoy the right of fishing and shooting on their holdings. Game, however, is scarce; but the fishing is fairly productive. The mineral wealth of Oldenburg is very small, and there are no mineral springs.

The industries are comparatively insignificant, though recently somewhat stimulated by the extension of the railway system and other causes. Woollen and cotton fabrics, stockings, jute, and cigars are made at Varel,

Delmenhorst, and Lohne; cork-cutting is extensively practised in some districts, and there are a few iron- foundries. Trade is relatively of more importance, chiefly

owing to the proximity of Bremen. The agricultural pro- duce of the duchy is exported to Scandinavia, Russia, England, and the. United States, in return for colonial goods and manufactures. Varel, Brake, and Elsfleth are the chief commercial harbours. In 1881 the ports of the duchy owned a merchant fleet of 345 vessels of 70,000 tons, and they are entered and cleared annually by from 2000 to 2500 vessels with an aggregate burden of 125,000 tons. Shipbuilding and boat-building are carried or at the above-named seaports and on the tributaries of the Ems. Before 1866 Oldenburg was destitute of railways, but it is now traversed by various lines. The high-roads are good ; in the north some of them are laid with "klinkers" like those in Holland. ;

II. The principality of Liibeck, formed of the old bishopric of that name, has an area of 209 square miles, and shares in the general physical characteristics of East Holstein, within which it lies. On the north-east it extends to the Baltic Sea, and on the south-west it is bounded by the Trave. The chief rivers are the Schwartau, a tributary of the Trave, and the Schwentine, flowing northwards to the Gulf of Kiel. The scenery of Liibeck is often pictur- esque, especially in the vicinity of the Ploner See and the Eutiner See, the most important of the small lakes with which it is dotted. Agriculture is practised here even more extensively than in the duchy of Oldenburg, about 75 per cent. of the area being cultivated. The population in 1880 was 34,973.

III. The principality of Birkenfeld, 194 square miles in extent, lies in the midst of the Prussian province of the Rhine, about 30 miles to the west of the Rhine at Worms and 150 miles to the south of the duchy of Oldenburg. It is a hilly district, intersected by the spurs of the Hoch- wald, which attain a height of over 2000 feet ; the valleys, however, are fertile and produce wine and grain in con- siderable abundance. About two-fifths of the surface are covered with forests. Iron-founding, cotton-spinning, and other manufactures are carried on; but the characteristic industry (having its seat

in Oberstein) is the polishing of agates, of which great numbers are found within the prin- cipality (compare Onyx), Birkenfeld is traversed from end to end, a distance of about 25 miles, by the Nahe, which rises close to its northern frontier. The population in 1880 was 38,685.

The total population of the grand-duchy of Oldenburg in 1880 was 337,478, showing an inerease of 1°10 per cent. per annum sinee the eensus of 1875, and an average of 186 persons to the square mile. The bulk of the inhabitants are of the Saxon stoek, but to the north and west there are numerous descendants of the ancient Frisians. The differences between the two raees are still to some extent pereeptible, but Low Gerinan (" Platt-deutsch") is nniver- sally spoken, exeept in one limited district, where a Frisian dialect has maintained itself. In general eharacteristies the Oldenburg peasants resemble the Duteh, and the absence of large landowners has contributed to make them sturdy and independent. Oldenburg has the eredit of showing almost the lowest average of illegitimate births among the German states, amounting in 1881 to only 5 per eent. This is in signifieant eontrast to the high rate (15 per cent.) among the semi-feudatory peasants of MuckLenbune (g.v.). The population of Oldenburg is somewhat nnequally distributed, some parts of the marsh lands containing over 300 persons to the square mile, while in the Geest the number oceasionally sinks as low as 40. Nearly 80 per cent. of the inhabitants are returned as belong- ing to the "rural" population. The only town with more than 10,000 inhabitants is Oldenburg, the eapital of the grand-duchy. The war-harbour of Wilhelmshaven, with 12,000 inhabitants, on the shore of the Jadebusen, was built by Prussia on a piece of land bought from Oldenburg. The chief towns of Birkenfeld and Liibeek are Birkenfeld and Eutin, with 2539 and 4574 inhabitants respectively. Oberstein in Birkenfeld has 4803; in the 12th eentury it was a lordship holding directly of the empire.

Oldenburg is a Protestant country, and the grand-duke is required to be a member of the Lutheran Church. Roman Catholicism, low- ever, preponderates in the south-western provinces, which formerly belonged to the bishoprie of Miinster. Oldenburg Roman Catholies are under the sway of the bishop of Minster, who is represented

by an official at Vechta; and the Catholics of Birkenfeld belong to the diocese of Treves. At the census of 1880 there were in the grand-duchy 260,416 Protestants, 74,254 Roman Catholics, and

1654 Jews. The educational system of Oldenburg is on a similar'

footing to that of north Germany in general, though the scattered position of the farmhouses interferes to some extent with school attendance. The proportion of Oldenburg recruits in 1882 unable to read or write was only 0°27 per cent., which compares favour- ably with the average of 1°54 for the whole empire. There is no university in Oldenburg territory, but an ample supply of primary, secondary, and special schools.

The constitution of Oldenburg, based upon a decree of 1849, revised in 1852, is one of the most liberal in Germany. It provides for a single representative chamber, elected indirectly by universal suffrage and exercising concurrent rights of legislation and taxation with the grand-duke. The chamber, which consists of thirty-four members (twenty-six for Oldenburg and four for each of the princi- palities), meets at regular intervals of three years. The executive consists of three ministers, who are aided by a committee of the landtag, when that body is not in session. The local affairs of Birkenfeld and Libeck are entrusted to provincial councils. All citizens are alike in the eye of the law, and all exemptions and privileges have been abolished. The municipal communities enjoy an unusual amount of independence.

The finances of each constituent state of the grand-duchy are managed separately, and there is also a fourth budget concerned with the joint administration. The last generally shows a sum of about £50,000 on each side, the expenditure including a matricular contribution of £33,500 to the imperial treasury. In the budget of 1882 the revenues of the duchy of Oldenburg, the principality of Ltibeck, and the principality of Birkenfeld were estimated at £289,965, £40,419, and £48,864, while the estimated expenditure was in each case somewhat less. The duchy of Oldenburg has a debt of nearly £2,000,000 and Liibeck one of £2000, while Birken- feld and the grand-duchy as a whole are free of debt. An annual allowance of about

£13,000 is made to the grand-duke, and he is believed to derive as much more from his private estates, The troops of Oldenburg furnish the German army with a regiment of infantry, a regiment of cavalry, and two batteries of artillery.

History.—The earliest recorded inhabitants of this district were the Germanic Chauci, who were afterwards merged in the Frisians. Old chroniclers delight in tracing the genealogy of the counts of Oldenburg up to Wittekind, the stubborn opponent of Charlemagne ; but their first historical representative is Elimar I., who flourished atthe close of the 11th century. His descendants appear as vassals of the powerful Saxon dukes, but attained the rank of independent princes of the empire on the dissolution of the Saxon power by Frederick Barbarossa (c. 1180). The countship of Delmenhorst at this time formed part of the Oldenburg dominions, but was after- wards frequently separated from them, and was not lastingly united under the same ruler till the beginning of the 17th century. The northern and western parts of the present duchy of Oldenburg were in the hands of more or less independent Frisian princes, who had generally remained pagans ; and Oldenburg history for the next two centuries is largely concerned with feuds with these small potentates, and gradual extension of territory at their expense. Bremen and Miinster were also frequently at war with the counts of Oldenburg. In 1448 Count Christian VIII. was elected king of Denmark, and, a little later, duke of Holstein and Schleswig, the latter event pregnant with important consequences for future history. Oldenburg was made over to his brother Gerhard, an ambitious prince, whose turbulent disposition resulted in an abdica- tion in favour of his sons, forced on him by a league of Hamburg, Liibeck, and Bremen. Protestantism was introduced by Anton I. (1531-1573), who, however, remained loyal to Charles V. in the Schmalkald war, and was thus enabled to increase his territories, On the accession of Anton Giinther in the beginning of the 17th century Oldenburg and Delmenhorst were finally welded into one, and about the same period the last free Frisian states, Jever and Kniphausen, were also absorbed by Oldenburg. Anton Giinther proved himself the wisest prince who had ruled in Oldenburg, and by his prudent neutrality in the Thirty Years' War secured for his domains immunity from the devastations to which most other German states were exposed. He also obtained from the emperor the right

~~*to levy tolls on vessels passing up the Weser, a lucrative grant, which soon formed one-fifth of his revenues. On his death without issue in 1667 the succession passed to the Danish reigning house, after the claims of the Holstein-Gottorp and Holstein-Sonder- burg branches of the family had been compromised. Oldenburg remained under the sway of the Danish monarchs for about a cen- tury,—a period, on the whole, of peaceful development. At length, in 1773, the Danish monarch agreed to a family compact, in accord- ance with which he resigned Oldenburg to the Holstein-Gottorp line in return for a renunciation on their part ofall claim to Schleswig and Holstein. The head of the Holstein-Gottorp family at this time was the grand-duke Paul of Russia (afterwards the emperor Paul I.); but he handed over Oldenburg, which was now created a duchy,*~~

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~~*to his cousin Frederick Augustus, bishop of Liibeck, representative of a younger line, The bishop's son, who followed his father in 1785, was a man of weak intellect ; and his cousin, Peter Frederick Louis, who acted as administrator and eventually succeeded to the*~~

~~*throne, is the direct progenitor of the present grand-duke. Peter*~~

~~*had the task of managing the duchy in the troublous times of the*~~

~~*Napoleonic wars, and, though he joined the Confederation of the*~~

~~*Rhine, had afterwards to see his domains forcibly annexed to France*~~

~~*on his refusal to exchange them for Erfurt. This led him to join*~~

~~*the allies, and his services were rewarded at the congress of Vienna*~~

~~*by the addition of Birkenfeld to his dominions, which were also — raised to the rank of a grand-duchy. The secularized bishopric of*~~

~~*Liibeck had been already added to Oldenburg in 1803. Oldenburg*~~

~~*did not escape the revolutionary wave that swept over Kurope in*~~

~~*1848, but no very serious disturbances took place, and the grand-*~~

~~*duke granted a constitution in 1849. This constitution was of an*~~

~~*ultra-liberal character, and, as the country had hitherto been ruled*~~

~~*in the spirit of an enlightened but absolute despotism, strengthened*~~

~~*by the absence of a privileged class of nobles, the unimportance of*~~

~~*the towns, and the comparative independence of the peasantry, it*~~

~~*was inevitable that it should not work at once without friction, In*~~

1852 it had to submit to some modification, which, however, still left it one of the most liberal constitutions in Germany. In 1864 the grand-duke seemed at first inclined to insist upon his claims to the Schleswig-Holstein succession, but he ultimately resigned them in favour of Prussia. In 1866 he sided with that power against Austria, and in 1871 the grand-duchy became a member of the German empire.

See Halem, Gesch. d. Herzogth. Oldenburg (1794-96) ; Runde, Oldenburgische Chrontk (3d ed., 1863); Bése, Das Grossherzogthum Oldenburg (1863); Kollinann, Das Herzogthum Oldenburg in seiner wirthschaftlichen Entwickelung wihrend der letzten 25 Jahre (1879); the publications of the Statistical Bureau of Oldenburg; the annual Hof- wnd Staatshandbuch des Grossherzogthums Oldenburg.

OLDENBURG, the capital of the grand-duchy of that name, is a quiet and pleasant-looking town, situated 24 miles to the west of Bremen, on the Hunte, which is navigable for river-craft up to this point. The inner or old town, with its somewhat narrow streets, is surrounded by avenues laid out on the site of the former ramparts, beyond which are the villas, parks, and gardens of the more modern quarters. Oldenburg has almost nothing to show in the shape of interesting old buildings. The Lambertikirche, though dating from the 13th century, has been so transformed in the present century as to show no trace of its antiquity. The palaces of the grand-duke and the town-house are Renaissance buildings of the 17th and 18th centuries. Among the other prominent buildings—all modern—are the theatre, the law-courts, the gymnasium, the commercial school, the three hospitals, and the new Roman Catholic church, The grand-ducal picture-gallery in the Augusteum includes works by Veronese, Velazquez, Murillo, and Rubens ; and there are collections of modern paintings and sculptures

in the two palaces. The public library contains 150,000 vols., and the duke's private library has 50,000. There is also a museum with a collection of antiquities and a cabinet of natural history. The industries of Oldenburg, which are of no great importance, include iron-founding and the making of tobacco, soap, and leather. A considerable trade is carried on in grain, and the horse-fairs are largely frequented. The population in 1880 was 20,575, or, includ- ing the suburban village of Osternburg on the other side of the Hunte and the Hunte-Ems Canal, 24,678. About four-fifths of these are Protestants.

According to popular tradition Oldenburg was founded by Walbert, grandson of Wittekind, and named after his wife Altburga ; but the first historical mention of it occurs in a document of 1108. It was fortified in 1155, and received a municipal charter in 1845. The subsequent history of the town is merged in that of the grand- duchy. (J. F.E. of.)

OLDHAM, a municipal and parliamentary borough and important manufacturing town of south-east Lancashire, is situated on an eminence near the source of the Medlock, at the junction of several railway lines, 6 miles north-east of Manchester. By the Oldham canal it has water-com- munication with Manchester, Ashton, Stockport, and Rochdale. Although consisting chiefly of monotonous rows of workmen's houses, interspersed with numerous im- mense factories and workshops, Oldham has some good

streets and a number of imposing public buildings.] A daughter and co-heiress of this Alwardus conveyed Werneth Hall

Among these the principal are the town-hall, a fine struc- ture in the Grecian style, with a tetrastyle portico copied from the Jonic temple of Ceres near Athens, enlarged by a new wing erected in 1880 at a cost of £24,000, the nucleus of much more extensive municipal buildings ; the lyceum, in the Italian style, erected in 1854 and enlarged in-1880; the public baths, erected in 1854—partly by money raised for a meniorial to Sir Robert Peel—and en- larged in 1880; the workmen's hall, erected in 1844

and enlarged in 1854; the Werneth mechanics' institute, 1867 ; the infirmary, erected in 1870 and enlarged in 1877; and the new post-office, 1877. There is a grammar school, founded in 1611; but a more important educational en- dowment is the blue-coat school, for which a sum of £40,000 was left in 1808. On account of a legal dispute the money was allowed to accumulate for over twenty years, so that the school started with an endowment of £100,000. The town possesses a commodious general market, opened in 1856, and also a fish market, opened in 1873. Both the gasworks and waterworks have since 1853 been in the hands of the corporation. Additional reservoirs have been added to meet the increasing needs of the town, their total capacity being now 1,233,500,000 gallons. During the cotton famine occupation was given to many of the distressed operatives in laying out 72 acres as a public park, which, under the name of the Alexandra Park, was opened in 1865, at a cost of about £37,000. The town, which is one of the most important seats of the cotton manufacture in the world, owes its prosperity in great part to its situation on the edge of the Lanca- shire coal-field, where the mineral is very easily wrought. There are many valuable seams of coal in the immediate neighbourlood of the town, those in highest repute being the Black Mine and Bent Mine coals. From entries in the church registers it would appear that linens 'were manufactured in Oldham as early as 1630. Watermills were introduced in 1770, and with the adoption of Ark- wright's inventions the cotton industry spread with great rapidity. After the introduction of steam power the town, owing to its proximity to the coal-beds, soon assumed a leading place in the manufacture of cotton. The total number of persons engaged in the industry is over 30,000, the annual consumption of cotton being over 700,000 bales, or about one-fourth of the whole quantity of cotton im- ported into the United Kingdom. The principal manufac- tures are fustians, velvets, cords, hats, shirtings, sheetings, and nankeens. There are also large foundries and mill and cotton machinery works, the most extensive establishment being that of Platt and Co. The gas-meters made at Oldham have a high reputation, and there are also several large manufactories of sewing-machines. The town is divided into eight wards, and is governed by a mayor, eight alder- men, and twenty-four councillors. The area of the town- ship is coextensive with that of the municipal borough, and comprehends 4730 acres, of which 13 are water. The parliamentary borough has an area of 12,310 acres, and, in addition to Oldham, includes the townships of

Cromp- ton, Royton, and Chadderton, and part of the parish of Ashton-under-Lyne. Within the present century the growth of Oldham has been very rapid. In 1714 the population numbered only 1750, which in 1801 had in- creased to 12,024, in 1841 to 42,595, in 1861 to 72,333, in 1871 to 82,633, and in 1881 to 111,343. The popula- tion of the parliamentary borough in 1871 was 113,100, and in 1881 it was 152,513.

The name Oldham is of Saxon origin. A Roman road, of which some traces are still left, passes through the township, but it does not appear to have been a Roman station. It is not mentioned in

Domesday ; but in the reign of HIenry III. Alwardus de Aldholme is referred to as holding "two bovats of land in Vernet (Werneth)."

and its manor to the Cudworths, a branch of the Yorkshire family, with whom it remained till the early part of last century. From the Oldhams was descended HIugh Oldham, who died bishop of Exeter in 1519. In 1826 the town was placed under the care of a board of commissioners, and in 1849 it received municipal govern- ment. Since 1832 it has returned two members to parliament.

OLDHIAM, Joun (1653-1683), a satirist of the Restora- tion period, achieved notoriety by his Satires on the Jesutts, published during the heat of the excitement caused by the revelations of Titus Oates and the murder of Godfrey in 1678. In such a time of national panic and hatred ' who peppered the highest was surest to please," and Oldham's satires could hardly be surpassed for energy of invective and copiousness of coarse extravagant irony. They were extravagant enough to pass in a more sober age for bur- lesques of anti-Popish frenzy. . Oldham was at the time a tutor in ajudge's family. HIe was the son of a Non- conformist minister, born at Shipton, near Tedbury in Gloucestershire, in 1653, was a B.A. of Oxford (Edmund HIall), and had been for some three years an usher in a school at Croydon. Before he appeared as a satirist, and while he was still an usher, his verses, circulated in MS., had attracted the attention of Will's Coffee-house, and Rochester with some of his boon companions had sallied down to Croydon to see what the new poet was like. It was prob- ably an extravagantly humorous dithyrambic drunkard's soliloquy that roused their curiosity, and when they found him a tall, thin, consumptive, harsh-featured

cynic they apparently left him to his drudgery. After the success of his Satires on the Jesuits, Oldham wrote more satires, imitations of Horace and Juvenal, and one of them, a satire on poets, setting forth bitterly their degradation, their poverty, their humiliating adulation of patrons, is often quoted as an index to the condition of men of letters in those days. He died prematurely(1683) at the age of thirty, and was eloquently lamented by Dryden as the " Marcellus of our tongue."

'« Farewell, too little and too lately known, Whom I began to think and call my own;

For sure our souls were near allied, and thine Cast in the same poetic mould as mine."

Oldham's verse was rugged, and his rage, as Pope said, "too like Billingsgate" ; but " maturing time," as Dryden hoped, might have softened these faults. Donne and Cowley were his literary models, and he poured into their forms great warmth of feeling, wealth of incident, and commanding force of language.

OLDYS, Witt1am (1696-1761), a useful bibliographer, was the natural son of Dr Oldys, chancellor of Lincoln, and was born in 1696. He was a good scholar, but of in- temperate habits, and never succeeded in freeing himself from the thraldom of Grub Street,—unless, indeed, when he was employed for some years by Harley, earl of Oxford, as librarian. He is best known by his British Librarian, an esteemed but unfinished work, which began to appear in 1737 (see BrBLioGRAPHY, vol. ili, p. 652). He was ap- pointed Norroy king-at-arms by the duke of Norfolk. His death took place on 15th April 1761. A MS. collection of notes by Oldys on various bibliographical subjects and a copy of Langbaine's Lives copiously annotated by him are preserved in the British Museum.

OLEANDER is the common name for the shrub known to botanists as Werium Oleander. It is a native of the Mediterranean and Levant, and is characterized by its tall shrubby habit and its thick lance-shaped opposite leaves, which exude a milky juice when punctured. The flowers are borne in terminal clusters, and are like those of the comimon periwinkle (Vinca), but

are of a rose colour, rarely white, and the throat or upper edge of the tube of the corolla is occupied by outgrowths in the form of lobed

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and fringed petal-like scales. the thickened stigma. The fruit or seed-vessel consists of

two long pods, which, bursting along one edge, liberate a

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number of seeds, each of which is provided with a tuft of silky hairs like thistle down at the upper end. The genus belongs to the family of Apo- . cynacezx, a family \ that, as is usual where the juice has a milky appear- ance, is marked by its poisonous pro- perties. Cases are recorded by Lind- ley of children poisoned by the flowers. The same author also narrates how in the course of the Peninsular War some French soldiers died in consequence of employing skewers made from freshly-cut twigs of oleander for roasting their meat. The oleander was known to the Greeks under three names, viz., rhododendron, nerion, and rhododaphne, and is well described by Pliny (xvi. 20), who mentions its rose-like flowers and poisonous qualities, at the same time stating that it was considered serviceable as a remedy against snake-bite. The modern Greeks still know the plant as pododédvy, although in a figure in the Rinuccini MSS. of Dioscorides a plant is represented under this name, which, however, has rather the appearance of a willow herb, Hpilobium. The oleander has long been cultivated in greenhouses in England, being, as Gerard says, "'a small shrub of a gallant shewe"; and of late numerous varieties, differing in the colour of their flowers and in the mutation of their stamens into petals so as to form double flowers, have been introduced.

OLEARIUS, Apam, a German traveller whose true name was Oelschliiger, was born at Aschersleben near Magdeburg in 1600, and died at Gottorp 22d February 1671. After studying at Leipsic he became librarian and court mathematician to Duke Frederick III. of Holstein- Gottorp, and in 1633 he was appointed secretary to the ambassadors Philip Crusius and Otto Briiggemann or Brugman sent by the duke to Muscovy and Persia in

~~the hope of making arrangements by which his newly-founded city of Frederikstad should become the terminus of an overland silk-trade. It is by his admirable narrative of this legation (Beschreibung der moskowitischen und per- sischen Reise, Schleswig, 1647, and afterwards in several enlarged editions) that Olearius is best known, though he also published a history of Holstein, and a translation of the Gulistan (Persianisches Rosenthal, Schleswig, 1654), to which was appended a translation of the fables of Lok-man.~~

~~The embassy to which Olearius was attached made two different journeys. The first (22d October 1633 to 6th April 1635) was by Hamburg, Liibeck, Riga, Dorpat (five months' stay), Revel, Narva, Ladoga, and Novgorod to Moscow, and back again by a somewhat different route. The second (22d October 1635 to 1st August 1639) was by a similar route to Moscow, thence to the Volga, down the river to Astrakhan, acrossthe Caspian to Nizovaya, and so on, by Shemakha, Ardebil, Sultanieh, Kaswin, &c., to Ispahan, and then back again by Resht and Lenkoran to Astrakhan, Kazan, Moscow, &c. Paul F'lem- Ing the poet and Mandelslo, whose travels to the East Indies are usually published with those of Olearius, accompanied the embassy.~~

~~OLEO-MARGARINE. The process by which the French chemist Mége-Mouriés sought to convert ordinary~~

~~Nerium Oleander.~~

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~~The hairy anthers adhere to | animal fat into butter has already been described under | Burrer (vol. iv. p. 592).~~

~~OLE~~

~~The following account of the mode of manufacture as carried on by the "Commercial Manufacturing Company" in New York is abridged from a report by Mr Victor Drummond, secretary to the British Embassy in Washington, in 1880.~~

Fresh fat from recently killed cattle is soaked in tepid water for one hour, then thoroughly washed with cold water, and, after having been soaked in cold water, assorted, the pieces less rich in "oil" being rejected and put aside for the manufacture of tallow. The fat thus selected is hashed up (almost minced) by machinery and melted down in water-jacketed caldrons, the water being heated by means of steam, so that the fat never becomes hotter than 124° Fahr. Through the action of this heat the fat divides into three parts, namely, shreds of membrane below, a scum of an emulsion of fat and water above, and clear oil between the two. The oil is drawn off and kept for thirty to thirty-six hours at a temperature of 85° Fahr., when a portion of the stearin and palmitin crystallizes out, while the more easily fusible components remain as a mother liquor, which is then squeezed out by hydraulic pressure. This oil, which on cool- ing freezes into a semi-solid fat, constitutes oleo-margarine, and is recommended as an excellent substitute for melted butter. Of the oil considerable quantities are worked up into imitation butter. For this purpose it is violently churned yp with milk for about twenty minutes, a little arnotto being added to produce a yellow colour. The emulsion is run direct on a mass of pounded ice to cause it to solidify without crystallization. After having been again churned up with fresh milk, it is kneaded to remove the excess of water, salted (in short, manipulated as genuine churned butter is), and sent out into the market.

The report includes a comparative analysis of real and of the Commercial Company's imitation butter, of which the following is a somewhat condensed copy :—

Real Butter. Imitation. 1. Glycerides of non-volatile fatty acids 51-4 56°3 2. Glycerides of butyric and other vola- RG Rn eo eptgn sas di we 74 18 a ee re cs 0-2 0°6 Pe BRIM oe Statice Maciek tare Vdeniais (6-0 cee aya 5'1 Fe aloe wiak woeinidies cess 23°8 249

Oleo-margarine,—that is, ordinary fat minus part of the palmitin and stearin—is necessarily somewhat richer in those components (2) which are characteristically pre- dominant in butter, but still falls far short of what real butter naturally contains. The physiological action of these butter-glycerides, as we may call them, has never been made out; possibly they

may account to some extent for butter being more easily digestible than ordinary fat.

Hehner and Angell have the merit of being the first to work out an easy and straightforward method for de- tecting (considerable) admixtures of ordinary animal fat, and consequently also of such things as oleo-margarine, with real butter. It consists in determining the percentage of insoluble and non-volatile acids contained in the pre- viously dehydrated and filtered article. By their modus operandi all ordinary animal fats yield close upon 95 per cent., while genuine butter yields only 86°5 to 87°5, at most 89 per cent., of fixed fatty acids. Easier and more decisive is the method of Reichert, who saponifies 2:5 grammes of the dry filtered article with 1 gramme of caustic potash dissolved in alcohol, expels the alcohol, decomposes the soap, after addition of 50 cubic centimetres of water, with 20 c.c. of dilute sulphuric acid (1 vol. of vitriol, 10 vol. of water), and distils off (exactly) 50 ¢.c., to determine therein the volatile acids by ascertaining the volume of a dilute standard solution of caustic alkali which is required to neutralize them. Real butter (per 2°5 grammes) yields 12 to 13 milligrammes, ordinary fats only 1°8 to 2°7, of volatile acids, calculated as butyric, $C_4H_8O_2$.

OLERON, an island lying off the west coast of France, opposite the mouths of the Charente and Seudre, and in- cluded in the department of the Charente-Inférieure, has an area of 59 square miles. It is about 18 miles in length from north-west to south-east, and 7 in extreme breadth ; the width of the strait separating it from the mainland

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is at one point less than a mile. The greater part of the island is very fertile, but there are also some extensive salt marshes, from which a considerable quantity of salt is made. The chief products are corn, wine, fruit, and vege- tables. The population of the island, which is mostly Protestant and supplies excellent sailors, numbered 18,244 in 1881; that of the chief town, Chateau d'Oleron, on the south-east coast, was 1727. Other towns are Saint-Georges d'Oleron (4943) and Saint-Pierre d'Oleron (1535). Oleron, the Uliarus Insula of Pliny, gave its name to a medieval code of maritime laws, for the origin and history of which see Sea Laws.

~~OLGA, wife of Igor, prince of Kieff, and afterwards (from 945) regent for Sviatoslaf her son, was baptized at Constantinople about 955 and died about 969. She was afterwards canonized in the Russian church, and is now commemorated on 11th July. See Russtra.~~

~~OLIVA, FeRNAN PEREZ DE, Spanish man of letters, one of the earliest writers of didactic prose in that language, was born at Cordova about 1492, and, after studying at Salamanca, Alcala, Paris, and Rome, was appointed to the chair of moral philosophy at Salamanca, where he died in 1530. HIs principal work, a Dialogue on the Dignity of Man, which he did not live to complete, was finished by Francisco Cervantes de Salazar, and published in 1546. HIs metrical translations from Euripides and Plautus are unimportant.~~

~~OLIVARES, Gasparo DE GUZMAN, ConDE DUQUE DE (1587-1645), Spanish statesman, was born at Rome on 6th January 1587, where his father, Count Enrique, who after- wards became viceroy successively of Sicily and Naples, was at the time ambassador to Pope Sixtus V. HIs grandfather, Count Pedro (1502-1562), had been a prominent figure at the courts both of Charles V. and of Philip Il. After studying at Salamanca Olivares received, through the in- fluence of his uncle the duke of Uceda, the appointment of gentleman of the bedchamber to the prince of Asturias. By his winning manners and valued, if not always very creditable, services he so ingratiated himself with the heir- apparent that the latter, on his accession as Philip IV. in 1621, forthwith made him his prime minister, conferring on him the title of Duque de San Lucar de Barrameda. It was the ambition of Olivares to regain for his country by arms and intrigue the influence it had formerly possessed in Europe, but his abilities, great as they were, were very un- equally matched with those of Richelieu, his rival in policy, and twenty-two years of almost autocratic power accord- ingly had no other result than deep national humiliation as well as personal disgrace (see Spain). The expedients to which he was compelled to resort in order to raise money for his long and unsuccessful war with the Dutch and for the support of his armies in Germany and Italy raised throughout the Spanish peninsula a spirit of discontent, which came to a crisis in 1640, when Catalonia rebelled, calling in the aid of the French, and Portugal declared its independence, electing the duke of Braganza as king. All his~~

~~attempts at pacification having failed, the enemies of Olivares succeeded in supplanting him in the king's favour in 1643. He was banished to Toro (Zamora) where he died in 1645.~~

~~. See De la Rocca, Hist. dw ministére dw Comte-duc ad' Olivares (Cologne, 1673).~~

~~OLIVE (Olea europea), the well-known plant that yields the olive oil of commerce, belongs to @ section of the natural order Oleacex, of which it has been taken as the type. The genus Olea includes about thirty-five species, very widely scattered, chiefly over the Old World, from the basin of the Mediterranean to South Africa and New Zealand. The wild olive, or oleaster, is a small tree or bush of rather straggling growth, with thorny branches~~

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~~and opposite oblong pointed leaves, dark greyish-green above and, in the young state, hoary beneath with whitish scales ; the small white flowers, with four-cleft calyx and corolla, two stamens, and bifid stigma, are borne on the last year's wood, in racemes springing from the axils of the leaves ; the drupaceous fruit is small in the wild plant, and the fleshy pericarp, which gives the garden olive its economic value, is hard and comparatively thin. In the cultivated forms the tree acquires a more compact habit, the branches lose their spinous character, while the young shoots become more or less angular ; the leaves are always hoary on the under-side, and are generally lanceolate in shape, though varying much in breadth and size in the different kinds. The fruit is subject to still greater altera- tions of form and colour; usually oval or nearly globular, in some sorts it is egg-shaped, in others much elongated ; while the dark hue that it commonly assumes when ripe is exchanged in many varieties for violet, green, or al- most white. At pre- sent the wild olive is found in most of the countries around the Medi- Wig terranean, extend- Wi ing its range on the west to Portugal, and eastward to the vicinity of the Cas- pian, while, locally, it occurs even in Afghanistan. An undoubted native of Syria and the mari- 5 cone P aria of Asia A, Olea europewa (from nature). B, opened flower ; Minor, its abund- '6, vertical section (after Luerssen, Med.-Pharm. ance in Greece and #anik, 1882).~~

the islands of the Archipelago, and the frequent allusions to it by the earliest poets, seem to indicate that it was there also indigenous ; but in localities remote from the Levant it may have escaped from cultivation, reverting more or less to its primitive type. It shows a marked preference for calcareous soils and a partiality for the sea-breeze, flourishing with especial luxuriance on the limestone slopes and crags that often form the shores of the Greek peninsula and adjacent islands.

The varieties of olive known to the modern cultivator are extremely numerous,—according to some authorities, equalling or exceeding in number those of the vine. In France and Italy at least thirty kinds have been enumer- ated, but comparatively few are grown to any large extent. None of these can be safely identified with ancient descrip- tions, though it is not unlikely that some of the narrow- leaved sorts that are most esteemed may be descendants of the famed "Licinian" (see below). Italy retains its old pre-eminence in olive cultivation ; and, though its ancient Gallic province now excels it in the production of the finer oils, its fast-improving culture may restore the old prestige. The broad-leaved olive trees of Spain bear a larger fruit, but the pericarp is of more bitter flavour and the oil of ranker quality. The olive tree, even when free increase is unchecked by pruning, is of very slow growth; but, where allowed for ages its natural development, the trunk sometimes attains a considerable diameter. De Candolle records one exceeding 23 feet in girth, the age being sup- posed to amount to seven centuries. Some old Italian olives have been credited with an antiquity reaching back

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to the first years of the empire, or even to the days of republican Rome; but the age of such ancient trees is always doubtful during growth, and their identity with old descriptions still more difficult to establish. The tree in cultivation rarely exceeds 30 feet in height, and in France and Italy is generally confined to much more limited dimensions by frequent pruning. The wood, of a yellow or light greenish-brown hue, is often finely veined with a darker tint, and, being very hard and close- grained, is valued by the cabinetmaker and ornamental turner.

~~The olive is propagated in various ways, but cuttings or layers are generally preferred ; the tree roots in favour- able soil almost as easily as the willow, and throws up suckers from the stump when cut down. Branches of various thickness are cut into lengths of several feet each, and, planted rather deeply in manured ground, soon vegetate ; shorter pieces are sometimes laid horizontally in shallow trenches, when, covered with a few inches of soil, they rapidly throw up sucker-like shoots. In Greece and the islands grafting the cultivated tree on the oleaster is a common practice. In Italy embryonic buds, which form small swellings on the stems, are carefully excised and planted beneath the surface, where they grow readily, these "uovoli" soon forming a vigorous shoot. Occasionally the larger boughs are inarched, and young trees thus soon obtained. The olive is also sometimes raised from seed, the oily pericarp being first softened by slight rotting, or soaking in hot water or in an alkaline solution, to facili- tate germination. The olives in the East often receive little attention from the husbandman, the branches being allowed to grow freely and without curtailment by the pruning-knife ; water, however, must be supplied in long droughts to ensure a crop; with this neglectful culture the trees bear abundantly only at intervals of three or four years; thus, although wild growth is favourable to the picturesque aspect of the plantation, it is not to be recommended on economic grounds. Where the olive is carefully cultivated, as in Languedoc and Provence, it is planted in rows at regular intervals, the distance between the trees varying in different "olivettes," accord- ing to the variety grown. Careful pruning is' practised, the object being to preserve the flower-bearing shoots of the preceding year, while keeping the head of the trec low, so as to allow the easy gathering of the fruit; a dome or rounded form is generally the aim of the pruner. The spaces between the trees are occasionally manured with rotten dung, or other nitrogenous matter ; in France woollen rags are in high esteem for this purpose. Various annual crops are sometimes raised between the rows, and in Calabria wheat even is grown in this way ; but the trees are better without any intermediate cropping. Latterly a dwarf variety, very prolific, and with green fruit, has come into favour in certain localities, especially in America, where it is said to have produced a crop two or three seasons after planting. The ordinary kinds do not become profitable to the grower until from five to seven years after the cuttings are placed in the olive- ground, Apart from occasional damage by weather or organic foes, the olive crop is~~

somewhat precarious even with the most careful cultivation, and the large untended trees so often seen in Spain and Italy do not yield that certain income to the peasant proprietor that some authors have attributed to them ; the crop from these old trees is often enormous, but they seldom bear well two years in succession, and in many instances a luxuriant harvest can only be reckoned upon every sixth or seventh season. The fruit when ripe is, by the careful grower, picked by hand and deposited in cloths or baskets for conveyance to the mill; but in many parts of Spain and Greece, and

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generally in Asia, the olives are beaten down by poles, or by shaking the boughs, or even allowed to drop naturally, often lying on the ground until the convenience of the owner admits of their removal; much of the inferior oil owes its bad quality to the carelessness of the proprietor of the trees. In southern Europe the olive harvest is in the winter months, continuing for several weeks; but the time varies in each country, and also with the season and the kinds cultivated. The amount of oil contained in the fruit differs much in the various sorts; the pericarp usually yields from 60 to 70 per cent. The ancient agriculturists believed that the olive would not succeed if planted more than a few leagues from the sea (Theophrastus gives 300 stadia as the limit), but modern experience does not confirm the idea, and, though showing a preference for the coast, it has long been grown far inland. A. calcareous soil, however dry or poor, seems best adapted to its healthy development, though the tree will grow in any light soil, and even on clay if well drained; but, as remarked by Pliny, the plant is more liable to disease on rich soils, and the oil is inferior to the produce of the poorer and more rocky ground the species naturally affects. The olive suffers greatly in some years from the attacks of various enemies. A fungoid growth has at times infested the trees for several successive seasons, to the great damage of the plantations. A species of coccus, C. olex, attaches itself to the shoots, and certain lepidopterous caterpillars feed on the leaves, while the "olive-fly" attacks the fruit. In France the olivettes suffer occasionally from frost ; in the early part of the last century many trees were cut to the ground by a winter of exceptional severity. Gales and long-continued rains during the gathering season also cause mischief.

~~The unripe fruit of the olive is largely used in modern as in ancient times as an article of dessert, to enhance the flavour of wine, and to renew the sensitiveness of the palate for other viands. for this purpose the fruit is picked while green, soaked for a few hours in an alkaline ley, washed well in clean water, and then placed in bottles or jars filled with brine; the Romans added amurca to the salt to increase the bitter flavour of the olives, and at the present day spices are sometimes used.~~

~~The leaves and bark of the tree are employed in the south, as a tonic medicine, in intermittent fever. A resinous matter called "olive gum," or Lucca gum, formed by the exuding juice in hot seasons, was an- ciently in medical esteem, and in modern Italy is used as a perfume.~~

~~In England the olive is not hardy, though in the southern counties it will stand ordinary winters with only the protection of a wall, and will bear fruit in such situa- tions ; but the leaves are generally shed in the autumn, and the olives rarely ripen.~~

~~The genus Olea includes several other species of some economic importance. The olive of America, 0. americana, a rather small tree, growing in the southern parts of the United States, with broadly-lanceolate leaves and com- pound racemes of small white fragrant flowers, is remark- able for the extreme hardness of its wood, which, resist- ing ordinary tools, is called devil-wood by the southern lumberers and squatters. O. paniculata is a larger tree, attaining a height of 50 or 60 feet in the forests of Queensland, and yielding a hard and tough timber. The yet harder wood of O. laurifolia, an inhabitant of Natal, is the black ironwood of the South African colonist. The white or yellowish sweet-scented flowers of O. fragrans, a Chinese species, are employed to communicate their aroma to some of the finer teas; the oblong serrated leaves are said to be used for the adulteration of inferior kinds. Some other species of olive furnish hard and close-grained wood, but are not yet of much general interest.~~

~~OLI—OLTI~~

~~At what remote period of human progress the wild oleaster passed under the care of the husbandman and became the fruitful garden olive it is impossible to conjecture ;—history aud tradition are alike silent regarding~~

~~the origin of most of the more valued plants of cultivation, and we know little more of the later evolution of the olive than of the remoter genealogies of our present wheat and maize. The frequent reference in the Bible to the plant and its produce, its implied abundance in the land of Canaan, the import- ant place it has always held in the economy of the inhabitants of Syria, lead us to consider that country the birthplace of the culti- vated olive. An improved variety, possessed at first by some sinall Semitic sept, it was probably slowly distributed to adjaeent tribes ; and, yielding profusely, with little labour, that oily matter so essen- tial to healthy life in the dry hot climates of the East, the gift of the fruitful tree beeame in that primitive age a symbol of peace and goodwill among the warlike barbarians. At a later period, with the development of maritime enterprise, the oil was conveyed, as an article of trade, to the neighbouring Pelasgic and Ionian nations, and the plant, doubtless, soon followed.~~

~~Hehn remarks that in the Homeric world, as depicted in the Iliad, olive oil is known only as a luxury of the wealthy, —an exotic pro- duct, prized chiefly for its value in the heroic toilet ; the warriors anoint themselves with it after the bath, and the body of Patro- clus is similarly sprinkled ; but no mention of the culture of the plant is made, nor does it find any place on the Achillean shield, on which a vineyard is represented. But, although no reference to the cultivation of the olive occurs in the Ziad, the presence of the tree in the garden of Alcinous and other familiar allusions show it to have been known when the Odyssey was written. Whenever the introduction may have taken place, all tradition points to the limestone hills of Attica as the seat of its first cultivation on the Hellenic peninsula. When Poseidon and Athene contended for the future city, an olive sprang from the barren rock at the bidding of the goddess, the patron of those arts that were to bring undying influenee to the rising state. That this myth has some relation to the first planting of the olive in Greece seems certain from the remarkable story told by Herodotus of the Epidaurians, who, on their crops failing, applied for counsel to the Delphic oracle, and were enjoined to erect statues to Damia and Auxesia (symbols of fertility) carved from the wood of the true eae olive, then possessed only by the Athenians, who granted their request for a tree on condition of their making an annual sacrifice to Athene, its patron; they thus obeyed the command of the Pythian, and their lands beeame again fertile. The sacred tree of the~~

goddess long stood on the Acropolis, and, though destroyed in the Persian invasion, sprouted again from the root,—some suckers of which were said to have produced those olive trees of the Academy in an after age no less revered. By the time of Solon the olive had so spread that he found it necessary to enact laws to regulate the cultivation of the tree in Attica, from which country it was probably distributed gradually to all the Athenian allies and tributary states. To the Ionian coast, where it abounded in the time of Thales, it may have been in an earlier age brought by Pheenieian vessels ; some of the Sporades may have reeeived it from the same source ; the olives of Rhodes and Crete had perhaps a similar origin. Samos, if we may judge from the epithet of Jischylus (éAaépuros), must have had the fruitful plant long be- fore the Persian wars. It is uot unlikely that the valued tree was taken to Magna Grecia by the first Achezan colonists, and the asser- tion of Pliny (quoted from Fenestella), that no olives existed in Italy in the reign of Tarquinius Priscus, must be received with the caution due to many statements of that industrious compiler. In Latin Italy the cultivation seems to have spread slowly, for it was not until the consulship of Pompey that the production of oil be- eame sufficient to permit of its exportation. In Pliny's time it was already grown abundantly in the two Gallic provinces and in Spain ; indeed, in the earlier days of Strabo the Ligurians sup- plied the Alpine barbarians with oil, in exchange for the wild produce of their mountains ; the plant may have been introduced into those districts by Greek settlers in a previous age. Africa was indebted for the olive mainly to Semitic agencies. In Egypt the culture never seems to have made much progress; the oil found in Theban tombs was probably imported from Syria. Along the southern shore of the great inland sea the tree was carried by the Pheenicians, at a remote period, to their numerous colonies in Africa,—though the abundant olives of Cyrene, to which allusion is made by Theophrastus, and the glaucous foliage of whose descend- ants still clothes the rocks of the deserted Cyrenaica, may have been the offspring of Greek plants brought by the first settlers. The tree was most likely introduced into southern Spain, and per- haps into Sardinia and the Balearic Islands, by Pheenician mer- chants; and, if it be true that old olive trees were found in the Canaries on their rediscovery by medieval navigators, the vener- able trees probably owed their origin to the same enterprising pioneers of the ancient world. De Candolle says that the means

~~by which the olive was distributed to the two opposite shores of the Mediterranean are indicated by the names given to the plant~~

~~by their respective inhabitants,—the Greek éala passing into the Latin olea and oliva, that in its turn becoming the wlivo of the modern Italian, the olivo of the Spaniard, and the olive, olivier, of the French, while in Africa and southeru Spain the olive retains' appellatives derived from the Semitic zait or seit; but the complete subjugation of Barbary by the Saracens sufficiently accounts for the prevalence of Semitic forms in that region; and accytwno (Arab. zeitén), the Andalusian name of the fruit, locally given to the tree itself, is but a vestige of the Moorish conquest. Yielding a grate- ful substitute for the butter and animal fats consumed by the raees of the north, the olive, among the southern nations of antiquity, became an emblem not only of peace but of national wealth and domestic plenty ; the branches borne in the Panathenea, the wild olive spray of the Olympic victor, the olive crown of the Roman conqueror at ovation, and those of the equites at their imperial review alike typified gifts of peace that, in a barbarous age, could be secured by victory alone. Among the Greeks the oil was valued as an important article of diet, as well as for its external use. The Roman people employed it largely in food and cookery,—the wealthy as an indispensable adjunct to the toilet ; and in the luxurious days of the later empire it became a favourite axiom that long and plea- sant life depended on two fluids, " wine within and oil without." Pliny vaguely describes fifteen varieties of olive cultivated in his day,—that called the " Licinian" being held in most esteem, and the oil obtained from it at Venafrum in Campania the finest known to Roman connoisseurs; the produce of Istria and Betica was regarded as second only to that of the Italian peninsula. The gourmet of the empire valued the unripe fruit, steeped in brine, as a provocative to the palate, no less than his modern representative ; and pickled olives, retaining their characteristic flavour, have been found among the buried stores of Pompeii. The bitter juice or refuse deposited during expression of the oil (called amurca), and the astringent leaves of the tree have many virtues attributed to them by aneient authors. The oil of the bitter wild olive was employed by the Roman physicians in medieine, but does not appear ever to have been used as food or in the culinary art.~~

~~In modern times the olive has been spread widely over the world ; and, though the Mediterranean lands that were its ancient home still yield the chief supply of the oil, the tree is now culti- vated successfully in many regions unknown to its early distributors. Soon after the discovery of the American continent it was conveyed thither by the Spanish settlers. In Chili it flourishes as Inxu- riantly as in its native land, the trunk sometimes becoming of large girth, while oil of fair quality is yielded by the fruit. To Peru it was carried at a later date, but has not there been equally successful. Introduced into Mexico by the Jesuit missionaries of the 17th century, it was planted by similar agency in Upper California, where it has prospered latterly under the more careful management of the Anglo-Saxon conqueror. Its cultivation has also been attempted in the south-eastern States, especially in Carolina, Florida, and Mississippi. In the eastern hemisphere the olive has been established in many inland districts, which would have been anciently considered ill adapted for its culture. To Armenia and Persia it was known at a comparatively early period of history, and inany olive-yards now exist in Upper Egypt, where the cultivation is said to be increasing. The tree has lately been introduced into Chinese agriculture, while in the present genera- tion it promises to become an important addition to the resources of the Australian planter. In Queensland the olive has found a climate specially suited to its wants; in South Australia, near Adelaide, it also grows vigorously ; and there are probably few coast districts of the vast island-continent where the tree would not flourish. It has likewise been successfully introduced into some parts of the Cape Colony. (C. P. J.)~~

~~OLIVES, Mount or, or Mount OLIVET (épos €Acu@vos or tov éda@v, in Mishna and Midrash p'nyn7n or~~

~~nnvinin, now Jebel al-Tir), is the hill facing the~~

~~Temple Mount on the east, and separated from it by the Kidron (see vol. xiii. p. 636 sg.). Here our Lord sat when He delivered His great eschatological address (Mark xiii, 3). That the ascension took place from the summit of the Mount of Olives is not necessarily implied in Acts i. 12, and appears to be excluded by Luke xxiv. 50, for Bethany lies at the back of the hill and almost a mile from the top. But since Constantine erected the basilica of the~~

ascension on the spot marked by a certain sacred cave (Euseb., V. Const., iii. 41) the site of the ascen- sion has been placed here and marked by a succession of churches. The present building is quite modern. Close to the chapel of the ascension is the vault of St Pelagia, and a little way down the hill is the labyrinth of rock-hewn sepulchral chambers now called the "Tombs of the Pro-

phets." A chapel bearing the name of 'Omar, and said to occupy the place where he encamped when Jerusalem surrendered to the Moslems, formerly stood beside the church of the ascension (Mokaddast).

OLIVETANS, a monastic order, that of Our Lady of Monte Oliveto, following the Benedictine rule, was founded about the year 1313 by Bernardo Tolomei of Siena (see Monacuism). The mother-house at Monte Oliveto Mag- giore, about 19 miles to the south of Siena, is a favourable specimen of a great Benedictine monastery ; the church and library contain some fine inlaid work by Fra Giovanni da Verona (1502-1505), and the court has celebrated frescos by Luca Signorelli and Ant. Bazzi (Soddoma).

OLMSTED, Denison (1791-1859), man of science, was born at East Hartford, Connecticut, U.S.A., on 18th June 1791, and became a student of Yale, where he graduated in 1813, and acted as college tutor from 1815 to 1817. In the latter year he was appointed to the chair of chem- istry, mineralogy, and geology in the university of North Carolina. This chair he exchanged for that of mathe- matics and physics at Yale in 1825; in 1836, when this professorship was divided, he retained that of astronomy and natural philosophy. He died at New Haven, Connec- ticut, on 13th May 1859.

His first publication (1824-25) was the Report of his geological survey of the State of North Carolina. It was followed by various text-books on natural philosophy and astronomy, but he ts chiefly known to the scientific world for his observations on hail (1830), on meteors, and on the aurora borealis. For his conclusions on the last-named subject see vol. viii. of the Smithsonian Contributions.

OLMUTZ (Slavonic, Olomouc or Holomauc), the second city and the ecclesiastical metropolis of Moravia, and one of the strongest fortresses in the Austrian empire, is situ- ated on the March, about 110 miles to the north of Vienna. Like most Slavonic towns, it contains several large squares, the chief of which is adorned with a trinity column, 115 feet high. The most prominent church is the cathedral, a Gothic building of the 14th century, containing the tomb of King Wenceslaus III., who was murdered here in 1306. The principal secular buildings are the archbishop's palace, the town-house, the arsenal, the barracks, and the various schools, convents, and hospitals. The old university is now represented by a theological faculty attended by about a hundred students. Its library formerly possessed an im- portant collection of Slavonic works, which was carried off by the Swedes during the Thirty Years' War. There is also an industrial museum. The manufactures of Olmiitz itself are comparatively insignificant, but it is important as the emporium of a busy mining and industrial district and as a mart for Russian and Moldavian cattle. The population in 1880 was 20,176, besides which there is a garrison of about 6000 men. German is the predominant language. The chief part of the fortifications, which were originally constructed in the time of the wars with Frederick the Great, consists of a girdle of about twenty outlying forts. In case of attack the adjacent district can be flooded with the water of the March.

Olmiitz is said to occupy the site of a Roman fort founded in the imperial period, the original name of which, Mons Julii, has been gradually corrupted to the present form. At a later period Olmiitz was long the capital of the Slavonic kingdom of Moravia, but it ceded that position to Briinn in 1640. During the Thirty Years' War it was occupied by the Swedes for eight years, and in 1758 it successfully resisted Frederick the Great during a siege of seven weeks, In 1848 Olmiitz was the scene of the emperor Ferdinand's abdication, and in 1850 of an important conference, for an account of which see GERMANY and AusTRIA. The bishopric of Olmiitz was founded in 1073, and raised to the rank of an archbishopric in 1777. The bishops were created princes of the empire in 1588. The archbishop is the only one in the Austrian empire who is elected by the cathedral chapter.

OLONETZ, a government of north-western Russia, ex- tending from Lake Ladoga almost to the White Sea, is

~~bounded on the W. by Finland, on the N. and E, by~~

~~Archangel and Vologda, and on the 8. by Novgorod. The area is 57,440 square miles. Its north-western por- tion belongs orographically and geologically to the Finland region; it is covered with hills reaching 1000 feet in height, and with numberless smaller ridges and hollows running from north-west to south-east. The rest of the government is a flat plateau sloping towards the marshy lowlands of the south. The geological structure is very varied. Granites, syenites, and diorites, covered with Laurentian metamorphic slates, occur extensively in the north-west. Near Lake Onega they are covered with Devonian sandstones and limestones, yielding marble and sandstone for building ; to the south of that lake the Car- boniferous limestones and clays make their appearance. The whole is covered by vast beds of boulder-clay,—the bottom moraine of the great ice-sheet of the Glacial period. The entire region bears traces of glaciation, either in the shape of scratching and elongated grooves on the rocks, or of eskers (asar, selgas) running parallel to the glacial stria- tion. Numberless lakes, more than 2000 being already laid down on the maps, still occupy the depressions of the surface, while a great many more have left evidence of their past existence in the shape of extensive marshes. Lake Onega covers 3765 square miles and reaches a depth of 125 fathoms. Lakes Seg, Vyg, Lache, and Vodlo cover from 140 to 480 square miles each, and their crustacean fauna shows a former connexion with the Arctic Ocean. The south-eastern part of Lake Ladoga belongs also to the government of Olonetz. Altogether, the area covered by lakes, marshes, and rivers reaches one-fifth of the whole surface. The rivers belong to the Baltic and White Sea basins. To the former system belong Lakes Ladoga and Onega, which are connected by the Svir and receive numer- ous streams; of these the Vytegra, which communicates with the Mariinsk canal-system, and the Oyat, an affluent of Lake Ladoga, are important for navigation. No less than 4,000,000 cwts. of timber, fire-wood, stone, metal, and flour are annually shipped on waters belonging to this government. The Onega river, which has its source in the south-eastern parts of the government and flows into the White Sea, is of minor importance. Seventy per cent. of the area of~~

~~Olonetz is occupied by forests; those of the crown, maintained for shipbuilding purposes, cover more than 800,000 acres.~~

~~The climate is harsh and moist, the average yearly temperature at Petrozavodsk (61° 8' N. lat.) being 33°:6 Fahr. (12°°0 in January, 57°°4 in July) ; the thermometer rarely falls under — 30° Fahr. The population, which numbered 321,250 in 1881 (296,400 in 1873), is made up of Great Russians and Finns; Karelians and Tchudis are estimated at about 52,000 each. The people mostly belong to the Greek Church, or are Nonconformists. Sparse though it is, the~~

~~population is still too dense in certain places when the smallness~~

~~of the area available for agriculture (only the summits of the selgas, or elongated ridges separated by marshes) is taken into account. The villages are mostly small, and in several parts of the government are still aggregated into federations of communes. Only 765,000 acres were under crops in 1877. Cattle and horse breeding, which are much interfered with by plague, are insignificant. The chief source of wealth is the timber-trade, next to which come fishing and hunting. Mushrooms and berries are exported to St Peters- burg. There are also quarries and iron-mines, and some 1600 men find employment in saw-mills, tanneries, iron-works, distilleries, and flour-mills. More than one-fifth of the entire male population leave their homes every year in search of employment. The govern- ment is divided into seven districts, the chief towns of which are the capital Petrozavodsk (12,000 inhabitants), Kargopol, Olonetz, Povyenets, Vytegra, and Pudozh. Olonetz includes the " Olonetz Mining District," a territory belonging to the crown, which covers 432 square miles and extends partly into the Serdobol district of Finland. The iron-works were begun by Peter I. in 1701-14. There is a population of about 60,000, who were, until 1864, serfs to the crown.~~

~~Olonetz was colonized by Novgorod in the 11th century, and though it suffered much from Swedish invasion its towns soon became wealthy trading centres. Ivan JII. annexed it to the principality of Moscow.~~

~~OLO—~~

~~OLORON-SAINTE-MARIE, the chief town of an arron- dissement in the department of Basses-Pyrénées, France, lies about 21 miles south-west of Pau, at the confluence of the mountain torrents (locally known as "gaves") Aspe and Ossau, which unite to form the Oloron, a tributary of the Pau. The united population of Oloron and of Sainte- Marie, on the opposite bank of the Aspe, is 7746. Oloron, curiously clustered on the summit and slopes of a steep hill, has remains of old ramparts and pleasant promenades with beautiful views. The only building of interest, the church of the Sainte-Croix, belongs mainly to the 11th century ; it contains a large altar of gilded wood, constructed in the Spanish style of the 17th century. The church of Sainte- Marie, which formerly served as the cathedral of Oloron, is a medley of various styles from the llth to the 15th century, and its sculptures are more antique than tasteful. The fairs and markets of Oloron for cattle, horses, wool, and hams are much frequented. It manufactures woollen goods, textile fabrics, and caps (bérets), and has also tan- yards and flour-mills.~~

~~Oloron, formerly Iluro, an ancient episcopal town, was destroyed by the Saracens, and afterwards by the Normans, and was re- built in 1080 by the viscount of Béarn. At the Reformation the place became a centre of Catholic reaction. In the 17th century it carried on a considerable trade with Aragon, until the Spaniards, jealous of its prosperity, pillaged the establishments of the Oloron merchants at Saragossa in 1694,—a disaster from which it only slowly recovered. 'The bishopric was suppressed in 1790.~~

~~OLYBRIUS, Roman emperor from 11th July to 23d October 472, was a member of the Anician family and a native of Rome, where he lived until the sack of Genseric in 455. He then went to Constantinople, where in 464 he was made consul, and about the same time married Placidia, daughter of Valentinian III. In 472 he was sent to Italy by the emperor Zeno to assist Anthemius against Ricimer, but, having entered into negotiations with the latter, was himself proclaimed emperor, and, on the murder of his rival, ascended the throne unopposed. His reign was as uneventful as it was brief. He died from natural causes.~~

OLYMPIA. The purpose of this article is to give a short but clear summary for English readers of the principal results obtained by the German exploration of Olympia in 1875-81, and recorded in the five volumes of the Ausgrabungen published at Berlin. While the sketch is necessarily confined to salient features and essential points, two aims have been kept in view :—first, to omit nothing that is important to the general study of antiquity ; secondly, to make the outlines, however slight, sufficiently precise and consecutive to serve as an introduction toa more special archeological study. Having enjoyed the advantage of seeing the excavations, under the courteous guidance of Dr. Treu (then at the head of the German archeological mission), at the close of the third campaign in June 1878, the writer is able to speak of the ground not from a book-knowledge alone. A few words must be premised on the geography and history of Olympia, so far as an acquaintance with the broader aspects of these must be presupposed in an intelligent survey of the topography.

On the western side of the Peloponnesus, the Alpheus, the chief river of the peninsula, issues from the central highlands of Arcadia. Increased by the tributary streams of the Ladon and the Erymanthus, it then flows, in a broad bed, between hills which gradually subside, until it enters on the sandy levels of the coast, and reaches the sea be- tween two long lagoons. The district traversed by its lower course is that which was anciently called Pisatis, extending from the mouth of the Alpheus to the Eryman- thus, between Elis on the north and Triphylia on the south. The alpine character of Arcadia has here entirely

disappeared. There are few steep cliffs or rocks; the.

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banks of the river are generally covered with alluvial earth; and rich vegetation prevails, with abundance of evergreen trees and bushes. Cornfields, vines, and currants are plentiful; even the sandy tracts, coated with a rich mud, prove fertile. Cattle-breeding prospers on the higher ground of Mount Pholoe ; and the lagoons yield fish. The stay-at-home character of the inhabitants which the his- torian Polybius notices was a natural result of their en- vironment. While the region was ill-suited to the secure development of a strong state, it was eminently favourable to a life of

quiet industry, and was open on every side to peaceful intercourse with the neighbouring country. The ° ancient landing-place was at the mouth of the Alpheus,— about 3000 metres above the present mouth. The site of the modern town of Pyrgos—then much nearer the sea— may be that of the ancient Dyspontium. The only modern landing-place is at Catdcolo, where a mole has been constructed by French engineers. It is visited by coasting steamers, being one of the export-stations of the currant-trade. In the valley of the Alpheus, a few miles east of the point at which it enters on the flat seaboard, there existed a primitive shrine of the Pelasgian Zeus. As in other places associated with his worship, the low range bounding the Alpheus on the north was called Olympus, while the name of Ossa was given to the hill-boundary of the valley on the south. When the worship of the Hel- lenic Zeus had been established on this spot, the place acquired the name of Olympia.

Olympia is on the right or north bank of the Alpheus (now the Ruphia), about 16 kilometres east in a straight line from the modern Pyrgos. The course of the river is here from east to west, and the average breadth of the valley is about 1000 metres. At this point a small stream, the ancient Cladeus, flows from the north, into the Alpheus. The area known as Olympia is bounded on the west by the Cladeus, on the south by the Alpheus, on the north by the low heights which shut in the Alpheus valley, and on the east by the ancient race-courses. One group of these heights terminates in a conical hill, about 122 metres high, which is cut off from the rest by a deep cleft, and descends abruptly on Olympia. This hill is the famous Cronion (Kpoviov), sacred to Cronus, the father of Zeus.

The natural situation of Olympia is, in one sense, of great beauty. When Lysias, in his Olympiacus (spoken here), calls it 'the fairest spot of Greece," he was doubtless thinking also—or perhaps chiefly—of the masterpieces which art, in all its forms, had contributed to the embellish- ment of this national sanctuary. But even now the praise seems hardly excessive to a visitor who, looking eastward up the valley of Olympia, sees the snow-crowned chains of Erymanthus and Cyllene rising in the distance. The valley, at once spacious and definite, is a natural temenos. Nowhere could the Greek Zeus be more fitly honoured by the display of human gifts,

physical or mental ; nowhere could the divided communities of Hellas find a more con- venient or attractive place of peaceful re-union.

The importance of Olympia in the history of Greece has, in fact, this twofold character: it is at once religious and political. The religious associations of the place date from the prehistoric age, when, before the states of Elis and Pisa had been founded, predecessors—perhaps ancestors—of the Hellenes worshipped the "heaven-father" in this valley. The political associations may be said to date from the time when the Achzans founded Pisa, and combined the Pelasgian worship of the god Zeus with a local cult of their own ancestor, the hero Pelops. It was then, and in honour of Pelops, that games were probably instituted for the first time at Olympia. The addition of Hera and of the mother of the gods to the specially honoured deities must have come early in the Hellenic period. Elis and

Pisa were at first associated, as equal states, in the control of the Olympian festival. Sixteen women, representing eight towns of Elis and eight of Pisatis, wove the festal peplus for the Olympian Hera. Olympia thus became the centre of an dudixtvovia, or federal league under religious sanction, for the west coast of the Peloponnesus, as Delphi was for its neighbours in northern Greece. It suited the interests of Sparta to join this amphictyony ; and, before the regular catalogue of Olympic victors begins in 776 B.c., Sparta had formed an alliance with Elis. Aristotle saw in the temple of Hera at Olympia a bronze disk, recording the traditional laws of the festival, on which the name of Lycurgus stood next to that of Iphitus, king of Elis. Whatever may have been the age of the disk itself, the relation which it indicates is well attested. Elis had from the first been stronger than Pisa. Elis and Sparta, making common cause, had no difficulty in excluding the Pisatans from their proper share in the management of the Olympian sanctuary. Pisa had, indeed, a brief moment of better fortune. The ascendency of Pheidon of Argos enabled him to reassert the old Achzan claim by celebrating the 28th Olympiad under the presidency of the Pisatans. This festival, from which the Eleans and Spartans were excluded, was afterwards struck out of the official register, as having no proper existence. At last, about 570 B.c., the destruc- tion of Pisa by the combined

forces of Sparta and Elis put an end to the long rivalry. Not only Pisatis, but also the district of Triphylia to the south of it, now became depend- ent on Elis. So far as the religious side of the festival was concerned, the Eleans had now an unquestioned supre- macy. It was at Elis, in the gymnasium of the city, that candidates from all parts of Greece were tested, before they were admitted to the athletic competitions at Olympia. To have passed through the training (usually of ten months) at Ehs was regarded as the most valuable preparation. Elean officials, who not only adjudged the prizes at Olympia, but decided who should be admitted to compete, marked the national aspect of their functions by assuming the title of Hellanodice.

Long before the overthrow of Pisa the list of contests at Olympia had been so enlarged and diversified as to invest the celebration with a Panhellenic character. Exercises of a Spartan type—testing endurance and strength with an especial view to war—had almost exclusively formed the earlier programme. But as early as the 25th Olympiad —.e., several years before the interference of Pheidon on behalf of Pisa—the four-horse chariot-race was added. This was an invitation to wealthy competitors from every part of the Hellenic world, and was also the recognition of a popular or spectacular element, as distinct from the skill which had a merely athletic or military interest. Horse-races were added later. For such contests the hippodrome was set apart. Meanwhile the list of contests on the old racecourse, the stadion, had been enlarged. Besides the foot-race in which the course was traversed once only, there were now the diaulos or double course, and the "long" foot-race (dolichos). Wrestling and box- ing were combined in the pancration. Leaping, quoit- throwing, javelin-throwing, running, and wrestling were combined in the pentathlon.

After the conquest of Messenia Spartan ambition had turned towards Arcadia. The aim of the Spartans was nothing less than the subjugation of the entire Pelo- ponnesus. But the decided check which the aggressors experienced in their new attempt produced a change of design, It became evident that a policy of forcible an- nexation could be pushed no further. Yet Sparta might at least aspire to the hegemony of the peninsula. The other states of the Peloponnesus, while remaining independent, might be virtually under Spartan control. And for the

~~establishment of such a hegemony what agency could be more suitable than that of Olympia? In the Olympian amphictyony, Sparta, closely allied with Elis, already held a commanding position. The rising popularity of the festival was constantly tending to make Olympia the religious and social centre of Peloponnesian life—indeed, in some sense, of the Hellenic world. As the Eleans, there- fore, were now the religious supervisors of Olympia, so the Spartans aimed at constituting themselves its political protectors. Their military strength—greatly superior at the time to that of any single Hellenic state—readily enabled them to do this in the most effectual manner. Spartan arms could enforce the sanction which the Olympian Zeus gave to the oaths of the amphictyones, whose federal bond was symbolized by common worship at his shrine. Spartan arms could punish any violation of that 'sacred truce '' which was indispensable if Hellenes from all cities were to have peaceable access to the Olym- pian festival. And in the eyes of all Dorians the assured dignity thus added to Olympia would be enhanced by the fact that the protectors were the Spartan Heraclide.~~

~~Thus, under the permanent guarantee of the strongest military power, and at the same time under auspices which, for a large part of the Greek world, were the most illustrious possible, Olympia entered on a new phase of brilliant and secure existence as a recognized Panhellenic institution. This phase may be considered as beginning after the de- struction of Pisa, about 570 B.c. And so it continued to be to the last. While the details of the scene and of the festival were the subjects of endless modification or change, Olympia always remained a central expression of the Greek ideas that the body of man has a glory as well as his intellect and spirit, that body and mind should alike be disciplined, and that it is by the harmonious discipline of both that men best honour Zeus. The significance of Olympia was larger and higher than the political fortunes of the Greeks who met there, and it survived the overthrow of Greek independence. In the Macedonian and Roman ages the temples and contests of Olympia still interpreted the ideal at which free Greece had aimed. Philip of Macedon and Nero are, as we shall see, among those whose names have a record in the Altis. Such names are typical of long series of visitors who paid homage to Olympia. Even those who were least in sympathy with the old spirit of the festival could~~

still feel that the place was représent- ative and unique. According to Cedrenus, a Greek writer of the 11th century (Zdvoyis 'Ioropiay, i. 326), the Olympian festival ceased to be held after 393 a.p., the first year of the 293d Olympiad. The list of Olympian victors, which begins in 776 B.c. with Corcebus of Elis, closes with the name of an Armenian, Varastad, who is said to have be- longed to the race of the Arsacid. In the 5th century the desolation of Olympia had set in. The chryselephant- ine statue of the Olympian Zeus, by Phidias, was carried to Constantinople, and perished in a great fire, 476 a.D. The Olympian temple of Zeus is said to have been destroyed, either by the Goths or by Christian zeal, in the reign of Theodosius IT. (402-450 a.p.).

The German excavations at Olympia were begun in 1875. After six campaigns, of which the first five lasted from September to June, they were completed on the 20th of March 1881. The result of these six years' labours was, first, to strip off a thick covering of earth from the Altzs, the consecrated precinct of the Olympian Zeus. This covering had been formed, during some twelve centuries, partly by clay swept down from the Cronion, partly by deposit from the overflowings of the Cladeus. The task presented to the German explorers may be judged by the fact that the coating of earth over the Altis had an average depth of no less than five metres.

Their work could not, however, be restricted to the Altis. It was necessary to dig beyond it, especially on the west, the south, and the east, where several ancient buildings existed, not included within the sacred precinctitself. The complexity of the task was further increased by the fact that in many places early Greek work had later Greek on top of it, or late Greek work had been overlaid with Roman. In a concise survey of the results obtained, it will be best to begin with the remains external to the precinct of Zeus.1

I.—REMAINS OUTSIDE THE ALTIS.

A. West Side.—The materials and the technical character of the wall bounding the Altis on the west are the same as those which belong to the western portion of the south Altis wall. Both be- long to the earlier part of the Macedonian age, and to a time at which the Altis received its largest

traceable extension to west, north-west, and south-west. In the west wall were two gates, one at its northern and the other at its southern extremity. Each

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Plan of Olympia.

gate was mpéarvdos, having before it on the west a colonnade con- sisting of a double row of four columns. A third and smaller gate, at about the middle point of the west wall, and nearly opposite the Pelopion in the Altis, was probably of a later age.

West of the west Altis wall, on the strip of ground between the Altis and the river Cladeus (of which the course is roughly parallel to the west Altis wall), the following buildings were traced. The order in which they are placed here 1s that in which they succeed each other from north to south.

1. Just outside the Altis at its north-west corner was a Gymna- sium.

uoit-throwing, javelin-throwing, running. 'The great length of the east portico is thus explained.

2. Immediately adjoining the gymnasium on the south was a Palestra, the place of exercise for wrestlers and boxers. It was

1 Permission to use the accompanying plan of Olympia has kindly been given by the publisher, Herr Weidmann of Berlin.

in the form of a square, of which each side was about 64 metres long, enclosing an inner building surrounded by a Dorie colon- nade. Facing this inner building on north, east, and west were rooms of different sizes, to which doors or colonnades gave access. The chief entrances to the palestra

were at south-west and south-east, separated by a long Ionic porch which extended along the south side.

3. Near the palestra on the south a Byzantine church forms the central point in a complex group of remains. (a) The church itself occupies the site of an older brick building, which is perhaps a remnant of the "workshop of Phidias" seen by Pausanias. (6) North of the church is a square fountain-house, of the Hellenic age. (c) West of this is a small circular structure, enclosed by square walls. An altar found (im sitw) on the south side of the circular enclosure shows by an inscription that this was the Heroon, where worship of the heroes was practised down to a late period. (d@) East of the fountain-house stood a large building, of Roman age at latest, arranged round an inner hall with colonnades, Its particular destination is uncertain. (e) So, too, is that of a long and narrow building on the south of the Byzantine church. It may have been the priests' house mentioned by Pausanias, or it may have been occupied by the gadpivra, those alleged " descend-

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ants of Phidias" (Pans. v. 14) whose hereditary privi- lege it was to keep the v® | statue of Zeus clean. The gh so-called "workshop of ui Phidias" (see a) evidently owed its preservation to the fact that it continued to be used for actual work, and the adjacent building would have been a con- venient lodging for the English Feet artists. ma 4. South of the group described above occur the remains of a large build- ing, dating from the late Hellenic or early Macedonian age. It is an oblong, of which the north and south sides measure about 80 metres, the east and west about 73. Its orientation differs from that of all the other build- ings above mentioned, being not from north to south, but from west-south-west to east-north-east. and there are signs that it was built before the west Altis wall. Externally it is an Ionic peri- pteros, enclosing suites of rooms, large and small, grouped round a small interior Doric peristyle. In Roman times it was altered in such a way as to distribute the rooms into (apparently) four quarters, each having an atrium with six or four columns. The most prob- able conjecture is that it was used as a lodging for distinguished visitors during the games,

such as the heads of the special missions from the various Greek cities (dpxi@éwpo.), or Roman officials. Traces existing within the exterior porticos on north, west, and east indicate much carriage traffic.

B. South Side.—Although the limits of the Altis on the south (t.e., on the side towards the Alpheus) can be traced with approxi- mate accuracy, the precise line of the south wall becomes doubtful after we have advanced a little more than one-third of the distance from the west to the east end of the south side. The middle and eastern portions of the south side were places at which architect- ural changes, large or small, were numerous down to the latest times, and where the older buildings met with scant mercy. The westernmost and best-defined part of the south-wall line is, as already stated, coeval with the west wall, belonging to the early Macedonian age.

1. The Council Hall (BovXevryjpiov, Paus. v. 23) was just out- side the Altis, nearly at the middle of its south wall. It comprised

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two séparate Doric buildings of identical form, viz., oblong, having a single row of columns dividing the length into two naves, and terminating to the east in a semicircular apse. The orientation of each was from west-south-west to east-north-east, one being south-south-east of the other. In the space between stood a small square building. In front, on the east, was a portico extending along the front of all three buildings ; and east of this again a large trapeze-shaped vestibule or fore-hall, enclosed by a colonnade. This bouleuterion would have been available on all occasions when Olympia became the scene of conference or debate between the representatives of different states, whether the subject was properly political, as concerning the amphictyonic treaties, or related nore directly to the administration of the sanctuary and festival. Two smaller Hellenic buildings stood immediately west of the bouleu- terion. The more northerly of the two opened on the Altis. Their purpose is uncertain.

2. Close to the bouleuterion on the south, and running parallel with it from south-west by west to north-east by east, was the South Portico, a late but

handsome structure, closed on the north side, open on the south and atthe east and west ends The external colonnade (on south, east, and west) was Doric; the interior row of columns Corinthian. It was used as a promenade, and as a place from which to view the festal processions as they passed towards the Altis.

8. East of the bouleuterion was a gateway of Roman age, with triple entrance, the central being the widest, opening on the Altis from the south. North of this gateway, but at a somewhat greater depth, traces of a pavement were found in the Altis. This was manifestly the gateway by which the sacred processions entered the Altis in Roman times. The older processional route, however, prob- ably struck the sonth boundary of the Altis at a point somewhat to the west of the Roman gate, proceeding past the front of the bouleuterion and the eastern end of the south portico.

C. Hast Side.—The line of the east wall, running due north and south, can be traced from the north-east corner of the Altis down about three-fifths of the east side, when it breaks off at the remains known as " Nero's house." These are the first which claim atten- tion on the cast side.

1. Pausanias mentions a building called the Leonidaion, crected by the Elean Leonidas " outside the Altis, and near the Processional Gate." This Leonidaion was the point from which he set out on many of his walks in the Altis. Its original form is traceable in Hellenic remains at the south-east angle of the Altis, which show that the Leonidaion—an oblong structure with colonnade on north, west, and south—stood within the Altis. But the Greek Leonidaion was afterwards absorbed into a Roman house which projected be yond the Altis on the east, the south part of the east Altis wall being destroyed to admit of this. A piece of leaden water- pipe found in the house bears NER, AVG. Only a Roman master could have dealt thus with the Altis, and with a building which, like the Leonidaion, stood within its sacred precinct. It cannot be doubted that the Roman house—from which three doors gave access to the Altis—was that occupied by Nero when he visited Olympia. Later Roman hands again enlarged and altered the building, which may perhaps have been used for the reception of Roman governors. But Pausanias, who speaks only of a Leonidaion, shows that the

old Greek name was retained, even when the building of Nero's time had placed the new Leonidaion beyond the limits of the Altis.

2, Following northwards the line of the east wall, we reach at the north-east corner of the Altis the entrance to the Stadion, which extends east of the Altis in a direction from west-south-west to cast-north-cast. The apparently strange and inconvenient posi- tion of the Stadion relatively to the Altis was due simply to the necessity of obeying the conditions of the ground, here determined by the curve of the lower slopes which bound the valley on the north. The German explorers excavated the Stadion so far as was necessary for the ascertainment of all essential points. Weak walls had originally been built on west, east, and south, the north boundary being formed by the natural slope of the hill. The walls were afterwards thickened and raised. The space thus defined was a large oblong, about 214 metres in length by 32 in breadth. There were no artificial seats. It is computed that from 40,000 to 45,000 spectators could have found sitting-room, though it is hardly probable that such a number was ever reached. The exact length of the Stadion itself—which was primarily the course for the foot-race—was 192°27 metres,—an important result, as it determines the Olympian foot to be 0°3204 metre. In the Heraion at Olympia, it may be remarked, the unit adopted was not this Olympian foot, but an older one of 0°297 metre. The starting- point and the goal in the Stadion were marked by limestone thresholds. Provision for drainage was made by a channel running round the enclosure. The Stadion was used not only for foot-races but for boxing, wrestling, leaping, quoit-throwing, and javelin- throwing.

The entrance to the Stadion from the north-cast corner of the Altis was a privileged one, reserved for the judges of the games, the competitors, and the heralds. Its form was that of a vaulted

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tunnel, 100 Olympian fect in length. Dating from about 350-300 B.c., it is one of the oldest examples of vaulted work in cut stone. To the west was a vestibule, from which the Altis was entered by a handsome gateway.

3. The Hippodrome, in which the chariot-races and horse-races werc held, can no longer be accurately traced. The overflowings of the Alpheus have

washed away all certain indications of its limits. But it is clear that it extended south and south-east of the Stadion, and roughly parallel with it, though stretching far beyond it to the east. From the state of the ground the German explorers inferred that the length of the hippodrome was 770 metres or 4 Olympic stadia.

D. North Side.—If the northern limit of the Altis, like the | west, south, and east, had been traced by a boundary wall, this would have had the effect of excluding from the precinct a spot so sacred as the Cronion, the hill inseparably associated with the oldest worship of Zeus at Olympia. It seems therefore unlikely that any such northern boundary wall ever existed. But the line which such a boundary would have followed is partly represented by the remains of a wall,running from east to west immediately north of the treasure-houses (see below), which it was designed to protect against the descent of earth from the Cronion just above. This was the wall along which, about 157 A.p., the main water-channcl constructed by Herodes Atticus was carried.

Having now surveyed the chief remains external to the sacred precinct on west, south, east, and north, we procced to notice those which have been traced within it.

IJ.—REMAINS WITHIN THE ALTIS.

The form of the Altis, as indicated by the existing traces, is not regularly rectangular. The length of the west side, where the line of direction is from south-south-east to north-north-west, is about 195 metres. The south side, running nearly due east and west, is about equally long, if measured from the end of the west wall to the point which the east wall would touch when produced due south in a straight line from the place at which it was demolished to make way for " Nero's house." The east side, measured to a point just behind the treastire-houses, is the shortest, about 180 metres. The north side is the longest. A line drawn eastward behind the treasure-honses, from the Prytaneion at the north-west angle, would give about 250 metres.

The remains or sites within the Altis may conveniently be classed in three main groups, viz.—(A) the chief centres of re- ligious worship ; (B) votive

~~buildings; (C) buildings, &c., connected with the administration of Olympia or the reception of visitors.~~

~~A. Chief Centres of Religious Worship.—l. The earliest Hellenic phase of the sanctuary, when a pre-Hellenic worship of Zeus was combined with a cult of the hero Pelops, is recalled by the Altar of Zeus. This, the central object of the older temenos, stood a little east of the Pelopion, and after the Altis had been enlarged was still nearly at its centre. The basis was of elliptic form, the . length of the lozenge being directed from south-south-west to north- north-east, in such a manner that the axis would pass through the Cronion. The upper structure imposed on this basis was in two tiers, and also, probably, lozenge-shaped. This was the famous 'Cash-altar" at which the Iamide, the hereditary gens of udvreis, practised those rites of divination by fire (uayrixy 50 éur'pwy) in virtue of which more especially Olympia is saluted by Pindar as 'mistress of truth" (déorow' ddadelas). The steps by which the priests mounted the altar seem to have been at north and south.~~

~~2. The Pelopion, to the west of the Altar of Zeus, was a small precinct in which, from the time when Pisa was founded by the Acheans, sacrifices were offered to the Achezan #pws Pelops. The traces agree with the account of Pausanias. Walls, inclined to each other at obtuse angles, enclosed a plot of ground having in the middle a low tumulus of elliptic form, about 35 metres from east to west by 20 from north to south. A Doric propylaion with three doors gave access on the south-west side.~~

~~The three temples of the Altis were those of Zeus, Hera, and the Mother of the gods. All were Doric. All, too, were completely surrounded by a colonnade, 7.e., were " peripteral."~~

~~3. The Temple of Zeus, south of the Pelopion, stood on a high substructure with three steps. The colounades at the east and west side were of six columns each ; those at the north and south sides (counting the corner columns again) of thirteeneach. The cella had a prodomos on the east and an opisthodomos on the west. The cella itself was divided longitudinally (i. ¢., from east to west) into three partitions by a double row of columns. The central partition, which was the widest, consisted of three sections. The west section was shut off ; it contained the throne and image of the~~

~~Olympian Zeus. The middle section, next to the east, contained a table and stele. Here, probably, the wreaths were presented to the victors. The third or easternmost section, which had side porticos, was. open to the public. This temple was most richly adorned with statues and reliefs. On the east front Peeonius had represented in twenty-one colossal figures the moment before the contest between Ginomaus and Pelops. The west front exhibited the fight of the~~

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~~Lapithe and Centaurs, and was connected with the name of Alca- menes. The Twelve Labours of Heracles were depicted on the metopes of the prodomos and opisthodomos ; and of these reliefs much the greater part was found,—enough to determine with certainty all the essential features of the composition. It was near this temple, at a point about 35 metres east-south-east from the south-east angle, that the explorers found the fragment of a flying goddess of victory—the Nice of Pxonius.~~

~~4, The Temple of Hera (Heraion), north of the Pelopion, was raised on two steps. It was originally built as a temple in antis, and afterwards converted into a peripteros, having colonnades of six columns each at east and west, and of sixteen each (counting the corner-columns again) at north and south. It was smaller than the temple of Zeus, and, while resembling it in general plan, differed from it by its singular length relatively to its breadth. When Pausanias saw it, one of the two columns of the opisthodomos (at the west end of the cella) was of wood; and for a long period all the columns of this temple had probably been of the same material. A good deal of patch-work in the restoration of particular parts seems to have been done at various periods. The cella—divided, like that of Zeus, into three partitions by a double row of columns—had four "tongue-walls," or small screens, projecting at right angles from its north wall, and as many from the south wall. Five niches were thus formed on the north side and five on the south. In the third niche from the east, on the north side of the cella, was found one of the greatest of all the treasures which rewarded the German explorers,—the Hermes of Praxiteles (1878).~~

~~5. The Temple of the Mother of the Gods (Metroon) was again considerably smaller than the Heraion. It stood to the east of the latter, and had a~~

~~different orientation, viz., not west to east, but west-north-west to east-south-east. It was raised on three steps, and had a peripteros of six columns (east and west) by eleven (north and south), having thus a slightly smaller length relatively to its breadth than either of the other two temples. Here also the cella had prodomos and opisthodomos. this temple had once been very rich and varied. There are indica- tions that in Roman times it underwent a restoration, conducted, apparently, with little taste or skill.~~

~~B. Votive Edifices.—Under this head are placed buildings erected, either by states or by individuals, as offerings to the Olympian god.~~

~~1. The twelve Zvreaswre-houses on the north side of the Altis, immediately under the Cronion, belong to this class. We have seen that on the north side the limit of the Altis does not seem to have been defined by a wall, as on the other three sides. Here, then, we cannot distinguish with the same precision between objects within or without the precinct. The row of treasure-houses is, however, so situated that they are most naturally regarded as standing within the Altis, with a single exception. This is the easternmost of the twelve, the treasure-house dedicated by the state of Gela, which projected on the east beyond the line of the east Altis wall. It was evidently the oldest of the series. Originally planned as a small Doric temple in antis, of which the longer sides were the north and south, it was afterwards adorned on the south side with a colonnade, having six columus in front. Doric cut stone-work, overlaid with coloured terra-cotta plates, occurred here, as in monuments found at Gela itself, at Selinus, and elsewhere in Sicily.~~

~~The same general character—that of a Doric temple in antis, facing south—is traceable in all its younger neighbours on the west. In the cases of six of these the fragments are sufficient to aid a reconstruction. Two—viz., the 2d and 3d counting from the west—had been dismantled at an early date, and their site was tra- versed by a roadway winding upward towards the Cronion. This roadway seems to have been older at least than 157 A.p., since it caused a deflexion in the watercourse along the base of the Cronion constructed by Herodes Atticus. Pausanias, therefore, would not have seen treasure-houses Nos. 2 and 3. This explains the fact that, though we can trace twelve, he names only ten.~~

~~As the temples of ancient Greece partly served the purposes of banks, in which precious objects could be securely deposited, so the form of a small Doric chapel was a natural one for the " treasure- house" to assume. Each of these treasure-houses was erected by a Greek state, either as a thank-offering for Olympian victories gained by its citizens, or as a general mark of homage to the Olympian Zeus. The treasure-houses were designed to contain the various dva0#uara or dedicated gifts (such as gold and silver plate, &c.), in which the wealth of the sanctuary partly consisted. The temple inventories recently discovered at Delos illustrate the great quantity of such possessions which were apt to accumulate at a shrine of Panhellenic celebrity. Taken in order from the west, the treasure-houses were founded by the following states:—1, Sicyon ; 2, 3, unknown; 4, Syracuse (referred by Pausanias to Carthage); 5, Epidamnus; 6, Byzantium ; 7, Sybaris; 8, Cyrene; 9, Selinus ; 10, Mctapontum ; 11, Megara ; 12, Gela. It is interesting to remark how this list represents the Greek colonics, from Libya to Sicily, from the Euxine to the Adriatic. Greece proper, on the other hand, is represented only by Megara and Sicyon. The dates of the founda- tions cannot be fixed.~~

~~a short space west-south-west of the Heraion.~~

~~The adornment and painting of~~

~~769~~

~~2. The Philippeion stood near the north-west corner of the Altis, It was dedicated by Philip of Macedon, after his victory at Cheronea (338 B.c.). Asa thank-offering for the overthrow of Greek freedom, it might seem strangely placed in the Olympian Altis. But it is, in fact, only another illustration of the manner in which Philip's position and power enabled him to place a decent disguise on the real nature of the change. Without risking any revolt of Hellenic feeling, the new "captain-general" of Greece could erect a monument of his triumph in the very heart of the Panhellenic sanctuary. The building consisted of a circular Ionic colonnade (of eighteen columns), about 15 metres in diameter, raised on threc steps, and enclosing asmall circular cella, probably adorned with fourteen Corinthian half-columns.~~

3. The Exedra of Herodes Atticus stood at the north limit of the Altis, close to the north-east angle of the Heraion, and immediately west of the westernmost treasure-house (that of Sicyon). It con- sisted of a half-dome of brick, 16°6 metres in diameter, with south- south-west aspect. Under the half-dome were placed twenty-one marble statues, representing the family of Antoninus Pius, of Marcus Aurelius, and of the founder, Herodes Atticus. In front of the half-dome on the south, and extending slightly beyond it, was a basin of water for drinking, 22 metres long. The ends of the basin at north-north-west and south-south-east were adorned by very small open temples, each with a circular colonnade of eight pillars. A marble bull, in front of the basin, bore an inscription saying that Herodes dedicates the whole to Zeus, in the name of his wife, Annia Regilla. The exedra must have been seen by Pausanias, but he does not mention it.

C. It remains to notice those features of the Altis which were connected with the management of the sanctuary or with the accommodation of its guests.

1, Olympia, besides its religious character, originally possessed also a political character, as the centre of an amphictyony. It was, in fact, a sacred 7é\ts. We have seen that it had a bouleu- terion for purposes of public debate or conference. So also it was needful that, like a Greek city, it should have a public hearth or prytaneion, where fire should always burn on the altar of the Olympian Hestia, and where the controllers of Olympia should exercise public hospitality. The Prytaneion was at the north-west corner at the Altis, in such a position that its south-east angle was close to the north-west angle of the Heraion. It was apparently a square building, of which each side measured 100 Olympian feet, with a south-west aspect. It contained a chapel of Hestia at the front or south-west side, before which a portico was afterwards built. The dining-hall was at the back (north-east), the kitchen on the north-west side. On the same side with the kitchen, and also on the opposite side (south-east), there were some smaller rooms.

2. The Poreh of Echo, also called the " Painted Porch" (c7od motxthy), extended to a length of 96 metres along the east Altis wall. Raised on three steps, aud formed by a single Doric colonnade, open towards the Altis, it afforded a place from which spectators could conveniently view the passage of processions and the sacrifices at the great altar of Zeus.

3. Before the Porch of Echo, and east of the Altar of Zeus, was the Proedria, a structure 20 metres long, containing places of honour for officials and visitors of distinction. A flight of steps, curved inwards in a semicircle, gave access from the west. At either end of the Proedria (north and south) stood a colossal Ionic column. These columns, as the inscriptions show, once supported statues of Ptolemy and Berenice.

4. The Agora was the name given to that part of the Altis which had the Porch of Echo and Proedria on the east, the Altar of Zeus on the west, the Metroon on the north, and the precinct of the Temple of Zeus on the south-west. In this part stood the altars of Zeus Agoraios and Artemis Agoraia.

5. The Zanes (Zéves) were brazen images of Zeus, the cost of making which was defrayed by the fines exacted from competitors who had infringed the rules of the contests at Olympia. These images stood at the northern side of the Agora, in a row, which extended from the north-east angle of the Metroon to the gate of the private entrance from the Altis into the stadion. Sixteen pedestals were here discovered in situ. A lesson of loyalty was thus impressed on aspirants to renown by the last objects which met their eyes as they passed from the sacred enclosure to the scene of their trial.

6. Arrangements for Water-supply.—A copious supply of water was required for the service of the altars and temples, for the pri- vate dwellings of priests and officials, for the usc of the gymna- sium, palestra, &c., and for the therm which arose in Roman times. In the Hellenic age the water was derived wholly from the Cladeus and from the small lateral tributaries of its valley. A basin, to serve as a chief reservoir, was built at the north-west corner of the Altis ; and a supplementary reservoir was afterwards constructed a little to the north-east of this, on the slope of the Cronion. A new source of supply was for the first time made available by Herodcs Atticus, c. 157 ap. At a short distance

east of Olympia, near the village of Miraka, small streams flow from comparatively high ground through the side- valleys which descend towards

~~the right or northern bank of the Alpheus. From these side-valleys water was now conducted to Olympia, entering the Altis at its north-east corner by an arched canal which passed behind the treasure-houses to the reservoir at the back of the exedra. The large basin of drinking-water in front of the exedra was fed thence, and served to associate the name of Herodes with a benefit of the highest practical value. Olympia further possessed several fountains, enclosed by round or square walls, chiefly in connexion with the buildings outside the Altis. The drainage of the Altis followed two main lines. One, for the west part, passed from the south-west angle of the Heraion to the south portico outside the south Altis wall. The other, which served for the trea- sure-houses, passed in front of the Porch of Echo parallel with the line of the east Altis wall. The whole subject of the water-works of Olympia was exhaustively investigated by Herr Graber, and has been explained by him in vol. v. of the Excavations, pp. 26 sq. Such, in brief outline, are the more important results of the German exploration of Olympia, an enterprise alike honourable to the Government which undertook it and to the eminent men by whom it was conducted. The work of excavation was from the outset guided by scientific knowledge, and the results were at no point confused or obscured by rash and unsound theories. The general out- come of the undertaking is certainly greater than could have reasonably been anticipated at its commencement. In the Olympia seen by Pausanias there was, of course, very much of which not the slightest trace has been found,—such, for instance, as the temples of Eileithyia, of Aphrodite Urania, and of Demeter Chameune. In regard to particular works of art, many hopes of discovery. have been disappointed, nor can "the survival of the fittest" be always acknowledged in the salvage from so many cen- turies of ruin. On the other hand, the German campaigns had their welcome surprises and their strokes of good fortune, such as the finding of the Hermes and the Nice. Above all, they have their reward in this, that the topo- graphy of Olympia is now thoroughly ascertained. We now know with certainty the exact position of the prin- cipal buildings, the plan of the Altis and its relation to its whole environment, and all the main local conditions of the festival. In reading an Olympian ode of Pindar, the modern student can now call up the scene with ade- quate fulness of detail. Precious as are the particular works of ancient art which have been discovered, and valu- able as are the results of the study of art and architecture, the largest gain of all consists in the vivid and suggestive light~~

~~thus shed on a great centre of Hellenic history and life. (&. On9?)~~
~~OLYMPIAS, the ambitious and energetic wife of Philip IL., king of Macedonia, and the mother of Alexander III., commonly called The Great, was daughter of Neoptolemus I., king of Epirus, who claimed to be descended from Pyrrhus, son of Achilles. Plutarch tells us that it was while being initiated in the Samothracian mysteries, in which she was an enthusiastic participant, that Philip, still very young, fell in love with her. The marriage took place in 359 B.c., shortly after his accession, and Alexander was born in 356. There was also a daughter, named Cleopatra. The fickleness of Philip and the vehement and jealous temper of Olympias led to a growing estrange- ment, which became complete when Philip married a second wife, Cleopatra, in 337. Alexander, who strongly sided with his mother, withdrew, along with her, into Epirus, whence they both returned in the following year, after the assassination of Philip, which Olympias is said to have countenanced. During the absence of Alexander, with whom she had regular correspondence on public as well as domestic affairs, she had great influence in Macedonia, and by her arrogance and ambition gave great trouble to Antipater,—so great, indeed, that on the death of her son (323) she found it prudent to withdraw into Epirus.~~

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~~Here she remained until 317, when, allying herself with Polysperchon, by whom her old enemy had been succeeded in 319, she took the field with an Epirote army; the op- posing troops at once declared in her favour, and for a short period Olympias was mistress of Macedonia. Cas- sander, Antipater's son, speedily, however, returned from the Peloponnesus, and, after an obstinate siege, compelled the surrender of Pydna, where she had taken refuge. One of the terms of the capitulation had been that her life should be spared; but this did not protect her against trial for numerous and cruel executions (including that of Nicanor, Cassander's brother) of which she had been guilty during her short lease of power. Condemned without a hearing, she was put to death tumultuously by the friends of those whom she had slain, and Cassander is said to have denied her remains the rites of burial (316).~~

~~OLYMPUS, the name of many mountains in Greece and Asia Minor, and of the fabled home of the gods, and also a city name and a personal name.~~

~~I. Of the mountains bearing the name the most famous is the lofty ridge on the borders of Thessaly and Macedonia. The river Peneus, which drains Thessaly, finds its way to the sea through the great gorge of Tempe, which is close below the south-eastern end of Olympus and separates it from Mount Ossa. The highest peak of Olympus is over 9000 feet high ; it is covered with snow for great part of the year. Olympus is a mountain of massive appearance, in many places rising in tremendous precipices broken by vast ravines, above which is the broad summit. The lower parts are densely wooded; the summit is naked rock. Homer calls the mountain dydvvidos, paxpds, ToAvderpas 5 the epithets vidoels, roAvdevdpos, frondosus, and opacus are used by other poets. The modern name is "EAvpmo, a dialectic form of the ancient word.~~

~~The peak of Mount Lyceus in the south-west of Arcadia was called Olympus. East of Olympia, on the north bank of the Alpheus, was a hill bearing this name; beside Sellasia in Laconia another. The name was even commoner in Asia Minor : a lofty chain in Mysia (Keshish Dagh), a ridge east of Smyrna (Nif Dagh), other mountains in Lycia, in Galatia, in Cilicia, in Cyprus, &c., were all called Olympus.~~

~~II. A lofty peak, rising high above the clouds of the lower atmosphere into the clear ether, seemed to be the chosen seat of the deity. Homer distinguishes between Olympus, which is the mountain, and the heaven or ether; but later poets use the terms as practically equivalent. In the elaborate mythology of Greek literature Olympus was the common home of the multitude of gods. Each deity had his special haunts, but all had a residence at the court of Zeus on Olympus ; here were held the assemblies and the common feasts of the gods.~~

~~III. There was a city in Lycia named Olynipus ; it was a bishopric in the Byzantine time.~~

~~TY. A semi-historical musician, named Olympus, was connected with the development of flute music about 700 B.c. It is probable that he introduced the double flute, and increased the number of holes in the instrument and~~

the tones of which it was capable: on the right flute were three holes for the low notes, on the left four for the high notes. He also brought into use compositions for the flute without words (xpotpara). It is said that he was an elegiac poet, but this is apparently a misconception. It is difficult to say whether Olympus is an actual histori- cal person, or whether he merely represents in an indivi- dualized form the influence which Phrygian music, used in the Phrygian religion, began to exert on the Ionian cities about 700 B.c. The growth of intercourse between Phrygia and Ionia at this time is certain (see PuRyGtra). In any case, the musical innovations associated with the name of Olympus were the beginning of a richer and more

varied school of lyric poetry, as well as of music, in the Greek world.

On the musician see, besides the general works on Greek litera- ture, Ritschl, "Olympos der Aulet," in Opuse., i. ; Flach, Gesch. d. griech, Lyrik, 1883; Westphal, Aletrik, &c.

OLYNTHUS was an important city of Chalcidice (see vol. xv. p. 137), situated in a fertile plain at the head of the Toronaic gulf between the peninsulas of Sithonia and Pallene, at some little distance from the sea, and about 60 stadia from Potidea. The district belonged origin- ally to a Thracian people, the Bottizi; and it is said that it was given over to the Greek colonists of Chal- cidice at the Persian invasion. It fell under Athenian influence during the 5th century, but regained its free- dom during the invasion of Brasidas (424 B.c.). It became the head of a great confederacy, and its power excited the jealousy of Sparta. A war broke out 383-379, and Olyn- thus was compelled to become a member of the Spartan confederacy. No long time afterwards the Athenians made themselves masters of several towns which had pre- viously been under the influence of Olynthus, and then a new and more dangerous enemy appeared on the northern frontier. Philip of Macedon found the city his most powerful rival, and directed all his strength against it. The Athenians made an alliance with Olynthus, but did not give any active aid, though Demosthenes tried hard to induce them to oppose Philip before he grew too strong. The famous series of Olynthiac orations was delivered by him at this crisis. After a long

~~siege the city was cap- tured by treachery in 347 B.c. ; it was razed to the ground, and the people sold as slaves.~~

~~OMAHA, the largest city in Nebraska, U.S., is situ- ated on the west bank of the Missouri, 600 miles from its confluence with the Mississippi, in 41° 15' 43" N, lat. and 95° 55' 47" W. long. (time 1>16™ after that of Wash- ington). The lower part, situated mainly on a terrace, is principally devoted to business ; the upper part, on the bluffs, to the finer residences, parks, and churches. It was founded in 1854, and in 1855 it became the capital of Nebraska Territory, when its inhabitants numbered little over 100; Lincoln, however, is the capital of the State. The population (1883 in 1860, 16,083 in 1870) was 30,518 in 1880, and in 1883 had risen to 49,710, its present growth surpassing that of any former period. Omaha con- tains the most extensive smelting and refining works in the Union. The number of men employed is 300, and the production of metals in 1882 was—lead, 43,711,921 b; gold, 16,272 oz. fine; silver, 4,853,851 oz. fine; sulphate of copper, 152,041 tb. Other manufactures amount to over $7,000,000 annually. The educational institutions include Creighton College, Brownell Hall for young ladies, a medical college, and a business college. The high school building, erected at a cost of $250,000, is one of the finest in the country. There are besides ten free schoolhouses, containing seventy-four schoolrooms. Among the public buildings are the post-office and court-house, an opera- house seating 1700 people, many hotels, and numerous churches. The streets are wide and cross at right angles, and the business portions are in process of being paved. The city is lighted by gas and the electric light. Street railways penetrate in all directions. Omaha is also an important railroad centre.~~

~~OMAN, or 'OMAN. See ARABIA.~~

~~'OMAR. See MoHAMMEDANISM, vol. xvi. pp. 563, 574.~~

~~'OMAR KHAYYAM. The great Persian mathemati- cian, astronomer, freethinker, and epigrammatist, GhiyAth- uddin Abulfath "Omar bin Ibréhim al-Khayyd4mi, who de- rived the epithet Khayyam (the tentmaker) most likely from his father's trade, was born in or close by Nishapur, and is stated to have died there in 517 a.u. (1123 a.p.).~~

This date is accepted by most Eastern and Western writers, but the renowned vizier of the Seljik sultans Alp Arslan and Malikshah, Niz4m-ulmulk of Tus, whose birth is fixed in 408 a.H.(1017 a.D.), expressly states in one of his writings that 'Omar was of the same age as himself, and attended with him the lectures of the imém Muwaffak in the college of Nishapir. However that may be, there cannot be the slightest doubt that at an early age 'Omar entered into a close friendship both with Niz4m-ulmulk and his school- fellow Hasan ibn Sabbah, who founded afterwards the terrible sect of the Isma'ilis or Assassins. The three friends pledged themselves by a solemn promise that he who should first gain an influential position in the world would lend a helping hand to the other two and promote their success in life. When Niz4m-ulmulk was raised to the rank of vizier by Alp Arslan (1063-1073 a.p.) he re- membered this covenant and bestowed upon Hasan ibn Sabbah the dignity of a chamberlain, whilst offering a similar court office to 'Omar Khayyém. But the latter contented himself with an annual stipend which would enable him to devote all his time to his favourite studies of mathematics and astronomy, and he soon proved his gratitude for the liberality of his patron and friend by the publication of his standard work on algebra, written in Arabic. This and other treatises of a similar character—for instance, on the extraction of cube roots and on the explanation of difficult definitions in Euclid—raised him at once to the foremost rank among the mathematicians of that age, and induced Sultan Maliksh4h to summon him in 467 a.H. (1074 a.D.) to institute astronomical observa- tions on a larger scale, and to aid him in his great enterprise of a thorough reform of the calendar. A twofold fruit resulted from "'Omar's elaborate research in the sultan's observatory,—a revised edition of the Zij or astronomical tables, and the introduction of the Ta'rfkh-i-Malikshahi or Jalali, that is, the so-called Jaldlian or Seljuk era, which commences in 47] a.H. (1079 a.p., 15th March).

Great, however, as "'Omar's scientific fame has always been throughout the East, it is nearly eclipsed by his still greater poetical renown, which he owes to his rubd'is or quatrains, a collection of about 500 epigrams, unequalled by any of his predecessors or followers. The peculiar form of the ruba'{i—viz., four lines, the first, second, and fourth of which have the

same rhyme, while the third usually (but not al- ways) remains rhymeless—was first successfully introduced into Persian literature as the exclusive vehicle for subtle thoughts on the various topics of Stfic mysticism by the sheikh Abt Sa‘id bin Abulkhair,! but ‘Omar differs in its treatment considerably from Abu Sa‘id. Although some of his quatrains are purely mystic and pantheistic, most of them bear quite another stamp ; they are the breviary of a radical freethinker, who protests in the most forcible manner both against the narrowness, bigotry, and un- compromising austerity of the orthodox ulemd and the eccentricity, hypocrisy, and wild ravings of advanced Siufis, whom he successfully combats with their own weapons, using the whole mystic terminology simply to ridicule mysticism itself. There is in this respect a great resem- blance between him and Hafiz, but ‘Omar is decidedly superior, not so much on account of his priority as for his more concise, more simple, and yet infinitely more energetic style. He has often been called the Voltaire of the East, and cried down as materialist and atheist. As far as purity of diction, fine wit, crushing satire against a debased and ignorant clergy, and a general sympathy with suffering humanity are concerned, ‘Omar certainly reminds us of the great Frenchman; but there the com- parison ceases. Voltaire never wrote anything equal to

1 Died Jan. 1049. Comp. Ethé’s edition of his ruba‘is in Sitzwngs- berichte der bayr. Akademie, 1875, pp. 145 sq., and 1878, pp. 38 sq.

fate which dooms to slow decay or sudden death and to eternal oblivion all that is great, good, and beautiful in this world. There is a touch of Byron, Swinburne, and even of Schopenhauer in many of his rub4‘is, which clearly proves that the modern pessimist is by no means a novel creature in the realm of philosophic thought and poetical imagination,

The Leyden copy of ‘Omar Khayydm’s work on algebra was noticed as far back as 1742 by Gerald Meerman in the preface to his Specimen calculi fluxionalis ; further notices of the same work by Sédillot appeared in the Nouv. Jour. As., 1834, and in vol. xiii. of the Notices et Extraits des MSS. de la Bibl. roy. The complete text, together with a French translation (on the basis of the Leyden and Paris copies, the latter first discovered by M. Libri,

see his Histoire des sciences mathématiques en Italic, i. 300), was edited by F. Woepcke, L'algebre d' Omar Alkhayydmt, Paris, 1851. Arti- cles on 'Omar's life and works are found in Reinaud's Géographie @ Aboulféda, pref., p. 101; Notices et Lxtraits, ix. 148 sq.; Garcin de Tassy, Vote sur les Ruba'iydt de 'Omar Khaiydm, Paris, 1857 ; and Rieu, Cat. Pers. MSS. in the Br. Mus., ii. p. 546. The quatrains have been edited at Calcutta, 1836, and Teheran, 1857 and 1862; text and French translation by J. B. Nicolas, Paris, 1867 (very incorrect and misleading) ; a portion of the same, ren- dered in English verse, by E. Fitzgerald, London, 1859, 1872, and 1879. A new English version was published in Triibner's " Orien- tal Series," 1882, by E. H. Whinfield, and the first critical edition of the text, with translation, by the same, 1883, (H. £.)

OMAYYADS. See MonamMepanism.

OMEN. See Aucurs, Divination, and Maatc.

OMSK, the chief town of the government of Akmolinsk and capital of western Siberia, stands at the junction of the Om with the Irtish, on the great highway of Siberia, 1795 miles east of Moscow. Distant as it is from the great line of steamboat communication leading to Tomsk, the true commercial capital of western Siberia, Omsk has a purely administrative importance ; its "fortress," or old earthwork, is now almost entirely abandoned. 'The town, situated in a wide steppe, broken only by the gently- sloping hill occupied by the fort, is almost entirely of wood. It has a military school, a lyceum, several lower schools, and a small public library. A "West Siberian branch of the Russian Geographical Society," opened in 1877, issues valu- able publications. Its industries (candlemaking, tanning, and the like) are insignificant ; but the trade, chiefly in cattle, skins, and furs imported from the Kirghiz Steppe, and partly also in tea, is of some importance. The popu- lation, which is entirely Russian, numbers about 31,000, of

whom about 5000 are military.

*The '*fort" of Omsk was erected in 1716 to protect the series of block- houses on the Russian frontier, and, as two lines of block- houses—that of the Ishim and that of the Irtish—met at this point, it became a military*

~~centre. In consequence of frequent incur- sions of the Kirghiz about the end of the last ceutury, a stronger earthwork, with bastions and a stone gate, was erected on the right bank of the Om. From being a district town of the government of Tobolsk, Omsk became in 1839 the seat of the administration of western Siberia in anticipation of a further advance of the Russians towards the south. Since the conquest of Turkestan it has lost even this strategic importance.~~

~~ON, or Hxtroporis. See Eeypr, vol. vii. p. 769.~~

~~ONEGA, next to Ladoga the largest lake in Europe, having according to Strelbitskiy an area of 3763 square miles, is situated in the heart of the government of Olonetz in European Russia, and, discharging its waters by the Svir into Lake Ladoga, belongs to the system of the Neva. The lake basin lies north-west and south-east, the same direction which is common to the lakes of Finland and to the line of glacier-scoring observed in this region. A straight line drawn from the village of Lumbuzha at the head of Povyenets Bay on the north to Oshta in the south measures 145 miles, but a considerable portion of it lies actoss the Zaonezhe peninsula. The greatest width is 50~~

~~OM A—ONE~~

~~'Omar's fascinating rhapsodies in praise of wine, love, and all earthly joys, to the fervent effusions of his heart so full of the most tender feelings and affections, and his passionate denunciations of a malevolent and inexorable~~

~~miles. Between the northern and southern divisions of the lake there is a considerable difference ; while the latter has a comparatively regular outline, and contains hardly any islands, the former splits up into a number of inlets and is full of islands and submerged rocks. It is thus the northern division which brings the coast-line up to 860 miles and causes the navigation of the lake to be so dan- gerous that previous to 1874, when additional buoys and beacons were laid down, the loss of life from shipwreck was about eighty persons perannum. The north-western shore between Petrozavodsk and the mouth of the river Lum- buzha consists of dark clay slates generally in horizontal~~

~~Strata and broken by raised parallel bands of diorite.~~

~~These bands extend far into the lake and are locally known as "hogs' backs." The eastern shore (as far as the mouth of the Andoma) is for the most part alluvial, with out- croppings of red granite and in one place (the mouth of the Pyalma) diorite and dolomite. To the south-east are sedimentary Devonian rocks, and the general level of the coast is broken by Mount Andoma and Cape Petropav- lovskii (160 feet above the lake); to the south-west a quartzy sandstone (well known as a building and monu- mental stone in St Petersburg) forms a fairly bold rim. Onega lies 236 feet above the sea. Towards the centre of the southern section a considerable area is upwards of 165 feet deep, and at one place a depth of 738 feet has been reached. The most important affluents, the Vodka, the Andoma, and the Vuiterga, come from the east. The Kumsa, a northern tributary, is sometimes represented in maps as if it connected the lake with Lake Seg, but the latter drains to the White Sea, and proposals to restore by means of a canal the communication which formerly existed here between the Arctic and Baltic basins have not yet been carried out. Lake Onega remains free from ice for 209 days in the year (middle of May to second week of December). The water is at its lowest level in the beginning of March ; by June it has risen 2 feet, A considerable population is scattered along the shores of the lake, mainly occupied in the timber trade, fisheries, and mining industries. Salmon, palya (a kind of trout), bur- bot, pike, perchpike, and perch are among the fish caught in the lake. Steamboats were introduced in 1832,~~

~~It is to be noted that the river Onega, which after a course of about 260 miles reaches the Gulf of Onega, an inlet of the White Sea, has no connexion with Lake Onega. At the mouth of this river (on the right bank) stands the district town and port of Onega (2275), which dates from settlements made by the people of Novgorod in the 15th century, and known in history as the Ustenskaya or Ustyanskaya volost. It has a cathedral (St Michael and the Holy Trinity), erected in 1796,~~

~~ONEIDA COMMUNITY, in Madison co., New York, is a society which has attracted wide interest on account of its pecuniary success and its peculiar religious and social principles. Its founder, organizer, and controlling mind~~

was John H. Noyes, who in 1834, while a student and licentiate of the theological seminary of Yale College, was led by his study of the New Testament to believe that the gospel of Christ, when fully accepted, secures present salvation from sin, and that the second coming of Christ, instead of being a future event, took place, according to promise, within a single generation of His first coming. Other religious doctrines at variance with popular theology were developed by Mr Noyes, such as that God is a dual being, Father and Son; that God is in no sense responsible for the existence of evil, but that the author of evil, as the © author of good, was uncreated ; that, the second coming of Christ being past, we are now living in a new dispensation of grace; that personal spiritual communication with Christ and His risen church is possible, and when perfected secures salvation from all evil, including disease and death itself.

These doctrines found their practical expression in a

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social system of pure communism. In the Oneida Com- munity, founded in 1848, “not one said that aught of the things which he possessed was his own, but they had all things in common.” The Community was a large family or brotherhood, numbering at one time over three hundred members, the common bond being paramount. The children were regarded as belonging primarily to the Community ; and it was a favourite theory, which they made some attempts to realize, that children should be begotten and reared only under the best conditions. So far as their experiments in this direction extended, the results, they claimed, justified their theories, and they adduced in con- firmation the testimony of critical observers like Professor Goldwin Smith, who wrote after a visit to the Community as follows :—

“ Undeniably, they are a fine, healthy-looking, merry set of children. They are reared under conditions of exceptional advan- tage, which could not fail to secure health to the offspring of any but positively diseased parents. The nurseries, with everything about them, are beautiful. Large playrooms are provided for exer- cise in winter. The nurses are not hirelings, but members of the Community who voluntarily undertake the office. Every precaution is taken against the danger of infection. A simple and wholesome dietary is

enforced, and no mother or grandmother is permitted to ruin digestion and temper by administering first a poison from the confectioner's and then another poison from the druggist's."

But, while the Oneida Communists extended the pente- costal principle to all social relations, they yet maintained strict order among themselves. The thousands of visitors who annually inspected their dwellings and factories, and admired their lawns and gardens, discovered none of the usual signs of lax social morality. Credit for this is unquestionably due in part to the strong personal influence of Mr Noyes, but credit is also due to the members for voluntarily subjecting themselves to a system of self-control in the intercourse of the sexes called 'male continence," and to 'mutual criticism," which last was in fact exalted into their principal means of government. The system is one of plain truth-telling, and was termed "mutual" because it was expected that all, or nearly all, would alternate as critic and subject. Sometimes persons were criticized by a standing committee selected for the purpose by the Community, sometimes by committees of their own selection, sometinies by the whole Community. The critics were expected in all cases to speak the truth with- out fear or favour, that the subject might see himself, whatever his faults or virtues, as others saw him.

Radical as its theories and practices were, the Oneida Community was able to conduct its experiment with much success for thirty years. About that time public opinion, aroused by the clergy of the surrounding region, demanded that its social practices should be abandoned; and this was accordingly done in 1879, under the counsel of its

founder and president, Mr Noyes, who had many times-

previously expressed his willingness to conform to the wishes of the public respecting the practical assertion of his social principles. This important change led to other changes in the society, including the introduction of marriage and family life; and in 1880 communism of property gave place to joint-stock, and the Community was legally incorporated as the Oneida Community, Limited. Each member now has a separate individual interest re- presented by shares of stock, in place of the undivided interest he formerly had in the common property. These changes were so wisely

managed that the complex manu- facturing and commercial businesses of the society were not seriously disturbed. In the division of the property of the Community, prior to its reorganization into a joint- stock company, a guarantee of support was first offered to all elderly and infirm persons in lieu of stock ; secondly, a guarantee was pledged for the support and education of the children of the Community till sixteen years of age ; thirdly,

labour in the new company was guaranteed to all members of the old society ; fourthly, some co-operative features were preserved, such as common dwellings and lawns, a common laundry, library, reading-room, &c.

Although the Oneida Community was started with very limited capital (the inventoried valuation of its property in 1857 being only $67,000), and hard work and poor fare were the lot of its members for many years, yet in dustry and business integrity brought their usual rewards, and upon the reorganization the members were able to divide $600,000. The last annual report of the Oneida Community, Limited, filed with the secretary of state at Albany, New York, shows that its assets, lst January 1884, were $785,656,—a sum covering, not only its capital stock of $600,000, but a surplus fund of $24,050, and all liabilities against the company.

The Oneida Community, Limited, owns water-powers and factories at Wallingford, Connecticut, and Niagara Falls, New York, as well as at Community, New York ; but its business is principally carried on at the two places last named. At Wallingford there existed, previous to the reorganization, a branch community, varying from thirty to sixty members, and having a common interest in the parent society,—both men and means being transferred from one society to the other as occasion required.

The Oneida Community has been often described by writers not connected with the society, the most noteworthy being Colonel T. W. Higginson, Professor Goldwin Smith, Charles Nordhoff in Communistic Socicties of the United States, and William H. Dixon in New America. The Community also published many pamphlets and larger works in exposition of its principles and social life, and a newspaper during its entire career of thirty years.

These may be consulted in several of the public libraries of the United States, and also in the British Museum, which has a complete set of the publications of the Oneida Community. The following list in- cludes the more important books and pamphlets :—AHistory of American Socialisms, by John H. Noyes, 1870; Bercan, Homc- Talks, Salvation from Sin, Male Continence, Scientific Propaga- tion, Dixon and his Copyists, all by the same author ; Report on the Health of the Children of the Oneida Community, by Dr T. R. Noyes ; Foot-Notes, by Alfred Barron; Mutual Criticism, and American Communities, by William Alfred Hinds. (W. A. H.)

'ONEIZA, or 'ANEYsA, a town in the Neftid or sand country of Al-Kasfm and, after Ridd, the most consider- able place in Nejd or highland Arabia, appears to have been founded about 500 years ago,! near the now ruined village of Jennah (settled some centuries before by colonists of the Bani Khalid). These new places were in the circuit of the old Bani Tamim towns destroyed by the sword of Khalid b. Walid, whose sites are now named Al-'Eyaria (Manzil "Eyar) and Al-Owshazia. Colonists of the Kaisite stock of Sbeya Arabs were the first builders of 'Oneiza, and the emirs of the township are still of this blood. After them came in colonists of the Tam{fm, who now form the chief element in the population. The old faction warfare between the villages Jennah and "Oneiza was incessant, and the Bani Khalid had'the greatest name in Nejd till the rise of the Wahhabite power. Jennah then made alliance with the Montefik Arabs in the north ; 'Oneiza sided with the Wahhabites, and, these soon overrunning all, a part of the Jennah villagers abandoned their country, and went to live in Mesopotamia, and the rest came in to inhabit 'Oneiza. The site of their old village is now in the orchards of 'Oneiza, enclosed by the common town-wall.

'Oneiza is built upon an old sez (freshet) strand (2600 feet above sea-level), and has been sometimes damaged by floods; the houses are of clay; the population, greatly increased, as Mr Doughty was told, in the fifteen years preceding his visit, was computed by him at nearly 7000. The site is near the great Wadi al-Romma (comp. Yakut,

1 The name belonged to the site before there was a town (see Bekri

and Yakut), and the same place is probably meant by the dual 'Onei- zatein in 'Antara's Jfo'allaka.

Plate XXII.

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ill. 738), and beyond the wadi, at 11 miles' distance, is the other great township of Middle Nejd, Boreida, less than 'Oneiza, with a population probably of 5000.

The people of these and the neighbouring towns, as Al- Russ,! are in great part caravaners and merchants; they are the Lombards of Arabia, and are called in the Mecca country '"'the easterlings," and in the Syrian and Mesopo- tamian border-lands the 'Azeil. These world-wandering men are commonly of easy, liberal mind in doctrines of religion, whilst the large half of their home-dwelling fellow-citizens are sour Wahhdbites. In these upper parts of the peninsula we see yet some remains of the ancient Arabian civilization, Here is found the art, elsewhere lost, of stone-cutting and well-building ; and at 'Oneiza are gold- smiths whose work is among the best seen in the bazaars of Mecca. '"Oneiza has an appearance of commercial pros- perity, but the poor farmers are much indebted to the money-lenders. The townsmen are among the greatest coffee-drinkers in Arabia. The horse-dealers of 'Oneiza procure young horses from the nomads round the town, even as far as Yemen, and ship these (known in India as "'Oneiza horses") at Koweyt for Bombay.

When Ibrahim Pasha marched to Nejd against the Wahhabite power this town was held by a resident for Ibn Sa'id. Ibrahim shelled the clay fortress, but allowed the governor to depart with arms and baggage. After the building of Al-Riad 'Oneiza fell again to the Wahhabites. Jellowwy, a brother of the Wahhabite prince Feysel ibn Sa'ud, was resident, but, bearing himself oppressively, he was expelled, as had been determined in a secret council of the sheikhs. This brought Ibn Sa'id with all Nejd under arms, and the Shammar prince Ibn Rashid, to recover the rebellious town. He encamped upon the borders of the Wadi al-Romma, and lay there till the second year (1853-54), but attempted nothing (since Arabs cannot be commanded or led to storm a clay town-wall even if, as in this case, it is no

more than 18 inches thick), and then departed, making peace with the townsmen upon their own terms. A second war followed after eight years. Abdullah al-Aziz al- Mohammed, the natural prince of Boreida, worsted by the Wah- habite faction, fled to 'Oneiza ; and a little later, when he was going to take refuge with the sherif of Mecca, the Wahhabites lay in wait for him in the desert and killed him. Word being carried to 'Oneiza, the townsmen sent out armed men, who overtook and fought with them because they had killed the guest of 'Oneiza, thus drawing a new conflict on the town. Mohammed, another brother of the prince Ibn Sa'td, came against 'Oneiza, and all subject Arabia in arms with him; and to meet this multitude 'Oneiza had little more than 1000 men. The Wahhabites had cannon, but could not handle them ; the 'Oneizians, in their walled township, followed their daily labours at leisure. The citizens made one sally in force, but after heavy fighting were driven back with a loss of 200 men. There were two slighter skirmishes in long months of warfare. At length the besiegers, impatient of the time vainly spent, drew homeward, and Ibn Sa'ud returned to Al-Riad.

ONKELOS. See Tarcum.

ONOMACRITUS was a seer, priest, and poet of Attica about 530-480 B.c. HIs importance lies in his connexion with the religious movements in Attica during the 6th century. HE had great influence on the development of the Orphic religion and mysteries; and the works of Museeus, the legendary founder of Orphism in Attica, are said to have been reduced to order by him (see ORPHIEUS). HE was in high favour at the court of the Pisistratide till he was detected by Lasus of HErmione making an inter- polation in an oracle of Muszus, and was banished by HIp- parchus. When the Pisistratidee were themselves expelled and were living in Persia, Onomacritus is said to have fur- nished them with oracles encouraging Xerxes to invade Greece and restore the tyrants in Athens. HE is also said to have interpolated HOmer, and has in modern times been considered by some critics to have remodelled the HOmeric poems.

ONTARIO is the name given under the confederation of the provinces of British North America to what was previously known as Upper Canada (see Canada). The

~~i ee ? Near Al-Russ is Al-Ethella, the site, probably, of Jarada, the ancient metropolis of Kasim,~~

~~river Ottawa, through a considerable part of its course, forms the eastern boundary separating it from the province of Quebec. Its southern and south-western boundaries are the Lakes Ontario, Erie, St Clair, Huron, and Superior, with the St Lawrence, Niagara, St Clair, Detroit, and St Mary rivers. The northern and western boundaries, which had remained without precise determination so long ag the region beyond was the hunting-ground of the Hudson's Bay Company, were defined in 1878 by arbitrators named by the Dominion and provincial Governments. By this award the boundary line is traced from a point deter- mined by a line produced due north from the head of Lake Temiscaming to James Bay, along the south shore of Hudson's Bay westerly to the mouth of the Albany river, and so by the river and lakes to the head of Lake Joseph, and by Lac Seul and the English river to a point of intersection with the meridian line drawn from the north-western angle of the Lake of the Woods on the United States boundary. The legislature of Ontario ac- cepted this award as determining the limits, and defining the boundary line between the provinces of Ontario and Manitoba, but the Dominion Government withheld its assent, and the final decision is now referred to the privy council, The area of the province within the limits thus defined would be 197,000 square miles. Its area as given in the census returns of 1881 is 101,733 square miles.~~

~~Geology and Minerals.—The shores of Lakes Erie and Ontario belong to the great plain of Canada, underlaid by Silurian and Devonian limestone and shales, above which rest beds of clay and gravel. Its average breadth is about 70 miles, and, though technically a plain, it is not merely undulating, but is broken by shelving rocks and precipices. To the north of the province a spur from the Laurentian chain in Quebec forms an extensive hilly region, and runs southwards to the coasts of Lake Huron and the Georgian Bay. Within the province there is a great variety of mineral wealth yet only partially developed. Iron, of which, according to the census returns, the annual yield is about 92,000 tons, is found in large quantities to the north of Lake Ontario, between the Georgian Bay and the Ottawa river. Magnetic iron is obtained in various beds, red hematite in the Bruce copper-mines near Lake Huron, and bog iron in the sandy tracks which flank the~~

Laurentian hills. Copper is found in the same region as iron, the Bruce mines yielding ore to the annual value of £50,000. Silver abounds on the shores of Lake Superior, especially in the neighbourhood of Thunder Bay,—Silver Islet, where the ore is dug 500 feet below Lake Superior, containing one of the richest veins in the world. Gold is obtained in the same region, but the yield is so uncertain as to discourage regular enterprise. There are petroleum wells of immense value in the western districts of the province, the annual yield being nearly 16,000,000 gallons of crude petroleum. Salt brine is drawn up from deep wells at Goderich and the neighbourhood, the annual yield being about 500,000 gallons. Mica is extensively worked, Marble equal to that of Carrara is quarried in several districts. The principal other minerals are galena, plumbago, antimony, arsenic, manganese, cale-spar, and gypsum.

Agriculture and Trade.—The oldest settled districts of the province on the shores of Lakes Ontario and Erie, and on the intervening peninsula of Niagara, are favoured in many respects by geographical position, soil, and climate. The fertile area stretching westward between Lake Eric and the Georgian Bay is often styled the "Garden of Canada." The settled portions include upwards of 9,000,000 acres, much of which has been long cleared and brought into a high state of cultivation. Thousands of acres are planted as orchards; and the apple crop is a

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profitable branch of farm produce. In the still earlier settled district of Niagara, which lies between the two great lakes, the extremes alike of summer heat and winter cold are tempered by those large bodies of water. There accordingly the peach, grape, and plum flourish ; orchards of apple and pear trees cover large areas; and, as seen from Queenston heights, the landscape looks like a garden. The vine is indigenous, and grows luxuriantly in the woods, as do all the smaller fruits.

But the energy of more recent settlers has greatly ex- tended cultivation. Bands of pioneers, lumber-men, and free-grant settlers have carried the axe and the plough into the Muskoka, Nipissing, and other northern districts ; and those regions are now accessible by steamboat and rail- way. The rich mineral regions of Lake Superior are also filling up with settlers. The town

~~of Prince Arthur's Landing, at the head of the lake, is now the terminus of the Canadian Pacific Railway, and already numbers fully 2000 inhabitants.~~

~~According to the census of 1881, 19,259,909 acres were in occupation, of which 11,294,109 were improved, 304,815 being in gardens and orchards, and 10,989,294 under cultivation in pasture or grain and root crops. Much of the land is well adapted for wheat, but in many places the crop has been grown too often. Barley, oats, and pease are common crops. Maize and tomatoes ripen well. Tobacco and sugar are profitable crops in some districts. The growth of flax is largely on the increase. As the soil in nearly every part of the province is admirably adapted for root crops, cattle are very largely kept, although there are no extensive grazing districts. The beef trade with England has become very extensive, and dairy-farming is largely prosecuted, especially the making of cheese, a large number of cheese factories being now established on the co-operative principle. Honey is an important source of revenue, about 1,200,000 ib being exported annually. There is a very large export of timber, including pines, oak, elm, hackmatack, birch, maple, walnut, and hickory. In the official returns of the exports of the different provinces some of the most valuable produce of Ontario is included in the shipments from the ports of Quebec. According to the trade and navigation tables for 1883, the total value of goods entered for consumption was $44,452,804, or £9,134,143, and of exports $32,890,019, or £6,758,242. The splendid natural water communications have been extensively supplemented by railways, of which there are about 4000 miles in operation. There are very extensive saw-mills at Ottawa. The manufacture of agricultural implements employs a large number of persons through- out the province, as does also that of machinery, sewing-machines, and edged tools. Among the principal other manufactures are woollen goods (especially tweeds), cottons, leather, paper, soap, and iron and hardware. According to the census returns the total capital invested in the various industries, not including agriculture but includ- ing cheese factories, was $80,950,847, the number of hands employed 118,308, and the total value of products**

~~$157,989,870.~~

Population.—The population in 1871 amounted to 1,620,851; in 1881 it had increased to 1,923,228. Of this, the population of twelve towns of upwards of 5000 inhabitants numbered in 1871 179,829. In 1881 the towns of a population exceeding 5000 had increased from twelve to nineteen, with inhabitants numbering 288,964, leaving the remaining population as occupants of the small towns, rural villages, and farms. At the end of 1883 the population was estimated at 1,935,130 (urban, orilli ; rural, 1,263,213).

Classified according to race, those of European origin were as follows in 1881 :—

\Uivtic ceerncreee eC eReeenr GOVP2OZeES Wisse ene caccbrusiccwsscense 2 Siar? i 535,835 | Scandinavian…..... il, 2a ..878,536 | Russians and Poles …... 787

US OES OAM ME CML ANSMecsegmee ceuinores «0s 687

...102,743 | Spanish and Portuguese 285

OP WER || JAW. aebedsansscocconsceoases 254

6,397

In addition to those from other provinces, the United

States, d&c., there were 15,325 Indians and 12,097 Africans. Classified according to religion, the principal denomina-

tions were in 1881 as follows :—

Methodists.....- 5 O75 080 | uthebans meyescsecsane: 37,901 Presbyterians …..... 417,479 | Congregationalists …... 16,340 Episcopalians …..... 366,529 | Dieciples'..... 010. 16,051 Roman Catholics …... S20sso0M Ouakerse …,.c0-e: seks se. 6,307 1 Bi) OUHISES) pococqenonondoone 106,680

The capital of the province is Toronto (population in 1881, 86,415); next in point of wealth, population, and general local advantages is the city of Hamilton (35,961) ; Ottawa (27,412) is the capital of the Dominion ; the

other large centres of population are London (19,746), Kingston (14,091). Next to these are Guelph, St Catherine's (on the Welland Canal), Brantford, Belleville, St Thomas, Stratford, Chatham, Brockville, Peterborough, Port Hope, Woodstock, Galt, and Lindsay, with populations ranging from 9890 to 5080. Cobourg (4957) is the seat of Victoria College.

Education.—One of the most distinctive features of the province is its system of public instruction, to which special attention has been given from an early period. So early as 1797 lands were set apart for educational pur- poses ; and there now exists a thoroughly efficient system of public schools, high schools and collegiate institutes, provincial college and university, under the administration of a minister of education as the head of this department. The management of all funds for general educational pur- poses, the provincial school inspectors, normal and model schools, &c., are under the direct charge of the educational department. Under its control the local government is vested in boards of school trustees elected by the rate- payers in rural districts or townships, villages, towns, counties, and cities, in accordance with a general system of municipal organization. Each local board determines the required rates to be levied for school purposes, purchases sites, builds schoolhouses, appoints teachers from among those duly qualified and holding Government certificates, and determines and pays their salaries. The councils of county municipalities have certain powers and duties con- ferred on them in reference to the townships, villages, and towns within each county. They also select duly qualified inspectors, appoint county boards for the exami- nation of third-class teachers, and levy a rate equivalent to the amount of the legislative educational grant to be expended in the payment of one-half of the salaries of their teachers and school inspectors. Collegiate institutes and high schools (in which a higher English course is taught, along with classics, mathematics, and French and German, to pupils admitted from the public schools on an entrance examination) are under the management of special boards of trustees appointed by city or county councils, with the power of requiring the council to raise all funds requisite for the efficient maintenance of the schools. Provincial normal schools for training teachers are estab- lished at Toronto and Ottawa, with model schools attached to them; and each county town maintains a model school for training third- class teachers. The school-system is thus mainly dependent on county and

local rates levied for the purpose by councils and school-boards elected by the people. This general system is modified in one respect. In any locality where Roman Catholics reside in sufficient numbers, they may require their share of the school funds

and rates to be applied for the maintenance of separate schools, under their own special school-board; but their teachers must hold the same Government certificates as others. The system includes provision for enforcing attendance of all children of school age, and, at the option of the trustees, making education free of all charge. The report of the minister of education for 1882 shows that there were in all 104 collegiate institutes and high schools, 501% public schools, and 193 Roman Catholic separate schools. The system thus thoroughly organized has be- come a model for the other provinces of the Dominion, with the exception of Quebec, where the Roman Catholic Church has the control of the public schools, and a sepa- rate school-system is allowed for the Protestant minority.

Upper Canada College, founded at Toronto on the model of the great public schools of England, was en-

dowed with public lands, from which it now derives an.

annual income of $15,000 in addition to its fees. The University of Toronto and University College are endowed with lands from the proceeds of which an annual income of upwards of $67,000 is derived. The university pre- scribes the requirements in all examinations, appoints ex- aininers, and confers degrees in the faculties of law, medi- cine, and arts. University College gives instruction in the departments of arts and science; but denominational and other colleges are admitted to affiliation, and their students can proceed to degrees in the university. University powers are also exercised by Victoria College, Cobourg, under the control of the Methodist Church ; Queen's Col- lege, Kingston, under the control of the Presbyterian Church ; and Trinity College, Toronto, and the Western University, London, both under the control of the Church of England.

~~Administration.—Like the other provinces of Canada, Ontario is under a lieutenant-governor, appointed for a term of four years by the governor-general in council ; the executive council numbers 6 ministers responsible to the local legislature or house of assembly, which consists of 88 members. The province is represented by 24 senators in the Dominion Senate, and by 92 members in the House of Commons. In addition to the counties and repre- sentative towns there are four provisional districts :— Algoma, Muskoka, Parry Sound, and Manitoulin.~~

~~History.—Lakes Ontario and Nipissing were visited by Cham- plain in 1615, and Lake Superior by traders in 1660. Perrot took possession of the district round Lake Huron in 1671. La Salle founded Niagara in 1679, and in the same year the lakes were explored to Lake Michigan. A fort was built at Toronto in 1749.~~

~~Forming originally part of French Canada, Ontario, then consist- ing of a few forts and trading ports, was conceded with that pro-~~

~~vince to Britain. Having previously formed part of the province of~~

~~Quebec, it was, under the name of Upper Canada, formed in 1791 into a distinct province, the first parliament being held at Niagara, 17th November 1792. During the war with the United States in 1812-15 the province was the seat of several conflicts. Political dissent prevailed in it from 1820 until, in 1837, it culminated in re- bellion. In 1867 Upper Canada, under the name of Ontario, was made the chief province of the Dominion of Canada. (D. W.)~~

~~ONTENIENTE, an old town of Spain, in the province of Valencia, stands on an elevation on the right bank of the Clariano or Onteniente, a sub-tributary of the J ucar, about 11 miles south-south-west from JAtiva, It has three churches, a good town-hall, and a palace of the dukes of Almodovar. Linen and woollen cloth, paper, brandy, and earthenware are manufactured ; and there is also some trade in the cereals, wine, and oil produced in the neigh- bouring district, which is very fertile. In 1877 the ayun- tamiento had a population of 11,727.~~

~~ONTOLOGY. See Mrrapuystc,~~

ONYX, a variety of agate consisting of layers of varie- gated chalcedony, arranged in parallel bands. The colours of the successive strata vary in different stones, but in the

typical onyx they are black and white. If one of the layers consists of the brown chalcedony known as "sard" or the red variety called "carnelian," the resulting stone is'termed a '"'sardonyx." It was probably this kind of stone that originally suggested the name "onyx" (from évvé, a nail), since the contrast between its layers remotely resembles that between the flesh-coloured part of the finger-nail and the white /unula at its root. It was the practice of certain Greek writers to restrict the word évv€ to the mineral in its natural condition, and to designate it, when worked into ornamental forms, by the diminutive évixvov. When an onyx presents a thin layer of whitish chalcedony spread over a black ground, the upper stratum often exhibits a bluish tinge, and collectors at the present day term such a stone a nicolo, evidently a corruption of the Italian diminu- tive onicolo, or "little onyx."

India has for ages yielded the finest onyxes, and hence

jewellers are in the habit of applying the expression " Ori-

ental onyx" to any stone distinguished by beauty of natural colour and by regularity of its layers. The true Indian stones are found as pebbles, associated with moss-agate,

jasper, and other silicious minerals in river-gravels, the

materials of which have been derived originally from the agate-nodules of trap-rocks, such as those which occur on an enormous scale in the Deccan. As far back as the first cen- tury the author of the Periplus of the Red Sea mentions the onyx among the products of Plythanz, a locality which may probably be identified with Paithon on the Godavari, whence agates are obtained even at the present day. He further states that the onyxes were taken down to Bary- gaza, the modern Broach, where a great trade in agates is still carriedon. It appears that the lapidaries of Broach and of

~~Cambay are now supplied with raw stones chiefly from Ratanpur, in the territory of the rajah of Rajpipla, where the gravels are systematically worked for the sake of their agates, jasper, onyx, and other silicious stones, See Ball's Zeonomic Geology of India, 188], p. 508.~~

~~The principal European locality for onyx is the neighbour- hood of Oberstein on the Nahe, a river which flows into the Rhine at Bingen. Near Idar, about two miles from Ober- stein, is a trap-hill called the Galgenberg, which for cen- turies was largely worked by means of tunnels driven into the hillside, in order to extract the nodules of agate which are embedded in the melaphyre forming the rock. When these nodules are broken open they occasionally yield a banded chalcedony which serves admirably for onyxes. The quarries have, however, been abandoned for many years in consequence of the discovery of larger and finer nodules in Uruguay, principally among the gravels of the Tarquarie and the Rio Pardo, These agates are still sent over in large quantities to Oberstein, where the cutting and polish- ing of such silicious stones form almost the sole industry of the locality. Coming from South America, they are commonly known in trade as "Brazilian agates"; and it is from these agates that most of our onyx is now obtained.~~

~~It is but rarely that the South-American agates present in their natural condition sufficient diversity of colour to constitute a good onyx, but for many years it has been the practice of the German agate-workers to colour these stones artificially. By this means an agate of dull colour may be rapidly converted into a deep-tinted onyx, the success- ive layers becoming sharply defined and vividly coloured during the process of staining. How this dyeing is effected has been described in the article AGatTs, vol. i. p. 277.~~

~~The onyx is largely employed for ring-stones, brooches, beads, and other ornamental objects; but its chief use is as a material for camei and intagli. By taking advantage of the different tints of the strata in this stone, a skilful artist is enabled to produce effects of a very pleasing character. Among the finest examples of ancient stone-~~

~~engraving which have descended to us are certain vessels in onyx, elaborately ornamented with cameo-work, such as the Cup of the Ptolemies, the Farnese Tazza, and the Mantuan or Brunswick Vase.~~

~~According to the Authorized Version of the Old Testament, the onyx formed the eleventh stone in the breast-plate of the high priest; but it is more probable that this stone (ane) is the beryl,~~

~~and that the onyx is nom, Exod. xxxix. 11 (E. V. diamond).~~

~~It is pointed out by the Rev. C. W. King that the earliest men- tion of the onyx as a precious stone is to be found in the inscrip- tions of the Parthenon, which date from the Peloponnesian War (431-404 B.c.), where a large engraved onyx is mentioned as an offering. It is to be specially noted that ancient writers applied the term évvé to two entirely different stones. While onc of them was the true onyx of modern mineralogists, as described above, the other was merely a stalagmitic variety of carbonate of lime, a mineral much softer, less precious, and much more widely distri- buted than the chalcedonic onyx, yet resembling it in so far as it also presents a parallel-banded structure. This mineral is still known as "onyx-marble" (see MARBLE, vol. xv. p. 529).~~

~~OODEYPORE, or Uparpur. See vol. v. p. 768.~~

~~OPAH (Lampris luna), a pelagic fish of the family Coryphenide or Dolphins. It differs from the typical dolphins (Coryphxna) materially in the shape of its body and the structure of the ventral fins. Instead of being elongate, the body is compressed and deep (more so than in the bream), and destitute of distinct scales. A long dorsal fin, high, and pointed anteriorly, runs along nearly the whole length of the back; the caudal is strong and deeply cleft. The ventral fins are broad paddles pointed at the extremity, and composed of numerous rays. This latter character is quite exceptional in the order of spiny- rayed fishes, but finds its explanation in the habits of the fish. A pelagic fish with so deep a body and go short a tail as those of the opah requires additional propelling power to be able to find or pursue its prey; and therefore to the ordinary function of the ventral fins, which in other fishes is confined to balancing the body in the water, has been superadded that of locomotion.~~

In its gorgeous colours the opah surpasses even the dolphins, all the fins being of a bright scarlet. It is only occasionally found near the shore; its real home is the Atlantic, especially near Madeira and the Azores, but many captures are recorded from Great Britain, Ireland, and Scandinavia ; it strays as far north as Iceland and New- foundland, and probably southwards to the latitudes of the coast of Guinea. It is rare in the Mediterranean. The name opah, which is now generally used, is derived from the statement of a native of the coast of Guinea who happened to be in England when the first specimen was exhibited (1750), and who thought he recognized in it a fish well known by that name in his native country. From its habit of coming to the surface in calm weather, show- ing its high dorsal fin above the water, it has also received the name of "'sun-fish," which it shares with Orthagoriscus and the basking shark. It grows to a length of 4 to 5 feet and a weight exceeding 100 ib, and is highly esteemed on account of the excellent flavour of its flesh.

OPAL, a natural form of hydrated silica, occurring in a '"'norodine" condition, 2.¢., it has apparently hardened from a gelatinous state. During consolidation it has suffered con- traction unequally in different directions ; and thus, though amorphous, it behaves in polarized light like a doubly-refracting body.

The beautiful variety known as noble or precious opal is remarkable for its play of iridescent colours. In the "harlequin opal" these rainbow-tints are flashed forth from small flakes, forming a kind of polychromatic mosaic, while in other kinds of opal the colours are disposed in broad bands or in irregular patches of comparatively large area. The tints vary with the angle at which the light is incident, and with the relative position of the stone

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and the observer, so that by moving the opal a brilliant succession of flashes of fire may be obtained. Careful examination of a precious opal shows that these flashes are reflected from surfaces of irregular dimensions, situated at different depths in the translucent stone, and intersecting at various angles. The colours are not due to the presence of any material pigment in the mineral, but are optical effects due to certain structural peculiarities,

~~According to Sir David Brewster the colours of the opal may be referred to the presence of multitudes of micro- scopic pores arranged in parallel lines, the differences of tint arising from differences in the magnitude of these cavities. M. Descloizeaux, a very high authority on the optical properties of minerals, has also connected the iridescence of the opal with a regular system of internal cavities, but at the same time seems disposed to think that the colours bear some relation to the presence of a small quantity of organic matter in the mineral. Mr Crookes refers the colours to delicate strie or minute fissures lying in different planes within the opal. The whole subject has been exhaustively studied by H. Behrens, who explains the colour as due not to reflexion from the walls of cavities but to the interposition of very thin lamellz possessing a different index of refraction from that of the matrix in which they are embedded. He has detected in the opal a variety of microscopic enclosures, including flecks of hydrophane and delicate laminae of ferric oxide. On the whole, therefore, it seems likely that the iridescence of the opal is simply a case of the well- known colours of thin plates. A ray of light is reflected from the anterior surface of an attenuated film ; another ray, having traversed the lamina, is reflected from the posterior surface ; and the meeting of these rays differing in phase gives rise to interference phenomena.~~

~~The noble opal, in consequence of its brilliant iridescence, is valued as an ornamental stone. It is displayed to best advantage when cut en cabochon or with a convex surface. Pliny relates that the rich Roman senator Nonius was proscribed by Mark Antony for the sake of a magnificent opalus which he possessed, a stone as large as a hazel nut, and valued at 20,000 sesterces.~~

~~The precious opal occurs in veins in trachytic rocks, chiefly in Hungary. The best-known localities are Czerwenitza and Kaschau, but the most brilliantly-coloured stones are said to come from Kremnitz and Dubnik. It is found also in Honduras, principally near Gracias a Dios, where it occurs in like manner, forming veins in volcanic rocks. The American opal is generally less milky and less fiery than the Hungarian. Of late years some very brilliant opal has been sent into the market from Queensland. This is found as thin films spread over the walls of fissures in ironstone nodules, occurring in the neighbourhood of the Baracorra river. It is gener- ally too~~

thin to be cut en cabochon, but is largely used for camet, the iridescent layers showing to great advantage against the iron- stone matrix, which when polished assumes a dark-brown colour. The so-called "black opals," which have lately become popular, consist of this matrix penetrated in all directions by veins and spots of opal, forming a mixture sometimes known as "root of opal." Certain stones sold as black opals have evidently been modified in colour by staining or by heat.

See Brewster, 'On the Cause of the Colours in Precious Opal," Edin. New Phil. Journ., xxxviii., 1845, p. 885; Descloizeaux, Manuel de Minéralogie, vol. i., 1862, p. 22; Crookes, "On the Spectral Phenomena of Opals," Quart. Journ. Science, vi., 1869, p. 481; and especially Belirens, " Mikroskopische Untersuch- ungen tiber die Opale," Sitzwngsber. d. k. k. Akad. d. Wissenschaften, Wien: math.-naturwiss. Classe, 1xvi., 1871, p. 519. Fora mineralogical description of the varieties of opal see MINERALOGY, vol. xvi. p. 390.

OPENSHAW, a township of Lancashire, England, is situated on the Manchester and Stockport Canal, about 34 miles east from the Manchester exchange. The church of St Barnabas dates from 1838-39, and that of St Clement from 1871. The mechanics' institute (1872) comprises assembly rooms with a reading-room and library. The town possesses railway-carriage and locomotive works, engineering shops, iron-foundries, cotton-mills, dyeworks, chemical-works, and breweries. The area of the township is 579 acres; population in 1871, 11,108; in 1881, 16,153.

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OPERA. See Drama, vol. vii. p. 437, and Muste.

OPHICLEIDE is a brass musical instrument with keys. It belongs to that class of instruments in which the column of air is set in vibration by a trembling of the lips applied to the edge of a hemispherical cup at the extremity of the tube, called the '"'embouchure." The lips vibrate from the action of the breath and play the part of reeds ; the degree of pressure of the embouchure determines the rapidity of their vibration, on which,

concurrently with the length of the tube, depends the pitch, or relative position, of the sound produced.

The name "ophicleide" is compounded of two Greek words, dus, serpent, and xAeides, keys,—the instrument owing, in fact, its origin to the appli- y cation of keys to the serpent, a wind | instrument the invention of which is generally attributed to Edme Guil- laume, canon of Auxerre, somewhere about 1590, He contrived it to serve as a bass to the zinken, instruments now entirely obsolete.

The serpent, represented by fig. 1, is composed of two pieces of wood, hollowed out and cut to the desired contour. 'They are joined together by gluing so as to form a tube, and are bound with leather to ensure solid- ity. The upper extremity ends with a bent brass tube or crook, to which the mouthpiece is applied. The tube is pierced laterally with six holes, the first three of which are covered by three fingers of the right hand, and the others by the corresponding fingers of the left hand. When all the holes are thus closed the instrument will produce the following sounds, of which the first is funda- mental and the rest are harmonics :—

——————e =]

ct on ee ve a ;

r ¢ ££ «4 a eo

The instrumentalist fills up the gaps in the diatonic or natural scale by the successive opening of the lateral holes after the manner practised in fingering the flute. The serpent remained in its primitive form for nearly two centuries, and then only it was attempted to improve it by adding keys. From the time of its origin it had served principally as an accompaniment to the liturgical chanting, but towards the middle of the 18th century it began to be employed as a bass for military music, and, notwithstanding its numerous imperfections, it was but slowly given up.

Fig. 2 represents a curious serpent made, about 1830, by L. Embach and Co., Amsterdam. The six lateral holes are here placed more rationally along the tube, but, being beyond the reach of the fingers, they are covered by

open keys, besides which the instrument also bears six closed keys for the following tones :—

Fig. 1.—The Serpent.

The primitive form of the serpent was most inconvenient, and it was a musician named Régibo, belonging to the orchestra of the church of St Pierre at Lille, who, about 1780, first thought of giving it the shape of a bassoon (Gerber, Lesxicon der Tonkiinstler, Leipsic, 1790). The merit of this innovation was rapidly recognized in England and Germany. Still to follow Gerber (Lexicon, 1812), one Frichot, who was established in London, published in 1800 a description of an instrument, entirely of brass, manu- factured by J. Astor, which he claimed as his invention,

calling it the basshorn, but which was no other in principle than the new serpent of Régibo. It only made its way to France and Belgium after the passage of the allied armies in 1815. We here reproduce (fig. 3) the drawing of a wooden serpent with bell and mouthpiece of brass, after a scale published by B. Schott of Mainz, in 1816. The English brass basshorn was designated on the Continent the English or the Russian basshorn, the "serpent / anglais," or the " basson russe." Under |fff this last name all instruments of the |§| form, whether of wood or brass, were later (. confounded in France and Bel- gium. The ' bas- gon russe" re- mained in great vogue until the appearance of the ophicleide, to dis- appear with it in the complete re- volution brought about by the in- vention of pistons.

The invention of the ophicleide is generally but falsely attributed to Alexandre Frichot, a professor of music at Lisieux, department of Calvados, France. The instru- ment, which the inventor called " basse-trompette," was approved of as early as 13th November 1806 by a com- mission composed of professors of the Paris Conservatoire, but the patent bears the date 31st December 1810. The ""basse-trompette," which Frichot in his specification had at first, in imitation of the English basshorn, called 'basse cor," was, like the English instrument, entirely of brass, and had, like it, six holes; it only differed in a more favourable disposition brought about by the curvings of the tube, and by the application of four crooks which permitted

~~the instrument to be tuned "in C low pitch and C high pitch for military bands, in C¥ for churches, and in D for concert use." The close relationship between the two instruments suggests the question whether this was the Frichot who worked with Astor in London in 1800.~~

~~The first idea of adding keys to instruments with cupped mouthpieces, unprovided with lateral holes, with the aim of filling up some of the gaps between the notes of the harmonic scale, goes back, according to Gerber (Lexicon of 1790), to Kélbel, a hornplayer in the Russian imperial band about 1754, Weidinger, trumpeter in the Austrian imperial band, improved upon this first attempt, and applied it in 1800 to the trumpet. But the honour be- longs to Joseph Halliday, bandmaster of the Cavan militia, of being the first to conceive, in 1810, the disposition of a certain number of keys along the tube, setting out from its lower extremity, with the idea of producing by their successive or simultaneous opening a chromatic scale throughout the extent of the instrument. The bugle- horn was the object of his reform; the only scale of which, he says, in the preamble of his patent, "until my invention~~

~~contained but five tones, viz., a~~

~~My improvements on that instrument are five keys, to be used by the performer according to the annexed scale, which, with its five original notes, render it capable of pro- ducing twenty-five separate tones in regular progression." Fig. 4 represents the keyed bugle of Joseph Halliday.~~

~~Fia. 8.—Wooden Serpent.~~

~~Fig, 2.—Serpent by Embach.~~

~~OPHICLEIDE~~

~~It was not until 1815 that the use of the new instru- ment spread upon the Continent. We find in the account-books of a Belgian maker, Tuerlinckx of Mechlin, that his first supply of a bugle-horn bears the date of 25th March 1815, and it was made "aen den Heer Muldener, lieutenant in het régiment duc d'Y ork."~~

The acoustic principle inaugurated by Halliday consisted in binding together by chromatic degrees

the second and third harmonics, ——— to iil — Fig. 4.—Keyed a Bugle, = He attained it, as we have just seen, by the help

of five keys. The principle once discovered, it became easy to extend it to instruments of the largest size, of which the com- pass, like the "basson russe," began at the lowest sound. It

was simply necessary to bind the fundamental ———=

a ed to the next harmonic sound — ——— by a larger number

of keys. This was done in 1817 by Jean Hilaire Asté, known as Halary, a professor of music and instrument-maker at Paris, We find the description of the instruments for which he sought a patent in the Rap- port de Académie Royale des Beaux-Arts de UInstitut de France, meeting of 19th July 1817. These instruments were three in number :—(1) the clavi-tube, a keyed trumpet; (2) the quinti-tube, or quinti-clave ; (3) the ophicleide, a keyed serpent. The clavi-tube was no other than the bugle-horn slightly modified in some details of construction, and

reproduced in the different tonalities Ab, F, Eb, D, C, Bb, A, and AD, The quinti-tube had nearly the form of a bassoon, and was, in the first instance, armed with eight keys,

and constructed in two tonalities, F and ED. This was the instrument afterwards named 'alto ophicleide." The ophicleide, of which we reproduce a drawing (fig. 5), had the same form as the quinti-tube. It was at first ad- justed with nine or ten keys, and the number was carried on to twelve,— each key to give a semitone (additional patent of 16th August 1822). The ophicleide or bass of the harmony was made in C and in Bb, the contra- bass in F and in Eb.)

It is certain that from the point of view of invention Halary's labours had only secondary importance; but, ifthe principle of keyed chro- matic instruments with cupped mouthpiece ? goes back to Halliday, it was

Halary's merit to know how to take advantage of the prin- ciple in extending it to instruments of diverse tonalities, in group- ing them in one single family, that of the bugles, in so complete a manner that the improvements of modern manufacture have not widened its limits either in the grave or the acute direction. Keyed chromatic wind instruments made their way rapidly ; to their in- troduction into military full or brass bands we can date the regenera- tion of military music. After pistons had been invented some forty years, instruments with keys could still reckon their partisans.

1 The report of the Académie des Beaux-Arts on the subject of this invention shows a strange misconception of it, which it is interesting to recall. "As to the two instruments which M. Halary designs under the names of ' quinti-clave' and ' ophicleide,' they bear a great resemblance to those submitted to the Academy in the sitting of the 11th of March 1811 by M. Dumas, which he designed under the names of 'basse et contrebasse guerriéres.'. . . The opinion of our commission on the quinti-clave and ophicleide is that M. Halary can only claim the merit of an improvement and not that of an entire invention ; still, for an equitable judgment on this point, we should compare the one with the other, and this our commission cannot do, not having the instruments of M. Dumas at our disposal." This is what the commission ought to have had, but it would have sufficed had they referred to the report of the sittings of 6th and 8th April, in which it is clearly explained that the instruments presented by M. Dumas were bass clarinets (Moniteur Universel of 19th April 1811).

2 We designedly omit the employment of the word "brass"' to qualify these instruments. The substance which determines the form of a column of air is demonstrably indifferent for the timbre or quality of tone so long as the sides of the tubes are equally elastic and rigid.

Fic, 5.—Ophicleide of Halary.

Now these have utterly disappeared and pistons or rotary cylinders remain absolute masters of the situation.

~~The invention of the piston is due to Stoelzel, a Silesian, and Bliimel of Waldenburg (patent of 12th April 1818). It was first signalized by G. B. Bierey, leader of the National Theatre of Breslan, in No. 18 of the Allgemeine musikalische Zeitung (Leipsic, 1815). The inventors first applied their discovery to the horn, trumpet, and trombone, and this application consisted of only two pistons, or "ventile," as they called them. We have seen up to this point that chromatic intervals were produced in instruments with cupped mouthpiece by shortenings of the tube by means of lateral openings. It is evident that a column of air so cut off must be very inferior in sonorousness to one vibrating from the mouthpiece to the ex- tremity of the bell ; this has been the capital defect of keyed instru- ments. Stoelzel and Bliimel proceeded in contrary fashion: they produced chromatic intervals by lengthening the tube, just as in the trombone with slides. They introduced contrivances the move- ment of which permitted an instantaneous communication between the principal tube and two additional tubes, lowering the instru- ment respectively a tone and a half-tone, or by their simultaneous employment one tone and a half. As these combinations did not suffice to peng a complete chromatic scale, a third piston with an additional tube of a tone and a half was soon afterwards added by the inventors.~~

~~Suppose an instrument giving without pistons the harmonics~~

~~S— = = = ey~~

~~by the union of the first and third,~~

~~us by joining all three pistons,~~

~~=~~

~~—a~~

~~Here is the whole theory of the fingering of these instruments @ pistons, of which the compass downwards is only bounded by the first harmonic.~~

~~A serious defect exists, however, in these piston instruments,—the want of truth of intonation whenever a note is produced by more than one piston.~~

Let us take, for ex-

ample, the low G as This note

is produced, as we have just seen, by the union of the first and third pistons ; in employing the first piston the pitch of the instrument is lowered a major second, and to produce the lowering to a fourth (two tones and a half) a further lowering of a minor third (one tone and a half) is necessary. Now the additional pipe to produce this lowering from C is neces- sarily proportionately shorter than what is required for a pipe already lowered a tone by the employment of the first piston. It there- fore results, as will be seen from this special case, that all notes produced by several pistons at one time are too high in pitch.

The invention of Stoelzel and Bliimel, like all new ideas, was not accepted without opposition ; notwithstanding its crushing superiority it had a lively struggle to sustain, and it is only within the last thirty years that the system of keys has been

Fic. 6.—Ophicleide with pistons.

Diseases of the con- junctiva,

finally superseded by pistons. We close this article with the curious representation (fig. 6) of an ophicleide with pistons manufac- tured about 1886 by C. Mahillon of Brussels, then at the beginning of his career. (V. M.)

OPHIR (pix), a place famous among the Hebrews

for its gold from the time of Solomon, whose Red Sea fleet, in conjunction with the Phoenicians, went to Ophir and brought thence a vast treasure of gold with precious stones and "almug" wood (1 Kings ix. 28, x. 11). It is quite plain from Gen. x. 29 that Ophir belonged to southern Arabia, from which the Phcenicians still derived gold and precious stones in the time of Ezekiel (xxvii. 22). All attempts to place Ophir in India or on the east coast of Africa (Sofdla) are at variance with Gen. x. It is true that Indian products

~~were also brought to Solomon (1 Kings x. 22), but these are not said to have come from Ophir, and therefore we cannot even be sure that Ophir was the emporium where the Indian trade and the Western met, as they did in southern Arabia in later times,—unless, indeed, the "almug" or "algum" wood is, as has been conjectured, the Indian sandalwood.~~

~~'OPHITES. See Gnosrics.~~

~~OPHTHALMOLOGY. The scientific development of the diagnosis and treatment of diseases of the eye belongs to the last hundred years. Helmholtz's invention of the ophthalmoscope is little more than thirty years old. Our knowledge of the refraction and accommodation of the eye has been worked out by Airy, Young, Sanson, Purkinje, Donders, Sneller, Helmholtz. Many of the major opera- tions have been perfected by Von Graefe and his followers in quite recent times. Finally, the important relations of ophthalmology to general medicine have been worked out principally by Hutchinson, Hughlings Jackson, Clifford Allbut, and Gowers within the last few years.~~

~~Acute Catarrhal Conjunctivitis begins with a feeling of stiffness of the lids, and pain as if from a particle of grit in the eye. The secretion increases, is at first watery, and is afterwards yellow and muco-purulent, collecting at the inner canthus and gumming the eyelids together. The conjunctiva, especially that on the lids, is reddened, and in severe cases may be so swollen as to overlap the cornea. The eye is generally well in a fortnight. The disease is caused by cold winds, and by irritating particles, and in one form is undoubtedly contagious. The eye must be left uncovered, bathed occasionally with an astringent lotion, and at night some ointment should be applied to the edges of the lids to prevent their adhesion and consequent reten- tion of the secretion.~~

~~Chronic conjunctivitis may result from the above, or be due to the irritation of dust. It occurs frequently from overstrain of hypermetropic eyes. The symptoms are~~

~~'similar, but less severe, and require similar treatment with~~

~~correction of the hypermetropia where present.~~

Purulent Ophthalmia) (ophthalmia of the newly born) is caused by contact of pus from a gonorrheal or leucorrheal discharge or from another eye similarly affected. It is one of the forms'of Egyptian ophthalmia. In children both eyes are generally affected ; in adults usually one. The symptoms begin, from one to three days after infection, with a watery discharge, which increases rapidly in amount, and becomes yellow and purulent. The conjunctiva becomes greatly congested and swollen, bleeding readily. The lids are so stiffened with infiltration that they can hardly be separated. When they are slightly opened quantities of pus escape. There is great pain in the eye, fever, and sleeplessness. The cornea is much endangered ; it may be perforated, may slough wholly or in part, and the eyeball may be destroyed. If one eye only is affected the other must

i ' The term 'ophthalmia " is now limited to conjunctival inflamma- ions.

be protected. Locally the greatest cleanliness is necessary, and the discharge must be constantly removed. Once daily the conjunctiva should be touched with a strong solution of nitrate of silver, and in the interval frequently bathed with astringent solutions. Recently, powdered iodoform has been much recommended as a local applica- tion. In adults leeching the temple and the continuous application of ice to the eye may be needed. The attend- ants must be warned of the danger of conveying infection to their own eyes.

Diphtheritic Conjunctivitis is characterized by the forma- tion of a yellowish false membrane on the conjunctiva, which becomes thickened and almost solid from infiltration, and by great liability to sloughing of the cornea. It occurs most frequently in North Germany, attacking weakly children during epidemics of ordinary diphtheria, and, like it, often proves fatal by exhaustion. It should be treated by the internal administration of tonics and stimu- lants, and by the loeal use of ice, antiseptic lotions, and the strictest attention to cleanliness.

Chronic Granular Conjunctivitis is a contagious disease arising from prolonged overcrowding under bad sanitary conditions. It is thus specially common among the Jewish and Irish poor, and among workhouse children. The mucous membrane of the lids becomes reddened, thickened, and studded over with small firm "granulations," like boiled sago grains. The

friction of these bodies produces a vas- cular opacity of the cornea (pannus), at first limited to the upper half of the cornea, but in bad cases involving its whole surface. There is considerable pain and discharge, and the eyelids are kept half-shut. There is a peculiar liability to acute exacerbations. The conjunctiva finally shrinks to a dense white scar, which curves the tarsal cartilage inwards, and brings the edge of the lids and the eyelashes to rub on the cornea, and increase its opacity.

It must be persistently treated by strong astringent or caustic applications to the conjunctiva. The pannus, as a rule, disappears with the granulations that caused it. If not, a zone of conjunctiva round the cornea may be divided ; or, as a last resort, the eye may be inoculated with pus from a purulent case, All acute exacerbations must be treated by soothing applications. Incurving of the tarsal cartilage and displacement of the lashes need special surgical operations, which are more or less successful.

If a case occurs in a school or in barracks it must be at once isolated.

Pterygium is a triangular thickening of the exposed part of the conjunctiva, which may or may not be vascular. Its apex is towards the cornea, over which it tends to grow, and thus to interfere with vision; otherwise it causes no irritation. Pterygium is a disease of middle life and of warm climates. If it cause no deformity or interference with sight it should be left alone. If large it may be dissected up from the apex and cut off, or transplanted into another part of the conjunctiva, where it will shrivel up.

The diseases of the cornea are of extreme importance, Diseases from their great frequency and from the fact that a small of the lesion may seriously affect the perfect transparency and °°!" regularity of curvature so necessary for clear vision.

Chronic Interstitial Keratitis attacks young persons, nearly all of whom, as was first pointed out by HIutchin- son, can be shown to be the subjects of hereditary syphilis, and who present some or all of the following physio-gnomical characters :—a depressed bridge of the nose, scars at the angle of the mouth, and notched and peg- shaped central upper incisor teeth. The disease affects both eyes, one generally some time before the other. It begins by the appearance of cloudy spots in the cornea, which spread until the

whole cornea has a ground-glass appearance, not uniform throughout but with denser

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opacities here and there. The corneal surface is "steamy." The ciliary zone of vessels, immediately round the cornea, is congested, and iritis isa frequent complication. Asa rule pain and photophobia are not great. The cornea seldom clears in less than a year, and even then only im- perfectly. Internally, minute doses of mercurials, or where there is decided struma the syrup of the iodide of iron should be given. Locally, atropine should be used to prevent iritis. As the cornea clears, some stimulant, as the dusting of fine calomel powder, may hasten the absorp- tion of the exudation.

Phiyctenular Ophthalmia occurs in strumous or weakly children, especially after hooping-cough or measles. There is great intolerance of light, the slightest attempt to separate the lids causing a gush of tears. The patient is generally kept in bed in a dark room and buries his head in the pillow to exclude the light. The conjunctiva is reddened generally, but spots of localized congestion are seen near little greyish or yellowish elevations on the conjunctiva, or on the cornea near its margin, These papules or pustules may succeed each other in crops for a long time. On the cornea they give rise to vascular ulcers, which may be single or so numerous as to constitute a condition of pannus. As they heal the vessels shrink, and a small white speck is left to mark the seat of the ulcer. As regards treatment, the patient must have a shade or dark glasses, and be sent out of doors daily when the weather permits. Tonics and nourishing food are required. Locally,'so long as the secretion is watery atropine must be used; later, mild astringent lotions ; and finally, to aid the healing of the ulcer and clearing of the residual opacities, some mercurial ointment or calomel powder should be applied.

Ulcers of the Cornea.—Ulcers occur under many forms, to which very various names have been given. All the forms have certain symptoms in common with each other and with the above diseases. There is great pain in and about the eye, great intolerance of light (especially in super- ficial ulcers), and congestion of the ciliary zone. They generally leave an opacity, which greatly interferes with sight if in the centre of the pupil. In severe

~~inflammatory or suppurative ulceration the above symptoms are well marked ; the base of the ulcer is greyish in colour, its edges irregular, and the surrounding cornea infiltrated. It ex- tends superficially and deeply, and may cause hypopyon (pus in the base of the anterior chamber), and even per- foration of the cornea, or iritis. The weak ulcer has little pain or congestion, and seems simply a loss of substance at one part of the cornea. It causes distorted or multiple images. Its existence is a sign of lowered health, and calls for local stimulation and tonic treatment. The small central ulcer of children is a small greyish funnel-shaped spot in the centre of the pupil, with little pain or congestion. It sometimes goes on to abscess, but usually heals quickly. The senile or serpiginous ulcer is a very serious form. There is great pain and photophobia, and unless treated the ulcer gradually eats its way across the cornea, or extends at its margins so as to isolate the central part of the cornea.~~

~~The treatment of corneal ulcers varies very much with the type of disease and with its several stages. In the acute cases the eyes should be shaded, sometimes bandaged ; atropine applied locally allays pain ; eserine is said to act similarly by reducing tension, and is preferable where con- junctival discharge is aggravated by atropine. The weak ulcer should be touched with a nitrate of silver solution, the senile bathed with a quinine lotion. Iftheinflammatory ulcer be not checked by atropine, and if hypopyon increase, tension may be diminished by incising the cornea at its margin, or through the base of the ulcer (Saemisch), or by performing iridectomy.~~

~~Abscess of Cornea may result from injury or ill-health.~~

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~~It begins as a yellow spot in the substance of the cornea, with some surrounding haze. It may become absorbed, or burst forwards and be converted into an inflammatory ulcer, or backwards, giving rise to hypopyon. If hot fomentations and atropine do not check it, it must be treated surgically like the inflammatory ulcer,~~

~~Staphyloma of the Cornea is a bulging forward in whole or in part of the new tissue which replaces the cornea after ulceration or sloughing. It has a bluish or greyish colour, and may be slight in amount, or so great as to keep~~

the eyelids widely separated and cause great irrita- tion. When there is no irritation it may be left alone; when it is increasing an iridectomy may check its progress, When it is large and causes irritation the eye may be removed entirely, or in part so as to leave a stump on which to fit an artificial eye.

Conical Cornea occurs principally in young women whose health has been much reduced from some chronic cause. The cornea becomes thinned in the centre, and is slowly bulged forward. The condition, which is easily recognized from the glistening appearance and the conical

'form of the cornea, causes great myopia, which can be only

imperfectly remedied by biconcave lenses obscured except at a small central aperture or slit. In severe cases opera- tion may be of some service.

Keratitis Punctata is usually secondary to some deeper- seated disease, ¢.g., iritis, choroiditis, or sympathetic ophthalmitis. Minute greasy-looking dots are deposited at the back of the lower part of the cornea, generally arranged as a triangle with its apex upwards. The ocular tension and amount of aqueous humour increase. The treatment is that of the causal disease, usually iodide of potassium or a mercurial, with atropine locally.

Arcus Senilis is a whitish crescent or ring just inside the corneal margin. It is a senile change, a fatty degen- eration of the corneal tissue, not necessarily accompanied by fatty degeneration elsewhere. It does not influence the healing of corneal wounds in any way.

In Acute Iritis the iris changes in colour and its fibres Diseases lose their definition and look muddy. The pupil becomes of the small, irregular in outline, and sluggish or immobile when ™

stimulated by light. There is a pink zone of congestion round the cornea (the ciliary zone). The aqueous humour is turbid ; it may contain blood, and even pus. There is more or less pain in the eye and temple, which is usually worst at night ; there is intolerance of light, great increase in the secretion of tears, and impairment of sight. In most cases lymph escapes from the posterior surface of the iris and fixes its margin to the lens at one or more

points, or all round, and may even occlude the pupil. In some cases the exudation is entirely serous and no ad- hesions are formed (serous iritis). Iritis is one of the symptoms of secondary syphilis; it is caused by rheu- matism, by ulcers and diffuse inflammations of cornea, by injuries to the cornea, iris, and lens, and forms part of nearly all cases of sympathetic ophthalmitis. The syphilitic form usually involves both eyes; it produces much exudation and often little yellow nodules, and rarely relapses. Rheumatic iritis is generally serous, unilateral, and recurs frequently. Atropine must be freely applied locally to prevent the formation of adhesions, or to break down such as may have already formed. The temple may be leeched, and opiates given if pain is severe. In the syphilitic forms calomel must be given ; in the rheumatic alkalis and colchicum. The eyes must be protected by a shade. Traumatic iritis should be treated by continuous cold and leeching. If it is due toa swollen lens, the latter must be removed. After the disease is past the pupil is frequently irregular from adhesions (synechiz) of the iris to the lens-capsule. If adhesions have been broken down

Diseases of the ciliary region,

small brown specks will be seen in the pupil. The whole free edge (exclusion), or the whole posterior surface (total posterior synechiz), may adhere to the lens-capsule, and the pupil may be completely covered with a film of lymph (occlusion). These three last conditions are apt to cause secondary glaucoma.

Coloboma of the Iris is a congenital defect in the iris. The defect is always in the lower part, and gives the pupil a balloon shape. It may or may not be accompanied by a similar defect in the choroid and retina.

From the intimate association of their vascular supply, the ciliary body, iris, cornea, sclerotic, and choroid are frequently affected together. Diseases in this region all agree in their tendency to relapse frequently during a very chronic course, and to involve separate patches.

Sclerotitis (episcleritis) forms a low painful swelling, of a peculiar rusty colour, under the conjunctiva in the ciliary region. It lasts for months, with frequent relapses. The subjects of this disease are mostly rheumatic or anemic women. Internally, iodide of potassium is some- times useful. If that fail small doses of mercury should be given. Locally, atropine, blistering the temple, or massage of the swelling through the upper lid may be tried.

Irido-cyclitis, inflammation of the iris and ciliary body, is characterized by congested patches of a violet colour in the ciliary region, cloudy areas in the cornea, and attacks of iritis with much plastic exudation. There is great pain and intolerance of light. It relapses frequently, each attack leaving more cloudiness of cornea and more iritic adhesions, till ultimately the sclerotic presents a bluish bulging in the ciliary region (ciliary staphyloma), the cor- nea is opaque, its curvature irregular, and the sight gone.

Lrido-chororditis resembles a mild attack of iritis ; there is little pain or photophobia, Small deposits form on the back of the cornea (keratitis punctata). Recent choroid- itis and sometimes opacities in the vitreous may be seen with the ophthalmoscope if the pupil be clear. This also relapses frequently, with the formation of much iritic adhe- sion, and sometimes of secondary glaucoma. This occurs mostly in delicate young persons, and generally involves both eyes. The treatment consists of atropine locally, disuse of the eyes, and tonics with iodide of potassium internally ; only in mild cases is a good result obtained. The iritic exudation is generally too plastic to be absorbed.

Wounds or Diseases in the Ciliary Region are extremely liable to involve the other eye sympathetically. There are two affections of very different moment. In sympa- thetic wrritation the eye is tender and irritable, cannot bear a bright light, and is easily fatigued by continued strain of the accommodation, as in reading or other close work. This condition usually yields speedily when the other eye is removed, which should be advised without hesitation. Sympathetic inflammation is of much more serious mo- ment. It may begin quite insidiously, or with acute pain and intolerance of light. Once begun, it becomes an inde- pendent disease, little influenced by treatment directed to the exciting eye, and usually ending at last in irrepar- able blindness. The symptoms are deposits on the back of the cornea

(keratitis punctata), violet-coloured ciliary congestion, often great tenderness of the ciliary region, the iris muddy and in severe cases buff-coloured, and with many large blood-vessels on its surface. Extensive iritic adhesions form which' cannot be absorbed. The process is an irido-cyclitis or irido-choroiditis. It may be set up two months or many years after the injury; the eye 18 never safe. Treatment must evidently be mainly preventive. All blind eyes liable to cause sympathetic inflammation should be at once removed. If some vision be left in the wounded eye, and the patient can be kept

under observation, it may be left,—the patient being warned of the danger to the other eye. The inflam- mation once arisen, the exciting eye, if blind, must be removed ; but not if there be any sight in it, as it may be eventually the better eye of the two. The patient must be kept in a dark room and not allowed to use his eyes. Atropine solution must be applied locally. After the in- flammation is quite quiescent removal of the lens with a portion of the iris may be of use in giving an artificial pupil.

Cataract.—Cataract is an opacity of the crystalline Diseases lens. It is due to some alteration in the structure and of the relationship of its fibres, as the result either of some senile seca change or defect of development, of local interference with . its nutrition (as in glaucoma), of some general diseases such as diabetes, or of local injury to the lens or its capsule. For practical purposes all cataracts are classified under three categories. (A) They may be hard or soft; below the age of thirty-five, and in diabetes of any age, cataracts are soft. (B) They may be general or partial, according to the amount of lens involved in the opacity. General cataract may be nuclear (beginning from the centre) or cortical (spreading inward from the periphery); or both conditions may coexist. Partial cataract may be (1) lamellar, where one or several of the concentric layers in an otherwise transparent lens becomes opaque. This form is often congenital. It is said to be frequently caused by infantile convulsions. (2) Pyramidal cataract is a small white spot on the lens-capsule in the centre of the pupil. This is the result of corneal perforation in purulent oph- thalmia. The cornea falls against the lens-capsule when the aqueous humour is evacuated, and becomes adherent to it. The aqueous, refilling after the healing of the per- foration, tears away the cornea and leaves the spot of lymph on the capsule.

~~(3) In posterior polar cataract the opacity begins at the posterior pole of the lens. It indicates deep-seated disease. (C) Cataract may be primary or secondary, according as it arises in an eye otherwise healthy or depends on some other disease in it. Cataracts arising from injury to the lens are called traumatic.~~

~~Symptoms and Treatment of Cataract.—Vision becomes gradually impaired. If the cataract be small and central, vision improves in a dull light or when the eyes are shaded. On ophthalmoscopic examination (see below) the opaque parts appear either as dark striz converging towards the centre or as a dark central mass. The fundus, if visible, appears red. An attempt should be made to ascertain if it is healthy. On oblique illumination by a convex lens the opaque parts now appear white and the rest of the pupil black. When the cataract is ripe the pupil is filled by a homogeneous pearly-white or amber-coloured opacity. The rest of the eye is healthy if the pupil reacts to light, and the patient can tell the direction of a candle-flame at four feet distance. Asa palliative atropine may be used if it be found to improve vision. To remove the cataract operation is required. Operation is undesirable in pyra- midal, secondary, and immature cataract, and usually if, while the cataract in one eye is ripe, the other eye remains good, unless the patient specially desires the operation.~~

~~The Operation.—In the soft cataract of infancy, youth, and diabetes the needle operation should be chosen. The pupil having been dilated by atropine, a fine needle is passed through the cornea near its margin, and lacerates the lens-capsule freely. The lens, acted on by the aqueous humour, swells up and gradually dissolves,—the process of solution taking from two to three months, and generally needing one or two repetitions of the needling. In hard cataracts the lens must be extracted entire. The follow- ing is the most usual operation. With a narrow knife an incision is made through the upper part of the cornea at its junction with the sclerotic, in length somewhat less~~

~~Glau- coma.~~

~~OPHTHALMOLOGY~~

than half the corneal circumference. A portion of iris is drawn through the corneal incision and cut off (iridectomy). Then the lens-capsule is lacerated by a needle. The lens is forced out of the eye by gentle pressure on the sclerotic below. All fragments of lens-substance are carefully removed, the edges of the incision are brought together, the eyes bandaged, and the patient kept in bed for a few days. Ninety-five per cent. of the cases do well, the others going wrong from hemorrhage into the eye, iritis, or sup-puration of the eye. In lamellar cataract two courses are open. If dilatation of the pupil by atropine enables the patient to see clearly, the removal of a portion of iris (artificial pupil) will be sufficient ; if not, the solution of the lens must be effected by the needle operation. In traumatic cataract the pupil is kept dilated by atropine to prevent iritis. If severe iritic or glaucomatous symptoms arise an incision must be made in the cornea, and the softened lens removed along a grooved scoop or by suction.

After the cataract is removed strong convex glasses must be worn for near vision and a somewhat weaker pair for distant vision. Their use must not be allowed till at least two months after the operation.

Dislocation of the Lens may arise from a blow or spon- taneously. The lens may pass into the anterior or posterior chamber. If in the posterior chamber it may be invisible, but the iris will be tremulous and the refraction very hyper- metropic. If the dislocation be partial the edge of the lens may be seen with the ophthalmoscope as a dark curved line. The lens generally becomes opaque. It may, and often does, cause glaucoma.

Glaucoma is a most serious disease, characterized in all its forms by increased tension of the eyeball, impairment of sight, and ultimate irremediable blindness. Its course is usually chronic, lasting sometimes many years ; sometimes absolute blindness comes on in a few hours or days.

In the chronic form the earliest symptoms are rapid onset of presbyopia, making it necessary to change the spectacles frequently, and attacks of mistiness of sight, during which artificial lights appear surrounded by coloured rings. Gradually sight is impaired and the field of vision contracted. The pupil is dilated and sluggish ; the cornea may be "steamy" and insensitive, the anterior chamber shallow. Large veins pierce the

sclerotic a little way from the corneal margin. The lens may have a greenish hue (hence the name), or may become opaque. The optic disk, if visible ophthalmoscopically, is "cupped" or hollowed, and in advanced cases also atrophied. The retinal vessels bend abruptly in rising over its edge, or in deep cupping seem to have their course interrupted for a short distance. The arteries pulsate either spontaneously or on slight press- ure on the eyeball. The tension (ascertained by pressing the eyeball against the floor of the orbit) is variously increased. This form may be painless throughout, and the gradual impairment of vision may lead to the fatal error of a diagnosis of cataract. More usually there are occa- sional acute attacks. Acute glaucoma comes on suddenly ; there is much pain in the eye and temple and congestion of the globe; increase of tension and loss of sight are extremely rapid.

All the symptoms depend on the increased tension of the intraocular fluids. The loss of sight and contraction of the visual field result from compression of the retina and its vessels. Pressure on the ciliary nerve paralyses the iris and the accommodation (hence the presbyopia), and renders the cornea insensitive. The anterior chamber is shallowed by the lens being driven forwards, and the disk is cupped by being driven backwards through the lamina cribrosa, the least resistent part of the sclerotic. The veins of the sclerotic are enlarged in order to relieve the ob-

structed vasa vorticosa. 'The explanation of the increase of tension is not yet complete. In most cases it is probably due to deficient removal of fluid. Normally this takes place through the suspensory ligament of the lens, round the free edge of the iris, leaving the anterior chamber at the angle of junction of the iris and cornea. Block- ing of any part of this channel (most often at the above angle) would cause increase in the tension. Increased blood-supply is also in many cases a cause. Glaucoma is most common after forty. It may be either primary or secondary to some disease or injury of the eye.

Eserine applied locally has proved useful in some early cases of glaucoma. Iridectomy—that is, the removal of a portion of iris through an incision in the cornea—is the most successful mode of checking the disease. In

secondary glaucoma the treatment must be directed to the cause, if it is removable.

Muscx Volitantes.—The floating bodies, specks, &c., so Diseases

often complained of are usually of no importance. occur most frequently in myopic eyes. Pathological muscc, however, depend on the presence of opacities in the vitre- ous, detectable by the ophthalmoscope. They are of very various sizes and shapes, from large masses, as in recent hemorrhage, to strings, specks, knotted bodies, or finely sparkling particles (cholesterin), or as a diffuse cloud or haze obscuring the retina. From the rate at which the bodies move an opinion may be formed of the fluidity of the vitreous. Disease of the vitreous is usually secondary to disease of some of the surrounding parts, as in high de- grees of myopia, in hemorrhagic and syphilitic choroiditis and retinitis, and diseases of the ciliary region. Heemor- rhage is frequent after blows on or wounds of the eye.

Disseminated Choroiditis is usually a symmetrical dis- ease, arising from acquired or inherited syphilis. There are no characteristic symptoms, but the ophthalmoscope shows in the early stage (rarely observed) yellowish patches (of exudation), over which, unless obscured by haze, the retinal vessels are seen to pass. Later, when the exuda- tion gives place to atrophy, white patches are seen of various sizes with masses of black pigment on or around them, distributed irregularly over the choroid. The re- tinal vessels may be seen to pass unaltered over some of the white areas. Sometimes the patches of atrophy in- volve merely the superficial layers and expose the deeper larger choroidal vessels. Vision is impaired, especially if the yellow spot is involved. The treatment is that for syphilis, with rest and protection of the eyes from light. This at least helps to prevent fresh accessions of the disease if it cannot restore the atrophied choroid. Similar spots are seen in non-syphilitic subjects, probably as the result of choroidal hzemorrhage.

In myopia the choroid is frequently atrophied near the disk, especially at its outer edge, forming what is variously known as "posterior staphyloma," "myopic crescent," or "sclerotico-choroiditis posterior." This pos- terior staphyloma varies much in shape, sometimes sur- rounding the disk, sometimes limited to the yellow spot, causing then greatly impaired central vision.

~~Tubercles are sometimes deposited in the choroid, appear- ing as small yellow spots. Their presence may be of assistance in forming a diagnosis of tubercular disease.~~

~~Rupture of the Choroid from injury is generally seen as a long curved line of atrophy with the concavity towards the disk.~~ ,

~~Coloboma of the choroid is a congenital defect, indicated by a large white patch of atrophy at the lower part, often embracing the disk,—the surface of the sclerotic often looking uneven. It may exist independently of similar defect in the iris.~~

~~Sarcoma of the Choroid is a malignant tumour, usually~~

~~They of the vitreous.~~

~~Diseases of the choroid.~~

~~Diseases of the retina~~,

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~~pigmented, which tends to destroy the eye, to spread along the optic nerve, and to cause metastalic deposits elsewhere in the body. It causes defect of sight, and if the media are clear may be seen by the ophthalmoscope. It often causes glaucoma and cataract. The tumour must be excised with as much of the optic nerve and orbital tissue as can be reached.~~

~~Detachment of the Retina is a separation of the retina from the choroid by an effusion of serum or of blood, or by the growth of a tumour between them. It occurs most frequently in myopia and from blows on the eye (also from dislocation of the lens and in albuminuria). The detachment varies greatly in extent; it is most usually situated at the lower part of the retina. It causes blind- ness on the corresponding opposite part of the visual field. With the ophthalmoscope, instead of the red appearance, a greyish reflexion is seen, generally uneven on the surface, with the retinal vessels, reduced in size and dark in colour, coursing over it. The grey surface may be seen to undulate with movements of the eye. Treatment is generally unsatisfactory.~~

~~Myopic cases should avoid stooping and strain of the eyes to prevent its extension.~~

~~Embolism of the Central Artery of the Retina is a plugging of this vessel by a small body, usually detached from one of the valves of a diseased heart. The eye becomes sud- denly blind, and on ophthalmoscopic examination the red reflex is found to be replaced by a diffuse white mist, except at the yellow spot where a "cherry-red" spot appears ; and the retinal vessels are often reduced to mere threads. After a time the haze passes off the retina, but an atrophied disk and narrowed blood-vessels are left. Treatment is useless. If the embolism is impacted in one of the branches of the retinal artery these appearances will be localized, and a blind spot will correspond to the affected area.~~

~~Albuminuric Retinitis occurs in an advanced stage of chronic Bright's disease of the kidneys, usually when the general health has become much impaired. It is especially associated with the granular kidney, and is not seldom the first indication of this serious disease. It causes defective sight, and some of the following characteristic ophthalmo- scopic appearances. In the early stage (rarely observed) a greyish haze presents itself at the centre of the retina (from the presence of an albuminous fluid) ; later, pearly-white sharply-defined spots of various sizes appear, often grouped round the yellow spot (due to fatty degeneration of the coagulated albumen and nerve-fibres). With these there may be found many small hemorrhages, or a condi- tion of optic neuritis. Vision is seldom completely lost, and may, except in the severest cases, be expected to im- prove somewhat, especially in the albuminuria associated with pregnancy. Its treatment is that of its cause.~~

~~Syphilitic Retinitis is usually a symptom of the second- ary stage, affecting both eyes, and producing dimness of vision and night-blindness. Ophthalmoscopically the disk appears hazy, the vessels full and tortuous, the retina also hazy or showing white misty patches, especially near the yellow spot. It is much benefited by a mercurial course,~~

~~Hemorrhage Retinitis is indicated by the appearance all over the retina of small flame-shaped hemorrhages with dilated veins. It is perhaps due to gout (Hutchinson).~~

~~Hemorrhages may result from vascular degeneration. They seriously damage sight if they occur at the yellow spot.~~

~~Pigmentary Retinitis is a peculiar chronic disease affecting both eyes symmetrically. It is either congenital or begins early in life and advances gradually till it produces com- plete blindness. Its cause is not well known. It is strongly hereditary, occurring often in several members of one family; it has been found also in the descendants of~~

~~OPEHYTEHREMOLOG Y~~

~~parents nearly related to each other, and it is common among deaf-mutes. In many cases no cause can be assigned. Its earliest symptom is an inability to get about in the dusk (night-blindness). Then follows a gradual contrac- tion of the field of vision, the patient feeling as if he looked through a tube, seeing objects clearly within his field in good daylight, but nothing beyond. Eventually this central vision also fails. The ophthalmoscopical ap- pearances are symmetrical in both eyes, and are equally characteristic. At the periphery of the retina masses of black pigment are distributed in an irregularly reticulated or lace-like manner over the retina and along the retinal vessels. The disk is pale and "waxlike," and the retinal vessels are much contracted,—it may be, reduced to mere threads. As the visual field contracts the retinal pigment approaches the disk. Treatment is of little use. Galvanism has lately been recommended.~~

~~Glioma of the Retina is a tumour of excessive malignancy, arising in the retina and rapidly filling the eye, and spread- ing from the eye along the optic nerve to the brain, or through the sclerotic to the orbit. It occurs in young children. 'Thorough and early removal of the eye with the optic nerve may prevent its recurrence.~~

~~The optic nerve may be inflamed in any part of its Diseases course, within the skull, in the orbit, and within the eye, of the~~

~~To the physician the most important of these inflamma- ae~~

~~retina,~~

~~tions is that of the intraocular end of the nerve or papilla, known as Optic Neuritis or Papillitis (choked disk), on account of its frequent association with tumour of the brain, of which it is one of the most diagnostic symptoms. The signs may be well marked to the ophthalmoscope before there is the slightest impairment of sight. At first the disk is seen swollen, reddened, its edge indistinct, and the veins distended and tortuous. Later, the swelling of the disk increases, obscuring the disk itself, and extending beyond its edge. The surface has a greyish appearance, streaked with reddish lines, which are enlarged blood- vessels. The retinal arteries and veins at their commence- ment are obscured by the exudation ; at the edge of the swollen disk they bend downwards to reach the retina, over which they pursue a tortuous course, the veins being much distended. Small hemorrhages are often seen on the disk and retina. All traces of the exudation may pass away. More usually the disk becomes atrophied, of a pale-white colour, with an indistinct margin and shrunken retinal vessels.~~

~~Papillitis of both eyes sometimes also arises from lead- poisoning or anzemia. Papillitis of one eye, with subse- quent atrophy, is generally due to local injury to the nerve.~~

~~Atrophy of the Optic Nerve is sometimes primary, 7.e., arises without previous neuritis. In this case the disk becomes gradually of a pale-white or pale-greyish colour, its edge more than usually distinct, and the vessels may not be contracted. Priniary atrophy of the optic nerve is one of the most marked symptoms of locomotor ataxia. Many of the cases where no cause is ascertainable are undoubtedly precursory to the usual symptoms of ataxy. Vision always suffers in this form more or less.~~

~~Atrophy of the disk may be secondary to glaucoma, neuritis, pigmentary retinitis, and some forms of choroid- itis, When unilateral it may be due to embolism, or, if it follow an injury to the head, to fracture of the optic canal, or to a retrobulbar neuritis,~~

~~Amblyopia, Amaurosis, &c.—Amblyopia means defect- ive sight ; amaurosis, blindness without sufficient obvious cause. Such defective sight is not uncommon in a squint- ing eye, or one of a different refractive power from its fellow. Tobacco amblyopia occurs in adults from excessive tobacco-~~

smoking, especially when combined with alcoholic excess. There is loss of visual acuteness, as tested by read-

&c.

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ing, of one-fifth to one-tenth, and green and red blindness in the centre of the field. The disk may be normal or havea muddy colour. It usually recovers under abstinence from smoking and alcohol and the use of small doses of strychnia.

Hemianopsia means loss of one-half of the visual field. It is generally bilateral and affects corresponding halves of the two retinz, e.g., the two right halves or the two left ; rarely the two inner halves or the two outer are involved. The dividing line is usually vertical, or nearly so, bending so as to avoid the fixation point. It is due to some disease of the brain, or of one optic tract. (It will be remembered that each optic tract divides at the optic commissure, and supplies one-half of each retina, the right tract going to the right halves, the left to the left.)

Night-blindness without organic change may be due to exposure to bright sunlight, sleeping in moonlight, or to scurvy. Snow-blindness is a similar condition, with con- gestion of the eyelids and intolerance of light.

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the strain on the internal recti. Myopic eyes are liable to various affections, —muscx volitantes, opacity and fiuidity of vitreous, choroidal hemorrhage, and detachment of retina.

Astigmatism is either regular or irregular. Regular astigmatism is due to the fact that the surfaces of the cornea and lens are not segments of spheres. The principal abnormality is in the cornea, and it is found that the meridians of greatest and least curvature (the principal meridians) are always at right angles to each other, and that the intermediate meridians pass by regular gradation from the one to the other. It is evident that rays of light from a point passing through the plane of greatest curvature will have

met before those passing through the plane at right angles to it, which will form a line, that similarly the first set of rays will have crossed and will in their turn form a line by the time the second have reached their focus, and that between these two points the image will be circular or oval, but blurred. In no case will the image be a point, and hence vision will never be distinct. If one of the principal meridians be emmetropic the astigmatism is "simple" ; if both be either hypermetropic or myopic it is "compound"; if one be hypermetropic and the other myopic it is " mixed."

If spherical lenses do not raise the sight of otherwise healthy eyes to the normal standard astigmatism is probable. On ophthalmo- scopic examination the disk will be found oval, and altering its

Errors of In Hypermetropia parallel rays falling on the eye meet in a point | shape when the lens is removed from the eye; with the direct refrac- behind the retina. This is due in most cases to shortening of the | method the vessels are not seen with equal distinctness, and may

tion.

axis of the eye (axial hypermetropia), in rarer cases to absence of the lens, and is the physiological condition, after the age of fifty- five, of all previously normal eyes, owing to diminution of the refractive power of the lens. Clear vision is obtained only when the entrant rays are focused on the retina. In the hypermetropic eye this is effected by increase in the refractive power of the lens by the action of the ciliary muscle. In slight hypermetropia this is easily accomplished, and no complaint may be made. In higher degrees the continuous severe strain on the accommodation in read- ing and other fine work gives rise to aching, watering, and misti- ness of the eyes (accommodative asthenopia). These symptoms may first appear after an exhausting illness or prolonged strain of the eyes,—in both cases from reduction of the tone in the ciliary muscle, Convergent squint isa common symptom. In the highest degrees, where no amount of accommodation gives distinct vision, the attempt is given up, and no complaint made. In most cases the continuous use of the accommodation produces a spasm of the ciliary muscle, which renders some of the hypermetropila " latent," what remains being the "manifest"' hypermetropia. Both together constitute the "total" hypermetropia. To ascertain the hyper- metropia place the patient 20 feet from Snellen's test- types. If

pass across the field in the two principal meridians in the same direction but at different rates if the astigmatism be compound, in opposite directions in "mixed" astigmatism. If the patient look at an arrangement of radiating lines of equal thickness he will not see them all with equal distinctness. Astigmatism is corrected by neutralizing the inequality of the refractive

surfaces by means of cylindrical lenses. In many cases the vision cannot be brought up to the nornial standard.

There are many ways of estimating astigmatism. One method is to find by the test-types the spherical lens which gives the best distant vision ; then, by means of a narrow slit in a metal disk, to find the plane in which vision is further most improved. Spherical lenses are placed in front of this slit till the one which gives the best attainable vision is found; this gives the cylindrical lens necessary for this plane. A similar inquiry is conducted with the plane at right angles to this. Spectacles are ordered compounded of the spherical lens and the two cylindrical lenses with their axes at right angles to each other.

Irregular astigmatism depends on irregularities in the surface of the cornea or in the refractive power of the lens. It can seldom be remedied.

a weak convex lens makes sight no worse try stronger and stronger glasses till the best vision is obtained. This gives the " manifest" hypermetropia. If there be no improvement with convex glasses the hypermetropia may be all latent. Paralyse the accommodation by putting a drop of atropine solution and test the " total" hyper-

Presbyopia.—From ten years onwards the "near"' point of the Dis- eye gradually recedes, owing to increasing firmness of the lens and orders of probably diminishing power in the ciliary muscle. Presbyopia has accom- been arbitrarily fixed as commencing when the near point recedes moda- to 9 inches, because then discomfort in reading is generally com- tion.

metropia. For the ophthalmoscopic tests, see below. Children with asthenopia should wear constantly glasses which nearly correct the hypermetropia. For adults it is not usually necessary to wear glasses for distant vision. For reading the manifest hypermetropia should be corrected, the strength of the glasses being increased as often as asthenopic symptoms reappear.

In Myopia or Short-sight the retina lies behind the focal point of parallel rays entering the eye; it will therefore be at the con- jugate focus of some point at a definite distance from the eye,—its "far point." Objects beyond

~~this point are seen indistinctly. Within this point and up to the "near" point objects are distinctly seen. Myopia is generally due to elongation of the posterior part of the eye, the sclerotic and choroid at the macula being thinned and bulging backwards. In severe cases the bulging is general, thinning all the coats and enlarging the eye. Myopia is highly hereditary. It rarely begins before seven, and rarely advances after twenty-five. It is always aggravated, and may be produced, by using the eyes on fine work, especially in a bad light and in a stooping position. Myopia results also from increased curvature of the cornea, as in interstitial keratitis and conical cornea. ;~~

~~The symptoms of myopia are well known. Distant vision is indistinct, and fine work or printed type is held near the eyes. In high degrees after reading for a time the letters seem to be blurred and to run into each other, while the eyes ache and water owing to inability of the internal recti to keep up the necessary convergence (muscular asthenopia). Divergent squint may be present. The eyes are often kept half shut (hence the name "myopia") to exclude the excess of light. Ophthalmoscopic examination often shows the "myopic crescent" at the outer side of the disk, or all round it, or at the macula. The other tests are described below. As regards treatment, all myopics should work in a good light, and not ina stooping position. If desired, concave lenses may be given for dis- tant vision. For near vision in high myopia concave lenses not fully corrective may be given, to enable the patient to hold his work at a greater distance and to avoid stooping. If there is muscular asthenopia prisms with their bases inwards may be used to relieve~~

~~plained of. In normal eyes it begins about forty, in hypermetropia earlier, and in myopia later. There is no increased difficulty in seeing distant objects, but ordinary type has to be held incon- veniently far away. The treatment consists in giving glasses to enable the patient to read at 9 inches. In practice it is usually sufficient to enable him to read at 12 inches' distance. As age advances the presbyopia increases, and it is necessary from time to time to increase the strength of the spectacles.~~

~~Paralysis of the Acecommodationis not uncommon after diphtheria ; it forms one of the symptoms of paralysis of the third nerve.~~

Spas of the Accommodation is common in hypermetropia, and is sometimes present in the opposite condition of myopia.

In strabismus the two eyes are not directed to the same point in Strabis. The deviation may be inwards or outwards, downwards or mus or upwards,— the first two forms being by far the most common. Jn- squint.

space.

ward or Convergent Strabismus is due either (1) to paralysis of the external rectus muscle or (2) to over-developmient of theinterni. (1) Paralytic convergent squint is the result of some affection of the sixth nerve or its nerve-centre, owing generally either to syphilis or to nervous exhaustion. It varies in amount from slight weak- ness to complete paralysis of the muscle. When the paralysis is complete the eye is turned inwards and cannot be moved outwards beyond the middle of the fissure of the eyelids. In minor degrees, where the deformity is not so evident, it may be difficult to tell which is the squinting eye. If the patient be told to look at an object held a short distance in front of him, and a piece of ground glass be placed before the squinting eye, neither eye will move ; if the sound eye now be covered the squinting eye will turn outwards to fix the object, while the sound eye will move a greater distance inwards; the "secondary" is greater than the "primary" squint. The reason of this is that the nerve to the paralysed externus and that to the sound internus of the other eye, which work together, both receive the same stimulus from the will, and that the sound muscle acts more strongly than the other. Owing to the displace- ment of the yellow spot double vision is produced, the false image being projected towards the side of the paralysed muscle (homony-

XVII. — 99

Diseases of the eyelids,

Diseases of the laerymal appara- tus.

mous diplopia). The diplopia is always most distressing, and may cause giddiness when the strabismus is slight. The treatment

probes are passed through the stricture. Abscesses when formed must be opened, and when inflammation has subsided the stricture

consists in the use of iodide of potassium in the syphilitic, and in nervine tonics in the neurasthenic cases. The muscle may be fara- dized to keep up its tone. In bad cases tenotomy of the internal rectus may be necessary. The squinting eye may be covered to pre- vent the diplopia. (2) Convergent strabismus from over-development of the internal recti ("concomitant" strabismus) is almost always due to hypermetropia. Its production depends on the intimate relation between accommodation and convergence, every degree of the one evoking a constant quantity of the other, so that nor- mally the two eyes are converged upon the object accommodated for. In hypermetropia clear vision needs an excess of accommoda- tion which in its turn produces an excess of convergence, so that the two eyes meet in a point nearer than that looked at ; they squint, in short. The eyes may squint only during accommodation for a near object (periodic squint), but generally the internal recti be- come so developed as to produce a constant convergence. If either eye is used indifferently for vision the squint is "alternating." Generally one eye is habitually used, the sight in the other eye becoming defective. The amount of squint bears no ratio to the amount of hypermetropia, being frequently absent in the higher degrees where accommodation fails to give clear sight and is not exercised. Double vision does not occur, because the image of the squinting eye is unconsciously suppressed. .

In periodic squint glasses to correct the hypermetropia ought to be given. For permanent squint division of the tendons of one or both internal rectimuseles is necessary. The operation diminishes the power of these muscles by allowing them to become attached to the globe farther back. Care must be taken not to produce too great an effect, it being preferable rather to leave a little convergence.

In rare cases myopta is associated with convergent squint.

Divergent Strabismus arises from weakness of the internal rectus, asin myopia. In the condition known as muscular asthenopia it is present only

~~after a prolonged effort of convergence. It arises also where the sight is defective, as with corneal opacities, or from unskilful operation for convergent squint. It can generally be improved by tenotomy of the external and "advancement " of the internal rectus muscle. :~~

~~In paralysis of the superior oblique muscle the deviation is slight. Owing to interference with the movement downward and outward, double vision is present when the eyes are directed below the hori- zontal line.~~

~~Paralysis of the Third Nerve causes ptosis, loss of accommodation, and dilatation of the pupil, and the eye can be moved only slightly downwards and outwards. All the branches are seldom affected alike.~~

~~Ophthalmia Tarst (blepharitis) is a chronic inflammation of the follicles of the eyelashes and their glands, attacking strumous children, especially after measles. The edges of the lids are covered with small scabs, which gum the lashes into pencils; when the scabs are removed small freely-bleeding ulcers are exposed. The conjunctiva is also reddened. Eventually the lashes either fall out or become misdirected, the border of the lids looks thickened and bald, and the eyes continually water from eversion of the orifice of the tear-duct. The scabs must be removed daily by means of an alkaline lotion, and a weak mercurial ointment applied to the lids. In bad cases the lashes must be pulled out, and the ulcers touched with nitrate of silver.~~

~~A Stye is an abscess in a Meibomian gland, or in the cellular tissue of the lid. Styes are apt to occur in crops, and generally point to some derangement of health. They should be poulticed till the matter points, then opened with a lancet. Tonics are needed internally.~~

~~Chalazion is a cyst ina Meibomian gland. It forms a small pea- sized painless swelling under the skin of the lid. It should be opened from the conjunctival surface and its contents expressed,~~

~~Lipithelioma (rodent ulcer) occurs in old people, grows slowly, forming a hard irregular mass, with an ulcerated surface covered by scabs ; it may extend in all directions, destroying the tissues it reaches. The treatment consists in complete removal by the knife or chloride of zinc paste.~~

~~The lacrymal gland sometimes suppurates, and must be treated like any other abscess. Most of the diseases of this system arise in the punctum, canaliculi, lacrymal sac, or nasal duct, and all cause overflow of tears on the cheek. The punctum may be everted, from disease of the conjunctiva, paralysis of the facial nerve, or the dragging of a scar in the cheek. The canaliculus may be constricted or obliterated. The nasal duct may be obstructed from chronic disease of its mucous membrane or bony wall. The result of this is the retention of tears in the lacrymal sac, then the formation by distension of this sac of a small tumour at the inner angle of the eye, from which first clear mucus, and possibly, at a later period, also pus may be pressed back into the eye. Finally, if the case is neglected an abscess may form which may burst externally and cause a troublesome fistula. The treatment in the first placee must be the dilatation of the stricture. The canaliculus is first slit on its conjunctival surface along its whole length, then successively larger~~

~~dilated. The sac may be washed with astringent solutions. When the stricture is due to bone-disease its cure is not hopeful. |~~

~~Blows may rupture the coats of the eye,—the sclerotic and Injuries | underlying coats being generally injured. Hemorrhage takes place of the between the coats and into the chambers of the eye. The eye may eyeball. be removed at once ; if any perception of light remain, the excision should be delayed to see if there be any chance of the eye being saved. Usually the eye shrinks and becomes quite useless.~~

~~Blows may cause damage to the interior of the eye without injuring the outer coats. There may be hemorrhage into the anterior or the posterior chamber,—the latter a most serious con- dition, seldom completely recovered from. The choroid may be ruptured, the lens dislocated, or the iris torn from part of its ciliary attachment ; and the retina is not seldom detached from the choroid.~~

~~Wounds.—Small foreign bodies—bits of steel, &c.—are often impacted in the cornea. They should be removed as soon as possible, as they give rise to great pain, and may seriously injure the cornea. If there is much after-irritation atropine should be used freely to the eye.~~

Burns with caustic alkalis and acids or molten lead are common.

When seen the whole conjunctiva should be carefully freed from all of the irritant. If lime has been the cause, a weak acid lotion should be used. Then oil should be dropped into the conjunctival sac, and any inflammatory symptoms treated as they arise. If the epithelial layer of the cornea only has been destroyed, it often clears to a wonderful extent ; but deeper injuries may cause severe ulcerative inflammation of the cornea, and the conjunctiva may slough in part, with ultimate formation of a scar binding the lid to the eye (symblepharon).

Penetrating Wounds.—Such wounds of the cornea and sclerotic, if only the foreign body be not in the eye, generally do well. Usually some of the deeper structures are involved, and these cases are always very serious. The eye may be rapidly lost from general inflammation, or if not it may become completely blind. In almost any case, especially where the wound is in the ciliary region, the other eye is apt to be sympathetically involved. If the injured eye therefore is blind, and if there is inflammation in the ciliary region, it must be at once excised. If the eye be not blind, the ciliary region quiet, and no foreign body in the lens or vitreous humour, the eye may be preserved,—the danger of involvement of the other eye being put before the patient. In such cases it is impossible to lay down any general rules. Each case must be judged on its own merits by the ophthalmic surgeon.

Usk oF THE OPHTHALMOSCOPE.

The ophthalmoscope consists of a small mirror with a small Use of aperture in the centre. Most instruments have now in addition a the oph- series of concave and convex lenses arranged on a disk so that they thalmo- can be brought successively behind the central perforation.

Rays of light entering the eye in any given direction are reflected by the choroid along the same direction. Ordinarily, therefore, the fundus cannot be seen, because an eye so placed as to see the emerging rays intercepts the entrant ones. The ophthalmoscope, by placing the source of light in front of the observer's eye, enables it to see and examine the interior of the other eye.

There are two methods of examination,—the indirect and the direct. (1) The indirect method, which forms a real, inverted, and slightly magnified image in front of the observed eye, may be illustrated thus. Place a convex lens of 2-inch focus in front of this page, and let these represent crystalline lens and retina respect- ively. Place now a second similar lens in front of the first, and the print will be seen inverted and slightly magnified. (2) The direct method forms a virtual, erect, much magnified image. Place one of the above lenses within 2 inches of the page and your own eye close to it. The letters will appear erect and enlarged.

To use the ophthalmoscope,—place the patient in a dark room, with a lamp to one side of and a little behind the head. If the indirect method is to be employed, sit in front of the patient, with the mirror in your right hand before your right eye, the large lens in your left. Reflect the light from a distance of about 2 feet into one of the eyes, and when you see a red reflexion place the lens in front of it, and you will obtain the inverted image of the fundus.

(A) Begin your examination with the optic disk by telling the patient to direct the observed eye a little inwards. Note the follow- ing points :—(aa) the colour of the disk, normally a yellowish pink, but varying considerably owing to tint of surrounding choroid, &c. ; (0) a paler spot in its centre, which may be due to the funnel-shaped expansion of the nerve, the physiological cup ; (c) the distinctness of the edge (spots of black pigment here are of no importance) ; (d) when the lens is removed from the eye the image of the disk remains of the same size if the eye is emmetropic, becomes smaller if the eye is hypermetropic, and larger if it is myopic, and alters in shape if there is astigmatism. (B) The retinal vessels appear as

red lines, the arteries paler and about two-thirds the size of the darker veins. They arise in the centre of the disk, run usually in pairs, branching as they pass over the retina. Note their light central streak, their amount of tortuosity, and the presence or absence of white lines by their side. (C) Note the usually uniform redness of the choroid. In light-haired and dark-haired persons the vessels appear as dark or light red bands on the general red

ground. (D) The yellow spot is indicated either by a deeper redness of the choroid or by a bright yellow spot surrounded by a shifting white halo.

By the direct method the mirror is used without the large lens,—if necessary, one of the smaller lenses being placed behind the cen- tral perforation. (A) Examine the crystalline lens (see "'cataract" above). (B) Opacities in the vitreous humour are detected as mov- ing bodies when the eye is moved about and then brought to a standstill. (C) Ascertain the refraction. The eye is ametropic if the vessels are seen distinctly at more than 18 inches' distance. It is hypermetropic if the observer on moving his head finds the vessels moving in the same direction ; myopic if they go the opposite way. To measure the amount of ametropia needs practice and power of the observer to relax his accommodation completely. Rays leaving the hypermetropic eye are divergent ; to be seen clearly by the observer they must be rendered parallel. The strongest convex lens, therefore, which, placed behind the central aperture, gives a clear image of the fundus is the measure of the hypermetropia. Similarly the lowest concave lens with clear image indicates the amount of myopia. (D) To examine the details of the fundus, the mirror is approached closely to the observed eye.

Retinoscopy.—The observer sitting at a distance of 4 feet from the patient reflects the light into his eye, after dilating the pupil with atropine, and rotates the mirror slightly. A shadow will be seen to cross the pupil,—in myopia of more than 1D (5) in the same direction as the rotation, in all other cases in the opposite direc- tion. This method is useful in determining and correcting the refraction where the patients are too young or too stupid to assist with their answers. (A. BR.)

OPIE, Ameria (1769-1853), the wife of John Opie, noticed below, was the daughter of Dr Alderson, a phy- sician in Norwich, and was born there in 1769. The cir- cumstances of her early life gave the bent to her after-career. In her girlhood she beguiled the solitude of her father's summerhouse by composing songs and tragedies; on her visits to London the superior society into which the accom- plishments of her mind and the graces of her person intro- duced her served to stimulate her aspirations ; and after her marriage in 1798 she was encouraged by her husband to become a candidate for literary fame. Accordingly, in 1801 she published a novel

entitled Father and Daughter. Although this tale showed no artistic ability in dealing either with incidents or with characters, yet it was the work of a lively fancy and a feeling heart, and speedily brought its author into notice. She was encouraged to publish a volume of sweet and graceful poems in 1802, and to persist in the kind of novel-writing which she had so successfully commenced. Adeline Mowbray followed in 1804, and Simple Tales in 1806. The death of her husband in 1807 and her return to Norwich did not slacken her industry. She published Zemper in 1812, Tales of Real Life in 1813, Valentine's Hve in 1816, Tales of the Heart in 1818, and Madeline in 1822. At length, in 1825, her assumption of the tenets and garb of the Quakers checked her literary ardour and changed her mode of life. Beyond a volume entitled Detraction Displayed, and several contributions in prose and verse to various periodicals, nothing afterwards proceeded from her pen. The rest of her life was spent in travelling and in the exercise of Chris- tian benevolence. She died at Norwich in 1853. A Life of Mrs Opie, by Miss C. L. Brightwell, was published in 1854.

OPIE, Joun (1761-1807), historical and portrait painter, was born at St Agnes near Truro in May 1761. He early showed a taste for drawing, and for scholarship also, hav- ing at the age of twelve mastered Euclid and opened an evening school for arithmetic and writing. Before long he won some local reputation by portrait-painting; and in 1780 he started for London, under the patronage of Dr Wolcot (Peter Pindar), who hoped to win credit, and still more substantial benefits, from the fame of his young protégé. Opie was introduced to the town as "The

Cornish Wonder," a self-taught genius. The world of fashion, ever eager for a new sensation, was attracted ; the carriages of the wealthy blocked the street in which the painter resided, and for a tiie he reaped a rich harvest by his portraits. But soon the fickle tide of popularity flowed past him, and the painter was left neglected. He now applied himself with redoubled diligence to correcting the defects which marred his art, meriting the praise of his rival Northcote—" Other artists paint to live; Opie lives to paint." At the same time he sought to supplement his early education by the study of Latin and French and of the best English classics, and to polish the rudeness of

his provincial manners by mixing in cultivated and learned circles. In 1786 he exhibited his first important historical subject, the Assassination of James L., and in the follow- ing year the Murder of Rizzio, a work whose merit was recognized by the artist's immediate election as associate of the Academy, of which he became a full member in 1788. He was employed on five subjects for Boydell's "Shakespeare Gallery"; and until his death, on the 9th of April 1807, his practice alternated between portraiture and historical work. His productions are distinguished by breadth of handling and a certain rude vigour, individu- ality, and freshness. They are wanting in grace, elegance, and poetic feeling. Opie is also favourably known as a writer on art by his Life of Reynolds in Wolcot's edition of Pilkington, his Letter on the Cultivation of the Fine Arts in England, in which he advocated the formation of a national gallery, and his Lectures as professor of painting to the Royal Academy, which were published in 1809, with a memoir of the artist by his widow.

OPITZ, Martin. See Germany, vol. x. p. 530.

OPIUM (6ruov, dim. from omés, juice), a narcotic drug prepared from the juice of the opium poppy, Papaver som- niferum, L., a plant probably indigenous in the south of Europe and western Asia, but now so widely cultivated that its original habitat is uncertain. The medicinal pro- perties of the juice have been recognized from a very early period. It was known to Theophrastus by the name of pnkoévov, and appears in his time to have consisted of an extract of the whole plant, since Dioscori- des about 77 A.D. draws a distinction between pnkdvevor, which he describes as an extract of the en- tire herb, and the more active dds, de- rived from the cap- sulesalone. From the Ist to the 12thcentury the opium of Asia Minor appears to have been the only kind known in commerce. In the 13th century opium thebarcum is mentioned by Simon Januensis, physician to Pope Nicholas IV., ta aeons peed Fic. 1.—Opium Poppy (Papaver somniferwm, L.). 16th century opium is mentioned by Pyres (1516) as a production of the kingdom of Cous (Kuch Behar, south-west of Bhutan) in Bengal and of Malwa.' Its introduction into India appears to have been connected with the spread of Islam. The opium monopoly was the property of the Great

1 Aromatum Historia, ed. Clusius, Ant., 1574.

Mogul and was regularly sold. In the 17th century Kaemp- fer describes the various kinds of opium prepared in Persia, and states that the best sorts were flavoured with spices and called "'theriaka." These preparations were held in great estimation during the Middle Ages, and probably supplied to a large extent the place of the pure drug. Opium is said to have been introduced into China, probably by the Arabs (1280-95), during the reign of Taitsu, and its use seems to have temporarily ceased in 1368. It appears to have been commonly used in that countryas a medicine before the trade with India commenced.! Ina Chinese herbal compiled more than two centuries ago both the plant and its inspissated juice are described, together with the mode of collecting it, and in the General HIstory of the Southern Provinces of Yunnan, revised and republished in 1736, opium is noticed as acommon product. Up to this date, however, it was imported in comparatively small quantity by the Chinese solely as a remedy for dysentery, diarrhoea, and fevers, and was usually brought from India by junks as a return cargo. In the year 1757 the monopoly of opium cultiva- tion passed into the hands of the East India Company through the victory of Clive at Plassey. Up to 1773 the trade with China had been in the hands of the Portuguese, but the quantity annually exported to that country rarely exceeded 200 chests. In that year the East India Company took the trade under their own charge, and in 1776 the annual export reached 1000 chests, and 4054 chests in 1790. Although the importation was forbidden by the Chinese emperor Keaking in 1796, and opium-smoking punished with severe penalties, which were ultimately increased to transportation and death, the trade continued and had increased during 1820-30 to 16,877 chests per annum. In 1839 a proclamation was issued threatening hostile measures if the English opium ships serving as depéts were not sent away. The demand for removal not being complied with, 20,291 chests of opium (of 1494 Ib each), valued at £2,000,000, were destroyed by the Chinese commissioner Lin ; but still the British sought to smuggle cargoes on shore, and some outrages committed on both sides led to an open war, which was ended by the treaty of Nanking in 1842 (see Cura, vol. vy. p.651). From that time to the present, in spite of the remonstrances of the Chinese Government, the exportation of opium from India to China has continued, having increased from 52,925

~~piculs (of 1334 tb) in 1850 to 96,839 piculsin 1880. It~~

~~appears to be certain, however, that, while the court of Peking was endeavouring to suppress the foreign trade in opium from 1796 to 1840, it did not or could not puta stop to the home cultivation of the drug, since a Chinese censor in 1830 represented to the throne that the poppy was grown over one-half of the province of Chekeang, and in 1836 another, Cho Tsun, stated that the annual produce of opium in Yunnan could not be less than several thousand piculs. At present it is estimated that south-western China, including Szechuen, produces not less than 224,000 piculs, while the entire import from India does not exceed 100,000 piculs. Opium is now produced in nine out of the eighteen provinces of China. The comparative cheapness of the Chinese opium, the lighter duties levied upon it, and the mereasing care taken in its cultivation are enabling it to compete successfully with the Indian drug even in eastern China, where, however, it has hitherto been chiefly used to mix with and cheapen the foreign article. A time is confi-

~~dently anticipated by the Chinese when Indian opium will be~~

~~entirely supplanted by the native drug. See Commercial Reports, China, No. 2 (1881), p. 138.~~

~~a Mr R. Saunders of Ghazipur suggests (Pharm. Journ., [3], iv. p. 652) that it was introduced from Nepal and afterwards supplied by the Dutch, who purchased the drug for export long before the East India Company held possessions in India.~~

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~~The amount of opium imported into Great Britain in 1861, 1871, and 1881 was 284,005, 591,466, and 793,146 Tb respectively, and the exports for the same years 290,120, 307,399, and 401,883 ib.~~

~~Production and Commerce.—Although the collection of opium is possible in all places where there is not an ex- cessive rainfall and the climate is temperate or subtropical, the yield is smaller in temperate than in tropical regions, and the industry can only be profitably carried on where labour and land are sufficiently cheap and abundant; hence production on a large~~

scale is limited to comparatively few countries. The varieties of poppy grown, the mode of cultivation adopted, and the character of the opium produced differ so greatly that it will be convenient to con- sider the opiums of each country separately.

Turkey.—The poppy cultivated in Asia Minor is the variety glabrum, Boissier, distinguished by the sub-globular shape of the capsule and by the stigmata or rays at the top of the fruit being ten or twelve in number. The flowers are usually of a purplish colour, but are sometimes white, and the seeds, like the petals, vary in tint from dark violet to white. The cultivation is carried on, both on the more elevated and lower lands, chiefly by peasant proprietors. A naturally light and rich soil, further improved by manure, is neces- sary, and moisture is indispensable, althongh injurious in excess, so that after a wet winter the best crops are obtained on hilly ground, and in a dry season on the plains. The land is ploughed twice, the second time crosswise, so that it may be thoroughly pulverized; and the seed, mixed with four times its quantity of sand, to prevent its being sown too thickly, is scattered broadcast, about # to 1 tb being used for every toloom (1600 square yards). The crop is very uncertain owing to droughts, spring frosts, and locusts, and, in order to avoid a total failure and to allow time for collecting the produce, there are three sowings at intervals from October to March,—the crops thus coming to perfection in succes- sion. But notwithstanding these precautions quantities of the drug are wasted when the crop is a full one, owing to the difficulty of gathering the whole in the short time during which collection is possible. The first sowing produces the hardiest plants, the yield of the other two depending almost entirely on favourable weather. In localities where there is hoar frost in autumn and spring the seed is sown in September or at latest in the beginning of October, and the yield of opium and seed is then greater than if sown later. After sowing, the land is harrowed, and the young plants are hoed and weeded, chiefly by women and children, from early spring until the time of flowering. In the plains the flowers expand at the end of May, on the uplands in July. At this period gentle showers are of great value, as they canse an increase in the subsequent yield of opium. The petals fall in a few hours, and the capsules grow so rapidly that in a short time—generally from nine to fifteen days—the opium is fit for collection. This period is known by the cap- sules yielding to pressure with the fingers, assuming a

lighter green tint, and exhibiting a kind of bloom called "cougak," easily rubbed off with the fingers ; they are then about 14 inches in diameter. The incisions are made by holding the capsule in the left hand and drawing a knife two-thirds round it, or spirally beyond the starting-point (see fig. 2, a, p. 790), great care being taken not to let the incisions penetrate to the interior lest the juice should flow inside and be lost. (In this case also it is said that the seeds will not ripen, and that no oil can be obtained from them.) 'The operation is usually performed after the heat of the day, commencing early in the afternoon and continuing to nightfall, and the exuded juice is collected the next morning. This is done by scraping the capsule with a knife and transferring the concreted juice to a poppy-leaf held in the left hand, the edges of the leaf being turned in to avoid spilling the juice, and the knife-blade moistened with saliva by drawing it through the month after every alternate scraping to pre- vent the juice from adhering to it. When as much opium has been collected as the size of the leaf will allow, another leaf is wrapped over the top of the lump, which is then placed in the shade to dry for several days. The pieces vary in size from about 2 oz. to over 2 Ib, being made larger in some districts than in others. The capsules are generally incised only once, but the fields are visited a second or third time to collect the opium from the poppy-heads subsequently developed by the branching of the stem. The yield of opium varies, even on the same piece of land, from 4 to 74 chequis (of 1°62 Tb) per toloom (1600 square yards), the average being 14 chequis of opium and 4 bushels (of 50 Tb) of seed. The seed, which yields 35 to 42 per cent. of oil, is worth about two-thirds of the value of the opium. The whole of the operation must, of course, be com- pleted in the few days—five to ten—during which the capsules are capable of yielding the drug. A cold wind or a chilly atmosphere at the time of collection lessens the yield, and rain washes the opium off the capsules. Before the crop is all gathered in a meeting

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of buyers and sellers takes place in each district, at which the price to be asked is discussed and settled, and the opium handed to the buyers, who in many instances have advanced money on the stand- ing crop. When sufficiently solid the pieces of opium are packed in cotton bags, a quantity

of the fruits of a species of Rumex being thrown in to prevent the cakes from adhering together. The bags are then sealed up, packed in oblong or circular baskets, and sent to Smyrna or other ports on mules. On the arrival of the opium at its destination, in the end of July or beginning of August, it is placed in cool warehouses to avoid loss of weight. until sold. When transferred to the buyer's warehouses the bags arc opened aud eachi piece is examined by a public inspector in the presence of both buyer and seller, the quality of the opium being judged by appearance, odour, colour, and weight. It is then sorted into three qualities :—(1) finest quality ; (2) current or second ; (3) chicanti or rejected pieces. A fourth sort consists of the very bad or wholly factitious pieces. The substances used to adulterate opium are grape-juice thickened with flour, fig-paste, liquorice, half-dried apricots, inferior gum tragacanth, and sometimes clay or pieces of lead or other metals. The chicanti is returned to the seller, who disposes of it at 20 to 30 per cent. discount to French and German merchants for the manufacture of morphia. After inspection the opium is hermetically sealed in tin-lined boxes containing about 150 tb. Turkey opium is principally used in medicine on account of its purity and the large percentage of morphia that it contains, a comparatively small quantity being exported to China.

A number of varieties exist in commerce, differing in certain qualities, and, to a certain extent, in external character. These are generally exported under the names of the districts where they are prepared, but are more generally known in English commerce by the name of the port from which: they are shipped. Thus, Constan- tinople opium includes the produce of Bogaditz, Karahissar Sahib, Kutchaya, Balukhissar, Kurkagatsch, Ghéve, Beybazar, Angora, Malatia, and Tokat, as well as Macedonian opium from Salonica. Smyrna opium comprises opium from Afium Karahissar, Ushak, Akhissar, Tanshanli, Isbarta, Koniyeh, Bulladan, Hamid, and Magnesia, and the Yerli} varieties. In English commerce these are roughly divided into shipping, druggist's, and manufacturer's opium.

Shipping opium includes varieties of a pale or yellowish colour internally, of a soft consistence, and free from poppy débris, &c., or "chaff," as it is technically called. Such opium affords a large amount of extract, and leaves very little insoluble residue when dis- solved in water, and on this account is preferred in countries where opium-smoking or eating is practised. The

principal varieties used for this purpose are Malatia (including that of Kharput), Tokat, Salonica, Balukhissar (including the produce of Kurkagatsch), Bogaditz, and the finest qualities of Angora and Yerli. The chief markets are China, Peru, the West India Islands, British Guiana, and Brazil ; and the United States also purchase the same kinds for reshipment.

Druggist's opium includes the varieties purchased for nse in medicine in European countries and the United States. It is generally of firmer consistence and rather darker colour than ship- ping opium. The finest varieties of this kind in English commerce are Beybazar, Yerli, Karahissar (including Adet, Amasia, and Akhissar opiums), "Current" Smyrna, and Angora. Ushak, Yerli, and Karahissar opiums are purchased chiefly for the American market, and the Ghéve or Ismid opium for the Continental.

Manufacturer's opium includes chicanti or low-priced qualities of all varieties, and is used only for the manufacture of morphia. Persian opium is used for this purpose when Turkey opium is dear.

Malatia opium usually occurs in pieces of irregular shape, weigh- ing from 14 to 3 ib, and about 1} to 2 inches thick, the " paste" or substance being soft and pale and remarkably free from foreign matter or "chaff," and the exterior being covered with a bright bluish green leaf; the paste of Tokat is similar, but usually of thinner consistence and darker colour. Bogaditz opium is met with in smaller pieces, usually 2 to 3 oz., and is covered with a yellowish green leaf, the surface being rough with Rumeza fruit. Occasionally, however, pieces are met with from 1 to 1} tb in weight, still more rarely up to 4 tb in weight, approaching more nearly to the Baluk- hissar and Kurkagatsch varieties, which are usually similar to the Bogaditz, but in larger pieces. Karahissar opium is in rather large conical lumps ; formerly the pieces frequently bore the impress of a poppy-head pressed into the top. The Adet, Akhissar, and Amasia opiums are very similar in appearance, and usually pass under the name of Karalissar. Angora opium usually occurs in small pieces carelessly prepared, so as to be rough and unsightly in appearance although of good quality. Occasionally samples of good colour, soft consistency, and excellent quality are met with, and these are always used as shipping opium. Yerli is a fine pasty or gummy opium,

with a rough surface and with much Rwmex fruit adhering to it. Ghéve or Ismid? opium is usually in small rounded cakes, weighing eS ee

1 The word yerli means 'grown near," and is applied to opium produced in the immediate neighbourhood of Smyrna. '

2 Ghéve is the commercial name for opium from Geiveh on the river Saka-ria, running into the Black Sea. It appears to find its way to Constantinople via the port of Ismid, and hence is known also by the latter name.

about 2 to 3 oz. in weight. The pieces, known in trade as " Con- stantinople pats," have a smooth shining appearance, with the midrib of the poppy-leaf they are wrapped in forming a median line on the surface. 'he interior often shows layers of light and dark colour. Yoghourma is a very inferior opium, and, as its name im- plies, is "remade" or made up at the port of shipment. It is usually sold to morphia manufacturers at a price determined by analysis.

In Macedonia opium culture was commenced in 1865 at Istip, with seed obtained from Karahissar in Asia Minor, and has since extended to the adjacent districts of Kotchava, Stroumnitza, Tikvish, and Kinprulu-veles. The crop in 1882 was 135,000 tb of opium and 500, 000 to 600,000 tb of seed, most of the drug being exported under the name of Salonica opium to Great Britain at prices ranging from 12s. 6d. to16s. per tb. Macedonian opium, especially that pro- duced at Istip, is very pure, yielding about 11 per cent. of morphia, and is considered equal to the Malatia produce. The Turkish Government encourage the development of the industry by remit-ting the tithes on opium and poppy-seed for one year on lands sown for the first time, and by distributing printed instructions for cultivating the poppy and preparing the opium. In these directions it is pointed out that the opium crop is ten times as profitable as that of wheat. Four varieties of poppy are distin- guished,—two with white flowers, large oval capsules without holes under their " combs " (stigmas), and bearing respectively yellow and white seed, and the other two having red or purple flowers and seeds of the same colour, one bearing small capsules perforated at the top, and the other larger oval capsules not perforated. The white varieties are recommended

as yielding a more abundant opium of superior quality. The yellow seed is said to yield the best oil ; that obtained by hot pressure is used for lamps and for paint, and the cold-pressed oil for culinary purposes.

Opium is also grown in Bulgaria, but almost entirely for home consumption ; any surplus produce is, however, bought by Jews and Turks at low prices and sent to Constantinople, where it is sold as Turkish opium. It is produced in the districts of Kustendil, Lowtscha, and Halitz, and is made into lumps weighing about 4 0z., of a light-brown colour internally, and containing a few seeds; it is covered with leaves which have not been identified. Samples that have been analysed by Herr Thcegarten have yielded from 7 to 19 per cent. of morphia, and only 2 to 3 per cent. of ash, and are therefore of excellent quality. ,

India.—The poppy grown in India is generally the saine as that used in Persia, but in the Himalayas a red-flowered variety with black seeds ismet with. The largest amount of opium is produced in the central tract of the Ganges, extending from Dinajpur in the east to Agra in the west, and from Gorakhpur in the north to Hazaribagh in the south, and comprising an area of about 600 miles long by 200 broad. The region next in importance consists of the tableland of Malwa and the slopes of the Vindhya Hills in Indore.

The opium industry in Bengal is a Government monopoly, and the districts are divided into two agencies, Behar and Benarcs, which are under the control of officials residing respectively at Patna and Ghazipur. In 1883 463,829 acres were under poppy cultivation in the Behar agency, and 412,625 in that of Benares. Any one who chooses may undertake the industry, but cultivators are obliged to sell the opium exclusively to the Government agent at a price fixed beforehand by the latter, which is approximately 3s. 6d. per Ib, the Government selling it at about lls. per Ib. The peasant is, however, said to be fully remuncrated by the price he receives. It is considered that with greater freedom the cultivator would

| produce too great a quantity, and loss to the Government would

soon result. Advances of moncy are often made by the Govern- ment to enable the ryots to grow the poppy.

~~In Malwa the cultivation is free and extremely profitable, the crop realizing usually from three to seven times the value of wheat~~

~~| or other cereals, and in exceptionally advantageous situations from~~

~~twelve to twenty times as much. On its entering British territory a~~

~~heavy duty is imposed on Malwa opium, so as to raise its price to an equality with the Government article. The tax was formerly collected at Indore only, but since other stations have been made at Ujjain, Jaora, and Udaipur the export has increased to 500 chests 'amonth. Malwa opium is shipped from Bombay.?*~~

~~The area under poppy cultivation outside these districts is com- paratively small, but it appears to be increasing: throughout the plains of the Punjab. The poppy is grown for opium, according to Stewart (Punjaub Plants, Lahore, 1869, p. 10), in the valley of tho Bias east of Lahore. It is cultivated up to 7500 feet above sea-level, the opium of Kulu in this district being considered of excellent quality. In Nepal, Bashahr, and Rampur, aud at Doda Kashtwar in the Jammu territory, opium is produced and exported to Yarkand, Khotan, Aksu, and various Chinese provinces.~~

~~The land intended for poppy culture is usually selected near vill- ages, in order that it may be more easily manured and irrigated. On arich soil a crop of maize or vegetables is grown during the rainy season, and after its removal in September the ground is~~

~~caus At eer aE ee ea ee 3 In 1882-83 India exported to China and other places a total of 91,798 chests (126,789 ewts.) of opium, valued at £11 481,376.~~

~~powdered poppy petals, and powdered seeds of various kinds are easily detected by breaking up the drug in cold water. F lour, potato- flour, ghee, and ghoor (crude date-sugar) are revealed by their odour and the consistence they impart. Various other adulterants are sometimes used, such as the inspissated juice of the prickly pear, extracts from tobacco,~~

stramonium, and hemp, pulp of the tamarind and bael fruit, mahwah flowers, and gums of different kinds. The price paid to the cultivator is regulated chiefly by the amount of water contained in the drug. When received into the Government stores the opium is kept in large wooden boxes hold- ing about 50 maunds and occasionally stirred up, if only a little below the standard. If containing much water it is placed in shallow wooden drawers and constantly tured over. During the process it deepens in colour. From the store about 250 maunds are taken daily to be manufactured into cakes,

Various portions, each weighing 10 sers (of 2; Tb), are selected by test assay so as to ensure the mass being of standard consist- ence (70 per cent. of the pure dry drug and 30 per cent. of water), and are thrown into shallow drawers and kneaded together. The mass is then packed into boxes all of one size, and a specimen of each again assayed, the mean of the whole being taken as the average. Before evening these boxes are emptied into wooden vats 20 feet long, 34° feet wide, and 1} feet deep, and the opium further kneaded and mixed by men wading through it from end to end until it appears to be of a uniform consistence, Next morning the manufacture of the opium into balls commences. The work. man sits on a wooden stand, with a brass cup before him, which he lines with the leaves of poppy petals before-mentioned until the thickness of half an inch is reached, a few being allowed to hang over the cup; the leaves are agglutinated by means of "lewa," a pasty fluid which consists of a mixture of inferior opium, 8 per cent. of pasewa, and the ***'dhoe" or washings of the vessels that have contained opium, and the whole is made of such consistence that 100 grains evaporated to dryness over a water-bath leave 53 grains of solid residue. All the ingredients for the opium-ball are furnished to the workmen by measure. When the inside of the brass cup is ready a ball of opium previously weighed is placed on the leafy case in it, and the upper half of it covered with leaves in the same way that the casing for the lower half was made, the overhanging leaves of the lower half being pressed upwards and the sphere complished by one large leaf which is placed over the upper half. The ball, which resembles a Dutch cheese in size and shape, is now rolled in '*** *poppy trash" made from the coarsely- powdered leaves, capsules, and stalks of the poppy plant, and is placed in an earthen cup of the same size as the brass one; the cups are then placed in dishes*

and the opium exposed to the sun to dry for three days, being constantly turned and examined. If it becomes distended the ball is pierced to liberate the gas and again lightly closed. On the third evening the cups are placed in open frames which allow free circulation of the air. This operation is usually completed by the end of July.. The balls thus made consist on the average of—

prepared for the poppy-culture. Under less favourable circum- stances the land is prepared from July till October by ploughing, weeding, and manuring. The seed is sown between the Ist and 15th of November, and germinates in ten or fifteen days. The fields are divided for purposes of irrigation into beds about 10 feet square, which usually are irrigated twice between November and February, but if the season be cold, with hardly any rain, the operation is repeated five or six times. When the seedlings are 2 or 3 inches high they are thinned out and weeded. The plants during growth are liable to injury by severe frost, excessive rain, insects, fungi, and the growth of a root-parasite (Orobanche indica). The poppy blossoms about the middle of February, and the petals when about to fall are collected for the purpose of making "leaves" for the spherical coverings of the balls of opium. These are made by heat- ing a circular-ridged earthen plate over a slow fire, and spreading the petals, a few at a time, over its surface. As the juice exudes, more petals are pressed on to them with a cloth until a layer of sufficient thickness is obtained. The leaves are forwarded to the opium-factories, where they are sorted into three classes, series to size and colour, the smaller and dark-coloured being reserve

for the inside of the shells of the opium-balls, and the larger and least coloured for the outside. These are valued respectively at 10 to 7 and 5 rupees per maund of 82? tb. The collection of

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Fic. 2.—Opium Poppy Capsules, &c., 3 natural size. a, capsule showing mode of incision practised in Turkey ; 0, capsule as incised in India ; c, nushtur, or instrument used in India for inaking the incisions. Drawn from specimens in the Museum of the Pharmaceutical Society of Great Britain. :

opium commences in Behar about 25th February, and continues to about 25th March, but in Malwa is performed in March and April. The capsules are scarified vertically (fig. 2, 6) in most dis- tricts (although in some the incisions are made horizontally, as in Asia Minor), the "nushtur" or cutting instrument being drawn

c A gltce > ro Standard Opipmiee.....sacses.-coccik 5 '50 chittacks. twice upwards for each incision, and repeated two to six times at iawe aie il eee een te pha 4 rl ae — ' intervals of two or three days. The nushtur (fig. 2, c) consists of Leaves (poppy petals)..... 0: 508088 three to five flattened blades forked at the larger end, and separated WOCNY REE 5 Boned. 95 ov on he ain srs 0 ,, 050 ,,

about one-sixteenth of an inch from each other by winding cotton thread between them, the whole being also bound together by thread, and the protrusion of the points being restricted to one-twelfth of an inch, by which the depth of the incision is limited. The operation 1s usually performed about three or four o'clock in the afternoon, and the opium collected the next morning. In Bengalasmall sheet-iron scoop or "seetoah" is used for scraping off the dried juice, and, as it becomes filled, the opium is emptied into an earthen pot carried for the purpose. In Malwaa flat scraper is employed, a small piece of cotton soaked in linseed oil being attached to the upper part of the blade, and used for smearing the thumb and edge of the scraper to prevent adhesion of the juice ; sometimes water is used instead of oil, but both practices injure the quality of the product. Sometimes the opium is in a fluid state by reason of dew, and in some places it is rendered still more so by the practice adopted by collectors of washing their Scrapers, and adding the washings to the morn- ing's collection. The juice, when brought home, is consequently a wet granular mass of pinkish colour, from which a dark fluid drains to the bottom of the vessel. In order to get rid of this fluid, called "pasewa" or "pussewah," the opium is placed in a shallow earthen vessel tilted on one side, and the pussewah drained off, The residual mass is then exposed to the air in the shade, and regularly turned over every few days, until it has reached the proper consistence, which takes place in about three or four weeks, The drug is then taken to the Government factory to be sold. It is turned out of the pots into wide tin vessels or "tagars," in which it is weighed in quantities not exceeding 21

~~Ib. It is then examined by a native expert (purkhea) as to impurities, colour, fracture, aroma, and consistence. To determine the amount of moisture, which should not exceed 30 per cent.,a weighed sample is evaporated and dried in a plate on a metallic surface heated by steam. Adul- terations such as mud, sand, powdered charcoal, soot, cow-dung,~~

~~2 sers 1°18 chittacks.~~

~~The average number of cakes that can be made daily by one man is about 70, although 90 to 100 are sometimes turned out by clever workmen. The cakes are liable to become mildewed, and require constant turning and occasional rubbing in dry " poppy trash" to remove the mildew, and strengthening in weak places with fresh poppy leaves. By October the cakes are dry and fairly solid, and are then packed in chests, which are divided into two ticrs of twenty square compartments for the reception of as many cakes, which are steadied by a packing of loose poppy trash.! Each case con- tains about 120 catties (about 160 Ib). The chests need to be kept in a dry warehouse for a length of time, but ultimately the opium ceases to lose moisture to the shell, and the latter becomes extremely solid. This is known as "provision " opium.~~

~~For home consumption Bengal opium is prepared in a different shape, and is known as Abkari or excisable opium. It is exposed to the heat of the sun until it contains only 10 per cent. of moist- ure; and is then formed into square cakes of 2 tb each, which are wrapped in oiled paper, or it is made into flat square tablets. In this form it has not the aroma of the ball-opium.~~

~~The care bestowed on the selection and preparation of the drug in the Bengal opium-factories is such that the merchants who purchase it rarely require to examine it, although permission is given to open at each sale any number of chests or cakes that they may desire.~~

~~In Malwa the opium is manufactured by private enterprise, the Government levying an export duty of 600 rupees (£60) per chest. It is not made into balls but into rectangular or rounded masses, and is not cased in poppy petals. It contains as much as 95 per cent. of dry opium, but is of much less uniform quality than the Bengal drug, and, having no guarantee as to purity, is not con-~~

1 This is purchased from the ryots at 12 annas per maund.

Or Fy it

sidered so valuable. The cultivation in Malwa does not differ in any important particular from that in Bengal. The opium is col- lected in March and April, aud the crude drug or "chick" is thrown into an earthen vessel and covered with linseed oil to prevent evapo- ration. In this state it is sold to itinerant dealers. It is after- wards tied up in quantities of 25 Ib and 50 tb in double bags of sheet- ing, which are suspended to a ceiling out of the light and draught to allow the excess of oil to drain off. This takes place in seven to ten days, but the bags are left for four to six weeks until the oil re- maining on the opium has become oxidized and hardened. In June and July, when the rains begin, the bags are taken down and emptied into shallow vats 10 to 15 feet across, and 6 to 8 inches deep, in which the opium is kneaded until uniform in colour and consistence and tough enough to be formed into cakes of 8 or 10 ounces in weight. These are thrown into a basket containing chaff made from the capsules. They are then rolled in broken leaves and stalks of the poppy and left, with occasional turning, for a week or so, when they become hard enough to bear packing. In October and November they are weighed and sent to market, packed in chests containing as nearly as possible 1 picul=1333 fb, the petals and leaves of the poppy being used as packing materials. The production is said to amount to about 20,000 chests annually.

The amount of opium revenue collected in India was £10, 480,051 in 1881. It is a remarkable fact that the only Indian opium eycr seen in England is an occasional sample of the Malwa sort, whilst the Government monopoly om is quite unknown ; indeed, the whole of the opium used in medicine in Europe and the United States is obtained from Turkey. This is in some measure due to the fact that Indian opium contains less morphia. It has recently been shown, however, that opium grown in the hilly districts of the Himalayas yields 50 per cent. more morphia than that of the plains, and that the deficiency of morphia in the Indian drug is due, in some measure, to the long exposure to the air in a semi- liquid state which it undergoes. In view, therefore, of the probable decline in the Chinese demand, the cultivation of the drug for the European market in the hilly districts of

India, and its preparation after the mode adopted in Turkey, viz., by drying the concrete juice as quickly as possible, might be worthy of the consideration of the British Government.

Persia.—The variety of poppy grown in Persia appears to be P. somniferum, var. y. album (P. officinale, Gm.), having roundish ovate capsules. It is most largely produced in the districts of Ispahan, Shiraz, Yezd, and Khonsar, and to a less extent in those of Khora- san, Kermanshah, and Fars. The Yezd opium is considered better than that of Ispahan, but the strongest or Theriak-c-Arabistant is produced in the neighbourhood of Dizful and Shuster, east of the river Tigris. Good opium is also produced about Sari and Balfarush in the province of Mazanderan. The capsules are incised vertically, or in some districts vertical cuts with diagonal branches are made. The crop is collected in May and June and reaches the ports for exportation between September and January. Al- though the cultivation of opium in Persia was probably carried on at an earlier date than in India, Persian opium was almost unknown in England until about the year 1870, except in the form of the inferior quality known as " Trebizond," which usually contains only 0°2 to 8 per cent. of morphia. This opium is in the form of cylindrical sticks about 6 inches long and half an inch in diameter, wrapped in waxed paper. Since 1870 Persian opium has been largely exported from Bushire and Bandar-Abbas in the Persian Gulf to London, the Straits Settlements, and China. At that date the annual yield is said not to have exceeded 2600 cases ; but, the profits on opium having about that time attracted attention, all available ground was utilized for this to the exclusion of cereals, cotton, and other produce. The result was a severe famine in 1871-72, which was further aggravated by drought and other cir- cumstances. Notwithstanding the lesson thus taught, the cultiva- tion is being extended every year, especially in Ispahan, which abounds in streams and rivers, an advantage in which Yezd is defi- cient. About Shiraz, Behbehan, and Kermanshah it now occupies much of the land, and has consequently affected the price and growth of cereals. The trade—only 300 chests in 1859—gradually increased until 1877, when the Persian opium was much adulter- ated with glucose. The heavy losses on this inferior opium and the higher prices obtained for the genuine article led toa great improve- ment in its preparation, and in 1880 the export had increased to 7700 chests. About five-sixths of this total finds its way to the

Chinese market, chiefly by sea, although some is carried overland through Bokhara, Khokand, and Kashgar ; a considerable quantity is exported by way of Trebizond and Samsun to Constantinople, and the remainder to Great Britain. The produce of Ispahan and Fars is carried for exportation to Bushire, and that of Khorasan and Kirman and Yezd partly to Bushire and partly to Bandar- Abbas. The Shuster opium is sent partly via Bushire to Muscat for transhipment to Zanzibar, and part is believed to be smuggled into India by way of Baluchistan and Mekran. Smaller quantities grown in Teheran, Tabriz, and Kermanshah find their way to Smyrna, where it is mixed with the local drug for the European

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market, the same practice being carried on at Constantinople with the Persian opium that arrives there from Samsun and Trebizond. For the Chinese market the opium is usually packed in chests containing 10} shahmans (of 13} fb), so that on arrival it may weigh 1 Chinese picul (= 1333 Ib), 5 to 10 per cent. being allowed for loss by drying. At Ispahan, Shiraz, and Yezd the drug, after being dried in the sun, is mixed with oil in the proportion of 6 or 7 tb to 141 Ib of opium, with the object, it is said, of suiting the tastc of the Chinese,—that intended for the London market being usually free from oil.

Persian opium, as met with in the London market, occurs in several forms, the most common being that of broad rounded cones weighing 6 to 10 oz. or more, or rarely twice that size. These are packed in poppy trash, or are wrapped separately in paper, or some- times in poppy, fig, or vine leaves. Ispahan opium also occurs in the form of parallelepipeds weighing about 16 to 20 0z.; sometimes flat circular pieces weighing about 20 oz. are met with. The opium is usually of much firmer and smoother consistence than that of Turkey, of a chocolate-brown colour and cheesy appearance, the pieces bearing evidence of having been beaten into a uniform mass previously to being made into lumps. The odour differs but slightly, except in oily specimens, from that of Turkey opium. Great care is now taken to prevent adulteration, and consequently Persian opium can be obtained nearly as rich in morphia as the Turkish drug,—on the average from 8 to 12 per cent. The greater propor- tion of the Persian opium imported into

London is again exported, a comparatively small quantity being used, chiefly for the manu- facture of morphia when Turkey opium is dear, and a little in veterinary practice. According to Dr Reveil, Persian opium usually contains 75 to 84 per cent. of matter soluble in water, and some samples contain from 18 to 30 per cent. of glucose.

China.—The variety of poppy grown in China appears to be chiefly the P. somniferum, y. album, especially in the low lands, but red and purple varieties are also met with. The production is principally carried on in the south-western provinces of Szechuen, Yunnan, and Kweichow. It is grown to a less extent in Shanse, Shense, and Shantung in the north, as well as in eastern Mongolia and north-eastern Manchuria and Shingking; but in these pro- vinces the richest soil and the utmost care are necessary to ensure the success of the crop, and the area under opium cannot be greatly extended. Formerly the province of Shense produced 30 per cent. of the native product, but since the famine caused by the neglect of cereals for opium the extension of the cultivation has been rigidly prohibited in Shense, Honan, and Chihli. In Kwangtung the soil and climate have been found unsuitable, and in Fuhkeen sugar proves equally remunerative, if not more so. There can be no question, however, that, as already stated, the cultivation of the poppy is extending rapidly, in spite of prohibitory edicts issued from time to time ; four-fifths of the opium at present used in China is home-grown. According to Consul Spence's report (1882) the poppy is cultivated chiefly on land near villages where manure and labour cau be easily obtained. As soon as the summer crop has been reaped the land is ploughed and cleaned, roots and weeds are burnt and the resulting ashes scattered over the ground, and dressings of night-soil are liberally applied. The seeds are sown in November and December in drills 18 inches apart. InJanuary, when the plants are a few inches high, the rows are thinned and earthed up so as to leave a free passage between. The ground is afterwards weeded occasionally and the earth stirred up. The poppy blooms in March or April, according to the situation. As. soon as the capsules begin to form, dressings of liquid manure are given, and in April and May the opium is collected. Vertical in- cisions are made in the capsules as in India. In some districts, however, a vertical shaving appears to be taken off the surface of the capsule. The excreted juice is scraped off and transferred to a small pot suspended at the waist. The mode of preparation for the market has not

been described, but, from the occasional samples that have been sent to England, the opium appears to have undergone manipulation, since it has a uniform pasty consistence and is with- out any trace of the granular structure indicative of unmixed opium like that of Turkey. The colour is darker and the consistence softer than that of Persian opium, but the odour is good. Some of the Szechuen opium appears to have been mixed with oil. The Yunnan and Szechuen opiums are made into flat cakes, and are wrapped in white paper. Chekeang opium is in the form of treacly extract, and is sold in jars containing 2 to 4lb. The yield of opium is calculated at 350 oz. per acre. The Shense drug is highly esteemed because it has a flavour resembling the Patna kind and gives 85 to 90 per cent. of extract. Yunnan opium comes next and Szechuen third in value.

The use of foreign opium by the Chinese bears some relation to its introduction, whicli was in the following order :—Patna, Malwa, Benares, and Persian. Thus the Patna opium is preferred along the south-eastern coast as far north as the Yangtsze river, except in the district about Ningpo. Malwa is chiefly consumed in the northern provinces, including part of Kwangtung, Kwangse, Keangse, and Ganhwuy, while Benares is the favourite kind in

Formosa and some parts of Fuhkeen. Persian replaces the Malwa toa limited extent on account of its lower price ; it goes principally to the province of Kwangse. Malwa opium is reputed to have a strong flavour and biting taste, and to be more stimulating ; it is said to causc heartburn in those unaccustomed to its use, to induce an unhealthy action of the skin, and to prove irritating to the nervous system. Patna is considered mild but narcotic. Persian is also reckoned hot and acrid, and apt to cause dysentery. In some respects the native opium is comparable to the Malwa, having a coarser and more fiery flavour than the Patna, and also has the dis- advantage of causing troublesome eruptions on the skin. Itis said to be frequently adulterated with seaweed, jelly, oil, &c. It seems worthy of inquiry how far this difference of flavour and action may be due to the oil with which both Malwa and Chinese opiums are often prepared. The native opium is said to have the advantage over the foreign that the habit of

smoking it can be broken off with comparative ease, which is not the case with the Indian drug.

Eigypt.—The variety grown in Egypt is the same as in Asia Minor. The cultivation is carried on in Upper Egypt near Esneh, Kenneh, and Siout. 'The capsules are incised in March by drawing a knife twice round them horizontally. The concreted juice is scraped off next day by a scoop-knife, collected on a leaf, and placed in the shade to harden. Good samples, which are of rare occurrence, yield 9 to 12 per cent. of morphia; but, asa rule, the plant is grown in too moist a soil, scarification is not always per- formed at the right date, and adulteration is extensively practised, so that the average yield of morphia is only 3 to 4 per cent. As met with in English commerce Egyptian opium is in the form of hard, flat, circular cakes about 4 inches in diameter, covered with poppy and other leaves, but free from the Rumex fruits usually seen on Turkey opium. The fracture is porous, dark liver-coloured, with shining embedded particles and reddish yellow points, aud occasionally starchy granules. The total amount ex- ported in 1879 was valued at £2310, of which there was sent to Italy. £990, France £630, Greece £540, and Turkey £150. It is not now regularly imported into Britain owing to its inferior quality. M. Gastinel found that, when cultivated in his garden at Cairo, the poppies yielded 10 to 12 per cent. of morphia when the cap- sules were nearly ripe, while opium collected immediately after the flowering was over contained only 8 to 4 per cent. ;

Algeria.—Opium has been grown in Algeria, but this kind is not known in English commerce.

Mozambique.—A company was cstablished in Lisbon in 1877, with a grant of 50,000 acres of land in Mozambique, and certain exclusive privileges ; the cultivation was commenced in 1879 and was carried on at Chaima between the Mulo and Quaqua rivers. The ground has been sown with Malwa seed, the plants thrive well, and the capsules are larger than those grown in India. The collection of opium is made about seventy-five days after the seed has been sown, and the yield compares favourably with that ob- tained in India. It is said to be mixed on the spot with 80 to 100 per cent. of a special matter known only to the cultivators. The mixture is made into balls weighing about 1 fb; these are packed in boxes with poppy trash

and covered with a layer of indigenous cotton. The yield from the first crop amounted only to a few pounds, and upou examination proved to be of modcrate quality only. It was of soft consistence, brownish colour, and yielded 4 per cent. of morphia and 4°38 per cent. of narcotin, and 40-9 per cent. of moisture. In 1884 specimens were sent to the London-market in the form of spherical balls, having the size and general appearance of Malwa and evidently intended to compete with it in the Chinese market.

Ausiralia.—Experiments in opium-cultivation have been made during the last ten years in the neighbourhood of Melbourne, near Bairnsdale in Gippsland, and at Dromana on Port Phillip Bay, and a few cwts. of opium have been obtained. The first specimens col- lected contained only 2 per cent. of morphia and about 8 per cent. of narcotin ; in subseqcent experiments opium yielding 4 to 10 per cent. of morphia was obtained. The secd, procured from Smyrna, was sown in June, July, and the beginning of August, and the opium collected in the summer months of J anuary, February, and March. The plants attained a height of 5 to 7 feet, and cach produced three or four large white flowers. The East India variety, with double purple or nearly black flowers, was found to produce only one flower and give but little opium. It seems probable that, with greater care in selection of sheltered hilly localities and rich soil for the cultivation of the poppy, and attention to the very important point of collecting the juice at exactly the right time, opium of very excellent quality might be produced in Australia in sufficient quantity to meet the local demand.

Hurope.—Experiments made in England, France, Italy, Switzer- land, Greece, Spain, Germany, and even in Sweden prove that opium as rich in morphia as that of Eastern countries can be pro- duced in Europe. In 1880 Mr Young, a surgeon at Edinburgh, succeeded in obtaining 56 Ib of opium from an acre of poppies, and sold it at 36s. per tb. In France the cultivation has been carried on since 1844 at Clermont-Ferrand by M. Aubergier. The juicc, of which a workman is able to collect about 9°64 troy oz. in a day,

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is evaporated by artificial heat immediately after collection. The Juice yields about one-fourth of its weight of opium, and the percent- age of morphia varies according to the variety of poppy used, the purple one

giving the best results. By mixing assayed samples he is able to produce an opium containing uniformly 10 per cent. of morphia. It is made up in cakes of 50 grammes, but is not pro- duced in sufficient quantity to become an article of wholesale commerce. Some specimens of French opium have been found by Guibourt to yield 22°8 per cent. of morphia, being the highest percentage observed as yet in any opium. Experiments made in Germany by Karsten, Jobst, and Vulpius have shown that it is possible to obtain in that country opium of excellent quality, con- taining from 8 to 18 per cent. of morphia. It was found that the method yielding the best results was to make incisions in the poppy- heads soon after sunrise, to collect the juice with the finger imime- diately after incision, and evaporate it as speedily as possible, the colour of the opium being lighter and the percentage of morphia greater than when the juice was allowed to dry on the plant. Cutting through the poppy-head caused the shrivelling up of the young fruit, but the heads which had been carefully incised yielded more seed than those which had not been cut at all. Newly- manured soil was found to act prejudicially on the poppy. The giant variety of poppy yielded most morphia.

The difficulty of obtaining the requisite amount of cheap labour at the exact time it is needed and the uncertainty of the weather render the cultivation of opium too much a matter of speculation for it ever to become a regular crop in most European countries,

North America.—In 1865 the cultivation of opium was attempted in Virginia by Mr A. Robertson, and a product was obtained which yielded 4 per cent. of morphia. In 1867 Dr H. Black grew opium in Tennessee which contained 10 per cent. of morphia. Opium pro- duced in California by Dr H. Flint in 1873 yielded 73 per cent. of morphia, equal to 10 per cent. in perfectly- dried opium. The ex- pense of cultivation exceeded the returns obtained by its sale. As in Europe, therefore, the high price of labour militates against its production on a large scale.

Chemical Constitution.—The activity of opium is princi- pally due to the vegetable alkaloid morphia or morphine, which opium of good quality contains to the extent of 8 to 17 per cent., the average amount being 10

~~percent. Opium yielding less than this is considered of inferior grade and below the commercial standard for use in medicine.~~

~~Morphia is interesting as being the first one that was discovered of the now large class of bodies known as alka- loids. Its basic nature was first clearly pointed out in 1816 by Sertiirner. It exists in opium in combination with sulphuric and meconic acids. Lactic acid has also been found in opium, but is believed to be formed in it subsequently to the collection of the drug.~~

~~Besides morphia several other basic substances have been detected in different varieties of opium, but only in minute quantities, rarely amounting to I percent. These are narceia ; codeia, 02 to 0°4 per cent.; thebaia, 0°15 to 1:0 per cent.; papaveria, 1:0 per cent.; cryptopia, meco- nidia, hydrocotarnia, laudanosia, protopia, codamia, gnos- copia; also a few other bodies of a feebly alkaline or neutral character, viz., narcotin, 2 to 8 per cent.; pseudo- morphin, 0°02; lanthopin, '005 ; and meconoiosin.~~

~~Opium also contains in considerable quantity a resinoid body which is soluble in its own weight of water, but is thrown down when this solution is diluted with ten times its bulk of water ; 11 per cent. of caoutchouc ; a gum dis- tinct from gum arabic; pectin; albumen ; wax, consisting of palmitate and cerotate of cerotyl; and 4 to 8 per cent. of calcareous salts. Sugar has been frequently found in opium, but whether natural or added as an adulteration is not known. The amount of -caoutchouc present has probably some bearing on the value of opium for smoking, since the Chinese estimate its value roughly by the "touch," t.¢., the rapidity or slowness with which a thread drawn out from the mass will break by its own weight.~~

~~Of the alkaloids above mentioned only three are used to any extent in medicine, viz., morphia, codeia, and narcotin. Narceia has also been used in medicine in France.~~

~~Morphia, CyyAHyyNO3.—Turkey opium of good quality and freed from moisture contains from 10 to 15 per cent. of morphia, and if less than 10 per cent. be present it is probably more or less adulter- ated. Persian opium is very variable in this respect, when of good~~

~~OPIUM~~

quality yielding from 8 to 13 per cent., while the variety met with in the form of sticks sometimes contains only 0°2 to 3 per cent. Indian opium is remarkable for the low percentage of morphia, the average yield being only 3 to 4 per cent., although samples of the kinds known as Khandesh and Garden Patna have afforded on analysis 6 to 7 per cent. Chinese opium is similar in this respect, giving, asarule, only 3 to 7 per cent. of this alkaloid. The amount of morphia present in opium bears no relation to the preference exhibited by smokers, opium containing a large quantity of morphia being generally considered by them as inferior in quality and apt to cause headache. For use in medicine those containing a large percentage of morphia are the most esteemed. Opium dried as soon as possible after being collected is usually much richer in morphia than that kept for some time in a moist state and exposed to the air ; and poppies grown on the hills yield an opium containing more morphia than those cultivated on the plains. Guibourt found that opium twenty years old contained less morphia than when previously analysed in the fresh state. To ascertain the percentage of morphia, the merchant extracts, by means of an instrument like a cheese-cutter, a small cylinder of opium about the thickness of a penholder and about 2 inches long, out of one-third of the pieces in a chest, and it is considered that the analysis of these pieces will fairly represent the value of the chest. Various methods are adopted for estimating the morphia, most of which depend upon the fact that this alkaloid can be precipitated from its salts by ammonia, and that it is insoluble in ether and only very slightly soluble in cold water. When pure it forms colourless shining prismatic crystals having an alkaline reaction. It unites with acids to form salts, most of which are soluble in water. It is soluble in 36 parts of boiling and 100 of cold alcohol, in 500 of boiling water, and very slightly in chloroform. It is also soluble in the fixed and volatile oils, and in solution of the fixed caustic alkalis and lime water, but only very slightly in caustic ammonia. With nitric acid it gives a red colour passing into yellow, with test solution of ferric chloride a blue colour which is destroyed by free acids or alcohol, and with sulphuric acid and bichromate of potash a greenish but not a purple or violet colour. Heated in the open air it burns readily, a portion being volatilized. The salts chiefly used in medicine are the hydrochlorate, sulphate, and acetate ; and for subcutaneous in- jection the tartrate has been recommended by Erskine Stuart, since it is more soluble, and more concentrated solutions can be used of it than of the other salts.

Heated in a sealed tube with hydrochloric acid, morphia is decomposed and an alkaloid named "apomorphia," ©,,H),NO.,, formed, which is one of the most speedy and effectual emetics known, and is of great value in cases of accidental poisoning, the subcutaneous injection causing the emptying of the contents of the stomach in a few minutes even when all ordinary emetics fail to act. In minute doses it has also valuable expectorant properties. It is soluble in ether and 50 parts of alcohol and in 68 parts of boiling water, but the solution soon decomposes, and assumes a green colour ; consequently it should be made fresh for use in medicine.

Codeia, C\3H.,NOs, exists in opium in combination with meconic acid, and remains in solution after the morphia is precipitated by ammonia; it may be obtained by evaporating the solution and purifying the crystals that form by dissolving them in hot ether, from whicli it crystallizes out on cooling in rather large octahedral prisms. It differs from morphia in not being soluble in solution of caustic potash or soda, while with nitric acid (sp. gr. 1°200) it gives a yellow solution which does not become red. It is soluble in 17 parts of boiling and 80 of cold water. Codeia has been found also in Turkish, French, and Indian opiums.

Narcotin, Co,H.,N O,.—This substance exists chiefly in a free state in opium ; being insoluble in cold water, it is left behind in consider- able quantity when opium is macerated in that liquid, although a small portion, probably in combination with sulphuric acid, is dis- solved. It is, however, very soluble in ether and benzol, and may be readily obtained by means of these solvents from the crude drug. It is doubtful if it should be classed with the alkaloids, for, although it forms definite compounds with some of the mineral acids, it does not exert any influence on vegetable colours. It differs from morphia in being insoluble in the caustic alkalis and not producing a blue colour with ferric salts.) When heated on a piece of paper over a candle it leaves a greasy stain.

Narceia, Cy7HogN Og, has been also used occasionally in medicine. Its alkaloidal character has been disputed ; but it is now generally classed as an alkaloid. It differs from morphia in giving a blue colour with dilute mineral acids, but does not give a blue colour with ferric salts or a red colour with nitric acid. For recent details concerning the less important

alkaloids reference may be made to Dr Hesse's papers, translated in the Pharm. Journ. and Trans., September 1870, p. 205, and January 1872, p. 549.

Opium of good quality for medicinal use should not lose more than 12% per cent. of water in drying, should not yield more than 8 per cent. of ash from the dried drug, and ought to afford at least 60 per cent. of matter soluble in water. It should be of somewhat tenacious consistence, yellowish brown colour, strong narcotic odour, and bitter taste. The preparation of crude opium most largely

used in medicine is the tincture, commonly known as "laudanum." It is composed of 14 oz. of powdered opium and 1 pint of spirit of wine of specific gravity 0°920. This name was, however, at first applied toa solid preparation, a pill-mass made of opium and various aromatics, which in the London Pharmacopeia of 1639 consisted of saffron, castor, ambergris, musk, and oil of nutmeg. The liquid preparation which bears the name of laudanum was apparently first introduced by the celebrated Dr Sydenham, and was inserted in the London Pharmacopeia for 1721. It also contained aromatics.

Physvological Action.—See Narcotics, supra, pp. 231-2.

Medicinal Uses.—The chief value of opium is to relieve pain, to relax spasm, to allay both local and general irrita- tion of the nervous system, and to procure sleep. Its power of diminishing secretions is taken advantage of in the cure of catarrh, bronchorrhoea, diarrhoea, and other forms of inflammation of the mucous membranes accompanied with excessive secretion, and also in diabetes. It is found of great value when conjoined with emetics in improving or stimulating the secretions of the skin. Its use is dangerous in inflammation of the brain or determination of blood to the head. The action of opium is exerted much more powerfully in proportion upon infants than upon adults, as small a dose as one drop of laudanum having proved fatal to an infant. For remedies in cases of poisoning see Poisons. Morphia differs slightly in its properties from opium. It is less stimulant, and does not produce the full diaphoretic action ; it causes less

~~headache, nausea, and constipation. When used hypodermically its action is more rapid and. smaller doses are required. Codeia is used in diabetes, in coughs, &c. Narceia is considered to be purely hypnotic. Narcotin is official in the pharmacopeia of India as a tonic in general debility arising from prolonged lactation, and in convalescence from acute febrile and inflammatory diseases.~~

~~Opium-eating.—Opium, like many other poisons, pro- duces after a time a less effect if frequently administered as a medicine, so that the dose has to be constantly increased to produce the same result on those who take it habitu- ally. When it is used to relieve pain or diarrhcea, if the dose be not taken at the usual time the symptoms of the disease recur with such violence that the remedy is speedily resorted to as the only means of relief, and thus the habit is exceedingly difficult to break off. Opium-eating is chiefly practised in Asia Minor, Persia, and India. Opinions differ widely as to the injurious effect of the habit; the weight of evidence appears, however, to indicate that it is much more deleterious than opium-smoking. It has been practised in India from very ancient times; some idea of its prevalence there may be gathered from the fact that the mere licence fees for one year amounted to £493,343, and that some of the opium dealers in Calcutta have each no less than seventeen shops where this drug only is sold.~~

~~The following statistics collected by Vincent Richards regarding Balasor in Orissa throw some light on the influence of this practice on the health. He estimates that onc in every 12 or 14 of the population use the drug, and that the habit is increasing. Of the 613 opium-eaters examined by him he found that the average age at which the habit was commenced was 20 to 26 years for men and 24 to 30 yearsfor women. Of this number 143 had taken the drug for from 10 to 20 years, 62 for from 20 to 30 years, and 38 for more than 30 years. The majority took their opium twice daily, morning and evening, the quantity taken varying from 2 to 46 grains daily, large doses being the exception, and the average 5 to 7 grains daily. The dose, when large, had been increased from the beginning ; when small, there had usually been no increase at all. The causes which first led to the increase of the drug were disease, example, and a belief in its aphrodisiac powers. The diseases for which it was chiefly taken were malarial fever, dysentery, diarrhcea, spitting of blood, rheumatism, and elephantiasis, A number~~

began to take it in the famine year, 1866, as it enabled them to exist on less food and mitigated their sufferings ; others used it to enable them to undergo fatigue and to make long journeys. Mr Richards concludes that the excessive use of opium by the agricultural classes, who are the chief consumers in Orissa, is very rare indeed. Its moderate use may be and is indulged in for years without producing any decided or appreciable ill effect except weakcuing the reproductive powers,

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the average number of the children of opium-eaters being 1°11 after 11 years of married life. It compares favourably as regards crime and insanity with intoxicating drinks, the inhabitants of Balasor being a particularly law-abiding race, and the insane forming only 0°0069 per cent. of the population. Dr W. Dymock of Bombay, speaking of western India, concurs in Mr Richards's opinion regard- ing the moderate use of the drug. He believes that excessive indulgence in it is confined to a comparatively small number of the wealthier classes of the community. Dr Moore's experience of Raj- putana strongly supports the same views. It seems probable that violent physical exercise may counteract in great measure the dele- terious effect of opium and prevent it from retarding the respiration, and that in such cases the beneficial effects are obtained without the noxious results which would accrue from its use to those en- gaged in sedentary pursuits. There is no doubt that the spread of the practice is connected with the ban imposed in Mohammedan countries on the use of alcoholic beverages, and to some extent with the long religious fasts of the Buddhists, Hindus, and Mos- lems, in which opium is used to allay hunger. ;)

To break off the habit of opium-eating is exceedingly difficult, and can be effected only by actual external restraint, or the strongest effort of a powerful will, especially if the dose has been gradually increased. Various remedies have been proposed to support the system while the habit is being dropped, the most recent of which are coca and strychnia. ; .

The habit is not confined to India, Persia, and Turkey, but is unfortunately practised in other forms in Western countries. In a few districts of England

more opium is consumed than in the rest of the United Kingdom, and in the United States it is calcu- lated that the number of opium-eaters is 82,696, and the average umount of opium consumed by each opium-eater in the State of Michigan is estimated at 1 oz. avoirdupois per week. Advanced opium-eaters also use in addition chloral and chloroform or ether. Of late years also the practice of using hypodermic injections of morphia has been followed as a luxury by many who have first experienced the speedy relief from pain obtained by its use.

Opiwm-smoking.—This is chiefly practised by the inhabitants of China and the islands of the Indian Archipelago, and in the countries where Chinese labour is largely employed. It is said to have com- menced in China forty or fifty years before the English began to import opium into that gs In 1858 it was estimated that about 2,000,000 of Chinese smoked opium, and in 1878 from one- fourth to three-tenths of the entire population of 400,000,000.

For smoking the Chinese use an extract of opium, the privilege of preparing and the exclusive right to deal in which is let to the highest bidder by the Government for a fixed term of years. The present holder of the monopoly in Hong-Kong pays 205,000 dollars annually. The same arrangement is in vogue in Singapore, French Cochin China, and Macao. The process of preparation is thus described by Mr Hugh M'Callum, Government analyst at Hong- Kong :—

—{The opium is removed from its covering of leaves, &c., moistened with a little water, and allowed to stand for about fourteen hours 3 it is then divided into pans, 23 balls of opium and about 10 pints of water going to each pan; it is now boiled and stirred occasionally until a uniform mixture having the con- sistence ofa thin paste is obtained. This operation takes from five to six hours. The paste is at once transferred to a larger pan and cold water added to about 3 gallons, covered, and allowed to stand for from fourteen to fifteen hours. A bunch of 'tang suin' (amp-wick, the pith of some plant) is then inserted well into the mass, and the pan slightly canted, when a rich, clear, brown fluid is thus drawn off, and filtered through 'chi mui' (paper made from bamboo fibre). The residue is removed to a calico filter and thoroughly washed with boiling water, the wash water being reboiled

and used time after time. The last washing is done with pure water; these washings are used in the next day's boiling.

"The residues on the calico filters are transferred to a large one of the same

material and well pressed. This insoluble residue, called 'nai chai' (opium dirt), is the perquisite of the head boiling coolie, who finds a ready market for it in Canton, where it is used for adulterating, or rather in manufacturing, the moist inferior kinds of prepared opium. The filtrate or opinm solution is concen- trated by evaporation at the boiling point, with occasional stirring until of a proper consistence, the time required being from three to four hours ; it is then removed from the fire and stirred with great vigour till cold, the cooling being accelerated by coolies with large fans. When quite cold it is taken to the hong and kept there for some months before it is considered in prime condition for smoking. As thus prepared it has the consistence of a thin treacly extract, and is called boiled or prepared opium. In this: state it is largely exported from China to America, Australia, &c., being carefully sealed up in smal! pots having the name of the maker (i.e., hong) on each. 'The Chinese recognize the following grades of opium :—(1) 'raw opium,' as imported from India ; (2) 'prepared opium,' opium made as above ; (3) 'opium dross,' the scrapings from the opium pipe; this is reboiled and manufactured as a second-class prepared opium ; a Chinese doctor stated lately at a coroner's inquest on a case of poisoning that it was more poisonous than the ordinary pre- pared opium ; (4) 'nai chai' (opium dirt), the insoluble residue left on exhaust- ing the raw opium thoroughly with water. The opium is sent every day from the hong (i.e., shop or firm) to the boiling-house, the previous day's boiling being then returned to the hong. The average quantity boiled each day is from six to eight chests of Patna opium, this being the only kind used."

By this process of preparation a considerable portion of the nar- cotin, caoutchouc, resin, oil, or fatty and insoluble matters are removed, and the prolonged boiling, evaporating, and baking over a naked fire tend to lessen the amount of alkaloids present in the extract. The only alkaloids likely to remain in the prepared opium, and capable of producing. well-marked physiological results, are morphia, codeia, and narceia. Morphia, in the pure state, can

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be sublimed, but codeia and narceia are said not to give a sub- limate. Even if sublimed in smoking opium, morphia would, in M'Callum's opinion, probably be deposited in the pipe before it reached the mouth of the smoker. The bitter taste of morphia is not noticeable when smoking opium, and it is therefore possible that the pleasure derived from smoking the drug is due to some product formed during combustion. This supposition is rendered probable by the fact that the opiums most prized by smokers are not those containing most morphia, and that the quality is judged by the amount of soluble matter in the opium, by its tenacity or "touch," and by peculiarities of aroma,—the Indian opium, especially the Patna kind, bearing much the same relation to the Chinese and Persian drug that champagne does to vin ordinaire. Opium-smoking is thus described by Mr Theo. Sampson of Canton :—

'*The smoker, lying on his side, with his face towards the tray and his head resting on a high hard pillow (sometimes made of earthenware, but more fre- quently of bamboo covered with leather), takes the pipe in his hand ; with the other hand he takes a dipper and puts the sharp end of itinto the opium, which is of a treacly consistency. Twist- ing it round and round he gets a large drop of the fluid toadhere to the dipper; still twisting itround to prevent it falling he brings the drop over the flame of the lamp, and twirl- ing it round and round he roasts it; all this is done with acquired dexterity. The opium must not be burnt or made too dry, but roasted gently till it looks like burnt worsted ; every now and then he takes it away from the flame and rolls it (still on the end of the dipper) on the flat surface of the bowl. When it is roasted « and rolled to his satisfaction he gently heats) the centre of the bowl, where there is a small

orifice ; then he quickly thrusts the end of the — ;

dipper into the orifice, twirls it round smartly, F16. 3.—Opium-smoking Appa- and withdraws it; if this is properly done, the tus. a, pipe; 6, dipper; ¢, opium (now about the size of a grain of hemp- lamp.

seed or a little larger) is left adhering to the bowl immediately over the orifice. It is now ready for smoking.

“The smoker assumes a comfortable attitude (lying down of course) at a proper distance from the lamp. He now puts the stem to his lips, and holds the bowl] over the lamp. The heat causes the opium to frizzle, and the smoker takes three or four long inhalations, all the time using the dipper to bring every particle of the x ge to the orifice as it burns away, but not taking his lips from the end of the stem, or the opium pellet from the lamp til! all is finished. Then he uses the flattened end of the dipper to scrape away any little residue there may be left around the orifice, and proceeds to prepare another pipe. The preparations occupy from five to ten minutes, and the actual smok- ing about thirty seconds. The smoke is swallowed, and is exhaled through both the mouth and the nose.”

Large quantities of morphia are exported to China from Europe for the purpose of preparing the so-called ‘cure for opium-smok- ing,” which consists of one-third of a grain of hydrochlorate of mor- phia mixed with a little powdered rice. The powders are taken at gradually increasing intervals, until the morphia is left off altogether.

Mr. Allen Williams, in a work recently published, states that there are now nearly a million persons in the United States who indulge in opium-smoking, and the habit seems to be on the in- crease in New York and other eastern cities, as well as in the west. The records of the National Bureau of Statistics show that, while the number of the Chinese in the United States has remained uearly stationary since 1876, the amount of opium imported has increased from 189,354 Tb of the crude and 49,375 tb of the pre- pared drug in 1872 to 248,211 tb of the former and 77,196 tb of the latter in 1880. Of the crude opium a certain quantity appears to be re-exported to the West Indies ; the larger proportion of the prepared drug is used in San Francisco.

So far as can be gathered from the conflicting statements pub- lished on the subject, opium-smoking may be regarded much in the same light as the use of alcoholic stimulants. To the great majority of smokers who use it moderately it appears to act asa stimulant, and to enable them to undergo great fatigue and to go for a considerable time with little or no food. According to the reports given by authorities on the subject, when the smoker has plenty of active work it appears to be no more injurious than

smoking tobacco. When carried to excess it becomes an inveterate habit ; but this happens chiefly in individuals of weak will-power, who would just as easily become the victims of intoxicating drinks, and who are practically moral imbeciles, often addicted also to other forms of depravity. The effect in bad cases is to cause loss of appetite, a leaden pallor of the skin, and a degree of leanness so excessive as to make its victims appear like living skeletons. All inclination for exertion becomes gradually lost, business is neglected, and certain ruin to the smoker follows. There can be no doubt that the use of the drug is opposed by all thinking Chinese who are not pecuniarily interested in the opium trade or cultivation, for several reasons, among which may be mentioned the drain of bullion from the country, the decrease of population, the liability to famine through the cultivation of opium where cereals should be grown, and the corruption of state officials.

See Pharmaceutical Journ., [1] xi. p. 269, xiv. p. 395; [2] x. p. 484; Impey, Report on Malwa Opium, Bombay, 1848; Report on Trade of Hankow, 1869; New

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Remedies, 1876, p. 229; Pharmacographia, 1879, p. 42; Journal of the Society of / aoe United States Dispensatory, 1883, p. 1054; The Friend of China, 1883, dec. "

OPODELDOC, a name now applied to a liniment com- posed of soap, camphor, the volatile oils of rosemary and origanum, solution of ammonia, and spirit of wine. It is made of such a consistence that it is solid at ordinary temperatures, but melts with the warmth of the hand. The origin of the name is lost in obscurity, but is believed to have been first applied to a plaster, invented by Mindererus or Paracelsus, and used for bruises and external injuries. In the Hdinburgh Pharmacopeia (1721) opodeldoc was official under the name of unguentum opodeldoch, and then consisted of thirteen aromatic ingredients besides Venice soap, camphor, and spirit of wine. Its first appear- ance in the London Pharmacopeia seems to have been in 1746 under the name of linimentum saponaceum. In the British Pharmacopeia of 1867 it is represented by the liniment of soap, which differs from the earlier prepara- tions in being fluid at ordinary temperatures.

OPORTO (a.e., GO Porto, The Port), the second city of the kingdom of Portugal, the capital of Entre Douro e Minho, the best-cultivated and the most fruitful province of the country, is situated on both banks of the Douro, about 3 miles from its mouth, in 41° 9' N. lat. and 8° 37' W. long. The part south of the Douro is known as Villa Nova da Gaia. The mouth of the river is obstructed by a very dangerous shifting sandbank, protected by a light-house and a castle situated in the village of Sao Jodo da Foz, which, along with Campanha, Paranhos, and Sordello, completes the suburbs. The population of the city is 80,295, and with the suburbs 108,346.

The view of the town from the river is singularly at- tractive and quaint. It possesses many buildings of 'interest, and picturesque thoroughfares, which, however,

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Oporto and Mouth of the Douro.

from the situation of the city, are very steep and irre- gular. The principal edifices are the cathedral and the archbishop's palace—the latter, containing a fine staircase, conspicuously situated on a high rock—and the Torre dos Clerigos, a granite tower 210 feet high, built in 1748, commanding a splendid view, and visible at sea a long way off. The English factory (built in 1790), including a library, reading-room, and ballroom, is one of the largest buildings, while the exchange (once the monastery of S. Francisco) is perhaps the finest and most elaborately de- corated structure in the country. The walls and floor of the hall are entirely covered with beautiful inlaid devices in polished native-coloured woods of all hues brought from the virgin forests of the Brazils. The museum, the public library, containing over 80,000 volumes, the barracks, the Da Miseracordia Hospital, and the opera-house are the other most important public buildings. The Rua Nova dos In- glezes is the most frequented street, and the Rua das Flores is one of the most interesting from the rich display of gold-work, for which the town is famous, both in its shop windows as well as—more characteristically and attract- ively—on the persons of the fishwomen in their everyday garb. The Praca de San Ovidio, situated on the heights, and laid out in terraces of flowers, deserves a visit from the

traveller, while the Largo da Torre da Marva is interesting as standing on the site of the ancient Cale, from which

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the kingdom derives its name (Porto Cale). The chapel of Cedo Feita, said to have been founded in 559 by the Visigothic king Theodomir (but much more probably not till the 12th century), is very curious ; the church of Nossa Senhora da Lapa, a well-known landmark, is a handsome Corinthian edifice. The city at one time had no less than 80 monasteries and chapels. The English community main- tain a chaplain and a doctor, and have a cemetery for their own dead. Railways run from Oporto to Lisbon, and up the valley of the Douro to Pezo da Regoa, and recently a junction has been made with the line through Spain to Paris, whereby the long journey from Lisbon to that capital via Madrid is vastly shortened ; a branch also runs to the frontier town of Valenga on the Minho. Oporto pos- sesses good schools, a medical college with numerous chairs, and a botanical garden. Several newspapers appear daily.

The industries of Oporto are the most important and numerous in the kingdom, employing about 6000 hands, the chief being paper, linen, wool, cotton, silk, and gold manufactures, brocade, lace, glove, button, and pottery making. Oporto is chiefly famous for the export of the wine which bears its name, of which the great storehouses are on the south side of the river. The vines from which it is made grow on the Alto Douro, a hilly and pre- cipitous region lying about 60 miles up the river, and having an area of 27 miles in length by 5 or 6 in breadth, cut off from the sea, and shut in from the north-east by a range of mountains. The trade was established in 1678, but the shipments for some years did not exceed 600 pipes (of 115 gallons each). In 1708 Lord Methven made a treaty with Portugal, under which Portu- guese Wines were admitted on easier terms than those of Gascony, and henceforward "port" began to be drunk. In 1747 the export reached 17,000 pipes. In 1754 the great wine monopoly company of Oporto originated, under which the shipments rose to 33,000 pipes. At the beginning of the present century the policy of the Government more and more favoured port wine, besides which the vintages from 1802 to 1815 were splendid both in Portugal and in Madeira,—that of 1815 has, in fact,

never been excelled. For the next few years the grape crop was not at all good, but the 1820 vintage was the most remarkable of any. It was singularly sweet and black, besides being equal in quality to that of 1815. This henceforth became the standard taste and colour for true port, and to keep up the vintage of following years to this exceptional standard adulteration by elder-berries, syrup, and jeropiga was resorted to. This practice did not long continue, for it was cheaper to adulterate the best wines with inferior sorts of port wine itself. There is scarcely a Portuguese wine, says Crawfurd, in skilful and intelligent hands not capable of being made both sound and palatable without recourse to any sort of adulteration. Port is now one of the purest wines. In 1852 the Oidiwm which spread over Europe destroyed most of the Portuguese vineyards. In 1867 the second monopoly company was abolished, and since then the exports have been increasing till 1877, when the amount shipped was 61,278 pipes, of which England absorbed 38,898. Since 1863 the total exported has been 782,171 pipes (521,531 to England). In England port is adulterated with the red Spanish wine of Tarragona, which is a true wine, but procurable at half the cost of the cheapest port. The port wine duties are, however, not oppressive, and, though the Phylloxera has produced great ravages, the trade is still very pros- perous. Brand wines are those made of different vintages blended together ; " vintage" is a wine blended by nature herself, and is of rare occurrence.

Besides wine Oporto exports oranges (228,000,000 in 1878), onions, shipped as of Spanish growth, and varying vastly in amount accord- ing to the season, and olives (which go to Brazil alone, although they are cheaper and finer-flavoured when truly ripe than those of any other country). An important trade is done in live cattle. Portugal is one of the few countries never visited by the cattle- plague. They are sent to England as fat cattle, and are said to yield the finest grass-fed beef admitted into the country. About 15,000 head were imported in 1878. Feijées or haricot (mostly the black, feijao pret) beans form a considerable item of export to Brazil : 975,000 kilos were shipped in 1877. They are identical with those from Sorrento, and are a little dearer, but of a distinctly finer quality. Cork and sumach are also among the exports. The imports are numerous: codfish (bacalh&o), a national dish, in immense quantities, as well as coals and ore, are brought from Newfoundland, and cottons and yarns from Great

Britain (mostly), France, and Holland. Iron and steel goods were in 1877 imported from England to the amount of 7,000,000 kilos, paying a 5 per cent. ad valorem duty ; in 1878, however, Sweden and Norway entered strongly into competition. Coal is also imported from England, and costs the consumer in Oporto twice its cost there. In 1878 of

215 steamers which entered Oporto (no vessel, owing to the danger- ous bar, comes into this port to call simply) 153 were British. — History.—The history of Oporto dates from an early period. Before the Roman invasion, under the name of Gaia, or Cago, it was a town with a good trade; the Alani subsequently founded a city on the opposite or northern bank, calling it Castrum Novum. About 540 a.p. the Goths under Leovogild obtained possession of the northern district, who yielded place in 716 to the Moors under Abdul Hassan, who then conquered the whole of that region. The Christians, however, again gained possession by the overthrow of the Moors, when it became the key of their position for the long period during which the latter held sway in the southern provinces of Portugal. The Moors once more became its masters for a short period, till in 1092 it was brought by Dom Alfonso Frederico finally under Christian domination. The town is renowned also in English military annals from the duke of eo ages famous passage of the Douro in its immediate neighbourhood, close to where the fine bridge of the northern railway now spans the river, by which he surprised and put to flight Soult's army, capturing the city on the lith May 1809. It sustained a severe siege in 1833 during the civil war headed by Dom Miguel, and was bravely defended by Dom Pedro with 7500 men, but with the loss of 16,000 of its

inhabitants. ; See Commercial Reports for 1878-79 ; Report of Wine Committee of House of Commons in 1879; Crawfurd, Portugal, Old and New, 1872. (H./0. FE.)

OPOSSUM. The animals to which this name is applied are the only non-Australian members of the Marsupials or pouched animals, being found throughout the greater part of the continent of America, from the United States to Patagonia, the number of species being largest in the more tropical parts (see MammaL1a—Marsupialia, vol. xv. p. 380). They form

the family Didelphyidz, distinguished from the other Marsupial families by their equally deve- loped hind-toes, their nailless but fully opposable hallux, and by their dentition, its formula being 7% ci pm3 m4, total 50, a number only exceeded among heterodont Mammalia by the Australian Myrmecobius fasciatus. The peculiarity in the mode of succession of these teeth has been explained in the article referred to, where also (p. 378) a figure of the teeth may be seen. Opossums are small animals, varying from the size of a mouse to that of a large cat, with long noses, ears, and tails, the latter being as a rule naked and prehensile, and with their great toes so fully opposable to the other digits as to constitute a functionally perfect posterior pair of "hands." These oppos- able great toes are without nail or claw, but their tips are expanded into broad flat pads, which are no doubt of the greatest use to such a climbing animal asan opossum. On the anterior limbs all the five digits are provided with long sharp claws, and the pollex or thumb is but little opposable. Their numerous teeth are covered with minute sharply- pointed cusps, with which to crush the insects on which they feed, for the opossums seem to take in South America the place in the economy of nature filled in other countries by the true Lnsectivora, the hedgehogs, moles, and shrews.

The family consists of two well-recognized genera only, viz., Didelphys, containing all the members of the family, with the exception of the Yapock, a curious animal which forms by itself the second genus, Chironectes, and is dis- tinguished from all other opossums by its webbed feet, non-tuberculated soles, and peculiar coloration. Its ground colour is light grey, with four or five sharply-contrasted brown bands passing across its head and back, giving it a very peculiar mottled appearance. It is almost wholly aquatic in its habits, living on small fish, crustaceans, and other water animals; its range extends from Guatemala to southern Brazil.

The other genus of opossums, Didelphys, is an extremely heterogeneous one, and has been split up into several groups, some of which perhaps ought also to be recognized as genera. The first of these consists of three or four large dull-coloured long- and coarse-haired species, with perfect marsupial pouches, large leafy ears, and greatly-developed muscular ridges on their skulls. The best known of these, and indeed of all the family, is the Virginian Opossum,

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Didelphys virginiana, an animal spread over all temperate North America ; it is extremely common, being even found living in the towns, where it acts as a scavenger by night, retiring for shelter by day upon the roofs of the houses or into the sewers. It produces in the spring from six to sixteen young ones, which are placed by the mother in her pouch immediately after birth, and remain there until able to take care of themselves; the period of gestation is from fourteen to seventeen days. Another very similar species is found in central and tropical South America, and is known as the Crab-eating Opossum (D. cancrivora). The second group, or sub-genus, named Metachirus, con- tains a considerable number of species found all over the tropical parts of the New World. They are of medium size, with short close fur, very long, scaly, and naked tails, and have less developed ridges on their skulls. They have as a rule no pouches in which to carry their young, and the latter therefore commonly ride on their mother's back, holding on by winding their prehensile tails round hers. The accompanying woodcut represents Lord Derby's Opossum (D. derbiana) carrying its young in this manner.

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Didelphys derbiana.

The third group is Micoureus (Grymexomys of Burmeister), differing only from Metachirus by the comparatively smaller size of its members and by certain slight differences in the shape of their teeth. Its best-known species is the Murine Opossum (D. murina), no larger than a house-mouse, of a bright-red colour, which is found as far north as central Mexico, and extends thence right down to the south of Brazil. The last sub-genus contains three or four wonder- fully shrew-like species, of very small size, with short, hairy, and non-prehensile tails, not half the length of the trunk, and with wholly unridged skulls. The most striking mem- ber of the groupis the Three-striped Opossum (D. tristriata), from Brazil, which is of a reddish-grey colour, with three clearly-defined deep-black bands down its back, very much as in some of the striped mice of Africa. This sub-genus

~~has been named Hemiurus or "half-tail" by Geoffroy Saint-Hilaire (Microdelphys of Burmeister), and should perhaps be allowed full generic rank.~~

~~The numerous fossil remains referable to species of the Didel- phyidz are of special interest as showing some of the connecting links in geographical distribution between the opossums and the Australian Marsupials, now so widely and absolutely separated. They consist of the bones of a considerable number of species from the Eocene and Early Miocene deposits of central France, one or two Eocene species having also been found in southern England. These ancient opossums have been separated generically from Di- delphys on account of certain differences in the relative sizes of the lower — but as nearly the whole of the species have been formed on lower jaws only, of which some hundreds have been found, it is impossible to judge how far these differences are correlated with other dental or osteological characters. In the opinion of Dr Filhol, who has devoted considerable attention to the subject, the fossils themselves represent two genera, Peratherium, containing~~

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~~the greater part of the species, about twenty in number, and Amphi- perathertum, with three species only. All are comparatively small animals, few of them exceeding the size of a rat.~~

~~Besides these interesting European fossils, a certain number of Didelphian bones have been found in the caves of Brazil, but these are either closely allied to or identical with the species now living in the same region. @, Wy)~~

~~OPPELN (Polish, Oppolie), the chief town of a district of its own name and the seat of government for Upper Silesia, Prussia, lies on the right bank of the Oder, 50 miles to the south-east of Breslau. It contains the oldest Christian church in the district, founded at the close of the 10th century, and a ducal palace of the 15th century, on an island in the Oder. The most prominent among the other buildings are the offices of the district authorities, the town-house, the normal seminary, and the hospital. The Roman Catholic gymnasium is established in an old Jesuit college. The industries of Oppeln include the manufacture of Portland cement, soap,~~

~~cigars, and lime ; and a trade is carried on by rail and river in cattle, grain, and the mineral produce of the district. The population in 1880 was 14,447, of whom 10,772 were Roman Catholics. The upper classes speak German, the lower Polish.~~

~~Oppeln was already a flourishing place at the beginning of the 11th century, and after 1132 was the capital of an independent duchy, which became a fief of Bohemia in 1327, and was absorbed by the empire in 1556.~~

~~OPPENHEIM, a small town in the grand-duchy of Hesse-Darmstadt, Germany, is picturesquely situated on a hill on the left bank of the Rhine, 20 miles to the south of Mainz. It contains (1880) 3288 inhabitants, half Roman Catholics and half Protestants, who cultivate the vine and manufacture tacks, quinine, and leather.~~

~~Oppenheim, which occupies the site of the Roman castle Bau- conica, was formerly much larger than at present ; and in the early Middle Ages it was a free town of the empire and one of the most important members of the Rhenish League. It lost its independ- ence in 1898, when it was given in pledge to the elector palatine. During the Thirty Years' War the town was alternately occupied by the Swedes and the Imperialists, and in 1689 it was entirely destroyed by the French under Melac. The only relic of its former importance is the church of St Catherine, one of the most beautiful Gothic edifices of the 13th and 14th centuries in Germany, recently carefully restored at the expense of Government.~~

~~OPPIAN. The literary history of the three Greek poems on fishing, hunting, and fowling respectively which have come down to us from antiquity under the name of Oppian involves several perplexing questions. According to Suidas, Eusebius, and Syncellus, the author was a native of Anazarbus or Corycus in Cilicia, and flourished in the reign of Marcus Aurelius. Athenzeus also, who almost certainly wrote under Septimius Severus, speaks of Oppian as a predecessor and near contemporary. According to an anonymous biographer, he was the son of a philosopher of Anazarbus named Agesilaus, who having incurred the dis- pleasure of Severus by neglecting to wait upon him was banished to Malta. Young Oppian accompanied his father, and by the exercise of his poetical talents obtained his re- call, and was further rewarded by a piece of gold for every line he~~

had written. He died prematurely upon his return to his native country, and was honoured by an epitaph, which has been preserved, celebrating his precocious genius, but affording no clue to his works or his date. On turning to Oppian himself we find that his poem on fish and fishing (Halieutica) is actually addressed to an emperor Antoninus who can have been no other than Marcus Aurelius, since the monarch's son is frequently mentioned, and the other Antonine princes were childless. The author seems to speak of himself as a Cilician. On the other hand, the poem on hunting (Cynegetica) is no less unmistakably addressed to the successor of Severus, Antoninus Caracalla, and the writer represents himself as a citizen of Pella or Apamea in Syria. The style of the two poems, moreover, is dis- similar, the former being polished and poetical, the latter

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inelegant and commonplace. If the Cynegetica had been the earlier this might have been explained, but the reverse is the fact. There seems no alternative, therefore, but to divide the authorship, and the allusions of the author of the Halieutica to Commodus make it almost certain that he must have written between the elevation of that prince to the dignity of Augustus and the death of Marcus (177- 180 a.D.), while the Cynegetica seem to have been composed after the death of Severus (211 a.p.). The improbability of two poets of the same name and writing on such simi- lar subjects having been such near contemporaries may be escaped by the supposition that the later writer was not really named Oppian, but has been confounded with his prede- cessor from their poems being transcribed together. This is the more probable as the poem on fowling (Ixeutica), which seems to resemble the Cynegetica in style, but 1s only extant in a prose epitome, is attributed in some MSS. to a certain Dionysius. In this case Oppian's premature death and his epitaph may be accepted as historical and genuine. The story of his deliverance of his father must be apocryphal, and the imperial reward is probably founded upon a too literal interpretation of the epithet " golden" applied to his verses.

The Halieutica are indeed excellent verses. Oppian has made the most of his subject, which he has adorned with all the resources of aquatic fancy and fable, and to which he has ingeniously imparted human interest by

~~constant parallels between the existence of fishes and the pursuits and perils of human life. His matter is arranged to the best advantage: "he loves descriptions," says M. Henri Martin, "' but not digressions." Though careless of fact in comparison with poetic embellishment, he has a first-hand acquaintance with his theme as a sportsman and a lover of nature. His diction is choice, his style animated, and his versification sonorous. Rhetorical display, the accumula- tion of detail, and an occasional inaptness in his compari- sons are his only serious faults. The writer of the Cyne- getica, who sometimes copies and spoils him, is a far in- ferior writer, frequently tasteless, generally awkward and dry. Some of his descriptions, however, possess merit ; he is a naturalist as well as a poet, and his observation of nature is often remarkably close, although, like his pre- decessor, he abounds in fables. His poem seems to want a final book, in which the stratagems of the chase would have been more fully described, The poetical qualities of the Ixeutica, if any, have evaporated in the paraphrase ; the descriptions of the fowler's snares are clear and precise.~~

~~The Halieutica were first printed in 1478, in the metrical Latin version of L. Lippus. The editio princeps of the original was pub- lished by Junta at Florence in 1515; the Haliewtica and Cyne- getica were printed together by Aldus in 1517; the Jxeutica did nat appear till 1704. The principal modern editions are those by Schneider (Strasburg, 1776), who first distinguished between the two Oppians, and by Lehrs (Paris, 1846, along with the Bucolic poets), who adopted a number of ingenious emendations by Koechly. Copious scholia on the Halicutica were edited by Bussemaker (Paris, 1849). The best authorities on the literary questions connected with the Oppians are Ferdinand Peter, Comimentatio, Zeitz, 1840 ; Henri Martin in the Journal général del Instruction Publique, vols. xxxi. and xxxii.; and Ausfeld, De Oppiano, &c., Gotha, 1876. The English translation of the Halieutica by Diaper, completed by Jones (Oxford, 1722), is not deficient in spirit, but much too diffuse. The French prose translations by Limes and Belin de Ballu have been superseded by Bourquin's, Coulommiers, 1877. (R. G.)~~

~~OPPIUS, Carus, was an intimate friend and confidant of Julius Cesar. He managed the dictator's private affairs, and took no public office, but during the time when Cesar was absent from Rome he, together with Balbus,~~

exercised very great influence on public business. According to Suetonius, many authorities considered Oppius to have written the histories of the Spanish, African, and Alexan- drian wars which are printed among the works of Cesar. Niebuhr unhesitatingly assigns the African war to Oppius.

OPTICS, Gzomerricat. The subject of optics is so extensive that some subdivision of it is convenient if not necessary. Under the head of Licur will be found a general sketch accompanied by certain developments. The wave theory and those branches of the subject which are best expounded in connexion with it are reserved for treat- ment ina later volume. The object of the present paper is to give some account of what is generally called geo- metrical optics,—a theoretical structure based upon the laws of reflexion and refraction. We shall, however, find it advisable not to exclude altogether the conceptions of the wave theory, for on certain most important and practical questions no conclusions can be drawn without the use of facts which are scarcely otherwise interpretable. Indeed it is not to be denied that the too rigid separation of optics into geometrical and physical has done a good deal of harm, much that is essential to a pro- C per comprehension of the subject havy- ing fallen between the two stools.

Systems of Rays im General.—In the investigation of this subject a few preli- minary propositions will be useful.

Tf a ray AB (fig. 1) travelling in a homogeneous medium suffer reflexion at a plane or curved surface BD, the total path between any two points A, C on the ray isa minimum, 2.¢, AB+ BC is less along the actual path than it would be if the point B were slightly varied.

For a variation of B in a direction perpendicular to the plane of reflexion (that of the diagram) the truth of this statement is at once evident. Fora small variation BB' in the plane of reflexion we see that the difference AB' — AB is equal to the projection of BB' upon AB, and that the difference CB — CB' is equal to the projection of BB' upon BC. These projections are equal, since by the law of re- flexion AB and BC are equally inclined to BB', and thus the variation of the total path, AB'+B'C-(AB+ BC), vanishes,

A corresponding proposition holds good in the case of refraction. If we multiply the distances travelled in the first and second media respectively by the refractive indices appropriate to the media, the quantity so obtained is a minimum for the actual path of the ray from any point to any other. It is sufficient to consider the case of a varia- tion of the point of passage in the plane of refraction.

In the first medium (fig. 2) »AB' — »AB= ,BB'cos ABD, and in the second medium p' CB — p' CB' = p' BB' cos CBD. The whole variation of the A quantity in question is therefore BB' (wu cos ABD — p' cos CBD).

Now by the law of refrac- tion the sines of the angles of incidence and refraction are in the ratio p':p, and accordingly

» cos ABD -f cos CBD=0.

In whichever direction, therefore, the point of tran- sition be varied, the varia- tion of the quantity under consideration is zero. It is evident that the second pro- position includes the first, since in the case of reflexion the two media are the same.

Fig. 2.

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The principle of the superposition of variations now allows us to make an important extension. If the quantity, which we may denote by 2s, be a minimum for separate variations of all the points of passage between contiguous media, it is also a minimum even when simultaneous varia- tions are admitted. Howeveer many times a ray may be reflected or refracted at the surfaces of various media, the actual path of the ray between any two points of its course makes Zs a minimum. Even if the variations of refrac- tive index be gradual instead of sudden, the same principle holds good, and the actual path of the ray makes /yds, as it would now be written, a minimum.

The principle itself, though here deduced from the laws of reflexion and refraction, is an immediate consequence of the fundamental suppositions of

~~the wave-theory of light, and if we are prepared to adopt this point of view we may conversely deduce the laws of reflexion and re- fraction from the principle. The refractive index p is in- versely proportional to the velocity of propagation, and the principle simply asserts that in passing from any point to any other the light follows the shortest course, that is, the course of earliest arrival.~~

~~If two points be such that rays issuing from one of them, and ranging through a finite angle, converge to the other after any number of reflexions and refractions, the value of 2s from one focus to the other must be the same for all the rays.~~

~~Thus, in order to condense rays issu- ing from one point S upon a second point H by a single reflexion (fig. 3), dctines the reflecting surface must be such that SP + HP =const., 1.¢., must be an ellipsoid of revolution with S and H for foci.~~

~~Again, if it be required to effect the same operation by a single refraction at the surface of a medium whose index is #, we see that P~~

~~the surface (fig. 4) must be such that Ss SP+HP=const.~~

~~If S be at an in- Fig. 4.~~

~~finite distance, 7.¢., if the incident rays be parallel, the surface is an ellipsoid of revolution with H for focus, and of eccentricity w-1 (u>1).~~

~~Another important proposition, obvious from the point of view of the wave-theory, but here requiring an independ- ent proof, was enunciated by Malus. It asserts that a system of rays, emanating originally from a point, retains always the property of being normal to a surface, whatever reflexions or refractions it may undergo in traversing singly- refracting media.~~

~~Suppose that ABCDE, A'B'C'D'E' .. . (fig. 5) are rays originally normal to a , surface AA', which undergo reflexions or refractions at BB', CC', &ce. On every ray take points E, EF', &e., such that Zps is the same along the courses AE, A'E', &c. We shall prove that the rays in the final medium are~~

normal to the surface EE'. For by hypothesis 2ps along ABCDE is the same as along

Fig. 5. A'B'CTDE,, and, by the property proved above to attach to every ray, 2us reckoned along the neighbouring hypo-

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thetical course A'BCDE' is the same as along A'B/C'D''E'. Hence Zps along A'BCDE" is the same as along ABCDE, or (on subtraction of the common part) the same along A'B, DE' as along AB, DE. But since AB is perpendicular to AA', the value along A'B is the same as along AB, and there- fore the value along DE' is the same as along DE; or, since the index is the same, DE= DF', that is, EE' is perpendi- cular to DE. The same may be proved for every point E' which lies infinitely near E, and thus the surface EE' is perpendicular to the ray DE, and by similar reasoning to every other ray of the system. It follows that reflexions and refractions cannot deprive a system of rays of the pro- perty of being normal to a surface, and it is evident that a system issuing from a point enjoys the property initially.

Consecutive rays do not in general intersect one another ; but if we select rays which cut the orthogonal surface along a line of curvature, we meet with ultimate intersec- tion, the locus of points thus determined being a caustic curve to which the rays are tangents. Other lines of cur- vature of the same set give rise to similar caustic curves, and the locus of these curves is a caustic surface to which every ray of the system is a tangent. By considering the other set of lines of curvature we obtain a second caustic surface. Thus every ray of the system touches two caustic surfaces.

In the important case in which the system of rays is symmetrical about an axis, the orthogonal surface is one of revolution. The first set of lines of curvature coincide with meridians. The rays corresponding to any one meridian meet in a caustic curve, and the surface which would be traced out by causing this to revolve about the axis is the first caustic surface. The second set of lines of curvature are the circles of latitude perpendicular to the meridians. The rays which are normal along one of these circles form a cone of revolution, and meet in a point situ- ated on the axis of symmetry.

The second caustic surface of the general theorem is therefore here represented by a portion of the axis.

The character of a limited symmetrical pencil of rays is illustrated in fig. 6, in which BAC is the ortho- gonal surface, and HFI the caustic curve having a cusp at F', the so-called geometrical focus. The distance FD between F and the point where the extreme ray BHDG cuts the axis is called the longitudinal aberration. On account of the sym- metry FD is an even function of AB. If the !

il be small, we ma C penci ' y in general consider FD to be proportional to AB?, although in particular cases the aberration may vanish to this order of approximation. Let us examine the nature of the sections at various points as they may be exhibited by holding a piece of paper in the solar rays converging from a common burning-glass of large aperture. In moving the paper towards the focus nothing special is observed up to the position HI, where the caustic surface is first reached. A bright ring is there formed at the margin of the illuminated area, and this gradually contracts. At D the second caustic surface DF is reached, and a bright spot develops itself at the centre. A little farther back, at EG, the area of the illuminated patch is a minimum, and its boundary is called the least circle of aberration. Farther back still the outer boundary corre- sponding to the extreme rays begins to enlarge, although

Fig. 6.

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the circle of intersection with the caustic surface continues to contract. Beyond F the caustic surfaces are passed, and no part of the area is specially illuminated.

As a simple example of a symmetrical system let us take the case of parallel rays QR, OA (fig. 7), incident upon a spherical minor AR. By the law of reflexion the angle ORg= angle ORQ = angle gOR. Hence the triangle RgO is isosceles, and if we denote the radius of the surface OAA by 7, and the angle AOR by a, we have

Oq

~ 2 cosa

If F be the geometrical focus, OF=AF=4r. If a be a small angle, the longitudinal

Fig. 7.

aberration Fg=Og -OF =$47 (sec a—1)=)a2r, in which AR=ra. Focal lines.—In the general case of a small pencil of

rays there is no one point which can be called the geo-

metrical focus. Consider the corresponding small area of the orthogonal surface and its two sets of lines of curvature. Of all the rays which are contiguous to the central ray there are only two which intersect it, and these will in general intersect it at different points. These points may be regarded as foci, but it is in a less perfect sense than in the case of symmetrical pencils. Even if we limit ourselves to rays in one of the principal planes, the aberration is in general a quantity of the first order in the angle of the pencil, and not, as before, a quantity of the second order. If, however, we neglect this aberration and group the rays in succession according to the two sets of lines of curvature, we see that the pencil of rays passes through two focal lines perpendicular to one another and to the central ray, and situated at the centres of curvature of the orthogonal surface. At some intermediate place the section of the pencil is circular.

It happens not unfrequently that the pencil under con- sideration forms part of a symmetrical system, but is limited in such a manner that the central ray of the pencil does not coincide with the axis of the system. The plane of the meridian of the orthogonal surface is called the primary plane, and the corresponding focus, situated on the caustic surface, the primary focus. The secondary focus is on the axis of symmetry through which every ray passes, The distinction of primary and secondary is also employed when the system, though not of revolution, is symmetrical with respect to a plane passing through the central ray, this plane being considered primary.

~~The formation of focal lines is well shown experimentally by a plano-convex lens of plate-glass held at an obliquity of 20° or 30° in the path of the nearly parallel rays, which diverge from a small image of the sun formed by a lens of short focus. The convex face of the lens is to be turned towards the parallel rays, and a piece of red glass may be interposed to mitigate the effects of chromatic dispersion.~~

~~To find the position of the focal lines of a small pencil incident obliquely upon a plane refracting surface of index p.~~

~~The complete system of rays issuing from Q (fig. 8) and refracted at the plane surface CA is symmetrical about the line QC drawn through Q perpendicularly to the surface. Hence, if QA be the central ray of the pencil, the secondary focus q, lies at the inter- section of the refracted ray with the axis. If @ be the angle of incidence, ¢' of refraction, AQ=u, Aq.=v., then~~

~~eT (1).~~

~~To find the position of the primary focus q,, let QA' be a neigh- bouring ray in the primary plane (that of the paper) with angles of incidence and refraction ¢ + 6¢ and ¢'+6¢', Aqg;=v. We have AA' cos $=uUd¢, AA' cos '=12,65¢' ; moreover, by the law of refraction, cos ¢ bf =p Cos P'b¢' ;~~

~~800~~

~~and thus : iy cine tacat (2). u ~~ cos?d~~

~~If the refracting surface be curved, with curvature r~1, we get by similar reasoning~~

~~24) 2 —~~

~~Mcos'p cos'p wcosd ell civees (8)3 Vy u r iy Lk Kel: 5 (4); % r ;~~

~~in which (1) and (2) are of course included as particular cases.~~

~~D~~

Fig. 8.

When the incidence is direct, cos ¢' = 1, cos = 1, and vw = %. In this case (3) and (4) become oc oF To find the positions of the focal lines of a pencil refracted obliquely through a plate of thickness t and index m. If be the angle of incidence (and emergence), ¢' the angle of refraction of the ray QAST (fig. 9), ity Sq.=V, AQ=u, we get

by successive applications of (1) and (2) =u + = S, on Diet eaganeeoaals (6) ; Vg=U+ ~ Fiala dices CA: If the incidence be direct, Y=, =U+ eee (8).

Thus, if we interpose a plate between the eye and an object, the effect is to bring the object apparently nearer by the amount

(ult

i On this result is founded a method for determining the refractive index of materials in the form of plates.

Prism.—Byaprism is meant in optics a portion of transparent material limited by two plane faces which meet ata finite angle ina straight line called the edge of the prism. A section perpendicular to the edge is called a principal section.

Parallel rays, refracted successively at the two faces, emerge from the prism as a system of parallel rays. The angle through which the rays are bent is called the deviation.

The deviation depends upon the angles of incidence and emergence ; but, since the course of a ray may always be reversed, the deviation is necessarily a symmetrical func- tion of these angles. The deviation is consequently a maximum or a minimum when a ray within the prism is equally inclined to the two faces, in which case the angles of incidence and emergence are equal. It is in fact a mini- mum ; and this position of the prism is described as the

Fig. 9.

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position of minimum deviation, and is usually adopted for the purposes of measurement.

The relation between the minimum deviation D, the angle of the prism A z, and the refrac- tive index yp is readily found. In fig. 10 the internal angles ¢', y are each equal to 42. The external an- gles ¢, w are also equal, and are con- — nected with ¢' by the law of refrac-

Fig. 10. tion sn $= sin $'. The deviation is 2(4—¢'). Hence sing sin 4(D +7) ;

~ sing' sings ?

and this is the formula by which the refractive index is usually determined, since both D and 7 can be measured with great precision.

The instrument now usually employed for this purpose is called a goniometer or spectrometer. Parallel rays are provided by a collimator, consisting of an object-glass and telescope-tube, by means of which the subject of examina- tion, either a fine slit or a set of cross wires, is seen as if it were at an infinite distance. The parallel rays from the collimator, after reflexion from a face or refraction through the body of the prism, are received by a telescope also provided with a set of cross wires at its focus. The table upon which the prism is supported, as well as the telescope, are capable of rotation about a vertical axis, and the position of either can be read off at any time by means of graduated circles and verniers.

As a preliminary to taking an observation it is neces- sary to focus the collimator and telescope. The first step is to adjust the eye-lens of the telescope until the cross wires are seen distinctly and without effort. The proper posi- tion depends, of course, upon the eyesight of the observer, and is variable within certain limits in virtue of the power of accommodation. It is usually best to draw out the lens nearly to the maximum distance consistent with dis- tinct vision. The telescope is now turned to a distant object and focused by a common motion of the cross wires and eye-lens, until both the object and the cross wires are seen distinctly at the same time.

‘The final test of the adjustment is the absence of a relative motion when the eye is moved sideways across the eye-piece. The colli- mator is now brought opposite to the telescope and adjusted until the cross wires in its focus behave precisely like the distant object.

To measure the angle of a prism it may be placed with its edge vertical upon the table, in a symmetrical position with respect to the collima- tor (fig. 11). The telescope is then successively brought into such positions that the cross wires of the telescope coincide with the cross wires of the collimator when seen by reflexion in the two faces.

The difference of the read- ings is twice the angle of the prism.

Another method is also Bae AP often employed in which the telescope is held fixed and the prism is rotated. The angle between the two posi- tions of the table found by use in succession of the two faces is the supplement of the angle of the prism.

or rics

Suppose next that we wish to determine D for the given prism and for sodium light. The’slit of the collimator is backed by a sodium flame, the telescope is adjusted for direct vision of the slit, and the reading taken. The prism is now placed upon the table, and rotated until the devia- tion of the light from its original direction when seen through the prism isa minimum. The difference of the readings for the two positions of the telescope is the value of D. The angle to be observed may be doubled by using the deviation in both directions. In this case no direct reading in the absence of the prism is required.

The following table of indices of refraction is taken from Watt’s Dictionary of Chemistry, article ‘ Light.”

Index of Index of Name of Substance. amachon Name of Substance. Haltaction.

Chromate of lead .. 2°50 to 2°97 || Phosphoric acid …. 1°534 Diamond ……— ..| 2°47 to 2°75 || Sulphate of copper ..| 1°531 to 1°552

PROSPHOPUA. <),.. 0… 00. 2°224 Canada balsam …... 1°532 Glass ofantimony .. 2°216 Clie acid: 5.5). com 1527 Sulphur (native) .... 2115 Crown glass -»»| 1°525 to 1°534 RROD Miraritens. «is 4+ 0% « 1°95 INt ok abo agg OeIde Done ec 1-514 Borate of lead …... 1°866 Plate PIASs 2.60600. | 1°514 to 1°542 Carbonate of lead ….) 1°81 to 2°08 {| Spermaceti …..... 1°503 BED ONG N, sarsVOUS /.(0 eiciace tain ares 1°764 Sulphate of potassium 1°500 WPOUTMEMN 50… 06 -e2.ns 1°668 Ferrous sulphate …. 1°494 Topaz (colourless).... 1°610 Tallow} WAR... c0c00. 1:492 CRE yllincifars, sis Siete verstelos eis 1°598 Sulphateofmagnesium 1°488 Tortoise-shell…..... 1‘591 Iceland spar …..... 1°654 MSTA. oie see vse e 1°585 (Ove Gh tiles os on goqeor 1°488 PUIG GIARS) voic.c cies alee 5k GO USSF | Guatinn 2i5)< 65,0. st0 earstereroiate 1:476 Rock-crystal …..... 1°547 BONA 2 cchgeis sre sean 1:475 Rock-salt…….....05 1°545 ARB EIN yei ages over Protelsea cots 1-457 Apophyllite …..... 17543 TPUORS AB 5g e-ciea) 1°436 ColophOny? jsysssievien oe 17543 | CORE CREB oS ae anOp oon. 1310 DUREE ceva icietrer 1535 Tabasheer af 11115

A selection from some results given by Hopkinson,! relating to Chance’s glasses, may be useful to those engaged in the designing of optical instruments. D is the more refrangible of the pair of sodium lines ; } is the most refrangible of the group of magnesium lines ; (G) is the hydrogen line near G.

| Double

Hard xtra . Extra

Soft : Light Dense Extra

Crown Light : é Dense 4 oa Crown. Flint. Flint. Flint. Flint. Dense Flint.

Specific : : c , ; : c 4 Grecite f 2°48575 | 2°55035 5 86636 | 3°20609 | 3°65865 | 3°88947 | 4°42162 is! eee 1518625 | 1°510916 | 1°536450 | 1°568558 | 1°615701 | 1642874 | 1°701060 CL… ..| 19514568 | 1°511904 | 1°537673 | 1°570011 | 1°617484 | 1644866 | 1°703478 D …...| 19517114 | 1°514591 | 1°541011 | 1°574015 | 1°622414 | 1°650388 | 1‘710201) eee 1°520331 | 1‘518010 | 1°545306 | 1°579223 | 1°628895 | 1657653 |

1°719114 OR ssteracaee 1°520967 | 1°518686 | 1°546166 | 1°580271 | 1°630204 | 1°659122 | 1°720924 We sired 1‘523189 | 1°520996 | 1°549121 | 1°583886 | 1‘634748 | 1°664226 | 1°727237 (eC) Wesecc 1°527994 | 1°526207 | 1°555863 | 1°592190 | 1°645267 | 1°676111 | 1°742063 OMe oc 1°528358 | 1°526595 | 1°556372 | 1°592824 | 1°646068 | 1°677019 | 1°743204 bh… | 1°580902 | 1°529359 | 1°560010 | 1°597332 | 1°651840 | 1°683577 | 1°751464 ABE seveweis. oc 1°532792 | 1°531416 | 1°562760 | 1°600727 | 1°656219 | 1-688569 | 1°757785

To determine the index of refraction of a liquid it must of course be placed in a hollow prism, whose faces are formed of some trans- parent material, usually of glass. The following results of Dale and Gladstone show the influence of temperature upon the refract- ing power of some important liquids. They relate to the soda flame, or the line D in the solar spectrum.

Tempera- | Bisulphide of Alcohol ture. Carbon. Water Ether, Absolute. Ce 1°6442 1°3330 ae ala 10° 1°6346 1:3827 1°3592 13658 20° 1°6261 1°3320 1°3545 1°3615 Ser 1°6182 1°3309 1°3495 1°3578 40° 1°6103 1:3297 ee 1°3536 50° a 1°3280 1°3491 60° 1°3259 1°34387

Refractive Indices of Bisulphide of Carbon for the several

Fixed Lines. Temperature. A B D E F ni i 16142 1°6207 1°6333 1°6465 1°6584 1°6836 86°°5 1°5945 1°6004 1°6120 1°6248 1°6362 1°6600 Difference ….| 0°0197 0°0203 0°0213 0°0217 0°0222 0-0236

The rapid alteration of refractive power with temperature is a serious obstacle to the use of bisulphide of carbon prisms for exact

1 Proc. Roy. Soc., June 1877.

purposes. Not only does the dispersive power vary from day to day, but inequalities of temperature in the various parts of the liquid at any one moment disturb the optical uniformity, and are thus the cause of bad definition. A difference of 1° Cent. alters the index about as much as a change in the light from one of the two D lines to the other, so that a

~~variation of one degree within the prism may be expected to prevent the satisfactory resolution of this double line.~~

~~Excellent results have recently been obtained by Liveing with prisms containing aqueous solution of iodide of potassium and mercury. This liquid can be brought up to a density as high as three times that of water, and gives a powerful dispersion. Some difficulty has, however, been experienced in finding a suitable cement for the faces. Bisulphide of carbon prisms are usually cemented with a mixture of glue and treacle.~~

~~For many purposes the deviation of the light in passing through an ordinary prism is objectionable. In such cases recourse may be had to direct vision prisms (fig. 12), in which two materials, usually flint and crown, are sO com- bined that the re- fractions are equal and opposite for a selected ray, while the dispersions are as unequal as may be. The direct vision prism may be contrasted with the achromatic lens (see Licut). In the first the object is to obtain dispersion without refraction, and in the second to obtain refraction without dispersion.~~

~~Compound prisms, composed of a flint between two crowns, are also made, in which the action of the crown is not carried so far as to destroy the deviation due to the flint. By this construction a larger angle is admissible for the more dispersive material, but it is not clear that any sufficient advantage is gained.~~

~~The principle of the compound prism is carried to its limit by employing media of eyual refracting power for the part of the spectrum under examination. For this pur- pose bisulphide of carbon and flint glass may be chosen. With Chance's "dense flint" the refractions are the same, and the difference of dispersions is about as great as for "double-extra-dense flint" and crown. A dozen glass prisms of 90° may be cemented in a row on a strip of glass and immersed in a tube of bisulphide of carbon closed at the ends by glass plates. To vary the ray, which passes with- out deviation, ether may be mixed with the bisulphide.?~~

~~The formation of a pure spectrum, which may be either thrown upon a screen or photographic plate, or received at once by the eye armed with a magnifier, has been explained under Licut. It sometimes happens that the~~

object is not to see the spectrum itself, but to arrange a field of view uniformly illuminated with approximately homogeneous light. For this purpose the pure spectrum is received upon a screen perforated by a narrow slit parallel to the fixed lines. The light which passes this second slit (eye- slit) is approximately homogeneous. Suppose that it corre- sponds to the red of the spectrum. The eye, placed im- mediately behind the eye-slit, receives only red light, and, if focused upon the prism, sees a red field of view whose brightness is uniform if the light falling in different direc- tions upon the original slit be uniform. 'To secure the fulfilment of the last condition we may use the light from an overcast sky, or that of the sun reflected from a large surface of white paper. If it be desired to work by arti- ficial light, an Argand gas flame diffused by an opal globe will be found suitable. When the adjustments are correct the tint should be perfectly uniform. Any difference of colour on the two sides of the field of view is an indication that the screen is not in its proper place.

The most important application of this arrangement is to the investigation of compound colours, as carried out by Maxwell. If light be admitted also through a second slit,

2 See "Investigations in Optics," Phil. Mag., January 1880. 3 "Theory of Compound Colours," Phil. Trans., 1860. XVII. — Io1

Fig. 12.

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displaced laterally from the position occupied by the first, a second spectrum overlapping the former will be thrown upon the screen, and a second kind of light will be admitted to the eye. In this way we may obtain a field of view lighted with a mixture of two or more spectrum colours, and we may control the relative proportions by varying the widths of the slits. For instance, by mixing almost any kind of red with any kind of green not inclining to blue we may match the brightest yellows, proving what so many find it difficult to believe, that yellow is a com- pound colour. In Maxwell's systematic examination of the spectrum, mixtures of three colours were used, and the proportions were adjusted so as to match the original white light incident upon the apparatus.

~~A similar arrangement (with one original slit) was em- ployed by Helmholtz in his examination of a fundamental question raised by Brewster. The latter physicist main- tained that there was abundant evidence to show that light of definite refrangibility was susceptible of further analysis by absorption, so that the colour of light (even of given brightness) could not be defined in terms of refrangibility or wave-length alone. The appearances which misled Brewster have since been explained as the effect of contrast or of insufficient purity. It is obvious that light, e.g., from the red end of the spectrum, may be contaminated with light from some other part, say the yellow, in such propor- tion that though originally entirely preponderant it may fall into the second place under the action of a medium very much more transparent to yellow than to red. To obtain light of sufficient purity for these experiments Helmholtz found it advisable to employ a double prismatic analysis. A spectrum is first thrown upon a screen per- forated by a slit in the manner already described. The light which penetrates the second slit, already nearly pure, is caused to pass a second prism by the action of which any stray light is thrown aside. Using such doubly puri- fied light, Helmholtz found the colour preserved, whatever absorbing agents were brought into play. Light of given refrangibility may produce a variety of effects, visual, thermal, or chemical, but (apart from polarization) it is not itself divisible into parts of different kinds. If yellow light produces the compound sensation of yellow, we are to seek the explanation in the constitution of the retina, and not in the divisibility of the light.~~

~~In all accurate work with the prism the use of a collimating lens to render the incident light parallel is a matter of necessity. If the incident rays diverge from a point at a finite distance, the pencil after emergence will be of a highly complicated character. 'There are, however, cases in which a collimator is dispensed with, and thus it is a problem of interest to find the foci of a thin pencil origin- ally diverging from a point at a moderate distance. Even when a collimator is employed, the same problem presents itself whenever the focusing is imperfect. For the sake of simplicity the pencil is supposed to pass so near the edge of the prism that the length of path within the glass may be neglected in comparison with the dis- tances of the foci.~~

We denote as usual the angles of incidence and emergence by ¢, ¥, and the corresponding angles within the glass by ¢', Y. The distance AQ from the edge of the prism to original source is denoted by w; the corresponding distanees for the primary and secondary foci %, 9, by 7, V. By suecessive applications of the results already proved for a single refraction, we get i — cos*¢' cos*y nee so that

V — cos*d' cos*y — (wu? —1) tan®@ + u? 9 V, cos*p cosy' (u?—1) tan'y+p2 (2).

In order that the primary and secondary foci may coincide we must have y=¢; that is to say, the ray must pass with minimum deviation. This is sometimes given as a reason why this arrange- ment should be adopted in spectroscopes ; but in reality, since the slit is parallel to the edge of the prism, a slight elongation in this direction of the image of a point is without detriment to the defini- tion. Hence a good image will be seen when the telescope is adjusted for the primary focus ; and it is not clear that any improve-

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ment would arise from coincidence of the two foci, the question being in fact one of aberration. The position of minimum devia- tion is, however, usually adopted for the sake of definiteness, and sometimes it is convenient that the fixed lines and the extremities of the slit (or the markings produced by dust) should be in focus together.

The deviation is a symmetrical function of ¢ and y, and therefore is not altered by an interchange of these angles. The correspond- ing values of v are thus by (1) reciprocals, and their product is equal to w. This principle has been ingeniously applied by Sehuster! to the adjustment for focus of the telescope and collimator of a spectroscope. The telescope is so placed that the deviation necessary to bring the object upon the cross wires is greater than the minimum, and the prism is adjusted in azimuth until the effect is produced, that position being chosen for which the angle of incidence is greater than the angle of emergence, so that 2, is greater than wv. After focusing the telescope the prism is turned into the other position which gives the same deviation, and the collimator is focused, the teleseope

~~remaining untouched. The prism is next brought back to the first position, and the telescope is again focused. A few repetitions of this operation, always focusing the telescope in the first position of the prism and the collimator in the second, will bring both into perfect adjustment for parallel rays.~~

~~Lenses.—The usual formula for the focal length of lenses~~

~~(vol. xiv. p. 593),~~

~~ignores the fact that the various parts of a lens bounded by spherical surfaces have not the same focus, and is appli- cable in strictness only when the aperture is small. It is~~

~~not necessary here to repeat the process by which (1) is usually obtained, but before passing on to give the form- ulz for the aberration of lenses it may be well to exhibit the significance of (1) from the point of view of the wave- theory. Taking the case of a convex lens of glass, let us suppose A~~

~~that parallel p rays DA, EC, ~· GB (fig. 13) fall upon the lens ACB, and are collected by it to a focus at F. The points D, G E, G, equally~~

~~distant from~~

~~B Fig. 13.~~

~~ACB, lie upon a front of the wave before it impinges upon~~

~~the lens. The focus is a point at which the different parts of the wave arrive at the same time, and that such a point can exist depends upon the fact that the propagation is slower in glass than in air. The ray ECF is retarded from having to pass through the thickness (¢) of glass by the amount (u—1)t. The ray DAF, which traverses only the extreme edge of the lens, is retarded merely on account of the crookedness of its path, and the amount of the re- tardation is measured by AF—CF. If F is a focus these retardations must be equal, or AF -CF=(u-1)t.~~

~~Now if y be the semi-aperture AC of the lens, and f be the focal length CF,~~

AF — OF = {2+ ?} -f=4 e approximately, fez

2(u—1)t

In the case of plate-glass —1=4 nearly, and then the rule (2) may be thus stated: the semt-aperture is a mean proportional between the focal length and the thickness. The form (2) is in general the more significant, as well as the more practically useful, but we may of course express the thickness in terms of the curvatures and semi-aperture by

means of 3 ee | t =4°(- a *) i

1 Phil, Mag., February 1879.

whence

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In the preceding statement it has been supposed for simplicity that the lens comes to a sharp edge. If this be not the case we must take as the thickness of the lens the difference of the thicknesses at the centre and at the cir- cumference. In this form the statement is applicable to concave lenses, and we see that the focal length is positive when the lens is thickest at the centre, but negative when the lens is thickest at the edge.

To determine practically the focal length of a convex lens we may proceed in several ways. A convenient plan is to set up a source of light Q (fig. 14) and . ascreengata / distance — ex- ceeding four

Fig. 14.

times the focal length, and to observe the two positions of the lens A, A' at which the source is in focus upon the

screen. These positions are symmetrically situated, and the distance between them is observed. Thus

AQ=4Qq+hAA', Apa

~~From the measured values of Qg and AA', f can be deduced.~~

~~If A and A' coincide, the conjugate foci Q and ¢ are as close as possible to one another, and then f= 4Qq.~~

~~The focal length on a concave lens may be found by com- bining it with a more powerful convex lens of known focus.~~

~~Aberration of Lenses.—The formula (1) determines the point at which a ray, originally parallel to the axis and at but a short distance from it, crosses the axis after passage through the lens. When, however, the ray considered is not quite close to the axis, the point thus determined varies with the distance y. In the case of a convex lens the ray DH (fig. 15), distant HC (=y) from the axis,~~

~~A~~

~~= Oe Fig. 15. crosses it after refraction at a point F' which lies nearer to the lens than the point F determined by (1), and corre- sponding to an infinitely small value of y. The distance EF is called the longitudinal aberration of the ray, and may be denoted by 6/.~~

~~The calculation of the longitudinal aberration as dependent upon the refractive index («) and the anterior and posterior radii of the surfaces (7, 3) is straight forward, but is scarcely of sufficient interest to be given at length in a work like the present. It is found that~~

~~i ie uit 1\5-2)} = =a les SARs f? ...(3); r, 8, and f being related as usual by (1).~~

~~The first question which suggests itself is whether it is possible so to proportion 7 and s that the aberration may vanish. Writing~~

~~for brevity R, S, F respectively for r~1, s~', f-1, and taking a= SO that —S= (G/u)-R, we get .~~

~~Li fseet Lyi by~~

~~aa has =e (2u+1)~~

=6{VII+2)-Ro oi 9)

= G{R%u+2)—RG(Qu+1)+uG?}

pPF3 4-1 (ui Huey 4

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Since » >1, both terms are of the same sign ; and thus it appears that the aberration can never vanish, whatever may be the ratio of r tos. Under these circumstances all that we can do is to ascertain for what form of lens the aberration is a minimum, the focal length and aperture being given. For this purpose we must suppose that the first term of (4) vanishes, which gives

—2(u+2)(u—1) a BJ Sia suvlcioleishs SaeatiRe (5). The corresponding value of—s is

—ga ut 2)(u—1)

44-2? ft errr? eer (6) 3 so that sn M(2u+1) $3 4+, —Qu? atufevare (elevates eetetni startin (7)

In the case of plate-glass 1~=1°5 nearly, and then from (5), (6), (7) 7 is r=j5V;—s=ohs =—s:7r=6;1.

Both surfaces are therefore convex, but the curvature of the anterior surface (that directed towards the incident parallel rays) is six times the curvature of the posterior surface. By (3) the outstanding aberration is

The use of a plano-convex lens instead of that above determined does not entail much increase of aberration. Putting in (3) s=o, and therefore by (1) r=4/, we get

This is on the supposition that the curved side faces the parallel

rays. If the lens be turned round so as to present the plane face to the incident light we have r=, -s=4/, and then OR St oisereiniacramieetsysieveoe ee 10

~~nearly four times as great.~~

~~For a somewhat higher value of » the plano-convex becomes the form of minimum aberration. If s=oo in (6), 4+m—2y?=0, whence u»=1°69.~~

~~If u be very great, we sce from (5) and (6) that 7 and s tend to become identical with f.~~

~~For the general value of » the minimum aberration corresponding~~

~~to (7) is by (4) : pha ew~~

~~Sf 8(u—-1)*(u+2) The right-hand member of (11) tends to diminish as pm increases,~~

~~catiesectnse (11).~~

~~but it remains considerable for all natural substances. If w=2, ey, Hat of: fF 16"~~

~~Oblique Pencils.—Hitherto we have supposed that the axis of the pencil coincides with the axis of the lens. If the axis of the pencil, though incident obliquely, pass through the centre of the lens, it suffers no deviation, the surfaces being parallel at the points of incidence and emer- gence. In this case the primary and secondary foci are formed at distances from the centre of the lens which can only differ from the distance corresponding to a direct pencil by quantities of the second order in the obliquity. Hence, if the obliquity be moderate, we may use the same formulze for oblique as for direct pencils.~~

~~The consideration of excentrical pencils leads to calcula- tions of great complexity, upon which we do not enter.~~

~~Chromatic Aberration.—The operation of simple lenses is much interfered with by the variation of the refractive index with the colour of the light. The focal length is decidedly less for blue than for red light, and thus in the ordinary case of white light it is impossible to obtaina perfect image,~~

~~however completely thé spherical aberration may be corrected. From the formula for the focal length we see that~~

~~so that~~

~~or the longitudinal chromatic aberration varies as the focal length and as the dispersive power of the material com-~~

~~posing the lens. The best image will be formed at a posi- tion midway between the two foci, and the diameter d of the circle over which the rays are spread bears the same ratio to the semi-aperture of the lens (vy) that of bears to Ff. Hence op Ge er Y.~~

~~The diameter of the circle of chromatic aberration is thus proportional to the aperture and independent of the focal length ; and, since the linear dimensions of the image are proportional to the focal length, the confusion due to chromatic aberration may be considered to be inversely as the focal length. Before the invention of the achromatic object-glass this source of imperfect definition was by far the most important, and, in order to mitigate its influence, telescopes were made of gigantic length. Even at the present day the images of large so-called achromatic glasses are sensibly impaired by secondary chromatic aberration, the effect of which is also directly as the aperture and inversely as the focal length.~~

~~Achromatic Object-glasses.—It has been shown in vol. xiv. p. 595 that the condition of achromatism for two thin lenses placed close together is~~

~~(VB tle Gee il (i ee (0 Rate csorsaroteac (i).~~

~~in which /, f' are the focal lengths of the two lenses, and du/(4—1), du'/(w'—1) the dispersive powers of the two kinds of glass. In practice crown and flint glass are used, the dispersive power of the flint being greater than that of the crown. Thus /" is negative and numerically greater than f, so that the combination consists of a convex lens of crown and a concave lens of flint, the converging power of the crown overpowering the diverging power of the~~

flint. When the focal length F of the combination is given, the focal lengths of the individual lenses are determined by (1) in conjunction with

The matter, however, is not quite so simple as the above account of it might lead us to suppose. In consequence of what is called the irrationality of spectra, the ratio of dis- persive powers of two media is dependent upon the parts of the spectrum which we take into consideration. What- ever two rays of the spectrum we like to select, we can secure that the compound lens shall have the same focal length for these rays, but we shall then find that for other rays the focal length is slightly different. In the case of a single lens the focal length continually diminishes as we pass up the spectrum from red to violet. By the use of two lenses the spectrum, formed as it were along the axis, is doubled upon itself. The focal length is least for a certain ray, which may be selected at pleasure. Thus in the ordinary achromatic lens, intended for use with the eye, the focal length is a minimum for the green, and Increases as we pass away from the green, whether towards red or towards blue. Stokes has shown that the secondary colour gives a sharp test of the success of the achromatizing process.

—"The secondary tints in an objective are readily shown by direct- ing the telescope to a vertical line separating light from dark, such as the cdge of a chimney seen in the shade against the sky, and covering half the object-glass with a screen having a vertical edge. So delicate is this test that, on testing different telescopes by well- known opticians, a difference in the mode of achromatism may be detected. The best results are said to be obtained when the secondary

green is intermediate between green and yellow. This corresponds to making the focal length a minimum for the brightest part of the spectrum.

'"To enable me to form a judgment as to the sharpness of the test furnished by the tint of the secondary green, as compared with the performance of an object-glass, I tried the following experiment. A sct of parallel lines of increasing finencss was ruled with ink on

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~~a sheet of white paper, and a broader black object was laid upon it as well, parallel to the lines. The paper was placed, with the black lines vertical, at a considerable distance on a lawn, and was viewed through two opposed prisms, one of crown glass and the other of flint, of such angles as nearly to achromatize each other in the positions of minimum deviation, and then through a small telescope The achromatism is now effected, and varied in char- acter, by moving one of the prisms slightly in azimuth, and after each alteration the telescope was focused afresh to get the sharpest vision that could be had. I found that the azimuth of the prism was fixed within decidedly narrower limits by the condition that the secondary green should be of. such or such a tint, even though no attempt was made to determine the tint otherwise than by memory, than by the condition that the vision of the fine lines should be as sharp as possible. Now asmall element of. a double object-glass may be regarded, so far as chromatic compensation is concerned, as a pair of opposed prisms ; and therefore we may infer that the tint of the secondary green ought to be at the very least as sharp a test of the goodness of the chromatic compensation as the actual performance of the telescope." !~~

~~In the case of photographic lenses the conditions of the problem are materially different. It is usually considered to be important to secure "coincidence of the visual and chemical foci," so that the sensitive plate may occupy the exact position previously found by the eye for the ground glass screen. or this purpose the ray of minimum focus must be chosen further up in the spectrum. If, however, the object be to obtain the sharpest possible photographs, coincidence of visual and chemical foci must be sacrificed, the proper position for the sensitive plate being found by trial. The middle of the chemically-acting part of the spectrum, which will vary somewhat according to the photographic process employed, should then be chosen for minimum focus.~~

~~When the focal lengths of the component lenses have been chosen, it still remains to decide upon the curvatures of the individual faces. Between the four curvatures we have at present only two relations, and thus two more can be satisfied. One of these is given by the condition that the first term in the expression for the aberration—that proportional to the square of the aperture—shall vanish for parallel rays. As to the fourth condition, various~~

pro- posals have been made. If equal and opposite curvatures are given to the second and third surfaces, the glasses may be cemented together, by which some saving of light is effected. Herschel proposed to make the aberration vanish for nearly parallel, as well as for absolutely parallel, rays. This leads to a construction nearly agreeing with that adopted by Fraunhofer.

The following results are given by Herschel? for the radii of the four surfaces, corresponding to various dispers- ive powers, and to mean refractive indices 1°524 (crown) and 1°585 (flint). The focal length of the combination is taken equal to 10, and, as well ag the radii, is measured in arbitrary units; so that all the numbers in the table (with the exception of the first column) may be changed In any proportion.

: ° : , . ve Focal Focal Ratio of | Radius of| Radius of | Radius of | Radius of Dispersive) First Second Third Fourth Tae @ Tenele of Powers. | Surface. | Surface. | Surface. | Surface. liens Teens ss pas is ct A 2 a 50 6°7485 4°2827 4°1575 14°3697 50 100000 55 6°7184 3°6332 3°6006 14°5353 4°5 8°1818 60 6°7069 3°0488 3°0640 14°2937 4°0 66667 65 6°7316 2°5208 2°5566 13°5709 ii) 5°3846 70 6°8279 2°0422 2°0831 12°3154 30 4°2858 75 70816 1°6073 1°6450 10°5186 o55 3°8333

The general character of the combination is shown in fig. 16. The radii of the first and fourth surfaces within prac- tical limits are so nearly constant that Herschel lays down

1 Proc. Roy. Soc., June 1878. 2 Phil. Trans., 1821.

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the following rule as in all probability sufficiently exact for use. A double object-glass will be free from aberration, provided. the radius of the exterior surface of the ; crown lens be 6°720 and of the flint 14:20, the focal length of the combin ation being 10°000, and the radii of the interior surface being computed from these data, by the formule given in all elementary works on optics, so as to make the focal lengths of the two glasses in the direct ratio of their dis- persive powers.

Numerous experiments have been made with the view of abolishing the secondary spectrum. Theoretically, if three different kinds of glasses are combined it will gen- erally be possible to make the focal lengths of the com- bination equal for any three selected rays of the spectrum. Or the ingredients of one of the glasses may be mixed in such proportions as to suit the requirements of the problem when combined with crown. In this way Stokes has succeeded in constructing a small object-glass free from secondary colour, but it is doubtful whether the practical difficulties could be overcome in the construction of a large object-glass, where alone the outstanding chro- matic aberration is important.

The practical optician is not limited to spherical surfaces, and the final adjustment of the aberration of large object- glasses is controlled by the action of the polishing tool. It is understood that some of the best makers apply a local correction, according to the methods developed by Foucault for mirrors. The light from a natural or artificial star is allowed to fall upon the lens. At the focus is placed a small screen, which is gradually advanced so as to cut off the light. The eye is immediately behind the screen and is focused upon the lens. If there are no imperfections the illumination falls off very suddenly, the surface of the mirror passing from light to dark through a nearly uniform grey tint. If, however, from uniform aberration, or from local defects, any of the light goes a little astray, the corre- sponding parts of the surface will show irregularities of illumination during the passage of the screen, and in this manner a guide is afforded for the completion of the figuring.

Téppler! has developed the idea of Foucault into a general method for rendering visible very small optical differences. Instead of a mere point of light, it is advis- able to use as source an aperture (backed by a bright flame) of sensible size, and bounded on one side by a straight edge. An image of this source is formed at a considerable distance by a lens of large aperture and free from imper- fections, and in the plane of the image is arranged a screen whose edge is parallel to the straight edge of the image, and can be advanced gradually so as to coincide with it. Behind this screen comes a small telescope through which the observer examines the object placed near the lens. When the light is just cut off by the advancing screen, the apparatus is in the most sensitive state, and the slightest disturbance of

the course of the rays is rendered evident. To show the delicacy of the arrangement Téppler intro- duced into the cone of light a small trough with parallel glass sides containing distilled water. A syphon dipped under the surface and discharged distilled water from another vessel, and it was found almost impossible so to control the temperatures that the issuing jet should remain invisible. Not only were sound-waves in air, generated by electric sparks, rendered visible, but their behaviour when reflected from neighbouring obstacles was beautifully exhibited.

An apparatus on this principle may often be employed

Fig. 16.

1 Pogg. Ann., exxxi., 1867.

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with advantage in physical demonstrations,—for instance, for the exhibition of the changes of density in the neigh- bourhood of the electrodes of a metallic solution under- going electrolysis. The smallest irregularity that could be rendered visible would be such as would retard trans- mitted light by a moderate fraction of the wave-length. In objectives for photographic use the requirements are

|.in many respects different from those most important in

the case of telescopes. A flat field, a wide angle of view— in some cases as much as 90°—freedom from distortion, and a great concentration of light are more important than a high degree of definition. Asa rule, photographs are not subjected to the ordeal of a high magnifying power. Usually the picture includes objects at various distances from the camera, which cannot all be in focus at once. That the objects at one particular distance should be de- picted with especial sharpness would often be rather a disadvantage than otherwise. A moderate amount of "diffusion of focus" is thus desirable, and implies residual aberration. In some lenses an adjustment is provided by means of which the diffusion of focus may be varied according to the circumstances of the case.

~~For landscapes and general purposes a so-called single lens is usually employed. This, however, for the sake of achromatism, is compounded of a flint and a crown cemented together ; or sometimes three component lenses are used, the flint being encased in two crowns, one on each side. To get tolerable definition and flatness of field a stop must be added, whose proper place is some little distance in front of the lens. .~~

~~For portraiture, especially before the introduction of the modern rapid dry plates, a brilliant image was a necessity. This implies a high ratio of aperture to focal length, which cannot be attained satisfactorily with any form of single lens. To meet the demand, Petzval designed the " portrait-lens," in which two achromatic lenses, placed at a certain distance apart, combine to form the image. This construction is so successful that the focal length is often no more than three times the available aperture. When stops are employed to increase the sharpness and depth of focus they are placed between the lenses.~~

~~Vision through a Single Lens.—A single lens may be used to improve the vision of a defective eye, or as a magnifying glass. A normal eye is capable of focusing upon objects at any distance greater than about 8 inches. The eyes of a short-sighted person are optically too powerful, and can- not be focused upon an object at a moderate distance. The remedy is of course to be found in concave glasses. On the other hand, persons beyond middle life usually lose the power of seeing near objects distinctly, and require convex glasses.~~

~~A not uncommon defect, distinct from mere short or weak sight, is that known as astigmatism. In such cases the focal length varies in different planes, and at no distance is the definition perfect. Many people, whose sight would not usually be considered inferior, are affected by astig- matism to a certain extent. If aset of parallel black lines ruled upon white paper be turned gradually round in its own plane, it will often be seen more distinctly and with greater contrast of the white and black parts in one azimuth than in another. When the focal line on the retina is parallel to the length of the bar, the definition (as in the case of the spectroscope) is not much prejudiced, but'it is~~

~~2 Even when the optical differences are not small it is well to re- member that transparent bodies are only visible in virtue of a variable illumination. If the light falls equally in all directions, as it might approximately do for, an observer on a high monument during a thick fog, the edge of (for example) a perfectly transparent prism would be absolutely invisible. If a spherical cloud, composed of absolutely transparent material, surround symmetrically a source of light, the illumination at a distance would not be diminished by its presence.~~

~~otherwise when the bars are turned through a right angle so as to be perpendicular to the focal line.~~

~~In extreme cases a remedy may be applied in the form of glasses of different curvatures in perpendicular planes, so adjusted both in form and position as to compensate the corresponding differences in the lens of the eye.~~

~~The use of a lens as a magnifier has been explained under Microscope. The simplest view of the matter is that the lens, consistently with good focusing, allows of a nearer approach, and therefore of a higher visual angle, than would otherwise be possible.~~

~~Telescope, &c.—In a large class of optical instruments an wnage of the original object is first formed, and this image is examined through a magnifier. If we use a single lens merely for the latter purpose, the field of view is very restricted. A great improvement in this respect may be effected by the introduction of a field-lens. The~~

~~ideal position for the field-lens is at the focal plane of~~

~~the object-glass. The image is then entirely uninfluenced, and the only effect is to bend round the rays from the margin of the field which would otherwise escape, and to make them reach the eye-lens, and ultimately the eye. If the field-lens and the eye-lens have nearly the same~~

~~focal length an image of the object-glass will be formed~~

~~upon the eye-lens, and through this small image will pass every ray admitted by the object-glass and field-lens.~~

~~However, to obtain a sufficient augmentation of the field of view it is not necessary to give the field-lens the exact position above mentioned, and other considerations favour a certain displacement. For example, it is not desirable that dust and flaws on the field-lens should be seen in focus. In Huygens's eye-piece the field-lens is dis- placed from its ideal position towards the object-glass. In Ramsden's eye-piece, on the other hand, the focal plane of the object-glass is outside the system. This eye-piece has the important advantage that cross wires can be placed so as to coincide with the image as formed by the object-glass. The component lenses of a Ramsden's eye-piece are some- times achromatic. or further particulars, with diagrams, on the subject of eye-pieces, see Microscopn.~~

~~In large telescopes the object-glass is often replaced by @ mirror, which may be of speculum metal, or of glass coated chemically with a very thin layer of polished silver. The mirror presents the advantage (especially important for photographic applications) of absolute achromatism. On the other hand, more light is lost in the reflexion than in the passage through a good object-glass, and the surface of the mirror needs occasional re-polishing or re-coating. For fuller information see TELESCOPE.~~

~~The function of a telescope is to increase the "apparent magnitude" of distant objects; it does not increase the "apparent brightness." If we put out of account the loss of light by reflexion at glass surfaces (or by imperfect reflexion at metallic surfaces) and by absorption, and suppose that the magnifying power does not exceed the ratio of the aperture of the object-glass to that of the pupil, under which condition the pupil will be filled with light, we may say that the "apparent brightness" is absolutely unchanged by the use of a telescope. In this statement, however, two reservations must be admitted. Jf the object under examination, like a fixed star, have no sensible apparent magnitude, the conception of "apparent brightness" is altogether inapplicable, and we are con- cerned only with the total quantity of light reaching the eye. Again, it is found that the visibility of an object seen against a black background depends not only upon the "apparent~~

~~brightness" but also upon the apparent magnitude. If two or three crosses of different sizes be~~

~~cut out of the same piece of white paper, and be erected "~~

~~against a black background on the further side of a nearly~~

~~Orrres~~

~~dark room, the smaller ones become invisible in a light still sufficient to show the larger. Under these circum- stances a suitable telescope may of course bring also the smaller objects into view. The explanation is probably to be sought in imperfect action of the lens of the eye when the pupil is dilated to the utmost. The author of this article has found that in a nearly dark room he becomes distinctly short-sighted, a defect of which there is no trace whatever in a moderate light.! If this view be correct, the brightness of the image on the retina is really less in the case of a small than in the case of a large object, although the so-called apparent brightnesses may be the same. However this may be, the utility of a night-glass is beydnd dispute.~~

~~The general law that (apart from the accidental losses mentioned above) the "apparent brightness" depends only upon the area of the pupil filled with light, though often ill understood, has been established for a long time, as the following quotation from Smith's Optics (Cambridge, 1738), p. 118, will show.~~

~~"Since the magnitude of the pupil is subject to be varied by various degrees of light, let NO be its semi-diameter when the object PL is viewed by the naked eye from the distance OP ; and upon a plane that touches the eye at O, let OK be the semi-diameter of the greatest area, visible through all the glasses to another eye at P, to be found as PL was; or, which is the same thing, let OK be the semi-diameter of the greatest area inlightened by a pencil of rays flowing from P through all the glasses ; and when this area is not less than the area of the pupil, the point P will appear just as bright through all the glasses as it would do if they were removed ; but if the inlightened area be less than the area of the pupil, the point P will appear less bright through the glasses than if they were removed in the same~~

~~proportion as the inlightened area is less than the pupil. And these proportions of apparent brightness would be accurate if all the incident rays were transmitted through the glasses to the eye, or if only an insensible part of them were stopt."~~

~~nae Power of Optical Instruments.—According to the principles of common optics, there is no limit to the resolving power of an instrument. If the aberrations of a microscope were perfectly compensated it might reveal to us worlds within a space of a millionth of an inch. In like manner a telescope might resolve double stars of any degree of closeness, The magnifying power may be exalted at pleasure by increase of focal length and of the power of eye-pieces ; and there are at any rate some objects, such as the sun, in dealing with which the accompanying loss of light would be an advantage rather than the contrary. How is it, then, that the power of the microscope is subject to an absolute limit, and that if we wish to observe minute detail on the over-lighted disk of the sun we must employ a telescope of large aperture? The answer requires us to go behind the approximate doctrine of rays, on which com- mon optics is built, and to take into consideration the finite character of the wave-length of light.~~

~~A calculation based upon the principles of the wave- theory shows that, no matter how perfect an object-glass may be, the image of a star is represented, not by a mathe- matical point, but by a disk of finite size surrounded by a system of alternately dark and bright rings. Airy found that if the angular radius of the central disk (as seen from the centre of the object-glass) be 6, 2R the aperture, A the wave-length, then r QR? showing that the definition, as thus limited by the finite- ness of A, increases with the aperture.~~

~~In estimating theoretically the resolving power of a telescope on a double star we have to consider the illu- mination of the field due to the superposition of the two independent images. If the angular interval between the components of the double star were equal to 20, the central~~

~~1 Camb. Phil. Proc., vol. iv.~~

~~Q=sibrenlsys~~

disks would be just in contact. Under these conditions there can be no doubt that the star would appear to be fairly resolved, since the brightness of the external ring systems is too small to produce any material confusion, unless indeed the components are of very unequal magni- tude. The diminution of star disks with increasing aper- ture was observed by W. Herschel; and in 1823 Fraun- hofer formulated the law of inverse proportionality. In investigations extending over a long series of years, the advantage of a large aperture in separating the components of close double stars was fully examined by Dawes.

The resolving power of telescopes was-investigated also by Foucault, who employed a scale of equal bright and dark alternate parts; it was found to be proportional to the aperture and independent of the focal length. In tele- scopes of the best construction the performance is not sensibly prejudiced by outstanding aberration, and the limit imposed by the finiteness of the waves of light is practically reached. Verdet has compared Foucault's re- sults with theory, and has drawn the conclusion that the radius of the visible part of the image of a luminous point was nearly equal to half the radius of the first dark ring.

The theory of resolving power is rather simpler when the aperture is rectangular instead of circular, and when the subject of examination consists of two or more light or dark lines parallel to one of the sides of the aperture. Supposing this side to be vertical, we may say that the definition, or resolving power, is ¢ndependent of the vertical aperture, and that a double line will be about on the point of resolution when its components subtend an angle equal to that subtended by the wave-length of light at a distance equal to the horizontal aperture.

The resolving power of a telescope with a circular or rectangular aperture is easily investigated experimentally. The best object is a grating of fine wires, about fifty to the inch, backed by a soda-flame. The object-glass is provided with diaphragms pierced with round holes or slits. One of these, of width equal, say, to one-tenth of an inch, is inserted in front of the object- glass, and the telescope, carefully focused all the while, is drawn gradually back from the grating until the lines are no longer seen. From a measure-

ment of the maximum distance the least angle between con- secutive lines consistent with resolution may be deduced, and a comparison made with the rule stated above.

Merely to show the dependence of resolving power on aperture it is not necessary to use a telescope at all. It is sufficient to look at wire-gauze backed by the sky, or by a flame, through a piece of blackened cardboard pierced by a needle and held close to the eye. By varying the distance the point is easily found at which resolution ceases ; and the observation is as sharp as with a telescope. The function of the telescope is in fact to allow the use of a wider, and therefore more easily measurable, aperture. An interesting modification of the experiment may be made by using light of various wave-lengths.

In the case of the microscope the wave-theory shows that there must be an absolute limit to resolving power independent of the construction of the instrument. No optical contrivances can decide whether light comes from one point or from another if the distance between them do not exceed a small fraction of the wave-length. This idea, which appears to have been familiar to Fraunhofer, has recently been expanded by Abbe and Helmholtz into a systematic theory of the microscopic limit. See Mrcro- SCOPE.

Similar principles may be applied to investigate the resolving power of spectroscopes, whether dispersing or diffracting. Consider for simplicity any combination of prisms, anyhow disposed, but consisting of one kind of glass. Let @ be the width and yu the

index of a parallel beam passing through, and let the thicknesses of glass traversed by the extreme rays on either side be ¢, and ¢,.

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It is not difficult to see that, if the index be changed to «+ 6m, the rays will be turned through an angle 6 given by

i= Ou(ty — by) ;

~~a Now, if the two kihds of light correspond to a double line which the instrument can just resolve, we have @=A/a, and thus t,-h=r/dp,~~

~~a formula of capital importance in the theory of the dispersing spectroscope. In a well-constructed instrument, 4, the smaller thickness traversed, may be small or negligible, and then we may state the law in the following form:—the smallest thickness of prisms necessary for the resolution of a double line whose indices are w and «+ du is found by dividing the wave-length by dz.~~

~~As an example, let it be required to find the sinallest thickness of a prism of Chance's "extra dense flint," necessary for resolution of the soda-lines.~~

~~By Cauchy's formula for the relation between mu and \ we have~~

~~w=A+Ba7-?, du= —2BrA~7 Or. ' i the results given by Hopkinson for this kind of glass we~~

~~n B='984×10-™, the unit of length being the centimetre. For the two soda-lines A=5'889 × 107%, dA= '006 × 10°; and thus the thickness ¢ necessary to resolve the lines is »4 1984~~

~~~2B6A 1°968dA the meaning of which is that the soda-lines will be resolved if, and will not be resolved unless, the difference of thicknesses of glass traversed by the two sides of the beam amount to one centimetre. In the most favourable arrangement the centimetre is the length of the base of the prism. It is to be understood, of course, that the magnifying power applied is sufficient to narrow the beam ultimately to the diameter of the pupil of the eye ; otherwise the full width would not be utilized.~~

~~The theory of the resolving power of a diffracting spectroscope, or grating, is even simpler. Whatever may be the position of the grating, a double line of wave-lengths \ and +6) will be just resolved provided~~

~~=1°'02 centimetre,~~

~~ee!~~
~~~

~~A mn' where 7 is the total number of lines in the grating, and m is the order of the spectrum under examination.~~

~~If a grating giving a spectrum of the first order and a prism of extra dense glass have equal power in the region of the soda-lines, the former must have about as many thousand lines as the latter has centimetres of available thickness.~~

~~The dispersion produced by a grating situated in a given manner is readily inferred from the resolving power. If a@ be the width of the beam after leaving the grating, the angle 60, corresponding to the limit of resolution, is A/a, and thus~~

~~66 mn~~

~~dd a Thus the dispersion depends only upon the order of the spectrum, the total number of lines, and the width of the emergent beam.~~

~~An obvious inference from the necessary imperfection of optical images is the usclessness of attempting anything like an absolute destruction of aberration. In an instrument free from aberration the waves arrive at the focal point in the same phase. It will suffice for practical purposes if the error of phase nowhere exceeds 4. This corresponds to an error of 3A in a reflecting and 4A in a (glass) refracting surface, the incidence in both cases being per- pendicular.~~

~~If we inquire what is the greatest admissible longitudinal aberra- tion in an object-glass according to the above rule, we find~~

of=a˙ : ’ a being the angular semi-aperture.

In the case of a single lens of glass with the most favourable curvatures, 6f is about equal to fa?; so that a must not exceed A/f. For a lens of 3-feet focus this condition is satisfied if the aperture do not exceed 2 inches.*

When parallel rays fall directly upon a spherical mirror the longitudinal aberration is only about one-eighth as great as for the most favourable-shaped single lens of equal focal length and aper- ture. Hence a spherical mirror of 3-fect focus might have an aper- ture of 24 inches, and the image would not suffer materially from aberration. !

On general optics the treatises most accessible to the English reader are Parkinson’s Optics (8d ed., 1870) and Glazebrook’s Physical Optics (1883). Verdet’s Lecons d’optique physique is an excellent work. Every student should read the earlier parts of Newton’s Optics, in which are described the funda- mental experiments upon the decomposition of white light.

1 For fuller information on the subject of the preceding paragraphs see Lord Rayleigh’s papers entitled “ Investigations in Optics,” Phzt. Mag., 1879, 1880.

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ORACLE. It was a universal belief in the ancient world that there is a capacity in the human mind to divine the will of God (pavrixéy re 7 Wux7, Plato, Phedr., 242 C). This capacity is not equally. developed in all men, and, practically, a very few persons, in whom it is strong, are distinguished from the massas pavreis. These are able to understand the methods by which the gods reveal their intentions to men. There occur cases where the gods speak directly to men, where a divine voice is heard issuing its commands or warnings, but these in- stances are confined, except in a few remarkable historical cases (such as the appearance of Pan to the Athenian messenger, 490 B.c., Herod., vi. 105), to the heroic age and to epic poetry. Setting these aside, we find that the divine will was revealed to the interpreting medium in two ways—by inspiration and by signs. In the former case the divine influence overpowers the soul of the medium and

takes entire possession of it for the time. The medium cannot himself bring on a revelation, but is at rare intervals affected by the power of the god, his con- sciousness ceases, and the god speaks through him words which he is himself unable to control or even to under- stand. So, for example, the prophetes of Apollo Ptoios gave a response in the Carian language, which no one except the questioner could understand (Herod., viii. 135). The second method of revelation, by signs, required a distinct art of interpretation ; certain events, phenomena in the heavens or in bird or animal life, the conduct of sacrificial animals and the appearance presented by their entrails, &c., presaged the will of the god to him who pos- sessed the art of interpreting them. The second method was called artificval (evrexvos), in opposition to the first, which is direct and artless (dreyvos).

In every case the revelation of the divine will is depend- ent on the direct act of the god; he affects the soul of the ».avres when and where he pleases ; he sends, when he chooses, the signs from which his intentions can be inferred. There was, however, a belief that at certain places the god gave revelations 'more frequently than at others. Such places were generally characterized by some marked physical feature. At these places there were established regular institutions, with a staff of priests and prophets, to which the neighbours resorted for counsel; the Latin term "oracle" (in Greek pavreia, ypyorjpwa) is the general 'name. With regard to these institutions we have to consider (1) their method of interpretation, in so far as this is not most naturally given under the articles treating of the particular localities, and (2) their rank and influ- ence among the Greeks.

1, The methods of interpretation varied greatly. Even at the same oracle several methods were often practised side by side. In the most primitive the spirits of the dead appeared and conversed directly with the inquirer. This method was rare in Greece; but an undoubtedly good example is recorded (Herod., v. 92) in Thesprotia, where Periander sent to consult the shade of his wife Melissa ; a Biblical instance is the apparition of the shade of Samuel to Saul. The visit of Odysseus to the lower world is ob- viously a mere poetical version of the consultation of a Beeotian oracle of Tiresias, where the hero spoke directly to his devotees. In the oracle of Trophonius at Lebadea in Beotia the method of inquiry was certainly modelled after the idea of a descent to the infernal world. Beside the oracle were the two

springs of Memory and Oblivion, which, according to the mystic teaching, were the two foun- tains of the lower world. The inquirer descended into an underground place, and, it is said, saw such sights that he never smiled again. This method belonged to a very primitive stage of Greek history ; and it is certain that Greek religion in general, and many oracles in particular,

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had experienced a long development before the time which we know best. Probably this method was originally more widely practised than we can actually trace.

The common method of revelation in hero-oracles, and in the oracles of some gods, was through dreams. Hero- oracles were certainly in their earliest form simply oracles of the dead; the word 7pws is a generic term for a dead man. We can trace occasional survivals of the most primi- tive form of the hero-oracle. The person who seeks advice goes to sleep over the actual grave, and the dead man appears in a dream. A type of the usual method, which was called "incubation" or éyxotnous, is the oracle of Amphiaraus near Oropus, beside the spring where the hero had risen from the earth to become a god. The in- quirer, after abstaining from wine for three days and from all food for twenty-four hours, slept in the temple on the skin of a ram which he had sacrificed. The oracles of Gea or Ge are closely connected with those of the dead and of heroes. The arth is giver of responses, as being the home of the dead, who sleep in her womb, but who can be called forth to give counsel to their descendants living on earth, arth-oracles also belong to a primitive stage of Hellenic religion, and had in historical times either given place te oracles of more developed Hellenic type or occupied a very secondary position. In Olympia it is prob- able that the oracle of Ga was the oldest institution, and it is universally recognized in ancient and modern times that the Delphic oracle originally belonged to the same goddess. Probably the cleft in the earth in the Delphic adyton was originally conceived as the passage of communication between the dead uncer the earth and the living on its surface. A uniform tradition (Paus., x. 5, 3; Aisch., Cho., 1 sq.) recognizes one most important fact : in the progress of Greek history, as religious thought developed, there was a

progressive development in the character of the Delphic oracle. Ga was replaced by Themis, a more moralized conception of the Earth-goddess, as the incarnation of natural order and law; but Apollo, the highest creation of Hellenic religion, finally occupies Delphi as the prophet and counsellor of his people. The oracles of Apollo work through inspiration. In Delphi the seer was a woman, Pythia, who was thrown into a state of ecstatic frenzy by the influence of a vapour ascending from a cleft in the earth within the adyton, and while in this state uttered words and cries which contained the answer of Apollo. All the methods of interpretation by signs were practised at different oracles in Greece ; even in Apolline oracles, such as the Delphic, the artificial method was employed along with that by inspiration.

2. The original purpose of the oracles was not to fore- tell the future, but to give counsel as to conduct in doubtful and difficult situations. In cases where human prudence and skill seemed to fail, recourse was had to the oracle, and the god gave advice to his people. Now it was the universal practice that the priests should take the answers, usually incoherent and unintelligible, of the seers and re- duce them to form, often metrical; practically the oracles were worked by the priests, and it is obvious that their character depended entirely on the character of the priests and of the nation asa whole. The influence of the oracles could be good only so long as the priests were not only honest and of lofty intentions, but also in a more advanced intellectual position than the people. In the early age of Greek history, when there was no education except what was to be gained by wide intercourse, the priests of such an oracle as Delphi occupied a most advantageous position. To Delphi as the yfjs dpudados, the central point of the civilized world, came embassies from every Greek city, and even from great non-Greek states such as Lydia and Phrygia. It was a knot where every strand in civilized

life was united. In accordance with this we find that almost all the great lawgivers and sages of the 8th and 7th centuries B.c. were in close relation with the Delphic oracle. All questions of colonization were referred to the oracle, and it is due a good deal to this central guiding influence that the overflow of the teeming popu- lation of Greece was directed so

systematically. It is instructive to compare the position of the oracles in Greece with those of the kindred races of Asia Minor. In the latter country the god is supreme over his people, the government is a pure theocracy, and the priests, as interpreters of the divine will, are absolute masters of the servants of the god. In Greece it is wholly different. In both cases the oracles are the creation of the national genius,—in Asia Minor Oriental and stationary, in Greece living and progressive. In the earliest time we can trace the influence of the oracles discouraging the relentless blood-feud, distinguishing classes of murder, and allowing purification aud expiation in suitable cases. They make the sanctity of oaths between man and man a special duty ; Apollo regards even hesitation to keep a pledge as already a sin (Herod., vi. 86; cf. i. 159). They are the centre of unions or amphictyonies which bind their mem- bers to observe certain duties and show mercy to their fellow-members ; and Delphi, as the oracle of an amphic- tyony including great part of Greece, had an important share in promoting that ideal unity of the whole country which, though never realized, yet floated always before the Greek mind. The oracles did something towards uniting the efforts of Greeks against foreigners, and towards spreading Greek influence abroad in a systematic way.

As education became more general the qualification of superior knowledge necessary to the proper working of the oracles was more difficult to keep up. At the same time the growth of political life in the states intensified their mutual enmities, and made it impossible for the oracles to maintain an attitude of perfect justice, neutral- ity, and superiority. Though the custom continued till a late period in Greek history that each state should consult the oracle in difficulties, yet complaints of partiality be- come frequent. Concurrently with the degradation in this respect there grew a demoralization in the whole tone of the oracles: they were consulted by all in the most trivial matters. It became an object to the priests to facilitate the access of votaries who contributed to the wealth of the temple. Whereas originally the Delphic oracle spoke only once a year, the number of days on which it was open to inquirers was gradually increased; and other oracles in like manner turned their attention to the wants of every applicant. In Dodona a large number of leaden tablets have been discovered containing the questions addressed to the god by inquirers; they range in date from the

end of the 5th century B.c. onwards, and do not give any very high idea of the kind of difficulties in which the god was asked to advise his worshipper.

See Carapanos, Dodone, also an important article in Fleckeisen's Jahrbiicher for 1883. The most complete work on oracles is Bouchy Leclere's Histoire de la divination dans Vantiquité. (W. M. RA.)

ORAN (Arabic, Wahrdn), the chief town of the depart- ment and military division which form the western part of the French colony of Algeria, lies at the head of a bay on the Mediterranean, in 35° 44' N. lat., and almost on the meridian of Greenwich. The population of the town in 1881 was 58,530; that of the commune, including town and suburbs, 59,377. In 1876, when the total for the town, besides 3728 in prisons, hospitals, &c. (5030 in 1881), was 45,640, 11,047 were French, 4948 Jews, 4782 natives, and 24,863 foreigners. The town is cut in two by the ravine of Oued Rekhi, now partly covered over by boule- vards and buildings. West of the ravine lies the port, and

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above this the old Spanish town with the ancient citadel looking down on it. On the east side the modern castle and the modern town (built since the Spanish occupation) rise like an amphitheatre, and here, too, are the Moorish houses of the Jews' quarter. Taken altogether, Oran has the shape of a triangle, the sea forming the base, and the angles at north-west, north-east, and south being respect- ively the Fort de la Moune, the modern castle, and Fort St André. Ramparts and forts are mainly of Spanish con- struction ; to the east they have béen rebuilt since the French occupation in advance of their old position. Of the six gates, three are on the west side, two on the south, and one on the east. The modern castle was formerly the seat of the beys of Oran ; it is now occupied by the general in command of the military division, and also serves as barracks, and accommodates most of the military depart- ments. The old castle was the residence of the Moham- medan rulers previous to the Spanish conquest, and continued to be the residence of the governors of the town up to the earthquake of 8th and 9th October 1790. The portion of the building which still remains is used as barracks and a military prison. Immediately behind, the Mourdjadjo hill rises to a height of 1900 feet; on the way up are passed

Fort St Grégoire, the votive chapel commemorative of the cholera of 1849, and Fort Santa Cruz, crowning at a height of 1312 feet the summit of the Aidour. Lastly, Fort de la Moune (so called from the monkeys which are said to have haunted the neighbour- hood) rises between the sea and the road from Oran to Mers al-Kebir. In the Spanish town the streets are steep, sometimes even becoming stairs; the "places" are mere widenings of the street. In the French town the streets are well laid out and fit for carriages, and there are various public squares, notably the Place d'Arnies ; the houses too, in spite of the risk from earthquakes, are built in the French style, several stories high. It is only in the Jews' quarter that the houses are of a peculiar type,—one-storied, with white-washed or red-washed walls, and enclosing an inner court shaded by a vine. Oran is the see of a bishopric dependent on the archbishopric of Algiers. The cathedral (St Louis) is an ancient mosque which has suc- cessively been a Roman Catholic chapel, a synagogue, and again a Catholic church according as the town changed hands. The last restoration was in 1839. A fine picture representing the landing of St Louis at Tunis deserves to be mentioned. The grand mosque (in Rue Philippe) was erected at the end of last century in commemoration of the expulsion of the Spaniards, and with money paid as ransom for Christian slaves. The minaret is one of the prettiest in Algeria. Other mosques have been utilized for military purposes. Permanent quarters have not yet been assigned to the prefecture, the courts of justice, and other civil offices; the bank alone occupies a building of an imposing character. The military hospital contains 1400 beds. Oran is well supplied with water; and a number of beautiful promenades greatly increase its at- tractions. The main peculiarity of the streets is the mixture of races, each with its own type and costume. Arabs, Spaniards, and Turks, successive masters of the town, have all left descendants; and with these are mingled black-gabardined Jews, Spanish immigrants of recent date in Andalusian garb, French soldiers of all branches of the service, Moors with nonchalant gait, and negroes, who serve as porters and day-labourers for the community. The negroes occupy a whole village on the outskirts of the town. While industrially of no import- ance, Oran is admirably situated for commerce. From Cartagena to Oran is the shortest passage between Europe and Algeria, and there is regular communication with Mar- seilles, Cette, and Port Vendres in France, with Barcelona, XVII. — 102

Valencia, Cartagena, Malaga, and Gibraltar in Spain, and with the various ports on the Barbary coast. A railroad (261 miles) runs to Algiers and is joined at Perregaux by the line from Arzeu to Saida and the Kreider, which serves the high halfa (esparto) plateaus. There is also a railway to Sidi Bel-Abbés. Previous to the French occupation there was no port at Oran, vessels anchoring at Mers al-Kebir at the north-west entrance of the bay. Mers al-Kebir is now reserved for the navy, and a harbour of 60 acres has been constructed by means of a pier 3280 feet long from Fort de la Moune, and two cross piers. A geographical society was founded at Oran in 1878.

If Oran was not already occupied in the time of the Romans, its foundation must be ascribed to the Andalusian seamen who settled there in the beginning of the 10th century. Rapidly rising into importance, it was taken and retaken, pillaged and rebuilt, by the various conquerors of northern Africa. Almoravides, Almohades, and Merinides succeeded each other, and in the space of half a century the town changed hands nine times. At length, in the latter half of the 15th century, it was subject to the sultans of Tlemcen, and reached the height of its prosperity. Active com- merce was maintained with the Venetians, the Pisans, the Genoese, the Marseillese, and the Catalans, who imported the produce of their looms, glass-wares, tin-wares, and iron, and received in return ivory, ostrich feathers, gold-dust, tanned hides, grain, and negro slaves from the interior of Africa. Admirable woollen cloth and splendid arms were locally manufactured. The magnificence of its mosques and other public buildings, the number ofits schools, and the extent of its warehouses shed lustre on the city ; but wealth and luxury began to undermine its prosperity, and its ruin was hastened by the piracy to which the Moorish refugees from Spain betook them- selves. Animated by the patriotic enthusiasm of Cardinal Ximenes, the Spaniards determined to put a stop to those expeditions which were carrying off their countrymen, destroying their commerce, and even ravaging their country. Mers al-Kebir fell into their hands on 23d October 1505, and Oran in May 1509. The latter victory, obtained with but trifling loss, was stained by the massacre of a third of the Mohammedan population. From 6000 to 8000 prisoners, 60 cannon, engines of war, and a considerable booty from the wealth accumulated by piracy fell into the hands of the conquerors. Car-

~~dinal Ximenes introduced the Catholic religion, with its churches, convents, Inquisition, &c., and also restored and extended the forti- fications. Oran became the penal settlement of Spain, but neither the convicts nor the noblemen in disgrace who were also banished thither seem to have been under rigorous surveillance ; fétes, games, bull-fights, &c., were held. Meanwhile the Turks had become masters of Algeria, and expelled the Spaniards from all their pos- sessions except Oran. The bey, finally settling at Mascara, watched his opportunity ; and at length, in 1708, the weakness of Spain and the treason of the count of Vera Cruz obliged the city to capitu- late. The Spaniards recovered possession in 1732, but found the maintenance of the place a burden rather than a benefit, all the neighbouring tribes having ceased to have dealings with the Chris- tians. The earthquake of 1790 furnished an excuse for withdrawing their forces, Commencing by twenty-two separate shocks at brief intervals, the oscillations continued from 8th October to 22d November. Houses and fortifications were overthrown, and a third of the garrison and a great number of the inhabitants perished. Famine and sickness had begun to aggravate the situation when the bey of Mascara appeared before the town with 30,000 men, By prodigies of energy the Spanish commander held out till August 1791, when, having made terms with the dey of Algiers, he was allowed to set sail for Spain with his guns and ammunition. The bey Mohammed took possession of Oran in March 17 92, and made it his residence instead of Mascara. On the fall of Algiers the bey placed himself under the protection of the conquerors. The French army entered the town 4th January 1831, and took formal pos- session on the 17th of August.~~

~~ORANG. See Aps, vol. ii. p. 149,~~

~~ORANGE (Citrus Aurantium), the plant that produces the familiar fruit of commerce, is closely allied to the citron, lemon, and lime, all the cultivated forms of the genus Citrus being so nearly related that their specific demarca- tion must be regarded as somewhat doubtful and inde- finite. Risso and Poiteau have described eighty kinds of orange (including the bergamots), chiefly differing in the external shape, size, and flavour of the fruit ; but all may probably be traced to two well-marked varieties—the Sweet or China Orange and the Bitter Orange or Bigarade,— though several of these modifications seem to indicate~~

crossing with the lemon or citron, if, indeed, they do not rather point to a more remote common origin from a primi- tive citrine type.

The bitter orange, by some made a sub-species (C. vui- garis), is a rather small tree, rarely exceeding 30 feet in height. The green shoots are furnished with sharp axillary spines, and alternate evergreen oblong leaves, pointed at the extremity, and with the margins entire or very slightly serrated ; they are of a bright glossy green tint, the stalks

Orange (Citrus Auwrantium), from nature, about one-third natural size. a, diagram of fruit, after Laurssen, Med.-Pharm. Botanik,

1882.

distinctly winged and, as in the other species, articulated with the leaf. The fragrant white or pale pinkish flowers appear in the summer months, and the fruit, usually round or spheroidal, does not perfectly ripen until the following spring, so that flowers and both green and mature fruit are often found on the plant at the same time. The bitter aromatic rind of the bigarade is rough, and dotted closely over with concave oil-cells ; the pulp is acid and more or less bitter in flavour. The sweet orange generally has the shoots destitute of spines, the petioles less distinctly winged, and the leaves more ovate in shape, but chiefly differs in the fruit, the pulp of which is agreeably acidu- lous and sweet, the rind comparatively smooth, and the oil-cells convex. The ordinary round shape of the sweet orange fruit is varied greatly in certain varieties, in some being greatly elongated, in others much flattened ; while several kinds*have a conical protuberance at the apex, others are deeply ribbed or furrowed, and a few are dis- tinctly "horned " or lobed, by the partial separation of the carpels. The two sub-species of orange are said by some authorities to reproduce themselves infallibly by seed ; and, where hybridizing is prevented, the seedlings of the sweet and bitter orange appear to retain respectively the more distinctive features of the parent plant ; but where grow- ing wild for successive generations they show a tendency to degenerate, the progeny of the sweet orange being apt to assume the broadly-winged petioles and spiny shoots of the bigarade.

~~Though now cultivated widely in most of the warmer parts of the world, and apparently in many completely naturalized, the diffusion of the orange has taken place in comparatively recent historical periods. To ancient Medi- terranean agriculture it was unknown; and, though the later Greeks and Romans were familiar with the citron as an exotic fruit, their "Median Apple" appears to have been the only form of the citrine genus with which they were acquainted. The careful researches of Gallesio have~~

~~proved that India was the country from which the orange spread to western Asia and eventually to Europe. Oranges are at present found wild in the jungles along the lower mountain slopes of Sylhet, Kumaon, Sikkim, and other parts of northern India, and, according to Royle, even in the Nilgiri Hills; the plants are generally thorny, and present the other characters of the bitter variety, but occasionally wild oranges occur with sweet fruit; it is, however, doubtful whether either sub-species is really in- digenous to Hindustan, and De Candolle is probably cor- rect in regarding the Burmese peninsula and southern China as the original home of the orange. Cultivated from a remote period in Hindustan, it was carried to south-western Asia by the Arabs, probably before the 9th cen- tury, towards the close of which the bitter orange seems to have been well known to that people ; though, according to Mas'tidi, it was not cultivated in Arabia itself until the beginning of the 10th century, when it was first planted in 'Oman, and afterwards carried to Mesopotamia and Syria. It spread ultimately, through the agency of the same race, to Africa and Spain, and perhaps to Sicily, following everywhere the tide of Mohammedan conquest and civilization. In the 12th century the bigarade was abundantly cultivated in all the Levant countries, and the returning soldiers of the Cross brought it from Palestine to Italy and Provence. An orange tree of this variety is said to have been planted by St Dominic in the year 1200, though the identity of the one still standing in the garden of the monastery of St Sabina at Rome, and now attributed to the energetic friar, may be somewhat doubt- ful. No allusion to the sweet orange occurs in contem- porary literature at this early date, and its introduction to Europe took place at a considerably later period, though the exact time is unknown. It was commonly cultivated in Italy early in the 16th century, and seems to have been known there~~

~~previously to the expedition of Da Gama (1497), as a Florentine narrator of that voyage appears to have been familiar with the fruit. The importation of this tree into Europe, though often attributed to the Portu- guese, is with more probability referred to the enterprise of the Genoese merchants of the 15th century, who must have found it growing abundantly then in the Levant. The prevailing European name of the orange is sufficient evidence of its origin and of the line taken in its migration westward. The Sanskrit designation nagrungo, becoming narungee in Hindustani, and corrupted by the Arabs into naéranj (Spanish naranja), passed by easy transitions into the Italian arancia (Latinized aurantium), the Romance arang?, and the later Provengal orange. The true Chinese variety, however, was undoubtedly brought by the Portu- guese navigators direct from the East both to their own country and to the Azores, where now luxuriant groves of the golden-fruited tree give a modern realization to the old myth of the gardens of the Hesperides! Throughout China and in Japan the orange has been grown from very ancient times, and it was found diffused widely when the Indian Archipelago was first visited by Europeans. In more recent days its cultivation has extended over most of the warmer regions of the globe, the tree growing freely and producing fruit abundantly wherever heat is sufficient and enough moisture can be supplied to the roots ; where night-frosts occur in winter or spring the culture becomes more difficult and the crop precarious.~~

~~The orange flourishes in any moderately fertile soil, if~~

~~it is well drained and sufficiently moist ; but a rather stiff loam or calcareous marl, intermingled with some vegetable humus, is most favourable to its growth. Grafting or budding on stocks raised from the seed of some vigorous~~

~~1 The modern Arabic name, Bortukdn (that is, Portuguese), shows that the China apple reached the Levant from the West.~~

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~~variety is the plan usually adopted by the cultivator. The seeds, carefully selected, are sown in well-prepared ground, and the seedlings removed to a nursery-bed in the fourth or fifth year, and, sometimes after a second~~

transplantation, grafted in the seventh or eighth year with the desired variety. When the grafts have acquired sufficient vigour, the trees are placed in rows in the permanent orangery. Propagation by layers is occasionally adopted; cuttings do not readily root, and multiplication directly by seed is always doubtful in result, though recommended by some authorities. The distance left between the trees in the permanent plantation or grove varies according to the size of the plants and subsequent culture adopted. In France, when the trunks are from 5 to 64 feet in height, a space of from 16 to 26 feet is left between; but the dwarfer trees admit of much closer planting. In the West Indies and Azores an interval of 24 or even of 30 feet is often allowed. The ground is kept well stirred between the trunks, and the roots manured with well-rotted dung, guano, or other highly nitrogenous matter; shallow pits are sometimes formed above the roots for the reception of liquid or other manures; in dry climates water must be abundantly and frequently supplied. The trees require regular and careful pruning, the heads being trained as nearly as possible to a spherical form. Between the rows melons, pumpkins, and other annual vegetables are fre- quently raised. In garden culture the orange is often trained as an espalier, and with careful attention yields fruit in great profusion when thus grown. In favourable seasons the oranges are produced in great abundance, from 400 to 1000 being commonly borne on a single plant in full bearing, while on large trees the latter number is often vastly exceeded. The trees will con- tinue to bear abundantly from fifty to eighty years, or even more ; and some old orange trees, whose age must be reckoned by centuries, still produce their golden crop ; these very ancient trees are, however, generally of the bitter variety. Oranges intended for export to colder climates are gathered long before the deep tint that indicates ma- turity is attained, the fruit ripening rapidly after picking ; but the delicious taste of the mature China orange is never thus acquired, and those who have not eaten the fruit ina perfectly ripe state have little idea of its flavour when in that condition. Carefully gathered, the oranges are packed in boxes, each orange being wrapped in paper, or with dry maize husks or leaves placed between them. The immense quantities of this valuable fruit imported into Britain are derived from various sources, but those kinds in most esteem are the produce of the Azores, whence, in 1878, 410,101 boxes, each holding 400 "St Michael's" oranges, are said to have been sent to Great Britain alone. Large numbers are also exported to England from Sicily, Portugal, and

Spain, and a considerable amount from other Mediter- ranean countries. North America is largely supplied from Jamaica and the Bahamas; but the extensive and rapidly increasing cultivation of the tree in Florida will probably in a few years supersede the foreign importation. In that State the bitter orange has grown, from an unknown period, in a wild condition, and some of the earlier botanical ex- plorers regarded it as an indigenous tree; but it was undoubtedly brought by the Spanish colonists to the West India Islands, and was probably soon afterwards trans- planted to Florida by them or their buccaneering enemies. The climate of Florida seems remarkably adapted for orange culture, and orangeries are becoming yearly more numerous and extensive,—the wild stocks, or those raised from wild seed, being generally employed by the grafter. In the other Gulf States this branch of agricultural industry is pursued to some extent; and in California the orange groves are productive and increasing.

Orange cultivation has been attempted with success in several parts of Australia, especially in New South Wales, where the orange groves near Paramatta yield an abundant colonial supply. The orangeries of Queensland and South Australia are likewise producing well, though, as yet, Australian fruit is chiefly consumed at home. In many of the Pacific Islands the plant has been long established : Tahiti exports oranges largely to San Francisco, and in Fiji the culture promises to become of considerable importance.

Certain varieties of orange deserve mention, from the peculiar character of their fruit. The Mandarin orange of China, sometimes made a distinct species, C. nobilis, is remarkable for its very flat spheroidal fruit, the rind of which readily separates with the slightest pressure ; the pulp has a peculiarly luscious flavour when ripe. The small Tangerine oranges, valued for their fine fragrance, are derived from the Mandarin. " Maltese" or "Blood" oranges, much grown in southern Italy, are distinguished by the deep-red tint of the pulp. The Bergamot has been already described (see vol. ili. p. 587). Orange plantations in Europe suffer much at times from a disease called by the French charbon, caused by a fungus (Demathium monophyllum), which rapidly spreads over stems, leaves, and green fruit.

~~Several insect enemies attack the plant, of which the scale-like Coceus citri is the most injurious in Europe ; in the Azores C. Hesperidis takes its place. Cold weather in winter has sometimes proved destructive in Provence, and many planta- tions were destroyed by the hard frosts of 1789 and 1820,~~

~~Besides the widespread use of the fruit as an agreeable and wholesome article of diet, that of the sweet orange, abounding in citric acid, possesses in a high degree the antiscorbutic properties that render the lemon and lime so valuable in medicine ; and the free consumption of this frnit in the large towns of England during the winter months has doubtless a very beneficial effect on the health of the people. The juice is sometimes employed as a cooling drink in fevers, as well as for making a pleasant beverage in hot weather ; it is likewise an essential ingredient in ‘“orange wine.”~~

~~The bitter orange is chiefly cultivated for the aromatic and tonic qualities of the rind, which render it a valuable stomachic. Planted long ago in Andalusia by the Moorish conquerors, it is still ex- tensively grown in southern Spain, —deriving its common English name of “ Seville” orange from the abundant groves that still exist around that city, though the plant is now largely cultivated else- where, The fruit is imported into Great Britain’ and the United States in considerable quantities for the manufacture of the favourite confection known as orange marmalade, which is prepared from the pulp and rind, usually more or less mingled with the pulp of the China orange. In medicine the dried peel is largely employed as an aromatic tonic, and often, in tincture and infusion, as a mere vehicle to disguise the flavour of more nauseous remedies. The essential oil of the rind is collected for the use of the perfumer, being obtained either by the pressure of the fresh pecl against a piece of sponge, or by the process known as écuelle, in which the skin of the ripe fruit is scraped against a series of points or ridges arranged upon the surface of a peculiarly-shaped dish or broad funnel, when the oil flows freely from the broken cells, Another fragrant oil, called in France essence de petit gram, is procured by the distillation of the leaves, from which also an aromatic water is prepared. ‘The flowers of both sweet and bitter orange yield, when distilled with water, the “oil of Neroli” of the druggist and per- fumer, and likewise the fragrant liquid known as “ orange – flower water.” The candied peel is much in request by cook and con- fectioner ; the favourite liqueur sold as “ curacoa”’ derives its aromatic~~

flavour from the rind of the bigarade. The minute imma- ture oranges that drop from the trees are manufactured into "issue- peas" ; from those of the sweet orange in a fresh state a sweetmeat is sometimes prepared in France. Orange trees occasionally acquire a considerable diameter ; the trunk of one near Nice, still standing in 1789, was so large that two men could scarcely embrace it ; the tree was killed by the intense cold of the winter of that year. The wood of the orange is of a fine yellow tint, and, being hard and close-grained, is valued by the turner and cabinetmaker for the manufacture of small articles; it takes a good polish.

Although the bitter "Poma de Orenge" were brought in small quantities from Spain to England as early as the year 1290, no attempt appears to have been made to cultivate the tree in Britain until about 1595, when some plants were introduced by the Carews of Beddington in Surrey, and placed in their garden, where, trained against a wall, and sheltered in winter, they remained until de- stroyed by the great frost of 1739-40. In the last century the tree became a favonrite object of conservatory growth; in the open air, planted against a wall, and covered with mats in winter, it has often stood the cold of many seasons in the southern coun- ties, in such situations the trees occasionally bearing abundant fruit ; but in Great Britain the orange can only be regarded as an object of ornamental culture. The trees are usually imported from

ORANGE

Italy, where, especially near Nervi, such plants are raised in great numbers for exportation ; they are generally budded on the stocks of some free-growing variety, often on the lemon or citron.

For details of orange varieties, cultivation, &c., see Risso and Poiteau, His- totre et culture des Orangers (edited by A. Du Breuil, Paris, 1872); for early history and diffusion, G. Gallesio, Traité du Citrus, Paris, 1811. (C. P. J.)

ORANGE, a city of France, the chief town of an arron- dissement in the department of Vaucluse, is situated 18 miles north of Avignon on the railway from Lyons to Marseilles at some distance from the left bank of the Rhone, in the midst of meadows, orchards, and mulberry plantations,

watered by a stream called the Meyne, and overlooked by the majestic summit of Mount Ventose, which lies 22 miles to the east. The district is highly fertile, and the city deals largely in silks, woollens, and fruits, and also till quite recently in wines and madder. The population of the city numbers 6860. Orange is in- teresting mainly from its Roman remains. The triumphal arch is not only far finer than any other in France, but ranks third in size and importance among those still ex- tant in Europe. Measuring 72 feet in height, 69 feet in width, and 26 feet in depth, it is composed of three arches supported by four Corinthian columns. On three sides it is well preserved, and displays remarkable variety and elegance in its sculptured decorations. To judge from a partly decipherable inscription, the arch seems to have been erected in the reign of Tiberius. It suffered from being used as a fortification in the Middle Ages. Another most imposing structure is the theatre, built against the hill commanding the town. The facade, which is 118 feet high, 340 feet long, and 13 feet thick, is pierced by three square gates surmounted by a range of blind arches and a double row of far-projecting corbels. Of the seats occu- pied by the spectators—to the number, it might be, of 7000—only the lower ranges remain. By many this theatre is regarded as the most beautiful, or at least the most im- posing, of the Roman monuments of France. The princes of Orange made it an outwork of the castle which they erected on the hill, and which was demolished by De Gri- gnan after he had taken the town for Louis XIV. Up to the beginning of the present century it was filled with hovels and stables; these are now quite swept away, and the preservation of the building assured. In the neigh- bourhood of the theatre traces have been found of a hippo- drome capable of containing 20,000 persons ; and statues, bas-reliefs, and ruins of an aqueduct also serve to show the importance of the Roman town. Several of the churches at Orange are very old. Notre Dame, the old cathedral, originally erected by the prefect of Gaul, was ruined by the Barbarians, rebuilt in the 11th century, and damaged by the Protestants. A statue of Rambaud II. count of Orange and that of Gasparin the celebrated agriculturist may also be mentioned.

Orange (Arausio), capital of the Cavari, became after Cesar an important Roman colony. Its ramparts and fine buildings were eget destroyed by the Alemanni and Visigoths, and partly ruined

y the erections of the Middle Ages. Orange was included in the kingdom of Austrasia, fell into the hands of the Saracens, and was recovered by Charlemagne. It became an independent count- ship in the 11th century; and Count Bertrand de Baux (d. 1181) received from Frederick I. the title of prince of Orange. On the death of Philibert of Chalons in 1530 the inheritance fell to his sister's son, René (Renatus) of Nassau Dillenburg, stadholder of the Netherlands, who, dying childless, chose (1544) as his successor his cousin William, afterwards William I. Though Francis I., king of France, whose predecessors had long claimed to be suze- rains of the principality, caused it to be declared part of the domain of Provence, Henry IT. recognized William's rights in the treaty of Cateau Cambresis, and " prince of Orange"' remained the title of the stadholders from Maurice to William III. In 1672 Louis XIV. seized the principality and handed it over to the count of Auvergne in compensation for his loss of the marquisate of Bergen-op-Zoom confiscated by William ; but the claims of the house of Nassau were acknowledged by the peace of Ryswick. On William's death there were two claimants, John William Friso of Nassau — Dietz, desig- nated heir by William's will, and Frederick I. king of Prussia, who

held that he was nearer of kin and had been appointed by the will of Frederick Henry. Thereupon Louis XIV. declared the princi- pality forfeited to the French crown and bestowed it on the prince of Conti, who also had pretensions. The parlement of Paris de- cided that this prince should have the dominium utile; and its finding was confirmed by the treaty of Utreclit, which, however, left the title and coat of arms to the king of Prussia, who is still styled prince of Orange (Prinz von Oranien). John William Friso, however, also took the title, and his descendants, the stadholders and kings of the Netherlands, have all been designated princes of Orange- Nassau.

ORANGE, a city of the United States, in Essex county, New Jersey, 16 miles west of New York by two lines of railway, and connected by tramway with Newark, 3} miles distant. Beautifully situated on rolling ground about 190 feet above the sea, Orange has become a favourite place of residence for New York business men. To the west lies Llewelyn Park, an area of 750 acres, studded with villas and laid out in common; and the summit of

Orange Mountain (650 feet), a little farther west, is also occupied with villas. Hat-making is largely carried .on in the city. The population was 9348 in 1870 and 13,207 in 1880. In 1860 the township of Orange received a town charter ; and in 1872 the town, diminished by East Orange and parts of South and West Orange, was raised to the rank of a city.

ORANGEMEN, an association of Irish Protestants, originating and chiefly flourishing in Ulster, but with ramifications in other parts of the United Kingdom, and in the British colonies. Orangemen derive their name from William III., but neglect the example of that tolerant prince. They are enrolled in lodges, and it is said that the initiated can always recognize each other. Much may be learned from their toasts, about which there is no conceal- ment. The commonest form is "the glorious, pious, and immortal memory of the great and good King William, who saved us from popery, slavery, knavery, brass money, and wooden shoes," with grotesque or truculent additions according to the orator's taste. The brass money refers to James II.'s finance, and the wooden shoes to his French allies. The final words are often "a fig for the bishop of Cork," in allusion to Dr Peter Browne, who, in 1715, wrote cogently against the practice of toasting the dead. Orangemen are fond of 'beating drums and flaunting flags with the legend "no surrender," in allusion to Londonderry.

Orangeism is essentially political, and may be useful in so far as it reminds Irish Protestants of their origin and of their common rights under the British crown. But its original object was the maintenance of Protestant ascendency, and too much of its spirit still survives. By repeating irritating watchwords, and publicly keeping anniversaries painful to their neighbours, Orangemen have done much to inflame sectarian animosity ; if their celebrations were private, little could be said against them. The first regular lodges were founded in 1795, but the system existed earlier. The Brunswick clubs, founded to oppose Catholic emancipation, were sprigs from the original Orange tree. The orange flowers of the Liliwm bulbiferum are worn in Ulster on the lst and 12th July, the anniversaries of the Boyne and Aughrim. Another great day is the 5th of November, when William III. landed in Torbay.

ORANGE RIVER FREE STATE, an independent republic adjoining the Cape Colony, South Africa (see vol. vi., Plate I.), is bounded on the N. by the Vaal river, S. by the Orange river, E. by the Caledon river and Drakensberg mountains, and W. by a line dividing it from Kimberley and the diamond fields of Griqualand West. The area is 70,000 square miles, and the population in 1880 was 133,518. Of this total 61,022 were whites or of European extraction (mostly Dutch), and 72,496 coloured or of native races.

The country, which has an average elevation of 4500 feet above the sea, consists of a series of extensive undulating plains, bounded or diversified by detached rocky hills. These plains slope from the central watershed northward and southward respectively to the Vaal and Orange rivers, and are intersected at various intervals by the Wilge, Rhenoster, Valsch, Vet, Modder, and Riet rivers, empty- ing their waters into the Vaal river, and by the Caledon, which joins the Orange river. The southern and eastern districts are covered with luxuriant grasses, affording excellent pasturage for stock. In the western districts the grasses are gradually being supplanted by a dwarf bush vegetation. The river-banks are fringed with willow, mimosa, and other indigenous trees, and shrubs and trees of larger growth are found on the eastern mountain ranges; but generally the country is woodless, and to remedy this Government offers premiums for the encouragement of tree-planting. The geological characteristics are similar to those of the inland districts of Cape Colony. The south-western portion is an extension of the Karroo or lacustrine formation of South Africa, consisting of sand- stone and shales intersected by intrusive igneous rocks. In this formation occurs the diamond mine of Jagersfontein, near the village of Fauresmith, which has been worked for several years past. The north-eastern part, again, con- sists of sandstones and carbonaceous shales resting con- formably on the Karroo formation, and containing horizon- tal coal-seams, classed as of the Triassic period. The coal outcrops in the Kronstad and Heilbron districts are being utilized. In the Drift deposits along some river-beds, such as the Sand, Caledon, and Vaal rivers, there are accumu- lations of pebbles, consisting of agate, jasper, chalcedony, carnelian, white quartz, garnets, and occasionally diamonds.

The climate is salubrious, and specially remarkable for its dryness. Thousands of wild game formerly occupied the plains of the state, but their numbers and variety have of late greatly diminished, and some have been entirely exterminated. The lion, giraffe, elephant, and rhinoceros are no longer found. But in a few districts there may still be seen considerable herds of antelopes, such as the springbok, blesbok, and wildebeeste or gnu. The resources of the state are agricultural, pastoral, and mineral. The principal occupations of the inhabitants are the breeding of cattle, daorses, goats, merino sheep, and ostriches. Agri- culture is attended to on a larger or smaller scale accord- ing to the capabilities of the various farms, and vineyards and orchards are planted on many properties. The staple articles of export, however, are wool, skins, ostrich feathers, and diamonds, all of which are shipped from the seaports of the Cape Colony and Natal.

Bloemfontein, the capital and seat of government, is situated about the centre of the state, in 28° 56' S. lat. and 26° 18' E. long. It is an agreeable town, with a population of about 3000, and has a handsome range of public offices, where the volksraad or assembly of the people meets, a high court (consisting of a clief-justice and two puisne judges), a municipal burgher council, two banks, two newspapers, two hotels, clubs, a college, schools, and several churclies, including the Dutch Reformed church, the Anglican church with a resident bishop, and Wesleyan, Lutheran, and Roman Catholic churches. The Dutch language is officially used in the volksraad and the courts of justice, but English is spoken by the community generally.

The other towns or villages of the state are—Fauresmith, Eden- burg, Philippolis, Jacobsdal, Boshoff, Winburg, Hoopstad, Kron- stad, Heilbron, Frankfort, Harrismith, Ladybrand, Ficksburg, Bethulie, Bethlehem, Smithfield, Rouxville, and Wepener.

At the commencement of this century the country was inha- bited by sections of aboriginal tribes—Bushmen, Korannas, and Bechuanas ; and soon afterwards a number of Griquas from the north-west of the Cape Colony came in among them. A chronic state of warfare prevailed between these races. In 1824 nomad farmers from the Colony, seeking pastures for their flocks, crossed the Orange river and settled in the territory. These were fol- lowed in 1835-36 by large bodies of Dutch Boer emigrants who

left the Colony in order to be beyond British control. They formed arude government for themselves, and in attempting to exercise authority came into collision with the Griquas, who claimed pro- tection from the Colony, with which they were allied by treaty. The British governor, Sir P. Maitland, intervened in 1845, assisting the Griquas with troops, and defeating the Boers at Zwart Koppics ; and, to prevent further collisions, a resident was appointed. In 1848 Governor Sir H. Smith visited the territory, and came to the conclusion that peace could not be maintained among the mixed elements forming the population without the establishment of a regular government. He therefore issued a proclamation, after- wards confirmed by the crown, annexing the territory to the empire under the name of the Orange River British Sovereignty. Thereupon some of the Boers, under their leader Pretorius, took up arms and expelled the British magistrates ; but a military force was brought against them by Sir H. Smith in person, and, after a short but sharp encounter at Boomplaats, the Boers were defeated, and the crown's authority re-established and maintained from that time until towards the close of 1853. During this period many Europeans and colonists of European descent tock up their abode in the sovereignty. But disturbances again occurred, arising from long-standing disputes between the native tribes ; and, in order to chastise the most powerful of them—the Basutos—for certain acts of outrage, Governor Cathcart in 1852 moved a large military expedition against their chief, Moshesh, and the battle of the Berea was fought, after which the chief, on behalf of the tribe, gave in his submission. After this expedition the British Govern- ment resolved to withdraw from the territory. Sir George Clerk was deputed as a special commissioner to carry out the abandon- ment of the country ; and, notwithstanding the protests of many inhabitants, he formally handed it over to a body of Boer delegates in terms of a convention entered into on the 23d February 1854. They were released from their allegiance, and permitted to consti- tute an independent republican community of their own, under the title of the " Orange River Free State." Since that time the government has been in the hands of a president assisted by an executive council, with a volksraad or congress elected by the people, exercising all legislative functions.

~~In the south-eastern portion of the State, and entirely surrounded by it, is a small independent native territory, of which the principal village is Thaba-Nchu, where 10,000 of the Baralong tribe reside, peaceably ruled by their chief according to their own laws.~~

~~ORANIENBAUM, a town of European Russia, with a population of about 4000, lies 100 feet above the sea on the south coast of the Gulf of Finland opposite Cronstadt, and is well known for its imperial palace and as a summer resort for the inhabitants of St Petersburg, from which it is 24 miles distant by rail.~~

~~In 1714 Menshikoff, to whom the site was presented by Peter the Great, erected for himself the country seat of Oranienbaum ; confiscated, like the rest of his estates, in 1727, it became an imperial residence. In 1743 the empress Elizabeth assigned the place to Peter Theodorovitch, who built there a castle, Peterst@lt (now de- stroyed), for his Holstein soldiers. The rise of the town was fostered by the appointment in 1764 of an official for the reception and enter- tainment of foreign immigrants entering Russia via Cronstadt.~~

~~ORATORIANS. See Nert.~~

~~ORATORIO. See Music.~~

~~ORCAGNA (c. 1316 c. 13761), whose full name was ANDREA DI Cronz, called ARcAGNUOLO,? was the son of a very able Florentine goldsmith, Maestro Cione, said to have been one of the principal artists who worked on the magnificent silver frontal of the high altar of San Gio vanni, the Florentine Baptistery. The result of Orcagna's early training in the use of the precious metals may be traced in the extreme delicacy and refined detail of his principal works in sculpture. He had at least three brothers who all practised some branch of the fine arts: Lionardo or Nardo, the eldest, a painter; Matteo, a sculptor and mosaicist ; and Jacopo, also a painter. They were fre- quently associated with Orcagna in his varied labours.~~

~~From the time of Giotto to the end of the 14th century~~

~~‘ The dates of Orcagna’s birth and death are not exactly known, According to Vasari, he died in 1389 at the age of sixty ; but a docu- ment dated 1376 provides a guardian for Tessa and Romola, daughters of Orcagna’s widow Francesca (see Bonaini, Afem. Ined., pp. 105-6). Possibly, therefore, 1876 was the year of his death ; and if Vasari is right about his age his birth would have been in 1316. Milanesi, the~~

~~able editor of Vasari, is inclined to think that Orcagna died in 1368, when he is known to have been seriously ill.~~

- ~~Of this form, sometimes spelt Orcagnuolo, Orcagna is a corruption.~~

~~ORA—ORC~~

~~Orcagna stands quite pre-eminent even among the many excellent artists of that time. In sculpture he was a pupil of Andrea Pisano; in painting, though indirectly, he was a disciple of Giotto. Few artists have practised with such success so many branches of the arts. Orcagna was not only a painter and sculptor, but also a worker in mosaic, an architect, and a poet. His importance in the history of Italian art rests not merely on his numerous and beau- tiful productions, but also on his widespread influence, transmitted to his successors through a large and carefully- trained school of pupils. In style as a painter Orcagna comes midway between Giotto and Fra Angelico: he com- bined the dramatic force and realistic vigour of the earlier painter with the pure brilliant colour and refined unearthly beauty of Fra Angelico. His large fresco paintings are works of extreme decorative beauty and splendour,—com- posed with careful reference to their architectural sur- roundings, arranged for the most part on one plane, with- out the strong foreshortening or effects of perspective with which the mural paintings of later masters are so often marred.~~

~~1. Orcagna as a Painter.—His chief works in fresco were at Florence, in the church of S. Maria Novella. He first covered the walls of the retro-choir with scenes from the life of the Virgin. These, unfortunately, were much injured by damp very soon after their completion, and towards the end of the following century were replaced by other frescos of the same subjects by Ghirlandaio, who, according to Vasari, made much use of Orcagna’s motives and invention. Orcagna also painted three walls of the Strozzi~~

~~chapel, at the north-east of the same church, with a grand series of frescos, which still exist, though in a much injured and "restored" state. On the northern end wall is the Last Judgment, painted above and round the window, the light from which makes it difficult to see the picture. In the centre is Christ floating among clouds, surrounded by angels; below are kneeling figures of the Virgin and St John the Baptist, with the twelve apostles. Lower still are patriarchs, prophets, and saints, with the resurrection of the blessed and the lost. The finest com- position is that on the west wall, unbroken by any win- dow. It represents paradise, with Christ and the Virgin enthroned in majesty among rows of brilliantly-coloured cherubim and seraphim tinged with rainbow-like rays of light. Below are long lines of the heavenly hierarchy mingled with angel musicians ; and lower still a crowd of saints floating on clouds. Many of these figures are of exquisite beauty, especially the few that have escaped restoration. Faces of the most divine tenderness and delicacy occur among the female saints; the two central angels below the throne are figures of wonderful grace in pose and movement; and the whole picture, lighted by a soft luminous atmosphere, seems to glow with an unearthly gladness and peace. Opposite to this is the- fresco attri- buted by Vasari to Orcagna's brother Bernardo, or rather Nardo (i.e. Lionardo); it was completely repainted in 1530, so that nothing but the design remains, full of horror and weird imagination. To some extent the painter has followed Dante's scheme of successive circles.~~

~~These paintings were probably executed soon after 1350, and in 1357 Orcagna painted one of his finest panel pictures, as a retable for the altar of the same chapel, where it still remains. In the centre is Christ in majesty between kneeling figures of St Peter and St Thomas Aquinas, attended by angel musicians; on each side are standing figures of three other saints. It is a work of the greatest beauty both in colour and composition; it is painted with extreme miniature-like delicacy, and is on the whole very well preserved. This retable is signed, "An. dni. mecclvii Andreas Cionis de Florentia me pinxit."~~

~~'ORC GN A~~

~~Another fine altar-piece on panel by Orcagna, dated 1363, is preserved in the Cappella de' Medici near the sacristy of Sta Croce; it represents the~~

four doctors of the Latin church. According to Vasari, Orcagna also painted some very fine frescos in Sta Croce, similar in subjects to those attributed to him in the Campo Santo of Pisa, and full of fine portraits. These do not now exist. In the cathedral of Florence, on one of the northern piers, there hangs a nobly-designed and highly-finished picture on panel by Orcagna, representing S. Zanobio enthroned, trampling under his feet Cruelty and Pride; at the sides are kneel- ing figures of SS. Eugenius and Crescentius,—the whole very rich in colour. The retable mentioned by Vasari as having been painted for the Florentine church of S. Pietro Maggiore is now in the National Gallery of London. It is a richly decorative composition of the Coronation of the Virgin, between rows of saints, together with nine other subjects painted in miniature. Other paintings on panel by Orcagna were sent by the Pope to Avignon, but cannot now be traced. The frescos also have been destroyed with which, according to Vasari, Orcagna decorated the fagade of S. Apollinare and the Cappella de' Cresci in the church of the Servi in Florence.!

2. Orcagna as a Sculptor and Architect?—In 1355 Or- cagna was appointed architect to the chapel of Or San Michele in Florence. This curiously-planned building, with a large upper room over the vaulting of the lower part, had been begun by Taddeo Gaddi as a thank-offering for the cessation of the plague of 1348. It took the place of an earlier oratory designed by Arnolfo del Cambio, and was the gift of the united trade-guilds of Florence. As to the building itself, it is impossible to say how much is due to Taddeo Gaddi and how much to Orcagna, but the great marble tabernacle was wholly by Orcagna. This, in its combined splendour of architectural design, sculptured reliefs and statuettes, and mosaic enrichments, is one of the most important and beautiful works of art which even rich Italy possesses. It combines an altar, a shrine, a reredos, and a baldacchino. In general form it is perhaps the purest and most gracefully designed of all specimens of Italian Gothic. It is a tall structure of white marble, with vaulted canopy and richly-decorated gables and pin- nacles, reaching almost to the vaulted roof of the chapel. The detail is extremely delicate, and brilliant gem-like colour is given by lavish enrichments of minute patterns in glass mosaic, inlaid in the white marble of the structure. It is put together with the greatest care and precision ; Vasari especially notes the fact that the whole was put together without any cement, which

might have stained the purity of the marble, all the parts being closely fitted together with bronze dowels. The spire-like summit of the tabernacle is surmounted by a figure of St Michael, and at a lower stage on the roof are statuettes of the apostles. The altar has a relief of Hope between panels with the Marriage of the Virgin and the Annunciation. On the right side, looking east, of the base of the tabernacle are reliefs of the Birth of the Virgin and her Presentation in the Temple; on the left, the Nativity and the Adoration of the Magi; and behind, the Presentation of Christ in the

1 The magnificent but much injured frescos of the Last Judgment, Hell, and the Triumph of Death in the Pisan Campo Santo, described with great minuteness and enthusiasm by Vasari, are attributed by him to Orcagna, but internal evidence seems to show that they are productions of the Sienese school. Crowe and Cavalcaselle attribute them to the two brothers Lorenzetti of Siena, but they have been so injured by wet, the settlement of the wall, and repeated retouchings that it is difficult to come to any clear decision as to their authorship. It appears, however, much more probable that they are the work of Bernardo Daddi.

2 Orcagna was admitted as a member of the Sculptors' Guild in 1352. His name occurs in the roll as "Andreas Cionis vocatus Arcagnolus, pictor."

Temple, and the Angel warning the Virgin to escape into Egypt. Above the last two subjects are large reliefs of the Death of the Virgin, surrounded by the apostles, and higher still her Assumption ; she stands in a vesica, and is borne by angels to heaven. On the base of the Virgin's tomb is inscribed " Andreas Cionis pictor Florentinvs oratorii archimagister extitit hvjvs mecclix." Orcagna's own portrait is given as one of the apostles. In addition to these richly-composed subject-reliefs the whole work is adorned with many other single figures and heads of pro- phets, angels, and the Virtues, all executed with wonderful finish and refinement. The shrine, which forms an aum- bry in the reredos, contains a miraculous picture of the Madonna. A fine bronze screen, with open geometrical tracery, encloses the whole. No work of sculpture in Italy is more magnificent than this wonderful tabernacle, both in general effect and in the delicate beauty of the reliefs and statuettes with which it is so lavishly enriched. It cost the

enormous sum of 96,000 gold florins. Unfor- tunately it is very badly placed and insufficiently lighted, so that a minute examination of its beauties is a work of difficulty.

No mention is made by Vasari of Orcagna's residence in Orvieto, where he occupied for some time the post of "capo- maestro" to the duomo.! He accepted this appointment on 14th June 1358 at the large salary (for that time) of 300 gold florins a year. His brother Matteo was engaged to work under him, receiving 8 florins a month. When Orcagna accepted this appointment at Orvieto he had not yet finished his work at Or San Michele, and so was obliged to make long visits to Florence, which naturally interfered with the satisfactory performance of his work for the Orvietans. The result was that on the 12th of September 1360 Orcagna, having been paid for his work up to that time, resigned the post of "'capo-maestro" of the duomo, though he still remained a little longer in Orvieto to finish a large mosaic picture on the west front. When this mosaic (made of glass tesseree from Venice) was finished in 1362, it was found to be uneven in surface, and not fixed securely into its cement bed. An arbitration was therefore held as to the price Orcagna was to receive for it, and he was awarded 60 gold florins.

Vasari mentions as other architectural works by Orcagna the design for the piers in the nave of the Florentine duomo, a zecca or mint, which appears not to have been carried out, and the Loggia dei Lanzi in the Piazza della Signoria. It is, however, more than doubtful whether Orcagna had any hand in this last building, a very grace- ful vaulted structure, with three semicircular open arches on the side and one at each end, intended to form a shel- tered meeting-place for the Priori during elections and other public transactions. This loggia was ordered by the General Council of Florence in 1356, but was not actually begun till the year 1376, after Orcagna's death. The architects were Benci di Cione (possibly a brother of Orcagna) and Simone di Francesco Talenti, both men of considerable reputation in Florence. The sculptured re- liefs of the seven Virtues in the spandrels of the arches of the loggia, also attributed to Orcagna by Vasari, were later still. They were designed by Angelo Gaddi (1383-1386), and were carried out by three or four different. sculptors.

Pupils of Orcagna named by Vasari are Bernardo Nello, a Pisan, Tommaso di Marco, a Florentine, and, chief of all, Francesco Traini, whose grand painting on panel of St Thomas Aquinas enthroned with the arch-heretics at his feet still hangs in the churcli for which it was painted,—Sta Caterina at Pisa. Orcagna had, in ad- dition to the two daughters mentioned above, a son named Cione,

who was a painter of but little eminence. Some sonnets attributed to Orcagna exist in MS. in the Strozzi and Magliabecchian libraries

1 See Milanesi, Storia dell' Arte Toscana, p. 238 (Siena, 1873); Luzi, Duomo @ Orvieto ; and Vasari, ed. Milanesi, i. p. 617 (Florence, 1878).

in Florence. They have been published by Trucchi (Poesie inedite, ii. p. 25, Prato, 1846). They are graceful in language, but rather

artificial and over-elaborated.

Authorities.—Vasari, ed. Milanesi, i. p. 593 (Florence, 1878); Giornale degli Archivi Toscani, iii. p. 282, &c.; Passerini, Curiosita storico-artistiche ; Gaye, Carteggio inedito, i. pp. 500-513, ii. p. 5 ; Rosini, Storia della pittura, vol. i.; Bal- dinucci, Professori del disegno, vol. i., Rumohr, Ricerche Italiane, ii., and Antologia di Firenze, iii.; Crowe and Cavalcaselle, Painting in Italy, i. p. 425 (London, 1864); Perkins, Tuscan Sculptors, p. 77 (London, 1865). (J. H. M.)

ORCHESTRA. See Music, supra, p. 98.

ORCHHA, or Txurti, a native state in Bundelkhand, Central India, lies between 24° 26' and 25° 34' N. lat., and between 78° 28' 30" and 79° 23' E. long., to the south of the British district of Jhansi. The area is about 2000 square miles; the population in 1881 was 311,514. A great portion of the area is covered with hill jungle and poor soil, and is thinly peopled. The present capital, Tehri, situated in the south-west corner of the state, is a poor ill- built town, the only good house being the palace of the raja. Orchha is the oldest and highest in rank of all the Bundela principalities,

~~and was the only one not held in subjection by the peshwa. The chief received the title of maharaj4 in 1865.~~

~~ORCHIDS. The word Orchis is used in a special sense to denote a particular genus of the Orchid family (Orchidacex) ; very frequently, also, it is employed in a more general way to indicate any member of that large and very interesting group. It will be convenient here to use the word Orchis as applying to that particular genus which gives its name to the order or family, and to employ the term ‘“‘orchid” in the less precise sense.~~

~~The flowers of all orchids, though extremely diverse within certain limits, and although superficially very dif- ferent from those of other monocotyledons, are all formed upon one common plan, which is only a modification of that observable in such flowers as those of the narcissus or snowdrop (Galanthus). The conformation of those flowers consists essentially in the presence of a six-parted perianth, the three outer segments of which correspond to a calyx, the three inner ones to a corolla. These segments’ spring apparently from the top of the ovary,—the real explanation, however, being that the end of the flower-stalk or “‘thalamus,” as it grows, becomes dilated into a sort of cup or tube enclosing and indeed closely adhering to the ovary, so that the latter organ appears to be beneath the perianth instead of above it as in a lily, an appearance which has given origin to the term “inferior ovary.” Within the perianth, and springing from its sides, or apparently from the top of the ovary, are six stamens~~

~~ps~~

~~e: ; e~~

~~Fig. 1. Fig. 2,~~

~~Fic. 1.—Diagram of the flower of Orchis. s, si, sl, the three divisions of the outer perianth ; pl, pl, the two lateral divisions of the inner perianth ; ps, the superior division or the labellum, which may become inferior by the twisting of the ovary; ¢, the fertile stamen, with its two pollen-masses in the anther-lobes; ¢, the one-celled ovary cut transversely, having three parietal placentas.~~

~~*Fig. 2.—Flower of an Orchid. 8, 8, 8, the three outer divisions of the perianth ; ", p, 1, the three inner, 2 being the labellum, here inferior by the twisting of the ovary ; c, spur of the labellum ; 0, the twisted ovary ; st, the stigma ; a, the anther, containing pollen-masses.*~~

~~*whose anthers contain pulverulent pollen- grains. These stamens encircle a style which is the upward continuation of the ovary, and which shows at its free end traces of the*~~

~~*ORC—ORC*~~

~~*three originally separate but now blended carpels of which the ovary consists. An orchid flower (disregarding for*~~

~~*Fig. 3. Fig. 4.*~~

~~*Fia. 3.—Upper part of an Orchid flower. The outer divisions of the perianth are seen, and two of the inner, the third or labellum being removed. The two anther lobes are seen with pollen-masses attached to the upper part of the stigma by viscid matter, re.*~~

~~*Fic, 4.—Pollen-masses of an Orchid, with their caudicles and common gland.*~~

~~*the moment a very small number of exceptions) has an*~~

~~*inferior ovary like that just described, but with the ovules*~~

~~*on the walls of the cavity (not in its axis or centre), a*~~

~~*six-parted perianth, a stamen or stamens, and a style or*~~

~~*styles. The main distinguishing features consist in the fact that one of the inner pieces of the perianth becomes in course of its growth much larger than the rest, and usually different in colour, texture, and form. So different is it that it receives a distinct name, that of the "lip" or*~~

~~*"labellum." In place of the six stamens we commonly find*~~

but one (two in Cypripedium), and that one is inseparably

blended with the style to form the "column," bringing about the condition technically called '" gynandrous."

Moreover, the pollen, instead of consisting of separate

cells or grains, consists of cells aggregated into " pollen-

masses," the number varying in different genera, but very generally two, four, or eight, and in many of the genera provided at the base with a strap-shaped stalk or "caudicle" ending in a flattish gland or "viscid disk" like a boy's sucker. The style has very generally at its upper part a peculiar pouch-like process called the "rostellum," in which the viscid disk of the pollen-masses is concealed till released in the manner presently to be mentioned. It would appear, then, that the orchid flower differs from the type in the irregularity of the perianth, in the suppression of five out of six stamens and of two out of three styles, and in the union into one column of the one stamen and the one style which remain in the adult flower. In addition to these modifications, which are common to nearly all orchids, there are others generally but not so universally met with; among them is the displacement of the flower

| arising from the twisting of the inferior ovary, in conse-

quence of which the flower is so completely turned round that the "lip," which originates in that part of the flower, conventionally called the posterior or superior part, or that nearest to the supporting stem, becomes in course of growth turned to the anterior or lower part of the flower nearest to the bract, from whose axil it arises. Other common modifications arise from the union of certain parts of the perianth to each other, and from the inordinate outgrowths from the lip,

These statements are borne out by evidence derived from a variety of sources, such as that afforded by the pro- gressive development of the parts of the flower from their earliest to their most complete condition, by the anatomy or internal organization of the parts of the flower, by the number and distribution of the vascular bundles which run through the cellular

tissue, by the comparative morphology of the floral organs of the different genera of the order, and by teratology, or the study of unusual or monstrous forma-

tions, which reveals the existence of a complete series of in- termediate forms constituting a regular gradation from the ordinary irregular gynandrous flower to regular flowers with six separate stamens such as we have takén as the type.

What brings about—what has brought about—this ex- traordinary series of changes, by virtue of which a flower typically as regular as a snowdrop becomes transmuted into the forms often more grotesque and extraordinary than can be found in any other group of plants? To the first part of the question the reply is that the present form has been inherited from generation to generation of orchids ; to the second part the answer most in accordance with the present state of knowledge is that these modifications are associated with the structure and habits of insects and their visits to the flowers. Cross fertilization, or the im- pregnation of any given flower by pollen from another flower of the same species on the same or on another plant, has been proved to be of great advantage to the plant by securing a more numerous or a more robust offspring, or one better able to adapt itself to the varying conditions under which it has to live. This cross fertilization is effected by the agency of insects. They are attracted to the flower by its colour or its perfume ; they seek, collect, or feed on its honey, and while so doing they remove the pollen from the anther and convey it to another flower, there to germi- nate on the stigma when its tubes travel down the style and their contents ultimately come in near apposition, per- haps in actual confluence, with the " oosphere " or immature egg, which becomes in consequence fertilized, and there- after gradually develops into a new plant. To facilitate the operations of such insects, by compelling them to move in certain lines so as to secure the due removal of the pollen and its subsequent deposit on the right place, the form of the flower and the conformation of its several parts are modified in ways as varied as they are wonder- ful. Other insects visit the flower with more questionable result. For them the pollen is an attraction as food, or some other part of the

flower offers an inducement to them for a like object. Such visitors are clearly prejudicial to the flower, and so we meet with arrangements which are calculated to repel the intruders, or at least to force them to enter the flower in such a way as not to effect mischief. It would be quite impossible within the limits of this article to go into detail on this subject. All we can do is to give one or two illustrations, referring the reader desirous of fuller information to Darwin's Fertilization of Orchids.

In the common orchids of British meadows, Orchis Morio, mascula (Shakespeare's long purples), &., the general struc- ture of the flower is as we have described it. In addition there is in this particular genus, as indeed in many others, a long tubular spur or horn projecting downwards from the back of the lip, whose office it is to secrete and store a honeyed juice ; the forepart of the lip forms an expanded plate, usually larger and more brightly coloured than the other parts of the flower, and with hairs or ridges and spots of various kinds according to the species. The re- maining parts of the perianth are very much smaller, and commonly are so arranged as to form a hood overarching the "column." 'This column stands up from the base of the flower, almost at right angles to the lip, and it bears at the top an anther, in the two hollow lobes of which are concealed the two pollen-masses, each with its caudicle terminating below in a roundish gland, concealed at first in the pouch-like rostellum at the front of the column. Below the anther the surface of the column in front is hollowed out into a greenish depression filled with viscid fluid,—this is the stigma. The other parts of the flower need not detain us. Such being in general terms the mechanism of the flower of a common orchis, let us now see how it acts. A bee, we will assume, attracted by the

colour and perfume of the flower, alights on that part of it which is the first to attract its attention,—the lip. There, guided by the hairs or ridges before-mentioned, it is led to the orifice of the spur with its store of honeyed juice. The position of this orifice, as we have seen, is at the base of the lip and of the column, so that the insect, if of suffi- cient size, while bending his head to insert his proboscis into the spur, almost of necessity displaces the pollen- masses. Liberated from the anthers, these adhere to the head or

~~back of the insect by means of the sticky gland at the bottom of the caudicle. Having attained his object the insect withdraws, taking with him the pollen-masses, and visits another flower. And now occurs another device or adaptation no less marvellous than those of which men- tion has been made. 'The two anther-cases in an orchis are erect and nearly parallel the one to the other; the pollen-masses within them are of course in like case, as may be thus represented |], but immediately the pollen- masses are removed movements take place in the caudicle so as to effect the bending of this stalk and the placing the pollen-mass in a more or less horizontal position, thus ==, or, as in the case of O. pyramidalis, the two pollen-masses originally placed parallel || diverge from the base like the letter VY. The movements of the pollen-masses may readily be seen with the naked eye by thrusting the point of a needle into the base of the anther, when the disks adhere to the needle as they would do to the antenna of an insect, and may be withdrawn. Sometimes the lip is mobile and even sensitive to impressions, as are also certain processes of the column. In such cases the contact of an insect or other body with those processes is sufficient to liberate the pollen often with elastic force, even when the anther itself is not touched. In other orchids movements take place in different ways and in other directions. The object of these movements will be appreciated when it is remembered that, if the pollen-masses retained the original direction they had in the anther in which they were formed, they would, when transported by the insect to another flower, merely come in contact with the anther of that flower, where of course they would be of no use ; but, owing to the divergences and flexions above alluded to, the pollen- masses come to be so placed that, when transplanted to another flower of the same species, they come in contact with the stigma and so effect the fertilization of that flower. These illustrations are comparatively simple ; it would have been easy to select others of a more com- plicated nature, but all evidently connected with the visits of insects and the cross fertilization of the flower. In some cases the form of the male flowers is so different from that of the female that before the different flowers had been found on the same spike, and before the facts of the case were fully known, they were taken to be representatives of distinct genera.~~

~~The floral structure is so curious that perhaps less attention has been paid to the vegetative organs than the pecu- liarities of their organization~~

demand. We can only allude to some of these points. The orchids of British fields | are all of terrestrial habit, and their | roots are mostly tuberous (fig. 5), the tubers being partly radical partly bud- like in their character. There is often a marked alternation in the production *”¢; Wie dete bbl of vegetative and flowering shoots re- Testrial Orchid. spectively ; and, sometimes, from various circumstances, the flowering shoots are not produced for several years in suc- cession. This fact will account for the profusion with which

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some orchids, like the common bee orchis for instance, are found in some seasons and their scarcity in others. Tropical orchids are mostly epiphytal, —that is, they grow upon trees without deriving nourishment from them. They are fre- quently provided with ‘ pseudo-bulbs,” large solid swellings of the stem, in the tissues of which water and nutritive materials are stored. Very generally, too, such plants have aerial roots, of thick or thin wire-like form, covered with a spongy white investment, the constituent cells of which are found under the microscope to contain spiral fibres tightly coiled up within them. By these “air-roots” the plants are able to absorb watery vapour and perhaps actual water.

The number of species of orchids is greater than that of any other monocotyledonous order—not even excepting grasses—amounting to between 4000 and 5000 at least. This large number is partly accounted for by the diligent search in all countries that has been made for these plants for purposes of cultivation, —they being held at present in the greatest esteem by plant-lovers, and prices being paid for new or rare varieties which recall the days of the tulipo- mania. It must be admitted, however, that orchid-lovers have better reasons to support their fancy than had the speculative growers and barterers of tulips.

The economic uses of orchids are not remarkable. When we have mentioned vanilla, which consists of the pods of an orchid, we have mentioned about the only economic product that now comes into market. Salep, still used in

the Levant, consists of the dried tubers of some terrestrial orchid, and contains a relatively large amount of nutritious matter.

Cypripedium demands notice, inasmuch as it, with one or two other genera, constitutes a tribe of the order in which two stamens are present, one on each side of the column instead of one only at the top. What may be considered the normal number of stamens is, as has been said, six, arranged in two rows. In most orchids the only stamen developed to maturity is the posterior one of the three opposite to the lip (anterior before the twisting of the ovary), the other two, as well as all three inner ones, being entirely absent, or present only in the form of rudiments. In Cypripedium all three of the outer stamens are wanting, but the two lateral ones of the inner series are present, the third being undeveloped. This arrangement may be understood by reference to the following dia- gram, representing the relative eee of the stamens in orchids generally and in Cypripedium. The letter L indicates the position of the labellum ; the large figures indicate the developed stamens ; the italic figures show the position of the suppressed stamens,

"4 4 6 4 65 6 6 2 3 2 3

L L Arrangement of stamens Arrangement of stamens in Orchis. in Cypripedium.

ORCHIL. See Arcum, aes

ORCHOMENUS, the name borne by two cities of ancient Greece.

I. A Beeotian city, situated in the angle between the Cephissus and its tributary the Melas, on a long narrow hill which projects south from Mount Acontium. Its position is exceedingly strong, being defended on every side by precipice or marsh or river, and it was admirably suited to be the stronghold of an early kingdom. The acropolis is at the north end of the hill, on a peak which is overhung by Acontium, but at a distance sufficient to be safe from an enemy with the weapons of early warfare posted on the mountain. At the foot of the acropolis are the springs of the Melas. Orchomenus was the capital of the Minyz, a race famous in the half-legendary history of early Beeotia ; the sway of the Minyz once extended

~~over Beeotia, including even Thebes, but the fKolic Beeotians who made Thebes their stronghold broke the power of the Orchomenian kings. The most remark- able relic of the early power of Orchomenus is the so-called "treasury," which is said to be the oldest in Greece, It was larger than the buildings of similar style at Mycenze (see Mycrnm), and the admiration which Pausanias ex- presses for it is justified by the beautiful ornamentation, especially of the roof, which has been brought to light by Schliemann's excavations. The monument, undoubtedly~~

~~OR C—~~

~~called Anchisia.~~

~~ORD~~

~~the tomb of some ancient ruler, or of a dynasty, lies outside the city walls. The worship of the Charites (see Graces) was the great cultus of Orchomenus, and the site of the temple is now occupied by a chapel, the Koiuyous ris Ilavayias. The Charites were worshipped under the form of rude stones, which had fallen from heaven during the reign of Eteocles ; and it was not till the time of Pausanias that statues of the goddesses were placed in the temple. Near this was another temple dedicated to Dionysus, in whose festival, the "Ayproivia, are apparent the traces of human sacrifice in early times. The city was destroyed by the Thebans in the 4th century ; the men were slain, and the women and children sold as slaves. About thirty years later, after the battle of Cheronea (338 B.c.), Philip of Macedon restored the city. The name is spelt on the dialectic inscriptions and coins '"Epydépevos. It is mentioned in the Homeric catalogue.~~

~~Il. An Arcadian city, situated in a district of the same name, north of Mantinea and west of Stymphalus. The district was mountainous, but embraced two valleys,— the northern containing a lake which is drained, like all Arcadian lakes, by a katabothron; the southern lying under the city, separated from Mantinea by a mountain ridge The old city occupied a strong and lofty situation ; in the time of Strabo it was a ruin, but Pausanias mentions that a new town was built below the old. A primitive wooden image of Artemis Cedreatis stood in a large cedar tree outside the city. Orchomenus is mentioned in the Homeric catalogue with the epithet~~

roAvpndos. It sent soldiers to Thermopyle and to Platza. The native form of the name was 'Epydpevos.

ORDEAL (Anglo-Saxon orddl, ordzl, judgment) corre- sponds to modern German wrtheil, but bears the special sense of the medizval Latin Dei judicium, a miraculous decision as to the truth of an accusation or claim. (The word is adopted in the late Latin ordalium, French ordalie. The ordeal had existed for many ages before it was thus named in Europe. In principle, and often in the very forms used, it belongs to ancient culture, thence flourishing up to the medieval European and modern Asiatic levels, but dying out before modern civilization. Some ordeals, which possibly represent early stages of the practice, are simply magical, being processes of divination turned to legal purpose. Thus in Burmah suits are still determined by plaintiff and defendant being each furnished with a candle, equal in size and both lighted at once,—he whose candle outlasts the other being adjudged, amid the acclama- tions of his friends, to have won his cause (Shway Yoe, The Burman, vol. ii. p. 254). Even quainter is a Dyak ordeal in Borneo, where the two parties are represented by two shell-fish on a plate, which are irritated by pouring on some limejuice, and the one first moving settles the guilt or innocence (as has been before arranged) of its owner (St John, Lorests of the Far East, vol. i. p. 89). The adminis- tration of ordeals has been much in the hands of priests, and they are more often than not worked on a theological basis, the intervention of a deity being invoked and assumed to take place even when the process is in its nature one of symbolic magic. For instance, an ancient divining instrument consisted of a sieve held suspended by a thread or by a pair of shears with the points stuck into its rim, and considered to move at the mention of the name to be discovered, &c. Thus girls consulted the "sieve-witch" (kooKkivdpavrts) about lovers (Theocr., Zdyll., lil, 31). This coscinomancy served in the same way to discover a thief, when, with prayer to the gods for direc- tion, the names of the suspected persons were called over to it (Potter, Greek Antiquities, vol. i. p. 352). When a suspended hatchet was used in the same way to turn to the guilty, the process was called axinomancy. The sieve-

Opie Ay Ih

ordeal remained popular in the Middle Ages (see the de- scription and picture in Cornelius Agrippa, De Occ. Phil.) ; it is mentioned in Hudibras (ii. 3) : *¢, , , th' oracle of sieve and shears That turns as certain as the spheres."

From this ancient ordeal is evidently derived the modern Christian form of the key and Bible, where a Psalter or Bible is suspended by a key tied in at Psalm 1. 18: "When thou sawest a thief, then thou consentedst with him" ; the bow of the key being balanced on the fingers, and the names of those suspected being called over, he or she at whose name the book turns or falls is the culprit (see Brand, Popular Antiquities, ed. Bohn, vol. iii. p. 351).

One of the most remarkable groups of divinations pass- ing into ordeals are those which appeal to the corpse itself for discovery of its murderer. The idea is rooted in that primitive state of mind which has not yet realized the full effect of death, but regards the body as still able to hear and act. Thus the natives of Australia will ask the dead man carried on his bier of boughs who bewitched him ; if he has died by witchcraft he will make the bier move round, and if the sorcerer who killed him be present a bough will touch him (Eyre, Australia, vol. ii, p. 344). That this is no isolated fancy is shown by its recurrence among the negroes of Africa, where, for instance, the corpse causes its bearers to dash against some one's house, which accuses the owner of the murder (J. L. Wilson, Western Africa, p. 231; Waitz, vol. ii, p. 193). This somewhat resembles the well-known ordeal of the bier in Europe in the Middle Ages, which, however, seems founded on a different principle, the imagination that a sympathetic action of the blood causes it to flow at the touch or neigh- bourhood of the murderer. Apparently the liquefaction of the blood which in certain cases takes place after death may have furnished the ground for this belief. On Teutonic ground, this ordeal appears in the Nibelungenlied, where the murdered Siegfried is laid on his bier, and Hagen is called on to prove his innocence by going to the corpse, but at his approach the dead chief's wounds bleed atresh. The typical instance in English history is the passage of Matthew Paris, that after Henry II.'s death at Chinon his son Richard came to view the body, " Quo superveniente, confestim erupit sanguis ex naribus regis mortui; ac si indignaretur spiritus in adventu ejus, qui ejusdem mortis causa esse credebatur, ut videretur sanguis clamare ad Deum." In Shakespeare (Rich. LIL, act 1, se. 2):

~~‘*O gentlemen, see, see! dead Henry’s wounds Open their congeal’d mouths, and bleed afresh !”~~

~~At Hertford assizes (4 Car. I.) the deposition was taken as to certain suspected murderers being required to touch the corpse, when the murdered woman thrust out the ring finger three times and it dropped blood on the grass (Brand, vol. ili, p. 231); and there was a case in the Scottish High Court of Justiciary as late as 1668 (T. F. Thiselton Dyer, Folklore of Shakespeare, p. 487). Durham peasants, ap- parently remembering the old belief, still expect those who come to look at a corpse to touch it, in token that they bear no ill-will to the departed (W. Henderson, Solklore of Northern Counties, p. 57).~~

~~Certain ordeals are closely related to oaths, so that the two shade into one another. Let the curse which is to fall on the oath-breaker take effect at once, it then becomes a sign condemning the swearer,—in fact, an ordeal. Thus the drinking of water on which a curse or magical penalty has been laid is a mere oath so long as the time of fulfil- ment is unfixed (see OaTH). But it becomes an ordeal when, as in Brahmanic India, the accused drinks three handfuls of water in which a sacred image has been dipped; if he is innocent nothing happens, but if he is guilty sick- ness or misfortune will fall on him within one to three~~

~~weeks (for accounts of these and other Hindu ordeals see Ali Ibrahim Khan in Asiatic Researches, vol. i. p. 389, and Stenzler’s summary in Z. D. Jf. G., vol. ix.). The earliest account of such an ordeal is in Numbers v., which describes the mode of administering to a woman charged with unfaithfulness the bitter water mixed with the dust of the tabernacle floor, with the curse laid on it to cause her belly to swell and her thigh to fallif guilty. Ewald (Antiqui- ties of Israel, 236) regards the draught as in itself harmless, and the operation of this curse on the guilty as due to the influence of the mind on the body. But the term “ bitter” is applied to the water before it has been cursed, which suggests that it already contained some drug, as in the poison-water ordeal still in constant use over a great part of Africa. Thus the red water of Guinea is a decoction made by pounding in a wooden mortar and steeping in water the inner bark of one of~~

~~the mimosas, producing a liquor like that of a tan-vat, astringent, narcotic, and when taken in sufficient quantity emetic. The accused, with solemn ceremony and invocation, drinks freely of it; if it nauseates him and he throws it up he is triumphantly acquitted, but if he becomes dizzy he is guilty, and the assembly fall on him, pelt him with stones, and even drag him over the rocks till he is dead. Here the result of the ordeal depends partly on the patient's constitution, but more on the sorcerer who can prepare the proper dose to prove either guilt or innocence. Among the various drugs used in different parts of Africa are the mbundu root, the Calabar bean, the tangena nut (Zanghinia venenrflua, a strong poison and emetic). The sorcerers who administer this ordeal have in their hands a power of inflicting or remitting judicial murder, giving them boundless influence (details in J. L. Wilson, Western Africa, pp. 225, 398 ; Burton, Lake Regions of Central Africa, vol. ii. p. 357 ; Bosman, "Guinea," in Pinkerton's Voyages, vol. xvi. pp. 398, &c.). The poison-ordeal is also known to Brahmanic law, decoc- tion of aconite root being one of the poisons given, and the accused if not sickening being declared free (Stenzler, /.c.). Theoretically connected with the ordeal by cursed drink is that by cursed food, which is, however, distinguished among this black catalogue by being sometimes an effect- ual means of discovering the truth. The ordeal by bread and cheese, practised in Alexandria about the 2d century, was practically the same as that known to English law five to ten centuries later as the corsned or "trial slice" of consecrated bread and cheese which was administered from the altar, with the curse that if the accused were guilty God would send the angel Gabriel to stop his throat, that he might not be able to swallow that bread and cheese. In fact, if guilty and not a hardened offender he was apt to fail, dry-mouthed and choking through terror, to get it down. The remembrance of this ancient ordeal still lingers in the popular phrase, " May this bit choke me if I lie!" In India the corresponding trial by rice is prescribed in the old laws to be done by suspected persons chewing the consecrated grains of rice and spitting them out, moist and untinged with blood, on a banyan leaf ; this or the mere chewing and swallowing of a mouth- ful of rice-grains is often used even by the English as a means of detecting a thief. A classical mention of the ordeals by carrying hot iron in the hands and by passing through the fire is made more interesting by the guards who offer to prove their innocence in this way offering further to take oath by the gods, which shows the intimate~~

~~connexion between oaths and ordeals (Soph., Ant., 264, see also Aschyl., fr. 284).~~

~~Fev 5° Eroupor kal pvdpous alpev xepoiv kal wip diéprew, kal Oeods dpxwmorey 7d pre Spdcar unre TH Evverdévar~~

~~Td mpaypa BovdevoarTt ujT eipyarpevyr~~

~~820~~

~~The passing through the fire is described in the Hindu codes of Yajnavalkya and others, and is an incident in Hindu poetry, where in the Rdmdyana the virtuous Sité thus proves her innocence to her jealous husband Rama (Stenzler, p. 669; Pictet, Origines Indo-E'uropéennes, part li, p. 457). It was not less known to European law and chronicle, as where Richardis, wife of Charles the Fat, proves her innocence by going into a fire clothed in a waxed shift, and is unhurt by the fire (Grimm, Deutsche Rechts-alterthtimer, p. 912). Yet more minutely prescribed in the Hindu ordeal-books is the rite of carrying the glowing hot iron seven steps, into the seven or nine circles traced on the ground, the examination of the hands to see if they show traces of burning, and the binding them up in leaves. The close historical connexion of the Hindu ordeal laws with the old European is shown by the correspondence of minute details, as where in a Scandinavian law it is pre- scribed that the red-hot iron shall be carried nine steps (Grimm, op. cit., p. 918). In Anglo-Saxon laws the iron to be carried was at first only one pound weight, but Athelstan's law (in Ancient Laws and Institutes of England, iv. 6) enacts that it be increased to weigh three pounds. Another form well known in old Germany and England was the walking barefoot over glowing ploughshares, generally nine. The law-codes of the early Middle Ages show this as an ordinary criminal procedure (see the two works last referred to), but it is perhaps best remembered in two non-historical legends. The German queen Kunigunde, "hee dicens stupentibus et flentibus universis qui aderant, vomeres candentes nudo vestigio calcavit et sine adustionis molestia transiit" (Vita Henrie, ap. Canisium, vi. 387). Queen Emma, mother of Edward the Confessor, accused of familiarity with Alwyn bishop of Winchester, triumphantly purges herself and him by the help of St Swithin,—each of the two thus acquitted giving nine manors to the church of Winchester, in memory of the nine~~

ploughshares, and the king being corrected with stripes (John Bromton; see Freeman's Norm. Cong., vol. ii. App.). To dip the hand in boiling water or oil or melted lead and take out a stone or ring is another ordeal of this class. The traveller may find some of these fiery trials still in use, or at least in recent memory, in barbaric regions of Africa or further Asia,—the negro plunging his arm into the caldron of boiling oil, the Burman doing feats with melted lead, while the Bedouin will settle a conflict of evidence by the Opposing witnesses licking a glowing hot-iron spoon (Burckhardt, Arabien, pp. 98, 233). This latter feat may be done with safety by any one, provided the iron be clean and thoroughly white hot, while if only red-hot it would touch and burn the tongue. Probably the administerers of the ordeal are aware of this, and of the possibility of dipping the hand in melted metal ; and there are stories of arts of protecting the skin (see the recipe in Albertus Magnus, De Mirabil- tbus), though it is not known what can be really done beyond making it horny like a smith's, which would serve as a defence in stepping on hot coals, but not in serious trials like that of carrying a heavy red-hot iron. The fire- ordeals are still performed by mountebanks, who very likely keep up the same means of trickery which were in official use when the accused was to be acquitted. The actual practice of the fire-ordeal contrasts shamefully with its theory, that the fire rather than harm the innocent re- strained its natural action. Thus it stands in the Hindu code of Manu (viii. 115): "He whom the flame does not burn, whom the water does not cast up, or whom no harm soon befals, is to be taken as truthful in his oath." The water-ordeal here referred to is that well known in Europe, where the accused is thrown bound into the water, which receives him if innocent, but rejects him if guilty. The manner of carrying out this test is well explained in the

directions given by Archbishop Hinemar in the 9th cen- tury: he who is let down into the water for trial is to be fastened by a rope, that he may not be in danger if the water receives him as innocent, but may be pulled out. In the later Middle Ages this ordeal by "swimming" or "fleeting" became the most approved means of trying a suspected witch: she was stripped naked and cross bound, the right thumb to the left toe, and the left thumb to the right toe. In this state she was cast into a pond or river, in which it was

thought impossible for her to sink. (Brand, vol. iil. p. 21.) The cases of "ducking" witches which have occurred in England within the last few years are remains of the ancient ordeal.

If there is one thing that may be predicated of man in a state of nature it is that two disputants tend to fight out their quarrel. When in the warfare of Greeks and Trojans, of Jews and Philistines, of Vandals and Alamans, heroes come out from the two sides and their combat is taken to mark the powers of the opposing war-gods and decide the victory, then the principle of the ordeal by battle has been practically called in. Among striking instances of the Teutonic custom which influenced the whole of medizval Europe may be cited the custom of the Franks that the princes, if they could not quell the strife, had to fight it out between themselves, and Wippo's account of the quarrel between the Christian Saxons and the Pagan Slavs as to which broke the peace, when both sides demanded of the emperor that it should be settled by duel, which was done by choosing a champion on each side, and the Christian fell. The Scandinavian term "holmgang" refers to the habit of fighting duels on an island. A passage from old German law shows the single combat accepted as a regular legal procedure : "If there be dispute concerning fields, vineyards, or money, that they avoid perjury let two be chosen to fight, and decide the cause by duel" (Grimm, Rechtsalterth., p. 928), In England, after the Conquest, trial by combat superseded other legal ordeals, which were abolished in the time of Henry III. Among famous instances is that of Henry de Essex, hereditary standard-bearer of England, who fled from a battle in Wales, in 1158, threw from him the royal standard, and cried out that the king was slain. Robert de Montfort afterwards, accusing him of having done this with treasonable intent, offered to prove his accusation by combat, and they fought in presence of Henry II. and his court, when Essex was defeated, but the king spared his life, and, his estate being confiscated, he became a monk in Reading Abbey. A lord often sent his man in his stead to such combats, and priests and women were ordinarily represented by champions. The wager of battle died out so quietly in England without being legally abolished that in the Court of King's Bench in 1818 it was claimed by a person charged with murder, which led to its formal abolition (Ashford v, Thornton in Barnewall and Alderson, 457; see details in H. C. Lea, Superstition and Loree, ii.). A distinct connexion may, however, be traced between the legal duel and the

illegal private duel, which has disappeared from England in our own time, but still flourishes in France and Germany. (E. B. T.)

ORDER, or Orprnation (Ordo seu sacra ordinatio), one of the seven sacraments of the Roman Catholic Church (see SAcRAMENT), is the rite by which the ministers of that church, in their respective ranks as priests, deacons, subdeacons, acolytes, exorcists, lectors, and doorkeepers (ostiarii), receive power and grace for the discharge of their several functions. The nature of these functions is stated in separate articles (see ACOLYTE, &c.). The sacrament of order or ordination cannot be administered except by a bishop. The seven ranks just mentioned are themselves called "orders," the first three being distinguished as the

"major" or " holy" orders (ordines majores, sacra); the others are "minor" (ordines minores). Within the order of the priesthood itself there are various degrees of power and dignity :—(1) that of priest, pure and simple ; (2) that of bishop; (3) that of archbishop; (4) that of patriarch (see BisHop, &c.). For a brief statement of the points of difference as to ecclesiastical orders between the Roman Catholic and the Orthodox Greek Churches, see vol. xi. p. 159. The Church of England expressly recognizes the diaconate and the priesthood, but no others, as distinct orders; bishops and archbishops are "ordained and conse- crated." In the 25th Article the name of sacrament is deliberately withheld from orders. Compare the articles CierGy, Eprscopacy, INDEPENDENTS, MonacHisM, PREs-BYTERIANISM.

ORDERICUS VITALIS, the author of a History of con- siderable value in relation to England and Normandy in the 11th and 12th centuries, was born in the year 1075 at Atcham near Shrewsbury. His father, Odeler of Orleans, was one of the followers of Roger Montgomery, a powerful baron who had accompanied William the Conqueror from Normandy, and in whom that monarch reposed especial confidence. Roger had at one time cruelly despoiled the abbey of St Evroul en Ouche, and in his latter years sought to make reparation by bestowing large gifts of benefices and lands on the society. In this manner Odeler also became interested in St Evroul. He was a married priest, and Orderic, the eldest of his three sons, who had at first

been sent by him to receive his education at Shrewsbury, was now at the age of ten years dedicated to the monastic life and sent to St Evroul. It was a Benedictine foundation, and at this time perhaps the most celebrated of all the schools in Normandy (Gallia Christiana, xi, 814-6). On the 21st of September 1085 the youthful Orderic received the tonsure and was admitted one of the oblates of the monastery. It was the feast of St Maurice, the commander of the legendary Theban legion, and Orderic's name, which seems to have been displeasing to the Norman ear, was now changed into that of Vitalis, one of Maurice's lieutenants. In March 1093 he was ordained a deacon, but was not admitted to priestly orders until 1107. We have it on his own testi- mony that he was treated with kindness in his new home, and his uneventful life was chiefly passed in a routine of religious observances and of such studies as the Benedict- ine rule was then interpreted to admit; but from this number, he tells us, pagan history was excluded. The discipline of the society at St Evroul was well maintained, and not a few of its members were worthy representatives of that spirit of devotion to learning by which their order was long so honourably distinguished. Orderic's superiors appear to have soon discerned his aptitude for literary labours, and at the suggestion of two of their number (Roger and Guérin) he first commenced to write the history of the foundation. Among his fellow-monks were men who had taken part in the expeditions of the Normans in Italy and Sicily, in the Crusades, and in the wars waged by William the Conqueror and his sons, and to such associations, as well as to the advantages which a resident at St Evroul would enjoy owing to its being a great centre of intercommunication, we must attribute much of the remarkably varied and minute information with which the Historia abounds. Travel, again, appears to have had for Orderic a special charm ; and, notwith- standing the difficulties interposed by his monastic vow, he twice revisited his native country, Croyland and Worcester having been his principal places of sojourn. We also find him at Cambrai, and in 1132 at Cluny at a great gathering of its celebrated order. In the year 1141, being, as he tells us, worn out with age and

infirmities, he was fain to bring his historical labours to a close, and it is inferred that his death occurred soon after. Although compelled to quit his

~~native country at so early an age, Orderic seems always to have felt himself an exile. In the title of his work he is careful to describe himself as "Angligena," and throughout the narrative he gives special prominence to whatever relates to England.~~

~~The Historia Ecclesiastica is divided into three parts. Of these the first, in two books, gives an outline of the history of the church from the commencement of the Christian era to the death of Pope Leo IV. in 855, a list of the popes from that date to Innocent II. being appended. The second part—the first in order of com- position (see supra)—is the Historia Uticensis, or history of the monastery of St Evroul from its foundation by Abbot Ebrulf in the year 560 to the narrator's own time; it contains many interesting sketches of the abbots and other members or benefactors of the society. The third part—the only genuinely historical portion of the work—is in seven books, and is devoted to a general account of events in Western Christendom from Carolingian times down to the year 1141. With the year 1084 (after a considerable break in the narrative) the work begins to assume its peculiar value as a storehouse of information with respect to the history and social condition of England and Normandy in the latter part of the llth and first half of the 12th century. In striking contrast to the ordinary chroniclers of his age, Orderic collected and recorded with scrupulous care numerous facts and incidents which others would have deemed too insignificant for notice. But there is no work relating to the same period, says Guizot, which throws so much light on the political, civil, and religious aspects of society in the West, and the conditions of feudal, monastic, and ordinary life. These merits, however, are in no slight degree obscured by Orderic's singularly involved style and turgid diction, while his absolute disregard of method renders his uarrative at times difficult to comprehend and follow.~~

~~In addition to the Historia there exists in the library at Rouen a manuscript edition of the Norman history of William of Jumiéges, which M. Leopold Delisle feels no hesitation in assigning to Orderic (see his Lettre d M. Jules Lair, 1873).~~

~~The best edition of the Historia is that edited by M. Auguste Le Prévost, in five volumes (1838-55). In the concluding volume (pp. i.-cvi.) there is an~~

~~admirable account and criticism of Orderic by M. Leopold Delisle. The edition in Migne's Patrologia, vol. clxxxviii., though a later publication, is a reprint of the less accurate text of Duchesne. A French translation by M. Guizot, in 4 vols., 8vo, was published at Caen in 1821-27; and there is an~~

~~English version (with Guizot's preface) by Thomas Forester, 4 vols., 1853-56, in Bohn's Antiquarian Library.~~

~~ORDERS OF KNIGHTHOOD. See KnicutHoop.~~

~~ORDINARY is the legal name for a bishop or other person with original ecclesiastical jurisdiction when exercis- ing the functions of his office. He is so called " quia habet ordinariam jurisdictionem in jure proprio et non per depu- tationem " (Coke upon Littleton, 96a). The word is also used in a non-ecclesiastical sense. By the Divorce Act, 1857, 20 and 21 Vict. c. 85 8q., the judge appointed by that Act had the title of Judge Ordinary. This title has now, however, become obsolete owing to the incorporation of the Divorce Court with the High Court of Justice by the Judicature Act, 1873. In Scotland the judge before whom a cause depends in the Outer House is called the Lord Ordinary in that cause, and the judge who officiates in the Bill Chamber is called the Lord Ordinary on the Bills. In the United States the ordinary possesses, in the States where such an officer exists, powers vested in him by the constitution and acts of the legislature. In South Carolina he is a judicial officer.~~

~~OREBRO, one of the most important cities in Sweden, the chief town of a province of its own nanie, lies on both sides of the Svarta about a mile above its entrance into Lake Hjelmar, and 160 miles by rail west of Stockholm. In great part rebuilt since the fire of 1854, it has quite a modern appearance. Besides the principal church, dating from the close of the 14th or beginning of the 15th century, but modernized in the 19th, the more conspicuous buildings are the castle, on an island in the middle of the stream, the new Gothic town-house, the theatre, and the hospital. In front of the town-house stands a statue by Qvarnstrém, erected in 1865, representing Engelbrecht, the nobleman who was elected administrator of the kingdom in 1435; and~~

~~Plate DOT.~~

in front of the principal hotel is an obelisk in honour of the Swedish Reformers Olaus and Laurentius Petri. Orebro has railway connexion with the mining districts round about, and carries on a trade with Stockholm by means of the Hjelmar Canal. The population was 2147 in 1749, 4227 in 1840, 9056 in 1865, and 11,785 in 1880.

Orebro was in existence in the 11th century. Its castle, erected by Birger Jarl in the 13th century, plays an important part in the early annals of Sweden ; and no fewer than twenty diets or important assemblies have been held either in castle or town. It is sufficient to mention the Orebro concilium of 1537, the diet of 1540 in which the crown was declared hereditary, and that of 1810 when Bernadotte was elected crown prince.

OREGON, one of the Pacific States of the American Union, is bounded N. by Washington Territory, E. by Idaho Territory, 8. by Nevada and California, and W. by the Pacific, and lies between 42° and 46° 15' N. lat. and 116° 45' and 124° 30' W. long. It has an area of 94,560 square miles, besides 1470 square miles of water- surface ; its average width from east to west is 345 miles, and from north to south 276 miles.

The State is divided by the Coast, Cascade, and Blue Mountains into well-marked sections, The Cascade range extends in an almost due north and south direction, parallel with the Pacific coast, and a little over 100 miles from it, entirely across the State, and thence northerly through Washington Territory into British Columbia; still farther north it forms the undefined boundary between the latter province and Alaska, In Oregon the range is heavily timbered, chiefly with coniferous evergreens, the principal trees being yellow, sugar, and scrub pine, yellow and white fir, several varieties of spruce, red and white cedar, yew, juniper, tamarack, and cypress; there is also a consider- able quantity of maple, ash, and alder, and some oak in the western foot-hills to the south. Its most striking feature is the number of beautiful cone-shaped peaks, ris- ing above the line of perpetual snow. Several quite low passes exist, which, however, are very little used. Com- mencing at the southern boundary of Oregon, the first of these peaks is Mount Pitt (9818 feet), flanked on all sides by outlying spurs and foot-hill ranges. Forty miles to the north stands Mount Scott (9016 feet), the eastern

slope of which, covered with ashes and light débris, is compara- tively easy of ascent; on the west the bluffs are almost perpendicular walls of igneous rock, sheltering great masses of snow. Mount Scott overlooks Mystic or Crater Lake, an elliptically-shaped basin of water about 5 miles long by 3 miles broad, entirely surrounded by unbroken cliff-walls ranging from 500 to 2000 feet; this occupies the crater of a gigantic old volcano of which Mount Scott is a portion of the eastern rim, all the rest having been carried away by erosion and other causes. Forty miles farther north is Diamond Peak (8807 feet high), which also gives evidence of being the south-eastern portion of an old crater rim. The portion of the mountain-chain from Mount Scott to Diamond Peak was a region of numer- ous volcanoes and of very extensive local lava-flows. It has a very high average elevation, and in it all the prin- cipal rivers of western Oregon have their sources: the Willamette, running to the north-west ; the Des Chutes, running to the north-east; the head-water streams of Klamath river, flowing to the south, and breaking through the range to the west; the Rogue river, flowing to the south-west; and the Umpqua to the west and north. The Three Sisters (in reality five) are the next marked peaks (about 9000 feet); they seem to be portions of an old crater rim, 12 miles in diameter, now broken and worn away. Mount Jefferson (about 10,200 feet) comes next, and then Mount Hood, the highest of all (11,225 feet). To the north of this the Columbia breaks through the range, having cut for itself a cafon, 4000 feet in depth,

through the overlying lava and far into the previously- formed conglomerate on which it rests.

Eastern Oregon is in its southern part a vast volcanic plateau, rocky and sterile, lacking water, and possessing few natural attractions. The great interior basin, with- out outlet to the ocean, extends far up into the State. In this region are a few lakes, generally alkaline and marshy sinks, fed by little streams which have their origin in the small neighbouring mountain masses. The principal vege- tation consists of several varieties of sage brush, dwarf pine, and juniper, the last furnishing the winter food of immense numbers of deer, which, during the summer, range through the highlands and glens of the Cascades. Many small peaks and ranges rise

~~from the plateau, all probably of volcanic origin, and some of them made up almost exclusively of blocks and masses of obsidian. From near its junction with the Boisée to the northern line of the State the Snake river forms the eastern boundary of Oregon, and nowhere in the world is there to be found a more perfect and impassable barrier than is formed by this river and its tremendous cafion, of which the walls (con- sisting of basaltic and kindred rocks) are from 2000 to 5000 feet in height, and so steep and precipitous that the most skilful mountaineer can scarcely find a place to ascend or descend them. In several cases the columnar black basalt takes wonderful shapes and produces most fantastic effects. The Snake in this part of its course is not navigable, and can never be made so. The northern portion of eastern Oregon is far superior in all its phy- sical characteristics to the southern. Confused masses, known as the Blue and Powder River Mountains, lie in the north-east, modifying the climate for the better, and giving many rich valleys and table-lands to the agricul- turist. 'The Grande Ronde, Umatilla, John Day, Burnt, and Powder rivers are the principal streams, and their main and tributary valleys are very lovely. The mount- ains are covered with pine of a very fair quality, with fir, cedar, and some maple, all of which is being rapidly cleared away. In the valleys cottonwood, willow, birch, aspen, and poplar grow freely. The hills are well stocked with the larger game, as bear, deer, mountain sheep, grey wolves, panthers, foxes, d&c., the valleys and lakes with feathered game in considerable variety, and the streams with trout and salmon. Many mines of gold and silver have been found in the Blue and Powder River Mount- ains, but none of remarkable richness. Nearly all the untimbered plains and valleys of north-eastern Oregon are covered with a rich growth of the hardy and nutritious "bunch grass." The soil is very deep, and, coming, as it does, from the disintegration of volcanic rocks, is very fertile. The Des Chutes river drains most of the eastern slope of the Cascades, flowing in a wild turbulent stream through a deeply-cut cafion. The river is so swift, crooked, and with such rugged banks and so many jagged rocks that it is deemed impracticable even for the lumberman's use in floating logs to the Columbia. ;~~

~~The warm oceanic current from Japan, flowing south along the coast, is the cause of the mild climate of western Oregon, and of the heavy and incessant rains with which it is visited, These rains, continued through the centuries,~~

have chiselled away the mountains, and, with other geo- logical agencies, produced the three principal valleys into which this portion of the State may be considered as divided,—the Willamette, Umpqua, and Rogue river valleys. The Willamette valley has an area of about 8000 square miles, and contains more than half the popu- lation and wealth of the entire State. Its lower portions are level loamy plains, covered with rank grass, and here and there great areas of lowland timber, such as alder, maple, ash, cottonwood, poplar, &c., and a vast profusion of

shrubbery. All about these lower plains are well-marked terraces, composing the higher levels, and from these, east, west, and south to the encircling mountains, are spread away the rolling fertile uplands, gradually merging into the dense fir and pine forests which crown the higher summits. Many things attest the former presence of an arm of the sea extending from Puget Sound to the southern end of the valley. Many basaltic ridges yet remain, but this rock has been largely washed away. Western Oregon is well supplied with the ordinary building stones, as granite, syenite, and sandstone. Marble and limestone are found in the extreme south-west, and a valuable cement stone in the valley of the Umpqua. The Umpqua is a rapid mountain stream, and its valley is narrow but extremely fertile. This and Rogue river break through the Coast range in cafions, deep, rugged, and heavily timbered. The valley of Rogue river is beautiful, with a delightful climate, but it has always been very difficult of access, and has only now been reached for the first time from the north by the railroad. Much gold has been taken from the placer mines of the valley, and the sands and gravels of nearly all the tributary valleys carry the precious metal. The country lying between the Coast range and the ocean is narrow and very rugged, with some small cultivable valleys very difficult of access. There are no good harbours on the coast, but the Government is making efforts to improve Coos and Yaquina bays and Port Orford.

The Columbia river enters the Pacific Ocean near the 46th degree of north latitude; it drains by means of its tributaries the western slope of the Rocky Mountains, from about the 42d to the 53d parallel, a distance of 900 niles. The area of its drainage-basin is nearly 245,000 square miles. The route of

communication by the Columbia has been of the greatest importance in the early develop- ment of Oregon, and its value increases daily. The head of navigation for sea-going ships is at Portland, about 100 miles up the Columbia and 12 miles up the Willamette. From this point up to the Cascades, river craft go freely with plenty of water at all seasons of the year, with, generally, the exception of a short time each winter when the river is frozen. The cascades of the Columbia are due north from Mount Hood, just on the central line of the range where it is cut through by the river. The obstruction to navigation here is complete ; but the Government has for several years been engaged in the construction of a canal which will make navigation continuous 45 miles farther, up to the Dalles, at the eastern base of the Cascades. Here there is another total obstruction, the river flowing swiftly through intricate channels, which seem to have been originally great cracks in a field of lava; surveys have been made, however, and plans prepared for improvements. Above the Dalles the Columbia is navigable for 190 miles and the Snake for 180. The Northern Pacific Railroad passes down on the Oregon side, through the cafion of the Columbia. The Columbia is noted for its beautiful scenery, for the great quantity of salmon taken from its waters, and for the dreaded bar at its mouth. The dangers from this bar have been greatly lessened of late years by improved pilot- age and more accurate knowledge of the phenomena ; and further ameliorations by the general Government are in contemplation.

The south-west warm winds from the Pacific distribute vapours over western Oregon abundantly in autumn, winter, and spring in dews, fogs, rains, and occasional snows, and over eastern Oregon in less amounts. The north-west summer winds are cool. The average tempera- ture in western Oregon is—in spring 52°, in summer 67', in autumn 53°, and in winter 39° Fahr, The thermometer

seldom rises above 90° in the hottest days of the summer, and rarely falls below 20° in the winter. In the thirteen years 1849-51 and 1858-68, two-thirds of the days were pleasant, and only one-third were either showery or rainy or snowy in the north-west part of the State. In the Willamette valley the average yearly rainfall is 44 to 54 inches, which is about the same as at

Philadelphia and at Davenport (Iowa). In the Umpqua and Rogue river valleys it is somewhat less. Thunder-storms seldom occur in the State, and cyclones and tornadoes are unknown.

Geology.—The geological history of the Cascade and Coast ranges of Oregon is very interesting. For an immense period before these ranges existed the primeval ocean washed the western shores of the great Rocky Mountain chain, and throughout the Paleozoic era and the whole Triassic and Jurassic periods of the Mesozoic era nuimer- ous rivers kept bringing down débris until an enormously thick mass of off-shore deposits had accumulated. This marginal sea- bottom became the scene of intense aqueo-igneous action in its deeply-buried strata, producing a line of weakness, which, yielding to the horizontal thrust produced by the secular contraction of the interior of the earth, was crushed together and swollen up into the Sierra Nevada and Cascade Mountains at the end of the Jurassic period. The range thus produced, as far as can be ascertained, was not of very great height, though probably higher to the south than tothe north. It existed for unknown centuries, and in its turn was the theatre of erosion and plant-growth, and was roamed over by the now extinct fauna of the Cretaceous and Tertiary periods, It was not yet covered by the great lava-flow and mountain range of the modern Cascades, but by forests of conifers and oaks. Beneath the overlying lava, where the Columbia breaks through the range, there is found along the water's edge, and for about 15 feet up- wards, a very coarse conglomerate of rounded porphyritic pebbles and boulders of all sizes up to 6 feet in diameter, held together by au imperfectly-lithified earthy paste. Above this conglomerate is a very distinct irregular old ground-surface bed, in which are found silicified stumps with roots extending over a diameter of 20 feet and penetrating into the boulder material beneath, evidently in situ. Resting directly on this forest ground-surface, and therefore en- closing the erect stumps, is a layer of stratified sandstone, 2 or 3 feet thick, filled with beautiful and perfect impressions of leaves of several kinds of forest trees, possibly of the very trees about whose silicified bases they are found ; this layer is not continuous, like the ground-surface on which it rests. Above this leaf-bearing stratuin rests a coarse conglomerate similar to that beneath at the water-level. Scattered about in the lower part of this upper con- glomerate and in the stratified sandstone, and sometimes lying in the dirt-bed beneath it, fragments of silicified drift-

wood are found. Above this last conglomerate, and resting upon it, rise the layers of lava, mostly columnar basalt, one above another, to a height of more than 3000 feet. The following order of events has been deduced from these facts by Professor Le Conte, their first observer.

The region of the Columbia river was a forest, probably a valley, overgrown by conifers and oaks. The subsoil was a coarse boulder drift produced by erosion of some older rocks. An excess of water

'came on, either by floods or changes of level, and the trees were

killed, their leaves shed and buried in mud, and their trunks rotted to stumps. Then came ona tumultuous and rapid deposit of coarse drift, containing drift-wood, which covered up the forest ground and the still remaining stumps, to a depth of one, perhaps several, hundred feet. The surface thus formed was eroded into hills and dales, and then followed the outburst of lava in successive flows, and the silicification of the wood and cementation of the drift by the percolation of the hot alkaline waters containing silica, Finally followed the process of erosion by which the present stream, channels, and valleys, whether main or tributary, have been cut to their enormous depths. The great masses of sediment sent down to the sea by the erosion of the primary Cascade range, form- ing a thick off-shore deposit, gave rise in turn at the end of the Miocene to the upheaval of the Coast range, the Cascade Mountains being at the same time rent along the axis into enormous fissures, from which outpoured the grand lava-floods, building the mount- ains higher, and covering the country for great distances. This is probably the grandest lava-flow known to geology, covering as it does an area of about 200,000 square miles. Commencing in middle California as separate streams, in northern California it becomes a flood, completely mantling the smaller and flowing around the greater inequalities. In northern Oregon and Washing- ton it becomes an absolutely universal flood, beneath which the whole original face of the country, with its hills and dales, mount- ains and valleys, lies buried several thousand feet. It covers the greater portion of northern California and north-western Nevada, nearly the whole of Oregon, Washington, and Idaho, and runs far into British Columbia on the north. The average thickness is

probably not far from 2000 feet, and the greatest (shown where the Columbia, Des Chutes, Snake, Salmon, and other rivers cut through it) about 4000 feet. To produce this many successive flows took place, and a very long period of time must have elapsed during which the volcanic actions were going on. During the period of these Cascade eruptions the Coast range was being slowly elevated, and became in its turn the scene of local volcanic action, which was, however, not very severe. At last the great fissure eruptions in the Cascades drew to a close by the fissures becoming blocked up ; the volcanic action was concentrated in a few localities, and the period of crater-eruptions followed. These eruptions con- tinued for a long time, almost to our own day, and to them the upbuilding of the snow-clad peaks is due. By the formation of the Cascade range there came into existence a grand interior basin, the waters of which collected into secondary reservoirs, some of very large extent, and were carried off by the rivers which have cut their way from the interior to the sea. The Columbia and its tributaries drained the northern part of this immense basin, and it was at this period, doubtless, that the Great Salt Lake of Utah assumed its once colossal proportions and found its outlet to the sea by the Snake and Columbia rivers. Then came the lava-floods, since denuded in places, exposing the Tertiary and Cretaceous beds, and furnishing evidence of the former condition of the region by the fossils found therein. At the end of the Miocene the Coast range was upheaved, and the lava-flows from the Cascade fissures commenced, but it was long before these reached the entire extent of the basins of Oregon, which continued to exist and to be endowed with life well into the Pliocene. The principal fossil beds of the State are those of the John Day, Des Chutes, and Grande Ronde countries, and near Christmas Lake in southern Oregon. The Glacial, Champlain, and Terrace epochs are very well illus- trated in several places, and have left marked evidences of their existence.

Fauna and Flora.—Since the occupation of the State by civilized men the grizzly, black, and cinnamon bears, grey wolf, coyote, panther, catamount, wild cat and polecat, deer, antelope, elk, and mountain sheep have slowly retreated from the settlements to the recesses of the hills. Fur-bearing animals have increased since the Hudson's Bay Company withdrew from the country. Silver foxes, martens, hares, rabbits, squirrels, raccoons, porcupines, beaver, otter, musk-rats, and seals are found in greater or less

abundance within the State. Salmon, sturgeon, trout, holibut, smelt, and other fish in countless numbers exist in the Columbia and its branches and in the bays and coast rivers, and oysters, shrimps, crabs, and clams along the shores. Eagles, hawks, cormorants, pelicans, gulls, cranes, albatross, vultures, buzzards, ravens, crows, Jays, robins, swallows, sparrows, rice-birds, yellow-birds, humming- birds, swans, geese, ducks, pigeons, and many other varieties of birds are found. Reptiles and insects are numerous.

The trees of Oregon include—Rhamnus Purshiana (bearberry), Acer cireinatwm (vine maple), A. macrophyllwm (large-leaved maple), Prunus (Cerasus) cmarginata, var. mollis (wild cherry), P. (C.) demissa (choke-cherry), Nuttallia cerasiformis (seam-berry, or squaw-berry), Cercocarpus ledifolius (mountain mahogany), Pyrus rivularis (Oregon crab-apple), P. sambucifolia (mountain ash), Crategus Douglasii (black haw), C. rivularis, Amelanchier canadensis (service-berry), Cornus Nuttallit (dog-wood), Sambucus glauca (elder), Arbutus Menzicsii (laurel, madrofio), Arctostaphylos pungens (manzanita), Fraxinus oregana (Oregon ash), Umbellularia (Oreodaphne) californica (myrtle), Myrica californica, Quercus chrysolepis (live oak), Q. densiflora, Q. Garryana (white oak), Q. Kelloggii (black oak), Castanopsis chrysophylla (chinquapin), Betula oceidentalis (birch), Alnus rhombifolia (alder), Salix lasiandra (willow), Populus tremuloides (quaking asp), P. trichocarpa, Taxus brevifolia (yew), Juniperus occidentalis (juniper), Cupressus (Chame- cyparis) Lawsoniana (Port Orford cedar), C. (Chamecyparis) Nut- kaensis (Sitka cedar), Thuya gigantea, Liboecdrus deeurrens (thick- barked cedar), Sequoia sempervirens (redwood), Abies concolor, A. grandis (white fir), A. nobilis, A. amabilis, A. subalpina, A. (Pseudotsuga) Douglasti, A. (Tsuga) Mertensiana (hemlock), .4. (Tsuga) Pattoniana (mountain hemlock), A. (Picea) Engelmanni, A. (P.) Sitchensis, Larix Lyallii (larch), L. occidentalis (larch, or tamarack), Pinus contorta (black pine, or jack pine), P. albicaulis, P. Lambertiana (sugar pine), P. monticola (silver pine), P. ponde- rosa, P. tuberculata.+

Agriculture, Manufactures, Commerce.—Wheat is the chief crop for home use and for export. All the smaller cereals are grown and produce largely. Flax is indigenous in southern and eastern Oregon ; it is cultivated both for seed and for lint. Maize gives a fair harvest, though the nights are too cool

~~for the best results. Vegetables of all kinds common to the temperate zone flourish, and orchard and garden fruits are sure. One species of clover is indigenous, but all varieties grow and spread rapidly over fields, pastures, and burnt forest lands.~~

~~Subjoined are the agricultural statistics for the years specified.~~

~~1 See List of the Trees of Oregon, published by Prof. G. H. Collier.~~

~~OREGON~~

~~1850. 1860. 1870. 1880.~~

~~Farm Produce.~~

~~Wheat, bushels…..... | 211,948 826,776 | 2,840,706 / 7,480,010 Oats, ee oe | 61,214 885,673 | 2,029,909 | 4,385,650 Barley, tie tat Coe 26,254 210,736 920,977 MIAN COM, 4,00 = een clet 2,918 76,122 72,138 126,862 Rye, 5 106 2,704 3,890 13,305 Buckwheat, ,, .../ sista 2,749 1,645 6,215 Potatoes, ISEINA ant pooooome unos dou 373 27,986 75,357 266,187 Hops) pounds' .....! 8 493 9,745 244,371 Tobacco ,, GQoutDS OOD 325 405 3,847 17,325 Liwe Stock and their Products. Value of live stock …... $1,876,189 | $5,946,255 | $6,828,675 | $13,808,392 Number of horses …..... 8,046 86,772 51,702 124,107 3 mules and asses | 420 980 2,581 2,804 as working oxen .. 8,114 7,469 2,441 4,182 Sc milch cows .. 9,427 53,170 48,325 59,549 a other cattle .. 24,188 98,492 69,431 352,561 3 BED. cos 15,382 86,052 318,123] 1,088,162 REE LPINS aoniacone: 30,235 81,615 119,455 156, 222 Pounds of butter …... 211,464 1,000,157 1,418,373 2,443,725 we (clreeset ete 36,980 105,397 79,838 153,198 » WOO] .....| 29,686 219,012 | 1,080,638 | 5,718,524 Farm Lands and Machinery. Number of farms . 1,164 5,806 7,587 16,217 Aéres in) ssevsese| 489,808} 2,060,539 | 2,889,952) 4,214,719 Ratio of improved land in 80°7 43°5 46°7 52°2 farms to total farm area, Value of farms ……..... $2,849,170 | $15,200,593 | $22,352,989 $56,908,575 » inplements and $183,423 $952,313} $1,293,717 | $2,956,178 machinery The statistics of manufactures are as follows :—~~

Manufactures, 1850. 1860. 1870. 1880. Establishments ..... 52 809 969 1,080 Capital .....| $848,600 | $1,837,238 | $4,376,849 | $6,812°056 Hands employed (average) .. 285 978 2,884 3,473 Wrest ce cee $388,620 | $635,256 | $1,120,173} $1,677,046

| Value of materials ..... $809, 560 | $1,431,952 | $3,419,756 | $6,954,436 » products ..... | $2,236,640 | $2,976,761 | $6,877,387 | $10,981,282 The principal industries ranked as follows in 1880 :— & Establish- ' Value of | Value of Selected Industries, ments. Capital. Material. | Product Meus and grist inill pro- 106 $1,286,200 | $2,978,714 | $8,475,531 ucts ee sash, doors, and 248 1,808,275 | 1,475,322 2,284,155 inds Woollen woods… 2… es… 10 566,800 227,486 549,080 Foundry and machine — shop 16 260,500 121,911 352,300 products Tin-ware, copper-ware, and 46 283,150 151,475 311,650 sheet-iron ware Other industries ..... 654 2,157,181 | 1,999,528 3,958,566 Total of all industries ....| 1080 $6,312,056 | $6,954,436 |. $10,981,232

Oregon has three ports of eutry—Astoria on the Columbia, Portland on the Willamette, and Coos Bay on the southern coast. The exports to foreign ports for the twelve months ending 31st July 1882 were $9,970,410; exports to domestic ports, $5,899,738 ; total exports, $15,870,148 ; wheat, $6,677,418 ; flour, $2,853,792 ; salmon, $2,484,761; wool, $1,488,360; oats, $417,640; lumber, $228,392. The salmon-canning business began in 1866 with a product of 4000 cases, valued at $64,000 ; the average annual value for the six years 1878-83 exceeded $2,000,000. Between Astoria and the cascades of the Columbia river there are about forty canneries. Over 1500 boats are employed in the fishery.

Railroads and Steamers.—In 1865 there were in Oregon 19 miles of railway open ; in 1875, 248 ; in 1880, 582; on 1st March 1884, 900 miles. Steamers ply twice a week between Portland and San Francisco (670 miles), and at frequent intervals on the Columbia river for 725 miles, on the Willamette 138 miles, and on the Snake river 180 miles.

Government and Finanec.—The statutes of Iowa and New York were the models of the provisional government of Oregon, and legislation has continued generally on these lines. The courts consist of a supreme court, with appellate jurisdiction, situated in Salem, the capital, and five circuit or

district courts, with county courts and justices' courts in every precinct of city and county. Cities have police courts also. There is a United States district court for Oregon, and a United States circuit court for Oregon with California and Nevada. The State debt in 1880 was $511,376, and local, county, city, and school debt was $377,126. The gross value of all property, as compiled from records in the office of the secretary of state in 1889, was $85,531,716; indebtedness, $22,300,912 ; exemption, $4,973,058 ; taxable property, $59,257,746 ; State tax, $325,917°38 ; wealth per head, $493°90.

Education.—In 1848 Congress granted to Oregon one-eighteenth of all the public domain for free schools. This area (3,387,520

OR E—

acres) was received by the State on its admission to the Union for the education of all its youth of both sexes. Congress also granted about twenty-six townships (500,000 acres) for a State university, and 90,000 acres for an agricultural college. A portion of these lands has been sold, and the proceeds have been made an irre- ducible fund for the objects named. The free-school system has been established in every county and almost every settlement. In Portland and other cities grades have been established from 'primary " to 'high school." The State university is established at Eugene City, and an agricultural college at Corvallis, This public-school system is supplemented by many corporate academies, seminaries, and colleges, and by parochial and private schools representing different denominations. A school for mutes and one for the blind have been established at Salem by the legislature. Ten institutions report as endowments $290, 132, yielding an annual income of $16,050, and thirteen report $35,166 from tuition, and a total annual income of $61,070. The number of children of school age (four to twenty years) is 65,216; enrolled in public schools 37,748, in private schools 5101. Public school expenses for the year ending 1st March 1882 amounted to $338,386 ; the

ublic schoolhouses numbered 1061, of the value of $684,298. The

nited States Indian Industrial Training School at Forest Grove, which numbers 146 pupils, taken from schools on the reservation, has become a

marked success. Of 119,482 white persons over ten years of age in 1880 only 3°6 per cent. were unable to write.

Charitable and Penal Institutions, —A State asylum for the insane at Salem has over 300 inmates. The State penitentiary is at Salem , the convicts are employed under contractors in various industries, subject to constant watch of officials.

Religion.—The statistics of 1875 report 351 religious organiza- tions of all denominations, with 242 church edifices, 320 clergymen, 14,324 communicants, and 71,630 adherents. The estimated value of church property was $654,000. The rank of the several denomina- tions in respect to numbers is approximately as follows: Methodists,

3aptists, Roman Catholics, Presbyterians, Episcopalians, Congre- gationalists, and five minor sects. The increase in seven years by immigration and other gains has been at least 35 per cent.

The Press.—Ovegon has 74 newspapers—72 in English and 2 in German. A weekly newspaper is published in every shire town, aud in many of the larger villages. Four daily papers are issued in Portland.

Cities and Chief Towns.—PoRTLAND (9.v.), on the Willamette, 115 miles from the ocean, is the chief city of the Pacific coast north of San Francisco (population in 1880, 17,577); Astoria is a commercial city of 3000 inhabitants, with large salmon-canning establishments, which do an annual business of over $2,000,000 ; Oregon City, at the falls of the Willamette, is a flourishing manufacturing town ; Salem (the capital), Albany, Corvallis, Eugene City, Roseburg, The Dalles, Pendleton, Union, and Baker City are places of rapidly- growing importance. :

Population.—The following statistics show the growth of the State during the last three decades : —

Census, Males. Females. Total. Pee UR ed 1850 8,278 5,016 13,294 (yl 1860 31,646 20,819 52,465 0°6 1870 53,131 37,792 90,928 0°9 1880 103,381 | 71,887 | 174,768 1°8

~~Of the total population in 1880 174 per cent. (80,503) were of foreign birth, 9472 being Chinese, 5034 Germans, 1557 Scandi- navians, 7918 British, and 3019 British Americans.~~

~~History. — Oregon at first included all the United States territory between the Pacific Ocean and the Rocky Mountains north of the 42d parallel, and thus had a total area of over 300,000 square miles. The Greek pilot De Fuca, in the service of Spain, in 1592, Admiral Fonte in 1640, and others had visited and mapped the coast as far as the 55th parallel. In 1792 Captain Robert Gray of Boston, in the ship "Columbia," discovered and ascended the river as far as Gray's Bay, and named the river after his vessel. Oregon was afterwards held by the United States Government to have been included in the sale of "Louisiana" by France in 1803. In 1804-5 Lewis and Clark explored the Columbia to its mouth and reported the great resources of the country. In 1810 Captain Winship, a New Englander, built the first house in Oregon, on the Columbia ; and in 1811 John Jacob Astor of New York estab- lished a fur-trading post 15 miles from the ocean at Astoria on that river. In 18138, during the war, his agent sold it to the North-Western Fur Company, who called it Fort George. Though restored to the United States after the war, it was held by the company, and in 1821 it passed, with their other possessions, into the hands of the Hudson's Bay Company. The British laid claim to Oregon by virtue of Drake's discovery of the coast in 48° N. lat. in 1558, of Cook's visit to De Fuca Strait in search of a north-west passage in 1778, and of the survey of the coast from 80° to 60° N.~~

~~lat., by order of the British Admiralty, made by Vancouver (who was with Cook in 1778), to find a north-west passage, and his dis- covery and ascent of the Columbia to the site of the present city of Vancouver in 1792.~~

~~OREL, or ORLoFF, a government of central Russia, bounded by Smolensk, Kaluga, and Tula on the N., and by Voronezh, Kursk, and Tchernigoff on the S., with an area of 18,040 square miles. The surface is an undulating plateau gently sloping towards the west ; the highest hills do not reach 900 feet, and none of the valleys are less than 450 feet above the sea. Geologically Orel consists prin- cipally of Lower Devonian limestones,~~

marls, and sand- stones, covered with Jurassic clays, the last appearing at the surface, however, only as isolated islands, or in the valleys, being concealed for the most part under thick beds of cretaceous chalk, marls, and sands. The Carboni- ferous limestones and clays (of the so-called Moscow basin) appear in the north-west only at a great depth. The Jurassic clays and marls are covered at several places with a stratum of clay containing good iron-ore, while the Devonian sandstones and limestones are worked for build- ing purposes. The whole is buried under a bed, from 30 to 40 feet thick, of boulder-clay and loess, the last covering extensive areas besides the valleys. The soil—a mixture of "black earth" with clay—is fertile, except in the Desna region, which is covered with sands and tough clays. The principal rivers are the Don, which forms the eastern boundary of the government and has many tribu- taries, the chief being the Sosna; the Oka, which rises in the district of Orel and receives the navigable Zusha and

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many smaller streams; and the Desna, with the Bolva, draining the marshy lowlands in the west. On the Oka, Zusha, Desna, and Bolva there is a brisk traffic in corn, oil, hemp, timber, metal, glass, china, paper, and building-stone. Marshes occupy large areas in the basin of the Desna, as also in several parts of that of the Oka; they are mostly covered with forests, which occupy from 50 to 65 per cent. of the districts of Bryansk, Trubtchevsk, and Karatcheff, while towards the east, in the basin of the Don, wood is so scarce that straw is used for fuel. The climate is moderate, the average yearly temperature at Orel being 41°*2 (14°°8 in January and 67°:0 in July).

The population, 1,596,900 in 1870, and 1,877,100 in 1881, con- sists almost exclusively of Great Russians belonging to the Greek Chnrch ; the Nonconformists are reckoned at about 12,000, the Catholics at 3000, and the Jews at 1000. The chief oecupation is agriculture, which is most productive in the east and towards the centre of the government. In 1877 59 per cent. of the province was under crops, the estimated yield being 7,196,000 quarters of corn and 1,212,000 quarters of potatoes. Of the grain

not used in the distilleries a large proportion is exported to the Baltic. Hemp and hemp-seed oil are extensively exported from the west to Riga, Libau, and St Petersburg. Tobacco is also cultivated with profit. Cattle-breeding and horse-breeding, though somewhat depressed within the last twenty years, are still in a better condition than in neighbouring governments,—the Orel breeds, both of carriage and of cart horses, being held in estimation throughout Russia. In 1881 there were 500,000 horses, 340,000 cattle, and 790,000 sheep. Bee-culture is widely diffused in the forest districts, as are also the timber-trade and the preparation of tar and pitch. Manufac- tures are rapidly increasing ; in 1879 there were 540 larger indus- trial establishments, employing 14,130 hands, and producing cast-irou rails, machinery, locomotive engines and railway waggons, glass, hemp-yarn and ropes, leather, timber, soap, tobacco, chemical produce, &c. There are also distilleries and a great many smaller oil-works and flour-mills. Karatcheff and Syevsk are important centres for hemp-carding ; Bolkhoff and Elets are the chief centres of the tanning industry ; while the districts of Elets, Dmitroff, and partly Mtsensk supply fiour and various food-pastes. At Bryansk a Government cannon-foundry employs 700 hands. The so-called "Maltsoff's works" in the district of Bryansk are worthy of men- tion as an industrial colony comprising several iron, machinery, glass, and rope works, where thousands of peasants find temporary or permanent employment; they have their own teclinical school, employ engineers of their own training, and have their own narrow- gauge railways and telegraphs, both managed by boys of the tech- nical school. Numerous petty trades are carried on by peasants, along with agriculture. The fairs held in many villages are animated, and have some importance for the cattle trade. Orel is divided into twelve districts, the chief towns of which are Orel (76,700 inhabitants), Bolkhoff (29,020), Bryansk (12,660), Dmitrovsk (6560), Elets (41,450), Karatcheff (11,200), Kromy (8050), Livny (21,170), Maloarkhanghelsk (3920), Mtsensk (14,200), Syevsk (9650), and Trubtchevsk (5170). ;

In the 9th century the country was inhabited by the Syeveryanes on the Desna and the Vyatichees on the Oka, who both paid tribute to the Khazars. The Syeveryanes recognized the rule of the princes of the Rurik family from 884, and the Vyatichees from the middle of the 10th century ; but the two peoples followed different histori- cal lines, the former entering into the

Suzdal principality, while the latter fell under the rule of that of Tchernigoff. In the 11th century both had wealthy towns and villages ; during the Tartar invasion these were all burned and pillaged, and the whole territory, lying as it did on the two chief lines of the Tartar advance, became a desert, where the Nogays encamped with their herds. With the fall of the Great Horde the western part of the country fell under Lithuanian rule and was the subject of repeated struggles between Lithuania and Moscow. In the 16th century the Russians began to erect new forts or to fortify the old towns, and the territory was rapidly colonized by immigrants from the north. In 1610 the towns of the present government of Orel (theu known as the Ukrayna or " border-region ") had an active share in the insurrection against Moscow under the pscudo-Demetrius, and suffered much from the civil war which ensued. They continued, however, to be united with the rest of Russia, and in the next century formed a basis for further Russian advance towards the south.

OREL, capital of the above government, lies at the confluence of the Oka with the Orlik, on the great line of railway to the Crimea, 238 miles south-south-west from Moscow. It has railway connexion also with Smolensk and the Baltic ports in the west, and with Saratoff, Tsari- tsyn, and Novotcherkassk in the south-east. It was founded

in 1566, but developed slowly, and had only a very few houses at the beginning of the last century. The cathedral, begun in 1794, was finished only in 1861. The town now possesses a military gymnasium (corps of cadets), a few secondary schools, a public library, and a theatre ; large storehouses for grain and timber, a spacious gostinoy dvor with numerous shops, and the offices of the municipal bank are perhaps its best buildings. The manufactures are rapidly increasing ; in 1879 the hemp-carding, hemp-spinning, and rope-making industries produced 1,020,000 roubles, the flour-mills about 300,000 roubles, and the aggregate from all the manufactures exceeded 2,000,000 roubles. Orel is one of the chief markets of central Russia for the trade in corn and hemp, as also in hemp- seed oil and tallow, which are shipped down the Oka or sent by rail. Metal wares, tobacco, kaolin, and glass ware are also exported, while salt, groceries, and

manufactured goods are imported for distribution throughout the villages of the government, or to be sent to the Don Cossacks. The population, 45,000 in 1875, was 76,700 in 1881.

ORENBURG, a government of south-eastern Russia, bounded on the N. by Ufa and Perm, on the 8. and E. by the steppe of the Orenburg Kirghiz, and on the W. by Samara, has an area of 73,890 square miles. Situated at the southern extremity of the Urals and extending to' the north-east on their eastern slope, Orenburg consists of a hilly tract bordered on both sides by steppes. The central ridge occasionally reaches an elevation of about 5000 feet ; there are several parallel ridges, which, however, nowhere exceed 2600 feet, and gradually sink towards the south. A great variety of geological formations are repre- sented within the government. Diorites and granites enter it from the north and appear at many places from under the Silurian and Devonian deposits. The Carboniferous limestones and sandstones, as also softer Permian, Jurassic, and Cretaceous deposits, have a wide extension in the south and east. Magnetic iron, copper, silver, and lead ores, auriferous sands, and salt from the lakes constitute the mineral wealth of Orenburg, along with its very fertile "black earth," which covers wide areas around the Urals. It is traversed from north to south by the Ural river, which also forms its southern boundary ; the chief tributaries are the Sakmara and the Ilek. The upper courses of the Byelaya and the Samara, tributaries of the Kama and the Volga, also lie within the government, as well as the affluents of the Tobol on the eastern slope of the Ural range. Numerous salt lakes occur in the district of Tchelabinsk ; but several parts of the flat lands occa- sionally suffer from want of water. Thirteen per cent. of the surface is under wood. The climate is continental and dry, the average temperature at Orenburg being 37°°4 Fahr, (4°°5 in January, 69° °8 in July). Frosts of — 38°, and heats of 98° are not uncommon.

The population (900,550 in 1870) numbered 1,120,700 in 1881. The increase is largely due to immigration, an extensive tract of uncultivated land which formerly belonged to the Bashkirs having recently been purchased by the Government officials and leased to immigrants from the interior of Russia. The inhabitants are mainly Great Russians, Bashkirs (26 per cent.), and Kirghiz (about 5 per cent.). The majority belong to the Greek Church, or are Nonconformists ; 27 per cent. are Mohammedans. The chief

occupations are agriculture and cattle-breeding. Although only 3°2 per cent. of the area is under crops, grain is both distilled and exported. In 1881 there were in the province 581,000 horses, 441,000 cattle, 880,000 sheep, and 65,000 pigs. Notwithstanding the abundance of iron and copper ore, mining is but little deve- loped. The industrial establishments (distilleries, tanneries, flour- mills, &c.) are few, and their aggregate production in 1879 was only 5,195,000 roubles, employing about 2200 workmen. The export trade in corn, skins, and tallow is of some importance, and the fairs at Orenburg, Troitsk, and Tchelabinsk yield large returns. There are five districts, the chief towns of which are Orenburg

(35,600 inhabitants), Orsk (14,350), Tchelabinsk or Tchelaba (9000), Troitsk (8300), and Verkhneuralsk (10,350).

ORE—ORE

The territory of the Orenburg Cossacks, which extends as a narrow strip up the Ural river, occupies the whole of the govern- ment east of the Ural mountains, and joins, by a narrow line of posts, the former line of blockhouses of the Siberian Cossacks, has an area of 85,820 square miles, with a population in 1880 of 290,800 Cossacks and 16,460 peasants ; 25,000 were Moslem Bashkirs.

ORENBURG, capital of the above government, is situ- ated on the right bank of the Ural river, 933 miles by rail south-east from Moscow. 'The fortress, which has eleven bastions and a circumference of 6300 yards, has lost its importance since the recent advances of Russia towards the south-east, and is falling into decay. The town, on the other hand, is rapidly increasing, and now includes the former suburbs of Golubinaya and Novaya. The population is 35,600. Orenburg has a military cadet school, two lower military schools, a lyceum, and various primary schools,—one of them for Kirghiz children. The inhabitants are chiefly occupied in agriculture and trade. The manufactures are few, but the trade is steadily increasing ; the imports include cotton, silk, furs, wool, cattle, and horses, while cotton and woollen stuffs, cotton yarn, leather, colours, sugar, and grain are exported. Orenburg is connected by rail with Samara on the Volga and with Moscow.

~~The government of Orenburg was formerly inhabited by the Kirghiz in the south and the Bashkirs in the north. The latter were brought under the rule of Russia in 1557, and the fort of Ufa was erected a few years later in order to protect them against the raids of the Kirghiz. The frequent risings of the Bashkirs and the continuous attacks of the Kirghiz led the Russian Govern- ment in the 18th century to erect a line of forts and blockhouses on the Ural and Sakmara rivers, which was afterwards extended south-westwards towards the Caspian, and eastwards towards Omsk. The central point of these military lines was the fort of Orenburg, originally founded at the confluence of the Or with the Ural (now Orsk), and afterwards removed (in 1740) 120 miles lower down the Ural river to its present site. In 1778 it was besieged by Pugatchoff, the leader of the great revolt of the peasantry, supported by the Bashkirs. The government of Oren- burg was created in 1774, embracing a wide territory which reached to the Volga, to the Caspian, and to Perm, the limits to the eastward being undefined. In 1865 this was divided into two governments,—Ufa in the north and Orenburg in the south. The steppe of the Kirghiz, which extends south of the Ural river towards the Caspian and the Sea of Aral, continued under the jurisdiction of the governor-general of Orenburg. Recently the steppe of the Orenburg Kirghiz has been incorporated with the newly-created provinces of Turgay and Uralsk ; and the territory of the Orenburg Cossacks, formerly independent, has been brought Within the government of Orenburg, and subdivided into districts.~~

~~ORENSE, an inland province of Spain, is bounded on the N. by Pontevedra and Lugo, on the E. by Leon and Zamora, on the S. by Portugal ('Traz oz Montes), and on the W. by Portugal (Entre Douro e Minho) and Pontevedra, and has an area of 2738 square miles. Its general char- acter is mountainous, and its products are those common to all Gazicta (¢.v.), of which historical province it formed a part. The principal rivers are the Minho and the Sil. The population in 1877 was 388,835; only one town (Orense) had a population exceeding 10,000.~~

~~ORENSE, capital of the above province, and the see of a bishop, suffragan to Santiago, stands on the western slope of Montealegre, on the left bank of the Minho. The river is here crossed by a bridge—one of the most remarkable in Spain—of seven arches, 1319 feet in length, and at its highest~~

point 135 feet above the bed of the river, built by Bishop Lorenzo in 1230 and repaired about the middle of the 15th century. The principal feature of the town is the Gothic cathedral, also dating from Bishop Lorenzo's time (1230) ; it isa comparatively small and unimportant build- i. : (13) ”] ing, but has a miraculous image, El Santo Cristo,” of wide celebrity in Spain, which was brought from Cape Finisterre in 1330. The three warm springs to the west of the town, known as Las Burgas, attract a considerable number of summer visitors ; the waters are similar to those of Carlsbad.

The trade and manufactures of the place are unimportant.

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Orense—the Agus Originis, or perhaps Salientis, of the Romans—in 1877 had a population, within the ayunta- miento, of 12,586.

ORESTES, son of Agamemnon and Clytemnestra. According to the legend in Homer, he was absent from Mycenze when his father returned from the Trojan War, and was murdered by Aigisthus. Eight years later Orestes returned, and revenged his father's death by slaying his mother and her paramour. Pindar mentions that his nurse saved him and conveyed him out of the coun- try when Clytemnestra wished to kill him. The tale is told much more fully and with many variations in the tragedians. He was preserved by his sister Electra, and conveyed to Phanote on Mount Parnassus, where king Strophius took charge of him. In his twentieth year he was ordered by the oracle to return home and revenge his father's death. According to Aischylus, he met his sister Electra before the tomb of Agamemnon, whither both had gone to perform rites to the dead; a recognition takes place, and they arrange how Orestes shall accomplish his revenge. Orestes, after the deed, goes mad, and is pur- sued by the Erinnyes, whose duty it is to punish any violation of the ties of family piety. He takes refuge in the temple at Delphi; but, though Apollo had ordered him to do the deed, he is powerless to protect his suppliant from the consequences. At last Athena receives him on the acropolis of Athens and arranges a formal trial of the case before twelve Attic judges. The Erinnyes demand their victim ; he pleads the orders of Apollo; the votes of the judges are equally divided, and Athena gives her cast- ing vote for acquittal. 'The Erinnyes are propitiated by a new ritual, in which they are worshipped as Eumenides (the Kindly), and

~~Orestes dedicates an altar to Athena Areia. Such is the account in which authorities generally agree, but Euripides introduces a different series of adven- tures after Orestes has taken refuge at Delphi. Apollo orders him to go to Tauris, carry off the statue of Artemis which had fallen from heaven, and bring it to Athens. He repairs to Tauris with Pylades, and the pair are at once imprisoned by the people, among whom the custom is to sacrifice all strangers to Artemis. The priestess of Artemis, whose duty it is to perform the sacrifice, is Iphigeneia, the daughter of Agamemnon, who had been transported hither by the goddess when her father was about to offer her (see IpHicENEIA). She offers to release Orestes if he will carry home a letter from her to Greece ; he refuses to go, but bids Pylades take the letter while he himself will stay and be slain. After a conflict of mutual affection, Pylades at last yields, but the letter brings about a recognition between brother and sister, and all three escape together, carrying with them the image of Artemis.~~

~~Orestes appears also as a central figure in the legends of many other places. In Cappadocia he introduced the worship of Artemis Tauropolos at Comana and Castabala. Near Gythium in Laconia was a stone called Zeus Cappotas ; here the madness left Orestes. In Troezen there was before the temple of Artemis a stone on which Orestes was purified, and a hut in front of the temple of Apollo Thearius in which he stayed till the purification was accomplished. Seven stadia from Megalopolis, on the left of the road to Messene, was a shrine of the Maniwz, ¢.e., the Erinnyes. Immediately beyond it was a tumulus, on the summit of which was an upright stone like afinger, Aax7v\ov Myfua, where Orestes bit off his own finger in his madness. Beyond the mound was another shrine of the Erinnyes, worshipped now as Eumenides in association with the Charites (see Graczs). Here the Erinnyes, who had hitherto appeared black to Orestes, appeared white to him, and the madness left him. Then he cut off his hair as an offering at a place Koupetov. The name of the tumulus is clearly connected with the belief still frequently occurring that a hand appears out of the tomb of any person who has murdered a mother or been murdered by her. The. tumulus itself was obviously one of those graves, which were especi- ally common in Lydia, a tumulus with a pillar on the apex; such tumuli were found in Laconia, where, as Atheneus says, they were called "the graves of the Phrygians who came with Pelops."~~

In these legends it is apparent that Orestes is the guilt-laden mortal who is purified from his sin by the grace of the gods ; his purification is a type of the merciful justice which the gods in- tend should be shown to all persons whose crime is mitigated by extenuating circumstances. These legends belong to an age when higher ideas of law and of social duty were being established ; the implacable blood-feud of primitive society gives place to a fair trial of the culprit, and in Athens, when the votes of the judges are evenly divided, mercy prevails. In the religion of Delphi similar ideas underlie the ancient festival Septerion: init Apollo himself is the murderer, and his example sets forth to mankind the method of purification which heaven opens to such sinners, if they are not entirely and wilfully guilty. Orestes is not a figure of the Apollo religion, but is clearly connected with the cultus of the Erinnyes ; and his relation to these goddesses, and the intention of the myth, are very plain in the Megalopolitan legend above mentioned. The Treezenian legend has no appearance of being really ancient, just as the tales that connect Orestes with the district Orestea in Arcadia, or Orestias in Epirus, are obviously fictions of a later time. On the other hand, the Orestes of Tauric and Cappadocian legend isa different person, connected with the spread of Artemis-worship ; it is not improbable that a similarity of name caused the identification of two heroes belonging respectively to the cultus of Artemis and of the Erinnyes.

Orestes had an historic part assigned to him as Greek mythology became systematized. Phocian auxiliaries restored him to the throne of his father, and, according to HHellanicus, he began the HHolic migration to Asia Minor. HHe was buried on the road from Tegea to Thyrea, and HHerodotus (ii. 67) tells a quaint story of the manner in which the Spartans discovered his bones and, in obedience to an oracle, carried them to Sparta.

ORFA. See Epzssa, vol. vii. p. 652.

ORFILA, Marutev JosepH BonaVENTURE (1787-1853), the founder of modern toxicology, and one of the most eminent of the French school of medicine during its brightest period, was by birth a Spaniard, having been born at Mahon in Minorca on 24th April 1787. An island merchant's son looked naturally first to the sea for a pro- fession ; but a voyage at the age

~~of fifteen to Sardinia, Sicily, and Egypt did not prove satisfactory. He next took to medicine, which he studied at the universities of Valencia and Barcelona with so great applause that the local authorities of the latter city granted him a pension to enable him to follow his studies at Madrid and Paris, preparatory to appointing him professor. He had scarcely settled for that purpose in Paris when the outbreak of the~~

~~logical action, and on the means of detecting them. Few branches of science, so important in their bearings on every-day life and so difficult of investigation, can be said to have been created and raised at once to a state of high advancement by the labours of a single man.~~

~~ORFORD, Earts or, See WALPOLE.~~

~~ORGAN. The notes of the organ are produced by pipes, which are blown by air under pressure, technically called wind. Pipes differ from one another in two principal ways—(1) in pitch, (2) in quality of tone. first a series of pipes producing notes of similar quality,~~

~~but differing in pitch. Such a series is called a stop. Stops.~~

~~Each stop of the organ is in effect a musical instrument in itself. (2) The pipes of different stops differ, musically speaking, in their quality of tone, as well as sometimes in their pitch. Physically, they differ in shape and general arrangement. 'The sounding of the pipes is determined by the use of keys, some of which are played by the hands, some by the feet. A complete stop possesses a pipe for every key of some one row of manuals or pedals. If one stop alone is caused to sound, the effect is that of performance on a single instrument. There are such things as incom- plete stops, which do not extend over a whole row of keys ; and also there are stops which have more than one pipe to each key. Every stop is provided with mechanism by means of which the wind can be cut off from its pipes, so that they cannot sound even when the keys are pressed, This mechanism is made to terminate in a handle, which is commonly spoken of as the stop. When the handle is pushed in, the stop does not sound; when the handle is pulled out, the stop sounds if the keys are pressed. An organ may contain from one to four~~

manuals or keyboards and one set of pedals. There are exceptional instruments having five manuals, and also some having two sets of pedals, half octaves, from C to g pedal is two and a half octaves, from C to f. This repre- sents the pitch in which the notes of the pedal are written ; but the pedal generally possesses stops sounding one octave lower than the written note, and in some cases stops sounding two octaves below the written note. Each

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(1) Consider .

The usual compass of the manuals is four and a Com- inclusive. The compass of the pass.

manual or pedal has as a rule one soundboard, on which Sound- all its pipes are placed. Underneath the soundboard is board, the windchest, by which the wind is conveyed from the ©

Spanish war, in 1807, threatened destruction to his pro- spects. But he had the good fortune to find a parent in a merchant uncle at Marseilles, and a patron in the good

and great Vauquelin the chemist, who braved the wrath of Napoleon against the Spaniards, claimed him as his pupil, guaranteed his conduct, and saved him from expulsion from Paris. Four years afterwards he graduated, and immedi- ately became a private lecturer on chemistry in the French capital. In 1819 he was appointed professor of medical jurisprudence, and four years later he succeeded Vauquelin as professor of chemistry in the faculty of medicine at Paris, In 1830 he was nominated dean of that faculty, a high medical honour in France. Under the Orleans dynasty, honours were lavishly showered upon him: he became successively member of the council of education of France, member of the general council of the department of the Seine, and commander of the Legion of Honour. The republic of 1848 put an end to these adventitious dis- tinctions ; and chagrin at the treatment he experienced at the hands of the Governments which succeeded that of Louis Philippe is supposed to have shortened his life. He died, after a short illness, in March 1853.

Orfila's chief publications are four in number :—On General Toxt- ecology (1814), On Medical Jurisprudence (1823), A Treatise on Chemistry (1817), and Medieo-legal Exhumations (1836); but he also wrote many valuable papers, chiefly on subjects connected with medical jurisprudence. HIs fame will rest mainly on the first- named (7'raité de Toxicologie Générale), published when he was only in his twenty-seventh year. It is a vast mine of experimental

observation on the symptoms of poisoning of all kinds, on the appearances which poisons leave in the dead body, on their physio-

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bellows, through the soundboard, to the pipes. In large organs there may be two or more soundboards for one manual or pedal. The windchest contains the mechanism of valves by which the keys control the admission of wind to the soundboard. The soundboard contains the grooves which receive the wind from the valves, and the slides by which the handles of the stops control the transmission of the wind through the soundboard to the pipes of the different stops.

The grooves of the soundboard are spaces left between wooden bars glued

on to the table of the

soundboard. There

is usually one groove

for every key. The ' grooves of the bass

notes, which have to

supply wind for large

pipes, are broader

than those of the

~~treble. The bass bars~~

~~are also thicker than~~

~~those of the treble, |~~

~~that they may the~~

~~better support the fro.1, —A portion of the table with the open great weight which grooves seen from below.~~

~~rests on the bass portion of the soundboard. 'The table~~

~~Pipes. Pipes are divided first in- $4.5 —A section abrightangles to | #gainst it. The free end of this wire is touched with the to flue-pipes and reed-pipes. fig. 2. tuning tool until a satisfactory note is produced. Flue-pipes are blown by a wind mouthpiece characteristic The pitch of the different stops is commonly denoted by Foot- of the organ, while in reed-pipes the wind acts on a metal | the conventional approximate length of the pipe sounded length, tongue vibrating on a7 by C, the lowest key of the manual. Even in incomplete ¥ am, reed, and the motion of stops which have no bass, the length of the pipe which C ~ the tongue , determines would have if the stop were extended down serves to the speech of the pipe. indicate the pitch. Pipes are made either The conventional length of the C-pipe for stops having of wood or of metal. Wood the normal pitch of the keys is 8 feet; a pipe having flue-pipes are generally of twice this length sounds the octave below, a pipe having the form of a rectangular half that length the octave above, and so on. Thus stops parallelepiped, metal flue- ° which sound the octave below the normal pitch of the keys pipes of a cylindrical ; are spoken of as 16-foot stops. Even where the pipes are shape. Reed-pipes are 7" o* Hahei Ng Adon it appears | stopped so that the actual length is only 8 feet, they are conical or pyramidal, and of the stops; the sinall circles show the | spoken of as having "16-foot tone." Similarly 32-foot widen towards the top, les for the wind. stops sound two octaves below the normal pitch of the Some flue-pipes are made with stopped ends; these asa | keys. But if these notes are produced by stopped pipes, rule sound a note about an octave lower than the corre- | whose actual length is only 16 feet, they are spoken of as sponding open having " 32-foot tone." Sixteen-foot and 32-foot stops~~

are pipes of the same [specially characteristic of the pedal, where the names also length. Suchare signify the length of the open pipe which would sound the the stopped dia- note actually produced by the lowest C. In old organs, pason, bourdon, where the modern compass was not adopted, it was not and stopped flute. unusual to find stops spoken of as of 12 feet or of 24 feet. Reson- The general ele- In these cases the lowest note was frequently F. Old auce of mentary theory of English organs, however, more often had G for their lowest Pipes. the resonance of a note. The designation of the stops in these cases had be-

ORGAN

forms the top of the grooves. closed below with ==> leather, except the opening left ineach, which is closed by the key-valve or pallet,

The sliders are connected with the draw-stops or stop- handles, which are covered in with stout wpper boards, on which the pipes stand. The stop-handles are pulled out, and holes are then bored straight

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boards, sliders, and table to Jit yy pa

admit the wind from the TT AUNT

VAAN

The grooves are generally

rr Rearas —S

Fic. 2, —A section of a groove, with the table, windchest, and pallet.

grooves to the pipes. When the sliders are shifted by pushing in the handles, the holes no longer correspond, and the pipes are silenced.

pipe is tolerably

829

pieces is a much more difficult matter, into which we cannot here enter.

In reed-pipes which are simply conical the resonance of the body is nearly the same as that of an open pipe of the same length. Where the form is irregular no simple rule can be given. But the resonance of the body of the pipe is generally the same as the note produced. The tongue of a reed-pipe alter- nately opens and closes the aperture of the reed. In this way it admits pulses of wind to the body of the pipe; these, if they recur at the proper intervals, maintain its vibration, which takes place when the note produced cor- dn anlar responds to the resonance of the pipe. The reed itself has its vibrating length determined by a wire which presses

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Fic. 6.—Mouthpieces in somewhat

Of

come rather anomalous, and need not be entered into.

simple. The effec- stops higher than the normal pitch of the keys, the octave tive length of the is denoted by 4 feet if made with open pipes, 4-foot tone pipe is determined if stopped ; the twelfth is commonly spoken of as 23, the by measuring from fifteenth or double octave as 2 feet. Higher-sounding stops

the upper lip to the open end in open pipes, and from the upper lip to the stopper n é % d and back be ou Fra. 5.—a, an open diapason ; b, a stopped diapason ; stopped pipes. To " ¢, an oboe; and d, a trumpet,—c and d being forms this is added an ° teed-pipes.

allowance for the effect of each opening, since the condition of perfect freedom from constraint. does not subsist at the opening itself. The corrected length is traversed twice (backwards and forwards) by sound, in the time of one vibration of the resultant note. This describes in a rough and general manner the way in which any disturbance gives rise to the note of the pipe; but the theory of the mouth-

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are occasionally used, but these generally form part of "mixtures," and the foot-lengths of the separate ranks are not usually given.

The true or accurate lengths of the pipes vary within considerable limits. The base of the scales (dimensions) varies according to the standard of pitch, and the voicing and the complicated natural laws of pipes produce other deviations from simple relations, so that the conventional dimensions can only be regarded as a simple means of classifying the stops according to their pitch-relations. For this purpose they are essential; they are continually appealed to in discussion and description ; and they are almost invariably marked on the stop-handles in all countries, so that a moderate knowledge of foreign nomen- clatures, combined with the habit of seizing the meaning

Manuals.

Great organ.

of the figures such as 16, 8, 4, on the stop-handles, will frequently suffice as a key to the complexities of a foreign organ.

Each of the manuals, or rows of keys, of an organ con- stitutes a separate organ, which is more or less complete in itself. The names of the different manuals or organs are great organ, swell organ, choir organ, and solo organ. The fifth manual, where it occurs, is the echo organ. The above is the usual order in point of development and frequency of occurrence, although the solo is sometimes preferred to the choir organ. The great organ is in a certain sense the principal department of the organ. It may be regarded as formed by a completely developed series of those funda- mental stops which constitute the solid basis of the tone of the instrument. If an instrument be constructed with only a single manual this necessarily assumes, in general, the characteristics of a great organ. The great organ is called "grande orgue" in French, and first manual or " haupt- werk " in German.

~~*It is proposed to describe the principal organ-stops under the heads of the manuals to which they belong. The enumeration will not be exhaustive, but will include all the usual types.*~~

~~*The great organ commences generally with stops of 16-foot length or tone in large instruments. In some cases a 32-foot sounding stop is introduced, but this cannot be said to be a proper characteristic of the great organ. The foundation tone is of 8 feet; the stops of higher pitch serve to add brilliancy; those of 16 feet, which sound the octave below the normal pitch, serve to add gravity and weight to the tone. Sixteen-foot stops are commonly spoken of as "doubles," their conventional length being twice that of stops of normal pitch.*~~

~~*The 16-foot stops are the 16 double open diapason, and the 16 bourdon or double stopped diapason, to which, in very large instruments, there may be added a 16 double trumpet. The double open diapason on the great organ consists usually of metal pipes, having moderate "scale" or transverse dimensions. These are of the same general character as the pipes of the ordinary open diapason, though they are made somewhat less powerful. In the better instruments of the second class as to size this stop alone would probably be regarded as representing suitably and sufficiently the class of doubles on the great organ. It gives great body to the general tone, and appears de- cidedly preferable to the bourdon, which frequently takes its place. The 16 double dulciana may be regarded as a variation of the double open diapason. It is sometimes used where the full effect of a double open is not considered desirable. It possesses the light and not full tone of the dulciana. It does not appear to be peculiarly suitable for the purposes of a double.*~~

~~*The 16 bourdon or double stopped diapason, when used on the great organ, is made of rather small scale and light tone. It gives great body to a large great organ, and affords interesting combinations with other stops, such as the 4-foot flute. It is used either alone in smaller organs of the second class or in addition to a double open in larger instruments. The notes are produced from wooden pipes of rectangular section, stopped at the end, and having half the conventional length,*~~

~~The 16 double trumpet is a trumpet (large reed stop) sounding the octave below the normal pitch. It is used generally in instruments of the largest size, but is some- what more common in Germany. It is useful in giving a massive character to the tone of the full great organ, which is otherwise apt to become disagreeable on account of the great development of stops of a piercing character. If, however, the double trumpet is rough in tone, it is apt to communicate to the whole a corresponding impression.~~

~~ORGAN~~

~~The judicious balancing of such elements as the double trumpet and the piercing stops such as mixtures is one of the principal features of a good German great organ.~~

~~We now proceed to the 8-foot stops (the reeds come at Great An ordinary great organ organ may contain 8 stopped diapason, 8 open diapason ® 'et~~

~~the end according to ordinary usage).~~

~~(one or more), 8 gamba, and 8 hohlfléte. The 8 stopped diapason on the great organ is usually of wood, of mode- rate scale, and some considerable fulness of tone. The actual lengths are about half the conventional lengths. These pipes are sometimes made of metal. Few stops admit of more variety and individuality in their quality of tone than the stopped diapason; but too frequently the great organ stopped diapason fails to attract attention on its merits, being regarded simply as an inconsiderable por- tion of the foundation tone.~~

~~If there is any one stop which in itself represents the organ as a whole it is the open diapason. The pipes of this stop are the typical metal pipes which have always been characteristic of the appearance of the organ. A single open diapason stop is capable of being used as an organ of sufficient power for many purposes, though of course without variety. The pipes of this stop are called "principal" in German, this appellation apparently corre- sponding to the fact that they are the true and original organ-pipes. The English appellation of " diapason" has been taken to mean that these are the normal pipes which run through the whole compass. This, however, does not appear to be the actual derivation of the term ; originally it is~~

~~technically applied to the organ-builder's rule, which gives the dimensions of pipes; and it appears that the application to the stop followed on this meaning.~~

~~The scales, character, and voicing of the open diapason vary with fashion, and are different in different countries. We may distinguish three principal types. The old English diapasons of the days before the introduction of pedal organs into England were characterized by a rich sweet tone, and were not very powerful. They were generally voiced on a light wind, having a pressure equivalent to that of a column of water of from 2 to 24 inches. The scale was in some cases very large, as in Green's two open diapasons in the old organ at St George's, Windsor ; in these the wind was light and the tone very soft. In other cases the scale was smaller and the voicing bolder, as in Father Smith's original diapasons in St Paul's Cathedral, But on the whole the old English diapasons presented a lovely quality of tone. English travellers of those days, accustomed to these diapasons, usually found foreign organs harsh, noisy, and uninterest- ing. And there are many still in England who, while recognizing the necessity of a firmer diapason tone in view of the introduction of the heavy pedal bass, and the corresponding strengthening of the upper departments of the organ tone, lament the disappearance of the old diapason tone. However, it is possible with care to obtain diapasons presenting the sweet characteristics of the old English tone, combined with sufficient fulness and power to form a sound general foundation. And there can be no doubt that this should be one of the chief points to be kept in view in organ design.~~

~~The German diapason was of an entirely different character from the English. The heavy bass of the pedals has been an essential characteristic of the German organ for at least two or three centuries, or, as it is said, for four. The development of the piercing stops of high pitch was equally general. Thus foundation work of comparatively great power was required to maintain the balance of tone; the ordinary German diapason was very loud, and we may almost say coarse, in its tone when compared with the old English diapason. The German~~

stop was voiced as a rule on from 33 to 4 inches of wind, not quite twice the pressure used in England.

The French diapason is a modern variety. It may be described as presenting rather the characteristics of a loud gamba than of a diapason. In other words, the tone tends towards a certain quality which may be described as "tinny" or metallic, or as approaching to that of a string instrument of rather coarse character. Some modern English builders appear to aim at the same model, and not without success.

The tone of a diapason must be strong enough to assert itself.

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If any such use is made of the flute it is desirable that it should not be too strong; but its habitual use to give point to the diapasons is in every way to be deprecated. If the diapasons are not strong enough, let them be altered ; but that the diapasons of any organ should never be heard without the accompaniment of a 4 flute is a barbarism. The ordinary use of the 4-foot stops is to add a degree of loudness to the diapasons. This is accompanied with a certain measure of keenness, which may become disagree- able if the 4-foot tone is disproportionately strong. The ordinary practice is to use the 4-foot tone very freely.

It is the foundation of the whole organ tone. It is the voicer's business to satisfy this condition in con- junction with the requirement that the tone shall be full

The 22 twelfth stop sounds fiddle g on the C key. It Great is composed of diapason pipes, rather small and gently organ voiced. Its use is said to be to thicken the tone, which oan at it certainly does. a

and of agreeable quality.

The 8 spitzfléte may be regarded as a variety of open diapason. The pipes taper slightly towards the top, and the quality is slightly stringy. This stop was much used at one time in place of a second open diapason. But it appears better that, where two open diapasons are desir- able, they should

~~both be of full diapason quality, though possibly of different strengths and dimensions. The ad- mixture of stringy qualities of tone with the diapasons is always to be deprecated.~~

~~The 8 gamba was originally an imitation of the viola da gamba, a sort of violoncello. When made of a light quality of tone it is a pleasing stop; but its use in the great organ instead of a second open diapason is greatly to be deprecated for the reasons just stated. It is frequently found that, where a gamba is provided on the great organ, it is necessary to remove it from the compositions (mechanical arrangements for pulling out the stop-handles in different combinations), as the tone does not blend.~~

~~The 8 hohlfléte is an open flute, usually of wood, and of small scale. If made to a moderate scale and fully voiced it possesses a full pleasant tone, which is a useful support to the foundation tone of the great organ. The 8 clarabella differs from the hohlfléte in being usually of rather large scale, and having the open pipes only in the treble. In old organs a separate bass was generally provided ; now it is more usual to supply the stop with a stopped bass. The dulciana and keraulophon, though sometimes found on the great organ, are regarded as more appropriately placed elsewhere.~~

~~But how far the particular effect pro- duced is desirable is another question. It is generally necessary that this stop should be accompanied by the fifteenth or other octave sounding stop of higher pitch. But in some cases the twelfth can be used with notes of lower pitch only. One such combination is—twelfth, full-toned 8-foot harmonic flute, soft reed in 16-foot pitch. This combination is sometimes used in single notes for solo purposes. The sound of the twelfth appears to be masked or absorbed by the volume of tone of lower pitch. These combinations require careful handling, as the effect of the twelfth is offensive if it remains distinctly perceptible.~~

~~The 2 fifteenth, or superoctave, of the great organ con- sists of diapason pipes sounding notes two octaves above the normal pitch of the keys. The 2 piccolo is a fluty stop of less power, having the same pitch. The 2-foot tone is commonly used as giving a degree of loudness to the great organ beyond that obtainable with the 4-foot tone.~~

The modern great organ fifteenth is generally a very powerful stop, and requires great caution in its use in organs of moderate size, or in limited spaces. The old English high pitched stops had little power, and their brilliancy was capable of pleasing without offence. The modern great organ up to fifteenth can only be heard with comfort in very large spaces. Under such suitable circumstances the fifteenth is capable of giving to the whole tone a ringing or silvery character, which lends itself specially to contrast with the tone of reeds. This peculiar keen tone, however, requires for its full develop- ment the mixtures.

Mixture, sesquialtera, furniture, cymbal, scharf, cornet, are various names applied to a description of stop which

Great The 4-foot stops of the great organ comprise the 4 prin- organ gipal and the 4 flute. The 4 principal is the octave of the | possesses several ranks, or several pipes to each note. The 4 feet. nen diapason, generally of somewhat reduced scale and | pipes of each note sound a chord, which is generally com-

light but bright quality of tone. The use of the word "principal " in connexion with this stop is purely English, and is said to be connected with the use made of it as the standard of tuning for the whole organ. The Germans and French both designate this stop as '" octave."

Of the 4 flute there are several varieties,—open, stopped, wood, metal, and harmonic. The harmonic flute has open metal pipes of double the conventional length, which speak their octave. This is determined partly by the voicing, partly by making a small hole about the middle of the length, which determines the motion as that of the two separate lengths between which the hole lies. Harmonic flutes have a sweet but full and powerful tone. Other flutes are generally rather light, except the waldflote, which is a powerful stop of a somewhat hooting quality.

The great organ flute is frequently used to give bril-

liancy to light combinations. Thus it may be used with

~~the stopped diapason alone, or with the 16 bourdon alone, or with any of these and either or both of the open dia- pasons. Where the diapasons are scarcely strong enough to assert themselves in accompaniment, it is a very common practice to put the 4 flute into the diapason composition,~~

~~posed of concordant notes of the harmonic series whose fundamental is the proper note of the key. Modern mix- tures generally consist of fifths and octaves. Their com- position is not the same throughout the whole range of the keyboard, A three-rank mixture may consist of the following (the numbers signify intervals, reckoned along the scale)— C — ce (tenor) 15— 19 — 22 c# to top 8—12—15. For a somewhat larger full mixture this may be modi- fied as follows— C — ¢' (middle) ef to top~~

~~15 — 19 — 22 1— 8—12—15. A sharp mixture suitable for a large instrument may be~~

~~as follows— Five Ranks. C —c 15—19— 22 — 26 — 29 ce — fe 8—12—15 —19—22 ie lS BT LS Sal) e"totop 1— 5— &8—12—165.~~

~~The last two compositions are given by Hopkins in his great treatise on the organ.~~

~~Great organ reeds.~~

~~Swell organ~~

~~832~~

~~The early mixtures generally included the tierce (17th, or two octaves and a third). The German practice was to unite this with a twelfth, carrying the combination 12-17 throughout the keyboard under the name of sesquialtera. It isagreed that there is no direct derivation of this use from the word, and that the name should be sexta. The combination is, however, not now usually provided. The old English sesquialtera was ordinarily simply a form of mixture, as was the furniture. The mounted cornet con- sisted usually of five ranks—~~

1— 8 —12— 15 — 17. It extended from middle c upwards. The pipes were raised on a small soundboard of their own; they were of very large scale and horn-like tone. The stop was used for re- inforcing a melody. It is now obsolete.

The question of the employment and composition of mixtures is of the greatest importance with respect to the good effect of the full organ proper, «.e., without reeds. With reference to the whole question of keen-toned stops it may be laid down that their free employment in the great organ does not produce a good effect unless the organ is situated in a very large space. If this is the case, properly proportioned mixtures are capable of giving to the tone of the full diapason work a character which is brilliant without being overpowering. The contrast between this class of tone and that afforded by the reeds is one of the most charming and legitimate effects within the range of the instrument.

We now pass to the reeds. The 16-foot trumpet has been already alluded to, and there remain 8 trumpet and 4 clarion or octave trumpet. These are both stops of great power. The best trumpets possess also richness and smoothness of tone. Stops of this class can be used with the diapasons only, producing what may be described as a rich-toned blare of moderate strength. The more usual employment of the reeds is in connexion with the entire great organ, the whole forming the ordinary fortissimo of the instrument.

The second department of the English organ is the swell organ. The whole of the swell pipes are enclosed in a box, faced on one or more sides with a set of balanced shutters. When these are closed the tone is almost com- pletely muffied. When the shutters are opened, by means of a pedal usually, the sound bursts out. In order that the use of the swell may be effective, it is necessary that the shutters should close tightly, and that there should be a sufficient volume of tone to produce an effect when they are opened. The swell is of entirely English origin; it has been introduced in Germany to a very small extent, but more widely in France. It is usually called "recitatif" on the Continent. The chief characteristic of the swell is the rich and powerful volume of reed-tone of a peculiar character which it contains. But other stops are also of im- portance. We consider them in order. The 16

bourdon, small scale, is very commonly used in swells. It assists in giving body to the tone. It occupies, however, a large space within the swell box ; and where the choice between it and a 16-foot reed has to be made there can be no doubt that the reed should be preferred, as it contributes so much more to the development of the characteristic swell tone. The 16 contra fagotto and the 16 bass oboe are two alternative forms of 16-foot reed. The first is the more powerful of the two. Either of these stops imparts great richness to the tone of the other swell reeds, giving specially to the bass the peculiar quality which suggests great power.

The 8-foot diapason work is principally valuable for the soft effects obtained from it. The diapasons are voiced less loudly than for the great organ; and within the shutters they sound very soft indeed. The dulciana is the

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| softest stop generally available ; and either this or some

similar stop is introduced into the swell for the purpose of obtaining effects of the most extreme softness. Space within the swell box has generally to be economized. The complete bass of the open diapason or dulciana requires an 8-foot swell box, whereas even a 16-foot reed can be bent round so as to go within a smaller box if necessary. The open diapason and the dulciana are therefore often cut short at tenor ¢, and completed, if desired, with stopped pipes. The 4 principal and the 4 flute stops are similar to the corresponding stops in the great organ, but are somewhat lighter in tone. As in the case of the great diapasons and the 4-foot flute, it sometimes happens that the first reed combination (oboe) is not strong enough. Then the principal is sometimes put into its composition. This almost invariably spoils the effect entirely.

The 2 fifteenth and mixtures are much more pleasing in the swell than in the great organ. The shutters tone them down, so that they cannot easily become offensive. Added to the reeds, they give a peculiar brilliancy to the full swell. But perhaps their most pleasing use is when all the diapason work of the swell is used alone, and as a con- trast to the reeds.

~~The usual reeds are as follows, besides the doubles already mentioned :—8 oboe, 8 cornopean, 8 trumpet, and 4 clarion (octave trumpet). The oboe (hautboy) is a conventional imitation of the orchestral instrument. It is a stop of delicate tone, and perhaps is at its best in solo passages, softly accompanied on another manual. The cornopean has a powerful horn-like tone. It is the stop which, more than any other, gives to the English swell its peculiar character. The trumpet is used in addition to the cornopean in large instruments. The clarion serves to add brightness and point to the whole.~~

~~The third department is the choir organ.~~

~~gamba, 8 keraulophon, and 8 hohlfléte.~~

~~As arule no open diapason is provided for choir organs, unless they are larger than usual ; but a small open is most useful as a means of obtaining a better balance than usual against the other manuals. The stopped diapason is gener- ally made to contrast in some way with that on the great organ. The hohlfléte, or its representative, is generally a lighter stop than what would be put on the great organ. The gamba is better placed in the choir organ than in the great or the swell. Such stops as the gamba and the keraulophon are frequently placed in the swell with the idea of adding to the reediness of the tone. But this is fallacious. Their tone is not strong enough to assert itself through the shutters, and their peculiar character is there- fore lost. On the choir organ, on the other hand, the sort of strength required is just about what they possess, and they show to advantage. The keraulophon is a stop in- vented by Gray and Davison, and has been widely adopted for many years. It has a hole made in each pipe near the top, and gives a peculiar tone very well described by its name (horn-flute). Though not very like the gamba, its tone is so far of the same type of quality that the two stops would hardly be used together. It is generally the case that similar stops of exceptional characters do not combine well, whereas stops of opposed qualities do com- bine well. Thus a gamba and a keraulophon would not combine well, whereas either of them forms an excellent combination with a stopped diapason or a hohlflote.~~

~~The 4 principal is sometimes very useful. A light com- bination on the choir, with excess of 4-foot tone, may often be advantageously contrasted with the~~

more full and solid tone of the great diapasons, or with other attainable effects. The 4 flute is constantly used. The 2 piccolo is frequently found on the choir-organ, but is not particularly useful.

The 8-foot Choir work may contain 8 stopped diapason, 8 open diapason, 8 organ.

Solo | organ.

Pedal organ.

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In organs which have no solo manual there is usually @ clarionet (cremona, cromorne, or krummhorn, in old organs sometimes corno di bassetto) on the choir, and often an orchestral oboe (real imitation of the instrument). These are reed-stops. The dulciana and another soft stop, the salicional, salcional, or salicet (of similar strength, but slightly more pungent quality), are often placed on the choir. They are, however, hardly strong enough to be of much use there, and in the swell they are useful for effects of extreme softness. In very large instruments a fifteenth and a mixture are sometimes placed on the choir, which in this case has a complete series of diapason work. If the fifteenth and the mixtures are light enough the result is a sort of imitation of the tone of the old English organ, It also forms a useful echo to the great organ, i.¢., a passage played on the great may be repeated on the similar but fainter tone of the choir with the effect of an echo. In instruments of the largest size the choir is sometimes pro- vided with a very small bourdon of 16-foot tone, which helps to give to the tone the character of that of a small full organ without reeds.

The solo organ is comparatively modern, at all events in its present usual form. A fourth manual was not un- known in old German organs ; but the contents of all four resembled each other in a general sort of way, and there was nothing like the English swell or the modern solo. The solo appears to have arisen with Cavaillé-Coll in France, and Hill in England, as a vehicle for the powerful reed-stops on heavy wind introduced by these builders. Thus the French term for the solo is "clavier des bom- bardes" ; and in the earlier English solos the "tuba mira- bilis " was usually prominent. A solo

organ may suitably contain any of the following stops :—8 tromba (a powerful reed on heavy wind), 8 harmonic flute (powerful tone and heavy wind), 8 clarionet and 8 orchestral oboe (real imi- tations of the instruments), and 8 vox humana (conven- tional imitation of the human voice).

The vox humana is sometimes placed in the swell. The last three stops are reeds. They may be with advantage enclosed in a swell box, having a separate pedal. In very large instruments a complete series of both diapason and reed stops is occasionally placed on the solo: But there does not seem to be much advantage in this arrange- ment.

We now come to the pedal. This forms the general bass to the whole organ. Thirty-two foot stops only occur in the largest instruments; they are as follows:—32 open diapason (wood or metal), 32-foot tone bourdon, and 32 contra trombone, posaune, bombarde, sackbut (reed). The 32-foot open diapason, whether wood or metal, is usually made of large scale, and produces true musical notes throughout. Its musical effect in the lower part of its range is, however, questionable, so far as this depends on the possibility of recognizing the pitch of the notes. It adds great richness to the general effect, particularly in large spaces. The 32-foot tone bourdon is not usually a successful stop. It rarely produces its true note in the lower part of its range. The 32-foot reed on the pedal has long been a characteristic of the largest instruments. With the old type of reed it was rarely pleasant to hear. The manufacture has been greatly improved lately, and these large reeds are now made to produce a fairly smooth effect. Deep reed notes, when rich and good, undoubtedly form one of the principal elements in giving the impression of power produced by large organs. From this point of view they are of great importance. Nevertheless the effect of large pedal reeds is generally more satisfactory to the performer than to the listener.

The 16-foot pitch may be regarded as the normal pitch of the pedal ; the principal stops are as follows :—16 open

diapason (wood or metal), 16-foot tone bourdon, 16 violone (in1itation of double bass), and 16 trombone or posaune (reed). The 16-foot open

diapason on the pedal assumes different forms according to circumstances. As a rule the character is sufficiently indicated by the stop being of wood or metal. The wooden open is generally of very large scale, and produces a ponderous tone of great power and fulness, which is only suitable for the accompaniment of the full organ, or of very powerful manual combinations. Such a stop is, as a rule, unsuitable in organs of: moder- ate size, unless supplemented by lighter 16s for ordinary purposes. The metal open is of considerably smaller scale (in fact all metal pipes are effectively of much smaller scale than wooden pipes of similar diameter). The metal gives a clear tone, lighter than that of large wooden pipes, and pleasanter for ordinary purposes. The metal open combines advantageously with a bourdon. In the largest organs both wood and metal open 16s may be suit- ably provided. Where metal pipes are made a feature in the organ-case, both the double open diapason in the great organ and the metal 16 of the pedal may be properly made of good metal (polished tin or spotted metal), and worked in to the design of the organ-case.1 The same applies to the 32-foot metal opens of the largest instruments. This saves space in the interior, and gives the large pipes room to speak, which is apt to be wanting when they are placed inside. The 16-foot tone bourdon on the pedal may be made of any scale according to circumstances. If it is the chief bass of the organ it is made very large and with great volume of tone. Such stops are unsuitable for soft purposes, and a soft 16, usually a violone, is required in addition. If the loud department of the 16 tone is otherwise provided for the bourdon may be made of moderate strength. It may also be made very soft, like a manual bourdon. These three different strengths ought always to be provided for in an instrument of a complete character. The violone is also made of all three strengths, In a few cases it furnishes the principal bass ; frequently it furnishes the moderate element; and it is often applied to obtain a very soft 16-foot tone. The 16-foot reed is very common. The observations made as to the effect of 32-foot reeds are applicable also in this case.

The 8-foot department of the pedal is only less important than the 16, because it is possible to replace it to a certain extent by coupling or attaching the manuals to the pedals. The usual 8-foot pedal-stops are as follows :—8 principal bass (metal or wood), 8 bass flute (stopped), 8 violon- cello (imitation of the instrument), and 8 trumpet. The remarks

made above as to the scale of open 16s apply with little change to the pedal principal. Only, since the manuals are generally coupled, it is perhaps best to pro- vide the large scale wood-stop, which presents the power- ful class of tone in which the manual diapasons are deficient. The bass flute is almost a necessity in combina- tion with the light 16-foot tone. A composition ought to be provided by which the pedal can be reduced to these two elements by a single movement. The violoncello is sometimes used instead of the bass flute for the last-named purpose, for which, however, it is not so suitable. It is a favourite stop for some solo purposes, but is not of much general utility. The 8-foot trumpet serves to give clear- ness and point to the tone of the 16-foot reed.

In the short preface to Mendelssohn's Organ Sonatas it is stated that everywhere, even in pianissimo, it is intended that the 16-foot tone of the pedal should be accompanied

1 Anything down to one-third tin and two-thirds lead is called tin. But "pure tin" should have over 90 per cent. of tin. Absolutely pure tin could not be worked. Spotted metal is said to have from one- third to two-thirds tin. Under one-third tin no spots are said to rise, and the mixture has the general characters of lead.

XVII. — 105

Second pedal.

Arrange- ment of manuals,

Composi- tions.

General mechan- ism.

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by 8-foot tone. For the purpose of realizing this as a general direction the soft 16-foot and 8-foot stops afe re- quired ; large instruments are, however, occasionally found which possess nothing of the kind.

~~The following stops of higher pitch are occasionally found on the pedal :—5} twelfth bass, 4 fifteenth bass, mixture, and 4 clarion. These serve to make the pedal tone practically independent of coupling to the manual, which is a matter of great importance, especially in the per- formance of certain compositions of Bach and other writers, who appear to have been independent of couplers.~~

~~The 8-foot and 4-foot reeds on the pedal afford the best, indeed almost the only means of performing some types of composition best known in the works of Bach, in which the pedal sounds a chorale in the 8-foot or 4-foot pitch, whilst an elaborate accompaniment is executed on the manuals. Where these pedal reeds are not present it is necessary to couple to the pedal an 8-foot or a 4-foot manual reed. 'The corresponding manual ceases to be available for the manual part of the composition ; and, as this generally involves two manuals, one of which must possess a 16-foot stop, the performance is sometimes im- practicable, even on large organs.~~

~~In some foreign instruments two sets of pedals are pro- vided, which may be described as great and choir pedals. The great pedal is in the usual position; the choir pedal is in front of the other, and sloping. It is so placed that the feet rest on it naturally when stretched out in front of the performer. There isa choir pedal of this kind in the organ in the minster at Ulm, built by Walcker of Ludwigsburg. It isa very large instrument, having 100 sounding stops. It has no compositions, which indeed are but little known in Germany; and without some arrangement such as this a soft pedal would hardly be obtainable. There are a few other instruments which have choir pedals, but they have not been introduced into England.~~

~~In organs which have a single manual the characteristics of the great and choir organs are usually united. In organs which have two manuals the lower usually repre- sents the united great and choir, the upper is the swell. In organs which have three manuals the lower is usually the choir, but sometimes combines choir and solo, the middle is the great, and the top is the swell. In organs which have four manuals the order is—solo, swell, great, choir, the solo being at the top and the choir at the bottom.~~

~~Compositions are mechanical contrivances for moving the stop-handles in groups at atime. The ordinary form consists of pedals, which project from~~

*the front just above the pedal keys. The arrangements are various. We may refer to the arrangement in the organ at Windsor, given later on. A species of composition was introduced by Willis some years ago, and has been adopted in many large English instruments, which acts by means of a series of brass disks placed just under the front of the keys of each*manual, within reach of the thumb. These act by means of pneumatic levers. A slight pressure on one of the disks sets the machine attached to it in action, and the required change in the stops is made without any exertion on the part of the performer.*

The connexion between the keys and their pallets is made by various mechanisms, some of which are very ancient. In square and trackerwork (fig. 7) the old squares were made of wood. They resemble in function the squares used for taking bell-wires round a corner. The trackers are slight strips of wood, having screwed wires whipped on to their ends, which hold by leather buttons. The trackers play the part of the bell-wires. Where pressure has to be transmitted instead of a pull, thin but broad slips

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of wood are used, having pins stuck into their ends to keep them in their places. These are stickers (fig. 8). Backfalls (fig. 9) are narrow wooden levers turning on pins which pass through their centres. = The fan frame (fig. 10) is a set of backfalls having one set of ends close together, usually corresponding to the keys; the other ends are spread widely apart. The roller board (fig. 11) is a more general mode of shift- ing the movements sideways. The roller is a slip of wood, or a bit of metal tube, which turns on two pins inserted in its ends. It NX

as two arms pro- jecting at right angles toits length. One of these re- ceives the pull at one point, the other gives it off at an- other. In case a pull has to be transmitted to more than one quarter, a roller will sometimes have more than two arms. The name of couplers (fig. 12) is given to themechanical stop by which the keys Fic, 9.—Backfall. of one manual are made to take down those of another, or those of the pedal to take down those of the manuals. Some old forms of the mechanism could not be put on while any of the keys were depressed ; others had a tendency to throw the fingers off the keys. These forms have been entirely super- seded. That now used consists

~~of a series of backfalls centred on a movable support. The one set of ends is connected with the moving keys; the other set of ends is pierced by the wires of the trackers or stickers from the keys to be moved. In the one position of the support these ends play freely over the wires; in the other they are brought up against the buttons of the; trackers or against the stickers to be moved. i The usual couplers are—each of the manuals | to the pedal, swell to great, swell to great octave, swell to great sub-octave, swell to choir, choir to great sub-octave, and solo to great. Theswelloc- tave and sub-octave couplers are sometimes placed on the swell itself. The objection to this is, that, if they are used when the swell is coupled to the great organ, as is very commonly the case, the octaves are reached through two couplers. And, as couplers are not generally screwed up quite tight, the octaves are often not sufficiently put down to sound in tune. The choir to great sub-octave coupler was used chiefly as a substitute for a double on the great organ. It is common in organs of the transition period, but 1s not a good arrangement.~~

~~Fic. 7.—A, square; B, tracker ; C, metal square.~~

~~Fic, 8.—A and B as in fig. 7; CO, sticker.~~

~~Fic. 10.—Fan frame,~~

~~Fig. 11.—Roller board.~~

~~Fic. 12.—Coupler.~~

~~The pneumatic lever (fig. 13) consists of a small power bellows attached to each key, so that the depression of the key admits high-pressure wind to the power bellows. The power bellows then performs the work of opening the valves, &c. In large organs the work to be done would be beyond the reach of the most powerful finger without this device. Similar de- vices are sometimes applied to the com- positions and other mechanical arrange- ments.~~

Pneumatre trans- mission, With many other mechanical de- vices, was invented by Willis. It con- sists of a divided pneumatic action. The pneumatic wind, instead of being at once admitted to the power bellows, is made to traverse a length of tubing, at the farther end of which it reaches the work to be done. This principle admits of application to divided organs, the pneumatic transmission passing under the floor, as in the organ at St Paul's Cathedral. It is peculiarly suitable for the pedals of large organs.

Ventils are valves which control the wind-supply of the different groups of stops. They were much recommended at one time as a substitute for compositions. The practical difference is that compositions shift the stop-handles, so that one can always see what there is on the organ ; ventils leave the stop handles unmoved, so that the player is liable to be deceived. Other inconveniences might be mentioned, but it is enough to say that practical opinion appears decidedly to condemn the use of ventils.

The original pedal boards of Germany were flat and of very large scale. The early practice in England was to make them very small, as well as of short compass. Of late the compass C—/', thirty notes, has been universally adopted with scales varying from 2) to 25 inches from centre to centre of the naturals; 23 inches is the scale now recommended. A large number of organs have been provided with what are called concave radiating pedal boards. These are most objectionable. All the best players dislike them. 'The objections are mainly two. They present different scales at different distances from the front; and, except just in front, they become so narrow that the smallest foot can hardly put down the pedals singly. This is fatal to legitimate playing, the essence of which consists in putting the feet over each other freely, so as to use the alternate method as much as possible; and this requires that the back of the pedal board shall be as available as the front. The concave parallel form appears to satisfy all requirements.

The diversities of the arrangements of different organs present a great difficulty. The best players take a certain time to master the arrangements of a strange instrument. With a view to the introduction of uniformity, a conference on the subject was arranged by the College of Organists in London, and a series of resolutions and a series of recom- mendations were published which deserve attention (1881). They go into considerable detail,

and we must refer to the document itself. But we may mention that the parallel concave form is recommended for the pedal board, and 22 inches for the scale. The positions of the stops of the various organs are to be as follows.

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Fira. 18.—Pneumatic lever.

Left. Right. Swell. Solo. Pedal. Great. Couplers. — Choir.

The order of compositions, &c., from piano to forte is to be in all cases from left to right. The groups of com- positions are to be in the order from left to right—pedal, swell, couplers, great. Some think that too much has been here sacrificed to uniformity. It is thought that, as the swell and great as a rule are provided with composi- tions, their stops are more properly placed on the right, leaving the solo and choir on the left, as the left hand is the more easily spared. Also some prefer to have the compositions arranged with the pianos in the middle and the fortes at the ends, so that the risk of putting down a loud composition in mistake for a soft one is avoided.

Two other points of detail may be alluded to. One is the position of the pedal board with reference to the keys. The height from the middle of the pedals to the great organ keys, it is agreed, should be 32 inches. Butas to the forward position there is a difference. The resolutions say that "a plumb-line dropped from the front of the great organ sharp keys falls 2 inches nearer the player than the front of the

centre short key of the pedal board."

The oldarrangement Great Organ», | ——— S gave usually 14 qe SS Se inches for this dis- an

tance. But it is thought that the change has not gone far enough, and 4 inches has been found

preferable. There is a tar scarcely any single [

arrangement which ; is so important for 2 College of Org anists the comfort of the I player as having

sufficient space in \Magdalen College & this direction (fig. 5° Georges. Windsor 14). The second 4 matter is the provi- sion of some other

means of acting on FG 14.—Relative position of manual and pedal. the swell than by the swell pedal. The use of the swell pedal is inconsistent with the proper use of both feet on the pedal keys; and there is no doubt that incorrect habits in this respect are commonly the result of the English use of the swell pedal. In fact, players sometimes keep one foot on the swell pedal all the time, so that proper pedal playing is impossible. Arrangements have been de- vised by means of which a movable back to the seat can be made the means of acting on the swell. The first "re- commendation " of the College of Organists illustrates the requirement; it is, that "the consideration of organ- builders be directed to the widely-expressed desire for some means of operating on the swell in addition to the ordinary swell pedal."

Ags an example of an organ ofa complete but not enormously large character, we give the details of the organ at St George's chapel, Windsor, which has been recently rebuilt by Messrs. Gray and Davison, according to Mr. Walter Parratt's designs.

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1 ' 1 ' '

Four manuals, C to a", 58 notes. Clarabellgs…< Scie ment an amenity as oe 8 Pedal, C to f', 30 notes. TPR GHA ci aseraaons a oie aeFeeis

~~xuafereere 4 an tg MRE 6.:0 serine Hees Geet): 4 ” FE SD WRRUIN ci dsials aistatonare stevetaller ciated Seeiow + 2~~

~~Great Organ (34-inch wind). PA cob orectgesct chee eae 2 Double open diapason …….- 16 |Sesquialteral ……. II ranks Large open diapason……. PB he ee oe ss ecte:-eateta get 11 ranks Opendiapasonl %....0.0.. 22-2 208 2 BP || OBA Caius 55.2 aye tele rare aes ae We. Be 8 Stopped diapason ……- S| GUAPO Co oye os. anc varg gisra croc. «Sans os 4~~

~~1 These are the old mixtures.~~

~~Early allusions~~,

~~Key- board~~,

~~836 ‘~~

~~ORGAN~~

~~Solo Organ (6-inch wind).~~

~~Swell Organ (8-inch wind). LLiebli¢h boardony o…..csicc ces: LG | Platimonie Hate ccc: cits «ates § als oie 8 Open diapsson sce c ce ciecsis cee 8 | Orchestral oboe ……e0es 8 Stopped diapason …….000. : ARO TIE eit ixePes vicars eicasis)< e's oe~~

~~RETO gore ag ciclo kone tsa, is se eterenets ’ Yor crloiile se ee eee ee 8 Pedal Organ (4-inch wind). TSSING ji Za Bog ibon Op omeaet aD On amo 4 | Open diapason (wood) . week Octave dulciana …….—.+++-. | WaiGGriel (HaStA)).fa.<6rcie ee orosarnees= wine aah 16 TERE VO OBAUEN cieiicloielels)s s/sictalelelviesernisisy-ame Bourdon (Wood) ……..00eeees 16 Mixture 2……..seeeeeeees ut ranks | Violoncello (metal) ……..+++- 8 COREE FABOFUO® .scye mei oe 20% octets 16 | Trombone (wood tubes) …….—+-- 16 @omGPeae. Gites sarees sais e 78 CUI all oobodonneninnan oudincees a0 8 Couplers. Vox huMaNA…. 0. eee sees eee ee ee 8 Solo to great. Swell to pedal. (OIE arc) WiQRMore man no same odol coc de BN a enite great, Great to pedal.~~

~~Solo to pedal. Choir to pedal.~~

~~Choir Organ (23-inch wind). Pneumatic action to great organ and IDOUCIRIAY ¥ 40.5. seid eaetreme ae 8 | its couplers. Keraulophon …... BNNais ae weugasra isis 8| The arrangement of the stops and Btopped diapason…. sc siseeseaes sce 8] compositions is as follows :— ; IMMORAL a: sallele. <4,iareler nels Aen eree a's 4 4). Left. Over the keys. Right. AOL eee. Lee COONO Grin eCOne saa 4 Solo. Couplers. Swell, BACCO: she as hagas aibrouts. 200% Bieter Hee bencs 2 | Choir, Tremulant. Great. Corno di bassetto (reed)..... 8! Pedal. (Knob below swell keys.)~~

~~Composition Pedals. Great and pedal~~

~~Great to pedal j in and out.~~

~~combined. ae ue] ee un / } aie pm ft ff x i~~

~~Reduce pedal to violone,~~

~~Great to pedal in. rs~~

~~The swell pedals control two sides of the swell box and the orchestral oboe. The vox humana is in a box which is always shut.~~

~~These swell pedals are on a new system, which admits of fixing them at any point, so that the tone can be determined to any strength,~~

~~HISTORY OF THE ORGAN,~~

~~The early history of the organ is very obscure.? As far back as classical times literary allusions occur occasionally to wind instruments involving the use of pipes and chan- nels and reservoirs of air, Some form of bagpipe appears to have been alluded to in this way. Vitruvius has left a description of the hydraulicon, or hydraulic organ. It is clear that it must have been a machine of some com- plexity ; but the way in which it acted is not intelligibly described.~~

~~Athenzus also has an account of the water organ. There is a treatise on pneumatics by Hero of Alexandria, which contains apparently actual~~

~~drawings of a pneumatic organ and of an hydraulic organ, with fairly clear descrip- tions. If these drawings are authentic they are remark- able ; for the pipes shown present very much the appear- ance of modern organ-pipes, and they are arranged in a row with the longest in the middle, just as pipes are often arranged now. 'There is a bit of sculpture on the obelisk of Theodosius at Constantinople (latter part of 4th century) which represents an instrument having eight pipes stand- ing inarow. The mouths are not shown, and the manipu- lation is apparently going on on the farther side, so that its nature is not shown. The wind is furnished by a sort of blacksmith's bellows, on which two men are standing, as if to give the pressure or "weight to the wind." It appears probable that organs were introduced into churches during the latter half of the first millennium a.p. As the keyboard does not appear to have been invented till after the close of this period, the notes can only have been sounded one at a time, and rapid successions can- not have been used. The notes seem to have been few in number, about ten, but each note had latterly a number of pipes.~~

~~A treatise on the construction of organs by a monk named Theophilus is assigned to the early part of the 11th~~

~~1 This stop consists of a soft stop slightly out of tune, waving tone with the dulciana.~~

~~2 These are the old mixtures.~~

~~= As regards this section the writer desires to acknowledge his obli- a to Rimbault's HIstory of the Organ, published with HIopkins's reatise,~~

~~producing a~~

~~century. While some of the practical work is recognizable, most of the descriptions are unintelligible. It appears clear, however, that no keyboard is mentioned.~~

~~The first keyboard is said to have been introduced into the organ in the cathedral at Magdeburg about the close of the 11th century. There were sixteen keys; and a drawing exists in a work of the 17th century* which pur- ports to represent them. They are said to have been an ell long and 3 inches~~

~~broad. The drawing represents a complete octave with naturals and short keys (semitones), arranged in the same relative positions as in the modern keyboard. As it is generally admitted that the semitones were not invented till later, it would seem that this draw- ing is probably not authentic. In early organs with key- boards the keys are said to have required blows of the fist to put them down. In these cases probably sounding the notes of the plain song was all that could be accom- plished.~~

~~As to the precise time and conditions under which the keyboard assumed its present form we know nothing. It is commonly said that the change to narrow keys took place in the course of the 14th century, and that the semitones were introduced about the same time. But all these statements rest on the authority of writers long subsequent to the dates in question, and the actual facts appear to be unknown. Many examples of organ key- boards still exist, both in England and on the Continent, which have black naturals and white short keys (semi- tones). The organ in the church at Heiligenblut in the Tyrol had in 1870 two manuals, one having black naturals and white semitones, the other white naturals and black semitones. In this organ the stops were acted on by iron levers which moved right and left. It possessed a reservoir bellows of great capacity, and was altogether a remarkable instrument. Harpsichords with black key- boards also exist.~~

~~The mode of blowing practised about the time of the in- Bellows.~~

~~*troduction of the first keyboard appears to have been that which ultimately developed into the method still generally used in Germany. There were a great many separate bellows, each like a magnified kitchen-bellows, but provided with a valve, so that the wind could not return into the bellows. One man had charge of two of these. Each foot was attached to one bellows, and the blower held on by a bar above. It was possible, by raising each of the two bellows in turn and then resting his weight upon it, to produce a constant supply of wind with the pressure due to his weight. A great many such bellows were provided, and it seems that each pair required one man ; so that great numbers of blowers were employed. This description is again drawn from the 17th-century work before alluded to ; and its very completeness and the clearness of the accom- panying drawing seem suspicious. A slight modification is enough to change this method into the German one. Instead of fastening the feet to the bellows and pulling them up, the blower treads on a lever which raises the bellows. The bellows being loaded then supplies the wind of itself, The bellows thus used have diagonal hinges, and various expedients are employed to make them furnish steady wind. But the English system of horizontal reser- voirs and feeders appears far superior.*~~

~~*While the notes were still few, and many pipes were connected with each note, the system of forming a chord on each note appears to have originated, which survives in the modern mixture. There was not at that time any- thing of the nature of stops; all the pipes connected with any one note sounded without exception whenever the note was made use of. The object probably was to give eee Se ee ee a el ins ae, el*~~

- ~~*Pretorius, Theatrum Instrumentorum.*~~

~~*Pedal.*~~

~~*Cases*~~,

~~*German organ.*~~

~~*Shortly after this date we find Renaissance cases.*~~

the single notes a powerful and dominating character, so as to enable them to lead the church song.

The invention of the pedal may be set down to the 15th century. About that time the organ assumed on the Con- tinent the general form which it has retained till lately, more especially in Germany. This may be described generally as having a compass of about four octaves in the manuals and of two octaves in the pedal, with occasionally extra notes at the top in both, and frequently "short octaves" at the bottom. German short octaves are as follows. E instead of C. Then the E key sounds C, F=F, FZ=D, G=G, G#=E, and the rest as usual. There were often three, sometimes four, manuals in large organs. The character of all these was in general much the same, but they were more softly voiced in succession, the softest manual being sometimes spoken of as an echo organ, There are one or two examples of the echo as a fourth manual in England at the present time, in organs which have been designed more or less under German inspiration. The old echo was long ago superseded by the swell in England.

A few ancient cases survive in a more or less altered condition.1 Of these the following are worthy of mention, as bearing on the question of date.

Sion (Switzerland). Gothic. A small instrument…….. 1390 Amiens. Originally Gothic. Large, with 16-foot pipes 1429 Perpignan. Gothic. Large, with 32-foot pipes …..... 1490

Liibeck. One of the finest Gothic organsin Europe. 82s…1504 (or, according to Hopkins, 1518).

In all these the cases are sufficiently preserved to make it almost certain that pipes of the same lengths were origin- ally employed. The actual pipes are generally modern. At La Ferté Bernard (dep. Sarthe) part of the substructure is Gothic, and is known to be of date 1501; the organ above is Renaissance, and is known to be of date 1536. At St Maurice, Angers, an organ was built in 1511, with Renais- sance case, two towers of 32-foot pipes, 48 stops, and a separate pedal. An account of the instrument in a procés verbal of 1533 furnishes good evidence. In the 16th cen- tury,

~~therefore, the organ had attained great completeness, and the independent pedal was general on the Continent.~~

~~We cannot follow the history of German organs through the intervening centuries; but we propose to give the items of one of the principal organs of the Silbermanns, the great builders of the 18th century,—namely, that stand- ing in the Royal Catholic Church, Dresden. Without being an enormously large instrument it is complete in its way, and gives a very good idea of the German organ. The account is taken from Hopkins. The date is 1754.~~

~~Great. TINGE PAL... seen 16 SGLAVON 2c Santon saeenss 2 Bourdon …….. 16 tone PUGNEIAM sete caseumeee > 13 HAPIMCI Pall… 028s 8 Oba) Ppaeeesbecodnde Iv ranks Viola da Gamba 8 Chrmleral nctabenodanane III Rohrflote…….. 8 tone (ChoTELE "secnaneonddeeds Vv Glave… wb suses 4 BOO bbe ere cr 16 Spitzflote…….. 4 MENDIMEE, fc0522<000r3 8 (Oybiballiss capponpnenee 23 laine ccesceneeee 4~~

~~Echo. Quintaton ……. 16 tone Octave nceessceereeeces 2 (aga) Saar 8 ODT a caits cay cecesea's 13 Gedaekt ..0 0.2.66 8 tone IEE OE, soononaodoce 1 Unda Maris … 8 tone INDIREUI neccecccces nes Iv ranks Octave maar. air 4 De) 0Xa) Pemeroronataenceen Vv Rohrflote…….. 4 tone Vox humana ……. 8 tone ENDSSAL cee cccee nee 23~~

~~Choir. Gedackt ……., 8 tone WAII) 2) oo Ae 14 HepEONpal 2.6.5.0. 4 UOUE.. cccewetearcets i Rohrflote…….. 4 tone NTRMT ee oc cise encses II ranks INGSSA bis. . <. <0 se. 23 Sesquialtera…….. II OCtAVE oo crct eee nine 2 Chalumeaux ……. 8 tone~~

~~1 In the remarks next following the writer is indebted for informa- tion to Hill's work on organ-cases.~~

~~The manual and pedal appear to terminate on .~~

~~837~~

~~Pedal. Untersatz pees 32 tone WUD athe sonaaaoanencsas Iv ranks PriMcrpale..:..... 16 Pausan (trombone) 16 Octav-bass ……, 8~~

~~Tromipetten…… 8 Octaves…ccs….: 4 CIO Pan gamanneneenee 4 Accessories.~~

~~Tremulant echo. Tremulant great.~~

~~Echo to great. Great to pedal.~~

~~Compass. Manuals—C to @'" in alt, | Pedal—C, to tenor c.~~

~~The chief difference between English organs and those English of the Continent was that until the present century the organs.~~

~~pedal was absolutely unknown in England. The heavy bass given by the pedal being absent, a lighter style of voicing was adopted, and the manuals were usually con- tinued down below the 8-foot C so as to obtain additional bass by playing octaves with the hands. Thus the old or- gan (date 1697) of Father Smith in St Paul's Cathedral had manuals descending to the 16-foot C (C,), with two open diapasons throughout. Green's old organ at St George's, Windsor, had manuals descending to the 12-foot F, also two open diapasons throughout, no F¥. But the more usual practice was to make the manual descend to the 102% G, leaving out the Gg. At the Revolution most of the organs in England had been destroyed. Shortly afterwards Bernard Smith, a German, commonly called Father Smith, and Thomas and René Harris, Frenchmen, were largely employed in building organs, which were wanted everywhere. Father Smith perhaps had the greatest reputation of any builder of the old time, and his work has lasted wonderfully. There is a list in Rimbault of forty-five organs built for churches by him. The list of René Harris is scarcely less extensive.~~

~~The most important step in the development of the old English organ was the invention of the swell. This was first introduced into an organ built by two Jordans, father and son, for St Magnus's church near London Bridge, shal ky~~

~~Burney writes (1771) :—~~

~~'*It is very extraordinary that the swell, which has been intro- duced into the English organ more than fifty years, and which is so capable of~~

~~*expression and of pleasing effects that it may be well said to be the greatest and most important improvement that was ever made in any keyed instrument, should be utterly unknown in Italy ; and, now I am on this subject, I must observe that most of the organs I have met with on the Continent seem to be inferior to ours by Father Smith, Byfield, or Snetzler, in everything but size! As the churches there are very often immense, so are the organs ; the tone is indeed somewhat softened and refined by space and distance ; but, when heard near, it is intolerably coarse and noisy ; and, though the number of stops in these large instruments is very great, they afford but little variety, being for the most part duplicates in unisons and octaves to each other, such as the great and small 12ths, flutes, and 15ths ; hence in our organs, not only the touch and tone, but the imitative stops, are greatly superior to those of any other organs I have met with."*~~

~~*(As to these opinions, compare section on great organ open diapasons above, p. 830.)*~~

~~*In the course of the 18th century most of the old echoes were altered into swells, and the swell came into almost universal use in England. The development of the swell is inseparably associated with the peculiar quality of English swell reeds. These must have originated during the development of the swell. We hear of a "good reed voicer" named Hancock, who worked with Crang, changing echoes into swells. However it originated, the English reed is beautiful when properly made. It has recently entirely superseded the free reed, which had been long used in Germany. The original swells were usually short in compass downwards, frequently extending only to fiddle g. It is only lately that the value of the bass of the swell has been properly appreciated. Short-compass swells may be said to have now disappeared.*~~

~~*Avery's*~~

~~*old Eng- nearly in its original condition.*~~

~~*lish organ.*~~

~~The organ in St Stephen's, Coleman Street, is probably It was built by Avery in 1775. At all events the following arrangements might very well have been the original ones. The pedal clavier without pipes is no doubt a subsequent addition, and 1s~~

~~omitted. Any. Sesquialtera—11r ranks.~~

~~Open diapason. { Mixture—11 ranks.~~

~~Stopped diapason.~~

~~Oh GA WwW~~

~~parts—such as bass with pedals, treble with right hand on a solo stop (¢.g., clarionet), two inner parts with a soft open diapason, or something of the kind—are of much greater difficulty in the first instance. Another distribution is bass with pedals, melody with reed or solo combination in the tenor with left hand (an octave below its true pitch), inner parts with right hand on a soft open diapason, or something that balances. This is of far greater difficulty. All this can be practised with common hymn-tunes ; but the performer who can do these things with ease is in some respects an advanced player.~~

~~Principal. Trumpet. What has been said above has much bearing on the arrangement Balance Twelfth. Clarion. of the different departments of the organ. It is one of the first of tone. Fifteenth. Cornet to middle e—v ranks. requisites that as many balances of tone as possible should be avail- Cesp able between the different manuals and the pedal. HIow many large St di Fift eceh organs there are on which such a balance can hardly be obtained ! one 1 i is | C Fo dees It would be difficult to®lay too much stress on the above observa- — ase | Son , tions with respect to balance between the manuals. This is all-~~

~~important in the performance of organ trios, such as the organ Trios.~~

~~Swell. sonatas of Bach. In these compositions there are generally three~~

~~Open diapason. Cornet—u11 ranks. notes sounding, which may be regarded as belonging to three dif- Stopped diapason. 'Trumpet. ferent voices, of nearly equal strength, but different mean pitch, Principal. Hautboy. and, if possible, different quality ; of these one is appropriated by Compass. each hand and one by the pedal. They are written in threc lines,~~

~~Great and choir—G, toe", | Swell—fiddle g to e'".~~

~~no G, t. i This gives an excellent idea of the old English organ. There are several different accounts of the introduction of~~

~~Pedals in pedals into England. It took place certainly before the England. end of the 18th century, but only in a few instances.~~

~~And, for long after, the usual arrangement was simply to provide a pedal clavier, usually from F, or G, to tenor c or d, which took down the notes of the great organ. Unison diapason pipes (12-foot) were occasionally used. In one or two cases, as in the transition states of the old organ at St George's, Windsor, a 24-foot open diapason was employed as well as the unison stop. But a more usual arrangement, of a most objectionable character, was to combine the G,—c pedal-board with a single octave~~

~~and are intended to be played on two manuals and the pedal. If there is a good choir organ, not too weak in tone, the clearest way is to play these things with a medium strength open diapason on the great organ for the right hand, the full 8-foot choir with or with- out the 4-foot flute with the left, and a metal 16-foot and 8-foot bass flute on the pedal. A usual course in England is to play the treble on aswell reed (oboe) with open swell, tenor on great diapason, and pedal as before ; or treble great diapason, tenor oboe, pedal as be- fore. Here there is some risk of the reed in the tenor being un-~~

~~leasant. We may also suggest harmonic flute solo treble, open~~

~~iapason great tenor, pedal as before. These compositions, how- ever, admit of infinite variety in treatment. It appears probable that they were written for harpsichords, and in any case the inten- tions of the composer have not come down tous. As a matter of fact they are rarely successful on large~~

~~English organs, on account of the want of balance between the manuals. And nothing could point the direction in which improvement is needed more than this observation.~~

~~The fugues of Bach are the classical organ music par excellence. Bach's As to these it is also true that nothing has come down to us as organ to the composer's intentions, except that he generally played the fugues. fugues on the full organ with doubles. It does not seem clear that this was the case with the preludes ; and, any way, the modern organ, with its facilities for managing the stops, appears to coun- tenance a different treatment. The eifect of doubles when a subject or tune is given out in solo is very bad. They may be drawn with pedal was the better, and the practice gradually became | advantage when the parts are moving in massive chords. The usual general of providing a complete pedal-board of 24 octaves practice is perhaps to employ various manual effects of a light char-~~

~~aie 2 acter until the pedal enters, and then to produce full organ in its (C— f'), with at least one stop of 16-foot tone throughout, | various modifications, but always to aim at variety of tone. If a~~

~~even on the smallest organs that pretended to be of any | prelude begins with heavy chords and pedal, then produce full~~

~~real use. The study of the classical works of Bach and | organ at once. If it then passes to lighter matter, reduce to some~~

~~Mendelssohn went hand in hand with this chanee: for | xt¢nt Some begin a fugue on the stopped diapason of the great~~

~~eheebaeari ; avi th ee Gl oa organ, add more as the parts enter, and continue working up at study was impossible without the change, and yet | throughout. But perhaps it is the better practice to throw in~~

~~the desire for the study was one of the principal motives | loud organ during the pedal parts, and soften between times.~~

~~for it. In the meantime Bishop, an English builder,~~

~~One of the greatest requisites in organ-playing is dignity of treat- Dignity had i ted compositi Thi "15 ment. This is continually competing with clearness. 'The chief and diue ih oe ae a Sn ie ee greatly py mode of keeping the different parts distinct, where that is neces- elear-~~

~~sary, is by using reeds of a pronounced character. These reeds ness.~~

~~of so-called pedal-pipes, extending from the 16-foot to the 8-foot C; so that, instead of a uniform progression in ascending the scale, there was always a break or repetition in passing C.~~

~~About the middle of the present century it began to be generally admitted that the German arrangement of the~~

~~(1850) the mechanics of the organ were advanced by the general introduction of the pneumatic lever into large in- struments ; the whole mechanism of the organ was revolu- tionized by Willis's improvements ; and the organ-builders of England, having obtained from the Continent the funda- mental ideas necessary for completeness, advanced to a point at which they appear to be decidedly ahead. The English organ is now probably superior to that of any other country.~~

~~GENERAL REMARKS ON ORGAN TREATMENT. The organ probably presents more difficulties than any other instrument in the way of a sound elementary mastery. A person of ordinary capacity may work at it for years before being able to play passages of moderate difficulty with confidence and correctness.~~

~~Element- 'The special difficulty appears to be chiefly mental, and arises from the ary diffi- number of things that have to be thought of simultaneously. It~~

~~culties.~~

~~does not lie in the execution—at least not chiefly ; for to play a hymn-tune correctly, the bass being taken with the pedals, the tenor with the left hand, and the two upper parts with the right, 1s a matter in which there is no~~

~~execution required ; but it is of great difficulty to an inexperienced player. Other distributions of~~

~~almost invariably verge on the comic, and anything more than the most sparing and careful employment of them is undesirable. Expression is not possible unless the stops are enclosed in a swell box,—a most desirable arrangement. In all cases hurry is to be avoided. A calm steadiness, a minute finish of all the phrasing, forms most of the difference between first and second rate players.~~

~~With reference to the general treatment of modern music we Modern quote the preface to Mendelssohn's Organ Sonatas:—"In these music.~~

~~sonatas very much depends on the correct choice of the stops ; but, since every organ with which I am acquainted requires in this respect special treatment, the stops of given names not producing the same effect in different instruments, I have only indicated cer- tain limits, without specifying the names of the stops. By for- tissimo I mean the full organ; by pianissimo, usually one soft 8-foot stop alone; by forte, full organ without some of the most powerful stops ; by piano, several soft 8-foot stops together ; and so on. In the pedal I wish everywhere, even in pianissimo, 8-foot and 16-foot (tone) together, except where the contrary is expressly in- dicated, as in the sixth sonata [this refers to a passage where an 8-foot pedal is used without 16]. It is therefore left to the player to combine the stops suitably for the different pieces, but particu- larly to see that, in the simultaneous use of two manuals, the one keyboard is distinguished from the other by its quality, without forming a glaring contrast."~~

~~ORG—ORTI~~

~~The treatment thus indicated is very different from that to which the suitability of English swell reeds for solo purposes has given rise. The effects commonly obtained by means of these reeds could hardly be more expressly described than in the final warn- ing sentence above quoted. However, these reed effects possess great clearness, and, with the improved character of modern reeds and the toning down of the swell box, they are probably not so objectionable as what Mendelssohn had in his mind. Indeed the deficiency of good balances between flue stops answering the re-~~

quirements above described is usually such that there is hardly any option but to employ swell reeds in such cases.

Consider particularly the pianissimo balances necessary for carry- ing out the above directions. In the first place it is clear that the soft 8-foot stops alluded to are not stops of extreme softness, such as the dulciana or salicional, as the attempt to produce a melody — on such stops would everywhere be a failure. We must recognize for such purposes a further degree of softuess, which may be denoted by ppp. We may take the average great organ stopped diapason as the measure of loudness of the soft stops pp ; then it is requisite that on the choir or elsewhere there should be stops that will, especially in the tenor, combine and balance singly with the great stopped diapason in two-manual work. Choir stops would have to be decidedly stronger than usual for this purpose. Such a stop might be a small open diapason, or perhaps a gamba or keraulophon. Other balances of various kinds might be suggested. Some such must be present if the smooth and liquid character, which the soft parts of Mendelssohn's works at least were undoubtedly intended to possess, is to be preserved at all.

As a ppp is needed for extreme softness, so an fff is needed to express the exceptional degree of force attainable in modern instru- ments by adding the solo reed (tromba) to the ordinary full organ.

Modern music generally indicates in detail the treatment in- tended by the author. We may mention one matter which has come forward lately ; this is the use of one hand on two manuals. This has become possible in consequence of the modern arrange- ment by which the manuals overhang.

For further details as to the history and construction of the organ, with numerous specifications, we must refer to the work of Hopkins and Riinbault on the organ. (R. H. M. B.)

ORGIES is a name given to certain rites in the worship of Dionysus-Bacchus. The rites, which were restricted to women, were celebrated in the winter among the hills in spots remote from city life. The women met in such places clad in fawn-skins (veSpis), with hair dishevelled, swinging the thyrsus and beating the cymbal; they danced and worked themselves up to a state of mad excitement. The holiest rites took place at night by the light of

torches. A bull, the representative of the god, was torn in pieces by them as Dionysus-Zagreus had been torn ; his bellowing reproduced the cries of the suffering god. The women tore the bull with their teeth, and the eating of the raw flesh was a necessary part of the ritual. Then the dead god was sought for. Some further rites, which varied in different districts, represented the resurrection of the god in the spring. On Mount Parnassus the women carried back Dionysus-Liknites, the child in the cradle. The most famous festival of the kind was the tprernpis, cele- brated every second winter on Parnassus by the women of Attica and Phocis. The celebrants were called Menads or Bacchz. The ecstatic enthusiasm of the Thracian women, KAddwves or Mipadddves, was especially distinguished. There is no doubt that in earlier times the murdered god was represented by a man, and the myths of Pentheus and Orpheus refer to the origina] form of the ritual.

ORIBASIUS. See Mepictryz, vol. xv. p. 804.

ORIFLAMME. See Fiag, vol. ix. p. 279.

ORIGEN (¢. 185-c. 254). Of all the theologians of the ancient church, with the possible exception of Augustine, Origen is the most distinguished and the most influential. HIe is the father of the church's science ; he is the founder of a theology which was brought to perfection in the 4th and 5th centuries, and which still retained the stamp of his genius when in the 6th century it disowned its author. It was Origen who created the dogmatic of the church and laid the foundations of the scientific criticism of the Old and New Testaments. HIe could not have been what he was unless two generations before him had laboured at the problem of finding an intellectual expression and a philo-

sophic basis for Christianity (Justin, Tatian, Athenagoras, Pantenus, Clement). But their attempts, in comparison with his, are like a schoolboy's essays beside the finished work of a master. Like all great epoch-making personali- ties, he was favoured by the circumstances of his life, notwithstanding the relentless persecution to which he was exposed. HIe lived in a time when the Christian communities enjoyed almost uninterrupted peace and held an acknowledged position in the world. By

proclaiming the reconciliation of science with the Christian faith, of the highest culture with the gospel, Origen did more than any other man to win the Old World to the Christian religion. But he entered into no diplomatic compromises; it was his deepest and most solemn conviction that the sacred oracles of Christendom embraced all the ideals of antiquity. His character was as transparent as his life was blameless ; there are few church fathers whose biography leaves so pure an impression on the reader. The atmosphere around him was a dangerous one for a philosopher and theologian to breathe, but he kept his spiritual health unimpaired, and even his sense of truth suffered less injury than was the case with most of his contemporaries. To us, indeed, his conception of the universe, like that of Philo, seems a strange medley, and one may be ata loss to conceive how he could bring together such heterogeneous elements; but there is no reason to doubt that the harmony of all the essential parts of his system was obvious enough to himself. It is true that in addressing the Christian people he used differ- ent language from that which he employed to the cultured ; but there was no dissimulation in that,—on the contrary, it was a requirement of his system. Orthodox theology has never, in any of the confessions, ventured beyond the circle which the mind of Origen first measured out. It has suspected and amended its author, it has expunged " his heresies ; but whether it has put anything better or more tenable in their place may be gravely questioned. Origen was born, perhaps at Alexandria, of Christian parents in the year 185 or 186. As a boy he showed evidence of remarkable talents, and his father Leonidas gave him an excellent education. At a very early age, about the year 200, lie listened to the lectures of Panteenus and Clement in the catechetical school. This school, of which the origin is unknown, was the first and for a long time the only institution where Christians were instructed simultaneously in the Greek sciences and the doctrines of the Holy Scriptures. Alexandria had been, since the days of the Ptolemies, a centre for the interchange of ideas between East and West—between Egypt, Syria, Greece, and Italy; and, as it had furnished Judaism with an Hellenic philosophy, so it also brought about the alliance of Christianity with Greek philosophy. Asia Minor and the West developed the strict ecclesiastical forms by means of which the church closed her lines against heathenism, and especially against heresy ; in Alexandria Christian ideas were handled ina free and speculative fashion and worked out with the help of Greek philosophy. Till near the end of the 2d century the line between

heresy and orthodoxy was less rigidly drawn there than at Ephesus, Lyons, Rome, or Carthage. In the year 202 a persecution arose, in which the father of Origen became a martyr, and the family lost their livelihood. Origen, who had distinguished himself by his intrepid zeal, was supported for a time by a lady of rank, but began about the same time to earn his bread by teaching; and in 203 he was placed, with the sanction of the bishop Demetrius, at the head of the cate- chetical school. Even then his attainments in the whole circle of the sciences were extraordinary. But the spirit of investigation impelled him to devote himself to the highest studies, philosophy and the exegesis of the Sacred Scriptures. With indomitable perseverance he applied

himself to these subjects ; although himself a teacher, he regularly attended the lectures of Ammonius Saccas, and made a thorough study of the books of Plato and Numenius, of the Stoics and the Pythagoreans. At the same time he endeavoured to acquire a knowledge of Hebrew, in order to be able to read the Old Testament in the original. His manner of life was ascetic; the sayings of the Sermon on the Mount and the practical maxims of the Stoics were his guiding stars. Four obolia day, earned by copying manuscripts, sufficed for his bodily sustenance. A rash resolve led him to mutilate himself that he might escape from the lusts of the flesh, and work unhindered in the instruction of the female sex. This step he afterwards regretted. As the attendance at his classes continually increased—pagans thronging to him as well as Christians—he handed over the beginners to his friend Heraclas, and took charge of the more advanced pupils himself. Meanwhile the literary activity of Origen was increasing year by year. He commenced his great work on the textual criticism of the Scriptures; and at the instiga- tion of his friend Ambrosius, who provided him with the necessary amanuenses, he published his commentaries on the Old Testament and his dogmatic investigations. In this manner he laboured at Alexandria for twenty-eight years (till 231-232). This period, however, was broken by many journeys, undertaken partly for scientific and partly for ecclesiastical objects. "We know that he was in Rome in the time of Zephyrinus, again in Arabia, where a Roman official wanted to hear his lectures, and in Antioch, in response to a most flattering invitation from

Julia Mammza (mother of Alexander Severus, afterwards emperor), who wished to become acquainted with his philosophy. In the year 216—the time when the imperial executioners were ravaging Alexandria—we find Origen in Palestine. There the bishops of Jerusalem and Cresarea received him in the most friendly manner, and got him to deliver public lectures in the churches. In the East, especi- ally in Asia Minor, it was still no unusual thing for lay-

men, with permission of the bishop, to address the people.

in the church. In Alexandria, however, this custom had been given up, and Demetrius took occasion to express his disapproval and recall Origen to Alexandria. Probably the bishop was jealous of the high reputation of the teacher ‘ and a coolness arose between them which led, fifteen years later, to an open rupture. On his way to Greece (appa- rently in the year 230) Origen was ordained a presbyter in Palestine by his friends the bishops. This was un- doubtedly an infringement of the rights of the Alexandrian bishop; at the same time it was simply a piece of spite on the part of the latter that had kept Origen so long without any ecclesiastical consecration. Demetrius con- vened a synod, at which it was resolved to banish Origen from Alexandria. Even this did not satisfy his displeasure. A second synod, composed entirely of bishops, determined that Origen must be deposed from the presbyterial status. This decision was communicated to the foreign churches, and seems to have been justified by referring to the self-mutilation of Origen and adducing objectionable doctrines which he was said to have promulgated. The details of the incident are, however, unfortunately very obscure. No formal excommunication of Origen appears to have been decreed ; it was considered sufficient to have him degraded to the position of a layman. ‘The sentence was approved by most of the churches, in particular by that of Rome. At a later period Origen sought to vindicate his teaching in a letter to the Roman bishop Fabian, but, it would seem, without success. Even Heraclas, his former friend and sharer of his views, took part against him; and by

this means he procured his own election shortly afterwards as Successor to Demetrius.

ORIGEN

- In these circumstances Origen thought it best voluntarily

to retire from Alexandria (231-232). He betook himself to Palestine, where his condemnation had not been acknow- ledged by the churches any more than it had been in Phoenicia, Arabia, and Achaia. He settled in Cexsarea, and very shortly he had a flourishing school there, whose repu- tation rivalled that of Alexandria. His literary work, too, was prosecuted with unabated vigour. Enthusiastic pupils sat at his feet (see the Panegyric of Gregory Thaumaturgus), and the methodical instruction which he imparted in all branches of knowledge was famous all over the East. Here again his activity as a teacher was interrupted by frequent journeys. Thus he was for two years together at Czesarea in Cappadocia, where he was overtaken by the Maximinian persecution ; here he worked at his recension of the Bible. We find him again in Nicomedia, in Athens, and twice in Arabia. He was called there to combat the unitarian christology of Beryllus, bishop of Bostra, and to clear up certain eschatological questions. As he had formerly had dealings with the house of Alexander Severus, so now he entered into a correspondence with the emperor Philip the Arabian and his wife Severa. But through all situations of his life he preserved his equanimity, his keen interest in science, and his indefatigable zeal for the instruc- tion of others. Jn the year 250 the Decian persecution broke out, Origen was arrested, imprisoned, and maltreated. But he survived these troubles—it is a malicious invention that he recanted during the persecution—and lived a few years longer in active intercourse with his friends. He died, probably in the year 254 (consequently under Valerian), at Tyre, where his grave was still shown in the Middle Ages.

Writings.—Origen is probably the most prolific author of the ancient church. 'Which of us," asks Jerome, "can read all that he has written?" The number of his works was estimated at 6000, but that is certainly an exaggera- tion. Owing to the increasing unpopularity of Origen in the church, a comparatively small portion of these works have come down to us in the original. We have more in the Latin translation of Rufinus; but this translation is by no means trustworthy, since Rufinus, assuming that Origen's writings had been tampered with by the heretics, considered himself at liberty to omit or amend heterodox statements. Origen's real opinion, however, may frequently be gathered from the Philocalia—a sort of

~~anthology from his works prepared by Basil the Great and Gregory Nazi-anzenus, The fragments in Photius and in the Apology of Pamphilus serve for comparison. The writings of Origen consist of letters, and of works in textual criticism, exegesis, apologetics, dogmatic and practical theology.~~

~~(1) Eusebius collected more than a hundred of Origen's letters, arranged them in books, and deposited them in the library at Cesarea (#7. Z., vi. 36). In the church library at Jerusalem (founded by the bishop Alexander) there were also numerous letters of this father (Euseb., H. Z., vi. 20). But unfortunately they have all been lost except two,— one to Julius Africanus (about the history of Susanna) and one to Gregory Thaumaturgus. There are, besides, a couple of fragments.~~

~~(2) Origen's textual studies on the Old Testament were undertaken partly in order to improve the manuscript~~

~~'tradition, and partly for apologetic reasons, to clear up the~~

~~relation between the LXX. and the original Hebrew text. The results of more than twenty years' labour were set forth in his Hexapla and Tetrapla, in which he placed the Hebrew text side by side with the various Greek versions, examined their mutual relations in detail, and tried to find the basis for a more reliable text of the LXX. The Hexapla was probably never fully written out, but excerpts were made from it by various scholars at Czesarea in the 4th century ; and thus large sections of it have been~~

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~~saved.! Origen worked also at the text of the New Testa- ment, although he produced no recension of his own.~~

~~(3) The exegetical labours of Origen extend over the whole of the Old and New Testaments. They are divided into Scholia (onpevdoers, short annotations, mostly gram- matical), Homalies (edifying expositions grounded on exe- gesis), and Commentaries (tépot). In the Greek original only a very small portion has been preserved; in Latin translations, however, a good deal. 'The most important parts are the homilies on Jeremiah, the books of Moses, Joshua, and Luke, and the commentaries on~~

~~Matthew, John, and Romans. With grammatical precision, antiquarian learning, and critical discernment Origen combines the allegorical method of interpretation—the logical corollary of his conception of the inspiration of the Scriptures. He distinguishes a threefold sense of scripture, a grammatico- historical, a moral, and a pneumatic,—the last being the proper and highest sense. He thus set up a formal theory of allegorical exegesis, which is not quite extinct in the churches even yet, but in his own system was of fundamental importance. On this method the sacred writings are regarded as an inexhaustible mine of philosophical and dogmatic wisdom ; in reality the exegete reads his own ideas into any passage he chooses. 'The commentaries are of course intolerably diffuse and tedious, a great deal of them is now quite unreadable ; yet, on the other hand, one has not unfrequently occasion to admire the sound lin- guistic perception and the critical talent of the author.?~~

~~(4) The principal apologetic work of Origen is his book xara KéAgov (eight books), written at Caesarea in the time of Philip the Arabian. It has been completely preserved in the original. This work is invaluable as a source for the history and situation of the church in the 2d century ; for it contains nearly the whole of the famous work of Celsus (Adyos éAnO%s) against Christianity. What makes Origen's answer so instructive is that it shows how close an affinity existed between Celsus and himself in their fundamental philosophical and theological presupposi- tions. The real state of the case is certainly unsuspected by Origen himself ; but many of his opponent's arguments he is unable to meet except by a speculative reconstruction of the church doctrine in question. Origen's apologetic is most effective when he appeals to the spirit and power of Christianity as an evidence of its truth. In details his argument is not free from sophistical subterfuges and superficial reasoning.®~~

~~(5) Of the dogmatic writings we possess only one in its integrity, and that only in the translation of Rufinus,' Ilept dpxov (On the Fundamental Doctrines). This work, which was composed before 228, is the first attempt at a dogmatic at once scientific and accommodated to the needs of the church, The material is drawn from Scripture, but in such a way that the propositions of the regula fidei are respected. This material is then formed into a system by all the resources of the intellect and of speculation. Origen~~

thus solved, after his own fashion, a problem which his predecessor Clement had not even ventured to grapple with. The first three books treat of God, the world, the fall of spirits, anthropology, and ethics. 'Each of these three books really embraces, although not in a strictly comprehensive way, the whole scheme of the Christian view of the world, from different points of view, and with different contents." The fourth book explains the

1 Field, Origenis Hexaplorum qua supersunt, 2 vols., Oxon., 1867-74.

2 See Reuss, Geschichte der heil. Schriften d. N. T., 5th ed., $511.

3 Keim, Celsus, 1873 ; Aubé, Hist. des persécut. de Véglise, vol. ii., 1875; Ornsby, " Origen against Celsus," Dublin Review, July 1879, p. 58; Pélagaud, Etude sur Celse, 1878 ; Lebedeff, Origen's Book against Celsus, Moscow, 1878 (Russian) ; Overbeck in the Theolog. Lit. Zeitung, 1878 No. 22, 1879 No. 9; Orig. c. Cels., ed. Selwyn, 1876.

4 There are, however, extensive fragments of the original in existence.

divinity of the Scriptures, and deduces rules for their interpretation. It ought properly to stand as first book at the beginning. The ten books of Stromata (in which Origen compared the teaching of the Christians with that of the philosophers, and corroborated all the Christian dogmas from Plato, Aristotle, Numenius, and Cornutus) have all perished, with the exception of small fragments ; so have the tractates on the resurrection and on freewill.®

(6) Of practical theological works we have still the

potperrixds eis paptipiov and the Ztvraypa rept evy7s. For a knowledge of Origen's Christian estimate of life and his relation to the faith of the church these two treatises are of great importance. The first was written during the persecution of Maximinus Thrax, and was dedicated to his friends Ambrosius and Protoctetus. The other also dates from the Cesarean period; it mentions many interesting details, and concludes with a fine exposi- tion of the Lord's Prayer.

(7) In his own lifetime Origen had to complain of falsi- fications of his works and forgeries under hisname. Many pieces still in existence are wrongly ascribed to him; yet it is doubtful whether a single one of them was composed on purpose to deceive. The most noteworthy are the Dialogues of a certain Adamantius "de recta in Deum fide," which seem to have been erroneously attributed to Origen so early as the 4th century.

Outline of Origen's View of the Universe and of Infe.— The system of Origen was formulated in opposition to the

"Greek philosophers on the one hand, and the Christian

Gnostics on the other.6 But the science of faith, as expounded by him, bears unmistakably the stamp both of Neo-Platonism and of Gnosticism. As a theologian, in fact, Origen is not merely an orthodox traditionalist and believing exegete but a speculative philosopher of Neo- Platonic tendencies. He is, moreover, a judicious critic. The union of these four elements gives character to his theology, and in a certain degree to all subsequent theology. It is this combination which has determined the peculiar and varying relations in which theology and the faith of the church have stood to each other since the time of Origen. That relation depends on the predomi- nance of one or other of the four factors embraced in his theology.

As an orthodox traditionalist Origen holds that Chris- tianity is a practical and religious saving principle, that it has unfolded itself in an historical series of revealing facts, that the church has accurately embedied the substance of her faith in the regula fidet, and that simple faith is suffi- cient for the renewal and salvation of man. As a philo- sophical idealist, however, he transmutes the whole con- tents of the faith of the church into ideas which bear the mark of Neo-Platonism, and were accordingly recognized by the later Neo-Platonists as Hellenic.' In Origen, how- ever, the mystic and ecstatic element is held in abeyance. The ethico-religious ideal is the sorrowless condition, the state of superiority to all evils, the state of order and of rest. In this condition man enters into likeness to God and blessedness ; and it is reached through contemplative isolation and self-knowledge, which is divine wisdom. "The soul is trained as it were to behold itself in a mirror, it shows the divine spirit, if it should be found

worthy of such fellowship, as in a mirror, and thus discovers the traces of a secret path to participation in the divine nature." As a means to the realization of this ideal,

5 See Redepenning, Origenis de principiis, first sep. ed., Leips., 1836 ; Schnitzer, Orig. iiber die Grundlehren des Glaubens, an attempt at reconstruction, 1835.

6 The opposition to the unitarians within the church must also be kept in mind.

? Porphyry says of Origen, kara Tas mepi mpayudrwy Kal rod Oelov dd£as ‘“EAAnvifwy (Euseb., H.#., vi. 19).

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Origen introduces the whole ethics of Stoicism. But the link that connects him with churchly realism, as well as with the Neo-Platonic mysticism, is the conviction that complete and certain knowledge rests wholly on divine revelation, 2.¢., on oracles. Consequently his theology is cosmological speculation and ethical reflexion based on the Sacred Scriptures. The Scriptures, however, are treated by Origen on the basis of a matured theory of inspiration in such a way that all their facts appear as the vehicles of ideas, and have their highest value only in this aspect. That is to say, his gnosis neutralizes all that is empirical and historical, if not always as to its actuality, at least absolutely in respect of its value. The most convincing proof of this is that Origen (1) takes the idea of the im- mutability of God as the regulating idea of his system, and (2) deprives the historical ‘Word made flesh" of all significance for the true Gnostic. To him Christ appears simply as the Logos who is with the Father from eternity, and works from all eternity, to whom alone the instructed Christian directs his thoughts, requiring nothing more than a perfect—z.e., divine—teacher. In such propositions his- torical Christianity is stripped off as a mere husk. The objects of religious knowledge are beyond the plane of history, or rather—in a thoroughly Gnostic and Neo-Pla- tonic spirit—they are regarded as belonging to a supra- mundane history. On this view contact with the faith

of the church could only be maintained by distinguishing an exoteric and an esoteric form of Christianity. This dis- tinction was already current in the catechetical school of Alexandria, but Origen gave it its boldest expression, and justified it on the ground of the incapacity of the Christian masses to grasp the deeper sense of Scripture, or unravel the difficulties of exegesis. On the other hand, in deal- ing with the problem of bringing his heterodox system into conformity with the regula jider he evinced a high degree of technical skill. An external conformity was possible inasmuch as speculation, proceeding from the higher to the lower, could keep by the stages of the re- gula fide, which had been developed into a history of salvation, The system itself aims in principle at being thoroughly monistic ; but, since matter, although created by God out of nothing, was regarded merely as the sphere in which souls are punished and purified, the system is pervaded by a strongly dualistic element. The immuta- bility of God requires the eternity of the Logos and of the world. At this point Origen succeeded in avoiding the heretical Gnostic idea of God by assigning to the Godhead the attributes of goodness and righteousness. The pre- existence of souls is another inference from the immuta- bility of God, although Origen also deduced it from the nature of the soul, which as a spiritual potency must be eternal. Indeed this is the fundamental idea of Origen—"the original and indestructible unity of God and all spirit- ual essences." From this follows the necessity for the created spirit, after apostacy, error, and sin, to return always to its origin in God. The actual sinfulness of all men Origen was able to explain by the theological hypo- thesis of pre-existence and the premundane fall of each individual soul. He holds that freedom is the inalienable prerogative of the finite spirit ; and this is the second point that distinguishes his theology from the heretical Gnosti- cism. The system unfolds itself like a drama, of which the successive stages are as follows :—the transcendental fall, the creation of the material world, inaugurating the history of punishment and redemption, the clothing of fallen souls in flesh, the dominion of sin, evil, and the demons on earth, the appearing of the Logos, His union with a pure human soul, His esoteric preaching of salva- tion, and His death in the flesh, then the imparting of the Spirit, and the ultimate restoration of all: things. The

doctrine of the restoration appeared necessary because the spirit, in spite of its inherent freedom, cannot lose its true nature, and because the final purposes of God cannot be foiled. The end, however, is only relative, for spirits are continually falling, and God remains through eternity the creator of the world. Moreover, the end is not conceived as a transfiguration of the world, but as a liberation of the spirit from its unnatural union with the sensual. Here the Gnostic and philosophical character of the system is particularly manifest. The old Christian eschatology is set aside ; no one has dealt such deadly blows to Chiliasm and Christian apocalypticism as Origen. It need hardly be said that he spiritualized the church doctrine of the resurrection of the flesh. But, while in all these doctrines he appears in the character of a Platonic philosopher, traces of rational criticism are not wanting. Where his funda- mental conception admits of it, he tries to solve historical problems by historical methods, Even in the christology, where le is treating of the historical Christ, he entertains critical considerations ; hence it is not altogether without reason that in after times he was suspected of "Ebionitic " views of the Person of Christ. Not unfrequently he re- presents the unity of the Father and the Son as a unity of agreement and harmony and "identity of will."

Although the theology of Origen exerted a considerable influence as a whole in the two following centuries, it cer- tainly lost nothing by the circumstance that several im- portant propositions were capable of being torn from their original setting and placed in new connexions. It is in fact one of the peculiarities of this theology, which professed to be at once churchly and philosophical, that most of its formulz could be interpreted and appreciated in utramque partem. By arbitrary divisions and rearrangements the doctrinal statements of this "science of faith" could be made to serve the most diverse dogmatic tendencies. This is seen especially in the doctrine of the Logos. On the basis of his idea of God Origen was obliged to insist in the strongest manner on the personality, the eternity (eter- nal generation), and the essential divinity of the Logos.) On the other hand, when he turned to consider the origin of the Logos he did not hesitate to speak of Him as a kticpa, and to include Him amongst the rest of God's spiritual creatures. A xtiopa, which is at the same time opootc.ov TH Oew, was no contradiction to him, simply be- cause he held the immutability, the pure knowledge, and the blessedness which constituted the divine nature to

~~be communicable attributes. In later times both the ortho- dox and the Arians appealed to his teaching, both with a certain plausibility ; but the inference of Arius, that an imparted divinity must be divinity in the second degree, Origen did not draw. With respect to other doctrines also, such as those of the Holy Spirit and the incarnation of Christ, &c., Origen prepared the way for the later dogmas. The technical terms round which such bitter controversies raged in the 4th and 5th centuries are often found in Origen lying peacefully side by side. But this is just where his epoch-making importance lies, that all the later parties in the church learned from him. And this is true not only of the dogmatic parties; solitary monks and ambitious priests, hard-headed critical exegetes,? allegorists, mystics, all found something congenial in his writings. The only man who tried to shake off the theological influence of Origen was Marcellus of Ancyra, who did not succeed in producing any lasting effect on theology.~~

~~The attacks on Origen, which had begun in his lifetime,~~

~~1 "Communis substantia est filio cum patre; dwéppora enim du0- ovetos videtur, 7.¢,, unius substantie cum illo corpore ex quo est dréppota."~~

~~2 H.g., Dionysius of Alexandria ; compare his judicious verdict on the Apocalypse.~~

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~~did not cease for centuries, and only subsided during the time of the fierce Arian controversy. It was not so much the relation between pistis and gnosis—faith and know- ledge—as defined by Origen that gave offence, but rather isolated propositions, such as his doctrines of the pre- existence of souls, of the soul and body of Christ, of the resurrection of the flesh, of the final restoration, and of the plurality of worlds. Even in the 3d century Origen's view of the Trinity and of the Person of Christ was called in question, and that from various points of view. It was not till the 5th century, however, that objections of this kind became frequent. In the 4th century Pamphilus, Eusebius of Ceesarea, Athanasius, the Cappadocians, Didy- mus, and Rufinus were on the side of Origen against the attacks of Methodius and many others. But, when the zeal of Epiphanius was kindled against him, when Jerome, alarmed about his own reputation, and in defiance of his past~~

attitude, turned against his once honoured teacher, and Theophilus, patriarch of Alexandria, found it prudent, for political reasons, and out of consideration for the un- educated monks, to condemn Origen,—then his authority received a shock from which it never recovered. There were, doubtless, in the 5th century church historians and theologians who still spoke of him with reverence, but such men became fewer and fewer. In the West Vincent of Lerins held up Origen as a warning example (Commontt., 23), showing how even the most learned and most eminent of church teachers might become a misleading light. In the East the exegetical school of Antioch had an aversion to Origen; the Alexandrians had utterly repudiated him, Nevertheless his writings were much read, especially in Palestine. The monophysite monks appealed to his authority, but could not prevent Justinian and the fifth cecumenical council at Constantinople (553) from anathe- matizing the teaching of Origen. It is true that many scholars (e.g., Hefele, Conciliengesch., i. p. 858 sg.) deny that Origen was condemned by this council; but Mdller rightly holds that the condemnation is proved (Realency- klop. f. protest. Theol..u. Kirche, vol. xi. p. 118).

Sourees and Literature.—Next to the works of Origen (see Rede- penning, "Des Hieronymus wiederaufgefundenes Verzeichniss der Schriften des Origens," in Ze. f. d. hist. Theol., 1851, p. 66 sq.) the most important sources are :—Gregory Thaumat., Panegyricus in Orig. ; Eusebius, H. £., vi. ; Epiphanius, Her., 64 ; the works of Methodius, the Cappadocians, Jerome (see De wir. tll., 54, 61), and Rufinus; Vincent. Lerin., Commonit., 23 ; Palladius, Hist. Laws., 147 ; Justinian, Hp. ad Mennam (Mansi, ix. p. 487 sq.); Photius, Biblioth., 118, &c. There is no complete critical edition of Origen's works. The best edition is that of Car. and C. Vine. Delarue, 4 vols. fol., Paris, 1733-59,—reprinted by Lommatzsch, 25 vols. 8vo, Berlin, 1831-48, and by Migne, Patrol. curs. compl., ser. Gr,, vols. x1. -xvii. Several new pieces have been edited by Gallandi and A. Mai. Amongst the older works on Origen those of Huetius (printed in Delarue, vol. iv.) are the best; but Tillemont, Fabricius, Walch (Historie d. Ketzereten, vii. pp, 362-760), and Schréckh also deserve to be mentioned. In recent times the doctrine of Origen has been expounded in the great works on church history by Baur, Dorner, Bohringer, Neander, Moller (Geschichte der Kosmologie in der griechischen Kirche), and Kahnis (Die Lehre vom h. Geist, vol. i.) ; compare with these the works on the history of philosophy by Ritter,

Erdmann, Ueberweg, and Zeller. Of monographs, the best and most complete is Redepenning, Origenes, eine Darstellung seines Lebens und seiner Lehre, 2 vols., 1841, 1846. Compare Thomasius, Orig., 1837; Kriiger, "' Ueber das Verhaltniss des Orig. zu Ammonius Sakkas," in the Zischr. f. hist. Theol., 1848, i. p, 46 sg. ; Fischer, Comment, de Orig. theologia et eosmologia, 1846; Ramers, Orig. Lehre von der Auferstehung des Fleisehes, 1851; Knittel, " Orig. Lehre von der Menschwerdung," in the Theol. Quartalsehr., 1872; Schultz, "Christologie des Orig.," in the Jahrb. f. protest. Theol., 1875; Mehlhorn, " Die Lehre von der menschlichen Freiheit nach Orig.," in Zettschr. f. Kirehengesch., vol. ii., 1878 ; Freppel, Origéne, vol. i., 2d ed., Paris, 1875. (A. HA.)

ORIHUELA, a town and episcopal see of Spain, in the southern portion of the province of Alicante, 13 miles north- east from Murcia and about 15 from the sea, is situated in a beautiful and exceedingly fertile " huerta," at the foot

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of a limestone ridge of moderate height, and on both sides of the Segura, here crossed by two bridges. There are remains of an old fort on the hill commanding the town; and the gateway on the side of Valencia—the Puerta del Colegio—is a fine lofty arch, surmounted by an emblematic statue and the city arms. The most prominent buildings are the episcopal palace (1733), with a frontage of 600 feet, but partly ruinous ; the town-house (1843), containing the municipal archives and a considerable number of curious and important documents of national history ; and the cathedral, a comparatively small Gothic structure built on the site of a former mosque in the 14th century, and enlarged and tastelessly restored in 1829. There are large barracks on the outskirts, and many noblemen have town houses or "palaces" in Orihuela. 'There are also a con- siderable number of convents, now suppressed. The uni- versity of Orihuela, founded in 1568 by the archbishop of Valencia, was closed in 1835, part of the revenue being applied to the support of a college affiliated to the univer- sity of Valencia. Besides numerous primary schools there are a theological seminary anda normal school. The final separation of Orihuela from the diocese of Cartagena took place in 1564. The inhabitants are largely engaged in

agriculture, the trade in fruit (oranges and citrons, pomegranates, dates), as well as in cereals, oil, and wine, being considerable. There is a lively and picturesque weekly market, The manufactures, which are of secondary importance, include textile fabrics, leather, saltpetre, and hats; dyeing is also carried on. The population of the ayunta- miento was 20,929 in 1877,

Orihuela is not mentioned in ancient geography, for a proposed identification with the Orcelis of Pliny is almost certainly wrong. As Auriela or Aurivalet, on the other hand, it figures frequently in the annals of the Moorish period ; in 713 it was held successfully for some time by Theodemir against Abd-al-Aziz. It was conquered by Jayme of Aragon, for his father-in-law Alphonso of Castile, in 1265, It suffered sack during the disturbances at the beginning of the reign of Charles V. (1520), and again in the War of Succession

(1706). Local annals specially mention the plague of 1648, the flood of 1651, and the earthquake of 1829,

ORINOCO, a river in the north of South America, which falls into the Atlantic on the north-east seaboard between 60° 20' and 62° 30' W. long., after draining an area of at least 366,000 square miles (belonging to Venezuela and Colombia) in a course of about 1500 miles, Between the source of its westmost affluent, the Guaviare, and that of its eastmost, the Caroni, there is a difference of 14 degrees of longitude. The head-waters of the main stream rise on the southern slope of the Sierre Parime ; but the branch which keeps the name Orinoco has not yet been traced by any European, and the position of the lake from which, according to native report, it issues can only be vaguely fixed. Michelena y Réjas, who ascended the Orinoco as far as the mouth of the Mawaca (itself about 30 feet deep), found it even there a deep and navi- gable river; and a little way lower down it receives no inconsiderable accession from the Ocamo and Padamo. Below Esmeralda, a settlement in 65° 50' W. long., long known as the limit of definite exploration, occurs one of the most remarkable bifurcations in the world ; while the main stream holds on in a north-west direction, a branch called the Casiquiare turns south and, increased by numerous small tributaries, runs for about 180 miles to the Rio Negro (an affluent of the Amazons) with so rapid a current that, while a boat takes only four natural

days to descend, the return voyage requires twenty to thirty days. In the neigh- bourhood of San Fernando de Atabapo (in 4° 2' N, lat. and 68° 10' W. long., a miserable village, but officially the capital of the Venezuelan province of the Amazons, and famous in the history of the river) the Orinoco is joined by the united waters of the Atabapo, the Ynirida, and the Guaviare,—the Guaviare receiving the Ynirida

about 10 or 15 miles west of San Fernando and then meeting the Atabapo opposite the village. The Guaviare is the first of the great rivers which bring down the waters of the Andes to the Orinoco, and is fit for steam- boat traffic a long way up. From its junction with the Guaviare to the great rapid of Mariapiri (a distance of about 180 miles) the Ynirida, which was explored in 1872 by Frédéric Montolieu, hastens through a rugged country with a swift and frequently interrupted stream; above Mariapiri, and as far as Guacamayo (Montolieu's farthest), it forms, on the other hand, a succession of lakes and lagoons with hardly any current (Bull. Soc. Géogr., Paris, 1880). Though smaller than either the Guaviare, the Ynirida, or the Orinoco, the Atabapo gives its northward direction to the united river, which below the confluence widens out into a noble flood several miles broad, but before long has its channel contracted and twisted and broken by the rough granitic rocks of the country through which it has to force its way. About 80 miles bring the river to the great cataracts of Maypures, and a few miles more to that of Atures; both are complete barriers to upward naviga- tion, and, since Humboldt's glowing description, have been ranked among the most striking pieces of river scenery in South America (Humboldt and Bonpland, Voy. au Nouv. Continent, vol. ii. pp. 360-363). Some distance below Atures is the confluence of the Meta, a powerful many-watered affluent from the Andes, which has been ascended by steamer within 60 miles of Bogoté; but the Orinoco still continues northward till, meeting the Apure, which drains the whole Merida Cordillera, it turns westwards through the great Venezuelan valley. In its onward course it receives a great many tributaries from both north and south, the former being comparatively short, but the latter, especially the Caura and Caroni, rising in the highlands hundreds of miles away. About 50 miles below the mouth of the Caroni and 120 miles from the sea begins the enormous delta, embracing

200 miles of coast. The southmost branch, Boca de Navios or Boca de Varime, continues in the line of the river; the Manamo or Vagre branch strikes off almost at right angles northward to the Gulf of Paria or Golfo Triste. The annual inunda- tion of the Orinoco, which makes a kind of false start in April, and, gradually increasing in May, June, and July, reaches its height in September, is extensive enough to lay the country under water in some places for scores of miles inland. As most of the regions through which it passes are in a state of nature, and there is hardly, with the exception of ANGosTURA (q.v.), a town of any consider- able size on the banks of either main stream or affluents, this noble river-system is but little turned to account for commerce. Not only, however, is it easily navigable for steamers for nearly 800 miles, but, as the lower part of its course lies in the line of the trade-winds, sailing craft are able to make their way slowly upwards against the current. Even at the junction of the Guaviare the height above the sea is only 744 feet.

In 1498 Columbus entered Golfo Triste, and probably observed the northern mouths of the Orinoco, and in 1499 the main channel appears to have been noted by Ojeda. The first to attempt the ascent of the river was Diego de Ordaz in 1535, who reached the mouth of the Meta. For its scientific exploration we are mainly indebted to José Iturriaga and José Solano (1756), Humboldt (1800), and Michelena y Rojas (1855-1856). , degre wae (Madrid, 1741); Michelena y Rédjas, Explora-

ORIOLE, from the Old French Oriol and that from the Latin aureolus, the name once applied to the bird, from its golden colouring, which is now generally admitted to be the Vireo or IcrErus (vol. xii. p. 696) of classical authors—the Oriolus galbula of Linnzeus—but now commonly used ma much wider sense. The Golden Oriole, which is the type of the Family Oriolidz of modern ornithologists, is a far

from uncommon spring-visitor to the British Islands ; but the conspicuous plumage of the male—bright yellow con- trasted with black, chiefly on the wings and tail—always attracts attention, and generally brings about its death. Yet a few instances are known in which it is supposed to have bred in England. The nest is a beautifully interwoven fabric, suspended under the

horizontal fork of a bough, to both branches of which it is firmly attached, and the eggs are of a shining white sometimes tinged with pink, and sparsely spotted with dark purple. On the Continent it is a well- known if not an abundant bird, and its range in summer extends so far to the east as Irkutsk, while in winter it is found in Natal and Damaraland. In India it is replaced by a closely allied form, O. kundoo, chiefly distinguishable by the male possessing a black streak behind as well as in front of the eye; and both in Asia and Africa are several other species more or less resembling O. galbula, but some depart considerably from that type, assuming a black head, or even a glowing crimson instead of the ordinary yellow colouring, while others again remain constant to the dingy type of plumage which characterizes the female of the more normal form. Among these last are the aberrant species of the group Jimetes or Mimeta, belonging to the Australian Region, respecting which Mr Wallace pointed out, first in the Zoological Society's Proceedings (1863, pp. 26-28), and afterwards in his Malay Archipelago (ii. pp. 150-153), the very curious facts—as yet only explicable on the theory of "mimicry"—of which mention has already been made (HoNEy-EATER, vol. xii. p. 139). It is a singular circumstance that this group Jfimeta first received its name from Captain King (Survey dc. of Australia, ii. p. 417) under the belief that the birds composing it belonged to the Family Aleliphagidz, which had assumed the appearance of Orioles, whereas Mr Wallace's investigations tend to show that the imitation (unconscious, of course) is on the part of the latter. The external similarity of the I/imeta and the 7'rogidorhynchus of the island of Bouru, one of the Moluceas, is perfectly wonderful, and has again and again deceived some of the best ornithologists, though the birds are structurally far apart. Another genus which has been referred to the Oriolidx, and may here be mentioned, is Sphecotheres, peculiar to the Australian Region, and dis-tinguishable from the more normal Orioles by a bare space round the eye. A. N.) ORION, the name of a constellation which has been the centre of many legends in Greece. It bears the form of a warrior carrying a club, and wearing a girdle which is composed of three very beautiful stars. Its disappearance in the autumn is the prelude to storms and rain. The legendary hero Orion, or, as Pindar calls him, Oarion, was according to Homer a giant, fairer and taller than the Aloides. Eos, the dawn-goddess, loved him, but the gods were angry; Artemis slew him in Ortygia with kindly shaft. A doubtful passage in the Odyssey calls him a mighty hunter,

~~The later poets give various discrepant accounts of his parentage. They usually connect him with some deed of violence to a maid, either the daughter of CEnopion in Chios, or the nymph Upis in Delos, or even Artemis herself. Others say that Artemis loved him, and was induced, by an artifice of the angry Apollo, to shoot him unwittingly. The Old Testament name of the constellation appears to be késél, the fool or impious (Amos v. 5; Job ix. 9, xxviii. 31). In Arabic and Semitic it is called the giant. Late writers (Cedrenus and the Paschal Chronicle) speak of a Persian identification of Orion with Nimrod. ORISSA, a province of British India, forming a division or commissionership under the jurisdiction of the lieutenant- governor of Bengal, situated between 19° 28' and 22° 34' 15" N. lat. and between 83° 36' 30" and 87° 31' 30" E. long. It forms the extreme south-western portion of Bengal,~~

~~bounded on the N. and N.E. by Chutid Nagpur and Lower Bengal proper, E. and §.E. by the Bay of Bengal, S. by Madras, and W. by the Central Provinces.~~

~~Orissa consists of two distinct territories—a fertile alluvial delta, comprising the three British districts of Cuttack, Balasor, and Puri, occupying an area of 8056 square miles; and a wild region of sparsely populated tributary Hill States, with an area of 16,084 square miles, the latter walling out the former from the central Indian plateau. In the latter district the two small territories of Angul and Banki (area 997 square miles) are subject to British management. Including these, the area of British Orissa is 9053 square miles.~~

~~British Orissa.—The Orissa delta is formed from the deposits of the Mahdnadi, the Bralimani, and the Baitaranf(, which converge towards the coast, to within 30 miles of each other, upon Orissa. The three rivers, together with two minor streams, the Sdélandi and Subanrekha, represent an accumulated drainage of 63,350 square miles, which, during the height of the hot weather, amounts only to a discharge of 1690 cubic feet per second. The average cold-weather discharge is 5360 cubic feet, but during the rains it rises to 2,760,000 cubic feet. This enormous mass of water falls suddenly upon a narrow level strip of country in which the river-beds are~~

~~altogether inadequate to carry it off. The Orissa canal-system now affords an outlet to much of this surplus water, which it also utilizes for irrigation.~~

~~The population of the British districts was 3,730,735 in 1881, dis- tributed over an area of 9053 square miles. The Hindus form the great mass of the population (8,634,049 in 1881), Mohammedans numbering 85,611, and aboriginal tribes still following their primi- tive modes of worship 10,923. The population is entirely rural, the people living almost solely by husbandry. In 1881 there were only five towns in the province containing upwards of 5000 in- habitants :— Cuttack (42,656), the headquarters of the provincial administration, and the starting-point of the great system of canals which irrigate the province ; Puri (22,095), the capital of the third district of Orissa, and the religious capital of the province ; Balasor (20,265), the official headquarters of the district of the same name, and the site of the earliest British factory on the seaboard of Bengal; Kendrapara (15,969) ; and Jaipur (11,283), also a great religious centre, with numerous ruined Sivaite temples.~~

~~The whole of Orissa is holy ground. On the southern bank of the Baitarani shrine rises after shrine in honour of Siva, the All- Destroyer. On leaving the stream the pilgrim enters Jaipur, liter- ally the city of sacrifice, the headquarters of the region of pilgrim- age sacred to the wife of the All-Destroyer. There is not a fiscal division in Orissa without its community of cenobites, scarcely a village without consecrated lands, and not a single ancient family that has not devoted its best acres to the gods. Every town is filled with temples, and every hamlet has its shrine. The national reverence of the Hindus for holy places has been for ages concen- trated on Puri, sacred to Vishnu under his title of Jagannath, the Lord of the World.~~

~~Rice forms the great staple, every variety of it being grown, from the dwarf plant, 18 inches high, on the dry uplands, to the long-stemmed paddy which rears its head above 6 or 7 feet of water. Other crops consist of wheat, many varieties of pulse, oil-seeds, hemp, tobacco, cotton, sugar-cane, betel-leaf, tubers, and vegetables of many kinds. Besides its copious water-supply in time of high flood, the province has a local rainfall of 624 inches per annum. Nevertheless, the uncontrolled state of the water- supply has subjected the country from time immemorial to droughts no less than to~~

inundation. Thus the terrible famine of 1865-66, which swept away one-fourth of the entire population, was followed in 1866 by a flood which destroyed crops to the value of £3,000, 000. Since then much has been done by Government to husband the abundant water-supply.

The early history of the kingdom of Orissa (Odra-desa), as recorded in the archives of the temple of Jagannath, is largely mythical. A blank in the records from about 50 B.c. to 319 A.D. corresponds to a period of Yavana occupation and Buddhist influence, during which the numerous rock monasterics of Orissa were excavated. The founder of the Kesari or Lion dynasty, which ruled from 474 to 1132 a.D., is said to have restored the worship of Jagannath, and under this line the great Sivaite temple at Bhuvaneswar was con- structed. In 1182 a newline (the Gangetic dynasty) succeeded, and Vishnu took the place of Siva in the royal worship. This dynasty was extinguished in 1532-34, and in 1578, after half a century of war, Orissa became a province of the Mogul empire.

In 1751 it passed to the Marhattas and suffered great miseries under their rule till the British conquest in 1803.

Orissa Tributary States.—These form a cluster of eighteen depend- ent territories or chiefships in the mountainous background of the Orissa division, occupying a succession of wooded mountain and rocky ranges, enclosing the rich valleys of the Mahanadi, Brahmani, and Baitaranf. The following table gives a list of the states, with their area in square miles and their population.

TRIBUTARY STATES OF ORIssA IN 1881.

States. Area. | Popu- States. Area, [ee

opu- lation. lation.

1 | Athgarh……; 168] 31,079 || 10 | Khandpara ..| 244 | 66,296 2 | Athmallik….| 730] 21,774 || 11 | Morbhanj ….| 4,243 | 385,737 8 | Baramba ….| 134] 29,772 || 12 | Narsinhpur ..; 199] 32,583 4 \ Bod and 2.064 |) 1805108 |) 1S) ||\aNilgini ©. <…. 278 50,972 5 Khundmal 14 | Nayagarh ….. 588 | 114,622 6 | Daspalla ….| 568] 41,608 || 15 | Pal Lahara

..| 452) 14,887 7 | Dhenkanal ..| 1,463 | 208,316 || 16 | Ranpur…... 203 36,539 8 lehineksl 35 hago |} 312 $8,802 || 17 | Talcher …... 899 35,590 9 | Keunjhar ….| 3,096 | 215,612 |] 18 | Tigaria …... 46 19,850 Total….| 15,187 |1,469,142

The largest town in the whole of the Tributary States is Khand- para, with 5548 inhabitants. It lies on the right bank of the Mahanadi, and is a considerable seat of trade.

Tillage is conducted in two methods, common to the whole Tributary States: (1) rice cultivation in hollows and on low lands which have a command of irrigation ; (2) upland or tala cultiva- tion, upon newly-cleared patches of land, which depends entirely on the local rainfall. In the valleys, where the mountain rivulets can be utilized, the peasants throw a dam across the stream and store up the water. The lower levels thus secure a supply of moist- ure the whole year round, and wet rice cultivation goes on through- out the twelve months. In the uplands the forests are cut down and burnt upon the spot; and the soil, thus enriched with salts, yields abundant crops of early rice, oil-seeds, and cotton. At the end of four or five years such clearings are abandoned for new ones, and the land relapses into jungle.

The states are under the political superintendence of the British commissioner of Orissa.

ORIZABA, or Orizava, a city of Mexico, in the state of Vera Cruz, is situated at a height of 3975 feet above the sea in a well-wooded valley 65 miles south-west of Vera Cruz, on one of the two high roads between that city and Mexico, and since 1872 on the Vera Cruz and Mexico Railway. It is a thriving place of 16,000 inhabitants, has a good exchange, a theatre, and two hospitals, spins cotton, and manufactures cotton and woollen cloth, and trades in tobacco, sugar, rum, and other local products. Originally called Izhuatlan, Orizaba is one of the oldest cities of Mexico. At the time of the Spanish conquest it formed part of the Aztec kingdom. In 1521 the natives massacred a large number of Spaniards. In 1862 Orizaba was the headquarters of the French army, which inflicted a defeat on the Mexicans on the outskirts of the city. Six miles north of the city stands the Pico de Orizaba or Citlal- tepetl, "The Mountain of the Star," an extinct volcano 17,665 feet high, and thus one of the loftiest summits in the continent. It was

ascended by W. F. Reynolds of the United States Topographical Engineers in 1848.

ORKNEY anp SHETLAND, a county of Scotland, formed of two separate groups of islands in the North Sea. The Orkneys are situated between 58° 41' and 59° 24' N. lat. and between 2° 22' and 3° 25' W. long., and are separated from the mainland of Scotland by the Pentland Firth, the breadth of which between Brough Ness in South Ronaldshay and Duncansby Head, Caithness, is about 7 miles. The Shetlands lie to the north-east of the Orkneys, between 59° 50' and 60° 52' N. lat. and between 0° 55' and 2° 14' W. long. 'The distance from Dennis Head in Orkney to Sumburgh Head in Shetland is about 50 miles, but Fair Isle, which is included in Shetland, is situated midway between the two main groups. The total area of the Orkneys and Shetlands is 593,352 acres or about 927 square miles, the area of the Orkneys being 240,476 acres, and that of the Shetlands 352,876 acres.

In the Orkney group there are fifty-six islands and islets,

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of which twenty-nine are inhabited, the others, which are called "holms," being frequently made use of for pasture. Besides Pomona or the Mainland, which has an area equal to all the others combined, the principal islands are, to the north, Rousay, Westray, Papa-Westray, North Ronaldshay, Sanday, Eday, Stronsay, and Shapinshay, and to the south, Hoy, North Walls, South Walls, Flotta, South Ronaldshay, and Burray. The members of the Shetland group are more

numerous than the Orkneys, consisting of about a hundred islands and islets ; besides the Mainland, the more important are Yell, Unst, and Fetlar to the north, Whalsay and Bressay to.the east, and East and West Burra, Papa-Stour, Muckle Roe, and Foula to the west. Except towards the west the surface of the Orkneys is comparatively flat, and in some cases, as in Sanday, the coast is so low as to be a frequent cause of shipwreck. The island of Hoy consists principally of lofty black barren rocks, of which the

Ward Hill attains a height of 1564 feet. In the southern part of the Main-land, to the west of Kirkwall, the hills also reach a con- siderable elevation, the highest summits being Wideford Hill near Kirkwall (740 feet) and the Ward Hill of Orphir (880 feet) ; and there is another hilly region in the north- west of the Mainland, opposite the island of Rousay. The centre of Rousay is occupied by hills of considerable height. On the west of Hoy perpendicular precipices of great height descend sheer to the Atlantic. The outline of the islands is very irregular, and through the numerous firths and sounds the tides rush with great rapidity, forming occa- sionally whirlpools called roosts, which in stormy weather frequently suck in fishing-boats and prove dangerous even to large vessels.

—The coast-scenery of the Shetland group is strikingly picturesque. The islands present an irregular rocky surface generally rising into hills of considerable elevation, the

highest summit being Roeness Hill (1475 feet) in the Mainland. By the action of the waves the rocks have been worn into numerous fantastic shapes, and the coast-line is also deeply indented by bays and "voes" or sea-lochs, caused partly by denudation and partly by glacial action. The greater part of the coast is stern and precipitous, but Sumburgh Head, the Noup of Noss, Fitful Head, the island of Papa-Stour with its surrounding rocks, Foula (especially on its western side), the Drongs and adjoining rocks of the parish of Northmavine with the coast-line from Roeness Voe to Haevdadal Head, and Unst the most northern of the group may be singled out for their picturesque beauty or impressive grandeur. numerous caves, the more remarkable of which are the immense Orkneyman's Cave near the Bard of Bressay, and the fantastic caves of Papa-Stour.

Geology.—The geological formation of the Orkneys is very similar to that of the adjoining mainland, and con- sists almost entirely of the lower Old Red Sandstone of the flagstone series. A red and yellow sandstone series occupies part of Sanday, Eday, Burray, Flotta, and South Ronaldshay, and a long narrow strip of the Mainland to the south of Kirkwall. The mountainous district of Hoy be- longs to the upper Old Red Sandstone, in which are inter- bedded volcanic rocks consisting of amygdaloidal lavas

~~and ashes, and forming the terraces of the northern slopes of the Hoy hills. These rocks rest unconformably on the lower Old Red Sandstone. North-west from Stromness Bay to Inga Ness there is an outcrop of crystalline rocks consisting of granite and micaceous gneiss. The flagstone series, especially in the neighbourhood of Stromness, contains numerous fossils,—ichthyolites, crustaceans, and plants being all represented. From the character of the striated surfaces of the rocks, and the presence of foreign rocks in the boulder-clay, it has been concluded that the Orkneys were subjected to a glacial action crossing from the North Sea to the Atlantic; and there are also traces of local glaciers, especially at Hoy.~~

~~The geological formation of the Shetlands, like that of the Orkneys, belongs principally to the lower Old Red Sandstone and the metamorphic rocks on which they rest unconformably ; but the proportion between the two species of rocks is reversed, the metamorphic rocks cropping to the surface throughout the greater part of the Shetland group. The central portion of the islands, including the north- western half of the Mainland and its eastern seaboard in~~

~~the parish of Northmavine, Whalsay, Yell, and the western ~~

~~seaboard of Unst, is occupied chiefly by micaceous and hornblendic gneiss with limestones and quartzites. In the southern portion of the Mainland the clay-slate series, with associated limestones and quartzites, prevails. In Unst and Fetlar there are large masses of serpentine and gabbro, and diorite occupies a large area in the districts of Delting and Northmavine. The lower Old Red Sandstone occupies the islands of Foula and Bressay, skirts the eastern sea- board of the Mainland from Lerwick southwards, and in- cludes the greater part of Walls. series of igneous rocks, especially in the western district of Northmavine, and there is also an intrusive series, Even more striking evidence of glacial action exists in Shetland than in Orkney. The metamorphic rocks are very rich in beautiful minerals, especially along the coast of North- mavine, among the varieties being felsite, epidote, actinolite, serpentine, anthophyllite, fluor-spar, steatite, magnetite, and cyanite. deposits of peat.~~

~~Climate and Agriculture.—The temperature, both of the Orkneys and of the Shetlands, presents smaller variations than that of Scotland or England.~~

~~The yearly average is a little over 45° Fahr., the average for the coldest months—~~

~~The action of the sea has formed—~~

~~It is associated with a—~~

~~Both in Orkney and Shetland there are large~~

~~a~~

~~ORR SMe Send SHETL AW D~~

~~January, February, and March—being nearly 39°, and for the warmest months—July, August, and September—about 53°. Though fogs are common, the rainfall is not excess- ive, but it is higher in Shetland than in Orkney. As the temperature is influenced by the Gulf Stream, the coldest month of the year is March, when the tide reaches its lowest point. The soil of Orkney varies in different islands, but generally it is either a sandy loam or a strong but friable clay, and remarkably fertile. Large quantities of seaweed, as well as lime and marl, are available for manure. Since the opening up of more constant communication with the south, and the construction of a complete system of roads, begun in 1857, the system of cultivation has undergone a complete transformation. are now occupied by. farmers from Scotland.~~

~~Between 1875 and 1880 the number of holdings in Orkney in- creased from 3147 to 3319, and their area from 93,618 acres to 104,958. In 1880 2873 holdings, or more than two-thirds of the total number, did not exceed 50 acres each, while 279 ranged from 50 to 100 acres, 131 from 100 to 300, and 36 were above 300. The total number of acres under cultivation in 1883 was 112,148, of which 38,459 were under corn crops, 32,051 rotation grasses, 22,755 permanent pasture, and 1031 fallow. Of the corn crops, 32.781 acres were under oats and 5641 under barley or bere, while 14,387 of the green crops were under turnips and 3104 under potatoes, Horses, which are for the most part a small and active breed, numbered 6092 in 1883, of which 4884 were used solely for agricul- tural purposes. Cattle numbered 25,624, of which 9405 were cows and heifers in milk or in calf.~~

Shorthorned and polled Angus are now the most common breeds, cattle-feeding being largely practised. Sheep, which in 1883 numbered 31,548, are now chiefly Cheviots and a cross between them and Leicesters, but the native sheep (identical with those of Shetland) are still kept in considerable numbers in Hoy and South Ronaldshay. Pigs numbered 4745.

In Shetland there has been no agricultural progress corresponding to that in operation in Orkney, the principal reason being insuffi- ciency of soil, which in many cases has to be made or increased by collecting turf. Between 1875 and 1880 the number of holdings decreased from 3839 to 3604, but the area under cultivation increased from 52,256 to 58,357 acres. In 1880 3529 holdings did not exceed 50 acres each, while 36 ranged from 50 to 100 acres, 30 from 100 to 300, and 11 were above 300. Although there are some good arable farms in a few favoured districts, the majority are small crofts held on a yearly tenancy by the fishermen along with their cottages. For the most part the cottages are only slightly improved specimens of the original cabin, the fireplace of at least the ' but" end being in the centre of the apartment, which was formerly shared with calves, pigs, and other young animals. The cows are now for the most part housed in separate buildings. Originally the rent was paid in kind, and it was a general custom for the landlord or tacksman to compel the crofter to barter a considerable portion of the fruits of his industry for provisions and clothing, and the prac- tice is not yet quite obsolete in certain districts. 'The cottages are*

—generally grouped together in small hamlets called '"touns." The size of a croft varies from 5 to 10 acres; but the old Norwegian measurement by merks is still retained. Originally the land was held on the "'runrig" system —that is, different owners held alter- nate ridges—but now in most cases each holding is separate, The implement anciently used for turning over the soil was the Nor- wegian plough drawn by four oxen abreast, but as the holdings became subdivided and distinctly separated from each other it was superseded by the small sharp spade now in almost universal use, Until lately implements with wheels were scarcely known, and even yet the crofters generally carry out even the manure for the land in straw baskets slung over the shoulders. A system of roads was constructed during the potato famine of 1846-49, and wheeled vehicles are in general use in the

neighbourhood of Lerwick and various other places. According to the agricultural returns of 1883 there were 58,393 acres under cultivation, of which 10,528 were under corn crops, 4511 green crops, and 41,628 permanent pasture. No system of rotation is practised. Of the corn crops 8050 acres were under oats and 2478 under bere ; and of the green crops 3357 acres were under potatoes and 943 under'turnips. Originally the grain supplies were obtained almost wholly from the Orkneys, and fora long period grey and black oats and bere or bigg were the only species grown, but now white oats are quite common. Frequently the grain does not ripen till the end of October or beginning of November. The culture of the cabbage is said to have been intro- duced by a detachment of Cromwell's soldiers, potatoes in 1730, and turnips in 1807. Black and red currants ripen in sheltered

situations. Horses in 1883 numbered 5305, of which only 908 were used solely for agricultural purposes ; cattle numbered 21,345, of which 8132 were cows and heifers in milk or in calf; sheep numbered

Many of the holdings in Orkney'

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81,163, and pigs 3788. The small ponies peculiar to the islands are now becoming scarce, though entire ponies are greatly in demand for working underground in collieries. The native cattle are a diminu- tive breed with sinall horns and short legs. They are said to possess many of the points of the best breeds. The beef is remarkable for tenderness and flavour ; and, when well fed, the cows yield a large supply of rich milk. In some districts crosses have been intro- duced. The native sheep of Shetland possess many of the charac- teristics of goats. The ewes, as well as the rams, have generally short horns, and the wool is long and of very fine quality. White, black, speckled grey, and a peculiar russet brown called "moorat" are the prevailing colours, It is the common custom to tear out the wool from the roots by the hand, as this is said to ensure a finer second drop. A few black-faced and Cheviot sheep are kept in some places. The Shetland pigs, which are very inferior, are often fed on fish. Large numbers of geese and poultry are kept.

~~According to the Valuation Roll, 1883-84, Orkney was divided among 1149 proprietors, possessing 220,873 acres, with an annual value of about £82,416, or7s 5d per acre. According to the Parlia- mentary Return of 1873 546 of the proprietors, or about 42 per cent. at that date, possessed less than 1 acre, and the following 10 pos- sessed upwards of 5000 acres each :—J. G. M. Heddle, 50,410 ; earl of Zetland, 29,846; D. Balfour, 29,054; R. Baikie, 7846; H. C. Hebden, 7500; F. T. Burroughs, 6693; A.S. Graeme, 6444; trustees of iate J. Stuart of Brugh, 6243; T. Traill, 5780; trustees of the late G. Traill, 5031. Shetland in 1883-84 was divided among 575 proprietors, possessing 352,876 acres, with a total value of £44,108, or nearly 2s 6d per acre. In 1873 240 of the proprietors, or about 45 per cent., possessed less than 1 acre, 15 possessed upwards of 5000 acres, 13 above 10,000, and the following 5 above 20,000 acres each :—trustees of Busta estate, 29,820; curators of W. A. Bruce, 25,180; Lady Nicolson, 24,785; T. M. Cameron, 24,363; A. G. Grierson, 22,006.~~

~~Fauna.—The faunas of the two groups of islands are very similar. Remains of deer have been found in the Orkneys, although few, if any, remained in the time of the Norse jarls. For some centuries hares were extinct, but they were reintroduced about 1830. Rabbits are very numerous in some districts. The otter and walrus are met with. "Seals may occasionally be observed basking on the rocks, especially in the neighbourhood of the Ve Skerries off the western coast of the Mainland (Shetlands); and whales, both large and small, are frequently captured in the baysand sounds. The common porpoise is abundant, and the grampus also haunts the coasts. Nearly all the Falconide found anywhere else in Britain at one time frequented the Orkneys, and the hen-harrier, the merlin, the pere- grine, and the sparrow-hawk are still numerous. The short-eared owl is common, and various other species occasionally haunt the islands. The raven, the Royston crow, the rook, and the jackdaw are all met with. The red grouse, the golden plover, the dotterel plover, and the grey plover are abundant in some districts. The snipe, the woodcock, the common heron, the curlew, the little bittern, the white stork, the white spoonbill, the knot, the ruff, and the common coot frequent the more remote regions. There is an immense variety of water-fowl. Most of the singing birds found in Scotland are either natives or occasional visitants. The great skua gull still breeds in the island of Foula, where its eggs are carefully preserved.~~

Flora.—Although the Orkneys contain some plants which are rare in the British Isles, the flora of the group is much smaller in variety than that of the more mountainous Shetlands. For lists — the reader is referred to the paper on the flora of the Orkneys by W. Irvine Fortescue, and that on the flora of Shetland by Dr Peter White, both contained in Tudor's Orkneys and Shetland, 18838.

Manufactures.—According to Barry the woollen manufacture was at one time of some importance in the Orkneys, but by the end of last century had been superseded by that of linen, introduced about 1747. For the manufacture flax was at one time largely grown. After the introduction of machinery in the south it was no longer possible to continue the manufacture with profit, and, although straw-plaiting for a time took its place, it also succumbed to southern competition. Next to the linen trade the most important industry in the 18th century was the manufacture of kelp, introduced in 1722. With the abolition of the duty on Spanish barilla the manufacture for a time suffered severely, but of late years it has revived and now yields about £1500 annually. It is, however, chiefly on agriculture that the Orkneys depend, and their rapid pro- gress in this respect has been greatly facilitated by the very ample steam communication by three different routes with Scotland. Since 1871 telegraphic communication has extended to Unst, the most northerly of the Shetland group. Straw-plaiting was at one time practised in Shetland, but kelp-making is no longer practised. The staple manufacture is knitted goods. According to Edmonston,

1 Interesting information, not yet altogether out of date, on the agrieulture of the Orkneys will be found in a paper by R. O. Pringle, and on that of the Shetlauds in papers by H. Evershed and R. S. Skirving in the Trans, of the Mighland and Agricultural Society, 1874.

stockings to the value of about £17,000 were annually exported from Shetland about the beginning of the present century. The manufacture of gloves was introduced about 1800, of shawls about 1840, and of veils about 1850. Fair Island has long been famous for its coloured hosiery, into the art of knitting which the inhabit- ants are said to have been initiated by the

wrecked mariners of one of the ships of the Spanish Armada. The various dyes employed are extracted from the plants and lichens of the island.

Fisheries.—For some centuries the neighbourhood of the Orkneys and Shetlands was frequented by the fleet of Dutch vessels connected with the great herring fishery, but Barry states that fishing in his time was almost wholly neglected by the inhabitants of the Orkneys. The principal herring-stations are at Papa-Stronsay, Deersound, Holm, and South Ronaldshay. The greater part of the eatch of spring herrings is despatehed direct to Hamburg. The cod and ling fishing is prosecuted chiefly by the inhabitants of the north isles, both in open boats and in smacks, at the Faroes and near Iceland. Fishing is almost the sole occupation of the Shetland men, the women doing nearly all the farm-work and occupying also every spare moment in knitting both in the house and when carrying their burdens. The Shetland herring fishery has lately (1884) made rapid strides, but the inerease in the take of herrings is partly due to boats from the south. As the herring fishery has increased, the deep-sea ling and cod fishing, formerly the mainstay of the islands, has proportionately diminished. The whole of the fisheries were originally in the hands of the Dutchmen, but in 1712 their supre- maey was destroyed by the imposition of the duty on salt. Until within recent years the boats chiefly used were the old "'sixerns" built in the islands after the model of the Norwegian yawl, but whole or half-decked boats are now rapidly taking their place. The total number of persons now employed in the fisheries of the Orkneys and Shetlands together is about 11,000, Shetland employing over 7430. The number of smaeks belonging to the Orkneys is about 30, employing over 800 men ; Shetland possesses about double this number, and the Shetland smaeks are much more successful than those of Orkney, as more of them frequent the distant fishing- grounds. Shetland possesses, in addition to these, 285 decked first-class and 15 second-class fishing boats.

Administration and Population.—The islands of Orkney and of Shetland form one sheriffdom or stewartry, but the sheriff has a substitute in Orkney and another in Shetland. The county of Orkney and Shetland returns one member to parliament, and Kirkwall is ineluded in the Wick district of burghs, which returns one member.' Orkney includes 18 parishes and Shetland 12. From 24,445 in 1801 the population of Orkney had in 1831

increased to 28,847, and in 1861 to 32,395, but in 1881 was only 32,044, of whom 14,982 were males and 17,062 females. The population of Shetland in 1801 was 22,379, which had increased in 1831 to 29,392, and in 1861 to 81,670, but by 1881 had diminished to 29,705, of whom 12,656 were males and 17,049 females. In Orkney there were 118-88 females to every 100 males, but in Shet- land the proportion is 184-71, by far the largest in any county of Scotland. The number of inhabited islands in Orkney was 29, the Mainland numbering 17,165 persons, while 5 other islands had a population of over 1000 each, viz., South Ronaldshay 2557, Westray 2200, Sanday 2082, Hoy 1380, and Stronsay 1274. Shetland com- prised 80 inhabited islands, of which the Mainland contained 20,821, Yell 2529, and Unst 2178. In the Orkneys the only town is Kirk- wall (3947), a royal and parliamentary burgh, and the villages are Stromness (1705) and St Margaret's Hope (412). Stromness, which received an independent charter in 1817, has risen within the last century from a mere fishing hamlet to a port of some importance. It possesses a fine natural harbour, with a pier accessible to vessels of large tonnage at high tides, and a patent slip. It is the rendez- vous of vessels for the whale fishery at Davis Straits and Greenland. In the Shetlands Lerwick (4045) is the principal town, distant 272 miles from Edinburgh and 95 from Kirkwall. It dates from the beginning of the 17th century. Its harbour can afford safe accom- modation for an immense fleet. Scalloway (648), the only village of the Shetlands, and the original capital, is situated on a fine bay about 6 miles west of Lerwick. It possesses the ruins of an ancient castle, and is the seat of a herring fishery.

History and Antiquities.—Scarcely any information is obtainable from Roman writers regarding the Orkneys, and none regarding the Shetlands, but there is abundant evidence that both groups of islands were originally inhabited by a Pictish population. Of the two forms of Picts' houses—chambered mounds and underground habitations or weems—many are still so entire as to afford an accurate notion of the character of the buildings; and of the barrows or burial-mounds, which number over 2000, the majority belong to the Pictish period. The rings of Brogar and Stenness are the only stone circles in the Orkneys, and there are only five groups in Shetland, three being in Unst and two in Fetlar. "It has been disputed whether the fort- resses known as borgs or broehs are to be attributed to the

Picts or the Norsemen, but the balance of probability seems to indicate that they were erected before the Norse invasion, and in defence against the Northmen. Orkney possessed 70 and Shetland 75, the most

perfect of existing specimens being the tower of Mousa in Shetland. Although few implements, and those of the rudest kind, have been discovered in the Picts' houses, the brochs contain handmills used for grinding corn, stone whorls and bone combs employed in woollen manufactures, and examples of a rude kind of pottery. Various scattered notices occur of early expeditions to the Orkneys, the most important being those of the Dalriadic Scots about the beginning of the 6th century ; but the Picts soon regained their power, and the islands remained in their possession uutil the Norse invasions of the 9th century.

The earliest notice regarding the Christianization of the islands is that of a visit of Cormac and other companions of St Columba to the Orkneys about 565. The Irish monk Dicuil, writing about 825, states that a "certain honest monk had visited" certain islands "in the northern British seas," which are evidently iden- tical with the Shetland Islands. Other proofs of the early Christian-

'ization of the Orkneys and Shetlands are the dedications to St

Columba, St Bridget, St Ninian, and St Tredwell; the designation Papa applied to several of the islands, that being the Norse name for the Irish missionaries ; monumental stones like those on the

-mainland of Scotland bearing the Ogham inscription, four having

been found in Shetland and one in the broch of Burrian in North Ronaldshay in Orkney; the discovery of square-sided bells peculiar to the early ages of the church; and the occurrence of the crescent symbol on various sculptured slabs.

About the end of the 8th century the Orkneys and Shetlands became the rendezvous of the northern vikings, who sailed thence to ravage the coasts

of Norway and the western coasts and islands of Scotland. About 872 the Norse settlement in the islands became perpetual by the flight to it of the jarls, dispossessed of their authority by Harold Haarfager. As the jarls began a retaliatory warfare on the coasts of Norway, Harold fitted out a great expedi- tion against them, and placed the Orkneys and Shetlands under the government of Rognvald, earl of Mceri, who, with the per- mission of Harold, handed it over to his brother Sigurd, Gut- torm succeeded his father Sigurd, but, dying childless about a year afterwards, was succeeded by Hallad, son of Rognvald, who, being unable to cope with the vikings, returned to Norway, Einar, another son of Rognvald, taking his place. He thor- oughly subdued the vikings, and also taught the inhabitants to use peat for fucl, from which he received the name of Torf Einar. The two eldest sons of Einar were slain in battle in England, and the third, Thorfinn Hausakliuf, who succeeded in 950, having married Grelauga, daughter of Duncan, earl of Duncansby, became joint-earl of Orkney and Caithness. - Thorfinn had five sons, all of whom were shortly afterwards slain, except the youngest, Hlodver. He was succeeded, about 980, by Sigurd the Stout, who fought against the Scots, but ultimatcly came to an agreement with Malcolm, king of the Scots, whose daughter he obtained in marriage. Sigurd was slain in a great battle at Clontarf against Brian Boroime, king of Munster, in 1014, upon which King Malcolm of Scotland bestowed the earldom of Caithness on Thorfinn, a son of Sigurd by his daughter, the earldom of the islands being divided among Somerled, Brusi, and Einar, Sigurd's sons by a former marriage. After the death of Somerled and Einar the claim of Brusi to the earldom of the islands was disputed by Thorfinn. An arrangement was finally made that Thorfinn should receive two-thirds of the islands ; but on the death of Brusi he took possession of all the islands; he came to an agreement, however, with Rognvald Brusi- son which lasted for eight years, when Thorfinn, having defeated Rognvald in a sea-fight in the Pentland Firth, took possession of the carldom also. Finally he obtained recognition from the king of Norway, and, after making a pilgrimage to Rome, built Christ's Church in Birsay, where he established a bishop's see. Thorfinn was succeeded, about 1064, by his two sons Paul and Erlend, whom King Magnus (Barefoot) of Norway subsequently replaced by his son Sigurd. He, on his father's death, became king of Norway, and was succeeded in the earldom of the Orkneys by Hakon, Paul's son, and Magnus, Erlend's son, the latter of whom was murdered by the former in

1115. Hakon was succeeded by his two sons Harold and Paul, the former of whom shortly afterwards died, when Kali, a nobleman of Norway, receiving from King Sigurd the gift of half of the Orkneys, surprised Paul and induced him to consent to this arrangement, whereupon, in accordance with a vow he had made, he built a "stone minster" at Kirkwall. Paul was carried off by the vikings, and his place as joiut-earl was taken by Harold, the son of Maddad, earl of Athole. King Eystein super- seded Harold by Erlend, son of Harold the son of Hakon. Erlend fortified himself against Harold in the broch of Mousa in Shetland, until Harold came to an agreement with him. Afterwards Erlend was slain in a battle with Harold and Rognvald, who then reigned jointly till the death of Rognvald in 1158. On account of Harold's support of Sigurd, son of Magnus Erlingson, against King Sverri of Norway, he was deprived of the whole of Shetland. He was succeeded in 1206 by his sons John and David, the former of whom, on the death of his brother seven years afterwards, became sole ruler. He was slain in an inn in Thurso in 1231, and, as the line of

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Norse earls became with him extinct, the earldom of Caithness was granted to Magnus, second son of Gilbride, earl of Angus, who was apparently confirmed in the earldom by the king of Norway. About 1321 the earldom passed from the Augus to the Strathearn line, and about 1379 to Henry St Clair, who erected the castle of Kirkwall. In 1468 the Orkneys and Shetlands were pledged by Christian I. of Denmark for the payment of the dowry of his daughter Margaret, betrothed to James III. of Scotland, and, as the money was never paid, their connexion with the crown of Scotland became perpetual. In 1471 King James III. bestowed the castle and lands of Ravenscraig in Fife on William, earl of Orkney, in exchange for all his rights to the earldom of Orkney, and an Act of Parliament was passed 20th February of the same year annexing the earldom of Orkney and Shetland to the Scottish crown.

In 1540 Kirkwall was visited by James V. In 1564 Lord Robert Stewart, natural son of James V., was made sheriff of the Orkneys and Shetlands, and received possession of the estates of the odallers ; in 1581 he was

created earl of Orkney by James VI., the charter being ratified in 1591 to his son Patrick. In 1615 the earldom was again annexed to the crown. The islands were made the rendez vous of the disastrous expedition of Montrose in 1650.- During the Protectorate the Orkneys were visited by a detachment of Crom- well's troops, who initiated the inhabitants into various industrial arts and new methods of agriculture. In 1707 the islands were

granted to James, twelfth earl, in mortgage, redeemable by thie crown on payment of £30,000, and subject to an annual feu-duty of £500; but in 1766 his estates were sold to Sir Lawrence Dundas of the family of the earls of Zetland.

Among the relics of the Norse settlement in the islands the most remarkable are the inscriptions on the great sepulchral cairn of Maeshow, the Orkahaug of the saga, which was, however, itself of Pictish origin. The topography, both of Orkney and of Shetland, is altogether Norse, and, although the influx of Scottish settlers . gradually extinguished the old Norse tongue, many of the Norse names still linger, and even a form of the old odal succession and mode of land tenure still survives. Norse was generally spoken in the islands in the 16th century; and, according to Barry, in Orkney as late as the end of the 17th century it continued to be spoken in four parishes in the Mainland by the people in their own houses ; but within his recollection it was almost entirely extinct, except in one parish in the heartof the Mainlaud. In Shetland it continued to be spoken much longer, and Low, during his tour in 1774, found the Norse language in Foula, " but much worn out." He states that it was the language of the last age, and he gives several specimens, including the Lord's Prayer and an old ballad (Low's Tour, pp. 105-112). The Shetlanders are still of almost unmixed Norse lineage, and words and phrases of Norse origin still tinge their dialect. Low describes a monument with Runic inscrip- tions in the churchyard of Crosskirk, Northmavine ; and a Runic fragment found at Mail's Voe, Cunningsburgh, Shetland, is now in the museum of the (Scottish) Society of Antiquaries. Broken swords and fragments of shield-bosses have been dug up in many places, and also many of the peculiar brooches buried as relics in the graves of the Norse women during tle Pagan period. At Birsay are remains of an old palace of the jarls.

~~In early times both the archbishop of Hamburg and the arch- bishop of York disputed with the Norwegians ecclesiastical jurisdic- tion over the Orkneys and the right of consecrating bishops ; but ultimately the Norwegian bishops, the first of whom was William the Old, consecrated in 1102, continued the canonical succession. The see remained vacant from 1580 to 1606, and from 1638 till the Restoration ; and, after the accession of William III., episcopacy was in 1697 finally abolished, although many of the clergy refused to conform. Besides the cathedral-church of KirKWALL (q.v.), the most interesting of the old churches are Egilshay church, built about the beginning of the 12th century, and possessing a round tower ; the ruins of the circular church at Orphir; the remains of Christ Church, Birsay, built by Earl Thorfinn in the 11th century ; the chapel of Weir, supposed to have been built in the 12th century ; St Peter's Church, Birsay; and the remains of a chapel on the brough of Deernéss, In Shetland there were at one time three towered churches—St Lawrence in Burra, St Magnus at Tingwall, and Ireland Head ; but of these there are now no remains, There are ruins of an old cruciform church at Culbinsbrough, of an old Norse church dedicated to St Olaf at Papil, and of various chapels~~

~~in several of the islands.~~

~~The earliest written record on the Orkneys and Shetlands is The Orkneyinga Saga, an edition of which, with notes by Joseph Anderson, was published in 1873. Next to the saga in antiquity is Jo Ben's Descriptio Insularum Orchadi- arwm, 1529. Several works on both groups were written during last century, or about the beginning of the present, including Waliace, Account of the Islands of Orkney, 1700 ; Brand, Brief Description of Orkney, Zetland, &c., 1701; Gifford, Description of the Zetland Islands in 1733, published in 1879; Low, Tour through the Islands of Orkney and Shetland in 1774, published in 1879; Barry, History of the Orkney Islands, 1805; Edmonston, Zetland Islands, 1809; and Shirreff, General View of the Agriculture of the Orkney and Shetland Islands, 1814. On the natural history there have been published—Low, Fauna Orcadensis, 1813 ; Baikie and Heddle, Historia Naturalis Orcadensis, part i., 1848; and Crichton, A Naturalist's Ramble to the Orcades, 1866. See also Gorrie, Summers and Winters in the Orkneys, 1868; Hibbert, Description of the Shetland Isles, 1862 ;~~

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Reid, Art Rambles in Shetland, 1869; Cowie, Shetland, 1874-80; Tudor, Orkneys and Shetland ; their Past and Present State, 1883; and Rampini, Shetland and the Shetlanders, 1884. — 4b

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ORLEANS, a city of France, chief town of he fepant: ment of Loiret, lies on the right bank of the Loire, 75 miles south-south-west of Paris. At Les Aubrais, a mile to the north, is one of the chief railway junctions in the country. Besides the Paris and Orleans Railway, which there divides into two main lines—a western to Nantes and Bordeaux wa Tours, and a southern to Bourges and Toulouse via Vierzon—branches leave Les :Aubrais east- wards for Pithiviers, Chalons-sur-Marne, and Gien, north-west for Chateaudun and Rouen. The whole town of Orleans is clustered together on the right bank of the river and surrounded by fine boulevards, beyond which it sends out suburbs along the various roads. With the suburb of St Marceau on the left bank it is connected by a hand- some stone bridge (1092 feet long and 51 feet wide) of nine arches, erected in the 18th century. Farther up is the railway bridge. The river is canalized on the right, and serves as @ continuation of the Orleans Canal, which unites the Loire with the Seine by the canal of the Loing. Owing to its position on the northmost point of the Loire Orleans has long been the centre of communica- tion between the Loire basin and Paris. Wines, grain, wool, and trees for planting are the main products of the surrounding. districts and the commercial staples of the city, which, while devoted rather to trade than to manu- factures, has establishments for the making of vinegar, blankets, hosiery, worsted, the so-called Rheims biscuits, confectionery, preserved foods, pins, pottery, boilers, paper, cardboard, soap, and dressed skins. The chief interest of the place, however, lies in its public buildings and the historical events of which it has been the scene. Proceed- ing from the railway station to the bridge over the Loire, the visitor crosses Orleans from north to south and passes through the Place du Martroi, the heart of the city. In the middle of the square stands an equestrian statue of Joan of Arc, 30 feet high, in bronze, resting on a granite pedestal surrounded by bas-reliefs representing the leading episodes in the life of the heroine. In 1855 it

took the place of an older statue executed in the beginning of the century, which was then transferred to the left bank of the Loire at the end of the bridge, a few paces from the spot where a simple cross marks the site of the ort des Tournelles captured by Joan of Arc on 7th May 1429. From the Place du Martroi, the Rue Jeanne d'Arc leads to the cathedral of Ste Croix. This church, commenced in 1287, was burned by the Huguenots in 1567 before its comple- tion. Henry IV., in 1601, laid the first stone of the new structure, the building of which has continued until now. It is a Gothic cathedral on a large scale, consisting of a vestibule, a nave with double aisles, a corresponding choir, a transept, and an apse. Its length is 482 feet, its greatest width 206, and the height of the central vaults 108 feet. The west front has two flat-topped towers each of three stories, of which the first is square, the second octagonal, and the third cylindrical, The whole front is Gothic, but was designed and constructed in the 18th century and exhibits all the defects of the period. A central spire 328 feet high, on the other hand, raised about twenty-five years ago, recalls the pure ogival style of the 13th century. In the interior the choir chapels and the apse, dating from the original erection of the building, are worthy of note. In the episcopal palace and the great seminary are several remarkable pictures and pieces of wood-carving ; and the latter building has a crypt which some antiquaries hold to belong to the 6th century. The church of St Aignan, said to have been founded by the son of Constantine, and often rebuilt, contains in a gilded and carved wooden shrine the remains of its patron saint, who occupied the

see of Orleans at the time of Attila's invasion. The crypt dates from the reign of Robert the Pious (the be- ginning of the 11th century). The once beautiful sculp- ture of the exterior has been altogether ruined; the interior has been restored, but not in keeping with the original style. A third church, St Euverte, consecrated to one of the oldest bishops of Orleans (0d. 391), is an carly Gothic building dating from the 12th century. To the west of Rue Royale stand the church of St Paul, whose facade and isolated tower both bear fine features of Renaissance work, and Notre Dame de Recouvrance, re- built between 1517 and 1519 in the Renaissance style and dedicated to

the memory of the deliverance of the city. The Hétel de Ville, built in 1530, was formerly the resi- dence of the governors of Orleans, and was occupied by the kings and queens of France from Francis IJ. to Henry IV. The front of the building, with its different coloured bricks, its balconies supported by caryatides attributed to Jean Gonjon, its gable-ends, and its windows, recalls the Flemish style. There are several niches with statues. Beneath, between the double flight of steps leading up to the entrance, stands a

bronze reproduction of the statue of Joan of Arc, a masterpiece of the princess Mary of Orleans, which is preserved in the Versailles museum. The richly-decorated apart- ments of the first story contain paintings, inter- esting chimneys, and a bronze statuette (also by | the princess Mary) re- presenting Joan of Arc mounted onacaparisoned horse and clothed in the F garb of the knights of F

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are of historical interest. The "White Tower" is the last representative of the towers rendered famous by that siege. Near the Quai du Chatelet a stretch of wall, dat- ing at least from the 9th century, was discovered some years ago; it is supposed to be a portion of the chdtelet or tête du pont of the Roman period. A statue has been erected in front of the town-house to the jurisconsult Pothier, one of the most illustrious of the natives of Orleans. The anniversary of Joan of Arc is celebrated every year with great pomp. After the English had raised the siege the popular enthusiasm improvised a pro- cession, which marched with singing of hymns to the cathedral of St Paul; and the ceremony is still repeated on the first days of May by the clergy and the civil and military functionaries. The population of Orleans is 57,264.

Whether Genabum is to be identified with Orleans or with Gien is matter of dispute; but Aurelianum appears as a flourishing town in the 5th century. St Aignan (as already mentioned) was bishop when, in 451, it was vainly besieged by Attila. Clovis got possession of the city in

498, and in 511 held there the first council assembled in

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the 15th century. The

great hall in which it is ==

placed also possesses a copy of Ingres's picture,

"Joan of Arc at the Consecration of Charles VILI.," anda plaster model of the Bigot tower at Rouen,where the heroine was imprisoned; the chimney is decorated with three bas-reliefs of Domremy, Orleans, and Rheims, all asso- ciated with her life. The historical museum at Orleans is. one of the most interesting of provincial collections ; a special section consists of all the objects—tapestries, banners,, pictures, statuettes—relating to Joan, as well as of arms or bullets found on the battle-field of Patay ; and the numismatic, medizval, and Renaissance departments, and the collection of ancient vases, are all of great value. The city also possesses a separate picture gallery, a sculp- ture gallery, a natural history museum, and four learned societies. The public library (50,000 volumes) comprises among its manuscripts a number dating from the 7th cen- tury, and obtained in most cases from St Benoft on the Loire. At Orleans the general hospital has incorporated the almshouse for the aged, the orphan asylum, the luna- tic asylum, the Hétel Dieu, the maternity hospital, and the preparatory school of medicine and pharmacy. It is one of the finest institutions in France. In the corn-ex- change is embodied a vast cloister formed by 16th-century arcades, once belonging to the old cemetery. Among the private houses those of Agnes Sorel and Francis L., and that occupied by Joan of Arc during the siege of 1429,

Plan of Orleans. France. Though the dignity which it then obtained, of being the capital of a separate kingdom, was lost by its union with that of Paris in 613, Orleans remained during all the medieval period one of the first cities of the French monarchy ; several of the kings dwelt within its walls, or were consecrated in its cathedral; it had a royal mint, was the seat of councils, and obtained for its schools the name of university (1305), and for its soldiery an equal standing with those of Paris. It became the apanage of one of the first princes of the blood under Philip of Valois, who made it a duchy for his second son, and under Charles VL, who bestowed

the duchy on his brother Louis. After the assassination of this last prince by Jean sans Peur, duke of Burgundy (1407), the people of Orleans sided resolutely with the Armagnacs, and in this way brought upon themselves the attacks of the Burgundians and the English. Joan of Arc, having entered the beleaguered city on 29th April 1429, effected the raising of the siege by 7th May by means of an attack on the Fort des Tour- nelles, in the course of which she was wounded. After the Amboise conspiracy (1560) the States-General were con- voked at Orleans, where Francis II. died. In 1562 it became the headquarters of Condé, the Protestant com-

mander-in-chief, and the duke of Guise was assassinated on his way to besiege it. Huguenot and Leaguer were alternately in possession till Henry IV. came in person to take it in 1594. The duchy of Orleans, united to the crown by Louis XII, was again detached in favour of Gaston, brother of Louis XIII., and afterwards for Philip, brother of Louis XIV. and founder of the present house of Orleans. Since 1789 the title "duke of Orleans" has been purely honorary. During the Revolution the city suffered from the sanguinary excesses of Barére and Collot d'Herbois. It was occupied by the Prussians in 1815 and in 1870, As the centre of the preparations made by the Government of the National Defence for raising the siege of Paris, it bore the brunt of numerous battles fought in its vicinity, and of the hostile occupation to which they led.

ORLEANS, Cartes, Duke or (1391-1465), com- monly called Charles d'Orléans, was the eldest son of Louis, duke of Orleans (brother of Charles VI. of France), and of Valentina Visconti, daughter of Galeaso of Milan. He was born on 26th May 1391. Although many minor details are preserved of his youth, nothing except his reception in 1403, from his uncle the king, of a pension of 12,000 livres d'or is worth noticing, until his marriage three years later (29th June 1406) with Isabella, his cousin, widow of Richard IJ. of England. The bride was two years older than her husband, and is thought to have married him unwillingly, but she brought him a great dowry,—it is said, 500,000 francs. She died three years later, leaving Charles a widower and father of a . daughter at the age of eighteen. He was already duke of Orleans, for Louis had been assassinated by the Bur- gundians two years

~~before (1407). He soon saw himself the most important person in France, except the dukes of Burgundy and Brittany, the king being a cipher. This position his natural temperament by no means qualified him to fill. His mother was eager for vengeance for her husband, and for years Charles did his best to carry out her wishes by filling France with intestine war. Of this, however, he was only nominally one of the leaders, the real guidance of his party resting with the great count of Armagnac, whose daughter, Bonne, he married, or at least formally espoused, in 1410. Five years of confused nego- tiations, plots, and fightings passed before the English invasion and the battle of Agincourt, where Charles was joint commander-in-chief. According to one account he was dangerously wounded and narrowly escaped with his life. He was certainly taken prisoner and carried to England, which country was his residence thenceforward for a full quarter of a century. Windsor, Pontefract, Ampthill, Wingfield (Suffolk), and the Tower are named among other places as the scenes of his captivity, which, however, was anything but a rigorous one. He was main- tained in the state due not merely to one of the greatest~~

~~nobles of France but to one who ranked high in the order ‘~~

~~of succession to the crown, He hunted and hawked and enjoyed society amply, though the very dignities which secured him these privileges made his ransom high, and his release difficult to arrange. Above all, he had leisure to devote himself to literary work. But for this he would hardly be remembered as anything better than a more than usually amiable and less than usually able example of the higher feudal nobility, whose political position rather than their personal faults made government difficult or impossible in the later Middle Ages.~~

~~The work which secures a measure of immortality to Charles d’Orléans consists wholly of short poems in the peculiar artificial metres which had become fashionable in France about half a century or more before his birth, and which continued to be fashionable till nearly a century~~

~~after his death. Besides these a certain number of English poems have been attributed to him. It is certain that he studied the language of lis captors,~~

but it is more than doubtful whether the extant English poems which bear his name are genuine, and in any case they are of no value. The ingenuity of a single English critic has striven to attribute to him a curious book in prose, called Le Débat des Hérauts de France et Angleterre, but M. Paul Meyer, in his edition of the book in question, has completely disposed of this theory. For all practical purposes, therefore, Charles's work consists of some hundreds of short poems, a few in various metres, but the majority either ballades or rondels. The chronology of these poems is not always clear, still less the identity of the persons to whom they are addressed, and it is certain that some, per- haps the greater part of them, belong to the later years of the poet's life. But many are expressly stated in the manuscripts to have been "composed in prison," others are obviously so composed, and, on the whole, there is in them a remarkable unity of literary flavour. Charles Orléans is not distinguished by any extraordinary strength of passion or originality of character; but he is only the more valuable as the last and not the least accomplished representative of the poetry of the middle of the Middle Ages, in which the form was almost every- thing, and the personality of the poet, save in rare instances, nothing. Yet Charles d'Orléans is not entirely without differentia. If he were he would hardly hold the place which at present he justly occupies. He is a capital example of the cultivated and refined—it may almost be called the lettered—chivalry of the last chivalrous age, expert to the utmost degree in carrying out the traditional details of a graceful convention in love and literature. But he is more than this; in a certain easy grace and truth of expression, as well as in a peculiar mixture of melancholy, which is not incompatible with the enjoyment of the pleasures, even the trifling pleasures, of life, with listlessness that is fully able to occupy itself about those trifles, he stands quite alone. He has the urbanity of the 18th century without its vicious and prosaic frivolity, the poetry of the Middle Ages without their tendency to tediousness. His best-known rondels—those on Spring, on the Harbingers of Summer, and others—rank second to nothing of their kind.

Poetry, however, could hardly be an entire consolation, and it is not surprising to find that Charles, during all the long years of his captivity,

was perpetually scheming for liberty. But the English Government had too many reasons for keeping him, and it was not till his hereditary foe Philip the Good of Burgundy interested himself in him that the Government of Henry VI., which had by that time lost most of its hold on France, released him in return for an immediate payment of 80,000 saluts @or, and an engagement on his part to pay 140,000 crowns at a future time. The agreement was concluded on 2d July 1440. He was actually released on 3d November following, and almost immediately cemented his friend- ship with Duke Philip by marrying his niece, Mary of Cleves, who brought him a considerable dowry to assist the payment of his ransom. He had, however, some diffi- culty in making up the balance, as well as the large sum required for his brother, Jean d'Angouléme, who also was an English prisoner. The last twenty-five years of his life (for, curiously enough, it divides itself into three almost exactly equal periods, each of that length) were spent partly in negotiating, with a little fighting intermixed, for the purpose of gaining the Italian county of Asti, on which he had claims through his mother, partly in travelling about, but chiefly at his principal seat of Blois. Here he kept a miniature court nicl, from the literary point of view at

least, was not devoid of brilliancy. At this most of the best-known French men-of-letters at the time—Villon, Olivier de la Marche, Chastelain, Meschinot, and others—were residents or visitors or correspondents. His son, afterwards Louis XII., was not born till 1462, three years before Charles's own death. He had become, notwith- standing his high position, something of a nullity in politics, and tradition ascribes his death to vexation at the harshness with which Louis XI. rejected his attempt to mediate on behalf of the duke of Brittany. At any rate he died, on 4th January 1465, at Amboise. Many of his later poems are small occasional pieces addressed to his courtiers and companions, and in not a few cases answers to them by those to whom they were addressed exist. The best edition of Charles d'Orléans's poems, with a brief but sufficient account of his life, is that of C. d'Héricault in the Nouvelle Collection Jannet, Paris, 1874. (G. 8a.) ORLEANS, Duxszs or. The title duke of Orleans was borne by three distinct dynasties of French princes of the blood. The first duke of Orleans was Lours (1371-1407), second son of King Charles V., who was

~~born in 1371, and received the title from his brother Charles VI. in 1392. Both he and his son and heir played very important parts in the history of the Hundred Years' War with England (see France) in opposition to the duke of Burgundy. He had been appointed regent of France during the madness of his brother, Charles VI., and had, by his immorality and his intimacy with the queen, raised a great scandal throughout the kingdom, The duke of Burgundy made himself the mouthpiece of the general discontent, and on 23d November 1407 had the regent murdered in the streets of Paris in revenge for his own father's death. Louis's son CHARLES is the subject of the preceding article. With his son's accession to the throne as Louis XII. the duke- dom of Orleans merged in the crown. It was revived in 1626, when Louis XIII. created his brother, JEAN Bap- TISTE Gaston (1608-1660), the third son of Henry IV., duke of Orleans and Chartres and count of Blois. Gaston of Orleans's fruitless intrigues fill the history of France from the time of Richelieu and Mary de' Medici to that of Mazarin and Anne of Austria. Four times he was banished from France, and more than four times did he sacrifice his associates, who had plotted the overthrow of Richelieu. To him Montmorency, Cing-Mars, and De Thou owed their deaths, and he was only protected from sharing their fate by the fact of his royal birth. On the death of Louis XIII. he was appointed lieutenant-general of the kingdom for the minority of Louis XIV. But Mazarin never meant him to exercise any real power, and when he became convinced that his power was subordi- nate to the cardinal's he entered the ranks of the Fronde (see Mazarin), in which he played a conspicuous part, but always as the tool or the mouthpiece of others. Far more manly and determined was his daughter, best known as La Grande Mademoiselle, who with her own hands directed the guns of the Bastille upon Turenne's soldiers on the day of the battle of St Antoine. He was after- wards exiled to his castle of Blois, where he died without male issue in 1660. The title was at once revived by Louis XIV., who created his brother Puiurprr (1640- 1701) duke of Orleans and of Chartres, and married him to Henrietta, the sister of Charles II. of England. The court was soon entertained by the details of the quarrels between the duke and duchess, and by the former's jealousy even of his brother the king, and, when Henrietta, after successfully detaching Charles from the Triple Alliance and negotiating the treaty of Dover, died suddenly in 1670, the duke was universally accused of poisoning her. In the~~

following year he married Princess Charlotte Elizabeth of Bavaria. In the campaign of 1677 he so

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distinguished himself that Louis XIV. became afraid of his popularity and refused to allow him to go again to the frontier.

He was obliged to waste his time at Paris like other noblemen, in attendance on the court, until his death in 1701. He left one son and three daughters: the daughters married Charles II. of Spain, Victor Amadeus IL. of Savoy, and Prince Charles of Lorraine ; the son was PuiiprE (1674-1723), the regent, who has been spoken of in FRANCE, vol. ix. p. 584. Before succeeding to the dukedom of Orleans in 1701 he had given no indication of political ambition or capacity, yet Louis XIV. distrusted him, and thought to mar his chance of allying himself with any royal or noble family, and to unite his interest with that of his own natural children, by marrying him to his illegitimate daughter by Madame de Montespan, Made-moiselle de Blois. This distrust was increased as the king's legitimate descendants died off, and in his will he left his natural son, the duke of Maine, guardian of the person of his great-grandson and heir, and greatly circumscribed the authority of Orleans as regent. On the death of the grand monarque in 1715 Philippe, guided by the advice of the duke of Saint Simon, induced the parliament of Paris to upset the will and make him regent of the realm with the fullest authority. By the same nobleman's advice he procured the degradation of the natural children of the late king from the precedence above the peers of France which had been conferred on them. Saint Simon hoped he would go yet further, and that he would entrust the nobility with their old political authority ; but the regent had no mind to restore the privileges which Richelieu had had so much difficulty in combating, and which the policy of Louis XIV. had only, after long years, been able to destroy. He determined to hand down to Louis XV. the absolute power of his great-grandfather. Another main object he sought was to keep France at peace, which alone could restore her to her former prosperity. With this in- tention he joined the Quadruple Alliance. He remained in close union with Stanhope, the prime minister of England, and the emperor, whilst Dubois worked out his intentions. This alliance enabled the kingdoms

of England and France to overthrow Alberoni and prevent his disturbing the peace of Europe. In compliance with the wishes of Lord Stair, the able English ambassador, Orleans expelled the Pre- tender from France, and was helped to overthrow the con- spiracy of Cellamare—the French part of Alberoni's scheme by which the bastards of Louis XIV. were to overthrow the regent. Under this peaceful policy France rapidly began to recover prosperity, and Philippe hoped to restore the condition of her finances by listening to the advice of a Scotch adventurer, and buying out the farmers-general of the-taxes, who were the real causes of the financial dis- tress (see Law, Jouy, vol. xiv. p. 367). It should also be noted that the regent showed both courage and deter- mination in putting a stop to the insane speculations of the Rue Quincampoix. He cannot be called a great states-man ; he indeed formed great plans, but left all details of government to Dubois. Yet his real political ability must not be overlooked, as is often done, because the period of the regency is only regarded, as a rule, as a period of wild debauchery, in which the regent ruled a court of bacchanals. Philippe never allowed his pleasures to interfere with his politics. His fidelity to the youthful monarch is no less remarkable in a man of his seemingly abandoned character, hence it is no wonder that when Louis XV. attained his majority he maintained the duke of Orleans and with him Dubois in power. Buta career of debauchery had weakened his physical powers, and, in the very year in which his ward had thus shown his gratitude to him (1728), he died. His character is best painted in an apologue of his mother's. 'The fairies were all invited to my bedside, and,

each giving my son one talent, he had them all. Unhappily an old fairy had been forgotten, who, on arriving after the others, exclaimed, ' He will have all the talents, excepting that of making good use of them.' "

The son of the regent, Louis (1703-1752), who succeeded him as duke of Orleans, played no part in politics, though his name fre- quently occurs in the social history of the time, and fills a great place in contemporary memoirs. Louis's son, Louis PHILIPPE (1725-1785), was equally averse to politics, though he served as a soldier at the battle of Dettingen; his great delight was the theatre, and his place is rather in the history of the Paris

green- rooms than in the history of France. But to Louis PHILIPPE JOSEPH (1747-1793), son of the preceding, a more adventurous life was allotted, and his part in the history of the French Revolution is one of the most difficult problems to solve of that exciting period. He was born at St Cloud in 1747, and bore the title of duke of Montpensier until his grandfather's death in 1752. He then became duke of Chartres, and in 1769 married Louise Marie Adelaide de Bourbon Penthiévre, ouly daughter and heiress of the duke of Penthiévre, grand admiral of France, and the richest heiress of the time. Her wealth made it certain that he would be the richest man in France, and he determined to play a part equal to that of his great-grandfather, the regent, whom he resembled in character and debauchery. As duke of Chartres he opposed the plans of Maupeou in 1771, and was promptly exiled to his country estate of Villers-Cotterets (Aisne). When Louis XVI. came to the throne in 1774 Chartres still found himself looked on coldly at court; Marie Antoinette hated him, and envied him for his wealth, wit, and freedom from etiquette, and he was not slow to return her hatred with scorn. In 1778 he served in the squadron of D'Orvilliers, and was present in the naval battle of Ushant. He hoped to see further service, but the queen was opposed to this, and he was removed from the navy, and given the honorary post of colonel general of hussars. He then abandoned himself to pleasure; he often visited London, and became an intimate friend of the prince of Wales (afterwards George IV.); he brought to Paris the "anglo- mania," as it was called, and made jockeys as fashionable as they were in England. He also made himself very popular in Paris by his large gifts to the poor in time of famine, and by throwing open the gardens of the Palais Royal to the people. Before the meeting of the notables in 1787 he had succeeded his father as duke of Orleans, and showed his liberal ideas, which were largely learnt in England, so boldly that he was believed to be aiming at becoming constitutional king of France. In November he again showed his liberalism in the lit de justice, which Brienne had made the king hold, and was again exiled to Villers-Cotterets. The approaching convocation of the States-General made his friends very active on his behalf; he circulated in every bailliage the pamphlets which Sieyés had drawn up at his request, and was elected in three—by the noblesse of Paris, Villers-Cotterets, and Crépy-en-Valois. In the estate of the nobility he headed the liberal minority under the guidance of Adrien Duport, and led the minority of forty-seven noblemen who seceded from their own estate

(June 1789) and joined the Tiers Etat. The part he played during the summer of 1789 is one of the most debated points in the history of the Revolution. The court accused him of being at the bottom of every popular movement, and saw the "gold of Orleans" as the cause of the Re- veillon riot and the taking of the Bastille, as the republicans later saw the "gold of Pitt" in every germ of opposition to themselves. There can be no doubt that he hated the queen, and bitterly resented his long court disgrace, and also that he sincerely wished for a thorough reform of the government and the establishment of some such constitution as that of England; and no doubt such friends as Adrien Duport and Choderlos de Laclos, for their own reasons, wished to see him king of France. The best testimony for the behaviour of Orleans during this summer is the testimony of an English lady, Mrs Grace Dalrymple Elliott, who shared his heart with Comtesse de Buffon, and from which it is absolutely certain that at the time of the riot of 12th July he was on a fishing excur- sion, and was rudely treated by the king on the next day when going to offer him his services. He indeed became so disgusted with the false position of a pretender to the crown, into which he was being forced, that he wished to go to America, but, as Comtesse de Buffon would not go with him, he decided to remain in Paris. He was again accused, unjustly, of having caused the march of the women to Versailles on 5th October. La Fayette, jealous of his popularity, persuaded the King to send the duke to England on a mission, and thus get him out of France, and he accordingly re- mained in England from October 1789 to July 1790. On 7th July he took his seat in the Assembly, and on 2d October both he and Mirabeau were declared by the Assembly entirely free of any com- plicity in the events of October. He now tried to keep himself as much out of the political world as possible, but in vain, for the court would suspect him, and his friends would talk about his being king. The best proof of his not being ambitious of such a doubtful piece of preferment is that he made no attempt to get himself made king,

regent, or lieutenant-general of the kingdom at the time of the flight to Varennes in June 1791. He, on the contrary, again tried to make his peace with the court in January 1792, but he was so insulted that he was not encouraged to sacrifice himself for the sake of the king and queen, who

persisted in remembering all old enmities in their time of trouble. In the summer of 1792 he was present for . a short time with the arniy of the north, with his two sons, the duke of Chartres and the duke of Montpensier, but had returned to Paris before 10th August. After that day he underwent great personal risk in saving fugitives ; in particular, he saved the life of the count of Champcenetz, the governor of the Tuileries, who was his personal enemy, at the request of Mrs Elliott. It was impossible for him to recede, and, after accepting the title of Citoyen Egalité, conferred on him by the commune of Paris, he was elected twentieth and last deputy for Paris to the Convention. In that body he sat as quietly as he had done in the National Assembly, but on the occasion of the king's trial he had to speak, and then only to give his vote for the death of Louis. HIs compliance did not save him from suspicion, which was especially aroused by the friendship of his eldest son, the duke of Chartres, with Dumouriez, and when the news of the desertion of Chartres with Dumouriez became known at Paris all the Bourbons left in France, including Egalité, were ordered to be arrested on 5th.April. In prison he remained till the month of October, when the Reign of Terror began. HIe was naturally the very sort of victim wanted, and he was decreed 'of accusation" on 3d October. HIe was tried on 6th November and was guillotinced on the same day, with a smile upon his lips and without any appearance of fear. No man ever was more blamed than Orleans ee the Revolution, but the faults of ambition and intrigue were his friends', not his; it was his friends who wished him to be on the throne. Personally he possessed the charming manners of a polished grand seigneur : debauched and cynical but never rude or cruel, full of gentle consideration for all about him but selfish in his pursuit of pleasure, he has had to bear a heavy load of blame, but it is ridiculous to describe the idle and courteous voluptuary as being a.dark and designing scoundrel, capable of murder if it would serve his ambition. The execution of Philippe Kgalité made the friend of Dumouriez, who was living in exile, duke of Orleans. Lovis PHiniprE (1773-1850) was known as duke of Orleans throughout his long emigration and under the Restora- tion, and as duke of Orleans he was called upon to become king of the French in 1830. HIs eldest son, FerDINAND Louis PHILIPPE CHARLES HeEnri (1810-1842), at once took the title of duke of Orleans. HIe was a brave soldier, and served in Algeria from 1834 to 1836. In 1837 he married Princess HIelena of Mecklenburg, and became the father of the count of Paris, who is therefore de jure duke of Orleans. In 1839 he

again went to Algeria, but the fatigues of the campaign were too much for him, and he died at Naples in 1842. With him died the last duke of Orleans, for his son will not take the title; but the whole party which supports him is rightly known as the Orleanist party.

The chief authorities on the three most important dukes of Orleans are :— for Gaston of Orleans, Avenel's Lettres de Richelieu, &c. ; Chéruel, Correspondance de Mazarin; Id., Histoire de France pendant la minorité de Louis XIV.; Id., Histoire de France pendant le ministére de Mazarin ; for the regent Orleans, the portions of Michelet's and Martin's Histories of France; and for Philippe

Egalité, Baschet's Histoire de Philippe Egalité, and the Journal of Mrs Grace Dalrymple Elliott (1859). (H. M. 8.)

ORME, Rosert (1728-1801), author of a History of British India, was the son of John Orme, surgeon in Bom- — bay, and was born at Anjengo, Travancore, in June 1728. He was sent to Harrow school in 1736, and in 1742 toa school near London to obtain an education preparing him for commercial pursuits. In 1744 he became a clerk in the East India Company's service in Calcutta. In 1752 he went to Madras, and in the following year he returned home with Lord Clive, with whom he lived on terms of close intimacy. His knowledge of Indian affairs gave him considerable influence with the company. Returning to Madras in 1755, he was appointed a member of the council, and in this position took an active part in directing the military operations in the Carnatic in 1755-59. By the court of directors he was appointed to succeed Lord Pigot in the government of Madras, and in 1757-59 he was commissary-general. In the latter year bad health com- pelled him to quit India, and he took up his residence in London, where he occupied himself in writing a History of the Military Transactions of the British Nation in Indo- stan from 1745, the first volume appearing in 1763, the second in 1775, and the third in 1778. In acknowledgment of his services he was appointed historiographer to the East India Company with a salary of £400 a year. In

1770 he was chosen a fellow of the Society of Antiquaries. He died at Ealing 13th January 1801.

The Aistory is characterized by great clearness and accuracy ; but, while the minute enumeration of unimportant details lends vivid- ness to certain portions of his narrative, it produces on the whole a feeling of tediousness, and tends to dull the leading episodes. In 1782 Orme also published Historical Fragments of the Mogul Empire from the year 1659, and in 1805 this was reprinted and published along with two other treatises, The Origin of the English Establishment and A General Idea of the Government and People of Hindostan, and preceded by a short Life of the author. He be- queathed several hundred volumes of manuscript collections, and a number of scarce tracts on Oriental subjects, to the library of the East India Company.

ORMONDE, James BUTLER, TWELFTH EARL AND FIRST DuxE oF (1610-1688), was born at London on or about 19th October 1610. He was grandson of Walter, earl of Ormonde, and eldest son of Thomas, Viscount Thurles, and Elizabeth Poyntz.1 His father having been drowned (15th December 1619) during the lifetime of Earl Walter, he became heir to the title and estates. By some legal artifice the boy was made a royal ward, and James I. at once removed him from his Catholic tutor and placed him in the household of Abbot, archbishop of Canterbury, with whom he stayed until 1626, after which he resided with his grandfather. In 1629, by his marriage with his cousin Elizabeth, the daughter of the earl of Desmond, he put an end to the long-standing quarrel between the families. In 1630 he accompanied the old earl to Carrick, and in 1632 succeeded him in the earldom.

He was already noted, as had been many of his race, for his fine presence and great bodily vigour. His active career began with the arrival of Strafford in 1633. In all ways he was forward in assisting the deputy, but showed such independence and masterfulness of character, along with considerable capacity, that Strafford was for a while doubtful whether to crush or to favour him. Reflecting that Ormonde was one of the richest and probably the most influential of the Irish nobility, he decided to secure his interest ; and Ormonde was throughout his government his chief friend and

~~support. Such was the confidence felt in him that in April 1640, when Strafford was with Charles, he was made commander-in-chief of the forces. In August he was appointed lieutenant-general of the kingdom by Strafford, who, upon the death of Wandesford in Decem- ber, urged Charles to make him deputy. His loyalty to his chief was shown by the vehemence with which he defended him against the attacks of the Irish House of Commons. Upon Strafford's death, and, it is said, at his request, Ormonde was offered the vacant Garter, but refused it for reasons characteristic of the man (Carte), On the arrival of the news of the rebellion in 1641 he received another commission as lieutenant-general from Charles him- self, and, though much hampered by the lords justices, he did admirable service in the expedition to the Naas, and in the march into the Pale in 1642, after the rebellion had drawn in the Roman Catholic gentry of English descent. In both of these expeditions the ferocious traditions of Irish warfare were but too faithfully followed. So highly were his ser- Vices regarded that he was publicly complimented by the English Parliament, who, along with their letter of thanks,~~

~~1 His pedigree extends back to Henry IT.'s expedition to Ireland, when Theobald Walter received, in addition to large estates, the here- ditary butlership of Ireland, and the prisage of wines, which formed an important part of the vast wealth which the family always possessed. The title of Ormonde appears to have been granted to James the~~

~~noble earl," who by the female side was a great-grandson of Edward Il. This title, at the request of Henry VIII., the 8th earl resigned to Sir Thomas Boleyn, receiving that of Ossory instead, and regaining that of Ormonde at Boleyn's death. The 9th earl, having borne a chief part in the suppression of the Geraldine rebellion, received a grant of the defeated chieftain's lands, and, in recognition of his further efforts~~

~~when Henry threw off his allegiance to the pope, the title of Viscount Thurles was given him.~~

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sent him a jewel of the value of £620. On 15th April 1642 he gained the battle of Kilrush against Lord Mount- garret, and on 18th March in the following year that of Ross against Preston. In September 1643, the civil war in England having meanwhile broken out, the opposition between Ormonde, who always stood much upon his dig- nity, and the lords justices became more open and acute. Ormonde, seeing that the large army of Scots in Ulster was both unable to cope with the rebels and was ill-disposed to the king, and that the rebels had been successful at many points, concluded on 15th September the "'cessation" with the latter, having power from Charles to treat with the recusants. He had previously, on 16th September 1642, been made a marquis by the king, and had been offered the lord-lieutenantship. This, however, he declined; but his command was made independent of Leicester. Ormonde now threw himself unreservedly into Charles's cause, and at his command sent a body of troops into England, having first exacted an oath of loyalty from the officers (see Monx); it, however, was shortly afterwards routed by Fairfax at the raising of the siege of Nantwich. On the arrival of the news of the "cessation" Charles, anxious to be quit of the Irish problem, which was complicated by the refusal of the Ulster Scots to concur in the "cessation," and desirous at the same time to see the country in safe hands, again offered Ormonde the supreme post, which he now accepted, receiving his commission in January 1644, with special instructions to do all in his power to keep the Scotch army occupied. In all the complications of Scots, Old Irish, Catholic Irish of English race, and Protestants, and in face of the intrigues of the Pope's nuncio as well as of the attempts of the Parliament's commissioners to Ulster to ruin his power, he showed firmness and ability, and especi- ally did his utmost to assist Antrim in his expedition into Scotland. He kept his post until the ground was cut from beneath him by Glamorgan's treaty with the Catholics in 1646, and until it was clear that he could not long hope to hold Dublin against the Irish rebels. He thereupon applied to the English Parliament, gave Dublin into their hands upon terms which protected the interests of both Protestants and Roman Catholics so far as they had not actually entered into rebellion, and sailed for England at the beginning of August 1647. He attended Charles during August and October at Hampton Court, and, after the king's escape to the Isle of Wight, appears to have been his agent in the preliminary negotiation regarding the "engagement" with the Scots. Having good reason to fear that the Parliament intended to

secure his person, he hurriedly left England and joined the queen and prince of Wales at Paris in March 1648, where he was of great service in dealing with the agents of the revolted Irish. In September of the same year, the pope's nuncio having been expelled, and affairs otherwise looking favourable, he returned to Ireland to endeavour to unite all parties for the king. He concluded a peace with the rebels on the basis of the free exercise of their religion, proclaimed Charles II., and upheld the royal cause with great vigour though with slight success. He was meanwhile urgent with Charles that he should come in person, but was out- witted and overborne by the Scots and their friends at the king's court. Cromwell having become irresistible, and Charles, under the influence of Argyll, having annulled the peace just concluded, Ormonde returned to France in 1650. He had meanwhile, in September 1649, received the Garter from Charles II.

Ormonde now, though in great straits for want of money, resided in constant attendance upon Charles and the queen- mother at Paris, and accompanied the former when, on his dismissal from France, he went to Aix and Cologne. He appears to have incurred the queen's enmity by frus-

trating the attempts which she made to induce the duke of Gloucester to become Catholic. In 1658, at great risk, he went upon a secret mission into England, to gain trust- worthy intelligence as to the chances of a rising. He attended the king at the treaty of Fontarabia, and was actively engaged in the secret transactions immediately preceding the Restoration. In the distribution of honours which followed he had a considerable share: he was at once made lord steward of the household, a privy councillor, lord-lieutenant of Somerset, high steward of Westminster, Kingston, and Bristol, chancellor of Dublin University, Baron Butler of Llanthony, and earl of Brecknock ; and on 30th March 1661 he was created duke of Ormonde in the Irish peerage and lord high steward of England. At the same time large grants, in recompense of the fortune he had spent in the royal service, were made by the king, while in the following year the Irish parliament presented him with £30,000. His losses, however, according to Carte, exceeded his gains by a sum almost incredibly enormous. On 4th November 1661 he once more received the lord-lieutenantship of Ireland, and was busily

~~engaged in the settlement of that country until 1664, His heart was in his government, and he vehemently opposed the bill prohibiting the importation of Irish cattle, which struck so fatal a blow at her trade; and, when it was passed, in order to lessen, as he thought, the misfortune, he prohibited the import of Scotch linen, and, further, obtained leave for a certain number of Irish vessels to trade with the foreign enemies of England. He encour- aged Irish manufactures and learning to the utmost, and it was to his efforts that the Irish College of Physicians owes its incorporation.~~

~~Ormonde's personality had always been a striking one. He had been noted for purity of life and purpose, and for generous and unswerving devotion to the royal cause, when purity and devotion, stimulated by the great argu- ment, were not rare in the court of Charles I. In the court of Charles II. he assumed a still more noteworthy character. At a time when every form of baseness had free course, he figured as almost the sole representative of the high-toned virtues of a nobler generation. Where everything was little he, by force of what is emphatically called "character" far more than by any special ability, was great. The friend and comrade of Strafford, one who had in the royal cause ungrudgingly spent a princely fortune, we see him standing aloof while persons like Bennet intrigued and lied for office or money. Of strict purity of life, he was a living rebuke to the Sedleys and Castlemaines who turned the court into a brothel. Com- pelled to see the councils of the king guided by dishonour, he acquired over him the influence which Charles was always ready to concede to greatness (eg., Pepys, 19th May 1668). Proud of the loyalty of his race, which had been unspotted through five centuries, he bore with silent self-respect calumny, envy, and his seven years' loss of court favour, waiting until his master should be shamed into an acknowledgment of the wrong.~~

~~He soon became the mark for attack from all that was worst in the court. Buckingham especially did his utmost to undermine his influence. In his almost irresponsible government of Ireland during troublous times Ormonde had no doubt acted now and then in a way which offered advantage to men eager for his overthrow. He had billeted soldiers on civilians, and had executed martial law. The impeachment, however, threatened by Buckingham fell through. Nevertlieless, by 1669, constant~~

importunity had had its usual effect upon Charles, and Ormonde was removed from the government of Ireland and from the

1 For a notice of this see Evelyn's Diary, 8th June 1658.

committee for Irish affairs. He made no complaint, in- sisted that his sons and others over whom he had influ- ence should retain their posts, and continued to fulfil with dignified persistence the duties of his other offices. The compromise made by Charles with his conscience was marked by a public declaration that, in spite of what had happened, Ormonde had in no degree lost his con- fidence.

By way of recompense, unsought honours came to him and his family. At the suggestion of Sheldon, Oxford chose him as her chancellor, while Dublin, ignoring Roberts, the new lord-lieutenant, gave to his eldest son Ossory the freedom of the city.

In 1670, while driving through London, he was attacked and dragged out of his carriage by the well-known ruftian Blood, who had been deeply concerned in the attempt upon Dublin Castle in 1663. By whom he was set upon this deed is not known, though Ossory publicly laid it to the charge of Buckingham. Nothing appears to have saved Ormonde's life but the whim of Blood to hang him at Tyburn. The delay thus caused, and Ormonde's vigorous resistance, gave time for rescue. What was the mysterious connexion between Blood and the court has never been discovered ; but it is certain that Charles, when Blood was captured, himself asked Ormonde to pardon him.

In 1671 Richard Talbot came over from Ireland in order, if possible, to secure the repeal of the Act of Settlement in favour of the dispossessed Irish gentry. Ormonde was placed: on the committee of investigation, and did his utmost to frustrate Talbot's endeavours.

The return of Ormonde to favour, and his appointment to the government of Ireland in 1677, were characteristic both of the times and of Charles himself (Carte). It appears probable that it was the result in a great

~~measure of the desire of James to set up a rival to Monmouth, for whom Shaftesbury had requested the lord-lieutenantship. On his arrival in Ireland he was for a considerable time occupied in placing the revenue and the army upon a proper footing. Upon the outbreak of the Popish terror in England he at once took the most vigorous and compre- hensive steps, though with as little harshness as possible, towards rendering the Catholics, who were in the pro- portion of 15 to 1, powerless (Carte). So mild, however, did his measures appear that they served, in spite of the fact that Ireland was kept in perfect peace, as a reason for an attack upon him in England, which was led by Shaftesbury, and from which he was defended with great spirit by his son Ossory. He kept his course, giving even justice to both religious parties, and Charles had the good sense to refuse to remove him.~~

~~Hitherto Ormonde had been singularly fortunate in his family life. But in 1680 he lost his eldest son Ossory, a pure and gallant man, and this was but the beginning of his private sorrows. In 1682 Charles summoned Ormonde to court, and from that time retained him about his person. His first duty was to answer, at the king's request, the memoirs published by the earl of Castlehaven, in which he had reflected upon Charles I. His vigour also during the election of aldermen and during the disputed election of sheriffs for the city after Shaftesbury's acquittal was of the greatest service to the court. On 9th November 1683 an English dukedom was conferred upon him, and in June 1684 he returned to Ireland; scarcely, however, had he set out when intrigues against him once more proved suc- cessful, and he was recalled in October. Before, however, he could give up his government to Rochester, Charles II. died, and Ormonde's last act as lord-lieutenant was to pro- claim James II. in Dublin. On his return to London he was met with all the pomp and ceremony which, while him- self of simple tastes, he had always practised as befitting~~

~~his office and name.~~

~~his intellectuals." on the 1st of August.~~

~~The principal authorities for Ormonde's life are Carte's Life and~~

~~the Carte papers in the Bodleian, the article " Butler" in the Biographia Britannica, Cox's and Leland's Histories of Ireland, and the diaries and memoirs of the period. (O: Be)~~

~~ORMSKIRK, a market-town of Lancashire, is situated on the Lancashire and Yorkshire Railway, 11 miles north- east of Liverpool. It consists principally of four streets, diverging at right angles from the market-place. The church of St Peter and St Paul is a spacious edifice in various styles of architecture, with a square embattled tower and steeple, and a Saxon window. To the south-east of the church, and divided from it by a screen, is the Derby chapel, the exclusive property of the earls of Derby, whose vault is contained within. A free grammar school was founded about 1614. Among the other public buildings are the sessions-house and police offices, the working-men's institute, the public library, the dispensary, and the union workhouse. Rope and twine making, iron-founding, and brewing are carried on, and the town has long been famous for its gingerbread. The population of the town and urban sanitary district (area 573 acres) was 6651 in 1881 (6127 in 1871).~~

~~Ormskirk is not found in Domesday ; but the parish according to tradition belonged to Orm, the Saxon proprietor of Halton. The name and church existed in the time of Richard I., when the priory of Burscough was founded. The prior and convent obtained from Edward I. a royal charter for a market at the manor of Ormskirk. On the dissolution of the monasteries the manor was granted to the earl of Derby.~~

~~ORMUS. This is the European form of the name Hor- muz or Hurmuz, applied to a famous city on the shores of the Persian Gulf, which occupied more than one position in the course of history, and which has now long practi- cally ceased to exist. The earliest mention of the name occurs in the voyage of Nearchus (325 B.c.). When that admiral beached his fleet at the mouth of the river Anamis on the shore of Harmozia, a coast district of Karmania, he found the country to be a kindly one, rich in every product except the olive. The Anamis appears to be the river now known as the Minab, discharging into the Persian Gulf near the entrance of the latter. The name Hormuz is derived by some from that of the Persian god Hormuzd, but it is not unlikely that the original etymology was connected~~

~~with khurma, "a date"; for the meaning of Moghistan, the modern name of the territory Harmozia, is "the region of date-palms." The founda- tion of the city of Hormuz in this territory is ascribed by one Persian writer to the Sasanian Ardashir Babegan *(c. 230 a.D.). But it must have existed at an earlier date, for Ptolemy takes note of "Appov(a réArs (vi. 8).~~

~~Hormuz is mentioned by Edrisi, who wrote ¢. 1150, under the title of Hormuz-al-sthiliah, "Hormuz of the shore" (to distinguish it from inland cities of the same name then existing), as a large and well-built city, the chief mart of Kirman. Sirdf and Kish (Kais), farther up the gulf, had preceded it as ports of trade with India, but in the 13th century Hormuz had become the chief seat of this traffic. It was at this time the seat also of a petty dynasty of kings, of which there is a history by one of their number (Turan Shah); an abstract of it is given by the Jesuit Teixeira. According to this history the~~

~~He now lived much in retirement at Cornbury (Oxfordshire), signalizing, however, his loyalty to Protestantism and the Church of England by opposing the attempts of James to assume the dispensing power, in spite of which James to his credit refused to take away his offices, and continued to hold him in respect and favour to the last. On Saturday, 21st July 1688, he died quietly of decay, not having, as he rejoiced to know, -" outlived He was buried in Westminster Abbey~~

~~ORM—ORM~~

~~founder of the dynasty was Shih Mohammed Dirhem-Ku ("the Drachma-coiner"), an Arab chief who. crossed the gulf and established himself here. The date is not given, but it must have been before 1100 a.p., as Ruknuddin Mahmid, who succeeded in 1246, was the twelfth of the line. These princes appear to have been at times in dependence necessarily on the atabegs of Fars, and on the princes of Kirman.~~

~~About the year 1300 Hormuz was so severely and repeatedly harassed by raids of Tartar horsemen that the king and his people abandoned their city on the mainland and transferred themselves to the island of Jerun (Organa of Nearchus), about 12 miles westward, and 4 miles from the nearest shore.~~

The site of the continental or ancient Hormuz was first traced in modern times by Colonel (Sir Lewis) Pelly when resident at Bushire. It stands in the present district of Mindo, several miles from the sea, and on a creek which communicates with the Mindo river,! but which is partially silted up and not now accessible for vessels, There remain

the traces of a long wharf and of extensive ruins.

English Miles wb o rr) 20

Map of the Strait of Ormus.

The island adopted for the new site is of a pear-shape, with the stalk to the north, about 134 miles in circum- ference and 4 miles in longest axis. The rounded southern portion is entirely composed of rugged serrated hills rising some 300 feet above the sea, and of an extraordinary variety of vivid colours, a few white peaks, like snow- covered hills, rising high above the general mass, one to a height of 690 feet. The hills, with the remarkable exception (according to the Persian Gulf Pilot) of the white peaks, and also of a range on the south and south-east, are all of salt. There is also sulphur. The island was devoid of fresh water except in one small well which exists, or formerly existed, at Turan Bagh, all the other water in use being collected in cisterns from rainfall; and of vegetation, with the exception of a very little scrub among the hills and of what was produced in the time of the kings by laborious gardening and irrigation at the spot above mentioned. The new city occupied a triangular plain forming the northern part of the island, the southern wall, as its remains still show, being about 2 miles in extent from east to west. A suburb with a wharf or pier, called Turan Bagh (garden of Turén) after one of the kings, a name now corrupted to Trumpdk, stood about three miles from the town to the south-east.

Oporic (q.v.) gives the earliest notice we have of the new city (c. 1320). He calls it Ormes, a city strongly fortified and abounding in costly wares, situated on an island 5 miles distant from the main, having no trees and

1 It is alleged, however, in the Persian Gulf Pilot, 1864, that this

~~creek, called Khor Mindb, "is in no way connected with" the river flowing past the town and fort of Mindo or Min4b.~~

~~OR MUS~~

~~no fresh water, unhealthy, and (as all evidence confirms) incredibly hot. Some years later it was visited more than once by Ibn Batuta, who seems to speak of the old city as likewise still standing. The new Hormuz, called also Jerun (7.¢., still retaining the original name of the island), was a great and fine city rising out of the sea, and serving as a mart for all the products of India, which were distri- buted hence over all Persia. The hills on the island were of rock-salt, from which vases and pedestals for lamps were carved. Near the gate of the chief mosque stood an enormous skull, apparently that of a sperm-whale. The king at this time was Kutbuddin Tahamtan, the son of Turan Shéh ; and the traveller gives a curious description of hin, seated on the throne, in patched and dirty raiment, whilst holding a rosary of enormous pearls, procured from the Bahrein fisheries, which at one time or another belonged, with other islands in the gulf and on the Oman shores from Ras-al-hadd (C. Rosalgat of the Portuguese) on the ocean round to Julfar on the gulf, to the princes of Hormuz. Abdurazzik, the envoy of Shah Rukh on his way to the Hindu court of Vijayanagar, was in Hormuz in 1442, and speaks of it as a mart which had no equal, frequented by the merchants of all the countries of Asia, among which he enumerates China, Java, Bengal, Tenasserim, Shahr-i-nao (i.e, Siam), and the Maldives. Nikitin, the Russian (c. 1470), gives a similar account ; he calls it "a vast em- porium of all the world."~~

~~In September 1507 the king of Hormuz, after for some time hearing of the terrible foe who was carrying fire and sword along the shores of Arabia, saw the squadron of Alphonso d'Albuquerque appear before his city, an appear- ance speedily followed by extravagant demands, by refusal of these from the ministers of the young king, and by deeds of matchless daring and cruelty on the part of the Portuguese, which speedily broke down resistance. The king acknowledged himself tributary to Portugal, and gave leave to the Portuguese to build a castle, which was at once commenced on the northern part of the island, com- manding the city and the anchorage on both sides. But the mutinous conduct and desertion of several of~~

Albuquerque's captains compelled him suddenly to abandon the enterprise ; and it was not till 1514, after the great leader had cap- tured Goa and Malacca, and had for five years been viceroy, that he returned to Hormuz (or Ormuz, as the Portuguese called it), and, without encountering resistance to a name 'now so terrible, laid his grasp again on the island and completed his castle. For more than a century Ormuz remained practically in the dominions of Portugal, though the hereditary prince, paying from his revenues a tribute to Portugal (in lieu of which eventually the latter took the whole of the customs collections), continued to be the instrument of government. The position of things during the Portuguese rule may be understood from the description of Cesare de' Federici, a Venetian merchant who was at Ormuz about 1565. After speaking of the great trade in spices, drugs, silk and silk stuffs, and pearls of Bahrein, and in horses for export to India, he says the king was a Moor (.¢., Mohammedan), chosen by and subordinate to the Portuguese. 'At the election of the king I was there and saw the ceremonies that they use. . . . The old king being dead, the captain of the Portugals chooseth another of the blood-royal, and makes this election in the castle with great ceremony. And when he is elected the captain sweareth him to be true . . . to the K. of Portugal as his lord and governor, and then he giveth him the sceptre regal. After this… with great pomp… he is brought into the royal palace in the city. The king keeps a good train and hath sufficient revenues, . . . because the captain of the castle doth maintain and defend his right . . . he is honoured as a king, yet he cannot ride abroad with his

train, without the consent of the captain first had" (in Hakluyt).t

The rise of the English trade and factories in the Indian seas in the beginning of the 17th century led to constant jealousies and broils with the Portuguese, and the success- ful efforts of the English company to open traffic with Persia especially embittered their rivals, to whom the possession of Ormuz had long given a monopoly of that trade. The officers of Shah Abbds, who looked with a covetous and resentful eye on the Portuguese occupation of such a position, were strongly desirous of the aid of English ships in attacking Ormuz. During 1620 and 1621 the ships of

Portugal and of the English company had more than once come to action in the Indian seas, and in November of the latter year the council at Surat had resolved on what was practically maritime war with the Portuguese flag. There was hardly a step between this and the decision come to in the following month to join with "the duke of Shiraz" (Im4m Kulf Khan, the gover- nor of Fars) in the desired expedition against Ormuz. There was some pretext of being forced into the alliance by a Persian threat to lay embargo on the English goods at Jashk; but this seems to have been only brought forward by the English agents when, at a later date, their proceed- ings were called in question. The English crews were at first unwilling to take part in what they justly said was "no merchandizing business, nor were they engaged for the like," but they were persuaded, and five English vessels aided, first, in the attack of Kishm, where (at the east end of the large island so called) the Portuguese had lately built a fort,? and afterwards in that of Ormuz itself. The latter siege was opened on the 18th February 1622, and continued to Ist May, when the Portuguese, after a gal- lant defence of ten weeks, surrendered. It is to be recol- lected that Portugal was at this time subject to the crown of Spain, with which England was at peace; indeed, it was but a year later that the prince of Wales went on his wooing adventure to the Spanish court. The irritation there was naturally great, though it is surprising how little came of it. The campany were supposed (apparently without foundation) to have profited largely by the Ormuz booty ; and both the duke of Buckingham and the king claimed to be "sweetened," as the record phrases it, from this supposed treasure. The former certainly received a large bribe (£10,000). The conclusion of the transaction with the king was formerly considered doubtful; but entries in the calendar of East India papers lately published seem to show that James received an equal suin.®

Ormuz never recovered from this blow. The Persians transferred their establishments to Gombroon on the main- land, about 12 miles to the north- west, which the king had lately set up as a royal port under the name of Bandar Abbasi. The English stipulations for aid had embraced an equal division of the customs duties. This division was apparently recognized by the Persians as applying to the new Bandar, and, though the trade with Persia was constantly decaying and precarious, the company held to their factory at Gombroon for the sake of this claim to revenue, which of course

was most irregularly paid. In 1683-84 the amount of debt due to the company in Persia, including their proportion of customs duties, was reckoned at a million sterling. As late as 1690-91 their right seems to have been admitted, and a payment of 3495 sequins was received by them on this account. The factory at Gom-

1 In Barros, Dec. II., book x. c. 7, there is a curious detail of the revenue and expenditure of the kingdom of Ormuz, which would seem to exhibit the former as not more than £100,000.

- The attack on Kishm was notable in that one of the two English- men killed there was the great navigator Baffin.

3 Colonial Series, E. Indies, by Sainsbury, vol. iii. passim, especially see pp. 296 and 329.

broon lingered on till 1759, when it was seized by two French ships of war under Comte d'Estaing. It was re-established, but at the time of Niebuhr's visit to the gulf a few years later no European remained. Niebuhr mentions that in his time (c. 1765) Mulla 'Ali Shah, formerly admiral of Nadir Shah, was established on the island of Ormuz and part of Kishm as an independent chief. On Ormuz the solidly-built Portuguese castle still stands, and some of the immense water-tanks, with fresh water in them, in almost perfect integrity. "With their arched and groined roofs, supported on heavy pillars, they appeared like the crypts of some great cathedral" (Colomb, Slave-catching in the Indian Ocean, 1873, pp. 142-148). Of the city hardly anything stands except a minaret,' by some called a lighthouse, but the traces of buildings are

1 Fraser heard that this was erected by Shah Abbas after the capture.

numerous and extensive. A small band of fishermen and salt-diggers living in mat huts and a small guard from Muscat in the castle form the sole population. The island is, with Kishm and other places near, rented from Persia by the sultan of Muscat, chiefly for the salt and sulphur. Works consulted, besides some of those specifically quoted above, have been Barros, Asia; Commentaries of Albuquerque, trans. by Birch (Hak. Society); Relaciones de Pedro Teixeira (Antwerp, 1610); Narratives in Hakluyt's Collection (reprint of 1809, vol. il.) and in Purchas's Pilgrims, vol. ii.; Pietro della Valle, Persia, lett. xii-xvii. ; Calendar of E. I. Papers, by Sainsbury, vol. iti. ; Ritter, Erdkunde, xii. ; Jowr. Roy. Geog. Soc., Kempthorne in vol. v., Whitelocke in vol. viii., Pelly in vol. xxxiv. ; Fraser, Narrative of a Journey into Khorasan (1825); Constable and Stiffe, Persian Gulf Pilot (1864); Bruce, Annals of the E. I. Company, &c. (1810). Gi Ye), ORMUZD (for Ahura-mazda or Auramazda, " the wise

lord"), the good principle in the dualism of Zoroastrianism, opposed to Ahriman or Angromainyu. (See ZoROASTER.)

END OF VOLUME SEVENTEENTH.

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Decoration on north chancel wall, Amencharads Rada Church, Sweden.

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DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XVIII

EDINBURGH: ADAM AND CHARLES BLACK

MDCCOLXXXV

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ENCYCLOPADIA BRITANNICA.

ORNE

RNE, a department of the north-west of France, about half of which formerly belonged to the province of Normandy and the rest to the duchy of Alencon and to Perche, lies between 48° 10’ and 48° 58’ N. lat., and between 1° E. and 0° 50’ W. long., and is bounded N. by Calvados, N.E. by Eure, 8.E. by Eure-et-Loir, 8. by Sarthe and Mayenne, and W. by Manche. The greatest length from east to west is 87 miles, and the area 2635 square miles. The population in 1881 numbered 376,126. Geologically there are two distinct regions: to the west of the Orne and the railway from Argentan to Alencon lie primitive rocks connected with those of Brittany; to the east begin the Jurassic and Cretaceous formations of Nor- mandy. The latter district is agriculturally the richest part of the department ; in the former the poverty of the soil has led the inhabitants to seek their subsistence from industrial pursuits. Between the northern portions, drain- ing to the Channel, and the southern portion, belonging to the basin of the Loire, stretch the hills of Perche and Normandy, which generally have a height of from 800 to 1000 feet. The highest point in the department, situated in the forest of Ecouves north of Alencon, reaches 1378 feet. The department gives birth to three Seine tribu- taries—the Eure, its affluent the Iton, and the Rille, which passes by Laigle. The Touques, passing by Vimoutier, the Dives, and the Orne fall into the English Channel,— the last passing Sées and Argentan, and receiving the Noireau with its tributary the Vere, which runs past Flers. Towards the Loire flow the Huisne, a feeder of the Sarthe passing by Mortagne, the Sarthe, which passes by Alengon, and the Mayenne, some of whose affluents rise to the north of the dividing range and make their way through it by the most picturesque defiles. Nearly the whole department, indeed, with its beautiful forests containing oaks several centuries old, its green meadows peopled with herds, its limpid streams, its deep gorges, its stupendous rocks, is one of the most picturesque of all France, though neither bathed by the sea nor possessing a truly moun- tainous character. In the matter of climate Orne be- longs to the Seine region. The mean temperature is 50° Fahr.; the summer heat is never extreme ; the west winds are the most frequent; the rainfall, distributed over about a hundred days in the year, amounts to

nearly 3 feet, or half as much again as the average for France.

Arable land occupies seven-twelfths of the surface, woods one-eighth, and pasture land almost as much. The live stock comprises 70,000 horses, 4000 asses, 122,000 sheep (35,500 high-bred), yielding in 1878 660,000 tb of wool of the value of nearly £25,000, 53,000 pigs, 2800 goats, 210,000 horned cattle, 30,000 dogs, 700,000 fowls, 53,000 geese, and 15,800 beehives, each producing on the average 2 lb of wax and 20 tb of honey. Horse-breeding is the most flourishing business in the rural districts ; there are three breeds—those of Perche, Le Merlerault (a cross between Norman and English horses), and Brittany.

|The great Government stud of Le Pin is situated

between Le Merlerault and Argentan. Several horse- training establishments exist in the department. A large number of lean cattle are bought in the neighbouring departments to be fattened; the farms in the vicinity of Vimoutier, on the borders of Calvados, produce the famous Camenbert cheese, and others excellent butter. In 1882 Orne produced 3,288,000 bushels of wheat, meslin 431,000, rye 315,700, barley 1,510,000, oats 3,410,000, buckwheat 600,000, potatoes 654,000, beetroot 939,000 ewt., colza seed 5000 cwt., hemp 8300 cwt., besides fodder in great quantity and variety, pulse, flax, fruits, &c. The variety of production is due to the great natural diversity of the soils. Small farms are the rule, and the fields in those cases are surrounded by hedges relieved by pollard trees. Along the roads or in the enclosures are planted numer- ous pear and apple trees (nearly 3,000,000), yielding 58,000,000 gallons of cider and perry, part of which is manufactured into brandy. Beech, oak, birch, and pine are the chief timber trees in the extensive forests of the department, of which a third belongs to the state. Orne contains iron ore of poor quality, granite quarries employ- ing from 400 to 500 workmen, and a kind of smoky quartz known as Alengon diamond. Its most celebrated mineral waters are those of the hot springs of Bagnoles, which contain salt, sulphur, and arsenic, and are employed for tonic and restorative purposes in cases of general debility. In the forest of Belléme is the chalybeate spring of La Hesse, which was used by the Romans. The other mineral springs of the department are chalybeate or XVIII. — 1

sulphurous. Cotton and linen weaving forms the staple industry of Orne, 51 establishments (123,000 spindles and 12,170 looms) being devoted to cotton, 2 establish- ments (500 spindles) to wool, and 3 establishments (2400 spindles and 2800 looms) to linen. Flers manufactures ticking, table-linen, furniture satin, cotton cloth, and thread, employs 28,000 workmen, and produces to the annual value of £1,520,000. La Ferté Macé employs 10,000 workmen in the hand-loom manufacture of cotton. Alengon and Vimoutier are engaged in the production of linen and canvas, and have also dye-works and bleacheries. About 2000 workmen are employed at Alengon in the making of the lace which takes its name from the town. Foundries, wire-works, and one blast furnace also exist in the department, and cutlery, boilers, and articles in copper,

zinc, and lead are manufactured. ‘Tin wares, pins, and needles are produced at Laigle. Glass-works give employ- ment to 600 workmen, and turn out glass to the value of more than £100,000. There are flourishing paper-mills, tanneries (the waters of the Orne giving a special quality to the leather), and glove-works. There are in all 133 establishments making use of steam (2128 horse-power). There are 848 miles of railway. The department consists of four arrondissements (Alengon, Argentan, Domfront, and Mortagne), 36 cantons, and 511 communes, forms the diocese of Sées, depends on the Caen court of appeal, and is included in the corps d’armée of Le Mans. The com- munes with moré than 5000 inhabitants are Alengon (17,237), Flers (12,304), La Ferté Macé (9396), Argentan (6300), and Laigle (5308).

ORNITHOLOGY

RNITHOLOGY? in its proper sense is the methodi-

cal study and consequent knowledge of Birds with all

that relates to them; but the difficulty of assigning a limit to the commencement of such study and knowledge gives the word a very vague meaning, and practically procures its application to much that does not enter the domain of Science. This elastic application renders it impossible

in the following sketch of the history of Ornithology to draw any sharp distinction between works that are.emphatically ornithological and those to which that title can only be attached by courtesy; for, since Birds have always attracted

far greater attention than any other group of animals with |.

which in number or in importance they can be compared, there has grown up concerning them a literature of corre- sponding magnitude and of the widest range, extending from the recondite and laborious investigations of the morphologist and anatomist to the casual observations of the sportsman or the schoolboy. The chief cause of the disproportionate amount of attention which Birds have received plainly arises from the way in which so many of them familiarly present themselves to us, or even (it may be said) force themselves upon our notice. Trusting to the freedom from danger conferred by the power of flight, most Birds have no need to lurk hidden in dens, or to slink from place to place under shelter of the inequalities of the ground or of the vegetation which clothes it, as is the case with so many other animals of similar size. Besides this, a great number of the Birds which thus display themselves freely to our gaze are conspicuous for the beauty of their plumage ; and there are very few that are not remarkable for the grace of their form. Some Birds again enchant us with their voice, and others administer to our luxuries and wants, while there is scarcely a species which has not idiosyncrasies that are found to be of engaging interest the more we know of them. Moreover, it is clear that the art of the fowler is one that must have been practised from the very earliest times, and to follow that art with success no inconsiderable amount of acquaint- ance with the haunts and habits of Birds is a necessity. Owing to one or another of these causes, or to the combina- tion of more than one, it is not surprising that the obser- vation of Birds has been from a very remote period a favourite pursuit among nearly all nations, and this obser- vation has by degrees led to a study more or less framed on methodical principles, finally reaching the dignity of a

1 Ornithologia, from the Greek épyi6-, crude form of dps, a bird, and -Aoyla, allied to Aédyos, commonly Englished a discourse. The earliest

known use of the word Ornithology seems to be in the third edition of Blount's Glossographia (1670), where it is noted as being '

science, and a study that has its votaries in almost all classes of the population of every civilized country. In the ages during which intelligence dawned on the world's total ignorance, and even now in those districts that have not yet emerged from the twilight of a knowledge still more imperfect than is our own at present," an additional and perhaps a stronger reason for paying attention to the ways of Birds existed, or exists, in their association with the cherished beliefs handed down from generation to generation among many races of men, and not unfrequently interwoven in their mythology.'

Moreover, though Birds make a not unimportant appear- ance in the earliest written records of the human race, the painter's brush has preserved their counterfeit presentment for a still longer period. What is asserted—and that, so far as the writer is aware, without contradiction—by Egyptologists of the highest repute to be the oldest picture in the world is a fragmentary fresco taken from a tomb at Maydoom, and happily deposited, though in a decaying condition, in the Museum at Boolak. 'This picture is said to date from the time of the third or fourth dynasty, some three thousand years before the Christian era. In it are depicted with a marvellous fidelity, and thorough apprecia- tion of form and colouring (despite a certain conventional treatment), the figures of six Geese. Four of these figures can be unhesitatingly referred to two species (Anser albifrons and A. rujficollis) well known at the present day ; and if the two remaining figures, belonging to a third species, were re-examined by an expert they would very possibly be capable of determination with no less certainty.* In later ages the representations of Birds of one sort or another in Egyptian paintings and sculptures become countless, and the bassi-riliext of Assyrian monuments, though mostly belonging of course to a subsequent period, are not without them. No figures of Birds, however, seem yet to have been found on the incised stones, bones, or ivories of the prehistoric races of Europe.

It is of course necessary to name ARISTOTLE (born B.C. Arist

385, died B.c. 322) as the first serious author on Ornithology with whose writings we are acquainted, but even he had,

2 Of the imperfection of our present knowledge more must be said presently.

8 For instances of this among Greeks and Romans almost any dictionary or treatise of ‘‘ Classical Antiquities” may be consulted, while as regards the superstitions of barbarous nations the authorities are far too numerous to be here named.

4 The portion of the picture containing the figures of the Geese has been figured by Mr Lortig (Ride in Egypt, p. 209), and the present writer owes to that gentleman’s kindness the opportunity of examining a copy made on the spot by an accomplished artist, as well as the information that it is No. 988 of Mariette’s Catalogue. See art. MURAL Decoration, vol. xvii. p. 39, fig. 7.

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as he tells us, predecessors ; and, looking to that portion of his works on animals which has come down to us, one finds that, though more than 170 sorts of Birds are mentioned, yet what is said of them amounts on the whole to very little, and this consists more of desultory observations in illustration of his general remarks (which are to a con- siderable extent physiological or bearing on the subject of reproduction) than of an attempt at a connected account of Birds. Some of these observations are so meagre as to have given plenty of occupation to his many commentators, who with varying success have for more than three hundred years been endeavouring to determine what were the Birds of which he wrote ; and the admittedly corrupt state of the text adds to their difficulties. One of the most recent of these commentators, the late Prof. Sundevall—equally proficient in classical as in ornithological knowledge—was, in 1863, compelled to leave more than a score of the Birds unrecognized. Yet it is not to be supposed that in what survives of the great philosopher’s writings we have more than a fragment of the knowledge possessed by him, though the hope of recovering his Zouxd or his “Avaropuxd, in which he seems to have given fuller descriptions of the animals he knew, can be hardly now entertained. A Latin transla- tion by Gaza of Aristotle’s existing zoological work was printed at Venice in 1503. Another version, by Scaliger, was subsequently published. Two wretched English trans- lations have appeared.

Next in order of date, though at a long interval, comes Carus Purntus SEcunDUS, commonly known as Priny the Elder, who died a.p. 79, author of a general and very dis- cursive Historia Naturalis in thirty-seven books, of which Book X. is devoted to Birds. A considerable portion of Pliny's work may be traced to his great predecessor, of whose information he freely and avowedly availed himself, while the additions thereto made cannot be said to be, on the whole, improvements. Neither of these authors attempted to classify the Birds known to them beyond a very rough and for the most part obvious grouping. Aristotle seems to recognize eight principal groups : —(1) Gampsonyches, approximately equivalent to the Accipitres of Linnzus; (2) Scolecophaga, containing most of what would now be called Oscines, excepting indeed the (3) Acanthophaga, composed of the Goldfinch, Siskin, and a few others; (4) Senipophaga, the Woodpeckers; (5) Peristeroide, or Pigeons ; (6) Schizopoda, (7) Steganopoda, and (8) Barea, nearly the same respectively as the Linnean Gralle, Anseres, and Galline.. Pliny, relying wholly on characters taken from the feet, limits himself to three groups—without assigning names to them—those which have "hooked tallons, as Hawkes; or round long clawes, as Hennes ; or else they be broad, flat, and whole-footed, as Geese and all the sort in manner of water-foule"—to use the words of Philemon Holland, who, in 1601, published a quaint and, though condensed, yet fairly faithful English translation of Pliny's work.

About a century later came AELIAN, who died about A.D. 140, and compiled in Greek (though he was an Italian by birth) a number of miscellaneous observations on the peculiarities of animals. His work is a kind of common- place book kept without scientific discrimination. A con- siderable number of Birds are mentioned, and something said of almost each of them; but that something is too often nonsense—according to modern ideas—though occasionally a fact of interest may therein be found. It contains numerous references to former or contemporary writers whose works have perished, but there is nothing to shew that they were wiser than /¥lian himself.

1This is Sundevall's estimate ; Drs Aubert and Wimmer in their excellent edition of the 'Ioroplat wept (wy (Leipzig: 1868) limit the number to 126.

_ The twenty-six books De Animalibus of ALBERTUS Albertus Macnus (Groot), who died a.p. 1282, were printed in Magnus.

1478 ; but were apparently already well known from manu- script copies. They are founded on the works of Aristotle, many of whose statements are almost literally repeated, and often without acknowledgment. Occasionally Avicenna, or some other less-known author, is quoted; but it is hardly too much to say that the additional information is almost worthless. The twenty-third of these books is De Avibus, and therein a great number of Birds' names make their earliest appearance, few of which are without interest from a philologist's if not an ornithologist's point of view, but there is much difficulty in recognizing the species to which many of them belong. In 1485 was printed the first dated copy of the volume known as the Ortus Sanitatis, to the popularity of which many editions testify.

Though said by its author, Jonann WONNECKE VON CAUB Cuba.

(Latinized as JOHANNES DE CuBA)," to have been composed from a study of the collections formed by a certain noble- man who had travelled in Eastern Europe, Western Asia, and Egypt—possibly Breidenbach, an account of whose travels in the Levant was printed at Mentz in 1486—it is really a medical treatise, and its zoological portion is mainly an abbreviation of the writings of Albertus Magnus, with a few interpolations from Isidorus of Seville (who flour- ished in the beginning of the seventh century, and was the author of many works highly esteemed in the Middle Ages) and a work known as PaystoLocus (q.v.). The third trac- tatus of this volume deals with Birds—including among them Bats, Bees, and other flying creatures; but as it is the first printed book in which figures of Birds are introduced it merits notice, though most of the illustrations, which are rude woodcuts, fail, even in the coloured copies, to give any precise. indication of the species intended to be repre- sented. 'The scientific degeneracy of this work is mani- fested as much by its title (Ortus for Hortus) as by the mode in which the several subjects are treated ;? but the

revival of learning was at hand, and Wint1Am TURNER, a Turner.

Northumbrian, while residing abroad to avoid persecution at home, printed at Cologne in 1544 the first commentary on the Birds mentioned by

Aristotle and Pliny conceived in anything like the spirit that moves modern naturalists.* In the same year and from the same press was issued a

Dialogus de Avibus by GyBertus Loncoutus, and in 1570 Longo- treatise De rariorum us. In this last work, small ©#™s-

Qarus brought out in London his animalium atque stirpium historia.

though it be, ornithology has a good share ; and all three may still be consulted with interest and advantage by its votaries.© Meanwhile the study received a great impulse from the appearance, at Zurich in 1555, of the third book

of the illustrious ConraD GEsNER's Historia Animalium Gesner.

"qvi est de Auium natura," and at Paris in the same year

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2 On this point see G. A. Pritzel, Botan. Zeitung, 1846, pp. 785-790, and Thes. Literat. Botanic (Lipsie : 1851), pp. 349-352.

8 Absurd as much that we find both in Albertus Magnus and the Ortus seems to modern eyes, if we go a step lower in the scale and consult the 'Restiaries" or treatises on animals which were common from the twelfth to the fourteenth century we shall meet with many more absurdities. See for instance that by PHinirps DE THAUN (PuILiprus TaONENSIS), dedicated to Adelaide or Alice, queen of Henry I. of England, and pro- pably written soon after 1121, as printed by the late Mr Thomas Wright, in his Popular Treatises on Science written during the Middle Ages (London: 1841).

4 This was reprinted at Cambridge in 1823 by the late Dr George Thackeray.

5 The Seventh of Worron's De differentiis animalium Libri Deeem, published at Paris in 1552, treats of Birds ; but his work is merely a compilation from Aristotle and Pliny, with references to other classical writers who have more or less incidentally mentioned Birds and other

animals. ‘The author in his preface states—“Veterum scriptorum sententias in unum quasi cummlum coaceruaui, de meo nihil addidi.” Nevertheless he makes some attempt at a systematic arrangement of Birds, which, according to his lights, is far from despicable.

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Belon, of Pierre Breton’s (BELLoNIUS) Histoire de la nature des | cited. With certain modifications in principle not very Oyseaux. Gesner brought an amount of erudition, hitherto | important, but characterized by much more elaborate detail, unequalled, to bear upon his subject ; and, making due allow- | Aldrovandus adopted Belon’s method of arrangement, but ance for the times in which he wrote, his judgment must in | ina few respects there isa manifest retrogression. The work most respects be deemed excellent. In his work, however, | of Aldrovandus was illustrated by copper-plates, but none there is little that can be called systematic treatment. | of his figures approach those of his immediate predecessors Like nearly all his predecessors since Aulian, he adopted an | in character or accuracy. Nevertheless the book was alphabetical arrangement,! though this was not too pedanti- | eagerly sought, and several editions of it appeared.® cally preserved, and did not hinder him from placing Mention must be made of a medical treatise by CASPAR Schwenck together the kinds of Birds which he supposed (and gene- | ScHWENCKFELD, published at Liegnitz in 1603, under the feld. rally supposed rightly) to have the most resemblance to that title of Thervotropheum Silesve, the fourth book of which one whose name, being best known, was chosen for the | consists of an “‘ Aviarium Silesiz,” and is the earliest of headpiece (as it were) of his particular theme, thus recog- | the works we now know by the name of Fauna. The nizing to some extent the principle of classification.?_ Belon, author was well acquainted with the labours of his predeces- with perhaps less book-learning than his contemporary, | sors, as his list of over one hundred of them testifies. Most was evidently no mean scholar, and undoubtedly had more | of the Birds he describes are characterized with accuracy practical knowledge of Birds—their internal as well as | sufficient to enable them to be identified, and his obser- external structure. Hence his work, written in French, | vations upon them have still some interest ; but he was contains a far greater amount of original matter ; and his | innocent of any methodical system, and was not

exempt personal observations made in many countries, from | from most of the professional fallacies of his time.*

England to Egypt, enabled him to avoid most of the Hitherto, from the nature of the case, the works aforesaid

puerilities which disfigure other works of his own or of a | treated of scarcely any but the Birds belonging to the orbis

preceding age. Besides this, Belon disposed the Birds | veteribus notus; but the geographical discoveries of the

known to him according to a definite system, which (rude | sixteenth century began to bear fruit, and many animals of

as we now know it to be) formed a foundation on which | kinds unsuspected were, about one hundred years later,

several of his successors were content to build, and even | made known. Here there is only space to name Bonrtivs,

to this day traces of its influence may still be discerned in | CLustus, HERNANDEZ (or FERNANDEZ), MaRcGRAVE,

the arrangement followed by writers who have faintly | NrzREMBERG, and Piso,° whose several works describing

appreciated the principles on which modern taxonomers | the natural products of both the Indies—whether the

rest the outline of their schemes. Both his work and that | result of their own observation or compilation—together

of Gesner were illustrated with woodcuts, many of which | with those of Oxins and Worm, produced a marked effect,

display much spirit and regard to accuracy. . since they led up to what may be deemed the foundation of Belon, as has just been said, had a knowledge of the | scientific Ornithology.®

anatomy of Birds, and he seems to have been the first to This foundation was laid by the joint labours of FRANcIs Wil-

institute a direct comparison of their skeleton with that of | WinLucHBy (born 1635, died 1672) and Jonny Ray (born lughby

Man ; but in this respect he only anticipated by a few | 1628, died 1705), for it is impossible to separate their ™¢4v-

Coiter. years the more precise researches of VoLCHER ColITER, a | share of work in Natural History more than to say that, : Frisian, who in 1573 and 1575 published at Nuremberg | while the former more especially devoted himself to zoology, two treatises, in one of which the internal structure of | botany was the favourite pursuit of the latter. Together Birds in general is very creditably described, while in the | they studied, together they travelled, and together they other the osteology and myology of certain forms is given | collected. Willughby, the younger of the two, and at first in considerable detail, and illustrated by carefully-drawn | the other's pupil, seems to have gradually become the figures. The first is entitled Luvternarwm et internarum | master; but, he dying before the promise of his life was ful- principalium humani corporis Tabulex, é&c., while the second, | filled, his writings were given to the world by his friend which is the most valuable, is merely appended to the | Ray, who, adding to them from his own stores, published Lectiones Gabrielis Fallopii de partibus similaribus humani | the Ornithologia in Latin in 1676, and in English with corporis, &c., and thus, the scope of each work being | many emendations in 1678. In this work Birds generally regarded as medical, the author's labours were wholly over- | were grouped in two great divisions—‘‘ Land-Fowl" and looked by the mere natural-historians who followed, though | ‘ Water-Fowl,"—the former being subdivided into those Coiter introduced a table, ‘“‘ De differentiis Auium," furnish- | which have a crooked beak and talons and those which have ing a key to a rough classification of such Birds as were | a straighter bill and claws, while the latter was separated known to him, and this as nearly the first attempt of the | into those which frequent waters and watery places and kind deserves notice here. those that swim in the water—each subdivision being

eee Contemporary with these three men was Utysszs ALprRo- | further broken up into many sections, to the whole of which

vanaus.

VANDUS, a Bolognese, who wrote an Historia Naturaliwm in sixteen folio volumes, most of which were not printed till after his death in 1605; but those on Birds appeared between 1599 and 1603. The work is almost wholly a compilation, and that not of the most discriminative kind, while a peculiar jealousy of Gesner is continuously displayed, though his statements are very constantly quoted—nearly always as those of " Ornithologus," his name appearing but few times in the text, and not at all in the list of authors

1 Even at the present day it may be shrewdly suspected that not a few ornithologists would gladly follow Gesner's plan in their despair of seeing, in their own time, a classification which would really deserve the epithet scientific.

2 For instance, under the title of '' Accipiter"" we have to look, not only for the Sparrow-Hawk and Gos-Hawk, but for many other Birds of the Family (as we now call it) removed comparatively far from those species by modern ornithologists.

a key was given, Thus it became possible for almost any diligent reader without much chance of error to refer to its

3 The Historia Naturalis of JOHANNES JOHNSTONUS, said to be of Scottish descent but by birth a Pole, ran through several editions during the seventeenth century, but is little more than an epitome of the work of Aldrovandus.

4 The Hierozoicon of Bochart—a treatise on the animals named in Holy Writ—was published in 1619.

5 For Lichtenstein's determination of the Birds described by Marcgrave and Piso see the Adbhandlungen of the Berlin Academy for 1817 (pp. 155 sq.).

6 The earliest list of British Birds seems to be that in the Pinax Rerum Naturalium of CHRISTOPHER MERRETT, published in 1667. In the following year appeared the Onomasticon Zooicon of WALTER CHARLETON, which contains some information on ornithology. An enlarged edition of the latter, under the title of Zercitationes &c., was published in 1677; but neither of these writers is of much authority. In 1684 SrBBaLp in his Scotia illustrata published the earliest Fauna of Scotland.

uinneus.

Barrere.

Méhrin g.

Klein.

_ Catesby,

proper place nearly every bird he was likely to meet with. Ray’s interest in ornithology continued, and in 1694 he completed a Synopsis Methodica Avium, which, through the fault of the booksellers to whom it was entrusted, was not published till 1713, when Derham gave it to the world.?

Two years after Ray’s death, Linnaus, the great reformer of Natural History, was born, and in 1735 ap- peared the first edition of the celebrated Systema Nature. Successive editions of this work were produced under its author’s supervision in 1740, 1748, 1758, and 1766. Impressed by the belief that verbosity was the bane of science, he carried terseness to an extreme which frequently created obscurity, and this in no branch of zoology more than in that which relates to Birds. Still the practice introduced by him of assigning to each species a diagnosis by which it ought in theory to be distinguishable from any other known species, and of naming it by two words—the first being the generic and the second the specific term, was so manifest an improvement upon any thing which had previously obtained that the Linnzean method of differ- entiation and nomenclature established itself before long in spite of all opposition, and in principle became almost

universally adopted. The opposition came of course from those who were habituated to the older state of things, and saw no evil in the cumbrous, half-descriptive half- designative titles which had to be employed whenever a species was to be spoken of or written about. The supporters of the new method were the rising generation of naturalists, many of whose names have since become famous, but among them were some whose admiration of their chief carried them toa pitch of enthusiasm which now seems absurd. Careful as Linneeus was in drawing up his definitions of groups, it was immediately seen that they occasionally were made to comprehend creatures whose characteristics contradicted the prescribed diagnosis, His chief glory lies in his having'reduced, at least for a time, a chaos into order, and in his shewing both by precept and practice that a name was not a definition. In his classifica- tion of Birds he for the most part followed Ray, and where he departed from his model he seldom improved upon it.

In 1745 Barrere brought out at Perpignan a little book called Ornithologie Specimen nowum, aud in 1752 Mourine published at Aurich one still smaller, his Aviwm Genera. Both these works (now rare) are manifestly framed on the Linnzan method, so far as it had then reached; but in their arrangement of the various forms of Birds they differed greatly from that which they designed to supplant, and they deservedly obtained little success. Yet as systematists their authors were no worse than Kiz1n, whose Historix Avium Prodromus, appearing at Liibeck in 1750, and Stemmata Avium at Leipzig in 1759, met with considerable favour in some quarters. The chief merit of the latter work lies in its forty plates, whereon the heads and feet of many Birds are indifferently figured."

But, while the successive editionsof Linnzeus's great work were revolutionizing Natural History, and his example of precision in language producing excellent effect on scientific writers, several other authors were advancing the study of Ornithology in a very different way—a way that pleased the eye even more than his labours were pleasing the mind. Between 1731 and 1743 Marx Carespy brought out in

1 To this was added a supplement by PETIVER on the Bird of Madras, taken from pictures and information sent him by one Edward Buckley of

Fort St George, being the first attempt to catalogue the Birds of any part of the British possessions jn India.

2 After Klcin’s death his Prodromus, written in Latin, had the unwonted fortune of two distinct translations into German, published in the same year 1760, the one at Leipzig and Liibeck by BERN, the other at Danzig by REy@zR—each of whom added more or less to the original.

5)

London his Natural History of Carolina—two large folios containing highly-coloured plates of the Birds of that colony, Florida, and the Bahamas —the forerunners of those numerous costly tomes which will have to be men- tioned presently at greater length? ELEAZAR ALBIN between 1738 and 1740 produced a Natural History of Birds in three volumes of more modest dimensions, seeing that it is in quarto; but he seems to have been ignorant of Ornithology, and his coloured plates are greatly inferior to Catesby’s. Far better both as draughtsman and as authority was George Epwarps, who in 1743 began, under the same title as Albin, a series of plates with letter- press, which was continued by the name of Gleanings in Natural History, and finished in 1760, when it had reached seven parts, forming four quarto volumes, the figures of which are nearly always quoted with approval.*

The year which saw the works of Edwards completed was still further distinguished by the appearance in France, where little had been done since Belon’s days,® in six quarto volumes, of the Ornithologie of MATHURIN JACQUES

Brisson—a work of very great merit so far as it goes, for Brisson,

as a descriptive ornithologist the author stands even now unsurpassed ; but it must be said that his knowledge, according to internal evidence, was confined to books and to the external parts of Birds’ skins. It was enough for him to give a scrupulously exact description of such specimens as came under his eye, distinguishing these by prefixing two asterisks to their namie, using a single asterisk where he had only seen a part of the Bird, and leaving unmarked those that he described from other authors. He also added

information as to the Museum (generally Réaumur’s, of which he had been in charge) containing the specimen he described, acting on a principle which would have been advantageously adopted by many of his contemporaries and successors. His attempt at classifica- tion was certainly better than that of Linnzus ; and it is rather curious that the researches of the latest ornitho- logists point to results in some degree comparable with Brisson’s systematic arrangement, for they refuse to keep the Birds-of-Prey at the head of the Class Aves, and they require the establishment of a much larger number of “ Orders” than for a long while has been thought advisable. Of such “Orders” Brisson had twenty-six, and he gave Pigeons and Poultry precedence of the Birds which are plunderers and scavengers. But greater value lies in his generic or sub-generic divisions, which, taken as a whole, are far more natural than those of Linnzeus, and consequently capable of better diagnosis. More than this, he seems to be the earliest ornithologist, perhaps the earliest zoologist, to conceive the idea of each genus possessing what is now called a “type ”—though such a term does not occur in his work ; and, in like manner, without declaring it in so many words, he indicated unmistakably the existence of subgenera— all this being effected by the skilful use of names. Untfor- tunately he was too soon in the field to avail himself, even had he been so minded, of the convenient mode of nomencla- Immediately on the

3 Several Birds from Jamaica were figured in SLoann’s Voyage, &c. (1705-1725), and a good many exotic species in the Thesaurus, BECh, of SEBA (1734-1765), but from their faulty execution these plates had little effect upon Ornithology.

4The works of Catesby and Edwards were afterwards reproduced at Nuremberg and Amsterdam by SELIGMANN, with the letterpress in German, French, and Dutch. :

5 Birds were treated of in a worthless fashion by one D. B. in a Dictionnaire raisonné et universel des animaux, published at Paris in

1759.

Salerne.

D’Auben- ton.

Butfon and Mont- beillard.

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was introduced. It is certain that the first four volumes were written if not printed before that method was promulgated, and when the fame of Linnzus as a zoologist rested on little more than the very meagre sixth edition of the Systema Nature and the first edition of his Fauna Suecica. Brisson has been charged with jealousy of if not hostility to the great Swede, and it is true that in the preface to his Ornithologie he complains of the insuffici- ency of the Linnean characters, but, when one considers how much better acquainted with Birds the Frenchman was, such criticism must be allowed to be pardonable if not wholly just. Biisson’s work was in French, with a parallel translation in Latin, which last was reprinted separately at Leyden two years afterwards.

In 1767 there was issued at Paris a book entitled Phistoire naturelle éclaircie dans une de ses parties princi- pales, V Ornithologie. This was the work of SALERNE, published after his death, and is often spoken of as being a mere translation of Ray’s Synopsis, but is thereby very inadequately described, for, though it is confessedly founded on that little book, a vast amount of fresh matter, and mostly of good quality, is added.

The success of Edwards’s very respectable work seems to have provoked competition, and in 1765, at the instiga- tion of Buffon, the younger D’AuBENTON began the pub- lication known as the Planches Enluminéez W histoire naturelle, which appearing in forty-two parts was not com- pleted till 1780, when the plates! it contained reached the number of 1008— all coloured, as its title intimates, and nearly all representing Birds. This enormous work was subsidized by the French Government; and, though the figures are utterly devoid of artistic merit, they display the species they are intended to depict with sufficient approach to fidelity to ensure recognition in most cases without fear of error, which in the absence of any text is no small praise.?

But Burron was not content with merely causing to be published this unparalleled set of plates. He seems to have regarded the work just named as a necessary precursor to his own labours in Ornithology. His Histoire Naturelle, générale et particuliére, was begun in 1749, and in 1770 he brought out, with the assistance of GUBNAU DE MonTBEILLaRrD,' the first volume of that grand undertaking relating to Birds, which, for the first time since the days of Aristotle, became the theme of one who possessed real literary capacity. It is not too much to say that Buffon's florid fancy revelled in such a subject as was now that on which he exercised his brilliant pen ; but it would be unjust to examine too closely what to many of his contemporaries seemed sound philosophical reasoning under the light that has since burst upon us. Strictly orthodox though he pro- fessed to be, there were those, both among his own country- men and foreigners, who could not read his speculative indictments of the workings of Nature without a shudder; and it is easy for any one in these days to frame a reply, pointed with ridicule, to such a chapter as he wrote on the wretched fate of the Woodpecker. In the nine volumes devoted to the Histoire Naturelle des Oiseaux there are passages which will for ever live in the memory of those

1} They were drawn and engraved by MaRTiNneT, who himself began in 1787 a Histoire des Oiseaux with small coloured plates which have some merit, but the text is worthless. The work seems not to have been finished and is rare. For the opportunity of seeing a copy the writer is indebted to Mr Gurney.

2 Between 1767 and 1776 there appeared at Florence a Storia Naturale degli Uccelli, in five folio volumes, containing a number of ill-drawn and ill-coloured figures from the collection of Giovanni Gerini, an ardent collector who died in 1751, and therefore must be acquitted of any share in the work, which, though sometimes attributed to him, is that of certain learned men who did not happen to be ornitho- logists (¢f. Savi, Ornitologia Toscana, i. Introduzione, p. v).

3 He retired on the completion of the sixth volume, and thereupon Buffon associated Bexon with himself.

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that carefully read them, however much occasional expres- sions, or even the general tone of the author, may grate upon their feelings. He too was the first man who formed any theory that may be called reasonable of the Geographical Distribution of Animals, though this theory was scarcely touched in the ornithological portion of his work, and has since proved to be not in accordance with facts. He pro- claimed the variability of species in opposition to the views of Linneeus as to their fixity, and moreover supposed that this variability arose in part by degradation. Taking his labours as a whole, there cannot be a doubt that he enor- mously enlarged the purview of naturalists, and, even if limited to Birds, that, on the completion of his work upon them in 1783, Ornithology stood in a very different position from that which it had before occupied. Because he opposed the system of Linneus he has been said to be opposed to systems in general ; but that is scarcely correct, for he had a system of his own; and, as we now see it, it appears neither much better nor much worse than the systems which had been hitherto invented, or perhaps. than any which was for many years to come propounded. It is certain that he despised any kind of scientific phraseology —a crime in the eyes of those who consider precise nomenclature to be the end of science ; but those who deem it merely a means whereby knowledge can be securely stored will take a different view—and have done so.

Great as were the services of Buffon to Ornithology in Latham,

one direction, those of a wholly different kind rendered by our countryman Joun LaTHAM must not be overlooked. In 1781 he began a work the practical utility of which was immediately recognized. This was his (General Synopsis of Birds, and, though formed generally on the model of Linnzus, greatly diverged in some respects there- from. The classification was modified, chiefly on the old lines of Willughby and Ray, and certainly for the better ; but no scientific nomenclature was adopted, which, as the author subsequently found, was a change for the worse. His scope was co-extensive with that of Brisson, but Latham did not possess the inborn faculty of picking out the character wherein one species differs from another. His opportunities of becoming acquainted with Birds were hardly inferior to Brisson’s, for during Latham’s long life- time there poured in upon him countless new discoveries from all parts of the world, but

especially from the newly- explored shores of Australia and the islands of the Pacific Ocean. The British Museum had been formed, and he had access to everything it contained in addition to the abundant materials afforded him by the private Museum of Sir Ashton Lever.' Latham entered, so far as the limits of his work would allow, into the history of the Birds he described, and this with evident zest, whereby he differed from his French predecessor ; but the number of cases in which he erred as to the determination of his species must be very great, and not unfrequently the same species is described more than once. His Synopsis was finished in 1785 ; two supplements were added in 1787 and 1802,° and in 1790 he produced an abstract of the work under the title of Index Ornithologicus, wherein he assigned names on the Linnzean method to all the species described. Not to recur again to his labours, it may be said here that between 1821 and 1828 he published at Winchester, in eleven volumes, an enlarged edition of his original work, entitling it A General History of Birds; but his defects as

- See Prof. Mivart's address to the Section of Biology, Rep. Brit. Association (Sheffield Meeting), 1879, p. 356.

5In 1792 SHaw began the Museum Leverianum in illustration of this collection, which was finally dispersed by sale, and what is known to remain of it found its way to Vienna. Of the specimens in the British Museum described by Latham it is to be feared that scarcely any exist. They were probably very imperfectly prepared.

6 A German translation by Bechstein subsequently appeared.

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a compiler, which had been manifest before, rather increased with age, and the consequences were not happy.! About the time that Buffon was bringing to an end his

. studies of Birds, Maupuyt undertook to write the Orni-

thologie of the Encyclopédie Méthodiqgue—a compara- tively easy task, considering the recent works of his fellow- countrymen on that subject, and finished in 1784. Here it requires no further comment, especially as a new edition was called for in 1790, the ornithological portion of which was begun by BonnavTErRE, who, however, had only finished three hundred and twenty pages of it when he lost his life in the French Revolution; and the work thus arrested was continued by VrerLuoT under the slightly changed title of Z'ableaw encyclopédique et méthodique des trois régnes de la Nature—the Ornithologie forming volumes four to seven, and not completed till 1823. In the former edition Mauduyt had taken the subjects alpha- betically; but here they are disposed according to an arrangement, with some few modifications, furnished by D'Aubenton, which is extremely shallow and unworthy of consideration.

Several other works bearing upon Ornithology in general, but of less importance than most of those just named, belong to this period. Among others may be mentioned the Genera of Birds by THomMas PENNANT, first printed at Edinburgh in 1773, but best known by the edition which appeared in London in 1781; the Alementa Ornithologica and Museum Ornithologicum of ScuArrer, published at Ratisbon in 1774 and 1784 respectively ; Perer Brown's New Illustrations of Zoology in London in 1776; Hermann's Tubule Affinitatum Animalium at Strasburg in 1783, followed posthumously in 1804 by his Observa- tiones Zoologice ; Jacquin's Beytraege zwr Geschichte der Voegel at Vienna in 1784, and in 1790 at the same place the larger work of SpaLowsky with nearly the same title ; SparrmMan's Museum Carlsonianum at Stockholm from 1786 to 1789; and in 1794 Hayes's Portraits of rare and curious Birds from the menagery of Child the banker at Osterley near London, The same

draughtsman (who had in 1775 produced a History of British Birds) in 1822 began another series of Figures of rare and curious Birds?

The practice of Brisson, Buffon, Latham, and others of neglecting to name after the Linnean fashion the species they described gave great encouragement to compilation, and led to what has proved to be of some inconvenience to modern ornithologists. In 1773 P. L. 8S. Mtzter brought out at Nuremberg a German translation of the Systema Nature, completing it in 1776 by a Supplement containing a list of animals thus described, which had hitherto been technically anonymous, with diagnoses and names on the Linnean model. In 1783 Boppazrr printed at Utrecht a Table des Planches Enluminéez,3 in which he attempted to refer every species of Bird figured in that extensive series to its proper Linnwan genus, and to assign it a scientific name if it did not already possess one. In like manner in 1786, Scopor1—already the author of a little book published

1 He also prepared for publication a second edition of his Jndex Ornithologicus, but this was never printed, and the manuscript is now in the present writer's possession.

2 The Naturalist's Miscellany or Vivarium Naturale, in English and Latin, of SHAW and NoppgEr, the former being the author, the latter the draughtsman and engraver, was begun in 1789 and carried on till Shaw's death, forming twenty-four volumes. It contains figures of more than 280 Birds, but very poorly executed. In 1814 a sequel, The Zoological Miscellany, was begun by LEACH, Nodder continuing to do the plates. This was completed in 1817, and forms three volumes with 149 plates, 27 of which represent Birds.

3 Of this work only fifty copies were printed, and it is one of the rarest known to the ornithologist. Only two copies are believed to exist in England, one in the British Musenm, the other in private hands. It was reprinted in 1874 by Mr Tegetmeier.

at Leipzig in 1769 under the title of Annus I. [Historico- naturalis, in which are described many Birds, mostly from his own collection or the Imperial

vivarium at Vienna—was at the pains to print at Pavia in his miscellaneous Delco Flore et Faune Insubrice a Specimen Zoologicum* contain- ing diagnoses, duly named, of the Birds discovered and

described by SonnERAT in his Voyage aua Indes orientales Sonnerat.

and Voyage ala Nouvelle Guinée, severally published at Paris in 1772 and 1776. But the most striking example

of compilation was that exhibited by J. F. Gmetin, who Gmelin.

in 1788 commenced what he called the Thirteenth Edition of the celebrated Systema Nature, which obtained so wide a circulation that, in the comparative rarity of the original, the additions of this editor have been very frequently quoted, even by expert naturalists, as though they were the work of the author himself. Gmelin availed himself of every publication he could, but he perhaps. found his richest booty in the labours of Latham, neatly condensing his English descriptions into Latin diagnoses, and bestow- ing on them binomial names. Hence it is that Gmelin appears as the authority for so much of the nomenclature now in use. He took many liberties with the details of Linnus's work, but left the classification, at least of the Birds, as it was—a few new genera excepted."

During all this time little had been done in studying the internal structure of Birds since the works of Coiter already mentioned ®; but the foundations of the science of Embry- ology had been laid by the investigations into the develop- ment of the chick by the great Harvey. Between 1666 and 1669 PERRAULT edited at Paris eight accounts of the dissection by Du Verney of as many species of Birds, which, translated into English, were published by the Royal Society in 1702, under the title of The Natural History of Animals. After the death of the two anatomists just named, another series of similar descriptions of eight other species was found among their papers, and the whole were published in the Mémoires of the French Academy of Sciences in 1733 and 1734. had brought out at Amsterdam an Anatome Animalium, containing the results of all the dissections of animals that he could find ; and the second part of this book, treating of Volatilia, makes a respectable show of more than one hundred and twenty closely-printed quarto pages, though nearly two-thirds is devoted to a treatise De Ovo et

Pullo, containing among other things a reprint of Harvey’s researches, and the scientific rank of the whole book may be inferred from Bats being still classed with Birds. In

But in 1681 Grerarp Buasius Gerard Blasius.

1720 VatentTin1 published, at Frankfort-on-the-Main, his Valentini.

Amphitheatrum Zootomicum, in which again most of the existing accounts of the anatomy of Birds were reprinted. But these and many other contributions,’ made until nearly the close of the eighteenth century, though highly meritori- ous, were unconnected as a whole, and it is plain that no conception of what it was in the power of Comparative Anatomy to set forth had occurred to the most diligent dissectors. This privilege was reserved for GEORGES Cuvier, who in 1798 published at Paris his Zableau Elémentaire de Vhistoire naturelle des Animaux, and thus laid the foundation of a thoroughly and hitherto unknown Sw, De es eS

4 This was reprinted in 1882 by the Willughby Society.

5 DauDIN’s unfinished Traité élémentaire et complet @ Ornithologie appeared at Paris in 1800, and therefore is the last of these general works published in the eighteenth century.

6 A succinct notice of the older works on Ornithotomy is given by Prof, SELENKA in the introduction to that portion of Dr Bronn’s Klassen und Ordnungen des Thierreichs relating to Birds (pp. 1-9) published in 1869; and Prof, Carus’s Geschichte der Zoologie, pub- lished in 1872, may also be usefully consulted for further information on this and other heads,

7 The treatises of the two BARTHOLINIS and BORRICHIUS published at Copenhagen deserve mention if only to record the activity of Danish anatomists in those days.

Cuvier.

Marsigli.

inode of appreciating the value of the various groups of the Animal Kingdom. Yet his first attempt was a mere sketch. ! Though he made a perceptible advance on the classification of Linnzeus, at that time predominant, it is now easy to see in how many ways—want of sufficient material being no doubt one of the chief—Cuvier failed to produce a really natural arrangement. His principles, however, are those which must still guide taxonomers, notwithstanding that they have in so great a degree overthrown the entire scheme which he propounded. Confining our attention here, as of course it ought to be confined, to Ornithology, Cuvier's arrangement of the Class Aves is now seen to be not very much better than any which it superseded. But this view is gained by following the methods which Cuvier taught. In the work just mentioned few details are given; but even the more elaborate classification of Birds contained in his Lecons d' Anatomie Comparée of 1805 is based wholly on external characters, such as had been used by nearly all his predecessors ; and the Fégne Animal of 1817, when he was in his fullest vigour, afforded not the least evidence that he had ever dissected a couple even of Birds ? with the object of determining their relative position in his system, which then, as before, depended wholly on the configuration of bills, wings, and feet. But, though apparently without such a knowledge of the anatomy of Birds as would enable lim to apply it to the formation of that natural system which he was fully aware had yet to be sought, he seems to have been an excellent judge of the characters afforded by the bill and limbs, and the use he made of them, coupled with the extraordinary reputation he acquired on other grounds, procured for his system the adhesion for many years of the majority of ornithologists, and its influence though waning is still strong. Regret must always be felt by them that his great genius was never applied in earnest to their branch of study, especially when we consider that had it been so the perversion of energy in regard to the classification of Birds witnessed in England for nearly twenty years, and presently to be mentioned, would most likely have been prevented.?

Hitherto mention has chiefly been made of works on General Ornithology, but it will be understood that these were largely aided by the enterprise of travellers, and as there were many of them who published their narratives in

separate forms their contributions have to be considered. Of those travellers then the first to be here especially named is Marsieut, the fifth volume of whose Danubius Pannonico- Mysicus is devoted to the Birds he met with in the valley of the Danube, and appeared at the Hague in 1725, followed by a French translation in 1744.4 Most of the many pupils whom Linnzeus sent to foreign countries sub- mitted their discoveries to him, but Kamm, HAssELQvIst, and OsBEcK published separately their respective travels

1 It had no effect on LactipkDE, who in the following year added a Tableau Méthodique containing a classification of Birds to his Discours @ Ouverture (Mém. de U Institut, iii. pp. 454-468, 503-519).

?So little regard did he pay to the Osteology of Birds that, according to De Blainville (Jour. de Physique, xcii. p. 187, note), the skeleton of a Fowl to which was attached the head of a Hornbill was for a long time exhibited in the Museum of Comparative Anatomy at Paris! Yet, in order to determine the difference of structure in their organs of voice, Cuvier, as he says in his Lecons (iv. p. 464), dissected more than one hundred and fifty species of Birds. Unfortunately for him, as will appear in the sequel, it seems not to have occurred to him to use any of the results he obtained as the basis of a classification.

3 It is unnecessary to enumerate the various editions of the Régne Animal. Of the English translations, that edited by Griffiths and Pidgeon is the most complete. The ornithological portion of it contained in these volumes received many additions from JoHN EDWARD Gray, and appeared in 1829.

4 Though much later in date, the Iter per Poseganam Sclavonizx of PILLER and MITTERPACHER, published at Buda in 1783, may perhaps be here most conveniently mentioned.

in North America, the Levant, and China.> The incessant journeys of Paxxas and his colleagues—FALK, GEORGI, Pallas. 8. G. Gmetin, GULDENSTADT, LEPECHIN, and others—in the exploration of the recently extended Russian empire sup- Z plied not only much material to the Commentari and Acta of the Academy of St Petersburg, but more that is to be found in their narratives,—all of it being of the highest interest to

students of Palearctic or Nearctic Ornithology. Nearly the whole of their results, it may here be said, were summed up in the important Zoographia Rosso-Asiatica of the first-named naturalist, which saw the light in 1811,—the year of its author's death,—but, owing to circumstances over which he had no control, was not generally accessible till twenty years later. Of still wider interest are the accounts of Cook's three famous voyages, though unhappily much of the information gained by the naturalists who accompanied him on one or more of them seems to be irretriev- ably lost: the original observations of the elder ForsTER The were not, printed till 1844, and the valuable collection of Forsters. zoological drawings made by the younger Forster still remains unpublished in the British Museum. 'The several accounts by JonNn Wuitr, CoLuins, Puitiies, HunTErR, and others of the colonization of New South Wales at the end of the last century ought not to be overlooked by any Australian ornithologist. The only information at this period on the Ornithology of South America is contained in the two works on Chili by Moxina, published at Bologna in 1776and1782. The travelsof Lz VaILLant in South Africa Le having been completed in 1785, his great Oiseaux d Afrique Vaillant. began to appear in Paris in 1790; but it is hard to speak properly of this work, for several of the species described in it are certainly not, and never were in his time, inhabitants of that country, though he sometimes gives a long account of the circumstances under which he observed them.®

From travellers who employ themselves in collecting the animals of any distant country the zoologists who stay at home and study those of their own district, be it great or small, are really not so much divided as at first might appear. Both may well be named " Faunists," and of the latter there were not a few who having turned their atten- tion more or less to Ornithology should here be mentioned, and first among them Rzaczynsk1, who inl1721 brought out Rzaczyn- at Sandomirsk the Historia naturalis curtosa regni Poloniz, ski. to which an Auctuarium was posthumously published at Danzig in 1742. This also may be perhaps the most proper place to notice the Historia Avium Hungarve of GrossINGER, published at Posen in 1793. In 1734 J. L. Grossin- Friscu began the long series of works on the Birds of 8. Germany with which the literature of Ornithology is Frisch. enriched, by his Vorstellung der Vogel Teutschlands, which was only completed in 1763, and, its coloured plates proving very attractive, was

again issued at Berlin in 1817. The little fly-sheet of Zorn ’—for it is scarcely more—on the Birds of the Hercynian Forest made its appearance at Pappenheim in 1745. In 1756 Kramer published at Kramer. Vienna a modest Hlenchus of the plants and animals of Lower Austria, and J. D. Prrersen produced at Altona in 1766 a Verzeichniss balthischer Vogel; while in 1791 J. B. Fiscuer’s Versuch einer Naturgeschichte von Livland appeared at Konigsberg, next year BESEKE brought out at Besek. Mitau his Beytrag zur Naturgeschachte der Vogel Kurlands,

5 The results of FoRSKAL’s travels in the Levant, published after his death by Niebuhr, require mention, but the ornithology they contain is but scant.

8 Jt has been charitably suggested that, his collection and notes having suffered shipwreck, he was induced to supply the latter from his memory and the former by the nearest approach to his lost specimens that he could obtain, This explanation, poor as it is, fails, however, in regard to sonie species,

7 His earlier work under the title of Petinotheologie can hardly be deemed scientific.

The Nau- manns.

Cetti.

Nozeman.

Briinnich,

Fabricius.

Bartram. Barton.

o, R. Forster.

OEBNIDTHOLOGY

and in 1794 Stemssen’s Handbuch of the Birds of Mecklen- burg was published at Rostock. But these works, locally useful as they may have

been, did not occupy the whole attention of German ornithologists, for in 1791 BrcHsTEIN reached the second volume of his Gemeinniitzage Naturge- schichte Deutschlands, treating of the Birds of that country, which ended with the fourth in 1795. Of this an abridged edition by the name of Ornithologisches Taschenbuch appeared in 1802 and 1803, with a supplement in 1812, while between 1805 and 1809 a fuller edition of the original was issued. Moreover in 1795 J. A. NAUMANN humbly began at Cothen a treatise on the Birds of the principality of Anhalt, which on its completion in 1804 was found to have swollen into an Ornithology of Northern Germany and the neighbouring countries. Eight supple- ments were successively published between 1805 and 1817, and in 1822 a new edition was required. This Naturge- schichte der Vogel Deutschlands, being almost wholly re- written by his son J. F. Naumann, is by far the best thing of the kind as yet produced in any country. The fulness and accuracy of the text, combined with the neat beauty of its coloured plates, have gone far to promote the study of Ornithology in Germany, and while essentially a popular work, since itis suited to the comprehension of all readers, it is throughout written with a simple dignity that commends it to the serious and scientific. Its twelfth and last volume was published in 1844—by no means too long a period for so arduous and honest a performance, and a supplement was begun in 1847 ; but, the editor—or author as he may be fairly called—dying in 1857, this continua- tion was finished in 1860 by the joint efforts of J. H. Buastus and Dr Barpamus. In 1800 BorxwauseEn with others commenced at Darmstadt a Teutsche Ornithologie in folio which appeared at intervals till 1812, and remains unfinished, though a reissue of the portion published took place between 1837 and 1841.

Other countries on the Continent, though not quite so prolific as Germany, bore some ornithological fruit at this period ; but in all Southern Europe only four faunistic products can be named :—the Saggio di Storia Naturale Bresciana of Pruatt, published at Brescia in 1769; the Ornitologia del? Europa Meridionale of Berytnt, published at Parma between 1772 and 1776; the Uccelli di Sardegna of Cxrrtt, published at Sassari in 1776; and the Romana Ornithologia of Git1us, published at Rome in 1781—the last being in great part devoted to Pigeons and Poultry. More appeared in the North, for in 1770 Amsterdam sent forth the beginning of Nozeman’s Nederlandsche Vogelen, a fairly illustrated work in folio, but only

completed by Hovrruyn in 1829, and in Scandinavia most of all was done. In 1746 the great Linnzus had produced a fauna Svecica, of which a second edition appeared in 1761, and a third revised by Rerztusin 1800. In 1764 Briwnice pub- lished at Copenhagen his Ornithologia Borealis, a com- pendious sketch of the Birds of all the countries then sub- ject to the Danish crown. At the same place appeared in 1767 Leew's work De Lapponibus Finmarchizx, to which GuNNERUS contributed some good notes on the Ornitho- logy of Northern Norway, and at Copenhagen and Leipzig was published in 1780 the Fauna Groenlandica of OTHO FAsRIcrvs.

Of strictly American origin can here be cited only Bartram's Travels through North and South Carolina and Barton's Fragments of the Natural History of Pennsyl- vania,! both printed at Philadelphia, one in 1791, the other in 1799; but J. R. Forsrer published a Catalogue of the Animals of North America in London in 1771, and the

See eee

1 This extremely rare book has been reprinted by the Willughby ociety.

greater attention. possess is that given by Merrett in his Pinax Rerum Merrett. Naturalium Britannicarum, printed in London in 1667.3

In 1677 Puor published his Natural History of Oxfordshire, Plot. which reached a second edition in 1705, and in 1686 that

of Staffordshire. and the Peak was sent out in 1700 by Leicu, and one on Leigh.

at Oxford. a well-illustrated folio, of which a second edition in octavo was published in 1768, and considerable additions (forming

9)

following year described in the Phelosophical Transactions a few Birds from Hudson's Bay.? was PENNANT's Arctic Zoology, published in 1785, with a Pennant. supplement in 1787. intended to be limited to North America, but circumstances induced him to include all the species of

Northern Europe and Northern Asia, and though not free from errors it isa praiseworthy performance.

A greater undertaking

The scope of this work was originally

A second edition appeared in The Ornithology of Britain naturally demands The earliest list of British Birds we

1792

A similar work on Lancashire, Cheshire,

Cornwall by BoruAse in 1758—all these four being printed Borlase. In 1766 appeared Pennant's British Zoology, Penuant.

the nominally third edition) in 1770, while in 1777 there were two issues, one in octavo the other in quarto, each called the fourth edition. In 1812, long after the author's death, another edition was printed, of which his son-in-law Hanmer was the reputed editor, but he received much assistance from Latham, and through carelessness many of the additions herein made have often been ascribed to Pennant. In 1769 BerKENHOUT gave to the world his Berken- Outlines of the Natural History of Great Britain and bout. Treland,which reappeared under the title of Synopsis of the same in 1795. Tunsraww's Ornithologia Britannica, which Tunstall. appeared in 1771, is little more than a list of names. In 1781 Nasw's Worcestershire included a few ornithological notices; and Waxcorr in 1789 published an illustrated Walcot. Synopsis of British Birds, coloured copies of which are rare. In 1791 J. Heysuam added to Hutchins's Cumberland a list of Birds of that county, and in 1794 Donovan began Donovan. a History of British Birds which was only finished in 1819 —the earlier portion being reissued about the same time. In 1800 Lewin brought out a very worthless work with Lewin. the same title.

All the foregoing publications yield in importance to two that remain to be mentioned, a notice of which will fitly conclude this part of our subject. In 1767 Pennant, several of whose works have already been named, entered

into correspondence with GuBert WuiIrTE, receiving from Gilbert him much information, almost wholly drawn from his own White. observation, for the succeeding editions of the British Zoology. In 1769 White began exchanging letters of a similar character with Barrington. The epistolary inter- course with the former continued until 1780 and with the latter until 1787. In 1789 White's share of the corre- spondence, together with some miscellaneous matter, was published as Zhe Natural History of Selborne—from the name of the village in which he lived. Observations on Birds form the principal though by no means the whole theme of this book, which may be safely said to have done more to promote alove of Ornithology in this country than any other work that has been written, nay more than all the other works (except one next to be mentioned) put together. It has passed through a far greater number of a og

2 Both of these treatises have also been reprinted by the Willughby Society.

3 In this year there were two issues of this book ; one, nominally a second edition, only differs from the first in having a new title-page. No real second edition ever appeared, but in anticipation of it Sir Tuomas Browne prepared in or about 1671 (?) his ‘‘ Account of Birds found in Norfolk,” of which the draught, now in the British Museum, was printed in his collected works by Wilkin in 1835. Ifa fair copy was ever made its resting-place is unknown.

4 It has been republished by the Willughby Society.

editions than any other work in Natural History in the whole world, and has become emphatically an English classic—the graceful simplicity of its style, the elevating tone of its spirit, and the sympathetic chords it strikes recommending it to every lover of Nature, while the severely scientific reader can scarcely find an error in any statement it contains, whether of matter of fact or opinion. It is almost certain that more than half the

zoologists of the British Islands for the past seventy years or more have been infected with their love of the study by Gilbert White ; and it can hardly be supposed that his influence will cease.!

The other work to the importance of which on Ornith- ology in this country allusion has been made is Brwicx's History of British Birds. The first volume of this, contain- ing the Land-Birds, appeared in 1797?—the text being, it is understood, by Beilby—the second, containing the Water-Birds, in 1804. The woodcuts illustrating this work are generally of surpassing excellence, and it takes rank in the category of artistic publications. Fully ad- mitting the extraordinary execution of the engravings, every ornithologist may perceive that as portraits of the Birds they are of very unequal merit. Some of the figures were drawn from stuffed specimens, and accordingly perpetu- ate all the imperfections of the original; others represent

species with the appearance of which the artist was not

familiar, and these are either wanting in expression or are caricatures ;* but those that were drawn from live Birds, or represent species which he knew in life, are worthy of all praise. It is well known that the earlier editions of this work, especially if they be upon large paper, command extravagant prices; but in reality the copies on smaller paper are now the rarer, for the stock of them has been consumed in nurseries and schoolrooms, where they have been torn up or worn out with incessant use. Moreover, whatever the lovers of the fine arts may say, it is nearly certain that the " Bewick Collector" is mistaken in attach- ing so high a value to these old editions, for owing to the want of skill in printing—indifferent ink being especially assigned as one cause—many of the earlier issues fail to shew the most delicate touches of the engraver, which the increased care bestowed upon the edition of 1847 (published under the supervision of Mr John Hancock) has revealed,— though it must be admitted that certain blocks have suffered from wear of the press so as to be incapable of any more producing the effect intended. Of the text it may be said that itis respectable, but no more. It has given satisfaction to thousands of readers in time past, and will, it may be hoped, give satisfaction to thousands in time to come.

The existence of these two works explains the widely- spread taste for Ornithology in this country, which is to foreigners so puzzling, and the zeal —not always according to knowledge, but occasionally reaching to serious study— with which that taste is pursued.

Having thus noticed, and it is to be hoped pretty thoroughly, the chief ornithological works begun if not

completed prior to the commencement of the present cen- a Se a ee ee ae 1 Next to the original edition, that known as Bennett's, published in 18387, which was reissued in 1875 by Mr Harting, was long deemed the best ; but it must give place to that of Bell, which appeared in 1877, and contains much additional information of great interest. But the editions of Markwick, Herbert, Blyth, and Jardine all possess features of merit. An elaborately prepared edition, issued of late years under the managementof one whogained great reputation as a naturalist, only shews his ignorance and his vulgarity.

3 There were two issues—virtually two editions—of this with the same date on the title-page, though one of them is said not to have been published till the following year. Among several other indicia this may be recognized by the woodcut of the ''Sea Eagle" at page 11 bearing at its base the inscription '' Wycliffe, 1791," and by the addi- tional misprint on page 145 of Sahaniclus for Schaniclus.

5 This is especially observable in the figures of the Birds-of-Prey.

tury, together with their immediate sequels, those which follow will require a very different mode of treatment, for their number is so great that it would be impossible for want of space to deal with them in the same extended fashion, though the attempt will finally be made to enter into details in the case of works constituting the founda- tion upon which apparently the superstructure of the future science has to be built. It ought not to need stat- ing that much of what was, comparatively speaking, only a few years ago regarded as scientific labour is now no longer to be so considered. The mere fact that the prin- ciple of Evolution, and all its admission carries with it,

has been accepted in some form or other by almost all naturalists, has rendered obsolete nearly every theory that had hitherto been broached, and in scarcely any branch of zoological research was theory more rife than in Ornithology. One of these theories must presently be noticed at some length on account of the historical import- ance which attaches to its malefic effects in impeding the progress of true Ornithology in Britain; but charity enjoins us to consign all the rest as much as possible to oblivion.

On reviewing the progress of Ornithology since the end of the last century, the first thing that will strike us is the fact that general works, though still undertaken, have become proportionally fewer, and such as exist are apt to consist of mere explanations of systematic methods that had already been more or less fully propounded, while special works, whether relating to the ornithic portion of the Fauna of any particular country, or limited to certain groups of Birds—works to which of late years the name of “Monograph” has become wholly restricted—have become far more numerous. But this seems to be the natural law in all sciences, and its cause is not far to seek. As the knowledge of any branch of study extends, it outgrows the opportunities and capabilities of most men to follow it as a whole; and, since the true naturalist, by reason of the irresistible impulse which drives him to work, cannot be idle, he is compelled to confine his energies to narrower fields of investigation. That in a general way this is for some reason to be regretted is true ; but, like all natural operations, it carries with it some recompense, and the excellent work done by so-called “specialists” has over and over again proved of the greatest use to advancement in different departments of science, and in none more than in Ornithology.*

Another change has come over the condition of Ornith- ology, as of kindred sciences, induced by the multiplica- tion of learned societies which issue publications as well as of periodicals of greater or less scientific pretension —the latter often enjoying a circulation far wider than the former. Both kinds increase yearly, and the despond- ing mind may fear the possibility of its favourite study expiring through being smothered by its own literature. Without anticipating such a future disaster, and looking merely to what has gone before, it is necessary here to premise that, in the observations which immediately follow, treatises which have appeared in the publications of learned bodies or in other scientific periodicals must, except they be of

prime importance, be hereinafter passed unnoticed ; but their omission will be the less felt because the more recent of those of a “faunal” character have generally been mentioned in a former dissertation (Birps, vol. ili. pp. 737-764) under the different Regions or

4 The truth of the preceding remarks may be so obvious to most men who have acquaintance with the subject that their introduction here may secm unnecessary ; but itis certain that the facts thcy state have been very little appreciated by many writers who profess to give an account of the progress of Natural History during the present century.

countries with which they deal, while reference to the older of these treatises is usually given by the writers of the newer. Still it seems advisable here to furnish some con- nected account of the progress made in the ornithological knowledge of those countries in which the readers of the pre- sent volume may be supposed to take the most lively interest —for example, the British Islands and those parts of the European continent which lie nearest to them or are most commonly sought by travellers, the Dominion of Canada and the United States of America, South Africa, India, together with Australia and New Zealand. The more important Monographs, again, will usually be found cited in the series of special articles on Birds contained in this work, though, as will be immediately perceived, there are some so-styled Monographs, which by reason of the changed views of classification that at present obtain have lost their restricted character, and for all practical purposes have now to be regarded as general works.

It will perhaps be most convenient to begin by mention- ing some of these last, and in particular a number of them which appeared at Paris very early in this century. First in order of them is the Jistoire Naturelle d’une partie dT Oiseaux nouveaux et rares de l’ Amérique et des Indes, a folio volume! published in 1801 by Le Vartuant. This is devoted to the very distinct and not nearly-allied groups of Hornbills and of birds which for want of a better name we must call “Chatterers,” and is illustrated, like those works of which a notice immediately follows, by coloured plates, done in what was then considered to be the highest style of art and by the best draughtsmen procurable. The first volume of a JTistoire Naturelle des Perroquets, a

companion work by the same author, appeared in the same year, and is truly a Monograph, since the Parrots constitute a Family of birds so naturally severed from all others that there has rarely been anything else confounded with them. ‘The second volume came out in 1805, and a third was issued in 1837~38 long after the death of its pre- decessor’s author, by Boursot St-Hitarre. Between 1803 and 1806 Le Vaillant also published in just the same style two volumes with the title of Histoire Naturelle des Oiseaux de Paradis et des Rolliers, swivie de celle des Toucans et des Barbus, an assemblage of forms, which, miscellaneous as it is, was surpassed in incongruity by a fourth work on the same scale, the J/istoire Naturelle des Promerops et des Guépiers, des Couroucous et des Touracos, for herein are found Jays, Waxwings, the Cock-of-the-Rock (Zupicola), and what not besides. ‘The plates in this last are by Barraband, for many years regarded as the perfection of ornithological artists, and indeed the figures, when they happen to have been drawn from the life, are not bad ; but his skill was quite unable to vivify the preserved specimens contained in Museums, and when he had only these as subjects he simply copied the distortions of the “ird-stuffer.” The following year, 1808, being aided by Temminck of Amsterdam, of whose son we shall presently hear more, Le Vaillant brought out the sixth volume of his Oiseaux d’Afrique, already mentioned. Four more volumes of this work were promised; but the means of executing them were denied to him, and, though he lived until 1824, his publications ceased.

A similar series of works was projected and begun about Audebert the same time as that of Le Vaillant by AUDEBERT and a , VIEILLOT, though the former, who was by profession a

mumee painter and illustrated the work, was already dead more than a year before the appearance of the two volumes, bearing date 1802, and entitled Oiseaux dorés ou a reflets métalliques, the effect of the plates in which he sought to heighten by the lavish use of gilding. The first volume

i ele =e 1 There is also an issue of this, as of the same author’s other works, on large quarto paper.

Le Vail- lant,

contains the “Colibris, Oiseaux-mouches, Jacamars et Promerops,” the second the ‘‘ Grimpereaux” and “ Oiseaux de Paradis”——associations which set all the laws of system- atic method at defiance. His colleague, Vieillot, brought out in 1805 a Histoire Naturelle des plus beaux Chanteurs de la Zone Torride with figures by Langlois of tropical Finches, Grosbeaks, Buntings, and other hard-billed birds ; and in 1807 two volumes of a Histoire Naturelle des Oiseaux de Amérique Septentrionale, without, however, paying much attention to the limits commonly assigned by geographers to that part of the world. In 1805 ANsSELME DESMAREST published a Histoire naturelle des Tangaras, Desmarest des Manakins et des Todiers, which, though belonging to the same category as all the former, differs from them in its more scientific treatment of the subjects to which it refers ; and, in 1808, Temmincx, whose father’s aid to Le Temminck. Vaillant has already been noticed, brought out at Paris a Histoire Naturelle des Pigeons illustrated by Madame Knip, who had drawn the plates for Desmarest’s volume.”

Since we have begun by considering these large illustrated works in which the text is made subservient to the coloured plates, it may be convenient to continue our notice of such others of similar character as it may be expedient to mention here, though thereby we shall be led somewhat far afield. Most of them are but luxuries, and there is some degree of truth in the remark of Andreas Wagner in his Report on the Progress of Zoology for 1843, drawn up for the Ray Society (p. 60), that they “are not adapted for the extension and promotion of science, but must inevitably, on account of their unnecessary costliness, constantly tend to reduce the number of naturalists who are able to avail themselves of them, and they thus enrich ornithology only to its ultimate injury.” Earliest in date as it is greatest in bulk stands AupUBon’s egregious Birds Audubon. of America in four volumes, containing four hundred and thirty-five plates, of which the first part appeared in London in 1827 and the last in 1838. It does not seem to have been the author’s original intention to publish any letter- press to this enormous work, but to let the plates tell their own story, though finally, with

the assistance, as is now known, of Wit~iaAm Maccitrivray, a text, on the whole Macgil- more than respectable, was produced in five large octavos livray. under the title of Ornithological Biography, of which more will be said in the sequel. Audubon has been greatly ex- tolled as an ornithological artist ; but he was far too much addicted to representing his subjects in violent action and in postures that outrage nature, while his drawing is very frequently defective.? In 1866 Mr D. G. Exxior began, and Elliot. in 1869 finished, a sequel to Audubon's great work in two volumes, on the same scale—T7he New and Ifitherto unfigured Species of the Birds of North America, containing life-size figures of all those which had been added to its fauna since the completion of the former.

In 1830 Jonnw Epwarp Gray commenced the J/lustra- Gray and tions of Indian Zoology, a series of plates of vertebrated Hardwicke. animals, but mostly of Birds, from drawings it is believed by native artists in the collection of General HARDWICKE, whose name is therefore associated with the work. Scientific

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2 Temminck subsequently reproduced, with many additions, the text of this volume in his Histoire naturelle des Pigeons et des Gallinacées, published at Amsterdam in 1813-15, in 3 vols. 8vo. Between 1838 and 1848 M. Fuorent-PRovosT brought out at Paris a further set of illustrations of Pigeons by Mdme. Knip.

3 On the completion of these two works, for they must be regarded as distinct, an octavo edition in seven volumes under the title of The Birds of America was published in 1840-44. In this the large plates were reduced by means of the "camera lucida," the text was revised, and the whole systematically arranged. Other reprints have since been issued, but they are vastly inferior both in execution and value. A sequel to the octavo Birds of America, corresponding with it in form, was brought out in 1853-55 by Cassin as Illustrations of the Birds of California, Texas, Oregon, British and Russian America.

Lear, ever supplied. In 1832 Mr Lxanr, afterwards well known | dissecting. The chief object of the author, who had been as a painter, brought out his

Jllustrations of the Family of | naturalist to the N iger Expedition, and curator to the Psittacide, a volume which deserves especial notice from | Museum of the Zoological Society of London, was to figure the extreme fidelity to nature and the great artistic skill | the animals contained in its gardens or described in its with which the figures were executed. Proceedings, which until the year 1848 were not illustrated.

This same year (1832) saw the beginning of the The publication of the Zoological Sketches of Mr Woxr, marvellous series of illustrated ornithological works by | from animals in the gardens of the Zoological Society, was

Gould. which the name of Joun Gout is likely to be always | begun about 1855, with a brief text by MrrcHeE x1, at that remembered. A Century of Birds from the Himalaya | time the Society's secretary, in illustration of them. After Mountains was followed by The Birds of Europe in five | his death in 1859, the explanatory letterpress was rewritten volumes, published between 1832 and 1837, while in the | by Mr ScuarEr, his successor in that office, and a volume interim (1834) appeared A Monograph of the Ramphastide, | was completed in 1861. Upon this a second series was of which a second edition was some years later called for, | commenced, and brought to an end in 1868. Though a then the Jcones Aviwm, of which only two parts were | comparatively small number of species of Birds are figured published (1837-38), and A Monograph of the Trogomdx in this magnificent work (seventeen only in the first series, (1838), which also reached a second edition. Sailing | and twenty-two in the second), it must be mentioned here, in 1838 for New South Wales, on his return in 1840 he | for their likenesses are so admirably executed as to place at once commenced the greatest of all his works, The Birds | it in regard to ornithological portraiture at the head of all of Australia, which was finished in 1848 in seven volumes, | others. There is not a single plate that is unworthy of the. to which several supplementary parts, forming another | greatest of all animal painters. volume, were subsequently added. In 1849 he began A Proceeding to illustrated works generally of less preten- Monograph of the Trochilide or Humming-birds extending | tious size but of greater ornithological utility than the to five volumes, the last of which appeared in 1861, and | books last mentioned, which are fitter for the drawing-room has

since been followed by a supplement now in course of | than the study, we next have to consider some in which the completion by Mr Satvin. A Monograph of the Odonto- | text is not wholly subordinated to the plates, though the phorine or Partridges of America (1850); The Birds of | latter still form a conspicuous feature of the publication. Asia, in seven volumes, the last completed by Mr Suarpz | First of these in point of time as well as in importance is (1850-83); The Birds of Great Britain, in five volumes | the Vouveau Recueil des Planches Coloriées d'Oiseaua of (1862-73) ; and The Birds of New Guinea, begun in 1875, | TeEMMINcK and LavcrEr, intended as a sequel to the Temminck and, after the author's death in 1881, undertaken by Mr | Planches Hnluminées of D'Aubenton before noticed (page 2™4 | Sharpe, make up the wonderful tale consisting of more | 6), and like that work issued both in folio and quarto U™sie™ than forty folio volumes, and containing more than three | size. 'The first portion of this was published at Paris in thousand coloured plates. The earlier of these works were | 1820, and of its one hundred and two livraisons, which illustrated by Mrs Gould, and the figures in them are fairly | appeared with great irregularity (Ibis, 1868, p. 500), the good; but those in the later, except when (as he occasionally | last was issued in 1839, containing the titles of the five did) he secured the services of Mr Woxr, are not so much | volumes that the whole forms, together with a "Tableau to be commended. There is, it is true, a smoothness and | Méthodique" which but indifferently serves the purpose finish about them not often seen elsewhere ; but, as though | of an index. There are six hundred plates, but the exact to avoid the exaggerations of Audubon, Gould usually | number of species figured (which has been computed at adopted the tamest of attitudes in which to represent his | six hundred and sixty-one) is not so easily ascertained. subjects, whereby expression as well as vivacity is want- | Generally the subject of each plate has letterpress to cor- ing. Moreover, both in drawing and in colouring there is | respond, but in some cases this is wanting, while on the frequently much that is untrue to nature, so that it has | other hand descriptions of species not figured are occasion- not uncommonly happened for them to fail in the chief | ally introduced, and usually observations on the distribu- object of all zoological plates, that of affordiiug sure means | tion and construction of each genus or group are added. of recognizing specimens on comparison. In estimating | The plates, which shew no improvement in execution on the letterpress, which was avowedly held to be of secondary | those of Martinet,

are after drawings by Huet and Prétre, importance to the plates, we must bear in mind that, to | the former being perhaps the less bad draughtsman of the ensure the success of his works, it had to be written to suit | two, for he seems to have had an idea of what a bird when a very peculiarly composed body of subscribers. Never- | alive looks like, though he was not able to give his figures theless a scientific character was so adroitly assumed that | any vitality, while the latter simply delineated the stiff scientific men—some of them even ornithologists—have | and dishevelled specimens from museum shelves. Still thence been led to believe the text had a scientific value, and | the colouring is pretty well done, and experience has proved that of a high class. However it must also be remembered | that generally speaking there is not much difficulty in that, throughout the whole of his career, Gould consulted | recognizing the species represented. The letterpress is the convenience of working ornithologists by almost | commonly limited to technical details, and is not always invariably refraining from including in his folio works the | accurate ; but it is of its kind useful, for in general know- technical description of any new species without first pub- | ledge of the outside of Birds Temminck probably surpassed lishing it in some journal of comparatively easy access. any of his contemporaries. The “Tableau Méthodique ”

An ambitious attempt to produce in England a general | offers a convenient concordance of the old Planches

Fraser, series of coloured plates on a large scale was Mr Fraszr’s | Enluminécs and its successor, and is arranged after the

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names are assigned to the species figured ; but no text was

Zoologia Typica, the first part of which bears date 1841- 42, Others appeared at irregular intervals until 1849, when the work, which seems never to have received the support it deserved, was discontinued. The seventy plates (forty-six of which represent birds) composing, with some explanatory letterpress, the volume are by C. Cousens and H. N. Turner,—the latter (as his publications prove) a zoologist of much promise, who in 1851 died, a victim to

his own zeal for investigation, of a wound received in

system set forth by Temminck in the first volume of the second edition of his Manuel d Ornithologie, of which something must presently be said.

The Galérie des Oiseaux, a rival work, with plates by

OvuDART, seems to have been begun immediately after the Oudart.

former. The original project was apparently to give a figure and description of every species of Bird; but that was soon found to be impossible ; and, when six parts had

been issued, with text by some unnamed author, the scheme was brought within practicable limits, and the writing of the letterpress was entrusted to VIEILLoT, who, proceeding on ‘a systematic plan, performed his task very creditably, completing the work, which forms two quarto volumes, in 1825, the original text and fifty-seven plates being relegated to the end of the second volume as a supple- ment. His portion is illustrated by two hundred and ninety-nine coloured plates that, wretched as they are, have been continually reproduced in various text-books—a fact possibly due to their subjects having been judiciously selected. It is a tradition that, this work not being favour- ably regarded by the authorities of the Paris Museum, its draughtsman and author were refused closer access to the specimens required, and had to draw and describe them through the glass as they stood on the shelves of the cases.

In 1825 JarpDINE and SELBy began a-series of Jllustra- . tions of Ornithology, the several parts of which appeared at long and irregular intervals, so that it was not until 1839 that three volumes containing one hundred and fifty plates were completed. Then they set about a Second Series, which, forming a single volume with fifty-three plates, was finished in 1843. These authors, being zealous amateur artists, were their own draughtsmen to the extent even of lithographing the figures. In 1828 James

WILson (author of the article ORNITHOLOGY in the 7th and 8th editions of the present work) began, under the title of [dlas- trations of Zoology, the publication of a series of his own drawings (which he did not, however, himself engrave) with corresponding letterpress. Of the thirty-six plates illustrating this volume, a small folio, twenty are devoted to Ornithology, and contain figures, which, it must be allowed, are not very successful, of several species rare at the time.

Though the three works last mentioned fairly come under the same category as the Planches Enluminées and the Planches Coloriées, no one of them can be properly deemed their rightful heirs. The claim to that succession was made in 1845 by Dzs Murs for his Iconographie Ornithologique, which, containing seventy-two plates by Prévot and Oudart} (the latter of whom had marvellously improved in his drawings since he worked with Vieillot), was completed in 1849. Simultaneously with this Du Bus began a work on a plan precisely similar, the Lsqucsses Ornithologiques, illustrated by Severeyns, which, however, stopped short in 1849 with its thirty-seventh plate, while the letterpress unfortunately does not go beyond that belonging to the twentieth. In 1866 the succession was again taken up by the Lxotic Ornithology of Messrs SCLATER and SaLvIN, containing one hundred plates, representing one hundred and four species, all from Central or South America, which are neatly executed by Mr Smit. The accompanying letterpress is in some places copious, and useful lists of the species of various genera are occasionally subjoined, adding to the definite value of the work, which, forming one volume, was completed in 1869.

Lastly here must be mentioned RowLzy’s Ornithological Miscellany in three quarto volumes, profusely illustrated, which appeared between 1875 and 1878. The contents are as varied as the authorship, and, most of the leading English ornithologists having contributed to the work, some of the papers are extremely good, while in the plates, which are in Mr Keulemans’s best manner, many rare species of Birds are figured, some of them for the first time.

All the works lately named have been purposely treated at some length, since being very costly they are not easily accessible. The few next to be

mentioned, being of smaller size (octavo), may be within reach of more persons, and

1 On the title page credit is given to the latter alone, but only two- thirds of the plates (from pl. 25 to the end) bear his name.

therefore can be passed over in a briefer fashion without detriment. In many ways, however, they are nearly as important. volumes, containing one hundred and eighty-two plates, whereof seventy represent Birds, appeared between 1820 and 1821, and in 1829 a Second Series of the same was begun by him, which, extending to another three volumes, contained forty-eight more plates of Birds out of one hundred and thirty-six, and was completed in 1833. All the figures were drawn by the author, who as an ornitho- logical artist had no rival in his time. Every plate is not beyond criticism, but his worst drawings shew more know- ledge of bird-life than do the best of his English or French contemporaries. A work of somewhat similar character, but one in which the letterpress is of greater value, is the

Centurie Zoologique of Lesson, a single volume that, Lesson.

though bearing the date 1830 on its title page, is believed to have been begun in 1829,? and was certainly not finished until 1831. It received the benefit of Isidore Geoffroy St-Hilaire's assistance. Notwithstanding its name it only contains eighty plates, but of them forty-two, all by Prétre and in his usual stiff style, represent Birds. Concurrently with this volume appeared Lesson's T'rracté @ Ornithologie, which is dated 1831, and may perhaps be here most conveniently mentioned. Its professedly system- atic form strictly relegates it to another group of works, but the presence of an " Atlas" (also in octavo) of one hundred and nineteen plates to some extent justifies its notice in this place. Between 1831 and 1834 the same author brought out, in continuation of his Centurie, his Ilustrations de Zoologie with sixty plates, twenty of which represent Birds.

In 1832 Kirrrrrz began to publish some Kupfertafeln zur Kittlitz.

Naturgeschichte der Vogel, in which many new species are figured ; but the work came toan end with its thirty-sixth plate in the following year.

extraordinary series of illustrated publications which, under titles far too numerous here to repeat, ended in or about 1855, and are commonly known collectively as his Voll- stdndigste Naturgeschichte der Végel.8 Herein are contained more than nine hundred coloured and more than one hundred uncoloured plates, which are crowded with the figures of Birds, a large proportion of them reduced copies from other works, and especially those of Gould.

It now behoves us to turn to general and particularly systematic works in which plates, if they exist at all, form but an accessory to the text. These need not detain us for long, since, however well some of them may have been executed, regard being had to their epoch, and whatever repute some of them may have achieved, they are, so far as general information and especially classification is concerned, wholly obsolete, and most of them almost useless except as matters of antiquarian interest. It will be enough merely to name DUMERIL's Zoologie Analytique (1806) and GravENHorst's Vergleich- ende Uebersicht des linnetschen und einiger neuern zoologischen

Systeme (1807); nor need we linger over Suaw's General Shaw and Zoology, a pretentious compilation continued by STEPHENS. Stephens.

The last seven of its fourteen volumes include the Class Aves, and the first part of them appeared in 1809, but, the original author dying in 1815, when only two volumes of Birds were published, the remainder was brought to an end in 1826 by his successor, who afterwards became well known as an entomologist. The engravings which these volumes contain are mostly bad copies, often of bad figures,

In 1828 he had brought out, under the title of Manuel @ Orni- thologie, two handy duodecimos which are very good of their kind. 3 Technically speaking they are in quarto, but their size is so small that they may be well spoken of here. In 1879 Dr A. B. Meyer brought out an Index to them.

Swarinson's Zoological Illustrations in three Swainson.

In 1845 REICHENBACH com- Reichen- menced with his Praktische Naturgeschichte der Vogel the bach.

Illiger.

Vieillot.

Tem- minck.

Ranzani.

Wagler.

Kaup.

though many are piracies from Bewick, and the whole is a most unsatisfactory performance. Of a very different kind is the next we have to notice, the Prodromus Systematis Mammalium et Avium of ItticER, published at Berlin in 1811, which must in its day have been a valu- able little manual, and on many points it may now be consulted to advantage—the characters of the Genera being admirably given, and good explanatory lists of the technical terms of Ornithology furnished. The classifica- tion was quite new, and made a step distinctly in advance of anything that had before appeared.! In 1816 V1EILLOT published at Paris an Analyse d'une nouvelle Ornithologie élémentaire, containing a method of classification which he had tried in vain to get printed before, both in Turin and in London.? Some of the ideas in this are said to have been taken from Illiger ; but the two systems seem to be wholly distinct. Vieillot's was afterwards more fully expounded in the series of articles which he contributed between 1816 and 1819 to the Second Edition of the Nouveau Dictionnaire Histoire Naturelle containing much valuable information. The views of neither of these systema- tizers pleased TemMMINcK, who in 1817 replied rather sharply to Vieillot in some Observations sur la Classification méthodique des Oiseaux, a pamphlet published at Amster- dam, and prefixed to the second edition of his Manuel Ornithologie, which appeared in 1820, an

Analyse du Systeme Général @Ornithologie. This proved a great suc- cess, and his arrangement, though by no means simple,? was not only adopted by many ornithologists of almost every country, but still has some adherents. The follow- ing year RANZANI of Bologna, in his Hlementi di Zoologia—a very respectable compilation—came to treat of Birds, and then followed to some extent the plan of De Blain- ville and Merrem (concerning which much more has to be said by and by) placing the Struthious Birds in an Order by themselves. In 1827 Wactzr brought out the first part of a Systema Aviwm, in this form never com- pleted, consisting of forty-nine detached monographs of as many genera, the species of which are most elaborately described. The arrangement he subsequently adopted for them and for other groups is to be found in his Watiirliches System der Amphibien (pp. 77-128), published in 1830, and is too fanciful to require any further attention. The several attempts at system-making by Kavup, from his Allgemeine Zoologie in 1829 to his Ueber Classification der Vogel in 1849, were equally arbitrary and abortive; but his Shizzirte Entwickelungs-Geschichte in 1829 must be here named, as it is so often quoted on account of the number of new genera which the peculiar views he had embraced compelled him to invent. These views he shared more or less with Vigors and Swainson, and to them attention will be immediately especially invited, while consideration of the scheme gradually developed

} Tliger may be considered the founder of the school of nomencla- tural purists. He would not tolerate any of the “barbarous ” generic terms adopted by other writers, though some had been in use for pany years.

2 The method was communicated to the Turin Academy, 10th January 1814, and was ordered to be printed (Mém. Ac. Se. Turin, 1813-14, p. xxviii); but, through the derangements of that stormy period, the order was never carried out (Mem. Accad. Se. Torino, xxiii. p. xcvii). The minute-book of the Linnean Society of London shews that his Pro- lusio was read at meetings of that Society between 15th November 1814 and 21st February 1815. Why it was not at once accepted is not told, but the entry respecting it, which must be of much later date, in the “ Register of Papers” is “ Published already.” It is due to Vieillot to mention these facts, as he has been accused of publishing his method in haste to anticipate some of Cuvier’s views, but he might well complain of the delay in London. Some

reparation has been made to his memory by the reprinting of his Analyse by the Willughby Society.

8 He recognized sixteen Orders of Birds, while Vieillot had been content with five, and Illiger with seven.

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from 1831 onward by CHarLes Lucien BonAPARTE, and Bona- still not without its influence, is deferred until we come parte.

to treat of the rise and progress of what we may term the reformed school of Ornithology. Yet injustice would be done to one of the ablest of those now to be called the old masters of the science if mention were not here made of the Conspectus Generum Avium, begun in 1850 by the

naturalist last named, with the help of ScHLEGEL, and Schlegel,

unfortunately interrupted by its author's death six years later.*

The systematic publications of Grorck Ropert G. R.

Gray, so long in charge of the ornithological collection of @t4Y-

the British Museum, began with A List of the Genera of Birds published in 1840. This, having been closely, though by no means in a hostile spirit, criticized by

STRICKLAND (Ann. Nat. History, vi. p. 410; vii. pp. 26 Strick- and 159), was followed by a Second Edition in 1841, in and.

which nearly all the corrections of the reviewer were adopted, and in 1844 began the publication of Zhe Genera of Birds, beautifully illustrated—first by MircHELL and afterwards by Mr Woir—which will always keep Gray's name in remembrance. The enormous labour required for this work seems scarcely to have been appreciated, though it remains to this day one of the most useful books in an ornithologist's library. Yet it must be confessed that its author was hardly an ornithologist but for the accident of his calling. He was a thoroughly conscientious clerk, devoted to his duty and unsparing of

trouble. However, to have conceived the idea of executing a work on so grand a scale as this—it forms three folio volumes, and contains one hundred and eighty-five coloured and one hundred and forty-eight uncoloured plates, with references to upwards of two thousand four hundred generic names— was in itself a mark of genius, and it was brought to a successful conclusion in 1849, Costly as it necessarily was, it has been of great service to working ornithologists. In 1855 Gray brought out, as one of the Museum publica- tions, A Catalogue of the Genera and Subgenera of Birds, a handy little volume, naturally founded on the larger works. Its chief drawback is that it does not give any more reference to the authority for a generic term than the name of its inventor and the year of its application, though of course more precise information would have at least doubled the size of the book. The same deficiency became still more apparent when, between 1869 and 1871, he published his Hand-List of Genera and Species of Birds in three octavo volumes (or parts, as they are called). Never was a book better named, for the working ornitho- logist must almost live with it in his hand, and though he has constantly to deplore its shortcomings, one of which especially is the wrong principle on which its index is constructed, he should be thankful that such a work exists. Many of its defects are, or perhaps it were better said ought to be, supplied by GreBet's Thesaurus Ornitho- logix, also in three volumes, published between 1872 and 1877, a work admirably planned, but the execution of which, whether through the author's carelessness or the printer's fault, or a combination of both, is lamentably disappointing. Again and again it will afford the enquirer who consults it valuable hints, but he must be niindful never to trust a single reference in it until it has been verified. It remains to warn the reader also that, useful as are both this work and those of Gray, their utility is almost solely confined to experts.

With the exception to which reference has just been made, scarcely any of the ornithologists hitherto named indulged their imagination in theories or speculations. Nearly all were content to prosecute their labours in a plain fashion consistent with common sense, plodding

4 To this very indispensable work a good index was supplied in 1865 by Dr Finsch.

Giebel.

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steadily onwards in their efforts to describe and group the various species of Birds, as one after another they were made known. But this was not always to be, and now a few words must be said respecting a theory which was promulgated with great zeal by its upholders during the end of the first and early part of the second quarter of the present century, and for some years seemed likely to carry all before it. The success it gained was doubtless due in some degree to the difficulty which most men had in comprehending it, for it was enwrapped in alluring mystery, but more to the confidence with which it was announced as being the long looked-for key to the wonders of creation, since its promoters did not hesitate to term it the discovery of “the Natural System,” though they condescended, by way of explanation to less exalted intellects than their own, to allow it the more moderate

appellation of the Circular or Quinary System.

A comparison of the relation of created beings to a number of intersecting circles is as old as the days of NIEREMBERG, who in 1635 wrote (Historia Nature, lib. iii. cap. 3)— Nullus hiatus est, uulla fractio, nulla dispersio formarum, invicem connexa sunt velut annulus annulo”; but it is almost clear that he was thinking only of a chain. In 1806 FiscHER DE WALDHEIM, in his Tableawa Synoptiques de zoognosie (p. 181), quoting Niercmberg, extended his figure of speech, and, while justly deprecating the notion that the series of forms belonging to any particular group of creatures— the Mammalia was that whence he took his instance—could be placed in a straight line, imagined the various genera to be arrayed in a series of contiguous circles around Man asa centre. Though there is nothing

to shew that Fischer intended, by what is here said, to do anything else than illustrate more fully the marvellous interconnexion of different animals, or that he attached any realistic meaning to his metaphor, his words were eagerly caught up by the prophet of the new faith. This was WILLIAM SHarps MACLEAY, a man of education and real genius, who in 1819 and 1821 brought out a work under the title of Horxw Entomologice#, which was soon after hailed by Vicors as containing a new revelation, and applied by him to Ornithology in some " Observations on the Natural Affinities that connect the Orders and Families of Birds," read before the Liunean Society of London in 1823, and afterwards published in its Transactions (xiv. pp. 895-517). In the following year Vigors returned to the subject in some papers published in the recently established Zoological Journal, and found an energetic condisciple and coadjutor in Swainson, who, for more than a dozen years—to the end, in fact, of his career as an ornithological writer—was instant in season and out of season in pressing on all his readers the views he had, through Vigors, adopted from Macleay, though not without some modification of detail if not of principle. What these views were it would be manifestly improper for a sceptic to state except in the terms of a believer. Their enunciation must therefore be given in Swainson's own words, though it must be admitted that space cannot be found here for the diagrams, which it was alleged were necessary for the right understanding of the theory. This theory, as originally pro- pounded by Macleay, was said by Swainson in 1885 (Geogr. and Classific. of Animals, p. 202) to have consisted of the following propositions :'—

"1. That the series of natural animals is continuous, forming, as it were, a circle; so that, upon commencing at any one given poirs, and thence tracing all the modifications of structure, we shall be imperceptibly led, after passing through numerous forms, again to the point from which we started.

"9, That no groups are natural which do not exhibit, or show an evident tendency to exhibit, such a circular series.

"3. That the primary divisions of every large group are ten, five of which are composed of comparatively large circles, and five of smaller : these latter being termed osculant, and being intcrmediate between the former, which they serve to connect.

“4, That there is a tendency in such groups as are placed at the opposite points of a circle of affinity ‘to meet each other.’

“5 That one of the five larger groups into which every natural circle is divided ‘ bears a resemblance to all the rest, or, more strictly speaking, consists of types which represent those of each of the four other groups, together witha type peculiar to itself.’ ”

As subsequently modified by Swainson (tom. cit. pp. 224, 225), the foregoing propositions take the following form :—

“ft, That every natural series of beings, in its progress from OES ee ee ee ee ee eer

1 We prefer giving them here in Swainson’s version, because he seems to have set them forth more clearly and concisely than Macleay ever did, and, moreover, Swainson’s application of them to Ornithology —a branch of science that lay outside of Macleay’s proper studies— appears to be more suitable to the present occasion.

a given point, either actually returns, or evinces a tendency to return, again to that point, thereby forming a circle.

“ff. The primary circular divisions of every group are three actually, or five apparently.

“II. The contents of such a circular group are symbolically (or analogically) represented by the contents of all other circles in the animal kingdom.

“TV. That these primary divisions of every group are character- ized by definite peculiarities of form, structure, and economy, which, under diversified modifications, are uniform throughout the animal kingdom, and are therefore to be regarded as the PRIMARY TYPES OF NATURE.

“V, That the different ranks or degrees of circular groups exhibited in the animal kingdom are NINE in number, each being involved within the

other.”

Though, as above stated, the theory here promulgated owed its temporary success chiefly to the extraordinary assurance and perti- nacity with which it was urged upon a public generally incapable of understanding what it meant, that it received some support from men of science must be admitted. OKEN, whose mysticism far surpassed that of the Quinarians. But it is obvious to every one who nowadays indulges in the profitless pastime of studying their writings that, as a whole, they failed in grasping the essential difference between homology (or “ affinity,” as they generally termed it) and analogy (which is only a learned name for an uncertain kind of resemblance)— though this difference had been fully understood and set forth by Aristotle himself—and, moreover, that in secking for analogies on which to base their foregone conclusions they were often put to hard shifts. Another singular fact is that they often seemed to be totally unaware of the tendency if not the meaning of some of their own expressions: thus Macleay could write, and doubtless in perfect good faith (Trans. Linn. Society, xvi. p. 9, note), “ Naturalists have nothing to do with mysticism, and but little with a priori reasoning.” Yet his followers, if not he himself, were ever making use of language in the highest degree metaphorical, and were always explaining facts in accordance with preconceived opinions. FLEMING, already the author of a harmless and extremely orthodox Philosophy of Zoology, pointed out in 1829 in the Quarterly Review (xli. pp. 802-827) some of the fallacies of Macleay’s method, and in return provoked from him a reply, in the form of a letter addressed to Vigors On the Dying Struggle of the Dichotomous System, couched in language the force of which no one even at the present day can deny, though to the modern naturalist its invective power contrasts ludicrously with the strength of its ratiocination. But, confining oursclves to what is here our special business, it is to be remarked that perhaps the heaviest blow dealt at these strange doctrines was that delivered by Renniz, who, in an edition of Montagu’s Ornithological Dictionary (pp. xxxiii-lv), published in_1831 and again issued in 1838, attacked the Quinary System, and especially its application to Ornithology by Vigors and Swainson, in a way that might perhaps have demolished it, had not the author mingled with his undoubtedly sound reasoning much that is foreign to any question with which a naturalist, as such, ought to deal—though that herein he was only

following the example of one of his opponents, who had constantly treated the subject in like manner, 1s to be allowed. This did not hinder Swainson, who had succeeded in getting the ornithological portion of the first zoological work ever published at the expense of the British Government (namely, the Fauna Boreali-Americana) executed in accordance with his own opinions, from maintaining them more strongly than ever in several of the volumes treating of Natural History which he con- tributed to the Cabinct Cyclopedia—among others that from which we have just given some extracts—and in what may be deemed the culmination in England of the Quinary System, the volume of the "Naturalist's Library" on The Natural Arrangement and History of Flycatchers, published in 1838, of which unhappy performance inention has already been made in this present work (vol. ix. p. 350, note). This seems to have becn his last attempt; for, two years later, his Bibliography of Zoology shows little trace of his favourite theory, though nothing he had uttered in its support was retracted. Appearing almost simultaneously with this work, an article by STRICKLAND (Mag. Nat. History, ser. 2, iv. pp. 219-226) entitled Observations upon the Affinities and Analogics of Organ- ized Beings administered to the theory a shock from which it never recovered, though attempts were now and then made by its adherents to revive it; and, even ten years or more later, Kaur, one of the few foreign ornithologists who had embraced Quinary principles, was by mistaken kindness allowed to publish Mono- graphs of the Birds-of-Prey (Jardine's Contributions to Ornithology, 1849, pp. 68-75, 96-121; 1850, pp. 51-80; 1851, pp. 119-130; 1852, pp. 103-122 ; and Trans. Zool. Socicty, iv. pp. 201-260), in which its absurdity reached the climax.

The mischief caused by this theory of a Quinary System was

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very great, but was chiefly confined to Britain, for (as has been already stated) the extraordinary views of its adherents found little favour on the continent of Europe. The purely artificial character of the System of Linnzus and his successors had been perceived, and men were at a loss to finda substitute for it. The new doctrine, londly proclaiming the discovery of a “ Natural” System, led away many from the steady practice which should have followed the tcaching of Cuvier (though he in Ornithology had not been able to act up to the principles he had lain down) and from the extended study of Comparative Anatomy. Moreover, it veiled the honest attempts that were making both in France and Germany to find real grounds for establishing an improved state of things, and con- sequently the labours of Dz BLAINVILLE, HrlENNE, GEOFFROY Sr- Hivarre, and L’HerMinier, of MERREM, JOHANNES MULLER, and Nitzscu—to say nothing of others—were almost wholly un- known on this side of the Channel, and even the value of the investigations of British ornithotomists of high merit, such as MAcARTNEY and MAccILLIVRAY, was almost completely over- looked. ‘True it is that there were not wanting othcr men in these islands whose common “sense refused to accept the metaphorical doctrine and the mystical jargon of the Quinarians, but so strenu- ously and persistently had the latter asserted their infallibility, and so vigorously had they assailed any who ventured to doubt it, that most peaceable ornithologists found it best to bend to the furious blast, and in some sort to acquiesce at least in the phraseology of the self-styled interpreters of Creative Will. But, while thus lamenting this unfortunate perversion into a mistaken channel of ornithological energy, we must not over-blame those who caused it. Macleay indecd never pretended to a high position in this branch of science, his tastes lying in the direction of Entomology ; but few of their countrymen knew more of Birds than did Swainson and Vigors; and, while the latter, as editor for many years of the Zoological Journal, and the first Secretary of the Zoological Society, has especial claims to the regard of all zoologists, so the former’s indefatigable pursuit of Natural History, and conscientious labour in its behalf—among other ways by means of his graceful pencil— deserve to be remembcred as a set-off against the injury he unwit- tingly caused.

It is now incumbent upon us to take a rapid survey of the ornithological works which come more or less under the designation of “ Faune”;! but

these are so numerous that it will be necessary to limit this survey, as before indicated, to those countries alone which form the homes of English people, or are commonly visited by them in ordinary travel.

Beginning with our Antipodes, it is hardly needful to go further back than Mr Buller's beautiful Birds of New Zealand (Ato, 1872-73), with coloured plates by Mr Keulemans, since the publi- cation of which the same author has issued a Manual of the Birds of New Zealand (8vo, 1882), founded on the former; but justice requires that mention be made of the labours of G. R. Gray, first in the Appendix to Dieffenbach's 7Z'ravels in New Zealand (1848) and then inthe ornithological portion of the Zoology of the Voyage of H.ILS. " Erebus" and " Terror," begun in 1864, but left unfinished from the following year until completed by Mr Sharpe in 1876. A considerable number of valuable papers on the Ornithology of the country by Drs Hector and Von Haast, Prof. Hutton, Mr Potts, and others are to be found in the 7rans-

_ actions and Proceedings of the New Zealand Institute.

Australia.

Ceylon.

India.

Passing to Australia, we have the first good description of some of its Birds in the several old voyages and in Latham's works before mentioned (pages 6 and 8). Shaw's Zoology of New Holland (4to, 1794) added those of a few more, as did J. W. Lewin's Natural History of the Birds of New South Wales (4to, 1822), which reached a third edition in 1838. Gould's great Birds of Australia has been alrcady named, and he subsequently reproduced with some additions the text of that work under the title of Handbook to the Birds of Australia (2 vols. 8vo, 1865). In 1866 Mr Diggles commenced a similar publication, The Ornithology of Australia, but the coloured plates, though fairly drawn, are not comparable to those of his pre- decessor. This is still incomplete, though the parts that have appeared have been collected to form two volumes and issued with title-pages. Some notices of Australian Birds by Mr Ramsay and others are to be found in the

Procecdings of the Linnean Society of New South Wales and of the Royal Society of Tasmania.

Coming to our Indian possessions, and beginning with Ceylon, we have Kelaart's Prodromus Faune Zeylunicw (8vo, 1852), and the admirable Birds of Ceylon by Capt. Legge (4to, 1878-80), with coloured plates by Mr Kculemans of all the peculiar species. It is hardly possible to name any book that has been more conscien- tiously executed than this. In regard to continental India many

1 A very useful list of more general scope is given as the Appendix to an address hy Mr Sclatcr to the British Association in 1875 (Report, pt. ii. pp. 114-138).

of the more important publications have been named in a former article (Birps, iii. pp. 762, 763), and since that was written the chief work that has appeared is Blyth's Afammals and Birds of Burma (8vo, 1875).2 Jerdon's Birds of India (8vo, 1862-64 ; re- printed 1877) still reigns supreme as the sole comprehensive work on the Ornithology of the Peninsula. A very fairly executed compilation on the subject by an anonymous writer is to be found in a late cdition of the Cyclopedia of India published at Madras. It is needless to observe that Stray Feathers, an ornithological journal for India and its dependencies, and maintained with much spirit by Mr A. O. Hume, contains many interesting and some valuable papers.

In regard to South Africa, besides the well-known work of South Le Vaillant already mentioned, there is the second volume of Sir Africa. Andrew Smith's Illustrations of the Zoology of South Africa (Ato, 1888-42), which is devoted to birds. This is an important but cannot be called a satisfactory work. Its one hundred and four- teen plates by Ford truthfully represent one hundred and twenty- two of the mounted specimens obtained by the author in his explorations into the interior. Mr Layard's handy Birds of South Africa (8vo0, 1867), though by no means free from faults, has much to recommend it. A so-called new edition of it by Mr Sharpe has since appeared (1875-84), but is executed on a plan so wholly different that it must be regarded as a distinct work. Andersson's Notes on the Birds of Damara Land (8vo, 1872) has been carefully edited by Mr Gurney, whose knowledge of South- African ornithology is perhaps greater than that of any

one else. lt is much to be regretted that of the numerous sporting books that treat of this part of the world so few give any important information respecting the Birds.

Of special works relating to the British West Indies, Waterton's West well-known Wanderings lias passed through several editions since Indies, its first appearance in 1825, and must be mentioned here, though, strictly speaking, much of the country he traversed was not British territory. To Dr Cabanis we are indebted for the ornithological results of Richard Schomburgh's researches given in the third volume (pp. 662-765) of the latter's Reisen im Britisch-Guiana (8vo, 1848), and then in Léotaud's Otscauxr de [tle de la Trinidad (8vo, 1866). Of the Antilles there is only to be named Mr Gosse's excellent Birds of Jamaica (12mo, 1847), together with its I/lustra- tions (sm. fol., 1849) beautifully executed by him. A nominal list, with references, of the Birds of the island is contained in the Handbook of Jamaica for 1881 (pp. 1038-117). a

So admirable a ‘‘ List of Faunal Publications relating to North North American Ornithology" up to the year 1878 has been given by Dr America, Coues as an appendix to his Birds of the Colorado Valley (pp. 567— 784) that nothing more of the kind is wanted except to notice the chief separate works which have since appeared. These may be said to be Mr Stearns's New England Bird Life (2 vols. 8vo, 1881-83), revised by Dr Coues, and the several editions of his own Check List of North American Birds (8vo, 1882), and Key to North American Birds (1884); while it may be added that the conclud- ing volumes of the North American Birds of Prof. Baird, the late Dr Brewer, and Mr Ridgway (the first three of which were pub- lished in 1874) are expected to be issued about the time that these lines will meet the reader's eye. Yet some of the older works are still of sufficient importance to be espccially mentioned here, and especially that of Alexander Wilson, whose American Ornithology, originally published between 1808 and 1814, has gone through more editions than there is room to specify, though mention should be made of those issued in Great Britain, by Jameson (4 vols. 16mo, 1831), and Jardine (3 vols. 8vo, 1832). The former of these has the entire text, but no plates ; the latter reproduces the plates, but the text is in places much condensed, and excellent notes are added.

A continuation of Wilsou's work, under the same title and on the same plan, was issued by Bonaparte between 1825 and 1833, and most of the later editions include the work of both authors. The works of Audubon, with their continuations by Cassin and Mr Elliot, and the Fawna Borcali-Americana of Richardson and Swainson have already been noticed (pages 11 and 15); but they need naming here, as also does Nuttall's Manual of the Ornithology of the United States and of Canada (2 vols., 1832-34 ; 2d ed., 1840) ; the Birds of Long Island (8vo, 1844) by Giraud, remarkable for its excellent account of the habits of shore-birds ; and of course the Birds of North America (4to, 1858) by Prof. Baird, with the co- operation of Cassin and Mr Lawrence, which originally formed a volume (ix.) of what are known as the " Pacific Railroad Reports." Apart from these special works the scientific journals of Boston, New York, Philadelphia, and Washington contain innumerable papers on the Ornithology of the country, while in 1876 the Bulletin of the Nuttall Ornithological Club began to appear and continued until 1884, when it was superseded by The Auk, estab- lished solely for the promotion of Ornithology in America, and

2 This is a posthumous publication, nominally forming an extra number of the Journal of the Asiatic Society; but, since it was separ- ately issued, it is entitled to notice here.

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numbering among its supporters almost every American ornitholo- gist of repute, its editors being Messrs Allen, Coues, Ridgway, Brewster, and Chamberlain.

Returning to the Old World, among the countries whose Orni- thology will most interest British readers we have first Iceland, the fullest—indeed the only full—account of the Birds of which is Faber's Prodromusder islandischen Ornithologie (8vo, 1822), though the island has since been visited by several good ornithologists,— Proetor, Kriiper, and Wolley among them. A list of its Birds, with some notes, bibliographical and biological, has been given as an Appendix to Mr Baring-Gould's Iceland, tts Scenes and Sagas (8vo, 1862); and Mr Shepherd's North-west Peninsula of Iceland (8vo, 1867) recounts a somewhat profitless expedition made thither expressly for ornithological objects. For the Birds of the Feeroes there is Herr H. C. Miiller's Ferdernes Fuglefawna (8vo, 1862), of which a German translation has appeared.! The Ornithology of Norway has been treated in a great many papers by Herr Collett, some of which may be said to have been separately published as Norges Fugle (8v0, 1868; with a supplement, 1871), and The Ornithology of Northern Norway (8vo, 1872)—this last in English. For Scandinavia generally the latest work is Herr Collin's Skandinaviens\Fugle (8vo, 1873), being a greatly bettered edition of the very moderate Danmarks Fugle of Kjerbélling ; but the orni- thological portion of Nilsson's Skandinavisk Fauna, Foglarna (3d ed., 2 vols. 8vo, 1858) is of great merit ; while the text of Sundevall's Svenska Foglarna (obl. fol., 1856-73), unfortunately unfinished at his death, and Herr Holmgren's Skandinaviens Foglar (2 vols. 8vo, 1866-75) deserve naming.

Works on the Birds of Germany are far too numerous to be recounted. That of the two Naumanns, already mentioned, and yet again to be spoken of, stands at the head of all, and perhaps at the head of the "Faunal" works of all countries. For want of space it must here suffice simply to name some of the ornitholo- gists who in this century have elaborated, to an extent elsewhere unknown, the science as regards their own country :—Altum, Baldamus, Bechstein, Blasius (father and two sons), Bolle, Borggreve, whose Vogel-Fauna von Norddeutschland (8vo, 1869) contains what is practically a bibliographical index to the subject, Brehm (father and sons), Von Droste, Gitke, Gloger, Hintz, Alex- ander and Eugen von Homeyer, Jackel, Koch, Konig-Wart- hausen, Kriiper, Kutter, Landbeck, Landois, Leisler, Von Maltzan, Bernard Meyer, Von der Miihle, Neumann, Tobias, Johann Wolf, and Zander.2 Were we to extend the list beyond the boundaries of the German empire, and include the ornithologists of Austria,

Bohemia, and the other states subject to the same monarch, the number would be nearly doubled ; but that would overpass our pro- posed limits, though Herr von Pelzeln must be named.' Passing onward to Switzerland, we must content ourselves by referring to the list of works, forming a Bibliographia Ornithologica Helvetica, drawn up by Dr Stélker for Dr Fatio's Bulletin de la Société Ornitho- logique Suisse (ii. pp. 90-119). As to Italy, we can but name here the Fauna d'Italia, of which the second part, Uceclli (8vo, 1872), by Count Salvadori, contains an excellent bibliography of Italian works on the subject, and the posthumously published Orni- tologia Italiana of Savi (8 vols. 8vo, 1873-77).4 Coming to the Iberian peninsula, we must in default of separate works depart from our rule of not mentioning contributions to journals, for of the former there are only Col. Irby's Ornithology of the Straits of Gibraltar (8vo, 1875) and Mr A. ©. Smith's Spring Tour in Portugal ® to be named, and these only partially cover the ground. However, Dr A. E. Brehm has published a list of Spanish Birds (Allgem. deutsche Naturhist. Zeitwng, iii. p. 481), and The Ibis con- tains several excellent papers by Lord Lilford and by Mr Saunders, the latter of whom there records (1871, p. 55) the few works on Ornithology by Spanish authors, and in the Bulletin de la Socrété Zoologique de France (i. p. 315; ii. pp. 11, 89, 185) has given a list of the Spanish Birds known to him.

Returning northwards, we have of the Birds of the whole of France nothing of real importance more recent than the volume

1 Journal fiir Ornithologie, 1869, pp. 107, 341, 381. One may almost say an English translation also, for Major Feilden's contribution to the Zoologist for hae on the same subject gives the most essential part of Herr Muiller's infor- mation.

2 This is of course no complete list of German ornithologists. Some of the most eminent of them have written scareely a line on the Birds of their own country, as Cabanis (editor sinee 1853 of the Journal fur Ornithologie), Finsch, Nartlaub, Prince Max of Wied, A. B. Meycr, Nathusius, Nehrkorn, Reichenbach, Reiehenow, and Schalow among others.

3 Auscful ornithological bibliography of the Austrian-Hungarian dominions was printed in the Verhandlungen of the Zoological and Botanical Society

of Vienna for 1878, by Victor Ritter von Tschusi zu Schmidhofen. A similar bibliography of Russian Ornithology by Alexander Brandt was printed at St Petersburg in 1877 or 1878.

4 A useful compendium of Greek and Turkish Ornithology by Drs Kriiper and Hartlaub is contained in Mommsen's Griechische Jahrzeiten for 1875 (Heft IIT.). For other countries in the Levant there are Canon Tristram's Fauna and Flora of ine (4to, 1884) and Capt. Shelley's Handbook to the Birds of Egypt (8vo,

eo In the final chapter of this work the author gives a list of Portuguese Birds, including besides those observed by him those recorded by Prof. Barboza du Bocage in the Gazeta Medica de Lisboa, 1861, pp. 17-21

Oiscauz in Vieillot's Faune Francaise (8vo, 1822-29); but there is a great number of local publications of which Mr Saunders has furnished (Zoologist, 1878, pp. 95-99) a catalogue. Some of these seem only to have appeared in journals, but many have certainly been issued separately. Those of most interest to English orni- thologists naturally refer to Britanny, Normandy, and Picardy, and are by Baillon, Beuoist, Blandiu, Bureau, Canivet, Chesnoun, Degland, Demarle, De Norguet, Gentil, Hardy, Lemettcil, Lemon- nicier, Lesauvage, Maignon, Marcotte, Nourry, and Taslé, while perhaps the Ornithologie Parisienne of M. René Paquet, under the pseudonym of Nérée Quépat, should also be named. Of the rest the most important are the Ornithologie Provengale of Roux (2 vols. 4to, 1825-29); Risso's Histotre naturelle… . des environs de Nice (5 vols. 8vo, 1826-27); the Ornithologie du Dauphiné of Boutcille and Labatie (2 vols. 8vo, 1843-44); the Fawne Mert- dionale of Crespon (2 vols. 8vo, 1844) ; the Ornithologie de la Savoic of Bailly (4 vols. 8vo, 1853-54), and Les Richesses ornithologiques du midi de la France (4to, 1859-61) of MM. Jaubert and

Barthélemy-Lapommeraye. For Belgium the Fauwne Belge of Baron Belgium.

De Selys-Longchamps (8vo, 1842), old as it is, remains the classical work, though the Planches coloriécs des Oiseaux de la Belgique of M. Dubois (8vo, 1851-60) is so much later in date. In regard to

Holland we have Schlegel's De Vogels van Nederland (8 vols. 8vo, Holland.

1854-58 ; 2d ed., 2 vols., 1878), besides his De Dieren van Nedcr- land : Vogels (8vo, 1861).

Before considering the ornithological works relating solely to the Europe in British Islands, it may be well to cast a glance on a few of those general.

that refer to Europe in general, the more so since most of them are of Continental origin. First we have the already-mentioned" Manuel @' Ornithologie of Temminck, which originally appeared as a single volume in 1815 ;§ but that was speedily superseded by the second edition of 1820, in twovolumes. Two supplementary parts were issued in 1835 and 1840 respectively, and the work for many years deservedly maintained the highest position as the authority on European Ornithology—indced in England it may almost without exaggeration be said to have been nearly the only foreign ornithological work known ; but, as could only be expected, grave defects are now to be discovered in it. Some of them were already manifest when one of its author's colleagues, Schlegel (who had been employed to write the text for Susemihl's plates, originally intended to illustrate Temminck's work), brought out his bilingual Revue critique des Oiseaux d' Europe (8v0, 1844), a very remarkable volume, since it correlated and consolidated the labours of French and German, to say nothing of Russian, ornithologists. Of Gould's Birds of Europe (5 vols. fol., 1832-87) nothing need be added to what has been already said. The ycar 1849 saw the publication of Degland's Ornithologie Europtenne (2 vols. 8vo), a work fully intended to take the place of Temminck's; but of which Bonaparte, in a caustic but by no means ill-deserved Revue Critique (12mo, 1850), said that the author had performed a miracle since he had worked without a collection of specimens and without a library. Asecond edition, revised by M. Gerbe (2 vols. 8vo, 1867), strove to remedy, and to some extent did remedy, the grosser errors of the first, but enough still remain to make few statements in the work trustworthy unless corroborated by other

evidence. Meanwhile in England Dr Bree had in 1858 begun the publication of The Birds of Europe not observed in the British Isles (4 vols. 8yo), which was completed in 1863, and in 1875 reached a second and improved edition (5 vols.). In 1862 M. Dubois brought out a similar work on the “Espéces non observées en Belgique,” being supplemen- tary to that of his above named. In 1870 Dr Fritsch completed his Naturgeschiehte der Vogel Europas (8vo, with atlas in folio); and in 1871 Messrs Sharpe and Dresser began the publication of their Birds of Ewrope, which was completed by the latter in 1879 (8 vols. 4to), and is unquestionably the most complete work of its kind, both for fulness of information and beauty of illustration— the coloured plates being nearly all by Mr Keulemans, or when not by him from the hardly inferior hand of Mr Neale. In so huge an undertaking mistakes and omissions are of course to be found if any one likes the invidious task of seeking for them; but many of the errors imputed to this work prove on investigation to refer to matters of opinion and not to matters of fact, while many more are explicable if we remember that while the work was in progress Ornithology was being prosecuted with unprecedented activity, and thus statements which were in accordance with the best information at the beginning of the period were found to need modification before it was ended. As a whole European ornitho- logists are all but unanimously grateful to Mr Dresser for the way in which he performed the enormous labour he had under- taken.

Coming now to works on British Birds only, the first of the British present century that requires remark is Montagu’s Ornithological Isles.

Dictionary (2 vols. 8vo, 1802; supplement 1818), the merits of which have been so long and so fully acknowledged both abroad and at home that no further comment is here wanted. In 1831

6 Copies arc said to exist bearing the date 1814.

Rennie brought out a modified edition of it (reissued in 1833), and Newman another in 1866 (reissued in 1883); but those who wish to know the author’s

views had better consult the original. Next in order come the very inferior British Ornithology of Graves (3 vols. 8vo, 1811-21), and a work with the same title by Hunt (3 vols. 8vo, 1815-22), published at Norwich, but never finished. Then we have Selby's Illustrations of British Ornithology, two folio volumes of coloured plates engraved by himself, between 1821 and 1833, with letterpress also in two volumes (8vo, 1825-33), a second edition of the first volume being also issued (1833), for the author, having yielded to the pressure of the " Quinarian " doctrines then in vogue, thought it necessary to adjust his classification accordingly, and it must be admitted that for information the second edition is best. In 1828 Fleming brought out his History of British Animals (8vo), in which the Birds are treated at considerable length (pp. 41-146), though not with great success. In 1835 Mr Jenyns (ow Blomefield) produced an excellent Manual of British Vertebrate Animals, a volume (8vo) executed with great scientific skill, the Birds again receiving due attention (pp. 49-286), and the descriptions of the various species being as accurate as they are terse. In the same year began the Colowred Illustrations of British Birds and their Eggs of H. L. Meyer (4to), which was completed in 1848, whereof a second edition (7 vols. 8vo, 1842-50) was brought out, and subsequently (1852-57) a reissue of the latter. In 1836 appeared Eyton's History of the rarer British Birds, intended as a sequel to Bewick's well-known volumes, to which no important additions had been made since the issue of 1821. The ycar 1837 saw the beginning of two remarkable works by Macgillivray and Yarrell respectively, and each cntituled 4 History of British Birds. Of the first, undoubtedly the more original and in many respects the more minutely accurate, mention will again have to be made (page 24), and, save to state that its five volumes were not completed till 1852, nothing more needs now to be added. The second has unquestionably become the standard work on British Ornithology, a fact due in part to its numerous illustrations, many of them indeed ill drawn, though all carefully engraved, but much more to the breadth of the author's views and the judgment with which they were set forth. In practical acquaint- ance with the internal structure of Birds, and in the perception of its importauce in classification, he was certainly not behind his rival ;'but he well knew that the British public in a Book of Birds not only did not want a series of anatomical treatises, but would even resent their introduction. He had the art to conceal his art, and his work was therefore a success, while the other was unhappily a failure. Yet with all his

knowledge he was deficient in some of the qualities which a great naturalist ought to possess. His concep- tion of what his work should be seems to have been perfect, his execution was not equal to the conception. However, he was not the first nor will he be the last to fall short in this respect. For him it must be said that, whatever may have been done by the generation of British ornithologists now becoming advanced in life, he educated them to do it; nay, his influence even extends to a younger generation still, though they may hardly be aware of it. Of Yarrell's work in three volumes, a second edition was published in 1845, a third in 1856, and a fourth, begun in 1871, and almost wholly rewritten, is still unfinished. Of the compilations based upon this work, without which they could not have been composed, there is no need to speak. Onc of the few appearing since, with the same scope, that are not borrowed is Jardine's Birds of Great Britain and Ireland (4 vols. 8vo, 1838-48), forming part of his Naturalist's Library ; and Gould's Birds of Great Britain has been already mentioned.

A considerable number of local works deserving of notice have also to be named. The first three volumes of Thompson's Natural History of Ireland (8vo, 1849-51) contain an excellent account of the Birds of that island, and Mr Watters's Birds of Ireland (8vo, 1858) has also to be mentioned. For North Britain there is Mr Robert Gray's Birds of. the West of Scotland (8vo, 1871), which virtually is an account of those of almost the whole of that part of the kingdom. To these may be added Dunn's Ornithologist's Guide to Orkney and Shetland (8vo, 1887), the unfinished Historia Naturalis Orcadensis of Baikie and Heddle (8vo, 1848), and Saxby's Birds of Shetland (8vo, 1874), while the sporting works of Charles St John contain much information on the Ornithology of the Highlands.? The local works on English Birds are still more numerous, but among them may be especially named Dillwyn's Fauna and Flora of Swansea (1848), Mr Knox's Ornithological Rambles in_ Sussex (1849), Mr Stevenson's Birds of Norfolk (1866-70), Mr Cecil Smith's Birds of Somerset (1869) and Birds of

? Though contravening our plan, we must for its great merits notice here Mr More's series of papers in The Ibis for 1865, " On the Distri- bution of Birds in Great Britain during the Nesting Season."

2 Did our scheme permit us, we should be glad to mention in detail the various important communications on Scottish Birds of Alston, Messrs Buckley, Harvie-Brown, Lumsden, and others.

Guernsey (1879), Mr Cordeaux's Birds of the Humber District (1872), Mr John Hancock's Birds of Northumberland and Durham (1874), The Birds of Nottinghamshire by Messrs Sterland and Whitaker (1879), Rodd's Birds of Cornwall edited by Mr Harting (1880), and the Vertebrate Fauna of Yorkshire (1881), of which the "Birds" are by Mr W. E. Clarke.

The good effects of "Faunal" works such as those named in the foregoing rapid survey none can doubt. "Every kingdom, every province, should have its own monographer," wrote Gilbert White more than one hundred years ago, and experience has proved the truth of his assertion. In a former article (BirDs, iii. pp. 736-764) the attempt has been made to shew how the labours of monographers of this kind, but on a more extended scale, can be brought together, and the valuable results that thence follow. Important as they are, they do not of themselves constitute Ornithology as a science; and an enquiry, no less wide and far more recondite, still remains. By whatever term we choose to call it—Classification, Arrangement, Systematizing, or Taxonomy—that enquiry which has for its object the discovery of the natural groups into which Birds fall, and the mutual relations of those groups, has always been one of the deepest interest, and to it we must now recur.

But nearly all the authors above named, it will have been seen, trod the same ancient paths, and in the works of scarcely one of them had any new spark of intelligence been struck out to enlighten the gloom which surrounded the investigator. It is now for us to trace the rise of the present more advanced school of ornithologists whose labours, preliminary as we must still regard them to be, yet give signs of far greater promise. It would probably be unsafe to place its origin further back than a few scattered hints contained in the " Pterographische Frag- mente" of Curistian Lupwia Nirzscu, published in the Magazin fiir den neuesten Zustand der Naturkunde (edited by Voigt) for May 1806 (xi. pp. 393-417), and even these might be left to pass unnoticed, were it not that we recog- nize in

them the germ of the great work which the same admirable zoologist subsequently accomplished. In these “Fragments,” apparently his earliest productions, we find him engaged on the subject with which his name will always be especially identified, the structure and arrange- ment of the feathers that form the proverbial characteristic of Birds. But, though the observations set forth in this essay were sufficiently novel, there is not much in them that at the time would have attracted attention, for perhaps no one—not even the author himself—could have then foreseen to what important end they would, in con- junction with other investigations, lead future naturalists ; but they are marked by the same close and patient deter- mination that eminently distinguishes all the work of their author ; and, since it will be necessary for us to return to this part of the subject later, there is here no need to say more of them. In the following year another set of hints— of a kind so different that probably no one then living would have thought it possible that they should ever be brought in correlation with those of Nitzsch—are contained in a memoir on Fishes contributed to the tenth volume of the Annales du Muséum Whistoire naturelle of Paris by ETIENNE GEOFFROY StT-H1LarrE in 1807.2 Here we have it stated as a general truth (p. 100) that young birds have the sternum formed of five separate pieces—one in the middle, being its keel, and two “annexes ” on each side to which the ribs are articulated—all, however, finally uniting to form the single “breast-bone.” Further on (pp. 101, 102) we find observations as to the number of ribs which are attached to each of the “annexes” —there being some-

2 In the Philosophie Anatomique (i. pp. 69-101, and especially pp. 1385, 186), which appeared in 1818, Geoffroy St-Hilaire explained the views he had adopted at greater length.

Nitzsch,

Hi. G. Sty Hilaire. |

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times more of them articulated to the anterior than to the posterior, and in certain forms no ribs belonging to one, all being applied to the other. Moreover, the author goes on to remark that in adult birds trace of the origin

of the sternum from five centres of ossification is always more or less indicated by sutures, and that, though these sutures had been generally regarded as ridges for the attachment of the sternal muscles, they indeed mark the extreme points of the five primary bony pieces of the sternum.

In 1810 appeared at Heidelberg the first volume of TrEDEMANN's carefully-wrought Anatomie und Natur- geschichte der Vogel—which shews a remarkable advance upon the work which Cuvier did in 1805, and in some respects is superior to his later production of SI. "Weel, however, only noticed here on account of the numerous references made to it by succeeding writers, for neither in this nor in the author's second volume (not published until 1814) did he propound any systematic arrangement of the Class. More germane to our present subject are the Osteographische Beitrége zur Naturgeschichte der Vogel of Nitzsch, printed at Leipzig in 1811—a miscellaneous set of detached essays on some peculiarities of the skeleton or portions of the skeleton of certain Birds—one of the most remarkable of which is that on the component parts of the foot (pp. 101-105) pointing out the aberration from the ordinary structure exhibited by the Goatsucker (Capri- mulgus) and the Swift (Cypselus)—an aberration which, if rightly understood, would have conveyed a warning to those ornithological systematists who put their trust in Birds' toes for characters on which to erect a classification, that there was in them much more of importance, hidden in the integument, than had hitherto been suspected ; but the warning was of little avail, if any, till many years had elapsed. However, Nitzsch had not as yet seen his way to proposing any methodical arrangement of the various groups of Birds, and it was not until some eighteen months later that a scheme of classification in the main anatomical was attempted.

This scheme was the work of Buastus MERREM, who, in a communication to the Academy of Sciences of Berlin on the 10th December 1812, which was published in its Abhandlungen for the following year (pp. 237-259), set forth a Zentamen Systematis naturalis Avium, no less modestly entitled than modestly executed. The attempt of Merrem must be regarded as the virtual starting-point of the latest efforts in Systematic Ornithology, and in that view its proposals deserve to be stated at length. Without pledging ourselves to the acceptance of all its details—some of which, as is only

natural, cannot be sustained with our present knowledge, resulting from the information accumu- lated by various investigators throughout more than seventy years—it is certainly not too much to say that Merrem's merits are almost incomparably superior to those of any of his predecessors as well as to those of the majority of his successors for a long time to come ; while the neglect of his treatise by many (perhaps it would not be erroneous to say by most) of those who have since written on the subject seems inexcusable save on the score of inadvert- ence. Premising then that the chief characters assigned by this ill-appreciated systematist to his several groups are drawn from almost all parts of the structure of Birds, and are supplemented by some others of their more prominent peculiarities, we present the following abstract of his scheme :!—

1 The names of the genera are, he tells us, for the most part those of Linneus, as being the best-known, though not the best. To some of the Linnzean genera he dare not, however, assign a place, for instance, Buceros, Wematopus, Merops, Glareola (Gmelin's genus, by the bye), and Palamedea.

wo)

J. AVES CARINATZ. 1. Aves aeree. A. Rapaces.—a. Accipitres—Vultur, Falco, Sagittarius. b. Striz. B. Hymenopodes.—wa. Chelidones: a. C. nocturne—Capri- mulgus; B. C. diurne—Hirundo.

b. Oscines: a. O. conirostres—Loxia, Frin- gilla, Emberiza, Tangara; p. O. ten- uirostres—Alauda, Motaeilla, Musci- capa, Todus, Lantus, Ampelis, Tur- dus, Paradisea, Buphaga, Sturnus, Oriolus, Gracula, Coractas, Corvus, Pipra?, Parus, Sitta, Certhiz quedam.

C. Mellisuge.—Trochilus, Certhia# et Upupe plurime. D. Dendrocolapte.—Picus, Yun. E. Brevilingues.—a. Upupa; b. Ispide. F. Levirostres.—a. Ramphastus, Scythrops?; b. Psittacus. G. Coceyges.—Cuculus, Trogon, Bucco, Crotophaga. 2. Aves terrestres. A. Columba. B. Galline.

3. Aves aquatica.

A. Odontorhynchi: a. Boscades—Anas; b. Mergus; ¢. Pheni- copter us.

B. Platyrhynchi.—Pelicanus, Phaeton, Plotus.

C. Aptenodytes.

D. Urinatrices: a. Cepphi—Alca, Colymbi pedibus palmatis; b. Podiccps, Colymbi pedibus lobatis.

E. Stenorhynchi. — Procellaria, Diomedea, Larus, Sterna, Rhynehops.

4, Aves palustres.

A. Rusticole: a. Phalarides— Rallus, Fuliea, Parra; 6. Limosuge—Numentus, Scolopax, Tringa, Charadrius, Receurvirostra.

B. Gralle: a. Erodii—Ardew ungue intermedio serrato, Cancroma; b. Pelargi—Ctconia, Mycteria, Tantali quidam, Scopus, Platalea; c. Gerani—Ardex cristate, rues, Psophia.

C. Otis.

II. Aves RATITA.—Struthio.

The most novel feature, and one the importance of which most ornithologists of the present day are fully pre- pared to admit, is of course the separation of the Class ‘Aves into two great Divisions, which from one of the most obvious distinctions they present were called by its author Carinate? and Ratite,® according as the sternum possesses a keel (crista in the phraseology of many anatomists) or not. But Merrem, who subsequently communicated to the Academy of Berlin a more detailed memoir on the “

flat-breasted ” Birds,t was careful not here to rest his Divisions on the presence or absence of their sternal character alone. He concisely cites (p. 238) no fewer than eight other characters of more or less value as peculiar to the Carinate Division, the first of which is that the feathers have their barbs furnished with hooks, in consequence of which the barbs, including those of the wing-quills, cling closely together ; while among the rest may be mentioned the position of the furcula and coracoids,® which kcep the wing-bones apart; the limitation of the number of the lumbar vertebra to fifteen, and of the carpals to two; as well as the divergent direction of the iliac bones,—the corresponding characters peculiar to the Ratite Division being (p. 259) the disconnected condition of the barbs of the feathers,through the absence of any hooks whereby they might cohere ; the non-existence of the furcula, and the coalescence of the coracoids with the scapulz (or, as he expressed it, the extension of the scapuli to supply the place of the coracoids, which he thought were wanting) ; the lumbar vertebrae being twenty and the carpals three in number; and the parallelism of the iliac bones. oe

2 From carina, a keel.

3 From rates, a raft or flat-bottomed barge.

4 ‘< Beschreibung der Gerippes eines Casuars nebst einigen beilaufigen Bemerkungen iiber die flachbriistigen Végel”—Abdhandl. der Berlin. Akademie, Phys. Klasse, 1817, pp. 179-198, tabb. i—ili.

5 Merrem, as did many others in his time, calls the coracoids “ clavi- cule’; but it is now well understood that in Birds the real clavicule form the furcula or ‘‘ merry-thought.”

De Blain- ville.

As for Merrem’s partitioning of the inferior groups there is less to be said in its praise as a whole, though credit must be given to his anatomical knowledge for leading him to the perception of several affinities, as well as differences, that had never before been suggested by superficial

systematists. But it must be confessed that (chiefly, no doubt, from paucity of accessible material) he overlooked many points, both of alliance and the opposite, which since his time have gradually come to be admitted. For instance, he seems not to have been aware of the dis- tinction, already shown by Nitzsch (as above mentioned) to exist, between the Swallows and the Swifts; and, by putting the genus Coracias among his Oscines Tenuirostres} without any remark, proved that he was not in all respects greatly in advance of his age; but on the other hand he most righteously judged that some species hitherto referred to the genera Certhia and Upupa required removal to other positions, and it is much to be regretted that the very concise terms in which his decisions were given to the world make it impossible to determine with any degree of certainty the extent of the changes in this respect which he would have introduced. Had Merrem published his scheme on an enlarged scale, it seems likely that he would have obtained for it far more attention, and possibly some portion of acceptance. He had deservedly attained no little reputation as a descriptive anatomist, and his claims to be regarded as a systematic reformer would probably have been admitted in his lifetime. As it was his scheme apparently fell flat, and not until many years had elapsed were its merits at all generally recognized.

Notice has next to be taken of a Memoir on the Employment of Sternal Characters in establishing Natural Families among Birds, which was read by Dz BLAINVILLE before the Academy of Sciences of Paris in 1815,? but not published in full for more than five years later (Journal de Physique… . et des Arts, xcii. pp. 185-215), though an abstract forming part of a Prodrome @une nouvelle distribu- tion du Régne Animal appeared earlier (op. cit., Ixxxiii. pp. 252, 253, 258, 259; and Bull. Soc. Philomath. de Paris, 1816, p. 110). This is a very disappointing performance, since the author observes that, notwithstanding his new classification of Birds is based on a study of the form of the sternal apparatus, yet, because that lies wholly within the body, he is compelled to have recourse to such outward characters as are afforded by the proportion of the limbs and the disposition of the toes—even as had been the practice of most ornithologists before him! It is evident that the features of the sternum on which De Blainville chiefly relied were those drawn from its posterior margin, which no very extensive experience of specimens is needed to show are of comparatively

slight value; for the number of “échancrures”—notches as they have sometimes been called in English—when they exist, goes but a very short way as a guide, and is so variable in some very natural groups as to be even in that short way occasionally mis- leading.® There is no appearance of his having at all taken Into consideration the far more trustworthy characters furnished by the anterior part of the sternum, as well as by the coracoids and the furcula. Still De Blainville made some advance in a right direction, as for instance by elevating the Parrots‘ and the Pigeons as “ Ordres,” equal in rank to that of the Birds-of-Prey and some others.

‘ He also placed the genus Todus in the same group, but it must be borne in mind that in his time a great many Birds were referred to that genus which (according to modern ideas) certainly do not belong to it, and it may well have been that he never had the opportunity of examining a specimen of the genus as nowadays restricted,

2 Not 1812, as has sometimes. been stated,

3 Cf. Philos. Transactions, 1869, p. 337, note.

- This view of them had been long before taken by Willughby. but abandoned by all later authors.

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According to the testimony of L’Herminier (for whom see later) he divided the “ Passereaux” into two sections, the “faux” and the “vrais”; but, while the latter were very correctly defined, the former were most arbitrarily separated from the “ Grimpeurs.” He also split his Grallatores and Natatores (practically identical with the Grallx and Anseres of Linnzeus) each into four sections ; but he failed to see—as on his own principles he ought to have seen— that each of these sections was at least equivalent to almost any one of his other “ Ordres.” He had, however, the courage to act up to his own professions in collocating the Rollers (Coracias) with the Bee-eaters (Merops), and had the sagacity to surmise that Menura was not a Gallinaceous Bird. The greatest benefit conferred by this memoir is probably that it stimulated the efforts, presently to be mentioned, of one of his pupils, and that it brought more distinctly into sight that other factor,

originally dis- covered by Merrem, of which it now clearly became the duty of systematizers to take cognizance.

Following the chronological order we are here adopting, we next have to recur to the labours of Nirzscu, who, in 1820, in a treatise on the Nasal Glands of Birds—a subject that had already attracted the attention of

Jacopson (Nouv. Bull. Soc. Philomath, de Paris, iii. pp. Jacob | 267-269)—first put forth in Meckel's Deutsches Archiv son.

Str die Physiologre (vi. pp. 251-269) a statement of his

general views on ornithological classification which were Nitasch,

based on a comparative examination of those bodies in various forms. It seems unnecessary here to occupy space by giving an abstract of his plan,> which hardly includes any but European species, because it was subsequently elaborated with no inconsiderable modifications in a way that must presently be mentioned at greater length. But the scheme, crude as it was, possesses some interest. It is not only a key to much of his later work —to nearly all indeed that was published in his lifetime—but in it are founded several definite groups (for example, Passerinz and Picarix) that subsequent experience has shewn to be more or less natural; and it further serves as additional evidence of the breadth of his views, and his trust in the teachings of anatomy; for it is clear that, if organs so apparently insignificant as these nasal glands were found worthy of being taken into account, and capable of form- ing a base of operations, in drawing up a system, it would almost follow that there can be no part of a Bird's organiza- tion that by proper study would not help to supply some means of solving the great question of its affinities. This seems to the present writer to be one of the most certain general truths in Zoology, and is probably admitted in theory to be so by most zoologists, but their practice is opposed to it; for, whatever group of animals be studied, it 1s found that one set or another of characters is the chief favourite of the authors consulted—each generally taking a separate set, and that to the exclusion of all others, instead of effecting a combination of all the sets and taking the aggregate.®

That Nitzsch took this extended view is abundantly proved by the valuable series of ornithotomical observa- tions which he must have been for some time accumulating,

5 This plan, having been repeated by Schépss in 1829 (op. cit., xii. p. 73), became known to Sir R. Owen in 1835, who then drew to it the attention of Kirby (Seventh Bridgewater Treatise, ii. pp. 444, 445), and in the next year referred to it in his own article “ Aves ” in Todd’s Cyclopedia of Anatomy (i. p. 266), so that Englishmen need no excuse for not being aware of one of Nitzsch’s labours, though his more advanced work of 1829, presently to be mentioned, was not referred to by Sir R. Owen.

8 A very remarkable instance of this may be seen in the Systema Avium, promulgated in 1830 by Wagler (a man with great knowledge of Birds) in his Natirliches System der Amphibien (pp. 77-128). He eet a tongue as his chief guide, and found it indeed an unruly member.

1’ Her- ninier,

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and almost immediately afterwards began to contribute to the younger N aumann’s excellent Maturgeschichte der Vogel Deutschlands, already noticed above (page 9). Besides a concise general treatise on the Organization of Birds to be found in the Introduction to this work (i. pp. 23-52), a brief description from Nitzsch’s pen of the peculiarities of the internal structure of nearly every genus is incorporated with the author’s prefatory remarks, as each passed under consideration, and these descriptions being almost without exception so drawn up as to be com- parative are accordingly of great utility to the student of classification, though they have been so greatly neglected. Upon these descriptions he was still engaged till death, in 1837, put an end to his labours, when his place as Naumann’s assistant for the remainder of the work was taken by Rudolph Wagner; but, from time to time, a few more, which he had already completed, made their posthumous appearance in it, and, even in recent years, some selections from his unpublished papers have through the care of Giebel been presented to the public. Through- out the whole of this series the same marvellous industry and scrupulous accuracyare manifested, and attentive study of it

will shew how many times Nitzsch anticipated the conclusions at which it has taken some modern taxonomers fifty years to arrive. Yet over and over again his de- termination of the affinities of several groups even of European Birds was disregarded ; and his labours, bemg contained in a bulky and costly work, were hardly known at all outside of his own country, and within it by no means appreciated so much as they deserved'—for even Naumann himself, who gave them publication, and was doubtless in some degree influenced by them, utterly failed to perceive the importance of the characters offered by the song-muscles of certain groups, though their peculiarities were all duly described and recorded by his coadjutor, as some indeed had been long before by Cuvier in his famous dissertation? on the organs of voice in Birds (Lecons @anatomie comparée, iv. pp. 450-491). Nitzsch's name was subsequently dismissed by Cuvier without a word of praise, and in terms which would have been applicable to many another and inferior author, while Temminck, terming Naumann's work an " ouvrage de use," —it being in truth one of the cheapest for its contents ever published, —effectually shut it out from the realms of science. unknown until quoted some years after its completion by

a catalogue-compiler on account of some peculiarities of }

nomenclature which it presented.®

Now we must return to France, where, L'Herminier, a creole of Guadaloupe and a pupil of De Blainville's, contributed to the Actes of the Linnzean Society of Paris for that year (vi. pp. 3-93) the " Recherches sur

Yappareil sternal des Oiseaux," which the precept and |

example of his master had prompted him to undertake, and Cuvier had found for him the means of executing. A second and considerably enlarged edition of this very remarkable treatise was published as a separate work in the following year. We have already seen that De Blainville, though fully persuaded of the great value of sternal features as a method of classification, had been compelled to fall back upon the old pedal characters so often employed before ; but now the scholar had learnt to excel his teacher, and not only to form an at least provi-

a Their value was, however, understood by Gloger, who in 1834, as = presently be seen, expressed his regret at not being able to use em. _ ® Cuvier’s first observations on the subject seem to have appeared in the Magazin Encyclopédique for 1795 (ii. pp. 880, 358). However, to this catalogue-compiler the present writer’s grati-

- due, for thereby he became acquainted with the work and its merits.

In Britain it seems to have been positively |

in 1827, |

sional arrangement of the various members of the Class, based on sternal characters, but to describe these characters at some length, and so give a reason for the faith that was in him. There is no evidence, so far as we can see, of his having been aware of Merrem’s views; but like that anatomist he without hesitation divided the Class into two great “coupes,” to which he gave, however, no other names than “ Ovseaux Normaux” and “ Oiseaux Anomaux,’— exactly corresponding with his predecessor’s Carinatx and Ratite—and, moreover, he had a great advantage in founding these groups, since he had discovered, apparently from his own investigations, that the mode of ossification in each was distinct; for hitherto the statement of there being five centres of ossification in every Bird’s sternum seems to have been accepted ag a general truth, without contradiction, wliereas in the Ostrich and the hea, at any rate, L’Herminier found that there were but two such primitive points,* and from analogy he judged that the same would be the case with the Cassowary and the Emeu, which, with the two forms mentioned above, made up the whole of the “ Oiseaua Anomaus” whose existence was then generally acknowledged. These are the forms which composed the Family previously termed Cursores by De Blainville ; but L’Herminier was able to distinguish no fewer than thirty-four Families of “Oiseaua Normaux,” and the judgment with which their separation and defini- tion were effected must be deemed on the whole to be most creditable to him. It is to be remarked, however, that the wealth of the Paris Museum, which he enjoyed to the full, placed him in a situation incomparably more favour- able for arriving at results than that which was

occupied by Merrem, to whom many of the most remarkable forms were wholly unknown, while L'Herminier had at his dis- posal examples of nearly every type then known to exist. But the latter used this privilege wisely and well—not,

after the manner of De Blainville and others subsequent

to him, relying solely or even chiefly on the character afforded by the posterior portion of the sternum, but taking also into consideration those of the anterior, as well as of the in some cases still more important characters presented by the pre-sternal bones, such as the furcula, coracoids, and scapula. L'Herminier thus separated the Families of " Normal Birds" :—

""Passereaux "" — Passercs,

1. " Accipitres" — Accipitres, | 18. Linn.

Linn. 2. " Serpentaires " — Gypogera- | 19. " Pigeons "— Columba, Linn.

nus, Iliger. 20. " Gallinacés "—Gallinacea. 3. "Chouettes""—Striz, Linn. | 21. "Tinamous" — Tinanwus, 4. "Touracos"—Opaetus, Vieillot. Latham.

5

. "Perroquets" — Psittacus, | 22. "Foulques ou Poules d'eau"

Linn. —Fulica, Linn.

6. " Colibris"—Zrochilus, Linn. | 23. " Grues "—Grus, Pallas.

7, "Martinets""—Cypselus, Illi- | 24. " Hérodions "—Herodii, Ili- ger. ger.

8. "Engoulevents"—Caprimul- | 25. No name given, but said to gus, Linn. include "les ibis et les

9. " Coucous "—Cuculus, Linn. spatules." _,

10. "Couroucous"—Trogon, Linn.| 26. "Gralles ou Kchassiers"—

11. “ Rollicrs ”—Galgulus, Bris- Grallx.

son. 27. “ Mouettcs ””—Larus, Linn. 12. “Guépiers ”—Merops, Linn. | 28. “Pétrels”—Procellaria,Linn. 13. “Martins-Pécheurs”—Alcedo,| 29. “ Pélicans”—Pelecanus, Linn. Linn. 30. “ Canards ”—Anas, Linn. 14, “Calaos””—Buceros, Linn. | 381. “Grebes”—Podiceps,Latham.

15. “ Toucans”” — Ramphastos, | 32. “Plongeons” — Colymbus, Linn. Latham.

16. “ Pies ”—-Picus, Linn. 33. “ Pingouins”—Alcea,Latham.

17. “Bpopsides” —. Epopsides, | 34. “ Manchots” — Aptenodytes, Vieillot. Forster.

4 This fact in the Ostrich appears to have been known already-to Geoffroy St-Hilaire from his own observation in Egypt, but docs not seem to have been published by him.

5 Considerable doubts were at that time, as said elsewhere (K1W1, vol. xiv. p. 104), entertained in Paris as to the existence of the A pteryx,

Nitzych.

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The preceding list is given to shew the very marked agreement of L’Herminier’s results conipared with those obtained fifty years later by another investigator, who approached the subject from an entirely different, though still osteological, basis. The sequence of the Families adopted is of course open to much criticism; but that would be wasted upon it at the present day; and the cautious naturalist will remember that it is generally difficult and in most cases absolutely impossible to deploy even a small section of the Animal Kingdom into line. So far as a linear arrangement will permit, the above list is very creditable, and will not only pass muster, but cannot easily be surpassed for excellence even at this moment. Experience has shewn that a few of the Families are composite, and therefore require further splitting ; but examples of actually false grouping cannot be said to

occur. The most serious fault perhaps to be found is the intercalation of the Ducks (No. 30) between the Pelicans and the Grebes—but every systematist must recognize the difficulty there is in finding a place for the Ducks in any arrangement we can at present contrive that shall be regarded as satisfactory. Many of the excellencies of L'Herminier's method could not be pointed out without too great a sacrifice of space, because of the details into which it would be necessary to enter; but the trenchant way in which he showed that the " Passereaux"—a group of which Cuvier had said "Son caractere semble d'abord purement négatif," and had then failed to define the limits—differed so completely from every other assem- blage, while maintaining among its own innumerable members an almost perfect essential homogeneity, is very striking, and shews how admirably he could grasp his sub- ject. Not less conspicuous are his merits in disposing of the groups of what are ordinarily known as Water-birds, his indicating the affinity of the Rails (No. 22) to the Cranes (No. 23), and the severing of the latter from the Herons (No. 24). His union of the Snipes, Sandpipers, and Plovers into one group (No. 26) and the alliance, especially dwelt upon, of that group with the Gulls (No. 27) are steps which, though indicated by Merrem, are here for the first time clearly laid down; and the separation of the Gulls from the Petrels (No. 28)—a step in advance already taken, it is true, by Illiger—is here placed on indefeasible ground. With all this, perhaps on account of all this, L'Herminier's efforts did not find favour with his scientific superiors, and for the time things remained as though his investigations had never been carried on.

Two years later Nitzsch, who was indefatigable in his endeavour to discover the Natural Families of Birds, and had been pursuing a series of researches into their vascular system, published the result, at Halle in Saxony, in his Observationes de Avium arteria carotide communi, in which is included a classification drawn up in accordance with the variation of structure which that important vessel presented in the several groups that he had opportunities of examin- ing. By this time he had visited several of the principal museums on the Continent, among others Leyden (where Temminck resided) and Paris (where he had frequent intercourse with Cuvier), thus becoming acquainted with a considerable number of exotic forms that had hitherto been inaccessible to him. Consequently his labours had attained to a certain degree of completeness in this direc- tion, and it

may therefore be expedient here to name the different groups which he thus thought himself entitled to

1 With the exception of a brief and wholly inadequate notice in the Edinburgh Journal of Natural History (i. p. 90), the present writer is not aware of attention having been directed to L'Herminier's labours by British ornithologists for several years after; but considering how they were employing themselves at the time (as is shewn in another place) this is not surprising.

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J, Avus CarinaT# [L'H. Oiseaux Normaux "]. A, Aves Carinatee aereze.

1. Accipitring [L'H. 1, 2 partim, 3]; 2. Passering [L'H. 18]; 3. Macrochircs [L'H. 6, 7]; 4. Cuculine [L'H. 8, 9, 10 (qu. 11, 12%)]; 5. Pictne [L'H. 15, 16]; 6. Psittacine [L'H. 5]; 7. Lipoglosse [L'H. 18, 14, 17]; 8. Amphibole [L'H. 4].

B. Aves Carinate terrestres. 1. Columbine [L'H. 19]; 2. Gallinaceew [L'H. 20]. C. Aves Carinate aquatics. Gralle.

1. Alectorides (= Dicholophus+ Otis) [L'H. 2 partim, 26 partim] ; 2. Gruine [L'H. 23]; 3. Fulicariew [L'H. 22]; 4. Herodiz [L'H. 24 partim]; 5. Pelargi [L'H. 24 partim, 25]; 6. Odonto- glossi (= Phenieopterus) [L'H. 26 partim] ; 7. Limicole [L'H. 26 peene omnes].

Palmate.

8. Longipennes [L'H. 27]; 9. Nasutx#w [L'H. 28]; 10. Ungwirostres [L'H. 30]; 11. Steganopodes [L'‘H. 29]; 12. Pygopodes [L'H. $1, 32, 33, 34].

II. Aves Ratira#[L'H. "Oiscaux Anomaux"').

To enable the reader to compare the several groups of Nitzsch with the Families of L'Herminier, the numbers applied by the latter to his Families are suffixed in square brackets to the names of the former ; and, disregarding the order of sequence, which is here immaterial, the essential

correspondence of the two systems is worthy of all atten- tion, for it obviously means that these two investigators, starting from different points, must have been on the right track, when they so often coincided as to the limits of what they considered to be, and what we are now almost justified in calling, Natural Groups.? But it must be observed that the classification of Nitzsch, just given, rests much more on characters furnished by the general struc- ture than on those furnished by the carotid artery only. Among all the species (188, he tells us, in number) of which he examined specimens, he found only four varia- tions in the structure of that vessel, namely :—

1. That in which both a right carotid artery and a left are present. This is the most usual fashion among the various groups of Birds, including all the "aerial" forms excepting Passerine, Macrochires, and Prcinx.

2. That in which there is but a single carotid artery, springing from both right and left trunk, but the branches soon coalescing, to take a midway course, and again divid- ing near the head. This form Nitzsch was only able to find in the Bittern (Ardea stellaris).

3. That in which the right carotid artery alone is present, of which, according to our author's experience, the Flamingo (Phenicopterus) was the sole example.

4. That in which the left carotid artery alone exists, as found in all other Birds examined by Nitzsch, and there- fore as regards species and individuals much the most common—since into this category come the countless thousands of the Passerine Birds—a group which out- numbers all the rest put together.

Considering the enormous stride in advance made by L'Herminier, it is very disappointing for the historian to have to record that the next inquirer into the osteology of Birds achieved a disastrous failure in his attempt to throw light on their arrangement by means of a comparison of their sternum. This was BERTHOLD, who devoted a long chapter of his Beitrdge zur Anatomie, published at Gottingen in 1831, to a consideration of the subject. So far as his introduc- tory chapter went—the development of the sternum —he was, for ee

2 Whether Nitzsch was cognizant of L’Herminier’s views is in no way apparent. The latter’s name seems not to be even mentioned by him, but Nitzsch was in Paris in the summer of 1827, and it is almost impossible that he should not have heard of L’Herminier’s labours, unless the relations between the followers of Cuvier, to whom Nitzsch attached himself, and those of De Blainville, whose pupil L’Hermi- nier was, were such as to forbid any communication between the rival schools. Yet we have L’Herminier’s evidence that Cuvier gave him every assistance. Nitzsch’s silence, both on this occasion and after- wards, is very curious; but he cannot be accused of plagiarism, for the scheme given above is only an amplification of that foreshadowed by him (as already mentioned) in 1820 —a scheme which seems to have been equally unknown to L’Herminier, perhaps through linguistic difficulty.

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his time, right cnough and somewhat instructive. It was only when, after a close examination of the sternal apparatus of one hundred and thirty species, which he carefully described, that he arrived (pp. 177-183) at the conclusion—astonishing to us who know of L’Herminier’s previous results —that the sternum of Birds cannot be used as a help to their classification on account of the egregious anomalies that would follow the procceding— such anomalies, for instance, as the separation of Cypsclus from Hirundo and its alliance with Trochilus, and the grouping of Hirundo and Fringilla together. He seems to have been persuaded that the method of Linneus and his disciples was indisputably right, and that any method which contradicted it must therefore be wrong. Moreover, he appears to have regarded the sternal structure asa mere function of the Bird’s habit, especially in regard to its power of flight, and to have wholly overlooked the converse position that this powcr of flight must depend entirely on the structure. Good descriptive anatomist as he certainly was, he was false to the anatomist’s creed; but it is plain, from reading his careful descriptions of sternums, that he could not grasp the essential characters he had before him, and, attracted only by the more salient and obvious features, had not capacity to interpret the meaning of the whole. Yet he did not amiss by giving many figures of sternums hitherto unrepresented. We pass from him to a more lively theme.

At the very beginning of the year 1832 Cuvier laid before the Academy of Sciences of Paris a memoir on the ‘ progress of ossification in the sternum of Birds, of which memoir an abstract will be found in the Annales des Sciences Naturelles (xxv. pp. 260-272). Herein he treated of several subjects with which we are not particularly con- cerned at present, and his remarks throughout were chiefly directed against certain theories which Etienne Geoffroy St-Hilaire had propounded in his Philosophie Anatomique, published a good many years before, and need not trouble us here ; but what does signify to us now is that Cuvier traced in detail, illustrating his statements by the preparations he exhibited, the progress of ossification in the sternum of the Fowl and of the Duck, pointing out how it differed in each, and giving his interpretation of the differ- ences. It had hitherto been generally believed that the mode of ossification in the Fowl was that which obtained in all Birds—the Ostrich and its allies (as L’Herminier, we have seen, had already shewn) excepted. But it was now made to appear that the Struthi- ous Birds in this respect resembled, not only the Duck, but a great many other groups—Waders, Birds-of-Prey, Pigeons, Passerines, and perhaps all Birds not Galli- naceous,—so that, according to Cuvier’s view, the five points of ossification observed in the Galline, instead of exhibiting the normal process, exhibited one quite exceptional, and that in all other Birds, so far as he had been enabled to investigate the matter, ossification of the sternum began at two points only, situated near the anterior upper margin of the side of the sternum, and gradually crept towards the keel, into which it presently extended; and, though he allowed the appearance of detached portions of calcareous matter at the base of the still cartilaginous keel in Ducks at a certain age, he seemed to consider this an individual peculiarity. This fact was fastened upon by Geoffroy in his reply, which was a week later presented to the Academy, but was not published in full until the following year, when it appeared in the Annales du Muséum (ser. 3, ii. pp. 1-22). Geoffroy here maintained that the five centres of ossification existed in the Duck just as in the Fowl, and that the real difference of the process lay in the period at which they made their appearance, a circumstance, which, though virtually proved by the preparations Cuvier had used, had been by him overlooked or misinterpreted. The Fowl possesses all five ossifications at birth, and for a long while the middle piece forming the keel is by far the largest. They all grow slowly, and it is not until the animal is about six months old that they

are united into one firm bone. The Duck on the other hand, when newly hatched, and for nearly a month after, has the sternum wholly cartilaginous.

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Then, it is true, two lateral points of ossification appear at the margin, but subsequently the remaining three are developed, and when once formed they grow with much greater rapidity than in the Fowl, so that by the time the young Duck is quite independent of its parents, and can shift for itself, the whole sternum is completely bony. Nor, argued Geoffroy, was it true to say, as Cuvier had said, that the like occurred in the Pigeons and true Passerines. In their case the sternum begins to ossify from three very distinct points—one of which is the centre of ossification of the keel. As regards the Struthious Birds, they could not be likened to the Duck, for in them at no age was there any indication of a single median centre of ossification, as Geoffroy had satisfied himself by his own observations made in Egypt many years before. Cuvier seems to have acquiesced in the corrections of his views made by Geoffroy, and attempted no rejoinder ; but the attentive and impartial student of the discussion will see that a good deal was really wanting to make the latter's reply effective, though, as events have shewn, the former was hasty in the conclusions at which he arrived, having trusted too much to the first appearance of centres of ossification, for, had his observations in regard to other Birds been carried on with the same attention to detail as in regard to the Fowl, he would certainly have reached some very different results.

In 1834 GuocErR brought out at Breslau the first (and unfortu- nately the only) part of a Vollsténdiges Handbuch der Natur- geschichte der Vogel Ewropa's, treating of the Land-birds. In the Introduction to this book (p. xxxviii., note) he expressed his regret at not being able to use as fully as he could wish the excellent researches of Nitzsch which were then appearing (as has been above said) in the successive parts of Naumanun's great work. Notwith- standing this, to Gloger scems to belong the credit of being the first author to avail himself in a book intended for practical ornitho- logists of the new light that had already been shed on Systematic Ornithology ; aud accordingly we have the second Order of his arrangement, the Aves Passcring, divided into two Suborders :— Singing Passerines (melodus),

and Passerines without an apparatus of Song-muscles (anomalw)—the latter including what some later writers called Picariz. For the rest his classification demands no particular remark ; but that in a work of this kind he had the courage to recognize, for instance, such a fact as the essential difference between Swallows and Swifts lifts him considerably above the crowd of other ornithological writers of his time.

An improvement on the old method of classification by purely external characters was introduced to the Academy of Sciences of Stockholm by SUNDEVALL in 1835, and was published the following year in its Handlingar (pp. 48-180). This was the foundation of a more extensive work of which, from the influence it still exerts, it will be necessary to treat later at some length, and there will be no need now to enter much into details respecting the earlier per- formance. It issufficient here to remark that the author, even then a man of great erudition, must have been aware of the turn which taxonomy was taking ; but, not being able to divest himself of the older notion that external characters were superior to those fur- nished by the study of internal structure, and that Comparative Anatomy, instead of being a part of Zoology, was something dis- tinct from it, he seems to have endeavoured to form a scheme which, while not running wholly counter to the teachings of Comparative Anatomists, should yet rest ostensibly on external characters. With this view he studied the latter most laboriously, and in some measure certainly not without success, for he brought into promin- ence several points that had hitherto escaped the notice of his pre- decessors. He also admitted among his characteristics a physio- logical consideration (apparently derived from Oken!) dividing the class Aves into two sections Altriccs and Preecoces, according as the young were fed by their parents or, from the first, fed themselves. But at this time he was encumbered with the hazy doctrine of analogies, which, if it did not act to his detriment, was assuredly of no service to him. He prefixed an “Idea Systematis” to his “Expositio”; and the former, which appears to represent his real opinion, differs in arrangement very considerably from the latter. Like Gloger, Sundevall in his ideal system separated the trne Passerines from all other Birds, calling them Volucres ; but he took a step further, for he assigned to them the highest rank, wherein Me ee ee

1 He says from Oken’s Vaturgeschichte fiir Schulen, published in 1821, but the division is to be found in that author’s earlier Lehrbuch der Zoologie (ii. p. 871), which appeared in 1816.

Gloger.

Sunde- vall.

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nearly every recent authority agrees with him ; out of them, how- ever, he chose the Thrushes and Warblers to stand first as his ideal “Centrum ”—a selection which, though in the opinion of the pre- sent writer erroneous, is still largely followed.

The points at issue between Cuvier and Etienne Geoffroy St-Hilaire before mentioned naturally attracted the atten- tion of L’Hrrminizr, who in 1836 presented to the French Academy the results of his researches into the mode of growth of that bone which in the adult Bird he had already studied to such good purpose. Unfortunately the full account of his diligent investigations was never published. We can best judge of his labours from an abstract printed in the Comptes Rendus (iii. pp. 12-20) and reprinted in the Annales des Sciences Naturelles (ser. 2, vi. pp. 107-115), and from the report upon them by Istpore Grorrroy St-Hiiaire, to whom with others they were referred. This report is contained in the Comptes Rendus for the following year (iv. pp. 565-574), and is very critical in its character. It were useless to conjecture why the whole memoir never appeared, as the reporter recommended that it should ; but, whether, as he suggested, the author’s observations failed to establish the theories he advanced or not, the loss of his observations in an extended form is greatly to be regretted, for no one seems to have continued the investigations he began and to some extent carried out; while, from his residence in Guadeloupe, he had peculiar advantages in studying certain types of Birds not generally available, his remarks on them could not fail to be valuable, quite irrespective of the interpretation he was led to put upon them. L’Herminier arrived at the conclusion that, so far from there being only two or three different modes

by which the process of ossification in the sternum is carried out, the number of different modes is very considerable— almost each natural group of Birds having its own. The principal theory which he hence conceived himself justified in propounding was that instead of jive being (as had been stated) the maximum number of centres of ossification in the sternum, there are no fewer than nine entering into the composition of the perfect sternum of Birds in general, though in every species some of these nine are wanting, whatever be the condition of development at the time of examination. These nine theoretical centres or " pieces" L'Herminier deemed to be disposed in three transverse series (rangées), namely the anterior or " prosternal," the middle or "mesosternal," and the posterior or "metasternal" —each series consisting of three portions, one median piece and two side-pieces. At the same time he seems, accord- ing to the abstract of his memoir, to have made the some- what contradictory assertion that sometimes there are more than three pieces in each series, and in certain groups of Birds as many as six.! It would occupy more space than can here be allowed to give even the briefest abstract of the numerous observations which follow the statement of his theory and on which it professedly rests, They extend to more than a score of natural groups of Birds, and nearly each of them presents some peculiar characters. Thus of the first series of pieces he says that when all exist they may be developed simultaneously, or that the two side-pieces may precede the median, or again that the median may precede the side-pieces— according to the group of Birds, but that the second mode is much the commonest. The same variations are observable in the second or middle series, but its side-pieces are said to exist in all groups of Birds without exception. As to the third or posterior series, when it is complete the three constituent pieces are developed almost simultaneously ;

1 We shall perhaps be justified in assuming that this apparent incon- sistency, and others which present themselves, would be explicable if the whole memoir with the necessary illustrations had been published.

but its median piece is said often to originate in two, which soon unite, especially when the side-pieces are wanting. By way of examples of L'Herminier's observa- tions, what he says of the two groups that had been the subject of Cuvier's and the elder Geoffroy's contest may be mentioned. In the Galline the five well-known pieces or centres of ossification are said

to consist of the two side-pieces of the second or middle series, and the three of the posterior. On two occasions, however, there was found in addition, what may be taken for a representation of the first series, a little "noyaw" situated between the coracoids—forming the only instance of all three series being present in the same Bird. As regards the Ducks, L'Herminier agreed with Cuvier that there are commonly only two centres of ossification—the side-pieces of the middle series; but as these grow to meet one another a distinct median " noyau," also of the same series, sometimes appears, which soon forms a connexion with each of them. In the Ostrich and its allies no trace of this median centre of ossification ever occurs; but with these exceptions its existence is invariable in all other Birds. Here the matter must be left; but it is undoubtedly a subject which demands further investigation, and naturally any future investigator of it should consult the abstract of L'Herminier's memoir and the criticisms upon it of the younger Geoffroy.

Hitherto it will have been seen that our present busi- ness has lain wholly in Germany and France, for, as is elsewhere explained, the chief ornithologists of Britain were occupying themselves at this time in a very useless way—not but that there were several distinguished men in this country who were paying due heed at this time to the internal structure of Birds, and some excellent descrip- tive memoirs on special forms had appeared from their pens, to say nothing of more than one general treatise on ornithic anatomy.? Yet no one in Britain seems to have attempted to found any scientific arrangement of Birds on

other than external characters until, in 1837, WILLIAM pfac- MACGILLIVRAY issued the first volume of his /istory of gillivray.

British Birds, wherein, though professing (p. 19) "not to add a new system to the many already in partial use, or that have passed away like their authors," he propounded (pp. 16-18) a scheme for classifying the Birds of Europe at least founded on a "consideration of the digestive organs, which merit special attention, on account, not so much of their great importance in the economy of birds, as the nervous, vascular, and other systems are not behind them in this respect ; but because, exhibiting great diver- sity of form and structure, in accordance with the nature of the food, they are more

obviously qualified to afford a basis for the classification of the numerous species of birds” (p. 52). Experience has again and again exposed the fallacy of this last conclusion, but it is no disparag- ment of its author, writing nearly fifty years ago, to say that in this passage, as well as in others that might be quoted, he was greater as an anatomist than as a logician.

2 Sir Richard Owen’s celebrated article ‘‘ Aves,” in Todd’s Cyclo- pedia of Anatomy and Physiology (i. pp. 265-358), appeared in 1836, and, as giving a general view of the structure of Birds, needs no praise here; but its object was not to establish a classification, or throw light especially on systematic arrangement. So far from that being the case, its distinguished author was content to adopt, as he tells us, the arrangement proposed by Kirby in the Seventh Bridgewater Treatise (ii. pp. 445-474), being that, it is true, of an estimable zoologist, but of one who had no special knowledge of Ornithology. Indeed it is, as the latter says, that of Linneus, improved by Cuvier, with an

additional modification of Tlliger’s—all these three authors having”

totally ignored any but external characters. Yet it was regarded ‘‘as being the one which facilitates the expression of the leading anatomical differences which obtain in the class of Birds, and which therefore may be considered as the most natural.”

He was indeed thoroughly grounded in anatomy,! and though undoubtedly the digestive organs of Birds have a claim to the fullest consideration, yet Macgillivray himself subsequently became aware of the fact that there were geveral other parts of their structure as important from the point of view of classification. He it was, apparently, who first detected the essential difference of the organs of voice presented by some of the New-World Passerines (subsequently known as Clamatores), and the earliest intimation of this seems to be given in his anatomical description of the Arkansas Flycatcher, Tyrannus verticalis, which was published in 1838 (Ornithol. Biography, iv. p. 425), though it must be admitted that he did not—because he then could not—perceive the bearing of their difference, which was reserved to be shown by the investigation of a still greater anatomist, and of

one who had fuller facilities for research, and thereby almost revolutionized, as will presently be mentioned, the views of systematists as to this Order of Birds. There is only space here to say that the second volume of Macgillivray's work was published in 1839, and the third in 1840; but it was not until 1852 that the author, in broken health, found an opportunity of issuing the fourth and fifth. His scheme of classification, being as before stated partial, need not be given in detail. Its great mierit is that it proved the necessity of combin- ing another and hitherto much-neglected factor in any natural arrangement, though vitiated as so many other schemes have been by being based wholly on one class of characters.

But a bolder attempt at classification was that made in 1838 by BiytH in the New Series (Mr Charlesworth's) of the Magazine of Natural History (ii. pp. 256-268, 314— 319, 351-361, 420-426, 589-601; iii. pp. 76-84). It was limited, however, to what he called Jnsessores, being the group upon which that name had been conferred by Vigors (Zrans, Linn. Society, xiv. p. 405) in 1823 (see above, p. 15), with the addition, however, of his Raptores, and it will be unnecessary to enter into particulars con- cerning it, though it is as equally remarkable for the insight shewn by the author into the structure of Birds as for the philosophical breadth of his view, which comprehends almost every kind of character that had been at that time brought forward. It is plain that Blyth saw, and perhaps he was the first to see it, that Geographical Distribution was not unimportant in suggesting the affinities and differences of natural groups (pp. 258, 259); and, unde- terred by the precepts and practice of the hitherto dominant English school of Ornithologists, he declared that "anatomy, when aided by every character which the manner of propagation, the progressive changes, and other physiological data supply, is the only sure basis of classi- fication." He was quite aware of the taxonomic value of the vocal organs of some groups of Birds, presently to be especially mentioned, and he had himself ascertained the presence and absence of ceca in a not inconsiderable number of groups, drawing thence very justifiable infer- ences. He knew at least the earlier investigations of

1 This is not the place to expatiate on Macgillivray's merits ; but the writer may perhaps be excused for here uttering the opinion that, after Willughby, Macgillivray was the greatest and most original ornitho- logical genius save

one (who did not live long enough to make his powers widely known) that this island has prdduced. The exact amount of assistance he afforded to Audubon in his Ornithological Biography will probably never be ascertained ; but, setting aside ‘‘all the anatomical descriptions, as well as the sketches by which they are sometimes illustrated,” that on the latter’s own statement (op. e7t., iv., Introduction, p. xxiii) are the work of Macgillivray, no impartial reader can compare the style in which the History of British Birds is written with that of the Ornithological Biography without recogniz- Ing the similarity of the two. On this subject some remarks of Prof, a (Bull. Nutt. Ornithol. Club, 1880, p. 201) may well be consuited,

L’Herminier, and, though the work of Nitzsch, even if he had ever heard of it, must (through ignorance of the language in which it was written) have been to him a sealed book, he had followed out and extended the hints already given by Temminck as to the differences which various groups of Birds display in their moult. With all this it is not surprising to find, though the fact has been generally overlooked, that Blyth’s proposed arrangement in many points anticipated conclusions that were subse- quently reached, and were then regarded as fresh dis- coveries. It is proper to add that at this time the greater part of his work was carried on in conjunction with Mr

BARTLETT, the present Superintendent of the Zoological Bartlett.

Society’s Gardens, and that, without his assistance, Blyth’s opportunities, slender as they were compared with those which others have enjoyed, must have been still smaller. Considering the extent of their materials, which was limited to the bodies of such animals as they could obtain from dealers and the several menageries that then existed in or near London, the progress made in what has since proved to be the right direction is very wonderful. It is obvious that both these investigators had the genius for recognizing and interpreting the value of characters ; but their labours do not seem to have met with much encouragement ; and a general arrangement of the Class laid by Blyth before the Zoological Society at this time ? does not appear in its publications, possibly through his neglect to reduce his scheme to writing and deliver it within the prescribed period. But even if this were not the case, no one need be surprised at the result. The scheme could hardly fail to

be a crude performance—a fact which nobody would know better than its author ; but it must have presented much that was objectionable to the opinions then generally prevalent. Its line to some extent may be partly made out—yvery clearly, for the matter of that, so far as its details have been published in the series of papers to which reference has been given—and some traces of its features are probably preserved in his Catalogue of the specimens of Birds in the Museum of the Asiatic Society of Bengal, which, after several years of severe labour, made its appearance at Calcutta in 1849; but, from the time of his arrival in India, the onerous duties imposed upon Blyth, together with the want of sufficient books of reference, seem to have hindered him from seriously con- tinuing his former researches, which, interrupted as they were, and born out of due time, had no appreciable effect on the views of systematizers generally.

Next must be noticed a series of short treatises communicated by JOHANN Frizpricu BRANnprT, between the years 1836 and 1839, to the Academy of Sciences of St Petersburg, and published in its Mémoires. Inthe year last mentioned the greater part of thesc was separately issued under the title of Beitrdge zur Kenntniss der Naturgeschichte der Vogel. Herein the author first assigued anatomical reasons for rearranging the Order Anseres of Linneus and Natatores of Illiger, who, so long before as 1811, had proposed a new distribution of it into six Families, the definitions of which, as was his wont, he had drawn from external characters only. Brandt now retaincd very nearly the same arrangement as his predecessor ; but, notwithstanding that he could trust to the firmer foundation of intcrnal framework, he took at least two retro- grade steps. First he failed to see the great structural difference between the Penguins (which Illiger had placed as a group, Impennes, of equal rank to his other Families) and the Auks, Divers, and Grebes, Pygopodes—combining all of them to form a “Typus ” (to use his term) Urinatores ; and secondly he admitted among the Natatores, though as a distinct ‘‘Typus” Podoidz,the genera Podoa and Fuliea, which are now known to belong to the Rallide—the latter indeed (see Coot, vol. vi. p. 341) being but very slightly removed from the Moor-1iEN (vol. xvi. p. 808). At

the same time he corrected the error made by Iliger in associating the PHALAROPES (q.v.) with these forms, rightly declaring their ee ee eames eS

2 An abstract is contained in the Minute-book of the Scientific Meetings of the Zoological Society, 26th June and 10th July 1838. The Class was to contain fifteen Orders, but only three were dealt

with in any detail. wii 4

Keyser- ling and Blasius.

Nitzsch,

relationship to Tringa (see SANDPIPER), a point of order which other systematists were long in admitting. On the whole Brandt's labours were of no small service in asserting the prineiple that eon- sideration must be paid to osteology ; for his position was such as to gain more attention to his views than some of his less favourably placed brethren had sueceeded in doing.

In the same year (1839) another slight advance was made in the elassification of the true Passerines, Kuryseriinc and Buasius briefly pointed ont in the Archiv fiir Naturgeschichte (v. pp. 332-334) that, while all the other Birds provided with perfect song-museles had the ‘‘planta" or hind part of the ‘‘ tarsus" covered with two long and undivided horny plates, the Larks (vol. xiv. p. 316) had this part divided by many transverse sutures, so as to be scutellated behind as well as in front; just as is the ease in many of the Passerines which have not the singing-apparatus, and also in the Hoopos (vol. xii. p. 154). The importanee of this singular but superficial departure from the normal strueture has been so need- lessly exaggerated as a character that at the present time its value is apt to be unduly depreciated. In so large and so homogeneous a group as that of the true Passerines, a constant echaraeter of this kind is not to be despised as a practical mode of separating the Birds which possess it ; and, nore than this, it would appear that the discovery thus announced was the immediate means of leading to a series of investigations of a much more important and lasting nature—those of Johannes Miiller to be presently mentioned.

Again we must recur to that indefatigable and most original investigator NirzscH, who, having never inter- mitted his study of the particular subject of his first con- tribution to science, long ago noticed, in 1833 brought out at Halle, where he was Professor of Zoology, an essay with the title Pterylographix Avium Pars prior. It seems that this was issued as.much with the object of inviting assistance from others in view of future labours, since the materials at his disposal were comparatively scanty, as with that of making known the results to which his researches had already led him. Indeed he only com- municated copies of this essay to a few friends, and examples of it are comparatively scarce. Moreover, he stated subsequently that he thereby hoped to excite other naturalists to share with him the investigations he was making on a subject which had hitherto escaped notice or had been wholly neglected, since he considered that he had proved the disposition of the feathered tracts in the plumage of Birds to be the means of furnishing characters for the discrimination of the various natural groups as significant and important as they were new and un- expected.! There was no need for us here to quote this

essay in its chronological place, since it dealt only with

the generalities of the subject, and did not enter upon any systematic details. These the author reserved for a second treatise which he was destined never to complete. He kept on diligently collecting materials, and as he did so

1 It is still a prevalent belief among nearly all persons but well- informed ornithologists, that feathers grow almost uniformly over the whole surface of a Bird’s body ; some indeed are longer and some are shorter, but that is about all the difference perceptible to most people. It is the easicst thing for anybody to satisfy himself that this, except in a few cases, is altogether an erroneous supposition. In all but a small number of forms the feathers are produced in very definite clumps or tracts, called by Nitzsch pteryle# (xrepév, penna, brn, sylva), arather fanciful term it is true, but one to which no objection can be taken. Between these pterylw are spaces bare of feathers, which he named apteria. Before Nitzsch’s time the only men who seem to have noticed this fact were the great John Hunter and the accurate Macartney. But the observations of the former on the subject were not given to the world until 1836, when Sir R. Owen introduced them into his

Catalogue of the Museum of the College of Surgeons in London (vol. iii. pt. ii. p. 311), and therein is no indication of the fact having a taxonomical bearing. The same may be said of Macartney's remarks, which, though subsequent in point of time, were published earlier, namely, in 1819 (Rees's Cyclopedia, xiv., art. " Feathers"). Ignorance of this simple fact has led astray many celebrated painters, among them Sir Edwin Landseer, whose pictures of Birds nearly always shew an unnatural representation of the plumage that at once betrays itself to the trained eye, though of course it is not perceived by spectators generally, who regard only the correctness of attitude and force of expression, which in that artist's work commonly leave little to be desired. Every draughtsman of Birds to be suceessful should study the plan on which their feathers are disposed.

was constrained to modify some of the statements he had published. He consequently fell into a state of doubt, and before he could make up his mind on some questions which he deemed important he was overtaken by death.? Then his papers were handed over to his friend and suc-

cessor Prof. BURMEISTER, now and for many years past of Bur- Buenos Aires, who, with much skill elaborated from meister,

them the excellent work known as Nitzsch's Pterylo- graphie, which was published at Halle in 1840. There can be no doubt that Prof. Burmeister (fortunately yet spared to us) discharged his editorial duty with the most conscientious scrupulosity ; but, from what has been just said, it is certain that there were important points on which Nitzsch was as yet undecided—some of them perhaps of which no trace appeared in his manu- scripts, and therefore as in every case of works posthum- ously published, unless (as rarely happens) they have received their author's "imprimatur," they cannot be implicitly trusted as the expression of his final views. It would consequently be unsafe to ascribe positively all that appears in this volume to the result of Nitzsch's mature consideration. Moreover, as Prof. Burmeister states in his preface, Nitzsch by no means regarded the natural sequence of groups as the highest problem of the system- atist, but rather their correct limitation. Again the arrangement followed in the Prerylographie was of course based on pterylographical considerations, and we have its author's own word for it that he was persuaded that the

limitation of natural groups could only be attained by the most assiduous research into the species of which they are composed from every point of view. The combination of these three facts will of itself explain some defects, or even retrogressions, observable in Nitzsch's later systematic work when compared with that which he had formerly done. On the other hand some manifest improvements are introduced, and the abundance of details into which he enters in his Pterylographie render it far more instructive and valuable than the older performance. As an abstract of that has already been given, it may be sufficient here to point out the chief changes made in his newer arrangement. To begin with, the three great sections of Aerial, Terrestrial, and Aquatic Birds are abolished. The "Accipitres" are divided into two groups, Diurnal and Nocturnal ; but the first of these divisions is separated into three sections :—(1) the Vultures of the New World, (2) those of the Old World, and (3) the genus falco of Linneus. The "Passerine," that is to say, the true Passeres, are split into eight Families, not wholly with judgment ;° but of their taxonomy more is to be said presently. Then a new Order " Prcariz" is instituted for the reception of the Macrochires, Cuculine, Picinx, Psittacine, and Amphibole of his old arrangement, to which are added three* others—Caprimulgine, Todidz, and Lipoglosse—the last consisting of the genera Buceros, Upupa, and Alcedo. The association of Alcedo with the

2 Though not relating exactly to our present theme, it would be improper to dismiss Nitzsch's name without reference to his extra- ordinary labours in investigating the insect and other external parasites of Birds, a subject which as regards British species was subsequently elaborated by Denny in his Monographia Anoplurorum Britannie (1842) and in his list of the specimens of British Anoplura in the col- lection of the British Musenm.

3 A short essay by Nitzsch on the general structure of the Passerines, written, it is said, in 1836, was published in 1862 (Zeitschr. Ges. Naturwissenschaft, xix. pp. 389-408). It is probably to this essay that Prof. Burmeister refers in the Pterylographie (p. 102, note ; English translation, p. 72, note) as forming the basis of the article **Passerine"' which he contributed to Ersch and Grnber's Encyklo- piédie {sect. iii. bd. xiii. pp. 139-144), and published before the Pterylographie.

4 By the numbers prefixed it would look as if there should be four new members of this Order; but that seems to be due rather to a slip of the pen or to a printer’s error.

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other two is no doubt a misplacement, but the alliance of Buceros to Upupa, already suggested by Gould and Blyth in 1838! (Mag. Nat. History, ser. 2, ii. pp. 422 and 589), though apparently unnatural, has been corroborated by many later systematizers; and taken as a whole the estab- lishment of the Pecariz was certainly a commendable pro- ceeding. For the rest there is only one considerable change, and that forms the greatest blot on the whole scheme. Instead of recognizing, as before, a Subclass in the Ratite of Merrem, Nitzsch now reduced them to the rank of an Order under the name “ Platysterne,” placing them between the “ Gallinacee” and “ Grallx,” though admitting that in their pterylosis they differ from all other Birds, in ways that he is at great pains to describe, in each of the four genera examined by him—Struthio, Rhea, Dromexus, and Casuarius.? It is significant that notwith- standing this he did not figure the pterylosis of any one of them, and the thought suggests itself that, though his editor assures us he had convinced himself that the group must be here shoved in (ecngeschoben is the word used), the intrusion is rather due to the necessity which Nitzsch, in common with most men of his time (the Quinarians excepted), felt for deploying the whole series of Birds into line, ‘in which case the proceeding may be defensible on the score of convenience. The extraordinary merits of this book, and the admirable fidelity to his principles which Prof. Burmeister shewed in the difficult task of editing it, were unfortunately overlooked for many years, and perhaps are not sufficiently recognized now. Even in Germany, the author’s own couutry, there were few to notice seriously what is certainly one of the most remark- able works ever published on the science, much less to pursue the investigations that had been so laboriously begun. Andreas Wagner, in his report on the progress of Ornithology, as might be expected from such a man as he was, placed the Pterylographie at the summit of those publications the appearance of which he had to record for the years 1839

and 1840, stating that for “ Systematik ” it was of the greatest importance. On the other hand Oken (Js:s, 1842, pp. 391-394), though giving a summary of Nitzsch’s results and classification, was more sparing of his praise, and prefaced his remarks by asserting that he could not refrain from laughter when he looked at the plates in Nitzsch’s work, since they reminded him of the plucked fowls hanging in a poulterer’s shop—it might as well be urged as an objection to the plates in many an anatomical book that they called to mind a butcher’s—and goes on to say that, as the author always had the luck to engage in researches of which nobody thought, so had he the luck to print them where nobody sought them. In Sweden

1 This association is one of the most remarkable in the whole series of Blyth’s remarkable papers on classification in the volume cited above. He states that Gould suspected the alliance of these two forms “ from

external structure and habits alone ;” otherwise one might suppose that.

he had obtained an intimation to that effect on one of his Continental journeys. Blyth “arrived at the same conclusion, however, by a different train of investigation,” and this is beyond doubt.

- He does not mention Apéeryz, at that time so little known on the Continent.

3 Soine excuse is to be made for this neglect. Nitzsch had of course exhausted all the forms of Birds commonly to be obtained, and speci- mens of the less common forms were too valuable from the curator’s or collector’s point of view to be subjected to a treatment that might end in their destruction. Yet it is said, on good authority, that Nitzsch had the patience so to manipulate the skins of many rare species that he was able to ascertain the characters of their pterylosis by the inspec- tion of their inside only, without in any way damaging them for the ordinary purpose of a museum. Nor is this surprising when we con- sider the marvellous skill of Continental and especially German taxi- dermists, many of whom have elevated their profession to a height of art inconceivable to most Englishmen, who are only acquainted with the miserable mockery of Nature which is the most sublime result of all but a few “ bird-stuffers. ”

- Archiv fiir Naturgeschichte, vii. 2, pp. 60, 61.

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Sundevall, without accepting Nitzsch's views, accorded them a far more appreciative greeting in his annual reports for 1840-42 (i, pp. 152-160); but of course in England and France® nothing was known of them beyond the scantiest notice, generally taken at second hand, in two or three publications. Thanks to Mr Sclater, the Ray Society was induced to publish, in 1867, an excellent translation by Mr Dallas of Nitzsch's Pterylography, and thereby, however tardily, justice was at length rendered by British ornithologists to one of their greatest foreign brethren.®

The treatise of Kess_Er on the osteology of Birds' feet, published Kessler.

in the Bulletin of the Moscow Society of Naturalists for 1841, uext claims a few words, though its scope is rather to shew differences than affinities ; but treatment of that kind is undoubtedly useful at times in indicating that alliances generally admitted are unnatural ; and this is the case here, for, following Cuvier's method, the author's researches prove the artificial character of some of its associations, While furnishing—almost unconsciously, however-—additional evidence for overthrowing that classification, there is, nevertheless, no attempt made to construct a better one ; and the elaborate tables of dimensions, both absolute and pro-portional, suggestive as is the whole tendency of the author's observations, seem not to lead to any very practical result, though the systematist's nced to look beneath the integument, even in parts that are so comparatively little hidden as Birds' feet, is once more made beyond all question apparent.

It has already been mentioned that MACGILLIVRAY con- Macgil-

tributed to Audubon's Ornithological Biography a series of livray n

descriptions of some parts of the anatomy of American 4

Birds, from subjects supplied to him by that enthusiastic jo,

naturalist, whose zeal and prescience, it may be called, in this respect merits all praise. Thus he (prompted very likely by Macgillivray) wrote :—“TI believe the time to be approaching when much of the results obtained from the inspection of the exterior alone will be laid aside; when museums filled with stuffed skins will be considered insufficient to afford a knowledge of birds ; and when the student will go forth, not only to observe the habits and haunts of animals, but to preserve specimens of them to be carefully dissected” (Ornith. Biography, iv., Introduc- tion, p. xxiv). As has been stated, the first of this series of anatomical descriptions appeared in the fourth volume of his work, published in 1838, but they were continued until its completion with the fifth volume in the following year, and the whole was incorporated into what may be termed its second edition, Zhe Birds of America, which appeared between 1840 and 1844 (see p.11). Among the many species whose anatomy Macgillivray thus partly described from autopsy were at least half a dozen’ of those now referred to the Family 7Zyrannidx (see K1NG-BIRD, vol. xiv. p. 80), but then included, with many others, ac- cording to the irrational, vague, and rudimentary notions of classification of the time, in what was termed the Family “ Muscicapine.” In all these species he found the vocal organs to differ essentially in structure from those of other Birds of the Old World, which we now call Passerine, or, to be still more precise, Oscinian. But by him these last were most arbitrarily severed, dissociated from their allies, and wrongly combined with other forms by no means nearly related to them (Brit. Birds, i. pp. 17, 18) which

5 In 1836JACQUEMIN communicated to the French Academy (Comptes Rendus, ii. pp. 374, 375, and 472) some observations on the order in which feathers are disposed on the body of Birds ; but, however general may have been the scope of his investigations, the portion of them published refers only to the Crow, and there is no mention made of Nitzsch’s former work.

6 The Ray Society had the good fortune to obtain the ten original copper-plates, all but one drawn by the author himself, wherewith the work was illustrated. It is only to be regretted that the Society did not also stick to the quarto size in which it appeared, for by issuing their English version in folio they needlessly put an impediment in the way of its common and convenient use.

7 These are, according to modern nomenclature, Tyrannus caroli- nensis and (as before mentioned) 7. verticalis, Myiarchus crinitus, Sayornis fuscus, Contopus virens, and Empidonax acadicus.

he also examined ; and he practically, though not literally,! asserted the truth, when he said that the general struc- .ture, but especially the muscular appendages, of the lower larynx was “similarly formed in all other birds of this family” described in Audubon’s work. Macgillivray did not, however, assign to this essential difference any systematic value. Indeed he was so much prepossessed in favour of a classification based on the structure of the digestive organs that he could not bring himself to con- sider vocal muscles to be of much taxonomic use, and it

Johannes was reserved to JOHANNES MULLER to point out that the

Miiller.

contrary was the fact. This the great German compara- tive anatomist did in two communications to the Academy of Sciences of Berlin, one on the 26th June 1845 and the other on the 14th May 1846, which, having been first briefly published in the Academy’s Monatsbericht, were afterwards printed in full, and illustrated by numerous figures, in its Abhandlungen, though in this latter and complete form they did not appear in public until 1847. This very remarkable treatise forms the groundwork of almost all later or recent researches in the comparative anatomy and consequent arrangement of the Passeres, and, though it is certainly not free from imperfections, many of them, it must be said, arise from want of material, not- withstanding that its author had command of a much more abundant supply than was at the disposal of Nitzsch. Carrying on the work from the anatomical point at which he had left it, correcting his errors, and utilizing to the fullest extent the observations of Keyserling and Blasius, to which reference has already been made, Miiller, though hampered by mistaken notions of which he seems to have been unable to rid himself, propounded a scheme for the classification of this group, the general truth of which has been admitted by all his successors, based, as the title of his treatise expressed, on the hitherto unknown different types of the vocal organs in the Passerines. He freely

recognized the prior discoveries of, as he thought, Audubon, though really, as has since been ascertained, of Macgillivray ; but Miller was able to perceive their system- atic value, which Macgillivray did not, and taught others to know it. At the same time Miiller shewed himself, his power of discrimination notwithstanding, to fall behind Nitzsch in one very crucial point, for he refused to the latter's Picarie the rank that had been claimed for them, and imagined that the groups associated under that name formed but a third "Tribe "—Prcarii—of a great Order Insessores, the others being (1) the Oscines or Polymyodi —the Singing Birds by emphasis, whose inferior larynx was endowed with the full number of five pairs of song-muscles, and (2) the Zracheophones, composed of some South-American Families. Looking on Miiller's labours as we now can, we see that such errors as he committed are chiefly due to his want of special knowledge of Ornithology, combined with the absence in several instances of sufficient materials for investigation. Nothing whatever is to be said against the composition of his first and second "Tribes"; but the third is an assemblage still more heterogeneous than that which Nitzsch brought together under a name so like that of Miiller—for the fact must never be allowed to go out of sight that the extent of the Picard of the latter is not at all that of the Picarie of the former.? For instance, Miiller places in his

} Not literally, because a few other forms such as the genera Polio- ptila and Ptilogonys, now known to have no relation to the Tyrannide,,. were included, though these forms, it would seem, had never been dis- sected by him. On the other hand he declares that the American Redstart, Muscicapa, or, as it now stands, Setophaga ruticilla, when young, has its vocal organs like the rest—an extraordinary statement which is worthy the attention of the many able American ornithologists.

2 It is not needless to point out this fine distinction, for more than one modern author would seem to have overlooked it.

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third " Tribe" the group which he called ~~Ampelidx, mean~~ ing thereby the peculiar forms of South America that are now considered to be more properly named Cotingidx, and herein he was clearly right, while Nitzsch, who (misled by their supposed affinity to the genus Ampelis—peculiar to

the Northern Hemisphere, and a purely Passerine form) had kept them among his Passerine, was as clearly wrong. But again Miiller made his third “Tribe” Picard also to contain the Z’yrannidx, of which mention has just been made, though it is so obvious as now to be generally admitted that they have no very intimate relationship to the other Families with which they are there associated. There is no need here to criticize more minutely his pro- jected arrangement, and it must be said that, notwithstand- ing his researches, he seems to have had some misgivings that, after all, the separation of the Jnsessores into those “Tribes” might not be justifiable. At any rate he wavered in his estimate of their taxonomic value, for he gave an alternative proposal, arranging all the genera in a single series, a proceeding in those days thought not only defens- ible and possible, but desirable or even requisite, though now utterly abandoned. Just as Nitzsch had laboured under the disadvantage of never having any example of the abnormal Passeres of the New World to dissect, and therefore was wholly ignorant of their abnormality, so Miller never succeeded in getting hold of an example of the genus Pitta for the same purpose, and yet, acting on the clew furnished by Keyserling and Blasius, he did not hesitate to predict that it would be found to fill one of the gaps he had to leave, and this to some extent it has been since proved to do. .

The result of all this is that the Oscincs or true Passercs are found to be a group in which the vocal organs not only attain the greatest perfection, but are nearly if not quite as uniform in their structure as is the sternal apparatus; while at the same time each set of characters is wholly unlike that which exists in any other group of Birds. In nearly all Birds the inferior larynx, or syrinx, which is, as proved long ago by the experiments of Cuvier, the seat of their vocal powers, is at the bottom of the trachea or windpipe, and is formed by the more or less firm union of several of the bony rings of which that tube is composed. In the Ratitw, the genus Rhea excepted, and in one group of Carinatxw, the American Vultures Ccater tile but therein it is believed only, there is no special modification of the trachea into a syrinx ;3 but usually, at a little distance froin the lungs, the trachea is somewhat enlarged, and here is founda thicker and stouter bony ring, which is bisected axially by a septwm or partition extending from behind forwards, and thus dividing the pipe,‘ each half of which swells out below the ring and then rapidly contracts to enter the lung on its own side. The

halves of the pipe thus formed are the bronchi, tubes whose inner side is flattened and composed of the membrana tympani- formis, on the change of form and length of which some of the varieties of intonation depend, while the onter and curved side is supported by bony half-hoops, connected by membrane just as are the entire hoops of the upper part of the trachea. The whole of this apparatus is extremely flexible, and is controlled by muscles, the real vocal muscles of which mention has previously been so frequently made. These vary in number in different groups of Birds, and reach their maximum in the Oscines, which have always five pairs, or even more according to some authorities.© But sup- posing five to be the number of pairs, as it is generally allowed to be in this group of them, two pairs have a common origin about the middle of the trachea, and, descending on its outside, divide at a short distance above the lower end of the tube ; one of them, the tensor postcrior longus, being directed downward and backward, is inserted at the extreme posterior end of the first half-ring of the bronchus, while its countcrpart, the tensor anterior longus, passing from the place of separation downward and forward, is inserted below the extreme point of the last ring of the trachea. Within the angle formed by the divergence of each of these pairs of muscles, a third slender muscle—the sterno-trachcalis —is given off

3 See Brrps, vol. iii. p. 726; but cf Forbes, Proc. Zool. Society, ISSiope 17.85 105.

4 In a few forms belonging to the Spheniscid# and Procellariida, this septwm is prolonged upwards, to what purpose is of course unknown. On the other hand, the Parrots have no septum (see BrRDs, ut supra).

5 See Brrps, vol. iii, p. 726.

on each side and is attached to the steruum.! The fourth pair, the | tensores postcriores breves, is the smallest of all, and, arising near the middle of the

lower end of the trachea, has its fibres inserted on the extremity of the first of the incomplete rings of the bronchi. The fifth pair, the tensorcs antcriorcs, originates like the last from the middle of the trachea, but is somewhat larger and thicker, appearing as though made up of several small muscles in close contact, and by some ornithotomists is believed to be of a com- posite nature. Its direction is obliquely downward and forward, and, attached by a broad base to the last ring of the trachea and cartilage immediately below, reaches the first or second of the half- rings of the bronchi—in the normal Oscines at their extremity; but, in another section of that group, which it will be necessary to mention later, it is found to be attached to their middle. There is no question of its being by the action of the syringeal muscles just described that the expansion of the bronchi, both as to length and diameter, is controlled, and, as thereby the sounds uttered by the Bird are modified, they are properly called the Song-muscles.

It must not be supposed that the muscles just defined were first discovered by Miiller; on the contrary they had been described long before, and by many writers on the anatomy of Birds. To say nothing of foreigners, or the authors of general works on the subject, an excellent account of them had been given to the Linnean Society by YARRELL in 1829, and published with elaborate figures in its Transactions (xvi. pp. 305-821, pls. 17, 18), an abstract of which was subsequently given in the article “Raven” inhis History of British Birds, and Macgillivray also described and figured them with the greatest accuracy ten years later in his work with the same title (ii. pp. 21-37, pls. x.~~xii.), while Blyth and Nitzsch had (as already mentioned) seen some of their value in classification. But Miiller has the merit of clearly outstriding his predecessors, and with his accustomed perspicuity made the way even plainer for his successors to see than he himself was able to see it. What remains to add is that the extraordinary celebrity of its author actually procured for the first portion of his researches notice in England (Ann. Nat. History, xvii. p. 499), though it must be confessed not then to any practical purpose; but more than thirty years after there appeared an English translation of his treatise by Prof. Jeffrey Bell, with an appendix by Garrod con~~ taining a summary of the latter’s own continuation of the same line of research, and thus once more Mr Sclater, for it was at his instigation that the work was undertaken, had the satisfaction of rendering

proper tribute to one who by his investigations had so materially advanced the study of Ornithology.?

It is now necessary to revert to the year 1842, in which Dr Cornay of Rochefort communicated to the French Academy of Sciences a memoir on a new Classification of Birds, of which, how- ever, nothing but a notice has been preserved (Comptes Rendus, xiv. p. 164). Two years later this was followed by a second contri- bution from him on the same subject, and of this only an extract appeared in the official organ of the Academy (ut supra, xvi. pp. 94, 95), though an abstract was inserted in one scicntific journal (L' Institut, xii. p. 21), and its first portion in another (Journal des Découvertes, i. p. 250). The Revwe Zoologique for 1847 (pp. 360-369) contained the whole, and enabled naturalists to consider the merits of the author's project, which was to found a new Classification of Birds on the form of the anterior palatal bones, which he declared to be subjected more evidently than any other to certain fixed laws. These laws, as formulated by him, are that (1) there is a coincidence of form of the anterior palatal and of the cranium in Birds of the same Order; (2) there is a likeness between the anterior palatal bones in Birds of the same Order; (8) there are relations of likeness

between the anterior palatal bones in groups of Birds which are near to one another. These laws, he added, exist in regard to all

1 According to Blyth (Mag. Nat. History, ser. 2, ii. p. 264),

Yarrell ascertained that this pair of muscles was wanting in ''the mina genus" (qu. Gracula?), a statement that requires attention either for confirmation or contradiction.

- The title of the English translation is Johannes Miiller on Certain Variations in the Vocal Organs of the Passeres that have hitherto escaped notice. Jt was published at Oxford in 1878. By some unaccountable accident, the date of the original communication to the

ny of Berlin is wrongly printed. It has been rightly given above,

parts that offer characters fit for the methodical arrangement of Birds, but it is in regard to the anterior palatal bone that they unquestionably offer the most evidence. In thc evolution of these laws Dr Cornay had most laudably studied, as his observations prove, a vast number of different types, and the upshot of his whole labours, though not very clearly stated, was such as to wholly sub- vert the classification at that time generally adoptcd by French ornithologists. He of course knew the investigations of L'Herminier and De Blainville on sternal formation, and lie also seems to have been aware of some pterylological differences exhibited by Birds— whether those of Nitzsch or those of Jacquemin is not stated. True it is the latter were never published in full, but it is quite conceiv- able that Dr Cornay may have known tlieir drift. Be that as it may, he declares that characters drawn from the sternum or the pelvis—hitherto deemed to be, next to the bones of the head, the most important portions of the Bird's framework—arc scarcely worth more, from a classificatory point of view, than characters drawn from the bill or the legs ; while pterylological considerations, together with many others to which some systematists liad attached more or less importance, ean only assist, and apparently must never be taken to control, the force of evidence furnished by this bone of all bones—the anterior palatal.

That Dr Cornay was on the brink of making a discovery of con- siderable merit will by and by appear ; but, with every disposition to regard his investigations favourably, it cannot be said that he accomplished it. No account need be taken of the criticism which denominated his attempt " unphilosophical and one-sided," nor does it signify that his proposals either attracted no attention or were generally received with indifference. Such is commonly the fate of any deep-seated reform of classification proposed by a compara- tively unknown man, unless it happen to possess some extraordinarily taking qualities, or be explained with an abundance of pictorial illustration. This was not the case here. Whatever proofs Dr Cornay may have had to satisfy himself of his being on the right track, these proofs were not adduced in sufficient number nor arranged with sufficient skill to persuade a somewhat stiff-necked generation of the truth of his views—for it was a generation whose leaders, in France at any rate, looked with suspicion upon any one who professed to go beyond the bounds which the genius of Cuvier had been unable to overpass, and regarded the notion of upsetting any of the positions maintained by him as verging alinost upon

profanity. Moreover, Dr Cornay's scheme was not given to the world with any of those adjuncts that not merely please the eye but are in many cases necessary, for, though on a subject which required for its proper compreliension a series of plates, it made eveui its final appearance unadorned by a single ex- planatory figure, and in a journal, respectable and well-known in- deed, but one not of the highest scientific rank. Add to all this that its author, in his summary of the practical results of his in- vestigations, committed a grave sin in the eyes of rigid systematists by ostentatiously arranging the names of the forty types which he selected to prove his case wholly without order, and without any intimation of the greater or less affinity any one of them miglit bear to the rest. That success should attend a scheme so inconclusively elaborated could not be expected.

The same year which saw the promulgation of the crude scheme just described, as well as the publication of the final researches of Miiller, witnessed also another attempt at the classification of Birds, much more limited indeed in scope, but, so far as it went, regarded by most ornithologists of the time as almost final in its operation.

Under the vague title of " Ornithologische Notizen" Prof. Cabanis Cabanis.

of Berlin contributed to the Archiv fiir Naturgeschichte (xiii. 1, pp. 186-256, 308-352) an essay in two parts, wherein, following the researches of Miiller * on the syrinx, in the course of which a correlation had been shewn to exist between the whole or divided condition of the planta or hind part of the "tarsus," first noticed, as has been said, by Keyserling and Blasius, and the presence or absence of the perfect song-apparatus, the younger author found an agreement which seemed almost invariable in this respect, and he also pointed out that the planéa of the different groups of Birds in which it is divided is divided in different modes, the mode of division being generally characteristic of the group. Sucli a coincidence of the internal and external features of Birds was naturally deemed a discovery of the greatest value by those ornithologists who thought most highly of the latter, and it was unquestionably of no little practical utility, Further exantination also revealed the fact * that

3 On the other hand, Miiller makes several references to the labours of Prof. Cabanis. The investigations of both authors must have been proceeding

simultaneously, and it matters little which actually appeared first.

4 This seems to have been made known by Prof. Cabanis the preceding year to the Gesellschaft der Naturforschender Freunde (of. Miiller, Stimmorganen der Passerinen, p. 65). Of course the variation to which the number of primaries was subject had not escaped the observation of Nitzsch, but he had scarcely used it as a classificatory character.

in certain groups the number of “ primaries,” or quill-feathers grow- ing from the manus or distal segment of the wing, formed another characteristic easy of observation. In the Oscines or Polymyodi of Miller the number was either nine or ten—and if the latter the outermost of them was generally very small. In two of the other groups of which Prof. Cabanis especially treated—groups which had been hitherto more or less confounded with the Oscines—the number of primaries was invariably ten, and the outermost of them was comparatively large. This observation was also hailed as the dis- covery of a fact of extraordinary importance ; and, from the results of these investigations, taken altogether, Ornithology was declared by Sundevall, undoubtedly a man who had a right to speak with authority, to have made greater progress than had been achieved since the days of Cuvier. The final disposition of the “Subclass Inscssores””—all the perching Birds, that is to say, which are neither Birds-of-Prey nor Pigeons—proposed by Prof. Cabanis, was into four “ Orders,” as follows :—

1. Oscines, equal to Miiller’s group of the same name ;

2. Clamatores, being a majority of that division of the Picarizx of Nitzsch, so called by Andreas Wagner, in 1841,! which have their feet normally constructed ;

8. Strisores, a group now separated from the Clamatores of Wagner, and containing those forms which have their feet abnor- inally constructed; and

4, Scansores, being the Grimpewrs of Cuvier, the Zygodactyli of several other systematists.

The first of these four “Orders” had been already indefeasibly established as one perfectly natural, but respecting its details more must presently be said. The remaining three are now seen to be obviously artificial associations, and the second of them, Clamatorcs, in particular, containing a very heterogencous assemblage of forms ; but it must be borne in mind that the internal structure of some of them was at that time still more imperfectly known than now. Yet even then enough had been ascertained to have saved what are now recognized as the Families Zodidew and Tyrannid# from being placed as “Subfaniilies” in the same “ Family Colopicride”; and several other in’stances of unharmonious conibination in this “Order” might be adduced were it worth while to particularize them. More than that, it would not be difficult to shew, only the present is not exactly the place for it, that some groups or Families which in reality are not far distant from one another are distributed, owing to the dissimilarity of their external characters, throughout these three Orders. Thus the Podargingw are associated with the Coractidx under the head Clamatores, while the Caprimulgidx, to which they are clearly most allied, if they do not form part of that Family (GOATSUCKER, vol. x. p. 711), are placed with the Strisorcs ; and again the Musophagide also stand as Strisorcs, while the Cuculide, which modern systematists think to be thcir nearcst relations, are considered to be Scansores.

But to return to the Oscines, the arrangement of which in the classification now under review has been deemed its greatest merit, and consequently has been very generally followed. That by virtue of the perfection of their vocal organs, and certain other properties—though some of these last have perhaps never yet been made clear enough ——they should stand at the head of the whole Class, may here be freely admitted, but the respective rank assigned to the various component Families of the group is certainly open to question, and to the present writer seems, in the methods of several systematists, to be based upon a fallacy. This respective rank of the different Families appears to have been assigned on the principle that, since by reason of one character (namely, the more complicated structure of their syrinx) the Oscines form a higher group than the Clamatores, therefore all the concomitant features which the former possess and the latter do not must be equally indicative of superiority. Now one of the features in which most of the Oscines differ from the lower “ Order ” is the having a more or

less undivided planta, and accord- ingly it has been assumed that the Family of Oscines in which this modification of the planta is carried to its extreme point must be the highest of that “Order.” Since, therefore, this extreme modification of the planta is

1 Archiv fir Naturgeschichte, vii. 2, pp. 93, 94. The divisicn seems to have been instituted by this author a couple of years earlier in the second edition of his Handbuch der Naturgeschichte (a work not seen by the present writer), but not then to have received a scientific name. It included all Picariz# which had not “ zygodacty- lous” feet, that is to say, toes placed in pairs, two before and two behind.

exhibited by the Thrushes and their allies, it is alleged that they must be placed first, and indeed at the head of all Birds. The groundlessness of this reasoning ought to be apparent to everybody. In the present state of anatomy at any rate, it is impossible to prove that there is more than a coincidence in the facts just stated, and in the association of two characters —one deeply seated and affecting the whole life of the Bird, the other superficially, and so far as we can perceive without effect upon its organism. Because the Clamatores, having no song- muscles, have a divided planta, it cannot be logical to assume that among the Oscines, which possess song-muscles, such of them as have an undivided planta must be higher than those that have it divided. The argument, if it can be called an argument, is hardly one of analogy; and yet no stronger ground has been occupied by those who invest ° the ‘Thrushes, as do the majority of modern systematists, with the most dignified position in the whole Class. But passing from general to particular considerations, so soon as a practical application of the principle is made its inefficacy is manifest. The test of perfection of the vocal organs must be the perfection of the notes they enable their possessor to utter. There cannot be a question that, sing admirably as do some of the Birds included among the Thrushes,? the Larks, as a Family, infinitely surpass them. Yet the Larks form the very group which, as has been already shewn (Lark, vol. xiv. p. 314), have the planta more divided than any other among the Oscines. It seems hardly possible to adduce anything that would more conclusively demonstrate the

independent nature of each of these characters—the complicated structure of the syrinx and the asserted inferior formation of the planta— which are in the Alaudide associated. Moreover, this same Family affords a very valid protest against the extreme value attached to the presence or absence of the outermost quill-feather of the wings, and in this work it has been before shewn (ut supra) that almost every stage of magnitude in this feather is exhibited by the Larks from its rudimentary or almost abortive condition in Alauda arvensis to its very considerable development in Melano- corypha calandra. Indeed there are many genera of Oscines in which the proportion that the outermost primary bears to the rest is at best but a specific character, and certain exceptions are allowed by Prof. Cabanis (p. 313) to exist. Some of them it is now easy to explain, inas- much as in a few cases the apparently aberrant genera have elsewhere found a more natural position, a contin- gency to which he himself was fully awake. Butas a rule the allocation and ranking of the different Families of Oscines by this author must be deemed arbitrary. Yet the value of his Ornithologische Notizen is great, not only as evidence of his extraordinarily extensive acquaintance with different forms, which is proclaimed in every page, but in leading to a far fuller appreciation of characters that certainly should on no account be neglected, though

2 Prof. Cabanis would have strengthened his position had he included in the same Family with the Thrushcs, which he called Rha- cnemid#, the Birds commonly known as Warblers, Sylviida, which the more advanced of recent systematists are inclined with much reason to unite with the Thrushes, Turdidx ; but instead of that he, trusting to the plantar eharacter, segregated the Warblers, including of course the Nightingale, and did not even allow them the sccond place in his method, putting them below the Family called by him Sylvicolide, consisting chiefly of the American forms now known as Mniotiltidx, none of which as songsters approach those of the Old World.

3 Tt must be observed that Prof. Cabanis does not place the Alaudidx lowest of the seventcen Families of which he makes the Oscines to be composed. They stand eleventh in order, while the Corvidez are last— a matter on which something has to be said in the sequel.

4 By a curious error, probably of the press, the number of primaries assigned to the Paradiseidx and Corvidex is wrong (pp. 884, 335). In each case 10 should be substituted for 19 and 14.

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too much importance may easily be, and already has been, assigned to them.!

This will perhaps be the most convenient place to mention another kind of classification of Birds, which, based on a principle wholly different from those that have just been explained, requires a few words, though it has not been productive, nor is likely, from all that appears, to be productive of any great effect. So long ago as 1831, BoNAPARTE, in his Saggio di wna distribuzione metodica degli Animali Vertcbrati, published at Rome, and in 1837 com- municated to the Linnean Society of London, ‘‘A new Systematic Arrangement of Vertebrated Animals,” which was subsequently printed in that Society’s Transactions (xviii. pp. 247-304), though before it appeared there was issued at Bologna, under the title of Synopsis Vertebratorwm Systematis, a Latin translation of it. Herein he divided the Class Aves into two Subclasses, to which he applied the names of Jnscssorcs and Grallatores (hitherto used by their inventors Vigors and Illiger in a different sense), in the latter work relying chiefly for this division on characters which had not before been used by any systematist, namely, that in the former group Monogamy generally prevailed and the helpless nestlings were fed by their parents, while the latter group were mostly Polygamous, and the chicks at birth were active and capable of feeding themselves. This method, which in process of time was dignified by the title of a Physiological Arrangement, was insisted upon with more or less pertinacity by the author throughout a long series of publications, some of them separate books, some of them contributed to the memoirs issued by many scientific bodies of various European countries, ceasing only at his death, which in July 1857 found him occupied upon a Conspectus Gencrum Avium, that in consequence remains unfinished (see p. 14). In the course of

this series, however, he saw fit to alter the name of his two Sub- classes, since those which he at first adopted were open to a variety of meanings, and in a communication to the French Academy of Sciences in 1858 (Comptcs Rendus, xxxvii. pp. 641-647) the denomination Jnscssores was changed to Altrices, and Grallatores to Precoces—the terms now preferred by him being taken from Sundevall's treatise of 1835 already mentioned. 'The views of Bonaparte were, it appears, also shared by an ornithological amateur of some distinction, Hoce, who propounded a scheme which, as he subsequently stated (Zoologist, 1850, p. 2797), was founded strictly in accordance with them ; but it wonld secm that, allowing his convictions to be warped by other considerations, he abandoned the original '' physiological" basis of his system, so that this, when published in 1846 (Zdinb. N. Philosoph. Journal, xli. pp. 50-71), was found to be established on a single character of the feet only ; though he was careful to point out, immediately after formulating the definition of his Subclasses Constrictipedcs and Inconstrictipedes, that the former ''inake, in general, compact and well-built nests, wherein they bring up their very weak, blind, and mostly naked young, which they feed with care, by bringing food to thei for many days, until they are fledged and sufficiently strong to leave their nest," observing also that they ''are princi- pally monogamous" (pp. 55, 56); while of the latter he says that they ''make either a poor and rude nest, in which they lay their eggs, or else none, depositing them on the bare ground. The young are generally born with their full sight, covered with down, strong, and capable of running or swimming immediately after they leave the egg-shell." He adds that the parents, which "are mostly polygamous," attend their young and direct them where to find their food (p. 63). The numerous errors in these assertions hardly need pointing out. The Herons, for instance, are much more ** Constrictipcdcs"' than are the Larks or the Kingfishers, and, so far from the majority of '' Jnconstrictipedes" being polygamous, there is scarcely any evidence of polygamy obtaining as a habit among Birds in a state of nature except in certain of the Gallinz and a very few others. Furthermore, the young of the Goatsuckers are at hatching far more developed than are those of the Herons or the Cormorants ; and, in a general way, nearly every one of the as- scrted peculiarities of the two Subclasses breaks down under careful examination. Yet the idea of a '* physiological" arrangement on the same kind of principle found another follower, or, as he thonght, inventor, in

NEwMAN, who in 1850 communicated to the Zoological Society of London a plan published in its Procecdings for that year (pp. 46-48), and reprinted also in his own journal The Zoologist (pp. 2780-2782), based on exactly the same consider- ations, dividing Birds into two groups, "‘ Hesthogenous ”’—a word so vicious in formation as to be incapable of amendment, but intended to signify those that were hatched with a clothing of down—and “‘Gymnogenons,” or those that were hatched naked. These three systems arc essentially identical ; but, plausible as they may be at

1 A muweh more extensive and detailed application of his method was begun by Prof. Cabanis in the Afuseum Heineanum, a very useful catalogue of specimens in the collection of Herr Oberamtmann Heine, of which the first part was published at Halberstadt in 1850, and the last which has appeared, the work being still unfinished, in 1863.

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the first aspect, they have been found to be practically useless, though such of their characters as their upholders have advanced with truth deserve attention. Physiology may one day very likely assist the systematist; but it must be real physiology and not asham.

In 1856 Prof. Gervais, who had already contributed to the Gervais.

Zoologie of M. de Castelnau’s Expédition dans les parties centrales de VAmérique du Sud some important memoirs describing the anatomy of the Hoactzin (vol. xil. p. 28) and certain other Birds of doubtful or anomalous position, published some remarks on the characters which could be drawn from the sternum of Birds (Ann. Se. Nat. Zoologic, ser. 4, vi. pp. 5-15). The considerations are not very striking from a general point of view ; but the author adds to the weight of evidence which some of his predecessors had brought to bear on certain matters, particularly in aiding to abolish the artificial groups ‘‘ Déodactyls,” ‘“Syndactyls, ” and ‘‘ Zygodactyls,” on which so mucli reliance had been placed by many of his countrymen ; and it is with him a great merit that he was the first apparently to recognize publicly that characters drawn from the posterior part of the sternum, and particularly from the **échancrures,” commonly called in English ‘‘ notches” or ‘‘emar- ginations,” are of comparatively little importance, since

their number is apt to vary in forms that are most- closely allied, and even in species that are usually associated in the same genus or unquestionably belong to the same Family,? while these ‘‘ notches” sometimes become simple foramina, as in certain Pigeons, or on the other hand foramina may exceptionally change to ‘‘ notches,” and not unfrequently disappear wholly. Among his chief system- atic determinations we may mention that he refers the Tinamous to the Rails, because apparently of their deep ‘‘notches,” but otherwise takes a view of that group more correct according to modern notions than did most of his contemporaries, ‘The Bustards he would place with the ‘‘ Limicoles,” as also Dromas and Chionis, the SHEATH-BILL (g.v.). Phaethon, the TRopic-BirD (q.v.), he would place with the ‘‘Laridés” and not with the “ Pelécanidés,” which it only resembles in its feet having all the toes connected by aweb. Finally Divers, Auks, and Penguins, according to him, form the last term in the series, and it scems fit to him that they should be regarded as forming a separate Order. It is a curious fact that even at a date so late as this, and by an investigator so well informed, doubt should still have cxisted whether Apteryx (Kiw1, vol. xiv. p. 104) should be referred to the group containing the Cassowary and the Ostrich. On the whole the remarks of this esteemed author do not go much beyond such as might occur to any one who had made a study of a good serics of specimens ; but many of them are published for the first time, and the author is careful to insist on the necessity of not resting solely on sternal characters, but associating with them those drawn from other parts of the body.

Three years later in the same journal (xi. pp. 11-145, pls. 2-4) M. BLaAncnarv published some Recherches sur Ics caractércs ostéo- logiques des Oiscaux appliquécs a& la Classification natwrelle de ces animaux, strongly urging the superiority of such characters over those drawn from the bill or feet, which, he remarks, though they may have sometimes given correct notions, have mostly led to mis- takes, and, if observations of habits and food have sometimes afforded happy results, they have often been deceptive; so that, should more be wanted than to draw up a mere inventory of creation or trace the distinctive outline of each species, zoology without anatomy would remain a barren study. At the same time he states that authors who have occupied themselves with the sternum alone have often produced uncertain results, especially when they have neglected its anterior

for its posterior part ; for in truth every bone of the skeleton ought to be studied in all its details. Yet this dis- tinguished zoologist selects the sternum as furnishing the key to his primary groups or ‘‘ Orders” of the Class, adopting, as Merrem had done long before, the same two divisions Carinatz and Ratitz, naming, however, the former Tvropidosternti and the latter Homalosternii.2 Some unkind fate has hitherto hindered him from making known to the world the rest of his researches in regard to the other bones of the skeleton till he reached the head, and in the memoir cited he treats of the sternum of only a portion of his first “Order.” This is the more to be regretted by all ornithologists, since he intended to conclude with what to them would have becn a very great boon—the shewing in what way external characters coincided with those presented by Osteology. It was also within the scope of his plan to have continued on a inore extended scale the researches on ossification begun by L’Herminier, and thus M.

2 Thus he cites the cases of Machetes pugnax and Scolopax rusti- cola among the “Limicoles,” and Larus cataractes among the “ Laridés,” as differing from their nearest allies by the possession of only one “notch” on either side of the keel. Several additional instances are cited in Philos. Transactions, 1869, p. 337, note.

3 These terms were explained in his great work L’ Organisation du Réegne Animal, Oiseaux (p. 16), begun in 1855, and still (1884) no further advanced than its fourth part, comprehending in all but thirty- two pages of letter-press, to mean exactly the same as those applied by Merrem to his two primary divisions.

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Blanchard’s investigations, if completed, would obviously have taken extraordinarily high rank among the highest contributions to ornithology. As it is, so much of them as we have are of con- siderable importance; for,

in this unfortunately unfinished memoir, he describes in some detail the several differences which the sternum in a great many different groups of his Z'ropidosternii presents, and to some extent makes a methodical disposition of them accordingly. Thus he separates the Birds-of-Prey into three great groups—(1) the ordinary Diurnal forms, including the Falconide and Vulturidz of the systematist of his time, but distinguishing the American Vultures from those of the Old World; (2) Gypogeranus, the SECRETARY-BIRD (g.v.); and (8) the Owls (infra, p. 88). Next he places the Parrots (g.v.), and then the vast assemblage of '' Passereaux '—which he declares to be all of one type, even genera like Pipra (MANAKIN, vol. xv. p. 455) and Pitta—and con- cludes with the somewhat hetcrogeneous conglomeration of forms, beginning with Cypselus (SwIFT, g.v.), that so many systematists have been accustomed to call Picariv, though to them as a group he assigns no name. A continuation of the treatise was promised in a succeeding part of the Annales, but a quarter of a century has passed without its appearance.?

Important as are the characters afforded by the sternum, that bone even with the whole sternal apparatus should obviously not be considered alone. 'To aid ornithologists in their studies in this respect, Eyron, who for many years had been forming a collection of Birds' skeletons, began the publication of a series of plates repre- senting them. The first part of this work, Osteologia Avium, appeared early in 1859, and a volume was completed in 1867. A Supplement was issued in 1869, and a Second Supplement, in three parts, between 1873 and 1875. The whole work contains a great number of figures of Birds' skeletons and detached bones ; but they are not so drawn as to be of much practical use, and the accompanying letter-press is too brief to be satisfactory.

That the eggs laid by Birds should offer to some extent characters of utility to systematists is only to be expected, when it is con- sidered that those from the same nest generally bear an extraordin- ary family-likeness to one another, and also that in certain groups the essential peculiarities of the egg-shell are constantly and dis- tinctively characteristic. Thus no one who has ever examined the egg of a Duck or of a Tinamou would ever be in danger of not referring another Tinamou's egg or another Duck's, that he might see, to its proper Family, and so on with many others. Yet, as has been stated on

a former occasion (Birps, vol. iii. p. 772), the expectation held out to oologists, and by them, of the benefits to be conferred upon Systematic Ornithology from the study of Birds' eggs, so far from being fulfilled, has not unfrequently led to dis- appointment. But at the same time many of the shortcomings of Oology in this respect must be set down to the defective informa- tion and observation of its votaries, among whom some have been very lax, not to say incautions, in not ascertaining on due evidence the parentage of their speciinens, and the author next to be named is open to this charge. After several minor notices that appeared in journals at various times, Drs Murs in 1860 brouglit out at Paris his ambitious Traité général d'Oologie Ornithologique au point de vue de la Classification, which contains (pp. 529-538) a "Systema Oologicum" as the final result of his labours. In this scheme Birds are arranged according to what the author considered to be their natural method and sequence ; but the result exhibits some unions as ill-assorted as can well be met with in the whole range of tentative arrangements of the Class, together with some very unjustifiable divorces. Its basis is the classification of Cuvier, the modifications of which by Des Murs will seldom commend them- selves to systematists whose opinion is generally deemed worth having. Few, if any, of the faults of that classification are removed, and the improvements suggested, if not established by his successors, those especially of other countries than France, are ignored, or, as is the case with some of those of L'Herminier, are only cited to be set aside. Oologists have no reason to be thankful to Des Murs, notwithstanding his zeal in behalf of their study. It is perfectly true that in several or even in many instances he acknowledges and deplores the poverty of his information, but this does not excuse him for making assertions (and such assertions are not unfrequent) based on evidence that is either wholly untrustworthy or needs further enquiry before it can be accepted (Jbis, 1860, pp. 381-885). This being the case, it would seem useless to take up further space by analysing the several proposed modifications of Cuvier's arrange- ment. The great merit of the work is that the author shews the necessity of taking Oology into account when investigating the classification of Birds; but it also proves that in so doing the paramount consideration lies in the thorough sifting of evidence as to the parentage of the eggs which are to serve as the building stones of the fabric to be erected. The attempt of Des Murs was

1M. Blanchard’s animadversions on the employment of external characters, and on trusting to observations on the habits of Birds, called forth a rejoinder from Mr Wallace (Jdis, 1864, pp. 36-41), who successfully shewed that they are not altogether to be despised. ’

praiseworthy ; but in effect it has utterly failed, notwithstanding the encomiums passed upon it by friendly critics (ev. de Zoologie, 1860, pp. 176-183, 313-325, 370-373).2

Until about this time systematists, almost without exception, may be said to have been wandering with no definite purpose. At least their purpose was indefinite compared with that which they now have before them. No doubt they all agreed in saying that they were pro- secuting a search for what they called the True System of Nature ; but that was nearly the end of their agreement, for in what that True System consisted the opinions of scarcely any two would coincide, unless to own that it was some shadowy idea beyond the present power of mortals to reach or evencomprehend. The Quinarians, who boldly asserted that they had fathomed the mystery of Creation, had been shewn to be no wiser than other men, if indeed they had not utterly befooled themselves ; for their theory at best could give no other explanation of things than that they were because they were. The conception of such a process as has now come to be called by the name of Evolution was certainly not novel; but except to two men the way in which that process was or could be possible had not been revealed. Here there is no need to enter into details of the history of Evolution; but the annalist in every branch of Biology must record the eventful Ist of

July 1858, when the now celebrated views of Darwin and Darwin Mr Watuace were first laid before the scientific world,‘ and and must also notice the appearance towards the end of the Wallace

following year of the former’s Origin of Species, which has effected the greatest revolution of human thought in this or perhaps in any century. The majority of biologists who had schooled themselves on other principles were of course slow to embrace the new doctrine ; but their hesita- tion was only the natural consequence of the caution which their scientific training enjoined. A few there were who felt as though scales had suddenly dropped from their eyes, when greeted by the idea conveyed in the now familiar

phrase “ Natural Selection”; but even those who had hitherto believed, and still continued to believe, in the sanctity of “Species” at once perceived that their life-long study had undergone a change, that their old position was seriously threatened by a perilous siege, and that to make it good they must find new means of defence. Many bravely maintained their posts, and for them not a word of blame ought to be expressed. Some few pretended, though the contrary was notorious, that they had always been on the side of the new philosophy, so far as they allowed it to be philosophy at all, and for them hardly a word of blame is too severe. Others after due deliberation, as became men who honestly desired the truth and nothing but the truth, yielded wholly or almost wholly to argu- ments which they gradually found to be irresistible. But, leaving generalities apart, and restricting ourselves to what is here our proper business, there was possibly no branch of Zoology in which so many of the best informed and con- sequently the most advanced of its workers sooner accepted the principles of Evolution than Ornithology, and of course the effect upon its study was very marked. New spirit was given to it. Ornithologists now felt they had something before them that was really worth investigating. Ques- tions of Affinity, and the details of Geographical Distribu- tion, were endowed with a real interest, in comparison with

2 Tn this historical sketch of the progress of Ornithology it has not been thought necessary to mention other oological works, since they have not a taxonomic bearing, and the chief of them have been already named (Brrps, vol. iii. p. 774, note 1).

3 Neither Lamarck nor Robert Chambers (the now acknowledged author of Vestiges of Creation), though thorough evolutionists, rationally indicated any means whereby, to use the old phrase, ‘‘ the transmutation of species” could be effected.

4 Journal of the Proceedings of the Linnean Society, vol. iii., Zoology, pp. 45-62.

which any interest that had hitherto been taken was a trifling pastime. Classification assumed a wholly different aspect. It had up to this time been

little more than the shufiling of cards, the ingenious arrangement of counters in a pretty pattern. Henceforward it was to be the serious study of the workings of Nature in producing the beings we see around us from beings more or less unlike them, that had existed in bygone ages and had been the parents of a varied and varying offspring—our fellow-creatures of to- day. Classification for the first time was something more than the expression of a fancy, not that it had not also its imaginative side. Men's minds began to figure to them- selves the original type of some well-marked genus or Family of Birds. They could even discern dimly some generalized stock whence had descended whole groups that now differed strangely in habits and appearance—their discernment aided, may be, by some isolated form which yet retained undeniable traces of a primitive structure. More dimly still visiqns of what the first Bird may have been like could be reasonably entertained ; and, passing even to a higher antiquity, the Reptilian parent whence all Birds have sprung was brought within reach of man's consciousness. But, relieved as it may be by reflexions of this kind —dreams some may perhaps still call them—the study of Ornithology has unquestionably become harder and more serious ; and a corresponding change in the style of investigation, followed in the works that remain to be considered, will be immediately perceptible.

That this was the case is undeniably shewn by some remarks of Canon TristRAM, who, in treating of the Alaudide and Sasxicoline of Algeria (whence he had recently brought a large collection of specimens of his own making), stated ([bis, 1859, pp. 429-433) that he could "not help feeling convinced of the truth of the views set forth by Messrs Darwin and Wallace," adding that it was "hardly possible, I should think, to illustrate this theory better than by the Larks and Chats of North Africa." It is unnecessary to continue the quotation; the few words just cited are enough to assure to their author the credit of being (so far as is known) the first ornithological specialist who had the courage publicly to recognize and receive the new and at that time unpopular philosophy.! But greater work was at hand. In June 1860 Prof. ParKER broke, as most will allow, entirely fresh ground, and ground that he has since continued to till more deeply perhaps than any other zoologist, by communicating to the Zoological Society a memoir "On the Osteology of Baleniceps," subsequently published in that Society's 7'rans- actions (iv. pp. 269-351). Of this

contribution to science, as of all the rest which have since proceeded from him, may be said in the words he himself has applied (wt supra, p. 271) to the work of another labourer in a not distant field:—“ This is a model paper for unbiassed observation, and freedom from that pleasant mode of supposing instead of ascertaining what is the true nature of an anatomical element.”2 Indeed the study of this memoir, limited though it be in scope, could not fail to convince any one that it proceeded from the mind of one who taught with the authority derived directly from original knowledge, and not from association with the scribes—a conviction that has become strengthened as, in a series of successive memoirs, the stores of more than twenty years’ silent observation and unremitting research

1 Whether Canon Tristram was anticipated in any other, and if so in what, branch of Zoology will be a pleasing inquiry for the historian of the future.

2 It is fair to state that some of Prof. Parker’s conclusions respect- ing Baleniceps were contested by the late Prof. J. T. Reinhardt (Overs, K. D. Vid. Selsk. Forhandlinger, 1861, pp. 185-154; Ibis, 1862, pp. 158-175), and as it seems to the present writer not ineffec- tually. Prof. Parker replied to his critic (dis, 1862, pp. 297-299).

were unfolded, and, more than that, the hidden forces of the science of Morphology were gradually brought to bear upon almost each subject that came under discussion. These different memoirs, being technically monographs, have strictly no right to be mentioned in this place; but there is scarcely one of them, if one indeed there be, that does not deal with the generalities of the study; and the influence they have had upon contemporary investigation is so strong that it is impossible to refrain from noticing them here, though want of space forbids us from enlarging on their contents.2 Moreover, the doctrine of Descent with variation is preached in all—seldom, if ever, conspicu- ously, but perhaps all the more effectively on that account. There is no reflective thinker but must perceive that Morphology is the lamp destined to throw more light than that afforded by any other kind of study on the obscurity that still shrouds the genealogy of Birds as of other animals; and, though as yet its illuminating power is admittedly far from what is desired, it has perhaps never shone more

brightly than in Prof. Parker’s hands. The great fault of his series of memoirs, if it may be allowed the present writer to criticize them, is the indifference of their author to formulating his views, so as to enable the ordinary taxonomer to perceive how far he has got, if not to present him with a fair scheme. But this fault is possibly one of those that are “to merit near allied,” since it would seem to spring from the author’s hesitation to pass from observation to theory, for to theory at present belong, and must for some time belong, all attempts at Classification. Still itis not the less annoying and disappointing to the systematist to find that the man whose life-long application would enable him, better than any one else, to declare the effect of the alliances and differ- ences that have been shewn to exist among various mem- bers of the Class should yet be so reticent, or that when he speaks he should rather use the language of Morphology, which those who are not morphologists find difficult of correct, interpretation, and wholly inadequate to allow of zoological deductions.*

3 It may be convenient to our readers that a list of Prof. Parker’s works which treat of ornithological subjects, in addition to the two above mentioned, should here be given. They are as follows :— In the Zoological Society’s Transactions, 25th November 1862, ‘On the Osteology of the Gallinaceous Birds and Tinamous,”” v. pp. 149-241; 12th December 1865, ‘‘On some fossil Birds from the Zebbug Cave,” vi. pp. 119-124 ; 9th January 1868, ‘‘On the Oste- ology of the Kagu,” vi. pp. 501-521; 18th February 1873, ‘On the Aigithognathous Birds,” Pt. 1. ix. pp. 289-352 ; 15th February 1876, “¢On the Skull of the Agithognathous Birds,” Pt. Il. x. pp. 251-314. In the Proceedings of the same Society, 8th December 1863, ‘* On the systematic position of the Crested Screamer,” pp. 511-518 5, 28th February 1865, ‘On the Osteology of Aficroglossa alecto, pp. 235-238. In the Philosophical Transactions of the Royal Society, 9th March 1865, ‘*On the Structure and Development of the Skull in the Ostrich Tribe,” pp. 113-183; 11th February 1869, ‘‘ On the Structure and Development of the Skull of the Common Fowl,” pp. 755-807, In the Linnean Society’s Transactions, 2d April 1874, “On the Morphology of the Skull in the Woodpeckers and Wrynecks,” ser. 2, Zoology, i. pp. 1-225; 16th December WEB) PO Ora the Structure and Development of the Bird’s Skull,” ¢om. cit., pp. 99-154. In the Monthly Microscopical Journal for 1872, ‘‘ On the Structure and Development of the Crow’s Skull,” pp. 217-253 ; for 1873, ‘‘On the

Development of the Skull in the genus Turdus," pp. 102-107, and "On the Development of the Skull in the Tit and Sparrow Hawk," parts i. and ii., pp. 6-11, 45-50. There is besides the great work published by the Ray Society in 1868, A Monograph on the Structure and Development of the Shoulder-girdle and Sternum, of which pp. 142-191 treat of these parts in the Class Aves ; and our readers will hardly need to be reminded of the article Brrps in the present work (vol. iii. pp. 699-728). Nearly every one of this marvellous series of contributions is copiously illustrated by plates from drawings made by the author himself.

4 Ag an instance, take the passages in which Turnix and Thinocorus are apparently referred to the digithognathe (Trans. Zool. Society, 1X. pp. 291 et seqg.; and supra, vol. iii. p. 700), a view which, as shewn by the author (7ransactions, x. p. 310), isnot that really intended by him.

XVIIL — 5

Wagner.

Owen.

Lillje- borg.

Huxley.

34

For some time past rumours of a discovery of the highest interest had been agitating the minds of zoologists, for in 1861 AnpREas WaGNer had sent to the Academy of Sciences of Munich (Sitzwngsberichte, pp. 146-154; Ann, Nat. History, ser. 3, ix. pp. 261-267) an account of what he conceived to be a feathered Reptile (assigning to it the name G'riphosaurus), the remains of which had been found in the lithographic beds of Solenhofen ; but he himself, through failing health, had been unable to see the fossil. In 1862 the slabs containing the remains were acquired by the British Museum, and towards the end of that year Sir R. OwEN communicated a detailed description of them to the Philosophical Transactions (1863, pp. 33-47), proving their Bird-like nature, and referring them to the genus Archxopterye of

Hermann von Meyer, hitherto known only by the impression of a single feather from the same geological beds. Wagner foresaw the use that would be made of this discovery by the adherents of the new Philosophy, and, in the usual language of its opponents at the time, strove to ward off the " misinter- pretations " that they would put upon it. His protest, it is needless to say, was unavailing, and all who respect his memory must regret that the sunset of life failed to give him that insight into the future which is poetically ascribed to it. To Darwin and those who believed with him scarcely any discovery could have been more welcome ; but that is beside our present business. It was quickly seen—even by those who held Archexopteryx to be a Reptile —that it was a form intermediate between existing Birds and existing Reptiles—while those who were convinced by Sir R. Owen's researches of its ornithic affinity saw that it must belong to a type of Birds wholly unknown before, and one that in any future for the arrangement of the Class must have a special rank reserved for it.) It has been already briefly described and figured in this work (Birps, vol. iii. pp. 728, 729).

It behoves us next to mention the "Outlines of a Systematic Review of the Class of Birds," communicated by Prof, LintsERore to the Zoological Society in 1866, and published in its Proceedings for that year (pp. 5-20), since it was immediately after reprinted by the Smithsonian Institution, and with that authorization has exercised a great influence on the opinions of American ornitholo- gists, Otherwise the scheme would hardly need notice here. This paper is indeed little more than an English translation of one published by the author in the annual volume (Arsskrift) of the Scientific Society of Upsala for 1860, and belonging to the pre- Darwinian epoch should perhaps have been more properly treated before, but that at the time of its original appearance it failed to attract attention. The chief merit of the scheme perhaps is that, contrary to nearly cvery precedent, it begins with the lower and rises to the higher groups of Birds, which is of course the natural mode of proceeding, and one therefore to be commended. Other- wise the " principles" on which it is founded are not clear to the ordinary zoologist. Oue of them is said to be " irritability," and, though this is explained to mean, not "muscular strength alone, but vivacity and activity generally,"? it does not seem to form a character that can be easily appreciated either as to quantity or quality; in fact, most persons would

deem it quite immeasurable, and, as such, removed from practical consideration. Moreover, Prof. Lilljeborg's scheme, being actually an adaptation of that of Sundevall, of which we shall have to speak at some length almost immediately, may possibly be left for the present with these

remarks,

In the spring of the year 1867 Prof. HuxieEy, to the delight of an appreciative audience, delivered at the Royal College of Surgeons of England a course of lectures on Birds, and it is much to be regretted that his many engagements hindered him from publishing in its entirety his elucidation of the anatomy of the Class, and the results

' This was done shortly afterwards by Prof. Hickel, who pro- posed the name Sawrure for the group containing it.

2 On this ground it is stated that the Passeres should be placed highest in the Class, But those who know the habits and demeanour of many of the Limicole would no doubt rightly claim for them much more " vivacity and activity " than is possessed by most Passeres,

which he drew from his investigations of it; for never assuredly had the subject been attacked with greater skill and power, or, since the days Buffon, had Ornithology been set forth with greater eloquence. To remedy, in some degree, this unavoidable loss, and to preserve at least a portion of the fruits of his labours, Prof. Huxley, a few weeks after, presented an abstract of his researches to the Zoological Society, in whose Proceedings for the same year it will be found printed (pp. 415-472) as a paper "On the Classification of Birds, and on the taxonomic value of the modifications of certain of the cranial bones observable in that Class." Starting from the basis (which, undeniably true as it is, not a little shocked many of his ornithological hearers) "that the phrase 'Birds are greatly modified Reptiles' would hardly be an exaggerated expres- sion of the closeness" of the resemblance between the two Classes, which he had previously brigaded under the name of Sauropsida (as he had brigaded the Pisces and Amphibia as Ichthyopsida), he drew in bold outline both their like- nesses

and their differences, and then proceeded to inquire how the Aves could be most appropriately subdivided into Orders, Suborders, and Families. In this course of lectures he had already dwelt at some length on the insufficiency of the characters on which such groups as had hitherto been thought to be established were founded : but for the consideration of this part of his subject there was no room in the present paper, and the reasons why he arrived at the conclusion that new means of philosophically and successfully separating the Class must be sought are herein left to be inferred. The upshot, however, admits of no uncertainty: the Class Aves is held to be composed of three “ Orders ”—(I.) Saururm, Hickel; (II.) Ratrra, Merrem ; and (III.) Carmvarm, Merrem. The Saurure have the metacarpals well developed and not ancylosed, and the caudal vertebre are numerous and large, so that the caudal region of the spine is longer than the body. The furcula is complete and strong, the feet very Passerine in appearance. The skull and sternum were at the time unknown, and indeed the whole Order, without doubt entirely extinct, rested exclusively on the celebrated fossil, then unique, Archeopterya (BirDs, vol. iii. pp. 728, 729). The Latitz comprehend the Struthious Birds, which differ from all others now extant in the combination of several peculiarities, some of which have been mentioned in the preceding pages. The sternum has no keel, and ossifies from lateral and paired centres only; the axes of the scapula and coracoid have the same general direction ; certain of the cranial bones have characters very unlike those possessed by the next Order—the vomer, for example, being broad posteriorly and generally intervening between the basisphenoidal rostrum and the palatals and pterygoids ; the barbs of the feathers are disconnected 5 there is no syrinx or inferior larynx ; and the diaphragm is better developed than in other Birds.2 The Ratite are divided into five groups, separated by very trenchant characters, principally osteological, and many of them afforded by the cranial bones. These groups consist of (i.) Struthio (Osrricn, infra, p. 62), (i.) Rua (¢.2.), (iii.) Casuarius and Dromxus (EmEv, vol. viii. I), (va) Dinornis, and (v.) Apteryx (Krw1, vol. xiv. p. 104); but no names are here given tothem. The Carinatz comprise all other existing Birds. The sternum has more or less of a keel, and is said to ossify, with the possible exception of Strigops (Kakapo, vol. xiii. p. 825), from a median centre as well as from paired and lateral centres, The axes of the scapula and coracoid meet at an acute, or, as in

Didus (Dopo, vol. vii. p. 321) and Ocydromus (OcypromE, vol. Xvil, p. 222), at a slightly obtuse angle, while the vomer is

3 This peculiarity had led some zoologists to consider the Struthious Birds more nearly allied to the Manvmalia than any others,

comparatively narrow and allows the pterygoids and palatals to articulate directly with the basisphenoidal rostrum. The Carmatx are divided, according to the formation of the palate, into four " Suborders," and named (i.) Dromexognathx, (ii.) Schizognathe, (iii.) Desmognathez, and (iv.) digithognathe.| The Dromzxognathe resemble the Ratitx, and especially the genus Dromexus, in their palatal structure, and are composed of the T1namous (g.v.). The Schizognathe include a great many of the forms belonging to the Linnean Orders Calline, Gralla, and Anseres. In them the vomer, however variable, always tapers to a point anteriorly, while behind it includes the basisphenoidal rostrum between the palatals; but neither these nor the pterygoids are borne by its posterior divergentends. The maxillo-palatals are usually elongated and lamellar, uniting with the palatals, and, bending backward along their inner edge, leave a cleft (whence the name given to the "Suborder") between the vomer and themselves. Six groups of Schizognathe are distinguished with considerable minuteness :—(1) Charadriomorphe, con- taining Charadriide (PLovER, q.v.), Otidide (BUsTaARD, vol, iv. p. 578), and Scolopacide ; (2) Geranomorphe, including Gruidx (CRANE, vol. vi. p. 546) and Rallidz, between which Psophide and Rhinochetide are intermedi- ate, while the SERIEMa (q.v.) would also seem to belong here ; (3) Cecomorphx, comprising Laride (GULL, vol. xi. p. 274), Procellariide (PETREL, q¢.v.), Colymbide (DIVER, vol, vii. p. 292), and Alcidx (GUILLEMOT, vol. xi. p. 262); 4) Spheniscomorphe, composed of the PENGUINS (q.v.) ; i Alectoromorphe (Fowt, vol. ix. p. 491), being all the

Galline except the Tinamous; and finally (6) Peristero-

morphex, consisting of the Dovus (vol. vii. p. 379) and Piczons (q.v.). In the third of these Suborders, the Desmognathx, the vomer is either abortive or so small as to disappear from the skeleton. When it exists it is always

slender, and tapers to a point anteriorly. The maxillo-palatals are bound together (whence the name of the “ Suborder”) across the middle line, either directly or by the ossification of the nasal septum. The posterior ends of the palatals and anterior of the pterygoids articulate directly with the rostrum. The groups of Desmognathx are characterized as carefully as are those of the preceding “Suborder,” and are as follows :—(1) Chenomorphe, consisting of the Anatidex (Duck, vol. vii. p. 505; Gooss, vol, x. p. 777) with Palamedea, the ScrEAMER (q.v.) ; (2) Amphimorphe, the Fiamincous (vol. ix. p. 286); (3) Pelargomorphx, containing the Ardetde (HRoN, vol. xi. p. 760), Ciconiide (StorK, g.v.), and Tantalidx; (4) Dysporomorphx, the Cormorants (vol. vi. p. 407), FRigaTs-Birps (vol. ix. p. 786), GANNETS (vol. x. p. 70), and Peicans (q.v.); (5) Aetomorphx, comprising all the Birds-of-Prey ; (6) Psittacomorphex, the Parrots (9. v.) ; and lastly (7) Coccygomorphe, which are held to include four groups, viz., (a) Coliide (Movusx-Birp, vol. xvii. p. 6); (6) Musophagide (PLANTAIN-EATERS and TouRA- Koos, g.v.) Cuculide (Cuckow, vol. vi. p. 685), Bucconide, Rhamphastide (Toucans, q.v.), Capitonide, Galbulide (JACAMAR, vol. xili, p. 531); (c) Alcedinide (K1NG- FISHER, xiv. p. 81,) Bucerotide (HorNBILL, xii. p. 169), Upupide (Hoopox, xii. p. 154), Meropidx, Momotidx (Mormot, xvii. p. 3), Coractide (RoLLER, ¢.v.); and (d) Trogonidz (TROGON, g.v.). Next in order come the Celeo- morphe or WOODPECKERS (q.v.), a group respecting the exact position of which Prof. Huxley was uncertain,’

1 These names are compounded respectively of Dromeus, the generic name applicd to the Emeu, ox{¢a, a split or cleft, 5€rua, a bond or tying, atyi@os, a Finch, and, in each case, -yvd0os, a jaw.

- Prof. Parker subsequently advanced the Woodpeckers to a higher rank under the name of Saurognathe (Monthly Microscop. Journal, 1872, p, 219, and Tr. Linn. Soc., ser. 2, Zoology, i. p. 2).

though he inclined to think its relations were with the next group, dgithognathe, the fourth and last of his “ Sub- orders,” characterized by a form of palate in some respects intermediate between the two preceding. The vomer is broad, abruptly truncated in front, and deeply cleft behind, so

as to embrace the rostrum of the sphenoid ; the palatals have produced postero-external angles ; the maxillo-palatals are slender at their origin, and extend obliquely inwards and forwards over the palatals, ending beneath the vomer in expanded extremities, not united either with one another or with the vomer, nor does the latter unite with the nasal septum, though that is frequently ossified. Of the githognathe two divisions are made—(1) Cypselo- morphe, including Z'rochilide (HUMMING-BIRD, vol. xii. p. 357), Cypselide (Swirt, g.v.), and Caprimulgidx (Goat- SUCKER, vol. x. p. 711); and (2) Coracomorphz, which last are separable into two groups, one (a) formed of the genus Menura (LyRE-B1rD, vol. xv. p. 115), which then seemed to stand alone, and the other (b) made up of Polymyodz, Tracheophone, and Oligomyode, sections founded on the syringeal structure, but declared to be not natural.

The above abstract ° shews the general drift of this very remarkable contribution to Ornithology, and it has to be added that for by far the greater number of his minor groups Prof. Huxley relies solely on the form of the palatal structure, the importance of which Dr Cornay, as already stated (p. 29), had before urged, though to so little purpose. That the palatal structure must be taken into consideration by taxonomers as affording hints of some utility there can no longer be a doubt; but the present writer is inclined to think that the characters drawn thence owe more of their worth to the extraordinary perspicuity with which they have been presented by Prof. Huxley than to their own intrinsic value, and that if the same power had been employed to elucidate in the same way other parts of the skeleton—say the bones of the sternal apparatus or even of the pelvic girdle—either set could have been made to appear quite as instructive and perhaps more so. Adventitious value would therefore seem to have been acquired by the bones of the palate through the fact that so great a master of the art of exposition selected them as fitting examples upon which to exercise his skill.* At the same time it must be stated this selection was not premeditated by Prof. Huxley, but forced itself upon him as his investigations proceeded.> In reply to some critical remarks (bis, 1868, pp. 85-96), chiefly aimed at shewing the inexpediency of relying solely on one set of characters, especially when those afforded by the palatal bones were not, even within the limits of Families, wholly diagnostic, the author (Jbis, 1868, pp. 357-362) announced a slight modification of his original scheme,

by introducing three more groups into it, and concluded by indicating how its bearings upon the great question of “Genetic Classifica- tion” might be represented so far as the different groups of Carinate are concerned :—

3 This is adapted from that given in the Record of Zoological Literature (iv. pp. 46-49), which is believed to have not inadequately represented the author’s views.

4 The notion of the superiority of the palatal bones to all others for purposes of classification has pleased many persons, from the fact that these bones are not unfrequently retained in the dried skins of Birds sent home by collectors in foreign countries, and are therefore available for study, while such boues as the sternum and pelvis are rarely pre- served. ‘The conimon practice of ordinary collectors, until at least very recently, has been tersely described to the present writer as being to “shoot a bird, take off its skin, and throw away its characters.”

5 Perhaps this may be partially explained by the fact that the Museum of the College of Surgeons, in which these investigations were chiefly carried on, like most other muscums of the time, contained a much larger series of the heads of Birds than of their entire skeletons, or of any other portion of the skeleton, Consequently the materials available for the comparison of different forms consisted in great part of heads only.

A. Milne- Edwards.

36

Tinamomorphee.

Turnicomorphee.

| Charadriomorphee, Alectoromorpha.

| | | | Cecomorphe. Geranomorphe, Pteroclo- Palamcdea,

morphee, Spheniseo- Actomorphe. Peristero Chenomorphe. morphea. : morphe. Hetero- Amphimorphe. morphee. : Si ican Psittaco- Coceygo-

Agitho- Dysporo- NITODO eee ras seeses IMO tOeerrsesesereasee gnathee. morphe.

The above scheme, in Prof. Huxley's opinion, nearly re- presents the affinities of the various Carinate groups,—the great difficulty being to determine the relations to the rest of the Coccygomorphx, Psittacomorphe, and Aigithognathe, which he indicated "only in the most doubtful and hypothetic fashion." Almost simultaneously with this he expounded more particularly before the Zoological Society, in whose Proceedings (1868, pp. 294-319) his results were soon after published, the groups of which he believed the Alectoromorphz to be composed and the relations to them of some outlying forms usually regarded as Gallina- ceous, the Zurnicide and Pteroclide, as well as the singular Hoacrzin (vol. xii. p. 28), for all three of which he had to institute new groups—the last forming the sole representa- tive of his Heteromorphe. More than this, he entered upon their Geographical Distribution, the facts of which important subject are here, almost for the first time, since the attempt of Blyth already mentioned,! brought to bear practically on Classification, as has been previously hinted (Brrps, vol. iii, pp. 736, 737); but, that subject having been already treated at some length, there is no need to enter upon it here.

Nevertheless it is necessary to mention here vhe intimate connexion between Classification and Geographical Dis- tribution as revealed by the paleontological researches of Prof. ALpHonse Mitnz-Epwarps, whose magnificent Ovseaux Fossiles de la France began to appear in 1867, and was completed in 1871—the more so, since the exigencies of his undertaking compelled him to use materials that had been almost wholly neglected by other investigators. A large proportion of the fossil remains the determination and description of which was his object were what are very commonly called the "long bones," that is to say, those of the limbs. The recognition of these, minute and fragmentary as many were, and the referring them to their proper place, rendered necessary an attentive study of the comparative osteology and myology of Birds in general, that of the "long bones," whose sole char- acters were often a few muscular ridges or depressions, being especially obligatory. Hence it became manifest that a very respectable Classification can be found in which characters drawn from these bones play a rather important part. Limited by circumstances as

is that followed by M. Milne-Edwards, the details of his arrange- ment do not require setting forth here. It is enough to point out that we have in his work another proof of the multiplicity of the factors which must be taken into consideration by the systematist, and another proof of the fallacy of trusting to one set of characters alone. But this is not the only way in which the author has rendered service to the advanced student of Omi- a ee

1 It is true that from the time of Buffon, though he scorned any regular Classification, Geographical Distribution had been occasionally held to have something to do with systematic arrangement ; but the way in which the two were related was never clearly put forth, though people who could read between the lines might have guessed the secret

from Darwin's Journal of Researches, as well as from his introduction to the Zoology of the "Beagle" Voyage.

thology. The unlooked-for discovery in France of re- mains which he has referred to forms now existing it is true, but existing only in countries far removed from Europe, forms such as Collocalia, Leptosomus, Psittacus, Serpentarius, and Trogon, is perhaps even more suggestive than the finding that France was once inhabited by forms, that are wholly extinct, of which, as has been already mentioned (Brrps, vol. iii. pp. 730, 731), in the older formations there is abundance. Unfortunately none of these, however, can be compared for singularity with Archzxopteryx or with some American fossil forms next to be noticed, for their particular bearing on our knowledge of Ornithology will be most conveniently treated here.

In November 1870 Prof. Marsu, by finding the im- perfect fossilized tibia of a Bird in the Middle Cretaceous shale of Kansas, began a series of wonderful discoveries which will ever be associated with his name,? and, making us acquainted with a great number of forms long since vanished from among the earth's inhabitants, has thrown a comparatively broad beam of light upon the darkness that, broken only by the solitary spark. emitted on the recognition of Archxopteryx, had hitherto brooded over our knowledge of the genealogy of Birds, and is even now for the most part palpable. Subsequent visits to the same part of North America, often

performed under circum- stances of discomfort and occasionally of danger, brought to this intrepid and energetic explorer the reward he had so fully earned. Brief notices of his spoils appeared from time to time in various volumes of the American Journal of Science and Arts (Silliman's), but it is unnecessary here to refer to more than a few of them. In that Journal for May 1872 (ser. 3, iii, p. 360) the remains of a large swimming Bird (nearly 6 feet in length, as afterwards appeared) having some affinity, it was thought, to the Colymbidz were described under the name of Hesperornis regalis, and a few months later (iv. p. 344) a second fossil Bird from the same locality was indicated as Ichthyornis dispar—tfrom the Fish-like, biconcave form of its vertebrae. Further examination of the enormous collections gathered by the author, and preserved in the Museum of Yale College at New Haven in Connecticut, shewed him that this last Bird, and another to which he gave the name of Apatornis, had possessed well-developed teeth implanted in sockets in both jaws, and induced him to establish (v. pp. 161, 162) for their reception a "Subclass" Odontor- mithes and an Order Ichthyornithes. Two years more and the originally found Hesperornis was discovered also to have teeth, but these were inserted in a groove. It was accordingly regarded as the type of a distinct Order Odontolcx (x. pp. 403-408), to which, were assigned as other characters vertebra of a saddle-shape and not biconcave, a keelless sternum, and wings consisting only of the humerus. In 1880 Prof. Marsh brought out a grand volume, Odontornithes, being a monograph of the extinct toothed Birds of North America. Herein remains, attri- buted to no fewer than a score of species, which were referred to eight different genera, are fully described and sufficiently illustrated, and, instead of the ordinal name Ichthyornithes previously used, that of Odontotorme was proposed. In the author's concluding summary he remarks on the fact that, while the Odontolcx, as exhibited in Hesperornis, had teeth inserted in a continuous groove—a low and generalized character as shewn by Reptiles, they had, however, the strongly differentiated saddle-shaped vertebree such as all modern Birds possess. On the other hand the Odontotormez, as exemplified in Ichthyornis, having the primitive biconcave vertebrae, yet possessed the highly

? It will of course be needless to remind the general zoologist of

Prof. Marsh’s no less wonderful discoveries of wholly unlooked-for types of Reptiles and Mammals. .

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specialized feature of teeth in distinct sockets. esperornis too, with its keelless sternum, had aborted wings but strong legs and feet adapted for swimming, while Ichthyornis had a keeled sternum and powerful wings, but diminutive Icgs and feet. ‘These and other characters separate the two forms so widely as quite to justify the establishment of as many Orders for their reception, and the opposite nature of the evidence they afford illustrates one fundamental principle of evolution, namely, that an animal may attain to great development of one set of characters and at the same time retain other features of a low ancestral type. Prof. Marsh states that he had fully satisfied himself that Archxopteryx belonged to the Odontornithes, which he thought it advisable for the present to regard as a Subclass, separated into three Orders—Odontolcx, Odontotorme, and Saurure—all well marked, but evidently not of equal rank, the last being clearly much more widely distinguished from the first two than they are from one another. But that these three oldest-known forms of Birds should differ so greatly from each other unmistakably points to a great antiquity for the Class. All are true Birds; but the Reptilian characters they possess converge towards a more generalized type. He then proceeds to treat of the characters which may be expected to have occurred in their common ancestor, whose remains may yet be hoped for from the Paleozoic rocks if not from the Permian beds that in North America are so rich in the fossils of a terrestrial fauna. Birds, he believes, branched off by a single stem, which gradually lost its Reptilian as it assumed the Ornithic type; and in the existing Ratitx we have the survivors of this direct line. The lineal descendants of this primal stock. doubtless at an early time attained feathers and warm blood, but, in his opinion, never acquired the power of flight, which probably originated among the small arboreal forms of Reptilian Birds. In them even rudimentary feathers on the fore-limbs would be an advantage, as they would tend to lengthen a leap from branch to branch, or break the force of a fall in leap- ing to the ground. As the feathers increased, the body would become warmer and the blood more active. With still more

feathers would come increased power of flight as we see in the young Birds of to-day. A greater activity would result in a more perfect circulation.

Bold as are the speculations above summarized, there seems no reason to doubt the probability of their turning out to be, if not the exact truth, yet something very like it.

From this bright vision of the poetic past—a glimpse, some may call it, into the land of dreams—-we must relapse into a sober contemplation of the prosaic present— a subject quite as difficult to understand. The former efforts at classification made by Sundevall have already several times been mentioned, and a return to their con- sideration was promised. In 1872 and 1873 he brought out at Stockholm a Methodi Naturalis Avium Disponend-arum Tentamen, two portions of which (those relating to the Diurnal Birds-of-Prey and the '"Cichlomorphex," or forms related to the Thrushes) he found himself under the necessity of revising and modifying in the course of 1874, in as many communications to the Swedish Academy of Sciences (K. V.-Ak. Férhandlingar, 1874, No. 2, pp. 21-30; No. 3, pp. 27-30). This Zentamen, containing the

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latest complete method of classifying Birds in general, has naturally received much attention, the more so perhaps, since, with its appendices, it was nearly the last labour of its respected author, whose industrious life came to an end in the course of the following year. From what has before been said of his works it may have been gathered that, while professedly basing his systematic arrangement of the groups of Birds on their external features, he had hitherto striven to make his schemes harmonize if possible with the dictates of internal structure as evinced by the science of anatomy, though he uniformly and persistently protested against the inside being better than the outside. In thus acting he proved himself a true follower of his great countryman Linneus ; but, without disparagement of his efforts in this respect, it must be said that when internal and exter- nal characters appeared to be in conflict he gave, perhaps with unconscious bias, a preference to the latter, for he belonged to a school of zoologists whose natural instinct was to believe that such a conflict always existed. Hence his efforts, praiseworthy as they were from several points of view, and

particularly so in regard to some details, failed to satisfy the philosophic taxonomer when generalizations and deeper principles were concerned, and in his practice in respect of certain technicalities of classification he was, in the eyes of the orthodox, a transgressor. Thus instead of contenting himself with terms that had met with pretty general approval, such as Class, Subclass, Order, Sub- order, Family, Subfamily, and so on, he introduced into his final scheme other designations, ‘‘Agmen,” ‘‘ Cohors,” “Phalanx,” and the like, which to the ordinary student of Ornithology convey an indefinite meaning, if any meaning at all. He also carried to a very extreme limit his views of nomenclature, which were certainly not in accordance with those held by most zoologists, though this is a matter so trifling as to need no details in illustration. It is by no means easy to set forth briefly, and at the same time intelligibly, to any but experts, the final scheme of Sunde-vall, owing to the number of new names introduced by hin, nevertheless the attempt must be made; but it must be understood that in the following paradigm, in which his later modifications are incorporated, only the most remark- able or best-known forms are cited as examples of his several groups, for to give the whole of them would, if any explanations were added, occupy far more space than the occasion seems to justify, and without such explanations the list would be of use only to experts, who would rather consult the original work.

First, Sundevall would still make two grand divisions (“Agmina ”) of Birds, even as had been done nearly forty years before; but, having found that the names, Altrices and Precoces, he had formerly used were not always applicable, or the groups thereby indicated naturally disposed, he at first distinguished them as Psilopedes and Ptilopedes. Then, seeing that the great similarity of these two words would produce confusion both in speaking and writing, he changed them (p. 158) into the equivalent Gymnopades and Dasypexdes, according as the young were hatched naked or clothed. The Gymnopedes are divided into two “ Orders ”—Oscines and Volucres—the former intended to be identical with the group of the same name established by older authors, and, in accordance with the observations of Keyserling and Blasius already mentioned, divided into two “Series ”—Laminiplantares, having the hinder part of the “tarsus” covered with two horny plates, and Scutell:- plantares, in which the same part is scutellated. ‘These Laminiplantares-are composed of six Cohorts as follows :—

Cohors 1. Cichlomorphe. S Phalanx 1. Ocreatz.—7 Families: the Nightingales standing first, and therefore at the head of all Birds, with the Redbreast, Redstart, and the American Blue-bird; after them the Chats,

Thrushes proper, Dippers, Water-Chats (Heniewrus), Bush-Chats, and (under the name of Huehline) the singular group commonly known as Pittas or Water-Thrushes.

Phalanx 2. Novempennate.—6 Families: Pipits, Wagtails, American Fly-eatehing Warblers, and Australian Diamond-birds (Pardalotis).

Phalanx 3. Sylviiformes.—17 Familics: divided geographi- cally (?) into two groups—the Old-World forms, and those of the New. The first is further broken up into three sections—(a) 4 Families with modcrately long wings and a slender bill, containing what may be called perhaps the normal Warblers, as the Willow- Wrens, W hitethroats, Sedge-birds, and others; (6) 5 Families, with short wings and a slender bill, what are often called by Indian and African writers Bush-babblers (Bradypterus, Crateropus, and others); (c) 3 Families, with a somewhat stout or blunt bill, the Thick-heads of some writers (Pachyeephalus) and Titmouse Family. The second or American group comprehends 5 Families, Vireos, Cat-birds, Wrens (not, by the way, peculiar to America), and some other forms for which it is impossible to find names that will pass as English.

Phalanx 4. Brachyptere.—3 Families: the short-winged Wren- Warblers, with long tails, of the Australian (Malwrus), Indian, and Ethiopian Regions.

Phalanx 5. Latirostres.—7 Families: the true Flycatchers (Museteapa), and several others of fly-catching habits.

Phalanx 6. Braehypodes.—8 Families: Waxwings, Orioles, Swallow-Flycatchers (Artamus), Caterpillar-catehers (Campophaga), and Drongos (Dicrizws).

Phalanx 7. Dentirostres or Laniiformes.—3 Families : Shrikes, Puff-backed Shrikes.

Phalanx 8. Subcorviformes,—1 Family : Bower-birds and some others.

Cohors 2. Controstres.

Phalanx 1. Decempennatz#.—3 Families : Weaver-birds(Ploceus), Whydah-birds (Vidua), and Hedge-Sparrows (Accentor).

Phalanx 2. Amplipalatales.—2 Families: Grosbeaks, true Finches.

Phalanx 3. Aretipalatales.—6 Familics: Crossbills, Buntings, Rice-birds, and many hard-billed forms which are usually placed among the Tanagers.

Phalanx 4. Stmplietrostres.—4 Families : Tanagers,

Cohors 3. Coliomorphe.

Phalanx 1. Novempennatw.—3 Families: Grackles or American Starlings.

Phalanx 2. Humilinares.—4 Families: peckers, Choughs.

Phalanx 3. Altinares.—3 Families: Nutcrackers, Jays, Crows.

Phalanx 4. Idiodaetylw.—5 Families : Crow-Shrikes, Birds-of- Paradise.

Cohors 4. Certhiomorphe.—38 Families: hatches.

Cohors 5. Cinnyrimorphe.—5 Families: suckers.

Cohors 6. Chelidonomorphe.—1 Family: Swallows.

The Scutelliplantares include a much smaller number of forms, and, with the exception of the first “Cohort ” and a few groups of the fourth and fifth, all are peculiar to

_America,

Cohors 1. Holaspides.—2 Families : Larks, Hoopoes,

Cohors 2. Endaspidew.—3 Families—all Neotropical: Oven-birds (Furnarius), Synallaxis, and the Piculules (Dendrocolaptes).

Cohors 3. Exaspidex.—4 Families: the first two separated as Lysodaetylx, including the King-birds or Tyrants, of which twelve groups are made ; the remaining two as Syndactyle, composed of the Todies and Manakins.

Cohors 4. Pyenaspidewx.—3 Families: Cocks-of-the-Rock (Rupi- cola), to which the Indian genus Calyptomena, Hurylemus, and some others are supposed to be allied, the Chatterers aud Fruit- Crows (Chasmorhynehus, Cephalopterus, and others), as well as Lityra and Lipaugus.

Cohors 5. Taxaspidew.—b5 Families : the very singular Madagas- car form Philepitta; the Bush-Shrikes (Thamnophilus), Ant-Thrushes (Formiearius), and Tapaculos (Picroptochus) of the Neotropical Region; and the Australian Lyre-bird.

We then arrive at the Second Order Volucres, which is divided into two “Series.” Of these the first is made to contain, under the name Zygodactyli,

Cohors 1. Psittae?.—6 Familics : Parrots ‘

Cohors 2. Pici.—6 Families: Woodpeckers, Pieulets (Piewmnus), and Wrynecks;

Cohors 3. Coceyges.—12 Families: divided into two groups— (1) Altinares, containing the Honey-Guides, Barbets, Toueans, Jaca- mars, Puff-birds, and the Madagascar genus Leptosomus ; and (2) Humilinares, comprising all the forms commonly known as Cucu- lide, broken up, however, into three sections ;

True Starlings, Ox-

Tree-creepers, Nut-

Sun-birds, Honey-

while to the second “ Series” are referred, as Anisodactyli,

Cohors 4. Cenomorphe.—4 Families: Plantain-eaters or Toura- cous, Mouse-birds, Rollers, and the peculiar Madagascar forms Atelornis and Brachypteracias ;

cs 5. Ampligulares.—4 Families : Trogons, Goatsuekcrs, and Swifts ;

Cohors 6. Longilingwes or Mellisuge.—12 Families: Humming- birds, arranged in three ‘‘ Series ;”

Cohors 7. Syndaetyle.—4 Families: Bee-eaters, Motmots, King- fishers, and Hornbills ;

Cohors 8. Peristeroidex. —3 Families: Didunculus, with the Dodo, Pigeons, and the Crowned Pigeons (Gowra) separated from the last.

The Dasypexdes of Sundevall are separated into six “Orders”; but these will occupy us but a short while. The first of them, Acciyrtres, comprehending all the Birds- of-Prey, were separated into 4 “Cohorts” in his original work, but these were reduced in his appendix to two— Nyctharpages or Owls with 4 Families divided into 2 series, and Hemeroharpages containing all the rest, and compris- ing 10 Families (the last of which is the Seriema, Dicholophus) divided into 2 groups as Rapaces and Saprophagi—the latter including the Vultures. Next stands the Order Galline with 4 “Cohorts” :— (1) Tetraono- morphx, comprising 2 Families, the Sand-Grouse (Pterocles) and the Grouse proper, among which the Central-American Oreophasis finds itself; (2) Phasianomorphe, with 4 Families, Pheasants, Peacocks, Turkeys, Guinea Fowls, Partridges, Quails, and Hemipodes (Turnix) ; (3) Macro- nyches, the Megapodes, with 2 Families ; (4) the Duodecim- pennatz, the Curassows and Guans, also with 2 Families ; (5) the Struthioniformes, composed of the Tinamous; and (6) the Subgrallatores with 2 Families, one consisting of the curious South-American genera T’hinocorusand Attagis and the other of the Sheathbill (Chionis). The Fifth Order (the third of the Dasypedes) is formed by the Grallatores, divided into 2 “series”—(1) Altenares, consisting of 2 “Cohorts,” /Zerodz with 1 Family, the Herons, and Pelargi with 4 Families, Spoonbills, Ibises, Storks, and the Umbre (Scopus), with Baleniceps ; (2) Humilinares, also consisting of 2

“Cohorts,” Limicole with 2 Families, Sandpipers and Snipes, Stilts and Avocets, and Cursores with 8 Families, including Plovers, Bustards, Cranes, Rails, and all the other “Waders.” The Sixth Order, Natatores, consists of all the Birds that habitually swim and a few that do not, containing 6 Cohorts : — Longipennes and Pygopodes with 3 Families each ; J’ote- palmate with 1 Family; Tubinares with 3 Families; Impennes with 1 Family, Penguins; and Lamellirostres with 2 Families, Flamingoes and Ducks. The Seventh Order, Proceres, is divided into 2 Cohorts—Veri with 2 Families, Ostriches and Emeus ; and Subnobiles, consisting of the genus Apteryx, The Eighth Order is formed by the Sauwrure.

Such then is Sundevall’s perfected system, which has in various quarters been so much praised, and has been partially recognized by so many succeeding writers, that it would have been impossible to pass it over here, though the present writer is confident that the best-informed ornithologists will agree with him in thinking that the com- pilation of the above abstract has been but so much waste of time, and its insertion here but so much waste of space. Without, however, some such abstract its shortcomings could not be made apparent, and it will be seen to what little purpose so many able men have laboured if arrangement and grouping so manifestly artificial—the latter often of forms possessing no real affinity—can pass as a natural method. We should be too sanguine to hope that it may be the last of its kind, yet any one accustomed to look deeper than the surface must see its numerous defects, and almost every one, whether so accustomed or not, ought by its means to be brought to the conclusion that, when a man of Sundevall’s knowledge and experience

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could not, by trusting only to external characters, do better than this, the most convincing proof is afforded of the inability of external characters alone to produce anything gave ataxy. The principal merits it possesses are con- fined to the minor arrangement of some of the Oscines ; but even here many of the alliances, such, for instance, as that of Pitta with the true Thrushes, are indefensible on any rational grounds, and some, as that of Accentor with the Weaver-birds and Whydah-birds, verge upon the

ridiculous, while on the other hand the interpolation of the American Fly-catching Warblers, Mniotdtidx, between the normal Warblers of the Old World and the Thrushes is as bad—especially when the genus Mniotdta is placed, not- withstanding its different wing-formula, with the Tree-ereepers, Certhiidx. The whole work unfortunately betrays throughout an utter want of the sense of proportion. In many of the large groups the effect of very slight differ- ences is to keep the forms exhibiting them widely apart, while in most of the smaller groups differences of far greater kind are overlooked, so that the forms which present them are linked together in more or less close union. Thus, regarding only external characters, great as is the structural distinction between the CGannets, Cormorants, Frigate-birds, and Pelicans, it is not held to remove them from the limits of a single Family; and yet the Thrushes and the Chats, whose distinctions are barely sensible, are placed in separate Families, as are also the Chats and the Nightingales, wherein no structural distinc- tions at all can be traced. Again, even in one and the same group the equalization of characters indicative of Families is wholly neglected. Thus among the Pigeons the genera Didus and Didunculus, which differ, so far as we know it, in every external character of their structure, are placed in one Family, and yet on the slightest pre- text the genus Goura, which in all respects so intimately resembles ordinary Pigeons, is set apart as the represen- tative of a distinct Family. The only use of dwelling upon these imperfections here is the hope that thereby students of Ornithology may be induced to abandon the belief in the efficacy of external characters as a sole means of classification, and, by seeing how unmanageable they become unless checked by internal characters, be per- suaded of the futility of any attempt to form an arrange-ment without that solid foundation which can only be obtained by a knowledge of anatomy. Where Sundevall failed no one else is likely to succeed; for he was a man gifted with intelligence of a rare order, a man of cultiva- tion and learning, one who had devoted his whole life to science, who had travelled much, studied much and reflected much, a man whose acquaintance with the literature of his subject probably exceeded that of any of his contemporaries, and a man whose linguistic attainments rendered him the envy of his many friends, Yet what should have been the crowning work of his long life is one that all who respected him, and that comprehends all who knew him, must regret.

Of the very opposite kind was the work of the two men next to be mentioned—GarropD and Forses—both cut short in a career of promise! that among students of Ornithology has rarely been equalled and perhaps never surpassed. The present writer finds it difficult to treat of the labours of two pupils and friends from whose assistance he had originally hoped to profit in the preparation of this very article, the more so that, while fully recognizing the brilliant nature of some of their researches, he is compelled very frequently to dissent from the conclusions at which

1 Alfred Henry Garrod, Prosector to the Zoological Society of London, died of consumption in 1879, aged thirty-three. His successor In that office, William Alexander Forbes, fell a victim to the deadly climate of the Niger in 1888, and in his twenty-eighth year.

they arrived, deeming them to have often been of a kind that, had their authors survived to a maturer age, they would have greatly modified. Still he well knows that learners are mostly wiser than their teachers ; and, making due allowance for the haste with which, from the exigencies of the post they successively held, their investigations had usually to be published, he believes that much of the highest value underlies even the crudest conjectures con- tained in their several contributions to Ornithology. Putting aside the monographical papers by which each of them followed the excellent example set by their predecessor in the office they filled—Dr Muniz ? —and beginning with Garrod's,® those having a more general scope, all published in the Zoological Society's Proceedings, may be briefly con- sidered. Starting from the level reached by Prof. Huxley, the first attempt made by the younger investigator was in 1873, "On the value in Classification of a Peculiarity in the anterior margin of the Nasal Bones in certain Birds." Herein he strove to prove that Birds ought to be divided into two Subclasses—one, called " Holorhinal," in which a straight line drawn transversely across the hindmost points of the external narial apertures passes in front of the posterior ends of the nasal processes of the preemaxille, and the other, called " Schizorhinal," in which such a line passes behind those processes. If this be used as a criterion, the validity of Prof. Huxley's group Schizognathe is shaken ; but there is no need to

enlarge upon the pro- posal, for it was virtually abandoned by its author within little more than a twelvemonth. The next subject in con- nexion with Systematic Ornithology to which Garrod applied himself was an investigation of the Carotid Arteries, and here, in the same year, he made a consider- able advance upon the labours of Nitzsch, as might well be expected, for the opportunities of the latter were very limited, and he was only able, as we have seen (page 22), to adduce four types of structure in them, while Garrod, with the superior advantages of his situation, raised the number to six. Nevertheless he remarks that their " dis- position has not much significance among Birds, there being many Families in which, whilst the majority of the species have two, some have only one carotid." The exceptional cases cited by him are quite sufficient to prove that the condition of this artery has nearly no value from the point of view of general classification. If relied upon it would split up the Families Bucerotide and Cypselide, which no sane person would doubt to be homogeneous and natural. The femoral vessels formed another subject of investigation, and were found to exhibit as much exceptional conformation as those of the neck—for instance in Centropus phasianus, one of the Birds known as Coucals, the femoral artery accompanies the femoral vein, though it does not do so in another species of the genus, C. rufipennis, nor in any other of the Cuculide (to which Family the genus Centropus has been always assigned) examined by Garrod. Nor are the results of the very great labour which he bestowed upon the muscular con- formation of the thigh in Birds any more conclusive when they come to be impartially and carefully considered. Myology was with him always a favourite study, and he

2 Dr Murie's chief papers having a direct bearing on Systematic Murie.

Ornithology are:—in the Zoological Society's Transactions (vii. p. 465), " On the Dermal and Visceral Structures of the Kagu, Sun-Bittern, and Boatbill"; in the same Society's Proceedings —(1871, p. 647) " Addi- tional Notice concerning the Powder-Downs of Rhinochetus jubatus," (1872, p. 664) ''On the Skeleton of Todus with remarks as to its Allies," (1879, p. 552) "On the Skeleton and Lineage of Fregilupus varius" ; in The Ibis—(1872, p.262) "On the genus Colius," (1872, p. 883) " Motmots and their affinities," (1873, p. 181) " Relationships of the Upupide."

8 Garrod’s Scientific Papers have been collected and published in a memorial volume, edited by Forbes. There is therefore no need to give a list of them here. Forbes’s papers are to be edited by Prof. F. J. Bell.

may be not unreasonably supposed to have a strong feeling as to its efficacy for systematic ends. It was in favour of an arrangement based upon the muscles of the thigh, and elaborated by him in 1874, that he gave up the arrange- ment he had published barely more than a year before based upon the conformation of the nostrils. Neverthe- less it appears that even the later of the two methods did not eventually content him, and this was only to be expected, though he is said by Forbes (Zbis, 1881, p. 28) to have remained “satisfied to the last as to the natural- ness of the two main groups into which he there divided birds ”»—Homalogonatz and Anomalogonate. The key to this arrangement lay in the presence or absence of the ambiens muscle, “not because of its own intrinsic import- ance, but because its presence is always associated with peculiarities in other parts never found in any Anomalo- gonatous bird.” Garrod thought that so great was the improbability of the same combination of three or four different characters (such as an accessory femoro-caudal muscle, a tufted oil-gland, and czeca) arising independently in different Birds that similar combinations of characters could only be due to blood-relationship. The ingenuity with which he found and expressed these combinations of characters is worthy of all praise; the regret is that time was wanting for him to think out all their consequences, and that he did not take also into account other and especially osteological characters. Every osteologist must recognize that the neglect of these makes Garrod’s proposed classification as unnatural as any that had been previously drawn up, and more unnatural than many. So much is this the case that, with the knowledge we have that ere his death he had already seen the need of introducing some modifications into it, its reproduction here, even in the briefest abstract possible, would not be advisable. Two instances, however, of its failure to shew natural affinities or differences may be cited. The first Order Galliformes of his Subclass Homalogonate is made to consist of three ‘ Cohorts ”—Struthiones, Gallinacex, and Psittaci—a, somewhat astonishing alliance; but even if that be allowed to pass, we find the second “Cohort” composed of the Families

Palamedeidx, Gallinx, Railide, Otrdidx (containing two Subfamilies, the Bustards and the Flamingoes), Musophagidz, and Cuculide. Again the Subclass Anomalogonatz includes three Orders—Pici- Sormes, Passeriformes, and Cypseliformes—a preliminary to which at first sight no exception need be taken; but immediately we look into details we find the Alcedinide placed in the first Order and the Meropide in the second, together with the Passeres and a collection of Families almost every feature in the skeleton of which points toa separation. Common sense revolts at the acceptance of any scheme which involves so many manifest incongruities, With far greater pleasure we would leave these investiga- tions, and those on certain other muscles, as well as on the Disposition of the deep plantar Tendons, and dwell upon his researches into the anatomy of the Passerine Birds with the view to their systematic arrangement. Here he was on much safer ground, and it can hardly be doubted that his labours will stand the test of future experience, for, though it may be that all his views will not meet with ultimate approval, he certainly made the greatest advance since the days of Miiller, to the English translation of whose classical work he added (as already mentioned) an excellent appendix, besides having already contributed to the Zoological Proceedings between 1876 and 1878 four memoirs replete with observed facts which no one can gainsay. As his labours were continued exactly on the same lines by Forbes, who, between 1880 and 1882, published in the same journal six more memoirs on the subject, it will be convenient here to state generally, and

in a combined form, the results arrived at by these two investigators.

Instead of the divisions of Passerine Birds instituted by Miiller, Garrod and Forbes having a wider range of experi- ence consider that they have shewn that the Passeres con- sist of two primary sections, which the latter named respectively Desmodactyli and Eleutherodactyli, from the facts discovered by the former that in the Zurylemidz, or Broadbills, a small Family peculiar to some parts of the Indian Region, and consisting of some nine or ten species only, there is a strong band joining the muscles of the hind toe exactly in the same way as in many Families that are not Passerine, and hence the name Desmodactyli, while in all other Passerines the hind toe is free. This point settled, the Hleutherodactyli form two great divisions, according to the structure of their vocal organs; one of them, roughly

agreeing with the Cla- matores of some writers, is called Mesomyodi, and the other, corresponding in the main, if not absolutely, with the Oscines, Polymyodt, or true Passeres of various authors, is named Acromyodi— an Acromyodian bird being one in which the muscles of the syrinx are attached to the extremities of the bronchial semi-rings, a Mesomyodian bird being one in which the muscles of the syrinx join the semi-rings in their middle." Furthermore, each of these groups is subdivided into two: the Acromyodi into "normal" and "abnormal," of which more presently ; the Mesomyodi into Homecomeri and Heteromeri, according as the sciatic or the femoral artery of the thigh is developed —the former being the usual arrangement among Birds and the latter the exceptional. Under the head Hetero- mert come only two Families the Cotingide (Chatterers) and DPipride (MANAKINS, vol. xv. p. 455) of most orni- thologists, but these Garrod was inclined to think should not be considered distinct. The J/omawomeri form a larger group, and are at once separable, on account of the struc- ture of their vocal organs, into Z'racheophonex (practically equivalent to the Z'racheophones of Miiller) and Haploo- phone (as Garrod named them)—the last being those Passeres which were by Miiller erroneously included among his Picariz, namely, the Tyrannidx (see Kin@-BrrD, vol. xiv. p. 80) with Rupicola, the Cocks-of-the-Rock. To these are now added Families not examined by him,—but subsequently ascertained by Forbes to belong to the same group,—Duttide, Philepitiidx, and Xenicide (more pro- perly perhaps to be called Acanthisittidx), and it is remarkable that these last three Families are the only members of the JAfesomyodi which are not peculiar to the New World—nay more, if we except the Tyranndz, which in North America occur chiefly as migrants,—not peculiar to the Neotropical Region. The Z'racheo- phone are held to contain five Families—Wurnariide Oven-birds), Pteroptochide (Tapacutos, q.v.), Dendro- colaptidx (Piculules), Conopophagidx, and Formicariide (Ant-Thrushes). Returning now to the Acromyodi, which include, it has just been said, a normal and an abnormal 'section, the latter consists of birds agreeing in the main, though not absolutely, as to the structure of the syrinx with that of the former, yet differing so con- siderably in their osteology as to be most justifiably separated. At present only two types of these abnormal Acromyodi are known—Menura (the LyRx-Birp, vol. xv. p. 115) and Atrichia (the Scrus-BiRD, g.v.), both from Australia, while all the remaining Passeres, that is to say, incomparably the greater number of Birds

in general, belong to the normal section. ‘Thus the whole scheme of the Passeres,1 as worked out by Garrod and Forbes, can be

1 It is right to observe that this scheme was not a little aided by a

consideration of palatal characters, as well as from the disposition of some of the tendons of the wing-muscles.

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briefly expressed as below; and this expression, so far as it goes, is probably very near the truth, though for simplicity’s sake some of the intermediate group-names might perhaps be omitted :—

PASSHRES, ELEUTHERODACTYLI, ACROMYODI, NoRMALES, ABNORMALES, Menura, Atrichia. MESOMYODI, HoM@OMERI, Tracheophone, Furnartide, Pteroptochide, Dendrocolaptide, Conopo-phagidze, Formicartide. Haploophone, Tyrannide, Rupicola, Pittide, Philepittide, Xenicidx, HETEROMERI, Cotingidx, Pipridx. DESMODACTYLI, Eurylemide.

It will be seen that noattempt is here made to separate the Normal Acromyodians into Families. Already, in The Ibis for 1874 (pp. 406-416), Mr Watxace had published a plan, which, with two slight modifications that were mani- festly improvements, he employed two years later in his great work on Zhe Geographical Distribution of Animals, and this included a method of arranging the Families of this division. Being based, however, wholly on alar char- acters, it has of course a great similarity to the schemes of Dr Cabanis and of Sundevall, and, though simpler than either of those, there is no need here to enter much into its details. The Birds which would fall under the category of Garrod’s Acromyodi normales are grouped in three series :—A. ‘‘Typical or Turdoid Passeres,” having a wing with ten primaries, the first of which is always more or less markedly reduced in size, and to this 21 Families are allotted; B. “Tanagroid Passeres,” having a wing with nine primaries, the first of which is fully developed and usually very long, and containing 10 Families; and C. “ Sturnoid Pusseres,” having

a wing with ten primaries, the first of which is “rudimentary,” with only 4 Families. The remaining Families, 10 in number, which are not nor- mally acromyodian are grouped as Series D. and called “Formicaroid Passeres.”

In The [bis for 1880 (pp. 8340-350, 399-411) Mr SctarEer made a laudable attempt at a general arrangement of Birds,! trying to harmonize the views of ornithotomists with those taken by the ornithologists who only study the exterior ; but, as he explained, his scheme is really that of Prof. Huxley reversed, with some slight modifications mostly consequent on the recent researches of Prof. Parker and of Garrod, and (he might have added) a few details derived from his own extensive knowledge of the Class. Adopting the two Subclasses Carinate and Ratitx, he recognized 3 “ Orders” as forming the latter and 23 the former—a number far exceeding any that had of late years met with the approval of ornithologists. It is certainly difficult in the present state of our knowledge to get on with much fewer groups; whether we call them “ Orders ” or not is immaterial. First of them comes the Passeres, of which Mr Sclater would make four Suborders:—(1) the Acromyodi normales of Garrod under the older name of Oscines, to the further subdivision of which we must immediately return; (2) under Prof. Huxley’s term Oligomyodz, all the Haploophonex, Ieteromeri, and Desmo- dactyli of Garrod, comprehending 8 Families—Oxyrhamph- ide,? Tyrannide, Pipride, Cotingide, Phytotomide,? Pittide, Philepittide, and Eurylemide ;3 (3) Tracheophone,

; 1 An abstract of this was read to the British Association at Swansea in the same year, and may be found in its Report (pp. 606-609).

Not recognized by Garrod.

3 To these Mr Sclater would now doubtless add Forbes’s Xenicide.

containing the same groups asin the older scheme, but here combined into 3 Families only—Dendrocolaptide, Formi- carudex, and Pteroptochide ; and (4) the Acromyodi abnor- males of Garrod, now elevated to the rank of a Suborder and called Pseudoscines.t With regard to the Acromyodi normales or Oscines, Mr Sclater takes what seems to be quite the most reasonable

view, when he states that they “are all very closely related to one another, and, in reality, form little more than one group, equivalent to other so-called families of birds,” going on to remark that as there are some 4700 known species of them “it is absolutely necessary to subdivide them,” and finally proceeding to do this nearly on the method of Sundevall’s Zentamen (see above pp. 37, 38), merely changing the names and position of the groups in accordance with a plan of his own set forth in the Nomenclator Avium Neotropicalium, which he and Mr Salvin printed in 1873, making, as did Sundevall, two divisions (according as the hind part of the “tarsus” is plated or scaled), A. Laminiplantares and B. Scutiplantares—but confining the latter to the Alaudide alone, since the other Families forming Sundevall’s Scutelliplantares are not Oscinian, nor all even Passerine. The following table shews the coniparative result of the two modes as regards the Laminiplantares, and, since the composition of the Swedish author’s groups was explained at some length, may be found convenient by the reader :—

Mr Sclater, 1880. Sundevall, 1872-78.

1. Dentirostres,5— practically equal to 1. Cichlomorphe.

2. Latirostres,°® 3 6. Chelidonomorphe. 8. Curvirostres, ° 4, Certhiomorphe.® 4, Tenuirostres ne 5. Cinnyrimorphe.

5. Conirostres, we 2. Conirostres,

6. Cultrirostres, af 3. Coliomorphee.

These six groups Mr Sclater thinks may be separated without much difficulty, though on that point the proceed- ings of some later writers (a notable instance of which he

himself cites) shew that doubt may still be entertained ;

but he rightly remarks that, “when we come to attempt to subdivide them, there is room for endless varieties of opinion as to the nearest allies of many of the forms,” and into further details he does not go. It will be perceived that, like so many of his predeccssors, he accords the highest rank to the

Dentzrostres, which, as has before been hinted, seems to be a mistaken view that must be con- sidered in the sequel.

Leaving the Passeres, the next ‘ Order” is Picarix, of which Mr Sclater proposes to make six Suborders :—(1) Pici, the Woodpeckers, with 2 Families ; (2) Cypseli, with 3 Families,” practically equal to the Macrochires of Nitzsch ; (3) Anisodactyle, with 12 Families—Colude (MovsE-BIRD, vol. xvii. p. 6), KINGFISHER, vol. xiv. p. 81), Bucerotidx (HoRNBILL, vol. xii. p. 169), Upupide (Hoopos, vol. xii. p. 154), Irrisoride, Meropide, Momotide (Mormor, vol. xvii. p. 3), Todidx (Topy, 9.v.), Coraciide (RoLLER, ¢.v.), Leptosomide, Podargide, and Steatornithide (Guacuaro, vol. xi. p. 227); (4) Heterodactyle, consist- ing only of the Trocons (q.v.); (5) Zygodactyle with 5 Families, Galbulide (JACAMAR, Vol. xiii. p. 531), Bucconide (Purr-Birb, ¢.v.), Rhamphastide (Toucan, q.v.), Capitonde, and Indicatoride (HonEy-cutbE, vol. xii. p. 139) ; and (6) Coccyges, composed of the two Families Cuculide and Musophagidx. That all these may be most conveniently

4 A term unhappily of hybrid origin, and therefore one to which purists may take exception.

5 These are not equivalent to Sundevall’s groups of the same names.

6 Mr Sclater (p. 848) inadvertently states that no species of Sundevall’s Certhiomorphe is found in the New World, having omitted to notice that in the Tentamen (pp. 46, 47) the genera Mniotilta (peculiar to America) as well as Certhia and Sitta are therein placed.

7 Or 2 only, the position of the Caprimulgide being left un- decided, but in 1883 (see next note) put here.

associated under the name Picariz seems likely enough, and the first two “ Suborders” are probably natural groups, though possibly groups of different value. In regard to the rest comment is for the present deferred. The

Lsittaci, Striges, and Accipitres, containing respectively the Parrots (q.v.), OWLS (q.v.), and diurnal Birds-of-Prey, form the next three " Orders "— the last being held to include 3 Families, Lalcondx, Cathartide, and Serpentarvide, which is perhaps the best that can be done with them—the difficult question as to the position of Cariama (SERIEMA, q.v.) being decided against the admission of that form to the last Family, notwithstanding its remarkable resemblance to Serpentarius (SECRETARY-BIRD, g.v.). We have then the Steganopodes to make the Sixth " Order," consisting of the

5 Families usually grouped together as by Brandt (supra,.

25) and others, aud these are followed naturally enough by the Herons (vol. xi. p. 760) under the name of Herodiones, to which the 3 Families Ardedx, Ciconiide (Stork, q.v.), and Plataleidx (SPOONBILL, q.v.) are referred ; but the FLaminGoss (vol. ix. p. 286), under Prof. Huxley's title Odontoglosse, form a distinct " Order." The Ninth "Order" is now erected for the Palamedex (SCREAMER, q.v.), which precede the Anseres—a group that, disen- cumbered from both the last two, is eminently natural, and easily dealt with. A great break then occurs, and the new series is opened by the Eleventh " Order," Columba, with 3 Families, Carpophagide, Columbide, and Gouridex, "or perhaps a fourth," Diduneulidx,1—the Dovos (vol. vii. p. 321) being "held to belong to quite a separate section of the order." The Twelfth "Order" is formed by the Pterocletes, the Sand-Grouse ; and then we have the very natural group Galline ranking as the Thirteenth. The next two are the Opisthocomi and Hemipodii for the Hoactzin (vol. xii. p. 28) and the Turnicide (often known as Button-Quails) respectively, to which follow as Sixteenth and Seventeenth the Fulicariz and Alectorides— the former consisting of the Families Rallide (Ratt, ¢.v.) and Heliornithide, and the latter of what seems to be a very lieterogeneous compound of 6 Families —Aramidz, Eurypygide (SUN Bitter, g.v.), Gruidx (CRANE, vol. vi. p. 546), Psophiidx (TRUMPETER, q.v.), Cariamide (SERIEMA, q.v.), and Otidide? (BUsTARD, vol. iv. p. 578). It is con- fessedly very puzzling to know how these varied types, or some of them at least, should be classed; but the need for the establishment of this group, and especially the insertion in it of certain forms, is not explained by the author. Then we have "Orders" Eighteen and Nineteen, the Limicole, with 6 Families, and Gaviz,

consisting only of Laride (GULL, vol. xi. p. 274), which taken in their simplest condition do not present much difficulty. The last are followed by Tubinares, the PETRELS (q.v.), and these by Pygopodes, to which only 2 Families Colymbidx (Diver, vol. vii. p. 292) and Alcidzx are allowed—the Gruszs (vol. xi. p. 79) being included in the former. The Jmpennes or PENGUINS (¢.2.) form the Twenty-second, and Tinamous (9.v.) as Crypturi complete the Carinate Subclass. For the Ratite only three “Orders” are allotted—Apteryges, Casuarti, and Struthiones.

As a whole it is impossible not to speak well of the scheme thus sketched out; nevertheless it does seem in some parts to be open to amendment, though the task of attempting to suggest any modifications of it by way of improvement is one that the present writer approaches with reluctance and the utmost diffidence. Yet the task, it appears, must be undertaken. From the preceding

1 In the eighth edition of the List of Vertebrated Animals in the Zoological Gardens, which, being published in 1888, may be taken as expressing Mr Sclater’s latest views, the first two Families only are recognized, the last two being placed under Columbida@.

2 Wrongly spelt Otida.

pages, recounting the efforts of many system-makers— good, bad, and indifferent—it will have been seen what a very great number and variety of characters need to be had in remembrance while planning any scheme that will at all adequately represent the results of the knowledge hitherto attained, and the best lesson to be learnt from

-them is that our present knowledge goes but a very little

way in comparison with what we, or our successors, may hope to reach in years to come. Still we may feel pretty confident that we are on the right track, and, moreover, that here and there we can plant our feet on firm ground, however uncertain, not to say treacherous, may be the spaces that intervene. Now that geographical exploration has left so small a portion of the earth’s surface unvisited, we cannot reasonably look for the encountering of new forms of ornithic life that, by revealing hitherto

unknown stepping stones, will quicken our course or effectively point out our path. Indeed, as a matter of fact, the two most important and singular types of existing Birds—Balwxniceps and Mhinochetus—that in later years have rewarded the exertions of travelling naturalists, have proved rather sources of perplexity than founts of inspiration. Should fortune favour ornithologists in the discovery of fossil remains, they will unquestionably form the surest guide to our faltering steps ; but experience forbids us to expect much aid from this quarter, however warmly we may wish for it, and the pleasure of any discovery of the kind would be enhanced equally by its rarity as by its intrinsic worth. However, it is now a well-accepted maxim in zoology that the mature forms of the past are repeated in the immature forms of the present, and that, where Paleontology fails to instruct us, Embryology may be trusted to no small extent to supply the deficiency. Unhappily the embryology of Birds has been as yet very insufficiently studied. We have indeed embryological memoirs of a value that can scarcely be rated too highly, but almost all are of a monographic character. They are only oases in a desert of ignorance, and a really connected and continuous series of investiga- tions, such as the many morphological laboratories, now established in various countries, would easily render possible, has yet to be instituted. No methodical attempt at this kind of work seems to have been made for nearly half a century, and, with the advantage of modern appliances, no one can justifiably doubt the success of a renewal of such an attempt any more than he can possibly foresee the precise nature of the revelations that would come of it.

The various schemes for classifying Birds set forth by the authors of general text-books of Zoology do not call for any particular review here, as almost without exception they are so drawn up as to be rather of the nature of a compromise than of a harmony. The best and most notable is perhaps that by Prof. Carus in 1868 (Handbuch der Zoologie, i. pp. 191-368) ; but it is of course now antiquated. The worst scheme is one of the most recent, that by Prof. Cuaus in 1882 (Grundziige der Zoologie, ii. pp. 818-388). Of most other similar text-books that have come under the writer’s notice, especially those issued in the United Kingdom, the less said the better. It is unfortunate that neither Prof. Gegenbaur nor the late Prof. F. M. Balfour should have turned their attention to this matter; but an improvement may

be expected from Dr Gadow, who is engaged in completing the ornithological portion of Bronn's Thicrreich, so long left unfinished.

Birds are animals so similar to Reptiles in all the most Relatio

essential features of their organization that they may be said to be merely an extremely modified and aberrant Reptilian type. Huxley twenty years ago,? and there are now but few zoologists to dissent from his statement, which by another man of science has been expressed in a phrase even more

3 Lectures on the Elements of Comparative Anatomy, p. 69; see also Carus, Handbuch der Zoologie, i, p. 192.

of Birds]

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pithy—" Birds are only glorified Reptiles." It is not intended here to enter upon their points of resemblance and differences. These may be found summarized with more or less accuracy in any text-book of zoology. We

43° might well be that of a modern Crow. The fossil remains of many other Birds, for example Prof. SEELEY's Znaliornis (Quart. Journ. Geol. Society, 1876, pp. 496-512), Sir R. OwEN's Odontopteryx (Birps, vol. ili. p. 729), Gastornis,

shall content ourselves by remarking that by the naturalist just named Birds and Reptiles have been brigaded together under the name of Sauropsida as forming one of the three primary divisions of the Vertebrata—the other two being

Prof. Copr's Diatryma (Proc. Acad. N. Sc. Philadelphia, April 1876), and some more, are too fragmentary to serve the purposes of the systematist ; but the grand discoveries of Prof. Marsh, spoken of above, afford plentiful hints as

Tchthyopsida and Mammalia. Yet Birds have a right to be considered a Class, and as a Class they have become so wholly differentiated from every

other group of the Animal Kingdom that, among recent and even the few fossil forms known to us, there is not one about the assignation of which any doubt ought now to exist, though it is right to

to the taxonomy of the Class, and their bearing deserves

the closest consideration. First of all we find that, while Antiquity Birds still possess the teeth they had inherited from their of the Reptilian ancestors, two remarkable and very distinct types Ratite

of the Class had already made their appearance, and we Garinate must note that these two types are those which persist at types,

state that some naturalists have even lately refused a place among Aves to the singular Archexopteryx, of which the remains of two individuals—most probably belonging to as many distinct forms!—-have been discovered in the quarries of Solenhofen in Bavaria. Yet one of them has been referred, without much hesitation, by Prof. Vogt to the Class Reptilia on grounds which seem to be mistaken, since it was evidently in great part if not entirely clothed with feathers.2 The peculiar structure of Archxopteryx has already been briefly mentioned and partly figured in this work (Birps, vol. iii. p. 728-9), and, while the present writer cannot doubt that its Bird-like characters predomin- ate over those which are obviously Reptilian, he will not venture to declare more concerning its relations to other Birds, and accordingly thinks it advisable to leave the genus as the sole representative as yet known of the Sub- class Saurure,? established for its reception by Prof. Hackel, trusting that time may shew whether this pro- visional arrangement will be substantiated. The great use of the discovery of Archxopteryx to naturalists in general is well known to have been the convincing testimony it afforded as to what is well called “the imperfection of the Geological Record.” To ornithologists in particular its chief attraction is the evidence it furnishes in proof of the evolution of Birds from Reptiles; though, as to the group of the latter from which the former may have sprung, it tells us little that is not negative. It throws, for instance, the Pterodactyls—so often imagined to be nearly related to Birds, if not to be their direct ancestors—completely out of the line of descent. Next to this its principal advan- tage is to reveal the existence at so early an epoch of Birds with some portions of their structure as highly organized as the highest of

the present day, a fact witnessed by its foot, which, so far as can be judged by its petrified relics,

1 See Prof. Seeley's remarks on the differences between the two specimens, in the Geological Magazine for October 1881.

2 Prof. Vogt lays much stress on the absence of feathers from certain parts of the body of the second example of Archwopteryx now, thanks to Dr Werner Siemens, in the museum of Berlin. But Prof. Vogt himself shews that the parts of the body devoid of feathers are also devoid of skin. Now it is well known that amongst most existing Birds the ordinary "contour-feathers" have their origin no deeper than the skin, and thus if that decayed and were washed away the feathers growing upon it would equally be lost. This has evidently happened (to judge from photographs) to the Berlin specimen just as to that which is in London. In each case, as Sir R. Owen most rightly suggested of the latter, the remains exactly call to mind the very familiar relics of Birds found on a seashore, exposed perhaps for weeks or even months to the wash of the tides so as to lose all but the deeply-seated feathers, and finally to be embedded in the soft soil. Prof. Vogt's paper is in the Revue Scientifique, ser. 2, ix. p. 241, and an English translation of it in The Ibis for 1880, p. 434.

3 Prof. Hickel seems first to have spelt this word Sawriure, in which form it appears in his Allgemeine Entwickelungeschichte der Organismen, forming the second volume of his Generelle Morphologie (pp. xi, and exxxix.), published at Berlin in 1866, though on plate vil. of the same volume it appears as Sawriwri. Whether the masculine or feminine termination be preferred matters little, though the latter 18 Come into general use, but the interpolation of the 7 in the middle of the word appears to be against all the laws of orthography.

the present day, and even now divide the Class into Ratite and Carinatez, the groups whose essentially distinct characters were recognized by Merrem. Furthermore, while the Ratite type ({esperornis) presents the kind of teeth, arrayed in grooves, which indicate (in Reptiles at least) a low morphological rank, the Carinate type (Ich- thyornis) is furnished with teeth set in sockets, and shew- ing a higher development. On the other hand this early Carinate type has vertebrae whose comparatively simple, biconcave

form is equally evidence of a rank unquestion- ably low; but the saddle-shaped vertebrae of the con- temporary Ratite type as surely testify to a more exalted position. Reference has been already made to this com- plicated if not contradictory state of things, the true explanation of which seems to be out of reach at present. It has been for some time a question whether the Ratite isa degraded type descended from the Carinate, or the Carinate a superior development of the Ratite type. Several eminent zoologists have declared themselves in favour of the former probability, and at first sight most people would be inclined to decide with them ; for, on this hypothesis, the easiest answer to the question would be found. But the easiest answer is not always the true one ; and to the present writer it seems that before this question be answered, a reply should be given to another—- Was the first animal which any one could properly call a “ Bird,” as distinguished from a “Reptile,” possessed of a keeled sternum or not? Now Birds would seem to have been differentiated from Reptiles while the latter had biconcave vertebrae, and teeth whose mode of attachment to the jaw was still variable. There is no reason to think that at that period any Reptile (with the exception of Pterodactyls, which, as has already been said, are certainly not in the line of Birds’ ancestors) had a keeled sternum. Hence it seems almost impossible that the first Bird should have possessed one ; that is to say, it must have been practically of the Ratite type. Prof. Marsh has shewn that there is good reason for believing that the power of flight was gradually acquired by Birds, and with that power would be associated the development of a keel to the sternum, on which the volant faculty so much depends, and with which it is so intimately correlated that in certain forms which have to a greater or less extent given up the use of their fore-limbs the keel though present has become pro- portionally aborted. Thus the Carinate type would, from all we can see at present, appear to have been evolved from the Ratite. This view receives further support from a, consideration of the results of such embryological research as has already been made—the unquestionable ossification of the Ratite sternum from a smaller number of paired centres than the Carinate sternum, in which (with the doubtful exception of the Anatidx) an additional, unpaired centre makes its appearance. Again the geographical dis- tribution of existing, or comparatively recent, Ratite forms points to the same conclusion. That these forms—Moa, Kiwi, Emeu and Cassowary, Rhea, and finally Ostrich —

must have had a common ancestor nearer to them than is the ancestor of any Carinate form seems to need no proof. If we add to these the Zpyornis of Madagascar, the fossil fatitx of the Siwalik rocks,! and the as yet but partially recognized Struthiolithus of Southern Russia,? to say no- thing of Gastornis, the evidence is stronger still. Scattered as these Birds have been or are throughout the world, it seems justifiable to consider them the survivals of a very ancient type, which has hardly undergone any essential modification since the appearance of Bird-life upon the earth—even though one at least of them has become very highly specialized.

No doubt the difficulty presented by the biconcave vertebrae of the earliest known representative of the Carinate type is a considerable obstacle to the view just taken. But in the American Journal of Science (April 1879), and again in his great work (pp. 180, 181), Prof. Marsu has shewn that in the third cervical vertebra of Ichthyornis “we catch nature in the act as it were” of modifying one form of vertebra into another, for this single vertebra in Ichthyornis is in vertical section “ moderately convex, while transversely it is strongly concave, thus presenting a near approach to the saddle-like articulation ”; and he proceeds to point out that this specialized feature occurs at the first bend of the neck, and, greatly facilitating motion in a vertical plane, is ‘“ mainly due originally to its predominance.” The form of the vertebrae would accordingly seem to be as much correlated with the mobility of the neck as is the form of the sternum with the faculty of flight. If therefore the development of the saddle shape be an indication of development, as well may be the outgrowth of a keel. However, the solution of this perplexing problem, if a solution be ever found, must remain for future paleontological or embryological dis- coverers. ‘The present writer is far from attempting to decide a question so complicated, though he does not hesitate to say, notwithstanding the weight of authority on the other side, that according to present evidence the probability is in favour of the Carinate having been evolved from a more ancient Ratite type. One thing only is certain, and that is the independent and contempo- raneous existence of each of these great divisions at the earliest period when Birds at all like

recent forms are known to have lived. The facts that each of these types was provided with teeth, and that the teeth were of a dif- ferent pattern, are of comparatively secondary importance.

It seems therefore quite justifiable to continue, after the fashion that has been set, to separate the Class Aves into three primary groups:—I. Sawrure, II. Ratitex, III. Carinate—the earliest members of the two last, as well as possibly all of the first, being provided with teeth. These three primary groups we may call “Subclasses.” Thus we shall have :—

SAURURA, Hackel. Archzopteryx the only known form. RATITA, Merrem. a. with teeth ; a’. with biconcave vertebraze—as yet unknown;

6’. with saddle-shaped vertebre-

—Hesperorms. b. without teeth—recent and existing forms.

‘ For notice of these see the papers by Mr Davies in the Geological Magazine (new series, decade ii., vol. vii. p. 18), and Mr Lydekker in the Records of the Geological Survey of India (xii. p. 52).

? Bull. Acad, Sc. St Petersburg, xviii. p. 158; Ibis, 1874, p. 4.

® Prof. Huxley has termed them “Orders”; but it is more in accordance with the practice of ornithological writers to raise them to a higher rank, and to call the secondary groups “Orders.” ‘There is a good deal to be said in behalf of either view; but, as in most cases of mere terminology, the matter is not worth wasting words over it, so Joug as we bear in mind that what here is meant by an “ Order ” of Aves is a very different thing from an “ Order ” of Reptilia.

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CARINATA, Merrem. a. with teeth ;

a’, with biconcave vertebrae —Ichthyornis ; b’. with saddle-shaped verte- bree—as yet unknown. b. without teeth—recent and

existing forms.

We have now to consider the recent and existing forms Orders) of toothless Hatitx. These were shewn beyond doubt by Méatile, |

Prof. Huxley to form five separate groups, which we shall here dignify by the name of Orders,* adding to them a sixth, though little is as yet known of its characteristics. Of this, which contains the great extinct Birds of Mada- gascar, he did not take cognizance, as it is here necessary to do. In the absence of any certain means of arranging all of these orders according to their affinities, it will be best to place their names alphabetically, thus :—

JEPYORNITHES. Fam. pyornithide.

Apreryces. Fam, Apterygide (Krwi, vol. xiv. p. 104).

Immanes. Fam. t. Dinornithide; Fam. ii. Pala- pterygide.®

Mercistanes. Fam. i. Casuariide ; Fam. ii. Dromaidz (Emu, vol. viii. p. 171).

Ruez. Fam. Rheide (RHEA, q.v.).

Struruiones. Fam. Struthionide (OstRicH, p. 62 infra).

Some systematists think there can be little question of the Struthiones being the most specialized and therefore probably the highest type of these Orders, and the present writer is rather inclined to agree with them. Nevertheless the formation of the bill in the Apteryges is quite unique in the whole Class, and indicates therefore an extraordinary amount of specialization. Their functionless wings, how- ever, point to their being a degraded form, though in this matter they are not much worse than the Megistanes, and are far above the Immanes—some of which at least appear to have been absolutely wingless, and were thus the only members of the Class possessing but a single pair of limbs.

Turning then to the third Subclass, the Carinate, their Orders of subdivision into Orders is attended with a considerable Carimata

amount of difficulty; and still greater difficulty is presented if we make any attempt to arrange these Orders so as in some way or other to shew their

respective relations—in other words, their genealogy. In regard to the first of these tasks, a few groups can no doubt be at once separated without fear of going wrong. For instance, the Crypturi or Tinamous, the Jmpennes or Penguins, the Striges or Owls, the Psittaci or Parrots, and the Passeres, or at least the Oscines, seem to stand as groups each quite by itself, and, since none of thein contains any hangers-on about the character of which there can any longer be room to hesitate, there can be little risk in setting them apart. Next comes a category of groups in which differentiation appears not to have been carried so far, and, though there may be as little doubt as to the association in one Order of the greater number of forms commonly assigned to each, yet there are in every case more or fewer outliers that do not well harmonize with the rest. Here we have such groups as those called Pygopodes, Ganz, Limicole, Galline, Columb, Anseres, Terodiones, Steganopodes, and Accipitres. Finally there are two groups of types presenting character- istics so diverse as to defy almost any definition, and, if it were not almost nonsense to say so, agreeing in little more than in the differences. These two groups are those known as Picariz and Alectorides; but, while the majority

4 See Ann. Nat. History, ser. 4, xx. pp. 499, 500.

5 On the supposition that the opinions of Dr Von Haast (Trans. and Proc. N. Zeal. Institute, vi. pp. 426, 427) can be substantiated; but they have since been disputed by Prof. Hutton (op. cié., ix. pp. 368- 365), and for the present it is advisable to suspend our judgment.

;

Ost TOO G

of Families or genera usually referred to the former plainly have some features in common, the few Families or genera that have been clubbed together in the latter make an assemblage that is quite artificial, though it may be freely owned that with our present knowledge it is impossible to determine the natural alliances of all of them.!

That our knowledge is also too imperfect to enable systematists to compose a phylogeny of Birds, even of the Carinate Subclass, and draw out their

pedigree, ought to be sufficiently evident. The uncertainty which still pre- _ vails among the best-informed ornithologists as to the respective origin of the Ratite and Carinatz is in itself a proof of that fact, and in regard to some groups much less widely differentiated the same thing occurs. We can point to some forms which seem to be collaterally ancestral (if such a phrase may be allowed), and among them perhaps some of those which have been referred to the group " Alectorides" just mentioned, and from a considera- tion of their Geographical Distribution and especially Isolation it will be obvious that they are the remnants of a very ancient and more generalized stock which in various parts of the world have become more or less specialized. The very case of the New-Caledonian Kagu (Rhinochetus), combining features which occasionally recall the Sun- Bittern (Hurypyga), and again present an unmistakable likeness to the Limicolz or the Rallidx, shews that it is without any very near relation on the earth, and, if con- venience permitted, would almost justify us in placing it in a group apart from any other, though possessing some characteristics in common with several.

It is anything but the desire of the present writer to invent a new arrangement of Birds. Such acquaintance as he possesses with the plans which have been already propounded warns him that until a great deal more labour

has been expended, and its results made clearly known,'

no general scheme of Classification will deserve to be regarded as final. Nevertheless in the best of modern systems there are some points which, as already hinted, seem to be well established, while in them there are also some dispositions and assignments which he is as yet unable to accept, while he knows that he is not alone in his mistrust of them, and he thinks it his duty here to mention them in the hope that thereby attention may be further directed to them, and his doubts either dispelled or established—it matters not which. The most convenient way of bringing them to the notice of the reader will per- haps be by considering in succession the different groups set forth by the latest systematist of any authority—Mr Sclater—a sketch of whose method has been above given. If we trust to the results at which Prof. Huxley arrived, there can be little doubt as to the propriety of

beginning the Carinate Subclass with his Dromxognathe, the Crypturt of Illiger and others, or Tinamous, for their resemblance to the atitx is not to be disputed ; but it must be borne in mind that nothing whatever is knqwn of their mode of development, and that this may, when made out, seriously modify their position relatively to another group, the normal Anseres, in which the investigations of Cuvier and L'Herminier have already shewn that there is some resemblance to the Ratite as regards the ossification of the sternum. It will be for embryologists to determine whether this asserted resemblance has any real meaning ; but of the sufficient standing of the Crypturi as an Order there can hardly be a question.] 1 Heterogeneous as is the group as left by the latest systematist, it is nothing to its state when first founded by Illiger in 1811; for it then contained in addition the genera Glareola and Cereopsis, but the last was restored to its true place among the Anseres by Temminck. The Alectrides of Duméril have nothing in common with the Alectorides

of Tlliger, and the latter is a name most unfortunately chosen, since the group so called does not include any Cock-like Bird.

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We have seen that Prof. Huxley would derive all other existing Carinate Birds from the Dromexognathe; but of course it must be understood in this, as in every other similar case, that it is not thereby implied that the modern representatives of the Dromeeognathous type (namely, the Tinamous) stand in the line of ancestry.

Under the name Jmpennes we have a group of Birds, the Dmpennes.

Penguins, smaller even than the last, and one over which until lately systematists have been sadly at fault ; for, though we as yet know little if anything definite as to their embryology, no one, free from bias, can examine any member of the group, either externally or internally, without perceiving how completely different it is from any others of the Carinate division. There is perhaps scarcely a feather or a bone which is not diagnostic, and nearly every character hitherto observed points to a low morpho- logical rank. It may even be that the clothing of Hesper- ornis was

not very dissimilar to the “plumage” which now covers the Jmpennes, and the title of an Order can hardly be refused to them.

The group known as Pygopodes has been often asserted to be closely akin to the Zmpennes, and we have seen that Brandt combined the two under the name of Urinatores, while Mr Sclater thinks the Pygopodes “seem to form a natural transition between” the Gulls and the Penguins. The affinity of the Alcide or Auks (and through them the Divers or Colymbidx) to the Gulls may be a matter beyond doubt, and there appears to be ground for considering them to be the degraded offspring of the former ; but to the present writer it appears questionable whether the Grebes, Podicipedide, have any real affinity to the two Families with which they are usually associated, and this is a point deserving of more attention on the part of morphologists than it has hitherto received. Under the name of Gaviz the Gulls and their close allies form a very natural section, but it probably hardly merits the rank of an Order more than the Pygopodes, for its relations to the large and somewhat multiform though very natural group Limicole have to be taken into consideration. Prof. Parker long ago observed (Z’rans. Zool. Society, v. p. 150) that characters exhibited by Gulls when young, but lost by them when adult, are found in certain Plovers at all ages, and hence it would appear that the Gawe are but more advanced Limicole. The Limicoline genera Dromas and Chionis have many points of resemblance to the Laride; and on the whole the proper inference would seem to be that the ZLimicole, or something very like them, form the parent-stock whence have descended the Gavizx, from which or from their ancestral forms the Alcidxe have proceeded as a degenerate branch. If this hypothesis be correct, the association of these three groups would constitute an Order, of which the highest Family would perhaps be Otididx, the Bustards; but until further research shews whether the view can be maintained it is not worth while to encumber nomenclature by inventing a new name for the combination. On the other hand the Petrels, which form the group Zubinares, would seem for several reasons to be perfectly distinct from the Gavix and their allies, and possibly will have to rank as an Order.

Considerable doubt has already been expressed as to the existence of an Order Alectorides, which no one can regard as a natural group, and it has just been proposed to retransfer to the Limicole one of the Families,

Otidide, kept in it by Mr Sclater. Another Family included in it by its founder is Cariamidz, the true place of which has long been a puzzle to systematizers. The present writer is inclined to think that those who have urged its affinity to the Accipitres, and among them taxonomers starting from bases so opposite as Sundevall and Prof. Parker, have more nearly hit the mark, and accordingly would

Gavie

and their

allies.

Tubinares.

‘¢ Alecto-

rides.”

Graliv. Allusion has also been made to the peculiarities of two | of by-gone years, under the name, however meaningless, other forms placed with the last among the Alectorides— | of Rasores. Failing that, the general resemblance of most Hurypyga and Rhinochetus—being each the sole type of a | parts of the osteology of the Sand-Grouse to that of the separate Family. It seems that they might be brought | Pigeons, so well shewn by M. Milne-Edwards, combined with the Gruidx, Psophiidx, and Aramidx into a group | with their Pigeon-like pterylosis, inclines the present writer or Suborder G’rwes,—which, with the Pulicariz * of Nitzsch | to group them as a Suborder of Columbx; but the many Coluibe, and Mr Sclater as another Suborder, would constitute an | important points in which they differ from the more normal Order that may continue to bear the old Linnean name | Pigeons, especially in the matter of their young being Gralle, It must be borne in mind, however, that some | clothed with down, and their coloured and speckled eggs,® members of both these Suborders exhibit many points of | must be freely admitted. Young Sand-Grouse are described resemblance to certain other forms that it is at present | as being not only “Dasypedes” but even “ Praecoces” at necessary to place in different groups—thus some /allide | birth, while of course every one knows the helpless condition to the

Galline, Grus to Otis, and so forth; and it is as | of “Pipers”—that is, Pigeons newly-hatched from their yet doubtful whether further investigation may not shew | white eggs. Thus the opposite condition of the young of the resemblance to be one of affinity, and therefore of | these two admittedly very near groups inflicts a severe taxonomic value, instead of mere analogy, and therefore of | blow on the so-called “physiological” method of dividing no worth in that respect. Birds before mentioned, and renders the Pteroclide so –

We have next to deal with a group nearly as com- | instructive a form. The Colwmbzx, considered in the wide

Gulline. plicated. The true Calling are indeed as well marked a | sense just suggested, would seem to have possessed another section as any to be found; but round and near them cluster | and degenerate Suborder in the Dodo and its kindred, some forms very troublesome to allocate. The strange | though the extirpation of those strange and monstrous Hoactzin (Opisthocomus) is one of these, and what seems to | forms will most likely leave their precise relations a matter be in some degree its arrested development makes its posi- | of some doubt ; while the third and last Suborder, the true tion almost unique,+—but enough has already been said of | Columbe, is much more homogeneous, and can hardly be it before (seevol. xii. p. 28, and supra p. 36). It must for the | said to contain more than two Families, Colwmbide and present at least stand alone, the sole occupant of a single | Didunculide—the latter consisting of a single species Order. Then there are the Hemipodes or Button-Quails, | peculiar to the Samoa Islands, and having no direct con- which have been raised to equal rank by Prof. Huxley as | nexion with the Dididx or Dodos,® though possibly it may Turnicomorphe; but, though no doubt the osteological | be found that the Papuan genus Otidiphaps presents a form differences between them and the normal Gallinx, pointed | linking it with the Columbide. out by him as well as by Prof. Parker, are great, they do The Galline would seem to hold a somewhat central Groups not seem to be more essential than are found in different | position among existing members of the Carinate division,” allied to members of some other Orders, nor to offer an insuperable | whence many groups diverge, and one of them, the Opis- ¢“4am objection to their being classed under the designation |

thocomi or Heteromorphx of Prof. Huxley, indicates, as he | Galline. If this be so there will be no necessity for | has hinted, the existence of an old line of descent, now removing them from that Order, which may then be | almost obliterated, in the direction of the Musophagidex, portioned into three Suborders—Zemipodit standing some- } and thence, we may not unreasonably infer, to the what apart, and Alectoropodes and Peristeropodes, which | Coccygomorphe of the same authority. But these are more nearly allied—the latter comprehending the | “ Coccygomorphs ” would also appear to reach a higher Megapodiidx and Cracidx, and the former consisting of | rank than some other groups that we have to notice, and the normal Galline, of which it is difficult to justify the | therefore, leaving the former, we must attempt to trace recognition of more than a single Family, though in that | the fortunes of a more remote and less exalted line. It two types of structure are discernible, has already been stated that the Gavix are a group closely

ae The Family of Sand-Grouse, Pteroclidz, is perhaps one | allied to though somewhat higher than the Limicolx, and

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now relegate it to that Order. It is doubtless an extremely generalized form,! the survival of a very ancient type, whence several groups may have sprung; and, whenever the secret it has to tell shall be revealed, a considerable step in the phylogeny of Birds can scarcely fail to follow.?

of the most instructive in the whole range of Ornithology. In Prof. Huxtey’s words (Proceedings, 1868, p. 303), they are “completely intermediate between the Alectoromorphex [z.c., Gallinz] and the Peristeromorphe [the Pigeons |. They cannot be included within either of these groups without destroying its definition, while they are perfectly definable themselves.” Hence he would make them an independent group of equal value with the other two. Almost the same result has been reached by Dr Gapow

Cariama is the oldest name for the genus, but being a word of ‘‘ barbarous” origin it was set aside by Illiger and the purists in favour of Dicholophus,

under which name ithas been sevcral times mentioned in the foregoing pages.

2 A brief description of the egg and young of Cariama cristata pro- duced in the Jardin des Plantes at Paris is given in the Zoological Society's Proceedings for 1881, p. 2.

3 This group would contain three families—Rallidw, Heliornithide (the Finfoots of Africa and Sonth America), and the Afesitide of Madagascar—whose at least approximate place has been at last found = aS by M. A. Milne-Edwards (Ann. Se. Naturelles, ser. 6. vii.

o. 6).

4 Mesites, just mentioned, presents a case which may, however, be very similar.

(op. cit., 1882, pp. 331, 332). No doubt there are strong and tempting reasons for taking this step; but peradven- ture the real lesson taught by this aggregation of common characters is rather the retention of the union of the Galline and Columbsx into a single group, after the fashion

that at least two forms of what have here been called Grallz present an affinity to the latter. One of them, Ethinochetus, has been several times thought to be con- nected through its presumed relative Lurypyga (from which, however, it is a good way removed both as regards distribution and structure) with the Heriodiones, Herons. On the other hand the Gaviz would seem to be in like manner related through Phaethon (the TRopic-BIRD, 9.2.) with the Steganopodes or Dysporomorphe of Prof. Huxley, among which it is usually placed, though according to Prof. Mivart (Zrans. Zool. Society, x. pp. 364, 365) wrongly. These supposed affinities lead us to two other groups of Birds that have, it has been proved, some com- mon characters ; and from one or the other (no one yet can say which) the Accipitres would seem to branch off—

® This fact tells in favour of the views of Dr Gadow and those who hold the Sand-Grouse to be allied to the Plovers ; but then he places the Pigeons between these groups, and their eggs tell as strongly the other way.

8 Cf. Phil. Transactions, 1867, p. 349.

7 Cf. Prof. Parker’s remarks in the Philosophical Transactions for 1869, p. 755.

possibly from some ancestral type akin to and now most directly represented by the enigmatical Carcama—possibly in some other way which we can only dimly foreshadow. – The Herodiones are commonly partitioned into three groups —Ardex, Ciconiz, and Platalex, the last including the Tbises—which may certainly be considered to be as many Suborders. Thesecond of them, the Storks, may perhaps be regarded as the point of departure for the Accipitres in the manner indicated,! as well as, according to Prof. Huxley, for the Flamingoes, of which he would make a distinct group, Amphimorphe, equivalent to the Odontoglosse of Nitzsch, intermediate between the Pelargomorphe and the Chenomorphe, that is, between the Storks and the Geese. When the embryology of the Phenicopteridx is investi- gated their supposed relationship may perhaps be made out. At present it is, like so much that needs to be here advanced, very hypothetical; but there is so much in the osteology of the Flamingoes, besides other things, that resembles the Anseres that it would seem better to regard them as forming a Subclass of that group to rank equally with the true Anseres and with the Palamedex (SCREAMER, g.v.), Which last, notwithstanding the opinion of Garrod, can hardly from their osteological similarity to the true Anseres be removed from their neighbourhood.

Whatever be the alliances of the genealogy of the Accipitres, the Diurnal Birds-of-Prey, their main body must stand alone, hardly divisible into more than two principal groups—(1) containing the Cathartide or the Vultures of the New World, and (2) all the rest, though no doubt the latter may be easily subdivided into at least two Families, Vulturidx and Falconide, and the last into many smaller sections, as has commonly been done; but then we have

the outliers left. The African Serpentariidx, though represented only by a single species,? are fully allowed to form a type equivalent to the true Accipitres composing the main body ; but whether to the Secretary-bird should be added the often-named Cariama, with its two species, must still remain an open question.

It has so long been the custom to place the Owls next to the Diurnal Birds-of-Prey that any attempt to remove them from that position cannot fail to incur criticism. Yet when we disregard their carnivorous habits, and certain modifications which may possibly be thereby induced, we find almost nothing of value to indicate relationship between them. That the Striges stand quite independently of the Accipitres as above limited can hardly be doubted, and, while the Psittaci or Parrots would on some grounds appear to be the nearest allies of the Accypitres, the nearest relations of the Owls must be looked for in the multifarious group Picarizx. Here we have the singular Steatornis (GUACHARO, vol. ix. p. 227), which, long confounded with the Caprimulgide (GoaTsuUCKER, vol. ix. p. 711), has at last been recognized as an indepen- dent form, and one cannot but think that it has branched off from a common ancestor with the Owls. The Goat- suckers may have done the like,? for there is really not much to ally them to the Swifts and Humming-birds, the Macrochires proper, as has often been recommended. However, the present writer would not have it supposed that he would place the Striges under the Picariz, for the

: Garrod and Forbes suggest a ‘‘Ciconiiform” origin for the Pubinares (Zool. Voy. ‘ Challenger,” pt. xi. pp. 62, 68).

- It was long suspected that the genus Polyboroides of South

Africa and Madagascar, from its general resemblance in plumage and outward form, might come into this group, but that idea has now been fully dispelled by M. A. Milne-Edwards in his and M. Grandidier’s magnificent Oiseawa de Madagascar (vol. i. pp. 50-66). ; 3 The great resemblance in coloration between Goatsuckers and Owls is of course obvious, so obvious indeed as to make one suspicious of their being akin ; but in reality the existence of the Hkeness is no bar to the affinity of the groups ; it merely has to be wholly disregarded.

last are already a sufficiently heterogeneous assemblage, and one with which he would not meddle. Whether the Woodpeckers should be separated from the rest is a matter of deeper consideration after the deliberate opinion of Prof. Parker, who would lift them as Saurognathe to a higher rank than that in which Prof. Huxley left them as Celeomorphx, indeed to be the peers of Schizognathe, Desmognathx, and so forth ; but this advancement is based solely on the characters of their palatal structure, and is unsupported by any others. That the P%ez constitute a very natural and easily defined group is indisputable; more than that, they are perhaps the most differentiated group of all those that are retained in the “Order” Picarie ; but it does not seem advisable at present to deliver them from that chaos when so many other groups have to be left in it.

Lastly we arrive at the Passeres, and here, as already Passeres,

mentioned, the researches of Garrod and Forbes prove to be of immense service. It is of course not to be supposed that they have exhausted the subject even as regards their Mesomyodi, while their Acromyodi were left almost untouched so far as concerns details of arrangement; but the present writer has no wish to disturb by other than very slight modifications the scheme they put forth. He would agree with Mr Sclater in disregarding the distinc- tions of Desmodactyli and Eleutherodactyli, grouping the former (Lurylemide) with the LHeteromeri and IHaploo-

phone, which all together then might be termed the their Sub-

Suborder Oligomyodt. Suborder the 7’racheophone as left by Garrod, and then as a third Suborder the abnormal Acromyodi, whether they are to be called Pseudoscines or not, that small group con- taining, so far as is known at present, only the two Families Atrichiidxe and Menuridx. Finally we have the normal Acromyodi or true Oscines.

To this would follow as a second orders.

This last and highest group of Birds is one which, as Oseines,

before hinted, it is very hard to subdivide.

Some two or their homo-

three natural, because well-differentiated, Families are to Pie

be found in it—such, for instance, as the Hirundinide or Swallows, which have no near relations ; the Alaudidez or Larks, that can be unfailingly distinguished at a glance by their scutellated planta, as has been before mentioned ; or the Meliphayide with their curiously constructed tongue. But the great mass, comprehending incomparably the greatest number of genera and species of Birds, defies any sure means of separation. Here and there, of course, a good many individual genera may be picked out capable of the most accurate definition ; but genera like these are in the minority, and most of the remainder present several apparent alliances, from which we are at a loss to choose that which is nearest. Sclater's "Laminiplantar" Oscines seem to pass almost imperceptibly into one another. We may take examples in which what we may call the Thrush-form, the Tree- creeper-form, the Finch-form, or the Crow-form is pushed to the most extreme point of differentiation, but we shall find that between the outposts thus established there exists a regular chain of intermediate stations so intimately con- nected that no precise lines of demarcation can be drawn cutting off one froni the other. Still one thing is possible.

ness.

Four of the six groups of Mr.

Hard though it be to find gupposed

definitions for the several groups of Oscines, whether we highrankof

make them more or fewer, it is by no means so hard, if we go the right way to work, to determine which of them is the highest, and, possibly, which of them is the lowest. It has already been shewn (page 30) how, by a woe- ful want of the logical apprehension of facts, the 7'urdidx came to be accounted the highest, and the position ac- corded to them has been

generally acquiesced in by those who have followed in the footsteps of Keyserling and

Turdidx

not borne out by alliances,

nor by size of brain,

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Blastus, of Prof. Cabanis and of Sundevall. To the present writer the order thus prescribed seems to be almost the very reverse of that which the doctrine of Evolution requires, and, so far from the Turdide being at the head of the Oscines, they are among its lower members. There is no doubt whatever as to the intimate relationship of the Thrushes (Turdidz) to the Chats (Saxicoline), for that is admitted by nearly every systematizer. Now most author- ities on classification are agreed in associating with the latter group the Birds of the Australian genus Petreca and its allies—the so-called "Robins" of the English- speaking part of the great southern communities. But it so happens that, from the inferior type of the osteological characters of this very group of Birds, Prof. PARKER has called them (Trans. Zool. Society, v. p. 152) " Struthious Warblers." Now if the Petreca-group be, as most allow, allied to the Saxicolinz, they must also be allied, only rather more remotely, to the Z'wrdide—for Thrushes and Chats are inseparable, and therefore this connexion must drag down the Thrushes in the scale, Let it be granted that the more highly-developed Thrushes have got rid of the low "Struthious" features which characterize their Australian relatives, the unbroken series of connecting forms chains them to the inferior position, and of itself disqualifies them from the rank so fallaciously assigned to them. Nor does this consideration stand alone. By submitting the Thrushes and allied groups of Chats and Warblers to other tests we may try still more completely their claim to the position to which they have been advanced.

Without attaching too much importance to the system- atic value which the characters of the nervous system afford, there can be little doubt that, throughout the Animal Kingdom, where the nervous system is sufficiently developed to produce a brain, the creatures possessing one are considerably

superior to those which have none. Con- sequently we may reasonably infer that those which are the best furnished with a brain are superior to those which are less well endowed in that respect, and that this infer- ence is reasonable is in accordance with the experience of every Physiologist, Comparative Anatomist, and Palzeon- tologist, who are agreed that, within limits, the proportion which the brain bears to the spinal marrow in a vertebrate is a measure of that animal's morphological condition. These preliminaries being beyond contradiction, it is clear that, if we had a series of accurate weights and measure- ments of Birds' brains, it would go far to help us in deciding many cases of disputed precedency, and especially such a case as we now have under discussion. To the dispraise of Ornithotomists this subject has never been properly investigated, and of late years seems to have been wholly neglected. The present writer can only refer to the meagre lists given by TIEDEMANN (Anat. und Naturgesch. der Vogel, i. pp. 18-22), based for the most part on very ancient observations ; but, so far as those observations go, their result is conclusive, for we find that in the Blackbird, Turdus merula, the proportion which the brain bears to the body is lower than in any of the eight species of Oscines there named, being as 1 is to 67. In the Redbreast, Erithacus rubecula, certainly an ally of the Zurdida, it is as 1 to 32; while it is highest in two of the Finches—the Goldfinch, Carduelis elegans, and the Canary-bird, Serinus canarius, being i in each as 1 to 14. The signification of these numbers. needs no comment to be understood.

Evidence of another kind may also be adduced in proof that the high place hitherto commonly accorded to the Turdide is undeserved. Throughout the Class Aves it is observable that the young when first fledged generally assume a spotted plumage of a peculiar character—nearly each of the body-feathers having a light-coloured spot at

its tip—and this is particularly to be remarked in most groups of Oscines, so much so indeed, that a bird thus marked may, in the majority of cases, be set down with- out fear of mistake as being immature. All the teachings of morphology go to establish the fact that any characters which are peculiar to the immature condition of an animal, and are lost in its progress to

maturity, are those which its less advanced progenitors bore while adult, and that in proportion as it gets rid of them it shews its superiority over its ancestry. This being the case, it would follow that an animal which at no time in its life exhibits such marks of immaturity or inferiority must be of a rank, compared with its allies, superior to those which do exhibit these marks. The same may be said of external and secondary sexual characters. ‘Those of the female are almost invari- ably to be deemed the survival of ancestral characters, while those peculiar to the male are in advance of the older fashion, generally and perhaps always the result of sexual selection.1 When both sexes agree in appearance it may mean one of two things—either that the male has not lifted himself much above the condition of lis mate, or that, he having raised himself, the female has success- fully followed his example. In the former alternative, as regards Birds, we shall find that neither sex departs very much from the coloration of its fellow-species; in the latter the departure may be very considerable. Now, applying

these principles to the Thrushes, we shall find that without nor by exception, so far as is known, the young have their first char-

plumage more or less spotted; and, except in some three or four species at most,? both sexes, if they agree in plumage, do not differ greatly from their fellow-species. Therefore as regards capacity of brain and coloration of plumage priority ought not to be given to the Turdide. It remains for us to see if we can find the group which is entitled to that eminence. Among Ornithologists of the highest rank there have been few whose opinion is more worthy of attention than Macgillivray, a trained anatomist and a man of thoroughly independent mind. Through the insufficiency of his opportunities, his views on general classification were confessedly imperfect, but on certain special points, where the materials were present for him to form a judgment, one may generally depend upon it. Such is the case here, for his work shews him to have diligently exercised his genius in regard to the Birds which we now call Oscines. He belonged to a period anterior to that in which questions that have been brought uppermost by the doctrine of Evolution existed, and yet he seems not to have been without perception that such questions might arise. including among others the Family Corvdx—the Crows, he tells us (Brit. Birds, i. pp. 485, 486) that they “are to be accounted among the most perfectly organized birds,”

justifying the opinion by stating the reasons, which are of a very varied kind, that led him to it. In one of the earlier treatises of Prof. PARKER, he has expressed (7Z'rans. Zool. Society, v. p. 150) his approval of Macgillivray's views, adding that, "as that speaking, singing, mocking animal, Man, is the culmination of the Mammalian series, so that bird in which the gifts of speech, song, and mockery are combined must be considered as the top and crown of the bird-class." Any doubt as to which Bird is here intended is dispelled by another passage, written ten

1 See Darwin, Descent of Man, chaps. xv., xvi.

2 According to Mr Seebohm (Cat. Birds Brit. Museum, v. p. 232) these are in his nomenclature Aerula nigrescens, M. fuscatra, M. gigas, and AM. gigantodes.

3 In this Order he included several groups of Birds which we now know to be but slightly if at all allied ; but his intimate acquaintance was derived from the Corvide# and the allied Family we now call Sturnid#.

In treating of what he termed the Order Vagatores,3 ha

years later, wherein (Monthly Microsc. Journal, 1872, p. 217) he says, " The Crow is the great sub-rational chief of the whole kingdom of the Birds ; he has the largest brain ; the most wit and wisdom ;" and again, in the Zoological Society's Z'ransactions (ix. p. 300), " In all respects, physio- logical, morphological, and ornithological, the Crow may be placed at the head, not only of its own great series (birds of the Crow-form), but also as the unchallenged chief of the whole of the ' Carinate.' "

It is to be supposed that the opinion so strongly expressed in the passage last cited has escaped the observation of recent systematizers; for he would be a bold man who would venture to gainsay it. Still Prof. Parker has left untouched or only obscurely alluded to one other considera- tion that has been here brought forward in opposing the claim of the Z'urdidz, and therefore a few words may not be out of place on that point—the evidence afforded by the coloration of plumage in young and old. Now the Corvide fulfil as completely as is possible for any group of Birds to do the obligations required by exalted rank. To the magnitude of their brain

beyond that of all other Birds Prof. Parker has already testified, and it is the rule for their young at once to be clothed in a plumage which is essentially that of the adult. This plumage may lack the lustrous reflexions that are only assumed when it is necessary for the welfare of the race that the wearer should don the best apparel, but then they are speedily acquired, and the original difference between old and young is of the slightest, Moreover, this obtains even in what we may fairly consider to be the weaker forms of the Corvide—the Pies and Jays. In one species of Corvus, and that (as might be expected) the most abundant, namely, the Rook, C. frugilegus, very interesting cases of what would seem to be explicable on the theory of Reversion occasionally though rarely occur. In them the young are more or less spotted with a lighter shade, and these exceptional cases, if rightly understood, do-but confirm the rule! It may be conceded that even among Oscines? there are some other groups or sections of

1 One of these specimens has been figured by Mr Hancock (N. H. Trans. Northumb. and Durham, vi, pl. 8); see also Yarrell's British Birds, ed. 4, ii. pp. 802, 303.

2 In other Orders there are many, for instance some Humming- birds and Kingfishers ; but this only seems to shew the excellence in those Orders attained by the forms which enjoy the privilege,

groups in which the transformation in appearance from youth to full age is as slight. This is so among the Paride ; and there are a few groups in which the young, prior to the first moult, may be more brightly tinted than afterwards, as in the genera Phylloscopus and Anthus. These anomalies cannot be explained as yet, but we see that they do not extend to more than a portion, and generally a small portion, of the groups in which they occur ; whereas in the Crows the likeness between young and old is, so far as is known, common to every member of the Family. It is therefore confidently that the present writer asserts, as Prof. Parker, with far more right to speak on the subject, has already done, that at the head of the Class Aves must stand the Family Corvidx, of which Family no one will dispute the

superiority of the genus Corvus, nor in that genus the pre-eminence of Corvus corax—the widely-ranging Raven of the Northern Hemisphere, the Bird perhaps best known from the most ancient times, and, as it happens, that to which belongs the earliest historical association with man. There are of course innumerable points in regard to the Classification of Birds which are, and for a long time will continue to be, hypothetical as matters of opinion, but this one seems to stand a fact on the firm ground of proof.

During the compilation of much of the present article the writer flattered himself with the hope that he might at its conclusion have been able to give a graphic illustration of the way in which the various groups of Birds may be conceived to be related to one another in the form of a map, such as has been so usefully furnished by several of his more gifted brethren in regard to other Classes or portions of Classes of the Animal Kingdom. This hope he has been reluctantly constrained to abandon,—whether from the inherent difficulty, perhaps impossibility, of at

_ present executing the task, or from his own want of charto-

graphical skill, it is not for him to say. He may, however, be allowed to express the belief that there is no group in Animated Nature that more assuredly deserves the further attention of the highest zoological intellects than Birds ; and, looking to the perplexities which on all sides beset their scientific study, there is no department of Zoology that will better repay the application of those intellects than Ornithology. (A. N.)

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ORNITHORHYNCHUS. See Piarypvs.

ORONTES. See Syria.

OROPUS, a Greek seaport, on the Euripus, in the district Tlepaixy, opposite Eretria. It was a border city between Beeotia and Attica, and its possession was a continual source of dispute between the two countries; but at last it came into the final possession of Athens, and is always alluded to under the Roman empire as an Attic town. The actual harbour, which was called Delphinium, was at the mouth of the Asopus, about a mile north of the city. The famous oracle of Amphiaraus was situated in the ter- ritory of Oropus, 12 stadia from the city. A village still called Oropo occupies the site of the ancient town.

OROSIUS, Pavtus, author of the once widely read Historiarum adversum Paganos Lnbri VIT., was born in Spain towards the close of the 4th century; that he was a native of Tarragona is a somewhat precarious inference from his manner of referring to “Tarraco nostra” in Hist. vii. 22. Having entered

the Christian priesthood, he naturally took an interest in the Priscillianist controversy then going on in his native country, and it was in connexfon with this that he went (or was sent) to consult Augustine at Hippo in 413 or 414. After staying for some time in Africa as the disciple of Augustine, he was sent by him in 415 to Palestine with a letter of introduction to Jerome, then at Bethlehem. The ostensible purpose of his mission (apart, of course, from those of pilgrimage and perhaps relic hunting) was that he might gain further instruction from Jerome on the points raised by the Priscillianists and Origenists ; but in reality, it would seem, his business was to stir up and assist Jerome and others against Pelagtus, who, since the synod of Carthage in 411, had been living in Palestine, and finding some acceptance there. The result of his arrival was that John, bishop of Jerusalem, was induced to summon at his capital in June 415 a synod at which Orosius communicated the decisions of Carthage and read such of Augustine's writings against Pelagius as had at that time appeared. Success, however,

was scarcely to be hoped for amongst Orientals who did not understand Latin, and whose sense of reverence was unshocked by the question of Pelagius "et quis est mihi Augustinus?" All that Orosius succeeded in obtaining was John's consent to send letters and deputies to Innocent of Rome; and, after having waited long enough to learn the unfavourable decision of the synod of Diospolis or Lydda in December of the same year, he returned to north Africa, where he is believed to have died. According to Gennadius he carried with him recently discovered relics of the protomartyr Stephen from Palestine to the West.

The earliest work of Orosius, Consultatio sive Commonitorium ad Augustinum de errore Priseillianistarwm et Origenistarwm, explains its object by its title; it was written soon after his arrival in Africa, and is usually printed in the works of Augustine along with the reply of the latter, Contra Priscillianistas et Origenistas Liber ad Orosium. His next treatise, Liber Apologeticus de arbitrii libertate, was written during his stay in Palestine, and in connexion with the controversy which engaged him there. It occurs in the Biblioth. Max. Patr., and also in Hardouin and Mansi. The Historix adversum Paganos was undertaken at the suggestion of Augustine, to whom it is dedicated. When Augustine proposed this task he had already planned and made some progress with his own De Civitate Dei; it is the

same argument that is elaborated by his disciple, namely, the evidence from history that the circum- stances of the world had not really become worse since the intro- duction of Christianity. The work, which is thus a pragmatical chronicle of the calamities that have happened to mankind from the fall down to the Gothic period, has little accuracy or learning, and even less of literary charm to commend it; but its purpose gave it value in the eyes of the orthodox, and the Hormesia, Ormesta, or Ormista (Or[osii] M[undi] Hist[oria]), as it was called, speedily attained a wide popularity. A free abridged translation by King Alfred is still extant (Old English text, with original in Latin, edited by H. Sweet, 1883). The ediio princeps of the original appeared at Vienna (1471); that of Havercamp (Leyden, 1738 and 1767) has now been superseded by Zangemeister, who has edited the Hist. and also the Lib. Apol. in vol. v. of the Corp. Ser. Heel. Lat. (Vienna, 1882). The “sources” made use of by Orosius have been investigated by Morner (De Orosii vita ejusque hist. libr. VIL. adversus Paganos, 1844); besides the Old and New Testaments, he appears to have consulted Livy, Justin, Tacitus, Suetonius, Florus, and a cosmography, attaching also great value to Jerome’s transla- tion of the Chronicles of Eusebius.

OR P—ORP

ORPHEUS, a very important figure in Greek legend. The name is an ancient Indo-European one; the original Arbhu can be traced in the ebhu of the Rigveda and the Alp or Elf of Teutonic folklore. It is, however, impossible to establish any connexion between the Orpheus legend in the highly developed form which alone has come down to us and the beliefs entertained about Ribhu and Elf. In Greece, Orpheus was always associated with the early Thracian race, which was supposed to have inhabited the neighbourhood of Mount Helicon, the district of Pieria in Macedonia, and the coasts and country generally on the north of the Augean Sea. The religion of the Muses and the religion of Dionysus, with both of which Orpheus is connected, are intimately associated with this race (see Musss). Orpheus was son of the river god CHagrus and the Muse Calliope. He played so divinely on the lyre that all nature stopped to listen to his music. When his wife Eurydice died, he went after her to Hades, and the strains of his lyre softened even the stern gods of the dead. Eurydice was released, and followed him to the upper world, but he looked back towards her before

she was clear of the world of death and she vanished again from his sight. The Thracian women, jealous of his unconquerable love for his lost wife, tore him to pieces during the frenzy of the Bacchic orgies ; his head and his lyre floated “down the swift Hebrus to the Lesbian shore,” where a shrine of Orpheus was built near Antissa. The legend, with all its melancholy, its love, and its sympathy with nature, has obviously taken shape in the hands of an early school of lyric poetry, associated with the worship of the Muses ; the ancient Thracian aotdoi are recognized as the earliest Singers in Greece, but their art and their Muse-religion have passed to Lesbos, which was the chief seat of Greek lyric poetry in the 7th and 6th centuries B.c. The tragic death of Orpheus is obviously connected with the Bacchic ritual (see Orc1Es). Orpheus is the representative of the god torn to pieces every year by the envious powers of nature, a ceremony that was duly enacted by the Baccha, in earlier times with a human victim, afterwards with a bull to represent the bull-formed god.

The Orpheus legend is closely analogous with that of Marsyas. Orpheus and Marsyas are embodiments of the supposed origin of music in Thrace and in Phrygia, countries inhabited by kindred races, viz., the influences of nature (both being closely connected with river-worship) and the teaching or gift of a goddess. The melancholy history of both must have its origin in the character of the Thraco-Phrygian people: the divine gift brings sorrow as well as power. ach uses the musical instrument that characterized his country.

The name of Orpheus is equally important in the religious history of Greece; and in this respect also it is associated with Thrace. He was the mythic founder of a religious school or sect, with a code of rules of life, a mystic eclectic theology, a system of purificatory and expiatory rites, and peculiar mysteries. This school is first observable under the rule of Pisistratus at Athens in the 6th century B.c. Its doctrines are founded on two elements—(1) the Thraco-Phrygian religion of Bacchus with its enthusiastic orgies, its mysteries, and its purifica- tions, and (2) the tendency to philosophic speculation on the nature and mutual relations of the numerous gods, developed at this time by intercourse with Egypt and the East, and by the quickened intercourse between different tribes and different religions in Greece itself. These causes produced similar results in different parts of

Greece. The close analogy between Pythagoteanism and Orphism has been recognized from Herodotus (ii. 81) to the latest modern writers. Both inculeated a peculiar kind of ascetic life; both had a mystical speculative

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theory of religion, with purificatory rites, abstinence from beans, &c.; but Orphism was more especially religious, while Pythagoreanism, at least originally, inclined more to be a political and philosophical creed.

The rules of the Orphic life (Gios ’Opduixds) prescribed abstinence from beans, flesh, certain kinds of fish, &c., the wearing of a special kind of clothes, and numerous other practices and abstinences, for all of which reasons were given in religious myths (iepot Adyor). The ritual of worship was peculiar, not admitting bloody sacrifices. The belief was taught in the homogeneity of all living things, in the transmigration of souls, in the view that the soul is imprisoned in the body, and that it may gradually attain perfection during connexion with a series of bodies. It is not possible here to treat of the Orphic mysteries (see Lobeck, Aglaophamus). The influence of Orphism on the Eleusinian mysteries has been described under MysTerizs, and points of similarity and diversity noted. Greek litera- ture was always hostile to the Orphic religion (cf. Eur., Hipp., 952 sq.; Plato, Rep., ii, 364; Theophr., Char., 25).

A large number of writings in the tone of the Orphic religion existed and were ascribed to Orpheus, as the poems of the Trojan and Theban cycles to Homer and Hesiod. The real names of the authors of these works were in many cases known to those who inquired into the matter, though the common people believed that all were written before the time of Homer by Orpheus (Herod., ii. 53). Aristotle declared that there had never been a poet Orpheus. The names of poets of the Orphic cycle can be traced as early as 550 B.c. Onomacritus is the most famous of them all (see ONomacritTus). These poems were recited at rhapsodic contests alongside of Homeric and Hesiodic works (Plato, Jon, 536). Orphic hymns were used in the mysteries at Phlya and Eleusis (Paus., 1x. 27, 2; 30, 5; 1. 14). The poems were a favourite sub- ject of study for the Alexandrian grammarians. Again in the controversies between Christian and pagan writers in the 3d and 4th centuries after Christ the Orphic religious poems played a great part: pagan

writers quoted them to show the real meaning of the multitude of gods, while Christians retorted by reference to the obscene and disgraceful fictions by which they degraded the gods.

The Orphic literature was united in a corpus, entitled ra ’Opdid, or Té els ’Oppéa avahepdueva; the different parts were connected, and the wholé prefaced by a dedication to Muszus as son and first initiate of Orpheus. The chief poem was 7 rod ‘Oppéws Peodroyla or pvoroila, which existed in several versions, showing consider- able variations. Tliere was also a collection of Orphic hymns, con- taining numerous liturgic songs used in the mysteries and in cxo- teric ceremonial; also practical treatises, “Epya nal ‘Huépat, and poems on stones, herbs, and plants, &c. These works have been lost, except fragments collected by Lobeck. There exist several poems called Orphic (Argonautica, Hymns, Lithica). These are very late works, composed at the time when paganism was passing away before Christianity.

The story of Orpheus, as was to be expected of a legend told both by Ovid and Boetius (bk. iii. cap, xxxv.), retained its popu- larity throughout the Middle Ages and was transformed into the likeness of a northern fairy tale. In English medizval literature it appears in three somewhat different versions:—Sir Orpheo, a “lay of Brittany” printed from the Harleian MS. in Ritson’s Ancient English Metrical Romances, vol. ii; Orpheo and Heurodis from the Auchinleck MS. in David Laing’s Select Remains of the Ancicnt Popular Poetry of Scotland ; and Kyng Orfew from the Ashmolean MS. in Halliwell’s Illustrations of Fairy Mythology (Shakespeare Soc., 1842), The poems bear trace of French influence,

ORPIMENT (auripigmentum), the trisulphide of arsenic, As,Sg, or yellow realgar, occurs in small quantities as a native mineral of a brilliant golden-yellow colour in Bohemia, Peru, &c. For industrial purposes an artificial orpiment is manufactured by subliming one part of sulphur with two of arsenious acid. The sublimate varies in colour from yellow to red, according to the intimacy of the combination of the ingredients ; and by varying the relative

quantities used many intermediate tones may be obtained. These artificial preparations all contain free arsenious acid, and are therefore highly poisonous. Formerly, under the name of king's yellow, a preparation of orpiment was in considerable use as a pigment, but now it has been largely superseded by chrome-yellow. It was also at one time used in dyeing and calico-printing, and for the unhairing of skins, &c.; but safer and equally efficient substitutes have been found.

ORRERY, Earts or. See Boys.

ORRIS-ROOT consists of the rhizomes or underground stems of three species of Iris, I. germanica, I. florentina, and J, pallida, closely allied plants growing in subtropical and temperate latitudes, but principally identified with North Italy. The three plants are indiscriminately culti- vated in the neighbourhood of Florence as an agricultural product under the name of "ghiaggiuolo." The rhizomes form joints of annual growth from 3 to 4 inches long; they branch and give off rootlets at the joints, and when these attain five years of age they begin to decay. When taken out of the ground the branches and rootlets are trimmed off, the brown bark removed, and the separated joints are put up to dry and mature. In its fresh condition orris-root contains an acrid juice and has an earthy odour, but 'it is quite destitute of the fragrance which ultimately characterizes the substance, and which develops fully only after a lapse of about two years, probably by fermenta- tion. As it comes into the market, orris-root is in the form of contorted sticks and irregular knobby pieces up to 4 inches in length, of a compact chalky appearance, having a delicate but distinct odour of violets. By distil- lation with water a crystalline body known as orris-camphor or oil of orris, possessing the fragrant properties of orris- root, is obtained. It is present in exceedingly small quantity, from 0°10 to 0°80 per cent., and Professor Fliickiger has demonstrated that the crude distillate con- sists only of myristic acid impregnated with or scented by the essential oil of orris, a body which may never be isolated owing to the necessarily minute quantities in which it could be produced. Orris-root has been a well- known and esteemed perfume from early Greek times. It is principally powdered for use in dentifrices and other scented dry preparations; but to some extent the crude oil is distilled for general perfumery purposes. It is also used in small pellets as issue peas.

ORSINI, Fericr (1819-1858), Italian patriot, was born in December 1819 at a small town in the Roman states uot far from Forli. He was educated for the church, but soon abandoned that career, and joined Mazzini's Young Italy Society in 1838. For engaging in revolutionary projects he was arrested Ist May 1844, and sentenced at Rome to the galleys for life, but by the amnesty proclaimed on the accession of Pius IX. he was restored to liberty. In 1848 he became leader of a band of youthful Romagnoli, distinguishing himself greatly at Vicenza and Treviso ; and in 1849 he was chosen a deputy to the Roman parliament. After the suppression of the revolution he became one of the most active agents of Mazzini, and while engaged in a mission to Hungary he was in December 1854 arrested at Hermannstadt and imprisoned at Mantua. A few months afterwards he made his escape by sawing through the bars of his cell, and in 1856 he published a narrative of his prison experiences under the title Austrian Dungeons in Italy. Some time after a rupture with Mazzini he went to Paris with the determination to assassinate Napoleon IIL, whom he regarded as the chief stumbling-block in the way of Italian independence, and the principal cause of the anti-liberal reaction in Europe. While the emperor and empress were returning from the opera on the evening of January 14, 1858, bombs were exploded at their carriage,

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but without inflicting any injury on either. In the attempt Orsini had three associates, Pieri, Rudio, and Gomez. Gomez was pardoned, the sentence against Rudio was commuted on thé scaffold, but Orsini and Pieri were executed 13th March 1858. Orsini, whose action had an important influence in precipitating the campaign of 1859 (see vol. ix. p. 624), met his fate with great dignity and stoicism.

See Memoirs and Adventures of Felice Orsini written by himself, trauslated by George Carbonel, Edinburgh, 1857 ; Lettere Edite ed Inedite di Felice Orsini, 2 vols., Milan, 1861; Z Contemporanet Ltaliani—Feliee Orsini, by Enrico Montazio, Turin, 1862; La Verité sur Orsini, par un aneien Proscrit, 1879.

ORSK (Yaman-kala of the Kirghiz), a district town of Orenburg, Russia, 155 miles to the east-south-east of the capital of the government, on the right bank of the Ural, was originally founded in 1735 as the principal Russian fort against the attacks of the Kirghiz. Though this was afterwards transferred to Orenburg, the town of Orsk has increased rapidly within the last few years, owing to the fertility of the surrounding country, to immigration, and to the growth of trade with the Kirghiz. The population, only 6000 some fifteen years ago, reached 14,350 in 1880, and has since become larger.

ORTELIUS, Orrett, or OERTEL, ABRAHAM, next to Mercator the greatest geographer of his age, was born at Antwerp in 1527, and died in the same city on June 28, 1598. He visited various parts of the Netherlands and Germany (1575), England and Ireland (1577), and Italy on several occasions. His Vheatrum Orlis Terrarum (published at Antwerp in 1570, and reissued in a revised form five times during his lifetime) was the first modern atlas, Mercator having, it is said, delayed the appearance of his collection out of consideration for his friend. Most of the maps were admittedly reproductions, and no attempt was made to reconcile discrepancies of delineation or nomen- elature. To the modern eye even England and Scotland appear with amusing distortions (the Mons Grampius, ¢.g., lies between the Forth and the Clyde); but, taken as a whole, the noble folio, with its well-nigh one hundred maps, and its careful accompaniment of text, was a monument of rare erudition and industry; and the author well deserved the appointment to be cosmographer to Philip II. bestowed upon him in 1575.

See Macedo in Annales des Voyages, ii., and Gérard in Bull. de la soe. géogr. d’ Anvers, 1880.

ORTHONYX, the scientific name given in 1820, by Temminck, to a little bird, which, from the straightness of its claws,—a character somewhat exaggerated by him,— its large feet and spiny tail, he judged to be generically distinct from any other form. Concerning its affinities much doubt has long prevailed, and this has been only lately set at rest. The typical species, O. spinicauda, is from south-eastern Australia, where it is said to be very local in its distribution, and strictly terrestrial in its habits. In

the course of time two other small birds from New Zealand, where they are known as the “ Whitehead” and “Yellowhead,” were referred to the genus, under the names of O. albicilla! and O. ochrocephala, and then the question of its affinity became more interesting. By some systematists it was supposed to belong to the otherwise purely Neotropical Dendrocolaptede, and in that case would have been the sole representative of the Tracheo-

1 Jt may be charitably conjectured that the nomenclator intended to write albicapilla.

phone Passeres in the Australian Region. Others con- sidered it one of the nearest relatives of Menwra, and if that view were correct it would add a third form to the small section of Pseudoscines (see LyRE-BirD, vol. xv. p. 115) ;- while Sundevall, in 1872, placed it not far from Timelia, among a group the proper sorting of which will probably for years tax the ingenuity of ornithologists. The late Mr W. A. Forbes shewed (Proc. Zool. Soc., 1882, p. 544) that this last position was the most correct, as Orthonyx spinicauda proved on dissection to be one of the true Oscines, but yet to stand, so far as is known, alone among birds of that group, or any other group of Passeres, in consequence of the superficial course taken by the (left) earotid artery, which is nowhere contained in the subver- tebral canal. Whether this discovery will require the segregation of the genus as the representative of a separate Family Orthonycide—which has been proposed by Mr Salvin (Catal. Coll. Strickland, p. 294)—remains to be seen. J orbes also demonstrated that one at least of the two New-Zealand species above mentioned, O. ochrocephala, had been wrongly referred to this genus, and they there- fore at present stand as Clitonyx. This isa point of some little importance in its bearing on the relationship of the fauna of the two countries, for Orthonyx was supposed to be one of the few genera of Land-birds common to both. The typical species of Orthonyx—for the scientific name has been adopted in English—is rather larger than a Skylark, coloured above not unlike a Hedge-Sparrow. The wings are, however, barred with white, and the chin, throat, and breast are in the male pure white, but of a bright reddish-orange in the female. The remiges are very short, rounded, and much incurved, showing a bird of weak flight. The rectrices are very

broad, the shafts stiff, and towards the tip divested of barbs. ‘Two other species that seem rightly to belong to the genus have been described—O. spaldingi from Queensland, of much greater size than the type, and with a jet-black plumage, and 0. nove-guinex, from the great island of that name, which seems closely to resemble O. spinicauda. (a. N.) ORTOLAN (French, Ortolan), the Emberiza hortulana of Linnzeus, a bird so celebrated for the delicate flavour of its flesh as to have become proverbial. A native of most European countries—the British Islands (in which it occurs but rarely) excepted—as well as of western Asia, it emigrates in autumn presumably to the southward of the Mediterranean, though its winter quarters cannot be said to be accurately known, and returns about the end of April or beginning of May. Its distribution throughout its breeding-range seems to be very local, and for this no reason can be assigned. It was long ago said in France, and apparently with truth, to prefer wine-growing districts ; but it certainly does not feed upon grapes, and is found equally in countries where vineyards are unknown—reach- ing in Scandinavia even beyond the arctic circle—and then generally frequents corn-fields and their neighbourhood. In appearance and habits it much resembles its congener the YELLOW-HAMMER (q.v.), but wants the bright colouring of that species, its head for instance being of a greenish- grey instead of a lively yellow. The somewhat monotonous song of the cock is also much of the same kind; and, where the bird is a familiar object to the country people, who usually associate its arrival with the return of fair weather, they commonly apply various syllabic interpreta- tions to its notes, just as our boys do to those of the Yellow-hammer. The nest is placed on or near the ground, but the eggs seldom shew the hair-like markings so characteristic of those of most Buntings, Ortolans are netted in great numbers, kept alive in an artificially lighted or darkened room, and fed with oats and other seeds. In a very short time they become enormously fat,

and are then killed for the table. If, as is supposed, the Ortolan be the Miliaria of Varro, the practice of artifici- ally fattening birds of this species is very ancient. In French the word Ortolan is used so as to be almost syn- onymous with the English “ Bunting”—thus the Ortolan- de-neige is the Snow-Bunting (Plectrophanes nivalis), the Ortolan-de-riz is the Rice-bird or

“Bobolink” of North America (Dolichonyx oryzivorus), so justly celebrated for its delicious flavour; but the name is also applied to other birds much more distantly related, for the Ortolan of some of the Antilles, where French is spoken, is a little Ground- Dove of the genus Chamepelia.

In Europe the Beccafico (Figeater) shares with the Ortolan the highest honours of the dish, and this may be a convenient place to point out that the former is a name of equally elastic signification. The true Beccajfico is said to be what is known in England as the Garden-Warbler (the Motacilla salicaria of Linneus, the Sylvia hortensis of many writers); but in Italy any soft-billed small bird that can be snared or netted in its autumnal emigration passes under the name in the markets and cook-shops. The “ Beccafico,” however, is not as a rule artificially fattened, and on this account is preferred by some sensi- tive tastes to the Ortolan. (A. N.)

ORVIETO, a town in Umbria, Italy, on the main road from Florence to Rome, situated on an almost isolated voleanic rock, about 770 feet above the plain. It is now the capital of a province, the seat of a bishop, and in 188] had a population of 8626. The town is of Etruscan origin, and is said to have joined the Volscians in their war against Rome; it is the Urbibentwm of Procopius (with which the Herbanwm of Pliny has been conjecturally identified), and the medieval Urbs Vetus (whence the modern name). Owing to the strong Guelphic sympathies of the inhabitants, and the inaccessible nature of the site, Orvieto has been constantly used as a place of refuge by the popes, of whom no less than thirty-two -have at different times found shelter there. The town is very picturesque, both from its magnificent position and also from the unusually large number of fine 13th-century houses and palaces which still exist in its streets. The chief glory of the place is its splendid cathedral, dedicated to the Virgin ; it was founded in 1290 by Nicholas IV. on the site of an older church ; it was designed by Lorenzo Maitani, a Sienese architect, and from the 13th till the 16th century was enriched by the labours of a whole succession of great Italian painters and sculptors (see OrcaGNa). The exterior is covered with black and white marble; the interior is of grey limestone with bands of a dark basaltic stone. The plan consists of large rectangular nave, with semicircular recesses for altars, opening out of the aisles, north and south. There are two transeptal chapels, and a short choir. The most magnificent part of the exterior is the

west facade, built of richly-sculptured marble, divided into three gables with intervening pinnacles, much resembling the front of Siena cathedral, the work of the same architect. The mosaics are modern, and the whole church has suffered greatly from recent ‘restoration.” The four wall-surfaces that flank the three western door- ways are decorated with very beautiful sculpture in relief, once ornamented with colour, the work mainly of pupils of Niccold Pisano, at the end of the 13th century. This at least is Vasari’s statement. Giovanni Pisano, Arnolfo del Cainbio, and Fra Guglielmo da Pisa were the chief of these. The subjects are scenes from the Old and New Testaments, and the Final Doom, with Heaven and Hell. In the interior on the north, the Cappella del Corporale possesses a large silver shrine, enriched with countless figures in relief and subjects in translucent coloured enamels —one of the most important specimens of early silver-

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smith’s work that yet exists in Italy. It was begun by Ugolino Veri of Siena in 1338, and was made to contain the Holy Corporal from Bolsena, which, according to the legend, became miraculously stained with blood during the celebration of mass to convince a sceptical priest of the truth of the doctrine of transubstantiation. This is supposed to have happened in the middle of the 13th century, while Urban IV. was residing at Orvieto; and it was to commemorate this miracle that the existing cathedral was built. On the south side is the chapel of S. Brizio, separated from the nave by a fine 14th-century wrought-iron screen. The walls and vault of this chapel are covered with some of the best-preserved and finest frescos in Italy—among the noblest works of Fra Angelico, his pupil Benozzo Gozzoli, and Luca Signorelli, mainly painted between 1450 and 1501,—the latter being of especial importance in the history of art owing to their great influence on Michelangelo in his early days (see Symonds, Renaissance in Italy—Fine Arts, pp. 278-291). The choir stalls are fine and elaborate specimens of tarsia and rich wood-carving—the work of various Sienese artists in the 14th century. In 16th-century sculpture the cathedral is especially rich, containing many statues, groups, and altar-reliefs by Simone Mosca, Ippolito Scalza, and Gian di Bologna,—some of them well designed and care- fully executed, but all showing strongly the rapid decay into which the art of that time was falling. The well, now disused, called Il pozzo di S.

Patrizio, is one of the chief curiosities of Orvieto. It is 180 feet deep to the water-level and 46 feet in diameter, cut in the rock, with a double winding inclined plane, so that oxen could ascend and descend to carry up the water from the bottom. It was begun by the architect San Gallo in 1527 for Clement VIL., who fled to Orvieto after the sack of Rome, and was finished by Simone Mosca under Paul III. It resembles in many respects the “Well of Joseph” (Saladin) in the citadel of Cairo. The Palazzo Faina has an interesting collection of objects found in Etruscan tombs, of which a large number exist in the neighbourhood of Orvieto. The church of S. Domenico contains one of the finest works in sculpture by Arnolfo del Cambio. This is the tomb with recumbent effigy of the Cardinal Brago or De Braye (1282), with much beautiful sculpture and mosaic. It is signed HOC OPVS FECIT ARNVLFVS. It was imitated by Giovanni Pisano in his monument to Pope Benedict XI. at Perugia.

See Guglielmo della Valle, Storia del Duomo di Orvieto (1791), and Stampe del Duomo di Orvieto (1791); Luzi, Descrizione del Duomo di Orvieto, &c., 1836; Cicognara, Storia della Scultura, 2d ed., 1823-24 ; Perkins, Tuscan Sculptors, 1864; Vasari, Vite det prttori, &c., Milanesi’s ed., 1878-82; Gruner, Die Basreliefs des Doms zu Orvieto, 1858 ; Crowe and Cavaleasclle, Painting in Italy, vols. i. and iii, 1866; Benois, Cathédrale ad Orvieto, 1877. For Etruscan remains see Dennis, Cities of Etruria, ii. p. 36, 1878.

ORYEKHOFF-ZUYEFF, or Oryexnovsxry Pocost, a village of European Russia, in the Pokroff district of the Vladimir government, 12 miles west of Pokroff by rail, on the Klyazma, a subtributary of the Volga. A great cotton factory in the vicinity has become the centre of a new town, which is called after the village, but also frequently Nikolskoye. About 12,600 hands are employed in the cotton manufacture itself, and about 6000 in digging peats and making bricks for the firm. There are forty-two steam engines (978 horse-power), and goods were manufactured to the value of 8,328,000 roubles in 1881 (2,590,000 in 1861). The cotton is procured from Asia and western Europe, and the goods are sold throughout southern and south-eastern Russia.

OSBORN, Suxerarp (1822-187 5), English admiral and explorer, was the son of Lieutenant-Colonel Osborn of the

Madras army, and was born 25th April 1899. Entering

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the navy as a first-class volunteer in 1837, he was in the following year entrusted, though only a midshipman, with the command of a gunboat, the “ Emerald,” at the attack on Kedah. He was present at the reduction of Canton in 1841, and at the capture of the batteries of Woo- sung in the following year. Having passed lieutenant in 1844, he was in the same year appointed gunnery mate of the “Collingwood,” under Sir George Seymour in the Pacific. On account of his interest in the fate of many of his friends and messmates, he took a prominent part in advocating a new search expedition for Sir John Franklin. When it was agreed upon he was appointed to the com- mand of one of the ships, and performed a remarkable sledge journey to the western extremity of Prince of Wales Island, of which he published an account entitled Stray Leaves from an Arctic Journal, 1852. In the new expedi- tion fitted out in the spring of that year he also took part as commander of the “ Pioneer,” and, after spending two trying winters up Wellington Channel, returned home in 1855. In 1856 he published the journals of Robert M‘Clure, giving a narrative of the discovery of the North-West Passage. Shortly after his return he was called to active service in connexion with the Russian war; and in com- mand of a light squadron of gunboats on the Sea of Azoff he distinguished himself in the destruction of the stores of the enemy at various points on the coast. Receiving post rank, he was appointed to the “ Medusa,” in which he continued to command the Sea of Azoff squadron until the conclusion of peace. As commander of the “ Furious ” he took a prominent part in the second Chinese war, during which he performed the remarkable feat of proving the navigability of the Yang-tsze, by taking the “ Furious ” as far up the river as Hankow, 600 miles from the sea. In 1859 he returned to England in broken health, and to support his family engaged in literary pursuits, contribut- ing many important articles to Blackwood’s Magazine, and publishing in December of that year The Career, Last Voyage, and Fate

of Sir John Franklin. In 1864 he was appointed to the command of the “ Royal Sovereign,” to assist Captain Coles in his experiments regarding the turret system of shipbuilding. Retiring soon afterwards on half pay, he was in 1865 appointed agent to the Great Indian Peninsula Railway Company, and in 1867 man- aging director of the Telegraph Construction and Maintenance Company, for the construction of a submarine system of telegraphy between Great Britain and her Eastern and Australian dependencies. In 1873 he was promoted rear-admiral. Continuing to interest himself in Arctic exploration, he induced A. H. Markham to visit Baffin’s Bay in a whaler to report on the possibility of ice-naviga- tion with the aid of steam. A record of his observations was published under the title of a Whaling Cruise to Bafin’s Bay in 1873, with the result that a new Arctic expedition was fitted out in 1874. Osborn died 6th May

1875.

OSCANS, or Opicans, was the name given both by Greeks and Romans to one of the ancient nations of cen- tral Italy. There can be no doubt that the original form of the name was Opscus, which, as we learn from Festus, was still used by Ennius. This the Greeks softened into Opicus, while the Latin writers always used Oscus as a national appellation, though they occasionally employ the term “opicus” in the sense of barbarous or ignorant. It is singular that, though there can be no doubt the name was a national one, it is not found in history as the name of any particular nation. No mention occurs of the Oscans among the populations of Italy that were succes- sively reduced by the Roman arms; but we learn inciden- tally from a passage in Livy (x. 20) that the language of the Samnites and Campanians was Oscan ; and it is cer-

tain that this continued to be the vernacular tongue of the people of Italy until long after the Roman conquest. Of the ethnical affinities or origin of the Oscans we know nothing, except what may be gathered philologically from the remains of their language ; and their relations with the Samnites and other Sabellian tribes, whom we find during the historical period settled in this part of Italy, are extremely obscure. Perhaps the most plausible theory is that they were in very early times the inhabitants of the regions

subsequently occupied by a race of invaders from the north, who were known as Sabines, Samnites, and Sabellians, but who, being comparatively few in numbers, and in an inferior stage of civilization, gradually adopted the language of the conquered race (see Iraty, vol. xiii.

. 445).

3 It 2 certain that the Oscan language continued in com- mon use as a vernacular dialect till the close of the Roman republic. Ennius boasted that he was possessed of three tongues because he could speak Latin, Greek, and Oscan (Gell. xvii. 17); and at the time of the Social War (88 B.c.) the allies made an attempt to introduce it as the official language, and struck coins with Oscan inscriptions bearing the names of Viteliu (for Italia), Safinim, cc. After the failure of that movement there can be no doubt that the language was never again employed for official purposes, though it would linger long in use among the rustic populations of the mountains. Nor was it altogether without a literature, for the Pabule Atellanex, a kind of rude farces popular among the Romans, not only derived their names and origin from the Oscan district of Campania, but were undoubtedly in the first instance composed and recited in the Oscan dialect. The monuments of the language which have been preserved to us by inscriptions are much more numerous than those of any other ancient Italian dialect. The principal of them are enumerated in the article above referred to, and they are all collected and examined in detail by Professor Mommsen in his Unter- Ltalischen Dialekte (Leipsic, 1850). The general result is that the Oscan language must have resembled the Latin much more closely than any other of the Italian dialects, but wanted almost entirely the Greek or Pelasgic element which is found so distinctly in the more cultivated language, and which formed the basis of the Messapian and other dialects of the southern part of the Italian penin- sula.

See Huschke, Die Oskischen und Sabellischen Denkmdler, Elber- feld, 1856.

OSHKOSH, a city of the United States, capital of Winnebago county, Wisconsin, stretches from the west side of Lake Winnebago for about 3 miles up Fox River to Lake Buttes des Morts, and covers an area of about 8 square miles. By rail the distance from Milwaukee is 84 miles. Oshkosh is

the seat of the United States district court for the eastern district of Wisconsin ; and, besides the court-house, it contains the State normal school, a fine high school, and two opera-houses. The leading industry is the manufacture of sashes, doors, and blinds. Lumber shingles, matches, trunks, and carriages are also manufactured, and there are foundries, match-factories, flour-mills, and breweries. The population was 6085 in 1860, 12,663 in 1870, and 15,748 in 1880. Oshkosh may be said to date from 1836; it was in- corporated in 1853. In 1859, 1866, 1874, and 1875 it suffered severely from conflagrations.

OSIANDER, Anprzas (1498-1552), German Reformer, was born at Gunzenhausen, near Nuremberg, on December 19, 1498. His German name was Heiligmann, or, ac- cording to others, Hosemann. After studying at Leipsic, Altenburg, and Ingolstadt, he was ordained in 1520 to the priesthood, when he became Hebrew tutor in the Augus-

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tinian convent at Nuremberg. Two years afterwards ho was appointed preacher in the St Lorenz Kirche, and about the same time he publicly joined the Lutheran party, taking a prominent part in the discussion which ultimately led to the adoption of the Reformation by the city. He married in 1525. As a theologian of recognized ability and influence, he was present at the Marburg con- ference in 1529, at the Augsburg diet in 1530, and at the signing of the Smalkald articles in 1537, and took part in other public transactions of importance in the history of the Reformation ; if he had an exceptionally large number of personal enemies the circumstance can be readily explained by his vehemence, coarseness, and arrogance as a controversialist. The introduction of the Augsburg Interim in 1548 necessitated his departure from Nurem- berg; he went first to Breslau, and afterwards settled at Kénigsberg as professor in the new university there at the call of Duke Albert of Prussia. Here in 1550 he published two disputations, the one De Lege et Hvangelio and the other De Justificatione, which aroused a vehement controversy that was not brought to a close by his death in 1552 (Octo- ber 17). The nature of the dispute has been indicated elsewhere (see LuruErans, vol. xv. p. 85). The party was

afterwards led by Funk, Osiander's son-in-law, but disappeared after his execution for high treason in 1566.

Osiander, besides a number of controversial writings, published a corrected edition of the Vulgate, with notes, in 1522, and a Harmony of the Gospels —the first work of its kind—in 1537. His son Lukas Osiander (1534-1604), a prominent ecclesiastic in Wiir- temberg, published a Biblia Latina ad fontes Hebr. text. emendata cum brevi et perspicua expositione illustrata (1573-86) in seven quarto volumes, whivh was highly appreciated in its day, an Jnsti- tutio Christiane Religionis (1576), and, his best-known work, an Epitome of the Magdeburg Centuries. Several other Osianders, also descendants of Andreas, figure with more or less prominence in the theological literature of Germany.

OSIRIS. See Ecypt, vol vii. p. 716.

OSKALOOSA, a city of the United States, capital of Mahaska county, Iowa, about 55 miles south-east of Des Moines. It lies on high ground between the Des Moines and the South Skunk, in a fine agricultural district, with coal and iron mines in the vicinity; and it contains two colleges—Oskaloosa College (1861), belonging to the "Disciples," and Penn College (1873), a Quaker institu- tion—flour-mills, wool-factories, iron and brass foundries, lumber yards, &c., and an artesian well 2900 feet deep. The population, 3204 in 1870 and 4598 in 1880, is esti- mated at over 7000 in 1884.

OSMAN. This transcription of the Arabic name 'Othman (which first appears in history as borne by the famous companion of Mohammed, and third caliph, see vol. xvi. pp. 548, 563) corresponds to the pronunciation of the Persians and Turks, and is therefore commonly used in speaking of Osman I. Ghazi, the founder of the dynasty of Osmanli or Ottoman Turks. He took the title of sultan in 699 a.u. (1299 a.p.), ruled in Asia Minor, and died in 726 aH. Osman IL., the sixteenth Ottoman sultan, came to the throne in 1616 .D., and was strangled in a sedition of the Janissaries in 1621. See TURKEY.

OSMIUM,, See PLATINUM.

OSNABRUCK, a prosperous manufacturing town of Prussia, the see of a Roman Catholic bishop, and the capital of a district of its own name in the province of Hanover, is pleasantly situated on the Hase, 70 miles to the west of the town of Hanover. The older streets are narrow and crooked, containing many interesting examples of Gothic and Renaissance domestic architecture, while the substantial houses of the modern quarters testify to the present well-being of the town. The old fortifications have been converted into promenades. The Roman Catholic cathedral, with its three towers, is a spacious building of the 12th century, partly in the Romanesque and partly in

the Transitional style; but it is inferior in architectural interest to the Marienkirche, a fine Gothic structure of the 14th century. The town-house contains portraits of the plenipotentiaries engaged in concluding the peace of West- phalia, the negotiations for which were partly carried on here, . Among the other principal buildings are the episco- pal residence, the law courts, the two gymnasia, the com- mercial school, and various other educational and charitable institutions. The museum contains antiquities and objects of natural history. The lunatic asylum on the Gertruden- berg occupies the site of an ancient nunnery. Linen was formerly the staple product of Osnabriick, but no longer takes so prominent a position among its manufactures, which now include paper, dyes, chemicals, machinery, nails, pianos, tobacco, and cotton. There are also large iron and steel works and a rolling mill. A brisk trade is carried on in grain, drugs, linen, and Westphalian hams, and import- ant cattle and horse fairs are held here at regular inter- vals. Osnabriick contains (1880) 32,812 inhabitants, one- third of whom are Roman Catholics. The patriotic writer and philanthropist Julius Méser (1720-94) was a native of Osnabriick, and has a statue in the cathedral square.

Osnabriick is a place of very ancient origin, and in 888 received the right to establish a mint, an annual fair, and a custom-house. It was surrounded with walls towards the close of the 11th century. The bishopric to which it gave name was founded by Charlemagne after the subjugation of the Saxon inhabitants of the district (c. 790), and embraced what was afterwards the

south-west part of the kingdom of Hanover. The town maintained a very independent attitude towards its nominal rulers, the bishops, and joined the Hanseatic League. It reached the height of its prosperity in the 15th century, but the decay inaugurated by the dissensions of the Reformation was accelerated by the trials of the Thirty Ycars' War. The peace of Westphalia decreed that the bishopric of Westphalia should be held alternately by a Roman Catholic and a Protestant bishop, and this curious state of affairs lasted down to its seculariza- tion in 1803. The last bishop was the late duke of York. Since 1859 Osnabriick has again been the seat of a Roman Catholic bishop, who, of course, has no territorial jurisdiction. The revived pro- sperity of the town dates from the middle of last century.

OSORIO, Geronymo (1506-1580), "the Cicero of Portugal," belonged to a noble family, and was born at Lisbon in 1506. After studying languages at Salamanca, philosophy at Paris, and theology at Bologna, he rose through successive ecclesiastical dignities to the bishopric of Sylves. He evaded the necessity of accompanying Dom Sebastian on his first African expedition (which he did all in his power to discourage) only by setting out for Rome, where he was well received by Gregory XIII. The disaster which overtook the Portuguese arms at Alcazarquivir in 1578 had a serious effect on Osorio's health and spirits ; he withdrew into solitude, and died at Tavira on August 20,

1580.

His principal work, a history of the reign of King Emanuel I. (De rebus Emmanuelis Lusitanize regis invictissimi virtute et auspicio domi forisque gestis libri XII., 1571), undertaken at the request of Cardinal Henry, entitles him to considerable literary rank, not only by pure Latinity and artistic arrangement, but also by historical accuracy and insight, as well as by impartiality and clevation of tone. An English translation appeared in 1752; and versions in French, German, and Dutch also exist. Osorio's De gloria libri V. (1552), and his double treatise De nobilitate civili et de nobilitate Christiana (1542) have been often reprinted; of the former D'Alembert is reported to have declared that it was really a production of Cicero's palmed off by the modern as his own. Osorio also published De regis institutione et disciplina libri VIII. (1574) and a large mass of theological matter,

including commen. taries on the Epistle to the Romans, the Gospel according to John, and some of the minor prophets. His Admonitio and Epistola to Queen Elizabeth of England are polemical treatises. The Opera Omnia of Osorio were collected and published at Rome by his nephew in 1592 (4 vols. folio).

OSPREY, or Ospray, a word said to be corrupted from “ Ossifrage,” in Latin Ossifraga or bone-breaker. The Ossifraga of Pliny (1. W., x. 3) and some other classical writers seems, as already said, to have been the LAmMMER- GHYER (vol. xiv. p. 244); but the name, not inapplicable

in that case, has been transferred—through a not uncommon but inexplicable confusion—to another bird which is no breaker of bones, save incidentally those of the fishes it devours! The Osprey is a rapacious bird, of middling size and of conspicuously-marked plumage, the white of its lower parts, and often of its head, contrasting sharply with the dark brown of the back and most of its upper parts when the bird is seen on the wing. It is the Falco haliaetus of Linneeus, but unquestionably deserving generic separation was, in 1810, established by Savigny (Ois, de V Egypte, p. 35) as the type of a new genus which he was pleased to term Pandion—a name since pretty generally accepted. It has commonly been kept in the Family Falconidx, but of late regarded as the representa- tive of a separate Family, Pandionidx, for which view not a little can be said.2 Pandion differs from the Falconidx not only pterylologically, as long ago observed by Nitzsch, but also osteologically, as pointed out by M. Alphonse Milne-Edwards (Ots. Moss. France, ii. pp. 418, 419), and it is a curious fact that in some of the characters in which it differs structurally from the Falconidx, it agrees with certain of the Owls; but the most important parts of its internal structure, as well as of its pterylosis, quite forbid a belief that there is any near alliance of the two groups. The Osprey is one of the most cosmopolitan Birds-of-Prey. From Alaska to Brazil, from Lapland to Natal, from Japan to Tasmania, and in some of the islands of the Pacific, it occurs as a winter-visitant oras a resident. The countries which it does not frequent would be more easily named than those in which it is found—and among the former are Iceland and New Zealand. Though migratory in Europe at least, it is

generally independent of climate. It breeds equally on the half-thawed shores of Hudson's Bay and on the cays of Honduras, in the dense forests of Finland and on the barren rocks of the Red Sea, in Kamchatka and in West Australia. Where, through abundance of food, it is numerous—as in former days was the case in the eastern part of the United States—the nests of the Fish-Hawk (to use its American name) may be placed on trees to the number of three hundred close together. Where food is scarcer and the species accord- ingly less plentiful, a single pair will occupy an isolated rock, and jealously expel all intruders of their kind, as happens in Scotland.? The lover of birds cannot see many more enjoyable spectacles than an Osprey engaged in fishing—poising itself aloft, with upright body, and wings beating horizontally, ere it plunges like a plummet beneath the water, and immediately after reappears shaking a shower of drops from its plumage. The feat of carrying off an Osprey's eggs is often difficult, and attended with some risk, but has more than once tempted the most daring of birds' nesters. Apart from the dangerous situa- tion not unfrequently chosen by the birds for their eyry,— a steep rock in a lonely lake, only to be reached after a

1 Another supposed old form of the name is " Orfraie "; but that is said by M. Rolland (Faune popul. France, ii. p. 9, note), quoting M. Suchier (Zeitschr. Rim. Philol., i. p. 482), to arise from a mingling of two wholly different sources:—(1) Oripelargus, Oriperagus, Orprats, and (2) Ossifraga. " Orfraie" again is occasionally interchanged with Efraie (which, through such dialectical forms as Fresaie, Fressaia, is said to come from the Latin presaga), the ordinary French name for the Barn-Owl, Aluco flammeus (see OWL, infra, p. 91); but the subject is too complex for any but an expert philologist to treat, According to Prof. Skeat's Dictionary (i. p. 408), " Asprey" is the oldest English form ; but " Osprey" dates from Cotgrave at least.

2 Mr Sharpe goes further, aud makes a "Suborder" Pandiones; but the characters on which he founds such an important division are obviously inadequate. The other genus associated with Pandion by him has been shown by Mr Gurney (Zd7s, 1878, p. 455) to be nearly allied to the ordinary Sea-Hagles (Haliaetus), and therefore one of the true Falconide.

3 Two good examples of the different localities chosen by this bird for its nest are illustrated in Ootheca Wolleyana, pls. B. & H.

long swim through chilly water, or the summit of a very tall tree,—their fierceness in defence of their eggs and young is not to be despised. Men and boys have had their head gashed by the sharp claw of the angry parent, and this happening when the robber is already in a pre- carious predicament, and unable to use any defensive weapon, renders the enterprise formidable. But the prize is worthy of the danger. Few birds lay eggs so beautiful or so rich in colouring: their white or pale ground is spotted, blotched, or marbled with almost every shade of purple, orange, and red—passing from the most delicate lilac, buff, and peach-blossom, through violet, chestnut, and crimson, to a nearly absolute black. A few years ago some of the best-informed ornithologists were led to think that perse- cution had exterminated the Osprey from Great Britain, except as a chance visitant. This opinion proved to be incorrect, and at the present time the bird is believed still to breed in at least two counties of Scotland, but the secret of its resorts is carefully guarded by those who wish to retain it as a member of the country's fauna, for publica- tion would doubtless speedily put an end to its occu- pancy. (A. N.) OSRHOENE, or OrrwoEns, the district of western Mesopotamia of which Edessa was the capital (see MEsoporamtia, vol. xvi. p. 47). It may be here added that the older form of the name appears to be Chosroene (Chosdroene). Edessa or Orrhoi thus appears to have been "the city of Chosrau," implying an early Parthian influence. See G. Hoffmann in 7. D. M. G., xxxii. 743. OSSETT-CUM-GAWTHORPE, a township and urban sanitary district in the West Riding of Yorkshire, includ- ing the contiguous hamlets of Ossett, South Ossett, and Gawthorpe, is situated about 3 miles west-north-west of Wakefield, and 14 north-west from the Horbury station on the Lancashire and Yorkshire Railway. The Great Northern Railway has two stations in the township. The church of the Holy Trinity, a fine cruciform structure in the Early Decorated style, was erected in 1865 at a cost of £20,000. There are woollen cloth and mungo mills, and in the neighbourhood extensive collieries. The population of the township (3105 acres) in 1871 was 9190, and in 1881 it was 10,957. OSSIAN, or O1sin. See Centre Literaturs, vol. v. pp. 311, 318, and Gagtic Litzrators,

vol. x. p. 13. OSSOLI, Saran Marcaret FuLier, MARCHIONESS, (1810-1850), an American authoress, was the eldest child of Timothy Fuller, a lawyer and politician of some emlinence, and was born at Cambridge Port, Massachusetts, 23d May 1810. Her education was conducted by her father, who, she states, made the mistake of thinking to “gain time by bringing forward the intellect as early as possible,” the consequence being “a premature develop- ment of brain that made her a youthful prodigy by day, and by night a victim of spectral illusions, nightmare, and somnambulism.” At six years she began to read Latin, and at a very early age she had selected as her favourite authors Shakespeare, Cervantes, and Moliére. Soon the great amount of study exacted of her ceased to be a burden, and reading became a habit and a passion. Having made herself familiar with the masterpieces of French, Italian, and Spanish literature, she in 1833 began the study of German, and within the year had read some of the masterpieces of Goethe, Kérner, Novalis, and Schiller. Her father dying in 1835, she went in 1836 to Boston to teach languages, and in 1837 she was chosen principal teacher in the Green Street school, Providence, Rhode Island, where she remained till 1839. From this year until 1844 she stayed at different places in the immediate neighbourhood of Boston, forming an intimate acquaintance with the colonists of Brook Farm, and number-

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ing among her closest friends R. W. Emerson, Nathaniel Hawthorne, and W. E. Channing. In 1839 she pub- lished a translation of Eckermann’s Conversations with Goethe, which was followed in 1841 by a translation of the Letters of Giinderode and Bettina. Aided by R. W. Emerson and George Ripley, she in 1840 started “he Dial, a poetical and philosophical magazine representing the opinions and aims of the New England Transcendentalists. This journal she continued to edit for two years, and while in Boston she also conducted conversation classes for ladies in which philosophical and social subjects were discussed with a somewhat over-accentuated earnestness, and which may be regarded as perhaps the beginning of the modern movement in behalf of women’s rights. R. W. Emerson, who had met her as early as 1836, thus describes her appearance :—‘“‘ She was then twenty-six years old. She had a face and frame that would indicate fulness and tenacity of life. She was rather under the middle height ; her

complexion was fair, with strong fair hair. She was then, as always, carefully and becomingly dressed, and of ladylike self-possession. For the rest her appearance had nothing prepossessing. Her extreme plainness, a trick of incessantly opening and shutting her eyelids, the nasal tone of her voice, all repelled ; and I said to myself we shall never get far." On fuller acquaintance this unprepossess- ing exterior seemed, however, to melt away, and her inordinate self-esteem to be lost in the depth and univer- sality of her sympathy. She possessed an almost irresist- ible power of winning the intellectual and moral confidence of those with whom she came in contact, and " applied herself to her companion as the sponge applied itself to water." She obtained from each the best they had to give. It was indeed more as a conversationalist than as a writer that she earned the title of the Priestess of Transcendentalism. It was her intimate friends who admired her most. Smart and pungent though she is as a writer, any originality that seems to characterize her views partakes more of wayward eccentricity than either intel- lectual depth or imaginative vigour. In 1844 she removed to New York to become contributor to The Tribune, and in 1846 she published a selection from her criticisms on con- temporary authors in Europe and America, under the title Papers on Art and Literature. The same year she paid a visit to Europe, passing some time in England and France, and finally taking up her residence in Italy. There she was married in December 1847 to the Marquis Giovanni Angelo Ossoli, a friend of Mazzini. During 1848-49 she was present with her husband in Rome, and when the city was besieged she, at the request of Mazzini, took charge of one of the two hospitals while her husband fought on the walls. In May 1850, along with her husband and infant son, she embarked at Leghorn for America, but when they had all but reached their destination the vessel was wrecked on Fire Island beach, and the Ossolis were among the passengers who perished.

The Autobiography of Margaret Fuller Ossoli, with additional Memoirs by J. F. Clarke, R. W. Emerson, and W. E. Channing, was published in 1852, the last edition being that of 1874. See also Margaret Fuller (Marchesa Ossolt), by Julia Ward Howe, 1883, in the Eminent Women Series. Her collected works were also published in 1874.

OSTADE. The Ostades are Dutch painters of note, whose ancestors were settled at Eyndhoven, near the small village of Ostaden, from which they took their name. Early in the 17th century Jan Hendricx, a weaver, moved with his family from Eyndhoven to Haarlem, where he married and founded a large family. The eldest and youngest of his sons became celebrated artists.

I. Aprian OstaDE (1610-1685), the first of Jan Hen- dricx's boys, was born at Haarlem shortly before the 10th December 1610, when he was christened in presence

of several witnesses. His death took place on the 27th April, his burial on the 2d May 1685, at Haarlem. According to Houbraken he was taught by Frans Hals, at that time master of Adrian Brouwer. At twenty-six he joined a company of the civic guard at Haarlem ; at twenty- eight he married his first wife, who lived till 1642. He speedily married again, but again became a widower in 1666. Persons curious of matters connected with the lives of famous men may visit the house in the Kénigsstraat at Haarlem where Adrian Ostade lived in 1657, or that of the Ridderstraat which he occupied in 1670. He took the highest honours of his profession, the presidency of the painters' guild at Haarlem, in 1662. Amongst the treasures of the Louvre collection, a striking picture represents the father of a large family sitting in state with his wife at his side ina handsomely furnished room, sur- rounded by his son and five daughters, and a young married couple. It is an old tradition that Ostade here painted himself and his children in holiday attire ; yet the style is much too refined for the painter of boors, and pitiless records tell us that Ostade had but one daughter. The number of Ostade's pictures is given by Smith at three hundred and eighty-five. It is probable that he painted many more. At his death the stock of his unsold pieces was over two hundred. His engraved plates were put up to auction, with the pictures, and fifty etched plates—most of them dated 1647-48—were disposed of in 1686. At the present time it is easy to trace two hundred and twenty pictures in public and private collec- tions, of which one hundred

and four are signed and dated, seventeen are signed with the name but not with the date, and the rest are accepted as genuine by modern critics,

Adrian Ostade is the contemporary of David Teniers and Adrian Brouwer. Like them he spent his life in the delineation of the homeliest subjects—tavern scenes, village fairs, and country quarters. Between Teniers and Ostade the contrast lies in the different condition of the agri- cultural classes of Brabant and Holland, and the atmo- sphere and dwellings that were peculiar to each region. Brabant has more sun, more comfort, and a higher type of humanity ; Teniers, in consequence, is silvery and sparkling ; the people he paints are fair specimens of a well-built race. Holland, in the vicinity of Haarlem, seems to have suffered much from war; the air is moist and hazy, and the people, as depicted by Ostade are short, ill- favoured, and marked with the stamp of adversity on their features dnd dress. Brouwer, who painted the Dutch boor in his frolics and passion, imported more of the spirit of Frans Hals into his delineations than his colleague ; but the type is tle same as Ostade's, only more animated and vicious. How was it that the disciples of Hals should have fallen into this course, whilst Hals himself drew people of the gentle classes with such distinction? It was probably because of his superiority and the monopoly which he and a few colleagues at Haarlem enjoyed that his pupils were forced into a humbler walk, and into this walk Hals was able to lead them, because he was equally able in depicting the strolling waif or fishwife, or the more aristocratic patrician who strutted about in lace collar, with his rapier at his side. Hals in this form was confined to the city, or to those wanderers from the country who visited towns. Brouwer and Ostade went to the country itself and lived in the taverns and cottages of peasants, where they got the models for their pictures. Neither of them followed the habits of the artists of the Hague, who took sitters into their studios and made compositions from them. Their sitters were people, unconscious that they sat, taken on the spot and from life, and transferred with cunning art to pictures.

But the practice of.

OSTADE

There is less of the style of Hals in Adrian Ostade than in Brouwer, but a great likeness to Brouwer in Ostade's early works. During the first years of

his career, Ostade displayed the same tendency to exaggeration and frolic as his comrade. He had humour and boisterous spirits, but he is to be distinguished from his rival by a more general use of the principles of light and shade, and especially by a greater concentration of light on a small surface in con- trast with a broad expanse of gloom. The key of his harmonies remains for a time in the scale of greys. But his treatment is dry and careful, and in this style he shuns no difficulties of detail, representing cottages inside and out, with the vine leaves covering the poorness of the outer side, and nothing inside to deck the patch-work of rafters and thatch, or tumble-down chimneys and ladder staircases, that make up the sordid interior of the Dutch rustic of those days. His men and women, attuned to these needy surroundings, are invariably dressed in the poorest clothes. The hard life and privations of the race are impressed on their shapes and faces, their shoes and hats, worn at heel and battered to softness, as if they had descended from generation to generation, so that the boy of ten seems to wear the cast-off things of his sire and grandsire. It was not easy to get poetry out of such materials. But the greatness of Ostade lies in the fact that he often caught the poetic side of the life of the peasant class, in spite of its ugliness and stunted form and misshapen features. He did so by giving their vulgar sports, their quarrels, even their quieter moods of enjoy- ment, the magic light of the sungleam, and by clothing the wreck of cottages with gay vegetation.

It was natural that, with the tendency to effect which marked Ostade from the first, he should have been fired by emulation to rival the masterpieces of Rembrandt. His early pictures are not so rare but that we can trace how he glided out of one period into the other. Before the dispersion of the Gsell collection at Vienna in 1872, it was easy to study the steel-grey harmonies and exaggerated caricature of his early works in the period intervening between 1632 and 1638. There is a picture of Rustics, dated 1632, in the Kosloff collection at St Petersburg; a Countryman having his Tooth Drawn, in the Belvedere of Vienna, of a similar date though unsigned ; a Bagpiper of 1635 in the Lichtenstein gallery at Vienna; Cottage Scenes of 1635 and 1636, in the museums of Carlsruhe, Darmstadt, and Dresden; Smokers in the House of Count Berchem at Munich; and Card Players of 1687 in the Lichtenstein palace at Vienna, which make up for the loss of the Gscll collection. The same style marks most of those pieces. About 1638 or 1640

the in- fluence of Rembrandt suddenly changed his style, and he painted the Annunciation of the Brunswick museum, where the angels appearing in the sky to Dutch boors half asleep amidst their cattle, sheep, and dogs, in front of a cottage, at once recall the similar subject by Rembrandt, and his effective mode of lighting the principal groups by rays propelled to the earth out of a murky sky. But Ostade was not successful in this effort to vulgarize Scripture. He might have becn pardoned had he given dramatic force and expression to his picture; but his shepherds were only boors without much emotion, passion, or surprise. His picture was a mere cffect of light, as such masterly, in its sketchy rubbings, of dark brown tone relieved by strongly impasted lights, but without the very qualities which made his usual subjects attractive. When, in 1642, he painted the beautiful interior at the Louvre, in which a mother tends her child in a cradle at the side of a great chimney near which her husband is sitting, tle darkness of a country loft is dimly illumined by a beam from the sun that shines on the cascment ; and one might think the paintcr intended to depict the Nativity, but that there is nothing holy in all the surroundings, nothing attractive indeed except the wonderful Rembrandtesque trans- parency, the brown tone, and theadmirable keeping of the minutest parts. The sparkle of Brouwer is not there; nor as yet the concen- trated evenness of such pictures of Rembrandt as the Meditative Philosopher at the Louvre. Yet there is perhaps morc conscien- tiousness of detail. Ostade was more at home in a similar effect applied to the commonplace incident of the Slaughtering of a Pig, one of the masterpieces of 1648, once in the Gsell collection at Vienna. In this and similar subjects of previous and succeeding years, he returned to the homely subjects in which his power and wonderful observation made him a master. He never seems to have goue back to gospel illustrations till 1667, when he produced the admirable Nativity of Mr Walter of Bearwood, which is only surpassed as regards

arrangement and colour by Rembrandt’s Carpenter’s Family at the Louvre, or the Woodcutter and Children in the gallery of Cassel. Innumerable almost are the more familiar themes to which he devoted his pencil during this interval, from small single figures, representing smokers or drinkers, to vulgarized allegories of the five senses (Hermitage and Brunswick

galleries), half-lengths of fish- mongers and bakers, and cottage brawls, or scenes of gambling, or itinerant players and quacks, and nine-pin players in the open air, The humour in some of these pieces is contagious, as in the Tavern Scene of the Lacaze collection (Louvre, 1653), where a boor squeezes the empty beer-pot in his hands to show that the last drop has been sucked out of it. It would be tedious to enumerate the masterpieces of this kind. But those who have no other opportunities may study with pleasure and advantage the large series of dated pieces which adorn every European capital, from St Petersburg to London. Buckingham Palace has a large store, and many and many a good specimen lies hid in the private collections of England. But if we should select a few as peculiarly worthy of attention, we might point to the Rustics ina Tavern of 1662 at the Hague, the Village School of the same year at the Louvre, the Tavern Court-yard of 1670 at Cassel, the Sportsmen's Rest of 1671 at Amsterdam, and the Fiddler and his Audience of 1673 at the Hague. At Amsterdam we have the likeness of a painter, ina red bonnet and violet coat, sitting with his back to the spectator, at his easel. The colour-grinder is at work in acorner, a pupil prepares a palette, and a black dog sleeps on the ground. The same picture, with the date of 1666, is in the Dresden gallery. Both specimens are supposed to represent Ostade himself. But unfortunately we see the artist's back and not his face. Ostade painted with equal vigour at all times. Two of his latest dated works, the Village Street and Skittle Players in the Ashburton and Ellesmere collections, were executed in 1676 without any sign of declining powers. The priccs which he reccived are not known, but those of the present day are telling when compared with those of the close of last century. Early pictures, which may have been sold by the painter for a few shillings, now fetch £200. Later ones, which were worth £40 in 1750, are now worth £1000, and Earl Dudley gave £4120 for a cottage interior in 1876. The signatures of Ostade vary at different periods. But the first two letters are gene- rally interlaced. Up to 1635 Ostade writes himself Ostaden. —e.9., in the Bagpiper of 1635 in the Lichtenstein collection at Vienna. Later on_he uses the long s (f), and occasionally he signs in capital letters (Strauss collection, Vienna, 1647; and Hague museum, 1673). His pupils are his own brother Isaac, Cornelis Bega, Cornelis Dusart, and Richard Brakenburg.

II. Isaac OsrapE (1621-1649) was christened on the 2dof June 1621, at Haarlem. He began his studies under Adrian, with whom he remained till 1641, when he started on his own account. At an early period he felt the influ- ence of Rembrandt, and this is apparent in a Slaughtered Pig of 1639, in the gallery of Augsburg. But he soon reverted toa style more suited to his pencil. He pro- duced pictures in 1641-42 on the lines of his brother,—amongst these, the Five Senses, which Adrian after- wards represented by a Man Reading a Paper, a Peasant Tasting Beer, a Rustic Smearing his Sores with Oint- ment, and a Countryman Sniffing at a Snuff-box. The contract for these pieces was made before 1643, when Leendert, a dealer, summoned him for a breach of his agreement before the burgomaster of Haarlem. The matter was referred to the guild, and evidence was adduced to prove that Isaac had promised in 1641 to deliver six pictures and seven rounds, including the Five Senses, for 27 florins. Isaac, in his defence, urged that he had finished two of the pictures and two of the rounds, which Leendert had seen, but neglected to fetch; that he had begun the remainder of the series, but that in the meanwhile the value of his works had risen, so that he thought that on that ground alone he was freed from the obligations he hadassumed. The guild decided that Isaac was bound to furnish the pictures before Easter 1643. But they reduced the number of the rounds to five, and assessed the price of the whole at 50 florins. A specimen of Isaac's work at this period may be seen in the Laughing Boor with a Pot of Beer, in the museum of Amsterdam ; the cottage interior, with two peasants and three children hear a fire, in the Berlin museum; a Concert, with people listening to singers accompanied by a piper and flute Player, and a Boor Stealing a Kiss from a Woman, in the

Lacaze collection at the Louvre. The interior at Berlin is lighted from a casement in the same Rembrandtesque style as Adrian's interior of 1643 at the Louvre. The value of these panels, which we saw estimated in 1643 at two florins apiece, was greatly enhanced in the following century, when the Laughing Boor at Amsterdam was sold for 56 florins. But the low price fixed by the guild of Haarlem must have induced Isaac to give up the practice, in which he could only hope to remain a satellite in the orbit of Adrian, and accordingly we find him gradu- ally abandoning the cottage

subjects of his brother for landscapes in the fashion of Esaias Van de Velde and Salomon Ruisdael. Once only, in 1645, he seems to have fallen into the old groove, when he produced the Slaughtered Pig, with the boy puffing out a bladder, in the museum of Lille. But this was a mere accident. Isaac's progress in the new path which he had cut out for himself was greatly facilitated by his previous experience as a figure painter; and, although he now selected his subjects either from village high streets or frozen canals, he was enabled to give fresh life and animation to the scenes he depicted by groups of people full of movement and animation, which he relieved in their coarse humours and sordid appearance by a refined and searching study of picturesque contrasts. Unfortunately he did not live long enough to bring his art to the highest perfection. He died at twenty-eight, on the 16th October 1649.

The first manifestation of Isaac's surrender of Adrian's style is apparent in 1644 when the skating and sledging scenes were executed which we see in the Lacaze collection and the galleries of the Hermitage, Antwerp, and Lille. Three of these examples bear the artist's name, spelt Isack van Ostade, and the dates of 1644 and 1645. The road-side inns, with halts of travellers, form a compact series from 1646 to 1649. In this, the last form of his art, Isaac has very distinct peculiarities. The air which pervades his composition is warm and sunny, yet mcllow and hazy, as if the sky were veiled with a vapour coloured by moor smoke. he trees are rubbings of umber, in which the prominent foliage is tipped with touches hardened in a liquid state by amber varnish mediums. The same principle applied to details such as glazed bricks or rents in the mud lining of cottages gives an unreal and conventional stamp to those particular parts. But these blemishes are forgotten when one looks at the broad contrasts of light and shade and the masterly figures of steeds and riders, and travellers and rustics, or quarrelling children and dogs, poultry, and cattle, amongst which a favourite place is always given to the white horse, who seems as invariable an accompaniment as the grey in the skirmishes and fairs of Wouvermans. But it is in wintcr scenes that Isaac displays the best qualities. The absence of foliage, the crisp atmosphere, the calm air of cold January days, unsullied by smoke or vapour, preclude the use of the brown tinge, and leave the painter no choice but to ring the changes on opal tints of great variety, upon which the figures come out with masterly effect on the light background

upon which they are thrown. Amongst the road-side inns which will best repay attention we should notice those of Buckingham [alace, the National Gallery, the Wallace, Ellesmere, Ashburton, Holford, Robarts, and Bearwood collections in England, and those of the Louvre, Berlin, Hermitage, and Rotterdam museums and the Rothschild collections at Vienna on the Continent. The finest of the ice scenes is the famous one at the Louvre. (J. A. C.)

OSTASHKOFF, a town of Tver, Russia, 163 miles by rail south-east from the capital of that government, on Lake Seliger, has a population of 12,500. The fisheries, which still employ a considerable number of the inhabitants, attracted settlers at an early date, but it is not till 1500 that the Ostashkoff villages are mentioned in Russian annals. The advantageous site, the proximity of the Smolenskiy Jitnyi monastery, a pilgrim-resort on an island of the lake, and the early development of certain petty trades, combined to bring prosperity to Ostashkoff; and its cathedral (1672-85) still contains rich offerings, as also do two other churches of the same century. About 200,000 pairs of boots are now manufactured annually; hatchets, scythes, shears, and similar implements are also made; and tanning is another important industry.

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OSTEND, a seaport of Belgium, in the province of West Flanders, 70 miles west-north-west from Brussels, is surrounded on the north and west by the sea; its site is an extensive plain, lying below high-water level, the town and surrounding country being protected by a sea-wall built of granite with a brick revetment, upon which the waves generally exhaust their force even in the roughest weather, though the town has occasionally been inundated through a combination of westerly gales and unusually high tides. The port is dangerous in unfavourable weather ; the channel leading into the two interior basins (which are calculated to hold more than a thousand vessels) is formed by two long wooden piers, and at its mouth has a width of only 165 yards. The rise of the tide in the harbour is about 15 feet, and as the bed of the sluice lies 3 feet under low-water mark, the depth at high water should amount to 18 feet; but the entrance to the harbour is obstructed by sandbanks, which frequently shift their posi- tion under the influence of wind and tide, and leave a free depth of only about 9 ->— feet. At the north-west extremity of the sea-wall (digue de mer) is a light- house erected in 1771, and & subsequently modernized, – with a light visible at a distance of 45 miles. The town has an active trade in refined salt, ropes, sails, soap, tobacco, lace, and wool. The imports greatly exceed the exports. In 1883 1345 vessels entered with 175,987 tons cargo, and 1342 cleared with

32,010.

The large fishing popu- lation is chiefly occupied in the cod or herring fisheries; the trade in oysters is important, these being brought over in large quantities from the English coast, principally about Harwich or Col- chester, and fattened in the Ostend oyster-beds. There are no manufactures Eze of any consequence ; and, unlike other Flemish cities, Ostend has no monument or building in any way worthy of notice. The town owes its repute and prosperity chiefly to its sea-beach, which is admirably adapted for bathing purposes, being composed of perfectly smooth sands, firm, level, and of great extent. Ostend is the yearly resort, from August to October, of many thousand visitors, com- prising not only members of the fashionable society of Brussels and the larger provincial towns of Belgium, but also foreigners, principally Germans and Russians. During the season the digue and piers are crowded ; entertain- ments and festivities are offered to guests at the Kursaal, Casino, &c.; a good deal of private and promiscuous gambling is carried on. The influx of bathers and pleasure-seekers has led to thé development of some quieter resorts in the immediate vicinity, such as Blankerbergh (lately a mere fishing village), Heyst, Middelkerk, and others. In 1880 the population of the town wags 16,823.

In the 10th century Ostend was but a cluster of fishermen’s huts. In 1072 Robert I. of Flanders built a church there in honour of St Peter. The place thenceforth grew in importance, and the

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harbour became noted. Margaret of Constantinople, countess of Flanders, raised it to the rank of a city in 1267. In 1445 Philip the Good caused it to be walled round, but the prince of Orange © was the first to fortify it in earnest (1583); anda short time after- wards it sustained a memorable siege, during the reign of Albert and Isabella, being invested on the 5th of July 1601, and taken by Spinola on the 14th of September 1604, after a resistance of more than three years. It was then ina state of almost absolute ruin, but was speedily rebuilt by the archduke, who granted the citizens many privileges. The prosperity of Ostend, however, was constantly

impeded by rivalries and dissensions. In the beginnin, of the 18th century it appeared in a fair way to attain comme eminence, the emperor Charles VJ. having selected it as the scat of the East Indian Company; but the interference of powerful neighbours, and principally of England and Holland, caused a stop to be ae to this by the treaty of Vienna in 1782. Ostend was taken by the French in 1794, and belonged to the republic until 1814, after which it formed part of the Netherlands, and subse- quently, since 1830, of the kingdom of Belgium,

OSTERVALD, Juan Fripiric (1663-1747), Swiss Protestant theologian, was born at Neufchatel on November 25, 1663, was educated at Zurich and at Saumur (where

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Plan of Ostend.

he graduated), studied theology at Orleans, Paris, and Geneva, and was ordained to the ministry in his native place in 1683. As preacher, pastor, lecturer, and author, he attained a position of great influence in his day, he and his friends J. A. Turretin of Geneva and 8. Werenfels of Basel forming what was once called the “Swiss triumvirate.” He died on April 14, 1747.

His principal works are Traité des sources de la corruption qui régne aujourd huy parmi les Chrétiens (1700), practically a plea for a more ethical and less doctrinal type of Christianity ; Catéchisme ow Instruction dans la Religion Chrétienne, 1702; Traité contre [Impureté, 1707 ; Sermons sur divers Textes, 1722-24; Theologizs Compendium, 1739; and Traduction de la Bible, 1724. All his writings attained great popularity among French Protestants; many were translated into various languages; and ‘‘ Ostervald’s Bible,” in particular, was long well known and much valued in Britain. A Life by Durand was published in London in 1778.

OSTIA, a city of ancient Latium, situated at the mouth of the Tiber, from which circumstance it obviously derived its name. Owing to this position it became from an early period the port of Rome, but its foundation as a regular colony of that city is ascribed by ancient authors to Ancus

_ Marcius, who is said to have at the same time established there extensive salt-works, which long continued to supply Rome and its neighbourhood with that necessary article. As the wealth and importance of Rome itself increased, the prosperity of Ostia naturally rose with it, and it continued throughout the period of the Roman republic to be at once the principal emporium of trade in this part of Italy and the permanent station of the Roman fleet. It was, however, at no period a really good port, and the natural disadvantages of its position were not merely felt the more keenly as its commercial importance increased, but they were continually aggravated by natural causes,—the allu- vial matter continually brought down by the Tiber having filled up the port, and at the same time in great measure blocked the mouth of the river, so as to render it inacces- sible to the larger class of vessels. Strabo gives a lively picture of the difficulties with which these had to contend in his time, and which were only surmounted on account of the great pecuniary advantages arising from its proximity to the capital. The necessity of taking some steps to obviate these evils had indeed already presented itself to the dictator Caesar, who had proposed to construct an artificial port at Ostia, with all the appurtenances requisite for so extensive a trade, but no steps were taken towards the execution of this project till the reign of the emperor Claudius, who constructed an entirely new basin or artificial port at a distance of about two miles north of Ostia, and communicating by an artificial channel with the Tiber on one side and the sea on the other. These works were afterwards largely augmented by Trajan, so that the port came to be known as the Portus Trajani, and the channel from thence to the sea was called the Fossa Tra- jani. This was undoubtedly the same with what is now become the right branch of the Tiber, entering the sea at Fiumicino. From this time the great mass of the trade was transferred to the new port, while that of Ostia con- tinually diminished, though the city itself continued to be a populous and flourishing place throughout the period of the Roman empire. It was not till the close of the western empire that Ostia itself, which was unprotected by walls, and consequently exposed to the attacks of the barbarians, fell into decay ; and after it was plundered by the Saracens in the 9th century the site became alto- gether abandoned, the modern village of Ostia (a very poor place) being situated ata distance of about half a mile from the ruins of the

ancient city. The extent and variety of these, as well as the beauty of the works of art dis- covered on the site, confirm the accounts given by ancient writers of the opulence and prosperity of Ostia in the days of the empire; while those of Porto, as the port of Trajan is still called, are of great interest as exhibiting not only the artificial basin of the port, with its quays and the remains of the surrounding magazines, but a large part of the circuit of walls and towers by which it was protected. Such was the importance of Portus under the Roman empire that it became an episcopal see, and still gives that title to one of the cardinals of Rome.

The continual advance of the coast-line, owing to the alluvial deposits brought down by the Tiber, has left the ruins of Ostia more than two miles from the sea. Those of Portus are separated from it by an equal interval,’and even the tower of Fiumicino, which was built in the last century at the entrance of the right branch of the Tiber— the only one now navigable—is already a considerable distance inland.

For a detailed aceount of the history and topography of Ostia and the neighbouring Portus, as well as of the ehanges in the eoast-line and channel of the Tiber, the reader may consult Nibby, Dintorni di Roma, vol. ii, p. 426-474, 602-660; and an elaborate paper by Preller in the Berichte der Sdchsischen Gesellschaft for 1849.

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_ OSTIAKS, or Ostyaks, a tribe of Finnish origin, who inhabit the basin of the Obi in western Siberia; a few hundreds also are nomads in the basin of the lower Yenisei. Plano Carpini and Marco Polo in the 13th century knew them on the flat lands of the Obi, and the best investigators (Castrén, Lerberg, A. Schrenck) consider the trans-Uralian Ostiaks and Samoyedes as identical with the Yugra of the Russian annals. During the Russian conquest their abodes extended much farther south than now, and they had numerous settlements on the basin of the Obi, no less than forty-one of their fortified places having been destroyed by the Cossacks in 1501, in the region of Obdorsk alone. Remains of these “towns” are still to be seen at the Kunovat river, on the Obi 20 miles below Obdorsk, and elsewhere. The total number of the Ostiaks may be estimated at a little over 27,000. Those on the Irtish are mostly settled, and have adopted the manner of life of Russians and

Tartars. Those on the Obi are mostly nomads; along with 8000 Samoyedes in the districts of Beryozoff and Surgut, they own 93,600 reindeer. The Obi Ostiaks are Russified to a great extent. They live almost exclusively by fishing, buying from Russian merchants corn for bread, the use of which has become widely diffused.

The Ostiaks call themselves Ass-yakh (people of the Obi), and it is supposed that their present designation is a corruption of this name. By language they belong (Castrén, Metscberichte, Reisebriefe; Ahlqvist, Ofvers. af Finska Vet.-Soc. Férh., xxi.) to the Ugrian branch of the eastern Finnish stem,—a classification eonfirmed by a grammar of their langnage, compiled in 1875, in Hungarian, by Hunfalvy. All the Ostiaks speak the saine language, mixed to some extent with foreign elements ; but three or four leading dialeets ean be distinguished.

The Ostiaks are middle-sized, or of low stature, mostly meagre, and not ill made, however elumsy their appearance in winter, in their thick fur-elothes. The extremities are fine, and the feet are usually small. The skull is braehyeephalic, mostly of moderate size and height. The hair is dark and soft for the most part, fair aud reddish individuals being rare; the eyes are dark, generally narrow ; the nose is flat and broad; the mouth is large and with thick lips; the beard is seanty. The younger men and women are sometimes of an agreeable appearanee. The Mongolian type is more strongly pronouneed in the women than in the men. On the whole, the Ostiaks are not a pure race; the purest type is found among the fishers on the Obi, the reindeer-breeders of the tundra being largely intermixed with Samoyedes (see Castren; Dr Finseh’s Reise nach West-Sibirien, &e.).

Investigators are unanimous in deseribing them as very kind, gentle, and honest; rioting is almost quite unknown among them, as also theft, this last oeeurring only in the vicinity of Russian settle- ments, and the only penalty enforeed being the restitution two- fold of the property stolen. The farther they are removed from eontaet with Russian dealers and traders the higher do their moral qualities become (Middendorff and Castren). ;

They are very skilful in the arts they practise, especially in carving wood and bone, tanning (with egg-yolk and brains), preparation of implements from bireh bark, &c. Some of their carved or deeorated bark implements

(like those figured in Middendorff's Stbirische Reise, iv. 2) show great artistic skill. Only a few have guns, the great majority continuing to hunt with bow and arrows.

Their folk-lore, like to that of other Finnish stems, is imbued with a deep feeling of natural poetry, and reflects also the sadness, or even the despair, which has been noticed among them. The number of those who are eonsidered Christians reaches 2000; but their Shamanism is still retained, hardly anything being borrowed from Christianity beyond the worship of St Nicholas, who is a most popular saint among them.

OSTRACISM, a peculiar political institution in Athens, designed by Clisthenes as a safeguard against any citizen acquiring too great power and aspiring to make himself tyrant of the state. Before it could be carried into effect, a decree of the people had to be passed that an ostracism was necessary. If this was done, the voting was fixed for a special day in the agora. The votes were given accord- ing to tribes; and each citizen wrote on an oyster shell (Sorpaxov) the name of the person who he thought should be ostracized. The person who obtained the majority was exiled for ten years, provided: the votes against him were

6000. If no person were designated on so many shells, the proceedings were at an end. The ostracized person might return at the end of his term of banishment, having then the full rights of citizenship, or his term might be shortened by a special vote of the people. The institution was intended as a precaution in view of the weakness of the central Government, which, having no standing army at its disposal, was liable to be disturbed or overturned by a sudden attack arranged by a powerful partisan. When party strife ran high, ostracism was frequently resorted to with the consent of the two parties, in order to test their strength; but when an ostracism had been arranged in 416 B.c. the parties subsequently compromised their dis- pute and directed their votes against an insignificant person named Hyperbolus. After this the institution fell into disuse. According to Aristotle and Philochorus, the people were required every year in the first assembly of the sixth prytany to determine whether or not an ostracism should take place. The same institution is said to have been in use at Argos, Miletus, and

Megara, and a similar one called petalismus was employed at Syracuse for a short time during the 5th century B.c.; the latter was named from the olive leaves (éraAa) used instead of oyster-shells.

OSTRICH (Old English, £stridge; French, Autruche; Spanish, Avestruz; Latin, Avis struthio). Among exotic birds there can be hardly one better known by report than the strange, majestic, and fleet-footed creature that "scorneth the horse and his rider," or one that from the earliest times to the present has been oftener more or less fully described; and there must be few persons in any civilized country unacquainted with the appearance of this, the largest of living birds, whose size is not insig- nificant in comparison even with the mightiest of the plumed giants that of old existed upon the earth, since an adult male will stand nearly 8 feet in height, and weigh 300 bb.

As to the ways of the Ostrich in a state of nature, not much has been added of late years to the knowledge acquired and imparted by former travellers and natural- ists, many of whom enjoyed opportunities that will never again oceur of discovering its peculiayities, for even the most favourably-placed of their successors in recent years seem to content themselves with repeating the older observations, and to want either leisure or patience to make additions thereto, their personal acquaintance with the bird not amounting to more than such casual meetings with it as must inevitably fall to the lot of those who traverse its haunts. Thus there are still several dubious points in its natural history. On the other hand we unquestionably know far more than our predecessors respecting its geographical distribution, which has been traced with great minuteness in the Vigel Ost-Afrikas of Drs Finsch and Hartlaub, who have therein given (pp. 597-607) the most comprehensive account of the bird that is to be found in the literature of ornithology.! As with most birds, the Ostrich is disappearing before the persecution of man, and this fact it is which gives the advantage to older travellers, for there are many districts, some of wide extent, known to have been frequented by the Ostrich within the present century, especially towards the extremities of its African range— as on the borders of Egypt and the Cape Colony—in which it no longer occurs, while in Asia there is evidence, more or less trustworthy, of its former existence in most parts of the south-western desert-tracts, in few of which it

1 A good summary of it is contained in the Ostriches and Ostrich Farming of Messrs De Mosenthal and Harting, from which the accom. panying figure is, with permission, taken. Von Heuglin, in his Ornithologie Nordost-A frika' s (pp. 925-985), has given more parti- cular details of the Ostrich's distribution in Africa.

is now to be found. Xenophon's notice of its abundance in Assyria (Anabasis, i. 5) is well known. It is probable that it still lingers in the wastes of Kirwan in eastern Persia, whence examples may occasionally stray northward to those of Turkestan,? even near the Lower Oxus ; bag the assertion, often repeated, as to its former occurrence in Baloochistan or Sindh, though not incredible, seems to rest on testimony as yet too slender for acceptance, Apparently the most northerly limit of the Ostrich's ordinary range at the present day cannot be further than that portion of the Syrian Desert lying directly to the eastward of Damascus; and, within the limits of what may be called.Palestine, Canon Tristram (Fauna and Flora of Palestine, p. 139) regards it as but a straggler from central Arabia, though we have little information as to its appearance and distribution in that country. Africa, however, is still, as in ancient days, the continent in which

the Ostrich most flourishes, and from the confines of Barbary to those of the European settlements in the south it appears to inhabit every waste sufficiently exten- sive to afford it the solitude it loves, and in many wide districts, where the influence of the markets of civilization is feebly felt, to be still almost as abundant as ever. Yet even there it has to contend with deadly foes in the many species of Carnivora which frequent the same tracts and prey upon its eggs and young—the latter especially; and Lichtenstein long ago remarked that if it were not for its numerous enemies "the multiplication of Ostriches would be quite unexampled." The account given of the habits of the species by this naturalist, who had excellent Opportunities of observing it during his three years' Sn Rees as ieee

2 Drs Finsch and Hartlaub quote a passage from Remusat's Remarques sur Vextension de Uv Empire Chinoise, stating that in about the seventh century of our era a live " camel-bird" was sent as a present with an embassy from Turkestan to China.

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travels in South Africa, is perhaps one of the best we have, and since his narrative! has been neglected by most of its more recent historians we may do well by calling attention thereto. Though sometimes assembling in troops of from thirty to fifty, and then generally associat- ing with zebras or with some of the larger antelopes, Ostriches commonly, and especially in the breeding season, live in companies of not more than four or five, one of which ig a cock and the rest are hens. All the latter lay their eggs in one and the same nest, a shallow pit scraped out by their feet, with the earth heaped around to form a kind of wall against which the outermost circle of eggs rest. As soon as ten or a dozen eggs are laid, the cock begins to brood, always taking his place on them at nightfall surrounded by his wives, while by day they relieve one another, more it would seem to guard their common treasure from jackals and small peasts-of-prey than directly to forward the process of hatching, for that is often left wholly to the sun.? Some thirty eggs are laid in the nest, and round it are scattered perhaps as many more. These last are said to be broken by the old birds to serve as nourishment for the newly- hatched chicks, whose stomachs cannot bear the hard food on which their parents thrive. The greatest care is taken by them not only to place the nest where it may not be discovered, but to avoid being seen when going to or from it, and their solicitude for their tender young is no less. Andersson in his Lake N'gami (pp. 253-269) has given a lively account of the pursuit by himself and Mr Francis Galton of a brood of Ostriches, in the course of which the father of the family flung himself on the ground and feigned being wounded to distract their attention from his offspring. Though the Ostrich ordinarily inhabits the most arid districts, it requires water to drink; more than that, it will frequently bathe, and sometimes even, accord- ing to Von Heuglin, in the sea.

The question whether to recognize more than one species of Ostrich, the Struthio camelus of Linneus, has been for some years agitated without leading to a satis- factory solution. It has long been known that, while eggs from North Africa present a perfectly smooth surface, those from South Africa are pitted (see Brrps, vol. iil. p. 775, note 1). It has also been observed that northern birds have the skin of the parts not covered with feathers flesh-coloured, while this skin is bluish in southern birds, and hence the latter have been thought to need specific designation as S. australis. Still more recently examples from the Somali country have been described as forming a distinct species under the name of S. molybdophanes from the leaden colour of their naked parts.

The genus Struthio forms the type of one group of the Subclass Ratitx, which differs so widely from the rest, in points that have been concisely set forth by Prof. Huxley (Proc. Zool. Society, 1867, p. 419), as to justify us in regarding it as an Order, to which the name Struthiones may be applied (see ORNITHOLOGY, p. 44); but that term, as well as Struthionidx, has been often used in a more general sense by systematists, even to signify the whole of the Ratitz, and hence for the present caution must be

1M. H. K. Lichtenstein, Reise im siidlichen Africa, il. pp. 42-45 (Berlin, 1812).

: By those whose experience is derived from the observation of captive Ostriches this fact has been often disputed. But, to say nothing of the effects of the enforced monogamy in which such birds live, the difference of circumstances under which they find themselves, and in particular their removal from the heat-retaining sands of the desert and its burning sunshine, is quite enough to aecount for the change of habit. Von Heuglin also (p. 933) is explicit on this point. That the female Ostriches while on duty crouch down to avoid detection is only natural, and this habit seems to have led hasty observers to suppose they were really brooding,

exercised as to whether certain fossil remains from the Sivalik formation, referred to “ Struthionide,” be re- garded as true Ostriches or not. The most obvious distinctive character presented by the Ostrich is the pre- sence of two toes only, the third and fourth, on each foot, —a character absolutely peculiar to the genus Struthio.

The great mercantile value of Ostrich-feathers, and the increasing difficulty, due to the causes already mentioned, of procuring them from wild birds, has led to the forma- tion in the Cape Colony and elsewhere of numerous "Ostrich-farms," on which these birds are kept in con- finement, and at regular intervals of time deprived of their plumes. In favourable localities and with judicious man- agement these establishments are understood to yield very considerable profit; while, as the ancient taste for wearing Ostrich-feathers shews no sign of falling off, but seems rather to be growing, it is probable that the practice will yet be largely extended.

Among the more important treatises on this bird may be men- tioned:—E. D' Alton, Die Skelete der Straussartigen Vogel abgebildet und beschrieben, folio, Bonn, 1827; P. L. Sclater, "On the Stru- thious Birds living in the Zoological Society's Menagerie," Trans- actions, iv. p. 353, containing the finest representation (pl. 67), by Mr Wolf, ever published of the male Struthio camelus ; Prof. Mivart, "On the Axial Skeleton of the Ostrich," op. eit., viii. p. 385; Prof. Haughton, "On the Muscular Mechanism of the Leg of the Ostrich," Ann. Nat. History, ser. 3, xv. pp. 262-272; and Prof. Macalister, "On the Anatomy of the Ostrich," Proe. #. Irish Academy, ix. pp. 1-24. (A. N.)

OSTUNI, a city of Italy, in the province of Lecce, 23 miles by rail north-west of Brindisi. It is a bishop's see, has a cathedral of the 15th century with a fine Romanesque facade, several other churches of some interest, a municipal library with a collection of antiquities, and a technical school. The population was 14,422 in 1871 and 15,199 in 1881, that of the commune being 16,295 and 18,226.

OSUNA, a town of Spain, in the province of Seville, distant 48 miles by road and 57 by rail east-south-east from that city, is built in a semicircular form on the slope of a hill, at the edge of a fertile plain watered by the Salado, a sub-tributary of the Guadalquivir. On the top of the hill, which commands an extensive view, stands the collegiate church, a mixed Gothic and cinquecento building, contain- ing several good specimens of Ribera, which, however, as well as the sculptures over the portal, suffered considerably during the occupation of the place by Soult. The vaults, which are supported by Moorish arches, contain the tombs of the Giron family, by

one of whom, Don Juan Tellez, the church was founded in 1534. The university of Osuna, founded also by him in 1549, was suppressed in 1820 ; but the large building is still used as a secondary school, A great number of the inhabitants of Osuna are engaged in agriculture, and the making of esparto mats employs many of the poorer people. Earthenware, bricks, oil, soap, linen, hats, are also manufactured; and barley, oil, and wheat are sent in large quantities to Seville and Malaga. The population of the ayuntamiento in 1877 was 17,211.

Osuna, the Urso of Hirtius, where the Pompeians made their last stand, was afterwards called by the Romans Gemina Urbanorum, from the fact, it is said, that two urban legions were simultancously quartered there. The place was taken from the Moors in 1239, and given by Alphonso the Wise to the knights of Calatrava in 1264. Don Pedro Giron appropriated it to himself in 1445. One of his descendants founded the university, and another, Don Pedro Tellez, was made duke of Osuna by Philip IT. (1562).

OSWALD (c. 604-642), “most Christian king of the Northumbrians,” was the son of King Ethelfrith, and was born about 604. On the death of his father on the battle- field in 617, he and his brothers were compelled to take refuge among the northern Celts, where they are said to have received baptism. ‘The fall of King Mdwin in 633 permitted their return, and after the death of Eanfrid,

who had received Deira, and of Osric, who had’ been | 1839, guards the entrance to the harbour ; it is a place of

chosen to Bernicia, Oswald was called to the throne of the united kingdoms, and established his claim to it by his great victory over Ceadwalla at Heavenfield near Hexham in 635. His beneficent reign, which was chiefly devoted to the establishment of Christianity throughout his dominions, was brought to an end by his defeat and death on August 5, 642 (see NoRTHUMBERLAND). The cross crected by Oswald on the scene of his victory in 635 was afterwards the scene or the instrument of many miracles,

and gradually his name found a place in the calendar, August 5th being the day sacred to his memory. A German “ Spielmannsgedicht ” of the 12th or 13th century takes its name from St Oswald, but the narrative has no relation to anything recorded about the hero in authentic history (see monographs by Zingerle, 1856 ; Strobl, 1870 ; and Edzardi, 1876). Oswald, bishop of Winchester, who died February 29, 992, is also commemorated as a saint (October 15).

OSWALDTWISTLE, a township of Lancashire, Eng- land, is situated on the Leeds and Liverpool Canal and the East Lancashire Railway, 34 miles east-south-east of Black- burn and 24 north of Manchester. It possesses cotton- mills, printworks, bleachworks, and chemical works, and in the neighbourhood there are collieries, stone quarries, and potteries. The population of the township and urban sanitary district (area 4883 acres) in 1871 was 10,283, and in 1881 it was 12,206.

OSWEGO, a city and port of entry of the United States, capital of Oswego county, New York, stretches between 2 and 3 miles along the south-east shore of Lake Ontario, on the low bluffs and hilly ground near the mouth of the Oswego river, which divides it into two nearly equal portions, and is spanned by three iron drawbridges. By the Delaware, Lackawanna, and Western Railroad it is 305 miles from New York, and by the New York, Ontario, and Western Railway 326 miles. The Oswego Canal connects at Syracuse with the Erie Canal. The situation of the city is a beautiful and healthful one: most of the streets are 100 feet wide, and there are two finely-shaded public parks, one on each side of the river. Among the more conspicuous buildings are the conjunct custom-house, post- office, and United States court-house, erected in 1858 at a cost of $120,000, the city-hall, the county court-house, the State armoury, the church of the Evangelists, the large Roman Catholic church in Mohawk Street, the public library (10,000 volumes), the normal and training schools, the city almshouse (2 miles outside the city limits), and the orphan asylum. Falling 34 feet in its passage through the city, Oswego river furnishes a good supply of water- power, rendered available by a canal on each side. Besides the Oswego starch factory (founded in 1848, and now probably the largest in the world, occupying 10 acres of ground, partly with fireproof buildings seven stories high, and producing 35 tons of starch daily), the manufactories

of Oswego comprise flour-mills, large iron-works (making steam-engines, steam-shovels, dredges, é&c.), knitting works, shade-cloth factories, railway carriage works and repair shops, box factories, planing-mills, and a large number of subsidiary establishments. In the extent of its trade Oswego is the principal United States port on Lake Ontario, importing vast quantities of grain and timber, and exporting coal, flour, and salt. The annual duties on imports average over $1,000,000. The inner harbour, formed by the river mouth being enclosed by jetties, has about 3 miles of wharfage, and a depth at low water of from 9 to 13 feet; and the outer harbour, formed by the construction since 1871 of a breakwater 5700 feet long,

has about 4 miles of wharfage, and a depth of 20 feet.

Fort Ontario, rebuilt by the United States Government in

some strength. The population of Oswego was 12,205 in 1850, 20,910 in 1870, and 21,112 in 1880.

Oswego was visited by Champlain in 1615, by the Jesuits Le Mayne in 1654, and by other carly explorers. In 1722 the English established a trading post here, and in 1727 Governor William Burnet (son of Bishop Burnet) erected Fort Oswego. A body of about 700 men, left here by Governor Shirley, constructed in 1755-56 two other forts—Fort Ontario on the east and Oswego New Fort on the west side of the river. In 1756 the place was bombarded and captured by Montcalm; but between 1757 and 1759 new works were constructed by the English, who kept possession till Oswego was transferred to the United States by the Jay treaty in 1796. In 1814 Sir James Yeo took the fortress after a bombardment of three hours. The little hamlet of Oswego, commenced by Neil M‘Mullen, rapidly increased after the intro- duction of steam navigation on the lake (1816) and the construction of the Welland and the Oswego Canal (1828). In 1828 it was incorporated as a Village, in 1848 as a city.

OSWESTRY, a market-town and municipal borough in Shropshire, England, on the borders of Wales, on two railway lines and near the Shropshire Canal, 18 miles north- west of Shrewsbury and 16 north from Welshpool. It is a well-built town with wide and regular streets, although

some of the old wooden houses still remain. There are still some traces of the ancient castle erected in the reign of Stephen. The church of St Oswald, originally conventual, has been very much altered, the original structure having been more than once damaged, and the tower taken down by the Royalists in 1644. It was restored in 1872 ata cost of £10,000. For the free grammar school, founded in the reign of Henry IV., a new building was erected in 1810, which was enlarged in 1863 and 1878. Among the other public buildings are the public hall, the Victoria Rooms, the guildhall, the general market-hall, the literary institute, the union workhouse, and the cottage hospital. The town possesses locomotive repairing works, steam-engine, threshing machine, and agricultural implement works, steam printing works, corn mills, malting works, breweries, and a leather factory. In the vicinity are coal- mines and limestone quarries. The population of the municipal borough (area 1888 acres) in 1871 was 7306, and in 1881 it was 7847.

Oswestry was called by the Britons Tre'r Cadciriau, the town of chairs or seats commanding an extensive view, in reference to the eminences in the neighbourhood. It existed in the 4th century, and, having been given in the 5th century by Cunedda Wledig, prince of North Wales, to his son Oswael, it received the name of Osweiling and subsequently Maserfield. After a battle in 642 between Oswald the Christian king of Northumbria, and Penda the pagan king of Mercia, in which the former was slain, the name was changed to Oswaldstre (Welsh, Croes Oswallt), which was gradually corrupted into Oswestry. On the spot where Oswald was slain a monastery was afterwards erected, and near its site there is a spring still called Oswald's well. In 777 Oswestry was disjoined from Powis and added to Mercia. It stands between Offa's and Wat's dykes. About a mile from the town is an old British earthwork, known as Old Port, a corruption of Old Fort (Welsh, Hén Dinas), and sometimes called Old Oswestry, from a tradition that Oswestry originally occupied its site. Oswestry is not mentioned in Domesday. The castle is said to have been built about 1149 by Madoc, the ruler of Powis Vadog. It was burned in 1216 and in 1233. Edward I. began in 1277 to surround the town with walls, which were about one mile in circumference and had four gates. During invasions of the Welsh the town was burned in 1400 and 1408 ; it also suffered sevcrely from a similar cause in 1542, 1544, and 1567, and in 1559 it was devastated

by the plague. Oswestry was garrisoned for the Royalists, but surrendered 22d June 1644, and a few years afterwards the castle was demolished. The town obtained the grant of a fair from Henry III. It received its first charter from William Fitz- Alan in the reign of Henry II., and a royal charter from Richard II. Its present charter was granted by Charles II.

See Price, History of Oswestry, 1815; Cathrall, History of Oswestry and Topo- graphy of the Borough, 1855; Pennant, Tour: Eyton, Antiquities of Shropshire.

OTAGO. See New ZEALAND.

OTAHEITE, or Tanrtr. See Socrery Isuanps.

OTHO, Marcus Satnvrus, Roman emperor from January 15 to April 15, 69 a.p., was born April 28, 32 A.D… He belonged to an ancient and noble Etruscan

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family, settled at Ferentinum in Etruria. His grandfather had been a senator and held the pretorship ; his father had added to the family honours the dignity of a consul- ship. Otho himself first appears in history as one of the most reckless and extravagant of the young nobles who surrounded Nero and shared his revels. But his friend- ship with that emperor was brought to an abrupt close in 58 a.p., when Otho was only twenty-six years old, by his refusal to divorce his beautiful wife Poppzea Sabina at the bidding of Nero, who was enslaved by her charms. The emperor, impatient as usual of anything that hindered the gratification of his passions, at once removed Otho from the scene by appointing him governor of the remote pro- vince of Lusitania. In this honourable exile Otho remaincd for ten years, and, contrary to all expectation, his administration was marked by a moderation unusual at the time. When in 68 his neighbour Galba, the governor of Hispania Tarraconensis, rose in revolt against Nero, Otho at once joined him and accompanied him to Rome. Resentment at the treatment he had received from Nero may very well have impelled him to this course, but to this motive was added before long that of personal ambi- tion. Galba was far advanced in years, and Otho, encouraged by the predictions of

astrologers, aspired to succeed him, and, as a preliminary step, to be adopted as his heir by the empcror himself. With this object in view he set himself to win the affections of the soldiery and the populace in Rome, who, disgusted by Galba's old-fashioned parsimony and severity, were easily brought to look, favourably upon a claimant for the imperial purple whose open-handed generosity and easy manners promised a return of the golden years of Nero. But in January 69 his hopes in this direction were dissipated by Galba's formal adoption of L. Calpurnius Piso as the fittest man to succeed him. Nothing now remained for Otho but to strike a bold blow for the prize which seemed to be slipping from his grasp. Desperate as was the state of his finances, thanks to his previous extravagance, he found money enough to purchase the services of some three-and-twenty soldiers of the pretorian guard, with whom he arranged his plan of operations. On the morning of January 15, five days only after the adoption of Piso, Otho attended as usual to pay his respects to the emperor, and then hastily excusing himself on the score of private business hurried from the Palatine to meet his slender band of accomplices in the forum. By them he was escorted to the preetorian camp, where, after a few moments of surprise and indeci- sion, he was saluted imperator by the assembled troops. At the head of an imposing force he returned to the forum, and at the foot of the Capitol encountered Galba himself, who, alarmed by vague rumours of treachery, was making his way through a dense crowd of wondering citizens towards the barracks of the guard. The cohort on duty at the Palatine, which had accompanied the emperor, instantly deserted him; Galba himself was brutally Imurdered by the fierce preetorians, and his fate was shared by his adopted heir Piso, and by his chief confidants and advisers. The brief struggle over, Otho returned in triumph to the camp. Towards sunset on the same day he proceeded to the senate-house, and there was duly invested by the senators with the name of Augustus, the tribunician power, and the other dignities belonging to the principate. Otho had owed his success largely, not only to the resentment felt by the pretorian guards at Galba's well-meant attempts to curtail their privileges in the Mterests of discipline, but also to the attachment felt in Rome for the memory of Nero; and his first acts as Cmperor showed that he was not unmindful of the fact. He accepted, or appeared to accept, the cognomen of Nero conferred upon him by the shouts of the populace, whom

his comparative youth and the effeminacy of his appear- ance reminded of their lost favourite. Nero’s statues were again set up, his freedmen and household officers reinstalled in their places, and the intended completion of the Golden House announced. At the same time the fears of the more sober and respectable citizens were allayed by Otho’s liberal professions of his intention to govern equitably, and by his judicious clemency towards Marius Celsus, consul- designate, a devoted adherent of Galba. These favourable. symptoms were eagerly seized upon as promising bettcr things than could have been hoped for from one who was only known as yet in Rome as a passionate and reckless profligate and spendthrift.

But any further development of Otho’s policy was speedily checked by the news which reached Rome shortly after his accession, that the army in Germany had declared for Vitellius, the com- mander of the legions on the lower Rhine, and were already advancing upon Italy under the conmand of Vitellius’s two lieutenants, Fabius Valens and Alienus Cecina. After in vain attempting to conciliate Vitellius by the offer of a share in the empire, Otho, with unexpected vigour, prepared for war. His resources were not contemptible. From the remoter provinces, indeed, which had acquiesced in his accession little help was to be expected ; but the legions of Dalmatia, Pannonia, and Meesia were eager in his cause, the pretorian cohorts were in themselves a formidable force, and an efficient fleet gave him the mastery of the Italian seas. Nor was he himself wanting in promptitude. The fleet was at once despatched to secure Liguria, and on March 14 Otho, undismayed by omens and prodigies, started northwards at the head of his troops, in the hopes of preventing the entry of the Vitellian troops into Italy. But for this he was too late. Both Valens and Cecina had already crossed the Alps,—the former by the Cottian, the latter by the Pennine passes,—and all that could be done was to throw troops into Placentia and hold the line of the Po, The campaign opened favourably for Otho, His advanced guard successfully defended Placentia against Cecina, and com- pelled that general to fall back on Cremona. But the arrival of Valens altered the aspect of affairs. The Vitellian commanders now resolved to bring on a decisive battle, and their designs were assisted by the divided and irresolute counsels which prevailed in Otho’s camp. The more experienced officers urged the

importance of avoiding a battle, until at least the legions from Dalmatia had arrived. But the inconsiderate rashness of the emperor's brother Titianus and of Proculus, prefect of the pretorian guards, added to Otho's feverish impatience of prolonged suspense, overruled all opposition, and an immediate advance was decided upon, Otho himself remaining behind with a considerable reserve force at Brixellum, on the southern bank of the Po, At the time when this decision was taken the Othonian forces had already crossed the Po and were encamped at Bedriacum, a small village on_ the Via Postumia, and on the route by which the legions from Dalmatia would naturally arrive. Leaving a strong detachment to hold the camp at Bedriacum, the Othonian forces advanced along tho Via Postumia in the direction of Cremona. At a short distance from that city they unexpectedly encountered the Vitellian troops, and a battle at once ensued. The Othonians, though taken at a dis- advantage, fought desperately, but were finally defeated at all points and forced to fall back in disorder upon their camp at Bedriacum. Thither on the next day the victorious Vitellians followed them, but only to come to terms at once with their disheartened enemy, and to be welcomed into the camp as friends. More unexpected still was the effect produced by the news of the battle at Brixellum. Otho was still in command of a formidable force—the Dalmatian legions had already reached Aquileia ; and the spirit of his soldiers and their officers was still unbroken. But he was resolved to accept the verdict of the battle which his own impaticnce had hastened. He had made a bold throw for success and had failed. He was weary of the suspense and anxieties of a protracted struggle, and he may cven have been sinccre in his pro- fessed unwillingness to cause further bloodshed. In a dignified speech he bade farewell to those about him, and then retiring to rest slept soundly for some hours. Early in the morning he stabbed himself to the heart with a dagger which he had concealed under his pillow, and died as his attendants entered the tent. His funeral was celebrated at once, as he had wished, and not a few of his soldiers followed thcir master's example by killing themselves at his pyre. A plain tomb was erected in his honour at Brixcllum, with the simple inscription "Diis Manibus Marci Othonis." At the time of his death (April 15, 69) he was only in his thirty-eighth ycar, and had reigned just three months. In all his life nothing became him so well as his manner of leaving it ; but the fortitude he then showed, even if it was not merely thc courage of despair, cannot blind us to the fact that he was little better than a reckless

and vicious spendthrift, who was not the less dangerous because his fiereer passions were concealed beneath an affectation of effeminate dandyism. (H. F. P.)

OTHO I. (912-973), called The Great, Holy Roman emperor, was born in 912. After the death of his father, Henry, king of Germany, he was elected and crowned king in 936 at Aix-la-Chapelle; and he occupied the throne upwards of thirty-six years. His reign was one of the most momentous in medizeval history, its chief incident being his assumption of the imperial crown, whereby he rendered impossible the growth of a compact German monarchy. Otho was a man of great ambition, stern and resolute ; and soon after his coronation as king of Germany his leading vassals saw that he intended to claim from them something more than nominal allegiance. First he had to suppress a rebellion headed by Eberhard, duke of Franconia, in association with Thankmar, a son of King Henry by a marriage which had been declared invalid. When this insurrection was put down, Thankmar having died, there was a more formidable rising, in which Eberhard secured the alliance of Otho’s younger brother Henry, of Giselbert, duke of Lorraine, of Frederick, archbishop of Mainz, and of other powerful prelates. The king was again triumphant, and on this occasion he strengthened his position by retaining Franconia in his own hands, and by granting Lorraine to his supporter Conrad, who married Otho’s daughter Liudgard. To his brother Henry, whom he pardoned, he gave Bavaria; and over Swabia, after the death of its duke, he placed his own son Ludolf. His native duchy, Saxony, was entrusted to, Count Hermann, called Billung, a brave noble who had distinguished himself in wars on the eastern borders of Germany. Thus all the great offices of the state were held by Otho’s kinsmen and friends; and he exercised more direct control over his subjects than any sovereign, except Charlemagne, had done before him. In wars with the Eohemians, the Wends, and the Danes Otho was not less successful. In 951 he crossed the Alps to help Queen Adelaide, and, having conquered Berengar II., he married her and became king of Lombardy. On his return to Germany his son Ludolf rebelled against him, and was aided by Duke

Conrad, by Archbishop Frederick of Mainz, and by many discontented magnates. In the midst of the struggle Germany was attacked by the Magyars, whom Duke Conrad had summoned to his aid. This common danger led to the establishment of internal peace, and Otho succeeded in defeating the Magyars. When in 955 they returned in greater numbers than ever, he inflicted on them so decisive a defeat that they did not again invade Germany. In 961, in response to the appeal of Pope John XII, Otho returned to Italy to punish his rebellious vassal Berengar ; and on the 2d February 962 he was crowned emperor by the pope, for the deposition of whom he soon after- – wards summoned a council. At this time Otho remained two years in Italy, and a later visit extended over six years, during which he not only maintained his authority in Lom- bardy, but sought to assert it in southern Italy. In Germany his policy was directed chiefly to the strengthening of the church, which was to act as a counterpoise to the influence of the secular nobles. He died on the 7th May 973, at Memleben, and was buried in Magdeburg, which he had made the seat of an archbishopric.

Sce Képke and Diimmler, Kaiser Otto der Grosse, 1876.

OTHO IL (955-983), Holy Roman emperor, son of Otho I. and Adelaide, was born in 955. In the lifetime of his father he was twice crowned, in 961 as king of Germany, and in 967 (at Rome) as emperor. He became sole ruler after the death of Otho I. in 973. Early in his reign he had to suppress a great conspiracy organized by

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his cousin, Duke Henry of Bavaria; and at the same time he was repeatedly attacked by Harold, king of the Danes, In 978, when his authority had been in some measure re-established, he was confronted by a new danger, for Lothair, king of France, suddenly invaded Lorraine. Otho hastily assembled an army, drove Lothair from Lorraine, and pushed on to Paris, which he unsuccessfully besieged. In the treaty by which peace was concluded, France formally recognized the right of Germany to Lorraine. Otho next went to restore order in Rome, from which Pope Benedict VIJ. had been expelled by Crescentius. In southern Italy Otho (who, in virtue of his wife, Theophano, claimed Apulia and Calabria) waged war with the Saracens,

and defeated them in a great battle. On the 13th July 982, however, he himself was defeated, and was very nearly taken prisoner. At a diet in Verona, attended by German and Italian princes, his son Otho, three years of age, was chosen to be his suc- cessor, and arrangements were made for a new campaign in the south. On the 7th December 983 Otho II. died, leaving the empire in a state of confusion, the Danes and the Wends, encouraged by his defeat, having risen against German supremacy. Although warlike and impetuous, Otho II. was a man of refined and scholarly tastes, which had been carefully cultivated by his mother. See Giesebreeht, Geschichte der deutschen Kaiserzett.

OTHO III. (980-1002), Holy Roman emperor, son of Otho II. and Theophano, was born in 980, and crowned king of Germany at Aix-la-Chapelle in 983. After his coronation his kinsman, Duke Henry of Bavaria, who had been imprisoned by Otho IT. in Utrecht, made his escape and seized the young king, in whose name he proposed to govern the empire. His pretensions were resisted, however, and he agreed to submit on condition of being reinstated in his dukedom. During Otho's minority public affairs were administered, with the aid of Willegis, archbishop of Mainz, by his mother Theophano, his grandmother Adelaide, and his aunt Matilda, sister of Otho II. and abbess of Quedlinburg. Otho was a dreamy and imaginative youth of brilliant talents, which were carefully developed by Gerbert, the greatest scholar of the age. In 996, when Otho was declared to have reached his majority, he went to Rome, where Crescentius had made himself supreme. After the death of Pope John XV. Otho caused Bruno, who was related to the Saxon dynasty, to be elected to the holy see; and by him (Gregory V.) Otho was crowned emperor on the 21st May 996. After Otho's departure Crescentius again rose, drove Gregory V. from Rome, and set up an anti-pope. Otho immediately returned, and Crescentius, with twelve of his supporters, was executed. On the death of Gregory V., Otho's tutor, Gerbert, archbishop of Ravenna, was appointed pope; and, in part through his influence, the emperor began to form great plans, deciding to make Rome the centre of the secular as well as of the spiritual world. At the approach of the year 1000, when it was commonly supposed that the earth was about to be destroyed, Otho returned to Germany and made a pilgrimage to the tomb of St Adalbert at Gnesen. Afterwards, in Aix-la-Chapelle, he entered the vault in which the body of

Charlemagne sat upon a throne, and took away the golden cross which hung on the mighty emperor's breast. In 1001 Otho went back to Italy for the purpose of carrying out his far-reaching schemes ; but popular disturbances in Rome compelled him to quit the city ; and on the way to Ravenna, where he proposed to wait for a German army, he died at Paterno, near Viterbo, on the 21st January 1002.

See Wilmans, Jahrbiicher des deutschen Reichs wnter Kaiser Otto III. ; Giesebrecht, Gesehiehte der deutsehen Kaiserzeit.

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OTHO IV. (c. 1174-1218), Holy Roman emperor, the second son of Henry the Lion, duke of Saxony and Bavaria, of the house of Guelph, was born about 1174. After the banishment of his father to England in 1180, Otho was educated at the court of Richard I., whose sister Matilda was Otho's mother. Otho distinguished himself in the war between England and France, and in 1196 Richard I. made him duke of Aquitaine and count of Poitou. In 1197, when the majority of the German princes, disregarding the previous election of Frederick I1., offered the crown to Philip of Swabia, a party in the Rhine country, headed by the archbishop of Cologne, set up Otho as anti-king, and he was crowned at Aix-la-Chapelle. The result was a eivil war which lasted about ten years, Philip being supported by most of the German princes and by the king of France, Otho by the kings of England and Denmark. For some time Pope Innocent hesitated to take part with either side, but at last he declared for Otho, who promised to make over certain fiefs claimed by the holy see. Notwithstanding the pope's aid, Otho's cause did not prosper; but in 1208 Philip was murdered by Otho of Wittelsbach, and then Otho IV. was universally acknow-

ledged as king. On the 27th September 1209, at Rome,

he was crowned emperor by the pope, to whom he had made new and more important concessions. Otho gave deadly offence to Innocent by seizing Ancona and Spoleto, which had been united to the papal territories ; and, when the emperor, having conquered Apulia, was about to cross to Sicily, the pope excommunicated him, released the German princes from their oath of allegiance, and recognized the right of Frederick II. to the throne. In

1212 Otho returned to Germany, where he acted with so much vigour that he seemed to be capable of defying the papacy; but he immediately lost ground when Frederick Il., a youth of brilliant genius, appeared as his rival. After the battle of Bouvines (July 27, 1214), in which Otho, with King John of England, was defeated by the French, the discredited emperor had no chance of recover- ing his position. He made some ineffectual attempts to assert his claims, but ultimately he contented himself with the principality of Brunswick, which he had inherited when the Guelphic territories were divided in 1202. On the 19th of May 1218 he died at the Harzburg.

See Langerfeldt, Kaiser Otto IV., 1872; Winkelmann, Philipp von Sehwaben und Otto IV., 1878.

OTHO or Fretstnc, German historian, was the son of Leopold IV., margrave of Austria, and of Agnes, the daughter of the emperor Henry IV. He became a priest, and was made provost of the monastery of Neuburg, which had been founded by his father. Soon afterwards he went to Paris to prosecute his studies; and on his way back he joincd the Cistercian order in the monastery of Morimont, in Burgundy, of which he became abbot. In 1137 he was elected bishop of Freising, and this position he held until his death on September 22, 1158.

_ He was the author of two important works, a universal history, im which he brought the record down to 1146, and a history of the Teign of the emperor Fredcrick I. The first of these works was continued (to 1209) by Otho of St Blasien, the second by Ragewin.

tho was nota very accurate historian, but he was much more than a mere chronicler, his materials being clearly and effectively arranged, and his narrative giving evidence of a penetrating and philosophical Judgment. A critical edition of his writings was presented for the first time in the Monwmenta Germaniz, and this was afterwards

separately published with the title, Ottonis Episcopi Frisingensis Opera, 1867,

OTIS, James (1724-1783), was born at Barnstable, Massachusetts, U.S., on February 5, 1724 (o.s.). He graduated with honours at Harvard in 1743, and

for a year or two afterwards devoted himself to the study of literature before reading law. Ho had been a dozen years at the bar, and had risen to professional distinction, when in 1760 he

published a Rudiments of Latin Prosody, a book long ago out of print as well as out of date, but of authority in its time. He wrote also a similar treatise upon Greek prosody ; but that was never published, because, as he said, there was not a fount of Greek letters in the country, nor, if there were, a printer who could have set it up. These, however, were his first and last works upon any other subject than politics. As the long war between Great Britain and France drew towards its close in 1762, measures were taken to enforce anew, in the British colonies in America, the commercial laws which had been in a measure lost sight of. The relaxation had taught the colonists that the burden was heavier than they thought when they bent beneath it; now the war had given them confidence in their own power, and the time had come, therefore, when resistance was inevitable. A trade with the West Indies in colonial vessels had been specially developed. This was in violation of the navigation laws, and to break it up an order in council was sent from England in 1760 directing the issue of writs of assistance, which would authorize the custom-officers to enter any man's house on suspicion of concealment of smuggled goods. The legality of a measure which would put so dangerous a power into the hands of irresponsible men was questioned, and the superior court consented to hear argument. Otis was a law-officer under the crown, and it was his duty to appear on behalf of the Government. He refused, resigned his office, and appeared for the people against the issue of the writs. His plea was profound for its legal lore, fearless in its assertion of the rights of colonial Englishmen, and so fervid in its eloquence that it was said he "was a flame of fire." Though it failed to convince a court where the lieutenant- governor, Hutchinson, sat as chief justice, Otis was from that momenta manof mark. John Adams, who heard him, said, " American independence was then and there born." The young orator was soon afterwards unanimously elected a representative from Boston to the Colonial Assembly. To that position he was re-elected nearly every year of the remaining active years of his life, serving there with his father, who was usually a member, and often speaker, of that body.

Of most of the important state papers addressed to the colonies to enlist them in the common cause, or sent to the Government in England to uphold the rights or set forth the grievances of the colonists, the younger Otis was the author. His influence at home in controlling and directing the movement of events which led to the revolution was universally felt and acknowledged; and abroad no American was so frequently quoted, denounced, or applauded in parliament and the English press, as the recognized head and chief of the rebellious spirit of the colonies! In 1765 Massachusetts sent him as one of her representatives to the first Continental Congress, where he was a conspicuous figure. Four years later his brilliant public career was brought to a close. In consequence of a newspaper controversy with some Tory office-holders in Boston, he was attacked in a darkened room in a public coffee-house by a dozen men, and wounded by a blow upon the head from which he never recovered. His health gave way, and he was subject to frequent attacks of insanity. He was killed by lightning on the 23d May 1783.

A biography of Otis by William Tudor appeared in 1823; and a much briefer one, by Francis Bowen, in 1844.

1 The political writings of Otis were chiefly controversial, and were published in the Boston newspapers. His more important pamphlets were A Vindieation of the Conduct of the House of Representatives of the Province of Massachusetts Bay, published in 1768; The Rights of the British Colonies Asserted and Proved, 1764; A Vindieation of the British Colonies against the Aspersions of the Halifax Gentleman, in his Letter to a Rhode Island Friend,—a letter known at the time as the “ Halifax Libel,” 1765; Considerations on Behalf of the Colonists in a Letter to a Noble Lord, published in England the same year.

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OTLEY, a market-town in the West Riding of York- shire, is picturesquely situated on the south bank of the Wharfe, at the foot of the precipitous Chevin Hill, 10 miles north of Bradford and 9 south-west of Harrogate. The river is crossed by a stone bridge of seven arches. The church of All Saints contains what is said to be a Saxon doorway belonging to the original building, and several in- teresting monuments. A free grammar school took

its origin from a bequest by Thomas Cave in 1602, and was named in honour of Henry, prince of Wales, son of James I. A mechanics' institute was erected in 1869 in the Italian style, and a court-house in 1875. Worsted spinning and weaving, machine making, tanning and leather dressing, organ-building, and paper-making are the principal indus- tries. Otley is a very old town. It is mentioned in Domesday, the name being possibly derived from Othelai —the field of Otho. The population of the town and urban sanitary district (area 2370 acres) was 5855 in 1871 and 6806 in 1881.

OTRANTO, a city of Italy in the province of Lecce (Terra d'Otranto), 534 miles by rail south of Brindisi on the coast of the Adriatic, within sight on a clear day of the mountains of Albania. Though at present a small place with a communal population of only 2333 (1881), it was formerly one of the most celebrated cities of southern Ttaly, and the seat of an archbishop who bore the title of primate of the Salentines.

Probably of Greek origin, Hydruntum or Hydrus, as it was called, seems for a time to have suffered from the prosperity of Brundusium, but by the 4th century it had become the regular for travellers bound for the East by Apollonia and Dyrrachium.

t remained in the hands of the Greek emperors till its second capture by Robert Guiscard in 1068. In 1480 the Turkish fleet under Achmet, grand-vizier of Mohammed I]I., destroyed the city and massacred or enslaved the inhabitants; and, though Otranto was recovered for Ferdinand by Alphonso, duke of Calabria, and fortified by King Alphonso and Charles V., it never rose to its former importance. During the war of the League of Cambrai, Ferdinand of Aragon expelled the Venetians, who had been for some time in possession of the city. In 1810 Napoleon made Fouché duke of Otranto. The cathedral (S. Annunziata), a three- aisled basilica ending in three apses, contains a mosaic floor dating from 1163, greatly injured by the Turkish horses; and the castle still stands which gave its title to Walpole's well-known novel, The Castle of Otranto.

OTTAWA, the capital of the Dominion of Canada, the seat of the supreme court, and the residence of the governor-general, of the Church of England bishop of Ontario, and of the Roman Catholic bishop of Ottawa, is situated

in 45° 25’ 59” N, lat. and 75° 42’ 4” W. long., in the province of Ontario, on the south bank of the Ottawa (which forms the boundary between Ontario and Quebec), about 90 miles above its junction with the St Lawrence. By the Canadian Pacific Railway, which here crosses from the north to the south side of the Ottawa valley, the city is 120 miles west of Montreal (by. the Canada Atlantic Railway the distance is 116 miles),.and from Prescott on the Grand Trunk Railway and opposite Ogdensburg in New York it is distant 54 miles. The site of Ottawa is sufficiently remarkable, extending as it does for about 2 miles along the Ottawa from the Chaudiére Falls (where the river, narrowed to 200 feet, rushes down about 40 feet over a broken ledge of rock) to the falls at the mouth of the Rideau (a right-hand tributary), and rising about midway into a cluster of hills—Parliament or Barrack Hill (160 feet), Major’s Hill, &c—which front the river with bold bluffs. The Rideau Canal, which skirts the east side of Parliament Hill, separates what is known as the higher from the lower town. To the south of Parliament Hill is the more commercial part of the city, stretching westward to the suburb of Rochesterville and the lumber district round the Chauditre Falls. Major’s Hill, east of the canal, is laid out as a public park ; and

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Sandy Hill, to the south of the lower town, forms a resi- dential quarter. Beyond the Rideau river lies the sub- urban village of New Edinburgh, with the official residence of the governor-general, Rideau Hall. The city of Hull too, on the opposite side of the Ottawa, in the province of Quebec, may be regarded as a suburb of the capital, with which it is connected bya suspension bridge. The Govern- ment buildings, which give the name to Parliament Hill, rank among the finest specimens of architecture in North America. The central pile, or Parliament House, is in Italian Gothic of the 13th century,—the material mainly Potsdam sandstone from Nepean. The main (south) front is 470 feet long and 40 feet high, and in the middle over the principal entrance stands Victoria Tower, 180 feet high, and surmounted by a great iron crown. In the centre of the north front is a semi-detached polygonal (almost cir- cular) hall, 90 feet in diameter, appropriated to the

library. The corner stone of the building was laid by the Prince of Wales in 1860. The total cost was about £1,000,000.

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Plan of Ottawa. (For ground plan and elevation see The Builder, 1859 and 1860.) Two extensive blocks of departmental buildings are placed like detached wings forming the sides of the quadrangle in front. Ottawa also contains a Roman Catholic cathedral (Notre Dame) with twin spires 200 feet high, the Gray Nunnery (the mother-house of the province of Ontario), the Black Nunnery, two convents, a Roman Catholic college (Ottawa University), a Roman Catholic hospital, a Protestant hospital, a Protestant ladies' college, a city-hall, a custom-house, the Government normal school for central Canada, the museum of the geological survey, &c. Besides being a great seat of the lumber trade, with saw-mills and match-works, it manufactures flour, cast-iron wares, leather, and bricks. The exports were valued at $1,683,148 in the fiscal year ending June 1874, and at $2,444,723 in the fiscal year 1883,—the im- ports at the same dates amounting to $1,495,169 and $1,562,344. The revenue arising from customs duties amounts to about £260,000 annually. The population of the city (about half being Roman Catholics and half Pro- testants) was 14,669 in 1861, 21,545 in 1871, and 27,412 in 1881.

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Stcamers ply in summer down to Montreal, and for about 900 miles up the river above the falls, as well as through the Rideau Canal to Kingston.

Philemon Wright of Woburn, in Massachusetts, scttled in 1800 at the foot of the portage round the Chaudiére Falls on the site of Hull, and some twenty years later he transferred his claim to the hills on the other side of the river to a teamster named Sparks, who would have preferred the $200 due to him. Sparks Street is now the fashionable commercial street of Ottawa. In 1827 the Rideau Canal was constructed at a cost of $2,500,000 to connect lower Canada with Kingston on Lake Ontario, and in that way prevent the necessity of gun-boats, &c., passing up the St Lawrence exposed to the enemy's fire; and soon afterwards a town sprang up at the Ottawa end, called Bytown after Colonel By, R.E., who had surveyed the eanal. At its incorporation as a city in 1854 Bytown received the name of Ottawa. In 1858 the queen, to whom the matter was referred, selected Ottawa as the capital of the Dominion of Canada,

artly because of the advantages of its site, and partly to avoid invidious preference among the rival claims of Quebec, Montreal, Kingston, and Toronto. The first session of parliament in Ottawa was opened in 1865.

OTTAWA, a city of the United States, capital of La Salle county, IlJinois, on both sides of the Illinois above and below the mouth of the Fox river (which furnishes abund- ant water-power by a fall of 29 feet), on the Illinois and Michigan Canal, and at the junction of the Fox river branch of the Chicago, Burlington, and Quincy Railway with the Chicago, Rock Island, and Pacific Railway, 84 miles south- west of Chicago. Ottawa ships large quantities of produce and live stock, and has manufactories of agricultural imple- ments, carriages, glass, and clothing. The more conspicuous buildings are those occupied by the county courts and jail, and the supreme court for the northern division of the State. Near the south bank of the Illinois there are mineral springs possessing important medicinal properties. In 1880 the population was 7834 (811 in South Ottawa).

OTTENSEN, a town of Prussia, in the province of Schleswig-Holstein, lies on the right bank of the Elbe, immediately below Altona, of which it practically forms a part. It contains numerous villas of Hamburg merchants, and carries on manufactures of machinery, tobacco, soap, gilt frames and

cornices, glass, iron, and other articles. Ottensen, which received its municipal charter in 1871, contained 15,375 inhabitants at the census of 1880. The three “Graves of Ottensen,” besung by the poet Riickert, are those of 1138 citizens, who were expelled from Ham- burg by Marshal Davoust in 1813-14, and perished here, of Charles, duke of Brunswick, who died at Ottensen of wounds received at the battle of Jena, and of Klopstock and his wife Meta. The last alone now remains.

OTTER, a group of animals belonging to the family Mustelidz, of the order Carnivora (see MAMMALIA, vol. xv. p. 439), distinguished from their allies by their aquatic habits. The true otters constitute the genus Lutra of zoologists, of which the common species of the British Isles, L. vulgaris, may be taken as the type. It has an elongated, low body, short limbs, short broad feet, with five toes on each, connected together by webs, and all with short, moderately strong, compressed, curved, pointed claws. Head rather small, broad, and flat; muzzle very broad; whiskers thick and strong ; eyes small and black; ears short and rounded. ‘Tail a little more than half the length of the body and head together, very broad and Strong at the base, and gradually tapering to the end, some- what flattened horizontally. The fur is of very fine quality, consisting of a short soft under fur of a whitish grey colour, brown at the tips, interspersed with longer, stiffer, and thicker hairs, very shining, greyish at the base, bright rich brown at the points, especially on the upper parts and outer surface of the legs; the throat, cheeks, under parts and inner surface of the legs brownish grey through- Out. Individual otters vary much in size. The total length from the nose to the end of the tail averages about

34 feet, of which the tail occupies 1 foot 3 or 4 inches. The weight of a full size male is from 18 to 24 hb, that of a female about 4 fb less.

As the otter lives almost exclusively on fish, it is rarely met with far from water, and usually frequents the shores of brooks, rivers, lakes, and, in some localities, the sea itself. It is a most expert swimmer and diver, easily over- taking and seizing fish in the water, but when it has cap- tured its prey it brings it to shore to devour it. When lying upon the bank it holds the fish between its fore-paws, commences at the head and then eats gradually towards the tail, which it is said always to leave. The female produces three

to five young ones at a time, in the month of March or April, and brings them up in a nest formed of grass or other herbage, usually placed in a hollow place in the bank of a river, or under the shelter of the roots of some overhanging tree. The Common Otter is found in localities suitable to its habits throughout Great Britain and Ireland, though far less abundantly than formerly, for, being very destructive to fish, and thus coming into keen competition with those who pursue the occupation of fish- ing either for sport or for gain, it is rarely allowed to live in peace when once its haunts are discovered. Otter hunting with packs of hounds of a special breed, and trained for the purpose, was formerly a common pastime in the country. When hunted down and brought to bay by the dogs, the otter is finally despatched by long spears carried for the purpose by the huntsmen.

The Common Otter ranges throughout the greater part of Europe and Asia. A closely allied but larger species, LZ. canadensis, is extensively distributed throughout North America, where it is systematically pursued by professional trappers for the value of its fur. An Indian species, Z. nair, is regularly trained by the natives of some parts of Bengal to assist them in fishing, by driving the fish into the nets. In China also otters are taught to catch fish, being let into the water for the TA le attached to a long cord.

Otters are widely distributed over the earth, and, as they are much alike in size and coloration, their specific distinctions are by no means well defined. Besides those mentioned above, the following have been described, Z. californica, North America; L. felina, Central America, Peru, and Chili; JZ. brasiliensis, Brazil; L. maculicollis, South Africa; L.whiteley?, Japan; L. chinensis, China and Formosa, and other doubtful species. A very large species from Demerara and Surinam, with a prominent flange-like ridge along each lateral margin of the tail, LZ. sandbachii, constitutes the genus Pieronura of Gray. Others, with the feet only slightly webbed, and the claws excecdingly small or altogether wanting on some of the tocs, and also with some difference in dental characters, are with better reason separated into a distinct genus called onyx. These are A. inunguis from South Africa and A. leptonyx from Java and Sumatra.

More distinct still is the Sea-Otter (Enhydra lutris). It differs from all other known Carniwora in having but two incisors on each side of the lower jaw,

the one correspond- ing to the first (very small in the true otters) being constantly absent. Though the molar teeth resemble those of Lutra in their proportions, they differ very much in the exceeding roundness and massiveness of their crowns and bluntness of their cusps. The fore feet are very small, with five short webbed toes, and naked palms; the hind feet are altogether unlike those of the true otters, but approaching those of the seals, being large, flat, palmated, and furry on both sides. The outer toe is the largest and stoutest, the rest gradually diminishing in size to the first. The tail is about one-fourth of the length of the head and body, cylindrical and obtuse. The entire length of the animal from nose to end of tail is about 4 feet, so that the body is considerably larger and more massive than that of the English otter. The skin is peculiarly loose, and stretches when removed from the animal so as to give the idea of a still larger creature than it really is. The fur is remarkable for the preponderance of the beautifully soft woolly under fur, the longer stiffer hairs being very scanty. The general colour is a deep liver-brown, everywhere silvered or frosted with the hoary tips of the longer stiff

hairs. These are, however, removed when the skin is dressed for commercial purposes.

Sea-otters are only found upon the rocky shores of certain parts of the North Pacific Ocean, especially the Aleutian Islands and Alaska, extending as ‘far south on the American

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The Sea-Otter (Enhydra lutris). From Wolf in the Proceedings of the Loological Society of London, 1865, pl. vii.

coast as Oregon; but, owing to the unremitting persecution to which they are subjected for the sake of their skins, which rank among the most valuable known to the furrier, their numbers are greatly diminishing, and, unless some restric- tion can be placed upon their destruction, such as that which protects the fur seals of the Pribyloff Islands, the species is threatened with extermination, or, at all events, excessive scarcity. When

this occurs, the occupation of five thousand of the half-civilized natives of Alaska, who are dependent upon sea-otter hunting as a means for obtaining their living, will be gone. The principal hunting grounds at present are the little rocky islets and reefs around the island of Saanach and the Chernobours, where they are captured by spearing, clubbing, or nets, and recently by the more destructive rifle bullet. They do not feed on fish, like the true otters, but on clams, mussels, sea-urchins, and crabs, and the female brings forth but a single young one at a time, apparently at no particular season of the year. They are excessively shy and wary, and all attempts to rear the young ones in captivity have hitherto failed,

See Elliott Coues, Monograph of North American Fur-bearing Animals, 1877. (W. H. F.)

OTTOMAN EMPIRE. See Turkey.

OTTUMWA, a city of the United States, capital of Wapello county, Iowa, lies on the Des Moines river (here spanned by a bridge), 75 miles north-west of Burlington by the main line of the Chicago, Burlington, and Quincy Rail- road. An important railway junction, in the heart of the coal-region of Iowa, and in possession of good water-power, Ottumwa, whose existence as a city dates from 1856, is growing in commercial and industrial activity. There is a large pork-packing establishment, killing 100,000 hogs annually. Among the manufactures are waggons and carriages, ploughs, sewing machine attachments, table- cutlery, corn-starch, linseed oil, harness, and furniture. The population was 1632 in 1860, 5214 in 1870, and 9004 in 1880.

OTWAY, Tuomas (1651-1685), the best English tragic poet of the classical school, was the son of the Rev. Humphrey Otway, rector of Woolbeding, near Midhurst in Sussex, and was born at the adjoining village of Trotton, March 3, 1651. He acknowledges his obligations to the care and education of his parents. He went to

school at Wickham, near Winchester, and in 1669 pro- ceeded to Christ Church, Oxford. In 1671 he appeared at the Duke's Theatre, Lincoln's Inn Fields, in the Forced Marriage, a new play by Aphra Behn, but failed ignomini- ously. Declining to take orders, he quitted the university in 1674, and obtained a cornetcy in a troop of horse, Within a twelvemonth he sold his commission, and came to London as a literary adventurer. In 1675 his Alcibiades,

a poor play, was performed with indifferent success at the —

Duke's Theatre. In the following year Don Carlos, a vigorous rhymed tragedy, puerile in conception and show- ing little knowledge of human nature, but full of declama- tory energy, took the town fairly by storm. He followed it up with translations of Racine's Berenice and Moliére's Fourberies. de Scapin, and with a very dull and indecent comedy of his own, Lriendship in Fashion. He next went as a volunteer to the wars in Flanders, an unfortunate expedition which pointed the merciless lampoons of Rochester, to whom Berenice had been dedicated, but with whom he had now quarrelled. It also prompted his mediocre but not uninteresting play, Zhe Soldier's Fortune (1679), in which he has turned his military experience to account. Next year he produced The Orphan, founded upon a novel called Lnglish Adventures, one of the two plays which have placed him in the first rank of English tragic poets; and Caius Marius, a wholesale but acknowledged plagiarism from Romeo and Juliet. In 1682 appeared his masterpiece, Venice Preserved, the plot of which is taken from Saint Réal's Histoire de la Conjuration du Marquis de Bedemar. Its success was decisive, but it brought little pecuniary advantage to the author, who was already sink- ing into abject poverty, and, as appears by some letters attributed by Mr Gosse to this date, was further tormented by a hopeless passion for the beautiful Mrs Barry, the principal female performer in his plays. Some of his letters to her were first published with Rochester's works, and subsequently included in his own. Desponding and broken-hearted, he seems to have given himself up to dissi- pation, and produced but one more insignificant play, The Atheist, a second part of the Soldier's Fortune (1684). On April 14, 1685, he died on Tower Hill, under most

melan- choly circumstances if the tradition can be believed that he was choked by a piece of bread begged from a passer by. There is no absolute confirmation of this sad story, or of a later account which attributes his death to a fever caught by over-exertion in pursuing a robber. Whatever the exact manner of his decease, he certainly expired in obscurity and want. A tragedy called Heroic Friendship was published under his name in 1719. It has generally been regarded as wholly spurious ; but Mr Gosse, his most sympathetic critic, recognizes some traces of his hand. Otway's strong point is pathos. In this respect, though in no other, he is the Euripides of the English stage. When he would excite compassion he is irresistible. Unlike Shakespeare's, however, his pathos springs entirely out of the situation. His characters in themselves are not interesting, but the circumstances in which they are placed afford scope for the most moving appeals, and merit and demerit are altogether lost sight of in the contemplation of human suffering. The love scenes between Jaftier and Belvidera cannot be surpassed; and no plot more skilfully calculated to move the emotions than that of Venice Pre- served was ever contrived by dramatist. It is to be regretted that modern fastidiousness has banished from the stage The Orphan, in which Johnson saw no harm. In everything but pathos Otway is mediocre: he has no deep insight into the human heart; his ideas are circum- scribed and commonplace ; and his attempted eloquence is frequently mere rant. Even the affecting madness of Belvidera verges. dangerously on burlesque, and is no

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doubt parodied in Sheridan's Critic. His boyish Alcibiades is positively absurd, and even Don Carlos produces much the same effect in the closet, though its rattling vigour carried it off well in the theatre at a time when nature was little regarded. It was probably not unknown to Schiller. The comedies and melodramas are simply tire- some, although a certain interest attaches to the military scenes in the Soldier's Fortune. There has hardly

been another instance of a poet whose best and whose worst are at such an immeasurable distance from each other as Otway's; but his supreme excellence in one of the most difficult branches of the dramatic art must always be held to entitle him to an exalted place as a tragic poet. It has been remarked that Dryden, with all his splendour, has but one truly pathetic passage in the whole range of his dramas. Otway, writing simply from the heart, reached at a bound an eminence inaccessible to the laborious efforts of the greater poet. His miscellaneous poems are only interesting in so far as they illustrate his life and character. Of the latter little is known. He was a man about town in a dissipated age; but his references to his parents and friends, and his letters to the object of his unfortunate passion, show that he possessed deep and refined feeling.

See Baker, Biographia Dramatica ; Johnson, Lives of the Poets ; Gosse, Seventeenth Century Studies ; and Ward, History of English Dramatic Literature, vol. ii. (R. G.)

OUDENARDE, or OUDENAERDE, a small town of Belgium, in the province of East Flanders, on the Scheldt, 17 miles south-south-west from Ghent, with a population (1880) of 5880. It has manufactures of cotton and woollen fabrics, lace, tobacco, and starch, dyeing and bleaching establishments, salt refineries, distilleries, and soon. The town-hall, built in 1530 by Van Pede, is remarkable for the elegance of its architecture and the profusion of its ornament; the portal of the council chamber is a masterpiece of wood-carving, executed in 1534 by Paul van der Schelden. Among other buildings of interest are the old church of St Walburga, of the 10th century, partly rebuilt in the 14th, and that of Our Lady of Pamele, an example, rare in Belgium, of the transition Gothic style. 1867 to the memory of the Belgians who fell in Mexico, at the battle of Zacamburo.

The origin of Oudenarde is unknown ; it appears to have been a stronghold of some importanee under the Romans. A fortress was erected there by Count Baldwin of Flanders in 1053. It was besieged in 1452 by the citizens of Ghent, who were repulsed by Simon de Lalaing after a memorable siege. Alexander Farnese took the town in 1581. Close to its walls was fought, on July 11, 1708, the battle of Oudenarde, in which the French were defeated

by the allied army under the command of Marlborough and Prince Eugene. It was retaken by the French in 1745.

OUDH, a province of British India, now under the political administration of the lieutenant-governorship of the North-Western Provinces, but in respect of its land and courts still a distinct chief-commissionership. Lying between 25° 34’ and 28° 42’ N. lat. and between 79° 44’ and 83° 9’ E. long., it is bounded on the N.E. by Nepal, on the N.W. by the Rohilkhand division, on the 8.W. by the Ganges river, on the E. and S.E. by the Benares division. The administrative headquarters of the province are at Lucknow.

Physical Aspects.—Oudh forms the central portion of the great Gangetic plain, sloping downwards from the Nepal Himdlayas in the north-east to the Ganges on the south-west. For 60 miles along the northern border of Gonda and Bahraich districts the boundary extends close up to the lower slopes of the Himalayas, embracing the

damp and unhealthy sub-montane region known as the

tardi, To the westward of this, the northern boundary recedes a little from the mountain tract, and the ¢ardi in

A monument was erected at Oudenarde in –

this portion of the range has been for the most part ceded to Nepal. With the exception of a belt of Government forest along the northern frontier, the rest of the province consists of a fertile and densely peopled monotonous plain. The greatest elevation (600 feet) is attained in the jungle- clad plateau of Khairigarh in Kheri district, while the extreme south-east frontier is only 230 feet above sea- level. Four great rivers traverse or skirt the plain of Oudh in converging courses—the Ganges, the Gumti, the Gogra, and the Rapti. Numerous smaller channels seam the whole face of the country, carrying off the surplus drainage in the rains, but drying up in the hot season. All the larger rivers, except the Gumti, as well as most of the smaller streams, have beds hardly sunk below the general level ; and in time of floods they burst through their con- fining banks and carve out new channels for themselves. Numerous shallow ponds or jhils mark the former beds of the shifting rivers. These jhils have great value, not only as

preservatives against inundation, but also as reservoirs for irrigation. The soil of Oudh consists of a rich alluvial deposit, the detritus of the Himalayan system, washed down into the Ganges valley by ages of fluvial action. Usually a light loam, it passes here and there into pure clay, or degenerates occasionally into barren sand. The uncultivable land consists chiefly of extensive wsar plains, found in the southern and western districts, and covered by the deleterious saline efflorescence known as rek. Oudh possesses no valuable minerals. Salt was extensively manufactured during native rule, but the British Govern- ment has prohibited this industry for fiscal reasons. Nodular limestone (kankar) occurs in considerable deposits, and is used as road metal.

The general aspect of the province is that of a rich expanse of waving and very varied crops, interspersed by numerous ponds or lakes. The villages lie thickly scattered, consisting of low thatched cottages, and surrounded by patches of garden land, or groves of banyan, pipal, and pakar trees. The dense foliage of the mango marks the site of almost every little homestead, —no less an area than 1000 square, miles being covered by these valuable fruit-trees. Tamarinds overhang the huts of the poorer classes, while the neighbourhood ofa wealthy family may be recognized by the graceful clumps of bamboo. Plantains, guavas, jack-fruit, limes, and oranges add further beauty to the village plots. The flora of the Government reserved forests is rich and varied. The sd/ tree yields the most important timber ; the finest logs are cut in the Khairigarh jungles and floated down the Gogra to Bahramghat, where they are sawn. The hard wood of the shisham is also valuable ; and several other timber-trees afford materials for furniture or roofing shingle. Among the scattered jungles in various parts of the province, the mahud tree is prized alike for its edible flowers, its fruits, and its timber. The jhils supply the villages with wild rice, the roots and seeds of the lotus, and the sinmghdra water-nut. The fauna comprises most of the animals and birds common to the Gangetic plain; but many species, formerly common, have now almost, ifmnot entirely, disappeared. The wild elephant is now practically unknown, except when a stray specimen loses its way at the foot of the hills. Tigers are now only found in any numbers in the wilds of Khairigarh. Leopards still haunt the cane-brakes and thickets along the banks of the rivers; and né/gd¢ and antelopes abound. Game birds consist of teal and wild duck, snipe, jungle fowl, and peacock.

Climate.—The climate of Oudh is less damp than that of Lower Bengal, and has greater varieties of temperature. The year falls naturally into three seasons—the rainy, from the middle of June to the beginning of October ; the cold weather, from October to February or March; and the

hot season, from March to June. The mean temperature at Lucknow for the thirteen years ending 1880 was 78°; in 1881 it was the same, the maximum temperature on any one day during the year being 111°, and the minimum 35°. The heat proves most oppressive in the rainy season. The heaviest downpours occur in July and September, but are extremely capricious. The average annual rainfall at Lucknow for the fourteen years ending 1881 amounted to 37°57 inches.

Population.—Oudh is probably more densely peopled than any other equal rural area in the world. The census of 1881 returned the population at 11,387,741 (5,851,655 males and 5,536,086 females), distributed over an area of 24,245 square miles. The following table exhibits the areas and populations of the districts separately.

Divisions. cena Square Miles. PR Mweknowennee: soeeueaeennt: 989 696, 824 eutelomoweer < MU WAO ts osscicesneacnnecrenes 1,747 899,069 Bara lsannkel crac cum ene: a re a Ela sa ven airvasvaa sees ; : SUPA. cay 4, | LAPOOL cya vvevece nes esncnteve Qek2 987,630 Le aaiavaesnaien sere tanten ee F pe ere DMO ic cao caasnencruteee ,081, eeabed) Bahraich (Bhardich) ..... 2,741 878,048 y Cone SERRE So: 280 Lae PUAN | <5 op, nates ; 51, RawBareli < | Sultampar…. 0.0… 1,707 957,912 Partabgarh (Pratapgarh)| 1,436 847,047 TG talPeee ee cick, ee 24,245 | 11,387,741

Divided according to religion, the population consisted of 9,942,411 Hindus, 1,483,448 Mohammedans, 1154 Sikhs, 9060 Christians, and 1673 others. ‘The Mohammedans are subdivided into the four classes of Sayyids, Shaikhs, Pathans, and Mughals, but they have lost greatly in social prestige since the downfall of the royal line. In the higher rank they still number seventy-eight tdlukdars. Some of these, as the rajas of Utraula and Nanpara, trace their descent from local Mohammedan chieftains. Others belong to ancient Hindu families. The Mohammedans still furnish the ablest public

servants in the province, and supply almost entirely the native bar. The lower orders make industrious cultivators and weavers, Among the Hindu population, the Brahmans preponder- ate, numbering 1,364,783, about one-eighth of the entire population. They include, however, only six ¢élukddrs in the whole province, and two of these acquired their wealth during the later days of Mohammedan rule. Large numbers of them follow agriculture, but they make undesirable tenants, —most of them refusing to hold the plough, and cultivating their fields by hired labour. They supply good soldiers, however, and many are employed in trade. The Kshattriyas, or Rajputs, form the great landholding class, but the majority are now in decayed circumstances. The Mohammedans, Brahmans, and Kshattriyas compose the higher social stratum of society, and number altogether about a fourth of the entire popu- lation. Amongst the lower Hindus, the Kayasths, or clerk and scrivener class, number 147,482. The Sudras or lowest class of Hindus include 1,185,512 Ahirs, cattle graziers and cultivators. The best tenantry and most industrious cultivators are to be found amongst the Kurmis, who number nearly 800,000. Of the aboriginal or semi-Hinduized tribes some, such as the Pasis, who number 718,906, make good soldiers, and furnish the greater part of the rural police. Others, like the Bhars and Tharus, live in small isolated groups on the outskirts of the jungle or the hill country, and hold no communication with the outer world. The Nats and Kanjars wander like gipsies over the country, with their small movable villages or wigwams of matting and leaf-screens. The Koris and Chamars, weavers and leather-cutters, reach the lowest depth ofall. In the northern districts many still practically occupy the position of serfs, bound to the soil, having seldom spirit enough to avail themselves of the remedy afforded by the courts of law. They hold the plough for the Brahman or Kshattriya master, and dwell with the pigs in a separate quarter of the village, apart from their purer neighbours.

Fifteen towns in the province have a population exceeding 10,000 persons, according to the census of 1881, namely—Lucknow, 239,773; Faiztbad, 38,828 ; Lucknow Cantonment, 21,530 ; Bahraich, 19,439; Shahabad, 18,510; Tanda, 16,594; Sandila, 14,865; Khairabad, 14,217; Nawabganj, 13,933; Ajudhia, 11,643 ; Rudauli, 11,394 ; Bilgram, 11,067; Mallawan, 10,970; Laharpur, 10,437 ; Hardoi, 10,026. Thirty-six other towns have a population exceed- ing 5000. ‘The general population is essentially rural,

spread over the surface of the country in small cultivating communities, Over 90 per cent. of the population belong to the rural class,

OUDH

Agriculture.—There arc three harvests, reaped respectively in September, December, and March, while sugar-cane comes to maturity in February, cotton in May, and sémwdn in almost any month of the year. The principal September crops are rice, Indian' eorn, and millets. Fine rice, transplanted in August from nurseries near the village sites, forms the most valuable item of the December harvest, the other staples being mustard-secd and pulses. Wheat forms the main spring crop. Sugar-cane occupies the land for an entire year; it requires much labour and several watcrings, but the result in ordinary years amply repays the outlay.

At the date of the annexation of Oudh in 1856, 23,500 villages, or about two-thirds of the entire area of the province, were in tho possession of the great tdélukddrs, heads of powerful clans and representatives of ancient families, a feudal aristocracy, based upon rights in the soil, which went back to traditional times, and which were heartily acknowledged by the subordinate holders. The new settlement paid no regard to their claims, and many landholders were stripped of almost their entire possessions. The mutiny of 1857 suddenly put a stop to this work of disinheritance, and it is hardly to be wondered at that throughout Oudh, the whole tdlukddrt, with a very few isolated exceptions, joined the sepoys. On the restoration of order the principle adopted was to restore to the tdlukdars all that they had formerly possessed, but in such a manner that their rights should depend upon the immediate grant of the British Government. About two-thirds of the number accepted an invitation to come to Lucknow, and there concluded political arrangements with the Government. On the one hand, the télukddrs bound themselves to level all forts, give up arms, and act loyally, to pay punctually the revenue assessed upon them and the wages of the village officials, and to assist the police in keeping order. On the other hand, the British Government conferred a right of property unknown alike to Hindu and to Mohammedan law, comprising full power of alienation by will, and succession according to primogeniture in case of intestacy. The land revenue demand was fixed at one-half the gross rental; subordinate tenure-

holders were confirmed in their ancient privileges; and a clause was introduced to protect the actual cultivators from extortion. Such were the main features of the sanads issued by Sir C. Wingfield in October 1859, which constitute the land system of Oudh to the present day, subject to a few minor modifications. The detailed operations for giving effect to this settlement were carried out by a revenue survey, conducted both by fields and villages, begun in 1860, and finished in 1871. The total assessed area in 1881-82 was 14,877,020 acres, the total assessment as land revenue being £1,449,147, or an average of 1s. 114d. per acre. The total culti- vated area is 8,274,560 acres; cultivable and grazing lands are set down at 4,035,351 acres ; and uncultivable waste at 2,567,109 acres.

The estates on the revenue roll are divided into thrce classes :— (1) those held under the tdlwkddrt rules described above ; (2) those held by ordinary zaménddrt tenure ; and (3) those held in fee-simple. There are altogether about 400 tdlukddrs in the province, of whom about two-thirds, with an area of about 24 million acres, hold their estates under the rule of primogeniture. The zaméinddrt estates, locally known by the name of mu/rdd, may be the undivided pro- perty of a single owner ; but far more commonly they are owned by a coparcenary community who regard themselves as desccndants ofa common ancestor. The fee-simple estates, which are very few in number, consist of land sold under the Waste Land Rules. The sub-tenures under the above estates are—(1) sub-settled villages eomprised within tdlukddrt estates; (2) lands known as str, daswant, nankan, and dihddrt, held by proprietors who have been unable to prove their right to the sub-settlement of a whole village; (3) groves

eld by cultivators, who, according to immemorial custom, give the landlord a certain share of the produce; (4) lands granted, either by sale or as gifts, for religious endowments ; and (5) lands held rent-free by village servauts and officials.

Commerce and Manufactures.—Under native rule the only exports were salt and saltpetre, while the imports were confined to articles of luxury required for the Lucknow court. Since the introduction of British authority, although Lucknow has declined, countless small centres of traffic have sprung up throughout the country. The staple exports consist of wheat and

other food grains, and oil-seeds; the main imports are cotton piece goods, cotton twist, and salt. Cawnpur, though lying on the southern bank of the Ganges within the North-Western Provinces, is, in fact, the emporium for the whole trade of Oudh, by rail, road, and river, The enormous exports of wheat and oil-seeds from Cawnpur represent to a great extent the surplus harvest of the Oudh cultivator. A brisk trade is also earried on with Nepal, along the three frontier distriets of Kheri, Bahraich, and Gonda. The policy of the Nepal court is to compel this traffie to be trans- acted at marts within its own dominions. At all of these a con- siderable number of Oudh merchants are permanently settled, whereas Nepalis rarely cross the frontier to trade except for the purchase of petty neccssaries. The principal exports from Oudh into Nepal are Indian and European piece goods, salt, sugar,

tobacco, spices, and chemicals. The imports from Nepal, which considerably exceed the exports in value, consist chiefly of rice, oil-seeds, ght or clarified butter, metal-wares, timber, spices, drugs, and cattle. . ’

No province of India is more destitute of wholesale manufac- tures than Oudh. Almost all manufactured articles of any nicety require to be imported. The only specialties are gold and silver lace-work, silver chasing, and rich cmbroidery, all confined to Lucknow, and the weaving of a peculiar class of cotton goods, which still flourishes at Tanda.

Communication. —The Oudh and Rohilkhand Railway forms the great trunk of communications. A branch runs from Lucknow through Unao to Cawnpur; and another diverges at Bara Banki for Bahramghat on the Gogra. The whole railway forms a loop- line between the East Indian and the Sind, Punjab, and Delhi systems. Good roads connect all the principal towns, and much traffic passes along the rivers.

Administration.—The administration belongs to the non-regu- lation system, under which a single officer discharges both fiscal and judicial functions. The province contains twelve districts, each under a deputy-commissioner. The chief-commissionership isnow amalgamated with the governorship of the North-Western Provinces. The high court, presided over by the judicial com- missioner, forms the ultimate court of appeal. The

principal items of revenue consist of the land revenue, which stands at about £1,400,000; stamps, £116,770 ; excise, £100,411; forests, £31,114; and cesses ovcr £101,000. In 1881 the total police force numbered. 7634 officers and men, maintained at a cost of £95,815.

History.—At the dawn of history Oudh appears as a flourishing kingdom, ruled over from Sravasti by a powerful sovereign. In its capital Sakya Muni (Buddha) began his labours, and the city long remained a seat of learning for Buddhist disciples. For six centuries Sravasti maintained a high position among the states of northern India, but in the 1st century of our era the Buddhist monarch of Kashmir was defeated by the Brahmanical king of Ujjain, who restored the fanes and holy places of Ajodhya, the Hindu sacred city, which had fallen into decay. A long struggle between Buddhism and Brahmanism followed, and when the Chinese pilgrim Fa Hian (c. 400 a.p.) visited Sravasti, as one of the most famous historical places of his religion, he found the once populous city still marked by lofty walls, enclosing the ruins of numerous temples and palaces, but inhabited only by a few destitute monks and devotees. In the 7th century the desolation was complete. According to local tradition, about the 8th or 9th century the Tharus, an aboriginal tribe, descended from the hills and began to clear the jungle which had overgrown the deserted kingdom, as far as the sacred city of Ajodhya. To the present day these aborigines are the only people who can withstand the influence of malaria, and so become the pioneers of civilization in the jungle tracts. About a century later, a family of Sombansi lineage, from the north-west, subjected the wild: settlers to their sway. The new dynasty belonged to the Jain faith, and still ruled at or near the ruins of Sravasti at the time of the invasion of Mahmuid’s famous general, Sayyid Salar. Towards the close of the 11th century Oudh was added to the kingdom of Kananj by conquest. After its downfall Shahab-ud-din Ghori, or his lieutenant, overran Oudh in 1194. Mohammed Bakhtiyar Khilji was the first Mohammedan to organize the administration, and establish in Oudh a base for his military operations, which extended to the banks of the Brahmaputra. On the death of Kutb-ud-din he refused allegiance to Altamsh as a slave, and his son Ghiyds-ud-din established an hereditary governorship of Bengal. Oudh, however, was wrested from the Bengal dynasty, and remained an outlying province of Delhi. Although nominally ruled in the name of the Delhi empire by great Mohammedan vassals from

Bahraich or Ménikpur, Oudh continued to be a congeries of Rajput principalities and baronies, which made war, collected revenues, and administered justice within their territories at their own pleasure. During the early days of Mohammedan supremacy the Hindu chiefs of southern Oudh were engaged in a desultory warfare with the receding Bhars, an aboriginal tribe who had obtained a tem- porary ascendency after the first Moslem invasions. Upon their subjection the Mohammedan kingdom of Jaunpur arose in the valley of the Ganges. Ibr4him Shah Sharki, the ablest of the Jaunpur rulers, turned his attention to the fruitful province which lay in the direct path between his capital and Delhi. He attempted thoroughly to reduce Oudh to the condition of a Moslem country, and, as long as he lived, the people sullenly acquiesced. But on his death the national spirit successfully reasserted itself under the leadership of Raja Tilok Chand, probably a descendant of the Kanauj sovereigns ; and for a hundred years the land had peace.

During the troubled times which followed the death of Babar, the first Mughal emperor of Delhi, Oudh became a focus of dis- allection against the reigning house. After the final defcat of the Afghan dynasty at Panipat, and the firm establishment of Akbar’s Tule, the province scttled down into one of the most important among the imperial viceroyalties. Under the Mughal dynasty in

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its flourishing days, the Hindu chieftains accepted their position without difficulty. But when the rise of the Mahratta power broke down the decaying cmpire of Aurangzeb, the chieftains of Oudh again acquired an almost complete independence. About 1732 Saddat Ali Khan, a Persian merchant, received the appointment of governor of Oudh, and founded the Mohammedan dynasty which ruled over Oudh down to our own days. Before his death, in 1748, Oudh had become practically an independent kingdom, the rulers retaining the title of nawab wazir, or chief minister of the empire. Saadat Khan was succeeded by his brother-in-law, Safdar Jang, under whose wise rule the conntry enjoyed internal prosperity, although exposed to constant attacks from the Rohillas on one side and the Mahrattas on the other. The next nawab, Shujd-ud-daula, who succceded his father

Safdar Jang in 1753, attempted to take advantage of the war in Bengal between the British and Mir Kasim to acquire for himself the rich province of Behar. He therefore advanced upon Patna, taking with him the fugitive emperor Shah Alam and the exiled nawab of Bengal. The euter- prise proved a failure, and Shuja-ud-daula retired to Baxar, where, in October 1764, Major Munro won a decisive victory, which laid the whole of upper India at the fect of the Company. The nawdb fled to Bareli (Bareilly), while the unfortunate emperor joined the British camp.

By the treaty of 1765 Korah and Allahabad, which had hitherto formed part of the Oudh viceroyalty, were made over to the emperor for the support of his dignity and expenses, all the remain- ing territories being restored to Shuja-ud-dauld, who had thrown himself upon the generosity of the British. A few years later, in 1771, the titular Mughal emperor, Shah Alam, was a virtual prisoner in the hands of the Mahrattas, who extorted from him the cession of Korah and Allahabdd. This was considered to be contrary to the terms of the treaty of 1765, and, as the emperor had abandoned possession of them, the British sold them to the Oudh nawab. Saddat Ali Khan, threatened by Sindhia on the advance of Zaman Shah to the Indus, concluded a new treaty with the British in 1801, by which he gave up half his territories in return for increased means of protection. Rohilkhand thus passed nnder British rule, and the nawdb became still more absolute within his restricted dominions. Saddat’s son, Ghazi-ud-din Haidar (1814), was the first to obtain the title of king. In 1847 Wajid Ali Shah, the last king, ascended the throne. The condi- tion of the province had long attracted the attention of the British Government. The king’s army, receiving insufficient pay, recouped itself by constant depredations upon the people. The Hindu chiefs, each isolated in his petty fort, had turned the surrounding country into ajungle as a meaus of resisting the demands of the court and its soldiery. Before 1855 the chronic anarchy and oppression had reduced the people of Oudh to extreme misery.

A treaty was proposed to the king in 1856, which provided that the sole civil and military government of Oudh should be vested in the British Government for ever, and that the title of king of Oudh should be continued to him and his heirs male, with certain privi- leges and allowances. He refused to sign the treaty, and on the 18th February 1856 the British

Government assumed the admin- istration of the province, Oudh thus becoming an integral part of the British empire.

Immediately after annexation in 1856, Oudh was constituted into a chief-commissionership, and organized on the ordinary British model. In March 1857 Sir Henry Lawrence assumed the admin- istration at Lucknow; and on the 80th of May five of the native regiments broke into mutiny. The remainder of the events con- nected with the siege and recovery of the capital have been narrated in the article on Lucknow. Since 1858 the province has been administered without further vicissitudes. On the 17th of January 1877 Oudh was partially amalgamated with the North- Western Provinces by the unification of the two offices of chief- commissioner and lieuwtenant-governor.

OUDINOT, Cuartes Nicotas (1767-1847), duke of Reggio, one of the most distinguished of Napoleon’s marshals, came of a good bourgeois family in Lorraine, and was born at Bar-le-duc on April 25, 1767. From his youth he had a passion for a military career, and served in the regiment of Médoc from 1784 to 1787, when he retired with the rank of sergeant, and the knowledge that as a bourgeois he could never obtain a commission. The Revolution changed his fortunes, and in 1792, on the out- break of war, he was elected lieutenant-colonel of the 3d battalion of the volunteers of the Meuse. His gallant

| defence of the little fort of Bitche in the Vosges in 1792

drew attention to him; he was transferred to the regular army in November 1793, and after serving in all the numerous actions on the Belgian frontier he was promoted general of brigade in June 1794 for his conduct at the battle of Kaiserslautern. He continued to serve with the greatest distinction on the German frontier under Hoche, Pichegru, and Moreau, and was repeatedly wounded and once (in 1795) made prisoner. He was Masséna’s right hand all through the great Swiss campaign of 1799—first as a general of division, to which grade he was promoted in April, and then as chief of

the staff—and was instru- mental in winning the battle of Zurich. He was present under Masséna at the defence of Genoa, and so distinguished himself at the combat of Monzambano that Napoleon pre- sented him with a sword of honour. On the declaration of the empire he was given the Grand Cross of the Legion of Honour, but was not included in the first creation of marshals. In the same year he received the command of ten battalions of the army of the reserve, which he formed into the famous division of the ‘“ grenadiers Oudinot,” and with which he won the battle of Ostrolenka and decided the fate of at least three great battles—Austerlitz, Fried- land, and Wagram. XVIII, and, unlike many of his old comrades, he remained faithful to his new sovereign, and did not desert to his old master in 1815. He died on September 13, 1847.

Oudinot’s son, Charles Nicolas Victor, second duke of Reggio (1791-1863), served through the later campaigns of Napoleon from 1809 to 1814, but is chiefly known by his capture of Rome from Garibaldi in 1849.

OUGHTRED, Wittram (1574-1660), an eminent mathematician, was born at Eton in 1574, and educated there and at King’s College, Cambridge, of which he became fellow. Being admitted to holy orders, he left the uni- versity about 1603, and was presented to the rectory of Aldbury, near Guildford in Surrey ; and about 1628 he was appointed by the earl of Arundel to instruct his son in mathematics. He corresponded with some of the most eminent scholars of his time on mathematical subjects ; and his house was generally full of pupils from all quarters. It is said that he expired in a sudden transport of joy upon hearing the news of the vote at Westminster for the restora- tion of Charles IT.

He published, among other mathematical works, Clawis Mathe- matica, In 1631; A Description of the Double Horizontal Dial, in 1636 ; and Opuscula Mathematica, in 1676.

OUNCE. See Mammatia, vol, xv. p. 435.

OURO PRETO, a city of Brazil, the chief town of the extensive province of Minas Geraes, lies 170 miles north by west of Rio de Janeiro, in the upper part of the Rio Sao Francisco basin, at a height of 3757 feet above the sea. A steep hill to the north of the peak of Ita- columi (5740) is broken up by

ravines into a number of distinct plateaus ; and it is round these plateaus, generally crowned by a church, that most of the houses of Ouro Preto cluster in irregular and almost independent groups. The streets run up and down hill in such a way as to

‘ Villa Rica was made the capital of the new province.

make riding on horseback hazardous and the use of carriages impossible. The stream which passes through the town and was formerly the scene of the most exten- sive gold washing operations, the Ribeiréo de Ouro Preto or Do Carmo, is a subtributary of the Sao Francisco, Besides the churches, the prominent buildings are the pre- sident’s palace, the town-house, and the prison, all fronting the principal square, the treasury, the theatre (the oldest in Brazil, and restored in 1861-62), and the hospital. The botanical garden, dating from 1825, used to distribute speci- mens of different kinds of tea, but is now practically defunet, A public library has been in existence since before 1865, At present the importance of Ouro Preto is almost entirely administrative ; formerly it was one of the great mining centres of Brazil. Its population is about 8000.

The first “ prospectors,” finding the hills full of a gold ore which, from the presence of silver alloy, turned black on exposure to the air, called them Serra do Ouro Preto, and the village, built in 1701 by Antonio Dias of Taubate, bore at first the same name (meaning Black Gold). In 1711 the settlement was formally constituted as the city of Villa Rica, and for sixty or seventy years it continued to deserve its new title,—the population amounting to 25,000 or 30,000, and 12,000 slaves being employed inits gold mines. When in 1720 Minas Geraes was separated from the captaincy of S. Paulo, In 1788 it was the centre of the disastrous attempt made by Tiradentes, the poet Gonzaga, &c., to found an independent republic in Brazil with Sao Joao d’el Rei as its capital and Villa Rica as its university town (see GonzAGA) ; and in 1821 it took a vigorous part in the successful revolution. A comarca of Ouro Preto was created in 1828, and Villa Rica received back its original name.

OUSEL, or OuzeEt, Anglo-Saxon Osle, equivalent of the German Amsel (a form of the word found in several old English books, and perhaps yet surviving in some parts of the country), apparently the ancient name for what is now more commonly known as the Blackbird, the Z'wrdus merula of ornithologists, but at the present day not often applied to that species, though, as will immediately be seen, used in a compound form for two others. In many parts of Britain the Blackbird is still called the Merle, a name had directly from the French, and abbreviated from the Latin Merula, which has thesame meaning. The adult male of this beautiful and well-known species scarcely needs any other description than that of the poet : —-

" The Ouzel-cock, so black of hue With orange-tawny bill." —Midsummer Night's Dream, act iii. se. 1. But the female is of an uniform umber-brown above, has the chin, throat, and upper part of the breast orange- brown, with a few dark streaks, and the rest of the plumage beneath of a hair-brown. The young of both sexes resemble the mother. The Blackbird is found in every country of Europe, even breeding —though rarely — beyond the arctic circle, and in eastern Asia, as well as in Barbary and the Atlantic islands. Resident in Britain as a species, its numbers yet receive considerable accession of passing visitors in autumn, and in most parts of its range it is very migratory. The song of the cock has a peculiarly liquid tone, which makes it much admired, but it is rather too discontinuous to rank the bird very high asa musician. The species is very prolific, having sometimes as many as four broods in the course of the spring and summer. The nest, generally placed in a thick bush, is made of coarse roots or grass, strongly put together with earth, and is lined with fine grass. Herein are laid from four to six eggs of a light greenish-blue closely mottled with reddish-brown. Generally vermivorous, the Blackbird will, when pressed for food, eat grains and seeds, while berries and fruits in their season are eagerly sought by it, thus earning the enmity of gardeners. More or less allied to and resembling the Blackbird are many other species which inhabit most parts of the world, excepting the Ethiopian Region, New Zealand and Australia proper, and

North America. Some of them have the legs as well as the bill yellow or orange ; and, in a few of them, both sexes alike display a uniformly glossy black. The only other species that need here be mentioned is the Ring-Ousel, Turdus torquatus, which differs from the Blackbird in the dark colour of its bill, and in possessing a conspicuous white gorget—whence its name. It has also very different habits, frequenting wild and open tracts of country, shun- ning woods, groves, and plantations, and preferring the shelter of rocks to that of trees. [ts distribution is accordingly much more local, and in most parts of England it is only known as a transitory migrant in spring and autumn—from and to its hardly as yet ascertained winter quarters. It does not seem to have an extensive range to the eastward, though it has been recorded from Persia. The Water-Ousel, or Water-Crow, now commonly named the " Dipper," —a term apparently invented and bestowed in the first edition of Bewick's British Birds (ii. pp. 16, 17),—not, as is commonly supposed, from the bird's habit of entering the water in pursuit of its prey, but because "it may be seen perched on the top of a stone in the midst of the torrent, in a continual dipping motion, or short courtesy often repeated." This, the Cinclus aquaticus of most ornithologists, is the type of a small but remarkable group of birds, the position of which many taxonomers have been at their wits' end to determine. It would be useless here to recount the various suppositions that have been expressed ; suffice it to say that almost all ornitho- logists are now agreed in regarding the genus Cinclus! as

Cinclus mexicanus.

differing so much from other birds that, though essentially one of the true Passeres (i.e., Oscines), it forms a distinct Family, Cinclide, which has no very near allies. That some of its peculiarities (for instance, the sternum in adult examples having the posterior margin generally entire, and the close covering of down that clothes the whole body—a character fully recognized by Nitzsch) are correlated with its aquatic habit is probably not to be questioned; but this fact furnishes no argument for associating it, as has often been done, with the Thrushes (7'wrdidz), the Wrens (Troglodytidx), or much less with other groups to which it has undoubtedly no affinity. The Dipper haunts rocky Streams, into which it boldly enters, generally by deliber- ately wading, and then by the strenuous combined action of its

wingsand feet makes its way along the bottom in quest of its living prey—freshwater mollusks, and aquatic insects in their larval or mature condition. By the careless and ignorant it is accused of feeding on the spawn of fishes, and it has been on that account subjected to much perse- cution. Innumerable examinations of the contents of its stomach have not only proved that the charge is baseless, but that the bird clears off many of the worst enemies of the precious product. Short and squat of stature, active and

? Some writers have used for this genus the name Hydrobata.

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restless in its movements, silky black above, with a pure white throat and upper part of the breast, to which succeeds a broad band of dark bay, it is a familiar figure to most fishermen on the streams it frequents, while the cheerful song of the cock, often heard in the hardest frost, helps to make it a favourite with them in spite of the obloquy under which it labours. The Water-Ousel's nest is a@ very curious structure,—outwardly resembling a Wren's, but built on a wholly different principle,—an ordinary cup-shaped nest of grass lined with dead leaves, placed in some convenient niche, but encased with moss so as to form a large mass that covers it completely except only a small hole for the bird's passage. The eggs laid within are from four to six in number, and are of a pure white. These remarks refer to the Water-Ousel of central and western Europe, including the British Islands; but, except as regards plumage, it is believed that they will apply to all the other species, about a dozen in number, which have been described. These inhabit suitable places throughout the whole Palearctic Region as well as the southern slopes of the Himalaya and the hill-country of Formosa, besides the Rocky Mountains and a great part of the Andes. Mr Salvin, in a very philosophical paper on the genus (Jbis, 1867, pp. 109-122), refers these species— some of which are wholly black and one slate-coloured—to five well-marked forms, of which the other members are either " representative species " or merely " local races"; but all seem to occupy distinct geographical areas,—that which is represented in the accompanying woodcut having a wide range along the mountainous parts of North America to Mexico; and it is quite possible that their number may yet

be increased, for the general habits of the birds preclude any invasion of territory, and thus produce practical isolation. (A. N.

OUSELEY, Sire Witrram (1769-1842), Orientalist, was the eldest son of Captain Ralph Ouseley, of an old Irish family, and was born in Monmouthshire in 1769. After a private education he went to Paris, in 1787, to perfect himself in French, and in the following year became cornet in the 8th regiment of dragoons. After obtaining the grade of lieutenant he, on the conclusion of the campaign of 1794, sold his commission in order to devote his attention to the study of Oriental literature, especially Persian. In 1795 he published Persian Mis- cellanies ; in 1797, Oriental Collections ; in 1799, Epitome of the Ancient History of Persia; in 1801, Tales of Bakthyar and Observations on Some Medals and Gems ; and in 1804, The Oriental Geography of Ebn Haukal. He received the degree of LL.D. from the university of Dublin in 1797, and in 1800 he was knighted by the Marquis Cornwallis. On his brother, Sir Gore Ouseley, being appointed ambassador to Persia in 1810, Sir William accompanied him as secretary. He returned to England in 1813, and in 1819-23 published, in three volumes, Travels in Various Countries of the East, especially Persia, in 1810, 1811, and 1812. He also published editions of the Travels and Arabian Proverbs of Burckhardt. He was a member of various learned societies, and contributed a number of important papers to the Zransactions of the Royal Society of Interature. He died at Boulogne in September 1842.

OUTLAW, in English law, is a person put out of the protection of the law by process of outlawry. A woman is properly said to be waived rather than outlawed. Out- lawry was usually the result of non-appearance of the de- fendant or accused at the trial, and involved deprivation of all civil rights. It was finally abolished in civil pro- ceedings in 1879 by 42 & 43 Vict. c. 59,§ 3. In criminal proceedings it has become practically obsolete, and the Criminal Code, § 458, proposes to formally abolish it.

In Scotland outlawry or fugitation may be pronounced by the supreme criminal court in the absence of the panel on the day of trial, In the United States outlawry never existed in eivil cases, and in the few eases where it existed in criminal proceedings it has become obsolete.

OUTRAM, Sir James (1803-1863), English general, was the son of Benjamin Outram of Butterley Hall, Derbyshire, civil engineer, and was born 29th January 1803. His father died in 1805, and his mother, a daughter of Dr Jaimes Anderson, the Scottish writer on agriculture, removed in 1810 to Aberdeenshire. From Udny school the boy went in 1818 to Marischal College, Aberdeen; and in 1819 an Indian cadetship was given him. Soon after his arrival in India his remarkable energy attracted notice, and in July 1820 he became acting adjutant to the first battalion of the 12th regiment on its embodiment at Poona, an experience which he found to be of immense advantage to him in his after career. In 1825 he was sent to Khandesh, where he succeeded in training a light infantry corps, formed of the wild robber Bhils, gaining over them a marvellous personal influence, and employing them with great success in checking outrages and plunder. Their loyalty to him had its principal source in their boundless admiration of his hunting achievements, which in their cool daring and hairbreadth escapes have perhaps never been equalled. Originally a ‘puny lad,” and for many years after his arrival in India subject to constant attacks of sickness, Outram seemed to win strength by every new illness, acquiring a constitution of iron, “nerves of steel, shoulders and muscles worthy of a six-foot Highlander.” In 1835 he was sent to Gujerat to make a report on the Mahi Kantha district, and for some time he remained there as political agent. On the outbreak of the Afghan war in 1838 he was appointed extra aide-de-camp on the staff of Sir John Keane, and besides many other brilliant deeds performed an extraordinary exploit in capturing a banner of the enemy before Ghazni. After conducting various raids against different Afghan tribes, he was in 1839 promoted major, and appointed political agent in Lower Sind, and later in Upper Sind. On his return from a short visit to England in 1843, he was, with the rank of brevet lieu- tenant-colonel, appointed to a command in the Mahratta country, and in 1847 he was transferred from Satdéra to Baroda. In 1854 he became chief-commissioner of Oudh, and in 1856 he received the honour of knighthood. Appointed in 1857, with the rank of lieutenant-general, to command an expedition against Persia, he defeated the enemy with great slaughter at Khushab, and otherwise conducted the campaign with such rapid decision that peace was shortly afterwards concluded, his brilliant services being rewarded by the Grand Cross of the Bath. From Persia he was summoned in June to India, with the brief explanation,—“ We want all our best men

here.” Immediately on his arrival in Calcutta he was appointed to command the two divisions of the Bengal army, occupying the country from Calcutta to Cawnpur; and to the military control was also joined the commissioner-ship of Oudh. Already the rebellion had assumed such proportions as to compel Havelock to fall back on Cawnpur, which he only held with difficulty, although a speedy advance was necessary to save the garrison at Lucknow. _On arriving at Cawnpur with reinforcements, Outram, “in admiration of the brilliant deeds of General Havelock,” conceded to him the glory of relieving Luck- now, and, waiving his rank, tendered his services to him as a volunteer. During the advance he commanded a troop of volunteer cavalry, and performed exploits of great brilliancy at Mangalwar, and in the attack at the Alam- bagh ; and in the final conflict he led the way, charging through a very tempest of fire. Resuming supreme com-

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mand, he then held the town till the arrival of Sir Colin Campbell, after which he conducted the cvacuation of the residency so as completely to deceive the enemy. In the second capture of Lucknow, on the commander-in-chief’s return, Outram was entrusted with the attack on the side of the Guinti, and afterwards, having recrossed the river, he advanced “through the Chattar Manzil to take the residency,” thus, in the words of Sir Colin Campbell, “putting the finishing stroke on the enemy.” After the capture of Lucknow he was gazetted lieutenant-general, In February 1858 he received the special thanks of both Houses of Parliament, and in the same year the dignity of baronet with an annuity of £1000. When, on account of shattered health, he returned finally to England in 1860, a movement was set on foot to mark the sense entertained, not only of his military achievements, but of his constant exertions in behalf of the natives of India, whose “ weal,” in his own words, “he made his first object.” The move- ment resulted in the presentation of a public testimonial and the erection of statues in London and Calcutta. He died 11th March 1863, and was buricd in Westminster Abbey, where the marble slab on his grave bears the pregnant epitaph “The Bayard of India.”

See James Outram, a Biography, by Major-General Sir F. J. Goldsmid, C.B., K.C.S.L, 2 vols., 1880, 2d ed., 1881.

OVAR, a town of Portugal, in the district of Aveiro (Beira), with a station on the railway 20 miles south of Oporto, lies at the northern end of the Aveiro lagoon, —an extremely unhealthy position. It contains 10,022 inhabitants (1878), and carries on a brisk trade with the colonies and northern Africa.

OVATION, an honour awarded in Rome to victorious generals. It was less distinguished than the triumph (see TRIUMPH), and was awarded either when the campaign, though victorious, had not been important enough for the higher honour, or when the general was not of rank sufficient to give him the right to a triumph. The ceremonial was on the whole similar in the two cases, but in an ovation the general walked or more commonly rode on horseback.

OVEN, a close chamber or compartment in which a considerable degree of heat may be generated either from internal or from external sources. In English the term is generally restricted to a chamber for baking bread and other food substances, being equivalent to the French four or the German Backofen ; but the chambers in which coal is coked are termed coke ovens. See Baxkrne, vol il. 257, and Coxg, vol. vi. 118.

OVERBECK, Jonann Friepricu (1789-1869), the reviver and leader of “Christian art” in the 19th century, was born in Liibeck 4th July 1789. His ancestors for three generations had been Protestant pastors ; his father was doctor of laws, poet, mystic pietist, and burgomaster of Liibeck. Within stone’s throw of the family mansion in the Kénigstrasse stood the gymnasium, where the uncle, doctor of theology and a voluminous writer, was the master; there the nephew became a classic scholar and received instruction in art.

The young artist left: Liibeck in March 1806, and entered as student the academy of Vienna, then under the direction of F. H. Fiiger, a painter of some renown, but of the pseudo-classic school of the French David. Here was gained thorough knowledge, but the teachings and associa- tions proved unendurable to the sensitive, spiritual-minded youth. Overbeck

wrote to a friend that he had fallen among a vulgar set, that every noble thought was suppressed within the academy, and that losing all faith in humanity he turned inwardly on himself. These words are a key to his future position and art. It seemed to him that im Vicnna, and indeed throughout Europe, the pure springs of

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Christian art had been for centuries diverted and corrupted, and so he sought out afresh the living source, and, casting on one side his contemporaries, took for his guides the early and pre-Raphaelite painters of Italy. At the end of four years, differences had grown so irreconcilable that Overbeck and his band of followers were expelled from the academy. True art, he writes, he had sought in Vienna in vain— ‘Oh! I was full of it; my whole fancy was possessed by Madonnas and Christs, but nowhere could I find response.” Accordingly he left for Rome, carrying his half-finished canvas Christ’s Entry into Jerusalem, as the charter of his creed—“ I will abide by the Bible ; I elect it as my stand- ing-point.”

Overbeck in 1810 entered Rome, which became for fifty-nine years the centre of his unremitting labour. He was joined by a goodly company, including Cornelius, Wilhelm Schadow, and Philip Veit, who took up their abode in the old Franciscan convent of San Isidoro on the Pincian Hill, and were known among friends and enemies by the descriptive epithets—“ the Nazarites,” “the pre-

Raphaelites,” “‘ the new-old school,” “the German-Roman |

artists,” ‘the church-romantic painters,” “the German patriotic and religious painters.” Their precept was hard and honest work and holy living; they eschewed the antique as pagan, the Renaissance as false, and built up a severe revival on simple nature and on the serious art of Perugino, Pinturicchio, Francia, and the young Raphael. The characteristics of the style thus educed were nobility of idea, precision and even hardness of outline, scholastic composition, with the addition of light, shade, and colour, not for allurement, but chiefly for perspicuity and com- pletion of motive. Overbeck was mentor in the movement ; a fellow-labourer writes: —‘‘No one who saw him or heard him speak could question his purity of

motive, his deep insight and abounding knowledge; he is a treasury of art and poetry, and a saintly man.” But the struggle was hard and poverty its reward. Helpful friends, however, came in Niebuhr, Bunsen, and Frederick Schlegel. Overbeck in 1813 joined the Roman Catholic Church, and thereby he believed that his art received Christian baptism.

Faith in a mission begat enthusiasm among kindred minds, and timely commissions followed. The Prussian consul, Bartholdi, had a house on the brow of the Pincian, and he engaged Overbeck, Cornelius, Veit, and Schadow to decorate a room 24 feet square with frescos from the Story of Joseph and his Brethren. The subjects which fell to the lot of Overbeck were the Seven Years of Famine and Joseph Sold by his Brethren. These tentative wail- pictures, finished in 1818, produced so favourable an impression among the Italians that in the same year Prince Massimo commissioned Overbeck, Cornelius, Veit, and Schnorr to cover the walls and ceilings of his garden pavilion, near St John Lateran, with frescos illustrative of Tasso, Dante, and Ariosto. To Overbeck was assigned,

in a room 15 feet square, the illustration of Tasso’s

Jerusalem Delivered; and of eleven compositions the largest and most noteworthy, occupying one entire wall, is the Meeting of Godfrey de Bouillon and Peter the Hermit. The completion of the frescos—very unequal in merit— after ten years’ delay, the overtaxed and enfeebled painter delegated to his friend Joseph Fiithrich, The leisure thus gained was devoted to a thoroughly congenial theme, the Vision of St Francis, a wall-painting 20 feet long, figures life size, finished in 1830, for the church of Sta Maria degli Angeli near Assisi. Overbeck and the brethren set them-Selves the task of recovering the neglected art of fresco and of monumental painting; they adopted the old methods, and their success led to memorable revivals throughout Europe.

Fifty years of the artist’s laborious life were given to

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oil and easel paintings, of which the chief, for size and import, are the following :—Christ’s Entry into Jerusalem (1824), in the Marien Kirche,

Ltibeck ; Christ’s Agony in the Garden (1835), in the great hospital, Hamburg ; Lo Sposalizio (1836), Raczynski gallery, Berlin; the Triumph of Religion in the Arts (1840), in the Stidel Institut, Frankfort ; Piets (1846), in the Marien Kirche, Liibeck ; the Incredulity of St Thomas (1851), in the possession of Mr Beresford Hope, London; the Assumption of the Madonna (1855), in Cologne Cathedral ; Christ Delivered from the Jews (1858), tempera, on a ceiling in the Quirinal Palace,—a commission from Pius IX., and a direct attack on the Italian temporal government, therefore now covered by a canvas adorned with Cupids. All the artist’s works are marked by religious fervour, careful and protracted study, with a dry, severe handling, and an abstcmious colour.

Overbeck belongs to eclectic schools, and yet was creative ; he ranks among thinkers, and his pen was hardly less busy than his pencil. He was a minor poet, an essayist, and a voluminous letter-writer. His style is wordy and tedious ; like his art it is borne down with emotion and possessed by a somewhat morbid “ subjec- tivity.” His pictures were didactic, and used as propa-

.gandas of his artistic and religious faith, and the teachings

of such compositions as the Triumph of Religion and the Sacraments he enforced by rapturous literary effusions. His art was the issue of his life: his constant thoughts, cherished in solitude and chastened by prayer, he transposed into pictorial forms, and thus were evolved countless and much-prized drawings and cartoons, of which the most considerable are the Gospels, forty cartoons (1852) ; Via Crucis, fourteen water-colour drawings (1857) ; the Seven Sacraments, seven cartoons (1861). Overbeck's composi- tions, with few exceptions, are engraved. His life-work he sums up in the words—" Art to me is as the harp of David, whereupon I would desire that psalms should at all times be sounded to the praise of the Lord." He dicd in Rome in 1869, aged eighty, and lies buried in San Bernardo, the church wherein he worshipped. (J. B. A.)

OVER DARWEN, a municipal borough of Lancashire, is situated in the vale of the Darwen river, shut in by heath-covered hills, and on the Lancashire and Yorkshire Railway, 3 miles south from Blackburn and 9 north from Bolton. There are four ecclesiastical parishes, each of which has a handsome church; and among the other public buildings are the market-house, the Liberal and Conservative club-houses, a free public library with 10,000 volumes, and the Peel baths, erected in memory of Sir Robert Peel. The town possesses cotton factories, iron and brass foundries, machine works, paper mills, paper-staining works—the first and probably the largest of their kind. In the neighbourhood there are collieries and stone quarries. The population of the municipal borough (area 5918 acres) in 1881 was 29,744. It includes part of Lower Darwen and Eccleshill, with 2118 inhabitants. The postal designation is Darwen.

Over Darwen was at one time included in Walton-le-dale, which was granted by Henry de Lacy to Robert Banastre in the reign of Henry II. In the 4th of Edward II. (1310) it is mentioned along with Livesey and Tockholes, the three containing a carucate of land in fee of the castle of Clitheroe. In 38 Edward III. (1364) a moiety of the manor of Over Darwen was held by Thomas Molyneux, the other moiety being held by the Osbaldeston family. Subsequently the whole manor became the property of the Traffords, of whom it was purehased in 1810 by the present owners the

Duckworths. Over Darwen was incorporated as a municipal borough in 1878, and a commission of iti peace was granted in

1881.

OVERTURE. See Music, vol. xvii. p. 95 sq. OVERYSSEL, or OVERIJSSEL, a province of Holland, bounded N.W. by the Zuyder Zee, N. by Friesland and

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Drenthe, N.E. by Hanover (Prussia), S.E. by Westphalia (Prussia), and 8S. and S.W. by Guelderland, with an area of 1291 square miles. The southern district belongs to the basin of the Yssel; the northern is watered by the Vecht and various small streams falling into the Zwarte- water, the river which was for so many generations the object of dispute between Zwolle and Hasselt. A large proportion of the surface is a sandy flat relieved by hillocks, rising at times to a height of 230 feet above the sea. Husbandry, stock-raising, and dairy-farming are the prin- cipal means of subsistence in the province, though the fisheries, turf-cutting, the shipping trade, and a number of manufacturing industries are also of importance. In the district of Twenthe (towards the east) more especially there are a great many cotton-mills and bleaching-works ; brick and tile making is prosecuted in the neighbourhood of the Yssel; and along the coast a good many people are engaged in making mats and besoms. During the present century the province has been opened up by the construction of several large canals—the Dedemsvaart, the Noord-Willems- vaart (between the Yssel and the Zwartewater), the “Overyssel canals” (running near the eastern frontier), &c.; and a fairly complete railway system has come into existence. The province is divided into the three adminis- trative districts of Zwolle, Deventer, and Almelo. Its popu- lation, 234,376 in 1859 and 263,008 in 1875 (134,201 males, 128,807 females), was 247,136 in 1879. Of the total for 1875, 181,863 were Protestants, 76,891 Roman Catholics, and 4018 Jews. The chief town, Zwolle, had in 1879 a communal population of 22,759, and there were fourteen other communes with more than 2000 inhabitants, including Deventer, 19,162; Kampen, 17,444; Almelo, 7758; Hengelo, 6502.

Both the present name Overyssel and the older designation Oversticht are explained by the fact that the province lies mainly on the other side of the Yssel from Utrecht, with which it long constituted an episcopal principality. Vollenhove was bestowed on the bishops in 948, Oldenzaal in 970, the land north-east of Vollenhove in 1042, Deventer in 1046, a part of Salland in 1226, the countship of Goor in 1248, the lordship of Diepenheim in 1331, and that of Almelo in 1406. In 1527 Bishop Henry of Bavaria advised the recognition of Charles V. as protector and ruler of the district, and Oversticht became Overyssel. It was the sixth province to join the Union in 1579. During the French oceupa- tion it bore the name of the department of Bouches de l'Issel.

OVID (P. Oviprus Naso) was the last in order of time of the poets of the Augustan age, whose works have given to it the distinction of ranking among the great eras in the history of human culture. As is the case with most other Roman writers, his personal history has to be gathered almost entirely from his own writings. The materials for his life are partly the record of the immediate impressions of the time in which they were written con- tained in the Amores, partly the reminiscences of his happier days, to which his mind constantly recurred in the writings from his place of exile.

His life is almost coincident in extent with that of the Augustan age. The year of his birth, 43 B.C.,—the year of the consulship of Hirtius and Pansa, which inter- vened between the death of Julius Cxsar and the partition of the Roman world among the Triumvirs,—may be regarded as the last year of the republic. It was the year of the death of Cicero, which marks the close of the re- publican literature. Thus the only form of political life known to Ovid was that of the ascendency and absolute rule of Augustus and his successor. His character was neither strengthened nor sobered, like that of his older con- temporaries, by personal recollection of the crisis through which the republic passed into the empire. There is no sense of political freedom in any of his writings. The spirit inherited from his ancestors was that of the Italian country districts and municipia, not that of Rome. He

was sprung from the Peligni, one of the four smal] mountain peoples whose proudest memories were of the part they had played in the Social War. They had no old race-hostility with Rome, such as that which made the most powerful representative of the Sabellian stock remain till the last her implacable enemy; and their opposition to the senatorian aristocracy in the Social War would predispose them to accept the empire. Ovid belonged by birth to the same social class as Tibullus and Propertius, that of old hereditary landowners; but he was more fortunate than they in the immunity which his native district enjoyed from the confiscations made by the triumvirs. His native town and district, Sulmo, lay high among the Apennines, and is described by Mr Hare as "grandly situated on an isolated platform, backed by snowy mountains." The poet himself describes this district as remarkable for the abundance of its streams and for its salubrity — 'Parva, sed irriguis ora salubris aquis ;"

and he recalls the fresh charm of its scenery from the desolate waste of his Scythian exile. To his early life in such a district he may have owed his eye for natural beauty, and that interest in the common sights of the country which relieves the monotony of his life of pleasure in Rome and the dreary record of the life spent within the walls of Tomi, and enables him to add the charm of natural scenery to the romantic creations of his fancy. The pure air of this mountain home may have contributed to the vigorous vitality which prevented the life of plea- sure from palling on him, and which beats strongly even through all the misery of his exile. But if this vitality —with its natural accompaniment, a keen capacity for enjoyment—was a gift due to his birthplace, it was apparently a gift transmitted to him by inheritance; for he tells us that his father lived till the age of ninety, and that he performed the funeral rites to his mother after his father's death. While he mentions both with the piety characteristic of the old Italian, he tells us little more about them than that "their thrift curtailed his youthful expenses,"! and that his father did what he could to dissuade hin from poetry, and to force him into the more profitable career of the law courts. He had one brother, exactly a year older than himself, who, after showing promise as a speaker, died at the age of twenty. The tone in which Ovid speaks of him is indicative of sincere affection, but not of such depth of feeling as was called forth in Catullus by asimilar loss. The two brothers had been brought early to Rome for their education, where they attended the lectures of the most

eminent rhetoricians of their time. Education had become more purely rhetorical and literary, less philosophical and political, than it had been in a pre- vious generation. Ovid is said to have attended these lectures eagerly, and to have shown in his exercises that his gift was poetical rather than oratorical, and that he had a distaste for the severer processes of thought. Like Pope, “he lisped in numbers,” and he wrote and destroyed many verses before he published anything. The earliest edition of the Amores, which first appeared in five books, and the Herovdes were given by him to the world at an early age. He courted the society of the older and younger poets of his time, and formed one among those friendly coteries who read or recited their works to one another before they gave them to the world. ‘He had only seen Virgil”; but Virgil’s friend and contemporary AEmilius Macer used in his advanced years to read his didactic epic to him; and, although there is no indication in the works of either the reigning or the rising poet of any intimacy between them, even the fastidious Horace sometimes delighted his ears i

1 Kz Ponto, i. 8, 42.

with the music of his verse. He had a closer bond of intimacy with the younger poets of the older generation, Tibullus, whose death he laments in one of the few pathetic pieces among his earlier writings, and Propertius, to whom he describes himself as united in the close ties of comradeship. ‘The name of Meecenas occurs nowhere in his poems. The time of his paramount influence both on public affairs and on literature was past before Ovid entered on his poetical career, but Messala and Fabius Maximus, whose name is mentioned by Juvenal along with that of Mzecenas as the type of a munificent patron of letters in the Augustan age, encouraged his earliest efforts. With their sons he lived in intimacy in after years, and, as he speaks of having known the younger Fabius in his cradle, his friendship with his family must have begun early in his career. He enjoyed also the intimacy of poets and men of literary accomplishment belonging to a younger generation; and with one of them, Macer, he travelled for more than a year. It is not mentioned whether he travelled immediately after the completion of his education, or in the interval between the publication of his earlier

poems and that of the Medea and Ars Amatoria; but it is in his later works, the Yastti and Metamorphoses, that we seem chiefly to recognize the impressions of the scenes he visited. In one of the epistles written from Pontus to his fellow-traveller there is a vivid record of the pleasant time they had passed together. Athens was to a Roman of that time what Rome is to an educated Englishman of the present day. Ovid speaks of having gone there under the influence of literary enthusiasm (“studiosus”); but the impression of his visit which remains on his writings is not of the wisdom taught “among the woods of Academus,” but of the flowers that grow on the neighbour- ing Hymettus. A similar impulse induced him to visit the supposed site of Troy. The two friends saw together the splendid cities of Asia, which had inspired the enthusiasm of travel in Catullus, and had become familiar to Cicero and Horace during the years they passed abroad. They spent nearly a year in Sicily, which attracted him, as it had attracted Lucretius! and Virgil,? by its manifold charm of climate, of sea-shore and inland scenery, and of legendary and poetical association, —a charm which has found its most enduring expression in some of his most delightful tales. He recalls with a fresh sense of pleasure the incidents of their tour (which they made sometimes in a pinnace or yacht, sometimes in a light carriage), and the endless delight which they had in each other’s conversation. We would gladly exchange the record of his life of pleasure in Rome for more of these recollections. The highest type of classic culture realized in ancient Rome—the type realized in such men as Cicero and Catullus, Virgil and Horace, Ovid and Germanicus—shows its affinity to a type which is the result of essentially similar studies in modern times by nothing more clearly than the enthusiasm for travel among lands famous for their natural beauty, their monuments of art, and their historical associations.

When settled at Rome, although a public career, leading to senatorian position, was open to him, and, although he filled various judicial offices, and claims to have filled them well, he had no ambition for such distinction, and looked upon pleasure and poetry as the occupations of his life. He tells us that he was married, when little more than a boy, to a wife for whom he did not care, who, he implies,

was not worthy of him, and from whom he was soon es —(Ctsss—s—~—S —C‘“C;SCCSCSCSS 1 Of. Lucret., i. 726— *“Quae cum magna modis

multis miranda videtur Gentibus humanis regio visendaque fertur."'

2 6 6 Bro 5 " (ae secessu Campanie Sicilizque plurimum uteretur." — Honat.

separated, and afterwards to a second wife, with whom his union, although through no fault of hers, did not last long. But he had other objects of his volatile affections, and one of them, Corinna, after the example of his predecessors Gallus, Propertius, and Tibullus, and their Alexandrian prototypes Callimachus, Philetas, &c., he makes the heroine of his love elegies. It is doubtful whether, like Lesbia, Delia, and Cynthia, she belonged to the class of Roman ladies of recognized position, or to that to which the Chloes and Lalages of Horace's artistic fancy evidently belong. If trust can be placed in the later apologies for his life, in which he states that he had never given occasion for any serious scandal, it is probable that she belonged to the class of ' libertinze." Ovid is not only a less constant but he is a much less serious lover than Catullus, Tibullus, or Propertius. His tone is that either of mere sensual self- regarding feeling or of persiflage. That tone isin many ways offensive to modern taste, but in nothing is it more charac- teristic of his age than in his light-hearted justification of his choice both of a theme and of a career. In his complete emancipation from all sense of restraint or wish for better things, Ovid goes beyond all his predecessors, although Tibullus and Propertius, and even Horace in the ironical dis- claimers of his earlier Odes, give indication of the same state of feeling. In this Ovid reflects the tastes and tone of fashionable, well-born, and wealthy Roman society between the years 20 B.c. and the beginning of our era. The memory of the civil wars no longer weighed on the world. The career of ambition was so far from attracting men that they had to be urged and coerced into filling official places and carrying on the routine duties of the senate. Society was bent simply on amusement. There was less of coarse- ness in the pursuit of pleasure than had prevailed among the contemporaries of Catullus. We find little trace in Ovid of the convivial pleasures which Horace celebrates in his lighter odes, or of the excesses of which Propertius makes confession. Ovid says of himself that he drank scarcely anything but water, and from what he tells us of his appearance and constitution he was evidently not of the temperament to which convivial excesses bring any temptation.2 But probably it was not the fashion of the time to live

intemperately. As a result of the loss of political interests, women came to play a more important and brilliant part in society, and the tone of fashionable conversation and literature was adapted to them. Julia, daughter of the emperor, wag by her position, her brilliant gifts, and her reckless laxity of character the natural leader of such a society. The awakening of the Roman world out of this fool's paradise of pleasure was due to the discovery of her intrigue with Iulus Antonius, son of Mark Antony, and to the open and violent display of anger with which Augustus resented what was at once a shock to his affections and a blow to his policy. Nearly coinci- dently with the publicity given to this scandal appeared the famous Ars Amatoria of Ovid, perhaps the most immoral and demoralizing work ever written, at least in ancient times, by a man of genius. Ovid was the favourite poet of the fashionable world; he lived on terms of intimacy with its leading members, the younger representatives of the old nobility, who had survived the proscriptions and the fatal day of Philippi. His poetical accomplishment would naturally recommend him to Iulus Antonius, of whose gifts Horace has spoken so eulogistically. His marriage with his third wife, a lady of the great Fabian house, and a friend of the empress Livia, had probably taken place before this time. It thus seems likely that he may have been admitted into the intimacy of the

3 Compare Am., ii. 23— '**Graciles, non sunt sine viribus artus ; Pondere, non nervis, corpora nostra carent."

younger society of the Palatine, although in the midst of his most fulsome flattery he does not claim ever to have enjoyed the favour of Augustus. Whether he was in any- way mixed up with this intrigue is not known. But that the work which appeared coincidently with it excited deep resentment in the mind of the emperor, as the pander to the passions by which the dignity of his family had been outraged and his state policy thwarted, is shown by his edict, issued ten years later, against the book and its author. Augustus had the art of dissembling his anger ; and Ovid appears to have had no idea of the storm that was gather- ing over him. He still continued to enjoy the society of the court and of the fashionable world ; he passed before the emperor in the annual procession among the ranks of the equites;

he filled a more important judicial place ; and he had developed a richer vein of genius than he had shown in his youthful prime. But he was aware that public opinion had been shocked, or professed to be shocked, by his last work ; and after writing a kind of apology for it, called the Remedia Amoris, he directed his genius into other channels, and wrote during the next ten years the Metamorphoses and the Fasti. He had already written one work, the Herotdes, in which he had imparted a modern and romantic interest to the heroines of the old mythology,} and a tragedy, the Medea, which must have afforded greater scope for the dramatic and psychological treatment of the passion with which he was most familiar. In the Fasti Ovid ‘assumes the position of a national poet? by imparting poetical life and interest to the ceremonial observances of Roman religion; but it is as the brilliant narrator of the romantic tales that have got so strangely blended with the realistic annals of Rome that he succeeds in the part assumed by him. The Metamorphoses professed to trace the relations of the gods with human affairs from the reign of Chaos to the deification of Augustus; and in the later books that work also may claim something of a national character. But it consists for the most part of a series of tales of the love adventures of the gods with nymphs and heroines, told in a tone of mixed irony and romance. This work, which he regards as his most serious claim to immortality, had not been finally revised at the time of his disgrace, and he committed it to the flames; but other copies were in existence, and the book was given to the world in his absence. He often regrets that it had not obtained his final revisal. The frasti also was broken off by his exile, after the comple- tion and publication of the first six books, treating of the first six months of the year.

The actual offence which gave occasion for his banish- ment is not exactly known. In his frequent references to it he wavers between assertions of his innocence of anything beyond simplicity and error and the admission that, though he had done nothing, he yet deserved his punishment. He had witnessed something which was a cause of pain and offence to the emperor. In a letter to one of his intimate friends, to whom he had been in the habit of confiding all his secrets, he says that had he confided this one he would have escaped condemnation. In writing to another friend in reference to his disgrace, he warns him against the danger of courting too high society—“ prelustria vita.” The cause which excited or renewed the anger of Augustus

was connected with the old offence of writing and publish- ing the Ars Amatoria. All this points to his having been in some way mixed up with some scandal affecting the imperial family. He distinctly disclaims the idea that he had anything to do with any treasonable plot; and he

en eenly modern character of the work appears in his

making a heroine of the time of the Trojan war speak of visiti

“learned” Athens (Heroid., ii. 83). : ‘ eae 2 Animos ad publica carmina flexi” (Trist., v. 23).

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certainly appears to have been the last man who ever could have been made the confederate of a serious conspiracy. All this seems to connect him with one event, coincident in time with his disgrace,—the intrigue of the younger Julia, granddaughter of the emperor, with Silanus,— mentioned by Tacitus in the third book of the Annals, Tacitus tells us how deeply Augustus felt these family scandals, looking upon them as acts of treason and sacrilege, Tt seems, at first sight, strange that the chief punishment fell, not on the real offenders, but on Ovid, who at the worst could only have been the confidant of their intrigue, perhaps may have lent his house as a place of rendezvous for the lovers. To Julia herself was assigned the lighter penalty of seclusion in one of the towns of Italy, and Silanus had no other punishment than that of exclusion from the court. Augustus must have regarded Ovid and his works as, if not the corrupter of the age, yet the most typical representative of that corruption which in its effects on his own family might be regarded as the nemesis attending on, as it was the direct consequence of, the outward success of his policy. The date of this scandal must have been 7 or early in 8 A.D., as Tacitus, under the date 28 a.p., mentions the death of Julia after twenty years of seclusion.

A delay of nearly two years seems to have taken place between the disgrace and the sentence passed on Ovid, and it must have been during this interval that he visited his friend Fabius at Elba,® probably with the view of inducing him to intercede for him. At last the edict, dictated by relentless policy rather than personal vindictiveness, was published. He was left in the

enjoy- ment of the rights of citizenship and in the possession of his property (perhaps through the exercise of the influence of Livia in favour of his wife), but was ordered to leave Rome on a particular day, and to settle at the very out- skirts of civilization,—-in the semi-Greek semi-barbaric town of Tomi, near the mouth of the Danube. He tells vividly the story of the agony of his last night at Rome, of the dangers and hardships of his winter voyage down the Adriatic, and of his desolate feelings on his first arrival at his new abode. But this was merely the beginning of his miseries. For eight years he bore up in his solitude, in the dreariest circumstances, suffering from the unhealthi- ness of the climate and exposed to constant alarm from the incursions of the neighbouring barbarians. He continued to be buoyed up by hopes first of a remission of his sentence, afterwards of at least a change to another place of exile. He wrote his complaints first in a series of books sent successively to Rome, afterwards in a number of poetical epistles, also collected into books, addressed to all his friends who were likely to have influence at court. He believed that Augustus had softened towards him before his death, but his successor was inexorable to his complaints. Perhaps the person who most deeply resented the offence was the one who exercised the greatest influence over both, the empress Livia, whose life and example were a protest against the laxity of the age, and who was an unsympathetic stepmother to the members of the imperial family. His chief consolation was the exercise of his art, and the only expression of a worthy feeling of resistance to his misery is in a letter to his daughter Perilla, in which he asserts that over his genius Augustus had no control:—

‘* Ingenio tamen ipse meo comitorque fruorque: Cesar in hoe potuit juris habere nihil.” —Tristia, iii. 7, 47.

Yet as time goes on he is painfully conscious of failure in power, and of the absence of all motive to perfect his work. He had access to no books except such as he may have brought with him, and the zest for reading, as for all

3 Hx Ponto, ii. 8, 83.

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other pleasure, was gone. THe recalls the memories of the happy days he had spent at Rome; and the chief relief to the misery of his exile was the receipt of letters from his friends. M. Gaston Boissier says that he left his genius behind him at Rome; and it is true that the works written in exile have not the brilliant versatility, the buoyant spirit, or the finished art of his earlier writings. They harp eternally on the same theme. All his faults of diffuseness and self-repetition appear in an exaggerated form. But there is the same power of vivid realization and expression, the same power of making his thought, feeling, and situ- ation immediately present to the reader. What they lose in art they gain in personal interest. They have, like the letters of Cicero to Atticus, the fascination exercised by those works which have been given to the world under the title of Confessions ; and they are the sincerest expression in literature of the state of mind produced by a unique experience,—that of a man, when well advanced in years, but still retaining extraordinary sensibility to pleasure and pain, withdrawn from a most brilliant position in the centre of social and intellectual life and material civiliza- tion, and cast upon his own resources in a place and among people affording the dreariest contrast to all that had gratified his eye, heart, and mind through the whole of his previous life. How far these letters and confidences are to be regarded as equally sincere expressions of his affection or admiration for his correspondents is another question, which need not be pressed. Even in those addressed to his wife, in which he might be supposed to pour out his heart naturally, there may perhaps be detected a certain ring of insincerity. He pays her compliments, addresses her in the studied language of gallantry, and compares her to Penelope and Laodamia and the other famous heroines of ancient legend. Had she been a Penelope or a Laodamia she would have accompanied him in his exile, as we learn from Tacitus was done by other wives! in the more evil days of which he wrote the record. There is a note of truer affection in the one letter to his daughter Perilla, of whose genius and beauty he was proud, and who in her tastes and character was more in sympathy with him. ‘This is one of several points of resemblance in the position, feelings, and fortunes of Ovid with one whose career and character were so essen- tially different—Cicero. He shows a regard for many of his friends, and dependence on their sympathy and apprecia- tion, and he recalls with some bitterness the coldness with which some of those in whom he had trusted treated him when his disgrace first overtook him. He was moved by the persistent hostility of one whom

he had regarded as a friend to an act of retaliation for which neither his temper nor his genius was adapted,—the composition of a lampoon, the Ibis, in imitation of a poem of Callimachus, called by the Same name. His affections, like his genius, were diffused widely rather than strongly concentrated, and he seems to have had rather a large circle of intimate acquaintances than any close friends to whom he was attached as Cicero was to Atticus, Horace to Mecenas, Catullus to Calvus and Verannius. He was evidently a man of gentle and genial manners; and, as his active mind induced him to learn the language of the new people among whom he was thrown, his active interest in life enabled him to gain their regard and various marks of honour. One of the last acts of his literary career was to revise the Fasti and re-edit it with a dedication to Germanicus. The last lines of the Hz Ponto sound like the despairing sigh of a drowning man who had long struggled alone with the waves :—

‘“‘Omnia perdidimus, tantum modo vita relicta est Prebeat ut sensum materiamque malis.”

Shortly after these words were written the poet died, at the nee ee) Be Dott ied, at ul

1c : i i i ili ‘ Comitati profugos liberos matres, secutz maritos in exilia conjuges”’ (Tac., Hist,, i. 3).

age of sixty-one, in the year 17 a.p., the third year of the reign of Tiberius.

The natural temperament of Ovid, as indicated in his writings, has more in common with the suppleness and finesse of the modern Italian than with the strength and direct force of the ancient Roman, That stamp of her own character and understanding which Rome impressed on the genius of those other races, Italian, Celtic, or Iberian, which she incorporated with herself, is fainter in Ovid than in any other great writer. He ostentatiously dis-claims the manliness which in the republican times was regarded as the birthright not of Romans only but of the Sabellian races from which he sprung. He is as devoid of dignity in his abandonment to pleasure as in the weak- ness with which he meets calamity. He has no depth of serious

conviction, no vein of sober reflexion, and is sus- tained by no great or elevating purpose. Although the beings of a supernatural world fill a large place in his writings, they appear stripped of all sanctity and mystery. It is difficult to say whether the tone in which the adven- tures of the gods and goddesses of mythology are told, or his prayer offered to the gods of heaven and of the sea, when in danger of shipwreck,

**Pro superi viridesque dei, quibus equora cure,”

implies a kind of half-believing return to the most childish elements of paganism, or is simply one of mocking unbelief. He has absolutely no reverence, and consequently almost alone among the greater poets of Greece or Rome (the “sancti” of Lucretius, the ‘‘ pii vates ” of Virgil) he inspires no reverence in his reader. With all a poet’s feeling for the life, variety, and subtlety of nature, he has no sense of her mystery and majesty. Though he can give dramatic expression to pathetic emotion, the profound melancholy of Lucretius, the spiritual sadness, half-relieved by dim spiritual hopes, of Virgil, the thoughtful renunciation with which Horace fronts “the cloud of mortal destiny,” are states of mind which were seemingly inconceivable by hin. Nor is he more capable of sounding the deeper sources of joy than of sorrow. The love which he celebrates is sensual and superficial—a matter of vanity as much as of passion. He prefers the piquant attraction of falseliood and fickleness to the charm of truth andconstancy. Even where he follows Roman tendencies in his art he per- verts them. Didactic poetry has set before itself many false ends in ancient Roman as in modern English litera- ture ; but the pedantry of systematic teaching has never been so strangely misapplied, as it never has been so strangely combined with brilliant power of execution, as in the methodical teaching of the art—‘‘corrumpere et corrumpi.” The Fasti is a work conceived in the prosaic spirit of Roman antiquarianism. But this conception might have been made poetical had it been penetrated by the religious and patriotic spirit in which Virgil treats the origin of ancient ceremonies, or the serious, half mystic spirit in which he accepts the revelations of science. The contrast between the actual trivialities of ancient science and ancient ceremonial, on the one hand, and the new meaning which both were capable of receiving from a reverential treatment, could not be more effectually enforced than by a comparison of passages in the

Georgics and ineid treating the astronomical fancies and religious ceremonies of early ages with the literal definiteness or the light persiflage of the Paste.

These grave defects in strength and gravity of character had an important effect on the artistic result of Ovid's writings. Though he wanted neither diligence, persever- ance, nor literary ambition, he seems incapable of conceiv- ing a great and serious whole. Though his mind works very actively in the way of observing and reflecting on

the superficial aspects of life, yet he has added no great thoughts or maxims to the moral or intellectual heritage of the world. With a more versatile dramatic faculty than any of his countrymen, he has created no great character, comparable either with the grand impersonations of Greek tragedy, or with the Dido and Turnus of Virgil. He has both the psychological power of reading and the rhetorical power of expressing passion and emotion of different kinds ; but he has not a genuine and consistent sense of human greatness or heroism. He represents with impartial sympathy the noble heart of Laodamia and the unhallowed lust of Myrrha. His spirit seems thoroughly ironical or indifferent in regard to the higher ideals or graver convic- tions of men.

But with all the laxity and levity of his character he must have had qualities which made him, if not much esteemed, yet much liked in his own day, and which have perpetuated themselves in the genial amiability of his writings. He claims for himself two social virtues, highly prized by the Romans, " fides" and ' candor,"—the quali- ties of social honour and kindly sincerity, the qualities which made a man a pleasant member of society and a friend who might be relied on in the ordinary relations of life. There is no indication of anything base, anything ungenerous, or anything morose in his relations to others. The literary quality of "candor," the generous appreciation of all sorts of excellence, he possesses in a remarkable degree. He heartily admires everything in the literature of the past, Greek or Roman, that had any merit. In him more than in any of the other Augustan

poets we find words of admiration more than once applied to the rude genius of Ennius and the high spirit of Accius. It is by him, not by Virgil or Horace, that Lucretius is first named and the sublimity of his genius is first acknowledged. The image of Catullus that most haunts the imagination is that of the poet who died so early—

.... ‘hedera juvenalia cinctus Tempora,” as he is represented by Ovid coming to meet the shade of the young Tibullus in Elysium. To his own contemporaries, known and unknown to fame, he is as liberal in his words of recognition. He enjoyed society too in a thoroughly amiable and unenvious spirit. He lived on a friendly footing with a large circle of men of letters, poets, critics, grammarians, &c., but he showed none of that sense of superiority which is manifest in Horace’s estimate of the “tribes of grammarians” and the poetasters of his day. Like Horace, too, he courted the society of the great, and probably he did not maintain an equally independent attitude towards it; but unlike Horace he expresses no contempt for the profane world outside. With his gifts of irony and knowledge of the world one might have expected him to be the social satirist of the later phase of the Augustan age. But he wanted the censorious and critical temper necessary for a social, and the admixture of gall in his disposition necessary for a successful personal satirist. “‘Candidus a salibus suffusis felle refugi”

-is a claim on our regard which he is fully justified in making.

In his exile, and in imitation of his model Callimachus, he did retaliate on one enemy and persistent detractor 3 but the (is is a satire more remarkable for irrelevant learning than for epigrammatic sting.

But his chief personal endowment was his vivacity, and his keen interest in and enjoyment of life. He had no grain of discontent in his composition. Hehad no regrets for an ideal past nor longings for an imaginary future. The age in which his lot was cast was, as he tells us, that in which more than any other he would have wished to live.

1 Ars Amatoria, iii. 121, &e.

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He is its most gifted representative, but he does not rise above it. The great object of his art was to amuse and delight it by the vivid picture he presented of its actual fashions and pleasures, and by creating a literature of romance which reflected these fashions and pleasures, and which could stimulate the curiosity and fascinate the fancy of a society too idle and luxurious for serious intellectual effort. The sympathy which he felt with the love adven- tures and intrigues of his contemporaries, to which he probably owed his fall, quickened his creative power to the composition of the Heroides and the romantic tales of the Metamorphoses. Catullus, by his force of concentration, makes the actual life of his age more immediately present; but none of the Roman poets can people a purely imaginary world with such spontaneous fertility of fancy as Ovid, In heart and mind he is inferior to Lucretius and Catullus, to Virgil and Horace, perhaps to Tibullus and Propertius; but in the power and range of imaginative vision he is surpassed by no ancient and by few modern poets. This power of vision is the counterpart of his lively sensuous nature. He has a keener eye for the apprehension of out- ward beauty, for the life and colour and forms of nature, than any Roman or perhaps than any Greek poet. This power, acting upon the wealth of his varied reading, gathered with eager curiosity and received into a singu- larly retentive mind, has enabled him to body forth scenes of the most varied and picturesque beauty in all the lands of Europe and Asia famous in ancient song and story. If his tragedy the Medea, highly praised by ancient critics, had been preserved, we should have been able to judge whether Roman art was capable of producing a great drama. In many of the Heroides, and in several speeches attributed to his imaginary personages, he gives evidence of true dramatic creativeness. Catullus, in his Aviadne and his Atts, has given a voice to deeper and more powerful feeling, and he presents an idyllic picture of the heroic age with a purer charm. But the range and variety of his art were limited by the shortness as well as the turmoil of his life. Catullus is unsurpassed as the author of an epic idyll. Ovid is not idyllic in his art, or whatever there is of idyllic in it is lost in the rapid movement of his narrative. But he is one, among the poets of all times, who can imagine a story with most vivid inventiveness and tell it with most unflagging animation. An ideal world, poetical and supernatural, but never fantastic or grotesque, of beings rich with the beauty and fulness of youth, play- ing their part in scenes of picturesque beauty, is brought before us in verse and diction of apparently inexhaustible resource

and unimpeded flow, partly created or rising up spontaneously for the occasion, partly borrowed boldly and freely from all his predecessors in Latin poetry, but always full of genuine life and movement. The faults of his verse and diction are those which arise from the vitality of his temperament,—too facile a flow, too great exuber- ance of illustration. He has as little sense of the need of severe restraint in his art as in his life. He is not without mannerism, but he is quite unaffected, and, however far short he might fall of the highest excellence of verse or style, it was not possible for him to be rough or harsh, dull or obscure.

As regards the school of art to which he belongs, he may be described as the most brilliant representative of Roman Alexandrinism. The latter half of the Augustan age was, in its social and intellectual aspects, more like the Alexandrian age than any other era of antiquity. The Alexandrian age was like the Augustan, one of refine ment and luxury, of outward magnificence and literary dilettanteism flourishing under the fostering influence of an absolute monarchy. Poetry was the only important branch of literature cultivated, and the chief subjects of

poetry were mythological tales, various phases of the passion of love, the popular aspects of science, and some aspects of the beauty of nature. These, too, were the chief subjects of the later Augustan poetry. The higher feelings and ideas which found expression in the poetry of Virgil, Horace, Varius, and the writers of an older generation no longer acted on the Roman world. It was to the private: tastes and pleasures of individuals and society that Roman Alexandrinism had appealed both in the poetry of Catullus, Cinna, Calvus, &c., and in that of Gallus, Tibullus, and Propertius. Ovid was the last of this school of writers ; he profited at the very entrance on his poetical career by the artistic accomplishment in form, metre, and diction which had been gained by the slow labours of his predecessors; his fancy was much more active and brilliant than that of any of them; and his spirit was more unreservedly satisfied with the condi- tions imposed both by the art to which he devoted him- self and the political and social circumstances by which he was surrounded. Like all his countrymen, he wanted power to create a new form of art and a new vehicle of expression. But if he could

have foreseen his future fame his literary ambition would have been completely satisfied by the consciousness that he had not only immeasurably surpassed, but had, for all after time, practically superseded his Greek models. He has confined himself to two vehicles of expression—the elegiac metre and the hexameter. In the first the great mass of his poetry is written,—the Heroides, the Amores, the Ars Amatoria, the Remedia Amoris, the Fast, the Tristia, the Hx Ponto, the Ibis, the Medicamina Faciei; in the hexameter we have the work which he regarded as that on which his hope of immor- tality was based, the Metamorphoses, and a fragment of a didactic poem written in the style of the Alexandrians, probably with the mere desire to kill time in the place of his exile, called the Halieutica. Of the first metre he is the acknowledged master. He brought it to its highest perfection, and all the immense mass of elegiac verse published and written in modern times has merely endeavoured to reproduce the echo of his rhythm and manner. In the direct expression and illustration of feel- ing, his elegiac metre has much more ease, vivacity, and sparkle than that of any of his predecessors, while he alone has communicated to it, without altering its essential characteristic of recurrent and regular pauses, a fluidity and rapidity of movement which makes it an admirable vehicle for tales of pathetic and picturesque interest. It was impossible for him to give to the hexameter a greater perfection than it had already attained, but he imparted to it also a new character, wanting indeed the weight, and majesty, and intricate harmonies of Virgil, but rapid, varied, animated, and in complete accord with the swift, versatile, and fervid movement of his imagination. One other proof he gave of his irrepressible energy and vitality by composing, during his exile, a poem in the Gothic language, in praise of Augustus,—the loss of which, what- ever it may have been to literature, is one much to be regretted in the interests of philological science.

Ovid would, in any previous century since the revival of classical studies, have been regarded as a more important representative of ancient life and feeling, and as a greater poet, than he is in the present day. During the earlier period of this revival, the beauty and refinement of ancient literature, and of the life to which that literature is the key, were better appreciated than their moral and Intellectual greatness. As the representative writer of an age of great material civilization and luxury, he gained the attention of a time and a class struggling towards a similar civilization and animated by

the same love of pleasure. It was in his writings that the world of romance and wonder, created by the early Greek Mmagination, was first revealed to the modern world. The vivid, Sensuous fancy through which he reproduced the tales and beings

of mythology, as well as the transparent lucidity, the unfailing liveliness, the ease and directness of the medium through which

this is done, made his works the most accessible and among the most attractive of the recovered treasures of antiquity. His in- fluence was first felt in the literature of the Italian Renaissance, But in the most creative periods of English literature he seems to have been more read than any other ancient poet, not even except- ing Virgil; and it was on the most creative minds, such as those of Marlowe, Spenser, Shakespeare,! Milton, and Dryden, that he acted most powerfully. The continuance of his influence is equally unmistakable during the classical era of Addison and Pope. The most successful Latin poetry of modern times has been written in imitation of him; and the accomplishment by which the faculty of literary composition and the feeling for ancient Roman culture were most developed in the great schools of England and France was the writing of Ovidian elegiacs. His works gave also a powerful stimulus and supplied abundant materials to the great painters who flourished during and immediately subsequent to the Renaissance. The mythological figures and landscapes which crowd the grcat galleries of Europe reproduce on canvas the forms, life, colour, and spirit which first were clothed in words and metre in his Hlegies and Metamorphoses.

But, whatever charm individual readers of ancient literature may still find in him, no one would claim for him anything like the same influence on literature, art, and education in the present day as he formerly enjoyed. Judged by the attention given to their works by professional scholars and also in current criticism, not only Virgil and Horace, but Lucretius and Catullus, appear to be more in esteem than Ovid. This may perhaps be due as much to a loss in imagination as to a gain in critical power. Although the spirit of antiquity is better understood now than it was in the 16th and 17th centuries, yet in the capacity of appreciating works of brilliant fancy we can

claim no superiority over the centuries which produced Spenser, Shakespeare, and Milton, nor over those which produced the great Italian, French, and Flemish painters. Still, whatever be the cause of the change in taste, Ovid is not one of those poets who seem to have much to teach us, or much power to move and interest us now. Perhaps the very liveliness and clearness of his style and manner, which made him the most accessible of ancient authors in times of less exact learning, have tended to deaden curiosity about him in the present day. There is no deep or recondite meaning to be extracted from him. The sensuous and more superficial aspects of the later phase of ancient civilization, of which he is the most brilliant exponent, have much less interest for us than the heroic aspects of its earlier phase, and the spiritual, ethical, and political significance of its maturity. The art which chiefly ministers to pees though it had its place in the great ages of antiquity, had then only a subordinate one; and it is to that place that it has been relegated by the permanent judgment of the world. It is of that art that Ovid is the chicf master, and it is that with which he is identified. There might almost seem to be some danger of his falling into the neglect which has deservedly overtaken the authors of the epics of the Flavian era. It is therefore perhaps worth while to indicate some of the grounds on which his works must continue to hold an important place in any comprchensive study of Roman literature or human culture.

His first claim on the attention of modern readers is that already indicated—the influence which he exercised on the earlier develop- ment of modern art and literature. Just as certain Greek poets and literary periods (the Alexandrian for instance) claim attention as much on account of their influence on the development of Roman literature as on their own account, so, iffor no other reason, the works of Ovid must always retain an importance, second only to those of Virgil and Horace, as one of the chief media through which the stream of ancient feeling and fancy mingled with the great river of modern literature.

He is interesting furthcr as the sole contemporary exponent of the last half of the Augustan age. The whole of that age is a time of which the outward show and theinner spirit are known from the works, not of contemporary historians or prose-writers, but of its poets. The successive phases of feeling and experience through which the world passed during the whole of this

critical period of human affairs are revealed in the poetry of Virgil, Horace, and Ovid. Virgil throws an idealizing and religious halo around the hopes and aspirations of the first rise of the empire. His aim seems to be to bring the new régime into living connexion with the past, not of Rome only but of the civilized world. Horace presents the most complete image of his age in its most varions aspects, realistic and ideal. Ovid, in all his earlier writings, reflects the life of the world of wealth and fashion under theiufluence of the new court. It isa life of material prosperity, splendour, refinement, of frivolity and intrigue, of dilettanteism in literature, of decay in all the nobler energies, of servility and adulation, He is the most characteristic painter such a time could have found. For the continuous study

1 The influence of Ovid on Shakespeare is shown conelusively in the interesting papers on ‘‘What Shakespeare learned at School,” contributed to Fraser’s Magazine (1879, 1880) by Prof. Baynes.

of the Roman world in its moral and social relations, his place is importaut as marking a stage of transition between the representa- tion of Horace, in which the life of pleasure and amusement has its place, but one subordinate to the life of reflexion and of serious affairs, and the life which reveals itsclf in the cynicism of Martial and the morose disgust of Juvenal. : From the times of Ennius and Lucilius, Roman poetry occupied itself much with the lives, pursuits, and personal feelings of its authors, and this is one element of interest which it has in common with such works as the Letters of Cicero and of Pliny. Few poets of any age or country bring themselves into such close relation with their readers as Catullus, Horace, Ovid, and Martial. Ovid is in mind and character perhaps the least interesting of the four. But an exceptional interest attaches to his history. He attracts curiosity by having a secret, which, though it may be guessed with an approach to certainty, is not fully revealed. He excites also personal sympathy by the contrast presented in his writings between the unclouded gaiety of his youth and prime and the long heart-break of his cxile. If we knew him only from the personal impression which he makes in the Amores and the Ars Ama- toria, it would be allowed that few men of equal genius had so little claim on the estcem of the world. In the ten books of complaint which he pours

out from his place of exile, though he shows no sign of a manlier temper than when he wrotc his ‘‘imbelles elegi,” yet by the vividuess with which he realizes the contrast between his past and present, by his keen capacity for pleasure and pain, by the unreserve with which he exposcs all his feelings, he forces himself on our intimacy, and awakens those sym- pathies which all sincere and passionate confessions create, where there is nothing base or malignant in the temper of their author to alienate them. Though his fate does not rouse the powerful interest inspired by the ‘‘fiery courage” and ‘‘ Titanic might” with which Byron struggled during his self-imposed exile, yet to it, too, apply the sympathetic words of Virgil—‘‘ Mentem mortalia tangunt.”

But it was not owing to the historical and personal interest of his works that he gained his great name among his countrymen and the readers of a former generation, nor is it on that ground solely that he claims attention now. He is the last true poet of the great age of Roman literature,—which begins with Lucretius and closes with him, —of the age which drew the most powerful stimulus from the genius and art of Greece, from the sentiment inspired by Rome, and from the Italian love of nature. Among the five or six great poets of that time Ovid is distinguished both as a brilliant artist who brought one branch of poetry to the highest perfection and also as a poet in whom one rich vein of the genius of Italy most conspicuously manifested itself. It is mainly through his reproduction of the forms, metres, and materials of the chicf Alexandrian poets that these have maintained an enduring place in literature. But, great as he was in art and imitative faculty, his spontaneous gifts of genius were still more remarkable. If his works had perished we should have had a most inadequate idea of what the fervid Italian genius could accomplish in ancient times. No other Roman poet can invent and tell a story and make an outward scene and dramatic situation present to the eye and mind with such vivid power. If he does not greatly move the deeper sources of emotion, he has the power of lightly stirring many of them. No Roman poet writcs with such ease, life, and rapidity of movement. None is endowed with such fertility of fancy, such quickness of apprehension. In respect of his vivacity and fertility we recognize in him the countryman of Cicero and Livy. But the type of genius of which he affords the best example is more familiar in modern Italian than in ancient Roman literature. While the scrious spirit of Lucretius and Virgil reappeared in

Dante, the qualities attributed by his latest and most accomplished critic to Ariosto may be said to reproduce the light-hearted gaiety and the brilliant fancy of Ovid.

There were several cditions of Ovid's collected works in the 16th and 17th centuries, the time in which he enjoyed his greatest popularity. Recent editions of the text have been published by R. Merkel and A, Riese. The most important aids to the study of Ovid recently made in England are the editions of the Jbis by Mr Robinson Ellis, and those of the Heroides by Mr A. Palmer. Much light is thrown on the diction of Ovid by Zingerle in his Ovidius und sein Verhdlt- niss 2b den Vorgdngern. The most interesting discussion on the cause of his exile is that of M. Gaston Boissier, which originally appeared in the Revue des Deux Afondes, and now forms part of his volume entitled Z' Opposition sous les Césars. (W. Y¥. S.)

OVIEDO, a city in the north of Spain, capital of a province of the same name,! stands on a gentle northern slope, about 72 miles by rail and diligence to the north EE eee ee

: The province of Oviedo, corresponding to the ancient province and principality of Asturias (9.v.), has an area of 4091 square miles and a population (1877) of 576,352. At that census the aynntamientos (besides the capital) having a population exceeding 10,000 were— Cangas de Tinéo, 22,212; Cudillcro, 10,113; Gijon, 30,591; Grado 20,255; Langréo, 12,832; Lena, 11,657; Llanes, 18,637; Miéres, 12,614 ; Pilona, 18,648 ; Salas, 16,394; Siero, 21,494 ; Tindo, 21,414; Valdés, 22,014; and Villaviciosa, 20,179, a

of Leon, and 14 miles to the south of the Bay of Biscay. About a mile to the north-west is the Sierra de Naranco, a Red Sandstone hill 1070 feet above the sea and about 470 above the town, which is thus shel- tered from the north wind, but subject in consequence to a large rainfall. Most of the town was burnt in 1521, and the reconstruction, till recently, has been irregular, The four main streets are formed by the roads connecting Gijon and Leon (north and south) and Grado and Santander (east and west), which cross each other in a central square, the Plaza Mayor. The streets are clean and

well lighted ; the projecting roofs of the houses give a characteristic effect, and some portions of the old Calle de la Plateria are highly picturesque. In the Plaza Mayor are the handsome Casas Consistoriales, dating from the 17th century ; one or two deserted mansions of the nobility are architecturally interesting. The university, founded by Philip ITI. in 1604, is lodged in a plain building, 180 feet square; connected with it are a small library and physical and chemical museums. The cathedral, an elegant Perpendicular building of the 14th century, occupies the site of an earlier edifice, founded in the 8th century, of which only the Camara Santa remains. The west front has a fine portico of ornamented arches between the two towers. Of these one, very richly adorned, has been completed, and is 284 feet high; the other, which is larger, does not as yet rise above the nave. The interior has some fine stained glass, but has been much disfigured with modern rococo additions. The Capilla del Rey Santo (Alphonso ITI., who died in Oviedo in 843) contains the remains of many successive princes of the house of Pelayo; and the Camara Santa (dating from 802) preserves in an arca the crucifix, sudarium, and other relics saved by Don Pelayo in his flight. The cathedral library has some curious old MSS., mostly from Toledo. On the Sierra de Naranco is the ancient Santa Maria de Naranco, originally built by Ramiro in 850 as a palace, and afterwards turned into a church. Higher up the hill is San Miguel de Lino, also of the 9th century ; and on the road to Gijon, about a mile outside the town, is the Santullano or church of St Julian, also of very early date. The modern town has the usual equipments in the way of hospitals, schools, theatre, casino, and the like; and in the neighbourhood are some pleasant paseos or promenades (San Francisco, Bombé, Jardin Botanico). The industries of the town include hat- making and tanning, and there is also a manufactory of arms. The population of the ayuntamiento in 1877 was 34,460.

Oviedo, founded in the reign of Fruela (762), became the fixed residence of the kings of the Asturias in the time of Alphonso the Chaste, and continued to be so until about 924, when the advancing reconquest led them to remove their capital to Leon. From that date the history of the city was comparatively uneventful. It was twice plundered during the war of independence—by Ney in 1809 and by Bonnet in the following year.

OVIEDO Y VALDEZ, Gonzato FERNANDEZ DE (1478-1557), an early historian of Spanish America, was born at Madrid, of noble Asturian descent, in 1478. He was brought up at the court of Ferdinand and Isabella as one of the pages of Prince John ; in this capacity he was present at the surrender of Granada in 1492, and saw Columbus at Barcelona on his first return from America in 1493. In 1514 he was sent out to San Domingo as supervisor of the gold-smeltings. He only occasionally afterwards visited his native country and the American mainland. Among other offices subsequently added to his original appointment was that of historiographer of the Indies, in the discharge of which he produced, besides some unimportant chronicles, two large works of abiding interest and value—La general y natural Historia de las Indias and Quincuagenas de los Notables de Espatia. He died at Valladolid in 1557,

The History of the Indies first appeared at Madrid in the form ofa Sumario in 1526. Of the full work, consisting of fifty books, the first twenty-one were published at Seville in 1535 a transl. by Eden, 1555; Fr. transl. by Poleur, 1556). The whole has rceeently been published for the first time by the Madrid Royal Academy of History (4 vols. fol., 1851-55). It eontains a large mass of valuable information, but written in a loose rambling moralizing style which makcs it somewhat difficult to use. Aeeording to Las Casas, it is ‘as full of lies almost as pages,” but the judgment of the humane ecclesiastie was, necessarily perhaps, somewhat preju- diced, The Quinewagenas, devoted to reminisecnees of the princi- pal characters who had figured in Spain during his lifetime, consists of a series of imaginary conversations full of gossip and curious anecdote of great interest to the student of history. Several MSS, are extant, but the work has never been printcd.

OWEGO, a post village and township of the United States, capital of Tioga county, New York, lies at the mouth of Owego Creek, on the north side of the Susque- hanna (here crossed by a_ bridge), 237 miles north- west of New York by the New York, Erie, and Western Railroad, which here connects with the Delaware, Lackawanna, and Western and the Southern Central Rail- roads, The village, built at the foot of a considerable hill in the

heart of a fine agricultural district, is a pleasant place with broad maple-shaded side-walks along its principal streets. Grist-mills, soap-works, marble-works, a piano factory, and carriage-works are among the industrial establishments. The population of the village was 4756 in 1870 and 5525 in 1880; that of the whole township 9442 and 9984 respectively.

OWEN, Jonn (Ovenus or Audoenus) (1560-1622), a writer of Latin epigrams, once very popular all over Europe, was of Welsh extraction, and was born at Armon, Caernarvonshire, in 1560. He was educated under Dr Bilson at Wykeham's School, Winchester, and afterwards studied at New College, Oxford, where he received a fellowship in 1584, and took the degree of bachelor of laws in 1590. Throwing up his fellowship during the follow- ing year, he turned schoolmaster, and taught successively at Trylegh, near Monmouth, and at Warwick, where he was master of the free school founded by Henry VIII. He soon became distinguished for his perfect mastery of the Latin language, and for the humour, felicity, and point of his epigrams. As a writer of Latin verse he takes rank with Buchanan and Cowley. Those who, with Dryden, place the epigram "at the bottom of all poetry" will not estimate Owen's poetical genius very high; yet the Continental scholars and wits of the day used to call him "the British Martial." 'In one respect he was a true poet," says a biographer; "namely, he was always poor." He wasa staunch Protestant besides, and could not resist the temptation of turning his wit against Popery occasionally. This practice caused his book to be placed on the Index Prohibitorius of the Roman Church in 1654, and, what was yet more serious, led a rich old uncle of the Roman Catholic communion, from whom he had " great expectations," to cut the epigrammatist out of his will. When the poet died in 1622, his countryman and relative, Bishop Williams of Lincoln, had him buried at St Paul's Cathedral, London, where he erected a monument to his memory bearing an elegant epitaph in Latin.

Owen's Epigrammata are divided into twelve books, of which the first four were published in 1606, and the rest at four different times. Owen frequently adapts and alters to his own purpose the lines of his predecessors in Latin verse, and one such borrowing has become eelebrated as a quotation, though few know where it is to be found. It is the first line of this epigram :—

“Tempora mutantur, nos et mutamur in illis: Quo modo? fit semper tempore pejor homo.” (Lib. 1. ad Edoardum Noel, epig. 58.) This first line is altered from an epigram by Matthew Borbonius, one of a series of mottocs for various emperors, this one being for Lothaire I. ; “Omnia mutantur, nos et mutamur in illis: ~ Illa viees quasdam res habet, illa vices.”

There are editions of the Epigrammata by Elzevir and by Didot;

the best is that edited by Renouard (2 vols., Paris, 1795). Transla- tions into English, either in whole or in part, have been made by Viears, 1619; by Peeke, in his Parnassi Puerperium, 1659 ; and by Harvey in 1677, which is the most eomplete. La Torre, the Spanish epigrammatist, owed much to Owen, and translated his works into Spanish in 1674. French translations of the best of Owen’s epigrams have been published by A. L. Lebrun, 1709, and by Kérivalant, 1819.

OWEN, Joun (1616-1683), theologian, was born of Puritan parents at Stadham in Oxfordshire in 1616. At twelve years of age he was admitted at Queen’s College, Oxford, where he took his B.A. degree in 1632 and M.A. in 1635. During these years he worked with such diligence that he allowed himself but four hours sleep a night, and damaged his health by this excessive labour. In 1637 he was driven from Oxford by his refusal to comply with the requirements of Laud’s new statutes. Having taken orders shortly before, he became chaplain and tutor in the family of Sir Robert Dormer of Ascot in Oxfordshire. At the outbreak of the civil troubles he adopted Parliamentary principles, and thus lost both his place and the prospects of succeeding to his uncle’s fortune. For a while he lived in Charterhouse Yard, in great unsettlement of mind on religious questions, which was removed at length by a sermon which he accidently heard at St Michael’s in Wood Street.

His first publication, in 1642, The Display of Arminian- ism, dedicated to the committee of religion, gained him the living of Fordham in Essex, from which a “scandalous minister” had been ejected. Here he was married, and by his marriage he had eleven children.

Although he was thus formally united to Presbyterianism, Owen's views were originally inclined to those of the Inde- pendents, and, as he acquainted himself more fully with the controversy, he became more resolved in that direction. He represented, in fact, that large class of persons who, falling away from Episcopacy, attached themselves to the very moderate form of Presbyterianism which obtained in England as being that which came first in their way. His views at this time are shown by his Duty of Pastors and People Distinguished. At Fordham he remained until 1646, when, the old incumbent dying, the presentation lapsed to the patron, who gave it to some one else. He was now, however, coming into notice, for on April 29 he preached before the Parliament. In this sermon, and still more in his Thoughts on Church Government, which he appended to it, his tendency to break away from Presbyterianism is displayed.

The people of Coggeshall in Essex now invited him to become their pastor. Here he declared his change by founding a church on Congregational principles, and, in 1647, by publishing Zshcol, as well as various works against Arminianism. He made the friendship of Fairfax while the latter was besieging Colchester, and urgently addressed the army there against religious persecution. He was chosen to preach to Parliament on the day after the execution of Charles, and succeeded in fulfilling his task without mentioning that event, and again on April 19, when he spake thus:—'The time shall come when the earth shall disclose her slain, and not the simplest heretic shall have his blood unrevenged ; neither shall any atone- ment or expiation be allowed for this blood, while a toe of the image, or a bone of the beast, is left unbroken."

He now became acquainted with Cromwell, who carried him off to Ireland in 1649 as his chaplain, that he might regulate the affairs of Trinity College; while there he began the first of his frequent controversies with Baxter by writing against the latter's Aphorisms of Justification. In 1650 he accompanied Cromwell to Scotland, and returned to Coggeshallin 1651. In March Cromwell, as chancellor, gave him the deanery of Christ Church, and made him

vice-chancellor in September 1652. In 1651, October 24, after Worcester, he preached the thanksgiving sermon before Parliament. In October 1653 he was one of several ministers whom Cromwell, probably to sound their views, summoned to a consultation as to church union. In December in the same year he had the honour of D.D. conferred upon him by his university. In the Parliament of 1654 he sat, but only fora short time, as member for Oxford university, and, with Baxter, was placed on the committee for settling the " fundamentals" necessary for the toleration promised in the Instrument of Government. He was, too, one of the Triers, and appears to have behaved with kindness and moderation in that capacity. As vice-chancellor he acted with readiness and spirit when a general rising in the west seemed imminent in 1655 ; his adherence to Cromwell, however, was by no means slavish, for he drew up, at the request of Desborough and Pride, a petition against his receiving the kingship (see Ludlow's Memoirs, ed. 1751, p. 224), During the years 1654-58 his chief controversial works were Divina Justitia, The Perseverance of Saints (against Goodwin), and Vindicte Hvangelice (against the Socinians). In 1658 he took a leading part in the conference which drew up the 'Savoy Declaration. Baxter declares that at the death of Cromwell Owen

jomed the Wallingford House party. This, though

supported by the fact that under the Restoration he had among his congregation a large number of these officers, Owen himself utterly denied. He appears, however, to have assisted in the restoration of the Rump Parliament, and, when Monk began his march into England, Owen, in the name of the Independent churches, to whom Monk was supposed to belong, and who were keenly anxious as to his intentions, wrote to dissuade him from the enter- prise.

In March 1660, the Presbyterian party being upper- most, Owen was deprived of his deanery, which was given back to Reynolds. He retired to Stadham, where he wrote various controversial and theological works, in especial the laborious Theologowmena Pantodapa, a history of the rise and progress of theology. In 1661 was published the celebrated Miat Lux, a work in which the oneness and beauty of Roman Catholicism are contrasted with the confusion and multiplicity of Protestant sects, At Clarendon's

request Owen answered this in 1662 in his Animadversions ; and this led of course to a prolonged controversy, Clarendon now offered Owen perferment if he would conform. Owen's condition for making terms was liberty to all who agree in doctrine with the Church of England ; nothing therefore came of the negotiation,

In 1663 he was invited by the Congregational churches in Boston, New England, to become their minister, but declined. The Conventicle and Five Mile Acts soon drove him to London; and in 1666, after the Fire, he, as did other leading Nonconformist ministers, fitted up a room for public service and gathered a congregation, composed chiefly of the old Commonwealth officers, Meanwhile he was incessantly writing; and in 1667 he published his Catechism, which led to a proposal from Baxter for union. Various papers passed, and after a year the attempt was closed by the following laconical note from Owen: "Tam still a well-wisher to these mathematics." It was now, too, that he published the first part of his vast work upon the Epistle to the Hebrews,

In 1669 Owen wrote a spirited remonstrance to the Congregationalists in New England, who, under the influ- ence of Presbyterianism, had shown themselves perse- cutors. At home, too, he was busy in the same cause. In 1670 Parker attacked the Nonconformists in his own style of clumsy intolerance. Owen answered him 3 Parker

repeated his attack; Marvell wrote The Rehearsal Trans.

prosed ; and Parker is remembered by this alone.

At the revival of the Conventicle Acts in 167 0, Owen was appointed to draw up a paper of reasons which was submitted to the House of Lords in protest. In this or the following year Harvard university invited him to become their president ; he received similar invitations from some of the Dutch universities,

When Charles issued his Declaration of Indulgence in 1672, Owen drew up an address of thanks. This indulg- ence gave the dissenters an opportunity

for increasing their churches and services, and Owen was one of the first preachers at the weekly lectures which the Independents and Presbyterians jointly held in Plummer's Hall. He was held in high respect by a large number of the nobility (one of the many things which point to the fact that Congregationalism was by no means the creed of the poor and insignificant), and during 1674 both Charles and James held prolonged conversations with him in which they assured him of their good wishes to the dissenters. Charles gave him 1000 guineas to relieve those upon whom the severe laws had chiefly pressed. In 1674 Owen was attacked by one Dr Sherlock, whom he easily vanquished, and from this time until 1680 he was engaged upon his ministry and the writing of religious works. In 1680, however, Stillingfleet having on May 11 preached his sermon on "The Mischief of Separation," Owen defended the Nonconformists from the charge of schism in his Brief Vindication. Baxter and Howe also answered Stillingfleet, who replied in Zhe Unreasonableness of Separation. Owen again answered this, and then left the controversy to a swarm of eager combatants. From this time to his death he was occupied with continual writing, disturbed only by an absurd charge of being concerned in the Rye House Plot. His most important work was his Z'reatise on Evangelical Churches, in which were contained his latest views regarding church government. During his life he issued more than eighty separate publications, many of them of great size. Of these a list may be found in Orme's Memoirs of Owen. For some years before his death Owen had suffered greatly from stone and asthma. He died quietly, though after great pain, at Haling, on August 24, 1683, and was buried on September 4th in Bunhill Fields, being followed to the grave by a large procession of persons of distinction. "In younger age a most comely and majestic form; but in the latter stages of life, depressed by constant infirmities, emaciated with frequent diseases, and above all crushed under the weight of intense and unremitting studies, it became an incommodious mansion for the vigorous exer- tions of the spirit in the service of its God,"

For engraved portraits of Owen see first edition of Palmer's Von-conformists' Memorial and Vertue's Sermons and Tracts, 1721. The chief authorities for the life are Owen's Works ; Orme's Afemoirs of Owen ; Wood's Athene Oxonienses ; Baxter's Life ; Neal's History of the Puritans; Edwards's Gangrena ; and the various historics of the Independents. (O. A.)

OWEN, Roserr (1771-1858), philanthropist, and founder of English socialism, was born at the village of Newtown, Montgomeryshire, in North Wales. His father had a small business in Newtown as saddler and ironmonger, and there young Owen received all his school education, which terminated at the age of nine. At ten he went to Stamford, where he served in a draper’s shop for three or four years, and, after a short experience of work in a London shop, removed to Manchester. His success at Manchester was very rapid. When only nineteen years of age he became manager of a cotton mill, in which five hundred people were employed, and by his administrative intelligence, energy, industry, and steadiness soon made it one of the very best establishments of the kind in Great Britain. In this factory Owen used the first bags of

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American sea-island cotton ever imported into the country; it was the first cotton obtained from the Southern States of America. Owen also made remarkable improvement in the quality of the cotton spun; and indeed there is no reason to doubt that at this early age he was the first cotton-spinner in England, a position entirely due to his own capacity and knowledge of the trade, as he had found the mill in no well-ordered condition, and was left to organize it entirely on his own responsibility. Owen had become manager and one of the partners of the Chorlton Twist Company at Manchester, when he made his first acquaintance with the scene of his future philanthropic efforts at New Lanark. During a visit to Glasgow he had fallen in love with the daughter of the proprietor of the New Lanark mills, Mr Dale. Owen induced his partners to purchase New Lanark; and after his marriage with Miss Dale he settled there, as manager and part owner of the mills (1800). Encouraged by his great success in the management of cotton factories in Manchester, he had already formed the intention of conducting

New Lanark on higher principles than the current commercial ones. The factory of New Lanark had been started in 1784 by Dale and Arkwright, the water-power afforded by the falls of the Clyde being the great attraction. Connected with the mills were about two thousand people, five hundred of whom were children, brought, most of them, at the age of five or six from the poorhouses and charities of Edinburgh and Glasgow. The children especially had been well treated by Dale, but the general condition of the people was very unsatisfactory. Many of them were the lowest of the population, the respectable country people refusing to submit to the long hours and demoralizing drudgery of the factories ; theft, drunkenness, and other vices were common ; education and sanitation were alike neglected ; most families lived only in one room. It was this population, thus committed to his care, which Owen now set himself to elevate and ameliorate. He greatly improved their houses, and by the unsparing and bene- volent exertion of his personal influence trained them to habits of order, cleanliness, and thrift. He opened a store, where the people could buy goods of the soundest quality at little more than cost price; and the sale of drink was placed under the strictest supervision. His greatest success, however, was in the education of the young, to which he devoted special attention. He was the founder of infant schools in Great Britain ; and, though he was anticipated by Continental reformers, he seems to have been led to institute them by his own views of what education ought to be, and without hint from abroad. In all these plans Owen obtained the most gratifying success. Though at first regarded with suspicion as a stranger, he soon won the confidence of his people. The mills con- tinued to be a great commercial success, but it is needless to say that some of Owen's schemes involved considerable expense, which was displeasing to his partners. Tired at last of the restrictions imposed on him by men who wished to conduct the business on the ordinary principles, Owen formed a new firm, who, content with 5 per cent. of return for their capital, were ready to give freer scope to his philanthropy (1813). In this firm Jeremy Bentham and the well-known Quaker, William Allen, were partners. In the Same year Owen first appeared as an author of essays, in which he expounded the principles on which his system of educational philanthropy was based. From an early age he had lost all belief in the prevailing forms of religion, and had thought out a creed for himself, which he considered an entirely new and original discovery. The chief points in this philosophy were that man's character 1s

made not by him but for him; that it has been formed by circumstances over which he had no control ; that he

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is not a proper subject either of praise or blame,—these principles leading up to the practical conclusion that the great secret in the right formation of man's character is to place him under the proper influences—physical, moral, and social—from his earliest years. These principles—of the irresponsibility of man and of the effect of early influences— are the keynote of Owen's whole system of education and social amelioration. As we have said, they are embodied in his first work, A New View of Society, or Essays on the Principle of the Formation of the Human Character, the first of these essays (there are four in all) being published in 1813. It is needless to say that Owen's new views theoretically belong to a very old system of philosophy, and that his originality is to be found only in his benevolent application of them. For the next few years Owen's work at New Lanark continued to have a national and even a European significance. His schemes for the education of his workpeople attained to something like completion on the opening of the institution at New Lanark in 1816. He was a zealous supporter of the factory legislation resulting in the Act of 1819, which, however, greatly disappointed him. He had interviews and communications with the leading members of Govern- ment, including the premier, Lord Liverpool, and with many of the rulers and leading statesmen of the Continent. New Lanark itself became a much-frequented place of pilgrimage for social reformers, statesmen, and royal personages, including Nicholas, afterwards emperor of Russia. According to the unanimous testimony of all who visited it, the results achieved by Owen were singularly good. The manners of the children, brought up under his system, were beautifully graceful, genial, and uncon- strained ; health, plenty, and contentment prevailed ; drunkenness was almost unknown, and illegitimacy was extremely rare. The most perfect good feeling subsisted between Owen and his workpeople, and all the operations of the mill proceeded with the utmost smoothness and regu- larity; and the business wasa great commercial success. ~~Hitherto Owen's work had been that of a philanthropist, whose great distinction was the originality and unwearying unselfishness of his methods. His first departure in socialism took place in~~

~~1817, and was embodied in a report communicated to the Committee of the House of Commons on the Poor Law. The general misery and stagnation of trade consequent on the termination of the great war was engrossing the attention of the country. After clearly tracing the special causes connected with the war which had led to such a deplorable state of things, Owen pointed out that the permanent cause of distress was to be found in the competition of human labour with machinery, and that the only effective remedy was the united action of men, and the subordination of machinery. His proposals for the treatment of pauperism were based on these principles. He recommended that communities of about twelve hundred persons each should be settled on quanti~~ ties of land of from 1000 to 1500 acres, all living in one large building in the form of a square, with public kitchen and mess-rooms. Each family should have its own private apartments, and the entire care of the children till the age of three, after which they should be brought up by the community, their parents having access to them at meals and all other proper times. These communities might be established by individuals, by parishes, by counties, or by the state; in every case there should be effective supervision by duly qualified persons. Work, and the enjoyment of its results, should be in common, The size of his community was no doubt partly suggested by his village of New Lanark; and he soon proceeded to advocate such a scheme as the best form for the reorganization of society in general. In its fully developed form—and it cannot be said to have

changed much during Owen's lifetime—it was as follows. He considered an association of from 500 to 3000 as the fit number for a good working community. While mainly agricultural, it should possess all the best machinery, should offer every variety of employment, and should, as far as possible, be self-contained. "As these townships," as he also called them, ''should increase in number, unions of them federatively united shall be formed in circles of tens, hundreds, and thousands," till they should embrace the whole world in a common interest.

His plans for the cure of pauperism were received with great favour. Zhe Times and The Morning Post and many of the leading men of the country

countenanced them; one of his most steadfast friends was the duke of Kent, father of Queen Victoria. He had indeed gained the ear of the country,and had the prospect before him of a great career as a social reformer, when he went out of his way at a large meeting in London to declare his hostility to all the received forms of religion. After this defiance to the religious sentiment of the country, Owen's theories were in the popular mind associated with infi- delity, and were henceforward suspected and discredited. Owen's own confidence, however, remained unshaken; and he was anxious that his scheme for establishing a community should be tested. At last, in 1825, such an experiment was attempted under the direction of his disciple, Abram Combe, at Orbiston near Glasgow; and in the same year Owen himself commenced another at New Harmony in Indiana, America. After a trial of about two years both failed completely. Neither of them was a pauper experiment ; but it must be said that the members were of the most motley description, many worthy people of the highest aims being mixed with vagrants, adventurers, and crotchety, wrong-headed enthusiasts. After a long period of friction with William Allen and some of his other partners, Owen resigned all connexion with New Lanark in 1828. On his return from America he made London the centre of his activity. Most of his means having been sunk in the New Harmony experiment, he was no longer a flourishing capitalist, but the head of a vigorous pro- paganda, in which socialism and secularism were combined. One of the most interesting features of the movement at this period was the establishment in 1832 of an equitable labour exchange system, in which exchange was effected by means of labour notes, the usual means of exchange and the usual middlemen being alike superseded. The word "socialism" first became current in the discussions of the Association of all Classes of all Nations, formed by Owen in 1835. During these years also his secularistic teaching gained such influence among the working classes as to give occasion for the statement in the Westminster fteview (1839) that his principles were the actual creed of a great portion of them. His views on marriage, which were certainly lax, gave just ground for offence. At this period some more communistic experiments were made, of which the most important were that at Ralahine, in the county of Clare, Ireland, and that at Tytherly in Hampshire. It is admitted that the former (1831) was a remarkable success for three and a half years, till the proprietor, having ruined himself by gambling, was obliged to sell out. Tytherly, begun in 1839, was an absolute

failure. By 1846 the only permanent result of Owen's agitation, so zealously carried on by public meetings, pamphlets, periodicals, and occasional treatises, was the co-operative movement, and for the time even that seemed to have utterly collapsed. In his later years Owen became a firm believer in spiritualism. He died at his native town at the age of eighty-seven.

The exposition and criticism of Owen's socialism and of his socialistic experiments belong to the gencral subject (see Socra-

1sM). Robert Owen was essentially a pioneer, whose work and influence it would be unjust to measure by their tangible results, Apart from his socialistic theories, it should, nevertheless, be remembered that he was one of the foremost and most energetic promoters of many movements of acknowledged and endurin

usefulness. He was the founder of infant schools in England; he was the first to introduce reasonably short hours into factory labour, and zealously promoted factory legislation—one of the most needed and most beneficial reforms of the century; and he was the real founder of the co-operative movement. In general education, in sanitary reform, and in his sound and humanitarian views of common life, he was far in advance of his time. Still he had many serious faults; all that was quixotic, crude, and superficial in his views became more prominent in his later years; and by the extravagance of his advocacy of them he did vital injury to the cause he had at heart. In his personal character he was without reproach—frank, benevolent, and straightforward to a fault; and he pursued the altruistic schemcs in which he spent all his means with more earnestness than most men devote to the accumulation of a fortune.

Of R. Owen's numerous works in exposition of his system, the most important are the New View of Society, already mentioned; the Report eommunicated to the Committee on the Poor Law; the Book of the New Moral World; and Revolution in the Mind and Practice of the Human Race, See Life of Robert Owen written by himself, London, 1857, and Threading my Way, Twenty-seven Years of Autobiography, by Robert Dale Owen, his son, London, 1874. There are also Lives of Owen by A. J. Booth (London, 1869) and by W. L. Sargant (London, 1860). For works of a more general eharaeter see G. J. Holyoake, History of Co-operation in England, London,

1875; Reybaud, Etudes sur les réformateurs modernes, Paris, 1856; Adolf Held, Zwei Biicher zur socialen Geschichte Englands, Leipsie, 1881. aks)

OWENSBOROUGH, a city of the United States, capital of Daviess county, Kentucky, on the Ohio, 160 miles below' Louisville. It engages extensively in the manufacture of whisky and the curing of tobacco, and has waggon factories, flour-mills, and foundries. The popula- tion, 6231 in 1880, exceeded 11,000 in 1883.

OWL, the Anglo-Saxon Ule, Swedish Uggla, and German Eule—allallied tothe Latin Ulula, and evidently of imita- tive origin—the general English name for every nocturnal Bird-of-prey,! of which group nearly two hundred species have been recognized. The Owls form a very natural assem- blage, and one about the limits of which no doubt has for a long while existed. Placed by nearly all systematists for many years as a Family of the Order Accipitres (or what- ever may have been the equivalent term used by the particular taxonomers), there has been of late a disposition to regard them as forming a group of higher rank. On many accounts it is plain that they differ from the ordinary diurnal Birds-of-prey, more than the latter do among themselves ; and, though in some respects Owls have a superficial likeness to the GoatsucKERS (vol. x. p. 711), and a resemblance more deeply seated to the GuacHARo (vol. xi. p. 227), even the last has not been made out to have any strong affinity to them. A good deal is therefore to be said for the opinion which would regard the Owls as forming an independent Order, or at any rate Sub-order, Striges. Whatever be the position assigned to the group, its subdivision has always been a fruitful matter of discus- sion, owing to the great resemblance obtaining among all its members, and the existence of safe characters for its division has only lately been at all generally recognized. By the older naturalists, it is true, Owls were divided, as was first done by Willughby, into two sections—one in which all the species exhibit tufts of feathers on the head, the so-called "ears" or "horns," and the second in which the head is not tufted. The artificial and therefore untrustworthy nature of this distinction was shewn by Isidore Geoffroy St-Hilaire (Ann. Sc. Naturelles, xxi. pp. 194-203) in 1830; but he did not do much good in the

1 The poverty of the English language—generally so rich in syhonyms—is here very remarkable. Though four well-known if not common species of Owls are native to Britain, to say nothing of half a dozen others which occur with greater or less frequency, none of them has ever acquired an absolutely individual name, and various prefixes have to be used to distinguish them. In Greece and Italy, Germany and France, almost each indigenous species has had its own particular designation in the vulgar tongue. The English Owlet or Howlet is of course a simple diminutive only.

arrangement of the Owls which he then proposed ; and it was hardly until the publication ten years later of Nitzsch's Pterylographie that rational grounds on which to base a division of the Owls were adduced. It then became inanifest that two very distinct types of pterylosis existed in the group, and further it appeared that certain differ- ences, already partly shewn by Berthold (Beitr. zur Anatomie, pp. 166, 167), of sternal structure coincided with the pterylological distinctions. By degrees other significant differences were pointed out, till, as summed up by Prof. Alphonse Milne-Edwards (Ois. joss. de la France, ii. pp. 474-492), there could no longer be any doubt that the bird known in England as the Screech-Owl or Barn-Owl, with its allies, formed a section which should be most justifiably separated from all the others of the group then known. Space is here wanting to state particularly the pterylological distinctions which will be found described at length in Nitzsch's classical work (English translation, pp. 70, 71), and even the chief osteo- logical distinctions must be only briefly mentioned. These consist in the Screech-Owl section wanting any manubrial process in front of the sternum, which has its broad keel joined to the clavicles united as a furcula, while posteriorly it presents an unbroken outline. In the other section, of which the bird known in England as the Tawny or Brown Owl is the type, there is a manubrial process; the furcula, far from being joined to the keel of the sternum, often consists but of two stylets which do not even meet one another; and the posterior margin of the sternum pre- sents two pairs of projections, one pair on each side, with corresponding fissures between them. Furthermore the Owls of the same section shew another

peculiarity in the bone usually called the tarsus. This is a bony ring or loop bridging the channel in which lies the common extensor tendon of the toes —which does not appear in the Sereech-Owl section any more than in the majority of birds. The subsequent examination by M. Milne-Edwards (Nouv. Arch. du Muséum, ser. 2, i. pp. 185-200) of the skeleton of an Owl known as Phodilus (more correctly Photodilus) badius, hitherto attached to the Screech-Owl section, shews that, though in most of its osteological characters it must be referred to the Tawny Owl section, in several of the particulars mentioned above it resembles the Sereech-Owls, and therefore we are bound to deem it a connecting link between them. The pterylological characters of Photodilus seem not to have been investigated, but it is found to want the singular bony tarsal loop, as well as the manubrial process, while its clavicles are not united into a furcula and do not meet the keel, and the posterior margin of the sternum has processes and fissures like those of the Tawny Owl section. Photodilus having thus to be removed from the Screech-Owl section, Prof. Milne-Edwards has been able to replace it by a new form Heliodilus from Madagascar, described at length by him in M. Grandidier's great work on the natural history of that island (Ocseaux, i. pp. 113-118). The unexpected results thus obtained preach caution in regard to the classification of other Owls, and add to the misgivings that every honest ornithologist must feel as to former attempts to methodize the whole group —misgivings that had already arisen from the great diversity of opinion displayed by previous classifiers, no two of whom seem able to agree. Moreover, the difficulties which beset the study of the Owls are not limited to their respective relations, but extend to their scientific terminology, which has long been in a state so bewildering that nothing but the strictest adherence to the very letter of the laws of nomenclature, which are approved in principle by all but an insignificant number of naturalists, can clear up the confusion into which the matter has been thrown by heed-

attempts very successful.

less or ignorant writers—some of those who are in general most careful to avoid error being not wholly free from blame in this respect.

A few words are therefore here needed on this most unprofitable subject! Under the generic term Strix Linneus placed all the Owls known to him; but Brisson most justifiably divided that genus, and in so doing fixed upon the S. stridula—the aforesaid Tawny Owl—as its type, while under the name of Aso he established a second genus, of which his contemporary's S. otus, afterwards to be mentioned, is the type. Some years later Savigny, who had very peculiar notions on nomenclature, disregard- ing the act of Brisson, chose to regard the Linnwan S. flammea—the Screech-Owl before spoken of—as the type of the genus Strix, which genus he further dissevered, and his example was largely followed until Fleming gave to the Screech-Owl the generic name of Aluco,? by which it had been known for more than three hundred years, and reserved Strix for the Tawny Owl. He thus anticipated Nitzsch, whose editor was probably unacquainted with this fact when he allowed the name Hybris to be conferred on the Sereech-Owl. No doubt inconvenience is caused by changing any general practice ; but, as will have been seen, the practice was not universal, and such inconveni- ence as may arise is not chargeable on those who abide by the law, as it is intended in this article to do. The reader is therefore warned that the word Strix will be here used in what is believed to be the legitimate way, for the genus containing the Strix stridula of Linneeus, while Aluco is retained for that including the S. flammea of the same naturalist.

Except the two main divisions already mentioned, any further arrangement of the Owls must at present be deemed tentative, for the ordinary external characters, to which most systematists trust, are useless if not mislead- ing.? Several systematizers have tried to draw characters from the orifice of the ear, and the parts about it; but hitherto these have not been sufficiently studied to make the If it be true that the predomin- ant organ in any group of animals furnishes for that group the best distinctive characters, we may have some hope of future attempts in this direction,* for we know that few birds have the sense of hearing so highly developed as the Owls, and also that the external ear varies considerably in form in several of the genera which have been examined. Thus in Surma, the Hawk-Owl, and in Vyctea, the Snowy Owl, the external ear is simple in form, and, though pro- portionally larger than in most birds, it possesses no very remarkable peculiarities,—a fact which may be correlated with the diurnal habits of these Owls—natives of the far north, where the summer is a season of

constant daylight, and to effect the capture of prey the eyes are perhaps more employed than the ears.5 In Bubo, the Eagle-Owl, though

1 Jt has been dealt with at greater length in The Ibis for 1876 (pp. 94-105).

2 The word seems to have been the invention of Gaza, the trans- lator of Aristotle, in 1503, and is the Latinized form of the Italian Allocco.

3 It is very much to be regretted that a very interesting form of Owl, Sceloglausx albifacies, peculiar to New Zealand, should be rapidly becoming extinct, without any effort, so far as is known, being made to ascertain its affinities. It would seem to belong to the Strigine section, and is remarkable for its very massive clavicles, that unite by a kind of false joint, which in some examples may possibly be wholly ancylosed, in the median line.

4 This hope is strengthened by the very praiseworthy essay on the Owls of Norway by Herr Collett in the Forhandlinger of Christiania for 1881.

5 But this hypothesis must not be too strongly urged; for in Carine, a more southern form of nocturnal (or at least crepuscular) habits, the external ear is perhaps even more normal. Of course by the ear the real organ of hearing is here meant, not the tuft of feathers often so called in speaking of Owls.

certainly more nocturnal in habit, the external ear, how- ever, has no very remarkable development of conch, which may perhaps be accounted for by the ordinary prey of the bird being the larger rodents, that from their size are more readily seen, and hence the growth of the bird’s auditory organs has not been much stimulated. In Strix (as the name is here used), a form depending greatly on its sense of hearing for the capture of its prey, the ear-conch is much enlarged, and it has, moreover, an elevated flap or operculum. In Asio, containing the lLong-eared and Short-eared Owls of Europe, Asia, and America, the conch is enormously exaggerated, extending in a semicircular direction from the base of the lower mandible to

above the middle of the eye, and is furnished in its whole length with an operculum.! But. what is more extraordinary in this genus is that the entrance to the ear is asymmetrical— the orifice on one side opening downwards and on the other upwards. This curious adaptation is carried still further in the genus WVyctala, containing two or three small species of the Northern hemisphere, in which the asymmetry that in Asio is only skin-deep extends, in a manner very surprising, to several of the bones of the head, as may be seen in the Zoological Society's Proceed- ings (1871, pp. 739-743), and in the large series of figures given by Messrs Baird, Brewer and Ridgway (V. Am. Birds, iii. pp. 97-102).

Among Owls are found birds which vary in length from 5 inches—as Glaucidium cobanense, which is therefore much smaller than a Skylark—to more than 2 feet, a size that is attained by many species. Their plumage, none of the feathers of which possesses an aftershaft, is of the softest kind, rendering their flight almost noiseless. But one of the most characteristic features of this whole group is the ruff, consisting of several rows of small and much- curved feathers with stiff shafts—originating from a fold of the skin, which begins on each side of the base of the beak, runs above the eyes, and passing downwards round and behind the ears turns forward, and ends at the chin— and serving to support the longer feathers of the " disk " or space immediately around the eyes, which extend over it. A considerable number of species of Owls, belonging to various genera, and natives of countries most widely separated, are remarkable for exhibiting two phases of coloration—one in which the prevalent browns have a more or less rusty-red tinge, and the other in which they incline to grey. Another characteristic of nearly all Owls is the reversible property of their outer toes, which are not unfrequently turned at the bird's pleasure quite back- wards. Many forms have the legs and toes thickly clothed to the very claws; others have the toes, and even the tarsi, bare, or only sparsely beset by bristles. Among the bare-legged Owls those of the Indian Ketupa are con- spicuous, and this feature is usually correlated with their fish-catching habits ; but certainly other Owls that are not known to catch fish present much the same character.

Among the multitude of Owls there is only room here to make further mention of a few of the more interesting. First must be noticed the Tawny

Owl—the Strix stridula of Linneus, the type, as has been above said, of the whole group, and especially of the Strigine section as here understood. This is the Syrniwm aluco of some authors, the Chat-huant of the French, the species whose tremulous hooting “tu-whit, to-who,” has been celebrated by Shakespear, and, as well as the plaintive call, “keewick,” of the young after leaving the nest, will be familiar sounds to many readers, for the bird is very generally:distributed throughout most parts of Europe, extending its range through Asia Minor to Palestine, and also to Barbary—but not belonging to the Ethiopian Region or to the eastern half of the Palearctie. It is the largest of the species indigenous to Britain, and is strictly a woodland bird, only occa-

sionally choosing any other place for its nest than a hollow tree. Its food consists almost entirely of small mammals, chiefly rodents ;

1 Figures of these different forms are given by Macgilli Bri Mat oa, ee

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but, though on this account most deserving of protection from al] classes, it is subject to the stupid persecution of the ignorant, and is rapidly declining in numbers.? Its nearest allies in North America are the S. nebuzlosa, with some kindred forms, one of which the S. occidentalis of California and Arizona, is figured below; but none of them seem to have the “merry note” that is uttered by the

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Fie. 1.—Striz occidentalis.

European species. Common to the most northerly forest-tracts of both continents (for, though a slight difference of coloration is observable

between American examples and those from the Old World, it is impossible to consider it specific) is the much larger S. cinerea or S. lapponica, whose iron-grey plumage, delicately mottled with dark brown, and the concentric circles of its facial disks make it one of the most remarkable of the group. Then may be noticed the genus Bubo—containing several species which from their size are usually known as Eagle-Owls. Here the Nearctic and Palearctic forms are sufficiently distinct—the latter, B. ignawus,? the Duc or Grand Duc of the French, ranging over the whole of Europe and Asia north of the Himalayas, while the former, B. virginianus, extends over the whole of North America, A contrast to the generally sombre colour of these birds is shown by the Snowy Owl, Myctea scandiaca, a circumpolar species, and the only one of its genus, which disdains the shelter of forests and braves the most rigorous arctic climate, though compelled to migrate southward in winter when no sustenance is left for it. Its large size and white plumage, more or less mottled with black, distinguish this from every other Owl. Then may be mentioned the birds commonly known in English as " Horned" Owls—the Hibous of the French, belonging to the genus Asio. One, A. otus (the Otus vulgaris of some authors), inhabits woods, and, distin- guished by its long tufts, usually borne erected, would seem to be common to both America and Europe—though experts profess their ability to distinguish between examples from each country. Another species, 4. accipitrinus (the Otus brachyotus of many authors), has much shorter tufts on its head, and they are ia carried depressed so as to escape observation. This is the " Wood- cock-Owl" of English sportsmen, for, though a good many are bred in Great Britain, the majority arrive in autumn from Scandinavia, just about the time that the immigration of Woodcocks occurs. This species frequents heaths, moors, and the open country gene- rally, to the exclusion of woods, and has an enormous geographical range, including not only all Europe, North Africa, and northern Asia, but the whole of America,—reaching also to the Falklands, the Galapagos, and the Sandwich Islands,—for the attempt to

2 All Owls have the habit of casting up the indigestible parts of the food swallowed in the form of pellets, which may often be found in abundance under the Owl-roost, and reveal without any manner of doubt what the prey of the birds has been. 'The result in nearly every case shows the enormous service they render to man in destroy- ing rats and mice. Details of many

observations to this effect are recorded in the Bericht tiber die XIV. Versammlung der Deutschen Ornithologen- Gesellschaft (pp. 80-34).

3 This species bears confinement very well, and propagates freely therein. To it belong the historic Owls of Arundel Castle.

separate specifically examples from those localities only shews that they possess more or less well-defined local races. Commonly od near Asio, but whether really akin to it cannot be stated, is the genus Scops, of which nearly forty species, coming from different parts of the world, have been described; but this number should probably be reduced by one half. The type of the genus, S. giu, the Petit Duc of the French, is a well-known bird in the south of Europe, about as big as a Thrush, with very delicately pencilled plumage, occasionally visiting Britain, emigrating in autumn across the Mediterranean, aud ranging very far to the eastward. Further southward, both in Asia and Africa, it is represented by other species of very similar size, and in the eastern part of North America by S. asio, of which there is a tolerably distinct western form, S. kennicotti, besides several local races. S. asio is one of the Owls that especially exhibits the dimorphism of coloration above mentioned, and it was long before the true state of the case was understood. At first the two forms were thought to be distinct, and then for some time the belief obtained that the ruddy birds were the young of the greyer form which was called S. nevia ; but now the “Red Owl” and the “Mottled Owl” of the older American ornithologists are known to be one species.!_ One of the most remarkable of American Owls is Speotyto cunicularia, the bird that in the northern part of the continent inhabits the burrows of the prairie dog, and in the southern those of the biscacha, where the latter occurs—making holes for itself, says Darwin, where that is not the case,—rattlesuakes being often also joint tenants of the same abodes. The odd association of these animals, interesting as it is, cannot here be more than noticed, for a few words must be said, ere we leave the Owls of this section, on the species which has associations of a very different kind—the bird of Pallas Athene, the emblem of the city to which science and art were so welcome. There can be no doubt, from the many representations on coins and sculptures, as to their subject being the

Carine noctua of modern ornithologists, but those who know the grotesque actions and ludicrous expression of this veritable buffoon of birds can never cease to wonder at its having been seriously selected as the symbol of learning, and can hardly divest themselves of a suspicion that the choice must have been made in the spirit of sarcasm. This Little Owl (for that is its only name —though it is not even the smallest that appears in England), the Chevéche of the French, is spread throughout the greater part of Europe, but it is not a native of Britain. It has a congener in C. brama, a bird well known to all residents in India.

Finally, we have Owls of the second section, those allied to the Screech-Owl, Aluco flammeus, the Effraie? of the French. This,

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Fia. 2.—Aluco flammeus.

with its discordant scream, its snoring, and its hissing, is far too well known to need description, for it is one of the most widely- spread of birds, and is the Owl that has the greatest geographical Tange, inhabiting almost every country in the world,—Sweden and Norway, America north of lat. 45°, and New Zealand being the principal exceptions. It varies, however, not inconsiderably, both im size and intensity of colour, and several ornithologists have tried

‘See the remarks of Mr Ridgway in the work before quoted (B. N, America, iii. pp. 9, 10), where also response is made to the observations of Mr Allen in the Harvard Bulletin (ii. pp. 338, 339).

Through the dialectic forms Fresaie and Presaie, the origin of the word is easily traced to the Latin prasaga—a bird of bad omen; but It has also been confounded with Orfraie, a name of the OSPREY (vide Pere, DP. 56).

to found on these variations more than half a dozen distinct species. Some, if uot most of them, seem, however, hardly worthy to be considered geographical races, for their differences do not always depend on locality. Mr Sharpe, with much labour and in great detail, has given his reasons (Cat. B. Brit. Muscwm, ii. pp. 291-309 ; and Ornith. Miscellany, i. pp. 269-298; ii. pp. 1-21) for acknowledging four “subspecies” of 4. flammeus, as well as five other species. Of these last, .4. tencbricosus is peculiar to Australia, while 4. nove-hollandiz inhabits also New Guinea, and has a “subspecies,” 4. castanops, found only in Tasmania; a third, A. candidus, has a wide range from Fiji and northern Australia through the Philippines and Formosa to China, Burmah, and India; a fourth, 4. capensis, is peculiar to South Africa; while A. thomensis is said to be confined to the African island of St Thomas. To these may perhaps have to be added a species from New Britain, described by Count Salvadori as Strix aurantia, but it may possibly prove on further investigation not to be an Alucine Owl at all. (A. N.)

OX. See CATTLE.

OXALIC ACID, an organic acid of the formula (COOH),, which, in a general scientific sense, excites our interest chiefly by its almost universal diffusion throughout the vegetable kingdom. ‘Traces of oxalates are contained in the juices of, probably, all plants at certain stages of their growth ; but so are lime-salts, which, in solutions, can coexist with the former only in the presence of free acid. Hence the frequent occurrence in plant-cells of those crystals of oxalates of lime with which all micro-scopists are familiar. In certain alge, if they grow on cal- careous soils, this salt, according to Bracannot, may form as much as one-half of the total dry solids.) Of phanero- gamic tissues, the roots of the officinal kinds of rhubarb may be named as being peculiarly rich in oxalate of lime- crystals. It is perhaps as well to add that the juicy stems of the garden rhubarb, although not free of oxalic, owe their sourness chiefly to malic acid. The strongly sour juices of certain species of Rumex and Acetosella, on the other hand, are exceptionally rich in acid oxalates. The juice of Oxalis Acetosella, when concentrated by evapora-

| tion, deposits on cooling a large crop of crystals of bin-

oxalate of potash. This salt, as an educt from the plant juice named, has been known for some three centuries as “sal acetoselle ” or “salt of sorrel.” Oxalic acid and all soluble oxalates are dangerous poisons, which almost implies that they cannot occur, under normal conditions, in the juices of the higher animals. Yet human urine always contains traces of oxalate of lime, which, when the urine is or becomes alkaline, forms on standing a micro-crystalline deposit. In certain diseased conditions of the system the oxalate is formed more largely, and may be deposited within the bladder in crystals or even develop into calculi.

The discovery of oxalic acid must be credited to Scheele, who obtained it in 1776 by the oxidation of sugar with nitric acid, and called it saccharic acid. In 1784 he proved its identity with the acid of sal acetoselle. Our knowledge of the elementary composition of oxalic acid is the result of the independent labours of Berzelius, Débe- reiner, and Dulong (1814-21).

Its artificial synthesis can be effected in various ways. Thus, for instance, (1) cyanogen, when dissolved in aqueous hydrochloric acid, gradually assimilates 4H,O per N,C, and becomes oxalate of ammonia, C,0,(NH,), (Liebig). Or (2) moist carbonic acid is reduced by potassium to formic acid, CO, + H,O -O=CH,O,, which, of course, assumes the form of potash salt (Kolbe). This latter, when heated beyond its fusing point, breaks up into oxalate and hydrogen, 2CHKO, = H, + C,0,K, (Erlenmeyer). At 350° dry CO, and sodium unite into oxalate C,0,Na, (Drechsel).

Sugar, starch, and many other organic bodies of the “fatty” series, when boiled with nitric acid, yield oxalic acid as a penultimate product of oxidation In this manner oxalic acid used to be produced, industrially, from

starch or molasses ; but this method, though not by any means obsolete, is almost superseded by a new process which we owe to Mr Dale of Manchester.

Mr Dale’s process is founded upon the old observation of Gay-Lussac’s that cellulose, by fusion with caustic potash, is oxidized into oxalate with evolution of (impure) hydrogen. In Mr Dale’s works (at Warrington)

sawdust and wood-shavings do service as cellulose, while a mixed caustic alkali lye of 1:34 to 1°35 specific gravity, containing 1KHO for every 3NaHO, serves as a reagent. Unmixed caustic soda gives no orlittle oxalate. The wood-shavings are soaked in a quantity of lye equal to 30 to 40 per cent. of their weight of dry alkali, and the mixture is evaporated down on iron plates at about 200° C. with constant agita- tion, until it is converted into a homogeneous brown mass completely soluble in water. This mass (which is as yet very poor in oxalate) is then dried up fully at a somewhat lower temperature, and thus converted into a crude oxalate equivalent to 28 to 30 per cent. of its weight of oxalic- acid crystals. Messrs Roberts, Dale, & Co. have come, latterly, to substitute for the iron plates an iron pipe passing slantingly through a heated chamber and provided inside with a revolving screw, which draws in the mixture of wood and alkali below, and conveys it along at such a rate that it comes out above as finished product. The crude oxalate is lixiviated with cold water, when the bulk of the oxalic acid remains as soda salt, while the rest of the alkali passes into solution as, substantially, carbonate. The oxalate, after having been washed with the least suffi- cient quantity of water, is boiled with a dilute milk of lime and thus converted into a precipitate of oxalate of lime, while caustic soda passes in to solution, which is added to the liquors produced in the separation of the oxalate of soda from the surplus alkali. The oxalate of lime is washed and then decomposed by boiling it with three times the calculated amount of dilute sulphuric acid, the sulphate of lime filtered off, and the solution evaporated to crystal- lization. The yield as oxalic acid crystals amounts to 50 to 60 per cent. of the weight of the wood-shavings. The united alkali-liquors are causticized with lime, and thus (apart from the unavoidable losses) the originally employed caustic alkali is recovered in its entirety.

Commercial (oxalic) acid is contaminated chiefly with sulphuric acid and alkali, of which the latter cannot be removed by recrystallization from water, but, according to Stolba, easily and exhaustively by recrystallization from 10 to 15 per cent. hydrochloric acid.

Crystallized oxalic acid forms colourless needles of the composi- tion C,0,H.2H,0. Ht melts at 98° C., and when kept at about this temperature readily loses its crystal-water, but at 110° the dry acid C,O,H, already

begins to volatilize. The latter sublimes most readily at 165° C., without previous fusion, in needles. At higher temperatures it breaks up, more or less completely, into CO, formic acid, CH,0,(or CO+H,O). The crystallized acid dissolves in 10°5 parts of water of 14°°5, also in alcohol. The solution readily neutralizes basic hydrates and carbonates ; in the case of the alkalies and alkaline earths, the point of neutrality to litmus corresponds to the normal salt, 7.¢, to the ratio CO,H : RHO, where R=K, Na, (NH,), 4Ba, &c. The normal salt CO,R com- bines with 1CO,H into‘ binoxalate,” and, in the case of R=K or NH, also with 83CO,H into “ quadroxalate.” Alkaline oxalates are soluble in water—the soda and ammonia salts rather sparingly; of the rest of oxalates, as far as they are normal salts, the majority are insoluble or difficultly soluble in water, and therefore most con- veniently produced, by double decomposition, as precipitates.

Potash Salts. —The normal salt, C,0,K, + H,0, is soluble in 3 parts of water of 16° C. The binoxalate (salt of sorrel) is generally an- hydrous, but occasionally C,0,KH+4H,0, the latter soluble in 26°2 parts of water of 8° C. The elsewhere extinct industry of manufacturing this salt from sorrel-juice survives in the Black Forest. It is used habitually for removing ink and rust-stains from linen, though oxalic acid is better and cheaper. The quadroxalate, C,0,KH +C,0,H, +2H,0, soluble in 20 parts of water at 20° Cz3 often sold as salt of sorrel.

Soda Salts.—The normal salt, C,0,Na,, gencrally forms small

imperfect crystals, soluble in 31°6 parts of water of 18°C. The acid salt, C,0,NaH +H,0, is soluble in 67°6 parts of water at TO™C:

Ammonium Salts.—The normal salt, C,0,(NH,),.+H,0, found native in guano, crystallizes in needles, and is soluble in 28°7 parts of water of 15°C. Itis much used in the laboratory asa most delicate precipitant for lime salts. The binoxalate, C,0,(NH,)H+H,0, dissolves in 16 parts of water of 11°°5. There is a quadroxalate, C,0,(NH,)H + C,0,H, + 2H,0.

Other Salts. —The normal lime salt, as obtained by precipitation of lime salts with alkaline oxalates or oxalic acid, and found in plant cells, is C,0,Ca+3H,O; but 2H,O are easily lost below 110°; the remaining 1H,0 is expelled only above 200°C. Ferrous oxalate, C,0,Fe+2H,0, obtainable by

precipitation of ferrous sulphate with oxalic acid, is a yellow crystalline powder. When heated it breaks up into CO, and finely divided metallic iron, which latter at once burns into red ferric oxide of a state of aggregation which fits it pre-eminently for the polishing of optical glasses. Ferric oxalate dissolves in oxalic acid, the solution, when exposed to the light, giving off CO, with precipitation of ferrous oxalate. Draper recommends it for measuring the chemical in- tensity of light.

Industrially oxalic acid chiefly serves the calico printers as a discharge for certain colours, which, unlike the otherwise equivalent mineral acids, does not attack the tissue. Minor quantitics are used, as solution, for cleaning metallic surfaces. It has been recommended for the metallurgic precipitation of NicKEL (q.1.).

Analysis.—Solid metallic oxalates, when heated, are decomposed without noteworthy climination of carbon. When heated with oil of vitriol they give off the components of the anhydride C,05 as carbonic oxide and carbonic acid gases, without blackening. Oxalate solutions are al by chloride of calcium ; the precipitate (C,0,Ca.#H,O) is insoluble in water, ammonia, ammonia salts, and acetic (though soluble in hydrochloric) acid. Even a mixture of free oxalic acid and gypsum solution deposits oxalate of lime. Oxalic acid is readily oxidized into carbonic acid by the conjoint action of dilute sulphuric acid and binoxide of manganese or permanganate of potash. In the latter case this re- action, even with small quantities, becomes visible by the discharge of the intensely violet colour of the reagent; the change, however, is slow at first; it becomes more and more rapid as thé MnSO, formed increases, and consequently goes on promptly from the first, if ready made MnSO, be added along with the reagent. The ele oa pn test is readily translatable into a titrimetric method for the determination of oxalic acid in solutions. (W. D.)

OXENSTIERNA, AxeEL, Counr or (1583-1654), Swedish statesman, was born at Fané in Upland on the 16th of June 1583. He studied theology at Rostock, Wittenberg, and Jena; and in 1602, having spent some time in visiting German courts, he returned to Sweden to take the oath of allegiance to Charles IX., whose service he entered. In 1606 he was sent as ambassador to the court of Mecklenburg, and in 1609 he became a member

of the Swedish senate. When Gustavus Adolphus succeeded to the throne, in 1611, Oxenstierna was appointed chancellor, and in 1613 he was plenipotentiary in the negotiations for the conclusion of peace between Sweden and Denmark. In 1614 he went with the king to Livonia, and helped to bring about the cessation of hostilities between Sweden and Russia. After the inter- vention of Gustavus in the Thirty Years' War, Oxenstierna was made governor-general of all the districts in Prussia which had been overrun by the Swedes; and, when the Imperialists were preparing to besiege Stralsund, he negotiated with the duke of Pomerania for the substitution of Swedish for Danish troops in the town, going subse- quently to Denmark to obtain the sanction of the Danish king. While Gustavus pushed on to Franconia and Bavaria, Oxenstierna was entrusted with the supreme direction of affairs, both political and military, in the Rhine country, and he took up his headquarters at Mainz. In 1632, when Gustavus fell at the battle of Liitzen, the responsibility for the maintenance of the Protestant cause fell chiefly upon Oxenstierna ; and in one of the greatest crises in the history of the world he displayed splendid courage, discretion, and resource. At a congress held in Heilbronn he was appointed director of the evangelical confederation, and in this capacity he went

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to France and Holland to secure the aid of these countries against the emperor. On his return he found the Pro- testants in a very desponding mood. The battle of Nérdlingen had been lost; the allies distrusted one another; the troops were dissatisfied and resented any attempt to subject them to strict discipline. Oxenstierna laboured indefatigably to restore the confidence of his party, and to a large extent he succeeded. He then returned, in 1636, to Sweden, where he resigned his exceptional powers and resumed his place in the senate as chancellor of the kingdom. He acted also as one of five guardians of Queen Christina, whom he carefully instructed in what seemed to him the true methods of. administra- tion. Oxenstierna

had the reputation of being one of the wisest statesmen of his age, and during his absence from his country he had drawn up the scheme of a system of government which had been accepted in 1634 by the Swedish estates. Abroad he upheld vigorously the honour of Sweden, and at home he maintained strict economy in public expenditure, while encouraging, according to the ideas of his time, the development of industry and the arts. In 1645, when he went back to Sweden after taking part in the negotiations with Denmark at Brémsebro, he was raised to the rank of count by the ueen. He died on the 28th of August 1654.

See Lundblad, Svensk Plutarch, 1824.

OXFORD, or Oxon, an inland county of England, is bounded N.E. *y Northamptonshire, N.W. by Warwick- shire, W. by Gloucestershire, 8.S.W. and 8.E. by Berks, and E. by Bucks. In shape it is very irregular, its breadth varying from about 7 to 274 miles, and its greatest length being about 52 miles. The total area is 483,621 acres, or about 756 square miles, The character of the scenery varies greatly in different districts. The Chiltern Hills cross the south-western extremity of the county from north- east to south-west. On the west side of the ridge Nettle- bed Hill expands into Nettlebed Common, an extensive table-land, reaching at some points nearly 700 feet above sea-level. The Chiltern district is supposed to have been at one time covered by forest, and there are still many fine beeches, as well as oak and ash trees, although for the most part the district is now utilized as’ a sheep- walk or as arable land. Camden mentions the woods of Oxfordshire as a special feature of the county. The forest of Wychwood extended to 3735 acres of forest proper. In the district of Staunton St John there are considerable traces of natural woodland. The most extensive of the recent plantations is the great belt at Blenheim. Imme- diately to the east of the city of Oxford a range of hills stretches between the valleys of the Thames and Cherwell, the highest point being Shotover Hill, 560 feet. In the central district the surface is less varied, and along the tivers there are extensive tracts of flat land, but the finely cultivated fields and the abundance of wood lend an aspect of richness to the landscape. The northern part of the county is flat and bare, its bleakness and monotony being mereased in some districts by the stone fences. Wych- wood has been recently disafforested by statute.

Oxfordshire abounds in streams and watercourses, the majority of which belong to the basin of the Thames, Which skirts the whole southern border of the county, forming for the most part of its course the boundary with Berks, In the earlier part of its course it is called the Isis. Before reaching the city of Oxford it receives the Windrush, and the united waters of the Evenlode and Glyme. _ It then divides into- various channels, but these Soon unite, and the river flowing round the city receives the united streams of the Cherwell and the Ray, and passes south-east to Dorchester, where it is joined by the Thame. From this point it is called the Thames. The

Windrush and Evenlode both flow south-east from Gloucestershire ; the Cherwell traverses the whole length of the county south from Northamptonshire; and the Thame crosses its south-east corner from Bucks. The Thames is navigable for small craft to Gloucestershire, and for vessels of considerable burden to Oxford. The Oxford Canal, 91 miles long, begun in 1769 and finished in 1790, enters the north-eastern extremity of the county near Claydon, and following the course of the Cherwell passes south to the city of Oxford.

Geology.—The low ground in the north-west, along the vale of Moreton, on the banks of the Cherwell as far as Steeple Aston, and along the banks of the Evenlode, is occupied by the blue clays of the Lower Lias, the higher regions being occupied by the Middle Lias. The Lower Lias contains beds of hard shelly limestone called Banbury marble, which is worked into chimneypieces; and associ- ated with the blue limestone of the Middle Lias there is a valuable deposit of brown hematite iron which is largely worked at Adderbury near Banbury, the total quantity obtained in 1882 being 8614 tons, valued at £1507. At one time the marlstone was covered by the Upper Lias clays, but these are now found only in isolated strips and patches. Beds of Oolite, called Northampton Sands, rest on the higher ridges above the Upper Lias, and the Great Oolite is exposed on both sides of the Evenlode and extensively quarried for building purposes, the upper beds forming also a white limestone containing numerous fossils. Forest marble occupies the greater part of Wychwood Forest, Blenheim Park, and adjoining regions. A wide extent of flat uninteresting country in the south-west, stretching as far

east as the city of Oxford, belongs to the Oxford clay. Coral rag, Kimmeridge clay, and white limestone occur at different places in the neighbourhood of the Thames. There are also various outliers of Upper and Lower Green- sand. At the junction of the Chalk with the Greensand there is a line of springs which have determined the sites of numerous villages. Chalk forms the ridges of the Chil- tern Hills, and Upper Chalk with flint extends eastward a considerable distance beyond them. In the northern and eastern districts there are large accumulations of drift along all the old river valleys; anda considerable breadth of flat country on the banks of the Thames and Cherwell is occupied by alluvial deposits. Ochre of remarkably fine quality is obtained from Shotover Hill.

Climate, Soil, and Agricultuwre.—Tho climate is salubrious and dry, but generally coldcr than the other southern districts of Kng- land, especially in the bleak and exposed regions of the Chiltcrns. Crops are Jatcr in the uplands than in more northerly situations at a lower clevation. Agriculture is in a fairly advanced condition, but the possibilities of improvement are not by any means ex- hausted, as the soil is on the whole above the avcrage in fertility. In the northern districts there is a strong yet friable loam, well adapted for all kinds of crops. The centre of the county is occupied for the most part by a good friable but not so rich soil, formed of decomposed sandstone, chalk, and limestone. A large district in the south-cast is occupied by the chalk of the Chiltern Hills, at one time covered by a forest of beech, but now partly arable and partly used as sheep-walks. The remainder of the county is occupied by a variety of miscellancous soils ranging from coarse sand to heavy tenacious clay, and occasionally very seeding to the agricultural returns of 1888, as many as 417,509 acres, or about eight-ninths of the total of the county, were under cultivation, corn crops occupying 152,437 acres, green crops 52,451, rotation grasses 44,472, and permanent pasture 153,898. Wheatand barley, with 51,796 acres and 47,611 acres respectively, occupy the largest areas among corn crops, and oats and beans come next with 31,771 and 14,389. Potatoes are not much grown, but turnips occupy as many as 34,618 acres. The most common course of crops on lighter soils is a four years’ rotation, somctimes lengthened to six years with pease, oats, or similar crops. On heavier soils the course is first turnips or other roots, second barley or oats, third threo or morc years of clover and grass seed, fourth wheat, and finally beans. Along

the smaller strcams there are very rich meadows for grazing, but those on the Thames and Cherwell are subject to floods. On the

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hills there are extensive sheep pastures. Horses in 1883 nuinbered 17,454, of which 13,716 were used solely for purposcs of agriculture. The number of cattle was 50,209, of which 16,914 were cows and heifers in milk or in calf. The dairy system prevails in many places, but the milk is manufactured into butter, little checse being made. The improved shorthorn is the most common breed, but Alderney and Devonshire cows are largely kept. Sheep numbered as many as 270,288, of which 157,248 were one year old and upwards, Southdowns are kept on the lower grounds, and Leicesters and Cotswolds on the hills. Pigs in 1883 numbered 44,682, the county being famous for its ‘‘ brawn.”

According to the latest return, the land was divided among 10,177 proprietors, possessing 452,232 acres, at an annual value of £1,073,246, an average per acre of about £2, 7s. Of the owners, 6838 possessed less than one acre, and the following 10 upwards of 5000 acres, viz., the duke of Marlborough, 21,945; earl of Ducie, 8799 ; earl of Abingdon, 8174; M. P. W. Boulton, 7946; Sir H. W. Dashwood, 7515 ; earl of Jersey, 7048 ; Edward W. Harcourt, 5721; earl of Macclesfield, 5491; Viscount Dillon, 5444 ; and Lord F. G. Churchhill, 5352. Upwards of 30,000 acres were held by various colleges of Oxford, the largest owner being Christ Church, 4837 acres.

Manufactures.—Blankets are manufactured at Witney, and tweeds, girths, and horsecloths at Chipping Norton. There are paper mills at Hampton-Gay, Shiplake, Sandford-on-Thames, Wool- vercot,and Eynshain. Agricultural implements and portable engines are made at Banbury, and gloves at Woodstock, where the polished steel work has long ago ceased. A large number of women and girls are employed in several of the towns and villages in the lace manufacture,

Railways.—The county is traverscd by several branches of the Great Western, which skirts its borders, and by the East Gloucester- shire and the London and North-Western Railways.

Administration and Population.—Oxfordshire comprises fourteen hundreds, the municipal boroughs of Banbury (3600) and Chipping Norton (4167), the greater part of the city of Oxford, of nae the remainder is in Berkshire, and a small portion of the municipal borough of Abingdon, of which the remainder is also in Berkshire. It has one court of quarter sessions, and is divided into ten petty and special sessional divisions. The boroughs of Abingdon and Banbury and the city of Oxford have commissions of the peace and separate courts of quarter sessions. For parliamentary purposes the county is not divided; it returns three members, having previous to the Reform Act of 1832 returned only two. The borough of Woodstock returns one member ; and there are parts of four other boroughs within the county, Oxford city returning two members, and Abingdon, Banbury, and Wallingford one each. The uni- versity of Oxford also returns two members. The county contains 292 civil parishes, with parts ofseven others. It is almost entirely in the diocese of Oxford. The population in 1801 was 111,977, which by 1841 had increased to 163,148, by 1851 to 170,439, by 1871 to 177,975, and by 1881 to 179,559, of whom 88,025 were males and 91,534 females. The average number of persons to an acre was 0°37, and of acres to a person 2°69.

History and Antiquities.—At the Roman invasion the district was inhabited by the Dobuni. To this carly British period probably belong the circle of stones and cromlech near Chipping Norton, the cromlech called the ‘‘ Hoarstone” at Enstone, and the scattered stones called the Devil’s Quoits at Stanton-Harcourt. Icknield Street crossed the centre of the county from Goring in the south- west to Chinnor in the north-east, and joined Watling Street in Northamptonshire. Akeman Strect crossed the county from east to west, entering it from Bucks at Ambrosden, and passing through Chesterton, Kirtlington, Blenheim Park, Stonesfield, and Asthall to Gloucestershire. Between Mongewell and Nuffield there is a vallum with embankment 2% miles in length called Grimes Dyke or Devil’s Ditch; and there are remains of another with the same name between the Glyme and the Evenlode near Ditchley. Traces still exist of Roman and British camps, and on the east side of the Cotswolds the square and the round camps lie together in pairs. Numerous Roman coins have been found at Dorchester, and tes- selated pavements at Great Tew and Stonesfield. Fora long time Oxford was the residence of the monarchs of Mercia. Cuthred of Wessex in

752 disowned the overlordship of Ethelbald of Mercia, whom he defeated at Burford. From this time a portion of Oxford- shire seems to have been subject to Wessex, but Offa of Mercia inflicted in 779 a severe defeat on the West Saxons under Cyne- wulf, after which Oxfordshire probably became Mercian. ‘The district of Oxford was frequently the scene of conflict during the long contests between the Saxons and the Danes, the latter of whom reduced the city of Oxford four times to ashes, and in the 11th century occupied nearly the whole region. In 1387 the insurgent nobles defeated the earl of Oxford at Radcot Bridge near Bampton. In 1469 the farmers and peasants of Yorkshire, to the number of 15,000, under the leadership of Robin of Redesdale, marched to Banbury, and defeated and captured the earl of Pembroke at Danes Moor on the borders of Oxford. During the civil wars the county

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was frequently entered by the armies both of the Parliament and the king, the morc important incidents being the seizing of Oxford, Banbury, and Broughton by the Royalists ; the assembling of the adherents of the king at the city of Oxford in 1644; the capture of the city by Fairfax in 1646; the surprise of the Parliamentarians by Rupert at Caversham; their repulse at Chalgrove Field, where Hampden received his death-wound ; and the defeat of the Royalist forces by Cromwell at Islip Bridge.

Some portions still remain of the old Norman castle at Oxford; there are traces of a moat at Banbury; of the castle at Bampton, the seat of Aylmer de Valence in 1313, there are a chamber and other fragments; and Broughton Castle is a good moated house of various periods. Among old mansions, mention may be made of Shirburn Castle, Mapledurham House, Chastleton House, Rousham Park, Crowsley Park, Hardwick House, Shipton Court, Stonor Park, Stanton-Harcourt Manor Housc, and Wroxton Abbey. In regard to Burford Priory, the High Lodge at Blenheim Park, and the old manor houses of Holton and Minster Lovell, the interest is chiefly historical. The most interesting churches, in addition to those in the city of Oxford, are Iffley, Norman, one of the finest specimens of early ecclesiastical architecture in England; Thame, with tombs and brasses ; Bampton, mostly transitional from Early English and Decorated;

Kidlington, Decorated, with a chancel and tower of earlier date ; Ewelme, Perpendicular ; Adderbury, with a chancel built by William of Wykcham,; Bloxham, with spire said to have been erected by Wolsey; Burford, Norman and later; Chipping Norton, with brasses of the 14th century; Dor- chester, once an abbey church; Stanton-Harcourt, with Early English chancel; Witney, Early English and Decorated, with Norman doorway. Among the religious foundations in addition to those in the city were a college and hospital at Banbury ; an abbey of Austin canons at Bicester; a Cistercian abbey at Bruern; a hospital at Burford; an Austin cell at Caversham; an alien priory at Charlton-on-Otmoor ; a Gilbertine priory at Clattcrcote; an alien priory of Black monks at Coggs; an Austin priory at Cold Norton ; a hospital at Crowmarsh ; a priory of Austin canons at Dorchester ; a hospital at Ewelme ; a Benedictine abbey at Eyns- ham; a priory of Austin nuns at Goring ; a preceptory at Gosford; a Benedictine house at Milton; an alien priory at Minster Lovell; an abbey of Austin canons at Osney; a preccptory at Sandford-on- Thames; a Cistercian abbey at Thame ; an establishment of tho Mathurins at Tuffield; a hospital at Woodstock ; and a house of Austin canons at Wroxton. There was a bishopric at Dorchester as a West Saxon see from 684 to 705, which was restored towards the close of the 9th century as a Mercian sec. The bishopric was transferred to Lincoln in 1067, from which Oxfordshire was separated and erected into a seein 1545. The diocese was enlarged by the addition of Berks in 1836 and of Bucks in 1846.

See Plot, Natural History of Oxfordshire, 1677; Walker, Flora of Oxfordshire, 1833 ; Skelton, Antiquities of Oxfordshire, 1823 ; Domesday Book Facsimile, 1862;

Davenport, Lords Lieutenant and High Sheriffs of Oxford, 1868; Id., Oxford- shire Annals, 1869; Phillips, Geology of Oxford and the Thames Valley, 1871.

OXFORD, the county town of Oxfordshire, a cathedral city, a municipal and parliamentary borough, and the seat of a famous university, is situated at a distance of 45 miles west-north-west from London, in the centre of the south midland district. It lies for the most part on a low ridge between the rivers Thames (locally called the Isis) and Cherwell, immediately above

their junction. The soil is gravel lying over extensive beds of Oxford clay. From some points of view the city seems to be surrounded with hills, a line of which runs from Wytham Hill (539 feet) to Cumnor Hurst (515 feet) and Stonesheath (535 feet) on the west of the, Thames valley, while on the east Headington Mill approaches still closer, with Shotover (560 feet) behind it. The river bed is about 180 feet above sea-level. Both the Thames and Cherwell valleys are liable to floods, especially in winter and spring.

University and City Buldings.—The view of the city, whether from the Abingdon road and Hinksey Hills, or from the old approach from London by Headington, or from the top of the Radcliffe, is a sight not to be forgotten. The towers and spires, numerous and yet varied in character, the quadrangles old and new with their profusion of carved stonework, the absence of large factories and tall chimneys, the groves and avenues of trees, the quiet college gardens, the well-watered valleys and encircling hills—all these combine to make Oxford the fairest city in England. The first place in importance as well as grandeur is taken by the buildings of the university, which will be briefly described in order.

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First among the institutions ranks the Bodleian Library (see LrprariEs, vol. xiv. p. 519). This noble home of study consists in the first place of the quadrangle once known as the “Schools ”—containing a Jacobean gateway tower, erected 1613-18, which exemplifies the so-called five orders of architecture—and the upper part of an H-shaped building immediately adjoining. In this older part the manuscripts and most of the printed books are preserved ; the fabric of the central part of the H dates from the 15th century, when it housed the library given by Humphrey, duke of Gloucester; while the contents and fittings, even to the readers’ seats, have been hardly altered since the days of Charles I. The present library, founded by Sir Thomas Bodley in 1602, has since 1610 had the right to receive a copy of

every book published in the United Kingdom, and its growth has been accelerated by dona-

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It contains models, ethnographical collections, English and Egyptian antiquities, and miscellaneous curiosities. The last and not the least of this central group of university

buildings is the church of St Mary the Virgin in the High St Mary’s.

Street, which derives peculiar interest from its long connexion with academic history. Here were held the disputations preparatory to a degree; here, time out of mind, the university sermons have been preached ; and the north-east corner is the ancient seat of the Houses of Convocation and Congregation. Round it were the earliest lecture-rooms, and its bell was the signal for the gathering of the students, as St Martin’s for the townsmen. It has memories too of Wickliffe, of Cranmer, Latimer, and Ridley, of Laud, of Newman, and of Pusey. The tower and spire, of which the height is about 190 feet, date from 1400, the chancel and nave from the succeeding century. The

tions from Selden, Rawlinson, Malone, Gough, Douce, and others. The modern books TH danke : are contained in the ad- jacent circular building known as the “Camera Bodleiana” or “Radcliffe,” built 1737-49 by James|_ ¥§ Gibbs with money left by |”¥ Dr Radcliffe to erect and endow a scientific library. The Radcliffe Library pro- per was removed in 1861 |?24 to the New Museum. The Eg height of the dome is 140 feet. The Bodleian at pre- sent gives a home to the Pomfret and Arundel mar- bles, including the famous Parian Chronicle, to anum- ber of models and pictures, to the Hope collection of 200,000 engraved por- traits, and in the tower to the archives of the uni- The Divinity

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low the older reading- |® room of the Bodleian, |° with its beautiful roof and |« g pendants of carved Caen |=_—=mai

stone, was finished in 1480, and is still the finest rom in Oxford. The Proscholium, a rare ex- ample of an original am- bulatory, adjoins it on the east, and the Convocation House on the west. To the north of these is the Sheldonian Theatre, built at the expense of Archbishop Sheldon from the designs of Sir Christopher Wren, and opened in 1669. The annual Act or "Enezenia," a commemoration of benefactors, accom- panied by the recitation of prize compositions and the conferment of honorary degrees, has almost invariably been held in this building. It contained also the University Press from 1669 until, in 1713, the Clarendon Building, a conspicuous object in Broad Street, was erected to contain the growing establishment, which was finally moved in 1830 to the present Clarendon Press; the Building is now used for university offices. The Ashmolean Museum, which also faces Broad Street, is an unpretentious edifice, the first public museum of curiosities in the kingdom,—founded by Elias Ashmole, and opened in 1683. The nucleus was formed

design of the porch was the ground of one of the articles

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Plan of Oxford.

in the impeachment of Laud. Farther down on the south New side of the High Street (the curve of which, lined with Schools.

colleges and churches in its course from the centre of the city at Carfax, leads with beautiful effect to Magdalen tower and bridge) is an extensive building completed in 1882, known as the New Examination Schools, on the site of the old Angel Hotel. The architect was Mr T. G. Jackson, the style Jacobean Gothic. The size and elaborate decoration of the rooms, which form three sides of an oblong quadrangle with an entrance hall

opening on the street, well adapt them for the lighter as well as the graver uses of the university. Farther on, and close to

the Cherwell, is the Botanic Garden, the first of its kind in Botanic England, opened in 1683, the design having been supplied Garden.

by Inigo Jones. The study of plants is unfortunately carried on at a great distance from the home of the other

branches of natural history and science, the New Museum, New

by the collections of John Tradescant, and not till lately which was built between 1855 and 1860 in the south-west Museum.

has the museum been made to serve a scientific purpose.

Obser- vatory.

Claren- don Press.

Taylor Building.

All Souls.

Balliol.

corner of the Park. The architects were Deane and Woodward, and the cost about £150,000. In it are gathered the numerous scientific collections of the uni- versity, from the time of Tradescant and Ashmole to that of the munificent donations of Mr Hope. The general plan isa central hall covered by a glass roof resting on Iron columns. The lecture-rooms and Radcliffe Library surround this on both floors. The chief adjuncts to this building are to the south-west a laboratory, an imitation of the shape of the Glastonbury Kitchen, to the south a chemical laboratory, and to the north-west the Clarendon laboratory of physical science. Ata short distance to the east in the Park is the University Observatory (1873), consisting of two dome-shaped buildings connected by lecture-rooms (see OBSERVATORY). The Clarendon Press in Walton Street is probably the best appointed of provincial establishments. Founded partly with the profits arising from the copyright of Clarendon’s History of the Rebellion, the Press was for long, as we have seen, established in the Clarendon Building. Of the present classical building, completed from Robertson’s designs in 1830, the chief

part forms a large quadrangle. The south side is entirely devoted to the printing of Bibles and prayer-books. All the subsidiary processes of type-founding, stereotyping, clectrotyping, and the like are done at the Press, and the paper is supplied from the University Mills at Wolvercote. Printing in Oxford dates from “1468” (1478%), but ceased after 1486 until 1585, except in 1517, 1518, and 1519. The first university printer was Joseph Barnes, in 1585. The Press is to a large extent a commercial firm, in which the university has a preponderating influence, as well as prior claims in the case of its own works. It is managed by the partners, and governed by eleven dele- gates. Returning towards the centre of the city by St Giles’s, we pass on the right the Taylor Building, partly devoted to the university gallery of pictures, which con- tains more than two hundred and seventy sketches and drawings by Michelangelo and Raphael, besides a Turner col- lection and individual paintings of interest. The rest of the building is divided between the Ruskin School of Drawing and the Taylor Library, which consists chiefly of books in modern European languages. The plan and architecture is Grecian, designed by Cockerell, and completed in 1849. Close by is the Martyrs’ Memorial (1841), commemor- ating the burning of Cranmer, Latimer, and Ridley. It resembles in shape the Eleanor crosses, and is 73 feet in height ; it was the first work which brought Sir George Gilbert Scott into notice.

The colleges may now be described, and for convenience of reference in alphabetical order (see also UNIVERSITIES). All Souls College (Collegiwm Omnium Animarum) occupies a central position, with fronts to Radcliffe Square and the High Street. The chief points of interest are the magnifi- cent reredos in the chapel, coeval with the college, but lost sight of since the Reformation until discovered and restored in 1872-76; the Codrington Library, chiefly of works on jurisprudence; and the turrets (1720) designed by Hawksmoor. The west front is due to Sir Christopher Wren. Founded in 1437 by Archbishop Chichele, with sixteen law fellows out of a foundation of forty, the college has always had a legal character which, combined with an almost entire absence of undergraduates, sufficiently marks it off from all the others. ‘The name records the ancient duty of praying for all who fell in the French wars of the early 15th century. Balliol College, at present the largest in numbers, is also among the oldest. In 1282 the Lady Dervorgilla, widow of John de Balliol, gave effect to his

wishes by issuing statutes to a body of students in Oxford who two years later settled on the present site of the college. The buildings are diverse in

OXFORD

style and date, the two most striking being the newest, the chapel built in 1856-57, in modern Gothic, by Butterfield, and the handsome hall erected by Waterhouge \ in 1876. The King's Hall and College of Brasenose pn… (Collegium Aenei Nast) is the combined work of William nos, _ Smith, bishop of Lincoln, and Sir Richard Sutton. The front quadrangle is among the most regular and, taken in connexion with the Radcliffe and St Mary's church, among the most picturesque in Oxford, remaining exactly as it was built at the foundation of the college in 1509, except that the third story was added, as in several other colleges, in the time of James J. The library and chapel date from the Restoration ; the roof of the latter shows some rich wooden fan-tracery. The name is that of one of the old halls absorbed into the new foundation, and probably signifies brew-house (from bracinum, malt, and ~~house), but is popularly connected with a brazen knocker above the gate, said to have been brought from Stamford after the migration of the university thither in 1334; it is however, first found in the 13th century. Christ Church qiyis (Aides Christe), the greatest and most imposing college, Chun | and projected on a still larger scale as Cardinal College by its first founder, Wolsey, was established by Henry VIII, in 1525. It is of a peculiar dual character, the cathedral being wholly within its precincts, and partly used as the chapel of the house, while the cathedral chapter shares in the government of the whole society. The dean presides over both institutions. The lower part of the great gate~~ way known as Tom Tower is Wolsey's design, the upper and incongruous part is by Wren; the large bell, weighing 7 tons 12 cwts., daily gives the signal for closing all the college gates by one hundred and one strokes at 9.5 p.M. The chief quadrangle, measuring 264 feet by 261 feet, was designed to have cloisters. The present classical buildings of Peckwater quadrangle are not of earlier date than 1705; the library on the south side was built in 1716-61. The latter contains valuable pictures and engravings not yet sufficiently known, as well as extensive collections of books. The hall (built in 1529), from its size (115 feet by 40 feet), the carving of the oak roof, the long lines of portraits, and the beauty of the entrance staircase, is one of the sights of Oxford. The

meadow buildings were erected in 1862-66. It is commonly said that the three great English religious revivals sprang from Christ Church, Wickliffe having been warden of Canterbury Hall, now part of the house, John Wesley a member of the college, and Pusey a canon. Corpus Christi College was founded in 1516 by Bishop Oorp Richard Fox, who expressly provided for the study of Greek and Latin; nor have classical traditions ever left | the ‘garden of bees,” as the first statutes term it. The chief ornament of the college is the library, which is rich in illuminated and early English MSS., and in early printed books. Exeter College may be said to have been founded Exet (as Stapeldon Hall) in 1314, by Walter de Stapeldon, bishop of Exeter; but Sir William Petre in 1566 largely added to the original endowment. Most of the buildings date from the present century; the chapel, the propor- tions of which resemble those of the Sainte Chapelle at Paris, was built in 1856-59 by Sir G. Gilbert Scott, the hall in 1818, the Broad Street front in 1855-58. The secluded gardens are beautifully situated beneath the shadow of the Divinity School and Bodleian. Hertford Hert

College, founded in 1874, is on a site of old and varied history. From the 13th century until 1740 it was occupied by Hart or Hertford Hall; at the latter date Dr Richard Newton refounded the hall with special statutes of his own framing as Hertford College. In 1822 the society of Magdalen Hall, after the fire at their buildings near Magdalen College, migrated thither, and finally the

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hall was merged in the new college which owes its existence to the munificence of Mr TT. C. Baring. The Welsh College, Jesus, dates from 1571, having been founded by Dr Hugh Price. Sir Leoline Jenkins, principal at the Restoration, was a conspicuous benefactor. The present buildings are of various dates. The direct connexion with the Principality extends to a moiety of the fellows and a majority of the scholars. Keble College is a testimony to the wide-felt reverence for the character and principles of the Rev. John Keble, who died in 1866. In his memory the college was founded with a special view to economical life and Christian training, based on the principles of the Church of England. Since its opening in 1870 its growth

has been continuous. The buildings are the design of Keble's friend Butterfield ; the richly ornamented chapel, the gift of Mr William Gibbs, was completed in 1876, and the library and hall in 1878. The style is Italian Gothic, the material to a large extent red brick relieved by white stone, and in the chapel by marble and mosaics. Bishop Richard Flemmyng founded

. Lincoln College in 1427, with the object, it is believed, of

opposing the doctrines of Wickliffe. Like Exeter and Jesus it boasts a second founder in Thomas de Rotherham, also bishop of Lincoln, in 1478. The library is of consider- able value, both for MSS. and books. The painted windows in the chapel were procured from Italy in the 15th century. Magdalen College is the most beautiful and the most complete in plan of all the colleges. The extensive water-walks in the Cherwell meadows, the deer park, the cloisters with their ivy-grown walls and quaint emblematic sculptures, the rich new buildings of pure Gothic, and, above all, the tower, combine in this conspicuous result. William Patten, better known as William of Waynflete, bishop of Winchester, established the college in 1456 for a president, forty fellows, and thirty scholars with chaplains and a full choir. The cloister quadrangle was first built in 1473, and the chapel in 1474-80; the latter has a decorated interior, an altarpiece of Christ bearing the Cross similar to that in Bolton Abbey, and painted windows. The tower, of exquisite proportions and harmony of detail, was commenced in 1492, and reached its full height of 145 feet in 1505 ; it stood fora few years isolated asa campanile. The custom of singing a hymn on the top at 5 A.M. on May-day has been kept up by the choir since the time of Henry VII. The meadow buildings date from 1733. The muniments and library are valuable, the former containing some 14,000 deeds, chiefly of religious houses suppressed at the Reformation. The high-handed attempt of James II. to force a president

'on the college in 1688 is matter of history. Merton

College is in a very definite sense the oldest ; the earliest extant statutes were given in 1264 by Walter de Merton, and before 1274 it was settled in Oxford, The statutes were a- model for all the more ancient colleges both in Oxford and Cambridge. The founder's special intention was to benefit the order of secular priests, and the first century of his society was more

prolific of great names than any similar period in any college. The fine chapel, which is also the parish church of St John the Baptist, rose gradually between 1330 and 1450, the tower belonging to the later part. The hall, of the 14th century, was thoroughly restored in 1872. The library, built about 1349, is the oldest existing library in England. To the east lie the quiet well-wooded gardens, still bounded on two sides by the city wall. New College, or more pro- perly the college of St Mary Winton, is the magnificent foundation of William of Wykeham, who closely connected it with his other great work Winchester School. Its name 18 still significant, for the first statutes marked a new departure, in the adaptation of monastic buildings and

rules to the requirements of a less fettered body of students ; and they, like those of Merton, were imitated by succeeding societies. The foundation-stone was laid in 1380, and the hall, chapel, and front quadrangle are of that period, except that the third story of the latter was added in 1674. The chapel is noteworthy for the west window, designed by Sir Joshua Reynolds, and the Flemish windows on the south side; the roof was renewed in 1880. The tower is built on one of the bastions of the city wall, and faces the new buildings in Holywell Street, erected in 1872-75, The gardens and cloisters are among _ the most picturesque sights of Oxford, the former encom- passed on the north and east by the city wall, still almost perfect. Oriel College was founded by Adam de Brome Oriel. in 1324, and reconstituted by Edward II. in 1326. The present buildings chiefly date from the first half of the 17th century. The Tractarian movement is closely connected with the college of Newman and Keble. Pembroke College (1624) derives its name from the Pem- chancellor of the university at the time when it was broke established by Richard Wightwick, partly by means of a legacy from Thomas Tesdale. The library contains many memorials of Dr Johnson, who was a member of the college. Queen’s College, so called from its first patroness, Queen’s. Queen Philippa, was founded in 1340 by Robert de Eglesfield, whose name is commemorated yearly in the custom of presenting a needle and thread (“aiguille et fil,” a rebus) to each fellow on New-Year’s Day. The present buildings are not older than the Restoration, while the front dates from the middle of the last century, and the west part of the front quadrangle was rebuilt after a disastrous fire in 1778. The interior of the chapel, which is classical in style, with an apse,

exhibits some fine wood- carving and windows. Queen’s possesses the largest and most valuable collegiate library of printed books, chiefly owing to the munificence of Bishop Barlow in 1691 and of Dr Robert Mason in 1841. On Christmas Day a boar’s head is brought into the hall to the accompaniment of an ancient carol. St John the Baptist’s College was the St John’s. work of Sir Thomas White, a London merchant, in June 1555. Archbishop Laud was closely connected with it, and built, almost entirely at his own expense, the second quadrangle, including the library ; his body rests within the college. The chapel and other parts of the buildings belonged to the earlier foundation of St Bernard’s College. The large gardens are skilfully laid out in alternate lawns and groves. ‘Trinity College, founded in February 1555 Trinity. by Sir Thomas Pope, was the first post-Reformation college and the first established by a layman. The library is the original one of Durham College, in which Richard de Bury’s books were deposited in the 14th century. The gardens are extensive, including a fine lime-tree avenue. University College, the proper title of which is the Great Uni- Hall of the University (Collegium Magne Aulx Universi- Vesity. tatis), is generally accounted the oldest college, although its connexion with Alfred is wholly legendary. It received the first endowment given to students at Oxford in 1249 from William of Durham, but its first statutes date from 1280, and its tenure of the present site from about 1340. None of the present buildings are older than the 17th century. The detached library was built in 1860. Wadham College was founded in 1610 by Dorothy Wadham. Wadham, in pursuance of the designs of her husband Nicholas, who died in 1609. The college buildings, made of exceptionally firm stone, have been less altered than those of any other college. The chapel exhibits a surpris- ingly pure Gothic style considering its known date, the early part of the 17th century. The meetings held in this college after the Restoration by Dr Wilkins, Bishop Sprat, Sir Christopher Wren, and others directly led to the institu-

Wor- cester.

Halls.

City build- ings,

Cathe- dral,

tion of the Royal Society. The gardens lie to the north and east. Worcester College, which has recently cele- brated the sexcentenary of its first building in 1283 as Gloucester Hall, was at first a place of study for Benedictines from all parts of the country, until it was dissolved at the Reformation, when the buildings passed to the see of Oxford. In 1560 the founder of St John's College reopened it as St John the Baptist's Hall, but after changing fortunes, and an attempt in 1689 to form it into a college for students of the Greek Church, it came in 1714 into the hands of the trustees of Sir Thomas Cookes, who founded the present college. The garden front still retains the antique style of Gloucester Hall, looking over the extensive gardens and pond. 'The other buildings rose at various periods in the 18th century, while the splendid interior decoration of the chapel, with its profusion of marble, inlaid wood, and painted panel-work, designed by Burgess, was conipleted in 1870. ;

Until Laud's time the number of private halls was con- siderable; by him five only were allowed to survive:— Magdalen Hall, now merged in Hertford College; St Mary Hall, founded in 1333, now destined to be absorbed into Oriel, as New Inn Hall into Balliol, and St Alban

'-Hall into Merton; and St Edmund Hall, which, though

closely connected with Queen's College, is likely to maintain a separate existence.

The public buildings of the city, as distinct from the university, do not require a detailed notice. The town- hall dates from 1752, the corn exchange and post-office from 1863 and 1882 respectively. The chief hospital is the Radcliffe Infirmary, opened in 1770, and due to the same liberal benefactor who has been mentioned in con- nexion with the Radcliffe Library, and who left funds for the erection of the large and important Radcliffe Obser- vatory, completed in 1795. There are two ladies' halls, Lady Margaret's and Somerville, and High Schools for boys and girls. Port Meadow is a large pasture to the north-west of the city, which has belonged from time immemorial to the freemen of the city. An extensive system of drainage has been recently carried out, involving the formation of

a sewage farm at Littlemore. Water is supplied from large covered tanks on Headington Hill, into which the water is forced from reservoirs at New Hinksey. The University Park, comprising 80 acres, is beautifully situated on the banks of the Cherwell.

The diocese of Oxford now includes the three ‘home counties” of Berkshire (originally in the diocese of Wessex, then till 1836 in that of Sherborne or Salisbury), Buckinghamshire (until 1845 under the see of Lincoln), and Oxfordshire (formerly in the dioceses of Dorchester, Winchester, or Lincoln). The patents for the formation of the bishopric bear dates of 1542 and 1546. The cathedral, already mentioned as part of Christ Church, was at first the church of St Frideswide, begun so far as the present buildings are concerned in about 1160, and forming “‘a fine example of Late Norman and Transitional work of early character.” The nave is pure Norman; the choir, with its richer ornament and delicate pendants, is the Transitional part; the present remarkable east end, having a circular window over two smaller round-headed ones, is believed to be a restoration of the original design. Part of the western end of the nave was destroyed by Wolsey to allow the large quadrangle to be formed. Within the cathedral the most noteworthy objects are the 15th century ‘shrine of St Frideswide,” the modern reredos, and the bishop’s throne, a memorial of Bishop Wilberforce. The stained glass is of different styles. The octagonal spire, 144 feet high, is of a peculiar pitch. The chapter- house on the south side of the nave, and the fine doorway leading from it to the cloisters, are early 13th-century

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work. Of the numerous parish churches some haye already been noticed. All Saints’ was built early in the 18th century, from designs by Dean Aldrich, in a classical style, but with much originality of detail; St Philip and St James’s and St Barnabas’s are among the most recent, the latter being in imitation of Italian style with separate campanile, The Roman Catholic church of St Aloysius in St Giles’s was opened in 1875.

History.—The legends connecting the city with Brute the Trojan, Mempric, and the Druids are not found before the 14th century, and are absolutely without foundation. The name, which is found in the 10th century as Oxenaford, and in the 11th as Oxenford, the Welsh (more modern)

Rhydychain, points to a ford for oxen across the shallow channels of the divided river near Folly Bridge, though many on theoretical grounds connect the first part of the word with a Celtic root signifying water, comparing it with Ouse, Oseney, Exford, and even Isis, The nucleus of the town was probably a nunnery, afterwards a house of sccular canons, founded in honour of St Frideswide in or before the 9th century, on the site of the present cathedral. After the peace of Wedmore (886) Oxford became a border town between Mercia and Wessex, and coins of Alfred with the legend OKSNAFORDA (on some types ORSNAFORDA) seem to prove that a mint was established there before the close of that century. The earliest undoubted mention of the city is in the English Chronicle under the year 912, when Edward the Elder made London and Oxford a part of his own kingdom of Wessex. To this period probably belongs the castle mound, still a conspicuous object on the New Road bctween the railway stations and the city, and similar to those found at Warwick and Marlborough. The subsequent notices of Oxford in the Chronicle before the Conquest prove the rapidly increasin importance of the place, both strategically as the chief stronghol of the valley of the upper Thames—as when the Danes attacked and burned it in 1009 and Sweyn took hostages from it and Winchester in 1018—and politically as a meeting-place for gemots in which the interests of north and south England were alike affected. Witenagemots were held there in 1015, when two Danish thegns were treacherously murdered; in 1036, when Harold was chosen king; and in 1065. In 1018, when Cnut first became king of all England, he selected the same spot for the confirmation by Danes and English of “Edgar’s law.” But the murder of King Edmund in 1016 and the death of Harold in 1039 seem to have given rise to the saying that it was ill-omened for the kings of England to enter or reside at Oxford. The Domesday survey of Oxford (c. 1086) is more than usually complete, and from it we gather that about six-sevenths of the town was held in equal proportions by ecclesiastical owners, by Norman followers of the king, and by citizens, one-seventh being in the king’s hands. The priory church of St Frideswide, and_ the churches of St Mary the Virgin, St Michael, St Peter in the East, and St Ebbe are mentioned ; from other sources it is known that St Martin’s at Carfax was in existence, and not less than seven more before the close of the century. It is a curious fact that, while two hundred and forty-three houses (dom?) paid tax, no less than four hundred and seventy-eight were waste (vastz), and even of the mansiones one hundred and ninety-one

were habitable and not fewer than one hundred and six waste. Oxford grew steadily when governed by the strong hand of Robert d'Oili (10702-1119). The existing remains which may be attributed to his building are the castle tower containing the church of St George and a crypt, the crypt and part of the church of St Peter's in the East, and the tower of St Michacl's; but it is known that he repaired other churches and built bridges. His nephew founded the abbey of Oseney, for Augustinian canons, in 1129. During the 12th century Beaumont Palace, built by Henry I. outside the north wall of the city, was a favourite royal residence, and the birthplace both of Richard I. and of John. In the charter granted by Henry I. the privileges of the town rank with those of London, and a large Jewry was formed near the site of the present town-hall. The flight of the empress Matilda from the castle over the ice-bound river to Abingdon in 1142, when besieged by Stephen, is a well-known incident. If we may trust the Oseney Chronicle it is in 1188 that we find the first traces of organized teaching in Oxford, the germ of the great university which was destined to far outstrip the city in privileges, wealth, and fame (see Universitigs). During the 18th century parliaments were often held in the town, notably the Mad Parliament in 1258, which led to the enactment of the " Provi- sions of Oxford." But this time also witnessed the beginning of the long struggle between the town and university, which produced serious riots, culminating on St Scholastica's day in 1354, and finally subjected the former to serious curtailment of its powers and jurisdiction. History has preserved the names of several heroes in the struggle for civic independence, but the issue was never doubtful, and the annals of the city in succeeding centuries admit of briefer narration. The religious orders found their way early

into Oxford :—in 1221 the Dominicans (whose settlement near the site of the present gas-works is still attested by Blackfriars Street, Preacher's Bridge, and Friar's Wharf) ; in 1224 the Franciscans (who built their house near Paradise Square); soon after 1240 the Car- melites (near Worcester College, to which Friar's Entry led); and in 1252 the Austin Friars, who settled near what is now Wadliam College. The greater orders were not less firmly established, —the Cistercians at Rewley Abbey (de Regali loco, founded about 1280), the Bencdictines scarcely later at Gloucester Hall and

Durham College, now Worcester and Trinity Colleges respectively. In the 13th and 14th centuries, as the university grew, an incrcasing number of students gathered in Oxford, filling the numerous halls and swelling the size, if not the wealth, of the place. The total of students in Henry III.'s time was placed at thirty thousand in con- temporary records seen by Thomas Gascoigne, but this can only be an exaggeration ora mistake. The town was frequently ravaged by plagues, and generally shared in the exhaustion and inactivity which marked the 15th century. The Reformation was unaccom- panied by important incidents other than those which affected the university and the see; but after the troubles of Mary's reign Oxford again began to revive under the personal favour of Elizabeth, which was continued by the Stuart kings. In the civil war Oxford becomes suddenly prominent as the headquarters of the Royalist party and the mecting-place of the king's parlia- ment. It was hither that the king retired after Edgehill, the two battles of Newbury, and Naseby ; from here Prince Rupert made his dashing raids in 1643. In May 1644 the earl of Essex and Waller first approached the city, from the east and south, but failed to enclose the king, who escaped to Worcester, returning once more after the engagement at Cropredy Bridge. The final invest- ment of the city, when the king had lost every other stronghold of importance, and had himself escaped in disguise, was in May 1646 ; and on June 20 it surrendered to Fairfax. Throughout the war the secret sympathies of the citizens were Parliamentarian, but there was no conflict within the walls. In October 1644 a destructive fire burnt down almost every house between George Street and St Aldate's church. Charles II. held the last Oxford parliament in 1681, the House of Lords sitting in Christ Church Hall, the Commons in the Schools. In the first year of George I.'s reign there were serious Jacobite riots, but from that time the city becomes Hanoverian in opposition to the university, the feeling coming to a head in 1754 during a county election, which was ultimately the subject of a parliamentary inquiry. The public works which distinguish the last century have been already men- tioned; the general history of the city proper presents few features of interest. Since the first railway (from Didcot) in 1844 its rate of progress has been accelerated, and it has at length vindicated for itself a vigorous aud independent municipal life.

Oxford grew up, as has been seen, on the slope leading from the ford near Folly Bridge to Carfax. Its earliest trade must have been twofold, partly

with London by way of the Thames, and partly with the west by the ford. No Roman road of importance passed within threc miles of the future town, and the Chiltern Hills prevented a dircct road to the metropolis. The first mention of townsmen is “seo buruhwaru” in the English Chronicle subd anno 1013, and of its trade in the toll paid to the abbot of Abingdon by passing barges from the 11th century (Abingdon Chron., vol. ii. p. 119). When the Domesday survey was made all the churches except St Mary Magdalen were within the line of walls. Mr James Parker estimates the population at that time to have been “not more than 1700,” occupying one hundred and uinety-one mansions and two hundred and forty-three houses. By the close of the 11th century the castle had been partly built, and the walls enclosed a space roughly of the shape of a parallelogram, its greater length lying nearly east and west, dominated by the castle at its western extremity. In Elizabeth’s time, as Ralph Agas’s view shows, nine- tenths of the city was still intra-mural. In 1789 the population was about 8300, but more than half lived outside the walls; in 1831, 20,650 ; in 1881 the municipal borough comprised 35,264, the local board district 38,289, exclusive of about 3000 members of the university. The chief extensions have been towards the north, Including both the fashionable quarter beyond the parks and the poorer suburb of Jericho, and on the south-east, where St Clement’s and Cowlcy St John have greatly increased. The newly built low-lying districts of Oseney town with Botley to tle west, and Grandpont with New Hinksey to the south, are comparatively unhealthy, contrasting in that respect with the houses rising on Headington Hill. The trade of the city has always been varicd Tather than extensive ; there has never been a staple produce, and the few manufactories are of recent introduction. Oxford being an agricultural centre has an important market, but the alternations of university terms and vacations affect the steadiness of general

usiness. The first charter known is one of Henry I., not now extant, mentioning a merchants’ guild (gilda mercatoria). That of Henry IT. specially connects the citizens with London, guia ipst et cives Londinenses sunt de una et eadem consuctudine et lege et libertate, They were to be butlers with the latter at the king’s

coronation—a privilege still retained by their representative. The earliest governing body was thc mayor and burgesses; aldermen were added in 1255, and the full institution from 1605 until 1835 consisted of a mayor, two bailiffs, four aldermen, eight assistants, and twenty-four common council men, together with a high steward, recorder, town-clerk, and inferior officers. At present the government is in the hands of a high steward, recorder, sheriff, and corporation, the latter consisting of a mayor, ten aldermen, and thirty councillors. For the election of the last two classes the city is divided into five wards. There is a local board of forty-seven members and a school board of seven. From the earliest times the city has been represented by two burgesses in parliament.

The chief authorities for the general history of Oxford are the works of Antony Wood, viz., the Hist. and Antiqu. of the University, 1792-96 (in Latin, 1674), Hist. and Antiqu. of the Colleges and Hails, 1786-90, and the Ancient and Present State of the City, 1773; andiIngram, Afemorials of Oxford, 1837 and 1847. There are good local directories and guides. Of a more special kind are James Parker's sketch of the early History of Oxford, 1871; Turner, Selections from

the Records of the City, 1879; Phillips, Geology of Oxford, 1871; and the accounts of All Souls, Exeter, and Magdalen Colleges by Burrows, Boase, and Bloxam

respectively. The Oxford Historical Society publishes works bearing on the history of the place. The history of the university will be found under Uni-VERSITIES, (F. M.*)

OXFORD, Ropert Haruey, First Earu or (1661- 1724), the eldest son of Sir Edward Harley, a prominent landowner in Herefordshire, was born in Bow Street, Covent Garden, London, 5th December 1661. His school days were passed near Burford, in Oxfordshire, in a small school which produced at the same time a lord high treasurer, a lord high chancellor, and a lord chief justice of the common pleas. The principles of Whiggism and Nonconformity were instilled into his mind at an early age, and if he changed the politics of his ancestors he never formally abandoned their religious opinions. At the Revolution of 1688 Sir Edward and his son raised a troop of horse in support of the cause of William IIL, and took possession

of the city of Worcester in his interest. The family zeal for the Revolution recommended Robert Harley to the notice of the Boscawen family, and led to his eléction, in April 1689, as the parliamentary representative of Tregony, a borough under their control. He remained its member for one parliament, when he was elected by the constituency of New Radnor, and he continued to represent it until his elevation to the peerage in 1711. From the first he gave great attention to the conduct of public business, bestowing especial care upon the study of the forms and ceremonies of the House, and acquiring from his labours that distinction which a knowledge of parliamentary precedents always bestows. This reputation marked him out asa fitting person to pre- side over the debates of the House, and from the general election of February 1701 until the dissolution of 1705 he held with general approbation the office of speaker. For a part of this period, from 18th May 1704, he combined with the speakership the duties of a principal secretary of state, displacing in that office the Tory earl of Nottingham, a circumstance which may have impelled that haughty peer to join the Whigs, some years later, in opposition to the treaty of Utrecht. At the time of his appointment as secretary of state Harley had given no outward sign of dissatisfaction with the Whigs, and it was mainly through Marlborough's good opinion of his abilities that he was admitted to the ministry. For some time, so long indeed as the victories of the great English general cast a glamour over the policy of his friends, and the constituencies were enthusiastic in support of a war policy, Harley continued to act loyally with his colleagues. But in the summer of 1707 it became evident to Godolphin that some secret influence behind the throne was opposing his wishes and shaking the confidence of the queen in her ministers. The sovereign had resented the intrusion into the adminis- tration of the impetuous earl of Sunderland, and had persuaded herself that the safety of the church depended on the fortunes of the Tories. These convictions were strengthened in her mind by the new favourite Abigail

Hill (a relative of the duchess of Marlborough through her mother, and of Harley on her father's side), whose soft and silky ways contrasted only too favourably in the eyes of the queen with the haughty manners of her old friend, the duchess of Marlborough. Both the duchess and Godolphin

communicated to Marlborough their belief that this change in the disposition of the queen was due to the sinister conduct of Harley and his relatives, and the persistent protestations of the accused persons to the contrary were accepted with an ill grace. Although Harley was for the present permitted to remain in his office, subsequent experience convinced the chiefs of the Government of the necessity for his dismissal, and an occurrence which showed the remissness of his official conduct, if it did not prove his treachery to the nation, furnished them with an opportunity for carrying out their wishes. An ill-paid and poverty-stricken clerk in Harley's office was detected in furnishing the enemy with copies of many documents which should have been kept from the knowledge of all but the most trusted advisers of the court, and it was found that through the carelessness of the head of the department the contents of such papers became the common property of all in his service. The queen was thereupon informed that Godolphin and Marlborough could no longer serve in concert with a minister whom

they distrusted, and of whose incapacity there were such.

proofs. They did not attend her next council, and when Harley proposed to proceed with the business of the day one of their friends drew attention to their absence, when the queen found herself forced (11th February 1708) to accept the resignation of her secret adviser. At that time it seemed as if Harley's fortunes had sunk for ever. Harley went out of office, but his cousin, who had now become Mrs Masham, remained by the side of the queen, and contrived to convey to her mistress the views of the ejected minister. Every device which the defeated ambition of a man whose strength lay in his aptitude for intrigue could suggest for hastening the downfall of his adversaries was employed without scruple, and not employed in vain. The cost of the protracted war with France, the danger to the national church, the chief proof of which lay in the prosecution of Sacheverell, were the weapons which he used to influence the masses of the people. Marlborough himself could not be dispensed with, but his proud spirit was insulted in a thousand ways, and his relations were dismissed from their posts in turn. When the greatest of these, Lord Godolphin, was sent into private life, five commissioners to the treasury were appointed (10th August 1710), and among them figured Harley as chancellor of the

exchequer. It was the aim of the new chancellor to frame an administration from the moderate members of both parties, and to adopt with but slight changes the policy of his predecessors ; but his efforts were doomed to disappointment. The Whigs refused to join in an alliance with the man whose rule began with the retirement from the treasury of the finance minister idolized by the city merchants, and the Tories, who were successful beyond their wildest hopes at the polling booths, could not understand why their leaders should pursue a system of government which copied the faults of their political opponents. The clamours of the wilder spirits of the party, the country members who met at the “October Club,” began to be re-echoed even by those who were attached to the person of Harley, when, through an unexpected event, his popularity was restored at abound.

(better known by the name of the marquis de Guiscard), °

was being examined before the privy council on a charge of treachery to the nation which had befriended him, when he stabbed Harley in the breast with a penknife (March

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1711). Toa man in good health the wounds would not have been serious, but the minister had been for some time indisposed—a few days before the occurrence Swift had penned the prayer “Pray God preserve his health, everything depends upon it”—and the joy of the nation on his recovery knew no bounds. Both Houses presented an address to the crown, suitable response came from the queen, and on Harley’s reappearance in the Lower House the speaker made an oration which was spread broadcast through the country. On the 24th May 1711 the minister became Baron Harley of Wigmore and earl of Oxford and Mortimer; before the month was ended he was created lord treasurer, and in the following year he became a knight of the Garter. Well might his friends exclaim that he had “ grown by persecutions, turnings out, and stabbings.”

With the sympathy which this attempted assassination had evoked, and with the skill which the lord treasurer possessed for conciliating the calmer members of either political party, he passed through several months of office without any loss of reputation. He rearranged the nation’s finances,

and continued to support her generals in the field with ample resources for carrying on the campaign, though his emissaries were in communication with the French king, and were settling the terms of a peace independently of England's allies. After many weeks of vacillation and intrigue, when the negotiations were frequently on the point of being interrupted, the preliminary peace was signed, and in spite of the opposition of the Whig majority in the Upper House, which was met by the creation of twelve new peers, the much-vexed treaty of Utrecht was at last brought to a conclusion. While these negotiations were under discussion the friendship between Oxford and St John was fast changing into hatred. The latter had resented the rise in fortune which the stabs of Guiscard had secured for his colleague, and when he was raised to the peerage with the title of Baron St John and Viscount Bolingbroke, instead of with an earldom, his resentment knew no bounds. The royal favourite, whose husband had been called to the Upper House as Baron Masham, deserted her old friend and relation for his more vivacious rival. The Jacobites found that, although the lord treasurer was profuse in his expressions of good will for their cause, no steps were taken to ensure its triumph, and they no longer placed reliance in promises which were repeatedly made and repeatedly broken. Even Oxford's friends began to complain of his habitual dilatori- ness, and to find some excuse for his apathy in ill health, ageravated by excess in the pleasures of the table and by the loss of his favourite child. By slow degrees the confidence of Queen Anne was transferred from Oxford to Bolingbroke; on the 27th July 1714 the former surrendered his staff as lord treasurer, and on the lst August the queen died.

On the accession of George I. the defeated minister retired to Herefordshire, but a few months later his impeachment was decided upon and he was committed to the Tower. After an imprisonment of nearly two years the prison doors were opened, and he was allowed to resume his place among the peers, but he took little part in public affairs, and died almost unnoticed 21st May 1724. Harley's political fame may now be dimmed by time, his statesmanship may seem but intrigue and finesse, but his character is set forth in the brightest colours in the poems of Pope and the prose of Swift. The Irish dean was his discriminating friend in the hours of prosperity, his unswerving advocate in adversity. The books and manuscripts which the first earl of Oxford and his son collected were among the glories of their

age. The manuscripts became the property of the nation; the books were sold to a bookseller called Osborne, and described in

a printed catalogue of four volumes, part of which was the work of Dr Johnson, In the recollection of the Harleian manuscripts, the Harleian library, and the Harlevan Miscellany, the family name will never die. (w. P. ©.)

OXUS. ‘This river rises in the lofty table-lands which are intercepted between the two great mountain ranges of central Asia, the Thian Shin and the Hindi Kush, in the region where they approach each other most closely. It flows westwards through a broad valley, receiving numerous affluents from the mountain ranges on either side; then bending to the north-west it traverses the arid deserts of western Turkestan on the borders of Bokhara, descends into and fertilizes the rich oasis of Khiva, and finally disembogues at the southern extremity of the Sea of Aral. Its course is roughly parallel to that of its sister river the Jaxartes, which rises to the north of the Thidn Shan water-parting, and disembogues at the northern extremity of the Sea of Aral.

The name Oxus is that by which the river is mentioned in the writings of the ancient Greek historians. In the older traditions of the Parsi books it is named the Veh- rid, in some form of which originates the classical name which we find it most convenient to use, and also it may be presumed the names of various territories on the banks of its upper waters, such as Wakhan, Wakhsh, and Washgird, which are no doubt identical in formation, if not in application, with the classical Oxiani, Oxii, and Oxi-Petra. The classical names have’ long ceased to be known to the inhabitants of the country. In early Mohammedan history the river was usually styled Al-Nahr, whence the title Ma waré 1 Nahr, or “ beyond the river,” which came to be bestowed on a province of Persia lying to the north of the Oxus, and which in modern use has been rendered Transoxiana. In subsequent Mohammedan writings Al- Nahr gives place to Jaihin, corresponding to the Gihon of the Mosaic garden of Eden. And now the river is known by Asiatics as the Amu Daria, a name of which the origin is uncertain.!

In the most remote ages to which written history carries us, the regions on both sides of the Oxus were subject to the Persian monarchy. Of their populations Herodotus mentions the Bactrians, Chorasmians, Sogdians, and Sace as contributing their contingents to the armies of the great King Darius. The Oxus figures in Persian romantic history as the limit between Iran and Turan, but the substratuin of settled population to the north as well as the south was probably of Iranian lineage. The valley is connected with many early Magian traditions, according to which Zoroaster dwelt at Balkh, where, in the 7th

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Sketeh Map of the Oxus. century B.¢., his proselytizing efforts first came into operation. Buddhism eventually spread widely over the Oxus countries, and almost entirely displaced the religion of Zoroaster in its very cradle. The Chinese traveller Hwen Tsang, who passed through the country in 630-644 A.p., fuund Termedh, Khilm, Balkh, and above all Bamian, amply provided with monasteries, stirpas, and

Natives of western India hold that it implies “mother” of rivers, im correlation with Ab{-sin or “father of rivers,” a title whieh is frequently given to its great southern neighbour, the river Indus.

colossal images, which are the striking characteristics of prevalent Buddhism ; even the Pamir highlands had their monasteries.

Christianity penetrated to Khorasan and Bactria at an early date ; episcopal sees are said to have existed at Merv and Samarkand in the 4th and 5th centuries, and Cosmas (c. 545) testifies to the spread of Christianity among the Bactrians and Huns.

Bactria was long a province of the empire which Alexander the Great left to his successors, but the Greek historians give very little information of the Oxus basin and its inhabitants. About 250 B.c. Theodotus, the “ governor of the thousand cities of Bactria,” declared himself king, simultaneously with the revolt of Arsaces which laid the foundation of the Parthian monarchy. The Greco- Bactrian dominion was overwhelmed entirely about 126 B.c. by the Yuéchi, a numerous people of Tibet who had been driven westwards from their settlements on the borders of China by the Hiongnu, the Huns of Deguignes. From the Yuéchi arose, about the Christian era, the great Indo-Scythian dominion which extended across the Hindi Kush southwards, over Afghanistan and Sind. The history of the next five centuries is a blank. In 571 the Haidthalah of the Oxus, who aresupposed to be descendants of the Yuéchi, were shattered by an invasion of the Turkish khakan; and in the following century the Chinese pilgrim Hwen Tsang found the former empire of the Haidthalah broken up into a great number of small states, all acknowledging the supremacy of the Turkish khakan, and several having names identical with those which still exist. The whole group of states he calls Tukhara, by which name in the form Tokharistan, or by that of Haiathalah, the: country continued for centuries to be known to the Mohammedans. At the time of his pilgrimage Chinese influence had passed into Tokharistan and Transoxiana. Yezdegird, the last of the Sasanian kings of Bokhara, who diedin 651, when defeated and hard pressed by the Saracens, invoked the aid of China; the Chinese emperor, Taitsung, issued an edict organizing the whole country from Ferghana to the borders of Persia into three Chinese administra- tive districts, with 126 military cantonments, an organization which, however, probably only existed on paper.

In 711-12 Mohammedan troops were conducted by Kotaiba, the governor of Khorasan, into the province of Khwarizm (Khiva), after subjugating which they advanced on Bokhara and Samarkand, the ancient Sogdiana, and are said to have even reached Ferghana and Kashgar, but no occuption then ensued. In 1016-25 the govern- ment of Khwarizm was bestowed by Sultan Mahmud of Ghazni upon Altuntash, one of his most distinguished generals.

Tokhéristan in general formed a part successively of the empires of the Sasanian dynasty of Bokhara (terminated 999 A.D.), of the Ghaznavi dynasty, of the Seljukian princes of Persia and of Khorasan, of the Ghori or Shansabanya kings, and of the sultans of Khwarizm. The last dynasty ended with Sultan Jalal-ud-din, during whose reign (1221-31) a division of the Moghul army of Jenghiz Khan first invaded Khwarizm, while the khan himself was besieging Bamian ; Jalal-ud-din, deserted by most of his troops, retired to Ghazni, where he was pursued by Jenghiz Khan, and again retreating towards Hindustan was overtaken and driven across the Indus.

The commencement of the 16th century was marked by the rise of the Uzbek rule in Turkestan. The Uzbeks were no one race, but an aggregation of fraginents from Turks, Mongols, and all the great tribes constituting the hosts of Jenghiz and Batu. They held Kindwz, Balkh, Khwarizm, and Khordsin, and for a time Badakhshan also; but Badakhshdn was soon won by the emperor Baber, and in 1529 was bestowed on his cousin Suliman, who by 1555 had established his rule over much of the region between the Oxus and the Hindi Kish. The Moghul emperors of India occasionally interfered in these provinces, notably Shah Jehan in 1646 ; but, finding the difficulty of maintaining so distant a frontier, they abandoned it to the Uzbek princes. About 1765 the wazir of Ahmed Shah Abdali of Cabul invaded Badakhshan, and from that time until now the domination of the countries on the south bank of the Oxus from Wakhan to Balkh has been a matter of frequent struggles between Afghans and Uzbeks.

The Uzbek rule in Turkestan has during the last twenty years been rapidly dwindling before the growth of Russian power. In 1863 Russia invaded the Khokand territory, taking in rapid succes- sion the cities of Turkestan, Chemkend and Tashkend. In 1866 Khojend was taken, the power of Khokand was completely crushed, a portion was incorporated in the new Russian province of Turkestan, while the remainder was left to be administered by a native chief almost as a Russian feudatory; the same year the Bokharians were defeated at Irdjar. In 1867 an army assembled by the amir of Bokhara was attacked and dispersed by the Russians, who in 1868 entered Samarkand, and became virtually rulers of Bokhara. In1873 Khiva was invaded, and as much of the khanate as lay on the right bank of the Oxus was incorporated into the

Russian empire, a portion being afterwards made over to Bokhara. Russia acquired the right of the free navigation of the Oxus throughout its entire course, on the borders of both Khiva and Bokhara. The administration of the whole of the states on the right bank of the Oxus, down to the Russian boundary line at Ichka

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Yar, is now in the hands of Bokhara, including Karategin—which the Russians have transferred to it from Khokand—and Darwaz at the entrance to the Pamir highlands. At the present time the statcs on the left bank of the Oxus, from its sources in the Panjah river down to the town and ferry of Khwaja Saleh, are mainly subject to Afghanistan ; from Khwaja Saleh to the frontiers of Khiva and Russia at Ichka Yar the left bank of the Oxus is subject to Bokhara ; from the same point the Afghan boundary is supposed to stretch across the Dasht-i-chul plains of the Turkomans, above Maimana, to Sarakhs, where it meets the Persian frontier.

The regions in which the Oxus takes its birth, and through which it passes until it becomes lost in the Sea of Aral, may be divided into upper, middle, and lower: the upper is constituted by the highlands between the Thidn Shan and the Hindi Kush ranges, and the middle by the plains and uplands which are situated in the broad valley between the western prolongations of the saine ranges; the lower lies in the plains of western Turkestan. Deserip-

tions of the chief provinces and states in the middle and lower regions will be found under Arauan TURKESTAN (vol. i. p. 241), including the eastern khanates of Kunduz, Khilm, Balkh, and Akcha, and the Chahér Wildyat, or Four Domains, viz. the western khanates of Sir-i-pul, Shibrghan, Andkhui, and Mainidna ; also under BADAKH- SHAN, Karatectn, Hissar, BoKHARa, and Kuiva; accounts have also been already given of Baorria, BALKu, and Bamian. Here we shall only treat of the highland regions of the Oxus, and the river itself in its downward course to the Sea of Aral, postponing all other matter to the article TURKESTAN (see also the map of Turkestan).

For a right understanding of the highland region, notice must be taken of its position relatively to the two great longitudinal systems of mountains, the Thi4n Shan and the Indian Caucasus, and their respective prolongations east and west, which form such a prominent feature in the physical geography of the continent of Asia. These mountain systems include between them a belt of table- lands of varying breadth, and generally of considerable altitude. The forces of nature by which both the

mountains and the intermediate table-lands were primarily |

evolved from the earth’s crust appear to have acted con- currently over the entire region, but with greatest elevat- ing effect along the northern edge of the Caucasus; for, though the highest peaks of the Hindi Kush and the Himalayan ranges are more frequently met with on spurs some distance to the south than on the northern water- parting, the elevated masses are here of greatest magni- tude ; here there are mountains whose peaks rise to great altitudes above the sea-level, but which are comparatively insignificant differentially, the visible height above the surrounding table-lands being rarely more than a third, and often less than a tenth, of the height above the sea; and here there are passes across great ranges of which the level is barely distinguishable from that of the surrounding table-lands, so that the traveller may cross a great water- parting without being aware of it, a tussock of grass decid- ing the course of the waters, whether towards the frontiers of China or of Europe or towards the Indian Ocean.

The elevated mass which forms a bridge between the Thién Shan and the Hindu Caucasus, in the quarter where they approach each other most

closely, constitutes the governing geographical and political feature of these regions, and gives birth to all the principal sources of the Oxus. A happy instinct has led the inhabitants to call it the Bam-i-dunia, or Roof of the World; modern European geographers have called it the “heart of Asia,” the “central boss of Asia.” It is the Tsungling of Chinese writers, the northern Imaus of Ptolemy, the Mountain Parnassus of Aristotle, “the greatest of all that exist toward the winter sunrise.” The geographical indications of the Puranas, considered in any but a fabulous light,

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point to it as Méru, the scene of the primeval Aryan paradise. Old Parsi traditions point to it as the origin and nucleus of the Aryan migrations. And it is here that the Mohammedan invaders are shown, by their iden- tification of the great rivers with the Gihon and Pison of the Mosaic narrative, to have believed that the terres. trial paradise, the cradle of the human race, was situated,

Few regions can present claims to interest and just curiosity so strong and various as this one. Its past history is interwoven with that of all the great Asiatic conquerors, and its position on the rapidly narrowing borderland between the British and the Russian dominions gives it additional interest at the present time. But its geography is most intricate and complicated, and has long been a fruitful subject of controversy. The region is intersected with mountain ridges and depressed river beds which are alike difficult to cross ; its altitude is unfavour- able for the growth of cereals, and it mostly lies buried in snow for half the year ; it is, moreover, sparsely inhabited, and does not produce sufficient food for the requirements of the inhabitants. It interposes a formidable barrier between eastern and western Turkestan across the ancient highway from Europe to China; and, though this barrier has been repeatedly crossed, the extant narratives of the journeys and descriptions of the routes present only occasional glimmerings of truth amidst a mass of error and confusion, and are at times barely available for sober inquiry; genuine facts of observation have been so mixed up with erroneous information that it has become impossible to reconcile conflicting statements or separate the true from the false. Thus within the last quarter of a century maps have been published by eminent. geographers in England

and Germany in which the great cities of eastern Turkestan are placed 3° to 4°, or over 200 miles, too far to the west, and the limits of the “heart of Asia” are materially narrowed,

The interest attaching to the region has even led to the fabrication of spurious documents which have darkened: the mist already enveloping it, and have betrayed eminent geographers into error and confusion.! .

While geography remained under the spell of these mis- chievous fictions, research was impeded, and an insurmount- able obstacle placed in the way of the true delineation of the region ; doubt was even thrown on the accuracy of the work of genuine explorers. But within the last decade the mist in which the “ Roof of the World” had so long been enveloped has been largely dispelled by the labours of Russian and British officers, and also by natives of India trained to geographical exploration and employed in con- nexion with the operations of the Great Trigonometrical Survey of India. In some parts there is still much doubt and uncertainty, but enough is now known to furnish the geographical student with a fairly accurate idea of the general course of the rivers and configuration of the table- lands and mountains.

Two systems of rivers give birth to the sources of the eee ee

1 Thus early in the present ccntury certain papers were lodged in the secret archives of the Russian Foreign Office which purported to give an account of two unpublished records of exploration in this obscure region, one by a German traveller, Georg Ludwig von —, said to have been an employé of the Anglo-Indian Government, the other by a Chinese traveller. They were brought to light in 1861, and excited the curiosity of all who were interested in the geography of this region. A few years afterwards it was discovered that a parallel mass of papers, cmbodying much of the same peculiar geography and nomenclature, but purporting to be the report of a Russian expedition sent through Central Asia to the frontiers of India, existed in the London Foreign Office. All three documents bear indubitable traces of having been fabricated for sale to the British and the Russian Governments by an acute geographer who, while availing himself of such genuine data as were actually within his reach, did not scruple to draw on his own imagination for the filling up of all blanks.

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Oxus, one to the north rising in and around the Alai plateau, the other to the south rising in the Pamir pla- teaus, of which there are several. The two systems are divided by a great chain of mountains known locally as the Kizil-yart range, but called by Fedchenko (looking from the north) the Trans-Alai range, and by recent Russian surveyors the Peter the Great range; it lies from east to west on the southern border of the Alai plateau, and throws out spurs westwards to Darwaz ; its medium height above the sea-level is 18,000 or 19,000 feet, with occasional peaks rising to 25,000 feet. Of the Oxianian affluents to its north and west the principal are the Wakhsh or Strkh-4b (=the Kizil-su=the Red River), rising in the Alai, and the Mukst and Khing-4b rivers, which join the Wakhsh in the district of Karategin.

The system of southern affluents is, however, the most important of the two politically as well as geographically, comprising as it does the water-partings which define the boundaries between China, Afghanistan, and Bokhara, and all the rivers of what is generally known as the Pamir region. The name Pamir is suggested by Bournouf to have been derived from Upa-Mért, meaning the lands “ beyond the mountain of Meru”; a later and more probable sugges- tion, by Major Trotter, is that it is the Khirgiz equivalent of Bam-i-dinia. It means simply an elevated steppe or plateau. By the people of the country it is not applied, as European geographers apply it, to the entire region, which is one of mountains as well as tablelands, but to each of the plateaus with the addition of a distinctive designation. Thus there is the Pamir-Kalin (great), the Pamir-Khurd (little), the Pamir-Alichur, the Pamir-Khargoshi (of the hare), the Pamir-Sarez (of the water-parting), and the Pamir- Rangkul, on which the Rangkul lake is situated. There is also another, the Pamir-i-Shiva, which, though only recently brought prominently to the notice of European geographers, is of considerable magnitude, elevation, and importance; it lies in that part of Badakhshdn which is enclosed to the north and east by the Panjah river, and to the south and west by a spur from the Hindu Kush range. This spur is an offshoot from the vicinity of the Tirich Mir“peak (25,400 feet) north of Chitral; it

lies between Faizabad and Ishkdshim, sinks to 10,900 feet at the Zebak pass, and then again, ascending to higher altitudes, trends to the north-west, and strikes the western spurs of the Kizil-yart range in the Darwaéz district; it forms the water-parting between the Kokcha river of southern Badakhshdn and the Panjah river. Though a spur from the main range, it is of itself an important range, and has some claim to be regarded as the western boundary of the Pamir table-lands, as it lies immediately over the Shiva Pamir; if the claim be admitted, the breadth of the elevated barrier between the plains of eastern and western Turkestan will be found to be about 250 miles, whereas geographers have hitherto accorded to the Pamir plateau a breadth of only 100 miles. Tho Panjah river flows downwards through the region where the spurs of this western bounding range meet those of the Kizil-yart range, passing between narrow and precipitous gorges which form @ natural gateway to the highlands, though one which in many parts is barely accessible, or has to be quitted altogether for the easier mountain passes on either hand.

The most elevated portion of the highlands occurs on the north-east border, above the plains of Kashgar and Yarkand. Here a chain of mountains, interwoven with the Thi4n Shén and the Kizil-yart ranges, trends to the east and south-east, and throws up peaks of great height, culminating in Tagharma (25,500 feet); viewed from the Plains to the east, it seems to form part of a great chain—

the Belt Tagh of Humboldt—which connects the Thidin

in range with the Hindi Kush; but it is broken

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through by rivers, and terminates over the plains of the Sarikol district. The line of water-parting which con-

| stitutes the real connexion between the Thian Shd4n and

the Hindu Kush lies more to the west, in hills which, emanating from the Kizil-yart range, pass between the Rangku] Pamir and the Kizil-yart plain, and then bending southwards strike an angle of the Hindu Kush range on

the borders of the Sarikol and Kanjut districts; they are probably nowhere of any great altitude above the general level of the table-lands; but they are of importance in that they may be regarded as the natural boundary between the states of eastern Turkestan now subject to China, and those of western Turkestan subject to Afghan- istan and Bokhara.

The best known river of the Pamir plateaus is the Panjah,1 which receives all the other rivers of this region before it enters the plains; above Kila Panjah it has two important affluents, one from the east rising in Kanjut, and probably about 120 miles long, the other from the north-east rising in the lake of the Great Pamir (Wood's Lake Victoria), and about 80 miles long. From the point of junction to Kila-Bdr-Panjah is 140 miles; here the united waters of the Sochdn and Shakhdara rivers from the east are received; 33 miles lower down, near Kila Wamar, the Bartang river, also from the east, is received. The upper source of the Bartang is the Ak-sti (white water) river, which rises in the Oikul or Gazkul lake of Little Pamir, and, winding round the highlands, passes through the Sarez Pamir, where its name changes to the Murghabi (water fowl), which lower down becomes Bartang (narrow passage). The Aksu-Bartang is probably the longest of the Pamir rivers ; its length exceeds 330 miles, while that of the Panjah from the source of its longest affluent down to the Bartang junction is probably under 300 miles ; thus it has been claimed as constituting, rather than the Panjah, the proper boundary line between Afghanistan and Bokhara. About 120 miles below Kila Wamar the Panjah debouches into the plains after receiving the Wanjab river of Darw4z on its right bank, and the Kof (Kufau) river coming from the Shiva Pamir on its left bank. Fifty miles farther on it receives on its right bank the Yakhst river conveying the waters of a system of valleys lying between the Panjah and the Wakhsh rivers, the courses of which are here nearly parallel; 18 miles onwards it receives (left bank) the Kokcha river of southern Badakhshin, and at this point it loses its individuality and becomes the Amu river; 80 miles to the west the Amu receives the Wakhsh or Surkh-ab river, when the whole of the waters of the Oxianian highlands are brought together into one channel.

Returning to the highlands, we briefly notice the princi- pal lakes. Chief of all is the Great Kéraktl—the Dragon Lake of Chinese writers; it stands in the Khargoshi Pamir, has an area of about 120 square miles, and an altitude

of 12,800 feet; it was long regarded as the source of the Oxus, but has recently been found to have no out- let. The Little Karakil and the Bulankul lakes, areas 15 and 8 square miles, on the Kizil-yart plateau, are probably over 13,000 feet. The Rangkul lake, area 15 square miles, is 12,800 feet. Wood's Victoria, the lake of. the Great Pamir, height 13,900 feet, has an area of 25

1 The name Panjah is conjectured to be derived from a confluence of five rivers; but more probably it is taken from the well-known fort of the same name, which is situated a little below the junction of the two upper affluents of the river. The fort derives its name cithcr from the circumstance of its being built on five mounds, or from a sacred edifice in the vicinity erected over a stone bearing the supposed impress of the palm and fingers (panjah) of Hazrat Ali, the son-in-law of Mohammed ; lower down the river, in Shighnan, there is a fort built over a similar mark, and called the Kila-Bar-Panjah ("the fort over the panjah ").

square miles. The Yashil-Kul, area 16 square miles, height 12,550 feet, is in the Alichtr Pamir, where in 1759 the Chinese troops surprised and defeated the Khwajas of Badakshan. The great Shiva-Kul, lately visited by Dr Regel, has, according to him, an- area ex- ceeding 100 square miles, and an altitude of 11,800 feet, and Wood alludes to it as of considerable magnitude. There are numerous small lakes, of which the most im- portant is the Oikul (13,100 feet), the source of the Ak-st river, in the Little Pamir.

Hill ranges crop up out of the table-lands in various quarters; their general direction is from north-east to south-west ; they form the boundaries between the several Pamirs and the principal water-partings between the valleys. The portion of the Hindu Kush range which lies immediately to the south of this region is of very varying altitude, sinking at the Baroghil pass to 12,000 feet, or only 1000 feet above the adjoining table-lands, but rising to heiglits of 22,600 to 25,400 in peaks to the west of that pass.

In 1872 the Panjah river was adopted by the British and the Russian Governments as the line of boundary between Bokhara and Afghanistan. But rivers which are readily crossed, and pass through valleys both sides of

which have much of life in common, rarely serve as bound- aries between the people residing on the opposite banks. The Panjah river has been found to divide no less than four states, Wakhadn, Shighndn, Roshan, and Darwaz, into two parts each; the first three of these are claimed by Afghanistan and the fourth by Bokhara, by whom they are administered—or at least are attempted to be admin- istered—without regard to the conventional boundary line of the Panjah; presumably, therefore, this line will have to be abandoned for the lines of water-parting along the hill ranges which form the natural boundaries of the several states.

The Pamir plateaus are generally covered with a rich soil which affords very sweet and nourishing grasses, though at too great an altitude for husbandry; there is an unlimited extent of summer pasture lands for the Khirgiz and other nomad tribes and the herdsmen of the surrounding districts. But for the plentiful supply of food for cattle which these regions afford during several months of the year, they could never have been crossed by the great armies and hordes which are said to have passed over them. The culturable areas are small, and are usually restricted to narrow ledges on the margins of the rivers, which, however, when well cultivated and manured yield rich returns ; food stuffs have to be largely obtained from the plains below ; mulberry trees thrive well and are much prized, because their unripened berries are ground to flour and form a serviceable article of food.

Wakhan contains some twenty-five scattered villages with about as many houses in each, and a population estimated at 3000 souls. Shighnan and Roshan may at present be regarded as one state, as they are governed by one ruler; the valleys of Sochdn-o-Gind and Shakhdara belong to the former, and that of Bartang to the latter (villages, 234; houses, 4477 ; souls, 22,000). Darwaz is famous for its difficult roads, called “ averings,” which are carried along the faces of perpendicular precipices, on planks resting on iron bolts driven into the rock ; the roads are, however, said to be much improved since the state came under Bokhara. Darwadz extends over the valley of the Khingab river to the north as well as over the valley of the lower Panjah. It has three amlakdarates on the Khing&b—Upper Wakhia, Lower Wakhia, and Khula4s— and one, Sagridasht, on an affluent of the

Khingab, containing 84 villages with 2458 habitations; it has also three subdivisions on the Panjah—south-eastern or

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-river from the east bifurcating from the upper Oxus or of

upper Darwaz terminating at Kila Khum, south-western Darwaz terminating at Zigor, and lower Darw4z—which contain 31 villages with 896 habitations on the right bank, including those of the Wanjab affluent, and 45 villages with 1379 habitations on the left bank, including thom of the Kufau river, which comes from the Shiva Pamir,

Russian officers have found that at the point where the Panjah enters the plains the level is about 1800 feet above the mean sea, or 12,100 feet below the sources of the river in Lake Victoria; 50 miles lower down, at the junction with the Kokcha, where the Panjah merges into the Ami Daria, the height is given as 1000 feet; at Kilif (214 miles) it is 730 feet; and at Chaharjui (203 miles), 510 feet,—thence the length of the course of the river to the Sea of Aral is somewhat over 500 miles. -The Aral is 158 feet above the mean sea-level. Thus the average slope of the Amt is about 14 inches in the mile above and 8 inches below Chahdrjui. The river has been reported to be navigable for steamers up to the junction with the Wakhsh or Surkhéb; and in 1878 a Russian steamer ascended it up to Khwaja Saleh, at the junction of the boundaries of Bokhara and Afghanistan.

The testimony of antiquity is almost unanimous in representing the Oxus as having once flowed into the Caspian Sea. Herodotus asserts that in his day the Jaxartes also entered the Caspian, but this statement is so highly improbable that it throws much doubt on his geographical accuracy as regards these regions. Greek historians also mention a river Ochus to the south of the Oxus, flowing towards the Caspian, into which it is supposed to have fallen either directly or after joining a branch of the Oxus; Strabo says that both this river and the Oxus were crossed by Alexander in marching from Samarkand to Merv. Maps recently published by both English and Russian geographers show the supposed ancient beds of the two rivers in the Turkomani deserts, the Oxus flowing southwards from the province of Khiva and joiing the Caspian below the Balkhan Bay, the Ochus flowing

from east to west in a lower latitude, and possibly striking the Oxus before it turns towards the Caspian. The first is called the old Oxus in English and the Uzboi in Russian maps ; the second is called the Onguz in Russian and the Chaharjui in English maps, and is some- times drawn as if it had been a bifurcation from the Oxus at some point near Chaharjui. But the recent explorations of the Russian engineer Lessar have shown that what hitherto has been taken for the dry bed of the Ochus is not the bed of a river, but merely a natural furrow between sand-hills, that it cannot be the continuation either of a

the Tejend river from the south as has been supposed, and also that it does not join the Uzboi, but ceases at a distance of fully 60 miles from the ancient bed of that river. Thus the bed of the Ochus has still to be discovered.

As regards the Oxus, some eminent geographers are Of opinion that it has disembogued into the Aral Sea from time immemorial as at this day; other geographers of equal weight have asserted that the Aral has fluctuated at different periods of. history between the condition of a great inland sea and that of a reedy marsh, according to the varying course of its two feeders the Jaxartes and the | Oxus. Now the position and height of the head of the delta of the Oxus relatively to the Aral and the Caspian Seas are such that comparatively slight changes in the relations of the river to its banks and bed would readily divert its course from one sea to the other. Khwéja-ili, at the head of the delta, is 217 feet above the mean sea; the Aral is 158 feet above and the Caspian 85 feet below the mean sea. The length of channel from Khwaja-ili to the Aral is 110 miles, with a fall of 59 feet, or about 6 inches

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in the mile; the length of channel from the town of Urganj near Khwaja-ili to the Caspian is about 600 miles, with a fall of (say) 300 feet, or also about 6 inches to the mile. ‘Thus the degree of slope is much the same in both

directions, and consequently the blocking of the channel towards one sea—either naturally as by an accidental deposit of silt, or artificially by the construction of dams for the diversion of the river—would most probably be soon followed by a flow of water towards the other sea. The writings of Strabo, Pliny, and Ptolemy indicate that from 500 B.C. to 600 A.D. the Oxus flowed into the Caspian. About 605 a great change is said to have taken place, which turncd the full stream of the Oxus into the Aral. In subsequent years dams were constructed for irrigation purposes which prevented the stream from reverting to the Caspian. In 1221, during the siege of Urganj by the Turks, the dams were purposely broken down, and the stream was allowed to find its way back to the Uzboi, which had been deserted for several centuries. But by 1643 the Oxus is said to have been again debouching into the Aral, as at the present time.

Authorities. —Colonel Yule's " Essay" in Wood's Oxus, 2d ed. ; Id., " Papers connected with the Upper Oxus Regions," in Jowr. Roy. Geog. Soc., xlii.; Sir Henry Rawlinson, England and Russia in the Fast ; 1d., Review of Yule's " Marco Polo," in Edin. Rev., January 1872; Id., "Monograph on the Oxus," in Jour. Roy. Geog. Soc., xlii.; Id., " Notes on the Ochus," in Proc. Roy. Geog. Soc., Xx.; Id., "Road to Merv," in Proc. Roy. Geog. Soc., March 1879; Price, Mahomedan History ; Lenz, Ancient Course of the Amu-Daria, translated from German by C. G.; Arendarenko, Darwdz and Karateghin, translated from Russian Military Journal by R. M.; General Walker, Map of Turkestan, 6th ed., 1883; "The Russian Pamir Expedition," in Proc. Roy. Geog. Soc., March 1884. (J. T. W.)

OXYGEN. See Cuemistry, vol. v. p. 479 sq.

OXYHYDROGEN FLAME. Hydrogen gas readily burns in oxygen or air with formation of vapour of water. The quantity of heat evolved, according to Thomsen, amounts to 34116 units for every unit of weight of hydrogen burned, which means that, supposing the two gases were originally at the temperature of, say, 0° C., to bring the hot steam produced into the condition of liquid water of 0° C., we must withdraw from it a quantity of heat equal to that necessary to raise 34116 units of weight of liquid water from 0° to 1° C. This heat-disturbance is quite independent of the particular mode in which the 'process is conducted ; it is the same, for instance,

whether pure oxygen or air be used as a reagent, being neither more or less than the balance of energy between 1 part of hydrogen plus 8 parts of oxygen on the one hand and 9 parts of liquid water on the other. The temperature of the flame, on the other hand, does depend on the circumstances under which the process takes place. It obviously attains its maximum in the case of ‘the firing of pure“ oxyhydrogen” gas (we mean a mixture of hydrogen with exactly half its volume of oxygen, the quantity it, combines with in becoming water). It becomes less when the “ oxyhydrogen” is mixed with excess of one or the other of the two co-reagents or an inert gas such as nitrogen, because in any such case the same amount of heat spreads over a larger quantity of matter. To calculate the “calorific effect,” we may assume that, in any case, for every 1 grain of hydrogen burned 9 × 637 =5733 units of heat are spent in #e conversion of the 9 grains of liquid water (theoretically imagined to be) produced into steam of 100° C., and that only the rest of 34116 — 5733 = 28383 units is available for heating up the products of combustion. Now the specific heat of steam (from 120 to 220° C.) has been found to be equal to 0°4805 units; hence, on the basis of certain obvious (but bold) assumptions, in the firing of 9 grains of oxyhydrogen gas, as every 9× 0‘4805 units of heat correspond to an

increase of 1° C. in temperature, the temperature of the flame should be by 28383 + 9 times 0°4805 (or 6564° C.) higher than 100°, or equal to 6664° C.

Let us now consider the case of 1 grain of hydrogen mixed with the quantity of air containing 8 grains of oxygen, 7.¢., the case of 1 grain hydrogen mixed with 8 grains of oxygen and 26°78 grains of nitrogen. Here the temperature ¢ of the flame will be governed by the equa- tion, 28383 = (t-— 100) x 9 × 0°4805+¢ x 26°78 × 0:2438, —the last coefficient being the specific heat of nitrogen. Thus ¢=2655° C., as against the 6664° obtained with pure oxygen. But one of our tacit assumptions is obviously untenable; ready-made vapour of water, if subjected to even the less of the two temperatures, would suffer far-going dissociation involving an absorption of heat and consequently a depression of tempera- ture. Hence

supposing a mass of oxyhydrogen gas to have been kindled, as soon as the temperature has passed a certain point the progress of the process of combina- tion will be checked by that of the corresponding dis- sociation, which latter, as the combustion progresses, will go on at a greater and greater rate, or until it just com- pensates the effect of the process of combination. That is to say, a8 soon as through the combustion of a certain fraction of the oxyhydrogen a certain temperature-(far less than 6664° C.) has been produced, there is no further increase of temperature, and the uncombined gas-residue would remain unchanged, if it were not for the practically unavoidable loss of heat by radiation and conduction, which enables it to become water.

This interesting matter was inquired into experimentally by Bunsen. He exploded fulminating gas mixtures in a close vessel constructed so that the maximum tension attained by the gas-contents during the combustion could be observed and measured, and from this value and the analytical data he calculated the maximum temperature and the proportion of gas-mixture which had assumed the form of a chemical compound at the moment when the maximum temperature prevailed. He found (a) for the case of pure oxyhydrogen gas—maximum temperature = 2844″ C., fraction of burned gas at the respective moment 0°337 ; (b) for the case of a mixture of 1 volume of oxygen, 2 volumes of hydrogen, and 3°78 of nitrogen (very nearly the same as one volume of oxygen in the shape of air)— maximum temperature = 2024° C., burned gas correspond- ing=0°547 of the potential water. Hence we see that the temperature of a pure oxyhydrogen flame is not so much above that produced in the combustion of hydrogen by air as we should have concluded from our calculations. But, whatever the exact numerical value may be, it has long been known that the calorific effect of an oxyhydrogen flame exceeds that of any furnace, and the effect has long been put to practical use in the oxyhydrogen lamp.

The most efficient form of this instrument is that which was given to it long ago by Newman, who pumps pure oxyhydrogen into a strong copper reservoir under 2 to 3 atmospheres’ pressure, lets the gas stream out of a narrow nozzle, and kindles it. The nozzle in the original apparatus consisted of a glass tube about 4 inches long and of gy-inch bore. Newman worked long with this ap- paratus without any accident occurring; but when he once

came to substitute a tube of #y-inch bore the flame travelled back and the apparatus burst like a bomb-shell. Of the many safety arrangements suggested we will mention only that of Hare, who inserts a plug of (microscopically) porous copper between reservoir and nozzle, and forces the gas through this plug by applying a sufficient pressure. The plug of course acts on the principle of the Davy lamp, and offers protection as long as it has not got heated. But it may get hot without the operator noticing it, aud probably has done so occasionally. At any rate, the use of ready mixed oxyhydrogen has long been given up in favour of the very oldest form of lamp, which was invented, before Newman's, by Hare. Hare's lamp, in all essential points, is our present gas-blowpipe as used for glass-blowing. The fuel (hydrogen, or coal-gas, which works as well) streams out of the annular space between two co-

axial tubes, while oxygen is being blown into the hydrogen flame through the ecntral tube. The calorific effeet of a Hare's lamp is of course less than that of Newman's, but still exceeds that of any ordinary fire ; it is inferior only to that of the eleetrie are. Platinum fuses in the flame with facility, and siliea and alumina (though absolutely infusible in the metallurgist's sense) run into viscid glasses. Notwithstanding its enormous temperature, an oxy-hydrogen flame emits only a feeble light; but this arises only from the absenee in it of good radiators. We need only communieate its high temperature to some non-volatile and infusible solid, and a considerable portion of the heat is converted into radiant energy which streams forth as a dazzling white light. In the oxyhydro- gen lamp as used in connexion with the magie lantern or the "solar" mieroseope, a bit of lime fixed to an upright wire serves as aradiator. Magnesia is said to be better, and it has been said that zireonia exeels both. Now that the electric light is com- ing into general use, the oxyhydrogen lamp as a source of light will soon be a thing of the past. It is sure, however, to survive as a powerful producer of intense heat, and not for scientific purposes only. Thanks to the pioneering activity of Deville and Debray, it has found its way into the platinum works, and will hold its ground there until it may be superseded by the electric arc. The

soldering together of the several parts of a platinum apparatus is now done “ antogynically ” (4.¢., Without the interposition of any foreign “ solder ”) by means of the oxyhydrogen blowpipe,—a great improvement over the old process of soldering with gold, which

stripped the platinum-work ofits most valuable character, namely,.

its relative infusibility. (W. D.) OXYNOTUS, the name of a genus of birds now ascer- tained to be peculiar to two of the Mascarene Islands—Mauritius and Réunion (Bourbon)—where the name of Cuisinier is applied to them, and remarkable for the fact, almost if not quite unique in Ornithology,! that, while the males of both species are almost identical in appearance, the females are wholly unlike each other. Though the habits of the Mauritian species, O. rufiventer, have been very fairly observed, there seems to be nothing in them that might account for the peculiarity. The genus Oxynotus is generally placed in the group known as Campophagide, most or all of which are distinguished from the Laniidx (to which they seem nearly allied) by the feathers on the lower part of the back and on the rump having the basal portion of the shaft very stiff and the distal portion soft— a structure which makes that part of the body, on being touched by the finger, feel as though it were beset with blunt prickles. Hence the name of the genus conferred by Swainson, and intended to signify “prickly back.” The males, which look rather like miniature Grey Shrikes (Lanius excubttor and others), are—except on close exami- nation, when some slight differences of build and shade become discernible—quite indistinguishable; but the female of the one species has a reddish-brown back, and is bright ferruginous beneath, while the female of the other species is dull white beneath, transversely barred, as are the females of some Shrikes, with brown. Both sexes of each species, and the young of one of them, are described and figured in The Ibis for 1866 (pp. 275-280, pls. vii. and viii). (A. N.) OYER AND TERMINER, in English law, is one of the commissions by which a judge of assize sits (see AssizE). By the commission of oyer and terminer the commissioners (in practice the judges of assize, though other persons are named with them in the commission) are commanded to make diligent inquiry into all treasons, felonies, and misdemeanours whatever committed in the counties specified in the commission, and to hear and determine the same according to law. The

inquiry is by means of the grand jury ; after the grand jury has found the bills submitted to it, the commissioners proceed to hear and determine (oyer and terminer) by means of the petty jury. The words oyer and terminer are also used to

1 The only other instance cited by Darwin (Descent of Man, ii. pp. 192, 193) is that of two species of Paradisea; but therein the males differ from one another to a far greater degree than do those of Oxynotus.

denote the court which has jurisdiction to try offences within the limits to which the commission of oyer and terminer extends.

By 7 Anne c. 21 the crown has power to issue commissions of oyer and terminer in Seotland for the trial of treason and mis- prision of treason. Three of the lords of justiciary must be in any such commission. An indietment for either of the offences mentioned may be removed by certiorari from the court of oyer and terminer into the court of justiciary.

In the United States oyer and terminer is the name given to courts of eriminal jurisdiction in some States, ¢.g., New York, New Jersey, Pennsylvania, and Georgia.

OYSTER. The use of this name in the vernacular js equivalent to that of Ostrea in zoological nomenclature ; there are no genera so similar to Ostrea as to be confounded with it in ordinary language. Ostrea is a genus of Lamel- libranch Molluscs, belonging to the third order Monomya, the valves of its shell being closed by a single large adductor muscle. The degeneration produced by sedentary habits in all lamellibranchs has in the oyster reached its most advanced stage. The muscular projection of the ventral surface called the foot, whose various modifications characterize the different classes of Mollusca, is almost entirely aborted. The two valves of the shell are unequal in size, and of different shape; the left valve is larger, thicker, and more convex, and on it the animal rests in its natural state. This valve, in the young oyster, is attached to some object on the sea-bottom ; in the adult it is some times attached, sometimes free. The right valve is flat, and smaller and thinner than the left. In a corresponding manner the right

side of the animal’s body is somewhat less developed than the left, and to this extent there isa departure from the bilateral symmetry characteristic of lamellibranchs.

The organization of the oyster, as compared with that of a typical lamellibranch such as Anodon (see MoLtusca), is brought about by the reduction of the anterior part of the body accompanying the loss of the anterior adductor, and the enlargement of the posterior region. The pedal ganglia and auditory organs have disappeared with the foot, at all events have never been detected; the labial ganglia are very minute, while the parieto-splanchnic are well developed, and constitute the principal part of the nervous system.

According to Spengel the pair of ganglia near the mouth, variously called labial or cerebral, represent the cerebral pair and pleural pair of a gastropod combined, and the parieto-splanchnic pair correspond to the visceral ganglia, the commissure which connects them with the cerebro-pleural representing the visceral commissure. Each of the visceral ganglia is connected or combined with an olfactory ganglion underlying an area of special- ized epithelium, which constitutes the olfactory organ, the osphradium. This view (which, it may be pointed out, differs from that given under Motzvusca) alone admits of a satisfactory comparison between the lamellibranch and the gastropod ; if the parieto-splanchnic were merely an olfactory ganglion its connexion by a commissure with its fellow would be an abnormality, and the olfactory ganglion in the lamellibranch would innervate the gills, adductor muscle, mantle, and rectum, parts which in gastropods are innervated from the visceral ganglia. The heart and pericardial chamber in the oyster lie along the anterior face of the adductor muscle, almost perpendicular to the direction of the gills, with which in Anodon they are parallel. In Anodon and the majority of lamelli- branchs the ventricle surrounds the intestine; in the oyster the two are quite independent, the intestine pass- ing above the pericardium. The renal organs of the oyster were discovered by Hoek to agree in their mor- phological relations with those of other lamellibranchs.

The generative organs of the oyster consist of a system of branching cavities on each side of the body lying immediately beneath the surface. All the cavities of a side are ultimately in communication with an efferent duct opening on the surface of the body a little above the line of attachment of the gills. The genital opening on each side is situated in a depression of the surface into which the renal organ also opens. The genital products are derived from the cells which line the cavities of the genital organs. The researches of Hoek have shown that in the same oyster the genital organs at one time produce ova, at another spermatozoa, and that consequently the oyster does not fertilize itself. How many times the alternation of sex may take place in a season is not known. It must be borne in mind that in what follows the species of the European coasts, Ostrea edulis, is under consideration. The ova are fertilized in the genital duct, and before their escape have undergone the earliest stages of segmentation. After escaping from the genital aperture they find their way into the infra-branchial part of the mantle cavity of the parent, probably by passing through the supra-branchial chamber to the posterior extremity of the gills, and then being conducted by the inhalent current caused by the cilia of the gills into the infra-branchial chamber. In the latter they accumulate, being held together and fastened to the gills by a white viscid secretion. The mass of ova thus contained in the oyster is spoken of by oyster fishers as “white spat,” and an oyster containing them is said to be “sick.” While in this position the ova go through the series of changes figured in vol. xvi. p. 638 (fig. 6). At the end of a fortnight the white spat has become dark- coloured from the appearance of coloured patches in the developing embryos. The embryos having then reached the condition of “trochospheres” escape from the mantle cavity and swim about freely near the surface of the water among the multitude of other creatures, larval and adult, which swarm there. The larve are extremely minute, about =, inch long and of glassy transparency, except in one or two spots which are dark brown. From the trochosphere stage the free larve pass into that of “‘veligers.” How long they remain free is not known; Prof. Huxley kept them in a glass vessel in this condition fora week. Ultimately they sink to the bottom and fix themselves to shells, stones, or other objects, and rapidly take on the appearance of minute oysters, forming white disks ;’, inch in diameter. The appearance of these minute oysters constitutes what the fishermen call a “ fall of spat.” The experiment by which Hoek conclusively proved the change of sex in the

oyster was as follows. In an oyster containing white spat microscopic examination of the genital organs shows nothing but a few unexpelled ova. An oyster in this condition was kept in an aquarium by itself for a fortnight, and after that period its genital organs were found to contain multitudes of spermatozoa in all stages of development.

The breeding season of the European oyster lasts from May to September. The rate of growth of the young oyster is, roughly speaking, an inch of diameter in a year, but after it has attained a breadth of 3 inches its growth 18 much slower. Prof. Mébius is of opinion that oysters over twenty years of age are rare, and that most of the adult Schleswig oysters are seven to ten years old.

The development of the American oyster, O. virginiana, and of the Portuguese oyster, O. angulata, is very similar to that of 0. edulis, except that there is no period of incubation within the mantle cavity of the parent in the case of these two species. Hencc ; 1s that so-called artificial fertilization is possible; that is to say, < fertilization may be allowed to take place in a tank or aqua- mum in which the conditions are under control. But if it is possible to procure a supply of spat from the American oyster by

Keeping the swarms of larva in confinement, it ought to be pos-

sible in the case of the European oyster. All that would be necessary would be to take a number of mature oysters containing white spat and lay them down in tanks till the larvee escape. This would be merely carrying oyster culture a stcp further back, and instead of collecting the newly fixed oysters, to obtain the frce larvee in numbers and so insure a, fall of spat independently of the uncertainty of natural conditions.

Natural beds of oyster occur on stony and shelly bottoms at depths varying from 3 to20 fathoms. Innature the beds are liable to variations, and, although Prof. Huxley is somewhat sceptical on this point, it seems that they are easily brought into an unproduc- tive condition by over-dredging. Oysters do not flourish in water containing less than 3 per cent. salt; and hence they are absent from the Baltic. The chief enemies of oysters are the dog-whelk, Purpura lapitlus, and the whelk-tingle, Murex erinaeeus, which bore through the shells. Starfishes swallow oysters whole. Cliona, thie

boring sponge, destroys the shells and so injures the oyster; the boring annelid Leweodore also excavates the shell.

The wandering life of the larve makes it uncertain whether any of the progeny of a given oyster-bed will settle within its area and so keep up its numbers. It is known from the history of the Liimfjord beds that the larve may settle 5 miles from their place of birth.

The genus Ostrea has a world-wide distribution, in tropical and temperate seas; seventy species have been distinguished. Its nearest allies are Anomia among living forms, Gryphwa amibng fossils. For the so-called Pearl-Oyster see Peart. (J. T. C.).

Oyster Industry.

The oyster industry of the world is seated chiefly in the United States and France. Great Britain has still a few natural beds remaining, and a number of well-con- ducted establishments for oyster culture. Canada, Holland, Italy, Germany, Belgium, Spain, Portugal, Denmark, Norway, and Russia have also oyster industries, which are comparatively insignificant, and in the case of the two countries last named, hardly worthy of consideration in a statistical statement. Recent and accurate statistics are lacking except in two or three instances. A brief review by countries in the order of their importance is here pre- sented. .

United States.—This is by far the inost extensive of the fishery industries of the country, yielding products three times as valuable as those of the cod fishery and six times those of the whale fishery. In 1880 it employed 52,805 persons, and yielded 22,195,370 bushels, worth to the fishermen $9,034,861. On 13,047,922 bushels there is a rise of value in passing from producers to market, which amounts to $4,368,991, and results either from replanting or from packing in tin cans. The value of the capital invested in the industry is returned as $10,583,295. There are employed 4155 vessels, valued at $3,528,700, and 11,930 boats. The actual fishermen number 38,249, the shoresmen 14,556. Fully 80 per cent. of the total yield is obtained from the watcrs of Chesapeake Bay.

France.—The oyster industry of France employed in 1881 29,4312 men, women, and children in the parks, beds, and preserves. The number of such establishments upon the public domain was 32,364, with an area of 19,891 acres, and 970 establishments upon private property, with an area of 926 acres. From_ these 374,985,770 oysters were dredged during the season of 1880-81, from September 1 to June 15, worth 2,061,758 francs, while the total number of oysters disposed of during this period amounted to 680,372,750, worth 17,951,114 francs. This total includes the oysters dredged in the sea as well as those gathered from the arti- ficial breeding-grounds or parks.

Great Britain.—A brief discussion of the British oyster fisheries may: be found under FisHErtEs, vol. ix. p. 265, A recent estimate® gives the total value of the oysters obtained from British seas at £2,000,000, worth 2d. each, or, perhaps, 240,000,000 in all. An extensive import trade is carried on with the United States, which has grown up within the past decade, as is shown by the following statement* of import values:—1874, $41,419;

1 The statistical summary prepared for the Fisheries Division of the Tenth Census by Mr Ernest Ingersoll shows the details, by States, of the oyster industry of the whole country.

2 Bouchon-Brandely stated in 1877 that the industry of oyster culture in France supported a maritime population of 200,000. It is difficult to reconcile this statement with the official statistics.

3 That of Mr James G. Bertram in Brit. Quart, Rev. for January

1883.

- Derived from the records of the United States Treasury.

1875, $38,733 ; 1876, $99,012 ; 1877, $121,301 ; 1878, $254,815 ; 1879, $306,941 ; 1880, $366,403 ; 1881, $414,584 ; 1882, $372,111 ; 1883, $371,497.

Holland.—Since 1870 the beds in the province of Zealand have been greatly enriched by careful methods of culture and protection; and in 1881 the product amounted to 21,800,000 oysters, worth about 1,350,000 guilders.1 About half the product of the Duteh oyster fishcry is sent to England, and large quantitics of the young oysters are laid down to fatten in the English oyster-beds.

Germany.—Germany has a small oyster industry on the west coast of Schleswig-Holstein.2 According to Lindeman, the largest annual product of these beds has rarely exceeded 4,000,000 oysters. From 1859 to 1879 they were rented to a company in Flensburg for an annual payment of 80,000 marks. In 1879 the lease was trans- ferred to a Hamburg firm, who paid for that year 163,000 marks.

Italy.—Oyster culture in Italy, according to Bouchon-Brandely,? is carried on in only one locality, Taranto, though small quan- tities of natives are obtained from the Gulfs of Genoa and Naples, from the coasts of the Adriatic, and from the ponds of Corsica. The sea of Taranto is leased by the city to a company that pays an annual rent of 38,000 francs. The product of this body of water is estimated variously at from 6,000,000 to 10,000,000 oysters yearly. The entire annual product of Italy does not probably ex- ceed 20,000,000 oysters, valued at about £40,000.

Belgium.—Oyster culture is carried on upon a small scale at Ostend. There being no native beds, the seed oysters are brought from England, a practice which, according to Lindeman, originated as carly as 1765. The product probably does not exceed 10,000 bushels a year, and is consumed chiefly in Germany and Holland, though there is a small exportation.

Spain.—According’ to a recent report by: Don Francisco Sola, there are forty-three establishments in Spain for the cultivation of oysters and other shell-fisheries. The amount of oysters annually produced is estimated at 167,673 kilogrammes (368,880 Ib), valued at 50,296 pesetas (about £2000). These are exported to Algiers, France, Portugal, and South America.

Portugal.—There appear to be no statistics for Portugal. Con- siderable quantities of seed oysters are planted at present in the Bay of Arcachon and

elsewhere in France, and in England the Anglo-Portuguese oyster is apparently growing in favour.*

Denmark, —The very insignificant oyster fishery of Denmark has its seat chiefly in the Liimfjord and at Frederikshaven. All the oyster-beds, being Government property, are carefully protected by law. Statistics for late years are not accessible. In 1847 the product of the Fredcrikshaven beds was about 200,000 oysters; but the yield of late years has been much smaller. The Liimfjord beds were dis- covered about 1851. From 1876 to 1881 the Danish oyster fisheries were leased to a firm in Hamburg, which paid 240,000 kroner (£18,000) as yearly rental.

Russia,—Grimin states that a species of oyster, Ostrea adriatica, is found in considerable numbers along the coast of the Crimea, and is the object of a considerable trade. Oysters brought from Theodosia cost in St Petersburg about 3s, sterling the score.

Norway.—The average value of the yield for the five years ending 1881 was 7600 kroner (£420). The quantity produced in 1881 was 267 hectolitres (785 bushels), valued at 7000 kroner ‘(£390). The industry is seated for the most part in the districts of southern Trondhjem and Jarlsberg, the product of the latter province being nearly half that of all Norway.

Subjoined is a rough estimate of the total number of oysters obtained annually from the sea (North America, 5,572,000,000 ; Europe, 2,331,200,000):—

United States ®....5,550,000,000 | Germany …... ..... 4,000,000 Canadarenescr: ceca 2250003000) |Melainitime… asc. ece 2,500,000

SHSER op sopnnnos Sache 1,000,000 UREN Sl errecncineeeoooue: 680,400,000 | Portugal….....00 800,000 Great Britain …... 1,600,000,000 } Denmark …..... 200,000 LOWES NGL oaneBbacococe 218005000) RUSsia) ...00.0.062s.0- 00s 250,000 Vitalin cs corer 20,000,000 | Norway ….....0 250,000

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1 Hubreeht, “Oyster Culture and Oyster Fisheries of the Netherlands” (eonferenee paper, International Fisheries Exhibition) ; Hoek, “ Ueber Austernzucht in den Niederlanden” (cireular 2, Deutsche Fischerei- Verein, 1879 ; translated in Report of the United States Fish Commis- sion, part viii. pp. 1029-35).

2 Mobius, Die Auster und die Austernwirthschaft (1877, pp. 126; translated in Report of the United States Fish Commission, part vili. pp. 683-751),

3 Rapport au Ministre de U Instruction sur la pisciculture en France et L’Ostréiculture dans la Méditerranée (Paris, 1878) ; the portion relating to oyster culture in the Mediterranean is translated in the Report of the United States Fish Commission, part viii. pp. 907-28.

“See Renaud, Notice sur I’ Huttre Portugaise et Francaise cultivée

dans la Baie @ Arcachon ; translated in the Report of the United States Fish Commission, part viii. pp. 931-41. * On basis of 250 oysters to the bushel.

Th b ‘ 150 to 400. @ number varies from

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The oyster industry is rapidly passing from: the hands of the fisherman into those of the oyster culturist. The oyster being sedentary, except for a few days in the earliest stages of its existence, is easily exterminated in any given locality ; since, although it may not be possible for the fishermen to rake up from the bottom every individual, wholesale methods of capture soon result in covering up or otherwise destroying the oyster banks or reefs, ag the communities of oysters are technically termed. The main difference between the oyster industry of America and that: of Europe lies in the fact that in Europe the native beds have long since been practically destroyed, perhaps not more than 6 or 7 per cent. of the oysters of Europe passing from the native beds directly into the hands of the consumer. It is probable that 60 to 75 per cent. are reared from the spat in artificial parks, the remainder having been laid down for a time to increase in size and flavour in shoal waters along the coasts. In the United States, on the other hand, from 30 to 40 per cent. are carried from the native beds directly to market. The oyster

fishery is everywhere, except in localities where the natural beds are nearly exhausted, carried on in the most reckless manner, and in all directions oyster grounds are becoming deteriorated, and in some cases have been entirely destroyed. It remains to be seen whether the Government of the States will regulate the oyster fishery before it is too late, or will permit the destruction of these most important reservoirs of food. At present the oyster is one of the cheapest articles of diet in the United States; and, though it can hardly be expected that the price of American oysters will always remain so low, still, taking into consideration the great wealth of the natural beds along the entire Atlantic coast, it seems certain that a moderate amount of protection will keep the price of seed oysters far below European rates, and that the immense stretches of submerged land especially suited for oyster planting may be utilized and made to produce an abundant harvest at much less cost than that which accompanies the complicated system of culture in vogue in France and Holland.

The most elaborate system of oyster culture is that practised at Arcachon and elsewhere in France, and, to a limited extent since 1865, on the island of Hayling, near Portsmouth, in England. The young oysters, having been collected in the breeding season upon tiles or hurdles, are laid down in artificial ponds, or in troughs, where the water is supplied to them at the discretion of their pro- prietors. The oysters are thus kept under control like garden plants from the time they are laid down to that of delivery to commercial control. The numerous modifiea- tions of this system are discussed in various recent reports.®

The simplest form of oyster culture is the preservation of the natural oyster-beds. Upon this, in fact, depends the whole future of the industry, since it is not probable that any system of artificial breeding can be devised which will render it possible to keep up a supply without at least occasional recourse to seed oysters produced under natural conditions. It is the opinion of almost all who have studied the subject that any natural bed may in time be destroyed by overfishing (perhaps not by removing all the oysters, but by breaking up the colonies, and delivering over the territory which they once occupied to other kinds of animals), by burying the breeding oysters, by covering

6 See especially the following English parliamentary papers :— Report of the Commissioners appointed to inquire into the Present State of the Oyster Fisheries of France, England, and Ireland, 1870 ; Report of the Select Committee appointed to inquire what are the Reasons for the Present Searcity of Oysters, &c., 1876 ; Report on the Principal Oyster Fisheries of France, with a short description of the System of Oyster Culture pursued at some of the most important places, &e., 1878.

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up the projections suitable for the reception of spat, and by breaking down, through the action of heavy dredges, the ridges which are especially fitted to be seats of the colonies.. The immense oyster-beds in Pocomoke Sound, Maryland, have practically been destroyed by over-dredg- ing, and many of the other beds of the United States are seriously damaged. The same is doubtless true of all the beds of Europe. It has also been demonstrated that under proper restriction great quantities of mature oysters, and seed oysters as well, may be taken from any region of natural oyster-beds without injurious effects. Parallel cases in agriculture and forestry will occur to every one. Mobius, in his most admirable essay Die Auster und Dre Austernwirthschaft, has pointed out the proper means of preserving natural beds, declaring that, if the average profit from a bed of oysters is to remain permanently the same, a sufficient number of mother oysters must be left in it, so as not to diminish the capacity of maturing. He further shows that the productive capacity of a bed can only be maintained in one of two ways :— (1) by diminish- ing the causes which destroy the young oysters, in which case the number of breeding oysters may safely be decreased ; this, however, is practicable only under such favourable conditions as occur at Arcachon, where the beds may be kept under the constant control of the oyster- culturist ; (2) by regulating the fishing on the natural beds in such a manner as to make them produce perma- nently the highest possible average quantity of oysters. Since the annual increase of half-grown oysters is estimated by him to be four hundred and twenty-one to every thousand

full-grown oysters, he claims that not more than 42 per cent. of these latter ought to be taken from a bed during a year.

The Schleswig-Holstein oyster-beds are the property of

the state, and are leased to a company whose interest it is to preserve their productiveness. The French beds are also kept under Government control. Not so the beds of Great Britain and America, which are as a general rule open to all comers,? except when some close-time regulation is in force. Prof. Huxley has illustrated the futility of “close-time ” in his remark that the prohibition of taking oysters from an oyster-bed during four months of the year is not the slightest security against its being stripped clean during the other eight months. “ Suppose,” he continues, “that in a country infested by wolves, you have a flock of sheep, keeping the wolves off during the lambing season will not afford much protection if you withdraw shepherd and dogs during the rest of the year.” The old close-time laws were abolished in England in 1866, and returned to in 1876, but no results can be traced to the action of parliament in either case. Prof. Huxley’s conclusions as regards the future of the oyster industry in Great Britain are doubtless just as applicable to other countries,—that the only hope for the oyster consumer lies in the encouragement of oyster-culture, and in the development of some means of breeding oysters under such conditions that the spat shall be safely deposited. Oyster culture can evidently be carried on only by private enterprise, and the problem for legislation to solve is how

SS eee eee Eee ee 1 Bven Prof. Huxley, the most ardent of all opponents of fishery legislation, while denying that oyster-beds have been permanently annihilated by dredging, practically admits that a bed may be reduced to such a condition that the oyster will only be able to recover its former state by a long struggle with its enemies and competition, —in faet that it must re-establish itself much in the same way as they have aequired possession of new grounds in Jutland, a process which, according to his own statement, occupied thirty years (Lecture at the Royal Institution, May 11, 1883, printed with additions in the Hnglish Mlustrated Magazine, i. pp. 47-55, 112-21). : * Connecticut has within a few years greatly benefited its oyster industry by giving to oyster-culturists a fee simple title to the lands under control by them.

” No steamers are allowed to be used.

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to give such rights .of property upon those shores which are favourable to oyster culture as may encourage com- petent persons to invest their money in that undertaking. Such property right should undoubtedly be extended to natural beds, or else an area of natural spawning territory should be kept under constant control and surveillance by Government, for the purpose of maintaining an adequate supply of seed oysters. ,

The existing legislation in the United States is thus admirably summarized by Lieutenant Francis Winslow :3—

“The fishery is regulated by the laws of the various States, the Federal Government exercising no control, and consequently the conditions under which the pursuit is followed are many and various. At the present time the laws relating to the oyster fishery may be said to be based upon one of two general principles. The first, the basis for the regulations of most of the States, con- siders the oyster-beds to be inalienable common property. Laws based upon this principle are generally of a protective nature, and are in reality regulations of the State, made by it in its capacity of gnardian of the common property. The second principle assumes the right of the State to dispose of the area at the bottom of its rivers, harbours, and estuaries, and, having disposed of it, to consider the lessee or owner as alone responsible for the success or failure of his enterprises, and the State in no way called upon to afford him other assistance than protection in legitimate rights. In general terms, under the first principle the beds are held in common 3 under the second, in severalty. But one State permits the pre- emption of an unlimited tract of bottom, and the holding of it in fee—the State of Connecticut, Rhode Island leases her ground for a term of years, at $10 per acre; but the person holding an area has no legal power of disposing of it beyond the limits of the lease. Massachusetts, New York, New Jersey, Maryland, and Virginia all permit pre-emption of small tracts by individuals for indefinite periods, and on the coast of Long Island the various towns along the shore lease tracts of considerable extent to private cultivators.

“ Various restrictions are also placed upon the time and manner of conducting the fisheries. Some of the States, noticeably Virginia, prohibit entirely the use of the dredge or scrape; others, noticeably New Jersey, prohibit such nse in some localities, and permit it in others. All the States, with one exception, prohibit the use of steam vessels or machinery, or fishing by other than their own inhabit- ants. Connecticut again forms the exception, and quite a large fleet of steam dredging vessels are employed on her beds.

“The laws of the various States have several common features. All general fishing is suspended during the summer months. No night fishing is permitted. No proprietary rights to particular areas are given beyond the right to ‘plant’ a limited number of oysters on bottoms adjoin- ing land owned by the planter, and peace officer’s and local authorities are charged with execution of laws relating to the fishery. In a few States or localities licenees are required to be obtained for cach fishing vessel; and in one State, Maryland, a regular police force and fleet of vessels are maintained to support the law. ‘These regulations are easily evaded, except those relating to the steamers and pre-emption of ground. Naturally, no one will put down oysters without being able to protect them ; and steamers are too readily detected to make their illegal employment possible. In Connecticut and Rhode Island, the beds being virtually private property, there is no restriction of the fishery, exeept that it shall not be conducted at night.”

The method of gathering oysters is simple, and much the same in all parts of the world, the implements in use being nippers or tongs with long handles, rakes, which are simply many-pronged nippers, and dredges. The subjomed account of the American method is abridged from that of Lieutenant Winslow:—

The character of the vessel or boat used depends in a tneasure npon the means. of the fisherman and the constancy of his employment, and is also influenced by the eharacter of the oyster ground, its location, and the laws governing the fish- ing. The last-named condition also decides the implement to be used; when permitted, it is the dredge—either the enormous one employed by the steamers, the smaller toothed rake-dredge, or smooth-scrape. When dredging is prohibited, the tongs, or nippers, with

two handles, sometimes 30 feet long, are uscd. The dredges are usually worked by an apparatus termed a ‘‘winder,” muny forms of which are employed, the best and most recent form being so designed that if, while reeling in, the dredge should ‘hang,” that is, become immovably fixed by some obstruction on the bottom, the drum is at once automatically thrown out of gearing, and the dredge-rope allowed to run out. Small craft use a more simple and less expensive description of winch, and frequently haul in by hand, while the steam dredgers have powerful machinery adapted for this special purpose. The number of men employed varies with the size of the craft; two, three, and four men are sufficient on board the smaller dredgers, while the larger carry ten and twelve.

While a great many oysters are transported in the shell to markets distant from the seaboard, the largest part of the inland consumption is of ‘‘opened” or “shucked” oysters, and nearly every oyster. dealer along the coast employs a larger or smaller number of persons to open the oysters and pack and ship the meats. Some of these establishments are small, having as few as half a dozen people engaged ; others are large buildings or sheds, and employ hundreds of “shuckers.” After having been removed from their shells and thoroughly washed, the oysters thus dealt with are transferred either to small cans, holding a quart of oysters, or to barrels, kegs, or tubs; when packed in tubs, kegs, or batrels, they goin bulk, with a large piece of ice; when packed in the tin cans, the cans are arranged in two rows inside of a long box, a vacant space being left in the centre, between the rows, in which is placed a large block of ice. The cans are carefully soldered up before packing, and together with the ice are laid in saw- dust. Oysters packed in this way can, in cool weather, be kept a week or more, und sent across the continent, or to the remote western towns.

The steaming process is that by which the “cove” oysters are prepared. The term “cove” is applied to oysters put up in cans, hermetically sealed, and intended to be preserved an indefinite time. The trade in coves is confined principally to the Chesapeake region, and the process of preparing them is as follows. The oysters, usually the smaller sizes, are taken from the vessels and placed in cars of iron frame-work, 6 or 8 feet long. These cars run ona light jron track, which is laid from the wharf through the ‘‘steam-chest” or ‘‘ steam- box” to the shucking shed. As soon as a car is filled with oysters

(in the shell) it is run into the steam-chest, a rectangular oak box, 15 to 20 feet long, lined with sheet iron and fitted with appliances for turning in steam ; the doors, which wok vertically and shut closely, are then let down, the steam admitted, and the oysters

3 Catalogue of the Economic Mollusca exhibited by the United States National Museum at the International Fisheries Exhibition, London, 1883.

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left for ten or fifteen minutes. The chest is then opened and the cars run into the shucking shed, their places in the chest being immediately occupied by other cars, In the shed thie cars are surrounded by the shuckers, each provided with a knife and a can arranged so as to hook to the upper bar of tlie iron frame-work of the car. The steaming having caused the oyster shells to open more or less widely, there is no difficulty in getting out the meats, and the cars are very rapidly emptied. The oysters are then washed in iced water and transferred to the " fillers'"' table. The cans, having been filled, are removed to another part of the room and packed in a cylindrical, iron crate or basket, and lowered into a large cylindrical kettle, called the 'process kettle" or ''tub," where they are again steamed. After this they are placed, crate and all, in the ''cooling tub;" and when sufficiently cool to be handled, the cans are taken to the soldering table, and there '' capped"—that is, are hermetically closed. From the ''cappers" they are transported to another department, labelled, and packed in boxes for shipment. The whole steaming pro- cess will not occupy an hour from the time the oysters leave the vessel until they are ready for shipment,

The extension of the area of the natural beds is the second step in oyster culture. As is well known to zoolo- gists, and as has been very lucidly set forth by Prof. Mobius in the essay already referred to, the location of oyster banks is sharply defined by absolute physical con- ditions, Within certain definite limits of depth, tempera- ture, and salinity, the only requirement is a suitable plate for attachment. Oysters cannot thrive where the ground is composed of moving sand or where mud is deposited ; consequently, since the size and number of these places are very limited, only a very small percentage of the young oysters can find a resting-place, and the remainder perish. Mobius estimates that for every oyster brought to market from the

Holstein banks, 1,045,000 are destroyed or die. By putting down suitable “cultch” or “stools” immense quantities of the wandering fry may be induced to settle, and are thus saved. As a rule the natural beds occupy most of the suitable space in their own vicinity. Unoccu- pied territory may, however, be prepared for the reception of new beds, by spreading sand, gravel, and shells over muddy bottoms, or, indeed, beds may be kept up in loca- tions for permanent natural beds, by putting down mature oysters and cultch just before the time of breeding, thus giving the young a chance to fix themselves before the currents and enemies have had time to accomplish much in the way of destruction.

The collection of oyster spat upon artificial stools has been practised from time immemorial. As early as the 7th century, and probably before, the Romans practised a kind of oyster culture in Lake Avernus, which still sur- vives to the present day in Lake Fusaro. Piles of rocks are made on the muddy bottoms of these salt-water lakes, and around these are arranged circles of stakes, to which are often attached bundles of twigs. Breeding oysters are piled upon the rookeries, and their young become attached to the stakes and twigs provided for their reception, where they are allowed to remain until ready for use, when they are plucked off and sent to the market. A similar though ruder device is used in the Poquonnock river in Connecti- cut. Birch trees are thrown into the water near a natural bed of oysters, and the trunks and twigs become covered with spat ; the trees are then dragged out upon the shore by oxen, and the young fry are broken off and laid down in the shallows to increase in size. In 1858 the method of the Italian lakes were repeated at St Brieuc under the direction of Prof. P. Coste, and from these experiments the art of artificial breeding as practised in France has been developed. There is, however, a marked distinc- tion between oyster culture and oyster breeding, as will be shown below. The natural beds of France in the Bay of Arcachon, near Auray in Brittany, near Cancale and Gran- ville in Normandy, and elsewhere, are, however, carefully cultivated, as it is necessary that they should be, for the support of the breeding establishments.}

More or less handling or ‘ working” of the oysters is necessary both for natural and transplanted beds. The most elaborate is that which has been styled the ‘‘ English system,” which is carried on chiefly near the mouth of

the Thames, by the Whitstable and Colchester corporations of fishermen and others. This consists in

1 See Report of the United States Fish Commission art viii 739-41, 753-59, 885-903, 931-41, »P * Pp.

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laying down beds in water a fathom or more in depth at low water and constantly dredging over the grounds, even during the close time, except during the period when the spat is actually settling, By this means the oysters are frequently taken out of the water and put back again, and it is claimed that in this way their enemies are bafficd and the ground put in better condition to receive the spat. As a matter of fact, however, the oysters have not for many years multiplied under this treatment, and the system is practically one of oyster-parking rather than one of oyster-culture. One of the advantages of the frequent handling is that the fishermen, in putting the oysters back, can assort them by sizes, and arrange them conveniently for the final gathering for market purposes.

American oyster culture, as practised in the ‘‘ East River” (the western end of Long Island Sound), in eastern Connecticut, and to some extent in Long Island and New Jersey, is eminently success. ful and profitable, and there seems to be no reason to doubt its permaneuce. conducted as it is in close proximity to the natural beds, and with due regard for preservation. In the Long Island Sound alone, in 1879, the labours of 1714 men produced 997,000 bushels, or perhaps 250,000,000 of native oysters, valued at $847,925, while all France produced in the following season 375,000, worth about $412,000, There was also a side product of 450,000 bushels (122,000,000) of transplanted oysters, worth $350,000, handled by the same men in the American beds, while France employed an additional force of 28,000 people to produce 305,000, 000 artificially bred oysters, worth $3,179,000. The Long Island Sound system cousists simply in distributing over the grounds, just before the spawning season, quantities of old oyster shells to which the young oysters become attached, and left undisturbed for from three to five years, when, having reached maturity, they are dredged for use. Spawning oysters are freqnently put down in the spring, two months before the ground is shelled ; this is done even when the natural

beds are near, but is not so essential as when a rather remote piece of bottom is to be colonized.?

An excellent summary ofthe methods of planting in different parts ofthe United States may be found in Winslow's paper already quoted.

The laying down or temporary deposit of dredged oysters in estuaries on floats or in tanks, to fatten, increase in size, or improve in flavour, is a concomitant of oyster culture, and may be used in connexion with any of the systems above referred to. It is in no sense oyster culture, since it has no relation to the maintenance of the supply. A system of this kind has been practised since the 16th century at Marennes and La Tremblade on the west coast of Franee, where oysters from natural beds are placed in shallow basins communicating with the sea during the spring tides, and where they obtain food which gives them a green colour and a peculiar flavour much Pe by Parisian epicures.? Similar methods of parking are practised at Caucale and Granville.

In England, brood oysters are laid down in fattening beds on the coast of Essex and in the Thames estuary, where they acquire deli- cacy of flavour, and to some extent, especially in the Thames, the green colour already referred to. Belgium las also, near Ostend, fattening beds supplied with foreign spat, chiefly from England.

In the United States an extensive business is carried on in laying down seed oysters from the Chesapeake Bay in the estuaries of southern New England and the Middle States.

Oyster-culturists practise in many places what is called ‘‘ plump- ing," or puffing up oysters for market by exposing them for a short time to the effects of water fresher than that in which they grew. By this process the animal does not acquire any additional matter except the water, which is taken up in great amount, but it loses a part of its saltness, and, in flavour, becomes more like an oyster from brackish waters.

There are large oyster reservoirs at Husum in Schleswig- Holstein, and at Ostend, which serve the double purpose of fattening the oysters and of

keeping a uniform supply for the markets at times unsuited to the prosecution of the fishery.

The artificial impregnation of oyster eggs has been successfully accomplished by many experimenters, and in 1888 Mr John A. Ryder of the United States Fish Commission succeeded in confining the swimming embryos in collectors until they had formed their shells and become fixed. The utility of this experiment seems to consist in the greater facility which it gives to oyster-culturists in securing a sure supply of spat, independent of the vicissitudes which currents and changes of weather entail upon those who rely upon its deposit under natural conditions. The spat thus secured can be reared either by the American, English, or French systems. It isnot probable that the common European species, Ostrea edulis, can be so readily handled by this method as the Portuguese species, Ostrea angulata, or the American, Ostrea virginica, though this can only be determined by trial. For the details of Mr Ryder's experiment, see the Bulletin of the United States Fish Commis- sion, vol. ii. pp. 281-94. (G. B. G.)

2 The Oyster Industry, by Ernest Ingersoll (Washington, 1881). 3 Mobius, Die Auster und Die Austernwirthschaft ; and De Bon, Ostriéculture en 1875.

OYSTER-CATCHER, a bird's name which does not seem to occur in books until 1731, when Catesby (Nat. Hist. Carolina, i. p. 85), used it for a species which he observed to be abundant on the oyster-banks left bare at low water in the rivers of Carolina, and believed to feed principally upon those molluses. In 1 776 Pennant applied the name to the allied British species, which he and for nearly two hundred years many other English writers had called the "Sea-Pie." The change, in spite of the mis- nomer—for, whatever may be the case elsewhere, in England the bird does not feed upon oysters —met with general approval, and the new name has, at least in books, almost wholly replaced what seems to. have been the older one! The Oyster-catcher of Europe is the Hematopus ? ostralegus of Linneus, belonging to the group now called Limicole, and is generally included in the Family Charadriide ; though some writers have placed it in one of its own, LFamatopodide, chiefly on account of its peculiar pill—a long thin wedge, ending ina vertical edge. Its feet also are much more fleshy than are generally seen in the Plover Family. In its strongly-contrasted plumage of black and white, with a coral-coloured bill, the Oyster- catcher is one of the most conspicuous birds of the European coasts, and in many parts is still very common. It is nearly always seen paired, though the pairs collect in prodigious flocks ; and, when these are broken up, its shrill but musical cry of " tu-lup," " tu-lup," somewhat pettishly repeated, helps to draw attention to it. Its wariness, how- ever, is very marvellous, and even at the breeding-season, when most birds throw off their shyness, it is not easily approached within ordinary gunshot distance. The hen- bird commonly lays three clay-coloured eggs, blotched with black, in a very slight hollow on the ground, not far from the sea. As incubation goes on the hollow is somewhat deepened, and perhaps some haulm is added to its edge, so that at last a very fair nest is the result. The young, as in all Limicole, are at first clothed in down, so mottled in colour as closely to resemble the shingle to which, if they be not hatched upon it, they are almost immediately taken by their parents, and there, on the slightest alarm, they squat close to elude observation. 'This species occurs on the British coasts (very seldom straying inland) all the year round; but there is some reason to think that those we have in winter are natives of more northern latitudes, while our home-bred birds leave us. It ranges from Iceland to the shores of the Red Sea, and lives chiefly on marine worms, crustacea, and such molluscs as it

is able to obtain. It is commonly supposed to be capable of prizing limpets from their rock, and of opening the shells of mussels; but, though undoubtedly it feeds on both, further evidence as to the way in which it procures them is desirable. Mr Harting informs the writer that the bird seems to lay its head sideways on the ground, and then, grasping the limpet's shell close to the rock between the mandibles, use them as scissor-blades to cut off the mollusc from its sticking-place. The Oyster-catcher 18 not highly esteemed as a bird for the table.

Differing from this species in the possession of a longer

1 It seems however very possible, judging from its equivalents in other European languages, such as the Frisian Oestervisscher, the German Augsterman, Austernfischer, and the like, that the name _ Oyster-catcher" may have been not a colonial invention but indigenous to the mother-country, though it had not found its way Into print before. The French Huttrier, however, appears to be a word coined by Brisson. "'Sea-Pie" has its analogues in the French Pic-de- Mer, the German Meerelster, Secelster, and so forth.

~ Whether it be the Hamatopus whose name is found in some editions of Pliny (lib. x. cap. 47) is at best doubtful. Other editions have Himantopus; but Hardouin prefers the former reading. Both words have passed into modern ornithology, the latter as the generic

hame of the Sriut (g.v.); and some writers have blended the two in the strange and impossible compound Hamantopus.

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bill, in having much less white on its back, in the paler colour of its mantle, and in a few other points, is the ordinary American species, already mentioned, Hematopus palliatus. Except that its call-note, judging from description, is unlike that of the European bird, the habits of the two seem to be perfectly similar ; and the same may be said indeed of all the other species. The Falkland Islands are frequented by a third, H. leucopus, very similar to the first, but with a black wing-lining and paler legs, while the Australian Region possesses a fourth, H. longirostris, with a very long bill

as its name intimates, and no white on its primaries. China, Japan, and possibly eastern Asia in general have an Oyster-catcher which seems to be intermediate between the last and the first. This has received the name of H. osculans; but doubts have been expressed as to its deserving specific recognition. Then we have a group of species in which the plumage is wholly or almost wholly black, and among them only do we find birds that fulfil the implication of the scientific name of the genus by having feet that may be called blood-red. H. niger, which fre- quents both coasts of the northern Pacific, has, it is true, yellow legs, but towards the extremity of South America its place is taken by H. ater, in which they are bright red, and this bird is further remarkable for its laterally com- pressed and much upturned bill. The South African ZZ, capensis has also scarlet legs; but in the otherwise very similar bird of Australia and New Zealand, H. unicolor, these members are of a pale brick-colour. (A. N.) OZAKA, or Osaka, one of the three imperial cities of Japan (Kioto and Tokio or Yedo being the other two), is situated in a plain in the province of Setsu or Sesshiu, measuring about 20 miles from north to south and from 15 to 20 miles east and west, and bounded, except towards the west, where it opens on Idzuminada Bay, by hills of considerable height. It lies on both sides of the Yodogawa, or rather of its headwater the Aji (the outlet of Lake Biwa), and is so intersected by river-branches and canals as to suggest a comparison with Venice or Stockholm. River steamers ply between Ozaka and its port Hiogo or Kobe, and a railway between the two places, opened in 1873, has since been extended to Kioto and farther. The streets are not very broad, but for the most part they are regular and well kept; the houses, about 20 or 25 feet in height, are all built of wood. Shin-sai Bashi Suji, the principal thoroughfare, leads from Kitahama, the district lying on the south side of the Tosabori, to the iron suspen- sion bridge (Shin-sai Bashi) over the Dotom-bori. The foreign settlement is at Kawaguchi at the junction of the Shirinashi-gawa and the Aji-Kawa. It is almost deserted by the foreign merchants, who prefer to have their establishments at Kobe, but it is the seat of a number of European mission stations. Though the Buddhist temples of Ozaka number 1380 and the Shinto temples 538, few of them are of much note. The Buddhistic Tennoji, founded by Shotoku Tai-shi, and restored in 1664, covers an immense area at the south-east corner of the city, and

has a fine pagoda from which an admirable view of the

country is obtained. Two other Buddhist temples, which form a conspicuous object in the heart of the city, are occupied, one as a Government hospital and the other as a Government school. The principal secular buildings are the castle, the mint, and the arsenal. The castle was founded in 1584 by Hideyoshi; the enclosed palace, “ probably the finest building Japan ever saw,” survived the capture of the castle by Iyeyasu, and in 1867 and 1878 witnessed the reception of the foreign legations by the Tokugawa shoguns; but in the latter year it was fired by the Tokugawa party. Externally the whole castle is protected by a double enceinte of high and massive walls and broad moats—the outer moat from 80 to 120 yards across and

from 12 to 24 feet deep. Huge blocks of granite 40 feet by 10 or 20 feet occur in the masonry. The mint, erected by T. J. Waters, and organized by Major T. W. Kinder and twelve European officials, covers an area of 40 acres, and employs about 600 persons. It was opened in 1871. Both cannon and guns are manufactured in the arsenal. Apart from these Government establishments Ozaka is the seat of great industrial activity, possessing iron foundries, copper foundries, and rolling mills, antimony works, large glass works, paper mills, a sugar refinery, a cotton spin- ning mill, rice mills, an oil factory, sulphuric acid works, match factories, soap works, saké distilleries, a brewery (after the German pattern), shipyards, é&c. Bronzes, sulphuric acid, and matches are among its chief exports. In the surrounding district large quantities of rape-seed are grown. The population in 1872 was 271,992; in

1877, 284,105.

Ozaka owes its origin to Ren-nio Sho-nin, the 8th head of the Shin-Shin sect, who in 1495-6 bnilt, on the site now ocenpied by the castle, a temple which afterwards became the principal residence of his successors. In 1580, after ten years’ successful defence of his position, Ken-nio, the 11th “abbot,” was obliged to surrender ;

and in 1583 the victorious Hideyoshi made Ozaka his capital. The town was opened to foreign trade in 1868. OZANAM, Antotne Friprric (1813-1853), the

greatest name, as far as literary and historical criticism is concerned, of the Neo-Catholic movement in France during the first half of the 19th century, was born at Milan on April 18, 1813. His family is said (as the name suggests) to have been of Jewish extraction, and has a circumstantial though possibly fabulous genealogy of extraordinary length. At any rate it had been settled in the Lyonnais for many centuries. In the third generation before Frédéric it had reached distinction through Jacques Ozanam, a mathematician of eminence. The critic's father, Antoine Ozanam, served in the armies of the republic, but could not stomach the empire, and betook himself to commerce, teaching, and finally inedicine. The boy was brought up at Lyons, and was strongly influenced by one of his masters, the Abbé Noirot. His conservative and religious instincts showed themselves early, and he published a pamphlet against Saint-Simonianism in 1831, which attracted the attention of Lamartine. He was then sent to study law in Paris, where he fellin with the Ampére family, and through them with excellent literary society. He also came under the influence of the Abbé Gerbet, the soberest and most learned member of the religious school of Lamennais and Lacordaire. Ozanam, however, though he joined with all the fervour of youth in the Neo-Catholic polemic, never underwent the uncomfortable experiences of the direct followers of Lamennais. His journal (for in those years every one was a journalist) was not the Avenir, but the more orthodox Z'ribune Catholique of Bailly, and he with some other young nien founded the famous society of St Vincent de Paul, which was occupied in practical good works, Meanwhile he did not neglect his studies. He was called to the bar, and in 1838 won his doctor's degree in letters with a thesis on Dante, which was the beginning of his best-known book. A year later he was appointed to a professorship of commercial law at Lyons, and in another year assistant professor to Fauriel at the Sorbonne. On this latter precarious endowment he married, and visited Italy on his wedding tour. At Fauriel's death in 1844 he succeeded to the full professorship of foreign literature, and his future was thereby tolerably assured. He had, however, by no means a strong constitution, and he tried it severely by combining with his professorial work a good deal of literary occupation, while he still continued his custom of district-visiting as a member of the society of St Vincent de Paul. The short remainder of his life was extremely busy, though it was relieved at intervals by

visits to Italy, Brittany, England, and other places, He produced numerous books, and during the revolution of 1848 (of which, like not a few of his school, he took an unduly sanguine view) he once more became a journalist in the Hre Nowvelle and other papers for a short time, He was in London at the time of the Exhibition of 1851, In little more than two years from that date he died of consumption (which he had vainly hoped to cure by visiting Italy) on September 8, 1853, at the age of forty.

Ozanam deserves the phrase which has been attached to his name at the beginning of this article. He was more sincere, more learned, aud more logical than Chateaubriand, less of a political partisan and less of a literary sentimentalist than Montalembert. Whether his conception of a democratic Catholicism was a possible one is of course a matter of opinion, and it may be frankly admitted that, well ashe knew the Middle Ages, he looked at them too exclusively through the spectacles of a defender of the papacy. He confessed that his object was to “prove the contrary thesis to Gibbon’s.” And no donbt any historian, literary or other, who begins with the desire to prove a thesis is sure to go more or less wrong. But his pictures were not so much coloured by his prepossessions as some contemporary pictures on the other side, and he had not onlya great knowledge of medieval literature, but also a strong-and appreciative sympathy with medieval life.

His chief works (collected in 1855-58) were Bacon et St Thomas de Cantorbéry, 1836; Dante et la Philosophie Catholique, 1839 (2d ed., enlarged, 1845); Etudes Germaniques, 1847-49 ; Documents inédits pour servir & V Histoire d’Italie, 1850; Les Poéttes Franciscatns, 1852. There is an interesting life of him in English by K. O’Meara (2d ed., London, 1878).

OZOCERITH, or OZoKERITE (6fwv, odour-emitting, and Kynpos, wax; smelling wax, mineral wax), is a combustible mineral which may be designated as crude native PARAFFIN (q.v.), found in many localities in varying degrees of purity. The only commercial sources of supply however are in Galicia, principally at Boryslaff and Dzwieniasz. Hofstadter in 1854 examined an ozocerite from “ Boristoff near Drohobiez,” Galicia; he found it to consist chiefly of hydrocarbon which, after crystallization from alcohol, exhibited the composition CH, of the olefines; this, however, is

quite compatible with their being really “»arafiins,” C,H.,42, which latter formula for a large a coincides practically with C,,H,,. At and near Baku and in other places about the Caspian Sea, soft oily native paraffins, known as “ nefto-gil” or “‘ nefte-degil” and “ kir,” are found with other petroleum products. The theory of the formation of ozocerite now generally accepted is that it is a product of the decomposition of organic substances, which was originally like petroleum, but has lost its more volatile components by volatilization. All native petroleum in fact, like crude paraffin oil, holds solid neraffin in solution.

Galician ozocerite varies in consistence from that of a rather firm and hard wax to that of a soft adherent plastic mass, and in colour from yellow to a dark (almost black) green. Its melting-point ranges from 58° to 98° C. (136° to 208° Fahr,); the extra high melting point of the paraffin extracted from it is one of its distinguishing features. Besides the earthy impurities which are always associated with the mineral as found in the “nests” containing it, it is mixed with liquid hydrocarbons, resinous oxygenated compounds, and water. In the following table columns I. and II. show the yield in two distillations of a superior quality of the ozocerite of Boryslaff, as given by Perutz.

Pyrene and chrysene. Coke and loss Water

The purified paraffin of ozocerite makes excellent candles, which are said to give more light, weight for weight, than

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those made from ordinary paraffin, besides being less easily fusible. Under the name of ceresin or ozocerotin a large proportion of the high-melting paraffin extracted from the mineral goes into commerce, to be used chiefly for the adulteration of beeswax. The various methods of refining used furnish certain proportions of soft paraffin, and of heavy and light oils as bye-products, which take their place in commerce beside the corresponding products from shale and petroleum. ae

A kind of mineral wax known as idrialine accompanies the mercury ore in Idria. According to Goldschmiedt it can be extracted by means of xylol,

amyl-alcohol, or turpentine, and also, without decomposition, by distillation in a current of hydro-

en or carbonicacid. Itisa white crystalline body, very difficultly fusible, boiling above 440° C, (824° F.), of the composition Cy)H»,0. Its solution in glacial acetic acid, by oxidation with chromic acid, yielded to Goldschmiedt a red powdery solid and a fatty acid fusing at 62° C., and exhibiting all the charactcrs of a mixture of palmitic and stearic acids.

OZONE has been defined and to some extent discussed under the heading CuEmisTRY, vol. v. p. 481.

From the time of Van Marum (1785) at least it was known that the passage of electric sparks through air is accompanied by the production of a peculiar smell; but the cause of this remained unknown until 1840, when Schénbein observed that a similar smell is exhibited by electrolytic oxygen (as obtained in the electrolysis of acidu- lated water), and also develops in the atmosphere of a vessel in which phosphorus suffers spontaneous oxidation at ordinary temperatures in the presence of water. The three kinds of odoriferous gas, he found, had the power of decom- posing iodide of potassium with liberation of iodine, and they agreed also in their behaviour to other reagents, whence he concluded that in all the three cases the smell was owing to the same peculiar substance which he called ozone (from dfew, to emit an odour). Numerous experi- ments confirmed his first impression that ozone is chem- ically similar to, though distinctly different from, chlorine, but he got no further towards establishing its nature. Having found, however, that dry phosphorus produces no ozone, and that ready-made ozone is destroyed by being passed through a heated glass tube, he surmised that ozone was a peroxide of hydrogen. This surmise was seemingly raised to a certainty by an investigation of Baumert's, who found that electrolytic (ozonized) oxygen, when de- ozonized by heat, yields water, and ascertained that the weight of water thus produced amounted to H,O=18 parts for every 41 = 4 × 127 parts of iodine which the same quantity of gas would have liberated if it had been de- ozonized by iodide of potassium. This, if true, would prove that ozone is H,O,,—a conclusion which passed current as an established fact, in reference to electrolytic ozone at least, until Andrews showed that Baumert's result was founded

upon incorrect observations. The merit of having discovered the true elementary composition of ozone belongs to Marignac and De la Rive, who proved that it can be produced, as easily and abundantly as in any other way, by the electrification of absolutely pure oxygen gas, whence it at once followed that—unless oxygen be a compound of two or more unknown elements—ozone cannot be anything else than an allotropic modification of oxygen,

With regard to the relations of the two kinds of oxygen to one another, our present knowledge is derived mainly from the work of Andrews and Prof. Tait. The first importaut result which they arrived at was that the ozonization of pure oxygen gas involves a contraction, and that consequently ozone is denser than oxygen gas. Presuming (with all their contemporaries) that in the de-ozoniza- tion of oxygen by iodide of potassium all the substance of the ozone 1s taken up by the reagent with elimination of its equivalent of lodine, they sought to determine the density of ozone by comparing the weight of oxygen-matter which goes into the iodide of potassium with the contraction involved in the process. But they obtained variable results, As their methods became more and more perfect,

the weight of unit volume of ozone grew greater and greater, and at last stood at oo. In other words, what they found and estab- lished finally was that the removal of ozone from oxygen by means of iodide of potassium involves no change of volume whatever, although de-ozounization by heat always leads to a (permanent) increase of volume. This result, to them and everybody else, appeared very singular ; but Andrews, after a while, found the cor- rect explanation. Supposing at a certain temperature and pressure one volume of ordinary oxygen contains a grains of matter, then one volume of ozone, being denser, contains a greater quantity of matter, say @+ grains; when the gas acts on iodide of potassium, the a grains come out as one volume of oxygen, while the x grains of surplus oxygen vanish in the iodide. In the decomposition by heat the x grains of surplus oxygen of course assume the form of x/a volumes of additional oxygen gas. It is no addition to Andrews’s explanation, but merely a close translation of it into the language of Avogadros law, to say that, if oxygen (proper) consists of

molecules O,, ozone must consist of molecules Oy4, (perhaps O41), and that in the iodide reaction this molecule breaks up into one molecule of oxygen gas and x atoms of oxygen which go to the reagent. What did constitute a new discovery was Berthelot's important observation that the conversion of ozonc into ordinary oxygen involves an evolution of heat which amounts to 29,600 units for every 16 parts of oxygen matter available for the liberation of iodine from iodide of potassium. What the real density of ozone is was made out with a high degree of probability by Soret. He took two equal volumes of the same supply of ozonized oxygen, and in one determined the contraction produced by shaking with oil of turpentine (which he assumes to take away the ozone as a whole), while the other served for the (direct or indirect) determination of the expansion involved in the destruction of the ozone by heat. He found this increase to amount to half a volume for every one volume of ozone present ; hence one volume of ozonc contains the matter of one and a half volumes of ordinary oxygen, 7.¢., its density is 1°5 (if that of ordinary oxygen is taken as unity), and its molecular weight is ¢x O,=0,. To check this result Soret determined the rate at which ozone diffuses into air, and compared it with the ratc, similarly determined, for carbonic acid. From the two rates, on the basis of Graham's law, he calculated the ratio of the density of ozone to that of carbonic acid, and found it in satisfactory accordance with O, :CO,=48 : 44.

From the facts that ozone is destroyed (7.e., converted into O,) at 270° (Andrews and Tait), and that this reaction is not reversible, it at once follows that it 1s impossible to convert oxygceu completely into ozone by electric sparks. Supposing the ozonization to have gone a certain way, each additional spark, besides producing ozone, will destroy some of that previously produced.

From Clerk Maxwell's notion concerning the distribution of tem- peratures amongst the molecules of a gas, it would follow that ozonized oxygen, even at ordinary tempcratures, will gradually relapse into the condition of plain oxygen, because, although the temperature as indicated by the thermometer may be only 20° C. (say), there are plenty of molecules at tempcratures above the tem- perature of incipient dissociation (which of course lies below 270°), and any ozone once destroyed will never come back. But, be this as it may, the lower the temperature of the oxygen treated with sparks

the greatcr the chance of the ozone formed to remain alive. This idea forms the basis of an important research by Hautefeuille and Chappuis, who, by operating upon oxygen at very low tem- peratures, produced unprecedentedly large percentages of ozone. By operating at 0° C. they produced a gas containing 14°9 per cent. by weight of ozone (presumably reckoned as O), while at —23° the percentage rosc to 21°4._ They subsequently (1882; Compt. Rend., xciv. p. 1249) succeeded in producing even liquid ozone, by applying a pressure of 125 atmospheres to richly ozonized oxygenat — 100°C. (the boiling point of liquefied ethylene). Liquid ozone is of a dark indigo-blue colour, which, as they tell us, is dis- tinctly visible even in ordinary ozonized oxygen if it is viewed in tubes about one metre long.

According to Carius the coefficient of absorption of ozone by water of +1° C. isabout 0°8; that is to say, one volume of water of 1°, if shaken with excess of pure ozoue at 1° and a pressure of 760 mm., would absorb 0°8 volume of ozone measured dry at 0° and 760 mm. pressure. But it is not certain that Carius's determina- tions are correct.

Antozone.—According to a now obsolete notion of Schonbein's, ordinary oxygen gas is a compound of two kinds of oxygen of which one is positively and the other negatively electrical. Ordinary ozone would be a mixture of the two in equal parts; but certain peroxides, according to Schénbein, contain the onc kind, others the other. He supported his view by many ingenious experimental arguments. Meissner and others, while adopting Schonbein's idea, somehow drifted into the notion that Schonbein's two kinds of oxygen correspond to two different substances, of which ordinary ozone is one. They naturally searched for the other, and of course did not fail to discover it; but their ‘“‘antozone,” when critically looked into, turned out to be peroxide of hydrogen. (W. D.)

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Plates IT, and III.

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P

p is the sixteenth letter of our alphabet. In the original Phoenician form (see ALPHABET) it was not un- like a crook. In Greece it became angular (M), and later the downward strokes were made equal in length (II), though in the old Corinthian the rounded form still occurs, closely resembling the Phcenician type. In old Latin the angular form is found, as in Greece, but also the form with which we are familiar, with the bottom of the curve joined to the straight line. The old guess that P was at first a rude sketch of a mouth must be abandoned unless we are pre- pared tocredit the Phoenicians with having so far anticipated Mr Melville Bell's " visible speech." "4

The sound it denotes is a closed labial, differing from basa surd from a sonant; it is heard only when the lips open; there is then a percussion as the breath escapes, which constitutes thesound. The difference between breath and voice can be easily seen in the production of the two sounds, pand 6, When the lips are closed—as they must be closed (exactly in the same way) for each of the sounds—if we then try to articulate p, no effort can produce any kind of sound till the lips open ; the chorde vocales do not vibrate, and there is therefore nothing in the mouth but mere breath. But if we make as though we would sound 8, while still keeping the lips shut, a certain dull sound is quite audible, produced by the vocalized breath (or voice) within the mouth ; and the action of the top of the larynx in producing this sound may be distinctly felt. Of course this sound is not a 0; that does not come till the lips part.

It is noteworthy how very small is the number of pure English words which begin with p. Such words correspond to words which began with 6 in Greek, Latin, and other members of the parent Aryan speech ; and these are equally few. Nearly all the words which we have in English beginning with p are therefore borrowed, such as " pain," "pair," "police," which came to us from France; others are scientific terms, oftenest modelled upon the Greek. The reason of this deficiency of words in the parent language commencing with 6 is not easy to find.

The Latins denoted the sound of Greek ¢ by the double symbol ph; this is a p followed by a slight breathing, not so strong as an h; thus "philosophia" was pro- nounced not as we now pronounce it, but rather like

“p’hilosop’hia.” But this sound eventually passed into the /-sound, and it is so written in Italian (e.g., “filosofia ”) ; French and English have kept the old spelling, but not the sound. So here, as elsewhere, we have quite unneces- sarily two symbols, ph and f, expressing the same sound.

PACCHIA, GiroLamo prt, and PACCHIAROTTO (or PACCHIAROTTI), Jacopo. These are two painters of the Sienese school, whose career and art-work have been much misstated till late years. One or other of them produced some good pictures, which used to pass as the performance of Perugino; reclaimed from Perugino, they were assigned to Pacchiarotto; now it is sufficiently settled that the good works are by G. del Pacchia, while

nothing of Pacchiarotto’s own doing transcends mediocrity, The mythical Pacchiarotto who worked actively at Fon- tainebleau has no authenticity.

Girolamo del Pacchia, son of a Hungarian cannon- founder, was born, probably in Siena, in 1477. Having joined a turbulent club named the Bardotti, he disappeared from Siena in 1535, when the club was dispersed, and nothing of a later date is known about him. His most celebrated work is a fresco of the Nativity of the Virgin, in the chapel of S. Bernardino, Siena, graceful and tender, with a certain artificiality. Another renowned fresco, in the church of St Catherine, represents that saint on her visit to St Agnes of Montepulciano, who, having just expired, raises her foot by miracle. In the National Gallery of London there is a Virgin and Child. The forms of G, del Pacchia are fuller than those of Perugino (his principal model of style appears to have been in reality Franciabigio) ; the drawing is not always unexcep- tionable ; the female heads have sweetness and_ beauty of feature ; and some of the colouring has noticeable force.

Pacchiarotto was born in Siena in 1474. In 1530 he took part in the conspiracy of the Libertini and Popolani, and in 1534 he joined the Bardotti. He had to hide for his life in 1535, and was concealed by the Observantine fathers in a tomb in the church of St John. He was stuffed in close to a new-buried corpse, and got covered with vermin and dreadfully exhausted by the close of the second day. After a while he resumed work; he was exiled in 1539, but recalled in the following year, and in that year or

soon afterwards he died. Among the few extant works with which he is still credited is an Assump- tion of the Virgin, in the Carmine of Siena.

PACHECO, Francisco (1571-1654), Spanish painter and art historian, born at Seville in 1571, was the pupil of Luis Fernandez, and a diligent and prolific workman, Favourable specimens of his style are to be seen in the Madrid picture gallery, and also in two churches at Alcala de Guadaira near Seville; they are characterized by care- ful drawing and correct if somewhat feeble composition, but prove that he was no colorist. He attained great popularity, and about the beginning of the 17th century opened an academy of painting which was largely attended. Of his pupils by far the most distinguished was Velazquez, who afterwards became his son-in-law. From about 1625 he gave up painting and betook himself to literary society and pursuits; the most important of his works in this department is a treatise on the art of painting (Arte de la Pintura: su anteguedad y grandezas, 1649), which, although characterized by prolixity and pedantry of style, and often nonsensical enough in its theories, is of considerable value for the information it contains, especi- ally on matters relating to Spanish art. He died inl654.

PACHOMIUS, or Pacuumius. See Monacnism, vol. x¥i. pp. 699, 700.

PACHYDERMATA. See Mammatta.

PACIFIC OCEAN

te ancient world was ignorant of the existence of

the vast expanse of water now known as the Pacific Ocean. In Ptolenty's map of the world, constructed in the 2d century of our era (see Map, vol. xv. Pl. VIL), this fact is clearly brought out, for the only space which might possibly represent the Pacific is the Magnus Sinus,

a sea so limited in extent, and represented in such a position, that it probably stands for the Gulf of Siam im the Indian Ocean.

Vague reports of a great ocean lying beyond China Prov'

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were current in Europe as early as the period of Arabian # qj

supremacy in learning.

cove, Indeed an Arab merchant named~ ~~

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Sulaiman, who visited China in the 9th century, declared that he had sailed upon it. But for several hundred years the reports continued so uncertain, and were so loaded with the wild extravagance of travellers' tales of the period, that it is difficult to get at the facts from which they probably took their origin. During the 13th and 14th centuries Marco Polo and his successors travelled far to the East and came to an ocean of the extent of which they were ignorant, but they partially explored its western coasts. The East was the region towards which all the commerce and enterprise of the Middle Ages tended, and it was the hope of finding a safer and shorter sea route to India that led the Spanish court in 1492 to furnish Columbus with a fleet for the exploration of the Western Ocean. Although convinced of the spherical form of the earth, he greatly under-rated its size, and, accepting the popular estimate of the great breadth of the Asiatic continent, he set out on his voyage confident of soon reaching "the Indies." The glowing descriptions of liis discoveries in that strange new world of the West that rose up before him to bar his advance immediately attracted the attention of adventur- ous Spanish mariners. Headed by Columbus himself, they cruised intrepidly amongst the Caribbean Islands, still lured by the hope of discovering some western passage to the coveted East. Columbus found that what he at first con- sidered a labyrinthine archipelago was a continent of vast extent, but not Asia, and he died without knowing what lay beyond. Spain and Portugal were the rival maritime powers at that time, and both took up the search for new countries with great ardour. Pope Alexander VI, in 1493, fearing that the two nations would quarrel over their colonies, assigned all the new lands that might be discovered west of the Azores to Spain, and all east of those islands to Portugal. The Portuguese accepting the gift followed Vasco da Gama in opening up the road to India by the Cape of Good Hope, and pushed forward their trading and piratical

excursions into the west Pacific far beyond the Spice Islands. The Spaniards confined themselves to the New World, visiting, naming, and plundering the West India Islands and the headlands of Central America. On the 29th of September 1513 Vasco Nufiez de Balbao, the leader of a Spanish party exploring the Isthmus of Panama, saw, from the summit of a mountain, a vast ocean stretching to the west—the very ocean of whose existence Columbus was certain, and which he had so long tried vainly to discover. Because he first saw it on Michaelmas day, Balbao named it the Golfo de San Miguel. Magellan, following the east coast of America farther to the south than any previous explorer, sailed on, in spite of terrific storms, until he found the strait which now bears his name, and, steering carefully through it, on the 27th of November 1520 he swept into the calm waters of that new sea on which he was the first to sail, and which he named the Mar Pacifico.

The victories of Cortez in Mexico about the same date opened the way for the exploration of the west coast of America, where Pizarro's conquest of Peru in 1526 gave the Spaniards a firm footing. From this time an intermnittent trade sprang up between Europe and the Pacific through Magellan Strait, and latterly round Cape Horn. Before long English fleets, attracted more by the prospects of plundering Spanish galleons than of discovering new territories, found their way into the Pacific. Sir Francis Drake, like Balbao, saw the ocean from the Isthmus of Panama, He entered the Pacific in September 1577, being the first Englishman to sail upon it ; some months later he sailed across it to the Moluccas. Alvaro de Mardana, who preceded him, had discovered the Solomon Islands in 1567.

Tasman, Roggewein, Dampier, and other explorers of the

17th century discovered Australia, New Zealand, Tasmania, and many smaller groups of islands. During the 18th century the voyages of Anson, Bass, Behring, the two Bougainvilles, Broughton, Byron, Cook, La Peérouse, and many more practically completed the geographical exploration of the Pacific Ocean. In the beginning of that century the Pacific had a curious fascination for commercial speculators, and the ill-fated Scottish colony founded at Darien in 1698 seemed only to prepare the way for the

English South Sea bubble that burst in 1720. All the navigators who explored these seas believed in the existence of a north-west passage between the Atlantic and Pacific, and made attempts to find it; but its discovery baffled all enterprise until 1850, when Maclure proved that there was such a channel, but that the ice prevented its being of any commercial utility. In the present century D'Entrecasteaux, Krusenstern, Beechy, Fitzroy, and Bennet have taken the lead amongst geographical explorers in the Pacific, although the ranks contain many names scarcely less worthy of remembrance. Within recent years several purely scientific exploring expeditions and British survey- ing vessels have examined the Pacific, investigating its depth, the nature and form of the bottom, the tempera- ture of the water at various depths and its density, as well as the marine fauna and flora. Of those expeditions the voyages of the "Challenger," " Gazelle," and " Tuscarora" are the most important.!

Extent.—The Pacific Ocean? is bounded on the N. by Extent.

Behring Strait and the coasts of Russia and Alaska, on the E. by the west coasts of North and South America ; on the §. the imaginary line of the Antarctic Circle divides it from the Antarctic Ocean, while its western boundary is the east coast of Australia, the Malay Archipelago separating it from the Indian Ocean, and the eastern coasts of the Chinese empire. Some modern geographers place the southern limit of the Atlantic, Pacific, and Indian Oceans at the 40th parallel, and name the body of water which surrounds the earth between that latitude and the Antarctic Circle the Southern Ocean.

Although differing from the Atlantic in its general form, being more nearly land-locked to the north, the Pacific resembles it in being open to the south, forming, in fact, a great projection northwards of that vast southern ocean of which the Atlantic is another arm.

The Pacific is the largest expanse of water in the world, covering more than a quarter of its superficies, and com- prising fully one-half of its water surface. It extends through 132 degrees of latitude, in other words, it measures 9000 miles from north to south. From east to west its breadth varies from about 40 miles at Behring Strait, where Asia and America come within sight of each other, to 8500 miles between California and China on

the Tropic of Cancer, and to more than 10,000 miles on the Equator between Quito and the Moluccas, where the ocean is widest. The area has been variously estimated at from 50,000,000 to 100,000,000 square miles ; but, defining its boundaries as above, Keith Johnston, from careful measure- ments, estimated it, with probably a near approach to the truth, at 67,810,000 square miles.

1 The principal ocean tracks followed by trading vessels in the Pacific are three :—(1) round Cape Horn and along the South Ameri- can coast—the great rush to California on the discovery of gold in 1847 led to the establishment of lines of fast clippers by this route and of steamers from Panama to San Francisco ; (2) from San Francisco to China a regular service was established in 1867 ; (3) the mails began to be carried from Australia to San Francisco in 1873 and to Panama in 1866. ‘The trade with the Pacific will no doubt be greatly increased when the Panama ship-canal is opened for traffic.

2 Formerly called the South Sea, and sometimes still so named by the French and Germans (la Mer du Sud; Stidsee, Australocean), with whom, however, La Mer (L’ Océan) Pacifique, and Grosser Ocean or Stilles Meex are the more usual designations.

Ameri- can coast.

Asiatic coast,

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Coasts, Seas, d&c.—The coast-line of the Pacific and Indian Oceans, taken together, only amounts to 47,000 miles; that of the Atlantic alone measures 55,000, the smaller ocean more than making up for its less extent by its numerous inland seas and inlets of smaller size. Speaking broadly, the eastern boundary of the Pacific is rugged, barren, mountainous, and singularly free from indentations, while its western shores are low, fertile, and deeply indented with gulfs and partially enclosed seas. Behring Strait unites the Arctic Ocean with the Sea of Kamchatka, or Behring Sea, which is bounded on the east by the irregular, low, swampy shores of Alaska, and on the south by the Alaskan peninsula and the Aleutian Islands. Along

British North America the coast is rugged, rocky, considerably indented, and, between the parallels of 50° and 60° N. lat., fringed with islands. The largest of these are Vancouver Island in the Gulf of Georgia, Queen Charlotte Island, Prince of Wales Island, and the islands of King George III.'s Archipelago. The Gulf of California runs northwards in the Mexican coast, reach- ing from 23° to 32° N. lat. It is the one important inlet on the whole west coast of America,—the only others which are worth naming being the Gulf of Panama and the Gulf of Guayaquil. The Mexican shore is low, and contrasts with the coasts to the north and to the south, which are generally steep and rocky, though there are occasional sandy beaches in Peru and Chili. The breadth of the plain between the Rocky Mountains and the sea gradually diminishes towards the south, and the mountain chain of the Andes runs close along the west coast of South America to the very extremity of the con- tinent.

A series of volcanoes, active and extinct, runs round the Pacific, commencing at Cape Horn, passing along the Andes and Rocky Mountains, crossing from the American continent by the Aleutian Islands to Kamchatka, and thence southwards by Japan and the East Indian Archipelago to New Zealand. Earthquakes are frequent all along this line.

There are few islands near the American coast north of Patagonia, and these are small and unimportant; but south of the 40th parallel there is a complete change. The end of the continent seems as if it had been shattered ; there are abrupt bays and jagged chasms; archipelagos of small islands rise up in splintered fragments along the shore. The Strait of Magellan forms a tortuous channel between the mainland and the rocky storm-beaten islands of Tierra del Fuego.

The coast-line on the Asiatic side is longer and greatly diversified. In the north the Sea of Okhotsk is cut off from Behring Sea by the peninsula of Kamchatka, from the extremity of which a chain of islands extends to the borders of the Antarctic Ocean. These islands are of all sizes, ranging from small islets to the island continent of Australia. The island chain hangs in loops along the Asiatic coast, each loop including an almost land-locked sea. These partially enclosed seas are more or less com- pletely cut off from the general oceanic circulation, and they consequently differ considerably

from the Open ocean as regards the temperature of the water, specific gravity, fauna and flora, and nature of the deposits. The Kurile Islands run from Kamchatka to Japan, cutting off the Sea of Okhotsk. The great Japanese Islands, with Saghalien to the north and the Chinese coast on the west, enclose the Sea of Japan, leaving it in communica- tion with the Sea of Okhotsk by the Channel of Tartary to the north, with the ocean on the west by the Straits of La Pérouse and Sangar, and on the south by the Straits of Corea. The Yellow Sea runs into the Chinese coast, and is divided from the Sea of Japan by the peninsula of

Corea. The China Sea, with the two great gulfs of Tonquin and Siam, is marked off from the Indian Ocean by the peninsula of Malacca—remarkable because it rung inthe same direction as the other two peninsulas of the Pacific, Kamchatka and Corea—and the islands of | Sumatra and Java, while Borneo and the Philippine Islands separate it from the Pacific. Between the south coast of China and the north of Australia the East Indian Archj- pelago cuts up the ocean into a network of small seas and narrow channels. The seas are named the Celebes, the Banda, the Sulu, the Java, the Flores, and the Arafura, The more important of the sea passages between the islands are the Straits and Channel of Formosa, which lead north- ward from the Pacific to the China Sea; the Strait of Macassar between Borneo and Celebes ; Molucca Passage between Celebes, the Moluccas, and Jilolo; and Torres Strait between New Guinea and Australia. The east coast of Australia is, as a rule, steep and rocky ; tliere are few inlets, and none of them compare in size with the Gulf of Carpentaria on the north coast. Moreton Bay and Port Jackson are two of the best harbours, and as a haven the latter has few equals in the world. The Great Barrier Reef lies off this coast fora length of more than a thousand miles, the distance between it and the shore varying from 60 to 100 miles. Bass Strait separates Australia from Tasmania on the south; and the two main islands of New Zealand, separated by Cook Strait, lie to the south- east of the continent. The Gulf of Hauraki, the Bay of Plenty, and Pegasus Bay are the chief inlets in these | islands. ewer-System.—The drainage area of the Pacific Ocean | is estimated at 8,660,000 square miles, while that of the Atlantic amounts to more than 19,000,000; the chief / reason for this disparity is that only half a million square | miles of the American continent are drained into the Pacific, the remaining six and a half millions being con-

. nected with the Atlantic river-system, and it is estimated that only one-seventh of the area of the Asiatic continent drains into the Pacific Ocean. The huge wall of the Andes Amer practically reduces the Pacific rivers of South America to the © _ rank of mountain streams; the Biobio and the Maypu in arsed Chili are the only ones exceeding 100 miles in length,— the former having a course of 180, the latter of 160 miles. The Rocky Mountain chain, which forms the watershed of North America, runs parallel to the Pacific coast at a distance of about 1000 miles, and the Cascade and minor ranges which skirt the shore are broken through in several places to give passage to rivers that are, in some cases, of considerable size. The Colorado rises in the State of that name, at the base of the Rocky Mountains, flows south- west through Utah and Arizona, and falls into the head of the Gulf of California. Its course measures about) 1100 miles, and it drains a rugged and barren area of | 170,000 square miles. California has only one river, the Sacramento, 420 miles long. The Oregon (or Columbia) | is formed by the union of two streams rising in the Rocky Mountains, one in British Columbia, the other in Idaho. It is a swift-flowing river, full of rapids and cataracts, and, though it is only 750 miles long, the area which it drains is greater by one-seventh than that drained by the Colorado. The ebb and flow of the tide are perceptible for a hundred miles from the mouth of the Oregon, and the river is navigable for that distance. The Frazer, which has a length of 600 miles, flows southward through British Columbia from the Rocky Mountains, and enters the sea in the Gulf of Georgia opposite Vancouver Island, carrying off the rainfall of 98,000 square miles. The northern limit of the American mountain chains is marked by the rise of the great river Yukon, which traverses Alaska ; and, after a run of more than 2000 miles, it enters

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Behring Sea opposite the island of St Lawrence. Its tributaries have not been fully explored, so the area which they intersect is unknown, but probably it is very large.

The Asiatic division of the Pacific river-system is very much more extensive than the American, and includes of great size and of considerable commercial importance. In the north the Amur is more than 2000 miles long, and it receives many tributaries, which rise on the north in the Stanovoi mountains, and on the west and south on the borders of the great table-land of the Gobi, the central Asiatic desert; altogether its basin measures nearly 900,000 square miles. The Hoang-ho (Hwang-ho or Whang-ho) and the Yangtze-keang both rise near the Kuen-lun mountains of Tibet amongst the extensive terraces which form the eastern slope of the great table-land of Central Asia. The Hoang-ho has a length of 2600 miles, and in its course it sweeps in a northerly curve close to the In-Shan mountains ; then, after being crossed repeatedly by the Great Wall of China, it turns sharply to the south, and finally runs due east into the Yellow Sea. The Yangtze-keang follows a southward direction from its source, but ultimately turns to the north-east and enters the Yellow Sea not far from the mouth of the Hoang-ho. It is one of the longest rivers in the world, for, including its windings, it measures 3200 miles from its source to the sea. These two rivers drain more than a million and a quarter square miles; and it is principally owing to the large amount of suspended matter which they carry down that the sea into which they fall is called the Yellow Sea. The other rivers of importance are the Choo-keang, the Mekong, and the Menam. The last two run into the Gulf of Siam, after watering the peninsula of Siam and Cochin China. Few rivers enter the Pacific on the east coast of Australia, and in conse- quence of the proximity of the mountains to the shore they are short and unimportant.

Atmospheric Pressure and Prevailing Winds.—When the mean atmospheric pressure for the year over the entire surface of the world is considered, it is found that there are two broad belts of high pressure which encircle the globe, one on each side of the equator. There is a wide area of slowly diminishing pressure between them, includ- ing a narrow central band along which the barometric readings attain a minimum. Two other regions of low pressure surround the poles, and extend to a considerable distance. That around the North Pole is connected with an area of still lower pressure over the North Pacific, and there is another permanent depression, which is even deeper, in the vicinity of Iceland. Atmospheric pressure is the fundamental meteorological phenomenon, and the mean pressure for the year affords a

clue to the cause of all such regular and continuous phenomena as trade winds and ocean currents, and to the distribution of temperature. Similarly a study of the isobars at different seasons throws light upon all periodical occurrences in the way of winds and currents.

A low barometer is always accompanied by a high per- centage of atmospheric aqueous vapour ; consequently the equatorial belt of continuous low pressure is a region of almost continuous rain, excessive cloud, and constant calm or light variable winds. The effect of a difference in atmospheric pressure being established between two places 18 to produce a flow of air from the region of high towards that of low pressure, and the winds in their turn largely determine the surface movements or drift currents of the ocean. — The region of calms between the north and south trades in the Pacific is both narrower, more irregular, and less clearly marked than the corresponding belt in the Atlantic. In the East Pacific it lies, at all seasons, con- siderably north of the equator; but during the southern

summer it is found south of the line in the western parts of the ocean, and disappears entirely in the northern summer, as the calms of the Indian Ocean do also. The reason of the southern position of the west end of the calm belt seems to be the simultaneous occurrence of low atmo- spheric pressure in the interior of Australia and an ex- ceptionally high barometer in Asia. In the southern winter the depression over Asia and the increase of pressure over Australia form an unbroken barometric gradient, and the result is that the calms are replaced by a southerly breeze of great regularity. The region of calms included between the zones of the two trade winds, and towards which they blow, is not the only one with which they are associated ; for the opposite meteorological conditions that characterize the northern border of the north-east trades and the southern margin of the south- east winds produce two fringing bands of calms. These regions are characterized by a high barometer, a sunny sky, and occasionally sudden squalls,— contrasting with the depressed barometer and dull, wet weather of the equatorial region. In January the low atmospheric pres- sure over the North Pacific produces winds which affect the climatological conditions of the

shores in very different ways. At Vancouver Island the prevailing wind is south- west, and consequently the winter on the shores of British Columbia is mild and moist. The opposite coast of Asia is visited during the same season by northerly winds,— north-east in Alaska, north-north-east in Kamchatka, and north-west in Japan ; and, asa result, the weather in these regions in winter is dry and bitterly cold. The West Pacific and the Indian Ocean are the regions of monsoons,— winds that blow as steadily as the trades, but which change their direction with the season. During the periods of transition the steady breeze gives place to variable winds, occasional calms, and sometimes terrific hurricanes. The general direction of the monsoons in the Pacific between April and October is southerly and south-easterly, and from November to April they blow from the north-east, and on nearing the continent of Asia from the north-west. Monsoonal winds are found connected with all continents ; they are produced by the great differences in the tempera- ture and pressure which prevail over the land at different seasons as compared with the adjacent ocean. The mon- soons give rise to oceanic currents which flow in the same direction as the wind, and like it run opposite ways during alternate half years. Although the velocity of the wind over the open sea is always greater than that near shore or on land, it was shown by the observations of the “Chal- lenger,” in the Pacific and other oceans, that there is no distinct diurnal variation in the wind’s force at sea, though

very decided periods of maxima and minima were noticed

in the vicinity of land (see Mrrzoronocy, vol. xvi. p. 125).

Currents.—The system of surface circulation in the Currents.

Pacific is much more complicated and less clearly defined than that in the Atlantic, as might be expected from the less constant character of the winds. The latter ocean has two wide channels of communication with the Arctic Sea, while, so far as currents are concerned, the Pacific is land- locked to the north—Behring Strait being narrow and shallow; consequently water enters the Pacific almost entirely from the south, where there is uninterrupted communication with the Antarctic Ocean. There is no direct information as to the movements of ocean water at depths greater than 200 or 300 fathoms; it is known, however, from indirect evidence, that

movements do occur. Although the subject of under-currents at depths less than those just mentioned has been extensively studied, it is only with respect to surface currents that anything very definite is as yet known.

The vast extent of the Pacific Ocean gives full scope for the current-producing action of tides and winds, while the smooth continental boundary on its eastern side, the numerous groups of islands which break its surface, and its indented western coast, combine to modify the direction of the main streams and to produce innumerable minor currents, some permanent, and others varying from time to time in velocity and direction. The chief cause of these currents is believed to be traceable to the direct or indirect action of wind ; but here it is proposed to refer merely to their gencral geography and physical effects, without dis- cussing the theory of their formation.

A general surface drift of the cold waters of the Antarctic Ocean, having a temperature lower than 40° Fahr. at all seasons, bears north-east towards Cape Horn, where it divides into two branches; one, the Cape Horn current, passes on into the Atlantic, and the other sweeps northward along the west coast of South America until it strikes the Peruvian shore, which deflects it westward. The cooling effect of this current on the water all along the coast is illustrated very clearly by the abrupt north- ward turn of the isothermals (see METEOROLOGY, figs. 8 and 9), which is more conspicuous in the chart for the southern winter than in that for the summer. In summer, however, there is a more striking evidence of this current's cooling power to be seen in the arrangement of the isothermals. The northern line of 70° Fahr. reaches as far south as 18° N. lat., and that of 80° makes a short loop from 18° N. to the equator; but the southern isothermal of 80° does not touch the American coast at all, and that of 70° lies farther from the equator than 30° 8. lat., so that the increase of temperature from the south is very gradual; so much so that at the Galapagos Islands, under the equator, the temperature of the surface water is only 70°, while a few hundred miles to the west it is over 80°. Penguins—essentially Antarctic birds—are found living on the shores of these islands. In consequence of this current, the highest surface temperature at all seasons of the year is found distinctly to the north of the equator in the eastern Pacific.

The Peruvian current forms the southern fork of the great equatorial current, which runs due west. This current is very broad, and divided by a narrow counter- current flowing in an opposite direction through its centre. The two branches of the equatorial current occupy very approximately the two areas of falling barometer between the north and south belts of high pressure and the central trough of minimum barometric readings. This difference of atmospheric pressure on each side produces the north- cast and south-east trade winds, and to these the current probably owes its regularity and constant direction. The counter-current lies in the narrow belt of low barometric pressure to which the trades blow, and probably originates from the banking up of the waters to the westward. Its rate and position consequently vary greatly at different times of the year. The “Challenger,” on her cruise between the Sandwich and Society Islands, found these currents to run with considerable force. In the ‘“ Narra- tive” of the cruise (chap. xviii.) the fact is alluded to thus:—

“From Hawaii Island to the 10th parallel the direction of the current was westerly, and its average velocity 18 miles per day, ranging from 10 to 23 miles. From the 10th to the 6th parallel the direction was easterly, and its average velocity 31 miles per day, ranging from 7 to 54 miles per day. From the 6th parallel of north latitude to the 10th parallel of south latitude the direction was again westerly, and the average velocity 35 miles per day, ranging from 17 to 70 miles per day. From thence to Tahiti the general tendency of the current was westerly, but its velocity was variable. The axis of greatest velocity of the counter-equatorial current was between the 7th and 8th parallels of north latitude.

The axis of greatest velocity of the equatorial current was on the parallel of 2° north, where its specd amounted to 3 niles per hour.”

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The equatorial current strikes on the East Indian Archipelago, where it is split up by the narrow channels and shallow waters, and diverted into numberless minor currents. The two main divisions, which have acquired a high temperature from prolonged exposure to the tropical sun, ultimately leave the archipelago; the southern arm curves southwards, carrying its warm water to the east coast of Australia and to New Zealand, whence it igs

diverted towards the cast, and becomes merged again in the general north-easterly antarctic drift. The north equatorial current, which varies in volume and velocity with the monsoons, strikes the coast of Asia between the Philippines and Japan, and is deflected in a north-easterly direction as the Kuro-Siwo or Japan current—wholly a warm oceanic river during the §.E. monsoon similar to the Gulf Stream of the Atlantic. The Japan current sends many branches into the inland seas and channels of the north-eastern coast of Asia, but the main body of water flows northward until it bifurcates in 40° N. lat., send- ing one fork among the Kurile Islands and along the Kamchatka peninsula into Behring Sea, whence it escapes by Behring Strait into the Arctic Ocean.

The general direction of surface circulation in the Pacific may be remembered by supposing the ocean divided into a northern and southern half by the cquatorial counter-current. In the northern half the water circulates in the direction of the hands of a watch, ¢.c., it passes up the west coast and down the east, while in the southern half the rotation is in the opposite direction—down the west coast and up the east; but the latter half does not exhibit the complete cycle so distinctly as the former. The centre of each area of circulation is occupied by a small Sargasso Sea, the northern being the more clearly defined, but neither approaches the well-known Sargasso Sea of the North Atlantic either in definiteness, extent, or amount of weed.

Temperature of Surface Water.—The distribution -of Surfac

temperature in the surface water of the Pacific varies con- ®™?”! The equatorial region is of

siderably during the year. course comparatively little affected by the change of season, but there is 4 general rise of temperature in the northern parts of the ocean, and a fall in the southern, during the northern summer, and a similar rise in the south and fall in the north during winter. The charts exhibit a general northward move in the isothermals during the former season, and a southward tendency in the latter. The change in the position of the lines is greatest in the temperate zones. The charts of ocean surface tempera ture (see Mrrrorotoey, figs. 8, 9) for February and August ‘show the direction of the isothermals at two opposite seasons ; and reference to

them will make it plain that in temperate regions the lines of equal temperature follow the parallels of latitude much more closely in the Pacific than in the Atlantic, while their displacement with the change of season takes place in a direction nearly north and south. There are notable instances of divergence from these rules, such as the peculiarity of the isothermal of 80° already alluded to. Another circumstance is the fact that the temperature of the surface water on the western side of a great continent is much lower than that on the eastern side in the same latitude; it seems as if the west side of

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a continent attracted the isothermals, making them con- verge towards the equator. It has already been pointed out that these effects are due to the winds and the cold eurrents which strike the western continental shores and run along the coasts. The surface temperature of the Pacific, between the latitudes of 45° N. and 45° §., no- where at any season falls below 50°. In August the southern isotherm of 50° remains close to the 50th parallel, not diverging more than a degree or two on either side. Between the 45th parallels and the northern and southern limits of the ocean the temperature is almost always below 50°. The southern isotherm of 40° is remarkable for its constant position all the year round, between latitudes 55° and 58°,—a result brought about by the gigantic antarctic icebergs which prevent the surface temperature of the water from rising during the southern summer.

The northern and southern ‘“isocrymes” of 68°, that is the lines which pass over water which has a mean temperature of 68° during the coldest months of the year, lie, according to Dana (Corals and Coral Islands, 1872), between the latitudes of 20° and 30° on each side of the equator, except in the neighbourhood of the South- American coast, where the isocryme runs north in a loop beyond the equator,—a consequence of the cooling effect of

the Peruvian current. These isocrymes mark out an area of great importance ; for the reef-building corals are con- fined within it.

The highest temperature which sea water has been observed to attain is 90° F., and water of this temperature is only met with in the Red Sea. The maximum in the Pacific in the month of August is reached in the boundary between it and the Indian Ocean (in the Malay Archi- pelago) and in a narrow strip along the Mexican coast ; in both these regions the thermometer immersed in the surface water registers 85° as a mean. ‘There is a con- siderable area which in August stretches between New Guinea and Japan, from 10° S. to nearly 30° N., where the surface temperature reaches 84°, but these are excep- tional temperatures. .

When the “Challenger” was cruising in the South Pacific—in 1874 and 1875-—the water was found to be uniformly warmer than the air, the difference in tem- perature between the two averaging 1°°5 to 2° Fahr. In the North Pacific, between the latitudes of 30° and 40°, on the other hand, the atmospheric temperature is about half a degree higher than that of the surface water. Such differences may be explained by considering the effect of warm and cold currents, which alter the temperature of the water much more rapidly than that of the air, and of warm and cold winds, which affect the atmosphere more quickly than the ocean.

_ Deep-Sea Temperature.—The serial temperature sound- ings of the “Challenger” in the Pacific give a very good idea of the distribution of temperature in the deeper waters. ‘There seems to be a slow massive movement of water from the Antarctic Ocean into the Pacific, which is not confined to the surface currents, but affects the whole mass of water down to the bottom. The rate of this motion is quite unknown. In the open sea, far from coasts and barriers, the temperature of the water con- tinually decreases as the depth increases. This is only true for the open ocean, fully exposed to the effects of the mass movement of the water; there is a very different distri- bution of temperature in enclosed seas such as those of the Western Pacific, or even in the ocean when a barrier pre- Sents itself to the moving water. The difference, which is

- brought out by the diagram (Plate II. fig. 1), is due to the

fact that when a barrier exists it retards the motion of the lower portion of the water, which has the lowest tempera- ture, while the higher passes on over it, and fills up the

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area beyond with water at the uniform temperature of the great ocean at the point to which the top of the ridge or obstruction reaches. In the Sulu Sea, for instance, the diagram shows! that the temperature falls steadily and rapidly from 80° at the surface to 50°°5 at 400 fathoms, and then continues at 50°°5 right down to the bottom in 2500 fathoms, instead of sinking to somewhere about 35°, as it is observed to do in the open ocean at that depth. The inference is that the Sulu Sea is surrounded by a ridge rising to at least about 400 fathoms from the surface, which prevents the great ocean circulation from having its cooling effect, and soundings indicate that this is really the case.

During the cruise of the “Challenger” the bottom temperature over the North Pacific was found to be 35°‘1; south of the Sandwich Islands it fell to 35°; in the Low Archipelago it again rose to 35°‘1; on the 40th parallel it fell to 34°-7 in the deep water, but rose to 35°‘4 and 35°°5 in the shallow water of the Patagonian elevation. The thermometer registered 34°°5 at the bottom between Australia and New Zealand; while in that part of the ocean to the north-east of Australia known as the Coral Sea, although the depth was the same (about 2500 fathoms), the bottom temperature was as high as 35°°9. The variations of temperature in the enclosed seas of the Eastern Archipelago were found to be considerable, and nearly all those seas show the phenomenon of constant temperature from an intermediate point to the bottom, consequent on the existence of barriers. The chief details of the thermal conditions of these seas are represented graphically in the diagram (Plate IT. fig. 1). Between the Caroline Islands and Japan the bottom temperature was 35°°3. The bottom temperature in the Pacific is on the average about 1° F. lower than that in the Atlantic.

The temperature of the water at the depth of 300 fathoms is nearly the same (40° to 45°) over the whole of the North Pacific, but above 300 fathoms the water is warmer in the western than in the central portion, while below that depth it is colder in the former than in the latter. The same phenomenon is

noticed between the latitudes of 34° S. and 40° S., but here 700 fathoms marks the plane of constant temperature. Between 33° N. and 40° S. the temperature of the water above 200 fathoms is higher in the North than in the South Pacific, whilst from 200 to 1500 fathoms it is lower in the North, and below the latter depth the condition reverts to what it was above 200 fathoms.

The diagram (Plate II. fig. 2) exhibits the bathymetrical Plate Il. distribution of temperature in a section of the Pacific from a fig. 2.

position in 38° 9’ N. lat. and 156° 25’ W. long. to one in 40° 3/ S, lat. and 132° 58’ W. long. as determined by H.M.S. “Chal- lenger” in 1875, and may be compared with similar diagrams of the ATLANTIC (see vol. ili. p. 23). In order to separate the iso- thermals in the first 200 fathoms sufficiently the scale of depths required to be made large, while in order that the length of the diagram might be kept within reasonable bounds the scale of latitude was made very much smaller. ‘The result of this is to exaggerate the inequalities of the sea bottom, making the slopes very much steeper than they are; this effect is best secn in the way in which islands are represented. The rapid falling off of temperature in the first few hundred fathoms, and then its very slow but stcady decrease to the bottom are to be observed, and the fact that latitude has a great effect on the surface temperature, but

1 The encircled numbers in the diagrams (Plate II. figs. 1 and 2) indicate the ‘‘ Challenger” stations.

2 An excellent example of the existence of a submarine barrier being pointed out by a wide divergence in the temperature in contiguous areas of the ocean is met with in the Faroe Channel (see NORWEGIAN Sea, vol. xvii. p, 594, and Norru Sea, p. 564, fig. 1).

Density of the water.

Plate II. chart.

none at considerable depths, for the isotherm of 40° is constantly between 300 and 400 fathoms, and also that depth alone deter- mines the bottom temperature in the open ocean, the coldest water occurring as a matter of fact under the equator in the deepest troughs open to the south.

Density of the Water.—The specific gravity of ocean water is an index of its salinity, since the researches of various chemists, foremost amongst whom are Forchham- mer and Dittmar, have shown conclusively that the per- centage composition of the salts in sea water is the same in all parts of the ocean, so far at least as regards the principal constituents. Mr J. Y. Buchanan made continu- ous observations on the specific gravity of sea water during the whole voyage of the "Challenger," and has published a very valuable paper on the distribution of salt in the ocean in the "Challenger" Reports (Phys. Chem. Chall. Exp., vol. i. part ii.). The chart in Plate II. showing the geogra- phical distribution of surface density is copied from that paper. The percentage of total salts in sea water, as deduced from the specific gravity, is, according to Buchanan and Dittmar—

TD ss 0¥S1 4 Gonaanepeocen 1:025 1-026 1027 1-028 Percentage…..... 8°3765 3°5049 3°63438 3°7637

The density of the water in different parts of the ocean must obviously change to a certain extent with the season; and it is not only the surface density that is affected in this way; any cause which promotes evaporation tends to increase the salinity of surface water, while any con- ditions that effect condensation of aqueous vapour produce dilution. For instance, in the China Sea during the month of November, at the end of the south-west monsoon, which is a moist wind accompanied by much rain, the specific gravity observed was 102518, and two months later, after the dry north-east monsoon had been blowing for some time, evaporation had proceeded so far that the specific gravity had risen to 1:02534. The climate is the principal factor in determining surface salinity, and the causes which produce well-marked climatic conditions have an equally apparent effect on the density of the water. Thus there are two zones of comparatively high density encircl- ing the globe in the region of the north-east and south-east trade winds, which are dry and promote rapid evaporation ; and similarly the region of calms and rain between the trades is distinguished by the low

specific gravity of the water. North and south of these areas there are two zones where the salinity maintains a mean value, in consequence of there being a balance between evaporation and con- densation; and round the poles there are areas of concentration brought about by the freezing of the sea water and the separation of salt, which of course increases the salinity of the water remaining unfrozen.

The distribution of density differs considerably in the two great oceans. In the Atlantic there are two areas of high specific gravity, one in the north, the other in the south ; while in the Pacific there is only one, situated in the southern division of the ocean in the neighbourhood of the Society Islands. It is neither so large as those of the Atlantic, nor has it so high a specific gravity. The density of the concentration areas in the Atlantic, taking pure water at 4° C. as unity, is 1:02750; that in the saltest portion of the Pacific is only 1:02700. In the North Pacific the salinity is less than in the South, and its distribution is much more uniform. The density in this region never exceeds 1:02650, and the minimum, in the rainy region of the equatorial counter current, is as low as 102485. The South Pacific has water of a relatively high density, its maximum being 1:02750. The water of the seas of the Eastern Archipelago, in the western basin of the Pacific, although exposed to the full force of an equatorial sun, and possessed of a very high surface temperature, is yet surprisingly fresh. The specific

gravity varies considerably with the season, but the aver- age for the year over the greater part of these seas is under 1:02550 ; and there is a large area surrounding the islands of Java and Sumatra where the dilution is greater, the hydrometer only indicating 1:02500. The weak salinity of these waters is largely to be attributed to the extreme humidity of the atmosphere, the frequent and heavy rains, and the fact that so many lofty and exten- sive islands, where the annual rainfall rises above 200 inches, drain into the seas. Water of such a degree of dilution is not met with anywhere else, except near the mouths of rivers and in the vicinity of melting ice, and, as a temporary phenomenon, after prolonged rain in the tropics.

In regions where there is decided and continuous con- centration in progress, the specific gravity of the water is greatest at the surface and

decreases as the depth increases, down to about 800 or 1000 fathoms, after which the density increases slowly with the depth until the bottom is reached. The density of the bottom water of the Pacific is almost the same everywhere ; it only varies from 1:02570 to 1:02590; and the same value holds for the South Atlantic. The North Atlantic has denser water at the bottom, varying from 1:02616 to 1:02632. In those regions where the surface water is being constantly diluted, as is the case in the equatorial belt of calms, the density increases with the depth down to between 50 and 100 fathoms, where there is a maximum, from which the density diminishes, as in the other case, to about 1000 fathoms, and afterwards increases slowly down to the bottom. There is a striking resemblance between the direction of the isohalsines, or lines of equal salinity, and of the isothermals; but the parallelism breaks down, of course, in the case of a subsurface maximum.

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Depth.—For a long time the opinion that the Pacific Depth

was a comparatively shallow ocean was entertained by Plate

geographers, and it is only the recent soundings of the “Challenger,” “Tuscarora,” “ Gazelle,” and other survey- ing ships that have succeeded in dispelling the illusion. It is now known that the average depth of the Pacific is greater than that of the Atlantic, and that areas of deeper water occur in it than in any other part of the globe. A line running along the western shores of the two Americas and along the eastern shores of the Asiatic continent more or less closely follows a great circle of the globe. On the one side of this line there are the continental masses of the Americas and of Europe and Asia, with an average height of about 800 feet above the level of the sea; and on the other side the vast oceanic depression of the Pacific, with an average depth of about 2500 fathoms. The average level of the continental area may thus be regarded as about three miles above the Pacific depression.

The attempt to divide the ocean ‘into sharply defined basins is more or less unsatisfactory; and for the considera- tion of the depth it is better to view the Pacific as marked off into two portions by an imaginary line passing through Honolulu and Tahiti, on the meridian of 150° W.

The eastern half is remarkable for the comparative absence of islands and the uniform nature of its depth. With the exception of the narrow strip of shallow water surrounding the Aleutian Islands and running along the American coast, the sounding line shows an average depth of from 2000 to 3000 fathoms undiversified by remarkable elevations or depressions, between the northern limit of the ocean and 30° §. lat. There is a great submarine plateau extending from the Patagonian coast (in 76° W. long.) in a westerly direction to 120° W. long., which rises to between 2000 and 1000 fathoms of the surface. This elevated area diminishes in breadth as it proceeds westward, but it is supposed by some authorities to be

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connected with the shallow water surrounding the Low Archipelago and the Marquesas Islands (groups which are bisected by the 140th meridian of west longitude) and the Society Islands. If this be the case there is an almost continuous area of elevation stretching between Patagonia and Japan. It has been remarked that many of the sub- merged plateaus of the Pacific have a south-east to north- west trend. The “Challenger” examined the depth of the eastern half of the Pacific in 1875, along a line which extended from 38° N. lat. on the 160th meridian south -east to the Sandwich Islands, and then as nearly as possible along the 150th meridian to the Society Islands in 23° S. lat. From this point the course was again south-east to the 40th parallel of south latitude, which was followed eastward to the Patagonian coast, a visit to Juan Fernan- dez forming a northward digression. The depth was ascertained at fifty points along this route, and it was found to vary on the

whole from 2000 to 3000 fathoms. There were two soundings of over 3000 fathoms between latitudes 38° and 36° N., and one a little to the south of the Sandwich Islands. Between the meridian of 120° W. and the coast of America the soundings showed the depth to vary considerably as the ship was in deep water or over the submerged Patagonian plateau. The actual numbers observed proceeding eastward from 120° W. long. were in fathoms :—2250, 1600, 2025, 2270, 1500, 1825, 1775, 1375, 2160, 2225, 1450, 1325. The soundings made by the United States ship ‘‘ Tuscarora” during 1874 were much more numerous, closer together, and extended along several lines, but the general result was similar to that of the “Challenger” observations. The results of all recent observations are shown on Plate ITI.

The western half of the Pacific Ocean is a complete con- trast to the eastern. Archipelagos and scattered islands are exceedingly numerous; the depth of the ocean is by no means uniform, for shallows and areas of unusual depth occur scattered over it at irregular intervals. Along the Asiatic coast and between the island groups there are a number of partially enclosed seas, and these are separated from the great ocean by submarine plateaus of sufficient extent and height to warrant the supposition that a moderate upheaval would extend the Asiatic continent as far south as Australia, transforming the seas into inland salt lakes. Considerations of the peculiar animal and vegetable life of New Zealand and Australia lend some degree of probability to the speculation that these islands were joined to the main continent of Asia at some very remote period ; and it is even possible to trace the sub- merged coast-line of the great continent which then existed. This line separates the very deep water of the West Pacific from the shallower tvater of the inland seas and archipel- agos ; it runs from Kamchatka, over Japan, Formosa, the Philippines, New Guinea, to Australia and New Zealand. The most conspicuous peculiarity of the West Pacific is the very deep water lying in a crescent shape to the east of the Kurile Islands and Japan. It extends from 50° N. lat. to nearly 20° N. lat., although it is of no great breadth. The average depth of this area is nearly 4000 fathoms, and a narrow strip of still more abysmal depths runs along its western margin, like a ditch across the entrance to the Sea of Okhotsk ; here the United States ship ‘“ Tuscarora ” found depths of over 4600 fathoms. The course of the “Challenger ” led her to explore the seas of the Eastern Archipelago pretty thoroughly, and she carried a line of soundings from the

archipelago to Japan, and thence east- ward across the Pacific, crossing the area of great depth about the centre, off Nippon, where two soundings of 3950 and 3625 fathoms respectively were obtained. Like the East Pacific, the western division of the ocean has an average depth of from 2000 to 3000 fathoms, although a

great number of small depressions exist where the depth is greater, and detached areas of shallower water occur still more frequently. Many of the islands rise from depths of about 3000 fathoms, forming isolated mountains springing from the bed of the ocean, and several peaks which do not rise to the surface have been detected. More usually a number of islands are bound together by submarine elevations, frequently within a few hundred fathoms of the surface, over wide areas. Although the greater part of the sea surrounding New Zealand, the north of Australia, and the adjacent islands is under 1000 fathoms in depth, there are areas of great depression aniongst the islands, and some very deep channels. In 1875 when sounding in the channel between the Carolines and Ladrones, the “Challenger” met with the deepest water of the cruise, 4475 fathoms, or about five miles and a quarter; and this is the greatest depth from which a specimen of the bottom has hitherto been obtained. This abysmal depth only extends over a relatively small area, for the two nearest “‘Challenger” stations, one to the north and one to the south, had depths of 2300 and 1850 fathoms respectively.

The seas branching off from the Pacific are usually relatively shallow. Behring Sea on the north has ex- tremely shallow water in its north-eastern half, where there is a depth of under 100 fathoms ; in the south-western por- tion the depth increases rapidly to between 1000 and 2000 fathoms, except round the coasts and the Aleutian Archi- pelago. The Sea of Okhotsk is still shallower: much of it is within the 100 fathom line; and in its deepest part it does not attain 1000 fathoms. The Yellow Sea is entirely within the hundred fathom line; while the Sea of Japan, only separated from it by the Corean Peninsula, is not inferior in depth to the open ocean, its average depth being from 2000 to 3000 fathoms. The western portion of the Pacific, which lies between the Philippines and the Carolines and Ladrones, is also very deep, its mean depth approaching 3000 fathoms. This sea is of importance, since

it is to the Pacific what the Gulf of Mexico is to the Atlantic—the source of its great northern thermal current. The fact that the temperature at 1500 fathoms over the whole of the North Pacific does not differ by more than 0° °5 F. from that at the bottom appears to indicate that this portion is cut off from the southern division by a ridge rising to within 1500 fathoms of the surface. The existence of such a barrier cannot be said to be proved, but the indications lead to the supposition that it may extend from Japan to the equator, through the Bonin, the Ladrone, and the Caroline Islands.

Taken altogether, so far as present knowledge goes, the bed of the Pacific is more uniform than that of the Atlantic, and its changes of level are less abrupt. Its depth is, on an average, greater, and appears to be more evenly distributed than in the Atlantic, but this appar- ent greater uniformity may be partly due to the fact that the latter ocean, both on account of its smaller size and its greater commercial importance, has been much more care- fully surveyed, and its bathymetrical conditions more exactly ascertained.

DEposIts.

The explorations of the “Challenger,” “‘Tusearora,”

surveying ships have in reeent years given a great amount of information respeeting the uature of the deposits now forming over the floor of the oeean, and the speeimens eolleeted by these expeditions have been made the subject of a eareful investigation by Messrs Murray and Renard. The great extent and depth of the Pacific Ocean make it the most suitable field for the study of the varieties of deep-sea deposits and the eonditions under which they are found. The various kinds of deposits, all of whieh are found in the Pacific Ocean, are elassed as follows :—

XVUL — 16

and other Deposits

Terri- genous deposits.

Blue mud.

Green muds and

sands.

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Shore formations. Found in inland seas

eee Sula and along the shores Reatmnad of continents. Found around oceanic

islands and along the shores of continents.

Coralline mud and sand. Volcanic mud and sand. Red clay.

Globigerina ooze. Pteropod ooze.

Diatom ooze, Radiolarian ooze.

Found in the abysmal regions of the oceanic basins.

Pelagic deposits,

Terrigenous | deposits, | N

Coral mud and sand. \ J

The terrigenous deposits are found in more or less close proximity to the land, and are chiefly made up of the triturated fragments carried down into the ocean by rivers, or worn away from the coasts by waves or currents. Those found in the deeper water surrounding the land differ from the sands, gravels, and shingles of the shore and shallow water chiefly in the smaller size of the grains and the greater abundance of clayey matter and remains of oceanic organisms. As, however, the water becomes still deeper and the distance from land greater, the deposits assume, more and morc, a deep-sea character until they pass into a true pelagic deposit.

The principal mineralogical constituents -of the terrigenous deposits near continental land are isolated fragments of rocks and minerals coming from

the crystalline and schisto-crystalline series, and from the clastic and sedimentary formations; according to the character of the nearest coasts they belong to granite, diorite, diabase, porphyry, &c., crystalline schists, ancient limestones, and the sedimentary rocks of all geological ages, with the minerals which come from their disintegration, such as quartz, monoclinic and tri- clinic felspars, hornblende, augite, rhombic pyroxene, olivine, muscovite, biotite, titanic and magnetic iron, tourmaline, garnet, epidote, and other secondary minerals. The trituration and decomposition of these rocks and minerals give rise to materials more or less amorphous and without distinctive characters, but the origin of which is indicated by association with the rocks and minerals just mentioned.

Mixed with these are found in many places phosphatic nodules, large quantities of glauconite, and minerals arising from chemical action probably in presence of organic matter.

Blue mud is the most extensive deposit now forming around the great continents and continental islands, and in all enclosed or partially enclosed seas. It is characterized by a slaty colour, which passes in most cases into a thin layer of a reddish colour at the upper surface. These deposits are coloured blue by organic matter in a state of decomposition, and frequently give off an odour of sulphuretted hydrogen. When dried, a blue mud is greyish in colour, and rarely or never has the plasticity and compactness of a trueclay. Itis finely granular, and occasionally contains fragments of rocks 2 cm. in diameter ; generally, however, the minerals which are derived from the continents, and arc found mixed up with the muddy matter in these deposits, haveamean diameter of 0°5 mm. and less. Quartz particles, often rounded, play the principal part ; next come mica, felspar, augite, hornblende, and all the mineral species which come from the disintegration of the neighbouring lands, or the lands traversed by rivers which enter the sea near the placc where the specimens have been collected. These minerals make up the principal and characteristic portion of blue muds, sometimes forming 80 per cent. of the whole deposit. Glauconite, though generally present, is never abundant. The remains of calcareous organisms are at times quite absent, but occasionally they form over 50 per cent. The latter is the case when the specimen is taken at a cousiderable distance from the coast and at a moderate depth. These calcareous fragments consist of

bottom-living and pelagic Foraminifera, Molluscs, Polyzoa, Serpulz, Echinoderms, Alcyonarian spicules, Corals, &c. The remains of Diatoms and Radiolarians are usually present. Generally speaking, as the shores are approached the pelagic organisms disappear ; and, on the con- trary, as we proceed seawards the size of the mineral grains diminishes, and the remains of shore and coast organisms give place to pelagic ones, till finally a blue mud passes into a true deep- sea deposit. In those regions of the ocean affected with floating ice, the colour of these deposits becomes grey rather than blue at great distances from land, and is further modified by the presence of a greater or less abundance of glaciated blocks and fragments of quartz. These deposits are found along the coasts of North and South America, and in all the enclosed and partially euclosed seas, such as the Japan Sea, China Sea, Arafura Sea, Sulu Sea, Banda Sea, Celebes Sea, Sea of Okhotsk, &c.

At some points in the same regions are found green muds and sands, which, as regards their origin, composition, and distribution near the shores of continental land, resemble the blue muds. They are largely composed of argillaceous matter and mineral particles of the same size and kind as the blue muds. Their chief character- istic is the presence of a considerable quantity of glauconitic grains, either isolated or united into concretions by a brown argillaceous matter. The Moraminifera and fragments of Echinoderms and other organisms in these muds are frequently filled with glauconitic substance, and beautiful casts of these organisms remain after

treatment with weak acid. At times there are few calcareous organisms in these deposits, and at other times the remains of Diatoms and Radiolarians are abundant. When these muds | are dried they become earthy and of a grcy-green colour. They frequently give out a sulphuretted hydrogen odour. The green colour appears sometimes to be due to the presence of organic | matter, probably of vegetable origin, and to the reduction of peroxide of iron to protoxide under its influence. The green sands differ from the muds only in the comparative absence of the argillaceous and other amorphous matter, and by the more important part played by the grains of glauconite, to which the green colour is chiefly due. Red mud is found where quantities

Red of ochreous matter are brought down by rivers and deposited along mu: the coast, as in the Yellow Sea, but it is most characteristic in the Atlantic off the Brazil coast of America.

In addition to the terrigenous deposits above referred to, volcanic Vo), muds and sands and coral muds and sands are found around the my shores of oceanic islands either of volcanic or coral origin. The gay, voleanic muds and sands are black or grey, and when dried are rarely coherent. The mineral particles are generally fragmentary, and consist of lapilli of the basic and acid series of modern voleanic rocks, which are scoriaceous or compact, vitreous or crystalline, and usually present traces of alteration. The minerals are sometimes isolated, sometimes surrounded by their matrix, and consist principally of plagioclases, sanidine, amphibole, pyroxene, biotite, olivine, and magnetic iron; the size of the particles diminishes with distanee from the shore, but the mean diameter is generally 0°5 mm. Glauconite does not appear to be present in these deposits, and quartz is also very rare or absent, The fragments of shells and rocks are frequently covered witha coating of peroxide of manganese, Shells of calcareous organisms are often present in great abundance, and render the deposit of a lighter colour. The remains of Diatoms and Radiolarians are usually present.

Coral muds frequently contain as much as 95 per cent. of Cor: carbonate of lime, consisting of fragments of Corals, calcareous mui alge, Moraminifera, Serpule, Molluscs, and remains of other lime- and secreting organisms. There is a large amount of amorphous san calcareous matter, which gives the deposit a sticky and chalky character. The particles may be of all sizes according to the | distance from the reefs, the mean diameter being 1 to 2 mm., but occasionally there are large blocks of coral and large calcareous concretions ; the particles are white and red. Remains of siliceous organisms seldom make up over 2 or 8 per cent. of a typical coral mud. The residue consists usually ofa small amount of argillaceous matter, with a few fragments of felspar and other volcanic minerals ; but off barrier and fringing reefs facing continents there may be a great variety of rocks and minerals. Beyond a depth of 1000 fathoms off coral islands the debris of the reefs begins to diminish, and the remains of pelagic organisms to increase;

the deposit becomes more argillaceous, of a reddish or rose colour, and gradually

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passes into a Globigerina ooze or a red clay. Coral sands con- tain much less amorphous matter than coral muds, but in other respects they are similar, the sands being usually found nearer the reefs aud in shallower water than the muds, except inside lagoons. In some regions the remains of calcareous algee predominate, and in these cases the name coralline mud or sand is employed to point out the distinction.

The extent and peculiarities of the region in which these terri- genous deposits are laid down are interesting. It extends from high-water mark down, it may be, to a depth of over 4 miles, and ina horizontal direction from 60 to perhaps 300 miles sea- wards, and includes all inland seas, such as the North Sea, Norwegian Sea, Mediterranean Sea, Red Sea, China Sea, Japan Sea, Caribbean Sea, and many others. It is the region of change and of variety with respect to light, temperature, motion, and biological conditions. In the surface waters the temperature ranges from 80° F. in the tropics to 28° F. in the polar regions. From the surface down to the nearly ice-cold water found at the lower limits of the region in the deep sea there is in the tropics an equally great range of temperature. Plants and animals are abundant near the shore, and animals extend in relatively great abundance down to the lower limits of the region, now marked out by these terrigenous deposits. The specific gravity of the water varies much, and this variation in its turn affects the fauna and flora. In the terrigcnous region tides and currents produce their maximum effect, and these influences can in some instances be traced to a depth of 300 fathoms, or nearly 2000 feet. ‘The upper or continental margin of the region is clearly defined by the high-water mark of the coast-line, which is constantly changing | through breaker action, elevation, and subsidence. The lowcror | abysmal margin passes in most cases insensibly into the abysmal region, but may be regarded as ending where the mineral particles from the neighbouring continents begin to disappcar from the deposits, which then pass into an organic ooze or a red clay. ‘

The area covered by terrigenous deposits has been called the) “transitional” or “critical area,” and is estimated at about —

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two-eighths of the earth’s surface, while the continents cover three-

eighths, and the deep-sea deposits of the abysmal regions, which

will now be considered, cover the remaining three-eighths. The true deep-sea deposits may be divided into two classes, viz.,

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deposits bearing the same names situated towards the centres of oceanic areas, with respect both to mineral particles and to re- mains of organisms.

Diatom ooze is of a pale straw colour, and is composed princi-

ta those in which the organic elements predominate, and those in | pally of the frustules of Diatoms. When dry it is a dirty white

Se which the mineral constituents play the chief part. Belonging to | siliceous flour, soft to the touch, taking the impression of the

the former class there are Globigerina, Pteropod, Diatom, and | fingers, and contains gritty particles which can be recognized by

Radiolarian Oozes, and to the latter Red Clay. the touch. It contains on an average about 25 per cent. of carbo-

a Globigerina ooze is the name given to all those truly pelagic | nate of lime, which exists in the deposit in the form of small @lo- 4 deposits containing over 40 per cent. of carbonate of lime which con- | bigerina shells, frag- gs = = a

sist principally of the dead shells of pelagic Foraminifera (Globige- rina, Orbulina, Pulvinulina, Pullenia, Spheroidina) and coccoliths andrhabdoliths. In some localities this deposit contains 95 percent. of

carbonate of lime. The colour is milky white, yellow, brown, or rose, the varieties of colour depending principally on the relative abundance in the deposit of the oxides of iron and manganese. This ooze is fine grained ; in the sat jor some of the Foraminifera

shells are macroscopic. When dried it is pulverulent. Analyses | dant; these are vol- show that the sediment contains, in addition to carbonate of lime, | canic, or, more fre- phosphate and sulphate quently, fragments of lime, carbonate of | and minerals coming ?

magnesia, oxides of |: iron and manganese, and argillaceous mat- ters. The residue is of a reddish-brown tinge. ; Lapilli, pumice, and * glassy fragments, often

altered into palagonite, seem always to be pre- sent, and are frequent- ly veryabundant. ‘The mineral particles are generally angular, and rarely exceed 0°08 mm. in diameter; miono- clinic and triclinic fel- |. spars, augite, olivine, hornblende, and mag- netite are the most fre- quent. When quartz is present, it is in the form of minute, rounded, probably wind-borne grains, often partially covered with

doliths,

ments of Echinoderms and other organisms. The residue is pale white and _ sliglitly plastic ; minerals and ¥ fragments of rocks are 52% in some cases abun- [ef

from continental rocks and transported by glaciers. The fine washings consist essen- tially of particles of 2 Diatoms along with argillaceous and other amorphous matter. It is estimated that the frustules of Diatoms and skeletons of siliceous organisms make up more than 50 per cent. of this deposit.

It has been already mentioned that Radiolarians are seldom, if ever, completely absent from marine deposits. they make up a considerable also found in Diatom ooze and in the terrigenous de- posits of the deeper water surrounding the land. In some regions of the Pa- cific, however, the skele- {i tons of these organisms |, make up the principal part of the deposit, to

Antarctic Ocean.

which the name Radio- i= larian ooze has been given. } The colour is reddish or |.

Radio- larian ooze.

oxide of iron. More rarely there are white and black particles of

tica, bronzite, actinolite, chromite, glauconite, and cosmic dust.

Siliceous organisms are probably never absent, sometimes forming

20 per cent. of the deposit, while at other times they are only

recognizable after careful microscopic examination. In some regions

the frustules of Diatoms predominate, in other the skeletons of iolarians,

Pteropod ooze differs in no way from a Globigerina ooze except in the presence of a greater number and variety of pelagic organisms, and especially in the presence of Pteropod and Heteropod shells, such as Diacria, Atlanta, Styliola, Carinaria, &c. The shells of the more delicate species of pelagic Foraminifera and young shells are also more abundant in these deposits than ina Globigerina ooze. It must be remembered that the name “ Pteropod ooze” is not intended to indicate that the deposit is chiefly composed of the shells of these Molluscs, but, as their presence in a deposit is char- acteristic and has an important bearing on geographical and bathy- metrical distribution, it is desirable to emphasize the presence of Fe shells In any great abundance. It may be pointed out

at there is a very considerable difference between a Globigerina ooze or a Pteropod ooze situated near continental shores and

deep brown, due to the presence of the oxides of iron and manganese. The & mineral particles consist [

of fragments of pumice, lapilli, and volcanic mine- rals, rarely exceeding 0°07 mm. in diameter. There is not a trace of carbonate of lime in the form

of ; shells in some samples of Radiolarian ooze, but other specimens contain 20 per cent. of carbonate of lime derived from the shells of pelagic Foraminifera. The clayey matter and mineral particles are the same as those found in the red clays, which will now be described.

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Fia. 4.—Radiolarian Qoze from 4475 fathoms in Central Pacific.

Of all the deep-sea deposits red clay is the one which is distri- Red It might be clay

buted over the largest areas in the modern oceans. said that it exists everywhere in the abysmal regions of the ocean basins, for the residue in the organic deposits which have been described under the names Globigerina, Pteropod, Diatom, and Radiolarian oozes is nothing else than the red clay. However, this deposit only appears in its characteristic form in those areas where the terrigenous minerals and calcareous and _ siliceous organisms disappear to a greater or less extent from the bottom. It is in the central regions of the Pacific that the typical examples are met with. Like other marine deposits, this one passes laterally, according to position and depth, into the adjacent kind of deep-sea ooze, clay, or mud.

The argillaceous matters are of a more or less deep brown tint from the presence of the oxides of iron and manganese. In the typical examples no mineralogical species can be distinguished by the naked eye, for the grains are exceedingly fine and of nearly uniform dimensions, rarely exceeding 0°05 mm. in diameter. It is plastic and greasy to the touch; when dried it forms lumps so coherent that considerable force must be employed to break them. It gives the brilliant streak of clay, and breaks down in water. The pyrognostic properties show that it is not a pure clay, for it fuses easily before the blowpipe into a magnetic bead.

Under the term red clay are comprised those deposits in which the characters of clay are not well pronounced, but which are mainly composed of minute particles of pumice and other volcanic material

Distri- bution of de-

posits.

which, owing to their relatively recent deposition, have not under- gone great alteration. Ifthe analyses of red clay are calculated, it will be seen, moreover, that the silicate of alumina preseut as clay (2S8i0,, Al,O3+2H,O) comprises only a relatively small portion of the sediment; the calculation shows always an excess of free silica, which is attributed chiefly to the presence of siliceous organisms.

Microscopic examination shows that a red clay consists of argillaceous matter, minute mineral particles, and fragments of siliceous organisms. The mineral particles are for the greater part of voleanic origin, except in those cases where continental matters are transported by floating ice, or where the sand of deserts has been carried to great distances by winds. These voleanic minerals are the same constituent minerals of modern eruptive rocks enum- erated in the description of volcanic muds and sands ; in the great majority of cases they are accompanied by fragments of lapilli and of pumice more or less altered. Vitreous volcanic matters belonging to the acid and basic series of rocks predominate in the regions where the red clay has its greatest development; and it will be seen presently that the most characteristic decompositions which there take place are associated with pyroxenic lavas. ‘

Associated with the red clay are almost always found concretions and microscopic particles of the oxides of iron and manganese, to which the deposit owes its colour. Again, in the typical examples of the deposit, zeolites in the form of crystals and crystalline spherules are present, along with metallic globules and silicates which are regarded as of cosmic origin. Calcareous organisms are so generally absent that they cannot be regarded as characteristic. On the other hand, the remains of Diatoms, Radiolarians, and Sponge spicules are generally present, and are sometimes very abundant. The ear-bones of various Cetaceans, as well as the remnants of other Cetacean bones and the teeth of sharks, are, in some of the typical samples far removed from the continents, exceedingly abundant, and are often deeply impregnated with, or embedded in thick coatings of, the oxides of iron and man- ganese. Over six hundred sharks’ teeth, belonging to the

genera Carcharodon, Oxyrhina, and Lamna, and one hundred ear-bones of whales, belonging to Ziphius, Balenoptera, Balena, Orca, and Delphinus, along with fifty fragments of other bones, have been obtained in one haul of the dredge in the Central Pacific. The remains of these vertebrates have seldom been dredged in the organic oozes, and still more rarely in the terrigenous deposits.

The abysmal region, in which the true pelagic deposits above described are laid down, shows a marked contrast with the “ tran- sitional” or ‘‘critical area” where the terrigenous deposits are found. The former area comprises vast undulating plains from 2 to 5 miles beneath the surface of the sea, the average being about 3 miles, here and there interrupted by huge volcanic cones (the oceanic islands). No sunlight ever reaches these deep cold tracts. The range of temperature over them is not more than 7°, viz., from 31° to 38° F., and is apparently constant throughout the whole year in each locality. Plant life is absent, and, although animals belonging to all the great types are present, there is no great variety of form oe abundance of individuals. Change of any kind is exceedingly slow.

Leaving out of view the coral and volcanic muds and sands which are found prineipally around oceanic islands, the blue muds, green muds and sands, red muds, together with all the coast and shore formations, are situated along the margins of the continents and in enclosed and partially cnclosed seas. The chief characteristic of these deposits is the presence in them of continental debris. The blue muds are found in all the deeper parts of the regions just in- dicated, and especially near the embouchures of rivers. Red muds do not differ much from blue muds except in colour, due to the presence of ferruginous matter in greater abundance, and they are found under the same conditions as the blue muds. The green muds and sands occupy, as a rule, portions of the coast where detrital matter from rivers is not apparently accumulating at a rapid rate, viz., on such places as the Agulhas Bank, off the east coast of Australia, off the coast of Spain, and at various points along the coast of America. In the tropical and temperate zones-of the great oceans, which occupy about 110° of latitude between the two polar zones, at depths where the action of the waves is not felt, and at points to which the terrigenous materials do not extend, there are now forming vast accumulations of Globigerina and other pelagic Foraminifera,

coccoliths, rhabdoliths, shells of pelagic Molluscs, and remains of otherorganisms. Thesedeposits may perhaps be called the sediments of median depths and of warmer zones, becausc they diminish in great depths and tend to disappear towards the poles. This fact is evidently in relation with the surface temperature of the ocean, and shows that pelagic Foraminifera and Molluscs live in the superficial waters of the sea, whence their dead shells fall to the bottom. Globigerina ooze is not found in enclosed seas nor in polar latitudes. In the sonthern hemisphere it has not been met with south of the 50th parallel. In the Atlantic it is deposited upon the bottom at a very high latitude below the warm waters of the Gulf Stream, and is not observed under the cold descending polar current which

runs south in the same latitude. These facts are readily cxplained if it be admitted that this ooze is formed chiefly by the shells of surface organisms, which require an elevated temperature and wide expanse of sea for their existence.

The distribution of oceanic deposits may be summarized thus. (1) The terrigenous deposits—blue muds, green muds and sands, red muds, voleanic muds and sands, coral muds and sands—are met with in those regions of the ocean nearest to land. ‘With the exception of the volcanic muds and sands and coral muds and sands around oceanie islands, these deposits are found only lying along the borders of continents and continental islands, and in enclosed and partially enclosed seas. (2) The organic oozes and red clay are confined to the abysmal regions of the ocean basins ; a Pteropod ooze is met with in tropical and subtropical regions in depths less than 1500 fathoms, a G@lobigerina ooze in the same regions between the depths of 500 and 2800 fathoms, a Radiolarian ooze in the central portions of the Pacific at depths greater than 2500 fathoms, a Diatom ooze in the Southern Ocean south of the latitude of 45° south, a red clay anywhere within the latitudes of 45° north and south at depths greater than 2200 fathoms.

As long as the conditions of the surface are the same, it might be expected that the deposits at the bottom would also remain the same. In showing that such is not the case, an agent must be taken into account which is in direct correlation with the depth, It may be regarded as established that the majority of the cal- careous organisms which make up the Globigerina and Pteropod oozes live in the surface waters, and it may also be taken for grauted that there is always a specific identity between the cal- careous organisms which live at the surface and the shells of these pelagic creatures found at the bottom. Globigerina ooze is found in the tropical zone at depths which do not exceed 2400 fathoms, but when depths of 3000 fathoms are explored in this zone of the Atlantic and Pacific there is found an argillaceous deposit without, in many instances, any trace of calcareous organisms. Descending from the “submarine plateaus” to depths which exceed 2250 fathoms, the Globigerina ooze gradually disappears, passing

into a greyish marl, and finally is wholly replaced by an argillaceous material which covers the bottom at all depths greater than 2900 fathoms. é

The transition between the calcareous formations and the argil- laceous ones takes place by almost insensible degrees. The thinner and more delicate shells disappear first. The thicker and larger shells lose little by little the sharpness of their contour and appear to undergo a profound alteration. They assume a brownish colour, and break up in proportion as the calcareous constituent disappears. The red clay predominates more and more as the calcareous element diminishes in the deposit. Recollecting that the most important elements of the organic deposits have descended from the super- ficial waters, and that the variations in contour of the bed of the sea cannot of themselves prevent the debris of animals and plants from accumulating upon the bottom, their absence in the red clay areas can only be explained by the hypothesis of decom- position.

Pteropod ooze, it will be remembered, is a calcareous organic deposit, in which the remains of Ptcropods and other pelagic Mollusca are present, though they do not always form a preponderat- ing constituent, and it has been found that their presence is in cor- relation with the bathymetrical distribution.

In studying the nature of the calcareous elements which are deposited in the abysmal areas, it has been noticed that, like the shells of the Foraminifera, those of the Thecosomatous Peropoda, which live everywhere in the superficial waters, cspecially in the tropics, become fewer in number in the deposit as the depth increases. It has just been observed that the shells of fora- minifera disappear gradually along a series of soundings from a point where the Globigerina ooze has abundance of carbonate of lime, towards deeper regions ; but it is also noticed that, when the sounding-rod brings up a graduated series of sediments from a declivity descending into deep water, among the calcareous shells those of the Pteropods and Heteropods disappear first in pro portion as the depth increases. At depths less than 1400 fathoms in the tropics a Pteropod ooze is found with abundant remains of Heteropods and Pteropods ; deeper soundings then give a Globi- gertna ooze without these Molluscan remains ; and in still greater depths, as has

been said above, there is a red clay in which cal- careous organisms are nearly, if not quite, absent.

In this manner, then, it is shown that the remains of calcareous organisms are completely eliminated in the greatest depths of the ocean. For if such be not the case, why are all these shells found at the bottom in the shallower depths, and not at all in the greater depths, although they are equally abundant on the surface at both places? There is reason to think that this solution of calcareous shells is due to the presence of carbonic acid throughout all depths of ocean water. It is well known that this substance, dissolved in water, is an energetic solvent of calcareous matter. The investiga- tions of Buchanan and Dittmar have shown that carbonic acl cxists in a free state in sea water, and Dittmar's analyses also show

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that deep-sea water contains more lime than surface water. This ig a confirmation of the theory which regards earbonie acid as the agent concerned in the total or partial solution of the surface shells before or immediately after they reach the bottom of the ocean, and is likewise in relation with the faet that in high latitudes, where fewer calcareous organisms are found at the surface, their remains are removed at lesser depths than where these organisms are in greater abundance. It has been shown that sea water itself has some effect in the solution of carbonate of lime, and further it is robable that the immense pressure to which water is subjected in great depths may have an influence on its eheniical aetivity. Objections have been raised to the explanation here advanced, on aceount of the alkalinity of sea water, but it may be remarked that alkalinity presents no diffieulty which need be here considered (Dittmar, P/ys. Chem. Chall. Exp., part i., 1884).

This interpretation also explains how the remains of Diatoms and Radiolarians (surface organisms like the Foraminifera) are found in greater abundance in the red clay than in a Globigerina ooze. The aetion which suffices to dissolve the calcareous matter has no effeet upon the silica, and so the siliceous shells accuinulate. Nor is this view of the case opposed to

the distribution of the Pteropod ooze. At first it would be expected that the Foraminifera shells, being smaller, would disappear from a deposit before the Pteropod shells; but if it be remembered that the latter are very thin and delicate, and, for the quantity of carbonate of lime present, offer a larger surface to the action of the solvent than the thicker, though smaller, Globigerina shells, this apparent anomaly will be explained.

The origin of these vast deposits of clay isa problem of the highest interest. It was at first supposed that these sediments were com- posed of microscopic particles arising from the disintegration of the rocks by rivers and by the waves on the coasts. It was believed that the matters held in suspension were earried far and wide by currents, and gradually fell to the bottom of the sea, But the uni- formity of composition presented by these deposits was a great objection to this view. It ean be shown that mineral particles, even of the smallest dimensions, continually set adrift upon dis- turbed waters must, owing to a property of sea water, eventually be precipitated at no great distance from land. It has also been supposed that these argillaceous deposits owe their origin to the inorganic residue of the calcareous shells which are dissolved away in deep water, but this view has no foundation in fact. Everything seems to show that the formation of the clay is due to the decomposition of fragmentary voleanic products, whose presenee ean be detected over the whole floor of the ocean.

These volcanic materials are derived from floating pumice, and

from volcanic ashes ejected to great distances by terrestrial volcanoes, and carried far by the winds. It is also known that beds of lava and of tufa are laid down upon the bottom of the sea. This assemblage of pyrogenic rocks, rich in silicates of alumina, decomposes under the ehemical action of the water, and gives rise, in the same way as do terrestrial volcanic rocks, to argillaceous matters, according to re- actions which can always be observed on the surface of the globe, and which are too well known to need special mention here. _ The universal distribution of pumice over the floor of the ocean is very remarkable, and would at first appear unaccountable; but when the fact that pieces of pumice have been known to float in sea water for a period of over three years before becoming suffici- ently waterlogged to sink is taken into consideration, it will be readily understood how

fragments of this material may be trans- ported by winds and currents to an enormous distance from their point of origin before being deposited upon the bottom. Frag- ments of pumice are dredged in the greatest profusion in the red clay of the Central Pacifie, and much less abundantly in the or. ganic oozes and terrigenous deposits. This is owing to the rate of deposition being much slower in the former than in the latter, where the rapid aceumulation of calcareous and silieeous organisms and continental debris masks their presence.

The detailed microscopic examination of hundreds of soundings has shown that the presence of pumice, of lapilli, of silicates, and of other voleanic minerals in various stages of decomposition can always be demonstrated in the argillaceous matter.

In the places where the red clay attains its most typical develop- ment, the transformation of the volcanic fragments into argillaceous matter may be followed step by step. It may be said to be the direct product of the decomposition of the basic rocks, represented by volcanic glasses, such as hyalomelan and tachylite. This decom- position, in spite of the temperature approximating to zero (32° F.), gives rise, as an ultimate product, to elearly erystallized minerals, which may be poised the most remarkable produets of the eo action of the sea upon the volcanic matters undergoing Gecomposition. These microseopic erystals are zeolites lying free = the deposit, and are met with in greatest abundance in the typical ted-clay areas of the Central Pacific. They are simple, twinned, or cm groups, whieh scareely exceed half a millimetre in oes The crystallographic and chemical study of them shows = they must be referred to christianite. It is known how easily

€ zeolites crystallize in the pores of eruptive rocks in process of

decomposition ; and the crystals of ehristianite, which are observed in eonsiderable quantities in the clay of the centre of the Pacific

Fig. 5.—Crystals of Christianite from the deep water of the Pacific.

(fig. 5), have been formed at the expense of the decomposing volcanie matters spread out upon the bed of that ocean.

In connexion with this formation of zeolites, reference may be made to a chemical process whieh gives rise to the formation of nodules of manganiferous iron. These nodules are almost uni- versally distributed in oceanic sediments, but are met with in the greatest abundance in the red clay. This association tends to show a common origin. It is exactly in those regions where there is an aecumulation of pyroxenic lavas in decomposition, containing sili- cates with a base of manganese and iron, such for example as augite, hornblende, olivine, magnetite, and basie glasses, that manganese nodules occur in greatest numbers. In the regions where the sedimentary action, mechanieal and organic, is, as it were, suspended, and where everything shows an extreme slowness of deposition, —in these calm waters favourable to chemical reac- tions, ferro-manganiferous substances form concretions around organie and inorganic centres.

These concentratious of ferrie and manganic oxides, mixed with argillaceous materials whose form and dimensions are extremely variable, belong generally to the earthy variety or wad, but pass sometimes, though rarely, into varieties of hydrated oxide of manganese with distinct indications of radially fibrous erystalliza- tion.! The interpretation necessary, in order to explain this formation of manganese nodules, is the same as that admitted in explanation of the formation of coatings of this material on the surface of terrestrial rocks. These salts of manganese and iron, dissolved in water by carbonic acid, then precipitated in the form of carbonate of protoxide of iron and manganese, beeome oxidized, and give rise in the calm and deep oceanie regions to more or less pure ferro-manganiferous ee: concretions. At the same time it must be admitted that rivers may bring to the ocean a contribution of the same substances.

Among the bodies which, in certain regions where red clay predominates, serve as centres for these mangani- ferous nodules are the re- mains of vertebrates. These remains are the hardest parts of the skeleton—tympanic bones of whales, beaks of Ziphius, teeth of sharks ; : and, just as the calcareous py¢, ¢—Section of a Manganese Nodule, enclos- shells are

eliminated in ing tympanic bone of a whale, from 2300 great depths, so all the re- fathoms, South Pacific. mains of the larger vertebrates are absent, except the most resistant portions. These bones often serve as a centre for the manganese iron concretions, being frequently surrounded by layers several

1 For the composition of these manganese nodules, see ManGanuse, Vol. xv. Pp.

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centimetres in thickness (fig. 6). In the same dredgings in the red-clay areas some sharks' teeth and Cetacean ear-bones, some of which belong to extinct species, are surrounded with thick layers of the manganese, and others with merely a slight coating. . The eosmic spherules incidentally referred to under the descrip- tion of red clay may be here described in greater detail. If a magnet be plunged into an oceanic deposit, especially a red clay from the central parts of the Pacific, particles are extracted, some of which are magnetite from volcanic rocks, to which vitreous matters are often attached ; others again are quite isolated, and differ in most of their properties from the former. The latter are generally round, measuring hardly 0°2 mm., usually smaller; their surface is quite covered with a brilliant black coating having all the properties of magnetic oxide of iron; often there may be noticed clearly marked upon them cup-like depressions (figs. 7 and 8). If these spherules be broken down in an agate mortar, the brilliant blaek coating easily falls away and reveals white or grey metallic malleable nuelei, which may be beaten out by the pestle into thin lamella. This metallie centre, when treated with an acid solu. tion of sulphate of copper, immediately assumes a coppery coat, thus showing that it is native iron. But there are some mal- leable metallic nuclei extracted from the spherules which do not give this reaction; they do not take the copper coating.

Fig. 7. Fic. 7.—Black Spherule with Metallie Nucleus (x60). This spherule covered with a coating of black shining magnetite represents the most

frequent shape. The depression here shown is often found at the surface of these sphcrules, From 2375 fathoms, South Pacific. Fic, 8.—Black Spherule with Metallic Nucleus (x60). The black external coat- ing of magnetic oxide has been broken away to show the metallic nucleus re- presented by the clear part at the centre. From 3150 fathoms.

Fig. 8,

Chemical reactions show that they contain cobalt and nickel ; very probably they constitute an alloy of iron and these two metals, such as is often found in meteorites, and whose presence in large quantities hinders the production of the coppery coating on the iron, G, Rose has shown that this coating of black oxide of iron is found on the periphery of meteorites of native iron, and its presence is readily understood when their cosmic origin is admitted. Indeed, these meteoric particles of native iron in their transit through the air must undergo combustion, and, like small portions of iron from a smith's anvil, be transformed either entirely or at the surface only into magnetic oxide, and in the latter case the nucleus is protected from further oxidation by the coating which thus covers at,

One may suppose that meteorites in their passage through the atmosphere break into numerous fragments, that incandescent particles of iron are thrown off all round them, and that these eventually fall to the surface of the globe as almost impalpable dust, in the form of magnetic oxide of iron more or less completely fused. The luminous train of falling stars is probably due to the combustion of these innumerable particles resembling the sparks which fly from a ribbon of iron burnt in oxygen, or the particles of the same metal thrown off when striking a flint. It is easy to show that these particles in burning take a spherical form, and are surrounded by a layer of black magnetic oxide.

Among the magnetic grains found under the same conditions as those just described are other spherules, which are referred to the chondres, so that, if the interpretation of a cosmic origin for the magnetic spherules with a metallic centre were not established in a manner absolutely beyond question, it almost becomes so when their association with the silicate spherules, which will now be described, is taken into account. It will be seen by the microscopic details that these spherules have quite the

constitution and strueture of chondres so frequent in meteorites of the most ordinary type, and on the other hand they have never been found, as far as is known, in rocks of a terrestrial origin ; in short, the presence of these spherules in the deep-sea deposits, and their association with the metallic spherules, are matters of prime importance.

Among the fragments attracted by the magnet in deep-sea deposits are distinguished granules' slightly larger than the spherules with the shining black coating above described. These are yellowish-brown, with a bronze-like lustre, and under the microscope it is notieed that the surface, instead of being quite smooth, 1s grooved by thin lamella. Their dimensions never attain a millimetre, generally they are about 0°5 mm, in diameter ; they

are never perfect spheres, as in the case of the black spherules with a metallie eentre ; and sometimes a depression more or less marked is to be observed in the periphery. When examined by the miero. scope it is observed that the lamelle which compose them are applied the one against the other, and have a radial eceentrie dis. position. It is the leafy radial structure (radialbldtirig), like that of the chondres of bronzite, which predominates in these spheres, The serial structure of the chondres with olivine is observed mueh less rarely, and indeed there is some doubt about the indications of this last type of structure. Fig. 9 shows the characters and texture of one of these spherules magnified 25 diameters. On aeeount of

their small dimensions, as well as of their friability due to their lamellar structure, it is difficult to polish one of these spherules, and it has been necessary to study them with reflected light, or to limit the observations to the study of the broken fragments, These spherules break up following the lamelle, which latter are

In rotating

seen to be extremely fine and perfectly transparent. between crossed nicols they have the extinctions of the rhombic system, and in making use of the condenser it is seen that they have one optic axis. It is observed also that when several of these lamelle are attached they extinguish exactly at /ijgix

the same time, so that]f everything tends to show } that they form a single individual.

In studying these trans- parent and very thin frag- ments with the aid of a high magnifying power, it is ob- served that they are dotted with brown-black inclu- pyg, 9,—Spherule of Brorizite (x25), from 3500 sions, disposed with a cer- fathoms in the Central South Pacific, show- tainsymmetry, and showing ing eae! Fe the pecniariies (oan to somewhat regular contours ; errs eo See these inclusions are referred to magnetic iron, and their presence explains why these spherules of bronzite are extracted by the magnet. It should be observed, however, that they are not so strongly magnetic as thosc-with a metallic nucleus.

They are designated bronzite rather than enstatite, because of the somewhat deep tint which they present; they are insoluble in hydrochloric acid. Owing to the small quantity of substance, only a qualitative analysis could be made, which showed the presence in them of silica, magnesia, and iron.

The study of deep-sea deposits suggests some interesting conelu- Great

sions.

regions of the ocean.

It has been said that the debris carried away from the land anti-

It is only in exceptional cascs that the finest ocean

terrigenous matcrials are transported several hundred miles from areas

the shores. In place of layers formed of pebbles and clastic elements with grains of considerable dimensions, whieh play so large a part in the composition of emerged lands, the great areas of the ocean basins are covered by the microscopic remains of pelagic organisms, or by the deposits coming from the alteration of voleanic products. The distinctive elements that appear in the river and eoast sediments are, properly speaking, wanting in the great depths far distant from the coasts. To such a degree is this the case that in a great number of soundings, from the centre of the

Paeific for example, no mineral particles on which the mechanical action of water had left its imprint have been distinguished, and quartz is so rare that it may be said to be absent. It is sufficient to indieate these facts in order to make apparent the profound differenees which separate the deposits of the abysmal areas of the ocean basins from the series of rocks in the geological formations, As regards the vast deposits of red clay, with its manganese concretions, its zeolites, cosmic dust, and remains of vertebrates, and the organic oozes which are spread out over the bed of the Central Paeific, Atlantic, and Indian Oceans, have they their analogues in the geological series of rocks? If it be proved that in the sedimentary strata the true pelagic sediments are not represented, it follows that deep and extended oceans like those of the present day cannot formerly have occupied the areas of the present continents, and as a corollary the great lines of the oceanic basins and continents must have been marked out from the earliest geological ages.

Without asserting that the terrestrial areas and the areas covered by the waters of the great ocean basins have had their main lines marked out since the commencement of geological history, it is a fact proved by the evidence of the pelagic sediments that these areas havea great antiquity. The accumulation of sharks' teeth, of the ear- bones of Cetaceans, of manganese concretions, of zeolites, of voleamie material in an advanced state of decomposition, and of cosmic dust, at points far removed from the continents, tends to prove this. There is no reason for supposing that the parts of the ocean where

accumulates at the bottom of the sea before reaching the abysmal 4

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rec irie ©UC HAN

these vertebrate remains are found are more frequented by sharks or Cetaceans than other regions where they are never, or only rarely, dredged from the deposits at the bottom. When it is remembered also that these ear-bones, teeth of sharks, and volcanic fragments are sometimes incrusted with

two centimetres of manganese oxide, while others have a mere coating, and that some of the bones and teeth belong to extinct species, it may be concluded with great certainty that the clays of these oceanic basins have accumulated with extreme slowness. It is indeed almost beyond question that the red-clay regions of the Central Pacific contain accumulations belonging to geological ages different from our own. ‘The great antiquity of these formations is likewise confirmed in a striking manner by the presence of cosmic fragments, the nature of which has been described. In order to account for the accumulation of all these substances in such relatively great abundance in the areas where they were dredged, it is necessary to suppose the oceanic basins to have remained the same for a vast period of time.

The sharks’ teeth, ear-bones, manganese nodules, altered volcanic fragments, zeolites, and cosmic dust are met with in greatest abundance in the red clays of the Central Pacific, at that point on the earth’s surface farthest removed from continental land. They are less abundant in the Radiolarian ooze, are rare in the Globt- gerina, Diatom, and Pteropod oozcs, and have been dredged only in a few instances in the terrigenous deposits elose to the shore. These substances are present in all the deposits, but owing to the abundanee of other matters in the more rapidly forming deposits their presence is masked, and the chance of dredging them is reduced. The greater or less abundance of these materials, which are so characteristic of a true red clay, may be regarded as a measure of the relative rate of accumulation of the marine sediments in which they lic. The terrigenous deposits accumulate most rapidly ; then follow in order Pteropod ooze, Globigerina ooze, Diatom ooze, Radiolarian ooze, and, slowest of all, red clay.

From the data now advanced it appears possible to deduce other conelusions important from a geological point of view. In the deposits due essentially to the action of the ocean, the great variety of sediments which may accumulate in regions where the external conditions are almost identical is very striking. Again, marine faunas and floras, at least those of the surface, differ greatly, both with respect to species and the relative abundance of individuals, in different regions of the ocean; and, as their remains determine the character of the deposit in many instances, it is legitimate to conelude that the occurrence of organisms of a different nature

in several beds is not an arguinent against the synchronism of the layers which contain them. In this connexion may be noted the fact that in certain regions of the deep sea no appreciable forma- tion is now taking place. Hence the absence, in the sedimentary series, of a layer representing a definite horizon must not always be interpreted as proof either of the emergence of the bottom of the sea during the corresponding period, or of an ulterior erosion.

The small extent occupied by littoral formatious, especially those of an arenaceous nature, and the relatively slow rate at which such deposits are formed along a stable coast, are matters of importance. In the present state of things there does not appear to be any- thing to account for the enormous thickness of the clastic sediments making up certain geological formations, unless the exceptional eases of erosion which are brought into play when a coast is under- going constant elevation or subsidence are considercd. Great move- ments of the land are doubtless necessary for the formation of thick beds of transported matter like sandstones and conglomerates. Arenaceous formations of great thickness rcquire seas of no great extent and coasts subject to frequent oscillations, which permit the shores to advance and retire. Along these, through all periods of the earth's history, the great marine sedimentary phenomena have taken place.

The continental geological formations, when compared with Marine deposits of modern seas and oceans, present no analogues to the red clays, Radiolarian, Globigerina, Pteropod, and Diatom oozes. On the other hand, the terrigenous deposits of lakes, shallow seas, enelosed seas, and the shores of the continents reveal the equivalents of the chalks, greensands, sandstones, conglomerates, shales, marls, and other sedimentary formations. Such formations as certain Tertiary deposits of Italy and the Radiolarian carth from Barbados, where pelagic conditions are indicated, must be regarded as having been laid down rather along the border of a continent than in a true oeeanic area, The white chalk is evidently not a deep-sea deposit, for the Foraminifera and fragments of other organisms of which it is largely composed arc similar to those found in comparatively shallow water not far from land. The argillaceous and calcareous Toeks recently discovered by Dr Guppy in the upraised coral islands in the Solomon group are identical with the deposits now forming around oceanic

islands, Regions situated similarly to enclosed and shallow seas and the borders of the present contincnts appear to have been, throughout all geological ages, the theatre of the greatest and most remarkable changes ; in short, all, or nearly all, the sedi- mentary rocks of the continents would seem to have been built up m areas like those now occupied by the tcrrigcnous deposits.

During cach era of the earth's history the borders of some lands have sunk beneath the sea and been eovered by marine sediments, while in other parts the terrigenous deposits have been elevated into dry land, and have carried with them a record of the organisms which flourished in the sea of the time. In this transitional area there has been throughout a continuity of geological and biological phenomena.

From these considerations it will be evident that the character of a deposit is determined mueh more by distance from the shore ofa continent than by actual depth ; and the same would appear to be the case with respect to the fauna spread over the floor of the present oceans. Dredgings near the shores of continents, in depths of 1000, 2000, or 3000 fathoms, are more productive both in species and in- dividuals than dredgings at similar depths several hundred miles seawards. Again, among the few species dredged in the abysmal areas farthest removed from land, the majority show archaic characters, or belong to groups which have a wide distribution in time as well as over the floor of the present occans. Such are the Hexactinellida, Brachiopoda, Stalked Crinoids and other Echino- derms, &e.

As already mentioned, the "transitional area" is that which now shows the greatest variety in respect to biological and physical conditions, and in past time it has been subject to the most frequent and the greatest amount of change. The animals now living in this area may be regarded as the greatly modified descendants of those which have lived in similar regions in past geological ages, and some of whose ancestors have been preserved in the sedimentary rocks as fossils. On the other hand, many of the animals dredged in the abysmal regions are most probably also the descendants of animals which lived in the shallower waters of former geological periods, but migrated into deep water to escape the. severe struggle for existence

which must always have obtained in shallower waters influenced by light, heat, motion, and other favourable conditions. Having found existence possible in the less favourable and deeper water, they may be regarded as having slowly spread themselves over the floor of the ocean, but without undergoing great modifications, owing to the extreme uniformity of the conditions and the absence of competition. Or it may be supposed that, in the depressions which have taken place near coasts, some species have been gradually carried down to deep water, have accommodated themselves to the new conditions, and have gradually migrated to the regions far from land. A few species may thus have migrated to the deep sea during each geological period. In this way the origin and distribution of the deep-sea fauna in the present oeeans may in some measure be explained. In like manner, the pelagic fauna and flora of the ocean is most probably derived originally from the shore and shallow water. uring each period of the earth's history a few animals and plants have been carried to sea, and have ultimately adopted a pelagic mode of life.

ISLANDS.

The Pacific Ocean is distinguished from the Atlantic by the greater number of small island groups that diversify its surface. The continental islands, lying along the coasts of America and Asia, have been referred to in speaking of the coasts; the islands of the Malay Archipelago, Australia, New Zealand, and probably New Caledonia belong to the same class. The true oceanic islands on the other hand have no direct geological connexion with the continents; the older sedimentary and metamorphic rocks appear to be quite absent, the islands being either of eruptive or coral formation. The fauna and flora of the oceanic islands present a considerable amount of uniformity, though each island or important group of islands has its peculiar species. There is an entire absence of terrestrial Mammalia. The genera and species are few in number when compared with those of the continents and continental islands from which they would appear to have been originally derived by immigration, and subsequently to have undergone modification. Recent researches appear also to show that the dredgings around oceanic islands yield fewer genera and species than dredgings at similar depths along the shores of continents, although the numbers of individuals of a few species may be extraordinarily abundant.

The most northern oceanic group is the Hawaiian Archipelago or Sandwich Islands (see vol. xi. p. 528), stretching for about 340 miles between the latitudes of 18° 52’ and 22° 15’ N., and the meridians of 154° 42’ and 160° 33’ W.; it consists of eight large islands—Hawaii (Owhyhee), Maui (Mowee), Kahulaui (Tahooroway), Lanai

(Ranai), Molokai (Morotoi), Oahu (Woahoo), Kauai (Atooi), and Niihau (Oneehoow), and four small barren islets, the entire area being 6100 square miles. The islands of this group are mountainous, and abound in active volcanoes; the great lake of fire, Kilauea, on the east side of the Mountain of Mauna Loa (13,760 feet) in Hawaii is probably the largest active crater in the world, while one of the largest known extinct craters is that of Mauna Haleakala (“The House of the Sun”) in Maui, at a height of 10,200 feet above the sea; it is 12 miles in circumference. The Hawaiian Islands being within the zone of coral formation are surrounded by fringing reefs, and there is abundant evidence that gradual upheaval has taken place over the whole area which they occupy. ‘There are beds of coral limestone in Molokai at a height of 400 feet, and in Kauai coral sand is found at an elevation of 4000 feet above the sea; in many.other islands coral and lava are found interstratified.

The three groups of the Bonin Islands known as the Parry, Beechy, and Coffin groups are composed of high rocky islets of a bold and fantastic outline, and are situated between 26° and 27° N. lat.

The Ladrones or Mariana Islands (see vol. xiv. p. 199) have a total area of 395 square miles; they stretch for nearly 450 miles between 13° and 20° N. lat. and 144° 37’ and 145° 55’ E. long. These islands are all of volcanic origin, and their mountains contain several active volcanoes.

The Caroline Archipelago (see vol. v. p. 125) lies about 170 miles to the south of the Ladrones, and, together with the Pelew Islands, has an area of 877 square miles. The Carolines embrace forty distinct island groups, five of which are basaltic and mountainous, though surrounded by coral reefs ; the remaining thirty-five groups are entirely of coral formation, and do not rise much above the sea-level. The Pelew Islands resemble the Carolines in

their physical characters ; they present peculiarities in the arrangement of atolls which will be alluded to below.

The Marshall Islands (see Micronzsta, vol. xvi. p. 256) consist of two chains running parallel to each other, and composed of fourteen and seventeen small groups respec- tively. They lie to the eastward of the Carolines, and are entirely of organic formation.,

The Gilbert Archipelago (see vol. xvi. p. 256) is cut by the equator. It contains sixteen groups of small coral islands, low and barren, but densely populated.

In the South Pacific oceanic islands are scattered with the greatest profusion over a region between 5° and 25° 8. lat. and 180° to 120° W. long. The northern part of the shallow water surrounding Australia, New Zealand, and the Malay Archipelago is occupied by the Solomon Islands, the New Hebrides, the bold rocky and mountain- ous islands of Fiji with fine barrier reefs, the Friendly Islands, and Samoa or the Navigators' Islands. Farther to the south there are the Society Islands, including Tahiti; they are lofty, of volcanic origin, and surrounded by very perfect barrier reefs. The Marquesas or Mendana Archi- pelago, farther to the north, also consists of volcanic islands, but they are not fringed by reefs.

_ The volcanic group of the Galapagos Archipelago is situated under the equator at a distance of 500 or 600 miles from the west coast of South America; it has been minutely described by Darwin.

The extensive Low or Paumotu Archipelago lies to the south-east of the Society Islands, and runs parallel to them. It consists of about eighty atolls, some of them of large size, and all typical examples of this form of coral island.

The total area of the islands of the Pacific is exceedingly small, especially when the vast number of groups that stud the ocean is taken into consideration.

PACU aC 3C OE aw

THirory OF CornaL ISLANDS.

The origin of coral islands was specially studied by Darwin during the voyage of the “Beagle” in 1881-36, and he shortly afterwards published a theory on the subject which has been fully detailed in the article Cora (vol. vi. p. 377). This theory was so simple, and it appeared so complete, that it acquired universa} acceptance; and the continuous action of subsidence in promoting the development of fringing reefs into barriers, and of barriers into atolls, was long unquestioned. In 1851 L. Agassiz! expressed the opinion that the theory of subsidence was insufficient to explain the formation of the coral reefs and keys of Florida. In 1868 Car} Semper stated that an attentive study of the Pelew Islands showed the complete inadequacy of this theory, and in 1868 he reitcrated his convictions.?

In 1880 Mr John Murray published an abstract of his “Chal- lenger” observations,® and gave a theory of coral island formation which claims to account for all the phenomena without calling in the aid of subsidence. It is pointed out that, with hardly an exception, the occanic islands are of volcanic origin, and it is assumed that the various pcaks which deep-sca soundings have shown to be scattered over the bed of the ocean, and rising to within various distances of the surface, are also, primarily, of volcanic origin. There is no evidence of any extensive submerged continent or mass of land such as Darwin’s theory requires, Whether built up sufficiently high to rise above the surface of the sea and thus form islands, or brought up only to varying heights below the sea-level, these volcanic eminences tend to become platforms on which coral recfs nay be formed. The erosive action of waves and tides tends to reduce all volcanic summits down to the lower limit of breaker action, thus producing platforms on which barrier reefs and atolls may spring up. Again, submarine eminences may be brought up to the zone of the reef builders by the deposit of volcanic and organic detritus falling from the surface, as well as through the agency of organisms sccreting lime and silica, which live in profusion at great depths, especially on the tops of submarine peaks and banks. The great profusion of life in the tropical surface waters is insisted upon, and it is pointed out that this pelagic life supplies the reef-building corals with food, and that, when these surface creatures die and their shells fall to the bottom, they carry down with them sufficient organic matter to furnish food to the animals living on

the floor of the ocean. As the result of tow-net experiments in the tropics Mr Murray estimated that, in the surface waters of the ocean, there were ina mass 1 mile square by 100 fathoms, 16 tons of carbonate of lime existing in the form of shells of pelagic Foraminifera and Molluses. In this way it is urged that submarine banks are continually being brought within the zone of reef-building corals. Darwin admitted that reefs not to be distinguished from atolls might be formed on such submarine banks, but the improbability of so many submerged banks existing caused him to dismiss this explanation without further consideration. He was not, however, aware of the great number of submerged cones which recent soundings have made known, nor of the enormous abundance of minute caleareous organisms—such as calcareous alge, Foraminifera, and Molluses in the surface waters—and of the comparatively rapid rate at which their remains might accumulate on the sea bottom. Nor had he any idea of the comparatively great abundauce of animals living at considerable depths.

Coral-reef builders starting on a bank, whether formed by elevation or subsidence, by erosion or the upward growth of aa sea deposits composed largely of organic remains, tend ultimately to assume the atoll or barrier form. When the coral reef or colony approaches the surface, the central portions are gradually placed at a disadvantage as compared with the peripheral parts of the mass, in being farther removed from the food supply which is brought by the oceanic currents, and consequently dwindle and die. In pro- portion as the reef approaches the surface, the centre becomes cut off from the food supply and the conditions become increasingly uncongenial. At last an outer ring of vigorously growing reef corals encloses a central lagoon. The windward side of the reef grows most vigorously, not because of a larger supply of oxygen and greater aeration of the water, but because that is the direetion in which the oceanic currents bring the food to the reef. As the atoll extends seawards from vigorous growth the lagoon becomes larger, chiefly from the removal of lime in solution by the action of the carbonic acid in sea water which flows in and out at each tide. This solvent action of sea water on dead calcareous organ-isms was shown by the “Challenger’s” observations to be unr versal.

Mr Murray reverses the order of growth as given by Darwin for the groups in the Indian Ocean. He regards the Laccadive, Caro- line, and Chagos

archipelagos as various stages in the growth of coral reefs towards the surface, aud he explains the various appear-

1 Bull, Mus. Comp. Zocl., vol. i. 2 Verhandl. Physik. Med. Geselisch. Witrzburg, Ecb. 1, 1868. 3 Proc. Roy. Soc. Edin., vol. x. p. 505.

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ances in the Maldive group of atolls without any necessity for {

i by oceanic currents as argued by Darwin. Precisely PE crplsvation is applied to the case of a barrier reef. It commences in the shallow water near the shore, and afterwards extends seawards on a talus built up of lumps of coral broken off by the surf. A very careful examination of the barrier reef at Tahiti was made by Lieutenant Swire of H.M.S. Challenger and Mr Murray, and they found that such an explanation was completely justified by the form and nature of the reef. There was much dead coral on the inner side of the barrier, which in many places was perpendicular or even overhanging; while, on the contrary, the outer surface was all alive, and sloped gradually sea- wards. A section of it, drawn to a true scale, is given in fig. 10,

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Fic. 10.—Section across the Barrier Reef, Tahiti.

This section shows that a ledge, over which there is a depth of from 80 to 40 fathoms of water, runs out for 250 yards from the edge of the reef. This ledge is covered with luxuriant heads and bosses of coral. Beyond it there is

a steep irregular slope at an angle of about 45°, the talus being formed apparently of coral masses broken off from the ledge, and piled up; this slope is covered with living Sponges, Alcyonarians, Hydroids, Polyzoa, Foraminifera, and other forms of life. The angle of inclination then decreases to 30°, and the ground is covered with coral sand; while beyond 500 yards from the edge of the reef the declivity is

insignificant, only 6°, and there is a bed of mud containing volcanic and coral sand mixed with Pteropod and other shells, in 590 fathoms of water. The vast perpendicular wall of coral limestone descending into unfathomable depiina which has been supposed usually to mark the outside of a coral reef, has always been looked upon as a conclusive proof of great subsidence having taken place; but the depth and the slope of such limestone walls have been greatly exaggerated, and no means have been taken to asccrtain beyond doubt that the rock is formed of coral throughout. The probability is that only the upper portion of such a wall is true coral limestone; and Dr Guppy has recently shown that this is actually the case in some upraised coral islands of the Solomon group. Upheaval has taken place to a considerable extent in the oceanic islands, and more extended examination of the limestone cliffs of other coral islands will probably lead to the discovery of many such cases. Mr Murray holds that the characteristic form of barrier reefs and atolls is in no way dependent on subsidence, that subsidence is not the cause of their peculiar features, that these reefs may be met with indiffcrently in stationary areas, in areas of subsidence, and in areas of elevation, and that elevation and sub- sidence only modify in a minor way the appearance of the islands. The chief phenomena are accounted for—(1) by a physiological fact,—the very vigorous growth of the reef-forming species on the outer or seaward face of the reef where there is abundance of food, and the much less vigorous growth, and even death, of these species on the inner parts of the reefs and in the lagoons, wherc there is much less food, and where there are other conditions inimical to growth ; and (2) by a physical and chemical fact,—the removal of lime in suspension and in solution from the inner portions of the reefs and from the lagoons, where much dead coral is exposed to the

action of sca water containing carbonic acid, the result being the formation, the deepening, and the widening of lagoons and lagoon channels.

For further information on subjects referred to in this article see John Murray, ‘On the Structure and Origin of Coral Reefs and Islands,” Proc. Roy. Soc. Edin., vol. x. p, 505; Alex. Agassiz, ‘‘On the Tortugas and Florida Reefs,” Zrans. Amer, Acad., vol. xi. (1883); Archd, Geikic, ‘‘The Origin of Coral Reefs,” Nature, vol. xxix. pp. 107 and 124; John Murray and A. Renard, “On the Nomenclature, Origin, and Distribution of Deep-Sea Deposits,” Proc. Roy. Soc. Edin,, vol. xii, p. 495 (1884); John Murray and A. Renard, ‘On the Microscopic Characters of Voleanie Ashes and Cosmic Dust, and their Distribution in the Deep-Sea Deposits,” Proc. Roy. Soc, Edin., vol. xii, p, 474, 1884, (J. MU.)

PACUVIUS, Marcus (219-129 B.c.), was the second in order of time of the three tragic poets who wrote for the Roman stage in the 2d century B.c. His life was so long that he might be described as a contemporary of all the writers who flourished during the first period of Roman literature. He was born in 219 Bc, when Livius Andronicus and Neevius were introducing their imitations of the Greek tragic and comic drama to Roman audiences ; he was recognized as the chief tragic poet about the time when Cecilius, and after him Terence, were the flourishing authors of Latin comedy; he continued to produce his tragedies till the advent of the younger poet Accius, who lived on till the youth of Cicero; and he died in the year (129 .c.) when Lucilius first appeared as an author. He stood in the relation of nephew as well as pupil to Ennius, by whom Roman tragedy was first raised to a position of influence and dignity. In the interval between the death of Ennius (169) and the advent of Accius, the youngest and most productive of the tragic poets, he alone maintained the continuity of the serious drama, and perpetuated the character first imparted to it by Ennius. Like Ennius he probably belonged to the Oscan stock, and was born at Brundisium, which had become a Roman colony in 244 B.c. To this origin may be attributed the fact that he never attained to that perfect idiomatic purity of style which was the special glory of the early writers of comedy, Neevius and Plautus. The fame of his uncle Ennius may probably have drawn him to Rome, and may have induced him to devote himself to the composition of tragedy. But he obtained distinction also as a painter; and

the elder Pliny mentions a work of his which in his time was still to be ee ee ee eee

Aitatis illius ista fuit laus tanquam innocentie sic Latine loquendi; née omnium tamen; nam jllorum equales Cecilium et Pacuvium male locutos videmus ; sed omnes tum fere, qui nec extra urbem hanc

Vixerant nec eos aliqua barbaries domestica infuscayerat, recte loque-bantur (Cicero, Brutus, 74),

seen in the temple of Hercules in the forum boarium. His relationship to the friend of the great Scipio would naturally recommend him to the consideration of the eminent men of the next generation, who fostered the new literature in his spirit; and thus Cicero, in the De Amicitia, represents C. Lelius as speaking of him as “hospitis et amici mei.” He was less productive as a poet than either Ennius or Accius; and we hear of only about twelve of his plays, founded on Greek subjects (among them the Antiope, Teucer, Armorum Judicium, Dulorestes, Chryses, Niptra, &c., most of them on subjects connected with the Trojan cycle), and one “ Pratexta,” Paulus, written in connexion with the triumph of L. fimilius Paulus, for his victory at Pydna, celebrated in the year 167 B.c., as the Clastidium of Nevius and the Ambracia of Ennius were written in commemoration of great military successes in their time. He continued to write tragedies till the age of eighty, when he exhibited a play in the same year as Accius, who was then thirty years of age. He retired to Tarentum for the last years of his life, and a story is told by Gellius of his being visited there by Accius on his way to Asia, who read to him one of his plays, which was famous in after times, the Atreus. The story is probably, like that of the visit of the young Terence to the veteran Cecilius, due to the invention of later grammarians; but it is invented in accordance with the traditionary criticism of the distinction between the two poets, the older being characterized rather by cultivated accomplishment, the younger by vigour and animation. “ Ambigitur quoties uter utro sit prior, aufert Pacuvius docti famam senis, Accius alti.” 2

He died at the age of ninety, having lived through the

long period from the beginning of the Second Punic War

2 Horace, Z., ii, 1, 54, 55. XVIII. — 17

till after the first outbreak of the revolutionary forces, in the tribunate of Tib. Gracchus, which led ultimately to the overthrow of the republic. His epitaph, said to have been composed by himself, is quoted by Aulus Gellius, with a tribute of admiration to its “modesty, simplicity, and fine serious spirit.”

‘** Adulescens, tam etsi propcras, te hoc saxum rogat Uti se aspicias, deinde quod scriptum ’st legas. Hic sunt poets Pacuvi Marci sita Ossa. Hoc volebam nescius ne esses. Vale.”?

Cicero, who frequently quotes passages from him, with great admiration, appears to rank him first among the Roman tragic poets, as Ennius among the epic, and Cecilius among the comic poets (Cic., De Opt. Gen. Or., 1). Ifa rough parallel might be drawn between the three great original Greek tragic poets and their three Roman imitators, we might perhaps recognize in the imaginative mysticism and soldierly spirit of Ennius an affinity to Aischylus, in the mellow wisdom of Pacuvius to Sophocles, and in the oratorical talent and power of moving the passions attributed to Accius a nearer approach to the genius of Muripides. The office performed by the Roman tragic poets to Roman culture was not only to familiarize their countrymen with the creations of Greek genius, and the heroes and heroines of Greek legend, but to be the moral teachers and moral philosophers of a time before the introduction of definite ethical speculation. The fragments of Pacnvius quoted by Ciccro in illustration or enforcement of his own ethical teaching appeal, by the fortitude, dignity, and magnanimity of the sentiment expressed in them, to what was noblest in the Roman temperament. They are inspired also by that fervid and steadfast glow of spirit which underlay the strong self-control of the Roman character, and which was the most powerful element in Roman oratory. They reveal alsoa gentleness and humanity of sentiment which it was the highest office of the new drama to blend with the severe gravity of the original Roman character. So far too as the Romans were capable of taking interest in speculative questions, the tragic poets contributed to stimulate curiosity on such subjects, and they anticipated Lucretius in using the conclusions of specula-

tive philosophy as well as of common sense to assail some of the pee forms of superstition. Among the passages quoted from

acuvius are several which indicate a taste both for physical and ethical speculation, and others which expose the pretcnsions of religious imposture, ¢.g.—

‘Nam isti qui linguam avium intelligunt, Plusque cx alieno jecore sapiunt quam ex suo, Magis audiendum quam auseultandum censeo.” 2

These poets aided also in developing that capacity which the Roman language subsequently displayed of being an organ of oratory, history, and moral disquisition. The literary language of Rome was in proccss of formation during the 2d centnry z.c,, and it was in the latter part of this century that the series of great Roman orators, with whose spirit Roman tragedy has a strong affinity, begins. But the new creative effort in language was accompanied by considerable crudeness of execution, and the novel word-formations and varieties of inflexion introduced by Pacnvius exposed him to the ridicule of the satirist Lucilius, and, long after- wards, to that of his imitator Persius. But, notwithstanding the attempt to introduce an alien element into the Roman language, which proved incompatible with its natural genius, and his own failure to attain the idiomatic purity of Nevius, Plautus, or Terence, the fragments of his dramas are sufficient to prove the service which he rendered to the formation of the literary language of Rome, as well as to the culture and character of his contem- poraries.

The best account of Pacuvius is to be found in the Rémische Tragédie of O.

Ribbeck, and the best collection of his ‘‘ Fragments” in the Zragicorum Latin- orum Reliquiz of the same author. (W. Y¥. 5S.)

PADANG. See Sumatra.

PADERBORN, an ancient town of Prussia, the seat of a Roman Catholic bishop, is situated in the province of Westphalia and district of Minden, 60 miles to the south- west of Hanover. It derives its name (Latin, Paderex Fontes) from the springs of the Pader, a small affluent of the Lippe, which rise in or close to the town under the cathedral to the number of nearly two

hundred, and with such force as to drive several mills within a few yards of their source. The most prominent building is the cathedral,

1 “ Young man, though thou art in haste, this stone entreats thee

to look at it, and then to read what is written. Here are laid the bones of the poet M. Pacuvius. This I desired to be not unknown to thee. Farewell.”

2 ** For they who understand the notes of birds, and derive their wisdom more from examining the livers of other beings than from their own (wit), I think should be rather heard than listened to.”

the western part of which dates from the 11th, the central part from the 12th, and the eastern part from the 13th century. The exterior is imposing, but heavy, and marred by a want of harmony arising from the successive stages of its construction. Among other treasures of art it contains the silver coffin of St Liborius, a substitute for one which was coined into dollars in 1622 by Duke Christian of Brunswick. The externally insignificant chapel of St Bartholomew ranks among the most interest. ing buildings in Westphalia, dating as it does from 1017 ‘ and possessing the characteristic features of the architec. ture of that early period. The old Jesuit church and the chapel of the convent of Abdinghof are also interesting, The town-hall is a picturesque edifice of the Renaissance, Paderborn formerly possessed a university, with the two faculties of theology and philosophy, but it was closed in 1819. The Roman Catholic gymnasium, however, enjoys a considerable reputation, and there are several other schools, hospitals, and religious endowments, as well as an historical and antiquarian society. The manufactures of Paderborn are unimportant, but the trade in grain, cattle, fruit, and wool has attained considerable dimensions since the opening of the Westphalian railway. The popu- lation in 1880 was 14,689 (12,602 Roman Catholics).

Paderborn is indebted for its development to Charlemagne, who discerned the favourable situation of the village of Patrisbrunnen, aud made it the capital of a bishopric. He frequently visited it, recciving the conquered Saxons here at a diet in 777 and ata later period the Saracen ambassadors

from Saragossa and the suppliant Pope Leo II. Several diets were also held here by the Saxon emperors. About the ycar 1000 the town was enlarged by Bishop Meinwerk and surrounded with walls. It afterwards joined the Hanseatic League, received many of the privileges of a free imperial town, and endeavoured to assert its independence of the bishops. The citizeus gladly embraced the doctrines of the' Refor- mation, but the older faith was re-established by Bishop Theodore, who took the town by force in 1604. The ccclesiastical princi pality of Paderborn, which had an area of close on 1000 square miles, was secularized in 1803 and handed over to Prussia. The bishop, however, was allowed to retain his spiritual jurisdiction. From 1807 to 1814 the territory was included in the kingdom of Westphalia.

PADIHAM, a township of Lancashire, is situated in a wild and dreary district on the precipitous banks of the Calder, and on the Lancashire and Yorkshire Railway, 5 miles south-east from Whalley and 4 north-east from Accrington. It possesses large cotton mills, and both stone and coal are wrought in the immediate neighbour- hood. The church of St Leonard, founded before 145], was frequently altered before it was rebuilt in 1866-68, in the Perpendicular style, at a cost of £11,000. There is a national school connected with a very old endowment. Padiham in 1251 was a manor in the possession of Edmund de Laci. The population of the urban sanitary district of Padiham and Hapton (area 950 acres) in 1871 was estimated at 7361, and in 1881 it was 8974.

PADILLA, Juan Loprz pz, insurrectionary leader in the 'guerra de las comunidades" in which the commons of Castile made a futile stand against the arbitrary policy of Charles V. and his Flemish ministers, was the eldest son of the commendator of Castile, and was born in Toledo towards the close of the 15th century. After the cities, by their deputies assembled at Avila, had vainly demanded the king's return, due regard for the rights of the cortes, and economical administration, to be entrusted to the hands of Spaniards, it was resolved to resort to force, and the " holy junta" was formed, with Padilla at its head. Anattempt was first made to establish a national government in the name of the imbecile Joanna, who was then residing at Tordesillas; with this view they took possession of her person, seized upon the treasury books, archives, and seals of the kingdom, and stripped Adrian of his regency. But the junta soon alienated the nobility

Db the boldness with which it asserted democracy and total abolition of privilege, while it courted defeat in the field by appointing to the supreme command of its forces not Padilla but Don Pedro de Giron, who had no recom- mendation but his high birth. After the army of the nobility had recaptured Tordesillas, Padilla did something to retrieve the loss by taking Torrelobaton and some other towns. But the junta, which was not fully in accord with its ablest leader, neutralized this advantage by grant- ing an armistice; when hostilities were resumed the commons were completely defeated near Villalar (April 23, 1521), and Padilla, who had been taken prisoner, was publicly executed on the following day. His wife, Dota Maria Pacheco de Padilla, bravely defended Toledo against the royal troops for six months afterwards, but ultimately was compelled to take refuge in Portugal.

PADUA (Lat., Pataviwm ; Ital., Padova), a city of north Italy, in 45° 24’ N. lat. and 11° 50’ E. long. on the river Bacchiglione, 25 miles W. of Venice and 18 miles S.E. of Vicenza, with a population in 1881 of 70,753. The city is a picturesque one, with arcaded streets and many

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2 Academy of Science und Art 3 University Library

@ Chamber of Commave

5 Sala dala Ragione and

f Palasso Municipale 6 Communal Palace

Scale of % a Mile

Plan of Padua.

bridges crossing the various branches of the Bacchiglione, which once surrounded the ancient walls. The Pal- azzo della Ragione, with its great hall on the upper floor, is reputed to have the largest roof unsupported by columns in Europe; the hall is nearly rectangular, its length 2674 feet, its

breadth 89 feet, and its height 78 feet ; the walls are covered with symbolical paintings in fresco; the building stands upon arches, and the upper story is surrounded by an open loggia, not unlike that which surrounds the basilica of Vicenza; the Palazzo was begun in 1172, and finished in 1219; in 1306 Fra Giovanni, an Augustinian friar, covered the whole with one roof; originally there were three roofs, spanning the three chambers into which the hall was at first divided ; the internal partition walls remained till the fire of 1420, when the Venetian architects who undertook the restora- tion removed them, throwing all three compartments into One, and forming the present great hall. In the Piazza dei Signori is the beautiful loggia called the Gran Guardia,

begun in 1493 and finished in 1526, and close by is the Palazzo del Capitanio, the residence of the Venetian governors, with its great door, the work of Falconetto of Verona, 1532. The most famous of the Paduan churches is the basilica dedicated to Saint Anthony, commonly called Il Santo; the bones of the saint rest in a chapel richly ornamented with carved marbles, the work of various artists, among them of Sansovino and Falconetto; the basilica was begun about the year 1230, and completed in the following century ; tradition says that the building was designed by Niccola Pisano; it is covered by seven cupolas, two of them pyramidal. On the piazza in front of the church is Donatello’s magnificent equestrian statue of Erasmo da Narni, the Venetian general (1438-41). The Eremitani is an Augustinian church of the 13th century, distinguished as containing the tombs of Jacopo (1324) and Ubertino (1345) da Carrara, lords of Padua, and for the chapel of Sts James and Christopher, illustrated by Mantegna’s frescos. Close by the Eremitani is the small church of the Annunziata, known as the Madonna dell’ Arena, whose inner walls are entirely covered with paintings by Giotto. Padua has long been famous for its university, founded by Frederick II. in 1238. Under the rule of Venice the university was governed by a board of three patricians called the Riformatori dello Studio di Padova. The list of professors and alumni is long and illustrious, containing, among others, the names of Bembo, Sperone Speroni, Veselius, Acquapendente, Galileo, Pompo- nazzi, Pole, Scaliger, Tasso, and Sobieski. The place of Padua in the history of art is nearly as important as her place in

the history of learning. The presence of the university attracted many distinguished artists, as Giotto, Lippo Lippi, and Donatello ; and for native art there was the school of Squarcione (1394-1474), whence issued the great Mantegna (1431-1506).

Padua claims to be the oldest ard in north Italy ; the inhabi- tants pretend to a fabulous descent from the Trojan Antenor, whose relics they recognized in a large stone sarcophagus exhumed in the year 1274. Their real origin is involved in that obscurity which conceals the ethnography of the earliest settlers in the Venetian plain ; but it is supposed that they were either Paphlagonians or Etruscans. Padua early became a populous and thriving city, thanks to its excellent breed of horses and the wool of its sheep. Its men fonght for the Romans at Canne, and the city became so powerful that it was reported able to raise two hundred thousand fighting men. Abano in the neighbourhood was made illustrious by the birth of Livy, and Padua was the native place of Valerius Flaccus, Asconius Pedianus, and Thrasea Petus. Padua, in common with north-eastern Italy, suffered severely from the invasion of the Huns under Attila (452). It then passed under the Gothic kings Odoacer and Theodoric, but made submission to the Greeks in 540. The city was seized again by the Goths under Totila, and again restored to the eastern empire by Narses in 568. Following the course of events common to most citics of north-eastern Italy, the history of Padua falls under eight heads:—(1) the Lombard rule, (2) the Frankish rule, (3) the period of the bishops, (4) the emergence of the commune, (5) the period of the despots, (6) the period of Venetian supremacy, (7) the period of Austrian supremacy, and finally (8) the period of united Italy. (1) Under the Lom- bards the city of Padua rose in revolt (601) against Agilulph, the Lombard king, and, after suffering a long and bloody siege, was stormed and burned by him. The city did not easily recover from this blow, and Padua was still weak when the F ranks succceded the Lombards as masters of north Italy. (2) At the diet of Aix- la-Chapelle (828) the duchy and march of Friuli, in which Padua lay, was divided into four counties, one of which took its title from that city. (3) During the period of episcopal supremacy Padua does not appear to have been either very important or very active. The general tendency of its policy, throughout the war of investitures, was imperial and not Roman ; and its bishops were, for the most part, Germans. (4) But under the surface two important move- ments were taking place. At the beginning

of the 11th century the citizens established a constitution composed of a general council or legislative assembly and a credenza or executive ; and during the next century they were engaged in wars with Venice and Vicenza for the right of water-way on the Bacchiglione and the Brenta,—so that, on the one hand, the city grew in power and self-reliance, while, on the other, the great families of Camposampiero, D'Este,

and Da Romano began to emerge and to divide the Paduan district between them. The citizens, in order to protect their liberties, were obliged to elect a podesta, and their choice fell first on one of the D'Kste family (¢. 1175). The temporary suceess of the Lombard league helped to strengthen the towns; but their ineradicable jealousy of one another soon reduced them to weakness again, so that in 1236 Frederick II. found little difficulty in establishing his vicar Ezzelino da Romano in Padua and the neighbouring cities, where he practised frightful cruelties on the inhabitants. When Ezzelino met his death, in 1259, Padua enjoyed a brief period of rest and prosperity: the university flourished ; the basilica of the saint was begun ; the Paduans became masters of Vicenza. But this advance brought them into dangerous proximity to Can Grande délla Scala, lord of Verona, to whom they had to yield in 1311. (5) As a reward for freeing the city from the Scalas, Jacopo da Carrara was elected lord of Padua in 1318. From that date till 1405, with the exception of two years (1388-90) when Gian Galeazzo Visconti held the town, nine members of the Carrara family succeeded one another as lords of the city. It was a long period of restlessness, for the Carraresi were constantly at war ; they were finally extinguished between the growing power of thie Visconti and of Venice. (6) Padua passed under Venetian rule in 1405, and so remained, with a brief interval during the wars of the league of Cambray, till the fall of the republic in 1797. The city was governed by two Venetian nobles, a podesta for civil and a captain for military affairs; each of these was elected for sixteen months. Under these governors the great and small councils continued to discharge municipal business and to administer the Paduan law, contained in the statutes of 1276 and 1362. The treasury was managed by two chamberlains; and every five years the Paduans sent one of their nobles to reside as nuncio in Venice, and to watch the interests of his native town.

(7 and 8) After the fall of the Venetian republic the history of Padua follows the history of Venice during the periods of French and Austrian supremacy, and must be sought for in the article Iraty. In 1866 the battle of Kéniggratz gave Italy the opportunity to shake off the last of the Austrian yoke, when Venetia, and with Venetia Padua, became part of the united Italian kingdom.

See Chronicon Patavinum (in Muratori's Ann. Med, 4v., vol. iv.); Rolandino and Monaco Padovano (Muratori's Rer. Ital. Scrip., vol. viii.) ; Cortustorum His- toria (ibid. vol. xil.); Gattari, /storia Padovana (ibid., vol. xvii.); Vergerius, Vite Carrariensium Principum (ibid., vol. xvi.); Verci, Storia della Marca Trevigiana; Gennari, Annali di Padova; Cittadella, Storia della domina- sione Carrarese; Litta, Famiglie Celebri, s.v., "Carraresi"; Cantu, Jllustra- ztone Grande del Lombardo- Veneto; Gonzati, La Basilica di Sant' Antonio di Padova. 1. F. B.)

PADUCAH, a city of the United States, the capital of M'Cracken county, Kentucky, on the south bank of the Ohio, at the mouth of the Tennessee river, is, next to Louisville, the most important commercial point in Kentucky. It is on the Chesapeake, Ohio, and South- Western railroads, and is the terminus for five lines of steamboats plying respectively to Evansville (Ind.), Cairo (Ill.), St Louis (Mo.), Nashville (Tenn.) and Florence (Ala.), and a regular stopping point for other lines plying on the Ohio, Tennessee, and Mississippi rivers. It ships tobacco, whisky, pork, lumber, flour, and grain, and contains a number of tobacco factories and warehouses, marine- ways for the building and repair of steamboats, and manufactories of furniture, hubs and spokes, harness, leather, soap, and brooms. Laid out in 1827, Paducah was incorporated as a town in 1830, and as a city in 1856. The population was 2428 in 1830, 4590 in 1860, 6866 in 1870, and 8036 in 1880.

PHONY (Pexonia), a genus of Ranunculacee remark- able for their gorgeous flowers, constructed almost exactly on the same lines as those of the common buttercup except as regards the pistil, which in the pzeonies consists of two or more separate carpels each containing several seeds, and surrounded at the base by a fleshy cup or disk, which grows up around the carpels. The receptacle of the flower, moreover, Instead of being flattish or somewhat convex, Is in peonies a little depressed in. the centre, so that the

stamens become somewhat perigynous as in water-lilies (Nymphea) or roses (Rosa). The carpels when ripe form dry follicles, splitting along one edge so as to expose the numerous shining black seeds, provided with a small fleshy aril, There are but few species, natives of the northern hemisphere of the Old World, and divisible into two main groups—those with herbaceous stems dying down in winter,

and those with shrubby stems (Moutan or Tree Pzsonies),. The herbaceous pzeonies have tuberous roots like those of a dahlia, and bold, much-divided leaves. Their magni. ficent cup-like flowers are, in different varieties, of all shades of colour from white to clear yellow (P. Wittman. nana), rose-coloured, and richest crimson.

PAESTUM (IocewWwvia, Posidonia, mod. Pesto), a Greek city in Lucania, Magna Grecia, near the sea, and about 5 miles south of the river Silarus (Salso). It is said by Strabo (v. p. 251) to have been founded by Trcezenian and Achzan colonists from the still older colony of Sybaris, on the Gulf of Tarentum ; this probably happened not later than about 600 B.c. Herodotus (i. 167) speaks of it as being already a flourishing city in about 540 B.c,, when the neighbouring city of Velia was founded. The name Posidonia was derived from Poseidon, the deity principally worshipped by the Troezenians. For many

years the city maintained its independence, though sur- rounded by the hostile native inhabitants of Lucania. Autonomous coins were struck, of which many specimens now exist.

Fig. 1 shows a didrachm of the 6th century 3.c., an interesting It is struck on a broad thin flan,

example of archaic Greek art. with guilloche pattern round the border. The obverse has a figure of Poseidon wicldingh his trident, with the chla- mys hung across his shoulders. The reverse has the same figure in- cuseé. Both sides have the legend (retrograde) in relief, MOM (OZ). Archaic forms of 2

and Tr are used, Later sil- ver coins (sce fig, 1) have the same figure of Poseidon on the ob- verse, and a bull on the reverse, both in relief, with the legend TOME AANATAM (MOSEIAANIATAS), in whicli the archaic M for & and $ for I occur. Bronze coins of the Roman period have the legend NAIZ (maierov).

After long struggles for independence the city fell into the hands of the native Lucanians (who nevertheless did not expel the Greek colonists), and in 273 B.c. it became 4 municipal town under the Roman rule, the name being changed to the Latin form Pestum. The neighbourhood was then healthy, highly cultivated, and celebrated for its flowers; the “twice blooming roses of Pestum” are mentioned by Virgil (Geor., iv. 118), Ovid (Met., xv. 708), Martial (iv. 41, 10; vi. 80, 6), and other Latin poets. Its present deserted and malarious state is probably owing

Fic, 1.—Two types of silver coins of Posidonia. The larger one, the earlier type, is thin, and is incuse on the reverse. The smaller one is much thicker, and is in relief on both sides, Their weight is nearly the same.

to the silting up of the mouth of the Silarus, which has overflowed its bed, and converted the plain into unproduc- tive marshy ground. Herds of buffaloes, and the few peasants who watch them, are now the only occupants of this once thickly populated and garden-like region. In the 9th century Pestum was sacked and partly destroyed by Arab invaders ; in the 11th century it was further dis- mantled by Robert Guiscard, and in the 16th century was finally deserted. The ruins of Posidonia are, however, among the most interesting of the Hellenic world. Remains of the city wall, sufficient to indicate the whole circuit (an irregular polygon about 3 miles round), still exist. The lower part of one of the gates, a fine specimen of Greek masonry, is still fairly perfect. This is a large square tower with inner and outer doorways, and on each side a projecting bastion, semicircular in plan; the whole is skilfully arranged so as to thoroughly command the door- ways. A ditch, about 40 feet outside the wall, gave additional security. The main wall is 16 feet 6 inches thick. The general design of this fortification

much resembles the very perfectly preserved walls and towers of Messene in the Peloponnesus. For plan and description of this gate see a paper by T. L. Donaldson, Museum of Classical Antiquities, vol. i. p. 35, 1851. Outside the north gate there is a long street of tombs, some of which have been excavated, and have yielded a number of interesting arms, vases, and mural paintings, mostly now in the museum at Naples. The chief glory of Posidonia is its wonderful group of three well-preserved Doric temples.

The largest of these, conjecturally called the “Temple of Poseidon,” is on the whole the most eomplete Greek temple now existing, and,

judging from other specimens of the Doric style, ean hardly be

later than 500 B.c. he characteristics which point to its remote age are the shortness (comparatively speaking) of the columns, their rapid diminution, the eomplete absence of entasis, the great projec- tion of the eapitals, and the massiveness of the entablature. Another

eculiarity is that the columns have twenty-four flutes, while other Dorie examples rarely exceed twenty. The eolumns on the flanks are fourteen in all, about an average number for a Doric hexastyle temple. Fig. 2 gives the plan, in which there is nothing con-

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Fia. 3. Plan of the (so-called) Basilica,

Fig, 2, Plan of the Great Temple. The shaded part does not now exist.

Jeetural ; the only serious loss is the absence of the greater part of the cella wall, and some of the upper range of interior eolumns ; the Seven eolumns of this upper order which still remain in sitw are Specially valuable, as no other temple still possesses any of them. The peristyle columns are 6 feet 10 inches in diameter at the base,

except those at the angles, which measure 7 feet. The inter- eolumniation at the angles is closer than elsewhere, after the usual Doric rule. The height of the columns, ineluding capitals, is 29 feet. The stylobate consists of three steps, and the eella floor is four steps above the peristyle pavement, 7.¢., nearly 5 feet, an un- usual height. Indieations still exist of the stairs leading to the roof or to the upper floor, which probably formed the internal eeil- ing over the aisles. The main dimensions of the building are, on the top step of the stylobate, nearly 196 feet in length by 79 feet wide, more than double the length of the celebrated temple of Egina, though not quite double the width.

The material of which this and the other temples are built is a coarse calcareous stone from the neighbouring hills, formed by water deposit. None of this stone was, however, left exposed. The whole building, inside and out, like that at Agina and other places, was carefully eovered with a fine hard stucco formed of lime and pounded white marble, whieh took a high polish, and could hardly have been distinguished from real marble. On this was painted the usual eoloured ornaments with whieh all important Greek buildings appear to have been decorated.

Arehaisms of style, like those in this temple, are also to be found in the seanty remains still existing of the temples at Corinth and Ortygia (Syraeuse), the latter probably an even earlier example of the Doric style. The other temples, though fine and well-pre- served, are inferior both in

size and interest. Though Greek in their general outline, and of the Dorie order, yet the details, sueh as eorniees, shafts, aud capitals, are debased in style, and can hardly belong to the autonomous period of Posidonia; more coat they were built under the native Lueanian or Roman

omination, while Hellenic traditions still lingered among the people. The larger of these, popularly ealled “the Basilica,” is quite unique in plan (see fig. 3). It has nine columns (an unequal number) on its ~— and a range of columns down the centre of the cella. It is pseudo-dipteral, and has eighteen columns on the flanks; all that is black in the plan still remains. The columns are very ungraceful in shape, with an extravagant amount of entasis, and a curious circlet of leaves immediately under the eehinus. The most probable explanation of the strange arrange- ment of the cella is that the temple was dedicated to two deities— each half containing one statue.

The third temple, popularly called that of Ceres, is hexastyle peripteral, about 108 feet by 48 on the top of the stylobate, with thirteen columns on the flanks. In plan it is abnormal in having an open vestibule within the peristyle. There is an opisthodomos behind the cella. Its details throughout are very debased and un- Hellenic.

Both these latter buildings offer a striking contrast to the pure aud severe Dorie of the great temple. Ruins and traces of several

‘other buildings within the city wall still exist, all ee of

the Roman period. Part of an amphitheatre, and of what may have been a eircus, can be distinguished, as well as ruins of an aqueduet outside the city. Various mounds and other inequalities in the ground suggest that mueh still remains hidden, and that Pestum would probably afford a rieh harvest to the careful explorer, while a very simple system of drainage might again restore to this once fertile plain its long-lost wholesomeness of air and richness of soil,

See Strabo, v. and vi.; Wilkins, Magna Grecia, 1807; Piranesi, Ville de Pestum, Rome, 1778; Major, Ruins of Pxstum, 1768; La Gardette, Ruines de Pxstum, 1779; Bétticher, Die Tektonik der Hellenen, 1844-52, vol. ii. p. 325, and plates; Fergusson, The Parthenon, 1883, p. 82; Labrouste, Les

Temples de Pestum, 1877. This last work has the best and most accurate drawings, specially exccuted for the Paris Ecole des Beanx Arts. (J. H. M.)

PAEZ, Jos ANTONIO, one of the leaders of the struggle for South-American independence, and the first president (1830-38) of the republic of Venezuela, was born of Indian parents in the neighbourhood of Acarigua in the province of Barinas, and died in exile at New York, May 6, 1873. His military career, which began about 1810, was distinguished by the defeat of the Spanish forces at Mata de la Miel (1815), at Montecal and throughout the province of Apure (1816), and at Puerto Cabello (1823). At first he acted in concert with Bonivar (q.v.), but in 1829 he procured the secession of Venezuela from the republic of Colombia. For his later life see VENEZUELA. His autobiography was published at New York in 1867- 69, and his son Ramon Paez (otherwise known as an author) wrote Public Life of J. A. Paez (1864).

PAEZ, Pxrpro (1564-1622), Jesuit missionary to Abyssinia, was born at Olmedo in Old Castile in 1564. Having entered the Society of Jesus, he was set apart for foreign mission service, and sent to Goa in 1588. Within a year he was despatched from that place along with a

fellow missionary to Abyssinia, but having fallen into the hands of pirates at Ormuz he was detained in that neighbourhood for seven years as a galley slave. Having been redeemed by his order in 1596, he next spent some years in mission work at Diu and Camboya and other places on the west coast of India, and it was not until 1603 that he reached his original destination, landing at the port of Massowab. At the headquarters of his order in Fremona, he soon acquired the two chief dialects of the country, translated a catechism, and set about the educa- tion of some Abyssinian children. He also established a reputation as a preacher, and, having been summoned to court, succeeded in vanquishing the native priests and in converting Za-Denghel, the king, who wrote to the pope and the king of Spain for more missionaries, an act of zeal which involved him in civil war, and ultimately cost him his life (October 1604). Under the succeeding sovereign the influence of Paez became still greater, not only the king but the nobility having abjured Paganism and accepted Christianity. Paez, who

is said to have been the first European to visit the Abyssinian Nile, died of fever in 1622. See Apyssinta, vol. i. p. 65.

PAGANINI, Nicozo (1784-1840), the most extra- ordinary of executants on the violin, past or present, was born at Genoa, February 18, 1784. His father, a clever amateur, imbued him with a taste for music at a very early age, He first appeared in public at Genoa, in 1793, with triumphant success. In 1795 he visited Parma for the purpose of taking lessons from A. Rolla, who, however, said that he had nothing to teach him. On returning home, he studied more diligently than ever, practising single passages for ten hours at a time, and publishing compositions so difficult that he alone could play them. After spending some years in close retirement, he started, in 1805, on a tour through Europe, astonishing the world with his matchless performances on the fourth string alone. In 1827 the pope honoured him with the Order of the Golden Spur ; and, in the following year, he extended his travels to Germany, beginning with Vienna, where he created a profound sensation. He first appeared in Paris in 1831; and on June 3 in that year he played in London, at the King's Theatre. His visit to England was preluded by the most absurd and romantic stories. He was described as a political victim who had been immured for twenty years in a dungeon, where he played all day long upon an old broken violin with one string, and thus gained his wonderful mechanical dexterity. The result of this and other foolish reports was that he could not walk the streets without being mobbed. Here, as in other countries, he amassed a princely fortune, notwithstanding enormous losses caused by his unhappy propensity for speculation. In 1834 Berlioz composed for him his beautiful symphony, Harold en Italie. He was then at the zenith of his fame ; but his health, long since ruined by excessive study, declined rapidly. In 1838 he suffered serious losses in Paris, yet generously presented Berlioz with 20,000 francs in return for his symphony. The disasters of this year increased his malady—laryngeal phthisis—and, after much suffering, he died at Nice, May 27, 1840. Paganini's style was impressive and passionate to the last degree. His cantabile passages moved his audience to tears, while his tours de force were so astonishing that a Viennese amateur publicly declared that he had seen the devil assisting him. No later violinist has as yet eclipsed his fame as an exe- cutant, though he was far from realizing the artistic perfection so nobly maintained by Spohr and Joachim. The best of his imitators was his pupil Sivori.

PAHLAVI, or Peutevi, the name given by the fol- lowers of Zoroaster to the character in which are written the ancient translations of their sacred books and some other

works which they preserve. The name can be traced back for many centuries; the great epic poet Firdausi (second half of the 10th Christian century) repeatedly speaks of Pahlavi books as the sources of his narratives, and he tells us among other things that in the time of the first Khosray (Chosroes I., 581-579 a.p.) the Pahlavi character alone was used in Persia.1 The learned Ibn Mokaffa* (8th century) calls Pahlavi one of the languages of Persia, and seems to imply that it was an official language.2 We cannot deter- mine what characters, perhaps also dialects, were called Pahlavi before the Arab period. It is most suitable to confine the word, as is now generally done, to designate a kind of writing—not only that of the Pahlavi books, but of all inscriptions on stone and metal which use similar characters and are written on essentially the same principles as these books,

At first sight the Pahlavi books present the strangest spectacle of mixture of speech. Purely Semitic (Aramaic) words—and these not only nouns and verbs, but numerals, particles, demonstrative and even personal pronouns—stand side by side with Persian vocables. Often, however, the Semitic words are compounded in a way quite unsemitic, or have Persian terminations. As read by the modern Zoroastrians, there are also many words which are neither Semitic nor Persian; but it is soon seen that this tradi- tional pronunciation is untrustworthy. The character is cursive and very ambiguous, so that, for example, there is but one sign for n, wu, and 7, and one for y, d, and g; this has led to mistakes in the received pronunciation, which for many words can be shewn to have been at one time more correct than itisnow. But apart from such blunders there remain phenomena which could never have appeared ina real language; and the hot strife which raged till recently as to whether Pahlavi is Semitic or Persian has been closed by the discovery that it is merely a way of writing Persian in which the Persian words are partly represented —to the eye, not to the ear—by their Semitic equivalents. This view, the development of which began with Wester- gaard (Zendavesta, p. 20, note), is in full accordance with the true and ancient

tradition. Thus Ibn Mokaffa‘, who translated many Pahlavi books into Arabic, tells us that the Persians had about one thousand words which they wrote otherwise than they were pronounced in Persian.’ For bread he says they wrote LHMA, ¢.¢., the Aramaic lahmd, but they pronounced nén, which is the common Persian word for bread. Similarly psra, the Arainaic besrd, flesh, was pronounced as the Persian géshkt. We still possess a glossary which actually gives the Pahlavi writing with its Persian pronunciation. This glossary, which besides Aramaic words contains also a variety of Persian words disguised in antique forms, or by errors due to the con- tracted style of writing, exists in various shapes, all of which, in spite of their corruptions, go back to the work which the statement of Ibn Mokaffa* had in view.4 Thus the Persians did the same thing on a much larger scale, as when in English we write £ (libra) and pronounce “pound” or write & or & (et) and pronounce “and.” No system was followed in the choice of Semitic forms. Sometimes

1 We cannot assume, however, that the poet had a clear idea of what Pahlavi was.

2 The passage, in which useful facts are mixed up with strange notions, is given abridged in Jihrist, p. 18, more fully by Yakut, i. 925, but most fully and accurately in the unprinted Ma/atih al-olém.

3 Fihrist, p. 14, 1. 13 sg., comp. 1. 4 sg. The former passage was first cited by Quatremére, Jowr. As. (1835), i. 256, and discussed by Clermont-Ganneau, bid. (1866), i. 480. The expressions it uses are not always clear; perhaps the author of the Jihrist has condensed somewhat.

4 Editions by Hoshangji and Haug (Bombay, 1870), and by Sale mann (Leyden, 1878). See also J. Olshausen, ‘ Zur Wiirdigung der Pahlavi-glossare-” in Kuhn’s Zeit. f. vergl. Sprforsch., N.¥., Vie 521 sq.

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a noun was written in its status absolutus, sometimes the emphatic was added, and this was sometimes written as x sometimes as. One verb was written in the perfect, another in the imperfect. Even various dialects were laid under contribution. The Semitic

signs by which Persian synonyms were distinguished are sometimes quite arbitrary. Thus in Persian khwésh and khwat both mean “self”; the former is written Nrshu (nafshé or najfsheh), the latter pNrshu with the preposition bé prefixed. Personal pro- nouns are expressed in the dative (z.e., with prepositional I prefixed), thus LK (/akh) for tu, “thou,” LNH (/and) for amd, “we.” Sometimes the same Semitic sign stands for two distinct Persian words that happen to agree in sound; thus because hdnd is Aramaic for “ this,” HNa represents not only Persian é, ‘‘ this,” but also the interjection , z.e., “CO” as prefixed toa vocative. Sometimes for clearness a Persian termination is added to a Semitic word; thus, to distinguish between the two words for father, pit and pitar, the former is written aB and the latter abirr. The Persian form is, however, not seldom used, even where there is a quite well-known Semitic ideogram.1

These difficulties of reading mostly disappear when the ideographic nature of the writing is recognized. We do not always know what Semitic word supplied some ambiguous group of letters (e.g., PUN for pa, “to,” or HT for agar, “if”) ; but we always can tell the Persian word— which is the one important thing—though not always the exact pronunciation of it in that older stage of the language which the extant Pahlavi works belong to. In Pahlavi, for example, the word for “female” is written mdtak, an ancient form which afterwards passed through mddhak into mddha. But it was a mistake of later ages to fancy that because this was so the sign T also meant D, and so to write Tfor D in many cases, especially in foreign proper names. That a word is written inan older form than that which is pronounced is a phenomenon common to many languages whose literature covers a long period. So in English we still write though we do not pronounce the gutteral in through, and write laugh when we pronounce laf.

Much graver difficulties arise from the cursive nature of the characters already alluded to. There are some groups which may theoretically be read in hundreds of ways ; the same little sign may be w, 8, n’, N77, 82, 73, and the i too may be either / or kh.

In older times there was still some little distinction between letters that are now quite identical in form, but even the fragments of Pahlavi writing of the 7th century recently found in Egypt show on the whole the same type as our MSS. The practical inconveniences to those who knew the language were not so great as they may seem ; the Arabs also long used an equally ambiguous character without availing themselves of the diacritical points which had been devised long before.

Modern MSS., following Arabic models, introduce dia- critical points from time to time, and often incorrectly. These give little help, however, in comparison with the So-called Pazand or transcription of Pahlavi texts, as they are to be spoken, in the character in which the Avestd itself is written, and which is quite clear and has all vowels as well as consonants. The trans¢ription is not Philologically accurate ; the language is often modernized, but not uniformly so. Pdzand MSS. present dialectical variations according to the taste or intelligence of authors and copyists, and all have many false readings. For us, however, they are of the greatest use. To get a concep- tion of Pahlavi one cannot do better than read the Minéi-Kiaradh in the Pahlavi with constant reference to the

r 1F or examples of various peculiarities see the notes to Noldeke's tanslation of the story of Artachshir 1 Papakdn, Gottingen, 1879.

Pazand.? Critical labour is still required to give an approximate reproduction of the author's own pronuncia- tion of what he wrote.

The coins of the later Sasdnian kings, of the princes of Tabaristan, and of some governors in the earlier Arab period exhibit an alphabet very similar to Pahlavi MSS. On the older coins the several letters are more clearly distinguished, and in good specimens of well-struck coins of the oldest Sdsdnians almost every letter can be re- cognized with certainty. The same holds good for the inscriptions on gems aud other small monuments of the early Sdsdnian period; but the clearest of all are the rock inscriptions of the Sdsdnians in the 3d and 4th centuries, though in the 4th century a tendency to cursive forms begins to appear. Only 7 and v are always quite alike. The character of the language and the system of writing is essentially the same

on coins, gems, and rocks as in MSS.—pure Persian, in part strangely disguised in a Semitic garb. In details there are many differences between the Pahlavi of inscriptions and the books. Persian endings added to words written in Semitic form are much less common in the former, so that the person and number of a verb are often not to be made out. There are also orthographic variations ; ¢g., long é in Persian forms is always expressed in book-Pahlavi, but not always in inscriptions. The unfamiliar contents of some of these inscriptions, their limited number, their bad preservation, and the imperfect way in which some of the most important of them have been published ® leave many things still obscure in these monuments of Persian kings ; but they have done much to clear up both great and small points in the history of Pahlavi.4

Some of the oldest Sasdnian inscriptions are accompanied by a text belonging to the same system of writing, but with many variations in detail,® and an alphabet which, though derived from the same source with the other Pahlavi alphabets (the old Aramaic), has quite different forms. This character is also found on some gems and seals. It has been called Chaldzo-Pahlavi, &c. Olshausen tries to make it probable that this was the writing of Media and the other that of Persia. The Persian dialect in both sets of inscriptions is identical or nearly so.® <

The name Pahlavi means Parthian, Pahlav being the regular Persian transformation of the older Parthava.' This fact points to the conclusion that the system of writing was developed in Parthian times, when the great nobles, the Pahlavans, ruled, and Media was their main seat, "'the Pahlav country." Other linguistic, graphical, and historical indications point the same way ; but it is still far from clear how the system was developed. We know indeed that even under the Achemenians Aramaic writing and speech were employed far beyond the Aramaic lands even in official documents and on coins. The Eranians had no convenient character, and might borrow

2 The book of the Mainyo-i-Khard in the original Pahlavi, ed. by Fr. Ch. Andreas, Kiel, 1882; Id., The Pdézand and Sanskrit Tects, by E. W. West, Stuttgart and London, 1871. West is the greatest living authority on Pahlavi.

3 See especially the great work of F. Stolze, Persepolis, 2 vols., Berlin, 1882. It was De Sacy who began the decipherment of the inscriptions. ;

4 Thus we now know that the ligature in book-Pahlavi whieh means “in,” the original letters of which eould not be made out, is for }*3, “between.” Itis to be read andar.

5 Thus pus, “son,” is written ‘11 instead of 72; pésh, “ before,” is written MNP, but in the usual Pahlavi it is sid=rgyd,

6 What the Fihrist (p. 13 sq.) has about various forms of Persian writing certainly refers in part at least to the species of Pahlavi. But the statements are hardly all reliable, and in the lack of trustworthy specimens little can be made of them.

7 This was finally proved hy Olshausen, following earlier scholars ; see J. Olshausen, Parthava und Pahlav, Mada und Mah, Berlin, 1877 (and in the Monatsd. of the Academy).

the Aramaic letters as naturally as they subsequently borrowed those of the Arabs. But this does not explain the strange practice of writing Semitic words in place of so many Persian words which were to be read as Persian. It cannot be the invention of an individual, for in that case the system would have been more consistently worked out, and the appearance of two or more kinds of Pahlavi side by side at the beginning of the Sas4nian period would be inexplicable. But we may remember that the Aramaic character first came to the Eranians from the region of the lower Euphrates and Tigris, where the complicated cunei- form character arose, and where it held its ground long after better ways of writing were known. In later antiquity probably very few Persians could read and write. All kinds of strange things are conceivable in an Eastern character confined to a narrow circle. Of the facts at least there is no doubt. _

The Pahlavi literature embraces the translations of the holy books of the Zoroastrians, dating probably from the 6th century, and certain other religious books, especially the Mindi-Khiradh (see above) and the Bundehish.1 The Bundehish dates from the Arab period. Zoroastrian priests continued to write the old language as a dead tongue and to use the old character long after the victory of a new empire, a new religion, a new form

of the language (New Persian), and a new character. There was once a not quite inconsiderable profane literature of which a good deal is preserved in Arabic or New Persian versions or reproductions, particularly in historical books about the time before Islam.? Very little profane literature still exists in Pahlavi; the romance of Ardashir has been mentioned above (p. 185, note 1). The difficult study of Pahlavi is made more difficult by the corrupt state of our copies, duc to ignorant and careless scribes. A Pahlavi grammar is of course an impossibility. The necessary preparation for the study is a sound knowledge of New Persian, with which one easily finds the cluc to the inconsiderable grammatical variations of the oldcr language. The lexical peculiaritics of the texts are more consider- able, and partly due to the peculiarities of pricstly thought and speech. Of glossarics, that of West (Bombay and London, 1874) is to be recommended; the large Pahlavi, Gujarati, and English lexicon of Jamaspji Dastur Minocheherji (incomplete, 3 vols., Bombay and London, 1877-82) is very full, but has numerous false or uncer- tain forms, aud must be used with much caution. (TH. N.)

PAINE, Tuomas (1736-1809), the author of The Rights of Man and The Age of Reason, would have had a very different kind of reputation if he had never written these works. Most of those who know him by name as a ribald scoffer against revealed religion are not aware that he has any other title to fame or infamy. But if he had never meddled with religious controversy, his name would have been remembered in the United States at least as one of the founders of their independence. He had a pro- minent reputation when he crossed the Atlantic to stir up the people of the Old World against monarchy and aristo- cracy, taking as his motto “ Where liberty is not, there is my country.” Even after he wrote The Rights of Man, if he had been guillotined by Robespierre, which he very narrowly escaped being, he might have been remembered in Britain as a clever but crazy and dangerous political enthusiast. The final verdict of history upon his useful- ness would have turned on the question whether the United States did well to declare and fight for independ- ence. But The Age of Reason brought his name into disrepute almost as much in the United States as in England. The career of Paine was a very extraordinary one. The son of a Quaker staymaker, of Thetford in Norfolk, he had emigrated to the American colonies some- what late in life, after erratically trying various ways of

making a living as a marine, an exciseman, a teacher of English, and acquiring a reputation in local political

1 The translations edited by Spiegel, the Bundehish by Wester- gaard and Justi, other Pahlavi books by Spiegel and Haug, by Hoshangji, and other Indian Parsees.

? We have also one book, the stories of Kalilag and Damnag, in a Syriac version from the Pahlavi, the latter in this case being itsclf taken from the Sanskrit.

clubs by extreme views and vigour in debate. Born in 1736, he was thirty-eight when he arrived in America, and he apparently went with a purpose, his combative temper attracted by the quarrel then reaching an acute stage, for he carried introductions with him from Franklin to the leaders of the resistance to the mother-country, His opportunity came when these leaders were dispirited and disposed to compromise. He then set the colonists in a flame with a pamphlet entitled Common Sense, a most telling array of arguments for separation and for the establishment of a republic, conveyed in strong direct unqualified language. There is a complete concurrence of testimony that Paine's pamphlet, issued on the 1st January 1776, was a turning-point in the struggle, that it roused and consolidated public feeling, and swept waverers along with the tide. The New York assembly appointed a com- mittee to answer it, but the committee separated with the conclusion that it was unanswerable. When war was declared, and fortune at first went against the colonists, Paine, serving with Washington as a private soldier, com- posed by the light of camp fires a short hortative tract, The Crisis, which was read to the army, and seems to have had a wonderful effect in restoring a courage that was considerably impaired by defeat. Its opening words, "These are the times that try men's souls," became a battle-cry. This and other literary services were recognized by Paine's appointment in the first Congress to be secretary of the committee on foreign affairs. The republic finally established, another phase of his turbulent career was entered on. He determined to return to England, and "open the eyes of the people to the madness and stupidity of the Government." His chief effort in this propagandism was The Rights of Man, written as an answer to Burke's

Reflections on the Revolutions in France. The first part appeared in 1791, and had an enormous circulation before the Government took the alarm and endeavoured to suppress it, thereby exciting the most intense curiosity to see it even at the risk of heavy penalties. Those who know the book only by hearsay as the work of a furious incendiary would be surprised at the dignity, force, and temperance of the style; it was the circumstances that made it inflammatory. Pitt "used to say," according to Lady Hester Stanhope, "that Tom Paine was quite in the right, but then he would add, 'What amI to do? As things are, if I were to encourage Tom Paine's opinions, we should have a bloody revolution.'" Paine accordingly was indicted for treason, but before the trial came off he — was elected by the department of Calais to the French Convention, and was allowed to pass into France followed by a sentence of outlawry. The first years that he spent in France form a curious episode in his life. As he knew _ little of tha language, he could have had but little influence | on affairs, but he was treated with great respect, and did | what he could in the interests of moderation till he incurred the suspicion of Robespierre and was thrown into prison, escaping the guillotine by an accident. He com- pleted the first part of the Age of Reason in the exciting | interval between his accusation and his arrest, and put it | into the hands of a friend on his way to prison. The publication of the work made an instant change in his position on both sides of the Atlantic, the indignation im the United States being as strong as in England Washington, to whom he had dedicated his Rights of Man, declined to take any steps for his release from the prison of the Luxembourg, and he lay there for several | months after the fall of Robespierre. The Age of Reason | can now be estimated calmly. It was written from the | point of view of a Quaker who did not believe in revealed | religion, but who held that "all religions are in their | nature mild and benign " when not associated with political

systems. Intermixed with the coarse unceremonious ridicule of what he considered superstition and bad faith are many passages of earnest and even lofty eloquence in favour of a pure morality founded on natural religion, fully justifying the bishop of Llandaff's saying :—" There is a philosophical sublimity in some of your ideas when speaking of the Creator of the

universe.” The work in short—a second part was published after his release — represents the deism of the 18th century, in the hands of a rough, ready, passionate controversialist. Paine remained in France till 1802, and then returned to America, occupy- ing the rest of his turbulent active life with financial uestions and mechanical inventions. He died in 1809.

PAINT. See PIGMENT.

PAINTING. A general examination of the place of painting among the Fine Arts will be found under that heading. The main ScHoots or Parntine (q.v.) will form the subject of a separate article. For the history of the art, see also ArcH#oLocy (CxassicaL) and the notices of individual painters. The present article is limited to a few practical notes on the methods of painting in oil and water colour, other methods being dealt with under the headings ENamet, Encaustic PAINTING, Fresco, and TEMPERA.

Painting-Room.—The painting-room or atelier should be of sufficient dimensions to allow the artist space to retire from his work, if it is ona scale large enough to require viewing froma distance. For large decorative paintings the room must be spacious. The size and altitude of the window is of great importance. If the opening is con- tracted, the light and shade on the model will be broad and intense, and the colouring sombre, especially in the shadows. If abundance of light is admitted, the tendency will be more towards brightness and purity. Painters generally prefer a window with a northern or eastern aspect.

The painting-room has a great influence in determining not only the effects in the works of individual artists, but the characteristics of whole schools. Leonardo da Vinci was among the first to show partiality to indoor effects and deep shadows. Correggio, the artists of the Bolognese school, Caravaggio, Spagnoletto, and other Neapolitan and Spanish painters followed; the Dutch painter Rembrandt perhaps carried these extreme contrasts of light and shade to the greatest length. The effects thus obtained are, however, more or less artificial, and very unlike the ordinary aspect of the open daylight face of nature.

Painters, unless there happens to be some special reason to the contrary, usually work with the light to the left to prevent the shadow cast from the

brush falling inwards. Some artists who seek to represent open air effects paint from their models in glass-houses, specially constructed for the purpose. The practice has much to recommend it, the diffused light enabling them to approximate more nearly to the truth of nature.

Implements used in Painting.—The easel is a frame, or rest, which supports the picture during its progress. Hasels are of various kinds:—the triangular, supplied with pegs for the adjustment of the height of the work ; the square, or rack easel, which is much more converffent ; and the French studio easel, having a screw at the back and worked by a handle in the front, by which arrange- ment pictures of considerable size and weight can be raised or lowered or inclined forward with great ease. There is also a variety of light portable easels used for out-door sketching.—The palette is the board on which the colours are arranged to paint from; it is usually either of an oval or oblong square form, of light-coloured wood, and, to avoid inconvenience being felt from its weight, it should be thin and well balanced on the thumb. It ought

to be kept clean and the colour never allowed to dry on it.—The palette-knife has a pliable blade, and is used for arranging the colours on the palette, mixing tints, &c. With some painters it not unfrequently takes the place of the brush in the application of colour.—The larger kinds of brushes are made of hog-hair. They are either round or flat, but the latter are generally preferred, though for some purposes round ones are found to be useful. Brushes are also made of sable; these should have the property of coming to a fine point when required. Brushes of badger’s hair are used for “softening ” or ‘‘sweetening,” —that is, blending the ¢olours by sweeping lightly to and fro over them while freshly laid (a practice to be avoided as much as possible). Brushes should be carefully washed after use, either in spirits of turpentine or with soap and tepid water, dried, and the hairs laid smooth with the finger and thumb. A brush in which the colour has been allowed to dry is difficult to clean, and is much injured, if not rendered entirely useless, by such negligence. Not a little depends on the good condition in which the brushes are kept.—The mahl-stick is used to steady the hand while painting details. It is held in the left hand, and the end of the

stick, properly wadded, rests on the canvas. It should be light and firm. Theold painters never used the mahl-stick when working on large pictures, and many artists dispense with it altogether. Rubens mentions being obliged to have recourse to one in his old age.—The dais or throne is a platform varying from a foot to 18 inches in height. Portrait painters, and artists who generally stand while at work, find it desirable to have the sitter or model nearly on a level with the eye.—A mirror hung in a convenient place in the painting-room will be found of great use. It enables the artist to detect faults in drawing to which he might otherwise be blinded from too long gazing at his work, The picture is seen in the mirror reflected in reverse, and errors consequently appear greater than they really are-—The Jlay-figure, a wooden or stuffed doll, usually life-size, is very service- able in painting elaborate dresses and draperies. The best kinds are so constructed that they can be made to assume and retain any posture. Fra Bartolommeo first brought the lay-figure into use.

Materials used in Painting.—These consist of canvases, prepared panels and mill-boards, oils, varnishes, and colours.

1. Canvas is the material now generally used. It is kept in rolls of various width and of three qualities—plain cloth, Roman, and ticken. It is prepared with two kinds of grounds—the hard or oil ground, and the absorbent ground. The ground is generally of a light colour; many artists prefer pure white. The grounds employed by the first oil painters were identical with those of tempera; the surface of the panel was prepared with two or three coats of size, a layer of coarse gesso was then applied, and on this at least eight layers of a finer description were spread, and the surface carefully scraped till it became smooth and white. In the Italian school of a later period, the grounds were generally composed of pipe-clay mixed with chalk. Tt is generally acknowledged that white grounds are in every way preferable, although it matters little whether the brightness reside in the ground or is reproduced at a subsequent stage by painting with a solid body of opaque colour over a dark ground, Velazquez and other Spanish painters used canvases prepared with a red earthy ground. The intention of priming the ground is to prevent the very rapid absorption of colours. Canvas prepared with the object of partially abstracting the oil from the first layers of colour is called “absorbent.” For small cabinet pictures panels of well-

seasoned mahogany are used ; mill-boards, academy boards, and oil paper are serviceable for sketching from nature.

2. Oils and Varnishes.—The introduction of oil paint- ing on the modern methods dates from the time of John Van Eyck. This artist introduced a varnish, probably composed of linseed or nut oil mixed with some resinous substance, which was more siccative than the oil vehicles previously in use, and possessed the property of drying without exposure to the sun or to artificial heat. The oil painting of the early Flemish masters was, strictly speaking, (oil) varnish painting: an oleo-resinous substance, such as amber varnish, was mixed with the colours, and rendered final varnishing unnecessary. The Venetian painters also adopted this vehicle. The term “vehicle” is borrowed from pharmacy. In art it is applied to the fluid used for bringing the pigments into a proper working state. Painters differ greatly as to the vehicles they employ : some use oil only ; others peculiar compounds of their own, made of linseed, poppy, or walnut oils, copal or amber varnishes, drying oil and mastic, &c. Siccatif, a medium specially prepared for oil painting, is now largely used; mixed with spirits of wine, it forms a beautiful transparent varnish.

3. Colours.—The permanent colours are the earths and ochres and those mineral colours which bear the test of fire and lime. Colours prepared from lead and animal and vegetable substances are more or less fugitive. Artist’s colours were originally kept in a dry state, and afterwards in small bladders; they are now enclosed in very con- venient collapsable metal tubes.

The discoveries of modern chemistry have added largely to the simple list of colours known to the old masters, but perhaps with little advantage to their successors, for their is much truth in the maxim that “the shortest way to good colouring is through a simple palette.” Pliny asserts that the ancient Greek painters employed but four colours in their works.

A large proportion of colours, such as the ochres, ver- milion, ultramarine, &c., is derived from minerals; indigo, madder, gamboge, &c., from vegetable, and carmine, Indian yellow, sepia, &c., from animal substances.

The artificial or chemical preparations include Prussian blue, Naples yellow, zinc white, French blue, cobalt, the lakes, &e.

The natural or true pigments are prepared for use by calcining and washing, and for oil painting are ground up in poppy or linseed oils. With two or three exceptions the pigments derived from the mineral kingdom are the most permanent, especially those containing iron or copper. Those derived from animal and vegetable substances have less permanence, but they form an important acquisition to the palette, as they not unfrequently possess a purity and brilliancy of colour which makes it almost impossible to dispense with them.

Colours are opaque or transparent. The former, on account of their solidity and opacity, are employed to represent light. For shadows and glazing transparent pigments are used. Yellow, red, and blue cannot be com- posed, and are called primary colours. The union of two of these in the three combinations of which alone they admit produces secondary colours. White represents light, and in oil painting the only white pigment used is white lead, prepared with great care. The ochres are the most permanent yellows. Their composition is very vari- able, but they may be considered true chemical combinations of clay and oxide ofiron. The native ochres are yellow and red. By calcination the yellow ochres become red. Other yellows are prepared from arsenic, lead, and vegetable substances. Iron is the great colouring principle of red in nature. All the three kingdoms—mineral, animal, and vegetable—contribute to the red pigments. The first supplies vermilion and the red ochres ; the second carmine, obtained from the cochineal insect ; the third

the madder pigments. The principal blue pigments aye ultramarine (native and artificial), cobalt, smalt, Prussian blue, and indigo. Ultramarine is the only pure primary colour ; the finer specimens have neither a tinge of green on the one hand nor of purple on the other. It is obtained from the mineral lazulite or lapis-lazuli, and js probably a volcanic product, as it resists the action of fire, Its scarcity, and consequent high price, have produced many

artificial imitations. These are of many qualities, The inferior are used in paper staining, the finer alone being reserved for artists' use. Cobalt is now prepared ina state of great purity, but it has the objection of appearing violet in artificial light.

In " guides to oil painting" long lists of pigments are generally given; but these serve only to perplex and embarrass. About a dozen colours, judiciously chosen, will be quite sufficient to supply the palette.

Processes and Manipulations.—There are various tech- nical distinctions in the modes of applying the colours toa picture in its successive stages. Glazing is the laying of thinly transparent colours, diluted with a considerable quantity of vehicle, which allows the work beneath to appear distinctly through, but tinged with the colour of the glaze. The Venetian painters, Titian especially, largely employed this process, advancing their pictures as far as possible with solid, opaque colour, and upon this ground glazing repeatedly the richest and purest colours. The process of glazing is generally effected by the applica- tion of diluted transparent colour, but semi-transparent colours are also used when rendered sufficiently trans- parent by the admixture of a large proportion of vehicle. When carried to excess, the result is a 'horny" impure dulness of surface and a heavy and dirty tone of colour. Much practice and experience are required for its proper performance. Scumbling resembles glazing in that a very thin coat is spread lightly over portions of the work, but the colour used is opaque instead of transparent.

Irregularities of surface in such passages of a picture as it may be desirable to repaint are removed by using an instrument especially made for the purpose ; but an old razor, an ordinary pocket-knife, or a piece of window glass, properly broken, will, in skilful hands, answer the purpose equally well. This process should not be attempted till the colour to be removed has hardened, otherwise the pigment will tear off and leave the surface in a condition which it will be found difficult to remedy.

It is the practice of some artists to lay the colours at first cold and pale, gradually strengthening the light and shad, and enforcing the colour in subsequent paintings. When this practice is adopted, the colours used should be as few and as simple as possible. It sometimes happens that

considerable portions of the first painting are apparent through all the subsequent processes, and this early part of the work should be done with great care and judgment. —

The first principle in the application of paint is to avoid unnecessary mixing, or, as it is called, “troubling” oF saddening the tints, the result of which is a waxy surface and muddiness of colour. When this is avoided the touches are clear and distinct, but when the principle is carried to

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excess it degenerates into manner ; or it may serve as a convenient screen for the want of accurate observation and thorough execution. ”

Among the masters most remarkable for precision and rapidity of handling are Velazquez, Tintoretto, Veronese, and Rubens. The execution of Leonardo da Vinci is laboured. Vanderwerf, Mengs, and Denner are also ‘nstances of laboured smoothness. The three last-named belong to a class designated “the polishers,”—“‘ little men, who did not see the whole at a time, but only parts of a whole, and thus vainly essayed to make up the whole by a smooth union of parts.”

No two artists employ the same method in painting. Some attain the result aimed at by involved and compli- cated, others by direct and simple methods. The difference in technique between the work of an English artist and artists trained in French or German ateliers may be seen at a glance, and it is of little use attempting to lay down hard and fast rules on the subject. Even among the great Italian painters a wide variety of practice existed. It has been pretty well ascertained, partly from unfinished works, that Titian’s method was to work out the effect of his pictures, as far as possible, with pure white, red, and black, the shadows being left cold. To prevent the yellowing of the oil, and to harden the colour, the picture was exposed to the sun, months were sometimes allowed to elapse, and then the surface of this dead or first colouring was rubbed down with pumice stone and fresh colours and the glazings applied, a considerable period—during which the picture was exposed to the sun—elapsing between successive appli- cations of colour. ‘Titian is said to have been very partial to the use of his fingers when laying on paint, particularly on flesh and glazings.

The practice of Paul Veronese was quite opposed to that of Titian. He sought almost the full effect at once by direct means and simple mixture of tints, seldom repeating his colours, and using few glazings. When the work was well advanced in this way he covered the whole with a thin coat of varnish to bring up the colours, and then re- touched the lights and enforced the shadows with dexterous touches,

It is said of Reynolds, who spent half his life in ex-

periments, that in order to discover their technical secrets he deliberately scraped away and destroyed Venetian pictures of value. The decay of so many of his works shows with how little success these experiments were rewarded. _ Numerous " guides to oil painting" exist, but little real instruction or benefit is to be gained from their perusal. They abound in minute directions how to paint " trunks of trees, heaths, fields, roads, skies (grey, blue, and stormy), sunsets, sunrises, running streams and waterfalls, moun- tains, the smoke or steam of steamers, and chimneys of cottages," as well as "heads, flesh, backgrounds, draperies (blue, red, and black)," with lists of the proper colours to be employed for each. All this, it is hardly needful to say, 1s worse than useless. The surest and safest way for any one who intends to study painting seriously, or to make it his profession, is to place himself under the instruction of an artist of repute, either in his own country or in some foreign atelier; but, even after acquiring a sound technical knowledge of the processes employed in paint- ing, 1t will be found that much remains to learn which no master can teach. It is said of Velazquez that "he dis- covered that nature herself is the artist's best teacher, and industry his surest guide to perfection, and he very early resolved neither to sketch nor to colour any object without having the thing itself before him."

Water-Colour Painting.—The use, in painting, of earths and minerals of different colours, diluted with water, is

of great antiquity. Painting with oils or oleo-resinous vehicles is a comparatively modern invention. Tempera, encaustic, and fresco were ancient modes of water paint- ing. Several of the early Dutch and Flemish

oil painters attained to considerable technical excellence in the sepa- rate practice of water-colour painting ; little more than simple washings of water colour were employed by them, the processes which have in modern times so greatly raised and extended its scope being then unknown.

Painting in water colour owes much of its development to English artists, and may be regarded as a peculiarly national school of art. The first English water-colour painter of note, Paul Sandby, used Indian ink in the earlier stages of his drawings, finishing them with a few tints of thin colour. At this period paintings in water colour were little more than flat washes, and in the early catalogues of the Royal Academy Exhibition were designated “ water-tinted” or “ water-washed drawings.” Improvements were gradually effected, first by varying the ground-work tint with blue and sepia, over which washes of colour, com- mencing with a warm generalizing tint, were struck. John Cozens was the first to substitute a mixture of indigo and Indian red in place of Indian ink as a neutral tint in the early stages of his work, a practice which was long retained. The old water-colour painters used the lead pencil or the reed pen in finishing their drawings. The first to break away from this conventional method was Girtin, who painted objects at once with the tints they appeared to possess in nature. Turner, perhaps the greatest master of the art, was closely associated with Girtin in early life, and in the course of his long career he carried water-colour painting to a degree of perfection which can scarcely be surpassed. Nearly all the great improvements which have taken place of late years in water-colour painting are due more or less to him. John Lewis, De Wint, Prout, Hunt, Cox, Harding, and Copley Fielding have all contributed to the development of the art.

Materials used in Water-Colour Painting.—1. Paper.—A great variety of papers is used, varying in texture from the extreme of roughness to hot-pressed smoothness. In many of Turner’s drawings the paper is tinted. Nothing, how- ever, seemed to come amiss to him; papers of almost any surface or texture were used. David Cox, in many of his later works, employed a rough paper made from old sail- cloth. The paper most generally used is known as “Imperial,” and is made of various degrees of texture and thickness. _Whatman’s papers are also much esteemed.

The proper sizing of the paper is of great importance ; if it is too strongly done the colours will not float or work freely, if too little they are absorbed into the fabric and appear poor and dead. In this last case, gum-arabic dissolved in warm water will improve the effect by bringing up the colour and giving greater depth and richness of tone. The paper is prepared to receive the drawing by being well sponged and stretched upon a drawing-board.

2. Pigments—The permanent earthy minerals were chiefly used in ancient works, and these, with the addition of a few transparent colours, such as ‘sepia, indigo, and Indian ink, satisfied the early ‘water-colour painters of England. Richer and more delicate colours were oradually added, and of late years chemistry has supplied many entirely new ones. No method of giving permanency to some of the transparent yellows, carmine, and other colours obtained from the cochineal insect has yet been discovered, but the improved methods of preparing pigments from the root of the madder plant have rendered the use of carmine not so necessary. The earths and minerals are the most permanent pigments, but when employed with water they are more unmanageable, and flow less freely than the fugitive vegetable colours. Among the earlier water-colour

painters the use of opaque or “body” colour was generally considered illegitimate. Turner was the first to break through this restraint, and since his time the use of opaque colour has been carried perhaps to excess, many modern artists wilfully resigning much of the peculiar freshness and brilliancy of pure water colour for the sake of rivalling the richness and depth of oil painting.

3. Brushes.—Biown sable is the hair generally used ; but brushes are also made of red sable and squirrel or “camel” hair. The brushes are made by the insertion of the hair into quills, the various sizes of brush being recognized by the names of the birds which supply them —eagle, swan, goose, crow, &. Flat brushes in German- silver ferules are also used.

Perhaps as great a variety of practice exists among water-colour painters as among those working in oils; each arrives at his own peculiar method by the teach- ing of experience. As in the case of oil painting, it would serve little

purpose if the attempt was made to lay down rules and methods. All men cannot be painters, and a knowledge of the nature of the materials and of the processes employed does not necessarily carry with it ability to paint. Such essentials as a knowledge of com- position, drawing, light and shade, and colour are all re- quisite, and these can only be obtained after years of study. If possible the guidance of some good master should be sought for at first ; this will shorten the way and prevent the making of some awkward mistakes. (G. RE.)

PAINTING, Housz. See Buriprne, vol. iv. p. 510; and Murat DEcoRATION.

PAISIELLO, or Paxrsretio, GiovANNI (1741-1815), one of the most talented precursors of Rossini in the Italian school of musical composition, was born at Tarento, May 9, 1741. The beauty of his voice attracted so much attention that, in 1754, he was removed from the Jesuit college at Tarento to the Conservatorio di S. Onofrio at Naples, where he studied under Durante, and in process of time rose to the position of assistant master. For the theatre of the Conservatorio he wrote some intermezzi, one of which attracted so much notice that he was invited to write two operas, La Pupilla and Il Mondo al Rovescio, for Bologna, and a third, 1 Marchese di Tulipano, for Rome. His reputation being now firmly established, he settled for some years at Naples, where, notwithstanding the popularity of Piccini, Cimarosa, and Guglielmi, of whose triumphs he was bitterly jealous, he produced a series of highly successful operas, one of which, Z'Jdolo Cinese, made a deep impression upon the Neapolitan public. In 1776 Paisiello was invited by the empress Catherine II. to St Petersburg, where he remained for eight years, pro- ducing, among other charming works, his masterpiece, J/ Barbiere di Siviglia, which soon attained a European reputation. The fate of this delightful opera marks an epoch in the history of Italian art; for with it the gentle suavity cultivated by the masters of the 18th century died out to make room for the dazzling brilliancy of a later period. When, in 1816, Rossini set the same libretto to music, under the title of Almaviva, it was hissed from the stage; but it made its way, nevertheless, and under its true title, J? Barhiere, is now acknowledged as Rossini's greatest work, while Paisiello's opera is consigned to ob- livion, —a strange instance of poetical vengeance, since Paisiello himself had

many years previously endeavoured to eclipse the fame of Pergolesi by resetting the libretto of his famous intermezzo, La serva padrona.

Paisiello quitted Russia in 1784, and, after producing ZI fe Teodoro at Vienna, entered the service of Ferdinand IV. at Naples, where he composed many of his best operas, including Mina and La Molinara. After many Vicissi- tudes, resulting from political and dynastic changes, he

was invited to Paris (1802) by Napoleon, whose fayour he had won five years previously by a march composed for the funeral of General Hoche. Napoleon treated him munificently, while cruelly neglecting two far greater com- posers, Cherubini and Méhul, to whom the new favourite transferred the hatred he had formerly borne to Cimarosa, Guglielmi, and Piccini. But he entirely failed to con. ciliate the Parisian public, who received his opera, Proserpine so coldly that, in 1803, he requested and with some difficulty obtained permission to return to Ttaly, upon the plea of his wife's ill health.

On his arrival at Naples Paisiello was reinstated in his former appointments by Joseph Bonaparte and Murat, but he no longer enjoyed the brilliant reputation for the attain- ment of which he had so industriously laboured. He had taxed his genius beyond its strength, and was unable to meet the demands nowmade upon it for new ideas. His prospects, too, were precarious. The power of the Bonaparte family was tottering to its fall; and Paisiello's fortunes fell with it. The death of his wife, in 1815, tried him severely, His health failed rapidly. His constitutional jealousy of the popularity of others was a continual source of worry and vexation. And on June 5, 1815, he died, a dis. appointed man, notwithstanding his extraordinary successes and well-earned fame.

It is impossible to believe that even the best of Paisiello's operas would be listened to at the present moment with patience, yet they abound with melodies the graceful beauty of which is still warmly appreciated. Perhaps the best known of these charming airs is the famous Wel cor pity from La Molinara, immortalized by Beethoven's delightful variations. The greatest singers of the time spread the fame of this and other similar effusions throughout the length and breadth of Europe. The part of Nina conduced to

one of Pasta’s most splendid triumphs; and of the ninety-four operas which Paisiello is known to have com- posed not one can be said to have been unsuccessful. His church music was very voluminous, comprising one hundred and three masses, besides many smaller works; he also produced fifty-one instrumental compositions of more or less importance, and many detached pieces. MS. scores of many of his operas were presented to the library of the British Museum by the late Signor Dragonetti.

PAISLEY, a municipal and parliamentary burgh of Ren- frewshire, Scotland, is situated on both sides of the White Cart, 3 miles from its junction with the Clyde, and on the Caledonian and the Glasgow and South-Western Railways, 7 miles west-south-west of Glasgow and 17 east-south-east of Greenock. In 1791 fhe river was at great expense made navigable to the town for sloops of about 50 tons burden. The old town, situated on rising ground on the west bank of the river, consists chiefly of long regular streets, and contains the principal warehouses and factories. The new town was begun towards the close of last century, and is built on level ground to the east, at one time form- ing the domains of the abbey. Surrounding the town there are extensive suburbs, occupied chiefly by villa resi- dences. The river is crossed by a railway viaduct, and three bridges for carriage traffic, two of these being of iron and an old one of stone. The abbey of Paisley was founded in 1164, originally as a priory, by Walter, great steward of Scotland. Its lands were erected by James II. into a regality of which the abbot was lord, and the abbey formed the mausoleum of the Stuarts until their accession to the throne. The abbey was burned in 1307 by the English, and in 1561 by Lord Glencairn. In 1484 the grounds were surrounded by a lofty wall of hewn stone about one mile in circumference. In 1553 Claude Hamil- ton, a boy of ten, fourth son of the duke of Chatellerault, was made abbot in commendam, and in 1587 the lands

and abbey were made a temporal barony in his favour. His son was created earl of Abercorn. The abbey lands, after passing from the earl of Abercorn to the earl of Angus and thence to Lord Dundonald, were purchased in 1764 by the earl of Abercorn, with the view of making the abbey his residence, but changing his intention he let the grounds for building sites. The

buildings inhabited by the monks have been totally demolished, but the nave of the abbey church is entire, and has been fitted up as a place of worship. It is one of the finest extant specimens of old ecclesiastical architecture in Scotland, and also con- tains several fine sculptures and monuments. The unroofed transept and the foundations of the choir enclose a burying ground. The chapel of St Mirin, forming part of the transept, and now used as the place of sepulture of the Abercorn family, contains a monument to Mary Bruce, mother of Robert IL, which has been recently recon- structed. ‘The principal secular buildings of the town are the county buildings and prison, erected in 1818 at a cost of £40,000, and afterwards extended ; the John Neilson institution, opened in 1852, a handsome structure occupy- ing a commanding position on the site of the old Roman camp; the George A. Clark town-hall, in the Gothic style, erected in 1882 at a cost of £50,000, and presented to

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Plan of Paisley.

the town ; the news-room, 1808 ; the grammar school, in the Gothic style, 1864; the Government school of art, 1847; and the theatre. The benevolent institutions include the infirmary, the town hospital or poorhouse, the philosophi- cal institution and humane society, the workhouse, the lunatic asylum, and Hutcheson’s charity school. The Duncan Wright educational endowment provides for natives of the town several school bursaries of the value of from £5 to £10, and several college bursaries of the value of £25. The town possesses three public recreation grounds :—the Fountain Gardens of 6 acres, presented by Mr Thomas Coats in 1868, and containing an elegant structure for a museum and library erected by Sir Peter Coats in 1870; the Brodie Park, 26 acres, laid out in 1877, and presented by the late Robert Brodie of Craigie- hall; and St James’s Park, formed out of the race-

course, which has lately been acquired by the corporation. There are statues of Wilson the ornithologist and Tannahill the poet.

Linen was manufactured at Paisley before the Union, shortly after which coarse linen cloths were succeeded by plain and figured lawns. About the beginning of the 18th century an important manufacturing industry is said to have been originated by Christian Shaw, daughter of the laird of Bargarren. She acquired great skill in the

spinning of yarn, and, with the co-operation of a friend in Holland, originated the manufacture of fine linen thread. From 1760 till 1785 silk gauze was the principal manu- facture. Muslin, cambric, and cotton thread next came into prominence. The shawl manufacture, introduced about the beginning of the present century, the specialty of which was imitation cashmere shawls— “Paisley filled plaids” —is now of minor importance. A wide range of

‘worsted goods, mixed figured fabrics, and light figured

muslins at present employ the looms. The spinning of thread and cotton is perhaps the industry for which the town is best known, although it is almost equally celebrated for its patent manufactures, including soap, starch, corn-flour, and preparations of coffee. There are also exten- sive bleachfields, large dye and print works, engineering works, and some shipbuilding. Since the beginning of the present century the population of the burgh (area 3520 acres) has more than trebled. In 1781 it was 11,000, which in 1791 had increased to 13,800, in 1801 to 17,026, in 1821 to 26,428, in 1831 to 31,460, in 1851 to 48,026, in 1871 to 48,257, and in 1881 to 55,642, of whom 25,832 were males and 29,810 females.

There is no doubt that on the ridge of high ground above the Cart there was a Roman fort and camp, and the supposition that Paisley was the Vanduara of the Romans is supported by the derivation of that name, which means white water. The modern village grew up round the abbey, but the origin of the name Paisley, which was first written Paslet, has been disputed. About the end of the 15th century its growth had excited the jealousy of the ee

burgh of Renfrew, to protect it from the molestations of which Abbot Schaw in 1488 obtained its erection into a free burgh of barony. According to this charter, granted by James IV., it obtained the privilege of returning a member to the Scottish parliament. By the Reform Act of 1888 it was created a parlia- mentary burgh with one representative. The burgh is governed by a provost, feur bgjlies, a treasurer, and ten councillors. Among the eminent persons connected with Paisley are Patrick Adamson, arch-bishop of St Andrews ; Tannahill the poet ; Alexander Wilson the ornithologist ; Watt, author of Bibliotheea Britannica. Motherwell the poet ; and Professor John Wilson, “Christopher North.”

See Crawford, History of Renfrewshire, 3d ed., with additions by George Robertson, 1818; Paisley Directory, 1832-33 ; Swan, Description of the Town and Abbey of Paisley, 1835; Chartulary of the Monastery of Paisley, published by the Maitland Club, 1882; David Semple, Saint Mirin, 1872; Monastery of Paisicy, 1876; J.C. Lees, Abbey of Paisley, 1878.

PAJOU, Avucustin (1730-1809), born at Paris on 19th September 1730, was a member of the Academy and a leading sculptor of the French school during the reigns of Louis XV. and Louis XVI. His portrait busts of Buffon and of Madame Du Barry, and his statuette of Bossuet (all in the Louvre), are amongst his best works. He died at Paris May 8, 1809.

Pienon, Mélanges de la Société des bibliophiles, 1856 ; Madame Du Barry, Mémoire des wuvres de Pajou; Barbet de Jouy, Sculptures mod. au Louvre.

PAKHOL, or Petal, a city and port of China, in the west of the province of Kwang-tung, situated on a bay of the Gulf of Tong-king, formed by a peninsula running south-west from the fu city of Lien-chow, in 21° 30’ N. lat. and 109° 10’ E. long. Dating only from about 1820-30, and at first little better than a nest of pirates, Pakhoi rapidly grew into commercial importance, owing partly to the complete freedom which it enjoyed from taxation, and partly to the diversion of trade produced by the Tai-ping rebellion. The establishment of a Chinese custom-house, and the opening of the ports of Hankow and Haiphong, for a time threatened to injure its prospects; but, foreign trade being permitted in 1876-77, it began in 1879 to be regularly visited by foreign steamers. The average value of the open trade between 1880 and 1882 was £475,000 per annum, and a great deal of

smuggling still takes place. Liquid indigo, sugar, aniseed and aniseed oil, cassia-lignea and cassia oil, cuttle-fish, and hides are the chief exports. With Macao especially an extensive junk trade is carried on, £77,000 worth of

goods being despatched for Pakhoi in the course of a year. A large number of the inhabitants (who exceed 10,000 in all) are engaged in fishing and fish-curing.

PALACKY, FranriSzx (Francis) (1798-1876), the Bohemian historian, was born in the year 1798 in the vil- lage of Hodslavice, in the north-eastern corner of Moravia, where his father was a schoolmaster. His ancestors had secretly remained Protestants through all the persecutions of the 17th century, and only declared themselves as such on the publication of the edict of toleration by the emperor Joseph IT. His mother's name was Anna Krizan; she died in the year 1822, before her son had gained his great reputation. His father, Jiri (George), died in 1836 ; besides Francis they had three other sons and three daughters. Concerning the early years of the future his- torian we are told that he was an indefatigable reader, eagerly devouring all books which came in his way. In 1812 Palacky entered the gymnasium of Pressburg ; his original intention was to become a Protestant clergyman. The national movement then going on in the country aroused the enthusiasm of the youthful student, who was induced to apply himself to the study of his native tongue by the Hssay on the Bohemian Language of Jungmann. While in Pressburg, Palacky assisted the publicist Palko- vich in his journal, 7'ydenntk, and first made his appear- ance as an author with a translation of some of the poems of Ossian (1817), then so popular throughout Europe. After this he was for some time private tutor in various families. In 1823 Palacky removed to Prague, and formed friendships with the leading Czech literati—Jungmann, Presl, Dobrovsky, Hanka, and others. Dobrovsky intro- duced him to Count Sternberg, and he was appointed editor of the new Casoyis Ceskeho Musea, which is still published. In this occupation he continued till 1838. Count Caspar Sternberg and his brother were munificent patrons of the new Bohemian Museum, which had finally been founded after many efforts. The conduct of these men was the more

remarkable that the Bohemian aristocracy had then become almost entirely Germanized.

In 1829 Palacky was appointed public historiographer by the Bohemian states, and made several lengthened tours to consult documents in public libraries at Munich, Berlin, Dresden, Rome, and elsewhere. He then commenced his History of the Bohemian People, which has earned him the undying gratitude of his countrymen. The first volume appeared in German in 1836, but the work was carried on in the Bohemian language from 1848, and was concluded with the year 1526, the period when Ferdinand I. ascended the throne and the political independence of the Czechs ceased. Besides this Palacky obtained a prize from the Bohemian Society of Arts for his work entitled Wiirdigung der alten bihmischen Geschichtschreiber. In the year 1840 he published, in conjunction with Schafarik, Die ciltesten Denkmédler der Bohmischen Sprache. In this he appears as the champion of the early Bohemian manu- scripts, the authenticity of which has been so much dis- puted, adopting among others the glosses in the Mater Verborum in the library at Prague, which have been proved to be forgeries. In the troubled year 1848 Palacky, a man of the student type, was forced into political life, but acquitted himself well. He refused to take a seat in the German parliament at Frankfort when invited to do so, on the ground that as a Czech he had nothing todo with Ger- nan affairs. It was on this occasion that he uttered the memorable sentiment that so essential was Austria to the interests of Europe that, if such an empire had not existed, it would have been necessary to create one—words which were afterwards used by Jellachich as the device on his flag. Before his death, however, Palacky had changed his opinion, and despaired of any help coming from such a

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in his old age under the title Radhost, he tells us—“] have thought all my life that the right would prevail, and my mistake has been in believing in the good sengg and spirit of justice of the German people.”

So great was the influence of Palacky at this period that he was offered a portfolio in the ministry of Pillersdorf ; but in a short time the confidence placed in him by the Austrian Government was withdrawn, and he was regarded with suspicion. He soon, however, quitted politics and betook himself to his literary labours. His influence among his countrymen was now at its height. In 1860 he had the misfortune to lose his wife, whom he had married in 1827. In 1861 he was made a life member of the Austrian senate. He died in 1876, busy with litera- ture to the end.

The great work of Palacky, his History of the Bohemian People, is indeed a monument of conscientious labour. His love of truth and marvellous accuracy are conspicuous on every page. To enable the Bohemians ~~to resist the insidious attempts at their denationalization which had been steadily pursued by their enemies during the 17th and 18th centuries, it was necessary to bring before them the great past which they had been taught to forget. This Palacky has done, and his work has become a national monument. 'The occupation of the last years of his life was the rewriting of some of the chapters, which had seemed to him imperfectly executed, owing to the want of original documents or the censorship of the Austrian Government. In 1845 the first part of his third volume appeared, dealing with the life and religious opinions of Huss. As the work was published, it had already undergone serious mutilation at the hands of the appointed censors, but the Bohemians saw the history of Huss presented to them in its true colours; and so great was the sensation created that a Roman Catholic publicist named Helfert was commissioned to write an account of Huss and Jerome, his disciple, with the view of counter~~ acting the effects of Palacky's work. This book duly appeared at Prague in 1857. Palacky, however, must be considered to have triumphed in the controversy. He published two other polemical works on the same subject in German: in 1868 appeared Die Geschichte des Hussiten- thums und Prof. C. Héfler, and in 1871 another work

entitled Zur Béhmischen Geschichtschreibung. Besides the

interesting portion of his work dealing with Huss and the subsequent Hussite wars, Palacky appears to great advan- tage when dwelling upon the most prosperous periods of Bohemian nationality, as the reigns of Charles

IV. and George Podébrad. No pains were spared by him in his researches. Dr Kalousek tells us in his interesting memoir that, when he visited Rome in 1837 to consult the library of the Vatican, he read through 45,000 documents in ten weeks and copied 400 of them with his own hand. ‘The work is a monument of erudition ; but it may perhaps be said to be written in a somewhat dry and frigid style. It has become familiar to general readers in a German translation. Palacky also founded an historical school in Bohemia, foremost among his pupils being Vaclav Tomek and Antonin Gindely.

PALADIN (Lat., palatinus) literally means a courtier, a member of a royal household, one connected with a palace. The palatium of the Roman emperors on the Palatine Hill supplied a name for all the royal and imperial residences in medizeval Europe, and a correspond- ing adjective and noun for royal officials and dependants. From being applied to the famous twelve peers of Charlemagne, the word paladin became a general term in romance for knights of great prowess.

PALAICHTHYES. See Icuruyoxocy, vol. xii. p. 685.

PALHOGRAPHY

ALEOGRAPHY is the study of ancient handwriting from surviving examples. While epigraphy (see InscRrIPTIONS) is the science which deals with inscriptions engraved on stone or metal or other enduring material as memorials for future ages, paleeography takes cognizance of writings of a literary, economical, or legal nature, written generally with stile, reed, or pen, on tablets, rolls, or books. The boundary, however, between the two sciences is not always to be exactly defined. The fact that an inscription occurs upon a hard material in a fixed position does not necessarily bring it under the head of epigraphy. Such specimens of writing as the graffiti or wall-scribblings of Pompeii and ancient Rome belong as much to the one science as to the other; for they neither occupy the position of inscriptions set up with special design as epigraphical monuments, nor are they the movable written documents with which we connect the idea of paleography. But such exceptions only slightly affect the broad distinction just specified.
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The scope of this article is to trace the history of Greek and Latin paleography from the earliest written docu- ments in those languages which have survived. In Greek paleography we have a subject which is self-contained. The Greek character, in its pure form, was used for one language only ; but the universal study of that language throughout Europe, and the wide diffusion of its litera- ture, have been the cause of the accumulation of Greek MSS. in every centre of learning. The field of Latin paleography is much wider, for the Roman alphabet has made its way into every country of western Europe, and the study of its various developments and changes is essential for a proper understanding of the character which we write.

Handwriting, like every other art, has its different phases of growth, perfection, and decay. A particular form of writing is gradually developed, then takes a finished or calligraphic style and becomes the hand of its period, then deteriorates, breaks up, and disappears, or only drags on. an artificial existence, being meanwhile superseded by another style which, either developed from the older hand or introduced independently, runs the same course, and, in its turn, is displaced by a younger rival. Thus in the history of Greek writing we see the uncial hand passing from early forms into the calligraphic stage, and then driven out by the minuscule, which again goes through a series of important changes. In Latin, the capital and uncial hands give place to the smaller character ; and this, after running its course, deteriorates and is superseded almost universally by the modern Italian hand dating from the Renaissance.

Bearing in mind these natural changes, it is evident that a style of writing, once developed, is best at the period when it is in general use, and that the oldest examples of that period are the simplest, in which vigour and naturalness of handwriting are predominant. On the other hand, the fine execution of a MS. after the best period of the style has passed cannot conceal deteriora- tion. The imitative nature of the calligraphy is detected both by the general impression on the eye and by uncertainty and inconsistencies in the forms of letters. It is from a failure to keep in mind the natural laws of development and change that early dates, to which they have no title, have been given to imitative MSS. ; and on the other hand, even very ancient examples have been post-dated in an incredible manner.

Down to the time of the introduction of printing,

writing ran in two lines—the set book-hand and the cursive. MSS. written in the set book-hand filled the place now occupied by printed books, the writing being regular, the lines kept even by ruling, and the pages provided with regular margins. Cursive writing, in which the letters employed were fundamentally the same as in the set hand, was necessary for the ordinary business of life. The set book-hand disappeared before the print- ing press; cursive writing necessarily remains.

Materials,—Before passing to the discussion of Greek and Latin handwriting, the materials employed and the forms which they took may be briefly noticed. The various works on paleography enumerate the different substances which have been put in requisition to receive writing. Metals, such as gold, bronze, lead, tin, have been used; leaden plates, for example, in addition to those which have been found buried with the dead and bearing inscriptions of various kinds, were also used in the Venetian states down to the 14th or 15th century as a material on which to inscribe historical and diplo- matic records. The ancient Assyrians reeorded their history on sun-dried or fire-burnt bricks; and inscribed potsherds or ostraka have been gathered in hundreds in the sands of Egypt. Such hard materials as these, however, would have no extensive use where more pliant and convenient substances, such as animal skin or vegetable growths, could be had. We have therefore practically to confine our attention to such materials as papyrus, vellum, and paper, the use of which became so universally estab- lished. But midway between the hard and soft substances, and partaking of the nature of both, stand the waxen tablets made of wood coated with wax, on which the writing was scratched with the point of the sédws or graphium. These tablets were called by the Greeks déAros, deArioy or SeAriStov, wruxtiov or wruKtiov, wivas, wwvaxis, Xc., and in Latin tabule or tabelle, or cere; and two or more, put together and connected with rings or other fastenings which served as hinges, formed a caudex or codex. A codex of two leaves was called 8/Oupo: or dirruxa, diptycha ; of three, rpirruxa, triptycha; and so on. From the early specimens which have survived, and which will be examined below, the triptycha appear to have been most commonly used. The tablets served for the ordinary affairs of life, for accounts, letters, drafts, school exercises, &e. The various

references to them by classical writers need not be here repeated; but their survival to a late time should be noted. St Augustine refers to his tablets, and St Hilary of Arles also mentions their use for the purpose of correspondence ; and there remains the record of a letter written in tabella as late as 1148 a.p. (Watten- bach, Schriftwesen, 2d ed., p. 46). They were very commonly used through the Middle Ages in all the west of Europe. Specimens inscribed with money accounts of the 13th and 14th centuries have survived in France; and similar documents of the 14th and 15th centuries are to to be found in several of the municipal archives of Germany. Reference to their use in England occurs in literature; and specimens of the 14th or 15th century have been dug up in Ireland. Similarly in Italy their use is both recorded and proved by actual examples of the 13th or 14th century. With the beginning of the 16th century their general employment seems to have come to an end; but a few survivals of this custom of writing on wax have lingered on to modern times. It is said that sales in the fish-market of Rouen are still noted down on this material.

Among the Romans ivory was sometimes substituted for wood in the waxen tablets, as appears from passages in classical authors. The large consular diptychs are examples of the custom. The rich carvings with which these were embellished have secured their preservation in several instances; and they were often kept in the churches in the Middle Ages and inscribed with lists of bishops or abbots and benefactors.

The employment of Papyrus (¢.v.) as an ordinary writing material in ancient Egypt, and, exported from thence, in Greece and Italy, is well known. The most ancient examples of Greek writing which will have to engage our attention are those which are found in the papyrus rolls of Egypt of the 2d century B.c. Thougl superseded in course of time by vellum, this material continued to be used by Greek scribes down to the 9th century. The earliest Latin writing on papyrus is contained in some fragments recovered at Herculaneum. Dating from the 5th to the 10th century are the papyrus deeds of Ravenna; and papal documents on the same substance extend from the 8th to the 11th century. Papyrus was also used for documents in France under the Merovingian kings. It was also made up into books, for the

reception of literary works, in which form it was sometimes strengthened by the addition of vellum leaves which encased the quires ; and, as far as can be ascertained from extant remains, it was used thus in Italy and France down to the 10th century.

Skins of animals have doubtless served as a writing material from the very earliest period of the use of letters. Instances of the use of leather in western Asia are recorded by ancient writers; and from Herodotus we learn that the JIonians applied to the later-imported papyrus the name dup6épa, by which they already desig- nated their writing material of leather. The Jews also have retained the ancient Eastern custom, and still in- scribe the law upon leathern rolls. The use of parcli- ment (zepyaunvy, charta pergamena) may be considered a revival of the ancient use of skins, now prepared by a new method attributed to Eumenes IL, king of Pergamum (197-158 B,c.), who was opposed by the jealousy of the Ptolemies in his endeavours to establish a library in his capital. They forbade the export of papyrus, and so compelled him to revert to the ancient custom, The new material was prepared in such a way as to be fit to receive writing on both sides, and could thus be conveni- ently made up into book-form, the cwudriv. The ancient name dupGépa. (Lat., membranx) was also transferred to the new invention. By common consent the name of parchment has in modern times given place to that of vellum, a term properly applicable only to calf-skin, but now generally used to describe a medizeval skin-book of any kind. Parchment is a title now usually reserved for the hard sheep-skin or other skin material on which law- deeds are engrossed.

Purple-stained vellum was used by the Romans for wrappers for their papyrus rolls. In the 3d century it is recorded that entire volumes were made of this ornamen- tal substance and written in gold or silver 3 and it was against luxury of this kind that St Jerome directed his often-quoted words in his preface to the book of Job, Examples of such costly MSS. of the 6th century have survived to the present day, as the Codex Argenteus of the Gothic Gospels at Upsala, the fragments of the illustrated Genesis at Vienna, the leaves of the purple Gospels in the Cottonian Library and elsewhere, the Codex Rossanensis, lately discovered, and some others. Some richly stained leaves of the 8th century remain in the Canterbury

Gospels (Royal MS., 1 E. vi.) in the British Museum. On the Continent the great impetus given to the production of

splendid MSS. under the rule of Charlemagne revived the art of staining; and several fine examples of it exist jp MSS. of the 8th, 9th, and 10th centuries. At a later period, when the art was forgotten, the surface only of the vellum was painted in imitation of the older staining which soaked into the substance of the skin. Other colours besides purple were sometimes employed, particularly in the period of the Renaissance, to paint or stain vellum; but MSS. so treated are rather to be regarded as curiosities produced by the caprice of the moment.

Cotton paper (charta bombycina) is said to have been known to the Chinese at a remote period, and to have passed into use among the Arabs early in the 8th century, It was imported into Constantinople, and was used for Greek MSS. in the 13th century. In Italy and the West it never made much way. Rag paper came into general use in Europe in the 14th century, and gradually displaced vellum. In the 15th century MSS. of vellum and paper mixed were common. See PAPER.

With regard to the forms in which writing material was made up, the waxen tablets have already been referred to, and will be more minutely described below. Ancient papyri usually appear in the form of rolls; vellum was made up into books. The roll («tAwSpos, volumen ; later, cidytapiov, eihytdv, éeiAnwa, rotulus) was the ordinary form of written documents known to the ancients. When a work was contained in several rolls, a single roll was called BiPros, BiBriov, volumen, charta; later, téuos. From the circumstance of the Bible filling many rolls it acquired such titles as pandectes and bibliotheca, the latter of which remained in use down to the 14th century. The title of the work was written at the end of the roll; and at the same place was recorded the number of columns and lines, orixo., Which it contained —probably for the purpose of estimating the price. To roll and unroll was eiAety and eedeiv, plicare and explicare ; the work unrolled and read to the end was the liber explicitus. Hence comes the com- mon explicit written at the end of a work ; and, from the analogy of incipit aber in titles, the word

was afterwards taken for a verb, and appears in such phrases as explicit liber, explicit, expliceat, ke.

The book-form was adopted from the waxen tablets, and the name caudex or codex was also taken over. It has been inferred, from the terms in which Martial speaks of vellum books, that they were articles of luxury at Rome; and, although no examples have survived from classical times, and none were found in the ruins of Herculaneum, the sumptuousness of the earliest extant volumes supports this view. The shape in which they are made up during the early centuries of the Middle Ages is the broad quarto.

The quires or gatherings of which the book was formed generally consisted, in the earliest examples, of four sheets folded to make eight leaves (rerpas or rerpadiov, quaternto), although occasionally quinterns, or quires of five sheets (ten leaves), were adopted. Sexterns, or quires of six sheets (twelve leaves), came into use at a later period. The quire-mark, or “signature,” was usually written at the foot of the last page, but in some early instances (e.g., the Codex Alexandrinus) it appears at the head of the first page. The numbering of the separate leaves in a quire, m the fashion followed by early printers, came in in the 14th century. Catch-words to connect the quires date back to the 12th century.

No exact system was followed in ruling the lines and in arranging the sheets when ruled. In the case of papyri it was enough to mark with the pencil the vertical marginal lines to bound the text ; the grain of the papyrus was a sufficient guide for the lines of writing. With the firmer material of vellum it became necessary to rule lines to keep the writing even. These lines were at first drawn

with a hard point, almost invariably on the hair (or outer) side of the skin, and strongly enough to be in relief on the flesh (or inner) side. Marginal lines were drawn to bound the text laterally ; but the ruled lines which guided the writing were not infrequently drawn right across the sheet. Each sheet should be ruled separately ; but two or more sheets were often laid and ruled together, the lines being drawn with so much force that the lower sheets also received the impressions. In rare instances lines are found ruled

on both sides of the leaf, as in some parts of the Codex Alexandrinus. In this same MS. and in other early codices the ruling was not always drawn for every line of writing, but was occasionally spaced so that the writing ran between the ruled lines as well as on them. In making up the quires, care was generally taken to lay the sheets in such a way that hair-side faced hair-side, and flesh-side faced flesh-side; so that, when the book was opened, the two pages before the reader had the same appearance, either the yellow tinge of the hair-side, or the fresh whiteness of the flesh-side. In Greek MSS. the arrangement of the sheets was afterwards reduced to a system: the first sheet was laid with the flesh-side down- wards, so that that side began the quire ; yet in so early an example as the Codex Alexandrinus the first page of a quire is the hair-side. In Latin MSS. also the hair-side appears generally to have formed the first page. Ruling with the plummet or lead-point came into ordinary use in the 12th century; red and violet inks were used for orna- mental ruling in the 15th century. The lines were evenly spaced by means of prickings in the margins; in some early MSS. these prickings run down the middle of the page.

Inks of various colours were employed from early times. Red is found in initial lines, titles, and colophons in the earliest vellum MSS. For purposes of contrast it was also used in glosses, as in the Lindisfarne Gospels and in the Durham Ritual. In the Carlovingian period entire volumes were occasionally written with this ink. Other coloured inks—green, violet, and yellow—are also found at an early date. Writing in gold and silver was inscribed on purple vellum in ancient MSS., as has been noted above; under Charlemagne it again came into fashion. Gold was then applied to the writing of ordinary vellum MSS. It was also injroduced into English MSS. in the 10th century.

With regard to writing implements, it will be here enough to note that for writing on waxen tablets the pointed stilus or graphium was used; that the reed (xaAapos, calamus or canna) was adapted for both papyrus and vellum, and that in Italy at least it appears to have been used as late as the 15th century ; and that the quill pen can be traced back to the 6th century of our era.

GREEK WRITING.

The period which has to be traversed in following the history of Greek palzography begins with the 2d century B.¢. and ends at the close of the 15th century. For all this long period the subject is illustrated by a fair amount of material, more or less connected in chronological sequence. Greek writing in MSS., as far as we know it from extant remains, passed through two courses,—that of the uncial or large letter, and that of the minuscule or small letter. The period of the uncial runs from the date of the earliest specimens on papyrus to the 9th century, that of the minuscule from the 9th century to the inven- tion of printing, An established form of writing, however, cannot, any more than any other human habit, be suddenly abandoned for a new one ; and we are therefore prepared to find the uncial character continue to be used after the first introduction of the smaller hand. It did in fact sur-

vive for special purposes for some three centuries after it had ceased to be the common form of book-writing. Inversely, no fully developed handwriting suddenly springs into existence ; and we therefore look for the first beginnings of the minuscule hand in documents of far higher antiquity than those of the 9th century.

Uncial.—The term uncial has been borrowed from the nomenclature of Latin paleography! and applied to Greek writing of the larger type to distinguish it from the minus- cule or smaller character. In Latin majuscule writing there exist both capitals and uncials, each class distinct. In Greek MSS. pure capital letter-writing was never employed (except occasionally for ornamental titles at a late time). As distinguished from the square capitals of inscriptions, the uncial writing has certain rounded letters, as €, C, W, modifications in others, and some extending above or below the line.

Uncial Greek writing in early times is found in two forms,—the set and the cursive. In examining the set or, as it may be termed, the literary hand, we find that regard must be had to the material on which it was written. For the material has always had more or less influence on the character of the writing. To the substitution of a soft surface for a hard one, of the pen for the graving tool, we undoubtedly owe the rounded forms of the uncial letters. The square-formed capitals were more easily cut on stone or metal;

the round letters more readily traced on skin or wax or papyrus with stile, reed, or pen. Again, the earliest specimens of Greek uncials are found on papyrus ; and this delicate and brittle material naturally required a light style of penmanship. When the firmer material of vellum came into use, there followed a change in the style of writing, which assumed the calligraphic form, which will be considered in its place.

The earliest examples of Greek uncial writing are on papyrus, and have been discovered in Egypt and in the ruins of Herculaneum. When we turn to the literary remains with the view of following the course of the set hand, a difficulty arises at the outset; for in some of the most ancient specimens (and notably the Evddgov rexvy referred to below) there is a fluctuation between set and cursive writing which makes it no easy matter to decide how they should be classed. In the same way, when we come to consider the first examples of cursive hand, we shall find much in them which might be termed a set cast of writing. In fact, in the period when these ancient examples were produced, the formal and cursive styles were not so distinctive as they afterwards became. For our present purpose we may class the literary works in this doubtful style of writing under the book-hand, and place the documents among the specimens of cursive.

With regard to the different dates to be assigned to these early relics, those which have been recovered from Herculaneum have a limit, after which they cannot have been written, in the year of the destruction of the city, 79 a.p. But how far before that date they may be set it is hazardous to conjecture, although the greater number probably fall within the Ist century of our era. In the case of most of the Egyptian papyri there is no such limit either way. In some instances, however, literary remains have been found in company with deeds bearing an actual date, and in two of them the documents are written on the backs of the literary papyri. The work on astronomy entitled Eiddgov rexvj, among the papyri of the Louvre (WV. et Extr., pls. i~x.),? is endorsed with deeds of 165 and

1 §t Jerome’s often-quoted words, “uncialibus, ut vulgo aiunt, litteris,” in his preface to the book of Job, have never been explained. Of the character referred to as “uncial” there is no doubt, but the derivation of the term is unknown.

2 Notices et Extraits des Manuscrits, vol. xviii., Paris, 1865.

164 B.c., and may consequently be at least as old as the first half of the 2d century B.c. The writing of the text of this MS8., as has been already noticed, is of a rather cursive character. But the fragments of a work on dialectics in the same collection (W. et £ztr., pl. xi.), which is endorsed with a deed of 160 B.c., is written in set uncials of a perfectly simple style, formed with fine and even strokes. The columns of writing lean out of the per- pendicular, to the right, a peculiarity which is seen again in the orations of Hyperides (below). So far as one may venture to take this specimen as a standard whereby to judge of the age of others, a simple and fine and light stroke, without exaggeration of forms in the letters, and unrestraint in the flow of the writing seem to be the chief characteristics of this class of hand in the centuries immediately preceding the Christian era. And these characteristics are generally to be observed in all docu- ments which there is reason to assign to this period.

Not inconsiderable fragments of the Ziad dating from the pre-Christian period have also come down to us, First in importance stands the fragmentary papyrus of bk. xviii, found in a tomb near Monfalat in 1849-50. It may be confidently dated as early as the lst century B.c. The text is written in slender uncials, formed with regularity and generally upright, the inclination, if any, being to the left. This tendency to incline-the letters back is a mark of age which repeats itself in the earliest forms of the set minuscule hand. Breathings and accents and various cor- rections have been added by a later hand in this papyrus, which is now in the British Museum (Cat. Anc. MSS., i. pl. 1.).! Another papyrus of a portion of the Jad, on the back of which is a work of Tryphon, the grammarian, was found at the same time, but remains in private hands. Among the papyri of the Louvre are also some fragments of the Ziad, viz., of bk. xiii. (WV. e Evxtr., pl. xii.) and of bks. vi. and xviii. (pl. xlix.), all of a date previous to the Christian era. The fragment of bk. vi. is of particular interest as being written ina hand which is much more set and formal than is generally found in papyri, in rather narrowed letters, among which the normal form of capital A appears. In the

other fragments are seen here and there accents and breathings which from all accounts are ancient, although not to be taken as the work of the first hand. Not being applied systematically, they are probably added by some teacher for instruction on particular points. But the Homeric papyrus which has hitherto had the widest reputation is that which bears the name of its former owner, Bankes, who bought it at Elephantine in 1821. It contains the greater part of the last book of the Ihad. The writing, however, differs very essentially from that of the other Homeric fragments just noticed. It is less free, and wants the spirit and precision of the others, and in the form of letters it approaches more nearly to the cast of those in the early MSS. on vellum. For these reasons it seems better to date this papyrus after the time of our Lord, perhaps even in the 2d century.

A fragment of papyrus containing a copy in duplicate of some lines supposed to be taken from the Temenides of Euripides, together with a few lines from the Medea and some extracts from other works, has been lately published (H. Weil, Un Papyrus inédit de la bibl. de M. A. Firmin- Didot, Paris, 1879). The writing is in set uncials earlier than the year 161 B.c., a document of that date having been added.

But the most important discovery hitherto made among the papyri from Egypt is that of four of the orations of the Athenian orator Hyperides, all of which are now in the British Museum. The papyrus containing the orations

1 Catalogue of Ancient MSS. in the British Museum—Port les Greek, 1881.

for Lycophron and Euxenippus is in unusually good pre- servation, being 11 feet in length and having forty-nine columns of writing. Other portions of the same roll are extant, containing fragments of a third oration against Demosthenes. The writing is particularly elegant, and jg evidently by a skilled penman, considerable play being exhibited in the formation of the letters, which, while still set uncials, are often linked together without raising the pen. The columns of writing incline to the right, There can be no hesitation in placing this papyrus as far back at least as the Ist century B.c. (see editions of Professor Babington, 1853; Cat. Anc. MSS., pls. 2, 3; Pal. Soc.,? pl. 126). Of much later date, however, is the papyrus containing the

funeral oration on Leosthenes, 323 Bc. The writing differs entirely from that of the other orations, being in coarsely-formed uncials, sometimes wide apart and in other places cramped together ; and the forms of the letters are irregular. This irregularity is not the rough and hasty character of writing of an early age, such as that of the Evddgou rexvy, where, in spite of the want of regularity, it is evident that the scribe is writing a natural and practised hand. Here we have rather the ill-formed character bred of want of skill and familiarity with the style of writing. On the back is a horoscope, which has been shown to be that of a person born in 95 A.D. It was at one time assumed that this was an addition written after the oration had been inscribed on the other face of the papyrus, But from the evidence of the material itself the contrary appears to be the fact; and we may accordingly accept the theory that, as no work intended for sale would have been so written, the text of the oration probably represents a student's exercise,—a view which is also supported by the numerous faults in ortho- graphy. This specimen of writing, then, may be assigned to the 2d century of our era.

Lastly, among the discoveries in Egypt in Greek litera- ture is the fragment of writings of the poet Aleman, now in the Louvre, which, however, appears to be not older than the lst century B.c., the hand being light and rather sloping, and inclining in places to cursive forms. It is of interest as having scholia in a smaller hand, and a few accents and breathings added probably, as in the case of the fragment of Homer quoted above, by a teacher for the purpose of demonstration (VV. e¢ £véir., pl. 1.). It may be also added that some early documents are extant written in a set hand (¢g., WV. et £xtr., pl. xvii., Nos. 12, 13).

Turning to the remains discovered at Herculaneum, it is to.be regretted that there exist hardly any sufficiently trustworthy facsimiles. The so-called facsimiles engraved in the Herculanensia Volumina are of no paleographical value. They are mere lifeless representations, and only show us that the texts of the different papyri are usually written in neatly-formed and regularly-spaced uncials. The character is better shown in two autotypes (Pal. Soc., pls. 151, 152) from the works of Philodemus and Metrodorus, although the blackening of the material by the action of the heated ashes threw great difficulty in the way of getting satisfactory reproductions by photography. In the first of these specimens the writing is very beauti- fully

formed and evenly spaced, in the second it is rougher. But it is well to remember, when we have facsimiles from the Herculaneum papyri before us, that in many cases the material will have shrunk under the heat of the destroying shower, and that the writing, as we see it, may be much smaller than it was originally, and so have a more delicate appearance than when first written.

Very few waxen tablets inscribed with Greek uncial writing have survived. Two of them found at Memphis are preserved in the British Museum, and on one of them

2 Paleographical Society, Facsimiles, 1873-88.

are traced some verses in large roughly-formed letters, the date of which can only be conjectured to fall in the Ist century (Verhandl. d. Philologen-Versamml. zu Wireburg, 1869, p. 244). Another set of five tablets is in the Cabinet des Médailles at Paris, containing scribbled alphabets, and a contractor’s accounts in a later and more current hand (Rev. Archéol., viii. p. 461). A tablet from which the wax has worn, and which is inscribed with ink upon the wood, in characters of the 4th century, as is thought, is described in Trans. Koy. Soc. Lit., 2d ser.,

ol. x.

, With the introduction of vellum as a writing material, the uncial characters entered on a new phase. As already observed, the firmer and smoother ground offered by the surface of the vellum to the pen of the scribe would lead to a more exact and firmer style in the writing. The light touch and delicate forms so characteristic of calligraphy ou papyrus gave place to a rounder and stronger hand, in which the contrast of fine hair-lines and thickened down- strokes adds so conspicuously to the beauty of the writing of early MSS. on vellum. Of such MSS., however, none have survived which are attributed to a higher antiquity than the 4thcentury. And here it may be remarked, with respect to the attribution to particular periods of these early examples, that we are not altogether on firm ground. Internal evidence, such, for example, as the presence of the Eusebian Canons ina

MS. of the Gospel, assists us in fixing a limit of age, but when there is no such support the dating of these early MSS. must be more or less conjectural. It is not till the beginning of the 6th century that we meet with a MS. which can be approximately dated ; and, taking this as a standard of comparison, we are enabled to distinguish those which undoubtedly have the appearance of greater age and to arrange them in some sort of chronological order. But these codices are too few in number to afford material in sufficient quantity for training the eye by familiarity with a variety of hands of any one period—the only method which can give entirely trustworthy results.

The earliest examples of vellum uncial MSS. are the three famous codices of the Bible. Of these, the most ancient, the Codex Vaticanus, is probably of the 4th century. The writing must, in its original condition, have been very perfect asa specimen of penmanship; but nearly the whole of the text has been traced over by a later hand, perhaps in the 10th or 11th century, and only such words or letters as were rejected as readings have been left untouched. Written in triple columns, in letters of uniform size, without enlarged initial letters to mark even the beginnings of books, the MS. has all the simplicity of extreme antiquity (Pal. Soc, pl. 104). The Codex Sinaiticus (Pal. Soc., pl. 105) has also the same marks of age, and is judged by its discoverer, Tischendorf, to be even more ancient than the Vatican MS. In this, how- ever, a comparison of the writing of the two MSS. leads to the conclusion that he was wrong. The writing of the Codex Sinaiticus is not so pure as that of the other MS., and, if that is a criterion of age, the Vatican MS. holds the first place. In one particular the Codex Sinaiticus has been thought to approach in form to its possible archetype on papyrus. It is written with four columns toa page, the open book thus presenting eight columns Im sequence, and recalling the long line of columns on an unfolded roll. The Codex Alexandrinus is placed In the middle of’ the 5th century. Here we have an advance on the style of the other two codices. The MS. 18 written in double columns only, and enlarged letters stand at the beginning of paragraphs. But yet the writing 18 generally more elegant than that of the Codex Ninaiticus, Examining these MSS. with a view to ascer-

tain the rules which guided the scribes in their work, we find simplicity and regularity the leading features; the round letters formed in symmetrical curves; € and C, &c., finishing off in a hair-line sometimes thickened at the end into a dot; horizontal strokes fine, those of €, H, and © being either in the middle or high in the letter; the base of A and the cross-stroke of II also fine, and, as a rule, kept within the limits of the letters and not projecting beyond. Here also may be noticed the occurrence in the Codex Alexandrinus of Coptic forms of letters (e.g.,4, JU, alpha and mu) in the titles of books, &c., confirniatory of the tradition of the Egyptian origin of the MS.

TEKNQUNCOYTTeG promroeve TACE NAAFOEIAIKAOWCeANTS Att NGAABOMENSTITOTOYTI Pe

Greek Uncial (Cod. Alex.), 5th century.

(rexvwy cov mwepimarouv Tas ev GAnGera Kabws evTo Anv edaBomev aro Tov [Lat]p[o]s.—2 John 4.)

In the 5th century also falls the illustrated Homer of the Ambrosian Library, sadly mutilated. Some fifty frag- ments remain, cut out for the sake of the pictures which they contain; and all the text that is preserved is that which happened to be on the backs of these pictures. Here the writing shows differences from that of the three codices just noticed, being taller ; and, to instance particu- lar letters, the cross-stroke of € is abnormally low down, and the shape of A and P (the latter not produced below the line) and the large bows of B are also points of difference. Jt has been suggested that the MS. was written in the “ie of Italy by a Latin scribe (Pal. Soc., pls. 39, 40, 50,

51).

To the 5th century may also belong the palimpsest MS. of the Bible, known from the upper text as the Codex Ephraemi, at Paris (ed. Tischendorf, 1845), and the Octateuch, whose extant leaves are divided between Paris, Leyden, and St Petersburg—both of which MSS. are prob- ably of Egyptian origin. Of the end of the 5th or beginning of the 6th century is the illustrated Genesis of the Cottonian Library, now unfortunately reduced to fragments

by fire, but once the finest example of its kind (Cat. Anc. MSS., i. pl. 8). And to about the same time belong the Dio Cassius of the Vatican (Silvestre, pl. 60) and the Pentateuch of the Bibliothtque Nationale (Id.,

We GL)s – In dhe writing of uncial MSS. of the 6th century there is a marked degeneration. The letters, though still round, are generally of a larger character, more heavily formed, and not so compactly written as in the preceding century. Horizontal strokes (e.g., in A, II, T) are lengthened and finished off with heavy points or finials. The earliest ex- ample of this period which has to be noticed is the Dios- corides of Vienna, which is of particular value for the study of the palzography of early vellum MSS. _ It is the earliest example to which an approximate date can be given. There is good evidence to show that it was written early in the 6th century for Juliana Anicia, daughter of Flavius Anicius Olybrius, emperor of the West in 472. Here we already notice the characteristics of uncial writing of the 6th century, to which reference has been made. To this century also belong the palimpsest Homer under a Syriac text, in the British Museum (Cat. Anc. MSS., i. pl. 9); its companion volume, used by the same Syrian scribe, in which are fragments of St Luke's Gospel (Jbid., pl. 10) ; the Dublin palimpsest fragments of St Matthew and Isaiah (T. K. Abbot, Par Palimpsest. Dubl.), written in Egypt ; the fragments of the Pauline epistles from Mount Athos, some of which are at Paris and others at Moscow (Silvestre,

pls. 63, 64; Sabas, pl. A), of which, however, the writing has been disfigured by retracing at a later period; the Gospels written in silver and gold on purple vellum, whose leaves are Scattered in London (Cott. MS., Titus C. xv.), Rome, Vienna, and its native home, Patmos; the frag- mentary Eusebian Canons written on gilt vellum and highly ornamented, the sole remains of some sumptuous volume (Cat, Anc. MSS., i. pl. 11); the Coislin Octateuch (Silvestre, pl. 65); the Genesis of Vienna, one of the very few early illustrated MSS. which have survived (Pal. Soc., pl. 178). Tischendorf has given facsimiles of others, but too insufficiently for the critical study of palzeography.

Reference may here be made to certain early bilingual Greco-Latin uncial MSS., written in the 6th and 7th ‘centuries, which, however, have rather to be studied apart, or in connexion with Latin paleography; for the Greek letters of these MSS. run more or less upon the lines of the Latin forms. The best-known of these examples are the Codex Bezz of the New Testament, at Cambridge (Pal. Soc., pls. 14, 15),and the Codex Claromontanus of the Pauline epistles, at Paris (Pal. Soc., pls. 63, 64), attributed to the 6th century; and the Laudian MS. of the Acts of the Apostles (Pal. Soc. pl. 80) of the 7th century. To these may be added the Harleian glossary (Cat. Anc. MLSS., i. pl. 13), also of the 7th century.

An offshoot of early Greek uncial writing on vellum is seen in the Mceso-Gothic alphabet which Ulfilas constructed for the use of his countrymen, in the 4th century, mainly from the Greek letters. Of the few extant remains of Gothic MSS. the oldest and most perfect is the Codex Argenteus of the Gospels, at Upsala, of the 6th century (Pal. Soc, pl. 118), written in characters which com- pare with purely written Greek MSS. of the same period. Other Gothic fragments appear in the sloping uncial hand seen in Greek MSS. of the 7th and following centuries.

About the year 600 Greek uncial writing passes into a new stage. We leave the period of the round and enter on that of the oval character. The letters €, 9, O, C, instead of being symmetrically formed on the lines of a circle, are made oval ; and other letters are laterally compressed into a narrow shape. In the 7th century also the writing begins to slope to the right, and accents are introduced and afterwards systematically applied. This slanting style of uncials continued in use through the 8th and 9th cen- turies, becoming heavier as time goes on. In this class of writing there is again the same dearth of dated MSS. as in the round uncial, to serve as standards for the assign- ment of dates. We have to reach the 9th century before finding a single dated MS. in this kind of writing. It is true that sloping Greek uncial writing is found in a few scattered notes and glosses in Syriac MSS. which bear actual dates in the 7th century, and they are so far useful as showing that this hand was firmly established at that time; but they do not afford sufficient. material in quan- tity to be of really practical use for comparison (see the tables of alphabets in Gardthausen’s Griech. Paldog.). Of more value are a few palimpsest fragments of the Elements of Euclid and of

Gospel Lectionaries which occur also in the Syriac collection in the British Museum, and are written in the 7th and 8th centuries. There is also in the Vatican a MS. (Reg. 886) of the Theodosian code, which can be assigned with fair accuracy to the close of the 7th century (Gardth., Gr. Pal., p. 158), which, however, being calligraphically written, retains some of the earlier rounder forms. This MS. may be taken asan example of transitional style. In the fragment of a mathematical treatise from Bobio, forming part of a MS. rewritten in the 8th century and assignable to the previous century, the slanting writing is fully developed. The formation

P Ab ae @en 2rrny

of the letters is good, and conveys the impression that the scribe was writing a hand quite natural to him.

lTpe TMPETIAN TCOTEPE VY eXH rp OC TMA €TEWwP 0 NEV Ep e c TOP

Greek Uncial (Mathemat. Treatise), 7th century. (rpwt[or] wlev] y[ap] ravt[os] orepeov oxnp[aros] Mpos Ts METEWPOY EvXEpedTEp—)

It should be also noticed that in this MS.—a secular one —there are numerous abbreviations (Wattenbach, Script, Gr. Specim.,! tab. 8). An important document of this time is also the fragment of papyrus in the Imperial Library at Vienna, which bears the signatures of bishops and others to the Acts of the council of Constantinople of 680. Some of the signatures are in slanting uncials (Wat- tenb., Seript. Gir. Specim., tabb. 12, 13 ; Gardth., Gr. Pal, tab. 1). Of the 8th century is the collection of hymns (Brit. Mus., Add. MS. 26113) written without breathings or accents (Cat. Anc. MSS., i. pl. 14). To the same cen- tury belongs the Codex Marcianus, the Venetian MS. of the Old Testament, which is marked with breathings and accents. The plate reproduced from this MS. (Wattenb., Script. Gr. Specim., tab. 9) contains in the second column a few lines written in round uncials, but in such a laboured style that nothing could more clearly prove the discontinu- ance of that form of writing as an ordinary hand. In the middle of the 9th century at length we find a MS. with a date in the Psalter of Bishop Uspensky of the year 862 (Wattenb., Script. Gir. Specim., tab.

10). A little later in date is the MS. of Gregory of Nazianzus, written between

867 and 886 (Silvestre, pl. 71); and at the end of the

9th or beginning of the 10th century stands a lectionary in the Harleian collection (Cat. Anc. MSS., i. pl. 17). But by this time minuscule writing was well estab- lished, and the use of the more inconvenient uncial was henceforth confined to church-service books. Owing to this limitation uncial writing now underwent a further calligraphic change. As the 10th century advances the sloping characters by degrees become more upright, and with this resumption of their old position they begin in the next century to cast off the compressed formation and again become rounder. All this is simply the result of calligraphic imitation. Service-books have always been the MSS. in particular on which finely-formed writing has been lavished ; and it was but natural that, when a style of writing fell into general disuse, its continuance, where it did continue, should become more and more traditional, and a work of copying rather than of writing. In the 10th century there are a few examples bearing dates. Facsimiles from two of them, the Curzon Lectionary of 980 and the Harleian Lectionary of 995, have been printed (Pal. Soc., pls. 154, 26, 27). The Bodleian commentary on the Psalter (D. 4, 1) is likewise of great paleeographic value, being written partly in uncials and partly in minus- cules of the middle of the 10th century (Gardth., Gr. Pal., p. 159, tab. 2, col. 4). This late form of uncial writing appears to have lasted to about the middle of the 12th century. From it was formed the Slavonic writing m use at the present day.

Under the head of late uncial writing must be classed a few bilingual Graco-Latin MSS. which have survived, written in a bastard kind of uncial in the west of Europe. This writing follows, wherever the shapes of the letters permit, the formation of corresponding Latin characters,— the purely Greek forms being imitated in a clumsy fashion. Such MSS. are the Codex Augiensis of Trinity

College, Cambridge, of the end of the 9th century (Pal.

1 Scripture Grece Specimina, Berlin, 1883.

Soc. pl 127), and the Psalter of St Nicholas of Cusa (pl. 128) and the Codex Sangallensis and Boernerianus of the 10th century (pl. 179). The same imitative characters are used in quotations of Greek words in Latin MSS. of the same periods.

Cursive-—The materials for the study of early Greek cursive writing are found in papyri discovered in Egypt and now deposited in the British Museum, the Louvre, the library of Leyden, and the Vatican. The earliest of these to which an exact date can be assigned are contained in the collection of documents of a certain Ptolemy, son of Glaucias, a Macedonian Greek, who became a recluse of the Serapeum at Memphis in 173-172 B.c., and collected or wrote these documents relating to himself and others connected with the service of the temple in the middle of the 2d century B.c. A series of these and other documents can be selected so as to give a fairly continuous course of cursive handwriting from that period for several centuries. The papyri are supplemented by the ostraka or potsherds on which were written the receipts for payment of taxes, &e., in Egypt under the Roman empire, and which have been found in large quantities. Lastly there are still extant a few specimens of Greek cursive writing on waxen tablets ; and in documents of the 6th and 7th cen- turies from Naples and Ravenna there are found subscrip- tions in Latin written in Greek characters (Marini, I papiri diplom., 90, 92, 121; Cod. Dipl. Cavensis, vol. ii, No. 250).

Facsimiles of the cursively written papyri are found scattered in different works, some dealing specially with the subject. By far the most plentiful and best executed are those which reproduce the specimens preserved at Paris in the atlas accompanying Wotices et Extraits des Manuscrits, vol, xviii.

In the earliest examples of cursive writing we find the uncial character in use, and, as has been already remarked, many of the specimens fluctuate between the more formal or set book-hand and the cursive. As time goes on the two styles diverge more widely. The uncial book-hand had, as we have seen, a disposition to become more formal ; cursive writing naturally has the opposite tendency, to become more flowing and disintegrated, the more exten- sively it isused. But the fact that there existed in Egypt in the 2d

century B.c. a cursive hand not differing very materially from a more formal contemporary hand seems to indicate that the two styles had diverged at no very long time before. It cannot, however, be supposed that a cursive form of Greek writing did not exist still earlier. The highly developed calligraphy of the earliest examples proves that Greek writing, as we there see it, was then no newly-discovered art. Judging by the analogy of later reforms, it is perhaps not going too far to conjecture that in the papyri under consideration we see the results of a calligraphic reform, in which a new model was perfected from earlier styles.

The cursive hand in its best style (e.g., WV. e¢ Extr., pls. XXVlil., xxix.) is very graceful and exact. This elegance 1s indeed characteristic of most of the writings of the 2d century B.c., and if a criterion can be established for assist- ing in the difficult problem of dating the early papyri, this simplicity and evenness of writing appears to be the best.

ppyeuaren oy, FOTOS] oprennrr Cyr fe aA Pe 0 . UM PETINN HITNNAS Greek Cursive, 163-162 B.c.

(up vpwv nu xpnuariCoueva evAaPeiay mpoopwuevwv nuwy Se)

Tn the course of successive centuries the cursive hand

becomes slacker and more sloping. There is more com- bination of letters, and a continual disintegration, so to say, of the forms of the letters themselves. Naturally the letters which undergo most change are those which lend themselves most readily to combination with others. Alpha, for example, a letter in constant use, and appearing in frequently recurring words (as xai), quickly altered its shape. In the earliest papyri it is seen more cursively written than most of its fellows. psilon, again, isa letter which soon took a second form. It was found easier to make the cross-bar in conjunction with the upper half of the curve of the letter than by a separate stroke after the formation of the full curve ©. The upper half of the letter naturally linked itself with the next following letter ; and the epsilon thus broken is found as early as a hundred years B.c., and runs through succeeding centuries. The tau was treated in the same way. In the specimen

given above it may be seen how the scribe first made half the horizontal stroke and attached it to the main limb by one action of the pen “, and then added the other half separately. By this device he avoided moving his hand far back. Next, to write the letter in one stroke, some- thing like a y, wasa natural development. The transforma- tion of pz follows on the same lines; and the n-shaped nu comes from the capital letter quickly written, just as the same shape was derived in the Roman alphabet. Such a form as the sickle-shaped rho } is one that would be expected; but the system of breaking-up is in no form better illustrated than in the case of delta. This letter, it might be thought, would, from its original shape, resist combination more than any other, yet even in the 2d century B.C. this combination is accomplished, and delta occasionally appears open on the right side and linked with the following letter 4

Minuscule—The gradual disintegration of the pure forms of the early uncials by this progressive development of more cursive characters led eventually to the formation of minuscule letters. By the beginning of the 6th cen- tury most of the letters which are afterwards recognized as minuscules in form had become individually developed. For example, the three letters B, H, and K, which in their capital or uncial shapes are quite distinct, had, at this period, acquired alternative shapes which are not very dissimilar from one another, and which by a careless reader may be confused. ‘The letter B in cursive writing lost its loops and was joined by a tag to the following letter—a process by which it became very like the Latin w. So the H readily passed through the formN to h.; and K became u. The A developed at the apex an elongation of the right side of the triangle, which, for junction with the next letter, was bent over, and hence resulted the small 6. The transformation of M through XY to p, and of N through V top, is obvious. This development, however, of minuscules from the old uncials was a work of time. The incipient changes in individual letters can be detected in papyri of the 2d and Ist centuries B.c.; but a fully developed minuscule hand, used as an independent form of writing, had no existence for some centuries to come. Arrived, however, at the end of the 6th century, we find a document of 600 a.p. given in facsimile in the Motices et Extracts (pl. xxiii, No. 20), the writing of which is so full of the smaller letters that the hand is practically a minuscule one. This document and six others which are extant formed part of the business papers ofone Aurelius Pachymius, a

dealer in purple dye, and, ranging in date from 592 to 616 a.D., are valuable material for elucidating the history of the Greek minuscule character. After an interval of eighty years another important document presents itself, in which the two styles of writing, the old uncial and the new minuscule, are seen on the same page. This is the frag-

mentary papyrus at Vienna, originally brought from Ravenna, which contains the subscriptions of bishops and others to the acts of the synod of Constantinople of 680 A.D. A facsimile was first printed by Lambecius (Comm. de Bibl. Czxsar., ed. Kollar, lib. viii. p. 863), and is repro- duced by Wattenbach (Script. Gr. Specim., tabb. 12, 13), whose latest opinion, however, with regard to the document is, that the writing is too uniform to be the actual subscrip- tions, but that it is the work of a scribe imitating to some extent (and certainly so far that he has repeated the uncials and minuscules as he found them) the peculiarities of the original. This appears to be really the case, but the document being a nearly contemporary copy continues to have considerable paleographical value. An analysis of the alphabets of this papyrus and of the one of 600 A.D. cited above is given by Gardthausen (G'r. Pal., taf. 4). The facsimile of the will of Abram, bishop of Harmonthis (Pal. Soc., pl. 107), may also be referred to as showing the mixture of large and small letters in the 8th century ; and in the single surviving specimen of Greek writing of the Imperial Chancery, containing portions of a letter addressed apparently to Pepin le Bref on the occasion of one of his wars against the Lombards in 753 or 756, appears a@ hand which approaches nearest to the set minuscule book-hand of the next century (Wattenb., Script. Gr. Specim., tabb. 14, 15).

Arrived at this matured stage of development, the minuscule character was in a condition to pass into the regular calligraphic form of writing. In the documents quoted above, it appears generally in a cursive form, and in this form it was undoubtedly also used for literary works. An example of such book-writing in the 8th century has been given in facsimile by Gardthausen (Beitr. zur griech. Pal., 1877, taf. 1). But in the 9th century the minuscule hand assumed a set form from which the writing of the succeeding centuries developed as from a new basis.

The establishment of this set hand is to be ascribed to the fact of the minuscule being now generally adopted as the recognized literary hand, in place of the larger and more inconvenient uncial, and its consequent introduction into vellum books. As we have already seen, uncial writing was influenced in the same way when applied to vellum. The firmer surface of the skin offered to the calligrapher a better working ground for the execution of his handiwork ; and thus may be explained the almost sudden appearance of the beautiful and regular writing which presents itself in the minuscule MSS. of the 9th century.

Greek MSS. written in minuscules have been classed as follows :—(1) codices vetustissimi, of the 9th century and to the middle of the 10th century; (2) vetusti, from the iniddle of the 10th to the middle of the 13th century ; (3) recentiores, from the middle of the 13th century to the fall of Constantinople, 1453 ; (4) novell, all after that date.

Of dated minuscule MSS. there is a not inconsiderable number scattered among the different libraries of Europe. Gardthausen (G'r, Pal., 344 sg.) gives a list of some thousand, ending at 1500 a.p. But, as might be expected, the majority belong to the later classes. Of the 9th century there are not ten which actually bear dates, and of these all but one belong to the latter half of the century. In the 10th century, however, the number rises to nearly fifty, in the 11th to more than a hundred.

_ In the period of codices vetustissimé the minuscule hand 1s distinguished by its simplicity and purity. The period has been well described as the classic age of minuscules. The letters are symmetrically formed ; the writing is com- pact and upright, or has even a slight tendency to slope to the left. In a word, the beauty of this class of minuscule

FALTASGh 2? Hh

writing is unsurpassed. But in addition to these general characteristics there are special distinctions which belone to it. The minuscule character is maintained intact, with. out intrusion of larger or uncial-formed letters. With its cessation as the ordinary literary hand the uncial character had not died out. We have seen that it wag still used for liturgical books. It likewise continued to survive in a modified or half-uncial form for scholia, rubrics

titles, and special purposes—as, for example, in the Bodleian Euclid (Pal. Soc., pl. 66)—in minuscule written M89. of the 9th and 10th centuries. These uses of the older character sufficed to keep it in remembrance, and it is therefore not a matter for surprise that some of its forms should reappear and commingle with the simple minuscule, This afterwards actually took place. But in the period now under consideration, when the minuscule had been cast into a new mould, and was, so to say, in the full vigour of youth, extraneous forms were rigorously excluded.

CAAN Got rusdou: haraaurakh ly h arwo Greek Minuscule (Euclid), 888 a.p.

(em To ABI emlredov dixa TunOhoerat OMN emmrédou’ dia ra avra 5} KL at] 7 do)

The breathings also of this class are rectangular, in unison with the careful and deliberate character of the writing ; and there is but slight, if any, separation of the words. In addition, as far as has hitherto been observed, the letters run above, or stand upon, the ruled lines, and do not depend from them as at a later period. The exact time at which this latter mechanical change took place cannot be named ; like other changes it would naturally establish itself by usage. But at least in the middle of the 10th century it seems to have been in use. In the Bodleian MS. of Basil’s homilies of 953 a.p. (Pal. Soc., pl. 82) the new method is followed; and if we are to accept the date of the 9th century ascribed to a MS. in the Ambrosian Library at Milan (Wattenb., Script. Gr. Specim., tab. 17), in which the ruled lines run above the writing, the practice was yet earlier. Certain scribal peculiarities, however, about the MS. make us hesitate to place it so early. In the Laurentian Herodotus (W. and V., Hxempla,! tab. 31), which belongs to the 10th century, sometimes the one, sometimes the other system is followed in different parts of the volume; and the same peculiarity happens in the MS. of Gregory of Nazianzus of 972 aD. in the British Museum (Pal. Soc., pl. 25 ; Haempla, tab. 7). The second half of the 10th century therefore appears to be a period of transition in this respect.

The earliest dated example of codices vetustissimi is the copy of the Gospels belonging to Bishop Uspensky, written in the year 835. A facsimile is given by Gardthausen (Bettrége) and repeated in the Hxvempla (tab. 1).

Better specimens have been photographed from the Oxford Euclid of 888 a.p. (Pal. Soc., pls. 65, 66; Hxempla, tab. 2) and from the Oxford Plato of 895 a.p. (Pal. Soc., pl. 81; Exempla, tab. 3). Sabas (Specim. Palzograph.) has also given two facsimiles from MSS. of 880 and 899. To this list may be added a facsimile of the Chronicles of Nicephorus in the British Museum, which falls within the 9th century (Cat. Ane. MSS., i. pl. 15), and also one of the Aristotle of Milan, which may be of the 9th or early 10th century (Pal. Soc., pl. 129; Wattenb., Seript. Gr. Specim., tab. 16). Of the year 905 is the Catena on Job at Venice (Zxempla, tab. 4); and other facsimiles of MSS. of this class are taken

1 Wattenbach and Von Velsen, Exempla Codicum Grecorum, litt. minusc. scriptorum, Heidelberg, 1878.

from a MS. of the Gospels in the British Museum (Cat. Ane. MSS., i. pl. 16), the Ambrosian Plutarch (Wattenb. Script. Gr. Specim., tab. 20), and the Ambrosian MS. of the Prophets (tab. 17), the last having,among other peculiarities, an unusual method of distinguishing the sigma at the end of a word by an added dot. These few facsimiles are all that are at present available for the purpose of studying minuscule book-writing of the first class.) They are, how- ever, all reproduced by photography, and serve sufficiently to show the character of writing which we are to look for in other, undated, examples of the same time.

After the middle of the 10th century we enter on the period of the codices vetusti, in which it will be seen that the writing becomes gradually less compact. The letters, so to say, open their ranks; and, from this circumstance aloue, MSS. of the second half of the century may generally be distinguished from those fifty years earlier. But altera- tions also take place in the shapes of the letters. Side by side with the purely minuscule forms those of the uncial begin to reappear, the cause of which innovation has already been explained. These uncial forms first show themselves at the end of the line, the point at which most changes first gained a footing, but by degrees they work back into the text, and at length become recognized

members of the minuscule characters. In the 11th and 12th centuries they are well established, and become more and more prominent by the large or stilted forms which they assume. The change, however, in the general character of the writing of this class of codices vetusti is very gradual, uniformity and evenness being well main- tained, especially in church books. Among the latter, a trilingual Psalter of the year 1153, in the British Museum (Pal. Soc., pl. 132), may be noted as an example of the older style of writing being adhered to at a comparatively late time. On the other hand, a lighterand more cursive kind of minuscule is found contemporaneously in MSS. of a secular nature. In thishand many of the classical MSS. of the 10th or 11th centuries are written, as the MS. of Aischylus and Sophocles, the Odyssey and the Apollonius Rhodius of the Laurentian Library at Florence, the Anthologia Palatina of Heidelberg and Paris, the Hippo- erates of Venice (Hxempla, tabb. 32-36, 38, 40), and the Aristophanes of Ravenna (Wattenb., Script. Gr. Specim., tab. 26). Ina facsimile from a Plutarch at Venice (Zz- empla, tab. 44), the scribe is seen to change from the formal to the more cursive hand. This style of writing is distin- guishable byits light and graceful character from the current writing into which the minuscule degenerated ata later time. The gradual rounding of the rectangular breathings takes place in this period. In the 11th century the smooth breathing, which would most readily lend itself to this modification, first appears in the new form. In the course of the 12th century both breathings have lost the old square shape; and about the same time contractions become more numerous, having been at first confined to the end of the line. Facsimiles from several MSS. of the codices vetusti and the following class have been published by the Palsographical Society and by Wattenbach and Von Velsen in their Hxempla.

When the period of codices recentiores commences, the

Wargo sri popes uemer=roys Wri: x . r) “ Ca [vd 2 No Use dpand co plows ocb rae iraubyairrgs Dare po Bou rarpOT yoUPde Harter Cod duar ne noc Greek Minuscule (Odyssey), 13th century. (} GAdvers B71 Tpov evinrnoas Toy GAHTHY

ds tpa pwvhoas opéaAas ZAAaBev adtap ddvoceds audivduou mpds yoova kabéCero SovaArxijos)

Greek minuscule hand undergoes extensive changes. The

contrast between MSS. of the 13th century and those of a hundred years earlier is very marked. In the later examples the hand is generally more straggling, there is a greater number of exaggerated forms of letters, and marks of contraction and accents are dashed on more freely. There is altogether a sense of greater activity and haste.

The increasing demand for books created a larger supply. Scholars now also copied MSS. for their own use, and hence greater freedom and more variety appear in the examples of this class, together with an increasing use of ligatures and contractions. The introduction of the coarse cotton paper into Constantinople in the middle of the 13th century likewise assisted to break up the formal minuscule hand. ‘To this rough material a rougher style of writing was suited. Through the 14th and 15th centuries the decline of the set minuscule rapidly advances. In the MSS. on cotton paper the writing becomes even more involved and intricate, marks of contraction and accents are combined with the letters in a single action of the pen, and the general result is the production of a thoroughly cursive hand. On vellum, however, the change was not so rapid. Church books were still ordinarily written on that material, which, as it became scarcer in the market (owing to the injury done to the trade by the competition of cotton paper), was supplied from ancient codices which lay ready to hand on the shelves of libraries. The result was an increasing number of palimpsests. In these vellum liturgical MSS. the more formal style of the minuscule was still maintained, and even on paper church services are found to be in the same style. In the 14th century there even appearsa partial Renaissance in the writing of church MSS., modelled to some extent on the lines of the writing of the 12th century. The resemblance, however, is only superficial; for no writer can entirely disguise the character of the writing of his own time. And lastly there was yet another check upon the absolute disintegration of the minuscule in the 15th century exercised by the professional seribes who worked in Italy. Here the rag-paper, which had never made its way in the East, was the only paper in use. Its smoother surfaceapproximated more nearly to that of vellum; and the minuscule hand as written by the Greek

scribes in Italy, whether on paper or vellum, re- verted again to the olderstyle. The influence of the Renais- sance is evident in many of the productions of the Italian Greeks which were written as specimens of calligraphy and served as models for the first Greek printing types.

The Greek minuscule hand had, then, by the end of the 15th century, become a cursive hand, from which the modern current hand is directly derived. We last saw the ancient cursive in use in the documents prior to the forma- tion of the set minuscule, and no doubt it continued in use concurrently with the book-hand. But, as the latter passed through the transformations which have been traced, and gradually assumed a more current style, it may not unreasonably be supposed that it absorbed the cursive hand of the period, and with it whatever elements of the old cursive hand may have survived.

LATIN WRITING.

In writing a history of Latin palzography, it will be first necessary, as with the Greek, to follow its development in two main divisions—the set book-hand and the cursive. Under the former head will be first ranged the capital, uncial, and half-uncial hands found in early MSS.; on the other side will be traced the course of Roman cursive writing in the waxen tablets and papyri. Next will be shown how this cursive hand was gradually reduced into forms of writing peculiar to different countries on the continent of Europe (reserving for separate examination

the development of the Irish and English schools), and finally how, in the revival of learning under Charlemagne, the reformed Caroline minuscule became the standard on which the writing of all the Western nations was finally modelled. .

Capital.—The oldest form of book-writing which we find employed in Latin MSS. is in capitals ; and of these there are two kinds—the square and the rustic. Square capitals may be defined as those which have their horizon- tal lines at right angles with the vertical strokes ; rustic letters are not less accurately formed, nor, as their title would seem to imply, are they

rough in character, but, being without the exact finish of the square letters, and being niore readily written, they have the appearance of greater simplicity. In capital writing the letters are not all of equal height ; F and L, and in the rustic sometimes others, as B and R, overtop the rest. In the rustic the forms are generally lighter and more slender, with short horizontal strokes more or less oblique and wavy. Both styles of capital writing were obviously borrowed from the lapidary alphabets employed under the empire. But it has been observed that scribes with a natural conservatism would perpetuate a style some time longer in books than it might be used in inscriptions. We should therefore be prepared to allow for this in ascribing a date to a capital ~~written MS., which might resemble an inscription older by a cen~~ tury or more. Rustic capitals, on account of their more convenient shape, came into more general use; and the greater number of the early MSS. in capitals which have survived are consequently found to be in this character.

In the Huempla Codicum Latinorum of Zangemeister and Wattenbach are collected specimens of capital writing, which are supplemented by other facsimiles issued by the Palzographical Society. The earliest application of the rustic hand appears in the papyrus rolls recovered from the ruins of Herculaneum (Zxempla, tabb. 1-3), which must necessarily be earlier than 79 a.p. In some of these speci- mens we see the letters written with a strong dashing Stroke ; in others they are mixed with cursive and uncial forms. In the vellum MSS. the writing in the earliest instances is of a perfectly exact character. MSS, of this class were no doubt always regarded as choice works, The large scale of the writing and the quantity of material required to produce a volume must have raised the cost to a height which would be within reach of only the wealthy. Such are the two famous copies of Virgil in the Vatican— the Codex Romanus, adorned with paintings, and the Codex Palatinus (Zxempla, tabb. 11, 12 3; Lal. Soe, plas 113-115), which may be even as early as the 3d or 4th century, for in the regularity of their letters they resemble very nearly the inscriptions of the lst and 2d century. There are no marks of punctuation by the first hand; nor are there enlarged initial letters.

TESTATVAQVEDEOSITEAVALSEADLAOELLACOGL
ISIAMITALOSTOSLISTALCAIERATOEDERA

Roman Rustic Capitals (Virgil), 3d or 4th century

(Testaturque deos iterum se ad proelia cogi Bis iam Italos hostis haec altera foedera)

In a third and younger MS. of Virgil, the Schede Vaticans (Lxempla, tab.13; Pal. Soe., pls. 116, 117), the imitation of the lettering of inscriptions is far less appar- ent, and the writing may be said to have here settled down into a good working book hand ; but, like the MSS. just noticed, this volume also was doubtless prepared for a special purpose, being adorned with well-finished paintings of classical style. In assigning dates to the earliest MSS. of capital-writing, one feels the greatest hesitation, none

FAD A @ GR 4.P H Y¥

of them bearing any internal evidence to assist the process, It is not indeed until the close of the 5th century that we reach firm ground,—the Medicean Virgil of Florence having in it sufficient proof of having been written before the year 494. The writing is in delicately-formed letters, rather more spaced out than in the earlier examples (Exempla, tab. 10; Pal. Soc., pl. 86). Another ancient MS. inrustie capitals is the Codex Bembinus of Terence (Exempla, tabb, 8, 9; Pal. Soc., pl. 135), a volume which is also of parti- cular interest on account of its marginal annotations, written in an early form of small hand. Among palimpsests the most notable is that of the Cicero In Verrem of the Vati- can (Hxempla, tab. 4).

Of MSS. in square capitals the examples are not 0 early as those in the rustic character. Portions of a MS, of Virgil in the square letter are preserved in the Vatican, and other leaves of the same are at Berlin (Zxempla, tab, 14). Each page, however, begins with a large coloured initial, a style of ornamentation which is never found in the very earliest MSS. The date assigned to this MS. is therefore the end of the 4th century. In very similar writ- ing, but not quite so exact, are some fragments of another MS. of Virgil in the library of St Gall, probably of a rather later time (Exempla, tab. 14a; Pal. Soc., pl. 208).

In the 6th century capital-writing enters on its period of decadence, and the examples of it become imitative. Of this period is the Paris Prudentius

(Exempla, tab. 15; Pal. Soe., pls. 29, 30) in rustic letters modelled on the old pattern of early inscriptions, but with a very different result from that obtained by the early scribes A compari- son of this volume with such MSS. as the Codex Romanus and the Codex Palatinus shows the later date of the Prudentius in its widespread writing and in certain incon- sistencies in forms. Of the 7th century is the Turin Sedulius (Zxempla, tab. 16),a MS. in which uncial writing also appears—the rough and misshapen letters being evidences of the cessation of capital writing as a hand in common use. The latest imitative example of an entire MS. in rustic capitals is in the Utrecht Psalter, written in triple columns and copied, to all appearance, from an ancient example, and illustrated with pen drawings. This MS. may be assigned to the beginning of the 9th century. If there were no other internal evidence of late date in the MS., the mixture of uncial letters with the capitals would decide it. In the Psalter of St Augustine's, Canterbury, in the Cottonian Library (Pal. Soc., pl. 19; Cat. Ane. MSS., ii. pls. 12, 13), some leaves at the beginning are written in this imitative style early in the 8th century; and again it is found in the Benedictional of Bishop Aithelwold (Pal. Soc., pl. 143) of the 10th century. In the sumptu ous MSS. of the Carlovingian school it was continually used ; and it survived for such purposes as titles and colo- phons, for some centuries, usually in a degenerate form of the rustic letters.

Uncial.—Uncial writing differs from the capital in adopting certain rounded forms, as &d€h Mm, and in having some of its letters rising above or falling below the line. The origin of the round letters may be traced in some of the Roman cursive characters as seen in the wall inscrip- tions of Pompeii and the waxen tablets. A calligraphic development of these slighter forms resulted in the firmly- drawn letters which are seen in the early vellum MSS. The most ancient of these may without much hesitation be assigned to the 4th century, and in them the writing is so well-established that one might well believe that it had been already practised for some generations. On the other hand, a calligraphic style may be stimulated into quick development by various causes,—caprice, fashion, or even the substitution of a different writing material, as vellum for papyrus. Uncial writing lasted as an ordinary book-

Patwo¢echk APH Y

hand into the 8th century, when it was supplanted by the reformed small writing of the Carlovingian school ; but, like the capitals, it survived for some time longer as an ornamental hand for special purposes.

The Exempla of Zangemeister and Wattenbach, so often quoted above, contains a series of facsimiles which illustrate the progress of uncial writing throughout the period of its eareer. The letter ® has been adopted by the editors as a test letter, in the earlier forms of which the last limb is not curved or turned in. The letter € also in its earlier and purer form has the cross stroke placed high. But, as in every style of writing, when once developed, the earliest examples are the best, being written with a free hand and natural stroke.

The Gospels of Vercelli (Hxempla, tab. 20), said to have been written by the hand of Eusebius himself, and which may indeed be of his time, is one of the most ancient uncial MSS. Its narrow columns and pure forms of letters have the stamp of antiquity. To the 4th century also is assigned the palimpsest Cicero De Republica in the Vatican

(Exempla, tab. 17; Pal. Soc., pl. 160), a MS. written in

fine large characters of the best type; and a very ancient fragment of a commentary on an ante-Hieronymian text, in three columns, has also survived at Fulda (Zuempla, tab. 21). Among the uncial MSS. of the 5th century of which good photographic facsimiles are available are the two famous codices of Livy, at Vienna and Paris (Zxempla, tabs. 18,19; Pal. Soc., pls. 31, 32, 183), and the Gaius of Verona (Hxempla, tab. 24). The latter MS. is also of special interest, as it- contains abbreviations and has cer- tain secondary forms amongst its letters. To distinguish between uncial MSS. of the 5th and 6th centuries is not easy, for the character of the writing changes but little, and there is no sign of weakness or wavering. It may, however, be noticed that in MSS. which are assigned to the latter century there is rather less compactness, and occasionally, as the century advances, there is a slight tendency to artificiality.

JammiBiillxquaeicnad RANUASAECULARISBO
NAOPINAIUROSTENDX”

Latin Uncial, 5th or 6th century. (Iam tibi illa quae igno rantia saecularis bo na opinatur ostendam)

When the 7th century is reached there is every evidence that uncial writing has entered on a new stage. The letters are more roughly and carelessly formed, and the compactness of the earlier style is altogether wanting. From this time down to the age of Charlemagne there is a continual deterioration, the writing of the 8th century being altogether misshapen. A more exact but imitative hand was, however, at the same time employed, when occasion required, for the production of calligraphic MSS., such as liturgical books. Under the encouragement given by Charlemagne to such works, splendid uncial volumes Were written in ornamental style, often in gold, several of which have survived to this day (Cat. Anc. MSS., ii. pls. 89-41),

Half-Uncial.—A very interesting style of writing, and for the study of the development of the set minuscule hand of later periods a most important one, is that to which the name of half-uncial has been given. It lies between cursive and uncial, and partakes of the character of both. As early apparently as the 4th century, a set style of small Writing, partly following in formation the characters found ithe Roman cursive writing of the Ravenna and other

documents on papyrus, and in some of its letters betraying an uncial origin, is found in glosses or marginal notes of early MSS. The limited space into which the annotations had to be compressed compelled the writer to abandon the free style of the ordinary cursive hand, and at the same time a mere reduction of capital or uncial letters would have been too tedious a process to adopt. A middle course was followed, and a neat minute hand, half-set half-current, was used,—just as in the present day it is no uncommon practice to write a so-called printing hand for similar purposes. The earliest example of this hand appears to be in the marginal directions for the painter in the Quedlinburg fragment of an illustrated early Italic version of the Bible (see Schum in Theolog. Studien u. Kritiken, 1876). In these notes appear 6, d, m, n as fully developed minuscules ; 7 is represented by M2, half way between the uncial and the minuscule, and sis’. Again in the notes by the Arian bishop Maximin (Lxempla, tab. 22), of

the 5th century, the same style of writing appears,—with some variations, however, in individual letters, as in g and 7, which come near to minuscule shapes. In the Codex Bembinus of Terence (Zxempla, tab. 8) there are many glosses giving ample opportunity for studying the hand, which is here in a small and well-formed character. From this specimen, and also from the notes inthe Itala of Fulda (Zxempla, tab. 21), a complete alphabet of set minuscule letters may be selected, as written probably early in the 6th century. Rather later and more uncial in form are the glosses in the Medicean Virgil (Zxempla, tab. 10).

This set form of small writing, then, was, as it appears from the examples quoted above and from many others (see the enumeration in Wattenbach, Hinlettung zur Lat. Palxog., p. 12), in pretty general use for the purposes of annotation ; and it was but natural that it should also come to be adopted in MSS. for the text itself. The intro- duction into the text of uncial-written MSS., at an early date, of forms of letters borrowed from cursive writing is illustrated by the Verona Gaius (Hxempla, tab. 24) of the 5th century, in which, besides the ordinary uncial shapes, d is also found as a minuscule, 7 as the transitional N, and sas the tall letter f. Again, in the Florentine Pandects of the 6th century, one of the scribes writes a hand which contains a large admixture of minuscule forms (Zxempla, tab. 54). And some fragments of a Greeco-Latin glossary on papyrus, of which facsimiles have been published (Com- ment. Soc. Gottingen. iv., 1820, p. 156; Rhein. Museum, v., 1837, p. 301), likewise contain, as secondary forms of uncial m,7, ands: 7N,M, f. From these few instances it is seen that in uncial MSS. of a secular nature, as in works relating to law and grammar, the scribe did not feel himself restricted to a uniform use of the larger letters, as he would be in producing a,church book or calligraphic MS. The adaptation then of a set small hand, very similar to, and in some particulars identical with, the annotating hand above referred to, is not surprising. The greater convenience of the small hand in comparison with the larger uncial is obvious, and the element of calligraphy which was infused into it gave it a vitality and status asa recognized book-hand. ‘Thus we have a series of MSS., dating from the end of the 5th century, which are classed as examples of half-uncial writing, and which appear to have been written in Italy and France. The MS. of the Fasti Con- sulares, at Verona, brought down to 494 a.p. (Exempla, tab. 30), is in this hand, but the earliest MS. of this class to

which a more approximate date can be given is the Hilary of St Peter's at Rome, which was written in or before the year 509 or 510 (Huempla, tab. 52; Pal. Soc., pl. 136); the next is the Sulpicius Severus of Verona, of 517 a.p. (Exempla, tab. 32); and of the year 569 is a beautifully-written MS. at Monte Cassino containing a

Biblical commentary (Zxempla, tab. 3). Other examples, of which good facsimiles may be consulted are the Corbie MS. of Canons, at Paris (Hxempla, tabb. 41, 42), and the St Severianus at Milan (Pal. Soc., pls. 161, 162), of the 6th century ; and the Cologne MS. of Canons (Exempla, tab. 44), and the Josephus (Pal. Soc., pl. 138) and St Ambrose (Pal. Soc., pl. 187) of Milan, of the 6th or 7th century.

incopimanumiNNocene:

clm NON [Lo panics UTIONGNUNEYOMNIT Te 1 Latin Half-Uncial, 509-510 A.D.

(episcopi manum innocente{m]— [lin]Jguam non ad falsiloquium coeg[isti] — nationem anterioris sententi[se]—)

The influence which this style of hand had upon the minuscule book-writing of the 7th and 8th centuries may be traced in greater or less degree in the Continental MSS. of that period. It appears at a comparatively late time with much of its old form in the Berlin MS. of Gregory's Moralia (Arndt, Schrifttaf., 5), attributed to the 8th century. After the Caroline reform an ornamental kind of half-uncial, evidently copied from this hand, was used for particular purposes in minuscule MSS. (Pad. Soc., pl. 239).

Curswve.—For examples of Roman cursive writing we are able to go as far back as the Ist century of the Christian era. During the excavations at Pompeii in July 1875, there was discovered in the house of L. Cacilius Jucundus a box containing as many as one hundred and twenty-seven libelli or waxen tablets consisting of per- scriptiones and other deeds connected

with sales by auction and receipts for payment of taxes (Atti della R. Accademia det Lincet, ser. ii., vol. iii. pt. 3, 1875-76, pp. 150-230). Other waxen tablets, twenty-five in number, some bearing dates ranging from 131 to 167 a.p., were found in the ancient mining works in the neighbourhood of Alburnus Major (the modern Verespatak) in Dacia, at different times between 1786 and 1855. In 1840 Massmann published such as had at that time been discovered (Lzbellus aurarius) ; and the whole collection is given in the Corpus Inscr. Lat. of the Berlin Academy, vol. iii. pt. 2 (1873).

Although the waxen tablets prepared for the reception of legal instruments followed the system of the bronze diptychs on which were inscribed the privileges granted to veteran soldiers under the empire, in so far that they contained the deed witnessed and sealed, and also its duplicate copy open to inspection, yet they differed in being generally triptychs. Wood was a cheaper material than bronze, and the third tablet gave protection to the seals. These triptychs then were libelli of three tablets of wood, cleft from one piece and fastened together, like the leaves of a book, by strings passed through two holes pierced near the edge. In the case of the Pompeian libelli one side of each tablet was sunk within a frame, and the hollowed space was coated with wax, in such a way that, of the six sides or pages, Nos, 2, 3, 5 were waxen, while 1, 4, 6 presented a wooden surface. ‘The first and sixth sides were not used, but served as the outside of the libellus ; on 2 and 3 was inscribed the deed, and on 4 the names of the witnesses were written in ink and their seals were added in a groove cut down the centre, the deed being closed against inspection by means of a string of twisted threads which passed through two holes, one at the head and the other at the foot of the groove, round the two tablets and under the wax of the seals which thus secured it. An abstract or copy of the deed was written on the fifth page. The arrangement of the Dacian libedl

PAU AVEDA PH X

differed in this respect that page 4 was also waxen, and that the copy of the deed was commenced on that page in the space on the left of the groove, that on the right being reserved for the names of the witnesses. In one instance (Corp. Inscr. Lat., iii. 2, p. 938) the seals and fastening threads still remain.

In these tablets some of the writing contains more capital letters, and is not 80 cursive as the rest; but here it is the cursive hand which has to be considered. This writing in both the Pompeian and Dacian tablets is very similar, differing only slightly in some of the letters; and both resemble the more cursive graffiti found on the walls of Pompeii.

Gay . fe ite en) Se ss aa berks tei NY GNI

Roman Cursive (Graffiti), 1st century.

(censio est nam noster magna habet pecuni[am]).

es . . ; Bre t O$G Proautnn Cssytems Aone ‘“< Dos ™ perf ste TYG rage C wre Roman Cursive (Dacian Tablet), 167 a.p. (descriptum et recognitum factum ex libello—

erat Alb[urno] maiori ad statione Resculi in quo scri— id quod i{nfra] s[criptum] est)

It is of particular importance to notice that, when examining the alphabet of this early Roman cursive hand, we find (as we found in the early Greek cursive) the first beginnings of minuscule writing. The slurring of the strokes, whereby the bows of the capital letters were lost and their more exact forms modified, led the way to the gradual development of the small letters, which, as will be afterwards seen, must have formed a distinct alphabet at an early time. With regard to the particular forms of letters employed in the waxen tablets, compare the tables in Corp. Inscr. Lat., vols. iii, iv. The letter A is formed by a main stroke supporting an oblique cross-stroke above it; similarly P and R, having lost their bows, and F throwing away its bar, are formed by two strokes placed in relatively the same positions but varying in their curves. The main stroke of B dwindles to a slight curve, and the two bows are transformed into a long bent stroke so that the letter takes the shape of a stilted a or of a d. The D is chiefly like the uncial»; the E is generally represented by the old form || found in inscriptions and in the Faliscan alphabet. In the modified form of G the first outline of the flat-headed g of later times appears; H, by losing half its second upright limb in the haste of writing, comes near to being the small 2, In the Pompeian tablets M has the four-stroke form |jj, as in the graffiti; in the Dacian tablets it is a rustic capital, sometimes almost an uncial m. The hastily written O is formed by two strokes, almost like a. As to the general character of the writing, it is close and compressed, and has an inclination to the left. There is also much combination or linking together of letters (Corp. Inscr. Lat., iii. tab. A). These peculiarities may, in some measure, be ascribed to the material and to the confined space at the command of the writer. The same character of cursive writing has also been found on a few tiles and potsherds inscribed with

———

PAL MOGRAPH Y

alphabets or short sentences—the exercises of children at school (Corp. Inser. Lat., iti. p. 962).

‘But unfortunately material for the study of this hand fails us for some time after the period of the Dacian tablets, and whole centuries have to be passed before we fnd examples. At length some very interesting fragments of papyri, assigned to the 5th century, disclose the official cursive hand of the Roman chancery of that time, in which are seen the same characters, with certain differences and modifications, as are employed in the waxen tablets. They contain portions of two rescripts addressed to Egyptian officials, and are gaid to have been found at Phile and Elephantine. Both documents are in the same hand; and the fragments are divided between the libraries of Paris and Leyden. For a long time the writing remained undeciphered, and Champollion-Figeac, while publishing a facsimile (Chartes ec MSS. sur papyrus, 1840, pl. 14), had to confess that he was unable to read it. Massmann, however, with the experience gained in his work upon the waxen tablets, succeeded without much difficulty in reading the fragment at Leyden (Libellus aurarius, p. 147), and was followed by M. de Wailly, who published the whole of the fragments (Mém. de U’Institut, xv., 1842, p. 399). Later, Mommsen and Jaffé have dealt with the text of the documents (Jahrbuch des. gem. deut. Rechts, vi., 1863, p. 398), and compared in a table the forms of the letters with those of the Dacian tablets.

Anonholdaabdor- phlrarbaunuia rir

Roman Cursive (Imperial Chancery), 5th century. (portionem ipsi debitam resarcire nec ullum precatorem ex instrumento)

The characters aro large, the line of writing being about three-fourths of an inch deep, and the heads and tails of the long letters are flourished; but the even slope of the strokes imparts to the writing a certain uniform and graceful appearance. As to the actual shapes of the letters, as will be seen from the reduced facsimile here given, there may be recognized in many of them only a more current form of those which have been described above. The A and R may be distinguished by noticing the different angle at which the top strokes are applied ; the B, to suit the requirements of the more current style, is no longer the closed d-shaped letter of the tablets, but is open at the bow and more nearly resembles a reversed b; the tall letters /, 4, /, and long s have developed loops ; O and v-shaped U are very small, and written high in the line. The letters which seem to differ essentially from

those of the tablets are E, M, N. The first of these is probably explained correctly by Jaffé as a development of the earlier || quickly written and looped. The M and N have been compared with the minuscule forms of the Greek mu and nu, as though the latter had been adopted ; but they may with better reason be explained as cursive forms of the Latin capitals M and N.

That this hand should have retained so much of the older formation of the Roman cursive is no doubt to be attributed to the fact of its being an official style of writ- ing which would conform to tradition. To find a more independent development we turn to the documents on papyrus from Ravenna, Naples, and other places in Italy which date from the 5th century and are written in a looser and more straggling hand. Examples of this hand will be found in largest numbers in Marini's work specially

treating of these documents (I Papiri Diplomatici), and also in the publications of Mabillon (De Re Diplomatica) Champollion-Figeac (Chartes et MSS. sur papyrus), Mass- mann (Urkunden in Neapel und Arezzo), Gloria (Paleo- grajia), as well as in Facs. of Ancient Charters in the British Museum, part iv., 1878, Nos. 45, 46, and in the Facsimiles of the Paleographical Society. The development that is found in these papyri of minuscule forms almost complete shows how great a change must have been at work during the three centuries which intervene between the date of the Dacian tablets and that of these documents; and the variety of shape which certain of them assume in combina- tion with other letters proves that the scribes were well practised in the hand.

f / bad oo ater Ww

Roman Cursive (Ravenna), 572 A.D. (huius splendedissimae urbis)

The letter a has now lost all trace of the capital; it is the open u-shaped minuscule, developed from the looped uncial (Qc) ; the 6, throwing off the loop or curve on the left which gave it the appearance of d, has developed one on the right, and appears in the form familiar in modern writing ; minuscule m, , and wu are fully formed (the last never joining a following letter, and thus always dis- tinguishable from a); p, g, and r approach to the

long minuscules, and s, having acquired an incipient tag, has taken the form Y which it keeps long after.

This form of writing was widely used, and was not con- fined to legal documents. It is found in grammatical works, as in the second hand of the palimpsest MS. of Licinianus (Cat. Anc. MSS., pt. ii, pls. 1, 2) of the 6th century, and in such volumes as the Josephus of the Ambrosian Library of the 7th century (Pal. Soc., pl. 59), and in the St Avitus of the 6th century and other MSS. written in France and referred to below under the head of Merovingian writing. It is indeed only natural to suppose that this, the most convenient, because cursive, hand, should have been employed for ordinary books which were in daily use. That so few of such books should have survived is no doubt owing to the destruction of the greater number by the wear and tear to which they were subjected.

NaTIONAL WRITING.

Roman writing—capital, uncial, half-uncial, and cursive —became known to the Western nations, and in different ways played the principal part in the formation of the national styles of writing. In Ireland and England it was adopted under certain restrictions. On the Continent it had a wider range; and from it were constructed the three kinds of writing which in many characteristics closely resembled one another, and which, practised in Italy, Spain, and Frankland, are known by the names of Lombardic, Visigothic, and Merovingian. The basis of all three was the Roman cursive, as is very evident in the national charters which have survived ; and bya certain admixture of uncial and half-uncial forms with the cursive were pro- duced the set book-hands of those countries.

Lombardic.—In Italy the cursive hand of the Ravenna documents, which have been already referred to, continued in use and became more and more intricate and difficult to read. Facsimiles have been reproduced from Milanese documents of the 8th and 9th century (Sickel, Monwmenta

Graphaca, fase. 1), the earlier examples, down to the middle of the 9th century, being in the large straggling character of their prototypes (see also

Cod. Dipl. Cavensis, vol. i.; and Silvestre, i., pl. 137). The illegible scrawl into which this hand finally degenerated in notarial instruments of southern Italy was at length suppressed by order of Frederick II. (1210-50 a.p.). But at La Cava and Monte Cassino was especially cultivated the Lombardic hand, properly so called. There is much resemblance between this hand in its earlier stages and that which appears in certain MSS. written in France at the same period. Both starting from the same basis, it is not surprising that a likeness should be maintained for some time. Hence there is often no small difficulty in deciding whether a particular MS. is to be classed as Lombardic or Merovingian. If all MSS. written in the Merovingian kingdom are to be styled Merovingian, there are different styles which must be included under that title. A form of Frankish writing which is marked by a certain solidity and evenness, and thus more nearly resembles the Lombardic writing of Italy, is often classed with the latter. The Lombardic book-hand as written in Italy is seen in facsimile in Hxempla Codd. Lat. (tabb. 29, 30), Silvestre (pl. 136), Pal. Soc. (pl. 92). As developed in the southern monasteries referred to above, it took, in the 9th century, a very exact and uniform shape, as seen in the Bible of La Cava (Silv., pl. 141). From this date the attention which it received as a calligraphic form of writing, accompanied with accessory ornamentation of initial letters, brought it to a high state of perfection in the 11th century, when by the peculiar treatment of the letters, they assume that strong contrast of light and heavy strokes which when exaggerated, as it finally became, received the name of broken Lombardic.

Seng Yt St quocfeppram Gt Exe nox wer Ref lannnocbrany~

Broken Lombardic Writing, 12th century.

([H]ec nox est de qua scriptum est Et nox ut dies illuminabitur)

This style of hand lasted tothe 13th century. The fullest collection of examples is to be found in facsimile in the Bibliotheca Casinensis (1873, &c.). For other specimens see Silvestre, pls. 142-146, 150; Arndt, Schrifitaf., 7, 32; Pal. Soc., pl. 146.

Papal Documents.—A form of writing practised in Italy, but standing apart, is that found in papal documents. It has been erroneously named littera

Beneventana. Speci- mens exist dating from the latter part of the 8th century. In the earliest examples it appears on a large scale, and has rounded forms and sweeping strokes of a very bold character. Derived from the official Roman hand, it has certain letters peculiar to itself, such as the letter a made almost like a Greek w, ¢ in the form of a loop, and e as a circle with a knot at the top.

This hand- may be followed in examples from 788 a.p. through the 9th century (acs. de Chartes et Diplomes, 1866 ; Gloria, Palzog., tab. 22; Ch. Figeac, Chartes et doc. sur Papyrus, i-xii.; Letronne, Diplom. Merov. Mtat., pl. 48 ; Silvestre, pls. 138, 139). In a bull of Silvester II., dated in 999 (Bibl. de Ec. des Chartes, vol. XXxvii.), we find the hand becoming less round; and at the end of the next century, under Urban IL., in 1097 (Mabillon, De Re Dipl., suppl., p. 115) and 1098 (Sickel, Mon. Graph., v. 4), it is in a curious angular style, which, however, then disappears. During the 11th and 12th centuries the imperial chancery hand was also used for papal documents,

and was in turn displaced by the exact and calligraphic, papal Italian hand of the later Middle Ages. The later invention of the 16th century, the so-called littera Saney, Petri, which seems to have been written to bagfile the uninitiated, need only be referred to.

Lessepreocondll wde ct a

Bull of Pope John VIII. (much reduced), 876 a.p.

(Dei genetricis mariae filib— haec igitur omnia quae huius praecepti)

Visigothic.—The Visigothic writing of Spain ran a course of development not unlike that of the other national hands ; and a series of photographic facsimiles lately pub- lished (Exempla Scripture Visigotice, 1883) enables us to mark the different periods of change. In the cursive hand attributed to the 7th century (Zz., 2, 3), the Roman cursive has undergone little change in form; but another century developed a most distinctive character (Zx., 4,5). In the 8th century appears the set book-hand in an even and not difficult character, marked by breadth of style and a good firm stroke. This style is maintained through the 9th century with little change, except that there is a

growing tendency to calligraphy. In the 10th century the writing deteriorates ; the letters are not so uniform, and, when calligraphically written, are generally thinner in stroke, The same changes which are discernible in all the hand- writings of western Europe in the 11th century are also to be traced in the Visigothic hand,—particularly as regards the rather rigid character which it assumes. It continued in use down to the beginning of the 12th century. Perhaps the most characteristic letter of the book-hand is the qshaped g. The following specimens illustrate the Visigothic as written in a large heavy hand of the 9th century (Cat. Anc. MSS., ii., pl. 37), and in a calligraphic example of 1109 (Pal. Soc., pl. 48).

abiduleddin epiox motum Cardinia _

aropsnim parrecan :

Visigothic Minuscules, 9th century. (tibi dulcedine proxi niorum et dignita te operum perfectorum)

pactum a pifiarum ‘ efionstuptlnts

gueganicab?e anpm¢naw denoenique

Lake ufquequo ffucair epldbcnw Visigothic Minuscules, 1109 a.p.

(patrum et profeéarum et sanctorwm et apostolorum que gemitibus et tormenta desiderii sui habuit usquequo fructum ex plebe sua)

PALMHMOGRAPHY

Merovingian.—The writing of the Frankish empire, to wider range than the other national hands. It had a long career both for diplomatic and literary purposes. In this writing, as it appears in documents, we see that the Roman cursive is subjected to a lateral pressure, so that the letters and tails are exaggerated to inordinate length.

eadtrpmtiy Dae oye.

birt eaporys hig (dedit in respunsis eo quod ipsa— de annus triginta et uno inter ipso— —ondam semper tenuerant et possiderant si—)

Facsimiles of this hand, as used in the royal and works; but a complete course of Merovingian diplomatic writing may be best studied in Letronne's Diplomata, and in the Kaiserurkunden of Profs. Sybel and Sickel now in course of publication. In the earliest documents, com- of the 8th century, the character is large and at first not so intricate as it becomes later in this period. The writing then grows into a more regular form, and in the 9th century a small hand is established, which, however, still direct course of this chancery hand may then be followed in the imperial documents, which from the second half of the 9th century are written in a hand more set and evidently influenced by the Caroline minuscule. This form already referred to, continued in force, subject, however, to the varying changes which affected it in common with other hands, into the 12th century. Its influence was felt as well in France as in Germany and Italy ; and certain the Normans brought with them into England.

The book-hand immediately derived from the early Merovingian diplomatic hand is seen in MSS. of the 7th and 8th centuries in a very neatly written but not very Schrifttaf., 28).

¢ dem gp cfinumfos selec fy rcfiurcmst oc ae Sespeudpseypsenct len gus ceppgnrcaosmtbfuspesfeen

which the title of Merovingian has been applied, had a received a curiously cramped appearance, while the heads Merovingian Cursive, 679-680 A.D. imperial chanceries, are to be found scattered in various mencing in the 7th century and continuing to the middle retains the exaggerated heads and tails of letters. The of writing, still accompanied by the lengthened strokes of its characteristics also appear in the court-hand which easy hand (Cat. Anc. MSS., ii, pls. 29, 30; Arndt, Merovingian Writing, 7th century.

(—dam intra sinum sancéfae eclesiae quasi uicinos ad— positos increpant. Saepe uero arrogantes— —dem quam tenent arrogantiam se fugire osten—)

But other varieties of the literary hand as written in France are seen to be more closely allied to the Roman cursive. The earliest example is found in the papyrus fragments of writings of St Avitus and St Augustine, of the 6th century (Etudes paléogr. sur des Papyrus du VI" Siecle, Geneva, 1866); and other later MSS. by their

diversity of writing show a development independent of the cursive hand of the Merovingian charters. It is among these MSS. that those examples already referred to occur which more nearly resemble the Lombardic type.

uniticatin fu tc frucfirteaecnte das hy fabyarendte ant bab 7

ltuem félunem fund tin elsumUnteum iF

Franco-Lombardic Writing, 8th century. (propter unitatem salua propriaetate na— non sub una substantia conuenientes, neque— —itam sed unum eundem filium. Unicum deum)

The uncial and half-uncial hands had also their influence in the evolution of these Merovingian book-hands; and the mixture of so many different forms accounts for the variety to be found in the examples of the 7th and 8th centuries. In the Notice sur un MS. Mérovingien Eugyppus (1875) and the Notice sur un MS. Méro- vingien de la Bibl. Epinal (1878), Delisle has given many valuable facsimiles in illustration of the different hands in these two MSS. of the early part of the 8th century. See also Hxempla Codd. Lat. (tab. 57), and autotypes in Cat. Anc. MSS. ii. There was, however, through all this period a general progress towards a settled minuscule writing which only required a master-hand to fix it in a calligraphic form.

Irish Writing.—The early history of the paleography of the British Isles stands apart from that of the Con- tinental schools. It is evident that the civilization and learning which accompanied the establishment of an ancient church in Ireland could not exist without a written litera- ture. The Roman missionaries would certainly in the first place have imported copies of the Gospels and other books, and it cannot be doubted that through intercourse with England the Irish would obtain Continental MSS. in sufficient numbers to serve as models for their scribes. From geographical and political conditions, however, no continuous intimacy with foretgn countries was possible ; and we are consequently prepared to find a form of writing borrowed in the first instance from a foreign school, but developed under an independent national system.

In Ireland we have an instance how conservative writing may become, and how it will hand on old forms of letters from one generation to another when there is no exterior influence to act upon it. After once obtaining its models, the Irish school of writing was left to work out its own ideas, and continued to follow one direct line for centuries. The English conquest had no effect upon the national hand- writing. Both peoples pursued their own course. In MSS. in the Irish language the Irish character of writing was naturally employed ; and the liturgical books produced in Irish monasteries by Irish monks were written in the same way. The grants and other deeds of the English settlers were, on the other hand, drawn up by English scribes in their national writing. The Irish handwriting, then, went on in its even uninterrupted course ; and its consequent unchanging form makes it so difficult a matter to assign dates to Irish MSS. A stereotyped form of letters is transmitted for so long that there is more risk of giving an early date to a late Irish MS., when written with care, than to one written, under similar conditions, in the English or Continental schools. And nowhere is it more necessary to look for the changes, slight though they be, which may indicate an advance.

The early Irish handwriting is of two classes—the round and the pointed. The round hand is found in the earliest examples; the pointed hand, which also was

developed at an early period, became the general hand of the country, and survives in the native writing of the present day. Of the earliest surviving MSS. written in Ireland none are found to be in pure uncial letters. That uncial MSS. were introduced into the country by the

early missionaries can hardly be doubted, if we consider that that character was so commonly employed as a book- hand, and especially for sacred texts. Nor isit impossible that Irish scribes may have practised this hand. The copy of the Gospels in uncials, found in the tomb of St Kilian, and preserved at Wiirzburg, has been quoted as an instance of Irish uncial. The writing, however, is the ordinary uncial, and bears no marks of Irish nationality (Zxempla, tab. 58). The most ancient examples are in half-uncial letters, so similar in character to the half-uncial MSS. of Italy and

France, noticed above, that there can be no hesitation in deriving the Irish from the Roman writing. We have only to compare the Irish MSS. of the round type with the Continental MSS. to be convinced of the identity of their styles of writing. There are unfortu- nately no means of ascertaining the exact period when this style of hand was first adopted in Ireland. Among the very earliest surviving examples none bears a fixed date ; and it is impossible to accept the traditional ascription of certain of them to particular saints of Ireland, as St Patrick and St Columba. Such traditions are notoriously unstable ground upon which to take up a position. But an examination of certain examples will enable the palao- grapher to arrive at certain conclusions. In Trinity College, Dublin, is preserved a fragmentary copy of the Gospels (Wat. MSS. Ireland, i., pl. ii.) vaguely assigned to a period from the 5th to the 7th century, and written in a round half-uncial hand closely resembling the Continental hand, but bearing the general impress of its Trish origin. This MS. may perhaps be of the early part of the 7th century.

adiledteimiaurrerponda&r hinnlnmola@aurerre lawor Cre e&piterwcubiculom

Irish Half-uncial Writing, 7th century.

(ad ille deintus respondens [dicit, No]li mihi molestus esse, iam osti[um clausum] est et pueri in cubiculo mecum [sunt])

Again, the Psalter (Wat. MSS. Ireland, i., pls. iii., iv.) traditionally ascribed to St Columba (ob. 597), and perhaps of the 7th century, is a calligraphic specimen of the same kind of writing, The earliest examples of the Continental half-uncial date back, as has been seen above, to the end of the 5th or beginning of the 6th century. Now the likeness between the earliest foreign and Irish MSS. forbids us to assume anything like collateral descent from a common and remote stock. Two different national hands, although derived from the same source, would not independently develop in the same way, and it may accordingly be granted that the point of contact, or the period at which the Irish scribes copied and adopted the Roman half-uncial, was not very long, comparatively, before the date of the now earliest surviving examples. This would take us back at least to the 6th century, in which period there is sufficient evidence of literary activity in Ireland. The

beautiful Irish calligraphy, ornamented with designs of marvellous intricacy and_ brilliant colouring, which is seen in full vigour at the end of the 7th century, indicates no small amount of labour bestowed upon the cultivation of writing as an ornamental art. It is indeed surprising that such excellence was so quickly developed. The Book of Kells has been justly acknowledged as the culminating example of Irish calligraphy (Nat. MSS. Irel.,

i., pls. vii.—xvii.; Pal. Soc., pls. 55, 56). The text is written in the large solid half-uncial hand which is again seen jy the Gospels of St Chad at Lichfield (Pal. Soc., pls. 20, 21, 35), and, in a smaller form, in the English-written Lindisfarne Gospels (see below). Having arrived at the calligraphic excellence just referred to, the round hand appears to have been soon afterwards superseded, for gene- ral use, by the pointed ; for the character of the large half- uncial writing of the Gospels of MacRegol, of about the year 800 (Wat. MSS. Irel., i., pls. xxii.-xxiv. ; Pal. Soc., pls. 90, 91), shows a very great deterioration from the vigorous writing of the Book of Kells, indicative of want of practice.

Traces of the existence of the pointed hand are early, It is found in a fully developed stage in the Book of Kells itself (Pal. Soc., pl. 88). This form of writing, which may be termed the cursive hand of Ireland, differs in its origin from the national cursive hands of the Continent, In the latter the old Roman cursive has been shown to be the foundation. The Irish pointed hand, on the contrary, had nothing to do with the Roman cursive, but was simply a modification of the round hand, using the same forms of letters, but subjecting them to a lateral compression and drawing their limbs into points or hair-lines. As this process is found developed in the Book of Kells, its beginning may be fairly assigned to as early a time as the first half of the 7th century ; but for positive date there is the same uncertainty as in regard to the first beginning of the round hand. The Book of Dimma (Wat. MSS. Irel., i., pls. xviii, xix.) has been attributed toa scribe of about 650 a.p. ; but it appears rather to be of the 8th century, if we may judge by the analogy of English MSS. written ina similar hand. It is not in fact until we reach the period of the Book of Armagh (Nat. MSS. Irel., pls. XxvV.-xxix.), a MS. containing books of the New Testament and other matter, and written by Ferdomnach, a scribe who died in the year 844, that we are on safe ground. Here is clearly a pointed hand of the early part of the 9th century,

very similar to the English pointed hand of Mercian charters of the same time. The MS. of the Gospels of MacDurnan, in the Lambeth Library (Wat. MSS. Irel., i., pls. xxx., Xxxi.) is an example of writing of the end of the 9th or beginning of the 10th century, showing a tendency to become more narrow and cramped. But coming down to the MS. of the 11th or 12th centuries we find a change. The pointed hand by this time has become moulded into the angular and stereotyped form peculiar to Irish MSS. of the later Middle Ages. From the 12th to the 15th centuries there is a very gradual change. Indeed, a carefully written MS. of late date may very well pass for an example older by a century or more. Later forms must be detected among the fairly written characters. A book of hymns of the 11th or 12th century (Wat. MSS. Trel., i., pls. xxxii.—xxxvi.) may be referred to as a good typical specimen of the Irish hand of that period ; and the Gospels of Melbrighte, of 1138 a.v. (Wat. MSS. Ire, 1, pls. xl.-xlii.; Pal. Soc., pl. 212), as a calligraphic one.

In Irish MSS. of the later period, the ink is black, and the vellum, as a general rule, is coarse and discoloured, a defect which may be attributed to inexperience in the art of preparing the skins and to the effects of climate.

When a school of writing attained to the perfection which marked that of Ireland at an early date, so far in advance of other countries, it naturally followed that its influence should be felt beyond its own borders. How the influence of the Irish school asserted itself in England will be presently discussed. But on the Continent also Irish monks carried their civilizing power into different countries, and continued their native style of writing in the monas- teries which they founded. At such centres as Luxeuil in

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PaebtmogckaPraA Y

France, Wiirzburg in Germany, St Gall in Switzerland, and Bobbio in Italy, they were as busy in the production of MSS. as they had been at home. At first such MSS. were no doubt as distinctly Irish in their character as if written in Ireland itself; but, after a time, as the bonds of connexion with

that country were weakened, the form of writing would become rather traditional, and lose the elasticity of a native hand. As the national styles also which were practised around them became more perfected, the writing of the Irish houses would in turn be reacted on; and it is thus that the later MSS. produced in those houses can be distinguished. Archaic forms are tradition- ally retained, but the spirit of the hand dies and the writing becomes merely imitative.

English Writing.—In England there were two sources whence a national hand could be derived. From St Columba's foundation in Iona the Irish monks established monasteries in the northern parts of Britain; and in the year 635 the Irish missionary Aidan founded the see of Lindisfarne or Holy Isle, where there was established a school of writing destined to become famous. In the south of England the Roman missionaries had also brought into the country their own style of writing direct from Rome, and taught it in the newly founded monasteries. But their writing never became a national hand. Such a MS. as the Canterbury Psalter in the Cottonian Library (Pal. Soc., pl. 18) shows what could be done by English scribes in imitation of Roman uncials; and the existence of so few early charters in the same letters (acs. of Anc. Charters, pt. i, Nos. 1, 2, 7), among the large number which have survived, goes to prove how limited was the influence of that form of writing. On the other hand, the Irish style made progress throughout England, and was adopted as the national hand, developing in course of time certain local peculiarities, and lasting as a distinct form of writing down to the time of the Norman Conquest. But, while English scribes at first copied their Irish models with faithful exactness, they soon learned to give to their writing the stamp of a national character, and imparted to it the elegance and strength which individualized the English hand for many centuries to come. :

As in Ireland so here we have to follow the‘ course of the round hand as distinct from the pointed character. The earliest and most beautiful MS. of the former class is the Lindisfarne Gospels or "Durham Book" in the Cottonian Library (Pal. Soc., pls. 3-6, 22; Cat. Ane. MSS., pt. ii., pls. 8-11), said to have been written by Eadfrith, bishop of Lindisfarne, about the year 700. The text is in very exactly formed half-uncials, differing but slightly

from the same characters in Irish MSS., and is glossed in the Northumbrian dialect by Aldred, a writer of the 10th century.

me heopns

_RCorumM Rom “Y) a a5¢ bon amlse = Fon (@) Coa. mrces Quontogwn ee Ja agn esas

IPs Postoebunc—

Lindisfarne Gospels, civc. 700 A.D.

{regnum caelorum. Beati mites quoniam ipsi posidebunt.

ric heofna eadge bidon da milde fordon da agnegad.)

MSS. in the same solid half-uncial hand are still to be seen in the Chapter Library of Durham, this style of writing having been practised more especially in the north of England. But in addition to this calligraphic book-writing, there was also a lighter form of the round letters

which was used for less sumptuous MSS. or for more ordinary occasions. Specimens of this hand are found in the Durham Cassiodorus (Pal. Soc., pl. 164), in the Canter- bury Gospels (Pal. Soc., pl. 7; Cat. Anc. MSS., pt. iL, pls. 17, 18), the Epinal Glossary (Z. Hng. Text, Soc.), and in a few charters (Pacs. Anc. Charters, pt. 1,153 ii, 2, 33 Pal. Soc., 10), one of which, of 778 a.D., written in Wessex, is interesting as showing the extension of the round hand to the southern parts of England. The examples here enumerated are of the 8th and 9th centuries,—the earlier ones being written in a free natural hand, and those of later date bearing evidence of decadence. Indeed the round hand was being rapidly displaced by the more con- venient pointed hand, which was in full use in England in the middle of the 8th century. How late, however, the more calligraphic round hand could be continued under favouring circumstances is seen in the Liber Vitze or list of benefactors of Durham (Cat. Anc. MSS., pt. il, pl. 25 ; Pal. Soc., pl. 238),

the writing of which would, from its beautiful execution, be taken for that of the 8th century, did not internal evidence prove it to be of about the year

840.

The pointed hand ran its course through the 8th, 9th, and 10th centuries, until English writing came under the influence of the foreign minuscule. The leading character- istics of this hand in the 8th century are regularity and breadth in the formation of the letters and a calligraphic contrast of heavy and light strokes—the hand being then at its best. In the 9th century there is greater lateral compression, although regularity and correct formation are maintained. But in the 10th century there are signs of decadence. New forms are introduced, and there is a disposition to be imitative. A test letter of this latter century is found in the letter a with obliquely cut top,a.

The course of the progressive changes in the pointed hand may be followed in the Yacsimiles of Ancient Charters in the British Museum and in the Facsimiles of Anglo- Saxon MSS. of the Rolls Series. The charters reproduced in these works have survived in sufficient numbers to enable us not only to form a fairly accurate knowledge of the criteria of their age, but also to recognize local peculiarities of writing. The Mercian scribes appear to have been very excellent penmen, writing a very graceful hand with much delicate play in the strokes. On the other hand the writing of Wessex was heavier and more straggling, and is in such strong contrast to the Mercian hand that its examples may be easily detected with a little practice. Turning to books in which the pointed hand was employed, a very beautiful specimen, of the 8th century, is a copy of Bede’s Ecclesiastical History in the University Library at Cambridge (Pal. Soc. pls. 139, 140), which has in a marked degree that breadth of style which has been referred to. Not much later is another copy of the same work in the Cottonian Library (Pal. Soc., pl. 141; Cat. Anc. MSS., pt. ii, pl. 19), from which the following facsimile is taken.

Tuy sit tfimponoe, Oo Beihai orditunald.urmabey, anny Inmonaytguo gi diMinhny

English Pointed Minuscules, 8th century.

(tus sui tempora gerebat. Uir uenerabilis oidiluuald, qui multis annis in monasterio quod dicitur Inhry——)

For an example of the beginning of the 9th century, a

MS. of miscellanea, of 811-814 a.p., also in the Cottonian Library, may be referred to (Pal. Soc., pl. 165; Cat. Ane.

MSS., pt. i, pl. 24); and a very interesting MS. written in the Wessex style is the Digby MS. 63 of the middle of the century (Pal. Soc., pl. 168). As seen in the charters, the pointed writing of the 10th century assumes generally a larger size, and is rather more artificial and calligraphic. A very beautiful example of the book-hand of this period is found in the volume known as the Durham Ritual (Pal. Soc., pl. 240), which, owing to the care bestowed on the writing and the archaism of the style, might at first sight pass for a MS. of higher antiquity, were not the character- istics of its period evident in the angularity of certain letters,

In the latter part of the 10th century the foreign set minuscule hand began to make its way into England, consequent on increased intercourse with the Continent and political changes which followed. In the charters we find the foreign and native hands on the same page:—the body of the document, in Latin, in Caroline minuscules ; the boundaries of the land conveyed, in the English hand. The same practice was followed in books. The charter (in book form) of King Eadgar to New Minster, Winchester, 966 A.D. (Pal. Soc. pls. 46, 47), the Benedictional of Bishop Aithelwold of Winchester (pls. 142, 144) before 984 a.D., and the MS. of the Office of the Cross, 1012-20 A.D. (pl. 60), also written in Winchester, are all examples of the use of the foreign minuscule for Latin. The change also which the national hand underwent at this period may certainly be attributed to this foreign influence. The pointed hand, strictly so-called, is replaced by a rounder or rather square character, with lengthened strokes above and below the line.

manan hepeeyhyy mersa.preapi preonoa ge pyle onpolc peeve berlagen ecrprge Tiny pam fo ~~onpall frope punoum fonsjuirioen~~

English Minuscules, 11th century.

(manan he wes his mega. sceard freonda ge fylled on folestede beslegen et secge. and his sunu forlet. on welstowe wundum forgrunden.)

This style of writing becomes the ordinary English hand down to the time of the Norman Conquest. That event extinguished the national hand for official purposes—it

disappears from charters ; and the already established use.

of the Caroline minuscule in Latin MSS. completed its exclusion as the handwriting of the learned. It cannot, however, be doubted that it still lingered in those parts of the country where foreign influence did not at once pene- trate, and that Englishmen still continued to write their own language in their own style of writing. But that the earlier distinctive national hand was soon overpowered by foreign teaching is evident in English MSS. of the 12th century, the writing of which is of the foreign type, although the English letter thorn, p, survived and continued in use down to the 15th century, when it was transformed to ¥.

The Caroline Reform.—The revival of learning under Charlemagne naturally led to a reform in handwriting. An ordinance of the year 789 required the revision of church books ; and a more correct orthography and style of writing was the consequence. ‘The abbey of St Martin of Tours was the principal centre from whence the reforma- tion of the book-hand spread. Here, from the year 796 to 804, Alcuin of York presided as abbot ; and it was under his direction that the Caroline minuscule writing took the simple and graceful form which was gradually adopted to the exclusion of all other hands. In carrying out this reformation we may well assume that Alcuin brought to

PA et OG h APH Y

bear the results of the training which he had received in his youth in the English school of writing, which had attained to such proficiency, and that he was also benefie- ally influenced by the fine examples of the Lombard schoo] which he had seen in Italy. In the new Caroline minus. cule all the

uncouthness of the later Merovingian hand disappears, and the simpler forms of many of the letters found in the old Roman minuscule hand are adopted, The character of Caroline writing through the 9th and early part of the 10th century is one of general uniformity, with a contrast of light and heavy strokes, the limbs of tall letters being clubbed or thickened at the head by pressure on the pen. As to characteristic letters—the dl, following the old type, is, in the 9th century, still fre. quently open, in the form of w; the bows of g are open, the letter somewhat resembling the numeral 3; and there is no turning of the ends of letters, as m and n,

Actipere’miarium contugem Tuan, quod enim execcnaftecumderpares ee. —_

durcem fitum ecuocabiMnomenemulihm

Caroline Minuscules, 9th century. (accipere mariam coniugem tuam quod enim ex ea nascetur de spiritu sancto est. autem filium et uocabis nomen eius Ieswm) In the 10th century the clubbing of the tall letters becomes less pronounced, and the writing generally assumes, so to say, a thinner appearance, But a great change is notice- able in the writing of the 11th century. By this time the Caroline minuscule may be said to have put off its archaic form and to develop into the more modern character of small letter. It takes a more finished and accurate and more upright form, the individual letters being drawn with much exactness, and generally on a rather larger scale than before. This style continues to improve, and is reduced to a still more exact form of calligraphy in the 12th century, which for absolute beauty of writing is unsur- passed. In England especially, the writing of this century is particularly fine.

Pariet

anlof dtarumulif fintaddeure firper’

dare at ydle carnibul & fimo crema or€ catia ft pega ditt

English Minuscules, 12th century.

(—culos cum arninulis suis adoleuit super altare uitulum cum pelle et carnibus et fimo cremans extra castra sicut preceperat dominus)

As, however, the demand for written works increased, the fine round hand of the 12th century could not be maintained. Economy of material became necessary, and a smaller hand with more frequent contractions was the result. The larger and more distinct writing of the 11th and 12th centuries is now replaced by a more cramped though still distinct hand, in which the letters are more linked together by connecting strokes, and are more laterally compressed. This style of writing is characteristic of the 13th century. But, while the book-hand of this period is a great advance upon that of a hundred years earlier, there is no tendency to a cursive style. Every letter 1s clearly formed, and generally on the old shapes. The particular letters which show weakness are those made of a succession of vertical strokes, as m, n, u. The new method of connecting these strokes, by turning the ends and running on, made the distinction of such letters

. coi difficult, as, for example, in the word minim. The

| ambiguity thus arising was partly obviated by the use of g small oblique stroke over the letter 2, which, to mark ‘ the double letter, had been introduced as early as the 11th ‘ century. ‘The dot on the letter came into fashion in the

14th century.

Cugreeelyadte cy wlacee cue Ceereiee preitiimnit peleans, iret ofif qual fereered pres wire

{a.anditfamonreoy in quogtta prans.Cgoatieoysiineatinent ota Bethe “oinp pis zare-Tv fea nob ur reling

Minuscule Writing, 13th century.

(Eligite hodie quod placet cui seruire potissimum

debeatis. Utrum diis quibus seruierwnt patres ueséri in

mesopotamia, an diis amoreorwm in quorwm terra

habitatis. Ego autem et domus mea seruiemus domino, Respon-

ditque populus ef ait, Absit a nobis ut relinqwanius dominum) In MSS. of the 14th century minuscule writing becomes slacker, and the consistency of formation of letters falters. There is a tendency to write more cursively and without raising the pen, as may be seen in the form of the letter a, of which the characteristic shape at this time is &, with both bows closed, in contrast with the earlier a. In this century, however, the hand still remains fairly stiif and upright. In the 15th century it becomes very angular and more and more cursive, but is at first kept within bounds. In the course of the century, however, it grows more slack and deformed, and the letters become continu- ally more cursive and misshapen. An exception, however, to this disintegration of minuscule writing in the later centuries is to be observed in church books. In these' the old set hand of the 12th and 13th centuries was imitated and continued to be the liturgical style of writing.

It is impossible to describe within limited space, and without the aid of illustrations, all the varieties of hand- writing which were developed in the different countries of western Europe, where the Caroline minuscule was finally adopted to the exclusion of the earlier national hands. In each country, however, it acquired, in a greater or less de- gree, an individual national stamp which can generally be recognized and which serves to distinguish MSS. written in different localities. A broad line of distinction may be drawn between the writing of northern and southern Europe from the 12th to the 15th century. In the earlier part of this period the MSS. of England, northern France, and the Netherlands are closely connected. Indeed, in the 12th and 13th centuries it is not always easy to decide as to which of the three countries a particular MS. may belong. As a rule, perhaps, English MSS. are written with more sense of gracefulness ; those of the Netherlands in darker ink. From the latter part of the 13th century, however, national character begins to assert itself more distinctly. In southern Europe the influence of the Italian school of writing is manifest in the MSS. of the south of France in the 13th and 14th centuries, and also, though later, in those of Spain. That elegant roundness of letter which the

Italian scribes seem to have inherited from the bold characters of the early papal chancery, and more recently from Lombardic models, was generally adopted in the book-hand of those districts. It is especially notice- able in calligraphic specimens, as in church books,—the writing of Spanish MSS. in this style being distinguishable by the blackness of the ink. The medieval minuscule writing of Germany stands apart. It never attained to the beauty of the hands of either the north or the south Which have been just noticed; and from its ruggedness and slow development German MSS. have the appearance of being older than they really are. The writing has also very commonly a certain slope in the letters which coni-

pares unfavourably with the upright and elegant hands of other countries. In western Europe generally the minus- cule hand thus nationalized ran its course down to the time of the invention of printing, when the so-called black letter, or set hand of the 15th century in Germany and other countries, furnished models for the types. But in Italy, with the revival of learning, a more refined taste set in in the production of MSS., and scribes went back to an earlier time in search of a better standard of writing. Hence, in the first quarter of the 15th century, MSS. written on the lines of the Italian hand of the early 12th century begin to appear, and become continually more numerous. This revived hand was brought to perfection soon after the middle of the century, just at the right moment to be adopted by the early Italian printers, and to be perpetuated by them in their types.

It must also not be forgotten that by the side of the book-hand of tlie later Middle Ages there was the cursive hand of every day use. This is represented in abundance in the large mass of charters and legal or domestic docu- ments which remains. Some notice has already been taken of the development of the national cursive hands in the earliest times. From the 12th century downwards these hands settled into well-defined and distinct styles peculiar to diffcrent countries, and passed through syste- matic changes which can be recognized as characteristic of particular periods. But, while the cursive hand thus followed out its own course, it was still subject to the same laws of change which governed the book-hand ; and the letters of the two styles did not differ at any period in their organic

formation. Confining our attention to the charter hand, or court hand, practised in England, a few specimens may be taken to show the principal changes which it developed. In the 12th century the official hand which had been introduced after the Norman Conquest is characterized by exaggeration in the strokes above and below the line, a legacy of the old Roman cursive, as already noted. Thcre is also a tendency to form the tops of tall vertical strokes, as in 8, , /, with a notch or cleft. The letters are well made and vigorous, though often rugged.

Charter of Stephen, 1136-39 A.D. (et ministris et omnibus fidelibus suis Francis et Regine uxoris mee et Eustachii filii

mei dedi et concessi ecclesie Beate Marie) As the century advances, the long limbs are brought into better proportion ; and early in the 13th century a very delicate fine-stroked hand comes into use, the cleaving of the tops being now a regular system, and the branches formed by the cleft falling in a curve on either side. This style remains the writing of the reigns of John and Henry

TI. athe pores Vredd omfetog cab: Boles g8- Pod 2. CRE? Conftalulbyrir knah ce (ifn D Pooob, ED SaydBvin Sn renner pain’ an planer ya Be pacer Charter of Henry IJI., 1259 a.p.

(uniuersis presentes litteras inspecturis salwtem. Noueritis quod— -_ford et Essexie et Constabularium Anglie et Willelmum de Fortibus —ad iurandum in animam nostram in presencia nostra de pace)

Towards the latter part of the 13th century the letters grow rounder ; there is generally more contrast of light and heavy strokes; and the cleft tops begin, as 1t were, to shed the branch on the left.

gpo2e crm crn 17 09028 ret Tove onremence 6etlongraudine ie meSum onore illine af én0 cApee Las @ Conmenns & qranSo Tmueyite er quim ‘ao

Charter of Edward I., 1303 a.D.

(More cum pertinenézis in mora que vocatur Inkelesmore continentem —se in longitudine per medium more illius ab uno capite— Abbas e¢ Conuentus aliquando tennerunt et quam prefatus Co—)

In the 14th century the changes thus introduced make further progress, and the round letters and single-branched vertical strokes become normal through the first half of the century. Then, however, the regular formation begins to give way and angularity sets in. Thus in the reign of Richard IT. we have a hand presenting a mixture of round and angular elements—the letters retain their breadth but lose their curves. Hence, by further decadence, results the angular hand of the 15th century, at first compact, but afterwards straggling and ill-formed.

1,9 3 O 029 dyinge 9 10 so& yin ia Gus – asp Rte 16

English Charter, 1457 a.p.

(and fully to be endid, payinge yerely the seid— successours in hand halfe yere afore that is— next suyinge xxiij. s.iiij. d. by evene porciouns.)

Palimpsests. —A class of MSS. must be briefly noticed which, on account of the valuable texts which many of them have yielded, have a particular interest. These are the palimnpsests. The custom of removing writing from the surface of the material on which it was inscribed, and thus preparing that surface for the reception of another text, has heen practised from early times. The term palim- psest is used by Catullus, apparently with reference to papyrus; by Cicero, in a passage wherein he. is evidently speaking of waxen tablets ; and by Plutarch, when he narrates that Plato compared Dionysius to a BiBAloy martbnoroy, in that his tyrant nature, being dvoéxmAvtos, showed itself like the imperfectly erased writing of a palimpsest MS. In this passage, reference is clearly made to the washing off of writing from papyrus. The word marlupnoros can only in its first use have been applied to MSS. which were actually scraped or rubbed, and which were, therefore, composed ofa material of sufficient strength to bear the process. In the first instance, then, it might be applied to waxen tablets ; secondly, to vellun books. There are still to be seen, among the surviving

waxen tablets, some which contain traces of an earlier writing under a fresh layer of wax. Papyrus could not be scraped or rubbed; the writing was washed from it with the sponge. This, however, could not be so thoroughly done as to leave a perfectly clean sur- face, and the material was accordingly only used a second time for documents of an ephemeral or common nature. To apply, therefore, the title of palimpsest to a MS. of this substance was not strictly correct ; the fact that it was so applied proves that the term was in common use.

In the early period of palimpsests, vellum MSS. were also washed, The ink of the earlier centuries was easily removed with the sponge, and at the moment when this was done it may be sup- posed that the pages presented a clean surface. In course of time, however, by atmospheric action or other chemical causes, the ori- ginal writing would to some extent reappear ; and it is thus that so many of the capital and uncial palimpsests have been successfully deciphered. In the later Middle Ages the knife was used; the surface of the vellum was scraped away and the writing with it. The reading of the later examples is therefore very difficult or alto- gether impossible. Besides actual rasure, various recipes for effac- ing the writing have been found,—such as, to soften the surface with milk and meal, and then to rub with pumice. In the case of such a process being used, total obliteration must almost inevitably have been the result. To intensify the traces of the original writ- ing, when such exist, various chemical reagents have been tried with

more or less success. The old method of smearing the vellum with tincture of gall restored the writing, but did irreparable damage by blackening the surface, and, as the stain grew darker in course f time, by rendering the text altogether illegible. Of modern reagents the most harmless appears to be hydrosulphurate of ammonta; but this also must be used with caution, and should be washed off when it has done its work.

The primary cause of the destruction of MSS. by wilful obliter- ation was, it need hardly be said, the dearth of material. Atcertain periods, from political or social changes, the market was interfered with, and production or importation failed. In the case of Greek MSS., so great was the

consumption of old books, for the sake of the material, that a synodal decree of the year 691 forbade the destruction of MSS. of the Scriptures or the church fathers—imper- fect or injured volumes excepted. The decline of the vellum trade also on the introduction of paper, as already noticed above, caused a scarcity which was only to be made good by recourse to material already once used. Vast destruction of the broad quartos of the early centuries of our era took place in the period which followed the fall of the Roman empire. The most valuable Latin palim- psests are accordingly found in the volumes which were remade from the 7th to the 9th centuries, a period during which the large volumes referred to must have been still fairly numerous. Late Latin palimpsests rarely yield anything of value: often the first writing precedes the later one by only a century or two; and some- times both hands are of the same age. In the earlier examples, many of the original texts were sacrificed to make room for patristic literature or grammatical works. In many instances MSS, of the classical writers have been thus destroyed ; and the sacred text itself has not always been spared. On the other hand, there are instances of classical texts being written over Biblical MSS.; but these are of late date. It has been remarked that no entire work has been found in any instance in the original text of a palimpsest, but that portions of many works have been taken to make upa single volume. These facts, however, go rather to prove, not so much that only imperfect works were put under con- tribution, as that scribes were indiscriminate in selection of material.

An enumcration of the different palimpsests of value is not here possible (see Wattenbach, Schriftwesen, pp. 252-257); but a few may be mentioned of which facsimiles are accessible. The MS, known as the Codex Ephraemi, containing portions of the Old and New Testaments in Greek, attributed to the 5th century, is covered with works of Ephraem Syrus in a hand of the 12th century (ed, Tischendorf, 1848, 1845). Among the Syriac MSS. obtained from the Nitrian desert in Egypt, aa now deposited in the. British Museum, some important Greek texts have been recovered, A volume containing a work of Severus of Antioch of the beginning of the 9th century is written on palimpsest leaves taken from MSS. of the liad of Homer and the Gospel of St Luke, both of the 6th century (Cat, Anc. MSS.,i., pls. 9,10), and the Hlements of Enclid of the 7th or 8th century. To the same collection belongs the double palimpsest, in which a text of St John

Chrysostom, in Syriac, of the 9th or 10th century, covers a Latin grammatical treatise in a cursive hand of the 6th century, which in its turn has displaced the Latin annals of the historian Granius Licinianus, of the 5th century (Cat. Anc. MSS., ii, pls. 1, 2). Among Latin palimpsests also may be noticed those which have been reproduced in the Lxempla of Zangemeister and Wattenbach, These are—the Ambrosian Plautus, in rustic capitals, of the 4th or 5th century, re-written with portions of the Bible in the 9th century (pl. 6); the Cicero De Republica of the Vatican, in uncials, of the 4th cen- tury, covered by St Augustine on the Psalms, of the 7th century (pl. 17; Pal. Soc., pl. 160); the Codex Theodosianus of Turin, of the 5th or 6th century (pl. 25); the Fasti Consulares of Verona,

_of 486 A.D. (pl. 29) ; and the Arian fragment of the Vatican, of the

Sth century (pl. 31). Most of these originally belonged to the monastery of Bobbio, a fact which gives some indication of the great literary wealth of that house. The new photographie processes are particularly well adapted for the reproduction of palimpsests, for the reason that, however faint the subject, it is nearly always intensified in the negative. By using skill and judgment, with a favouring light, photography may be often made a useful agent in the decipherment of obscure palimpsest texts.

Mechanical Arrangement of Writing in MSS.—In the papyrus rolls the text was written in columns, generally narrow, whose length was limited by the width of the material, allowing a margin at top and bottom. In books, if the text did not extend across the page, it was usually written in two columns. A few instances, however, are known of MSS. which have more than two columns of writing ina page. Among them, the Codex Sinaiticus of the Bible has four columns, and the Codex Vaticanus three columms. In the Fulda fragment of an ancient Latin Bible (Exempla, 21) the arrangement is one of three columns; and a late instance of the same number occurs iu a Latin Bible of the end of the 9th century in the British Museum (Cat. Anc. MSS., ii., pl. 45). Besides the practice of continuous writing without distinction of words, which

reabaoG kh “& PH ¥

rj -eferred to more fully below, the letters towards the end of

. a in the Eliade MSS., reduced in size and cramped together, and very frequently in Latin MSS. two or more letters were linked or combined ina monogrammatic form, as ® WT (ur, unt). By these devices space was saved and words were less divided petween two lines. Combinations survived partially in minuscule MSs. The opening lines of the main divisions of the text, as for example the different books of the Bible, were frequently written in red, for distinction. At first there was no enlargement whatever of letters in any part of the text, but still at an early period the frst letter of each page was made larger than the rest. Rubrics and titles and colophons were at first written in the same character as the text; afterwards, when the admixture of different kinds of writing was allowed, capitals and uncials were used at discretion. In papyri it appears to have been the practice to write the name of the work at the end only. Running titles or head-lines are found in some of the earliest Latin MSS. in the same characters as the text, but of a small size. Quotations were usually indicated by ticks or arrow-heads in the margin, serving the purpose of the modern inverted commas. Sometimes the quoted words were arranged as a sub-paragraph or indented passage. In commentaries of later date, the quotations from the work commented upon were often written in a different style from the text of the commentary itself, , In MSS., both Greek and Latin, of the earlier centuries the writing runs on continuously without breaking up into distinct words. ‘To this system there are, however, a few partial exceptions, in some of the very earliest examples. For instance, the Evddtou rexvh, Written on papyrus in the 2d century B.c., hasa certain amount of separation of words, and in the fragments of the poem on the battle of Actium which were recovered at Herculaneum the words are marked off with points, monosyllabic or short pre- positions and conjunctions, however, being joined to the words which immediately follow them—a system which we find in practice at alater time. In the early vellum MSS. there is no such separa- tion; and unless there is a pause in the sense, at which a small space may be left, the line of letters has no break whatever. In Greek MSS., indeed, a system of distinct separation of words was never thoroughly worked out, even as late as the 15th century. The continuous writing of the uncial MSS. was carried on in the minuscules ; and, although, in the latter, a certain degree of separa- tion is noticeable as early as the 10th century, yct a large propor- tion of words remain linked together or wrongly divided.

In the case of Latin uncial MSS., when the latter part of the 7th century is reached, there is more evidence of separation, although no regular system is followed. Concurrently the same process is observed in minuscule MSS., in which a partial separation goes on in an uncertain and hesitating manner down to the time of the Caroline reform. In early Irish and English MSS., however, it may be observed that separation is more consistently followed. In MSS. of the 9th and 10th centuries the long words are separated, but short prepositions and conjunctions are joined to the next following word, It was not until the 11th century that these smaller words were finally detached and stood apart.

Punctuation.—From the use of continuous writing naturally arose in the first place the necessity for the breaking up of the text into paragraphs and sentences, and afterwards the introduction of marks of punctuation. In the Greek works on papyrus before the Christian era certain marks of division are found. In the Harris Homer (Cat. Anc. MSS., i., pl. 1) a wedge-shaped sign > is in- serted between the beginnings of the lines to mark a new passage. In the prose works of Hyperides a pause in the sense (unless it occurs at the end of a line) is indicated by a short blank space being left in the line and by a horizontal stroke being drawn under the first letter of the line in which the pause occurs. In a few instances, in the space left to mark the pause a full point or slight oblique stroke is added high in the line. As large letters were un- known, this system of dividing the paragraphs was calculated to sacrifice the least amount of space, as the rest of the line, after the pause, was utilized for the beginning of the next paragraph. In the early vellum MSS. the same plan is followed, with the more general use of the full point, which is placed on a level with either the top or the middle of the letters; and the marginal dividing Signs are of different patterns. When large letters were introduced to mark the paragraphs, had they been invariably placed at the beginning of their respective paragraphs, the latter must of necessity have each begun a new line, unless the lines had been wide enough apart to leave room for the insertion of the large letters. This latter arrangement would, however, have entailed considerable loss of space; and the device was accordingly invented, in cases where the paragraph began in the middle of a line, to place the large letter as the first letter of the next line, even though it might there occur In the middle of a word, and, as it was placed in the margin, it did not affect the normal space between the

lines. It need hardly be Fics that, if the paragraph commenccd at the beginning of a line, 2 large letter took its natural place as the initial. The use of

ese large or initial letters led to the abolition of the paragraph

marks. As early as the 5th ceutury there is evidence in the case of the Codex Alexandrinus that the marks were losing their meaning in the eyes of the scribes ; for in that MS. they are frequently placed in anomalous positions, particularly over the initial letters of the different books, having been evidently considered as mere ornaments. The position of the initial as the leading letter of the second line of a paragraph beginning in the middle of a line was maintained in the Greek minuscule MSS, intothe 15thcentury. The practice of con- tinuous writing also led to the arrangement of the text of the Bible and some other works in short sentences, according to the sense, which were called otfxo., as will be noticed presently ; but other minor methods were followed to prevent the ambiguity which would occasionally arise. In even the earliest Greek uncial MSS. an apostrophe was often inserted above the line between two words, as a dividing mark, as, for instance, in the Codex Alexandrinus, OYN’OTK; and it was specially used after words ending in x, x, &, p, and after proper names which have not a Greek termination. It was even placed, apparently from false analogy, between two consonants in the middle of a word, as HNEI’KEN. Some of these nses of the apostrophe survived in minuscule MSS. A mark also, resembling an accent or short horizontal stroke, was employed to indicate words consisting of a single letter, as H, which as a word has so many different meanings.

In the earliest surviving Latin volumes there was no punctuation by the first hand, but in the later uncial MSS. the full point, in various positions, was introduced—being placed on a level with either the bottom, middle, or top of the letters, the two latter positions being the most common. In minuscule MSS. the full point, on the line or high, was first nsed ; then the comma and semicolon, and the inverted semicolon (‘), whose power was rather stronger than that of thecomma. In Irish and early English MSS. the common mark

of punctuation was the full point. As a final stop one or more points with a comma. ., were frequently used.

Stichometry.— While dealing with the subject of punctuation, the system of stichometry, or division of the texts into orlxoi, versus, or lines of a certain length may be referred to.1_ It was the custom of the Greeks and Romans to estimate the length of their literary works by lines. In poetical works the number of verses was com- puted ; in prose works a standard line had to be taken, for no two scribes would naturally write lines of the same length. This standard was a medium Homeric line, and it appears to have consisted, on an average, of 34 to 38 letters, or 15 to 16 syllables. The lines of any work, so measured, were called orixo: or rn. The practice of thus computing the length of a work can be traced back to the 4th century B.c. in the boast of Theopompus that he had written more éry than any other writer. The number of such orlxor or 2m contained in a papyrus roll was recorded at the end with the title of the work ; and at the end of a large work extending to several rolls the grand total was given. The use of such a stichometrical arrangement was in the first place for literary refer- ence. The numeration of the or(xo: was no doubt at an early period regularly noted in the margin, just as lines of poetical works or verses in the Bible are numbered in our printed books. In a Greek Biblical MS. at Milan they are numbered at the end of every hundred, and the verses in the Bankes Homer are counted in the same way. But the system was also of practical use in calculating the pay of the scribes and in anata the market value of a MS. When once a standard copy of a work had been written in the normal lines, the scribes of all subsequent copies had only to record the number of erfxo: without keeping to the prototype. When we find therefore at the end of the different books of a Bible that they severally contain so many o7lxor or versus, it is this stichometrical arrangement which is referred to. Callimachus, when he drew up his catalogue of the Alexandrian librarics in the 3d century B.c., registered the total of the orixo: in each work. Although he is generally lauded for thus carefully recording the numbers and setting an example to all who shonld follow him, it has been suggested that this very act was the cause of their general disappearance from MSS. For, when his rlvaxes were published, scribes evidently thought it was needless to repeat what could be found there ; and thus it is that so few MSS. have descended to us which are marked in this way. ‘There was also in nse in

Biblical MSS. another arrangement. This was the division of the text into short sentences or lines, according to the sense, chiefly with a view to a better understand- ing of the meaning and a better delivery in public reading. The Psalms, Proverbs, and other poetical books were anciently thus written, and hence received the title of B/BAo: orixhpets, or atixnpal ; and it was on the same plan that St Jerome wrote, first the books of the prophets, and subsequently all the Bible of his version, per cola et commata ‘quod in Demosthene et Tullio solet fieri,” In the Greek Testament also Euthalius, in the 5th century, introduced the method of writing or:ynd6v, as he termed it, into the Pauline and Catholic Epistles, and the Acts. The surviving MSS. which contain the text written in short sentences show by Bi ee ete ee ee ee

1 See the article by C. Graux in Revue de Philologie, 1878, vol. ii. p. 97.

the diversity of the latter that the rhythmical sentences or lines of sense were differently calculated by different writers ; but the original arrangement of St Jerome is thought to be represented in the Codex Amiatinus at Florence, and that of Euthalius in the Codex Claromontanus at Paris. With regard to St Jerome’s reference to the division per cola et commata of the rhetorical works of Demosthenes and Cicero, it should be noticed that there are still in existence MSS. of works of the latter in which the text is thus written, one of them being a volume of the Tusculans and the De Scnectute in the Bibliotheque Nationale at Paris. The same arrangement of the text of the orations of Demosthenes is also men- tioned by the rhetoricians of the 5th and subsequent centuries. lt is a curious circumstance also that the text of the only two surviv- ing documents of the Roman chancery addressed to Egyptian officials in the 5th century (see above) is written in lines of various lengths, apparently for rhetorical convenience.

Corrections.—For obliteration or removing pen strokes from the surface of the material the sponge was used in ancient times. While the writing was still fresh, the scribe could easily wash off the ink by this means ; and for a fragile material, such as papyrus, he could well use no other. On vellum he might use sponge or knife. But after a MS. had left his hands it would undergo revision at the hands of a corrector, who had to deal with the text in

a different manner. He could no longer conveniently apply the sponge. On hard material he might still use the knife to erase letters or words or sentences. But he could also use his pen for such purposes. Thus we find that avery early system of indicating erasure was the placing of dots or minute strokes above the letters to be thus ‘‘expunged.” The same marks were also (and generally, at later periods) placed under the letters ; in rare instances they stood inside them. It need scarcely be said that letters were also struck out with strokes of the pen or altered into others, and that letters and words were interlined. A long sentence, liowever, which could not be admitted between the lines, was entered in the margin, and its place in the text indicated by corresponding reference marks, such as hd. hs. =hic decst, hoc supra, &e.

Tachygraphy.—The systems of tachygraphy which were followed by both Greeks and Romans had an effect upon the forms of contrac- tion found in medieval MSS. The subject of Greek tachygraphy has lately received a good deal of attention on account of recent dis- coveries. How far back the practice of shorthand writing existed among the Greeks there is nothing to show ; for, although certain words of Diogenes Laertius have been taken to imply that Xenophon wrote shorthand notes (droonuewoduevos) of the lectures of Socrates, yet a similar expression in another passage, which will not bear this meaning, renders it hardly possible that tachygraphy is referred to. The first undoubted mention of a Greek shorthand writer occurs in 195 a.p., in a letter of Flavius Philostratus. But unfortunately there appear to be no very ancient specimens of Greek tachygraphy in existence; for it is denied that certain notes and inscriptions in the papyri dating from the 2d century B.o., which have been put forward as such, are in ‘shorthand at all, The extant examples date only from the 10th century. First stands the Paris MS. of Hermogenes, with some tachygraphic writing of that period, of which Montfaucon (Pal. Gr., p. 351) gives some account, and accompanies his description with a table of forms which, as he tells us, he deciphered with incredible labour. Next, the Add. MS. 18231 in the British Museum contains some marginal notes in shorthand, of 972 a.p. (Wattenb., Script. Graec. Specim., tab. 19). But the largest amount of material is found in the Vatican MS. 1809, a volume in which as many as forty-seven pages are covered with tachygraphic writing of the 11th century. Mai first published a specimen of it in his Seriptorwm Veterum Nova Collectio, vol. vi. (1832) ;

and in his Nove Patrum Bibliotheces tom. secundus (1844) he gave a second, which, in the form of a marginal note, contained a fragment of the book of Enoch. But he did not quote the num- ber of the MS., and it has only lately been found again. The tachygraphic portion of it is now being made the subject of special study by Dr Gitlbauer for the Vienna Academy. It contains frag- ments of the works of St Maximus the Confessor, the confession of St Cyprian of Antioch, and works of the pseudo-Dionysius Areopagita. The writing used in these examples is syllabic, and appears to be a younger form of tachygraphy as distinguished from an older system, the existence of which may be inferred from the occurrence of certain signs or symbols of contraction used in the minuscule MSS. For, while many of the signs thus used correspond with the tachygraphic signs of the above examples, there are others which differ and which have been derived from an earlier source. For a system of tachygraphic contractions had been developing at an earlier period ; and its elements have been traced in both cursive and uncial MSS. as far back as the 5th or 6th century. If then we may suppose that the new system of tachygraphy was an invention of the 9th or 10th century, this will account for the occurrence in MSS. of that period of two forms of abbreviation for certain syllables—the one adopted from the old or ordinary system, and the other being the neo-stenographic symbol. As to the first origin of Greek tachygraphy, it has been supposed that it grew from a system

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of secret writing which was developed from forms of abbreviation and which the early Christians adopted for their own nse, ;

Evidence of the use of tachygraphy among the Romans ig to be found in the writings of authors under the empire. It appears to have been taught in schools, and, among others, the emperor Titus is said to have been skilful in this style of writing. Ennius hag been named as the inventor of a large collection of shorthand symbols ; but more generally Cicero’s freedman M. Tullius Tiro ig regarded as the author of these signs, which commonly bear the title of ‘‘Note Tironiane.” The shorthand writers or notaries were well trained in the use of these notes, and in the early Christian times were largely employed in taking down the words of the bishops of the church

which were preached in sermons or spoken in councils, and in recording the acts and lives of martyrs. In the Frankish empire the notes were used in signatures or subscriptions of charters, and later, in the 9th and early 10th centuries, they were adopted by the revisers and annotators of the texts of MSS. Of this period also are several MSS. containing the Psalter in these characters, which it has been suggested were written for practice at a time when a fresh impulse had been given to the use of short. hand in the service of literature. The existence also of volumes eontaining collections of the Tironian notes, and written at this time, points to a temporary revival. The notes appear to have gone out of general use, however, almost immediately after this, although in isolated cases, such as in subscriptions to charters, they linger as late as the beginning of the 11th century. A few of the forms of the Tironian notes were adopted in medieval MSS. as symbols of contraction for certain common words, as will be noticed presently,

Contractions. —The use of contractions or abbreviations in MSS. would arise from two causes—first, the natural desire to write as quickly and shortly as possible words of frequent occurrence which could not be misread in a contracted form, and, secondly, tho necessity of saving space. The eoutractions satisfying the first requirement were necessarily limited in number and simple in char- acter, and are such as are found with more or less frequency in the oldest MSS. But the regular system of contracted forms, with the view of getting as much writing as possible into a limited space, was only elaborated in course of time, and was in use in the later centuries of the Middle Ages. Different kinds of literature also were, according to their nature, more or less contracted. From early times abbreviations were used more freely in secular books, and particularly in works in which technical language was employed, such as those on law or grammar or mathematics, than in Biblical MSS. or liturgies. In the Greek fragment of a mathematical treatise of the 7th century, at Milan, there are numerous contrac- tions ; and the same is found to be the case in a Latin MS. of the 5th century, the Verona Gaius. With regard to the different systems or styles of contraction, the oldest and simplest is that in which a single letter, or at most two or three letters, represent a whole word. Among Latin classical writers we know that these contractions were common enough, and ancient inscriptions afford plentiful examples. In the waxen tablets also they are found; and they survive in the later papyri of Ravenna,

&c., and in law deeds. Next is the system of dropping the final syllable or syllables ofa word, or of omitting a letter or syllable or more in the middle, — such omissions being easily supplied from the general sense of the context—e.g., oxnu’ = ox fuaros, habuet =habucrunt, prm=patrem. And lastly, there are the arbitrary signs and contractions formed in a special manner or marked by certain figures whereby they inay be regularly interpreted.

Traces of a system of contraction are found in some of the early Greek papyri. For example, in the papyrus of the oration of Hyperides for Lycophron, of at least the Ist century B.c., the nu of the syllable wy, when occurring at the end of a line, is omitted, and its omission marked by a light horizontal stroke above the line of writing; aud, as marks of reference to an accidentally omitted line, abbreviated forms of &yw and xdérw are used. In the Bankes

Homer also the sign jo for woinrhs is placed in the margin to mark

the narrative portion of the text. In the ancient Greek Biblical MSS. the contractions are usually confined to the sacred names and

titles, and a few words of common occurrence, as OC = eds, IC= inoods, XC=xpiords, TINA=mvedua, CHP=cwrhp, KC=xipioss CTPOC =ovraupés, MHP = rarhp, MHP=,477p, TC =vids, ANOC=

uvOpwros, OYNOC =otpayds, K=xal, T=rat, Ni=jou, po, &¢. Final N, especially at the end of a line, was dropped, and its place occupied by the horizontal stroke, as TO-. This limited system of contraction was observed generally in the uncial Biblical and liturgical MSS. In the mathematical fragment at Milan abbrevia- tions by dropping final syllables, and contracted particles and pre- positions, are numerous; and in the palimpsest Homer of the 6th century in the British Museum final syllables are occasionally omitted. Such omissions were, however, indicated by strokes or curves, or by some leading letter of the omitted portion being placed above the line of writing. Certain signs also were borrowed from tachygraphy, at first sparingly, but afterwards, in the later and

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more elaborate system of contraction, in sufficient numbers to repre- sent certain common words and terminations, In the early Greek minuscule MSS. contractions are not very fre- uent in the texts ; but in the marginal glosses, where it was an object to save space, they are found in great numbers as early as the 10th century. The MS. of Nonnus, of 972 A.p., in the British Museum (Wattenb. and Von Vels., Exempla, 7) is an instance of a text contracted to a degree that almost amounts to tachygraphy. In secular MSS. contractions developed most quickly. In the 19th, 13th, and 14th centuries texts were fully contracted ; and as the writing became more cursive contraction-marks were more care- lessly applied, until, in the 15th century, they degenerated into mere ishes. Latin Biblical uncial MSS. the same restrictions on abbrevia- tions were exercised as in the Greek. The sacred names and titles DS=deus, DMS, DNS=dominus, SCS = sanctus, SPS =spiri- tus, and others appear in the oldest codices. The contracted ter- minations Q°=que, B‘=bus, and the omission of final m, or (more rarely) final , are common to all Latin MSS. of the earliest period. There is a peculiarity about the contracted form of our Saviour’s name that it is always written by the Latin scribes in

letters imitating the Greek IHC, XPO, the, ape. In secular works, as already noticed, contractions were used in many forms at an early period. In minuscule MSS. of the 8th, 9th, and 10th centuries the system of dropping middle or final syllables was commonly applied. In this stage the simpler marks of contraction, such as a horizontal stroke or an apostrophe to mark the omitted termination, were generally used. Certain ordinary words also, as prepositions and conjunctions, and a few prefixes and terminations, had parti- cular forms of contraction from an early date. Such are @=est, t=vcl, i=non, p’=pre, p=per, p=pro, > =termination us, The letter ¢ with distinctive strokes applied in different positions re- presented the often recurring relative and other short words, as quod, quia. Conventional signs also derived from the Tironian notes were employed, particularly in Irish and English MSS., as K=autem, —=est, 9=ejus, H=enim, 7 =et. From the practice of writing above the line a leading letter of an omitted syllable, as int*=intra, t’=tur, other conventional signs were also de- veloped. Such growths are well illustrated in the change under- gone by the semicolon,

which was attached to the end of a word to indicate the omission of the termination, as b;=dus, q;=que, deb;=debet, and which in course of time became converted into a 2, a form which survives in our ordinary abbreviation viz. (¢.¢., vi;=videlicet). The different forms of contraction which have been noticed were common to all the nations of western Europe. The Spanish scribes, however, attached different values to certain of them. For example, in Visigothic MSS., gm, which elsewhere represented quoniam, may be read as guum; and p, which else- where = pro, is here= per.

By the 11th century the system of Latin contractions had been reduced to exact rules ; and from this time onwards it was univer- sally practised. It reached its culminating point in the 13th cen- tury, the period of increasing demand for MSS., when it became more than ever necessary to economize space. After this date the exact formation of the signs of contraction was less strictly observed, and the system deteriorated together with the decline of hand- writing. In conclusion, it may be noticed that in MSS. written in the vernacular tongues contractions are more rarely used than in Latin texts. A system suited to the inflexions and terminations of this language could not be readily adapted to other languages so different in grammatical structure.

Breathings and Accents.—These were not systematically applied to the texts of Greek MSS. before the 7th century. Such as are found in isolated passages in the ancient papyri do not appear to have been written by the first hand, and most of them are probably of much later date. They have becn freely added to the ancient texts of Homer, as in the Harris and Bankes papyri, but palpably long after the dates of the writing. Nor were they used in the early uncial MSS. The ancient codices of the Bible are devoid of them; and, although in the Ambrosian Homer of the 5th century itis thought that some of the breathings may be by the original hand, the other marks of breathing and the accents are of later date. So likewise the few breathings and accents which ave seen

PALAOLOGUS, a Byzantine family name which first appears in history about the middle of the 11th century, when George Palxologus is mentioned among the Prominent supporters of Nicephorus Botaniates, and afterwadrs

as having helped to raise Alexius I. Comnenus to the throne in 1081; he is also noted for his brave defence of Durazzo against the Normans in that year. Michael Palzologus, probably his son, was sent by

in the palimpsest Homer of the 6th century in the British Museum have been, to all appearance, added afterwards. In Latin texts, and particularly in early Irish and English MSS., an accent is occasionally found over a monosyllabic word or one consisting of a single letter. But such accentuation, serving to distinguish such small words in reading, rather corresponds to the similar marking of short words in Greek MSS., as noticed above.

Numerals, —An examination of the different forms of numerals to be found in Greek and Latin MSS. is beyond the province of this article. It may, however, be pointed out that, while in Greek MSS. one system was followed, in Latin MSS, both the Roman and Arabic numerals were in use. The Roman numerals appear in all kinds of documents at all times. When occurring in the text of a MS. they were usually placed between full points, ¢.g., .cxiiii., to prevent confusion with the letters of the words. Arabic numerals were established in common use by the end of the 14th century, but their occurrence in MSS. has been traced back to the middle of the 12th century, from which date down to the time of their general adoption they were principally confined to mathe- matical works.

Bibliography.—GREEK PALROGRAPHY.—The first book which dealt with the subject in a systematic manner was the Palaographia Greca of the learned Benedictine, Dom Bernard de Montfaucon, published in1708. So thoroughly well was tlie work doue that down to our own time no other scholar attempted to improve upon it, and Montfaucon remained the undisputed authority in this branch of learning, At length, in 1879, Gardthausen published his Griechische Palxographie, in which is embodied fuller information that was unavailable in Montfaucon’s day. In this work the development of Greek writing in its various styles is carefully and lucidly worked out and illustrated with tables, and a useful list of dated Greck MSS. is added. See also a review of Gardt- hausen’s work by Charles Graux in the Journal des Savants (1881). A most useful and handy

introduction is Wattenbacli's MSS. With regard to facsimiles, those which are found in Montfaucon and other books of the samc time are practically useless for critical purposes. The invention of photography has entirely driven into the background all hand- made facsimiles, and in the future none will be admissible which are not pro- duced by the action of light. Autotypes or photo-lithographs from MSS. are given in the Facsimiles of the Palssographical Society (1873-83); in the Brempla Codicum Grecorum litterts minuscults scriptorum (1878) of Wattembach and Von Velsen; in the Catalogue of Ancient MSS. in the British Museum, part i, (1881); in Wattenbach's Scripture Grace Speciniina (1883); and, in fewer numbers, in Specimina Palxographica codd, Grec. et Slav, bibl. Mosquensis (1863-64) by Bishop Sabas. Facsimiles made by hand, but excclllently finished, are in Silvestre's Paléographie Universelle (1850) and in Notices et Extraits des Manuscrits, tom. xviii., pt. 2 (1865), where the papyri of Paris are faithfully represented.

LATIN PALMOGRAPHY.—The bibliography of Latin palxograpliy in its different branches is very extensive, but there are comparatively few books which deal with it asa whole. The most complete work is due to the Benedictines, who in 1750-65 produced the Nouveau Traité de Diplomatique, which examines the remains of Latin writing in a most exhaustive manner. The fault of the work lies indeed in its diffuseness and in the superabundance of subdivisions which tend to confuse the reader, The extensive use, however, which the authors made of the French libraries renders their work most valuable for reference. As their title shows, they did not confine themselves to the study of MS, volumes, but dealt also with that other brancli of paleography, the study of documents, in which they had been preceded by Mabillon in his De Re Diplomatica (1709). Wattenbach's Anleitung zur Lateinischen Paleographte, 3d cd., 1878, is a thoroughly practical introduction, classifying the different kinds of writing, and giving full biographical references, and tracing the forms of letters and the history of contractions, &c. Works which give facsimiles in general are— Silvestre, Paléographie Universelie, the Facsimiles of the Paleographical Society; Arndt, Schrifttafein, 1874, 1878; the Catalogue of Ancient MSS. in the British Museum, part ii, 1884; and among those which deal with particular branches of Latin paleography the following may be enumcrated—Exempla Codicum Latin- orum litterts matuscults scriptorum (1876, 1879) by

Zangemeister and Wattenbach, on Roman cursive, and on Lombardic, Merovingian, and Visigothic writing, the Corpus Inscriptionum Latinarum, vols. iii., iv., Massmann, Libellus aurartus, 1840; Marini, Papiri Diplomatici, 1805; the Chartes Latines sur Papyrus (1835- 40) of Champollion-Figeac; Gloria, Paleografia, 1870; Sickcl, Monumenta Graphica, 1858-69; Letronne, Diplomata et Charte Merovingice Atatis, 1848; Facsimile de Chartes et Diplomes," in the Archives de Empire, 1866; Sybel and Sickel, Kaiserurkunden, 1880-84; Bibliotheca Casinensis, 1873, &e.; Merino, #scuela Paleographica, 1780; and the Exempla Scripturx Visigotice (1883) of Ewald and Loewe. On Irish and English writing—Astle, Origin and Progress of Writing, 1873; Facsimiles of Ancient Charters in the British Museum, 1873-78 ; Facsimiles of Anglo-Saxon MSS., 1878, 1881, Rolls Series; Facsimiles of National JUSS. of Eng- land, Scotland, and Ireland, in separate series. The various works on illumina- tion, such as those of Count Bastard, Westwood, Tymms and Wyatt, and others may also be consulted. For the study of the Tironian Notes, see Carpentier, Alphabetum Tirontanum, 1747; Kopp, Palxographia Critica, , 18175, Jules Yardif, ‘‘ Mémoire sur les Notes Tironiennes," in the Afémoires del Académie des Inscriptions, sér. 2, tom, ili., 1852; and the "Note Bernenses," <&c., published in the Panstenographikon periodical, A uscful handbook of contractions is Chassant's Dictionnaire des Abréviations, 1862. For particularsas to materials employed and the mechanical arrangements followed in the production of MSS., see Birt's Antéke Buchwesen (1882) and Wattenbach's Schrtftwesen im Mittelalten (1875). (E. M. T.)

Manuel II. Comnenus into Italy as ambassador to the court of Frederick I. in 1154; in the following year he took part in the campaign against William of Sicily, and died at Bari in 1155. A son or brother of Michael, named George, received from the emperor Manuel the title of Sebastos, and was entrusted with several important missions; it is uncertain whether he ought to be identified with the George Paleologus who took part

in the conspiracy which dethroned Isaac Angelus in favour of Alexius Angelus in 1195. Andronicus Palso- logus Comnenus was Great Domestic under Theodore Lascaris and John Vatatzes; his eldest son by Irene

Palzologina, MicHAEL (9.v.), became the eighth emperor of that name in 1260, and was in turn followed by his son Andronicus II. (1282-1328). Michael, the son of Andronicus, and associated with him in the empire, died in 1320, but left a son, Andronicus III., who reigned from 1328 to 1341; John VI. (1355-1391), Manuel II. (1391-1425), and John VII. (1425-1448) then followed in lineal succession ; Constantine XIII, the last emperor of Constantinople (1448-1453), was the younger brother of John VII. Other brothers were Demetrius, prince of Morea until 1460, and Thomas, prince of Achaia, who died at Rome in 1465. A daughter of Thomas, Zoe by namie, married Ivan III. of Russia. A younger branch of the Palxologi held the principality of Monferrat from 1305 to 1533, when it became extinct.

PALHZONTOLOGY. See Gzoxoey, vol. x. pp. 319 sg. Further details will be found in DistTripution and in the articles on the various zoological groups and forms (see, eg., Brrps, IcHTHyotocy, IcHTHYosauURUS, MamM- MALIA, MAMMOTH),

PALAZOTHERIUM. See Mammatta, vol. xv. p. 429.

PALA/PHATUS, the author of a treatise rept dricruy, ‘On Incredible (Narratives),” which has been preserved. It consists of a series of explanations of Greek legends, without any attempt at arrangement or plan. It is obviously a mere epitome of some more complete work. The great number of MSS., containing numerous varia- tions in text, and the frequent quotations made from the treatise by late writers, show that it was a favourite work in their time. It is probable that the original treatise, from which it was abbreviated, was the Avoes tov pubis cipnuévov of a late writer mentioned by Suidas as a grammarian of Egypt or of Athens.

PALAFOX Y MELZI, Jost px (1780-1847), duke of Saragossa, was the youngest son of an old Aragonese family. Brought up at the Spanish court, he entered the guards at an early age, and in 1808 he accompanied Ferdinand ‘to Bayonne, but made his escape after the king’s abdication. While he was living in retirement at his family seat near Saragossa, the inhabitants proclaimed him governor of that city and captain-general of the kingdom of Aragon (May 25, 1808), an honour which he owed to his rank, and, it is said, to his appearance, rather than to talent or experience in military affairs. Despite the want of money and of regular troops, he lost no

time in declaring war against the French, who had already overrun the neighbouring provinces of Catalonia and Navarre, and soon afterwards the attack he had provoked began ; Saragossa was bombarded on July 22, and on August 4 the French were masters of nearly the half of the town. Summoned to surrender, Palafox sent the famous reply of “War to the Knife,” and on the following day his brother succeeded in forcing a passage into the city with 3000 troops. It was resolved, amid the en- thusiasm of the inhabitants (whose real leaders belonged to the lower orders), to contest possession of the remaining quarters of Saragossa inch by inch, and if necessary to retire to the suburb across the Ebro, destroying the bridge. The struggle, which was prolonged for nine days longer, resulted in the withdrawal of the French (August 14) after a siege which had lasted sixty-one days in all. Operations, however, were resumed by Marshals Mortier

and Moncey in November, and after more than 50,000

(it is said) of the inhabitants had perished, partly through the ravages of an epidemic by which Palafox himself was attacked, a capitulation was signed on February 21.

After his recovery Palafox was sent into France and closely confined at Vincennes, but was liberated on the restoration of Ferdinand. InJune 1814 he was confirmed in the office of captain-general of Aragon, but soon afterwards withdrew from it, and, having indeed no rea] aptitude for them, ceased to take part in public affairs He received the title of duke of Saragossa in 1824, and died at Madrid on February 15, 1847.

PALAMAS. See Hzsycuasts, vol. xi. p. 782.

PALANPUR, a native state in Guzerat, Bombay, India, lying between 23° 57’ and 24° 41’ N, lat., and between 71° 51’ and 72° 45’ E. long., with an area of 3510 square miles, and a population of 234,402. The country is mountainous, with much forest towards the north, but undulating and open in the south and east. The principal rivers are the Saraswati and Bands. The chief, an Afghan of the Lohdni tribe, enjoys an estimated gross revenue of

£40,000, and pays a tribute to the gdekwdr of Baroda, Palanpur town, the capital of the state, contained a popu- lation in 1881 of 17,547.

PALATINATE, THE (German, Pfalz), included for some time (from the middle of the 17th to the latter part of the 18th century) two distinct German districts, the Upper or Bavarian Palatinate, and the Lower Palatinate or the Palatinate on the Rhine. The Upper Palatinate, a duchy, belonged to the Nordgau and Bavarian circle, and was bounded by Baireuth, Bohemia, Neuburg, Bavaria, and the territory of Nuremberg. In 1807 (with Cham and Sulz- bach) it had 283,800 inhabitants. The Lower Palatinate belonged to the electoral Rhenish circle, and was bounded by Mainz, Katzenellenbogen, Wiirtemberg, Baden, Alsace, Lorraine, and Treves. It took in the Electoral Palatinate (with a population, in 1786, of 305,000), the principality of Simmern, the duchy of Zweibriicken, half of the county of Sponheim, and the principalities of Veldenz and Lautern.

The palsgraves of the Rhine originally had their seat in Aix-la-Chapelle. In the 11th century the country called the Palatinate belonged to them as an hereditary fief, in virtue of which they ranked among the foremost princes of the empire. In 1156, after the death of Palsgrave Hermann III. without heirs, the Palatinate was granted by the emperor Frederick I. to his step-brother Duke Conrad of Swabia. Conrad was succeeded by his son-in-law, Duke Henry of Brunswick, the eldest son of Henry the Lion. In the contest for the crown between Otho IV. and Frederick II, Henry took part with Otho IV., his brother; and in 1215 Frederick II. punished him by putting him to the ban of the empire, and by granting the Palatinate to Louis, duke of Bavaria. Louis was never able to assert his claims with complete success ; but his son Otho II. married Agnes, the daughter and heiress of Henry, and thus the Palatinate passed into the hands of the Bavarian family. In 1256 the whole territory of the family was divided between Louis II. and Henry, Otho’s sons,—Louis II. obtaining the Palatinate and Upper Bavaria, and Henry Lower Bavaria. The possessions of Louis II. were inherited in 1294 by his two sons, Rudolph I. and Louis, the Palatinate and the electoral dignity going to the former, while the latter (who ultimately became emperor) received Upper Bavaria, to which Lower Bavaria was afterwards added. The claims of Louis to the imperial crown were contested by Frederick the Fair, duke of Austria; and, as Rudolph I. supported Frederick,

his brother deprived him of his lands, which were then held in succession by Rudolph's three sons, Adolph, who died in 1327, Rudolph II. who died in 1353, and Rupert L, who died in 1390. Rudolph II. concluded a treaty with the emperor Louis, whereby the electoral vote was to be delivered alternately by Bavaria and by the Palatinate;

put the emperor Charles IV., in return for a part of the Upper Palatinate, conferred on Rupert I. and his heirs the exclusive right to the electoral dignity. Rupert I, in 1386, founded the university of Heidelberg. He was succeeded by his nephew, Adolph's son, Rupert II., whose son and successor, Rupert III., was elected emperor in 1400. After the death of Rupert III. in 1410, his here- ditary territories were divided among his four sons, Louis IIL, John, Stephen (who became palsgrave of Simmern and Zweibriicken), and Otho. The families of John and Otho soon died out, and the last representative of the line of Louis IIJ.—Otho Henry—died in 1559, The lands of Otho Henry and the electoral dignity then passed to Frederick [II., of the Simmern line; and Frederick Il. marked an important epoch in the history of the electorate by definitely associating himself and his house with the Reformed or Calvinistic Church. His immediate successors were Louis VL, Frederick IV., and Frederick VY. The latter, in 1619, rashly accepted the crown of Bohemia; and the result was that, after his expulsion from his new kingdom, the Palatinate was given by the emperor Ferdinand II. to Maximilian, duke of Bavaria. In virtue of the treaty of Westphalia, Charles Louis, Frederick V.'s son, who died in 1680, received back the Lower Palatinate, and in his favour an eighth electorate was created, with which was associated the office of lord high treasurer (Erzschatzmeisteramt). The house of Bavaria retained the Upper Palatinate, with the office of arch-sewer (Erztruchsessamt), and with the rank which had formerly been held in the electoral college by the counts palatine ; but it was arranged that, if the male line of Bavaria died out, the lands and rights which had belonged to the rulers of the whole Palatinate should be restored to their descendants. Charles, Charles Louis's son, who died in 1685, was the last representative of the Simmern line. The electoral dignity and the lands con- nected with it then passed to Charles's kinsman, Philip William, of the Neuburg line, which sprang from Louis the Black, the second son of

Stephen, son of Rupert III. Of Louis the Black's two grandsons, Louis and Rupert, the latter was the ancestor of the Veldenz line, which died out in 1694, while from the former sprang all other pala- tine lines—the Neuburg line, the Neuzweibriicken line, the Birkenfeld line, the Sulzbach line. Philip William, of the Neuburg line, died in 1690, and was succeeded by his son John William, who in 1694 inherited Veldenz, and during the war of the Spanish succession received the Upper Palatinate and all the ancient rights of his house. At the conclusion of the war, however, both rights and lands were restored to the elector of Bavaria. In 1716 John William was succeeded by his brother Charles Philip; and with Charles Philip, who died in 1642, the Neuburg line came to an end, and the Lower Palatinate was inherited by Charles Theodore, of the Sulzbach line. In 1777 the male line of Bavaria be- came extinct by the death of the elector Maximilian Joseph; and then, in accordance with the treaty of West- phalia, the Upper Palatinate and the Lower Palatinate were reunited, and the palsgrave resumed the office of arch-sewer and the ancient place of his family in the electoral college, while the office of lord high treasurer was transferred to the elector of Brunswick. The successor of Charles Theodore, who died childless in 1799, was Maxi- milian Joseph, duke of Zweibriicken. By the treaty of Lunéville in 1801 his territories were divided, the part which lay on the left bank of the Rhine being taken by France, while portions on the right bank were given to the Srand-duchy of Baden, to Hesse-Darmstadt, to the prince of Leiningen-Dachsburg, and to Nassau. By the treaties of Paris concluded in 1814 and in 1815, the palatine lands

on the left bank of the Rhine were restored to Germany, the larger part of them being granted to Bavaria, and the rest to Hesse-Darmstadt and Prussia. The Prussian part of the Palatinate is in the Rhine province; the Hesse-Darmstadt part is included in the province of Starkenburg and Rhine Hesse; the Bavarian part is known as Rhenish Bavaria; and the Baden part is in the Lower Rhine district, which in 1865 was divided into the districts of Mannheim, Heidelberg, and Mosbach.

See Hausser, Geschichte der rheinischen Pfalz, 1845 ; Nebenius, Geschichte der Pfalz, 1874.

PALAWAN. See Puritiprrne IsLanps.

PALAZZOLO (often P.-Acreide to distinguish it from several other places of the same name), a city of Italy, in the province of Syracuse, Sicily, 28 miles west of Syracuse, with a population of 11,069 according to the census of 1881. It is mainly of interest on account of the remains it still preserves of the ancient city of Acra, which was founded by Syracuse in 663 B.c. These consist of a temple, an aqueduct, a theatre with a fine view towards Etna, a smaller theatre or odeum, a group of thirteen cisterns, and, in the vicinity, various rows of rock-cut tombs, from which a rich harvest of vases, &c., was obtained by Baron Judica, the great explorer of the site. See Judica, Antichita di Acre.

PALEARIO, Aonio (c. 1500-1570), Italian humanist and Reformer, was born about 1500 at Veroli in the Roman Campagna. Other forms of his name are Antonio Della Paglia, A. Degli Pagliaricci. In 1520 he went to Rome, where, during the years immediately following, he made lasting friendships among the scholars and men of letters whom Leo X. had gathered to his brilliant court. Driven from Rome by the troubles of 1527, he found a home first at Perugia and afterwards, from 1530 onwards, at Siena, where he married happily in 1534. In 1536 his didactic poem in Latin hexameters, De Immortalitate Animarum, was published at Lyons. It is divided into three books, the first containing his proofs of the divine existence, and the remaining two the theological and philosophical arguments for immortality based on that postulate. The whole concludes with a rhetorical descrip- tion of the occurrences of the second advent. Meanwhile his religious views had been undergoing considerable modification, and in 1542 an Italian tract written by him and entitled Della Pienezea, Sufficienza, et Satisfazione della Passione di Christo, or Libellus de Morte Christi, was made by the Inquisition the basis of a charge of heresy, from which, however, he successfully defended himself. To the period of his stay in Siena belongs also his Actio in Pontifices Romanos et eorum Asseclas, a vigorous indict- ment, in twenty “ testimonia,” against what he now be- lieved to be the fundamental error of the Roman Church in subordinating Scripture to tradition, as well as against various particular doctrines, such as that of purgatory; it was not, however, printed until after his death (Leipsic, 1606). In 1546 he accepted a professorial chair at Lucca,

which he exchanged in 1555 for that of Greek and Latin literature at Milan. Here about 1566 his enemies renewed their activity, and in 1567 he was formally accused of having taught the doctrine of justification by faith alone, denied that of purgatory, spoken slightingly of monastic institutions, and so on. Removed to Rome to answer these charges, he was detained in prison until sentence of death was carried out in July 1570.

An edition of his works (Ant. Palearti Verulani Opera), includ- ing four books of Hpistolz and twelve Orationes besides the De Immortalitate, was published at Lyons in 1552; this was followed by two others, at Basel, during his lifetime, and several after his death, the fullest being that of Amsterdam, 1696. A work entitled Benefizio di Cristo ("The Benefit of Christ's Death"), frequently translated, has often been attributed to Paleario, but on insufli- cient grounds.

PALEMBANG. See Sumatra.

PALENCIA, an inland province of Spain, one of the eight into which Old Castile is divided, is bounded on the N. by Santander, on the E. by Burgos, on the S. by Valladolid, on the W. by Valladolid and Leon, and has an area of 3127 square miles. In shape it is an irregular parallelogram, measuring 83 miles from north to south with a maximum breadth of 48 miles, sloping from the Canta- brian chain to the Douro. The general direction of all its larger streams is from north to south ; of these the principal are the Pisuerga and the Carrion, which unite at Duefias and flow into the Douro in Valladolid. The tributaries of the former within the province are the Burejo, the Cieza, and the united streams of the Buedo and Abanades; the latter is joined on the right by the Cueza. The northern part of the province, including the whole partido of Cervera, is mountainous, with some wood and with good pasture in the valleys; the remainder, the "Tierra de Campos," belongs to the great Castilian table-land, and is in general level and almost wholly devoid of trees. In the south occurs a considerable marsh or lake known as La Laguna de la Nava, as yet only partially drained. The mountainous district abounds in minerals, but only the coal is worked, the principal mines being those of San Feliceo de Castilleria, Orbo, and Villaverde de la Pefia. The province is crossed in the south-east by the trunk

railway connecting Madrid with Irun, while the line to Santander traverses it throughout from north to south ; there is also railway connexion with Leon, The highways following the same routes are maintained in good order;:the state of the other roads is often bad. The Canal de Castilla, begun by Ensenada in 1753, and completed in 1832, connects Alar del Rey with Valladolid. The province is essentially agricultural, wheat and other cereals, legumes, hemp, and flax being every- where extensively grown, except in the mountainous dis- tricts, Other industries are of secondary importance, the principal being flour-milling and the manufacture of linen and woollen stuffs. The province is divided into seven partidos—Astudillo, Baltanas, Carrion, Frechilla, Palencia, Saldafia, and Cervera; the total population in 1877 was 180,785. The only ayuntamiento with a population exceeding 10,000 was that of Palencia.

PALENCIA, capital of the above province, occupies a level site on the left bank of’ the river Carrion, here crossed by a good stone bridge and by another called Los Puentecillos. Palencia is the junction of the lines from Asturias and Galicia, and is 7 miles from Venta de Bafios on the Madrid and Irun Railway. The distances north- north-east from Valladolid and south-east from Leon are 23 and 82 miles respectively. The height above sea-level is 2362 feet. The town is protected on the west by the river; on the other sides the old machicolated walls, 36 feet high by 9 in thickness, are in fairly good preservation, and beautified by alamedas or promenades which were laid out in 1778. The city is divided into two parts, the ciudad and the puebla, by a winding arcaded street, the Calle Mayor, which traverses it from north to south. The cathedral, which overlooks the Carrion, was begun in 1321 and finished in 1504; itis a large building in the later and somewhat poor Gothic style of Spain. The site was previously occupied by a church erected by Sancho el Mayor over the cave of St Antholin, which is still shown. The church of San Miguel is a good and fairly well- preserved example of 13th-century work; that of San Francisco, of the same date, is inferior, and has suffered more from modernization. The hospital of San Lazaro issaid to date in part from the time of the Cid, who was married to Ximena here. The leading industries of Palencia are the woollen and linen manufactories, in which

a third of the inhabitants are engaged; flour-milling comes _ next in importance. The population of the ayuntamiento was 14,505 in 1877.

Palencia, the Pallantia of Strabo and Ptolemy, was the chief town of the Vaccei. Its history during the Gothic and Moorish periods js obscure ; but it was a Castilian town of some importance in the 12th and 13th centuries. The university founded here in 1208 by Alphonso IX. was removed in 1239 to Salamanca.

PALENQUE, Ruins or, in Chiapas, Mexico. Beg ARCHITECTURE, Vol. ii. pp. 450-51; and H. H. Bancroft, Native Races of the Pacific Coast of North America, vol. iy,

PALERMO (Greek, Udvoppos; Latin, Panhormus, Panor- mus), the capital of the Sicilian kingdom as long as it kept its separate being, now capital of a province of the same name in the kingdom of Italy, and the see of an arch-bishop. The population numbered 205,712 in 1881. The city stands in the north-west part of the island, on a small bay looking eastwards, the coast forming the chord of a semicircle of mountains which hem in the campagna of Palermo, called the Golden Shell (Conca d'Oro). The most striking point is the mountain of Heirkte, now called Pellegrino (from the grotto of Santa Rosalia, a favourite place of pilgrimage), which rises immediately above both the sea and the city. Palermo has been commonly thought to be an original Phoenician settlement of unknown date,

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Plan of Palermo,

1. Church of S. Giuseppe. 3. Church of S. Salvatore. 4

2. Palazzo del Municipio. 4, Church of S, Giovanni degli Eremiti. but lately Prof. Holm, the historian of ancient Sicily, has suggested that the settlement was originally Greek.' There is no record of any Greek colonies in that part of Sicily, and Panhormus certainly was Phoenician as far back as history can carry us. According to Thucydides (vi. 2), as the Greeks colonized the eastern part of the island, the Pheenicians withdrew to the north-west, and

concentrated themselves at Panhormus, Motye, and Soloeis (Soluntum, Solunto). Like the other Phcenician

1’The coins bearing the name of MIM are no longer assigned to Palermo; but it is probable that certain coins with the name }”¥ (Ziz) are of Panhormus,

-eolonies in the west, Panhormus came under the power of Carthage, and became the head of the Carthaginian ‘%, dominion in Sicily. As such it became the centre of that strife between Europe and Africa, between Aryan and Semitic man, in its later stages between Christendom and slam, which forms the great interest of Sicilian history. Asthe Semitic head of Sicily, it stands opposed to Syracuse ‘ the Greek head. Under the Carthaginian it was the head of the Semitic part of Sicily; when, under the Saracen, all Sicily came under Semitic rule, it was the chief seat of that rule. It has been thrice won for Europe by Greek, Roman, and Norman conquerors—in 276 B.c. by the Epirot king Pyrrhus, in 254 3B.c. by the Roman consuls Aulus Atilius and Gneus Cornelius Scipio, and in 1071 | A.D. by Robert Guiscard and his brother Roger, the first count of Sicily. After the conquest by Pyrrhus, the city was soon recovered by Carthage, but this first Greek occupation was the beginning of a connexion with western Greece and its islands which was revived under various | forms in later times. After the Roman conquest an attempt to recover the city for Carthage was made in 250 B.c., which led only to the great victory of Metellus just under the southern wall of the city. Later in the First Punic War, Hamilcar Barca was encamped for three years on Heirkte or Pellegrino, but the Roman possession of the city was not disturbed. Panhormus remained a ‘ Roman possession, and one of the privileged cities of Sicily, till it was taken by the Vandal Genseric in 440 a.p. It _ afterwards became a part of the East-Gothic dominion, and ‘ _wasrecovered for the empire by Belisarius in 535. It again ‘ remained a Roman possession for exactly three hundred “years, tillit was taken by the Saracens in 835. As Syracuse _ remained to the empire for a much longer time, Panhormus | now became the Mussulman capital. In 1063 the Pisan fleet broke through the chain of the harbour and carried | off much spoil, which was spent on the building of the | great church of Pisa. After the

Norman conquest the city remained for a short time in the hands of the dukes of | Apulia. But in 1093 half the city was ceded to Count | Roger, and in 1122 the rest was ceded to the second Roger. When he took the kingly title in 1130, it became and re- mained the capital and crowning-place of the kingdom, “Prima sedes, corona regis, et regni caput.” During the Norman reigns Palermo was the main centre of Sicilian history, especially during the disturbances in the reign of William the Bad (1154-66). The emperor Henry VI. entered Palermo in 1194, and it was the chief scene of his eruelties. In 1198 his son Frederick, afterwards emperor, was crowned there. His reign was the most brilliant time in the history of the city. After his death Palermo was for amomenta commonwealth. It passed under the dominion of Charles of Anjou in 1266, but he was never crowned there. In the next year, when the greater part of Sicily revolted on behalf of Conradin, Palermo was one of the few towns which was held for Charles ; but the famous Vespers of 1282 put an end to the Angevin dominion. From that time Palermo shared in the many changes of the Sicilian kingdom. In 1535 Charles V. landed there on his return from Tunis. The last kings crowned at _ Palermo were Victor Amadeus of Savoy in 1713, and Charles III. of Bourbon in 1735. The loss of N aples by the Bourbons in 1798, and again in 1806, made Palermo onée more the seat of a separate Sicilian kingdom. The city rose against Bourbon rule in 1820 and in 1848. In 1860 came the final deliverance at the hands of Garibaldi, but with it came also the yet fuller loss of the position

| of Palermo as the capital of a kingdom of Sicily. The original city was built on a tongue of land between two inlets of the sea, There is some question as to their extent inland, and as to the extent of salt and fresh

water. But there is no doubt that the present main street, the Cassaro, Via Marmorea, or Via Toledo (in official language Via Vittorio Emmanuele), represents the line of the ancient town with water on each side of it. Another peninsula with one side to the open sea, meeting as it were the main city at right angles, formed in Polybius’s time the Veapolis or new town, in Saracen times Khalesa, a name which still survives in that of Calsa. It was on this side that both the Romans and the Norman conquerors entered the city. But the-old relations of land and water have long been changed. The two ancient harbours have been dried up; the two peninsulas

have met; the long street has been extended to the present coast-line ; a small inlet called the Cala alone represents the old haven. The city kept its ancient shape till after the time of the Norman kings. It is still easy to mark the site of the two inlets, which now form valleys on each side of the long street. The old state of things fully explains the name IIdvoppos.

There are not many early remains in Palermo. The Phoenician and Greek antiquities in the museum do not belong to the city itself. The earliest existing buildings date from the time of the Norman kings, whose palaces and churches were built in the Saracenic and Byzantine styles prevalent in the island (see Normans). Of Saracen works actually belonging to the time of Saracen occupa- tion there are no whole buildings remaining, but many inscriptions anda good many columns, often inscribed with passages from the Koran, which have been used up again in later buildings, specially in the porch of the metropolitan church. This last was built by Archbishop Walter, a native of England, and consecrated in 1185, on the site of an ancient basilica, which on the Saracen conquest became a mosque, and on the Norman conquest became a church again, first of the Greek and then of the Latin rite. What remains of Walter's building is a rich example of the Christian-Saracen style. This church contains the tombs of the emperor Frederick the Second and his parents, as also the royal throne, higher than that of the archbishop ; for the king of Sicily, as hereditary legate of the see of Rome, was the higher ecclesiastical officer of the two. But the metropolitan church has been so greatly altered in modern times that by far the best example of the style in Palermo, or indeed anywhere, is the chapel of the king's palace at the west end of the city. This is earlier than Walter's church, being the work of King

Roger in 1143. Besides the wonderful display of mosaics,

it is, simply as an architectural whole, beyond all praise. Of the palace itself the greater part has been rebuilt and added in Spanish times, but there are some other parts of Roger's work left, specially the hall called Sala Normanna. : fae |

Alongside of the churches of this Christian-Saracen type, there is another class which follow the Byzantine type. Of these the most perfect is the very small church of San Cataldo, embodied in public buildings. But the best, though much altered, is the church commonly called Martorana, the work of George of Antioch, King Roger's admiral. This is rich with mosaics, among them the portraits of the king and the founder. Both these and the royal chapel have cupolas, and there is a still greater display in that way in the church of San Giovanni degli Eremiti, which it is hard to believe never was a mosque. It is the only church in Palermo with a bell-tower, itself crowned with a cupola.

Most of these buildings are witnesses in different ways to the peculiar position of Palermo in the 12th century as the "city of the threefold tongue," Greek, Arabic, and Latin. Elements from all three sources may be seen, and inscrip- tions abound in all three ae King Roger's sun-

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dial in the palace is commemorated in all three, and it is to be noticed that the three inscriptions do not translate one another. In private inscriptions a fourth tongue, the Hebrew, is also often found. For in Palermo, under the

Norman kings, Christians of both rites, Mussulmans, and

Jews were all allowed to flourish after their several fashions. This distinguishes Palermo from some other Sicilian cities which belonged wholly or mainly to one people—Greek, Latin, or Saracen. In many of the early churches of Palermo it is easy to see that they were first designed for the Greek rite, which was gradually supplanted by the Latin. The abiding connexion of Palermo with the races of south-eastern Europe comes out in several other shapes. In Saracen times there was a Slavonic quarter on the southern side of the city, and there is still a colony of United Greeks, or more strictly Albanians, who sought shelter from the Turks, and who keep their national religious usages.

The series of Christian-Saracen buildings is continued in the country houses of the kings which surround the city, La Favara and Mimnerno, the works of Roger, and the better known Ziza and Cuba, the works severally of William the Bad and William the Good. The Saracenic architecture and Arabic inscriptions of these buildings have often caused them to be taken for works of the ancient emirs; but the inscriptions of themselves prove their date. Different as is their style, their mere shape is not very unlike that of a contemporary keep in England or Normandy.

All these buildings are the genuine work of Sicilian art, the art which had grown up in the island through the presence of the two most civilized races of the age, the Greek and the Saracen. Later in the 12th century the Cistercians brought in a type of church which, without any great change of mere style, has a very different effect, a high choir taking in some sort the place of the cupola. The greatest example of this is the neighbouring metro-politan church of Monreale; more closely connected with Palermo is the church of San Spirito, outside the city on the south side, the scene of the Vespers. Palermo is full of churches and monasteries of later date, as in Saracen times it was crowded with mosques. But only a few are of any architectural importance, and they often simply range with the houses.

Domestic and civil buildings, from the 12th century to the 15th, abound in Palermo, and they present several types of genuine national art, quite unlike anything in Italy. The later houses employ a very flat arch, the use of which goes on in some of the houses and smaller churches of the Renaissance, some of which are very pleasing. But the general aspect of the streets is later still, dating from mere Spanish times. Still many of the houses are stately in their way, with remarkable heavy balconies. The most striking point in the city is the central space at the cross- ing of the main streets, called the Quattro Cantoni. Here the eye catches the mountains at three ends and the sea at the fourth. But none of the chief buildings come into this view, and the intersecting streets suggest a likeness, which is wholly deceptive, to the four limbs of a Roman chester. “Two indeed of the four are formed by the ancient Via Marmorea, but the Via Macqueda, which supplies the other two, was cut through a mass of small streets in Spanish times.

The city walls remain during the greater part of their extent, but they are of no great interest. The gates also are modern, — The best is Porta Nuova, near the king's palace, built in 1584 to commemorate the return of Charles V. fifty years earlier, The design is far better than could have been looked for at that time. Outside the walls, in the immediate neighbourhood of the city, there are, besides

the royal country houses and the church of San Spirito, several buildings of the Norman reigns. Among these are the oldest church in or near Palermo, the Lepers' church founded by the first conqueror or deliverer, Count Roger, and the bridge over the forsaken stream of the Oreto, built in King Roger's day by the admiral George. There are also some later medizeval houses and towers of some importance. These all lie on to the south of the city, to. wards the hill called Monte-Griffone (Griffon = Greek), and the Giant's Cave, which has furnished rich stores for the paleontologist. On the other side, towards Pellegrino, the change in the ancient haven has caused a new one to grow up, but there is little of artistic or historic interest on this side.

Besides works dealing with Sicily generally, the established Jocal work on Palermo is Descrizione di Palermo Antico, by Salvatore Morso, Palermo, 1827. Modern researeh and criticism have been applied in Die Mittelalterliche Kunst in Palermo, by Anton Springer, Bonn, 1869; Historische Topographie von Panormus, by Julius Sehubring, Litbeek, 1870; Studii di Storia Palermitana, by Adolf Holm, Palermo, 1880. See also ‘‘ The Normans in Palermo,” in the third series of Historical Essays, by E. A. Freeman, London, 1879. The deseription of Palermo in the second volume of Gsel- fels's guide-book, Unter-Italien und Sicilien, Leipsic, leaves nothing to wish for. (E. A. F.)

PALES, an old Italian deity, worshipped in the festival of the Palilia at Rome on the 21st April. Like most of the ancient Italian deities, Pales is little more than a name to us; the authorities are at variance whether the name belonged to a goddess or toa god. In this festival Pales was invoked to grant protection and increase to flocks and herds; the worshippers entreated forgiveness for any unintentional profanation of holy places of which they

might have been guilty, and sprang through fires of straw as a purificatory rite. The German Jfacfeuer, which remained in use till a very recent date, was a precisely similar custom; the intention was to propitiate the wrath of the deity for any neglect of her service before the sum- mer began, and so ensure her favour to the flocks. The foundation of Rome, dies natalis Romx, was commemorated on this same day,—a custom still kept up. The name Palilia is often written, by dissiniilation, Parilia.

PALESTINE. As Palestine, geographically considered, forms the southernmost third of Syrra, its general geogra- phical relations, as well as its geological structure, its botany, &c., will be treated under that heading. In the matter of climate, on the other hand, it holds a more or less independent position; and this is more strikingly the case with its ethnographic characteristics, at least so far as the pre-Christian period is concerned. Purely historical questions have already been discussed in the article ISRAEL.

By Palestine is to be understood in general the country seized and mainly occupied by the Hebrew people. That portion of territory is consequently excluded which they held only for a time, or according to an ideal demarcation (cf. Numbers xxxiv., from the older source) by which the land of the Israelites was made to extend from the “river of Egypt” to Hamath ; but, on the other hand, that other ancient tradition is accepted which fixes the extreme borders at Dan (at the foot of Hermon) in the north and at Beersheba in the south, thus excluding the Lebanon district and a portion of the southern desert. In like manner, though with certain limitations to be afterwards mentioned, the country east of Jordan stretched from the foot of Hermon to the neighbourhood of the Arnon. Towards the west the natural boundary—a purely ideal one so far as occupation by the Israelites was concerned— was the Mediterranean, but towards the east it is difficult to fix on any physical feature more definite than the beginning of the true steppe region. ‘That the territory of Israel extended as far as Salcah (east of Bosra at the foot of the Hauran Mountains) is the statement of an ideal rather

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than an historical frontier (Josh. xiii. 11). Palestine thus lies between 31° and 33° 20’ N. lat.; its south-west point is situated about 34° 20’ E. long.,

some distance south of Gaza (Ghazza), its north-west point about 35° 15’ E. long., atthe mouth of the Litany (Kasimfye). As the country west of the Jordan stretches east as far as 35° 35’ it has a breadth in the north of about 23 miles and in the south of about 80 miles. Its length may be put down as 150 miles; and, according to the English engineers, whose survey included Beersheba, it has an area of 6040 square miles. For the country east of the Jordan no such precise figures are available. The direct distance from Hermon to Arnon is about 120 miles, and the area at the most may be estimated at 3800 square miles. The whole territory of Palestine is thus of very small extent, equal, in fact, to not more than a sixth of England. The classical writers ridicule its insignificant size.

General Geography.—Palestine, as thus defined, consists of very dissimilar districts, and borders on regions of the most diverse character. To the south lies a mountainous desert, to the east the elevated plateau of the Syrian steppe, to the north Lebanon and Anti-Libanus, and to the west the Mediterranean. In the general configuration of the country the most striking feature is that it does not rise uninterruptedly from the sea-coast to the eastern plateau, but is divided into two unequal portions by the deep Jordan valley, which ends in an inland lake (see JorDAN). Nor does the Jordan, like the Nile in Egypt, simply flow through the heart of the country and form its main artery ; it is the line of separation between regions that may almost be considered as quite distinct, and that too (as will afterwards appear) in their ethnographic and political aspects. This is especially the case in the southern sections of the country; for even at the Lake of Tiberias the Jordan valley begins to cut so deep that crossing it from either direction involves a considerable ascent.

The country west of Jordan is thus a hilly and moun- tainous region which, forming as it were a southward con- tinuation of Lebanon, slopes unsymmetrically east and west, and stretches south, partly as a plateau, beyond the limits of Palestine. The mountain range consists of a great number of individual ridges and summits, from which valleys, often rapidly growing deeper, run east and west. Towards the Mediterranean the slope is very gradual, especi- ally in the more southern parts, where the plain along the coast is also at its broadest. About three-fourths of the cis-Jordan country lies to the west of the watershed. Towards the Dead Sea, on the

other hand, the mountains end in steep cliffs; and, as the Jordan valley deepens, the country draining towards it sinks more abruptly, and becomes more and more inhospitable. The plateaus back from the coast-cliffs of the Dead Sea have been desert from ancient times, and towards the east they form gullies of appalling depth. On the other side of the Jordan the mountains have quite a different character, nising from the river gorge almost everywhere as a steep wall (steepest towards the south) which forms the edge of the great upland stretching east to the Euphrates.

Geology.—The mountains both east and west of the J ordan consist in the main of Cretaceous limestone ; num- mMulitic limestone appears but rarely, as on Carmel, Ebal, and Gerizim. Towards the Dead Sea the rock is traversed by hornblende and flint. Formations of recent origin, such as dunes of sea-sand and the alluvium of rivers and lakes, cover the western margin of Palestine (i.e., the whole of Philistia and the plain of Sharon) and the entire valley of the Jordan. Plutonic or volcanic rocks occur occasionally in the country east of Jordan; less frequently in the Country to the west, as, for example, in the mountains round the plain of Jezreel.

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Physical Divisions,—The mountain system west of Jordan must be broken up into a number of separate groups, which, it may be remarked, are of political as well as physical significance. A first group, consisting of the country north of the plain of Jezreel, may be subdivided into a large northern portion with summits reaching a height of 4000 feet, and a smaller southern portion not exceeding 2000 feet. The former, the Upper Galilee of antiquity, is a mountainous region with a somewhat intricate system of valleys, stretching from the Kadsimfye in the north toa line drawn from Acre (“Akka) towards the Lake of Tiberias. Of the valleys (more than thirty in number) which trend westwards to the Mediterranean, the Wadi Hubeishtye, Wadi “Ezztye, and Wadi el-Kurn deserve to be mentioned. Not far west of the watershed is a plateau-like upland draining northwards to the Kdsimiye. The slope to the Jordan is steep. Jebel Jermak, a forest-clad eminence 3934 feet above the sea, is the highest massif. The whole territory is fruitful, and forms decidedly one of the most beautiful as well as best-wooded districts of Palestine. The plain along the Mediterranean is on the

average hardly a mile broad ; between cliffand sea there is at times barely room for a narrow road, and at some places indeed a passage has had to be cut out in the rock. South of Ras en-Nakiura, on the other hand, this plain widens con- siderably ; as far as Acre the portion named after this town is about 4 miles broad.

The mountain structure of the second subsection, or Lower Galilee, is of a different character,—low chains run- ning east and west in well-marked lines, and enclosing a number of elevated plains. Of these plains the most im- portant is that of Buttauf (plain of Zebulun or Asochis), an extremely fertile (in its eastern parts marshy) depression 9 miles long and 2 broad, lying 400 to 500 feet above the sea, between hills 1700 feet high. To the south-west, about 700 feet above the sea, is the smaller but equally fertile plain of Tor‘an, 5 miles long and 1 mile broad. Among the mountains the most conspicuous landmarks are Nebi Sa‘in (1602) near Nazareth, Jebel es-Sth (1838), and especially, to the east of this last, Jebel et-Tur or Tabor (1843), an isolated wooded cone which rises on all sides with consider- able regularity, and commands the plain of Esdraelon. Eastwards the country sinks by a succession of steps: of these the lava-strewn plateau of Sahel el-Ahma, which lies above the cliffs that look down on the Lake of Tiberias, but is 300 feet below the level of the Mediterranean, deserves mention. The principal valleys of the whole region are (1), towards the west, the great basin of Nahr Na‘mdn (Belus of the ancients), whose main branch is Wadi Khalztin, known in its upper course as Wadi Sha’‘fb or Wadi Khashab, and, farther south, the basin of the Wadi Melek (Wadi Rumméni), which flows into the Nahr el- Mukatta‘ (Kishon); and (2) towards the east the rapid-flowing Wadi Rubuditye, Wadi el-Hamam, and Wadi Fejjas.

A certain connexion exists between the plains already mentioned (those of Buttauf, Acre, &c.) and the great plain which, with an average height of 250 feet above the sea, stretches south from the mountains of Galilee and separates them from the spurs of the mountains of Samaria (the central portion of the cis-Jordan country). This great plain, which in ancient times was known as the plain of Megiddo, and also as the valley of Jezreel or plain of Esdraelon, and which now bears the name of Merj Ibn ‘Amir (pasture land of the son of “Amir), is one of the main features of the whole cis-Jordan region (Josephus called it the Great Plain par excellence), and

presents the only easy passage from the coast districts to the Jordan valley and the country beyond. The larger portion lies west of the watershed, which at El-‘Afule is 260 feet above

the Mediterranean. In the narrower application of the name, the whole plain forms a large triangle with its southern corner near Jennin and its western near the mouth of the gorge of the Nahr el-Mukatta‘ (for here the hills of Nazareth shoot out towards Carmel); and connected with it are various small plains partly running up into the hills. The plain to the south of Acre, in which marshes are formed by the Kishon and Na‘mén, and various other recesses towards north and east really belong to it. To the north-east stretches a valley bounded in one direction by Jebel Duhy (the Lesser Hermon, a range 15 miles long and 1690 feet high) and in the other direction by the hills of Nazareth and Mount Tabor (where lie Iksal and Deburlye); then to the east of the watershed lies the Bire valley, and the well-watered Wadi Jalud from Zer‘in (Jezreel) falls away towards the Jordan between the slopes of Jebel Duhy and the more southern range of Jebel Fuku‘a (Mountains of Gilboa). And finally towards Jennin in the south lies the secondary plain of ‘Arrane. Quite recently it has been proposed to construct in the Merj Ibn ‘Amir the beginning of a railway system for Palestine, and to turn to account the wonderful fertility of its rich basaltic loam which now lies almost completely waste, though in ancient times the whole country was densely peopled and well-cultivated.

To the south of the plain of Jezreel, which belongs to the northern system of Palestine, it is much more difficult to discover natural divisions. In the neighbour- hood of the watershed, which here runs almost regularly in great zigzags, lie a number of plains of very limited extent :—the plain of ‘Arraébe (700 to 800 feet above the sea) connected south-east with the Merj el-Ghuruk, which having no outlet becomes a lake in the rainy season; the plain of Fendekumtye (1200 feet) ; and the plain of Rujib, east of Shechem, connected with the plain of Mukhna (1600 to 1800 feet) to the south-west. The highest mountains too are generally near the watershed. In the east lies the south-westward continuation of Gilboa. In the west Mount Carmel (highest point 1810 feet, monastery 470) meets the projection of the hills of

Nazareth, and sends its wooded ridge far to the north-west so as to form the southern boundary of the Bay of Acre, and render the harbour of Haifa, the little town at its foot, the best on all the coast of Palestine. The belt of land along the shore, barely 200 yards wide, is the northern end of the lowland plain, which, gradually widening, stretches south towards Egypt. At Athlit (9 miles south) it is already 2 miles broad, and it continues much the same for 21 miles to the Nahr ez-Zerka (named by the ancients after the crocodile which is still to be found in its marshes), where a small ridge El-Khashm projects from the highlands. South of Nahr ez-Zerka begins the marvellously fertile plain of Sharon, which with a breadth of 8 miles near Czesarea and 11 to 12 milesnear Yafa (Jaffa), stretches 44 miles farther to the Nahr Rubin, and slopes upwards towards the mountains to a height of about 200 feet above the sea. Its surface is broken by lesser eminences, and ee by a few coast streams, notably the Nahr el-

alik, _ Between the maritime plain and the mountains proper lies a multiform system of terraces, with a great number of small ridges and valleys. In this the only divisions are those formed by the basins of the larger wadis, which, though draining extensive districts, are here too for the most part dry. They all have a general east and west direction. First comes the basin of the Nahr Mefjir, bounded south by the Bayazid range, and debouching a little to the south of Cesarea ; and about 5 miles farther south is the mouth of the Iskandertine, which is distin- guished in its upper portion as the WAdi Sharir, running

east as far up as Nabulus (Shechem), hardly a mile west of the watershed. It is in this neighbourhood that we find the highest portions of the mountains of Samaria—Jebe] Eslamiye or Ebal, 3077 feet high, to the north of Shechem, and Jebel et-Tur or GERiziM (q.v.), 2849 feet high. Both are bare and rugged, and consist, like all the loftier eminences in the district, of hard limestone capped with chalk. It was generally possible, however, to carry cultivation up to the top of all these mountains, and in ancient times the highlands of Samaria are said to have been clothed with abundant forest. From the watershed eastward the important Wadi Fara (also known as Wadi Kerdwa in its lower course) descends to the J ordan. Returning to the

western slope, we find to the south of Nahr el-Falik the basin of the‘ Auja, which after it leaves the hills is fed by perennial (partly palustrine) sources, and falls into the sea 5 miles north of Jaffa. As at this place the watershed bends eastward, this extensive basin stretches proportionally far in that direction; and, the right side of the Jordan valley being also very broad, the mountains of the eastern slope soon begin to sink rapidly, On the watershed, not far from Jifna, lies Tell Astir (3378 feet), and with this summit of hard grey limestone begin the hills of ancient Judah. South of the ‘Auja comes the Nahr Rubin (near Jabne), perennial up to the Wadi Surdr (Sorek of Scripture ?), and reaching, as Wadi Bét Hanina, as far as the country north of Jerusalem; the Wadi el- Werd is one of its tributaries. Farther south begins the maritime plain of Philistia, which stretches 40 miles along the coast, and, though now but partially under cultivation, consists of a light brown loamy soil of extraordinary fertility. It is crossed by numerous ridges of hills; and to the south of Ashdod (Ezdud) the highlands advance westwards, and form a, hilly district composed of horizontal strata of limestone, sometimes considered part of the lowlands (Shephela), and separated from the more elevated region in the interior by a ridge more or less parallel with the line of the watershed. ‘The basins to the south of the Rubin are those of Wadi Sukereir, which runs up towards Tell-es-Safi in one direction and to Bét Jibrin in another, of Wadi el-Hesy, and finally of WAdi Ghazza, which forms the proper boundary of Palestine towards the south, runs past Beersheba as Wadi es-Seba, and receives the Wadi el-Khalil (Hebron) from the north-east.

As regards the central parts of the country, the mountain- ous district north of Jerusalem is now known as Jebel el- Kuds, of which the loftiest point is the summit of the Nebi Samwil (2935), rising above the plateau of El-Jib. Near Jerusalem the watershed lies at a height of about 2600 feet. Wild deep-sunk valleys descend eastwards to the Jordan ; the Wadi Kelt, Wadi en-Nar (Kedron valley), Wadi ed-Dereje, and southernmost Wadi Seyal deserve to be mentioned. The country sloping to the Dead Sea falls in a triple succession of terraces,—a waterless treeless waste (in ancient times known as the desert of Judah), which has never been brought under cultivation, but in the first Christian centuries was the chosen abode of monasticism. To the north of Hebron, in the neighbour- hood of Hulhul, lie the highest elevations of this part of the central highlands (up to 3500 feet), which may

be distinguished as the mountains of Hebron. Towards Yutta (Juttah) in the south is a sudden step; there begins a plateau at a height of about 2600 feet, but 500 feet below the Hebron watershed. It consists of open wolds and arable land, the soil being a white soft chalk ; but there are no wells. Southward another step leads to the white marl desert of Beersheba, abounding in caves. In ancient times this southern district was called the Negeb 3 it extends far to the south, but is properly a part of Palestine. The country was in former times a steppe region without

definite boundaries, and consequently the abode of nomadic herdsmen.

The Jordan valley having already been described in a separate article (vol. xiil. p. 746), we may pass at once to a brief sketch of the physical character of the country east of Jordan (compare also the article GILEAD, vol. x. p. 594). This‘is a more difficult task for several reasons : first, no connected series of investigations and measure- ments has been made in this region; and, secondly, as the ideal demarcation of the book of Joshua is a hardly sufficient basis on which to build, and the information about the actual state of matters supplied by other ancient sources is insufficient, it is impossible to determine the limits of the country as far as it was occupied by the Israelites.

In the opinion of the present writer, the plain of BasHAN (q.v.) can hardly be assigned to Palestine. To the south of the Yarmuk (Hieromax of the Greeks and Romans, Hebrew name unknown), which falls into the Jordan below the Lake of Tiberias, begins the Cretaceous formation ; only in the east of the country the basalt of the Hauran territory stretches farther south. Ascending from the Yarmuk, we first of all reach a mountainous district of moderate elevation (about 2000 feet) rising towards the south ; this is Jebel “Ajluin, which abounds in caves, and, according to recent explorers, is extremely well watered and of great fertility—the whole surface being covered with pasture such as not even Galilee can show. East- wards are massive ridges as much as 4000 feet in height —Jebel Kafkafa and especially Mardd—separating this territory from the waterless desert lying at no great depth below. The plateau stretches away to the south of the deep gorge of the perennial Zerka (Jabbok), and reaches a considerable height in

Jebel Jil‘4d (Gilead in the stricter sense). The landmark of the region is Jebel ‘Osha, to the north of Es-Salt, so-called from the traditional tomb of Hosea. From the deep-sunk Jordan valley the mountains rise grandly in terraces, partly abrupt and rocky ; and, while fig trees and vines flourish down in the lower levels, valonia oaks, Laurus Pinus, cedars, and arbutus grow on the declivities. Owing to its perennial springs, the interior terrace of the country, Mishdr, is a splendid pasture land, famous as such in ancient times; and abundance of wood and water renders this whole middle region of the trans- Jordan country one of the most luxuriant and beautiful in Palestine. Only a few individual summits, such as Jebel Neb’ (Mount Nebo), are noticeable in the ridges that descend to the Jordan valley. The country from the Zerka southward to the Méjib (Arnon) is now known as El Belka; and beyond that begins the land of Moab proper, which also consists of a steep mountain-wall through which deep gorges cut their way to the plain, and behind this of a plateau poorly watered but dotted over with ancient ruins. In this district, too, there are a few individual summits. And here also a mountain-wall Separates the plain from the eastern desert; and the mountain district continues farther south along the Araba (of. IpumRa, vol. xii. p. 699).

Water.—Palestine is not exceptionally deficient in water. Perennial Streams, indeed, are scarce, and were so in antiquity ; but except in certain districts, as the desert of Judah, the country is not badly supplied with springs. Tn keeping with the structure of the rocks, these usually break out at the junction of the hard and soft strata. Thus abundant springs of good water occur on the very summit of the cis-Jordan country, as, for example, near Hebron, at Nabulus, and in Galilee ; and, though few are found in the immediate neighbourhood of Jerusalem, more than forty may be counted within a radius of 15 to 20 miles round the city. There is no water in the low hilly

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country behind the coast region; and, though in its northern portion some fairly large streams take their rise, the same is true of the coast-region itself. Rising as they do at the foot of a great mountain range, the most abundant springs in Palestine are those of the Jordan, especially those near Banias

and Tell-el-Kadi. The mountains of Gilead are rich in excellent water. A considerable number of hot springs occur throughout the country, especially in and near the Jordan valley; they were used in ancient times for curative purposes, and might still be so used. The water of the bath of E]-Hammam, about 2 miles south of Tiberias, has a temperature of 137° Fahr., and the spring near the Zerka Main, formerly known as Callirrhoe, as much as 142° Fahr. Hot sulphur springs also occur on the west coast of the Dead Sea. Many of the springs in Palestine are slightly brackish. From the earliest times cisterns have naturally played a great part in the country ; they are found everywhere in great numbers. Generally they consist of reservoirs of masonry widening out downwards, with a narrow opening above often covered with heavy stones. Open reservoirs were also constructed to collect rain and spring water. Such reservoirs (pools; Arab., birka; Hebrew, berékha) are especially numerous near Jerusalem and Hebron; the largest still extant are the three so-called Pools of Solomon, in Wadi Urtas (Artas), arranged in steps at a little distance from each other. Besides the conduits connected with this gigantic work, fine remains of aqueducts of Roman date are found near Jericho, in the ruins of many towns in the trans-Jordan country, at Sefurfye (Sepphoris) in Galilee, in ancient Cesarea, &c. Many of these aqueducts, as well as many now ruined cisterns, could be restored without much trouble, and would give a great stimulus to the fertility and cultivation of the country.

Climate and Vegetation.—Palestine may be considered part of the subtropical zone. At the summer solstice the sun stands 10 degrees south of the zenith; the shortest day is thus one of ten hours, the longest of only fourteen. In a few points, as already remarked, there is a difference between Palestine and the rest of Syria. The extensive maritime plain and the valley of the Jordan give rise to important climatic contrasts. From its vicinity to the sea the former region is naturally warmer than the highlands. The mean annual temperature is 70° Fahr., the extremes being 50° and 85°. The harvest ripens two weeks earlier than among the mountains. Citrons and oranges flourish ; the palm also grows, but without fruiting; melons are largely cultivated; and pomegranate bushes are to be seen. Less rain falls than in the mountains. Another climatic zone consists of the highlands (from 500 to 3000 feet above the sea), which were the real home of the Israelites. The average temperature of Jerusalem, which may be taken as

pretty much that of the upland as a whole, is 62°, but the extremes are considerable, as the thermometer may sink several degrees below the freezing point, though frost and snow never last long. The rain- fall of 20 inches is distributed over about fifty days. In this climate the vine, the fig, and the olive succeed admir- ably. Even in the southernmost districts (of the Negeb), as well as throughout the whole country, there are traces of ancient wine-growing. A large share of the oil is consumed at home, partly in the manufacture of soap. The mountain ridges in this zone are for the most part bare, but the slopes and the valleys are green, and beauty and fertility increase as we advance northwards. In regard to the climate of the third zone, see JoRDAN (vol. xill. ut sup.). The barley harvest here ends with the middle of April. The thermometer rarely sinks below 77°, and goes as high as 130°. The fourth zone, the elevated plateau of the trans-Jordan region, has an extreme climate.

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The thermometer may frequently fall during the night below the freezing point, and rise next day to 80°. The mountains are often covered with snow in winter. Whilst the rainfall in the Jordan valley is very slight, the pre- cipitation in the eastern mountains is again considerable ; as in western Palestine the dewfall is heavy. From this short survey it appears that Palestine is a country of strong contrasts. Ofcourse it was the same in antiquity; climate, rainfall, fertility, and productiveness cannot have seriously altered. Even if we suppose that there was a somewhat richer clothing of wood and trees in the central districts of the country, yet on the whole the general appearance must have been much the same as at present. To the stranger from the steppes arriving at a favourable season of the year Palestine may still give the impression of a land flowing with milk and honey. The number of cisterns and reservoirs is proof enough that it was not better supplied with water in ancient times; but, on the other hand, the numerous ruins of places which were still flour- ishing during the Roman period show that at one time (more especially in the southern districts, which now possess but few inhabited localities) cultivation must have been carried on more extensively and thoroughly. In general the country enjoyed the greatest security, and con- sequently the greatest prosperity, under Western rule, which even protected the country east of Jordan (at present

partly beyond the control of the Government) from the inroads of the Bedouins. The Romans also did excellent service by the construction of roads, portions of which (as well as Roman milestones and bridges) still exist in good preservation in many places. Thus it cannot be denied that the resources of the country were formerly better developed than at present. Like all the lands of the nearer East, Palestine suffers from the decay of the branches of industry which still flourished there in the Middle Ages. The harbours are not of sufficient size for large vessels; that of Haifa alone is capable of any development. The road from Yafé to Jerusalem is the only one in the country fit for carriages. The proposal to construct a railway along this route (for which a firman was granted in 1875) is renewed from time to time; but it will be hard to carry it out, as, in spite of the pilgrims (who, besides, are restricted to one period of the year), the passenger traffic is not large enough to be remunerative, and commercial traffic there is almost none. At the same time the formation of means of communica- tion would increase the productiveness of the country. The culture of olives and export of oil are especially capable of expansion. As regards the industrial arts, souvenirs for the pilgrims, rosaries, carved work in olive wood and mother-of-pearl, &c., are produced at Jerusalem and Bethlehem, and to some extent are exported. Wheat from the Hauran is also shipped at Acre and elsewhere, but neither exports nor imports are commercially important. The salt farming, which could easily be carried on at the Dead Sea and the deposit of salt to the south of it, is hampered by the difficulty of bringing the produce up the steep paths to the top of the mountains. In the valley of the Jordan all the products of the tropics could with little trouble be cultivated. Bee-keeping still receives attention, but might also be extended.

Political Geography.—Evidence of an early occupation of Palestine is afforded by the stone monuments (cromlechs and circles of stones), which are found more especially in the country east of Jordan, but also in the country to the west. ‘To what period they belong in this part of the world is as doubtful as it is elsewhere ; but it may be remarked that stories of a gigantic primeval population once prevailed in Palestine. To what race these people may have belonged is, however, unknown. For thousands

of years Palestine was an object of conflict between the vast monarchies of western Asia. As Egypt, whenever she sought to extend her power, was from the very position of the country naturally led to make herself mistress of the east coast of the Mediterranean, so, on the other hand, there were no physical boundaries to prevent the westward advance into Palestine of the Asiatic empires. For both Egypt and the East indeed the country formed a natural thoroughfare, in time of war for the forces of the contend. ing powers, in time of peace for the trading caravans which carried on the interchange of African and Asiatic merchandise.

One of the oldest of the still extant historical documents in regard to the geography of Palestine is the inscription on the pylones of the temple of Karnak, on which Thothmes ITI. (in the beginning of the 16th century B.c.) has handed down an account of his military expedition to western Asia. Many of the topographical names of Palestine there mentioned are certainly hard to identify ; a number, how- ever, such as Iphu for Yaf4, Luden for Lydda, Magedi for Megiddo, &c., are beyond dispute. The lists show that these names are of extreme antiquity, dating from before the Hebrew immigration. There is also a hieratic papyrus of the 14th century B.c., which contains a description of a carriage journey through Syria made by an Egyptian officer, possibly for the collection of tribute. Bethshean and the Jordan, among other localities, appear to be men- tioned in this narrative, but the identification of most of the names is very dubious. Another foreign source of in- formation as to the geography of Palestine can only be alluded to—the records contained in the cuneiform inscrip- tions, which mention a number of the most important towns:—Akku (Akko, Acre), Dwru (Dor), Magidu (Megiddo), Yappu (Jaffa), Asdudu (Ashdod), Iskaluna (Askalon), Hazzatu (Ghazza, Gaza), Altaku (Eltheke), Ursalimmu (Jerusalem), and Samarina (Samaria), and— of course only from the 8th century, when they came into hostile contact with Assyria—the countries of Judah, Moab, Ammon, and Edom.

The information supplied by the Old Testament enables us to form only an extremely imperfect conception of the earliest ethnographic condition of the country. The population to the east of the Jordan was already, it is clear, sharply marked off from that to the west. In the latter region dwelt an agricultural people which had already reached no inconsiderable degree of

civilization. Closely related to the Phoenicians, they were distinguished as Canaanites from the name of their country, which originally applied to the maritime belt and afterwards to the whole cis-Jordan territory (vol. iv. p. 62), Though for particular reasons they are placed among the Hamitic races in Gen. x., many modern investigators are of opinion that, according to our principles of ethnographic classifica- tion, they were Semitic; their language, at any rate, was very similar to Hebrew. The separation of Canaanites from Semites may have been due, in part at least, to the fact that a deep contrast made itself felt' between them and the Hebrews, though they were only, perhaps, an older result of Arabic emigration. The enumeration of the names of the various branches of the Canaanites leaves it an extremely difficult task to form a clear idea of their tribal distribution ; names of separate sections, 100, like that of the Amorites, are sometimes applied to the Canaanites as a whole. The Amorites were at any rate the most powerful tribe; they' dwelt in the southern portion of Canaan, as well as more especially in the northern parts of the country east of Jordan. About the others nothing more can be said save that the Perizzites, Hivites, and Girgashites dwelt in the heart of Canaan and the Jebusites near Jerusalem. The Philistines occupied

the south-west of the country; an Arabian population was settled in the south and south-west. Amalekites and Midianites, and the Kenites, a branch of the latter, early entered into close relationship with the Israelites, and along with them took possession of the extreme south, where, however, they remained nomadic. Of peoples closely akin to the Israelites may be mentioned the Moabites, the Ammonites, and the Edomites. Before the arrival of the Israelites the Moabites had developed a certain degree of power. The district, bordering on Edom, which they occupied in the south of the country east of Jordan, was pounded on the south by Wadi el-Ahsa (called in Is. xv. 7 the brook of the willows), an affluent of the southern part of the Dead Sea, and on the north stretched far beyond the Arnon (originally, indeed, to the north end of the sea, as in later times the country near Jericho was known as the steppes of Moab). Its eastern frontier must always have been matter of dispute, the relations of the nomadic tribes of the Syrian desert being the same as they are now, and contests with the

Ammonites taking place from time to time. The Ammonites, a closely related people, lay to the north-east of Moab, east of the later possessions of Israel; but, as they were in the main nomadic, their frontiers were of a shifting character (see yol.i. p. 742). The Edomites (also nomadic) were situated in the south of the country east of Jordan ; how far, at an earlier period, they extended their encampments to the west of Jordan and into the Negeb district cannot be with certainty decided.

It depends on the conception we form as to the general tribal relations of Israel how we represent to our- selves the method in which the settlement of the country by the tribes was accomplished as they passed from the nomadic to the fixed mode of life (cf. IsranL, JosEPH, Jupau). To explain this tribal relationship is not the task of a geographical sketch; it is enough for the present pur- pose to call attention to the fact that the account of the rise of the Israclitic tribes as it has come down to us is in great measure mythical or the product of later reflexion ; even the number twelve is made out only with difficulty. Further, the settlements of the several tribes must be by no means conceived as administrative districts after the fashion of the modern canton ; and, thirdly, the view that the several tribes had, after a general invasion of the country, their tribal territories allotted by Joshua (as we now read in the book of Joshua) is taken from the most modern, post-exilic, source of the Hexateuch, and stands in glaring opposition to the accounts in other books, according to which the conquest was in the main a peaceful one, and the assimilation with the native Canaanites gradually effected. The tribes which settled to the north of the great plain, especially those on the sea-coast, appear to have been much less successful in keeping free from Canaanitish influence; gradually, however, as the state and religion of Israel grew stronger, Israelitish influence made its way more and more even there. The heart of the country was the central portion later known as Samaria. The opposition between this district and the southern part of the country took shape at an early date. In the extreme south the Simeonites retained their nomadic way of life, and were by degrees mixed up with other wandering tribes. Down into the time of the early kings the dominion of the powerful Philistines stretched far into the centre of the country, and gave the first impulse to a firmer concentration of the energies of Israel. But the Israelites did not succeed in forcing their way in the southern regions down to the sea ; in culture and well- established political

institutions they were far surpassed a the Philistines. As regards the geography of the

ilistine territory, the position of four of their chief

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towns, Gaza, Askelon, Ashdod, and Ekron, is known ; but it has not been ascertained where the fifth, Gath, was situated, though it must have lain not far from the present Bét Jibrin.—No definite boundaries can be assigned to the Israelitic country to north, south, or west.

Up to the conquest of Jebus the most important city of the southern region was undoubtedly Hebron (see vol. xi. p- 608). Clans belonging to Judah had there combined with others of alien origin; and the portions of this tribe which dwelt in the farthest south had become mingled with elements from the tribe of Simeon, while on the other hand the Simeonites acquired certain places in the territory of Judah. In regard to the south country in general, we obtain in the Old Testament the most detailed description of the frontiers, but the reason that weare able to follow it with so much accuracy is that the statements refer exclusively to post-exilic times, though it must be assumed that a certain recollection was still preserved of the original boundary between Judah and Benjamin. The line of the marches of the northern tribes, as indeed this whole system of demarcation, frequently follows the configuration of the ground, but occasionally becomes vague and doubtful. Especially striking is the omission of the districts of Samaria ; it seems that at the time of the codification of the system this district was little known to the Judxans. A great deal of trouble has been expended—more especially since the rise of a more scientific exploration of the country—in verifying the old placenames which are known from the Bible, the writings of Eusebius, and the Talmud. The task is rendered much easier by the fact that in Palestine, as in every country where the ethnographic conditions have not been too violently revolutionized, a large number of ancient names of places have been preserved in use for thousands of years, often with only insignificant changes of form—a state of matters to which the continuous existence in the country of Semitic-speaking people has powerfully contributed. The identification of the ancient with the modern names demands none the less thorough historical and philological investigation.

Through the labours of Robinson and Guérin we now possess a list of the names in use at least in the country west of Jordan. The list of six thousand names collected during the English survey by Licuts. Conder and Kitchener is particularly rich,—though it must be borne in mind that the orthography in many cases has not been determined with sufficient accuracy, and that a revision of the collection on the spot by a trained Arabic scholar would be desirable. By the help of this abundant material many of the ancient place-names can undoubtedly be assigned to their localities, and in part at least the direction of the tribal boundaries as they were conceived by the author of the lists preserved in the book of Joshua can be followed. In regard to a large number of places, Joshua leaves us to mere conjecture ; and the investiga- tions and combinations hitherto effected are (in the opinion of the present writer) far from sufficient for the construc- tion of such a map of ancient Palestine as the Palestine Exploration Fund has published. The difficulties of the case are further increased by the fact that the ancient localities were at an early date fixed by tradition. An undoubted example of this is furnished by the grave of Rachel between Jerusalem and Bethlehem, the localizing of which goes back to an ancient gloss on Gen. xxxv. WW. Even in the case of apparently well-established identi- fications such as Beitin=Bethel, the question may be raised whether in reality artificial tradition may not have been at work, and ancient Bethel have to be sought elsewhere. Too much care, therefore, cannot be brought to bear on the reconstruction of the ancient geography of Palestine.

It lies beyond the purpose of the present article to enter into the | the western slope of the Hauran Mountains. From these facts it details of the ancient tribal demarcation of Palestine, especially as | is evident that in the traus-J ordan region north of the Yarmuk the tradition, as has been explained, is relatively late and artificial. | and east of the Lake of Tiberias, there were at least a few Israelite Asan illustration of our view of the subject we may select the | colonies; but they occupied mercly scattered points, and thus in boundaries of Judah itself (Josh. xv.). Here the first thing that this district also the allotment of the country in the book of Joshua strikes the reader is that the westcrn frontier as there described for | must be regarded as a mere pious wish. Other peoples settled in the earliest times is

purely ideal, inasmuch as it includes the land | the Hauran, and the ever-advancing Arameans soon diminished of the Philistines. Inconsistencies of view are apparent in the | and absorbed these Israelitic possessions. ascription of certain places in Judah to Simeon and of others to Dan. The tribes of Israel made a great step in the conquest of the A further difficulty arises from the discrepancies between the Masso- | country when, under the early kings, they became subject to a retic text and that of the Septuagint in regard to the number of | single central government. They were now strong enough to seize towns belonging to Judah. As regards the southern boundaries many of the walled towns which the Canaanites had hitherto described in Josh. xv. 2 sq., the course of the line, in our opinion, | occupied; and their dominion, indeed, extended far beyond the cannot be determined with certainty even if it were generally | limits of Palestine. Our information in regard to the divisions of admitted that Kadesh-Barnea is to be fixed at ‘Ain Kadis. The | the country during the regal period is very defective. The list of determination of the northern boundary is more explicit: it ran | Solomon’s twelve “ officers” (1 Kings iv.) at least is derived from from the mouth of the Jordan to Beth-hogla (which is found in | ancient sources; but it must be observed that, while the boundaries ‘Ain el-Hajla). The position of Beth-arabah (Beth ha-Araba) | of some of the districts appear to coincide with the tribal boundaries, is doubtful; and at least it has not been absolutely settled | the political division was not based on the tribal. Nor ata later whether Eben Bohan ben Reuben really corresponds to Hajar | date was the line of separation betwcen the kingdoms determined el-Asbah. The identification of Debir with Thughrat-ed-Debr may | simply by the tribal division ; the most that is meant is that Judah be correct. Gilgal, which follows, is unknown. The ascent from } and Benjamin stood on the one side ; of Simeon there is no longer Adummim may correspond with Talat-ed-Dem, which preserves at | any word. In the account given in 1 Kings xi. mention is only least an echo of the older name. It is a mere conjecture which | made of one tribe that remained true to David, by which must places the water of En (Ain) Shemesh in ‘Ain Haudh. The Fuller’s | naturally be understood that of Judah. The limits, in fact, so far Spring, En Rogel, has in recent times been sought in St Mary’s | as they related to the tribal territory of Benjamin, scem to have Well; but, with others, we consider Bir Eiyub a more probable | varicd from time to timc; the northern portion as far as Ramah identification. The position of the

valley of Hinnom and the plain | (1 Kings xv.), or as far as the ravine of Michmash (Mukhmés), of Rephaim has been determined ; Nephtoah corresponds perhaps to | usually belonged to the northern kingdom, and the same was the the modern Lifta. The places situated on Mount Ephron—Baalah | case with Jericho. It was to this kingdom of Israel, also, with and Kirjath-Jearim—cannot be made out any more than the | its general superiority in strength and influence, that all the mountains Seir and Jearim. It may be admitted that Chesalon is | Israelitic districts beyond Jordan were attached. That it con- Kesla and Bethshemesh is ‘Ain Shems, since the direction towards | sisted, however, of ten tribes (1 Kings xii.) is a highly artificial Timnah (Tibna) is imperative. The position of Ekron is ascer- | computation. The small extent of the southern kingdom is evident tained; but it is hazardous to find Shicron in Khirbet Sukereir; | from a list (if indeed it be trustworthy) given in 2 Chron. xi. of the and where Mount Baalah was situated we do not know. Finally, | towns fortificd by Rehoboam. As regards the capitals of the northern Jabniel corresponds to Yebna. From this example it isclear how | kingdom, the royal court was originally at Shechem (Nabulus), from difficult it is with the existing material to determine the ancient | the time of Jeroboam I. at Tirzah (not yet identified), and from the tribal limits, and how necessary it is in such an undertaking to | time of Omri at Samaria (Sebastiye) ; the house of Ahab had its distinguish provisional conjecturcs from well-established identifica- | seat for a season at Jezreel (Zer‘in) (see vol. xiii. p. 689). tion. To carry out this task lies beyond the scope of this article; It is rather an historical than a geographical task to describe in to prove individual points whole treatises require to be written. | detail the boundaries or divisions of Palestine in later times. From Compare the articles on the several tribes and the maps. the lists for the post-exilic period, found in the books of Ezra and

It has already been remarked that the extension given to the | Nehemiah, and containing a series of new topographical names, it tribal territories in the book of Joshua is frequently the mere re- | is evident that a considerable portion of the old tribal territory of flexion of pious wishes. This holds true in general of the territories | Benjamin as well as of Judah was again peopled by Jews,—on the of Zcbulun, Naphtali, and especially Asher ; it is to be particularly | one hand the places from Jericho to Lydda, on the other a strip to remembered that down to a very late date (the time of the

Maccabces) | the north of Bethel down to Beersheba in the south. Gradually, the Israelites were almost entirely shut out from the sea-coast. To | however, Edomites (perhaps pressed upon by Nabateans) foreed the north of the land of the Philistines the maritime plain was in | their way into the southern portion of the country, with the capital the hands of the Pheenicians; the plain to the south of Dor (the | Hebron, so that it obtained the name of Idumcea. modern Tautura) was called Naphoth Dor (hill range of Dor). Before proceeding to the Greco-Roman period it will be well to Even in the New Testament mention is made of a district of Tyre | consider the names by which the country in general was called at and Sidon to which we must not assign too narrow an extension | different times. Gilead was the centre of the power of the Israelites inland. How mattcrs stood in the country east of Jordon it is hard | on the east side of Jordan, and the whole country which they pos- to decide. The stretch from the north of the Dead Sea to the | sessed there bore this name. Gilead consequently is opposed to Yarmuk (practically to the south end of the Lake of Tiberias) was | Canaan, the "Promised Land." For the later Hebrews distinguished the only portion securely held by the tribes of Israel ; here, on the | this western territory as more especially the country which had been Jabbok, in the centre of the trans-Jordan region, the Gadites had | promised them, and regarded it as the possession of their national settled ; here there was an ancient Israelitic district in the neigh- | God, and therefore as a holy land. After the separation the more bourhood of Mahanaim, Jabesh (on the present Wadi Y4bis), | important northern and eastern portion naturally became the land Succoth, Penuel—places whose position for the most part cannot | of Israel par eacellencc, while the southern portion ultimately be determined. From some passages it is evident that the warlike | received the name of the individual tribe of Judah (as indeed the tribe of Gad found it difficult to protect itself against its enemies. | northern kingdom was frequently called after the most powerful Numbers xxxii., a chapter belonging to the older class of sources, | tribe of Ephraim). The name of the southern kingdom appears in throws much light on the conditions under which the country east | Cuneiform inscriptions as mat (ir) Ya-u-du (di); and it is said that of Jordan was occupied, and it represents Reuben and Gad as having | mat Sir'lai occurs once for the land of Israel, though more frequently scized the Moabite territory to the north of the Arnon. We have | it is called m4t Humrt (Land of Omri). Though it has not been in this a picture of a temporary extension

of the territory of Israel, absolutely proved that even the Assyrians occasionally included probably from the time of Omri (compare MoAB). Judah under the designation Palastav or Pilista (Philistia), still there

According to the inscription of King Mesha, the Gadites were | is nothing improbable about the supposition. But it cannot be still in Ataroth; Dibon, on the contrary, was Moabitic; other | taken for granted that the cis-Jordan country bore the name 0 towns, such as Kirjathaim, Nebo, Jahaz, had been conquered by | land of the Philistines at a time when it was the scene of a great Mesha from the Israelites. It is remarkable that the Reubenites | development of the Philistian power; the name was rather, a8 80 are not once mentioned in the inscription. At the date, too, when | often happens, extended by their neighbours from Philistia proper Isaiah xv.—xvi. were written (before the time of Isaiah himself ?), | to the country beyond, and from the Egyptians it passed to the the Moabite dominion was widely extended. From all this it may | Greeks. Inthe Old Testament Peleshet is still always restricted to be concluded that the Reubenites had to carry on a protracted | the Philistine coast-plain ; the same is the case in Josephus ; ane struggle with Moab for the possession of the country,—the walled | in Herodotus, though the usage is not very explicit, Palestina towns being now subject to the one belligerent and now to the appears usually to have no wider application. Gradually, how- other, and the Arnon consequently forming only an ideal boundary. | ever, the designation Palestina Syria, or simply Palestina, got into 7 sheiagt! knowledge of the condition of the scttlements of vogue, and was made to include even the country east of Jordan,

anassch in the country east of Jordan has come down tous. The | and consequently the whole territory between Lebanon and Sinal clan Machir had its seat in Gilead ; and there, too, were the tent- We now return to the divisions of Palestine. Already in the villages of Jair, a clan which also possessed the district of Argob | book of Kings (that is, by the time of the exile) the name in Bashan, situated somewhere to the east of the Lake of Tiberias. | Shomeron (Samaria) is applied to the territory of the northern The Nobah clan was settled in Kenath (the modern Kanawat) on | kingdom, for mention is made of the “ towns of Samaria,” In the

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apocryphal books of the Old Testament, Judea and Samaria (Sapaperris, Zapyaprs, Zapapera) are opposed to each other ; but the limits of the two divisions at the time of Christ, and for centuries previously, can hardly be laid down. Thusin Josephus the Mediter- ranean coas : é

this country was bounded by Idumea ; in the north it extended to about 8 miles to the south of Nabulus (Shechem). Whether Samaria extended from the Jordan to the sea is uncertain; in the north it reached the southern edge of the plain of Esdraelon, the fronticr town being ‘En Gannim (Jennin). Galilee (in regard to which see yol. x. p. 27) was originally the district in the neighbourhood of Kedes, afterwards distinguished as Upper Galilee. The Jewish popu- lation was there largely mixed with Phoenicians, Syrians, Greeks, andeyen Arabs. The whole maritime region to the north of Dor was still called Phoenicia in the time of the Romans, and thus does not strictly belong to Palestine in our sense of the word. Along the coast, as well as more especially in the north of the country, numer- ous Greek colonies were established ; how strong the foreign influ- ence must have been in Samaria and Galilee is evident from the preservation of so many Greco-Roman names like Neapolis (Nabulus), Sebaste (Sebastiye), Tiberias (Tabariye). Elsewhere too, iu the south for example, the old nomenclature was altered: Ablia was substituted for Jerusalem, Azotus formed from Ashdod, and so on; but the old names were always retained in the mouth of the people. The north of the country and the trans-Jordan region were much more thoroughly brought under the influence of the Greeks and Romans than the south, The Greek towns in some eases date from the time of Alexander the Great, and others were founded by the Ptolemies ; but most of them owe their origin to the Seleucids. One district of the trans-Jordan region retained at that period its old name in the Greek form of Perza. Josephus says that this district extended from the Jordan to Phila- delphia (Rabbath Ammon, ‘Amman) and Gerasa (Jerash), went southward as far as Macherus (Mkaur on the Zerka Ma‘in), and north as far as Pella (Fahil opposite Beisan). Adjoining Perea, and mainly to the east of Jordan, lay the Decapolis, which

was not, how- ever, a continuous territory, but a political group of cities occupied by Greek republics distinguished from the tetrarchies with their

Jewish-Syrian-Arabic population in the midst of which they were

scattered. The largest of these ecitics was Scythopolis (Beisan) ; others were Hippos, Gadara (Mkés), Philadelphia, Dion, Gerasa, &e.; but ancient authorities do not agree about the names. Little requires to be said about the division of the country in later Roman times. In the 5th century a threefold partition began to prevail:— Palestina Prima (roughly equal to Judea and Samaria), Palestina Scounda (the countries about the upper Jordan and the Lake of Gennesaret), and Palestina Tertia or Salutaris (Idumea and Moab). In the time of the crusades the same names were applied to three divisions (at once political and ecclesiastical) of the country west of Jordan,— Palestina Prima or Maritima being the coast region as far as Carmel (with Czsarea as its archbishop's see), Palestina Secunda comprising the mountains of Judah and Ephraim (with the patri- archal see of Jerusalem), and Palestina Tertia corresponding roughly to Galilee (with its bishop's see at Nazareth). The country east of Jordan was called Arabia, and was in like manner divided into three parts lying north and south of each other.

The Arabians retained the name Filistin, and they divided the country into two principal portions,—the Jordan district (chiefly the northern ita and Filistin proper, which extended from the Lake of Gennesaret to Aila and from Lejjun to Refah, Under the Turks Palestine was till quite recently subject to the governor of Syria; the greater part of it now forms an independent vilayet. The chief districts are (each with its town) Gaza, Hebron, Yafa, Ludd (with Ramla), Nabulus, Sha'rawlye, Jennin (with Beisan), Haifa, Aere, Tabariye, Nasira, Safed ; and in the country east of Jordan 'Ajhin, Belka es-Salt, Kerak, and Ma'an.

Palestine is by no means so strikingly a country apart as is usually supposed. It lay, as already mentioned, near the great nulitary highway from western Asia to Egypt and Africa. The traffic by sea was also formerly of importance ; and even in the Middle Ages something was done for the protection of the harbours. At no time, however, was the country in the proper sense of the word a rich one ; it hardly ever produced more than was necessary forhome consumption. 'The great trading caravans which passed

through were glad for the most part to avoid the highlands, and that region at least was thus more or less isolated. The following 18a brief survey of the principal routes, partly as they formerly existed, and partly as they are still used. From Egypta road runs by El“Arish (Rhinocolura) or “the river of Egypt” by Rafah (Raphia) to Gaza (q.v.). From Gaza another runs by Umm Lakis (Lachish?) and Bét Jibrin (Eleutheropolis) across the mountains to Jerusalem. Northwards from Gaza the main route continues along the plain at some distance from the sea (which in this part has piled up great sand dunes) to El-Mejdel (Migdal Gad) near Askelon, and so on to Ashdod (Ezdud, Azotus). From Ashdod a road runs by ‘Akir (Ekron) to Ramle, an important town in the medieval Arabian period, and Ludd (Léd, Lydda). From these towns, which are con-

t as faras Acre is assigned to Judea ; towards the south-

nected with the port of Yafa (Japho, Joppa), three routes run to Jerusalem, of which the one most used in antiquity was evidently the northern one passing by Jimzu (Gimzo) and the two Bét Urs (Beth-horon), and not the one now followed by ‘Amwés (Nicopolis) and Wadi ‘Ali. From Yafa a road continues along the coast by Arsuf (Apollonia) to the ruins of Kaisariye (Cesarea), then past Tantura (ruins of Dor) and ‘Athlit (Castellum Peregrinorum of the crusaders) and round the foot of the promontory of Carmel, to Haifa and Acre (a town of great importance from early times). Another route starting from Ludd runs north close to the mountains by Antipatris (now Kefr Saba or Ras el-Ain?) and Kakun, and ends at Khan Lejjin. The Great Plain offered the easiest passage from the coast inland, El-Lejjun (a corruption of the Latin Zegio) was certainly an important point; it is still conjecturally identified, according to Robinson’s suggestion, with the ancient Megiddo, which Conder would rather place at Mejedde’a. In the vicinity lie the ruins of Taanuk (Taanach), and farther south-west the great centre of Jennin (En Gannim, Ginnea). From Acre there also runs a road directly east over the mountains to Khan Jubb Yusuf.

The coast road from Acre northwards passes through Zib (Akhzib, Ecdippa) and the two promontories of Ras eu-Ndkura and Ras-el-Abyad (Scala Tyriorum), and so continues to the niaritime plain of Tyre.—To return to the

south, from Egypt (Sucz, Arsinoe) the desert was crossed to Ruheibe (Rechoboth), Khulasa (Elusa), and Bir-es-seb'a (Beersheba), and from this place the route went north- ward to Ed-Dhoheriye and El-Khalil (Hebron). In like manner a road from Aila up the Araba valley crossed the Es-Sufah pass to Hebron.—One of the most frequented highways traverses the central mountain chain northwards, and, though somewhat difficult in various parts, connects a number of the most important places of central Palestine. Starting from Hebron, it runs past Rama and Hulhul through the Wadi el-Biyar, and leaving Bethlehem on _ the right holds on to Jerusalem, where a branch strikes east by Khan Hadrur (probably there was once another route) to Jericho. From Jerusalem northwards it naturally continues by Sha'fat past Er-Ram (Rama) to El-Bire (Becroth), and then onwards by 'Ain el-Harainiye, Sinjil, and Khan Lubban through the Mukhna plain to Nabulus (Shechem). From this point a route runs down to the Jordan and Es- Salt (Ramoth Gilead ?); another passes by Tubas (Thebez) north- eastward in the line of the Jordan valley to Beisan (Bethshean, Seythopolis). The road across the highlands passes a-little to the cast of Sebastiye (Samaria, Scbaste), running along the west side of the Merj-el-Ghuruk and past Tell Dothan (Dothan) to J ennin. Thence the road northward to Nazareth skirts the east side of the plain of Esdraelon, and from Nazareth a path strikes to Acre. The caravan route proper passes from 'Afale north-eastwards past Jebel et-Tur (Tabor) to Khan et-Tujjar (where several roads cross), and reaches the Lake of Tiberias near Mejdel (Magdala). It keeps by the shore only for a short distance. Having traversed the small plain of Gennesar, it begins again to climb the mountains where they approach the lake at Khan Minye (which, however, for many reasons cannot be Capernaum), and then it goes on to Khan Jubb Yusuf, strikes down again into the valley of the Jordan, and crossing the river at Jisr Bondt Ya' kub holds on across Jebel Hish to Damasens. The moun- tain district of Samaria is crossed bya great number of small roads, but none of them are true caravan routes or worth particular men- tion. An old caravan route once ran northwards up the Jordan valley from Jericho to Beisan ; and from Beisan an important, now less frequented, road crossing the river at the bridge El-Mejam'a struck north-cast to Fik Tscil and Nawa in the Hauran, and finally to Damaseus.—In the country cast'of Jordana great highway of traffic ran from Petra (or really from the Elanitic Gulf) by Kerak (Kir Moab) to Rabba (Rabbath Moab, Areopolis); in front of Aroer ('Ardir) it crosses the Mdjib (Arnon)

and runs northwards through the highlands to Hesban (Heshbon) and thence to Amman (Rabbath Ammon, Philadelphia). A route also led from Jericho to Es-Salt (which could also be reached from Hesban) and thence northwards to the Jabbok and Jerash (GERASA, see vol. x. p. 441); and then from Jerash one stretched north-west by Tibne to Mkés (Gadara) and the valley of the Jordan, and another north-east to the Zumle and the Hauran or more precisely to Bosra (Bostra), and so on to Damascus. It must also bo mentioned that the great pilgrim's track direct from Damascus to Medina and Mecca skirts the eastern frontier of the country. A great many roads await more detailed investigation ; what has been said may suffice to show what lines of communication existed and still exist between the more import- ant places of Palestine.

Population. —There are no trustworthy estimates of the number of inhabitants in the country at any period of its history. Certain districts, such as Galilee, have, there is no doubt, from early times been much more populous than certain other districts ; the desert of Judah and some portions of the country cast of Jordan must all along have been very sparsely peopled. The figures given in the book of Numbers indicate that the whole country contained about 24 million souls,—it being assumed that the statistics do not refer to the time of the wandering in the wilderness, and that the details

may be suspected of being artificially adjusted. The number 23 to 3 millions may indeed be taken as a maximum; the population can hardly ever have been more than four times its present strength, which is estimated at 650,000 souls. Thus, in the most flourishing period, about 250 to 300 inhabitants would go to the square mile, while at present there may be about 65, a number which is rather above than below the mark. Lists based on information collected by the Turkish Government give much lower figures, viz., for the sanjak of Jerusalem (with the districts Jerusalem, Yafa, Hebron), 276 places with about 24,000 houses (families); for the sanjak Belka (with the districts of Nabulus, Jennin, Ajlun, and Es-Salt), 817 places and 18,984 houses; for the sanjak 'Akka (Acre) (with the districts 'Akka,

Haifa, and Safed), 160 places with 11,023 houses, —making a total of 753 places with 54,237 houses. Reckoning five persons per house, this gives a population of 271,185, exclusive of the small number of Bedouins. Detailed statistics there are none as regards the relative strength of the Bedouin element and the peasantry, the numerical representation of the different religions, or any matter of this sort. ;

The ethnographico-geographical sketch given above has shown how the population of Palestine even at an early date was a very mingled one ; for even when they arrived in the country foreign elements were present among the Israelites, and latcr on they absorbed or were absorbed by the Canaanites. The Philistines, Moabites, and others in course of time were merged in the new nationality. From the period of the cxile colonies from the cast settled in the country, and so powerful did the Aramsan con- tingent gradually grow that Aramzan became the popular tongue. Next were added Greek and Roman colonies, The Arabie clement exerted considerable influence cven before the days of Islam ; with the Mohammedan conquest it became the dominant power, though it was only by slow degrees that it obtained numerical superiority. The Arab tribes transplanted to Palestine their old distinctions, especially that between Northern and Southern Arabs (Kais and Yemen; ef. AnAstaA). The Arab peasantry is still divided into clans; for example, the distriets of the Beni Hasan and Beni Malik to the west of Jerusalem, those of the Beni Harith, Beni Zeid, and Beni Murr4 to the north, and that of Beni Salim to the east. Till recently the relations of the separate clans of fellahin was one of mutual hostility, and, unhindered by the Turkish Government, they engaged in sanguinary conflicts. In manners and in language (though Arabie is universally in vogue) the Palestine peasants retain much that is ancient, It is extravagant, however, to main- tain from the traditions they preserve that primeval Canaanite clements still exist among them. The prevalent type, in facet, is Syro-Arabic, or in many districts pure Arabic ; and their supersti- tious customs are partly remains of Syrian beliefs, partly modern Arabie reproductions, under similar extcrnal conditions, of ancient superstitions, These remarks are applicable to the saint worship at present spread through the whole Oriental world. The fellahin are on the whole a diligent frugal race, not destitute of intelli- gence. If well treated by a just Government which would protect them from the extortions of the nomadie tribes, they would be the means, with the

assistanee of the eapitalist, of greatly improving the cultivation of the country, especially in the various lowland districts. They choose their own village sheiks, who derive most of their authority from the reputation of their virtues, their bravery, and their liberality. The Bedouins, ¢.¢., wandering tribes of pure Arab origin, also play an important part in the country. ‘Till quite recently they used to visit certain settled dis- tricts and exact black mail from the peasants ; and they find their undisputed domain in those districts which are ineapable of eultiva- tion, and fit only for cattle rearing, and in other fertile portions which for various reasons are not oceupied by the husbandman. To the first class belong the belt of desert to the west of the Dead Sea, the southernmost parts of the country west of Jordan and the south country beyond the river (Moab) ; to the seeond belong the greater portion of the maritime plain, the depression of the Jordan valley, and part of the country to the east. The divisions of the Arab tribes will be discussed in the article Syrra. In Palestine east of Jordan the Beni Sakhr (Moab) are of most importance ; Jebel ‘Ajlun is the seat of the ‘Adwan. The Ghawadrine (the inhabitants of the Ghor or Jordan depression) form a peculiar race which, as they are partly agricultural, have been a long time settled in the district. In type, as well as by their degeneracy, they are distinguished from the other Bedouins. The true Bedouin style of life can be studied only beyond the Jordan or to the south of Palestinc,—theo tribes west of the river, such as the Ta‘imire and Jehalin in the south being all more or less deteriorated. As the Turkish race does not fall to be treated in connexion with Palestine, it simply remains to mention the Frankish (European) elements. During the Middle Ages these were not unimportant, especially along the coast ; numerous ruined churches are still to be seen as the last and only memorials of crusaders’ colonies (see Vogiié, Les églises de la Terre Sainte, Paris, 1860, and the article Syria). Nor must the missionary efforts be forgotten which in our own times have been again specially directed to Palestine. As regards the Roman Catholie Chureh, the Francis-

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cans have maintained their position in the Holy Land even in troublous times, and have not only established schools and printing presses but protected the Christian sanetuaries and taken care of pilgrims and travellers. On the whole it may be said that, in comparison with that of the Roman and Greek Churches, the influence of Protestants is outwardly small. 4 German seet called the Templars settled in Palestine some years ago, and has now eolonics at Yafa, Sarona, Jerusalem, and Haifa, The colonists, about 1000 in number, have to contend with many and grievous diffieulties, and are deficient in eapital. Wine-growing is the most luerative braneh of their activity. As long as the Turks hold rule over the country successful colonization is hardly possible.

Literature.—The litcrature in regard to Palestine is extremely abundant, As bibliographical guides of the first class may be mentioned—Tobler, Bibliographia geographica Palestine, Leipsie, 1869 (a supplement to this appeared in Petz. holdt's Neuer Anzeiger ftir Bibliogr. und Bibliothekwissenschaft, Dresden 1875). The works published between 1867-77 (with additions to Tobler) will be found in Rthrieht and Meisner's Deutsche Pilgerretsen nach dem Heiligen Lande Berlin, 1880 (pp. 547-648). Soein has given an annual survey of eurrent litera- ture from 1877 in the Zettschr. des Deutschen Paldstina-Vereins. Compare also Archives de Orient Latin, i., Paris, 1881, The scrics of old pilgrimages pub. lished by the Soeiété de l'Orient Latin deserves special mention :—Jtinera Latina beliis sacrts anteriora, Geneva, 1879; Itinéraires a Jérusalem et descriptions de la Terre Sainte red. en francats aux XI-XIII siécles, Gencva, 1882. Older studies on the geography of Palestine are Eusebius, Onomasticon urbtum et locorum Sancte Scripture (edited by Larsow and Parthey, 1862, and De Lagarde, 1870); Neubauer, La géographte du Talmud, Paris, 1868; Hadr. Reland, Palestina monumentts veteribus illustrata, 2 vols., 1714 ; Ritter, Vergleichende Erdkunde, vol, xv.-xvii., Berlln, 1850-55 ; K. Raumer, Paldstina (4th ed., 1860; now to be com- pletely remodelled by Furrer). Strictly seientitie accounts of travel begin only in the present eentury; the credit of having led the way belongs to E. Robinson (Biblical Researches in Palestine, 1841; Later Biblical Researches, 1856; Physical Geography, 1865). Of importance is the voluminous work of V. Guérin, Deserip- tion géographique, historique, et archéologique de la Palestine, 1868, sq. Splendid service has been rendered by the Palestine Exploration Fund,

which has published Quarterly Statements since 1869,—the labours of Wilson, Warren, and Conder being particularly noteworthy. In 1880 appcared Conder and Kitehener's Map of Western Palestine (26 sheets), the result of surveys extending over many years; an edition in six sheets was published in London in 1881. Trelawney Saunders's Special Edition illustrating the Divisions and the Mountain Ranges, 1882, is to be recommended (compare his valuable Introduction to. the Survey of Western Palestine—its Waterways, Plains, and Highlands, 1881); but the same eannot be said about the Special Edition of the map illustrating the Old Testament and that illustrating the New Testament, London, 1882 (each six sheets), many of the identifications resting on mere provisional conjecture. As companions to the great maps we have Memoirs of the Topography, Orography, Hydrography, and Archeology (8 vols.), a Name-List (1 vol.), Spectal Papers (reprinted from the Statements, 1 vol.), Jerusalem (1 vol.), Flora and Fauna (1 vol.). The Exploration Fund is preparing to aceomplish a similar work for the eountry east of Jordan, since the American Society, which was to have undertaken the survey of that region, has relinquished the undertaking (compare also Selah Merrill, Last of the Jordan, New York, 1881). The German Paliistina-Verein has published its Zeitschrift since 1878, a yearly volume of topographical and historical investi- gations on definite points. Guide-books which may partly serve as works of reference are—Baedeker's Palestine and Syria (written by Soein, 1876), Murray's Handbook for Travellers in Syria and Palestine (by Porter, 1875), and Joanne's Guide (new edition, 1882). The best illustrated work is Picturesque Palestine, Syria, and Egypt (edited by Colonel Wilson,'&e., London, 1881), to which may be added D. Roberts, The J/oly Land, and Lortet, La Syrie d'aujourd hui, 1884, W. M. Thomson's Zhe Land and the Book, London, 1881-83, is of particular value for manners and customs. For natural history, sec Tristram, Zhe Land of Israel (London, 1861) and Natural History of the Bible (London, 1873). Lartet's geological investigations will be found in De Luynes, Voy, d'exploration & la Mer Morte, &¢., Paris, 1876. For matter of geographical detail consult especially Tobler's works (Bethlehem; Nazareth; Dritte Wanderung, &c.). Wilson, The Lands of the Bible, Edinburgh, 1847; Conder, Tent Work in Palestine, 18783 and Finn, Byeways in Palestine, London, 1868, may eonclude the list. Menke's Histor- ischer Atlas (Gotha, 1868) is still the best. (A. 50.)

PALESTRINA. See PR&NESTE.

PALESTRINA, Giovannt Prerturcr pa (¢ 1524 1594), now universally distinguished by the honourable title Princeps Musicx, occupies a more important position in the history of art than any other composer, ancient or modern ; for it is to his transcendent genius that music is indebted for its emancipation from pedantic trammels, which, ignoring beauty as its most necessary element, were fast tending to reduce it to the level of an arithmetical problem.

The exact date of Palestrina's birth is unrecorded. It most probably took place in 1524, and certainly at Palestrina (the Preeneste of Roman geographers,—whence the style accorded to him in Latin!). Some early wnters call him Gianetto da Palestina, or simply Gianetto; and this early custom—which has led some modern critics t0 mistake his identity—combined with the general use of his Christian names only, has induced the belief that he was of peasant origin; but Signor Cicerchia is said t0 have discovered at Palestrina documents proving that his father bore the family name of Sante, and his mother that of Gismondi,—in which case he must have been of gentle birth. The statement, however, needs confirmation.

1 Joannes Petrus Aloysius (or Pctraloysius) Prenestinus.

Paktts TRINA

In early youth Palestrina studied at Rome in company with Animuccia, and, perhaps also, Giovanni Maria Nanini, in a music-school founded by Goupimen (¢.v.). After

this, we hear no more of him until 1551, when, by favour of Pope Julius IIL, he was elected Magister Cappella and Magister Puerorum at the Cappella Giulia, 8. Pietro in Vaticano, with a salary of six scudi per month, and a house. Three years later he published his Mist Book of Masses, dedicated to Pope Julius III, and beginning with the Missa "Ecce Sacerdos magnus," concerning which we shall have to speak more particularly hereafter.! On January 13, 1555, Palestrina was enrolled, by com- mand of Pope Julius III., among the singers of the Cappella Sistina. This honour involved the resignation of his office at the Cappella Giulia, which was

accordingly bestowed upon his friend Animuccia. But the legality of the new appointment was disputed on the ground that Palestrina was married, and the father of four children, his wife, Lucrezia, being still alive; and, though, for the moment, the pope's will was law, the case assumed a different complexion after his death, which took place only five weeks afterwards. The next pope, Marcellus II., was succeeded, after a reign of twenty-three days, by Paul IV. ; and within less than a year that stern reformer dismissed Palestrina, together with two other married singers, Ferrabosco and Bari, with a consolatory pension of six seudi per month to each. This cruel disappointment caused Palestrina a dangerous illness; but better fortune was in store. In October 1555 he was appointed Maestro di Cappella at the Lateran, without forfeiting his pension ; and in February 1561 he exchanged this preferment for a similar one, with an allowance of sixteen scudi per month, at Santa Maria Maggiore.

Palestrina remained in office at this celebrated basilica for ten years ; and it was during this period that the most critical event in his life took place—an event of such grave importance that its results have never ceased to furnish matter for discussion to the musical historian from the time of its occurrence to the present day.

In 1562 the council of Trent censured the pre- valent style of ecclesiastical music with extreme severity. In 1564 Pope Pius IV. commissioned eight cardinals to investigate the causes of complaint; and these proved to be so well founded that it was seriously proposed to forbid the use of all music in the services of the church, except unisonous and unaccompanied plain-chant—a proceeding which, so far as the church was concerned, would have rendered the "art of music," properly so called, a dead letter, not only for the time being, but in perpetuity, for the decree, once promulgated, could only have been repealed by another general council.

_ it is evident that very gross abuses must have been needed to justify so stringent a measure as this in the eyes of men accustomed. to regard art as the obedient handmaid of religion; yet, strange to say, the nature of these abuses has never yet been clearly established by any musical historian, either English or foreign. Baini devotes several chapters of his great work? to their dis- cussion, but without arriving at any definite conclusion. Burney

and Hawkins seem to have regarded the question as one involving no deeper significance than a more or less exalted standard of artistic purity. Ambros, gencrally so reasonable a critic, denies the existence of any just ground of complaint at all, even in the limited sense claimed by Burney and Hawkins, and condemns the Severer censures of Baini and his followers as attempts to sub- stantiate a groundless myth. Bernsdorf speaks little less strongly, simply because a certain tradition, which represented the circum- Stances as having taken place in 1555, during the short reign of

Pope Marcellus IT., has been proved to be certainly false. That more than one groundless myth have been substituted for the real Oifeees eee

Pe 1 The first edition of this was printed in 1554; the second—with a ae representing Palestrina offering his music to the Pope—in

Memorie storico-critiche della vita e delle opere di Giovanni Pierluigi da Palestrina, Rome, 1828.

feo

account of the occurrence is true enough—one, at least, involving an anachronism of no less than twelve centuries. But no sober historian has ever credited these absurd stories; and it is not to them that Baini gives currency or that Ambros objects. The misfortune is that each successive narrator has perpetuated the vague statements of his predecessors, instead of seeking for infor- mation at original sources; and this mistaken course has resulted in an infinity of oracular utterances, no two of which agree. To conflicting opinions like these, one only form of answer-is possible— that furnished by contemporary documents. Fortunately, an immense amount of church music, written in the style universally cultivated at the period of which we are treating, has been preserved to us both in MS. and in print; and, though the forms of notation employed by its transcribers are no longer in common use, students of medieval music are able to decipher them with absolute certainty. Objections like those raised by Ambros can therefore be met by reference to examples of the music actually sung at the time the council of Trent condemned the then prevail- ing style.

The first impression derived from the study of these venerable records tends to confirm a statement already made, to the effect that the art of music was rapidly degenerating into a niere system of figures. There is evidence enough to prove the existence, from the 14th century downwards, of a growing tendency to cultivate, at the expense of ideal beauty, certain forms of technical ingenuity worthy only of association with a clever conundrum.

Another still more serious abuse consisted in the introduction, among the words of the Mass, of foreign passages having no connexion whatever with the original text,—one voice being made to sing “Alleluia” or “Ave Maria,” while others were singing the words of the “Credo” or the “Sanctus.”

In order to justly appreciate the true bearing of this very prevalent abuse, it will be necessary for the English Church composer to divest himsclf of certain not very unnatural prejudices, —and, first of all, of the idca that the custom implied intentional irreverence on the part of those who introduced it, which, in spite of appearances, it certainly did not. In England the music sung forms an csscutial part of the service. This is not the case with the Mass. In reciting the prescribed form of words with the prescribed ceremonies, the officiating priest fulfils unaided all the necessary conditions of the service, while the congregation looks on and worships, and the choir endeavours to excite its devotion by singing appropriate music. As a matter of fact, the words to which this music is sct are identical with a portion of those recited by the priest; but they represent no essential element of the service, nor are they for the most part sung at the same time that the priest recites them. Except in the dclivery of a few responses, the action of the choir is entirely independent of that of the pricst ; and the action of the congregation 1s independent of both. Each member of it may use any book of devotions he pleases, and he will generally be carcful to use prayers and meditations suitable to the festival in which he is taking part. For instance, at Christmas he will meditate on the nativity of our Lord, at Easter on His resurrection, —coutinuing his meditations on these subjects, without reference, during the greater part of the mass, to the words the priest is reciting. It is only by bearing these facts earefully in mind that we can rightly understand what is to follow.

The medisval composer very rarely constructed his Mass upon an original subject. His favourite plan was to select as his principal theme a fragment of some well-known plain-chant hymn or antiphon, and from the words proper to this melody— technically called the canto fermo—thc Mass was named. We

still possess countless examples of the Missa “Alterna Christi munera,” the Missa “Vidi turbam magnam,” “Repleatur os meum,” “Dum complerentur,” “Iste Confessor,” and others of like character, all named after the canti fermi on which they are based, though, except in a few comparatively rare cases to be presently mentioned, the words proper to the canti fermi do not appear in the work, the selected melody being adapted to the actual words of the Mass. And thus far the custom was not only an unobjectionable but a thoroughly commendable one; for the melodies employed were familiar to every educated member of the congregation, and to these the sound of the well-known tune must necessarily have suggested the sacred words belonging to it, and that so powerfully that the performance on Christmas Day of a Mass founded on the melody of “Hodie Christus natus est,” or on Whitsunday of one based on that of “ Veni, Creator Spiritus,” could scarcely have failed to induce in the minds of the assembled worshippers the exact train of meditation most desirable on these great festivals.

Had composers been contented with this, all would have been well, But unhappily they were tempted to add the extrancous words; and their intention, in doing so, has been grossly mis- represented. They have been accused of wilfully sacrificing sense to sound, with the unworthy object of displaying their technical skill to greater advantage. At the first blush there may seem some truth in this; but here again the strictures will not bear examina- tion in presence of the actual records.

Nearly a century before the birth of Palestrina, Joannes de Tinctoris—the compiler of the earliest known Dictionary of Musical Terms—wrote a Mass in which one voice interpolated the words here printed in italics, while the others sang the authorized text, exactly as it appears in the Missal :—

Cherubim ac seraphim cextertque spiritus angelici Deo in altissimis incessabili voce prociamant, “ Sanctus, Sanctus, Sanctus, Dominus Deus Sabaoth.”” ‘* Puert Hebreorum sternentes vestimenta ramos palmarum Jesu filio David clamabant Osanna in excelsis.” ‘* Benedictus semper sit filius Altissimi, qui de celis huc venit in nomine Domini.”

Clearly this is nothing more than an amplification of the received version—a reverent commentary upon the words actually recited by the priest. In what way can the addition of these extraneous sentences conducc to the display of the composer’s musical learning ? He might just as easily have set the same notes to the unaltered text.

Again, Palestrina himself begins his Liber primus Missarum, already mentioned, with a Mass for which he has chosen, as a canto Jermo, the entire melody of the gradual, “ Ecce Sacerdos magnus,” sung on the festivals of certain great doctors of the church, such as Ambrose and Athanasius,—one voice being constantly employed in the reiteration of this in long, slow notes, sung to its own proper words, while three others sing the authorized text in the usnal way. What object could possibly have tempted the composer to arrange his music thus, other than that of using the familiar words and tune as a means of reminding his hearers of the great work wrought by the saints whose festival they are commemorating? Palestrina was the last man in the world to have paraded his learning ; and, had he wished to call attention to it, he might have done so in a hundred easier ways. Indeed, if the Mass were to be sung to-morrow, nothing would be casicr than to fit the words of the Mass to the notes of the canto fermo throughout. Still, not- withstanding the innocence of the composer’s intention, there can be no doubt that the custom was a highly reprehensible one ; and it led to something very much worse.

The troubadours and minnesingers of the Middle Ages produced a host of beautiful secular melodies, many of which still live among us in the guise of “national airs,” though the names of their authors have been forgotten for ages. The beauty of many of these melodies tempted composers to select them as canti fermé for their Masses ; and not a few such works were actually named after them, as the Missa “L’Homme armé” (a very common example), the Missa “ Mon cueur se recommande &4 vous,” and many

others. And in this the medieval musician had no more thought of intentional irreverence than had the Flemish painter when he represented the Nativity as taking place in a little roadside hostelry like that to which he was accustomed to resort for his evening meal. But he committed a grave error of judgment. For, just as the sound of the sacred canto fermo brought to remembrance the words with which it was connected, so, we may be sure, did that of the secular one; and the greater its beauty the more surely would it do its evil work, It was by its beauty alone that it attracted the composer ; yet his treatment of it proves beyond all doubt that he meant no se ae {Bes the a stage of our history at which we can

Of 10; and perhans “ i Oe eaint allittle toc ce ps even here we may have strained

As might naturally have been expected, the introduction of the secular canto fermo was followed by exactly the same results as that of the sacred one. It took a longer time to bring about the evil, but it came at last. _The familiar words were sung to the familar notes, not by the will of the composer, wlio would never have — to insert them, cven had he wished to do so, but by that of profane singers, who surreptitiously trolled them forth for the

PALES YHRIN A

gratification of a prurient taste, while the great body of the choir adhered to the sacred text. And, in the face of these undeniable facts, Hawkins calmly speaks of the reform as one of style only, while Ambros, intoxicated by the beauty of so much of the music pre. served to us, and especially by the compositions of Claude Goudime] for whom he entertained a well-founded admiration, tells us, in gq many words, that no reform of church music was ever needed or demanded, and that no such reform as that popularly attributed to the influence of Palestrina ever took place.

Two of the commissioners, however,—Cardinals Borromeo and Vitellozzi, —while admitting the urgent need of reform, pleaded for a compromise, and happily the commission agreed to postpone its final decision until Palestring— already recognized as the greatest composer then living— had been permitted to prove, if he could, the possibility of producing a Mass which should not only be free from the abuses complained of, but should

also conduce to the excitation of true devotional feeling by bringing the plain sense of the words into the strongest possible relief, and that so manifestly that it might be presented to all future composers as the pattern of what true ecclesiastical music ought evermore to be.

A careful comparison of Palestrina's works with those of the best of his contemporaries conclusively proves that in him alone were united all the qualifications necessary for the success of this difficult attempt, which demanded the earnestness of a deeply religious mind, the science of a profoundly learned musician, and the refined taste of an artist whose sense of beauty was strong enough to over- come all desire for the display of technical power at the expense of that delicacy of expression without which the required solemnity of style would have been unattainable. Animuccia lived as holy a life as Palestrina. The elder Nanini, if not so learned a musician as he, was at any rate more learned than by far the greater number of his contemporaries. But the world had yet to learn how far refinement of taste could be carried in the composition of sacred music; and upon Palestrina devolved the duty of teaching it its lesson. Ockenheim had already astonished it by the ingenuity with which he evolved from the con- trapuntal materials at his command a form so symmetric- ally proportioned that it seemed as if no future artificer could add to its perfection!; but the materials were dry bones, and the resulting form no more than a wonderfully articulated skeleton. To the erudition of Ockenheim Josquin Depres united the fire of true genius.) To him we are indebted for many, if not most, of the finest works produced before the age of Palestrina.2 Yet even he could do no more than clothe Ockenheim's bare skeleton with flesh. It remained for Palestrina to breathe into the perfect body the breath of that artistic life which alone could enable it to give thanks to the Creator of all things in tones which betokened the presence of the soul within it. He first taught the world that music was not a mere lifeless collection of notes, —that, as the gift of speech enabled man to express his thoughts to his fellow-man, s0 the gift of harmony enabled him to express his feelings, whether of devotion, or praise, or prayer, and this so intelligibly that he might "sing praises with understand- ing " in the truest sense of the words. And it was to the decree of the council of Trent that he was indebted for the opportunity of showing how great a work it was possible to accomplish in this direction, as well as for the means of accomplishing it with such good

effect that to this day the results are apparent in every church in which true ecelesr astical music is sung. ‘

Dreading to trust the issue of so severe a trial to a single work, Palestrina, with characteristic modesty, submitted ee TT nt en

1 For examples, consult the Dodecachordon of Glareanus, and Petrueci’s Odhecaton and Canti C. No. cento cinquanta.

2 See two extremely rare volumes of his Masses in the library of the British Museum.

three Masses to Cardinal Carlo Borromeo for approval. These were privately rehearsed, in presence of the com- missioners, at the palace of Cardinal Vitellozzi ; and, while warmly admiring them all, the judges were unanimous in deciding that the third mass fulfilled, in the highest ossible degree, all the conditions demanded. The private trial took place in June 1565 ; and, on the 19th of that month, the Mass was publicly sung at the Sistine Chapel, in presence of Pope Pius IV., who compared its music to that heard by St John in his vision of the New Jerusalem. Thenceforth it was formally accepted as the type of all true ecclesiastical music. Parvi transcribed it, for the library of the choir, in characters of extraordinary size and beauty ; and, in acknowledgment of his services to art, Palestrina

_ was appointed by the pope composer to the Sistine Chapel,

an office created expressly in his honour, and confirmed to him by seven later pontiffs, though with the very insufficient honorarium of three scudi per month, in addition to the

six which formed his pension.

In 1567 this Mass was printed in Palestrina’s Zzber secundus Missarum. The volume was dedicated to Philip IL of Spain, but the Mass was called the “ Missa Papze Marcelli.” ‘This title, clearly given in honour of the short- lived pope Marcellus IL, has given rise to an absurd story, told by Pellegrini and others, to the effect that the Mass was composed by Pope Marcellus I., martyred early

in the 4th century, and was only discovered by Palestrina. Of course, in the 4th century the composition of such

music was impossible ; but this is only a specimen of the innumerable fables which have brought the true history into disrepute. The Missa Pape Marcelli is undoubtedly Palestrina's greatest work. Its ineffable beauty has often

been described in glowing terms by those who have heard

it in the Sistine Chapel, but it was never heard in Eng- land until 1882, when the Bach choir, consisting of two hundred unaccompanied voices, sang it at St James's Hall, under the direction of Mr Otto Goldschmidt ; and the effect produced on that occasion more than justified all that had ever been said of the music, which is certainly the most beautiful, the most solemn, and the most truly devotional that has ever been dedicated to the service of the church.

We have dwelt at some length on these circumstances, because they left a more indelible impression upon the history of art than any other events in Palestrina's life, which was not what the world would call a prosperous one, though he himself was quite satisfied with his condition.

Upon the death of Animuccia in 1571 Palestrina was re-elected to his appointment at the Cappella Giulia. He also succeeded Animuccia as Maestro di Cappella at the Oratory of Philip Neri; but these appointments were far from lucrative, and he still remained a very poor man. In 1580 he was much distressed by the death of his wife ; and the loss of three promising sons, Angelo, Ridolfo, and Silla, left him with one child only—Igino—a very unworthy descendant. In 1586 a new trouble befel him: Pope Sixtus V. wished to appoint him maestro to the pontifical choir, as successor to Antonio Boccapadule, then about to resign, and commissioned Boccapadule to prepare the choir for the change. Boccapadule, however, managed so clumsily that Palestrina was accused of having meanly plotted for his own advancement. The pope was very angry, and punished the calumniators very severely ; but Palestrina lost the appointment. These troubles, however, did not hinder his work, which he continued, without

Intermission, until February 2, 1594, when he breathed his last in the arms of his friend, Filippo Neri.

The printed works of Palestrina include twelve volumes of Masses; Seven volumes of Motets for from four to twelve voices; two

volumes of Offertoria, and one of Hymns, for the whole year ; one

volume of Lamentations, three of Litanies, and one of Magnificats ; two of Madrigals, the loveliest in existence ; and two of Madrigali spirituali ; besides an immense number of compositions still remain- ingin MS. The whole of these are now in course of publication by Breitkopf and_Hartel, of Leipsic. (W. S. R.) PALEY, Winuiam (1743-1805), was born in 1743 at Peterborough, where his father was one of the minor canons of the cathedral. The Paley family belonged to the West Riding of Yorkshire, and in 1745 Paley's father was appointed head master of the grammar school of Giggleswick, his native parish. Here Paley received his early education under his father's care. In 1759 he proceeded to Cambridge, where his first undergraduate years were given up, according to his own account, more to society than to study. But, being roused by a reproof from one of his companions, he used the remainder of his time to such advantage that he came out senior wrangler at the end of his course. After taking his degree in 1763, Paley was for about three years assistant in a school at Greenwich ; but on his election to a fellowship he returned to Cambridge, and became, in 1768, one of the junior tutors of his college. His colleague in this office was John Law, son of Dr Edmund Law, then master of Peterhouse, and afterwards bishop of Carlisle. To the connexion thus formed Paley was afterwards indebted for his first preferments in the church. As tutor at Christ's, Paley lectured on Locke, Clarke, and Butler, and also delivered a systematic course on moral philosophy, which formed the basis, more than ten years later, of his well-known treatise. The subscription coutroversy was then agitating the university, and Paley published an anonymous Defence of a pamphlet in which Bishop Law had advocated the retrenchment and simplification of the thirty-nine articles. But, though Paley was all for "worshipping God in that generality of expression in which He himself has left some points," he did not see his way to join the petitioners for a

relaxation of the terms of subscription. His own view of the articles, as simply “articles of peace,” probably led him to consider their action as a piece of overstrained conscientiousness. In 1776 Paley vacated his fellowship by marriage, and retired to the rectory of Musgrave in Westmoreland, which had been conferred on him the year before by the bishop of Carlisle. This very modest living was soon supplemented by the vicarage of Dalston, and presently exchanged for that of Appleby. In 1782 he became archdeacon of Carlisle on the appointment of the younger Law to an Irish bishopric. His first important work, The Principles of Moral and Political Philosophy, was published (as Principles of Morality and Politics) in 1785, and Paley received the unusually large sum of £1000 for the copyright. The book at once became the ethical text-book of the university of Cambridge, and passed through fifteen editions in the author’s lifetime. It was followed in 1790 by his first essay in the field of Christian apologetics, Hore Pauline, or the Truth of the Scripture History of St Paul evinced by a comparison of the Epistles which bear his name with the Acts of. the Apostles and with one another, ‘Though the original idea of the book was derived from Doddridge, this is probably the most original of its author’s works. It was followed in 1794 by a more general work in the same field, the celebrated View of the Evidences of Christianity. Paley’s latitudinarian views, combined with a certain homely outspokenness in the Moral and Political Philo- sophy regarding the foundations of civil authority (“the divine right of kings is like the divine right of constables ”), are said to have debarred him from the highest positions in the church. But his able defence of the faith brought him substantial acknowledgments from the episcopal bench. The bishop of London gave him a stall in St Paul’s; the bishop of Lincoln made him subdean of that

diocese ; and the bishop of Durham conferred upon him the rectory of Bishop-Wearmouth, worth £1200 a year. Paley transferred his household to Bishop-Wearmouth in 1795. His wife, the mother of eight children, had died four years before, and in the end of 1795 Paley married a second time. During the remainder of his life his time was divided between Bishop-Wearmouth and Lincoln. In 1800 he was attacked by the disease of the kidneys which ultimately carried him off. It was in the intervals of

comparative health and ease that remained to him that his last, and in some respects his most remarkable, work was produced, Natural Theology, or Hvidences of the Existence and Attributes of the Deity collected from the Appearances of Nature (1802). He endeavoured, as he says in dedicating the book to the bishop of Durham, to repair in the study his deficiencies in the church. He died on the 25th May 1805.

In the dedication just referred to, Paley claims a systematic unity for his works. It is true that "they have been written in an order the very reverse of that in which they ought to be read"; nevertheless the Natwral Theology forms "the completion of a regular and comprehensive design." The truth of this will be apparent, if it is considered that the Moral and Political Philosophy admittedly embodies two presuppositions—(1) that "God Almighty wills and wishes the happiness of His creatures," and (2) that adequate motives must be supplied to virtue by a system of future rewards and punishments. Now the second presupposition depends, according to Paley, on the credibility of the Christian religion (which he treats almost exelusively as the revelation of these "new sanctions" of morality). The Zvideneces and the Horz Pauline were intended as a demonstration of this credi- bility. The argument of these books, however, depends in turn upon the assumption of a benevolent Creator desirous of com- municating with His creatures for their good; and the Natwral Theology, by applying the argument from design to prove the existence of such a Deity, becomes the foundation of the argu- mentative edifice. The sense of unity in the structure is increased to arcader of the present day by the uniformity of the point of view from which the world is regarded throughout. Paley has popularized for 19th-century use the Deistic conception of the universe and the divine economy which was common ground last eentury both to the assailants aud the defenders of orthodox Christianity.

In his Natural Theology Paley has adapted with consummate skill the argument which Ray (1691) and Derham (1711) and Nieuwentyt! (1730) had already made familiar to Englishmen. "For my part," he says, "I take my stand in human anatomy " ; and what he everywhere insists upon is " the necessity, in each particular ease, of au intelligent designing mind for the eontriving and determining of the forms which organized bodies bear." This is the whole argument, and the book consists of a mass of well- chosen

instances marshalled in support of it. But by placing Paley's facts in a new light, the theory of evolution has deprived his argument of its foree, so far as it applies the idea of special contrivance to individual organs or to species. Paley's idea of contrivance is only applicable if we suppose a highly developed organism to be dropped suddenly into foreign surroundings. But the relation of an organism to its environment is not of this external nature, and the adaptation of the one to the other must be regarded as the result of a long process of interaction in the past history of the species. In thus substituting the operation of general laws for Paley's continual invocation ofa supernatural cause, evolution passes no judgment on the question of the ultimate dependence of these laws upon intelligenee ; but it evidently alters profoundly our general conception of the relation of that intelligence to the world.

'The Hvidences of Christianity is mainly a condensation of Bishop Douglas's Criterion and Lardner's Credibility of the Gospel History. But the task is so judiciously performed that it would probably be difficult to get a more effective statement of the external evidences of Christianity than Paley has here presented. The general position, however, that the action of the first preachers of Christianity was due "solely" to their belief in the occurrence of

1 Nieuwentyt (1654-1718) was a Dutch disciple of Descartes, whose work, Regt gebruyk der weereld beschovinge, published in 1716, was translated into English in 1780 under the title of The Religious Philosopher. A charge of wholesale plagiarism from this book was brought against Paley in the Atheneum for 1848. Paley refers several times to Nieuwentyt, who uses the famous illustration of the watch. But the illustration is not peculiar to Nieuwentyt, and had been appropriated by many others before Paley. In the case of a writer whose chief merit is the way in which he has worked up existing material, a general charge of plagiarism is almost irrelevant.

certain miraculous events is on the same level as the view that "the proper business of a revelation" is to certify future rewards and punishments. It

betrays a defective analysis of the religions consciousness. For the rest, his idea of revelation depends upon the same mechanical conception of the relation of God to. the world which dominates his Vatural Theology; and he seeks to prove the divine origin of Christianity by isolating it from the general history of mankind, whereas later writers find their chief argument in the continuity of the process of revelation,

For the place of Paley's theological utilitarianism in the history of ethical speculation in England, sce Ernics.

The face of the world has changed so greatly since Paley's day that we are apt to do less than justice to his undoubted merits, He is nowhere original, and nowhere profound, but_he justly claims to be "something more than a mere compiler." His strong reasoning power, his faculty of clear arrangement and_ forcible statement, place him in the first rank of expositors and advocates, He inasses his arguments, it has been said, with a general's eye, His style is perfectly perspicuous, and its "strong home-toueh" compensates for what is lacking in elasticity and grace. Paley's avoidance of ultimate speculative questions commended him to his own generation, and enabled him to give full scope to the shrewd practical understanding in which his strength lay. He displays little or no spirituality of feeling; but this is a matter in which one age is apt to misjudge another, and Paley was at least practi- cally 'benevolent and conscientiously attentive to his parish duties, The active part he took in advocating the abolition of the slaye- trade is evidence of a wider power of sympathy. His unconquerable cheerfulness becomes itself almost religious in the last chapters of the Natural Theology, when we consider the circumstances in which they were composed. The chapter on the goodness of the Deity is more touched with fceling than any other part of his writings, and impresses the reader with respect for his essential goodness of heart. (A. SE.)

PALGHAT, a town in Malabar district, Madras, India, situated in the gap or pass of the same name in the Western Ghats, in 10° 45' 49" N. lat. and 76° 41' 48″ E. long., 74 miles south-east of Beypur, with a population in 1881 of 36,339. Being the key to Travancore and Malabar from the east, it was formerly of considerable strategic importance. The fort fell for the first time into British hands in 1768, and subsequently formed the basis of many of

the operations against Tippoo, which terminated in the storming of Seringapatam. It still stands, but 1s no longer garrisoned. Palghat is a busy entrepdt for the exchange of produce between Malabar and the upland country, and is a station on the Madras railway. The easy ascent by the Palghat Pass, formerly covered with teak forests, supplies the great route from the south-west coast of India to the interior.

PALGRAVE, Srr Francts (1788-1861), historian, was born in London in July 1788, the son of Meyer Cohen, a Jew, and a wealthy member of the stock exchange. He was privately educated, and such was his capacity for languages that at the age of eight he translated the Latin version of the Frogs and Mice into French, which his father published in 1797 with a short preface. On account of the failure of his father's fortunes in 1803 he was articled as clerk to a firm of solicitors, with whom he remained till 1822, acting for some years as their managing clerk, after which he took chambers in King's Bench Walk, Temple, and was employed under the record commission. On his marniage in 1823 he obtained the royal permission to change his name from Cohen to Palgrave, the maiden name of his wife's mother. He was called to the bar at the Middle Temple in 1827, and soon acquired a good practice m pedigree cases in the House of Lords. From an early period of his life he had devoted much attention to literary and antiquarian studies. In 1818 he edited a collection of Anglo-Norman chansons, and previous to his call to the bar contributed largely to the Hdinburgh and Quarterly Reviews. In 1831 he published the History of England, in the Family Library series, and in 1832 he brought out The Rise and Progress of the English Commonwealth, and Observations on the Principles of New Municipal Corport tions. The same year he received the honour of knight-

hood. In 1837 he published Merchant and Friar, an imaginary history of Marco Polo and Friar Bacon. On the reconstruction of the record commission service in 1838, he was appointed to the post of deputy-keeper. Under the sanction of Government he edited Hotuli Curie Regis (2 vols., 1835) and Calendars and Inventories of the Exchequer (3 vols., 1836). He

was the author of Detached Thoughts on the Polity and Ecclesiastical [istory of the Middle Ages, printed for private circulation, and a learned and elaborate History of Normandy and England (4 vols., 1851-64). He died at Hampstead, 6th July 1861.

PALI (pronounced Bali by the Siamese) is the name of the literary language of the Buddhists in Ceylon, Burmah, Siam, and Cambodia. Laloubére (Hel. de Stam)

‘ is the first European writer who mentions the name,

towards the end of the 17th century. Various opinions have been advanced as to the etymology—from path, to read (Mason, Minayeff), or pdli=pra+dli (J. D’Alwis, E. Kuhn)—and original meaning of the word. The latter, iven as “row,” “range,” “ line,” is applied by Trenckner (Pali Mise. i. 69) to the “series” of teachers by whom the text of the sacred tradition was handed down, and, according to the Burmese conception of the word (see Forchhammer’s Report for 1879-80, p. 6), to the sacred texts simply, irrespectively of the language or dialect in which they are written; whereas Pali scholars generally use the word less in the sense of sacred canon than in that of the language in which the canon is written (Childers, D’Alwis, Fausbéll, Oldenberg). The same applies to the synonymous term Zanti. When and where that lan- guage was formed is still a matter of controversy. We quote here only the opinions of the two principal writers on the subject, Professors E. Kuhn and H. Oldenberg. The former, following Westergaard, holds that Pali was the Sanskritic vernacular spoken at Ujjain, the capital of Malava, at the time when Mahendra, the son and successor of the great Asoka, took the sacred canon with

him to Ceylon in the form in which it had two years _ previously received the sanction of the third general

council (Beitr. zur Pali-Gramm., Berlin, 1875). On the other hand, Professor Oldenberg, rejecting that tradi- tion, considers the naturalization of the Pali language in Ceylon to have been the fruit of a period of long and continued intercourse between that island and the adjacent parts of India, more especially the Kalinga country. Though he does not state within what limits of time that gradual naturalization took place, he records his opinion that at

least one portion of the Buddhist canon, the Vinaya, in its present form existed in the Pali language about a hundred and fifty years before Mahendra, that is, about 400 p.c. This is in all probability the earliest period that may be assigned to Pali as a literary language (The Vinayapitakam, edited by Oldenberg, vol. i., 1879, Introduction). Both scholars have discussed the question as to the Pali being identical with the Magadhi dialect, and have satisfactorily disposed of it. ‘There can be no doubt that some considerable time must have elapsed before the Pali recension of the canon was completed, and that, as regards the locality of the language, through the contiguity of cognate vernaculars a palpable number of words and word-forms found their way into Pali, enriching alike its vocabulary and its grammatical resources ; or how else could we account for the occurrence of such doublets and triplets as adda, alla (Sanskrit, Ardra), data, avuta (S. Avrita), isa, issa, ikka, accha (S. riksha), Kiecha, kasira (S. kricchra), gaddha, giddha, gijjha (S. gridhra), kil4, khelA, khidda (8. Krid4), tanh4, tasina (trishné), tikkhina, tikkha, tinha (S. tikshna), dosind, junha (8. jyotsn4), rukkha, vaccha (S. vriksha), sita, mihita (S, smita), sindna, nahdna (8. snana), sunisa,

sunha, husd (8. snushd), and for the many alternative forms in the declensions, some of which will presently be specified? It is also certain that the very belief in the sacred character of the canon must have tended to preserve the text unchanged in form and substance from the time that it was received in Ceylon till the present day. There is, however, a voluminous literature which has grown around and out of the sacred texts, such as Buddhaghosa’s great commentary on them (beginning of the 5th century), and several historical works and their commentaries. In this secondary stage many new words and hybrid grammatical forms, due to what Childers appropriately calls false analogy, have found admission into the language (see Fausbéll’s Dhammapada, Introduction); and the grammarians who at this period appear to have treated of language after the Sanskrit models enrol them in their scheme as correct and legitimate.

Though tradition (Mahdvansa, xii. 6; Buddhavansa, xxii.) makes the introduction of Buddhism into Burmah contemporaneous with the

conversion of Ceylon, there is every probability that the event took place at a much later period. It must, however, have taken firm root in Burmah at the time that in consequence of religious persecutions Buddhist priests from Ceylon went to Burmah to obtain a copy of the sacred canon and Buddhaghosa's commentary thereon (5th century of our era). Thence an uninterrupted religious intercourse has been kept up between the two countries up to the present, notwith- standing which certain discrepancies between the Pali texts of Burmah and those of Ceylon point to the fact that the latter retain older forms and expressions, whereas the former replace these by more modern, more common, or more regular ones (Fausbéll, Zen Jdtakas, Introd.). This fact, however, can only be established on a scientific basis when good old copies of grammatical works, both in the Sinhalese and Burmese character, shall have been carefully examined and compared ad hoc, It is certainly true that in Ceylon, where the study of Sanskrit flourishes, and where the people have spoken for upwards of two thousand years an Indo-Aryan idiom, Pali learning has obtained a far firmer and more favourable footing than in Burmah, where the nature of the vernacular places considerable difficulties in the path of the student of the sacred language.

As regards the status of Pali in Siam, no trustworthy information is available. It would appear, however, that Pali MSS. from that country—invariably written in the Cambodian character—are more remarkable for caligraphy than for correctness. Both in Burmah and Ceylon Pali is written in the character of the vernacular. The well- known Manual used at the admission of a novice into the monastic order is almost the only book in which the so-called square character is customary (see Burnouf and Lassen, Hssai sur le Pali, Paris, 1826).

Since the days of Prinsep the name of Pali has also been given to the various local dialects, and the name of Pali character to the monumental alphabet, or rather alphabets, in which the so-called Asoka inscriptions are written. The language of these records, it is true, comes nearer to the Pali than to any other early Sanskritic idiom ; still it is sufficiently distinct from the language of Buddhist literature to be treated by itself (see E. Senart, Les Inscriptions de Piyadasi, vol. i., Paris, 1881; and G. Biihler, in 7. D. M. G., vol. xxxvii.).

Pali has aptly been said to stand phonetically in the same position to Sanskrit as Italian does to Latin. There is the same tendeney to smooth down all sounds diffieult of utterance, to assimilate or otherwise simplify compound consonants, and to substitute vocalie or nasal for consonantal word-terminations.

More especially, Pali lacks the rz and 7 vowels and the diphthongs ai and aw. The Sanskrit vowel ri gencrally passes in Pali into a,

sometimes also into 7 or w; as isi (S. rishi), dadha (S. dridha), putha (S. prithag). # and o, representing S. a7 and au _respec- tively, can before double consonants be further shortened into 4 and uv, just as other long vowels may be shortened under the same circumstances; thus wssukka (S. autsukya), rattha (S. rashtra). Some anomalous vowel changes are exhibited in the following examples :—kondafiita (S. kaundinya), pana (S. punar), purisa (S. purusha), wsw (S. ishu), vad (S. vijtid), hetthd (S. adhastat). As regards consonants, Pali has only the dental sibilant, and replaces by anusvara most final consonants of Sanskrit words; as manam (S. manik), sanim (S. sanais), khattum (S. kritvas). Two or more consonants meeting in the middle of a word are mostly assimilated, as wmmagga (S. unmarga), pabbhdra (S, pragbhara). Other changes are paftha (S. pragna), pallanka (S. paryanka), ddthé (S. damshtra), and of initial consonants latthi (8. yashti), ludda (rudra), nangala (S. langala), kipillika (S. piptlika), khdnu (S. sthanu). Contraction is very frequent, as well as metathesis, as the following examples will show:—kho (S. khalu), acceka (S. atyayika), dcera (S. Acdrya), cuddasa (S. caturdagan), issera (S. aigvarya), abbohdra (S. avyavahara). In the Scenic Prakrits and in the Magadht of the Jains the consonantal decay has reached a much higher stage than it has in Pali, showing that the latter holds its place between the former and the Sanskrit. This applies also to Sandht, which in Pali is indeed sporadically and irregularly attended to, but shows a tendency to being altogether neglected.

There is no dual in the declension any more than in the con- jugation; the only remnants of it appear to be ¢o (S. tau) and ubho (8S. ubhau). The old dative case is rarely used, and the genitive takes its place. The declension of nouns has in some cases been encroached upon by the pronominal

dcclension. According to the nature of Pali phonology, there cannot be any real consonantal stems, and therefore no regular consonantal declension. Final consonants are cither dropped or have an a added to them. In the former case the final consonants reappear before the vowel terminations, in the latter the declension follows the false analogy of the a-declension. Thus, dhima (S. dhimat) is declined as follows :—Sing.-—-nom. dhima, dhimanto ; voc. dhimam, dhima, dhim4; acc. dhimantam, dhimam; instr. dhtmataé, dhiman- tena; dat. gen. dhimato, dhimantassa, dhimassa; abl. dhimata ; loc. dhimati, dhimante, dhimantasmim, dhimantamhi ; Plwr.— nom. voc. dhimanto, dhimanta; acc. dhimante; instr. abl. dhimantebhi, dhimantehi; dat. gen. dhimatam, dhimanténam ; loc. dhimantesu. Examples of multiform cases are the loc. sing. of nadt, which exhibits the forms nadiy4, nadiyam, najjam ; the voc. plur. of the honorific pronoun bhavam (S. bhavat), which has bhavanto, bhonto, bhante ; the gen. dat. sing. of pita, which has pitu, pituno, pitussa, aud in the plur. pitfinam, pitunnam, pitara-nam, pitanam ; the loc. sing. of mano, manam (S. manas), which has manasi, mane, manasmim, manamhi. The personal pronouns also show a variety of forms, some ef which are still traceable in the modern Prakrits, Thus aham has in the plural—nom. vayam, mayam, amhe ; acc. asme, amhe, amhikam; instr. abl. amhebhi, amhehi; dat. gen. amhikam, amhanam, amham; loc. amhesu. Similarly, the gen. dat. sing. fem. of the demonstrative pronoun has the forms imiss4, imiss&ya, imaya, ass4, assdya.

The Pali verb shows even more than docs the noun a tendency to break with the analogy of the Sanskrit. Though native gram- marians arrange the conjugations on a plan similar to that of the Sanskrit, the disorganizing process which pervades the whole of Pali grammar is in no part so advanced as in this particular. Thus, the present tense of the verb thd (S. stha) is thati as well as titthati; of dhd@ it is dadhati, dahati, and dhati; of da dadati, deti, dati, and (by false analogy from the optative dajjam) dajjati; of ji jayati, jeti, and jinati; of bAt bhayati; of rwdh rundhati, rundhiti, rundhiti, and rundheti; of mar (S. mri) marati and miyati; and of kar (S. kri) the plural has karoma, karotha, karonti, and also regularly kubbanti, from which form again by false analogy a 3d person singular kubbati has been derived. The termination re of the 3d person plural perfect 4tmancpada has been transferred to the present tense, where it is used along with ~~ante. But there is a general predilection for the parasmaipada termina~~ tions, even in

the passive. While the perfect sensibly recedes before the other tenses, and is of rare occurrence, the use of the aorist largely encroaches on that of the imperfect, the conjugation of which is in many verbs influenced by the former, as, ¢.g., in the verb as, in which the imperfect is:—I1st sing., Asim or Asi; 2d and 3d, asi; 1st plur., dsimha ; 2d, dsittha ; 3d, dsimsu. In the impera- tive par. the Ist sing. and 2d plur. do not differ from the corre- sponding forms of the present. The affixes of the future (-ssa) and passive (-yw) may also be added to the special base; thus we have the forms dakkhati and passissati, ‘*he will sce,” and gamiyati and gacchiyati, ‘‘he is gone to.” In the causative verb the form with p greatly preponderates, and may even be added to the special base, as, ¢.g., Sunapeti (S. gravayati), “he informs”; ganhapeti (S. grahayati). Lastly, the gerund in -tvd is not only used in compound verbs in preference to the one in -ya, but may also

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occasionally be superadded to the latter for the sake of preatep precision. Thus, sajjitvi=sad+ya+i+tva; and abhiruyhity4< abhiruh + ya+i+tva. Instead of ¢vd the forms tvéna and ting often occur. There are two forms of the infinitive, there being besides the usual form in -twm one in -tave, which appears to haye lingered in the vernacular long aftcr it was disused in Sanskrit literature.

Literature.—The study of Pali by Europeans is of com. paratively recent date; in fact, our knowledge of the very existence of an extensive Pali literature dates scarcely

balf a century back. It is true that in 1826 Professors

Burnouf and Lassen were enabled, from an examination of certain Pali MSS. which had fallen under their notice, to give a general account of the language ; but it was reserved for the late Mr G. Turnour, colonial secretary of Ceylon, to collect the first trustworthy information concerning the sacred books of the island, and to edit and translate the first Pali text of any extent. His choice of the Mahdvansa, one of the oldest chronicles, was all the more fortunate, as, in the almost total absence of historical works in Sanskrit literature, these annals were calculated to yield a vast amount of information regarding the origin and earlier history of the Buddhistic

religion in India. The book had been ready for the press many years, but was not published till 1837, while a series of articles by the same author, em- bodying the results of his examination of the Mahdvansa

| and its commentary and of the contemporaneous Dépavansa

(Jour. Bengal As. Soc., vols. v. and vi.), had been received by Oriental scholars with the utmost interest. The thirty- eight chapters published by him bring the history of Ceylon down to 477 a.p.; they comprise the original work of Mahdndma. Six more chapters, ready for the press in text and translation, were found among Turnour's papers at his early death in 1842, and are now in the India office library. The whole Mahdvansa, in Pali and Sinhalese, has since been printed at the Government press, Colombo, 1877-83, and an English translation is in progress. How- ever, a critical edition of the earlier part, and more especially of the commentary upon it, is still a desidera- tum. There is an excellent edition and translation of the Dipavansa by Professor Oldenberg (London, 1879); according to whom the work was written between the beginning of the 4th and the first third of the 5th cen- tury. Among the historical works may also be classed the Ddthdvansa, a poetical history of the tooth-relic of Buddha, composed by Dhammakitti early in the 13th cen- tury. The work was printed at Colombo in 1882, and an English translation by M. Kumaraswdmi appeared in Lon- don in 1874. Further, the Attanagalwvansa, the history of a temple, likewise of the 13th century, edited and trans- lated by J. D'Alwis at Colombo in 1866. Other historical works are described in the catalogues 'of Pali MSS. Lastly, there exist many medieval Pali inscriptions, some of considerable extent, as, ¢.g., those of Kaly4ni in Burmah, which are now in course of publication, and are likely to yield valuable historical results. Many of them are accompanied by a translation in Burmese or Talaing,—a language now all but extinct. It is worth noting that neither in Ceylon nor in Cambodia have any old Pah inscriptions been found ; in the island the old inscriptions are in Sinhalese, in Cambodia they are in Sanskrit, fre quently with a translation in Khmer.

Though there is an old ninefold division (navanga, se Dr R. Morris's " Report on Pali Literature," in Phzlological Society's Proceedings, 1880) of the canonical scriptures, 1 is the general practice of Pali scholars to abide

by the division into three “baskets ” (tipitaka, pitakattaya), first specified by G. Turnour, and then more correctly m Childers’s Dictionary, p. 507, viz., the Vinayapitaka, the Suttapitaka, and the Abhidhammapitaka, or the baskets of discipline, of discourses, and of metaphysics, Only the

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- first of these, and at the same time the earliest, has been published in a critical edition in five volumes by Professor – Oldenberg, London, 1879-83, while a translation by the game and Mr Rhys Davids is in progress in the Sacred Books of the East. One of its constituent parts, the Pétimokkha, mentioned already by Laloubére, was edited and translated into Russian by Minayeff (1869); an English translation by Gogerly had appeared thirty years previously in vol. iii. of the Ceylon Friend, and the Journal of the Royal Asiatic Society for 1875 brought out a new translation, accompanied by the Pali text, by J. F. Dick- son. Editions of the text have also appeared in Ceylon and Burmah. A ritualistic manual, the Kammavdcd, the first chapter of which was edited by Spiegel with a Latin translation in 1841, was the first Pali text published in Europe. ‘The first of the numerous works composing the Suttapitaka that was made accessible to Pali scholars in Europe was the Dhammapada, or Path to Virtue, a criti- cal edition of which, with a Latin translation and copious extracts from Buddhaghosa’s commentary, was brought out by Professor Fausboll, of Copenhagen, in 1855, So popu- lar has this work proved as a type of Buddhistic sentiment that no less than two English translations (by Professor F. Max Miiller in 1870 and 1881, and by Professor J. Gray, of Rangoon, in 1881), one in German (by Professor A. Weber, 1860), and one in French (by M. F. Hf, 1878) have appeared, besides various editions printed at Colombo and Rangoon, with translations into the respective ver- naculars. Other collections of moral maxims also, such as Lokaniti and Dhammaniti, appear to be fayourite books in Burmah. Of the other works of the Suttapitaka, the Jdataka Book, an account of the five hundred and fifty previous births of Buddha, has till quite recently absorbed the lion’s share of attention on account of its being the oldest extant collection of fables and popular stories, many of which have at an early date found their way to the West,

and are still current amongst us. Three volumes of the text of this extensive work, edited by Professor Fausbdll, and one volume of the translation, by Professor Rhys Davids, have up to the present appeared, while many of the most interesting tales, in groups of from two to twelve, were separately published by the same editor between the years 1858 and 1872. Other works belonging to the same division which have been published are Khuddakapdtha (by Professor Childers, 1869), Buddhavansa and Cariydpitaka (by Dr Morris, 1882), Anguttaranckdya (by the same, 1884), and Majjhimanikdya (by Trenckner, 1884); and a number of others, such as Itivuttaka, Theragdtha, Theri- gathd, and Apaddna, are, thanks to the active zeal of the working members of the newly founded Pali Text Society, either in progress or in preparation. An edition of Sutta- nipdta, by Professor Fausbéll, whose translation of the work appeared in 1881, is also passing through the press. Seven suttas from the Dighanikdya, prepared for publication by the late P. Grimblot, appeared in Paris in 1876; and a number of others, from various collections, edited and translated by L. Feer, are to be found in the Journal Asiatique. An edition, by Professor Childers, of the Mahéparinibbinasutta, from the Dighanikdya, was pub- lished in 1876, and a translation of the same and other suttas, by Professor Rhys Davids, forms vol. xi. of the Sacred Books of the East. Lastly, Dr Morris has in the press an edition and translation of “ the Six Jewels of the Law,” one of which is the Mahdsatipatthdnasutta, a favourite text-book in Burmah and Ceylon. The Milinda- pantha, a work of the middle of the 2d century B.c., a scholarly edition of which we owe to Trenckner (1880), though obviously not a canonical book, may well be classed with this second division. The Abhidhammapitaka has so little in it to attract the European student of Pali that an

edition of any of its components parts is not likely to be forthcoming for some time. A compendium of its tenets, the Abludhammatthasangaha, has been frequently printed in the Burmese and in the Sinhalese character.

While in Siam and Ceylon the law-books are in the vernacular, they are in Burmah in the original Pali, which is generally accompanied by a Burmese gloss. San Germano translated one of them (see his work on Burmah, p. 173

sq.) in the end of last century. Several of them have in recent years been brought out at Rangoon by Colonel H. Browne, and the oldest of them, by King Wagaru, is passing through the press. The editor, Professor Forchhammer, has also supplied valuable translations to the series of Mr Jardine's Notes on Buddhist Law, which are appearing at Rangoon.

_The age of the oldest Pali grammarian, Kaccayana, is still under dispute; it is far more likely, however, that it has to be placed towards the end of the 11th century A.D. (see Colonel Fryer's paper in Jour. Beng. As. Soc. for 1882) than with J. D'Alwis in the 6th century B.c. While his system is the one which has long been current in Burmah, the grammar by Moggallana (second half of the 12th century) represents the leading grammatical school of Ceylon. Round both a large number of grammatical works have grown up, more than sixty of which are specified and fully described by Subhuti in the introduction to his book on the Pali declensions (Wamamdla, Colombo, 1876). M. E. Senart has given an excellent edition and exposition of Kacc&yana's grammar Paris, 1871), some chapters of which had previously been made the subject of separate treatises by J. D'Alwis and Professor E. Kuhn. The first five chapters of the Bdalévatara were edited and translated by L. F. Lee (Ceylon As. Soc. Jowr. for 1870-71), and the sixth chapter of the Rapasiddhi, another old grammar, was recently published by Dr Griinwedel (Berlin, 1883). The oldest Pali vocabulary, called Abhidhdnappadipika, and compiled by the above-mentioned Moggallina on the model of the Amara- kosha, was first printed at Colombo in 1824 as an appendix to Clough's grammar. A better edition, by Subhuti, with English and Sinhalese interpretations, notes, and appendices, appeared in 1865, of which a much improved reissue has just appeared at Colombo, to be followed in a second volume by full alphabetical indices. The Dhdtumanjdsd, a dictionary of Pali radicals, by Silavansa, was edited with English and Sinhalese translation at Colombo in 1872. Vuttodaya, a work on metre by Sangharakkhita, who is identified with Moggallana, was first cdited and translated by Professor Minayeff of St Petersburg in 1869, and in 1877, as No. II. of his Pali Studies, by Colonel G. E. Fryer, who had previously, in the first essay (1875), given the text with a full analysis of a work on rhetoric, called Subodhdlankara, by the same author.

There are great facilities in Europe for the study of Pali and its extensive literature. The British Museum, the University Library of Cambridge, and the library of the India Office are rich in Pali MSS., and a catalogue raisonné of the last-mentioned collection, by Professor Oldenberg, is accessible to students. The Royal Library of Copenhagen contains the MSS. which the late Professor E. Rask had brought from India, probably the finest collection in Europe, a catalogue of whieh was published in 1846, The National Library of Paris is the only one in Europe that possesses, in addition to a large number of MSS. in the Sinhalese and Burmese eharacters, a fine assemblage of MSS. in Cambodian letters. There are also Pali MSS. in the museums of learned societies and in private hands, and it would be well if means eould be devised for bringing these hidden treasures to light and utilizing them for literary purposes, for the study of the Pali language and literature has been making rapid strides within the last ten years. Lectures on PAli are delivered at Cambridge, in Paris, and in most of the Gcrman univer- sities, and the number of publications of Pali texts increases year by year. It is already admitted that Childers's Dictionary, the publieation of which in 1875 formed an epoch in the study of PAli, no longer sufiiees to supply the want, and that a more comprehensive work, or at least a supplementary dictionary, is urgently needed. Clough's Pali Grammar, which appeared at Colombo in 1824, found its way to Europe so tardily that it was still unknown to the authors of the Essai sur le Pali when they published their supplement to it in 1827, and it has always been a searee book. In 1872 Professor Minayeff brought out at St Petersburg a Pali grammar, written in Russian, which was translated into French py M. S. Guyard five years later. An English translation made from that Freneh version, by C. G. Adams, appeared at Maulmain in 1882. Meantime Professor E. Kuhn of Munieh published his valuable Betirdge zur Pali-Gram- mattk (Berlin, 1875), a mine of wealth for all students of the language. It is from this book and from Dr Ed. Miiller's grammar, to be named presently, that most of the examples in the above grammatieal sketeh have been culled. In 1881 there appeared at Christiania Die Flexion des Pali in threm Verhdliniss zum Sanskrit, by Alf Torp, and last year in London Dr Frankfurter's Handbook of Péli, being an Elementary Grammar, a Chrestomathy, and a Glossary, at the same time that at Rangoon Professor J. Gray's Elements of Pali Grammar left the press, The grammar by Dr Ed. Miiller, just published, deserves to be called a pattern of eritical scholarship.

Mueh valuable information on grammatieal and etymologieal questions may also be gained from Professor Fr. Miiller's Beitrage zur Kenntniss der Pali-Sprache, Vienna, 1867-69; Dr Morris's " Report on Pali Literature," in Proc. Philol. Soc., 1880; and last, not least, V. Trenckner's Pali Miscellany, part i., Copenhagen, 1879. (R. BR.)

PALIMPSEST, a term applied to any material from which writing has been removed to make room for another text, and which has thus been prepared or scraped a second time (radluyoros). Such an object therefore as an in-scribed monumental! stone or brass may be made palimpsest.

But the term is most commonly applied to ancient MSS. which have undergone this treatment. See PALHOGRAPHY. PALINDROME (rddAw, again, and dpdpos, a course), a

verse or sentence which runs the same when read either backwards or forwards. Such is the verse—

Roma tibi subito motibus ibit amor ; or

Signa te, signa, temere me tangis et angis ;

or

viboy avouhuara wy udvay dpe. Some have refined upon the palindrome, and composed verses each word of which is the same read backwards as forwards,—for instance, that of Camden—

Odo tenet mulum, madidam mappam tenet Anna, Anna tenet mappam madidam, mulum tenet Odo.

The following is still more complicated, as reading in four ways—upwards and downwards as well as backwards and forwards :—

SATOR AREPO TENET OPERA ROTAS

PALISSY, Bernarp (1510-1589), was born in 1510 at La Chapelle Biron, a village in the province of Périgord, France. His parents were poor, and at an early age he was thrown upon his own resources for even the most elementary education. With indomitable energy he read all the books within his reach, and, aided by naturally keen powers of observation, gained a knowledge, remarkable for that time, of chemistry, geology, botany, and other branches of natural history. Bernard Palissy's father was a painter of stained glass, and taught his son the practice of this important craft; he thus became a skilful draughtsman, learned the manipulation of colours, and gained that train- ing of the eye which in after years helped to bring him success and reward as a potter. After a period of travel- ling apprenticeship, Palissy marriedand settled in Saintes. At first he practised his craft of glass-painter, varied by portrait-painting and land-surveying. The search for subjects for his window-paintings led Palissy to extend his already wide course of study to history and classical mythology. He had not long been married when the whole course of his life was changed by a new ambition. He happened to see a fine piece of enamelled pottery, prob- ably majolica ware from Italy, and thereupon resolved to spend any time and labour to discover for himself the secret of the beautiful enamelled surface that he admired so much in that piece of pottery. His trade as a glass- painter had taught him something of the methods of paint- ing and firig enamel colours, and at the neighbouring village of La Chapelle des Pots he learned the rudiments of the potter's art in its simplest form; but this was all the help he had. He knew nothing whatever of the manu- facture of the finer sorts of faience, or of the composition of the white enamel which was to form the covering of his clay vessels and the ground for his coloured ornament.

Year after year, through a succession of utter failures, and almost without a gleam of hope, he laboured on, working often blindly and at random in search for the secret of the white enamel. Almost starving for want of food, his wife in rags bitterly and not unreasonably reproaching him for his cruelty, his furniture broken up to feed his kilns, and without a hand to help, Palissy struggled on for nearly sixteen years before success came. A truly tragic story is this, for after all it was no new discovery that Palissy ever reached or even aimed at, SS Ee ee ee

1 This last is from the xapxivor of the emperor Leo VI., the Philo- sopher, and oeeurs in a palindrome piece of twenty-seven lines, which can be seen in the Hacerpta Varia of Leo Allatius (1641). See also NV. and Q., 5th ser., vii. 372, viii. 77

The secret of the white enamel was known to every potter of northern Italy, and there, if he had but known, he might have learned that process on the rediscovery of which he wasted so many of the best years of his life All those struggles and failures are most vividly told by Palissy himself in one of the most thrilling pieces of autobiography ever written. The nearest parallel to it js perhaps (widely different as the two men are) that of his contemporary the Florentine Cellini.

For a few years Palissy enjoyed untroubled reward for his years of toil and unflinching constancy of purpose, His works were bought and appreciated by the queen, Catherine de' Medici, and many of the great nobles of her court, who were eager for specimens of his skill, But before long Palissy, who had always been something of a theologian and a constant Bible student, became irresistibly enthralled by the new doctrines of the Reformation, and enrolled himself an enthusiastic member of the Huguenot party. He could do nothing by halves; he devoted himself heart and soul to the cause, and, in 1558, while engaged in making plaques, tiles, and rustic figures in faience to decorate the Constable de Montmorency's Chateau d'Ecouen, Palissy was arrested and imprisoned at Bordeaux, while his kilns and the materials of his trade were destroyed by command of the magistrates,

Through the intervention of the French court Palissy was, after a time, liberated, and about 1563, under the protection of the king, set up his pottery-works in Paris, on a plot of ground afterwards occupied by part of the gardens of the Tuileries. Here Palissy lived and worked in comparative peace and prosperity till 1588, when a fresh outburst of religious zeal against the Huguenots proved too strong even for the royal patronage, which for so long had sheltered him. He was thrown into the Bastille, and, though Henry III., who was then king, offered him rewards and freedom if he would recant, Palissy preferred death to falsehood. Henry III., though not unmindful of the forty-five years during which Palissy had faithfully served

the court of France, was too timid or too weak to save his old servant, then nearly eighty years of age. Palissy was condemned to death, but died shortly after, in one of the dungeons of the Bastille, in the year 1589. This martyr's death was a not unfitting end for one whose whole life had been a sacrifice to noble aims, and who, years before, had suffered a protracted martyrdom in the to him sacred cause of art.

Palissy's Pottery.—Though very varied in design, Palissy's pot- tery is for the most part executed after one technical process. Hard well-burnt earthenware, sometimes fired at so high a temper- ature as to have almost a metallic ring, was covered with a white enamel, formed of the usual ingredients of glass, to which opacity and creamy whiteness were given by the addition of an oxide of tin. On this white ground various colours were applied in enamel- pigments, and the whole finally covered with a thin plumbo- vitreous glaze. The potter's wheel was but little, if at all, used by Palissy, who, in his pieces, aimed less at purity and beauty of outline than at elaborate surface-decoration in high relief, formed by pressing the clay into a mould.

Palissy's best-known productions are large plates, ewers, vases, and other forms, decorated in alto-relief, with very realistic figures of reptiles, fish, insects, shells, plants, and other objects, executed with wonderful truth and accuracy from moulds formed by taking casts of the objects themselves (see woodcut). Thus we see repro- duced every scale on a snake's or fish's back, and the minutest peculiarities of the fossil shells and living plants which Palissy saw around him and delighted in copying with the scientific accuracy of a student of natural history and geology. Casts from these objects were fixed on to a metal dish or vase of the shape required, and a fresh cast from the whole formed a mould from which Palissy could reproduce many articles of the same kind. After being covered with the long-sought-for white enamel, the various parts of the piece were painted in realistic colours, or as near truth as could be reached by the pigments Palissy was able to discover and prepare. These colours were mostly various shades*of blue from indigo 1 ultramarine, some rather crude greens, several tints of brows

and greys, and, more rarely, yellow. . Other pieces, such as dishcs and plaques, were ornamented by figure subjects treated after the game fashion, generally Scriptural scenes or subjects from classical mythology. These were in many cases copied from works in sculpture by contemporary artists.

Another class of designs used by Palissy were plates, tazze and the like, with geometrical patterns moulded in relief and pierced through, forming a sort of open network. Perhaps the most suc- cessful as works of art were those plates and ewers which Palissy moulded in exact facsimile of the rich and delicate works in pewter for which Francois Briot and other Swiss metal-workers were so

Rustic Plate by Palissy.

celebrated. These are in very slight relief, and are exccuted with _ eameo-like finish, mostly of good design, after the style of the _ Italian silversmiths of the 16th century. Palissy's ceramic repro- ductions of these metal plates are not improved by the colours with which he picked out the designs.

Some enamelled and painted earthenware statuettes, full of life and expression, have been attributed to Palissy; but it is doubtful whether he ever worked in the round. On the whole his produc- tions cannot be assigned a very high rank as works of art, though they are certainly remarkable as objects of curiosity and marvels of ingenious skill. They have always been highly valued, and in the 17th century attempts were made both at Delft and Lambeth to copy his "'rustic" plates with the reliefs of animals and human figures, These imitations are very blunt in modelling, and coarsely painted. They are generally marked on the back in blue with initials and a date—showing them to be honest copies, not attempts at forgery, such as have been produced in the present century.

The best collections of Palissy ware are those in the museums of the Louvre, the Hétel Cluny, and Sévres ; and in England that at Narford Hall, with a few specimens in the South Kensington and British Museums.

As an author Palissy was perhaps even more successful than as a

otter. A very high position among French writers is assigned to

im by Lamartine (B. Palissy, 8vo, Paris, 1852). He wrote ona great variety of subjects, such as agriculture, natural philosophy, religion, and especially his L’ Art de terre, in which he gives an account of his processes and how he discovered them. A complete edition of his works was published by P. Antoine Cap, L’ Zuvres Completes de B. Palissy, Paris, 1844.

See Morley, Life o iSsy, : ’ “Y, >» Pp. an Dumesnil, vie, 4 ae > en. eee = etd eras Brvstiides 4 Palissy, 1863; Delécluze, B. Palissy, 1888; Enjubault, L’Art céramique de B. Palissy, 1858; Audiat, Etude sur la vie… de B, Palissy, 1868; Delange,

onographie de Veuvre de B. Palissy, 1862. For Palissy as a Huguenot see Rossignol, Les Protestants illustres, No. iv., 1861. (VJ. H

_ PALITANA, a “second class” native state of India, in KArarwAr (g.v.), Bombay presidency, lying between 21° 23′ 30” and 21° 42’ 30” N. lat., and between 71° 31’ and 72° 0’ 30” E. long., with an area of 305 square miles, and a population (1881) of 49,271. The chief pays a tribute jointly to the gdekwar of Baroda and the nawab of Junagarh, The capital of the state is Palitana (popula- tion, 7659). Above the town, to the west, rises the sacred hill of Satrunjaya, which is covered with temples dedicated to Adinath, one of the deified saints of the Jains, and is the resort of innumerable pilgrims from all parts of India.

_ PALLADIO, Anprea (1518-1580), a native of Vicenza I the north of Italy, one of the chief architects of his century. Palladio’s early student life was spent in Rome, where he learned the practical part of his profession, and

spent several years in making drawings of the buildings of ancient Rome. In 1547 he returned to his native city Vicenza, where he designed a very large number of fine buildings—among the chief being the Barbarano, Porti, and Chieregati palaces, as well as many others for various nobles of Vicenza and the neighbourhood. Perhaps his finest work in Vicenza itself was the Palazzo della Ragione, with two stories of open arcades of the Tuscan and

Ionic orders. Most of these buildings, however, look better on paper than in reality, as they are mainly built of brick,

covered with stucco, now in a very dilapidated condition.

This does not affect the merit of their design, as Palladio intended them to have been executed in stone. His fame extended widely throughout Italy, and Pope Paul III. sent for him to Rome to report upon the state of St Peter's. In Venice, too, Palladio built many stately churches and palaces, such as 8. Giorgio Maggiore, the Capuchin church, and some large palaces on the Grand Canal. His last great work was the Teatro Olimpico at Vicenza, designed after a classical model; he died before its completion, and it was finished, though not altogether after the original design, by his pupil and fellow-citizen Scamozzi.

In addition to his town buildings, Palladio designed many country villas in various parts of northern Italy. The villa of Capra is perhaps the finest of these, and has frequently been imitated. Palladio wasa great student of classical literature, and was much influenced by Vitruvius's great work on architecture. He also published in 1575 an edition with notes of Czesar's Commentaries.

His great literary work was J quattro libri dell' Archi- tettura, first published at Venice in 1570, which has passed into countless editions, and been translated into every European language. The original edition is a small folio, richly illustrated with well-executed full-page woodcuts of plans, elevations, and details of buildings,—chiefly either ancient Roman temples or else palaces designed and built by himself. The influence of this book on the architecture of Europe has been enormous. Among many others, an edition with notes was published in England by Inigo Jones, most of whose works, and especially the palace of Whitehall, of which only the banqueting room remains, owed much to Palladio's inspiration. Though other Italian architects in the 16th century worked out and developed the same style, yet, in England at least, the term Palladian has been used to include all the results of this revival of classicalism. Vignola, Scamozzi, and Serlio were among the chief of Palladio's contemporaries. The style adopted and partially invented by Palladio expressed a kind of revolt against the extreme licence both of composi- tion and ornament into which the architecture of

his time had fallen. Though often noble, dignified, and full of the most harmonious proportions, Palladio's style is dull and lifeless, dominated by scholasticism, and regardless of con- siderations of utility and convenience.

He was fascinated by the stateliness and beauty of pro- portion which are the chief charms of the buildings of ancient Rome, and did not stop 'to reflect that reproduc- tions of these, however great their archeological accuracy, could not but be lifeless and unsuited to the wants of the 16th century. Palladio's carefully measured drawings of ancient buildings are now of great value, as in many cases the buildings have altogether or in part ceased to exist.

The following is a short abstract of the contents of Palladio's great work on architecture :—

Book I. Materials ; construction ; the five orders (Tuscan, Doric, Ionic, Corinthian, and Composite); the proportions of various parts of buildings; construction of stairs. :

Book II. Plansand elevations of city and country houses designed by Palladio; restoration of Greek and Roman houses; sites; Palladio's designs for palaces for certain Venetian and other noblemen, in Venice, Vicenza, Verona, and elsewhere.

Book III. Roads; bridges; piazze; piazze of Greeks and Romans; ancient basilica; modern basilica at Vicenza; baths and xysti of the Greeks.

Book IV. Temples of ancient Rome; Bramante's ''Tempictto" (S. Pietro in Montorio); Roman temples in Italy, outside Rome; Roman temples (such as those at Nimes) outside Italy.

See Montanari, Vita di Andrea Palladio, 1749; Rigato, Osservazioni sopra Andrea Palladio, 1811; Magrini, Memorie intorno la vita di Andrea Palladio, 1845; Milizia, Memorie degli Architetti, 1781, ii, pp. 35-54; Symonds, Renaissance in Italy—Fine Arts, pp. 94-99.

PALLADIUM, an archaic wooden image (£davov) of Pallas, preserved in the citadel of Troy as a pledge of the safety of the city. It represented the goddess, standing in the stiff archaic style, holding the spear in her right hand. According to one story, Zeus had thrown it down from heaven when Ilus was founding the city of Ilium. Odysseus and Diomedes carried it off from the temple of Pallas, and thus made the capture of Troy possible. Many different cities boasted that this ancient image had passed into their possession—Athens, Argos, Rome, Lavinium, &c. It is probable that the Palladium is an image of the warlike goddess Pallas, who must in origin be distinguished from Athena. The theft of the Palladium is a frequent subject in Greek art, especially of the earlier time.

PALLADIUS, Rutinivs Taurus AimmiANvs, a writer of the 4th century after Christ, author of a poem on agriculture (De Re Rustica) in fourteen books. It is not certain whether he can be identified with any known historical person of the time. His work consists of an introductory book of general directions on agriculture, twelve books describing the operations suitable for the twelve months of the year, and a final book on the cultivation of trees. The material is derived from Columella and other earlier writers. The work was popular in the Middle Ages; it is conveniently arranged, but far inferior in every other respect to that of Columella.

PAL LAHARA, a tributary state of Orissa (q.v.).

PALLAS. See AtuEna, vol. ii. 830.

PALLAS, Prrsr Stmon (1741-1811), naturalist and traveller, was born in Berlin, September 22, 1741, the son of Simon Pallas, surgeon in the Prussian army, and pro- fessor of surgery in Berlin. Pallas was carefully educated by his father, being accustomed from boyhood to the use of several languages, among them English and French. He was intended for the medical profession, and his progress was such that in 1758 he lectured publicly on anatomy. Pallas studied at the universities of Berlin, Halle, Géttingen, and Leyden. He early displayed a strong leaning towards natural history investigations, which by the time he reached manhood almost monopolized his attention. In 1761 he came to England, where he spent a year, devoting himself to a thorough study of the collections he found there, and to a geological investiga- tion of part of the English coast; and at the

age of twenty-three he was elected a foreign member of the Royal Society. Pallas spent some time in Holland, where he found ample scope for investigation in his special subjects, the results of which appeared at the Hague in 1766 in his Llenchus Zoophytorum and Miscellanea Zoologica, and in 1767-1804 in his well-known Spicilegia Zoologica (Berlin). In 1768 he gladly accepted the invitation of the empress Catherine to fill the professorship of natural history in the Imperial Academy of Science, St Petersburg, and from that time until within a year of his death his home was in Russia. The great event of his life, and that by which he will be permanently remembered, was the expedition through Russia and Siberia in 17 68-74, in which he acted as naturalist, in company with Falk, Lepechen, and Giildenstadt, the immediate object being the observation of the transit of Venus in 1769. In this leisurely journey Pallas went by Kasan to the Caspian,

spent some time among the Calmucks, crossed the Urals to Tobolsk, visited the Altai Mountains, traced the Irtish to Kolyvan, went on to Tomsk and the Yenissei, crossed Lake Baikal, and extended his journey to the frontiers of China. Few explorations have been so fruitful as this six years' journey. Pallas's collections included all depart. ments of natural history, and his observations extended to every point of interest in the region traversed and its inhabitants. The leading results were given in his Reisen durch verschiedene Provinzen des Riissischen Reichs (3 vols, 4to, St Petersburg, 1771-76), richly illustrated with coloured plates. A French translation in 1788-93, in 8 vols., with 9 vols. of plates, contained, in addition to the narrative, the natural history results of the expedition; and an English translation in three volumes appeared in 1812. As special results of this great journey may be mentioned Sammlungen historischer Nachrichten tiber die Mongolischen Volkerschaften (2 vols. 4to, St Petersburg, 177 6~-1802) ; Nove Species Quadrupedum, 1778-79; Pallas's con- tributions to the dictionary of languages of the Russian empire, 1786-89; Icones Insectorum, presertim Rossix Siberieque peculiarium, 1781-1806; Zoographia Rosso- Asiatica (3 vols, 1831); besides many special papers

in the Zransactions of the academies of St Petersburg and

Berlin, The empress bought Pallas's natural history collec- tions for 20,000 roubles, 5000 more than he asked for them, and allowed him to keep them for life. He spent a considerable time in 1793-94 in visiting the southern pro- vinces of Russia, and was so greatly taken with the Crimea that he determined to take up his residence there. The empress gave him a large estate at Simpheropol, and 10,000 roubles to assist in equipping a house. Though dis- appointed with the Crimea as a place of residence, Pallas continued to live there, devoted to constant research, especially in botany, till the death of his second wife in 1810, when he removed to Berlin, where he died September 8, 1811. The results of his journey in southern Russia were given in his Bemerkungen auf einer Reise durch die siid- lichen Statthalterschaften des Riissischen Reichs (Leipsic, 1799-1801 ; English translation by Blagdon, vols. 5-8 of Modern Discoveries, 1802, and another in 2 vols. 1812). Pallas also edited and contributed to MWeue Nordische

Beitriige zur physikalischen Erd- und Vilkerbeschreibung, Naturgeschichte, und Oekonomie (1781-96), published Zllus- trationes Plantarum imperfecte vel nondum cognitarum (Leipsic, 1803), and contributed to Buffon's Natural History a paper on the formation of mountains, and to the Transactions of various learned societies a great number of special papers.

The solid value and great extent of Pallas's contributions to natural science have been long admitted; his name is inseparably associated with the geography (in its varied branches) of Siberia and a large part of European Russia. That he had a marked influence on the progress of zoology there is no doubt; some authorities even hold that he changed the face of the science; while his geological investigations and speculations, if they did not revolutionize the young science (as has been maintained), greatly helped its progress. 'Though not in any sense brilliant either as an investigator or as a writer, Pallas is certainly one of the most important figures in the science of the latter half of the 18th century.

See the Essay of Rudolphi in the Zransactions of the Berlin Aeademy for 1812; Cuvier's Eloge in his Recueil des Eloges Historiques, vol. ii.; and the Life in Jardine's Naturalists' Library, vol. iv., Edin., 1848.

PALLAVICINO, Frrrante (1618-1644), a writer of pasquinades, who is now known chiefly for his early and tragical end, was a member of the old and widely ramified Italian family of the Pallavicini, and was born at Piacenza in 1618. He received a good education at Padua and elsewhere, and early in life entered the Augustinian order, residing chiefly in Venice. For a year he accompanied Ottavio Piccolomini, duke of Amalfi, in his German campaigns as field chaplain, and shortly after his return

he published a number of clever but exceedingly scurrilous satires on the Roman curia and on the powerful house of the Barberini, which were so keenly resented at Rome that a price was set on his head. A Frenchman of the name of Charles de Breche decoyed him from Venice, where he was comparatively safe, to the neighbourhood of Avignon, and there betrayed him into his enemies' hands. After fourteen months' imprisonment and

some observance of the formalities of a trial he was beheaded at Avignon on March 6, 1644.

His Opere Permesse was published at Venice in 1655, but being, as may be imagined, inferior in seurrility and grossness (Palla- yicino's specialities), are much less prized by the curious than the Opere Seelte (Geneva, 1660), which were more than once reprinted in Holland, and were translated into German in 1663.

PALLAVICINO, or Patiavictnt, Srorza (1607-1667), cardinal, representative of another branch of the same family, was born at Rome in 1607. Having taken holy orders in 1630, and joined the Society of Jesus in 1638, he successively taught philosophy and theology in the Collegio Romano; as professor of theology he was a member of the congregation appointed by Innocent X. to investigate the Jansenist heresy. In 1659 he was made a cardinal by Alexander VII. His death occurred in 1667.

Pallavicino is chiefly known by his history of the council of Trent, written in Italian, and published at Rome in two folio volumes in 1656-57 (2d edition, considerably modified, in 1666). His avowed object was to correct and supersede the very damaging

work of Sarpi on the same subject, and he certainly, by virtue of

his position, had access to many important sources from the use of which his predecessor had been precluded ; the contending parties, however, are far from agreed as to the completeness of his success. The work was translated into Latin by a Jesuit named Giattinus (Antwerp, 1670). There is a good edition of the original by Yaccharia (6 vols. 4to, 1792-99). It ;was translated into German by Klitsche in 1835-37.

PALLIUM, PALLA. These articles of Roman dress, corresponding to the Greek himation, are described in the article Costume (vol. vi. pp. 453, 456-57), where also the pallium, as an ecclesiastical vestment peculiar. to arch-bishops in the Roman Church, has been spoken of (pp. 461,463). In the East the pallium is worn by all bishops, and one or two instances have occurred in the Western Church also in which it has been conferred by the pope on prelates of less than archiepiscopal rank. The canon law forbids archbishops

to wear this vestment until it has been solemnly asked for (either personally or by deputy) and obtained from the holy see; even then it is only to be worn on certain specified occasions, such as at high ponti- fical mass or at an episcopal consecration. Every arch- bishop must apply for it within three months after his consecration, and it is buried with him at his death. The pallium is never granted until after payment of consider- able dues. The pallia are prepared by nuns from white wool obtained from lambs which have been consecrated on St Agnes's eve in the church of that saint in Rome; the vestments are blessed on the festival of Saints Peter and Paul, and deposited fora night on the altar over St Peter's tomb; they are afterwards taken charge of by the sub- deacon, and given out as required. The growth of the occasional practice of bestowing the pallium into an invariable custom, and of the custom into a law, will be traced in the article PopEDoM.

PALM. From their noble aspect, and perhaps from the surpassing utility of several of the members of the group, the Palms (Palmacex) have been termed the princes of the vegetable kingdom. Neither the anatomy of their stems nor the conformation of their flowers, however, entitles them to any such high position in the vegetable hierarchy. Their stems are not more complicated in structure than those of the common butcher's broom (Ruscus) ; their flowers are for the most part as simple as those of a rush (Juncus). For all that, palms have

always had great interest, not only for botanists, but also for the general public, in the latter case by reason of the his- torical and legendary interest connected with them no less than from their beauty and economic value. Palmacex is characterized among monocotyledonous plants by the presence of a stem very frequently unbranched, and bearing a tuft of leaves at the extremity only, or with the leaves scattered, these leaves, often gigantic in size, being usually firm in texture and branching in a pinnate or palmate fashion. branching spikes, very generally protected by a spathe or

The order

The flowers are borne on simple or

spathes, and each consists typically of a perianth of six

greenish, somewhat inconspicuous segments in two rows, with six stamens, a pistil of 1-3 carpels, each with a single

ovule and a succulent or dry fruit never dehiscent (figs. 1, 2). The seed consists almost exclusively of perisperm or

albumen in a cavity in which is lodged the relatively very

minute embryo (fig. 3). These are the general charac

Bigs vl.

Fig. 2.

Fic. 1.—Diagram of the 6 flower of Chamerops, Fan-Palm, showing six divisions of the perianth and six stamens.

Fic. 2.—Diagram of the Q flower of the Chamerops, showing six divisions of the perianth in two rows, and three cells of the ovary. Fic. 3.—Portion of the perisperm of a palm, showing the embryo

within a small cavity,

Fig. 3.

teristics by which this very well-defined order may be discriminated, but, in a group containing considerably more than a thousand species, dispersed widely and at dif- ferent elevations throughout the tropics of both hemi-spheres, with stragglers in subtropical and even in warm temperate regions, it may well be imagined that devia- tions from the general plan of structure occur with some frequency. As the characteristic appearances of palms depend to a large extent upon these modifications, some of the more important among them may briefly be noticed. Taking the stem first, we may mention that it is in very many palms relatively tall, erect, unbranched, regularly cylindrical, or dilated below so as to form an elongated cone, either smooth, or covered with the projecting remnants of the former leaves, or marked with circular scars indicating the position of those leaves which

have now fallen away. In other cases the stem is very slender, short, erect, prostrate, or scandent by means of formidable hooked prickles which, by enabling the plant to support ‘tself on the branches of neighbouring trees, also permit the stem to grow to a very great length and so to expose the foliage to the light and air above the tree-tops of the dense forests these palms grow in, as in the genus Calamus. In some few instances the trunk, or that portion of it which is above ground, is so short that the plant is in a loose way called “stemless” or “acaulescent,” as in Geonoma, and as happens sometimes in the solitary species found in a wild state in Europe, Chamerops humilis. In many species the trunk 1s covered over with a dense network of stiff fibres, often compacted together at the free ends into spines. This fibrous material, which is so valuable for cordage, consists of the fibrous tissue of the leaf-stalk, which in these cases persists after the decay of the softer portions. It is very character- istic of some palms to produce from the base of the stem a series of adventitious roots which gradually thrust them- selves into the soil and serve to steady the tree and prevent

its overthrow by the wind. The underground stem of some

species, ¢.g., of Calamus, is a rhizome, or root-stock, lengthen-

ing in a more or less horizontal manner by the development of the terminal bud, and sending up lateral branches like suckers from the root-stock, which form dense thickets of cane-like stems.

the apex.

The internal structure of the stem does not differ funda-

mentally from that of a typical monocotyledonous stem,

the taller, harder trunks owing their hardness not only to the fibrous or woody skeleton but also to the fact that, as growth goes on, the originally soft cellular tissue through which the fibres run becomes hardened by the deposit of woody matter within the cells, so that ultimately the cellular portions become as hard as the woody fibrous

matters proper.

The leaves of palms are either arranged at more or less

distant intervals along the stem, as in the canes (Calamus, &c.), or are approximated in tufts at the end of the stem,

thus forming those noble crowns of foliage which are so closely associated with the general idea of a palm. In the young condition, while still unfolded, these leaves, with the succulent end of the stem from which they arise, form “the cabbage,” which in some species is highly esteemed

as an article of food.

The adult leaf very generally presents a sheathing base

tapering upwards into the stalk or petiole, and this again bearing the lamina or blade.

course of time, the upper parts of the leaf decay and fall off the base of the leaf-stalk and sheath often remain, either entirely or in their fibrous portions only, which latter constitute the investment to the stem already mentioned. In size the leaves vary within very wide limits, some being only a few inches in extent, while those of the noble Caryota may be measured in tens of feet. In form the leaves of palms are very rarely simple ; usually they are more or less divided, sometimes, as in Caryota, extremely so. In Geonoma Verschaffeltia, and some others, the leaf splits into two divisions at the apex and not elsewhere ; but more usually the leaves branch regularly in a palmate fashion as in the fan-palms Latania, Chamerops, Sabal, &c., or in a pinnate fashion as in Areca, Kentia, Calamus, &c. The form of the segments 1s generally more or less linear, but a very distinct appearance is given by the broad wedge-shaped leaflets of such palms as Caryota, Martinezia, or Mauritia. These forms run one into another by transitional gradations ; and even in the same palm the form of the leaf is often very different at different stages of its growth, so that it is a difficult matter to name correctly seedling or juvenile palms in the condition in which we generally meet with them in the nurseries, or even to foresee what the future development of the plant is likely to be. Like the other parts of the plant, the

leaves are sometimes invested with hairs or spines; and, in some instances, as in the magnificent Ceroxylon andicola, the under surface is of a glaucous white or bluish colour.

The inflorescence of palms consists generally of a fleshy spike like that of an Arum, either simple or much branched, studded with numerous, sometimes extremely numerous, flowers, and enveloped by one or more sheathing bracts called “spathes.” ‘These parts may be small, or they may attain relatively enormous dimensions, hanging down from amid the crown of foliage like huge tresses, and adding greatly to the noble effect of the leaves,

‘mentioned already.

The branching of the stem above ground is unusual, except in the case of the Doum Palm of Egypt (Hyphzne), and, when present, is probably the result of some injury to the terminal bud at the top of the stem, in consequence of which buds sprout out from below

The sheath and the petiole are very often provided with stout spines; and when, in

PALM

As to the individual flowers, they are usually small, greenish, and insignificant; their general structure has been Modifications from the typical struc. ture arise from differences of texture, and specially from suppression of parts, in consequence of which the flowers are very generally unisexual (figs. 1, 2), though the flowers of the two sexes are generally produced on the same tree (moncecious), not indeed always in the same season, for a tree in one year may produce all male flowers and in the next all female flowers. Sometimes the flowers are modi- fied by an increase in the number of parts ; thus the usually six stamens may be represented by 12 to 24 or even by hundreds. The carpels are usually three in number, and more or less combined; but they may be free, and their number may be reduced to two or even one. In any case each carpel contains but a single ovule.

Owing to the sexual arrangements before mentioned, the pollen has to be transported by the agency of the wind or of insects to the female flowers. This is facilitated some. times by the elastic movements of the stamens and anthers, which liberate the pollen so freely at certain times that travellers speak of the date-palms of Egypt (Phenix dactylifera) being at daybreak hidden in a mist of pollen grains. In other cases fertilization is effected by the agency of man, who removes the male flowers and scatters the pollen over the fruit-bearing trees, This practice has been followed from time immemorial ; and it afforded one of the earliest and most irrefragable proofs by means of which the sexuality of plants was finally established. The fruit which results from this process of fertilization is various: sometimes, as in the common date, it is a berry with a fleshy rind enclosing a hard stony kernel, the true seed; sometimes it is a kind of drupe as in the cocoa-nut, Cocos nucifera, where the fibrous central portion investing the hard shell corresponds to the fleshy portion of a plum or cherry, while the shell or nut corresponds to the stone of stone-fruits, the seed being the kernel. Sometimes, as in the species of Sagus, Raphia, &c., the fruit is covered with hard, pointed, reflexed shining scales, which give it a very remarkable appearance.

The seed varies in size, but always consists of a mass of perisperm, in which is imbedded a relatively very minute embryo (fig. 3). The hard stone of the date is the perisperm, the white flesh of the cocoa-nut is the same substance in a softer condition; the so-called “vegetable ivory ”is derived from the perisperm of Phytelephas.

Hooker, who in his recent revision of the genera follows the work of his predecessors Martius, Wendland, and Drude, enumerates about one hundred and thirty-two genera of the order ranged under five tribes, distinguished by the nature of the foliage, the sexual conditions of the flower, the seed umbilicate or not, the position of the raphe, &c. Other characters serving to distinguish the minor groups are afforded by the habit, the position of the spathes, the “‘eestivation” of the flower, the nature of the stigma, the ovary, fruit, &c.

It is impossible to overestimate the utility of palms. They furnish food, shelter, clothing, timber, fuel, building materials, sticks, fibre, paper, starch,

sugar, oil, wax, wine, tannin, dyeing materials, resin, and a host of minor pro- ducts, which render them most valuable to the natives and to tropical agriculturists, The Cocoa-nut Palm, Cocos nuci-

fera, and the Date Palm, Phenix dactylifera, have been’

treated under separate headings. Sugar and liquids capable of becoming fermented are produced by Caryota urens,

Cocos nucifera, Borassus flabelliformis, Rhapis vinifera, Arenga saccharifera, Phenix silvestris, Mauritia vinifera, &c. Starch is procured in abundance from the stem of the Sago Palm, Sagus Rumphii, and other species. The seeds of Elais guineensis of western tropical Africa yield, when

erushed and boiled, “ palm oil.” Cocoa-nut oil is extracted from the cocoa-nut. Wax is exuded from the stem of Ceroxylon andicola and Copernicia cerifera. A variety of « dragon’s blood,” a resin, is procured from Calamus Draco and other species. Edible fruits are yielded by the date, the staple food of some districts of northern Africa. The eocoa-nut is a source of wealth to its possessors, and many of the species are valued for their “cabbage”; but, as this is the terminal bud whose removal causes the destruction of the tree, this is a wasteful article of diet unless care be taken by judicious planting to avert the annihilation of the supplies. The famous “coco de mer,” or double cocoa- put, whose floating nuts might have suggested the twin steamboats, and are .the objects of so many legends and superstitions, is known to science as Lodowcea Sechel- larum. ‘The tree is peculiar to the Seychelles, where it is used for many useful purposes. Its fruit is like a huge plum, containing a stone or nut like two cocoa-nuts (in their husks) united together. These illustrations must suffice to indicate the numerous economic uses of palms. The only species that can be cultivated in the open air in England, and then only under exceptionally favourable circumstances, are the European Fan-Palm, Chamezrops humilis, the Chusan Palm, C. Fortunei, of which speci- mens may be seen out of doors at Kew, Heckfield, Osborne, &c., and the Chilian Jubza spectabilis. The date-palm now so commonly planted along the Mediter- ranean coast is the

common Date-Palm; but this does not ripen its fruit north of the African coast. There are several low growing palms, such as Rhapis flabelliformis, Chamerops humilis, &c., which are suited for ordinary green-house culture, and many of which, from the thick texture of their leaves, are enabled to resist the dry and often gas-laden atmosphere of living rooms. Many species are now cultivated for the special purpose of the decora- tion of apartments, particularly the very beautiful Cocos Weddelliana. But, to gain anything like an idea of the magnitude and majestic character of palms, a visit to such establishments as the palm stoves at Kew, Edinburgh, or Chatsworth is necessary. In some instances, as in the famous Talipot Palm, Borassus flabelliformis, the tree does not flower till it has arrived at an advanced age and acquired a large stature, and, having produced its flowers, it dies like an annual weed. (M. T. M.) PALMA, the chief town of the Spanish province of Baleares, the residence of a captain-general, a bishop's see, and a flourishing seaport, is situated 135 miles from Barcelona, on the south-west coast of Majorca, at the head of the fine Bay of Palma, which stretches inland for about 10 miles between Capes Cala Figuera and Regana. It is the meeting place of all the highways in the island, and the terminus of the railway which (opened in 1875) runs to Inca and (1879) Manacor, and will be extended to Alcudia. The ramparts, which enclose the city on all sides except towards the port (where they were thrown down in 1872), have a circuit of a little more than 4 miles. Though begun in 1562, after the plans of Georgio Fretin, they were not finished till 1836. Palma has undergone considerable change since 1860; streets have been widened and houses built in the ordinary modern style, and the fine old-world Moorish character of the place has suffered accordingly. The more conspicuous buildings are the cathedral, the exchange, the palace, now occupied by the captain-general and the law courts, the general hospital (1456), the town-house (end of the 16th century), the picture gallery, and the college. At the time of the partial suppression in 1835 there were twenty-five monastic build- Ings in Palma; none of those still extant are of much note. The church of San Francisco is interesting for the tomb of Raymond Lully, a native of Palma. The cathedral, a fine

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Gothic building with massive buttresses, crowns the sum- mit of the hill on which the city stands. It was erected and dedicated to the Virgin in terms of a vow made by King Jayme as he sailed to the conquest of Majorca, but, though commenced in 1230, it was not finished till 1601. The older and more interesting portions are the royal chapel (1232), with the tomb (1779) of Jayme II., and the south front with the doorway known as del mirador (1389). The principal dimensions of the edifice are— length from the door to the high altar, 347 feet ; width, including the chapels, 190 feet; height of the central nave, 147 feet; height of the side naves, 78 feet ; and height of the belfry tower, 166. Of the architecture of the exchange (lonja), a Gothic building begun in 1426, the people of Palma are particularly proud, as it excited the admiration of the emperor Charles V. The columns of the windows, in black and grey marble, are of almost unexampled slim- ness. The harbour (formed by a mole constructed to a length of 387 yards in the 14th century and afterwards extended to more than 650 yards), has been greatly improved and enlarged since 1875 by dredging operations and a further addition to the mole of 136 yards. Pre- viously it was not accessible to vessels drawing more than 18 feet, and men-of-war and large merchant steamers were obliged to anchor in the bay, which is sometimes rendered dangerous by violent storms. Porto Pi, about 2 miles from the city, was once a good harbour, but is now fit only for small craft. Shoemaking, tanning, and rope- spinning are prosecuted on a very extensive scale; and direct commerce is carried on with Valencia, Barcelona, Algeria, Marseilles, Cuba, Porto Rico, &e. Many of the Majorcan vessels used to be Palma-built, but the increase of steam navigation has changed the character of the trade. The population of the ayuntamiento, 53,019 in 1860, was 58,224 in 1877. There is a considerable number of Christian Jews (Chuetas) who were formerly confined to their own quarter.

Palma probably owes, if not its existence, at least its name (symbolized on the Roman coins by a palm branch), to Metellus Balearicus, who in 123 B.c. scttled three thousand Roman and Spanish colonists on the island. The bishopric dates only from the 14th century, its foundation having been strongly opposed by the bishop of Barcelona. About a mile south-west of Palma is the castle of Bellver, where Jovellanos and Arago were imprisoned.

PALMA, distinguished since 1861 as Palma Campania, a city of Italy, in the province of Caserta, 4% miles south of Nola. The population was 5858 in 1881.

PALMA, distinguished since 1861 as Palma di Monte- chiaro, a city of Italy, in the province of Girgenti, Sicily, 13 miles 8.E. of Girgenti. Though situated some distance inland, it has a port of considerable value to the coasting trade. The exports are wine, dried fruits, soda, and sulphur. Hodierna, the mathematician (1597-1660), was a priest at Palma patronized by the duke of Palma. The population, 13,458 in 1871, was 11,702 in 1881.

PALMA, one of the Canary IsLanps (9.2.).

PALMA, Jacopo, a painter of the Venetian school, was born at Serinalta near Bergamo, towards 1480, and is said to have died at the age of forty-eight, or towards 1528, He is currently named Palma Vecchio (Old Palma) to distinguish him from Palma Giovane, his grand- nephew, a much inferior painter. About the facts of his life little is known. He is reputed to have been a com- panion and competitor of Lorenzo Lotto, and to some extent a pupil of Titian, after arriving in Venice early in the 16th century; he may also have been the master of Bonifazio. His earlier works are in the older manner, and betray the influence of the Bellini; but, modifying his style from the study of Giorgione and Titian, Palma took high rank among those painters of the distinctively Venetian type who remain a little below the leading masters. For rich-

ness and suffusion of colour he is hardly to be surpassed; but neither in invention, strength of character, nor vigorous draughtsmanship does he attain any peculiar excellence. His finish is great, his draperies ample, his flesh golden-hued. He painted many fine portraits. A face frequently seen in his pictures is that of his daughter Violante, of whom Titian was more or less enamoured. Two works by Palma are more particularly celebrated. The first is a composition of six paintings in the Venetian church of §8. Maria Formosa, with St Barbara in the centre, under the dead Christ, and to right and left Sts Dominic, Sebastian, John Baptist, and Anthony. ‘The second work is in the Dresden Gallery, representing three sisters seated in the open

air (presum- ably the painter’s daughters) ; it is frequently named The Three Graces. Other leading examples are—the Last Supper, in S. Maria Mater Domini; a Madonna, in the church of §. Stefano in Vicenza; the Epiphany, in the Brera of Milan; the Holy Family, with a young shepherd adoring, in the Louvre; St Stephen and other Saints, Christ and the Widow of Nain, and the Assumption of the Virgin, in the Accademia of Venice; and Christ at Emmaus, in the Pitti Gallery. Palina’s grand-nephew, Palma Giovane, was also named Jacopo (1544 to about 1626). His works, which are extremely numerous in Venice, and many of them ona vast scale, belong to the decline of Venetian art.

PALMAS, Las. See Canary Istanps, vol. iv. p. 799.

PALMER, Epwarp Henry (1840-1882), Orientalist, was born at Cambridge, August 7, 1840. He lost his parents when he was a mere child, and was then brought up by an aunt. Asa schoolboy he showed the character- istic bent of his mind by picking up the Romany tongue and a great familiarity with the inner life of the Gipsies. He was not, however, remarkably bookish, and from school was sent to London as a clerk in the City. Palmer disliked this life, and varied it by learning French and Italian, mainly by frequenting the society of foreigners wherever he could find it. He had a peculiar gift for making himself at home with all manner of strange people, which served him throughout life, and was as effective with Orientals as with Europeans. His linguistic faculty was in fact only one side of a great power of sympathetic imitation. He learned always from men rather than from books, and by throwing his whole flexible personality into unison with those from whom he was learning. In 1859 Pahner returned to Cambridge, apparently dying of con- sumption. He had an almost miraculous recovery, and in 1860, while he was thinking of a new start in life, fell in at Cambridge with a certain Sayyid Abdullah, a teacher of Eastern languages. Under his influence he resolved to give himself to Oriental studies, in which he made very rapid progress. He now attracted the notice of two fellows of St John’s College, became an undergraduate there, and in 1867 was elected a fellow on the ground of his attain- ments, especially in Persian and Hindustani. He was soon engaged to join the survey of Sinai, and followed up this work in 1870 by exploring the Wilderness of the Wandering along with Drake. After a visit to Palestine and the Lebanon he returned to England in 1870, and

next year published his Desert of the Exodus. In the close of the year 1871 he became Lord Almoner's Professor of Arabic at Cambridge, married, and settled down to teaching work. Unhappily his affairs were somewhat straitened, mainly through the long illness of his wife, whom he lost in 1878 ; he was obliged to use his pen for Oriental and other work in a way that did not do full justice to his talents, and at length he became absorbed in journalism. In 1881, two years after his second marriage, he finally left Cambridge and ceased to teach. In the following year he

was asked by the Government to go to the. East and assist the Egyptian expedition by his knowledge and his great influence over the Arabs of the desert Al-Tih. It was a hazardous task, but Palmer rightly judged that he could not refuse his country a service which no one else was able to render. He went to Gaza, and without an escort made his way safely through the desert to Suez—an exploit of singular boldness, which gave the highest proof of his capacity for dealing with the Bedouins. From Suez he was again sent into the desert with Captain Gill, to procure camels and do other service of a very dangerous kind, and on this journey he and his companion were attacked and murdered (August 1882). Their remains were re covered after the war, and now lie in St Paul's Cathedral.

Palmer's highest qualities appeared in his travels, especially in the heroic adventures of his last journeys. His brilliant scholar- ship is also seen to advantage in what he wrote in Persian and other Eastern languages, but not so much so in his English books, which were generally written under pressure. His scholarship was wholly Eastern in character, and lacked the critical qualities of the modern school of Oriental learning in Europe. All his works show a great linguistic range and very versatile talent; but he was cut off before he was able to leave any permanent literary monu- ment worthy of his powers. His chief writings are The Desert of the Exodus, 1871; Poems of Beha ed Din (Ar. and Eng., 2 vols.), 1876-77; Arabic Grammar, 1877; History of Jerusalem, 1871 (by Besant and Palmer—the latter wrote the part taken from Arabic sources); Persian Dictionary, 1876, and English and Persian Dictionary (posthumous, 1883) ; translation of the

Qu’rdz (unsatis- factory), 1880. He also did good service in editing the Name Lists of the Palestine Exploration.

PALMER, Samvet (1805-1881), landscape painter and etcher, was born in London on the 27th January 1805. He was delicate asa child, and received his educa- tion, in which a study of the classics—English as well as Greek and Latin—played a notable part, at home under the wise and genial care of his father. In 1819 we find him exhibiting both at the Royal Academy and the British Institution; and shortly afterwards he became intimate with John Linnell, who gave him excellent counsel and assistance, advising drawing from the figure and from the antique in the British Museum, and intro- ducing him to Varley, Mulready, and, above all, to William Blake, whose strange and mystic genius had the most powerful effect in impressing on Palmer’s art its solemn and poetic character. Before very long the studies of this period were interrupted by an illness which led to a residence of seven years at Shoreham in Kent. Here the artist sought a closer acquaintance with nature, and the characteristics of the scenery of the district are con- stantly recurrent in his works. Among the more important productions of this time are the Bright Cloud and the Skylark, paintings in oil, which was Palmer’s usual medium in earlier life, but one with which he is now hardly at all associated in the popular mind. In 1839 he married a daughter of Linnell’s. The wedding tour was to Italy, where he spent over two years in study. Returning to London, he was in 1843 elected an associate and in 1854 a full member of the Society of Painters in Water Colours, a method to which he afterwards adhered in his painted work. His productions are distinguished by an excellent command over the forms of landscape, and by mastery of rich, glowing, and potent colouring. He delighted in the more exceptional and striking moments of nature, and especially in her splendours of sunrise and sunset. His paintings are less literal transcripts than poetic and imaginative renderings. They are admirably composed and well-considered pastorals, which find a singularly accurate literary parallel in the landscape work of Milton in his minor poems; indeed among the best and most important paintings executed by Palmer during his later years was a noble series of illustrations to Z’ Allegro and Li Penseroso, now in the possession of Mr L. R. Valpy.

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In 1853 the artist was elected a member of the English Etching Club; and his work with the needle is no less individual and poetic than his work with the brush. Mr Hamerton has pronounced him “one of the few really great English etchers,” “one of the most accomplished atchers who ever lived.” Considering his reputation and success in this department of art, his plates are few in number. They are executed with care and elaboration. Their virtues are not those of a rapid and vivid sketch, depending on force and selection of line, and adopting a frankly interpretative treatment; they aim rather at truth and completeness of tonality, and embody many of the characteristics of other modes of engraving—of mezzotint, of line, and of woodcut. Readily accessible and sufficiently representative plates may be studied in the Early Ploughman, in Htching and Etchers (1st ed.), and the Herdsman’s Cottage, in the third edition of the same work. In 1861 Palmer removed to Reigate, where he spent an honoured and productive old age, till his death on the 24th of May 1881. One of his latest efforts was the production of a series of etchings to illustrate his English metrical version of Virgil’s Hclogues, which was published in 1883, illustrated with reproductions of the artist’s water-colours and with etchings, of which most were left unfinished at his death, and completed by his son, A. H. Palmer. A collection of Palmer’s works was brought together by the Fine Arts Society in the year of his death. The descriptive and critical catalogue of this exhibition, and the memoir by his son, may be consulted for particulars of the painter’s life and art. PALMERSTON, Henry Joun Tempuz, VIscounr, (1784-1865), statesman, minister of foreign affairs, and twice prime minister of England, was born at Broadlands, near Romsey, Hants, on the 20th October 1784. The Trish branch of the Temple family, from which

Lord Palmerston descended, was very distantly related to the great English house of the same name, which played so conspicuous a part in the politics of the 18th century; but these Irish Temples were not without distinction. In the reign of Elizabeth they had furnished a secretory to Sir Philip Sidney and to Essex. In the reign of William and Mary Sir William Temple figured as one of the ablest diplomatists of the age. From his younger brother, who was speaker of the Irish House of Commons, Lord Palmerston descended ; the son of the speaker was created a peer of Ireland, March 12, 1722, and was succeeded by his grandson, the second viscount, who married a Miss Mee, a lady celebrated for her beauty, who became the mother of the subject of this notice. Lord and Lady Palmerston were persons of great taste and fashion, who travelled several times in Italy with their children. Their eldest son, Henry John, is mentioned by Lady Elliot in her correspondence as a boy of singular vivacity and energy. These qualities adhered to him through life, and he had scarcely left Harrow, at the age of eighteen, when the death of his father (April 17, 1802) raised him to the Irish peerage, and placed him at the head of his family. It was no doubt owing to his birth and con- nexions, but still more to his own talents and character, that Lord Palmerston was thrown at a very early age into the full stream of political and official life. Before he was four-and-twenty he had stood two contested elections for the university of Cambridge, at which he was defeated, and he entered parliament for a pocket-borough, Newtown, Isle of Wight, in June 1807. Through the interest of his guardians Lord Malmesbury and Lord Chichester, the duke of Portland made him one of the junior lords of the Admiralty on the formation of his administration in 1807. A few months later he delivered his maiden speech in the House of Commons in defence of the expedition against

Copenhagen, which he conceived to be justified by the known designs of Napoleon on the Danish court. This speech was so successful that it marked him out as one of the rising statesmen of the day, in so much that, when Perceval formed his Government in 1809, he proposed to this young man of five-and-twenty to take the chancellor- ship of the exchequer, following apparently the examples of Pitt and Lord Henry Petty, who had filled that office at about the same age. Lord Palmerston, however, though extremely

surprised and flattered by the proposal, had the wisdom to refuse it, on the ground that he was totally ignorant of finance, and had only once addressed the House of Commons. Nor did he allow the offer of a seat in the cabinet to break his modest resolution. He con- tented himself with the far less important office of secre- tary at war, charged exclusively with the financial business of the army, without a seat-in the cabinet, and in this position he remained, singularly enough, without any signs of an ambitious temperament or of great political abilities, for twenty years (1809-1828). His administrative talents were confined within the limits of the War Office, which he kept in perfect order, and his parliamentary speeches to the annual statements in which he moved the army estimates of those eventful years. During the whole of that period Lord Palmerston was chiefly known as a man of fashion, and a subordinate minister without influence on the general policy of the cabinets he served. Some of the most humorous poetical pieces in the Vew Whig Guide were from his pen, and he was entirely devoted, like his friends Peel and Croker, to the Tory party of that day. The political opinions of Lord Palmerston at that time, and perhaps through life, were those of the school of Pitt —not the effete Toryism of the Pitt clubs, which he always treated with disdain, but the enlarged Conserva- tive views of the great minister himself, as represented after Pitt's death by Canning. Lord Palmerston never was a Whig, still less a Radical; he was a statesman of the old English aristocratic type, liberal in his sentiments, favourable to the cause of justice and the march of pro- gress, but entirely opposed to the claims of democratic government, Thus he supported from the first the cause of Catholic emancipation, and he sympathized warmly with the constitutional party throughout the world, but he was opposed to the extension of the franchise in England, and he regarded the impulse of popular power as a force to be directed and controlled rather than obeyed. So successfully did he practise the art of governing a free people that he lived to be regarded as a popular minister, though he had been for twenty years a member of a Tory Government, and never materially altered his own opinions. In the later years of Lord Liverpool's administration, after the death of Lord Londonderry in 1822, strong dissen- sions existed in the cabinet. The Liberal section of the Government was gaining ground. Canning became foreign minister and leader of the House of Commons. Huskisson began to advocate and apply the doctrines of free trade. Catholic emancipation was made an open question. Although Lord Palmerston was

not in the cabinet, he cordially supported the measures of Canning and his friends. Upon the death of Lord Liverpool, Canning was called to the head of affairs; the Tories, including Peel, withdrew their support, and an alliance was formed between the Liberal members of the late ministry and the Whigs. In this combination the chancellorship of the exchequer was first offered to Lord Palmerston, who accepted it, but this appointment was frustrated by the king's intrigue with Herries, and Palmerston was content to remain secretary at war with a seat in the cabinet, which he now entered for the first time. The Canning administration ended in four months by the death of its XVIII. — 25

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illustrious chief, and was succeeded by the feeble ministry

of Lord Goderich, which barely survived the year. But

the " Canningites," as they were termed, remained, and

the duke of Wellington hastened to include Palmerston, Huskisson, Charles Grant, Lamb, and Dudley in his Government. A dispute between the duke and Huskisson soon led to the resignation of that minister, and his friends felt bound to share his fate. In the spring of 1828 Palmerston found himself, for the first time in his life, in opposition, From that moment he appears to have directed his attention closely to foreign affairs ; indeed he had already urged on the duke of Wellington a more

active interference in the affairs of Greece; he had made

several visits to Paris, where he foresaw with great accuracy the impending revolution; and on the Ist June 1829 he made a speech on foreign affairs of such excellence that never but once in his long career did he surpass it. For it may here be remarked that Lord Palmerston was

no orator; his language was unstudied, and his delivery

somewhat embarrassed ; but he generally found words to

say the right thing at the right time, and to address the House of Commons in the language best adapted to the

capacity and the temper of his audience, An attempt was made by the duke of Wellington in September 1830

to induce Palmerston to re-enter the cabinet, which he

refused to do without Lord Lansdowne and Lord Grey,

and from that time forward he may be said to have

associated his political fortunes with those of the Whig party. It was therefore natural that Lord Grey should place the department of foreign affairs in his hands upon the formation of the great ministry of 1830, and Palmerston entered with zeal on the duties of an office over which he continued to exert his powerful influence, both in and out of office, for twenty years,

The revolution of July 1830 had just given a strong

shock to the existing settlement of Europe. The kingdom of the Netherlands was rent asunder by the Belgian revolution ; Portugal was the. scene of civil war; the Spanish succession was about to open and place an infant princess on the throne. Poland was in arms against Russia, and the Northern powers formed a closer alliance, threatening to the peace and the liberties of Europe, In presence of these varied dangers, Lord Palmerston was prepared to act with spirit and resolution. The king of the Netherlands had appealed to the powers who had placed him on the throne to maintain his rights; and a conference assembled accordingly in London to settle the question, which involved the independence of Belgium and the security of England. On the one hand, the Northern powers were anxious to defend the king of Holland; on the other hand a party in France aspired to annex the Belgian provinces. The policy of the British Government was a close alliance with France, but an alliance based on the principle that no interests were to be promoted at variance with the just rights of others, or which could give to any other nation well-founded cause of jealousy. If the Northern powers supported the king of Holland by force, they would encounter the resistance of France and

England united in arms; if France sought to annex Belgium she would forfeit the alliance of England, and find herself opposed by the whole continent of Europe. In the end the policy of England prevailed ; numerous difficulties, both great and small, were overcome by the conference ; although on the verge of war, peace was maintained 5 and Prince Leopold of Saxe-Coburg was placed upon the throne of Belgium, which enjoyed for half a century the benefits of his enlightened rule, followed with equal success by that of his son and successor. Upon the whole this transaction may be regarded as the most important and most successful of Lord Palmerston's public life.

PALWERS TON

In 1833 and 1834 the youthful queens Donna Maria of Portugal and Isabella of Spain were the representatives and the hope of the constitutional party in those countries, —assailed and hard pressed by their absolutist kinsmen Don Miguel and Don Carlos, who were the representatives of the male line of succession. Lord Palmerston conceived and executed the plan of a quadruple alliance of the con. stitutional states of the West to serve as a counterpoise to the Northern alliance. A treaty for the pacification of the Peninsula was signed in London on the 22d April 1834 ; and, although the struggle was somewhat prolonged in Spain, it accomplished its object. France, however, had been a reluctant party to this treaty. She never executed her share in it with zeal or fidelity. Louis Philippe was accused of favouring the Carlists underhand, and he positively refused to be a party to direct interference in Spain. It is probable that the hesitation of the French court on this question was one of the causes of the extreme personal hostility Lord Palmerston never ceased to show towards the king of the French down to the end of his life, if indeed that sentiment had not taken its origin at a much earlier period. Nevertheless, at this same time (June 1834) Lord Palmerston wrote that "Paris is the pivot of my foreign policy." M. Thiers was at that time in office. Unfortunately these differences, growing out of the opposite policies of the two countries at the court of Madrid, increased in each succeeding year ; and a constant but sterile rivalry was kept up, which ended in results more or less humiliating and injurious to both nations,

The affairs of the East interested Lord Palmerston in the highest degree. During the Greek War of Independ- ence he had strenuously supported the claims of the Hellenes against the Turks and the execution of the treaty of London. But from 1830 the defence of the Ottoman empire became one of the cardinal objects of his policy. He believed in the regeneration of Turkey. “ All that we hear,” he wrote to Mr Bulwer, “about the decay of the Turkish empire, and its being a dead body or a sapless trunk, and so forth, is pure unadulterated nonsense.” The two great aims he had in view were to prevent the establishment of Russia on the Bosphorus and the establish- ment of France on the Nile, and he regarded the main- tenance of the authority of the Porte as the chief barrier against both these aggressions, Against Russia he had long maintained a suspicious and hostile attitude. He wasa party to the publication of the “Portfolio” in 1834, and to the mission of the “Vixen” to force the blockade of Circassia about the same time. He regarded the treaty of Unkiar Skelessi which Russia extorted from the Porte in 1832, when she came to the relief of the sultan after the battle of Konieh, with great jealousy; and, when the power of Mohammed Ali in Egypt appeared to threaten the existence of the Ottoman dynasty, he succeeded in effecting a combination of all the powers, who signed the celebrated collective note of 27th July 1839, pledging them to maintain the independence and integrity of the Turkish empire as a security for the peace of Europe. On two former occasions, in 1833 and in 1835, the policy of Lord Palmerston, who proposed to afford material aid to the Porte against the pasha of Egypt, was overruled by the cabinet ; and again, in 1839, when Baron Brunnow first proposed the active interference of Russia and England, the offer was rejected. But in 1840 Lord Palmerston returned to the charge and prevailed. The moment was critical, for Mohammed Ali had occupied Syria and won the battle of Nezib against the Turkish forces, and on the Ist July 1839 the sultan Mohammed expired. The Egyptian forces occupied Syria, and threatened Turkey; and Lord Ponsonby, then British ambassador at Constan- tinople, vehemently urged the necessity of crushing so

formidable a rebellion against the Ottoman power. But France, though her ambassador had signed the collec- tive note in the previous year, declined to

be a party to measures of coercion against the pasha of Egypt. Palmerston, irritated at her Egyptian policy, flung himself into the arms of the Northern powers, and the treaty of the 15th July 1840 was signed in London without the knowledge or concurrence of France. This measure was not taken without great hesitation, and strong opposition on the part of several members of the British cabinet. Lord Holland and Lord Clarendon and some other ministers thought that, whatever might be the merits of the quarrel between the sultan and the pasha, our interfer- ence was not worth the price we were paying for it—an alliance with Russia and the rupture of our alliance with France ; and the Government was more than once on the point of dissolution. Lord Palmerston himself declared in a letter to Lord Melbourne that he should quit the ministry if his policy was not adopted; and he carried his point. His consummate knowledge of details, his administrative ability, his impetuous will, and his conviction that France could not declare war against the four great powers of Europe prevailed over the resistance of an indolent premier and hesitating colleagues. The operations were conducted with extraordinary promptitude, good fortune, and success. The bombardment of Beirut, the fall of Acre, and the total collapse of the boasted power of Mohammed Ali followed in rapid succession, and before the close of the year Lord Palmerston's policy, which had convulsed and terrified Europe, was triamphant, and the author of it was regarded as one of the most powerful statesmen of the age. At the same time, though acting with Russia in the Levant, the British Government engaged in the affairs of Afghanistan to defeat her intrigues in Central Asia, and a contest with China was terminated by the conquest of Chusan, afterwards exchanged for the island of Hong Kong. Seldom has Great Britain occupied a prouder posi- tion abroad, although by a singular contrast the cabinet was in the last stage of decrepitude at home. Within a few months Lord Melbourne's administration came to an end, and Lord Palmerston remained for five years out of office. The crisis was past, but the change which took place by the substitution of M. Guizot for M. Thiers in France, and of Lord Aberdeen for Lord Palmerston in England, was a fortunate event for the peace of the world. Lord Palmerston had adopted the opinion that peace with France was not to be relied on, and indeed that war between the two countries was sooner or later inevitable. France

was in his eyes a power likely to become an enemy ; and:

he encouraged the formation of an English party to thwart her influence all over the world. Had he remained in office, the exasperation caused by his Syrian policy and his harsh refusal to make the slightest conciliatory conces- sion to France, in spite of the efforts of his colleagues, would probably have led to fresh quarrels, and the emperor Nicholas would have achieved his main object, which was the complete rupture of the Anglo-French alliance. Lord Aberdeen and M. Guizot inaugurated a different policy; by mutual confidence and friendly offices they entirely succeeded in restoring the most cordial understanding between the two Governments, and the irritation which Lord Palmerston had inflamed gradually subsided. During the administration of Sir Robert Peel, Lord Palmerston led a retired life, but he attacked with characteristic bitter- ness the Ashburton treaty with the United States, which closed successfully some other questions he had long kept open. In all these transactions, whilst full justice must be done to the force and patriotic vigour which Lord Palmerston brought to bear on the questions he took in hand, it was but too apparent that he imported into them

an amount of passion, of personal animosity, and imperious language which rendered him in the eyes of the queen and of his colleagues a dangerous minister. On this ground, when Lord John Russell attempted, in December 1845, to form a ministry, the combination failed because Lord Grey refused to join a Government in which Lord Palmerston should resume the direction of foreign affairs. A few months later, however, this difficulty was surmounted ; the Whigs returned to power, and Palmerston to the foreign office, with a strong assurance that Lord John Russell should exercise a strict control over his proceed- ings. A few days sufficed to show how vain was this expectation. The French Government regarded the appointment of Palmerston as a certain sign of renewed hostilities, and they availed themselves of a despatch in which Palmerston had put forward the name of a Coburg prince as a candidate for the hand of the young queen of Spain, as a justification for a departure from the engage- ments entered into between M. Guizot and Lord Aberdeen. However little the conduct of the French Government in this transaction of the Spanish marriages can be vindicated, it is certain that it originated in the belief that in Palmerston France had a

restless and subtle enemy. The efforts of the British minister to defeat the French marriages of the Spanish princesses, by an appeal to the treaty of Utrecht and the other powers of Europe, were wholly unsuccessful ; France won the game, though with no small loss of honourable reputation. Not long after- wards Sir Henry Bulwer was expelled from the Peninsula for an attempt to lecture General Narvaez on his duties, and for his notorious intrigues with the opposition ; and in Paris the British embassy became the centre of every species of attack on the king's Government, so that friendly diplomatic relations were temporarily interrupted with both countries. No doubt the rupture of the Anglo-French alliance and the tension existing between the two Govern- ments contributed in some degree to the catastrophe of 1848, which drove Louis Philippe from the throne, and overthrew the constitutional monarchy in France; but Palmerston did not regret the occurrence or foresee all its consequences.

The revolution of 1848 spread like a conflagration through Europe, and shook every throne on the Continent except those of Russia and Spain and Belgium. Palmerston sympathized, or was supposed to sympathize, openly with the revolutionary party abroad. No state was regarded by him with more aversion than Austria. Prince Metternich he abhorred; and, with some inconsistency, after the fall of Metternich he still pursued a policy of unrelenting hostility to his successors. Yet his opposition to Austria was chiefly based upon her occupation of great part of Italy and her Italian policy, for Palmerston maintained that the existence of Austria as a great power north of the Alps was an essential element in the system of Europe. Antipathies and sympathies had a large share in the political views of Lord Palmerston, and his sympathies had ever been passionately awakened by the cause of Italian independence. He knew the country; ite knew the language; and in London some of his closest friends were Italians, actively engaged in the national cause. Hence he threw all the moral support he could give into the Italian revolution. He supported the Sicilians against the king of Naples, and even allowed arms to be sent them from the arsenal at Woolwich ; and, although he had endeavoured to restrain the king of Sardinia from his rash attack on the superior forces of Austria, he obtained for him a reduction of the penalty of defeat. Austria, weakened by the revolution, sent an envoy to London to request the mediation of England,

based on a large cession of Italian territory ; Lord Palmerston rejected the terms

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he might have obtained for Piedmont. a couple of years.

by Russian intervention. the government of the empire with dictatorial power ; and,

in spite of what Palmerston termed his “judicious bottle-

holding,” the movement he had encouraged and applauded,

but to which he could give no material aid, was every- where subdued. The British Government, or at least Palmerston as its representative, was regarded with sus- picion and resentment by every power in Europe, except the French republic; and even that was shortly afterwards

to be alienated by his attack on Greece.

This state of things was regarded with the utmost annoyance by the British court and by most of the British Palmerston had on many occasions taken important steps, without their knowledge, which they dis- approved. Over the foreign office he asserted and exercised an arbitrary dominion, which the feeble efforts The queen and the prince consort did not conceal their indignation at the position in which he had placed them with all the other

ministers.

of the premier could not control.

courts of Europe. When Kossuth, the Hungarian leader, landed in England, after having been rescued by Palmerston from the demands made for his surrender, he proposed to receive this personage at Broadlands, a design which was only prevented by a peremptory vote of the cabinet; and in 1850 he took advantage of some very questionable claims on the Hellenic Government to organize an attack on the little kingdom of Greece. Greece being a state under the joint protection of three powers, Russia and France

pro- tested against this outrage, and the French ambassador temporarily left London, which promptly led to the termi- nation of the affair. But it was taken up in parliament with great warmth. After one of the most memorable debates of this century, Palmerston's policy was condemned by a deliberate vote of the House of Lords. The Houso of Commons was moved by Roebuck to reverse the sentence, which it did by a majority of forty-six, after having heard from Palmerston the most eloquent and powerful speech ever delivered by him, in which he sought to vindicate, not only his claims on the Greek Government for Don Pacifico, but his entire administration of foreign affairs. It was in this speech, which lasted five hours, that Palmerston made the well-known declaration that a British subject—" Civis Romanus sum "—ought everywhere to be protected by the strong arm of the British Government against injustice and wrong. 'The entire Liberal party, from motives of party allegiance and patriotism, supported the minister who uttered these words. Even Sir Robert Peel, who opposed the resolution, said that the country was proud of him. Yet notwithstanding this parliamentary triumph, there were not a few of his own colleagues and supporters who condemned the spirit in which the foreign relations of the crown were carried on; and in that same year the queen addressed a minute to the prime minister in which Her Majesty recorded her dissatisfaction at the manner in which Lord Palmerston evaded the obligation to sub- mit his measures for the royal sanction, as failing in sin- cerity to the crown. This minute was communicated to Palmerston, who did not resign upon it. These various circumstances, and many more, had given rise to distrust and uneasiness in the cabinet, and these feelings reached their climax when Palmerston, on the occurrence of the coup @état by which Louis N. apoleon made himself master of France, expressed to the French ambassador in London, without the concurrence of his colleagues, his personal approval of that act of lawless violence, Upon this, Lord John Russell advised his dismissal from office (December

PALM WH

Ere long the reac- tion came ; this straw-fire of revolution burnt itself out in In Hungary the civil war, which had thundered at the gates of Vienna, was brought to a close Prince Schwarzenberg assumed

1851). Palmerston speedily avenged himself by turnin out the Government ona Militia Bill; but, although he survived for many years, and twice filled the highest office in the state, his career as foreign minister ended for ever, and he returned to the foreign office no more. Indeed he assured Lord Aberdeen, in 1853, that he did not wish to resume the seals of that department. N otwithstanding the zeal and ability which he had invariably displayed ag foreign minister, it had long been felt by his colleagues that his eager and frequent interference in the affairs of foreign countries, his imperious temper, the extreme acerbity of his language abroad, of which there are ample proofs in his published correspondence, and the evasions and artifices he employed to carry his points at home rendered him a dangerous representative of the foreign interests of the country. He accused every foreign states- man who differed from him of “bully and swagger”: foreign statesmen in more polite language imputed the same defects to him. The lesson of his dismissal from office was not altogether lost upon him ; and, although his great reputation was chiefly earned as a foreign minister, it may be said that the last ten years of his life, in which he filled other offices, were not the least useful or dignified portion of his career.

Upon the formation of the cabinet of 1853, which was composed by the junction of the surviving followers of Sir Robert Peel with the Whigs, under the earl of Aberdeen, Lord Palmerston accepted with the best possible grace the office of secretary of state for the Home Office. He speedily overcame the slight hesitation or reluctance he had expressed when the offer was first made to him, on the ground that the views of Lord Aberdeen and Lord Clarendon on foreign affairs had differed widely from his own ; nor was he ever chargeable with the slightest attempt to undermine that Government. At one moment he withdrew from it, because Lord John Russell persisted in presenting a project of reform, which appeared to him entirely out of season; and he advocated, with reason, measures of greater energy on the approach of war, which might possibly, if they had been adopted, have averted the contest with Russia. As the difficulties of the Crimean campaign increased, it was not Lord Palmerston but Lord John Russell who broke up the Government by refusing to meet Roebuck’s motion of inquiry. Palmerston remained faithful and loyal to his colleagues in the hour of

danger. Upon the resignation of Lord Aberdeen and the duke of Newcastle, the general sentiment of the House of Commons and the country called Palmerston to the head of affairs, and he entered, on the 5th of February 1855, upon the high office which he retained, with one short interval, to the day of his death. Palmerston was in the seventy-first year of his life when he became prime minister of England.

A series of fortunate events followed his accession to power. In March 1855 the death of the emperor Nicholas removed his chief antagonist. In September Sebastopol was taken. The administration of the British army was reformed by a consolidation of offices. In the following spring peace was signed in Paris. Never since Pitt hada minister enjoyed a greater share of popularity and power, and, unlike Pitt, Palmerston had the prestige of victory in war. He was assailed in parliament by the eloquence of Gladstone, the sarcasms of Disraeli, and the animosity of the Manchester Radicals, but the country was with him. The Liberals applauded his spirit and his sympathy with the cause of liberty abroad ; the Conservatives knew that he would never lend himself to rash reforms and democratic agitation at home. Defeated by a hostile combination of parties in the House of Commons on the question of the Chinese War in 1857, he dissolved the parliament and

appealed to the nation. The result was the utter defeat of the extreme Radical party, and the return of a more compact Liberal majority. The great events of the suc- ceeding years, the Indian revolt and the invasion of Italy by Napoleon III., belong rather to the general history of the times than to the life of Palmerston; but it was fortunate that a strong and able Government was at the head of affairs. Lord Derby’s second administration of 1858 lasted but a single year, Palmerston having casually been defeated on a measure for removing conspiracies to murder abroad from the class of misdemeanour to that of felony, which was introduced in consequence of Orsini’s attempt on the life of the emperor of the French. But in June 1859 Palmerston returned to power, and it was on this occasion that he proposed to Cobden, one of his most constant opponents, to take office; and, on the refusal of that gentleman, Milner Gibson was appointed to the Board of

Trade, although he had been the prime mover of the defeat of the Government on the Conspiracy Bill. Palmerston had learnt by experience that it was wiser to conciliate an opponent than to attempt to crush him, and that the imperious tone he had sometimes adopted in the House of Commons, and his supposed obsequiousness to the emperor of the French, were the causes of the tem- porary reverse he had sustained. Although Palmerston approved the objects of the French invasion of Italy, in so far as they went to establish Italian independence, the annexation of Savoy and Nice to France was an incident which revived his old suspicions of the good faith of the French emperor. A proposal was made to him to cede to Switzerland a small portion of territory covering the canton of Geneva, but he rejected the offer, saying, “ We shall shame them out of it”; in this he was mistaken, and his remonstrances found no support in Europe. About this time he expressed to the duke of Somerset his convic- tion that Napoleon III. “ had at the bottom of his heart a deep and unextinguishable desire to humble and punish England,” and that war with France was a contingency to be provided against. The unprotected condition of the principal British fortresses and arsenals had long attracted his attention, and he succeeded in inducing the House of Comnions to vote nine millions for the fortification of those important points.

In 1856 the projects for cutting a navigable canal through the Isthmus of Suez was brought forward by M. de Lesseps, and resisted by Palmerston with all the weight he could bring to bear against it. He did not foresee the advantages to be derived by British commerce from this great work, and he was strongly opposed to the establish- ment of a powerful French company on the soil of Egypt. The concession of land to the company was reduced by his intervention, but in other respects the work proceeded and was accomplished. It may here be mentioned, as a remarkable instance of his foresight, that Palmerston told Lord Malmesbury, on his accession to the Foreign Office in 1858, that the chief reason of his opposition to the canal was this :—he believed that, if the canal was made and proved successful, Great Britain, as the first mercantile state, and that most closely connected with the East, would be the power most interested in it; that this country would therefore be drawn irresistibly into a more direct interference in Egypt, which it was desirable to avoid, because England has already enough upon her hands, and because our intervention might lead to a rupture with

France. He therefore preferred that no such line of com- munication should be opened. Recent events have shown that there was much to be said for this remarkable forecast, and that the mercantile advantages of the canal are to some extent counterbalanced by the political difficulties to Which it may give rise.

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Upon the outbreak of the American civil war in 1861,

Lord Palmerston acknowledged that it was the duty of the British Government to stand aloof from the fray, but his own opinion led him rather to desire than to avert the rupture of the Union, which might have been the result of a refusal on the part of England and France to recog- nize a blockade of the Southern ports, notoriously imperfect, and extremely prejudicial to the interests of Europe. and, although the belligerent rights of the South were promptly recognized, the neutrality of the Government was strictly observed. When, however, the Southern envoys were taken by force from the “Trent,” a British packet, Palmerston did not hesitate a moment to exact a full and complete reparation for this gross infraction of international law, which President Lincoln was wise enough to make. of the British Government at that crisis, and the active operations of Southern cruisers, some of which had been

which was

The cabinet was not of this opinion,

But the attitude and language of some members

fitted out by private firms in British ports, aroused a

feeling of resentment amongst the American people which it took many years to efface, and which was at last removed by an award extremely onerous to England.

The last transaction in which Palmerston engaged arose out of the attack by the Germanic confederation, and its leading states Austria and Prussia, on

the kingdom of Denmark and the duchies of Schleswig and Holstein. There was but one feeling in the British public and the nation as to the dishonest character of that unprovoked aggression, and it was foreseen that Austria would ere long have reason to repent her share in it. Palmerston endeavoured to induce France and Russia to concur with England in maintaining the treaty of London, which had guaranteed the integrity of the Danish dominions. But those powers, for reasons of their own, stood aloof, and the conference held in London in 1864 was without effect. A proposal to send the British fleet into the Baltic was overruled, and the result was that Denmark was left to her own resources against her formidable opponents. It may be interesting to quote, as a specimen of Lord Palmerston's clear and vigorous style and insight, one of the last letters he ever wrote, for, though it relates to the affair of Schleswig- Holstein, it embraces at a glance the politics of the world. " September 18, 1865. "My Dear Russett,—It was dishonest and unjust to deprive Denmark of Sleswick and Holstein. It_is another question how those two duchics, when separated from Denmark, can be disposed of best for the interest of Europe. I should say that, with that view, it is better that they should go to inerease the power of Prussia than that they should form another little state to be added to the cluster of small bodies politie which encumber Germany, and render it of less force than it ought to be in the general balance of power in the world. Prussia is too weak as she now is ever to be honest or independent in her action ; and, with a view to the future, it is desirable that Germany, in the aggregate, should be strong, in order to control those two ambitious and aggressive powers, France and Russia, that press upon her west and east. As to France, we know how restless and agressive she is, and how ready to break loose for Belgium, for the Rhine, for anything she would be likely to get without too great an exertion. As to Russia, she will, in due time, beeome a power almost as great as the old Roman empire. She can become mistress of all Asia, except British India, whenever she chooses to take it; and, when enlightened arrangements shall have made her revenue proportioned to her territory, and railways shall have abridged distanees, her eommand of men will become enormous, her pecuniary means gigantic, and her power of transporting armies over great distances most formid-able. Germany ought to be strong in order to resist Russian aggression, and a strong Prussia is essential to German strength. Therefore, though I heartily condemn the whole of the proceedings of Austria and Prussia about the

duchies, I own that I should rather see them incorporated with Prussia than converted into an additional asteroid in the system of Europe. Yours sineerely, PALMERSTON.” | In little more than a month from the date of this letter, on the 18th October 1865, he expired at Brocket

Hall, after a short illness, in the eighty-first year of his age. His remains were laid in Westminster Abbey.

Although there was much in the official life of Lord Palmerston which inspired distrust and alarm to men of a less ardent and contentious temperament, it is certain that his ambition was not selfish but patriotic, that he had a lofty conception of the strength and the duties of England, that he was the irreconcilable enemy of slavery, injustice, and oppression, and that he laboured with inexhaustible energy for the dignity and security of the empire. In private life his gaiety, his buoyancy, his high-breeding, made even his political opponents forget their differences ; and even the warmest altercations on public affairs were merged in his large hospitality and cordial social relations. In this respect he was aided with consummate ability by the tact and grace of Lady Palmerston, the widow of Earl Cowper, whom he married at the close of 1839. She devoted herself with enthusiasm to all her husband’s interests and pursuits, and she made his house the most attractive centre of society in London, if not in Europe.

A Life of Lord Palmerston, by the late Lord Dalling, was pub- lished in three volumes in 1870, which owes its chief merit to the selections from the minister’s autobiographical diaries and private correspondence. The work, however, ends at the year 1840, when more than half his ministerial career remained untold. This bio- graphy was resumed and continued by Mr Evelyn Ashley in 1876, after the death of Lord Dalling; but the whole period from 1846 to 1865 is compressed into two volumes, and no doubt materials are in existence, though still unpublished, which will eventually supply a fuller account of the important part played by this eminent a for sixty years in the affairs of the British empire and of

urope.

PALM SUNDAY (Dominica in Palmis), the Sunday immediately before Easter (see Hony Weerx), in the Roman Catholic communion is characterized by a striking ceremonial which takes place in church at the beginning of the high mass of the day. Branches of palms and olives or other trees having previously been laid in sufti- cient quantity in front of the high altar, the anthem Hosanna is sung by the choir, the collect is said by the celebrant, and lessons from Exodus xv. and xvi. and Matt. xxl. are sung by the subdeacon and deacon respectively. The branches of palm and olive (held to symbolize ‘‘victory over the prince of death” and “the coming of a spiritual unction”) are then blessed with prayer and aspersion, whereupon the principal person of the clergy present approaches the altar, and gives a palm to the celebrant, who afterwards gives one to him, then to the rest of the clergy in the order of their rank, and finally to the laity, who receive kneeling. During the distribution appropriate antiphons are sung, and when it is over a procession begins for which there is another series of antiphons. At the return of the procession two or four singers go into the church, and, shutting the door, with their faces towards the procession, sing two lines of the hymn “Gloria, laus, et honor,” which are repeated by the celebrant and others outside; this continues till the end of the hymn. The subdeacon next knocks at the door with the end of the cross he carries; the door is opened, and the procession re-enters the church. Then follows mass, when all hold the palms in their hands during the singing of the Passion and the Gospel. There is evidence that the feast of palms (Gatwy éopr/) was observed, in the East at least, as early as the 5th century, but the earliest mention of a procession similar to that which now takes place on Palm Sunday both in the Greek and in the Latin _ communion occurs in an Ordo Offcii probably not earlier than the 10th century.

PALMYRA is the Greek and Latin name of a famous city of the East, now sunk to a mere hamlet, but still an object of interest for its wonderful ruins, which its

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Semitic inhabitants and neighbours called Tadmor, The latter name, which is found in the Bible (2 Chron. viii, 5), and is written 9n and 7}974n in Palmyrene inscriptions, has survived to the present day, and is now locally

pro. nounced Tudmir or Tidmir. The site of Palmyra! isan oasig in the desert that separates Syria from ‘Irak, about 50 hours’ ride or 150 miles north-east from Damascus, 32 hours from Emesa, and five days’ camel journey from the Euphrates,? The hills which fringe the oasis mark the northern limit of the Hammad, the springless and stony central region of the great Syrian desert. The direct route between the Pheenician ports and the cities of ‘Irdk and the Persian Gulf would be from Damascus eastward through the Hammad, but this region is so inhospitable that for at least two thousand years caravans have preferred to make a detour to the north and pass through the oasis of Tadmor. At this point also the. great line between the Persian Gulf and the Mediterranean is intersected by other routes connecting Palmyra with northern Syria on the one hand and with Bostra, Petra, and central Arabia on the other —routes now deserted or little traversed, but which in ancient times were of very considerable consequence, especially in connexion with the overland incense trade, The oasis was thus naturally marked out as a trading post of some importance, but the commanding position which Palmyra held in the 2d and 3d centuries of our era was due to special causes. The rise and fall of Palmyra form one of the most interesting chapters in ancient history, and must be studied not only from ancient writers but from the numerous inscriptions that have been collected from the ruins of the city and the tombs that surround it.

The oldest notice of Palmyra is in 2 Chron. viii. 5, when Tadmor in the wilderness is said to have been built by Solomon. But the source of this statement is 1 Kings ix, 18, and here the name is TMR, which cannot be read Tadmor, and from the context—in which Judean towns are spoken of —is almost certainly the Tamar of Ezek. xlvii. 19, xlviii, 28. It is indeed extremely improbable that Solomon, whose policy was to enrich Judah by developing the Red Sea traffic, and so carrying the trade of the East to the Mediterranean ports through his own country, would have encouraged the rival route by Tadmor, which lies quite outside the Israelite settlements, and passes through districts over which Solomon was unable to maintain even the recognition of suzerainty which David had extorted by his Syrian wars. After the time of Solomon the Red Sea trade was interrupted, and an over-land caravan trade from Pheenicia to Yemen: and the Persian Gulf took its place. But neither on the cuneiform inscriptions nor in the Old Testament writings prior to Chronicles, not even in Ezekiel’s account of the trading

connexions of Tyre, is there any mention of Tadmor; up to the 6th century B.c. the caravans seem to have been organized by merchants of southern or central Arabia, and they probably reached Damascus by way of Dima (Jaut Beni‘ Amir) and the W. Sirhan, without coming near the oasis of Palmyra (see especially Isa. xxi. 11 sg. ; Ezek. Xxvil.). On the other hand Tadmor cannot have been a new place when the Biblical Chronicler ascribed its foundation to Solomon, and thus we shall hardly be wrong in connecting its origin with the gradual forward move- ment of the nomadic Arabs which followed on the over- throw of theancient nationalities of Syria by the Chaldwan empire. Arabian tribes then took possession of the partly cultivated lands east of Canaan, and, as has been explained in the article NABATHANS, became masters of the Eastern

1 According to the Duc de Luynes, the great temple is in 84° 32’ 30” N. lat. and 35° 54’ 85” E. long,

2 Pliny (viii, 89) gives the distances as 176 Roman miles from Damascus and 337 from Seleucia.

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PALMYRA

trade, gradually acquired settled habits, and learned civilization and the use of writing from the Aramzans, whose language was in current official and commercial use in the Persian empire west of the Euphrates. The Nabateans of Petra naturally appear in Western literature before the remote Palmyrenes, who are not even mentioned by Strabo. But we learn from Appian (Bell. Ciw., v. 9) that in 42-41 B.c. the city was rich enough to excite the cupidity of Mark Antony, and that the population was still small and mobile enough to evade that cupidity by timely flight. The series of Semitic inscriptions of Palmyra begins a few years later. The oldest (De Vogiié, 30) bears the date 304 of the Seleucid era (9 B.c.), and was placed upon one of the characteristic tower-shaped tombs which overlooked the

city from the surrounding hill- sides, The dialect and the writing (a form of the “square” character) are western Aramaic; the era, as we have just seen, is Greek,! the calendar Macedonian ; and these influences, to which that of Rome was soon added, were the determining factors in Palmyrene civilization. The proper names and the names of deities are also partly Syriac, but in part they are unmistakably Arabic. The Arabic element appears in the names of members of the chief families, and these retain some distinctive grammati- cal forms which suggest that, though Aramaic was the written language, Arabic may have not been quite obsolete in common life. That the town was originally an Arabic settlement is further rendered probable by the use of a

purely Arabic term (tna “fahdh”) for the septs into.

which the townsmen were divided. And thus we can best explain how, when the oasis was occupied by a settlement of Arabs, it gradually rose from a mere halting-place for caravans to a city of the first rank. The true Arab despises agriculture ; but the pursuit of commerce, the organization and conduct of trading caravans, is an honourable business which gives full scope to all the personal qualities which the Bedouin values, and cannot be successfully conducted without widespread connexions of blood and hospitality between the merchant and the leading sheikhs on the caravan route. An Arabian merchant city is thus neces- sarily aristocratic, and its chiefs can hardly be other than pure Arabs of good blood. The position of Palmyra in this respect may be best illustrated by the analogy of Mecca. In both cities the aristocracy was commercial, and the ruling motive of all policy lay in the maintenance of the caravan trade, which involved a constant exercise of tact and personal influence, since a blood feud or petty tribal war might close the trade routes at any moment. To keep the interests of commerce free from these embar- rassments, it was further indispensable to place them under the sanctions of religion, and, though we cannot prove that this policy was carried out at Palmyra with the same consistency and success as at Mecca, we can trace significant analogies which point in this direction. Mecca became the religious centre of Arabia in virtue of the cosmopolitan worship of the Ka‘ba, in which all tribes could join without surrendering their own local gods. So at Palmyra, side by side with the

worship of minor deities, We find a central cultus of Baal (Bel or Malachbel) identified with “the most holy sun.” To him belonged

the great temple in the south-east of the city with its

vast fortress-like courtyard 256 yards square, lined with colonnades in the style of Herod’s temple; and the presidence of the banquets of his priests, an office coveted by the first citizens of Palmyra (W., 2606, a), may be compared with the Meccan rifdda, or right of entertaining

: The oldest Greek inscription (bilingual) is of 10 a.p., for a statue erected jointly by the Palmyrenes and the Greeks of Seleucia, Jour. As., ser, 8, i, 243.

the pilgrims. And, just as in Mecca the central worship ultimately became the worship of the supreme and name- less god (All4h), so in Palmyra a large proportion of the numerous votive altars are simply dedicated to “the good and merciful one, blessed be his name for ever.” In Palmyra as at Mecca the name Rahman (merciful) may be due to the influence of the Jewish colony, which settled in the town after the destruction of Jerusalem; but the tendency to a universal religion, of which the dropping of the local proper name of God is so decided a mark, and which nevertheless is accompanied by no such rejection of polytheism as made Jehovah and Elohim synonymous in the religion of the Hebrew prophets, appears too early to be due to Jewish teaching (Mordtmann, 1), and seems as at Mecca to be rather connected with the cosmopolitanism of a merchant city. A secondary parallelism with Mecca is found in the sacred fountain of Ephka. Its tepid and sulphureous waters perhaps acquired their reputation from their medicinal use to cure the rheumatism which has always prevailed in Palmyra.’ This spring, like Zemzem at Mecca, had a guardian, appointed by the “ moon-lord ” Yarhibdl (W., 2571, ¢; De V., 30), whose oracle is alluded to in another inscription, and who may therefore be com- pared with the Meccan Hobal.

The wars between Rome and Parthia favoured the growth of Palmyra, which astutely used its secluded posi- tion midway between the two

powers, and by a trimming policy secured a great measure of practical independence and continuous commercial relations with both (Appian, ut sup.; Pliny, v. 89). These wars, too, must have given it a share in the trade with north Syria, which in more peace- ful times would not have chosen the desert route. To some extent, however, the oasis soon came under Roman control, for decrees regulating the custom-dues were issued for it by Germanicus and Corbulo. The splendid period of Palmyra, to which the greater part of the inscribed monuments belong, began with the overthrow of the Nabatean kingdom of Petra (105 a.p.), which left it without a commercial rival. Hadrian took Palmyra into his special favour, and gave it on the occasion of his visit to the town (circa 180 a.p.) the name of Adrianopolis.* Under the same emperor (8th April 137) the customs and dues of Palmyra were regulated by a law which has recently been copied from the stone on which it was engraved, and gives the fullest picture of the life and commerce of the city. At this time the supreme legislative authority lay in the hands of a senate (BovAy), with a president, a scribe, two archons, and a fiscal council of ten. At a later date, probably under Septimius Severus or Caracalla, Palmyra received the jus italicwm and became a Roman colony,° and according to usage the legislative power came into the hands of the senate and people under the administration of officers called strategi. The Romans had soon other

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2 The sacrifices were partly maintained by endowments given by rich citizens (De V., 3; W. 2588). The dates of the inscriptions show that much the commonest time for the erection of honorific statues— often in a connexion partly religious—was in spring (Adar, or more often Nisan), and this seems to point to a great spring festival, corre- sponding to the Arabic sanctity of Rajab. Palmyra had an important trade with the Bedouins in skins and grease (fiscal inscr., xvi. sq, xxx.)} the herds of the desert are in condition for slaughter in spring, and this also points to a spring feast and fair. A trace of the hospi- tality so necessary to keep the Bedouins in humour may perhaps be found in De V., 16; W., 2585.

8 See Mordtmann, 18, and his notes; the oasis lies 1300 feet above the sea, is constantly swept by cutting winds, and is liable to sudden and extreme

variations of temperature.

4 See Uranius, apud Steph. Byz., now confirmed by the great fiscal inscription.

5 See Ulpian, Dig., 1. 15, 1, and Waddington, p. 596. Palmyrenes who became Roman citizens took Roman names in addition to their native ones, and these in almost every case are either Septimius or Julius Aurelius.

than commercial reasons to favour Palmyra, which became an important military post, and turned its commercial organization to good account in aiding the movements of the legions marching against the Persians (De V., 15). It was the Persian wars that raised Palmyra to brief political importance, and made it for a few years the mistress of the Roman East; but before we pass to this last epoch of its greatness we must attempt to describe the aspect and life of the city during the century and a half of its chief commercial prosperity.

The chief luxuries of the ancient world—silks, jewels, pearls, perfumes, and the like—were drawn from India, China, and southern Arabia; and Pliny computes the yearly import of these wares into Rome at not less than three quarters of a million of English money. ‘The trade followed two routes, one by the Red Sea, Egypt, and Alexandria, the other from the Persian Gulf through the Syro-Arabian desert. The latter, after the fall of Petra, was in the hands of the Palmyrene merchants. West of Palmyra there were Roman roads, and the bales could be conveyed in waggons, but east of the oasis there was no road, and the caravans of Palmyra traversed the desert either to Vologesias (near the ancient Babylon and the later Cufa), where water carriage was available, or to Forath on the Pasitigris and Charax at the head of the Persian Gulf, The trade was enormously profitable not only to the merchants but to the town, which levied a rigorous duty on all exports and imports, and even farmed out the water of the two wells; but the dangers of the desert and the risks of Parthian or Persian hostility were also formidable, and successfully to plan or conduct a great caravan was a distinguished service to the state, often recognized by public monuments erected by the “senate and people,” or by the merchants of the caravan.

These monuments, which form a conspicuous feature in Palmyrene architec- ture, took the form of statues placed on pedestals project- ing from the upper part of the long rows of pillars which lined the chief streets; for every great merchant was eager to see his name handed down to posterity by an enduring memorial, and to add to the colonnades a series of pillars "with all their ornaments, with their brazen capitals (4) and painted ceilings," was the received way of honouring others or winning honour for oneself. Thus arose, besides minor streets, the great central avenue which, starting from a triumphal arch near the great Temple of the Sun, formed the main axis of the city from south-east to north-west for a length of 1240 yards, and at one time consisted of not less than 750 columns of rosy-white lime- stone each 55 feet high. We must suppose that this and the other pillared streets were shaded from the fierce heat of the sun like a modern bazaar; and in some parts the pillars seem to have served to support a raised footway, from which loungers could look down at their ease on the creaking waggons piled with bales of silk or purple wool or heavy with Grecian bronzes designed to adorn some Eastern palace, the long strings of asses laden with skins or alabastra of precious unguents, the swinging camels charged with olive oil from Palestine or with grease and hides from the Arabian deserts, and the motley crew of divers nationalities which crowded the street beneath—the slave merchant with his human wares from Egypt or Asia Minor, the Roman legionary and the half-naked Saracen, the Jewish, Persian, and Armenian merchants, the street hawkers of old clothes, the petty hucksters at the corners offering roasted pine cones, salt fish, and other cheap dainties, the tawdry slave-girls, whose shameful trade went to swell the coffers of the state, the noisy salt auction, presided over by an officer of the customs. The produc- tion of "pure salt" from the deposits of the desert was apparently one of the chief local industries, and another

which could not be lacking on the confines of Arabia was the manufacture of leather. We read too, on the inscriptions, of a guild of workers in gold and silver; but Palmyra wag not a great industrial town, and the exacting fiscal system, which reached the most essential industries, and drew pro- fit from the barest necessaries of life, must have weighed heavily on the artizan classes. Though all quarters of the town still show traces of splendid

buildings, wealth wag probably confined to a comparatively small number of great families, and we must picture Palmyra in its best days as displaying a truly Oriental compound of magnifi- cence and squalor, where the mud or straw-built huts of the poor stood hard by the palaces of the merchant princes.

The life of the mass of the population was the unchang- ing life of the Eastern poor; the great families too remained essentially Oriental under the varnish of their Greek culture and Roman citizenship. The life of a pro- minent townsman included an active share in the organ- ization and even the personal conduct of caravans, the discharge of civic offices, perhaps the superintendence of the market and the victualling of a Roman expedition, The capable discharge of these functions, which sometimes involved considerable pecuniary sacrifices, ensured public esteem, laudatory inscriptions, and statues, and to these honours the head of a grest house was careful to add the glory of a splendid family tomb, consecrated as the " long home "(xnby na—the same phrase as in Eccles, xii. 5) of himself, his sons, and his sons' sons "for ever." These tombs, which lie outside the city, are perhaps the most interesting monuments of Palmyra. Some are lofty square towers, with as many as five sepulchral chambers oceupy- ing successive stories, and overlooking the town and its approaches—a feature characteristically Arabic—from the slopes of the surrounding hills. Others are house-like buildings of one story, a richly decorated portico opening into a hall whose walls are adorned with the names and sculptured portraits of the dead. The scale of these monuments corresponds to the wide conception of an Eastern family, from which dependants and slaves were not excluded ; and on one inscription, in striking contrast with Western usage, a slave is named with the sons of the house (De V., 33, a). 'The tombs are the only buildings of Palmyra that have any architectural individuality; the style of all the ruins is late classic, highly ornate, but without refinement.

The frequent Eastern expeditions of Rome in the 3d century brought Palmyra into close connexion with several emperors, and opened a new career of ambition to her citizens in the Roman honours that rewarded services to the imperial armies. One house which was thus distin- guished was to play no small part in the world's history. Its members, as we learn

from the inscriptions, prefixed to their Semitic names the Roman gentilicium of Septimius, which shows that they received the citizenship under Septimius Severus, presumably on the occasion of his Parthian expedition. In the next generation Septimius Odzenathus! (Odhainat), son of Hairan, son of Wahballath, son of Nassor, had attained the rank of a Roman senator, conferred no doubt when Alexander Severus visited Palmyra (comp. De V., 15). The East was then stirred by the progress of the new Sdsdnian empire, and the Palmyrene aristocracy, in spite of its Roman honours, had probably never cordially fallen in with the changes which had made Palmyra a colony and a military station. Indeed the Romanizing process had only changed the surface life of the place; it lay in the nature of things that the

1 *Odalvados, not ‘Od€vabos, is the form of the name on the inscrip- tions,

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greatest merchant prince, with the openest hand, and the widest circle of connexions along the trade routes, was the real head of the community, and could do what he pleased with boule and demos except when a Roman commander interfered. Odzenathus appears to have been the head of a party which secretly meditated revolt, but the outbreak was prevented by a Roman officer Rufinus, who procured his assassination.! He left two sons; the elder named Hairan appears in an inscription of 251 a.p. as “ head-man” (vw, éapxyos) of the Palmyrenes, but it was the ounger brother Odzenathus who sought revenge for his father’s death and inherited his ambition. In him the old Bedouin blood reasserted itself; an Esau among the Jacobs of Tadmor, he spent his youth in the mountains and deserts, where the hardships of the chase prepared him for thd fatigues of war, and where no doubt he acquired the absolute influence over the nomad tribes which was one of the chief secrets of his future success. In 258, the year of Valerian’s ill-fated march against Sapor, Odzenathus is called hypatikos or consular, the highest honorary title of the empire, in an inscription erected to him by the gold and silver smiths of Palmyra. The title no doubt had just been conferred by the emperor on his way eastward, and the munificent patron of the guild of workers in precious metals had, we may judge,

liberally scattered their wares among the wives and daughters of the Bedouin sheikhs. He meant to have a strength and party of his own, whatever the issue of the war. If we may trust the circumstantial account of Petrus Patricius, the captivity of Valerian and the victorious advance of Sapor induced Odenathus to send gifts and letters to Sapor, and it was only when these were rejected that he threw himself heart and soul into the Roman cause. Sapor was offended that Odzenathus did not appear before him in person; the Palmyrene chief in fact did not mean to be the mere subject either of Persian or Roman, though he was ready to follow whichever power would leave him practically sovereign at the price of occasional acts of homage. Rome in her day of disaster could not afford to be so proud as the Persian; the weak Gallienus was the very suzerain whom Odznathus desired ; and, joining his own considerable forces with the shattered fragments of the Roman armies, the Palmyrene commenced a successful war with Persia, in which he amply revenged himself on the arrogance of Sapor, and not only saved the Roman East but reduced Nisibis, twice laid siege to Ctesiphon itself, and furnished Gallienus with the captives and trophies for the empty pomp of a triumph. From the confused mass of undigested and contradictory anecdotes which form all the history we possess of this period it is impossible to extract a satisfactory picture of the career of Odznathus ; but we can see that he steadily aimed at concentrating in his own person the whole sovereignty of Syria and the neighbouring lands, and as the organization of the empire had entirely broken down, and almost every Roman general who had a substantial force at his com- mand sooner or later advanced a claim to the purple, the Palmyrene prince, always acting in the name of Gallienus, gradually disembarrassed himself of every rival repre- Sentative of Western authority throughout the greater part of Roman Asia. In the year 264 he was officially named supreme commander in the East,? and, though to

- See the anonymous continuator of Dio (Fr. Hist. Gr., iv. 195). The elder Odenathus is also alluded to in Pollio’s life of Cyriades, “Ss which one may infer that he plotted with a Persian party in

yria,

2 This date is given by Pollio (Gallienus, c. 10) and is confirmed by other notices. The order of events is very obscure, and Pollio is self-contradictory in several places. But the two events which he dates

Y consulates, and which therefore are probably most trustworthy, are the imperiwm of Odenathus in 264 and the rejoicings in Rome over his

the Romans he was a subject of the empire, among his own people he was an independent sovereign, supreme over all the lands from Armenia to Arabia, and able to count on the assistance of both these nations. Odsnathus himself seems to have been engaged in almost constant warfare in the east and north against the Persians and perhaps the Scythians, but in his absence the reins of government were firmly held by his wife Zenobia, the most famous heroine of antiquity, to whom indeed Aurelian, in a letter preserved by Trebellius Pollio, ascribes the chief merit of all her husband's success. Septimia Zenobia was by birth a Palmyrene; her native name was Bath Zabbai (De V., 29) ;? and Pollio's descrip- tion of her dark beauty, black flashing eyes, and pearly teeth, together with her unusual physical endurance and the frank commanding manners which secured her author- ity in the camp and the desert, point emphatically to an Arabic rather than a Syrian descent.4 To the union of firmness and clemency, which is the most necessary quality of an Eastern sovereign, Zenobia added the rarer gifts of economy and organization, and an unusual range of intellectual culture. She spoke Coptic as well as Syriac, knew something of Latin, and had learned Greek from the famous Longinus, who remained at her court to the last, and paid the penalty of his life for his share in her counsels. She was also a diligent student of Hastern and Western history, and the statement that she enjoined her sons to speak Latin so that they had difficulty in using Greek implies a consistent and early adoption of the policy which made the success of Odenathus, and, taken in con- nexion with Aurelian's testimony, in a letter preserved by Pollio, that she had the chief merit of her husband's exploits, seems to justify the conclusion that it was her educated political insight that created the fortunes of the short-lived dynasty. In the zenith of his fame Odenathus was cut off by assassination along with his eldest son Herod, and it is generally assumed that the murder took place under

Gallienus. The authority for this view is Pollio, who says that on receiving the news Gallienus sent an army against the Persians, which was destroyed to a

Persian victories in 265 (reading consulatu for consulta in Gall. c. 12 with Klein in Rhein. Mus. 1880, p. 49 sg.). With this agrees Jerome's date of 265 for the campaign against Sapor; and it is also possible to make out from the series of Palmyrene inscriptions referring to a certain Septimius Worod that in 263-264 the military organization of Palmyra ceased to be Roman. On the other hand up to 262-263 Syria was held by Macrianus and his son Quietus. Odenathus took Emesa and destroyed Quietus probably in 263. Up to this time his sphere of action was limited by the desert, but the overthrow of Quietus left: him the only real power between Rome and Persia. There is really no evi- dence that he was at war with Sapor before 265, and before 263 he was hardly in a position to send an embassy to hii. It is most likely that his final decision in favour of Rome was not made till the fall of Emesa. Pollio is certainly wrong in saying that in 265 Odenathus was named Augustus. He seems to have been nisled by a medal in which the Augustus represented dragging Persians captive was really Gallienus, whom we know to have triumphed for Odenathus's victories. But after his Persian successes Odeenathus strengthened his position, 'as we learn from coins, by having his son associated in his imperium. The first year of Wahballath is 266-267, when his father, as will be presently shown, was still alive. The title of "king" was perhaps not conferred on Wahballath till the reign of Aurelian (Sallet, Mum. Zeit., 1870). ; ;

3 The original reading of De Vogiie and Waddington, Bath Zebina, ig now known to be incorrect. Zabbai is a genuine Palmyrene name, borne also at this period by Septimius Zabbai, the general of the forces of the city.

4 We need not attach any weight to the fact that Zenobia, when she was mistress of Egypt, boasted of descent from Cleopatra and the Ptolemies, Athanasius, in speaking of the support she gave to Paul of Samosata, calls her a Jewess; this is certainly false, for her coins bear pagan symbols. Athanasius probably drew a hasty conclusion, not so much from her sympathy with the Monarchian Paul as from her patronage of the Jews in

Alexandria, for which the evidence of an inscription from a synagogue still exists (see Mommsen in Zeitsch. f. Numismatik, v. 229 sq., 1873).

man by Zenobia—a statement quite incredible, since we know from coins of her son Wahballath or Athenodorus, struck at Alexandria, that the suzerainship of Rome was acknowledged in the Palmyrene kingdom till the second year of Aurelian. That Odzenathus fell under Gallienus seems, however, at first sight to be confirmed by the coins, which give 266-7 as the first year of Wahballath. On the other hand the inscriptions on two statues of Odzenathus and Zenobia which stand side by side at Palmyra bear the date August 271, and, though De Vogiié, mistaking an essential word, supposed the former to be posthumous, the inscription really implies that Odeenathus was then alive.} Now Pollio himself says that his wife and sons were associated in the kingship of Odeenathus, and therefore the years of Wahballath do not necessarily begin with his father's death. The fact seems to be that, while Odeenathus was busy at the other end of his kingdom, Zenobia administered the government at Palmyra and directed the conquest of Egypt, still nominally acting under the emperor at Rome, whose authority on the Nile was dis- puted by one or more pretenders.? It still seems strange that Wahballath should strike money in his father's life- time —and he did so both at Antioch and Alexandria— when there are no genuine coins of Odsnathus ; but it is equally strange and yet an undoubted fact that Zenobia, who not only enjoyed the real authority behind her beard- less son, but placed her name before his on public inscrip- tions,? struck no coins till the second year of Aurelian, when the breach with Rome took place, and she suddenly appears as an empress (S

When, however, Aurelian had restored the unity of the West, and stood at the head of a powerful army flushed by victory in Gaul, Palmyra had to choose between real sub- jection and war with Rome. Some time in the year ending August 28, 271, Wahballath assumed the title of Augustus, and drops Aurelian from his coins, and just at the same time Zabdai, generalissimo of the forces, and YZabbai, commander of the army of Tadmor, erected the statues already mentioned, where Odzenathus is styled

“king of kings and restorer of the state.” This was an open challenge, and the assassination of Odenathus, which took place at Emesa, a town in which the Roman party was strong, must have followed immediately afterwards, and on political grounds. Zenobia, supported by her two generals, kinsmen of her husband, was now face to face with a Roman invasion, She held Egypt, Syria, Mesopo- tamia, and Asia Minor as far as Ancyra; and Bithynia was ready to join her party had not the army of Aurelian appeared just in time from Byzantium. She could count too on the Armenians and the Arabs, but the loyalty of Syria was doubtful: the towns disliked ayrule which was essentially “barbarian,” and in Antioch at least the patroness of the Monarchian bishop Paul of Samosata could not be popular with the large Christian party by whom he was bitterly hated. There were many Romans ee ee eee

- That Odenathus lived to begin the war with Aurelian seems to have been known to Vopiscus (Probus, ¢. 9).

- That the Probatus of Pollio, Claudius, c. 11 (the Probus of Zosi- mus), must have been a pretender was first seen by Mommsen, apud Sallet, Fiirsten von Palmyra, p. 44.

3 This is shown for Syria by an inscription near Byblus (C. 7. G., 4503 b ; Waddington, p. 604), and for Egypt by the inscription from the Jewish synagogue already quoted, where indeed the names are not given but the order is BagtAloons kad BaciAdws—in the Latin Regina et rex gusserunt.

“ See, for the attitude of Emesa, Zosimus, i. 54, Prag. Hist. Grec., iv. 195. The assassin was a relative of Odenathus named Meeonius, that is M’annai (Pollio Trig. Tyr.; Zonaras, xii. 24),

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in Zenobia’s force, and it was they who bore the brunt of the two great battles at Antioch and Emesa, which followed Aurelian’s rapid advance through Asia .Minor. But Zenobia made light of these defeats,—“ TI have suffered no great loss” was her message to Aurelian, “for almost all who

have fallen are Romans” (fr. H. Gr., iv. 197). ae was now plain that the war was one of races, and the fact that the fellahin of Palestine fought with enthusiasm on the side of Aurelian is the clearest proof that the empire of Palmyra was really an empire of Arabs over the peasants of the settled Semitic lands, whom the true Bedouin always despises, and who return his contempt with burning hatred. Thus the analogy already traced between the early history of Tadmor and Mecca is com- pleted by an equally striking parallel between the empire of the Septimians at Palmyra and that of the Omayyads at Damascus. In each case it was a family of Arabian mer- chant princes, strong in its influence over the sons of the desert, which rose to sovereignty and governed the old lands of the Semites from a city which had the desert behind it, But the empire of Palmyra came four centuries too soon. Rome was not yet exhausted, and Zenobia had neither the religious discipline of Islam to hold the Arabs together nor the spoil of the treasuries of Persia to keep their enthu- siasm always fresh. Aurelian’s military skill was strained to the uttermost by the prudence and energy of Zenobia, but he succeeded in forming and maintaining the siege of Palmyra in spite of its bulwark of desert, and his gold corrupted the Arab and Armenian auxiliaries. Zenobia attempted to flee and throw herself on the Persians, but she was pursued and taken, and then the Palmyrenes lost heart and capitulated. Aurelian seized the wealth of the city, but spared the inhabitants, and to Zenobia he granted her life while he put her advisers to death. She figured in his splendid triumph, and by the most probable account accepted her fall with dignity, and closed her days at Tibur, where she lived with her sons the life of a Roman matron. The fall of Zenobia may be placed in the spring of 272. Soon after, probably within a year, Palmyra was again in revolt, but on the approach of Aurelian it yielded without a battle; the town was destroyed and the popula- tion put to the sword.

An obscure and distorted tradition of Zenobia as an Arab queen sur- vived in the Arabian tradition of Zabba, daughter of ‘Amr b. Zarib, whose name is associated with Tadmor and with a town on the right bank of the Euphrates, which is no doubt the Zenobia of which Procopius speaks as founded by the famous queen. See O. de Perceval, ii. 28 sg., 197 sg. ; Tabari, i. 757 sq. Butthe ruins of Palmyra, which excited the lively admiration of the Bedouins, were not associated by them with the great queen ; they are referred to by Nabigha as proofs of the might of Solomon and his

sovereignty over their builders the Jinn. This legend must have come from the Jews, who either clung to the ruins or returned when Palmyra partially revived as a military station founded by Diocletian. Under the Christian empire Palmyra was a bishopric ; about 400 A.D. it was the station of the first Illyrian legion (Not. Dig.). Justinian furnished it with an aqueduct, and built the wall of which the ruins are still visible : it was deemed important, as we gather from Procopius, to have a strong post on the disputed marches of the Arabs of Hira and Ghassdn. At the Moslem conquest of Syria Palmyra capitulated to Khalid without embrac- ing Islam (Beladhori, p. 111 sg.; Yakut, i831). The town became a Moslem fortress and received a considerable Arab colony; for in the reign of Merwan II. it sent a thousand Kalbite horsemen to aid the revolt of Emesa, to the district of which it is reckoned by the Arabic geographers. The rebellion was sternly suppressed and the walls of the city destroyed.6 References to Palmyra in later

5 Ibn Athir (127 a.H.); compare Frag. Hist. Ar., 189 (where it is said to have been held by the Beni ‘Amir); Ibn Wadih, ii. 230; Mokaddasi, p. 156.

§ In this connexion Yakut tells a curious story of the opening of one of the tombs by the caliph, which in spite of fabulous incidents, recalling the legend of Roderic the Goth, shows some traces of local knowledge. The sculptures of Palmyra greatly interested the Arabs, and are commemorated in several poems quoted by Yakut and others.

times have been eolleeted by Quatremére, Sultans Mamlouks, ii. 1, p- 255. Once all but annihilated by earthquake (434 A.H.), and passing through many political vicissitudes, Tadmor was still a wealthy place, with considerable trade, as late as the 14th century; but in the general decline of the East, and the change of the great trade routes, it at length sunk to a poor group of hovels gathered in the eourtyard of the great Temple of Sun, ‘he ruins first became known to Europe in 1678 through W. Halifax, an Aleppo merchant. The architeeture was earefully studied in 1751 by Wood and Dawkins, whose splendid folio (The

Ruins of Palmyra, Lond., 1753) also gave eopies of inscriptions.? |

But, though the site was often visited and some stones with Semitic as well as Greek writing reached Europe, the great epigraphic wealth of Palmyra was first thoroughly opened to study by the eollections of Waddington and De Vogiié, made in 1861-62. Subsequent dis- coveries have been of minor importance, with the notable exeeption of the great fiscal inscription spoken of above, diseovered by Prinee

Abamelek Lazarew.

Sources.—To the writers already used by Tillemont and Gibbon, of whom Zosimus appears on the whole the best informed, must be added the fragments of the anonymous continuator of Dio (Petrus Patricius ?) first published by Mai. For the coins, Sallet's firsten von Palmyra (1866) must be read with his later essay, Vum. Zettsch., ii. 81 sq. (Vienna, 1870). For the Greek inscriptions, see the Cor. Insc. Gr., but especially the work of Le Bas and Waddington, vol. iii. To the great collection of Aramaie inscriptions in De Vogtié, Syrie Centrale, must be added the gleanings of other travellers (Mordtmann, Sitzungsb. of the Munich Ac., 1875; Sachau, in Z. D. M. G., xxxv. 728 sq.), With some stones brought to Europe at an earlier date, and the monuments of natives of Palmyra in Africa and Britain (see Levy, 2. D. M. G., xii., xv., Xviii.; W. Wright, 'The Palmyrene Inscr. of 8. Shields," 7. Soc. Bib. Arch., vi.). The great fiscal inscription was published by De Vogiié, Jour. As., ser. 8, vols. i, ii; eomp. Sachau in 7. D. M.G., xxxvil. 562 sq., and R. Cagnat in Rev. de Philol., viii. 135 sg. The dialect has been thoroughly discussed by Néldeke in Z. D. M. G., xxiv. 85 sq. Its nearest affinities are with Biblical Aramuic. (W. R. S.)

PALOMINO DE CASTRO Y VELASCO, Acrscto Awytonto (1653-1726), Spanish painter and writer on art, was born of good family at Bujalance, near Cordoba, in 1653, and studied philosophy, theology, and law at that capital, receiving also lessons in painting from Valdes Leal, who visited Cordoba in 1672, and afterwards from Alfaro (1675). After taking minor orders he removed to Madrid in 1678, where he associated with Alfaro, Coello, and Carefio, and executed some indifferent frescos. He soon afterwards married a lady of rank, and, having been appointed alcalde of the mesta, was himself ennobled ; and in 1688 he was appointed painter to

theking. He visited Valencia in 1697, and remained there three or four years, again devoting himself with but poor success to fresco painting. Between 1705 and 1715 he resided for con- siderable periods at Salamanca, Granada, and Cordoba; in the latter year the first volume of his work on art appeared in Madrid. After the death of his wife in 1725 Palomino took priest's orders. He died on August 13, 1726.

His work, in three vols. folio (1715-24), entitled 27 Museo Pictorico y Escala Optica, eonsists of three parts, of which the first two, on the theory and practice of the art of painting, are with- out interest or value; the third, with the subtitle #7 Parnaso Espaiiol Pintoresco Lawreado, is a mine of important biographical material relating to Spanish artists, which, notwithstanding its faulty style, has proeured for the author the not altogether undeserved honour of being called the "Spanish Vasari." It was partially translated into English in 1739; an abridgment of the original (Las Vidas de los Pintores y Estatuarios Espafioles) was published in London in 1742, and afterwards appeared in a French translation in 1749. A German version was published at Dresden in 1781, and a reprint of the entire work at Madrid in 1797.

PALUDAN-MULLER, Freperrk (1809-1876), the leading poet of Denmark during the middle of the present century, was born at Kjerteminde on the 7th February 1809. His father was' Jens Paludan-Miiller, a distin- guished bishop of Aarhuus. He was educated at the cathedral school of Odense from 1820 to 1828; in the latter year he passed to the university of Copenhagen. In 1832 he opened his career as a poet with Hour Romances, and a romantic comedy entitled Kjerlighed ved Hoffet ("Love at Court"). This enjoyed a great success, and was succeeded in 1833 by Dandserinden ("The Dancer"), and

1 For the site and the present aspect of the ruins, which are less perfect than at Wood's visit, see especially papers by W. Wright (of Damascus) in Leisure Hour, 1876 ; Socin-Baedeker's Handbook; and the recent Reise of Sachau (Berlin, 1883), which gives a general photograph, and one of the most perfect ruin, the small Sun-Temple.

in 1834 by the lyrical drama of Amor og Psyche. There was now no doubt about Paludan-Miiller's genius. In 1835 he came under the influence of Byron, and published an Oriental tale, Zuleimas Flugt (" Zuleima's Flight"), which was less successful than the preceding books. But he regained all that he had lost by his two Volumes of Poems in 1836 and 1838. Paludan-Miiller now left his native country for the first time, and spent two years (1838-40) in Germany, Italy, and France. The next dates in his career are those of the publication of his principal masterpieces— his lyrical dramas, Venus, 1841; Dryadens Bryllup (" The

| Dryad's Wedding"), 1844; Zithon (" Tithonus "), 1844 ;

and his famous didactico-humoristic epic Adam Homo, in three volumes, 1841-48. His later works include Abels Déd ("The Death of Abel"), 1854; Kalanus, an Indian tragedy ; Paradiset (" Paradise"), a lyrical drama, 1861 ; Benedikt fra Nurcia, 1861; Tiderne Skifte ("The Times are Changing"), a comedy, 1874; and Adonis, an exqui- site romance in verse, 1874. Besides these works, all of which are poetical, Paludan-Miiller published a story, Ungdomskilden ("The Fountain of Youth"), in 1865, and an historical novel in three volumes, Jvar Lykke's Historie (" The Story of Ivar Lykke"), 1866-73. The poet lived a very retired life, first in Copenhagen, then for many years in a cottage on the outskirts of the royal park of Fredensborg. He died in his house in Ny Adelgade, Copenhagen, on the 27th December 1876.

Paludan-Miiller's genius has been madc the subjeet of one of the most brilliant of George Brandes's monographs. His work was varied, but of remarkably high and level merit. His lyrical dramas form a group of pure poems, of an elevated class, which would dis- tineuish him above most of the European pocts of his timc, even if he had not shown himself, in Adam Homo, to be a great satirist as well. His artistic form was singularly fine. He might have becn a more finished thinker if his imagination had not becn dis- turbed by Byron. The reader who desires to study Paludan- Miiller at his best must read the first book of Adam Homo, and the whole of Kalanus and of Adonis. His poctical works were eolleeted in eight volumes in 1878-79.

PALWAL, in Gurgaon district, Punjab, India, with a population in 1881 of 10,635, is a town of great antiquity, supposed to figure in the earliest Aryan

traditions under the name of Apelava, part of the Pandava kingdom of Indraprdstha. Its importance is purely historical, and the place is now a mere agricultural centre.

PAMIERS, capital of an arrondissement, an episcopal see, and the most populous town (10,478 inhabitants) of the department of Ariége, France, lies on the right bank of that river, 40 miles south of Toulouse, in the middle of a fertile and well-watered valley. Its wines were at one time in high repute. Its industrial establishments at present comprise flour-mills, spinning-mills, serge factories, and some large forges, and there is also a gold-washing company (the Ariége derives its name from its auriferous character). The cathedral of Pamiers, with an octagonal Gothic tower, is a bizarre mixture of the Greco-Roman and Gothic styles; the church of Notre Dame du Camp is noticeable for its crenellated and machicolated fagade. From the site of the old castle, which still retains the name of Castellat, there is a fine view of the Pic de St Barthélemy and the valley of the Ariége.

Pamiers was originally a castle built in the beginning of the 12th eentury by Roger JI., count of Foix, on lands belonging to the abbey of St Antonin de Frédelas. The abbots of St Antonin, and afterwards the bishops, shared the superiority of the town with the counts, This gave rise to numerous disputes between monks, counts, sovereigns, bishops, aud the consuls of the town. Pamiers was sacked by Jean dc Foix in 1486, again during the religious wars, and, finally, in 1628 by Condé.

PAMIR. See Asta, vol. ii. p. 686, and Oxus, p. 103, supra.

PAMPAS. Sec ArcENTINE REPUBLIC, vol. ii. p. 487.

PAMPHILUS, an eminent promoter of learning in the early church, is said to have been born, of good family,

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at Berytus, in the latter half of the 3d century. After

studying at Alexandria under Pierius, the disciple of

Origen, he was ordained presbyter at Cxsarea in Palestine, where the remainder of his life was spent. There he established a theological school, and warmly encouraged students ; he also founded, or at least largely extended, the great library to which Eusebius and Jerome were after- wards so much indebted. He was very zealous in the

transcription and distribution of copies of Scripture and of

the works of various Christian writers, especially of Origen ; the copy of the complete works of the last-named in the

library of Ceesarea was chiefly in the handwriting of

Paniphilus himself. At the outbreak of the persecution under Maximin, Pamphilus was thrown into prison, and there, along with his attached friend and pupil Eusebius (sometimes distinguished as Eusebius Pamphili), he com- posed an Apology for Origen in five books, to which a sixth was afterwards added by Eusebius. He was put to death in 309.

Only the first book of the Apology of Pamphilus is extant, and that but in an imperfect Latin translation by Rufinus. It has been reprinted in De la Rue's edition of Origen, and also by Routh and by Galland. Eusebius wrote a memoir of his master which also has unfortunately disappeared.

PAMPHLETS. The earliest appearance of the word is in the Philobiblon (1344) of Richard de Bury, who speaks of "panfletos exiguos" (chap. viii). In English we have Chaucer's "this leud pamflet" (Zest. of Love, bk. iii.), Occleve's "go litil pamfilet" (Mason's ed., 1796, p. 77), and Caxton's "paunflettis and bookys" (Book of Eneydos, 1490, Prologue). In all these examples pamphlet is used to indicate the extent of the production, and in contradis- tinction to book. In the 16th century it became almost exclusively devoted in English literature to short poetical effusions, and not till the 18th century did pamphlet begin to assume its modern meaning of a prose political tract. "Pamphlet " and "pamphlétaire" are of comparatively recent introduction into French from the English, and generally indicate fugitive criticism of a more severe, not to say libellous, character than with us. The derivation of the word is a subject of contention among etymologists. The experts are also undecided as to what is actually understood by a pamphlet. Some bibliographers apply the term to everything, except periodicals, of quarto size and under, if not more than fifty pages, while others would limit its application to two or three sheets of printed matter which have first appeared in an unbound condition. These are merely physical peculiarities, and include academical dissertations, chap-books, and broadsides, which from their special subjects belong to a separate class from the pamphlet proper. As regards its literary character- istics, the chief notes of a pamphlet are brevity and spontaneity. It has a distinct aim, and relates to some matter of current interest, whether religious, political, or literary. Usually intended to support a particular line of argument, it may be descriptive, controversial,

didactic, or satirical. It is not so much a class as a form of literature, and from its ephemeral character represents the changeful currents of public opinion more closely than the bulky volume published after the formation of that opinion. The history of pamphlets being the entire record of popular feel- ing, all that is necessary here is to briefly indicate the chief families of political and religious pamphlets which have exercised marked influence, and more particularly in those countries—Kngland and France—where pamphlets have made so large a figure in influencing thought and events.

It is difficult to point out much in ancient Literature which precisely answers to our modern view of the pamphlet. The (belli famosi of the Romans were simply abusive pasquinades. Some of the small treatises of Lucian, the lost Anti-Cato of Cesar, Seneca's Apocolocyntosis

written against Claudius, Julian's Kaicapes } Supmdécroy and "AytioxiKds 7) Mucordywv, from their general applica- tion, just escape the charge of being mere satires, and may therefore claim to rank as early specimens of the pamphlet.

At the end of the 14th century the Lollard doctrines were widely circulated by means of the tracts and leaflets of Wickliffe and his followers, The Ploughman's Prayer and Lanthorne of Light, which appeared about the time of Old- castle's martyrdom, were extremely popular, and similar brief vernacular pieces became so common that it wag thought necessary in 1408 to enact that persons in authority should search out and apprehend all persons owning English books. The printers of the 15th century pro- duced many controversial tractates, and Caxton and Wynkin de Worde printed in the lesser form. It was in France that the printing press first began to supply reading for the common people. During the last twenty years of the 15th century there arose an extensive popular literature of farces, tales in verse and prose, satires, almanacs, &c., extending to a few leaves apiece, and circulated by the itinerant booksellers still known ag colporteurs. These folk-books soon spread from France to Italy and Spain, and were introduced into England at the beginning of the 16th century, doubtless from the same quarter, as most of our early chap-books are transla- tions or adaptations from the French. Another form of literature even more transient was the

broadside, or single sheet printed on one side only, which appears to have flourished principally in England, but which had been in use from the first invention of printing for papal indulgences, royal proclamations, and similar docu- ments. Throughout western Europe, about the middle of the 16th century, the broadside made a considerable figure in times of political agitation. In England it was chiefly used for ballads, which soon became so extremely popular that during the first ten years of the reign of Elizabeth the names of no less than forty ballad-printers appear in the Stationers' Registers. The humanist move- ment of the beginning of the 16th century produced the famous Epistole Obscurorum Virorwm, and the leading spirits of the Reformation period—Erasmus, Hutten, Luther, Melanchthon, Francowitz, Vergerio, Curio, and, Calvin—found in tracts a ready method of widely circulat- ing their opinions.

The course of ecclesiastical events was precipitated in England by the Supplicacyon for the Beggars (1528) of Simon Fish, answered by Sir Thomas More's Sup- plycacion of Soulys. In the time of Edward VI. brief tracts were largely used as a propagandist instrument in favour of the Reformed religion; political tracts were repre- sented by the address of the rebels in Devonshire (1549). The licensing of the press by Mary greatly hindered the production of this kind of literature. From about 1570 there came an unceasing flow of Puritan pamphlets, of which more than forty were reprinted under the title of A parte of a register (London, Waldegrave, 4to). To this publication Dr John Bridges replied by a ponderous quarto, A defence of the government established in the church of England (1587), which gave rise to Oh read over D, John Bridges . . . by the reverend and worthie Martin Marprelate gentleman (1588), the first of the famous Martin Marprelate tracts, whose titles sufficiently indicate their opposition to priestly orders and episcopacy. Bishop Cooper's Admonition to the People of England (1589) came next, followed on the other side by Hay any worke for Cooper… by Martin the Metropolitane, and by others from both parties to the number of about twenty-three. The controversy lasted about a year, and ended in the discomfiture of the Puritans and the seizure of their secret press. The writers on the Marprelate side are generally

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supposed to have been Penry, Throgmorton, Udal, and Fenner, and their opponents Bishop Cooper, John Lilly, and Nash.

As early as the middle of the 16th century we find ballads of news; and in the reigns of Elizabeth and James I. small pamphlets, translated from the German and French, and known as ‘“‘news-books,” were circulated by the so-called “ Mercury-women.” These were the immediate predecessors of weekly newspapers, and continued to the end of the 17th century. A proclamation was issued by Charles IL, May 12, 1680, “for suppressing the printing and publishing of unlicensed news-books and pamphlets of news.”

In the 17th century pamphlets began to contribute more than ever to the formation of public opinion. Nearly one hundred were written by or about the restless John Lilburne, but still more numerous were those of the undaunted Prynne, who himself published above one hundred and sixty, besides many weighty folios and quartos. Charles I. found energetic supporters in Peter Heylin and Sir Roger L’Estrange, the latter noted for the coarseness of his pen. The most distinguished pamphleteer of the period was John Milton, who began his career in this direction by five anti-episcopal tracts (1641-42) during the Smectymnuus quarrel. In 1643 his wife’s desertion caused him to publish anonymously Doctrine and discipline of divorce, followed by several others on the same subject. He printed the Z’ract on Education in 1644, and, unlicensed and unregistered, his famous Areopagitica—a speech for the liberty of wnlicensed printing. He defended the trial and execution of the king in Zenure of kings and magistrates (1648). The Hikon Basilike dispute was con- ducted with more ponderous weapons than the kind we are now discussing. When Monk held supreme power Milton addressed to him Zhe present means of a_free commonwealth and Readie and easie way (1660), both pleading for a commonwealth in preference to a monarchy. John Goodwin, the author of Obstructors of Justice (1649), John Phillipps, the nephew of Milton, and Abiezer Coppe were violent and prolific partisan writers, the last-named specially known for his extreme Presbyterian principles. The tract Killing no murder (1657), aimed at Cromwell, and attributed to Colonel Titus or Colonel Sexby, excited more attention than any other political effusion of the time. The history of the civil war period is told day by day in the well-known collection made by ‘Thomason the bookseller, now preserved in the

British Museum. It numbers 30,000 separate books, pamphlets, and broadsides, ranging from 1640 to 1662, and is bound in 2000 volumes. Each article was dated by Thomason at the time of acquisition. William Miller was another bookseller famous for his collection of pamphlets, which were catalogued by Tooker in 1693. Wm. Laycock printed a Proposal for raising a fund for buying them up for the nation.

The Catholic controversy during the reign of James II. gave rise to a multitude of books and pamphlets, which have been described by Peck (Catalogue, 1735) and by Jones (Catalogue, Chetham Society, 1859-65, 2 vols.). Politics were naturally the chief feature of the floating literature connected with the Revolution of 1688. The political tracts of Lord Halifax are interesting both in matter and manner. He is supposed to have written The character of a political trimmer (1689),-sometimes ascribed to Sir W. Coventry. About the middle of the reign Defoe was introduced to William IL, and produced the first of his pamphlets on occasional conformity. He issued in 1697 his two defences of standing armies in support of the Government, and published sets of tracts on the partition treaty, the union with Scotland, and many other subjects.

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His Shortest way with the Dissenters (1702) placed him in the pillory.

Under Queen Anne pamphlets arrived at a remark- able degree of importance. Never before or since has this method of publication been used by such masters of thought and language. Political writing of any degree of authority was almost entirely confined to pamphlets. If the Whigs were able to command the services of Addison and Steele, the Tories fought with the terrible pen of Swift. Second in power if not in literary ability were Bolingbroke, Somers, Atterbury, Prior, and Pulteney, The Government viewed with a jealous eye the free use of this powerful instrument, and St John seized upon fourteen booksellers and publishers in one day for “libels” upon the administration (see Annals of Queen Anne, October 23, 1711). In 1712 a duty was laid upon newspapers and pamphlets, displeasing all parties, and soon falling into disuse. Bishop Hoadly’s sermon on the kingdom of Christ (1717), holding that the clergy could claim no temporal jurisdiction, occasioned the Bangorian controversy, which produced seventy

or eighty pamphlets. Soon after this period party-writing declined from its comparatively high standard and fell into meaner and venal hands. Under George III. Bute took Dr Shebbeare from Newgate in order to employ his pen. The court part received the support of a few able pamphlets, among which may be men- tioned The consideration of the German War against the policy of Pitt, and The prerogative droit de Koy (1764) vindicating the prerogative. We must not forget that although Samuel Johnson was a pensioned scribe he has for an excuse that his political tracts are his worst per- formances. Edmund Burke, on the other hand, has pro- duced in this form some of his most valued writings. The troubles in America and the union between Ireland and Great Britain are subjects which are abundantly illustrated in pamphlet literature.

Early in the present century the rise of the quarterly reviews threw open a new channel of publicity to those who had previously used pamphlets to spread their opinions, and later on the rapid growth of monthly magazines and weekly reviews afforded controversialists a much more certain and extensive circulation than they could ensure by an isolated publication. Although pamphlets are no longer the sole or most important factor of public opinion, the minor literature of great events is never likely to be entirely confined to periodicals. The following topics, which might be largely increased in number, have each been discussed by a multitude of pamphlets, most of which, however, are likely to have been hopeless aspirants for a more certain means of preserva- tion :—the Bullion Question (1810), the Poor Laws (1828- 34), Tracts for the Times and the ensuing controversy (1833-45), Dr Hampden (1836), the Canadian Revolt (1837-38), the Corn Laws (1841-48), Gorham Contro- versy (1849-50), Crimean War and Indian Mutiny (1854— 59), Schleswig-Holstein (1863-64), Ireland (1868-69), the Franco-German War, with Dame Europa’s School and its imitators (1870-71), Vaticanism, occasioned by Mr Glad- stone’s Vatican Decrees (1874), the Eastern Question (1877-80), and the Irish Land Laws (1880-82).

France. —The activity of the French press in putting forth small

tracts in favour of the Reformed religion caused the Sorbonne in 1523 to petition the king to abolish the diabolical art of printing. Even one or two

sheets of printed matter were found too eumber- some, and single leaves or placards were issued in such numbers that they were the subject of a special edict, September 28, 1553. An ordonnance of February 1566 was specially directed against libellous pamphlets, and those who wrote, printed, or even possessed them. The rivalry between Francis I. and Charles V. gave rise to many political pamphlets, and under Francis II. the Guises were attacked by similar means. Fr. Hotman directed his Hpistre envoiée au tygre de France against the Cardinal de Lorraine. ‘The Valois and

Henry III. in particular were severely handled in Les Hermaphro- dites (c. 1605), which was followed by a long series of imitations. Between Francis I. and Charles IX. the general tone of the pam- phlet-literature was grave, pedantic, and dogmatie, with few songs and an oeeasional political satire. From the latter period to the death of Henry IV. it became audacious, eruel, and dangerous, attended, however, with a considerable increase of political songs.

The Satyre Ménippée (1594), one of the most perfeet models of the pamphlet in the language, did more harm to the League than all the vietories of Henry IV. The pamphlets against the Jesuits were many and violent. Pére Rieheome defended the order in Chasse du renard Pasquier (1603), the latter person being their vigorous oppon- ent Etienne Pasquier. On the death of the king the eountry was filled with appeals for revenge against the Jesuits for his murder; the best known of them was the Anti-Coton (1610), generally attri- buted to César de Plaix. During the regency of Mary de’ Medici the pamphlet changed its severer form to a more facetious type. In spite of the danger of such proeeeding under the uneompromising ministry of Richelieu, there was no lack of libels upon him, whieh were even in most instances printed in Franee. These largely inereased during the Fronde, but it was Mazarin who was the sub- ject of more of this literature than any other historieal personage. It has been calculated that from the Parisian press alone there eame sufficient Mazarinades to fill 150 quarto volumes each of 500 pages. ight hundred were published during the siege of Paris (February 8 to Mareh 11, 1649). A eollection of satirical pieces, entitled Tableau du gouvernement de

Richelier, Mazarin, Fouquet, et Colbert (1693) extends to 432 pages. Pamphlets dealing with the amours of the king and his courtiers were in vogue in the time of Louis XIV., the most caustic of them being the Carte Géogra- phique de la Cour (1668) of Bussy-Rabutin. The presses of Holland and the Low Countries teemed with tracts against Colbert, Le Tellier, Louvois, and Pére Lachaise. The first of the ever-memor- able Provineiales appeared on January 23, 1656, under the title of Letive de Louis de Montalte aun provineial de ses amis, and the remaining eighteen eame out at irregular intervals during the next fifteen months. They excited extraordinary attention throughout Europe. The Jesuit replies were feeble and ineffectual. John Law and the schemes of the bubble period eaused much popular raillery. During the long reign of Louis XV. the distinguished names of Voltaire, Rousseau, Montesquieu, Diderot, D'Alembert, D'Holbaeh, Helvétius, and Beaumarchais must be added to the list of writers in this elass,

The preliminary struggle between the parliament and the crown gave rise to hundreds of pamphlets, which grew still more numerous as the Revolution approached. Linguet and Mirabeau began their appeals to the people. Camille Desmoulins eame into notice as a publicist during the elections for the states-general; but perhaps the pieee which caused the most sensation was the Qu'est ce que le Tiers Etat (1789) of the Abbé Sieyés. The Domine salvum fae Regem and Pange lingwa (1789) were two royalist brochures of unsavoury memory. The finaneial disorders of 1790 occasioned the LEffets des assignats sur le prix du pain of Dupont de Nemours ; Neeker was attacked in the Criminelle Neekerologie of Marat ; and the Vrai nurotr de la noblesse dragged the titled names of France through the mire. The massacre of the Champ de Mars, the death of Mirabeau, and the flight of the king in 1791, the noyades of Lyons and the erime of Charlotte Corday in 1798, and the terrible winter of 1794 have each their respeetive pamphlet literature, more or less violent in tone. Under the consulate and the empire the only writers of note who ventured to seek this method of appealing to the world were Madame de Staél, B. Constant, and Chateaubriand. The royalist reaction in 1816 was the cause of the Pétition of Paul Louis Courier, the first of those brilliant productions of a master of the art. He gained the distinetion of judicial procedure with his Simple Diseowrs in 1821, and published in 1824 his last political work Le pamphlet des panphlets, the

most eloquent justification of the pamphlet ever penned. The Mémoire a consulter of Montlosier attacked the growing power of the Congrégation. The year 1827 saw an augmentation of severity in the press laws and the establish- ment of the eensure. The opposition also increased in power and aetivity, but found its greatest support in the songs of Béranger and the journalism of Mignet, Thiers, and Carrel. M. de Comenin was the chief pamphleteer of the reign of Louis-Philippe. His Oui et non (1845), Few, fer (1846), and Livre des orateurs, par Timon, were extremely suecessful. The events of 1848 gave birth to a number of pamphlets, chiefly pale eopies of the more virile writings of the first revolution. Among the few men of power Louis Veuillot was the Pere Duchesne of the elerieals and Victor Hugo the Camille Des- moulins or Marat of the republicans. After 1852 there was no laek of venal apologies of the eoup d'état. Within more recent times the seeond empire suffered from many bitter attaeks, among which may be mentioned the Lettre sur Phistotre de Franee (1861) of the Due d'Aumale, Propos de Labiénus (1865) of Rogeard, Dialogue

aux enfers (1864) of Maurice Joly, and Ferry's Comptes fantas- tiques @ Haussmann (1868).

PAM—PAM

Literature.—In the article Linrarres will be found references to collections of pamphlets in public libraries. An excellent catalogue by W. Oldys of those in the Harleian Library is added to the 10th volume of the edition of the Mis- cellany by T. Park; and in the Biblioteca volante di @. Cinelli, 24 ed., 1734~ 47, 4 vols, 4to, may be seen a bibliography of pamphlet-literature, chiefly Italian and Latin, with notes. It is of course impossible to supply an account of all the volumes of collected pamphlets, but a few of the more representative in English may be mentioned. These are—The Phenix, 1707, 2 vols. 8yo; Morgan's Phenix Britannicus, 1732, 4t0; Bishop Edmund Gibson's Preservative against Popery, 1438, 8 vols. folin, new ed., 1848-49, 18 vols. sm, 8vo, consisting chiefly of the anti-Catholic discourses of James 11.'s time; The Harleian Miscellany, 1744-53, 8 vols. 4to, new ed. by T. Park, 1808-13, 10 vols. 4to, containing 600 to 700 pieces illustrative of Euglish history, from the library of Edward Harley, earl of Oxford; Collection of scaree and valuable tracts [Anown as Lord Somers Tracts],

1748-52, 16 parts 4to, 2d ed. by Sir W. Scott, 1809-15, 13 vols, 4to, also full of matter for English history; and The Pamphleteer, 1818-28, 29 vols, 8yo, containing the best pamphlets of the day.

For the derivation of the word p:mphlet consult Skeat's Etymological Dict.; Pegge's Anonymiana; Notes and Queries, 3d series, iv. 315, 379, 462, 482, v. 167, 290; 6th series. ii. 156. The general history of the subject may be traced in M. Davies, Zcon libellorum, 1715; W. Oldys, '' History of the Origin of Pamphiets," in Morgan's Phentx Brit, and Nichols's Zz. Anecdotes ; Dr Johnson's lutroduc- tion to the Harleian Miscellany; D'lsraeli, Amenities of Literature; Revue des Deux Mondes, April 1, 1846; Irish Q. Review, vii. 267; Edinb'. Rev., Oct. 1855; Huth's Ancient Ballads and Broadsides (Philobiblon Soc.); Maskell, Martin- Marprelate Controversy ;.T. Jones, Cat. of collection of tracts for and against Popery—the whole of Peck's lists and his references (Chetham Soc., 1856-65); Blakey's Hist. of Political Literature; Andrews, Hist. of British Journalism : Laronsse, Grand Dict. Universel; Nodier, Sur la liberté de la presse; Leber, De Vétat réel de la presse; Moreau, Bibliographie des Mazarinades; Bulletin du Bib- liophile Belge, 1859-62; Nisard, Hist. des livres populaires. (HIRa)

PAMPHYLIA, in ancient geography, was the name Seevol. ; given to a region in the south of Asia Minor, between Plate IL.

Lycia and Cilicia, extending from the Mediterranean to Mount Taurus. It was bounded on the N. by Pisidia, a rugged mountain tract, while Pamphylia occupied only the district between this and the sea. It was therefore a country of small extent, having a coast-line of only about 75 miles with a breadth of about 30. There can be little doubt that the Pamphylians and Pisidians were really the same people, though the former had received colonies from Greece and other lands, and from this cause, combined with the greater fertility of their territory, had attained a higher degree of civilization and more refinement than their neighbours of the interior. But the distinction between the two seems to have been established at an early period. Herodotus, who does not mention the Pisidians at all, enumerates the Pamphylians among the nations of Asia Minor, while Ephorus mentions them both, correctly including the one among the nations

on the coast, the other among those of the interior. Strabo distinetly describes the position of Pamphylia as given above, and assigns as its limits the pass of Mount Climax on the west, and the fortress of Coracesium, which belonged to Cilicia, on the east. Under the Roman administration the term Pamphylia was extended so as to include Pisidia and the whole tract up to the frontiers of Phrygia and Lycaonia, and in this wider sense it is employed by Ptolemy.

Pamphylia is in one respect a country of peculiar character; although it consists almost entirely of a plain, extending from the slopes of Mount Taurus to the sea, this plain, though presenting an unbroken level to the eye, does not consist, as in most similar cases, of alluvial deposits, butis formed almost wholly of travertine. "'The rivers pouring out of the caverns at the base of the Lycian and Pisidian ranges of the Taurus come forth from their subterranean courses charged with carbonate of lime, and are continually adding to the Pamphylian plain. They build up natural aqueducts of limestone, and after flowing for a time on these elevated beds burst their walls and take a new course. Consequently it is very difficult to reconcile the accounts of this district, as transmitted by ancient authors, with its present aspect, and the distribution of the streams which water it. By the sea-side the traver- tine forms cliffs from 20 to 80 fect high" (Forbes's Lycia, vol. ii. p. 188). Strabo describes a river which he terms Catarractes as a large stream falling with a great noise over a lofty cliff, but for the reason above given it cannot now be identified with certainty. He places it between Olbia and Attalia, where there is now no river of

any importance. East of the latter city is the Cestrus, and beyond that again the Eurymedon, both of which are considerable streams, navigable for some distance from the sea. Near the mouth of the latter is a lake called Caprias, mentioned by Strabo, but it isa mere salt marsh.

The chief towns on the coast are—Olbia, the first town in Pamphylia, near the Lycian frontier ; Attalia, founded by Attalus IL., king of Pergamus, which still retains the name of Adalia, and is the principal port in this part of Asia Minor; and Side, about 15 miles east of the Eurymedon. On a hill above that river, some distance inland, stood Aspendus, and in a similar

position above the river Cestrus was Perga, celebrated for its temple of Artemis. Between the two rivers, but somewhat farther inland, stood Sylleum, a strong fortress, which even ventured to defy the arms of Alexander. None of these towns are historically known to have been Greek colonies ; but the foundation of Aspendus was traditionally ascribed to the Argives, and Side was said to be a colony from Cymein Molis. Butit is certain that the inhabitants, even of these towns, retained little of a Hellenic character, and spoke a semi-barbarous dialect. The legend related by Herodotus and Strabo, which ascribed the origin of the Pamphylians to a colony led into their country by Amphi- lochus and Calchas after the Trojan War, is merely one of those mythical fictions current among the Greeks with regard to so many non-Hellenic races. The coins of Aspendus, though of Greek character, present us with legends in a barbarous dialect.

The Pamphylians never appear in history as an inde- pendent people. They are first mentioned among the nations subdued by the kings of Lydia, and afterwards passed in succession under the dominion of the Persian and Macedonian monarchs. After the defeat of Antiochus III. in 190 B.c., they were included among the provinces annexed by the Romans to the dominions of Eumenes, king of Pergamum ; but at a somewhat later period they joined with their neighbours the Pisidians and Cilicians in their piratical ravages, and their port of Side became the chief centre of the naval power of these freebooters, and the place where the captives were sold as slaves. Pamphylia was for a short time included in the dominions of Amyntas, king of Galatia, but after the death of that monarch lapsed into the ordinary condition of a Roman province, and its name is not again mentioned in history.

PAMPLONA (Pampeluna, Fr. Pampelune), a city of Spain, capital of the province of Navarre, and an epis- copal see, is situated 1378 feet above sea-level, on the left bank of the Agra, a tributary of the Ebro, on a height commanding a wide view of the hill-encircled plain known as the “cuenca” or “bowl” of Pamplona. It is a station on the Ebro railway connecting Alsasua with Saragossa. The climate in general is cold and moist, but owing to the purity of the air and the excel- lence of its drainage the town is not unhealthy. From its position Pamplona has always been the principal fortress of Navarre. The fortifications form a rectangle of which the north-

east and north-west sides face the river (here crossed by several bridges), while on the south-west side stands the citadel, which owes its present construction to Philip IL, who modelled it on that of Antwerp. It is @ pentagon, separated from the city by an esplanade, and is calculated to accommodate 7500 men. The streets of the town are regular and broad; there are three “ plazas,” the principal of which, containing the Casa de la Diputa- cion and the theatre, is sometimes on festive occasions turned into a bull-ring. The cathedral is a late Gothic structure begun in 1397 by Charles III. (El Noble) of Navarre, who is buried within its walls; of the previous structure raised by Don Sancho about 1123 only a small

portion of the cloisters remains. The interior, which is fine, is remarkable for the peculiar structure of its apse ; the wood carvings of the choir, in English oak, by Miguel Ancheta, a native artist, are excellent. The principal fagade is Corinthian, from designs of Ventura Rodriguez (1783). The same architect designed the superb aqueduct by which the city is supplied with water from Monte Francoa, some nine miles off. The beautiful cloisters on the south side of the cathedral, and the chapter-house beyond them, as well as the old churches of San Saturnino (Gothic) and San Nicolas (Romanesque), are also of interest to the student of architecture. Among other places of public resort in Pamplona may be mentioned the bull-ring, capable of accommodating 8000 spectators, and the tennis court (El Trinquete). The town has a well- equipped secondary school, two normal and numerous primary schools, as well as an academy of design; and there are three hospitals. Of the public gardens and walks the finest is La Taconera. The surrounding district is fertile, producing wine as well as grain and other seeds ; the manufactures are comparatively unimportant, the chief being that of linen. The yearly fair in connexion with the feast of San Fermin (July 7), the patron saint of the city, attracts a large concourse from all parts of the country. Population of ayuntamiento in 1877, 25,630.

Originally a town of the Vascones, Pamplona was rebuilt in 68 B.c. by Pompey the Great, whence the name Pompelo or Pompelo (Strabo). It was captured by Euric the Goth in 466 and by the Franks under Childebert in 542 ; it was dismantled by Charlemagne in 778, but repulsed the emir of

Saragossain 907. In the 14th cen- tury it was greatly strengthened and beautified by Charles I1I., who built a citadel on the site now occupied by the Plaza de Toros and by the Basilica de 8. Ignacio, the church marking the spot where Ignatius Loyala received his wound in defending the place against André de Foix in 1521. From 1808 it was occupied by the French until taken by Wellington in 1818. In the Carlist war of 1836-40 it was held by the Cristinos, and in 1875-76 it was more than once attacked, but never taken, by the Carlists.

PAN, a Greek god worshipped chiefly in Arcadia, among whose mountains he had numerous sanctuaries and holy caves. While he is a very common figure in poetry and art, it is exceedingly difficult to gain any clear idea of his actual worship in his Arcadian home. He appears to have been worshipped on the mountain tops as well as in caves; he was the herdsman's god, and the giver of fertility to flocks; he was a god of prophetic inspiration and of dreams, in which he sometimes revealed the cure of diseases; he was himself a huntsman and the god of hunters, and Arcadian sportsmen beat his image if they returned empty-handed from the chase; even fishermen invoked him for aid in their occupation; he guided travellers (as évdSus and zoymaios) on the pathless mountains, and even smoothed the rough sea by the sound of his flute; he was the god of music, of dance, and of song, Echo and Syrinx were the objects of his love, and he sported and danced with the mountain Nymphs. The nineteenth Homeric Hymn gives a most poetic account of his birth from the union of Hermes and the daughter of Dryops, and of his life among the Arcadian mountains and . springs. His power of inspiration and prophecy shows that there was an orgiastic, enthusiastic side of his worship, which made it easy for Pindar to connect him with the worship of Cybele, and for others to identify him with Marsyas. His voice inspires terror, and he produced sudden panics among men, The Athenian herald Phidip- pides heard his voice by the way promising victory at Marathon ; the Athenians attributed their triumph to his aid, and to the panic he inspired among the Persians, and consecrated to hima cave in the north side of the Acropolis. He had a temple and oracle near Acacesium, in which a fire burned continually. The analogy of his nature with Dionysus led to his assimilation with the Satyrs, and he is

often pictured among the Bacchic Thiasus. It was only a step further to speak of many Pans, male and female, and of infant Panisci. In the mystic eclecticism of Orphic religion, Pan was conceived as the universal god in a pantheistic fashion. His mother is variously called Ginoe, or Callisto, or Penelope; his father is Zeus, or Hermes, or Apollo, or Odysseus, or the suitors generally. He was represented as a half-human half-brute figure, with the legs and horns of a goat and a face whose features resembled those ‘of an animal. According to the Homeric Hymn, his mother was terrified when he was born with his hideous figure and long goat’s beard. The story, alluded to by Milton, Mrs Browning, and the modern poets, of the pilot Thamus, who, sailing near Paxos in the time of Tiberius, was commanded by a mighty voice to proclaim that “ Pan is dead,“ is first found in Plutarch (De Orac. Defectu, 699).

PANATIUS, a Stoic philosopher, lived about 185-112 B.c. He belonged to a Rhodian family, but was probably educated partly in Pergamum and afterwards in Athens. About 156 z.c. he came from Athens to Rome, where he became a friend of Lelius and of Scipio the younger. He lived as a guest in the house of Scipio, and accompanied him in his final campaign against Carthage and in his expedition to Egypt and Asia, 143 B.c. He had an important influence in the introduction of Greek philosophy into Rome, and taught a number of distinguished Romans. He returned to Athens, probably after the murder of Scipio in 129 B.c., and succeeded Antipater as head of the Stoic school. The right of citizenship was offered him by the Athenians, but not accepted. In his teaching he laid most stress on ethics; and his most important works, of which only insignificant fragments are preserved, were on this subject. He wrote (apparently during his Roman visit) a treatise on virtue, zept rod KxaOyxovros, in three books, upon which Cicero has chiefly founded his work De Officits. Works wept rpovoids, wept edOvpias, &c., were also composed by Panzetius,

PANAMA, a state and city of Colombia, in the extreme north of South America. The city, which is the capital of the state and the seat of a bishop, is situated on the coast of the Pacific at the head of the Gulf of Panama, a few miles east of the mouth of the Rio Grande, occupying partly a tongue of coral and basaltic rock and partly a gentle rise towards Mount Ancon, an eminence 560 feet in height. The cathedral stands in 8° 57’ 16” N. lat. and

79° 30° 50” W. long. In the 16th and 17th centuries Panama was, next to Cartagena, the strongest fortress in South America; but its massive granite ramparts, con- structed by Alfonzo Mercado de Villacorta (1673), in some places 40 feet high and 60 feet broad, have been razed on the land side (where they separated the city proper from the suburbs of Santa Ana, Pueblo Nuevo, and Arrabal) and allowed to fall into a ruinous condition towards the sea. Of the old Spanish houses constructed in the Moorish fashion comparatively few remain; but three-story build- ings, in which the two upper stories project, are sufficiently common to give a distinctive character to the city, which thus differs from the other towns of Central America. Ruins of churches and convents occupy a large area, those of the Jesuit college being the most imposing, and those of the Franciscan monastery (on the north-west sea wall) the most extensive. The cathedral, built in 1760, is a spacious edifice in the so-called Jesuit style, and its two lateral towers are the loftiest in Central America. It was restored in 1873-76, but the facade was destroyed and oak thrown down by the earthquake of September name, is of interest as the rallying point of the insurgents in the local revolutions; the high ground on which it

The church of Santa Ana, in the suburb of that:

PAN—PAWN

stands commands the city, and was long kept carefully free of all buildings. The president’s residence, the governor’s office, the state assembly house, the hospital in the old convent of the Conception, and the grand hotel (now the head offices of the canal company) in the principal square are the buildings now of most note. Besides the episcopal seminary there exist a sisters-of-charity school and a ladies’ college, with teachers from the United States and Canada. In the rainy season streams of water flow down the streets, but in the dry season the city is dependent on water brought in carts from the Matasnillo, a distance of several miles, the only perennial wells which it possessed having been dried up by the earthquake of 8th March 1883. By 1885, however, water-works introducing the

ATLANTIC OCEAN ZY ‘i

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Railway and Canal from Panama to Colon,

water of the Rio Grande at a cost of £50,000 are to be completed. Rents are high, and living is expensive. As Panama, like Colon, is a free port, statistics of trade are not collected. The local exports are india-rubber (growing scarcer), gold-dust, hides, ivory nuts, manganese, shells, tobacco, cocobolo (a cabinet wood), tortoise-shell, vanilla, whale oil, sarsaparilla, and cocoa-nuts. The Panama pearl fishery is still prosecuted with success. The passengers across the isthmus were 35,076 in 1868, 22,941 in 1876, 52,113 in 1881, and 75,703 in 1882. In 1870 the popu- lation of Panama (of very varied origin) was 18,378; by 1880 it was 25,000, of whom about 5000 were strangers. Panama (an Indian word meaning abounding in fish) was founded in 1518 by Pedro Arias Davila, and is thus the oldest European city in America, the older settlement at Santa Maria el Antigua near the Atrato having been abandoned and leaving no trace. Originally it was situated six or seven miles farther north on the left side of the Rio Algarrobo; but the former city, which was the great emporium for the gold and silver from Pera, and “had eight monasteries, a cathedral, and two churches, a fine hospital, 200 richly furnished houses, nearly 5000 houses of a humbler sort, a Genoese chamber of commerce, and 200 warehouses, was after three weeks ofrapine and murder burned, February 24, 1671, by Morgans buccaneers, who carried off 175 laden mules and more than 600 pris- oners” (see Travels of Pedro de Cieza de Leon, Hakluyt Soc., 1864). A new city was founded on the present site by Villacorta in 1673.

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The Isthmus and State.—By the Isthmus of Panama is sometimes understood the whole neck of land between the continents of North and

South America; more generally the name is restricted to the narrow crossing from Panama to Colon, the two other narrowest crossings being distin- guished as the Isthmus of San Blas (31 miles) and the Isthmus of Darien (46 miles). Nearly the whole isthmus, in the wider sense of the word, constitutes (since 1855) a state of the Confederation of Colombia, extending from the frontiers of Costa Rica to those of the state of Cauca. Besides Panamé the capital and Colon (Aspinwall), it con- tains Santiago, formerly chief town of a province and an apanage of the family of Columbus, Penonomé (about 15,000 inhabitants), Los Santos, formerly chief town of a province, Nata, and David. It is divided into six depart- ments—Coclé, Colon, Chiriqui, Los Santos, Panama, Veragua. ‘The total population in 1870 was 221,052.

Railway and Canal.—It is the Isthmus of Panama in the narrower sense which is crossed both by the interoceanic railway and by the line of the interoceanic ship-canal at pre- sent in course of construction. It affords a much shorter route than that of Darien, and while the central Cordillera does not sink lower than 980 feet in the Isthmus of San Blas, at the Culebra Col it is rather less than 290 feet high. As the watershed runs much nearer the south than the north side of the isthmus, the streams flowing to the Pacific are of comparatively little importance, while the Chagres on the Atlantic slope, with its tributary the Rio Obispo, forms a navigable river whose volume attains formidable dimensions at certain seasons. The railway (a single line) starting from Colon (on the swamp-island of Manzanillo on Limon Bay) reaches the valley of the Chagres at Gatun, runs along its northern flanks to Bar- bacoas, crosses the river by a large bridge, continues along the southern flank and up the tributary Obispo to the Culebra Col, from which it descends straight to Panama. The ship-canal is to follow very much the same route ; only it will keep closer to the bed of the Chagres, which it is to cross again and again, and on the Pacific slope it will descend the valley of the Rio Grande and be continued seaward to the island of Perico. The total length is 54 miles, Throughout the whole distance the bottom is to lie 81 metres (nearly 28 feet) below the mean level of the oceans, and the width is to be 22 metres (72 feet) at bottom and 50 metres (160 feet) at top, except in the section through the Culebra ridge, where the depth is to be 9 metres, the bottom width 24, and the top width 28. The two great difficulties connected with the under- taking are those

caused by the mountain and the river. As the idea of tunnelling the col has been abandoned, it will be necessary to cut down through the solid strata for a depth of 300 to 350 feet over a considerable distance ; the rock happily is of a comparatively soft schistous character, disposed almost horizontally. The Chagres has anaverage discharge at Matachin of 100 cubic metres per second, which at low water may sink to 15 or 20 cubic metres, and during flood rise to 500 or 600. At Gamboa, which lies just above the influx of the Rio Obispo, it is proposed to construct an enormous reservoir by throwing a dam across the valley. From Cerro Obispo on the one side to Cerro Santa Cruz on the other this dam will be 960 metres long at the base and 1960 metres at the top, with a width at the bottom of 1000 metres and a height of 45 metres. It will thus be the largest dyke yet constructed in the world. Altogether it is calculated that the excavation of the canal involves the removal of 3531 millions of cubic feet of earth; by January 31, 1884, the actual quantity removed was 118,448,595 cubic feet, or only about one-thirtieth of the whole. All along the Toute, however, at Buhio Soldado, Tabernilla, San Pablo,

in January 1855. was not. lost sight of ; and in 1875 it came up for discussion in the

Mamei, &c., workshops and settlements have been formed,

and by 1883 11,000 men were at work. At certain states of the tide the levels of the two oceans differ materially: while at Colon the difference between high and low water is not more than 23 inches, at Panama it is generally 13 feet, and at times even upwards of 194 feet. thus produced in the canal would be sufficient to stop navigation for a number of hours at each tide; and to obviate this difficulty it will be necessary either to construct locks at the Panam4 extremity or to slope the canal from Colon to Panama.

The current

A proposal to pierce the Isthmus of Daricn was made as early as

1520 by Angel Saavedra ; Cortez causcd the Isthmus of Tehuantepec to be surveyed for the construction of a canal; and in 1550 Antonio Galvio suggested four different routes for such a scheme, one of them being across the Isthmus of Panama. Spanish cortes ordered the viceroy of New Spain to undertake the piercing of the Isthmus of Tehuantepec; but the War of Independ- ence intervened, and, though a survey was made by General Obegoso in 1821, and José de Garny obtained a concession for a canal in 1842, nothing was accomplished. Bolivar, president of Colombia, caused Messrs Lloyd and Falmarc to study the Isthmus of Panama. Lloyd, whose paper was published in the Philosophical Transactions, London, 1830, proposed to make only a railway from Panama or Chorrera to the Rio Trinidad (tributary of the Chagrcs), and to establish a porton the Bay of Limon. out by the French Government in 1843, advocated the construction of a sluiced canal. sudden increase of traffic across the isthmus caused by the discovery of gold in California, commenced in 1849 to construct a railway, and their engineers, Totten and Trautwine, already known in connexion | with the canal from Cartagena to the Magdalena, managed, in spite

In 1814 the

M. Napoleon Garella, sent

An American company, stimulated by the

of the extreme difficulty of procuring labour, to complete the works | Meanwhile the question of an interoceanic canal

Congrés des Sciences Géographiques at Paris. A society under General Tiirr was formed for prosecuting the necessary explorations ; and Lieutenant Wyse, assisted by Ccller, A. Reclus, Bixio, &c., was sent out to the isthmus in 1876. In 1878 the Colombian Govern- ment granted the society known as the Civil International Inter- oceanic Canal Society the exclusive privilege of constructing a canal between the two oceans through the Colombian territory ; and at the same time the ports and canal were neutralized. In 1879 M. de Lesseps took the matter up, and the first meeting of his company was held in 1881. The capital necessary for the “ Com- pany of the Interoceanic Canal of Panama,” as it is called, was stated at 600,000,000 francs, —the

estimated cost of excavation being 430,000,000, that of weirs and trenches to take fresh water to the sea 46,000,000, and that of a dock and tide-gates on the Paeific side 36,000,000. The Panama canal was bought for $20,000,000, The contractors, Couvreux & Hersent, began operations in October of the same year. Meanwhile the United States Government proposed to make a treaty with Colombia by which it would be free to establish forts, arsenals, and naval stations on the Isthmus of Panama, though no forecs were to be maintained during peace ; but the British Government objected to any such arrangement.

Details in regard to engineering and finance will be found in the Bulletin du Canal Océanique, issued since 1879, and in Hngineering, 1883 and 1884, See also Reclus's "Explorations" in Zour du Monde, 1880, for an interesting series of views. '

PANATHEN ASA, the most splendid and brilliant of all the Athenian festivals, with perhaps the exception of the Great Dionysia. The mythic foundation is ascribed to Erechtheus; and Pausanias declares that the Olympia, the Lycaa, and the Panathenzea were the three oldest feasts in Greece. It was originally a religious celebration in honour of the patron goddess of the city, celebrated by her own worshippers. Itis said that when Theseus united the whole land under one government he made this festival of the city-goddess common to the entire country, and the older name Athensea was then changed to Panathenza. In addition to the religious rites there is said to have been a chariot race from the earliest time; Erechtheus himself won the prize in the race. The Panathenza were modified and rendered far more magnificent by Pisistratus and hissons. It is probable that the distinction of Greater and Lesser Panathenza dates from this period. Every fourth year the festival was celebrated with peculiar magnificence ; gymnastic sports were added to the horse races; and there is little doubt that Pisistratus aimed at

making the penteteric Panathenea the great Ionian festival in rivalry to the Dorian Olympia. The penteteric festival was celebrated in the third year of

each Olympiad. The annual festival consisted solely of the sacrifices and rites proper to this season in the cultus of the goddess. One of these rites originally consisted in carrying a new peplus to the temple to serve as the clothing of the image, a ceremonial known in other cities and represented by the writer of the [liad (vi.) as being in use at Troy; but it is probable that this rite was afterwards restricted to the great penteteric festival. Even the religious rites were celebrated with much greater splendour at the Greater Panathenza. The whole empire shared in the great sacrifice ; every colony and every subject state sent a deputation and sacrificial animals. On the great day of the feast there was a procession of the priests, the sacri- ficial assistants of every kind, the representatives of every part of the empire with their victims, the cavalry, in short of the population of Attica and great part of its depend- encies. The peplus was borne in the procession and presented to the goddess, and the hecatomb was sacrificed. At least as early as the 3d century before Christ the custom was introduced of spreading the peplus like a sail on the mast of a ship, which was rolled on a machine in the procession. The subject of the frieze of the Parthenon is an idealized treatment of this great procession.

The festival which had been beautified by Pisistratus was made still more imposing under the rule of Pericles. He introduced a regular musical contest in place of the old recitations of the rhapsodes, which were an old standing accompaniment of the festival. The order of the agones from this time onwards was—first the musical, then the gymnastic, then the equestrian contest. Many kinds of contest, such as the chariot race of the apobatat, which were not in use at Olympia, were practised in Athens. The season of the festival was the last days of Hecatom- bzeon, and the great day was the 28th, third from the end of the month (rpiry POivovros, called by Euripides 6uwas duépa). The prize in the games was an amphora full of olive oil produced from the holy olives, the. property and gift of the goddess herself. Only one Panathenaic amphora has been found in Attica itself; and, though

many have been discovered outside of Attica, especially in

Cyrene, it has been maintained that the latter are not really prizes in the games, but imitations made in the export trade as a sort of mark that the oil sold in them was of the very finest quality.

PANAY. See Paiuiepine IsLanps.

PANCH MAHALS, a district in the east of Guzerat, Bombay presidency, India, lying between 22° 30’ and 23° 10’ N. lat., and between 73° 35’ and 74° 10’ E. long., with an area of 1613 square miles. The south-western portion is for the most part a level plain of rich soil; while the northern, although it comprises some fertile valleys, is generally rugged, undulating, and barren, with but little cultivation. The mineral products comprise limestone, sandstone, trap, quartz, basalt, granite, and other varieties of building stone. Only recently has any attempt been made to conserve the extensive forest tracts, and con- sequently but little timber of any size is now to be found.

The census of 1881 returned the population at 255,479 (131,162 males and 124,317 females); the Hindus numbered 159, 624 ; Mohammedans, 16,060; Parsis, 30; and Christians, 44. Of the total population 30 per cent. belong to aboriginal tribes, the ma- jority being Bhils. Of 350,996 acres—the total area of Government cultivable land—202,498 acres were taken up for cultivation in 1881-82. Of 153,262 acres under actual cultivation (41,828 acres

being twice cropped), grain crops occupied 127,032 acres ; pulses, 42,444; and oil-seeds, 22,238,

PANCSOVA, a town of Hungary, near the Servian frontier, is situated on the river Temes, just above its

junction with the Danube, which it reaches 9 miles aboyg Belgrade. The town contains Roman Catholic, Protestant, and Greek churches, a convent, and manufactories of starch and beetroot sugar. Cotton and mulberries (for feeding silkworms) are cultivated, and a brisk trade in live stock and grain is carried on with Turkey. The hog fairs are largely attended. In 1880 Pancsova contained 17,127 inhabitants, partly Serbs and partly Germans. It wag burned by the retreating Austrians in 1788, and was again occupied by Austrian troops in 1849, after they had defeated the Hungarians in the vicinity.

PANDARUS, son of Lycaon, led the people of Zeleia in the Troad as allies of the Trojans against the Greeks, In other passages his country is named Lycia. It is frequently said that the Lycians of the J/iad are a tribe of the Troad, different from the people of the country Lycia; but it is more probable that the conflicting accounts belong to different strata in the Homeric poetry. Pandarus was worshipped as a hero at Pinara in Lycia. lLycaon, the name of Pandarus's father, is merely an epithet of Apollo, the great god of Lycia. Pandarus is not an important figure in the Jliad. He breaks the truce between the Trojans and the Greeks by treacherously wounding Menelaus with an arrow, and finally he is slain by Diomedes. In medizval romance he became a pro- minent figure in the tale of Troilus and Cressida. He encouraged the amour between the Trojan prince and his niece Cressida; and his name has passed into modern language as the common title of a lovers' go-between in the worst sense.

PANDECTS. See Justinian and Roman Law.

PANDERPUR, or PANDHARPUR, a town in Shol4pur district, Bombay, India, situated on the right bank of the Bhima river, in 17° 40′ 40" N. lat. and 75° 22' 40" E. long., with a population in 1881 of 16,910. 1+ is held in great reverence by the Brahmans for its celebrated temple dedi- cated to Vithoba, an incarnation of Vishnu. 'Three large annual religious fairs are held.

PANDORA. See PRoMETHEUS.

PANDUA, or Parrvan. See Gaor, vol. x. p. 115.

PANGOLIN. In Africa, India, and Malayana are found certain curious Mammals known to the Malays as Pangolins, to the English as Scaly Anteaters, and to naturalists by the scientific name of Manis. These animals, which, by a superficial observer, might be taken for reptiles rather than mammals, belong to the order LEdentata, otherwise almost wholly confined to the New World, and containing, besides the Pangolins, the Sloths, Anteaters, Armadillos, and Aard Varks.

In size pangolins range from 1 to 8 feet in length, exclusive of the tail, which varies from much shorter than to nearly twice the length of the rest of

the animal; their legs are short, so that the body is only a few inches off the ground ; their ears are very small; and their tongue is long and worm-like, and is used to catch ants with. Their most striking character, however, is their wonderful external coat of mail, composed of numerous broad over-lapping horny scales, which cover the whole animal, with the exception of the under surface of the body, and, in most species, of the lower part of the tip of the tail. Besides the scales there are generally, especially in the Indian species, a certain number of isolated hairs, which grow up between the scales, and are also scattered over the soft and flexible skin of the belly. There are five toes on each foot, the claws on the pollex and hallux rud-mentary, but the others, especially the third of the fore- foot, long, curved, and laterally compressed. In walking the fore claws are turned backwards and inwards, so that the weight of the animal rests on their back and outer sur- faces, and their points are thus kept from becoming blunted.

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Their skulls are long, smooth, and rounded, with imper- fect zygomatic arches, no teeth of any sort, and, as in other ant-eating mammals, with the bony palate extending

unusually far backwards towards the throat. The lower jaw consists of a pair of thin styliform bones anchylosed to each other at the chin, and rather loosely attached to

the skull by a joint which, instead of being horizontal, is

tilted up at an angle of 45°, the outwardly-twisted

condyles articulating with the inner surfaces of the long

glenoid processes, an arrangement quite unique among mammals, the sloths alone showing a slight tendency towards it. The other skeletal and anatomical characters have already been sufficiently described under MAMMALIA (vol. xv. p. 388).

The single genus Manis, which contains all the pangolins, may be conveniently divided into two groups, distinguished both by their

geographical distribution and by certain convenient, though not highly important, external characters. (1) The Asiatic pangolins arc charac- terized by having the central series of body-scales con- tinued quite to the extreme end of the tail, by having many isolated hairs growing up between the scales of the back, and by their small external ears. They all have a

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White-bellied Pangolin (Manis tricuspis). small naked spot beneath the tip of the tail, which is said to be of service as an organ of touch. ‘There are three species, viz., Manis javanica, ranging from Burmah, through Malacca and Java, to Borneo; J. aurita, found in China, Formosa, and Nepal; and the common Indian Pangolin, I. pentadactyla, distributed over the whole of India and Ceylon. (2) The African species have the central series of scales suddenly interrupted and breaking into two at a point about 2 or 3 inches from the tip of the tail; they have no hair between the scales, and no external ear-conch. The following are the four species belonging to this group :—the Long-tailed Pangolin (J. macrura), which has a tail nearly twice as long as its body, and containing as many as forty-six caudal vertebrae, nearly the largest number known among Mammals; the White-bellied Pangolin (I. tricuspis), closely allied to the last, but with longer and tricuspid scales, and white belly hairs (these two, like the Indian species, have a naked spot beneath the tail tip, a character probably correlated with the power of climbing, and they are, moreover, peculiar in having the outer sides of their fore legs clothed with hair, all the other species being scaly there as elsewhere); and the Short-tailed and the Giant Pangolins (JZ. temmincku and

gigantea), both of which have their tailscovered entirely with scales, and evidently never take to arboreal habits. All the four species of the second group are found in the West African region, one only, I. temminckui, extending besides into south and eastern equatorial Africa. The following account of the habits of Manis tricuspis is taken from Mr Louis Fraser’s Zoologia T’ypica :—

“During my short residence at Fernando Po I sueeeeded in procuring two living specimens of this animal. The individuals, judging from the bones, were evidently not adult; the largest measured 30 inches in length, of which the head and body were 12 inches and the tail 18 inehes. I kept them alive for about a week at Fernando Po, and allowed them the range of a room, where they fed upon a small black ant, which is very abundant and trouble-some in the houses and elsewhere. Even when first procured they displayed little or no fear, but continued to elimb about the room without noticing my occasional entrance. They would climb up the somewhat roughly-hewn square posts which supported the building with great facility, and upon reaching the ceiling would return head foremost ; sometimes they would roll themselves wp into a ball and throw themselves down, and apparently without experiencing any inconvenience from the fall, which was in a measure broken upon reaching the ground by the semi-yielding seales, which were thrown into an erect position by the eurve of the body of the animal. In climbing, the tail, with its strongly- pointed seales beneath, was used to assist the feet ; and the grasp of the hind feet, assisted by the tail, was so powerful that the animal would throw the body back (when on the post) into a horizontal position, and sway itself to and fro, apparently taking pleasure in this kind of exercise. It always slept with the ‘body rolled up ; and when in this position in a eorner of the building, owing to the position and strength of the scales, and the power of the limbs combined, I found it impossible to remove the animal against its will, the points of the scales being inserted into every little noteh and hollow of the surrounding objects. The eyes are very dark hazel, and very prominent. The eolonial name for this species of Manis is ‘Attadillo,’ and it is called by the Boobies, the natives of the island, ‘Gahlah.’ The flesh is said to be exceedingly good eating, and is in great request among the natives.” (O. ‘T.)

PANIPAT, g decayed historical town in Karnal district, Punjab, India, situated on the Grand Trunk Road, 53 miles north of Delhi, in 29° 23’ N. lat. and 77° 1’ 10” E. long. The town is of great antiquity, dating back to the great war of the Mahdbharata between the Pandavas and Kaurava brethren, when it formed one of the tracts demanded by Yudishthira from Duryodhana as the price of peace. In modern times, the plains of Panipat are celebrated as having thrice formed the scene of decisive battles which sealed the fate of upper India,—in 1526, when Babar on his invasion of

India with his small but veteran army completely defeated the imperial forces; 1n 1556, when his grandson, Akbar, on the same battlefield, conquered Hemu, the Hindu general of the Afghan Sher Shah, thus a second time establishing the Mughal power; and finally, on 7th January 1761, when Ahmad Shah Durdni decisively shattered the unity of the Mahratta power. The modern town stands near the old bank of the Jumna, upon high ground composed of the debris of earlier buildings. The population in 1881 numbered 25,022, including 16,917 Mohammedans. Although there are many brick-built houses and some well-paved streets in the centre of the town, the outskirts are low and squalid, and the general aspect of the whole town miserable and poverty-stricken. =”

PANIZZI, Sm Awnruony (17 97-1879), principal librarian of the British Museum, was born at Brescello in the duchy of Modena, September 16, 1797. After taking his degree at the university of Parma, he became an advocate, and speedily obtained considerable practice. Always a fervent patriot, he was almost of necessity implicated in the movement set on foot in 1821 to over- turn the miserable Government of his native duchy, and in October of that year barely escaped arrest by a precipitate flight. He first established himself at Lugano, where he published an anonymous and now excessively rare pamphlet

generally known as I Processt di Rubiera, an exposure of the monstrous injustice and illegalities of the Modenese Government’s proceedings against suspected persons. Ex- pelled from Switzerland at the joint instance of Austria, France, and Sardinia, he repaired to England, where he arrived in May 1823, in a state bordering upon destitution. His countryman Foscolo provided him with introductions to Roscoe and Dr Shepherd, and by their aid he was enabled to earn a subsistence in Liverpool by giving Italian lessons, while diligently instructing himself in English. Roscoe further introduced him to Brougham, by whose influence he was called to London to assume the professorship of Italian in University College, upon the foundation of that institution in 1828. His chair was almost a sinecure ; but his manners, his culture, and his abilities rapidly ingratiated him with the best London society; and in 1831 Brougham, having become lord

chancellor, used his ex officio position asa principal trustee of the British Museum to obtain for Panizzi the post of an extra assistant librarian of the printed book department. At the same time he was actively prosecuting the most important of his purely- literary labours, his edition of Boiardo's Orlando Inna- morato. Boiardo's fame had been eclipsed for three centuries by the adaptation of Berni; and it is highly to the honour of Panizzi's taste to have redeemed him from oblivion, and restored to Italy one of the very best of her narrative poets. His edition of the Orlando Innamorato and the Orlando Furtoso was published between 1830 and 1834, prefaced by a valuable essay on the influence of Celtic legends on medieval romance, and dedicated to his benefactor Roscoe. In 1835 he edited Boiardo's minor poems, and was about the same time engaged in preparing a catalogue of the library of the Royal Society, which led toa warm controversy. Panizzi was shortly to find library work of a much more important and agreeable description in the institution with which he was officially connected. The unsatisfactory condition and illiberal management of the British Museum had long excited discontent, and at length a trivial circumstance led to the appointment of a parliamentary committee, which sat throughout the sessions of 1835-36, and probed the condition of the institution very thoroughly. Panizzi's principal contributions to its inquiries as respected the library were an enormous mass of statistics respecting foreign libraries collected by him upon the Continent, and some admirable evidence on the catalogue of printed books then in contemplation. In 1837 he became keeper of printed books upon the retize- ment of Mr Baber, and immediately set himself to grapple with the special tasks imposed upon him by the peculiar circumstances in which he found the library. The entire collection, except the King's Library, had to be removed from Montague House to the new building; the reading- room service had to be reorganized; rules for the new printed catalogue had to be prepared, and the catalogue itself undertaken. All these tasks were successfully accom- plished ; but, although the rules of cataloguing devised by Panizzi and his assistants have become the basis of whatever has since been attempted in this department, the progress of the catalogue itself was slow. The first volume, comprising letter A, was published in 1841, and from that time, although the catalogue was continued and completed in MS., no attempt was made to print any more until, in 1881, the task was resumed under the direction of the present principal librarian. The chief cause of this comparative failure was

injudicious interfer- ence with Panizzi, occasioned by the impatience of the trustees and the public. Panizzi's appointment, as that of a foreigner, had from the first been highly unpopular. He gradually broke down opposition, partly by his social influence, but far more by the sterling merits of his

administration, and his constant efforts to improve the library. 'The most remarkable of these was his great report, printed in 1845, upon the Museum's extraordinary deficiencies in general literature, which ultimately pro- cured the increase of the annual grant for the purchase of books to £10,000. In 1847 his friendship with the Right Hon. Thomas Grenville led to the nation's being enriched by the bequest of that gentleman's unique library, valued even then at £50,000. In 1847-49 a royal commission sat to inquire into the general state of the Museum, and Panizzi was the centre of the proceedings, His administration, fiercely attacked from a multitude of quarters, was triumphantly vindicated in every point ; and the inquiry had the excellent effect, not merely of establish- ing his reputation, but of abolishing the' main source of maladministration, the anomalous position and illegitimate influence of the secretary. Panizzi immediately became by far the most influential official in the. Museum, though he did not actually succeed to the principal librarianship until 1856.

It was thus as merely keeper of printed books that he conceived and carried out the achievement by which he is probably best remembered, the erection of the new library and reading-room. The want of space had become so crying an evil that purchases were actually discouraged from lack of room in which to deposit the books. Panizzi cast his eye on the empty quadrangle enclosed by the Museum buildings, and conceived the daring idea of occupy- ing it with a central cupola too distant, and adjacent galleries too low, to obstruct the inner windows of the original edifice. The cupola was to cover three hundred readers, the galleries to provide storage for a million of books. The original design, sketched by Panizzi's own hand on April 18, 1852, was submitted to the trustees on May 5; in May 1854 the necessary expenditure was sanc- tioned by parliament, and the building was opened in May 1857. Its construction had involved a multitude of ingenious arrangements, all of which had been contrived or inspected by Panizzi with

the genius for minute detail which he shared with so many men equally remarkable for the general breadth of their conceptions, and with the mechanical inventiveness of which he was continually giving proof. There is probably no building in the world better adapted to the purpose which it is intended to serve; and it is no discredit to the designer if, imposing as it is, neither the space nor the funds at his disposal allowed him to plan it on the colossal scale which its utility would have warranted.

Panizzi succeeded Sir Henry Ellis as principal librarian in March 1856. The most remarkable incidents of his administration were the great improvement effected in the condition of the Museum staff by the recognition of the institution as a branch of the civil service, and the decision, not carried out for long afterwards, to remove the natural history collections to Kensington. Of this questionable measure Panizzi was a warm advocate; he was heartily glad to be rid of the naturalists. He had small love for science and its professors, and, as his friend Macaulay said, “would at any time have given three elephants for one Aldus.” Many important additions to the collections were made during his administration, especially the Temple bequest of antiquities, and the Halicarnassean sculptures discovered at Budrun by Mr ©. T. Newton. Feeling the effects of age and excessive labour, he expressed a wish to retire in 1865, but remained some time longer in office at the instance of the trustees. He ultimately retired in July 1866, receiving as a special mark of distinction & pension equal to the full amount of his salary. He took a house in the immediate neighbourhood of his cherished institution, and continued to interest himself actively in 1ts

affairs until his death, which took place on April 8, 1879. He had been created a K.C.B. in 1869.

Along with Panizzi’s visible and palpable activity as the centre of energy at the British Museum was another systematic activity no less engrossing and important, but unacknowledged by himself and little suspected by the world. His devotion to the Museum was rivalled by his devotion to his country, and his personal influence with English Liberal statesnien enabled him to promote her cause by judicious representations at critical periods.

Through- out the revolutionary movements of 1848-49, and again during the campaign of 1859 and the subsequent transactions due to the union of Naples to the kingdoin of Upper Italy, Panizzi was in constant communication with the Italian patriots, and their eon- fidential representative with the English ministers. He laboured, according to circumstances, now to excite now to mitigate the latter's jealousy of France ; now to moderate their apprehensions of revolutionary excesses, now to secure encouragement or con- nivance for Garibaldi. The letters addressed to him by patriotic Italians, edited by his literary executor and biographer, Mr L. Fagan, alone compose a thick volume. His own have not as yet been collected ; but the internal evidence of the correspondence published attests the priceless value of his services, and the boundless confidence reposed in his sagacity, disinterestedness, and discretion. He was charitable to lis exiled countrymen in England, and, chiefly at his own expense, equipped a steamer, which was lost at sea, to rescue the Neapolitan prisoners of state on the island of Santo Stefano. His services were recognized by the offer of a senatorship and of the direction of public instruction in Italy ; but England, where he had been legally naturalized, had become his adopted country, though in his latter years he frequently visited the land of his birth.

Panizzi's merits and defects were those of a potent nature. He was a man born to rule, and in a free country would probably have devoted himself to public life and become one of the leading statesmen of his age. His administrative faculty was extra- ordinary: to the widest grasp le united the minutest attention to matters of detail. His will and perseverance were indomitable, but the vehemence of his temper was mitigated by au ample endowment of tact and circumspection. He was a powerful writer, a persuasive speaker, and an accomplished diplomatist. He was undoubtedly arbitrary and despotic; in some few points upon which he had hastily taken up wroug views, incurably prejudiced ; in others, such as the claims of science, somewliat perversely narrow-minded. But on the whole he was a very great man, whi, by introducing great ideas into the management of the Museum, not only redeemed that institution from being a mere show- place, but raised the standard of library administration all over England. His successors may equal or surpass luis achievements, but ouly on condition of labouring in his spirit, a spirit whieh did not exist before hini. His moral character was the counter- part of his intellectual: he was warm hearted' and

magnani- mous, extreme in love and hate, a formidable enen1y, but a devoted friend. The list of his intimate friends is a long and brilliant one, including Lord Palmerston, Mr Gladstone, Roscoe, Grenville, Macaulay, Lord Langdale and his family, Rutherfurd (Lord Advo- cate), and above all, perhaps, Haywood, the translator of Kant. His most celebrated friendship, however, is that with Prosper Méri- mée, who, having begun by seeking to enlist his influence with the English Government on behalf of Napoleon III., discovered a con- geniality of tastes which produced a delightful correspoudence. Mérimée's part has been published by Mr Fagan; Panizzi's oC in the conflagration kindled by the Paris commune. The oss is to be regretted rather on acount of the autobiographical than the literary value of Panizzi's share of the correspondence, although he was an accomplished mani of letters of the 18th century pattern. But no man of ability has more completely exemplified the apophthegm of another distinguished person, that success is won less by ability than by character.

See L. Fagan, Life of Sir Anthony Panizzt, 2 vols., London, 1880, (R. G.)

PANNA, or PUNNAH, a native state in Bundelkhand, India, situated for the most part on the table-lands above the Vindhyan Ghats, and containing much hill and jungle land, with an area of 2568 square miles, and a population in 1881 of 227,306. 'The state was formerly celebrated for its diamond mines in the neighbourhood of Panna town, but these appear to have become almost exhausted, and only a small and fluctuating revenue is now derived from them.

PANNONIA, in ancient geography, is the country bounded N. and E. by the Danube from a point 9 or 10 miles north of Vindobona (Vienna) to Singidunum (Belgrade) in Meesia, and conterminous westward with Noricum and Italy and southward with Dalmatia and

Meesia Superior. It thus corresponds to the south-west of Hungary with portions of Lower Austria, Styria, Carniola, and Croatia and Slavonia. Partially conquered in 35 B.C. (when the town of Siscia was taken), Pannonia (but probably only what was afterwards known as Lower Pannonia) was made a Roman provinceby Tiberius in 8 A.D. The three

legions stationed in the country at the death of Augustus (14 A.D.) rose in rebellion and were quelled by Drusus. Somewhere between 102 and 107 Trajan divided the province into Pannonia Superior and Pannonia Inferior. These, according to Ptolemy, were separated by a line from Arrabona (Raab) in the north to Servitium (Gradisca) in the south, but at a later date the boundary lay farther east, to the diminution of Pannonia Inferior. The erection of two new provinces, Valeria and Savia, in the time of Diocletian gave rise to a fourfold division; and Constantine placed Pannonia Prima, Valeria, and Savia under the pretorian prefect of Italy, and Pannonia Secunda under the preetorian prefect of Illyricum. Pannonia Prima was the north part of the old Pannonia Superior and Savia the south part; Pannonia Secunda lay round about Sirmium, at the meeting of the valleys of the Save, the Drave, and the Danube; and Valeria (so called by Galerius after Valeria his wife and Diocletian's daughter) extended along the Danube from Altinum (Mohacs) to Brigetio (O-Szény). TheodosiusII. had to cede Pannonia to the Huns, and they were followed in turn by the Ostrogoths, the Longobards, and the Avars.

During the four hundred years of Roman occupation Pannonia reached a considerable a. of civilization, and a number of the native tribes were largely Latinized. Upper Panuonia contained Vindobona (Vienna), a municipium ; Carnuntum (Petronell), whieh became probably about 70 A.D. tlie winter quarters of the Pannonian legions, was made a muuicipium by Hadrian or Antoninus Pius, appears in the 8d century as a eolonia, and has left important epigraphie remains; Arrabona (Raab or Gyr), a considerable military station ; Brigetio (O-Szény), founded probably in the 2d century as the seat of Legio Prima Adjutrix, and afterwards designated niunieipium and colonia; Scarabantia or Scarbantia (Oedenburg or Soprony), a municipium of Julian origin according to Pliny, but of Ailiau according to the inscriptions ; Savaria or Sabaria (Stein am Anger or Szombathely), a purely civil munieipium founded by Claudius, and a frequent residence of the later emperors ; Poetovio (Potobium of Ptolemy, Patavio of /éin. Anton.; modern Pettau), first mentioned by Tacitus (69 A.D.) as the seat of Legio XIII. Gemina, and made a colonia by Trajau ;} Siscia (Sziszek), formerly known as Segesteca or Segeste, a place of great importance down to the close of the empire, made a colonia probably by Vespasian, and restored by Severus (colonia Flavia Septimia) ; Neviodunum

(Dernovo), designated munieipium Flavium; muni- cipium Latobicorum (Treffen); Emona or Heniona, “Huava, (Laibach); aud Nauportus (Ober-Laibach). Lower Pannonia contained Sirmimn (Mitrovic), first mentioned in 6 A.p., made a colonia by Vespasian or his successor, and a frequent residence of the later emperors ; Bassiane (near Petrovce), Cusum (Peterwardein), Malata or Bononia (Banostor), Cibale (Vinkovece), a municipium ; Mursa (Eszek), niade a colonia by Hadrian 133 a.p. ; Sopiane (Fiinfkirchen or Pees), scat of the preses of Valcria, and an importaut place at the meeting of five roads; Aquincum (Alt-Ofen), made a colonia by Hadrian, and the seat of Legio 11. Adjutrix; and Cirpi (near Bogdany). See Corp. Inscr. Lat., vol. iii. 1.

PANORAMA is the name given originally to a pictorial representation of the whole view which is visible from one point by an observer who in turning round looks successively to all points of the horizon. In an ordinary picture only a small part of the objects visible from one point is included, far less being generally given than the eye of the observer can take in whilst stationary. The drawing is in this case made by projecting the objects to be represented from the point occupied by the eye ona plane. If a greater part of a landscape has to be represented, it becomes more convenient for the artist to suppose himself surrounded by a cylindrical surface in whose centre he stands, and to project the

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1 In the 4th century it became a town of Noricum, not of Pannonia.

landscape from this position on the cylinder. In a panorama such a cylinder, originally of about 60 feet, but now extending to upwards of 130 feet diameter, is covered with an accurate representation in colours of a landscape, so that an observer standing in the centre of the cylinder sees the picture like an actual landscape in nature completely surround him in all directions. This gives an effect of great reality to the picture, which is skilfully aided in various ways. The observer stands ona platform representing, say, the flat roof of a house, and the space between this platform and the picture is covered with real objects which gradually blend

into the picture itself. The picture is lighted from above, but a roof is spread over the central platform so that no light but that reflected from the picture reaches the eye. In order to make this light appear the more brilliant, the passages and staircase which lead the spectator to the platform are kept nearly dark. These panoramas were invented by Robert Barker, an Edinburgh artist, who exhibited the first in Edinburgh in 1788, representing a view of that city. A view of London and views of sea fights and battles of the Napoleonic wars followed. Panoramas gained less favour on the Continent, until after the Franco-German war a panorama of the siege of Paris was exhibited in Paris.

The name panorama, or panoramic view, is also given to drawings of views from mountain peaks or other points of view, such as are found in many hotels in the Alps, or, on a smaller scale, in guide-books to Switzerland and other mountainous districts. These too are drawn as if projected on a cylinder afterwards cut open and unrolled, The geometrical laws which guide the drawing of panoramas follow easily from the general rules for PROJECTION (¢.v.).

PANSY (Viola sp.). This flower has been so long cultivated that its source is a matter of uncertainty. As we now see it, it is a purely artificial production, differing considerably from any wild plant known. By some it is supposed to be merely a cultivated form of Viola tricolor, a corn-field weed, while others assert it to be the result of hybridization between JV. tricolor and other species such as V. altaica, V. grandiflora, &c. As florists and gardeners conducted, and still too often conduct, their operations without scientific method, it is unfortunately not possible to arrive at any definite conclusion on this point. Some experiments of M. Carriére, however, go to show that seeds of the wild V. tricolor will produce forms so like those of the cultivated pansy that it is reasonable to assume that that flower has originated from the wild plant by con- tinuous selection. Mr Darwin confesses himself to have been foiled in the attempt to unravel the parentage of the pansy, “and gave up the attempt as too difficult for any one except a professed botanist.” The changes that have been effected from the wild type are, however, more strik- ing to the eye than really fundamental. Increase in size, an alteration in form by virtue of which the narrow oblong petals are converted into circular ones, and variations in the intensity and

distribution of the colour—these are the changes that have been wrought by continued selection, while the more essential parts of the flower have been relatively unaffected. The stamens and pistil, in fact, present the characteristics of the genus Viola. In that genus the construction of the stamens and pistil is such as to favour cross-fertilization, and that circumstance alone would account for much of the variation that is observed. In practice it is customary to propagate by means of cuttings the varieties it is desired to perpetuate, while, if additional varieties are desired, reproduction by seed, and careful selection of seedlings, according to the desire or

(cleistogamic) flowers, such as occur in various species of violet, and in which the petals are absent or inconspicuous, not being required for the purpose of attracting insects, have not as yet been observed in pansies.

PANTAINUS, head of the catechetical school at Alexandria at the close of the 2d Christian century, is known chiefly as having been the master of Clement, who succeeded him. Eusebius and Jerome speak of him ag having been, originally at least, a Stoic, and as having been sent, on account of his zeal and learning, as a missionary to ‘‘India”—Yemen perhaps being meant, He was the author of commentaries on various books of Scripture, all of which have been lost with the exception of a few insignificant fragments. His teaching work in Alexandria seems to have begun before 180 a.p., and it was brought to an end by the persecution of Septimius Severus in 202.

PANTELLARIA, Panratarta, or officially Panret- LERIA (the ancient Cossyra or Cosyra), an island in the Mediterranean, which, though only 45 miles from the African coast to the south of Cape Bon, and 75 miles from the coast of Sicily, is included in the Italian province and circondario of Trapani. It is of volcanic origin, and its area is estimated at 58 square miles. Its principal sum- mit reaches a height of 2440 feet. Hot sulphur springs occur in various places, and there is a small salt-lake of somewhat high temperature; but there is a lack of fresh water. The principal town, Oppidolo or Pantellaria, on the north-west, lies round a port protected by two redoubts and a citadel now used asa prison. Trade is carried on with Algeria, Tunis, and Malta. From 131 vessels (12,917 tons) in 1863 the

movement of the port had by 1880 in- creased to 923 vessels (83,524 tons). In 1881 the popula- tion of the town was 3167, that of the island 7315.

The Phoenician name D348, Zranim, on coins has led Renan to identify the island with the Inarime of the Latin poets. The eap- ture of Cosyra by M. Amilius and Servius Fulvius in the First Punic War was thought worth mentioning in the triumphal fasti, though the Carthaginians recovered possession in the fol- lowing year. In modern times the island has formed a prinel- pality in the hands of the Requesens family. The bastard Italian spoken by the inhabitants shows Arabic influence.

PANTHEISM. See Turis.

PANTHER. See LEoparp.

PANTOGRAPH is an instrument for making a reduced, an enlarged, or an exact copy of a plane figure. One of the simplest forms is represented in fig. 1. Four links of wood or metal are jointed together so as to form a parallelogram ABCS. On two sides BA and BC produced points P and P’ are taken in a line with S, so that the triangles PSA and SP’C are similar, as the sides of the

P Cc x

Fig. 1. Fig. 2.

one are parallel to those of the other. Hence SA/AP= PC/CS. Now the parallelogram ABCS is movable, its angles changing whilst its sides remain unaltered. The above ratio will therefore remain constant, and therefore again the points PSP’ will always remain ina line. At the same time the ratio PS/SP’ does not change, as 1t

fancy of the cultivator, are had recourse to. Self-fertilizing | equals the ratio PA/AB, . If then the point 8 be kept

fixed in a plane, and if P be made to describe any given figure, the point P’ will describe another figure which is similar and similarly situated to the given one with § as centre of similitude, the ratio of similitude being PS: SP’. Thus if the point S be fixed at § fig. 2, and if P be made to describe the figure ABCD, then P’ will describe the similar figure A’B’C’D’. For the geometry of figures which are similar and similarly situated, compare “Similar Figures” under PROJECTION.

For praetieal working there is at P a steel tracer having a fine but not sharp point, and at P’a tracing pencil for drawing the eopy, or sometimes a sharp steel point for at once engraving the eopy on a plate of metal. To obtain the smooth and steady motion of the instrument required for delieate work, a variety of different constructions are in use under various names, but all rest on the above principle that three points are kept in a line with their distances in a constant ratio. It will be noticed if any three points T, Q, Q’ in a line be taken, asin fig. 1, these fulfil the con- ditions required, so that, for instance, T’ might be taken as the fixed point, and Q, Q’ as the tracer and pencil.

PANTOMIME is a term which has been employed in different senses at different times in the history of the drama. Of the Roman pantomimus, a spectacular kind of play in which the functions of the actor were confined to gesticulation and dancing, while occasional music was sung by a chorus or behind the scenes, some account has been given elsewhere (vol. vii. p. 412). To speak of the Western drama only, there is no intrinsic difference between the Roman pantomimus and the modern “ballet of action,” except that the latter is accompanied by instrumental music only, and that the personages appearing in it are not usually masked. The English ‘“dumb-show,” though fulfilling a special purpose of its own, was likewise in the true sense of the word pantomimic. On the other hand, the modern pantomime, as the word is still used, more especially in connexion with the English stage, signifies a dramatic entertainment in which the action is carried on with the help of spectacle, music, and dancing, and in which the performance is partly carried on by certain conventional characters, originally derived from Italian “masked comedy,” itself an adaptation of the fabule Atellane of ancient Italy. Were it not for this addition, it would be difficult to define modern pantomime so as to distinguish it from the mask, and the least

rational of English dramatic species would have to be regarded as essentially identical with another to which in its later development our dramatic literature owes some of its choicest fruit (see Drama, vol. vii.).

As a matter of course, no fixed date can be assigned to the birth of modern pantomime. The contributory elements which it contains had very soon in varying proportions and manifold combinations introduced themselves into the modern drama as it had been called into life by the Renaissance. In Italy the transition was almost imper- ceptible from the pastoral drama to the opera; on the Spanish stage ballets with allegorical figures and military spectacles were known already towards the close of the 16th century; in France ballets were introduced in the days of Mary de' Medici, and the popularity of the opera was fully established in the earlier part of the reign of Louis XIV. Meanwhile, in the previous century the improvised Italian comedy (commedia dell' arte) had crossed the Alps with its merry company of characters, partly borrowed from masked comedy, though also largely corresponding to the favourite types of regular comedy both ancient and modern, and including Pantalone, with Arlecchino, among other varieties of zanni.1 Readers of Molitre are aware of the influence of the Italian

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'Whether the traditional costume of the ancient Roman mimi— the centunculus or variegated harlequin's jacket, the shaven head, the Sooty face, and the unshod feet—had before this been known among the provincials, may be left undecided.

players upon the progress of French comedy, and upon the works of its incomparable master. In other coun- tries, where the favourite types of Italian popular comedy had been less generally seen or were unknown, popular comic figures such as the English fools and clowns, the German Hanswurst, or the Dutch Pickelhering, were ready to renew themselves in any and every fashion which preserved to them the gross salt favoured by their patrons. Indeed in Germany, where the term pantomime was not used, a rude form of dramatic buffoonery, corresponding to the coarser sides of the modern English species so-called, long flourished, and threw back for

centuries the progress of the regular drama. After being at last suppressed, it found a commendable substitute in the modern Zauberposse, the more genial Vienna counterpart of the Paris féerve.

In England, where the mask was only quite exceptionally revived after the Restoration, the love of spectacle and other frivolous allurements was at first mainly met by the various forms of dramatic entertainment which went by the name of “opera.” In the preface to Albion and Albanius (1685), Dryden gives a definition of opera which would fairly apply to modern extravaganza, or to modern panto- mime with the harlequinade left out. . Character-dancing was, however, at the same time largely introduced into regular comedy; and, as the theatres vied with one another in seeking quocunque modo to gain the favour of the public, the English stage was fully prepared for the innovation which awaited it. Curiously enough, the long-lived but cumbrous growth called pantomime in England owes its immediate origin to the beginnings of a dramatic species which has artistically furnished congenial delight to nearly two centuries of Frenchmen. Of the early history of vaudeville it must here suffice to say that the unprivileged actors at the fairs, who had borrowed some of the favourite character-types of Italian popular comedy, after eluding prohibitions against the use by them of dialogue and song, were at last allowed to set up a comic opera of their own. About the second quarter of the 18th century, before these performers were incorporated with the Italians, the light kind of dramatic entertainment combining pantomime proper with dialogue and song enjoyed high favour with the French and their visitors during this period of peace. The vaudeville was cultivated by Le Sage and other writers of mark, though it did not conquer an enduring place in dramatic literature till rather later, when it had, moreover, been completely nationalized by the extension of the Italian types.

It was this popular species of entertainment which, under the name of pantomime, was transplanted to England before in France it had attained to any fixed form, or could claim for its productions any place in dramatic literature. Colley Cibber mentions as the first example, followed by “that Succession of monstrous Medlies,” a piece on the story of Mars and Venus, which was still in dumb-show ; for he describes it as “form’d into a connected Presentation of Dances in Character, wherein the Passions were

so happily expressed, and the whole Story so intelligibly told, by a mute Narration of Gesture only, that even thinking Spec- tators allow'd it both a pleasing and a rational Entertain- ment." There is nothing to show that Harlequin and his companions figured in this piece. Geneste, who has no record of it, dates the period when such entertainments first came into vogue in England about 1723. In that year the pantomime of Harlequin Dr Faustus had been produced at Drury Lane,—its author being John Thurmond, a dancing master, who afterwards (in 1727) published a grotesque entertainment called The Miser, or Wagner and Abericock (a copy of this is in the Dyce Library). Hereupon, in December 1723, John Rich (1681-1781), then lessee of the theatre in Lincoln's Inn

Fields, produced there as a rival pantomime The Necro- mancer, or History of Dr Faustus, no doubt, says Geneste, "gotten up with superior splendour." He had as early as 1717 been connected with the production of a piece called Harlequin Executed, and there seem traces of similar enter- tainments as far back as the year 1700. But it was the inspiriting influence of French example, and the keen rivalry between the London houses, which in 1723 really established pantomime on the English stage. Rich was at the time fighting a difficult battle against Drury Lane, and his pantomimes at Lincoln's Inn Fields, and after- wards at Covent Garden, were extraordinarily successful. He was himself an inimitable harlequin, and from Garrick's lines in his honour it appears that his acting consisted of "frolic gestures" without words. The favourite Drury Lane harlequin was Pinkethman (Pope's "noor Pinky"); readers of The Tatler (No. 188) will remember the ironical nicety with which his merits are weighed against those of his competitor Bullock at the other house. Colley Cibber, when described by Pope as "mounting the wind on grinning dragons," briskly denied having in his own person or otherwise encouraged such

fooleries ; in his Apology, however, he enters into an

elaborate defence of himself for having allowed himself to be forced into countenancing the " gin-shops of the stage," pleading that he was justified by necessity, as Henry IV. was in changing his religion. Another butt of Pope's, Lewis Theobald, was himself the author of more than one

pantomime ; their titles already run in the familiar fashion, e.g. A Dramatick Entertainment, call'd Harlequin a Sorcerer, with the loves of Pluto and Proserpine (1725; the " book of the words," as it may be called, is in the Dyce Library). In another early pantomime (also in the Dyce Library) called Perseus and Andromeda, with the Rape of Colombine, or The Flying Lovers, there are five " inter- ludes, three serious and two comic." This is precisely in the manner of Fielding's dramatic squib against panto- inimes, Z'umble-down Dick, or Phaeton in the Suds, Arst acted in 1744, and ironically dedicated to "Mr John Lun," the name that Rich chose to assume as harlequin. It is a capital bit of burlesque, which seems to have been directly suggested by Pritchard's Fall of Phaeton, produced in 1736. —

There seems no need to pursue further the history of English pantomime. "Things of this nature are above criticism," as Mr Machine the " composer" of Phaeton says in Fielding's piece. The attempt was made more than once to free the stage from the incubus of entertainments to which the public persisted in flocking; in vain Colley Cibber at first laid down the rule of never giving a pantomime together with a good play; in vain his son Theophilus after him advised the return of part of the entrance money to those who would leave the house before the pantomime began. "It may be questioned," says the chronicler, "if there was a demand for the return of £20 in ten years." Pantomime carried everything before it when there were several theatres in London, and a dearth of high dramatic talent prevailed in all; and, allowing for occasional counter-attractions of a not very dissimilar nature, pantomime continued to flourish after the Licensing Act of 1737 had restricted the number of London play- houses, and after Garrick's star had risen on the theatrical horizon. He was himself obliged to satisfy the public appetite, and to disoblige the admirers of his art, in defer- to the drama's most imperious patrons—the public at arge.

It should be noted that in France an attempt was made by Noverr:z (q.v.) to restore pantomime proper to the stage as an independent species, by treating mythological subjects

course could not prove permanently successful, met in England also with great applause. In an anonymous tract of the year 1789 in the Dyce Library,

attributed by Dyce to Archdeacon Nares (the author of the Glossary), Noverre's pantomime or ballet Cupid and Psyche is commended as of very extraordinary merit in the choice and execution of the subject. Itseems to have been without words. The writer of the tract states that " very lately the serious pantomime has made a new advance in this country, and has gained establishment in an English theatre ;" but he leaves it an open question whether the grand ballet of J/ledea and Jason (apparently produced a few years earlier, for a burlesque on the subject came out in 1781) was the first complete performance of the kind produced in England. He also notes The Death of Captain Cook, adapted from the Parisian stage, as possessing considerable dramatic merit, and exhibiting "a pleasing picture of savage customs and manners." To conclude, the chief difference between the earlier and later forms of English pantomime seems to lie in the fact that in the earlier Harlequin pervaded the action, appearing in the comic scenes which alternated throughout the piece with the serious which formed the backbone of the story. Columbine (originally in Italian comedy Harlequin's daughter) was generally a village maiden courted by her adventurous lover, whom village constables pursued, thus performing the laborious part of the policeman of the modern harlequinade. The

brilliant scenic effects were of course accumulated, instead

of upon the transformation scene, upon the last scene of all, which in modern pantomime follows upon the shadowy chase of the characters called the radly. The commanding influence of the clown, to whom pantaloon is attached as friend, flatterer, and foil, seems toabe of comparatively modern growth; the most famous of his craft was undoubtedly Joseph Grimaldi (1779-1837), of whom Charles Dickens in his youth edited a biography. His memory, is above all connected with the famous pantomime of Mother Goose, produced at Covent Garden in 1806. It boots not to enumerate favourites of later days; the type of Christmas pantomime cherished by a generation now passing away has been preserved from oblivion in Thackeray's Sketches and Travels in London. The species still maintains its hold over sections of the grown-up public, and, though now only cultivated in a few of the leading London theatres, appears at Christmas 1883-84, according to professional statistics, to have multiplied itself in the capital alone by thirteen examples.

See Geneste, Account of the English Stage, especially vol. iil; Dibdin, Complete History of the Stage, especially vols. ii., iv., and V.; Apology for the Life of Colley Cibber; Fitzgerald, Life of Garrick; Prolss, Dramaturgie. (A. W. W.)

PANYASIS, of Halicarnassus, a poet of the early half of the 5th century B.c. He was a near relation of the historian Herodotus. According to some his father Polyarchus was brother of Herodotus's father Lyxes; according to others, Rhceo or Dryo, the mother of Herodotus, was a sister of Panyasis. He led a revival of the old Ionian epic poetry, and his younger contemporary Antimachus continued the movement. Only insignificant fragments of his works are preserved. He wrote a Hera cleas, in which the whole of the Heracles-myths were embraced in 14 books (9000 lines), and another poem 10 elegiacs, 7000 lines long, called "Iwvxé, in which he related the story of the Ionic settlements in Asia Minor and the exploits of Codrus and Neleus. Though not much thought of in his own time, he is praised by later critics. He was slain by Lygdamis, tyrant of Haliearnassus.

PAOLI, Pasquatz pr (1725-1807), generalissimo of Corsica, was the son of Giacinto Paoli, a Corsican patriot,

seriously in artificial ballets. This attempt, which of and his mother was descended from the old family of the

Caporali. He was born in the village of La Stretta in thé district of Rostino, 25th April 1725. After the hopes of the Corsicans were overthrown by the French in 1738, he accompanied. his father to Naples, where he entered the military college. In an expedition against Calabrian bandits he greatly distinguished himself, and when in 1755 he returned to Corsica he had acquired so high a reputation that he was chosen generalissimo in a full assembly of the people. His refusal to accept Matra for a colleague, led the latter to take advantage of the dissatisfaction of some influential Corsicans to stir up an insurrection. With the aid of the Genoese, Matra for a time made a formidable stand, but after his death in pattle Paoli turned his arms against the Genoese with such success that in 1761 they proposed terms of peace. As Paoli would consent to nothing less than the com- plete

independence of Corsica, the Genoese, despairing of their ability to establish a hold on the island, sold it in 1768 to France. The French effected a landing in 1769 with 22,000 men under Count Vaux, and after stubborn and prolonged resistance Paoli was totally defeated, and, barely succeeding in cutting his way through the enemy, escaped on board an English frigate and went to England. His rule in Corsica, notwithstanding the distraction of the continual struggle to maintain its independence, had been marked by the introduction of many important reforms, such as the remodelling of the laws, the establishment of permanent courts, the regulation . of the coinage, and the furtherance of various measures for the encouragement of agriculture, manufactures, and commerce. At the instance of the duke of Grafton, prime minister of England, Paoli received from the English Government a pension of £1200 a year. He came to be on intimate terms with Dr Samuel Johnson, to whom he was introduced by Boswell. When, after the French Revolu-

tion, Corsica was numbered among the departments of France, Paoli agreed to return to Corsica as lieutenant- general and governor of the department ; but, the excesses of the Convention having alienated his sympathies, he, with the help of Great Britain, organized a revolt, and in 1793 was elected generalissimo and president of the council of government at Corte. Despairing, however, of maintaining the independence of the island, he in 1795 agreed to its union with Great Britain, and on George ITI. being declared king returned to England. He died near London in February 1807. Clemente, elder brother of Pasquale Paoli, also distinguished himself in the struggles of Corsica against the Genoese. Subsequently he retired to a convent at Vallambrosa, but at the end of twenty years returned to Corsica, and died there in 1793.

See Boswell’s Life of Johnson and his Account of Corsica, 1768; Review of the Conduct of Pascal Paoli, 1770; Lives of Paoli, by Arrighi (Paris, 1843), Klose (Brunswick, 1853), Bartoli (Ajaccio, 1867), and Oria (Genoa, 1869).

PAOLO, Fra. See Sarrt.

PAOLO VERONESE. See VERONESE.

PAPA, a large country-town of Hungary, in the district of Veszprim, lies on the Raab and Steinamanger Railway, 75 miles to the west of Pesth. It is the seat of a fine chateau and park of the Eszterhazy family, by whom the handsome Roman Catholic church, lined with red marble, was built in 1778. It also contains a Protestant church, a good Protestant school established about 1530, a Roman Catholic gymnasium, and three convents. A quaint one- storied edifice is shown as the house of Matthew Corvinus. The chief industries are weaving, wine-growing, and the manufacture of paper and stoneware. The population in 1880 was 14,654.

PAPACY. See Pore and PopEpom.

PAPAL STATES. See Staves of THE CHURCH.

PAPER

a origin and early history of paper as a writing material are involved in much obscurity. The art of making it from fibrous matter, and, among other sub- stances, from the wool of the cotton plant, reduced to a pulp, appears to have been practised by the Chinese ata very | distant period. Different writers have traced it back to the 2d century z.c. But however remote its age may have been in eastern Asia, cotton paper first became available for the rest of the world at the beginning of the 8th century, when the Arabs captured Samarkand (704 a.p.), and there learnt its use. The manufacture was taken up by them in that city, and rapidly spread through all parts of their empire. From the large quantities which were produced at Damascus, it obtained one ofthe titles, charta Damascena, by which it was known in the Middle Ages. The extent to which it was adopted for literary purposes is proved by the comparatively large number of early Arabic MSS. on paper which have come down to us, dating from the 9th

century.

} 1A few of the earliest dated examples may be instanced. The Gharibu l-Hadith, a treatise on the rare and curious words in the sayings of Mohammed and his companions, written in the year 866, is probably one of the oldest paper MSS. in existence (Pal. Soc., Orient. Ser., pl. 6). It is preserved in the University ‘Library of Leyden. A treatise by an Arabian

physician on the nourishment of the different members of the body, of the year 960, is the oldest dated Arabic MS. on paper in the British Museum (Or. MS. 2600; Pal. Soc., pl. 96). The Bodleian Library possesses a MS. of the Diwdinw ’1-Adab, a grammatical work of 974 a.D., of particular interest as having been written at Samarkand on paper presumably made at that seat of the first Arab manufacture (Pal. Soc., pl. 60). Other early examples are a volume of poems written at Baghdad, 990 a.D., now at Leipsic, and the Gospel of St Luke, 993 a.D., in the Vatican Library (Pal.

With regard to the introduction of paper into Europe, it naturally first made its appearance in those countries more immediately in contact with the Oriental world. Besides receiving the names of charta and papyrus, transferred to it from the Egyptian writing material manufactured from

| the papyrus plant (see Papyrus), cotton paper was known

in the Middle Ages as charta bombycina, gossypina, cuttuned, aylina, Damascena, and serica. The last title seems to have been derived from its glossy and silken appearance. It was probably first brought into Greece through trade with Asia, and from thence transmitted to neighbouring countries. Theophilus presbyter, writing in the 12th century (Schedula diversarum artvum, i, 23), refers to it under the name of Greek parchment —“ tolle pergamenam Grecam, que fit ex lana ligni” In the 10th century bambacinum was used at Rome. There is also a record of the use of paper by the empress Irene at the end of the 11th or beginning of the 12th century, in her rules for the nuns of Constantinople. It does not appear, however, to have been very extensively used in Greece before the middle of the 13th century, for, with one doubtful excep- tion, there are no extant Greek MSS. on paper which bear date prior to that period.

The manufacture of paper in Europe was first established by the Moors in Spain, the headquarters of the industry being Xativa, Valencia, and Toledo. But on the fall of ee es SS ee

Soc., pls. 7, 21). In the great collection of Syriac MSS. which were obtained from the Nitrian desert in Egypt, and are now in the British Museum, there are many volumes written on cotton paper of the 10th century. The two oldest dated examples, however, are not earlier than 1075 and 1084 .p.

the Moorish power the manufacture, passing into the hands of the less skilled Christians, declined in the quality of its production. In Italy also the art of paper-making was no doubt in the first place established through the Arab occupation of Sicily. But the paper which was made both there and in Spain, it must be remembered, was in the first instance cotton paper. In the laws of Alphonso of 1263 it is referred to as cloth parchment, a term which well describes the thick material made from cotton. As, however, the industry was pushed north, into districts where cotton was not to be found as a natural growth or was not imported, other substances had to be pressed into the service. Hence by degrees arose the practice of mixing rags, in the first instance no doubt of woollen fabrics, with the raw material. The gradual substitution of linen, in countries where it was more abundant or where it was the only suitable material at hand, was a natural step in the progress of the manufacture.

The first mention of rag paper occurs in the tract of Peter, abbot of Cluny (1122-50 a.p.), adversus Judzos, cap. 5, where, among the various kinds of books, he refers to such as are written on material made “ex rasuris veterum pannorum.” At this early period woollen cloth is probably intended. Linen paper was first made in the 14th century ; but in the first half of that century it is probable that woollen fabrics still entered largely into the component parts of the pulp—a fact which, however, can only be proved in individual instances by aid of the micro- scope. This being the case, it is of less practical advantage to try to ascertain an exact date for the first use of linen in paper-making than to define the line of demarcation between the two classes of paper, viz., that made in the Oriental fashion without water-marks, and that in which these marks are seen. The period when this latter kind of paper came into existence lies in the first years of the 14th century, when paper-making at length became a veritable European industry. Cotton paper of the Oriental pattern, it is true, is still found here and there in use some time after the manufacture of the water-marked material had begun, but the instances which have survived are few and are mostly confined to the south of Europe.

A few words may here be said respecting the extant examples of cotton paper MSS. written in European countries. Several which have been quoted by former writers as early instances have proved, on more recent examination, to be nothing but vellum. The ancient fragments of the Gospel of St Mark, preserved at Venice, which were stated by Maffei to be of cotton paper, by Montfaucon of papyrus, and by the Benedictines of bark, are in fact written on skin. The oldest document on cotton paper is a deed of King Roger of Sicily, of the year 1102; and there are others of Sicilian kings, of the 12th century. The oldest known imperial deed on the same material is a charter of Frederick II. to the nuns of Goess in Styria, of the year 1228, now at Vienna. In 1231, however, the same emperor forbade further use of paper for official documents, which were in future to be inscribed on vellum. In Venice the Liber plegiorum, the entries in which begin with the year 1223, is made of rough cotton paper; and similarly the registers of the Council of Ten, beginning in 1325, and the register of the emperor Henry VII. (1308- 13) preserved at Turin, are also written on a like sub- stance. In the British Museum there is an older example ina MS. (Arundel 268) which contains some astronomical treatises written on an excellent paper in an Italian hand of the first half of the 13th century. The letters addressed from Castile to the English king, Edward L, in 1279 and following years (Pauli in Bericht. Berl. Akad., 1854) are instances of Spanish-made paper ; and other specimens in existence prove that in this latter country a rough kind of

~workmen.

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charta bombycina was manufactured to a comparatively late date.

In Italy the first place which appears to have become a great centre of the paper-making industry was Fabriano in the marquisate of Ancona, which rose into importance on the decline of the manufacture in Spain. The jurist Bartolo, in his treatise De insigniis et armis, refers to the excellent paper made there in the middle of the 14th century, an encomium which will be supported by those ‘who have had occasion to examine the extant MSS. of Italian paper of that period, which even now excites admiration for its good quality. In 1340 a factory was established at Padua; another arose later at

Treviso 5 and others followed in the territories of Florence, Bologna, Parma, Milan, Venice, and other districts. From the line of factories of northern Italy the wants of southern Germany were supplied as late as the 15th century, As an instance the case of Gérlitz has been cited, which drew its paper from Milan and Venice for the half century between 1376 and 1426. But in Germany also factories were rapidly founded. The earliest are said to have been set up between Cologne and Mainz, and in Mainz itself about the year 1320. At Nuremberg Ulman Stromer established a mill in 1390, with the aid of Italian Other places of early manufacture were Ratisbon and Augsburg. Western Germany, as well as the Netherlands and England, is said to have obtained paper at first from France and Burgundy through the markets of Bruges, Antwerp, and Cologne. France owed the establishment of her first paper-mills to Spain, whence we are told the art of paper-making was introduced, as early as the year 1189, into the district of Hérault. The French paper of this early date was.of course of cotton. At a later period, in 1406, among the accounts of the church of Troyes, such mills appear as molins @ toile. The develop- ment of the trade in France must have been very rapid, for, as we have already noticed, that country was soon in a position to supply her neighbours as well as to provide for her own wants. And with the progress of manufac ture in France that of the Netherlands also grew.

A study of the various water-marks has yielded some results in tracing the different channels in which the paper trade of different countries flowed; but a thorough and systematic collection and classification of them has yet to be accomplished. Experience also of the different kinds of paper, and a knowledge of the water-marks, aid the student in fixing nearly exact periods to undated docu- ments. Rag paper of the 14th century may generally be recognized by its firm texture, its stoutness, and the large size of its wires. The water-marks are usually simple in design ; and, being the result of the impress of thick wires, they are therefore strongly marked. In the course of the 15th century the texture gradually becomes finer and the water-marks more elaborate. While the old sub- jects of the latter are still continued in use, they are more neatly outlined, and, particularly in Italian paper, they are frequently enclosed in circles. The practice of inserting the full name of the maker in the water-mark came into fashion in the course of the 16th century. The variety of subjects of water-marks is most extensive. Animals,

birds, fishes, heads, flowers, domestic and warlike imple- ments, armorial bearings, &c., are found from the earliest times. Some of these, such as armorial bearings, and national, provincial, or personal cognizances, as the imperial crown, the crossed keys, or the cardinal's hat, can be attributed to particular countries or districts; and the wide dissemination of the paper bearing these marks in different countries serves to prove how large and inter- national was the paper trade in the 14th and 15th centuries.

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In the second half of the 14th century the use of paper for all literary purposes had become well established in all western Europe; and in the course of the 15th century it gradually superseded vellum. In MSS. of this latter period it is not unusual to find a mixture of vellum and paper, a vellum sheet forming the outside leaves of a quire while the rest are of paper.

With regard to the early use of paper in England, there is evidence that quite at the beginning of the 14th century it was a not uncommon material, particularly for registers and accounts. Under the year 1310, the records of Merton College, Oxford, show that paper was purchased "pro registro," which Prof. Rogers (Hist. Agricul. and Prices, i. p. 644) is of opinion was probably cotton paper of the same character as that of the Bordeaux customs register in the Public Record Office, which date from the first year of Edward II. The college register referred to, which was probably used for entering the books that the fellows borrowed from the library, has perished. There is, however, in the British Museum a paper MS. (Add. 31,223), written in England, of even earlier date than the one recorded in the Merton archives. This is a register of the hustings court of Lyme Regis, the entries in which commence in the year 1309. The material is cotton paper, with apparently an admixture of rag, the threads of which are visible, imbedded in the pulp—similar to the kind which was used in Spain. It may indeed have been imported direct from that country or from Bordeaux ; and a seaport town on the south coast of England is exactly the place where such early relics might be looked for. Professor Rogers also mentions an early specimen of paper made from rag in the archives of Merton College, on

which is written a bill of the year 1332; and some leaves of water-marked paper of 1333 exist in the Harleian collec- tion. Ofa date only a few years later is the first of the registers of the King's Hall at Cambridge, a series of which, on paper, are preserved in the library of Trinity College. Of the middle of the 14th century also are many of the municipal books and records still to be found among the archives of ancient cities and towns. The knowledge, however, which we have of the history of paper- making in England is extremely scanty. The first maker whose name is known is one Tate, who is said to have set up a mill in Hertford early in the 16th century; and a German named Spielman had works at Dartford in 1588. But it is incredible that no paper was made in the country before the time of the Tudors. No doubt at first it was imported. But the comparatively cheap rates at which it was sold in the 15th century in inland towns, as well as in those nearer the coast, seem to afford ground for assum- ing that there was at that time a native industry in this commodity, and that it was not altogether imported.

As far as the prices have been observed at which different kinds of paper were sold in England in the early period of its introduction, it has been found that in 1355-56 the price of a quire of small folio paper was 5d., both in Oxford and London. In the 15th century the average price seems to have ranged from 3d. to 4d. for the quire, and from 3s. 4d. to 4s. for the ream. At the beginning of the 16th century thc price fell to 2d. or 3d. the quire, and to 3s, or 3s. 6d. the ream; but in the second half of the century, owing to the debasement of the coinage, it rose, in common with all other commodities, to nearly 4d. the quire, and to rather more than 5s. the ream. The relatively higher price of the ream in this last period, as compared with that of the quire, seems to imply a more extensive use of the material which enabled the trader to dispose of broken bulk more quickly than formerly, and So to sell by the quire at a comparatively cheap rate.

Brown paper appears in entries of 1570-71, and was

sold in bundles at 2s. to 2s. 4d. Blotting paper is appar- ently of even earlier date, being mentioned under the year 1465. It was a coarse, grey, unsized paper, fragments of which have been found among the leaves of 15th

century accounts, where it had been left after being used for blotting. See Gerardi Meerman et doctorum virorum ad eum Epistole atquc Observationes de Chartz vulgaris sew lince origine, Hague, 1767 ; G. F. Wehrs, Yom Papicr, Halle, 1789; M. Koops, Historical Account of the substances used to describe events and to convey ideas, from the carliest date to the Invention of Paper (London, 1801), in great part repeating Wehrs —the book is printed on paper manufac- tured from straw ; Ersch and Gruber, Allgem. Encyklopddie, art. “Papier,” Leipsic, 1888; Sotzmann, “Ueber die dltere Papier- fabrikation,” in Serapewm, Leipsic, 1846; W. Wattenbach, Das Schriftwesen im Mittelalter, Leipsic, 1875, pp. 114-123; J. E. T. Rogers, History of Agriculture and Prices in England, Oxtord, 1866-82, passim. (EB. M. T.)

MANUFACTURE OF PAPER.

Paper is a thin tissue composed of vegetable fibres (rarely of woollen fibres), resulting from their deposition on wire- cloth while suspended in water. At first it was entirely made by hand, but the invention in 1798 of the paper machine by Louis Robert, a clerk in the employment of Messrs Didot, of the celebrated Essonnes paper-mills, near Paris, gave a new impetus to the industry. The invention was introduced into England through the agency of Messrs Fourdrinier, who employed Bryan Donkin, the engineer, to assist in working it out; but, although they expended a large fortune in developing the invention, their enterprise resulted only in bankruptcy. Their first paper machine was erected in 1804 at Frogmoor Mill, near Boxmoor, Herts. In the United States it was not till 1820 that such a machine was started for the first time by Messrs T. Gilpin & Co., on the Brandywine. Since that period, machine-made paper has gradually supplanted that made by hand for all except special purposes, and has been brought to a high state of perfection by subsequent im- provements in the machinery.

Paper may be divided into three main classes :—writing paper, printing paper, and wrapping paper. The staple of which writing and printing paper is made is, in Britain, rags and esparto; in America a considerable quantity of wood pulp is used. The staple of wrapping papers is old ropes and in some cases jute. The best writing and print- ing papers are still made, whether by hand or by machine, from rags.

Manufacture of Paper from Rags.—The first process is the cutting and sorting of the rags, which is invariably done by women. The rag-cutter stands behind a knife about 14 inches long set in an oblique position in a table before her; the rags are cut into pieces about the size of the hand, and the linen pieces separated from the cotton, the various qualities being put into different receptacles. After being cut they are subjected to the action of the willow and duster, which knocks the loose dust off. The willow is composed of two conical cylinders, inside of which iron spikes project. In_ the interior of these cylinders an iron drum, also provided with spikes, revolves at about 300 revolutions per minute. The rags are fed into the first cylinder by a travelling felt, and dashed through from the one to the other by the action of the revolving drum, and from the second cylinder thrown for- ward into the duster. This consists of a large rectangular wooden case, in the interior of which an iron cage, covered with coarse wirecloth, revolves slowly at right angles to the willow. This cage is set at a slight incline, so that the rags which are thrown into it by the willow at one end slowly pass to the other, while the dust, &c., which has been disengaged by the action of the willow, falls through the wirecloth, and the dusted rags pass out at the other end, now ready for the boiler. The boiler is of different

forms, revolving or stationary. The most usual is stationary. It consists of an upright cylinder of cast or malleable iron (fig. 1), about 8 feet in diameter by 6 feet deep, and fitted with a perforated false bottom, on which the rags rest. The boiler is further fitted with a filling door A at the top, and an emptying door B below. After being

Fia. 1.—Section of Rag-Boiler.

charged with rags, it is filled to about half its height with water ; a sufficient quantity of caustic soda, varying accord- ing to the nature of the rags, is introduced ; the door is then shut, and steam is admitted by a small pipe C which is con- tained in, and communicates at the foot with, a larger pipe D and causes a constant circulation of hot liquid, which is dispersed all over the boiler by striking against a hood E at the top. This is technically known as the “ vomit.” The rags are boiled in this solution of caustic soda for ten to twelve hours, when the steam is turned off and the liquid is discharged by

the pipe G. After a subsequent washing with cold water in the boiler the lower door is opened and the boiled rags withdrawn into small trucks, and picked by women to remove impurities, such as india-rubber, &c.

The rags are now submitted to the action of the break- ing engine (figs. 2 and 3), This is an oblong trough with

rounded ends, and may be about 6 feet wide and 12 feet long by about 2 feet in depth, but the size varies greatly. It is partially divided in the centre by the midfeather A, and provided with a heavy iron roll B, fitted with knives technically called bars, which revolves at a high speed on the plate C, also furnished with knives. The engine is half filled with water and packed with the boiled rags.

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Water is introduced by the valve D, and is withdrawh' by the washer E. The washer consists of a drum about 3 feet in diameter and 18 inches broad, covered with fine wire-cloth, and fitted inside with buckets shown by the dotted lines G. It is partially immersed in the pulp, and as it revolves discharges the water by the centre down the

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Fia. 3.—Breaking Engine—Horizontal Section.

shoot H. The rags are allowed to remain in this washer, according to their cleanness, from one to two hours, and then the solution of chloride of lime by which they are bleached is introduced. After running mixed with this in the engine from one to two hours, the pulp is run down into large stone chests, where it is allowed to lie for twenty-four hours till it becomes

perfectly white; it is then drained and pressed to remove the remaining bleach- ing solution as far as possible.

The bleached pulp is now removed to the beating engine, which differs but little from the washing engine except that in the roll of the beater there are three bars to the bunch, while in the washer there are only two to the bunch. Here the pulp is furnished in the engine with water as before, and washed till it is free from chloride of lime, or this may be neutralized by the use of a sulphite or hyposulphite of soda. The pulp is then submitted to the action of the beater roll for from four to six hours, the circular knives being allowed to revolve very near the plate, so as to draw out the fibres into a very fine state, while preserving their strength as far as possible. While the operation of “ beating” is being proceeded with, the loading material, consisting of china clay or pearl white, is added. This is by no means to be viewed entirely as an adulteration, as it too generally is. No doubt toa certain extent it weakens the paper, but it is not added in hand-made papers, in which great strength is required… In writing papers for ordinary purposes, however, and in printing papers, the addition of mineral matter in modera- tion is of positive advantage, as it closes up the pores of the fibres and enables the paper to take a much better finish than it would otherwise do.

The next process is the sizing, to which all papers for writing and most of those for printing purposes are sub- jected. Sizing consists in the deposition on the fibres of a substance which is comparatively waterproof, and for engine sizing a mixture of resin soap treated with alum 1s employed. The resin soap is formed by dissolving resin in carbonate or caustic soda, allowing the mixture to cool, when the soap floats on the surface, and the mother-liquor, containing the excess of alkali, is run off. It is of con siderable importance to get rid of this mother-liquor before using the soap, as it is of no use, and takes alum to neutralize it. The soap is now dissolved in water, and, In many mills where starch is used for stiffening purposes,

mixed with the starch. This mixture is put into the | a considerable extent for the superiority of the American beating engine in which the pulp is circulating, and when | papers.! . it is thoroughly incorporated with the pulp the solution of After the pulp is prepared in the beating engine it is alum or

sulphate of alumina is added. This forms a finely | run into the chests of the paper machine (figs. 4 and 5). divided precipitate of resinate of alumina on the fibres. | These chests A are fitted with agitators, and from them The pulp, after the sizing material is thoroughly incorpor- | the pulp is pumped into the supply-box B, which com- ated with it, is now ready for colouring. Even to produce municates with the sand-traps C by means of a regulating a pure white, colour must be added to the pulp. In| cock. Along with the pulp a certain amount of water is general, for white papers, either cochineal and ultramarine | allowed to flow into the sand-trap, so as to thin it down blue are employed, or magenta and aniline blue. In all | sufficiently; in most cases the save-all water (see below) is cases where permanence of colour is of importance, the | employed for this purpose. The pulp flows backward and former are to be preferred. For blue papers, ultramarine | forward here in a shallow stream, so as to deposit any is generally used. Tinted papers are, as a rule, pro- | heavy impurities which it may contain. After issuing from duced by the use of aniline colours. Coloured papers are the sand-traps it is delivered on to the strainers, which produced by the use of various pigments. are made in many varieties, the most common being The operation of beating the pulp is of the greatest the revolving strainer D, shown on the plan. This is a importance, and too much care cannot be devoted to it. | rectangular trough into which the pulp flows. In the In America, where the mills are generally driven by | centre of this the strainer, rectangular in form, composed water-power, the pulp is kept for a much longer time in | of four sets of brass plates bolted to a frame in which very

On == the engine than in Great | fine slits are cut, revolves slowly. The size of this is —— |

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Britain, and this accounts to |! about 7 feet by 2 feet.. The pulp is made to flow from the

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Fic, 4.—Paper Machine—Vertical Section. outside through the slits to the inside of the strainer by | the water runs off through the meshes of the wire by

means of suction produced by bellows or disks in the | gravitation, and the rest is removed through the suction interior of the plates, and is discharged by the pipe E into | boxes L by the vacuum pumps M. Stretching along a box from which it flows on to the apron F, which is | under the wire from the breast roll to the first suction box placed on the top of the breast roll. The apron is made | is the save-all, a shallow trough into which the water of

a piece of moleskin or india-rubber cloth the full width | which passes through the wire falls. The contents of this of the wire, and prevents the pulp from running away | box flow into a cistern at the back of the machine into down the back of the wire. It covers the wire for 12 to | which the vacuum pumps also discharge their water ; and 18 inches at the beginning. The wire consists of an end- | from this cistern the water is pumped into a service box less sheet of fine wirecloth (about 66 wires per square | and used instead of fresh water for mixing with the pulp inch) which stretches from the breast roll G to the couch | as it flows on to the sand-trap. There is a considerable roll H, returning underneath by the leading rolls I. | saving in this, as the fine fibre, size, &c., contained by Underneath the first portion of the wire are the tube rolls | the water passing through the wire is all in this way « Bad fai rther along are the vacuum boxes L, L. These | “i Another form of beating engine which is finding great favour communicate by pipes with the vacuum pumps M. As | is the Umpherston engine, which differs little from the ordinary the wire revolves in the direction shown in fig. 4 the | beater, except in having, instead of a midfeather, a passage under pulp is allowed to flow from the strainer and spreads itself | the roll by which the pulp circulates. It is claimed for it that one out in a thin film. co vering the surface of the wirecloth. capable of Prepariig 10 cwts. of paper does not occupy more floor It ? ; : : area than an ordinary beater for 3 cwts. The pulp is also said to

Is prevented from flowing over the sides of the wire by | travel more freely, and does not lodge about the corners as im the the deckle straps, endless india-rubber straps N. Part of | ordinary engine.

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dandy roll, a skeleton roll covered with wirecloth, revolves on the top of the pulp. By means of raised wires on it in the form desired the paper is rendered thinner at these parts and a water-mark is produced. In order to secure regularity in the layer of pulp, as also to increase the strength of the paper, a lateral motion is communicated to the wire by the shake O. The half-dried pulp now passes between the couch rolls, where it receives the first pressure. The under couch roll generally consists of a brass shell fixed by iron rings to a spindle; the top roll may be either similar to the lower one

or made of mahogany, and is always covered with a felt jacket. Pres- sure is applied to the ends of the top roll by means of levers and weights. From these the sheet of partially

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Fia. 5,— Paper Machine—Horizontal Section. bs

to the paper cutter. In cases where the paper is to be sized with gelatin after leaving the machine, it is wound up rough.

A modification of the Fourdrinier machine, suitable for the manufacture of thin papers and those which only require to be smooth on one side, is shown in fig. 6. It consists of an ordinary paper machine as far as the couch rolls A, A. From these the paper is carried backwards on the top of the endless felt B till it comes in contact with the large steam-heated cylinder © at d. Here it adheres to the cylinder, being pressed against it at the same time by the press roll E. The paper then continues round the surface of the cylinder, and is wound up dry on reels at G. The felt washer H is a box filled with

water through which the felt passes as it travels. After this the paper is cut or glazed in the usual way.

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recovered. Between the first and second suction box the |

dried pulp is carried by endless felts through the first and second press rolls R and §. The press rolls are either made of solid iron, or may with advantage have a brass shell shrunk on. Having been freed by these from a great part of its water, the web of paper is carried over

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the steam-heated cylinders T, T.. The first two cylinders are generally bare, and the heat applied to these is gentle ;

in the case of the others, the paper is kept close to the cylinder by means of endless felts. The web then passes through the intermediate rolls U in a half-dried state, over three more cylinders and the calenders V. These are heavy iron rollers heated by steam internally and. polished externally. Their object is to communicate a gloss to the web of paper. It is then wound up on the reel W, and these reels when filled with paper are removed as required

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At this stage papers which require to be hard-sized, principally the better sorts of writing papers, are sized with gelatin or “tub-sized.” This is done occasionally by passing the sheets separately through a trough contain- ing a strong solution of gelatin, and afterwards hanging them up to dry in the same way as hand-made papers, but in general the paper is sized and dried in the web after leaving the paper machine. For this purpose a sizing and drying machine is used (fig. 7). The web of paper to be sized is shown at A. From this it is passed through a trough B containing a strong solution of gelatin into which a certain amount of alum is introduced; after passing through this by means of the size rolls C, GC, it is passed through the press rolls D, which squeeze out the super fluous size from it, and rewound on a reel at E to allow

the size time to sct. The web is then transferred to the | paper rests, while a current of heated air from pipes under- drying machine at G, and passed over a series of spar | neath ascends through them and is driven against the inner drums H, H at a slow speed. These drums are fitted | surface of the

paper by the fanners K, K, which revolve round their circumference with wooden spars [on which the | at a high speed. The great thing to be studied in this

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operation is to keep as low a temperature as possible, not | as two hundred of them go to adrier. After being wound above 80° Fahr. There may be any number of these | up at the end of the drier the paperis ready for cutting in drums; the larger the number the lower the temperature | the ordinary way.

at which the paper can be dried. In some mills as many | ‘The ordinary paper cutter (fig, 8) cuts from six to eight

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Another form of paper cutter which is employed for water-marked papers (see paper machine) is the single- sheet cutter, fig 9. In this cutter only one web of paper is cut at a time, but it can be adjusted to a much

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webs at once. The webs to be cut may be seen on the drawing at a,a. The webs of paper from these are led between the leading rolls b, 6 through the feeding rolls ¢,¢. These, by means of the change pulley d, are driven at such

a speed that they feed the paper to the revolving knife at the exact speed necessary to give the length of sheet required. After pass- ing the feeding rolls the paper passes on to the slitting knives e, These are circular revolving knives which slit the paper into the width required. From these the webs pass through the drawing rolls f, f tothe revolving knife g, which, coming down with a sheer against the dead knife g’, cuts them ~ crosswise into the required length of sheet. The size of the sheet may be made longer or shorter, by altering the ‘ size of the expanding pulley / and the : change pulley d. After being cut, the “”======= =

sheets of paper are caught by the end- Fic. 8.—Reel Paper Cutter.

less felt ¢ and carried forward to the table k, where they | greater degree of nicety than the revolving cutter. After are arranged by boys. passing through the slitting knives A, which are in all

respects similar to those in the revolving cutter, the paper is carried over the measuring drum C, which, by a crank arrangement DE receives an oscillating motion and can be adjusted to draw the exact quantity of paper forward for the length of sheet required. The paper is kept fast on the drum by the gripper rolls F’, F, arranged so as to rise and fall

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Fic, 9.—Single-Sheet Paper Cutter. as the drum oscillates, while the dancing roll B keeps the web ata uniform tension. The paper is cut into sheets by the knife I, connected with cranks and linksG, and supported by the link rods H, H working horizontally with a swinging motion against the dead knife K. At the same time the clamp L holds the web in position. The sheet to be cut may be seen hanging ‘down at the dotted line M. The sheets are then caught by girls and dressed up in the usual way. This cutter requires a great deal of attention, and is only used when extreme accuracy is required.

Calenders.—If it is desired to give the paper a higher gloss than can be done on the calenders of the paper machine, or where, as in the case of papers

sized with gelatin, these must be glazed after leaving the paper machine, it is done by the use either of the plate or roll

aay”

Fic, 10.—Plate Calender,

calender. (1) The plate calender (fig. 10) is composed of a framework A, in which are set two highly polished rolls of solid iron B, B, with a space of about } inch intervening. By means of levers and weights pressure can be applied to the top roll. The paper to be glazed is placed sheet by sheet between copper or zinc plates, till a bundle consider- ably thicker than the space between the rolls is made. This bundle is then passed backward and forward between the rollers, under considerable pressure, and the polished surface of the plates communicates a gloss to the paper.

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(2) In America a calender of different construction jg employed (fig. 11). In it a perpendicular series of highly polished iron and compressed cotton or paper rolls are placed alternately between frames, and revolve at a high speed. The sheets of paper are one by one introduced by an attendant, who sits in a convenient position near the

top of the calender, under the tapes a, which, running against the roll A, convey the sheet to the next roll B. After passing under the roll A, the paper has a tendency to adhere to the metal surface; this is overcome by a sharp-pointed knife 6 placed against it, so that the sheet is again caught by the next set of tapes, and so on till it completes its course, and comes out at the foot of the calender. Ifa still higher glaze is required, the sheets are passed through a second time. A much larger quantity of paper can be glazed in the same time by one of these calenders than by the so-called plate calender, and ata greatly smaller outlay for wages, but the surface acquired by the paper wants the peculiar gloss communicated to it by the latter, and for the higher grades of paper this still retains its position in Great Britain.

After being cut, and, if necessary, calendered, the paper is sorted, that is to say, it is examined sheet by sheet, and all torn or soiled sheets are taken out.

It is then counted into quires and reams, each quire containing twenty-four sheets, and each ream twenty quires.

Hand-Made Paper.—So far the preparation of pulp, whether for paper making by hand or by machine, is iden- tical, the chief difference being that only the most expensive drawing and writing papers are now manufactured by hand, and for this purpose only the finest qualities of rags are used. The process will be best understood by reference to the drawing (fig. 12). The pulp, after being prepared in the beating engine as above described, is run into large chests from which the vat is supplied. Before reaching this it is strained as on the paper machine. Hand-made paper is made by means of a mould (fig. 13). This consists of a framework of fine wirecloth with a “deckle” or movable frame of wood all round it, to keep the pulp from running off. Nearly all hand-made papers have also a water-mark (W. King in this instance), which is produced by wires representing these letters being raised above the rest of the mould. Hence the paper in these parts is thinner, and the letters can be read on holding the sheet up to the light.

PAPER

The sheet of paper is formed in the following way. The vatman, fig. 12, takes up enough pulp on the mould to fill the deckle. He runs the stuff evenly over the mould from the foreside to the back, throwing back any pulp

which may be superfluous, and then gives the mould the “shake,” a gentle shake both along and across the mould, causing the water to run through the wirecloth while the pulp which forms the sheet of paper stays on the top. The vatman then brings the mould to the stay ; it is placed by the coucher on an inclined elbow, where some more water drains away, and he afterwards turns it over on the

felt, leaving the sheet of paper on the felt. When the

Fic. 13.—Mould.

proper number of sheets of paper, with a felt between each, has been placed in the pile called a “ post,” it is taken to the press, and a great quantity of

the water is pressed out, leaving the sheets of paper sufficiently dry to be handled by the “ layer,” who places them in packs, one sheet above the other, and after being parted sheet from sheet they are re-pressed. After this the paper is hung in a drying loft on cow-hair ropes in spurs of three to five sheets thick until dry. It is then sized by passing the spurs through a strong solution of gelatin contained ina long trough. The

_among these is Esparto (q.v.).1 does not greatly vary from that of rags.

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In America, papers of great strength are manufactured by machinery, and not much hand-made paper is made.

Manufacture from other Substances than Rags.—Although the better varieties of both writing and printing paper are still manufactured from rags, the supply of these has been found altogether insufficient to supply the increasing demand for paper, and other fibres have to a great extent been substituted for the cheaper classes of paper. First The treatment of esparto On arrival at the mill the grass is sorted ; that is to say, it is spread out in bunches on a table with a wire gauze cover, and these are shaken to remove the dust, while the roots and weeds are removed by picking. This is technically known as dry picking. In some mills this process is done mechanically by aid of a duster, which removes dust and other heavy impurities from the esparto, but it must then be picked in the wet state after boiling. The boiling is done in the same way as rags, but with a larger proportion of caustic soda. Mr Thomas Routledge, the introducer of esparto, specifies 10 per cent. real caustic soda, but with improved forms of boilers such as Roeckner’s or Sinclair’s, operating at 40 to 50 Ib pressure, a considerable saving on this amount of alkali may be effected. The subsequent treat- ment of esparto is similar to that for rags; it is again “wet-picked ” after boiling, then washed and bleached, a much larger quantity of chloride of lime being required than in the case of rags. It can be treated either alone or mixed with rags, and forms a very mellow bulky paper admirably adapted for printing purposes.

A considerable quantity of straw is used both in Britain and in America for paper-making. In general it is mixed either with rags or with esparto, being

of too brittle a nature when bleached to make into paper alone. It is generally dusted after arrival at the mill, in many cases cut into chaff before the boiling operation, so as to allow the soda freer access to the fibres, and boiled under high

| pressure with considerable quantities of caustic soda up to

15 per cent. of real caustic. It is then washed either separately or along with esparto, and bleached in the ordinary way. As at present treated, the yield averaging only 33 to 40 per cent., straw will not come into general use, except in cases where the raw material can be bought on unusually advantageous terms. There is no doubt that, in this case especially, a morérational method of extracting the cellulose than by boiling under high pressure with a large amount of caustic soda is most desirable, for, many of the fibres of the straw being extremely fine, these are to a considerable extent actually dissolved by the soda, and, whereas theoretically straw with 15 per cent. moisture ought to produce 45 per cent. cellulose, by the soda treat- _ ment not more than 33 per cent. are obtained, where a good white colour is desired.

The only other fibre which has seriously threatened to compete with rags or esparto is wood. From the fact that the supply of this raw material is apparently

paper passes along on an endless felt, and is freed from »inexhaustible, a great deal of attention has been paid to

superfluous size by press rolls at the end of the trough. It is then parted again to prevent the sheets from sticking together, and is again dried at a temperature of 70° to 80° Fabr. After being picked and then glazed between plates, it 1s sorted and finished in the same way as other paper, but with much greater care.

It will readily be understood that the expense of manu- facturing paper in this way is very much greater than by machinery ; but the gain in strength, partly owing to the time allowed to the fibres to knit together, and partly to the free expansion permitted them in drying, still maintains

‘methods for reducing it to a fibre capable of being made

into paper. These divide themselves into two—(1) mechanical and (2) chemical treatment. (1) The wood generally selected for this purpose is white pine or poplar. It is cut into slabs of convenient size, which are then pressed against the face of a mill-stone revolving at a high speed, while a flow of water conveys the fibres of wood away as they are separated. They are then sieved according to fineness, collected, and pressed into pulp or half stuff, which is used for admixture in inferior

| papers, or even, in some cases, for making paper. By a Steady demand for this class of paper, and probably 60 |

1 The imports, which in 1863 amounted to 18,000 tons, had risen

to 70 tons per week are made in Great Britain at present. | to 100,000 tons in 1870, and in 1883 reached 206,000 tous.

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this means of treatment, however, the wood is not split up into its ultimate fibres, but is left with all the incrust- ing matter attached, and the pulp and paper so obtained are only fitted for the commonest purposes. (2) Many efforts have been made with the view of preparing wood chemically, so that the resulting fibre might be introduced into fine papers, and latterly with considerable success. In the earlier processes, patented by Houghton and Sinclair, wood was boiled with about 20 per cent. real caustic soda under a pressure of from 10 to 14 atmospheres. By this means, with certain improvements in detail, dictated by experience, so-called chemical wood pulp is prepared in large quantities on the Continent, and is imported as pulp into England to a considerable extent. In America this process has been extensively adopted. While pulp of very fair quality is prepared in this way suitable for papers where a perfectly white colour is not required, there is no room for doubt that the action of the caustic soda solution at the extreme temperature which a pressure of upwards of 10 atmospheres involves, leads to a certain extent to a degradation and consequent

weakening and browning of the fibres, and a great deal of work has been directed to the surmounting of this difficulty. The result has been a series of patents, all containing the same principle, namely, the treating the wood with a chemical agent which should prevent oxidation and subsequent degradation of the fibres from taking place. Such patents are those of Mitscherlich and Francke (bisulphite of lime), Ekman and Graham

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prepared from wood by all the acid processes is that it is not pure, but a considerable quantity of incrusting matter is left in the fibre, and hence the paper manufactured from it solely is harsh in character and very transparent; to pro- cure a pure cellulose, it must be exhausted in an alkaline solution subsequent to the treatment with acid.

The waste of jute is largely used in the manufacture of coloured papers, but it has not hitherto been found possible to thoroughly bleach this fibre without at the same time destroying its strength.

A long series of experiments, with a view to the intro. duction of bamboo fibre for paper making, has been undertaken by Mr Thomas Routledge, the well-known introducer of esparto, who recommends the employment of the young shoots. It may well be doubted whether the bamboo has any chance as a competitor against the new processes for preparing wood.

A host of other fibres have been tried from time to time, such as dis grass from the north coast of Africa, the leaves of the dwarf palm, sugar-cane refuse, the stalks of the hop plant, nettles, peat, Phormium tenax from New Zealand, with many others (see Dr Hugo Miiller’s Pflanzenfaser), but none with such success as to call for notice here.

Soda Recovery.—In the preparation of esparto, wood, and other raw material for manufacture into

(bisulphite of magnesia). While these all containa common principle, they differ in detail, as to pressure, blowing off of the sulphurous acid gas, &c., but they all present a very marked resemblance to Tilghmann’s expired patent, 1866, No. 2924. The pulp produced by all those processes is of

excellent quality; and, according to the statements of the patentees, it can be prepared at a cost greatly lower than by the soda process. The strength of the fibre is maintained unimpaired even after bleaching, and white paper made solely from such pulp is in every respect superior to that manufactured solely from pulp prepared by boiling with caustic soda. Dr Mitscherlich’s process has been extensively adopted in Germany, and there seems little doubt that these pro- cesses will in time supplant the use of soda in the case of wood. The great objection to them all is that, as they all depend on the use of bisulphite, which, being an acid salt, cannot be worked in an iron boiler, the boiler must be lined with lead; and great difficulty has been encoun- tered in keeping the lead lining of the boiler in repair. This is a difficulty, however, which will probably be over- come with further experience. The objection to cellulose

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Fia. 14.—Porion Evaporator.

paper, large quantitics of caustic soda are employed, and, as the resulting liquid after boiling the fibre in canstic soda solution is strongly alkaline and dark-coloured, it is very desirable to keep it out of the rivers. In order to effect this it is in many mills evapo- rated, and the soda it contains recovered, and, after caustiecizing, re-used. Many forms of evaporator have been proposed, and of late years great improvement has been made in their construction. Pro- bably the best form is the Porion evaporator (fig. 14). This consists of an evaporating chamber A, on the floor of which a few inehes of the liquid to be evaporated rest. By the action of fanners B, B re- volving at a high speed and dipping into the liquid, it is thrown up in a fine spray through which the heated gases pass to the chimney. After being concentrated in the evaporating chamber the liquid flows into the incinerating furnaces C,C, where the remaining water is driven off by the heat of the fire D, and the mass afterwards ignited to drive off the carbonaceous matter. A considerable feature in this evaporator is Menzies and Davis's patent smell chamber E, a cham- ber filled with masonry in which the strongly-smelling gases from the incinerating furnace are allowed to remain at a red heat fora short time. After being recovered, the soda, in the form of crude ear- bonate, is lixiviated and re-causticized by boiling with milk of lime. Sizes of Paper.—The following are the ordinary sizes :—

Printing Papers. Cartridge Papers.

Ins. Ins. : Ins. Ins. ce 12h % 15 | Booleea eases sicncoves DS: AGE COB cise canna 16)-x 21 | Fools… on gam 14 ×18? Dale POPs cocacciceonenecaey Ce ee see hs Fee 0 oer 178 ×29} | Demry…0..2… a8 173 × 225 POOIMAP 6.45 ce. ecissea hice LSE LOR | Meta Wan 2 owoee serene 7h O26) Medium |, .2.4..00. 184 «x 90 | Reyal …03.0.28 19 ×24 Double foolscap!. ....06.0..6 16h ae 204 | Baye .ccnten anes $9 OE. | Baa. ocemenen-0 20 ×25 | Super royal…..... 19} x 275 Foolscap and third…..... 13} x 22 {Super royal…..... *, 84% 97 | Super royals…....+. 21 ×27 | Imperial…..... 20 ae Foolscap and half…..... 18) % 242 | Kanperiall i… «0.4 29> x80) | Double pott s.c.2.2. 15 ×25 | Elephant…..... 23 ×28 PIBENOA OM… cence ove 144×184 | Elephant…..... 28 ×28 | Double foolscap….. 1? 2a Lh Se rer 154×19 | Double elephant…. 26440 | Double crown…..... 20 ×30 Dowiblenpast. 2… 006.0000 Fe LG SOR" Atlas eee Sear ae 264×84 | Double demy…..... 224 × 854 LGR MORE. Haters ceeds

«250 164 × 20% | Columibier . 2.06. s.0— 234 × 244 Double large post ……..... 202×383 | Antiquarian……..... 31 ×53

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American Paper Trade,—At the end of 1882 there were in the

United States 1051 paper mills (1004 the previous year). Of this number 1018 are in active operation. These mills are owned and worked by 823 firms or establishments, an inerease of 23 over the previous year. Twenty-three mills were abandoned during 1882, while 17 were destroyed by fire ; 36 were in course of construetion, and 68 new mills went into full work during 1882, This number is composed of a few mills reconstrueted after fire, and 39 new establishments erected during 1882. The mills represent almost every variety of paper and pulp, and have an estimated daily capacity of 300 tons. Altogether there were in 1883 44 more mills in operation than in 1882. At the beginning of 1884 36 new mills

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British Paper Trade. — The eomparative returns of the | the Board of Trade (Great Britain) for the years 1882 and 1883 amounts and values of the imports and exports published by ; are as follows :— CN eee Eee Imports. Exports. Article, Weight. Value. Weight. Value. 1882 1883. 1882. 1883. 1882. 1883, 1882 ‘1883. _ a Cwts. Cwts. £ £ Cwts, Cwts. & £ Writing and printing papers ……..... 190,089 209,455) 335,621 344,186 | 413,645 445,859 | 1,003,247 | 1,026,617 Miscellaneous papers ……..... ..ceeeee ».| 911,458 952,723 | 872,590 902,514 | 171,302 152,930 301,778 258,017 BOL PAPEL .....seceseee- Bs eaneedont 1,101,547 | 1,162,178 | 1,208,211 | 1,246,700 | 584,947 598,789 | 1,305,025 | 1,284,630 Tons. Tons. Tons, Tons. BUSPATLO, «2.0.2 cc ee cece eee cecee wees eennceresens 181,056 206,558 | 1,282,014 | 1,383,021 ae ace ae Fee OE eee eee eee a al 301,083 401,615 49,352 51,019 526,554 501,035 Ss. S. oon s cat pec aveudevenseenee ve 84,981,120 80,626,560; 821,692 756,616 ne Cwts.

Cwts.

121,607 | 123,038 | 1,169,592 | 1,175,642 were being eonstrueted and may be expeeted to be at work during the year. Every variety of paper is extensively manufactured in the United States with the exception of hand-made, but of late years attention has becn devoted to this also, English plant and labour having been imported for the purpose, and hand-made papers are now regularly produeed in small quantities.

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PAPER HANGINGS. See Murat Decoration, vol. Bea. p. 38.

PAPHLAGONTIA, in ancient geography, was the name given to a province of Asia Minor, situated on the Euxine Sea, and adjoining Bithynia on the west and Pontus on the east, while towards the south it was separated from Galatia by a range of mountains which may be considered asa prolongation to the east of the Bithynian Olympus. According to Strabo, whose authority is generally followed upon this point, the river Parthenius formed the western limit of the region so-called, and it was bounded on the east by the much more important river Halys. Although the Paphlagonians play scarcely any part in history, they were one of the most ancient nations of Asia Minor, as their name appears in the Homeric catalogue of the allies of Priam during the Trojan War (J1., ii. 851). They are after- wards mentioned by Herodotus among the races reduced to subjection by Croesus, and they sent an important con- tingent to the army of Xerxes in 480 B.c. They seem, however, to have enjoyed a state of at least semi-independ- ence, as Xenophon speaks of them as being governed by a prince of their own, without any reference to the satraps of the neighbouring parts of Asia. The rugged and difficult nature of their country, which is described by Xenophon as containing fertile and beautiful plains, but traversed by lofty ranges of mountains, which could only be crossed by narrow and difficult

passes, doubtless contri- buted to this result. At a later period Paphlagonia passed under the yoke of the Macedonian kings, and we find it after the dcath of Alexander the Great assigned, together with Cappadocia, to Eumenes. It continued, however, to be governed by native princes until it was absorbed by the encroaching power of the neighbouring kingdom of Pontus. The rulers of that dynasty became masters of the greater part of Paphlagonia as early as the reign of Mithradates Hil, (802-266 x.c.), but it was not till that of Pharnaces

(183 B.c.). From this time the whole province was Incorporated with the kingdom of Pontus until the fall of

I. that the important city of Sinope fell into their hands |

the great Mithradates (65 B.c.). In the settlement of Asia |

which followed that event, Pompey united the coast districts of Paphlagonia with the province of Bithynia, but left the interior of the country under one of the native princes, two or three of whom followed in succession until the dynasty became extinct and the whole country was incorporated in the Roman empire. All these petty native rulers appear to have borne the name or surname of Pylemenes, as a token that they claimed descent from the chieftain of that name who figures in the Jéiad as the leader of the Paphlagonians. Under the Roman empire Paphlagonia, with the greater part of Pontus, was united into one province with Bithynia, as we find to have been the case in the time of the younger Pliny; but the name was still retained by geographers, though its boundaries are not distinctly defined by Ptolemy. It reappears as a separate province in the 5th century (Hierocles, Synecd., c, 33).

ike ethnic relations of the Paphlagonians are very uncertain. It seems perhaps most probable that they belonged to the same race with the Cappadocians, who held the adjoining province of Pontus, and who were undoubtedly a Semitic race. Their language, however, would appear from the testimony of Strabo to have been distinct from that of their neighbours. Equally obscure is the relation between the Paphlagonians and the Eneti, or Heneti, who are mentioned in connexion with them in the Homeric catalogue, and who were supposed in the mythical fictions of antiquity to be

the ancestors of the Veneti, who dwelt at the head of the Adriatic. But no trace is found in historical times of any tribe of that name in Asia Minor.

The greater part of Paphlagonia is a rugged and mountainous country, but it contains fertile valleys, and produces great abundance of fruit. The mountains also are clothed with dense forests, which are conspicuous for the quantity of boxwood which they furnish. Hence its coasts were from an early period occupied by Greek colonies, among which the flourishing city of Sinope, a colony from Milctus, founded about 630 B.c., stood pre-eminent. Amastris, a few miles east of the Parthenius,

became an important town under the Macedonian monarchs; while Amisus, a colony of Sinope, which was situated a short distance east of the Halys, and therefore did not fall strictly within the limits of Paphlagonia as defined by Strabo, though often considered as belonging to that pro- vince, rose to be almost a rival of its parent city. The other towns along the coast of the Euxine were of little consequence, and none of those in the interior ever rose to any importance. The most considerable were Gangra, in ancient times the capital of the Paphlagonian kings, after- wards called Germanicopolis, and situated near the frontier of Galatia, and Pompeiopolis, in the valley of the Amnias (a tributary of the Halys), near which were extensive mines of the mineral called by Strabo sandarake (red arsenic), which was largely exported from Sinope. (E. H. B.) PAPHOS, the name of two cities near the west coast of Cyprus. Old Paphos was on the river Bocarus, about 10

stadia from the coast, near the promontory Zephyrium ; it

had a harbour at the mouth of the river. The city was distinguished by a temple of Aphrodite, to which an oracle was attached ; the priest exercised a sort of hieratic supre- macy over the whole island. Paphos was the favourite city of Aphrodite, who is often styled the Paphian goddess. The grave of Aphrodite was shown in the city, and her image in the temple was a conical stone. There is no doubt that both the city and the cultus were of Phcenician origin. Apollodorus says that the Syrian king Cinyras was the founder. The place was subject to earthquakes ; it was totally destroyed by a

shock in the time of Augustus, and, being restored by that emperor, took the name Augusta or S

PAPIAS, bishop of the Phrygian Hierapolis in the first half of the 2d century, is mentioned by Irenzu; as “an ancient man,” “the hearer of John and the com- panion of Polycarp.” According to the Chronicon Pascale, Papias suffered martyrdom at Pergamum in the year of that of Polycarp at Smyrna (163 a.p., or, according to other reckonings, 156). His name figures largely in Biblical criticism in connexion with his work entitled Aoyiwy kuptaxév e&yynows, of which only a few small frag- ments have been preserved in the form of citations in the writings of Irenzus, Eusebius, and later authors. See GOSPELS, vol. x. p. 815 sq.

The fragments are collected in Routh’s Relig. Sacr. (vol. i., 1846), and in Gebhard and Harnack’s Patr. Apost. Opera.

PAPIER MACHE (mashed or pulped paper) is a term embracing numerous manufactures in which paper pulp is employed, pressed and moulded into various forms other than uniform sheets, such as ordinary paper and millboards. In the East the art has long been practised, especially in Kashmir, where, under the name of kar-1- kalamdani, or pen-tray work, the manufacture of small painted boxes, trays, and cases of papier mdché is a characteristic industry. About the middle of the 18th century papier maché work came into prominence in Europe in the form of trays, boxes, and other small domestic articles, japanned and ornamented in imitation of Oriental manufactures of the same class; and contempor- aneously papier maché snuff boxes ornamented in vernis Martin came into favour. In 1772 Henry Clay of Birmingham secured a patent for a method of preparing this material, which he used for coach-building, for door and other panels, and for many furniture and structural pur- poses. In 1845 the application of the material to internal architectural decoration was patented by C. F. Bielefeld

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of London, and for this purpose it has come into extensive use. Under the name of carton pierre, a substance which is essentially papier maché is also

largely employed as a substitute for plaster in the moulded ornaments of roofs and walls, and the ordinary roofing felts, too, are very closely allied in their composition to papier maché. Under the name of ceramic papier maché, architectural enrich- ments are also made of a composition patented by Mr Martin, the constituents of which are paper pulp, resin, glue, a drying oil, and acetate of lead. Among the other articles for which the substance is used may be enumer- ated masks, dolls' heads and other toys, anatomical and botanical models, artists' lay figures, milliners' and clothiers' blocks, mirror and picture frames, tubes, &e.

The materials for the commoner classes of work are old waste and scrap paper, repulped, and mixed with a strong size of glue and paste. To this very often are added large quantities of ground chalk, clay, aud fine sand, so that the preparation is little more than a plaster held together by the fibrous pulp. For the finest class of work Clay's: original method is retained. It consists of soaking several sheets of a specially made paper in a strong size of paste and glue, pasting these together, and pressing them in the mould of the article to be made. The moulded mass is dried in a stove, and, if necessary, further similar layers of paper are added, till the required thickness is attained. The dried object is hardened by dipping in oil, after which it is variously trimmed and prepared for japanning and ornamentation. For very delicate relief orna- ments, a pulp of scrap paper is prepared, which after drying is ground to powder mixed with paste and a proportion of potash, all of which are thoroughly incorporated into a fine smooth stiff paste, The numerous processes by which surface decoration is applied to papier maché differ in no way from the application of like ornamentation to other surfaces. Papier mache for its weight is an exceedingly tough, strong, durable substance, possessed of pe elasticity, little subject to warp or fracture, and unaffected by

amp.

PAPIN, Denis (1647-c.1712), French physicist, and one of the inventors of the steam-engine, was a native of Blois, where he was born in 1647. In 1661 or 1662 he entered upon the study of medicine at the university of Angers, where he graduated in 1669, with the intention apparently of settling as a practising physician in that city. Some time prior to 1674 he

removed to Paris and assisted Huygens in his experiments with the air-pump, the results of which (Hapériences du Vuide) were published at Paris in that year, and also in the form of five papers by Huygens and Papin jointly, in the Philosophical Transactions for 1675. Shortly after the publication of the Lxpériences, Papin, who had crossed to London hoping to find some congenial employment, was hospitably received by Boyle, and gave him some assistance in his laboratory and with his writings ; about this time also he introduced into the air-pump the improvement of making it with double barrels, and replacing by the two valves the turn-cock hitherto used. He is said, moreover, to have been the first to use the plate and receiver, which are organs of capital importance in the modern form of the instrument. Subsequently he invented the condensing-pump, and in 1680 he was admitted, on Boyle's nomination, to the Royal Society. In the following year he communicated to the Society an account of his famous steam " digester, or engine for softening bones," afterwards described in a tract published at Paris, and entitled La maniere Pamollir les os et de faire couire toutes sortes de viandes en fort peu de tems et & peu de frais, avec une description de la marmite, ses propriétés et ses usages. In this instrument the principle of the safety-valve was applied for the first time. After some further experiments with the digester he accepted an invitation to Venice to take part in the work of the recently founded Academy of the Philosophical and Mathematical Sciences; here he remained until 1684, when he returned to London and received from the Royal Society an appointment as "temporary curator of experl- ments," with a small salary. In this capacity he carried

on numerous and varied investigations, in the course of which he discovered a siphon acting in the same manner as the "Sipho Wirtembergicus" (Phil. Z'r., 1685), and also constructed a model of an engine for raising water from a river by means of pumps worked by a water-wheel In November 1687 he was ap- pointed to the chair of mathematics in the university of Marburg, and here he remained until 1696, when he re- From the time of his settlement in Germany he carried on an active correspondence with Huygens and Leibnitz, which is still preserved, and in one

driven by the current.

movea to Cassel.

of his letters to Leibnitz, in 1698, he mentions that he is

engaged on a machine for raising water to a great height

by the force of fire ; in a later communication he speaks also of a little carriage he had constructed to be propelled by this force. Again in 1702 he wrote about a steam “hallista,” which he anticipated would “promptly compel France to make an enduring peace.” In 1705 Leibnitz sent Papin a sketch of Savery’s engine for raising water,

and this stimulated him to further exertions, which re-

sulted two years afterwards in the publication of the Ars nova ad aquam ignis adminiculo efficacissime elevandam (Cassel, 1707), in which his high-pressure boiler and its applications are described (see Steam-Encine). In 1707 he resolved to quit Cassel for London, and on September 24th of that year he sailed with his family from Cassel in an ingeniously constructed boat, propelled by paddle- wheels, to be worked by the crew, with which he appa- rently expected to reach the mouth of the Weser. The expedition, however, came to an ignominious end at Minden, where the vessel was confiscated at the instance of the boatmen, who objected to the invasion of their ex- elusive privileges in the Weser navigation. Papin, on his subsequent arrival in London, found himself without re- sources and almost without friends; various applications through Sloane to the Royal Society for grants of money were made in vain, and he died in total obscurity, pro- bably about the beginning of 1712.

The published writings of Papin, besides those already referred to, consist for the most part of a large number of papers, princi- pally on hydraulics and pneumatics, contributed to the Journal des Savans, the Nouvelles de la Republique des Lettres, The Philosophical Transactions, and the Acta Eruditorum; many of them were eollected by himself into a Fasciculus dissertationum (Marburg, 1695), of which he published also a translation into French (Recwetl de diverses pieces touchant quelques nouvelles

machines (Cassel, 1695). His correspondence with Leibnitz and Huygens, along with a biography, lias been published by Dr Ernst Gerland (Leibnizen's wnd Huygens' Briefwechsel mit Papin, nebst der Biographie Papin's, Berlin, 1881).

PAPINIAN, the most celebrated of Roman jurists, was magister libellorum and afterwards preetorian prefect under Septimius Severus. He was an intimate friend of the emperor, whom he accompanied to Britain, and before his death Severus specially commended his two sons to his charge. Papinian was faithful to his trust, and tried to keep peace between the brothers, but with no better result than to excite the hatred of Caracalla, to which he fell a victim in the general slaughter of Geta's friends which followed the fratricide of 212 a.p. The details are variously related, and have undergone legendary embellishment, but it is certain that the murder of Papinian, which took place under Caracalla's own eyes, was one of the most disgraceful crimes of that hideous tyrant. Little more is known about Papinian. He was perhaps a Syrian by birth, for he is said to have been a kinsman of Severus's second wife, Julia Domna; that he studied law along with Severus under Sceevola is asserted In an interpolated passage in Spartian (Caracal., c. 8). Papinian's place and work as a jurist will fall to be dis- cussed under Roman Law (¢.v.).

PAPPENHEIM, Gorttrriep HEINRICH,

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(1594-1632), imperialist general in the Thirty Years' War, was born on the 29th May 1594. He attended the high schools of Altdorf and Tiibingen, but did not seem to profit much by the instruction he received at either institution. In his twentieth year he joined the Roman Catholic Church ; and zeal for his new faith induced him to enter the military service of King Sigismund in Poland and afterwards that of Maximilian, duke of Bavaria, head of the Catholic League. In 1620, as a colonel in the army of the League, he distinguished himself in the battle near Prague which decided the fate of Frederick, king of Bohemia. In this battle, after fighting with extraordinary energy, he was severely wounded, and for many hours lay

unnoticed under his horse. He received, in 1623, the command of a regiment of cuirassiers who became famous as the Pappenheimer, and with them he fought from 1623 to 1625 at the head of the Spaniards in Lombardy. In 1626, having been recalled to Germany by Duke Maximilian, he crushed an insurrection of peasants in Upper Austria, obtaining in the course of a month a series of victories in which 40,000 peasants are said to have been killed. He then went to the help of Tilly against Christian IV. of Denmark, and took a prominent part in the storming of Magdeburg, the inhabitants of which were treated by him and by his soldiers with savage cruelty. After the battle of Breitenfeld, which was fought at an unsuitable time, contrary to the wish of Tilly, in conse- quence of Pappenheim's impetuosity, he covered the retreat of the imperialists; and in Westphalia and the country of the lower Rhine he stimulated the enthusiasm of his party by several successful engagements. When Tilly died, Pappenheim aided Wallenstein in subduing Saxony. On his way to the lower Rhine, where he proposed to support the Spaniards, he was summoned by Wallenstein to Liitzen, where battle was about to be given to Gustavus Adolphus ; and at the moment of his arrival fortune seemed already to have declared for the Swedes. Pappenheim threw himself into the conflict, and his attack was so furious that the enemy began to give way; but two musket balls penetrated his breast, and he had to be carried from the field. He died on the 17th November 1632, the day after the battle. He left behind him the reputa- tion of one of the bravest warriors and most ardent Catholics of his day. Notwithstanding the sternness of his discipline, he was idolized by his troops.

Sec Hess, Gottfried Heinrich, Graf zu Pappenhecim, 1855.

PAPPUS, or ALEXANDRIA, a geometer of a very high order, belongs to a time when already the Greek mathematicians of great original genius had been succeeded and replaced by a race of learned compilers and com- mentators, who confined their investigations within the limits previously attained, without adding anything to the development of mathematics. To the general medio- crity Pappus must be considered to be a remarkable exception ; for, although much even of his work is of the nature of compilation (which is, however, itself of great historical value), there is yet much the discovery of which cannot well be attributed to any one else.

According to Proclus, he was at the head of a school; but how far he was above his contemporaries, how little appreciated or understood by them, is shown by the absence of references to him in other Greek writers, and by the fact that his work had no effect in arresting the decay of mathematical science. In this respect the fate of Pappus strikingly resembles that of Diophantus, another living power amid general stagnation. In reading the Collection of Pappus, we meet with no indication of the date of the authors whose treatises he makes use of, or of the time at which he himself wrote. If we had no other information than can be derived from a perusal of his work, we should

only know that he was later than Claudius Ptolemy, whom he quotes often and with respect. Suidas states that he was of the same age as Theon of Alexandria, who wrote commentaries on Ptolemy's great work, the Almuagest, and flourished in the reign of Theodosius I. (379-395 a.p.). Suidas asserts also that Pappus wrote a commentary upon the same work of Ptolemy. But it would seem incredible that two contemporaries should have at the same time and in the same style composed commentaries upon one and the same work, and yet neither should have been mentioned by the other, whether as friend or opponent. We have apparently no reason to question the statement of Suidas that Pappus wrote such a commentary. But the similarity of two such commentaries as those of Pappus and Theon may easily have led Suidas to confuse the two, and so suppose the two authors to have been contemporary. There is, then, reason to believe that Suidas may have been mistaken ; we have, however, another authority, whose statement, on the supposition that it is false, is completely incomprehensible. This is the author of certain historical glosses, which are found in the margin of a MS. belonging to the beginning of the 10th century. Here it is stated, in connexion with the reign of Diocletian (284-305 .p.), that Pappus wrote during that period. Except the two distinctly contradictory statements of Suidas and the scholiast, we have no evidence of the date of Pappus; and it seems accordingly best to accept the date indicated by the scholiast.

The work of Pappus which has come down to us bore the title cuvvaywyy or Collection, as we gather from references in the work itself, and from the scholia appended to the Vatican MS. 218 of the 12th century. This collection, which consisted of eight books, we possess only in an incomplete form, there being no part remaining of the first book, and the rest also having suffered con- siderably. It is curious that no ancient writer, with the exception of the author of the appendix to book iii, quotes the work under its proper title, though Eutocius's reference (Archimedes, p. 139 sq., ed. Torelli), és Idzros év pnxaviKats cicaywyats, is no doubt to book viii. of the Collection.

Suidas enumerates other works of Pappus as follows :— Xepoypadpia oikoumenky, cis Ta Técoapa PiBrAla THs IIrodcuaiou peydAns cuvragews brduvypa, rorapods Tovs ev ArBvy, dverpoxpirexd. The question of Pappus's com- inentary on Ptolemy's work is discussed by Hultsch, Pappi Collectio (Berlin, 1878), vol iii. p. xiii. sg. Pappus himself refers to another commentary of his own on the dvéAnppa of Diodorus, of whom nothing is known. There are, inoreover, indications that he commented on Euclid's Llements, and on Ptolemy's dpwovxé. Further, there is a doubtful work entitled Opusculum de multiplicatione et divistone sexagesimalibus Diophanto vel Pappo tribuendum, which has been edited by C. Henry (Halle, 1879); and, lastly, a tract, Anonymi commentarius de Jiguris planis aso-perumetris, has been inserted by Hultsch in vol. iii. of his edition of Pappus.

The characteristics of Pappus's Collection are that it con- tains an account, systematically arranged, of the most im- portant results obtained by his predecessors, and, secondly, notes explanatory of, or extending, previous discoveries. These discoveries form, in fact, a text upon which Pappus enlarges discursively, many of his additions having no very decided points of connexion with the direct subject under discussion. Very valuable are the systematic introductions to the various books which set forth clearly in outline the contents and the general scope of the subjects to be treated. From these introductions we are able to judge of the style of Pappus's writing, which is excellent and even elegant the moment he is free from the shackles of

mathematical formule and expressions. At the same time his characteristic exactness makes his collection a most admirable substitute for the texts of the many valuable treatises of earlier mathematicians of which time has deprived us.

We proceed to summarize briefly the contents of that portion of the Collection which has survived, mentioning separately certain propositions which seem, in the light of modern developments of mathematics, to be among the most important.

Of book i. the whole has been lost. We can only conjecture that it, as well as book ii., was concerned with arithmetie, book ifi, being clearly introduced as beginning a new subject,

The whole of book ii. (the former part of which is lost, the exist- ing fragment beginning in the middle of the 14th proposition) related to a system of multiplication due to Apollonius of Perga, On this subject see Nesselmann, Algebra der Gtriechen, Berlin, 1842, pp. 125-1384; and Friedlein, Die Zahlzeichen und das elementare Rechnen der Griechen und Rémer, Erlangen, 1869.

Book iii. contains geometrical problems, plane and solid. Tt may be divided into five sections. (1) On the famous problem of finding two mean proportionals between two given lines, which arose from that of doubling the cube, reduced by Hippoerates to the former. Pappus gives the solutions of this problem by Eratosthenes, Nicomedes, and Heron, and finally his own solution of the more general problem of finding geometrically the side of a cube whose content is in any given ratio to that of a given one. (2) On the three different means between two straight lines, the arithmetic, the geometric, and the harmonic, and the problem of representing all three in one and the same geometrical figure, This serves as an introduction to a general theory of means, of which Pappus distinguishes ten kinds, and gives a table repre- senting examples of each in whole numbers. (3) On a curious problem of the same type as Eucl. i. 21. (4) On the inseribing of each of the five regular polyhedra in a sphere. (5) An addition by a later writer on another solution of the first problem of the book.

Of book iv. the title and preface have been lost, so that the programme has to be gathered from the book itself. At the begin- ning are various theorems on the circle, leading up to the problem of the construction of a circle which shall circumscribe three given circles touching each other two and two. This and several other problems of contact form the first division of the book. Pappus turns then to a consideration of certain properties of Archimedes's spiral, the conchoid of Nicomedes (already mentioned in book i. as supplying a method of doubling the cube), and the curve dis- covered most probably by Hippias of Elis about 420 B.c., and known by the name 4 rerpaywvifovea, or quadratrix, from the property that, if it could be practically constructed, it would enable us to square the circle. Having described the ordinary—the mechanieal, as Pappus calls it—definition of this curve, he proceeds to show how it might be constructed by projecting orthogonally suitable plane sections of certain surfaces which he calls plectoids described by means of (a) the helix described on a cylinder, (6) the plane helix, or Archimedes's-spiral. From these propositions it would seem that plectoid was the Greek general term for surfaces deseribed by the motion of a straight line always passing through a fixed straight line and a curve, aud remaining parallel to a fixed plane. Proposition 30 describes the construction of a curve of double curvature called by Pappus the helix on a sphere; it is deseribed by a point moving uniformly along the arc of a great circle, whieh itself turns about its diameter uniformly, the point deseribing a quadrant and the great circle a complete revolution in the same time. The arca of the surface included between this curve and its base is found—the first instance of quadrature of a curved surface. The rest of the book treats of the trisection of an angle, and the solution of certain problems by means of the quadratrix and spiral.

In book v., after an interesting preface concerning regular polygons, and containing some remarks upon the hexagonal form of the cells of honeycombs, Pappus addresses himself to the eom- parison of the areas of different plane figures which have all the same perimeter (following Zenodorus's treatise on this subject), and of the volumes of different solid figures whicl: have all the same superficial area, and, lastly, a comparison of the five regular solids of Plato. ?

Aceording to the preface, book vi. is intended to resolve diffi- culties occurring in the so-called pixpds dorpovomotpevos. It accordingly comments on the Sphewrica of Theodosius, a treatise of Autolycus, Theodosius's book on Day and Night, the treatise of Avistarchus On the Size and Distances of the Sun and Moon, and Kuelid's Opties and Phenomena.

The preface of book vii. explains the terms analysis and synthesis, and the distinction between theorem and problem. Pappus then enumerates works of Euclid, Apollonius, Aristeus,

and Eratosthenes, thirty-three books in all, the substance of which he intends to give, with the lemmas necessary for their elucidation. With the mention of the Porisms of Euelid we have an account of the relation of porism to theorem and problem. Inthe same preface we have enunciatcd (a) the famous problem known by Pappus's name—Having given a number of straight lines, to find the geometric locus of a point such that the lengths of the perpendiculars upon, or (more generally) the lines drawn from t obliquely at given inclina- tions to, the given lines satisfy the condition that the product of certain of them may bear a constant ratio to the product of the remaining ones ; (b) the theorems which since the 17th century have been called by the name of Guldin, but appear to have been dis- covered by Pappus himself. Book vii. contains also (1) under the head of the de determinata sectione of Apollonius, lemmas which, closely examined, are seen to be cases of the involution of six points ; (2) important lemmas on the Porisms of Euclid (see Ports); (3) a lemma upon the Conics of Apollonius, which is the first statement of the constant relation between the distances of any point ou a conic from the focus and directrix.

Lastly, book viii. treats principally of mechanics, the properties of the centre of gravity, and some mechanical powers. Inter- spersed are some questions of pure geometry. Proposition 14 gives a simple construction for the axes of an ellipse, when a pair of con- jugate diameters are given.

Of the whole work of Pappus the best edition is that of Hultseh, bearing the title Pappi Alexandrini Collectionis que supersunt e libris manuscriptis

edidit Latina interpretatione et commentariis instruxit Fridericus Hulisch, Berlin, 1876-78. Previously the entire eolleetion had been published only in a Latin translation, Pappi Alerandrini mathematice collectiones a Federico Commandino Urbinate in latinum converse et commentariis illustrate, Pesaro, 1588 (reprinted at Venice, 1539, and Pesaro, 1602). A seeond edition of this work was published by Carolus Manolessius, entitled Pappi Alexandrini mathematice collectiones a Federico Commandino Urbinate in latinum converse et commentariis illustratx, in hac nostra editione innumeris quibus scatebant mendis et precipue in Greco contextu diligenter vindicate, Bologna, 1660. The merits of these two works are diseussed by Hultseh, who remarks that the editor of the second edition, so far from making good the title and his boastful preface, has actually much marred the original book.

Of books whieh contain parts of Pappus's work, or treat ineidentally of it, we may mention the following titles:—{1) Pappi Alexandrini collectiones mathe- matice nunc primum Greece edidit Herm. Jos. Eisenmann, Libri quinti pars altera, Parisiis, 1824. (2) Pappt Alexandrini Secundi Libri Mathematice Col- lectionis Fragmentum e codice MS. edidit Latinum fecit Notisque tilustravit Johannes Waitlis, Oxonize, 1688. (8) Apollonit Pergwi de sectione rationis libri duo ex Arabico MSto latine versi, Accedunt eiusdem de sectione spatti libri duo restituti, Premittitur Pappi Alexandrini prefatio ad VIImum collectionts mathe- matice, nunc primum grece edita: cum lemmatibus eiusdem Pappit ad hos Apol- lonii libros, Opera et studio Edmundi Halley, Oxonii, 1706. (4) Apollonit Pergexi conicorum libri IV. priores cum Pappi Alexandrint lemmatis ex codd. MSS. Grecis edidit Edmundus Haileius, Oxonie#, 1710. (5) Der Sammiung des Pappus von Alexandrien siebentes und achtes Buch grtechisch und deutsch herausgegeben von C. I, Gerhardt, Halle, 1871. CES WH)

PAPUAN LANGUAGES. The languages spoken in New Guinea (9.v.) and other islands peopled by Papuas differ more widely from the Malayo-Polynesian languages than those of the Negritos in the Philippine Islands do from the dialects of the contiguous Malayan tribes. In fact, they form as separate a class by themselves as the Melanesian languages do as contradistinguished from the Polynesian group. From the meagre grammatical sketch of the Mafor (or Nufor) language—the only one to

which the Dutch missionaries have paid some attention, but which may be taken as a type of the class—we gather that the verb has the subject pronoun prefixed in the singular, dual, and plural; past time is expressed by the word kwar, “already,” prefixed, and futurity by nerri, “ still,” added to the verb; certain modifications of the sense are effected by 7 being prefixed, and others by ¢ being affixed, to the radical vowels a, 0, or wu, and others again by the substantive affix 7a (plur. sia). Much uncertainty, however, still prevails as to the precise import of those grammatical forms. See J. L. van Hasselt’s Woordenboek and Beknopte Spraakkunst der Noefoorsche taal, both of which appeared at Utrecht in 1876; Fr. Miiller’s Grundriss der Sprach- wissenschaft, i., ii. p. 30 sg.; and more especially G. von der Gabelentz and A. B. Meyer, Bettrdge zur Kenntniss der Melanesischen, Mikronesischen, und Papuanischen Sprachen, Leipsic, 1882, and their essay, “ Einiges tiber das Verhiltniss des Mafoor zum Malayischen,” in Bijdragen tot de taal-, land-, en volkenkunde van Neder- landsch-Indié, for 1883. The former of these publications contains also a survey of the literature .on the subject. Vocabularies of the languages spoken by the various coast tribes with whom Europeans have come in contact have been collected by S. Miiller, Von Rosenberg, Miklucho

Maclay, and others. An intercomparison of those voca- bularies not only shows great phonetical divergencies, especially in the liquids r and J, but also in many cases the same absence of word affinity in consequence of which neighbouring Melanesian tribes are known to be unable to understand one another.

PAPYRUS, the paper reed, the Cyperus Papyrus of Linnzeus, was in ancient times widely cultivated in the Delta of Egypt, where it was used for various purposes, and especially as a writing material. As; however, the plant is now extinct in Lower Egypt, it is believed that it was not indigenous there, but was probably introduced from Nubia, where it is found at the present time, as well as in Abyssinia. Theophrastus (Hist. Plant., iv. 10) adds that it likewise grew in Syria; and, according to Pliny, it was also a native plant of the Niger and Euphrates. From one of its ancient Egyptian names, P-apu, was derived its Greek title mamupos, Lat. papyrus. By

Herodotus it is always called BvBAos, a word which was apparently also of Egyptian origin. The first accurate description of the plant is given by Theophrastus, from whom we learn that it grew in shallows of 2 cubits (about 3 feet) or less, its main root being of the thickness of a man's wrist, and 10 cubits in length. From this root, which lay horizontally, smaller roots pushed down into the mud, and the stem of the plant sprang up to the height of 4 cubits, being triangular and tapering in form. The tufted head or umbel is likened by Pliny to a thyrsus.

The various uses to which the papyrus plant was applied are also enumerated by Theo- phrastus. Of the head nothing could be made but garlands for the shrines of the gods ; but the wood of the root was employed in the manufacture of different utensils as well as for fuel. Of the stem of the plant were made boats, sails, mats, cloth, cords, and, above all, writing material (ra BiBAia), The pith was also a common article of food, and was eaten both cooked and in its natural state. Herodotus too notices its consumption as food (ii. 92), and incidentally mentions that it provided the material of which the priests' sandals were made (ii. 37). He likewise refers to the use of byblus as tow for caulking the seams of ships ; and the statement of Theophrastus that King Antigonus made the rigging of his fleet of the same material is illus- trated by the ship's cable, d7Aov BvBdwov, wherewith the doors were fastened when Ulysses slew the suitors in his hall (Odyss., xxi. 390). That the plant was itself used also as the principal material in the construction of light skiffs suitable for the navigation of the pools and shallows of the Nile, and even of the river itself, is shown by sculptures of the period of the fourth dynasty, in which men are represented in the act of building a boat with stems cut from a neighbouring plantation of papyrus (Lepsius, Denkm., ii. 12). It is to boats of this description that Isaiah probably refers in the "vessels of bulrushes upon the waters" (xviii. 2). If the Hebrew gome (4) also is to be identified with the Egyptian papyrus, something may be said in favour of the tradition that the bulrushes

of which the ark was composed in which the infant Moses was laid, in the flags by the river's brink, were in fact the latter plant. Ancient authors have

likewise referred to the adaptation of the papyrus to other domestic purposes, both culinary and medicinal. But it seems hardly credible that the Cyperus Papyrus could alone bave sufficed for the many uses to which it is said to have been applied. Wilkinson has pointed out (Anc. Egyptians, ii. 121) that, the cultivation of this variety being limited to certain districts, where, moreover, it was a monopoly of the Government, it cannot have been employed for so many purposes; and we may therefore conclude that several plants of the genus Cyperus were comprehended under the head of byblus or papyrus—an opinion which is supported by the words of Strabo, who mentions both inferior and superior qualities. The Cyperus dives is still grown in Egypt, and is used to this day for many of the purposes named by ancient writers.

The widespread use of papyrus as a writing material throughout the ancient world is attested by early writers, and by documents and sculptures. In addition to the names of the plant, which were also applied to the material, the latter was also known as ydprys, charta. Papyrus rolls are represented in ancient Egyptian wall-paintings ; and extant examples of the rolls themselves are sufficiently numerous. The most ancient of these, known, from the name of its former owner, as the Prisse papyrus, and now preserved at Paris, contains a work composed in the reign of a king of the fifth dynasty, and is computed to be itself of the age of upwards of 2000 years B.c. The papyri dis- covered in Egypt have generally been found in tombs, and in the hands, or swathed with the bodies, of mummies. The ritual of the dead, which in its entirety or in an abridged form was buried with every person of consequence from the eighteenth dynasty to the Roman period, is most frequently the subject. And, besides the ritual and religious rolls, there are the hieratic, civil and literary, documents, and the demotic and enchorial papyri, relating generally to sales of property. Coptic papyri usually contain Biblical or religious tracts or monastic deeds.

The early use of papyrus among the Greeks is proved by the reference of Herodotus (v. 58) to its introduction among the Ionians. An inscription of 407 B.c. records the sale of two sheets (xdépra: dvo) at Athens, for two drachmas and four obols. ‘ Greek papyri have been found in Egypt of great importance both for their paleeographical and literary worth. The first instalment which came to light, as late as the year 1778, consisted of some

fifty rolls, which were discovered in the neighbourhood of Memphis ; but all, with one single exception, were carelessly destroyed. More fortunate were the documents found near the Serapeum of Memphis, and connected with that temple ; and further discoveries of valuable texts of Homer, Hyperides, and other classical writers have rewarded later searches (see PaLmocrapHy). The numerous rolls found in the ruins of Herculaneum generally contain the less interesting works of writers of the Epicurean school.

Papyrus also made its way into Italy, but at how early a period there is nothing toshow. Under the empire its use must have been extensive, for not only was it required for the production of books, but it was also universally employed for domestic purposes, correspondence, and legal documents. So indispensable did it become that it is reported that in the reign of Tiberius the scarcity and dearness of the material, caused by a failure of the papyrus crop, nearly brought on a riot (Pliny, WV. /, xiii. 13).

The account which Pliny (1. ZZ., xiii. 11-13) has trans- mitted to us of the manufacture of the writing material from the papyrus plant should be taken strictly to refer to the process followed in his own time ; but, with some

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differences in details, the same general method of treat, ment had doubtlessly been practised from time immemorial. His text, however, is so confused, both from obscurity of style and from corruptions in the MSS., that there is much difference of opinion as to the meaning of many words and phrases employed in his narrative, and their application in particular points of detail. In one important parti- cular, however, affecting the primary construction of the material, there can no longer be any doubt. The old idea that it was made from layers or pellicules growing between the rind and a central stalk has been abandoned, as it has been proved that the plant, like other reeds, con- tains only a cellular pith within the rind. The stem was in fact cut into longitudinal strips for the purpose of being converted into the writing material, those from the centre of the plant being the broadest and most valuable, The strips (philyre), which were cut with a sharp knife or some such instrument, were laid on a board side by side to the required width, thus forming a layer (scheda), across which another layer of shorter

strips was laid at right angles. The two layers thus “woven ”—Pliny uses the word ¢exere in describing this part of the process—formed a sheet (plagula, or net), which was then soaked in water of the Nile. ‘The mention of a particular water has caused trouble to the commentators. Some have supposed that certain chemical properties of which the Nile water was possessed acted as a glue or cement to cause the two layers to adhere ; others, with more reason, that glutinous matter contained in the material itself was solved by the action of water, whether from the Nile or any other source ; and others again read in Pliny’s words an implication that a paste was actually used. Be this as it may, the sheet was finally pressed and dried in the sun. Any roughness was levelled by polishing with ivory or a smooth shell. But the material was also subject to other defects, such as moisture lurking between the layers, which might be detected by strokes of the mallet; spots or stains; and spongy strips (¢enix), in which the ink would run and spoil the sheet. When such faults occurred, the papyrus must be re-made. To form a roll the sheets were joined together with paste (glue being too hard), but not more than twenty sheets in a roll (scapus). As, however, there are still extant rolls consisting of more than the prescribed number of sheets, either the reading of wicenx is corrupt, or the number was not constant in all times. The best sheet formed the first or outside sheet of the roll, and the others were joined on in order of quality, so that the worst sheets were in the centre of the roll. This arrange- ment was adopted, not for the purpose of fraudulently sell- ing bad material under cover of the better exterior, but in order that the outside of the roll should be composed of that which would best stand wear and tear. Besides, in case of the entire roll not being filled with the text, the unused and inferior sheets at the end could be better spared, and so might be cut off.

The different kinds of papyrus writing material and their dimensions are also enumerated by Pliny. The best quality, formed from the middle and broadest strips of the plant, was originally named hicratica, but afterwards, in flattery of the emperor Augustus, it was called, after him, Augusta ; and the charta Livia, or seeond quality, was so named in hoaour of his wife. The hieratica thus descended to the third rank. The first two were 18 digiti, or about 94 inches in width; the hécratica, 11 digiti or 8 inches. Next eame the charta amphithcatrica, named after the principal place of its manufaeture, the amphitheatre of Alexandria, of 9 digiti or 64 inches wide. The charta

Fanniana appears to have been a kind of papyrus worked up from the amphithcatria, which by flattening and other methods was increased in width by an ineh, in the factory of a certain Fanniusat Rome. The Sartea, which took its name from the eity of Sais, and was probably of 8 digiti or 53 inches, was ofa common description. The Teeniotica, named apparently from the place of its manufacture, a tongue 0 land (roivia) near Alexandria, was sold by weight, and was of

uncertain width, perliaps from 4} to 5 inches. And lastly there was the common packing-paper, the charta emporctica, of 6 digiti or 42 inches. Isidore (Etymol., vi. 10) mentions yet another kind,

the Corneliana, first made under C. Cornelius Gallus, prefect of

Egypt, which, however, may have been the samme as the amphi- theatrics or Fanniana. the anger of Augustus may have been suppressed by the same influence that expunged the episode of Gallus from the Fourth

Georgic (Birt, Antik. Buchwesen, p. 250). In the reign of the

emperor Claudius also another kind was introduced and entitled

Claudia. It had been found by experience that the charta Augusta Was, from its fincness and porous nature, ill suited for literary use ; it was accordingly reserved for eorrespondence only, and for other purposes was replaced by the new paper. The charta Claudia was made from a composition of the first and seeond qualities, the Argusta and the Livia, a layer of the former being backed with one of the latter; and the sheet was increased to nearly a foot in width. The largest of all, however, was the meaerocollon, probably of good quality and equal to the hieratic, and a cubit or nearly 18 inches wide. It was used by Cicero (pp. ad Alfic., xiii. 25; xvi. 3). The width, however, proved incon- venient, and the broad sheet was liable to injury by tearing.

‘An interesting question arises as to the accuracy of the different

measurements given by Pliny. His figures regarding the width of

the different kinds of papyri have gencrally been understood to eoncern the width (or height) of the rolls, as distinguished from their length. It has, however, been observed that in practice the width of extant rolls does not tally in any satisfactory degree with Pliny's measurements ; and a more plausible explanation has been lately offered (Birt, Antik. Buchwesen, pp. 251 sq.) that the preadth (not height) of the individual sheets of which the rolls are composed is referred to.

The first sheet of a roll was named zpwrtéxoAAoyv ; the last, egxaTordAAtoy. the comes largitionum, who had control of the manufacture, with the date and name of place. It was the practice to cut away the portion thus marked; but in case of legal documents this inutilation was forbidden by the laws of Justinian. On the Arab eonquest of Egypt in the 7th century, the manufacture was con- tinued, with the substitution of Arabic in marking the protocol. An instance of one of these Arab signatures is prescrved in a bull of Pope John VIII. of the year 876.

Varro's statement, repeated by Pliny, that papyrus was first made in Alexander's time, should probably be taken to mean that its mannfacture, which till then had been a Government monopoly, wasrelieved from all restrictions. Itis not probable, however, that it was ever manufactured from the native plant anywhere but in Egypt. At Rome there was certainly some kind of industry in papyrus, the charia Fanniana, already referred to, being an instance inillustration. But it seems probable that this industry was con- fined to the re-making of material imported into Italy, as in the case of the charta Claudia. This second manufaeture, however, is thought to have been detrimental to the papyrus, as it would then have been ina dried condition requiring artificial aids, such as a more liberal use of gum or paste, in the process. The more brittle condition of the Latin papyri found at Hereulaneum has been instanced as the evil result of this re-making of the material.

According to Strabo the Romans obtained the papyrus plant from Lake Trasimene and other lakes of Etruria, but this statement is unsupported by any other authority and appears to have been niade imerror, At a later period, however, a papyrus was eultivated in Sicily, which has bcen identified by Parlatore with the Syrian variety (Cyperus syriacus), far

exceeding in height the Egyptian plant, and having a more drooping head. It grew in the east and south of the island, where it was probably introduced during the Arab occupation. It was seen in the 10th eentury, by the Arab traveller Ibn-Haukal, in the neighbourhood of Palermo, where it throve luxuriantly in the pools of the Papireto, a stream to which it lent its name. From it paper was made for the sultan's use. 3ut in the 13th century it began to fail, and in 1591 the drying up of the Papireto caused the extinction of the plant in that district. itis still to be seen at Syracuse, but it was probably transplanted thither at a later time, and reared only as a curiosity, as there 18 no notice of it to be found previous to 1674. Itis with this Syracusan plant that some attempts have been made in recent ycars to manufacture a writing material similar to ancient papyrus.

Even after the introduction of vellum, papyrus still continued in use among the Romans, and was not entirely superscded until a late date. It ceased, however, to be used for books sooner than for documents. In the 5th century St Augustine apologizes for sending @ letter written on vellum instcad of the more usual substance, papyrus (Ep. xv.); and Cassiodorus (Varr., xi. 38), writing in the 6th century, indulges in a high-flown panegyric on the plant and its value, and refers to the abolition of the tax on paper by the emperor Theodoric. Of medieval Greek papyria very few remains containing Biblical or patristic matter have survived, and one or

two fragments of Graco-Latin glossaries have been published. Of

The name of the man who had incurred

Under the Romans, the former bore the name of

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Greek documents, apart from monastie decds discovered in Egypt there are two which are well known, viz., the fragmentary epistle of Constantine V. to Pepin le Bref, of 753 or 756, now preserved at Paris, and the papyrus containing the subscriptions to tho council of Constantinople of 680, at Vienna. Medizval Latin MSS. on papyrus in book form are still extant in different libraries of Europe, viz.:—the Homilies of St Avitus, of the 6th century, at Paris; Sermons and Epistles of St Augustine, of the 6th or 7th

century, at Paris and Geneva; works of Hilary, of the 6th century, at Vienna; fragments of the Digests, of the 6th century, at Pommersfeld; the Antiquities of Josephus, of the 7th century, at Milan; Isidore, De Contemptu Mundi, of the 7th eentury, at St Gall; and the Register of the Church of Ravenna, of the 10th cen- tury, at Munich. Of Latin documents on papyrus (¢omus was the technical word of the Middle Ages to designate sueh a document), the first to be mentioned arc the fragments of two imperial reseripts addressed to an official in Egypt in the 5th eentury. The employment of this material in Italy for legal purposes is sufficiently illustrated by the large number of documents which were preserved at Ravenna, and date from the 5th to the 10th century. In the papal chancery too it was used at an early date, evidence of its presence there being found in the biography of Gregory I. But of the extant papal deeds the earliest to which an authentic date can be attached is a bull of Stephen III. of the ycar 757, while the latest appears to be one of 1004. There is evidence to show that in the 10th century papyrus was used, to the exclusion of other materials, in papal deeds. In Franee it was a common writing substance in the 6th century (Gregory of Tours, Hist. Frane., y. 5). Of the Merovingian period there are still extant several papyrus deeds, the earliest of the year 625, the latest of 692. Under Charlemagne and his suceessors it was not used. By the 12th century the manufacture of papyrus had entirely ceased, as appears from a note by Eustathius in his commentary on the Odyssey, xxi. 390.

See Melch. Guilandino's commentary on the chapters of Pliny relating to papyrus, Papyrus, hoc est Commentartus, &c., Venice, 1572; Montfaucon, '' Dis- sertation sur Ja plante appellée Papyrus," in the Mémoires de VAcadémie des Inscriptions, 1729, pp. 592-608; T.C. Tyehsen, "' De Chartee Papyracese in Europa per medium evum usu," in the Comment. Soc. Reg. Scient. Gottingensis, 1820, pp. 141-208; Dureau de la Malle, " Mémoire sur le Papyrus," in the Afém. de Pinstitut, 1851, pp. 140-183; Ph. Parlatore, ""'Mémoire sur le Papyrus des aneiens," &c., in the Mém: a? Acad. des Sci., 1854, pp. 469-502; Bliimner, Tech- nologie und Terminologie der Gewerbe und Kiinste bet Griechen und Rémern, Leipsic, 1875, i. pp. 808-827; Ces. Paoli, Del Papiro, Florenee, 1878. See also W. Wattenbach, Das Schriftwesen im Mittelolter, Leipsic, 1875, pp. 80-91; and T. Birt, Das antike Buchwesen, Berlin, 1882, pp. 223-278, (E, M. T.

PARA, or Santa Marra DE Betem po Grado Par, one of the most flourishing cities of Brazil, capital of the province of Para or Grado Para, lies on a point of land with sandy porous soil at the junction of the Guama with the Rio Para or eastern arm of the Amazons, about 75 miles from the sea. The main river is about 20 miles wide opposite the town, but is broken by numerous islands. Para is regularly built, well-paved, and well-lighted. The houses, which seldom exceed two or three stories in height, are usually substantial structures of stone; and a general brightness of aspect is produced by red-tiled roofs and white, yellow, or even pink and blue coloured walls relieved by dense tropical foliage. The Estrada das Mon- gubeiras, running about a mile from the river to Largo da Polvora in the east end of the city, has long been famous for its magnificent cotton trees (Bombax Monguba, B. Ceiba); but the grand old trees are dying out, and the finest avenue in Para is now the Estrada de Sao José, with its colonnade of tall “royal palms” (Oreodowxa regia). In the outskirts of the city the wealthy merchants have villas with very extensive grounds, anda little way beyond these begins the dense swamp-forest. Para has a wonder- fully pleasant and healthy climate, with a temperature extremely equable throughout the year. “The mornings are cool, From 10 till 2 the heat increases rapidly, com- monly reaching 90° or 91”. A little later great black clouds appear in the east and spread quickly over the sky ; the temperature falls suddenly, the wind blows in varying gusts, the rain pours down, and ere one is aware the sun leaps out. Sometimes the first shower is followed by a second or even a third. By sunset the ground is dry.” This is the rule all the year round; only in the height of the dry season a week may pass without any showers. The Brazilians have a proverb, “Who came to Parad was glad to stay; who drank assai went never away.” The

assai referred to is a beverage made by squeezing the black grape-like berries of the assai palm (uterpe edulis) ; it is largely drunk by all classes in Paré. The importance of the city is due to its being the great emporium of the rapidly-developing trade of the Amazons. The trade is carried on by several steamboat companies; the most im- portant, the Amazonian

Steamboat Company, receives a subsidy from the Brazilian Government. Two lines of steamers run between Liverpool and Pard; there are also a French line and a German line. A large trade is trans- acted with the United States, but mainly through English, French, German, and Portuguese houses. The principal exports are cocoa, Brazil nuts, hides, deer-skins, isinglass, balsam of copaiba, tonka beans, and Peruvian bark. In 1863 the total value of the imports was about £500,000 and of the exports about £525,000; by 1882 the duties paid to the custom-house amounted to £864,396.

Population has been growing faster than the supply of houses. In 1819 the inhabitants were estimated at 24,500, but by 1850 they had declined to 15,000; in 1866 they were 36,000 (about 5000 slaves); and they are now (1884) nearly 40,000. Besides a vast cathedral (1720) and the president's palace, usually considered one of the best buildings of its kind in Brazil, Para contains an episcopal palace (formerly the Jesuit college), a handsome theatre, a large market building, a custom-house (formerly a convent, with two great towers), naval and military arsenals (the first of some size, with shipbuilding yards anda gridiron), a botanical garden, &c. About amile from the city is the chapel of Our Lady of Nazareth, the most celebrated shrine in northern Brazil.

In 1615 Francisco Caldeira de Castello Branco, sent out by the Portuguese at Maranhao, built the fort of Santo Christo and founded the settlement of Nossa Senhora de Belem. By 1641 it was a place of 400 inhabitants, with four monasteries. A premature declaration of independence was made at Para in 1823, and soon after Captain Grenfell, sent by Lord Cochrane, brought the city over to the Brazilian party; but for many years it was subject to political disturbance. In 1835 "every respectable white was obliged to leave the city" by the anarchical proceedings of the so-called "Liberals" Gomes, Vinagre, and Rodriguez.

See Bates, Naturalist on the River Amazons, 1863 ; H. H. Smith, Brazil, 1879.

PARACELSUS (c. 1490-1541). It seems now to be established that Paracelsus was born near Einsiedeln, in the canton Schwyz, in 1490 or 1491 according to some, or 1493 according to others. His father, the natural son

of a grand- master of the Teutonic order, was Wilhelm Bombast von Hohenheim, who had a hard struggle to make a subsistence as a physician. His mother was superintendent of the hospital at Einsiedeln, a post she relinquished upon her marriage. Paracelsus's name was Theophrastus Bombast von Hohenheim ; for the names Philippus and Aureolus good authority is wanting, and the epithet Paracelsus, like some similar compounds, was probably one of his own making, and was meant to denote his superiority to Celsus. In 1502-3 his father, taking his family with him, removed to Villach in Carinthia; and he resided there in the practice of the medical art till his death in 1534. In one of his works, dedicated to the magistracy of the town, Paracelsus refers to the esteem in which his father was held, and expresses his own gratitude for it.

Of the early years of Paracelsus's life there is hardly anything known. His father was his first teacher, and took pains to instruct him in all the learning of the time, especially in medicine. Doubtless Paracelsus learned rapidly what was put before him, but he seems at a com- paratively early age to have questioned the value of what he was expected to acquire, and to have soon struck out ways for himself. As he grew older he was taken in hand by several distinguished churchmen, although it has been objected that dates will not warrant the idea of actual

personal instruction. This, however, is not correct, for all the men Paracelsus mentions were alive in his lifetime though he was so young that he could hardly have profited by their lessons, unless on the supposition that he wags a quick and precocious boy, which it is very likely he was. At the age of sixteen he entered the university of Basel, but probably soon abandoned the studies therein pursued. He next went to Trithemius, the bishop of Sponheim and Wiirzburg, under whom he prosecuted chemical researches. 'Trithemius is the reputed author of some obscure tracts on the great elixir, and as there was no other chemistry going Paracelsus would have to devote himself to the reiterated operations so characteristic of the notions of that time. But the confection of the stone of the philosophers was too remote a possibility to gratify the fiery spirit of a youth like Paracelsus, eager to make what he knew, or could learn, at once available for practical

medicine. So he left school chemistry as he had forsaken university culture, and started for the mines in Tyrol owned by the wealthy family of the Fuggers. The sort of knowledge he got there pleased him much more, There at least he was in contact with reality. The struggle with nature before the precious metals could be made of use impressed upon him more and more the importance of actual personal observation. He saw all the mechanical difficulties that had to be overcome in mining; he learned the nature and succession of rocks, the physical properties of minerals, ores, and metals; he got a notion of mineral waters; he was an eyewitness of the accidents which befel the miners, and studied the diseases which attacked them ; he had proof that positive knowledge of nature was not to be got in schools and universities, but only by going to Nature herself, and to those who were constantly engaged with her. Hence came Paracelsus's peculiar mode of study. He attached no value to mere scholarship; scholastic disputations he utterly ignored and despised,— and especially the discussions on medical topics, which turned more upon theories and definitions than upon actual practice. He therefore went wandering over a great part of Europe to learn all that he could. In so doing he was one of the first physicians of modern times to profit bya mode of study which is now reckoned indispensable. In the 16th century the difficulty of moving about was much greater than it is now; still Paracelsus faced it, and on principle. The book of nature, he affirmed, is that which the physician must read, and to do so he must walk over the leaves. The humours and passions and diseases of different nations are different, and the physician must go among the nations if he will be master of his art; the more he knows of other nations, the better he will under stand his own. For the physician it is ten times more necessary and useful to know the powers of the heavens and the earth, the virtues of plants and minerals, than to spend his time on Greek and Latin grammar. And the com- mentary of his own and succeeding centuries upon these very extreme views is that Paracelsus was no scholar, but an ignorant vagabond. He himself, however, valued his method and his knowledge very differently, and argued that he knew what his predecessors were ignorant of, be cause he had been taught in no human school. " Whence have I all my secrets, out of what writers and authors! Ask rather how the beasts have learned their arts. If nature can instruct irrational animals, can it not much more men?" In this new school discovered by Paracelsus, and since attended with the happiest results by many others, he remained for about ten years. He had

acquired great stores of facts, which it was impossible for him to have reduced to order, but which gave him an unquestion- able superiority to his contemporaries. Soin 1526 or 1527, on his return to Basel, he was appointed town physician,

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and shortly afterwards he gave a course of lectures on medicine in the university. Unfortunately for him, the

lectures broke away from tradition. They were in German, not in Latin ; they were expositions of his own experience,

of his own views, of his own methods of curing, adapted

to the diseases that afflicted the Germans in the year 1527,

and they were not commentaries on the text of Galen or

Avicenna. Unfortunately they attacked, not only these great authorities, but the German graduates who followed them and disputed about them in 1527. They criticized in no measured terms the current medicine of the time, and exposed the practical ignorance, the pomposity, and the greed of those who practised it.

The truth of Paracelsus’s doctrines was apparently con-

firmed by his success in curing or mitigating diseases for which the regular physicians could do nothing. For about a couple of years his reputation and practice increased to a surprising extent. But at the end of that time people began to recover themselves. Paracelsus had burst upon the schools with such novel views and methods, with such irresistible criticism, that all opposition was at first crushed flat. Gradually the sea began to rise. His enemies watched for slips and failures; the physicians maintained that he had no degree, and insisted that he should give proof of his qualifications. His manner of life was brought up against him. It was insinuated that he was a profane person, that he was a conjurer, a necro- mancer, that, in fact, he was to be got rid of at any cost asa troubler of the peace and of the time-

honoured tradi- tions of the medical corporations. Moreover, he had a pharmaceutical system of his own which did not harmonize with the commercial arrangements of the apothecaries, and he not only did not use up their drugs like the Galenists, put, in the exercise of his functions as town physician, urged the authorities to keep a sharp eye on the purity of their wares, upon their knowledge of their art, and upon their transactions with their friends the physicians. The growing jealousy and enmity culminated in the Lichtenfels dispute ; and, as the judges sided with the canon, to their everlasting discredit, Paracelsus had no alternative but to tell them his opinion of the whole case and of their notions of justice. So little doubt left he on the subject that his friends judged it prudent for him to leave Basel at once, as it had been resolved to punish him for the attack on the authorities of which he had been guilty. He departed from Basel in such haste that he carried nothing with him, and some chemical apparatus and other property were taken charge of by Oporinus, his pupil and amanuensis. He went first to Esslingen, where he remained for a brief period, but had soon to leave from absolute want. Then began his wandering life, the course of which can be traced by the dates of his various writings. He thus visited in succession Colmar, Nuremberg, Appenzell, Zurich, Pfaffers, Augsburg, Villach, Meran, Middelheim, and other places, seldom staying a twelvemonth in any of them. In this way he spent some dozen years, till 1541, when he was invited by Archbishop Ernst to settle at Salzburg, under his protection. After his endless tossing about, this seemed @ promise and place of repose. It proved, however, to be the complete and final rest that he found, for after a few months he died on the 24th of September. ‘The cause of hig death, like most other. details in his history, is uncertain. His enemies asserted that he died ina low tavern in consequence of a drunken debauch of some days’ duration. Others maintain that he was thrown down a steep place by some emissaries cither of the physicians or of the apothecaries, both of whom he had during his life Most grievously harassed. In proof of this surgeons have pointed out in Paracelsus’s skull a flaw or fracture, which could have been produced only during life. Authorities,

however, are not agreed on this point, and it may be simplest to suspend belief until more evidence is got. He was buried in the churchyard of St

Sebastian, but in 1752 his bones were removed to the porch of the church, and a monument of reddish-white marble was erected to his memory.

In making the attempt to ascertain what was Paracelsus's charac-

ter, and what were his philosophical and medical opinions, a very considerable difficulty presents itself at the outset. Of the volu- minous writings which pass under his name, what are really his work, and what, if not actually composed by him, express his ideas? To this question no complete critical reply has as yet been given, though many opinions have been expressed. Dr Marx, for example, will admit only ten treatises as genuine. Dr Haeser allows seventeen for certain, a considerable number—some twenty-four—as doubtful, and the rest—he enumerates eleven—as spurious. Dr Mook does not accept these estimates, or the criteria by which the genuineness of a treatise is ascertained. But neither does he give altogether convincing criteria of his own, and, what is still less satisfactory, he does not apply them—such as they arc—to decide the numcrous doubtful cases. The only thing Mook has done is to draw up a list of the different editions of Paracelsus's so-called works, This list is not complete in the enumeration of editions, and it is quite imperfect in bibliographical description, but with these and other scrious defects it is the fullest at present extant. The first book by Paracelsus was printed at Augsburg in 1529. It is entitled Practica D. Theophrasti Paracelsi, gemacht auff Europen, and fornis a small quarto pamphlet of five leaves. Prior to this, in 1526-27, appeared a programme of the lectures he intended to deliver at Basel, but this can hardly be reckoned a specific work, During his lifetime fourteen works and editions were pub- lished, and thereafter, between 1542 and 1845, there were at least two hundred and thirty-four separate publications according to Mook's enumeration. The first collected edition was made by Johann Huser in German. It was printed at Basel in 1589-91, in eleven volumes quarto, and is the best of all the editions, Huser did not employ the early printed copies only, but collected all the manuscripts which he could procure, and used them also in forming his text. The only drawback is that rather than omit anything which Paracelsus may have composed, he has gone to the opposite extreme and included writings with which it is pretty certain Paracelsus had nothing to do. The second collected German edition is in four volumes folio, 1603-5. Parallel with it in 1603 the first collected

Latin edition was made by Palthenius. It is in eleven volumes quarto, and was completed in 1605. Again, in 1616-18 appeared a reissue of the folio German edition of 1603, and finally in 1658 came the Geneva Latin version, in three volumes folio, edited by Bitiskius. The works were originally composed in Swiss-German, a vigorous speech which Paracelsus wielded with unmistakable power. The Latin versions were made or edited by Adam von Bodenstein, Gerard Dorn, Michael Toxites, and Oporinus, about the middle of the 16th century. A few translations into other languages exist, as of the Chirurgia Magna and some other works into French, and of one or two into Dutch, Italian, and even Arabic. ‘The translations into English amount to about a dozen, dating mostly from the middle of the 17th century. The original editions of Paracelsus’s works are getting less and less common; even the English versions are among the rarest of their class. Over and above the numerous editions, there is a bulky literature of an explanatory and controversial character, for which the world is indebted to Paracelsus’s followers and enemies. A good deal of it is taken up with a defence of chemical, or, as they were called, ‘spagyric,” medicines against the attacks of the supporters of the Galenic pharmacopeia. ‘

The aim of all Paracclsus’s writing is to promote the progress of medicine, and he endeavours to put before physicians a grand ideal of their profession. In his attempts he takes the widest view of medicine. He bases it on the general relationship which man bears to nature as a whole ; he cannot divorce the life of man from that of the universe ; he cannot think of disease otherwise than as a phase of life. He is compelled therefore to rest his medical prac- tice upon general theories of the present state of things ; his incdi- cal system—if there is such a thing—is an adaptation of his cos- mogony. It is this latter which has been the stumbling-block to many past critics of Paracelsus, and unless its character 1s remem- bered it will be the same to others in the future. Dissatisfied with the Aristotelianism of his time, Paracelsus turned with greater expectation to the Neoplatonism which was reviving. His eager- ness to understand the relationship of man to the universe led him to the Kabbala, where these mysteries seemed to be explained, and from these unsubstantial materials he constructed, so far as it can be understood, his visionary philosophy. Interwoven with it, how- ever,

were the results of his own personal expericnee and work in natural history and chemical pharmacy and practical medicine,

unfettered by any speculative gencralizations, and so shrewd an observer as Paracelsus was must have often felt that his philosophy and his experience did not agree with onc another. It was doubt- less a very great ideal of medicine which Paracelsus raised ; but when it came to realizing it in every-day life he could hardly do clse than fail, During the three hundred years which have elapsed since his time knowledge both of the macrocosm and of the microcosm has increased far beyond what Paracelsus could have understood, even had it been all forctold him; the healing art has advanced also, though perhaps scarcely at the saine rate, but it would be as hard for us as for him to apply any cosmogony, however rational, to curing disease. We are not one whit ncarcr the solution of the problems which puzzled Paracelsus than he was ; the mystery of the origin, continuance, and stoppage of life is, perhaps through the abundance of light shed on other phenomena, even darker than it may have seemed to Paracelsus. If this be so it is no matter for surprise, or blame, or ridicule that he missed constructing a theory of the universe which at the same time would be a never-failing guide to him in the practical work of alleviating the evils which a residence in this universe scems to entail.

Some of his doctrines have been already alluded to in the article Mrpicrng (g.v.), and it would serve no purpose to give even a brief sketch of his vicws, seeing that thcir influence has passed entirely away, and that they are of intcrest only in their place in a general history of medicine and philosophy. Defective, however, as they may have been, and unfounded in fact, his kab- balistie doctrines led him to trace the dependence of the human body upon outer nature for its sustenance and cure. The doctrine of signatures, the supposed connexion of every part of the little world of man with a corresponding part of the great world of nature, was a fanciful and false exaggeration of this doctrine, but the idea carried in its train that of specifics. This led to the search for these, which werc not to be found in the bewildering and untested mixtures of the Galenic prescriptions. Paracelsus had seen how bodies were purified and intensified by chemical operations,

and he thought if plants and minerals could be made to yield thcir active principles it would surely be better to employ these than the crude and unpre- pared originals. He had besides arrived by some kind of intuition at the conclusion that the operations in the body were of a chemical eharacter, and that when disordered they were to be put right by counter operations of the same kind. It may be claimed for Paracelsus that he embraced within the idea of chemical action some- thing more than the alchemists did. Whether or not he believed in the philosopher's elixir is of very little consequence. If he did, he was like the rest of his age ; but he troubled himself very little, if at all, about it. He did believe in the immediate use for thera- peutics of the salts and other preparations which his practical skill enabled him to make. 'Technically he was not a chemist; he did not concern himself either with the composition of his compounds or with an explanation of what occurred in their making. If he eould get potent drugs to cure disease he was content, and he worked very hard in an empirical way to make them. That he found out some new compounds is certain ; but not one great and marked dis- covery can be ascribed to him. Probably therefore his positive services are to be summed up in this wide application of chemical ideas to pharmacy and therapeutics; his indirect and possibly greater services are to be found in the stimulus, the revolutionary stimulus, of his ideas about method and general theory. It is not difficult, however, to criticize Paracelsus and to represent him as so far below the level of his time as to be utterly contemptible. It is difficult, but perhaps not impossible, to raise Paracelsus to a place among the great spirits of mankind. It is most difficult of all to ascertain what his true charactcr really was, to appreciate aright this man of fervid imagination, of powerful and persistent con- victions, of unbatcd honesty and love of truth, of kcen insight into the errors (as he thought them) of his time, of a merciless will to lay bare these errors and to reform the abuses to which they gave rise, who in an instant offends us by his boasting, his grossness, his want of self-respect. Itis a probleni how to reconcile his ignorance, his weakness, his superstition, his crude notions, his erroneous observations, his ridiculous inferences and theorics, with his grasp of method, his lofty views of the true scope of medicine, his lucid statements, his incisive and epigrammatic criticisms of men and motives.

A character full of contradictory elements cannot but have had eontradictory judgments passed on it; and after three hundred a the animus

is as strong and the judgments are as diverse as

(J. F.)

PARADISE 1s an old Persian word (Pairidaéza in the Vendidad) meaning an enclosure, a park. The Greeks use the word in the form TapdSeos of the parks of the Persian kings, and it was borrowed also by the Hebrews in the form DTP (Cant. lv. 13; Eccles, ii. 5; Neh. ii. 8; A. V., “orchard,” “forest). The Septuagint chose the Greek form to translate the “garden ” of Genesis i. ; other

Greek and Latin versions followed them, and thus “paradise ” became the usual ecclesiastical name for the garden of Eden, which has been spoken of under Epzy, Now, as Paradise in this sense was the residence of man before he sinned, it was natural enough that theological speculation as to the dwelling-place of the righteous, after death, or in the future glory, should attach itself to the account given in Genesis of the original habitation of righteous Adam, and borrow not only the name but in some measure also the conception of paradise as there described. This took place in more than one way, as we see from the Jewish apocalyptic literature, and especially from the book of Enoch. Thus we find (1) the idea that the old Paradise still exists in a secret part of the earth, and that Enoch, Elijah, and other elect and righteous persons dwell there. This is the foundation of the doctrine of the earthly paradise, which passed into Christianity—being supposed to find confirmation in the New Testament, especially in Luke xxiii. 43. The earthly paradise, as developed by Christian fancy, is the old garden of Eden, which lay in the far East beyond the stream of Ocean, raised so high on a triple terrace of mountain that the deluge did not touch it. It is the residence of certain departed saints, and the pictures drawn of it are coloured with classical reminiscences of Elysium and the Islands of the Blest. How these outlines were filled up at different periods may be learned from Ephraem Syrus’s poem on Paradise (4th century), from Cosmas Indicopleustes (6th century), from the Divina Commedia of Dante, and other medizeval sources. A more ideal con- ception is (2) that of the heavenly paradise. To the Hebrews ideal things represent themselves as the heavenly counterparts of earthly things ; ideals which God’s people are to realize in the future are

already existent in heaven; or even things which have once been lost, but which are necessary to man's true happiness, are preserved in heaven. Thus the heavenly paradise was either a mere figure for the good things, corresponding to those which Adam lost, which are reserved in heaven for the righteous, or it was the heavenly archetype of which the earthly paradise was a copy, or on a crasser way of thinking it was held that the paradise which Adam lost had been actually trans- ported to heaven. The commonest form of the idea was perhaps that expressed in 4 Ezra and the Talmud, by saying that paradise was created before the earth. This paradise is not conceived as the place of the souls of all the righteous after death, but it is inhabited by certain select persons—Enoch, Elijah, Moses, Ezra—who enjoy in it the fellowship of the coming Messiah. After the last judgment, when the enemies of Israel are cast into Gehenna, the righteous are raised to paradise, and there behold the glory of God. Associated with such views as these, we find farther the idea (3) that in the future glory paradise, or the heavenly Jerusalem, which stood in paradise before the fall and was removed to heaven with it (Apoc. Baruch), will be brought down from heaven to earth, that the tree of life will be planted on Zion (Bk. Enoch, 4 Ezra), All these apocalyptic crudities, which it is not necessary to follow into details, are really mechanical developments of a legitimate, one may even say an inevitable, inference from the position that the garden of Gen. ii. represents a state of ideal human felicity lost through sin. For, if this be so, the future bliss of the redeemed must be conceived as somehow analogous to the life of Eden, and a literal un- imaginative conception of this analogy, making no allowance for the difference between the happiness of childhood, prior to experience of the everyday world, and the happiness of a life which has conquered the world, must end in regarding the future home of the blest as a mere reproduction of Eden. But the use of the word paradise for the home of

the blessed does not necessarily imply so mechanical a con- ception as we find in the Jewish apocalypses ; to speak of the future bliss at all, without the use of metaphysics, is possible only in the form of poetical description, and for such description the story of the garden of Eden supplied the necessary concrete elements, which the apocalyptists took literally, while

higher thinkers used them as symbols— and ordinary language, perhaps, as mere conventional equl- yalents—for ineffable things. Thus the images borrowed from Eden in such a prophecy as Isa. xi. are certainly not meant literally, any more than the figure of the tree of life in the book of Proverbs. So in the New Testament even Rev. ii. 7 is plainly figurative, and in Luke xxiii. 43 paradise is simply the place of bliss. In 2 Cor. xii. 4 paradise is a heavenly place where ineffable words were heard by Paul; but he himself does not know whether he visited it in the body or out of the body.

See Dillmann's Buch Enoch, and his articles " Eden Pcnerel "Paradies" in Schenkcl's Bibel-Lexicon; Weber, Alisynagogale Theologie ; and the books on Biblical theology. The Mohammedan paradise (al-Janna) is borrowed from the Jews, as appears from the name Jannatu'Adnin, that is, Garden of Eden. It is described in the Koran and by later theologians as a place of all sensuous delights, where the rightcous recline on couches in a fair garden drinking the delicious beverage supplied by the fountain Tasnim and waitcd on by damsels with great bright eyes Cir, Kory. 72, hence our "houri," which is properly a Persian form). The expression " gardens of Firdaus" (the Persian form of the word Paradise) occurs in Kor. xviii. 107, and is interpreted as meaning the highest region of the Janna (Beidawi én J.)

PARADISE, Brros or. See vol. iii. p. 778.

PARAFFIN. In the course of his classical investiga- tion on the tar produced in the dry distillation of wood, Reichenbach in 1830 discovered in it, amongst many other things, a colourless wax-like solid which he called paraffin (parum affinis) because he found it to be endowed with an extraordinary indifference towards all reagents. A few years later he isolated from the same material a liquid oil chemically similar to paraffin, to which he gave the name of ewpion (ciziwv, very fat). For many years both these bodies were known only as chemical curiosities, and even scientific men looked upon them as things entirely sui generis; this was natural enough as far as paraffin is concerned, but it is rather singular that it took so long before it was realized that eupion or something very much like it forms the body of Perroteum (q.v.), which had been known, since the time of Herodotus at least, to well up abundantly from the bowels of the earth in certain places. Though extensively known, it was used only as an external

medicinal agent, until the late Mr James Young conceived the idea of industrially working a com- paratively scanty oil-spring in Derbyshire, and subse- quently found that an oil similar to petroleum is obtained by the dry distillation of cannel coal and similar materials at low temperatures. This discovery developed into a grand industry, which may be said to have led to the utilization of those immense natural stores of petroleum in America. Scientific chemists naturally directed their attention to the products of these new industries, and it Was soon ascertained that solid paraffin and eupion, as well as natural and artificial petroleum, are substantially more or less impure mixtures of saturated hydrocarbons ; and so it

comes that, on the proposal of H. Watts, the word paraffin |

in scientific chemistry has been adopted as a generic term for this class of compounds of carbon and hydrogen.

When the electric light is generated within an atmo- sphere of hydrogen, then, at the immense temperature of the electric arc, part of the carbon of the charcoal terminals unites with the hydrogen into acetylene gas, C,Hp. Apart from this isolated fact, which was discovered by Berthelot in 1862, it might be said that the two elements are not capable of uniting directly, although an innumerable

formule) occupy the same volume.

are called. We speak of

variety of hydrocarbons exist in nature, and can be pro- duced artificially from organic substances. Individual hydrocarbons may differ very much in their properties. At ordinary temperature and pressure a few are gases; the majority present themselves as liquids ; not a few are solids. But the solids are fusible; and all liquid or liquefied hydrocarbons, at a high enough temperature, volatilize, as a rule without decomposition. To the latter circumstance to a great extent we owe our precise know- ledge of their chemical constitution.

In all the numerous series of hydrocarbons the percentages of carbon vary from 75 (in marsh gas) to 94°7 (in chrysene). Within this narrow range of

some 20 per cent. several dozens of elementary compositions have to be accommodated; and many of these, to be represented in formule C,Hy with an adequate degree of precision, require formule in which the coefficients x and y are so large that, by means of integers lcss than these, any fancy composition (within our limits) may be expressed with a degree of exactitude which is quite on a par with the analyses. But these hydrocarbons, in gencral, can be volatilized into gases, and in regard to these Avogadro's law tells us that quantities proportional to the mole- cular weights (i.e., the weights represented by the true chemical Hence, to find the true value, M=C,H,, of the formula as a whole, we need only determine the

vapour density, and from it calculate the weight of the respective hydrocarbon which, as a gas at @ and P millimetres pressure,

occupies the same volume as, for instance, H,O parts of steam. This is M. The clementary analysis enables us to ealeulate the weight xx C of carbon contained in M parts, and the analysis must be very poor to leave us in doubt as to whether it is for instanec 6×12 parts of carbon or 7×12 parts that we have to deal with. The reader will now understand how it has been possible to aseer-

tain the elementary composition of all pure hydrocarbons with a

degree of precision which goes beyond that of the analysis, and to prove what analysis could never have done by itself, namely, that there are numerous groups of hydrocarbons which have absolutely identical elementary compositions, —cases of isomerism, as they

'isomerism in the narrower sense" when the atomic formule are identical (there are, for instance, two

hydrides of butyl, C,Hjo), while we speak of "polymeric" bodies

when the several formulz are integer multiples of the same primi- tive group (¢g., ethylene, 2x CHy, and butylene, 4x CHg, are polymers to one another).

The following table gives an idca of the several classes of hydro- carbons which for us come more particnlarly into consideration.

Paraffins. Olefines. | Aeetylenes. Benzols. 1 Vacat. Vaecat. | yc Vaeat. 2 Coby C,H, | :5 = Vacat 3 Cag C,H, (S) £ Vacat 4 C,H, sis a Vacat. 5 CH» : aes Vacat 7 C, CrHy,y | eo C,H, 8 C CgHig B bE CgHio aoe aoe eee = oy I o Hy. nN CrHents CrHon ae CrHon-6

Oe ae i The first column, under “2,” gives the number of carbon atoms per molecule in the compounds whose formule stand in that hori- zontal line,— these lattcr being arranged in a descending serics according to the number of hydrogen atoms united with n atoms of carbon. Instead of pointing out those regularities, in regard to the atomic proportions in which carbon and hydrogen can unite into compounds, which the table illustrates so forcibly, let us rather state that the “benzols,” in opposition to all that stands to their left in the table, are things of their own kind. In them six atoms of the carbon are most firmly united (into a “ring,” as a certain theory says), and the rest are, so to say, hooked on to the ring 1n a less intimate fashion. Thus benzol is (C,)H,; cach one of the six

’s being tied to one of the six C’s ; toluol is (C,H;)—CHs ; it isa penzol from which one of the six hydrogen atoms has been removed, and in which the gap left has been filled by a “methyl,” CH, :—

C,H, oe CH,= 1Bls ap (CgsH;)—(CHs) . Benzol. Marsh gas.

But similarly two dehydrogenated benzols, C,H;, can unite into one double ring of diphenyl: 2C,H,— 9H =(CgH;)(CgH;); and two beuzol rings may unite more firmly in such a manncr that two carbon atoms of the one ring do service for the two rings, and a double ring is formed firmly united by these two common carbons, the four hydrogens of the original two benzols being away. This gives naphthalenc :—

C,H, + C,H, a aC as 4H a Caglals .

Benzol. Nephthalene.

238 eee) Gi

In a similar manner three benzols may unite into one anth-

Tacene :— Cire cl. + On, 40 Sse 8… Benzol. Anthracene.

Generally speaking, a hydrocarbon is the more volatile the less the number of carbon atoms and the greater the number of hydrogen atoms in the molecule. Thus, in the series of “paraffins,” CH, (marsh gas) and C,H, (ethane) are gases, C,H, (propane) and C,H, (butane) are very volatile liquids, and C,H)», &c., are liquids,—with higher and higher boiling points as we ascend the series. From a certain value of 2 upwards we find ourselves amongst the paraffins proper, which are solids, more or less easily fusible, but not, in general, volatile without decomposition, Benzol, C,H,, and its neighbouring homologues are volatile liquids. Naphthalene and anthracene are crystalline solids, fusible at 79°‘2 and 180° C., and boiling at 217° and above 300° C. respectively without decomposition.

All hydrocarbons agree in this, that they are practically insoluble in water, but more or less readily soluble (in general) in alcohol and in ether. They are all combustible ; the more readily volatile ones are inflammable. Any complete combustion, of course, leads to the formation of only carbonic acid and water, with evolution of a large amount of heat ; but the mechanism of the process is more or less complex. Naphthalene and anthracene remain un- decomposed at a red heat; only at the very high tempera- ture of their flames, and by the co-operation of the oxygen of the air, they are decomposed with large elimination of charcoal; a similar, though less, stability is exhibited by the benzols. The paraffins, on the other hand, are relatively unstable. Marsh gas, it is true, stands a red heat; but, to pass to the other end of the series, the paraffins proper, and also the higher liquid paraffins to some extent, even when being distilled, and especially when distilled “under pressure,” 2.¢., at higher temperatures than their natural boiling points, break up into olefines and lower paraffins (Thorpe and John Young). Similar changes take place when the vapours of paraffins are passed through red-hot tubes; only the products formed then suffer deeper-going decomposition with formation of hydrogen, marsh-gas, acetylene, ethylene, and charcoal, and, last not least, benzols and naphthalene. To this latter fact the paraffins owe their pre-eminent fitness as illuminating agents,

When organoid minerals, such as cannel coal, shale, &c., are subjected to dry distillation, all the several classes of hydrocarbons are in general produced at the same time but, from what we have said it will be understood that, even with the same material, the quantitative composition of the complex vapour which comes out of the retort depends on the way in which the distillation is being conducted. If we operate at the lowest practicable temperature; comparatively little gas is produced, and in the condensible part of the vapour the paraffins pre- dominate largely ; at a bright red heat, such as is used in making coal gas, and especially if the vapours have to pass along red-hot surfaces before they get into the condenser pipes, more gas is produced, and the place of the liquid paraffins is taken by benzols. These latter, however, are always accompanied by naphthalene, often also by anthra- cene, and invariably by certain ternary benzol-derivatives, namely, by “phenols,” feebly acid bodies containing hydroxyl groups, OH’s, where the corresponding hydro- carbon bore plain hydrogens (ordinary phenol, C,H,(OH), derived from benzol, C,H;H, is a representative example), and, secondly, basic compounds of carbon, hydrogen, and nitrogen. Of the latter aniline and picoline— both C,H,;N, but widely different in their properties ——may be quoted as examples. The gas produced in this case through the presence in it of the vapour of higher hydrides, but especially of acetylene, O,H,, and

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benzol is highly luminous. Supposing now, as a third instance, the distillation to be conducted at a white heat, and so that the primary vapour has to wind its way through a spiral pipe kept at a bright red heat, the pro- portion of gas increases largely, and there is an increased yield of retort charcoal; but the liquid hydrocarbons of all classes almost vanish; the gas consists mainly of hydrogen, marsh gas, carbonic oxide, and carbonic acid, and gives little light when kindled.

The aim of the paraffin oil manufacturer is to produce the best possible approximation to a mixture of parafiins, wherefore he conducts his distillation at the lowest work- ing temperature. Of course his paraffin mixture contains more or less of the other classes of bodies referred to, whose removal, however, offers no great difficulty. In the laboratory we

should commence by shaking the crude oil with caustic alkali ley, which withdraws the phenols and other acid bodies, as part of a lower layer, the upper being purified oil. By shaking the latter with dilute sulphuric acid the bases are removed as a solution of their sulphates, and a still purer oil results. Application of con- centrated sulphuric acid to the latter removes part at least of the benzols and olefines as sulpho-acids, and also of the phenols and all the bases, should the two preceding operations have been omitted. But the most thorough mode of getting quit of the benzols and their derivatives is —after having exhausted the milder agents—to shake the oil with first aqueous and then stronger and stronger nitric acid, which reagent converts the benzol-bodies into nitro- products, soluble in the acid, or removable, after separation of the acid layer, by aqueous alkali. By all these tortures the paraffins—being what the name implies—are not much affected, so that what ultimately survives all belongs to their family. The separation of the individual paraftins from one another is a very difficult problem which has not yet found a satisfactory solution. What we know of in- dividual paraffins is derived chiefly from the investigation of decompositions of pure chemical substances leading to the formation of that one paraffin principally if not solely. To split up a mixture of paraffins approximately the only known method is fractional distillation (see DisTrLLaTIoN, vol. vil. p. 260), preferably by means of an apparatus so constructed that the vapour, before reaching the con- denser, ascends through an intermediate inverted con- denser or still-head, and there suffers partial condensation at some suitable temperature (enforced in the most perfect form of the apparatus by an oil-bath surrounding the still- head). In this latter case, singularly—not as a matter of course by any means—what goes over boils very nearly at the temperature of the still-head. This particular form of the method therefore lends itself chiefly for the final purification of an unitary substance of known boiling point already purified by preceding distillations. With mixtures of unknown composition the process is very tedious, and may assume something like this form.

We distil the substance (slowly and with ample chance of partial condensation) and collect as separate fractions what came over at, for instance, 100° to 105°, 105° to 110°, 110° to 115°, &e., as L, IL, IIL, IV., &e. Baciae these when redistilled yields I. and II. and III. and IV., &c., which parts are poured into the respective receptacles, and on this principle

we continue working, If the sub- stance happens to be of comparatively simple composition, it usually turns out, after a while, that (say) the two fractions II. and VI. increase while the rest get less and less ; and by working on we may be able to isolate two bodies of the constant boiling points ¢, and ¢, respectively, with formation of “tails” of other boiling points. Unfortunately, even a constant boiling point is no proof of chemical purity ; and, if a constant-boiling substance is a

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mixture, only chemical methods can help us out of the difficulty.

The following table (extracted from Roscoe and Schorlemmer’s Handbook of Chemistry, German edition) gives the names, specific gravities, and boiling points of the more important paraffins The first column, “n,” gives’ the number of carbon-atoms in the molecule, and consequently the molecular weight M and the vapour density S. In the case of “pentan,” for instance, we have n=5 ; henee M=C,Hj)= 72; and, as H,=2, the gas-density, referred to hydrogen=S = 36, while, as air is 14:45 times as heavy as hydrogen, for the gas-density referred to air the value

4M+14‘45=36 +1445 =2°491.

Boiling Point in Sp. Gr. of I Name. Degrees. Lig. at ¢° C. Fahr. Cent. t 2 at Liquid at —11° C. and 180 atmos heres’ 1 |*Methan or marsh £a8..ccccessoceess iaestire (Cailletet). Pp 2|*Ethan or dimethy1…...ereseseeees ene. a B |PPVOPAaN …..eeceesecscsaeccesccesecseneeeees —13° to —22° |—25°to —30°| 4 [*Butan, MOLMAL .....-.ccceenceseeeeeeee +34° +1° 0°600 |} () 4) Isobutan or trimethylmethan, a gas 1° —17° () 5 *Pentan, MOLMAL....cccccrscscccseeseerees 99° to 102° | 487° to 39° | 0°6263 | 17° 5 |PISOPENtAMN ..secsecceressernnreeeccceeeeecsees 86° 30° 0°6385| 14° 5| Tetramethylmethan 49° 9°°5 (2) 6 |*Hexan, normal…..... oe 156° 69° 0°663 | 17° G |FISONCKAM.....ccencseeseecesceesseeses 144° 62° 0-701 0° 6| Methyl-diethylmethan…....0. 140° 60° (?) 6| Tetramethylethan…....—c.—seseeeee 136° 8° 0°6769 | 10° 6) Trimethylethylmethan…..... ...-| 109° to 118° | 438° to 48° () 7 |*Heptan, nOrmal…..serecceereees 209° 98°°4 0:7005 | 0° 7|

Isoheptan…...cscecsccssceee 195° 90°°3 0°6969 0° 7| Triethylmethan…..... a 205° 96° 0°689 | 27° 7| Diethyl-dimethylmetha ..| 187° to 189° | 86° to 87° | O0°7111} 0° 8 |*Octan, NOTMAL.....ceceesseersseeceeres 258° 125°°5 0°7188) 0° 8| Tetramethyl]-butan…....ecsceoerseee 220 108°°5 0°7111 0° 8 ep iethan, fuses at 96 \ 221° to 223° | 105° to 106°| (7) 9 |*Nonan, normal…....c0e .| 297° to 298° | 147° to 148° | 0°7279 | 13°5 9} Tetramethyl-pentan.. ob 270° BO 0°7247 | 0° 9| Pentamethyl-butan….. 66 266° 130° @) 10 *Dekan [normal ?]..... ..| 331° to 334° | 166° to 168° | 0°7394 | 13°5 10| Dimethyl-heptylmethan…....ss0e 320° about 160° (?) 10| Tetramethy]-hexan or “diamyl”... 320° 160° 0°7413; 0 11 | Hendekan…....csccccssscocerssccceecneeee Not yet isolated.| ... 12| Dodekan, normal…...,.,e0e-eseeerveees 396° 202° (?)

13

14 > Not isolated yet.

15.

}16| Hekdeka-dekan, normal, fuses at 592° | SO ccsee-cereccorccsstorccssreseses

Probably all the paraffins enumerated in the table are present in paraffin oil and in petroleum ; those marked * have been actually found in the one or the other. The solid paraffins are not known as unitary chemical substances ; no chemist as yet has succeeded in splitting up solid paraffin into its proximate components. The manufacturer, in regard to the liquid paraffins even, does not trouble him- self with the isolation of chemical species; he contents himself with splitting up his oil into fractions correspond- ing to certain ranges of boiling point, and consequently adapted to certain practical applications. But even the boiling point is not much heeded industrially ; the several kinds of oil are defined by their specific gravity at 60° F., which, as experience shows, increases as the boiling point rises, But it is as well here to point out that the same (initial) boiling point even, and in a much higher degree the same specific gravity, may be exhibited by oils of widely different proximate composition. Hence a relatively (and in a sense sufficiently) high specific gravity is no guarantee against dangerous

inflammability; the degree of inflammability in an oil must be—and in practice always is being—determined by direct experiment. For this purpose it is not sufficient to heat a sample oil in an open vessel gradually to higher and higher temperatures, and to note the temperature at which the atmosphere over the oil proves inflammable when a lighted taper is brought in contact with it. By this method (which formerly was the universally recognized test) the most varying results may be obtained with the same oil. Far

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to time to apply a light to its atmosphere. execution of this test many varieties of apparatus have been proposed. That adopted by Abel, and now (1884) legally recognized in Great Britain, is made of sheet copper, the exact thickness of which is prescribed for every part. an air-bath, which latter is heated by immersion ina warm- water bath, provided with an air-jacket. oil cup is pierced with three circular orifices, one in the

holes for admitting air at the close of each trial. holes are covered by a slide so contrived that when the

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more trustworthy is the close test first proposed by Keates about 1870, the principle of which is to heat the oil within a close vessel which is opened only from time For the

The oil is placed in a close cup, suspended in The top of the

centre for trying the best flame, and two smaller lateral The

central hole has become almost uncovered the lateral ones are also open. The slide carries a small colza-oil lamp

suspended on trunnions, having a flame of a prescribed

size. A pendulum two feet in length vibrates in front of the observer, who, in testing, withdraws the slide slowly during three vibrations, tilts the lamp

to bring its flame in contact with the atmosphere of the vessel, and quickly shuts the slide during the fourth vibration. To execute a test the oil at about 60° F. is placed in the cup, which is

immersed in the water-bath having water of 130° F. A

thermometer plunged into the oil and another in the water-bath indicate their temperatures. When the oil has approached its presumable flashing point, trials are made at each rise of 1° F. in the temperature of the oil. The lowest temperature at which the atmosphere of the cup inflames is the flashing point of the oil tested. The legal minimum flashing point of burning oil by the close test is 75° F., corresponding to about 100°F. by the obsolete open test.

The variety of mixed paraffins which the oil-distiller produces may be arranged under the following heads :— (1) oils too volatile to be available for domestic illumina- tion, serving chiefly as solvents; (2) burning oils, as required for house lamps; (3) oils of very high boiling point, available, and used chiefly, for lubricating purposes ; (4) solid paraffin.

The products of the second class have long come to practically supersede the colza oil which used to be the illuminating oil par excellence. Over it they offer the advantages of greater cheapness and of giving, weight for weight, more light. But their drawbacks are that, how- ever carefully refined they may be, they have, when allowed to leak out, or in lamps of inferior construction, a somewhat disagreeable pungent odour, and that there is always a lurking danger in the possible presence of highly volatile inflammable hydrocarbons. Colza oil will never burn without a wick ; paraffin oil or petroleum may do so. Products of the second and third classes, separately or combinedly, are of course available as fuels proper, 2.¢., for the production of heat. At the time when mineral oil was first produced in great quantity in America, the advantages it would offer as a fuel for marine boilers especially were very emphatically insisted on. Of course mineral oil can be more economically stored than coal, and its combustion-heat is susceptible of more exhaustive utilization. The latter fact forms the raison d’étre of those beautiful petroleum kitchen-stoves and culinary lamps which are very much used on the Continent where gas is not at hand. But to talk of mineral oil as a cheap fuel for wholesale heating is

nonsense. H. St Claire Deville, about 1870, made an extensive investigation on the calorific value of American petroleum which, as we know, is pretty much the same thing as paraftin oil. He used a large apparatus, enabling him to burn several hundred litres of oil in one experiment ; in fact he realized

more fully than other experimenters had ever done the conditions prevailing in the working of steam-boilers ; the only difference was that he took care to collect all the heat produced in a large mass of water of known weight, and measured the heat by the increase of temperature produced in this heat receptacle. He found that even heavy Virginia lubricating oil gave not more than 10,180 units of heat (Centigrade) per unit-weight of fuel burned. But, on the other hand, in direct experiments made by Scheurer-Kestner, a coal containing 88-4 per cent. of carbon, 4°4 of hydrogen, and 7:2 per cent. of oxygen, nitrogen, and ash gave 9628 units of heat, while another

coal of the same elementary composition gave 9117 units.

Gas retort coke (though a far closer approximation to pure carbon) yields only 8050 units. Supposing coal yielded just that in opposition to the 10,000 units from petroleum, it is clear that the latter must not cost more than 1:25 times as much as coal weight for weight, or else it is the more expensive fuel. Take one ton of coal at 10s.; eight- tenths of a ton of petroleum is its calorific equivalent ; but this weight of the oil (taking the specific gravity at 0°8) measures 224 gallons. Hence petroleum, to be as cheap as coal, must not cost more than about a _halfpenny a gallon. Cheap as mineral oil is nowadays, it has not yet come down to this level. .

To pass to the lubricating oil (third class), it, like the burning oil, competes with the fats and fatty oils which until lately were exclusively employed. In opposition to these it offers other and very substantial advantages besides its lower price. Good mineral lubricating oil may have such very high flashing point that it may be positively less inflammable than fatty oils or tallow; and, as a lubricant for high-pressure steam cylinders, it offers the great advantage that it is not, like fatty oils, decomposed by hot steam into glycerin and fatty acids, which latter cannot but attack the metal of the

machinery to some extent. A still more important feature in mineral lubricating oil is that, even when diffused throughout:a mass of cotton (or other textile) waste, it shows no tendency towards spon- taneous combustion. In exhaustive experiments by Galletly and by Coleman, it was found that mineral lubricating oils diffused through textile waste do not take fire at temperatures at which even colza oil ignites, and also that fatty lubricants to which from 20 to 50 per cent. of mineral oil was added were thereby prevented from igniting.

Solid paraffin, industrially and commercially, is a sub- stitute for the more expensive stearin as a material for candles. To this latter it is more than equivalent in light- giving power ;. but it offers the drawback of greater soft- ness and lower fusing point. In practice paraffin is always alloyed with stearin to produce candles possessing the necessary degree of hardness and stability of form.

The Paraffin Oil Industry of Scotland.

In December 1847 Lyon Playfair drew the attention of the late Mr Jaines Young, F.R.S., a Glasgow chemist, to a spring or exuda- tion of petroleum at Alfreton in Derbyshire, and induced him to leasc the spring, with the view of turning the material to commercial advantage. In 1848 Mr Young commenced the purification aud preparation from this petroleum of two varieties of oil—one, thick, for lubricating, the other, thin and limpid, for burning in lamps. Tt was found that this crude petroleum contained paraffin in notable proportion; but the solid paraffin was not separated for trade purposes, and that body continued still a simple chemical curiosity. Within two years the quantity of petroleum yielded by the spring began to decrease, and in the beginning of 1851 it was practically exhausted, and the business there ceased. Meantime it had occurred to Mr Young that the petroleum he was working might have becn produced by the action of heat on the underlying coal ; and, under the impression that it might be possible by artificial means to pro- duce a similar substance, he began an extensive series of experiments on the destructive distillation of coal. Ag the result of a long-con-

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tinued investigation in this direction, with many varieties of coal, Mr Young in October 1850 secured a patent for the manufacture of paraffin and paraffin oil from bituminous coal, which patent became the basis of the new industry. “The coals,” the patentee says, “which I deem to be best fitted for the purpose are such as are usually called parrot eoal, cannel coal, and gas coal, and which are much used in the manufacture of gas for the purpose of illumination.” Early in 1850 Mr Young’s attention was called to the Boghead mineral, which he found to be of all the substances experimented upon the most promising for his purpose. That circumstance determined Mr Young and his original partners to set up their works at Bathgate in the region of the Boghead mineral, where con- sequently, in 1850, the necessary buildings and plant were erected, and manufacturing operations were begun in 1851. In 1853 a law- suit of great importance, which turned on the scientific question “What is coal?” took place betwecn the proprietor of a portion of the Boghead mineral and his mineral tenant, who was entitled to work coal only. The proprietor averred that the mineral in question was not coal; but, after a great amount of scientific evidence on both sides had been heard, the decision was that the substance came, so far as regarded the purposes of the lease, within the definition of coal. Had the issue of the case been in favour of the proprietor of the mineral, Mr Young’s patent would have been practically valueless, for he claimed only the distillation of bituminous coal. The dis- tillation of mineral schists or shale at a low red heat had, moreover, been previously patented by Du Buisson; and the only raw materials which have been used to any extent in the Scottish industry are the Boghead mineral and subsequently bituminous shale.

The essential feature of Young’s invention was the distillation of bituminous substances at the lowest temperature at which they could be volatilized to a practically sufficient extent. In practice it was found that a temperature of 800° F. is the point about which the best results are obtained.

The material exclusively distilled in the carly ycars of the industry in Scotland was the Boghead cannel or Torbanehill mineral. The supply of this mineral was limited, and, as its value for gas-making as well as for oil-distilling was very great, it rapidly advanced in price from 138s. 6d. per ton, at which it was contracted for when the Bathgate works began operations,

till it rose to 90s. per ton before its final disappearance from the market about 1866. As early as 1859 the bituminous shales which are found in the Scottish Carboniferous formation began to attract attention as a possible source of raw material for the industry, and in that year a seam was experimentally opened up at Broxburn, Linlithgowshire. In 1861 a shale oil work was established at Gavieside, West Calder, and by the period of the expiry of Young's patent in 1864 several works distilling shale were in operation. But, while from the Bog- head mineral from 120 to 130 gallons of crude oil were obtainable for every ton distilled, the ordinary bituminous shales yield at most only 35 gallons per ton ; and even with the improved methods of working in use at the present day the average yield of crude oil from shales is not more than 32 gallons per ton.

The bituminous shales of Scotland are found in a wide belt of the Carbonifcrous formation, extending from Ayrshire in a north-easterly direction to the Fife eoast. In Ayr and Renfrew they are found to some extent in the true Coal-measures; but, generally, and especially in the east, they are obtained in the Lower Carboniferous series. These oil shales consist of fissile argittaceous bands, highly impreg- nated with bituminous mattcr. As a rule the shale of the west country yieldsa high percentage of crude oil, but the Linlithgow, Midlothian, and Fife shales produce oils comparatively rich in lubricating oil and solid paraffin, the most valuable product of the industry. The ordinary Broxburn shale contains 17 per cent. of bituminous volatile matter, and leaves 76 per cent. of spent shale (char) on distillation. In contrast with this is the composition of the Boghead mincral, which contained not less than 65 per cent. of volatile bituminous matter and only 22 per cent. of ash.

In the early years of the industry at Bathgate, the two classes of oil—heavy (lubricant) and light (illuminating)—were the products to which attention was principally directed. Paraffin was separated from the heavy oils; but the demand for it was at first small, and many difficulties had to be overcome before eandles consisting principally of that body could be favourably brought into the market. "With the increased knowledge, improved methods, and eager competition of the present day, the range of products has largely extended, and almost everything obtainable from the shale, except the incombustible ash, is turned to profitable account. The

commercial products embrace sulphate of ammonia, illuminating and heating gas, gasoline and naphtha, highly volatile oils, several grades of burning oil and of lubricating oil, heavy green oil used for making oil gas, and solid paraffin. The sequence of manufacturing operations las not changed in any esscntial particular since first established by Young; but at every stage and in all the appliances numerous and important modifications have been, and continue to be, actively introduced, all tending to greater cconomy of work, increase of production, and improvement of the quality and variety of commercial products.

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Manufacturing Operations.

The manufacture divides itself into two distinct sections :—(1) the crude works, dealing with the preparation and distillation of the shale and with the production of crude oil and the collateral products

(Iluminating gas, partly burned a partly condensed to form gasoline.

Oieewan ae B. Burning portion.

Coke,

.. oil. {

SHALE,

C. Heavy oi] with hard

With sulphuric acid scale.

Ammoniaeal liquor. { =Sulphate of ammonia.

Crude Works.—Bituminous shale as brought from the pits is passed through powerful toothed cylinder machinery, reducing it to fragments not larger than a man’s fist. In this state it is conveyed in hutches to the retorts, in which it undergoes destruc- tive distillation—the distinctive operation under Mr Young’s patent. The retorts used have undergone many and important

modifications. arranged in benches, in all respects like gas retorts, were employed, put these in the Scottish trade very quickly gave way to the vertical retort. The form of vertical retort originally in general use consisted of a cast-iron cylinder, circular or oval in cross section, 8 or 10 feet in height and about 2 feet in diameter, or equivalent thereto. It tapered at the top, where it was provided with a hopper for charging the material to be distilled and a valve for closing the retort mouth. The bottom end dipped into a trough of water, forming an efficient lute, and effectually preventing the escape downwards of any of the gaseous products of distillation. These retorts were arranged in linear benches of six, three on each side of a furnace fed with coal, the heat from which passed to each side into the chamber or oven in which the retort stood. The distilled vapours passed away by a pipe at the upper end of the retort, their emission being aided by a jet of superheated steam injected at the bottom. The distillation in these retorts was continuous, a portion of spent shale being withdrawn through the water in the trough every hour or thereby, and a corresponding amount of fresh shale being added by the hopper.

As competition with American petroleum increased, the efforts of manufacturers were dirccted to cheapening the distilling process, by utilizing the spent shale from the retorts in its hot condition as fuel for distilling the succeeding charge. The difficulties in the way of accomplishing this were very great, chiefly on account of the large proportion of ash in the coked residue, amounting to from $5 to 90 per cent. of the whole. To use spent shale so poor in carbon it was essential that it should be dropped into the fur- nace direct from the retort without exposure to the air, and this was first successfully accomplished by the improved retorts aud furnace patented by Mr Norman M. Henderson in 1878. According to the Henderson system, which has been adopted in the more important Scottish oil works—a series of four vertical retorts are arranged in quadrangular order over a common fire-chamber or furnace ; the bottom ends of the retorts are provided with doors capable of being closed gas-tight ; and immediately below each door there is a valve which, in one position, and while the charge is being distilled, entirely cuts off the retort bottom from the furnace or fire-chamber, leaving the retort bottom exposed to the external air, but when the retort charge has been exhausted of oil, and is about to be passed into the furnace as fuel, the valve can be turned over

outwards, in which position it forms an inclined shoot contiguous to the bottom of the retort and the fire-chamber. The door-closing at the bottom of the retort having been first withdrawn, and the valve drawn back, the contents of the retort pass freely into the furnace, where their combustion is at first assisted by a jet of the incondensible inflammable gas given off by the retorts themselves.

Each Henderson retort can contain about 18 cwt. of shale. The four retorts forming a set are being cleared in rotation at intervals of five hours, so that each charge suffers distillation for twenty hours. The temperature is kept at about 800° F., this giving the best results. The vapour produced in the retort is led off by a pipe issuing from near the bottom, and, in order to avoid unnecessarily prolonged sojourn of the vapour in the hot vessel, a Jet of superheated steam is constantly made to stream in above and guide the vapour downwards. The vapour, which amounts to about 8000 cubic feet per ton of shale distilled, is passed through a system of condensing pipes, communicating below through a pro- perly-divided horizontal chest, like that used in gas works for the condensation of the tar, From the last compartment of the con- denser the still uncondensed gas is drawn away by a fan or other

exhaust" through a sct of "scrubbers." In the first of these the

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Originally, as was natural, horizontal retorts |

—illuminating gas, gasoline, and ammonia; and (2) the refinery, in which the crude oil is purified and separated or split up into the considerable range of commercial products obtainable from it. The

following table shows the stages through which the various pro- ducts are derived from shale':—

A 2, Solvent naphtha, A 3. Burning naphtha, A 4, Burhing oil.

Bee Naphtha®..,..s—.ces

Teetocsweatcerorsccsesusoreststsirs sss Al, Gasoline.

Burning oil of various den- sities, Intermediate oi] with soft) 1, Intermediate oil.

1 Be, Burning fraction, seale. 2, Soft scale.

| B 3, Heavy oil with iol 1, Lubricating oils, various scale, densities. C1. Heavy oil with soft (2, Soft scale. scale,

C 2. Hard scale. = Paraffin of high melting

point.

gas is washed with water and thus stripped of what it still contains of ammonia ; in the succeeding ones it is washed with heavy oil, which withdraws a considerable portion of the vapours of the more highly volatile hydrocarbons which are diffused throughout it. From this heavy-oil solution the absorbed hydrocarbons are extracted by distillation as “naphtha.” The gas, after having thus been freed from its more readily condensible parts, is either led away into gas- holders to be utilized as illuminating gas or used directly as a fuel (see above). The product which collects in the condenser chests consists of crude oil (about one-fourth of it) and a weak aqueous solution of ammonia and volatile ammonia salts, containing from 2 to 5 per cent, of real ammonia, NH,, which, however, in all cases represents only a small percentage of the potential ammonia which was contained in the original shale in the form of nitrogenous carbon

compounds. In the golden days of paraffin oil making this ammonia

liquor was simply allowed to go to waste ; but when the American petroleum began to depress the prices of the oils the manufacturer saw the propriety of working up the liquors for sulphate of ammonia by the same methods as are employed in connexion with the coal-gas industry (see NiTRoGEN, vol. xvii. p. 519). And as, during the last decade or two, the demand for ammonia has becn steadily increasing, the ammonia in the shale industry by and by rose from the rank of a minor collateral to that of one of the principal products, and a number of attempts have been made to recover

that part of the nitrogen which, in the ordinary process, is lost as a component of the coke. Dr H. Grouven proved (1875-77) that all nitrogenous organic or organoid matter when exposed to a current of steam at about 1000° C. burns into carbon oxides, hydrogen, and ammonia, the last-named including all the nitrogen. Messrs G. T. Beilby and William Young have worked out and patented a process for discounting this fact in the shale industry for a more exhaustive extraction of the ammonia. In one of the later forms of the process the shale is being distilled in retorts standing over a fire- brick chamber surrounded by flues and kept at a far higher temperature than the retorts themselves. The coke from the retorts is discharged straight into this chamber, and therein exposed toa mixed current of steam aud air, which burns away the carbonaceous part into carbonic acid, carbonic oxide, hydrogen, and ammonia. The large mass of hot gas thus produced passes next through the retorts above to aid in the distillation, and conjointly with the retort vapour is subjected to systematic successive condensation. The incondensible gas which is ultimately obtained includes all that the gas from the ordinary process contains, and also a large proportion of hydrogen and carbonic oxide from the hot-chamber process. It serves as a fuel for heating the chamber and the retorts; but, as it does not furnish quite enough of heat for all this, a combined retort and gas-producer 1s built into the bench with the shale retorts. This supplementary apparatus 1s charged with coal, which, in it, is first distilled, then converted partially into gas by steam and at last completely by a regulated cur- rent of air. The gas from the first and second stages is scrubbed to strip it of its ammonia and tar, and then, conjointly with the gas from the third, used as a fuel for the retorts. In this way the advantages of gas-firing are secured at little expense, as the condensed products are nearly equivalent in money value to the coal consumed. In the Young-Beilby process, which is extensively used in Scottish works, the yield of ammonia is on the average double, and in special cases five times, that obtained in the ordin- ary process of distillation. a -4 The Working of the Ozl.—The composition of the crude oil is very variable (see above). It generally forms a very dark green, almost black, liquid, somewhat tarry In appearance, and endowed with a highly unpleasant empyreumatic odour. The specific gravity ranges from 0°862 to 0°895. Each tou of shale distilled yields on an average 30 gallons of crude oil (about 260 tb), 700 tb of coke, gas, and loss, and 1270 ib of cinders. The crude oil on refining yields 88 to 44 per cent. of oils available as “spirit ” or

for burning, 15 to 20 per cent. of lubricating oil, and 9 to 12 per cent. of solid paraffin. AVML —~9r

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Refinery.—The first operation in oil refining consists in submit- ting the crude oil to distillation in large pot-shaped stills capable of holding 1200 or 1400 gallons. The distillation is continued till only a pure vesicular coke remains in the still, and the vapours (condensed by the ordinary worm-pipe arrangement) constitute “onee-run oil,” which from its bright green colour is also known as green oil, The once-run oil is the material from which, by a repeated series of washings with sulphuric acid and caustic soda and fractional distillations, the graduated series of purified pro- ducts is finally obtained. ; ,

Washing.—Once-run oil contains a series of basic and acid com- ponents. To separate these the oil is first repeatedly treated with sulphuric acid of different degrees of strength, which is thoroughly intermixed and brought in contact with the oil by mechanical means in an agitating tank or washer. The acid first used is a weak tarry acid which has been already used in a subsequent stage of the manufacture. This produces a copious tarry deposit, which is removed ; the process is repeated with a similar result ; and there- after the oil is further treated with two successive washings of strong vitriol. After settling and removal of the precipitated tars, a similar series of washings with caustic soda solutions of increasing strength, and corresponding precipitation and removal of tars which combine with the alkali, are carried out. During both the acid and the soda treatments the oil is maintained at a tempera- ture of about 100° F. by the circulation of steam through the tanks in coiled pipes. The sulphuric acid tars are to sonie extent used as fuel in the fractionating stills.

Fractional Distillation. —The purified once-run oil is a very mixed substance, giving off vapours within a wide range of temperatures, which condense into products of varied specific gravity. By the series of fractional distillations to which it is submitted a series of products are ultimately obtained comparatively homogeneous in constitution, which distil within relatively narrow limits of tem- perature. The ordinary method of fractionating once-run oil consists in running it into large cylindrical boiler

stills heated by furnaces in which the acid tar already spoken of is consumed. The stills have led into them steam-pipes, through which steam is injected into the oil in process of distillation as required. When the heat is first raised, superheated steam is injected to aid in carry- ing off the lighter vapours, which are condensed as naphtha or “spirit.” As the distillation proceeds, and the gravity of the con- densed product increases, it is run into separate receivers, and thus a series of fractionated intermediate products is produced, the first portion up to 0°750 specific gravity being naphtha, while from 0°750 to 0°850 is the burning oil portion, and the subsequent portion separated is heavy oil containing paraffin. The portion remaining in the still is removed to the residue stills, in which it is distilled till the still contains only coke. The oil driven off from the residue stills is called “heavy oil and paraffin,” the paraffin house for treatment there.

Improved Fractionating Stills.—Many attempts have been made to adapt the fractionating still to a system of continuous working by keeping the contents at a constant level as the distillation pro- ceeds. For a long period continuous distillation was only imper- fectly applicable, and yielded unsatisfactory results. The lighter fractions alone were driven off, and as the distillation progressed the density of the contents of the still gradually increased, making the difference between the oil added to the still and that within it increasingly great. In the end the contents of the still had to be removed and completely distilled as one charge in a separate still. In 1883 Mr Norman M. Henderson, the patentee of the Henderson retort, patented a continuous process of distillation which com- pletely obviates all difficulties, and largely reduces the time, labour, and cost of fractionation as compared with the ordinary intermittent method. According to Henderson’s system, purified once-run oil is fractionated continuously in a connected series of three cylindrical stills. ach still is fitted with inlet and outlet pipes, the mouths of which opening upwards are placed at opposite extremities of the still, The outlet pipe of No. 1 passes as inlet into No. 2, and similarly outlet of No. 2 is connected as inlet with No. 3, while the outlet of No. 3 passes into one or more common residue stills. The inlet or feed pipe of No. 1 traverses the long horizontal con- densing pipes of the whole three, and thus the once-run oil, while absorbing heat before entering No. 1 still, also aids the condensation of the vapours. In working there is a constant feeding of heated once-run oil into No, 1 still, a like steady flow from No. 1 to No.

2, from No. 2 to No. 3, and from No. 3 to a residue still. The oil of course increases in density as it passes onwards; but the specific gravity in each still is practically constant, and, as the heat applied is increased In proportion to the gravity, the oil vaporized in each separate still is of uniform quality and specific gravity. In No. 8 ee where, in consequence of the high gravity and temperature,

ere is a tendency to deposit carbonaceous matter, circulating plates or dishes hinged to each side of the still, and concentric with the bottom shell, are placed. The circulation of the oil from the bottom up the sides in the space between the shell and the circulating plates is directed and assisted by jets of steam from a pipe laid

and passes to.

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along the bottom of the still. In this way the oil is kept in steady circulation up the sides and down the centre, and any deposit of coke which may take place forms on the inner surface of the cireu- lating plates, from which there is provision for its casy removal when required.

The manufacturer has now his material split up into three pro- ducts—naphtha, burning oil, and heavy oil with paraffin. By renewed treatments with acid and alkali and fractional distilla- tions, these products are further purified and diffcrentiated. We cannot go into technical details, andin regard to the principles upon which the processes are founded reference may be made to what has becn said above in connexion with corresponding laboratory methods. As a final result the following products (or a similar series of other products) are produced and sent out into the market :—

1. Gasoline : a mixture of paraffins, so volatile that a current of air by being passed through it at ordinary temperatures is converted into combustible (uon- explosive) gas.

2. Naplitha: a mixture of hydrocarbons which in volatility and otherwise are equivalent to the crude benzol of the coal-gas industry.

8. Burning oil: a mixture of oils sufficiently volatile and light to be suitable for combustion in domestic lamps with wicks, and yct practically free of dangerously volatile inflammable components.

4, Heavy oil, corresponding to arange of very high boiling points; too heavy or viscid to be raised by the wick of a lamp, but well adapted for lubricating purposes. This part contains the solid paratfin which the manufacturer takes care to extract as completely as possible before the oil is sold as ‘‘ lubricating oil.” The several kinds of crude paraffin extracted arc classed as ‘hard scale” or ‘‘soft scale,” according to their fusing points and consequent degrces of hard- ness at ordinary temperatures.

Separation of Hard Scale.—The heavy oil forming the last of the three portions into which once-run oil is fractionated, at ordi- nary atmospheric temperatures, becomes thick and pasty by the abundant formation of crystals of solid paraffin. This mixture of oil and paraffin is separated by draining through canvas bags, or, as is now the almost universal practice, by passing the magma into a filter press. This apparatus contains a series of thirty or forty perforated plates about 2 feet square, the faces of which are covered with filtering canvas. They are screwed up together in an oblong horizontal frame, so that a space or chamber about an inch wide is left between each pair of plates. Into these chambers the pasty mixture is forced under high pressure, the material pass- ing into and filling each chamber through an orifice in the centre of the plates till the whole of the chambers are filled. The pressure being kept up, the fluid oil exudes through the canvas and perforations in the plates, leaving solid paraffin, which continues to accumulate till the chambers are filled with it in a comparatively dry condition. The soft cake from the filter press is further squeezed in canvas in an hydraulic press giving off more fluid oil, and the cake from this pressure consists of commercial hard scale or crude paraffin.

Soft Scale.—The heavy oils separated in the second and third fractionation of burning oils, and the oil from which the above hard scale is separated, hold dissolved in them paraffin of low melting point, which can only be crystallized out by bringing the oil to a very low temperature. For this purpose the oils are reduced to from 18° to 20° F. by artificial refrigeration. The method now employed consists in sufficiently cooling a continuous

current of brine or of chloride of calcium solution by passing it through an ether refrigerating machine. This cold current of brine circulates through the interior of a large cylinder or drum, which revolves slowly, dipping into a trough containing the oil to be cooled. The cold surface of the drum in contact with the oil takes on a deposit of solid paraffin crystallized out of the mixture. It is removed by scrapers and made to fall into a separate receptacle, whence it goes to the filter press and the hydraulic press in the same way as the hard scale.

Lubricating Oil.—The oil from which hard and soft paraffin are separated as above stated exhibits a blue fluorescence, and is hence called blue oil. It receives an acid and soda series of washings, after which it is submitted to fractionation. The first portion

| given off, up to about 0°850 specific gravity, is transferred to the.

burning-oil series, with which it is mixed for further treatment. The remainder is received as various grades of lubricating oil, with specific gravity ranging from 0°860 to 0890. These heavy oils are again refrigerated, yielding a further crop of soft scale, after which they get a final acid and alkali treatment, and are finished for use by having steam blown through them for a prolonged period, the effect of which is to reduce greatly their objectionable smell. Finally they are kept in warm settling tanks at a temperature of not less than 90° F. for eight or ten days, when they are ready for the market.

Occasion has already been taken to name the advantages which this kind of mineral oil offers asa lubricating agent. Let us now add that it cannot quite take the place of fatty lubricants, lack- ing the degree and kind of viscosity which fits these for certain purposes. A mixture of fatty and mineral oil in proper proportions is often found to work better than either component would by itself. As mincral oil is far cheaper than all the fatty oils, it is largely used as adulterant of thesc. Such adulteration can

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often be detected without the aid of chemical tests; all heavy mincral oils exhibit a characteristically strong blue fluorescence, which becomes rather more prominent by the presence of fatty oil. Manufacturers, however, have learned to remove the fluorescence by the addition of certain chemical substances, and large quanti- ties of such “ bloomless” oil are being sold and used as colza or other fatty oil.

Parafin Refining.—The crude paraffin which remains to be dealt with consists of soft scale, melting point between 90° and 105° F., and hard scale melting between 115° and 120° F. The greater part of the soft scale is disposed of in the crude state for impreg- nating match splints in lucifer-match making. The remainder, Hard and soft, is purified by an acid and soda treatment, and decolorized by repeated washings with solvent naphtha. To this end the scale is melted, mixed with 25 per cent. of naphtha, cooled down, and thus caused to crystallize, and subjected to hydraulic pressure. The solvent naphtha is thus squeezed out, and this series of operations is repeated two or three times. Each of the mother-liquors produced is utilized as a purifying agent for the paraffin of a preceding stage of purity, so that it at last arrives at and serves for the original crude scale.

In its progress through these washings the naphtha takes up much heavy oil and solid paraffin, which are extracted by systematic fractionation and crystallization. The paraffin, after its last squeez- ing, isa dull chalky-looking white mass strongly impregnated with naphtha, to drive off which it is melted and has a current of steam blown through it, till no trace of naphtha odour comes away with the steam. The ultimate decolorization is effected by mixing the heated paraffin with animal charcoal, allowing the charcoal to settle, and drawing off the paraffin through filters. The molten paraffin flows into oblong tins which mould it into the beautiful translucent blocks used for candle making and the several other purposes to which paraffin is applied.

The soda-tar obtaincd in the various processes is to some extent collected and treated for the recovery of a soda sufficiently pure to be used in the first stages of purification of the crude oil. It is also employed to neutralize the acid tar, after which both are distilled, yielding as a bye-product an oil

known as “ green oil,” largely used for the manufacture of oil-gas under Pintsch’s patent.

Commerce. —The development of the paraffin industry under Young’s patents, and the rapid increase of demand for the products, led directly to the rise of the great petroleum industry in Amcrica. The Unitcd States acting commissioner of patents, Mr John L. Hayes, in reporting on Mr Young’s claim for an extension of his patent rights, states that “the manufactures of coal oil in this country had their origin in Mr Young’s discovery. The use of petroleum followed so directly and obviously from the use of coal oils that it can hardly be denied that the one originated from the other.” The petroleum industry once started, however, grew with so startling rapidity, and attained such gigantic proportions, that it threatened the entire extinction of the parent manufacture. In the early days of the trade a considerable development of manufacturing activity took place in Wales, where an inferior kind of cannel coal was distilled ; and at many localities in Germany brown coal and sometimes peat were utilized as the raw materials of a considerable industry. The pressure of the competition with American oil was felt severely by all, and it was only with much difficulty that the great Scottish companies succeeded in holding their own, and in carrying on a constantly extending production. The Welsh industry was practically extinguished, and the production in Germany, not- Withstanding the imposition of high protective duties, was greatly circumscribed. The chief seats of the manufacture in Germany are now in Saxony, near Weissenfels, where a peculiar variety of lignite called ‘‘ pyropissite” forms the raw material for distillation.

In the Scottish industry there was in the middle of 1884 about £2,000,000 of capital invested, the working capacity of works in operation being equal to the distillation of 4170 tons of shale a day, while plant is being provided to increase that capacity to 5920 tons. ‘The following table represents the present output of a year of 312 working days.

Actual. In View. | Total.

Shale distilled per day, tonS…….ssseee 4,170 1,750 | 5,920 Shale distilled, tons……. per annum | 1,301,040 546,000 | 1,847,040 Crude oil

produced, gallons.. 6 39,031,200 | 16,380,000 | 55,411,200 Burning oil and_ spirit, in

barrels of 40 gallons…..... 400,070 167,895 567,965 Lubricating oil, tons (of about

BAGEGANONS)...0.ssccceccesreeoees os 24,490 10,277 34,767 Paraffin scale, tons…....000 0 15,334 6,435 21,769 Sulphate of ammonia, tons… 10,454 4,388 14,842

(W. D.—J. PA.) PARAGUAY, a South American republic situated in the basin of the Parana-Paraguay system, between 22° and 27° 35’S. lat. and 54° 35’ and 61° 40’ W. long. It is conterminous with Brazil, Bolivia, and the Argentine

Republic, and its boundaries were long under dispute. The Argentine Republic especially laid claim to a portion of the Gran Chaco to the north-east of the Pilcomayo; but in 1878 the president of the United States (to whose arbitration the matter had been submitted) decided in favour of Paraguay. The town of Villa Occidental, on the Gran Chaco side of the Paraguay river, opposite Asuncion, has since been called Villa Hayes. The whole area of the country is estimated at 91,980 square miles, of which 35,280 are in the Gran Chaco portion.

Paraguay proper, or the country between the Paraguay and the Parana, is traversed from north to south by a broad irregular belt of highlands which are known as the Cordillera Amanbaya, Cordillera Urucury, &c., but partake rather of the character of plateaus, and form in fact a con- tinuation and outwork of the great interior plateau of Brazil (Keith Johnston, jun.?). The elevation nowhere much excéeds 2200 feet. On the western side these highlands terminate with a more or less sharply-defined edge, the country sloping gradually up to their bases in gentle undulations with open ill-defined valleys; on the eastern side they send out broad spurs enclosing deep-cut valleys, and the whole country retains more of an upland character. The tributaries that flow westward to the Paraguay are consequently to some extent navigable, while those that run eastward to the Parand are

interrupted by rapids and falls often of a formidable description.» Apart from the central highlands there are several plateaus and knots of hills in the west between 25° and 26° 20’ 8. lat. The plateau on the edge of which Asuncion is built has a relative height of about 200 feet, and skirts the Paraguay for about 25 miles with red sandstone cliffs ; to the north of this is the Altos Cordillera, witha relative height of 600 feet. From the Asuncion plateau southwards, near the confluence of the Paraguay and Parana, there is a vast stretch of marshy country draining partly into the Ypoa lagoon ; and smaller tracts of the same character are found in other parts of the lowlands, especially in the valley of the Paraguay. The country sloping to the Parana is nearly covered with dense and well-nigh impenetrable forest, and has been left in possession of the sparsely- scattered native tribes. On the other hand the country sloping to the Paraguay, and comprising the whole of the properly settled districts, is, in keeping with its proximity to the vast plains of the Argentine Republic, grassy and open, though the hills are usually covered with forest, and clumps of trees are frequent in the lowlands. Except in the marshy regions already mentioned and along the rivers the soil is dry, porous, and sandy, produced by the weathering of the red sandstone, which is the prevailing formation throughout the country.

The year in Paraguay is divided into two seasons,— “summer” lasting from October to March, and “ winter from April to September. December, January, and February are generally the hottest months, and May, June, July, and August the coldest. The most temperate month is April. The mean temperature for the year seems to be about 75° or 76°; for summer 81”, for winter 71°. The rainfall, amounting to 58 inches at Asuncion, is distributed

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1 By the treaty of 1872 the Brazilian frontier was drawn up the Parand from the mouth of the Y-Guazu (25° 30’ 8. lat.) to the Salto Grande or Great Cataract of La Guayra (24° 7’), thence west along the watershed of the Sierra de Maracayu, north along the Sierra de Ainanbaya to the sources of the Apa, and down that stream to its junction with the Paraguay. The Buenos Aires treaty of February 3, 1876, fixed the frontier between Argentina and Paraguay, and assigned to Paraguay the portion of the Gran

Chaco between Rio Verde and Bahia Negra; the appropriation of the portion between Rio Verde and the Pilcomayo was left for after consideration.

2 See his papers in the Academy, 1875 ; Proc. R. Geogr. Soc., 1876; and Geographical Magazine, 1875.

3 In regard to the rivers, compare the article PLATE RIVER.

over 84 days,—75 days being cloudy and 206 bright and clear. In the five years 1877-81 only 50 frosts were observed, and of these 17 fell in August. The wind blows from the south on 118 days, and from the north on 103 ; while from the east it blows only 44 days, and from the west only 3. Neither north nor south appears to obtain any definite mastery in any month or season. The south wind is dry, cool, fresh, and invigorating, and banishes mosquitoes for a time; the north wind is hot, moist, and relaxing. Violent wind-storms, generally from the south, average sixteen perannum. Goitre and leprosy are the only endemic diseases; but the natives, being underfed, are prone to diarrhoea and dyspepsia.

The fauna of Paraguay proper is practically the same as that of Brazil. Caymans, water-hogs (capinchos), several kinds of deer (Cervus paludosus the largest), ounces, opossums, armadillos, vampires, the American ostrich, the ibis, the jabiru, various species popularly called partridges, the pato real or royal duck, the Palamedea cornuta, parrots and parakeets, are among the more notable forms. Insect life is peculiarly abundant; the red stump-like ant-hills are a feature in every landscape, and bees used to be kept in all the mission villages.

As to the mineral resources of Paraguay but little is known—possibly because there is little to know. The gold mines said to have been concealed by the Jesuits may have had no existence; and, though iron was worked by Lopez II. at Ibicuy (70 miles south-east of Asuncion), and native copper, black oxide of manganese, marbles, lime, and salt have been found in greater or less abundance, the real wealth of the country consists rather in the variety and value of its vegetable productions. Its forests yield at least seventy kinds of timber fit for industrial purposes,— some, such as the

lapacho and quebracho, of rare excellence and durability, as is shown by the wonderful state of pre- servation in which the wood-work of early Jesuit churches still remains. Fifteen plants are known to furnish dyes, and eight are sources of fibre—the caraguatay especially being employed in the manufacture of the exquisite fianduty or spiderweb lace of the natives. Fruit trees of many kinds flourish luxuriantly; the cocoa palm often forms regular groves, and the orange tree (reaching a height of 50 feet) is so common and bears so profusely that oranges, like bananas, have a merenominal value. In the Marts (g.v.), or Paraguayan tea, Paraguay has a commercial plant of great importance, which may be said to be peculi- arly its own ; and most of the primary crops of the tropics could be cultivated with ease if there were only men and means. Paraguay tobacco is prized in all the La Plata countries, and, as men, women, and children all smoke, there is a large home consumption; but only a small quantity finds its way to Europe, under other names; coffee (though the berry is of excellent quality, if slightly bitter) is even more neglected; sugar is grown only for manufacture into rum and syrups, and loaf-sugar has to be imported from Brazil; and, although the whole popula- tion is clothed exclusively in white cotton stuffs, and cotton grows almost spontaneously in the country, English goods burdened by a duty of 40 per cent. keep the market. Wheat, oats, and rice can all be raised in different districts, but the dietary staples of the Paraguayans are still, as when the Spaniards first came, maize and mandioca (the latter the chief Ingredient in the excellent chipa or Paraguayan bread), varied it may be with the seeds of the Victoria regia, whose magnificent blossoms are the great feature of several of the _lakes and rivers. Cattle-breeding was formerly a very important interest in several of the depart- ments, but the stock was nearly all destroyed during the

Further details will be found in Keith Johnston (Geog. Mag.) and

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Mr Vansittart’s Report.

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war, and is only being slowly recruited from the Argentine Republic. The total number of horned cattle is estimated at 500,000. Land may be

purchased from private owners for from £160 to £200 per square league of 4500 English acres, but the Government rate amounts to £900 or £1000, ~

The inhabitants of Paraguay are mainly Guaranis or half-breeds with a strong proportion of Guarani blood.? A peaceful, simple people, fond of flowers and fétes, they displayed during the desolat- ing wars of 1865-70 (as so often before in the time of the Jesuits) indomitable courage in the face of overwhelming odds. Trust- worthy figures in regard to the population can hardly be said to exist. A so-called census for 1879 gives a total of 346,048, which is probably not far from the truth. The female births being always in excess of the male, and most of the full-grown men having perished in the wars, the females form about two-thirds of the whole. Of the foreign residents in 1879, about 4000 were Italians, 400 Germans, 400 Spaniards, and 40 English. Formerly, about 1857, divided into twenty-five departments, the country was in 1876 distributed into twenty-three electoral districts, each with a gefe politico, a juez de paz, and a municipality. AsuNcron (q.v.), the capital, is also the largest city (40,000 in 1857, 16,000 in 1879), Other places of present or historical importance are Villa Rica, (12,570 in 1879), often called Villa Pobre, the chief seat of the, tobacco trade, and the easternmost of the larger towns; Villa Pilar. or El] Pilar (3722), formerly Neembucu, opposite the mouth of the Bermejo, and the “strangers’ farthest” under Dr Francia’s des- potism ; San Estanislao (7453) ; San Pedro (9706), near the Tejui, about 3 leagues from its junction with the Paraguay; Concepcion (10,697), the northernmost of the towns or villages, 200 miles above Asuncion, and the trading centre for the northern maté plantations ; Humaita (3868), 198 miles below the capital, the site of the great earthworks by whicl Lopez stopped the advance of the allies for more than a year; Paraguari (5315), the present ter- minus of the railway ; Jaguaron (3413), 24 leagues from Paraguari, founded in 1536, and the seat of a manufacture of orange-flower essence ; Ita (6332), known for its earthenware ; Itangua (6948), with brick and tile works ; Luque (8878), the provisional capital in 1868; Villa Hayes (Villa Occidental, Nouvelle Bourdeaux), 10 miles above Asuncion, founded in 1854 by Lopez with French settlers.?

Paraguay is a constitutional republic. The president and vice- president hold office for four years, and are again eligible after eight years. The legislative

bodies arc a chamber of deputies (one deputy from each 6000 inhabitants) and a senate (one senator from each terri- torial division with 8000 inhabitants, and beyond that from every 12,000 inhabitants). There are five Government departments, and a supreme court of three salaried judges. The people are nominally Roman Catholics, but full rcligious liberty prevails. Crime is comparatively rare, and is rapidly diminishing. Marriage has fallen so completely out of fashion that only 3 per cent. of the births are legitimate. Education is technically compulsory; but the 178 schools were in 1879 attended only by 5862 boys and 920 girls. There is only one public library (3000 vols.) in the country. The army, which, when Lopez II. ascended the throne, numbered 12,000 men, but with a reserve of 46,000, is now reduced to 500 men; every able-bodied citizen is under obligation to serve in case of need. There is but one war-steamer, of 440 tons burden. The only railway is the line (45 miles) from Asuncion to Paraguari, which was begun by Lopez I. in 1859, and surveyed as far as Villa Rica. It was bought for £100,000 by a jcint-stock company in 1877. Ths double run, occupying twelve hours, is performed four times a week. The general trade of the country has begun to revive: from £131,493 in 1876, the value of the imports rose to £258,000 in 1881, and the exports from £68,577 to £385,700. Among the exports (all duty free) there appeared in 1881—maté, £182,025; dry hides, £28,345; tobacco, £131,730; 20,009,597 cigars, £4802 (about seventeen a penny); 47,917,700 orar.ges, £9583 ; and hard woods, £3342. The customs furnish nearly four-fifths of the national revenue (not much more than £100,000 in 1881). Previous to the war there was no national dcbt. In 1871 and 1872 two foreign loans (nominally £1,000,000 and £2,000,000) were contracted through Messrs Robinson, Fleming, & Company, London, and hypo- thecated on the public lands of Paraguay, valued at £19,380,000. Apart from the war debt of more than £45,000,000, the official statement for 1882 recognizes a foreign debt of £3,463,000.

History.—In 1528 Sebastian Cabot, following in the footsteps of De Solis, reached Paraguay and built a fort called Santo Espiritu. Asuncion was founded on August 15, 1537, by Juan de Ayolas, and his successor Martinez de Irala determined to make it the capital of the Spanish possessions east of the Andes. From this centre Spanish adventurers pushed east to La Guayra beyond the Parana, and west into the Gran Chaco ; and before long vast

numbers of the less warlike natives were reduced to scrfdom. The name Paraguay

wh graphic description of the Guarani physique is given by Captain Burton, Battlefields of Paraguay, p. 11. 3 Mr Vansittart in Reports by Sec. of Emb. and Legation, 1888.

was applied not only to the country between Rio Paraguay and Rio Parana, but to the whole Spanish.territory, which now comprises parts of Brazil, the republic of Uruguay, and the Argentine provinces of Buenos Ayres, Entre Rios, Corrientes, Misiones, and part of Santa Fé. It was not till 1620 that Paraguay proper and Rio de la Plata or Buenos Ayres were separated from each other as distinct overnments, and they were both dependent on the vice-royalty of Peru till 1776, when Buenos Ayrcs was erected into a vice-royalty, and Paraguay placed under its jurisdiction. In the history of Paraguay down to the latter part of the 18th century, the interest develops along two main lines, which from time to time get entangled with each other—the struggle between Spaniard and Portuguese for the possession of the border region between the Brazils and the country of the plains, and the formation and defence of a great philanthropic despotism by the Jesuits. The first Christian mis- sions in Paraguay were established by the Franciscans—Armenta, Lebron, Solano (who was afterwards canonized as the apostle of Paraguay), and Bolaitos—between 1542 and 1560 ; but neither they nor the first Jesuit missionaries, Salonio, Field, and Ortega, were allowed to make their enterprise a permanent success. This fcll to the lot of the second band of Jesuits, Cataldino, Mazeta, and Lorenzana, who began work in 1605. The methods by which they controlled and disciplined the Guaranis have been described in the article AMERICA.) The greater number of the Jesuit “ reductions” lay outside of the present limits of the republic, in the country south of the Parana, which now forms the two Argentine provinces of Corrientes and Misiones. La Guayra, one of the most celebrated, is in the Brazilian province of Parand. Though they succeeded in establishing a kind of imperiwm in imperio, and were allowed to drill the natives to the use of arms, the Jesuits never held rule in the government of Paraguay ; indeed they had nearly as often to defend

themselves from the hostility of the governor and bishop at Asuncion as from the actual invasions of the Paulistas or Portu- guese settlers of Sdo Paulo. It was only by the powerful assistance of Zabala, governor of Buenos Ayres that the Anti-Jesuit and quasi- national party which had been formed under Antequera was crushed in 1735. In 1750 Ferdinand VI. of Spain ceded to the Portuguese, in exchange for the fortified village of Colonia del Sacramento (Uruguay), both the district of La Guayra and a territory of some 20,000 square miles to the east of the Uruguay. Seven of their reductions being included in this area, the Jesuits determined to resist the transference, and it was only after several engagements that they were defeated by the combined forces of Spain and Portu- gal. The treaty which they thus opposed was revoked by Spain in 1761, but the missions never recovered their prosperity, and the Jesuits were finally expelled the country in 1767. In 1811 Paraguay declared itself independent of Spain; by 1814 it was a despotism in the hands of Dr Francia (g.v.). On Francia's death in 1840, the chief power passed to his nephew Carlos Antonio LopEz (q.v.), and he was in 1862 succeeded by his son Francisco Solano Lopez, whose ambitious scheines of conquest resulted in the almost total extinction of Paraguayan nationality. The three allies, Uruguay, Brazil, and the Argentine Republic, which united against him, bound themselves by the treaty of 1865 to respect and guaran- tee for five years the independence, sovereignty, and territorial integrity of Paraguay, and at the close of the war in 1870 a new constitution was established, and a president, Jovcllanos, appointed under their protection. Reduced to utter helplessness, the country owes its continued existence to the jealousy and balance of power existing between its neighbours. By a separate treaty with Brazil in 1872 it undertook to pay the cost of the war—£40,000,000 to Brazil, £7,000,000 to the Argentine Republic, and £200,000 to Uruguay, or more than £136 per head of the population. An attempt made in 1873 by Messrs Robinson and Fleming to establish an English colony of so-called Lincolnshire farmers ended in disaster. Somewhat better success has as yet attended the German colony of San Bernardino on Lake Ipacanay (414 colonists in 1879). The Brazilian army of occupation was withdrawn only in 1876.

Of older works on Paraguay the most important are Azara's Voyages dans P Amérique Méridionale, Paris, 1809; and Charlevoix, Histoire, already referred to. As commissioner for the settlement (in 1781) of the fronticr

betwecn Spanish and Portuguese territory, Azara enjoyed exceptional opportunities of informa- tion. Lozano's Hist, deia Conquista del Paraguay (used in MS. by Azara) was first printed at Buenos Ayres, 1873-74, Ulrich Schmidt (often, even in editions of his work, called Schmidel or Schmidels), a German adventurer, Icft a narrative of the first Spanish expeditions, which was published at Frankfort in 1563. Like much else of the older literature it is included in Pedro de Angelis, Coleccion de docum. hist. del Rio de la Pluta, 1835, &c., aud in De Bry's similar collection, as well a8 in Barcia's Historiadores. A systematic narrative of events in the Spanish period is given in Gregorio Funcs, Ensayo de la hist, civil del Paraguay, oe Aires, y Tucuman, 3 vols., Buenos Aires, 1816; Washburn's History of oe aguay, Boston, 1871, deals with later times, See also Dobrizhoffer, Hist. de L tponibus; Page, La Plata, &c., New York, 1867; Mansfield, Paraguay, &c.,

ondon, 1856; Burton, Letters from the Battlefields of Paraguay, 1870; Muthall, Handbook of the River Plate Republics, 1875; Mrs Mulhall, Between the Amazon and Andes, 1881; E. F. Knight, Cruise of the Falcon, 1883. (H. A. W.)

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| See Duran, Relation, 1638 ; Ruiz de Montoya, Conquista Hspi- ritual del Paraguay, 1639; Muratori's panegyrical J1 Cristianesimo Felice, 1743 ; Charlevoix, Histoire de Paraguay, 1756; Davie, Letters Srom Paraguay, 1805, &c.

PARAGUAY RIVER. See Piare River.

PARAHYBA, or Paratpa, distinguished as Parahyba do Norte from Parahyba do Sul or 8. Jo&o de Parahyba to the south of Rio de Janeiro, is a city of Brazil on the right bank of the river of the same name, 12 miles from the sea, at the terminus of a railway running 87 miles into the interior. It is divided into a lower commercial town and an upper town containing the governor's residence and other public buildings. From December to March the climate is not considered healthy. The harbour, ob- structed by several

reefs, has a depth of 15 feet, but vessels ground at low water; there is safe anchorage, however, at Cabedello at the mouth of the river. The population, which was 40,000 about 1845, has decreased to between 12,000 and 14,000, and direct trade with Europe has been given up since 1840. Sugar, cotton, and india-rubber are still exported.

PARALLAX may be defined, generally, as the change produced in the apparent place of an object when it is viewed from a point other than that of reference. In astronomy, the places of the moon and planets are referred to the centre of the earth, those of the fixed stars to the centre of the sun. It is shown in Astronomy (vol. ii, p. 775) that, the maximum or horizontal parallax of a celestial object being known, its parallax from any point of observation can be calculated. The present article will be restricted to an account of the methods employed for determining the solar and lunar parallaxes and those of the fixed stars.

Sonar PARAaLLAX.—The sun’s mean equatorial hori- zontal parallax (termed briefly the “solar parallax”) is the angle which the equatorial radius of the earth would subtend toan observer at the sun when the earth is at mean distance from the sun. For its determination it would appear only necessary to observe the sun’s apparent position simultaneously ? from two widely different points on the earth’s surface; the difference of the apparent positions will be due to displacement by parallax, from which displacement the mean equatorial horizontal parallax can be readily deduced.

The requirements of modern astronomy demand that the solar parallax shall be determined with an accuracy of yyy part of its amount—that 1s, within less than >$5 part of a second of arc. But measures in the neighbour- hood of the sun cannot be made with any approach to this accuracy, not only on account of the effect of the sun’s heat on the various parts of the instruments employed, but also of the atmospheric currents created by heat, which tend to destroy steady atmospheric definition and to render the solar image incapable of exact observation. It is thus hopeless to look for any solution of the problem by the most direct method. Two courses remain—either to seek some method which affords a larger angle to measure, or one which permits a mode of observation affording a higher precision. There are many relations to the solar parallax which are well established.

(1) Theparallax of the moon is known with very consider- able precision by direct determination. — The proportion of this parallax to that of the sun is an important term in the lunar theory, and the constant of this term (the parallactic inequality ®) is a known function of the solar parallax. Hence, if the constant of the parallactic inequality is independently determined, the solar parallax becomes known. The elements of the orbits of Venus and

2Jn using the word simultaneously the reader must understand that, though it is impossible for two widely separated observers to make precisely simultaneous observations, yet there is no difficulty (since the apparent motion of the sun is accurately known) in reducing the observations so as to represent the result as if the two observations

had been made at the same instant. 3 See ASTRONOMY, Vol. ii. p. 796.

Mars undergo secular variations which increase from year to year, from century to century, and at last acquire very large values. These secular variations (on the assump- tion that all the terms of the theories of the planets are mathematically accurate) have also a well-determined relation to the solar parallax, and therefore afford a means of determining that parallax with an accuracy which increases by the continuance of observation.

(2) It has been shown (Astronomy, vol. ii. p. 779 sq., and Mrcuanics, vol. xv. p. 708) that the proportions of the interplanetary distances can be very accurately determined and tables be computed from observations of the apparent places of the planets, without any knowledge or assump- tion as to absolute distances (although an accurate know- ledge of the solar parallax is required for giving final perfection to the lunar and planetary tables). In astro- nomical ephemerides therefore the distances of planets from the earth are accurately expressed in terms of the earth’s mean distance from the sun, the latter being reckoned unity. Hence, to determine the solar parallax, it is only necessary to measure, at some favourable opportunity, the parallax of any planet, and to multiply the parallax so found by the number which expresses the relation of the distance of the planet from the earth to the earth’s mean distance from the sun.

(3) When Jupiter is in opposition he is nearer the earth by the diameter of the earth's orbit than when in conjunc- tion ; hence, since light occupies a very sensible time to travel, eclipses of Jupiter's satellites will seem to occur too soon in the first case and too late in the latter, the differ- ence between the extremes of acceleration and retardation being the time occupied by light in crossing the earth's orbit. This time is about 164 minutes for the mean diameter of the earth's orbit; hence, if the velocity of light can be independently determined, the diameter of the earth's orbit becomes known. The determination, by employing the velocity of light, is also arrived at in another way. The constant of aberration (see ASTRONOMY, p-. 757), or the maximum apparent change of a star's true place due to the motion of the observer, depends on the relative velocity of the motion of the observer in space compared with the velocity of light. The angular velocity of the observer is perfectly known; hence if his linear velocity is known his radius of motion is known. Thus, if the constant of aberration and the velocity of light are independently determined, the radius of motion (that is the sun's parallax) will be found.

There are thus three distinctive typical methods :—(1) the gravitational method, depending on terms in the lunar and planetary theories, the constants of which are determined by observation ; (2) the geometrical, or direct observational, method ; and (3) the physical method.

1. The Gravitational Method.—The moon's parallactic inequality appears, at first sight, to furnish a very accurate method, as its constant is about 125", or fourteen times as great as the solar parallax, and the existing observations are very numerous. Unfortunately its determination is inextricably mixed up with the determination of the moon's diameter—a diameter increased by irradiation, and therefore different for every telescope, and perhaps for every observer. But this is not all. The maximum and minimum effect of the parallactic inequality occur at first and last quarter, ¢.e., when the moon is half full. One half of the observations for parallactic inequality therefore are made when the sun is above the horizon, and a great portion of the other half during twilight; whilst those on which the moon's diameter depend are made at midnight, when the irradiation is a totally different quantity from what it is in daylight or during twilight. Newcomb has attempted to determine the correction of the diameter by

the errors in right ascension, derived by comparing Hansen's tables of the moon with observations made by daylight and at night ; but he confesses that the result is so mixed up with the correction of the coefficient of the variation (and, he might have added, with the observer's personality and the telescope employed) that it cannot be relied upon. The following are the most important discussions :—

Hansen, Mon. Notices R. A. S., vol. xxiv. p. 8……... result 8°92

Stone, Afon. Notices R. A. S., vol. xxvi. p. 271……... 9 (Onee Newcomb, Washington Observations, 1865…....0c…00 » 884 Neison, unpublished, probably toappearin Mem. R.A.S. ,, 8°78

One cannot look with confidence upon a method which thus permits discordance of more than one per cent. in the discussion of the same observations by different astronomers. The result arrived at must depend on the adopted correc- tions of the moon's diameter, and, since that diameter is not capable of determination under the same circumstances of illumination as those in which the observations for paral- lactic inequality are made, the judgment of the theorist must step in and assign some more or less hypothetical grounds for the adoption of a particular diameter ; and upon this assumption will turn the whole of the quantity of which we are in search.

It is, however, not impossible that the method of observ- ing a spot near the centre of the moon, instead of the moon's limb, may lead to a more reliable result. But it will have to be shown by independent methods that the position of the selected spot is not systematically affected by phase.

Attention was first called to the method which employs the secular variations of the elements of the orbits of Venus and Mars for determining the solar parallax by a most able and comprehensive paper communicated by Leverrier to the Paris Academy of Sciences, and published in their Comptes Rendus for 1872, July 22. The most important of these variations is that of the perihelion of Mars. The earth's attraction increases the heliocentric position of Mars at perihelion by about 50" in a century, and

this change at a favourable opposition subtends an angle of 185” at the earth.

On 1672, October 1, the star y Aquarii was occulted by Mars. The appulse was observed by Richer at Cayenne, by Picard near Beaufort, and by Romer at Paris. The separate comparisons differ only 05, 0’°8, and 0°38 respectively ; and the star w Aquarii was very frequently observed by Bradley. The increase in two centuries of the geocentric longitude, corresponding to the distance of the planet Mars from the earth on 1672, October 1, is 294”, Hence M. Leverrier concludes that (attributing an error not greater than 1” to the determination of the observed variation) the time has arrived when the solar parallax can be determined with a probable error not ex- ceeding gd of its amount, or the concluded parallax will be exact to nearly +001. The value of the parallax so deduced M. Leverrier finds to be

8”°866. Similarly he finds from the latitude of Venus, determined by the transits of Venus in 1761 and 1769, combined with the latitude determined by meridian observations of the present day

8”°853. From the discussion of the meridional observations of Venus in an interval of one hundred and six years, he finds

8”°859. These values from the theories of Venus and Mars accord in a wonderful manner, and would appear at first sight to justify considerable confidence in the result. But it is impossible to forget the extraordinary intricacy of the

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processes through which these results have been evolved, and the liability to some systematic source of error, such, for example, as some neglected term producing a long inequality which may beconie mixed up with the secular variation.

In 1874 the tabular errors of Venus, as determined by the planet’s transit across the sun’s disk, amounted to more than 5” of arc both in R.A. and declination, and the tabular errors of Mars amounted to more than 8” in R.A. and to about 3” in declination at the opposition of 1877, equivalent to

an error of 2’:45 in heliocentric longitude (Mem. &. A. S., vol. xlvi. p. 172). Leverrier’s planetary tables do not, therefore, possess the accuracy attributed to them by their distinguished author, and the conclusions at which he arrived probably require some further modi- fication. Tisserand (Comptes Hendus, 1881, March 21) has continued the researches of Leverrier, and finds that they require modification, and are also subject to very considerable probable error. The later researches of Tisse- rand appear to point to a value of the solar parallax smaller than that found by Leverrier, but his work has not yet been brought to final conclusion.

2. The Geometrical Method.—The most favourable oppor- tunities for the application of this method are afforded, in a geometrical sense, by the planets Venus and Mars, when the former is in conjunction and the latter in opposition. Of these Venus approaches the earth within one-fourth of the sun’s mean distance, whilst Mars, in the most favour- able circumstances, approaches only within one-third of the same distance.

When Venus is near conjunction she is only visible as a slender crescent in the neighbourhood of the sun, and at conjunction is only visible on the occasion of a transit across the sun's disk. It generally happens, therefore, that the only means of determining the apparent position of Venus near conjunction is to refer that position to the sun's limb or sun's centre. But the sun's place is also affected by parallax, so that when the position of Venus is referred to the sun the parallactic displacement is only the difference of the parallax of the sun and Venus. Mars, on the other hand, can be referred to stars of which the parallax is absolutely insensible ; thus it happens that the advantage of Venus in point of parallactic displacement is diminished till the geometrical conditions are only 5 per cent. in favour of Venus. 'Transits of Venus across the sun's disk have been observed for parallax in 1761, 1769, 1874, and 1882.1

If an astronomer at each of two widely separated stations observes the absolute instant of apparent internal contact of Venus with the sun's limb, he is sure that the centres of the sun and Venus are separated by an angular distance equal to the "semidiameter of the sun minus the Semidiameter of Venus." The difference of the absolute times at the two stations is due to parallactic displacement, and, the planet's tabular motion being accurately known, the amount of displacement becomes known. If instead of one contact only the two observers note the instants of internal contact both at ingress and egress, then they practically find the chords described by the planet as seen from both stations. The difference of length of these chords (in time) being known, as well as the approximate diameters of the sun and Venus, and their tabular motion, Wwe have the data for computing the difference of least dis- tance of centres of the sun and Venus at the two stations, and this distance being due to parallax, we have the means of computing the parallax of Venus and thence the solar parallax. This latter method (originally proposed by Halley in 1716) has the advantage of not requiring a

1 An * . For conditions when a transit will occur, and past and future transits, see ASTRONOMY, vol. ii. p. 796.

rigid determination of the absolute instant of each contact, but merely of the duration of the transit; in other words, it involves no very rigid determination of the longitude or clock error, but only an exact knowledge of the clock rate.

It was Halley's opinion that the instants of contact could be observed with an accuracy within two or three tenths of a second of time, but experience has gone to show that the actual errors are from ten to forty times this amount, and the causes of those errors can now be assigned with considerable certainty. These causes are— (1) irradiation and diffraction; (2) disturbance of the image by irregular refraction in the earth's atmosphere; (3) the effect of the atmosphere of Venus in complicating the phenomena at the point of contact.

(1) Irradiation increases the diameter of the sun and diminishes that of Venus. Its extent depends on the aper- ture of the telescope, the perfection of its optical quality, and the perfection of the focal adjustment. Its amount is also changed by the brilliancy of the sun, é.e., is affected by the transparency of the sky and the density of the sun-shade employed. Also, when the space between the limbs of the sun and Venus becomes smaller than the diffraction disk of the object-glass employed, a greyness or shadow is perceived at the point of past or approaching contact; therefore, within a minute angle equal to the sepa- rating power (the diameter of the diffraction disk) of the object-glass, the actual instant of contact can only be esti- mated by changes in the diffraction phenomena. (2) When the images are thrown into rapid vibration by irregular re- fraction in the earth's atmosphere, it becomes impossible to distinguish between the vibration of the image of the dark body of Venus across the sun's limb near the point of contact and the regular phenomena of irradiation, provided that the atmospheric vibrations are sufficiently rapid to produce a persistent image on the retina of the observer's eye. Thus at the transit of Venus in 1882 observers were instructed to note at ingress the time when there was "a well-marked and persistent discontinuity in the illumina- tion of the apparent limb of the sun." Now it so happened that at the Royal Observatory, Cape of Good Hope, the definition was very bad—a south-easter was blowing, the effect of which was, as is almost invariably the case, to create a rapid minute vibration in the images of celestial objects

(see Sir John Herschel's Hesults of Observations at the Cape of Good Tope, p. xiv.). Thus "a well-marked and persistent discontinuity in the illumination of the apparent limb of the sun" was seen by all of five observers at the Royal Observatory from 10 to 20 seconds of time longer than at the adjoining stations in the Cape Colony, where the images were seen comparatively steady and well- defined. The instant of occurrence of the above-described phase is therefore a function of the state of the atmo- spheric definition, and no accurate means exist of estimat- ing such influence. (3) The observation is besides com- plicated by the illuminated atmosphere of Venus, which forms an arc of light round the planet near the point of contact. In many cases this light has been confounded with the light of the sun, and has thus caused very con- siderable errors of observation.

From these various causes the apparent phenomena are different at different stations ; and probably also the same phenomena are described by different observers in very different language. The real difficulty of the discussion of the results arises when these different and differently described phenomena have to be combined. It is of no consequence whether a real or seeming contact has been observed ; it is only necessary to be certain that those observations are combined which represent the same phenomenon. The same phenomenon would correspond with the same apparent angular distance of centres of the

sun and Venus, if all the telescopes were alike, if all the telescopes were in perfect focal adjustment, and if the atmo- spheric conditions of definition at all the stations were per- fect or identical. But if these conditions are not realized (and they cannot be realized in practice) the same appar- ent phenomena will not represent corresponding phases ; and, further, the observers at different stations use such different language to express what they saw that it becomes impossible to select even apparent corresponding phases with any certainty.

The value of the solar parallax deduced from a series of observations of the contacts of Venus with the sun's limb will therefore entirely depend upon the interpretation put upon the language of the various observers. 'The

result will besides be systematically affected if the state of atmospheric definition is systematically different in the opposite stations.

It is thus not surprising that very different results have been arrived at by different astronomers from different transits, and even from different discussions of the same observations of the same transit.

Laplace, Mechanique Céleste……..... transits of 1761 and 1769, 8°81 Eneke, Entfernung der Sonne, p. 108 ap Dp ews Stone, Afon. Notices Rk, A. S., vol. xxviii. p. 255,..transit of 1769, 8°91 Powalky, Ast. Nachrichten, lxxvi. col. 161…... 33 1769, 8°79 Airy, Monthly Notices, vol. xxxviii. p. 16…..... » 1874, 8°76 Stone, Monthly Notices, vol. xxxviii. p. 294…. 5 1874, 8°88 Tupman, Monthly Notices, vol. xxxviil. p. 455. ne 1874, 8°85

Besides observing the contacts, another method was employed by the Germans, the Russians, the Dutch, by Lord Lindsay's expe- dition at the transit of Venus in 1874, and by the Germans in 1882, viz., the heliometric method. This consists in observing with the heliometer (see MIcROMETER, vol. xvi. pp. 252-254) the distance of Venus from opposite limbs of the sun along known position-angles nearly in the line of greatest and least distance of Venus from the sun's limb. The method possesses many apparent advantages, because it affords the opportunity of multiplying the observations and of eliminating many sources of error.

At first sight it seems as if the method is free from the necessity for any accurate determination of the seale-value of the instrument, because, if measures are made from opposite limbs of tlie sun, the sun's diameter may be taken as the standard for all observers, and the place of the planet may be interpolated relatively to the oppo- site limbs. Unfortunately it happens that there is a very marked difference in observing the sun's diameter due both to instrument and observer. Thus two observers with different instrumeuts, who have compared scale-value by a number of pairs of stars, or zones of stars, will measure sun-diameters with a marked constant difference. If the sun's diameter is assumed to be constant, it, in fact, determines the scale-value; hence the distance of centres measured by the two observers will differ by the proportionate part a Ad, where s is the distance of centres, d the true diameter, and Ad the difference of diameter as measured by the two observers. Thus it is only when s=0 (that is, when the planet is near the

centre of the sun) that this method can be used,—a condition that does not exist in practice. _

In the case of the transit of Venus fully one-third of the whole of this personality would enter into the result by this method of reduction. For rigid reduction therefore it is absolutely necessary to have a rigid determination of scale-value in seconds of are. Unfortunately this value, when determined for any uniform instrumental condition of temperature, is liable to change, because, in observations of the sun, difference of temperature be- tween the tube, the object-glass, and the scale of the instrument is produced, and the focal adjustment is also disturbed. The scale- value depends on the relation of the focal length of the object- glass to the length of a part of the scale, and is besides affected by abnormal focal adjustment of the eyepiece.

Drs Auwers and Winnecke adopted a very complete scheme for determining the scale-value at any instant.

1. The scale-value was determined for a uniform condition of the temperature of the instrument by measuring zones of stars whose places were rigidly determined by meridian observations ; and by the same means the temperature coefficient of the instrument was determined for different temperatures, the various parts of the instrument being assumed of a uniform temperature in observations of stars by night.

2. The effect of a displacement of focus was determined by measuring the sun’s diameter and distances of pairs of stars with different positions of the focal adjustment.

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3. The focal point was determined during sun-observations by adjusting the focus on a telescope fixed in a specially prepared chamber, where its temperature would change very slowly, and the temperature of the scale (and hence its length) were measured by a metallic thermometer ; hence the change of the proportion of the scale-length to the focal length became known.

In Lord Lindsay’s expedition similar precautions were employed, excepting that in the last case an attempt was made to determine the temperature of the tube by thermometers and that of the object- glass by a thermo-pile, and the position of the focal point was cal- culated from these data.

The uncertainties of all these operations are considerable, and, though from the extraordinary labour and care bestowed upon the determination of the necessary corrections by the German astro- nomers a fairly reliable result may be arrived at, it is certain that the method of determining the solar parallax from heliometric observation of transits of Venus can now be surpassed by methods more direct, more reliable, and at the same time less laborious and costly.

If photographs can be obtained during a transit in which the limbs of the sun and Venus are sufficiently well-defined, the distance of the centres of the sun and planet can be determined (as in the heliometer method) provided ouly that the pictures are affected by no systematic errors. That this latter condition may be fulfilled the following are the essential conditions.

1. The picture must be formed on the photographic plate without distortion, or, if it is affected by distortion, that distortion must be ascertained and allowed for.

2. No change must take place in the process of developing and fixing the picture, or, if such change is possible, means must be provided for its detection and elimination.

3. The angular value of one inch on the plate must be accurately known, so as to convert measured distances into arc—for the same reasons as in the heliometer method.

It is necessary to employ an image of considerable size, because otherwise the particles of collodion, if magnified so mucli as to permit measurement of the requisite accuracy, give an irregularity to the limbs that is fatal to accurate estimation. Thus it becomes necessary either to employ a lens of very considerable focal length (40 feet was generally adopted), or to introduce a secondary lens to magnify the image formed in the primary

focus. The first of these methods was employed by the Americans, by the French, and in Lord Lindsay's expedition at the transit of 1874, the second by the British, German, Russian, and Dutch expeditions.

The use of an object-glass of long focus renders mounting of the lens in the usual manner, though not a practical impossibility, yet at least a matter of extreme inconvenience. Accordingly, where lenses of long focus were employed, the telescope was mounted in a horizontal position, and the sun's rays were reflected by a plane mirror in the direction of the tube's length. It is not easy to con- ceive that any sensible distortion in the image can be produced by a lens of such long focus even if only of mediocre quality of figure ; indeed the method may be assumed free from any such error ; but it is undoubtedly exposed to all the errors of distortion which may be produced by the plane. From the perfection now attained in the construction of optical planes, and the means which exist for testing them, the errors due to this cause may also probably be safely neglected, except in so far as the figure of the plane is dis- torted by the heat of the sun, and it is not impossible that some sources of systematic error may be thus created.

To determine the angular value of one inch (or other unit of length) on the photographic plate, it is only necessary to measure the distance of the plate from the posterior surface of the object- glass, and then to determine the distance of the optical centre of the lens from that surface ; the sum of these two distances is the radius of which lines on the surface of the plate (reckoned from the centre of the plate) are tangents.

The French adopted the daguerrotype method of photography, in which it is impossible to imagine any errors due to contraction of the photographic film, as in the collodion process, because the picture is virtually a portion of the silver plate on which it is taken. But in adopting this process the advantage of measuring the photo- graphs by transmitted light was lost ; and itis a practical question, which experience has not yet decided, whether the loss or the gain is the greater.

The Americans, and Lord Lindsay in 1874, using the collodion process, took the precaution to provide means for the detection of possible contraction of the film during development of the picture or drying of the film. This was done by placing the sensitive plate near to or in contact with

a reticule ruled on glass near the primary focus ; this reticule was thus photographed simultaneously with each photograph of the sun; hence any change produced during the development would cause a similar change in the relative positions of the images of the ruled lines on the developed plate. As a matter of fact the American astronomers have found fairly reliable results from their photographic operations, but the accuracy arrived at is by no means very considerable, the probable

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error of the complete measurements of an average plate amounting

to + 0”°5. p But the difficulties of dealing with systematic crrors are cnor-

mously increased when a secondary magnifier is employed, be- cause it is theoretically impossible with the present optical glass (employing spherical curves) to construct a perfect secondary

magnifier in which the scale value should be absolutely the same in every part of the field ; still less is it possible, when the attempt ig made, to combine the visual and photographic rays in the same focus ; hence every photoheliograph of this construction must be separately studied for distortion of the image. The results of actual trial prove that the distortion is even greater than was expected, and is besides not the same in each radius, and the latter error may be produced by a very small error of centring in the lenses which compose the sccondary magnifier. The investigation of such errors with the required accuracy would be a laborious and at best an unsatisfactory operation, and is rendered practically impossible by the fact that, whenever the instrument is turned upon the sun, the object-glass becomes heated, its focal lengtl changed, and the optical relation of the secondary magnifier to the image in the principal focus of the object-glass changed also.

For these reasons the photographic observations in Which second- ary magnifiers were employed might be expected to prove a failure, and this expectation has been confirmed by the result of experience.

The observation & the transit of Venus on a large scale of national expenditure was certainly justified in 1761 and 1769. In those days there were no refined means of measuring angles with high accuracy, and the employment of the motion of Venus and a time-scale of measurement was the best available method of determining the solar parallax. But since 1820 the art of measurement has so advanced, and such refined instruments and methods have been thus introduced, that it may be:a matter of some surprise and question to future generations of astronomers why so much labour and money were expended upon so imperfect a method in 1874 and 1882. The justification of these expeditions must be found, not in the reliability of the value of the solar parallax determined by them, but in the impulse given to the construction of instruments, the awakening of a widespread interest in astronomy, the stimulus to invention of new methods of research, and the accurate determination of the latitudes and longitudes of a large number of important and previously undetermined stations on the earth's surface.

If an opposition of Mars occurs when that planet is near perihelion and the earth near aphelion the planet is then about one-third of the sun's distance from the earth. When these conditions are nearly realized the opportunity is a favourable one for determining the solar parallax.

On 1672, October 1, the star y Aquarii was occulted by Mars. Estimations of the distance of the planet from the star were made at well-observed instants of time by Richer, Picard, and Romer, as already noticed, and from these observations the first approximate determination of the solar parallax was made by Cassini, viz., 9'°5.

The method of observing Mars that has been most largely employed consists in observing the apparent declina- tion of the planet by means of the transit circle—at ob- servatories both in the northern and in the southern hemi- Sphere. To increase the accuracy of the result, the same Stars near the planet are observed at the various observa- tories, so that the method is reduced to measuring the difference of declination between the planet and neigh- bouring stars. The effects of periodic error in the gradua- tion of the circles, of flexure of the instruments, and of abnormal refraction are thus nearly eliminated, and there remain only the systematic errors which may be supposed to arise from the difference of the habit of the observers in

bisecting a star and a planet. To some extent these errors could be eliminated by the use of a reversing prism applied in the place of a sun-shade between the eyepiece and the observer's eye. By the use of such a prism the motion of the spider-web and the limbs of the planet can be reversed with respect to the vertical, and such errors as

depend on a different habit of bisecting a similar apparent upper and lower limb would be thus eliminated. But on account of the chromatic dispersion of the atmosphere the lower limb of the planet is coloured red and the upper limb violet ; and in the illuminated field of the telescope it is probable that the observer has a tendency to cut with his spider-web more deeply into the feeble violet limb than into the more glaring red limb. The effect of his so doing would be to increase the value of the resulting parallax, and it seems not improbable that from this cause a larger value of the parallax has been obtained by this than by other methods.

The following are the most important series of observa- tions, and their discussion by this method :—

Winnecke (Ast. Nachrichten, lix. col. 261), opposition of Mars 1862; from observations at Pulkowa and Cape of

(GeO ISIYN@ aauanosn ocecunnoedacneacosunancnononoaqceanoauoD us omaseoS 8°96 Newcomb (Washington Observations, 1865, Appendix II.); from all meridian observations of Mars in 1862……..... 8°85

Eastman (Wash. Obs., 1877, Appendix III.); from meridian observations of Mars at six observatories in 1877……..... Stone, Monthly Notices, xlii. p. 300 ; including observations MeV CCUG CMV) MAS LIM AM fey .: ccan ucts cise cee rne se eer 8°95

In 1872 (Ast. Mach., No. 1897) Dr Galle of Breslau proposed a method of determining the solar parallax which

appears to be the foundation of the method of the future,

viz., to measure, by means of the equatorial, the difference of declination between selected stars and a minor planet, or rather to interpolate the declination of a minor planet relative to two stars of comparison, A minor planet presents precisely the appearance of a star, and it is impossible to conceive any personality which can affect the observation of sucha planet anda star. The interpolation of the planet's declination relative to two including star- declinations (i.e, measurement from stars nearly equally north and south of the planet) entirely eliminates errors due to error of the adopted arc-value of the micrometer screw. It igs true that in the case of minor planets the parallax factor can hardly exceed 1}, whilst in the case of Mars that factor may be 3; but their disks present objects which are capable of being observed with quite two and a half times the accuracy of Mars. Hence the condi- tions of accidental accuracy are equalized for a single opposition, whilst the advantages of systematic accuracy are entirely in favour of the minor planets. Moreover, the opportunities offered by favourable oppositions of minor planets are much more frequent than in the case of Mars. The opposition of the minor planet Flora in 1874 was observed, at the request of Dr Galle, by a considerable number of observers in both northern and southern hemi- spheres, but unfortunately only in very few cases with the precaution, care, and perfection of instrumental equipment necessary. In 1882 the minor planets Victoria and Sappho were similarly observed at the request of Gill. The work was taken up by a number of astronomers In both hemi- spheres, in a much more complete and systematic manner, with better instrumental means, and with the benefit of former experience. The results have not yet been reduced, but it is believed they will afford a valuable contribution to the problem in question. The results of Dr Galle's discussion of the observations of Flora in 18741 give for

the solar parallax 8”°87+407°042 ;

but the same results when the relative weights are assigned in a more legitimate manner lead to the value

8”°82-40”°06. But in any plan requiring numerous and widely spread observers it is very difficult to secure that entire sympathy

l Ueber eine Bestimmung der Sonnen Parallaxe aus correspondiren- den Beobachtungen des Planeten Flora in October und November 1878,

Breslau, 1875. XVIIL — 32

with the end in view, that scrupulous care in minute detail, which is essential in the highest class of observation, and it becomes impossible to alter the previously prepared programme in such a case, should circumstances render it desirable to do so; nor does it always happen that distant observatories can be supplied with the necessary instru- mental details in sufficient time. In the case of the Victoria and Sappho observations of 1882 the requisite sympathy and care were accorded in a very remarkable degree, but on account of the errors of the planetary tables (discover- able only when the observations were begun) the selected stars of comparison were not by any means the most favourable that could have been chosen, and were con- sequently not the stars that a single observer would have selected at the time. Hence arises the desirability of a method not requiring co-operation, in which success depends upon a single observer, who may obtain independently by his own observations a complete series of results.

In 1857 Airy, in an address to the Royal Astronomical Society on the methods available for determining the solar parallax during the next twenty-five years, called attention to the favourable opposition of Mars in 1877, and declared his opinion that the best method of finding the solar parallax was to determine at an equatorial station the difference of right ascension of that planet and neighbour- ing stars in the evening and early morning, by observing transits of stars and planet across the webs of a well- adjusted rigidly mounted equatorial. The motion of the earth’s rotation would transport the observer 6000 or 7000 miles between the evening and morning observations, and the requisite displacement would thus be obtained. In other words, the observer would avail himself of the diurnal displacement to determine the parallax of the planet. Of course a very large number of observations would be required, because the observation of a transit over the webs of a telescope is not so exact as the micro- metric comparison of two points. Only one observer availed himself of Airy’s suggestion, but a

very good series of observations by this method was obtained by Maxwell Hall at the island of Jamaica. The detailed observations are printed in Adem. &. A. S., vol. xliv. p. 121; the result- ing value of the solar parallax is

Oe 700 06: In 1874 (in connexion with Lord Lindsay's expedition to Mauritius) Gill, combining the suggestion of Galle as to the employment of a minor planet and Airy's suggestion as to the employment of the diurnal displacement, observed the minor planet Juno, which was at that time favourably situated for the purpose. But instead of employing the inethod of transits of the planet and stars across spider- webs he used a heliometer, and measured with that instru- ment the distance of the planet from the same star in the evening and morning. In order to eliminate the effects of changes in the scale-value, Gill selected stars on opposite sides of the planet, and so arranged his observations as to measure simultaneously the angle between the planet and both comparison stars. That is to say, if the two dis- tances in question are called a and 8, the measures were ar- ranged in the order a,0,0,a or 6,a,a,b. Thus any abnormal scale-value of the instrument applicable to the measurement a would be equally applicable to the measurement 0. If the places of the comparison stars are thus determined by meridian observations, the scale-value may be derived from the observations themselves with all desirable accur- acy, and the effect of change in the scale-value (which alone is all-important) be absolutely eliminated. The observations so made at Mauritius showed that the posi- tion of the planet Juno relative to two stars of comparison could be so interpolated with a probable' error less than yoth of a second of arc. A full account of these observa-

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tions, together with a description of the heliometer, is given in the Dunecht Publications, vol 1. Lord Lindsay's yacht, which conveyed the heliometer to Mauritius, unfor- tunately did not reach her destination till the most favourable time for making the observations was past; but sufficient observations were obtained to test the method thoroughly and to prove its capabilities! The value of the solar parallax resulting from the observations of Juno at Mauritius was 87-77 +0°"04

In 1877, instead of observing the favourable opposition of Mars of that year by Airy's method, Gill proposed to the Royal Astronomical Society to employ a heliometer (kindly lent by Lord Lindsay) to observe the planet in a similar manner to that in which he had observed the minor planet Junoat Mauritius in 1874. The offer was accepted. Gill selected the island of Ascension, and there carried out the necessary observations. The stars of comparison, by the kind and hearty co-operation of astronomers, were observed at thirteen of the principal observatories with meridian instruments, a combination of their results affording standard places of high accuracy. In general the angular distance of the planet was measured both in the evening and morning from each of three surrounding stars. The observed readings of the heliometer were corrected for the effects of refraction and phase, for the errors of division of the scales and of the micrometer screw, and were then converted into arc on an assumed value of one revolution of the micrometer screw (or rather of half an interval of the scale divisions).

The tabular apparent distance of the centre of Mars from each star for the instant of each observation was then computed with an assumed approximate value of the solar parallax (8”°80). The calculation of the.solar parallax and the elimination of errors of scale-value were then easily effected as follows :—

Let Aa, A5=the corrections in seconds of arc to be applied to the tabular right ascension and declination respectively to obtain the true right ascension and declination of Mars at the epoch ty.

p =the position angle of the planet referred to the star of comparison.

8, =the approximate mean declination of the star and planet.

x =thedaily rate of increase of Aa for the epoch 7p.

x’ =the daily rate of increase of Ad for the epoch 7.

7 =the Greenwich mean time of observation.

a =the number of z4y parts (or the percentage) that the assumed solar parallax must be increased.

z =the correction required to be applied to an observed are of 10000” reduced on the assumed scale-value.

the observed distance in seconds of are = 10000 i

O =the observed angular distance, computed with the assumed scale-value.

C =the calculated or tabular distance computed with the assumed value of the solar parallax.

Then each observation furnishes an equation of condition of the following form— fibat fl Ast f’n —ve=(O-C)-f’(r – 19) —f” (7 — To)’ 5 we —— =Sin p Cos by Sf” =cosp — fit= parallax in R.A. f’+ parallax in an j=

100 100 :

the parallaxes in f’” being in seconds of are.

The equations resulting from each group of observations are then combined, care being taken to combine together in one group such observations only as have been made nearly simultancously and where the value of z may therefore be assumed to be the same. |

The combination of a group of evening with a group of morning observations (in which the term representing the error of scale- value must then be represented by s and 2’) thus affords six

1 A more complete test has since been furnished by observations for stellar parallax, to which reference will afterwards be made. –

FPehAakh ea xX

equations involving five unknown quantities, from which the most probable value of n can be climinated with its weight by the method of least squares, in terms of « and x’.

Care, however, must be taken to confine the combination to such

oups as depend on measures from the same stars, if it is desired fo eliminate the effects of errors in the adopted star places. Also, since it is assumed that « and «’ vary proportionally with the time, it is necessary that only such observations should be com- pined as have becn made at epochs sufficiently near together to render this a safe assumption.

Finally the absolute values of « and x’ for the various combina- tions are deduced by developing the values of Aa and Ad from each combination in terms of the time, and thus the definitive values of 7 are obtained.

The combination of these values of , having regard to the weight of each, led to the result

n= —0°209.

Whence the value of the solar parallax was

B7iSHE0″ 012% It should be remarked that in these observations a reversing prism was so employed as to eliminate any systematic error on the part of the observer which might be due to astigmatism of his eye, or a habit of placing the image of the star otherwise than truly central on the image of Mars. The probable error of one observation of distance having weight unity was found to be+0”24. Twelve such observations were

generally made (and often more) on each night, and complete combinations of observations were secured on twenty-five nights.

This probable error does not exceed that of a single obser- vation of contact on the occasion of a transit of Venus, and yet one hundred and ninety-six such observations were secured, as compared with two which is the utmost that can be secured as the result of any single observer's expedition to observe a transit of Venus.

It is impossible, however, to say with certainty that the above result is entirely free from systematic error. There is one possible source of such error to be suspected, viz., the possible effect of the chromatic dispersion of the atmosphere which colours the limbs of Mars in the manner already described. In the case of heliometer observations the effect is certainly minimized from the fact that the star disk which is compared with the limb of Mars is coloured precisely in the same way as the limb—but whether all error is so eliminated it is impossible to say. A detailed account of these observations and their reduc- tions is given in Mem. R. A. S., vol. xlvi. pp. 1-172.

If a minor planet, however, is observed in the above described manner, no suspicion of the error in question can attach to. the final result; and, so far as is known, that method affords the only geometrical means of arriving at an absolutely definitive value of the solar parallax.

The following table represents the oppositions of minor planets that will be available for determining the solar parallax till the end of the present century.

Approximate _ Horizontal Parallax at

Date of Opposition.

Number and Name

Magnitude of Planet. "

i Opposition.

Opposition. 1886 November. 8 Flora. 9” 84 1886 December. 79 Eurynome. 8 93 1888 September. 75 Eurydicc. 10 94 1888 November. 7 Iris. 10 i 1889 July. 12 Victoria. 10 8 1889 August. 80 Sappho. ° 9 1890 January. 27 Euterpe. 8 83 1890 June. 43 Ariadne. 10 84 1890 December. 20 Massilia. 8 83 1892 August. 192 Nausicaa, 8 8% 1893 September. 6 Hebe. 9 74 1894 September. 84 Clio. 9 95 1897 July. 194 Procne. 8 9 1898 June. 25 Phocca. 8 9% 1899 November. 7 Iris. 9 3 1899 December. 8 Flora. 8 8

The results of many hundreds of observations for stellar parallax by Gill and Elkin (Mem. R. A. S., vol. xlviii. part 1) prove that the difference of two opposite angular distances each not greater than 2° can be measured by a small heliometer with a probable error not exceeding +015 when the objects measured are points of light such as two stars (or a star and a minor planet). Hence it is easy to show, that a single observer at an equatorial station (furnished with a suitable heliometer) can determine the solar parallax by the careful observation of two or three of the more favourable of the above oppositions with a probable error not exceeding+0‘01, and with absolute Freedom from systematic error. Such a result is not possible by any other known method.

3. The Physical Method.—The determination of the velocity of light has recently been the subject of very refined and accurate measurement by the methods both of Fizeau and of Foucault (see Licut, vol. xiv. p. 585). The results of the most recent and best determinations of the velocity of light, expressed in kilometres per second, are the following (Sidereal Messenger, vol. ii. No. 6):—

Comma byaWiZeallspmethaderucsn «.ereckecncsoas cence ase 300,400
Michelson, by modification of Foucault’s method……..... 299,940
Newcomb, by still more powerful apparatus and modifica-

TOMTOM MO ICAUS MED MOMs seeee sess. reeeee nee 299,717

If we denote by & the interval required by light to cross the mean radius of the earth’s orbit, any independent determination of & will obviously afford, when combined with the velocity of light, a determination of the sun’s dis-

tance, i.¢., of the solar parallax (see Licur, vol. xiv. p. 584). Such a determination of & is afforded by a discussion of the eclipses of Jupiter's satellites. Only two such discus- sions that have any claim to acceptance exist :—the first by Delambre in the early part of the present century, from a discussion of an immense mass of eclipses of the satellites of Jupiter comprising observations from 1662 to 1802 ; the second by Glasenapp, in a Russian thesis, in which there are discussed the observations of the first satellite of Jupiter from 1848 to 1873.

Instead of Dclambre's value of k= 493*'2

Glasenapp finds &k=500° 84102. Todd, in calling attention to Glasenapp's results (Am. Journal of Science, vol. xix. p. 62), remarks on these two values as follows :—

"The former determination rests on a much greater number of observations than the latter; but tt is difieult to form a just estimate of the work of an average last-eentury observation of an eclipse of a satellite of Jupiter. And, moreover, astronomers have no means of knowing the process which led the distinguished French astronomer to his result—which was adopted in his own tables of the satellites, and which was adopted by Damoiseau in his Tables Eeliptiques, published in 1836. The latter determina- tion rests upon a mass of observations of definite exeellenee, which have been diseussed after the modern fashion."

Astronomers, however, whilst generally endorsing these remarks, will not be inclined to follow Todd in combining Dalambre's value with Glasenapp's by giving double weight to the latter. Having regard to those portions of Todd's remarks which we have printed in italics, astro- nomers would generally be of opinion that only Glasenapp's value of & can be seriously considered at the present day. This value, combined with the above mean value of the velocity of light, leads to

8"°76-40″ 02 as the value of the solar parallax.

The photometric observation of the eclipses of Jupiter's satellites as now being carried out at Cambridge, U. &., under Prof. Pickering, will probably ere long furnish the data for a much more accurate determination of k, and

it is not impossible that very refined heliometric observa- tions of the distance of the first satellite (when apparently

near the planet) from the other satellites may likewise yield a reliable value of &.

On the relations between the constant of aberration, the solar parallax, and the velocity of light, see Licut, vol. xiv. pp. 584, 585.

The mean of the nine best modern determinations of the constant of aberration (¢.e., from 1830 to 1855) gives 20”°496.1

The most recent and valuable paper on this constant is that of Nyrén (AMém. de Acad. de St Pétersbourg, 7th ser., vol, xxxi. No. 9), in which the constant is derived from independent researches extending over many years, with each of the three great fixed instruments of the Pulkowa observatory. The independent mean results are—

From observations with the prime vertical transit…..... 20°490 ms os WENNER CHU Gagnedoodoaucnaercuoons 20°495

” UTA MTSTPAUONE MN, GoxBaen Gonb6e 20°491

INTC a ercseettertes sec ccueas 20°492

This result, combined with the above quoted values of the velocity of light, gives the following values of the solar parallax :—

Combined with Cornu’s velocity ….....06 8°78 rp Michelson’s velocity…..... 8°791 re Newcomb’s velocity ….....+. 8°798

UGS. 0’s 0 24 nearer See 8°789

There still remain some little theoretical difficulties with regard to the theory of aberration. That theory is perfectly obvious on the emission theory of light, but is a priort by no means so obvious on the undulatory theory. Is it certain that the velocity of light in the celestial spaces is

identical with (or bears an exactly known relation to) the velocity of light which, having travelled a certain space in air, undergoes reflexion and returns? This is a question for the physicist, and a question that probably demands a practical as well as a theoretical answer.2

Also Villarceau (Comptes Rendus, 1872, October 14) points out that in the ordinary theory of aberration no account is taken of the sun's motion of translation through space, and shows that, if the normal constant of aberration is A, the constant for any particular star is A+A xa, where a depends on the angle which the star's direction makes with the direction of the sun's translation in space. In the observations of Nyrén, above referred to, there is a well-marked periodic variation in the values of the con- stant of aberration derived for twenty-seven stars, which seems to be a function of the right ascension of the stars. This variation may be due to some cause (such as lateral refraction in the nortl-and-south direction) depending on the seasons, or it may have a real physical significance on the theory of Villarceau. If further observation (especi- ally in the southern hemisphere, where the seasons are reversed) should confirm the latter hypothesis, two im- portant conclusions result :—

(a) We obtain some idea of the direction and amount of motion of the milky way, combined with that of the solar system in space; and

(6) We may conclude that our theory of light is correct, which supposes that a ray of light is transmitted through space with uniform veldcity, independently of the velocity of the source of light, and that ether is fixed and infinite—that is, nowhere limited in extent.

On the other hand a negative result would go far to show that our conception of ether is not correct, at least would force us to adopt one of two conclusions, —either that the milky way is stationary in space (within limits of our power of measurement), or that the ether accom-

1 See Mem. R. A. 8, vol. xlvi. p. 166. * See also letter by Lord Rayleigh in Nature 1881, August 25.

Paha bh & x

panies the milky way and is not fixed in space and net infinite.

It is, however, a priort improbable that from any of these causes the deduced value of the solar parallax will be affected by zag of its deduced amount.

The tendency of the best modern determinations is to fix the solar parallax at

8-78 or 8°79,

and hence the mean distance of the earth from the sun at 93 millions of miles, a result which is almost certainly exact within 200,000 miles.

Lunar Parattax.—The constant of the lunar parallax may be determined by a method precisely similar to that followed in the meridian declination observations of Mars. Our knowledge of the parallax of the moon de- pends at present entirely on such observations made nearly simultaneously at the Royal Observatories of Greenwich and the Cape of Good Hope. The resulting values of the parallax, found directly from these observations, are then multiplied by a factor which expresses the relation between the constant of the lunar parallax (Astronomy, vol. ii. p. 798) to the moon's tabular parallax at the time; thus each nearly simultaneous observation at the two observatories gives an independent determination of the constant of the lunar parallax.

A better method, however, will be found when theresults of numerous occultations of stars have been employed to determine the constants of a new and more accurate lunar theory—a work about to be undertaken by Prof. Simon Newcomb.

The best determination of the constant of the lunar parallax is that of Mr Stone, viz., 3422'-71 (Mem. R.A.S., vol. xxxiv. pp. 11-16), derived from meridian observa- tions at Greenwich and the Cape of Good Hope.

STELLAR PaRaLLAx.—The constant of parallax of a fixed star is the maximum angle whicli a line equal to the earth's mean distance from the sun would subtend if viewed at the star.

The distances of the fixed stars are so remote that till very recent times their parallaxes have been found to be insensible ; that is to say, the earth's orbit viewed from the nearest fixed star presents a disk (or ellipse) too small for measurement.

The limits of this article do not permit a detailed history of the early attempts of astronomers to determine the parallaxes of the fixed stars. The reader is referred on this point to Peters's Précis historique des travaux sur la parallaxe des étoiles fixes, forming the first section of his celebrated work Hecherches sur la Parallame des étoiles fines (Mém. de PAcad. Imp. de St Pétersbourg, sec. Math. et Physiques, vol. v.). The most notable incident in that history was the discovery of aberration by Bradley, in 1728, when engaged in an unsuccessful attempt to determine the parallax of the star y Draconis.

The first determination of the parallax of a fixed star is due to Henderson, His Majesty's astronomer at the Cape of Good Hope in 1832 and 1833.3 It was followed by the nearly simultaneous discoveries of the parallax of 61 Cygni by Bessel* and that of a Lyre by Struve® from observations made in the years preceding 1840. Since that time similar researches have been prosecuted with gradually increasing success,

The methods of observation may be divided into two classes,—the absolute and the differential.

The absolute method depends on observation of the zenith distance of a star about the epochs of maximum

3 Mem. R. A. S., vol, xii. p, 829. 4 Astron. Nachrichten, Nos. 365, 366, and 401. 5 Astron. Nachrichten, No. 396.

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parallactic displacement in declination—in practice, how- | change of instrumental flexure, &c., be completely over- ever, generally throughout the whole year. The differences | come; the method of absolute altitudes does not, in fact of declination so observed, after allowing for the effects | respond in accuracy to the demands of the problem. of refraction,

precession, aberration, nutation, and proper The differential method depends on measuring the motion, afford the means of deducing the parallax of the star. | difference of declination, of distance, or of position angle The most notable series of observations of this character | between the star whose parallax is to be determined and are those of Maclear at the Cape of Good Hope, by which | one or more stars of comparison. It is assumed that he confirmed the results of his predecessor Henderson | the stars most likely to have sensible parallax are those and those of Peters at Pulkowa in the second section of | which are remarkable for brilliancy or proper motion, and his work above mentioned. The latter is the most classic | that the parallaxes of the stars of comparison (having work in existence on refined observations of absolute decli- | little or no sensible proper motion and faint magnitude) nation, and it is by no means certain that, in more modern | are so small as to be insignificant. So far as our know- meridian observations, the work and methods of that dis- | ledge goes these assumptions are justified.

tinguished observer have been equalled—except perhaps Researches on stellar parallax by these methods have at Pulkowa. The minute precautions necessary in such | been followed of late years with considerable success. The work will be found in Peters’s paper above mentioned | instruments employed have been the heliometer and the (see also Transit Crecie). But not with all the skill of | filar micrometer (see Micromzrsr, vol. xvi. pp. 243-248), Peters, nor with every refinement of equipment and obser- | the latter instrument being used in conjunction with an vation, can the difficulties caused by refraction and minute | ordinary equatorial (see TELEScoPE). The precautions

SECONDS SCALE OF TIME IN YEARS FROM 1882-0 SECONDS OF ARC OF ARG hee -0+4 “0-3 -0-2 Or 0-0 40-1 40-2 #0-3 #0*4 40-5 40+6 40-7 +0-8 40°9 41-0 Ape 41.2 41.3 4064 if *0°5 Pa 7 SZ, ~~. o’s

yp 4 (eqn °

4

- dis LoS Set 4 + ii “” ={‘o mt bia ad a OES ia 10 Fig. 1. SECONDS SCALE OF TIME !N YEARS FROM 1882-0 SECONDS ec OF ARO-0+5

-0-4 0-3 -O:2 ⊖! 0-0 #0-1 #0-2 £0-3 40-4 40-5 40:6 40°7 40*8 40°9 41 O irl wie? +ie3 48-4 49-65 41-6 ¥le7 488 19° “ e 1 x dle ores | : ; so ~ Bo ele o| *, -=-05 gave 6 | = Os 8

Fig. 2.

required to determine and eliminate systematic error, | which the parallax is known with considerable accuracy,— and to secure the necessary refinement of accuracy, demand | Nos. 1 to 13 being in the northern and Nos. 14 to 22 in more space for their description than the limits of this | the southern hemisphere.!

article admit. The reader is referred for these particulars Sn ieee | Al to the undermentioned papers on the subject. Miaguntade: | Freper Meme) Petaline The heliometer method seems to present the greatest | |———— _____ ‘| . see 5} a de Gill to determine the parallax of a Centauri, with a helio eh aaialintiinch a ca 0-14 meter at the Cape of Good Hope. The ordinates of the | | 99) aes 6 2-05 0:06 curve are the time reckoned from 1882°0, the abscissa || 21. Canopus….. 1 0:00 Insensible. B Contautlesn eps; i Insensible.

the changes in the place of a Centauri due to the parallax computed from the observations. Each dot represents the observations of each single night, and the reader will be | 1 Audhorities.—1. 0. Struve, Mém. Acad. St Péersbourg, ser. vii. able to judge of the accuracy of the observations from the | vol. i. p. 45 (0-506); Auwers, Ast. Nach., Poe el As! Ball, agreement of the dots with the curve. Fig. 2 in like Dunsink Observations, vol. iii. p. 27 (0”°465); Hall, Wash. Observa-

: ; ee tions, 1879, Appendix I. (0’478 +014). 2, Winnecke (helio- manner represents a series of observations of Sirius. meter), Pub. Astron. Gesellschaft, No. xi. (0”50140”°011). 3. 0.

These and many other results show that, with similar | Struve, Mon. Notices R. A. S., vol. xliv. p. 287. 4. Auwers (differ- means, it is now possible to detect any differential parallax | ences of R.A.), Math. Abhand. Berliner Acad., 1867 (0292+

i a ; : : oer 0036). 5. Auwers (heliometer), Astron. Nachrichten, No. 1411 ene to 0-05 with in seer ede ays apie Gomeistng (0 ards OD): Krueger (heliometer), Mon. Notices R. a; S., vol. of a reasonable number of like observations—thus opening | 5×13 p. 173 (0”-26040”°020). 6. Krueger (heliometer), Jbid., Up a wide and unportant field for future research. (0-247 + 0021). 7. Brunnow, Dunsink Observations, vol. ii.

The following table contains a list of those stars of | p. 31 (0724040011). 8 0. Struve, Mém. Acad. St Péters-

i) wo

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A glance at the table is sufficient to show that neither ap- parent magnitude nor apparent motion affords a criterion of the parallax of any fixed star. Similar researches must, in fact, be carried out on a much more extended scale before any definite conclusions can be drawn. At present we can only conclude that different stars really differ greatly in absolute brightness and absolute motion.

The following are the formule which will be found most useful in computing the corrections for parallax :—

For the Sun, Moon, and Planets.

Put 2 =the equatorial horizontal parallax ; A =the distance of the object from the earth ; ? ¢and ¢’ =the geocentric and apparent zenith distances respec-

tively; : A and A’=the geocentric and apparent azimuths respectively; @ and ¢’ =the geographical and geocentric latitudes respec- tively; p =the earth’s radius corresponding tog; _ aand a’ =the geocentric and apparent right ascensions of the object respectively; mae 8 and 8’ =the geocentric and apparent declinations of the object; t =the hour angle of the object (reckoned + when west of meridian). ; 1. To find the parallax of the moon in zenith distance and azi- muth, from the observed (or apparent) zenith distance and azimuth. Put ; y=(~- ¢’) cos A’ ; Then sin(¢’- ¢)=psin x sin (¢

=a)5 sil sin(A’< SO ; sin ¢ The corresponding quantities are found with all desirable precision for the sun and planets by the formule— ¢'~~; or approximately =~~ sin ¢’; A’-A=prsin (¢— ¢’) sin A’ cos ¢’; the latter quantity may generally be neglected. 2. To find the parallax of the moon in right ascension and decli- nation from the true (or geocentric) right ascension and declination.

9 psin x cos ¢’ cost |

Put sin : cos 6 then tan (2—a@’)=tan @ tan (45°+ 40) tan¢. tan ¢’ cos $(a — a’) | Ea a cos[t+4$(a-a’)] ’ six ofa? sin + sin ¢’cos (ry — 3) | sin y i then tan (5 — 6’) = tan 6’ tan (45° + 46’) tan (y— 8).

3. To find the parallax of the moon in right ascension and decli-

nation from the observed (or apparent) right ascension and decli- nation.3

a? sin 3 cos @’ sin ¢! cos 6 tan ¢’ cos $(a— a’), cos[t’—$(a—a’)] ’ psin x sin ¢’ sin (y — 8’) Ss sin Y ‘

sin (a—a ; tan y=

sin (5 — 8’

bourg, ser. vii. vol. i. (0’°14740”:009 2); Brunnow, Dunsink Obser- vations, vol. i, (0-21240”-012), vol. ii, (0’“188-40”-033); Hall, Washington Observations, 1879, Appendix I. (0““180+0“‘005). 9. Krueger (heliometer), Ast. Nach., 1403 (0’°162+0“‘007). 10. Johnson (heliometer), Radcliff Obs., vol. xvi. p. xxiii (0138+ 0”°052). 11. Wichmann (heliometer), Ast. Nach., No. 841 (0”:087 40°02); Brunnow, Dunsink Obs., vol. ii. (008907017). 12. Brunnow, Jéid. (0”-07040“‘014). 13. Brunnow, Ibid. (00544 0”°019), 14. Gill and Elkin, Bfem. R. A. S., vol. xlviii. p. 40 (0”°747 4.0018), p. 51 (0”-76-b 021), p. 71 (07840028), p. 82 (068+ °027), independent investigations. 15. Gill and Elkin, Jéid., p. 97 (0”°3740“‘009), p. 115 (0’°39+. 023), independent investiga- tions, 16. Gill, Zbid., p. 154 (0-285 + 0-02). 17. Gill and Elkin, Zbid., p. 1380 (0”:27+0““02), p. 138 (0”°170407°03). 18. Gill, Zbid., p. 160 (0-1664-0”-018). 19. Elkin, Zoid, p.

180 (0144002), 20. Elkin, Ibid, p. 174 (0-0640’-02). 21, Elkin, Jbid., p. 184 (0’-03+0”°03). 22. Gill, Lbid., p. 167 (—0-018+0”-019).

- In the case of the sun, planets, and comets this distance is generally expressed in terms of the earth’s mean distance from the sun, that distance being reckoned unity.

- Here ¢ must first be found by subtracting the value of Ga6 from the observed value of ¢’.

° In preliminary computation of (a— a’) employ 6’ for 6. With

this value compute y and §—8’. Finally, with resulting value of 8, |

correct preliminary computation of ¢— a’,

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4. To find the parallax of the sun, planets, or comets in right ascension or dcclination.4

,__prcos ¢’ sin?’

C= aan 3

an-

cos 6’ tan ¢’ tany= ; e ; 5-9 =P sin ¢’sin (y— 3’) – sin y ;

When the distance of the object from the earth (A) is given (the earth’s mean distance from the sun being reckoned unity), as is usually the case in ephemerides of minor planets and comets, we have

pean solar parallax 8°78 = z an eu

The reader will find the proof of these formule in Chauvenet’s Spherical and Practical Astronomy, vol. i. pp. 104-127.

For the Parallax of the Fixed Stars.

Put py =the maximum angle subtended by the mean distance of the earth from the sun at the distance of the star,

=the star’s annual parallax; e =the obliquity of the ecliptic; @andr =the sun’s longitude and radius vector; aanda’) the star’s true and apparent right ascensions and 5 and 3’ declinations respectively.

1. To find the heliocentric parallax of a star in right ascension and declination, its annual parallax () being known.

a’—a= —pr scc 6(cos **() sin a— sin ©) cos €cos a); §’— = — pr sin ©@) (cos esin 5 sin a— sin e cos 8) — pr cos (cos a. 2. To find the effect of parallax on the distance (s) and position angle® (P) of two stars, one of which has sensible annual parallax.® As=prm cos ((@)- M); AP=prm’‘cos (()** — M’); where msin M=(-—cos asin P+sin §sin ecos P) cos e— cos 6 cos P sin ¢; mcos M=sin asin P+sin 8cosacosP;

‘ 1 ; : : ; i am’ sit Mw’ =—| – (cosacos P+sin Ssinasin P)cose+cosésin Psin |

? (= i P – in a i nh m’’ cos M 81N COs $1n 6 cos @si * (D. GI.)

PARALLELS, Turory or. The fundamental princi- ples of mathematics have not in general received from mathematicians the attention which they deserve. Mathe- matical science might in fact be compared to a building far advanced in construction. As to the firmness of its foundations there can be no doubt, to judge by the weighty superstructure which they carry; but the aspect of the building is not a little marred by the quantity of irrelevant rubbish which lies around those foundations, concealing their real strength and security. The question of the parallel axiom in Euclid’s geometry is to some extent an exception. There have been endless discussions concerning it. The difficulty is well known, and will be found succinctly stated in the article GromErry (vol. x. p. 378). Those who have treated the subject have devoted themselves either to criticizing the form of Euclid’s axion, suggesting modifications or substitutes (sometimes with undoubted advantage, e.g., Playfair), or to questioning its necessity, offering either to demonstrate the axiom or to dispense with it altogether. It would serve no useful purpose to attempt a complete account of the literature of the subject ; we may refer the reader who is curious in such matters to the various

editions of Perronet Thomson’s Geometry without Axioms. It will be sufficient to mention Legendre’s views, which, although by no means reaching to the root of the matter, may be held as indicating the dawn of the true theory.’ The delicacy of the question

4 ¢ and 6 may be used instead of ¢’ and 8’ in these formule without sensible error.

5 The position angle is to be reckoned from north through east, the star which has sensible parallax being taken for origin.

5 Obviously, also, P may here express the relative parallax of the two stars.

7 For some interesting controversy on this subject see Leslie’s

Geometry, 3d edition, p. 292; and Legendre, Eléments de Géométrie, 12th edition, p. 277.

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may be illustrated by the story which is told of Lagrange. It is said that towards the end of his life he wrote and actually took to the Institute a paper dealing with the theory of parallels. He had begun to read it; but, before he had proceeded very far, something struck him. He stopped reading, muttered “T] faut que j’y songe encore, ” and put the paper in his pocket (De Morgan, Budget of Paradoxes, p. 173). There appears to be no doubt that the true theory first presented itself to the mind of Gauss. The history of the matter is interesting, and deserves to be more generally known than it appears to be. In his earlier days, before his career in life was determined, when he had to consider the possibility of his becoming a teacher of mathematics, he drew up a paper in which he gave a philosophical development of the elements of mathematics. It was probably in the course of this discussion (about 1792) that he first came across the difficulty of the parallel axiom. He arrived at the conclusion that geometry became a logically consistent structure only after the parallel axiom was given as part of its foundation; and he convinced himself that this axiom could not be

proved, although from experience (for example, from the sum of the angles of the geodesic triangle Brocken, Hohenhagen, Inselberg) we know that it is at least very approximately true. If, on the other hand, this axiom be not granted, there follows another kind of geometry, which he developed to a considerable extent and called the antieuclidian geometry. Writing to Bessel on the 27th January 1829, he says—

“Tn leisure hours now and then I have again been reflecting on a subject which with me is now nearly forty years old; I mean the first principles of geometry; I do not know if I have ever told you my views on that matter. Here too I have carried many things to farther consolidation, and my conviction that we cannot lay the foundation of geometry completely @ priori has become if possible firmer than before. Meantime it will be long before I bring myself to work out my very extensive researches on this subject for publication, perhaps I shall never do so during my lifetime ; for I fear the outcry of the Beotians, were I to speak out my views on the question.”

Bessel entered heartily into the ideas of Gauss, and urged him to publish them regardless of the Bceotians. Concerning the generality of mathematicians in his day, Gauss probably judged rightly, however, for his intimate correspondent Schumacher was, as we learn from their correspondence in 1831, unable to follow the new idea. One of the letters (Gauss to Schumacher, 12th July 1831) is of great interest because it shows us that Gauss was then in full possession of the most important propositions of what is now called hyperbolic geometry. In particular he states that in hyperbolic space the circumference of a

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circle of radius 7 is hl eis es where & is a constant,

which we know from experience to be infinitely great compared with any length that we can measure (supposing, he means, the space of our experience to be hyperbolic), and which in Euclid’s geometry is infinite.

Gauss never published these researches; and no traccs of them seem to have been found among his papers after his death. Our first knowledge of the

hyperbolic geometry dates from_the publication of the works of N. Lobatschewsky and W. Bolyai. Lobatschewsky's views were first published in a lecture before the Faculty of Mathematics and Physics in Kasan, 12th February 1826. See Frischauf, Elemente der Absoluten Geometrie, Leipsic, 1876, page 33. Speaking of a German edition of Lobatschewsky's Work, which he had seen published at Berlin in 1840, Gauss says that he finds nothing in it which is materially new to him, but that Lobatschewsky's method of development is different from his own, and is a masterly performance carried out in the true Keometric spirit. The theory received its complement in_ the famous Hubilitationsschrift of Riemann, in which the elliptic geometry for the first time appears. Beltrami, Helmholtz, Cayley, Klein, and others have greatly developed the subject ; but it is

' Sartorius von Waltershausen, Gauss zum Geddchtniss, Leipsic, 1856, ios tule

unnecessary to pursue its later history here, since all essential details will be found in the article MEASUREMENT, vol. xv. p. 659. All that we need do is to call the attention of those who busy themselves with mental philosophy to this generalization of geometry, as one of the results of modern mathematical research which they cannot afford to overlook. (G. CH.)

PARALYSIS,? or Pansy, the loss of the power of muscular action due to some interruption to the nervous mechanism by means of which such action is excited (see 'Nervous System " in Puysiotocy). In its strict sense the term might include the loss of the influence of the nervous system or any of the bodily functions, the loss of common sensation or of any of the special senses; but other terms have come to be associated with these latter conditions, and the word "paralysis" in medical nomenclature is usually restricted to the loss or impairment of voluntary muscular power. Paralysis is to be regarded rather as a symptom than a disease per se, and is generally connected with some well-marked lesion of some portion of the nervous system. According to the locality and extent of – the nervous system affected, so will be the form and character of the paralysis. It is usual to regard paralysis as depending on disease either of the brain, of the spinal

cord, or of the nerves distributed to parts and organs ; and hence the terms cerebral, spinal, and peripheral paralysis respectively. he distribution of the paralytic condition may be very extensive, tending to involve in greater or less measure all the functions of the body, as in the general paralysis of the insane (see Insanity) ; or again, one half of the body may be affected, or one or more extremities, or it may be only a certain group of muscles in a part sup- plied by a particular nerve. Reference can be made here only to the more common varieties of paralysis, and that merely in general terms.

1. Paralysis due to Brain Disease.—Of this by far the most common form is palsy affecting one side of the body, or Hemiplegia. It usually arises from disease of the hemi sphere of the brain opposite to the side of the body affected, such disease being in the form of haemorrhage into the brain substance, or the occlusion of blood-vessels, and consequent arrest of the blood supply to an area of the brain; or again it may be due to the effect of an injury, or toa tumour or mor- bid growth in the tissues of the brain, The character of the seizure and the amount of paralysis vary according to the situation of the disease or injury, its extent, and its sudden or gradual occurrence. Theattack may come on as a fit of apoplexy, in which the patient becomes suddenly unconscious, and loses completely the power of motion of one side of the body; or a like result may arise more gradually and without loss of consciousness. In either case of “complete” hemiplegia the paralysis affects more or less the muscles of the tongue, face, trunk, and extremities. Speech is thick and indistinct, and the tongue, when pro- truded, points towards the paralysed side owing to the unopposed action of its muscles on the unaffected side. The muscles of the face implicated are chiefly those of mastication. The paralysed side hangs loose, and the corner of the mouth is depressed, but the muscles clos- ing the eye are as a rule unimpaired, so that the eye can be shut, unlike what occurs in another form of facial paralysis (Bell’s palsy). The muscles of respiration on the affected side, although weakened, are seldom wholly paralysed, but those of the arm and leg are completely powerless. Sensation may at the first be impaired, but as a rule returns soon, unless the portion of the brain affected be that which is connected with this function. Rigidity of the paralysed members is occasionally present as an early or alate symptom. In many cases of even complete hemiplegia improvement takes place after the lapse of

Wickliffe has palesy, and another

2 From mapadveiv, to relax. old form of the word is parlesy.

weeks or months, and is in general first indicated by a return of motor power in the leg, that of the arm following at a longer or shorter interval. Such recovery of move- ment is, however, in a large proportion of cases only partial, and the side remains weakened. In such instances the gait of the patient is characteristic. In walking he leans to the sound side and swings round the affected limb from the hip, the foot scraping the ground as it is raised and advanced. Besides this the evidence of the “shock ” is felt more or less upon the system generally, the patient rarely (though occasionally) recovering his nervous stability. The paralysed parts retain as a rule their electric con- tractility, but they are apt to suffer in their nutrition both from disuse and also from certain degenerative changes which the interruption of nervous influence is apt to exer- cise upon them.

It is to be observed that in many instances the hemi- plegia is only partial, and instead of the symptoms of complete paralysis above described there exist in varied combination only certain of them, their association depend- ing on the extent and locality of the lesion in the brain. Thus there may be impairment of speech and some amount of facial paralysis, while the arm and leg may be unaffected, or the paralysis may be present in one or both extremities of one side while the other symptoms are absent. Further, the paralysis may be incomplete throughout, and the whole of the side be weak, but not entirely deprived of motor power. To partial paralysis of this latter description the term “ paresis” is applied.

Besides hemiplegia, various other forms of paralysis may arise from cerebral disease. Thus occasionally the paralysis is crossed, one side of the face and the opposite side of the body being affected simultaneously. Or again, as is frequently observed in the case of tumours of the brain, the paralysis may be limited to the distribution of one of the cranial nerves, and may produce an association of phenomena (such as squinting, drooping of the eyelid, and impairment or loss of vision) which may enable the seat of the disease to be accurately localized.

2. Paralysis due to Disease of the Spinal Cord.—Of paralysis from this cause there are numerous varieties depending on the nature, the site, and the extent of the diseasc. Some of the more important only can be noticed.

Paraplegia, paralysis of both lower extremities, including usually the lower portion of the trunk, and occasionally also the upper portion—indeed the whole parts below the seat of the disease in the spinal cord—is a form of paralysis which is a not unfrequent result of injuries or disease of the vertebral column; also of inflammation affecting the spinal cord (MyEttris, g.v.), as well as of hemor- rhage or morbid growths involving its substance. When due to disease, the lesion is generally situated in the lower portion of the cord. The phenomena necessarily vary in relation to the locality and the extent of the disease in the cord. Thus, if in the affected arca the posterior part of the cord, including the posterior nerve roots, suffer, the function of sensation in the parts below is impaired because the cord is unable to transmit the sensory impressions from the surface of the body to the brain. If on the other hand the anterior portion of the cord and anterior nerves be affected, the motor impulses from the brain cannot be conveyed to the muscles below the seat of the injury or disease, and consequently their power of movement is abolished. In many forms of this complaint, particularly in the case of injuries, the whole thickness of the cord is involved, and both sensory and motor functions are arrested. Further, the functions of the bladder and bowels are apt to suffer, and either spasm or paralysis of these organs is the result. The nutrition of the paralysed parts tends to become affected, and

bed-sores and wasting of the muscles are common. Oeca- sionally, more especially in cases of injury, recovery takes place, but in general this is incomplete, the power of walking being more or less impaired. On the other hand the patient may linger on for years bedridden, and at last succumb to exhaustion or to some intercurrent disease.

A form of spinal paralysis, often showing itself ag paraplegia, occasionally occurs in children, and is termed—

Infantile or Essential Paralysis.—It is caused by an inflammatory affection limited to the anterior portion of the grey matter of the spinal cord throughout a greater or less extent, and affects therefore the function of motion, leaving that of sensation unimpaired. This disease ig most common during the period of first dentition (although a similar affection is sometimes observed in adults). The commencement may be insidious, or there may be an acute febrile attack lasting for several days. In either case paralysis comes on, at first very extensive, involving both upper and lower extremities, but tending soon to become more limited and confined to one or other limb or even to a group of muscles. The affected muscles lose their electric contractility and are apt to waste. Hence limbs become shortened, shrivelled, and useless, and deformities such as club foot may thus be readily produced. In many instances fortunately recovery is complete, and the pro- spect of amendment is all the greater if the muscles show any reaction to electricity. There is throughout an absence of some of the more distressing of the phenomena of paraplegia, such as disturbances of the bladder and bowels or extensive bed-sores, and in general the health of the child does not materially suffer.

Progressive Muscular Atrophy or Wasting Palsy is a disease usually occurring in early or middle life. It is characterized by the wasting of certain muscles or groups of muscles accompanied with a corresponding weakness or paralysis of the affected parts, and is believed to depend on a slow inflammatory change in the anterior cornua of the grey matter of the spinal cord. It is insidious in its onset, and usually first shows itself in the prominent muscular masses in the palm of the hand, especially the ball of the thumb, which becomes wasted and deficient in power. The other palmar muscles suffer in like manner, and as the disease advances the muscles of the arm, shoulders, and trunk become implicated if they have not themselves been the first to be attacked. The malady tends to spread symmetrically, involving the corresponding parts of the opposite side of the body in succession. It is slow in its progress, but, notwithstanding it may occasion- ally undergo arrest, it tends to advance and involve more and more of the muscles of the body until the sufferer is reduced to a condition of extreme helplessness. Should some other ailment not be the cause of death, the fatal result may be due to the disease extending so as to involve the muscles of respiration.

Another form of paralysis in certain respects resembling the last, and supposed by some to be due to a similar cause, is Pseudo-hypertrophic Paralysis, a condition occur- ring most frequently in male children, in whom in such cases there exists at first a remarkable enlargement of certain muscles or groups of muscles, followed sooner or later by wasting and paralysis. The enlarged muscles are chiefly those of the calf and hips, and their abnormal size is caused by an over-development of their connective tissue, and is therefore not a true hypertrophy. The child acquires a peculiar attitude and gait. He stands with bis legs widely separated, his body arched forward, and in walking assumes a rocking or waddling movement. Later on the enlarged muscles lose their bulk, and at the same time become weakened in power, so that walking becomes impossible, and the child is completely paralysed in the

limbs and all other affected parts. In most instances death takes place from some intercurrent disease before maturity.

Paralysis Agitans or Trembling Palsy is a peculiar form of paralysis characterized chiefly by trembling movements in certain parts, tending to become more widely diffused throughout the body. It is a disease of advanced life. The symptoms come on somewhat insidiously, and first show themselves chiefly by involuntary tremblings of the muscles of the fingers, hand, arm, or leg, which are aggra- vated on making efforts or under excitement. These trembling movements become more marked and more extensive with the advance of the disease, and along with the tremors there generally occurs increasing weakness of the affected muscles. This is very manifest in walking, the act being performed in a peculiar tottering manner with the body bent forward. The trembling movements cease during sleep. This disease is a chronic one, and is intractable to treatment, but life may be prolonged for many years.

Glosso-labio-laryngeal Paralysis is a form of paralysis affecting, as its name indicates, the functions of the tongue, lips, and larynx (besides others), and depending upon disease of certain localities in the medulla oblongata from which the nerves presiding over these functions arise. The symptoms come on slowly, and are generally first manifested in some difficulty of speech

owing to impaired movements of the tongue. Associated with this there is more or less difficulty in swallowing, owing to paralysis of the muscles of the pharynx and soft palate, by which also the voice is rendered nasal. With the advance of the disease the paralysis of the tongue becomes more marked. It cannot be protruded, and frequently undergoes atrophy. Certain of the facial muscles become implicated, especi- ally those in the neighbourhood of the mouth. The features become expressionless, the lips cannot be moved in speaking, the mouth remains open, and the saliva flows abundantly. The muscles of the larynx may also be involved ‘in the paralysis. In the later stages of the malady the power of speech is completely lost, the difficulty in swallowing increases to a degree that threatens suffoca- tion, the patient’s condition altogether is one of great misery, which is in no way mitigated by the fact of his mental power remaining unaffected. Complications con- nected with the respiratory or circulatory functions, or disease affecting other parts of the nervous system with which this complaint may be associated, often terminate the patient’s sufferings, and in any case life is seldom pro- longed beyond two or three years.

3. Peripheral Paralysis, or local paralysis of individual nerves, is of not unfrequent occurrence. The most com- mon and important examples of this condition can only be briefly referred to.

Facial Paralysis, Bell’s Palsy, are the terms applied to paralysis involving the muscles of expression supplied by the seventh nerve. It is unilateral, and generally occurs as the result of exposure of one side of the head toa draught of cold air which sets up inflammation of the nerve as it passes through the aqueductus Fallopii, but it may also be due to injury or disease either affecting the nerve near the surface or deeper in the bony canals through Which it passes, or in the brain itself involving the nerve at its origin. Here the paralysis is manifested by a marked change in the expression of the face, the patient being unable to move the muscles of one side in such acts as laughing, whistling, &c., or to close the eye on that side. The mouth is drawn to the sound side, while, although the muscles of mastication are not involved, the food in eating tends to lodge between the jaw and cheek on the palsied side. Occasionally the sense of taste is

impaired. In the ordinary cases of this disease, such as those due to exposure, recovery usually takes place in from two to six weeks, the improvement being first shown in the power of closing the eye, which is soon followed by the disappearance of the other morbid phenomena. When the paralysis proceeds from disease of the temporal bone, or from tumours or growths in the brain, it is more apt to be permanent, and is in many cases of serious import. Throughout there is no diminution of sensibility in the paralysed muscles; but they early lose their reaction te faradization, retaining that to galvanism.

Lead Palsy is a not uncommon form of local paralysis. It is due to the poisonous action of lead upon the system, and, like the other phenomena of lead poisoning, affects chiefly workers in that metal (see Leap). The pathology of this disease is still unsettled, but it is believed to depend upon the local effect of the lead upon the nerves of the part rather than to any disease, at least in the first instance, of the nerve centres. The paralysis in this case is as a rule confined to the muscles of the forearm which extend the hand, and as they lose entirely their power the hand cannot be raised when the arm is held out, which gives rise to the condition termed “wrist drop.” The paralysis may come to affect other muscles of the arms as well as certain of those of the legs and trunk, and along with the paralysis there occurs wasting of the affected muscles and loss of their electrical reactions. Occasionally in severe cases other nervous phenomena, such as convul- sions, delirium, &c., may become superadded. The symp- toms usually disappear on the removal of the patient from the source of lead contamination, along with the applica- tion of the treatment appropriate to poisoning with this meta],—and all the more speedily if the case has not been of long duration and the affected muscles have not under- gone atrophic change.

A form of peripheral paralysis not unlike the last occasionally results from chronic alcoholism, The paralysis occurring after diphtheria, another example of the peri- pheral variety, has been already referred to (see Dipu- THERIA).

Treatment.—It is impossible in a general notice like the present to refer at any length to the treatment of paralysis. The conditions of the disease in any particular case and its associations are so manifold that they can only be fully understood and appreciated by the medical expert under whose direction alone treatment can be advantageously carried out. It may be stated generally, however, that, since paralysed muscles tend to undergo certain degenera- tive changes (see Paruotocy), it becomes an object in treatment to endeavour to maintain as long as possible their molecular integrity. With this view, when pain and other acute symptoms which may be present have ceased, the use of nervine tonics such as iron, quinine, and strych- nine, and the suitable dieting of the patient, are the best constitutional remedies; while of local applications fric- tions or massage, but more particularly the employment of electricity, will be found of service, the latter agent often yielding markedly beneficial results. (J. 0, A.)

PARAMARIBO, the administrative and commercial capital of Dutch Guiana or Surinam, is situated in 5° 44’ 30’ N. lat. and 55° 12’ 54” W. long., on the right bank of the Surinam, which, though at that point 20 miles from the sea, is a tidal river nearly a mile broad and 18 feet deep, Built on a plateau about 16 feet above low-water level, Paramaribo is well-drained, clean, and in general healthy; the straight canals running at right angles to the river, the broad, straight, tree-planted streets, the spacious squares, and the solid if plain-looking public buildings would not be unworthy of a town in: the Netherlands. Among the more conspicuous edifices

are—Fort Zeelandia (used as a civil and military prison) at the north corner, between the town proper and the Combé suburb; the Government-house, surrounded by a * magnificent garden and park ; the town-house, with a tower 100 feet high ; the law courts; the public hospital, where there is a remarkable betel-nut avenue 50 feet in height ; the Reformed Dutch, Lutheran, Moravian, and Roman Catholic churches; and the Portuguese and Dutch syna- gogues. The population, barely 16,000 in 1854, was 20,373 in 1869, and 21,265 in 1878.

The Indian village of Paramaribo became the site of a French

settlement probably in 1640, and in 1650 it was made the capital of the colony by Lord Willoughby of Parham. In 1683 it was stil] only a “cluster of twenty-seven dwellings, more than half of them grog-shops,” but by 1790 it counted more than a thousand houses. The town was partly burned down in 1821, and again in 1832,

PARANA. See Pirate River.

PARANAHYBA (PaRNanyBa, or PERNAHYBA), Sio Luiz bg, a city of Brazil, the chief port of the province of Piauhy, is situated on the right bank of the important Rio de Paranahyba, near the beginning of its delta. It hasa population of about 15,000, and trades in cotton, leather, &c., but its port is little visited by foreign steamers,

PARASITISM

ANIMAL PARASITISM.

ee problems suggested by the occurrence of parasites

not only in the intestines or the kidneys but even in flesh and blood, in eye or brain, have occupied alike physician and naturalist from the earliest times. From ancient Egyptian and Jewish sanitary and religious codes we may perhaps infer considerable knowledge of the distri- bution and danger of parasites,—unclean animals like the pig, rabbit, and dog being peculiarly infested with them. The schoolmen, too, perplexed themselves with quaint hypotheses as to the time and place and mode of the introduction of the parasites of man, while the long per- sistence of medieval myths is evidenced by the “ Furia infernalis” of the Systema Nature. The spontaneous generation of parasites seems never to have been doubted until the commencement of the 18th century, when Redi proved the origin of maggots from eggs of the blow-fly, and Swammerdam announced the similar origin of lice and other insect parasites. Both naturalists, however, opposed the extension of their results to the Entozoa, but the discovery of

microscopic animalcules, and the reflexion that these must readily be introduced into the body, induced Boerhaave to suggest the origin of parasites from free-living worms and infusorians. The sexuality and characteristics of a few Hntozoa gradually became better known, while Linnzeus, though little dreaming of their complex form-history, expelled the spontaneous generation theory by the in-so-far fortunate mistake of identifying the free Bothriocephalus of the stickleback as the young stage of 4. latus of man, and certain free Planarians and Nematoids as the young of liver flukes and thread worms. His school vastly increased the hitherto scanty catalogue of known forms, while their exacter knowledge rendered his hypo- thesis improbable. The origin of Hntozoa from eggs which leave the body of their host, enter new hosts in food or drink, and when developing in other organs than the ali- mentary are carried thither by the circulation, was clearly put forward by Pallas, who also revived the early view of inheritance, which had been propounded before by the contemporaries of Leeuwenhoek (then, however, to avoid the apparently insoluble difficulty of tracing the origin of the parasite from its innumerable yet apparently wasted ova). With the enormous labours of Rudolphi and Bremser hel. minthology rose to the rank of an important special study, yet the degeneration of the Linnean school had nowhere fuller course: observation of faunistic and systematic detail excluded all physiological or morphological research, and the knotty problem of origin was simply cut by a return to the hypothesis of spontaneous generation. This view seemed supported by the absence of reproductive organs In cystic parasites, and reigned almost undisputed until the accumulation of a new chain of evidence. Of this the main links were the discovery of the ciliated larva of a Trematode (Monostomum) by Mehlis in 1831, of the Redia or Cercaria stages of the same genus, and of the

six-hooked embryo of Z'enia by Siebold in 1835, and the renewed study of Bothriocephalus latus by Eschricht, who maintained that the encysted forms were persistently larval, and that the life-history of the Zntozoa should be viewed as broadly parallel to that of parasitic insects. Yet in spite of all this, and of the corroborative researches of Valentin, many helminthologists remained obstinate, until these incredible life-histories had been confirmed and treated as so many other cases of the " Alternation of Generations" in the epoch-making work of Steenstrup (1842). Dujardin next observed the

wanderings of Mermis, and Siebold those of Gordius; the latter, however, advanced the doctrine that cysts were not larval stages, but mere pathological modifications of those worms which had chanced to “wander” into situations unfitted for their normal life. Meanwhile were commencing the important labours of Van Beneden, who traced the actual development of the cystic parasites of the bony fishes into the tape-worms of the rays and dogfishes which had devoured them, so proving that the transmission of the parasites depended upon the mode of feeding. Kiichenmeister, who not only transmuted cyst into tape- worm by transmission in food, but redeveloped the cystic form by feeding with eggs from the adult tape-worm, thus (1852-53) commencing the modern era of experimental helminthology. Haubner and Leuckart eagerly followed for the same group; Filippi, Valette, Pagenstecher, and Cobbold made similar investigations on Trematodes; while Leuckart transferred Pentastomum from rabbit to dog, and traced the formidable Trichina from pig to man. From this time (1860) the advances of our knowledge have been no longer in principle, though numerous and important, but in detail. To Kiichenmeister, Cobbold, Davaine, and others, but more especially to Leuckart, we owe valuable general works; to the last the present article is especially indebted.!

Any discussion of parasitism with its difficulties and wide theoretic bearings should naturally be preceded by an account of the known facts. This would involve the pre- paration of two systematic lists,—the first enumerating the parasitic members of each animal group, while the second, from the point of view not of parasites but of hosts, would indicate the forms which are infested, stating by what parasites. Of these lists the following scanty outlines

must suffice. A. List of Parasites.

Protozoa (see Protozoa).—Amceboid organisms are occasionally detected in dysentery and kindred diseases; the best known of these is Ameba coli. Parasitic Infusoria occur much more fre- quently : thus in the paunch of sheep and oxen six species (Oph- ryoscolex, Entodinium, Isotricha) are constant; similarly in the rectum of the frog are invariably present Opalina, Nyctotherus, and Balantidium; while B. coli, first described from man, inhabits

1 See Leuckart, Die menschlichen Parasiten, 2 vols., Leipsic, 1863-76; a second edition (commencing in 1879) is now in progress as Die Parasiten des Menschen 5 Cobbold, Parasites, London, 1879; Kiichenmeister and Ziirn, Die Parastien d. rome 1881; Hirsch, Hand. d. hist.-geogr. Pathol., 2d ed., vol. ii., Stuttgart,

These results were soon confirmed by-

the pig. Zrichodina infests Planarians. Flagellate parasites are more numerous: Cercomonas intestinalis is frequently observed in choleraie affections ; Z'richomonas intestinalis and vaginalis are also deseribed in diseases. In perhaps all invertebrates and cold-blooded vertebrates ciliate and flagellate parasites scem to occur. Acinetx are sometimes parasitic on other Jnfisoria.

By far the most important group, however, are the exclusively parasitie Gregarinida. These are very widely distributed among the tissues of invertebrates, especially worms and insects, and their normal life-history is readily observed in the species infesting the tissues of the common earthworm. Their spores or pscudo- mavicelle are apparently closely related to the psorosperms fre- quently detected in both vertebrate and invertebrate tissues, and even in the liver and hair of the human subject.?

Dicyemida.—This group contains only one entirely parasitic genus, various species of which live in the renal organs of Cephalo-

oda. The adult consists essentially of a simple sac of finely ciliated ectodermal cells enclosing a single elongated endodermal cell, which discharges nutritive and reproductive functions. Some have attempted to demonstrate a mesoderm. The embryos are of two kinds, nematogenic or vermiform, and rhombogenic or infusiform, differing in origin, structure, and life-history, but of still uncertain relations andimport. Theinfusiform embryo which beeomes free is of complicated structure, and probably completes its development in some new host. Some have conneeted the Dicyemida with such higher forms as the Rotifera or Trematodes, and have regarded the simplicity of the adult as the result of that degeneration which

is suggested both by development and habit. Haeckel, while acknowledging degeneration, regards Dicyema as a survivor of the originally simple Gastrwada from,which the Metazoa have sprung.

Orthonectida.—This group consists of a number of minute para- sites, sueh as Rhopalura, infesting some Nemertines, Turbellarians, and Ophiuroids, Although moving in linear direction, as their name implies, they exhibit radiate structure. The ciliated and segmented ectoderm encloses an inner endoderm layer and a central cavity which usually contains embryos. They exhibit a well- marked sexual dimorphism, the males being smaller and with fewer segments. Their position is as problematic as that of the Dicyemida; they may be regarded as degraded forms allied to the Turbellaria, Trematoda, or Rotatoria, or as survivors of the Gastreada.? ms

Celenterata.—In this group (see Corats, Hyprozoa), while the fixed forms are frequently indebted for support to other organisms or to each other, and although such associations occasionally seem tolerably constant, true parasitism is remarkably rare. Young Narcomedusx (Cunina) are parasitic within the mouth of Carma- vina, and the hydroid Lafea parasitica grows like ivy on Aglaophenia.

Similar remarks apply to the Afol/usca, where, with one or two exceptions (¢.g., Entoconcha mirabilis discovered by Johannes Miller in Synapta, and another Philippine species described by Semper) parasitism is unknown.

Echinodermata.—There are no parasitic Echinoderms.

Vermes.—To this sub-kingdom belong the majority of parasites, but the greater groups are treated in separate articles. Sce NEMATOIDEA, and for Cestoids and Trematodes sce TAPEWORM.

Acanthocephala.—This group, usually regarded as degenerate from NeMATOIDEA (q.v.), is represented by various species of Echinorhynchus. These parasites possess a muscular elongated body with a retractile proboseis armed with hooks, which serves to fix the animal to its host. Sense organs, mouth, alimentary canal, and anus are wanting; but the muscles, nerves, and generative organs are well developed. There is a complicated subcutancous eanal system; the sexes are distinct, and the

reproduction is vivi- parous. The embryo, well provided with ensheathing membranes and with hooks, is expelled with the exereta of its vertebrate host and swallowed by some Arthropod, such as Asellus or Gammarus. There a remarkable metamorphosis takes place: the adult is formed within the body of the larva, the skin being the only part of the larva whieh passes over to the adult. The young Echinorhynchus finally passes with its invertebrate host into the alimentary canal of some vertebrate, ¢.g., fish or bird or even pig, and there attains sexual maturity.

Rotatoria,—Such forms as Albertia, found externally on certain worms (Nats, &c.), and Balatro inside the same, are distinctly parasitie, and are not improbably differentiations of the same form.

mong the Nemerteans various parasites occur, such as Ponto- bdella, Branchellion, Piscicola, found especially on fish. The Chetopoda are never parasitic, and but rarely commensal. The

; See Leuckart, Bronn's Protozoen, and article Protozoa. C0 – van Beneden, Bulletin del Acad. Royale de Belgique, xi. and xlii., 1876; en Po, Mitth. Zool. Stat. Neapel, 1882, iv. 1-89; Jour. Roy. Microscop. is ' coe Jour. de VAnat. et de la Physiol., xv., 1879; Comptes Rendus. IRSA a pee Jour. Microscop. Sci., vol. xx., 1880 (figure); Metschnikoff, Zool. 1881 ° 43,1879; Jour. Roy. Microscop. Soc., 1881; Ztschr. f. w. Zool., XXXV., ; Jour. Roy. Microscop. Soc., 1880, p. 86. ;

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Myzostomata are probably, however, degenerate Chetopods, repre- sented by the genus Myzostoma living ectoparasitically on Crinoids.

Crustacea.—This group includes an immense number of forms in varying degree parasitic. The Copepoda include all grades from free-living forms to such degenerated parasites as Achtheres, Lernxa, Chondracanthus, and Argulus. Many Entomostraca are parasitic, and among the Jsopoda we find such forms as Bopyrus and Cryptoniscus. Among the Cirripedia again are

various grades of parasitism from some of the Lepadidez to the ne plus ultra of degeneration—the Rhizocephala.*

Jnsecta.—Insects furnish a large proportion of ectoparasites, but comparatively few endoparasites, for very obvious reasons. The Strepsiptera, parasitic on bees, the ichneumoui-flies, Platygaster, and allied Hymenopterous fornis, the Pediculinew (Hemiptera) and the Mallophaga are the more iniportant parasites. Many of the other groups also include parasitic members. See INSECTS.

Arachnida.—The majority of Acarina (see MITE) are parasitic, aud there are many other Arachnida of similar habit. To the Arachnida the Pycnogonida and the Pentastomida are often referred. The former are parasitic in their youth at least on Hydroids. Pentastomum exhibits eonsiderable divergenee from the Araehnoid type, and has a life-history closely parallel to that of the Cestoids. The adult form is found in the frontal sinus of the dog or wolf ; the embryos pass through the nose to the exterior, and if eaten by a hare or rabbit lose their investment, penetrate to the liver, eneyst, and pass through a complieated series of ehanges, finally attaining maturity and sexuality when the flesh of the rodent is eaten by the origina] host.

Vertebrata.—The Vertebrata are rarely parasitic. The best case of ineipient parasitism is that of Myxine, which burrows into the codfish. With this may be compared the well-known Aemora, whieh attaches itself externally to sharks, &. Commensalism is, however, more common, many small Teleosteans living with Mcdusx, sea anemones, and such like. Fierasfer finds a lodgment inside the respiratory tree of Holothurians; and Semper describes a Philippine species which actually devours the viscera of its Holo- thurian host.

B. Distribution of Parasites and List of Hosts.

Protozoa are of course rarely infested ; Calenterata also rarely; species of Distomwm have been taken on Physophora, Velella, Pelagia, Beroe, and Cestum ; a seolex and a nematoid have been described from Ctenophores, while various Arthropods oecur eeto- parasitically. Echinoderms are also very free from parasites ; on Echinus, however, despite its pedicellarie,

occur oeeasionally the semi-planariform Trematode Syndesmis, and the molluses Sty/ifer, Anaplodium, and Eulima (the latter occurs also on starfishes). The Comatule of all seas bear Myzostoma. Holothurians from the Pacific occasionally contain crustaceans, sueh as the crab Pinnotheres, and several Copepods. Their respiratory tree lodges Fierasfer, while Synapta contains the mollusc Entoconcha mirabilis.

Mollusca are more largely infested. Pinnotheres and other Crustacea frequently inhabit the mantle cavity of marine Lamelli- branchs, as the Arachnid Atax does the fresh-water mussel. The Lamellibranchs also have their peculiar Trematodes like Aspido- gaster and Buccphalus, besides Cercariz, from whieh probably few Gasteropods, whether marine, fresh water, or terrestrial, are ever free. The Cephalopods not only eontain certain Dicyemz in their renal organs, but through their piscivorous habits acquire 7’’ctra- rhynchus and

Crustaceans frequently contain Gregarines ; and a few Cestoids, Trematodes, and Nematoids (and Branchiobdella) have been described, as well as the cystic Echinorhynchus, from Gammarus pulex. More formidable, however, are the Copepods, like the familiar Nicothoe of the lobster’s gills; and, worst of all, the Rhizoccphala, like Peltogaster and. Sacculina of the hermit and shore crab respectively.

Guanine oie contain Nematoids, and spiders Mermis and Gordius. Insects are preyed upon by ichneumons, are largely plagued by ticks externally, and internally by Gregarines and worms, most frequently Gordius and Mermis ; but also by larval Hymenoptera of many families, by certain Diptera, and by the Strepsiptera. See INSECTS. } ;

The Z’unicata harbour many erustaccans, &c., chiefly in the test.

It is among vertebrates, however, that parasitism is most frequent and most fatal. Fishes swarm externally with Trematodes, leeches, and parasitic erustaceans, internally with cysts and intestinal worms all too numerous for enumeration. Nothing gives a more vivid idea of the extent to which parasitism has reached than an examination of a ray, or even better, the eommon sunfish (Orthagoriscus). Amphibians are inhabited by many parasites,—the common frog

4 See CrusTAcrA, and the more recent researches of Claus and Kossmann, as also those of Lacaze-Duthiers on Laura, and the especially rcinarkable investiga- tions of Delage on Sacculina (Zoolog. Jahresbericht, 1880-84).

having almost constantly Ascaris nigrovenosa in its lungs, and infusorial parasites in its rectum, and may also yield Distomum, Echinorhynchus, &c., twenty species in all. Lizards harbour tape- worms, Nematoids, including species of Zrichina, more rarely Trematodes. Ophidians have all kinds of parasitic worms, Chelo- nians chiefly Nematoids and Trematodes. The parasites of birds are of extraordinary number and variety ; preying, fishing, and oninivorous birds serve, of course, very constantly as intermediate hosts; but graminivorous birds are hardly more exempt. The number of parasites is often so vast as to occasion the most serious disease; thus the “gapes” of poultry is due to the choking of the bronchial passages by multitudes of Nematoids (Sclerostoma syngamus), and the grouse disease to a similar cause (Strongylus pergracilis),

Yet a great number of parasites may be borne without apparent injury: thus the post-mortem examination of a single stork has yielded twenty-four Filaria and sixteen Strongylus from the lungs and air passages, one hundred Spiroptera from the coats of the stomach, more than a hundred of various species of Distomum, and many hundreds of Holostomwm from the gulletand intestine. Ticks and insect parasites are also common; of these the most remarkable are the feather-cating Mallophaga. The majority of the Mammalia have as internal parasites many different species of worms either in adult or cystic form, which are fully described in veterinary works. The special parasites of man are estimated by Cobbold at as many as 121 species (13 Trematodes, 16 Cestodes, 21 Nematoids, 10 Leeches, 17 Arachnids, 44 Insects) ; many of these, especially among insects, have occurred only very rarely, and should not be reckoned, ¢e.g., Musca vomitoria and Blaps mortisaga, while a con- siderable number of the truly parasitic forms have only been once or twice described,—the above estimate thus becoming reduced well-nigh to half.}

Taxonomy.—Far then from there being, as was formerly thought, one great group of Hntozoa by itself, we have seen that most invertebrate groups have

their parasitic members and exhibit transitions or grades connecting these with free-living forms. The systematic position of many parasitic species is, however, not yet clear, many have been named by accident or according to habitat, and great con- centration seems necessary. It is, for example, extremely probable that a careful systematic study of genera like Gordius, Distomum, and Tetrarhynchus, of which innumer- able species have been described from as many different hosts, would result in proving the identity of many forms described as distinct, and that experiment would show that many of the forms still apparently specifically distinct are really only individuals of the same species more or less modified by the host upon whom the lotterv of nature has chanced to quarter them.

With the increasing completeness of our knowledge of parasitic forms the transitions from free to parasitic species are becoming more prominent, and the relationships of the parasitic to the non-parasitic groups more definite. Among the Nematoidea, for example, as Leuckart indicates, we are able to construct a series, starting from free-living forms, and through such cases as Leptodera (a Rhabditis-like form, sometimes free, sometimes parasitic), thence to parasitic Nematodes hardly to be distinguished from their free-living relations, but passing gradually through Oxyuris, Tricho- cephalus, Spiroptera, &c., to such highly parasitic forms as Trichina, where all relation to the outer world is lost. The Acanthocephala Leuckart has taught us to regard as Nematodes highly modified by parasitism, and he points out how Gordius, with its atrophied alimentary canal, terminal position of female reproductive organs, and other persistent and embryonic characters in which it differs from the typical Nematoid, really leads up to Echinorhynchus. As Echino- rhynchus is related to the Nematodes, so are the Cestoids to the Trematodes. The close alliance suggested by numerous points of anatomical correspondence, and by the close parallelism in life-history, is corroborated by such inter- mediate forms as Caryophylleus and Amphilina, from which we pass with ever-increasing parasitic adaptation

1 For lists see, in addition to general authorities, Linstow Compendium ad. eg one. “aii : Ng Beneden, Animal Parasites and Messmates ; old, dzuman Parasites (1882), and Parasites of Domestic Animals (1874): Ziegler’s Pathology, English ed., London, 1883. (.

through the Ligulide to Bothriocephalus and Tenia. Leuckart further points out how closely the Trematodes are united by intermediate forms to the Planarians. The affinities of Myzostoma and Pentastomum are not yet precisely determined, though the former is most plausibly regarded as a degenerate Chzetopod and the latter as similarly degenerated from some low Arachnid or at least Arthropod type. In the Copepoda, Cirripedia, and other crustaceans all degrees in intimacy of association may be observed, making the relations of the parasitic to the free forms sufficiently obvious. Everywhere, in short, we find a morphological and physiological gradation from free to parasitic forms.

Nature and Degree of Parasitism—Commensalism.— From the foregoing necessarily much abbreviated lists we observe not only the enormously wide prevalence of para- sitism—the number of parasitic individuals, if not indeed that of species, probably exceeding that of non-parasitic forms—but its very considerable variety in degree and detail. The majority indeed derive their main support from their host, but of these some are free, wandering about from animal to animal, some are attached per- manently to the exterior of their victim, while others again are concealed within its body. In some cases the parasitism is only temporary, with others it is a life-long habit. The majority are free in their youth, while some pass their early life as parasites, becoming free in their mature state, and others again spend their whole life on their host.

In some cases there is the very slightest association ; every student of marine forms is familiar with the complex

Fia. 1.—Colony of sea-anemones (Sagaritia parasitica) on shell of hermit erab,

incrustations and intergrowths of sessile forms, and has seen how almost any surface or cranny may afford a lodgment. Parasitism for support is not infrequent; it may be temporary or permanent; in the former case it 18 useful in diffusion,—the glochidium-larva of the fresh- water mussel, for

example, being transported on the fins of fishes. From cases like those of many Cirripedes, which occur indifferently on rocks or on animals, we pass readily to permanent associations like that of Loxosoma on the posterior end of Phascolosoma. Vague and loose assocta- tions, if useful to one or both participants, may become perpetuated by natural selection. Thus sea anemones may settle on any surface,—occasionally therefore on shells inhabited by hermit crabs; hence have arisen permanent

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associations. Of these there are many familiar instances, such as the hermit crabs bearing Sagartia parasitica (fig. 1), or having their shell-mouth enveloped by Adamsia. One of the quaintest instances is a lately described species of crab which wields an anemone firmly grasped in either claw. Tn such cases the association is obviously useful: the crab is protected from the octopus and other enemies by the nematocysts of its comrade, which also aid in holding the prey, while the Act:nia too gains its share of the food, and vicariously acquires means of locomotion. ‘To such cases where two animals are associated together for mutual sup- port and advantage the term “ Commensalism” is applied. Tn the struggle for existence increased complexity of needs, and difficulty in satisfying them, evokes in the individual organism a certain specialization of function and conse- quent differentiation of structure. Similar causes result not so much in the differentiation of each individual of a species as in the specialization of certain individuals for certain specific functions, resulting again in that specialization of structure which is called polymorphisn1. Thus in a Hydractinia or Siphonophore colony many different individuals of the same species have been specia- lized in each to perform a certain function. The same purpose is served by those associations, not of individuals of the same species, but of two individuals of different species, united as we have just seen for mutual advantage, and each working out some definite part of the common life-problem. Just as polymorphism in the same species is physiologically equivalent to differentiation in the indi- vidual organism, so

is commensalism between different species the physiological equivalent of polymorphism in a single species.

But cases of co-operation on equal terms are rare ; size constitutes the most frequent disparity, and the smaller tends to become first wholly dependent upon the other for support, then for concealment, and finally perhaps for sustenance. ‘The reverse may occasionally occur, the weaker being utilized for the purposes of the stronger ; thus a species of Dromia adapts a colony of sponge or ascidian as a removable upper garment for concealment.}

Parasitism within the same Species.—In some cases even within the morphological unity of the species a physio- logical relation is established analogous to commensalism if not to parasitism. Thus in Bonellia the diminutive and degenerate male lives in the uterus of the female, in Trichosomum crassicauda of the rat three or four male are found within the spermatheca of the female, while in Bilharzia the incipient reciprocal of these cases is found, the male being host. Many of the most remarkable cases are also afforded by the Cirripedia, in which a female may bear males in various states of dependence and degenera- tion. In viviparous animals a certain absorption by the young from the tissues of the parent can hardly avoid taking place; this is therefore so far an analogy to endo- parasitism. This advantage is clearly retained and deve- loped if absorption take place by an organ specialized for the purpose. Thus in the well-known shark Mustelus levis the young are attached to the oviduct by a placenta developed on the yolk sac; and the like arrangement, though morphologically different, is physiologically the same among the Mammalia.

Hyperparasitism.—Not only are very few animals alto- gether free from parasites, but even parasites themselves find their nemesis in being themselves infested by lesser parasites, though not “ad infinitum.” Thus Leuckart mentions that water-lice and thread-worms are found on parasitic crustaceans, and the endoparasitic larva of some Hymenoptera are themselves preyed upon by other larvee

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Pa an account of many cases of commensalism, see V. Beneden, Animal rasites, and Semper, Animal Life, both in International Science Series.

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(Pteromalinz). Nematodes are found in Nicothoe, and associated with Sacculina are frequently found two other crustacean parasites, one of which, after destroying the greater part of its host, continues to subsist upon the nourishment afforded by its root-like processes which sur- vive the operation.

_ Classification. —Some classification of these various parasitic forms is necessary. Van Beneden introduced the useful term commensals or messmates, under which he includes (1) otkosites or fixed and (2) coinosites or free partuers. These he distinguishes not only from parasites but from mtualists where two species are associated, but neither share a common food nor does one prey on the other. Parasites he divides according to the duration of their state of attachment to a host, distinguishing (1) those which are frec all their life (leeches, bugs, fleas, &c.); (2) those free as adults but parasitic when young (Lehneumon, Mermits, &c.) ; (3) those free only in youth, and attaining their adult form either directly in the first host entered, or only after a migration from one host to another (most parasitic worms) ; (4) those which pass all phases of their life on or in their host, ¢9., Strepsiptera, Tristomum, &e. In this classification there is no attempt to define the degree of dependence or the closeness of the association, except in the general distinction between parasites and commensals; the group of mutualists is entirely superfluous and confused, no clear definition being given, and in the examples of the various groups the limits of his own defini- tions are not adhered to.

_Leuckart distinguishes parasites as ccto- and endo-parasitic, and divides the former into temporary and permanent. Endoparasites he divides according to the nature and duration of their strictly parasitic life. (1) Some have free-living and self-supporting embryos which become sexually mature either in their freedom or only after assuming the parasitic habit. (2) Others have embryos which, without having a strictly free life, yet pass

through a period of active or passive wandering, living fora while in an intermediate host. They may either (a) escape to pass their adult life in freedom (Archigetes and Aspidogaster), or (6) they may become sexual, or © they may bore their way to another part of the body (7’richina), or (d) most frequently they pass to their fina] host either directly when their interincdiate host is devoured as food, or indirectly seeking for themsclves another intermediate host, or producing asexual forms which do so (Trematodes and Cestoids). (8) Others again have no free-living or even migratory embryonic stage, but pass through their complete life-cycle in one host (Trichocephalus, Oxyuris, &c.). This somewhat detailed classification has at least the advantage of clearness, and of showing to some extent the various degrees of parasitism.

Kossmann has proposed a more physiological classification dealing with the organization and habit of the parasite. This he has applied to the Crustacea :—I. Diosmotici, or vegetative without independent digestive organs, ¢.g., Rhizocephala ; Il. Digestorii, with independent digestive system, and including (1) Sedentaru, Copepoda ateletmeta, Bopyridx, Euboniscide, Cryptoniscide ; (2) Vagantes, Copepoda holotmeta, Branchiura, Cymothoide. The great variety of details, however, makes it almost impossible to establish any logically accurate division. Any strict classification of such a variety of organisms having only in common the physiological corre- spondence of their mode of life is almost impossible, and the most that can be done is to point out the existence of series of adapta- tions varying with the intimacy and constancy of the association and the degree of dependence.

Origin of Parasitism and Transmission of Parasites.— With the dismissal of the theory of generatio aquivoca, the question of the origin of parasites 1s limited to the discus- sion of the causes which might induce such a change of habit and environment. ‘There are obviously many oppor- tunities for one animal either in adult or larval state being swallowed by another in food or drink, in which case, if the environment were not too utterly different from that previously enjoyed, parasitism might arise in a purely unconscious way. It is again easily conceivable that animals which have sought a host for temporary protection from climate or enemies, or for safety and seclusion in the bearing and breeding of the young, might,

finding the environment congenial and a supply of food at hand, remain there during a large portion of their life. It is worth noticing, as corroboratory of the idea that the host was in many cases resorted to primarily as a sort of mater- nity asylum, that we find many parasitic females with free males, ¢.g., Vicothoe. Given an animal with a carnivorous habit, it is intelligible enough that during a period of

scarcity of food or of extreme pressure from enemies, vari- ous methods of solving the problem of life would be

attempted, the successful results of which in a few cases”

persist especially in ectoparasitism, not the least obvious mode of retaliation on stronger foes. The degree of the parasitism is, as we have seen, not of primary moment, and its intimacy may be increased. There are naturally some physiological limits of respiration, &c., determining the possibilities of parasitism—air-breathing insects are found on land animals or at most on some amphibian forms, water-breathing Arthropods on water-breathers, water- breathing worms only in the interior of land animals; but even these limits may be overstepped by adaptation when, for example, the respiration becomes cutaneous in Penta- stomum, Sarcoptes, &c.

The various modes of transmission of parasites, though of great practical importance, do not call for much dis- cussion here. They may be summarized as follows after Leuckart :—(1) the majority of parasites reach their hosts through the medium of food or drink; (2) eggs are in some cases transferred from one animal to another by actual bodily contact, e.g., the eggs of Pentastomum by the licking of dogs; (3) sometimes the eggs are deposited in or on the host by the mother, for example, by insect para- sites, such as Jchnewmons, Gistridex, &c. ; (4) in some rare cases parasites are transmitted by self-infection,—for example, young 7’richinex, born free in the alimentary canal of their host, bore their way thence directly into the muscles, there to grow into the well-known encapsuled worms. Eggs or proglottides of tape-worm may, on gain- ing the exterior, be transmitted inadvertently to the _ mouth, and so recommence their life-cycle within the same host.

The mode of diffusion of the ova of parasites presents many analogies to that of seeds in the vegetable kingdom : thus wind and water are alike utilized, passing animals may serve as unconscious bearers, and the like. Though well protected by a usually thickened egg-shell and an often remarkable degree of vitality, so as to resist pro- longed drought, burial, and other vicissitudes, the parasite has an exceedingly small chance of success in finding a host ; to preserve the species from extinction an enormous number of eggs must be produced, far exceeding that of free-living organisms. Thus Leuckart points out that as a tapeworm has an average lifetime of two years, and pro- duces in that time about 1500 proglottides, each contain- ing say 57,000 ova, and since the species is not increasing in numbers, an ovum has thus only one chance in 85,000,000 of reaching maturity. The difficulties are of course increasingly greater as the life-history becomes more

complicated, demanding an increasing number of hosts. °

Given a sufficient number of eggs, however, no difficulty is insuperable, and few parasitic forms accordingly seem in any risk of disappearance, except, it is to be hoped, in the case of civilized man and the domestic animals, where the large consumption of cooked food, aided by conscious hygienic precautions and medical aid, tends to exclude or remove them.

_ Affects of Parasitic Life on Parasites.—So far from treat- ing the phenomena of parasitic life as highly aberrant, and the peculiarities of parasitic form as differentiations sui generis, it becomes evident that we have to do with only one of the many cases in which the influence of environment on organism is clearly marked. The etiology of parasitism is only a fraction of a vaster general ques- tion; and we shall never fully understand the adaptation of the parasite to its host until the relation of environment to organism has been far more profoundly analysed and completely experimented on—inquiries which have only recently begun to be seriously set on foot. The most cur-

sory consideration of the action of environment shows how profoundly it determines form; of this no better examples can be found than those furnished by the habit of plants. It is easy to see how submerged leaves must become dissected, or desert plants tend to become succu- lent ; how evergreens are only possible in certain condi- tions of climate, or thorns are only useful where herbivor- ous mammals abound. In the same way we can broadly see that the conditions of life profoundly influence animal form. Before considering how the abnormal parasitic environment affects the parasite, we should know how the normal environment affects the non-parasite, and how the two cases differ. The environment thus needs analysis into its factors, the organism similarly into its constituent systems of organs; and the influence of any factor of the environment upon each system and organ demands deter- mination, species by species, before safe and exhaustive generalizations can be obtained. Pending these inquiries, which are destined to take so large a place in the biology of the future, and within the present narrow limits, only the merest outline can be attempted.

Morphological science has but slowly and with difficulty disentangled itself from the primitive classifications of plants and animals by habit and resemblances of external form; the physiologist, however, needs to reassert the claims of these and develop them in detail; as for the child so for him whales are in a sense fishes, and bats birds,—just as the swimming organs of the former, like those of the penguin or cuttlefish, are all fins, or the flying organs of the latter and those of insects are wings alike. Such considerations show too the first importance of the mechanical conditions, primarily those of locomotion or rest, and whether in water, or land, or in air, since these determine, not only external form, but muscular and skeletal disposition and structure. These determined, conditions of heat and light play an obvious part; copious supplies of heat energy to the organism have a distinct result in stimulating plant growth, and accelerating that of animals ; light too, a primal necessity for green plants, has also the most marked effect on animals, which develop tracts of absorbent pigments in its presence, these becoming locally evolved for perception into eyes; while in relation to sound-vibrations and impressions of contact other sense organs develop. Quantity of food has its influence mainly on size, but nature of food and mode of feeding demand many appropriate specializations of details of form. Expressing the same adaptations from the other point of

view, that of the organism, we see how not only the general form but the integument with its colour and texture, and also the respiratory and alimentary organs, are necessarily fitted to avail themselves of the given con- ditions; how the circulatory and how the reproductive systems must comply ; how the sensory organs must take note more and more of the changes in the environ- ment; and how the whole series of complex adaptations demands a similarly complex internal mechanism for their co-ordination through the nervous system.

From the slightest analysis then of the relation of organism to environment, the theory of evolution might almost have been predicted, since, if the details of environ- ment and organism be indeed obviously and_ precisely adapted one to another, change in the former must either be followed by the extinction of the latter or its modifica- tion in the requisite details. To explain the modus operandi of change in the organism, we have mainly to bear in mind Dohrn's admirably expressed "principle of functional change,"—the simple conception that any living tissue, however specialized, still retains traces of all the functions of living protoplasm, and that any one of these traces may be indefinitely increased by favourable conditions, and the

specialized function similarly reduced to a trace. Along with this, or rather as a corollary of it, comes the concep- tion of economy of unused structure; our notions of specialization become henceforth associated with a corre-sponding possibility of simplification, and our idea of pro- gress must be for ever accompanied by the corresponding possibility of degeneration.

The conditions of parasitic life are readily seen to differ primarily from those of independent organisms in negative characters, 7.¢., in the simplification of the factors of the environment ; let us therefore briefly consider the results of such progressive simplification upon organisms in general. Let the mechanical conditions be simplified by the cessation of active movement ; the specialized body-form necessary for locomotion then becomes unnecessary; locomotor muscles and their skeletal attachments are simplified or dis- appear; organs of sense are far less needed ; and nervous adaptations and structures become correspondingly reduced. In all these

respects then sessile parasites simply agree with other sessile animals. Again, let us simplify the environment by the deprivation of light ; eyes and pigment are useless, and our organism, whether cave-dwelling insect or crustacean or internal parasite, becomes blanched and blind; and similarly with other senses. Or let us subtract as far as possible the element of danger from other animals by special protection or concealment in one of the "nooks of life"; here again for shelled mollusc, sand-buried Amphioxus, or hidden parasite the diminished need of nervous adaptations is a similar degenerative factor. Let focl become abundant, the same nervous economy follows; let it be highly nutritive, and digestive structures and func- tions may be simplified ; thus the examples of progressive degeneration of the alimentary system up to its complete replacement by superficial absorption, afforded by various parasitic series, are natural.enough. The soft integument unprotected and blanched, the reduced muscular activities, the simple or absent alimentary tube, the reduced circu- latory and respiratory organs consequent upon diminished waste and softened integument, are all intelligible enough, as also is the increase in reproductive activity demanded by increased risk of failure to find the appropriate condi- tions. The few adaptive conditions are readily understood: given the continuous application of a flat muscular surface to resist detachment from the host, and atmospheric pres- sure helps the development of the sucker; given either a clutching limb or a portion of the body-wall thrust for support into the host, and the mechanical conditions aid the differentiation of a hook ; here, if anywhere, function in fact may be said to make the organ, and such curious resemblances of superficial form as those between say a gregarine, a tapeworm, and an Echinorhynchus are not hard to explain.

Further details of the process of retrograde metamor- phosis and of the enormously important phenomena of degeneration cannot here be attempted ; it must suffice if the general dependence of such changes upon simplification of environment—freedom from danger, abundant alimen- tation and complete repose, dc. (in short, the conditions commonly considered those of complete material well- being)—has been rendered clearer, and if the phenomena of parasitism, however apparently aberrant, become intel- ligible as new evidences of the unity of organic nature.!

_ Lfects of Parasite on Host.—As the result of the associa- tion of two organisms with more or less constancy, various mutual modifications of form and function must obviously Sccur. The more important effects of parasite on host may be briefly outlined. Semper cites numerous cases Where the commensal or parasite has a mechanically trans-

te See Dohrn, D, Princip. d. Functionswechsel ;

Lankester, On Degeneration ndon, 1880 ; Semper, Animal Life. ” é

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forming effect on the host. Thus a horny coral with which an annelid is constantly associated has become permanently modified to form an encasing tube. Worms inside corals have enlarged the base of the cavity by stimulating growth, and may also produce permanent pores. Pycnogonids on Campanularia produce galls, which ac- quire specific characters, and various species of crab para- sitic on corals form galls, two of which coalescing, form a sort of “cave dwelling” with two fissures which are kept open by the respiratory currents of the crab, which thus both stimulates and checks the growth of the polyps. In higher animals, and with more intimate parasitism, the mechanical influences of the parasite on the host are more serious and more markedly pathological. Thus parasitic worms, by their size and number, frequently close up passages such as arteries, windpipe, c&c., causing often fatal results. But many parasites are also actively de- structive to certain tissues of their host—thus, as Semper points out, Peltogaster destroys the female reproductive organsof Pagurus, a Trematode those of Limnea stagnalis, the larva of a fly (Cuterebra emasculator) the testes of various species of American squirrel. In none of these cases, how- ever, is the general vitality of the host affected. The results of active motion within the host are productive of still more serious mischief; thus the internal migration and burrowing of such parasites as 7’richina and Bilharzia is well known to produce violent inflammation. The per- foration of vessels, the consequent extravasation of blood, and the destruction of tissue often end fatally for the host. Leuckart distinguishes pathological effects as due either to growth and increase of parasites, or to their

wanderings within the host, or thirdly to the very consider- able loss of nourishment which a number of parasites of appreciable size necessarily entails. Some blood-sucking parasites are specially dangerous, and many less ferocious forms doubtless poison their host to some extent by their waste products. Roux also notes how parasites—an Echinococcus, for example—by inducing a flow of nutritive material, may develop a net-work of capillaries and produce other histological changes.?

It is probable that many of the most remarkable integumentary specializations of the animal kingdom are defences against parasites (somewhat as the stings or thorns which protect foliage, or the hairs which keep ants from flowers) ; thus the nematocysts of ccelenterates, the mol- luscan shell or the crustacean mail, the vigilant pedicellarize of the echinoderm, or the scales of the fish are alike largely specialized as defences against the never-ceasing attacks of swarms of larval parasites, eagerly struggling to gain entrance or footing anywhere. –

The history of the medical aspects of parasitism can only be very briefly alluded to. From the time of the ancient Arabian physicians some diseases, such as itch, have been referred to parasites. With the increasing knowledge as to the prevalence and importance of parasitism there arose a distinct parasitic theory of disease, and in the 17th and 18th centuries such questions were discussed as “an mors naturalis sit substantia verminosa.” In spite of the gradual unravelling of the mysteries of origin and life- history, physicians long clung conservatively to the old hypothesis of spontaneous generation, even Bremser regarding the pathological states of the host not as caused by the parasites, but as causing and in fact creating them. Tt was not till within the last thirty years that, with the rise of experimental helminthology, medical science shook itself free from superstition and ignorance, and devoted close attention to ztiology and treatment, culminating in that systematic warfare against all forms of parasitism bia Mit oe ae Oe ee

2 Leuckart, op. cit.; Semper, Animal Life; Roux, D. Kampf d. Theile im Organismus ; Ziegler’s Pathology, &c.

which now occupies so important a place in medicine and the veterinary art (see p. 269 infra and VETERINARY SCIENCE). (P. GE.)

VEGETABLE PARASITISM.

The name of parasites has been given to those plants which are nourished wholly or partially at the expense of other living organisms. The degree and nature of the benefit thus obtained varies greatly with different plants, and the effect produced upon the host ranges from an almost imperceptible one to complete destruction. At one extreme are certain forms which, while drawing the nourishment necessary for life from their hosts, yet do so in such fashion that both organisms continue to live in intimate association, and, it may be, rendering mutual help. From these by a series of gradations we come to parasites of such destructive influence as to cause wide- spread death to certain animal and vegetable forms of life. This physiological group is closely related to another, the saprophytes, which obtain their nourishment from the dead remains of organisms. True parasites belong ex- clusively to the dicotyledonous flowering plants and the fungi. A few alge are partial parasites.

The remarkable appearance presented by most parasitic flowering plants undoubtedly attracted notice in remote times. They are frequently mentioned by early writers, but there is no evidence sufficient to enable us to deter- mine whether they were regarded as independent plants or merely as pathological excrescences—unless in the one case of the mistletoe, which was recognized as the former by Pliny, who gives an account of its reproduction by seed. The effects of the attack of parasitic fungi were also observed in very early times, as there is abundant evidence to show, but the plants themselvés which caused the damage were necessarily not detected as such from their minute size and obscure nature. We must come to the middle of the 18th century for the first attempt to establish a botanical group of flowering parasites. Pfeiffer, in his treatise on the PFungus melitensis (Cynomoriwm coccineum), divides all flowering parasites into three groups, according as they infested the whole plant or attacked but one place or were confined to the root; but he includes many epiphytes, such as ivy, lichens, &c. After this remarkable classification a knowledge of native and exotic forms grew up, and nothing noteworthy occurred in the history

of the subject until the end of last century and beginning of the present one, when there was a relapse to the old theory that parasites were no more than degener- ate outgrowths from their hosts. For example, Meyen attempted to account on anatomical grounds for the exist- ence of Lathrea squamaria on its host, and more absurdly still, Trattinick, in a letter to Schlechtendal, gave a short list of plants to which parasites bear a very superficial resemblance, and gravely affirmed his belief that the latter are but specific degenerations of these. Thus he con- tended that Balanophora is but an Arum, Cytinus a Cotyledon, Raflesia a cabbage, &c. De Candolle made the first genuine attempt in 1832 to establish a classifica- tion of parasites on morphological and physiological grounds ; Unger followed in 1840 with a purely morpho- logical arrangement, and, though he advanced matters considerably, his treatise contains much speculation not borne out by facts. Martius's classification of about the same time 1s on much the same lines as De Candolle's. The knowledge of parasitic fungi has advanced gradually with the improvement of the microscope, and the accumu- lation of the life-histories of forms has grown up under the hands of numerous observers, among the earliest of whom Knight performed admirable service. With increas- ing knowledge of native and exotic forms, and the advance

made in the fields of vegetable anatomy and physiology, the whole group of vegetable parasites has become more strictly defined,—the last noteworthy service being the establishment by De Bary (Morph. u. Physiol. der Pilee, Flechten u. Myxomyceten) of the physiological group of "saprophytes" to receive those plants which differ from the parasites in obtaining their nourishment from the dead bodies of organisms and from soil rich in humus.!

PHANEROGAMIA.—The parasitic flowering plants are ex- clusively dicotyledons confined to natural orders falling under the two divisions of Gamopetale and Monochlamydee, Among the Gamopetale there are the (Monotropez)) Lennoacex, Cuscuteex (Convolvulacee), certain genera of Scrophulariacez (such as Rhinanthus, Melampyrum, Eu- phrasia, and Pedicularis), and the Orobanchex. Among the Monochlamydex there are the

Cytinacex, Cassytha (Laurinex), Loranthacex, Santalacee, and Balanophoracez, The vegetative bodies of these exhibit various degrees of degradation, and this process may go so far that, excepting the parts concerned in reproduction, not only the external appearance but the whole structure of the tissues character- istic of a vascular plant may be lost to the parasite. The roots in particular undergo considerable change of form and structure in adaptation to their peculiar function, and the typical root of a vascular plant may lose all its character- istics, retaining only its physiological properties. A degraded root or part of a root so adapted is termed a haustorium, and the mistletoe, dodder, Thesium, Balano- phora, and fafflesia exhibit such in various degrees of removal from the true type. ?

The arrangement of the orders as follows is that adopted in systematic botany. Their physiological relations will be afterwards indicated.

The Monotropex, which are allied to the heaths, possess no chlorophyll and only small scale-like leaves. MMonotropa, which may be taken asa type of the group, undoubtedly subsists as a saprophyte ou organic matter derived from the soil. There has been some controversy as to the parasitism of these plants. Perhaps the strongest evidence in its favour was offered by Drude, who stated that he found a parasitic connexion between Jfonotropa and the roots of Abies vxcelsa. Monotropa was then generally regarded as both parasite and saprophyte. More vecently, however, Kamienski has denied the accuracy of Drude’s interpretation of the case, and, affirming that Monotropa possesses no haustoria, upholds the view that it is no true parasite. Upon the evidence it may be taken that no case has yet been satisfactorily made out for the parasitism of this group. The suborder consists of ten or twelve species included in nine genera occurring in north temperate regions, Monotropa Hypopitys, L., is distributed through Europe; var. glabra, Roth, mostly among deciduous trees ; and var. hirsuta, Roth, commonly among conifers.®

The Lennoacew arc a very small order confined to Mexico and California. They are succulent herbs with simple or slightly branched stems bearing small scale-like leaves, and resemble im general habit the Monotropex, to

which they are allied. They possess no chlorophyll, and are probably always parasitic.*

The Cuscutacew (Dodders) are a suborder of Convolvulacee, and are distinguished by their fibrous, climbing stems bearing very small scale-like leaves. They are entirely without chlorophyll, and are true parasites. The group consists of annual plants reproduced each year from their seed, which commonly ripens about the same time as that of the host plants. The seeds of host and parasite are frequently found mixed, and it consequently happens that they are sown together. When the seed of the dodder germinates it

1 Pfeiffer, Fungus melitensis, Linneus's Ameanitat. Acad., Dissert. 1xv., vol. iv., 1755; De Candolle, Physiologie végétale, iii, Des parasites phanerogameés, 1832; Unger, 'Beitr. zur Kenntniss der parasitischen Pflanzen," Ann. d. Wiener Mus., ii., 1840; Martlus, '"' Ueber die Vegetation der unechten und echten Parasiten zundehst in Brasilien," Gel. Anz. d. Kgl. bair. Acad. d, Wissensch., xly. : 2 The following recent works deal more or less completely with parasitic flowering plants asa group :—Solms Laubach, "' Ueber den Bau und dle Entwick- clung der Ernahrungsorgane parasitischer Phanerogamen," Pringsheinv's Jahrb. J. wissensch. Bot., vi.; Chatin, Anatomie comparée des vegetaux—Plantes para- sites, Paris, 1862; Brandt, Wonnulla de parasit, quibusdam phanerogam. obs. Linnea, 1849; Pitra, " Ueber die Anheftungsweise einiger phanerogamischer Parasiten an ihre Nahrpflanzen," Bot. Ztg., 1861. a

3 Solms Laubach, Joc. cit.; Drude, Die Biologie von Monotropa Hypopitys, Gottingen, 1873;, Kamienski, ''Die Vegetationsorgane von #Monotropa Hypo- pitys," Bot. Ztg., 1881.

4 Solms Laubach, "Die Familie der Lennoaeeen," Abhandl. d. Naturf. Gesell. zu Halle, xi.

ushes up its stem, which mecting with the stem of the host plant develops a papilla-like body at the point of contact. From the papilla there proceeds the true haustorium, which penetrates the tissues of the host as far as the vascular system, where it expands slightly and terminates in a broad surface. The haustorium is furnished with a central vascular bundle originating in the vascular system of the dodder stem. When this haustorium has been developed the root of the dodder dies off and all connexion with the soil ceases, while the stem above the haustorium continues to wind round its host, producing fresh haustoria at short intervals, and gradually enveloping and destroying the plant. The influences exerted are of two kinds :—(1) a truly parasitic influence, since the dodder, possessing neither connexion with the soil nor chlorophyll, obtains all its nourishment from its host by the action of its haustoria ; and (2) a mechanical influence, in depriving its host of air, light, &c., and preventing the development of branches, leaves, fee. (see fig. 2). The commonest species are Cuscuta Epithymum, Murr., distributed throughout Europe, growing on Thymus Ser- pyllum, Calluna vulgaris, Genista, &c.; var. trifolit on clover, to which crop it is cnormously destructive ; C. cwropea, L., occurring throughout Europe on hops, vines, &c., and C. Epilinum, Weihe, commonly found throughout Europe growing on flax.*

There are at least five genera of Scrophulariacee which are partially parasitic, viz., Rhinanthus, Melampyrum, Pedicularis, Euphrasia, and Striga. They all contain chlorophyll, and possess true roots on which small haustoria are developed. Huphrasia, occurring in both north and south temperate regions, is partially parasitic on roots of grasses. Pedicularis is common in alpine and arctic regions of the northern hemisphere, Melampyrum and

Fig. 2.—Cuscuta glomerata, Choisy.

A, Parasite entwining host; B, section through union betweém parasite and host; c, stem of host; @, stem of Cuscuta,;

h, haustoria. After Dodel-Port.

Rhinanthus in the north temperate zone, and Striga is a native of Asia, Africa, and Australia. The last possesses perhaps more dis- tinctly parasitic

habits than the others—though the cultivation experiments of Decaisne, Cornu, and others tend to show that parasitism is necessary in the cases of Melampyrum, Rhinanthus, and Euphrasia.*

The Orobanchee (Broomrapes) possess erect, simple or little- branched stems bearing numerous scale-like leaves, and are variously coloured, but destitute of chlorophyll. They are parasitic on the roots of many different herbs and shrubs by means of their haustoria, which penetrate to the vascular system of the host. They attach themselves thus immediately after germination. There are about one hundred and fifty so-called species of Orobanche, of which the following are perhaps best known:—Orobanche rubens, Wallr., parasitic on and very destructive to lucerne; 0. minor, Sutt., on red clover; 0. major, L., which attains a height of 2 feet on roots of furze and other leguminous plants; and 0. Rapwm, Thuill. Phelipwa ramosa, Mey., attacks particularly hemp and tobacco. Lathrexa, which according to Solms Laubach belongs to Scrophulariacee, Is parasitic on the roots of trees such as hazels.®

1 Desmoulins, Etudes organiques sur les Cuscutées, Toulouse, 1853; Solms Laubach, loc, cit.; Uloth, “ Beitrige zur Physiol. der Cuscuteen,” Flora, 1860; Koch, Die Klee und Flachsseide, Untersuch. tiber deren Entwickelung, &¢., Heidelberg, 1880, where references to further literature are given.

Decaisne, Ann. d. Sci. Nat., 1847, ser. iii., vol. viii. p. 2; Cornu, Bull, d. la – Bot. de France, 1876, vol. xxiii. p. 195; Henslow, Bot. Ztg., 1849,‘p. 14; Pitra, : Zig. 1861, pp. 66 and 72; Solms Laubach, Joc. cét. 4

Solms Laubach, “ De Lathrea generis positione systematica,” in Berlin.

The Cytinacee are a very remarkable order of truly parasitic plants which are wholly destitute of chlorophyll, and of a very degraded structure. Cytinus possesses a scaly stem bearing sessile flowers, while Rafiesia and Brugmansia consists one may say of a single flower, measuring in the case

of Raffiesia as much as 8 feet across. These flowers appear first in the form of knobs emerging from the host plant, and before expanding resemble an unopened cabbage. They remain expanded only for a few days, when putrefaction begins and a smell as of putrescent flesh is emitted, serving thus to attract insects whieh probably aid in effecting fertilization, since the stamens are in differeut flowers. There are about twenty-four species in the order, and these are mostly tropical. Cytinus Hypocistis, ., which is parasitic on the roots of Cissus, occurs in southern Europe. Rafilesia and Brugmansia are limited to the Malay Islands, and Sapria has a wider distribution throughout the same region. Aafflesia is parasitic on both roots and stems, the latter generally prostrate. Pilostyles, a native of America and Africa, and Apodanthes, confined to America, are parasitic on branches. Hydnora, found in tropical and south Africa, grows on succulent plants, chiefly Huphorbiaceex ;: and closely allied to it is Prosopanche, an American genus.*

The genus Cassytha (Laurinex), of which there are about fifteen species occurring in the tropics, but mostly in Australia, strongly resembles Cuscuta. The plants are exceedingly alike in appearance and in parasitic habit, for which reason the name of ‘‘ dodder laurels” has been given to the Cassythex. They are wholly without chlorophyll, and their thin, twining, cylindrical stems, bearing scaly leaves, envelop their hosts, to which they are attached by nieans of papilla-like haustoria. The secds germinate in the soil, and the roots subsequently die off as in Cuscuta.®

The Loranthacegx are parasitic on the stems and branches of trees, but, since they bear mostly thick and leathery leaves containing ehlorophyll, their parasitism cannot be considered so complete as in, those cases where chlorophyll is absent. The order is for the most part a tropical one, but it is represented in Europe by Loranthus europeus, L., and Viscum album, L., the common mistletoe. Lor- anthus is a large tropical genus containing upwards of three hun- dred species. Arceuthobium occurs in southern Europe. The mode of parasitism of Viscum album, L., the mistletoe, may be taken as illustrative of the order. Its seeds adhere to the young shoots of trees by means of the viscid pulp of the fruit (uscd in the pre- paration of bird-lime). On germination it shoots out rootlets which traverse the cortex of the host mostly in the direction of the axis, sending down numerous

haustoria into the wood, where the cells of the parasite become partly lignified, and thus attain an intimate connexion with the wood-cells of the host. A layer of meristem is formed in the haustorium where it passes through the cambium region of the host stem, thus enabling the parasite to keep pace with the growth in thickness, and gradually to beeome more deeply fixed. ‘The function of the growing point, which soon passes over into permanent tissue, is thus transferred to this region of the haustorium. Ultimately this layer of meristem is also transformed into permanent tissue, and the activity of the parasite in this direc- . tion ceases. The haustoria are commonly situated elose together in considerable numbers, and an excessive demand upon the host is thus brought about, causing local death and a hurtful influence. throughout the plant, exhibited in its defective development. Where a tree has been attacked by mistletoe a corroded and dis- torted appearance is presented, owing to the drying up of the tissues and the reparative processes that ensue, When the mistle- toe has thus exhausted one region of supply it frequently sends out adventitious shoots, which, attacking the host in fresh places, give rise to new growths of the parasite. ‘The mistletoe grows on a large number of different trees, such as the apple, lime, elm, maple, willow, thorn, poplar, and even on conifers. Though exceedingly plentiful on the apple, it rarely attacks the pear tree, and the Lombardy poplar seems to be exempt, while other poplars suffer considerably. Very rarely does it attack the oak, and Dr Bull, who made exhaustive inquiry (Journ. Bot., vol. ii.) into the matter, succeeded in’ discovering only seven authentic cases in

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i 1865, and loc. cit., also in Abhandl. d. Naturforsch, Ges. zu Haile, ae Koch, i Untersuch. iiber a. Entwickelung d. Samens d. Orobanchen, in Jahrb. f. wissensch. Bot., xi; Caspary, ‘‘ Ueber Samen, Keimung, ete., der Orobanchen,” fora, 1854; Lory, ‘an la respiration et la structure des Oro-

i .d. Sci. Nat., ser. iii. B ‘

a Sen ea ‘¢ ‘Account of a New Genus of Plants, named Rafiesta, Trans. Linn. Soc., xiii. (published also in Miscellaneous Works); Id., On the Female Flower and Fruit of Raffesia Arnoldi, and on [fydnora africana,” Ibid., xix.; Solms Laubach, loc. c#t., and ‘‘ Ueber das Haustorium der

Loranthaceen und den Thallus der Rafflesiaceen und Balanophoreen," Abhandl. d, Naturforsch. Ges. zu Halle, xiii.; Id., "Ueber den Bau der Samen in der Fam. der Raffiesiaceen und Hydnoreen," Bot. Ztg., 1874; Beccari, " Osservaz. 8. alcune Rafiestacex," Nuovo giorn. bot, Ital., 1875; Teysmann, 'Nouvelles recherches sur la culture de Rafflesta "Arnoldi," Batavia, 1856; De Bary," Prosopanche Burmeistert, eine mane Hydnoree aus Sud-America," Abhandl. a. Naturf. Ges, zu Haile, x.; Schimper, Die Vegeta- tionsorgane von Prosopanche Burmeisteri," Ibid., xv. ; Baillon, * Sur le developpe- ment du Cytinus," Bull. de la Soc. Linn, de Paris, 1874; Archangeli, '' Etude sui le Cytinus Hypocistis," Atti del Congresso internaz. botan., Florence, 1874.

5 Poulsen, " Ueber d. morphol. Werth d. Haustoriums v. Cassytha," Flora,

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England. Loranthus europeus, L., occurs on the oak in southern Europe.!

The Santalacew are mostly if not all partially parasitic shrubs or herbs—their foliage containing chlorophyll. Santalum (S. album yields sandal wood), distributed throughont the East Indies, Malay Islands, and Australia, and 7hestwm, a native of Europe, are parasites on the roots of plants, especially monocotyledons. Their haustoria are more or less globular in shape, and emit from the surface in contact with the host a process which penetrates the tissues. Osyris also attacks the roots of trees. Henslowta and Myzodendron are partially parasitic on the branches of trees. 'The latter, a native of south temperate climates, attaclies itself to its host by means of the feathered processes on its seeds. These retain them in contact with the branches on which they fall until germination (thus per- forming the same function as the viscid pulp of the mistletoe), when the haustoria penetrate the bark and become, as it were, grafted into the living tissues."

The Balanophoracex are flowering plants of degraded structure, destitute of chlorophyll, and generally coloured red, yellow, or brown. In appearance they somewhat resemble Cytinacex, though there is no real affinity in the case. The stems are succulent, some- what knob-shaped or cylindrical,

varying in height from a few inches to a foot, in which latter case they are sometimes branched, and bear imbricated scales in place of leaves. They are true parasites on the roots of woody Dicotyledons, rarely on Monocotyledons. The haustoria vegetate in the tissues, frequently setting up exten- sive hypertrophy. They occur chiefly in mountainous tropical regions —some in Australia and the Cape. The order contains thirty-five species in fourteen genera, of which Balanophora, Cyno- morium, and Langsdorfia are the best known. Cynomorium coccineum—the Fungus melitensis of old writers—is found in Malta, the Levant, North Africa, and the Canary Islands.?

Atcu,—Several microscopic alge may very well be partial parasites, though it is probable that in most cases they are little more than epiphytes in their relation to the plants in which they occur. They all possess chlorophyll and are able to assimilate; but from their situation in the tissues of other plants a degree of parasitism may be inferred. A species of Wostoc occurs in the intercellular spaces of the roots, leaves, and thalli of other plants; and Chlorochytrium is found in the tissues of Lemna, Cerato- phyllum, and in another alga Schizonema. More distinctly parasitic is the case of Phyllosiphon Arisari, Kihn, which inhabits the parenchymatous tissue of Arum Ari- sarum.*

LicHENESs.—Mycoidea parasitica, Cunn., was described and figured by Cunningham as a_ parasitic green alga. It, or a closely allied form, has been recently examined by Ward, who says, “It seems clear that the injury is not due to a direct parasitic action of the thallus; even in the extreme case of Citrus I do not imagine the active development to depend so much on absorption of food from the living leaf as on the sheltered situation enjoyed by the ensconced thallus.” 5

Fune1.—The absence of chlorophyll from all fungi, and the necessity thus thrown upon them of taking up the carbon compounds assimilated by other organisms, deter- mines their mode of life, which is therefore either parasitic or saprophytic. The parasitic organ of the fungal thallus

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_ 1 Solms Laubach Joe. cit. ; Id., “ Ueber das Haustorium der Loranthaceen,” &c., in Abhandl. d. Naturforsch. Ges. 2u Halle, xiii.; Karsten, “ Beitrag zur Ent- wickelungsgeschichte der Loranthaceen,” in Bot. Ztg., 1852: De Candollc, Memoire sur la famille des Loranthacées, Paris, 1830; Giimbel, ‘Zur Entwickel- ungsgeschichte von Viscum album,” Flora, 1856,

.” Solms Laubach, loc, cit.; Mitten, ‘ On the Economy of the Roots of Thesium linophyllum, in Iook. Lond. Journ, Bot., vol. vi.; Scott, ‘‘ Untersuch. iiber 4, Parasitismus von Santalum album” (for which see Solms Laubach, Bot. Ztg.; 1874) ; Schultz, “ Beobachtung tiber Ajuga genevensis, Thesium intermedium, und. d. Verhiltniss der Schmarotzer zur Nahrpflanze,” in Flora, 1854,

3 Solms Laubach, loc. cit. ; Id.,‘* Ucber das Haustorium der Loranthaceen und den Thallus der Rafflesiaccen und Balanophoreen ” in Abhandl. d. Naturforsch. Ges. zu Halle, xiii. ; J. D. Hooker, “* On the Structure and Affinitics of Balano- phorex,” &e,, in Trans, Linn. Soc., xxil.; Gocppert, ‘Ueber den Bau der Balano- phoren, in Act. Acad. Cvs, Leop, Carol., N. Cur., voi. xvili.,1842, suppl.; Caruel, 2 Osservazioni sul Cynomorium,” in Nuovo giorn. bot. Ital., viii.; Weddell,

Mémoire sur le Cynomorium coceineum,” in Arch. du Mus., x.

4 Cohn, Ueber parasitische Algen,” in Beitrage zur Biologie der Pflanzen, i.; Perceval Wright, “On a New Species of Parasitic Green Alga belonging to the ee of Cohn,” in Zrans. Roy, Irish Acad. vol. xxvi.; Kiihn,

: einc neue parasitis g j ‘tsart),” § Sitzungsber. d. Naturf, Gesellsch. Halle, ae eS 2 eae 5 Cunningham, ‘On Mycoidea Parasttica,” in Trans. Linn. Soc., ser. fi., vol. i.,

Ward, “Structure, Development, and Lifé-Histor opi i Lichen,” Jbéd., vol, ii, 1″ > History of a Tropical Epiphyllous

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is the mycelium, upon which haustoria are sometimes developed in the form of lateral protuberances of various shapes and sizes. In the same species of parasitic fungus receptacles frequently occur of different kinds, succeeding each other more or less regularly in cycles, and sometimes in their course preying upon hosts of remote affinities among themselves, This course of life is of practical importance when effort is made to limit the ravages of such a parasite (see Mitpew, vol. xvi. p. 293), Many indiscriminately attack plants nearly allied to each other; numerous species are peculiar to one host; while others are confined to a single region such as the ovary, the stem, or the leaf of one or more species of the higher plants. The spores, invariably of microscopical dimen- sions, represent the infectious agent, as the seeds of flowering parasites commonly do. They are conveyed by the atmosphere, by contact of one plant with another, by insects and other animals, &c., and germinate by the emission of a germ-tube, the production of zoospores sometimes intervening. Access to the host is obtained by the penetration of the epidermal tissue or by way of the open stomata. The main body of the fungus is either endophytic or epiphytic—the spore-producing portion in nearly all cases opening externally. The amount of damage effected by the attack varies from slight local injury to the destruction of the host; in some cases cell- contents only are destroyed, while in others whole tissues perish. The effect produced is often in the direction of abnormal stimulus, and the hypertrophy of whole regions or the production of galls ensues. The parasite commonly prepares the way for the saprophyte, which steps in to break up the dead and decaying remains. In certain rare instances the union of parasitic and saprophytic modes of life in the same species has been observed (see below).

The fungi which are concerned in the constitution of

lichens maintain with the algal components throughout life relations of consortism which will be dealt with below, under ‘Symbiosis. ” 6

For the life-histories of the following groups the student is referred to the article Funcus (vol. ix. p. 827), and to the literature therein cited.

Saprolegnice.—The fungi of this suborder are many of them saprophytes, as thcir name implies, but some are of distinctly para- sitic habits. Certain species of Pythiwm are parasitic on fresh- water alge, on the prothallia of

vascular cryptogams, and in the tissues of the higher plants. Several species of Saprolegnia are parasitic on similar hosts, but one in particular, S. feraz, Gruith, is well known for the part it plays in the disease of fishes in fresh water—commonly called the salmon disease. That this fungus possesses both parasitic and saprophytic modes of life is established, and the fact is one of remarkable importance, since it stands almost by itself in this respect among the higher fungi.”

The Peronosporex are all parasites on vascular plants of many different orders. The mycelium inhabits the tissues of the host, and, in many of the spccies, while passing through the intercellu- lar passages, sends globular or irregularly branching filamentous haustoria (see fig. 8) into the adjoining cclls. On the other hand the mycelial filaments of certain species, such as Phytophthora infestans, De Bary, the potato disease, possess no true haustoria, but they pene- trate the cells, breaking down the cell-walls in their course. In the regions where the oospores of Peronosporee are formed hyper- trophy of the tissues of the host sometimes occurs, and, the normal functions being checked, the parts in question die off. The Peronosporex are cnormously destructive to the higher plants, and may be reckoned among the most dangerous enemies of agriculture aud horticulture, Besides the potato disease, Cystopus candidus

§ The following works have special reference to fungal parasites :—Frank, Die Krankheiten der Pflanzen, 1880; Sorauer, Handbuch der Pflanzenkrankheiten, 1874; O. Comes, Le Crittogame parassite delle piante agrarie, Nayles, 1882. Of historical interest are Unger, Die Erantheme der Pflanzen (1883), and Bettrage zur vergleichenden Pathologie (1840); Meyen, Pflanzen- Pathologie, 1841. s

7 Pringsheim, “ Die Saprolegnieen,” in his Jahrb. f. wissensch, Bot., i., hi., and ix.; De Bary, “ Einige neue Saprolegnieen,” Jdid., ii.; Lindstedt, Synopsis der Saprolegnicen, Berlin, 1872; Cornu, “Monographie des Saprolegniées,” in Ann. Sci. Nat., ser. v., vol. xvi.; Hesse, Pythium de Baryanum, &c., Halle, 1874; Sadcbeck, “Untersuch. fiber Pythium Equtseti,” in Cohn’s Beitr. zur Biol. d. Pflanzen, i.; ‘T, H. Wuxley and G. Murray, “On Salmon Disease,” in Inspector of lisheries Reports for 1881,

1882, 1888 ; Marshall Ward. “ Observations on the Genus Pythium,” in Quart, Journ. Microscop. Scz., vol, xxiii, new ser.

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and Peronospora parasitica, both occurring plentifully on Crucifera, may be mentioned as typical of the group.’

The Chytridice are a small suborder of parasitic fungi inhabiting rarely the epidermal tissue of higher plants, but commonly attacking fresh-water alge and sometimes Jnfusoria. Many of these excced- ingly simple plants consist merely of a sporangial cell maintained in position and nourishment by a haustorinm which penetrates the host cell. The affinities of the group arc somewhat uncertain, but probably they are correctly placed among Zygomyeetcs.”

The Uredines are endophytic parasites on vascular plants pro- dueing the disease popularly called rast. These fungi occur on very various plants, and in their life-history go through a cycle of renerations on at least in many cases two different hosts. Corn- mildew is the best known of them, and may be taken as typical of the rest (sec MILDEW, vol. xvi. p. 293 ; and for figures, see Funeus, yol. ix.). This suborder, like the Peronosporex, is exceedingly destructive to cultivated and other plants. The Restelia of the pear tree (which alternates with the Podisoma of junipers) and the Puecinia of Malvacee may be mentioned as familiar examples of the group. The coffee-leaf disease, Hemileia vastatrix, is considered by Ward to be allied to this group.’

The Ustilaginex are all parasites of a very destructive nature on the stems, leaves, ovaries, &c., of the higher plants, The mycelial filaments inhabit the tissues of the host, where hypertrophy is

Fia, 3.—Peronospora parasitica, De By. A. Conidiophore with conidia. B. Mycelium with haustoria (7).

frequently set up, and the enlarged space thus obtained is used by the fungus to contain the masses of spores formed by the breaking upofthehyphx. Their whole life-history is carried out in the same host. Though attacking grain crops particularly, many species infest other plants. Ustilago Carbo, Tul., is perhaps the commonest, and is exceedingly destructive to a considerable number of grasses. *

The Entomophthorce are a very small group attacking insects. The mycelium ramifies densely in the body of the insect and breaks out through the skin where spores are produced singly on basidia. Within the body resting spores are formed by means of which the fungus hibernates. Hmpusa Muscew is very common on the ordinary house fly.®

a De Bary, “Recherehes sur le développement de quelques ehampignons parasites,” Ann. d. Sci. Nat., ser. iv., vol. xx.; Id., “‘ Zur Kenntniss der Perono- sporeen,” in Beitr. zur Morph. u. Phystol. d. Pilze, Hft. 2. See also Porato.

? Braun, ‘‘ Ueber Chytridium,” &e.,in Abh, d. Berl, Akad., 1856; Nowakowski, ‘Beitrag zur Kenntniss der Chytridiaceen,”’ in Colin’s Bettr. zur Biol. d. Pflanzen, li, ; De Bary and Woronin, ‘‘ Beitrag zur Kenntniss d. Chytridieen,” in Ber. d. Naturforsch. Gesell. zu Freiburg, 1868; Woronin, in Bot. Zég., 1860.

sae Bary, Unitersuch, tiber die Brandpilze (Berlin, 1853), and ‘‘ Neue Untersuch. ber Uredineen ” in Monatsber, d. Berl. Akad. (1865); Tulasne, “‘Mém. sur les Uredinées,” &e.,in Ann, Sci. Nat., ser. iii., vol. vii. (Uredin., p. 43), and J0id., ser. De gi ii.; Sehréter, “‘Entwiekelungsgesehichte einiger Rostpilze,” in Cohn’s =. zur Biol. d. Pflanzen, i.; Ward, “Researches on the Life-History of

“ete vastatrix,” in Linn, Soc, Journ. Bot., vol. xix.

U ase, loc. ctt.; Fischer v, Waldheim, ‘‘Beitrige zur Biologie. . der a Stilagineen,” in Pringsh, Jahrb. f. wissensch. Bot., vii.; and Apercu Systematique les Ustilaginees, leurs plantes nourriciéres, &e., Paris, 1877; De Bary, Uniersuch. roe co Brandpilze, Berlin, 1853; Kiilin, ‘‘ Ueber die

Art des Eindringens der Zt ” &e., in Sttzungsber. d, Naturforsch. Gesellsch. Halle, 1874, and Bot.

$5 74 3 Brefetd, Bot. Untersuch. tiber Hefenpilze, v. 1883, ig <0 Empusa Musce und die Krankheit der Stubenfliege,” in Nova Acia, ats refeld, ‘Untersuch. iiber die Entwickelung der &. Musce und £. radt- igee uy Abh, d. Naturforsch. Gesellsch, Halle, 1871; and “ Ueber Entomoph-

oreen,” &¢., in Sitzungsber, d, Gesellsch. Naturforsch. Freunde, Berlin, 1877.

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The Hymenomycctes is the only suborder of Basidiomycetes certainly known to inelude parasitic members, and these relatively few in number. Agaricus melleus, Vahl, by means of its subter- ranean mycelium (Rhizomorpha subterranca of older authors), is excecdingly destructive to the roots of many trees and woody plants. Other Agaricini, such as Nyctalis parasitica, attack members of the same group as themselves, but by far the greater number are saprophytes. Trametes radictperda, R. Hart., and T. pint, Fr., Polyporus fulvus, Scop., P. vaporarius, Fr., P. mollis, Fr., and P. borealis, Fr., all attack Coniferez especially, while P. sulphureus,

Fr., P. igniarius, Fr., and P. dryadeus, Fr., arc parasitic on oaks,

poplars, beeches, willows, and other dicotyledonous trecs. Thele- ese Stereum, and Hydnum also include species parasitic on Trees.

The Diseomyeetes, like the last group, are mostly saprophytes, but a few distinctly parasitic members are to be found in it. Aseomyces, Gymnoaseus, and Exoaseus (HE. Pruni, Fiickel, and £. deformans, Fiickel) are parasitic, the last-named upon plum, peach, and cherry trees. Several species of Peziza, as P. calyeina, Schum., on the larch, and a number of those belonging to the section of Pseudo- peziza attack the higher plants. It is highly probable that many Sclerotia, numbers of them parasitic, the positions of which are not definitely known, will be found to belong to sueh

discomycetous forms as Peziza. Peziza sclerotioides, Lib., is said to remain living as a saprophyte after the death of its host. Rhytisma is a very common disease of leaves, such as those of Acer, in which it pro- duces large darkly discoloured patches.”

Pyrenomyectes.—Of this group the Erysiphee are perhaps the most destructive as para- | ,

sites. They exhibit in their life-history a cycle of generations each of con- siderable parasiticactivity. The main body of the fungus is commonly epi- phytic, the mycclium sending down haustoria through the epidermis of the host (see fig. 4). Of the perithecial form of fructification good ex- amples are Sphezrotheca Castagnei, Lev., the hop mildew (sce MrupEw, vol. xvi. p. 294), Phyllaetinia, Oneinula, Caloeladia, and Erysiphe (E. graminis, Lev., #. Linki, Lev., E. Martii, Lev., and £. lamproearpa, Link.). The oidium forms are also con- spicuous as parasites, a familiar example being p> found in EZ. Tuckert, Berk., I B

. . v the vine-mildew (sce MIL- ye. 4.—zrystphe Tuckert, Berk. A and B, my- DEW, as above). Clavi- eelium (m), with haustoria (4). After De ceps purpurea, Tul., the Bary. ae ergot of grasses (see Ercor, vol. vill. p. 251), is the best known and most important of all pyrenomycetons parasites. The gronp includes a multitnde of minor parasites, —some of them, however, doubtfully so—belonging to such genera as Stigmatea, Spherella, Fusisporium, Ramularia, Fumago, Polystigma, Pleospora, Nectria, &e. Neetria ditissima, Tul., is reputed to be the cause of canker in certain trees. Cordyceps is well known as a discase of insects.®

Nature or Vecrrapte Parasirism.—It has been seen that the dependence of parasites upon their hosts for the means of subsistence varies considerably in degree, but it is equally manifest that underlying this condition of existence there are certain facts which char- acterize every case. The most important of these is the absence or the inadequate supply of chlorophyll and the

6 R. Hartig, Wichtige Krankheiten der Waldbaume, Berlin, 1874; Brefeld, Botanische Untersuch. tiber d. Ce eile iii. ; and compare also De Bary in n. u. Physiol. der Pilze, p. 22. A ; ;

Be Die nanapeion Feinde des Waldes, il. ; Rehm, Die Entwickel-ungsgeschichte eines die Kleearten zenrstérenden Pilzes, Gottingen, 1872; Prantl, “¢ Hystertum Pinastri, Schrad., als Ursaehe der Sehtittekrankheit der Kiefer, in Flora, 1877; Uartig, Joc. cié. ; Tiehomiroff, ‘‘ Peztza Kaufmanniana, eine neue aus Sclerotium stammende und auf Hanf schmarotzende Beeherpilz-Species, ” in Bull. Soc. Nat. Moscow, 1868; Brefeld, Bot. Untersuch. tiber Schinmelpilze, ipsie, iv. Heft, 1881. ‘

nos, Selecta fungorum Carpologia, Paris, 1861-65, and “Mémoire sur YErgot des Glumaecées,” in Ann. Sci. Nat., ser, iii., vol. xx.; Kiihn, * Untersueh, diver d. Entwick., &c., des Mutterkornes,” in Mitth. Physiol. Lab. Univers. Halle, 1 Hft., 1863; V. Mohl, “ Ueber die Fleekenkrankheit der Maulbeerblitter und die Septoria Mort, Lev.,” in Bot. Zig., 1854; and ‘ Ueber die Traubenkrankheit,

in Bot. Ztg., 1854; De Bary, “‘ Zur Kenntniss inseetentidtender Pilze,” in Bot.

Ztg. 1867.

consequent loss or deficiency of the power of assimilation. For a comparison of this abnormal condition with the normal state a subject is found ready to hand in the nourishment of one organ by another, as exemplified in the growth of young seedlings, which in the case of seeds containing endosperm (cocoa-nut, date-palm, and many other monocotyledons) absorb by means of a definite organ the nourishment necessary for their development. Young plants nourished from the reserve-materials stored in bulbs and the like, and the young shoots of a tree from winter buds, afford a comparison which is even closer in an anatomical respect, since in this case there is present, as in the intimate association of parasitic haustoria with the host, a continuity of tissues which is not so strongly marked in the union of the absorbing organ of a seedling with the endosperm. Looking at the subject wholly from the point of view of the process of nutrition, there seems to be little essential difference between parasite and saprophyte, since we have not only experimental instances of the nutrition of parasites on artificially prepared solutions, but the natural

union of both habits in the same individual (salmon-disease, &c.; see also the experiments of Grawitz on the growth of saprophytic fungi in the blood of animals). These are exceptional instances, however, and it is manifest that other properties must be brought into play, since most parasites affect peculiar hosts, and many of them certain regions only of the plant. It is equally true that many saprophytes are able to grow only in peculiar substrata. ;

That parasitism is often but partial is apparent from |

such instances as the mistletoe, Rhinanthus, Thesium, &c., which probably obtain from their hosts in the main only water and mineral substances in solution, to be prepared for plant food in their green leaves. It is most likely, however, that a small quantity of certain organic com- pounds is a necessary accompaniment in all such instances. Here again there exist the means for comparison with green saprophytes. The taking up of ash constituents from the soil may occur in such parasites as Orobanche, which possesses rootlets, though undoubtedly the whole

of the necessary carbon compounds are obtained from the |

host.

This mode of life not only acts upon the host, but reacts upon the parasite itself, as is manifested by the aberrant and degraded structure of the parts (directly and indirectly) concerned in nutrition, and even of the reproductive system. This is strongly marked in the case of the embryo. It is apparent that large transpiratory surfaces are unnecessary, and would even be of detriment to a parasite ; and with this the formation of wood so intim- ately connected with the process of transpiration keeps pace in degradation. In the mistletoe, for example, the bulk of wood is in relation to the small transpiratory surface, and in the cases of parasites without chlorophyll it dwindles to insignificance. No other abnormal mode of life so influences the structure of a plant as a parasitic or a saprophytic one, though we see an approach to it in the adaptations existing in insectivorous plants.

The effect upon the host ranges from local injury to destruction on the one hand, and, on the other, in the case of stimulus, from the local production of

galls to the com- plete hypertrophy and transformation of at least large regions of a plant. The exciting of definite reparative processes 1s an indirect effect. It must be noticed also that many parasites, especially fungi, cause in the host enormous destruction of food material far exceeding that necessary to their maintenance. In this way the parasite frequently commits suicide ag it were, and the act is in

striking contrast to the relations of symbiosis as exemplified in the lichen thallus.

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The change of or alternation between two different hosts is adapted to suit the requirements of the parasite, This is notably so in the case of the corn-mildew, which passes an intermediate stage on the barberry until a period when the wheat plant has sufficiently developed to become a suitable host.

Most fungi are endophytic, and certain phanerogamic parasites, such as Lafflesia, develop within the cortex of the host, while on the other hand the fungal part of a lichen encloses the algal.

The existence and complete dependence upon its host of a parasite culminating in the production of seed after its kind is one of the most impressive relationships physio- logy presents.?

SyMBIosIs.—This, the consortism of organisms in such fashion that mutual services are rendered sufficient to make the alliance profitable and successful to the whole community of organisms, is a mode of life closely related to parasitism, in which, however, as has been seen, the profit

/ is one-sided and the alliance ends with the exhaustion of

the host or the detachment of the parasite. The term was first employed by De Bary (Die Erscheinung der Symbrose, 1879), but the relations expressed by it were first brought into general notice by the epoch-marking discovery of the dual nature of the lichen thallus by Schwendener in 1868, and established after prolonged and searching controversy, more especially by the classical histological researches of Bornet, and the actual artificial lichen synthesis (by sowing fungus on alga) by Stahl. Some theory of reciprocal accommodation was necessary to

_ account for the duration of such relations between a fungal

organism and an algal ; and, though it is not yet precisely known in what way these relations are maintained, specu- lation has been active enough. It may safely be inferred that the fungal portion of the thallus is nourished by the exosmose of starch and the like in much the same fashion as the colourless cells of a plant are fed by those bearing chlorophyll; and there can be little doubt that the algal cells benefit in return by the endosmose of the waste pro- ducts of the fungal protoplasm. In the reproductive pro- cess an adaptation exists in certain lichens for the supply of gonidia to the new lichen. Hymenial-gonidia (the offspring of the thallus-gonidia) are present in the apothecia, from which they are cast out along with the spores, and falling with them are subsequently enclosed by the germ tubes (see Funeus, vol. ix. p. 835). It may be noted here that, though the fungal portions of the thallus retain the marks of near relationship to ascomy- cetous fungi, they are yet considerably modified by this mode of life, and unfitted most probably in nearly every case for the distinctly parasitic or saprophytic life

normal tofungi. The algal portion, on the other hand, is capable of independent existence after liberation from the fungal thallus. The complete symbiotic community represents an autonomous whole, living frequently in situations where neither alga nor fungus is known to support existence separately.”

The presence of chlorophyll in animals (Zydra and Vortex) was discovered by Max Schultze in 1851, and con- firmed more recently (Hydra and Spongilla) by the spectroscopic evidence furnished by Lankester and by Sorby. That a chlorophyll-bearing animal is able to

1 P. Grawitz, “Ueber Schimmelvegetationen im tierischen Organismus,” in Virchow’s Archiv, \xxxi., 1880; and ‘‘Experimentelles zur Infeetionsfrage,” in Berlin. klinische Wochenschrift, No. 14,1881; Brefeld, Botanische Untersuchungen tiber Schimmelpiize (1881), and Ueber Hefenpilze (1883), A very graphic account of the physiology of parasitism is to be found in Sachs, Vorleswungen tiber Phlanzen- Physiologie, 1882. See also Pfeiffer, Pflanzenphysiologie, 1881.

2 Schwendener, Untersuch. tiber den Flechten-Thallus, 1868; Stahl, Beitrage zur Entwickelungsgeschichte der Flechten, 1877 ; Bornet, ‘“‘ Recherches sur les gonidies des Lichens,” Ann. Sci. Nat., 5th ser., 1873; De Bary, Morphologie u. Physiologie der Pilze, Flechten, und Myxomyceten (1866), and Die Erscheinung der Symbtose (1879), whieh ineludes an account of the association of Azol/a with Anabena, aud of the relations of Nostoc to cyead roots.

vegetate by means of its own intrinsic chlorophyll was finally established in 1878 by the experiments of Geddes on Convaluta Schultzti, Schm, He found that the analysis of the gas given off by these green animals, under the influence of direct sunlight, “ yielded from 45 to 55 per cent. of oxygen.” The discovery of these vegetating animals directed fresh attention to chlorophyll-bearing animals, with much result. The nature and functions of the yellow cells of radiolarians had long been an unsolved enigma. Haeckel had detected in them in 1870 the pre- sence of starch, and regarded them as stores of reserve material. Cienkowski, in the following year,

contended for their algal nature without finally deciding the question, and without perceiving the significance such organisms would have in the economy of the radiolarian. Much suggestive observation followed by the Hertwigs, Brandt, Entz, Korotneff, Lankester, Moseley, and others on similar bodies in various organisms; but the subject remained in uncertainty till its reinvestigation by Brandt, and sim- ultaneously and much more conclusively by Geddes, finally supplied the solution of the difficulties. After confirming Haeckel's discovery of the presence of starch, and the observations of Cienkowski, Brandt, and others on the survival of the yellow cells after the death of the radiolarian, and extending his observation to various other organisms, Geddes demonstrated the truly algal nature of these cells from their cellulose walls, the identity of their yellow colouring-matter with that of diatoms, and the evolution of oxygen (in some instances, such as Anthea Cereas, very copiously) under the influence of sunlight. It was pointed out that the animal protoplasm investing these starch-producing cells (and containing amylolytic ferment) must obtain by osmosis its share of the dissolved starch, and that benefit must accrue to the animal from thedigestion of the dead bodies of the alge. The evolution of oxygen during sunshine into the surrounding animal protoplasm 'isarespiratory function fittingly compared to that per- formed by certain stationary deposits of hemoglobin. On the other hand the carbonic acid and nitrogenous waste produced by the animal cell is the nutritive return made to the alga, which in removing them performs an intracel- lular renal function. The young gonophores of Vededla, after budding off from the parent, start in life with a pro- vision of alge, and in this respect bear interesting resem- blance to the function performed by the hymenial-gonidia of lichens described above. The physiological relations are summed up as follows :—" Thus, then, for a vegetable cell no more ideal existence can be imagined than that within the body of an animal cell of sufficient active vitality to manure it with abundance of carbonic anhydride and nitrogenous waste, yet of sufficient transparency to allow the free entrance of the necessary light. And, con- versely, for an animal cell there can be no more ideal existence than to contain a sufficient number of vegetable cells, constantly removing its waste products, supplying it with oxygen and starch, and being digestible after death." The completeness of the case thus established for a symbiotic mode of life marks one of the most interesting and impressive chapters in the history of the biological relations between animals and plants.

A re-discussion of the subject, largely historical and controversial, but with excellent bibliography, has been lately furnished by Brandt, and more recently a further contribution has been made by Oscar Hertwig, who repeats the views of preceding investigators and goes on to Speculate as to the nature of symbiosis and its general relations with other modes of life. (G. MU.)

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1Schultze, Beitr. zur Naturges. d. Turbellarien, 1851; Lankester, ‘‘ Abstract of a Report on the Spectroscopie Examination of certain Animal Substances,” Jour. Y Anat., iv. 1870; 1d., “On Haliphysema,” Quart, Jour. Microscop. Sci., 1879, and “On the Chlorophyll Corpuscles and Amyloid Deposits of Spongtlla and

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PARASITISM IN MEDICINE,

Only a limited number of the parasitic diseases of man are included in the present article. Under Tapeworm will be found all that medically relates to that important parasitic group, and under Scuizomyceres will be dis- cussed the significance of the parasitic micro-organisms (Bacterium, Bacillus, Spirillum, Vibrio, &c.) in morbid pro- cesses, and particularly in the infective diseases. There fall to be considered here (1) the skin-diseases due to filamentous fungi, (2) a peculiar disease called “actino- mycosis,” primarily affecting cattle, (3) the itch, and (4) certain diseases caused by various species of nematodes, and one disease caused by a trematode.

1. Skin Diseases due to Parasitic Fungi.

Favus (“honeycomb”) is a common diseasc of the scalp (more rarely of the hairless parts of the skin) in children, primarily of scro- fulous or ill-cared-for children, but apt to spread to others, especially in schools. The uncomplicated appearance is that of a number of yellowish circular cup-shaped crusts, grouped in patches like a piece of honeycomb, each about the

size ofa split pea, with a hair pro- This was the first discase in which a fungus was discovered—by Schénlein in 1889 ; the discovery was published in a brief note of twenty lines in Afiller's Archiv for that year (p. 82), the fungus having been subsequently named by Remak Achorion Schinleinii after its discoverer. The achorion consists of slender mycelial threads matted together, bearing oval nucleated gonidia either free or jointcd. The spores would appear to enter through the unbroken cutaneous surface, and to germinate mostly in and around the hair-follicle and sometimes in the shaft of the hair. Favus is commonest among the poorer Jews of Russia, Poland, Hungary, Galicia, and the East, and among the same class of Mohammedans in Turkey, Asia Minor, Syria, Persia, Egypt, Algiers, &c. It is not rare in the southcrn departments of France, in some parts of Italy, and in Scotland.

The treatment of favus is difficult and disappointing. The first requisite is good feeding; meanwhile the crusts are to be removed by poulticing, the hair being cut short. The next thing is to destroy the fungus, to which cud a lotion of sulphurous acid (one part to three or four of water) may be applied repeatedly by means of lint, and the scalp kept covered by an oil-silk cap. To prevent the return of the fungus, various agents may be rubbed in, such as cod- liver oil, oil of cade, or an ointment of iodine or of pitch, the oil-silk cap being worn continuously. It has often been found of advantage to pull out all the broken stumps of hairs with a tweezers (sce Bennett's Prin. and Pract. of Med., 5th ed., Edin., 1868, p. 847).

Ringworm, or Tinea Tonsurans, a much more common diseasc of the scalp (especially within the tropics), consists of bald patches, usually round, and varying in diameter from half an inch up to several inches, the surface showing the broken stumps of hairs and a fine whitish powdering of desquamated epidcrmic scales. In scrofulous subjects niatter is sometimes produced, which forms crusts or glues the hairs together or othcrwise obscures the characteristic appearance. The disease is due to a fungus, Trt-chophyton tonsurans, which exists mostly in the form of innu- mrable spores (with hardly any mycelium), and is most abund- ant within the substance of the hairs, especially at their roots. If a picce of the hair near the root be soaked for a time in dilute liquor potasse and pressed flat under a cover-glass, the microscope will show it to be occupied by long rows of

minute oval spores, very uniform in size, and each bearinga nucleus. The treatment of ring- worm is very much the same as the treatment of favus.

The same fungus sometimes attacks the hairs of the beard, pro- ducing a disease called “sycosis.” Sometimes it invades the hairless regions of skin, forming “tinea circinata ;” circular patches of skin disease, if they be sharply defined by a margin of papules or vesicles, may be suspected of depending on the tinea-fungus. Interesting varieties of tinea are found in some of the Pacific and East Indian islands.

A less serious condition of the skin due to a fungus is Pétyriasis

NR Hydra,” Quart. Jour, Microscop. Sci., 1882; Sorby, On the Chromatological Relations of Spongilla fluviatilis,” Quart. Jour, Microscop. Sci., 1875; Geddes, “Observations on the Physiology and Histology of Convoluta Schulteti,” Proc. Roy. Soc. Lond., 1879, and ‘‘On the Nature and Functions of the Yellow Cells of Radiolarians and Coelenterates,” Proc. Roy. Soc. Edin., 1882; Haeckel, ‘ Amy- lum in d. gelben Zellen d. Radiolar.,” Jena Zeitsch., 1870; Cienkowski, ‘‘ Ueber Schwadrmeibildung bei Radiolar.,” Archiv. Mikr. Anat., 1871; R. Hertwig, “ 220″ Histologie der Radiolar.,” 1876 ; * Der Organismus der Radiolar.,” Jena Denkschr., 1879; O. and R. llertwig, “ Die Actinien,” Jena Zeitschs., 1876; O. Hertwig, Die Symbiose, 1883; Brandt, “Untersuchungen an Radiolarien,” Afonatsb. Akad. Berl., 1881; Id., “Ueber d. Zusammenleben von Thieren und Algen,” Verhandl. d. physiol. Ges. zu Berl., 1881; Id., ‘‘ Ueber d. Morph. u. Physiol. Bedeutung d. Chlorophylls bei Thieren,” Arch. f. Anat. u. Phystol., 1882, and Afittheit d. Zool. Stat. Neapel, 1883; Entz, ‘ Ueber d. Natur. d. Chlorophyll-Kérperchen niederer Ticre,” Biol. Centralblatt, 1882; Korotneff, “On Myriothela ” Soc. Nat. Hist. Mosk. 1881; Moseley, Notes of a Naturalist on the ‘* Challenger,” p. 293,

versicolor, consisting of patches of brownish discolorations of various sizes and shapes, mostly on the front of the body, and often attended with itching, especially after heating exercise. The pigmentation seems to radiate from the orifices of hair-follicles. The epidermis is in a scaly condition over the patch, and among the debris of the epidermic cell there may be seen minute

oval spores, which are sup- posed to belong to a fungus, the Microsporon Furfur. The disease is mostly one of adult age, found all over the world, and not associ- ated in any special way with poor general health. The treatment consists of rubbing in an ointment of sulphuret of potassium, or onc of the mercurial ointments, or using sulphur-soap habitually.

The remarkable brown, black, and blue spots of discoloration of the whole body met with endemically in Mexico, Panama, New Granada, and Venezuela, and known under the name of “ pinto ” or “mal de los pintos,” have been claimed by Gastambide (Presse Med. Belge, 1881, Nos. 33-41) as due to the presence of a fungus, whose spores and even mycelial filaments may be detected among the deeper rows of cells of the rete mucosum. The disease, which is some- what serious from its large superficial area, would appear to be one of the many forms of morbus misert# ; but it is contagious, and is sometimes seen in the well-to-do. In some villages of the western districts of Tabasco (Mexico), it has been estimated that 9 per cent. of the inhabitants suffer from the pinto; M‘Clellan says that in 1826 in the city of Mexico he saw a whole regiment of “ pintados.”

Before leaving the parasitic fungi of the skin, it should be mentioned that Otdiwm albicans is apt to plant itself on the mucous menibrane of the mouth in young and ailing children, causing whitish patches known as thrush.

2, Actinomycosis.

In certain tumour-like formations of cattle, usually growing from the alveoli of the lower molar teeth, and protruding externally near the angle of the jaw, Bollinger in 1877 detected the presence of a number of sulphur-yellow bodies about the size of a hemp seed and of a fatty consistence. These were found to be aggregates of a pecu- liar radiate fungus (Actinomyces), which assumed the form of minute rosettes, the mycelial filaments expanding into flask-like swellings at their free or circumferential ends. The yellow seed-like con- glomerates lay in spaces of the tumour, and they were also found within cavities on the tongue, fauces, larynx, mucous membrane of the stomach, in lymphatic glands, and (by a later observer) in the lungs. In 1879 Ponfick found the same sulphur-yellow bodies in the body ofa man who had

died of chronic disease of the chest, and who had a number of sinuses in the skin of the back. Some twenty cases of actinomycosis in man have now been described in Germany ; in most of them there have been centres of chronic inflammation in front of the vertebre in the cervical, dorsal, or lumbar regions, with numerous sinuses penetrating the muscles and opening on the skin. The yellow conglomerates of Actinomyces are found in or upon the granulations of these sinuses, or iu the sero-purulent discharge from them, or in the muscles, or more rarely in centres of granulation- like new growth in some of the viscera. The relation of the fungus to the primary tumour-like new growth of the ox has not yet been made out, and there is hardly any clue to the connexion between the bovine disease and the somewhat modified form of it in man. In some respects there is an analogy between actinomycosis and the fungus-foot of India as described by Vandyke Carter.

3, Scabies.

Of the human diseases due to animal parasites there is only one of any importance affecting the skin, namely, scabies or the itch. The parasite is the Sarcoptes scadiet (see Mire, vol. xvi. p. 529), which burrows under the epidermis at any part of the body, but hardly ever in the face or scalp of adults ; it usually begins at the clefts of the fingers, where its presence may be inferred from several scattered pimples, which will probably have been torn at their sum- mits by the scratehing of the patient, or have been otherwise con- verted into vesicles or pustules. The remedy is soap and water, and sulphur ointment.

4. Discases due to Nematode and Trematode Worms,

The common thread-worm (Oxyuris), a small white object about half an inch long, is very frequent in all countries, mostly in children ; its habitat is the lower bowel, but it is often a troublesome irritant outside the bowel as well. The round-worm (Ascaris lumbricoidcs), about 6 inches long when full-sized, and not unlike the common earth-worm, is less common in England and other Western countries ; but it is enormously common all over the East, and in the tropics generally. Hundreds of them may accumulate in the body, causing an obvious enlargement of the abdomen. The most valuable remedy against them is santonine powder, A third intestinal

nematode is the whip-worm (Trichocephalus dispar), about 2 inches long, having a slender anterior extremity joined on to the body like the thong to the handle of a whip. It is said to be very common in some countries, such as France, but it has no great importance as regards disease,

The nematodes of greatest pathological interest are Trichina

spiralis, causing the serious malady of trichinosis ; Anchylostoma

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duodenaic, often associated with the profound anemia of men work- ing in mines, making tunnels, and the like ; Anguillula stercoralis, associated with a specific kind of diarrhcea in Cochin China ; Filaria sanguinis homints, a blood-worm occurring mostly in China and other parts of the East, and often associated with the discase called lymph-scrotum, and with hemato-chyluria; and Filaria medinensis, the Guinea-worm, very common on the Guinea coast and in many other tropical regions, a long and slender filament like a hair from a horse’s tail, and mostly infesting the skin of the legs.

Trichinosis.—The presence of encysted trichine in the muscles was discovered in one or more of the London disseeting-rooms in 1828 and following years; but it was not until thirty years later that the clinical characters of the acute disease caused by the invasion of the parasite were discovered. This discovery was made in 1860 by Zenker, on examining the abdominal muscles of 4 patient who had died at Dresden, with symptoms taken to be those of typhoid fever, the case being afterwards accounted one of trichi- nosis on the post mortem evidence. Epidemics of this disease occur from time to time, especially in north Germany, from the eating of uncooked swine’s flesh, in which trichine are not uncommon. The greatest care isnow taken in Germany to examine the carcases of swine for trichine, a piece of the diaphragm of every animal being searched with the microscope by an inspector specially appointed, The symptoms in mau are occasioned by the presence of the free parasites in the intestine, by the development of young tri- chine from the eggs, and most of all by the

migration of the parasites fron the intestinal canal to the muscles, where they become quiescent within a calcareous shell. This cycle occupies from four to six weeks. When consumed in small quantity, the parasites may give rise to no marked symptoms, and they are sometimes found acci- dentally in muscular fibre in the bodies of those who had probably experienced no definite symptoms from their invasion. In the more acute and serious cases, sometimes ending fatally, the early symp- toms are nausea, failure of appetite, diarrhcea, and fever ; later, when the migration to the museles begins, there is more fever, stiffness, pain, and swelling in the limbs, swelling of the eyelids, continued exhausting diarrhcea, perspirations, and sometimes de- lirium. During convalescence there is desquamation of the cuticle. If the diagnosis be made early in the case, brisk purgatives, par- ticularly calomel, are the best treatment ; if the parasites are already on their way to the muscles, the only thing left to do is to support the patient's strength.

Anemia and Cachexia caused by Anchylostoma duodenale.—A disease which caused a great mortality among the negroes in the West Indies towards the end of last ceutury, and of which deserip- tions were afterwards sent from Brazil and various other tropical and subtropical regions, was identified, chiefly through the labours of Bilharz and Griesinger in Egypt (1854), as being due to the presence in the intestine of nematoid worms from one-third to half an inch long, and variously named

Chyluria and Lymph-Scrotum caused by Filaria sanguinis hominis. —A milky appearance of the urine, dne to the presence of a substance like chyle, which forms a clot, had been observed from time to time, especially in tropical and subtropical countries; and it has been proved by the late Dr Wucherer of Bahia, and by Dr Timothy Lewis, that this peculiar condition is uniformly associated with the presence in the blood of minute eel-like worms, visible only under the microscope, being the embryo forms of a Filaria. The parent worms are very difficult to find, and their characters and habits are imperfectly known; but they are supposcd to be about 3 inches long, and to inhabit dilatations of the lymph-carrying vessels. It is not yet clear how the chyle gets iuto the urine, but it seems probable that the blood in which filarie are present is altered in its constituents, although there is no obvious change in

its microscopic characters beyond-the presence of the young nema- todes. These are also present in the chylous urine. Sometimes the discharge of lymph takes place at one or more points of the surface of the body, and there is in other cases a condition of ne- void elephantiasis of the scrotum, or lymph-scrotum. More or less of blood may occur along with the clrylous fluid in the urine. Both the chyluria and the presence of filariz in the blood are curiously intermittent ; it may happen that not a single filaria is to be seen during the daytime, while they swarm in the blood at night, and it has been ingeniously shown by Dr 8S. Mackenzie that they may be made to disappear if the patient sits up all night, reappearing while he sleeps through the day.

Dr Manson of Amoy has proved that mosquitoes imbibe the embryo filariz from the blood of man; and that many of these reach full development within the mosquito, acquiring their freedom when the latter resorts to water, where it dies after depositing its eggs. Mosquitoes would thus be the intermediate host of the filariz, and their introduction into the human body would be through the medium of water.

Dracontiasis or Guinea-worm.—Filaria medinensis, or Dracun- culus, or Guinea-worm, is a very long filarious nematode like a horse hair, whose most frequent habitat is the skin of the legs and feet. It is common on the Guinea coast, and in many other tropical and subtropical regions, and has been familiarly known since ancient times. The condition of dracontiasis due to it is a very common one, and sometimes amounts to an epidemic. The black races are most liable, but Kuropeans of almost any social rank and of either

PARC. See Fates, vol. ix. p. 49.

PARCHMENT consists of skins of various animals, nnhaired, cleaned, and dried so as to form sheets of uniform thickness suitable for writing upon and for the numerous other purposes to which such preparations are devoted (see Patmocrapuy, p. 144). The skins employed for parchment are principally those of sheep, lambs, and calves; but goat and ass skins are similarly dressed for special purposes. The preliminary unhairing and

cleaning of the skins are effected as in the leather manufacture (see LEATHER, vol. xiv. p. 380). In their moist flexible condi- tion the unhaired skins are tightly and uniformly stretched over a wooden frame termed a herse, and on the flesh side they are carefully gone over with a semicircular fleshing kmife which removes all adherent flesh. The grain side is also gone over to clean the surface and squeeze out a proportion of the absorbed moisture. Ordinary binder's parchment and drum-head parchment need no further pre- paration, but are simply allowed to dry gradually on the frames on which the skins are stretched. But fine parchment for writing and vellum are powdered with chalk on the flesh side and carefully rubbed with fine pumice stone till a delicate uniform velvety surface is raised, All inequalities on the grain side are also re- moved by paring and rubbing with fine pumice. Stout vellum is made from calf skins, and ordinary qualities from split sheep skins ; for drum heads, tambourines, and like applications goat and calf skins are used, and it is said that wolf skins yield the best drum heads.

Vegetable Parchment, or parchment paper, is a modified form of paper produced by chemical treatment, having considerable similarity to ordinary animal parchment. It 18 prepared by acting on ordinary unsized paper with dilute sulphuric acid, and immediately washing away all trace of acid. Paper so treated will be found to have undergone a remarkable change : the porous intertexture of cellulose composing unsized paper will have expanded and agglutinated, forming a homogeneous surface, translucent, horny, and parchment-like ; it will have acquired about five times the strength of ordinary paper ; it will become Soft and flaccid when steeped in water, to which, however, lt is impervious ; and it is unaffected by boiling in water. The formation of vegetable parchment is due to a molecular change in cellulose when acted on by sulphuric acid, Owing to which the substance is transformed into a

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> not The worm lives in water, and, like the Filaria sanguinis hominis, appears to have an intermediate host for its larval stage. It is doubtful whether the worm pene- trates the skin of the legs directly; it is not impossible that the intermediate host (a cyclops) which contains the larve

may be swallowed with the water, and that the larve of the Dracunculus may be set free in the course of digestion.

Endemic Hematuria and Calculus due to Distoma hematobtum. —D. hematobium is a trematode or fluke-worm, which is exten- sively parasitic in man in northern and southern Africa—in the former along the Nile, and in the latter mostly on a narrow belt of the Natal coast. The parasites live mostly in the blood-vessels of the intestine and of the urinary bladder, whence they reach the mucous membranes ; and the most remarkable effects of their para- sitism are bleeding from the surface of the bladder and the forma- tion of uratic and phosphatic calculi around the clusters of eges deposited by the Distoma. The mode of access to their human habitat is still uncertain.

sex are not altogether exempt.

Literature.—The more special memoirs are Ponfick, Die Actinomykose des Menschen, eine neue Infecttonskrankheit (plates, Berlin, 1882); Leuckart, Unter- such. uber Trichina spiralis (plates, Leipsic, 2d ed., 1866); Virechow, Darstellung der Lehre von den Trichinen (plate, Berlin, 24 ed., 1864); Long. “ De ’anémie des, mineurs du Gothard, eausée par FAnkylostome duodénal,” in Trans. Internat. Med. Congr., 1881, i. p. 437, and papers quoted in Hirsch: T. R, Lewis, On a Hematozoon inhabiting Human Blood, its relation to Chyluria, &c., Calcutta, 1872; Manson, The Filaria Sanguinis Hominis, &e. (plates, London, 1884); S. Mackenzie, “‘ Case of filarial hamato-echyluria,” in Trans. Path. Soc. Lond., 1882, p. 394; see also Hirsch, Historisch-geographische Pathologie, vol. ii., Stuttgart, 1883 (English translation). (CEC)

starch-like body—amyloid—with simultaneous swelling of the fibres, which thereby soften and agglutinate. The preparation of vegetable parchment was patented in 1857 by Mr W. E. Gaine, and machinery has been adapted for the manufacture. The paper to be acted on passes in a continuous web through a vat containing commercial sulphuric acid diluted with half its volume of water. In this it is immersed from five to twenty seconds at a tem- perature of about 60° Fahr. It then passes in succession through pure water, next an ammoniacal solution to remove all acid, and finally again through water, after which it is dried and finished by passing

between felted rollers and over heated polished metal cylinders. A similar effect is produced on paper by treating it with a syrupy solution of zine chloride at from 120° to 212° Fahr. Vegetable parch- ment has not realized all the expectations of it. It is most largely used as covers for preserve jars, bottles, &c., and to some extent for tracings of plans, charts, &c. PARDON is the remission, by the power entrusted with the execution of the laws, of the penalty attached to a crime. The right of pardoning is coextensive with the right of punishing. Ina perfect legal system, says Beccaria, pardons should be excluded, for the clemency of the prince seems a tacit disapprobation of the laws (Dei Delitii e delle Pene, ch. xx.).1_ In practice the prerogative is extremely valuable, when used with discretion, as a means of adjust- ing the different degrees of moral guilt in crimes or of rectifying a miscarriage of justice. By the law of England pardon is the sole prerogative of the king, and it is declared by 27 Hen. VIII. c. 24 that no other person has power to pardon or remit any treasons or felonies what- soever. This position follows logically from the theory of English law that all offences are breaches of the king's peace. Indictments still conclude with a statement that the offence was committed "against the peace of our lady the queen, hercrown and dignity." The crown by pardon only remits the penalty for an attack upon itself. The prerogative is in modern times exercised by delegation, the crown acting upon the representation of the secretary of state for the home department in Great Britain, of the lord lieutenant in Ireland. The prerogative of the crown is subject to some restrictions. (1) The committing of a

1 See further, on the ethieal aspeet of pardon, Montesquieu, Esprit des Lois, bk. vi. ch. 21; Bentham, Principles of Penal Law, bk. vi. ch. 4.

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subject of the realm to a prison out of the realm is by the Habeas Corpus Act a premunire, unpardonable even by the king (31 Car. II. c. 2,§12). (2) The king cannot pardon an offence in a matter of private rather than of public wrong, so as to prejudice the person injured by the offence. Thus a common nuisance cannot be pardoned while it remains unredressed, or so as to prevent an abate- ment of it. A fine or penalty imposed for the offence may, however, be remitted. By 22 Vict. c. 32 Her Majesty is enabled to

remit wholly or in part any sum of money imposed upon conviction, and, if the offender has been imprisoned in default of payment, to extend to him the royal mercy. There are other statutes dealing with special offences, ¢.g., by 38 & 39 Vict. c. 80 Her Majesty may remit any penalty imposed under 21 Geo. IIL. c. 49 (an Act for preventing certain abuses and profanations on the Lord's Day called Sunday). (3) The king's pardon cannot be pleaded in bar of an impeachment. This principle,

first asserted by a resolution of the House of Commons in»

the earl of Danby's case, 5th May 1679, forms one of the provisions of the Act of Settlement, 12 & 13 Will. IIL. c. 2. It is there enacted " that no pardon under the great seal of England shall be pleadable to an impeachment by the Commons in parliament," §3. This provision does not ex- tend to abridging the prerogative after the impeachment has been heard and determined. Thusthree of the rebel lords were pardoned after impeachment and attainder in 1715. (4) In the case of treason, murder, or rape, a pardon is ineffectual unless the offence be particularly specified therein (13 Rich. II. c. 1,§2). Before the Bill of Rights, 1 Will. & M. c. 2, § 2, this statute seems to have been frequently evaded by a non obstante clause. But, since by the Bill of Rights no dispensation by non obstante is allowed, general words contrary to the statute of Richard II. would seem to be ineffectual.

Pardon may be actual or constructive. Actual pardon is by warrant under the great seal, or under the sign-manual counter- signed by a secretary of state (7 & 8 Geo. IV. c. 28, § 13). Con- structive pardon is obtained by endurance of the punishment. By 9 Geo. IV. c. 82, §3, the endurance of a punishment on conviction of a felony not capital has the same effect as a pardon under the great seal. This principle is reaffirmed in the Larceny Act, 1861 (24 & 25 Vict. c. 96, § 109), and in the Malicious Injuries to Property Act, 1861 (24 & 25 Vict. c. 97, § 67). Further, _pardon may be free or conditional. A conditional pardon most commonly occurs where an offender sentenced to death has his sentence commuted to penal servitude or any less punishment. The condition of his pardon is the endurance by him of the substi- tuted punishment. 'The effect of pardon, whether actual or con- structive, is to put the person pardoned in the position of an innocent man, so that he may

have an action against any one thenceforth calling him traitor or felon. He cannot refuse to give

evidence respecting the offence pardoned on the ground that his |

answer would tend to criminate him. A pardon may be pleaded on arraignment in bar of an indictment (though not of an impeach- ment), or after verdict in arrest of judgment. No doubt it would generally be advantageous to plead it as early as possible.

It is obvious that, though the crown is invested with the right to pardon, this does not prevent pardon being granted by the higher authority of an Act of Parliament. Acts of Indemnity have fre- quently been passed, the effect of which is the same as pardon or remission by the crown. Recent examples of Acts of Indemnity are two private Acts passed in 1880 torelieve Lords Byron and Plunket from the disabilities and penalties to which they were liable for sitting and voting in the House of Peers without taking the oath.

Civil rights are not divested by pardon. The person injured may have a right of action against the offender in spite of the pardon of the latter, if the right of action has once vested, for the crown cannot affect private rights. In Scotland this civil right is specially preserved by various statutes. Thus 1593, c. 174, provides that, if any respite or remission happen to be granted before the party grieved be first satisfied, the same is to be null and of none avail, The assythment, or indemnification due to the heirs of the person murdered from the murderer, is due if the murderer have received pardon, though not if he have suffered the penalty of the law. The pardon transmitted by the secretary of state is applied by the supreme court, who grant the necessary orders to the niagistrates in whose custody the convict is.

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In the United States the power of pardon vested in the president is without any limitation, except in the case of impeachments (U.S. Constitution, art. ii. §2). The power of pardon is also vested in the executive authority of the different States, with or without the concurrence of the legislative authority. Thus by the New York Code of Criminal Procedure, 1881, §§ 692, 693, the

governor of the State of New York has power to grant reprieves, commutations, and pardons, except in the case of treason, where he can only suspend the execution of the sentence until the case can be reported to the legislature, with whom the power of pardon in this case rests. The usual form of pardon in the United States is by deed under seal of the executive.

PARDUBITZ, a town of Bohemia, situated at the confluence of the Elbe and the Chrudimka, 55 miles to the east of Prague. The most interesting buildings are the old fortified chateau of the 16th century, with its Gothic chapel ; the church of St Bartholomew, dating in its present form from 1538; the quaint town-house; the

Griines Thor, a medieval gateway; and the handsome

new synagogue. The inhabitants, amounting to 10,292 in 1880, are engaged in the manufacture of sugar, agricultural implements, sweetmeats, spirits, beer, and iron. There is also a tolerably active trade in grain and timber, and the horse-fairs attract numerous customers. Pardubitz is a town of ancient origin, the history of which is little more than a record of a succession of feudal superiors. In 1560 it passed into the possession of the crown, which retained the town-lands down to 1863, when it sold them to the Austrian Credit Bank. Pardubitz suffered severely in the Hussite wars.

PARE, Amprorsz, the father of French surgery, was born at Laval, in the province of Maine, in 1509, and died in 1590. A collection of his works was published at Paris in 1561, and was afterwards frequently reprinted. Several editions have also appeared in German and Dutch. Among the English translations was that of Thomas Johnson, London, 1634. For Paré's professional career and services, see SURGERY.

PAREJA, JUAN DE (1606-1670), Spanish painter, was a mestizo, born in the West Indies about 1606, and in early life passed into the service of Velazquez, who employed him in colour-grinding and other menial work of the studio. By day he closely watched his master's methods, and by night stealthily practised with his brushes

| until he had attained considerable manipulative skill. The

story goes that, having succeeded in producing a picture satisfactory to himself, he contrived furtively to place it among those on which Velazquez had been working, immediately before an expected visit of King Philip IV. The performance was duly discovered and praised, and Pareja forthwith received his freedom, which, however, he continued to devote to his former employer's service. His extant works are not very numerous; the best known, the Calling of St Matthew, now, in the Royal Picture Gallery, Madrid, has considerable merit as regards technique, but does not reveal much originality, insight, or devotional feeling. He died in 1670.

PARENT AND CHILD. See Basrarp, Inrant, and MARRIAGE.

PARENZO, a city on the west coast of Istria (Austria- Hungary), 30 miles south of Trieste, with about 3000 in- habitants (2825 in 1879), has considerable historic and architectural interest. It is built on a peninsula nowhere more than 5 feet above the sea-level; and from the fact that the pavements of the Roman period are 3 feet below the present surface it is inferred that this part of the coast 1s slowlysubsiding. The well-preserved cathedral of St Maurus was erected by Euphrasius, first bishop of Parenzo, pro- bably between 535 and 543. The basilican type is very pure; there are three naves; the apse is hexagonal with- out and round within. The total length of the church proper is only 120 feet; but in front of the west entrance

is a square atrium with three arches on each side; to the west of the atrium is a now roofless baptistery, and to the west of that rises the campanile; so that the total length from campanile to apse is about 230 feet. Mosaics, now greatly spoiled, form the chief decoration of both outside and inside. The high altar is covered with a noble baldachin, dating from 1277. Small portions of two temples and an inscribed stone are the only remains of the ancient Roman city that readily catch the eye.

Parentium, conquered by the Romans in 178 B.c., was made a colony probably by Augustus after the battle of Actium, for its title in inscriptions is Colonia Julia and not, as it has often been given, Col. Ulpia. It grew to bea place of some note with about 6000 inhabitants within its walls and

10,000 in its suburbs. The bishopric, founded in 524, gradually acquired ecclesiastical authority over a large number of abbeys and othcr foundations in the surrounding country. The city, which had long been under the influence of Venice, formally recognized Venetian supremacy in 1267, and asa Venetian town it was in 1854 attacked and plundered by Paganino Doria of Genoa. In 1630 the plague (which had already visited Parenzo in 1360, 1456, &c.) reduced the population to barcly 100; but by 1800 the number had increased again to 2000. The bishoprics of Polaqnd Parenzo were united in 1827. The basilica is one of those churches in which the priest when cclebrating mass stands behind the altar with his face to the west.

See Vergottin, Breve saggio distoria della citta di Parenzo, Venice, 1796; Kandler, Cenni al forestiero che visita Parenzo, Trieste, 1845; Neale, Notes on

Dalmatia, Istria, &c., 1861, with ground plan of cathedral; and E. A. Freeman in Saturday Review, 1875, reprinted in his Subject and Neighbour Lands of Venice,

1881.

PARGA, a town on the Albanian coast, in the Turkish vilayet of Janina, beautifully situated in the midst of orchards devoted to the cultivation of the larger citron, with a rock-built citadel and a harbour formed by a mole constructed by the Venetians in 1572. Its population does not now exceed 1500, but its imports and exports (citrons, wool, oak bark, and skins) reach a value of £42,000 (1880), and the place is historically famous.

Originally occupying the site of the ancicnt Toryne (Palwo-Parga), ashort distance to the west, Parga was removed to its present position after the Turkish invasion. Undcr Venetian protection, freely accepted in 1401, the inhabitants maintained their municipal independence and commercial prosperity down to the destruction of the great republic in 1797, though on two occasions, in 1500 and 1560, their city was burned by the Turks. The attempts of Ali Pasha of Janina to make himself master of the place were thwarted partly by the presence of a French garrison in the citadel and partly by the heroic attitude of the Pargiotes themselves, who were anxious to have their city incorporated with the Ionian Republic. To secure their

purpose they in 1814 expelledthe French garrison and accepted British protection ; but the British Government in 1815, with a breach of faith which excited general reprobation, determined to go back to the convention of 1800 by which Parga was to be surrendered to Turkey, though no mosque was to be built or Mussulman to settle withinits territory. Rather than subject themselves to the tyranny of Ali Pasha, the Pargiotes decided to forsake their country ; and accordingly in 1819, having previously exhumed and burned the remains of their ancestors, they migrated to the Ionian Islands. The Turkish Government was constrained to pay them £142,425 by way of compensation.

See Edinburgh Review, 1819, and Finlay's iZist. of Greece (Tozer's edition) for authorities,

PARHELIA. See Hato, vol. xi. pp. 398, 399.

PARIAN CHRONICLE. This famous Chronicle is contained in the ARUNDELIAN MAarpies (q.v.) now at Oxford. It originally embraced an outline of Greek history from the reign of Cecrops, king of Athens (1582 B.C.), down to the archonship of Diognetus at Athens (264 B.c.), but the remaining portion extends no farther than 355 B.C. The Chronicle seems to have been set up by a private person, but, as the opening of the inscription has perished, we do not know the occasion or motives which prompted the step. The author of the Chronicle has given much attention to the festivals, and to poetry and music ; thus he has recorded the dates of the establishment of festivals, of the introduction of various kinds of poetry, the births and deaths of the poets, and their victories in contests of poetical skill. On the other hand, important political and military events are often entirely omitted ; thus the return of the Heraclidew, Lycurgus, the wars of

Messene, Draco, Solon, Clisthenes, Pericles, the Pelopon- nesian War, and the Thirty Tyrants are not even mentioned. The years are reckoned backward from the archonship of Diognetus, and the dates are further specified by the kings and archons of Athens. The reckoning by Olympiads is not employed. Amongst the legendary dates recorded in the Chronicle the following may be mentioned :—

Deucalion’s Deluge, 1265 years before the archon- ADD AOL DIO GUE US RE Cicceenaide dees csacscsacee sane 1529 B.c.

Origin of Amphictyonic league ….....0000000 1522

National name changed from Greeks (Graikoi) to

TOMEI SER (See Merten eae ee oo vac oes IAL Arrival of Cadmus; foundation of Cadmea…..... WSS) Arrival of Danaus and the Danaides in Greecc…. 1511 ,, TiivGribignOt Tae HUTS occc3hcy «xsi: + SR, aren S06.

Minos reigns in Crete; discovery of iron in Mount

UW ao ice tiene ech one etn eee te 1432 ,, Introduction of corn by Ceres and Triptolemus… 1409 ,, Orpheus publishes his poetry ….....0..s0s00seesess 13899 ,, First purification for manslaughter….....06.. 13826 ,, Theseus founds Athens by union of twelve cities ;

he establishes the democracy ….....2..s00008 159 are Bes miming on Treen Wat 2202. .c vese0sssseescavescrass WAY CARNE Nooo vin sce ve segs dbasex aaves deveeasaceae 1209 |, ie HOO OMGISIES: jo; -.s1kcaras ances co exescaebacememere oon ys HN OMBer” WOUMIENIOS: «2. sucas… 2c Sakescanee cpescsamteeeses 907

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From the attention bestowed on poets and tyrants in’ the Chronicle, Boeckh infers that its author drew mainly on the works of Phanias of Eresus, a disciple of Aristotle, who wrote on poets, the tyrants of Sicily, tyrannicide, &c. Further, from some resem- blances betwecn Eusebius and the Chronicle, Boeckh is led to conjecture that the Christian historian may have made use of the same sources as the author of the Chronicle.

The Parian Chronicle is given by Boeckh in the Corpus Inscriptionum Greca-

rum, vol. ii., and by Miller in the Fragmenta Historicorum Grecorum, vol. i.; it is edited separately by Flach, Ttibingen, 1883.

PARINI, Giusepre (1729-1799), Italian poet, was born in the district of Bosisio in the Milanese, on the 22d of May 1729. His parents, who possessed a small farm on the shore of Lake Pusiano, sent him to Milan, where he studied under the Barnabites in the Academy Arcimboldi, maintaining himself latterly by copying manu- scripts. In 1752 he published at Lugano, under the pseudonym of Ripano Eupilino, a small volume of sczolto verse which secured his election to the Accademia dei Transformati at Milan and to that of the Arcadi at Rome. Encouraged yet further by his success in two controversies with Alessandro Bandiera and Onofrio Branda, he pro- ceeded to utilize in the composition of the satire, J/ Mattino, the knowledge of aristocratic life which he had gained as tutor in the Borromei and Serbelloni families. The poem, which was published in 1763, and which marked a distinct advance in Italian blank verse, consisted of ironical instructions to a young nobleman as to the best method of spending his mornings. It at once established Parini's popularity and influence, and two years later a con- tinuation of the same theme was published under the title of Il Mezzogiorno, The Austrian plenipotentiary, Count Firmian, who had favoured the publication of the poems, interested himself in procuring the poet's advancement, appointing him, in the first place, editor of the Gazette, and in 1769, in despite of the Jesuits, to a specially created chair of belles lettres in the Palatine School. His subse- quent lectures as professor of rhetoric in the Gymnasium di Brera are still of value, and as occupant of the chair of fine arts he was frequently consulted by the artists of the day in matters of taste and design. On the French occupation of Milan he was appointed magistrate by Napoleon and Saliceti, but almost immediately retired to resume his literary work and to complete /7 Vespro and La Notte, the two last divisions of the Gorno. He died on the 15th of August 1799. An indisputable force in the history of Italian literature, he owed his influence rather to a carefully cultivated taste than to any strongly marked originality of genius. His works were published in 6 vols. 8vo, Milan, 1801-4.

Plate V.

Climate.

Bound- aries.

PARIS

ARIS, the capital of France, the seat of the legislature and of the administrative departments, is situated on both banks of the Seine, in 48° 50’ 14” N. lat. and 2° 20’ 14” E. long. (Observatory). It occupies the centre of the so-called Paris basin, which is traversed by the Seine from south-east to north-west, open towards the west, and surrounded by a line of Jurassic heights. The granitic substratum is covered by Jurassic, Cretaceous, and Tertiary formations; and at several points building materials—freestone, limestone, or gypsum—have been laid bare by erosion. It is partly, indeed, to the existence of such quarries in its neighbourhood, or on the very ground on which it stands, that the city owes its vast development.! The mean elevation of the Seine valley at Paris is from 100 to 130 feet. On the north bank rise the heights of Charonne, of the Buttes-Chaumont (404 feet), of La Villette, and of Montmartre (345 feet); on the left or south bank the Butte-aux-Cailles, and beyond the valley of the Bievre the hill of Ste Genevieve and Montrouge. Between those lines of heights, the Seine flows from east to west, encircling the island of St Louis, the fle de la Cité, and lower down the fle aux Cygnes. The Biévre or Gobelins stream flows for some distance in an open channel on the left side of the river, and then disappears in a sewer. On the right side the brook which used to run from Ménilmontant to Chaillot past the site now occupied by the opera, has at length been dammed by masonry, driven into the sewers, or lost underground. Clumate.—Paris enjoys a fairly uniform climate, subject, however, to frequent changes at all seasons of the year. The mean temperature, calculated by M. Flammarion from observations extending over seventy-two years (1804-76), is 51°-4 Fahr. The highest reading observed (in July 1874, and again in July 1881) is 101° Fahr., the lowest (in December 1879) is ~14°. The monthly means for the sixty-four years 1806-1870 are—January 36°°3, February 40°11, March 43°°5, April 50°-2, May 57°6, June 63°-0, July 66°°0, August 65°°3, September 60°38, October 52° °3, November 43°°7, December 38°:7. The river freezes when the temperature falls below 18°, It was frozen in nearly its whole extent from

Bercy to Auteuil in the winters of 1819-20, 1829-30, 1879-80; and partially in the winters of 1840-41, 1853-54, 1857-58, and 1870-71. Rain falls, on an average, on 143 days, of which 38 are in winter, 35 in spring, 34 in summer, and 36 in autumn,—the average quantity in a year being 19°68 inches. The driest month is February, the rainiest July,—the rainfall for these months being respectively 0°87 inch and 2°15 inches. There are 12 days on which snow falls, 184 on which the sky is covered, 40 with fogs, and 9 with hail. The following figures show the directions of the winds:—N. 38 days, N.E. 41, E. 24, S.E. 26, 8. 53, S.W. 70, W. 67, and N.W. 36, with 10 calm days. Thunderstorms average 13 per annum,—ranging from 6 (in 1823) to 25 (1811). There is comparatively little variation in the barometer. Its mean height is 29-763 inches at a height of 216 feet above sea-level. On the whole the climate is healthy and agreeable, its variations, though frequent, being comparatively slight. Boundaries,—Since January 1, 1860, the boundaries of Paris have extended to the fortifications built in accordance

1The quarries of Montrouge, the Montmartre and the Buttes- Chaumont plaster-kilns, and the brick-works of Vaugirard or of Passy are gradually being built over. At Passy there is a cold chalybeate

spring, and sulphurous waters are found at Belleville and at Les Batignolles,

with the scheme of 1840. The total area thus included is 30 square miles, of which 6 square miles are occupied by the public streets, 458 acres by squares and gardens, 6425 acres by the river and canals, and 224 acres by cemeteries. The line of fortifications measures 221 miles. On the right side of the river it presents 68 fronts, and on the left 26, each consisting of a curtain connecting two demi-bastions. It is pierced by 56 gates, 9 openings for railways, and 2 openings for the Ourcq and the St Denis canals. Outside of this enceinte are a number of detached forts arranged in two main lines. First come the* forts erected previous to 1870 at St Denis, Aubervilliers, Romainville, Noisy, Rosny, Nogent, Vincennes, Ivry, Bicétre, Montrouge, Vanves, Issy, and Mont Valérien; and next the new forts of Palaiseau, Villeras, Buc, and St Cyr, which protect Versailles, and Marly, St Jamme, and Aigremont, which surround St Germain. On the right side of the Seine are Forts Cormeilles, Domont, Montlignon, Montmorency, Ecouen, Stains, Vaujours, Villiers, and Villeneuve St Georges. Between the two lines the

Chatillon fort occupies the site of the German batteries which bombarded Paris in 1871.

Boulevards, Streets, and Squares—The line of the Street

Boulevards from the Madeleine to the Bastille, nearly 3 miles, is one of the busiest and most fashionable in the world ; here are the Porte St Denis, the Porte St Martin, most of the large cafés, the Opera-House, and the various theatres distinguished as Le Vaudeville, Les Nouveautés, L'Opéra Comique, Les Variétés, Le Gymnase, La Porte St Martin, La Renaissance, L'Ambigu, Les Folies Drama- tiques, Dejazet, Beaumarchais, and Le Cirque. Traffic passes east and west from the Bastille to the Place de la Concorde by Rue St Antoine and Rue de Rivoli. North and south the line of the Boulevard de Strasbourg and the Boulevard de Sébastopol stretches from the station of the Eastern Railway (Gare de l'Est) to the Seine, and is continued by the Boulevard du Palais in the Cité and the Boulevard St Michel, on the left side of the river, as far as the observatory. The total length is not less than 24 miles. On the right side of the river may also be mentioned the Rue Royale; the Malesherbes and Haussmann boulevards, which cross the most elegant quarters of the town ; the Avenue de |'Opéra, which unites the Place du Palais Royal with the Place de Opéra, and terminates at the main entrance of the Opera; the Rue de la Paix, Rue Auber, and Rue 4 Septembre, which also terminate in the Place de l'Opéra, and are remarkable for their magnificent shops ; Rue Lafayette, one of the longest thoroughfares of Paris, traversing the town from the Opera to the end of La Villette; the Boulevard Magenta, from Montmartre to the Place de la République; Rue de Turbigo, from this place to the Halles Centrales. The older streets known as Richelieu, Vivienne, De la Chaussée d'Antin, St Honoré, Montmartre, St Denis, St Martin, are full of shops and offices. The Place de l'Are de Triomphe de Etoile is the centre of twelve avenues stretching out from it like the spokes of a wheel, but not all as yet lined with buildings. On the left side of the river the main thoroughfare is the Boulevard St Germain, from Pont Sully to the Pont de la Concorde, which passes in front of the school of medicine, the Place St Germain des Prés, and the war office. The Rue de Rennes, which extends from St Germain des Prés to the Mont Parnasse Railway station, is to be prolonged as far as the Seine.

The finest of the public squares in Paris are Place de la Squar

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Concorde; Place de Etoile; Place Vendéme, with the column and statue of Napoleon I.; Place du Carrousel, with a small triumphal arch commemorative of the cam- paign of 1806, which formed the entrance to the palace of the Tuileries, now demolished; Place des Victoires, with the equestrian statue of Louis XIV.; Place des Vosges, formerly Place Royale, with that of Louis XIII. ; Place de la Bastille, with the column commemorative of the Revolu- tion of July 1830; Place de la République, with the Republic statue; Place de lHotel de Ville; Place du Chatelet, with a column commemorative of the Italian campaign of 1796; those which take their names from the Bourse, the Palais Royal, and the Opera; Place de Rivoli, with the equestrian statue of Joan of Arc; Place Moncey, adorned with a monument in memory of the defence of Paris in 1814, as Place Denfert, at the opposite extremity of the town, is adorned with a colossal lion symbolizing the defence of 1871. South of the Seine are the Place St Michel, adorned with a monumental fountain, and one of the great centres of traffic in Paris; Place du Panthéon; Place St Sulpice ; Place Vauban, behind the dome of the Invalides, and Place du Palais Bourbon, in front of the chamber of deputies. Besides those already mentioned there are monumental fountains in the Places de la Con- corde, de la République, and du Chatelet, the Avenue de YOpéra, and the Place Louvois opposite the national library ; and attention must also be called to the Fountain of the Innocents near the markets, which was originally adorned with sculptures by Jean Goujon; the Moliere Fountain, in the Rue Richelieu; the Gaillon Fountain; and on the left side of the river the Fountain of Rue de Grenelle.

The Seine.—The Seine flows for 7 miles (taking five hours) through Paris. As it enters and as it leaves the city it is crossed by a viaduct used by the circular railway and for ordinary traffic; that of Point du Jour has two stories of arches. Two bridges, the Pont des Arts and the Passerelle de Passy, are for foot passengers only; all the others are for carriages as well, The most famous is the Pont Neuf, the two portions of which rest on the extremity of the island called La Cité where the river is at its widest (961 feet). On the embankment below Pont Neuf stands the statue of Henry IV.,

the people’s king. Between La Cité and the left bank the width of the lesser channel is reduced to 161 feet. The whole river has a width of 532 feet as it enters Paris and of 440 as it leaves it. As it descends it passes under the bridges of Tolbiac, Bercy, and Austerlitz (built of stone), that of Sully (of iron), those of Marie and Louis Philippe between fle St Louis and the right bank; that of Les Tournelles between fle St Louis and the left bank; that of St Louis between fle St Louis and La Cité; and Pont d’Arcole, a very elegant structure connecting La Cité with Place de l’Hétel de Ville. La Cité besides communicates with the right bank by the bridges of Notre Dame and Au Change; with the left bank by that of the Archevéché, the so-called Pont au Double, the Petit Pont, and Pont St Michel. Below Pont Neuf come the Pont des Arts, Pont du Carrousel (of iron), Pont Royal (a fine stone structure leading to the Tuileries), and those named after Solferino, La Concorde, the In- valides, Alma, Jena, (opposite the Champ de Mars), Passy, and Grenelle.

The houses of Paris nowhere abut directly on the river banks, which in their whole extent from the bridge of Austerlitz to Passy are protected by broad embankments or “quays.” At the foot of these lie several ports for the discharge of goods :—on the right side Bercy for wines, La Rapée for timber, the Port de l’Arsenal at the mouth of the St Martin Canal,! the Port de ’Hétel de Ville for

? This canal, leaving the Seine below Austerlitz Bridge, passes by a tunnel under Place de la Bastille and Boulevard Richard Lenoix, and

fruits, and the Port St Nicholas or du Louvre (steamboats for London); on the left bank Port de la Gare for timber St Bernard for wines, and those named after La Tournelle, the Saints Péres, the Invalides, and Grenelle.

Promenades and Parks.—In the heart of Paris are situated the gardens of the Tuileries (74 acres), laid out in parterres and bosquets, planted with chestnut trees, lindens, and plane trees, and adorned with playing fountains and basins, and numerous statues mostly from the antique. From the terrace along the river side a fine view is to be had over the Seine to the park and palace of the Trocadéro ; and from the terraces along the Place de la

Concorde the eye takes in the Place and the Avenue of the Champs Elysées. The gardens of the Luxembourg, in front of the palace occupied by the senate, are rather larger than those of the Tuileries ; with less regularity of form they present greater variety of appearance. In the line of the main entrance extends the beautiful Observatory Walk, terminat- ing ina monumental fountain, which is in great part the work of Carpeaux. The Luxembourg conservatories are rich in rare plants; and classes are held in the gardens for the study of gardening, fruit-tree pruning, and bee-keeping. The Jardin des Plantes will be mentioned below in the list of scientific establishments. Besides these three great gardens laid out in the French taste, with straight walks and regular beds, there are several in what the French designate the English style. The finest and most exten- sive of these, the Buttes-Chaumont Gardens, in the north- east of the city, occupy 62 acres of very irregular ground, which up to 1866 was occupied by plaster-quarries, lime- kilns, and brick-works. The “ buttes” or knolls are now covered with turf, flowers, and shrubbery. Advantage has been taken of the varying relief of the site to form a fine lake and a cascade with picturesque rocks. The Montsouris Park, in the south of the city, 40 acres in extent, also con- sists of broken ground ; in the middle stands the meteoro- logical observatory, built after the model of the Tunisian palace of Bardo, and it also contains a monument in memory of the heroic and unfortunate Flatters expedition. Monceau Park, surrounded by the most aristocratic quarters of modern Paris, is a portion of the old park belonging to King Louis Philippe, and is now the property of the town. The gardens of the Palais Royal are surrounded by arcades and fineshops. There is hardly, it may be further remarked, a district in Paris which has not of recent years its well- planted square kept up at municipal expense on some plot of ground cleared during the improvements, Such are those named after Tour St Jacques (one of the most graceful monuments of old Paris), the Conservatoire des Arts et Métiers, the Temple, Montholon, Cluny, &e. There have recently been added the park of the Champs de Mars, and that of the Trocadéro with its fountains and aquarium.

But the real parks and Bois de Vincennes, which belong to the city, though situated outside of the fortifications. The former is reached by the wide avenue of the Champs Klysées as far as the Arc de Triomphe, and thence by the avenue of the Bois de Boulogne or that of the Grande Armée. The first

of these, with its side walks for foot passengers and equestrians, grass-plots, flower-beds, and elegant buildings with gardens and railings in front, affords a wide and magnificent prospect over the Bois and the hills of St Cloud and Mont Valérien. The Bois de Boulogne covers an area of 2158 acres, one- fourth of which is occupied by turf, one-eighth by roads, and the rest by clumps of trees, sheets of water, or running streams. Here are the two race-courses of Longchamps (flat races) and, Auteuil (steeple-chases), and the gardens ASRS SO so ch a cee

rises by sluices to the La Villette basin, from which the St Denis Canal descends to the Seine at St Denis. In this way boats going up or down the river can avoid passing through Paris.

of Paris are the Bois de Boulogne Bois de

Bois de Vin- cennes.

Public build- ings.

of the Acclimatization Society, which, with their mena- geries, conservatories, and aquarium, are largely visited by pleasure-seekers. The Bois de Vincennes, a little larger than the Bois de Boulogne, is similarly adorned with streams, lakes, cascades; and from the Gravelle plateau there is a splendid view over the valleys of the Marne and the Seine. Unfortunately the wood is cut in two by an open space comprising a drill-ground for artillery and infantry, a race-course, and a farm (La Faisanderie) for agricultural experiments. Trees for the public parks and squares are grown in the great municipal nurseries at Auteuil and Bois de Boulogne; and the municipal botanical gardens of La Muette, with thirty-five conser- vatories covering 14 acres, and an equal area under frames, contain magnificent collections of azaleas, palm-trees, and other exotics for ornamenting the public gardens or decorating official apartments on féte days.

Public Buildings, Palaces, &c.—The following are among the public buildings of Paris which have most architectural interest. The palace of the

Louvre (see pp. 281, 288), which lies on the right side of the Seine in the heart of the city, consists of a quadrangle with an inner court 394 feet square, two galleries extending westwards from two sides of the quadrangle, and two galleries external and parallel to these, and continued till they meet the side wings of the Tuileries. The east front of the Louvre is 548 feet long and 90 feet high, and the first story is occupied by Perrault's famous colonnade. Towards the west are those portions of the Tuileries which escaped the fire of 1871, —the connecting galleries and (on the south) the Flora pavilion and (on the north) the Marsan pavilion, which was entirely rebuilt between 1872 and 1877. From Perrault's colonnade to the Flora pavilion the side facing the quay is 2250 feet long. In the matter of sculpture the south and west sides of the inner court are considered the best parts of the Louvre. On the west side lies the oldest part of the palace, and the principal points in the former arrangement of the building are indicated by the paving of the court. In the middle of each facade there is a pavilion rising above an archway. The western archway, which is surmounted by the clock, leads into Place Napoléon III., which has its centre occupied by a square, and its north and south sides bordered with porticos surmounted by statues of eminent Frenchmen. 'To the west is the Place du Carrousel. On the south side at the junction of the Lcuvre and the Tuileries is a gateway with three arches, of which the middle one is crowned with the bronze group by Mercier, " The Genius of the Arts," erected in 1875. The river-front of the Louvre is in an older and more elegant style than the side facing Rue de Rivoli. It is connected with the buildings of the quadrangle by Henry IV.'s pavilion, which contains in its first story the elegant Apollo gallery.

The Palais de Justice in La Cité presents on the W. side, towards Place Dauphine, a Greek facade by Duc (1865-1870), one of the finest productions of modern art. From the Boulevard du Palais on the east it is separated by a magnificent 18th-century railing in wrought iron and gilt. On this side lie the Salle des Pas Perdus and the Sainte- Chapelle. The fine square tower known as the Clock Tower stands at the corner formed by the Quai du Nord and the Boulevard du Palais; and on the north side lies the Con- ciergerie prison with the dungeon once occupied by Marie Antoinette. Opposite the Palais de Justice on the other side of the Boulevard is the Tribunal de Commerce with a remarkable staircase under the cupola.

On the left bank of the Seine are the Luxembourg palace, the seat of the senate and formerly the residence of Mary de' Medici; the Bourbon palace, the seat of the chamber of deputies, fronting the river and Pont de la Con- corde with a fine columned portico and pediment ; the

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palace of the Legion of Honour, an exquisite building of Louis XIV.'s time ; and the palace of the Institute, with a handsome dome. On the right side of the river lie the Elysée palace (in the Champs-Elysées), a vast building in a modern style, the residence of the president of the re- public, and the palace of the Trocadéro, built for the Exhi. bition of 1878, the central rotunda of which contains the largest music-hall in Paris (for 15,000 auditors) and a colossal organ.

Among the Government and administrative buildings may be mentioned the Hétel de Ville, burnt in 1871, but rebuilt finer than before on the old site; the ministry of foreign affairs, where the congress of Paris was held in 1856; the ministry of marine, which occupies on Place de la Con- corde one of the two pavilions erected by Gabriel on each side of Rue Royale; the ministry of war in the Boulevard St Germain ; the Bank, formerly the De la Vrilliére "hétel," built by Mansard ; the Mint, with a fine facade stretching 394 feet along Quai Conti not far from Pont Neuf; the national printing establishment, formerly Cardinal Rohan's mansion; and the national record office, close at hand, formerly the Soubise mansion. These last two buildings are in the Quartier du Marais, where a great many ancient

mansions are now used as warehouses and workshops.

Besides the Hétel Carnavalet and the Hétel de Cluny may be mentioned the tower of Rue aux Ours, the last remnant of the Hotel de Bourgogne; the Hétel de Sens, formerly the residence of the archbishop of the province; the Hétel Lambert at the head of fle St Louis, adorned with paintings by Lesueur; the turret of the Hotel Barbette (Rue vieille du Temple).

The largest and finest of the religious buildings of Paris Churche |

is the cathedral of Notre Dame (426 feet long by 164 wide), restored between 1846 and 1879 by Viollet-le-Duc. As it now exists this church has five naves running the whole length of the building, and square chapels; the central fléche, recently restored, is 312 feet high, and two massive square towers worthily crown the principal facade, which is one of the most beautiful that has come down to us from the Middle Ages. The transept has also two facades, which, while less imposing, are more richly decorated with chiselled work, dating from about the middle of the 13th century. Of the elaborate decoration of the interior all that is old is a part of the screen of the choir, from the 14th century. St Geneviéve or the Panthéon, consecrated by the Con- vention to illustrious men, but since restored to Christian worship, has the form of a Greek cross with a doine in the centre and a columned portico in front, the pediment of which contains an immense bas-relief by David of Angers representing great men crowned by their country. Fénelon, Rousseau, Voltaire, Mirabeau, Laplace, Cuvier, &c., may be distinguished. The crypt contains the tombs of Soufflot (the architect of the church), Rousseau, Voltaire, &c. Near St Geneviéve stand St Etienne du Mont with a, magnificent roodloft, and the chapel of St Geneviéve with the tomb of this patroness of Paris. The Madeleine, intended by Napoleon I. for a temple of victory, has consequently the form of a Greek temple. At St Germain des Prés, St Severin, and St Vincent de Paul are beautiful frescos by Hippolyte Flandrin, to whom a monument has been erected in St Germain. St Eustache contains Colbert's tomb; St Germain lAuxerrois has a curious porch ; and St Sulpice, which is nearly as large as Notre Dame, presents in its main front the most vigorous effort yet made to apply classical architecture in the building of Christian churches. Notre Dame des Victoires is a great resort of pilgrims. The church of the Vow of the Sacred Heart, at present m course of erection on Montmartre, will when finished be one of the most remarkable buildings in Paris from its com- manding site, the extent of its crypt, and the vast propor-

tions of its dome and tower, respectively 197 and 262 feet in height.

es. Theatres.—Of the many buildings in Paris devoted to theatrical entertainments there is only one, at once the largest and the most beautiful, which is of real archi- tectural importance—the Grand Opéra, or national academy of music and dancing. The opera house, which covers 23 acres, is

the finest theatre in the world. The process of erection, directed by Charles Garnier, lasted from 1861 to 1875, required 673,295 days' work, and cost £1,440,000. The front is decorated on the ground story by allegorical groups (music by Guillaume; lyrical poetry by Jouttroy ; lyrical drama by Perraud ; and dancing by Carpeaux) and allegorical statues. In the first story a row of coupled Corinthian columns (each consisting of a single block) forms an open gallery, above which are seven busts of famous musicians, Mozart, Beethoven, &c. Above the architrave of the front appears the dome which covers the auditorium, and behind that rises the vast pediment above the stage decorated at the corners with enormous groups. On the summit of the pediment an Apollo, raising aloft his lyre, is seen against the sky and forms the culminating point of the whole edifice. The sides are not so richly decorated as the front, but each has in the centre an elegant cylindrical pavilion with a carriage entrance. Behind are the build- ings occupied by the managers and staff. The interior is decorated throughout in the most gorgeous manner with massive gilding, flamboyant scroll-work, statues, paintings,

&e. The grand vestibule with statues of Lully, Rameau,

Gluck, and Handel, the grand staircase (an indubitable

masterpiece), the avant-foyer or corridor leading to the foyer,

and the foyer or crush-room itself are especially worthy of

mention. This last, which is 197 feet long, 43 broad, and 59 high, has its ceiling brilliantly painted by Baudry, whose _ work, however, can hardly be appreciated properly from the excess of light. The auditorium is seated for 2156; its ceiling is painted by Lenepveu. Behind the stage is the foyer de la danse or green-room for the ballet, adorned with large allegorical panels and portraits of the most eminent danseuses.

The comic opera has a theatre to itself, L'Opéra Co- mique; and operettas are played at La Renaissance, Les Bouffes, Les Folies Dramatiques, and Dejazet. The Théatre Francais and the Odéon represent the works of the classical dramatists, as well as modern pieces tragic or comic. Comedy and vaudevilles are played at the Gymnase and the Vaudeville; and the Palais

Royal, the Varietés, and the Nouveautés devote themselves especi- ally to farce. Pieces of the popular class, fairy scenes and spectacular displays, are the main attraction of the Chatelet, the Gaiété, the Porte St Martin, and the Ambigu. The Chateau d'Eau now gives popular operatic performances. Equestrian entertainments are supplied by the hippodrome and three circuses. The café concerts— which during the summer season abound in the Champs

lysées—remove in winter to the Boulevard de Strasbourg and the Montmartre and Poissonniére faubourgs, where there are also some permanent establishments of the kind. Several companies give concerts of classical music on stated days in the winter season; the finest are those of the | Conservatoire and the Chateau d'Eau, Chatelet, and Cirque r theatres,

a Arrondissements.—The city is divided into twenty arrondisse- = ments. Only the first twelve belonged to Paris previous to 1860 ;

8. the others correspond to the old suburban communes then annexed. The first four arrondissements occupy the space on the right of the river, extending from the Place de la Concorde to the Bastille, and from the Seine to the line of the Grands Boulevards; the 5th, 6th, and 7th arrondissements lie opposite them on the left side; the 8th, 9th 10th, 11th, and 12th surround the first four arrondisse-

ments on the north; the 13th, 14th, and 15th are formed out of the old suburban communes of the left side ; and the 16th, 17th, 18th,

Yo bal 5

207

Zee and 20th out of the old surburban communes of the right side. Population and Vital Statistics.—The growth of the population Popula-

o the last six hundred years is shown in the following table tion.

Population.

Population.

935,261 1,058,897 1, 053,2621 1,174,346 1,696,7412 1,825,274 1,851,792 1,988, 806 2,269, 028

215,861 260,000 509,000 576,000

660,000 547,756) 718,966 785, 862 868, 438

The figures for December 1881, like the rest of those in the table, represent the number of people legally domiciled at Paris at the date given, but the nuinber actually present in the city at last census was only 2,239,928 (1,113,326 males and 1,126, 602 females).

The following table (II.) shows the distribution of the population in the several arrondissements :-—

| No. of Births | Deaths | Inhabit- (1881). | (1881). | ants per

Number and Name of

‘Arrondissement, Inhabitants. | Houses,

WOW TCtesecesesssessses 75,390

76,394 94,254

103,760 114,444 97,735 83,327 89,004 122,896 159,809

209,246 102,435 91,315 91,713 100,679 60,702 143,187 178,836

2,164 2,278 2,380 2,404 3,208 2,746 9,441 3,393 3,480 3,773 5,539 4,181 3,933 4,372 5,229 4,406 5,366 6,166 4,033 5,522

OOF SOREN: RS

. Batignolies.

. Montmartre

. Buttes-Chaumont.. . Ménilmontant,

117,885 126,917

77,014 | 59,874 | 57,066 117

19,177 | 2,239,928

The number of births and of deaths in Paris during the five years 1876-80-—278,785 births and 252,500 deaths—apparently shows nothing exceptional as compared with the rest of France. It is to be observed, however, that the population is composed to a larger extent than usual of adults, young children being sent to the country, and old men withdrawing. The number of marriages, 20,993 for 1881, with an average of 18,427 for the five previous years, is rather small for the proportion of marriageable persons. Of the 1,113,326 males in 1881, 621,569 were unmarried, 440,022 married, and 51,735 widowers; of the 1,126,602 females, 557,054 were unmarried, 446,297 married, and 123,251 widows. The sub- joined table (III.) shows the proportion of individuals of the various ages specified, in each 10,000 of the inhabitants, according to the census of 1881. It will be seen that the proportion was greater in Paris from 20 to 55, and smaller below and above those

ages.

Number of Persons

Number of Persons

Age.

In Paris. | In France. In Paris. | In France. alll 976 50 to 55 554 546 642 867 Hon el) 391 483

671 869 60 ,, 65 297 415 849 858 65 ,, 70 186 317

1,118 874 70 ,, 75 119 222

1,010 709 75 ,, 80 67 140

966 707 80,, 85 D9; 62

901 682 85,, 90 9 18 800 641 90 ,, 95) 7 675 604 95 ,,100 0 3

The following table shows the occupations of the population in fey) ;

eee 1 The decrease between 1784 and 1800 was due to the Reign of Terror, and that between 1846 and 1851 to the Revolution of 1848.

2 The inerease in 1861 is largely due to the incorporation of the suburban distriets.

Employers. Agents or Clerks.

Females,

Males. | Females.| Males.

Agriculture. Landowners farming thcir lands.. 598 96 60 16 Farmers, cultivators, “métayers” 220 28 24 10 Small proprietors working for 142 49 12 9 OUNOTS car sons ne pe Seis e PGROS LOTS ws cctedsi. rune eee TSB. 376 210 97 23 Industry.

Engaged in mines, quarries, and b metal-working establishments Lae BAL | (eee ig Engaged in other manufactur-

ing establishments …..... ate per | S28 | eon In petty industries …....65. 40,148 | 20,521 | 29,700 | 19,919

Trade.

Bankers, agents, wholesale 14.128) 1.539 | 43.099! 7.288

GRAUET Ss cotecamanae ane ldcter 4 é ? : Retail traders, shopkeepers…..... 40,525 | 15,349 | 47,972 | 25,306 Keepersof hotels,taverns,coffee- a

houses, and lodging-houses. BTS | ohh ELS || apeee

Transport and Shipping.

Engaged on railways or asearriers| 1,401 74 | 10,737 514 Conneeted with mereantile 261 6 118 8

marine, pilotage, fisheries, &e.

Army, Navy, and Police. BEG ss sil os wstee visoikels ven av’e ste Lo 10,988 182 10 ONES AVE ete eter seve oar ea Oe 198 8 3 Gendarmerie and poliec……..... 8,105 995 14 Liberal Professions.

PFN BOT IBO: 6 ccs baeanescyuces over een 6,945 55381 16,509| 1,947 ey Feeney cael esc tnae 1,308 ae 166 Hie Religious eommunities……. ..... 1,107 | 3,432 278 309 Justice, administration of…..... 38, 638 0s 2,114 23 UORIIOMIES satartorocces amare eee 3,913} 1,429 994 412 MUA Oth mse: Reo te see em 4,398 | 4,082] 1,573] 1,407 II ssc nates Matin pins 00 ea ee 11,874] 4,527) 2,934 538 a ae eee 3,591 281 208 28

Living on Realized Means. Proprietors, ‘‘rentiers”’..... 39,244 | 44,337 | 6,923] 7,891

Pensioners, We. s sa. censscosacese 7,083 | 1 383 448 54

Occupation unknown

Nation-

a Barely a third (322 per 1000) of the population are Parisians by ality.

birth, —38°2 per 1000 having been born in the other communes of the department of Seine, 565 in the other departments of France or in Freneh colonies, and 74°8 abroad. The foreign population shows a tendeney to increase; in 1876 380 per 1000 were natives of the department, the proportion of foreigners being only 60. In 1881 the English numbered 10,789 ; Germans, 31,190; Belgians, 45,281; Dutch, 9250 ; Italians, 21,577; Swiss, 20,810; Amerieans, 5987 ; and other nationalitics, 19,154,

The following were the principal causes of death in 1882 :— phthisis, 10,342 deaths ; diarrhoea, 5095 ; pneumonia, 4127 ; conges- tion of the

brain, 2668 ; organic diseases of the heart, 2873; men- ingitis, 2605; chronic bronchitis, 2630; eancer, 2251; typhoid fever, 3352 > acute bronchitis, 1730; croup and diphtheria, 1805 ; small-pox, 661; infantile weakness, 1458 ; senile debility, 1350. Adminis- Municipal Administration.—Each arrondissement is divided into tration. four quarters, each of which nominates a member of the municipal

council. The functionaries of the arrondissement are—a mayor (maire) and three deputies (adjeints) nominated by the prefect of Seine, who act as registrars, and preside over the poor-relief (bureau de bienfaisance) of their arrondissement, and a justiee of the peaee

Mort- ality.

Without Occupation.—Children supported outside of their own commune by their parents ; inmates of hospitals, prisons, &e.

PARIS :

TapLe 1V.—Distribution of Population according to Occupation (1881).

Members of Family . nae : D t: ttached Workpeople. is oe a bo Geb sae Males. Females. Males. Females, | Males. | Females.

6389 222 659 1,151 248 454 4,148 264 85 180 302 69 50 1,232 455 78 240 3824 24 47 1,380 489 222 597 707 75 127 2,923

Uj Ufo) 2 en eRe eee ee nntnaneces a= 5: 9,678 12,728} 1,080] 5,138] 9,940|/ 267] 863] $2,854 46,478 | 31,748| 17,984| 27,835] 1,474] 3,769| 189,863 258,506 | 239,364 | 108,663 | 185,844] 8,123]18,813| 929,596 | Motta Ed, pen Raexnegnstssaces ef eineein eFC eee 1,102,318 6,970| 3,917] 17,781] 40,083] 3,794] 14,844] 85,765 23,128] 17,851} 29,520] 61,605| 5,687 | 16,082 146,835 6,467 3,006 | 16,083} 27,975 | 6,518 | 11,255 61,314 MIS ove obtener a athe Svan eens otcoreny pn ek 293,914 10,539 858 7,202 | 16,301 | 281 923 48,830 115 ile 147 326 32 49 1,075 socal. pee raceraner ac opaia orevotegaserne ersiarel secre eer ote 49,905

789 6 391 1,106 203 407 14,082

1 iis 50 138 78 100 576 614 Al 2,782 6,448 98 267 19,389 AB OEAIN Mca Me oh hema Lae, eee One 34,047 3,149] 1,170] 8,746] 19,789] 1,856] 5,856| 66,720

382 2 159 636 193 651 3, 219 36 120 6 172 147 336 5,938

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(juge de paix) nominated by the Government. There is no cleetive mayor of Paris: the president of the municipal eouncil, who is nom- inated by his eolleagues, merely acts as chairman of their meetings. When oceasion requires, the function of mayor of Paris is discharged by the prefect of Seine. The municipal eouncil discusses and votes the budget of the city. The importance of the business thus trans- acted will be seen below. The prefect of Seine and the prefect of police (both magistrates named ty the Government, but each with a quite distinct sphere of action) represent the executive authority as opposed to the municipal eouneil, which latter has no power by refusing a vote of eredit to stop any public serviee the mamtenance of which legally devolves on the city: in case of such refusal the minister of the interior may officially insert the credit in the budget. And in like manner he may appeal to the head of the state to cancel any decision in which the couneil has exceeded its legal funetions. The prefecture of Seine comprises a departmental service, differing in no essential particular from that of other pre- fectures, and a munieipal service for the city of much more import- ance. Elections, rates, municipal debt, city schools, public

lands, municipal buildings, markets and market-places (in respect to the collection of dues), cemeteries, roads and streets, publie edifices,

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enue,

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water-works and sewers, promenades and plantations, river naviga- tion and river ports, public pawnbroking establishments, and the relief of the poor are all under the control of the prefecture of Seine.

The prefecture of police includes the whole department of Seine and the neighbouring communes of the department of Scine-et- Oise—Meudon, St Cloud, Sevres, and Enghien. It consists of three sections—political police, police of public safety, and admin- istrative police, the two former being rather national than muni- cipal. The state consequently repays two-fifths of the annual budget of about £800,000 which this prefecture receives from the city.

‘The municipal police deals with public health, civil order, and repression of crimes and misdemeanours, whether against person, property, or morals. It exercises surveillance over lodging houses, the insane, and prostitutes, tests weights and measures, and has charge of the markets, the public vehicles, the fire department, sanitary arrangements, and exhumations and reinterments in the cemeteries.

The prefect of police has a staff of 8500 officials—commissaires de police, officiers de paix, gardiens de la paix (a kind of police- magistrate), and inspectors. He has also underhis orders the sapeurs pompiers or fire-brigade (1742 men), and the republican guard, long called the municipal guard, which numbers 3295 men, besides a mounted force of 726. He has full control over the budget of his department, which is voted en bloc by the municipal council.

Revenue and Expenditure.—The heaviest item of expenditure is the public debt: the sum at 31st December 1888, represented by the series of aunuities terminable in 1950, amounts to a total of £171,730,965. The annuity for 1883 was £3,693,303. Over and above this the city is authorized to have a floating debt of £800,000. The following are in round numbers the main items of the ordinary budget for 1888,—the exact sum varying from year to year :—

Prefecture of police (partly repaid by the state)..... £950,000

Streets and roads (“ voie publique” and “voierie”)..... 999,000 Memary and professional education….....ssceeeiecsceres 890,000 ME I eis cerca arco aimce sasinen ase en eaainiecel can mneane 795,000 BM ewOUKSeaTl(! (TAINACC 2. ..cc.secsensseevcocesseas son ansedvors 520,000 Public walks, plantations, and lighting….....::6006 392,000

Octroi or customs (the main source of municipal revenue) 296,000 Central administration, “ mairies,” and municipal council 337,000 PRE NE TATIC (IMC QUES ....s001 so secede sesaneserissiines sce venieoe 212,000

By the addition of the expenses of the Collége Rollin (an institu- tion for secondary education belonging to the city), and some miscellaneous expenses of less amount, the ordinary budget for 1883 reached the sum of £10,106,533, and by the further addi- tion of £44,000 belonging to the previous year, a grand total of £10,150, 533.

The extraordinary budget shows expenses to the amount of £298,444 on general funds, and £90,000 on special funds. The former is specially devoted to architectural works (rebuilding the Hotel de Ville) and keeping up streets and roadways, and the latter to the erection of buildings (Sorbonne, faculty of law, and canal St Denis).

The following are the principal items of ordinary revenue :—

eM TUNICIPAl CUSLOMS).....-2:oceveserseverserasenes £5,996, 802

Communal centimes added to the direct contributions 948,805 Municipal share in the profits of the gas company….. 604,000 Water-rates and income

from the canals belonging to

[och OUI ooudeGMeGnE Beers npetbsc. stn etacoceteer nop eens neteian. 442,867 Government subsidy to the municipal police…..... 307,753 MMe cHOOLING lICENCES…....0erceesesverserensecensars 220,110 Revenue for public instruction (legacies, &.)..... Unknown Duty on gas supplied to private persons (0°02 fr. per

eub. met., about 54d. per 1000 cub. feet)..... 225,250 Cab-stands, omnibuses, and tramwayS…....cssesees 194,937 Government subsidy for the maintenance of the public

Beers GMATIAUS EROCUS c5)¢ cis :ssines sister aneadaenmeanamernornrsnasaaiane 164,000 Dues from goods exposed for saleinthe public markets 180,012 TOGO oc ccnenerinneiersnddehensgaesariax aveeoes 138,136 Householders' street-cleaning tax (tae de balayage)... 108,416 CCI re.) ees. oie « « « dosaehigsiese cre teelanidinn's 101,492 Sale of burial-lots in the cemeteries…....cccceseeees 94,284 Stands in the markets and market-places.,..... 83,461 Paving and Gledwing Of the SETEELS .....61.0.0r2c000e00005 95,717 Ground-rents 10:0 Der ONE Ci SRR DUT EC OBERT Aer ara 62,594 BMA SEWAGE, ... 00-2. cccceesoncee sos cesesnsnneennes 56,597 Rent of stands on the public strects…....cccseevreees 51,782

Including less important items, the total ordinary revenue in 1882 was £10,489,373 ; and the arrears of former years' revenue paid up amounted to £1,218, 883.

The extraordinary budget on general and special funds amounts to £6,450,037 ; but a large proportion of this consists of sums which are carried forward from one fiscal year to another, till the expenses Which they are meant to cover are liquidated.

279

The chief items in the octroi are—

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Total (1882), comprising other less important items,....£5, 986,541

Strects.—The public streets, covering an area of 3877 acres, Bele a total length of 580 miles, 143 miles being bordered with

rees,

as rapidly as possible, though each new tree costs about £8.

The staff entrusted with maintaining and cleaning the public streets comprises 320 engineers, overseers, and timekeepers, who have under their orders 2123 paviors and roadmen and 3185 per- manent and supernumerary scavengers. The maintenance of the streets costs £406,800; that of the pavements and sidewalks, £62,224; cleaning, £259,480. The streets are for the most part paved (1525 acres on January 1, 1883), usually with Yvette sand- stone from the neighbourhood of Paris. The most frequented crossings are laid with Belgian porphyry. The metalled roadways cover 445 acres, the asphalted 83 acres, the earthen 26. Wooden paving, previously employed only for 2 acres, was in 1883 laid down in the Champs Elysées, and in 1884 extended to the Avenue de l’Opéra, Rue de Rivoli, the line of the Grands Boulevards, and Rue Royale. Of the total area of 1131 acres occupied by pavements and sidewalks, two-ninths are covered with asphalt, one-third with sand, one-seventh with granite, and the rest with paving-stone.

There are 5070 plugs for the watering of the streets, and 400 water-carts. The annual consumption of water for this purpose amounts to 180,174,478 cubic feet (195 days). The sweeping of the streets in the morning devolves

on the houscholders, and is commuted by payment of a tax (see above); during the day the whole cost falls on the municipality.

The point of greatest traffic in Paris is the Place de la Bastille ; one current passing from Rue St Antoine to the Faubourg St Antoine and another from the Grands Boulevards to the railway stations for Vincennes, Lyons, and Orleans. On an average 42,000 carriages and 55,900 draught horses pass through this square in the twenty-four hours. Next in amount of tratfie come Rue de Rivoli, 33,232 vehicles ; Avenue de l'Opéra, 29,460 ; Rue du, Pont Neuf, 20,668 ; Boulevard des Italiens, 20,124; Place de 1'Etoile, 18,311; Rue Royale, 14,095. The most frequented of the bridges are Pont de la Concorde, 10,003; Pont Neuf, 8519; and Pont d' Austerlitz, 7340.

Means of Conveyance.—Cabs, omnibuses, tramways, steamboats, and a railway (the Chemin de Fer de Ceinture) are the local means of transit in Paris. The steamboats ply up the river to Charenton, down the river to Suresnes. Within the city, in 1882, they plied on 329 days, made an aggregate of 8162 days of service, traversed 479,997 miles, and conveyed 11,170,980 passengers. Out- side the limits of the city, up the river, the days were also 329— aggregate days 2265, aggregate distance 123,007 miles, passengers 3,122,593 ; down the river the days were 329—ageregate days 2356, miles 180,138, and passengers 1,262,680. The omnibus company employs both ordinary omnibuses aud tramway-cars. In 1882 it employed 610 omnibuses and 255 tram-cars, conveyiig 200,187,455 passengers. The two tramway companies distinguished as Northern and Southern have conveyed respectively 26,076,761 and 27,067,951 passengers. The Chemin de Fer de Ceinture, which runs round the city just within the fortifications, conveyed 21,617,909 passengers. As cab-hiring is an open industry (though the cabmen are restricted in their charges by a tarif, and are subject to police control), the movement of the cabs cannot be given exactly. In 1882 the number of horses belonging to private persons and bound to be at the service of the army in,case of mobi- lization was found to be 95,847; in 1878 the number of carriages

was 13,372.

Streets,

The municipality is going on with the work of planting |

Convey- anee.

Water and Drainage.—Paris derives its water-supply (1) from Water

the Seine and the Marne, (2) from the Oureq Canal, (3) from artesian wells, and (4) from springs. (1) The two steam-pumps at Chaillot on the Seine raise cach at their ordinary rate 635,688 cubic feet and at their maximum 1,518,588 in the twenty-four hours. The ten pumps at Port 4]'Anglais and Maisons-Alfort above Paris, at St Ouen below Paris, and at the Quai d'Austerlitz and Auteuil (within the city), can supply about 600,372,000 cubic feet per annum. In 1880 about 2,119,000 cubic feet ou an average were taken daily from the Seine. The water is stored in reservoirs at the highest points in Passy, Montmartre, Charonne, andGentilly. The establishment at St Maur, situated on the canal which closes the loop of the Marne, and partly moved by the head of water and partly by steam, supplies the Bois de Vincennes and the elevated districts of Belleville and Ménilmontant. It can furnish 2,896,000 cubic feet in the twenty-four hours. (2) The Ourcq Canal, which is

supply.

Drain-

also used as a water-way, comes from the department of Aisnc, and terminates at the La Villette basin, wliich also receives the St Denis and St Martin Canals. It brings a volume of 4,414,500 cubic feet per day, to which are added in summer from 2,000,000 to 2,500,000 cubic feet procured from the Marne near the confluence of the Ourcq, and discharged into the canal. The water is hardly suitable for domestic use owing to the quantity of foreigu matter which it con- tains. (8) The water of the artesian wells is much purer. The Grenelle well is 1797 feet deep, and reaches the greensand ; its daily yield is 12,860 cubic feet of water at a temperature of 80° Fahr., which rises to a height of 288 or 289 feet, and can thus be carried to the summit of Mont St Genevieve. The Passy well is 1922 feet deep, and yields

an average of 233,000 cubic feet in the twenty-four hours. By the hydrometer Seine water registers 18°, that of the Ourcq 28°, that of the Passy well only 9°. A new well is being sunk (1884) at La Chapelle, and another at Butte-aux-Cailles. (4) Till quite recently all the spring water was brought to Paris by two aqueducts. ‘The Arcueil aqueduct, 8 miles long, on the left of the Seine, furnishes 67,100 cubic feet per day; that of Belleville, on the right side, which up to the beginning of the 17th century fed all the fountains of Paris with the waters of Belleville and the Prés St Gervais, now yields only 6000 cubic feet in the twenty-four hours. This insufficiency of spring water has been supplied by the Dhuis and the Vanne, two streams of La Champagne. The former is diverted near Chateau Thierry (Aisne) and conveyed by an aqueduct 81 miles long into the Ménil- montant reservoirs (354 feet above the sea, or more than 250 feet above the level of the Seine), which consist of two stories, one above the other, with a united capacity of 4,538,000 cubic feet, and usually containing a store equal to five average days’ influx. In the valley of the Vanne (a tributary of the Yonne, which it reaches at Sens), Paris has obtained possession of a great number of springs, which, when the rivers are at their lowest, yield in the twenty-four hours 3,531,600 cubic feet of a perfectly pure water at a steady temperature of 52° Fahr. The aqueduct from the Vanne ends at Montrouge at a hcight of 262 feet, in reser- voirs capable of holding 10,594,800 cubic feet, cqual to three average days’ influx. Every year new works are constructed to increase the quantity of water distributed. In June 1883 the machines raised for the first time 2,825,000 cubic feet on the plateau of Villejuif. The total quantity of water supplied to Paris will now be 20,130,000

cubic fect in the twenty-four hours. The quantity actually required .

is not less than 14,127,000 cubic feet, or not quite 44 gallons per lead of the population, a proportion exceeded in several other great cities. This water is distributed by 66 monumental fountains, 763 bornes-fontaincs (t.e., smaller fountains or wells, similar in appear- ance to a boundary stone or milestone), 5249 common street taps, 53 pumps, 181 plugs for the use of the watering carts, 4175 plugs for attachment of watering hose, 363 fire-plugs, 178 cocks at cab-stands, in the Wallace fountains, and the urinals. There is a certain number of fountains not open to the public where water is retailed to the water-carriers ; and a large number of private houses have

water laid on to their courts, or in many cases to the several stories. The public baths (151 in number) and the washing establishments (263, with 21,911 stands) receive daily 2,358,000 gallons of water. The water-pipes, varying in diameter froma little more than an inch to upwards of 4 feet, the commonest size being about 8 inches, have a total length of 94,904 miles.

Since about the middle of the present century all houses have been bound to discharge their rain and waste water directly into the sewers ; but, though these are annually being extended, there are still streets into which they have not been introduced. On the 31st of December 1881 their total length was nearly 441 miles. The drainage of both sides of the river is collected in a great sewer ending in the Seine at Clichy opposite Asniéres ; the main sewer of the left side of the river is connected with that of the right side by a siphon which passes under the Seine by a tunnel near the Pont de l'Alma. A departmental sewer, receiving the waters of the elevated districts of Charonne, Ménilmontant, Belleville, and Montmartre, terminates at St Denis. These sewers are much more than great drains: they are used as passages for water-pipes, gas- pipes, telegraph wires, and pneumatic tubes. The two largest classes of them have a height respectively of 144 feet and 17 feet 6 inches at the keystone, and a width respectively of 18 feet 5 inches and 17 feet at the spring of the arch. The smallest class is ouly 6 feet high and 8 feet wide. The most usual class, of which there are 171 miles, has a height of 74 feet and a width of 44 feet.

The sewage from these mains is partly employed in irrigation in the plain of Gennevilliers on the left bank of the Seine opposite St Denis and Clichy. At the close of 1881 1216 acres were under treat- ment, though the system was only commienced in 1872 on a tenth of that area ; and the drains employed, varying from 1 to 4 feet in diameter, had an extent of 21 miles, and discharged the sewage by 571 outlets. The quantity of sewage discharged daily by the sewers varies from 10,171,000 cubic feet to 13,112,266 cubic feet (1881). The amount absorbed by'irrigation varies according to the season. Thus in May 1881 it was 95,907,555 cubic feet, and in

which still go to pollute the Seine. é

September only 15,719,780 cubic feet. The daily average through- out the year shows 54,935,945 cubic feet, watering 213 acres,

The value of the land (originally sandy) at Gennevillicrs hag considerably increased since the introduction of this system. The rent ofa hectare (2°47 acres), which was 152 francs between 1865 and 1870, reached 300 francs in 1878 and 450 in 1880. The cultivation of the plain gives employment to 1850 hands, and the population of the commune has steadily increased—1897 in 1872, 2389 in 1876 3192 in 1881. The municipality proposes to extend this system of irrigation, which absorbs only a part of the sewage, to the foot of the St Germain forest, and thus to utilize the masses of foul water

Nightsoil is collected in three different ways :—(1) in cesspools of mason-work, which ought to be watertight and to communicate with the open air by a ventilating pipe rising above the tops of the neighbouring houses ; (2) in movable buckets, placed in suitably ventilated cellars ; (8) in filtering tinettes, which discharge their liquids directly into the sewer. On the 31st December 1882 the number of cesspools was 66,610, of movable buckets 14,952, and of tincttes 17,033. The nightsoil contractors have to be authorized by the prefect of Seine. The cesspools must not be emptied except by night. The quantity removed in 1881 was 39,797,810 cubic feet—35,098,453 cubic feet from the cesspools, 3,682,187 from the movable buckets, and 1,017,170 from thc tinettes.

Lighting.—The lighting of Paris is practically in the hands of Light- the gas company, electric lighting being still in the experimental ing, stage (28 burners in the public streets in 1882), and oil being used only in a small and ever-diminishing number of out-of-the-way streets (472 burners in 1881). The gas company manufactured in 1861 2,974,690,553 cubic feet of gas, in 1875 6,218,435,025 cubic feet, and in 1882 9,726,709, 281 cubic feet, this last quantity being obtained from 917,867 tons of raw material (10,597 cubic feet per ton). The gas mains belonging to the company make a total length of 1222 miles ; those in the public streets feed 42,514 burners, con-suming 1,301,226,027 cubic feet for public lighting. The company further supplies 7,163,994,098 cubic feet to 154,962 private cus- tomers in the city, and 600,208,654 cubic feet to 58 communes / in the outskirts. About 660,593,880 cubic feet, or 6°8 per cent., , is lost in transmission. The daily consumption reaches a maxi- ‘ mum (86,005,949 cubie feet) in December and a minimum , (14,073,112 cubic feet) in July.

Public Instruction.—The so-called salles d’asile are infant Educa.) schools for children from three to six years of age, 7.¢., from the tion. time when their mothers place them in the créches or day-nurscries (see below) and the time when they may be admitted to the primary schools. The municipality maintains 126 secular salles d’asile { receiving 15,939 children, and one salle congrégantste (i.e., under i the management of a religious society) with 279 children. The | |

private establishments comprise 23 secular ‘‘salles” with 1243 children, and 39 congreganist ‘““salles” with 4231.

In 1882 the municipality supported 173 primary secular schools (56,369 pupils) for boys, 161 secular schools (46,579 pupils) and 2 congreganist schools (765 pupils) for girls. The private primary | schools are 188 sccular schools and 70 congreganist for boys, f 577 secular schools and 186 congreganist for girls,—number of pupils unknown. At certain hours the primary schools are trans- } formed into classes for adults—116, with 14,288 pupils. The . “higher schools” (écoles supériewres) supply education for in- dustrial or commercial careers. They have 677 pupils between six and thirteen years of age and 2956 above thirteen, who are dis- ; tributed among the Oollége Chaptal and the Turgot, Lavoisier, | Colbert, J. B. Say, and Arago schools. Theapprentice school (école @apprentis) with 228 pupils, the normal schools (for males, 205 pupils ; for females, 68 pupils), and the Pape-Carpentier scliool, which trains matrons for the salles d’asile, complete the list of the municipal establishments for primary education. Besides there are { private normal schools for Protestant teachers (male and female), a private normal school for girls, normal classes for ladies under the auspices of the Society for Elementary Instruction, and professional schools for both girls and boys. Commercial instruction is give in two schools placed under the patronage of the chamber of com- merce, and a special commercial high school established about 1880. In 1881 a fund was established for placing indigent but deserving pupils in free primary boarding-schools, at the expense of the city. Between Oct. 1881 and Oct. 1882 494 pupils were thus dealt with at a cost of £9367. Municipal libraries, subsidized by the city, have been established in all the arrondissements; in 1882 they lent 401,415 works, the number of books contained in the libraries being 89,355. }

Secondary education is provided by the municipal Collége Rollin; } in the national lycécs (Louis le Grand, Henry IV., St Louis, and | Vanves), which have both boarders and day pupils ; the Charlemagne and Condorcet lycées, for day pupils only ; and the Collége Stanislas, more especially for boarders. It is between thesc establishments, subjected to the same university programme, and the Versailles lycee that the great compctition of the Sorbonne takes place at the close of each school year. The number of their pupils in 1882 (Stanislas

demolished since about 1850. It corresponded on the whole to the pre-Revolutionary quarter of St Benoit or the University, otherwise called the Faubourg St Jacques. The most distinctive portion lay between Rue St Jacques and Boulevard St Michel. Rue de la Harpe opens into Boulevard St Michel; and Rue du Fouarre, frequently mentioned in medieval and Renaissance writers, strikes N. E, from Rue St Jacques. The students now live for the most part in the vicinity of Sorbonne and the schools of medicine and law. They frequent the cafés and becrshops of Boulevard St Michel and its neighbourhood.

The principal libraries in Paris have already been described Libra- under Liprarizes (vol. xiv. pp. 524-6), and an account of the ries, observatory will be found in vol. xvii. p. 712.

The Bureau des Longitudes, which was founded in 1795 for Bureau the advancement of astronomy and navigation, and publishes the des Connaissance des Temps, is located at the Institute. ‘The meteoro- Longi- logical office and observatory is situated in the Montsouris Park, and tudes. in connexion with it is a school of nautical astronomy and practical geodesy. The observatory for physical astronomy is at Meudon.

The Conservatoire des Arts et des Métiers, in the old priory of Conser- St Martin des Champs, was founded (1794) as a public repository of vatoire machines, models, tools, plans, descriptions, and books in regard des Arts. to all kinds of arts and trades. Various courses of lectures on the

excepted) was 8048. Among the private establishments giving secondary education mention must be made of the Collége Ste Barbe, the Monge, Bossuet, Fénelon, and Massillon schools, the old Jesuit colleges at Vaugirard, Rue de Madrid, and Rue Lhomond, the two lesser seminaries of Notre Damc des Champs and St Nicolas, and numerous institutions preparatory for the examinations and special schools. In 1881 there were 11,608 pupils in the secular and 15,811 in the ecclesiastical establishments, of which 1584 in addition attended a lycée course. For some years there have been at the Sorbonne special classes for young ladies, but the secondary education of girls is only beginning to be organized. Higher education is given in the faculties of scienco, literature, and Catholic theology, which are together in the Sorbonne, and in the facultics of law and of medicine, each of which is by itself. There is also a faculty of Protestant theology transferred to Paris from Strasburg. These faculties confer the degrees of bachelor, licentiate, and doctor. The Catholic Institute, a private foundation, has faculties of law, literature, and science, but has no right of conferring degrees. The Sorbonne, the scat of the Academy of Paris and of its rector, who is the head of the whole educational system, contains a library of 100,000 volumes belonging to the university, and a well-appointed muscum of hysical science, and laboratories. The school of law has a library of 30,000 volumes and the school of medicine 60,000 volumes,

forming the most complete medical collection in the world. Connected with the school of mcdicine are the Orfila museum of

practical school of anatomy, and a botanic garden, and the midwifery schools of the Maternity and De la Pitié hospitals; the

applications of science to commerce and industry have been added from time to time; they are all open to the publie without fee, and are addressed rathcr to workmen and artisans than to the wealthy or learned. The Agronomic Institute has recently been removed to the Conservatoire.

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; comparative anatomy, the Dupuytren pathological museum, the

: :

The Jardin des Plantes (1626), about 75 acres in extent, forms Jardin one of the most interesting promenades in Paris ; its museum of des natural history (1793), with its zoological gardens, its hothouses Plantes.

higher school of pharmacy and the dissecting amphitheatre for hospital students are also affiliated institutions. Whilst the “faculties” are specially intended to prepare for and

confer university degrees (though thcir lectures are open to the public), the Collége de France is meant to give instruction of the highest order to the general public (men or women) ; and the various sciences are there represented by thirty-seven chairs. The Ecole des Hautes Etudes supplements the theoretical instruction provided by the public lectures of the higher education by practical training. The upper normal school is for the training of “professors” for secondary classical education and for the facultics, TheHcole des Hautes Etudes Ecclesiastiques prepares ecclesiastical “professors” for the institu- tions and lesser seminaries which supply secondary education, and are placed in the hands of the clergy. The free school of the political sciences prepares more cspecially candidates for adininis- trative employments (council of state, &c.). The Ecole des Chartes trains record-keepers in the reading and study of ancient documents. Theschoolof living Oriental languages teaches the principal languages from Russian and Modern,Greek to Malay, Chinese, and Japanese. The Polytechnic school (Ecole Polytechnique) trains military and naval engineers for the artillery corps, the corps of engineers, and the navy-yards, and civil engineers for the national corps of the roads and bridges, the mines, and the state manufactories (tobacco, powder, and saltpetre). As for infantry and cavalry officers, they usually come from the special military school of St Cyr, when they donot risc from the ranks. In Paris too are situated—the Hcolo Supérieure de Guerre ; the practical schools of roads and_ bridges and of nines, for the training of civil engineers, with libraries and collections of models and classes in some cases open to the public; the Ecole d’Application des Tabacs; the school of military medicine and pharmacy. The central school of the arts and manufactures, though some ycars ago it became a Government

and greenhouses, its nursery and naturalization gardens, its museums of zoology, anatomy, anthropology, botany, mineralogy, and geology, its laboratories, and its courses of lectures by the most distinguished professors in all branches of natural science, make it an institution of universally acknowledged eminence.

Learned Societies. —Among the learned societies of Paris the first Learned in importance is the Institut de France, which has already been societies.

described (see InsTiruTE oF FRANOE, vol. xiii. p. 160). The committee of learned societies at the ministry of public instruc- tion forms, as it were, the centre of the various societies not maintained by the Government ; and the French Association for the Advancement of the Sciences, founded in 1872, is based on the model of the older British society, and like it mects every year ina different town. The other societies may be classified as follows :— 1. Historical or Geographical—History of France, Anti- quaries of France (till 1814 known as Ccltic Academy), Historic Studies, Numismatics and Archeology, Bibliophiles, School of Charters, Ethnography, Geography (1821, and thus the oldest of its class), Asiatic (1822), French Alpine Club (Club Alpin); 2. Natural and Medical Sciences—Anthropology, Zoological Acclima- tization (which has the direction of the zoological gardens in the Bois de Boulogne), Entomological, Geological, Surgery, Anatomy, Biology, Medical of the Hospitals, Legal Medicine or Medical Jurisprudence, Practical Medicine, Pharmacy, Agricul- ture,! Horticulture ; 3. Industrial and Moral Sciences—Encourage- ment of National Industry, Statistics, Elementary Instruction, Franklin (for the foundation of popular libraries) ; 4. Posatvve Sciences and Fine Arts—Philomathic, Physical, Philotechnic, Atheneum of the Arts, Sciences, and Literature (1792), Concerts of the Conservatoire de Musique (1795).

institution, still educates engineers for ordinary industrial careers. The school of the fine arts (Ecole des Beaux Arts), intended for painters, sculptors, and architects, contains valuable collections, which render the palace in which they are exhibited one of the most interesting museumsin Paris. The instruction in this institu-

Newspapers.—Paris is very largely supplied with newspapers of News- all descriptions. See Newspapers, vol. xvil. pp. 423-8, papers,

Museums.—The richest museum in Paris occupies the Louvre, the Muse- finest of its palaces. On the ground floor are museums (1) of ums.

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tion is at once theoretical and practical. It is open to all French- men from fifteen to thirty years of age, and cven in some cases to foreigners. Of the various competitions open to the pupils the Most important is for the prix de Rome. The successful com- petitor is rewarded with four years' residence in Italy at Government expense, two years being spent at the Medici palace in Rome. Schools of design for boys and girls serve as preparatory for the school of the fine arts, or train designers for industrial occupa- tions. There is a free school of architecture. Music and elocution are taught at the Conservatoire, which possesses a musical library and a very curious collection of musical instruments. The diocesan seminary of St Sulpice receives clerical pupils from all France to the number of 200; the foreign mission scminary trains missionaries for the far East, and the seminary of St Esprit mis- Sionaries for the French colonies. The Lazarists have also a noviciat of their own. The Irish, English, and Scotch colleges, as their names suggest, prepare priests for the Roman Catholic dioceses of the United Kingdom.

A district at one time almost exclusively occupied by students and known as the Quartier Latin or Pays Latin was situated on the left side of the river mainly in the arrondissement of Luxem- bourg; the old houses have, however, been almost entircly

ancient sculpture, containing such treasures as the Venus of Milo, the Pallas of Velletri (the most beautiful of all statues of Minerva), the colossal group of the Tiber, discovered at Rome in the 14th century, &c. ; (2) of medieval and renaissance sculpture, compris- ing works by Michelangelo, Jean Goujon, Germain Pilon, John of Bologna, &c., and special rooms devoted to early Christian monu- ments and to Jewish antiquities (this last a feature peculiar to the Louvre); (3) of modern French sculpture, with works by

Puget, Coustou, Coysevox, Chaudet, Houdon, Rude, David of Angers, &c. ; (4) of Egyptian sculpture and inscriptions ; (5) of Assyrian anti- quities ; (6) of Greck and Pheenician antiquities ; (7) of engraving. On the first floor are (1) the Lacaze museum, a magnificent collection of pictures presented to the state by M. Lacaze in 1869 ; (2) the splen- did musée de peinture ; (3) the Campana muscum ; (4) a museum of Greek antiquities ; (5) a museum of Egyptian antiquities ; (6) an Oriental museum (Persian pottery, Chinese vases, lacquered work, &c.); (7) the Lenoir museum (suuff-boxes, jewels, miniatures, lac- quered wares, bequeathed to the Louvre by M. and Madame Lenoir

1 Asthe National Socicty of Agriculture, in contrast to nearly all the other societies, consists of only a limited number of persons named by the Government, to be a member of this corporation has a distinct value similar (though at a con- siderablé remove) to that of being a member of the Institute.

“i — 36

Hos- pitals.

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-in 1874); (8) the Duchatel room, bequeathed by the widow of the |

ininister of that name (Za Source, a masterpiece by Ingres); (9) the Timbal, His de la Salle, and Davilliers colleetions, consisting re- spectively of furniture drawing and curiosities, drawings, and pottery, furniture, and tapestry ; (10) a medieval and renaissance museum, comprising French, Italian, or Hispano-Moorish pottery and terra cotta ware, as well as objects in bronze, glass, and ivory— the Sauvageot collection being of note; (11) the museum of drawings and chalks, of which the more valuable are preserved in drawers ; (12) a museum of ancient bronzes; (13) the Apollo gallery, adorned by the leading artists who have been employed on the palace, and containing the royal gems and jewels, articles of goldsmith’s work, and enamels. The second floor accommodates the naval museum, the eta, museum (African, Chinese, Mexican), part of the French school of painting, and rooms for the study of Egyptian papyrus-rolls. ; .

The museum of the Luxembourg, installed in a portion of the palace occupied by the senate, is devoted to works of living painters and sculptors acquired by the state. They remain there for ten years after the death of the respective artists, that the finest may be selected for the Louvre.

The Cluny museum occupies the old mansion of the abbots of that order, built in the 15th century by Jacques d'Amboise. It was founded by M. du Sommerard, whose collections were acquired by the state in 1843. Increased from year to year since that date, it now contains about 10,000 articles—pieces of sculpture in marble and stone, carvings in wood, ivories, enamels, terra cottas, bronzes, furniture, pictures, stained glass, pottery, tapestry, glass ware, lock- smith work, and jewellery of medieval and Renaissance times. In the neighbourhood are the remains of the ancient palace of the emperor Julian; in the midst of the ruins, and in the garden which surrounds them, has been collected a Gallo-Roman museum, to which have been added many fragments of medieval sculpture or masonry, found in the city or its vicinity. The Carnavalet museum occupies the mansion in which Madame de Sévigné resided ; it is a municipal musewin, in which are brought together all objects of interest for the history of Paris. The artillery museum, in the Hétel des Invalides, comprises ancient armour, military weapons, flags, and an ethnographic colleetion reproducing the principal types of Oceania, America, and the coasts of Africa and Asia. The permanent exhibition of the products of Algeria and the colonies is in the Palais de l'Industrie ; and finally the Trocadéro palace contains a museum of comparative sculpture and ethnographic galleries for exhibiting curiosities brought home from distant countries by the principal French official travellers.

Public Charity—Hospitals, &c.—The administration of public charity is entrusted to a responsible director, under the authority of the Seine prefect, and assisted by a board of supervision consisting of twenty members. The funds at his disposal are derived (1) from the revenue of certain estates, houses, farms, woods, stocks, shares (£250,680 in 1882); (2) from taxes on seats in the theatres (one-tenth of the price), balls, concerts, the Mont de Piété, and allotments in the cemeteries (£252,117); (3) from subsidies paid by the town, the department, and the state (£976,368); (4) from other

sources (£522,398, including £130,787 from voluntary donations). The charges on the administration consist of “ outside

No. of Patients,

Ist January 1882. the Year.

79,106 21,794 9,454 3,140 872

General hospitals

Special hospitals

Children’s hospitals

Maison de Sante

Temporary service of the hospices…

Grand total for the hospitals…

114,366

Hospices, retraites, and fondations.. Hospitals for Insane—

Bicétre (men)

Salpétriére (women)

6,811

426 266

Several of the hospitals are of recent construction—Hotel-Dieu, Tenon, Lariboisitre. The Hétel-Dieu was rebuilt in La Cité at an outlay of £1,800,000, or £4000 per bed; the arrangements for practical education are excellent, and secure the institution a world-wide reputation. La Salpétriére (oldest of all the hospital buildings) is remarkable for its extent, occupying 74 acres, with 45 large blocks lighted by 4682 windows.

_ The benefits of the hospitals or hospices are generally given gratu- itously, but a certain number of patients pay their expenses, and in 1880 the funds of the department were in this way augmented by £89,262. In connexion with these establishments are a bakery, a slaughter-housc, a wine eellar, a central drug-store, a purveyor for purchasing provisions in the open market, a central depét for bed- ding, linen, clothing, furniture, and utensils; and a certain number

Entered during |Left during

PARIS

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relief" to the poor (sccowrs & domicile) the "service" of the hospitals, and the support of charity children. In each arrondisse- ment there is a bureaw de bienfaisancc, consisting of the maitre, his assistants, twelve administrators, and an indefinite number of ladies and gentlemen (known as commissaires and dames de charité) who give voluntary and gratuitous assistance. The secretary and treasurer is a paid official ; and 180 doctors, 110 midwives, and 207 religieuses, distributed among fifty-eight liouses of relief (mai- sons de secours), are employed in the service of the bureaus, which in 1880 received 104,236 applications for aid presented by 68 "visi- tors." The expenses for that year amounted to £69,843 for food, £13,140 for clothing, £6114 for fuel, £29,361 for medicine and medical advice, £15,032 for other assistance in kind, and £83,843 for assistance in money. The pauper population, enumerated every three years, consisted in 1880 of 123,735 persons (53,591 males, 70,144 females) in 46,815 families, or at the rate of 1 person for every 16°07 inhabitants in the city,—an increase of 3153 families and 10,418 persons since 1877, and 10,102 families and 33,448 persons since 1861. Of the families assisted in 1880, 18,125 obtained temporary relief and 28,690 relief throughout the entire year. This destitute class is very unequally distributed among the several arrondissements. Whilst in the 9th arrondissement there is only 1 pauper in 50 inhabitants, and in the Ist, 8th, and 2d 1 pauper in 46, 45, and 44 inhabitants, in the 13th arrondissement there is 1 in 7, in the 20th 1 in 8, and in the 19th 1 in 9. 'The paupers are for the most part under sixty years of age, and occupy single rooms, at a rent of from £4 to £8 per annum,

generally with a single fireplace and a single bed. There are usually no children under fourteen years of age.

The doctors in 1880 gave 453,036 consultations at the dispensaries, and performed vaccination in 31,549 cases. The midwives attended 5126 women boarding in their houses for their confinement, and gave assistance to 14,178 during pregnancy. Domiciliary visits were paid by the medical staff in 1880 to 30,822 patients and to 48,269 necessitous persons.

The doctors, surgeons, chemists, both resident and non-resident, connected with the hospitals, are all admitted by competitive ex- amination. In 1880 the staff for the hospitals of Paris and the auxiliary hospitals of Forges, Garches, and Roche Guyon (Seine- et-Oise), and Berek (Pas de Calais) consisted of 32 doctors or surgeons at the central office of admission, 118 hospital doctors or surgeons, 8 doctors for the insane, 18 cheinists, 291 internes,! 470 externes, 575 probationers, and 9 midwives or midwives' assistants, The hospitals are classified as general hospitals—Hétel Dieu, Pitié, Charité, Saint Antoine, Necker, Cochin, Beaujon, Laribois- iére, Tenon, Laennec, Tournelles ; special hospitals—St Louis (skin diseases), Midi or South (venereal diseases, men), Lourcine (venereal diseases, women and children), Maternity, Clinical (operations) ; children's hospitals —Enfants Malades, Trousseau, Berck-sur-Mer, La Roche-Guon ; hospices —Bicétre (old men), La Salpétriere (old women), Ivry (incurables); maisons de retraite—lssy, La Roche- foucauld, Ste Périne ; fondations— Boulard St, Michel, Brézin at Garclies (for ironworkers), Devillas, Chardon Lagache, Lenoir- Jousseran ; and asylums for the insane—Bicétre (men), Salpétriere (women). The following table (V.) gives details regarding these institutions in 1882 :—

Remaining on No. of Mean Length

Deaths. | 31st December, Patient Days. of Term

the Year.

6,489

2,932,802} 29°28

775,549 736,768 122,186

61,709

11,339 781 1,721

67,375 20,974 7,726 2,644 541

603 140

99,322 | 14,522 | 10,010 4,628,502

4,979 | 1,418 9,201 3,561,342

308 105 205 64

665 708

293, 016 330,525

of articles are retailed to other departments or private institu- tions.

Foundlings and orphans are sent to the Hospice des Enfants Assistés, which also receives children whose parents are patients the hospitals or undergoing imprisonment. In 1882 the hospice received 9620 children; the inmates from the preceding ycar num- bered 274. Of these children 2549 were restored to their parents, 2814 were boarded out in the country, 561 died, and 2594 were

1 The internes and externes are two grades of medieal students—the inter- nes the higher of the two and limited in number. Many doctors of medicine have not passed the tnternat. f

2 The mortality is here stated for the mean number present on the Ist 0 January and adinitted during the year,—one death for 6°94, &e., of this mean number, The larger thenumber in the table the less, of eourse, is the mortality.

formally enrolled among the enfants assistés, or charity children. There are in the hospice 102 resident wet-nurses ; infants, however, are not kept in the institution, but are boarded out with nurses in the eountry, of whom 1707 were engaged under the supervision of 361 matrons. Up to twelve years of age these children are kept at the expense of the department of Seine, and they remain under the guardianship of the poor-board till twenty-one years of age. On December 31, 1882, there were 13,861 ehildreu of the first elass and 12,135 of the second distributed among 32 agencies and 257 medieal circuits situated in Nivernais, Burgundy, Bourbonnais, Normandy, Artois, Pieardy, and Brittany.

The Quinze-Vingts still gives shelter to the 300 (fifteen score) blind for whom it was founded by St Louis, and gives outdoor assist- ance to 1550 besides. The blind asylum for the young (Institution des Jeunes Aveugles) has 250 pupils (one-third girls, two-thirds boys) ; the eourse of study lasts for eight years ; most of the pupils are bursars of the state or the departments ; some pay a small fee; suitable trades are taught. The deaf-mute institution is for boys only, and they are generally paid for by the state, the departments, and the communes. During a course of seven years they are taught artieulation and lip-reading. The Charenton asylum for the insane receives 300 male and 280 female patients, most of them paying for their board, and elassed according to their means. Those of Vineennes (522 beds for male patients) and Le Vesinet (300 beds for female patients) take in eonvaleseents from the hospitals sent by the eharity boards or friendly soeieties whieh subscribe to the institution. The Hétel des Invalides is for old and infirm soldiers. The pensioners, who have numbered at times as many as 5000, are now only a few hundred, and their immense edifice aeeommodates the Keole Supérieure de Guerre, the artillery museum, the galleries for plans in relief of fortified posts, and numerous storehouses of the war department. Under the dome of the Invalides is the tomb of Napoleon I., and in the church the funeral obsequies of distinguished soldiers are performed. ‘There are four military hospitals in Paris—Val de Graee (960 beds for all ranks), Gros Cail- lou (630 beds), Saint Martin (425 beds), and Vincennes (630).

Private benefieenee maintains a great variety of institutions in Paris. ‘There are 30 créches or day-nurseries in the eity and 14 in the suburbs (eapable of

aecommodating respectively 1093 and 398 infants), where mothers who have to go out to work may leave their infants under two years ; they are under the direetion of the sisterhood of St Vineent de Paul. The Soeiety of St Vineent de Paul, which must not be confounded with the sisterhood, isa society of laymen founded in 1833 and divided into as many eonfereneces as there are parishes, for the purpose of visiting the poor and giving them advice and assistance. The Société Philanthropique distributes food rations in its “kitehens” by means of a system of eheap tickets. The Société de Charité Maternelle devotes its attention to women in ehildbed; the Petites Sceurs des Pauvres have five houses for poor old men, for whom they colleet seraps from the restaurants. The Freres St Jean de Dieu take care of ehildren suffering from ineurable diseases. A large number of institutions known as owvroirs or workrooms bring up orphan and destitute girls and fit them for various industrial oeeupations, especially the use of the needle, The night asylums offer shelter to the homeless. The Society for the Protection of the Alsaee-Lorrainers, and the charity office of the British embassy, are naturally limited to speeial nationalities. Friendly societies, supported by ordinary subserip- tions, donations from honorary members, and state subsidies, are numerous ; they give assistanee to their members when they are sick or out of work, and pay their funeral expenses.

An evangelistie mission, eommeneed in 1872 by the Rev. R.W. M‘All in the district of Belleville has met with remarkable success. By 1884 it had between thirty and forty stations in Paris and the suburbs, and had extended its activity to various towns in the Provinces, to Corsiea, and to Algiers. Its ineome in 1883-4 was £10,607. Homes for English girls were established in 1872 by Miss Ada Leigh, and the association to whieh they have since been transferred has been presented with an orphanage by M. Galignani.

The Mont de Piété is a national pawnbroking establishment.

arging 9 per eent. for working expenses, it hands over all its proceeds to the public eharity funds. The average number of articles pawned per day is 5205, of which 5 only are of suspicious origin (theft); the average sum lent on each was 28 franes in 1881. When the depositor does not redeem his pledge or purehase a renewal the artiele is sold. In 1882 there were 1,669,582 new transactions and 664,617 renewals, while 1,401,944 articles

were redeemed, and 214,340 sold,—the loans amounting respectively to £1,619,621, £676,671, £1,320,888, and £144,315. If the sale Myolves a loss this falls on the agent who overestimated the Value when the article was deposited; any profit, on the eon- aay, Is divided between the administration and the person eon- erned,

The Caisse d'Hpargne, or savings bank, the natural eomplement of the Mont de Piété, was founded in Paris in 1818. It began that Jear with 351 depositors, and deposits to the amount of £2153; in

1882 it had 440,728 depositors, and owed them £3,518,432, The new deposits for the year reached a sum of £1,874,697, and the repayments £1,236,060. The number of new pass-books issued

was 63,146, of aceounts elosed 24,228. Three per eent. interest was paid to the depositors. The maximum deposit is £80.

Law and Justicc.—Paris is the seat of four courts having juris- Justiee.

diction over all Franee :—(1) the Tribunal des Conflits, for settling disputes between the judicial and administrative authorities on questions as to their respeetive jurisdietion; (2) the Council of State, for litigations between private persons and public departments ; (3) the Cour des Comptes ; and (4) the Cour de Cassation. The first three sit in the Palais Royal, the fourth in the Palais de Justice, which is also the seat of (1) a eour d'appel for seven departments (five civil ehambers, one ehamber of appeal for the correetional poliee, one ehamber for preliminary proceedings), (2) a eour d'assises (members nominated for a term of three months; two sessions per month), (8) a tribunal of first instanee for the depart- ment of Seine (seven eivil ehambers for civil affairs, sequestration of real estate, and sale of personal property; four ehambers of corree- tional police), (4) a police court where each juge de paix presides in his turn assisted by a commissaire de police. Litigations between: the departmental or municipal administrations and private persons are deeided by the conseil de préfecture.

The prefect of police, eharged with the maintenance of public safety, has the prison department under his supervision. There are eight prisons in Paris—Mazas, La Santé, Ste Pélagie, St Lazare (for females), the depdt (police station) of the prefecture of poliee, the Coneiergerie or loek-up at the Palais de Justiee, the Grande Roquette (for eondemned criminals), and the Petite Roquette reformatory. In 1882 there passed through these prisons 108,231 prisoners (83,022 men, 25,209 women), the daily average being 5529. Out of the total number, 30,990 were kept in solitary confinement, and 2905 (males) worked in eompany by day and were plaeed in separate cells at night. The prisons also reeeived 1067 young children who accompanied their mothers, and 732 ehildren lost in the streets. The mendieity-station at Villers-Cotterets (Aisne) has besides a daily roll of 919 prisoners (male and female). In the so- ealled House of Repression at St Denis are confined those mendi- eants who cannot be removed to Villers-Cotterets, or those dis- eharged prisoners who have not aequired a suffieiency for their im-mediate necessities ; 3240 persons passed through St Denis in 1882, The same year 46,457 persons were arrested in Paris, —44,955 being taken flagrante delicto or arrested as vagabonds ; 41,207 were brought before the judges. Of the whole number eight-ninths were males. Against five-ninths no previous eharge had been made: 899 were tieket-of-leave men, 3291 were forcigners (959 Belgians, 759 Italians, 376 Swiss, 379 Germans, and 126 English), The most frequent eauses of arrest were—vagabondism and begging, 16,985; theft in its various forms, 8604; rioting, 5619; assaults and acts of violenee, 1338; offences against morals, 825; breaeh of eertifieate by tieket-of-leave men, 899; murders, assassinations, and assault by night, 330; drunkenness, 312. ; ;

The prefeet of poliee has the control of the locating, diseharg- ing, or maintaining of the insane in the six publie asylums of Ste Anne, La Salpétriere, Bieétre, Charenton, Vaueluse, and La Ville Evrard, —the last two situated in the department of Seine-et- Oise. The financial and administrative management of these establishments is entrusted to the prefeet of Seine. At the Ist of January 1882 there were in the different asylums 8260 lunaties, and during 1882 3670 were admitted, while 3938 left or died. Private asylums for the insane eannot be opened within his pre-feeture without the permission of the prefeet of police. Children put out to nurse, and women wishing to be engaged as wet- nurses, are also under his

supervision. — In 1881 18,527 infants were registered by their parents as requiring to be put to nurse in the various departments; on December 31, 1881, 4398 infants under three years of age were out at nurse within the prefeeture ; 407 died during the year. An institution of a reformatory eharaeter commenced operations on January 1, 1881. _ In 1881 and 1882 it received 1644 children—1131 brought by their parents, 262 by the magistrates, and 251 by the prefeet of police. On Deeember 1882 there remained 1330 ehildren boarded out in the eountry. The expense for the two years was £18, 160.

Establishments which are dangerous or unhealthy are of three elasses, aceording as they have to be kept absolutely at a distance from dwelling-houses or simply subjeeted to certain precautions. They ean be opened only with the permission and under the surveillance of the prefeet of poliee. The first class comprises slaughter- houses, nightsoil reservoirs, vitriol works, &c. In 1882 there were of all the three classes 3049 establishments within the eity of Paris; in 1881 there were 2922 in the suburban eommunes. The shops for mineral oils (3615) and those for mineral waters (1133) are also subjeet to inspection, and the groceries, drug-stores, and chemists' shops in whieh medieines are sold (9224) are under the supervision of the upper sehool of pharmacy. Steam maehin- ery, (8317 machines, of 29,529 horse-power) which must be regis- tered, is inspected by the engineers.

Ceme- teries.

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Kighty local committees—forty composed of men and forty of women—are entrusted with the duty of visiting the 12,316 workshops in which 27,402 children are employed (16,945 boys or girls between twelve and sixteen years of age, and 10,336 girls between sixteen and twenty-one, ¢.c., still minors). Street porters (commissionatres), rag-pickers, hawkers, and lodging-house keepers are under police surveillance. The bodies of the drowned or of those who have died in the streets are conveyed to the Morgue, where post-mortem examinations are performed at the command of the court, and lectures delivered on medical jurisprudence. The number of bodies is increasing (718 in 1878 ; 879 in 1882). Of this total 673 were adults (committed suicide, 219 ; killed by accident, 105; murdered, 45; died

suddenly, 86). Drowning is the most frequent cause of death (321 cases). Of the 673 adults 588 were identified ; the 85 unidentified were photographed before burial. — ae

Cemeteries.—A corpse cannot be buried in Paris without a certificate from a medical man who has ascertained that death has really taken place ; and at least twenty-four hours must be allowed to elapse. In most cases (30,825 out of 57,871 deaths) the families are too poor to pay any funeral expenses, and the body is conse- quently buried free of eharge. Other interments are divided into nine elasses, the cost of which ranges from 15s. to £287, without counting secondary and religious expenses. There are twenty cemeteries in Paris or outside the gates. Pere la Chaise, the most extensive, contains 1064 acres; it is there that the most illus- trious personages are generally buried. In 1882 the number of interments was no less than 3048 (all permanent). Montmartre, or the Northern Cemetery (26 acres), received 970 (all permanent) ; Montparnasse, or the Southern Cemetery (46 acres), 1945 (10 being temporary). The two cemeteries of St Ouen (61 acres) received 12,462 gratuitous and 5761 temporary interments, but only 10 permanent; and the two cemeteries at Ivry (69 acres) 20,380 gratuitous interments and 7038 temporary. It is towards St Ouen and Ivry that most of the funerals now make their way and those graveyards, though but recently formed, will before long prove insufficient. The other Paris cemeteries arc due to the incorpora- tion of the suburban communes in 1860. The little graveyard at

Wine and

Population. Spirits.

Gallons.

1,825,274 1,851,792 1,988,806 2,239,928

The average annual consumption of bread is 849°46 pounds per head. Wholesale merchandise in food stuffs, though legal in all the market-places of Paris, is, as a matter of fact, concentrated in the central markets (halles centrales), with the exception of the butcher- meat trade, which is carried on by public auction or private sale both in the central markets and the

slaughter-houses. The central markets comprise ten elegant “ pavilions” of iron and glass, each about 4 acre, and separated from each other by streets which are for the most part covered. Dealers from the neighbourhood of Paris took to these markets, in 1882, 80,472 vehicles loaded with fruit, 723,257 with vegetables, 39,740 with potatoes, and 37,584 with pease and beans. These are cntered as market-garden produce. There was also sold wholesale in the pavilions 1506 tons of ‘‘choice”’ fruits and vegetables, 6896 of “fine” fruits and vegetables, 6903 of ordinary vegetables, 4837 of cresses, 321,047,149 eggs (at an average price of 51s. per thousand), 192,629 “hundreds ” of oysters, 21,144 tons of fish, 5746 tons of shell-fish, 6167 tons of “new” cheese, 697 tons of dry cheesc, 12,419 tons of butter, 21,931 tons of poultry and game (comprising 6,454,876 fowls, 3,102,269 rabbits, 2,819,083 pigeons, 1,936,560 larks, &c., at an average price of 103d. per Ib), 33,086 tons of beef, veal, mutton and pork,—these last figures including butcher meat sold by public auction in the market of the La Villette slaughter-house. Through the same market there passed to the shambles in 1882 354,277 oxen, cows, and bulls, 199,416 calves, 2,054,680 sheep, 315,306 pigs. This cattle-market, connected with the Chemin de Fer de Ceinture so that the trains bring the cattle trucks right into the market, occupies with its slaughter-houses an areaof1llacres. The places of sale (pavilions de vente) are capable of containing 4600 horned cattle, 22,000 sheep, 7000 pigs, 4000 calves. Horned cattle are liable to an entry fee of 3 francs, calves and pigs 1 franc, sheep 0°30 franc. Animals not sold are kept in sheds, cattle paying 4 franc per night, and the others in proportion. The slaughter-houses can accom- modate 1200 butehers, and contain a tallow-melting house (fondotr). Most of the cattle come from Maine-et-Loire, Niévre, Calvados ; sheep from Seine-et-Oise, Seine-et-Marue, Céte d’Or, Nord, Aisne, Allier, Indre, Cher ; calves from Seine-et-Marne, Eure-et-Loir, Loiret, Nord, Aube; pigs from Sarthe, Allier, Creuse, Indre-et-Loire, and Maine-ct-Loire. Foreign countries also contribute to the supply, especially ofsheep. Germany in 1882 sent 576,563, Austria-

Poultry and Game.

Pa Wh ts

Picpus is the property of a few families. Old cemeteries, long ago abandoned, in the heart of the city have gradually been built over, The bones found on breaking up the ground are collected in the ossuary of the Catacombs at Montrouge. The Catacombs are ancient quarries extending under a great part of the city south of the Seine ; they are subjected to continual inspections and shoring- up to prevent subsidenccs such as have taken place on several oecasions.

Fires, —The fire brigade has a military organization, and consists Fires,

of 1742 officersand men. On3lst December 1882 they had at their disposal 1678 fire-plugs. In the course of that year they extin- guished 982 fires (127 in January, the maximum; 55 in September, the minimum) and 1656 burning vents; and there were 72 false alarms. They used 1778 fire-engines, 1389 of them worked by steam. Eight individuals perished in the conflagrations ; 55 were saved by the firemen. Only 19 of the fires were serious. In 703 cases the damage was less than £40. The total loss for the ycar was £309,200. The most frequent cause of fires was some defect in the buildings (157 cases); lights ranked next (142 cascs), and the falling of petroleum or naphtha lamps accounted for 84.

Military.—Paris is the seat ofa military government, whose com- Milita mandant has under him all the troops stationed in the departments organi The soldiers recruited in the two tion.

of Seine and Seine-et-Oise. departments arc distributed among the 2d, 3d, 4th, and 5th corps d’armée, whose headquarters are at Amiens, Rouen, Le Mans, and Orleans. The principal barracks belonging to the state in Paris are those of the military school of Prince Eugene and Napoleon; the town possesses the barracks of the repnblican guard, the gendarmes, and the firemen in different quarters. The most important are those of La Cité, to which the prefecture of police was transferred after the destruction of its former buildings by fire in 1871. Besides the war office and the hospitals named above, the main establishments comprise the depét of the fortifications, the central artillery depét with the workshops of St Thomas d’Aquin, and the depét of the commissariat department.

Food Supply.—The following table (VI.) shows the annual average of food consumed per head of the inhabitants of Paris :—

Butcher

Mest. Butter.

Tripe, &c.

Tb 18°36 17°16 15°96 16°66

Tb 6°148

5348

6°391 6°64

Ib 165°78 156°10

168

172°74

Hungary 352,376, Russia 156,005, Algeria 38,172, and Italy 37,694. Beside the Halles Centrales is the Halle aux Blés or corn-market. A certain number of full sacks are stored under the cupola (which, architecturally considered, is a bold and striking design), but the whole of this class of goods arriving at Paris does not necessarily pass through the building. Brought by boat or rail, they are either stored at the stations or taken directly to the bakers, the general warehouses, or the military stores. In 1881 71,961 tons of grain and 208,374 tons of flour reached the city.

The consumption of wine has not increased in Paris during the last decade, allowance being made for the growth of the population. For 1872 the figures were 85,407,322 gallons of wine in cask and 404,272 gallons in bottle ; for 1880, 92,840,374 in cask and 428,450 in bottle. But the average consumption of spirits (1,312,498 in 1872, 2,907,190 in 1880) has doubled in the interval. More than the half of the wines and spirits consumed in Paris pass through the entrepOts of Bercy, Quai St Bernard, or Pont de

Flandre. To these great markets must be added the market for skins and hides (which, according to the latest returns—taken, however, in 1872—did business to the amount of £880,000), the horse-market (£414,200), charcoal-markets on the boats along the Seine (£180,000), flower- markets (£80,000), and the markets for fodder, dogs, birds, &c. The Marché du Temple, rebuilt about 1864, is devoted to the sale of old clothes and second-hand articles of all sorts. All the market-houses and market-places are placed under the double supervision of the prefect of Seine and the prefect of police. The former official has to do with the authorization, removal, suppression, and holding of the markets, the fixing and collecting of the dues, the choice of sites, the erection and maintenance of buildings, and the locating of vehicles. The latter maintains order, keeps the roads clear, and watches against fraud. A municipal laboratory has recently been established, where any purchaser can have the provisions he has bought analysed, and can obtain precise information as to their quality. Spoiled provisions are seized by the agents of the pre- fecture ; in 1880 458 tons of butcher meat, 123 tons of horse ficsh, 52 tons of tripe, fish, vegetables, fruit, mushrooms, &c., were seized in this way.

Industries and Commerce.—Returns issued by the chamber of commerce for 1872 estimated the industrial production of Paris as in the following table:—

Food | suppl)

Jndus tries.

J de Ga Is

Taste VII.—Industries of Paris.

Total Class of Industry. Annual Wages. £

FOO ..sccssscesseeeesessccecnaescnceecessnscccnscsescnseceres 3,494,551
BuUiGINg…..eeccccccecceesseseecssscescescecseeesaaeeasens 3,501,638
FUIMiture…..-eseecccseescecesessscccescesctsearccssescecee 3,409,128
ClOtHINg…..1-c00.cceseessneceseeesetecsensseeereseaseecas 6,393,737
Spun and woven OU lseetesserennestcec-c sheen en serre 1,197,618

Ordinary metals……..-scseeressecsssserersrteersreeces 2,133,972 Precious Metals…..cescecesseeeeeeeresceecceranseeceerrs 1,232,412

Chemical stuffs and POttery…...scccccseeerereeees Printing, engraving, Cae Cemeterterccssccesess Philosophical instruments, musieal instru- ments, cloekwork a Gkins and leather….ccccsescescessssssceeseceeees Carriages, saddlery, military equipments Basket-work, brushes, «&c.. Artieles de Taris Miseellaneous…....++

1,101,457 1,707,229

1,173,746 388,837 1,447,405 243,444 1,684,577 2,110,429

30,420,137

The larger manufaeturing establishments of Paris comprise engineering and repairing works eonnected with the railways, simi- lar private works, foundries, and sugar refineries. Government works are the tobaeeo faetories of Gros Caillou (2000 workmen) and Reuilly (1000), the national printing establishment (1000), the mint (where money and medals are coined by a eontractor under state control), and the famous tapestry factory and dye-works of the Gobelins. The list of minor establishments is a very varied one; most of them devoted to the production of the so-called articles de

285

Paris, and carrying the principle of the division of labour to an extreme. The establishments whieh rank next to those above mentioned in the number of workmen are the ehemieal faetories, the gas-works, the printing offiees, eabinetmakers' workshops, boot faetories, tailoring establishments, hat faetories, and works for the produetion of paperhangings.

Among the workers are ineluded 189,401 women, girls, and boys, and 123,369 masters—this last a figure whieh shows how great is the number of the small establishments. The total value produeed was estimated at £134,763,717 in 1860, and must have sinee in- ereased enormously. (Compare Table 1V. p. 278.) In 1881 the

| average day’s wages paid in the petite industrte were estimated

at 4s. 5d. for the men and 2s. 5d. for the women. Sinee 1878 an inerease has taken place year by year, at least for the men. Clerks in warehouses earn about £48 per annum, shop women £32, shop girls £16, male domesties £24, and female domesties £20.

In 1882 2400 new houses were built and 1883 old houses en- larged ; on the other hand, 997 old houses were entirely demolished and 777 partially. The last offieial industrial valuation of rental is for the year 1876. At that date there were 76,129 houses eon- taining 1,038,124 separate establishments, 699,175 being used as dwelling-houses at a rental of £13,981,836, and 338,949 for in- dustrial purposes at a rental of £10,049,542.

Between 1872 and 1881 the navigation of the Seine doubled in Com- There are meree.

importanee. It has been free from all dues sinee 1880. three divisions—the navigation of the upper Seine and the Marne (above Paris), that of the lower Seine and the Oise (below Paris), and that of the Canal del’Oureq with its terminus at the La Villette basin, whenee the St Denis Canal branches off to the lower Seine and the St Martin Canal to the upper Seine.

Taste VIII.—WNavigation of the Seine.

a

Arrivals.

Lower Seine and Oise.

Upper Seine and Marne.

Tons,

803,749 1,220,015

Tons.

417,780 521,332

Average for 1872-80…….....-:+00 ‘i 1882

The goods arriving by the upper Seine are chiefly building sand, paving-stones, firewood, timber, grain, coal and coke, pyrites, ehareoal, and wines ; those by the lower Seinc, coal and coke, sand, paving-stones, wines, building materials, grain, and timber; and those by the Canal de l’Oureq, building materials. By the upper Seine Paris despatehes mainly refuse and manure; by the lower Seine, manure, pyrites, grain, and refined sugars ; by the Canal de lOureq, agricultural produce and manure. To the traffic of the river ports situated within the city must be added that of the ports along the canals, and especially that of La Villette, the third port of all Franee, judged by its eommercial activity. The follow- ing table (IX.) shows the tonnage of the merchandise that passed through each of the canals in 1882 (the same merchandise may sometimes figure on two canals, or may have also been entered for the ports within the city):—

Oureq Canal, St Denis Canal. Total for the Three

Canals.

St Martin’s Canal.

Down.

Up. | Down. Up.

Down. Up.

Tons.

424,603

Tons To

b ns. Ton

112,720 894,198

Ss. Tons.

1,017,726

361,002

Tons.

3,427,050

Tons.

618,800

The Oureq Canal brings down wood, building stones, bricks, flour, and espeeially plaster, and takes in return coal, manure, and night- soil for the Bondy manure-works. The St Denis Canal brings up eoal from Nord, Pas de Calais, Belgium, and England ; freestone from the valley of the Oise, sands from the lower Seine, wood for industrial purposes, grain, sewage for the works at Aubervilliers, colonial wares for La Villette, &c., and the most important articles taken down are sewage for Aubervilliers, and the various wares embarked at La Villette for Rouen or La Havre. Along the St Martin Canal, on the upward passage, sand, gravel, paving-stones or blocks, firewood, lime or eement, freestone, bricks, tiles, slates are discharged, and sewage especially is taken in for Aubervilliers. On the downward passage are diseharged plasters from the Oureq Canal, eoal, and stones and sand from the Oise and the Oureq. There is besides a large transit traffic.

Five of the great railway eompanies have a terminus at Paris. The “Nord” and the “ Paris, Lyons, and Mediterranean” lines have each only one station; the “Ouest” has two, St Lazare and Montparnasse; the “Est” two, one of whieh, Bastille, is only a eet station for the use of the Vineennes line and its pro- ongation; the “Orleans” two, of which one, Barriére d’Enfer, 1s restricted to the short line from Paris to Sccaux and Limouwrs.

Canal de YOureq.

Tons. Tons. Tons. Tons. Tons.

6,629 106,160 249,938 12,246 1,596,502 11,286 “193,445 329,966 10,594 2,286,638

Departures. Total Movement.

Canal de TOureg.

Lower Seine and Oise.

Upper Seine and Marne.

The following table (X.) shows the number of passengers and quantity of goods that left Paris in 1880:—

Paris-Lyons- Nord. Est. Mediterranean.

2,996,000 | 5,594,300 | 10,521,500 | 1,900,100 1,367,093 | 653,596 | 1,359,704| 601,970

Ouest. Orleans.

Passengers…....- Goods (tons).....

1,621,800 1,238,029

Some goods are registered and pay dues at the Paris eustom- house ; but many pay these dues at the frontier. The following returns (Table XI.) must therefore be eonsidered only as showing the importanee of the Paris custom-house, and not the extent of the trade of the city :—

General Trade. Speeial Trade. Quantity in Tons,

£26,228,459| (B) 490,135 £26,602,716 18,503,776 | 72,955 | 17,331,080

Value.

Quantity in Value. Tons,

(a) 484,228

Imports.

85,442

Exports. po The “special” trade is for home consumption. The duty paid on the imports was £3,774, 407.

Till 31st Deeember 1897 the J privilege of issuing bank-notes. Notes are at present issued for 1000, 500, 100, and 50 franes (£40, £20, £4, and £2); at different times there have been notes for 5000, 2000, 25, 20, and 5. The Bank of Franee, whieh has already been described in BANKING (see vol. iii. p. 387-39), has 90 braneh offiees in the provinees. In 1877 the bank received bills and stock to the value of £56,022,582 ; its advances on seeurities amounted to £15,038,072 ; and the change of bank-notes into gold caused a movement of £33,288, 000.

The other ehief finaneial establishments in Paris are the Caisse des Dépéts et des Consignations, whieh reeeives voluntary deposits or those whieh are obligatory in certain cases fixed by law; the Crédit Foneier de Franee, which gives advances to landowners on real property; the Comptoir National 7 Eseompte, whieh earries on the same branches of business as the bank, with the exeeption of the issue of notes.

Among the great private joint-stock banks must be mentioned the Soeiété Générale, the Crédit Industriel et Commereial, the Credit Lyonnais, the Banque de Paris et des Pays Bas, the Soeiété de Dépéts et Comptes Courants, the Banque d’Eseompte, &e. The Bourse or Exchange is open from noon to 8 o’elock for the negotia-

Bank of Franee has the exelusive Banks.

Post- office,

Tele- graplis,

tion of public stock, and from 8 to 6 for commercial transactions. The former is effected by means of brokers (agents de change) named by ministerial decree, and possessing the exclusive right of dealing in public stocks and bills. Brokers for the purchase and sale of goods enjoy freedom of trade, but the tribunal of commerce issucs a list of the brokers who have

taken the oath. These brokers meet to decide the priees current of the various goods.

The conseils de prud@'hommes settle differences between work- men and workmen, or between workmen and masters ; the whole initiative, however, rests with the parties. There are four of these bodies in Paris (for the metal trades, the ehemical trades, the textile trades, and miscellaneous industries), composed of an equal number of masters and men. They succeed in settling without litigation 95 per cent. of the disputes submitted to them.

The tribunal of commerce, composed of business men elected by the "notables" of their order, deals with cases arising out of com- mercial transactions ; declarations of bankruptcy are made before it; and it acts as court of appeal to the conseils de prud'hommes. In 1882, out of 75,660 cases brought into this court, judgment was given in 66,156, of which 20,696 were cases of first and 45,460 cases of last instance; 4584 cases were compromised. In the same year 1696 bankruptcies were declared, 10 applications made for rehabili- tation, and 7 such applications granted by the Paris court of appeal. Money due to bankrupt estates is paid into the Caisse des Depéts et des Consignations. In 1882 the tribunal of commerce registered 1963 deeds of partnership, 1167 dissolutions of partner- ship, 1840 home trade marks, and 175 foreign trade marks.

The chamber of commerce (under the honorary presideney of the Seine prefect) consists of twenty-one elective members, of whom a third are renewable every two years. Its duty is to present its views on the meaus of increasing and developing Parisian com- merce. The Condition des Soies, as its name indicates, has to determine exactly the quality of the silk purchased by the dealers. The Chambre Syndicale des Tissus, a non-official association, is the recognized mouthpiece of the textile industries and trade in their dealings with the public administration.

Post-office and Telegraphs.—The post and telegraph department comprised at the close of 1881 56 mixed offices, 22 post offices, 24 telegraph offices, and 862letter boxes. The postal conimunications are collected eight times per day, and conveyed to one or other of the 15 sorting-offices (bureaux de passe), which arrange them accord- ing to their destinations. All are then brought together in the General Post Office (Recette principale de la Seine),

which in 1881 sent out 277,588,000 letters or post cards and 866,816,144 lower- rate packets (objets affranchis a prix réduits), and received 188,815,000 letters and post cards, and 40,716,000 lower-rate packets. In 1882 there were issued 2,148,952 ordinary money orders, 45,823 telegraphic orders, and 240,734 international orders; 3,841,335 ordinary orders, 30,693 telegraphic orders, and 188,430 international orders were cashed. The greatest number of foreign ordcrs is from Belgium (36,835) and from Germany (35,684). Great Britain sent only 19,314 in 1881.

Telegraphic communication is effected partly by pneumatie tubes and partly by electric apparatus. The year 1881 showed a great

increase over 1880 in the matter of pneumatic missives,

TABLE XII.

1881, 1882,

| Telegram-cards within Paris …..... 619,418 846,611 Closed telegrams do. do… 335,108 515,503 Ordinary pneumatic telegrams do….) 221 084 246,664

Sue 1,715,610 | 1,608,778

Lak. 4,452,705 | 4,113,069

Do. from Paris to places outside 4,399,558 | 3,981,614 Do. passing through Paris bj

pneumatic tubes…..... 393,153 314,785

Total of telegraphic MESSAGES... se seses. 10,421,024 | 10,018, 246

The pneumatie system had at the close of 1881 64 miles of tube and 49 offices, and by 1884 it was extended as far as the fortifica- tions, and into almost all quarters of the town. The Government clectric telegraph system has 27,000 miles of double wires; the branch offices being connected with the central office by 94 wires and with the Bourse office by 58. The municipal system, used by the various departments of the local

administration, the police, the fire-brigade, &c., and for the indication of observatory time, has a length of 534 miles. The telephonic system on the Ist January 1882 had a length of 1392 miles and 2144 subscribers, — increased to 2306 miles and 2637 subscribers on the Ist of January 1883. The central telegraphie offiee has 315 instruments at work in direct communication with 22 foreign towns and 124 offices in the provinces. In 1880 it sent 11,559,200 messages, and in 1881 13,955,291, °”’(G. ME.)

Pak is

HIStory.

At its first appearance in history there was nothing to foreshow the important part which Paris was to play in Europe and in the world. An island in the Seine, now almost lost in the modern city, and then much smaller than at present, was for centuries the entire site. The sole importance of the town lay in its being the capital of a similarly insignificant Gallic people, which navigated the lower course of the Seine, and doubtless from time to time visited the coasts of Britain. So few were its inhabitants that they early put themselves under the pro- tection of their powerful neighbours the Senones, and this vassalship was the source of the political dependence of Paris on Sens throughout the Roman period, and of a religious subordination which lasted till the 17th century, The capital did not at once take the name of the Parisii, whose centre it was, but long kept that of Lucetia, Lucotetia, or Lutetia, of which Lutaéce is the generally recognized French form.

During the war of Gallic independence, after being subjugated by Cesar, who even in 53 3.c. made their territory the meeting-place of deputies from all Gaul, the Parisii took part in the great rising of the year 52, at the same time separating their cause from that of the Senones, who were held in check by Cwxsar’s lieutenant, Labienus. They joined their forces to the army commanded by an Aulercian, the old Camulogenus, which in turn was to unite with the Bellovaci to crush Labienus advancing from Sens to attack the Parisians. Having marched along the right bank of the river till opposite Lutetia, Labienus learned that the Bellovaci were in arms, and, fearing to find himself between two armies at a distance from his headquarters, he sought to get rid of Camulogenus, who, posted on the left bank,

endeavoured to bar his way. The bridges had been cut and the town burned by order of the Gallic chief. By means of a stratagem Labienus drew his opponent up the river to the district now occupied by the Jardin des Plantes, and quietly by night crossed the Seine lower down in the neighbourhood of Grenelle, near a place which Cesar calls Metiosedum, identified, but not conclusively, with Meudon, The Gauls, retracing their steps a little, met the Romans and allowed themselves to be routed and dispersed ; their leader fell in the fore-front of the battle. Still unsubdued, the Parisii were called upon by the general council assembled in Alesia to furnish eight thousand men to help in raising the siege of that city. It is doubtful whether they were able to contribute the whole of this contingent, when their powerful neighbours the Bellovaci managed to send only two thousand of the ten thousand demanded of them. This was their last effort, and after the check at Alesia they took no part in the desperate resistance offered by the Bellovaci.

Lutetia was somewhat neglected under the Roman emperors of the first centuries. Its inhabitants continued quietly carrying on their river traffic, and devoted part of their wealth to the maintenance of a great temple to Jupiter built on the site of the present cathedral of Notre Dame. It is not known at what date Christianity was introduced into the future capital of France; but it is probable, judging by the use of the title “city,” that

Lutetia was the see of one of the earliest of the bishoprics _

of Gallia Celtica. The name of the founder of the church is known, but a keen controversy, not yet settled, has recently been raised with regard to the date when the first Roman missionary, St Dionysius or Denis, reached the banks of the Seine, along with his two deacons Rusticus and Eleutherius. A pious belief, which, in spite of its antiquity, has its origin in nothing better than parochial vanity, identifies the first-named with Dionysius the

Areopagite, who was converted by St Paul at Athens, and thus takes us back to the middle of the 1st century of the Christian era. Better founded is the opinion which dates the evangelization of the city two centuries later ; the

regular list of bishops, of whom, after Denis, the most famous was St Marcel, begins about 250.

Lutetia was in some sort the cradle of Christian liberty, having been the capital, from 292 to 306, of the mild Constantius Chlorus, who put an end to persecution in Brittany, Gaul, and Spain, over which he ruled. This emperor fixed his residence on the banks of the Seine, doubtless for the purpose of watching ‘the Germans with- out losing sight of Brittany, where the Roman authority was always unstable; perhaps he also felt something of the same fancy for Lutetia which Julian afterwards expressed in his works and his letters. Be that as it may, the fact that these two princes chose to live there naturally drew attention to the city, where several buildings now rose on the left side of the river which could not have been reared within the narrow boundaries of the island. There was the imperial palace, the remains of which, a magnificent vaulted chamber, beside the Hotel de Cluny, are now known, probably correctly, as Julian’s Baths. At some distance up the river, in the quarter of St Victor, excavations in 1870 and in 1883 laid bare the foundations of the amphitheatre, which was capable of holding about 10,000 spectators, and thus suggests the existence of a population of 20,000 to 25,000 souls. Dwelling-houses, villas, atid probably also an extensive cemetery, occupied the slope of the hill of St Geneviéve.

It was at Lutetia that, in 360, Julian, already Cesar, was in spite of himself proclaimed Augustus by the legions he had more than once led to victory in Germany. The troops invaded his palace, which, to judge by various circumstances of the mutiny, must have been of great extent. As for the city itself, it was as yet but a little town (roArxv)) according to the imperial author in his Misopogon. The successive sojourns of Valentinian I. and Gratian scarcely increased its importance. The latest emperors preferred Treves, Arles, and Vienne in Gaul, and, besides, allowed Paris to be absorbed by the powerful Armorican league (c. 410). When the patricians Aetius, Mgidius, and Syagrius held almost independent sway over the small portion of Gaul which still held together, they dwelt at Soissons, and it was there that Clovis fixed himself during the ten or eleven years between the defeat of

_Syagrius (486) and the surrender of Paris (497), which opened its gates, at the advice of St Geneviéve, only after the conversion of the Frankish king. In 508, at the return of his victorious expedition against the south, Clovis made Paris the official capital of his realm—Cathedram regnt constituit, says Gregory of Tours. He chose as _ his residence the palace of the Therma, and lost no time in erecting on the summit of the hill, as his future place of interment, the basilica of St Peter and St Paul, which became not long afterwards the church and abbey of St Geneviéve. After the death of Clovis, in spite of the supremacy granted to the kingdom of Austrasia or Metz, Paris remained the true political centre of the various Frankish states, insomuch that the four sons of Clothaire, fearing the prestige which would attach to whoever of them might possess it, made it a sort of neutral town, though after all it was seized by Sigebert, king of Austrasia, Chilperic, king of Neustria (who managed to keep possession for some time, and repaired the amphi- theatre), and Gontran, king of Burgundy. The last sovereign had to defend himself in 585 against the pre- tender Gondowald, whose ambition aspired to uniting the whole of Gaul under his dominion, and marching on Paris to make it the seat of the half barbarian half

Roman administration of the kingdom of which he had dreamed.

Numerous calamities befell Paris from 586, when a terrible conflagration took place, to the close of the Merovingian dynasty. During a severe famine Bishop Landry sold the church plate to alleviate the distress of the people, and it was probably he who, in company with St Eloi (Eligius), founded the Hétel-Dieu. The kings in the long run almost abandoned the town, especially when the Austrasian influence under the mayors of the palace tended to shift the centre of the Frankish power towards the Rhine.

Though the Merovingian period was for art a time of the deepest decadence, Paris was nevertheless adorned and enriched by pious foundations. Mention has already been made of the abbey of St Peter, which became after the death of Clovis the abbey of St Genevieve. On the same side of the river, but in the valley, Childebert, with the assistance of Bishop St Germain, founded St Vincent, known a little later as St Germain-des-Prés, which was the necropolis of the Frank kings before St Denis. On the right bank the

same king built St Vincent le Rond (afterwards St Germain lAuxerrois), and in La Cité, beside the cathedral of St Etienne, the basilica of Notre Dame, which excited the admiration of his contemporaries and in the 12th century obtained the title of cathedral. Various monasteries were erected on both sides of the river, and served to group in thickly-peopled suburbs the popula- tion, which had grown too large for the island.

The first Carlovingian, Pippin the Short, occasionally lived at Paris, sometimes in the palace of Julian, sometimes in the old palace of the Roman governors of the town, at the lower end of the island; the latter ultimately became the usual residence. Under Charlemagne Paris ceased to be capital; and when feudal France was constituted under Charles the Bald it was liberally bestowed, like any ordinary place, on mere counts or dukes. But the dangers of the Norman invasion attracted general attention to the' town, and showed that its political importance could no longer be neglected. When the suburbs were pillaged and burned by the pirates, and the city regularly besieged in 885, Paris was heroically defended by its " lords," and the emperor Charles the Fat felt bound to hasten from Ger- many to its relief. The pusillanimity which he showed in purchasing the retreat of the Normans was the main cause of his deposition in 887, while the courage displayed by Count Eudes procured him the crown of France. Robert, Eudes's brother, succeeded him; and, although Robert's son Hugh the Great was only duke of France and count of Paris, his power counterbalanced that of the last of the Carlovingians, shut up in Laon as their capital.

With Hugh Capet in 987 the capital of the duchy of France definitively became the capital of the kingdom, and in spite of the frequent absence of the kings, several of whom preferred to reside at Orleans, the town continued to increase in size and population, and saw the develop- ment of those institutions which were destined to secure its greatness. Henry I. founded the abbey of St Martin- des-Champs, Louis the Stout that of St Victor, the mother-house of an order, and a nursery of literature and theology. Under Louis VII. the royal domain was the scene of one of the greatest artistic revolutions recorded in history: the Roman style of architecture was exchanged for the Pointed or Gothic, of which Suger, 'n his reconstruction of the basilica of St Denis, exhibited the earliest type. The capital could not remain aloof from this movement: several sumptuous

buildings were erected; the Roman choir of St Germain-des-Prés was thrown down to give place to another more spacious and elegant ; and when, in 1163, Pope Alexander had solemnly consecrated it, he was invited by Bishop Maurice de

Sully to lay the first stone of Notre Dame de Paris, a cathedral on a grander scale than any previously under- taken. Paris still possesses the Roman nave of St Germain-des-Prés, preserved when the building was rebuilt in the 12th century; the Pointed choir, consecrated in 1163; and the entire cathedral of Notre Dame, which, completed sixty years later, underwent various modifica- tions down to the beginning of the 14th century. The sacristy is modern ; the site previous to 1831 was occupied by the episcopal palace, also built by Maurice de Sully, who by a new street had opened up this part of the island.

Philip Augustus may be considered the second founder of Paris. He seldom quitted it save for his military expeditions, and he there built for himself, near St Ger- main l'Auxerrois, the Louvre, the royal dwelling par excel- lence, whose keep was the official centre of feudalism. He created or organized a regular system of administration with its headquarters at Paris; and under his patronage the public lectures delivered at Pré-aux-Cleres were regu- lated and grouped under the title of a university in 1200.

This university, the most famous and flourishing in Christendom, considerably augmented the local population, and formed as it were a new town on the left side of the river, where the important abbeys of St Geneviéve, St Germain-des-Prés, and St Victor, and a vast Carthusian monastery already stood. Colleges were erected to receive the students of the different countries, and became the great meeting-place of the studious youth of all Europe. Neturning to their native lands, where rank and honours awaited them, the pupils of the Paris university spread abroad the name and prestige of France; and sometimes they took home with them, or afterwards sent for, French artists, to whose wanderings must be ascribed the astonishing propagation in other countries of Pointed architecture.

The right side of the river, where commerce and in- dustry had taken up their abode, and where the Louvre, the abbey of St Martin, and a large number of secondary religious establishments were already erected, became a centre of activity at least as important as that on the left. The old suburbs, too, were now incorporated with the town and enclosed in the new line of fortifications con- structed by Philip Augustus, which, however, did not take in the great abbeys on the left side of the river, and thus obliged them to build defensive works of their own.

Philip Augustus issued from the Louvre a celebrated order that the streets of the town should be paved. Not far from lis palace, on the site of the present Halles Cen- trales, he laid out an extensive cemetery and a market-place, which both took their name from the Church of the Innocents, a building of the same reign, destroyed at the Revolution. Fountains were placed in all the quarters. As for the lighting of the town, till the close of the 16th century the only lamps were those in front of the madonnas at the street corners. But the first “illumination” of Paris occurred under Philip Augustus: on his return from a victorious expedition to Flanders in 1214 he was welcomed by the Parisians as a conqueror; and the public rejoicings lasted for seven days, “interrupted by no night,” says the chronicler, alluding to the torches and lamps with which the citizens lighted up the fronts of their houses. Ferrand, count of Flanders, the traitor vassal, was dragged behind the king to the dungeons of the Louvre, whose doors closed on him for ever,

In 1226 there was held at Paris a council which, by excommunicating Raymond VIL, count of Toulouse, helped to prepare the way for the most important treaty which had as yet been signed in the capital. By this treaty (12th April 1229) Blanche of Castile obtained from Raymond VII. a great part of his possessions, while the

remainder was secured to the house of Capet through the marriage of Alphonse of Poitiers, brother of St Louis, with Jeanne, the last natural heiress of Languedoc,

In affection for his capital St Louis equalled or even surpassed his grandfather Philip, and Paris reciprocated his goodwill. The head of the administration was at that time the provost of Paris, a judiciary magistrate and police functionary whose extensive powers had given rise to the most flagrant abuses. Louis IX. reformed this office and filled it with the judge of greatest integrity to be found in his kingdom. This was the famous Etienne Boileau, who showed such vigilance and uprightness that the capital was completely purged of evil-doers ; the sense of security thus produced attracted a certain number of new inhabit ants, and, to the advantage of the public revenue, increased the value of the trade. It was Etienne Boileau who, by the king's express command, drew up those statutes of the commercial and industrial guilds of Paris which, modified by the necessities of new times and the caprice of princes, remained in force till the Revolution.

St Louis caused a partial restoration of St Germain PAuxerrois, his parish church (completed in the 15th century, and deplorably altered under Louis XV.) ; and, besides preferring the palace of La Cité to the Louvre, he entirely rebuilt it, and rendered it one of the most comfort- able residences of his time. Of this edifice there still remain, among the buildings of the present Palais de Justice, the great guard-room, the kitchens with their four enormous chimneys, three round towers on the quay, and, one of the marvels of the Middle Ages, the Sainte Chapelle, erected in 1248 to receive the crown of thorns sent from Constantinople. This church, often imitated during the 13th and 14th centuries, is like an immense shrine in open work ; its large windows contain admirable stained glass of its own date, and the basements are adorned inside with pictures recently restored. It has a lower story ingeni- ously arranged, which served as a.chapel for the palace servants. The Sainte Chapelle was designed by Pierre de Montereau, one of the most celebrated architects of his time, to whom is attributed another marvel still extant, the refectory of the abbey of St Martin, now occupied by the library of the Conservatoire des Arts et des Métiers. This incomparable artist was buried in the abbey of St Germain- des-Prés, where, too, he had raised magnificent buildings now no longer existing. Under St Louis, Robert de Sorbon, a common priest, founded in 1253 an unpretending theological college which afterwards became the celebrated faculty of the Sorbonne, whose decisions were well-nigh as authoritative as those of Rome.

The capital of France had but a feeble share in the communal movement which in the north characterizes the 11th, 12th, and 13th centuries, Placed directly under the central power, it was never strong enough to force con- cessions; and in truth it did not claim them, satisfied with the advantages of all kinds secured for it by its political position and its university, And, besides, the privileges which it did enjoy, while they could be revoked at the king's pleasure, were of considerable extent. Its inhabit- ants were not subjected to forced labour or arbitrary imposts, and the liberty of the citizens and their com- merce and industry were protected by wise regulations. The university and all those closely connected with it pos- sessed the fullest rights and liberties. There was a munt- cipal or bourgeois militia, which rendered the greatest service to Philip Augustus and St Louis, but afterwards became an instrument of revolt. The communal adminis- tration devolved on échevins or jurés, who, in conjunction with the notables, chose a nominal mayor called provost of the merchants (prévét des marchands), The powers of this official had been grievously curtailed in favour of the

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provost of Paris, and his lieutenants named by the sovereign. His main duties were to regulate the price of provisions and to control the incidence of taxation on merchandise. He was the chief inspector of bridges and ubli: wells, superintendent of the river police, and com- mander of the guard of the city walls, which it was also his duty to keep in repair. And, finally, he had juris- diction in commercial affairs until the creation of the consular tribunals by L'H6pital (Lalanne, Dict. historique de la France). The violent attempts made by Etienne Marcel in the 14th century, and those of the communes of 1793 and 1871, showed what reason royalty had to fear too great an expansion of the municipal power at Paris. The town council met in the 13th and 14th centuries in an unpretending house on Ste Geneviéve, near the city walls on the left side of the river. The municipal assem- plies were afterwards held near the Place de Gréve, on the right side of the river, in the " Maison aux Piliers," which Francis I. allowed to be replaced by an imposing hétel de ville.

two Valois did little for their capital. Philip the Fair, however, increased its political importance by making it the seat of the highest court in the kingdom, the parle- ment, which he organized between 1302 and 1304, and to which he surrendered a part of his Cité palace. Under the three sons of Philip the Fair, the Tour de Nesle, which stood opposite, on the site now occupied by the buildings of the Institute, was the scene of frightful orgies, equally celebrated in history and romance. One of the queens who, if the chronicles are to be trusted, took part in these explated her crimes in Chateau-Gaillard, where she was strangled in 1315 by order of her husband, Louis X. During the first part of the war of the Hundred Years, Paris escaped being taken by the English, but felt the effects of the national misfortunes. Whilst destitution excited in the country the revolt of the Jacquerie, in the city the miseries of the time were attributed to the vices of the feudal system, and the citizens seemed ready for insurrection. The provostof the merchants, Etienne Marcel, equally endowed with courage and intellect, sought to turn this double movement to account in the interest of the

Paris in 1880.

municipal liberties of Paris and of constitutional guarantees. The cause which he supported was lost through the violence of his own acts. Not content with having massacred two ministers under the very eyes of the dauphin Charles, who was regent whilst his father John lay captive in London, he joined the Jacquerie, and was not afraid to call into Paris the king of Navarre, Charles the Bad, a notorious firebrand who at that time was making common cause with the English, Public sentiment, at first favourable to Marcel’s schemes, shrank from open treason. A watch was set on him, and, at the moment when, having the keys of the town in his possession in virtue of his office, he was pre- paring to open one of the gates, he was assassinated by order of Jean Maillard, one of the heads of the milice, on the night of July 31, 1358. Marcel had enlarged Philip

Augustus’s line of fortifications on the right side of the river, and had commenced a new one.

When he became king in 1364, Charles V. forgot the outrages he had suffered at the hands of the Parisians during his regency. He robbed the Louvre to some extent of its military equipment, in order to make it a convenient and sumptuous residence; his open-work staircases and his galleries are mentioned in terms of the highest praise by writers of the time. This did not, however, remain always his favourite palace ; having built or rebuilt in the S¢ Antoine quarter the mansion of St Paul or St Pol, he was particularly fond of living in it during the latter part of his life, and it was there that he died in 1380. It was Charles V. who, in conjunction with the provost of the

hants, Hugues Aubriot, erected the famous Bastille merchants g ae

to protect the St Antoine gate. A library which he founded—a rich one for the times—became the nucleus of the national library. With the exception of some of: the upper portions of the Sainte Chapelle, which were altered or reconstructed by this prince or his son Charles VL, there are no remains of the buildings of Charles V.

The reign of Charles VI. was as disastrous for the city as that of his father had been prosperous. From the very accession of the new king, the citizens, who had for some time been relieved by a great reduction of the taxes, and had received a promise of further alleviation, found them- selves subjected to the most odious fiscal exactions on the part of the king’s uncle, who was not satisfied with the well- stored treasury of Charles V., which he had unscrupulously pillaged. Aubriot, having ventured to remonstrate, was thrown into prison as a heretic, and in 1382 a riot took place for the purpose of delivering the provost and seizing the fiscal agents. Preoccupied with his expedition against the Flemings, Charles VI. delayed putting down the revolt, and for the moment remitted the new taxes. On his victorious return on 10th January 1383, the Parisians in alarm drew up their forces in front of the town gates under the pretext of showing their sovereign what aid he might derive from them, but really in order to intimidate him. They were ordered to retire within the walls and to lay down their arms, and they obeyed. The king and his uncles, having destroyed the gates, made their way into Paris as into a besieged city ; and with the decapitation of

Desmarets, one of the most faithful servants of the crown, who perished at the age of seventy, began a series of bloody executions. Ostensibly through the intercession of the regents an end was put to that species of severities, a heavy fine being substituted, much larger in amount than the annual value of the abolished taxes. The municipal administration was suspended for several years, and its functions bestowed on the provost of Paris, a magistrate nominated by the crown.

The calamities which followed were due to the weakness |

and incapacity of the Government, given over because of the madness of Charles VI. to the intrigues of a wicked queen and of princes who brought the most bloodthirsty passions to the service of their boundless ambition. First came the rivalry between the dukes of Orleans and Burgundy, brought to an end in 1407 by the assassination of the former in Rue des Francs-Bourgeois. Next followed the relentless struggle for supremacy between two hostile parties, the Armagnacs on one side, commanded by Count Bernard of Armagnac (who for a brief period had the title of constable), and supported by the nobles and burgesses, and on the other side the Burgundians, depending on the common people, and recognizing the duke of Burgundy (John the Bold) as their head. The mob was headed by a skinner at the Hotel-Dieu called Jean Caboche, and hence the name Cabochians given to the Burgundian party. They became masters of Paris in 1412 and 1413; but so violent were their excesses that the most timid rose in revolt, and the decimated bourgeoisie managed by a bold stroke to recover possession of the town. The Armagnacs again entered Paris, but their intrigues with England and their tyranny rendered them odious in their turn ; the Burgundians were recalled in 1418, and returned with Jean Caboche and a formidable band of pillagers and assassins. Perrinet Leclerc, son of a bourgeois guard, secretly opened the gates to them one night in May. The king resided in the Hétel St Paul, an unconscious spectator of those savage scenes which the princes Louis and J ohn, successively dauphins, were helpless to prevent.

The third dauphin, Charles, afterwards Charles VAL, managed to put an end to the civil war, but it was by a crime as base as it was impolitic—the assassination of

John the Bold on the bridge of Montereau (1419). Next year a treaty, from the ignominy of which Paris happily escaped, gave a daughter of Charles VI. to Henry V. of England, and along with her, in spite of the Salic law, the crown of France. The king of England made his entry into Paris in December 1420, and was there received with a solemnity which ill concealed the misery and real con- sternation of the poor people crushed by fifteen years of murders, pillage, and famine. Charles VI. remained almost abandoned at the Hétel St Paul, where he died in 1422, whilst his son-in-law went to hold a brilliant court at the Louvre and Vincennes. Henry V. of England also died in 1422. His son Henry VI, then one year old, came to Paris nine years later to be crowned at Notre Dame, and the city continued under the government of the duke of Bedford till his death in 1435.

The English rule was a mild one, but it was not signal- ized by the execution of any of those works of utility or ornament so characteristic of the kings of France. The choir of St Severin, however, shows a style of architec. ture peculiarly English, and Sauval relates that the duke of Bedford erected in the Louvre a fine gallery decorated with paintings. Without assuming the mission of deliver- ing Paris, Joan of Arc, remaining with Charles VIL. after his coronation at Rheims, led him towards the capital; but the badly conducted and abortive enterprise almost proved fatal to the Maid of Orleans, who was severely wounded at the assault of the gate of St Honoré on the 8th September 1429. The siege having been raised, Charles awaited the invitation of the Parisians themselves upon the defection of the Burgundians and the surrender of St Denis. The St Jacques gate was opened by the citizens of the guard to the constable Arthur of Richemont on April 13, 1436 ; but the solemn entry of the king did not take place till November 12 of the following year; subsequently occupied by his various expeditions or attracted by his residences in Berry or Touraine, he spent but little time in Paris, where he retired either to the Hétel St Paul or to a neighbouring palace, Les Tournelles, which had been acquired by his father.

Louis XI. made equal use of St Paul and Les Tournelles, but towards the close of his life he immured himself at Plessis-les-Tours. It was in his reign,

in 1469, that the first French printing press was set up in the Sorbonne. Charles VIII. scarcely left Plessis-les-Tours and Ambéise except to go to Italy; Louis XII. alternated between the castle at Blois and the palace of Les Tournelles, where he died January 1, 1515.

Francis I. lived at Chambord, at Fontainebleau, at St Germain, and at Villers-Cotterets; but he proposed to form at Paris a residence in keeping with the taste of the Renaissance. Paris had remained for more than thirty years almost a stranger to the artistic movement begun between 1498 and 1500, after the Italian expedition.

‘Previous to 1533, the date of the commencement of the

Hotel de Ville and the church of St Eustache, Paris did not possess, apart from the “ Gourt of Accounts,” any important building in the new style. Between 1527 and 1540 Francis I. demolished the old Louvre, and in 1541 Pierre Lescot began a new palace four times as large, which was not finished till the reign of Louis XIV. The buildings were not sufficiently advanced under Henry IL. to allow of his leaving Les Tournelles, where in 1559 he died from a wound received at a tournament. His widow, Catherine de’ Medici, immediately caused this palace to be demolished, and sent her three sons—Francis IL, Charles IX., and Henry III.—to the unfinished Louvre. Outside the line of the fortifications she laid the foundations of the Chateau des Tuileries as a residence for herself.

Of the three brothers, it was Charles IX. who resided

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most at the Louvre; it was there that in 1572 he signed the order for the massacre of St Bartholomew. Henry III. remained for the most part at Blois,

and hardly came to Paris except to be witness of the power of his enemies the Guises.

Taking advantage of the absence of the kings, the League had made Paris a centre of opposition. The municipal militia were restored and reorganized ; each of the sixteen quarters or arrondissements had to elect a deputy for the central council, which became the council or rather faction of The Sixteen, and for four years, from 1587 to 1591, held the city under a yoke of iron. Henry III, having come to the Louvre in 1588, unwillingly received there the duke of Guise, and while endeavouring to take measures for his own protection provoked a riot known as the Day of the Barricades. It was with difficulty that he escaped from his palace, which at that time had no communication with the country, and which Henry IV. afterwards proposed to unite with the Tuileries in order to provide a sure means of escape in case of need.

When, after the murder of the duke of Guise at Blois at the close of 1588, Henry III. desired to return to Paris, he was not yet master of the city, and was obliged to besiege it in concert with his presumptive heir the king of Navarre. The operations were suddenly interrupted on August 1, 1589, by the assassination of the king, and Henry IV. carried hisarms elsewhere. He returned with his victorious forces in 1590. ‘This second siege lasted more than four years, and was marked by terrible suffering, produced by famine and the tyranny of The Sixteen, who were supported by the intrigues of the king of Spain and the violent harangues of the preachers. Even the conversion of the king did not allay the spirit of fanaticism, for the king’s sincerity was suspected, and the words (which history, however, fails to substantiate), “Paris is surely worth a mass,” were attri- buted to him. But after the coronation of the king at Chartres the commonalty of Paris, weary of intriguing with strangers and Leaguers, gave such decided expression to its feelings that those of its leaders who had kept aloof or broken off from the faction of The Sixteen attached them- selves to the parlement, which had already evaded the ambitious designs of the king of Spain; and after various negotiations the provost of the merchants, L’Huillier, offered the keys of the city to Henry IV. on March 22, 1594. The king met no resistance except on the part of a company of German landsknechts, which was cut in pieces, and the students of the university, who, steeped in the doctrines of

the League, tried to hold their quarter against the royal troops, but were dispersed. The Spanish soldiers who had remained in the town decamped next day.

Henry IV., who carried on the building of the Louvre, was the last monarch who occupied it as a regular residence. Attempts on his life were made from time to time, and at last on May 14, 1610, he fell under Ravaillac's knife near the market-house in Rue de Ja Ferronnerie.

Whether royalty gave it the benefit of its presence or not, Paris continued all the same to increase in political importance and in population. Here is the picture of the city presented about 1560 by Michel de Castelnau, one of the most celebrated chroniclers of the 16th century :—

"Paris is the capital of all the kingdom, and one of the most famous in the world, as well for the splendour of its parlement (which is an illustrious company of thirty judges attended by three hundred advocatcs and more, who have reputation in all Christendom of being the best seen in human laws and acquainted With justice) as for its faculty of theology and for the other tongucs and sciences, which shine more in this town than in any other in the world, besides the mechanic arts and the marvellous traffic which render it very populous, rich, and opulent; in such sort that

the other towns of France and all the magistrates and subjects have their eyes directed thither as to the model of their decisious

and their political administrations."

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Castelnau spoke rather as a statesman and a magistrate, and he did not look close enough to see that the university was beginning to decline. The progress of the sciences somewhat lessened the importance of its classes, too specially devoted to theology and literature ; the eyes of men were turned towards Italy, which was then considered the great centre of intellectual advance; the colleges of the Jesuits were formidable rivals; the triumphs of Protestantism deprived it of most of the students who used to flock to it from England, Germany, and Scandinavia; and finally the

unfortunate part it played in political affairs weakened its influence so much that, after the reign of Henry IV., it no longer sent its deputies to the states-general.

If the city on the left side of the river neither extended its circuit nor increased its population, it began in the 16th century to be filled with large mansions (hétels), and its com- munications with the right bank were rendered easier and more direct when Henry IV. constructed across the lower end of the island of La Cité the Pont Neuf, which, though retaining its original name, is now the oldest bridge in Paris. On the right side of the river commerce and the progress of centralization continued to attract new inhabitants, and old villages become suburbs were enclosed within the line of a bastioned first enceinte, the ramparts of Etienne Marcel being, however, still left untouched. Although Louis XI, except during his minority, rarely stayed much in Paris, he was seldom long absent from it. His mother, Mary de' Medici, built the palace of the Luxembourg, which, after being extended under Louis Philippe, became the seat of the senate.

Louis XIII. finished, with the exception of the eastern front, the buildings enclosing the square court of the Louvre, and carried on the wing which was to join the palace to the Tuileries. Queen Anne of Austria founded the Val de Grace, the dome of which, afterwards painted on the interior by Mignard, remains one of the finest in Paris. Richelieu built for himself the Palais Royal since restored, and rebuilt the Sorbonne, where now stands his magnificent tomb by Girardon. The island of St Louis above La Cited, till then occupied by gardens and meadows, became a populous parish, whose streets were laid out in straight lines, and whose finest houses still date from the 17th century. Building also went on in the Quartier du Marais (quarter of the marsh); and the whole of Place Royale (now Place des Vosges), with its curious arcaded galleries, belongs to this period. The church of St Paul and St Louis was built by the Jesuits beside the ruins of the old Hétel St Paul ; the church of St Gervais received a fagade which has be- come in our time too famous. St Kitienne du Mont and St Eustache were completed (in the latter case with the exception of the front). The beautiful Salle des Pas-Perdus (Hall of Lost Footsteps) was added to the Palais de Justice. Besides these buildings and extensions Paris was indebted to Louis XILL and his minister Richelieu for three 1mport- ant institutions—the royal printing

press in 1620, the Jardin des Plantes in 1626, and the French Academy in 1635. The bishopric of Paris was separated from that of Seng and erected into an archbishopric in 1623.

As memorials of Mazarin Paris still possesses the Collége des Quatre-Nations, erected with one of his legacies immedi- ately after his death, and since appropriated to the Institute, and the palace which, enlarged in our own time, now accommodates the national library.

The stormy minority of Louis XIV. was spent at St Germain and Paris, where the court was held at the Palais Royal. The intrigues of the prince of Condé, Cardinal de Retz, and (for a brief space) Turenne resulted in a siege of Paris, during which more epigrams than balls were fired off ; but the cannon of the Bastille, discharged by order of Mademoiselle de Montpensier, enabled Condé to enter the

city. Bloody riots followed, and came to an end only with the exhaustion of the populace and its voluntary submission to the king. Though Louis XIV. ceased to stay in Paris after he grew up, he did not neglect the work of embellish- ment. On the site of the fortifications of Etienne Marcel, which during the previous hundred years had been gradually disappearing, he laid out the line of boulevards connecting the quarter of the Bastille with that of the Madeleine. Though he no longer inhabited the Louvre (and it never was again the seat of royalty), he caused the great colonnade to be constructed after the plans of Claude Perrault. This immense and imposing fagade, 548 feet long, has the defect of being quite out of harmony with the rest of the build- ing, which it hides instead of introducing. The same desire for effect, altogether irrespective of congruity, appears again in the observatory erected by the same Perrault, without the smallest consideration of the wise suggestions made by Cassini. The Place Vendéme, the Place des Victoires, the triumphal gates of St Denis and

St Martin, and several fountains, are also productions of the reign of Louis XIV. The hospital of La Salpétriére, with its majestically simple dome, was

finished by Libéral Bruant. The Hotel des Invalides, one of the finest institu- tions of the Grand Monarque, was also erected, with its chapel, between 1671 and 1675, by Bruant; but it wag reserved for the architect Hardouin Mansart to give to this imposing edifice a complement worthy of itself: it was he who raised the dome, admirable alike for its proportions, for the excellent distribution of its ornaments, and for its gilded lantern, which rises 344 feet above the ground, “Private persons,” says Voltaire, “in imitation of their king, raised a thousand splendid edifices. The number increased so greatly that from the neighbourhood of the Palais Royal and of St Sulpice there were formed in Paris two new towns much finer than the old one.” All the aristocracy had not thought fit to take up their residence at Versailles, and the great geniuses of the century, Corneille, Racine, La Fontaine, Moliére, Madame de Sévigné, had their houses

Paris in 1615.

in Paris ; there also was the Hétel de Rambouillet, so famous in the literary history of the 17th century.

The halls of the Palais Royal during the minority of Louis XV. were the scene of the excesses of the regency ; later on the king from time to time resided at the Tuileries, which henceforward came to be customarily regarded as the official seat of the monarchy. To the reign of Louis XV. are due the rebuilding of the Palais Royal, the “Place” now called De la Concorde, the military school, the greater part of the church of Ste Genevidve or Panthéon (a masterpiece of the architect Soufilot), the church of St Roch, the palace of the Elysée (now the resi- dence of the president of the republic), the Palais Bourbon (with the exception of the facade) now occupied by the 8 a : ee ‘- the mint, a majestic and scholarly

rk by the architect Antoin ildi Sie tag Ao tence e, as well as the rebuilding

Louis XVI. finished or vigorously carried on the works

begun by his grandfather. He did not come to live in Paris till compelled by the Revolution. That historical movement began indeed at Versailles on June 17, 1789, when the states-general were transformed into a con- stituent assembly; but the first act of violence which proved the starting-point of all

its excesses was performed in Paris on July 14, 1789, when Paris inaugurated, with the capture of the Bastille, its “ national guard,” organized and then commanded by the celebrated La Fayette. At the same time the assassination of the last provost of the merchants, Jacques de Flesselles, gave the opportunity of establishing, with more extended powers, the “mairie” (mayoralty) of Paris, which was first occupied by Bailly, and soon became, under the title of commune, a political power capable of effectively counterbalancing the central authority.

Paris had at that time once more outgrown its limits. The quarter on the left side of the river had more than

doubled its extent by the accession of the great monasteries, the faubourgs of St Germain and St Marceau, the Jardin des Plantes, and the whole of Mont Ste Geneviéve. The line of the new enceinte is still marked by a circuit of boulevards passing from the Champs de Mars at Pont @Austerlitz by Place de l’Enfer and Place d’Italie. Similar enlargements, also marked out by a series of boulevards, incorporated with the town on the right side the faubourgs of St Antoine and Poissonniére and the quarters of La Chaussée d’Antin and Chaillot. In 1784 was begun, instead of a line of fortifications, a simple customs-wall, with sixty propylea or pavilions in a heavy but characteristic style, of which the finest are adorned with columns or pilasters like those of Paestum. In front of the Place du Trone (now Place de la Nation), which formed as it were a facade for Paris on the east side, there were erected two lofty rostral columns bearing the statues of Philip Augustus and St Louis. Towards the west, the city front was Place Louis XV. (Place de la Concorde), preceded by the magni- ficent avenue of the Champs Elysées. Between the barriers of La Villette and Pantin, where the highways for Flanders and Germany terminated, was built a monumental rotunda flanked on the ground floor by four peristyles arranged as a Greek cross, and in the second story lighted by low arcades supported by columns of the Pstum type. None of these works were completed till the time of the empire. It was also in the latter part of the reign of Louis XIV., and under the first republic, that the quarter of La Chauss¢e d’Antin was built.

It does not enter into the plan of the present sketch to narrate the history of Paris during the Revolutionary period ; that is the history rather of France, and to a certain extent of the whole world (see France). During the consulate hardly anything of note took place at Paris except the explosion of the infernal machine directed against Bonaparte on December 24, 1800.

The coronation of Napoleon by Pope Pius VII. was celebrated in Notre Dame on December 2, 1804. Eight years later, during the Russian campaign, the conspiracy of General Malet, happily suppressed, was on the point of letting loose on all France a dreadful civil war. The empire, however, was then on the wane, and Paris was witness of its fall when, after an heroic resistance of two days, the city was obliged to surrender to the allies on March 30, 1814.

After the return of the Bourbons, Paris had to submit to a treaty more humiliating than the capitulation. Already in 1763 Louis XV. had signed in his capital the treaty with England known as the shameful (/Zonteuse), by which he surrendered a great part of the American and Indian colonies, and notably Canada. That of May 30, 1814, was more truly disastrous, since it dismembered the mother- country, cancelled almost all the conquests of the republic and the empire, and lessened the military strength of France by robbing it of half its fleet. And worse even than this was the treaty of 28th November 1815, which not only suppressed the slight accessions of territory re- cognized by the treaty of 1814, and doomed to demolition the fortifications of Huningue, but exacted a war indemnity of 700 million francs (£28,000,000), and demanded the maintenance in seven departments of 150,000 soldiers of the allied army until the payment of the entire sum. _ Under Louis XVIII. the only event of note that occurred in Paris was the assassination of the duke of Berry by Louvel, February 13,1820. Ten years later the revolution of 1830, splendidly commemorated by the Column of July in Place de la Bastille, put Charles X. to flight and inaugur- ated the reign of Louis Philippe, a troublous period which was closed by the revolution of 1848 and a new republic. It was this reign, however, that surrounded Paris with

bastioned fortifications with ditches and detached forts. The republic of 1848 brought no greater quiet to the city than did the reign of Louis Philippe. insurrection was that of June 23 to 26, 1848, distinguished by the devotion and heroic death of the Archbishop Affre. It was quelled by General Cavaignac, who then for some months held the executive power. next became president of the republic, and after dissolving the chamber of deputies on December 2, 1851, caused himself to be proclaimed emperor just a year later.

The most terrible

Prince Louis Napoleon

The second empire completed that material transforma- tion of Paris which had already been begun at the fall of the ancient monarchy. First came numerous cases of destruction and demolition caused by the suppression of the old monasteries and of many parish churches. A number of medizval buildings, civil or military, were cleared away for the sake of regularity of plan and improvements in the public streets, or to satisfy the taste of the owners, who thought more of their comfort or profit than of the historic interest of their old mansions or houses. Destructions of this kind, in some instances of advantage, in other cases without excuse, still continue with more or less frequency. It was under the first empire that the new series of improvements were inaugurated which have made Paris a modern city. Napoleon began the Rue de Rivoli, built along this street the wing intended to connect the Tuileries with the Louvre, erected in front of the court of the Tuileries the triumphal arch of the Carrousel, in imitation of that of Septimius Severus at Rome. In the middle of the Place Vendéme was reared, on the model of Trajan’s column, the column of the grand army, surmounted by the statue of the emperor. To immortalize this same grand army he ordered

_from the architect Pierre Vignon a Temple of Victory, which

without changing the form of its Corinthian peristyle has become the church of the Madeleine; the entrance to the avenue of the Champs Elysées was spanned by the vast triumphal arch De VEtoile (of the star), which owes its celebrity not only to its colossal dimensions and its magnifi- cent situation,

but also to one of the four subjects sculp- tured upon its faces—the Chant du Depart or Marseillaise, one of the masterpieces of Rude and of modern sculpture. Another masterpiece was executed by David of Angers, the pediment of the Panthéon, not less famous than Soufilot's dome. 'The museum of the Louvre, founded by decree of the Convention on July 27, 1793, was organized and con- siderably enlarged ; that of the Luxembourg was created in 1805, but was not appropriated exclusively to modern artists till under the Restoration. The Conservatoire des Arts et Métiers, due to the Convention, received also con- siderable additions in the old priory or abbey of St Martin des Champs, where the council of the Five Hundred had installed it in 1798.

Under the Restoration and under the government of July many new buildings were erected; but, with the exception of the Bourse, constructed by the architects Brongniart and Labarre, and the colonnade of the chamber of deputies, these are of interest not so much for their size as for the new artistic tendencies affected in their architecture. People had grown weary of the eternal Graeco-Roman compilations rendered fashionable by the Renaissance, and reduced under the empire to mere imitations, in producing which all inspiration was repressed. The necessity of being rational in architecture, and of taking full account of practical wants, was recognized ; and more suggestive and plastic models were sought in the past. These were to be found, it was believed, in Greece; and in consequence the government under Louis Philippe saw itself obliged to found the French school at Athens, in order to allow young artists to study their favourite types on the spot. In the case of churches it was deemed judicious to revive the

Christian basilicas of the first centuries, as at Notre Dame de Lorette and St Vincent de Paul; and a little later to bring in again the styles of the Middle Ages, as in the ogival church of Ste Clotilde.

Old buildings were also the object of labours more or less important. The Place de la Concorde was altered in various ways, and adorned with eight statues of towns and with two fountains; on October 25, 1836, the Egyptian obelisk, brought at great expense from Luxor, was erected in the centre. The general restoration of the cathedral of Notre Dame was voted by the

Chamber in 1845, and en- trusted to Viollet-le-Duc; and the palace of the Luxembourg and the Hétel de Ville were considerably enlarged at the same time, in the style of the existing cdifices.

But the great transformer of Paris in modern times was Napoleon III. To him or to his reign we owe the Grand Opéra, the finest theatre in the world, and the masterpiece of the architect Garnier; the new Hétel-Dieu; the finishing of the galleries which complete the Louvre and connect it with the Tuileries ; the extension of the Palais de Justice and its new front on the old Place Dauphine; the tribunal of commerce ; the central markets; several of the finest railway stations; the viaduct at Auteuil; the churches of La Trinité, St Augustin, St Ambroise, St Francois Xavier, Belleville, Ménilmontant, &c. For the first inter- national Paris exhibition (that of 1855) was constructed the “palace of industry”; the enlargement of the national library was commenced ; the museum of French antiquities was created by the savant Du Sommerard, and installed in the old “hétel” built at the end of the 15th century for the abbots of Cluny.

All this is but the smallest part of the memorials which Napoleon IIT. left of his presence. Not only was the city traversed in all directions by new thoroughfares, and sumptuous houses raised or restored in every quarter, but the line of the fortifications was made in 1859 the limit of the city. The area was thus doubled, extending to 7450 hectares or 18,410 acres, instead of 3402 hectares or 8407 acres. It was otherwise with the population ; to the 1,200,000 inhabitants which Paris possessed in 1858 the incorporation of the suburban zone only added 600,000.

Paris had to pay dear for its growth and prosperity under the second empire. This Government, which, by straightening and widening the streets, thought it had effectually guarded against the attempts of its internal enemies, had not sufficiently defended itself from external attack, and at the first reverses of 1870 Paris found itself prepared to overthrow the empire, but by no means able to hold out against the approaching Prussians.

The two sieges of Paris in 1870-71 are among the most dramatic episodes of its history. The first siege began on September 19, 1870, with the occupation by the Germans of the heights on the left side of the river and the capture of the unfinished redoubt of Chatillon. Two days later the

investment was complete. General Trochu, head of the French Government and governor of the city, had under his command 400,000 men—a force which ought to have been able to hold out against the 240,000 Germans by whom it was besieged, had it not been com- posed for the most part of hurried levies of raw soldiers with inexperienced officers, and of national guards who, never having been subjected to strict military discipline, were a source of weakness rather than of strength. The guards, it is true, displayed a certain warlike spirit, but it was for the sole purpose of exciting disorder. Open revolt broke out on October 31; it was suppressed, but increased the demoralization of the besieged and the demands of the Prussians. The partial successes which the French obtained In engagements on both sides of the river were rendered useless by the Germans recapturing all the best positions;

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the severity of winter told heavily on the garrison, and the armies in the provinces which were to have co-operated with it were held in check by the Germans in the west and south. In obedience to public opinion a great sortie was undertaken ; this, in fact, was the only alternative to a surrender ; for, the empire having organized everything in expectation of victory and not of disaster, Paris, insuffi- ciently provisioned for the increase of population caused by the influx of refugees, was already suffering the horrors of famine. Accidental circumstances combined with the indecision of the leaders to render the enterprise a failure. Despatches sent by balloon to the army of the

‘Loire instructing it to make a diversion reached their

destination too late; the bridge of Champigny over the Marne could not be constructed in time; the most advan- tageous positions remained in the hands of the Germans; and on the 2nd and 3rd December the French abandoned the positions they had seized on the 29th and 30th of November, Another sortie made towards the north on December 21st was repulsed, and the besieged lost the Avron plateau, the key to the positions which they still held on that side, The bombardment began on December 27th, and great damage was done to the forts on the left of the Seine, especially those of Vanves and Issy, directly commanded by the Chatillon battery. A third and

last sortie (which proved fatal to Regnault the painter) was attempted in January 1871, but resulted in hopeless retreat. An armistice was signed on January 27th, the capitulation on the 28th. The revictualling of the city was not accom- plished without much difficulty, in spite of the generous rivalry of foreign nations (Lendon alone sending provisions to the value of £80,000).

On the Ist of March the Germans entered Paris. This event, which marked the close of the siege, was at the same time the first preparation for the " commune ;" for the national guard, taking advantage of the general confusion and the powerlessness of the regular army, carried a number of cannon to the heights of Mont- martre and Belleville under pretext of saving them. President Thiers, appreciating the danger, attempted on March 18th to remove the ordnance; his action was the signal of an insurrection which, successful from the first, initiated a series of terrible outrages by the murder of the two generals, Lecomte and Thomas. The Government, afraid of the defection of the troops, who were demoralized by failure and suffering, had evacuated the forts on the left side of the river and concentrated the army at Versailles (the forts on the right side were still to be held for some time by the Germans). Mont Valérien happily remained in the hands of the Government, and became the pivot of the attack during the second siege. All the sorties made by the insurgents in the direction of Versailles (where the National Assembly was in session from March 20) proved unsuccessful, and cost them two of their improvised leaders—Generals Flourens and Duval. The incapacity and mutual hatred of their chiefs rendered all organization and durable resistance impossible. On Sunday May 21st the Government forces, commanded by Marshal M‘Mahon, having already captured the forts on the right side of the river, made their way within the walls; but they had still to fight hard from barricade to barricade before they were masters of the city ; Belleville, the special Red Republican quarter, was not assaulted and taken till Friday. Meanwhile the communists were committing the most horrible excesses: the archbishop of Paris (GEORGES Darsoy, g.v.), President Bonjean, priests, magistrates, journalists, and private individuals, whom they had seized as hostages, were shot in batches in the prisons; and a scheme of destruction was ruthlessly carried into effect by men and women with cases of petroleum (pétroleurs and

pétroleuses). ‘The Hotel de Ville, the Palais de Justice, the Tuileries, the Ministry of Finance, the palace of the Legion of Honour, that of the Council of State, part of the Rue de Rivoli, &c., were ravaged by the flames ; barrels of gunpowder were placed in Notre Dame and the Panthéon, ready to blow up the buildings ; and the whole city would have been involved in ruin if the national troops had not gained a last and crowning victory in the neighbourhood of La Roquette and Pére-la-Chaise on May 28th. Besides the large number of insurgents who, taken in arms, were pitilessly shot, others were afterwards condemned to death, to penal servitude, to transportation ; and the survivors only obtained their liberty by the decree of 1879.

From this double trial Paris emerged diminished and almost robbed of its dignity as capital; for the parlia- mentary assemblies and the Government went to sit at Versailles. For a little it was thought that the city would not recover from the blow which had fallen on it. All came back, however—confidence, prosperity, and, along with that, increasing growth of population and the execu- tion of great public works. The Hétel de Ville has been rebuilt, the school of medicine adorned with an imposing

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fagade, a vast school of pharmacy established in the old gardens of the Luxembourg, and boulevards completed. The exhibition of 1878 was more marvellous than those of 1855 and 1867, and unlike that of the latter year has left a lasting memorial, the palace of the Trocadéro. Tinally the chambers in 1879 considered quiet sufficiently restored to take possession of their customary quarters in the Palais Bourbon and the Luxembourg. This happy event closes for the present the annals, at times only too dramatic, of the capital of France. (Swsieps)

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PARIS, the som of Priam, king of Troy. Before he was born his mother Hecuba dreamed that she was delivered of a firebrand. The dream was interpreted that her child would ruin his country, and when Paris was born he was exposed on Mount Ida. His life was saved by the herds- men, and he grew up among them, distinguished for beauty and strength, till he was recognized and received by his parents. When the strife arose at the marriage of Peleus and Thetis between Hera, Athena, and Aphrodite, each claiming the apple that should belong to the most beauti- ful, Paris was selected as the judge. The three rivals unveiled their divine charms before a mortal judge on Mount Ida. The scene afterwards became a favourite subject in Greek art, and it is usual to represent Hermes escorting the goddesses. Each tried to bribe the judge, Hera by promising power, Athena wisdom, Aphrodite the most beautiful woman in the world. Paris decided in favour of Aphrodite, and thus made Hera and Athena the bitter enemies of his country. To gain the woman whom Aphrodite had promised, Paris set sail for Lacedzmon, deserting his old love Gnone, daughter of the river-god Cebren, who in vain tried to induce him to give up his purpose. He was hospitably received by Menelaus, whose kindness he repaid by seducing his

wife Helena to flee with him to Troy. The details of the flight are variously related (see HELENA). Greeks followed. Paris proved a lazy and backward fighter, though not wanting in actual courage when he could be roused to exert himself. Before the capture of the city he was mortally wounded by Philoctetes with an arrow. He then bethought him of the slighted nymph Ginone, who he knew could heal the wound. He was carried into her presence, but she refused to save him. Afterwards, when she found he was dead, she committed suicide. Paris is represented in Greek art as a beautiful young man, beardless, wearing the pointed Phrygian cap, and often holding in his hand the apple.

PARIS, Marruew or. See vol. xv. p. 633.

PARISH. In England the parish may be regarded as essentially an ecclesiastical institution, being defined as the township or cluster of townships which was assigned to the ministration of a single priest, to whom its tithes and other ecclesiastical dues were paid; and it has been decided that uf a place has not a church, churchwardens, and sacramen- talia it is not a parish in this original sense of the term.

The siege of Troy by the united

The word has now acquired several distinct meanings, which must be separately mentioned and investigated. The Old Ecclesiastical Parish.—In the absence of evi- dence to the contrary, the ecclesiastical parish is presumed to be composed of a single township or vill, and to be con- terminous with the manor within the ambit of which it is comprised. Before the process of subinfeudation became prevalent, the most ancient manors were the districts which we call by that name when speaking of the tenants, or “townships ” when we regard the inhabitants, or “ parishes ” as to matters ecclesiastical. The parish as an institution is in reality later in date than the township. The latter has been in fact the unit of local administration ever since the country was settled by the English in their several states and kingdoms ; the beginnings of the parochial system are attributed to Theodore of Tarsus, who was archbishop of Canterbury towards the close of the 7th century. The system was extended in the reign of Edgar, and it appears not to have been complete until the reign of Edward ITI. Tt has been considered that the intimate connexion of church and state

militates against the view that the parochial system was founded as a national institution, since any legislation on the subject of the township and parochial systems would probably have resulted in the merging of the one into the other. “The fact that the two systems, the parish and the township, have existed for more than a thousand years side by side, identical in area and administered by the same persons, and yet separate in character and machinery, is a sufficient proof that no legislative Act could have been needed in the first place ; nor was there any lay council of the whole nation which could have sanctioned such a measure” (Stubbs, Const. Hist., i. 227). The boundaries of the old ecclesiastical parishes are usually identical with those of the township or townships comprised within its precinct ; they are deter- mined by usage, in the absence of charters or records, and are evidenced by perambulations, which formerly took place on the “gang-days” in Rogation week, but are now for the most part held triennially, the Poor-Law Act of 1844 permitting the parish officers to charge the expense on the poor-rate, “ provided the perambulations do not occur more than once in three years.” The expense of preserving the boundary by land-marks or bound-stones is chargeable to the same rate. Many parishes contain more than one township, and this is especially the case in the northern

counties, where the separate townships are organized for administrative purposes under an Act passed in 1662. In the southern and midland districts the parishes are for the most part subdivided into hamlets or other local divisions known as “tythings,” “boroughs,” and the like; the distinction between a parish and a subordinate district lies chiefly in the fact that the latter will be found to have never had a church or a constable to itself. The select committee of 1873, appointed to inquire into parochial boundaries, reported to the effect that the parish bears no definite relation to any other administrative area, except indeed to the Poor-Law Union. It may be situated in different counties or hundreds, and in many instances it contains, in addition to its principal district, several outlying portions intermixed with the lands in other parishes. Since the abolition of compulsory church rates in 1868 (subject to certain exceptions as to rates which had already been mortgaged), the old ecclesiastical parish has ceased to be of importance as

an instrument of local government. Its officers, however, have still important duties to perform. The rector, vicar, or incumbent is a corporation-sole, in whom is vested the freehold of the church and churchyard, subject to the parishioners' rights of user; their rights of

burial have been enlarged by the Burial Laws Amendment |

Act, 1880, and an Act passed in 1882 to regulate the inter- ment of suicides. The churchwardens are the principal lay officers. Their duties consist in keeping the church and churchyard in repair and in raising a voluntary rate for the purpose to the best of their power; they have also the duty of keeping order in church during divine service ; and by Acts passed in 1860 and 1877 they are required to furnish annual accounts to the Local Government Board. The other officials are the parish-clerk and sexton. They have freeholds in their offices, and are paid by customary fees. The office of the clerk is regulated by an Act of 1844, enabling a curate to undertake its duties, and providing facilities for vacating the office in case of inisconduct. It is said that the only civil function of the parish-clerk now remaining is to undertake the custody of maps and documents, which may be deposited under the provisions of the Railway Clauses Act, 1845.

The New Ecclesiastical Parish—Under the powers given by the Church Building Acts, many populous parishes have been subdivided into smaller ecclesiastical parishes. This division has not affected the parish in its civil aspect (Chalmers, Local Government, 39). The change has helped to increase the distinction between the ecclesiastical and civil parishes. Mr Chalmers estimates that there are now about 15,000 civil and 13,000 ecclesiastical parishes in England, and that in 1871 not more than 10,000 civil parishes coincided with the ecclesiastical districts of the same names,

The Poor-Law Parish.—For the purposes of civil government the term "parish" means a district for which a separate poor-rate is or can be made, or for which a separate overseer is or can be appointed ; and by the Poor Law Amendment Act, 1866, this definition is to be used in interpreting all statutes except where the context is inconsistent therewith. This district may of itself con- stitute a poor law union ; but in the great majority of cases the unions, or areas under the jurisdiction of boards of guardians according to the Poor-Law Amendment Act of 1834, are made up of aggregated poor-

law parishes. Each of these poor-law parishes may represent the extent of an old ecclesiastical parish, or a township separately rated by custom before the practice was stayed in 1819 or separated from a large parish under the Act of 1662, or it may repre- sent a chapelry, tything, borough, ward, quarter, or hamlet, or other subdivision of the ancient parish, or an area formed by the merger of an extra-parochial place with an

adjoining district under the Acts of 1857 and 1869, or by the union of detached portions with adjoining parishes under the Acts of 1876 and 1879, or by the subdivision of a large parish for the better administration of the relief of the poor under the Poor- Law Amendment Act of 1867 and the Local Government Board Act of 1871. The civil importance of the poor-law parishes may be dated from the introduction of the poor law by the statute of 43 Elizabeth, which directed overseers of the poor to be appointed in every parish, and made the churchwardens into ex officio overseers. The statute was preceded by tentative provi- sions of the same kind enacted in the reigns of Edward the VI. and Mary and in the fifth year of Elizabeth, and after several renewals was made perpetual in the reign of Charles LT The chief part of the parochial organization is the vestry-meeting. It derives its name from the old place of assembly, which in parishes exceeding two thousand in population may now be replaced by a vestry- hall. The vestry represents the old assembly of the town- ship, and retains so much of its business as has not been inseusibly transferred to the court-baron and court-leet. The freemen, now appearing as the ratepayers, elect the “parish officers,” as the churchwardens and way-wardens, the assessors, the overseers, and (if required) paid assistant- overseers, a secretary or vestry-clerk, and a collector of rates if the guardians apply for his appointment.

The Land-Tax Parish.—The parishes or places sepa- rately assessed for land tax form another class. They are described in the series of land-tax accounts from 1692 to the present time, and are also defined in the Taxes Management Act of 1880.

The Burial Acts Parish.—The Burial Acts from 1852 to 1875 deal with areas which are treated as parishes for the purposes of those Acts, but which

have no necessary connexion with the boundaries of the civil and ecclesiastical districts known as parishes in the ordinary sense of the term.

The Highway Parish.—The word “parish” is used in a very wide and vague manner in the Highway Acts. It includes any civil district less than the county, such as wapentakes, hundreds, cities, liberties, or franchises, as well as subdivisions of the ordinary parish, such as town- ships and hamlets, if by reason of tenure or custom or otherwise such larger or smaller district either maintains its own highways or would do so if it were not included m a highway district composed of several highway parishes or in an urban sanitary district. The constitution of the highway parish is discussed in the Report of the Lords’ Committee on Highways. (co. LE)

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The Parish in Scotland.—There can be little doubt that about the beginning of the 13th century the whole, or almost the whole, of the kingdom of Scotland was parochially divided. It seems probable (though the point is obscure) that the bishops presided at the first formation of the parishes—the parish being a subdivision of the diocese—and at any rate down to the date of the 2eformation they exercised the power of creating new parishes within their respective dioceses (Duncan, Parochial Law, p. 4). After the Reformation the power of altering parishes was assumed by the legislature. The existing parochial districts being found unsuited to the ecclesiastical requirements of the time, a general Act was passed in 1581, which made provision for the parochial clergy, and, enter alia, directed that ‘‘a sufficient and competent” district should be appropriated to each church as a parish (1581, eap. 100). Thereafter, by a series of special Acts in the first place, and, subsequent to the year 1617, by the decrees of parliamentary commissions, the creation of suitable parochial districts was pro- ceeded

with. The powers conferred on the parliamentary conunis- sions embraced what are technicaily known as (1) the disjunction and erection of parishes, (2) the union of parishes, and (8) the disjunction and annexation of parishes. In altering and defining parochial areas in those several ways, the object which the com- qnissioners had in view was to provide for the spiritual wants of particular districts of the country, and to procure from the lands in the parish a proper stipend for the clergy. In the year 1707 the powers exercised by these commissioners were permanently transferred to the Court of Session, whose judges were appointed to act in future as ‘‘ Commissioners for the Plantation of Kirks and Valuation of Teinds” (Act, 1707, cap. 9). Under this statute the areas of parishes continued to be altered and defined down to 1844, when the Act commonly known as Graham’s Act was passed, (7 & 8 Vict. c. 44). This Act, which applies to the disjunction and erection of parishes, introduced a simpler form of procedure, and to some extent dispensed with the consent of the heritors, which had been required under the earlier statute. Since 1844 proceedings for disjunction and crection of parishes have been taken under it.

The main division of parishes in Scotland as they now exist is into civil and ecclesiastical, or, to speak more accurately, into parishes proper (7.¢., for all purposes, civil and ecclesiastical) and ecclesiastical parishes. This division is expressed in legal language by the terms, parishes quoad omnia (7.¢., guoad civilia et sacra) and parishes quoad sacra—civilia being such matters as church rates, education, poor law, and sanitary purposes, and sacra being such as concern the administration of church ordinances, and fall under the cognizance of the church courts. There arc other minor divisions which will be noticed below. (1) The Parish Proper.—In a number of instances it is difficult to determine the exact areas of such parishes at the present day. The boundaries of the old ecclesi- astical parish were nowhere recorded, and the descriptions in the titles of private properties which appear to lie in the parish have sometimes to be taken as evidence, and sometimes the fact that the inhabitants attended a particular church or made payments in favour of a particular minister. Where there has been a union or disjunction and ercction of parishes the evidence of the boundaries is the relative statute, order in council, or decree of commission or of Court of Teinds. The total number of parishes proper in Scotland is eight hundred and eighty-six, and they vary to a great degree both in size and population. For ecclesiastical

purposes, the minister and kirk-session constitute the parochial authority. The minister is vested with the manse and glebe, to be held by him for himself and his successors in office, and along with the kirk-session he administers church ordinances and exercises church disaipline. For purposes of local government, on the other hand, the Scottish parish, unlike that of England, has been largely utilized by modern legislation. The oldest governing authority is the meeting of the heritors or landowners of the parish. Though shorn of much of its oldimportance, the heritors' meeting has still the power of imposing an assessment for the purpose of providing and maintaining a church and churchyard and a manse and glebe for the minister. t also possesses power to assess under the Parochial Buildings Acts of 1862 and 1866. In a certain number of parishes also, which have not adopted a parochial board under the Poor-Law Act, 1845, the heritors along with the kirk-session provide for the relief of the ae and administer the funds legally destined for that purpose. n the great majority, however, of civil parishes the chief governing authority is the parochial board, which in non-burghal parishes is composed of owners of land of £20 annual value and upwards, and Tepresentatives of the kirk-session and of the magistrates of any

argh within the parish and of the rate-payers—the number of representative members being in each case fixed by the Board of Supervision. Another local authority of great importance is the School board, created by the recent Education Acts. Speaking generally, the matters administered in the civil parish are poor relief, education, public health, burial, registration, and church Tates. (2) Quoad Sacra Parishes.—The ecclesiastical or guoad sacra parish isa modern creation. Under Graham's Act, above mentioned,

a parish may be disjoined and erected guoad sacra tantwm on the application of persons who have built and endowed a church, and who offer securitics for its proper maintenance. The creation is made purely on a consideration of the spiritual interests of a par- ticular district, and not for any purposes of civil administration. By the Education Act of 1872, however, the guoad sacra parish has been adopted as a separate school district. There are three hun- dred and twenty-five such parishes in

Scotland. (3) Extra-Burghal Parishes.—For sanitary purposes, highways, and some others, cer- tain classes of burghs have been made separate areas from the parishes in which they lie. This fact creates a set of incomplete parishes, which are called extra-burghal, (4) Burghal, Land- ward, and Burghal-Landward (or Mixed) Parishes. —This division of parishes depends, as the names imply, upon local character and situation of the parochial districts. The importance of the dis- tinction arises in connexion with the rnle of assessment which is to be adopted for various parochial burdens, and the nature of the rights of the minister and corresponding obligations of the parishioners. (5) Combined Parishes.—Under the Poor-Law, Education, and Registration Acts power is given to the central authority to combine parishes for purposes of local administration.

The Parish in the United Statecs.—The term “ parish” is not in use as a territorial designation except in Lonisiana, the fifty-eight parishes of which correspond to the counties of the other States of the Union.

The principal records from which information may be gained as to the oldest parochial system in England are the records called Nomina Villarum, the Taxatio Pape Nicholai madc in 1291, the Monarum Inquisitiones relating to assessments made upon the clergy, the Valor Ecclesiasticus of Henry VITI., the lay subsidies from the reign of Edward ITI. to that of Charles H., the hearth-tax asscssments, and the land-tax accounts, On the subject of the parish generally the reader should consult Stubbs’s Constitutional History, Glen’s Parish Law, Toulmin Smith’s work on the Parish, Holdsworth’s Handy Book of Parish Law, and M. D. Chalmers’s work on Local Government, published in the English Citizen Scries. For fuller information regarding the Scottish parish the following works may be consulted :—Connell on Teinds ; Duncan’s Parochial Ecclestastical Law; the Cobden Club essays on Local Government and Taxation in the United Kingdom, published in 1882; Goudy and Smith’s Local Government tn Scotland,

PARK, Munco (1771-18061), a celebrated African traveller, was born in Selkirkshire, Scotland, on the 20th September 1771, at Fowlshiels on the Yarrow,—the farm which his father rented from the duke of Buccleuch. He was the seventh in a family of thirteen. Having received a good education

(at home from a private tutor, and afterwards at the grammar school of Selkirk), he was apprenticed to a surgeon named Anderson, in Selkirk, and then attended the university of Edinburgh for three sessions (1789-91). By his brother-in-law, James Dickson, a botanist of repute, he was introduced to Sir Joseph Banks, and through his good offices he obtained the post of assistant-surgeon on board the ‘“ Worcester” Hast Indiaman. In this capacity he made the voyage in 1792 to Bencoolen in Sumatra, and on his return in 1793 he con- tributed a description of eight new Sumatran fishes to the Transactions of the Linnean Society. Park next offered his services to the African Association, then looking out for a successor to the unfortunate Major Houghton, and, again supported by the influence of Sir Joseph Banks, he was successful in hisapplication. On the 21st June 1795 he reached the Gambia, but it was not till December 2d that he started for Pisania with only two Negro servants (Johnson and Demba) on the hazardous and difficult expedition into the interior, from which he was to return with the proud distinction of being the first of modern Europeans to reach the well-nigh fabulous waters of the Niger. Striking north-eastward across the upper basin of the Senegal, he advanced through Kaarta and El Hodh, and descended upon the great river of his quest at Segu on the north bank, about 13° 5’ N. lat. and 6° 20’ W. long. Though he was not able to proceed down stream any farther than Mursan and Silla, he managed on his home journey to follow the river valley as far up as Bammako, a, distance of about 300 miles. By the 10th June he was again at Pisania, but he did not reach England till December 22, 1796. An account of his journey was at once drawn up for the Association by Bryan Edwards, and a detailed narrative from his own pen appeared in 1799 (Travels in the Interior of Africa). Abundance of incident, and an unaffected charm of style, at once rendered

the work extremely popular, and it still holds its place as one of the acknowledged classics in this department of literature. It seemed for a time as if Park was now to settle down quietly at home; he married a daughter of his old master, Mr Anderson, and commenced practice as a country doctor

at Peebles, where at least he could enjoy “a glass of strong beer and a peep at the sky through Mr Oman’s telescope”; but he was ill at ease—his heart was in Africa. In 1804 the people of Peebles were amused and alarmed by the vagaries of Sidi Omback Boubi from Mogador, who had come to teach their doctor Arabic ; and in autumn Park parted from Sir Walter Scott, who had been one of his best friends, with the hopeful proverb on his lips, “ Freits (omens) follow those that look to them.” He had accepted Lord Hobart’s proposal that he should take command of a Niger expedition. He sailed from Portsmouth on January 30, 1805; and the expedition started from Pisania on May 4th. Unfortunately the rainy season soon afterwards commenced; by the time Bammako was reached the party was reduced from forty- four Europeans to eleven, and from Sansanding the leader had to report “five only are at present alive, viz., three soldiers (one deranged in his mind), Lieutenant Martyn, and myself.” Among those who had died at Sansanding was his brother-in-law Mr Anderson. On November 19th he set sail down the river from Sansanding with the “ fixed resolution to discover the termination of the Niger or perish in the attempt.” Isaaco, the Mandingo guide who had accompanied the expedition up to this point, was afterwards sent on a mission to find out the fate of the voyagers ; it was learned that they had managed to make their way through countless perils to Bussa (Boussa) between 9° and 10° N. lat., and that they were there attacked by the natives, and were drowned in endeavouring to escape. Park was 6 feet in height, active and robust ; his countenance was prepossessing, his manner in company plain and simple, but somewhat cold and reserved.

See the Life (by Wishaw) prefixed to Journal of a Mission into the Interior of Africa in 1805, London, 1815; H. B., Life of

Mungo Park, Edinburgh, 1835; and an interesting passage in Lockhart’s Life of Sir Walter Scott, vol. ii.

PARKER, Joun Henry (1806-1884), architectural archzeologist, was the son of a London merchant, and was born in 1806. He was educated at Manor House School, Chiswick, and in 1821 entered business as a bookseller. Succeeding his uncle Joseph Parker as a bookseller at Oxford in 1832, he conducted the business with great success, the most important of the firm’s publications being perhaps the series of the “ Oxford Pocket Classics.” The

cares of business did not prevent him from devoting, in the earlier period of his life, much of his time to those architectural studies which latterly engaged his chief attention. In 1836 he brought out his Glossary of Architecture, which, published in the earlier years of the Gothic revival, had considerable influence in extending the movement, and supplied a valuable help to young architects. In 1848 he edited the fifth edition of Rickman's Gothic Architecture, and in 1849 he published a handbook based on his earlier volume, and entitled Introduction to the Study of Gothic Architecture. The completion of Hudson Turner's Domestic Architecture of the Middle Ages next engaged his attention, three volumes being published (1853-60). In 1858 he published Medieval Architecture of Chester. Parker was one of the chief advocates of the "restoration" of ecclesiastical buildings, and published in 1866 Architectural Antiquities of the City of Wells. Latterly he devoted much attention to explorations of the history of Rome by means of excavations, and succeeded in satisfying himself of the historical truth of much usually regarded as legendary. Two volumes of his Archeology

of Rome have been published, the one in 1873, and the other in 1875, while six additional parts have also appeared, and two others were in the press at his death. In recogni- tion of his labours he was decorated by the king of Italy, and received a medal from Pope Pius IX. In 1869 he endowed the keepership of the Ashmolean Museum with a sum yielding £250 a year, and under the new arrange- ment he was appointed the first keeper. In 1871 he wag nominated C.B. He died 31st January 1884.

PARKER, Marrygw (1504-1575), archbishop of Canterbury, the eldest surviving son of William Parker and Alice Monins, his wife, was born at Norwich 6th August 1504. His father was an artisan, a calenderer of woollen stuffs, but through his mother he could afterwards trace his descent from the earls of Nottingham. He was instructed in reading by Thomas Benis, rector of St Clement's, Norwich, and in the elements of Latin by one William Neve ; in the latter he found (a somewhat excep- tional experience in those days) a kind and sympathizing teacher. When Matthew was twelve years of age he lost his father; but his mother was, notwithstanding, able to

send him at the commencement of the Michaelmas term, 1521, to Cambridge, and to maintain him there until his merits secured some recognition. He was educated partly in St Mary's Hostel and partly in Corpus Christi College. In March 1523 he was elected to a bible-clerkship in the college, an office which involved reading the Bible aloud on prescribed occasions, and waiting at the fellows' table at dinner. In the March of the following year he was admitted B.A.; he was subsequently made a deacon and a priest, in 1527 was elected to a fellowship, and in 1528 commenced M.A.

His industry as a student and his general ability marked him out for early notice; and when, in 1521, Wolsey was founding Cardinal College (afterwards Christ Church), Oxford, Parker was one among a number of rising Cambridge students who were invited to become fellows of the new society. Fortunately, however, for himself and for Cambridge he elected to stay at Corpus. The university was at this time becoming a great centre of the Reformation movement, and he found himself attracted to the meetings held at the White Horse (an inn in the town), which the Catholic party derisively styled "Germany," from the fact that it was the known rendezvous of the supporters of Lutheran tenets. Among those with whom he was thus brought into contact was Bilney, the martyr; and when, in 1531, the latter was burned at Norwich, Parker attended him in his last hours, and afterwards bore testimony to his constancy. On Cranmer's election to the archbishopric of Canterbury, Parker received a licence to preach, and soon became known in Cambridge and its neighbourhood as a divine of considerable oratorical power. He was summoned to preach at court; and in 1535 the queen, Ann Boleyn, appointed him her chaplain. He shortly after received a further mark of her favour by being made dean of the college of St John the Baptist, at Stoke, near Clare, Suffolk—an institution for the training of the secular clergy. Here he gave the earliest indication of his skill as an administrator; and the new statutes which he drew up for the college were deemed so judicious that the duke of Norfolk, in 1540, adopted them asa model for the code which he gave to a similar foundation at Thetford. Parker's retired life at Stoke did not altogether secure him from attack on account of his courageously avowed sympathies with the Reformation, and in the year 1539 he was accused by the townsmen of Clare of manl- festing undue contempt for the Catholic ritual.

At Stoke Parker continued to reside more or less until the year 1545. His disposition throughout life was naturally retiring. In one of his letters to Cecil, written

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about 1543, he confesses to a “ natural viciosity of over- much shamefacedness”; and this constitutional defect would seem, at this time, to have been aggravated by a state of health which made it necessary for him to obtain the permission of the university, when preaching in St Mary’s, Cambridge, to do so with his head covered. In the year 1538 he was created D.D. Although his in- different health and love of study alike inclined him to a retired life, his seclusion was frequently broken in upon by honours and preferment which came unsought. He was selected by Thomas Cromwell to preach at Paul’s Cross, on account of “his learning in holy letters and uncorrupt judgment in the same.” He was appointed one of the king’s chaplains, and in the year 1541 was made a canon of Ely. In 1542 his own college of Stoke presented him to an Essex living. About this time it began to be rumoured that the dissolution of Stoke College could not be averted, and the arguments for Parker’s return to his university, in whose welfare his interest had continued undiminished, were such as he could no longer resist. The mastership of Corpus having fallen vacant, he consented to be elected to the post, at that time scarcely of the annual value of £10 ; to this, however, the society shortly after added the rectory of Landbeach. In January 1545 he was elected to the vice-chancellorship of the university by a large majority. The colleges of both universities were at this period in continual fear of being, sooner or later, handed over, as the monasteries had been, to the greed of the despoiler. It was accordingly resolved, in order to anticipate a commission consisting of unscrupulous courticrs and lawyers, that the university should obtain the royal authority fora commission composed of those who were intimately acquainted with the real state of affairs, and, through the good offices of Catherine Parr, Parker, along with two other heads of colleges, was selected for the task. When their survey had been completed, they repaired to Hampton Court, and laid their statement before the king. Henry, on reading the report, expressed his emphatic admiration at the economical management of the colleges, and dismissed the commission with assurances which completely baffled the

expectations of the courtiers. The fate which was averted from Cambridge fell, however, upon Stoke College. Its estate was confiscated, but subject to a charge of £40 per annum as compensation. The purchaser was Sir John Cheke, Parker's personal friend, by whom the money was regularly paid to the former dean. Parker now entered upon the married state, and espoused a Norfolk lady named Margaret Harleston. His choice appears to have been singularly fortunate. His wife proved a true helpmate, and was distinguished for the graceful hospi- tality she extended to the poor clergy whom Parker was in the habit of inviting to the college lodge at Cambridge.

In the measures which marked the further progress of the Reformation during Edward's reign Parker seems to have cordially co-operated. But he had no sympathy with the bigotry which now began to characterize the contend- ing sects of Protestantism abroad; and when Martin Bucer was fain to quit Strasburg, after the failure of his efforts to mediate between the Lutherans and the Zwinglians, the master of Corpus extended to that eminent theologian a cordial welcome to England. During the short time that the latter filled the post of regius Professor of divinity at Cambridge, he found in Parker a firm friend, and it was by Parker that his funeral Sermon was preached. Parker's services to his party were not unrecognized. He was occasionally appointed to preach before the young king, and was promoted to the deanery of Lincoln and to the prebend of Corringham in that cathedral. On the occasion of Kett's rebellion in Norfolk, happening to be in Norwich, he visited the rebels'

camp and ventured to preach submission to the constituted authorities.

When Queen Mary ascended the throne, most of the college heads at Cambridge were deprived of office, and Parker only forestalled a like fate by resignation. The fact of his being a married man alone sufficed to entail the loss of all his ecclesiastical preferments. He did not, however, like many of the leaders of his party, fly from the country, but lived in strict retirement, his place of resid- ence being a secret which appears to have died with him. This feature in his career is deserving of note, as offering an important point of contrast to the experiences of those other eminent churchmen who, known as the Marian exiles, returned to England after a

long sojourn at the chief centres of the Reformed party on the Continent, strongly prejudiced in favour of Calvinistic doctrine, and bigotedly intolerant of everything approaching to the Roman discipline and ritual. Parker, like Whitgift, stayed in England, and was thus probably better able afterwards to maintain a fairly impartial position in relation to contend- ing religious parties. He himself speaks of these years of his life, passed as they were in solitude among his books and in meditation, but cheered by the possession of a clear conscience, as productive of far more solid enjoyment than he afterwards found in the varied duties and anxieties of the episcopal office.

A fall from horseback, when he was on one occasion compelled to flee by night from Mary's emissaries, resulted in a permanent injury (his language appears to imply a rupture) which still further disinclined him to active and laborious public duties; and upon Elizabeth's accession he evinced little readiness to avail himself of prospects of preferment held out by Sir Nicholas Bacon, the lord keeper. He believed himself to be summoned by duty to return to his former sphere of labour at Cambridge, at that time, like Oxford, in a singularly depressed and unsatis- factory condition. "Of all places in England," he writes to Bacon, "I would wish to bestow most of my time in the university, the state whereof is miserable at this present." His services were needed, however, for a wider sphere of action; and in December 1558 he was summoned by royal command to London, where it was intimated to him that he was to be appointed to the primacy. His clection to the office took place on the first of the following August, and his consecration on the 17th December, in the chapel at Lambeth Palace. He was consecrated by Bishop Barlow, formerly bishop of Bath and Wells, bishop- elect of Chichester; John Scory, formerly bishop of Chichester, bishop-elect of Hereford ; Miles Coverdale, late bishop of Exeter ; and John Hodgkin, suffragan bishop of Bedford. 'The delay which took place in his consecration arose from the fact that the three bishops named in the original warrant (Tonstal, Bourne, and Poole) refused to act, and a second warrant was consequently found necessary. In the following century the Romanist party sought, by circulating the " Nag's Head fable," to throw discredit on Parker's consecration by representing that he, together with certain other bishops, was simply ordained, and that too in an irreverent and uncanonical fashion, at a tavern in Fleet Street. The evidence which contravenes this

story (see Pocock's edition of Burnet's ITistory of the Reformation, vol. v.) 1s, however, singularly full and satisfactory. ;

During the fifteen years of his primacy, Parker's best energies were devoted to defining more accurately the discipline and belief of the newly constituted Church of England, and to bringing about a general conformity. The Thirty-Nine Articles were passed by convocation under his presidency in 1562. In the year 1566 he issued his celebrated "Advertisements," "for the due order in the

public administration of common prayers and using the holy sacraments, and for the apparel of all persons eccle- siastical." Notwithstanding that they related mainly to questions of detail and ceremonial, these new regulations excited strenuous opposition from the Puritan party, owing to the fact that, although they enjoined the discontinuance of " gorgeous vestments" and the cope, they prescribed the use of the surplice. It is asserted that they were promul- gated by the command of Elizabeth, who subsequently with- held her formal sanction, and permitted the obloquy they evoked to fall on Parker. It is certain that they added materially to the embarrassment of his position. The revised translation of the Scriptures known as the Bishops' Bible (1568 and 1572) owed its origin to Parker, and is regarded by English Churchmen as a valuable service to their communion, from the fact that it served to prevent the adoption of the Geneva Bible until superseded by the authorized version.

The determination which Parker showed to withstand, and if possible repress, the growing boldness of the Puritan party, involved him during the latter years of his primacy in a struggle which was detrimental to his health, his temper, and his reputation. In August 1570 his wife died, and the blow was severely felt. He was still able, however, to discharge with efficiency the duties of his office; and in 1573 he entertained Elizabeth with great splendour and sumptuousness in the grand hall of his palace at Canterbury. Among his last measures of reforn are to be noted his personal visitation of the church and chapter at Canterbury, and the drawing up ofa series of injunctions for their more efficient regulation, the issuing of a commission for the visitation of his diocese, and the publication of new constitutions for

the Court of Arches. In 1575 his health began rapidly to give way, and he died on the 17th May in that year, giving evidence almost to the last of that vigorous intellect and strong will by which

he was distinguished throughout life.

As an anthor, Parker cannot be held entitled to any high place. He compiled a Latin treatise, De Antiquitate Britannic Keelesizs et Privilegiis Ecclesie Cantuariensis, printed by John Day in 1572, which shows considerable research in connexion with the circum- stances under which Christianity was introduced into Britain. In this, however, as in most of his more learned works, he was probably largely assisted by his secretary, Josselin. His letters, which have been published under the title of the Parker Correspondence (Parker Socicty, 1853), are marked throughout by his usual natural good sense and sobriety of judgment, but are characterized neither by originality nor brilliancy of thought. His other writings are chiefly statutes for various ecclesiastical or collegiate foundations, sermons, forms of prayer, and ordinances for the church.

As an editor, while his industry must be admitted by all, he had but an imperfect sense of the responsibilities attaching to such a function and of the limits to be observed in its exercise. He edited Ailfric's Anglo-Saxon Homily, a treatise much valued by religious controversialists as exhibiting the theory of the early English Church in relation to the doctrine of transubstantiation. The treatise of Gildas, De Excidio Britanniz#, next appeared ; but this was mainly, if not entirely, the work of Josselin. The Flores Historiarum (probably the work of Roger of Wendover) was edited by Parker under the belief that it was the work of an unknown 'Matthew of Westminster." The other chronicles which he pub- lished were the Historia Major of Matthew Paris, the Historia Anglicana of Walsingham, the life of Alfred (Gesta Allfredi) of Asser, and the Ziinerarium of Giraldus Cambrensis. The extreme licence in which he indulged in altering the texts of these writers, and especially that of Matthew Paris, renders his cditions, how- ever, almost worthless, and has met with the severest censures from succeeding historical scholars.

But, notwithstanding these errors and defects, Parker's memory must ever be venerated by Englishmen and by scholars ; and his country, his

university, and his college were alike laid by him under no ordinary debt of gratitude. He revived the study of Saxon literature and of the origines of our national history; and the sertptortum which he maintained at Lambeth (after the fashion of the medizval monastcries) was a busy scene where the transcriber, the illuminator, the engraver, and the bookbinder each plicd his craft, to the no small after advantage of letters and of art. Among the printers whom he patronized were Richard J ugge, John Day,

and Richard Grafton. As a collector of books and manuscripts he was indefatigable ; and one of his numcrous agents, named Batman, is stated to have collected in four years no less than 6700 volunies, chiefly works which had been scattered on the dissolution of the monasteries. The greater part of this splendid collection, styled by Fuller ‘‘the sun of English antiquity,” Parker bequeathed to Corpus Christi College. His interest in his university at large did not diminish after his elevation to the archbishopric, and the Regent Walk (an improved approach to the public schools) and the university library were long-standing memorials of his munificence, He also founded a grammar school at Rochdale, and numerous scholarships and annual charities elsewhere. That he died rich cannot be denied ; and his enemies have asserted that he was far from scrupulous in the means which he employed in acquiring wealth, especially in ‘‘admitting children to cures.’’ On the other hand, it must be allowed that he made a good and generous use of his wealth, and his contemporary biographer claims for him the rare merit of combining strict economy with liberality. Parker had five children. Of these the eldest, John, who was knighted by King James in 1603, alone survived him; he died at Cambridge in 1620, in great want, the cost of his funeral being defrayed by Corpus Christi College.

The best source of information in all that relates to Parker is his Live and Acts, by Strype (8 vols., Oxford, 1824), a performance on which that distinguished antiquary bestowed even more than his usual amount of painstaking research. A copy of the folio edition (1711), preserved in the library of St John’s College, Cambridge, is enriched with numerous and valuable MS. notes by the donor, the eminent Thomas Baker, The titles of

the books which he presented to his own college will be found in Nasmith’‘s Cat. of the C_.C. MSS. (1777). (J. B. M.)

PARKER, TuzoporEe (1810-1860), a distinguished American rationalistic preacher and social reformer, born at Lexington, Massachusetts, August 24, 1810, was the youngest of eleven children. His father, John Parker, a small farmer and skilful mechanic, was a typical New England yeoman, a man of sterling moral worth, of strong intellect, meditative, and fond of reading,—a strict dis- ciplinarian in his house, a Unitarian in his theology before Unitarianism was known in New England as a system, and a Federalist in his politics when there were but four Federalists in Lexington. His mother, “an imaginative, delicate-minded, poetic, yet very practical woman,” took great pains with the religious education of her children, “caring, however, but little for doctrines,” and making religion to consist of love and good works. Theodore’s paternal grandfather, Captain John Parker, fired the first shot upon the British at the battle of Lexington, com- manding on that occasion a troop of seventy men. The historic musket from which that shot was fired became one of the most valued ornaments of the grandson’s study. His mother taught him to listen to the monitions of con- science as the voice of God, and from his infancy his life was dominated by moral and religious emotions and ideas of overpowering force. The boy was richly endowed intellectually and physically. His memory was marvel- lously retentive. The acquisition of languages was a delight and recreation to him. He obtained the elements of knowledge in the schools of the district, which were open during the winter months only. During the rest of the year he worked on his father’s farm. He wasall the time an immense and omnivorous reader, and his powerful memory enabled him to remember all that he read. At the age of seventeen he became himself a winter school- master, and in his twentieth year he entered himself at Harvard, working on the farm as usual while he followed his studies, and going over to Cambridge for the cxamina- tion only. For the theological course he took up in 1834 his residence in the college, meeting his expenses by a small sum amassed by school-keeping and by help from a poor students’ fund. He studied fourteen hours a day, not only following the usual course of the college, but plunging deep into German theology and Biblical criticism, and especially the history of non-Christian religions. At the close of his college career he began his translation of De Wette’s Introduction to the Old Testament. His journal and

letters show that he had made acquaintance with a large number of languages, including Hebrew, Chaldce, Syriac, Arabic, Coptic, Ethiopic, as well as the classical and the

principal modern European languages. When he entered the divinity school he was an orthodox Unitarian; when he left it, he entertained strong doubts about the infallibility of the Bible, the possibility of miracles, and the exclusive claims of Christianity and the church. Emerson's transcendentalism greatly influenced him, and Strauss's Leben Jesu left its mark upon his thought. His first ministerial charge was over a small village parish, Roxbury, a few miles from Boston. He was ordained June 1837, and held his pastorate there until the autumn of 1848. He was extremely happy in his position. His parishioners loved him, he had ample time to pursue his studies, and the neighbourhood of Boston gave him congenial society. His views were slowly assuming the form which subse- quently found such strong expression in his writings ; but the process was slow, and the cautious reserve of his first yationalistic utterances was in striking contrast with his subsequent rashness. But in 1841 he preached at Boston a sermon on "the transient and permanent in Christianity," which presented in embryo the main principles and ideas of his final theological position, and the preaching of which determined his subsequent relations to the churches with which he was connected and to the whole ecclesiastical world. The only permanent element he discovered in the Bible, in Christianity, in Christ, was " absolute, pure morality, absolute, pure religion, the love of man, the love of God acting without let or hindrance." He denied all special authority to the Bible, to Christ, to Christianity. He maintained that "' Jesus had not exhausted the fulness of God." The Boston Unitarian clergy denounced the preacher, and declared that the "young man must be silenced." No Unitarian publisher could be found for his sermon, and nearly all the pulpits of the city were closed against him. To exchange with him was fatal to a minister's reputation for Unitarian orthodoxy. But when the Unitarian clergy cast Parker off the laity took him up. A number of gentlemen in Boston invited him to give a series of lectures there. The result was that he delivered in the Masonic Hall, in the winter of 1841-42, as lectures, substantially the volume afterwards published as the Discourse

of Matters pertaining to Religion. The lectures in their published form made his name famous throughout America and Europe, and confirmed the stricter sect of the American Unitarians in their attitude towards him and his supporters. His friends, however, resolved that he should be heard in Boston. They engaged for him the Music Hall in that city, in which he regularly preached to a congregation of some three thousand persons during the remaining fourteen years of his life. Previous to his removal from Roxbury to Boston, Parker spent a year in Europe, calling in Germany upon Paulus, Gervinus, De Wette, and Ewald amongst other savants, and preaching in Liverpool in the pulpits of James Martineau and J. H. Thom. Soon after his return, in 1844, to America he resigned his charge at Roxbury, and devoted himself exclusively to his work in Boston. In addition to his Sunday labours, he lectured throughout the States, and prosecuted his wide studies, collecting particularly the materials for an opus magnum on the development of religion in mankind. Above all he took up the question of the emancipation of the slaves, and at the imminent risk of his life nobly and powerfully advocated in Boston and throughout the States, from the platform and through the press, the cause of the negroes. Indeed, he did more. He assisted actively in the escape of fugitive slaves, and helped to furnish John Brown with means for carrying out his schemes of liberation. His Sunday sermons were themselves often elaborate essays, almost treatises, on great questions of social and political reform, and he was all along contributing articles and papers on literary,

political, social, and theological subjects to the periodical press. By his voice, his pen, and his utterly fearless action in social and political matters, he became a great power in Boston and America generally. But his days were numbered. From his mother he inherited consump- tion, and the reckless disregard of the laws of health which he was guilty of in his early years, combined with the tremendous strain of his ordinary work, and the terrible privations and fatigues of his lecturing tours, developed in the prime of his life the fatal seeds. In January 1859 he had an attack of bleeding of the lungs, and sought relief by retreating first to Santa Cruz, and afterwards to Europe. He died at Rome, May 10, 1860.

The fundamental articles of Parker's religious faith were the three ''instinictive intuitions' of God, of a moral law, and of immortality. His owu mind, heart, and life were undoubtedly pervaded, sustained, and ruled by the feelings, convictions, and hopes which he formulated in these thzee articles. But he cannot be said to have achieved success when he came to strictly define, expound, and establish them. In his doctrine of God he maintains that man has an innate idea of God as a being of infinite power, goodness, and wisdom ; but he often uses language which borders on pantheism, while his criterion of the notions men have formed of the Divine Being appears to leave him no foundation for anything higher than an abstract pantheistic idea of Him. His proof of his fundamental creed is no less at fault than his statement and exposition of it. It is strange that a man who had read so widely aud honestly the best literature of his day on the religions ideas of mankind should have referred to the consensus gentiwm for his main proof of the universality of his triad of religious ideas. His own chapter on the immortality of the soul in his Discourse abundantly illustrates the weakness of his proof from induction. The dis- tinction he was compelled to draw between the conception and the idea of God illustrates the weakness of his deductive proof. Parker's definitions of religion are various, and show that he had never closely traced its true nature. Of revelation—the counterpart of religion— his notions were of the vaguest description. He could ask 'Is Newton less inspired than Simon Peter?" He had never formed any approximately just conception of the work of a great religious teacher, and could say, '' Christianity, if true at all, would be just as true if Herod or Catiline had taught it." Naturally, therefore, he never formed an adequate idea of the place of Christianity amongst the world's religions, though he often used language about Christ which in the case of a closer thinker would have indicated the acceptance of Christianity as the absolute and final religion for man. But in truth Parker was more of a speaker than a thinker, of a reformer than a philosopher. He had a wide and firm grasp of facts and principles, but his thought was neither profound nor subtle, neither accurate nor self-consistent. Although rich in poetic elements, he was singularly defective, too, in artistic faculty. He has produced nothing that is perfect in form, while all his works are disfigured by outrageous violations of taste and good fceling. But with all his numerous defects Parker ranks amongst America's great and noble sons, and may perhaps obtain finally a place amongst the world's great men. A

future biographer will have to assign him his final position. The three biographies which at present exist—Weiss's (1863), Frothingham's (1874), and Dean's (1877)—are the work of eager partisans and admiring panegyrists

rather than of calm critics and historians. _ am, Parker's principal works are A Discourse on Matters pertaining to Religion, 1842; Ten Sermons of Religion, 1852; Thetsm, Atheism, and the Popular Theology, 1853. A collected edition of his works has been published in England by Frances Power Cobbe, in 12 vols. A German translation of part of his works was made by Zicthen, Leipsic, 1854-57. Valuable reviews of his theological position and of his character and work have appeared—by James Martineau, in the Nattonal Review (April 1860), and J. H. Thom, in the Theological Review

(March 1864). : f (J. F. 8.) PARKERSBURG, a city of the United States, next to

Wheeling the largest city in West Virginia, is the capital of Wood county, and lies on the left bank of the Ohio, at the mouth of the Little Kanawha. It is the western terminus of the Baltimore and Ohio Railroad, and is connected by a fine railway bridge (14 miles in length, and constructed at a cost of more than $1,000,000 in 1869- 1871) with Belpré, where the Marietta and Cincinnati Railroad begins. Steamers ply both on the Ohio and the Little Kanawha (rendered navigable for 38 miles). The staple industry is the refining of petroleum, but there are also foundries, flour-mills, saw-mills, brickyards (most of the buildings are of brick), &c. The population was 2493 in 1860, 5546 in 1870, and 6582 in 1880. As a town Parkersburg dates from 1820, as a city from 1860.

PARLIAMENT

HE British Parliament is the supreme legislature of the United Kingdom of Great Britain and Ireland, consisting of the King, or Queen, and the three estates of the realm, viz., the Lords Spiritual, the Lords Temporal, and the Commons.

HISToRY.

An inquiry into the early growth and later development of this powerful institution presents at once an interesting historical study and profound political instruction. Its great antiquity, its continuous but ever-changing life, and the social and political causes which have shaped its pre- sent constitution and authority are themes which can never fail to attract the historian and the statesman ; while speculations regarding its future course concern the destinies of the British empire.

The Anglo-Saxon Polity.—The origin of parliament is to be traced to Anglo-Saxon times. The Angles, Saxons,

_and other Teutonic races who conquered Britain brought

‘to their new homes their own laws and customs, their settled framework of society, their kinship, their village communities, and a certain rude representation in local affairs. And we find in the Anglo-Saxon polity, as deve- loped during their rule in England, all the constituent parts of parliament. In their own lands they had chiefs and leaders, but no kings. But conquest and territorial settlement were followed by the assumption of royal dignities ; and the victorious chiefs were accepted by their followers as kings. They were quick to assume the tradi- tional attributes of royalty. A direct descent from their god Woden, and hereditary right, at once clothed them with a halo of glory and with supreme power ; and, when the pagan deity was deposed, the king received consecration from a Christian archbishop, and was invested with sacred attributes as “the Lord’s anointed.” But the Saxon monarch was a patriarchal king of limited authority, who acted in concert with his people; and, though his succes- sion was hereditary, in his own family, his direct descendant was liable to be passed over in favour of a worthier heir. Such a ruler was a fitting precursor of a line of constitu- tional kings, who in later times were to govern with the advice and consent of a free parliament.

Meanwhile, any council approaching the constitution of a House of Lords was of slow growth. Anglo-Saxon society, indeed, was not without an aristocracy. The highest in rank were ethelings—generally, if not exclu- sively, sons and brothers of the king. The ealdorman, originally a high

officer, having the executive government of a shire, and a seat in the king's witan, became heredi- tary in certain families, and eventually attained the dignity of an earl, But centuries were to pass before the English nobility was to assume its modern character and denomi- nations. At the head of each village was an eorl, the chief of the freemen, or ceorls—their leader in war and patron in peace. The king's gesiths and thegns formed another privileged class. Admitted to offices in the king's household and councils, and enriched by grants of land, they gradually formed a feudal nobility.

The revival of the Christian church, under the Anglo- Saxon rule, created another order of rulers and councillors, destined to take a leading part in the government of the state. The archbishops and bishops, having spiritual authority in their own dioceses, and exercising much local

{influence in temporal affairs, were also members of the \national council, or witenagemdét, and by their greater

learning and capacity were not long in acquiring a leading part in the councils of the realm. Ecclesiastical councils were also held, comprising bishops, abbots, and clergy, in which we observe the origin of convocation. The abbots, thus associated with the bishops, also found a place with them in the witenagemét. By these several orders, sum- moned to advise the king in affairs of state, was formed a council of magnates—to be developed, in course of time, into an Upper Chamber, or House of Lords. |

The rise of the commons, as a political power in the national councils, was of yet slower development; but in the Anglo-Saxon moots may be discerned the first germs of popular government in England. In the town-moot the assembled freemen and cultivators of the “ folk-lands” regulated the civil affairs of their own township, tithing, village, or parish. In the burgh-moot the inhabitants administered their municipal business, under the presidency ofareeve. The hundred-moot assumed a more representa- tive character, comprising the reeve and a selected number of freemen from the several townships and burghs within the hundred. The shire-moot, or shire-gemédt, was an assembly yet more important. An ealdorman was its pre- sident, and exercised a jurisdiction over a shire, or district comprising several hundreds. Attended by a reeve and four freemen from every hundred, it assumed a distinctly representative character. Its members, if not elected by the popular voice, were, in some fashion, deputed to act on behalf of those whose interests they had come to guard. The shire-moot was also the general folk-moot of the tribe, assembled in arms, to whom their leaders referred the decision of questions of peace and war.

Superior to these local institutions was the witena- gemdt, or assembly of wise men, with whom the king took counsel in legislation and the government of the state, This national council was the true beginning of the parliament of England. Such a council was originally held in each of the kingdoms commonly known as the Heptarchy ; and after their union in a single realm, under King Edgar, the witenagemét became the deliberative and legislative assembly, or parliament, of the extended estate.

The witenagemdét made laws, imposed taxes, concluded treaties, advised the king as to the disposal of public lands and the appointment and removal of officers of state, and even assumed to elect and depose the king himself.

The king had now attained to greater power, and more royal dignities and prerogatives. He was unquestionably the chief power in the witenagemét; but the laws were already promulgated, as in later times, as having been agreed to with the advice and consent of the witan. The witan also exercised jurisdiction as a supreme court. These ancient customs present further examples of the continuity of English constitutional forms.

The constitution of the witenagemdét, however, was necessarily less popular than that of the local moots in the hundred or the shire. The king himself was generally present; and at his summons came prelates, abbots, ealdormen, the king's gesiths and thegns, officers of state and of the royal household, and leading tenants in chief of lands held from the crown. Crowds sometimes attended the meetings of the witan, and shouted their acclamations of approval or dissent ; and, so far, the popular voice was associated with its deliberations ; but it was at a distance from all but the inhabitants of the place in which it was assembled, and until a system of representation had slowly grown up there could be no further admission of the

people to its deliberations. In the town-moot the whole body of freemen and cultivators of the folk-lands met freely under a spreading oak, or on the village green ; in the hundred-moot, or shire-gemot, deputies from neighbour- ing communities could readily find a place; but all was changed in the wider council of a kingdom. When there were many kingdoms, distance obstructed any general gathering of the commons; and in the wider area of England such a gathering became impossible. Centuries were yet to pass before this obstacle was to be overcome by representation ; but, in the meantime, the local institu- tions of the Anglo-Saxons were not without their influence upon the central council. The self-government of a free people informed the bishops, ealdormen, ceorls, and thegns who dwelt among them of their interests and needs, their sufferings and their wrongs; and, while the popular forces were increasing with an advancing society, they grew more potential in the councils of their rulers. Some writers, naturally sympathizing with every tradition of English liberty, have discovered proofs of an earlier representation ; but popular franchises are

now too firmly established to need support from doubtful traces of anti- quity.

Another circumstance must not be overlooked in esti- mating the political influence of the people in Anglo-Saxon times. For five centuries the country was convulsed with incessant wars—wars with the Britons, whom the invaders were driving from their homes, wars between the several kingdoms, wars with the Welsh, wars with the Picts, wars with the Danes. How could the people continue to assert their civil rights amid the clash of arms and a frequent change of masters? The warrior-kings and their armed followers were rulers in the land which they had con- quered.

At the same time the unsettled condition of the country repressed the social advancement of its people. Agricul- ture could not prosper when the farm of the husbandman too often became a battlefield. Trade could not be extended without security to property and industry. Under such conditions the great body of the people con- tinued as peasants, handicraftsmen, and slaves. The time had not yet come when they could make their voice heard in the councils of the state.

The Norman Conquest.—The Anglo-Saxon polity was suddenly overthrown by the Norman Conquest. A stern foreign king had seized the crown, and was prepared to rule his conquered realm by the sword. He brought with him the absolutist principles of Continental rulers, and the advanced feudal system of France and Normandy. Feudalism had been slowly gaining ground under the Saxon kings, and now it was firmly established as a military organization. William the Conqueror at once rewarded his warlike barons and followers with enormous grants of land. The Saxon landowners and peasants were despoiled, and the invaders settled in their homesteads. The king claimed the broad lands of. England as his own, by right of conquest ; and when he allowed his warriors to share the spoil he attached the strict condition of military service in return for every grant of land. An effective army of occupation of all ranks was thus quartered upon every province throughout the realm. England was held by the sword ; a foreign king, foreign nobles, and a foreign soldiery were in possession of the soil, and swore fealty to their master, from whom they held it. Saxon bishops were deposed, and foreign prelates appointed to tule

over the English Church. Instead of calling a national witenagemét, the king took counsel with the ollicers of his state and household, the bishops, abbots, earls, barons, and knights by whom he was pleased to surround himself. Some of the forms of a national council

were indeed maintained, and its counsel and consent were proclaimed in the making of laws; but, in truth, the king was absolute.

Such a revolution seemed fatal to the liberties and ancient customs of Saxon England. What power could withstand the harsh conqueror? But the indestructible elements of English society prevailed over the sword. The king grasped, in his own hands, the higher administration and judicature of the realm; but he continued the old local courts of the hundred and the shire, which had been the basis of Saxon freedom. The Norman polity was otherwise destined to favour the liberties of the people, through agencies which had been designed to crush them. The powerful nobles, whom William and his successors exalted, became formidable rivals of the crown itself ; while ambitious barons were in their turn held in check by a jealous and exacting church. The ruling powers, if combined, would have reduced the people to slavery ; but their divisions proved a continual source of weakness. In the meantime the strong rule of the Normans, bitter as it was to Englishmen, repressed intestine wars and the disorders of a divided realm. Civil justice was fairly administered. When the spoils of the conquerors had been secured, the rights of property were protected, industry and trade were left free, and the occupation of the soil by foreigners drove numbers of landowners and freemen into the towns, where they prospered as merchants, traders, and artificers, and collected thriving populations of towns- men. Meanwhile, foreign rulers having brought England into closer relations with the Continent, its commerce was extended to distant lands, ports and shipping were encouraged, and English traders were at once enriched and enlightened. Hence new classes of society were growing, who were eventually to become the commons of England.

The Crown, the Barons, the Church, and the People.— While these social changes were steadily advancing, the barons were already preparing the way for the assertion of popular rights. Ambitious, turbulent, and grasping,

they were constantly at issue with the crown. Enjoying vast estates and great commands, and sharing with the prelates the government of the state, as members of the king's council, they were ever ready to raise the standard of revolt. The king could always count upon barons faith- ful to his cause, but he also appealed for aid to the church and the people. The baronage was thus broken by insur- rections, and decimated by civil wars, while the value of popular alliances was revealed. The power of the people was ever increasing, while their oppressors were being struck down. The population of the country was still Saxon; they had been subdued, but had not been driven forth from the land, like the Britons in former invasions. The English language was still the common speech of the people; and Norman blood was being mingled with the broader stream of Saxon life. A continuous nationality was thus preserved, and was outgrowing the foreign element. ;

The crown was weakened by disputed successions and foreign wars, and the baronage by the blood-stained fields of civil warfare; while both in turn looked to the people in their troubles. Meanwhile the church was struggling, alike against the crown and the barons, in defence of its ecclesiastical privileges and temporal possessions. _lts clergy were brought by their spiritual ministrations into close relations with the people, and their culture contri- buted to the intellectual growth of English society. When William Rufus was threatened by his armed barons, he took counsel with Archbishop Lanfranc, and promised good laws and justice to the people. His promises were broken; but, like later charters, as lightly set aside, they

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were a recognition of the political rights of the people. By the charter of Henry I. restoring to the people the laws of Edward the Confessor, the continuity of English institutions was acknowledged ; and this concession was also proclaimed through Archbishop Anselm, the church and the people being again associated with the crown against the barons. And throughout his reign the clergy and the English people were cordially united in support of the crown. In the anarchic reign of Steplien—also dis- tinguished by its futile charters—the clergy were driven into opposition to the king, while his oppressions alienated the people. Henry IL. commenced his reign with another charter, which may be taken as a profession of good

intentions on the part of the new king. So strong-willed a king, who could cripple his too powerful nobles, and forge shackles for the church, was not predisposed to extend the liberties of his people; but they supported him loyally in his critical struggles; and his vigorous reforms in the administrative, judicial, and financial organization of his realm promoted the prosperity and political influence of the commons. At the same time the barons created in this and the two previous reigns, being no longer exclu- sively Norman in blood and connexion, associated them- selves more readily with the interests and sympathies of the people. Under Richard I. the principle of repre- sentation was somewhat advanced, but it was confined to the assessment and collection of taxes in the different shires.

The Great Charter.—It was under King John that the greatest progress was made in national liberties. ‘he loss of Normandy served to draw the baronage closer to the English people ; and the king soon united all the forces of the realm against him. He outraged the church, the barons, and the people. He could no longer play one class against another; and they combined to extort the Great Charter of their liberties at Runnymede. It was there ordained that no scutage or aid, except the three regular feudal aids, should be imposed, save by the common council of the’realm, To this council the archbishops, bishops, abbots, earls, and greater barons were to be summoned per- sonally by the king’s letters, and tenants in chief by a gene- ral writ through the sheriff. The summons was required to appoint a certain place, to give forty days’ notice at least, and to state the cause of meeting. At length we seem to reach some approach to modern usage.

Growth of the Commons.—The improved administration of successive kings had tended to enlarge the powers of the crown. But one hundred and fifty years had now passed since the Conquest, and great advances had been made in the condition of the people, and more particularly in the population, wealth, and self-government of towns. Many had obtained royal charters, elected their own magistrates, and enjoyed various commercial privileges. They were already a power in the state, which was soon to be more distinctly recognized.

The charter of King John was again promulgated under Henry IIT., for the sake of a subsidy ; and henceforth the commons learned to insist upon the

redress of grievances in return fora grant of money. This reign was memorable in the history of parliament. Again the king was in con- flict with his barons, who rebelled against his gross mis- government of the realm. Simon de Montfort, earl of Leicester, was a patriot, in advance of his age, and fought for the English people as well as for his own order. The barons, indeed, were doubtful allies of the popular cause, and leaned to the king rather than to Simon. But the towns, the clergy, the universities, and large bodies of the commonalty rallied round him, and he overthrew the king and his followers at Lewes. He was now master of the realm, and proclaimed a new constitution. Kings had

made promises, and granted illusory charters; but the rebel earl called an English parliament into being. Chureh- men were on his side, and a few barons; but his main reliance was upon the commons. He summoned to a national council, or parliament, bishops, abbots, earls, and barons, together with two knights from every shire and two} burgesses from every borough. Knights had been sum, | moned to former councils ; but never until now had repre. | sentatives from the towns been invited to sit with bishops, barons, and knights of the shire.

In the reign of Edward I. parliament assumed substan- tially its present form of king, lords, and commons. The irregular and unauthorized scheme of Simon de Montfort was fully adopted in 1295, when the king himself sum- moned to a parliament two knights from every shire, elected by the freeholders at the shire court, and two bur- gesses from every city, borough, and leading town. The rebel earl had enlarged the basis of the national council ; and, to secure popular support, the politic king accepted it as a convenient instrument of taxation. The knights and freeholders had increased in numbers and wealth ; and the towns, continually advancing in population, trade, and com- merce, had become valuable contributors to the revenue of the state. The grant of subsidies to the crown, by the assembled baronage and representatives of the shires and towns, was a legal and comprehensive impost upon the entire realm.

Secession of the Clergy.—It formed part of Edward’s policy to embrace the clergy in his scheme for the repre- sentation of all orders and classes of his

subjects. They were summoned to attend the parliament of 1295 and succeeding parliaments of his reign, and their form of summons has been continued until the present time; but the clergy resolutely held aloof from the national council, and insisted upon voting their subsidies in their own con- vocations of Canterbury and York. The bishops retained their high place among the earls and barons, but the

clergy sacrificed to ecclesiastical jealousies the privilege of —

sharing in the political councils of the state. As yet, indeed, this privilege seemed little more than the voting of subsidies, but it was soon to embrace the redress of grievances and the framing of laws for the general welfare of the realm. This great power they forfeited ; and who shall say how it might have been wielded,-in the interests of the church, and in the legislation of their country? They could not have withstood the Reformation; they would have been forced to yield to the power of the crown and the heated resolution of the laity; but they might have saved a large share of the endowments of the chureh, and perhaps have modified the doctrines and formularies of the reformed establishment.

Reluctance of the Commons to Attend.—Meanwhile the commons, unconscious of their future power, took their humble place in the great council of the realm. The knights of the shire, as lesser barons, or landowners of good social standing, could sit beside the magnates of the land without constraint; but modest traders from the towns were overawed by the power and dignity of their new associates. They knew that they were summoned for no other purpose than the taxing of themselves and their fellow townsmen; their attendance was irksome ; it inter- rupted their own business; and their journeys exposed them to many hardships and dangers. It is not surprising that they should have shrunk from the exercise of so doubt- ful a privilege. Considerable numbers absented them- selves from a thankless service ; and their constituents, far from exacting the attendance of their members, as 1 modern times, begrudged the sorry stipend of 2s. a day, paid to their representatives while on duty, and strove to evade the burden imposed upon them by the crown. Some

even purchased charters, withdrawing franchises which they had not yet learned to value. Nor, in truth, did the representation of towns at this period

afford much protec- tion to the rights and interests of the people. Towns were enfranchised at the will or caprice of the crown and the sheriffs ; they could be excluded at pleasure ; and the least show of independence would be followed by the omission of another writ of summons, But the principle of repre- sentation, once established, was to be developed with the expansion of society; and the despised burgesses of Edward I., not having seceded, like the clergy, were destined to become a potential class in the parliaments of England.

Sitting of Parliament at Westminster.—Another consti- tutional change during this reign was the summoning of parliament to Westminster instead of to various towns in different parts of the country. This custom invested parliament with the character of a settled institution, and constituted it a high court for the hearing of petitions and the redress of grievances. The growth of its judica- ture, as a court of appeal, was also favoured by the fixity of its place of meeting.

Authority of Parliament recognized by Law.—Great was the power of the crown, and the king himself was bold and statesmanlike ; but the union of classes against him proved too strong for prerogative. In 1297, having outraged the church, the barons, and the commons by illegal exactions, he was forced to confirm the Great Charter and the Charter of Forests, with further securities against the taxation of the people without their consent, and, in return, obtained timely subsidies from the parliament.

Henceforth the financial necessities of a succession of Kings ensured the frequent assembling of parliaments. Nor were they long contented with the humble function of voting subsidies, but boldly insisted on the redress of grievances and further securities for national liberties. Tn 1322 it was declared by statute 15th Edward II. that “the matters to be established for the estate of the king and of his heirs, and for the estate of the realm and of the people, should be treated, accorded, and established in parliament, by the king, and by the assent of the prelates, earls, and barons, and the commonalty of the realm, according as had been before accustomed.” The constitutional powers of parliament as a legislature were here amply recognized,—not by royal charter, or by the occasional exercise of prerogative, but by an authori- tative statute, And these powers were soon

to be exercised in a striking form. Already parliament' had established the principle that the redress of grievances Should have precedence of the grant of subsidies; it had maintained the right of approving councillors of the crown, and punishing them for the abuse of their powers; and in 1327 the king himself was finally deposed, and the succession of his son, Edward III., declared by parliament.

Union of Knights of the Shire and Burgesses.—At this period the constitution of parliament was also settling down to its later and permanent shape. Hitherto the different orders or estates had deliberated separately, and agreed upon their several grants to the crown, The knights of the shire were naturally drawn, by social ties and class interests, into alliance with the barons; but at length they joined the citizens and burgesses, and in the fitst parliament of Edward ITI. they are found sitting together as " the Commons."

This may be taken as the turning point in the political history of England. If all the landowners of the country had become united as an order of nobles, they might have proved too strong for the development of national liberties, While the union of the country gentlemen with the

burgesses formed an estate of the realm, which was destined to prevail over all other powers. The withdrawal of the clergy, who would probably have been led by the bishops to take part with themselves and the barons, further strengthened the united commons.

Increasing Influence of Parliament.—The reign of Edward ITI. witnessed further advances in the authority of parliament, and changes in its constitution. The king, being in continual need of subsidies, was forced to sum- mon parliament every year, and in order to encourage its liberality he frequently sought its advice upon 'the most important issues of peace or war, and readily entertained the petitions of the commons praying for the redress of grievances. During this reign also, the advice and con- sent of the

commons, as well as of the lords spiritual and temporal, was regularly recorded in the enacting part of every statute.

Separation of the Two Houses. —But a more important event is to be assigned to this reign,—the formal separa- tion of parliament into the two Houses of Lords and Com- mons. There is no evidence—nor is it probable —that the different estates ever voted together as a single assembly. It appears from the Rolls of Parliament that in the early part of this reign, the causes of summons having been declared to the assembled estates, the three estates deliberated separately, but afterwards delivered a collective answer to the king. While their deliberations were short, they could be conducted apart, in the same chamber ; but, in course of time, it was found convenient for the commons to have a chamber of their own, and they adjourned their sittings to the chapter-house of the abbot of Westminster, where they continued to be held after the more formal and permanent separation had taken place. The date of this event is not clearly established, but is generally assigned to the 17th Edward ITI.

The Commons as Petitioners,—Parliament had now assumed its present outward form, But it was far from enjoying the authority which it acquired in later times. The crown was still paramount ; the small body of earls and barons—not exceeding forty—-were connected with the royal family, or in the service of the king, or under his influence ; the prelates, once distinguished by their inde- pendence, were now seekers of royal favour; and the commons, though often able to extort concessions In return for their contributions to the royal exchequer, as yet held an inferior position among the estates of the realm. Instead of enjoying an equal share in the fram- ing of laws, they appeared before the king in the humble guise of petitioners. Their petitions, together with the king’s answers, were recorded in the Rolls of Parliament ; but it was not until the parliament had been discharged from attendance that statutes were framed by the judges, and entered on the statute rolls. Under such conditions legislation was, in truth, the prerogative of the crown rather than of parliament. Enactments were often found in the statutes at variance with the petitions and royal answers, and neither prayed for by the commons nor assented to by the lords. In vain the commons pro- tested against so grave an abuse of royal authority ; but the same practice was continued during this and succeed- ing reigns. Henry V., in the second

year of his reign, promised “ that nothing should be enacted to the petitions of the commons, contrary to their asking, whereby they should be bound without their assent”; but, so long as the old method of framing laws was adhered to, there could be no security against abuse ; and it was not until

the reign of Henry VI. that the introduction of the more |

regular system of legislating by bill and statute ensured the thorough agreement of all the estates in the several provisions of every statute.

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Increasing Boldness of the Commons.—The commons, however, notwithstanding these and other discouragements, were constantly growing bolder in the assertion of their rights. They now ventured to brave the displeasure of the king, without seeking to shelter themselves behind powerful barons, upon whose forwardness in the national cause they could not reckon. Notably in 1376 their stout Speaker, Peter de la ¥err, inveighed, in their name, against the gross mismanagement of the war, impeached ministers of the realm, coniplained of the heavy burdens under which the people suffered, and even demanded that a true account should be rendered of the public expendi- ture. The brave Speaker was cast into prison, and a new parliament was summoned which speedily reversed the resolutions of the last. But the death of the king changed the aspect of affairs. Another parliament was called, when it was found that the spirit of the commons was not subdued. Peter de la Wass was released from prison, and again elected to the chair. The demands of the former parliament were reiterated with greater boldness and persistence, the evil councillors of the late reign were driven out, and it was conceded that the principal officers of state should be appointed and removed, during the minority of Richard IJ., upon the advice of the lords. The commons also insisted upon the annual assembling of parliament under the stringent provisions of a binding law.

They claimed the right, not only of voting subsidies, but of appropriating them, and of examining public accounts. They inquired into public abuses, and im- peached ministers of the crown. Even the king himself was deposed by the parliament. Thus during this reign all the great powers of parliament were asserted and exercised. The foreign wars of Henry IV. and Henry V., by continuing the financial necessities of the crown, main- tained for a while the powers which parliament had acquired by the struggles of centuries.

Relapse of Parliamentary Influence.—But a period of civil wars and disputed successions was now at hand, which checked the further development of parliamentary liberties. The effective power of a political institution is determined, not by assertions of authority, nor even by its legal recognition, but by the external forces by which it is supported, controlled, or overborne. With the close of the Wars of the Roses the life of parliament seems to have well-nigh expired.

To this constitutional relapse various causes contributed at the same period. The crown had recovered its absolute supremacy. ‘The powerful baronage had been decimated on the battlefield and the scaffold; and vast estates had been confiscated to the crown. Kings had no longer any dread of their prowess as defenders of their own order or party, or as leaders of the people. The royal treasury had been enriched by their ruin; while the close of a long succession of wars with France and Scotland relieved it of that continual drain which had reduced the crown to an unwelcome dependence upon parliament. Not only were the fortunes of the baronage laid low, but feudalism was also dying out in England ason the Continent. It was no longer a force which could control the crown; and it was being further weakened by changes in the art of war. The mailed horseman, the battle-axe and cross-bow of burgher and yeoman, could not cope with the cannon and arquebus of the royal army.

In earlier times the church had often stood forth against the domination of kings, but now it was in passive sub- ussion to the throne. The prelates were attracted to the court, and sought the highest offices of state; the inferior clergy had long been losing their influence over the laity by their ignorance

and want of moral elevation, at a period of increasing enlightenment ; while the church at large was

weakened by schisms and a wider freedom of thought, Hence the church, like the baronage, had ceased to bea check upon the crown.

Meanwhile what had become of the ever-growing power of the commons? It is true they had lost their stalwart leaders, the armed barons and outspoken prelates, but they had themselves advanced in numbers, riches, and enlightenment ; they had overspread the land as knights and freeholders, or dwelt in populous towns enriched by merchandise. Why could they not find leaders of their own? Because they had lost the liberal franchises of an earlier age, All freeholders, or suitors present: at the county court, were formerly entitled to vote for a knight of the shire; but in the eighth year of Henry VI. (1430) an Act was passed (c. 37) by which this right was confined to 40s. freeholders, resident in the county. Large numbers of electors were thus disfranchised. In the view of parliament they were “of no value,” and complaints had been made that they were under the influence of the nobles and greater landowners; but a popular element had been withdrawn from the county representation, and the restricted franchise cannot have inmipaired the influence of the nobles.

As for the cities and boroughs, they had virtually renounced their electoral privileges. As we have seen, they had never valued them very highly; and now by royal charters, or by the usurpation of small self-elected bodies of burgesses, the choice of members had fallen into the hands of town councils and neighbouring landowners. The anomalous system of close and nomination boroughs, which had arisen thus early in our history, was suffered to continue without a check for four centuries, as a notorious blot upon our free constitution.

All these changes exalted the prerogatives of the crown. Amid the clash of arms and the strife of hostile parties, the voice of parliament had been stifled ; and, when peace was restored, a powerful king could dispense with an assembly which might prove troublesome, and from whom he rarely needed help. from the reign of Henry VI. to that of Elizabeth, the free parliaments of England were in abeyance. The institution retained its form

and constituent parts; its rights and privileges were theoretically recognized, but its freedom and national character were little more than shadows.

The Three Estates of the Realm.—This check in the fortunes of parliament affords a fitting occasion for examining the composition of each of the three estates of the realm.

Lords Spiritual and Temporal.—The archbishops and bishops had held an eminent position in the councils of Saxon and Norman kings, and many priors and abbots were from time to time associated with them as lords spiritual, until the suppression of the monasteries by Henry VIII. They generally outnumbered their brethren, the temporal peers, who sat with them in the same assembly.

The lords temporal comprised several dignities. Of these the baron, though now the lowest in rank, was the most ancient. The title was familiar in Saxon times, but it was not until after the Norman Conquest that it was invested witha distinct feudal dignity. Next in antiquity was the earl, whose official title was known to Danes and Saxons, and who after the Conquest obtained a dignity equivalent to that of count in foreign states. The highest dignity, that of duke, was not created until Edward I. conferred it upon his son, Edward the Black Prince. The rank of marquis was first created by Richard II., with precedence aftera duke. It was in the reign of Henry VL. that the rank of viscount was created, to be placed

Hence for a period of two hundred years, ‘

between the earl and the baron. Since that time no new dignity has been invented, and the peerage consists of the five dignities of duke, marquis, earl, viscount, and baron. During the 15th century the number of temporal peers summoned to parliament rarely exceeded fifty, and no more than twenty-nine received writs of summons to the first parliament of Henry VII. There were only fifty-nine at the death of Queen Elizabeth. At the accession of William III. this number had been increased to about one hundred and fifty.

Infe Peerages.—The several orders of the peerage are alike distinguished by the hereditary character of their dignities. Some life peerages, indeed, were created between the reigns of Richard II. and Henry VI., and several ladies had received life peerages between the reigns of Charles II. and George II. The highest authorities had also held that the creation of life peerages was within the prerogative of the crown. But four hundred years had elapsed since the creation of a life peer, entitled to sit in parliament, when Queen Victoria was advised to create Sir James Parke, lately an eminent judge, a baron for life, under the title of Lord Wensleydale. The object of this deviation from the accustomed practice was to strengthen the judicature of the House of Lords, without unduly enlarging the numbers of the peerage. But the lords at once took exception to this act of the crown, and, holding that a prerogative so long disused could not be revived, in derogation of the hereditary character of the peerage, resolved that Lord Wensleydale was not entitled by his letters patent, and writ of summons, to sit and vote in parliament. His lordship accordingly received a new patent, and took his seat as an hereditary peer. But the necessity of some such expedient for improving the appellate jurisdiction of the House of . Lords could not be contested ; and in 1876 three lords of appeal in ordinary were constituted by statute, enjoying the rank of baron for life, and the right of sitting and voting in the House of Lords so long as they continue in office,

__ Lhe Commons.—The commons formeda more numerous

body. Inthe reign of Edward I. there were about 275 members, in that of Edward III. 250, and in that of Henry VI. 300. In the reign of Henry VIII. parliament added 27 members for Wales and 4 for the county and city of Chester, and in the reign of Charles IL. 4 for the county and city of Durham. Between the reigns of Henry VIII. and Charles II, 130 members were also added by royal charter.

Parliament under Henry VIII.—To resume the history of parliament ata later period, let us glance at the reign of Henry VIII. Never had the power of the crown been greater than when this king succeeded to the throne, and never had a more imperious will been displayed by any king of England. Parliament was at his feet to do his bidding, and the Reformation enormously increased his power. He had become a pope to the bishops ; the

old nobles who had resisted his will had perished in the field or on the scaffold ; the new nobles were his creatures ; and he had the vast wealth of the church in his hands as largesses to his adherents. Such was the dependence of parliament upon the crown and its advisers during the Reformation period that in less than thirty years four vital changes were decreed in the national faith. Each of the successive reigns inaugurated a new religion.

Queen Elizabeth and her Parliaments.—With the reign of Elizabeth commenced a new era in the life of parliament. She had received the royal prerogatives unimpaired, and her hand was strong enough to wield them. But in the long Interval since Edward IV, the entire framework of

nglish society had been changed ; it was a new England

that the queen was called upon to govern. The coarse barons of feudal times had been succeeded by English country gentlemen, beyond the influence of the court, and identified with all the interests and sympathies of their country neighbours. From this class were chosen nearly all the knights of the shire, and a considerable proportion of the members for cities and boroughs. They were generally distinguished by a manly independence, and were prepared to uphold the rights and privileges of parliament and the interests of their constituents. A change no less remark- able had occurred in other classes of society. The country was peopled with yeomen and farmers, far superior to the cultivators of the soil in feudal times; and the towns and seaports had grown into important centres of commerce and manufactures. Advances not less striking had been made in the enlightenment and culture of society. But, above all, recent religious revolutions had awakened a spirit of thought and inquiry, by no means confined to questions of faith. The Puritans, hostile to the church,

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and jealous of every semblance of Catholic revival, were ‘

embittered against the state, which was identified, in their eyes, with many ecclesiastical enormities ; and their stub- born temper was destined to become a strong motive force in restoring the authority of parliament.

The parliaments of Elizabeth, though rarely summoned, displayed an unaccustomed spirit. They discussed the succession to the crown, the marriage of the queen, and ecclesiastical abuses; they upheld the privileges of the commons, and their right to advise the crown upon all matters of state ; and they condemned the grant of mono- polies. The bold words of the Wentworths and Yelvertons were such as had not been heard before in parliament. The conflicts between Elizabeth and the commons marked the revival of the independence of parliament, and fore- shadowed graver troubles at no distant period.

Conflicts of James I. with the Commons.—James I., with

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short-sighted pedantry, provoked a succession of conflicts ©

with the commons, in which abuses of prerogative were stoutly resisted and the rights and privileges of parliament resolutely asserted. The “remonstrance” of 1610 and the “ protestation” of 1621 would have taught a politic ruler that the commons could no longer be trifled with ; but those lessons were lost upon James and upon his ill- fated son.

Charles I. and the Commonwealth—The momentous struggles between Charles I. and his parliaments cannot be followed in this place. The earlier parliaments of this reign fairly represented the earnest and temperate judgment of the country. They were determined to obtain the redress of grievances, and to restrain undue prerogatives , but there was no taint of disloyalty to the crown ; there were no dreams of revolution. But the contest at length became embittered, until there was no issue but the arbitra- ment of the sword. Thecivil war and the commonwealth, however memorable in the history of England, are beyond the range of this narrative. supreme power of the commons, when supported by popular forces. Everything gave

way before them. They raised victorious armies in the field, they overthrew the church and the House of Lords, and they brought the king himself to the scaffold. It also displayed the

impotence of a parliament which has lost the confidence .

of the country, or is overborne by mobs, by an army, or by the strong will of a dictator. – Political Agitation of this Period.—It is to this time of fierce political passions that we trace the origin of political agitation, as an organized method of influencing the deliberations of parliament. The whole country was then aroused by passionate exhortations from the pulpit and in the press. No less than thirty thousand political

But this period proved the |

tracts and newspapers during this period have been pre- served. Petitions to parliament were multiplied in order to strengthen the hands of the popular leaders. Clamorous meetings were held to stimulate or overawe parliament. Such methods, restrained after the Restoration, have been revived in later times, and now form part of the acknow- ledged system of parliamentary government.

Parliament after the Restoration. —On the restoration of Charles II. parliament was at once restored to its old constitution, and its sittings were revived as if they had suffered no interruption. No outward change had been effected by the late revolution ; but that a stronger spirit of resistance to abuses of prerogative had been aroused was soon to be disclosed in the deposition of James II. and the “glorious revolution” of 1688. At this time the full rights of parliament were explicitly declared, and securities taken for the maintenance of public liberties. The theory of a constitutional monarchy and a free parliament was established ; but after two revolutions it is curious to observe the indirect methods by which the commons were henceforth kept in subjection to the crown and the terri- torial aristocracy. The representation had long become an illusion. The knights of the shire were the nominees of nobles and great landowners; the borough members were returned by the crown, by noble patrons, or close corporations; even

the representation of cities, with greater pretensions to independence, was controlled by bribery. Nor were rulers content with their control of the repre- sentation, but, after the Restoration, the infamous system of bribing the members themselves became a recognized instrument of administration. The country gentlemen were not less attached to the principles of rational liberty than their fathers, and would have resisted further encroachments of prerogative ; but they were satisfied with the Revolution settlement and the remedial laws of William IIL., and no new issue had yet arisen to awaken opposi- tion. Accordingly, they ranged themselves with one or other of the political parties into which parliament was now beginning to be divided, and bore their part in the more measured strifes of the 18th century. From the Revolution till the reign of George III. the effective power of the state was wielded by the crown, the church, and the territorial aristocracy ; but the influence of public opinion since the stirring events of the 17th century had greatly increased. Both parties were constrained to defer to it; and, notwithstanding the flagrant defects in the representation, parliament generally kept itself in accord with the general sentiments of the country.

Union of Scotland. —On the union of Scotland in 1707, important changes were made in the constitution of parlia- ment. The House of Lords was reinforced by the addition of sixteen peers, representing the peerage of Scotland, and elected every parliament; and the Scottish peers, as a body, were admitted to all the privileges of peerage, except the right of sitting in parliament, or upon the trial of peers. No prerogative, however, was given to the crown to create new peerages after the Union; and, while they are distinguished by their antiquity, their number 1s consequently decreasing. ‘To the House of Commons were assigned forty-five members, representing the shires and burghs of Scotland.

Parliament under George II.—With the reign of George III. there opened a new period in the history of parliament. Agitation in its various forms, an active and aggressive press, public meetings and political associations, the free use of the right of petition, and a turbulent spirit among the people seriously changed the relations of parliament to the country. And the publication of debates, which was fully established in 1771, at once increased the direct responsibility of parliament to the

people, and ultimately brought about other results, to which we shall presently advert.

Union of Ireland.—In this reign another important change was effected in the constitution of parliament, Upon the union with Ireland, in 1801, four Irish bishops were added to the lords spiritual, who sat by rotation of sessions, and represented the episcopal body of the Church of Ireland. But those bishops were deprived of their seats in parliament in 1869, on the disestablishment of the Church of Ireland. Twenty-eight representative peers, elected for life by the peerage of Ireland, were admitted to the House of Lords. All the Irish peers were also entitled to the privilege of peerage. In two particulars the Irish peerage was treated in a different manner from the peerage of Scotland. The crown was empowered to create a new Irish peerage whenever three Irish peerages in existence at the time of the Union have become extinct, or when the number of Irish peers, exclusive of those

holding peerages of the United Kingdom, has been

reduced to one hundred. And, further, Irish peers were permitted to sit in the House of Commons for any place in Great Britain, forfeiting, however, the privilege of peerage while sitting in the Lower House. The exped- iency of both these provisions has often been called in question.

At the same time one hundred representatives of Ireland were added to the House of Commons. This addition raised the number of members to six hundred and fifty-eight. Parliament now became the parliament of the United Kingdom, and high hopes were entertained of a salutary fusion of diverse nationalities into a single assembly; but these hopes have scarcely been realized, and the relations of the Irish people to Great Britain and the imperial government continue to be a source of the gravest embarrassment and danger.

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Schemes for Improving the Representation.—By the »

union of Scotland and Ireland, the electoral abuses of those countries were combined with those of England. Notwith- standing a defective representation, however, parliament generally sustained its position as fairly embodying the political sentiments of its time. Public opinion had been awakened, and could not safely be ignored by any party in the state. Under a narrow and corrupt electoral system, the ablest men in the country found an entrance into the IIouse of Commons; and their rivalry and ambition ensured the acceptance of popular principles and the pass- ing of many remedial measures. As society expanded, and new classes were called into existence, the pressure of public opinion upon the legislature was assuming a more decisive character. The grave defects of the representation were notorious, and some minor electoral abuses had been from time to time corrected. But the fundamental evils,— nomination boroughs, limited rights of election, the sale of seats in parliament, the prevalence of bribery, and the enormous expense of elections, —though constantly exposed, long held their ground against all assailants. as 1770 Lord Chatham had denounced these flagrant abuses. “ Before the end of this century,” he said, “ either the parliament will reform itself from within, or be reformed with a vengeance from without.” In 1782, and again in 1783 and 1785, his distinguished son, William Pitt, condemned the abuses of the representation, and proposed schemes of parliamentary reform. In 1793 Mr Grey (afterwards Earl Grey) submitted a motion on the same subject; but the excesses of the French Revolution, political troubles at home, and exhausting wars abroad discouraged the supporters of reform for many yeats. Under more favourable conditions the question assumed greater proportions. guished himself in 1820, and in several succeeding yeas,

Lord John Russell especially distin- |

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PARLIAMENT

by the able exposure of abuses and temperate schemes of reform. His efforts were assisted by the scandalous disclosures of bribery at Grampound, Penryn, and East Retford. All moderate proposals were rejected; but the concurrence of a dissolution, on the death of George IV., with the French Revolution of 1830, and an ill-timed declaration of the duke of Wellington that the representa- tion was perfect and could not be improved, suddenly precipitated the memorable crisis of parliamentary reform. It now fell to the lot of Earl Grey, as premier, to be the leader in a cause which he had espoused in his early

youth.

The Reform Acts of 1832.—The result of the memorable struggle which ensued may be briefly told. By the Reform Acts of 1832 the representation of the United Kingdom was reconstructed. In England, fifty-six nomination boroughs returning one hundred and eleven members were disfranchised ; thirty boroughs were each deprived of one member, and Weymouth and Melcombe Regis, which had returned four members, were now reduced to two. Means were thus found for the enfranchisement of populous places. Twenty-two large towns, including metropolitan districts, became entitled to return two members, and twenty less considerable towns acquired the right of re- turning one member each. The number of county members was increased from ninety-four to one hundred and fifty- nine, the larger counties being divided for the purposes of representation.

The elective franchise was also placed upon a new basis. In the boroughs a £10 household suffrage was substituted for the narrow and unequal franchises which had sprung up,—the rights of freemen, in corporate towns, being alone respected. In the counties, copyholders and leaseholders for terms of years, and tenants at will paying a rent of £50 a year, were added to the 40s. freeholders.

By the Scottish Reform Act, the number of members representing Scotland was increased from forty-five, as arranged at the Union, to fifty-three, of whom thirty were assigned to counties and twenty-three to cities and boroughs. In counties the franchise was conferred upon owners of property of £10 a year, and certain classes of leaseholders ; in burghs, upon £10 householders, as in England.

By the Irish Reform Act, no boroughs, however small, were disfranchised ; but the franchise was given to £10 householders, and county constituencies were enlarged. These franchises, however, were extended in 1850, when an £8 household suffrage was given to the boroughs, and additions were made to the county franchises. The hundred members assigned to that country at the Union Were increased to one hundred and five. Notwithstanding these various changes, however, the total number of the

‘ House of Commons was still maintained at 658.

The Reformed Parliament.—The legislature was now brought into closer relations with the people, reflected their opinions, and was sensitive to the pressure of popular forces. The immediate effects of this new spirit were per- ceptible in the increased legislative activity of the reformed parliament, its vigorous grappling with old abuses, and its preference of the public welfare to the narrower interests of classes. But, signal as was the regeneration of parlia- ment, several electoral evils still needed correction. Strenuous efforts were made, with indifferent success, to overcome bribery and corruption, and proposals were often Ineffectually made to restrain the undue influence of land- lords and employers of labour by the ballot; improve- ments were made in the registration and polling of electors, and the property qualification of members was abolished. Complaints were also urged that the middle classes had been admitted to power, while the working classes were excluded from the late scheme of enfranchisement. Twenty

years after the settlement of 1832, its revision was seri- ously approached.

Later Measures of Reform.—In 1852, and again in 1854, Lord John Russell introduced further measures of reform ; but constitutional changes were discouraged by the Russian war. In 1859 Lord Derby’s Conservative government pro- posed another scheme of reform, which was defeated ; and in 1860 Lord John Russell brought in another Bill, which was not proceeded with; and the question of reform con- tinued in abeyance until after the death of Lord Palmerston. Earl Russell, who succeeded him as premier, was prompt to redeem former pledges, and hastened to submit to a

new parliament, in 1866, another scheme of reform. This measure, and the ministry by whom it was promoted, were overthrown by a combination of the Con- servative opposition and the memorable “cave” of mein- bers of the Liberal party. But the popular sentiment in favour of reform, which had for some years been inert, was suddenly aroused by the defeat of a Liberal ministry, and the triumph of the party opposed to reform. Lord Derby and his colleagues were now constrained to under- take the settlement of this embarrassing question ; and by a strange concurrence of political events and party tactics, a scheme far more democratic than that of the Liberal Government was accepted by the same parliament, under the auspices of a Conservative ministry.

The Reform Acts of 1867-68,—By the English Reform Act of 1867, four corrupt boroughs were disfranchised, and thirty-eight boroughs returning two members were hence- forth to return one only. A third member was given to Manchester, Liverpool, Birmingham, and Leeds ; a second member to Merthyr Tydfil and Salford ; the Tower Hamlets were divided into two boroughs, each returning two mem- bers ; and ten new boroughs were created, returning one member each, with the exception of Chelsea, to which two were assigned. By these changes twenty-six seats were taken from boroughs, while a member was given to the university of London. But before this Act came into operation, seven other English boroughs were disfranchised by the Scottish Reform Act of 1868, these seats being given to Scotland. Thirteen new divisions of countics were erected, to which twenty-five members were assigned. In counties, the franchise of copyholders and leaseholders was reduced from £10 to £5, and the occupation franchise from £50 to £12. In boroughs the franchise was extended to all occupiers of dwelling-houses rated to the poor-rates, and to lodgers occupying lodgings of the annual value of £10 unfurnished.

By the Scottish Reform Act of 1868, the number of mem- bers representing Scotland was increased from fifty-three to sixty,—three new members being given to the shires, two to the universities, and two to cities and burghs. The county franchise was extended to owners of lands and heri- tages of £5 yearly value, and to occupiers of the rateable value of £14; and the burgh franchise to all occupiers of dwelling-houses paying rates, and to tenants of lodgings of £10 annual value unfurnished.

By the Irish Reform Act of 1868, no change was made in the number of members nor in the distribution of seats ;

but the boroughs of Sligo and Cashel, already disfranchised, were still left without representation. The county fran- chise was left unchanged ; but the borough franchise was extended to occupiers of houses rated at £4, and of lodg- ings of the annual value of £10 unfurnished.

Present Position of Parliamentary Reform.—That these changes in the representation—especially the household suffrage in boroughs—were a notable advance upon the reforms of 1832, in the direction of democracy, cannot be questioned. The enlarged constituencies speedily over- threw the ministry to whom these measures were due ; and

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the new parliament further extended the recent scheme of reform, by granting to electors the protection of the ballot, for which advanced reformers had contended since 1832. Nor was the representation, as lately determined, long suffered to continue without question. First, it was pro- posed, in 1872, by Mr Trevelyan, to extend the household franchise to counties, and this proposal found favour in the country and in the House of Commons ; but, the Con- servative party having been restored to power in 1874, no measure of that character could be promoted with any prospect of success. At the dissolution in 1880 a more general revision of the representation was advocated by leading members of the Liberal party, who were soon re- stored to power; and further measures of reform are now under the consideration of parliament. Meanwhile, tren- chant enactments have been made in restraint of corrupt practices, and for reducing the excessive cost of elections.

Relations of the Commons to the Crown and the Lords.— Having brought this rapid sketch of the history and con- stitution of parliament to a close, a few remarks may be offered as to the relations of the House of Commons to the crown, the House of Lords, and the people. Prior to the reign of Charles J. the condition of society was such as naturally to subordinate the

Commons to the crown and the Lords. After the Revolution of 1688, society had so far advanced that, under a free representation, the Commons might have striven with both upon equal terms. But, as by far the greater part of the representation was in the hands of the king and the territorial nobles, the large constitutional powers of the Commons were held safely in check. Since 1832, when the representation became a reality, a corresponding authority has been asserted by the Commons. For several years, indeed, by reason of the weakness of the Liberal party, the Lords were able successfully to resist the Commons upon many important occasions; but it was soon acknowledged that they must yield whenever a decisive majority of the Com- mons, supported by public opinion, insisted upon the passing of any measure, however repugnant to the senti- ments of the Upper House. And it became a political axiom that the Commons alone determined the fate of ministries, and the policy of the state. The relations of the two Houses, however, can only be understood in con- nexion with the action of political parties. The Lords may be said, generally, to represent the opinions prevalent before 1832, while, during the greater part of the period since that time, the Commons, under leaders of the Liberal party, have represented the progressive views of a later generation. Hence, under Liberal administrations, the two Houses have been in frequent conflict; under Conservative administrations they have been brought into general agreement, the electors having supported the party which commanded a majority in both Houses. In the conflict of parties, the ultimate appeal is to the country. But as the representation of the people is further extended, an accord between the two Houses will be more difficult, while the power of resistance on the part of the Lords will be pro- portionately weakened.

Severe Pressure upon the House of Commons.—The House of Commons having thus become the centre of political power, it has been impelled to extraordinary activity. The legislation of the last fifty years affords the only example in history of so wide a reconstruction of insti- tutions, and so bold a redress of grievances, having been accomplished without a revolution. But this prodigious work, of which the main burthen has rested upon the Commons, has formed only a part of their labours. The voting of supplies for the public service, and financial policy, are their exclusive province, and offer unbounded opportunities for debate. They have also assumed a large

share of executive power. Every act of administration js open to question, controversy, and censure. Matters of executive policy—foreign, colonial, and domestic—are eagerly discussed in this numerous and excited assembly. Nor are discussions mainly directed to such important topics. The close connexion of the Commons with the people, the publicity of debates, the rapidity of communi- cations with all parts of the world, and the activity of the press, have made the floor of that House the popular plat- form of the country. On that arena are discussed every conceivable grievance, complaint, opinion, project, or delu- sion. Subjects the most trivial are forced upon the attention of the House, by means of questions and inci- dental debates ; and after weary sittings, such as no other deliberative assembly has ever been willing to endure, matters of the first importance fail to obtain a hearing, These difficulties were apparent in the first reformed parliaments after 1832; and they have since been agera- vated so seriously as to threaten the character and com- petency of the most powerful branch of the legislature.

Such difficulties, grave enough in themselves, have lately assumed more dangerous proportions under the per- nicious tactics of obstruction. The liberal opportunities provided, by the rules of the House, for free discussion have been perverted and abused ; and the effective power of the House has often been held in check, and sometimes nearly paralysed. Already some partial remedies have been applied to this acknowledged evil, but further measures are still needed for facilitating the action of parliament. It were strange, indeed, if the House of Commons, having attained pre-eminence in the legislature, should now prove unequal to the responsibilities of its freedom and its power. The methods of earlier times, and other political conditions, will assuredly be reviewed, and adapted to the multiplied obligations of an assembly whose fruitful labours are essential to the welfare of the country.

PowWERS AND PRIVILEGES OF PARLIAMENT.

Such being the history and constitutional character of parliament, this survey would be incomplete without a more detailed view of the powers

and privileges of each of its constituent parts, and of its ordinary proceedings.

Prerogatives of the Crown.—The crown, pre-eminent in rank and dignity, is also the legal source of parliamentary authority. The Queen virtually appoints the Lords Spiritual, and all the peerages of the Lords Temporal have been created by herself or her predecessors. Thus the entire House of Lords is the creation of the crown. The Queen summons parliament to meet, and prescribes the time and place of its meeting, prorogues and dissolves it, and commands the issue of writs for the election of members of the House of Commons. By several statutes, beginning with the 4th Edward III. c. 14, the annual meeting of par- liament had been ordained ; but these statutes, continually disregarded, were virtually repealed in the reigns of Charles II. and William and Mary (16 Ch. IL, 31; 6&7 Will. and Mary, 32). The present statute law merely exacts the meeting of parliament once in three years; but the annual voting of supplies has long since superseded obsolete statutes. When parliament is assembled, it cannot procced to business until the Queen has declared the causes of sum- mons, in person or by commission. Other prerogatives of the crown, in connexion with parliament, will be noticed in reference to the proceedings of the two Houses.

Powers of the House of Lords.—The House of Lords, which at present consists of about five hundred and twenty members, is distinguished by peculiar dignities, privileges, and jurisdictions. Peers individually enjoy the rank and

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precedence of their several dignities, and are hereditary councillors of the crown. Collectively with the Lords Spiritual they form a permanent council of the crown ; and, when assembled in parliament, they form the highest court of judicature in the realm, and area co-equal branch of the legislature, without whose consent no laws can be made. Their judicature is of various kinds, viz., for the trial of peers; for determining claims of peerage and offices of honour, under references from the crown; for the trial of controverted elections of Scotch and Irish peers; for the final determination of appeals from courts in England, Scotland, and Ireland ; and, lastly, for

the trial of impeachments. Powers of the House of Commons.—The House of Com- mons also has its own peculiar privileges and jurisdictions.

_ Above all, it has the paramount right of originating the

imposition of all taxes, and the granting of-supplies for the service of the state. It has also enjoyed, from early times, the right of determining all matters concerning the election of its own members, and their right to sit and vote in par- liament. This right, however, has been greatly abridged, as, in 1868, the trial of controverted elections was trans- ferred to the courts of law; but its jurisdiction in matters of election, not otherwise provided for by statute, is still re- tainedintact. As part of this jurisdiction, the House directs the Speaker to issue warrants to the clerk of the crown to make out new writs for the election of members to fill up such vacancies as occur during the sitting of parliament. Privileges of Parliament.~~Both Houses are in the enjoy~~ ment of certain privileges, designed to maintain their authority, independence, and dignity. These privileges are founded mainly upon the law and custom of parliament, while some have been confirmed, and others abridged or abrogated by statute. The Lords rely entirely upon their inherent right, as having "'a place and voice in parliament "; but, by a custom dating from the 6th Henry VIII, the Commons lay claim, by humble petition to the crown at the commencement of every parliament, "to their ancient and undoubted rights and privileges." Each House has its separate rights and jurisdictions; but privileges properly so-called, being founded upon the law and custom of parlia- Ment, are common to both Houses. Each House adjudges

' whether any breach of privilege has been committed, and

punishes offenders by censure or commitment. This right of commitment is incontestably established, and it extends to the protection of officers of the House, lawfully and properly executing its orders, who are also empowered to callin the assistance of the civil power. The causes of such commitments cannot be inquired into by courts of law, nor can prisoners be admitted to bail. Breaches of privi- lege may be summarized as disobedience to any orders or rules of the House, indignities offered to its character or proceedings, assaults, insults, or libels upon members, or Interference with officers of the House in discharge of their duty, or tampering with

witnesses. Such offences are dealt with as contempts, according to the circumstances of the respective cases, of which numerous precedents are to be found in the journals of both Houses. The Lords may imprison for a fixed period, and impose fines; the Commons can only imprison generally, the commitment being concluded by the prorogation, and have long dis- continued the imposition of fines.

Freedom of Speech.—Freedom of speech has been one of the most cherished privileges of parliament from early times. Constantly asserted, and often violated, it was finally declared by the Bill of Rights “that the freedom of Speech, and debates and proceedings in parliament, ought not to be impeached or questioned in any court or place Out of parliament.” Such a privilege is essential to the independence of parliament, and to the protection of mem- bers in discharge of their duties. But, while it protects

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members from molestation elsewhere, it leaves them open to censure or other punishment by the House itself, when- ever they abuse their privilege and transgress the rules of orderly debate.

Freedom from Arrest.—¥Freedom from arrest is a privi- lege of the highest antiquity. It was formerly of extended scope, but has been reduced, by later legislation, within very narrow limits. Formerly not only the persons of members but their goods were protected, and their privilege extended to theirservants. At present members are themselves free from arrest, but otherwise they are liable to all the pro- cesses of the courts. If arrested, they will be immediately discharged, upon motion in the court whence the process issued, Peers and peeresses are, by the privilege of peerage, free from arrest at all times. Members of the House of Commons are free only for forty days after prorogation and forty days before the next appointed meeting ; but prorogations are so arranged as to ensure a continuance of the privilege. Formerly, even suits against members were stayed, but this offensive privilege has been abolished by statute. Exemption from attending as witnesses upon sub- poena, once an acknowledged privilege, is no longer insisted upon ; but immunity from service upon juries is at once an ancient privilege and a statutory right. The privilege of freedom from arrest is limited to civil causes, and has not been suffered to exempt members from

the operation of the criminal law, nor even from commitments for contempt by other courts. But, whenever the freédom of a member is so interfered with, the courts are required immediately to inform the House of the causes of his commitment. Witnesses, suitors, counsel, and agents in attendance upon parliament are protected from arrest and molestation, and from the consequences of statements made by them, or other proceedings in the conduct of their cases.

Conflicts between Privilege and Law.—As both Houses, in enforcing their privileges, are obliged to commit offenders or otherwise interfere with the liberty of the sub- ject, the exercise of these privileges has naturally been called in question before the courts. Each House is the sole judge of its own privileges; but the courts are bound to administer the law, and, where law and privilege have seemed to be at variance, a conflict of jurisdiction has arisen between parliament and the courts. Many interesting controversies have arisen upon such occasions; but of late years privilege has been so carefully restrained within the proper limits of the law, and the courts have so amply recognized the authority of parliament, that unseemly con- flicts of jurisdiction have been averted.

PARLIAMENTARY PROCEDURE.

We may now present a general outline of the proceed- ings of parliament during the transaction of its multifarious business.

On the day appointed by royal proclamation for the meeting of a new parliament, both Houses assemble in their respective chambers, when the Lords Commissioners for opening the parliament summon the Commons to the bar, by the gentleman usher of the black rod, to hear the commission read. The Lord Chancellor then states that, when the members of both Houses shall be sworn, Her Majesty will declare the causes of her calling this parlia- ment ; and, it being necessary that a Speaker of the House of Commons shall be first chosen, the Commons are directed to proceed to the appointment of a Speaker, and to present him, on the following day, for Her Majesty’s royal approbation. The Commons at once withdraw to their own Hous: and proceed to the election of their Speaker. The next day the Speaker-elect proceeds, with the House to the House of Lords, and, on receiving the royal approbation, lays claim, in the accustomed form, on

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behalf of the Commons, “to their ancient and undoubted rights and privileges.” The Speaker, now fully confirmed, returns to the House of Commons, and, after repeating his acknowledgments, reminds the House that the first thing to be done is to take and subscribe the oath required by law. Having first taken the oath himself, he is followed by other members, who come to the table to be sworn. The swearing of members in both Houses proceeds from day to day, until the greater number have taken the oath, or affirmation, when the causes of summons are declared by Her Majesty in person, or by commission, in “the Queen’s speech.” This speech being considered in both Houses, an address in answer is agreed to, which is presented to Her Majesty by the whole House, or by “the lords with white staves” in one House and privy councillors in the other.

Sittings of Both Houses.—The real business of the session now commenees : the committees of supply and ways and means are set np; bills are introduced ; motions are made; committecs are appointed ; and both Houses are, at once, in full activity. The Lord Chanccllor presides over the deliberations of the Lords, and the Speaker over those of the Commons. A quorum of the House of Lords, including the Chancellor, is three; that of the House of Commons, including the Speaker, is forty. If forty members cannot be assembled at 4 o’clock, the House is at once adjourned ; and so also if it be found, at a later hour, that less than that number are present. The Lords usually met at 5 o’clock, but have recently changed that hour to a quarter past 4. The usual hour for the mecting of the Commons is a quarter before 4, except on Wed- nesdays, when the House meets at 12 and adjourns at 6, and on other morning sittings from 2 till 7. In both Houses accomimo- dation is provided for strangers and reporters, and there are separate galleries for ladies.

Questions put from the Chair.—Every matter is determined, in both Houses, upon questions put from the chair, and resolved in the affirmative or negative, or otherwise disposed of by the with- drawal of the motion, by amendments, by the adjournment of the House, by reading the orders of the day, or by the previous question. Notices are required to be given of original

motions ; and the different stages of bills, and other matters appointed for considera- tion by the House, stand as orders of theday. Certain days in the week are appointed for notices of motions and orders of the day respectively ; and on Monday and Thursday Government orders of the day have precedence. Questions of privilege are allowed pre- cedenee of all the business on any day; but this rule, being lable to grave abuses, is guarded by strict limitations. Debate arises when a question has been proposed from the chair; and at the close of the debate the question is put, with or without amendment, as the case may be, and is determined, when necessary, by a division. No question or bill, substantially the same as one upon which the judgment of the House has already been given, may be again pro- posed during the same session.

Rules of Debate.—Members claim to be heard in debate by rising in their places. When more than one member rises at the same time, in the Lords the member who is to speak is called by the House, in the Commons by the Speaker. Every member, when called,is bound to speak to the question before the House; and calls to order for irrelevance, or for referring to other matters which have been disposed of, or which stand for consideration on other days, are very frequent. A member may speak once only to any question, except to explain, or upon a point of order, or to reply when a mem- ber has himself submitted a motion to the House, or when an amend- ment has been moved which constitutes a new question. He may not refer to past debates, nor to debates in the other House ; nor may he refer to any other member by name, or use offensive and disorderly language against the Queen, either House of Parlianicnt, or other members. Members offending against any of the rules of debate are called to order by the Speaker, or the attcntion of the chair is directed to the breach of order by another member. Order is generally enforced by the authority of the chair; but in extreme cases, and especially when obstruction is being practised, the offend- ing member is named by the Speaker, and suspended by an order of the House, or otherwise punished at the discretion of the House. And, when a debate has been unduly prolonged, the House may order it to be closed, but under such conditions and restrictions that this power can rarely be exercised. The rules to be observed by members in the House during a debate are such as to ensure the order and decorum becoming a deliberative assembly.

Diwvisions.—At the conclusion of a debate, unless themotion bewith-drawn, or the question (on being put from the chair) be agreed to, or negatived, the House proceeds to a division, which effects the twofold purpose of ascertaining the numbers supporting and opposing the question, and of recording the names of members voting on either side, On each side of the House is a division lobby ; and in the

Lords the “‘contents” and in the Commons the ‘‘ayes” are directed to go to the right, and the ‘‘not contents” or ‘‘noes” to the left. The former pass into the right lobby, at the back of the speaker’s chair, and return to the Honse through the bar; the latter pass into the left lobby, at the bar, and return at the back of the chair. The opposing partics are thus kept entirely clear of one another. In each lobby there arc two members acting as tellers, who count the members as they pass, and two division clerks who take down their names. After the division, the four tellers advance to the table, and the numbers are reported by one of the tellers for the majority. In case of an equality of numbers, in the Lords the question is negatived in virtuc of the ancient rule “semper presumitur pro negante ””; in the Commons the Spcaker gives the casting vote.

Committees of the Whole House.—For the sake of convenience in the transaction of business, there are several kinds of committees, Of these the most important is a committee of the whole House, which, as it consists of the entire body of members, can scarcely be accounted a committee. It is presided over by a chairman, who sits in the clerk’s chair at the table, the mace, which represents the authority of the House itself, being for the time placed under the table. In this committee are discussed the several provisions of bills, resolutions, and other matters requiring the consideration of details. To facilitate discussion, members are allowed to speak any number of times to the same question ; otherwise the proceed-ings are similar to those of the House itself. In the Lords, the chair is taken by the chairman of committees ; and in the Commons by the chairman of the committee of ways and means, or in his absence by any other member. The quorum of such a committee is the same as that of the House itself. It reports from time to time to the House, but has no power of adjournment.

Grand and Standing Committces.—1n the House of Commons there were formerly four grand committees, viz., for religion, for grievances, for courts of justice, and for trade. They were founded upon the valuable principle of a distribution of labours among several bodies of members ; but, having fallen into disuse, they were discontinued in 1832. The ancient committee of privileges, in which ‘‘all who come are to have voices,” is still appointed at the commencement of every session, but is rarely called into aetion, as it has been found more convenient to appoiut a select committee to inquire into any question of privilege as it ariscs. In 1882 a partial revival of grand committees was effected by the appointment of two standing committees for the consideration of bills relating to law and courts of justice and to trade; and there is reasonable ground for hoping that this system may be widely extended, so as to lighten the labours of the House, and facilitate the arduous work of legislation.

Seleet Committees.—In select committees both Houses find the means of delegating inquiries, and the consideration of other matters, which could not be undertaken by the whole House. The reports of such committees have formed the groundwork of many important measures ; and bills are often referred to them which receive a fuller examination than could be expected in a committee of the whole House. Power is given to such committees, when required, to send for persons, papers, and records. In the Lords the power of examin- ing witnesses upon oath has always been exercised, but it was not until 1871 that the same power was extended to the Commons, by statute.

Communications between the Two Houses.—In the course of the proceedings of parliament, frequent communications between the two Houses become necessary. Of these the most usual and con- venient form is that of a message. Formerly the Lords sent a message by two jndges, or two masters in chancery, and the Commons by a deputation of their own members ; but since 1855 messages have been taken from one House to the other by one of the clerks at the table. A more formal communication is effected by aconference, in reference to amendments to bills or other matters; but this proceeding has been in great measure superseded by the more simple form of a message. ‘The two Houses are also occasion- ally

brought into communication by means of joint committecs and of select committees communicating with each other. ;

Communications between the Crown and Parliament.—Commum- cations, in various forms, are also conducted between the crown and both Houses of Parliament. Of these the most important are those in which the Queen, in person or by commission, is present in the House of Lords, to open or prorogue parliament, or to give the royal assent to bills. Her Majesty is then in direct communl cation with the three estatcs of the realm, assembled in the same chamber. The Queen also sends messages to both Houses under the royal sign manual, when all the members are uncovered. Verbal messages are also sent, aud the Quecn's plcasure, or royal recommendation or consent to bills, or other matters, signified through a minister of the crown or a privy councillor. Messages under the sign mannal are acknowledged by addresses, except where grants of money are proposed, in which case no address 18 presented by the Commons, who acknowledge them by making)r0 vision accordingly.

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Both Houses approach the crown, sometimes by joint addresses, but usually by separate addresses from each House. Such addresses are presented to Her Majesty, either by the whole House, or by the lords with white staves in one House and by privy councillors in the other. Her Majesty answers, in person, addresses presented by the whole House ; but, when presented otherwise, an answer is brought by one of the lords with white staves, or by one of the privy councillors, by whom the address has been presented. Re- solutions of either House are also sometimes directed to be laid before Her Majesty ; and messages of congratulation or condolence are sent to other members of the royal family.

The Passing of Public Bills.—The passing of bills forms the most considerable part of the business of parliament ; but a brief notice will suffice to explain the methods of procedure. These are

substantially the same in both Houses; but the privileges of the Commons, in regard to supply and taxation, require that all bills imposing a charge upon the people should originate in that House. On the other hand, the

Lords claim that bills for restoration of honours or in blood, or relating to their own privileges and juris- diction, should commence in their House. An act of grace, or general pardon, originates with the crown, and is read once only *1 both Houses. Bills are divided into public and private ; but here the former only are referred to. In the Lords any peer is entitled to present a bill, but in the Commons a member is required to obtain the previous leave of the House to bring in the bill ; and, in the case of bills relating to religion, trade, grants of public money, or charges upon the subject, a preliminary committee is necessary before such leave will be given. A bill, when presented, is read a first time, and ordered to be printed; and a day is appointed for the second reading. At this latter stage, the prin- ciple of the bill is discussed ; and, if disapproved of by an adverse vote, the bill is lost and cannot be renewed during the same session. If approved of, it is usually committed to a committee of the whole House, where every provision is open to debate and amendment. When the bill has been fully considered it is reported to the House, with or without amendments, and is ready to pass through its remaining stages. Sometimes, however, the bill is re- ferred to a select committee before it is committed to a committee of the whole House.

By recent standing orders of the Commons, bills relating to law and courts of justice and to trade may be committed to standing committees, specially constituted, instead of to a committee of the whole House. When a bill has been reported from a committee of the whole House, or from a standing committee, with amendments, the bill, as amended, is ordered to be considered on a future day, when further amendments may be made, or the bill may be recom- mitted. The next and last stage is the third reading, when the principle of the measure, and its amended provisions, are open to review. Even at this stage the bill may be lost ; but if the third reading be agreed to, it is at once passed and sent to the other House. There it is open to the like discussions and amendments, and may be rejected. If returned without amendment, the bill merely awaits the royal assent ; but if returned with amendments, such amendments must be agreed to, or otherwise adjusted, by mutual concessions, by the two Houses, before it can be submitted for the royal assent ; and in case of ultimate disagreement the bill is lost. The royal assent consummates the work of legislation, and converts the bill into an Act of Parliament.

Petitions. —Both Houses are approached by the people by means

of petitions, of which prodigious numbers are presented to the House of Commons every session. They are referred to the com- mittce on public petitions, under whose directions they are classified, analysed, and the number of signatures counted ; and, when neces- sary, the petitions are printed am extenso. _ Parliamentary Papers.—Another source of information is found in parliamentary papers. These are of various kinds. The greater part are obtained either by a direct order of the House itself, or by an address to the crown for documents relating to matters in which the prerogatives of the crown are concerned. Other papers, relating to foreien and colonial affairs and other public matters, are presented to both Houses by command of Her Majesty. Again, many papers are annually presented, in pursuance of Acts of Parliament. In the House of Commons, these various printed documents occupy from eighty to one hundred volumes every year.

The Granting of Supplies. —The exclusive right of the Commons to grant supplies, and to originate all measures of taxation, imposes a very onerous service upon that House. This is mainly performed by two committees of the whole House,—the Committee of Supply, and the Committee of Ways and Means. The former deals with all the estimates for the public service presented to the House by command of Her Majesty ; and the latter votes out of the Consoli- dated Fund such sums as are necessary to meet the supplies already granted, and originates all taxes for the service of the year. It is here that the annual financial statement of the chancellor of the exchequer, commonly known as ‘‘the Budget,” is delivered. The Tesolutions of these committees are reported to the House, and, when agreed to, form thc foundation of bills, to be passed by both

eos anid res for the royal assent ; and towards the close of the session an ropriation Act is passed, a i for the service of ae a ar. ee

Elections. —The extensive jurisdiction of the Commons in matters of election, already referred to, formerly occupied a considerable share of their time, but its exercise has now been contracted within narrow limits. Whenever a vaeaney occurs during the eontinu- ance of a parliament, a

warrant for a new writ is issued by the Speaker, by order of the House during the session, and in pursuanee of statutes during the recess. The causes of vacancies are the death of a member, his being called to the House of Peers, his aeceptance of an office from the crown, or his bankruptcy. When any doubt arises as to the issue of a writ, it is usual to appoint a committee to inquire into the circumstances of the case ; and during the recess the Speaker may reserve doubtful cases for the determi- nation of the House.

Controverted elections had been originally tried by select com- | mittees, afterwards by the committee of privileges and elections, and ultimately by the whole House, with scandalous partiality, but | under the Grenville Act of 1770, and other later Acts, by select committees, so constituted as to form a more judicial tribunal. The influence of party bias, however, too obviously prevailed until 1839, when Sir Robert Peel introduced an improved system of nomination, which distinctly raised the character of election committees; but a tribunal constituted of political partisans, how- ever chosen, was still open to jealousy and suspicion, and at length, in 1868, the trial of election petitions was transferred to judges of the superior courts, to whose determination the House gives effect, by the issue of new writs, or otherwise. The House, however, still retains and exercises its jurisdiction in all cases not relegated, by statute, to the judges.

Impeachments and Trial of Peers.—Other forms of parliamentary judicature still remain to be mentioned. Upon impeachments by the Commons, the Lords exercise the highest criminal judicature known to the law; but the occasions upon which it has been brought into action have been so rare, in modern times, that its procedure need not be dwelt upon. Another judicature is that of the trial of peers by the House of Lords. And, lastly, by a bill of

‘attainder, the entire parliament is called to sit in judgment upon

offenders.

Private Bill Legislation.—One other important function of parliament remains to be noticed,—that of private bill legislation. Here the duties of parliament are partly legislative and partly judicial. Public interests are promoted, and private rights secured. The vast industrial undertakings of

the country—canals, docks, harbours, railways, waterworks, and the lighting and iinprovement of towns—have thus been sanctioned, at a cost far exceeding the amount of the national debt, while the rights of property have been jealously guarded. This whole jurisdiction has been regulated by special standing orders, and by elaborate arrangements for the nomination of capable and impartial committees. A prodigious legislative work has been accomplished,—but under conditions most costly to the promoters and opponents of private bills, and involving a serious addition to the onerous labours of members of parliainent. Means have already been found, by general Acts and provisional orders, to lighten the pressure of private bill legisla- tion ; and further expedients will, doubtless, be devised for the relief of parliament from a branch of business which is scarcely compatible with the engagements of members in the weightier affairs of state. :

Varied Functions of Parliament.—Such are the vast and varied functions of the imperial parliament,—to legislate for an empire, to control the executive government, to hear the complaints of the people, and to redress their grievances. To be equal to its high jurisdiction, it needs the guidance of accomplished statesmen, wisdom and patriotism in its members, and an organization which shall make fruitful the talents, the practical knowledge and experi- ence, of the ablest men of their generation. Its history 1s bright with records of eloquence, of statesmanship, of wise legislation, and of generous sympathy with the people ; and that its future great- ness may be worthy of its past glories is the earnest hope of every

good citizen.

Ltterature.—See Rolls of Parliament, and Journals of both Houses; Parlta- mentary Hist,; Iansard, Parl. Ilist., and Debates; Gray, Debates ; Cavendish, Debates ; Wilkins, Leges Anglo-Saz.; Kemble, The Saxons tn England ; Turner, History of the Anglo-Saxons, and Hist. of England during the Middle Ages ; Sir F. Palgrave, English Commonwealth; Id., Hist. of Normandy and of England; 1d., Parliamentary Writs; Stubbs, Const. Ihistory of England; Holingshed, Chron. ; Selden, Titles of Honour; Ruffhead, Preface to Statutes; Cotton, Abridgment (Preface); Parry, Parliaments and Counctis of England ; Reports of Lords Com- mittee on the Dignity of the Peerage; Coke, Institutes ; Lord Hale, History of the

Common Law, Jurisdiction of the Lords; Lord Lyttelton, Hist. of Henry 18GB, D'Ewes, Journals of Queen Elizabeth; Elsynge, Manner of holding Parliaments ; Hakewel, Modus Tenendi Parliamentum; Barrington, On the Statutes ; Madox, Hist. of the Exchequer; Blackstone, Comm.; Lord Colchester, Diary; Hallam, Middle Ages, and Constitutional History of England; Hatsell, Precedents; Sir T. Erskine May, Law and Usage of Parliament; Id., Const. Hist. of England; Id., Democracy in Europe, a History (vol. ii.); Rules, Orders, and Forms of Proceeding of the House of Commons ; Freeman, Growth of the English Constitution, and The Norman Conquest of England, Green, History of the English People ; Bagehot, The English Constitution, (ty 135 AG)

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PARMA, one of the finest cities of northern Italy, is situated in 44° 48' N. lat. and 10° 20' E. long., 354 miles by rail south-east of Piacenza and 324 north-west of Modena, in a fertile tract of the Lombard plain within view of the Alps, and sheltered by the Apennines. From south to north it is traversed by the channel of the Parma, crossed here by three bridges; and from east to west for a distance of 6700 feet runs the line of the Aimilian Way, by which ancient Parma was connected on the one hand with Ariminum (Rimini), and on the other with Placentia (Piaeenza) and Mediolanum (Milan), The old ramparts and bastions (excluding the circuit of the citadel in the south- east) make an enceinte of about 4} miles, but the enclosed area is not all occupied by streets and houses ; there is an extensive "royal garden" or public park in the north-west angle, as well as a botanical garden and public promenades in the neighbourhood of the citadel, and various open spaces in other parts. In the centre of the city the Aimilian Way widens out into the Piazza Grande, a large and picturesque- looking square which contains the Palazzo del Comune and a modern statue of Correggio, whose masterpieces form the chief artistic attraction of Parma. The cathedral of the Assumption (originally St Herculanus), erected between 1064 and 1074, and consecrated in 1106 by Pope Paschal IL, is a Romano-Byzantine building in the form of a Latin cross, 230 feet long by 84 feet wide. The west front, 94 feet high and 90 feet broad, is relieved by three rows of semicircular arches, and has

a central porch (there were at one time three) supported by huge red marble lions sculptured by Bono da Bisone. The walls and ceiling of the interior are covered with frescos; those of the octagonal cupola representing the Assumption of the Virgin are by Correggio, but much restored (see CorREGGIO, vol. vi. p. 487). The crypt contains the shrine of Bishop San Bernardino degli Uberti and the tomb of Bartolommeo Prato—the former by Prospero Clementi of Reggio. To the south-west of the cathedral stands the baptistery, designed by Benedetto Antelami; it was commenced in 1196 and completed in 1281. The whole structure, which has a height of 98 feet and a diameter of 76 feet, is com- posed of red and grey Verona marble. Externally it is an irregular octagon, each face consisting of a lower story with a semicircular arch (in three cases occupied by a portal), four tiers of small columns supporting as many continuous architraves, and forming open galleries, and above these a row of five engaged columns supporting a series of pointed arches and a cornice. Internally it is a polygon of sixteen unequal sides, and the cupola is sup- ported by sixteen ribs, springing from the same number of columns. In the centre is an octagonal font bearing date 1298. To the east of the cathedral, and at no great distance, stands the church of San Giovanni Evangelista, which was founded along with the Benedictine monastery

in 981, but as a building dates from the 16th century,-

and has a facade erected by Simone Moschino early in the 17th. The frescos on the cupola representing the vision of St John are by Correggio, and the arabesques on the vault of the nave by Anselmi. Madonna della Steccata (Our Lady of the Palisade), a fine church in the form of a Greek cross, erected between 1521 and 1539 after Zaccagni's designs, contains the tombs and monuments of many of the Bourbon and Farnese dukes of Parma, and preserves among a rich variety of paintings Parmigiano's Moses Breaking the Tables of the Law and Anselmi's Coronation of the Virgin. The ducal palace, usually called La Pilotta, 1s a vast and irregular group of buildings dating mainly from the 16th and 17th centuries; it now comprises the academy of fine arts (1752) and its valuable picture gallery (Correggio's St Jerome and Madonna della Scodella), the schools of painting, sculpture, and engraving, the

archeological museum (Trajan's Tabula Alimentaria and ruins from Velleia), and the great royal library (with De Rossi's Oriental MSS. and Zani's collection of engravings, Luther's Hebrew Psalter and Bodoni's types and matrices), The Teatro Farnese, a remarkable wooden structure erected in 1618-19 from Aleotti d'Argenta's designs, and capable of containing 4500 persons, has long been in a very ruined condition; the new theatre, opened in 1829, cost £80,000, and is celebrated as one of the best in Europe for the clear conveyance of sound. The royal university of Parma, founded in 1601 by Ranuccio I., and reconstituted by Philip of Bourbon in 1768, had 217 students in 1881-82, Among the benevolent institutions, in which the city is particularly rich, are a monte di pieta dating from 1488 and a hospital for incurables founded in 1332. Leather, silk-stuff for sieves, linen, hemp, and cotton stuffs, glass, crystal, and earthenware, wax candles, cast-iron wares, and pianofortes are all manufactured in or near the city; a very considerable trade is carried on in grain, cattle, and the dairy produce of the district. The "grana" cheese known as Parmesan is not now so well made at Parma as in some other parts of Italy——Lodi, for example. The popula- tion in 1861 was 47,067 for the city and 47,428 for the commune ; the removal of the military and civil function- aries of the old duchy caused a considerable decrease, and the figures for 1881 were only 44,492 and 45,217.

The old Gallic town of Parma, which became a Roman colonia civium for 2000 colonists in 183 B.c., and after it had been plundered by Mark Antony's soldiers was recruited by Augustus, continued to be a place of importance till the later times of the empire. Under Theodoric its walls were rebuilt. The Grecks of the 6th eentury called it Chrysopolis or City of Gold, and this name appears in the medieval chronicles as Grisopolis. In 872 Carloman granted the city to bishop Widiboldus with the title of count. During the 11th, 12th, and 13th centuries Parma had its full share of the Guelf and Ghibelline struggles, and also carricd on repeated hostilities with Borgo San Donnino and Piacenza. As a republic its government was mainly in the hands of the Rossi, Pallavicino, Correggio, and Sanvitale families. The fruitless siege of Parma in 1248 was the last effort of the unfortunate Frederick I]. In 1803 the city became a lordship for Giberto da Correggio,

who laid the basis of its territorial power by conqucring Reggio, Brescello, and Guastalla, and was made commander-in-chief of the Guelfs by Robert of Apulia. The Correggio family never managed to keep possession of it for long, and in 1346 they sold it to the Visconti, and from them it passed to the Sforza. Becoming subject to Pope Julius IJ. in 1512, Parma remained (in spitc of the French occupa- tion from 1515 to 1521) a papal possession till 1545, when Paul ILI. (Alexander Farnese) invested his son Pierluigi with the duchies of Parma and Piacenza. There were eight dukes of Parma of the Farnese line—Pierluigi (died 1547), Ottavio (1586), Alessandro (1592), Ranuccio I. (1622), Odoardo (1646), Ranuccio II. (1694), Francesco (1727), Antonio (1731). See FARNEsE, vol. ix. p. 36. Autonio and Francesco both having died childless, the duchy passed to Charles of Bourbon (Don Carlos), infante of Spain, who, becom- ing king of Naples in 1735, surrendered Parma and Piacenza to Austria, but retained the artistic treasures of the Farnese dynasty which he had removed from Parma to Naples. Spain reconquered the duchies in the war of succession (1745) ; they were recovered by Austria in 1746; and Maria Theresa again surrendered them to Don Philip, infante of Spain, in 1748. Ferdinand, Philip's son, who succeeded under Dutillot's regency in 1765, saw his states occupied by the revolutionary forces of France in 1796, and had to purchase his life-interest with 6,000,000 lire and 25 of the best paintings in Parma. On his death in 1802 the duchies were incor- porated with the French republic and his son Louis became " king of Etruria." Parma was thus governed for several ycars by Moreau de Saint-Méry and by Junot. At the congress of Vienna, Parma, Piacenza, and Guastalla were assigned to Maric Louise (daughter of Francis I. of Austria and Napolcon's second consort), and on her death they passed in 1847 to Charles 11. (son of Louis of Etruria and Marie Louise, daughter of Charles 1V., king of Spain), The new duke, unwilling to yicld to the wishes of his people for greater political liberty, was soon compelled to take flight, and the duchy was fora time ruled by a provisional Government and by Charles Albert of Sardinia; but in April 1849 Baron d'Aspre, with 15,000 Austrians, took possession of Parma, and the ducal government was restored under Austrian protection. Charles I]. (who had in 1820 married Theresa, daughter of Victor Emmanuel of Sardinia) abdi- cated in favour of his son Charles I1I., March 14, 1849. On the

assassination of Charles III. in 1854, his widow, Marie Louise (daughter of Ferdinand, prince of Artois and duke of Berry), became regent for her son Robert. In 1860 his possessions were formally incorporated with the new kingdom of Italy.

The duchy of Parma in 1849 had an area of 2376 square miles, divided into five provinces—Borgo San Donnino, Valditaro, Parma, Lunigiana Parmeuse, and Piacenza. Its population in 1851 was 497,343, Under Marie Louise (1815-47) the territory of Guastalla (50 square miles) formed part of the duchy, but it was transferred in 1847 to Modena in exchange for the communes of Bagnone, Filattiera, &c., which went to coustitute the Lunigiana Parmense.

Parma has given birth to Sforza Pallavicino, Mazzola (Parmigiano) the painter, Antclami the architect, and Toschi the engraver.

Guicciardini, the historian, was governor of the city under Leo X.

See Affé, Storia di Parma, 1792-95; Scarabelli, Storia dei ducati dit Parma, Piacenza, ¢ Guastalla, 1858; Buttafuoco, Dizion. corogr. dei ducati, &c., 1853; Mon. hist. ad provincias Parmensem et Placentinam pertinentia, 1855, &e.; Ughelli, /taléa Sacra, vol. ii.

PARMENIDES or Exza, the most notable of the philosophers of the Eleatic succession, is said by Diogenes Laertius (presumably on the authority of Apollodorus) to have been “in his prime” in Olymp. 69 (= 504-500 B.c.); whence it would appear that he was born about 539. Plato indeed (Parmemdes, 127 B; compare Theextetus, 183 EF, Sophist, 217 C) makes Socrates, who was born 470 or 469, see and hear Parmenides when the latter was about sixty- five years of age, in which case he cannot have been born before 519; but, in the absence of evidence that any such meeting took place, it is reasonable to regard this as one of Plato’s many anachronisms. However this may be, Parmenides was a contemporary, perhaps a somewhat younger contemporary, of Heraclitus, with whom the first succession of physicists ended; while Anaxagoras and Empedocles, with whom the second succession of physicists began, as well as Protagoras, the

earliest of those humanists whose rejection of physical research prepared the way for the Platonic metaphysic, were very decidedly his juniors, Belonging, it is said, to a rich and distinguished family, Parmenides attached himself, at any rate for a time, to the aristocratic society or brotherhood which Pythagoras had established at Croton; and accordingly one part of his system, the physical part, is apparently Pythagorean. To Xenophanes, the founder of Eleaticism,—whom he must have known, even if he was never in any strict sense of the word his disciple,—Parmenides was, perhaps, more deeply indebted, as the theological speculations of that thinker unquestionably suggested to him the theory of Being and Not-Being, of the One and the Many, by which he sought to reconcile Ionian monism with Italiote dualism. Tradition relates that Parmenides framed laws for the Eleates, who each year took an oath to observe them.

Parmenides embodied his tenets in a short poem called Nature, of which fragments, amounting in all to about a hundred and sixty lines, have been preserved in the writings of Sextus Empiricus, Simplicius, and others. Nature is traditionally divided into three parts—the “Proem,” “Truth” (r& mpds dArjGecav), and “ Opinion ” (ra mpds dogav). In “Truth,” starting from the formula “the Ent (or existent) is, the Nonent (or non-existent) is not,” Parmenides attempted to distinguish between the unity or universal element of nature and its variety or particularity, insisting upon the reality of its unity, which IS therefore the object of knowledge, and upon the unreality of its variety, which is therefore the object, not of knowledge, but of opinion. In “Opinion” he pro- pounded a theory of the world of seeming and its develop- ment, pointing out, however, that, in accordance with the principles already laid down, these cosmological specula- tions do not pretend to anything more than probability. In spite of the contemptuous remarks of Cicero and Plutarch about Parmenides’s versification, Wature is not without literary merit. The introduction, though rugged, 18 forcible and picturesque ; and the rest of the poem is Written in a simple and effective style suitable to the sub-

j ject. It is, however, a summary rather than an exposi-

tion, and its brevity sometimes leads to obscurity. Partly for this reason, but partly also in consequence of the mutilations and the corruptions of the text, the interpreta-

tion of the system which Nature represents early became a matter of controversy.

“ Procm.”—In the “ Proem” the poet describes his journey from darkness to light. Borne in a whirling chariot, and attended by the daughters of the Sun, he reaches a temple sacred to an unnamed goddess (variously identified by the commentators with Nature, Wisdom, or Themis), by whom the rest of the poem is spoken. He must learn all things, she tells him, both truth, which is certain, and human opinions ; for, though in human opinions there can be uo confidence, they must be studied notwithstanding for what they are worth.

“ Truth.” —“ Truth” begins with the declaration of Parmenides’s principle in opposition to the principles of his predecessors. There are three ways of research, and three ways only. Of these, one asserts the non-existence of the existent and the existence of the non-existent [7.¢., Thales, Anaximander, and Anaximenes suppose the single element which they respectively postulate to be trans- formed into the various sorts of matter which they discover in the world around them, thus assuining the non-existence of that which is elemental and the existence of that which is non-elemental] ; another, pursucd by “restless” persons, whose “road returns upon itself,” assumes that a thing “is and is not,” *“is the same and not the same” [an obvious reference, as Bernays points out in the Lheinisehes Musewm, vii. 114 sq., to Heraclitus, the philosopher of flux]. These are ways of error, because they confound existence and non-existence. In contrast to them the way of truth starts from the proposition that “the Ent is, the Nonent is not. ”

On the strength of the fundamental distinction between the Ent and the Nonent, the goddess next announces certain characteristics of the former. The Ent is uncreated, for it cannot be derived either from the Ent or from the Nonent; it is imperishable, for it ° cannot pass into the Nonent; it is whole, indivisible, continuous, for nothing exists to break its continuity in space ; it is unchang- able [for nothing exists to break its continuity in time]; it is per- fect, for there is nothing which it can want; 1t never was,

nor will be, but only is; it is evenly extended in every direction, and there- fore a sphere, exactly balanced; it is identical with thought [z.¢., it is the object, and the sole object, of thought as opposed to sensation, sensation being concerned with variety and change].

As then the Entis one, invariable, and immutable, all plurality, variety, and mutation belong to the Nonent. Whence it follows that all the states and processcs which we commonly recognize — generation and destruction, being and not-being [predicated of things], change of place, alteration of colour, and the like—are no more than empty words. : ;

“Opinion,”—The investigation of the Ent [2.¢., the existent unity, extended throughout space and enduring throughout time, which reason discovers beneath the variety and the mutability of things] being now complete, it remains in ‘‘ Opinion” to describe the plu- rality of things, not as they are, for they are not, but as they seein to be. In the phenomenal world then, there are, it has been thought [and Parmenides accepts the theory, which appcars to be of Pythagorean origin], two primary elements—namely, fire, which is gentle, thin, homogeneous, and night [or earth], which is dark, thick, heavy. Of these elements [which, according to Aristotle, were, or rather were analogous to, the Ent and the Nonent re- spectively] all things consist, and from them they derive their several characteristics. The foundation for a cosmology having thus been laid in dualism, the poem went on to describe the genera- tion of “earth, and sun, and moon, and air that is common to all, and the milky way, and furthest Olympus, and the glowing stars”; but the scanty fragments which have survived suflice only to show that Parmenides regarded the universe as a series of coucentric rings or spheres composed of the two primary elements and of combina- tions of them, the whole system being directed by an unnamed goddess established at its centre. Next camea theory of animal development. This again was followed by a psychology, which made mind depend upon bodily structure, thought [as well as sensation, which was conceived to differ from thought only in respect of its object] being the excess of the one or the other of the two constituent elements, fire and night. “Such, opinion tells us, was the generation, such is the present existence, such will be the end, of those things to which men have given distinguishing names. ” ; f ue

In the truism “the Ent is, the Nonent is not,” dv eort,

pm dv od« éort, Parmenides breaks with his predecessors, the physicists of the Ionian succession, Asking them- selves—What is the material universe? they had replied respectively—It is water, it is pera£d vr, it is air, it is fire. Thus, while their question meant, or ought to have meant,

What is the single element which underlies the apparent plurality of the material world? their answers, Parmenides conceived, by attributing to the selected element various and varying qualities, reintroduced the plurality which the question sought to eliminate. If we would discover that which is common to all things at all times, we must, le submitted, exclude the differences of things, whether simultaneous or successive. Hence, whereas his prede- cessors had confounded that which is universally existent with that which is not universally existent, he proposed to distinguish carefully between that which is universally existent and that which is not universally existent, between év and px év. The fundamental truism is the epigram- matic assertion of this distinction.

In short, the single corporeal element of the Ionian physicists was, to borrow a phrase from Aristotle, a per- manent ovcia having ra6y which change; but they either neglected the 7é@y or confounded them with the oicia. Parmenides sought to reduce the variety of nature toa single corporeal element; but he strictly discriminated the inconstant 74@y from the constant otaia, and, under- standing by “ existence” universal, invariable, immutable being, refused to attribute to the 7407 anything more than the semblance of existence.

Having thus discriminated between the permanent unity of nature and its superficial plurality, Parmenides pro- ceeded to the separate investigation of the Ent and the Nonent. The universality of the Ent, he conceived, necessarily carries with it certain characteristics. It is one; it is eternal; it is whole and continuous, both in time and in space; it is immovable and immutable; it is limited, but limited only by itself; it is evenly extended in every direction, and therefore spherical. These pro- positions having been reached, apart from particular experience, by reflexion upon the

fundamental principle, we have in them, Parmenides conceived, a body of infor- mation resting upon a firm basis and entitled to be called “truth.” Further, the information thus obtained is the sum total of “truth ;” for, as “existence” in the strict sense of the word cannot be attributed to anything besides the universal element, so nothing besides the universal element can properly be said to be “ known,”

If Parmenides’s poem had had “ Being” for its subject, it would doubtless have ended at this point. Its subject is, however, “ Nature”; and nature, besides its unity, has also the semblance, if no more than the semblance, of plurality. Hence the theory of the unity of nature is necessarily followed by a theory of its seeming plurality, that is to say, of the variety and mutation of things. The theory of plurality cannot indeed pretend to the certainty of the theory of unity, being of necessity untrustworthy, because it is the partial and inconstant representation of that which is partial and inconstant in nature. But, as the material world includes, together with a real unity, the semblance of plurality, so the theory of the material world includes, together with the certain theory of the former, a probable theory of the latter. “ Opinion” is then no mere excres- cence ; it is the necessary sequel to “ Truth.”

Thus, whereas the Ionians, confounding the unity and the plurality of the universe, had neglected plurality, and the Pythagoreans, contenting themselves with the reduc- tion of the variety of nature to a duality or a series of dualities, had neglected unity, Parmenides, taking a hint from Xenophanes, made the antagonistic doctrines supply one another’s deficiencies ; for, as Xenophanes in his theo- logical system had recognized at once the unity of God and the plurality of things, so Parmenides in his system of nature recognized at once the rational unity of the Ent and the phenomenal plurality of the Nonent.

The foregoing statement of Parmenides’s position differs

from Zeller’s account of it in two important particulars, First, whereas it has been assumed above that Xenophanes was theologian rather than philosopher, whence it would seem to follow that the philosophical doctrine

of unit originated, not with him, but with Parmenides, Zeller, supposing Xenophanes to have taught, not merely the unity of God, but also the unity of Being, assigns to Parmenides no more than an exacter conception of the doctrine of the unity of Being, the justification of that doctrine, and the denial of the plurality and the mutability of things. This view of the relations of Xenophanes and Parmenides ig hardly borne out by their writings ; and, though ancient authorities may be quoted in its favour, it would seem that in this case as in others they have fallen into the easy mistake of confounding successive phases of doctrine, " con- struing the utterances of the master in accordance with the principles of his scholar—the vague by the more definite, the simpler by the more finished and elaborate theory" (W. H. Thompson). Secondly, whereas it has been argued above that "Opinion" is necessarily included in the system, Zeller, supposing Parmenides to deny the Nonent even as a matter of opinion, regards that part of the poem which: has opinion for its subject as no more than a revised and improved statement of the views of opponents, introduced in order that the reader, having before him the false doctrine as well as the true one, may be led the more certainly to embrace the latter. In the judgment of the present writer, Parmenides, while he denied the real existence of plurality, recognized its apparent existence, and consequently, however little value he might attach to opinion, was bound to take account of it: "pour celui méme qui nie l'existence réelle de la nature," says Renouvier, "il reste encore 4& faire une histoire naturelle de Vapparence et de Villusion."

The teaching of Parmenides variously influenced both his immediate successors and subsequent thinkers, By his recognition of an apparent plurality supplementary to the real unity, he effected the transition from the monism of the first physical succession to the pluralism of the second. While Empedocles and Democritus are careful to emphasize their dissent from "Truth," it is obvious that "Opinion" is the basis of their cosmologies. The doctrine of the deceitfulness of "the undiscerning eye and the echoing ear" soon established itself, though the grounds upon which Anaxagoras, Empedocles, and Democritus maintained it were not those which were alleged by Parmenides. Indirectly, through the dialectic of his pupil and friend Zeno and otherwise, the doctrine of the in- adequacy of sensation led to the humanist movement, which for a time threatened to put an end to

philosophical and scientific speculation. But the positive influence of Parmenides's teaching was not yet exhausted. To say that the Platonism of Plato's later years, the Platonism of the Parmenides, the Philebus, and the Timezus, is the philosophy of Parmenides enlarged and reconstituted, may perhaps seem paradoxical in the face of the severe criticism to which Eleaticism is subjected, not only in the Parmenides, but also in the Sophist. The criticism was, however, pre- paratory to a reconstruction. Thus may be explained the selection of an Eleatic stranger to be the chief speaker m the latter, and of Parmenides himself to take the lead in the former. In the Sophist criticism predominates over recon- struction, the Zenonian logic being turned against the Parmenidean metaphysic in such a way as to show that both the one and the other need revision: see 241 D, 244 B sq., 257 B sg., 258 D. In particular, Plato taxes Parmenides with his inconsistency in attributing (as he certainly did) to the fundamental unity extension and sphericity, so that "the worshipped ér is after all a pitiful py dv" (W. H. Thompson). In the Parmenides reconstruc-

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tion predominates over criticism—the letter of Eleaticism being here represented by Zeno, its spirit, as Plato con- ceived it, by Parmenides. Not the least important of the results obtained in this dialogue is the discovery that, whereas the doctrine of the "one" and the "many" is suicidal and barren so long as the "solitary one" and the "indefinitely many" are absolutely separated (137 C sq. and 163 B sq.), it becomes consistent and fruitful as soon as a "definite plurality" is interpolated between them (142 B sq. 157 B sq., 160 B sg.). In short, Parmenides was no idealist, but Plato recognized in him, and rightly, the precursor of idealism.

Bibliography.—The fragments have been edited and annotated by G. G. Fiilleborn (Fragmente des Parmenides, Zillichau, 1795), C. A. Brandis (Commentationes Eleaticw, Altona, 1813), 8. Karsten (Philos. Grecor. Reliquiz, I., ii, Amsterdam, 1885), F. W. A. Mullach (Aristotelis de Melis. Xenoph. et Gorg. disp. cum Elcati- corum fragm., Berlin, 1845; reprinted in

the Fragmenta Philos. Grezcor., Paris, 1860, i. 109-130), T. Vatke (Parmenidis doctrina qualis fuerit, diss. inaug., Berlin, 1864), and H. Stein ("Die Frag- mente des Parmenides wep) dicews," in the Symbola Philologorum Bonnensium in honorcm F. Ritschelii collecta, Leipsic, 1867, 11. 763- 806). The study of Karsten and Stein jointly is recommended. The well-known Historia Philosophie Gr. et Rom. of Ritter and Preller contains all the important fragments. The extant remains have been translated into English hexameters by T. Davidson (Journal of Speculative Philosophy, St Louis, Mo., 1870, iv. 1-16), and paraphrased in English prose by W. L. Courtney (Studies in Philosophy, London, 1882, pp. 1-25).

The philosophical system has been treated by several of the writers already mentioned, especially Brandis, Karsten, and Vatke, by F. Riaux (Hssai sur Parménide d'Elée, Paris, 1840), and by the historians of Greek philosophy, of whom it will suffice here to men- tion C. A. Brandis (Handb. d. Griechisch-Rimischen Philosophic, Berlin, 1835), G. W. F. Hegel (Vorlesungen iiber d. Geschichte d. Philosophie, Berlin, 1840), Ch, Renouvier (Manuel de Philosophie Angienne, Paris, 1844), L. Striimpell (Gesch. d. theoretischen Philo- sophic d. Griechen, Leipsic, 1854), J. F. Ferrier (Lectures on Greek Philosophy, Edinburgh, 1866), J. E. Erdmann (G@rundriss d. Gesch. d. Philosophie, 2d ed., Berlin, 1869), A. Schwegler (Gesch. d. Griech. Philos., 2d ed., Tiibingen, 1870), F. Ueberweg (Grundriss d. Gesch. d. Philosophie, 4th ed., Berlin, 1871 ; English translation, 3d ed., London, 1880), E. Zeller (Die Philosophie d. Griechen, 4th ed., Leipsic, 1876; English translation, Presocratic Philosophy, London, 1881). On the cosmology, see A. B. Krische (Die theolo- gischen Lehren d. Griechischen Denker, Gottingen, 1840, pp. 97- 116). On the relations of Eleaticism and Platonism, see W. H. Thompson, "On the Genuineness of Plato's Sophist," in Jour. of Philol., viii. 303 sq. (H. JA.)

PARMENIO (Ilappeviwv), a distinguished Macedonian general, born about 400 B.c., was the son of Philotas, and

first appears in history as a favourite counsellor of Philip,

in the course of whose reign he obtained a great victory over the Illyrians (356 B.c.), successfully upheld, at the head of an army, the Macedonian influence in Eubcea (342), and was appointed one of the commanders of the

force that was sent to secure a footing in Asia, and to prepare for the future reduction of that country (336 B.c.). His influence became still greater in the succeeding reign; at Alexander's council table he was always heard with deference, and in the field he was virtually second in command. He led the left wing of the army in the battles of the Granicus, Issus, and Arbela ; and, while the king himself continued the pursuit of Darius into the wastes of Parthia and Hyrcania, Parmenio was entrusted with the task of completing the conquest of Media. Here he was stabbed by Cleander at the instance of the king, in 330, under circumstances which have been elsewhere described (see ALEXANDER, vol. i. p. 483).

PARMIGIANO (1504-1540). The name of this cele- brated painter of the Lombard school was, in full, Girolamo Francesco Maria Mazzuoli, or Mazzola; he dropped the name Girolamo, and was only known as Francesco. He has been more commonly named Il Parmigiano (or its diminutive, Il Parmigianino), from his native city, Parma. Francesco, born on 11th January 1504, was the son of a Painter. Losing his father in early childhood, he was

brought up by two uncles, also painters, Michele and Pier-[ario Mazzola. His faculty for the art developed at a very boyish age, and he addicted himself to the style of Correggio, who visited Parma in 1519. He did not, how- ever, become an imitator of Correggio; his style in its maturity may be regarded as a fusion of Correggio with Raphael and Giulio Romano, and thus fairly original. Even at the age of fourteen (Vasari says sixteen) he had painted a Baptism of Christ, surprisingly mature. Before the age of nineteen,*vhen he migrated to Rome, he had covered with frescos seven chapels in the church of 8. Giovanni Evangelista, Parma. Prior to starting for the city of the popes in 1523, he deemed it expedient to execute some specimen pictures. One of these was a portrait of himself as seen in a convex mirror, with all the details of divergent perspective, &c., wonderfully exact,—a work which, both from this curiosity of treatment and from the beauty of the sitter—for Parmigiano was then "more like an angel than a man"—could not fail to attract. Arrived in Rome, he presented his specimen pictures to the pope, Clement VII., who gladly and admiringly

accepted them, and assigned to the youthful genius the painting of the Sala de' Pontefici, the ceilings of which had been already decorated by Giovanni da Udine. Patrons were willing to regard him as a second Raphael for art and for sweetness of manner, and he was almost as skilful at lute-playing as at painting; but, while fortune was winning him with her most insinuating smiles, the utter ruin of the sack by the Constable de Bourbon and his German and other soldiers overtook both Rome and Parmigiano. At the date of this hideous catastrophe he was engaged in painting that large picture which now figures in the London National Gallery, the Vision of St Jerome (with the Baptist pointing upward and backward to the Madonna and infant Jesus in the sky). It is said that through all the crash and peril of this barbarian irruption Parmigiano sat quietly before his vast panel, painting as if nothing had happened. A band of German soldiery burst into his apartment, breathing fire and slaughter ; but, struck with amazement at the sight, and with some reverence for art and her votary (the other events of the siege forbid us to suppose that reverence for religion had any part in it), they calmed down, and afforded the painter all the protection that he needed at the moment. Their captain, being something of a connoisseur, exacted his tribute, however—a large number of designs. Rome was now no place for Parmigiano. He left with his uncle, intending apparently to return to Parma ; but, staying in Bologna, he settled down there for a while, and was induced to remain three or four years. Here he painted for the nuns of St Margaret his most celebrated altarpiece (now in the Academy of Bologna), the Madonna and Child, with Margaret and other saints. This work became the idol of the Caracci and their school—Guido professing his preference for it even over the St Cecilia of Raphael. ;

Spite of the great disaster of Rome, the life of Mazzola had hitherto been fairly prosperous—the admiration which he excited being proportionate to his charm of person and manner, and to the precocity and brilliancy (rather than depth) of his genius; but from this time forward he became an unfortunate, and it would appear a soured and self-neglectful, man. Greatly to his chagrin, a number of his drawings were stolen by his assistant for engraving purposes, Antonio da Trento. He painted, from observa- tion without sittings, a portrait of the emperor Charles V. crowned by Fame, but through some mismanagement lost the advantages which it had bidden fair

to procure him. In 1531 he returned to Parma, and was commissioned to execute an extensive series of frescos in the choir of the

church of 8. Maria della Steccata. These were to be com- pleted in November 1532; and half-payment, 200 golden scudi, was made to him inadvance. A ceiling was allotted to him, and an arch in front of the ceiling; on the arch he painted six figures—two of them in full colour, and four in monochrome—Adam, Eve, some Virtues, and the famous figure (monochrome) of Moses about to shatter the tables of the law. But, after five or six years from the date of the contract, Parmigiano had barely made a good beginning with his stipulated work. According to Vasari, he neglected painting in favour of alchemy—he laboured over futile attempts to " congcal mereury," being in a hurry to get rich anyhow. It is rather difficult to believe that the various graphic and caustic phrases which Vasari bestows upon this theory of the facts of-Mazzola's life are altogether gratuitous and wide of the mark ; nevertheless the painter's principal biographer, the Padre Affd, undertook to refute Vasari's statements, and most subsequent writers have accepted Affo's conclusions. Whatever the cause, Parmi- giano failed to fulfil his contract, and was imprisoned in de- fault. Promising to amend, he was released ; but, instead of redeeming his pledge, he decamped to Casal Maggiore, in the territory of Cremona. Here, according even to Vasari, he relinquished alchemy, and resumed painting ; yet he still hankered (or is said by Vasari to have hankered) after his retorts and furnaces, lost all his brightness, and presented a dim, poverty-stricken, hirsute, and uncivilized aspect. A fever carried him off on 24th August 1540, before he had completed his thirty-seventh year. By his own desire, he was buried naked in the church of the Servites called La Fontana, near Casal Maggiore.

Grace has always and rightly been regarded as the chief artistic

endowment of Parmigiano,—grace whicli is genuine as an expression of the painter's nature, but partakes partly of the artificial and affected in its developments. ''Un po' di grazia de] Parmigia- nino" (a little, or, as we might say, just a spice, of Parmigianino's grace) was among the ingredients which Agostino Caracci's famed sonnet desidcrates for a perfect picture.

Mazzola constantly made many studies of the same figure, in order to get the most graceful attainable form, movement, and drapery—the last being a point in which he was very successful. The proportions of his figures are over-long for the truth of nature—the stature, fingers, and neck ; one of his Madonnas, now in tlie Pitti Gallery, is cur- rently named ‘‘ La Madonna del collo lungo.” He used to ponder long over a picturc,~~and construct it in his head before he began actual work upon it; he then proceeded rapidly, with a resolute pencil, his great exercise in drawing standing him in good stead. His pictures were executed with diligence and finish, although he was not on the whole a sedulous worker. Neither expression nor colour is a strong point in his works; the figures in his composi~~ tions are generally few—the chief exception being the picture of Christ Preaching to the Multitude. He was good at portraits and at landscape backgrounds, and famous for drawings; he etched a few plates, being apparently the earliest Italian painter who was also an etcher ; but the statement that he produced several woodcuts does not seem to be correct. _ The most admired easel-picture of Parmigiano is the Cupid Mak- ing a Bow, with two children at his feet, one crying, and the other laughing. This was painted in 1536 for Francesco Boiardi of Parma, and is now in the gallery of Vienna. There are various replicas of it, and some of these may perhaps be from Mazzola’s own hand. Of his portrait-painting, two interesting examples are the likeness of Amcrigo Vespucci (after whom America is named) in the Studj Gallery of Naples, and the painter’s own portrait in the Uffizi of Florence. One of Parmigiano’s principal pupils was his cousin, Girolamo di Michele Mazzola ; probably some of the works attributed to Francesco are really by Girolamo. (W. M. R.)

PARNASSUS, a mountain of Greece, in the south of Phocis, rising over the town of Delphi. It had two pro- munent peaks, Tithorea and Lycoreia, besides smaller ones, Hyampeia, Nauplia, &c. Parnassus was one of the most holy mountains in Greece, hallowed by the worship of Apollo, of the Muses, and of the Corycian nymphs, and by the orgies of the Bacchantes. The Delphic oracle, the Castalian fountain, and the Corycian cave were all situated among the clefts in its densely wooded sides.

PARNELL, Tomas (1679-1718), has a place in literature among the minor Queen Anne poets. He was a man of some private fortune, being the head of an English

‘family settled in Ireland, and inheriting landed property

both there and in Cheshire. Born in Dublin in 1679, and educated at Trinity College, he took orders and obtained various preferments in the Irish Church. But bothas a landowner and a clergyman he was an absentee, and spent most of his time in London, where he was patronized by Harley, and received into the intimate friendship of Swift and Pope. He was a member of the Scriblerus Club, and co-operated in burlesquing the “Dunces” and defending the Tory ministry, at the same time attaining some repute in the London pulpits as a preacher. An easy-going wit, with interests mainly in literature and society, he made his peace with the Whigs on the accession of George, but still continued his alliance with Pope. When Pope published his Homer, Parnell produced a translation of the Battle of the Frogs and Mice (1717), and indirectly defended Pope against his critics in the accompanying “remarks of Zoilus” on the principles of translation. After his death in 1718— he died on his way to a living in Ireland—Pope published a collection of his poems. They are nearly all translations and adaptations. The best known of them, Zhe Hermit, is sometimes overpraised on the supposition that it is original; all that Parnell did was to trick out a tale from the Gesta Romanorum with reflexions in the “elevated diction” of the period. “ His praise,” Johnson says with justice, “must be derived from the easy sweetness of his diction ; in his verses there is more happiness than pains ; he is sprightly without effort, and always delights, though he never ravishes ; everything is proper, yet every- thing seems casual.”

PARNY, Evarists DistreE DE ForcEs, VIcoMTE DE (1753-1814), was born in the Isle of Bourbon on 6th February 1753. He was sent to France at nine years old, was educated at Rennes, and in 1771 entered the army. He was, however, shortly recalled to Bourbon, where he fell in love with a young lady whom he celebrated poetically as Eléonore. His earlier biographers state her to have been called Esther de Baif, while the later give her the name of Mdlle. Troussaille. His suit was not favoured by the lady’s family. He returned to France, published his Poéstes Hrotiques in 1778, was

saluted by Voltaire on his last visit to Paris as “ Mon cher Tibulle,” and acquired at once a reputation for graceful and natural verse-writing which, though he lived many years and pro- duced much inferior work, never entirely left him. He had some fortune, and he established himself near Paris. The Revolution impaired his means, but did not otherwise trouble him; indeed he obtained an appointment under it. In 1796 (he had published much else, but nothing of importance) appeared the Guerre des Dieux, a poem in the style of Voltaire’s Pucelle, directed against Christianity, and containing some wit, but much more that is simply dull and indecent. It commended itself to the times, however, and the author is said to have afterwards amplified it into a Christianide, the manuscript of which the Government of Louis XVIIL., according to the story, bought for thirty thousand francs and destroyed. Parny devoted himself in his later years almost entirely to the religious or anti-religious and political burlesque, Under the consulate and the empire he turned his wrath from Christianity to England, and produced in 1805 an extra- ordinary allegoric poem attacking George IIL, his family, and his subjects, under the eccentric title of “Goddam! Goddam ! par un French-dog.” The body of the poem 1s quite worthy of its title. Another and longer poem called Les Rose-Croix, though less extravagant, is still less read- able; and indeed all Parny’s later work is valueless except

as a curiosity. His early love poems or elegies, however, and some slight miscellaneous work of his more mature years, show, with something of the artificiality of the time, a remarkable grace and ease, a good deal of tender- ness, and not inconsiderable fancy and wit. One famous piece, the Hlegy on a Young Girl, is scarcely to be excelled in its kind. In the natural comparison of Parny with his younger English contemporary, Moore, whom he in many ways resembles, the palm must be given to the French poet for precision and enduring elegance of style at his best, though he has less melody and tenderness, and though he condescended to much work far inferior both morally and artistically to the worst of Moore’s.

There is no complete edition of Parny’s works, and the lossis small, There are several good selections containing alinost everything of real value,

among which may be mentioned that of Garnier Freres.

PARODY (rrapwéia, literally a song sung beside, a comic parallel) may be defined as an imitation of the form or style of a serious writing in matter of a meaner kind so as to produce a ludicrous effect. The lowest savages show a turn for comic mimicry, and it is almost as old in European literature as serious writing. The Batracho- myomachia, or " Battle of the Frogs and Mice," a travesty of the heroic epos, was ascribed at one time to Homer himself ; and it is probably at least as old as the 5th century B.c. The great tragic poetry of Greece very soon provoked the parodist. Aristophanes parodied the style of Euripides in the Acharnians with a comic power that has never been surpassed. The debased grand style of medizeval romance was parodied in Don Quixote. Shakespeare parodied the extravagant heroics of an earlier stage, and was himself parodied by Marston, incidentally in his plays and elaborately in a roughly humorous burlesque of Venus and Adonis. The wits of the Queen Anne age succeeded better in mock-heroics than in serious composition. A century later the most celebrated parodists were the brothers Smith, whose [ejected Addresses may be regarded as classic in this kind of artificial production. The Victorian age has pro- duced a plentiful crop of parodists in prose and in verse, in dramatic poetry and in lyric poetry. By common con- sent, the most subtle and dexterous of metrical parodists is the late Mr C. S. Calverley, who succeeded in reproducing not merely tricks of phrase and metre, but even manner- istic turns of thought. Johnson's dictum about pastoral poetry, that most of it is "easy, vulgar, and therefore dis- gusting," might be applied to parody; but Calverley would escape the censure.

PAROS, or Paro, an island in the gean Sea, one of the largest of the group of the Cyclades, with a population of 8000. It lies to the west of Naxos, from which it is Separated by a channel about 6 miles broad, and with which it is now grouped together, in popular language, under the common name of Paronaxia. It is in 37° N. lat. and 25° 10' E. long. Its greatest length from north-east to south-west is 13 miles, and its greatest breadth 10 miles. It is formed of a single mountain about 2400 feet high, sloping evenly down on all sides to @ Maritime plain, which is broadest on the north-east and south-west sides, The island is composed of marble, though gneiss and mica-schist are to be found in a few Places. Grey and bare rises

the mountain, but on the level ground as well as on some of the lower slopes corn and vines are cultivated with success. A sweetish dark- ted wine is exported in considerable quantities. The Island is almost treeless ; the olives, which formerly yielded abundance of oil, were cut down by the Venetians for fire- Wood in the war of Candia. The capital, Paroikia or Parikia (Italian, Parechia), situated on a bay on the north- West side of the island, occupies the site of the ancient capital Paros. Its harbour admits small vessels; the

entrance is dangerous on account of rocks. Houses built in the Italian style with terraced roofs, shadowed by luxuriant vines, and surrounded by gardens of oranges and pomegranates, give to the town a picturesque and pleasing aspect. Here on a rock beside the sea are the remains of a medizval castle built almost entirely of ancient marble remains. Similar traces of antiquity in the shape of bas-reliefs, inscriptions, columns, &ec., are numerous in the town. Outside the town is the church of Katapoliani (77 “ExarovramrvAtavy), well known in the Archipelago. On the north side of the island is the bay of Naousa (Naussa) or Agoussa, forming a safe and roomy harbour. In ancient times it was closed by a chain or boom. Another good harbour is that of Drios on the south-east side, where the Turkish fleet used to anchor on its annual voyage through the Augean. The three villages of Tragoulas, Marmora, and Kepidi (Kyzié:, pronounced Tschipidi), situated on an open plain on the eastern side of the island, and rich in remains of antiquity, probably occupy the site of an ancient town. They are known together as the “ villages of Kephalos,” from the steep and lofty headland of Kephalos. On this headland stands an abandoned monastery of St Anthony, amidst the ruins of a medizval castle, which belonged to the Venetian family of the Venieri, and was gallantly though fruitlessly defended against the Turkish general Barbarossa in 1537. In antiquity the island contained a famous altar, the sides of which were said to be a stadium (606 feet) long. But the celebrated marble quarries are the real centre of interest of the island. They le on the northern side of the mountain anciently known as Marpessa (afterwards Capresso), a little below a former convent of St Mina. The marble, which was employed by Phidias, Praxiteles, and other great Greek sculptors, was obtained by means of subterranean

quarries driven horizontally or at a descend- ing angle into the rock, and the marble thus quarried by lamplight got the name of Lychnites, Jiychneus (from lychnos, a lamp), or Lygdos (Plin., H. W., xxxvi. 5, 14; Plato, Hryxias, 400 D; Athen, v. 2050; Diod. Sic., 2, 52). Several of these tunnels are still to be seen. At the entrance to one of them is a celebrated bas- relief dedicated to the Nymphs by one Adamas, of the Thracian tribe of the Odryse ; it represents a festival of Silenus or Pan.

History.—Like the rest of the Cyclades, Paros seems to have been peopled at an early date by Carians (Herod., i. 171; Thuc., i. 4) —perhaps also by the Phoenicians, whom we know from the Greek historians to have occupied other islands in the Algean, including the neighbouring Thera (Herod., ii. 44; iv. 147; compare INOWBVE. 5 Bl 8). The institution of a form of sacrifice to the Graces, apparently peculiar to Paros, at which neither garlands nor flutes were made use of, was ascribed to Minos. The story that Paros was colonized by one Paros of Parrhasia, who brought with him a colony of Arca- dians to the island (Heraclides, De Rebus Publicis, 8 ; Steph. Byz., s.. Wdpos), is onc of those etymologizing fictions in which Greek legend abounds. Ancient names of the island are said to have been Plateia (or Pactia), Demetrias, Zacynthus, Hyria, Hyleessa, Minoa, and Cabarnis (Steph. Byz.). From Athens the island afterwards received a colony of Ionians (Schol. Dionys., Per., 525; comp. Herod., i. 171), under whom it attained a high degree of prosperity. It sent out colonies to Thasos (Thuc., iv. 104; Strabo, 487) and Parium on the Hellespont. In the former colony, which was planted in thejl5th or 18th Olympiad, the poet Archilochus, a native of Paros, is said to have taken part. As late as 385 B.c. the Parians, in conjunction with Dionysius of Syracuse, founded a colony on the Illyrian island of Pharos (Diod. Sic., xv. 18). So high was the reputation of the Parians that they were chosen by the people of Miletus to arbitrate in a party dispute (Herod., v. 28 sq.). Shortly before the Persian War Paros seems to have been a depend- ency of Naxos (Herod., v. 31). In the Persian War Paros sided with the Persians and sent a trireme to Marathon to support them. In retaliation, the capital Paros was besieged by an Athenian fleet under Miltiades, who demanded a fine of 100 talents. But the town offered a vigorous resistance, and the Athenians were obliged to sail away after a siege of twenty-six days, during which they had laid the island waste. It was at a temple of Demeter Thesmo-

phorus in Paros that Miltiades received the hurt of which he afterwards died (Herod. vi. 183-136). By means of an inscrip- tion Ross was enabled to identify the site of the temple; it lies, in agreement with the deseription of Herodotus, on a low hill beyond the boundaries of the town. Paros also sided with Xerxes against Greeee, but aftcr the battle of Artemisinm the Parian contingent remained in Cythnos watching the progress of events (Herod., vill. 67). For this unpatriotic conduct the islanders were punished by Themistoeles, who exacted a heavy fine (Herod., viii, 112). | Under the Athenian naval confedcracy, Paros paid the highest tribute of all the islands subject to Athens, —30 talents annually, according to the assessment of Olymp. 88, 4 (429 B.c.). Little is known of the constitution of Paros, but inscriptions seem to show that it was democratic, with a senate (Bowle) at the head of affairs (Corpus Inscript., 2376-2383 ; Ross, Inser. Ined., ii. 147, 148). In 410 B.C. the Athenian general Theramenes found an oligarchy at Paros ; he deposed it and restored the democracy (Diod. Sic., xili. 47). Paros was included in the new Athenian confederacy of 378 B.c., but after- wards, along}with Chios, it renounced its connexion with Athens, probably about 357 B.C. Thenceforward the island lost its political importance. From the inseription of Adule we learn that the Cyclades, and consequently Paros, were subject to the Ptolemies of Egypt. Afterwards they passed undcr the rule of Rome. When the Latins made themselves masters of Constantinople, Paros, like the rest, became subject to Venice. In 1537 it was conquered by the Turks. The island now belongs to the kingdom of Greece.

See Tournefort, Voyage du Levant, vol. i. p. 2382 sq., Lyons, 1717; Clarke, Travels, vol. iii, London, 18145 Leake, Travels in Northern Greece, vol. iti. p. 84 sg., London, 1835; Prokesch, Denkwiirdigkeiten, vol. ii. p. 19 sg., Stutt- gart, 1836; Ross, Reisen auf den griechischen Inseln, vol. i. p. 44 sq., Stuttgart and Tubingen, 1840; Fiedler, Reise durch alle Thetle des Kénigreiches Griechen- land, vol. ii. p. 179 sq., Leipsic, 1841; Bursian, Geographie von Griecheniand, vol. ii. p. 483 sg., Leipsic, 1872.

PARQUETRY is a kind of mosaic of wood used for ornamental flooring. Materials contrasting in colour and grain, such as oak, walnut, cherry, lime, pine, é&c., are employed; and in the more expensive kinds the richly

coloured tropical woods are also used. The patterns of parquet flooring are entirely geometrical and angular (squares, triangles, lozenges, &c.), curved and irregular forms being avoided on account of the expense and difficulty of fitting. There are two classes of parquetry in use—veneers and solid parquet. The veneers are usually about a quarter of an inch in thickness, and are laid over already existing floors. Solid parquet of an inch or more in thickness consists of single pieces of wood grooved and tongued together, having consequently the pattern alike on both sides. It forms in itself a sufficient floor of great strength and durability; but veneer, on the other hand, is generally more elegant and complex in design.

PARR. This name was originally applied to small Salmonoids which are abundant in British rivers, and were for a long time considered to constitute a distinct species (Salmo salmulus). They possess the broad head, short snout, and large eye characteristic of young Salmonoids, and are ornamented on the sides of the body and tail with about eleven or more broad dark cross-bars, the so-called parr-marks. However, John Shaw proved, by experiment, that these fishes represent merely the first stage of growth of the salmon, before it assumes, at an age of two years, and when about six inches long, the silvery smolt-dress preparatory to its first migration to the sea. The parr- marks are produced by a deposit of black pigment in the skin, and appear very soon after the exclusion of the fish from the egg; they are still visible for some time below the new coat of scales of the smolt-stage, but have entirely disappeared on the first return of the young salmon from the sea. Although the juvenile condition of the parr is now almost universally admitted, it is a remarkable fact, which has not yet received a satisfactory explanation, that many male parr, from 7 to 8 inches long, have their sexual organs fully developed, and that their milt has all the fertilizing properties of the seminal fluid of a full-grown and sexually matured salmon. On the other hand, no female parr has ever been obtained with mature ova. Not only the salmon, but also the other species of Salmo, the grayling, and probably also the Coregoni, pass through a

parr-stage of growth. The young of all these fishes are barred, the salmon having generally eleven or more bars, and the parr of the migratory trout

from nine to ten, or two or three more than the river-trout. In other respects these parr are very similar to one another ; and in the first year of their life it is very difficult and sometimes almost impossible to ascertain their parentage, whilst in the second year the specific characteristics become more and more conspicuous. In some of the small races or species of river-trout the parr-marks are retained throughout life, but subject to changes in intensity of colour.

PARR, Samvuen (1747-1825), the son of Samuel Parr, surgeon at Harrow-on-the-Hill, was born there 15th January 1747. At Easter 1752 he was sent to Harrow School as a free scholar, where he made the acquaintance of many pupils, such as Bishop Bennet, Sir William Jones, and Warburton Lytton, who became eminent in after life. They read in the same class, they shared in the same sports, and their friendship lasted from youth to age. As Parr was destined for his father's profession, he was removed from school in the spring of 1761, and for the next few years assisted his father in his practice. When the old surgeon realized that his son was but ill- adapted for this pursuit, the boy was sent to Emmanuel College, Cambridge (autumn of 1765), but on his father's death shortly afterwards he was compelled, through lack of means, to return to Harrow. From February 1767 to the close of 1771 he acted as head assistant at Harrow School to Dr Sumner, a teacher whom he idolized, and had under his care many pupils, of whom Sheridan was the best known. When the headmaster died in September 1771 Parr became a candidate for the place, but was rejected, chiefly on account of his youth, whereupon he started another school at Stanmore, and drew after him about forty of his former scholars. After a trial of five years he found himself unable to bear up against the attractions of his old establishment, and dismissed the boys entrusted to his charge, becoming first the headmaster of Colchester Grammar School (1776-78) and then of Norwich School (1778-86). The small rectory of Asterby in Lincolnshire was conferred upon him in 1780, and it was followed three years later by the vicarage of Hatton near Warwick. Though he exchanged this latter benefice for Wadenhoe in Northamptonshire in 1789, he stipulated to be allowed to reside, as assistant curate, in the parsonage of Hatton. In this retirement he spent the rest of his days, cheered by the attractions of an excellent library, described by Mr H. G. Bohn in Bibliotheca Parriana (1827), and the converse of his classical friends, some of whom, like Porson

and E. H. Barker, passed many months in his company. The degree of LL.D. was conferred on him by the university of Cambridge in 1781. Parr died at Hatton vicarage, 6th March 1825, and was buried in the chancel of its church. He had to middle age felt the pressure of poverty, but through the gift in 1788 of the prebendal stall of Wenlock

Barns in St Paul's Cathedral (then worth only a reserved

rent of £20 a year, but on the lapse of the lease in 1804 a preferment of considerable value), and through the purchase for him by his friends in 1789 of an annuity of £300, he died possessed of a large fortune.

Dr Parr's writings fill several volumes, but they are all beneath the reputation which he acquired through the variety of his know- ledge and the dogmatism of his conversation. The chief of them are his character of Charles James Fox; his Latin preface, a long eulogy of Burke, North, and Fox, to a new edition of three books of Bellendenus ; and his reprint of the Tracts of Warburton and a Warburtonian, not admitted into their works, a volume still not without interest for its scathing exposure of Warburton and Hurd. The character of Parr's compositions may be gathercd from a passage in the Edinburgh Revicw (October 1802) on his Spital ser- mon, "a discourse of no common length… . an immeasurable mass of notes which appear to concern every learned thing, every

learned man, and almost every unlearned man since the beginning of the world." Even amid the terrors of the French Revolution he adhered to Whiggism, and his correspondence included every man of emitience, either literary or political, who adopted the same creed. There are two memoirs of his life, one by the Rev. William Field (1828, 2 vols.), the other, with his works and his letters, by John Johnstone (1828, 8 vols.); and E. H. Barker published in 1828-29 two volumes of Parriana, a confused mass of information on Parr and his friends. An essay on his life is included in De Quincey's works, vol. v., and a little volume of the Aphorisms, Opinions, and Reficctions of the late Dr Parr appeared in 1826. PARRAMATTA, a town of New South Wales, at the head of the navigation of the Parramatta river, and 14 miles to the west of Sydney, with which it is connected by

railway, was one of the earliest inland settlements, and the seat of many of the public establishments connected with the working of the convict system. Many of these still remain in another form (the district hospital, the lunatic asylum, the gaol, two asylums for the infirm and destitute, the Protestant and Catholic orphan schools), involving a Government expenditure which partly sustains the business of the town. Parramatta was one of the earliest seats of the tweed manufacture, but its principal industrial dependence has been on the fruit trade. With the exception of Prospect and Pennant Hills, where there is an outburst of trap rock, the surface soil is the disinte- gration of the Wainamatta shale, which is well suited for orangeries and orchards. The value of the annual fruit crop is estimated at £100,000. The earlier governors had their country residence near the town, but the domain is now a public park in the hands of the municipality. Close by was an early observatory where, in 1822, were made the observations for the Parramatta Catalogue, numbering 7385 stars, but it has long been abandoned. The Church of England grammar school (King's School), which accommodates ninety boarders, is on the north side of the river. The population in 1881 was 8453. PARRHASIUS, of Ephesus, was one of the greatest painters of Greece. He settled in Athens, and may be ranked among the Attic artists. The period of his activity is fixed by the anecdote which Xenophon records of the conversation between him and Socrates on the subject of art; he was therefore distinguished as a painter before 399 b.c. Seneca relates a tale that Parrhasius bought one of the Olynthians whom Philip sold into slavery, 346 B.c. (see OLYNTHUS), and tortured him in order to have a model for his picture of Prometheus; but the story, which is similar to one told of Michelangelo, is chronologically impossible. Another tale recorded of him describes his contest with Zeuxis. The latter painted some grapes so perfectly that birds came to peck at them. He then called on Parrhasius to draw aside the curtain and show his picture, but, finding that his rival's picture was the curtain itself, he acknowledged himself to be surpassed, for Zeuxis had deceived birds, but Parrhasius had deceived Zeuxis. The arrogance and vanity of Parrhasius are the subject of many other anecdotes. He dressed himself in the purple robe, golden crown, and staff of a king, called himself the prince, and boasted his descent from Apollo. As to his artistic position, it is impossible for us in the entire absence of direct evidence to do more than repeat the opinion of ancient critics, as retailed by Pliny. He was universally placed in the very first rank among painters. His

skilful drawing of outlines is especially praised, and many of his drawings on wood and parchment were preserved and highly valued by later painters for purposes of study. He first attained skill in making his figures appear to stand out from the background. His picture of Theseus adorned the Capitol in Rome. His other works, besides the obscene subjects with which he is said to have amused his leisure, are chiefly mythological groups. A picture of the Demos, the personified People of

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Athens, is famous ; according to the story, the twelve pro- minent characteristics of the people, though apparently quite inconsistent with each other, were distinctly expressed in this figure. The way in which this was accomplished is an insoluble riddle. PARROT, according to Prof. Skeat (Htymol. Dictionary,

422), from the French Perrot or Pierrot, a proper name and the diminutive of Pierre,! the name given generally to a large and very natural group of Birds, which for more than a score of centuries have attracted attention, not only from their gaudy plumage, but, at first and chiefly,

it would seem, from the readiness with which many of them learn to imitate the sounds they hear, repeating the words and even phrases of human speech with a fidelity that is often astonishing. It is said that no representation of any Parrot appears in Egyptian art, nor does any reference to a bird of the kind occur in the Bible, whence it has been concluded that neither painters nor writers had any know-. ledge of it. Aristotle is commonly supposed to be the first author who mentions a Parrot; but this is an error, for nearly a century earlier Ctesias in his Indica (cap. 3),? under the name of Birraxos (Bittacus), so neatly described a bird which could speak an “Indian” language—natur- ally, as he seems to have thought—or Greek—if it had

been taught so to do—about as big as a Sparrow-Hawk (Hierax), with a purple face and a black beard, otherwise blue-green (cyaneus) and vermilion in colour, so that there cannot be much risk in declaring that he must have had before him a male example of what is now commonly known as the Blossom-headed Parakeet, and to ornitho- logists as Paleornis

cyanocephalus, an inhabitant of many parts of India. Much ingenuity has been exercised in the endeavour to find the word whence this, and the later form of the Greek name, was derived, but to little or no purpose.

After Ctesias comes Aristotle's yurrdxn (Psittace), which Sundevall supposes him to have described only from hearsay, a view that the present writer is inclined to think insufficiently supported. But this matters little, for there can be no doubt that the Indian conquests of Alexander were the means of making the Parrot better known in Europe, and it is in reference to this fact that

another Eastern species of Palzornis now bears the name

of P. alexandri, though from the localities it inhabits it

could hardly have had anything to do with the Macedonian

hero. That Africa had Parrots does not seem to have been

discovered by the ancients till long after, as Pliny tells us

(vi. 29) that they were first met with beyond the limits of

Upper Egypt by explorers employed by Nero. These

birds, highly prized from the first, reprobated by the

moralist, and celebrated by more than one classical poet,

in the course of time were brought in great numbers to

Rome, and ministered in various ways to the luxury of the

age. Not only were they lodged in cages of tortoise-shell

DS a 1 "Parakeet" (in Shakespeare, 1 Hen. FV., ii. 3, 88, " Paraquito 2) is said by the same authority to be from the Spanish Perigquito or Perroqueto, a small Parrot, diminutive of Perico, a Parrot, which again may be a diminutive from Pedro, the proper name. Parakeet (spelt in various ways in

English) is usually applied to the smaller kinds of Parrots, especially those which have long tails, not as Perroquet in French, which is used as a general term for all Parrots, Perruche, or sometimes Perriche, being the ordinary name for what we call Parakeet. The old English “ Popinjay” and the old French Papegaut have almost passed out of use, but the German Papagei and Italian Papagaio still continue in vogue. These names can be traced to the Arabic Babaghd; but the source of that word is unknown. The Anglo-Saxon name of the Parret, a river in Somerset, is Pedreda or Pedrida, which at first sight looks as if it had to do with the proper name, Petrus; but Prof. Skeat believes there is no con- nexion between them—the latter portion of the word being rid, a stream.

2 The passage seems to have escaped the notice of all naturalists except Broderip, who mentioned it in his article “ Psittacide,” in the Penny Cyclopedia (vol. xix. p. 88).

and ivory, with silver wires, but they were professedly esteemed as delicacies for the table, and one emperor is said to have fed his lions upon them! But there would be little use in dwelling longer on these topics. With the decline of the Roman empire the demand for Parrots 1 Europe lessened, and so the supply dwindled, yet all knowledge of them was not wholly lost, and they are occasionally mentioned by one writer or another until in the 15th century began that career of geographical dis- covery which has since proceeded uninterruptedly. This immediately brought with it the knowledge of many more forms of these birds than had ever before been seen, for whatever races of men were visited by European naviga- tors——whether in the East Indies or the West, whether in Africa or in the islands of the Pacific—it was almost invariably found that even the most savage tribes had tamed some kind of Parrot; and, moreover, experience soon showed that no bird was more easily kept alive on board ship and brought home, while, if it had not the

merit of “speech,” it was almost certain to be of beautiful

plumage. Yet so numerous is the group that even now new species of Parrots are not uncommonly recognized, though, looking to the way in which the most secluded parts of the world are being ransacked, we must soon come to an end of this.

The home of the vast majority of Parrot-forms is unquestionably within the tropics, but the popular belief that Parrots are tropical birds only is a great mistake. In North America the Carolina Parakeet, Conurus carolinensis, at the beginning of the present century used to range in summer as high as the shores of Lakes Erie and Ontario— a latitude equal to that of the south of France ; and even within the last forty years it reached, according to trust-worthy information, the junction of the Ohio and the Mississippi, though now its limits have been so much curtailed that its occurrence in any but the Gulf States is doubtful. In South America, at least four species of Parrots are found in Chili or La Plata, and one, Conurus patagonus, is pretty common on the bleak coast of the Strait of Magellan. In Africa, it is true that no species is known to extend to within some ten degrees of the tropic of Cancer ; but Pzonias robustus inhabits territories lying quite as far to the southward of the tropic of Capricorn. In India the northern range of the group is only bounded by the slopes of the Himalaya, and further to the eastward Parrots are not only abundant over the whole of the Malay Archipelago, as well as Australia and Tasmania, but two very well-defined Families are peculiar to New Zealand and its adjacent islands (see KaxKaPpo, vol. xiii. p. 825; and Nestor, vol. xvii. p. 354). No Parrot has recently inhabited the Palearctic Region, and but one (the Conurus carolinensis, just mentioned) probably belongs to the Nearctic; nor are Parrots represented by many different forms in either the Ethiopian or the Indian Regions. In continental Asia the distribution of Parrots is rather remarkable. None extend further to the west- ward than the valley of the Indus,? which, considering the nature of the country in Baluchistan and Afghanistan, is perhaps intelligible enough ; but it is not so easy to under-

1 A few remains of a Parrot have been recognized from the Miocene of the Allier in France, by Prof. A. Milne-Edwards (Ois. Foss. France, ii. p. 525, pl. cc.), and are said by him to show the greatest resemblance to the common Grey Parrot of Africa, Psittacus erithacus, through having also some affinity to the Ring-necked Parakeet of the same country, Palwornis

torguatus. He refers them, however, to the same genus as the former, under the name of Psittacus verreauxti.

- The statements that have been made, and even repeated by writers of authority, as to the occurrence of “a green parrot” in Syria (Chesney, Exped. Survey Euphrates and Tigris, i. pp. 448, 537) and of a Parrot in Turkestan (Jour. As. Soc. Bengal, viii. p- 1007) originated with gentlemen who had no ornithological knowledge, and are evidently erroneous.

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stand why none are found either in Cochin China op China proper ; and they are also wanting in the Philippine Islands, which is the more remarkable and _ instructive when we find how abundant they are in the groups a little further to the southward. Indeed Mr Wallace has wel] remarked that the portion of the earth’s surface which contains the largest number of Parrots, in proportion to its area, is undoubtedly that covered by the islands extending from Celebes to the Solomon group. “ The area of these islands is probably not one-fifteenth of that of the four tropical regions, yet they contain from one-fifth to one fourth of all the known Parrots” (Geogr. Distr. Animals, ii. p. 330). He goes on to observe also that in this area are found many of the most remarkable forms—all the red Lories, the great black Cockatoos, the pigmy Wasi- terne, and other singularities. In South America the species of Parrots, though numerically nearly as abundant, are far less diversified in form, and all of them seem capable of being referred to two or, at most, three sections. The species that has the widest range, and that by far, is the common Ring-necked Parakeet, Palzxornis torquatus, a well-known cage-bird which is found from the mouth of the Gambia across Africa to the coast of the Red Sea, as well as throughout the whole of India, Ceylon, and Burmah to Tenasserim.? On the other hand there are plenty of cases of Parrots which are restricted to an extremely small area—often an island of insignificant size, as Conurus xantholemus, confined to the island of St Thomas in the Antilles, and Palzornis exsul to that of Rodriguez in the Indian Ocean—to say nothing of the remarkable instance of Westor productus before mentioned (vol. xvii. p. 355). The systematic treatment of this very natural group of birds has long

been a subject of much difficulty, and the difference of opinion among those who have made it their study is most striking, for there is hardly an approach to unanimity to be found, beyond the somewhat general belief which has grown up within the last forty years that the Parrots should be regarded as forming a distinct Order of the Class, though there are some men, justly accounted authorities, who even question this much. A few system- atists, among whom Bonaparte was chief, placed them at the top of the Class, conceiving that they were the analogues of the Primatesamong mammals. Prof. Huxley has recog- nized the Psittacomorphe as forming one of the principal groups of Carinate birds, and, by whatever name we call them, that much seems to be evident. It will here, however, be unnecessary to discuss the exact rank which the Parrots as a groupshould hold, for sufficient on that score has already been said above (ORNITHOLOGY, p. 47), and it is quite enough of a task to consider the most natural or—if we cannot hope at present to reach that—at least the most expedient way of subdividing them. It must be admitted as a reproach to ornithologists that so little satisfactory progress has been made in this direction, for of that the existing differences of opinion—differences as wide as have ever existed in any branch of ornithic taxonomy—are sufficient proof. More- over, the result is all the more disheartening, seeing that there is no group of exotic birds that affords equal oppor- tunities for anatomical examination, since almost every genus extant, and more than two-thirds of the species, have within recent times been kept in confinement in one or another of our zoological gardens, and at their death have furnished subjects for dissection. Yet the laudable attempt

3 Itis right to state, however, that the African examples of this bird are said to be distinguishable from the Asiatic by their somewhat shorter wings and weaker bill, and hence they are considered by some authorities to form a distinct species or subspecies, P. docilis; but in thus regarding them the difference of locality seems to have influenced opinion, and without that difference they would scarcely have been separated, for in many other groups of birds distinctions so slight are regarded as barely evidence of local races.

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of M. Blanchard (Comptes' Rendus, xliii. 1097-1100 and xliv. 518-521) has not been regarded as successful, and it cannot be affirmed positively that the latest arrange- ment of the Psittac: is really much more natural than that planned by Buffon one hundred and twenty years ago. He wasof course unaware of the existence of some of the most remarkable forms of the group, in particular of Strigops and Nestor; but he began by making two great divisions of those that he did know, separating the Parrots of the Old World from the Parrots of the New, and subdividing each of these divisions into various sections somewhat in accordance with the names they had received in popular language—a practice he fol- lowed on many other occasions, for it seems to have been with him a belief that there is more truth in the discrimi- nation of the unlearned than the scientific are apt to allow. The result is that he produced a plan which is comparatively simple and certainly practical, while as just stated it cannot be confidently declared to be unnatural. However, not to go so far back as twenty years, in 1867-68 Dr Finsch published at Leyden an elaborate monograph of the Parrots,! regarding them asa Family, inwhich he admitted 26 genera, forming 5 Subfamilies :—(1) that composed of Strigops (Ka- KAPO, wt supr.) only; (2) that containing the crested forms or Cockatoos ; (3) one which he named Stttacinx, compris- ing all the long-tailed species—a somewhat heterogeneous assemblage, made up of Macaws (vol. xv. p. 130) and what are commonly known as Parakeets; (4) the Parrots proper with short tails; and (5) the so-called " brush- tongued" Parrots, consisting of the Lorixs (vol. xv. p. 7) and NusTors (ut sup.). Except in the characters of the last group he recognized none that were not external, and that fact is sufficient to cast suspicion on his scheme being natural. .

In 1874 the late Prof. Garrod communicated to the Zoological Society the results of his dissection of examples of 82 species of Parrots, which had lived in its gardens, and these results were published in its Proceedings for that year (pp. 586-598, pls. 70, 71). The principal points to which he attended were the arrangement of the carotid artery, and the presence or absence of an ambiens muscle, an oil-gland, and a furcula; but except as regards the last character he unfortunately almost wholly neglected the rest of the skeleton, looking upon such osteological features as the formation of an orbital ring and peculiarities of the atlas as "of minor importance "—an estimate to which nearly every anatomist will demur ; for, though

undoubtedly the characters afforded by blood-vessels and muscles are useful in default of osteological characters, it is obvious that these last, drawn from the very framework of any vertebrate's structure, cannot be inferior in value to the former. Indeed the investigations of Prof. A. Milne-Edwards (Ann. Sc. Nat. Zoologie, ser. 5, vi. pp. 91-111; viii. pp. 145-156) on the bones of the head in various Psittacine forms make it clear that these alone present features of much significance,and if his investigations had not been carried on for a special object, but had been extended to other parts of the skeleton, there is little doubt that they would have removed some of the greatest difficulties. The one osteological character to which Garrod trusted, namely, the condition of the furcula, cannot be said to contribute much towards a safe basis of classification. That it is wholly absent in some genera of Parrots had long been known, but its imperfect ossification, it appears, is not attended in some cases by any diminution of volant powers, which tends to shew that it is an unimportant character, an inference confirmed by the fact that it is found wanting in genera Placed geographically so far apart that the loss must have had in some of them an independent origin. Summarily

1 Die Papageien, monographisch bearbeitet.

expressed, Garrod's scheme was to divide the Parrots into two Families, Palxornithide and Psittacide, assigning to the former three Subfamilies Palzornithine, Cacatuine, and Stringopine, and to the latter four, Arine, Pyrrhurine, Platycercinzx, and Chrysotine. That each of these sections, except the Cacatuine, is artificial any regard to osteology would shew, and it would be useless here to further criticize his method, except to say that its greatest merit is that, as before mentioned (Love-Birp, vol. xv. p. 28), he gave sufficient reasons for distinguishing between the genera Agaporms and Psittacula. Inthe Journal fiir Ornithologie for 1881 Dr Reichenow published a Conspectus Psittacorum, founded, as several others 2 have been, on external characters only. He makes 9 Families of the group, and recognizes 45 genera, and 442 species, besides subspecies. His group- ing is generally very different from Garrod's, but displays as much artificiality ; for instance, Nestor is referred to the Family which is otherwise composed

of the Cockatoos. Still more recently we have the arrangement followed by Mr Sclater in the List of those exhibited of late years in the gardens of the Zoological Society, and published in 1883. This is more in accordance with the views that the present writer is inclined to hold, and these views may here, though with mucli diffidence, be stated. First there is Strigops, which must stand alone, unless, as before hinted (vol. xiii. p. 826), Geopsittacus and Pezoporus may have to be placed with it in a Family Strigopide. Next Nestor, from its osteological peculiarities, seems to form a very separate type, and represents a second Family Nestoridx. These two Families being removed, all the Parrots that remain will be found to have a great resemblance among them- selves, and perhaps it is impossible justifiably to establish any more. Families. For the present at any rate it would seem advisable to keep them in a single Family Psittacida, but there can be no objection to separating them into several Subfamilies. The Cockatoos, for instance, can be without much difficulty defined, and may stand as Cacatuina, and then the brush-tongued Lories as Lortine, after which the Macaws, Arinx—including possibly Conurus and its allies. Platycercus and its neighbours may form another section, and the same with Paleornis; but for the rest there is not yet material for arriving at any determination, though Chrysotis and Psittacus seem to furnish two different types, to the former of which Psettacula appears to bear much the same relation as Agapornis does to the latter. Amongst the genera Chrysotis, Palzornts, and Psittacus are probably to be found the most highly organized forms, and it is these birds in which the faculty of so-called “ speech reaches its maximum development. But too much import- ance must not be assigned to that fact; since, while Psittacus erithacus—the well-known Grey Parrot with a red tail —is the most accomplished spokesman of the whole group, it is fairly approached by some species of Chrysotis —usually styled Amazons—and yet its congener P. tumneh is not known to be at all loquacious.’ Considering the abundance of Parrots both as species and individuals, and their wide extent over the globe, it is surprising how little is known of their habits in a wild state. Even the species with which Englishmen and their descendants have been more in contact than any other has an almost unwritten history, compared with that of many other birds; and, seeing how it is oppressed by and yielding to man’s occupation of its ancient haunts, the

9 Such, for instance, as Kuhl’s treatise with the same title, which appeared in 1820, and Wagler’s Monographia Psittacorum, published in 1832—both good of their kind and time.

3 In connexion with the “speaking” of Parrots, oue of the most curious circumstances is that recorded by Humboldt, who in South America met with a venerable bird which remained the sole possessor of a literally dead language, the whole tribe of Indians, Atures by name, who alone had spoken it having become extinct.

extirpation of the Carolina Parakeet is certain, and will probably be accomplished before several interesting and some disputed points in its economy have been decided. The same fate possibly awaits several of the Australian species and all those in New Zealand—indeed the experience of small islands only foreshadows what will happen in tracts of greater extent, though there more time is required to produce the same result; but, the result being inevit- able, those who are favourably placed for observations should neglect no opportunities of making them ere it be too late. (a. N.) PARROT-FISHES, more correctly called PaRrrot- Wrassgs, are marine fishes, belonging to the Wrasse family, and referred to four closely-allied genera, viz., Scarus, Scarichthys, Callyodon, and Pseudoscarus. They are easily recognized by their large scales, of which there are from twenty-one to twenty-five in the lateral line, by having invariably nine spines and ten rays in the dorsal fin and two spines with eight rays in the anal, and especially by their singular dentition, of jaws as well as pharynx. The teeth of the jaws are soldered together, and form a sharp- edged beak similar to that of a parrot, but without a middle

projecting point, and the upper and lower beak are-

divided into two lateral halves by a median suture. In a few species the single teeth can be still distinguished, but in the majority (Pseudoscarus) they are united into a homo- geneous substance with polished surface. By this sharp and hard beak parrot-fishes are enabled to bite or scrape off those parts of coral-stocks which contain the animal- cules, or to cut off branches of tough fucus, which in some of the species forms the principal portion of

their diet. The process of triturating the food is performed by the pharyngeal teeth, which likewise are united, and form plates with broad masticatory surface, not unlike the grinding surface of the molars of the elephant. Of these plates there is one pair above, opposed to and fitting into the single one which is coalesced to the lower pharyngeal bone. The contents of the alimentary canal, which are always found to be finely divided and reduced to a pulp, prove the efficiency of this triturating apparatus ; in fact, ever since the time of Aristotle it has been maintained that the Scarus ruminates. Nearly one hundred species of parrot-fishes are known from the tropical and subtropical parts of the Indo-Pacific and Atlantic Oceans ; like other coral-feeding fishes, they are absent on the Pacific coasts of tropical America and on the coast of tropical West Africa. The most celebrated is the Scarus of the Medi- terranean. Beautiful colours prevail in this group of wrasses, but are subject to great changes and variation in the same species ; almost all are evanescent, and cannot be preserved after death. The majority of parrot-fishes are eatable, some even esteemed ; but they (especially the carnivorous kinds) not unfrequently acquire poisonous pro- perties after they have fed on corals or medusze containing an acrid poison. Many attain to a considerable size, upwards of 3 feet in length.

PARRY, Sir Witt1am Epwarp (1790-1855), arctic navigator, was the fourth son of Dr Caleb Hillier Parry, a physician of some celebrity in Bath, and was born there 19th December 1790. He was educated at the Bath Grammar School, and was intended for the medical pro- fession, but through the intervention of a lady friend of the family he was permitted, through the kindness of Admiral Cornwallis, to join the “Ville de Paris,” the flagship of the Channel fleet, as a first-class volunteer. In 1806 he became a midshipman in the “Tribune ” frigate, from. which he was, in the spring of 1808, transferred to the “ Vanguard” in the Baltic fleet. After obtaining his heutenant’s commission he joined the “ Alexander ” frigate, employed in the protection of the Spitzbergen whale

fishery. Taking advantage of the opportunity for the study of astronomy, and the observation of the fixed stars in the northern hemisphere, he afterwards published the result of his studies in a small volume on Nautical Astro-

nomy. He also employed himself in preparing accurate charts of the northern navigation. Having joined the “La Hogue” at the North-American station, he remained there till 1817, distinguishing himself in an expedition up the Connecticut river, for which he received a medal. Shortly after his return to England he obtained an appointment to the “ Alexander ” brig in the expedition of Sir John Ross to discover the probabilities of a North-West Passage to the Pacific. Ross, mistaking clouds for the Croker mountains barring his way westwards, returned to England in the belief that further perseverance was hopeless; but Parry, confident, as he expressed it, “ that attempts at polar discovery had been hitherto relinquished just at a time when there was the greatest chance of succeeding,” obtained the command of a new expedition, consisting of two ships, the “Griper” and “ Hecla,” with which he sailed from the Thames in May 1819. Passing up Baffin’s Bay, he explored and named Barrow’s Straits, Prince Regent’s Inlet, and Wellington Channel, and reached Melville Island at the beginning of September, having crossed longitude 110° W., thus becoming entitled to the reward of £5000 offered by parliament. After wintering in Melville Island he made an effort to force a passage to Behrings Straits, but, the state of the ice rendering this impossible, he returned to England, re-entering the Thames in November 1820. A narrative of the expedition appeared in 1821. Shortly after his return he was pro- moted to the rank of commander, presented with the freedom of Bath and Norwich, and elected a member of the Royal Society. With the “Fury” and the “ Hecla” he set sail on a second expedition in May 1821, and after great hardships returned to England in November 1823 without achieving his purpose. During his absence he had in November 1821 been promoted to post rank, and on Ist December 1823 he was chosen acting hydrographer to the navy. His Journal of a Second Voyage for the Discovery of the North-West Passage appeared in 1824. With the same ships he, in May 1824, set sail on a third expedition, which, however, was also unsuccessful, and after the wreck of the “Fury” he returned home in October 1825 with a double ship’s company. Of this voyage he published an account in 1826. Having obtained the sanction of the Admiralty to journey to the North Pole from the northern shores of Spitzbergen in boats that could be fitted to sledges, he set sail with the “Heela,” March 27, 1827, and in June set out for the Pole. He, however, failed to find the solid plain of ice he expected ; and as, moreover, owing to the ice drift, he found his efforts at progress northwards in great degree

frustrated, he was compelled, after reaching 82° 45’ N. lat., to retrace his steps, and arrived in England in October. Of his journey he published an account under the title of Narrative of the Attempt to reach the North Pole in Boats, 1827. On April 29, 1829, he received the honour of knighthood, Sir John Franklin being also knighted on the same occasion. After continuing his duties as hydrogra- pher till May 1829, he went to New South Wales as com: missioner to the Australian Agricultural Company. On his return to England in 1835 he was appointed assistant poor-law commissioner in Norfolk. This he in little more than a year resigned, and in 1837 he was employed m organizing the packet service between Liverpool, Holyhead, and Dublin. For nine years from 1837 he was comptroller of the steam department of the navy. On retiring from active service he was appointed captain-superintendent of Haslar Hospital. He vacated this office in 1852 on obtain-

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ing the rank of rear-admiral, and in 1853 he was appointed governor of Greenwich Hospital, which post he retained till his death, 8th July 1855. Besides the journals of his different voyages, Parry was the author of a Lecture to Seamen, and Thoughts on the Parental Character of God.

See Memoirs of Rear-Admiral Sir W. E. Parry, by his son Rev. Edward Parry, M.A., 3d ed., 1857.

PARSIS, or Parsexs. The resident in Bombay who wanders to the Back Bay beach at sunset to inhale the fresh sea-breezes from Malabar Hill will there observe a congregation of the most interesting people of Asia. They are the Parsis, the followers of Zarathustra, and the descendants of the ancient Persians who emigrated to India on the conquest of their country by the Arabs, about the year 720 A.D.

The men are well-formed, active, handsome, and intelligent. They have light olive complexions, a fine aquiline nose, bright black eyes, a well-

turned chin, heavy arched eyebrows, thick sensual lips, and usually wear a light curling moustache. The women are delicate in frame, with small hands and feet, fair complexions, beautiful black eyes, finely arched eyebrows, and a luxurious profusion of long black hair, which they dress to perfection, and ornament with pearls and gems.

The Parsis are much more noble in their treatment of females than any other Asiatic race ; they allow them to appear freely in public, and leave them the entire manage- ment of household affairs. They are proverbial for their benevolence, hospitality, and sociability. They are good scholars, and usually learn several languages—Gujarati, Hinddstini, and English The Parsis are notoriously fond of good living, and do not hesitate to spend their money freely for the best the market affords. They indulge in wines, but do not reach the vice of intoxication.

On getting out of bed in the morning, an orthodox Parsi first says his prayers. He then rubs a little nirang (cow-urine) upon his face, hands, and feet, reciting during the ceremony a prayer or incantation against the influence of dévas, or evil spirits, for which the “nirang” is considered a specific. He next takes his bath, cleans his teeth, and repeats his prayers. He then takes his morning meal, a light breakfast,—-say, tea or chocolate, bread, and fruits. The dinner is more abundant, and is composed of the dishes of the country—meats, stews, vegetables, rice, fruits, dc. These dishes are seasoned with pungent sauces, curries, chutneys, pickles, &c., one of which, famous in Bombay, is marked with the mild initials H. F. (hell-fire). The evening meal is taken after sunset, when the labours and ceremonies of the day are over, and is the signal for licence in eating, drinking, and conversation. A tat, or parting drink for the night, is a time-honoured custom among the Parsis.

The costume of the Parst is loose and flowing, very picturesque in appearance, and admirably adapted to the climate in which he lives. The sadara, or shirt, which is considered the most sacred garment, because it is worn next the skin, is a plain loose vest, usually made of muslin, or with the opulent of fine white linen. A long coat or gown is worn over the sadara, extending to the knees, and fastened round the waist with the kust?, or sacred cord, which is carried round three times, and fastened in front with a

double knot. The pyjamis, or loose trousers, are fastened round the waist by a silken cord with tassels at the ends, which are run through a hem. The material of these pyjamis among the common classes is cotton, but the rich indulge in fancy-coloured silks and satins. The head is covered with a turban, or a cap of a fashion Peculiar to the Parsts; it is made of stiff material, some-

_ thing like the European hat, without any rim, and has an

angle from the top of the forehead backwards. It would

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not be respectful to uncover in presence of an equal, much less of a superior. The colour is chocolate or maroon, except with the priests, who wear a white turban. The shoes are of red or yellow morocco, turned up at the toes.

The dress of Parst ladies is something gorgeous. They are enveloped in a maze of mysteriously wound silk. They appear as houris floating about the earth in silk balloons, with a ballasting of anklets, necklaces, earrings, and jewellery. The dressmakers' bills, fortunately for the head of the family, are not exorbitant, as the costumes have not been through the hands of the modiste, but are composed of many yards of fancy-coloured silks wound round the nether limbs and gradually enfolding the body, covering part of the bosom, and then thrown over the shoulders and head, drooping on the left arm, as a shield against the inquisitive gaze ofa stranger. The pyjamis, or drawers, are common to both sexes, but the ladies of course excel in the fine texture and fanciful colours of these garments.

A Parst must be born upon the ground floor of the house, as the teachings of their religion require life to be commenced in humility, and by " good thoughts, words, and actions" alone can an elevated position be attained either in this world or the next. The mother is not seen by any member of the family for forty days. Upon the seventh day after the birth of the child, an astrologer is invited, who is either a Brahmana or a Parst priest, to cast the nativity of the child. He has first to enumerate the names which the child may bear, and the parents have the right to make choice of one of

them. Then he draws on a wooden board a set of hieroglyphics in chalk, and his dexterity in counting or recounting the stars under whose region or influence the child is declared to be born is marvelled at by the superstitious creatures thronging around him. All the relatives press forward to hear the astrologer predict the future life and prospects of the babe. This document is preserved in the family archives as a guidance and encouragement to the child through life, and may exert some influence in shaping its destiny. At the age of seven years or thereabouts, according to the judg- nient of the priest, the first religious ceremony of the Parsis is performed upon the young Zarathustrian. He is first subjected to the process of purification, which consists of an ablution with “nirang.” The ceremony consists in investing the young Parsi with the cincture, or girdle of his faith. This cincture is a cord woven by women of the priestly class only. It is composed of seventy-two threads, representing the seventy-two chapters of the Yagna, a portion of the Zand-Avesta, in the sacredness of which the young neophyte is figuratively bound. The priest ties the cord around the waist as he pronounces the benediction upon the child, throwing upon its head at each sentence slices of fruits, seeds, perfumes, and spices. He is thus received into the religion of Zarathustra. After the performance of this ceremony, the child is considered morally accountable for its acts. Ifa child die before the performance of this ceremony, it is considered to have gone back to Ahurd-Mazda, who gave it, as pure as it entered into this world, having not reached the age of accountability. The ceremony of the kustt, or encircling with the girdle, is closed by the distribution of refreshments to the friends and relatives of the family who have attended the investiture of the younger follower of Zarathustra with the sacred girdle of his faith.

The marriages of children engage the earliest attention ofthe parents. Though the majority of Parsi marriages are still celebrated while the children are very young, instances frequently occur of marriages of grown-up boys and girls. The wedding day is fixed by an astrologer, who consults the stars for a happy season. The wedding day being

fixed, a Parsi priest goes from house to house with a list of |

the guests to be invited, and delivers the invitations with

respect for the departed. The body, when put upon the bier, is covered over from head to foot. Two attendants

much ceremony. The father of the bride waits upon bring it out of the house, holding it low in their hands,

near relatives and distinguished personages, soliciting the honour of their attendance. A little before sunset a pro- cession is formed at the house of the bridegroom, and proceeds with a band of music, amid great pomp and cere- mony, to the house of the bride's father. Here a number of relatives and friends are collected at the door to receive the bridegroom with due honour. Presents are sent before, according to the time-honoured customs of the East. Upon the arrival of the procession at the house of the bride, the gentlemen gallantly remain outside, leaving room for the ladies to enter the house with the bridegroom as his escort. As he passes the threshold, his future nother-in-law meets him with a tray filled with fruits and rice, which she strews at his feet. The fathers of the young couple are seated side by side, and between them stands the priest ready to perform the magic ceremony. The young couple are seated in two chairs opposite each other, their right hands tied together by a silken cord, which is gradually wound around them as the ceremony progresses, the bride in the meantime being concealed with a veil of silk or muslin. The priest lights a lamp of incense, and repeats the nuptial benediction first in Zand and then in Sanskrit. At the conclusion of the ceremony they each throw upon the other some grains of rice, and the most expeditious in performing this feat is considered to have got the start of the other in the future control of the household, and receives the applause of the male or female part of the congregation as the case may be. The priest now throws some grains of rice upon the heads of the married pair in token of wishing them abundance ; bouquets of flowers are handed to the assembled guests, and rose-water is showered upon them. The bride and bridegroom now break some sweetmeats, and, after they have served each other, the company are invited to partake of refreshments. At the termination of this feast the pro- cession forms, and with lanterns and music escorts the bridegroom back to his own house, where they feast until midnight. As midnight approaches, they return to the house of the bride,

and escort her, with her dowry, to the house of the bridegroom, and, having delivered her safely to her future lord and master, disperse to their respective homes. Eight days after the bridal ceremony a wedding feast is given by the newly-married couple, to which only near relatives and particular friends are invited. This feast is composed entirely of vegetables, but wine is not forbidden ; at each course the wine is served, and toasts are proposed, as “ happiness to the young couple,” &c. The funeral ceremonies of the Parsts are solemn and imposing. When the medical attendant declares the case of a Parsi hopeless, a priest advances to the bed of the dying man, repeats sundry texts of the Zand-Avesta, the substance of which tends to afford consolation to the dying man, and breathes a prayer for the forgiveness of his sins. After life is extinct, a funeral sermon is delivered by the priest, in which the deceased is made the subject of an exhortation to his relatives and friends to live pure, holy, and righteous lives, so that they may hope to meet again in paradise. The body is then taken to the ground floor where it was born, and, after being washed and perfumed, is dressed in clean white clothes, and laid upon an iron bier. A dog is brought in to take a last look at his inanimate master in order to drive away the evil spirits or Nasus. This ceremony is called sagddd. A number of priests attend and repeat prayers for the repose of the soul of the departed. All the male friends of the deceased go to the door, bow down, and raise their two hands from touching the floor to their heads to indicate their deepest

and deliver it to four pall-bearers, called nasasaldr, all clad in well-washed, clean, white clothes. All the people present stand up as the body is taken out of the house, and bow to it in respect as it passes by. A procession is formed by the male friends of the deceased, headed by a number of priests in full dress, to follow the body to the dakhma, or “tower of silence,” the last resting-place of the departed Parsi. These towers are erected in a beauti- ful garden on the highest point of Malabar Hill, amid tropical trees swarming with vultures ; they are constructed of stone, and rise some 25 feet high, with a small door at the side for the entrance of the body. Upon arriving at the “ tower of silence” the bier is laid down, and prayers are said in the sagr?, or house of prayer, containing a fire- sanctuary, which is erected near the entrance to the garden. The attendants then raise the body to its final resting- place, lay it upon its stony bed, and retire. A round pit about 6 feet deep is surrounded by an annular stone pavement about 7 feet wide, on

which the body is exposed to the vultures, where it is soon denuded of flesh, and the bones fall through an iron grating into a pit beneath, from which they are afterwards removed into a subterranean entrance prepared for their reception. On the third day after death an assemblage of the relatives and friends of the deceased takes place at his late residence, and thence proceed to the Atish-bahrdém, or “temple of fire.” The priests stand before the urns in which the celestial fire is kept burning, and recite prayers for the soul of the departed. The son or adopted son of the deceased kneels before the high-priest, and promises due performance of all the religious duties and obsequies to the dead. The relatives and friends then hand the priest a list of the contributions and charities which have been subscribed in memory of the deceased, which concludes the ceremony of “rising from mourning,” or “ the resurrection of the dead.” On each successive anniversary of the death of a Parsi, funeral ceremonies are performed in hismemory. An iron framework is erected in the house, in which shrubs are planted and flowers cultivated to bloom in memory of the departed. Before the frame, on iron stands, are placed copper or silver vases, filled with water and covered with flowers. Prayers are said before these iron frames two or three times a day. These ceremonies are called mktad, or ceremonies of departed souls.

The numerical strength of the followers of Zarathustra at the present day does not exceed 82,000 persons, including the Parsis of Persia at Kerm4n, Yazd, and Teheran. ‘The greater number 1s found in Bombay, and in some of the cities of Gujarat, as Now- sart, Surat, Bharoch, Ahmedabad, &c. Parsis have also settled for the purpose of trade in Calcutta, Madras, and in other cities of British India, in Burmah, China, and in other parts of Asia. According to the census of 1881, there are in the Bombay presl- dency 72,065 Parsis, and in Persia 8499, according to Houtum- Schindler (see Jowrnal of the Oriental German Society, vol. XXXVI. “i a Parsis of India are divided into two sects, the Shenshais and the Kadmis. They do not differ on any point of faith; the dispute is solely confined to a quarrel as to the correct chronological date for the computation of the era of Yazdagird, the last king of the Sasanian dynasty, who was dethroned by the caliph Omar about 640 A.D. The difference has been productive of no other inconvenl- ence than arises from the variation of a month in the cclebration of the festivals. The Shenshai sect, represented by Sir Jamsetjl Jijibhai, Bart.,

greatly outnumbers the Kadmis, formerly headed by the late famous high-pricst Mulla Firdz.

The Parsis, as stated above, compute time from the fall of Yazdagird. Their calendar is divided into twelve months of thirty days each; the other five days, being added for holy days, are not counted. Each day is named after some particular angel of bliss, under whose special protection it is passed. On feast days a division of five watches is made under the protection of five different divinities. In midwinter a feast of six days is held in commemo

ration of the six periods of creation. About the 21st of March, the vernal equinox, a festival is held in honour of agriculture, when planting begins. Inthe middle of April a feast is held to celebrate the creation of trees, shrubs, and flowers. On the fourth day of the sixth month a feast is held in honour of Sahrévar, the deity presiding over mountains and mines. On the sixteenth day of the seventh month a feast is held in honour of Mithra, the dcity pre- siding over and directing the course of the sun, and also a festival to celebrate truth and friendship. On the tenth day of the eighth “inonth a festival is held in honour of Farvardin, the deity who pre- sides over the departed souls of men. This day is especially set apart for the performance of ceremonies for the dead. The people attend on the hills where the ‘‘ towers of silence” are situated, and perform in the sagris prayers for the departed souls. The Parsis are enjoined by their religion to preserve the meiory of the dead by annual religious ceremonies performed in the house, as said above ; but such of their friends as die on long voyages, or in un-known places, and the date of whose death cannot be known, are honoured by sacred rites on this day. The Parsi scriptures require the last ten days of the year to be spent in doing deeds of charity, and in prayers of thanksgiving to Ahurad-Mazda. On the day of Yazdagird, or New Year’s Day, the Parsis emulate the Western world in rejoicing and social intercourse. They rise early, and after having performed their prayers and ablutions dress themselves in a new suit of clothes, and sally forth to the ‘‘ fire-temples,” to wor- ship the emblem of their divinity, the sacred fire, which is perpetu- ally burning on the altar. Unless they duly perform this ceremony they believe their souls will not be allowed to pass the bridge

‘‘Chinvad,” leading to heaven. After they have performed their religious services, they visit their relations and friends, when the ceremony of ‘‘hamijur,” or joining of hands, is performed. The ceremony is a kind of greeting by which they wish each other ‘a happy new year.” ‘Their relatives and friends are invited to dinner, and they spend the rest of the day in feasting and rejoicing ; alins are given to the poor, and new suits of clothes are presented to the servants and dependants.

There are only two distinct eastes among the Parsis, —the priests (dastérs, or high priests ; mobeds, or the middle order of priests; and herbads, or the lowest order of priests) and the people (bchadin, behdin, or ‘‘ followers of the best religion”). The priestly office is hercditary, and no one ean become a priest who was not born in the purple; but the son of a priest may become a layman.

The secular affairs of the Parsis are managed by an elective com- mittee, or Panchdyat, eomposed of six dasttirs and twelve mobeds, making a council of eighteen. Its functions resemble the Venctian council of ten, and its objects are to preserve unity, pcace, and justice amongst the followers of Zarathustra. One law of the Panchayat is singular in its difference from the law or eustom of any other native community in Asia ; nobody whio has a wife living shall marry another, except under peculiar circumstances, such as the barrenness of the living wife, or her immoral conduet. It isa matter of just pride that we find the Parsis have not imitated the barbarous and tyrannical custom of prohibiting widows from re- marrying whieh is so prevalent among the Hindus.

Their religion teaches them benevolence as the first principle, and no people practise it with more liberality. A beggar among the Parsis is unknown, and would be a scandal to the society. Iu the city of Bombay alone they have thirty-two different eharitable institutions. The sagacity, activity, and commereial enterprise of the Parsis are proverbial in the East, and their credit as merchants is almost unlimited. They frequently control the opium production of India, which amounts annually to something like £10,000, 000 Sterling. They have some fifty large commercial houscs in Bombay, fourteen in Calcutta, twenty in Hong-Kong, ten in Shanghai, four in London, three in Amoy, two in Yokohama, and many throughout India,

Persia, and Egypt. Further, their Interest in the extension of agriculture in India is prominent; they are also very much esteemed as railway contractors or rail- way guards. It is often said that the Parsis are superstitious about extinguishing fire, but thisis a mistake. They are the only people in the world who do not smoke tobacco, or some other Stimulating weed. Their reverence for fire as a symbol of Ahura- Mazda prevents them from dealing with it lightly. They would not play with fire, nor extinguish it unnecessarily; and they generally Welcome the evening blaze with a prayer of thanksgiving. Their religion forbids them to defile any of the crcations of Ahura-Mazdé, such as the earth, water, trees, flowers, &e., and on no aceount would a Parsi indulge in the disgusting habit of expectoration. They have been accustomed to the refinement of fingcr-bowls after meals for several thousand years, aud resort to ablutions frequently.

Of all the natives of India the Parsis are most desirous of receiving the benefits of an English education, and their eagerness to embrace the science and literature of the West has been eonspieuous in the Wide spread of female education among them. The difference between the Parsis of thirty years ago and those of the present day

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is simply the result of English cducation and intercourse with Englishmen. The condition of the Parst priesthood, however, demands improvement. Very few of them understand their litur- gieal Zand works, although able to reeite parrot-like all the ehapters requiring to be repeated on occasions of religious eere- monies, for which services they receive the regulated fees, and from them mainly they derive a subsistence. It is, however, very gratifying to notice an attempt that is now being made to impart a healthy stimulus to the priesthood for the study of their religious books. Two institutions, styled the “Mulla Firéz Madrasa ” and the ‘‘Sir Jamsetji Jijibhai Madrasa,” have been estab- lished under the superintendence of eompetent teachers. Here the study of Zand, Pazand, Pahlavi, and Persian is cultivated ; and many of the sons of the present ignorant priests will occupy a higher position in the society of their countrymen than their parents now enjoy. The present dasttirs are intelligent and well-informed men, possessing a sound knowledge of their religion ; but the mass of the mobeds and herbads

are profoundly ignorant of its first principles. As active measures are being devised for improvement, the darkness of the present will doubtless be suc- ceeded by a bright dawn in the future. (A. F.)

PARSON is a technical term of English law, and is a corruption of persona, the parson being, as it were, the persona ecclesix, or representative of the church in the parish, Parson imparsonee (persona impersonata) is he that as rector isin possession of a church parochial, and of whom the church is full, whether it be presentative or impropriate (Coke upon Littleton, 300 6). The word parson is properly used only of a rector, though it is some- times loosely extended to any one in holy orders. Though every parson is a rector, every rector is not a parson. A parson must be in holy orders; hence a lay rector could not be called a parson. The parson is tenant for life of the parsonage house, the glebe, the tithes, and other dues, so far as they are not appropriated. Further information on this subject will be found under ADvowsoN, BENEFICE, and ‘TITHES,

PARSONS, or Persons, Ropert (1546-1610), a cele- brated Jesuit, was the son of a blacksmith, and was born at Nether Stowey, near Bridgwater, England, in 1546. His precocity attracted the attention of the vicar of the parish, who gave him private instruction, and procured his entrance in 1563 as an exhibitioner to Balliol College, Oxford. He graduated B.A. in 1568, and M.A. in 1572. He was fellow, bursar, and dean of his college, but in 1574 he resigned his fellowship and offices, for reasons which have been disputed, some alleging improprieties of conduct, and others suspected disloyalty. Soon after his resignation he went to London, and thence in June to Louvain, where he spent some time in the company of Father William Good, a Jesuit. He then proceeded to Padua to carry out a previously conceived intention to study medicine, but furiher intercourse with English Jesuits so influenced his mind, that in July 1575 he entered the Jesuit Society at Rome. In 1580 he was selected along with Cam- pian, a former associate at Oxford, and others, to undertake a secret mission to England against Elizabeth, ‘Through the vigilance of Burghley the plot was discovered and Campian arrested, but Parsons made his escape to Rouen, and occupied himself for some time in the composition of treasonable tracts against Elizabeth, which he caused to be secretly sent to England. In 1583 he returned to Rome, where he was appointed prefect of the English

mission, and in 1586 chosen rector of the English seminary. He also devoted much energy to the establishment of seminaries elsewhere on the Continent, for the training of priests to be despatched to England to aid in reviving the cause of Romanism. After the disaster to the Spanish Armada in 1588, he endeavoured to persuade the Spanish monarch to undertake a second invasion, and, unsuccessful in this, he incited various plots against Elizabeth, all of which were, however, abortive. On the death of Cardinal Allen in 1594 he made strenuous efforts to be appointed his successor, and, failing in this, he retired to Naples until

the death of Clement VIII. in 1606. From this time he continued his active intrigues against Protestantism in England until his death, 18th April 1610.

Parsons was the author of a large number of polemical tracts, a list of which, to the number of thirty-three, is given in Chalmers's Biographical Dictionary. For portrait, see Gentleman's Magazine, vol. lxiv.

PARSONSTOWN, formerly Brrr, a market-town of King's County, Ireland, is situated on an acclivity rising above the Birr, and on a branch of the Great Southern and Western Railway, 124 miles north of Roscrea and 7} south of Banagher. Cumberland Square, in which there is a Doric column, surmounted by a statue of the duke of Cum- berland to commemorate the battle of Culloden, contains a number of good shops, and the streets diverging from it are wide and well built. The fine castle of Birr, besides its historical interest, has gained celebrity on account of the reflecting telescope erected there (1828-45) by the third earl of Rosse. The other principal buildings are the court-house, the Protestant Episcopal and Roman Catholic churches, the convent of the sisters of mercy, the model school, the mechanics' institute, the fever hospital, and the infirmary. There is a bronze statue by Foley of the late Lord Rosse. Some trade is carried on in corn and timber, and the town possesses a distillery and brewery. The population was 5401 in 1861, 4939 in 1871, and 4955 in 1881.

An abbey was founded at Birr by St Brendan. The district formed part of Ely O'Carrol, and was not included in King's County till the time of James I. A great battle is said to have been fought near Birr in the 3d century

between Corinac, son of Cond of the Hundred Battles, and the people of Munster. The castle was the chief seat of the O'Carrols. In the reign of James I. it and its appendages were assigned to Lawrence Parsons, brother of Sir William Parsons, surveyor-general. It was more than once besieged in the time of Cromwell, and was taken by Ireton in 1650. It also suffered assault in 1688 and 1690.

PARTABGARH, PraTABGARH, or PERTABGURH, a district of Oudh, India, situated between 25° 34' and 26° 10' 30" N. lat., and between 81° 22' and 82° 29' 45" E. long., is bounded on the N. by Rai Bareli and Sultan- pur, and on the E., 8., and W. by Jaunpur and Allahabad districts. The Ganges forms the south-western boundary line, while the Gumti marks the eastern boundary for a few miles. The area (1881) is 1436 square miles. The general aspect of Partabgarh is tliat of a richly wooded and fertile plain, here and there relieved by gentle undulations, and in the vicinity of the rivers and streams broken into ravines. The one important river (the Ganges and Gumti nowhere entering the district) is the Sai, which is navigable in the rains, but in the hot season runs nearly dry. The only mineral pro- ducts are salt, saltpetre, and kankar or nodular limestone. The manufacture of salt and saltpetre from the saliferous tracts is prohibited. Tigers and leopards are hardly ever met with ; but wolves still abound in the ravines and grass lands. JVilgdi, wild cattle, hogs, and monkeys do much damage to the crops. Snakes are not numerous. Small gaine abounds.

The population in 1881 was 847,047 (420,730 males, 426,317 females ; 768,054 Hindus, 83,944 Mohammedans, 48 Christians). The principal grain crops are barley, wheat, and rice. Other food erops are gram, peas, arhar, jodr, and bdjra. Sugar-cane cultivation has largely increased of late years, and poppy is grown under the superintendence of the Opium Department. Miscel- laneous crops include tobacco of superior quality, indigo, fibres, pan, &c. Irrigation is extensively carried on, and manure is made use of wherever procurable. Rents have steadily increased since the introduction of British rule, and still show a tendency to rise. Artisans and skilled labourers have much improved in circum- stances of late years ; but agricultural labour is still paid in kind at about the same rates that prevailed under native rule. Partab- garh is now well opened up by roads. Four large

ferries are main- tained on the Ganges, and two on the Gumti. Partadbgarh forms a great grain-exporting district. Other important exports comprise

tobacco, sugar, molasses, opium, oil, giz, cattle and sheep, hides, &e. The imports consist mainly of salt, cotton, metals and hardware country cloth, and dyes. The manufactures of the district com- prise sugar, blanket weaving, glass beads and bracelets, water-bottles, &c. The gross revenue of the district in 1882-83 was £175,785, of which the land revenue contributed £98,220. Education is afforded by 91 schools, on the rolls of which on 31st March 1888 there were 3493 scholars. The climate is healthy. The average rainfall for the fourteen years ending 1881 was 37 inches.

PARTABGARH, or PERTABGURH, a native state in Rajputana, India, lying between 23° 14’ and 24° 14’ N, lat., and between 74° 27’ and 75° E. long., and entirely surrounded by native territory, has an estimated area of 1460 square miles, and an estimated population (1881) of 80,568, mostly Bhils and other aboriginal tribes. The revenue is about £60,000, of which about £20,000 are enjoyed by feudatory chiefs and nobles. It is a hilly country, mainly producing maize and jodr (Holcus sorghum).

PARTHENIUS, a Bithynian poet, said to have been captured in the Mithradatic war and carried to Rome. He lived there for many years, as late as the time of Tiberius, His poems were on erotic subjects, and many of them treated of obscure mythological stories. The only work of his which is preserved is a collection of short love tales in prose, dedicated to the poet Cornelius Gallus, but apparently not intended for publication.

PARTHENON. See ATHENS, vol. iii. p. 5.

PARTHIA. See PErsta.

PARTINICO, a town of Sicily, in the province of Palermo, and 284 miles W. of Palermo by rail, has a good trade in wine and oil, and in 1881 had 21,000 inhabitants,

PARTITION, in law, is the division between several persons of land or goods belonging to them as co-pro- prietors. It was a maxim of Roman law, followed in modern systems, that-in communione vel societate nemo potest invitus detinert. Partition was either voluntary or was obtained by the actio commum dividendo. In English law the term partition applies only to the division of lands, tenements, and hereditaments, or of chattels real between coparceners, joint tenants, or tenants in common. It is to be noticed that not all hereditaments are capable of parti- tion. There can be no partition of homage, fealty, or common of turbary, or of an inheritance of dignity, such as a peerage. Partition is either voluntary or compulsory. Voluntary partition is effected by mutual conveyances, and can only be made where all parties are sui juris. Since 8 & 9 Vict. c. 106, § 3, it must be made by deed, except in the case of copyholds. Compulsory partition is effected by private Act of Parliament, by judicial process, or through the inclosure commissioners. At common law none but coparceners were entitled to partition against the will of the rest of the proprietors, but the Acts of 81 Henry VUL. c. 1 and 82 Henry VIII. c. 32 gave a compulsory process to joint tenants and tenants in common of freeholds, whether in possession or in reversion, by means of the writ of partition. In the reign of Elizabeth the Court of Chancery began to assume jurisdiction in partition, and the writ of partition, after gradually becoming obsolete, was finally abolished by 3 & 4 Will. IV. c. 27. The Court of Chancery could not decree partition of copyholds until 4& 5 Vict. c. 35,§ 85. By the Judicature Act, 1873, § 34, partition is one of the matters specially assigned to the Chancery Division. An order for partition is a matter of right, subject to the discretion vested in the court by the Partition Act, 1868 (31 & 32 Vict. c. 40, amended by 39 & 40 Vict. c. 17). By § 3 of the Act of 1868 the court may, on the request of a party interested, direct a sale instead of a partition, if a sale would be more beneficial than a partition. By § 12 a county court has jurisdiction in partition where the property does not exceed £500 in value. Under the powers of the Inclosure Act, 1845,

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8 & 9 Vict. c. 118, and the Acts amending it, the inclosure commissioners have power of enforcing compulsory parti- tion among the joint owners of any inclosed lands. An order of the inclosure commissioners or a private Act vests the legal estate, as did also the old writ of partition. But an order of the Chancery Division only declares the rights, and requires to be perfected by mutual conveyances so as to pass the legal estate. Where, however, all the parties are not suc juris, the court may make a vesting order under the powers of the Trustee Act, 1850, 13 & 14 Vict. c. 60, § 30.

Partition is not a technical term of Scots law. In Scotland division of common property is effected either extra-judicially, or by action of declarator and division or division and sale in the Court of Session, or (to a limited extent) in the sheriff courts. Rights of common are not divisible in English law without an Act of Parliament or a decree of the inclosure commissioners, but in Scotland the Act of 1695, c. 38, made all commonties, except those belonging to the king or royal burghs, divisible, on the application of anyhaving interest, by action in the Court of Session. By 40 & 41 Vict. c. 50, § 8, the action for division of common property or commonty is competent in the sheriff court, when the subject in dispute does not exceed in value £50 by the year, or £1000 value. Runrig lands, except when belonging to corporations, were made divisible by the Act of 1695, c. 23. A decree of division of commonty, common property, or runrig lands has the effect of a conveyance by the joint proprietors to the several participants (87 & 88 Vict. c. 94, § 35).

In the United States, ‘‘it is presumed,” says Chancellor Kent, (4 Comm., lect. \xiv.), ‘‘that the English statutes of 31 & 32 Henry VIII. have been generally re-enacted and adopted, and probably with increased facilities for partition.” In a large majority of the States, partition may be made by a summary method of petition to the courts of common law. In the other States the courts of equity have exclusive jurisdiction. As between heirs and devisees the probate courts may in some States award partition, The various State laws with regard to partition will be found in Washburn, Real Property, bk. 1. ch. xiii, § 7.

PARTNERSHIP, in law, is a voluntary association of two or more persons for the purpose of gain. This is of course not an exhaustive definition, but

will serve to include most of the definitions of partnership which have been attempted.1. The word partner is a contracted form of partitioner.

The partnership of modern legal systems is based upon the socvetas of Roman law. Societas is not defined by any of the Roman jurists. But the Roman view is no doubt sufficiently expressed in the definition by Voet:— societas est contractus juris gentium, bone fider, consensu constans, semper re honesta, de lucri et damni communione. Societas was either wniversorum bonorum, a complete communion of property ; negotiationis alicujus, for the purpose of a single transaction ; vectigalis, for the collection of taxes; or rev wnius, joint ownership of a particular thing. The prevail- Ing form was societas wniversorum que ex questu veniunt, or trade partnership, from which all that did not come under the head of trade profit (questus) was excluded. This kind of societas was presumed to be contemplated in the absence of proof that any other kind was intended. Societas was a consensual contract, and rested nominally on the consent of the parties— really, no doubt (though this was not in terms acknowledged by the Roman jurists), on the fact of valuable consideration moving from each partner. No formalities were necessary for the constitution of a societas. Lither property or labour must be con- tributed by the sociws; if one party contributed neither Property nor labour, or if one partner was to share in the loss but not in the profit (/eonina societas), there was no true societas. Societas was dissolved on grounds substan- ually the same as those of English law (see below). The only ground peculiar to Roman law was change of status (capitis deminutio). Most of the Roman law on the subject of societas is contained in Dig. xvii. tit. 2, Pro Socio. The

The difficulties of definition are pointed out by Sir N. Lindley, ” Partnership, i., Introd.

main points of difference between the Roman and English law will be treated below.

There is no statutory or judicial definition of partnership in English law. It is defined by the Indian Contract Act § 239,? as “the relation which subsists between persons who have agreed to share the profits of a business carried

on by all or any of them on behalf of all of them.” Sir N. Lindley declines to pledge himself to any definition, but lays down the following principles :— (1) partnership is the result of an agreement to share profits and losses; (2) partnership is prima facie the result of an agreement to share profits, although nothing may be said about losses, and although there may be no common stock ; (3) partner- ship is prima facie the result of an agreement to share profits, although community of loss is stipulated against ; (4) partnership is not the result of an agreement to share gross returns; (5) partnership is not the result of an agreement which is not concluded; (6) partnership is not the result of an agreement to share profits so long as anything remains to be done before the right to share them accrues (1 Lindley, bk. i. ch. i, § 1). It was held in 1793, in the case of Waugh v. Carver, (2 H. Blackstone, 235), that sharing in profits constituted partnership, though no partnership was in fact contemplated by the parties. But in 1860 the House of Lords in Cox ». Hickman (8 House of Lords Cases, 268), established the principle that persons who share the profits of a business do not incur the liabilities of partners unless the business is carried on by themselves or their real or ostensible agents. In 1865 the Act 28 & 29 Vict. c. 86 (which applies to the United Kingdom, and is commonly called Bovill’s Act) was passed in order to remove certain difficulties arising from Cox v. Hickman. It enacts that the advance by way of loan to a person engaged or about to engage in any trade or undertaking, upon a contract in writing that the lender is to receive a rate of interest varying with the profits, or a share of the profits, is not of itself to constitute the lender a partner (§ 1); that no contract for the remuneration of a servant or agent by a share of the profits is of itself to render such servant or agent responsible as a partner or give him the rights of a partner (§ 2); that no widow or child of a partner of a trader receiving by way of annuity a portion of the profits is, by reason only of such receipt, to be deemed to bea partner (§ 3); that no person receiving by way of annuity or otherwise a portion of the profits in consideration of the sale of the goodwill is, by reason only of such receipt, to be deemed to be a partner (§ 4); that in the event of any such trader being adjudged bankrupt, é&c., the lender of any such loan is not to be entitled to recover his principal or profits and interest, or the vendor of a goodwill his profits, until the claims of the other creditors for valuable consideration have been satisfied. Participation in profits has thus ceased to be an absolute test of partnership. Another test that has been proposed is the existence of

such a participation as to constitute the relation of principal and agent. But this has been objected to on the ground that agency is deducible from partnership and not partner- ship from agency (see Holme ». Hammond, Law Rep. 7 Exch. 218). The principles laid down by Sir N. Lindley above no doubt form the best means of deciding the matter, but every case must depend to a large extent upon its own particular circumstances. Though participation in profits is of itself no evidence of partnership, on the other hand societies and clubs, the object of which is not to share profits, are not partnerships. The liability of clubs or provisional committee men depends entirely upon

2 The definition was adopted in the Partnership Bill which was introduced into parliament in 1880; see Appendix to Pollock's Digest

of the Law of Partnership. xvii — ae

the question of agency. They are not as a rule in the position of partners as against third persons. No partner- ship can exist in an office depending upon personal confidence, as the office of executor or trustee. J oint tenants or tenants in common are not necessarily partners. If A and B agree to contribute a sum for the purchase of goods to be divided between them, they are joint owners after purchase and before division. But if they resell the goods and divide the profits, they then become partners (Smith's Mercantile Law, bk. i. ch, ii.).

A valid contract of partnership can be entered into by any person not under the disability of minority or unsoundness of mind, or of being a convict within the Felony Act, 1870 (33 & 34 Vict. c. 23), or an alien enemy. It is presumed that the disability of coverture no longer exists since the Married Women's Property Act, 1882. An infant may nominally be a partner, but he incurs no liability, and may disaflirm past transactions when he comes of age. A clergyman becoming a partner for pur- poses of trade is (with certain exceptions) liable to ecclesiastical penalties, but the contracts of the partnership are not void, 1 & 2 Vict. c. 106, § 31. At common law there is no limit to the number of partners, but by the Companies Act, 1862 (25 & 26 Vict. c. 89, § 4), not more than ten persons can carry on the business of

bankers, and not more than twenty any other business, unless (with some exceptions) they conform to the provisions of the Act. (See CoMPAny.)

A partnership may be constituted by deed or other writing, or it may be implied from acts. It is usually, though not of necessity, evidenced by deed. The usual clauses in a partnership deed provide for the nature of the business, the time of the commencement of the partnership and its duration, the premium, the capital and property, the interest and allowances, the conduct and powers of the partners, the custody of the books, the taking of the accounts, retirement, dissolution, and expulsion, the valua- tion and transmission of shares, annuities to widows of deceased partners, prohibition against carrying on business in opposition after retirement, sale of goodwill, getting in debts, indemnity to outgoing partners, and arbitration clauses. Though a deed may serve to adjust the rights of the partners inter se, their liabilities to third persons cannot be affected by provisions in a deed of which the latter are ignorant. Whether a partnership exists in a particular case is a mixed question of law and fact. The partnership may last for any time agreed upon by the partners. It is determinable at will unless it has been agreed that it shall endure for a specified period, or unless it is dissolved by some of the circumstances which will be hereafter mentioned. A partnership may be general or special, e.g., the ownership of a single race-horse, or the conduct of a single case by a firm of solicitors. The rights and liabilities of partners may be considered as they affect the partners (1) inter se, and (2) in their relation to third persons.

1. The shares of partners are prima facie equal. Inequality must be proved by evidence. Each member of a partnership is entitled to take a share in its management, unless, as is frequently the case, one member is appointed managing partner. A partner is in a fiduciary position. It is therefore his duty to use reasonable diligence, to keep within the limits of his authority, and to observe good faith, ¢.g., not to compete with the partnership. He may be a partner in another firm, and the fact of his being a partner in firms A and B does not make A and B partners, for sociws mer socii non est meus socius. In matters which are within the ordinary course of the business of the partnership, such as the period of division of profits, if the partnership articles be silent on the subject, the minority

must yield to the majority. In matters beyond the scope of the partnership business, such as a change in the character of the business, one dissentient can forbid a change, and can obtain an injunction to prevent the change from being carried out. A partner is entitled to have accounts kept, and to inspect them at proper times, Where a partner has as agent for the firm paid more than his share, he is entitled to contribution from the rest, One partner cannot be expelled ‘by the others unless there — is ‘a special power of expulsion given by the articles. A partner has no right to assign his share without the express or implied consent of the other partners. If the partner- ship be one at will, the assignment ipso facto dissolves it; if not at will, the others are entitled to treat the assign- ment as a ground of dissolution. The assignee takes the share subject to the claims of the other partners. Each partner has an equitable lien upon the partnership property, enabling him within certain limits to control the disposi- tion of it. On the death of a partner his share goes to his representatives, not, as in joint-tenancy, by accretion to the survivors. It is an ancient maxim of law that jus accrescendt inter mercatores non habet locum (Coke upon Littleton, 182 a).

2. A more important and difficult question is the rela- tion of partners to those not members of the partnership. From this point of view partnership is to a great extent a branch of the law of agency (see AGENT). As far as contracts are concerned, it is the rule that one partner is its general agent for the transaction of its business in the ordinary way, and the firm is responsible for whatever is done by any of the partners when acting for the firm within the limits of the authority conferred by the nature of the business which it carries on (1 Lindley, bk. iL ch. i.). The authority is defined by the business, not by any private understanding between the partners. Thusa merchant can bind his partners by accepting a bill of exchange for the firm, but a solicitor or medical man cannot. A partner cannot execute a deed, except a simple release of a debt, so as to bind the firm. In many cases an act not warranted by authority, such as a submission to arbitration, may be adopted by ratification so as to bind the firm. And in other cases the rights of a bona jide claimant will prevail, even though the authority has been exceeded and there has been no ratification, ¢.g., where @ bill given by a partner on his private account passes into the hands of a

bona fide holder for value. Where the partner contracts on behalf of the partnership, it is the latter and not the individual who is primarily liable. I the name of a firm and an individual is the same, a bill drawn in that name for partnership purposes is prima facie a bill of the firm (Yorkshire Banking Co. v. Beatson, Law Rep. 5 C. P. D., 109). But a partner may hold himself out as the sole partner, and so make himself separately liable. Every member of a partnership is at common law liable in solido for the debts of the firm, 4 liability co-extensive with his power to transfer the whole property of the firm. This liability cannot be restricted except by statute (as the Companies Act) or by express contract with the creditors. A dormant partner is liable, like an ostensible partner, for debts contracted during his partnership; if, however, the ostensible partners have been sued to judgment, an action cannot be brought to charge the dormant partner (Kendall v. Hamilton, Law Rep., 4 App. Cas., 504). The liability of a dormant and an ostensible partner terminates in a different manner, 11 the former case by his simple retirement without notice, in the latter only after notice, a general notice in the Gazette being the usual means of informing the public of the change, while special notice is given to known customers. It is a question of fact whether the liability of the new

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frm has been accepted in place of that of the previous firm. A guarantee to or for a firm ceases upon a change

in the firm unless it appears by express stipulation or.

necessary implication that the guarantee is to continue, 19 & 20 Vict. c. 97, § 4. There are cases in which a relation of quasi-partnership is created, #¢, in which persons not partners inter se become partners gua third persons. A person who holds himself out as a partner incurs the liability of a partner. This was clearly laid down by Lord Chief Justice Eyre in Waugh v. Carver, and is now an established principle of law. “ Holding out” means that credit has been obtained by the use of his name, or even by permitting reference to him as one who wishes to have his name concealed.

Where the liability arises out of tort, the law is not quite the same as it is where the liability arises from con- tract. The presumption is against the

authority of a partner to commit a tort, and so opposed to the presump- tion in the case of contract. But a partnership is liable jointly and severally for any wrongful act or omission of one of its members in conducting the business of the firm, eg., the neglect of a managing partner to keep the shaft of a mine in order, but not for a wilful wrong unconnected with the business, eg., malicious prosecution. With respect to fraud by misappropriation of money, some obligation on the part of the firm to take care of the money must be shown. A receipt from the firm prima facte imposes this obligation.

An action should be brought by all the partners (except merely nominal partners, who need not be joined unless in an action on a contract under seal). They cannot delegate a right of action to one of themselves for convenience. This can only be done by statute, as 7 Geo. IV. c. 46, enabling banking companies to sue and be sued by a public officer. All the partners ought to be sued, subject to any statutory exception, as that contained in the Carriers' Act, 11 Geo. IV., and 1 Will. IV. c. 68, §§ 5, 6. But misjoinder or nonjoinder of parties does not defeat an action (Rules of the Supreme Court, 1883, ord. xvi. r. 11), The method of procedure does not affect the principle of the liability of each partner 7 solido, a principle on which is based one of the main points of difference between a partnership and a corporation. Ina corporation the collective whole is distinct from the in- dividuals composing it (see Corporation). But in a partnership the firm, as distinct from the individual partners, is recognized by English law only to a very limited extent, and as matter of procedure rather than of substantive law. Since the Judicature Acts, in an action against a partnership, power is given to sue and be sued in the firm name, but the partners are bound to disclose the names of the persons constituting the firm, and, though judgment goes against the firm, execution may issue against a partner (Lules of the Supreme Court, 1888, ord. vii. r. 2, xvi. r. 14, xlii. r. 10), An adjudication of bankruptcy cannot be made against the firm in the firm name, but only against the partners individually (Bank- ruptcy Rules, 1883, r. 197).

A partnership at will is dissolved by determination of the will or assignment of the partnership share. A partnership other than a partnership at will is dissolved by (1) effluxion of time ; (2) retirement of a partner; (3) alienation by operation of law of a partner's share, e.g., by bankruptcy or (formerly)

by marriage of a female partner ; (4) death; (5) business becoming unlawful, as by a partner becoming an alien enemy ; (6) assignment of partnership share ; (7) lunacy; (8) liability of a partner to criminal prosecution ; (9) impossibility of carrying on the business. In the last four cases the partnership is not tpso facto dissolved, but they are grounds on which the

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court may order a dissolution (see Pollock, art. 47 sq.). Where a partner has been induced to enter into a partner- ship by fraud, he has in general the option of affirming or rescinding the contract at his election.

The dissolution of partnerships and the taking of partner- ship accounts are matters specially assigned to the Chancery Division (Judicature Act, 1873, § 34). After dissolution the persons who constituted the partnership become tenants in common of the partnership property until the division of assets, unless any other provision is made by agreement. The partnership debts are paid out ” of the partnership assets, and the private debts out of the private assets.

The principle of law that a partnership debt is joint and several comes into operation where the partnership is dis- solved by bankruptcy or death. The joint estate is the primary fund for the payment of joint debts, but the joint creditors can look to any surplus of the separate estate (after payment of the separate debts) to satisfy any deficiency in the joint estate. See the Bankruptcy Act, 1883, §59. Partners cannot compete with the creditors of the firm either against the joint estate or the several estate of a partner; that is to say, they cannot be satisfied until all the debts of the firm have been paid. In the case of death, although the partnership is dissolved by death, it is still treated as subsisting for the purposes of administra- tion. The creditor has the same rights against the estate of the deceased as he would have had in his lifetime in some cases, so that he may proceed against this estate in the first instance, without recourse to the surviving partners (see the judgment of Lord Selborne in Kendall ». Hamilton, Law Rep., 5 App. Cas. 539). Further, the death of a partner has the result of converting the real property of the firm. ‘“ Whenever a partnership purchases real estate for partnership purposes, and with partnership funds, it is, as between the real

and personal representatives of the partners, personal estate' (Darby v. Darby, 3 Drewry 506).

At common law no criminal prosecution was maintain- able by one partner against another for stealing the property of thefirm. But this difficulty has been removed by 81 & 32 Vict. c. 116.

Though the English law of partnership is based upon Roman law, there are several matters in which the two systems differ. (1) There was no limit to the number of partners in Roman law. (2) In soctetas one partner could generally bind another only by express mandatum ; one partner was not regarded as the implied agent of the others. (3) The debts of a soctetas were apparently joint, and not joint and several. (4) The heres of a deceased partner could not succeed to the rights of the deceased, even by express stipulation. There 1s no such disability in England. (5) In actions between partners in Roman law, the beneficium competeniix applied, that is, thie privilege of being condemned only in such an amount as the partner could pay without being reduced to destitution. (6) The Roman partner was in some respects more strictly bound by his fiduciary position than is the English partner. For instance, a Roman partner could not retire 1n order to enjoy alone a gain which he knew was awaiting him. (7) There was no special tribunal to which matters arising out of societas were referred.

The law of Scotland as to partnership agrees in the main with the law of England. The principal difference is that Scots law recognizes the firm as an entity distinct from the individuals com- posing it. English law, as has been said, does this only to a very

limited extent. The firm of the company is either proper or descriptive. A proper or personal firm is a firm designated by the

1 The term "company" is not confined, as in England, to ap association existing by virtue of the Companies Act, 1862, or similar Acts.

name of one or more of the partners. A descriptive firm does not introduce the name of any of the partners. The former may sue and be sued under the

company name; the latter only with the addition of the names of three at least (if there are so many) of the partners. A consequence of this view of the company as a separate person is that an action cannot be maintained against a partner personally without application to the company in the first instance, the individual partners being in the position of cautioners for the company rather than of principal debtors. The provisions of the Mercantile Law Amendment Act, 1856 (19 & 20 Vict. c. 60, § 8), do not affect the case of partners. But, though the company must first be discussed, diligence must necessarily be direeted against the individual partners. Heritable property cannot be held in the name of a firm; it can only stand in the name of individual partners. Notice of the retirement of even a dormant partner is necessary. The law of Scotland draws a distinction between joint adventure and partnership. Joint adventure or joint trade is a partnership confined to a particular adventure or speculation, in which the partners, whether latent or unknown, use no firm or social name, and incur no responsibility beyond the limits of the adventure. In the rules applicable to cases of insolvency and bankruptcy of a company and partners, Scots law differs in several respects from English. Thus a company can be made bankrupt without the partners being made so as individuals. And, when both company and partuers are bankrupt, the company creditors ‘are entitled to rank on the separate estates of the partners for the balance of their debts equally with the separate creditors. But in sequestration, by 19 & 20 Viet. c. 79, § 66, the creditor of a com- pany, in claiming upon the sequestrated estate of a partner, must deduct from the amount of his claim the value of his right to draw payment from the company’s funds, and he is ranked as creditor only for the balance. (See Erskine’s Znst., bk. iii. tit. iii.; Bell’s Comm., li. 500-562; Bell’s Principles, §$ 350-403.)

In the United States the English common law is the basis of the law. Most States have, however, their own special legislation on the subject. Partnership is defined by Chancellor Kent to be “a contract of two or more competent persons to place their money, effects, labour, and skill, or some or all of them, in lawful commerce or business, and to divide the profit and bear the loss in certain proportions” (3 Kent’s Comm., lect. xliii.). The definition of the New York Civil Code, art. 1283, runs thus :— “partnership is the association of two or more persons for the purpose of carrying on business together, and dividing its profits between them.” The most striking

feature of the law in the United States is the existence of limited partnerships, correspond- ing to the sociétés en commandite established in France by the ordinance of 1673. The State of New York was the first to introduce this kind of partnership by legislative enactment. The provisions of the New York Act have been followed by most of the other States. In many States there can be no limited partnership in banking and insurance. In this form of partnership one or more persons responsible in solido are associated with one or more dormant partners liable only to the extent of the funds supplied by them. In Louisiana such partnerships are called partnerships in commendam (Civil Code, art. 2810). In New York the respon sible partners are called general partners, the others special partners. Such partnerships must, by the law of most States, be registered. (In 1880 a bill providing for the legislation of such partnerships in the United Kingdom was introduced in the House of Commons, but failed to become law.) In Louisiana universal partnerships (the soctetates universorum bonorum of Roman law) must be created in writing and registercd (Civil Code, art. 2800). In some States the English law as it stood before Cox v. Hickman is followed, and participation in profits is still regarded as the test of partnership, e.g., Leggett v. Hyde (58 New York Rep. 272). In some States nominal partners are not allowed. Thus in New York, where the words “and Company” or “and Co.” are used, they must represent an actual partner or partners. A breaeh of this rule subjects offenders to penalties. In most States claims against the firm after the death of a partner must, in the first instance, be made to the survivors. The creditors cannot, as in England, proceed directly against the representatives of the deceased. The law as to the conversion of realty into personalty on the administration of the estate of a deceased partner in some States agrees with English law, in others does not. (See 3 Kent’s Comm., lect. xliii.; Story, On Partnership; Troubat, On Limited Partnership; and Angell, On Private Corporations.) (J. Wt.)

PARTRIDGE, in older English Prrrricur, Dutch Patrijs, French Perdriz, all from the Latin Perdix, which word in sound does not imitate badly the call-note of this bird, so well known throughout the British Islands and the greater part of Europe as to need no description or account of its habits here. The English name properly denotes the only species indigenous to Britain, often now-

adays called the Grey Partridge (to distinguish it from

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others, of which more presently), the Perdix cinerea of ornithologists, a species which may be regarded as the model game-bird—whether from the excellence of the sport it affords in the field, or the no less excellence of its flesh at table, which has been esteemed from the time of Martial to our own —while it is on all hands admitted to be wholly innocuous, and at times beneficial to the agri- culturist. It is an undoubted fact that the Partridge thrives with the highest system of cultivation; and the lands that are the most carefully tilled, and bear the greatest quantity of grain and green crops, generally produce the greatest number of Partridges. Yielding perhaps in economic importance to the Red Grouse, what may be called the social influence of the Partridge is greater than that excited by any other wild bird, for there must be few rural parishes in the three kingdoms of which the inhabitants are not more or less directly affected in their movements and business by the coming in of Partridge- shooting, and therefore a few words on this theme may not be out of place.

From the days when men learned to “shoot flying” until some forty years ago, dogs were generally if not invariably used to point out where the “covey,” as a family party of Partridges is always called, was lodged, and the greatest pains were taken to break in the “pointers” or “setters ” to their duty. In this way marvellous success was attained, and the delight lay nearly as much in seeing the dogs quarter the ground, wind and draw up to the game, helping them at times (for a thorough understanding between man and beast was necessary for the perfection of the sport) by word or gesture, as in bringing down the bird after it had been finally sprung. There are many who lament that the old-fashioned practice of shooting Partridges to dogs has, with rare exceptions, fallen into desuetude, and it is commonly believed that this result has followed wholly from the desire to make larger and larger bags of game. ‘The opinion has a certain amount of truth for its base ; but those who hold it omit to notice the wholly changed circumstances in which Partridge- shooters now find themselves. In the old days there were plenty of broad, tangled hedgerows which afforded per-

manent harbour for the birds, and at the beginning of the shooting-season admirable shelter or “lying” (to use the sportsman’s word) was found in the rough stubbles, often reaped knee-high, foul with weeds and left to stand some six or eight weeks before being ploughed, as well as in the turnips that were sown broadcast. Throughout the greater part of England now the fences are reduced to the narrowest of boundaries and are mostly trimly kept; the

- stubbles—mown, to begin with, as closely as possible to the

ground—are ploughed within a short time of the corn being carried, and the turnips are drilled in regular lines, offering inviting alleys between them along which Partridges take foot at any unusual noise. Pointers in such a district—and to this state of things all the arable part of England is tending—are simply useless, except at the beginning of the season, when the young birds are not as yet strong on the wing, and the old birds are still feeble from moulting their quill-feathers. Of late years there- fore other modes of shooting Partridges have had to be employed, of which methods the most popular is that known as “driving”—the “guns” being stationed in more or less concealment at one end of the field, or series of fields, which is entered from the other by men or boys who deploy into line and walk across it making a noise. It is the custom with many to speak depreciatingly of this proceeding, but it is a fact that as much knowledge of the ways of Partridges is needed to ensure a successful day’s “driving” as was required of old when nearly every- thing was left to the intelligence of the dogs, for the course

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of the birds’ flight depends not only on the position of the line of beaters, but almost on the station of each person composing it, in relation to the force and direction of the wind and to the points on which it is desired that the Partridges should converge. Again, the skill and alacrity wanted for bringing down birds flying at their utmost velocity, and often at a considerable height, is enormously greater than that which sufficed to stop those that had barely gone 20 yards from the dog’s nose, though ad-

mittedly Partridges rise very quickly and immediately attain great speed. Moreover, the shooting of Partridges to pointers came to an end in little more than six weeks, whereas ‘‘driving ” may be continued for the whole season, and is never more successful than when the birds, both young and old, have completed their moult, and are strongest upon the wing. But, whether the new fashion be objectionable or not, it cannot be doubted that to go back to the old one with success would necessitate a reversion to the slovenly methods of agriculture followed in former years, and therefore is as impossible as would be a return to the still older practice of taking Partridges in a setting-net, described by Gervase Markham or Willughby.

The Grey Partridge has doubtless largely increased in numbers in Great Britain since the beginning of the present century, when so much down, heath, and moor- land was first brought under the plough, for its partiality to an arable country is very evident. It has been observed that the birds which live on grass lands or heather only are apt to be smaller and darker in colour than the average; but in truth the species when adult is subject to a much greater variation in plumage than is commonly supposed, and the well-known chestnut horse-shoe mark, generally considered distinctive of the cock, is very often absent.

In Asia our Partridge seems to be unknown, but in the.

temperate parts of Eastern Siberia its place is taken by a very nearly allied form, P. barbata, and in Tibet there is a bird, P. hodgsoniz, which can hardly with justice be generically separated from it. The relations of some other forms inhabiting the Indian Region are at present too obscure to make any notice of them expedient here.

The common Red-legged Partridge of Europe, generally called the French Partridge, Caccabis rufa, seems to be justifiably considered the type of a separate group.! This bird has been introduced into England within little more than one hundred years ago, and has established itself in various parts of the country, notwithstanding a widely- spread, and in some respects unreasonable prejudice against it. It has certainly the habit of trusting nearly as much to its legs as to its wings, and thus incurred the obloquy of old-fashioned sportsmen, whose dogs it vexatiously kept at a running point; but, when it was also accused of driving away the Grey Partridge, the charge

only shewed the ignorance of those that brought it, for as a matter of fact the French Partridge rather prefers ground which the common species avoids—such as the heaviest clay-soils, or the most infertile heaths. But even where the two species meet, the present writer can declare from the personal ob- servation of many years that the alleged antipathy between them is imaginary, and unquestionably in certain parts of

the country the “head of game” has been increased by OS Sh oes ee ee

1 Prof. Parker first (Trans. Zool. Soc., v. p. 155) and, after him, Prof. Huxley (Proc. Zool. Soc., 1868, pp. 299-302) have pointed out that the true @allinw offer two types of structure, “one of Which may be called Galline, and the other Tetraonine,” to use the latter’s words, though he is “by no means clear that they do not etete Into one another”; and, according to the characters assigned 2. him, Caccabis lies “on the Galline side of the boundary,” while a belongs to the Tetraonine group. Further investigation of b 1s matter is very desirable, and, with the abundant material possessed

Y Zoological gardens, it might easily be carried out.

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the introduction of the foreigner.2 The French Partridge has several congeners, all with red legs and plumage of similar character. In Africa north of the Atlas there is the Barbary Partridge, C. petrosa; in southern Europe another, C’. saxatilis, which extends eastward till it is ro- placed by C. chukar, which reaches India, where it isa well- known bird. Two very interesting desert-forms, supposed to be allied to Caccabis, are the Ammoperdix heyt of North Africa and Palestine and the A. bonhami of Persia; but the absence of the metatarsal knob, or incipient spur, suggests (in our ignorance of their other osteological char- acters) an alliance rather to the genus Perdix. On the other hand the groups of birds known as Francolins and Snow-Partridges are generally furnished with strong but blunt spurs, and therefore probably belong to the Cacca- bine group. Of the former, containing many species, there is only room here to mention the Francolin, which used to be found in many parts of the South of Europe, Francolinus vulgaris, which also extends to India, where it is known as the Black Partridge. This seems to have been the Attagas or Attagen of classical

authors,3 a bird so celebrated for its exquisite flavour, the strange disappear- ance of which from all or nearly all its European haunts has been before noticed (Brrps, vol. ill. p. 736, note), and still remains inexplicable. It is possible that this bird has been gradually vanishing for several centuries, and if so to this cause may be attributed the great uncertainty attend- ing the determination of the Attagen—it being a common practice among men in all countries to apply the name of a species that is growing rare to some other that is still abundant. Of the Snow-Partridges, Tetraogallus, it is only to be said here that they are the giants of their kin, and that nearly every considerable range of mountains in Asia seems to possess its specific form.

By English colonists the name Partridge has been very loosely applied, and especially so in North America.

Where a qualifying word is prefixed no confusion is caused,

but without it there is sometimes a difficulty at first to know whether the Ruffed Grouse (Bonasa umbellus) or the Virginian Colin (Ortyx perme isintended. (a. N.) PASCAL, Braise (1623-1662), was born at Clermont Ferrand on the 19th June 1623. His father was Etienne Pascal, president of the Court of Aids at Clermont; his mother’s name was Antoinette Bégon. The Pascal family were Auvergnats by extraction as well as residence, and they had for many generations held posts in the civil service. They were ennobled by Louis XI. in 1478, but, as in many other cases, no attempt seems to have been made to assume the privileged particle de. The earliest anecdote of Pascal is a singular story recorded by his niece, Marguerite Perier (the heroine of the Holy Thorn miracle), of his being bewitched, and freed from the spell by the witch with strange ceremonies. His mother died when he was about four years old (the exact date is differently stated), and left him with two sisters—Gilberte, who after- wards married M. Perier, and Jacqueline. Both sisters are of importance in their brother’s history, and both are said to have been beautiful and accomplished. When Pascal was about seven years old, his mother having been already dead for some time, Etienne Pascal the father gave up his official post at Clermont, and betook himself

2 It is a singular fact that the game-preservers who object most strongly to the Red-legged Partridge are not agreed on the exact grounds of their objection. One party will declare that it vanquishes the Grey Partridge, while the other holds that, though the latter, the “English” Partridge, is much vexed by the introduced species, it invariably beats off the “ Frenchman”!

3 However, many naturalists have maintained a different opinion— some making it a Woodcock, a Gopwit (q.v.), or even the Hazel-hen (see GrousE, vol. xi. p. 223). The question has been well discussed by Lord Lilford (Jbis, 1862, pp. 352-356).

to Paris for the education of his children and for his own indulgence in scientific society. It does not appear that Blaise, who went to no school, but was taught by his father, was at all forced, but rather the contrary. Never- theless he has a distinguished place in the story of pre- cocious children, and in the much more limited chapter of children whose precocity has been followed by great per- formance at maturity, though he never became what is called a learned man, perhaps did not know Greek, and was pretty certainly indebted for most of his miscellaneous reading to Montaigne. How, purposely kept from books, he worked out the more elementary problems of geometry for himself; how at sixteen he wrote a treatise on conic sections which Descartes refused to believe in except as the work of a master and not of a student; how he wrote treatises on acoustics at twelve, and began elaborate cal- culating machines when he was still a boy,—are things dwelt upon in all biographies of him. In this notice his attainments in mathematical and physical science, except those which have some special connexion with his life and history, will be dealt with separately and later.

The Pascal family, some years after settling in Paris, had to go through a period of adversity. Etienne Pascal, on leaving Clermont, had bought certain of the Hétel de

Ville rentes, almost the only regular investment open to.

Frenchmen at the time. Richelieu reduced the interest and the investors protested, Pascal amongst them. But the great cardinal did not understand such protests, and to escape the Bastille Pascal had to go into hiding. He was, according to the story, restored to favour owing to the good acting and graceful appearance of his daughter Jacqueline in a representation of Scudéry's Amour Tyran- nique before Richelieu. Indeed Jacqueline, who was only fourteen, herself gives the account in a pleasant letter which is extant, and which contains an allusion to her brother's mathematical prowess. Madame d'Aiguillon's intervention in the matter was perhaps as powerful as Jacqueline's acting, and Richelieu not only relieved Ktienne Pascal from the necessity of keeping out of the way, but gave him (in 1641) the important and lucrative though somewhat troublesome intendancy of Rouen. The family accordingly removed to the Norman capital, though Gilberte Pascal shortly after, on her marriage, returned to Clermont. At Rouen they became acquainted with Corneille, and Blaise Pascal pursued his studies with such vehemence that he already showed signs of an injured constitution, Nothing, however, of importance happened till the year 1646. Then Pascal the elder was confined to the house by the consequences of an accident on the ice, and was visited by certain gentlemen of the neighbourhood who had come under the influence of St Cyran and the Jansenists. It does not appear that up to this time the Pascal family had been contemners of religion, but they now eagerly embraced the creed, or at least the attitude of Jansenism. One of the more immediate results of this conversion has rather shocked some modern admirers of Pascal, who forget that toleration,.except of the Gallio kind, is an idea which had no place in men's minds in Pascal's day. He came into contact with a Capuchin known as Pére St Ange, but whose real name was Forton, and who seems to have entertained some speculative ideas on theological points which were not strictly orthodox. Thereupon Pascal with some of his friends lodged an information against the heretic with the representative of the archbishop of Rouen. There seems to have been no lack of zeal about the accusers, but the accused made no difficulty whatever in making profession of orthodoxy, and the judge appears to have been by no means anxious to push the matter home. No doubt Pascal was perfectly sincere, and like most of his contemporaries held the

opinion attributed to a great English nonconformist con- temporary of his, that, while it was very shocking that men who were in the right should not be tolerated, it was almost equally shocking that men who were in the wrong should be.

His bodily health was at this time very far from satis- factory, and he appears to have suffered, not merely from acute dyspepsia, but from a kind of paralysis. He was, however, except when physicians positively forbade study, and probably sometimes when they did so forbid, inde- fatigable in his mathematical work. In 1647 he published his Nouvelles Hxpériences sur le Vide, and in the next year the famous experiment with the barometer on the Puy de Dome was carried out for him by his brother-in-law Perier, and repeated on a smaller scale by himself at Paris, to which place by the end of 1647 he and his sister Jacqueline had removed, to be followed shortly by their father. In a letter of Jacqueline's dated the 27th of September, an account of a visit paid by Descartes to Pascal is given, which, like the other information on the relations of the two, gives strong suspicion of mutual jealousy. Descartes, however, gave Pascal the very sensible advice to stay in bed as long as he could (it may be remembered that the philosopher himself never got up till eleven) and to take plenty of beef tea. But the relations of Pascal with Descartes belong chiefly to the scientific achievements of the former. He had, however, other relations, both domestic and miscellaneous, which had nothing to do with science. As early as May 1648 Jacqueline Pascal was strongly drawn to Port Royal, and her brother fre- quently accompanied her to its church. She desired indeed to join the convent, but her father, who at the date above mentioned returned to Paris with the dignity of counsellor of state (his functions at Rouen having ceased), disapproved of the plan, and took both brother and sister to Clermont. Pascal stayed in Auvergne for the greater part of two years, but next to nothing is known of what he did there. Fléchier, in his account of the Grands Jours at Clermont many years after, speaks of a "belle savante" in whose company Pascal had frequently been—a trivial mention on which, as on many other trivial points of scantily known lives, the most childish structures of comment and conjecture have been based. It is sufficient to say that at this time, despite the Rouen "conversion," there is no evidence to show that Pascal was in any way a recluse, an ascetic, or in short anything but a young man of great intellectual promise and performance who was not

indifferent to society, but whose aptitude both for society and study was affected by weak health and the horse-doctoring of the time. He, his sister, and their father returned to Paris in the late autumn of 1650, and in September of the next year Etienne Pascal died. Almost immediately afterwards Jacqueline fulfilled her purpose of joining Port Royal— a proceeding which led to some soreness, finally healed, between herself and her brother and sister as to the dis- posal of her property. Perhaps this difference, but more probably the mere habitual use of the well-known dialect of Port Royal, led Jacqueline to employ in reference to her brother expressions which have led biographers into most unnecessary excursions of fancy. For these they have seemed to find further warrant in similar phrases used by the Periers, mother and daughter. It has been supposed that Pascal, from 1651 or earlier to the famous accident of 1654, lived a dissipated, extravagant, worldly, luxurious (though admittedly not vicious) life with his friend the Duc de Roannez and others. His Discours sur les Passions de Amour, a striking and characteristic piece, only recently discovered and printed, has also been assigned to this period, and has been supposed to indicate a hope-

Jess passion for Charlotte de Roannez, the duke's sister. Tt cannot be too decidedly said that all this is sheer romancing. The extant letters of Pascal to the lady show no trace of any affection (stronger than friendship) between them. As to Pascal's worldly life, it might be thought that only the completest ignorance of the usual

dialect of the stricter religious sects and societies (and

it may be added of Port Royal in particular) could induce any one to lay much stress on that. A phrase of Jacqueline's about the " horribles attaches" which bound her brother to the world may pair off with hundreds of similar expressions from Bunyan downwards. It is, how- ever, certain that in the autumn of 1654 Pascal's second "conversion" took place, and that it was lasting. He betook himself at first to Port Royal, and began to live a recluse and austere life there. Madame Perier simply says

that Jacqueline persuaded him to abandon the world.

Jacqueline represents the retirement as the final result of along course of dissatisfaction with mundane life. But there are certain anecdotic embellishments of the act which are too famous to be passed over, though they are in part apocryphal. It seems that Pascal in driving to Neuilly was run away with by the horses, and would have been plunged in the river but that the traces fortunately broke. To this, which seems authentic, is usually added the late and more than doubtful tradition (due to the Abbé Boileau) that afterwards he used at times to see an imaginary precipice by his bedside or at the foot of the chair on which he was sitting. Further, from November 93, 1654, dates the singular document usually known as "Pascal's amulet," a parchment slip which he wore con- stantly about him, and which bears the date followed by some lines of incoherent and strongly mystical devotion.

But, whatever may have been the immediate cause of Pascal's conversion and (for a time) domestication at Port Royal, it certainly had no evil effect on his intellectual or literary powers. Indeed, if he had been drowned at Neuilly he would hardly be thought of now as anything but an extraordinarily gifted man of science. It must also be noted that, though he lived much at Port Royal, and partly at least observed its rule, he never actually became one of its famous solitaries. But for what it did for him (and for a time his health as well as his peace of mind seems to have been improved) he very soon paid the most ample and remarkable return that any man of letters ever paid to any institution. At the end of 1655 Arnauld, the chief light of Port Royal, was condemned by the Sorbonne for a letter which he had published expressing doubt whether the famous five propositions were to be found in Jansen, and, as much was made of this condemna- tion, it was thought important by the Jansenist and Port Royal party that steps should be taken to disabuse the popular mind on the whole controversy. Arnauld would have undertaken the task himself, but his wiser friends knew that his style was anything but popular, and over- tuled him. It is said that he personally suggested to Pascal to try his hand, and that the first of the famous Provincial Letters (this familiar name, or rather misnomer, isan abbreviation from the proper title of Lettres Ecrites par Lowis de Montalte & un Provincial de ses Amis) was written in a few days, or, less probably, in a day. It was printed on the 23d January 1656, and, being immensely popular and successful, was followed by others to the

number of eighteen, in which not merely the special points at Issue but the whole ethical and doctrinal system of the Jesuits was pulled to pieces.

In the Provinciales Pascal, who it must be remembered published under a, strict incognito, denies that he belongs to Port Royal, and in fact, though during the last years of his life he was wholly devoted to its interests, he was

never a regular resident there, and usually abode in his own house at Paris. Shortly after the appearance of the Provinciales, on May 24, 1656, occurred the miracle of the Holy Thorn, a fragment of the crown of Christ pre- served at Port Royal, which cured the little Marguerite Perier of a fistula lacrymalis. The Jesuits were much mortified by this Jansenist miracle, which, as it was offici- ally recognized, they could not openly deny. Pascal and his friends rejoiced in proportion. But the details of his later years after this incident are somewhat scanty, and as recorded by his sister and niece they tell of increasing ill health, and of ascetic-practices and beliefs increasing still more. One curious incident, contrasting equally with this state of things and with Pascal's studious character and renown, is what Madame Perier calls "'affaire des carrosses," a scheme of the Duc de Roannez and others for running omnibuses in Paris, which was actually carried out, of which Pascal was in some sort manager, and from which he derived some profit. This, however, is an excep- tion. Otherwise, for years before his death, we hear only of acts of charity and of, as it seems to modern ideas, extravagant asceticism. Thus Madame Perier tells us that he disliked to see her caress her children, and would not allow the beauty of any woman to be talked of in his pre- sence. What may be called his last illness began as early as 1658, after which year he never seems to have enjoyed even tolerable health, and as the disease progressed it was attended with more and more pain, chiefly in the head. In June 1662, having given up his own house to a poor family who were suffering from small-pox, and being unwilling that his sister should expose herself to infection, he went to her house to be nursed, and never afterwards left it. His state was, it seems, mistaken by his physicians, who to the last maintained that there was little

danger— so much so that the offices of the church were long put off. He was able, however, to receive the eucharist, and soon afterwards died in convulsions on August 19th. A post mortem examination was held, which showed not only grave derangement in the stomach and other organs, but a serious lesion of the brain.

Eight years after Pascal's death appeared, in a small volume, the book which has given most trouble to all students of Pascal, and most pleasure to some of them. It purported to be Pascal's Pensées, and a preface by his nephew Perier gave the world to understand that these were fragments of a great projected apology for Christianity which the author had in conversation with his friends planned out years before. The editing of the book was peculiar. It was submitted toa committee of influential Jansenists, with the Duc de Roannez at their head, and, in addition, it bore the imprimatur of numerous unofficial approvers who testified to its orthodoxy. It does not appear that there was much suspicion of the garbling which had been practised,—garbling not unusual at the time, and excused in this case by the fact of a lull in the troubles of Port Royal and a great desire on the part of its friends to do nothing to disturb that lull. But as a matter of fact no more entirely fictitious book ever issued from the press. The fragments which it professed to give were in them- selves confused and incoherent enough, nor is it easy to – believe that they all formed part of any such single and coherent design as that referred to above. But the editors omitted, altered, added, separated, combined, and so forth entirely at their pleasure, actually making some changes which seem to have been thought improvements of style. Asan instance of their anxiety to avoid offence, it may be noticed that they rejected, apparently as too outspoken, Madame Perier's invaluable life of her brother, which was written to accompany the second edition of the Pensées, but did not actually appear with them till 1684.

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This rifacimento remained the standard text with a few unimportant additions for nearly two centuries, except that by a truly comic revolution of public taste Condorcet in 1776 published, after study of the original, which remained accessible in manuscript, another garbling, con- ducted this time

in the interests of unorthodoxy. It was not till 1842 that Victor Cousin drew attention to the absolutely untrustworthy condition of the text, nor till 1844 that M. Faugére edited that text from the MS. in something like a condition of purity, though, as subse- quent editions have shown, not with absolute fidelity. But even in its spurious condition the book had been recognized as remarkable and almost unique. Its contents, as was to be expected, are of a very chaotic character—of a character so chaotic indeed that the reader is almost at the mercy of the arrangement, perforce an arbitrary arrangement, of the editors. But the subjects dealt with concern more or less all the great problems of thought on what may be called the theological side of metaphysics :— the sufficiency of reason, the trustworthiness of experience, the admissibility of revelation, free will, foreknowledge, and the rest. The peculiarly disjointed and fragmentary condition of the sentiments expressed by Pascal aggravates the appearance of universal doubt which is present in the Pensées, just as the completely unfinished condition, from the literary point of view, of the work constantly causes slighter or graver doubts as to the actual meaning which the author wished to express. Accordingly the Pensées have always been a favourite exploring ground, not to say a favourite field of battle, to persons who take an interest in the problems. Speaking generally, their tendency is towards the combating of scepticism by a deeper scepticism, or, as Pascal himself calls it, Pyrrhonism, which occasionally goes the length of denying the possi- bility of any natural theology. Pascal explains all the contradictions and difficulties of human life and thought by the doctrine of the fall, and relies on faith and reve- lation alone to justify each other. Comparison of the Pensées with the Prownciales is, considering the radical differences of state (the one being a finished work deliber- ately issued from the master's hands, the other not even a rough draught, scarcely even "heads" or "outlines," but a collection of loose and uncorrected notes settled neither as to the exact form of each nor as to the relation of each to any whole), impossible. But it may be said that no one can properly perceive how great a man of letters Pascal was from the Pensées alone, and that no one can perceive how deep if not wide a thinker he was from the Provinciales alone. An absolute preference of either argues a certain onesidedness in the relative estimate of matter and form. 'The wiser mind distinctly prefers both, and recognizes that if either were lacking the greatness of Pascal would fail to be perceived, or at least to be per- ceived fully.

Excluding his scientific attainments, which, as has been noted above, will be the subject of separate notice, Pascal presents himself for comment in two different lights, the second of which is, if the expression be permitted, a com- posite one. The first exhibits him as a man of letters, the second as a philosopher, a theologian, and a man. If this last combination seems to be audacious or clumsy, it can only be said that in hardly any thinker are theological thoughts, and thoughts more strictly to be called philo- sophical or metaphysical, so intimately, so inextricably blended as in Pascal, and that in none is the colour of the theology and the philosophy more distinctly personal. This latter fact adds to the difficulty of the problem ; for, though Pascal has written not a little, and though a vast amount has been written about him, it cannot be said that his character as a man, not a writer, is very distinct.

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The accounts of his sister and niece have the defect of al] hagiology (to use the term with no disrespectful inten- tion) ; they are obviously written rather with a view to the ideas and the wishes of the writers than with a view to the actual and absolute personality of the subject. Except from these interesting but somewhat tainted sources, we know little or nothing about him. Hence conjecture, or at least inference, must always enter largely into any estimate of Pascal, except a purely literary one.

On that side, fortunately, there is no possibility of doubt or difficulty to any competent inquirer. The Provincial Letters are the first example of French prose which is at once considerable in bulk, varied and important in matter, perfectly finished in form. They owe not a little to Descartes, for Pascal's indebtedness to his predecessor is unquestionable from the literary side, whatever may be the case with the scientific. But Descartes had had neither the opportunity, nor the desire, nor probably the power, to write anything of the literary importance of the Provinciales. 'The unanimity of eulogy as to the style of this wonderful book has sometimes tempted foreigners, who feel or affect to feel an inability to judge for them. selves, into a kind of scepticism for which there is abso- lutely no ground. The first example of polite contro- versial irony since Lucian, the Provinciales have continued to be the best example of it during more than two centuries in which the style

has been sedulously practised, and in which they have furnished a model to generation after generation without being surpassed by any of the works to which they have shown the way. The unfailing freshness and charm of the contrast between the import- ance, the gravity, In some cases the dry and abstruse nature, of their subjects and the lightness sometimes almost approaching levity in its special sense of the manner in which these subjects are attacked is a triumph of literary art of which no familiarity dims the splendour, and which no lapse of time, affecting as that lapse has already done toa great extent the attraction of the sub- jects themselves, can ever impair. The tools of phrase and diction by which this triumph is achieved were not in all cases of Pascal's invention—Descartes and Corneille had been beforehand with him to some extent—but many of them were actually new, and all were newly and more skilfully applied. Nor perhaps is this literary art really less evident in the Pensées, though it is less clearly dis- played, owing to the fragmentary or rather chaotic condi- tion of the work, and partly also to the fact that the subject here for many readers and in many places claims attention almost to the disregard of the form. The vivid- ness and distinction of Pascal's phrase, his singular faculty of inserting in the gravest and most impassioned medita- tion what may be almost called quips of thought and diction without any loss of dignity, the intense earnestness of meaning weighting but not confusing the style, all appear here, and some of them appear as they have no chance of appearing in at least the earlier Provinciales. .

No such positive statements as these are, however, possible as to the substance of the Pensées and the attitude of their author towards "les grands sujets." In the space and circumstances of the present notice nothing more can be attempted than a summary of the opinions hitherto advanced on the subject, and an indication of the results which may seem most probable to unprejudiced inquirers who possess a fair knowledge of and interest in the problems concerned. Hitherto the widest differences have been manifested in the estimate of Pascal's opinions on the main questions of philosophy, theology, and human conduct. He has been represented as a determined apolo- gist of intellectual orthodoxy animated by an almost fanatical ‘‘ hatred of reason," and possessed with a purpose

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to overthrow the appeal to reason; as a sceptic and pessimist of a far deeper dye than Montaigne, anxious chiefly to show how any positive decision on matters beyond the range of experience is impossible ; as a nervous believer clinging to conclusions which his clearer and better sense showed to be indefensible; as an almost ferocious ascetic and paradoxer affecting the credo quia impossibile in intellectual matters and the odi quia amabile in matters moral and sensuous; as a wanderer in the regions of doubt and belief, alternately bringing a vast though vague power of thought and an unequalled power of expression to the expression of ideas incompatible and irreconcilable. In these as in all other matters the first requisite seems to be to clear the mind of prepossession and commonplace. It has already been hinted that far too much stress may be laid on the description of Pascal by his family as a converted sinner, and it may be added that at least as much stress has been laid on the other side of the notion of him as of a clear-headed materialist and expert in positive science, who by ill-health, overwork, and family influence was persuaded to adopt, half against his will, supernaturalist opinions. An unbiassed study of the scanty facts of his history, and of the tolerably abundant but scattered and chaotic facts of his literary production, ought to enable any one to steer clear of these exaggerations, while admitting at the same time that it is impossible to givea complete and final account of his attitude towards the riddles of this world and others. He certainly was no mere advocate of orthodoxy; he as certainly was no mere victim of terror at scepticism; least of all was he a free- thinker in disguise. He appears, as far as can be judged from the fragments of his Pensées, to have seized much more firmly and fully than has been usual for two cen- turies at least the central idea of the difference between reason and religion. Where the difficulty rises respecting him is that most thinkers since his day who have seen this difference with equal clearness have advanced from it to the negative side, while he advanced to the positive. In other words, most men since his day who have not been contented with a mere concordat, have let religion go and contented themselves with reason. Pascal, equally dis- contented with the concordat, held fast to religion and continued to fight out the questions of difference with reason. The emotion, amounting to passion, which he displays in conducting this campaign, and the superfluous energy of his debate on numerous points which, for

instance, such a man as Berkeley was content to leave in the vague must be traced to temperament, aggravated no doubt by his extreme intellectual activity, by ill health, and by his identification comparatively late in life and under peculiar circumstances with a militant and so to speak sectarian form of religious or ecclesiastical belief. Surveying these positions, we shall not be astonished to find much that is surprising and some things that are con- tradictory in Pascal's utterances on "les grands sujets." But the very worst method that can be taken for dealing with these contradictions is to assume, as his critics on one side too often do, that so clever a man as Pascal could hot possibly be a convinced acceptor of dogmatic Christi- anity, or to assume, as too many of his critics on the other do, that so pious and orthodox a man as Pascal could not entertain any doubts or see any difficulties in reference to dogmatic Christianity. He had taken to the serious con- templation of theological problems comparatively late ; for the Rouen escapade noted above is merely a specimen of the kind of youthful intolerance which counts for no- thing when justly viewed. The influence exercised on him by Montaigne is the one fact regarding him which has not been and can hardly be exaggerated, and his well-known Lntretien with Sacy on the subject (the restoration of

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'which to its proper form is one of the most valuable

results of recent criticism) leaves no doubt possible as to the source of his "Pyrrhonian" method. The atmo- sphere of somewhat heated devotion in which he found himself when he retired to Port Royal must naturally count for something in the direction and expression of his thoughts ; his broken health for something more. It is unfortunately usual with societies like Port Royal to generate a kind of mist and mirage which deceives and distorts even the keenest sight that looks through their eyes. But it is impossible for any one who takes Pascal's Pensées simply as he finds them in connexion with the facts of Pascal's history to question his theological ortho- doxy, understanding by theological orthodoxy the accept- ance of revelation and dogma; it is equally impossible for any one in the same condition to declare him absolutely content with dogma and revelation. Excursions into the field beyond formularies were necessary to him, and he made them freely; but

there is no evidence that these excursions tempted him to remain outside, and it appears particularly erroneous to take his celebrated “ wager” thoughts (the argument that, as another world and its liabilities, if accepted, imply no loss and much possible gain, they should be accepted) as an evidence of weakened belief or a descent from rational religion. It is of the essence of an active mind like Pascal’s to explore and state all the arguments of whatever degree of goodness which make for or make against the conclusion it is investigat- ing, and this certainly is neither the least obvious nor the weakest of the arguments which must have presented themselves to him.

In ecclesiastical questions as distinguished from theo- logical Pascal appears to have been an ardent Jansenist, adopting without very much discrimination the stand- point of his friends and religious directors Sacy, Arnauld, Singlin, and others. In one point he went beyond them, boldly disputing the infallibility of the pope, and hinting not obscurely at the propriety of agitation against errone- ous papal decisions. The Jansenists as a body could not muster courage to adopt this attitude. But it is not easy to discuss isolated points of this kind here; indeed their discussion belongs more properly to the general subject of Jansenism, and the history of Port Royal.

To sum up, the interest and value of the Pensées is positively diminished if they are taken as gropings after self-satisfaction or feeble attempts at freethinking. They are excursions into the great unknown made with a full acknowledgment of the greatness of that unknown, but with no kind of desire for something more known than the writer’s own standpoint. If to any one else they communicate such a desire that is not Pascal’s fault; and, if it seems to any one that without such a desire they could not have been indulged in, that comes mainly from an alteration of mental attitude, and from a want of familiarity with the mental attitude of Pascal’s own time. From the point of view that belief and know- ledge, based on experience or reasoning, are separate domains with an unexplored sea between and round them, Pascal is perfectly comprehensible, and he need not be taken as a deserter from one region to the other. To those who hold that all intellectual exercise outside the sphere of religion is impious, or that all intellectual exercise inside that sphere is futile, he must remain an enigma.

There are few writers who are more in need than Pascal of being fully and competently edited. The chief nominally complete edition at present in existence is that of Bossut (1779, 5 vols., and since reprinted), which not only appeared before any attempt had been made to restore the true text of the Pensées, but is in other respects quite inadequate. The edition of Lahure, 1858, is not much better, though the Pensées appear in their more genuine form. An

edition has been long promised for the excellent collection of.

Les Grands Ecrivains de la France; it has been understood to be under the charge of M. Faugére. Meanwhile, with the exception of the Provinciales (of which there are numcrous editions, no one much to be preferred to any other, for the text is undisputed and the book itself contains almost all the exegesis of its own contents necessary), Pascal can be read only at a dis-advantage. There are four chief editions of the true Pensées: that of M. Faugere (1844), the editio princeps; that of M. Havet (1852, 1867, and 1881), on the whole the best; that of M. Victor Rochet (1873), good, but arranged and edited with the deliberate intention of making Pascal first of all an orthodox apologist; and that of M. Molinier (1877-79), a carefully edited and interesting text, the important corrections of which have been introduced into M. Havet's last edition. Unfortunately, none of these can be said to be exclusively satisfactory. The minor works must chiefly be sought in Bossut or reprints of him. Works on Pascal are innumerable: Sainte-Beuve's Port Royal, Cousin's writings on Pascal and his Jacqueline Pascal, and the essays of the editors of the Pensées just mentioned are the most noteworthy. Principal Tulloch has contributed a useful little monograph to the series of Foreign Classics for English Readers (Edinburgh and London, 1878). (G. SA.)

Pascal as Natural Philosopher and Mathematician.— |

Great as is Pascal's reputation as a philosopher and man of letters, it may be fairly questioned whether his claim to be remembered by posterity as a

mathematician and physicist is not even greater. In his two former capacities all will admire the form of his work, while some will question the value of his results; but in his two latter capacities no one will dispute either. He was a great mathematician in an age which produced Des- cartes, Fermat, Huygens, Wallis, and Roberval. There are wonderful stories on record of his precocity in mathe- matical learning, which is sufficiently established by the well-attested fact that he had completed before he was sixteen years of age a work on the conic sections, in which he had laid down a series of propositions, discovered by himself, of such importance that they may be said to form the foundations of the modern treatment of that subject. Owing partly to the youth of the author, partly to the difficulty in publishing scientific works in those days, and partly no doubt to the continual struggle on his part to devote his mind to what appeared to his conscience more important labour, this work (like many others by the same master-hand) was never published. We know something of what it contained from a report by Leibnitz, who had seen it in Paris, and from a résumé of its results published in 1640 by Pascal himself, under the title Hssai pour les Coniques. The method which he fol- lowed was that introduced by his contemporary Desargues, viz. the transformation of geometrical figures by conical or optical projection. In this way he established the famous theorem that the intersections of the three pairs of opposite sides of a hexagon inscribed in a conic are collmear. This proposition, which he called the mystic hexagram, he made the keystone of his theory; from it alone he deduced more than four hundred corollaries, embracing, according to his own account, the conics of Apollonius, and other results innumerable,

Pascal also distinguished himself by his skill in the infinitesimal calculus, then in the embryonic form of Cavalieri’s method of indivisibles. The cycloid was a famous curve in those days; it had been discussed by Galileo, Descartes, Fermat, Roberval, and Torricelli, who had in turn exhausted their skill upon it. Pascal solved the hitherto refractory problem of the general quadrature of the cycloid, and proposed and solved a variety of others relating to the centre of gravity of the curve and its segments, and to the volume and centre of gravity of solids of revolution generated in various ways by means of it. He published a number of these theorems without

demonstration as a challenge to conteniporary matlema- ticians. Solutions were furnished by Wallis, Huygens,

Wren, and others; and Pascal published his own in the form of letters from Amos Dettonville (his assumed name as challenger) to M. Cercavi. There has been some dis. cussion as to the fairness of the treatment accorded by Pascal to his rivals, but no question of the fact that his initiative led to a great extension of our knowledge of the properties of the cycloid, and indirectly hastened the pro- gress of the differential calculus.

_ In yet another branch of pure mathematics Pascal] ranks as a founder. The mathematical theory of proba- bility and the allied theory of the combinatorial analysis were in effect created by the correspondence between Pascal and Fermat, concerning certain questions as to the division of stakes in games of chance, which had been | propounded toe the former by the gaming philosopher De Meéré. A complete account of this interesting correspond- ence would surpass our present limits ; but the reader may be referred to Todhunter's History of the Theory of Proba- bility (Cambridge and London, 1865) pp. 7-21. It appears that Pascal contemplated publishing a treatise De Alex Geometria; but all that actually appeared was a fragment on the arithmetical triangle ("Properties of the Figurate Numbers") printed in 1654, but not published till 1665, after his death.

Pascal's work as a natural philosopher was not less remarkable than his discoveries in pure mathematics. His experiments and his treatise (written 1653, published 1662) on the equilibrium of fluids entitle him to rank with Galileo and Stevinus as one of the founders of the science of hydrodynamics. The idea of the pressure of the air and the invention of the instrument for measuring it were both new when he made his famous experiment, | showing that the height of the mercury column in a barometer decreases when it is carried upwards through the atmosphere. This experiment was made in the first place by himself in a tower at Paris, and was afterwards carried out on a grand scale under his instructions by his brother-in-law Perier on the Puy de Déme in Auvergne. Its success greatly helped to break down thie old prejudices, and to bring honie to the minds of

ordinary men the truth | of the new ideas propounded by Galileo and Torricelli.

Whether we look at his pure mathematical or at his physical researches we receive the same impression of Pascal; we see the strongest marks of a great original genius creating new ideas, and seizing upon, mastering, and pursuing farther everything that was fresh and un- familiar in his time. After the lapse of more than two hundred years, we can stil point to much in exact science that is absolutely his ; and we can indicate infinitely more which is due to his inspiration. (G. CH.)

PASCHAL I., pope from 817 to 824, a native of Rome, was raised to the pontificate by popular acclamation, — shortly after the death of Stephen IV., and before the | sanction of the emperor (Louis the Pious) had been — obtained—a circumstance for which it was one of his first cares to apologize. His relations with the imperial | house, however, never became cordial; and he was also unsuccessful in retaining in Rome itself the popularity to which he had owed his election. He died at Rome while the imperial commissioners were investigating the circunl- stances under which two important officers of Lothair, the eldest son of Lonis, had been seized at the Lateran, blinded, and afterwards beheaded ; Paschal had shielded the murderers but denied all personal complicity in their crime. The Roman people refused him the honour of burial within the church of St Peter, but he now holds place in the Roman calendar (May 16), Like one or two of his more immediate predecessors he was liberal in his donations to several churches of the city, St Cecilia in Trastevere having been restored and St Maria in Domnica

rebuilt by him; he also built the church of St Prassede. The successor of Paschal I. was Eugenius II.

PASCHAL II., pope from 1099 to 1118, was the successor of Urban II. Of his early history nothing is known except that his proper name was Rainicri, that he was of Tuscan origin, and that in early life he became a monk, probably of Cluny. He was raised to the cardin- alate by Gregory VII. about 1076, and was elected to the papal chair on August 13, 1099. In the long struggle with the imperial power about INVEsTITURE (q.v.) he gealously carried on the Hildebrandine policy, but hardly with Hildebrandine success.

One of his first acts was to expel from Rome the antipope Clement IIL, otherwise known as Guibert of Ravenna, and to renew his prede- cessor's sentence of excommunication against the emperor Henry IV., by the help of whose rebellious son it seemed at one time as if the claims of the church were to become wholly triumphant. But Prince Henry, who succeeded to the purple in 1106 (see Henry V.), proved a still more active and persistent opponent of papal pretensions than ever his father had been. Paschal was courteously invited to Germany to assist in arranging definitely the affairs of the empire (1107), but, while the pope delayed his journey, the emperor proceeded actually to exercise all the rights of investiture to the fullest extent, and, having disposed of various wars in Bohemia, Hungary, and Poland, announced in 1110 the intention of proceeding to Rome to be crowned and to re-establish order in Italy. From Arezzo he sent ambassadors to Rome, and the pope after negotiation agreed to his coronation on the footing that the church should surrender all the possessions and royalties it had received of the empire and kingdom of Italy from the days of Charlemagne, while Henry on his side gave up the form of investiture. But on Henry's arrival in Rome (Feb. 1111), where feeling was strong against this pact, Paschal was slow to implement it, and the emperor ulti- mately found it necessary to withdraw from the city,—not, however, until he had compelled the pope and many of the cardinals to accompany him. After two months the pope yielded ; the coronation took place in the church of St Peter on April 13, and forthwith the emperor withdrew beyond the Alps after exacting a promise that no revenge should be taken for what had passed. The Lateran council, however, held in March 1112, repudiated as void, under penalty of excommunication, the concessions that had been extorted by the violence of Henry; and a council held at Vienne some months afterwards actually excommunicated him, the pope himself ratifying the decree. On the death of the Countess Matilda of Tuscany, who had bequeathed her whole possessions to the church LYS), the emperor at once laid claim to them as imperial fiefs, and, descending into Italy, drove the pope first to Monte Casino and then to Benevento. Paschal returned to Rome, after the emperor's withdrawal, in the beginning of 1118, but died within a few days (January 21, 1118). His successor was Celasius IT.

a CONTROVERSY. See Easter, vol. vii. p. 614.

PASCO. See Cerro pE Pasco, vol. v. p. 347.

PAS DE CALAIS, a maritime department of northern France, formed in 1790 of nearly the whole of Artois and the northern maritime portion of Picardy, including the Boulonnais, Calaisis, Ardrésis, and the districts of Langle and Bredenarde, lies between 50° 2’ and 51° N. lat. and I” 35’ and 3° 10’ E. long., and is bounded N. by the Straits of Dover (“ Pas de Calais”), E. by the department of Nord, S. by that of Somme, and W. by the English Channel. The distance from England is only 21 miles. Nord, which separates Pas de Calais from Belgium, is at one place only 3 miles wide, and from Arras (the chief

town) to Paris ina direct line is about 100 miles. Except in the neighbourhood of Boulogne, with its cétes de fer or ‘iron coasts,” the seaboard of the department, which measures 65 miles, consists of dunes. From the mouth of the Aa (the limit towards Nord) it trends west-south-west to Gris Nez, the point of France nearest to England ; in this section he the port of Calais, Cape Blanc Nez, rising 440 feet above the sandy shores, and the port of Wissant (Wishant). Beyond Gris Nez the direction is due south ; in this section are the port of Ambleteuse, Boulogne at the mouth of the Liane, and the two bays formed by the estuaries of the Canche and the Authie (the limit towards Somme). The highest point in the department (700 feet) is in the west, between Boulogne and St Omer. From the uplands in which it is situated the Lys and Scarpe flow east to the Scheldt, the Aa north to the German Ocean, and the Slack, Wimereux, and Liane to the Channel. Farther south are the valleys of the Canche and the Authie, running from east-south-east to west-north- west, and thus parallel with the Somme. Vast plains, open and monotonous, but extremely fertile and well culti- vated, occupy most of the department. The greenest and most picturesque valleys are in the west. To the north of the hills running between St Omer and Boulogne, to the south of Gravelines and the south-east of Calais, lies the district of the Wattergands, fens now drained by means of canals and dykes, and turned into highly productive land. The climate is free from extremes of heat and cold, but damp and changeable.

At Arras the mean annual tem- perature is 47°; on the coast it is higher. The rainfall in the one case is 22 inches, in the other 31.

With a total area of 2550 square miles, the department has 1899 square miles (more than two-thirds) of arable land, while woods and pasture land each occupy only about a twentieth. The live stock in 1880 comprised 76,224 horses, 9642 asses or mules, 156,060 cows, 35,272 calves, 5080 bulls or oxen, 256,031 sheep, 131,722 pigs, 26,760 goats. The sheep in 1880 yiclded 857 tons of wool, worth £57,398… The national sheepfolds of Tingry are in Pas de Calais. The 22,260 beehives of the department yielded in 1878 1753 tons of honey and 394 tons of wax. No department except Somme breeds fowls so extensively. Wheat, beetroot, and oil seeds are the principal crops. In 1882 wheat gave 9,855,483 bushels, meslin 920,023 bushels; in 1879, rye 781,150 bushels, barley 2,362,138 bushels, oats 9,421,818 bushels, beetroot 1,576,355 tons (almost entirely consumed by the sugar works), potatoes 7,250,813 bushels, vegctables 581,727, and colza seed 30,263. Besides there were considerable quantities of poppy-seed, flax (of excellent quality), hops, hemp, and tobacco (1275 tons). There are two great coal- fields, that of Pas de Calais proper, a continuation of the coal-field of Valencicnnes and Hainault, and that of Boulonnais. The former contains a total area of 134,270 acres; the latter is about a tenth of that size. Taken together they number 72 pits, 57 of which are active. In 1882 5,036,455 tons of coal were extracted and 1,378,818 consumed in the department; the industry gives employment to 22,925 persons. Peat (to the amount of 375,034 tons in 1882) is obtained in the valleys of the Scarpe and the Aa. Iron-mines in the arrondissement of Boulogne employ 162 workmen (26, 674 tons) ; the stone and marble quarries 2130 workmen ; and about 800 are cngaged in obtaining phosphates of lime (295,566 tons), which are exported for manure. Blast furnaces, foundrics, enginccring works, nailerics, boiler-works, agricultural implement factories, and steel-pen works are all carried on in the department. In 1883 805 tons of iron, 16,355 tons of steel, 65,025 tons of cast iron were manu- factured; and the avcrage production of pens 1s 400,000,000 per annum. Thecstablishments at Biache St Vaast melt, refine, and roll copper and zinc, and also work lead and auriferous silver. The ship- yards do not launch any large vessels, but in 1881 they built cighty luggers or sloops, with an aggregate burden of 2456 tons. The eighty-nine sugar-works in 1880 produced 42,121 tons of sugar

and 29,730 of molasses ; the distilleries 4,658,984 gallons of spirits ; the oil works 15 tons of hempsced oil, 389 tons of linseed oil, 3066 tons of poppyseed, rapeseed, and cameline oil, &c., and 797 tons of colza oil. ‘There are 553 brewcries in the department. Cotton-spinning and weaving employ 116,364 spindles and 625 looms ; wool- spinning 26,300 spindles ; and the flax, hemp, and jute manufacture 35,700 spindles and 497 looms. St Pierre-les-Calais carrics on the weaving of tulles in linen, cotton, and silk, employing 10,000 hands, and producing with its 1506 looms goods to the value of £2, 400,000 per annum. There are besides in the department establishments

for the manufacture of paper and cardboard, hosiery, embroidery, boots and shocs (for exportation), flooring, pipes, glass wares, chemical products, pottery, chicory, starch, biseuits (800 to 400 workmen), and gin. The national powder-mills of Esquerdes are among the largest in France. The port towns fit out a considerable number of vesscls for the mackerel, cod, and herring fishing—a growing industry. In 1882 Boulogne and Etaples had 340 boats (18,919 tons) and 4586 fishermen, and Calais 37 boats (265 tons) and 281 fishcrmen, and their united take was 2856 tons. There is a large export of sugar, spirits, calves, sheep, and cggs to England. In 1882 the port of Boulogne had a movement of 3614 vesscls and that of Calais 4436, with a total burden for the two ports of 2,212,920 tons. In 1878 404,769 travellers passed by this way between Franec and England. Calais is emphatically a transit port ; Boulogne has besides an export trade in local products such as marble, frcestone, mincrals, and Boulogne horses, remarkable for size and strength. Theroads of the department (national, depart- mental, &c.) make a length of 9393 miles, the waterways 105} miles, the railways 546 miles, and the industrial railways 60 miles. The canal system coniprises part of the Aa, the Lys, the Scarpe, the Deule (a tributary of the Lys passing by Lille), the Lawe (a tribu- tary of the Lys passing by Bethune), and the Sensée (an affluent of the Scheldt), as well as the varions canals proper from Aive to La Bassee, Neuffossé, Calais, &c., and in this way a line of communi- cation is formed from the Scheldt to the sea by Bethune, St Omer, and Calais, with branches to Gravclines and

Dunkirk in Nord. The total tonnage of the whole inland navigation was 2,124,442 tons in 1878.

In 1881 Pas de Calais had 819,022 inhabitants (311 per square mile), ranking sixth among the departments in density of popu- lation. It forms the diocese of Arras in the arclibishopric of Cambrai, belongs to the district of the first (or Lille) corps d'armée, and is within the jurisdiction of the Douai court of appeal. There are six arrondissements bearing the names of their ehief towns— Arras (27,041 inhabitants), Bethune (10,374), Boulogne (44,842), Montreuil (3852), St Omer (20,479), and St Pol (3694). Other places of importance are St Pierre-lés-Calais (30,786 inhabitants), the industrial town of Calais (18,529), Lens (10,515), Lievin (8281), Carvin (6480)—the last three with important coal-mines, and Aire (5000), formerly a fortified place.

PASIPHAE. See Mrnos.

PASKEWITCH, Ivan Ferporowrrcy (1782-1856), prince of Warsaw, and general-in-chief of the Russian army, was descended from an old and wealthy family, and was born at Poltava 8th May 1782. He was educated at the imperial institution for pages, where his progress was so rapid that after his first examination he received the promise of a leutenant's commission in the guards, and was named aide-de-camp to the emperor. His first active service was in 1805, in the auxiliary army sent to the assistance of Austria against France, when he took part in the battle of Austerlitz. From 1807 to 1812 he was engaged in the campaigns against Turkey, and distinguished himself by many brilliant and daring exploits. During the French war of 1812-14 he was present, in command of the 26th division of infantry, at all the most important engagements; at the battle of Leipsic he took 4000 prisoners. On the outbreak of war with Persia in 1826 he was appointed second in command, and, succeeding in the following year to the chief command, gained rapid and brilliant successes which compelled the shah to sue for peace 19th February 1828, In reward of his services he was raised by the emperor to the rank of count of the empire, with the surname of Erivan, and received a million of roubles and a diamond-mounted sword. From Persia he was sent to Turkey in Asia, and, having captured in rapid succession the fortresses of Kars, Erzeroum, and Akalkalaki, he was at the

end of the campaign made a field marshal. In 1831 he was entrusted with the command of the army sent to suppress the revolt of Poland, and after the fall of Warsaw, which gave the death-blow to Polish independ. ence, he was raised to the dignity of prince of Warsaw, and created viceroy of the kingdom of Poland, In this position he is said to have manifested the highest qualities as an administrator, and in his relations with the kings of Prussia and Austria he secured their confidence and esteem. On the outbreak of the insurrection of Hungary in 1848

he was appointed to the command of the Russian troops sent to the aid of Austria, and finally compelled the insurgents to lay down their arms at Vilagos. In April 1854 he again took the field in command of the army of the Danube, but on the 9th June, at Silistria, where he suffered defeat, he received a contusion which compelled him to retire from active service. He died 29th January

1856

Tolstoy, Hssat Biographique et Historique sur le Feld-Maréchal Prince de Varsovie, Paris, 1835; Notice Biographique sur le Maréchal Paskévttch, Leipsic, 1856.

PASQUIER, Errennz (1529-1615), one of the glories of the French bar, and one of not the least remarkable men of letters of the 16th century, was born at Paris on the 7th June 1529 by his own account, according to others a year earlier. Nothing is known of his family, and hardly anything of his youth, but he seems to have inherited a small property at Chatelet in the district of Brie. He certainly studied law early, and in 1547 was a pupil of the famous Cujas at Toulouse. Thence, like many of his contemporaries, he went to finish his studies in Italy. He was called to the Paris bar in November 1549, having not yet (or at most barely) reached his majority. He practised diligently and with success, but by no means neglected literature. Some of his work both at this time and later is light and almost frivolous. A treatise on love, the Mono- phile, appeared in 1554, and not a few similar publica- tions followed it, one of them, the Ordonnances d’ Amour, being somewhat Rabelaisian in character. Pasquier, how- ever, though not a stoic, was a man

of perfectly regular life, and he married early ; his wife, who was of his own age, affluent, and, it is said, handsome, being a widow for whom he had gained a lawsuit. The next year he had the misfortune to eat some poisonous mushrooms and very nearly died of them; indeed he did not recover fully for two years. This lost him his practice for the time, and he again betook himself to general literature, publishing in 1560 the first book of his great' work the Recherches de la France. Before very long, however, clients once more came to him, and in 1565, when he was thirty-seven, his fame was established by a great speech still extant, in which he pleaded the cause of the university of Paris against the Jesuits, and won it. He was thenceforward constantly employed in the most important cases of the day, and his speeches, many of which we possess, displayed a polished eloquence which was new in his time. But he did not neglect general literature, pursuing the Recherches steadily, and publishing from time to time much miscellan- eous work. His literary and his legal occupations coin- cided in a curious fashion at the Grands Jours of Poitiers in 1579. These Grand Jours (an institution which fell into desuetude at the end of the 17th century, with bad effects on the social and political welfare of the French provinces) were a kind of irregular assize in which a com- mission of the parlement of Paris, selected and despatched at short notice by the king, had full power to hear and determine all causes, especially those in which seignorial rights had been abused. At the Grands Jours of Poitiers of the date mentioned, and at those of Troyes in 1583, Pasquier officiated; and each occasion has left a curious literary memorial of the kind of high jinks with which he and his colleagues relieved their graver duties. The Poitiers work was the celebrated collection of poems on a flea, of which English readers may find a full account in Southey's Doctor, Up to this time Pasquier had held no regular office except the lieutenant-generalship of Cognac, where his wife had property ; but in 1535 Henry III. made him advocate-general at the Paris Cours des Comptes, an important body having political as well as financial and legal functions. Pasquier distinguished himself here

particularly by opposing, sometimes successfully, the mis- chievous system of selling hereditary places and offices, which more perhaps than any single

thing was the curse of the older French monarchy. He was present at the famous States of Blois, where Guise was assassinated, and he met Montaigne there. The civil wars brought him much personal sorrow. His wife and children had remained in Paris much harassed by the Leaguers; Madame Pasquier was even imprisoned, and, though she regained her liberty, she died shortly afterwards, in 1590. Her youngest son was killed fighting on the royalist side the year before. For some years Pasquier lived at Tours, working steadily at his great book, but he returned to Paris in Henry IV.'s trainon the 22d March 1594. He continued until 1604 at his work in the Chambre des Comptes; then he retired. He survived this retirement more than ten years, produc- ing much literary work, and died after a few hours' illness on September 1, 1615, at the age of at least eighty-six.

In so long and so laborious a life Pasquier's work was naturally considerable, and it has never been fully collected or indced printed. The standard edition is that of Amsterdam, 1723, 2 vols. folio. But for ordinary readers the selections of M. Léon Feugére, pub- lished at Paris in 2 vols. 8vo, 1849, with au elaborate introduction, are most accessible. As a poet, though very far from contemptible, Pasquier is chiefly interesting as a minor member of the Pléiade movement. As a prose writer he is of much more account. The three chief divisions of his prose work are his Recherches, his letters, and his professional speeches. Al] are of much value as important documents in the history of the progress of French style. The Recherches and the letters have a value independent of this. The letters are of much biographical interest and historical importance, and the Recherches contain in a somewhat miscellaneous fashion invaluable information on a vast variety of subjects, literary, political, antiquarian, and other.

PASQUINADE is a variety of libel or lampoon, of which it is not easy to give an exact definition, separating it from other kinds. It should, perhaps, more especially deal with public men and public things. The distinction, however, has been rarely observed in practice, and the chief interest in the word is in its curious and rather legendary origin. According to the received tradition, Pasquino was a tailor (others say a cobbler) who had a biting tongue, and lived in the 15th century at Rome. His name, at the end of that

century or the beginning of the next, was transferred to a statue which had been dug up in a mutilated condition (some say near his shop) and was set up at the corner of the Palazzo Orsini (al. Palazzo Braschi). To this statue it became the custom to affix squibs on the papal Government and on prominent persons. At the beginning of the 16th century Pasquin had a partner pro- vided for him in the shape of another statue found in the Campus Martius, said to represent a river god, and dubbed Marforio, a foro Martis. The regulation form of the pasquinade then became one of dialogue or rather question and answer, in which Marforio usually addressed leading Inquiries to his friend. The proceeding soon attained a certain European notoriety, and a printed collection of the Squibs due to it (they were long written in Latin verse, with an occasional excursion into Greek) appeared in 1510. In the first book of Pantagruel (1532 or there- abouts) Rabelais introduces books by Pasquillus and Marphurius in the catalogue of the library of St Victor, and later he quotes some utterances of Pasquin's in his letters to the bishop of Maillezais. These, by the way, show that Pasquin was by no means always satirical, but dealt in grave advice and comment. The 16th century Was indeed Pasquin's palmy time, and in not a few of the Tare printed collections of his utterances Protestant polemic (which was pretty certainly not attempted on the actual statue) is mingled. These utterances were not only called pasquinades but simply pasquils (Pasquillus, Pas- quillo, Pasquille), and this form was sometimes used for the mythical personage himself. Under this title a con-

siderable satirical literature of quite a different kind from the original personal squibs and political comments grew up in England at the end of the 16th and the beginning of the 17th century under the titles of Pasquil's Apology, Pasquil's Nightcap, &e. The chief writers were Thomas Nash and, after his death, Nicholas Breton. These pieces (of extreme rarity, but lately reissued by the Rev. A. B. Grosart, in private reprints of the works of their authors) were in prose. The French pasquils (examples of which may be found in Fournier's Variétés Historiques et Lnttéraires) were more usually in verse. In Italy itself Pasquin is said not to have condescended to the vernacular till the 18th century. During the first two hundred years of his career few mornings, if any, found him unplacarded, and the institution

supplied a kind of rough and scurrilous gazette of public opinion. But the proceeding gradually lost its actuality, and was, moreover, looked on with less and less favour by the authorities. Indeed a sentinel was latterly posted to prevent the placarding. It is said, how- ever, that isolated pasquinades, having at least local ap- propriateness, occurred not many years ago. Marforio, it should be added, was soon removed from his companion's neighbourhood to the Capitol. Contemporary comic peri- odicals, especially in Italy, still occasionally use the Marforio-Pasquin dialogue form. But this survival is purely artificial and literary, and pasquinade has, as noted above, ceased to have any precise meaning.

PASSAU, anancient town and episcopal see of Bavaria, lies in the district of Lower Bavaria, and occupies a highly picturesque situation at the confluence of the Danube, the Inn, and the Ilz, 90 miles to the north-east of Munich, and close to the Austrian frontier. It consists of the town proper, on the rocky tongue of land between the Danube and the Inn, and of the three suburbs of Innstadt, on the right bank of the Inn, Ilzstadt, on the left bank of the Ilz, and Anger, in the angle between the Ilz and the Danube. Passau is one of the most beautiful places on the Danube, a fine effect being produced by the way in which the houses are piled one above another on the heights rising from the river. The best general view is obtained from the Oberhaus, an old fortress now uscd as a prison, which crowns a hill 300 feet high on the left bank of the Danube. A detailed inspection of the buildings of the town, most of which date fron: the 17th and 18th centuries, scarcely fulfils the expectation aroused by their imposing appearance as a whole. The most noteworthy are the cathedral, a florid rococo structure on the site of an earlier church, which claiuns to have been founded in the 5th century ; the post-office, in which the treaty of Passau was signed ; the episcopal palace ; the old Jesuit college, with a library of 30,000 volumes; the arsenal ; the Romanesque church of the Holy Cross; and the double church of St Salvator. The old forts and bastions have been deniolished, but the Niederhaus, at the base of the Oberhaus, is still extant, though no longer maintained as a fortress. The chief products of the insignificant industry of the town are tobacco, leather, and paper. It also possesses iron and copper foundries and a few barge-building yards. The well-known Passau cru- cibles are made at the neighbouring village of Obernzell. Trade is carried on

in iron and timber, large quantities of the latter being floated down the Ilz. The inhabitants (15,365 in 1880) are nearly all Roman Catholics.

Passau is a town of very ancicnt origin. The first settlement here is belicved to have been the Celtic Botudurum, on the site of the present Innstadt ; and the Romans afterwards established a colony of Batavian vetcrans (Castra Batava) on the site of the town proper. The bishopric was founded in the 8th century, and most of the sub- sequent history of Passau is made up of broils between the bishops

and the townsmen. The fortress of Oberhaus was erccted by the former in consequence of a revolt in the 13th century, and at a later

petiod its guns were often turned on the town. In 1552 Charles V. and Elector Maurice of Saxony here signed the treaty of Passau, by which the former was constrained to acknowledge the principle of religious toleration. The town was a frequent object of dispute in the war of the Spanish succession, and it was taken by the Austrians in 1806. he bishopric was secularized in 1803, and its territory annexed to Bavaria two years later. The present bishopric was established in 1817.

PASSERAT, Jean (1534-1602), a poet of merit and a contributor to the Satire Ménippée, was born at Paris in 1534. He was well educated, but is said to have played truant from school and to have had some curious adven- tures—at one time working in a mine. He was, however, a scholar by natural taste, and after a time he returned to his studies, Having finished them he became in his turn a teacher at the Collége de Plessis, and at the death of Ramus was made professor of Latin in the Collége de France. This, however, was not till 1572. In the mean- while Passerat had studied law, and had composed much agreeable poetry in the Pléiade style, the best pieces being his short ode “On the First of May,” and the charming villanelle “J’ai perdu ma tourterelle.” Like most of the men of letters and learning at the time, Passerat belonged to the politigues or moderate royalist party, and was strongly opposed to the League. His exact share in the Ménippée, the great manifesto of the politique party when it had declared itself for Henry of Navarre, is differently stated ; but it is agreed that he

wrote most of the verse, and the charming harangue of the guerilla chief Rieux is sometimes attributed to him. Towards the end of his life, after he had re-entered on the duties of his professorship, he became blind. He died at Paris in 1602, and his poems were not published completely till four years later. Passerat united with his learning abundant wit and a faculty of elegant and tender verse, and was altogether a good specimen of the man of letters of the time, free from pedantry while full of scholarship, and combining a healthy interest in politics and a taste for light literature with serious accomplishments. He had also a considerable reputation as an orator.

PASSIONFLOWER (Passiflora) is the typical genus of the order to which it gives its name. The species are mostly natives of western tropical South America; others are found in various tropical and subtropical districts of both hemispheres. The tacsonias, by some considered to form part of this genus, inhabit the Andes at considerable elevations. They are mostly climbing plants (fig. 1) having a woody stock and herbaceous or woody branches, from the sides of which tendrils are produced which enable the branches to support themselves at little expenditure of tissue. Some few form trees of considerable stature desti- tute of tendrils, and with broad magnolia-like leaves in place of the more or less palmately-lobed leaves which are most generally met with in the order. Whatever be the form of leaf, it is usually provided at the base of the leaf- stalk with stipules, which are inconspicuous, or large and leafy; and the stalk is also furnished with one or more glandular excrescences, as in some cases are the leaf itself and the bracts. The inflorescence is of a cymose character, the terminal branch being represented by the tendril, the side-branches by flower-stalks, or the inflorescence may be reduced to a single stalk, The bracts on the flower-stalk are either small and scattered or large and leafy, and then placed near the flower forming a sort of outer calyx or epicalyx. The flower itself (seen in section in fig. 2) consists of a calyx varying in form from that of a shallow saucer to that of a long cylindrical or trumpet-shaped tube, thin or fleshy in consistence, and giving off from its upper border the five sepals, the five petals (rarely these latter are absent), and the threads or membranous processes constituting the “corona.” This coronet forms

the most conspicuous and beautiful part of the flower of many species, and consists of outgrowths from the tube formed subsequently to the other parts, and having little morphological significance, but being physiologically useful in favouring the cross-fertilization of the flower by means of insects. Other outgrowths of similar character, but less conspicuous, occur lower down the- tube, and

Fic. 1.—Passiflora cerulea, var., showing leaf, stipule, tendril, and detached flower.

their variations afford useful means of discriminating between the species. From the base of the inner part of the tube of the flower, but quite free from it, uprises a cylindrical stalk-surrounded below by a small cup-like out-

+H) j GYNOPHORE

Fic. 2.— Flower of Passionflower cut through the centre to show the arrangement of its constituent parts, growth, and bearing above the middle a ring of five flat filaments each attached by a thread-like point to an anther. Above the ring of stamens is the ovary itself, upraised on a prolongation of the same stalk which bears the filaments, or sessile. The stalk supporting the stamens and ovary is called the “gynophore” or the “ oynandro- phore,” and is a special characteristic of the order, shared

ated

PAS—PAS

in by the Capparids and no other order. The ovary of passionflowers is one-celled with three parictal placentas, and bears at the top three styles, each capped by a large button-like stigma. The ovary ripens into a berry-like, very rarely capsular, fruit with the three groups of seeds arranged in lines along the walls, but embedded in a pulpy arillus derived from the stalk of the seed. This succulent berry is in some cases highly perfumed, and affords a delicate fruit for tlhe dessert-table as in the case of the “ranadilla,” P. quadrangularis, P. edulis, P. macrocarpa, and various species of Z’acsonia known as ‘“‘curubas” in Spanish South America. The fruits in question do not nsually exceed in size the dimensions of a hen’s or of a swan’s egg, but

that of P. macrocarpa is a gourd-like oblong fruit attaining a weight of 7 to 8 ib. Many species are cultivated for the beauty of their flowers, and one or two species are nearly hardy in south and western Britain and Ireland, the commonest, P. cerulea, being, singular to say, a native of southern Brazil. Many species of the Tacsonia would probably prove equally hardy. The name passionflower—jlos passionis—arose from the supposed resemblance of the corona to the crown of thorns, and of the other parts of the flower to the nails, or wounds, while the five sepals and five petals were taken to symbolize the ten apostles,— Peter, who denied, and Judas, who betrayed, being left out of the reckoning. In some of the botanical books of the 16th and 17th centuries curious illustrations of these flowers are given, in which the artist's faith or imagination has been exercised at the expense of actual fact.

PASSION PLAYS. See Drama, vol. vii. p. 404. On the Oberammergau Passion Play, see OBERAMMERGAU.

PASSION WEEK, thie fifth week in Lent, begins with Passion Sunday (Donunica Passionis or de Passione Domini), so called from very early times because with it begins the more special commemoration of Christ's passion. In non-Catholic circles Passion Week is often identified with Hoty WEEK (q.v.), but incorrectly.

PASSOVER anp FEAST OF UNLEAVENED BREAD, It is explained in the article Pentateucs (p. 511) that the ancient Israelites were accustomed to open the harvest season by a religious feast. No one tasted the new grain, not even parched or fresh ears of corn, till the first sheaf had been presented to Jehovah, and then all hastened to enjoy the new blessings of divine goodness by eating unleavened cakes, without waiting for the tedious process of fermenting the dough. This natural usage became fixed in custom, and at a comparatively early date a new significance was added to it by a reference to the exodus from Egypt, when, as tradition ran, the people in their hasty departure had no time to leaven the dough already in their troughs. The two elements of a thankful recogni- ion of God's goodness in the harvest, which every one was eager to taste the nioment that Jehovah had received His tribute at the sanctuary, and of grateful remembrance of the first proof of His kingship over Israel, went very

fittingly together. A similar combination is found in the thanksgiving of Deut xxvi. 5 sq, in the law, Deut. xxlv, 19-22, and elsewhere; the yearly blessings of the harvest were the proof of the continued goodness of Hini Who brought Israel forth from Egypt to set him in a fruitful and pleasant land ”

The feast of unleavened bread (Hebrew N1¥2, mageath), with the presentation of the harvest sheaf, which is its leading feature, presupposes agriculture and a fixed resi- dence in Canaan. In the pastoral life the same religious feelings find their natural expression in thank-offerings for the increase of the flocks and herds, consisting of sacrifices

of the firstlings of the flock and the fatlings thereof,” such as Gen. iv. 4 makes to date back from the very

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beginnings of human history. The firstlings answer to the first fruits; the increase of cattle falls mainly in the spring ; and spring is also the time of the best pasture in a climate where the harvest-tide lies between Easter and Whitsunday, the time therefore when a fat sacrifice can be selected and when vows would generally be fulfilled ; especially as the latter, among the pastoral Hebrews as among the Arabs, would frequently have reference to the multiplication of the flock. Abel’s sacrifice of firstlings and fatlings corresponds in fact exactly to the old Arabic fara and ‘atira, the former of which was the firstborn of the herd and the latter a sacrifice offered in the spring month Rajab in fulfilment of a vow conditional on the good increase of the herd.) The accumulation of the sacrifices of firstlings and fatlings at one season of the year would readily give rise to a spring feast, and it appears from the Jehovist that something of this kind existed before the exodus (see PENTATEUCH), and gave occasion to the request of Moses for leave to lead the people out into the wilderness to sacrifice to Jehovah. Pharaoh’s refusal was appropriately punished by the destruction of the firstborn of man and the firstlings of beasts in Egypt. The recollection of this fact reacted on the old Hebrew usage, and supplied a new reason for the sacrifice of all male firstlings after the Israelites were settled in Canaan (Exod. xiii. 11 sg.). Up to the time of Deuteronomy this sacrifice was not tied to any set feast (contrast Exod. xxli. 30 with Deut. xv. 20); the old

sacrificial spring feast, like the Arabic feast of Rajab, was not wholly dependent on the firstlings, but might also be derived from vows. But when Israel was thoroughly united under the kings the tendency plainly lay towards a concentration of acts of cultus in public feasts at the great sanctuaries; and the final result of this tendency, which appears to some degree in earlier laws, but reached its goal only through the Deuteronomic centralization of all sacrifices at the one sanctuary, was that the spring pastoral feast coalesced with the agricultural A/a¢roth, and that its sacrifices were swollen by the prohibition of continued private sacrifices of the male firstlings. This is the form of the Deutero- nomic passover (Deut. xvi. 1 sq.). The passover is a sacrifice drawn from the flock or the herd, presented at the sanctuary and eaten with unleavened bread. It is slain on the evening of the first day of the feast, so that the sacrificial feast is nocturnal; and the pilgrims may return to their homes next morning, but the abstinence from Teaven lasts seven days, and the seventh day, observed as a day of rest, is the ‘asereth or closing day of the feast. The passover is now viewed specially as a commemoration of the Exodus; and by and by, in Exod. xii. 27, its name (Heb. NDB, Gr. wécxa, Lat. pascha) is explained from Jehovah “passing over” the Israelites when he smote Egypt. That this was the original meaning is by no means clear; there is no certain occurrence of the name before Deuteronomy (in Exod. xxxiv. 25 it looks lke a gloss), and the corresponding verb denotes some kind of religious performance, apparently a dance, in 1 Kings xviii. 26. A nocturnal ceremony at the consecration of a feast is already alluded to in Isa. xxx. 29, who also perhaps alludes to the received derivation of MDD in ch. xxxi. 5. But the Deuteronomic passover was a new thing in the days of Josiah (2 Kings xxiii. 21 sq). It underwent a farther modification in the exile, when sacrifices in the proper sense of the word were impossible, but the com- memorative side of the feast was perpetuated in the house- hold meal of the paschal lamb, eaten with unleavened bread and bitter herbs (Exod. xii.—from the Priestly Code). The paschal lamb is quite different from the paschal

1 Yuzeni ou Harith’s Ao adl., 1. 69; Bokhari, vi. 207 (Bulak vocalized edition).

sacrifices of Deuteronomy and from the ancient firstlings. In Deuteronomy, for example, the sacrifices may be either from the flock or from the herd, and are boiled, not roasted (A.V. in Deut. xvi. 7 mistranslates); the paschal lamb is necessarily roasted, and the only traces of sacrificial character that remain to it are the sprinkling of the blood on the lintel and door-posts,! and the burning of what is not eaten of it. After the restoration the passover seems to have retained its domestic character, for, though the feast at the sanctuary was renewed, its public features now con

sisted of a series of holocausts and sin-offerings continued for seven days (Num. xxix. 16 sq.). The feast is now exactly dated.?2 The paschal lamb is chosen on the tenth day of the first month (Abib or Nisan) and slain on the even

ing of the fourteenth. Next day—that is, the fifteenth— is now the first day of the feast proper (a change from the Deuteronomic ordinance naturally flowing from the fact that the properly paschal ceremony is now not festal but domestic), so that the seven days end with the twenty first and close with a " holy assembly" at Jerusalem, The old ceremony of presenting the first sheaf had been fixed, in Lev. xxiii. 11, for the '' morrow after the Sabbath," This naturally means that the solemn opening of harvest was to take place on a Sunday. But when the feast was fixed to set days of the month the "Sabbath" was taken to mean the first day of the feast or of unleavened bread (Nisan 15), and the sheaf was presented on the sixteenth.? As the feast was now again a great pilgrimage occasion, there was a natural tendency to restore to the pasclial lamb a more strictly sacrificial character. This tendency does not appear as yet inthe Pentateuch, where the latest provisions are those put in historical form in Exod. xii.; but in 2 Chron. xxxv., which must be taken as describing the practice of the author's own time, the paschal lamb is slain before the temple, the blood is sprinkled and the fat burned (? verse 14) on the altar; and at the same time we find the Deuteronomic paschal sacrifices existing side by side with the paschal lamb of the later law as subsidiary sacrifices. The later Jewish usage followed this practice ; the Deuteronomic sacrifices in their new subsidiary form constituted the so-called hagiga. The pre-eminent import- ance which the passover (with the feast of unleavened bread) acquired after the exile, from the fact that its rites, like those of the Sabbath and of circumcision, could be

in great part adapted to the circumstances of the dispersion, was still further increased by the fall of the second temple, and the ritual of the Mishna (Pesihim) was supplemented by the later paschal Haggada. The lamb, however, not being slain at the temple, is not in later praxis regarded as strictly the paschal lamb of the law. Some of the post- Biblical features are of interest in connexion with the New Testament, and especially with the last supper. The company for a single lamb varied from ten to twenty; the bitter herbs and unleavened cakes were dipped in a kind of sweet sauce called hardseth ; and the meal was accom- panied by the circulation of four cups of wine and by songs of praise, particularly the Hallel (Ps. exiii—cxviii.).

_ The history of the passover is one of the most complicated sub- jects in Hebrew archeology, and has been a great battlefield of Pentateuch criticism. The present article should thercfore be read

with the article PentatrucnH. The older books on Hebrew archeology are of little use, exccpt for the later Jewish practicc ;

u The sprinkling of blood on a tent in order to put it under divine Pieienon appears also among the Arabs; Wakidi, ed. Kremer, p. 28. ; In everything that has to do with sacrifice a day means the day- time with the following night; in other words, the feast days do not begin in the evening. Compare Reland, Ant. HWeb., iv. § 15. This exegesis and practice are as old as the LXX. version of Leviticus. The passage of Leviticus has given risc to much contro-

Ke the commentaries and Lightfoot’s Hore on Luke vi. I, cts ii, 1.

on this full details will be found in Bartolocci’s Bibliotheca Rabbinica, or in Bodeuschatz’s Kirehliche Verfassung der Juden. The Biblical data can only be understood in connexion with a criti- cal view of the Pentateuch, and have been discussed in this con- nexion by Kucnen (G@odsdienst), Wellhauscn (Prolegomena), and others. The present position of those who oppose the Grafian hypothesis may be gathered from Delitzsch’s art. ‘‘Passah” in Richm’s Handworterbuch, and from Dillmann’s commentary

on Exodus and Leviticus. Hupfeld, De vera et primitiva Festorum . ratione, 1852-65, and Ewald's Antiquities, may also be con- sulted. CW. Ree

PASSPORT. A passport or safe conduct in time of war is a document granted by a belligerent power to protect persons and property from thie operation of hostilities, In the case of the ship of a neutral power, the passport isa

requisition by the Government of the neutral state to suffer

the vessel to pass freely with her crew, cargo, passengers,

&e., without molestation by the belligerents. The requisi- tion, when issued by the civil authorities of the port from which the vessel is fitted out, is called a sea-letter. But the terms passport and sea-letter are often used indis- criminately. A form of sea-letter (litera salvi conductus) is appended to the treaty of the Pyrenees, 1659. The passport is frequently mentioned in treaties, e.g., the treaty of Copenhagen, 1670, between Great Britain and Denmark. The violation of a passport, or safe conduct, is a grave breach of international law. The offence in the United States is punishable by fine and imprisonment where the passport or safe conduct is granted under the authority of the United States (Act of Congress, April 30, 1790). In time of peace a passport is still necessary for foreigners travelling in certain countries, and is always useful, even when not necessary, as a ready means of proving identity. It is usually granted by the foreign office of a state, or by its diplomatic agents abroad. Passports granted in England are subject to a stamp duty of sixpence. They may be granted to naturalized as well as natural- born British subjects. Sweden was the first country to abolish passports in time of peace, and Russia is one of the last to retainthem. They are demandable from foreigners in England on their arrival from abroad by 6 & 7 Will. IV. ec. 11, § 3; but this provision is not enforced in practice.

PASTE, or Srrass. See Grass, vol. x. p. 665.

PASTON LETTERS. This invaluable collection of documents consists of the correspondence of the principal members of the Paston family in Norfolk between the years 1424 and 1506, including several state papers and other documents accidentally in their possession. The papers appear to have been sold by William Paston, second earl. of Yarmouth, the last

representative of the family, to the antiquary Le Neve early in the 18th century. After Le Neve's death in 1729 they came into the hands of Mr Thomas Martin of Palgrave, who had married his widow, and upon Martin's death in or about 1771 were purchased by Worth, a chemist at Diss, from whose executors they were subsequently bought by Mr (afterwards Sir) John Fenn. In 1787 Fenn published two volumes of selections from the MSS., whose extreme value was at once recognized by Horace Walpole and other competent judges. In acknowledgment of his services Fenn received the honour of knighthood, and on this occasion, May 28, 1787, presented to the king three bound volumes of MSS. containing the originals of the documents printed by him. Most unfortunately these volumes have disappeared, and the originals of two more subsequently published by Sir John Fenn, and of a fifth edited after his death by Mr Serjeant Frere, were also lost until very re- cently. Under these circumstances it is not surprising that doubts should have been raised as to the authenticity of the papers. Their genuineness was impugned by Mr Herman Merivale in No. 8 of the Fortnightly Review, but

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satisfactorily vindicated on grounds of internal evidence by Mr James Gairdner of the Record Office in No. 11 of the same periodical. Within a year Mr Gairdner's position was established by the discovery (1865) of the originals of the fifth volume at Mr Serjeant Frere's house at Dungate, Cambridgeshire. In 1875 the original MSS. of the third and fourth, with many additional letters, were found at the family mansion of the Freres at Roydon Hall, near Diss. The MSS. presented to the king have not been found, and were probably appropriated by some person about the court. In 1872—75 Mr Gairdner published a most careful and accurate edition in three volumes in Arber's English reprints, accompanied with valuable introductions to each volume, including an historical survey of the reign of Henry VI., notes, and index, and incorporating more than four hundred additional letters derived from Magdalen College, Oxford, and other quarters. Abstracts of some of the additional letters discovered at Roydon were added in an appendix. The total number of documents printed wholly or in abstract is one thousand and six. A thousand family letters of the 15th century must in any case be full of interest; the Paston letters are peculiarly

interesting from the importance and in some respects the representative character of the family. The founder was Clement Paston, a humble peasant living at

the end of the 14th century, who throve in the world ‘

and gave his son William the sound education which enabled him to rise to the position of justice of the common pleas. Judge Paston acquired much landed property in Norfolk, and in the days of his son John, in 1459, the family was greatly enriched by a bequest from the stout old soldier but grasping usurer Sir John Fastolf, a kinsman of Sir John Paston’s wife. The Pastons, however, were even at that time greatly harassed by rival claimants to their estates; and Sir John’s legacy involved them in a fresh set of troubles and contentions, which were not allayed until the time of the third Sir John Paston, about 1480, This perturbed state of affairs imparts especial Interest to the correspondence, causing it to reflect the general condition of England during the period. It was a time of trouble, when the weakness of the Government had disorganized the administration in every branch, when the succession to the crown itself was contested, when great nobles lived in a condition of civil war, when the prevalent anarchy and discontent found expression in tumultuary insurrections like Cade’s, countenanced, as the Paston letters show, by persons of condition, when any man’s property might be assailed with or without colour of law by covetous rivals, and upstart families like the Pastons were especially exposed to attack. The correspondence therefore exhibits them in a great variety of relations to their neighbours, friendly or hostile, and abounds with illustrations of the course of public events, as well as of the manners and morals of the time. Nothing is more remarkable than the habitual acquaintance of educated people with the law, which was evidently indispensable to & person of substance. In its broader aspects the corre- spondence exhibits human nature much as it is now, except for the notable deficiency in public spirit, and the absence of large views or worthy interests in life. The contrast with our own times is instructive, showing how largely commerce and literature, art and travel, have contributed to augment moral and intellectual as well as material wealth. After the death of the second Sir John Paston, grandson of the judge, in 1479, the letters become scanty and of merely personal interest. The family continued to flourish. In the next century it produced

Clement Paston, a distinguished naval commander under Henry VIII. ; and Mm the days of Charles II. Sir Robert Paston was raised to the peerage as earl of Yarmouth. His son dissipated

scholastic writer of the preceding age.

the hereditary property, and the title and the family became extinct upon his death in 1732. (R. G.)

PASTORAL is the name given to a certain class of modern literature in which the “idyl” of the Greeks and the “eclogue” of the Latins are imitated. It was a growth of humanism at the Renaissance, and its first home was Italy. Virgil had been imitated, even in the Middle Ages, but it was the example of TuHrocritus (¢.v.) that was originally followed in pastoral. Pastoral, as it appeared in Tuscany in the 16th century, was really a developed eclogue, an idyl which had been expanded from a single scene into a drama. ‘The first dramatic pastoral which is known to exist is the Favola di Orfeo of Politian, which was represented at Mantua in 1472. This poem, which has been elegantly translated by Mr J. A. Symonds, was a tragedy, with choral passages, on an idyllic theme, and is perhaps too grave in tone to be considered as a pure piece of pastoral. It led the way more directly to tragedy than to pastoral, and it is the Zl Sagrijizio of Agostino Beccari, which was played at the court of Ferrara in 1554, that is always quoted as the first complete and actual dramatic pastoral in European literature.

In the west of Europe there were various efforts made in the direction of non-dramatic pastoral, which it is hard

to classify. Early in the 16th century Alexander Barclay,

in England, translated the Latin eclogues of Mantuanus, a Barnabe Googe, a generation later, in 1563, published his Hglogs, Epytaphes, and Sonnettes, a deliberate but not very successful attempt to introduce pastoral into English

literature. In France it is difficult to deny the title of pastoral to various productions of the poets of the Pléiade, but especially to Rémy Belleau's pretty miscellany of prose and verse in praisé of a country life, called La Bergerie (1565). But the final impulse was given to non-dramatic pastoral by the publication, in 1504, of the famous Arcadia of G. Sannazaro, a work which passed through sixty editions before the close of the 16th century, and which was abundantly copied. Torquato Tasso followed Beccari after an interval of twenty years, and by the success of his Aminta, which was performed before the court of Ferrara in 1573, secured the popularity of dramatic pastoral. Most of the existing works in this class may be traced back to the influence either of the Arcadia or of the Aminta. Tasso was immediately succeeded by Alvisio Pasqualigo, who gave a comic turn to pastoral drama, and by Cristoforo Castelletti, in whose hands it grew heroic and romantic, while, finally, Guarini produced in 1590 his famous Pastor Fido, and Ongaro his fishermen's pastoral of Alceo. During the last quarter of the 16th century pastoral drama was really a power in Italy. Some of the best poetry of the age was written in this form, to be acted privately on the stages of the little court theatres that were every- where springing up. Ina short time music was introduced, and rapidly predominated, until the little forms of tragedy, and pastoral altogether, were merged in opera.

With the reign of Elizabeth a certain tendency to pastoral was introduced in England. In Gascoigne and in Whetstone traces have been observed of a tendency towards the form and spirit of eclogue. It has been con- jectured that this tendency, combined with the study of the few extant eclogues of Clément Marot, led Spenser to the composition of what is the finest example of pastoral in the English language, the Shepherd's Calendar, printed in 1579. This famous work is divided into twelve eclogues, and is remarkable because of the constancy with which Spenser turns in it from the artificial Latin style of pastoral then popular in Italy, and takes his inspiration direct from Theocritus. It is important to note that this is the first effort made in European litera-

ture to bring upon a pastoral stage the actual rustics of a modern country, using their own peasant dialect. That Spenser's attempt was very imperfectly carried out does not militate against the genuineness of the effort, which the very adoption of such names as Willie and Cuddie, instead of the customary Damon and Daphnis, is enough to prove. Having led up to this work, the influence of which was to be confined to England, we return to Sannazaro's Arcadia, which left its mark upon every literature in Europe. This remarkable romance, which was the type and the original of so many succeeding pastorals, is written in rich but not laborious periods of musical prose, into which are inserted at frequent intervals passages of verse, contests between shepherds on the "humile fistula di Coridone," or laments for the death' of some beautiful virgin. The characters move in a world of supernatural and brilliant beings; they commune without surprise with "i gloriosi spirti degli boschi," and reflect with singular completeness their author's longing for an innocent voluptuous existence, with no hell or heaven in the background.

It was in Spain that the influence of the Arcadia made itself most rapidly felt outside Italy. Gil Vicente, who was also a Portuguese writer, had written Spanish religious pastorals early in the 16th century. But Garcilaso de la Vega is the founder of Spanish pastoral. His first eclogue, El dulce lamentar de los pastores, is considered one of the finest poems of its kind in ancient or in modern literature. He wrote little and died early, in 1536. Two Portuguese poets followed him, and composed pastorals in Spanish, Francisco de S4 de Miranda, who imitated Theocritus, and the famous Jorge de Montemayor, whose Diana (1524) was founded on Sannazaro's Arcadia. Gaspar Gil Polo, after the death of Montemayor in 1561, completed his romance, and published in 1564 a Diana enamorada. It will be recollected that both these works are mentioned with respect, in their kind, by Cervantes. The author of Don Quixote himself published an admirable pastoral romance, Galatea, in 1584. The rise of the taste for picaresque literature in Spain towards the close of the 16th century was fatal to the writers of pastoral. In Portugal it can hardly be said that this form of literature has ever existed, although Camoens published idyls.

In France there has always been so strong a tendency towards a graceful sort of bucolic literature that it is hard to decide what should and what

should not be mentioned here. The charming pastourelles of the 13th century, with their knight on horseback and shepherdess by the road- side, need not detain us further than to hint that when the influence of Italian pastoral began to be felt in France these earlier lyrics gave it a national inclination. We have mentioned the Bergerie of Rémy Belleau, in which the art of Sannazaro seems to join hands with the simple sweetness of the medieval pastourele. But there was nothing in France that could compare with the school of Spanish pastoral writers which we have just noticed. Even the typical French pastoral, the Astrée of Honoré @Urfé (1610), has almost more connexion with the knightly romances which Cervantes laughed at than with the pastorals which he praised. D'Urfé had been preceded by Nicolas de Montreux, whose Bergeries de Juliette are Just worthy of mention. The famous Asétrée was the result of the study of Tasso's Aminta on the one hand and Montemayor's Diana on the other, with a strong flavouring of the romantic spirit of the Amadis. To remedy the pagan tendency of the Astrée a priest, Camus de Pontecarré, wrote a series of Christian pastorals. Of the romances which followed in the wake of the Astrée, and in which the pastoral element was gradually reduced toa minimum, a succinct but admirable account is given in Mr Saintsbury's

Short History of French Interature. The main authors in this style were Mademoiselle de Scudéry, La Calprenéde, and Gomberville. Racon produced in 1625 a pastoral drama, Les Bergeries, founded on the Astrée of D'Urfé.

In England the movement in favour of Theocritean simplicity which had been introduced by Spenser in the Shepherd's Calendar was immediately defeated by the success of Sir Philip Sidney's Arcadia, a romance closely modelled on the masterpiece of Sannazaro. So far from attempting to sink to colloquial idiom, and adopt a realism in rustic dialect, the tenor of Sidney's narrative is even more grave and stately than it is conceivable that the con- versation of the most serious nobles can have ever been. In these two remarkable books, then, we have two great contemporaries and friends, the leading men of letters of their generation, trying their earliest flights in the region of pastoral, and producing typical masterpieces in each of the

two great branches of that species of poetry. Hence- forward, in England, pastoral took one or other of these forms. It very shortly appeared, however, that the San- nazarean form was more suited to the temper of the age, even in England, than the Theocritean. In 1583 a great impetus was given to the former by Robert Greene, who was composing his Morando, and still more in 1584 by the publication of two pastoral dramas, the Gallathea of Liyly and the Arraignment of Paris of Peele. It is doubtful whether either of these writers knew anything about the Arcadia of Sidney, which was posthumously published, but Greene, at all events, became more and more imbued with the Italian spirit of pastoral. His Menaphon and his Never too Late are pure bucolic romances, While in the general form of his stories, how- ever, he follows Sidney, the verse which he introduces is often, especially in the Menaphon, extremely rustic and colloquial. In 1589 Lodge appended some eclogues to his Sella's Metamorphosis, but in his Rosalynde (1590) he made a much more important contribution to English literature in general, and to Arcadian poetry in particular. This beautiful and fantastic book is modelled niore exactly upon the masterpiece of Sannazaro than any other in our language. The other works of Lodge scarcely come under the head of pastoral, although his Phillis in 1593 included some pastoral sonnets, and his M/argarite of America (1596) is modelled in form upon the Arcadia. The Stxe Ldillia of 1588, paraphrases of Theocritus, are anonymous, but conjecture has attributed them to Sir Edward Dyer. In 1598 Bartholomew Young published an English version of the Diana of Montemayor.

In 1585 Watson published his collection of Latin elegiacal eclogues, entitled Amyntas, which was translated into English by Abraham Fraunce in 1587. Watson is also the author of two frigid pastorals, MJelibeus (1590) and Amyntze Gaudia (1592). John Dickenson printed at adate unstated, but probably not later than 1592, a " pas- sionate eclogue" called The Shepherd's Complaint, which begins with a harsh burst of hexameters, but which soon settles down into a harmonious prose story, with lyrical interludes. In 1594 the same writer published the romance of Avisbas. Drayton is the next pastoral poet m date of publication. His Jdea: Shepherd's Garland bears the date 1593, but was probably written much earlier. In 1595 the same poet produced an Endimion and Phebe, which was the least happy of his works. He then turned his fluent pen to the other

branches of poetic literature; but after more than thirty years, at the very close of his life, he returned to this early love, and published in 1627 two pastorals, The Quest of Cynthia and The Shepherd's Sirena. The general character of all these pieces is rich, but vague and unimpassioned. The Queens Arcadia of Daniel must be allowed to lie open to the sane

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charge, and to have been written rather in accordance with a fashion, than in following of the author's predomin- ant impulse. It may be added that the extremely bucolic title of Warner's first work, Pan. his Syrinx, is mislead- ing, These prose stories have nothing pastoral about them. 'The singular eclogue by Barnfield, Zhe Affectionate Shepherd, printed in 1594, is an exercise on the theme "© crudelis Alexi, nihil mea carmina curas," and, in spite of its juvenility and indiscretion, takes rank as the first really poetical following of Spenser and Virgil, in distinc- tion to Sidney and Sannazaro. Marlowe's pastoral lyric Come live with Me, although not printed until 1599, has been attributed to 1589. In 1600 was printed the anony- mous pastoral comedy in rhyme, The Maid's Metamor- phosis, long attributed to Lyly.

With the close of the 16th century pastoral literature was not extinguished in England as suddenly or as com- pletely as it was in Italy and Spain. Throughout the romantic Jacobean age the English love of country life asserted itself under the guise of pastoral sentiment, and the influence of Tasso and Guarini was felt in England just when it had ceased to be active inItaly. In England it became the fashion to publish lyrical eclogues, usually in short measure, a class of poetry peculiar to the nation and to that age. The lighter staves of Zhe Shepherd's Calendar were the model after which all these graceful productions were drawn. We must confine ourselves to a brief enumeration of the principal among these Jacobean eclogues. Nicholas Breton came first with his Passeonate Shepherd in 1604. Wither followed with The Shepherd's Hunting in 1615, and Braithwaite, an inferior writer, published The Poet's Willow in 1613 and Shepherd's Tales in 1621. The mention of Wither must recall to our minds that of his friend William Browne, who published in 1613-16 his beautiful collection of Devonshire idyls called Britanna's Pastorals. These were in heroic verse, and less

distinctly Spenserian in character than those eclogues recently mentioned. In 1614 Browne, Wither, Christopher Brook, and Davies of Hereford united in the composition of a little volume of pastorals entitled The Shepherd's Pipe. Meanwhile the composition of pastoral dramas was not entirely discontinued. In 1606 Day dramatized part of Sidney's Arcadia in his Jsle of Gulls, and about 1625 the Rev. Thomas Goffe composed his Careless Shepherdess, which Ben Jonson deigned to imitate in the opening lines of his Sad Shepherd. In 1610 Fletcher produced his Faithful Shepherdess in emulation of the Aminta of Tasso. This is the principal pastoral play in our language, and, in spite of its faults in moral taste, it preserves a fascination Which has evaporated from miost of its fellows. The Arcades of Milton is scarcely dramatic ; but it is a bucolic ode of great stateliness and beauty. In the Sad Shepherd, which was perhaps written about 1635, and in his pastoral masques, we see Ben Jonson not disdaining to follow along the track that Fletcher had pointed out in the Faithful Shepherdess. With the Piscatory Eclogues of Phineas Fletcher, in 1633, we may take leave of the more studied forms of pastoral in England early in the 17th century.

When pastoral had declined in all the other nations of Europe, it enjoyed a curious recrudescence in Holland. More than a century after date, the Arcadia of Sannazaro began to exercise an influence on Dutch literature. Johan van Heemskirk led the way with his popular Batavische Arcadia in 1637. In this curious romance the shepherds and shepherdesses move to and fro between Katwijk and the Hague, ina landscape unaffectedly Dutch. Heemskirk had a troop of imitators. Hendrik Zoeteboom published his Zaanlandsche Arcadia in 1658, and Lambertus Bos his Dordische Arcadia in 1662. These local imitations of the suave Italian pastoral were followed by still more crude

romances, the Motterdamsche Arcadia of Willem den Elger, the Walchersche Arcadia of Gargon, and the Noordwijker Arcadia of Jacobus van der Valk. Germany has nothing to offer us of this class, for the Diana of Werder (1644) and Die adriatische Rosamund of Zesen (1645) are scarcely pastorals even in form.

In England the writing of eclogues of the sub-Spenserian class of Breton and Wither led in another generation to a rich growth of lyrics which may be roughly called pastoral, but are not strictly bucolic. Carew, Lovelace, Suckling, Stanley, and Cartwright are lyrists who all contributed to this harvest of country-song, but by far the most copious and the most characteristic of the pastoral lyrists is Herrick. He has, perhaps, no rival in modern literature in this particular direction. His command of his resources, his deep originality and observation, his power of concen- trating his genius on the details of rural beauty, his interest in recording homely facts of country life, combined with his extraordinary gift of song to place him in the very first rank among pastoral writers; and it is noticeable that in Herrick's hands, for the first time, the pastoral became a real and modern, instead of being an ideal and humanistic thing. From him we date the recognition in poetry of the humble beauty that lies about our doors. His genius and influence were almost instantly obscured by the Restoration. During the final decline of the Jacobean drama a certain number of pastorals were still produced. Of these the only ones which deserve mention are three dramatic adaptations, Shirley's Arcadia (1640), Fanshawe's Pastor Iido (1646), and Leonard Willan's Astrea (1651). The last pastoral drama in the 17th century was Settle's Pastor Fido (1677). The Restoration was extremely unfavourable to this species of literature. Sir Charles Sedley, Aphra Behn, and Congreve published eclogues, and the Pastoral Dialogue between Thirsis and Strephon of the first-mentioned was much admired. All of these, however, are in the highest degree insipid and unreal, and partook of the extreme artificiality of the age.

Pastoral came into fashion again early in the 18th century. The controversy in the Guardian, the famous critique on Ambrose Philips's Pastorals, the anger and rivalry of Pope, and the doubt which must always exist as to Steele's share in the mystification, give 1708 a consider- able importance in the annals of bucolic writing. Pope had written his idyls first, and it was a source of infinite annoyance to him that Philips contrived to precede him in publication. He succeeded in throwing ridicule on Philips, however, and his own pastorals were greatly admired. Yet there was some nature in Philips, and, though Pope is more elegant and faultless, he is not one whit more genuinely bucolic than his rival. A far better writer of pastoral than either is Gay, whose Shepherd's Week was a serious attempt to throw to the winds

the ridiculous Arcadian tradition of nymphs and swains, and to copy Theocritus in his simplicity. Gay was far more successful in executing this pleasing and natural cycle of poems than in writing his pastoral tragedy of Dione or his “tragi-comico pastoral farce” of The What dye call i (1715). He deserves a very high place in the history of English pastoral on the score of his Shepherd’s Week. Swift proposed to Gay that he should write a Newgate pastoral in which the swains and nymphs should talk and warble in slang. This Gay never did attempt; but a northern admirer of his and Pope’s achieved a veritable and lasting success in Lowland Scotch, a dialect then considered no less beneath the dignity of verse. Allan Ramsay’s Gentle Shepherd, published in 1725, was the last, and remains the most vertebrate and interesting, bucolic drama produced in Great Britain. The literary value of this play has been exaggerated, but it is a very clever and natural essay, and

the best proof of its success as a painting of bucolic life is that it is still a favourite, after a hundred and fifty years, among lowland reapers and milkmaids.

With the Gentle Shepherd the chronicle of pastoral in England practically closes. This is at least the last per- formance which can be described as a developed eclogue of the school of Tasso and Guarini. It is in Switzerland that we find the next important revival of pastoral pro- perly so-called. The taste of the 18th century was very agreeably tickled by the religious idyls of Salomon Gessner, who died in 1787. His Daphnis und Phillis and Der Tod Abel’s were read and imitated throughout Europe. In German literature they left but little mark, but in France they were cleverly copied by Arnaud Berquin. A much more important pastoral writer is Jean Pierre Clovis de Florian, who began by imitating the Galatea of Cervantes, and continued with an original bucolic romance entitled Fistelle. His eclogues had a great popularity, but it was said that they would be perfect if only there were sometimes wolves in the sheepfolds. The tone of Florian, as a matter of fact, is tame to fatuity. Neither in France nor in Germany did the shepherds and shepherdesses enjoy any considerable vogue. It has always been noticeable that pastoral is a form of literature which disappears before a

breath of ridicule. Neither Gessner nor his follower Abbt were able to survive the laughter of Herder. Since Florian and Gessner there has been no reappearance of bucolic literature properly so-called. The whole spirit of romanticism was fatal to pastoral. Voss in his Luise and Goethe in Hermann und Dorothea replaced it by poetic scenes from homely and simple life.

Half a century later something like pastoral reappeared in a totally new form, in the fashion for Dorfgeschichten. About 1830 the Danish poet 8. §. Blicher, whose work con- nects the grim studies of our own Crabbe with the milder modern strain of pastoral, began to publish his studies of out-door romance among the poor in Jutland. Immermann followed in Germany with his novel Der Oberhof in 1839. Auerbach, who has given to the 19th-century idyl its peculiar character, began to publish his Schwarzwdélder Dorfgeschichten in 1843. Meanwhile George Sand was writing Jeanne in 1844, which was followed by Za Mare au Diable and Frangois le Champi, and in England Clough produced in 1848 his remarkable long-vacation pastoral The Bothie of Tober-na-Vuolich. It seems almost certain that these writers followed a simultaneous but independent impulse in this curious return to bucolic life, in which, however, in every case, the old tiresome conventionality and affectation of lady-like airs and graces were entirely dropped. This school of writers was presently enriched in Norway by Bjérnson, whose Synnéve Solbakken was the first of an exquisite series of pastoral romances. But perhaps the best of all modern pastoral romances is Fritz Reuter’s Ut mine Stromtid, written in the Mecklenburg dialect of German. In England the Dorsetshire poems of Mr Barnes and the Dorsetshire novels of Mr Hardy belong to the same class, which has finally been augmented by the ap- pearance of Mr Munby’s remarkable idyl of Dorothy. It will be noticed of course that all these recent productions have so much in common with the literature which is pro- duced around them that they almost evade separate classifi- cation. It is conceivable that some poet, in following the antiquarian tendency of the age, may enshrine his fancy once more in the five acts of a pure pastoral drama of the school of Tasso and Fletcher, but any great vitality in pastoral is hardly to be looked for in the future. (E. W. G.)

PASTORAL EPISTLES, the name given to three epistles of the New Testament which bear the name of St Paul, and of which two are addressed

to Timothy and one to Titus. The reason of their being grouped together

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is that they are marked off from the other Pauline epistles

by certain common characteristics of language and subject- matter ; and the reason of their special name is that they consist almost exclusively of admonitions for the pastoral administration of Christian communities. None of the Pauline epistles have given greater ground for discussion, partly on account of the nature of their contents, partly on account of their philological peculiarities, and partly on account of their historical difficulties.

1. Contents.—The Pastoral Epistles are chiefly distin- guished from the other Pauline epistles by the prominence which they give to doctrine. From an objective point of view Christian teaching is ‘‘the word” (2 Tim. iv. 2), or “the word of God” (2 Tim. ii. 9), or “the doctrine of God our Saviour” (Tit. ii, 10), or “the truth” (1 Tim. iii. 15, 2 Tim. i. 18; iv. 4; Tit. i, 14), or “the faith” (1 Tim. iy, 1). From the point of view of the individual it is “the knowledge of the truth”.(2 Tim. ii. 25; iii. 7); and Chris- tians are those who “believe and know the truth” (1 Tim. iv. 3). It had existed long enough to have become perverted, and hence a stress is laid upon “sound” doctrine! (1 Tim. i. 10; 2 Tim. iv. 3; Tite ii. 1; in the plural, “sound words,” 1 Tim. vi. 3; 2 Tim. i. 13). It had also tended to become dissociated from right conduct; hence a stress is laid upon a “ pure con- sclence” (1 Tim. i. 19; iii. 8), and the end which it endeavours to attain is ‘‘love out of a pure heart, and out of a good conscience, and out of unfeigned faith” (1 Tim. i. 5). Consequently the “things that befit the sound doctrine” are moral attributes and duties (Tit. ii. 1 sq.), and the things that are “contrary to the sound doctrine” (1 Tim. i. 10) are moral vices. This combina- tion of sound doctrine and right conduct is “ piety” (evoéBeaca, 1 Tim. ii. 2; iii. 16; iv. 7, 8; vi. 5, 6, 11; 2 Tim. ili. 4) or “godliness” (@ecooéBeca, 1 Tim. ii. 10); and sound doctrine is, in other words, “the doctrine,” or “the truth, that is in harmony with piety” (1 Tim. vi. 3; Tit. ti TL) eo in the hands of the church or community (1 Tim. vi. 20; 2 Tim. i. 14), and is therefore a “common faith” (Tit, i. 4), of which the church is the “pillar and stay” (1 Tim. iii, 15). Its substance appears to be given in 1 Tim. iii. 16, which has been regarded, not without

reason, as a rudimentary form of creed, and possibly part of a liturgical hymn. But the church is no longer identical with “them that are being saved” or “the elect”; it is compared to “a great house” which contains vessels “some unto honour, and some unto dishonour” (2 Tim. ii. 20). It is in other words no longer an ideal commu- nity, the “Israel of God” (Gal. vi. 16), but a visible society. And, being such, its organization had come to be of more importance than before. But the nature of the organization to which these epistles point is an unsolved problem. The solution of that problem is attended by the preliminary question, which in the absence of collateral evidence cannot be definitely answered, of the relation in which Timothy and Titus are conceived to stand to the other or ordinary officers. According toa tradition mentioned by Eusebius, but for which he gives no definite authority, Timothy was “bishop” of Ephesus and Titus of Crete; according to others their position was rather that of the later “metropolitans”; and some modern writers, accepting one or other of these views, take it as part of the proof that the epistles belong toa period of the 2d century in which the monarchical idea of the episcopate was struggling to assert itself. On the

1 Most commentators have omitted to note that the word rendered “sound ” is a common expression of some of the later Greek philo- sophers. denoting simply “true,” e.g., Epictet., Dissert., i. 11, 28; i. 1D, 2s

This doctrine or truth is regarded as a sacred.

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- other hand, it appears from the epistles themselves that

the positions of Timothy and Titus were temporary rather than permanent, and that they were special delegates rather than ordinary officers (1 Tim. ui. 14, 15; iv. 13; Tit. iii, 12). For the ordinary officers the qualifications are almost all moral, and they are so similar to each other, and to the moral qualifications of all Christians, as to imply that the sharp distinctions of later times between one grade of office and another, and between the officers and the other members of the communities, were not yet developed (1 Tim. iii, 2-12; Tit. i. 6-9, possibly also ii. 9-6). The most probable

solution of the difficulties which present themselves in relation to the apparent interchange of the names ‘‘ bishop” and “elder,” and to the apparent double use of the word “elder,” sometimes as a title and sometimes as a designation of age, is that in these epistles there is an imperfect amalgamation of two forms of organization, Jewish and Gentile: in the former the dis- tinction between the governing and the governed classes was mainly that of age, and the functions of the govern- ing class were mainly those of discipline; in the latter the distinction was mainly that of functions, and the functions were mainly those of administration. (1) The distinction between elder and younger appears in regard to both men and women (1 Tim. v. 1, 2; Tit. ii, 2-6). Out of the elder men some appear to have been chosen or appointed to preside (of zpocorares, 1 Tim. v. 17; a cognate form of the designation is found in Rom. xii. 8, 1 Thess. v. 12, and constitutes almost the only link of connexion between the organization of these and that of the other Pauline epistles), and to have constituted a collective body or “presbytery” (1 Tim. iv. 14, the word was in use to designate the Jewish councils of elders, for which the more common word was yepovoia). Their func- tions, like those of the corresponding officers in the Jewish communities, were probably for the most part disciplinary ; to these some of them added the function of teaching (1 Tim. v. 17). The elder women also were charged with disciplinary functions; they had to “train the young women to love their husbands, to love their children, to be sober-minded ” (Tit. ii. 3, 4). Out of such of them as were widows some were specially entered on the roll of church-officers (karaAoyos), and formed a class which, though it did not long survive the growth of monasticism, is mentioned in almost all early documents which refer to ecclesiastical order (see Smith and Cheetham, Dict. of Chris. Antiq., s.v. ““Widows”). Whether the younger men and women, or a selected number of them had, as such, corresponding duties is not clear, but an inference in favour of the supposition may be drawn from a comparison of 1 Tim. v. 1, 2, 13, Acts v. 6,10. (2) Side by side with this, and sometimes, but not always, blended with it, was the organization which was probably adopted from the contemporary civil societies, especially those in which, as in the Christian communities, there were funds to be administered ; the presiding elders, or some of them, were also “bishops” or administrators, and some of the younger men were “deacons” or servants. A bishop was ‘‘God’s steward”

(Tit. i. 7); a deacon was the active helper of the bishops in both administration and discipline.

2. Language.—These epistles are distinguished from the other Pauline epistles by many peculiarities of language, of which only a few can be mentioned here. (1) In 1 Timothy there are seventy-four words which are not elsewhere in the New Testament; in 2 Timothy there are forty-six such words, and in Titus forty-eight. In the three epistles taken together there are one hundred and thirty-three words which are not found in the other Pauline epistles, though they are found elsewhere in the New Testament; and many of the most marked and

o49 frequent expressions of St Paul are absent, (2) There is a tendency which is not found elsewhere in the Pauline epistles to form unusual compounds, eg., Aoyopnayety, éerepodidackadrciv, tYnogpovelv, avtoxatakpitos. (3) Words are used for which the other Pauline epistles invariably substitute a different, though nearly synonymous, word ; €.9., deamdrns is used for kvptos, xricja for xriows. (4) The particles, which are even better tests of identity of style than nouns and verbs, are different: the Pauline ydp is rare ; dpa, apa ovv, ert, pyrws, wadwv, daomep, are absent. (5) “In the other Pauline epistles the fulness of the apostle’s thought struggles with the expression, and causes peculiar difficulties in exposition. The thoughts slide into one another, and are so intertwined in many forms that not seldom the new thought begins before a correct expression has been given to the thought that preceded. Of this confusion there is no example in the Pastoral Epistles” (Huther, Znéroduction, Eng. tr., p. 10). A complete account of the linguistic peculiarities of these epistles will be found in Holtzmann, pp. 84~117.

3. Historical Difficulties.~~The historical difficulties to which these epistles give rise are of two kinds:—(1) that of finding a place for them in any period of the recorded life of St Paul, and (2) that of determining the state of theo~~ logical opinion to which they are relative.

(1) In regard to the first kind of difficulties, each of the three epistles has its own problems.

The data of the historical position of 1 Timothy appear to be («) that St Paul had gone into Macedonia, (6) that he had left Timothy at Ephesus (i. 3). The chief hypotheses which have been framed to satisfy the con- ditions which these data imply are the following. (1) The majority of older writers suppose that St Paul left Timothy at Ephesus when he went into Macedonia after the émeute in the theatre (Acts xx. 1). The difficulties in the way of this hypothesis are that Timothy had been sent into Macedonia (Acts xix. 22), and probably at the same time to Corinth (1 Cor. iv. 17), that he had not returned when St Paul himself reached Macedonia, inas- much as St Paul waited for him there (1 Cor. xvi. 11), that the two were together in Macedonia when 2 Corin- thians was written (2 Cor. i. 1), and that they returned together to Asia Minor (Acts xx. 4). Some of these difficulties have been met by the conjecture that Timothy never reached Corinth, but returned to St Paul at Ephesus and rejoined him in Macedonia; but the conjecture implies that Timothy disobeyed the apostle's exhortation to tarry at Ephesus almost as soon as he had received it, and that the apostle, so far from "hoping to come unto him shortly" (1 Tim. iii. 14), was in reality intending to go to Jerusalem and to Rome (Acts xix. 21), not even calling at Ephesus on his way (Acts xx. 17). (2) It has been supposed that there was an unrecorded journey of St Paul into Macedonia during his long stay in Ephesus (Acts xix. 1-20; so Mosheim, Schrader, Wieseler, and Reuss, the last of whom makes the journey extend to Crete and Illyricum). There is little difficulty in the supposition of such a journey into Macedonia, but there is great difficulty in supposing that the epistle was written in the course of it,—first, because its language is not compatible with the idea that Timothy was merely left in temporary charge during a short absence of the apostle, and, secondly, because the epistle implies the existence of an organized community which had existed long enough to have had errors growing up in it (whereas in Acts xx. 29-30 the coming of heretical teachers is regarded as still future), and in which it was possible that a bishop should be "not a novice" (1 Tim. iii. 6). (8) It has been sup- posed that St Paul wrote the epistle during his imprison- ment at Czsarea or at Jerusalem; but this does not

avoid the difficulty which is fatal to the two preceding hypotheses, that Timothy had been left at Ephesus when the apostle was ‘going into Macedonia.” (4) In order to avoid this fatal difficulty some writers (especially Otto, Die geschichtlichen Verhdltnisse der Pastoralbriefe, Leipsic, 1860, and Kélling, Der erste Brief Pauli an Trmotheus, Berlin, 1882) have attempted a new but impossible trans- lation of 1 Tim. i. 3, so as to make it appear that it was Timothy and not Paul that was going into Macedonia (for criticisms of this attempt see Huther’s edition of Meyer’s commentary ad /oc., and Weiss in the Studien u. Kritiken for 1861, p. 577).

The data of the historical position of 2 Timothy appear to be (a) that St Paul either was or had been in Rome (i. 17), (b) that he was in prison (i. 16; ii. 9), (c) that he had already had a trial (iv. 16), (d) that he believed himself to be near the end of his life (iv. 6), (e) that he was expecting shortly to see Timothy (i. 4; iv. 9, 21), (f) that he had been, apparently not long before, at Troas, Corinth, and Miletus (iv. 13, 20). Upon these data two hypotheses have been framed. (1) It has been supposed that the required his- torical position is to be found at the beginning of the “two whole years” of Acts xxviii. 30, and that con- sequently the epistle was written before those to the Philippians and Colossians (so, among others, Schrader, Otto, and Reuss). The difficulties in the way of this hypothesis are chiefly two,—first, that of accounting for the complete change of tone between the close anticipation of death of 2 Tim. iv. 6 and the hopefulness of Philippians i. 23, 24, Philemon 22, and, secondly, that of accounting for the “ first defence ” of 2 Tim. iii. 16; this Otto does by supposing it to be the process before Festus at Ceesarea, a supposition which implies the very improbable further supposition that the process before Felix was not what was technically known as an “ actio,” and that the term “make my defence” (Acts xxiv. 10) was wrongly applied by St Paul himself to his own speech. (2) It has been supposed that the required position is to be found in the period immediately succeeding the “two whole years” of Acts xxviii. 30, and that the epistle was written after those to the Philippians and Colossians (so, among others, Wieseler). One of the main difficulties in the way of this hypothesis is that it implies an interval of at least four years since the journey referred to in chap. iv., and that it is incredible that St Paul should have written to a disciple in Asia Minor to mention the casual incidents of a voyage —such as the leaving a cloak at Troas and a companion sick at Miletus—which had

occurred several years before ; the difficulty would not be much lessened even if the ingenious conjectures were adopted by which Wieseler endeavours to identify this voyage with that of Acts xxvii.

The data of the historical position of the epistle to Titus are (a) that Paul and Titus had been in Crete together, and that Titus had been left there, (b) that Paul was intending to winter at Nicopolis (wherever that may be, places of that name being found in several Roman pro- vinces). Upon these data many conjectures have been built. It has been supposed that St Paul visited Crete either (1) at the commencement of this second missionary journey (Acts xv. 41), or (2) during his residence at Corinth (Acts xviii 1, 8; so Michaelis and Thiersch). Each of these conjectures is met, in addition to other difficulties, by the fact, which seems fatal to it, that Apollos, who is mentioned in Titus iii. 13, was not known to Paul and his company until after the second missionary journey (Acts xvill. 24), (3) The same fact is also fatal to the supposition of Hug and others that the visit to Orete took place during the journey from Corinth to Ephesus (Acts xvill, 18, 19), a supposition which is also inconsistent with the apostle's apparent desire to reach Syria without much

delay, and which requires for its support the further supposition that, although on his way to Antioch and Cresarea, he had selected the almost unknown town of Nicopolis in Cilicia to winterin. (4) It has been supposed (Credner) that the visit to Crete was made as a detour in the course of the journey from Antioch to Ephesus (Acts Xvill, 22, 23; xix. 1); this is not only improbable in itself but also inconsistent with the summary of that journey: " Paul, having passed through the upper," 4.e., the inland, "country, came to Ephesus." (5) It has been supposed that St Paul called at Crete in the course of a journey which he probably made to Corinth during his long sojourn at Ephesus (so Wieseler, who thinks that he went first to Macedonia, 1 Tim. i. 3, and thence to Corinth, Crete, and back to Ephesus; and Reuss, who thinks that the route was Ephesus, Crete, Corinth, Illyricum, Macedonia, Ephesus) ; but this supposition seems to be excluded by the inconsistency between the expressed intention to winter in Nicopolis (Tit. ili. 12) and the similar intention to pass the same winter at Corinth (1

Cor. xvi. 6), unless the ingenious hypothesis of Wieseler be adopted that he intended to spend part of the winter in one place and the rest in the other. (6) It has been supposed that he made his journey from Macedonia to Greece (Acts xx. 1-3) by way of Crete (so Matthies); but this supposition seems to be excluded by the fact that in 2 Cor. viii. 6, 17 (which was written from Macedonia), Titus who had been with Paul in Macedonia had gone forward on his own account not to Crete but to Corinth. And all these endeavours to find a place for the epistle in St Paul's life before his voyage to Rome are met by the improbability that, if Crete had been already so far Christianized as to have communities in several cities (which is implied in Tit. i, 5), there should be no hint of the fact in Acts xxvii.

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The difficulties of all endeavours to find a place for these epistles in the recorded history of St Paul have been so strongly felt by most of those modern writers who support their authenticity that such writers have generally trans- ferred them toan unrecorded period of his life, subsequent to the close of the Acts of the Apostles. The external authorities for the belief that there was such a period, and that in the course of it St Paul underwent a second im- prisonment, are chiefly the statement of Clement of Rome that he went to "the goal of the West," and that of the Muratorian fragment that he went to Spain (see PAUL, infra, p. 422). Both these statements admit of much dis- pute, the one as to its meaning, the other as to its authority ; and their value as evidence is weakened by the fact that Ireneus, Tertullian, and Origen, though they mention the death of the apostle at Rome, say nothing of any journeys subsequent to his arrival there. In the 4th century Eusebius, for the first time, mentions a second imprisonment, but prefixes to his statement the ambiguous words Adyos éxet, " there is a story" or " tradition holds." Several fathers subsequent to his time repeat and amplify

'his statement ; but that statement, if accepted, involves

the further difficulties on the one hand of finding room for St Paul's journeys before the great Neronian persecution of 64 a.D., and on the other hand of accounting for the fact that, supposing the apostle to have survived that per- secution, he makes no mention of it. For all these diffi- culties

more or less plausible answers have been framed, and many narratives of St Paul's unrecorded travels have been written ; but, although it may be adinitted that such narratives are conceivably true, yet it must be conceded on the other hand that they rest rather upon conjecture than upon evidence. It may be added that the hypothesis of a second imprisonment is rejected not only by writers like Baur and Hilgenfeld, who deny the authenticity of

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both the Pastoral Epistles and the other ' Epistles of the Captivity," but also by conservative writers, suchas Meyer, Ebrard, Otto, Wieseler, Thiersch, and De Pressensé¢.

(2) The second kind of historical difficulties, that of determining the state of theological opinion to which these epistles are relative, arises partly from the incidental nature of the references to false teachers in the epistles themselves and partly from the fragmentary character of our knowledge of contemporary teaching. The character- istics of the false teachers are mainly the following. (1.) They once held "sound doctrine" but have now fallen Meay irom it (1 Tim. i. 6, 19; vi. 5, 21; 2 Tim. ii. 18); and, puffed up with self-conceit (1 Tim. vi. 4) and claiming to have a special "knowledge" (yvécrs, vi. 20; implied also in Tit. i. 16), they oppose the truth (Tit. i. 9; 2 Tim. ii, 25; iii. 8) and teach a different doctrine (1 Tim. 1. 3) ; yet they remain within the church and cause factions within it (Tit. iii 10). (ii.) They profess asceticism, "forbidding to marry and commanding to abstain from meats," apparently on the ground that some " creatures of God" are evil (1 Tim. iv. 3), and at the same time their moral practice is perverted, they are "unto every good work reprobate" (1 Tim. vi. 5; 2 Tim. iii. 13; Tit. i. 16), and they make their teaching of religion a means of gain (1 Tim. vi. 5; Tit.i.11). (iii.) Their teaching is concerned with "fables and endless genealogies " (1 Tim. i. 4; Tit. 1. 14), with questionings and disputes of words (1 Tim. vi. 4), with empty sounds and contradictions (1 Tim. vi. 20), with " profane and old wives' fables" (1 Tim. iv. 7), with "foolish questionings and genealogies, and strifes and fightings about the law" (Tit. iii. 9), and they held that the "resurrection is past already " (2 Tim. ii. 18). It has been sometimes held that these statements refer rather to errors of practice than errors of doctrine, and rather to tendencies than to matured

systems (Reuss); and it has also been sometimes held that different forms of opinion are referred to in either different epistles or different parts of the same epistle (Credner, Thiersch, Hilgenfeld) ; but the majority of writers think that the reference is to a single definite form of error. The main question upon which opinions are divided is whether the basis of this false teaching was Judaistic or Gnostic, ¢.e., whether that teaching was a rationalizing form of Judaism or a Judaiz- ing form of Gnosticism. (1) The former of these views branches out into many forms, and is held on various grounds. It is sometimes held that the reference is to the allegorizing and rationalizing school of which Philo is the chief representative, and which was endeavouring to take root in Christian soil, the “fables” being the allegorical interpretations of historical facts, the “ genealogies ” those of the Pentateuch, or possibly the Pentateuch itself, which served as the basis of philosophical speculations (Wiesinger, Hofmann). It is sometimes held that the reference is to what in later times was known as the Kabbalah, the assumption being made that the Kabbalah must be dated many centuries earlier than other testimony warrants us in believing (so Vitringa, Grotius, Schéttgen, and more recently Olshausen and Baumgarten). It is

Sometimes held that the false teachers were not so much

theosophic as thaumaturgic, allied to the Judeeo-Samaritan school of which Simon Magus is the typical representative, and that this is the point of the reference to Jannes and Jambres and to “jugglers… . deceiving and being deceived” (2 Tim. ili. 8, 13). It is sometimes supposed that they combined Essenism with a form of Ebionism, and this view (the ablest supporter of which is Mangold, Die Irrlehrer der Pastoralbriefe, 1856) is that which now prevails among those who contend for the early date of the epistles, if not for their authenticity. (2) It is con- tended on the other hand that none of these theories quite

cover the facts. It is maintained that genealogies did not take the place in the Jewish speculative schools which they evidently had in the false teaching to which these epistles refer; that even if they had done so it is

difficult to account for the epithet “endless” which is applied to them ; that there is no sufficient proof that the Essenes held a dualistic theory of the relation of spirit to matter, or that they denied the resurrection (the testimony of Hippolytus on this point being more probable than that of Josephus), or that they taught for gain, or that they pro- secuted a propaganda among women (2 Tim. iii. 6). It is further contended that all these points are generally characteristic of Gnosticism. The use of the epithet “falsely so called,” it is urged, shows that “ knowledge ” (yv@ots) is used in a technical sense; in the “ endless genealogies” writers so early as Ireneus and Tertullian recognized Gnostic systems of zons, to which the phrase seems exactly to apply; the abstinence from meats and from marriage belongs not to any form of Judaism but to Gnostic theories of the nature of matter; the description of the teachers as making a gain of their teaching and as “taking captive silly women laden with sins” suits no one so well as the half-converted rhetoricians who brought into Christian communities the practices as well as the beliefs of the degenerate philosophical schools of the empire. It is probable that this view is substantially correct ; at the same time it may be granted that the evidence is too scanty to allow of the identification of the Gnostics to which reference is made with any particular Gnostic sect, and that the several attempts which have been made so to identify them have failed.

The result of this combination of difficulties—the differences between the pastoral epistles and the other Pauline epistles in respect of the character of their con- tents, their philological peculiarities, the difficulty of reconciling the historical references with what is known from other sources of the life of St Paul, the difficulty of finding any known form of belief which precisely answers to the opinions which they attack, and the further difficulty of believing that so elaborate a debasement of Christianity had grown up in the brief interval between St Paul’s first contact with Hellenism and his death—has been to make the majority of modern critics question or deny their authenti- city. The first important attacks were that of Schleier- macher, who, however, only rejected 1 Timothy, and a few years afterwards that of Eichhorn, who rejected all three ; but the modern criticism of them practically begins with Baur’s treatise Die sogenannten Pastoralbriefe des Apostel’s Paulus in 1835. Since then the controversy has been keenly waged on both sides; the history of it will be found in Holtzmann, Die

Pastoralbriefe (Leipsic, 1880), which is by far the ablest work on the negative side of the con- troversy, and which, whether its conclusions be accepted or not, is more full of accurate information than any other. The mostavailable works on the conservative side, for English readers, are the translation of Huther's edition of Meyer's Commentary (Edinburgh, 1881); Dr Wace's introduction to the Pastoral Epistles in the Speaker's Commentary (London, 1881); and Archdeacon Farrar's excursus on "The Genuineness of the Pastoral Epistles " in his St Paul (vol. ii. p. 607). (2. Ts)

PASTORAL LETTER, a letter addressed, in his pastoral capacity, by a bishop to his clergy, or the laity of his diocese, or both. In the Church of Rome it is usual for every bishop to issue at least one pastoral annually, the Lenten Mandates or Instructions, containing exhortations relating to that fast, and enumerating the dispensations granted and devotions prescribed. Others are issued in connexion with the principal solemnities of the church, or as occasion arises.

See Plate XI.vol.i.

PATAGONIA, in the widest application of the name, is that portion of South America which, to the east of the Andes, lies south of Rio Negro (mouth in 41° 5' S. lat.), and, to the west of the Andes, south of the Chilian pro- vince of Chiloe,! with a total area of 322,550 square miles (306,475 continental, 16,075 insular) according to Dr E. Wisotzki's measurement (Behm and Wagner, Bevolkerung der Erde, 1880). By the treaty of 22d October 1881 this vast region was divided between Chili and the Argen- tine Republic, the boundary being the unexplored water- shed of the Andes down to 52° S. lat., and then con- tinuing along the parallel to 70° W. long., thence to Point Dungeness, and so southwards (through Tierra del Fuego) along the meridian of 68° 34' W. long.? In this way about 62,930 of the 322,550 square miles fall to Chili and 259,620 to the Argentine Republic.?

The Chilian portion, the main bulk of which is com- prised under the title of Magellan Territory (Zerritorio Magallanes), is chiefly remarkable for the way in which the combined action of glacier and sea has cut up the country into a multitude of rugged and irregular islands and peninsulas, separated

by intricate channels and fjords. South of Chiloe, the first great island of the Chilian coast, the islands are grouped under the name of the Chonos Archipelago, which is bounded on the south by the spacious Gulf of Pefias. The Chonos Islands (upwards of 1000 in number, without counting mere islets and rocks) are with- out exception mountainous, and in some cases the summits remain white throughout the year, though in the lowlands snow lies only a few days. The general temperature is remarkably even. A thick covering of vegetation (low and stunted on the seaward parts) is spread over nearly all the surface, but the layer of vegetable soil is very thin. Potatoes grow wild, and cabbage, onions, radish, &c., are cultivated. The sea-elephant appears to be exterminated ; seals still abound. On Taytao peninsula is found the pudu, the smallest known deer. The old Indian inhabit- ants—Chonos—are practically extinct, though their sitting mummies give name to Momias Bay, and they still occupy some of the islands far south near Magellan's Strait. There are only one or two permanent settlements in the whole archipelago—on the Guaitecas Islands (43° 52' 8. lat.) and at Puerto Americano or Tangbac (45° §. lat.). Wood-cutters, however, visit the islands in considerable numbers for the sake of their valuable timber, mainly cipré (Zzbo- cedrus tetragona). Besides Magdalena—which is by far the largest of the whole group and contains the extinct volcano of Motalat, 5400 feet high—it is enough to men- tion Chaffers, Forsyth, Johnson, Tahuenahuec, Narborougli (named after the old English explorer), Stokes, Benja- min, James, Melchor, Victoria, Luz, and Rivero Islands. The broad Moraleda Channel, from 75 to 175 fathoms deep, which may be said to separate the rest of the archipelago from Magdalena and the mainland, is continued south by the Costa and Elefantes Channels, and would have proved of great service to navigation had it not been that the southern exit is barred by the narrow isthmus of Ofqui, which alone prevents the strangely formed Taytao peninsula from being an island. The glacier of San Rafael, which discharges into the lagoon of the same name on the north side of the isthmus, is nearer the equator than any other

coast-glacier in the world.4 ee ee

1 Chiloe is sometimes considered part of Patagonia,

? Of the Tierra del Fuego archipelago 20,341 square miles are Chilian and 7890 Argentine,

3 Documents in regard to the disputed possession will be found in Quesada, La Patagonia y las Tierras Australes, Buenos Ayres, 1875. By a treaty in 1856 the uti possidetis of 1810 was accepted.

: The Chonos Archipelago was explored by E. Simpson of the rags navy in 1871-72. See map and text in Petermann's Mittheil.,

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South of the Gulf of Pefias a navigable channel exists between the mainland and the long succession of islands which, under the names of Wellington Island (150 miles long), Madre de Dios Archipelago, Hanover Island, and Queen Adelaide Archipelago, extend for about 400 miles to the mouth of Magellan's Strait; and it is now regularly used by steamers, which are thus protected from the terrible western storms that make the deep-sea pass- age along this coast so dangerous. At one or two points only is the navigation difficult—at the English Narrows in Messier Channel (as the northern division is called), and at the Guia Narrows farther south. The scenery throughout is of the most beautiful and picturesque de- scription. Among the serviceable inlets are Connor Cove, Port Grappler, Puerto Bueno (pointed out by Sarmiento) and Isthmus Harbour.®

The southern coast of Patagonia is bounded for 365 miles by Magellan's Strait, which separates the mainland from the countless islands of the Tierra del Fuego archi- pelago and breaks it up into a number of very irregular peninsulas. Of these the largest are King William IV. Land and Brunswick Peninsula, and between them lies the extensive inlet of Otway Water, which is further con- nected westward by Fitzroy Channel with Skyring Water. On the east coast of Brunswick Peninsula, opposite the Broad Reach of the strait, and in the finest part of the straitward district, lies the Chilian military post and penal settlement of Punta Arenas or Sandy Point. It was founded in 1851 as a substitute for the unfortunate Port Famine settlement, which lay farther south on the same coast. In spite of convict mutinies (as in 1878) and the questionable character of many of the settlers (chiefly Chilotes), Punta Arenas begins to flourish; in 1875 its population was 915, and since

that date a series of “ fac- tories” or cattle-stations have been established along the coast to north and south. The country behind the settle ment, unlike the districts at either end of the strait, is well wooded, mainly with Chilian beech (/agus antarctica) and Winter’s bark (Drimys Winteri, so called after Captain Winter, Drake’s companion), and considerable quantities of timber are exported. Coal also, though of inferior quality, is worked in the neighbourhood.’

Patagonia east of the Andes is for the most part a region of vast steppe-like plains. Unlike the pampas of the Argentine Republic, with which it is conterminous on the north, it rises in a succession of abrupt steps or terraces about 300 feet at a time, and is covered, not with soft stoneless soil, but with an enormous bed of shingle, which instead of luxuriant grass supports, where it is not abso- lutely bare, only a thin clothing of coarse and often thorny brushwood and herbage. So peculiar is this, the largest tract of shingle in the world, that from D’Orbigny down- wards geologists have generally characterized it simply as the Patagonian formation. It is of Tertiary marine origin ; but, whilst Bove makes it correspond to the Miocene sub- division, Doering (Roca’s expedition) assigns it to the somewhat older Oligocene. Beneath the shingle, which is sometimes at least 200 feet thick, and has its pebbles whitewashed and cemented together by an aluminous substance, there stretches a vast deposit, sometimes more than 800 feet thick, of a soft infusorial stone resem- bling chalk. In the hollows of the plain as far south as

5 See Lieut. Eardley- Wilmot, Our Journal in the Pacific, 1878, especially the appendix; and The Voyages of the “‘ Adventure” and the “* Beagle.”

8 Magellan’s Strait was first named, probably by its discoverer, Canal de Todos los Santos, and in older writers often appears as Estrecho Patagonico and Estrecho de la nave Victoria (Magellan’s ship).

? Punta Arenas was a German station for the observation of the transit of Venus in 1882,

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Santa Cruz there are frequently lakes or ponds; they are generally impregnated with common salt, Epsom salts, or some other mineral ingredient, the substance varying from lake to lake without any regularity of distribution (see Bur- meister, La République Argentine, vol. ii. (1876) appendix). Certain limited tracts with finer soil and richer vegetation occur, especially in the river-valleys, but the general aspect of the plains is one of sterility and desolation.

The most ordinary bushes are the jume (Salicornia) and the calafate (Berberis buaxifolia); the ashes of the former contain 41 per cent. of soda, and the latter makes excel- lent fuel and bears a pleasant bluish-purple berry known to the older English explorers as Magellan's grape. Among the perennial herbs may be named Strongyloma struthium, Chuquiragas, Adesmias, Azorellas. The palm-tree men- tioned by many travellers as growing on the south coast is really a kind of fern, Lomarza boryana.}

The guanaco, the puma, the zorro or Canis Azarex (a kind of fox), the zorrino or Mephitis patagomca (a kind of skunk), and the tuco-tuco or Ctenomys magellanicus (a kind of rodent) are the most characteristic mammals of the Patagonian plains. Vast herds of the guanaco roam over the country, and form with the ostrich (hea americana, and more rarely rhea Darwinit) the chief means of sub- sistence for the native tribes, who hunt them on horseback with dogs and bolas.

Bird-life is often wonderfully abundant. The carrancha or carrion-hawk (Polyborus Tharus) is one of the charac- teristic objects of a Patagonian landscape; the presence of long-tailed green parroquets (Conurus cyanolysius) as far south as the shores of the strait attracted the attention of the earlier navigators ; and humming-birds may be seen flying amidst the falling snow. Of the many kinds of water-fowl it is enough to mention the flamingo, the up- land goose, and in the strait the remarkable steamer duck.

As the Andes are approached, a great change is observed in the whole condition of the country. The shingle is replaced by porphyry and granite and vast masses of basalt and lava; vegetation becomes luxuriant, majestic trees—evergreen beeches, alerces, ciprés, araucarias, &c.— combined with jungle-like underwood clothing the ravines and hillsides ; and, with the richer plant life, animal life grows more abundant and varied, deer,

peccaries, wild cattle, and wild horses? finding fitting pasture. The fruit trees planted by the Jesuits in the neighbourhood of Lake Nahuel-Huapi have spread into vast natural orchards, which furnish the local tribes of Araucanians with food and wine, and have given rise to the designation Man- zaneros or apple-folk by which they are distinguished.

Eastern Patagonia is traversed from west to east by a consider- able number of rivers, but few if any can ever be of much use as highways, In their passage seawards they are joined by compara- tively few tributaries from the low country ; rain falls seldom, and the water sinks away among the shingle and sand. The Rio Negro, Which separates the pampas from Patagonia proper, is formed by the junction of the Neuquen and the Limay. The former collects by numerous channels the drainage of the Andes between 36° 25’ and 38° 40’; the latter has its main source in the great Nahuel- Huapi Lake, which was discovered in 1690 by Mascardi the Jesuit (whose station on the lake was maintained till 1723), and is reached from Chili by the Bariloche pass, rediscovered by Jorje Rohde in 1882. For some distance the Rio Negro is navigable for steamers drawing 12 feet, but only vessels with powerful engines can make head against the current. South of this river there stretches north and south a chain of hills—the Valchita and Uttak Tange—which, lying from 50 to 100 miles from the coast, forms a secondary watershed, draining westward into the plain as well as

eastward to the Atlantic. The next great Andean river is the Chubut (Chubat or Chuba, z.c., erosion), which gives its name of

1 See Dr Karl Berg, “Eine Naturhist, Reise nach Patagonien,” in Petermann’s Mitteilungen, 1875 ; and the botanical part of the report of Roca’s expedition (résumé in Nature, 1884).

Hence the name Cordillera de Baguales applied to the southern extremity of the Andes.

Chubut Territory to the northern division of Argentine Patagonia, and is well known from the Welsh colonics established in its valley in 1865 by Mr. Lewis Jones. Its northmost affluent rises probably a little south of Nahuel-Huapi, about 41° 25’, and its southmost between 46° and 47°. The latter stream, the Sengel or Senguer (explored by Durnford 1877, Moyano 1880), has this peculiarity, that, beforc entering the shallow basin of Lake Colguape (Huapi), Colhue, or, as Thomas and Moreno call it, Dillon, the volume of water is so much larger than when it issues again that the Welsh settlers distinguish the lower course of the stream as Sengellen or the Little Sengel.? Rio Deseado, which disembogues at Port Desire (Puerto Deseado), well known in the early history of the coast, has its source about 46° 42’, in the vicinity of a large lake, Buenos Ayres (20 milcs long by 14 broad), which lies, however, 600 feet below the level of the river, and consequently has no connexion with it. Of the rivers which unite in the Santa Cruz estuary the Rio Chico (explored by Musters, Moyano, and Lista) and the Chatta or Sheuen (explored by Moyano and Moreno) have little that calls for notice ; but the Santa Cruz is connected with the most remarkable cluster of mountain-lakes in the country. The largest of these is Capar or Viedma Lake (discovered by Viedma in 1782); northward it communicates by a narrow channel with what may be distinguished as Moreno Lake, which again opens into San Martin, and southward it discharges into the very irregular Lago Argentino or Fitzroy Lake (discovered, according to Musters, by an adventurer called Holstein in 1868, and next visited by Fallberg), which in its turn probably has extensive ramifications. From the east end of Lago Argentino issues the rapid current of the Santa Cruz. Round these lakes the moun- tains rise with glaciers and snow-fields from 3000 to 3500 feet, and at the north-west end of Viedma stands the active volcano of Chalten. At the time of Moreno’s visit in March (the latter part of summer) gigantic icebergs rising 70 feet above the water continued to float about Lago Argentino. With the melting of the snows the river rose rapidly, and by 17th March was 63 feet above its ordinary level. So swift was its current that the explorers sped down the whole length of its course in twenty-four hours, though they had taken a month to ascend. In some parts the rate was at least 15 miles per hour. The Rio Gallegos, the last of the rivers of Patagonia which flow west and east, is comparatively insignificant except during thaw-floods, when it complctely interrupts communication by its wide and raging torrent (see Beerbohm’s exciting

narrative). The eastern coast of Patagonia contrasts strikingly with the western ; hardly an island of any considerable size exists on all the 2000 miles of its development, and it is scooped out into spacious and open gulfs. The peninsula of San José or Valdes to the south of the Gulf of San Matias is quite exceptional. But the whole seaboard offers only one or two safe harbours ; and submerged reefs, strong tides, currents, and overfalls combine to render it highly perilous. Besides E] Carmen or Patagones, near the mouth of the Rio Negro, a place of 1690 inhabitants in 1869, there is hardly a permanent settlement of any size from the river to the strait; but, since the partition between Chili and the Argentine Republic, beginnings of colonization have becn made at the more promising points. A notice of the native Patagonians is given in the article INDIANS (AMERICAN), vol. xii. p. 829; and the history of the Araucanian tribes of the Chilian side has been sketched undcr AMERICA, vol. i. pp. 701-702. ;

History.—Patagonia was discovered in 1520 by Magellan, who called the country Tierra de Patagones from the large footsteps observed near his winter quarters at San Julian, and on his passage along the coast named many of the more striking features—Bay of San Matias, Bay of Santa Cruz, Cape of 11,000 Virgins (now simply Cape Virgin or De la Vierge), &. By 1611 the Patagonian god Setebos (Settaboth in Pigafetta) was familiar to the hearers of the Tempest. Rodrigo de Isla, despatched inland in 1535 from San Matias by Alcazava Sotomayor (on whom western Patagonia had been conferred by the king of Spain), was the first to traverse the great Patagonian plain, and, but for the mutiny of his men, he would have struck across the Andes to the Chilian side. Pedro de Mendoza, on whom the country was next bestowed, lived to found Buenos Ayres, but not to carry his explorations to the south. Camargo (1539), Ladrilleros (1557), Hurtado de Mendoza, and Ercilla (1558) helped to make known the western coasts, and Drake’s voyage in 1577 down the eastern coast through the strait and northward by Chili and Peru was memorable for several reasons; but the geography of Patagonia owes more to Pedro Sarmiento de Gamboa, who, devoting himself especially to the south- west region, made such careful and accurate surveys that from twenty to thirty of the names which he affixed still appear in maps (Kohl). The settlements which he founded at Nombre de Dios and San Felipe were neglected by the Spanish Government, and the latter was in such a miserable state when Thomas

Cavendish visited it in 1587 that he called it Port Famine. The district in the neighbourhood of Port Desire, explored by John Davis about Saas ee es Se

3 See Durnford's account in The Field, 23d and 30th Dec. 1882, and Proc. Roy. Geogr. Soc., 1883. : AVE, — 4s

the same period, was taken possession of by Sir John Narborough in name of King Charles II. in 1669. In the latter half of the 18th century our knowledge about Patagonia was considerably augmented by Byron (1764-65), Wallis (1766), Bougainville (AGG) Thomas Falkner, a Jesuit who "resided near forty years in those parts," published his Description of Patagonia (Hereford, 177A) 5 Francesco Viedma founded El] Carmen, and Antonioad vanced inland to the Andes (1782) ; and Villarino ascended the Rio Negro (1782). The "Beagle" and "Adventure" expeditions under King (1826-30) and Fitzroy (1832-36) were of first-rate importance, the latter especially from the participation of Charles Darwin ; but of the interior of the country nothing was observed except 200 miles of the course of the Santa Cruz. Captain Musters wandered in company with a band of natives through the whole length of the country from the strait to the Manzaneros in the north-west, and collected a great deal of information about the people and their mode of life. Since that date explorations of a more scientific character have been carried on by Moreno (1873-80), Rogers (1877), Mista (1878-80), and Moyano (1880, &c.), a convenient survey of which will be found

in Petermann's Mittheilungen, 1882.

Bibliographical lists for Patagonia are given in Wappaus, Handbuch der Geogr. u. Stat. des ehemal. span. Mittel- und Siid-Amerika (Leips., 1863-70); in Quesada's work already quoted ; and in Coan, Adventures in Patagonia (New York, 1880). It is enough to mention Darwin's Journal of Researches (1845) and Geological Observations on South America (1846); Snow, A Two Years' Cruise off . – - Patagonia (1857); Musters, At Home with the Patagonians (1871) ; Cunning- ham, Nat. Hist. of the Strait of Magellan (1871); Moreno, Viage a la Patagonia austral (1879); Lady Florence Dixie, Across Patagonia (1880); Lista, Mis esploraciones … en la

Patagonia (Buenos Ayres, 1880); Beerbohm, Wander- ings in Patagonia (1878); Informe Oficial . .. de la Exp, al Rio Negro (under General Roca, 1879, Buenos Ayres, 1882); Giacomo Bove, Patagonia, Terra del Fuoco (Genoa, 1883). (H. A. W.)

PATARENES, a name apparently first used in Milan about the middle of the 11th century to denote the party most extremely opposed to the marriage of priests ; besides Patareni, the forms Paterini, Patarelli, Patarzei occur among others. Various etymologies, more or less far- fetched, have been offered ; it seems, however, pretty well established that the party was so called because, under the leadership of Arialdus, a deacon of Milan, its members used to assemble in the Pataria, or ragmen's quarter of that city (pates being a provincial word for a rag). The name ultimately came to be applied to the dualistic sect of the Cathari, who were opposed to marriage altogether, and indeed was one of their most common designations in Italy, France, and Bosnia.

PATENTS. Patents for inventions, instruments which formerly bore the great seal of the United Kingdom, are now issued at the Patent Office in London under the seal of that office. By their means inventors obtain a monopoly in their inventions for fourteen years, a term which, if insufficient to remunerate the inventor, can be extended. This monopoly is founded on exactly the same principle as the copyright enjoyed by authors and artists. There are persons who argue that no such privilege should be permitted ; there are others who think that the most trifling exertions of the inventive faculties should be pro- tected.. The right course lies between these extremes. All civilized nations have in modern times considered it desir- able to give inventors an exclusive right to their inven- tions for a limited period, not only as a matter of justice to individuals but as a piece of sound policy tending to the advantage of the whole community. The monopoly is granted in the expectation that the inventor will derive some profit from it; and the hope of profit is known to be a great stimulus to invention. When an author writes a book, or an artist designs a picture, the law allows a right of property to those persons in their productions, and accompanies the recognition of this right with the power to repress infringements. If this were not so, probably very few persons would employ their time in writing books or creating works of art; and hardly any one will

be bold enough to assert that the extinction of the race of authors and artists is to be desired. The same principle applies to Inventors, who ought to have the works of their brain protected from piracy fully as much as the other classes of mental producers. By holding out to them the pro- spect of gain they are induced, at a present loss of time

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and money, to attempt to discover improvements in the useful arts, in machinery, in manufacturing processes, &e. : and thus the interests of the community are advanced more rapidly than if such exertions had not been brought into play. Just as the rule of rewarding inventors is in theory attended with some difficulty, so is the practical ap- plication of it. To grant a very long term of exclusive possession would be detrimental to the public, since it would tend to stop the progress of improvement. A limited property must therefore be allowed,—large enough to give the inventor an opportunity of reaping a fair reward, but not barring the way for an unreasonable period. And, when this compromise has been decided on, it will be seen how difficult it may be to determine beforehand what is the real merit of an invention, and apportion the time to that merit. Hence it has been found necessary to allot one fixed period for all kinds of inventions falling within the purview of the patent laws. This regulation appears to be open to the complaint that the least valuable and the most meritorious inventions are placed on the same footing, But it may be replied that in the result this is of little consequence, since meritorious inventions alone obtain the patronage of the public, those which are destitute of value being neglected. Besides, if the complaint were well founded, there is here no sound argument against the policy of privileges of this nature, seeing that it is impos sible to weigh beforehand one invention against another in the scale of merit, or to obtain a true standard of com- parison.

Leaving the discussion of general considerations, we will now give an outline of the law affecting patent privi- leges in the United Kingdom. Formerly the reigning prince considered himself entitled, as part of his preroga- tive, to grant privileges of the nature of monopolies to any one who had gained his favour. These grants became so numerous that they were oppressive and unjust to various

classes of the commonwealth ; and hence, in the reign of –

James I., a statute was wrung from that king which de- clared all monopolies that were grievous and inconvenient to the subjects of the realm to be void. (See Monopoty.) There was, however, a special exception from this enact- ment of all letters patent and grants of privilege of the “sole working or making of any manner of new manutfac- ture within the realm to the true and first inventor of such manufacture, which others at the time of making such letters patent and grants should not use, so they be not contrary to law, nor mischievous to the state by raising of the prices of commodities at home or hurt of trade or generally inconvenient.” Upon these words hangs the whole law of letters patent for inventions. Many statutes were afterwards passed, but these were all repealed by the Patent Act of 1883 (46 and 47 Vict. c. 57), which, besides introducing a new procedure, modified the law in several particulars. When the lawremains unaltered, it has to be gathered from the numerous decisions of the courts, for patent law is for the most part “judge-made law.” Of the law as it now stands we proceed to give an outline. The inventions for which patents are obtained are chiefly either vendible articles formed by chemical or mechanical operations, such as cloth, alloys, vulcanized india-rubber, &c., or machinery and apparatus, or processes. It may be remarked here that a scientific principle cannot form the subject of a valid patent unless its application to @ practical and useful end and object is shown. An abstract notion, a philosophical idea, may be extremely valuable in the realm of science, but before it is allowed to form a sound basis for a patent the world must be shown how to apply it so as to gain therefrom some immediate material advantage. With regard to processes, the language of the statute of James has been strained to bring them within

the words “any manner of new manufacture,” and judges on the bench have admitted that the exposition of the Act has gone much beyond the letter. However, it is un- doubted law that a process is patentable ; and patents are accordingly obtained for processes every day.

The principal classes of patentable inventions seem to be these :—(1) new contrivances applied to new ends, (2) new contrivances applied to old ends,

(3) new combinations of old parts, whether relating to material objects or pro- cesses, (4) new methods of applying a well-known object.

With regard to a patent for the new application of a well-known object it may be remarked that there must be some display of ingenuity in making the application, otherwise the patent will be invalid on the ground that the subject-matter is destitute of novelty. For example, a machine already in use as an excavator on land cannot be separately patented as an excavator under water; nor can a machine employed in the finishing of cotton goods be afterwards patented without alteration as applied to the finishing of woollen fabrics. A small amount of inven- tion is indeed sufficient to support a patent where the utility to be derived from the result is great. A small step in advance, a slight deviation from known processes, may have been apparently brought about by the exercise of little ingenuity ; but, if the improvement be manifest, either as saving time or labour, a patent in respect of it will stand. The mere omission of a step from some com- monly practised process has been held sufficient to support a patent for a new method of manufacture ; and how often do we see what appears to be a very trifling degree of novelty attended with very advantageous consequences, sometimes resulting in the entire revolution of a manu- facture, or in a lowering of price appreciable in every pound of an article extensively used by the public ?

Whatever be the nature of the invention, it must possess the incidents of utility and novelty, else any patent obtained in respect of it will be invalid. The degree of utility need not, however, be great. As to novelty, this is the rock upon which most patents split; for, if it can be shown that other persons have used or published the invention before the date of the patent, it will fall to the ground, although the patentee was an independent inventor deriving his ideas from no one else. The difficulty of steer- ing clear of this rock will be apparent at once. Suppose Ain London patents an invention the result of his own ingenuity and patient study, and it afterwards appears that B, in some distant part of the kingdom, had been previously openly using the same thing in his workshop, A’s patent is good for nothing. Thus, in one of the cases which arose out of Heath’s carburet of manganese patent —a, patent celebrated in the law-courts—it appeared that three firms had used a process in the manufacture of steel which was substantially the same as that

forming the subject of the patent. They had used the process openly in the way of their trade previous to the date of the patent, although it had not become generally known. This prior use of the invention was held to deprive the patent of validity. It is therefore a very frequent sub- ject of inquiry, whether an invention has been previously used to such an extent as to have been publicly used in the sense attached by the courts to this phrase. The inventor himself is not allowed to use his invention, either In public or secretly, with a view to profit, before the date of the patent. Thus, if he manufactures an article by some new process, keeping the process an entire secret, but selling the produce, he cannot afterwards obtain a patent in respect of it. If he were allowed to do this he might in many cases easily obtain a monopoly in his in- vention for a much longer period than that allowed by law. The rule that an inventor's use of the invention

invalidates a subsequent patent does not, however, apply to cases where the use was only by way of experiment with a view to improve or test the invention. And it has been repeatedly decided that the previous experiments of other persons, if incomplete or abandoned before the realization of the discovery, will not have the effect of vitiating a patent. Even the prior discovery of an inven- tion will not prevent another independent discoverer from obtaining a valid patent if the earlier inventor kept the secret to himself, the law holding that he is the " true and first inventor " who first obtains a patent.

When an invention is the joint production of more per- sons than one, they must all apply for and obtain a joint patent, for a patent is rendered invalid on showing that a material part of the invention was due to some one not named therein. The mere suggestion of a workman em- ployed by an inventor to carry out his ideas will not, however, require that he should be joined, provided that the former adds nothing substantial to the invention, but merely works out in detail the principle discovered by his employer. In certain cases in which patents taken out by the celebrated Sir Richard Arkwright came to be in- quired into, it was proved that the inventions were really made by persons in Arkwright's employment. Their value being

perceived by him, he adopted them, and obtained the patents in question, but under these circumstances they were adjudged invalid.

Tf it can be shown that the invention in respect of which a patent has been obtained was previously described in a printed book in circulation in Great Britain, whether such book be in the English or a foreign language, the patent is also invalid, because a man has no right to obtain a monopoly in that which is already a part of the stock of public information; and it is not necessary to prove that the patentee was acquainted with the book, and derived his ideas from that source. The most usual prior publication fatal to a patent is a prior specification of a similar invention. But persons are allowed to obtain patents for inventions imported from abroad, if such in- ventions are new within the realm, and if they acknow- ledge, on the face of their applications, that the inventions are imported, not original. Such patents are now common.

The attributes of novelty and utility being possessed in due degree by an invention, the chief remaining difficulty with which a patent has to contend resides in the com- plete specification, the instrument by which the inventor describes the nature of the invention and the means by which it may be carried into effect. An inventor is bound, in return for the monopoly conceded to him, to instruct the public how to work the invention when the monopoly shall have expired, and to inform them in the meantime what it is they are shut out from using; and now the patent is not granted till the complete specification is filed. The patentee is bound to make by this instrument a full disclosure of his secret ; he must not keep anything back either wilfully or accidentally ; he must render everything plain and clear, showing no attempt to mislead, and leaving nothing ambiguous ; he must distinguish what is old from what is new; he must point out distinctly what it 1s that he claims as his own exclusive property, and he must take care that he claims no more than he is entitled to. Very many patents have been invalidated by a disregard of the requirements of the law, the most common fault being that the specification claims too much ; in other words, it claims something that is already public property, or another man’s patented invention. And here we are brought back to the question of novelty. If a patentee discovers that his specification claims more than he is entitled to,

he may put the matter right by filing an amendment, and excising the superfluous parts ; but he will not be allowed to extend

his claims in any degree. He may cut out anything, but he can insert nothing, except matter which is of the nature of correction or explanation.

The term for which a patent is originally granted is fourteen years, but the crown has been empowered by parliament and through the intervention of the judicial committee of the privy council, before which the pro- ceedings take place, to extend the time of a patent from its expiration for any additional time not longer than fourteen years. But an extension will only be granted on the patentee showing that the invention is meritorious, and that he has not been adequately rewarded in spite of his best efforts directed to that end. What is adequate re- ward depends on the special circumstances of each case. The crown has hitherto had a right to the free use of a patented invention, but this right has been abolished by the new Act.

Patent privileges, like most other rights, can be made the subject of sale. Partial interests can also be carved out of them by means of licences, instruments which empower other persons to exercise the invention, either universally and for the full time of the patent (when they are tantamount to an assignment of the patentee's entire rights), or for a limited time, or within a limited district. By an exclusive licence is meant one that restrains the patentee from granting other licences to any one else. By means of a licence a patentee may derive benefit from his patent without entering into trade and without running the risks of a partnership.

One of the regulations of the recent Act is that a patentee can be compelled by the Board of Trade to grant licences to persons who are able to show that the patent is not being worked in the United Kingdom, or that the reasonable requirements of the public with respect to the invention cannot be supplied, or that any person is pre- vented from working or using to the best advantage an invention of which he is possessed.

A patentee's remedy for an infringement of his rights is by civil suit, there being no criminal proceedings in such a case. In prosecuting such suit he

subjects those rights to a searching examination, for the alleged infringer is at liberty to show that the invention is not new, that the patentec is not the true and first inventor, &c., as well as to prove that the alleged infringement is not really an infringement. But it may here be remarked that a patentee is not bound down (unless he chooses so to be) to the precise mode of carrying the invention into effect described in the specification. If the principle is new, it is not to be expected that he can describe every mode of working it; he will sufficiently secure the principle by giving some illustrations of it; and no person will be per- mitted to adopt some mode of carrying the same principle into effect on the ground that such mode has not been described by the patentee. On the other hand, when the principle is not new, a patentee can only secure the par- ticular method which he has invented, and other persons may safely use other methods of effecting the same object. Instances of this occur every day; and it is well known that scores of patents have been taken out for screw- propellers, steam-hammers, water-meters, &c., each of which is limited to the particular construction described, and cannot be extended further. Again, where the inven- tion patented consists of a combination of parts, some old and some new, the whole constituting a new machine or a new process, it is not open to the world to copy the new part and reject the rest. A man is not permitted to allege that the patent is for a combination, and that, the identical combination not having been used, there has been no in- fringement. If he has borrowed the substance of the invention, it will be held that he has infringed the patent.

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A patent may be revoked by a court of law on any one taking proceedings for that purpose, and showing good ground for a revocation, such as want of novelty or utility in the invention, the fact of the patentee not being the in- ventor, insufficiency of the specification, fraud, or the like.

Patents are not now extended to the colonies, and such of the English colonies as possess a legislature are gradually acquiring patent laws for themselves (see injra).

The new Act enables the crown to make arrangements with foreign states for the mutual protection of inventions, under which a person who has

applied for protection for any invention in a foreign state will be entitled to apply for a patent in England within a limited time in priority to other applicants (see p. 358).

The patent business of the United Kingdom is transacted at the Patent Office in London under the superintendence of the comptroller, an officer appointed by the Board of Trade, under whose direction he performs his duties. At this office is kept a register of all patents issued, of assign- ments of patents, licences granted under them, &e. An illustrated journal of patent inventions is published at the same office, where printed copies of all specifications can also be obtained. The proceedings taken with a view to obtain a patent commence with an application drawn up in a special form and accompanied by a description of the invention and a declaration as to its originality. Any person, whether a British subject or not, may apply for a patent. The actual inventor must always be a party to the application, but he may join other persons with him- self, and the patent when issued will be granted to them all jointly. The fees payable to Government on patents have been considerably reduced by the new Act, and they may now be paid by convenient annual instalments.

During the ten years ending with 1882 the average annual number of patents issued was 3506. ‘There has been a large increase under the new law, the number of patents applied for in the first three months of 1884 being

5748.

Patents are frequently obtained through the intervention of persons termed patent agents, who devote themselves to this branch of business.

United States.—Under an Act passed in 1874 a patent must in all cases be applied for in the name of the original inventor, although he may contemporaneously execute an assignment of the invention, and the patent will thereupon be issued to the assignee. Every application is referred to an official examiner. The patent will be refused if any part of the invention is wanting in novelty, or if the

application is not in proper form. The applicant may,.

however, make a re-application, and if the inventor is dis- satisfied with the report of the examiner he can appeal. Patents are issued for the term of seventeen years, but expire with any earlier foreign patents for the same inven- tion. A foreign inventor may obtain a patent if his inven- tion has not been in public use or on sale in the United States for more than two years prior to his application.

Patent Laws in India and the British Colonies,

Prior to 1852 British letters patent extended to all Her Majesty's colonies, but the Patent Act of 1852 restricted the rights granted to Great Britain and Ireland, the Channel Islands, and the Isle of Man. Soon after the date of this Act the legislatures of the colonies began to pass Acts of their own for the protection of inven- tions, and at the present time most English colonies have patent laws. As a rule, the application in the colony must be made by petition accompanied with a specification and drawings of similar nature to those used in the British application ; and in most cases the application must be made by the inventor himself or by his assignee, or by some person holding his power of attorney. The patents are in all cases assignable and the deeds of assignment must be registered in the respective colonies. The patents are usually granted for a term of fourteen years, and the inventions must not have been publicly used in the colony prior to the date

of the application. Inventions may be protected in most if not all the other British eolonies by special Acts of the eolonial legis- atures.

Australian Colonies.—The colonial Aet for New South Wales is dated 14th September 1852. Applications are referred to a board consisting of two scientific men, and upon their report and the payment of £20 the governor will grant letters patent of registra- tion, which have the effect of letters patent. These letters of registra- tion are granted for the term of fourteen years. The New South Wales Act of 1852 still continues in force in Queensland. By an order in council of 6th November 1859 patents similar in terms to those granted in New South Wales can be obtained, and at the same cost. By an Act passed in 1867 inventions can be provisionally protected, but the provisional protection only appears to be useful to residents in the colony. In South Australia the law of patents is governed by the Acts of 1877 and 1881. The application is submitted to an official

examination. The patent is granted for a term of fourteen years, and is subject to taxes of £2 10s. to be paid before the end of the third year and £2 10s. before the end of the seventh year. ‘he invention must be worked in the colony within three years from the date of the grant. In Victoria power is given to the governor to issue letters patent by Act No. 240, 1865. The sum of £15 must be paid before the expiration of the third year, and £20 before the expiration of the seventh year. For Western Australia the colonial Act is dated 15th August 1872, under which bona fide holders of letters patent in any other country ean obtain letters of registration having the foree of patents and cxpiring with the original patent. The government fee is £25. The governor has also power to grant original patents, but these are seldom applied for except by residents in the colony. ‘The government fee on these is £50. The application for a patent must be made before the application is made in any other colony or country.

British Guiana.—The law of patents is governed by an ordinanee dated 12th July 1861. Patents are granted very much in the same form and on the same conditions as British letters patent. A duty of $100 is payable before the end of the seventh year. The governor has power to prolong the term for a period not exceeding seven years.

British Honduras. —The Act for amending the law for granting patents for inventions dated 10th September 1862 rules here. This Act has provisions very similar to the British Patent Law Amend- ment Act 1852. The government fee ou sealing is $30, and the further government duties payable are $50 at the end of the third year and $100 at the end of the seventh year. Prolongations of the original term of fourteen years may be obtained for an addi- tional term not cxeeeding seven years.

Canada.—The Acts in force are those of 1872, 1875, and 1883. Inventors or their assignees may obtain patents for fifteen years for all inventions not having been in public use or on sale in Canada for more than a year prior to the application. When a period of more than twelve months has elapsed sincc the date of any other patent for the same invention the application will be refused. A government duty of $20 must be paid for the first five years, $40 for the second five years, and $60 for the last five years. These duties can be paid either altogether on application or by three instalments. The

invention must be worked in Canada within two years from the date of the patent. The patent is void if after the expiration of twelve months from the grant the patentee imports into Canada the objects of the invention manufactured elsewhere.

_ Cape of Good Hope.—The Act of 1860 prescribes a system very similar to that laid down by the English Patent Act of 1852. A stamp duty of £10 is payable at the expiration of the third year and £20 at the expiration of the seventh year of the grant. The patent will expire with the expiration of any earlier patent in any other eountry for the same invention.

Ceylon.—The inveutions ordinance of 1859 governs the law of patents here. Patents are granted for a term of fourteen years from the time of filing the specification, and the governor has power to grant prolongations not exceeding fourteen years. Thc fee on fling the specification is £10.

Hong-Kong.—By the law of 8d July 1862 the governor in eouneil may grant patents for inventions which have already been patented in England to the inventor or to the owner by assignment of the British patent. Thc patent will extend over the same term as the British patent. Subjects of foreign states not having British patents cannot obtain patents in Hong-Kong.

India.—The law of patents is governed by an Act dated 17th May 1859, Where therc is no prior English patent the invention Must not have been used or published before filing the application. Where an English patent has already becn obtained, the applica- tion must be made within twelve months from the date of the English patent. The exclusive privilege is aequired by merely

ling a specification of the invention upon leave obtained from the governor-gencral for that purpose, and no patent is issued. The governor-general has power to extend the original term for another term not exceeding fourteen years. The government fees on application amount to £10; no further duties are payable.

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Jamaica.—Chap. 30, 21 Viet. 1857, governs the law of patents here. The invention must be brought into operation in the island within two years from the date of the patent. A patent bears a stamp duty of £6 10s., and there is a reference to the attorney- general, upon which he is paid a fee of £5. The duration of the patent is limited to that of any previous foreign patent. Improve- ments on the original invention may be protected by certificates of addition. Patents may be extended for a further period of seven years beyond the original term of fourteen years.

Leeward Islands. —The law is regulated by the Aets of 1876 and 1878, the provisions being similar to those of the English Patent Act of 1852. The patent expires with the termination of any earlier patent clsewhere for the same invention. The payments amount to £28 on every application which is not opposed, and a duty of £10 is payable at the termination of the third year and £20 at the termination of the seventh year.

Mauritius.—The law is regulated by an ordinance dated 22d May 1875. The governor has power to extend patents for any period not exeeeding fourteen years beyond the original term of fourtcen years. A patent may be applied for by the executors or administrators of a deeeased inventor. Payments of £12 are re- quired to be made upon application for the patent and upon sealing.

Natal.—The provisions of the eolonial Aet of 1870 are similar to those of the English Patent Act of 1852. The fees on sealing are £1 10s., and there isa third year’s duty of £5, and a seventh year’s duty of £10. The patent expires with the termination of any British or foreign patent of earlier date. The lieutcnant-governor can grant a prolongation of the original term for a fresh term not exceeding fourteen years.

Newfoundland.—Under an Act passed in 1856 patents are granted for fourteen years, but may be extended upon application for a further period of seven years. The patent expires with the expira- tion of any previous foreign patent for the same invention. Im- provements may be protected by eertificates of addition. The invention must be worked in the eolony within two years from the date of the patent.

New Zealand.—Under the New Zealand Patent Aet of 1883 in- ventors ean obtain either letters patent or letters of registration as they think fit. The fee for letters of registration is £10, and _ for letters patent £2 10s., with a further duty of £10 at the end of five years. Letters of registration are granted as of course upon proof of the applicant being the actual owner of the foreign patent. The invention patented must be worked in the colony within two years from the date of the patent.

Tasmania.—The colonial Act for Tasmania is dated 5th November 1858. The procecdings preseribed are very similar to those in England. The government fees are £7 10s. on application, £15 at the end of the third year, and £20 at the end of the seventh year.

Patcnts may also be obtained in St Helena, the Straits Settlements, and Trinidad.

Foreign Patent Laws.

Argentine Republic.—Patents are granted under a law dated 11th October 1864, for five, ten, or fifteen years, to the inventor or to his assignec. The applications are subjected to an official examination, and the patent when granted is liable to government fees and stamp duties, which vary from about £20 to £60, according to the term of the patent. The invention must uot have been published either at home or abroad prior to the application, and must be worked in the republie within two years from the date of the issuc of the

atent.

7 Austria-Hungary.—By an imperial decree of the 15th August 1852, although separate patents are issued, they are made upon one application. The protection extends to Bosnia and Herzegovina. Where the applicant for a patent is a foreigner he must have ob- tained a patent in his own country for the same invention, and patents are only granted to the original inventor or his assignee. Inventions are considered new when at the time of the applications for patents they have not been put into operation or made public in the cmpire. The government taxes commence at the rate of 26 florins per annum for the first five years, and gradually increase until in the

fifteenth year the duty is 132 florins. If the patent is originally granted for less than fifteen years 1t may at any time be prolonged for that term. The invention must be worked in the empire within a year from the date of the patent, and the working must not be suspended for more than two years ; during its continu- ance there is no objection to the patented articles being imported from a foreign country. . ‘

Belgium.—Patents are granted to the inventor or to his assignec, or to any one holding the authority of the inventor for that purpose. The term is fixed at twenty years, except in the ease of inventions previously patented elsewhere, when the Belgium patent expires with the previous foreign patent of the greatest length. Patents are subject to an annual tax beginning at 10 franes for the first year, and inereasing annually at the rate of 10 francs. Patents of addition expiring with the original patent may be obtained. The invention must be worked in Belgium within one year from its

being worked abroad, but patented articles manufactured abroad may be introduced into Belgium.

Brazil.—By a statute passed in 1882 patents are granted alike to natives and to foreigners. In the case of a foreigner the applica- tion must be made in Brazil within seven months from the date of his foreign patent. The specification must be in the Portuguese language. Patents are granted for a term of fifteen years, subject to the payment of a duty of £1 for the first year, and increasing £1 yearly. The patent must be put into operationin Brazil within a year from the date of the grant, and the working must not be interrupted for more than a year. The Brazilian patent expires on the expiration of any earlier foreign patent for the same-invention. The foreign patentee must appoint an accredited agent to represent him in Brazil.

Chili.—Patents are granted for a term of ten years, subject toa tax of £10 to be paid on application. An extension of a patent may be obtained when the importance of the invention is con- sidered sufficient to warrant it. The invenuion must be worked in Chili within a term fixed in the patent, and the working must not be discontinued as long as the patent is valid.

Denmark.—Native inventors may obtain patents for fifteen years, but patents granted to foreigners are limited to five years.

France.—Grants of patents (brevets d’invention) are regulated in France by the law of 5th July 1844. Patents are granted to inventors or their assignees, whether natives or foreigners, and the French patent expires with any foreign patent of earlier date. Applications for French patents must be made prior to the filing of the complete specification in any foreign country. Patents are granted for a term of fifteen years upon payment of an annual duty of £4. All the duties must be paid up prior to an assignment of the patent being registered. Alterations, additions, or improve- ments may be protected by patents of addition which expire with the original grant. ‘The subject of the patent must be manufac- tured entirely in France, and cannot be imported from a foreign country without invalidating the patent. The invention must be put into execution within two years from the date of the

grant, aud the working must not then cease for any period of two con- secutive years. The patent extends to all the French colonies,

Germany.—By a law dated 25th May 1877 patents are granted for fifteen years to natives and foreigners. The invention must not have been previously described in a printed publication in any way. The patentee may obtain supplementary patents for improve- ments expiring with the original patent. A government duty of £1 10s. is paid on the issue of the patent, together with an annuity commencing at £2 10s. and increasing by £2 10s. each year for the whole term. The Government may revoke the patent if the invention has not been carried out in Germany within tliree years from the date of the patent.

Jtaly.—Patents are granted only to inventors or their assignees for terms varying from one to fifteen years. The publication of a previous foreign patent docs not invalidate the grant provided the application is made during the continuance of the foreign patent, but the Italian patent will expire with the previous foreign patent. Patents of addition are granted expiring with the original patent. Patents are liable to taxes amounting to about 50 francs for each of the first three years of the patent, and increasing gradually. The invention must be worked in Italy within two years from the date of the grant. The description of the invention may be either in the Italian or the French language.

Norway.—By laws of 15th July 1839 and 9th May 1842 patents are granted for a term not exceeding ten years to inventors only. The invention must not have been published in Norway prior to the application, which is subject to an official examination, not usually of a stringent character. A payment of 10 specie dollars must be made in respect of each application. The invention must be put in practice in the country within two years from the date of the grant.

Paraguay.—Under a law of 20th May 1845 citizens or foreigners are alike entitled to protection, and the term of the grant varies from two to ten years. Where there is a previous foreign patent for the same invention the patent is not valid for more than six months beyond the termination of the foreign patent. The inven- tion patented must be worked within two years from the date of the grant.

Portugal.—By a royal decree of 31st December 1852 inventors, whether natives or foreigners, may obtain patents for terms varying from one to fifteen years. Certificates of addition are also granted, but expire with the original patent. A patent will not be granted to an inventor for a longer term than that of his original pateut. The government taxes amount to about £1 8s. per annum, in addi- tion to which certain official fees are payable. ‘The patent becomes void if the invention is not carried into practice within two years from the date of its grant.

Russia.—The law is set forth in several imperial decrees, under which patents are granted to natives and foreigners alike for the term of three, five, or ten years, and upon payment of government duties of 90 roubles for three years, 150 roubles for five years, and 450 roubles for ten years. The patent also covers the kingdom of Poland. There is great delay in obtaining patents. A period of from one to two years usually elapses between the application and the date of the grant. The specification must be written in the Russian language. The invention must be worked in Russia within one quarter of the time for which the patent is granted. Separate patents are issued for Finland.

Spain.—The law is dated 1st August 1878. Patents are granted to foreigners as well as to natives for terms varying from five to twenty years. The application must be made prior to the publica- tion of the specification of the invention in another country. The annual taxes begin with 10 francs for the first year, and increase at the rate of 10 francesa year. The patent covers the Spanish colonies of Cuba, Porto-Rico, and the Philippine Islands. The specification must be made in the Spanish language. Certificates of addition are granted for improvements, expiring with the original patent. The invention must be put into operation within two years from the date of the grant.

Sweden.—Patents are granted to natives and foreigners for terms varying from three to fifteen years, but the patent of a foreigner expires with the expiration of the foreign patent. The invention must be put into operation within the country before the expira- tion of two years from the date of the grant.

Turkey.— Under a law dated 2d March 1880 patents are granted to natives or foreigners for five, ten, or fifteen years, subject to an annual payment of two Turkish pounds. A patent expires with the termination of any earlier foreign patent for the same invention. Certificates of alteration, addition, or improvement are granted, and expire with the termination of the original grant. The inven- tion must be worked within two years from the date of the patent, and the working must not be discontinued for two consecutive years subsequently. Patented articles manufactured abroad cannot be imported into Turkey without invalidating the patent.

In addition to the above-mentioned countries the following also have laws for the protection of inventions under which foreigners may obtain patents : — United States of Colombia, Guatemala, Grand Duchy of Luxemburg, Mexico, Nicaragua, and San Salvador.

international Patents.

The Governments of Belgium, Brazil, France, Guatemala, Holland, Italy, Portugal, San Salvador, Servia, Spain, and Switzerland have recently signed, and Great Britain is about to sign, an international convention relating to patents, the salient points of which are :— (1) that the subjects of each of the above states shall in all the other states, as regards patents, enjoy the advantages that their respective laws grant to their own subjects ; (2) that any person who has duly registered an application for a patent in any one of the states shall enjoy a right of priority protecting the first patentee against any acts accomplished in the interval for a term of six months—a month longer being allowed for countries beyond the sea; (3) that the introduction by the patentee into the country where the patent has been granted of objects manufactured in any of the other states shall not entail forfeiture ; but the patentee remains bound to work his patent in conformity with the laws of the country into which he introduces the patented objects; (4) that the states agree to grant temporary protection to patentable inventions for articles appearing at officially recognized inter- national exhibitions.

It is understood that Holland and Switzerland, where there are at present no patent laws, will shortly adopt measures in pursuance of the terms of the above convention whereby inventions may be protected. 1 (J. H. J.)

PATERCULUS, Marcus? VELLEIUs, a Roman historian, was probably born about 19 B.c. THis father, a cavalry officer, belonged to a good Capuan family, several members of which had risen to some military or magisterial distine- tion. The historian himself served as military tribune m Thrace, Macedonia, Greece, and the East, and in 2 A.D. was present at the interview on the Euphrates between C. Ceesar (grandson of Augustus) and the Parthian king. Afterwards as prefect of cavalry and legatus he served for eight years (from 4 a.D. onward) in Germany and Pannonia under Tiberius, in whose triumph (12 a.D.) he and his brother bore a conspicuous part. For his services

1 For further information on the subject the reader is referred to Johnson's Patentee's Manual, fifth edition, 1884.

2 Marcus is the name given by Priscian; but Renier identifies the historian with the "C. Velleio Paterculo" of a North-African mile- stone (Acad. des Inser., Dec. 1875; Rev. Archéol., 1875), the date of which he places (on inconclusive grounds) in 36 a.D.

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he was rewarded with the questorship in 7, and, along with his brother, with the prztorship in 15. He was still alive in 30, for his history contains many references to the consulship of M. Vinicius in that year. The date and manner of his death are unknown. It has been con- jectured that he was put to death in 31 as a friend of Sejanus, whose praises he celebrates.

He wrote a compendium of Roman history in two books dedicated to M. Vinicius, from the dispersion of the Greeks after the siege of Troy down to the death of Livia in 29 AD. 'The first book brings the history down to the destruction of Carthage, 146 B.c.; portions of it are want- ing, including the beginning. The later history, especially the period from the death of Cesar, 44 B.c., to the death of Augustus, 14 a.D., is treated in much greater detail. Brief notices are given of Greek and Roman literature, put, strange to say, no mention is made of Plautus, Horace, and Propertius. The author is a vain and shallow courtier ; "full of wise saws," he is nevertheless entirely destitute of true historical insight. His knowledge is superficial, his blunders numerous, his chronology inconsistent. He labours at portrait-painting, but

his portraits are daubs. On Cesar, Augustus, and above all on his patron Tiberius, he lavishes praise or flattery. The repetitions, redund- ancies, and slovenliness of expression which disfigure the work may be partly due to the haste with which (as the author frequently reminds us) it was written. Some blemishes of style, particularly the clumsy and involved structure of his sentences, may perhaps be ascribed to insufficient literary training. The inflated rhetoric, the straining after effect by means of hyperbole, antithesis, and epigram, mark the degenerate taste of the Silver Age, of which Paterculus is the earliest example. He purposed to write a fuller history of the later period, which should include the civil war between Cesar and Pompey and the wars of Tiberius ; but there is no evidence that he carried out this intention.

Paterculus was little known in antiquity. He seems to have been read by Lucan and imitated by Sulpicius Severus, but he is mentioned only by the scholiast on Lucan, and once by Priscian. Ail we know of his life is derived from his own statements. The text of his work, preserved in a single badly-written MS. (now lost), is very corrupt, and its restoration has tasked the ingenuity of Many learned men. The editio princeps appeared at Basel in 1520 ; subsequent editors have been J. Lipsius, Leyden, 1591 ; J. Gruter, Frankfort, 1607 ; N. Heinsius, Amsterdam, 1678; P. Burmann, Leyden (2d ed.), 1744; D. Ruhnken, Leyden, 1779; J. C. Orelli, Leipsic, 1835; F. Kritz, Leipsic, 1840 and 1848; F. Haase, Leipsic (2d ed.) 1858; C. Halm, Leipsic, 1876.

Besides the literary histories of Bernhardy and Teuffel, see the prolegomena to Kritz’s edition; H. Sauppe, in Schweiz. Museum, i. p. 183; A. Pernice, De Vellet fide historica, Leipsic, 1862; contributions to the criticism of the text by J.C. M. Laurent, Loci Velleiani, Altona, 1836; J. Jeep, Emendationes Vellei- ang, Wolfenbiittel, 1889; N. Madvig, Adversaria, ii. p. 297 sg.; English trans- lations by Newcoinb, Paterson, and Watson; German by Jacobs, Walther, and Eyssenhardt; French by Després and Gréard ; Italian by Manzi, Boccanera, and Spiridione Petrettini.

PATERINES. See PaTarEnes.

PATERNO, a town of Sicily, in the province of Catania, stands at the south-west foot of Mount A®tna, 10 miles north-west of Catania near the railway

from that city to Leonforte. It is a long straggling place with a medieval castle (1073) and several churches and suppressed convents. The surrounding country is fertile, producing corn, oil, wine, flax, hemp, and timber, in which articles an active trade is carried on. Paternd gives the title of “prince” to a Sicilian family. In the neighbourhood the remains of ancient baths, tombs, and aqueduct, and a bridge across the Simcto have been discovered. The town is supposed F ag the site of the ancient Hybla Major. Population

PATERSON, the “Lyons of America,” a city of the Juited States, capital of Passaic county, New Jersey, is situated on the Passaic river and the Morris Canal, 17 miles north-west of New York by the Erie and the Dela-

ware, Lackawanna, and Western Railroads. As the river, which forms the boundary of the city for a distance of 9 miles, has at one place a sheer fall of 50 feet, it is an unfailing source of abundant water-power ; and Paterson ranks second among the manufacturing cities of the State. Silk, iron, and cotton are the great industrial staples ; silk-dyeing is also practised. One of the chief industries is the making of locomotives. Further, fire-engines, “Whitney” sewing-machines, iron bridges, brass wares, flax, hemp, and jute goods, calico-prints, paper, and chemi- cals are all manufactured. The population was 11,334 in 1850, 19,586 in 1860, 33,579 in 1870, and 51,031 in 1880. Founded in 1792 by a cotton company under the patronage of Alexander Hamilton and named after Gover- nor William Paterson, who signed its town charter, Paterson obtained the rank of a city in 1851.

PATERSON, Witi1am (1658-1719), founder of the Bank of England, projector of the Darien scheme, and a voluminous writer on subjects connected with finance, was born in April 1658 at the farmhouse of Skipmyre, parish of Tinwald, Dumfriesshire. His parents occupied the farm there, and with them he resided till he was about seven- teen.

At that time the people of the northern kingdom were engaged in considering how they might share in the bene-

fits of that trade which was so rapidly enriching their southern neighbours. Paterson embraced the opportunity thus offered. He removed to Edinburgh, unfolded his Darien scheme, and soon had the whole nation in favour of it. He, it is supposed, drew up the Act of 1695 which formed the “Company of Scotland trading to Africa and the Indies.” This company, he arranged, should establish a settlement on the isthmus of Darien, and “thus hold the key of the commerce of the world.” There was to be free trade, tle ships of all nations were to find shelter in this harbour not yet erected, differences of race or religion were to be made nothing of ; but a small tribute was to be paid to the company, and this and other advantages would so act that, at one supreme stroke, Scotland was to be changed from one of the poorest to one of tlie richest of nations.

On the 26th of July 1698 the first ships of the expedi- tion set sail “amidst the tears and prayers and praises of relatives and friends and countrymen.” Some financial transactions in which Paterson was concerned, and in which, though he had acted with perfect honesty, the com- pany had lost, prevented his nomination to a post of im- portance. He accompanied the expedition as a private individual, and was obliged to look idly on whilst what his enemies called his “‘ golden dream ” faded away indeed like the “ baseless fabric of a vision” before his eyes. His wife died, and he was seized with a dangerous illness, ‘‘of which, as I afterwards found,” he says, “‘ trouble of mind was not the least cause thereof.” One who knew him in this evil time tells us “he hath been so mightily concerned in this sad disaster, so that he looks now more like a skeleton than aman.” Still weak and helpless, and yet protesting to the last against the abandonment of Darien, he was carried on board ship, and, after a stormy and terrible voyage, he and the remnant of the ill-fated band reached home in December 1699.

In his native air Paterson soon recovered some of his strength, and immediately his fertile and eager mind was at work on new schemes. First he did all he could to pre- vent the Darien scheme already engaged in from being finally abandoned, then he prepared an elaborate plan for developing Scottish resources by means of a council of trade, and then he tried to

induce King William to enter on a new Darien expedition. About the beginning of the century he removed to London, and here by confer- ences with statesmen, by writing, and by personal persua- sion helped on the Union, of which his far-reaching mind enabled him, perhaps better than any other man then living, to see the advantages. At the Union one of the last acts of the Scottish parliament was to recommend him to the consideration of Her Majesty Queen Anne for all he had done and suffered. The united parliament, to which he was returned as a member for the Dumfries burghs, though he never took his seat, decided that his claim should be attended to, but it was not till 1715 that an indemnity of £18,241 was ordered to be paid him. Even then he found considerable difficulty in obtaining his due. His last years were spent in Queen Square, Westminster, but he removed from his house, though probably to some other part of London, shortly before his death, which happened 22d January 1719.

As many as twenty-two works, all of them anonymous, are attri- buted to Paterson. These are classified by Bannister under six heads, as dealing with (1) finance, (2) legislative union, (3) colonial enterprise, (4) trade, (5) administration, (6) various social and political questions. Of these the following deserve special notice. (1) Proposals and reasons for constituting a Counetl of Trade

(Edinburgh, 1701).1 This was a plan to develop the resources of his country.

1 This work was attributed to John Law (see Law, vol. xiv. p. 367, note), who certainly borrowed some of his ideas from it. To Law’s

“system ” Paterson was strongly opposed, and it was ehiefly due to his influence that it made no way in Scotland.

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members, was to be appointed. It was to have a revenue collected from a duty on sales, lawsuits, successions, &. With these funds the couneil was to set the Darien seheme going again, to build workhouses, to employ, relieve, and maintain the poor, and to encour- age manufactures and fisheries. It was to give loans without interest to companies and shippers, it was to remove

monopolies it was to construct all sorts of vast public works. Encouragement was to be given to foreign Protestants and Jews to settle in the kingdom, gold and silver were to be coined free of charge, and money was to be kept up to its nominal standard. All export duties were to be abolished and import regulated on a new plan. By means like these Paterson believed the disasters lately under- gone would be more than retricved. (2) A proposal to plant a colony im Darien to protect the Indians against Spain, and to open the trade of South America to all nations (1701). ‘This was a proposal to King William to establish the Darien seheme on a new and broader basis. It points out in detail the advantages to be gained; free trade would be advanced over all the world, and Great Britain would derive great profits. (3) Wednesday Club dialogues upon the Union (London, 1706). These were imaginary conveisations in a club in the city of London about the union with Scotland. Paterson’s real opinions were put into the mouth of a speaker called May. The result of the diseussion is that till the Darien busi- ness all Scots were for the Union, and that they were so still if reasonable terms were offered. Such terms ought to include an incorporating union with equal taxes, freedom of trade, and a proportionate representation in parliament. A union with Ireland ‘Cas likewise with other dominions the queen either hath or shall have” is proposed. (4) Along with this another discussion of the same imaginary body, dn inguiry into the state of the Union of Great Britain and the trade thereof (1717), may be taken. This was a consideration of the consequences of the Union, which, now ‘*that its honeymoon was past,” was not giving satisfaction in some quarters, and also a discussion as to the best means of paying off the national debt,—a subject which occupied a great deal of Pater- son’s attention during the later years of his life.

Paterson’s plans were vast and magnificent, but it is a great mistake to suppose that he was a mere dreamer. Every one of his designs was worked out into minute detail,? and every one was pos- sible and praetieal. The Bank of England was a stupendous success. The Darien expedition failed from hostile attaeks and bad arrange- ments. But the original design was that the English and Dutch should be partakers in it, and, if this had occurred, and the arrange- ments, against many of which Paterson in letter after letter in vain protested, had becn different, Darien might have been to Britain another India, whose history was shadowed by the memory of no

wrong.’ Paterson was a zealous almost a fanatic free-trader long before Adam Smith was born, and his remarks on finance and his argument against an inconvertible paper-eurrency, though then novel, now hold the place of economic axioms. In his description of the ‘‘merchants in an extended sense” Paterson has drawn his own eharacter for us. They are those ‘‘ whose education, genius,

general scope of knowledge of the laws, governments, polity, and _

management of the several countries of the world allow them sufii- cient room and opportunity not only to understand trade as ab- stractly taken but in its greatest extent, and who accordingly are zealous promoters of free and open trade, and consequently of liberty of conscience, general naturalization, unions, and annexions.”

Paterson’s works are well written, and the form as well as the matter are excellent. As already noticed, they are all anonymous, and they are quite impersonal, for few men who have written so much ever said so little about themselves. There is no reference to the scurrilous attacks made on him. They are the true products of a noble and disinterested as well as vigorous mind. Paterson was not rewarded for his labours. The Bank of England wasa great success, but he lost rather than gained by it. In the Darien scheme he was ruined, and this ruin he never quite retrieved. The credit of his other schemes has been usually ascribed to other and inferior men. There is thus singular fitness in the motto “‘sic vos non vobis” inscribed under the only portrait of him that we possess.

See Life of W. Paterson, by 8. Bannister (Edinburgh, 1858); Paterson’s Works, 3 vols., by S. Bannister (London, 1859); The Birthplace and Parentage of W. Paterson, by W. Pagan (Hdinburgh, 1865). The brilliant account in the fifth volume of Macaulay’s History is incorrect and misleading. That in Burton’s Hist. of Scotland (vol. viii. ch. 84) is much truer. A list of a number of fugitive writings on Paterson will be found in Poole’s Mag. Index. F. WA.)

2 The books of the Darien company were kept after a new and very much improved plan, which it is believed was an invention of Paterson’s (Burton’s Hist. Seot., vol. viii. p. 36, note).

3 The revival of the Darien scheme in our own day is a signal proof of Paterson's foresight. Of a canal he says: ''From Venta Crucis to Panama upon the South Sea there is by land about eight short French leagues, six whereof is so level that a canal might easily be cut through, and the other two leagues are not so very high and im- practicable ground, but that a eut might likewise be made were it in these places of the world, but considering the present circumstances of things in those it would not be so easy' (Works, Bannister's ed., vol. i. p. 140).

ATHOLOGY (za6os, Adyos, the doctrine of disease or

(lit.) of that which is suffered) holds a peculiar place among the natural sciences. Although it is laid down, in the opening sentences of the Hippocratic treatise De prisca medicina, that the medical art, on which all men are dependent, should not be made subject to the influence of any hypothesis (such as that of the four cardinal qualities, hot, cold, moist, and dry), that the care and cure of the sick should not be subordinated to pathological me theory, but should be guided by experience ; yet the prac-

c- titioners of medicine have at no time been able to dispense i} with theory, not even those avowed followers of the Hippo- eratic tradition who, while they professed a kind of quiet- ism amidst the rise and fall of systems, have none the less been profoundly influenced by theory at every step of their practice. The position of Cullen is the only rational one: "You will not find it possible to separate practice from theory altogether; and, therefore, if you have a mind to begin with theory, I have no objection… . To render it safe, it is necessary to cultivate theory to its Jull extent."

§ 1.—ProGress AND SCOPE.

The progress of pathology hitherto has been exactly parallel with the progress of philosophy itself, system suc- ceeding system in genetic order. No other department of biological science has shown itself so little able to shake off the philosophical character, or to run in the career of positivism or pure phenomenalism. This unique position of pathology among the natural sciences is doubtless owing to the fact that it is a theory of practice, a body of truth and guess-work existing for the benefit of a working pro- fession which is daily brought face to face with emer- gencies and is constantly

reminded of the need of a reasoned tule of conduct. It is idle to attribute the philosophizing _ habit in medicine, or the habit of system-making, to an | unscientific method in past times. The extremely various _ points of view from which the problems of diseased life are approached in the very latest and most authoritative writings are an evidence that the difficulty is really in- herent in the subject-matter.

The positive progress of the biological sciences does

holding the balance fair between that which is “exopathic” in disease and that which is “ endopathic” may be read in Virchow’s article, “ Krankheitswesen und Krankheits- ursachen,” written in reply to objections that the cellular pathology was inadequate. ‘What I wished to treat of in the Cellular Pathology,” he says, “was the behaviour of the elements of the living body in the usual kinds of illness, or, to put it more briefly, the history of the element- ary processes of disease. Upon that basis, it seemed to mé, the doctrine of the nature of disease should be built. The respective causes I adverted to only now and then ; thus I spoke of poisons, and even fungi had a place in the cellular pathology, although a very modest one. If the Cellular Pathology had ever pretended to be a general pathology it would have contained also the whole of etiology.” Thus far Professor Virchow writing in 1880. If we now turn toa text-book of the same date, which does bear the title of General Pathology, that of Professor Cohnheim, we find pathology defined as “an explanatory science which seeks (1) to discover the causes of disease, and (2) to ascertain the esoteric connexion subsisting among disease-manifestations.” It is only (2) that forms the subject of Professor Cohnheim’s two volumes; etiology, he remarks, is absolutely without limits. It “comes into relation with” cosmical physics, meteorology, geology, sociology, chemistry, botany, and zoology; from these sciences it gets its subject-matter. In the general patho- logy of Cohnheim, accordingly, etiology is omitted ; and with it are omitted many of the problems underlying the philosophical systems of the past, which have “only an historical interest,” as well as much of the natural history of disease. General pathology, he says, knows no other direction aud no other

order than physiology, “and accordingly we shall take up successively, and in the same order as physiology would take them, the pathology of the circulation, digestion, respiration, tissue-nutrition, and the like” (the pathology of the nervous system is not included in the two volumes). Without adducing other instances of eclecticism in the contents of modern patlo- logical text-books, it will be convenient to give a brief notice of the latest attempt at a philosophical scheme of diseases,—the Hlemente der Pathologie of Rindfleisch, 1883.

not essentially depend on the philosophical conception of life as action and reaction; but the notion of action and reaction comes to the front in every page of a patho-

There are certain groups of symptoms, says Rindfleisch, Rind. which recur with the uniformity of a type in the most — various diseases, depending as they do upon one constant **“°™”™**

logical treatise, and at every step of practice. In con- sidering the forms of diseased life, if not in the study of living things themselves, we are constantly driven back to that ultimate analysis. The influences from without, which make up «etiology or the doctrine of causes of disease, assume a position in medicine the urgency or immediate interest of which far exceeds that of the bio- logical problem, “the correspondence between life and , |” Mts circumstances.” The standing difficulty in pathology lod has been its relation to etiology, or the relation of the as mori to the ayens morbi. One of the most singular Ways of meeting the difficulty is that of Paracelsus, who boldly perpetrated the paradox: “ Hnxs ist ein Ursprung, Welches Gewalt hat, den Leib zu-regiren.” The five classes of entia of Paracelsus are a composite catalogue, of which (1), (2), and (5) stand for influences from without, and _ *) and (4) for spontaneities, dispositions, or liabilities within. From time to time the centre of interest has been shifted to within the body, as in the “animism” of Stahl, in the “vitalism” of the school of Montpellier (end of 18th century), and in the “cellular pathology” of es A discussion of the inherent difficulty of

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factor,—the human body and its structural and functional tendencies. ‘The larger number of maladies do not arise autochthonously or ‘under a whole skin,” they are gener- ated by certain morbific causes; and it is the variety of causes that corresponds to the variety of disease-species, or to those ever-changing sequences and coexistences of symptoms in which the experienced eye of the practitioner learns to distinguish one disease from another. The mor- bific cause is an Invasion upon the normal course of our life, usually a strong and forcible interference with the physical and chemical constitution of a particular part of the body. The disease as a whole stands for the effects of this interference, and these effects flow in part from the nature of the morbific cause and in part from the nature of the body which suffers. That which is uniform in these effects flows from the nature of the sick body ; that which is various flows from the variety of morbific causes. It is above all the seat of the disease, its duration, the sequence and combinations of the type-groups of symptoms which are determined by the morbific cause. Only this vary- ing element can be used to distinguish one disease from ; another. Therefore there is only one truly natural prin-

Simon’s view.

Exo- pathic,

dominant

view,

ciple of subdividing diseases and only one point of view in special pathology from which the construction of a natural system may be approached,—namely, the etiolo- gical principle of classification and the xtiological system. In each group of diseases, and in each individual disease, the causation has to be inquired into as closely as possible and described after the natural-history manner; we have to ask how and where the cause acts upon the organism, and finally to show how, from this action

and from the re- action of the organism towards the same, we may explain those special features of disease and that special morbid process which are peculiar to each group of maladies or to each malady individually. In a word, the species morbe are made by the morbific causes ; all that separates one dis- ease from another is contained in the cause; only the causal differences, and no other, furnish those units of disease-life which can be brought under genera and species.

If we now inquire into the categories of causation, according to Rindfleisch, we find that they are five in number, as were the categories of Paracelsus. They are (1) injury from without, (2) parasitism, (3) deficient rudi- ments and defective growth, (4) over-exertion, and (5) pre- mature involution or obsolescence. It is impossible not to discover heterogeneous elements in this enumeration ; it is a composite catalogue like that of Paracelsus, and we shall find it hard to say in the case of (3) and (5) whether we are dealing with the ens morbz or with the agens morbi.

A statement of the definition and scope of pathology simi- lar to that of Rindfleisch had been given by John Simon in his Lectures on General Pathology. Diseases were for the most part the normal phenomena of life under abnormal circumstances, ‘‘When you know the whole case you are obliged to admit that, according to the normal constitution of the body, the symptoms in question ought to have followed the operation of those several causes.” The doc- trine of disease, accordingly, is mostly an ‘“‘exopathic” one, although a small residue of it may be “autopathic.” It is impossible, says Simon, absolutely to exclude autopathic diseased states; there may be some such, mostly develop- mental, which “are actual caprices and spontaneities of life, without any exterior causation whatsoever.”

The exopathic point of view may be said to be the dominant one at present; more particularly, it is from the etiological side that the enormous aggregate of con- tagious and infective sickness is mostly studied. Thus in the nosology of Rindfleisch the whole of the specific fevers and infections (including even climatic fevers) are placed (tentatively) under the head of “ Parasitism,” the parasites being minute living organisms having their independent place in the scale of being. The numerous researches of the

parasitic school may be regarded as the most formal attempt as yet made to separate the study of the agens morbt from that of the ens morbi.!

§ 2.—INTRODUCTION.

The plan of this article will be to take diseases as they occur in the concrete, and to apply an analytical method to them. In a given disease, or in an individual case of the same, the object would be to find the point of divergence from the beaten path of health, or, failing that, to seek out the nearest analogies in the physiological life for the unaccustomed and even grotesque things of disease. The effects of disease in man's body may be likened, in a too pleasing figure, to the effects of a magician's wand ; there is

: Literature. —Hiaser, Lehrbuch der Geschichte der Medicin und der epidemischen Krankheiten, 3d ed., 8 vols., Jena, 1875-82 ; Virchow,

Krankheitswesen und Krankheitsursachen," in Virchow's Archiv, vol. Ixxix., 1880; Cohnheim, Vorlesungen 'ber allgemeine Patho- logie, 2 vols., Berlin, 1877-80; Rindfleisch, Die Elemente der Patho-

logie, ein natiirlicher Grundriss der wisscnschaftlichen Medicin, Leipsic, 1883 ; Simon, Lectures on General Pathology, London, 1850.

PATHOL OG ¥

'nothing of him but is changed into something rich and strange." This fascinating region of science is well outlined by Buckle in his remarks on the genius of Hunter :—

''In nature, nothing is really irregular or disorderly ; if we are apt to fancy that the chain is broken, it is only because we cannot see every link in it… . Being satisfied that everything which happens in the material world is so connected and bound up with its antecedents as to be the inevitable result of what had pre. viously occurred, Hunter looked with a true philosophical eye at the strangest and most capricious shapes. To him they were neither strange nor capricious. They were deviations from the natural course ; but it

was a fundamental tenet of his philosophy that nature, even in the midst of her deviations, still retains her regularity.”

Hunter’s own words are: “Nature is always uniform in her operations, and, when she deviates, is still regular in her deviations. ... It certainly may be laid down as one of the principles or laws of nature to deviate under certain circumstances.” ‘The interest of this science, says Buckle, “‘depends simply on the fact that, when it is com- pleted, it will explain the aberrations of the whole organic world.” The same science of deviations was provided for by Bacon in his classification of the sciences ; and, after him, by D’Alembert, under the head of “ Prodigies, or deviations from the usual course of nature,” in his classifi- cation for the E’ncyclopédie.

The science of deviations begins, in the writings of Hunter and of Paget, with the erratic forms of crystals, and with the indwelling power of crystals to repair injuries on the lines of their growth if they be placed in the pro- per mother-liquor. In the hands of each of these two pathologists this science next proceeds to elemental aber- rations in the life of plants, where there is neither heart nor nervous system to complicate matters; and, so advanc- ing from the simpler to the more complex, we should have a science of the abnormal coextensive with life itself. Without attempting to treat of pathology in that evolu- tional order, which proceeds from elemental pathology upwards, we may still adopt, for the narrower subject of human pathology, a somewhat analogous order, that is to say, a method based upon the facts of embryonic develop- ment. Confining our attention, then, to the processes of disease within the human body, and seeking out from among these the broadest of the facts, we shall find evi- dence, as we proceed, that the life of the body retains vividly the memories of its past. Nothing marks so generally the disease-incidents of life as crudity or re- crudescence in the activities of cells, tissues, organs, and mechanisms. In other words, we shall find much in pathology to show that, when the organism goes wrong, it retreats to broader ground, or reverts to modes of life which it had come through. But, even in the normal functional and structural processes of the mature body, we find occasional evidences of the same reversion to embryo- nic modes of life. These are practically limited, in health, to the reproductive system, or to that part of life which goes to the maintenance of the species. Here we find pertodicity still in full force, the

same periodicity, prim- arily following the seasons, which underlies the life of vlants and of most animals. The greatest example in the human body is the building up anew, from time to time, of an entire organ, the placenta, for the intra-uterine nourish-

ment of the child; in this periodical formation we have a \

reversion, in the midst of mature life, to vessel-making and blood-making such as the body goes through otherwise only

during its development. The provision for the nourish- |

ment of the child after it is born is a somewhat modi- fied instance of the same kind. ‘The full structure and

function of the breast also develop periodically (although |

the framework is permanent), and each of these period: ical developments is a repetition of the incidents in the

original embryonic development of structure and function. —

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It is when we come to the several tissues that we meet with the most striking reminders of persisting de- yelopmental characters, the most universal fact of the kind being the indwelling embryonic character of the common binding tissue. In that tissue, indeed, we have a constant reminder that in the midst of the very highest or most perfected modes of cellular life we are but a step removed from the most rudimentary. Thus in the brain and in the retina the elaborate nervous mechanism is supported on a framework of connective tissue; there is a morbid con- dition of these organs, called glioma, in which the con- nective tissue, or neuroglia, absolutely usurps the place of the nervous mechanism of which it is ordinarily the mechan- ical support; and this it may so completely do, as in disease of the pons Varolii, that even the outward form and mark- ings of the part are not interfered

with. An equally striking instance of a return to embryonic characters and predominance may sometimes be observed in the primi-

healed, and now a fifth head was formed, quite perfect ; and after it, as perfectly, a sixth and a seventh head. All these were produced in fifteen months.” This spontaneity resides in every living thing, and its efforts are directed by the memory of what the species had come through in reaching its place in the scale of organization ; it is able, indeed, to make perfect reparation for injuries or losses only where the cells are little differentiated into tissues, or where the tissues are little specialized for diverse func- tions. In all animals, and most notably in the higher, this spontaneity is most effective for repair in the periods of development and growth. With reference to the degree of reparative power possessed, Paget formulates the rule as follows: “The amount of reparative power is in an inverse ratio to that of the development, or change of structure and mode of life, through which the animal has

passed in its attainment of perfection, or on its way thitherward.”

tive nuclei of muscle; the muscle-fibres will be found to have surrendered their high function, to have retraced the steps of their development, and to have sunk their identity

Healing by Granulations.—It will now be convenient to advance Granu- in medias res, and to give some account of the process of repair in lation- man, where there is a breach of continuity in the course of the repair.

in a rudimentary form of cell-life.

Thus the body nowhere loses altogether the memory of the past, even when the periods of development and growth are, strictly speaking, ended. Among the normal processes of mature life there are such as amount to a recrudescence of structure and function ; and an analogous recrudescence in the tissues is one of the most fundamental facts in the processes of disease. There are several advan- tages in proceeding in an exposition of pathological prin- ciples from this evolutional or developmental basis. It

enables us to take up, in an order not unsuited to their importance, the sections relating to repair, to new growth of tumours, to errors of growth, such as rickets, to errors of blood-making, and the like. At the outset comes the process of repair, for which Paget has formulated the embryological principle as follows: “The powers for development from the embryo are identical with those exercised for the restoration from injuries ; in other words, the powers are the same by which perfection is first achieved, and by which, when lost, it is recovered.”

§ 3.—TueE Process oF REPAIR.

The spontaneity of certain polyps under injury is a good example of the indwelling power of all the cells and tissues to return to the established order, to the order and harmony which had been slowly acquired, and of which the memory is vividly retained. Trembley cut a hydra longitudinally, and “in an hour or less,” says Paget, “each half had rolled itself and seamed up its cut edges So as to be a perfect hydra. He split them into four; he quartered them; he cut them into as many pieces as he could; and nearly every piece became a perfect hydra. He slit one into seven pieces, leaving them all connected by the tail, and the hydra became seven-headed, and he saw all the heads eating at the same time. He cut off the seven heads and, hydra-like, they sprang forth again.” The recovery of perfection may be more gradual. Thus, Sir J. G. Dalyell (as quoted by the same writer) cut a specimen of Hydra tuba in halves; each half regained the perfect form, but only very slowly, and, as it were, by a gradual improvement of parts that were at first ill formed. In Tubularia indivisa, after the natural fall of its head, the stem was slit for a short distance down; an imperfect head was first produced, at right angles to the stem, from One portion of the cleft; “after its fall another and more nearly perfect one was regenerated, and, as it grew, im- proved yet more. A third appeared, and then a fourth, which was yet more nearly perfect, though the stem was thick and the tentacula imperfect. The cleft was almost

blood-carrying and lymph-carrying vessels, of the nerves, sinews, binding tissue, bone, fat, and skin. What is the effort that they each and all make to adapt themselves to the circumstances, in the case, let us say, of a stump after amputation? (The repair be- tween the two ends of a broken bone will

be discussed separately.) Disregarding the cases where the inost perfect coaptation of parts issecured by the surgeon, and selecting the extreme case where the wound is ‘‘left to granulate,” the following is the order of events. The divided vessels being scaled up either by ligature or by clots of blood (which are in the end absorbed), there oozes from the raw surface a blood-tinged serous-looking fluid. Becoming paler by degrees, it sets on the surface as a greyish-white film or glazing, especially on the exposed surface of muscle. The film of surface- glazing will be found to contain numerous corpuscles embedded in it resembling the colourless corpuscles of the blood. They have probably the same formative or reparative value as the granulation- cells proper, but it will appear from the facts about to be given that they are practically superseded by the latter in all cases where a wound is ‘‘left to granulate.” After an interval of two or three days of apparent rest reddish points are scen on the edges of skin, on the muscular substance, and on the marrow of the bone; these are the beginnings of the granulation-tissue, which in the end covers the whole surface and grows until it fills up the gap somewhat beyond the level of the edges of skin. When the growth of granu- lations projects considerably beyond the skin it is known as ‘proud flesh.” Usually the surface begins to skin over when the defect of substance has been sufficiently made good, the new skin showing as a delicate bluish border or frill to the old skin. This frill becomes broader and broader until the growing points meet in the centre, and the continuity of the skin is restored. Meanwhile the granulation ~~tissue beneath has been changing into more charac~~ teristic forms of mature tissue, although the status quo antea 1s never quite restored. ; ; . Notwithstanding the regularity of this process, and its daily occurrence in surgical practice, there is an almost incredible amount of conflicting opinion as to its details, —radical differences as to the source or sources of the reparative material, and as to the mode of development of the new blood-vessels and of the new skin ; and these differences of opinion must be the measure of the difficulty of analysis where the interference takes place in the highly coi- plex and subtly integrated life of man. Direct observation of the reparative process does not of itself suffice to discover the law of it ; it is necessary to seek elucidation from the nearest analogies, both among the regular processes of life and growth and among thie deviations therefrom. Among the former there is in particular one rich source of analogous detail to be found in the periodical new formation on the surface of the uterus for the purposes of the

embryo—in the placenta; among the latter are certain kinds of tumours and cysts. Hunter sought for a parallel to the new vessels of granulation-tissue in the first formation of vessels in the embryo ; but these arise in the continuity of development, and not as a somewhat abrupt incident in the mature life. On the other hand, the formative process of the placenta is an example—and a unique example—of an extensive new growth of vascular tissue occurring periodically in the adult, and_as somewhat of an interruption on the ordinary course of life. It matters little for this parallelism whether we accept the extreme position of Ercolani, that a total destruction of the uterine mucosa precedes the placental new growth, or whether we adopt the more likely view that the new formation takes place under an intact surface. In either case we have to do with a remarkable spontaneity of the body, a spontaneity which

reveals the indwelling power of the tissues, and especially the vessel-making powcr. \ Analogy of Placental new Formations.—The first adaptations for

develop- the placenta are not in the pre-existing vessels, but in the pre-

ments.

Tendon- granula- tions.

existing tissues around. The elon- gated and almost fibre-like cells @ . become more plump, they join to | form cylinders of nucleated proto-plasm, the adjoining cylinders open out to form meshes between them, and all this takes place in | the intervals between the peaile | and their capillaries (fig. 1). The cells of the tissue return to that | y nit

embryonic state which preceded the formation of blood – vessels, supplying their own juices, as it were, and opening out so as to Ore

form plasmatic canals in their Fre. 1.—a, uterine tissue at early stage midst. Inthe placental rudiment of decidua; 8, ¢, the same at later it isa mucus-likealbuminous fluid St@ges.

that they mostly yield, but there is some evidence that they also yield blood-corpuscles.

at a later stage it is the perivascular cells that keep up this acti- vityfig. 2). The phase of developmentin which \ the cells supply their \ own juices, retaining them in meshes of the tissue, is succeeded by a new formation of ves- sels, a more periman- ent provision. Certain tracts of cells are told Fic. 2.—From deeper part of placenta (guinea-pig), aft ie tov Che walle ok poli oi cell-growth in and around the blood-vessels, the chan-

nel of the vessel being the space between two such adjoining tracts (fig. 3). These selected cylinders of cells become the new and enlarged system of blood-vessels, adequate to the requirements of the part. In this placental process the original capillaries play a

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Fia. 8.—New formation of vessels in placenta (guinea-pig).

very subordinate part; the thin cell-plates that form their walls are far outrun in the hyperplastic race by the cells of the tissues around, and it is the latter which furnish the materials for the new vessels. That which distinguishes the placental new formation is the enormous thickness of the walls of the new vessels and their terminal capillary loops. It remains to consider whether this pla- cental new formation of vascular tissue—the only instance of the kind in the ordinary course of adult life—offers any help to the understanding of granulation-tissue.

Tendon in a Granulating Stump.—It is at once evident that the tissues of a stump after amputation have a very unequal value for formative purposes, and probably all of them a lower value than the uterine tissue, which is at no time far removed from embryonic characters. This inequality is seen in the order in which granula- tions appear—first on the vascular layer of the skin, on the ends of muscle, and on the marrow of bone, and last on the

ends of tendon. The attempt of a severed tendon to cover itself with a cap of granulations is somewhat feeble, and its slowness gives us an opportunity of marking points of detail. Tendon consists of wavy bundles of fibres in close order, and in full-grown animals its cellular elements are reduced to small dimensions. They are thin plates folded round the bundles, presenting in the face view the appearance in a, fig. 4, and in the side view the appearance in 8,

g. 4. In the granulating end of a tendon the appearance is that of ¢, fig. 4; the thin plates have become solid or cubical, and where

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they have increased in number at the free end of the tendon they have lost their orderly arrangement ; they have, in fact, become granulation-cells. The tendon has drawn upon its reserve of celly and placed them at the disposal of the reparative process. All the

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Fia, 4.—a, tendon-bundle covered by cell-plates, detached plate beneath (highly magnified ; after Ranvier); 6, ordinary appearance of normal tendon in section, the plates being seen in profile as linear thickenings ; c, tendon from a gran- ulating stump of the leg,—the cell-plates have become cubical.

other tissues of the part have already done the same, some much earlier and more extensively than others. Wherever capillaries are most numerous there the cellular activity is greatest, the cells nearest to the wall of the capillary becoming more plump or more embryonic. The cellular material for the purposes of repair is supplied first around the severed vessels (according to

some it is even supplied from within the vessels in the form of colourless blood- corpuscles) of the highly vascular muscle, of the marrow of bone, and of the subcutaneous tissue, and ultimately even by the ends of the tendons. In the placental process the formative materials had been furnished much more evenly over the whole area. Blood-vessels of Repair.—The next step is towards the nutrition Blooc of the formative cells. Whether their nutrition is for a time plas- vesse matic (as in fig. 1, from the placental growth) does not appear ; gran about the third day the formative tissue begins to be furnished tion. with numerous blood- vessels, Their for- * mation is very diffi- ~~: cult to observe in young granulations ; in older granulation~~ tissue they have the appearance drawn in .\ fic. 5, a series of .« parallel tubes mak- ing straight for the surface, ramifying on the same, joining by numerous loops near the surface, and of unequal calibre throughout their course, being widest onor nearthe surface. These vessels are dif- ferent in several respects from the vessels in a vascular area of the normal organism of corresponding extent, unless it be in the decidua uterina. ‘I’hey are not branching arterioles ending in a fine capillary network, but they are of somewhat uniform and exceedingly simple structure throughout, and their calibre is often greater at the distal than at the proximal end. We have next to consider how these vessels have originated. S. The youngest granulations that can be prepared for examination consist of a uniform mass of cells, mostly round, and of somewhat wide vascular channels separated from the mass of cells by thin walls of more elongated cells (fig. 6). The most probable analogy for these new and wide vessels is not the embryo nor the tadpole’s tail, but the placenta ; that is to say, certain of the cells along pre- determined lines agminate to form the opposite sides of a tube, be- coming adapted in shape to that end (fig. 8). According to Billroth, there is hardly ever in granulations an extension of the pre-existing capillaries by outgrowth of branching cells from their walls such

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Fiq. 5.—Blood-vessels in the surface-layer of chronic granulations.

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as may be observed in the tadpole’s tail (Unterswehungen tiber die

Entwickelung a oa agi Berlin, 1856, p. 80); and the circum-

stances are so little ana- fe) A 1 AGx0

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become fused intoa more ells. (After Billroth.) uniform fleshy stratum, the lower layers contract as the cells approximate to fibrous tissue, and skin begins to form on the surface. If a healed surface be examincd long after, in micro- scopic sections through the skin and subjacent tissue, the parallel vessels will still be observed running at intervals towards the surface, only more obliquely than in the granulation-tissue. They are invested by a certain quantity of fibrous tissue arranged parallel to their course, while all the rest of the space between two of them is occupied by horizontal lines of fibrous tissue, with spindle- shaped cells lying regularly , among the bundles. This P@:ij = change has been, first of | spherical granulation – cells | into spindle-shaped cells, with development of intercellular or perinuclear substance (fig. [f 7), and then fibrillation of { the latter. It is worthy of | note that a development into elastic fibres goes on in the jG sear for months or even years after healing is complete. | Hairs, hair-follicles, and se- baceous glands are not repro- tnt duced in the skin of scars, nor Fic. 7.—Vessels of granulation-tissue, their walls invested by longitudinal spindle- aresweat-

glands. On the other cells; the interval occupied by round hand, fat develops readily in cells or transverse spindle-cells.

the usual situations.

P Suppuration in Repair.— Meanwhile there has becn a remark- able concomitant of the growth and adaptation of the reparative inaterial, namely, a flow of pus or matter from the surface. Matter or pus varies in its physical characters somewhat; it may be creamy and yellowish-white (pus laudabile) or greenish-white, or it may be thin and watery or more viscid. It has an alkaline reaction and a faintly swcetish odour. Standing in a vessel, it separates into two parts,—a supernatant fluid or serosity, clear, and _ ofa yellowish tint, and a sediment of pns-cells. The serum coagu- lates when boiled, and it may even happen that a fibrinous clot forms in pus after death, just as in drawn blood. The serum of pus contains from 1 to 4 per cent. of albumen, and very much the same Salts as blood-serum. The cells of

pus are spherical elements of some- what uniform size, of the greyish colour

of protoplasm, granular on the surface,

(and disclosing the presence of two,

. three, or four nuclei when treated with acetic acid (fig. 8). They are capable | of ameeboid movements, and they may be seen to take into their substance such particles as charcoal with which the wound may be dressed. _ Physiological Analogy of Pus.—Pus 1S a very remarkable adjunct of the Teparative process—to go no farther Fic. 8.—Pus-corpuscles. a, fresh; ito the inflammatory processes for %, under acetic acid—the nuclei the present. The pus-cells are evi- visible ; ¢, blood-disks, to com- ently a condition or product of the sae stanulation-cells on the extremities and sides of the vascular out- growths, and they are detached from these situations, carrying with them a certain amount of fluid. Is there anything analogous | —” in other formative processes of the body? The following © at inter” 1s very close in some at least of the circumstances. The te , op of a cyst removed by operation from the neck region 1s 1 ion cs to be covered with

vascular tufts, which have precisely the 8. C ae of granulations as regards the blood-vessels. Each vas- a ar tuft is covered by a cap of cells like a granulation, and the “Me Investment of cells can be followed as a cylindrical column down the vessel into the depth of the cyst-wall. These cells are) Somewhat peculiar, They are cubical or polyhedric elements, with a

nucleus and a broad zone of protoplasm (fig. 9, a). On the summit and sides of a vascular tuft they are found becomin g detached and dis- integrated, the nucleus being cleft

into fragments, which afterwards coalesce, while the cell-substance flows off in the form of spherical or oval or pear-shaped vesicles of a reddish tint (fig. 9, 5). The cyst ~ isa blood-cyst,—its contents, aclear € brownish fluid with many red blood- disks floating in it, having been produced by the disintegration of the cells covering the vascular tufts. The cells are hematoblasts; their cell-substance is disengaged in drops which afterwards become * red blood-disks, and their nucleus, Fic. 9.—a, perfect hematoblasts; », after being cleft into several frag- disintegrated hematoblasts, the ments of unequal size, is remade ned Oe date ed and survives as a cell of the size of mains of the hematoblasts, resem- a pus-cell, and containing several bling pus-corpuscles in the cleavage nuclei likea pus-cell (fig.9,¢). This or dispersion of the nuclear particles. isa curious instance of blood-making from connective-tissue cells late in life, and it is not so much inexplicable in its characters as it is rare in its occurrence. The formation of pus on the granu- lations of repair is one of the commonest of incidents, but it is open to elucidation even by a rare analogy. In the one case a blood-like fluid is formed, and in the other pus; the fluid part of pus corresponds to the plasma together with the red blood-disks in the cyst, and the cellular part of pus, the pus-corpuscle, corresponds to the surviving but broken-up nucleus of the hematoblast. The granulation-cell is comparable to the perivascular cell of this blood- making process, and in passing into the condition of a pus-cell with several small nuclei it disengages merely a fluid plasma and no red blood-disks. The cells of the injured part having returned to an embryonic state, their first activity is a revival of early

embryonic activity ; if they do not make blood, they yield that which may be regarded as its substitute, namely, pus.

This analogy will appear all the closer from a consideration of another cyst. In this new growth, which occurred under the skin of the back, and was removed, like the former, by operation, the wall is lined by a certain thickness of tissue which is practically the same as the granulation-tissue of repair ; there are the same parallel vessels ending in loops, the same cells, and the same deliquescence of the surface. The fluid in the cyst is indeed the result of this liquefaction—a somewhat turbid brownish fluid. In a small recess of the cyst there is a formation of a considerable layer of epidermis-like scales on the surface. One important point of difference is that the deeper layers of cells show uo tendency to become spindle- shaped, to take a transverse order in the intervals between the parallel vessels, and so to become fibrous tissue. On the contrary, one finds in the depths of the tissue the stems of vessels surrounded by zones of young cells, perivascular sources of the new growth by which the loss of substance around the terminal loops of the vessels is constantly made good. On these terminal loops the process is not one of pus-formation, nor is it altogether one of blood-formation as in the former cyst ; but it isan intermediate process which helps us still further to understand the significance of the pus in repair. The new formation is comparable to that of the blood-cyst in the obvious perivascular grouping of its cells, and it is comparable to the granulations of repair in the forms of its cells; and it thus supplies the link between the blood – yielding tufts of the former and the pus-yielding vascular points of the latter. What, then, is the nature of the deliquescence in the interior ~ of thiscyst? It is partly blood; and there may ¢ be seen also the large cells from whose proto- ; plasm the blood-disks oe sores baat : are also seen the remarkable cells with nucleus g) - cleft into three or four, so like the cells of pus co) (>) O (fig. 10,6); the latter are the surviving nucleus b of the hematoblast, the peculiar form of which 5 is best explained by watching the more perfect , oe process of blood- formation on_ the wall of the se oa ra blood-cyst. Fewer of the cells in the second the wail of a cyst; cyst undergo this transformation ; fewer of 6, their nuclei sur- them ever attain the perfect form of hemato-paler at ba blasts so as to be able to undergo it. For the 24 ticod-disks, most part they pursue a devious development, and it is in this that they resemble

granulation-cells. The differ- ence is only one of degree ; the type or law of the process is the hematoblastic type, which may be more or less perfectly attained. We are accordingly confirmed in the impression that pus-cells are the surviving nuclei of embryonic cells whose perfect law is blood- making, and that the fluid which accompanies them is the cell-pro- toplasm which has failed to disengage itself in the form of individual buds that casily pass into red blood-disks, but has become a veritable albuminous fluid. Pus, then, may be said to be blood absolutely

Skin-for- mation.

Giant- cells.

wanting in red blood-disks, and with the colourless corpuscles in enormously disproportionate numbers. We shall afterwards see that there is a kind of blood—leucocythemic blood— which ap- proximates to pus in these its essential characters.

That which distinguishes the process of repair from the forma- tive process in the two cysts, and in all tumours whatsoever, is that the former is self-limited ; after a time skin forms on the surface of the granulatious, and the lower layers of cells pass into the resting condition of fibrous tissue. Each of these adaptations has now to be described. ;

Formation of Skin on a Granulating Surface.—The new skin appears as a delicate bluish frill extending gradually over the raw surface from the margin of the old skin. Nothing is more natural, therefore, than to suppose that it is a continuous growth from the cells of the rete mucosum of the old skin; and, according to the embryological dogma of an impassable gulf between the epiblast, mesoblast, and hypoblast for histogenetic purposes, the new epidermis can have no other source than proliferation from corre- sponding cells of the old. But, dogma apart, there isa radical difference of opinion as to the origin of the epidermic or epithelial cells on the surface of granulations. Notwithstanding the fact that the new epithelium springs up alongside the old, it has appeared to many observers with the microscope that it was derived, not from subdivision of the latter, but from the

granulation- cells becoming flat and otherwise adapted to surface purposes. In considering these difficulties let us, as before, seek analogies among other formative incidents of mature life. In the first place it should be mentioned that the new skin may be peculiar. The accompanying figure (fig. 11) is drawn from a section through the —

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scar of an ulcer of the leg which had broken out and healed re- peatedly. The peculiarity is that the epithelial cells are every- where a narrow belt which bends down and encloses the terminal vessels as in a loop; in other words, the surface vessels are driven through the midst of the rete mucosum of the new skin. For an analogy to this epitheliation of granulation-tissue we may take the case of the cyst already referred to ; it was covered in part with a thick layer of epidermic scales. The origin of these in the cyst is not difficult to trace; they are the ~=> ; granulation-cells enlarged, with two, 4 (9%)) SF three, or four nuclei, and with a © “60 0-26: ¢ more homogeneous protoplasm. The ‘@,-.6¢ Os surface-layer is in fact largely made a OLS DS up of multinuclear blocks, some of 095 zoo which become excavated in their in- terior, while their nucleated peri- phery forms a narrow belt of surface- cells with a descending loop enclos- ing a space, in which collections of blood-corpuscles may sometimes be seen (fig. 12). If we imagine the ; plexus of vessels ramifying on the rig, 12.—From surface of a cyst granulating surface to form com- lined with epidermis; above, a munications with these excavations Continuous piece of the cyst-wall; 6 5 below, individual multinuclear in the multinuclear blocks, we gelis excavated. should be able to understand how it Z that they are driven through the rete mucosum of a scar, as in fig. 11.

Giant-cclls in Repatr.—These multinuclear blocks are the so- called giant-cells. Their occurrence LEO in fungous granulations was de- scribed by Billroth (op. ctt., p. 32) in 1856, he having previously secn them in the

granulations of bone and taken them to be elements \¢: **necessary for the new formation of vessels in osteophytes or in cal- lus.” The accompanying figure (fig. 18) shows several examples of them from the granulations of a slow-healing stump. Precisely the same forms occur in the wall of the cyst whose structure has been already referred to in order to illus- trate the granulations of repair. But for these multinuclear blocks of tissue we have a clear physio- logical parallel in that unfailing source of analogies for the formative processes of mature life, namely, the placenta. The accompanying

Fic. 13.—Giant-cells from chronic granulations.

examples (fig. 14) are drawn from the deepest layer of a discoid placenta (the guinea-pig’s). Here it is evident that they result from the subdivision of a single nucleus within a growing cell of the inner muscular coat; and their place in the placental pro- cess is as clear as their histogenesis. They enter into the formation of the blood-sinuses of the deeper parts of the organ, some- times forming a consider- able part of the wall of a vessel by being excavated in their interior (the nuclei being driven to the side), at other times forming one side of a blood-channel, — a corresponding multinuc- lear block forming the other, and the lumen of the vessel being the space between them. They represent a some- what feebler continuation of those vaso-formative processes in the placenta which we have already used as the analogy for the pro- duction of the new vessels of granulations. That their function and significance in granulations is not wholly vaso-formative will appear from the fact of their co-operating to build up the surface epithelium.

Fic. 14.—Vaso-formative giant-cells from deeper layers of placenta (guinea-pig).

Conversion of Granulation-tissue into Scar-tissuc.—The skin Sear

of a scar is never perfect ; it is always thin, wanting the descend. tissi

ing processes and papille of the natural skin, and wanting also the hair-follicles, hairs, sebaceous glands, and sweat-glands. Its blood-vessels never become the orderly capillary loops of the original type; they remain fora

time as an extensive plexus of large vessels close to the surface, giving a recent scar its livid ap- pearance; afterwards the channels of the vessels become narrower, and many of them quite occluded ; and the scar has in the enda somewhat blanched appearance, which continues even when the surrounding skin is thrown into a state of ruddy glow. The underlying tissue, however, gradually acquires more of the natural type. If a section be made through an old scar it will be seen that the subcutaneous tissue is fibrillar and fibrous, with more or less of fat-cells. In the figure (fig. 15), drawn from a section

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Fia. 15.—Scar-tissue of an ulcer of the leg which had broken out and healed repeatedly ; spindle-cells with brown pigment in the interfibrillar spaces.

through the scar of an ulcer of the leg which had broken out and healed more than once, the tissue is composed of parallel wavy fibres, with spindle-cells between them at regular intervals, the cells having (as a characteristic of scar-tissue after repeated heal- ing) brown pigment-grains in their substance. The successive changes which have led up to this horizontal fibrillation are not difficult to follow. While the ascending vessels acquire more and more of elongated cells on their walls, the granulation-cells in the intervals between them become extended horizontally or obliquely (see fig. 7), the spindle-cells among the fibrillar bundles in the figure being the surviving representatives of them. The change of the spherical cells into spindle-cells, which precedes the fibrillation, takes place first in the deepest or oldest stratum of the granula- tion-tissue, and it appears to be accompanied by a certain dragging down or obliquity of the vessels running to the surface. There 1s always a considerable thickness of spindle-cells parallel to the vessels, so that these, together with the horizontal tracts between. the vessels, make up a kind of warp and woof. But as the scar- tissue matures the horizontal bands come to overshadow the vertical or oblique. The fibrillation takes place, as it does in ordinary growth, in an intercellular or perinuclear homogeneous protoplasm, Which becomes more extensive as the embryonic or purely cellular character of the granulation-tissue fades. One of the most striking facts in this development of embryonic tissue into mature tissue in the adult

is its shrinkage, corresponding to the well-known col- traction of the area of a healing surface.

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° 5 . is – Repair of a Broken Bonc.—The reparative process 1m bone is Bo

much simpler and it may be said to be much easier { healing of a stump. The bones retain even to old age the materials out of which new bone may be produced ; these are the somewhat

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PATHOLOGY

embryonic membrane covering the bone, or the periosteum, and the marrow. During’ the growing period these two tissues retain pronounced embryonic characters, and at all times they take on a formative action readily. However unlikely an object, then, a bone may seem for repair, it has within and around it the materials for a tolerably direct renewal of osscous substance. The most orderly or intelligible form of the re- arative process is that seen in animals. A long bone, such as the tibia or shin-bone, after having been broken and carefully set, presents an appearance such as is drawn in the figure (fig. 16, a). Opposite the line of fracture there is a fusiform thickening all round the bone, which is bulky and carti- laginous for a time, and afterwards becomes greatly reduced in extent, and, at the same time, osseous in its structure. It is called the callus. It will be convenient to de- seribe the details of this process of repair from actual specimens of the tibia of a young frog which was found undergoing repair after fracture. The tibia, when cleared of the muscles, was found to have a spindle-like enlargement about its middle of the size and shape of an oat (fig. 16, 0) and of a whitish colour. It was easily cut up into sections passing through its whole length as well as through the projecting ends of the spindle representing the normal shaft of the bone (fig. 17). The bulk of this fusiform enlargement is made up of |f cartilage developed between the upraised eo and the dense substance of the one. But there is another and

independ- ent new-formed mass projecting from the canal of the bone, and clearly marked off from the wide extent of cartilage around it, ; —- —this is the direct osseous formation from F!°- Pie ye Sear tibia of the marrow. The cartilage has been pro- vaglaslaig ug OF Ere duced from the periosteum, each spindlc- lage-callus opposite the eell of the latter altering its form and fracture (from Paget); b, developing a disproportionate amount of a ee at cell-substance, which becomes the hyaline cartilage covering a frac- matrix of the cartilage, while the nucleus ture. of the original cell, generally excavated or reduced to a crescentic shape, remains as the cartilage-cell. From this cartilage, again, bone is formed very muchasit is formed from thecentralrod of cartilage in the foetal bone, and it also resembles the

latter in being formed only to be reabsorbed. In

these preparations from the frog, nar- row spicule of bone may be seen start- ing from the thin end of the spindle and spreading over the surface of the cartilaginous cal- ¢ lus. In the deeper strata of the latter, and still at the thin end of the spindle, the cartilage – cells group themselves round the walls of alveolar spaces, as in the ossification of epiphysial carti- lage, and that is, |. doubtless the pro-?- – ~ cess which extends | throughout — the

whole mass of car- ; S

tilage, Meanwhile Fic. 17.—Section through broken tibia of a young frog,

there ha 7 —upper fragment. a, ensheathing callus (cartilage) IS arisen a between periosteum and shaft ; b, intermediate callus

fungus-like protru- (bone), growing from the cells and vessels of the

Sion of new bone Marrow.

the medullary canal of the bone; it lines the inner walls of € medullary cavity for a short distance up from the line of

eee

weeks. are joined by a band of tissue, which has been proved by examination of it at various stages of the reparative process in animals to be at first composed of

line of the nerve-bundles (fig. 18) ; these

neurilemma, they pass through the ori- ginal embryonic phases, and ultimately become more or less perfect nerve-tubes ¥1q.18.—Repaired nerve(frog)

inch in length. responding process is described; but the repair of a ruptured muscle such as the rectus extensor of the

fracture, and projects for a greater distance into the midst of the cartilaginous callus. This centre of ossification is intimately connected with the blood-vessels of the marrow ; they form the framework of the osseous growth, the embryonic marrow -cells (themselves the lineal descendants of cartilage-cells) becoming the osteoblasts or future bone-corpuscles. The whole of the new growth of bone is ultimately moulded into a more compact form ; but the seat of an old fracture will always retain a certain roughness of exterior, and a certain want of regularity in its Haversian systems. The repair of bone in man is not altogether the same as in animals; the ensheathing cartilage is not usually found except in broken ribs, and the uniting osseous substance corresponds mostly to that part of the new bone (in the preparation from the frog) which issues from the medullary cavity in association with the blood-vessels of the marrow. ‘he callus in man is accordingly said to be chiefly intermediate” or between the broken ends, and partly also “interior,” or extending into the medullary canal ; and it is naturally permanent and not subject to removal like the ‘“‘ensheathing” callus developed from cartilage. But the sources of new bone in man depend upon the amount of displacement of the broken ends; if the displacement be very considerable, the connective tissues around may be drawn upon for bone-forming materials, their cells becoming embryonic in form and ultimately osteoblasts. Comparing the repair of a bone with the repair of soft parts, the former is much more direct ; the osteoblastic tendency or memory is strong in the tissues within and around a bone,

above all in the periosteum and in the young or red marrow ; and true osseous union is readily effected except in such fractures as the neck of the thigh-bone and the knce-cap, where the union is often merely ligamentous or fibrous. In the ‘‘green- stick” fractures of children the periosteum is still a succulent layer engaged in the natural growth of y i 3 MGR sa the bones, and there is reason to suppose [{/ie that it is the chief source of whatever (ye reparative materials may be needed. Repair of Nerves and Muscles.—When a nerve, such as the ulnar, is divided by a cut near the wrist, sensibility is lost over the area of skin to which the nerve is distributed, and, under ordinary cir- cumstances, it is restored in about three The severed ends of the nerve

Nerve- repair,

embryonic spindle-cells arranged in the

cells are derived from the nuclei of the

ten weeks after section ; spindle-celled tissue replac- ing nerve-tubes. (From Billroth, after Hjelt.)

filling the gap in the divided nerve,—a gap which may be a quarter or half an

In muscle, also, a cor- Muscle –

repair.

thigh is commonly fibrous only, and the gap can be felt even

through the skin.?

§ 4.—Errors oF EMBRYOLOGICAL GROWTH IN CERTAIN TIssUES—MESOBLASTIC TUMOURS.

No chapter or section treating of tumours as a whole can Tumour. be homogeneous ; and, in order to preserve the develop- mental or evolutional order already sketched, it will be convenient to consider here only a part of the morbid processes which result in tumours, leaving the rest to be

introduced at appropriate points in the sequel. The dis- advantage of applying the developmental or embryological idea to all tumours whatsoever comes out in the tumour- hypothesis of Cohnheim. According to that hypothesis, the tumours of the body are due to the awakened growth of small centres or foci of embryonic tissue which had

1 Literature.—Paget, Lectures on Surgical Pathology, 4th ed., Lond., 1876; Darwin, Animals and Plants under Domestication, vol. ii. chap. xxvii., newed., Lond., 1882; Billroth, Veber die Entwickelung der Blutgefisse, &c., Berlin, 1856 ; Id., in Beitrdge zur pathol. Histol., Berlin, 1858, and in his Allgem. Chirurg. Pathol. (Engl. transl.) ; Ziegler, Untersuch. iber pathol. Bindegewebs- und Gefaissneubildung, Wiirzburg, 1876, and in his Pathol. Anat. und Pathogenese, Jena, 1880-84 (Engl. transl.) ; Rindfleisch, Lehrbuch der pathol. Gewebelehre @ (Engl. transl., 1872-73) ; Golding Bird, ‘‘ Constructive Inflammation and Uleers,” in Guy’s Hosp. Reports, vol. xxiv., 1879, p. 525.

remained over from the foetal development, persisting in their embryonic characters while all else around them had assumed the characters of maturity. For the arguments and illustrations of this hypothesis the reader may refer to the section beginning at p. 622, vol. 1., of Cohnheim’s Vorlesungen wiber allgemeine Pathologie. It must suffice to say here that groups of resting embryonic cells in the various organs and parts of the body, or embryonic rudi- ments in the sense of Cohnheim, are not known to exist at all generally. That which we are well assured of is an indwelling power of all the mesoblastic tissues to revert to embryonic characters,—the spontaneity of the tissues never quite worn out, or the memory of development more or less deeply rooted in them to the end of life. From this point of view we have traced the process of repair, finding a developmental analogy even for pus. From the same point of view we have now to consider certain kinds of new formation as arising, not to make good defects, but under an erratic impulse, or in the course of an erratic spontaneity. Congenital tumours have always been regarded as errors of development, and it will be con- venient to select a simple congenital

tumour to begin with. Fibroma.—The texture drawn in the figure (fig. 19) occurred in a tumour of the back of the neck ina young child having _ been there since birth. It is a jibroma, and consists essen- tially of bundles of wavy fibres

crossing or de- cussating in di-

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rection, some-

times thick i

bundles, some- / Wty fy iY times only a few Hi WZ if Vy, Ws strands, the Af yy ie 3 Wikia Hy if

whole forming MVNA!

a dense warp- and-woof tex- ture. The pe- culiarity is that such a tissue should have formed under the skin as a tumour or lump the size of a hen’s egg; spread out in thin layers, the same warp-and-woof texture of fibres occurs naturally in the aponeuroses and the sheaths of muscles, and in other fibrous membranes, such as the dura mater; and the large number of nuclei among the fibres, as shown in the figure, would be appropriate to the fibrous tissue at the early period of life to which the tumour belonged. At various centres these embryonic cells had developed into fat-cells, so that the tumour may be called a fibro-lipoma. The tissue has increased in three dimensions, and so has resulted in a palpably distinct object in the body, which could be dissected out from among the surrounding structures as an individual thing. The overgrowth had taken place probably in one of the aponeu- roses of the trapezius muscle, and the noteworthy point is that it has faithfully adhered to the warp-and-woof texture proper to the tissue on which it is based. The new formation possesses length, breadth, and thickness, and its fibres are interwoven in the three dimensions as if it had been constructed at some unusual kin of loom. The same interlacing Of © jay gn 3 wid ust bundles of wavy fibres is found very _//W2))\¥4 St) commonly in the fibromata,—their favourite seats, besides the flat fibrous sheaths, aponeuroses, and mem- branes, being the uterus and its

appendages, where the tumours may be stalked or sessile. Sometimes the fibres are concentrically arranged round a number of centres, or the bundles may pursue a sinuous course. _ One variety may be specially men- tioned as exemplifying a modification of fibrous structure which is often met with in various normal and patholo- gical processes. In this modification the fibres become as if fused into broader homogeneous bundles, the

nuclei being left lying as if in spaces or holes in a structureless

Fic. 19.—Congenital fibroma from a child's back; warp- and-woof fibrous texture, with embryonic nuclei; bundles of fibres seen also in cross-section.

Fic. 20.—Recurrent ossifying fibroina of lower jaw.

ground-substance. This variety of fibroma is generally found in the bones of the jaws; it may be ossified at some points, the nuclei becoming the bone-corpuscles, and the homogeneous ground. substance becoming impregnated with the carthy substance of bone, The accompanying figure (fig. 20) is drawn from a preparation of a fibrous tumour, ossified in part, within the medullary space of the lower jaw in an adult. It had been removed once, and grew again (recurrent fibroma or fibroid).

Where the modification the cells at the expense of the fibres, we have a fibro-cellular 9 tumour. The tumour is con- @\///| posed of elon- Sz, gated elements, ~o ob which are vir- on= 0. tually nucleated S=== cells with very long amounting = most to fibres. ose The figure . (fig. "ZZ 21) is made from an extensive tumour deeply seated in the carotid region of the neck in a woman aged twenty-two.

Fic. 21.—Fibro-cellular tumour ; decussating bundles.

There is nothing more remarkable in all these varieties of tumonr Sarco

than the constancy of the warp-and-woof texture, and we shall find that the same is an important characteristic of the class of tumours where the fibrous structure is wanting and everything becomes cellular. Tumours of the latter

kind form the group of sar- comata orflesh-like === tumours. Proceed- So ing from the fibro- < cellular – tumour (\' last mentioned and sketched, we come to the variety of spindle – celled sar- coma, in which the cells differ from the fibro- cellular elements of the former, chiefly in the greater prominence of the nuc- leus and the greater delicacy of the tapering prolongation of cell- substance. It is sometimes called a small spindle-celled sarcoma. The figure (fig. 22) shows the structure to be purely cellular, with- out any fibrous supporting tissue. In the cross-section the spindle- cell appears as a small round cell.

In the sarcoma with large spindle-cclls we have a form of tumour not uncommon in certain regions of the body, often associated with brown pigmentation, and very generally malignant in its course. One common seat LE SS of it is the choroid TZ coat of the eye, where large pig- mented cells, both spindle-shaped and branched, exist naturally, An- other common seat is the subcutaneous tissue, where pig-\® mentation is nota XS normal occurrence. The illustration (fig. 28) is taken from a case where there was, how- ever, brown pig- mentation of the skin for a considerable distance round the tumour. The situation was the shin, the common seat of chronic ulcers, and the tumour seemed to have begun in the scar-tissue of an ulcer of that kind. The cells are very large spindle-like elements grouped in decussating bundles, the distribution of pigment being partial (omitted entirely in the cut), and not uncommonly confined to the narrow bands of cells separating two broader or thicker bundles. The developmental or embryonic character of these cells is sufft- ciently obvious; but the occasion for their reappearance in mature life is not so clear. For the particular case of tumour over the shin

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Fia. 22.—Tumour composed of small spindle-cells in decussating bundles.

Fic. 23.—Tumour composed of large spindle-cells im decussating bundles.

takes the direction of an increase of Fibro. j cellula

the following may be conjectured. In the pigmented scar of an old ulcer of the same region the subcutaneous fibrillar tissue is found to be thickly occupied with large spindle-cells full of brown pigment granules (sce fig. 15). Now, the skin for some distance round the fumour in question had preciscly the brown pigmentation of a scar that had re-formed repeatedly, and the brown colour resided pre- sumably in the same embryonic elements as are drawn in fig. 15. It eannot be supposed, however, that that explanation applies to all spindle-celled sarcomas with pigment, even if we do not include ihhete of the choroid tunic of the eye. A more general explanation must be sought for the pigmentation, which will apply also to the pigment in scar-tissue itself.

sof Cystic Sarcoma.—The activity of tumours, even of those classes ion that we have hitherto considered, is not purely structural or forma- tive; it may be obviously functional, involving an instability of the ur- structure. Even the fibrous tumours may become cystic in their -ure. interior, as notably in the case of fibroids of the uterus ; and it may be stated generally that all such traces of cyst-formation in solid masses of embryonic tissue are so many traces of the deeply-rooted embryonic function of those tissues. ‘This important principle of tumour pathology may be conveniently introduced through a par- ticular case of spindle-celled sarcoma, which grew to a great size on the outer side of the thigh of a boy aged fifteen, having its root deep

down in the interval between e829 Lo

the tensor fasciee muscle and SE =,

the vastus externus. In no OZ SSNWO

part of this tumour were ory EXE ONS traces wanting of an embry- SV AKG) oh \\ SS onic function residing in its Iya 2 fi HIN 67f-) WSS component cells. Although fils © of y aS iy n° the section of the tumour } Ig Ely hy We Kgs Tx was close and firm, yet one «/y Off By psy O’lg g M® found under the microscope ,%2¢ Lif Lyf! “fo aries AAC) the appearance drawn in the ZA Ts Ci 69 Wag figure (fig. 24). The tracts of Vii

Geos WG G\| {‘*.4e spindle-celled tissue are in- ~7~y ©) 686, EN TNISAAN “9 terrupted by spaces lined by 4G fy Sins Q\ BEANS ANG) cubical cells, which are’the 8 lig © Nye SP surface-modification of the INNO My O>¢ spindle-cells. ‘These are the \ N99 Yi blood-spaces of the tumour, ON EZ 6

and blood is to be seen in NS

the excavation has been ex- tensive the spaces have formed communications, and left the spindle-celled tissue projecting into them as free cylinders or columns, with rounded ends covered with the same cubical epituelial-like elements. A central area of the tumour was more spongy in consistence; and that character is found to depend upon the greater development of the spaces, ap- proaching remotely toa cystie development. It is here that one sees the true physiological or embryological significance of the inter- stitial spaces, of their contents, and of the cubical cells round their walls, ‘The surface-row of cubical cells loosen from their attach- ment, fall into the space, and are succeeded by another row, which are detached in turn; and so the excavation proceeds at many centres. ‘he detached cells do not remain free solid elements ; they may sometimes change in toto into a mucous fluid, but their full gs physiological activity is the hama- fir toblastic or blood-making. The spaces contain the hematoblastic cells and their derivatives in various forms. One may see the cubical cells on the margin of the space (fig. 24) acquiring a yellowish tint, then the same cells disengaged and lying free in the space and_ probably increased in size (fig. 25), then red blood-disks of the same colour as the protoplasm of the hematoblasts, and cells with Fic. 25.—Hematoblastic process in several nuclei corresponding to those the spaces of sarcomatous Hnewued already described as the surviving Sahota Leese Ly Lg pai nuclei of the disintegrated heemato- geneous; b, blood-disks of various blast, the whole lying in the midst shapes; ¢, the surviving nuclei. of a mucus-like coagulum. ‘This is neither more nor less than the early blood-making function of the mesoblast revived. The result is not by any means always or altogether blood, and in cysts it is indeed for the most part a mucous or serous fluid.

Tn one direction this process goes on to the ultimate destination of a thin-walled cyst ; and the following case of spindle-celled sar- comatous tumour may be regarded as an interesting intermediate phase. The tumour is the size of an orange, from the neck region of a dog ; the peculiarity of it is that it is excavated completely on the side next the skin, while the deeper half of the sphere is made Up partly of a firm texture with slits or spaces lined by cubical cells, as already described, and partly of a beautiful interlacing system

‘columns and free projecting cylinders of the cyst.

of polished cylinders crossing the cavity from side to side, or hang- ing free into it. The process of excavation has merely been an extension of that drawn in fig. 24; it may be compared to the ex- cavation of the heart in the embryo,—the columne carne and musculi papillares and pectinati of the latter corresponding to the

ojecti It is noteworthy that a trabeculated interior is characteristic of many cysts.

Myxoma or Mucous Sarcoma.—In another direction the hemato- Myxoma. blastic softening process goes on to the variety of tumour called myxoma or mucous sarcoma; and this change may be actually observed in parts of the above-mentioned extensive spindle-celled sarcoma from the outer side of the thigh. A myxoma is that par- ticular modification of embryonic incsoblast in which the softening or fluid disintegration takes place, not along definite or selected tracts, but uniformly over a particular area. The cells become excavated somewhat as in fat formation, the nucleus remaining at one side, and their thin membranous walls appearing as branching processes, which join with those of the next cell. Hence the nuclei often lie as if at nodal points of a meshwork of fibres, and they are often triangular or lozenge- wp HEY shaped. This is one common ,\\\ | form of myxomatous tissue. ‘ \ But the mucous transformation \\)\, taking place in each individual Wal! cell may result in adumour pre- \\/’\, senting a very

different appear- || ance. The figure (fig. 26) is | taken from a soft gelatinous tumour of the subcutaneous tissue. Nothing could be more orderly than the grouping of its large mucus-yielding cells in rows following the waved course of the bundles of fibres or fibrils; they are as regular as the cell-plates of tendon, Their origin can be traced to the fixed con- nective-tissue cells of the part, which have emerged from their inconspicuous state, and have acquired breadth and thickness, a cubical form, and mucus-yielding protoplasm. Precisely the same process may end in a cystic excavation. The relation of this change to the indwelling tendency of the mesoblastic cells towards blood- making is revealed in the actual hematoblastic character of the cells here and there, and in the blood-disks and cells with cleft nucleusidying around. Another intermediate or occasional form of the cells in this tumour reveals also the true affinities of spindle- cells filled with yellow or brown or black pigment. Such pigmented spindle-cells replace the mucous eclls here and there; we must consider them to be also a somewhat devious development in the hematoblastic process, their pigment being practically the same as blood-pigment.

‘Alveolar Sarcoma.—In this connexion also we must take the Alveolar kind of tumour that is often called alveolar sarcoma. The epithelial- sarcoma. like form of cell, which lines the spaces among the spindle-cells in the case already mentioned, now comes to predominate. The follow- ing is an instance, with figure (fig. 27). (O73 *9)

A tumour the size of a large walnut, (6 deeply pigmented, with the skin drawn tightly over it as if it had grown in the position of a mole or congenital mark, was removed from a man’s leg. Al- though the tumour is somewhat black throughout, the pigment is found to `y reside only in certain narrow tracts or <7 law clusters of cells. The structure isdivided \ “` //*

into oblong or alveolar spaces by narrow bands of fibres, the cells within the spaces } /¢ being all of the epithelial type. Some |a\t

of the cells are much larger than others,

oRaere.

\ & RAGES

Fic. 26.—Mucous sarcoma of subcuta- neous tissue (dog).

and these largest elements are tinted jaf fe EOS). \ bright yellow or brown. It is no great |///. To ya \ \ step from this singular structure to the Ko faxed \ ; embryonic structure and function of \® (eo @S

former cases. Instead of a few cells at & Fig. 27,—Melanotie alveolar time forming an epithelial -like surface sarcoma of subcutaneous to an alveolar space (the great ball: of S68t =

the tissue remaining as tracts and columns of spindle-cells), here the alveolation has been general through the whole area, and all the cells have become as if surface-cells. Furthermore, they have been fixed in that condition, proceeding to no further develop- ment, whether mucus-forming or blood-forming,—only certam groups of them, and these by far the largest and most epithelial- like, acquiring the yellow colour of hamatoblasts, or a brown colour. The pigment is otherwise contained in spindle-cells which occupy the interalveolar septa, and in them it is m a more granular form.

Si. —. 47

Cavern- ous tumour.

Traces of

blood- making in tumours.

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Cavernous Blood-twmours.—The pigmented alveolar sarcoma is sufficiently common in the situation of congenital mother-marks of the skin to be one of their characteristic developments. Another of their developments or equivalents is the nevus or angeioma or cavernous tumour, whose structure may be said to consist, in general terms, of a spongy meshwork of alveolar spaces, bounded by coarse and elastic trabeculae and filled with blood. Arteries open into such tumours and veins pass out from

them, the cavernous territory being intermediate ; but, according to several authorities, this con- nexion with the circulation is not primary to the cavernous tumour but acquired. Without entering upon a discussion of details, the analogy of the alveolar sarcoma growing on the same basis of a congenital pigment-spot may be kept in view. The alveolation is the same in both cases, although the trabeeule in the cavernous tumour are somewhat stouter, the grand difference being in the contents. If, however, we suppose the epithelial-like cells of the alveolar sarcoma all to become large and filled with a yellowish colouring matter, as indced many of them do, and if we suppose that these hematoblasts (for such they are) go on to fulfil their destiny, then we should have a cavernous blood-tumour, that is to say, the alveoli would be filled with red blood-corpuscles. It will not be possible to offer evidence of this process except for the cavernous blood-tumour of the liver, an organ in which such tumours are comparatively frequent, and mostly in later life. The cylinders of liver-cells appear to become nar- s rower and narrower, as if from pres- sure of the capillaries, and ultimately 4 to disappear. From the supporting / tissue a new growth of cells takes /@: place (fig. 28). These are hemato- * blasts; their protoplasm becomes red __ blood-disks, and their nucleus sur- (@

“yf arta

vives with the remarkable trefoil th arrangement of cleavage which has é been described for several other in- © stances of the hematoblastic pro- ! @ Msi cess. There can be no mistaking ey

0m Ge © g 923 °@ @

Fig. 28.—Hematoblastic process in cavernous growths of liver (dog). a, the supporting tissue producing hematoblasts 6; ¢, nuclear re- mains of hematoblasts and red pblood-disks side by side.

the identity of this process with that of the blood-cyst of the neok already mentioned; it is essentially a mani- festation of hematoblastic function late in life, differing from that of the blood-cyst in the fact that the centres of blood-formation are sepa- rated from one another within alveolar boundaries, These cases illustrate another striking property of cavernous blood ~~tumours, namely, to heal spontaneously in parts or to develop~~

~~embryonic scar~~ tissue through more or less of their extent (fig. 29, a). The ordinary cavernous texture of an angcioma is produced by the formative pro- cess stopping short of embryonic connective tissue or scar-tissue. The accompanying figure (fig. 29, b) is from an enormous angeiomatous

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Fig. 29.—a, cicatricial tissue from cavernous tumour of liver (dog); 6, mesh- work occupied by red blood-disks, from cavernous tumour of head (ox),

tumour on the side of an ox's head; the structure is very like that

of the young connective tissue of the former figure, except that the

meshes are densely packed with red blood-corpuseles. There are, however, other parts of the tumour where the fibres are broader, the meshes narrower, and with embryonic cells lying in them, in- stead of or along with blood-corpuscles.

There is no definite limit betwecn such cavernous blood-tumours and true blood-cysts; in the latter the numerous hematoblastic centres open eommunications, and the further process takes place in the cellular tissue forming the cyst-wall.

The blood-making office of the mesoblast is the earliest and greatest of the functions of embryonic cells, and it is not surprising that it should come out more or less obviously in those formative processes in the common binding tissue of the body where there isa persistence or revival of embryonic activity. We seem to find traces of it in the pigmentation, in the cystic excavation, in the alveolation, in the mucous or myxomatous transformation, and in the cavernous structure of mesoblastic new growths. The embryonic spontaneity in the middle layer is, of course, wider than mere blood-making ; but the hematoblastic function or tendency is certainly the most fundamental, and the traces of it.in the foregoing tumours are our best help towards a rational interpretation of them. Persisting or

| body have lost theirs.

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revived embryonic activity in subcutaneous and other homologous tissues cannot but bring to light more or less of this all-important mesoblastic function ; the memory of it is too strong to be ignored, We come next to a function of embryonic cells which is only second to the hematoblastic, namely, the osteoblastic or bone-making fune- tion ; and even with the bone-making process the earlier blood- making process is deeply interwoven, for in the marrow of the bones the hematoblastic activity of cells persists long after it has ceased elsewhere.

The bone-making function of embryonic tissue—if function it Tuy may be called—comes into a large number of tumours ; or, in other of }

words, a large proportion of all mesoblastic tumours are tumours of the bones. In all of these the embryonic law of development and growth is clearly present. The results, however, are frequently more complex than in the tumours hitherto considered; or, in other words, tumours of the bones are exceedingly liable to have a structure so mixed as almost to baffle systematic description. One reason of this is that the osteoblastic and hematoblastic functions of embryonic cells go hand in hand in their production ; and the complexity of structure is, accordingly, greatest in those which grow from that part of the bone where the blood-making resides, namely, the marrow. The other great formative tissue of bone is the periosteum, a tissue which retains its embryonic strue- tural features long after the mesoblastic tissues elsewhere in the The marrow and the periosteum are fre- quently involved in the same tumour ; or an essentially similar morbid product may be derived from cither. That is notably the case with the tumours of the bones which we come to first, the cartilaginous tumours or enchondromata.

~— eter

Ecchondrosis.—It is only rarely that a cartilaginous tumour Carte

grows from cartilage, the observed instances having occurred at the tum’.

cartilaginous lines of union of the base of the skull, at the epiphy- sial lines in long bones, and in such permanent cartilages as those of the larynx and trachea. To these direct outgrowths of cartilage- cells Virchow has given the distinctive name of ecchondroses. Usually the cartilaginous tumours do not grow from pre-existing cartilage ; they grow either from the periosteum or the marrow of the bones, or they form in certain glandular organs, especially the salivary glands (parotid, labial, &c.), the mammary gland (oftenest in the dog), the lacrymal gland, the testis, &c. These latter enchondromata are a class apart, involving considerations of disordered everyday secretion rather than of the revival of embryonic activity (see "Errors of Secretion," p. 379 below). The enchondromata that fall to be considered here are those which grow within or upon the metacarpal bones and the finger-bones, more rarely in the corre- sponding bones of the foot, not unfrequently in the bones of the face, and, it may be, in the leg-bones and arm-bones, or in bone anywhere.

Enchondroma.—The simplest cases (but the least frequent) are those that form between the periosteum and the hard bone from the growth and transformation of the cells of the periosteum, bemg directly homologous to the ensheathing cartilage-callus of repair. They differ from the cartilage of repair in precisely the same way that a granulation-like sarcoma differs from the granulation-tissue of repair,—that is to say, the existence of the tissue is not self limited, or it has no tendency, or only a feeble tendency, to cica- tricial modification, shrinkage, or absorption. These purely sub-periosteal enchondromata are said by Paget to be nearly character- istic of the ends of long bones, although they do not encroach on the articular cartilage. When a cartilaginous tumour occurs in the shaft of the bone it is partly subperiosteal and partly in the marrow; and in the most characteristic seat of enchondromata, the bones of the fingers, the growth is entirely in the marrow if the tumours are multiple ; but, curiously enough, it is subperiosteal if there is only a single tumour (Paget). There are also cases where islands of cartilage form in the compact substance of the bones, corresponding to Haversian systems.

The tissue-affinities of a cartilaginous tumour growing between the periosteum and the hard bone are not difficult ; the homologue, as we have said, is the callus-cartilage of repair. The histogenesis and physiological

analogies of an enchondroma of the medullary canal of a bone are less easy. We know that the marrow was pre- ceded, in the development, by a bluish rod of foetal cartilage, of which all characteristic traces had disappeared before birth, As the blood-vessels entered it, it had changed into a spongy kind of bone, in whose spaces Jay many spherical nucleated cells retaining a hematoblastic or blood-making function ; all the spongy bone 1s gradually absorbed in the shaft, the last traces of it being a few spicule on the hard inner wall of the medullary canal, and the cavity is occupied by a highly vascular substance, the red marrow characteristic of young bones. The spherical cells of the red mar- row become excavated into fat-cells, and the red colour changes to yellow. It is probably in this final phase of the development inside the shaft of a bone that we must look for the opportunity of the central enchondromata forming. The secret of the return to cartilage in some cases, and at certain spots, probably lies in the change of red marrow into yellow; instead of becoming fat, it

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The tumours in question are most

becomes a kind of cartilage. common, at least, just at the time of life when that change in the character of the marrow takes place. bones, where the marrow remains red, the internal enchondromata rarely occur (a case is quoted by Paget at the lower end of the fibula), but chiefly the subperiosteal. If the enchondromata were composed of a definite type of cartilage, and, above all, if they were stable in their structural characters, the relation of them to the marrow of bones, which these facts point to, would not be a very intelligible one. But the enchondromata are rather a kind of new growth in which there is a good deal of gristly substance of one kind or another, associated with a good deal of mucous or myxomatous tissue, with cystic spaces containing – gpucous or honey-like fluid, and even with blood-spaces. Besides

the myxomatous tissue, there may also be tracts and areas of other soft tissue made up of spindle-cells, multinuclear cells, and various

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Fig. 380. Fig. 31.

Fic. 30.—Feetal or parenchymatous cartilage from enchondroma of upper jaw (horse). (The hyaline intercellular substance is left out.)

Fia. 31._From enchondroma of upper jaw of woman; a few large cartilage-cells in a tissue consisting mostly of branched cells.

nondescript forms; and, most significant of all, there may be much of the cartilaginous substance quite foetal in its characters, —that is to say, consisting almost entirely of cells, with a small amount of more or less tough hyaline intercellular substance. Fig. 30 shows a highly cellular kind of cartilage from a tumour of the upper jaw of a horse. The next cut (fig. 31) is from a cartila- ginous tumour of the upper jaw of a woman ; it shows cartilage- cells with definite capsules, and surrounded by a kind of tissue which would be called myxomatous. The shades of difference among the tissues of enchondromata are indeed endless. They may be said to be all possibilities open to the red marrow (hemato- blasts) on the way to become fat ; sometimes one devious route is : taken, sometimes another, and the result may be soft mucous tissue, various forms of cartilage, or true bone as an ulterior development of the cartilage. Osteoma.—Next to the enchondromata among the tumours of bone we may take the osteomata, or outgrowths from the bone ____ which have themselves the structure of true bone, Their most ostosis.common form is the exostosis, an osscous node or spine, or

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Osteoid Tumours (Subperiosteal Malignant Tumours).—By far the – most important of the tumours of bone are those which are com- period, or shortly after growth has

rounded tumour generally, on the outer surface of a bone. Some- H | times an exostosis is found covered by a considerable cap of car- ! | y posed of a

crude kind of bone, or of various kinds of soft tissue which show a more or less ceased ; they. are by no means rare, and

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tilage; and, whether it be or had been partly cartilaginous, or whether it be entirely: osseous, it isa product of the periosteum, and it illustrates the ordinary osteoblastic function of that tissue. Sometimes the exostosis is spongy, at other times it is hard as ivory, the flat bones of the head being the favourite scat of the feeble tendency to

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teum, or the external tumours of bone, and those which begin in the medullary canal, or the internal. The former are much the least complex; and, like the subperiosteal enchondromata, they are mostly found at the ends of long bones, especially at the end of

Again, at the spongy ends of

the femur. The growth is clearly subperiosteal; the outlines of the compact bone of the shaft can often be seen running through it. The structure of this kind of tumour is tolerably uniform ; it is not bone, but an irregular product of the periosteum to which the name of ‘‘osteoid” has been given. The structure is that shown in fig. 32. There is a network of slender trabecule, mostly form- ing long parallel meshes, and with numerous but less conspicuous cross subdivisions; these are impregnated with osseous salts; but it can hardly be said that bone-corpuscles are embedded in them as in the normal growth ¢ of bone from periosteum (fig. 33). rhe cells which correspond to the osteo- @

blasts are ranged along op

the sides of these trabe- Fig. 33.—Spicule from ossifying parietal bone (kitten); osteoblasts becoming included as bone-corpuscles.

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cule and in the spaces between them; but they fall short of the true osteoblastic grouping, and they seldom become bone-corpuscles embedded in an osseous ground-substance. This is

a peculiar error of the osteoblastic process, but a not unintelligible

one. It may be further illustrated by another form of periosteal

tumour in which there was no deposition of the hardening matter

at all. This tumour (fig. 84) grew around the metatarsal bone of Soft peri- the little toe, and, like the osteoid kind of tumour last described, osteal

it had a power of infecting the neighbouring tissues and even dis- tumour. tant organs, which need not be dwelt upon at present. The struc-

ture is a strange reminder of the inherent osteoblastic function

of the periosteum from which it grew. There is not a particle

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Fria. 34.—Periosteal tumour of fifth metatarsal bone.

of osseous or earthy matter in its substance ; but it has the trabe- cular type of osteoid tissue, and the cells have the surface-grouping of osteoblasts. They are the elongated or spindle-shaped cells of the periosteal tissue, which have become more cubical and angular, and have formed rows of free cells round the walls of the inter- stitial slits or alvcolar spaces. The difference between this and an osteoid tumour is that a certain attempt has been made in the latter towards true bone in the deposition of earthy or bone salts in the trabecule. In the case of the soft tumour of the periosteum there were clear traces of rickets in infancy, and the essential thing in rickets is the tardy or inadequate deposition of earthy matter in the growing bone, In both tumours the formative activity of the periosteal cells outruus their osteoblastic and ossifying functional activity, so that the latter is always behind, and the perfect result of hard bone is never attained. How this crror makes a malignant tumour is another and more difficult question.

Myeloid and other Internal Tumours of Bone.—The foregoing are Myeloid representative instances of external or subperiosteal tumours of bone- bone in addition to the enchondromata and osteomata. There tumour. remains an important group of internal tumours, or tumours of the bone-marrow ; and these, with the corresponding group of internal enchondromata, exhaust the morbid new formations incidental to the growth of the skelcton. There is, indeed, no hard-and-fast line between the enchondromata and the internal tumours of bone ; the latter have almost the same mixture and confusion of structure in various parts that the cartilaginous tumours have. The principal seat of the soft tumours of the bone-marrow is the lower end of the thigh-bone, the ends of the other long bones being the next most favourite seats. A certain tumour of the jaws, the myeloid epulis, is also classed with them. The tumour often grows quickly, and may attain an enormous size ; it causes the absorption or trans- formation of the hard walls of the bone, and there may be nothing between it and the skin, muscles, and tendons but a more or less continuous thin shell of bone. The interior has a most diversified aspect. Many patches are friable and ycllowish, other areas are a livid purple and gelatinous, and there are often blood-clots and cystic spaces filled with a tenacious brownish mucous or colloid fluid. Amidst these softer parts there run tracts of more spindle- celled or fibrous tissue,

and there are often islands of cartilage, or fragments of osteoid substance. The only clue to this puzzling diversity of texture is the inherent range of possibilities in the function of the bone-marrow, Derived from embryonic mesoblast,

Dermoid eyst.

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it began as a temporary feetal cartilage; it then became spongy bone filled with red marrow, in which state it remains in the ends of long bones, in the diploe of flat bones, and in the in- terior of bones like the vertebre. In the shafts of long bones the trabecule of bone are all removed and only red marrow remains, with a pronounced hematoblastic function ; but, when growth is well advanced, the cells of the red marrow become exca- vated to fat-cells, their blood-forming function ceasing therewith. We have also seen that, in the process of repair, the marrow and its blood-vessels together are able to produce new bone between the broken ends. There are here memories cnough to produce very fantastic results if anything should arise to recall the develop- mental activity. Disregarding the livid or blood-like patches, the mucous areas (whether myxomatous tissue or colloid fluid), and the fragments of cartilage and of osteoid tissue, some of which have been spoken of above, let us consider the tissue that is most characteristic of this group of internal bone-tumours. It is the yellowish or sand-coloured areas of friable texture, corresponding to the tissue named by Paget “myeloid,” or marrow-like. Its name is duc to the fact that it always contains a number of multinuclear eells, giant-cclls or myeloplaxes, such as are found in the

marrow of young D> bones. Its yellow- Ls ish colourisalmost 4 : sufficient of itself SA @)

to indicate the ry presence of these ‘/s

elements. The cut on ep (fig. 35) shows FF” selina abies $ several of these Fig. 35.—Myeloid tissue of tumour of thigh.

myeloplaxes lying among cells of various shapes with a single nucleus. In one direetion it is no great step from this to myxo- inatous tissue or other hematoblastic modifications; and in another direction it is no great step back to cartilage. We shall probably not go very wide of the mark if we take the common starting-point of the various tissues to be fcetal cartilage, as drawn in fig. 30 from an enchondroma of the upper jaw ; and, given feetal cartilage, it is not difficult to follow it along the various lines of its historical development in the shaft of a boue, to imagine the development taking a devious turn at one point or another, and so to account for the heterogeneons structure of the tumour,—some of the structure, indeed, being strange to the normal types of growth. Dermoid Cysts.—Having now illustrated two great instances of embryonic function revived in after life to the. production of tumours—namely, the blood-making and the bone-making functions —and having therewith disposed ofa considerable number of all the tumours that have a mesoblastic homology, it will be convenient to advert to a remarkable kind of tumour which shows to the fullest extent what the embryonic mesoblast can do in the way of fantastic new productions, namely, dermoid cysts. Not only blood and bone, but teeth, skin, hair, glands, musele, and nerve are pro- dueed as the tumour-constituents in these remarkablenew growths. Their usual seat, and the invariable seat of the most perfect of them, is the ovary; and the ovarian is just that mesoblastic tissue upon which the memories of development are as if concen- trated ; for it is from an ovarian cell that the embryo grows in the perfect likeness of the parent. These selected cells of the ovary, or, in other words, the ova, are specially charged with the reeollec- tions of the past history of evolution and growth ; and the rest of the ovary appears to possess the same lively memory, if not to the same extent, yet to a much greater extent than mesoblastic tissue elsewhere. The stroma of the ovary is the best example in the body of embryonic spindle-celled mesoblast ; only in some animals does it become normally fibrous, and in any animal it may revert to embryonic characters with the greatest ease at the generative periods or at other times, and even in extreme old age. But for the fact that the tissue keeps within normal limits of form and extent it might pass muster for spindle-celled sareoma, in all respeets, including the warp-and-woof arrangement of the tracts of cells. From this tissue cysts are developed interstitially, and they are not the less interstitial in their development that their homo- logue is often, if not always, a Graafian follicle. That, however,

is a region of controversy, and it will be more convenient to take an unambiguous case first. Such would be a dermoid cyst under the skin, say in the neighbourhood of the orbit. It is true that even these cases are sometimes explained by assuming that the skin has somehow become involuted at the particular spot during development ; but no observed facts warrant this assumption, an the histogenetic facts of the new growth itself are entirely against it. Fig. 36 shows a portion of new-formed skin on the wall of a small congenital dermoid cyst over the external angular proeess of the frontal bone ; adjoining the actual skin there may be seen the interstitial cells of the connective tissue becoming adapted in form and arrangement to continue the layer of rete mucosum over the cyst-wall beyond. The adaptation is very

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much the same which has already been mentioned with referenee to the new skin of a granulating surface ; the conneetive-tissue cells become large and cubical, often multinuclear, and elongated towards

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Fic. 36.—Wall of dermoid cyst, showing how the surface-stratum is produgell from interstitial connective-tissue cells.

the surface. The supply of these formative cells comes from the eonnective-tissue elements lying among the parallel fibrous bundles of the cyst-wall.

For a dermoid of the ovary it is impossible in a brief space to give any idea of the marvellous textures that are being woven side by side in various parts of the cyst-wall,—the areas of fetal cartilage, the interlacing bundles of plain muscular fibres, the long rows of pigment-cells, and, not far off, the rows of mucous cells developed interstitially, and maturing so as to be fused into the fluid of sub- ordinate cysts. At one place there is a piece of skin, underneath which will be found an enormous development of sebaceous glands ; where the skin ends a brownish velvety patch begins, with no sebaeeous glands, although there are rudimentary hairs at various depths.

This under the microscope will be found to approximate to granulation-like tissue, with many variously-shaped pigment-eells, and corresponding probably to the congenital mothcr-marks of the skin proper. It must suffice to give a single illustration of the strange formative activity of this mesoblastie tissue, namely, the Jormation of hairs.

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Hairs in dermoid cysts are formed in a very Hai f

peeuliar manner. It is usual in subcutaneous dermoids to find them der: d embedded parallel to the surface at various depths in the midst of cyst.

multinuclear or giant-cells. Some of these multinuclear masses

_may be secn undergoing a vitreous transformation down the middle,

as in fig. 37, a; elsewhere

central rodextending througli a succession of giant-cells ; and, most remarkable of all, there is the appearance drawn in c. In this last case the vitreous rod is capped at each end by a giant-cell, and the characteristic imbrieation of scales has developed on it over the intervening leugth. The cross section of such a hair isseenind. The section of hair is evidently a part of

the multinuclear cylinder; it ;

is in this instance well to one F!¢- 37.—4, vitreous transformation along a

aide. tat de dw otill enclosed central line in interior of giant-cell; 0,

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f : b, hairs lying among giant-cells in wall of by the marginal nuclei of the a

dermoid cyst; ¢, hair in dermoid cyst, cell, which are flattened into capped by giant-cells; d, cross-section of plates upon it; in other in-

a hair a ae of a giant-cell (der- res 5 id cyst). stances it is found lying out- «Scales side the largest of a cluster of giant-cells and surrounded by the smaller ones. The. nature of the transformation in the heart of these multinuclear blocks is not easy to determine; the most

_striking circumstance is that other giant-cells, which appear to be

advancing in the same direction, or to have diverged from the same kind of development, have an area of deep-brown or orange pig- nent in their centre instead of the vitreous or horny transforma- tion,—the marginal belt being free from pigment. This is a peculiar formative use of giant-cclls. We have already seen that they are used in the vessel-making processes of the placenta and of repair ; we have seen also that they may be the media through which a granulation-surface acquires a covering of epidermis; and here we find them playing the part of hair-follicle.

A dermoid cyst reveals the surprising spontancities of a collec- tion of embryonic cells of the mesoblast,—the inherited traditions of their life,—manifested in diverse ways side by side, and mani fested often fecbly and grotesquely. There is no reason to seek for the source of these various products beyond the stroma of the ovary itself ; and the variety of the products must be a measure of what that kind of tissue can do in the way of new formation. When various kinds of structure are thus brought together in their de- velopment we have an evidence, not only of the indwelling power of mesoblastic tissue to revert to embryonic modes of life, but also

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- will be found to have a useful application.

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of a common starting-point for structures that come to be very unlike. We may note, among other things, how small a step there is from the production of blood and blood-pigment on the one hand to that of hair on the other.}

§ 5.—ERRORS OF DEVELOPMENT AND GROWTH IN GENERAL.

The more usual departures from the normal type in the embryological rudiments or in the growth of particular organs and parts of the body have been already described in the article Monster. ‘The present section will be de- voted to those errors of development and growth which amount practically to constitutional diseases.

Rickets.—We have hitherto considered the indwelling spon- taneities of the cells and tissues as manifested in the process of repair, and manifested: capriciously in soine tumour-processes ; in these it has secmed as if the blood-making function of the embryo were the most fundamental of all its primitive tendencies, traces of it beg found in the reparative process and in the new growth of tumours. Next to it, and even bound up with it, is the bone-making function ; and we now come to a general or universal disorder of the bone-making function in whigh these developmental doctrines This disorder is rickets, a common malady of infancy and childhood. Attention was first drawn to it in 1650 by Glisson, who spoke of it as a disease of children that had been known to be endemic for thirty years in Somersetshire, and had been brought from the country to London. It is very common in all great cities ; in Vienna it is still known as “‘die Englische Krankheit.” A child developing this error of growth becomes profoundly affected in its health generally. It is tender all over, dislikes to be touched or handled, throws off the bedclothes even in cold weather, perspires profusely about the head, moves its head restlessly in sleep, so as even to wear the hair off, and in its waking hours sits perfectly still and subdued under a kind of suffering which can be but half-realized by its con- sciousness. Such children give little trouble, seldom crying even when left alone. They are very sensitive to cold, and proportion- ately liable to catarrh ; their nervous impressibility also is height- ened, making a peculiar liability to convulsions and to laryngismus stridulus. ‘They are ‘‘ backward children,” and, in particular, late in getting their teeth.

The conspicuous error in such subjects is in the growth of the bones everywhere throughout the body. The rickety condition often begins in children who are plump and apparently well nourished ; and, if the nutritive and other processes are involved at length, it is the osteoblastic process that is primarily at fault.

The details are somewhat different for the two kinds of ossifica-

tion—in membrane or periosteum, and in cartilage. Regarding the former, the error will be readily understood by reference to the accompanying cut (fig. 88) of normal ossification of the

Fig. 38.—Ossifying parietal bone of foetal kitten. a, a, spindle-celled membrane, corresponding to periosteum ; 0, spicule of caleified ground-substance, with free osteoblasts at one end and imprisoned bone-corpuscles at the other ; ¢, broader bars of bone.

parietal bone. ‘The spindle-cells of the membrane are becoming cubical along a line a little below the surface, and a few of them are half-included or imprisoned in the thin bar of bone ; most of them are free on the surface of the calcified bar, as osteoblasts, the Included ones being bone-corpuscles. Increase of the osseous tissue takes place through other ostcoblasts becoming surrounded by cal- cifying ground-substance ; and, in the broader bars of bone below, the bone-corpuscles may be seen to be two or three rows deep. This process goes on until the whole of the osteoblasts (derived from Spindle-cells) have been included one by one within the calcifying matrix ; once included, these cells are incapable of growth ; the multiplication is always in the spindle-shaped cells of the membrane, or on the surface of the hony bars or trabecule ; and the inclusion

. * See Virchow, Die krankhaften Geschwilste, 8 vols., 1863-67 ; Paget, i Path.; Cohnheim, Vorles. iiber allg. Pathol., vol. i. p. 622; Rud. aer, Lehrd. der allg. pathol. Anatomie, Leipsic, 1871.

is of that gradual and co-ordinated kind that there is always a set of free cells left on the surface to keep up the succession of formative elements. It

is not until growth is completed that osteoblasts cease. The error in rickets is that the multiplication of spindle- shaped cells and osteoblasts far outruns the calcifying process. Instead of these elements being produced only as fast as they are wanted for inclusion as bone-corpuscles, they are produced regardless of the forwardness of the calcifying process, upon whose exact co-operation with the cellular formative proccss all true periosteal bone-making depends, The error, or part of the error, of rickets is that the calcifying process is behindhand. A large quantity of soft bone-making material accumulates, which would, under ordi- nary circumstances, have become hard bone as soon as it was formed ; sooner or later it becomes bone, even in rickets, but the deposition of earthy salts is slow, and in the meantime the bones have be- come bent. Not only is there a relative slowness in the calcifying process, but there is an absolute excess of the cellular elements or of the osteoblasts ; and, in the flat bones of the skull, this is shown in the thickness of the bones ultimately, especially along their growing edges. The same excess of formative material beyond what can be used up for bone is seen in the ossification from carti- lage at the epiphysial line. The cartilage-cells divide and multiply at an excessive rate, and the columns of them, instead of keeping in the line of the axis of the bone, radiate to the sides, so that there is often a bulbous enlargement where the epiphysis joins the shaft. The want of harmony in the calcifying and osteoblastic parts of the process is shown by the irre-

gularity of the epiphysial line (fig. 39); it is a straight line normally, but in rickety growth it runs out aud in, cutting off islands of car- tilage in the midst of spongy bone ; and this irregularity is due to the fact that the blood-channels in the cartilage are formed sooner at some points than at others, the calcifi- cation following close on them. In the shaft of a long bone the process is the same as in a flat membrane- bone of the skull ; the periosteum is thick and its inner layers are blood-red, and in extreme cases there is what looks like a stratum of blood between it and the bone. Bone is at length formed from this layer, but it is of the spongy kind, so that the sltaft is softer and more

a@ porous on the outside than on the Fic. 39.—Lower end of femur of

baboon with rickets, showing the broad and irregular epiphysial line of growing cartilage (white), with spongioid tissue above it and islets of cartilage in the spongy bone be- neath, a, a, a; 0, b, irregular epi- physial line of cartilage. (From J. B. Sutton, in Path. Trans., xxxiv.)

inside. In the flat bones of the head, also, the structure is apt to be of the spongy kind throughout, so that they consist as if of diploe entirely, and not of a layer of diploe between two hard plates. Sooner or later, under favourable circum- stances, the spongy bone is replaced by compact bone, and in the end the bones of a rickety subject are harder and thicker than usual. In the worst cases deformities remain, notably the bent spine, the pigeon-breast, and the deformed pelvis. In the very worst cases the stature is dwarfed and the long bones are bent and twisted. Analysing these phenomena and filling in details, we come in the last resort to an indwelling disposition, probably acquired in most cases, or in largest measure, before birth. These tendencies come to an issue in the skeleton, because the growth of the bones is of a nature to tax the organism. The growth of the bones is the great instance of metaplasia; it is a succession of tissue – changes long kept up, and it requires a peculiar co-ordination or orderliness at each step, owing to the fact that stiffness has to be combined with plasticity. The requisite stiffness can only be got step by step through the sacrifice of that plasticity which goes with growth, and hence the special adaptation of a free row of osteoblasts on the surface of bone-trabecule to ensure the apposi- tion of new layers. Cartilage gives the stiffness for a time in all the bones except the clavicle and those of the vault of the skull ; having served its purpose, it becomes spongy bone, blood, and marrow, the spongy bone being finally removed in the shafts of long bones, the marrow remaining, and the blood continuing to be added to the general blood of the body. In these adaptations the early importance of blood-making among the embryonic cells is duly asserted. When the fcetal cartilages have served their turn the hematoblastic function becomes prominent in the cells, and a large part of all that was cartilage literally becomes blood. Accord- ing to numerous observers, it even becomes blood without the accompanying formation of blood- vessels with definite walls. Some of it becomes bone; but the bone is in thin plates only, and much of it is ultimately removed. In the periosteal process, also, where the cartilage-stage of the formative tissue is never gone

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through, there are not wanting indications that the same hemato- blastie function is present concurrently with the osteoblastic.

Coming, then, to the actual faets of riekets, we shall find that those features of the process on which the greatest stress has been laid in the recent elaborate researches of Kassowitz are of the nature of over-vascularization or hyperemia. In the ossification from cartilage he finds that the vessels from the perichoridium extend inwards toa greater extent and with less orderliness than usual; then there is a development in the cartilage of colossal vessels, and finally of blood-spaces, packed full of red blood-disks, and with no very definite walls, so that it looks, at the first glance, as if hemorrhage had taken place into the bone-marrow. In many eases there is no sharp line of separation of the embryonic marrow from the contents of these blood-spaees ; it is probable that the gelatinous tissue of the former had ‘‘ passed direct into hemato- blastie substance and so into blood-corpuseles.” In the periosteum also there is much more blood than usual, and the same large blood- spaces are sometimes found. These errors of vascularization Kasso- witz places at the foundation of the rickety process. Deposition of caleareous salts, he points out, eannot take place where there is so mueh blood ; the calcifieation follows in an orderly way only where the movements of the blood. and juices are restrained or distant, the best example of this law being the gradual reduetion of the wide eentral space of an Haversian system to a narrow ehannel containing a single twig of blood-vessel.

The exeess of vascularity in rickets is, by Kassowitz, put down to ‘‘inflammation,” or to the hyperemia of the same ; but we have seen that he also invokes, as a detail in the proeess, an excessive hematoblastic aetivity in the embryonie marrow-eells. The latter is a more fundamental and intelligible fact than ‘‘inflammation” (which begs all the fundamental questions), and we shall do well to give it prominence accordingly. We should then interpret the observations of Kassowitz as follows.

The due regulation of the blood-supply, the restriction of it to definite and ever-narrowing channels, is necessary for the proper deposition of the earthy matter and for the building up of bone in Haversian systems. The embryonic cells surrender their indi- vidual hematoblastic function, while certain tracts of them become definite vessels for the supply of all the rest ; and in proportion as they give up individually their primitive function of blood-making they are in a position to take on individually the function of bone- making. In eompaet bone this change of direetion is carried out most completely ; the cells become osteoblasts in suceessive rows, a ground-substanee impregnated with earthy matter closes in around them, and they are imprisoned for ever as bone-corpuseles. In spongy bone, however, there is still a reserve of hamatoblastic foree ; only thin lamine of bone are formed out of some of the cells, while many of them continue to be hematoblasts and to form the familiar red marrow. Adopting, then, the figure of a struggle between the hematoblastie and osteoblastic tendeneies in embryonie cells, or the pereeption of a divided duty, we shall con- clude that rickets is the undue preponderance of the former. It means spongy bone where there shonld be hard bone, and mueh wider spaces than usual, with much more blood in them in the proper seats of spongy bone itself; and it means in general a retardation of the hardening process.

All this enormous hematoblastie energy or local blood-forma- tion is unfortunately wasted ; the child is no better for it, and is more likely than not to be anemic. The formative powers are diverted from bone-making, and spent upon blood-making ; and the lime-salts in the organism that should have gone to make bone are actually thrown out with the urine, which has been known to have as much as four or even six times its due amount of phos- phates, The organism, when rickets overtakes it, is in this fix, that it makes blood which it ean no longer profit by, and has meanwhile

to part with bone-salts whieh it will want again. The disease is, in fact, an unfortunate contretemps.

Many of the faets of rickets are thus secondary to an initial error in the embryonic functions of the tissues, and the evidenee seems to show that the error must have begun in most cases before birth. Although it is well known that the obvious phenomena of riekets are not usually remarked until the child isa few months old, yet, as Kassowitz has ascertained, the condition "' begins mueh more frequently than has hitherto been assumed in the later months of intra-uterine development." The facts point very clearly to the health of the mother as being primarily at fault. ''The health of the mother," says Sir William Jenncr, ''has a decided influence on the development of riekets in the ehild. Whatever renders her delicate, whatever depresses her powers of forming good blood, that tends to produce rickets in an offspring. . . . The child of an ill-nourished mother is disposed to become riekety when placed under unfavourable cireumstanees after birth, or even under favourable circumstanees in some cases." The disposition must be in most eases, and in the worst eases, congenital in the child's tissues. We should therefore seek in the intra-uterine con- nexion between mother and child for some defect on the maternal side which would induee that whieh would appear to be essential

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to rickets in the child, namely, a preponderance of the hemato- blastie function of embryonic cells over the osteoblastic, a reversion in the eell-life of the growing frame towards independent blood- making. In seeking for this source of error, it will be necessary to reeall for a moment the nature of the intra-uterine connexion between mother and child, or the part played by the placenta. Placental Function in Congenital Disorders.—The embryo makes Pj, , its own blood and establishes the connexion with the mother by tal t its own blood-vessels. Its blood is earried to the placenta to be nexiy aerated, as the phrase goes; but it is much more than aerated. and The placenta is a glandular or secreting organ of the mother, riclet inasmuch as the maternal blood, flowing slowly through the sponge- | like tissue of thiek-walled vessels, reeeives additions of mucus-like drops from the

deliquescence of the large nuelei in the proto- plasmic vessel-walls (fig. 40). This mucus-like addition is clearly an adaptation for the ~ Be

foetus ; and the sur- faees of the placenta, where the foetal ves- sels touch it, are further adapted, through a thiek-set eap of nuclei, for . exuding it where it . can be taken up by the plasmatic tissue ofthe chorion. This placental eontribu- tion is the ‘‘uterine milk” furnished by the mother for the use of the foetus, so 2 that, although the latter makes its own blood (and blood-vessels), it reeeives material additions to its blood from the af mother. It is obvi- ; Saree eee ‘ ous, therefore, that Fic. 40.—Secreting structure of placenta (guinea-pig); the secretion of the the walls of the maternal blood-channels are them-

. selves the secreting structure, their substance yield- placenta 18 very €8- ing drops of mucus a, which mix with the blood 0. sential to the foetus,

and the due endowment of the latter must depend greatly upon the structural and functional sufficiency of that organ. It sup- plies the foetus with much of the fluid that eireulates in the latter’s vessels ; it may be said to spare the foetus to that extent the need of producing sueh fluid itself, or to dispense with the hemato- blastic activity of its tissues, so that they may take other formative direetions, such as bone-making. Or it may be eontended that there are ingredicnts in the normal plaecntal secretion which are specially adapted to bone-making. Now, if there should be any interference with these placental contributions, we are left to sup- pose that there must then be a reversion on the part of the foetal cells to self-helping tendencies, and especially to loeal blood-making. The excessive blood-making of rickets, and the retardation of bone- making consequent thereon, would thus be traced to failure in the plaeental function.

But, if there be such a change in the direction of the formative processes of the fcetus as an adaptation to its speeial intra-uterine conditions, why should rickets not become declared until several months after birth? In the first place, we have the evidence col- lected by Kassowitz that there are plain indications of the rickety process to be observed where death of the child has oeeurred before the full term; and, further, there are analogies to show that it requires all the extra-uterine functions to have been in action for some little time before a congenitally-acquired tendency manifests

itself. Although the intra-uterine life comes to an end, and the | child ceases to be dependent on the placental function of the mother, yet the acquired tendency, or the adaptation to a deficient performance of that function, remains for a certain time longer. It comes to an end, however, from the seeond to the fourth year; the | bone-forming tissues cease to follow the devious direetion, the bone- | salts present in the organism are put to their proper use, ossification | resumes its normal course, and, as the soft formative material of bone had aceumulated in exeess, the bones of the once rickety child are in the end harder and thicker than those of normal growth.

There is an assumption in the foregoing which ealls for remark, the assumption, namely, that the placental fuuction has been – adequate on the mother's side or that the requisite additions to the blood have not been made. Our almost complete ignorance of the pathology of the placenta is the reason why the above-mentioned facts and principles have to be eked out by an assumption. We do, indeed, know that the placenta suffers in syphilis of the parent; and we know that in congenital syphilis of the child the growth of the bones is affeeted in many ways analogous to the shortcomings of rickets, and that, as in rickets, the error of growth may not show

itself for some time after birth. It is highly probable that the placental strueture and function suffer under many less special con- ditions of ill-health and mal-nutrition of the mother. The placenta is, in fact, a great formative effort, and the formative power cannot always be adequate. There are in particular two conditions in the mother favourable to rickets in the child, in each of which an absenee of structural and functional perfection in the new-formed organ of intra-uterine nutrition is a priori probable. The one is the extreme youth or immaturity of the mother, assigned by Schonlein as the chief eause of rickets; the other is child-bearing up to a comparatively late period, the latest of a succession of pregnancies being often found to be those which yield the rickety members of a family. But amongst the poor there must be many other causes of general ill-health in the mother operating from time to time. Whatever makes the mother's milk poor

cannot but have told at an earlier stage upon’ the placental structure and function ; and that earlier stage is a vastly more critical time for the endowments of the child, —for all its formative, nutritive, and functional tendencies.

Osteomalacia.—A sort of counterpart to rickets occurs in the _ disease known as osteomalacia or mollities ossium ; and, curiously enough, this is a disease (as distinguished from senile softening) almost exclusively of women during mature life, apt to occur in the gravid state, and especially if there have been repeated pregnancies. It is mostly a disease of poor and hard-worked women, just as rickets is a disease of the children of poor and hard-worked women ; itis not very common, although it is said to be endemic in some localities. ‘The bones become soft or friable, owing to the encroach- ment of the medullary cavity upon the compact substance and the farther absorption of spongy bone; the encroachment may be so extensive that only a thin shell of bone or parchment-like mem- brane remains. ‘This enormous medullary space is filled with marrow, but not the marrow of adult life. The marrow is of the fetal kind, red, and often containing areas of blood, abounding in nucleated marrow-cells, and with a deereasing number of fat- cells, Ultimately the marrow becomes gelatinous. The process consists essentially of a reduction of the bone to red marrow, as in the first formation of the medullary cavities of long bones ; the carthy salts are removed, and all the cells of the tissue acquire an embryonic character. Although there arc some facts to show that this proeess takes place sometimes in the young, especially in young animals under confinement, yet its charaeteristic occurrence isin women during one of their later pregnancies. It is generally admitted that there is some intimate connexion betwecn the out- break of mollities ossium and the gravid state. We have found reason to conelude that there is an equally intimate connexion between rickets and the gravid state, only that the rickets is in the child. If, in rickets, the child is deprived of something maternal which it should have received, then in osteomalacia the mother parts with something for the child which she ought to havekept. In both cases the organism of the mother is overtaxed ; but in the more general case, where the child becomes rickety, the tax has not been met. In the rarer case, the welfare of the child in utero takes precedence of the welfare of the parent ; one may conceive that the formative effort for the placenta liad been so great that the organism in

general was impoverished. As a matter of fact, the bones of the mother are robbed of their earthy matter, and the commenecment, at least, of that diversion of substance is somehow connected with the gravid state. It is noteworthy, in this con- nexion, that a fractured bone in a pregnant woman repairs badly, owing to the deficient production of bony callus. Having onee begun, the disease progresses, and the patient dies bedridden ; only in rare instances do the bones become hard again. The loss of osseous matter in mollitics is accompanied by a return to em- bryonie characters and function on the part of all the cells that now form the very extensive marrow ; the hematoblastic function Is conspicuous in the process, and there are also numerous myelo- plaxes. Both the unmaking of bone in the parent and the diversion of embryonic tissue from bone-making in the child would appear to be correlated with the hematoblastic function of the cells. In both diseases phosphates are discharged in excess in the urine, and m neither is there any advantage from the excessive formation of blood. In osteomalacia the embryonic state of the marrow changes after a time to a more gelatinous state ; sometimes a wall forms round the red pulpy fluid, producing a cyst of the bone with brownish contents, and in these cases the disease is said not to progress farther.

Cretinism.—A much more profound error or defect of all the developmental powers of the body than that of rickets is found in cretinism. Certain aspects of this subject have already bcen treated of in the articles Crurinism and INSANITY; and another aspect of itis referred to in the section of this article dealing with the thyroid gland (see p. 385). It remains to mention here a few of the anatomical and external characters of the disease. With the ow mental development there usually go a large tongue, a broad and flat nose, loose and thick skin, and stunted limbs. The error of growth in the bones, which is only a part of a very extensive Tange of erroneous development, is somewhat different from that of

rickets. In the bones of the skull there is usually found synostosis, or premature union at one suture or another, not unfrequently at the sphenobasilar, giving the base of the skull an up-and-down direction. ‘The premature union along one line or other leads to compensating expansion

elsewhere, so that the skull is misshapen ; the forehead usually retreats, the top of the head is flat, and the oeciput small, the type of skull being markedly brachycephalic or broad. One distinctive point in the bone-lesions of eretinism relates to the stunted limbs, which are not at all characteristic of rickets. The stunted growth depends upon a complete departure from the ordinary relation of the epiphysis to the shaft. A bone such as the thigh-bone grows geal to the length, chiefly by the activity of the cartilage of the epiphysis along the epiphysial line: the carti- lage-cells multiply on the surface of the epiphysis next to the shaft ; they become grouped in long perpendicular columns ; and, as ossi- fication proceeds, the new bone becomes an integral part of the shaft. Meanwhile the epiphysis itself is becoming ossified radially from the centre outwards. In the crcetin the aetivity along the epiphysial line is somehow checked, and it has been found that a fibrous band extending inwards from the periosteum forms a kind of barrier in the position of the proliferating epiphysial line, cutting off the shaft from the epiphysis ; thus the shaft is deprived of those accretions at each end upon which its elongation mainly depends. At the same time the cartilaginous epiphysis spends its proliferative force within itself; it expands in all directions, becoming a large knob, and part of its ossification may be effected by a sort of in- verted activity of the epiphysial line, which proliferates towards the interior of the epiphysis, instead of growing towards the con- tiguous shaft. No analysis of these peculiarities of bone-growth in cretins need be attempted, but some remarks are offered on p. 385 with reference to the mother’s share in this congenital condition.

Chlorosis.—Contrasting with rickets, in whieh the tendency Chlor- born with the child produces symptoms of ill-health in ehildren of osis,

both sexes within the first year, and seldom later than the seeond, chlorosis is a congenital condition of which there are symptoms first at the age of puberty, and almost exclusively in the female sex. The congenital nature of this condition has been made prob- able by the anatomical observations of Virchow, which go to show that in chlorotic subjects there is very uniformly found a narrow or inadequate aorta, much more elastic than usual, with its inner coat irregular in thickness and disposed to degenerative changes, and with its intercostal branches coming off in a more than ordi- narily irregular manner. These anatomical peculiarities are natur- ally part of the congenital

endowment of the individual. The full force of the chlorotic state is not felt until the time of puberty, and in the male sex it is hardly felt at all. It is, indeed, associated in the most intimate way with the remarkable periodicity of ovu- lation to which the female sex is subject ; it manifests itself in the years when that function begins, and chiefly at each successive period of the function. After a few years the indications of it become feebler and tend to disappear. Want of sunlight in the daily life of the individual is the chief aggravating circumstance of the anemia of chlorosis. The vascular system is on a small seale, to begin with, and there is too much blood in the body for the size of the vessels ; the blood is not quite normally constituted, having too few corpuscles in proportion to the plasma, and in the red disks there is too little hemoglobin or colouring matter. While the blood and blood-vessels are poor, the fat of the body, and especially the subcutaneous, is abundant.

Hamophilia.—This is another general state of the vascular sys- tem, which is always congenital, and often runs in families, one or more of whose members are ‘‘bleeders.” It is a disorder of the boys of a family just as distinctively as chlorosis is a disorder of the girls. A remarkable disposition to bleed, with or without the pro- vocation of an injury, is the whole disease ; neither structural change of the blood-vessels nor peculiar composition of the blood has been made out, and there is nothing remarkable in the ordinary appear- ance of a bleeder. When the bleeding is spontaneous it comes from the mucous membranes, especially from the nose, but also from the mouth, bowel, and bronchial tubes; one of the most eommon and fatal traumatic occasions of bleeding is the extraction of a tooth. Even slight bruises are very apt to be followed by extrava- gations of blood into the tissues; the swollen joints (knee especially) of a bleeder are probably due, in the first instance, to the escape of blood into the joint-cavity or into the synovial membrane. It is always from the very smallest vessels that the blood escapes, and from these it may escape in such quantities as to cause death within a few hours. It appears that the same extensive capillary hemor- rhage may occur anywhere in the body provided the opportunity is furnished, by a slight injury or otherwise, for the blood to escape.” eee ee eS ee

1 Literature.—Of riekets :—W. Jenner, Afed. Times and Giaz., 1860, vol. i.; Virchow, Cellular- Pathologie, 4th ed., 1871, chap. xx. (also in his Archiv, vol. v., 1851) ; Kassowitz, Die normale Ossification und die Erkrankungen des Knochensystems bei Rachitis und hereditirer Syphilis, Vienna, 1883; Id., in summary, in Trans. Internat. Med. Congress, vol. iv. p. 45, Lond., 1881; J. Guérin, Alémoires sur les

Leuk- emia,

§ 6.—Errors oF Bioop-MAkING IN Mature Lire.

The words quoted above from Sir William Jenner— “Whatever depresses the mother’s powers of forming good blood tends to produce rickets in an offspring”—are a special application of a general doctrine of blood-making which has been held empirically by the medical profession at all times. It is not easy to discover with scientific pre- cision the facts of blood-making in mature life upon which this doctrine, otherwise amply justified, is based. It is remarked by Sir Thomas Watson: “ Although we cannot doubt that any considerable modification or defect of the fluids that feed and renovate the blood, and particularly of the chyle, must have a direct influence upon its com- position and quality, we really know but little about them except in their effects. We seldom have any means of procuring these the first products of nutrition so as to ex- amine them, or to test their qualities, yet we can perceive causes that are likely to deteriorate or deprave those fluids (unfit aliment, impure air), and we know that, under the continued operation of such causes, the blood, replenished by these fluids, 7s actually and sensibly modified.” The more recent development of the physiology of metabolism has been followed by an extension of our knowledge of the state of the blood in disease ; thus the text-books speak of such conditions as glycemia (glucose in the blood), aceton- eemia, cholemia (jaundice), lipseemia (fat in the blood), uremia, &c., some of which fall to be spoken of in sec- tions following. In the present section it is rather the corpuscular part of the blood that has to be considered with reference to its renewals in mature life. It is now known that red blood-disks are continually being added to the blood, continually perishing in a like ratio; the red marrow of bone is unquestionably a source of the red disks, and so probably is the pulp

of the spleen ; again, the liver plays some part, not yet precisely determined, in the cycle of changes that the solid elements of the blood undergo. Confining the attention, then, to the corpuscular elements of the blood, we shall best approach the question from the side of the colourless or white blood-corpuscles, the undue proportion of which is the most obvious fact in the import- ant disease called leukeemia.

Leukemia, or Lewcocythemia.—The relation of the colourless corpuscles of the blood to the red disks is variously explained ; all that we know, however, from such occasional cases as blood-cysts points to the red blood-disks being the detached protoplasm of the hematoblast,—the nucleus surviving. Appearances in the sub- eutaneous tissue of the foctus, in the thymus, in the spleen, and in bone-marrow point in the same direction. The colourless corpuscles of the blood would thus be the surviving nuclei of the original hematoblasts, the red disks being detached portions of the proto-plasm of the same. There would be in any case several red disks for one surviving nucleus; but in actual blood the proportion of cells of the latter kind is very much smaller than that. The pro- portion varies in health from time to time, and it is usually increased during pregnancy, making a physiological leucocytosis. Ordinarily the colourless corpuscles are in the proportion of from 1 in 300 red (after a meal) to 1 in 1000 red (in the fasting state). If the colourless cells are the surviving nuclei of hemato-blasts, we must suppose that the protoplasm continues to be renewed around the old nucleus, so that the same hematoblast gives off successive generations of red disks. The cells of red marrow, of the thymus (while it lasts), and of the splenic pulp would thus be standing sources of new red corpuscles. Evi- dences that they are so are not wanting in fine sections of these tissues, although the process of budding of the hemoglobin-

Difformités du Systeme osseux, Paris, 1889-43 ; Humphry, The Human Skeleton, Camb., 1858 ; various authors in Zrans. Path. Soc., vol. xxx, Lond., 1881. Of osteomalacia :—Kassowitz, op. cit., chap. Val 8 Cohnheim, Vorles. tiber allgem. Pathologie, vol. i. p. 518; Rib- bert, in Virchow’s Archiv, vol. lxxx. Of eretinism (morbid anatomy): —-Virehow, several papers reprinted in his Ges. Abhandl., p. 891 sq., Frankfort, 1856 ; Eberth, Die foctale Rachitis und ihre Beziehungen zum Cretinismus, Leipsiec, 1878 ; Barlow and others in Trans. Path. Soc. , Lond. , 1881-84. Of chlorosis:—

Virehow, Ueber die Chlorose, &c., Berlin, 1872; Laache, Die Andmie, Christiania, 1883. Of hemophilia: —J. Wickham Legg, Treatise on Haemophilia, Lond., 1872.

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tinted fragments of protoplasm is not so marked in all its stages as in those abnormal instances of heematoblastie activity to which reference has been made (blood-cysts, angeioma of liver), In the normal process there seems to be less cleavage of the nucleus although the nucleus is not unfrequently seen to be constricted or half-divided ; the marginal protoplasm detaches itself from one side as if with little trouble, new protoplasm gathers around the nucleus, and so the supply is kept up just as if it were secretion from the eells of a gland. If the cell which had disengaged its red- dish protoplasm in the form of one or more disks or globules were thereupon to continue in its nuclear state, and to acquire no further investment of cell-substance, it would practically amount to a colourless corpuscle of the blood. There are, as we have seen always a few such eells in the blood—one in several hundred red disks—and the real difficulty about them is to understand why they should be present in the circulating fluid at all. In the disease of leucocythemia they increase enormously, so as to be in the ratio of twenty, fifty, or even one hundred to the hundred red disks, which are themselves absolutely fewer; and, if we interpret that pheno- menon according to the view that they are residual nuclei of hematoblasts, we shall conclude that the hematoblasts have very generally ceased to produce new generations of red disks, have stood still at the lower grade, and have passed bodily from their blood-forming habitat into the blood-stream. There would be, in short, an arrest of function, manifesting itself not only in the great falling off in the number of red disks but also in the presence within the vessels of these sluggish or crippled elements of the blood-making organs and tissues, as if in lieu of the red disks themselves. What, then, is the actual condition of the proper seats of blood-making in the leucocythemic disease?

The interest centres in the state of the spleen and of the bone- Mor!

marrow ; according to modern views the so-called lymphatic leuco- anat’ cythemia belongs to another class of processes and may be here of le

disregarded. The spleen is in all cases enlarged, from twice up emid

to fifty times its normal size ; it retains its form, but its struc- ture is firmer, less sanguineous, streaked with pale or yellowish lines, or mottled with yellowish. patches. The marrow in the bones is often changed in appearance: it has become grey or red- dish grey and diffluent; and this change may be observed even in the marrow-fat of long bones. These changes are essentially in the hematoblastic tissue,—in the splenic pulp and in the bone- marrow ; the cells of that tissue have to a great extent ceased to form blood, their activity has taken another and formative direc- tion, from which no functional product results (red blood-disks), but mere overgrowth of tissue and of cellular nuclei. The hema- toblasts have, in fact, become constructive when they should have continued functional. The enormous number of colour- less corpuscles thrown into the blood has to be traced to the same diversion of the hematoblastic forces which has in the spleen led to textural overgrowth ; instead of remaining in the seats of blood-making, and continually reclothing themselves with hemoglobin-tinted protoplasm, the hematoblasts have passed bodily into the blood-current in their naked nuclear condition. The colourless cells of leukemia may be said to have the same relation to the hematoblastic process that was claimed, in a former section (see p. 365), for the pus-cells of granulations. The peculiar state of the bone-marrow characteristic of leukeemia has often been compared to granulation-tissue ; in some cases it has even the appear- ance of puriform infiltration. Again, the first cases of leucocythemia were described by Hughes Bennett as cases of ‘‘suppuration of the blood” ; and, if the pus of granulations is an analogy for the cells of leukemic blood, the textural developments of granulations may be held to be an analogy for those formative changes in the spleen which are found in its enlarged state.

Pseudo ~~leukemia.—Leucocythemia is a definite and generally fatal disease wherein the increase of colourless corpuscles of the blood and the decrease of the red disks are referable, in the last resort, to disordered hematoblastic function in the spleen or bone~~ marrow, or in both.

There may be a state of lewcocytosis without Levy

this profound and fatal hematoblastic disorder, wherein the in- cyt®:

crease of colourless corpuscles is referable to organs and tissues which have no blood-making function. Affections of the lymph- atic glands are the principal occasion of this leucocytosis 0” pseudo-leukemia, and such affections may occur in the course of morbid processes so various as scrofula, cancer, and typhoid fever. A considerable degree of leucocytosis occurs also in_the later mouths of pregnancy as a perfectly normal incident. The lymph- atic glands and the lymphatic follicles of the mucous mel: branes are collections of lymphoid cells which have no true blood-making function, however closely their cells may resemble those of the bone-marrow, of the spleen-pulp, and of the thymms ; they are rather related to the cellular by-products, or the solid waste of secretion (see section 7). From them, or through them, the eolourless cells in the blood may receive considerable additions from time to time; but these have a significance quite different from the profound disturbance of blood-making which constitutes leucocythemia, and they are better classed under the heading ©

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leucocytosis or pseudo-leucocythemia. The difference is even dis-coverable, according to Virchow, in the morphological character of the colourless corpuscles in the two cases. In true leukemia (splenic) the corpuscles in the blood are somewhat large, with multiple nuclei, and more rarely with a single nucleus ; in the pseudo-leukemia (lymphatic) the cells are small, the nucleus single and large for the cell, the cell-substance being often so narrow a zone as to be hardly appreciable around the nucleus. These are practically the differences between the eells of lymph-glands or follicles and the residual nuclei of hematoblasts (or pus-cells).

This pseudo-leukeemia connects, on the one hand, with Hodgkin’s disease, a general condition of lymph-gland overgrowth, and, on the other hand, with solitary Zymphomatous tumours, such as grow, mostly perhaps, in children in the kidney, or in the follicular tissue of the intestine, or elsewhere.

Pernicious Anemia.—This is another serious and generally fatal error of blood-making, which presents both an instructive parallel to lencocythemia

and an instructive contrast. The onset of this disease is often sudden, it may be with symptoms of chills and heats and other febrile manifestations. It occurs at all periods of life, and in both sexes. The body seems to become strangely blood- less, so that even the point of the finger will not bleed if cut. There is much listlessness, often giddiness, tendency to hemorrhages, especially into the retina, and pains in the bones. Recoveries, temporary or permanent, are more usual than in leucocythemia, especially under the administration of arsenic. The blood is pro-

foundly altered, and the state of it may vary much within a space

of weeks or even of days. The red disks are enormously reduced in number, and many of those that are left have departed from the usual type; they may be either very large or very small, two or three times larger than usual, or two or three times smaller. Some of them are oval and flat, and some of them pear-shaped

vesicles (fig. 41). They a may have also an in- ereased colouring power, whieh means an undue concentration of hemo- globin. When the two ehief blood-making tis- sues are investigated in sueh cases after death they do not always fur- nisl a rational explana- tion of the state of the blood. It is, in fact, somewhat rare to find anything elucidative in the state of the spleen, and the interest is thrown mostly upon the bone-

cious anemia; in the left lower corner is a group of normal red blood-disks for com-

profoundly altered; even the yellow marrow of the (After Laache.)

long bones is red or jelly-like, few or no fat-cells are visible, red blood-disks are everywhere, along with granulation-like marrow- eells, in a fine reticulum, and traversed by blood-sinuses which have been compared to the sinuses of the spleen. Sometimes the nuclear cells of the marrow are found with a zone of reddish pro- toplasm round them or in the state of perfect hamatoblasts. In this peculiar disorder of the blood-making process the salient facts appear to be the following. Red disks are formed from hemato-

parison.

times been held by practitioners to be of the first importance in diagnostics and prognostics. The local distribution of blood, or the amount of it within and the rate of its passage through particular organs and parts, is a more recently investigated subject bound up with the doctrine of vaso-motor nerves. One of the most striking facts in this chapter of physiology is the varying amount of blooc within the “splanchnic area” from time to time. In pathology the question of the varying distribution of blood comes largely into the doctrine of fever and of inflammation ; the further discus- sion of it is reserved for a later part of the article.

§ 7.—ERrors oF SECRETION.

The pathology of secreting structures is concerned, not only with deviations from their normal activities as de- scribed in physiological treatises, but also with an addi- tional series of phenomena recalling the more elementary or embryonic kinds of cellular activity. Besides those great disorders of glandular structure and function which fall to be considered in the next section as errors of meta- bolism, there is a large part of the sum-total of disease which is merely an affair of elementary cellular irregu- larities in the mucous surfaces and glandular organs of the respiratory, digestive, and reproductive systems. In the foregoing illustrations of pathological processes it has often occurred to notice the obtrusion, as it were, of earlier phases of cellular activity into later life, or the revival of embryonic characteristics, both structural and functional. The illustrations already given have related chiefly to blood-making and bone-making ; we now come to a corre-

| sponding class of illustrations from the epitheliated parts

of the body. In the latter also there is a liability to revert to rudimentary forms of cell-life, wherein the epithelial

‘ cells reveal their inherent power to act as independent units,

or their spontaneity and their self-governing properties. Thus, among the morbid conditions of the respiratory apparatus there are only a few, such as

asphyxia, the Cheyne-and-Stokes breathing, and the like, which are directly in contact with the physiology of the respiratory mechanisms. On the other hand, pulmonary catarrhs and their structural after-effects (together with laryngeal and tracheal inflammations) enter largely into the pathology of the respiratory organs, although they are hardly devia- tions from those respiratory functions that have the en- grossing interest for physiology. There is the same class of elementary cellular deviations among the morbid states of the digestive organs, and, most of all, in the pathology of the genito-urinary system,—of the uterus, bladder, and prostate,—and of the breasts. The most universal error that epitheliated surfaces or organs are liable to is catarrh; and closely related to their liability to catarrh is their liability to polypous and simple-glandular tumours, and, under special circumstances, to cancer.

blasts with difficulty; they are mostly either much too large or mueh too small; the hemoglobin is too concentrated in them; the bone-marrow makes quite unusual hematoblastic efforts; but the

Catarrh in general.—The term catarrh (kard, down ; péw, flow) Catarrh was originally applied to a running from the nose ; the mucus was in gen- called ‘‘ pituita,” and in the Hippocratic doctrine of the humours it eral.

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vessels at large remain ill snpplied with blood, while the marrow itself 1s everywhere full of blood, and sometimes even tends to or- ganize itself into a structure like the spleen, Degeneration follows m the muscular structure of the heart and in the walls of blood- vessels ; to the former are owing some prominent symptoms, and probably to the latter the hemorrhages. One of the most singular things in this remarkable disease is the power of recovery, cither temporary or permanent, that the organism may acquire, chiefly under the stimulus of arsenic. As compared with leucocythemia the striking fact is that the part played by the colourless corpuscles 1S from first to last a subordinate and even unrecognizable one.

_Seurvy.—In scurvy we have a blood-disease of a kind somewhat different from leucocythemia and pernicious anemia, inasmuch as it depends, not upon unacconntable and seemingly capricious errors In the blood-making

tissues, but upon errors in the ingesta, upon well-understood defects of diet. (See ScuRVY.)

Lrregularities of Blood ~~distributton.—While the facts of blood~~

was exalted to a place side by side with the blood and the bile. The vague importance assigned to this humour in. the medical philosophy of the Greeks is further shown in the curious fiction which made it to issue from the hypophysis cerebri or ‘‘ pituitary ” body. The mucus of the nose may stand for the mucus of the air- passages generally, and it differs only in degree from that which is expectorated when there is considerable bronchial catarrh. It is now usual, and the usage is scientifically justified, to include all other mucous or muco-purulent or purulent discharges from epitheliated surfaces as the result of a ‘‘catarrhal ” process.

Those mucous surfaces that are most liable to catarrh are ordi- narily kept moist by an exhalation or secretion ; in the mucous

1 See Virchow, Cellular- Pathologie, chaps. ix., x.; Wilks, articles on leukemia in Guy’s Hosp. Reports, and in Wilks and Moxon, Path. Anat., 2d ed., London, 1875; Mosler, Die Pathologie und Therapie der Leukiémie, Berlin, 1872; Gowers, art. “ Leucocythemia,” in Rey-

a making are among the most fundamental in pathology, the facts | nolds’s System of Med.; Malassez, in Arch, de Physiol, 1877 sq.; ‘ is of blood- distribution come more visibly into the every-day mani- | Pye-Smith, ‘Idiopathic Anemia of Addison,” in Guy’s Hosp. Reports,

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festations of disease. ‘The speed and force with which the blood s driven round its whole circuit vary much ; as measured by the pulse at the wrist these conditions of the circulation have at all

xxvi.; Eichorst, Progressive perniziise Andmie, Leipsic, 1878 ; Laache, Die Andimie, Christiania, 1883; Bizozzero, Rindfleisch, and others on the hematoblastic function.

The ca- tarrhal process.

Catar- rhal infil- tration.

membrane of the stomach and intestine the surface-moisture amounts to a definite layer of glairy or tenacious mucus. In some of the mucous membranes, such as those of the pharynx and cesophagus, trachea and bronchi, there are distinct racemose glands which appear to subserve solely the purpose of lubricating or keeping moist. In every case the normal mucus of an epithelial surface may be taken to be a product of the epithelial cells ; it is as if it were a common and rudimentary function of surface-epithelium anterior to the specific secretions of organs. It is in this common and rudimentary function that the catarrhal process has its roots, a process which not only exceeds the physiological limits of sur- face-moisture, but may even throw into the shade the specific secretion of the part or organ. The catarrhal secretion is always eharacterized by the large preponderance of cells, and the propor- tion of eellular elements increases as the mucous substance becomes muco-purulent and purulent. It is important to observe that there is no definite line where the limits of normal moistness end and ‘¢inflammation” begins ; and, as it is desirable to put off as long as possible the introduction of that entity into pathology, we shall best proceed in the study of catarrh by advancing from the physio- logical activities of cells.

Nature of the Catarrhal Process.—The catarrhal process, like all the so-called inflammatory processes, has been rendered ambiguous by the undoubted share in it that is taken by hyperemia or afflux of blood to the particular epithelial region. By some the hyper- eemia has been taken to be the primary fact, the increased rush of blood to the part and the local stagnation of the same being traced to an upset of the controlling and equalising nervous mechanism of the vessels and to alteration of their walls; by others the local cellular process has been regarded as determining the afflux of blood, as if by a kind of attraction. Whether the afflux of blood precedes the unusual activity of the epithelial cells, and whether some of the catarrhal cells may not be emigrated colour- less corpuscles, are questions that may be considered open ; but there can be no question that catarrh is essentially a hypersecre- tion of the epithelium, or the secretory activity so modified that it becomes to a great extent formative, or its product toa great

extent cellular. The difficulty of proving this is owing to the fact that the normal production of mucus from epithelium is a very subtle and rapid process, the morphological phases of which are hardly to be detected ; in this respect it must be considered analogous to the formation of red blood-disks from hzematoblasts. And, as the details of the hematoblastic process are best seen in certain abnormal manifestations of it, and even in those cases where the morbid condition is one of anemia, so the complete physiological paradigm of mucus-production is best seen where there has been some interference with the perfection of function. We shall per- haps not go wide of the mark if we describe the catarrhal process as a reversion to a more embryonic or more elementary type of cellular activity. The higher the type of secretion, the less obvious are the morphological changes in the secreting cell; in an organ like the liver, which had been early acquired in the evolution of the animal body, the secretion has become so elaborated in the higher animals that the steps of it present hardly any morphologi- cal features at all; on the other hand, in an organ like the breast,

which is a late (mammalian) acquisition, the changes in the secret-

ing cell can be followed at leisure. Catarrh in any mucous surface is the same primitive kind of secretion, and it may be said, in a word, to consist of a fluid product and of an additional by-product of cells, The original epithelial cell is detached bodily, nucleus and all; the protoplasm becomes the more or less viscid or semi- fluid part of the mucus; and the nucleus goes with it as the catarrhal cell. The more the cellular elements predominate, the farther does the secretion deviate from the normal, until we reach the limit of pus, where we invoke the entity of ‘‘inflammation.” Suceulenee and Thiekening of the Catarrhal Mucous Membrane.— A mucous membrane which has been the subject of catarrh for some considerable time becomes thicker and more succulent. If it be examined in microscopic sections it will be found that the underlying connective tissue has become involved; the tissue is ‘infiltrated”’ with round nuclear cells (fig.42); thefibresare becoming

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Fic. 42.—Epithelial surface and submucous tissue in a state of catarrh (tubular gland of the dog's skin). a, a', collections of catarrhal cells in the epithelial layer; 0, the same in the underlying connective tissue.

thicker ; and the fineness, delicacy, and translucency of the tissue are disappearing. At certain spots where the 'infiltration " and asso- ciated changes are greatest the surface breaks or ulcerates, and a

''catarrhal ulcer" remains. The central fact in this process is the infiltration of the round nuclear cells beneath the epithelial surface The facile way of accounting for them is to assume that the colour. less corpuscles of the blood had escaped through the walls of the small veins ; but it is more in accordance with observed facts and with unanibiguous analogies to regard them as catarrhal cells which have found their way into the depths of the tissue instead of flowin off by the surface. The presence of these cells in the spaces of the connective tissue is not without effect on that tissue itself; they rouse it to a formative activity which conducts to the succulence and thickening of the mucous membrane, and, it may be, to ulcera- tion at particular spots. To enter on this subject at present would be to open up the question of the infective action of one kind of cell upon eells of another kind (see pp. 382, 383).

Physiological Analogies of Catarrhal Infiltration.—The infiltration of catarrhal eells beneath the mucous surface has close analogies in the normal processes of the body. It is exactly paralleled in one of those crude forms of secretion to which the catarrhal pro- cess has been compared, namely, the kind of secretion, gradually rising in intensity, which goes on in the breast during the period of gestation. This process can be most conveniently observed in the mamma of the cat or dog, where the crude secretory products are for a time cells of considerable size filled with yellow or brown pigment ; the pigmented cells can be followed from the secreting structure into the spaces of the surrounding connective tissue, and thence into lymphatic glands. It would not be carrying this analogy too far to regard the lymphatie follieles of the mucous membranes as collections of or receptacles for the cellular by-pro- ducts of the mucous secretion ; such are the tonsils, the follicles on the back of the tongue and pharynx, the

lymphatic follicles of the stomach of some animals (but not of man, unless it be in infancy), the extensive stratum of lymphoid cells in the villi of the small intestine and the more definite collections of the same (Peyer's patches), and the lymphatic follicles of the great intestine.

Certain it is that all these collections of round nuclear cells are subject to very considerable increase when there is catarrh in the corresponding mucous surface. Not only so, but in catarrh they will show themselves prominently even where they are hardly known to exist normally ; thus, in the intestinal catarrh (summer diarrhea) of young children, even the thin folds of the mucous membrane (valvule conniventes) will be found studded with round nodular or somewhat flattencd lymphatic follicles. In intense catarrh — |

changing into a 'follicular ulcer." In other cases the catarrhal process makes its influence felt in the nearest lymphatic glands, which may be regarded as the second line of receptacles for the by-products of secretion (as well as for the matters of absorption), the submucous follicles being the first line; and, under these circumstances, the lymphatic glands may even suppurate (as in the axillary lyniph-glands of the breast after weaning). Tumour-diseases of Mucous Membranes and of Secreting Structures Tunit- generally.—If catarrh of mucous membranes enters, as Rindfleisch dise says, into the larger half of all the morbid conditions to which of e| mankind is subject, the tumour-diseases of the epitheliated surfaces thel ad and organs may be said to rank among the most formidable of all suri}. maladies, inasmuch as they include cancer. Cancers are diseases primarily of mucous membranes and other secreting structures, most commonly of the stomach, next to it of the uterus, of the i female breast, and of the intestine; another variety of cancers : (epithelioma) is diseases of modified epithelial surfaces, namely, | the skin in general, and the lip and tongue. There are, however, |

these follicles are the favourite scats of ulceration, their substance | f

much simpler tumour-disorders of epitheliated surfaces which it | will be convenient to take first. . i Warts (Papillomata).—Papillomata of the moist epitheliated Wa surfaces are found almost exclusively in those situations where there is a transition from skin to mucous membrane. The rule may not be universal, but there are many instances in which these wart-like

growths have an undoubted relation toa catarrhal pro- | cess of the surface, where the removal of the catarrhal products — has been interfered with. One of the most striking ilustra- tions of this law occurs in veterinary practice; in the horse, especially when he is overworked and ill cared for, the natural smegma of the prepuce gets retained, owing to the fixity of the sheath ; the accumulation has more than a mechanical effect, for it appears to induce a papillomatous condition sometimes of the whole mucous surface. The papillomata are new growths, either in a broad i layer of the uniform thickness of a quarter of an inch or more, Or — they are large dendriform masses arising at various points and each attached by a narrow stem. It is hardly a catarrhal process that we have here to deal with, but it is none the less a disorder of secretion. The natural secretion not finding an outlet, the secretmg surface adapts itself gradually to the unusual conditions. The surface becomes ridged or thrown into folds, or papille arise at isolate points ; blood-vessels run in the central parts of all these reduplica- tions of the membrane ; and the epithelium, instead of disengaginé itself in successive generations of cells after the manner of the natural smegma, takes on a formative activity and builds up 4?

adventitious tissue on the surface, the pattern of which is deter- mined by the looping or den- driform branch- | ing of the blood- vessels (fig. 43). These formative aberrations of secretion are apt to return after removal, even al- though the con- ditions which gave rise to them are obviated ; the |, newdevelopment \ and persistence of the blood- vessels entering their stems ap-

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duct ; the result is what is called an

**intra-canalicular papilloma,”

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Fia. 45,—Papillary outgrowths of epithelial lining in a tubu- lar gland.

Fic. 46.—Intra-canalicular papilloma of breast.

and it is not different in its origin and nature from the papillomata of expanded mucous surfaces which we have already considered.
Cartilaginous Tumours of Glands.—Another formative result of Dis- disordered function, which takes us quite beyond the limits of ordered catarrhal effects, is the occupation of the walls and interior of the glandu- acinus, not with papille of the lining epithelium nor with the lar func- epithelial cells shed into the free spaee as solid by-products of tions pro- the secretion, but with a new tissue foreign to the gland. This ducing occurs in the mamma (more often in the dog than in man), in the cartilage.

rence in these

of fibrous tissue.

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cases.

Mucous Polypi.—In many cases mucous polypi have an un- doubted connexion with those states of the mucous membranes which are included under catarrh. An approximation toa multiple polypous condition may be found in the stomach subject to long- standing catarrh, where the ridges and furrows of the mucous mem- brane amount to an actual polyposis ventriculi. Multiple polypi are sometimes met with also in the intestine. The commonest seats of the isolated and stalked mucous polypus are the nasal passages and the cervix uteri. Their structure is after the same plan as the more epidermic papilloma, everywhere tu- bular mucous glands, the epithelium of which is wonderfully perfect (fig. 44); these may branch or communi- cate more than do the normal gland- tubes of the part, and they are separated by tracts of connective £ tissue which appear to the naked

salivary glands (parotid, submaxillary, and labial), in the lacrymal gland, and in skin-glands (e.g., of the scalp); the new tissue may be of the mucous or myxomatous kind, and it is not rarely carti- laginous, or even osseous, at

a few points in the midst of the car- tilage. The occurrence of myxomatous and cartilaginous areas is common in the parotid tumours of man and in the mammary tumours of the dog, and it is nsually explained as an arbitrary and unaccountable overgrowth and transformation of the support- ing connective tissue of those organs. It remains to inquire whether it may not be brought into a rational connexion with disorder of the proper secretory fune- tion. The cut (fig. 47) is taken from a case of extensive tu- mour-diseasein the mamma of

eye as dendriform white lines. In #499) }/; the bitch, in ,

these morbid products the line is iog3//Ps. which much /)ie definitely crossed from functional to {2-7 Py cartilage had (my Vers formative, but we cannot assume any ‘% ‘formed. It

indwelling #2: secretory activity of the part; the

other force than the

represents se- veral acini of

ow fact that presents itself here = f/f) /9)! the gland, hav- Mies A),

is that a perversion of that force ! 0”) 7 Ff ing their in- lect gives rise to an organ-like new forma- F’s. —— pth at polypus | terior occupied st

tion whose plan of structure is plainly “iia J aces with large \P2Ke determined by the blood-vessels. It is worthy of note that the | spherical or NOE g bronchial mucous membrane, which is the most liable to catarrhs, | oval _vesicu- ee

has practically no liability to mucous polypi; and the bronchial mucosa is distinguished, not only by its investment of cartilaginous rings and plates, but by the density of its elastic and muscular coats.

Simple Glandular Tumour (Adenoma).—As the mucous polypus

gli ular is characteristic of the wide expanse of mucous membrane, so the

lated cells with Fic. 47.—Group of acini of mamma (dog), occupied in part firm hyaline with large vesiculated hyaline cells which are practically contents. There °@“tilaginous.

can be no question that these are epithelial cells strangely changed ; but the change will not seem so strange if we keep in mind the range

twur. simple glandular tumour or adenoma is the formative result of | of transformation which the secreting cells of the breast are nor- | functional disorder in the definitely bounded epithelial organs with | mally liable to. There is a stage in the unfolding of this gland

_ tacemose systems of ducts. The glands that are most liable to this | from its periodical state of rest In which the cells become vesicles

; condition are the breast, the salivary glands (including the buccal | filled with mucus, just as there is a more mature period when and labial), the lacrymal glands, and the skin-glands in certain | they are still vesicles but filled with a more fatty or milk-like regions, Whenever the more uniform expanses of glandular struc- | fluid. The change in the tumour is, after all, only from the

ture, such as those of the stomach and the intestine, take on a | mucus-filled vesicles to vesicles occupied by a firm hyaline sub-

_ formative activity to the depth (instead of to the surface, in the | stance ; and, if it were connective – tissuc cells that we were deal- | form of polypi), the result is a cancer, involving other considerations | ing with, the explanation would be at once accepted, according besides those primary or direct deviations from the secreting activity | to the well-known correlation between fat, myxomatous tissue, and if which we are now considcring. cartilage. The facts seem to require that the same formative oh. Intra-canalicular Papilloma.—The simple or non-cancerous | possibilities be granted to epithelial cells ; so that the ae hegre 7 tumour-disease of glands may be represented in most cases in the | and cartilaginous formations in secreting structures oO us — . 7 ht of deviations from the normal secretory activity,— deviations | to their active elements. The supporting tissue of the glands 1s

- Which take a formative direction.

; They connect not remotely with catarrhal states of the secreting structure; but, speaking generally, they stand for irregularities of the apparatus and process of secretion which transcend the notion of catarrh. It will be convemient, however, to proceed in the analysis of them from that familiar basis. The nearest approach to the effects of catarrh is shown in the folded or uneven state of the wall of the terminal secreting recesses or acini of a gland; this condition may be ob- Served in certain skin-glands and in the breast. The cut (fig. 45) is taken from a tumour of the skin-glands of the dog. The lining of columnar or cubical epithelial cells, which is ordinarily a perfectly even surface, is raised into distinct papillary eminences. These may even meet across the space, changing its interior into a nearly solid or at least trabecular tissue. The next cut (fig. 46) shows precisely

€ same process in the breast, this time not in an acinus but in a

a priori passive, and, as a matter of fact, it has not been proved by any detailed observations to be the source of those myxomatous and cartilaginous new formations. The occurrence of vesiculated epithelial cells with firm hyaline contents 1s not the only piece of

ositive evidence. It is much more common to find the columnar epithclial cells elongating into fibre-like elements, straight or crescentic, and developing mucous or hyaline intervals of inter- cellular substance ; in this way there results the myxomatous and fibro- cartilaginous tissue that is so often found in the tumour- disorders of the salivary glands atid more rarely in the labial mucous glands. The glandular plan of the structure in these cases very goon becomes obliterated, and the limits between supporting tissue and secreting apparatus removed ; in a considerable area of hyaline cartilage or fibro-cartilage there are naturally few or no traces left of the apparatus and process of secretion; and there may some-

times be seen (as in the mamma of the bitch) the most remarkable development of all, the change of the cartilage into bone, with perfeet medullary spaces lined by perfect osteoblasts. There are, indeed, no limits, other than the fundamental embryological limits, to the formative possibilities of cells whieh have reverted to primitive embryological funetion. We have already seen that the standing example of an embryonie tissue, the spindle-celled tissue of the ovary, contains within itself the whole range of development which is expressed in the grotesque variety of a dermoid cyst. Another common effect of disordered glandular function is the excessive formation of solid by-products of the secretion, which are either retained in the recesses of the gland or are infiltrated

. into the spaees of the underlying and supporting conneetive tissue.

Where the produets are retained within the gland-space we have the familiar and simple result of cysts from retention, of which the sebaceous cysts or “wens” of the scalp are good examples, But a far more momentous oceurrenee is the infiltration of these erude pro- ducts or by-products of seeretion into the depth. We have already found reason to believe that the same kind of infiltration below the surface takes place in catarrhs, that the nuclear cells found in the deeper layers of a thiekened mucous membrane are of the same origin as the catarrhal cells of the surface-diseharge, and that their presence in the spaces of the eonneetive tissue had been the excit- ing cause of the fibres becoming thick and coarse, or, in other words, of the “inflammatory” changes in that tissue. The infil- tration which comes under our notiee in tumours of seereting struetures is different from this as regards the characters and pro- perties of the eells: as regards their characters, the eells retain more of the epithelial type, that is to say, they are not naked nuelei, but they have a considerable investment of eell-substance ; as regards their properties, these epithelial eells infiltrated below the mueosa do not excite ‘‘inflammation,” but they excite cancer. What remains to be said of the infiltration of by-products of glandular secretion will be included in the section on cancer immediately following.

§ 8.— CANCER.

The popular estimate of the nature of cancer is so well founded that a definition is superfluous. Cancer in patho- logical anatomy differs from

cancer as commonly under- stood in being restricted to the malignant tumour-diseases of secreting structures and epitheliated surfaces generally, to the exclusion of a certain number of equally malignant tumours which grow from the periosteum or the marrow of bone, or from other mesoblastic tissues. The great majority of all the cases which have the fatal progressiveness of cancer are diseases of the stomach, the uterus, the breast, the intestine, and the skin; this group makes so large an element in the sum-total of tumour-disease, and is so homo- geneous within itself, that it may justly appropriate the name of cancer, leaving the other cases of tumour-malig- nancy to be described by more technical names. At the same time it should be clearly understood that the smaller detached group does contain cases where the particular man- ner of fatal progression is not different from the progressive- ness of the epithelial tumour-disorder, such, for example, as the cases of periosteal tumours becoming parosteal.

Chief Seats of Cancer.—The absolute and relative frequency of cancer in the various seats of secretion has been ascertained by D'Espine, from the mortality returns of the eanton of Geneva, for both hospital patients and the well-to-do treated at home, to be as follows over the period from 1838 to 1855 :—

Btomieein ¢:.80 8 0 ccc. Syelvetsoeiows 399 cases, or 45 per cent. (EN COWS CG aondoammsoneearcc cour al a 15 * BANGIN Sacto c nfecy gts ores 93 Cs; LOD sy IER Veni carci neRT EES i m0 S'S: | wy Small and large intestine …... 3 ae DO Sy PROC EMM ia.08 Aesroeate es fea 25° 5; 3 ~

being 762 or 85°3 per cent in a total of 889 cases of malignant tumours of all sorts. Most cases of cancer of the liver are really secondary to cancers in the stomach or elsewhere, so that the leading position of the stomach, and after it of the uterus, the breast, and the intestine, becomes more marked. According to the facts collected by Virehow from the mortality returns of the town of Wiirzburg from 1852 to 1855, the deaths from malignant tumours

were 5°3 per cent. of the total mortality, and the percentages among malignant tumours were as follows :—

GGMACHY soy sarc dees 34: ‘ Witenes KOE. 35.5… acunz 22 18-5 si Intestine…..... ei 4 Liver, fe, ...-..... ‘> 2 Face and lips…..... 49 ISTRY eaters. of 5.5 ane aes ne 4:3 ,

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78°2 per cent. of all malignant tumours.

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It may be aeeepted, then, that the digestive tract is the seat in about one-half of the eases of malignant tumour-disease, and the female sexual organs (excluding the ovaries, but ineluding the breasts) in about one-fourth, while the remaining fourth has to be apportioned among other epithelial organs or parts and the bones and other mesoblastic tissues. It must not be supposed that these ratios hold good equally for all localities; the breast sometimes appears to usurp a larger share, and sometimes the rectum. Again it is a noteworthy faet that cancer is a eomparatively rare disease among the vast populations within the tropics.

The beginnings of cancer have to be sought for in disturbanees of the apparatus and process of seeretion. Even in the eases where hereditary or eongenital predisposition plays a part there must have been local irregularities of strueture and function to deter- niine the seat of the disease; thus, of four sisters of whom three were married and had families, one died of cancer of the breast, another of cancer of the stomach, a third of cancer of the rectum, and the fourth of caneer of the uterus,—the ineidenee of the disease in them all happening about the age of fifty to sixty. Cancer in secreting structures is essentially one process; but each of the favourite seats of cancer has its own speeial liability, as well as points of structure special to itself. The lability of the female breast is an entirely different thing from the liability of the stomach ; and the liability of the uterus is more closely allied to that of the stomach than to that of the breast, although the breast and the uterus have a closer systemic relationship. There is, however, something in the eellular law of secretion common to them all, and it is that common feature of the secretory process which first engages the attention.

Relation of Cancer to Seeretory Process. —The product of seeretion Canc is not, under all circumstances, a fluid; in the simpler forms of and t animal life, and in more recent or less elaborated glands of the secret higher forms, it may be thrown off in cellular shape, just as it is proce

always cellular in its origin. We have already seen that in the eatarrhal state the cellular admixture is considerable, and there can be hardly any question that the eells of a catarrhal discharge are derivatives of the epithelial cells, being indeed little other than their nuclei. We have also seen reason to believe that the infiltration of nuelear cells in the thickened mucous membrane of chronic eatarrh had been a real infiltration of the eatarrhal cells bencath the surfaee. Now the favourite seats of chronic catarrh, the stomach and the uterus, are also the favourite seats of eancer. What, then, is the relation between these two very different diseases, both of them primarily disorders of the apparatus and process of secretion ?

A particular case will bring out the points of resemblance and the Diffu) In a fatal case of cancer of the stomach the cancé: whole organ is found to be uniformly thiekened, the mucous mem- whol) brane being much ridged and furrowed ;. but its epithelium is un- stom

points of differenee.

broken. ‘The interval of submucous tissue, ordinarily a loose layer between the mucosa and the muscular coats, is oecupied through- out the whole extent of the organ by a nearly uniform stratum of firm whitish tissue. This is an exceptional case of eancer of the stomach, but it is a very instructive one; the morbid condition is as uniformly .

diffused over the organ as if it had been the thickening of ehronie ca- tarrh, and. it wants the usual tumour – ehar- aeter of eaneer. The miero- scopic exami- 2 nation proves, – whatthewhite- – nessand almost gristly firmness of the submu- cous interval had suggested, that the disease is hard cancer. The white stra- tum under the mucosa has the structure shown in the cut (fig. 48), and it is an average example of the infiltration of scirrhous cancer. Epithelial ~~like eells, with a disproportionately large nucleus, are as if packed in rows in the spaces of a very dense fibrous tissue, which contains a large number of elastic fibres. Besides the linear processions of cells,~~

~~there are elsewhere groups of them arranged round the walls of spaces like the epithelium of a gland. Throughout the whole thickness of the coats of the stomach in this case such collections of cells are found ; in the muscular coats they are met with chiefly where there are fibrous septa ; and it is noteworthy that the gland~~ like collections are by far the most numerous in the tissue most

Fic. 48.—Infiltration of scirrhous cancer uniformly diffused throughout the whole sub-mucosa of the stomach.

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remote from the physiological glandular surface, namely, the connective tissue of the serous or external coat (fig. 49). It is impossible to trace a continuous vo~Ner 2-2 growth of these subserous gland- \/@*))\ like groups of cells from the actual glands of the mucous surface ; they are separated from the latter by nearly a quarter of an inch of mus- cular and other tissue, in which

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sary to retain the doctrine of the seminiwm, the part played by that

hypothetical element is not formative within its own particles ; but

it 1s a fertilizing or infecting influence upon the pre-existing cells of

the neighbourhood. In most cases the cells so fertilized are the

corpuscular elements of the common binding-tissne of the body, or

the connective-tissuc cells. Canecrous Infection of the Connective-tissue Cells. —The cut (fig. Caneer-

51) is an exact drawing of a piece of cancerous tumour where the ous in-

eonnective-tissue cells can be seen in the act of transforming into fection

the “infiltration” occurs only here .\/, and there. The wide extension of \\ the cancerous process is not mere overgrowth or protrusion of the -~ <== secreting structure, nor is it even <= an infiltration, in the literal sense, << ee rss of the cast-off secreting cells; it is S2—-——-— = ▬ an infection of the cells of the sub- Fic. 49.—Diffused cancer of stomach ; jacent tissue to become epithelial tubular-gland grouping of eells in cells and gland-like cell-groups. *#>-Peritoneal tissue. And therein lies the essence of cancer.

Extension of Cancer from the Surface to the Depth.—Whereas,

q Ms under commoner circumstances, the catarrhal by-products of the

process of secretion find their way to the underlying textures and there give occasion to an ‘inflammatory ” reaction, to hardness and coarseness of the connective tissue, under other circumstances the less nuclear or more epithelial by-products of the glandular activity have the power to induce the remarkable formative process in the neighbouring tissues which we know as cancer. The cancerous pro- cess implies, accordingly, such a condition of the secreting structure and function, or of its individual cells, as can excite this formative reaction, and it involves also the changing of the surrounding tissue (or of its cells) into epithelial forms of cells, cither in rows or groups or in gland-like systems. As regards the former, there is no lack of evidence that cellular by-products of secretion are often the ante- eedent or concomitant of cancer in an epithelial organ or part ; they may be seen sometimes in the stomach heaped up between the glandular tubules, or in the mammary gland (especially of the bitch) infiltrated into the sur- LIAS rounding stroma. The cut (fig. 50) is an illustration from the mamma; the rows of cells which lie in the spaces of the connect- ive tissue are the cellular products of the secretory function characteristic of an immature or low-pow- ered intensity of secretion, and they are easily iden- tified in all phases of the! mammary secretion in the dog, whether regular or irregular, by their yellow- | || ish-brown pigmentation. |/ |\) It is not to be expected || \ that such an infiltration of, by-products of secretion can be proved for every case of cancer, nor is there’ Treason to suppose that! there is always such an infiltration. The elements of the secreting structure may serve in sitw to excite or infect the neighbour-

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ing tissue, and this they “oie bio kaeoe [he ee usually do for the con- case of tumour (dog).

nective tissue on which they immediately rest. But we have to take due account of the much more important fact that the in- fection also manifests itself at a number of remote and isolated centres, within each of which the new growth arranges itself as if oy according to a design, the pattern being the more or ie regular epithelial type proper to the organ or part. Thus in on 49, from a diffuse cancer of the whole stomach, the glandular ube-like structures have arisen at a number of points in the con- hective tissue of the outer coat. The pattern of tubular glands 18 often more complex than in that figure, both in other stomach €ases and in cancers of the great intestine and rectum. This Temarkable breaking out, as it were, of very perfect epithelial tubules, disconnected from the physiological tubules and often in the midst of dense tracts of plain muscular fibre, appeared to Johannes Miiller to be so extraordinary that he ascribed them to an invisible semanium dispersed through the tissues ; according to him, the seminium was a literal seed whose particles themselves grew to be the new epithelial cells. We do not now admit the possibility of cells so arising by generatio equivoca; every cell must be the descendant of ‘some pre-existing cell. And, although it is neces-

epithelial cells, or in various stages of that transformation-process. The process carries us once more back to that embryonic activity

Fig. 51.—Cancerous infection of connective tissue in a case of tumour of skin-glands of the dog.

of cells in mature life which we have had frequently occasion to discover in other elementary processes of disease. The cells of the connective tissue are ordinarily quiescent in the form of plates more or less compressed laterally, the cell-plates of tendon being extreme examples. Just as, in the process of repair, they become plump and granular, developing in the third dimension as well, and ultimately becoming granulation-cells, so in cancerous infection they start from their obscurity among the bundles of fibres,

passing by rapid trans- itions into the form and semblance of the epithelial cells proper to the occasion; and they may even go on to assume a glandular

grouping round the wall of a space, acting as if harmoniously or

according to an implicit design. There is no fact in pathology more noteworthy than this; if it has any analogy among the facts of normal biological processes, we shall probably have to go to the very lowest groups of animals or to the earliest stages of evolution to find it. Whatever the infective influence may have been, it touches all the quiescent cells over a eertain area simultaneously ; a ‘terri- tory” of tissue, larger or smaller as the case may be, but always involving a number of cells, assumes the embryonic life throughout its whole extent, and goes through all the steps of the transformation towards the epithelial type and grouping, as if its cells had received one common impact.

States of the Connective Tisswe predisposing to Infcetion.—There are, indeed, reasons for thinking that the special factor in the production of cancer, and of the production of it at particular spots in a large area of choice, is not so much the presence of cellular by-products of the secretion as a particular disposition of the connective tissue of the particular spot to be easily acted on by them. Catarrhal products are often present withont any infection following; but the two favourite seats of repeated or chronic catarrh, namely the stomach and the uterus, may at length become the seats of cancer. Cancer is hardly ever a disease of the first half of life ; it is very distinctively a disease apt to occur after the meridian is passed. In those who are liable to uterine and gastric catarrhs the mucosa and the submucosa at length become thick and succulent. ‘This happens at particular spots, notably just within the pylorus of the stomach ; the epithelial surface may not be appreciably different from the surface elsewhere, but the under- lying tissues are thickened and, it may be, contracted to a stricture. It is in such dense new formations of connective tissue that cancer is most apt to form ; what is called cicatricial tissue is proverbially liable to cancer, and a tissue may be to all intents and purposes “ eicatricial” (and apt to shrink) even if it underlie an unbroken surface. Some cancers of the stomach form entirely below the surface, in the thickened floor of a healed nicer, or even in the not unfrequent dense adhesions between the serous membrane of the back of

the stomach and the piece of peritoneum which is drawn over the anterior surface of the pancreas. A cancerous stricture of the intestine or rectum is not unlikely to have been to some extent a stricture before it became a cancer. The eondition of the con- nective tissue in all such circumstances is not easy to define ; it is often spoken of as young connective tissue or “embryonic,” and there is probably in it a smaller preponderance of the fibrous clement over the cellular than is usual in mature life. A general change in the connective tissue of the body has been asserted to take place as age advances, a senile change which has been described by Thiersch, for the eorium, as a relaxed state. The epitheliated localities subject to persistent functional disturbance do at least seem to undergo a change in their underlying or surrounding con- nective tissue, whereby that tissue becomes predisposed to cancerous infection. The infection cmanates from the secreting structure proper, for it carries with it the likeness of such structure (in its more or less irregular or morbid state). The cellular waste or by- products of the secretion would appear to acquire something of the property of sperm-cells ; and, inasmuch as the infected or impreg- nated connective tissue produces not merely individual epithelial

cells of the appropriate type but also the appropriate grouping of such cells, the sperm-cells must be held to carry more than the influence of cell-units, and in fact to be representative of the whole structural and functional process in which they had played a part.

Varictics of Cancer.—The two main varieties of cancerous texture are the hard and the soft, or the scirrhous and the medullary.

Scirrhous Scirrhous cancer is very often the “infiltrating” kind, with the

caneer.

Medul- lary caneer.

Colloid caneer.

Caneer of

epithelial cells lying in scattered groups or in single file within the spaces of a peculiarly dense and elastic connective tissue. It is common in the breast and not rare inthe stomach. The medullary cancer consists of very much larger

¢ a = SS and closer groups of cells, which 77-————=> may be in nondescript heaps or in // “7 /72=S

the more regular arrangement of | ;// glandular structure. When the \\ |(‘ glandular type is very distinct the \ \

tumour is sometimes called a “de- structive adenoma.” Colloid can- cer is a very peculiar variety, apt to occur in the stomach but not unknown in the breast ; most of /,//,

the structure is changed into a [i/{// 7 brownish jelly – like atl

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substance | which forms more or less definite \\l\\,{}\/“4 spherical or alveolar masses sepa- NI : rated by narrow bands of stroma. '\ Under the microscope (fig. 52) little of cellular structure of any kind is found remaining, but in place of it there are an immense pyg, 52,—Colloid cancer of the breast. number of spherical pearl – like bodies, each of which consists of several delicate concentric lamin arranged round a more dense nuclear point.

Cancer of the skin, and of the lips and tongue, is generally termed

skin, &c. epithelioma ; it is not a disorder of secretion in the same sense as (epitheli- other cancers are, but it is a disorder incidental to the constant

oma).

waste and repair of the epithelium of the skin. It is characterized by the encroachment of processes of the rete mucosum upon the corium and subcutaneous tissues, or, in the lips, tongue, upper part of the cesophagus, &c., of epithelial columns of cells upon the subepithelial region. The type

of this encroachment is the papillary arrangement of the normal rete mucosum, where the appearance of regular columns of epithelium reaching down into the corium is equally due to the reciprocal protrusion of loops of blood-vessels upwards. Bayete

The interlocking of MK

epithelial columns and ! connective-tissue tracts in epithelioma is much more extensive and ir- ; regular than in the normal skin, and it is |,J:\' always difficult to de- f cide, from the super- [ii \4//5 ficial microscopic ap- *~t/}. pearances, whether the encroachment of the epithelium is merely a 'ali:

displacing or a trans- |; forming encroachment (fig. 53). In some cases, { such as destructive epi- | theliomas of the tongue, | or of chimney-sweep's '\// cancer, it is possible to J. find reliable evidence in | the microscopic sections that the progressiveness of the disease is really an infection, like that of cancer elsewhere — that is to say, the neighbouring tissues, and more especially the connective-tissue cells, are infected so that they assume the epi- thelial type proper to the locality—and that infection tends to spread without limit. But the doctrine of continuous growth from the rete mucosum downwards, by mere subdivision of pre-existing epithelium, appears to be justified as a part, at least, of the patho- logy of cancer of the skin. Asin cancers of the stomach and uterus, the regions liable to skin-cancer are especially those subject to re- peated irritation or to prolonged functional disturbance. One of the most striking instances of this law used to be the cancer of the skin of the scrotum and groins in chimney-swecps, a form of disease which has become much less common of late. Again, it is nearly always the lower of the two lips that suffers, and the rare cases of epithelioma of the lip that occur in women are among those of the sex who smoke pipes. Like other cancers, the cancer of the skin, lips, and tongue, &c., is a disease of later life ; according to

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Fie. 53.—Epithelial cancer of skin deeply involv- ing the side of the neck. The cylinders of epithelial cells, resembling those of the rete mucosum, are surrounded by fibrous tissue in- filtrated with small nuclear cells,

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Thiersch, it is due to a “disturbance of the histogenetic equilibrium between epithelium and stroma, to the disadvantage of the stroma.” The perfect balance of tissues would be exemplified by that regular interlocking of vascular papille from below and epithelial processes from above which the skin ordinarily shows ; as age advances the downward force of the epithelial growth prevails, owing to a certain decreased “turgor vitalis,” or to loss of resistance on the part of the tissue carrying the blood-vessels, so that, when long-standing irritation of a particular spot is added, we should have the two great determining causes of cancer of the skin. But the question will always remain, whether the essence of the disease is not really an infective transformation of the quiescent cells of the connective tissue into the type and pattern of the irritated epithelial structure.

The female breast is peculiar among the glands of the body in its great liability to cancer ; the disease is of essentially the same nature as that which we find in the stomach and other epitheliated organs, but the occasion of it is quite different. It will therefore be convenient to reserve further remarks on cancer of the female breast until the next section—that on the “liabilities of obsolescence.”

Extension of Cancer to Lymphatic Glands and other Discontinuous Disco Parts.—If the beginnings of cancer are to be sought for in some tinuo disorder of the apparatus and process of secretion, the disease very infect

soon passes the limits of the primarily disordered organ or part. The cancerous property of a tumour, as we have concluded, is from the first an affair of infection of the neighbouring tissues by epithelial products; the infected neighbourhood is the seat of the primary tumour, the progressiveness or infiltrating character of which may soon cause a large area to be involved and a large growth to result. Sooner or later there is discontinuous infection, or the infection of more or less remote centres, whereby secondary twmours arise. This phase of cancerous infectiveness is by no means dependent on the extent of the primary infection or the infection of the original neighbourhood. That which distinguishes secondary can- ccrous nodules, wherever they are found, is the very close mimicry of the pattern of structure in the indigenous seat of disease, a pattern which is itself determined by the structural and func- tional characters of the secreting organ or part-concerned. In the majority of cases the nearest lymphatic glands become the subject of this mimetic process first; the liver also is very liable to discontinuous infection, not only in cancers of the stomach and intestine, but even in cases of cancer of the breast, sub- maxillary glands, &c. There is always an interval of time before this secondary infection is set up; and, although the cellular process is not different in kind from the infection of the neigh- bourhood of the indigenous disease, it is necessary to regard the latter as, in a sense, the parent of the former. This parental

parts, particularly in the lungs. In cancers, accordingly, we should distinguish three factors, and in sarcomas only two: in the former we have first the accumulation of cellular by-products of the secre- tion, next the infection of the predisposed connective tissue by these epithelial products, and lastly the parental influence of the whole primary seat of infection ; in the latter we have the embryonic reversion of cells over a particular region, together with their increase or growth, and then the parental influence of the tumour which had so arisen. In both cases the primary tumour acquires a kind of individuality and a power to reproduce itself; but it is only in some cases of sarcoma, especially those soft tumours of periosteal origin which become parosteal, that there is infection of the neighbourhood, whereas a cancer is not a cancer at all until the tissues adjoining or supporting the epithelial secreting structure are epithelially infected. This difference between sarcoma and cancer corresponds to the familiar fact that the former

are only occasionally “infiltrating” tumours, being in most cases marked off from the neighbouring tissues by a definite capsule.

The simplest case of discontinuous cancerous infection is in the lymphatic glands near the original seat of disease. It is only ex- ceptionally that the lymphatic glands are infected in sarcomatous tumours, and those cases appear to be mostly the infiltrating sarcomas which have the distinctively cancerous property of in- fecting the neighbourhood. Infection of the axillary lymphatic glands is the common sequel of cancer of the breast, while the ep!- gastric, portal, nesenteric, and other abdominal lymph-glands receive the infection in cancer of the stomach and intestine. In epithelioma of the lip and tongue the infection of lymph-glands is much slower, and is often so slight as to be undetected during life ; it specially affects the lymph-glands under the chin. In all cases the tendency is to reproduce the exact pattern of the primary tumour. In some, including those sarcomatous cases where this kind of infection does take place, the lymph-gland seems to have been transformed ¢ masse, very rapidly and directly, so that steps in the process are hardly to be detected. But in other cases it is possible to find, either within the same gland or among the various glands of a cluster, a certain amount of instructive histogenetic detail as to the

‘i Cont relationship is made all the more probable by the fact that sar- betw coniatous tumours, which depend in many cases upon a reversion sarc’ to or survival of embryonic characters in the mesoblastic cells of a and particular locality, are also apt to be followed by tumours in distant cane

mode of infection. The lymphoid cells become affected, not cer- tainly in the way of atrophy, but in the way of transformation. There is indeed nothing more wonderful in the whole range of biological phenomena than to observe the adaptation of the cells and tissues of a lymph-gland to assume the cancerous structure already established in the organ to which they are related, an adaptation always close in its mimicry, involving the co-operation of large groups of cells and fibres, and directed as if by a presiding intelligence. In many instances the infecting substance may even want the perfect cellular character ; it may be no more than the detritus or the juices of cells and tissues. ‘Fhe most obvious form of infection,

although probably the rarest, is where the new growth extends continuously along the sides or in the interior of lymphatic vessels from the secreting structure to the lymph-gland; but even this continuous extension has been shown to be, not a protrusion of the primary tumour by increase or subdivision of its elements, put a succession of infective transformations along the line of cells constituting the lymph-vessel or investing it. Under all circum- stances the lymph-gland becomes changed ultimately into a texture which reproduces with astonishing fidelity the particular pattern of the primary cancer, a pattern which is never quite the same in any two cases of tumour-disease even of the same organ. In some cases it is not always uniform throughout the same tumour ; thus pre- parations might be described from a cluster of infected lymph-glands under the cancerous mamma of the bitch wherein two kinds of structure in the extensive strip of primary discase are severally reproduced in different lymph-glands.

In tion The infection of the liver is a very common sequel of cancer of of er, the digestive tract, as well as of other cancers, and even of sarcomas

(especially the melanotic) and lymphomas. Opinions differ as to the share which the liver-cells take in the building up of the new texture; but there is hardly any room for doubting that it is from the pre-existing cells of each infected area, even if it be exclu- ‘sively from the cells of the supporting tissue and the capillary walls, that the elements of the secondary tumours are derived by infective transformation. The infection breaks out and proceeds part passw ata number of areas throughout tho liver-substance, affecting the whole of an area as if at one blow ; there is an absolute lack of evidence in favour of the assertion often made, that the

persist when the local ravages of the disease have made consider- able progress.

§ 9.—Tue LIABILITIES OF OBSOLESCENCE.

We have seen in the foregoing sections that various liabilities to error underlie the embryological tissue-de- velopments, the process of blood-making, the process of bone-making, and the process of secretion. But there

are functions of the body, of its tissues and organs, in which the morbid liability is something special. The most striking instance of this is in the reproductive organs, particularly those of the female; the obsolescence of the function, and in part of the structure, in the ovaries, uterus, and breasts of women long before the natural term of life creates a peculiar liability to disease. There are two other organs, the thyroid and the suprarenal, which hold a some- what special position ; it cannot be doubted that each of these organs plays an important part in the economy, but there are suggestions in their morphology of survivalship from a former state of things, and their diseased conditions are not only peculiar in their occasion but also peculiarly important in their consequences. Lastly, there are two minute bodies situated at the bifurcation of great arterial trunks, the coccygeal gland and the intercarotid body, which are clearly marked as survivals; and the former, at least, of these carries a peculiar liability to tumour-disease during the period of intra-uterine life. These instances do not include the so-called “involution-diseases” or the liabilities of old age. ‘The self-limitation of life may be said to be too large a problem for the present purpose ; but sexual involution is a part of this problem which comes directly into pathology.

Cancer of the Breast in connexion vith Obsolescence of Structure Obsoles- and Funetion.—The diseases of the climacteric period in women cenee of make an important chapter in the special pathology of the sex ; mam- together with the disorders incidental to maturation, they stand mary

secondary tumours are due to the mere increase, by division, of cells detached from the primary mass and lodged here and there in the liver. There is a certain amount of evidence in favour of some such embolic theory for the secondary tumours of the lungs, which

are usually a sequel of sarcomatous growth in some bone or in other mesoblastic tissue. Sarcomatous tumours are apt to grow through the walls of neighbouring veins, and pieces of them doubtless get detached and carried into the pulmonary circulation ; but it is more than doubtful whether even these emboli give rise to the secondary tumours of the lungs merely by continuous proliferation of their cells, and not rather NG OC. gall ‘iN

by the infective action of © NB ae mi) a We wie their presence. Zn Coa) \ WAN a NG ys

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thelial and melanotic sarco- matous, is the serous mem- branes. The accompanying figure (fig. 54), from a nodule on the diaphragm in a case of cancer of the colon in the horse, may be set beside fig. 51 as showing the substan- ! tial identity of the infective A.G7/ process in the secondary and @C/)\ primary seats of disease; in “Y both cases the cells of the connective tissue are seen in

the stages of transformation towards the epithelial form

and grouping. The infection Fic. 54.—Caneerous nodule on the peritoneal of the neighbourhood is the surface of diaphragm, secondary to eancer Mf ihe cancerous of the colon (horse).

process. But the discontinuous infection of distant parts is not different from it in kind. It is merely “Wirkung in der Ferue,”

and it is More mysterious only because it is more remote. — disorder of secretion thus eventually assumes a cancerous : aracter in which traces of its origin may be hard to find. As the isease persists or extends the patient’s colour becomes sallow or 1 grey, the colourless cells are increased in the blood, the bones — become fragile, and general wasting (curiously associated some- ge local production of fat at the seat of disease) puts an end : . ife of suffering. In abdominal cancers death may be hastened cA anal of the peritoneum ; in various forms of the disease there i y be fatal bleeding from an eroded vessel. It has often been marked that an appearance of exceptionally blooming health a the liability to cancer; and the blooming appearance e face and plump condition of the tissues will sometimes

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for the larger part of the special ill health of women. be possible in this article to give more than a single illustration of the morbid effects of this peculiar periodicity, namely, the obsolescence of the mammary function. The statistics collected by Paget clearly show that cancer of the breast in women is peculiarly a disease of the climacteric and post-climacteric period ; throughout the whole period from the age of about fifteen to about forty-five, during which the breast is capable of lactation, the cancerous disorder is rare in it, the tumour-disorders to which the organ is then liable being comparatively tractable. A few words about the physiology will serve to indicate the pathology of the simpler as well as of the more formidable malady.

The reproductive functions in the female are not only peculiar among other functions of the organism in their maturation and obsolescence, but they are further remarkable for their periodicity within the period of vigour itself. In the lower species of the vegetable and animal kingdoms seasonal periodicity is in every- thing, in the higher it is only in the sexual and secondary sexual characters, and in the human species it is practically confined to the reproductive system. The consequences, as regards the breast, are that its structure and function unfold during the term of gestation, continue in full vigour for a longer or shorter period (which may be arbitrarily limited), and then go through definite stages of subsidence and upfolding to the resting state. This periodical reduction of structure in an orderly way is a peculiar and unique thing; it is “as though a rose should

shut and be a bud again.” ‘The upfolding and unfolding of structure have corresponding functional aspects; there are crude secretory pro- ducts formed and discharged, and hence it is that the breast is a peculiarly suitable organ in which to investigate the question of cellular by-products or waste of secretion, and their disposal by the lymphatic system. Compared with other secreting organs and parts the breast is not peculiarly liable to catarrh, but it has a physiological liability of 1ts own which puts it on the same footing, as regards tumour-disease, with the great seats of catarrhal dis- order, the stomach and the cervix uteri. Like these organs, it is not generally subject to cancer until after middle life ; but, where- as in them the predisposition appears to depend on long-continued functional irregularities, the liability of the breast ariscs out of its

1 See Paget, Lectures on Surgical Pathology ; Rindfleisch, Die Bés- artigheit der Carcinome, dargestellt als eine Folge threr értlichen De- structivitét, Leipsie, 1877 ; various eontributors in Pathol. Trans., xxv., 1874; C. H. Moore, The Antecedents of Cancer, Lond., 1865: K. Thiersch, Der Epithelialkrebs, namentlich der Haut, Leipsic, 1865.

It will not funetion.

Supra- renal blood.

normal obsolescence. Its secreting mechanism becomes finally broken up, so that one may find little left besides traces of the larger ducts in the midst of wide areas of fibrillar tissue and fat. Traces of the glandular structure persist to a very various extent in different women, and even in different parts of the same breast. It is obvious that the process is one which offers nuincrous oppor- tunities for a devious course ; it may be retarded, or advance un- equally, or be in the end ineomplete. That which in all cases must be held to create the peculiar liability to eanecrous infection is the readiness of the preponderant connective tissue to be aeted on by epithelial cells dispersed throughout it or otherwise in direct eontact with its eorpuseles.

§ 10.—SprctaL LIABILITIES OF THE SUPRARENAL AND THYROID.

(1) Of the Suprarenal—Addison's Disease.—The peculiar condition of ill health—always fatal—which Addison dis- covered to be associated with caseous degeneration of both suprarenal bodies was described by himself as "anzemia, general languor and debility, remarkable feebleness of the heart's action, irritability of the stomach, and a peculiar change of colour in the skin." Some of these symptoms appear to be due to interference with the function of the sympathetic nervous system; the disease, as a whole, however, is almost certainly the direct effect of withdrawal from the general life of the body of those services which the suprarenals are adapted to render. Where there is no caseous degeneration (and consequent non-circulation of blood) in each of the suprarenals the peculiar group of symptoms constituting Addison's disease does not occur ; there may be hyperplasia (struma suprarenalis) of one or both suprarenals, or even true cancer of one or both, but these morbid conditions do not seem to be able to produce the same effect on the organism which is produced by caseous degeneration. On the other hand, Addison's disease has resulted in a few cases where the suprarenals had not been destroyed by caseous degeneration, but had undergone extreme atrophy. We shall best approach this somewhat intricate disease by considering it from the point of view of suprarenal function, and of the peculiar relation of the present probable function of the organ to its past morpho- logical history.

Evidence of Suprarcnal Funetion.—A simple experiment will show that the blood passing through the suprarenal receives im- portant additions. If the organ taken quite warm from a recently- killed animal, such as the horse, be cut into pieees and placed in a solution of potassium bichromate the central region assumes a rich brown colour. Under the microscope the brown colour will be found to reside in the coagulated plasma filling the numerous lacunar spaces and large veins of the central region and in the eells adhering outside their walls. At the same time it will be seen that the groups of red blood-disks, wherever they occur in the coagulated plasma, form areas of bright green colour. These eolour-reaetions with chromium are not known to oeeur anywhere else in the tissues and fluids of the body ; there is that in the out- going blood of the suprarenal which reduces the orange-red ehro-inium-salt to a brown oxide, and (in the case of the red blood-disks with more oxygen) toa green oxide. It will hardly prove an easy task to isolate the substance whose existence is thus indicated, but it is not difficult to

follow in the suprarenal structure the adaptations for supplying some such substanee to the blood. It is precisely analogous to the adaptation of the placenta, as described above (p. 374), for supplying its metabolie product to the blood destined for the foetus. Several arteries reach the suprarenal all round its eireumferenee ; they break up into capillaries which radiate to the eentre, earrying the suprarenal cells closely adherent to their walls ; towards the centre certain laeunar spaces form, and from these the eentral outearrying vessel reeeives its blood, being provided with eontraetile muscular walls (in man, the horse, &c.). Whatever is added to the blood passing through the suprarenal must come from the suprarenal eells. There is reason to suppose that this addition is an actual exuded plasma, just as it is in the placenta. In the latter ease the added fluid drops from the protoplasmie wall of the vessel into the cireulating blood; in the suprarenal a membrane 1s interposed between the lumen of the vessel and the eylinders of secreting cells, namely, the wall of the vessel itself. In this respeet the suprarenal cells are as well placed for contributing to the blood flowing past them as are the liver-cells for exercising their glyco- genie funetion. We shall conclude, at least, that the suprarenal blood has received additions whilst in the organ, and that these

additions have been a material exudation (plasma) from the supra- renal cells.

The easeous or putty-like or cretaceous change which overtakes the Addi suprarenals in Addison’s disease involves the eomplete suppression son’; of this function, for it praetieally amounts to the arrest of cireula. Ciseas tion through the organ ; blood neither enters the organ nor passes out of it, and there ean be therefore no metabolism. Whatever be the nature of the services that this remarkable organ is adapted to render to the general life, Addison’s disease is the evidence that such services eannot permauently be withdrawn with impunity. The most striking effect is the formation of brown pigment, often so abundant as to appear almost black, in the lower cells of the rete muecosuin in eertain regions of predilection of the skin, and here and there in the mucous membranes. Doubtless a large part of the symptoms of Addison’s disease might be traced vaguely to disorder of the sympathetic nervous system; but, while it is diffieult to prove the existence of such disorder of the solar plexus, exeept as an inference from the

symptoms, we have the patent faet that the full train of symptoms in Addison's disease is associated with loss of suprarenal structure and funetion, ineluding naturally so much of the strueture and function of the sympathetic nerve as properly belongs to the organ.

The causes of the molecular deeay of the suprarenals and conse- quent cessation of their funetion are various. It may be the mere contiguity to a lumbar abscess, or it may be a part of general tubereulous disease in the body, or it may be assoeiated with no extrinsic morbid condition whatsoever. Enlargement seems usually to have preeeded the final molecular break-down. The liability of the suprarenals (with or without preceding enlargement) to caseous degeneration must be considered to be somewhat special to the pair of organs, just as the suppression of their funetion is of special significance for the life of the body. The caseation soon overtakes the whole structure on both sides, so that a relatively small amount of that not very rare degeneration is of fatal import if the suprarenals be the seat of it. There is a good deal of morphological and developmental evidenee that the suprarenals are in one sense obsolete, their structure being, however, adapted or utilized for new funetions; associated with this adaptation of the organs we have the peculiar instability of their protoplasm, the absenee of any power of recovery, and the very marked and fatal effects that follow the withholding of their contributions to the metabolism of the body. i

(2) Special Liabilities of the Thyroid Gland.—The thyroid is m Bd some respects parallel with the suprarenals. Its cells furnish a thyrc muecus-like plasma which is, in the first instanee, poured into the gland closed vesicles of the organ, but is taken up again and carried into the circulation (as Baber's observations tend to prove, Phil. Trans., { 1876, 1881) by the lymphatic vessels in their walls. We have now |

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to consider those not unimportant or infrequent morbid condi- tions which are associated with the peculiar functional position of this organ. , Goitre.—The grand disease in which the functional activity of Goiti the thyroid is implicated is goitre. Under certain conditions of locality a large part of the population become goitrous, that is to say, their thyroids undergo

enlargement. (See Gorrre.) There have also been epidemies of temporary enlargement of the thyroid in garrisons. The simple enlargement undergoes a considerable variety of subsequent changes in the different cases: it may be general or partial at the outset, it may become cystic or “aneul- ismal,” gelatinous or hemorrhagic, it may become fibrous, very generally it becomes petrified at various centres, sometimes there 1s a kind of osseous framework developed through its substance, and there may be amyloid concretions. These transformations are too many and complex to be entered upon, although they are full of interest for the elucidation of indwelling embryonic tendeneles. The primary fact is enlargement of the thyroid among popula- tions whose food, water, air, or environment generally has some. | thing defective or unsuitable. The enlargement of the thyroid | means that the organ has greater calls upon its ordinary fume tion, that it makes an effort to meet the cireumstances of the | case. And there can be no doubt that in most cases the effort | is successful ; for goitre, apart from the inconvenient size of the | thyroid and the mechanical consequenees of pressure, is a harmless | condition. The subsequent changes in the enlarged organ are the | inevitable consequences of hyperplasia ; but the primary enlarge =| ment is conservative and adaptive. The adaptation has the effect of elaborating from the blood brought to the thyroid more of the mucous substance which it is the office of the thyroid to elaborate, the same being probably returned to the blood more or less directly. There is that in the water, food, or air of these populations, and in the nutrition of men and animals in isolated cases elsewhere, which ealls for more of this peculiar metabolism. Myst Myxedema.—Surgeons have in some places practised removal h of the enlarged thyroid ; and attention has lately been called in ‘en Switzerland to the after-effects of such removals. The connective tissue in all parts of the body has becomo oceupied with a mucus: like substance or has shown evidence of unwonted functional an

plastic activity in its cells and fibres. Of eighteen cascs of com- plete removal of the enlarged thyroid at the hospital of Bern this condition followed in sixteen, and in the two which escaped it an “accessory ” thyroid

had arisen. The condition is that which had been described by Ord as myxedema (from the mucous dropsy of the skin), a progressive disease, with hebetude and other symptoms of impaired higher functions, and tending to a fatal result in a few years. The interesting fact is that iu such eases of idiopathic myxcedema the thyroid has very generally been observed to be small or wanting; where the diminished organ has been examined after death it has been found practically re- dvecd to a mass of connective tissue infiltrated with mucus, like the connective tissue elsewhere. The relation then between the eases of myxcedema following operative removal of a goitre and the idiopathic cases would seem to be that, in the one, a niucous condition of the whole connective tissue of the body follows when the thyroid, enlarged to meet the metabolic needs of the body, has been removed by the surgeon, while, in the other, the same condi- tion has followed where the thyroid has either proved too small for the ordinary metabolic ends that it is adapted to serve, or has degenerated under an unusual call upon its metabolism. Of the nature of this metabolism we are ignorant ; we know only that a material fluid is elaborated, and that the fluid is of the mucous kind. Cretinism.—If reference be made to fig. 40, showing the more spongy tissue of the placenta, it will be seen that there also a fluid is elaborated and added to the blood from the richly protoplasmic walls of the vessels ; and that fluid is also of the mucous kind. It is the “uterine milk” of earlier authors, and it would appear to exude through the densely nucleated marginal tracts of the placenta where the foetal vessels and their plasmatic supporting tissue touch it. It is this great metabolic function, so essential to the vigorous development of the child, that is probably at fault in the poor and over-worked or otherwise over- taxed mothers whose offspring become rickety ; and the fault may be said morc particularly to be deficient quantity or quality of the placental mucous secretion. The simi- larity of the thyroid and placental metabolisms cannot but come into account in considering the very peculiar condition of cretinism, proper to the offspring of goitrous mothers, or of mothers who had resided during their pregnancy in a goitrous district. Under the same endemic circumstances which cause the com- pensatory enlargement of the thyroid in the parents we meet with cretinism in tlie offspring. Although the defects of develop- ment and growth in cretinism are on the whole different from and much more universal than those of rickets, yet there is a certain parallelism between the two conditions. The cretin, like the child who

becomes rickety, must have been born with the disposition. The condition is not inherited, but it is congenital,—that 1s to say, it is derived from the mother in respect of her pregnancy only, and that means that it is derived most of all from the placenta. Cretinism is to goitrous districts what riekets is to other localities. And, although there is no positive evidence as to the placental function either in the one case or in the other, yet the placenta is clearly pointed to in both cases; and we may conjecture that cretins are the offspring of those mothers whose maternal nutriment is Impaired, not by the general hardships of those who bear rickety children, but by the special. endemic conditions which serve also to tax that other mucus-producing organ, the thyroid gland. The endemic conditions may not have caused goitre in the mother, although, as a matter of fact, they generally do; but, under a special concurrence of circumstances, as common in goitrous districts as are the determining causes of rickets elsewhere, they have caused a cretinous habit of body in the child, and to do so they must have affected the placental efficiency in some manner as yet unknown. _ This mode of associating goitre and cretinism assumes an error Iu the placental function which has not been shown by direct observation of the placenta to have existed. It has probably not been looked for; and, even if it had been, there would have been some difficulty in making out its morphological characters. Under the cireumstances of the case the evidence can hardly be othcr than deductive. Graves's Disease, or Exophthalmie Goitre.—In certain cases of . anemia In women there is enlargement of the thyroid, fluctuating Mm amount or permanent, but not liable to the common develop- Tents or degenerations of endemic goitre. Associated with the anemia and the enlarged thyroid there are disturbance of the func- tions of the sympathictic nervous system and a remarkable promi- hence of the eyeballs. It is probable that another aspect of the thyroid function than the mucus-making is involved here. It is an old contention of Kohlrausch that the droplets of hyaline substance, often With a yellowish or pale reddish tint, that are found in the thy- mixed with the ordinary mucus of its alveoli were an embryonic a of blood-globules. In the thyroid of the dog these droplets may often seen of a more uniform size, and so like blood-corpuscles (allowing for irregularities of form and size) that they have been y regarded as such, and put down, when in considerable quan- aes to "hemorrhage" from the vessels that run on the other side othe epithelial wall of cells. There is not the slightest reason to sup-

pose that these droplets have escaped from the blood-vessels : the are produced from the epithelium of thc organ along with the other mucus-like fluid. They point, indeed, to a hematoblastic function of the cells, somehow correlated to their ordinary mucus-yielding function. There are analogies among the connective tissues, at least, for this correlation between mucous and hematoblastic pro- duction, in new growths, and there is an analogy in the carly stage of embryonic fat-formation, in the production of red blood-disks from the same mesoblastic cells at one stage of their existence and of mucus-like fluid within them at the next. Now, although there is no evidence that the enlargement and increased functional activity of the thyroid in thesc peculiar cases of anemia has a more special relation to the hematoblastic side of the function than to the mucous, yet the coexistence of an enlarged thyroid with certain cases of anemia becomes intelligible in the light of these indications of hematoblastic function. The enlargement of the thyroid may be considered a special effort, comparable to the effort of the bone-marrow in pernicious anemia. The profound dis- turbance of the vascular system which goes with this condition must stand as an empirical fact, but it may be classed with the analogous sympathetic disturbances in Addison's disease ; both the suprarenal and the thyroid are to be considered as organs in which disorder of function has a special relation to the sympathetic, —the abdominal sympathetic in the one case and the cervical in the other. It is to be observed that in common goitre, where there is not so much an alteration, diversion, or disorder of function as a com- pensating increase of the ordinary function, there are no symptoms referable to the sympathetic ; so that the relation in the enlarged thyroid of anemia cannot be a mere mechanical one.

Secondary Tumours of the Thyroid.—The last special liability of the thyroid to be mentioned is a very peculiar one; there is a number of well-authenticated cases in which a simple enlargement or hyperplasia of the organ has been associated with the new forma- tion of masses of the proper thyroid-texture, with the proper mucous secretion, in the lungs and at various points of the sub- cutaneous tissue. In these cases the hyperplastic thyroid exhibits the property of an infective tumour, the new growth of thyroid- tissue at remote points being the secondary products of infection. Is

there anything in the normal overgrowth of the thyroid to account for its infectiveness as manifested on rare occasions? One of the unsettled questions of thyroid physiology is the mode of development of the new alveoli when the organ enlarges. It is apt to be too readily assumed that the new structure is formed by continuous extension from the pre-existing, by expansion or germi- nation; but the point has been raised by observers whether the new alveoli are not. formed interstitially at numerous independent centres throughout the stroma or supporting tissue of the organ, at first as small groups of cells which come to develop a space in their midst, and to group themselves as epithelium round the periphery. This is the ordinary mode of interstitial development in cancerous infection ; and, if that mode be substantiated for the physiological increase of the thyroid (and the facts in the dog's thyroid point that way), it would enable us to understand how it is that some- times, as if in a freak, the simple hyperplastic thyroid plays the part of an infective tumour, reproducing its own likeness at dis- continuous and even distant centres.!

§ 11.—Errors or METABOLISM.

In the foregoing sections metabolic functions have been claimed for the placenta, for the suprarenal, and for the thyroid. Connected with these obscure and hitherto al- most unregarded metabolic functions are several important morbid conditions, which are mostly of the so-called con- stitutional sort; with errors of the placental metabolism we connect such defective intra-uterine endowments of the foctus ag gave rise to rickets and cretinism in the child (and, it may be added, to some of the manifestations of congenital syphilis); with loss of the suprarenal meta- bolism we connect Addison's disease ; and with a compen- sating or conservative increase of the thyroid metabolism we connect goitre, a condition which is harmless but for its mechanical effects. It will now be convenient to pass to those greater but hardly better understood metabolic

1 See Thomas Addison, On the Constitutional and Loeal Hffects of Disease of the Suprarenal Capsules, Lond., 1855; Greenlow, On Addison's Disease, Lond., 1875; Id., in Trans. Internat. Med. Con- gress, Lond., 1881, vol. ii.; Wilks, " Addison's Disease,"' in Reynolds's System of Med., vol. v., Lond., 1879. Goitre, Cretinism, &c.—Hirsch, Historisch-geographisehe

Pathologie, 2a ed., vol. ii., Stuttgart, 1883 (Engl. trans.) ; Virchow, Ges. Abhandl. zur wiss. Med., Frankfort, 1856, p. 891; Ord, ‘‘On Myxcedema,” in Med. Chir. Trans., 1878; and various authors in Clin. Trans., 1882-84.

functions with whose disorders are associated some of the severe diseases of common occurrence, taking them accord- ing to the organs, and taking the liver first.

The liver-structure is very much that of a blood-gland ; its system of bile-ducts is subordinate to its blood-system, just as its biliary function, though the amount of its product be great, is in modern physiology subordinate to its glyco- genic, Except in connexion with JAUNDICE (q.v.), the biliary function does not concern us; we come at once to the not uncommon and very serious malady which may be regarded as an error of the glycogenic function, namely, diabetes.

Diabetes. —Like the errors of metabolism treated of in previous sections, diabetes is a “constitutional” or general disease. It depends essentially upon the circumstance that the blood passing to the kidney is overcharged with sugar; the kidney drains off the sugar along with an immense quantity of water, so that the prominent symptom is copious urine loaded with sugar. Diabetes can hardly be called a disease of the kidneys; these organs are but the ministers of disordered metabolism whose seat is elsewhere, and their structure is not even materially altered in the disease. In pronounced dia-betes sugar is everywhere. There may be half a per cent. of it in the blood, it is in all the tissue-juices and in all secretions, and it may enter into the composition of the urine to as much as 10 per cent. The diabetic patient drinks enormously (the thirst being due, it is conjectured, to the more concentrated state of the sugary blood), and eats or desires to eat two or three times more than in health ; the amount of urine voided is proportionately great, and it contains a total of urea in the twenty-four hours which corresponds approximately to the high feeding. All the while there is

no proper nutrition ; the body wastes, the skin becomes dry, the hair falls out, the muscles become flabby, the heart's action is weak, and the secreting organs become reduced in bulk and enfeebled in func- tion. Wounds tend to become gangrenous, boils and carbuncles are apt to form, and pulmonary consumption is a frequent com- plication. The saccharine state of the fluids is favourable to the lodgment of fungi (moulds), and these are found in the centres of disease in the lungs. The disease isan example of those paradoxes that we frequently come to in the last resort in the analysis of con- stitutional disturbances ; in spite of the enormous supplies that the organism demands (and receives), the tissues and organs are not nourished. It is only in some cases that the disease is checked by a pure nitrogenous diet. There issome maladaptation in the economy whereby there is an enormous quantity of sugar produced which is not wanted, and a great lack of that which is wanted. Where does the divergence occur from the physiological track ?

The blood ordinarily contains a trace of sugar, and traces of it may be discovered in the urine. It may be permitted to regard these traces as no more than the slight margin of non-perfect adapt- ation which is discoverable in many structural and functional effects. But the antecedent of this sugar, namely glycogen, exists in considerable quantity in animals the moment after death, and is assumed to exist in them during life. Although this assumption must be grantcd, it is not so justifiable to admit, with some authors, that the glycogen of the body is normally changed into sugar, the latter being at once disposed of in the further course of combustion.

Glycogen is now known to exist in various tissucs, more parti- cularly in inactive muscle ; but it is impossible not to conclude, on the evidence, that the liver is still the organ of its choice; and Ber-

nard's original position, that diabetes isa disorder of the glycogenic .

function of the liver, may be regarded as the reasonable one. The structure of the liver is in great part an adaptation to some such metabolic function, an adaptation to take somewhat from the blood and to add somewhat to the blood again. The intermediate state of this metabolism is glycogen, a starchy substance which changes to sugar under the action of a ferment out of the body, and changes to sugar sometimes in the body. Various kinds of

interference cause glycogen to change to sugar within the body—puncturing the inedulla oblongata at a particular spot with a fine spear-like point , the administration of curare, whose chief action is to paralyse the muscles through their nerves; the administration of nitrite of amy], whose more obvious effect is vaso-motor paralysis of the surface- vessels, causing dilatation of them. These interferences produce a passing diabetes. It has been objected that the diabetes so pro- duced is too transitory to be counted as analogous to the grave human malady; but it is well known that the same transitory effects are not uncommonly met with in medical practice. The true and serious diabetes is merely the established and confirmed habit of turning everything to sugar, and it cannot be doubted that Bernard's original experimental analogies are still the best clue to the nature of the disease.

These experimental interferences point to some profound upset of the nervous control. The spot in the medulla where puncture causes temporary diabetes is otherwise known to be the vaso-motor centre ; the effects of nitrite of amyl are otherwise such nerve-effects as

blushing ; the several effects of curare are identical with the muscular limpness of fear. The observations of clinical medicine point in the same direction; a large proportion of all the cascs of diabetes where the antecedents have been ascertaincd with any degree of relevancy are cases of profound emotional and intellectual strain, of shocks and jars and worries to the mind, and especially to the primary instincts and affections. Along with these we have a few significant cases of tumour in, or upon, or in the neighbourhood of the medulla. These clinical facts point clearly enough to some upsct of the nervous control, although there are certainly few or none of the usual concomitants of nervous disturbance. The nerve- paths that are implicated are the same as the vaso-motor ; but the effects themselves are not vaso-motorial. Nitrite of amyl causes artificial blushing, and it-also causes diabetes ; in like manner those subjective states of the mind (or mechanical states of the brain) which ordinarily take such outward directions as blushing and pallor, or the vaso-motorial direction, sometimes spend themselves otherwise, causing an upset of the glycogenic adaptation. It is cer- tainly not a simple affair of vaso-motor paralysis, even if the path

of influence be the same. Some nervous mechanism allied to the vaso-motor, or using the same path of influence, is probably con- cerned, the same kind of unknown nervous mechanism which would appear to be concerned in Addison's disease (of the supra- renal) and in Graves's disease (of the thyroid). The upset of this controlling nerve-force is followed by the production of a substance from the liver-cells which is directly added to the blood as sugar, and is removed as sugar in the urine. This substitution of sugar in the blood for some other substance is fatal to nutrition ; it is so wasteful an expenditure that the physiological bankruptcy cannot be averted even when the patient receives the enormous amount of food and drink for which he craves.

For the pathology of diabetes the obvious desiderata are to know the normal sources and normal ways of disposal of the glycogen of the liver. It seems to be premature to infer that, because aly- cogen, as its name implies, may easily become sugar, therefore it ordinarily does become sugar as a transition-stage towards some other product. If the regular conversion of glycogen into sugar be assumed, the cause of diabetes would be referred to the inadequate disposal of the sugar (¢.g., its inadequate combustion in the lungs). Cohnheim, after summing up the evidence from all sources, con- cludes that such inadequate disposal of sugar, properly present in the body, does occur in diabetes ; and he would seek for the reason of the failure in the want of some "ferment" which, in health, brings about the further breaking up of the sugar. The question, how- ever, is a sufficiently open one for us to contend that the initial error lies in the making of sugar at all; or, in other words, that the failure of the ferment (or of the nerve-control of metabolism) has to be assigned to an earlier stage of the metabolic process.

It is probably more than an accidental coincidence that the pancreas has often been found shrunken and indurated in diabetes, the shrinkage having followed apparently on an earlier hyperplasia. According to analogy it would mean that the error of the hepatic function had thrown more work upon the pancreas. Apart from the state of the pancreas there is nothing distinctive in the struc- tural conditions associated with diabetes.

Acute Yellow Atrophy of the Liver.—Here we have another severe " ye

concerned. atrc J It arises under a variety of circumstances, the chief of which are of lt

constitutional disorder, but much rarer than diabetes, in which the hepatic functions are chiefly, and perhaps primarily,

respectively poisoning by phosphorus, profound emotional troubles, and the state of pregnancy. ‘The early implication of the hepatic functions is shown by the existence of a degree of common jaundice for some time before the distinctive and fatal onset. The disease may be said to consist in a complete disorganization of the whole hepatic activity,—in the arrest of its biliary secretion and of its other metabolism. . The liver-cells fall into a state of molecular disintegration, and the organ shrinks bodily, sometimes to a mer’ fraction of its original volume. The ducts contain no bile, but a colourless plasma in place of it; the cells, where they keep their outlines, are full of albuminous granules; large quantities of leucin and tyrosin are found in the organ after death. What is there common to phosphorus-poisoning, profound emotional troubles, and the state of pregnancy which can be brought into relation with this remarkable upset of function and rapid disintegration of structure ?

As regards the effects of phosphorus, they belong toa remarkable class of effects, counterfeiting idiopathic diseased states, which it 1s the property of certain of the chemical elements, including arsenic, antimony, and lead, to induce. The action of this element may be said to be an arrest of metabolism, falling with special stress upon the great seat of such functional activity (and on the secret- ing cells of the stomach and kidney as well). As regards the acute yellow atrophy of the liver which follows profound emotional troubles, we have many slighter analogous instances of nervout inhibition of visceral function due to more transitory states 0 emotion ; the disorganization of the liver-function would be the proportionate effect of a more profound and more lasting men

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trouble. As to the acute yellow atrophy of the pregnant state the circumstances are doubly complex. In all the incidents of preg- nancy we must take into account the placental function, a meta- polism almost as great for the time as that of the liver itself; and, if we are to find any link of connexion between the seemingly diverse conditions here in question, we should have to resort to the somewhat vague generality that, in a rare concurrence of circum- stances, the placental function makes demands upon the maternal blood and tissues, or upon the ordinary metabolisms of the mother, which are of an upsetting kind, the incidence falling sometimes on the metabolic functions of the liver.

Albuminuria.—The waste of albumen in the course of the urinary excretion is a much more frequent and hardly less serious factor in disease than the sugar-waste; but albuminuria differs from diabetes in two important respects: firstly, the albumen which escapes is, in great part at least, the proper albumen of the blood (serum-albumin and globulin); and secondly, there goes hand in hand with the error of function a series of progressive structural changes fatal to the general efficiency of the kidney itself. Albuminuria is the functional error that corresponds on the whole closely to Bright's disease ; but it would be a mistake to suppose that Bright's disease can be measured by the amount of albumen lost. A con- sideration of these complex forms of constitutional disturbance may proceed, however, from the side of albuminous leakage, and from the point of view of the adaptations in the kidney whereby the leakage is ordinarily prevented or reduced to a minimum.

The problem, as it may be called, of the renal excretion is howto discharge from the blood and from the body absolutely the wash- ings of the tissues, or the waste-matters of metabolism, without allowing other dissolved substances of the blood to be discharged at the same time. In adaptation hereto, the kidney is in part a secreting organ and in part a mechanical filter. Those parts or regions of its structure where its epithelium is in the form of very large and richly protoplasmic cells have a true secretory function, so that nothing passes from the blood to be cast out from the body except through the interior of a very considerable cell, and_in all probability through a metabolic sclective process therein. This is known to be the urea-region of the kidney ; and the separation of urea from the blood may be said

to be the greatest of the renal functions. But by far the largest part of the urine, namely the water of it, is strained off from the blood by another kind of kidney- structure, which is more truly a mechanism ; not all the water of the urine, but the greater part of it, is filtered from the blood as it passes through the remarkable coils or glomeruli of small vessels which are placed at the farther end of the tubular system. In these the structural adaptations all point to mechanical filtration and not to selective secretion. The circulation in the vascular coils of the kidney is unique as regards the balance of driving force and resisting force ; the lateral pressure in these spherical coils of small vessels is greater than in any other capillary region of the body. It is indeed great enough to cause a transudation of water ; but is it so nicely balanced as not to allow an escape of albumen ?

gested state of the kidney, whether the embarrassment be traced to the side of influx or of efflux, to the arterial or the venous side. is favourable to the leakage of albumen, and a large part of all the albuminuria of medical practice is of that nature. ‘The congested state has been often experimentally induced in animals by various devices, and the laws of albuminous leakage have thus been determined with an exactitude which is very considerable. In these experiments the embarrassment of the circulation has been induced in various ways—by clamping the renal vein so as to dam up the blood in the kidney, by clamping the renal artery, by inter- fering with the nervous mechanisms, either at the spot or more centrally, and by introducing toxic substances into the circu- lating blood. Probably all of these forms of experimental inter- ference have their analogies in disease, although the gross mechan- ical impediments area rare type. The albuminuria of the pregnant state—not certainly an invariable occurrence, but rather a liability of that condition—may be referred in great part, if not altogether, to embarrassed venous reflux, for there are analogous cases of tem- porary albuminuria in which the cause is not the gravid uterus, but a uterine or ovarian tumour. In pregnancy it is specially apt to occur in primipare and in cases of twins, and in the later months. Again, the albuminuria of some forms of heart-disease, of emphy- sema, and of chronic bronchitis is an affair of difficult venous reflux. It is on the arterial side that we have to place the detcr- mining forces of a considerable number

of albuminuric cases, and these the most insidious. In all those cases where the congestion of the kidney is “inflammatory” there are the irregularities of circulation usual in inflammation, the parenchymatous cellular changes of inflammation, and the somewhat difficult correlation between these two factors in the process. These cases may be said to exhaust the instances of albuminuria due to heightened blood- pressure. The albuminuria of cachectic subjects is known to be dependent mostly on the impaired integrity of the glomerular vessel-walls,—on an amyloid change in them which permits the transudation of albumen under the ordinary conditions of pressure. But there is still a third determining cause of albuminuria, namcly, a changed state of the blood when both the pressure and the state of the vessel-walls are constants.

It has been mentioned that there are two instructive points of contrast between the drain of sugar and the drain of albumen; the sugar is not ordinarily present in the blood, and its discharge by the kidney is unattended with structural changes in that organ. The albumen of albuminuria is to a great extent the ordinary albu- men of the blood (serum-albumin and globulin) ; but in the urine there are other albumins found which are not ordinarily present in the blood, such as the variety identical with pepton, and another variety, hemialbumose, or ‘‘propepton.” The latter is found in eases of osteomalacia, and it may be detected under other circum- stances as well. Even when there are no new and specially diffus-ible albumins in the blood, it is probable that some alteration in the relative composition of the blood—in the proportion of its salts and the like—will make its albumen more liable to transude

‘sio- There can be no question that albumen does often find its way into cal the urine without amounting to a serious functional error or toa min-clinical condition of disease ; and it is equally certain that the

in the renal glomeruli. The albuminuria of phosphorus-poisoning and of acute yellow atrophy of the liver raises another possibility,—the possibility,

. leakage takes place at the glomeruli.

| Albumen is found so often in the urine when it is looked for systematically from day to day that we may admit, with Senator, that any one may be more

or less albuminuric from time to time. In 119 healthy soldiers, 19, or 16 per cent., had albumen in the urine; in 200 seemingly healthy persons examined for life assurance therc were 24 with albumen, or 12 per cent.; in 61 healthy children, 7, or 11°5 per cent ; in 32 hospital attendants in good health, 14, or 44 per cent. Add to these experiences the difficulty of detecting small quantities of albumen in ordinarily dilute urine and the impossibility of detecting certain varieties of albumen (known to occur in the urine) except by Special tests, and we may safely conclude that the filtration of water from the blood in the renal capillaries is very apt to be attended with a slight leakage of albumen also. The adaptation that water should drain off, but not albumen, is a very nicely balanced one, and therefore very easily upset. Asa matter of fact it is frequently upset ; the physiological albuminuria, like the physiological glycosuria, and like the small admixture of colourless cells among the multitude of blood-disks proper, is the narrow

namely, that the albumen is produced in the course of the meta- bolic process in the proper secreting epithelium of the kidney- tubules. Certainly the large epithelial cells of the kidney in these two conditions are filled with peculiar granules of ‘‘albuminous ” matter. The question has to be at least entertained, whether certain cases of albuminuria may not be due to a primary disorder of the renal metabolism, to some interference with its ‘‘ ferment.”

Four factors, then, are concerned in the waste of albumen, and they may act either singly or in combination. In the order of their importance they are :—(1) disorder of the vascular pressure, whereby the niccly-adjusted filtering mechanism in the glomeruli is deranged ; (2) states of the blood exceptionally favourable to the diffusion of its albumen, or even the presence in the blood of pecu- liar forms of albumen with high diffusibility ; (3) a more perme- able condition of the vessel-wall (as in amyloid disease); and (4) an error in the proper metabolism of the secreting epithelium where- by an albuminous by-product is formed from it. It now remains to consider briefly the other distinctive point in the acquired habit of albuminous waste, namely, the associated structural changes.

Struetural Changes in the Kidney.—If the kidneys be exainined Large from a case in which the symptoms, sometimes lasting for years, white had been

albumen in the urine (with cylindrical casts of the kid- kidney.

Margin of non-perfect adaptation which meets us frequently in the economy of living organisms. The nicely-adjusted balance of

driving force and resisting force in the vascular tufts is constantly exposed to disturbing influences, so that one may reckon to find a certain small average of albuminous leakage.

The great occasion of this leakage is sluggish circulation through the glomeruli, whether from over-distension of the veins beyond or

m other cause. The faster the blood passes through these capil- laries the greater the quantity of water drained off, and the more minimal the quantity of albumen that escapes; but when the blood travels slower there is absolutely less water filtered off in a given time, and the proportion of albumen that passes with it is increased

from a minimal quantity to something considerable. Thus a con-

ney-tubules), a more or less scanty amount of urine, and a small proportion of urea, together with dropsy and marked anemia, they will most likely be found to be enormously enlarged, and of a pale fawn colour, compared by Watson to the cut surface of a parsnip. This is the “large white kidney” of chronic Bright’s disease, the enlargement being in the outer zone of the organ, in the region of the glomeruli and secreting tubules. ‘‘ The incised surface gives one the notion of some deposit whereby the original texture of the part is obscured.” How comes it that an attack of congestion at some more or less remote period, or repeated congested states of the

organ, have led to so remarkable a result? It does not help us, for the purpose of rational analysis, to turn to ‘inflammation ” as a last resource ; what the analysis really conducts us to is the corre- lation between the disordered function and the structural changes.

It is impossible not to connect the remarkable form of hyper- plasia in the large white kidney (or where there is also the amyloid complication) with the albuminous character of the exuda- tion in which the organ, and more especially its cortex, is bathed. Sugar, as we have seen, has no such effect on structure, nor has uric acid, as we shall see in speaking of the kidney in gout ; the albumen has a special influence on the local centres of nutrition, on the cells and tissues of the organ. Again, the excess of nutri- tion does not conduct to increase on the normal lines. There are such cases of normal increase in the kidney's bulk, as when one kidney has to do the work of two, owing to removal or congenital absence of the other. But in the large white kidney of albumin- uria the increase is of an unprofitable kind ; it is a hyperplasia that not only does not add to the efficiency of the organ but even seri- ously impairs it. The large epithelial cells of the secreting region

are clouded with albuminous deposit, aud their nuclei show a.

fainter reaction to the colouring agents; or they fall into an unstable granular condition and into molecular detritus ; or they are shed bodily into the lumen of the tubule. The flattened cells of the Bowman's capsule are less apt to degenerate ; they are more likely to multiply i sitw, and to build up an unnaturally thick wall around the capsule. Further, the interstices of the tubules and the margins of the glomeruli are occupied by collections of round nuclear cells, like the collections underlying a catarrhal mucous membrane. All this activity is misdirected ; it does not help the function, but overwhelms it. The urine is scanty and the propor- tion of urea small; and these consequences may be traced, firstly to the sluggish circulation within the organ, and secondly to the complete obliteration of some glomeruli and the cumbrous thicken- ing of others, and to the degeneration of the secreting epithelium interfering with its proper metabolism. There is hardly any tendency to restitutio ad tntegrum in the large white kidney, the unprofitable overfeeding of its elements continuing to the end.

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themselves more by ardent spirits than by ordinary food, and next most frequently in the subjects of gout and of lead – poisoning although there are a good many cases of the disease remaining fo be accounted for by less obvious causes.

The dropsy of Bright’s disease is difficult in its pathology. The p, watery state of the blood, or the hydremia, consequent on the loss of “a of much of its albumen does not suffice by itself. A subsidiary Bri ht hypothesis, adopted by Cohnheim, is that the blood-vessels of the Fas skin become unusually permeable. Sometimes the dropsy appears = first round the ankles, at other times it shows itself in putiiness of the eyelids and a somewhat bloated pallor of the face.

Gout and the Uratic Diathcsis.—Many other states of the system @oyt besides podagra—the disease which usually begins in the night with pain and redness of the great-toe joint—are now reckoned as be- longing to gout. The disease, in the extended use of the name, is indeed a widespread error of metabolism which may manifest itself in very various ways. The particular liabilities to error arise dur- ing the metabolism of proteids, from the first stage of digestion in the stomach to the last stage of excretion in the kidney. Hence it is that gout, in its widest meaning, has been taken to be a form of “dyspepsia.” The opportunity for going wrong may be said to depend on the fact that there are two chief forms of nitrogenous waste remaining to be got rid of in the end, which are somehow correlated to one another,—the Inghly soluble substance urea, and the highly insoluble substance uric acid. There are remarkable ditferences in the proportions of these two waste-products through- out the animal kingdom; in most reptiles and in birds the form of nitrogenous waste is mostly uric acid, whereas in man (and other mammals) it is mostly urea. But in man the waste is still to a small extent in the form of uric acid. In normal human urine the proportions are :—to 1500 grammes (52°91 ounces) of water m the urine of twenty-four hours the total of solids is 72 grammes (2°54 ounces), of which 33°18 (117 ounces) are urea, and only ‘555 (019 ounce) uric acid, or not more than one-sixticth of the quantity of urea. Whether or not we are to regard this small margin of urie acid as another of those instances of non-perfeet adaptation of which we have previously found instances in the

Granular Contrasting with the large white kidney is the contracted kidney physiological traces of sugar and of albumen in the urine, and of con- in another variety of chronic Bright’s disease. For the present | colourless corpuscles in the blood, there can be no doubt that the tracted purpose it is necessary to follow the broader lines of distinction, adaptation, such as it is,

whereby the nitrogenous waste is mostly kidney. and to avoid the transitions and finer shades in the pathology ; and | the highly soluble urea, but to a very small amount also the less

it may be stated as a general truth that the large white kidney goes with scanty urine and much waste of albumen (the waxy modifica- tion having only the latter), while the small granular contracted kidney is associated with even copious urine and a waste of albu- men which is often small, and in any case variable. The error in these latter cases appears to lic with the arterial side of the circula- tion ; the left heart is hypertrophied, and so is the muscular coat of the arteries in the kidney, if not also elsewhere. It is cssen- tially an interstitial disease of the kidney, leading to enormous development of its supporting tissue ; whole tubules become obli- terated, but in those that remain the epithelium is not degenerated. Obliteration also overtakes the glomeruli, but there must be a compensating increase in the work done by those that survive to account for the copious urine; it often happens, also, that num- erous small cysts are produced.

Shrinkage of the connective tissue after a period of revived embryonic activity is the cause of all these changes; it is the ordinary shrinkage of cicatricial tissue, and it has the effect of com- pressing the- proper urinary apparatus—the filtering and the secret- ing—to its destruction. The kidneys may be reduced even to one- fourth of their natural size, and their uneven surface shows that there has been mechanical dragging along certain lines. In the end the urea-waste accumulates in the blood to such an extent that death results, usually from uremic coma and convulsions. In some cases cerebral hemorrhage anticipates the fatal effect of uremia.

The small granular contracted kidney is usually of a reddish- brown colour, but it may be whitish, in which case the lobulation of its surface is larger. It is one of the standing difficulties of renal pathology to decide whether the small contracted kidney is not often a later stage of the large white, But there can be hardly any doubt that it is oftenest the structural manifestation of an entirely different disease, an arterial disease. That which has been emphasized by some pathologists as the distinctive process in this affection is the overgrowth of cells on the inner wall of the arteries, the so-called endo-arteritis or arterio-capillary sclerosis, whereby the lumen of the vessel

tends to be occluded. But it may be made a question whether this is not really a part of the revived embry- omic activity in the connective tissue, whose shrinkage gives the organ its granular contracted character. The interest would thus come to centre in the error of nutrition whereby so much activity is diverted to the connective tissue, an activity that takes the embryonic formative direction. We have a close analogy in cirrhosis of the liver, a discase associated with the drinking of raw spirits ; and it is noteworthy that the insidious form of Bright's disease, whose morbid anatomy is summed up in the small contracted and puckered kidney, occurs most frequently in those who sustain

soluble uric acid, is the occasion of many and serious morbid con- ditions. The liability to these gouty and calculous disorders depends partly on the increase of uric acid at the expense of the urea, together with the low solubility of the former, but it seems to depend also on an abnormally low power of the animal fluids to dissolve uric acid, or of the kidney to eliminate it when its quantity is not excessive.

The peculiar liability from uric acid is sometimes called the Urati uric-acid or uratic diathesis or constitution ; some persons have it dia- much more than others, and it is exceedingly apt to be handed thesi: down from parent to offspring, so that the stock, in countries and among elasses where gout is common, may be said to be widely inoculated with it. Where the acquisition of it can be traced at first hand it is often found that the associated circumstances are high-feeding and a life of physical inaction and feeble intellectual zest. These are among the best-known conditions of gout, admitted equally by the ancients and the moderns. It is now known, however, that practically the same gouty constitution may be and often is induced by conditions which have hardly anything in common with luxury. Thus gout is a common liability of workers in lead, being one of the various manifestations of lead-poisoning ; it is also common among those classes of labourers, such as dock- labourers on the Thames, whose habitual drink is porter; and it is said to have become common among the working-class in Dublin, where it was rare twenty or thirty years ago, according as they have taken to drinking porter instead of ardent spirits. 'There are still other cases of gouty constitution for which neither heredity, nor luxury, nor lead-poisoning, nor porter-drinking can be in- voked as an explanation ; and

these are the cases which justify the somewhat wide definition of gout as a form of dyspepsia.

In order to have the gouty effect there need be no great inercase Uric d in the ainount of uric acid formed in the course of the metabolism ing of proteids. During an acute attack of gout, and previous to it, the amount of uric acid in the urine will probably be much below the average; it is the kidney that has failed in its function, So that the uric acid is retained in the blood to be deposited else- where. The presence of uric acid (urate of soda) in the blood in gout is the well-known discovery of Garrod, who has also pointed out that its proportion in the urine is at the same time reduced. But there need not even be failure of the kidney's function, al- though, as a matter of fact, there often is; the error may lie m the heightened insolubility of the uric acid, It is observed that the uric acid of urine is apt to be deposited in the form of urates, as a brick-red sediment, even when there is no excess of it; 4 more acid state of the urine seems to favour the precipitation © the uric acid ; and it has been conjectured (from the success of the

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alkaline treatment) that there may be some analogous acidity intro- duced into the blood and lymph in the form of organic acids (pro- dueed in the course of faulty digestion), which would cause the nrie acid to be deposited from the blood as it circulates generally. It is in the cartilages of the joints that the deposition usually takes place, the great-toe joint (metatarso-phalangeal) having a quite remarkable and inexplicable liability. The surface of the cartilage is crusted with patches of a whitish opaque substance, which proves to be needle-shaped crystals of urate of soda; the deposition ex- tends deeper and affects the fibrous structures of the joint ; it may be so exteusive in other fibrous structures as to amount to tophi or chalk-stones. In some rare cases of gout such organs as the parotid giands may be completely disorganized by the chalky de- posit, or there may be numerous centres of its deposition in the membranes of the spinal cord.

Albuminuria and Eezema of Gout.—Two morbid conditions are so frequently associated with gout as to be part of its natural

_ history, namely, eczema of some regions of the skin (eyelids, back

of neck, &c.) and albuminuria. We have absolutely no elue to the connexion between the skin-disease and the uratic diathesis ; for the albuminuria a connexion may be suggested. The albumen will at first be absent in the intervals of gouty attacks, showing itself during the attack, or fora few days previously ; its appear- ance in the urine thus coincides, so far as it goes, with the decrease of uricacidin the urine. It isinipossible to exclude the possibility that the albumen is here an error of the renal metabolism. All the facts of the gouty constitution point to a far-reaching disturb- ance of the metabolic functions, which may be induced by causes so different as lead-poisoning and a luxurious life; uric acid is not the only metabolic product concerned, although it is the chief, for there is even an occasional implication of the glycogenic metabolism, as shown by the presence of sugar in the urine, and there is the much more common albuminuria. It is impossible to believe that there are structural changes in the kidney to account for the earliest occurrences of albumen in the urine in gout, for the urinary sccretion may be normal for long intervals ; and it is by no means certain that the albumen is a leakage from the glomeruli owing to the altcred pressure of congestion.

The kidney in chronic gout may be affected in obvious characters ; it will show, on section, streaks of white opaque substance within or between the tubules,—that which is between them being composed of erystals of urate soda often in fan-shaped bundles, while that which is within them is an amorphous mixture of urates of ammonia and soda and uric acid. The so-called gouty kidney may and often does assume the progressive structural changes which lcad to the state of contraction and puckering. (There are other renal deposits of uric acid, as in new-born children, which are transitory.)

The uric-acid diathesis may manifest itself, not in gout, but in gravel. In this case the excess of uric acid is thrown into the tubules of the kidney, where it forms concretions; these may either be washed out by the urine as fine

grains, or may remain for a time to increase by accretion, forming renal and vesical calculus.

Obesity, Local Formations of Fat.—The significance of fat under all circumstances in the animal body is by no means well under- stood, but it may be conveniently approached from the side of metabolism. Adipose tissue is a somewhat special development of mesoblastic tissue, and most usually of the common binding tissue. The embryonic cell transforms the greater part of its protoplasm into an oily fluid which contains no nitrogen, the nucleus being retaied on one side along with a narrow fringe of cell-substance ; a fat-cell in its early stage thus resembles a signet-ring, and in its later development it becomes a thin-walled vesicle which may be distended by its oily contents much beyond the limits of even the largest cells of other tissues. This transformation may happen to the cells of the connective tissue in almost any part of the body ; but in the ordinary course of development it has certain seats of election, such as the stratum of gelatinous tissue underlying the kidney and the subcutaneous tissue. All synovial and serous membranes, except those of the liver and lungs, are favourite seats of fat-formation. In the subcutaneous tissue the first formation of fat appears to be associated with local formation of blood, the same mesoblastic elements being at one stage hemato- blasts and afterwards, in their vesiculated state, fat-cells. It cannot be doubted that there is a close adaptation to the needs of the economy in the vicissitudes of the fat-tissue; but it must be admitted at the same time that the adaptation is often singularly obscure. In many cases the changes in the fat-tissue seem rather to be a correlated necessity.

_ One of the earliest facts that we meet with in this connexion isthe gradual replacement of the thymus gland by fat, the fluid being absorbed in its turn, and the mass of tissue shrinking. Another fact of the same kind is the change into fat-cells of

lymphoid” cells elsewhere, as the change of red marrow into yellow marrow in the central canals of the long bones. Both of these changes have a prototype or an analogy in the transition that one sees in groups of the subcutaneous spindle-shaped cells from a hematoblastic activity to a fat-making activity. The scason of

puberty isa time of active fat-formation, more especially in women and notably in the breast-region. A still more remarkable develop- ment of fat oecurs in many eases of sterility, and in many women after the child-bearing period has ceased in ordinary. Such in- stances of a greater or less degree of obesity are so clearly associated with the obsolescence of an important function that they may be called physiological. Other instances of obesity have no such obvious or uniform association. Thus, an obese habit may follow one or more attacks of malarial fever; it sometimes occurs as one of the lifelong changes induced by an attack of typhoid fever. There is often a great degree of plumpness along with the extreme ill health of chlorosis. Idiocy and some forms of insanity are apt to be associated with fatness ; in the pseudo-hypertrophic muscular paralysis of boys the connective-tissue cells between the muscular bundles become so active in fat-making that they usurp the place ofthe muscle. Asan effect of dietetic errors obesity usually follows the inordinate consumption of starchy and saccharine substances, and especially the drinking of much beer, stout, and even other forms of alcohol. As a racial character obesity is found among the negro populations in some parts of Africa (South Africa and the Upper Nile).

Among the most extraordinary developments of true fat are those Local cases where it develops locally in association with cancers or other fat-for- malignant tumours. Thus, in a boy who had suffered amputation mations. of the leg for a malignant tumour of the tibia there was a recur- rence of the disease in the stump and in the ilium ; le died in a state of extreme emaciation of all the body except the thigh of the affected side, which was enveloped in a layer of ordinary sub- cutaneous fat half an inch thick all round, contrasting strangely with the wasted limb of the other side. To take another unambigu- ous ease, an extensive development of fat through all its embryonic phases can actually be traced in the serous covering of the rectum in a case of cancerous stricture of the part. There is usually much local development of fat round the sac of an old hernia. In certain glandular organs, such as the pancreas, the supporting conneetive tissue sometimes takes on an extensive fat-forming activity, so that the organ is half transformed into adipose tissuc ; the same may be found around the pelvis of the kidney in old age.

Lipomatous Tumours.—It is not always possible to say whether Lipoma. a local development of fat should be called a lipoma or not ; thus, the fat around an old hernia may be so circumscribed as practically to amount to a fatty tumour, and that may be the ease also with the fat around the breast or behind the eyeball. On the intestine, notably the transverse colon, the masses of fat do become pendulous fatty tumours (much more often in the domestic quadrupeds than in man) of a uniform or lobulated structure, which may hang by a long and slender vascular stem, like an apple or a cherry on its stalk ; when the vascular supply is kept up with difficulty these pen- dulous masses of fat tend to become ealcified or otherwise sclerosed, and to fall off into the abdominal cavity as “loose bodies.” The loose bodies of the joints originate sometimes in the same manner from the pendulous masses of subsynovial fat. On the peritoneal surface the pendulous growth of fat may have a short stem and abundant blood-vessels, aud go on to form a large lobulated tumour ; but more usually in that situation the twmour-habit is established at a number of points, leading to the condition of multiple lipo- mata. The lipomata of the subcutaneous tissue may be single or multiple ; if they are not congenital they are most often associated with a general obese habit ; and they may grow to an enormous size. The submucous tissue of the stomach or intestine is a com- paratively rare seat of fatty tumour. The most inexplicable lipo- mata are those which form, under very rare circumstances, as circumscribed nodular masses in the interstitial connective tissue of the cortex of the kidney, and in the subarachnoid tissue of the brain and spinal cord.

It is convenient to place these occurrences of obesity, of local Of fat-overgrowths of fat, and of lipomatous tumours under the head of making errors of metabolism, but it is difficult to find one physiological in gen- rationale for them all. Where obesity is due to dietetic errors we eral. may say that the carbohydrates supplied to the body have been more than the combustion could overtake, and that the residue is “ stored up” as fat. Where there is a degree of embonpoint in such a inalady as chlorosis we may say that the feeble oxygen-carrying capacity of the red-blood corpuscles has led to an inadequate combustion of the carbohydrates supplied in due quantity, and that the residue has been stored up in that case also. In the unhealthy fattening that sometimes follows malarial or typhoid fever it does not appear why there should be the residue requiring to be

stored up. Again, there are persons of an obese habit (probably con- genital) who avoid a diet of carbohydrates, but turn even their meat diet to fat, just as there are confirmed diabetics who turn everything to sugar. Still further, we have the very remarkable tendency to make fat when the reproductive functions have ceased either prematurely or in the ordinary course; and that is a fre- quently occurring case which can hardly be bronght into the doctrine of inadequate combustion of carbohydrates. The peculiar liability of the connective tissue between or upon the bundles of

muscle to become fat-tissue may point to some defective com- bustion in the work done by muscles. In the cases of pseudo- hypertrophic paralysis of the leg-muscles in children we are con- fronted with an enormous development of the same process. Other eases of local fat-formation, as in the interstitial tissue of the pancreas or around the kidney, are still more inexplicable. Lipo- matous tumours, where they are congenital, may be referred to an carly error of tissue-growth ; where they are acquired, we have usually a coexisting or previous obesity (local or general) to resort to, and the only difficulty is to understand how the lobules of fat came to acquire the delimitation or individuality of a tumour.

Degenera- Degenerations.—In a nosological outline there is perhaps no

tions.

Mucous.

Albu- minous,

Fatty.

Calcare- ous.

Caseous.

more convenient place for some remarks ou the general subject of degenerative changes than at the end of sections dealing with the liabilities

of obsolescence, the special liabilities of the suprarenal and thyroid, and the larger errors of metabolism.

The usual healthy appearance of the most elementary kind of protoplasm is a soft translucent grey; undcr the microscope this greyish protoplasm is uniformly and finely granular. From that standard of health there are various deviations, representing various kinds or degrees of degeneration. The chief degenerations are the mucous, the albuminous, the fatty, the calcareous, the caseous, and the amyloid.

The mcous change proceeds on more obvious physiological lines than inost of the others ; it is, as we have seen, the proper destiny of surface-epithelium in many situations ; and we have found also, in treating of myxomatous tumours, that even in these it has not very remote affinities to the hematoblastic function. A some- what obscure form of it, the collotd change, has been mentioned in connexion with cancer of the stomach and breast.

The albwminous change is that which is often found in the large glandular cells of the,liver, kidney, &c., in disorders accompanied by a rise of temperature. The cells are somewhat swollen, and their substance is clouded so as to obscure the central nucleus.

Merging imperceptibly with the albuminous degeneration is the fatty, in which numerous small droplets appear in the cell-sub- stance, which is no longer uniform but diversified with highly- refracting granules; these droplets are of the nature of fat. In the liver-cells the droplets may run together, so that the liver-cell has the ordinary appearance of a physiological fat-cell. But there is in general a broad line of distinction between the transformation of protoplasmic substance into fat (usually in the connective-tissue cells) and fatty degeneration as above described. The latter occurs under many circumstances. It is an accompaniment of phosphorus- poisoning and of those idiopathic states which run parallel with the former, such as acute yellow atrophy of the liver. It is apt to occur in the inner coat of arterics in chlorotic subjects, producing yellowish opaque patches, which sometimes give rise to erosions. The arteries of the brain are liable to a similar degeneration more universally and under other circumstances than chlorosis. The very common condition of atheroma of

the large arteries (especially aorta) is a more extensive degeneration of a fatty kind, on the basis of antecedent swelling or increase of tissue in the deeper part of the inner coat, or in the interval between the inner and the middle coats. This variety of fatty change is often associated with the production of cholesterin scales, and with a subsequent calcare- ous transformation. Although it is most common after middle life, it is not a senile change proper, inasmuch as the most long-lived persons have none of it.

The calcareous degeneration is most often found in the cartilages of the ribs after middle life ; but, like the atheromatous change, it is not properly senile, as the very aged sometimes have their costal cartilages quite soft. The deposition of lime-salts (carbonate of lime) is in the capsules of the cartilage-cells ; on applying a drop of hydrochloric acid to a thin slice of such cartilage an efferves- cence of carbonic-acid gas will occur. Lime is often deposited in the enlarged thyroid of goitre, and it is sometimes found in degen- erated areas of the placenta. In the suprarenal it is much rarer than the cheesy degeneration. Fatty tumours in the lower animals, especially in the bovines, are liable to become calcareous ; and the presence of granules of lime is a very common feature (along with the cheesy degeneration to be next mentioned) of the peculiar form of tuberculous growths of the serous membranes, or tuberculous nodules and infiltrations of the viscera and lymphatic glands, in those animals. In other tumours, of man or of animals, it is much less common. Lastly, foreign bodies lodged in the tissues, and the encysted trichina-parasite in the muscles, acquire a deposit of lime in the thickening of tissue which forms their capsule.

_The caseous or cheesy form of degeneration is the characteristic disintegration that the cells and tissues undergo in tuberculous and scrofulous disease. Collections of pus, as in chronic abscess of the liver or in chronic empyema (pus in the pleural cavity), are liable to the same process of drying up and molecular disintegra- tion. In the central parts of hard cancers also it is not unusual to find cheesy areas. A form of degencration not very unlike the caseous may be observed as a perfectly normal incident in the deeper parts of the placenta. It is by far the most common degen-

eration of the suprarenal cells, whether in association with general tuberculous disease or not. Under all these circumstances the caseous change follows upon a certain amount of hyperplasia of the tissue, for the maintenance of which there has been no adequate provision in the way of new blood-vessels.

The gummatous degeneration of the products of syphilitic infec- Gyn tion is not always easily distinguished from the caseous; but, for toys the most part, the substance is firmer and more cohesive, as the name implies, less dry and friable in the section, and of a brown colour rathcr than of the yellowish or fawn colour of cheesy degeneration,

A vitreous, hyaline, or waxy degeneration of muscular fibre occurs Vity in the courseof some fevers, as well as in progressive muscularatrophy.

The amyloid degeneration is the most peculiar of them all. The Amy degenerate substance was thought to be allied to starch (whence ojq the name) on account of the reaction with iodine (mahogany-red), but it is now known to be a nitrogenous principle. When it is present in large quantity, as in the amyloid liver, it gives the cut surface a peculiar glance, like that of fat bacon, and hence it has been called lardaceous or waxy degeneration. Its proper seat is the walls of the smaller arteries and the capillarics ; these undergo a kind of hyaline swelling, like the swelling of boiled sago, so that the aggregate effect in such an organ as the liver is to make it very much larger, firmer, and more rigid in its outlines. This alteration in the vessel-wall facilitates the escape of the fluid part of the blood ; hence the amyloid change in the kidney is a cause of albuminuria and in the intestine of diarrhcea. In the wall of the intestine the course of the amyloid vessel may be tracked by the mahogany-red line left by iodine. This remarkable form of degeneration of the vessels is associated with long-standing sup- puration (especially in discases of bone), with chronic dysentery, syphilis, and other of the constitutional states called cachectic,4

§ 12.—ERRors oF THE NERVOUS CONTROL.

Reference has already been made to the obscure impli- cation of nerve-control in such disorders as Addison's dis- ease, Graves's disease, diabetes, and acute yellow atrophy of the liver; the integrity of the controlling nerve-force may be said to be necessary to the perfect carrying out of the give-and-take of metabolism, or to the full effect of the "ferment" in each of the breaking-up processes. Ina subsequent section (p. 393 sq.) reference is made to another controlling nervous mechanism, whose paralysis or dis- | order is immediately accountable for a very large part of the sum-total of sickness in the world, namely, the mechanism which regulates the animal heat. The present section will be devoted to a few morbid conditions of the cerebro-spinal system, selected to illustrate pathological principles. |

Neuralgia and Tetanus.—One or two instances of neuralgia and Nev of tetanus will serve to illustrate a peculiarity of the disorders of the algi nervous system among morbid processes of the body. A personin j getting up from a stooping posture before the fire hits the right eyebrow hard against the cdge of the mantelpiece; the blow has | touched the filaments of the supra-orbital nerve, and there is more or less of pain for a time over the limited area to which these small _ sensory twigs are distributed. Several weeks afterwards, when the accident had been forgotten, there is an attack of severe neuralgia over the whole of that side of the face; the pain shoots alongall | the nerve-branches above the eyebrow, along all the branches | below the eye-socket (infra-orbital), and along the branches goig

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to the skin of the lower-jaw region or chin. The sequence 0 events means that the injury to the branch of the trigeminusabove | the eyebrow has touched the trunk of the nerve in such a manner | that, after a considerable interval, intermittent attacks of pain | are felt along all three sets of branches covering the whole of one side of the face. In other words, a molecular condition of nerve, originally peripheral and limited, has become central and diffusive. Another instance is as follows. A person seated at a high desk day after day exposes the outer side of the ankle and region of the Achilles-tendon to currents of cold air from the opening and shut- ee EE EEE eee

1 See Cl. Bernard, Nouvelle fonction du Foie, comme Organe pro- ducteur de Matiére sucrée, Paris, 1858, and Lecons sur le Diabéte et la Glycogenése

animale, Paris, 1877; Pavy, Researches on the Nature and Treatment of Diabetes, Lond., 1862; Senator, Die Albuminure, Berlin, 1882; Cohnheim, Allg. Pathol., vol. ii, Berlm, 1881; Grainger | Stewart, Practical Treatise on Bright's Disease of the Kidneys, Edin. , 1868, and in Trans. Internat. Med. Congr., Lond., 1881, vol. th; 5. Rosenstein, Die Pathologie und Therapie der Nierenkrankheiten, Berlin, 1868, and in Trans. Internat. Med. Congr., Lond., 1881, vol. it. ; Garrod, Treatise on Gout, &c., 8d ed., Lond., 1876, and on " Eczema and Albu- minuria in relation to Gout," in Trans. Internat. Med. Cong?., Lond. ' 1881, vol. ii.; Virchow, "Lipoma," in Krankhaft. Geschwiilste, vol. 1.

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ting of a door, some occasional pains being felt where the external saphenous nerve runs behind the outer ankle and over the outside of the heel. After a lapse of time there is an attack of sciatica, the first of a series continuing for years, in which the course of the diffusive pain can be tracked, as if it had had an anatomical know- ledge of the nerves of the limb, along all the branches of the great sciatic nerve to the thigh, leg, and foot. In this case the sequence of events is the same as in the former: the original excitant had touched the terminal twigs of the external saphenous branch of

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the consciousness, and little if at all controlled by the will. Some disorders in this group are purely functional, that is to say, there

are no concurrent structural changes. In others, the functional disorder is attended or closely followed by degeneration ; and these

are mostly diseases of the spinal cord.. Representative instances

from each of these two classes will now be adverted to briefly.

Convulsions (Eelampsia).—Apart from the convulsions of uremic Convul-

poisoning, there are two prominent divisions of eclampsia—the sions.

the great sciatic nerve ; after an interval intense neuralgic pain begins to be felt far up the great nerve-trunk itself; and the pain diffuses itself not only to the filaments belonging to the extcrnal saphenous branch but along all the branches. A limited peri- pheral disturbance has, after an interval, become central and diffusive, and the pain apt to recur intermittently for years after. _ Let us now take a case of tetanus involving the very same peri- pheral nerve as the last case. A boy engaged on a farm chafes the outer side of one heel by wearing boots too large for his feet ; the abrasion, which is exactly over the course of the external saphenous nerve, is disregarded, and the irritation of the boot permitted to continue. Ina few days he is admitted into hospital with tetanus, that is to say, with the neck-muscles rigid, the jaw locked, the features drawn, the recumbent body bent forwards from time to time like a bow, its whole weight resting on the head and heels, occasional wild jerkings of the limbs, and the muscles everywhere as hard as boards. ‘This horrible and painful state of the muscular system usually ends in the patient dying after a week or ten days or less, exhausted by hunger and thirst and want of sleep, or by inability to breathe under the vice-like grip in which the chest is held by the muscles of respiration. The sequence of events is here closely parallel with that in the cascs of neuralgia: an irritated condition of a small outlying nerve-twig, which is not a motor nerve, has, after a short interval, touched the spinal cord in such a manner that motor force is freely and continuously let loose over the whole muscular system, with occasional discharges of a more intense kind. Spasm commencing in the muscles near the injury has been spoken to by the patients or attendants sometimes ; but the observation has been recorded, on the whole, seldom. Strangely enough, it isin the muscles of the face, neck, and throat that the tetanic rigidity shows itself first, in whatever part of the body the injured nerve may be. There probably always is an injured nerve somewhere, although it is necessary to admit a few cases of “ idio- pathic” tetanus in which the nerve-injury is unknown. Gunshot- wounds of nerves are most likely to be followed by tetanus, as well as lacerated, contused, and punctured wounds generally, including the bites inflicted by canine tecth. The tetanic onset may follow the wound immediately, or it may come on while the wound is “cleaning” or suppurating, or during the stage of scarring, or some time after the cicatrix has formed. A wound which has

been neglected in the healing, in which foreign particles have been left, or in which the nerve has been involved in the tightening of the scar is most apt to be followed by tetanus. A certain temperament, or state of the mind and body, predisposes to it ; the frequency of tetanus in war may be due to more than one cause, but it seems necessary to include among the predisposing factors the excitement or preoccupation of thc battlefield. Certain states of climate predispose to it; in the dry Australian air it is not uncommon for wounds to be followed by tetanus, and the disease is equally common within the tropics, especially under the circumstances which ordinarily cause chill. Among animals the horse is particularly liable to it, especially as a sequel of castration. The rise of temperature in tetanus is probably the effect of the excessive muscular metabolism. Explosive Discharges of Nerve-force on slight Provoeation.— Instances of neuralgia and of tetanus as the sequel of a peripheral ~~injury, or series of scarcely observed excitations, are illustrations of that remarkable property of the nervous system which Rind~~ fleisch speaks of as involving a “disproportion between cause and effect.” The central nervous system, he says, ‘‘has a capacity for absorbing enormous quantities of centripetal or ingoing excitations asif they left no trace; but in reality it stores them up in the form of potential encrgy. It is this that enables an impression which may hardly exceed the limits of physiological excitation, but is aided in various ways by circumstances, such as inherited feeble- ness, lowered nutrition, or blood-poisoning, suddenly to let loose the whole store of these accumulated forces and to give rise to an outbreak of the most acute feclings and the most powerful move- ments.” The want of outlet at the time is an error that underlies much of nervous disease, both purely psychical and other. The brooding upon wrongs, real or imagined, the unsatisfied hunger for sympathy, pent-up or unexpressed emotion under many cir- cumstances, even the solitude of shepherds on the Australian and lew Zealand downs, are among the causes tending to a total un- Inging of the mind. Such illustrations of the general principle are beyond the scope of this article ; the illustrations that concern US most at present are found rather in the province of reflex nervous activity, where the response is automatic, not always recorded by

convulsions of infancy and childhood and the convulsions of the pregnant or puerperal state. In infancy the reflex movements and uncontrolled

spontaneities are predominant, just as the impressions from the outer world are but little discriminated or retained. It takes little to throw some infants into a fit; the irritation of teething, of ill-digested food, of worms, and the like will suffice. Whither in these cases the excitations have been accumulating or not, the discharge of outgoing energy is always explosive. The muscles that straighten the back are contracted to the utmost, and the air is forcibly expelled from the chest with a prolonged cry ; the head is thrown back, and the arms and legs kept rigid. The state of rigid spasm (tonic contraction) is succeeded by rapid con- tractions and relaxations (clonic) of the muscles of the face and limbs and whole body, which gradually become more comprehensive in sweep and slower in rhythm until they cease. Consciousness has meanwhile been suspended, and does not return until some ten or twenty minutes after. the convulsive movements have ceased ; with the return of consciousness the patient “comes out of the fit.’ The liability to such attacks diminishes very strikingly as the intelligence and the will develop and the body hardens. It is not until the circumstances of pregnancy and childbed arise that any liability to convulsious at all comparable to that of infancy is again met with. No analysis of the circumstances of puerperal convulsions can be attempted here ; if they are in some cases of “uremic ” origin, in association with the albuminuria of pregnancy, there are other cases that are primarily disorders of reflex inner- vation.

Epilepsy.—An epileptic fit does not differ materially in its pheno- Epilepsy.

mena from a fit of convulsions as above described ; the tongue is more apt to be caught between the teeth in the rapid movements of the lower-jaw muscles, and the spectacle of a grown person in a fit is more distressing in every way. That which really distin- guishes epilepsy from eclampsia is that it is a habit of the nervous system, with a good deal of regularity in its recurrences. Tits of convulsions in infancy will eease when the cause is removed, when teething is over, or worms expelled, or after the probationary state of the nervous system has been outgrown. The convulsions of childbed also, if the patient happily survive the attack, come to an end when the critical state of the system has passed. But it is the distinctive mark of epilepsy that it tends to become an ingrained habit, that the fit is there in posse, as if detached from its exciting cause, established,

permanent, and self-existent on the paths of ingoing and outgoing nerve-influence. This tendency of a disordered reflex action to repeat itself is the same “memory” that has been claimed by Hering for the cells and inechanisms of the body generally. That which is implied in the original use of the word, namely, retentiveness or the resurrection of past im- pressions, and the contagion of associated ideas, is a mystery large enough to cover the minor mystery of morbid habit. Epilepsy 1s, as it were, the self-existent memory of a disordered reflex ; and thisis what we may understand by the term “ neurosis.” It is true that a primary disorder of reflex action due to an adequate cause, such as infantile or puerperal convulsions are, cannot be always shown to have occurred at one time or another in epileptics. In a certain proportion of cases there has been an injury to the skull, or there are evidences of tumour or other new formation within the skull, or there is a tumour of a peripheral nerve, or a nerve involved in the scar of a wound or sore; but there are many more epileptics in whom such antecedents cannot be made out. The habit, in fact, is one which tends to be ingrained not only in the individual who has begun it but also in his or her family. Epilepsy is one of the clearest instances of a liability transmissible from parent to off-spring. The heredity of epilepsy has even been proved by Brown- Séquard for the guinea-pig ; when an epileptic habit was induced in guinea-pigs by injuring the spinal cord or the medulla oblongata, or by cutting the sciatic nerves, the litters of such epileptic guinea- pigs were apt to have epileptic seizures, attributable to nothing but inherited liability. According to Hasse’s figures, epilepsy has begun before the age of twenty in by far the larger number of cases, and that fact is doubtless an index of the extent of hereditary influence. If we do not assign all such cases to heredity, the advent of puberty in girls may be held to be itself a causc of epi- lepsy ; that time of life is distinguished by the somewhat abrupt acquisition of a much wider emotional and intellectual range, and presumably by some special liability to explosions of reflex nerve- force upon slight provocation. had ;

Chorea (St Vitus’s Danee).—This is another variety of uncontrolled St movement which is also a habit, like epilepsy, confined to girlhood and boyhood.

and is practically Vitus’s It may occur in pregnant dance.

Mimetic and epi- demie ehorea.

Degenera-

tions of spinal cord.

Loco- motor ataxia.

women, but it disappcars with delivery. The movements are intermittent, beginning from a state of repose with a certain fidgety restlessness, and going on to the most irrelevant and un- rhythmical jerkings, hitchings, and twistings of the limbs, head, and body, or of one limb, only, or one shoulder, or of the head only, or of the tongue. The muscles do not cease to be the ministers of the will, but voluntary movements are performed with some want of aim and certainty; and the gait in walking may be seriously affected. The choreic movements themselves can- not be restrained by the will; excitement and self-consciousness intensify them; and they cease during sleep. One of the most sincular facts in this strange nervous habit is its association with rheumatic fever ; a significant proportion of those subject to it are found to have had rheumatie fever, but there are others, curiously enough, who afford indications only of that state of the endo-cardinm (or lining membrane of the heart and its valves) which often goes with rheumatic fever. This fact of endocarditis has suggested a theory that the disease is due to the minute arterics of the corpus striatum being blocked with small fibrinous plugs washed off from the inflamed interior of the left ventricle, or from the surface of its valves. It is more accordant, however, with all the phenomena to regard the disease as a functional habit of muscle and nerve, with the usual intermissions of a nervous habit and the usual exacerbations, in which the implication of the heart-muscle creates a peculiar liability to endocarditis. A further analysis is offered at the end of the remarks on rheumatic fever (p. 398).

Mimetic and Epidemic Chorea.—The choreic habit has, like hysteria, a singular power of becoming a fixed idea in others ; there is no doubt that choreic movements are involuntarily mimicked by young persons who witness them in orphanages or other institutions where a number of girls are

living under the same circumstances of work and leisure. Chorea may thus be said to be contagious, while epilepsy is hereditary. It 1s no great step from these cases, which depend solely upon the fantastic trick being caught under the influence of the zdée fixe, to the remarkable epidemics of dancing frenzy of which some are historical, and of which there are still instances occurring from time to time under some general excite- ment, particularly the vivid prepossession of a large number of persons at once by the same religious hopes and fears.

In this connexion come certain other diseases—cestasy, catalepsy, and hysterta—of which the details are given in the respective articles, Ecstasy, &c.

Diseases of the Spinal Cord.—In the foregoing group of errors of the nervous control we have had to consider a mere functional con- dition, —a molecular state, no doubt, but one which cannot be seen any more than can the electricity in a wire. Structural changes, when they occur at all, are a very late effect, as in some cases of epilepsy. But there is a very large and important part of tlie functional errors in the controlling nervous mechanisms which are associated with textural changes or degenerations. The most obvious of these are disorders of the reflex functions of the spinal cord. In respect of these structural changes acconipanying func- tional irregularities, the spinal cord approximates to the organs and parts of the body which we have already considered. But there is one character in the textural changes of the spinal cord (and of the brain) which is in a sense nnique, namely, their tend- ency to spread up and down in the particular tracts of fibres. Hence the ascending and descending degeneration and sclerosis of the cord, the extensions of bulbar paralysis, and the like.

Locomotor Ataxia, or Tabes Dorsatis.—The muscles of the body act ordinarily in groups, so that complex movements, such as carrying a spoonful of soup to the mouth, are performed by a number of independent voluntary muscles as if by a mechanism or automaton. The highest point attained by the muscles in this direction is the precision of military drill. In the disease called locomotor ataxia the muscles that are ordinarily grouped together in their action become slow to act in concert, the want of co-ordination being inost obvious in the legs and hips in walking. Progression

is not of the usual well-considered kind, but the leg is thrown outwards as well as forwards, and the foot is brought down as if the inten- tion were to strike the ground with it, the knee having been pre- viously straightened. With so little ease are these muscular com- binations initiated that the patient requires to look at his feet as if the sewse of effect were failing and had to be aided by the sight. Later on the muscles of the upper extremity are in like manner unable to act consentaneously, so that the patient cannot fasten a button, pick up a pin, or the like. Still later there is not only loss of the nicely-adjusted harmonious action among the muscles, but there is a loss of all moderation or graduation in the move- ments instituted. Whether or not this also be due to loss of the sense of effect, the movement is not adapted to the effect required ; it is quick and of short range even when it should be slow and sweeping, and the time and range of the movement of the given limb are practically the saine under all circumstances. These errors of the locomotor control are so conspicuous as to have given the disease one of its names ; to them we have to add other symptoms varying in the different cases, such as flying pains in the limbs,

numbness, squinting and double vision, and functional disorders of the abdominal and jelvie organs. A certain painless struetura] alteration of the joints (especially the knee), first described by Charcot, is now and then met with, and the remarkable condition known as perforating ulcer of the foot is sometimes found (but not every case of it) to be associated with locomotor ataxia.

The structural changes in the spinal cord begin in the lumbar region and spread upwards ; they are in the posterior columns, and especially on their outer limits. Grey degeneration is the name given to the structural condition, and it depends essentially upon the loss of the opaque white substance that invests the axis. cylinder of each nerve like an insulating stratum; this layer gives the colour to the white tracts of the cord, and the loss of it reduces these tracts to the grey condition of the central columns of cord where the nerves are normally without the white insulat- ing layer.

The degenerations of the spinal cord, however caused, have little varicty; the loss of the white substance may be followed by hardening of the tract of

tissue (sclerosis), or there may be a development of the cells of the supporting tissue or neuroglia, keeping pace with the decay of the nerves themselves, whereby the tract acquires a gelatinous appearance. Sometimes the degen- eration is not perfectly continuous, but occurs at many isolated, spots (multiple disseminated sclerosis).

The causes of the degeneration in locomotor ataxia arc various, Cau According to the statistics of Erb, it is nearly always associated of ¢ with constitutional syphilis; other causes are probably always degchs. peripheral somewhere within the region supplied with nerves from tion the lumbar part of the cord.

The causes of degeneration other than that of tabes dorsalis are also various, and associated with various groups of symptoms, which need not further be considered. Mechanical injury to the cord is followed by degeneration, and the pressure of a tumour may have the same cffect. It is found that the solution of continuity of a nerve causes the same loss of the white substance in its peripheral portion as in these degenerations of the cord, and the degeneration of the nerve is set down to its being cut off from its “trophic centre.” The same “trophic” hypothesis is applied to the spinal decay. If the structural degeneration in the cord differs from the degenerations that elsewhere go with disordered function, in its remarkable tendency to spread up or down, that is a difference which may be itself associated with the distinctive conducting function of the nerves and nerve-centres.

In so-called bulbar paralysis, associated with inarticulateness of Bu speech, there is described a certain decay of the ganglion-cells in par’sis the nucleus of the hypoglossal uerve, situated in the “bulb” or | medulla oblongata, together with general shrinkage of the nueleus; this condition progresses both structurally and functionally towards a more general paralysis.

In infantile paralysis the structural degeneration is found per- Infjle vading the anterior horns of grey matter of the cord (anterior polio- par)ss inyelitis), and it includes the ganglion-cells.

Pseudo-hypertrophic Paralysis, Progressive Muscular Atrophy.— Ps These are two closely allied conditions, the one in young children and hyy the other mostly in male adults, which afford the most instruetive tro|¢

contrasts. There is gradual loss of muscular power in both, in the pai” case of the children’s malady chiefly in the coarse or static muscles sis,!°- that keep the body erect, and in the nimble and richly inner- grey¢ vated muscles of the hand, forearm, and tongue in the progressive mu tla muscular atrophy of male adults. In both the loss of muscular atr/y: power goes hand in hand with.a loss of muscular structure ; but m

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the coarse and sluggish groups of muscles which are mostly affected in growing children the loss of muscular structure is more than made up for, in mere bulk, by the development of interstitial con- nective tissue and fat, while in the nimble muscles of the hand and tongue, chiefly and primarily implicated in the characteristic disease of maturity, there is visible shrinkage of the part. It is only in the limbs, when the affection extends to them, that the bulk and outline are preserved in adults. Hence the affection in children 1s called pseudo-hypertrophic paralysis, and in adults progressive muscular atrophy. A few cases of great interest have been recorded in which adults have had the two conditions in combination. Children so affected walk as if on tiptoe, with a waddling gait, balancing the body for a perceptible interval on one foot; when they arc stripped the dorsal contour is peculiar, the shoulders being thrown back and the belly forward, the calves and lips standing out prominent and hard. In the muscular atrophy of adults the ball of the right thumb is nearly always wasted, and if the other muscles of the hand are equally attenuated there 1s pro- duced the characteristic appearance of a bird’s claw; the tongue also is often shrivelled. a

In contrast to locomotor ataxia, and to paralysis from injury 1 or pressure on the brain and spinal cord, these two diseases art illustrations of the peripheral relationship of muscle and nerve, of a loss of integrity in that executive relationship, which brings with it both loss of power in the muscle and concomitant failure of its nutrition. They may be quoted as instances of tropho-neuroses,

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so long as it is clearly understood that the term really explains nothing. There are, indeed, changes described | for them in the anterior cornua of the grey matter of the cord, with wasting of the anterior roots of the spinal nerves.

« Dissolution” Principle of Nervous Diseases.—It is known from

. 1” physiological experiment that a muscle is capable of excitation

when the nerve-force is withdrawn from it; muscular substance is not only a contractile form of protoplasm under the control of nerves, but it has proper irritability when the nervous influence is paralysed (as by the action of the curare poison). The coudition of the motor nerves in pseudo-hypertrophic muscular paralysis and in progressive muscular atrophy is such that the muscles are left to their indigenous contractility, being deprived of their innervating force. We shall find these two diseases a convenient opportunity of stating a principle in nervous diseases which has been expounded by Hughlings Jackson under the name of the “dissolution” prin- ciple. Morbid states of the nervous system (or many of them) arc said to be of the uature of a breaking up of the acquisitions of evolution, with loss of the more finished acquisitions, and a falling back to a simpler type, whose unsuitability to the individual in his then general circumstances amounts to a disease. The illus- trations already given (S§ 4, 5) of ‘‘memories” of development inherent in the cellular life of the body belong to the same class of ‘facts or the same order of ideas.

In applying this principle to the diseases in question we have to consider both the clectrical reaction of the muscles and the retro- grade changes in their structure. The “reaction of degeneration” isa peculiar oe, and it is the diagnostic mark of paralysis of peri- pheral origin. The degenerated muscle shows a considerable in- crease of irritability for a time under the galvanic eurrent ; the contraction is sluggish and sustained ; the anodal closure gives a stronger contraction than the kathodal, while, conversely, the kathodal opening has the advantage. These peculiarities of the electrical reaction in

“degenerated” muscles are analogous to the physiological reaction when the nerve-influence has been abrogated. We may take it that a ‘‘degenerating”’ muscle falls back upon its proper irritability, that the contractility becomes “ ideo-muscular ” as contrasted with “neuro-muscular.” The muscle, so to speak, takes lower ground by way of adapting itself to circumstances.

In the disease in question, as it affects children, the groups of muscles that suffer are precisely those in which the contractility is already of the sluggish, sustained, and ideo-muscular kind, — such museles as the erector spine, glutei, and others, which have an extremely limited nerve-supply in proportion to their bulk. Side by side with this fact we have the other fact of an merease of bulk, as shown in the seemingly strong and hard back, hips, and calves. The paralysis of the muscles has brought with it extreme dilatation of their small arteries, and consequent venous hyperemia; and this presence of the blood in increased quantity has given an enormous impetus to the growth of the interstitial tissue, in the form of young connective tissue and more particularly in the form of fat-tissue. On the other hand, in the muscular atrophy as it affects adults (mostly of the male sex), it is the very nimblest of all the muscles of the body that are picked out first—the muscles of the right hand—in which the ideo- muscular contractility is naturally small and the neuro-muscular contractility naturally great ; and these muscles, with those of the tongue, undergo a remarkable atrophy with little or no spurious compensation from the interstitial tissue. When the disease pro- gresses to other muscles, however, there may be so much new-formed interstitial tissue (fibrous and adipose) that there may be no actual loss of volume in the limb. The precise significance of these differences in the two diseases is not easy to state; in both the males are very much more often affected than the females, being in the one mostly very young boys beginning to walk, and in the other men whose manual dexterity is a formed habit.

The structural changes in the muscular fibre itself are very much the same in both ; as the striation of the fibres disappears the quies- cent muscle-nuclei become numerous and prominent. The muscle may be said to fall back upon the more embryonie condition, upon theindividual life of the cell-units which had been fused in the fibre it retreats to earlier ground, and, as the proper texture of niuscle finally goes, the life of the part takes the still

more elementary direction of the common binding-tissue and fat. In this sequence of functional and structural events we may discover an illustration of the dissolution principle. The muscles, having lost, or beginning to lose, their innerv ¥ ol uritability; as the downward course of failure proceeds, they Yetreat still farther to an embryonic structural condition; when the Muscle itself is practically lost the commoner forms of meso- i tissue take up the retrograde succession ; and, last stage of

» even the fat.and the fibrous tissue waste.?

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1 iM, Lectures on Diseases of the Nervous System, Lond., vue ee Ross, Treatise on the Diseases of the Nervous System, 2 Stes. ded., Lond., 1883; Buzzard, Clin. Lect. on Dis. of Nervous ¥st., Lond., 1883 ; Gowers, Epilepsy and other Chronic Convulsive

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ation, fall back upon the more primitive kind –

§ 13.—ERRoRs IN THE REGULATION of THE Bopity Hzar.

The constancy of the bodily temperature under all circum- stances of external heat and cold—of torrid and arctic zones, of summer and winter, of sunshine and darkness—is not the least remarkable instance in nature of a self-adapting me- chanism. The average internal heat of the human body or of the blood is from 98° to 99° Fahr., and the healthy range in different individuals, or in the same individual at various periods of life, or in various circumstances of exercise and repose, sleeping and waking, is not more than a degree or two below or above the mean. It will be at once apparent that the sensations of heat and cold are no measure of the bodily temperature. The mechanism by which the body’s heat is kept uniform is a co-operation of a number of agencies. It is an equation, of which the two sides are the amount of heat produced in the organism and the amount of heat dissipated. In hibernating mammals the former of these is the side to which adaptation

is most directed, in such wise that the whole fires of the animal burn lower while the winter cold lasts. But in man the work and waste go on always, and therefore the heat of combustion is practically uniform at all times, so that the adaptation to seasonal and climatic changes of tem- perature is mainly on the other side of the equation, the regulation of the amount of heat given off from the body. In cold weather the amount of bodily heat parted with is limited by warm clothing (or clothing which conducts heat with difficulty), by keeping up the temperature of the air artificially by fires, and by the contraction of the surface-vessels and other muscular structures in the skin, which has the effect of diminishing the insensible perspiration and makes the familiar sensation of cold. While these adaptations to external cold are decidedly the greatest, it is not to be supposed that there are no adapta- tions on the other side of the account. There is, in fact, an increased production of animal heat also, so that more can be parted with, and the constant temperature of 98°°5 be still unaffected… The increased production is often in the way of increased muscular exercise, which every one is prone to in cold weather ; it is to some extent also through the more active circulation in all the internal organs, especially brain and liver, their greater functional activity being attended with a larger amount of the heat of mnieta- bolic combustion. A heat-forming diet of carbohydrates (chiefly fats), and the physical benefit of the subcutaneous fat resulting therefrom, are well-known elements of the adaptation in colder latitudes.

When it comes to be an adaptation to great solar heat, the adaptation is again mostly in the way of regulating the heat lost. The vessels of the skin are dilated, and its other muscular elements (in the sweat-glands, &c.) re- laxed (making the familiar sensation of heat), so that per- spiration flows freely; the evaporation of the sweat on the surface of the body is constantly consuming heat, and the clothing is worn light, and of such colour and texture as will readily conduct heat (both of radiation and of evapora- tion). There is nowas much effort to part with the body’s heat as in winter there was effort to retain it. At the same time the hcat of combustion in the body is kept down as much as possible ; muscular exertion is avoided, the brain and the digestive functions are less active, and fatty substances are partaken of more sparingly.

The various parts of this conservative adaptation are somchow co-ordinated through the central nervous system. The vascular system is obviously a chief means by which the body's heat is kept constant, not only by the quick transit of the blood to all parts and the free mixture and Diseases, Lond., 1881, and Aforbid Conditions of the Spinal Cord, 3A ed., Lond., 1884; J. Hughlings Jackson, " Evolution and Dissolution of the Nervous System," in Brit. Med. Jowrn., i., 1884.

interchange of its particles, but also by the control of the amount of blood sent to the skin on the one hand (say, in warm weather) and to the muscles and viscera on the other (say, in cold weather). The vaso-motor nervous mechan- ism, therefore, is an integral part of the nervous control of the bodily temperature. But there is reason to think that the regulation of the bodily heat is committed to the charge of a still higher and more commanding centre in the nervous system than the vaso-motor. It is a remark- able fact, observed from time to time in clinical practice, that certain cases of injury to the brain, from fracture of the skull or internal hemorrhage, are attended with a quite phenomenal rise of the body-temperature—a rise to 107° or 108° Fahr.,—and that, too, when there is nothing strikingly unusual in the vaso-motor effects, as revealed in the skin or elsewhere. In such cases it is the surface- region of the pons Varolii, the great cerebellar commissure, that has been injured or compressed by the effusion and coagulation of blood. The evidence of specially-devised experiments confirms and amplifies the clinical evidence ; and it is considered in physiology to be a well-grounded fact that there are thermic or heat-regulating centres in the brain, one, at least, being in the region of the pons Varolii. Bernard would further assume the existence of "calorific" and " frigorific" nerves side by side with vaso- dilator and vaso-constrictor.

Thermic Fever and Heat-Stroke.—Such, then, being the nicely- balanced and carefully safeguarded mechanism for keeping man's internal heat about 98° Fahr. under all cireumstances, the question arises whether we may trace

any considerable part of the sickness and mortality of the globe to a marked and conspicuous failure or break-down of this mechanism of adaptation :—

“But errs not Nature from this gracious end, From burning suns when livid deaths descend?”

Undoubtedly the ardent or thermic fever of Indian practice, the heat-apoplexy, heat-stroke, or sunstroke, is the direct result of an upset or disintegration of the heat-regulating nerve-centre. Either the disorder of innervation is shown in sudden syncope or depres- sion of the heart’s action, as among labourers working or soldiers marching in the sun; or the effect of atmospherie heat, direct solar or other, is a universal state of venous engorgement, indicat- ing profound vaso-motor paralysis, and ending in death from asphyxia, literally the “livid death” alluded to in the couplet ; or the heat-stroke leads to an attack of thermic or “ardent” fever, coming on perhaps in the night within a few hours of exposure, or after a longer interval, having a prodromal stage of inalaise, a rise of the body-heat to as much as 108° or 110° Fahr., embarrassments of the lungs and heart, profound brain- troubles, and probably a fatal termination in general venous engorgement and asphyxia. These various forms of heat-stroke all point to a profound dis- organization of the nervous centres by the more or less direct action of solar heat,—to cardiac depression in the syncopal form, to more general vaso-motor paralysis in the asphyxial form, and to dis- organization of the thermic nerve-mechanism in the hyperpyrexial form. When recovery takes place, as it does in a large proportion of cases, there are often lasting traces of injury to the nervous system in other functions than the vaso-motor or thermogenic.

These cases of heat-stroke or thermic fever are the most obvious illustrations of a break-down of the heat-regulating mechanism, but they are by no means the most usual illustrations of it. It is in a vastly more common form of sickness, in malarial fevers of all kinds, that we discover the typical failure of the heat-regulating centre under circumstances that tax the self-adapting powers of the body. The enormous prevalence of malarial or climatic fever may be said to be the greatest indication of failure or imperfection in the adaptation of man to his surroundings. In some few spots, which even the instinct of the brutes leads them to desert for a

season, the effects of heat and moisture are such as to induce an endemic diseased habit of body, so universal in its incidence and so insidious in its development as practically to amount to an ethnological distinction (sec Heber's description of villagers in the Terai, Indian Journal, vol. i. p. 251). Throughout the whole intertropical zone, and for 5° beyond it in the southern hemisphere and 20° beyond it in the northern, the climatic fever, in its various forms, stands for almost as much sickness and mortality as all other diseases put together. So stupendous a power has it always been that its pathology has with difficulty emerged from the stage of gross materialism and superstition. But malarial or climatic fever is the true "essential" or "primary" fever of the older writers; its paroxysm is the abstract fever of pathological treatises, which is

discussed without reference to communicability from person to person ; and, if it has a periodicity which seems to give it specific characters of its own, a little analysis serves to show that its periods of waxing and waning are no other than the cosmical periods of the earth itself.

Cullen's Theory of Fever.—According to Cullen's theory of fever Prin: (which was a modification of Hoffmann's), ''the first incident in op the chain of sequences constituting fever is a depressed state of essen the brain and nervous system; spasm of the extreme capillaries fever,

results from this depression ; and reaction of the circulation with its accompanying phenomena, is an effort of the system to overcome the spasm. The Cullenian theory, in a modified form, coutinues still to be the prevailing creed of those who adhere to the tenets of solidism, and who believe at the same time in the existence of primary or essential fever." This is the language of Christison in 1840 (Tweedie's Library of Medicine vol, i. p. 116); and he adds that the chief rival to this doctrine is one which "denies the existence of any primary or essential fevers, and holds them all to be merely symptomatic of some local disorder." Cullen did not ignore the differences among fevers in respect of the local condition, exanthematous or other; but his desire for a broad generalization led him to find something common in the antecedents of them all. This was "diminished energy of the brain," and the nervous depression was caused by "human and marsh

effluvia.” When the disentanglements of the century following are eredited to Cullen’s doctrine the latter will be seen to be still radically sound. The collocation of “ human and marsh effluvia” is nothing but a verbal one ; there is no uni- formity of effect among human “cffluvia” themselves, but rather specifie differences ; in marsh effluvia nothing has ever been found but common watery vapour; and the characteristic effects of “marsh effluvia”’ are by no means rare on barren uplands where there is no standing water or decaying vegetation for miles around. The modern disentanglement has put into a class by themselves all the communicable infective diseases which bring more or less of febrile disturbance, and has fixed the attention on the specific features and evolutional antecedents of each. Hence the existence of “primary or essential fever” has come to be denied, except as the abstract febrile state. But it had been forgotten that, for malarial or climatic fevers, there is no conimunicability, and no specific virus bred in the body or in the body’s discharges ; and to them therefore belongs the heritage of “primary or essential fever.” The common aguish intermittent is the source of all the concepts that enter into the doctrine of fever,—the initial malaise, the cold fit and the hot fit, the crisis and the defervescence. It is to it that the classical description of a febrile paroxysm applies, in paragraphs 16 to 28 of Culleu’s First Lines, just as the fever pathology of Hippocrates and Sydenham applies to it; and the first incident in the chain of sequences, according to Cullen, was an “enfeebled energy of the brain.” It will be found that this doc- trine of primary or essential fever, understanding climatic or malarial fever therein, is fundamentally in agreement with modern physio- logical teaching as to the animal heat and the errors in its regulation.

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Malarial or Climatic Fevers. —Turning, then, to the analysis of a Par- paroxysm of ague, we find that there is a preceding sense of languor ysnit and unfitness for a few hours; all at once the patient begins to agi)

feel cold, he shivers, his teeth chatter, lis skin becomes “ goose- skin ” from the powerful contraction of all the muscular elements in it. If this occurred in the orderly course of regulating the body-heat it would mean that the internal temperature was falling below the mean ; the vigorous contraction

of the blood-vessels on the surface of the body is by way of preventing the escape of heat. But the truth is that the body-heat is rising much beyond the normal all the while that the skin is acting so as to kecp in the heat. This procedure at cross purposes goes on for a few hours, during which the internal heat may rise to 104° or 105° Fahr. The cold fit passes into the hot, and then the crisis is reached ; there 1s 4 violent rebound, the muscular elements of the skin and its vessels relax, perspiration flows freely, the kidneys begin to remove all the products of excessive and uncalled-for combustion, and in the morning the patient awakes with probably no very serious effects after his feverish night. Assuming the case to be a common quartan, the individual goes to his work next day feeling tolerably well; on the day after he has probably forgotten all about his feverish paroxysm, if it be his first ague ; and it is not until the afternoon of the third day that he is again reminded of it. Let us say that he is returning from work towards the end of an ordinarily active day ; suddenly he has the same uncontrollable feeling of chills, he shivers, and seeks warmth by crouching over the fire or by wrapping himself in warm clothes. The drama of three days before is repeated, he awakes again from a feverish night, the morning urine being again full of brick-red urates ; he now knows that he is the subject of quartan ague, and that another paroxys™ is due three days later, which he is fortunately able to prevent pr at least to mitigate by taking quinine in the meantime. Whatevel may have induced the first paroxysm, the second is a mere imita- tion of it, an affair of habit, just as a return of an epileptie con-

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yulsion is. It can hardly be doubted that in the repetition of a simple ague-paroxysm we are concerned, not with the nervous system as co-ordinating the two sides of the account in the produc- tion and discharge of animal heat, but with an acquired habit of the nervous system, with a usurpation of the power committed to it for the purposes of control only. This acquired faculty of the heat-regulating centre to act quasi-autocratically is often exempli- fied in those persons who, having suffered from malarial fever under its usual exciting circumstances, experience a return of it under widely different circumstances. Thus, a pronounced ague-shake has occurred to a person crossing an ice-slope 10,000 feet above the sea-level,

the original ague having been contracted several years pefore in a malarious locality.

We come next to the circumstances under which the heat-regu- lating centre suffers this disorganization, the memory of which may remain with it for long after. The circumstances of intermittent and remittent fevers have been already discussed in the article Mavaria, and it remains to give here only a brief epitome. Where- ever and whenever malarial fevers occur there are considerable degrees of solar heat and of moisture in the lowest stratum of the air, and a considerable drop of the temperature after sunset. So far as the individual is concerned, he incurs risk by working in the sun and resting or slceping in the chill of the evening, by letting a wind such as the monsoon blow upon his fatigued body, by passing suddenly from the relaxing conditions of heat to the constricting conditions of cold, by arriving from cooler latitudes in the hot season, and by doing one or all of these things when his nervous power, as Cullen said, is enfeebled by such causes as anxiety, in- temperance in drinking, ‘‘and other circumstances which evidently weaken the system.” A high degree of moisture in the lowest stratum of the air is the most universal of the external factors within the malarious latitudes, and it may be produced either by the extreme dampness of the soil or by the extremely rapid cooling of a dry soil (even bare rocks) by radiation of heat after sunset, whereby a moderate degree of atmospheric moisture gives a fall of dew. On the other hand, wherever the atmosphere is exceptionally dry, as on the southern littoral of Australia, there is no malaria notwithstanding the great solar heat ; and wherever there are only a few degrees of difference between the day and night temperature and a very slight range throughout the year, as at sea within the tropics, or at such localities as Singapore and the Amazon valley under the line, malaria is far less active than the great solar heat

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the executive and the central authority, are at cross purposes so far as the object is to keep the temperature at the level of 98° or 99° Fahr. Now, the rise of temperature in this case can have had no other source than internal combustion (in the liver, muscles, brain, &c.); but the combustion is an

unnatural one, inasmuch as no proper physiological work has been got as its equivalent out of the muscles, brain, or liver, although there has been the due physio- logical waste (carbonic acid and urea), A slight chill, or the sudden abstraction of a not very large amount of heat from the surface of the body, has excited the heat-regulating centre in such a way that it lets loose an extravagant amount of its “thermogenic” forec.! The nervous centre has been called upon to equalize the slight abstraction of heat at a moment when it is still in the state of strain from its previous and well-sustained efforts to keep the balance, and it is upset by the sudden call. It answers by an altogether disproportionate discharge of its force, which is botli ill adapted to the momentary needs of the body and continues in operation much beyond the occasion for it.

Under ordinary circumstances of taking the ague there is usually an interval between the exposure to heat and tle exposure to chill. Usually, also, the exposure to heat is more or less prolonged or habitual ; the heat-regulating centre is taxed over and over again, and it is taxed so much the more if there is moisture in the air along with solar heat, the dissipation of the body’s heat by the insensible perspiration and by radiation being much more difficult in a damp atmosphere than ina dry. Whenever the chill comes, it finds the heat-regulating centre without that tone which would enable it to act according to the emergency, so that the abstraction of heat, even if it be slight, is the signal for an enormous stirring up of all the internal fires and a rapid combustion to meet a loss of heat which is not greater than the body endures under other circum- stances with impunity. This phenomenal burst of heat-making is, so to speak, misunderstood by the motor nerves of the skin; when- ever, under the same circumstances of repose, there is the same thermogenic activity, it means that the heat is wanted to keep up the level of 98° or 99° Fahr., and all the muscular elements in the skin and in its vessels contract to keep the heat in, producing the feeling of external cold, or of shivering if the contraction be extreme. The same thing happens under the incoherent and extravagant action of the heat-regulating centre; and hence the paradox of the body shivering all the while that its internal heat is rising to 5° or 6° Fahr. above the average of health.

Another way of expressing the paradox is to employ Bernard’s A long language of “thermic nerves”; we should then say that stimula- cold fit tion

of “calorific nerves” gocs with a stimulation of “ vaso-con- means a strictor” nerves in the skin, so that a violent discharge of force mild along the one path is associated with a violent discharge along the fever.

and moisture might lead one to expect. Whatever in the telluric and atmospheric surroundings taxes the nervous mechanism which keeps the heat of the body always about 98° or 99° Fahr. is a cause of malarial fever.

The Cold Fit of Fever.—The central point of interest in a par- oxysm of fever, the grand paradox of fever-pathology, is the rise of the heat of combustion, as shown by the clinical thermometer, and the simultaneous closing of the natural outlets of excessive heat, as shown by the shivering and the feeling of ‘“ goose-skin.” The value of any pathological doctrine of intermittent and remit- tent fever may be estimated by its success in dealing with this paradox. We inay conveniently approach this subject through the following concrete instance, as given by Oldham. “At Jhansi, in June 1860, a young officer of the battery of artillery to which I belonged was exposed for some time to the sun at mid-day ; he then, ina profuse perspiration, came into the house, through Which a hot wind was blowing, as all the woodwork had been burned by the rebels, and the tatties, which served for doors and windows, were almost dry; in a few minutes he complained of being chilly, and in a few more he was in the cold stage of a sharp attack of intermittent. This officer had never previously suffered from fever; when he went out a short time before he Was in perfect health, and he had not, whilst away, been into any malarious locality; in fact, at that season, the whole country round was parched and dry.” This case illustrates an unportant point,—antecedent exposure to great solar heat. Exer- cise in the sun means active internal combustion in the muscles, liver, &¢., and the body warmed at the same time by the sun’s trays ; the equalizing of the heat made and the heat lost is accord- ingly a difficult task, which falls mostly on the skin (and lungs) to execute, and the heat-regulating centre to order and control. We may take it that both the regulating function of the nerve- centre and the executive function of the skin are strained to the utmost. In the case quoted, where there was no interval between the cause and the effect, the body in its glowing state is suddenly exposed to a slight abstraction of heat through the draught in the house; the sudden loss of heat, however slight the amount, is the signal for the skin to close its pores so as to lose no more heat, and

hence the passing feeling of chill. But the passing feeling of chill 1S m this case succeeded, at only a few minutes' interval, by the Prolonged state of contraction of the cutaneous vessels, sweat-glands, a other muscular structures which corresponds to the rigors and } "s fit of ague ; and, all the while that the skin is thus vigor- us y adapting itself to prevent the escape of heat, the heat of the

Yi rising several degrees. The skin aud the nervous centre,

other. Whether, as Traube has suggested, the extravagant action of the heat-regulating centre might be altogether counteracted by the usual heat-discharging mechanism but for the inopportune constriction in the cutaneous vessels and the surface of the body generally, is a curious question, but hardly a practical one. In that degree of shock to or disorganization of the nerve-centre . which occurs in ordinary tertian or quartan intermittent the dura- tion and degree of the shivering fit arc the index of the mildness of the attack ; the more pronounced the cold stage, the more prompt is the crisis and the more certain the defervescence. But in the much more severe shock which brings a quotidian or a remittent, the cold stage is short and feeble, and the crisis and defervescence are proportionately undecided and uncertain. The remittent degree of climatic fever approximates, indeed, to the forms of continued fever in which the rigor is a mere survival of the great cold fit of intermittent ; the initial rigors even of pneumonia are little more than formal, and the hot stage of the process is practically the whole. It would thus appear that the vaso-motor constriction, upon which the phenomena of the cold fit depend, is the duc accompannnent of a certain moderate degree of upset in the thermogenic nerve- mechanism ; the paradox of the body shivering while its internal heat is rising is after all a paradox, and not an antagonism. The severer types of climatic fever are those in which the primary shock has been most severe or least well sustained. " Degrees of fever," says Ferguson, "might be almost measured by degrees of solar heat, from the agues of Lincolnshire to the malignant remittents of the West Indies."

The periodicity of agues is a reflex of the normal periodicitics Period-temperature rises to its highest icity of point in the course of the afternoon and falls to its lowest a little agues.

of the bodily heat ; in health the

after midnight, and in a typical intermittent these are usually the De eee SS

1 “There is no a priori reason,” says Foster (Text-book of Physiology, p. 877), ‘positively contradicting the hypothesis that the metabolism of even muscular tissue might be influenced by nervous or by other agency in such a way that a large decomposition of the muscular substance, productive of much heat, might take place without any contraction being necessarily caused. If we were to permit ourselves to suppose that the contractile material whose meta- polism when resulting in a contraction gives rise to so much heat, eould undergo the same amount of metabolism, in so far a different fashion that all the energy thereby set free took on the form of heat, variations in the temperature of the body, at present difficult to understand, would become readily intelligible.”

Malarial cachexia.

Dysen- tery.

Tropieal abscess of liver.

hours when a paroxysm begins and ends respectively. These normal maxima and minima of the body’s heat within a diurnal revolution are probably in their origin an adaptation to the periods of labour and rest, both muscular and digestive; but the habit is an ingrained one, and it obtains when the ordinary round of work and repose, of waking and sleeping, is departed from. In short, it follows the sun and not the vicissitudes of human occupation. Again, the periodical recurrences of the febrile paroxysm appear to follow the lunar intervals. In the United States an ague is observed which has only a weekly paroxysm ; the quartan of northern latitudes is the bi-weekly interval. Tertian and quotidian agues would not of themselves suggest lunar periodicity, but they are related to the types with obvious lunar intervals. The “critical days” of con- tinued fevers, which were closely observed in former times, have been brought with much ingenuity under a law of cosmical period- icity. It is observed in climatic

fevers that, if there be an interval of one or more weeks in which the paroxysms are in abeyance, the next succeeding paroxysm will occur at its due time, and that various minor indications of constitutional disturbance in the inter- val (perhaps neuralgias) will have marked the periods when the full paroxysm should have developed. ,

It is necessary to pass over the changes in the blood and in the secretions which accompany the febrile paroxysm. In ague there is a remarkable production of free pigment traced to the red blood- disks, which accumulates in the spleen, the bone-marrow, and else- where. The spleen undergoes also an enlargement, and so does the liver ; these are permanent where the malarial cachexia exists. The malarial cachexia, marked by hydremia and lassitude, occurs most frequently in those who reside on a waterlogged soil, and are permanently subject to the difficulties of heat-regulation during their work which an atmosphere saturated with watery vapour entails. In such cases there may be no febrile paroxysms from first to last, but a state of adaptation of the body which is at once a disease and almost an cthnological character.

Dysentery.—It is universally admitted that the causes which produce intermittent in one man of an exposed party may produce remittent in another, dysentery in a third, and abscess of the liver ina fourth. The incidence in the form of dysentery is apparently capricious ; we have simply the fact that, in a certain proportion of cases, the shock resolves itself into a profound disorganization of the function of the great intestine, which may pass off in a few days or become chronic. The dysenteric seizure is most frequent where there is extreme atmospheric moisture as well as extreme heat, and where the surface of the body is most directly exposed. The region of the loins is somehow a region of great liability, just as the head is, the turban or pith helmet and the loin-cloth of hot countries being the indications of these liabilities. One important point of difference between dysentery and intermittent and remittent is that the former disease runs its course in one attack, whereas in the latter there is the remarkable habit of repetition. The return of the ague paroxysm is an evidence that the disorder is fundamentally one of the nerve-centres ; it is an instance of the “memory” or “habit ” which disordered nerve-mechanisms are peculiarly apt to fall into and to retain. In dysentery the disorder is localized ; it is not

so much central as peripheral. Whoever has had dysentery once is apt to have it again, and it thay become chronic from the first seizure. But it has obvious points of difference from climatic fever, and these differences are associated with the localized inci- dence of the primary disturbance.

Dyseutery may arise under other circumstances than exposure to tropical heat and moisture and to tropical chill, as in wars_and famines, in cold, and amidst privations and overcrowding. In such cases it is correlated rather to typhus fever than to malarial, but it is probable that there is the same kind of primary effect produced through the nervous mechanisms as when the vicissitudes of a tropical climate are the cause. Again; the dysentery of slave-ships (formerly) and of coolie-ships (at present), in tropical waters, would appear to be a mixed effect.

The effluvia from dysenteric dejecta (or water contaminated by the dejecta) appear to have the power of exciting, in persons who have not been directly exposed to the causes of dysentery, either dysentery itself or some vicarious infection, such as typhus fever or yellow fever, according to the source of the dejecta, or the kind and degree of putrefaction which they had undergone, or according to racial differences in the exposed persons. This question belongs to another part of the subject.

Tropical Abscess of the Liver.—This is intimately associated with dysentery in its causation ; it may be either a primary effect, as it were, instead of dysentery, or it may bean after-effect of one or more attacks of the latter. The primary effect has been dwelt upon by some, and the after-effect by others (notably W. Budd), but there is really no antagonism between them. Asa primary effect tropical abscess of the liver is closely parallel with tropical dysentery and with malarial fever. It is not the effect of heat by itself, but of chill as the sequel of great exposure to heat. Solar heat is trying to the hepatic function, there being an increase of bile; when the organ has been thus overtaxed it is sensitive to the vicissitudes of

heat and cold. It is pointed out by Dr James Johnson (The Injlu- ence of Tropical Climates, p. 177) that genuine hepatitis is even more frequent in the Carnatic, with uniform but high temperature than in Bengal with a more variable and damp climate. “The casual visitor may well wonder how cold can be often applied on the burning coast of Coromandel, where the

temperature is high and steady by day, where the nights are, for months together, hot, and seldom raw or damp as at Bombay or Bengal. . . . The European soldier or sailor, exhausted by exercise in the heat of the day and by profuse perspiration, strips himself the moment his duty

is over, and throws himself down opposite a window or port to inhale the refreshing sea-breeze, his shirt in all probability dripping with sweat," and the consequences are likely to be an attack of hepatitis

or abscess of the liver. A slight abstraction of heat completely upsets the organ which had been most taxed under the particular climate ; the incidence is not so much upon the heat ~~regulating central government as upon a most important member of its executive. As the sudden abstraction of a small amount of heat from a fatigued and perspiring body can produce an extravagant dis~~ charge of heat-producing force, or a paroxysm of fever, by touching the nerve-centre, so it can produce a peripheral effect in the most. important of the heat-forming organs, which had under the special circumstances been overtaxed in its function. But the effect on this peripheral part of the heat-producing mechanism is not, for the most part, an increased production of heat as in fever; it is, in fact, local congestion of blood and suppuration. When the strain falls on the central government the effect is fever ; when the strain falls on an important member of the executive the effect is inflam- mation.

Pneumonia.—Congestion of the lungs and pneumonia are not Pne unfrequent accompaniments of remittent fever in India, especially mon in those whose health had been previously enfeebled, andamongthe more ill-clad natives. Pneumonia is liable to occur in those who had been acclimatized to heat, on their exposure to unusual degrees of cold, as among the negroes in the United States. It has been also observed to become widely prevalent, and in a form which amounted almost to pneumonia pure and simple, among the troops from India employed in Afghanistan in 1838-39, and again in 1878, when they were exposed to the winter cold.

Pneumonia is indeed an effect of chill proper to higher lati- tudes, just as intermittents and remittents, dysentery, and hepatic abscess are most characteristically the effects of disorder, either central or peripheral, in the heat-regulating mechanism as adapted to tropical and sub-tropical

conditions. That pneumonia is nearly always caused by chill is generally believed (the pneumonias of con- tagions origin being excepted) ; but it may not be so readily admitted that we have here to deal with a disorder of the heat-regulating mechanism. Pneumonia is, at all events, a fever ; it has an initial period of rigors, more pronounced than in most continued fevers, although far behind the cold fit of intermittent; the pyrexia 1s sometimes present for some hours before the other symptoms be- come marked ; it usually comes to an end abruptly some time before the consolidation of the lung is all cleared up; and that — crisis in the disease is apt to fall within a week of the onset, | and is seldom delayed more than a day or two over the week. The stress of this disease falls upon the lung, usually upon one lung, and more particularly upon the lower half of the lung. Leaving, for the present, the question why the lung isin thiscase | the organ of metabolism upon which the stress falls, let us consider the nature of the pulmonary condition. j ;

First, there is engorgement of blood, a condition which is due, | according to all analogies, to paralysis of the vaso-motor nerves. The abundant capillary vessels round the air-cells are greatly dis- | tended with blood, and the mucous membrane of all the bronchial | tubes is also much injected. Accompanying this state of the pul- monary circulation there is more or less obvious distress of breath- | ing, or dyspneea, together with a strong, full, and quickened action of the heart. If the action of the heart be weak and the distress | of breathing great it is a . sign that the shock has = been more severe than the patient, as he is then cir- cumstanced, can stand, and _ death may result merely from congestion of the lung. Usually the extreme congestion of the vessels is relieved by exudation from them into the air-cells which they surround; if the pa-

tient should die at this, the es ve a second stage of pneumonia, TY. ition; alveoli occupied by Abrinous the lung, or lobe of the fhreads and a few cells.

lung, is found to be solid :

enough to sink in water ; it is still red, as in the stage of i ment, but the cut surface is firm, and under a lens looks to it finely granulated. Each little granule corresponds to an alr-ce’,

the air-cell no longer containing air, but a solid coagulum consist- ing of numerous threads of fibrin, with a homogeneous plasma as the basis, and a few red blood-disks and white blood – corpuscles (fig. 55). The whole of this is an escape from the overloaded plood-capillaries. The lung is just one of those organs where such an escape from the blood is possible ; the engorged vessels are dis- tributed as a plexus over the thin walls of air-filled spaces, and the fluid part of the blood, together with a certain proportion of its solid particles, passes through the walls of the vessels into the air- space. If the lung be examined from a case of pneumonia fatal a day or two later, or in the third stage, it is still solid, but the redness is mottled with grey, or has become uniformly grey. The number of round nuclear eells in the air-vesicles has inereased enormously, usurp- ing the place of the fibrin and plasma (fig. 56). There is no good reason to suppose that this enormous accumulation \) of cells is due to successive #® additions of colourless cor-puscles from the blood ; they are now, many of them, much larger than the blood-cells, and we may take it that they are the product either of sub-division of the few original blood-cells or of the epithe- lium of the air-vesicles. The solidity now begins to give : way, the contents of the air- Fic. 56.— Pneumonie lung, stage of grey * : . hepatization; alveoli filled with cells.

vesicles undergoing a mucoid ;

or other disintegration, and they are gradually removed for the most part by expectoration. In ten days from the onset the lung may have returned to its normal condition.

We have now to consider briefly this disease as an error in the heat-regulating mechanism, in which the strain falls upon an im- portant peripheral or executive part. Hepatitis may be taken to be this kind of effect where the chill is a slight abstraction of the

to 104° or 105°, and in some exceptional cases (of “ hyperpyrexia”) rising to 109° Fahr. There is an afternoon rise of 1° or more, and a corresponding

fall in the night. The severity of the case —apart from its danger, which really depends on the pericardial or endoeardial part of the disease, or on complications with pneu- monia and the like—is measured by the height of the tempera- ture, with which, again, the intensity of the pain in the joints goes hand in hand. The outbreaks of sweat do not follow any obvious law, and they are not "'critieal," as in intermittents ; but they seem to give the patient relief for the time, even if they leave weakness behind. Nine days is considered an average time for such an attack to run its course if the patient be well cared for; but defervescence is gradual, and complete restoration to health is often slow, much weakness and anemia remaining to be made good. Warren, a physician of a former generation, when asked what was the best remedy for rheumatic fever, answered "Six weeks." Relapse is not uncommon, a very slight chill or sudden abstraction of heat sufficing to bring the fever back.

Now if we assume that the occasion of an attack of rheumatic fever is ehill —that is to say, a sudden shock or injury to, or dis- organization of, the nervous centre which presides over the uniform body – temperature—-we enter upon a profoundly interesting prob- lem in following out the constitutional manifestations. Every- thing points to the mechanisms of locomotion, to the structures and surfaces where muscular work is applied ; even the heart, as Watson remarks, is in its perpetual to-and-fro movement comparable to "ore of the large joints." There is heat of combustion from some source or another to account for the rise of temperature, which is sometimes enormous; but it is not the heat of work done. We are again confronted with that most fundamental of all the questions relating to fever, the question, as stated by Foster, whether the "metabolism of even muscular tissue might be influenced by nerv- ous or by other agency in such a way that a large decomposition of the muscular substance, productive of much heat, might take place without any contraction being necessarily eaused . . . in such a way that all the energy set free would take on the form of heat." Is rheumatic fever one of those cases where disorder of the heat- regulating mechanism falls on an important member of the exe- cutive, namely, the muscular system, just as it falls on the liver in tropical abscess, and on the lungs in pneumonia ?

body’s heat under tropical conditions ; pneumonia is this kind of effeet where the chill is caught under the vicissitudes of the weather in spring, or in changeable weather generally, within the

Certainly we know of no muscle but the heart itself which The shows appreciable structural changes in rheumatic fever ; the heart articular is liable to “ myocarditis,” as well as to endocarditis and pericarditis, nerves.

temperate zone. Why should the liver be the organ of choice in the one case and the lung in the other? It may be said at least that each organ, in the respective circumstances, is the locus mino- ris resistenti#. A sudden abstraction of heat is a strain or shock to the heat-regulating centre, and, if the incidence is to be on the executive, it will fall on that member of the executive whose funetion had been, under the circumstances, most taxed. It is to be remarked that such cases of so-called peripheral incidence are associated with individual predisposition ; hence these diseases are generally sporadic. Something in the antecedents of the individual has determined the local character of the effects of chill, whereas the great climatic fevers more uniformly befall those who expose themselves,

Rheumatic Fever.—Rheumatic fever is universally admitted to be an effect of chill. “I know of no other exciting cause of acute rheumatism,” says Watson, “than exposure to cold, and especially cold eombined with moisture.” The conditions, both external and redisposing in the individual, which constitute the peculiar lia-

lity to rheumatie fever are nowhere found more distinctively than in the variable climate of the British Islands, and in the habit of body of the people. It is especially a disease of early manhood and womanhood, and of the working class; when it occurs before puberty it is associated in a remarkable way with the Hability to chorea.

_ The onset of the fever is preceded for a few days by general ill health, chilliness, furred tongue, “break-bone”’ pains, flying pains in the joints, some quinsy, and disturbed sleep. If these symptoms proeeed no farther, the patient would be judged to have had a chill, a catarrhal attack, a quinsy, or the like. When the mitial upset has been more considerable the pains “settle” in one or more of the larger joints, often the ankles at first, the

knees Subsequently, or the wrists, elbows, and shoulders. The patient lies flat on his back, not daring to move, and following the objects around with his eyes only. Profuse sweats break out from time to time, having a peculiar acrid smell, by which rheumatic fever can even be diagnosed. The joints where the acute pain is seated for the time being are swollen, tender, and often red and hot, the swelling being either in the fibrous structures around the joint or in us Synovial cavity. The locale both of pain and swelling shifts from Jomt to joint ; the disease often “flies to the heart ” (pericardium and endocardium), more rarely it “flies to the brain” (membranes). € urine is scanty, high-coloured, depositing brick-red urates, ~ with an excess of urea on analysis ; it is, in fact, the urine of isordered heat-regulation. The temperature is 100° or 101° up

but, for all other museles, the changes are in the tendons, liga- ments, and synovial membranes only, or, in faet, in those structures by which the work of muscles is applied. These structures have nerves, some of them large enough to be looked for in the dis- secting-room, although less is made of them in physiology. The function of the nerves of the joints is not sensory in the ordinary use of the term, but it may be said to be to convey to the centres the sense of effect of the work done by muscles. When there is intense metabolism of the museular substance, but no work done, the same nerves, having no sense of effect to convey, convey an acute sense of pain. The pain of rheumatic fever’is altogether more acute than in inflammations. In tropical abscess pain is subordinate, and its place is taken by a vague feeling of trouble, or tightness, or weight, or heat in the hypochondrium, and the same substitution is sometimes made for the pain in pneumonia ; put in rheumatic fever pain may be said always to be the grand symptom, and a measure of the very remarkable power of recovery. Reversing the maxim which applies to tropical abscess and to the worst cases of pneumonia, we may say of rheumatic fever: “Affert plus doloris quam periculi.”

Sweating is the other grand symptom of rheumatic fever. It ean hardly be said to be critical for the disease as a whole, because the temperature does not fall ; but the joints affected for the time being are relieved by it, and it is critical to that extent. We may, indeed, say that the temperature does not fall

because the heat goes on being generated in some other group or groups of muscles in whose joint or joints the pain is next felt.

We may regard, then, the sequence of events in rheumatic fever somewhat as follows. There is an upset of the heat-regulating centre by ehill, owing to which an extravagant amount of heat- generating nerve-influence is sent out ; this falls, for some reason of the body's habit (inherited or proper to the individual's occupa- tion, or otherwise special), upon the muscular system, whose meta- bolism produces heat without work; the articular nerves which are ordinarily employed to convey the sense of effect of work done, from the surfaces where the movement is applied, convey, under the changed circumstances of the muscles' activity, a sense of pain. One set of muscles after another generates heat without work, so that one joint becomes painful after another ; and, although there are perspirations by which the heat of the body is parted with, other sets of muscles take up the work of combustion in their turn, so that the excessive temperature is maintained. Among other muscles the heart is affected ; and, just as in the voluntary muscles the structural effects are in the synovial membranes, ligaments,

Chorea and rheuma- tie fever.

Herpes

in febrile regulating nervous mechanism.

attacks.

tendons, and aponeuroses, so in the heart they are in the peri- cardium and in the more fibrous parts of the endocardium. But they are sometimes in the cardiac muscular tissue itself, the mus- cular substance of the heart being peculiar.

The association with chorca may now be noticed. Chorea is not a disorder of heat-regulation, and it is not due to chill; it is a disorderly habit of some nervous centre or centres whereby the ordinary work of muscles is made irregular, and it is due to some feebleness in, rather than to injury of, the

nervous mechanism. The eonsiderable liability of choreic subjects to rheumatic fever, the actual endocarditis that they suffer from even if they have never had rheumatic fever, the occasionally observed choreic movements of the muscles in the course of true rheumatic fever in adults, the occurrence of chorea as a sequel of rheumatic fever —all these associated things go to show that the disordered nerve- centre is the same in both diseases, and that the discharge of its force may pass readily from one path to another. It may either set free muscular heat without muscular work, excessive in degree and attended by unique pain in the joints; or it may spend itself in those gratuitous displays of muscular work which amount to chorea.

The foregoing diseases have been regarded as errors of the heat- In rheumatic fever we have seen that there is a singular relationship to a truly nervous disorder, namely, chorea. It remains to mention another implication of the nervous system which several of them have in common, namely, an herpetic eruption about the corners of the mouth. Herpes is now accepted as an affair of certain cutaneous nerve-areas ; and in malarial fever, pneumonia, and acute attacks of quinsy due to chill there are very apt to be eruptions of herpes labialis. Why the labial region should be involved is uot obvious.

§ 14.—INFLAMMATION.

The inflammations may be regarded as an empirically made-up group of disordered states which have somewhat in common. Although inflammation is certainly a provisional category, there has always been a tendency to overcrowd it with newly-described morbid conditions, rather than to empty it of its temporary occupants. Whenever patho- logists have become impatient to say the last word about the endless perplexities of disease the class of inflamma- tions has become unusually full; this happened in the period of Broussais, when even the specific infections were placed therein, as gastro-enteritis and the like; and the frequent resort to the termination z¢is in more recent pathology may be taken as an evidence of a correspond- ing habit of mind. Thus there is much fairness in the bold criticism of Andral: “Regu dans le langage, sans qu’aucune idée précise lui ait jamais été attachée, sous le triple rapport des symptomes qui l’annoncent, des

lésions qui la caractérisent, et de sa nature intime, Pexpression inflammation est devenue une expression tellement vague, son interpretation est tellement arbitraire, quelle a réellement perdu toute valeur; elle est comme une vieille monnaie sans empreinte, qui doit étre mise hors de cours, car elle ne causerait qu'erreur et confusion." It is at least the duty of pathology to reduce the congeries of inflammations to as small a bulk as possible, to follow up the analysis of the inflammations one after another until they are reduced to the scientific position of errors of the respective structures and functions. Inflamma- tions, indeed, are best regarded as an ever-diminishing residue; there is always the residue, because the correlated structural and functional aspects of the life of the tissues cannot be stated with equal clearness for all of them. It is the great binding tissue of the body that gives occasion for this nosological residue ; the connective tissue is the one tissue about whose dual life of structure and function there is a difficulty. We shall appreciate its unique posi- tion best .by comparing it with so direct a modification of

1 See Senator, Untersuch. tiber den Jieberhaften Process, Berlin, 1873 (abstract and criticism by Sanderson, in Rep. Med. Off. Privy Council, 1875); C. F. Oldham, What is Malaria, and why is it most intense 1m Hot Climates? Lond., 1871; Cl. Bernard, Lecons sur la Chaleur animale, Paris, 1876 ; Morehead, Clinical Researches on Diseases in India, 2 vols., Lond., 1856 ; Jas. Johnson, Influence of Tropical Climates, 4th ed., Lond., 1827,

itself as fat-tissue. But even these phlegmasiz are capable of some further analysis in the direction of disordered structure and function if we have regard to the functions of the embryonic mesoblast, and to the "memories" of the same that the common binding tissue never quite loses.

The earliest and most fundamental notions about inflam- mation, and those which pertain to the residue above spoken of, were derived from the external parts of the body when injured by blows, wounds, scalds, the lodg- ment of foreign bodies, and such-like palpable irritations, Along with simple inflamed wounds were taken cases of erysipelas, a disease which has now become the sole heir of the original Greek name for inflammation,

namely, phlegmon. It will be convenient to begin with a brief reference to erysipelas.

Erysipelas.—Besides phlegmonous erysipelas, or diffuse inflam- Erysi mation and suppuration of the cutaneous and subcutaneous eon- pelas,

nective tissues, there is a common form consisting of redness, swelling, pain, and heat of the surface only, and stopping short of suppuration.

This condition often follows a wound, especially in the region of the scalp or face; it may occur also when there is no obvious wound, although there will probably have been a catarrhal state of the nearest mucous membrane. Fever or constitutional dis- turbance usually precedes the inflammation twenty-four hours or less, aud in this respect erysipelas is eomparable to the effects of ehill already treated of. Wounds received in a drunken brawl are especially apt to become erysipelatous ; also the wounds of those suffering from kidney-disease or liver-disease. Erysipelas is most apt to occur in cold weather with east winds, or in cold and damp weather. One attack predisposes to others. It often arises spon- taneously or autochthonously, but it is perhaps equally often induced by contagion and inoculation from pre-existing cases. Of its origin de novo from time to time there need be no question; thus, it has been observed in a single individual of a ship's com- pany at sca off Cape Horn. The redness and swelling advance with a well-marked border from the wound or other starting-point until they have invaded, it may be, a large cutaneous area. There is exuded plasma in the spaces of the connective tissue, and there

are also nuclear cells (leucocytes) in the lymphatic spaces and vessels,

and in the tissue generally. An increase of the colourless cells in the blood is also described. Since attention has been called to the presence of minute living organisms in disease there have not been wanting authentic descriptions of micrococci in the lymphatic spaces of the advancing margin in erysipelas, although they are said to be absent in the older areas of the inflammation, and during the stage of subsidence generally.

In phicgymonous erysipclas the connective tissues to a eonsider- Phlee able depth beneath the skin are soaked in serous fluid, whieh be- mond comes

turbid, like thin pus ; ata later stage the lines of pus extend erysi| in all directions along the tracts of binding tissue, fragments of the pelas;

latter being found as detached shreds in the larger purulent centres. The skin, usually of a limb, may thus become involved over a large area and toa great depth, considerable pieces of tissue falling at once into a state of slough. The temperature is often as high as 105”, and delirium, with other symptoms of nervous disorganization, is common. Death from failure of the heart is probable. This dis- ease is tle most extreme form of phlegmon, by far the most formid- able inflammation that exists. It is usually the sequel of a wound, but not invariably. Chilliness and all the other symptoms of eom- mencing fever precede the local phlegmon, so that the condition is comparable to those errors in the regulation of the animal heat, previously mentioned, in which the incidence falls upon a peripheral part. That it is itself a local effect of general temperature disorder cannot be maintained, inasmuch as there is usually nothing in the antecedent circumstances to implicate directly the heat-regulating centre. However, it is not the extent of the local injury that serves to account for the inflammation, but the habit of body of the patient, especially the drinking habit. It is not an overtaxed heat-regulating eentre that is implicated, but a nervous system overtaxed in more general respects. A peripheral injury, not necessarily a severe one, tells in an unusual way upon the unstable centres, just as in tetanus; and the outgoing response falls ina peculiar way or with a peculiar force upon the wounded part, pro- ducing phlegmon there and fever generally. Whether the rise of the body-temperature is mainly due to over-combustion within the injured area is open to discussion. The connective tissue as a source of heat has not hitherto eome into our consideration ; if it is to be regarded as a member of the heat-produeing executive, under the central nervous control, its membership is at least not important except when the redness, swelling, heat, and pain 0

inflammation are present.

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FAaTH OLOGY

The same state of the tissues as in phlegmonous erysipelas is prought about, all but the redness of the surface, by a very different cause—the introduction of a minute quantity of venom, either the cadaveric venom introduced in a dissection-wound or the venom of the rattlesnake and adder. The bites or stings of many other animals produce more transitory inflammatory effects.

In common inflammation, such as follows the lodgment of a spicule of broken glass nnder the skin of the hand or arm (to bor- row Watson’s illustration), there is first pain ; soon there is redness around the point of entrance, with swelling and heat ; the skin becomes of a bright-red colour; the swelling increases, becoming hard and firmatthe centre of theinflamed area, and exquisitely tender, or painful to the touch. If these local effects are at all considerable (according to the nature and extent of the injury, and to the sus- ceptibility or habit of body of the individual) there is inflammatory At first there is usually chilliness and feebleness, then there is a general feeling of heat and dryness, with a quick, full, and hard pulse, headache, wandering pains in the limbs, restlessness, some mental confusion, disturbed sleep, a white tongue, thirst, and loss of appctite. If the piece of glass be removed all these symptoms, local and general, may subside quickly. If the source of irritation remain, or even, notwithstanding its removal, if the primary shock has been severe, the symptoms continue and intensify. Relief to the constitutional disturbance comes with the further developments in the injured area—with suppuration or, at the latest, with the bursting or letting out of the matter. Healing then proceeds as described under “repair.”

This is the usual sequence of events in common inflammation, in the inflammation of moderate degree.in a healthy person. It differs from erysipelas or phlegmon in the importaut respect that the fever follows the local effects at an interval of several hours. Where the injury is of the most violent kind, as in some machinery accidents, neither the local effects nor the fever are pronounced ; the “reaction” is said to be in abeyance, and death is apt to occur from shock. In these cases the face is blanched, the action of the heart and lungs feeble, and the mental faculties profoundly oppressed ; the presiding control has been so npset by the injury to eyen a limb that the forces of the body do not rally.

The heat of an inflamed part is not merely in the feelings of the patient ; it is actually several degrees (up to 6° or 7° Fahr.) higher than the temperature of the part in health or of the corresponding part on the opposite side, although it is never above the central blood-heat of health. It is not solely dependent, therefore, on the general state of fever. Neither can it be said that the general state of fever is solely dependent on the increased local combustion. In erysipelas, as we have seen, the general fever usually precedes the local, and must depend upon some general error of heat-making. Again, in a common inflamed wound, the general fever may, and usually does, subside some time before the cellular changes in the part, degenerative or formative or both, have passed their climax.

Implication of the Nervous Control in Inflammation.—From slight inflammations, with little more than redness and pain at the seat of injury, to the most shattering strokes there is a succession of steps. The nervous system is implicated in them all, for the reason that the nerves are everywhere, and everywhere ready to transmit impressions to the centre. It is not surprising, then, that in every doctrino of inflammation since the time of Cullen the events have been largely traced to the direct action of the nerves and nerve-centres. Amidst all the conflicting views taken of the nature of inflammation in current writings, there is agree- ment on this point at least, that the nervous control has much to do with it,—if not always the central control, yet some local control whose existence would hardly be suspected but for the Phenomena of inflammation. The differences of opinion begin when we come to the details of the nervous control. Does the nervous system preside over the action of the vessels only, or does it preside over the whole cellular life or the nutrition of the part? Opinions have had a tendency to range themselves on two sides, corresponding in the main to the more mechanical or to the more "vitalist " conception of life as a whole. The afflux of blood, which every one recognizes as the first conspicuous event in an inflamed part, has been attributed in the latter view to an attraction exercised by the cells of the part, to a hunger for blood comparable to that which causes a determination of blood in an organ that is going to be physiologically active. ''The facts," says Alison, "afford a strong presumption that the impressions made on the capillaries, and on the blood contained in them, solicit the flow through them on the principle of a vital attraetion of the blood rather than of relaxation of the vessels." This is the "soli- citation of fluids," the "movement of turgescence" or the "vital erection of vessels" of the older authors. If the needs of nutrition are the ordinary attraction, they may be simulated by such in- aidents as wounds, scalds, and the like ; and it is the peculiarity of inflammation that the incidence of these is on a tissue whose Physiological interest is ordinarily of little or no account, namely, € common binding tissue. It is with justice that Rindfleisch emphasizes the intimate connexion between the eommon binding

tissue and the peripheral nerves and nerve-plexuses, “They run exclusively in the connective tissue ; in it they divide and form plexuses, which ultimately join, without any definite demarcation

with the network of conncctive-tissue corpuscles. Their distribu- tion in the connective tissue designates these nerves for some de- finite function ; they are admirably adapted to play a part in the general physical and chemical changes of the organs, to give in- formation of the same to the central nervous system through their corresponding states of excitation. With the connective tissue they participate in the most intimate structure of organs, with the connective tissue they are stretched and pressed upon, with it also they suffer those chemical excitations which any considerable accu- mulation of waste matters brings with it.” Now, it is known from numerous experiments that, if a nerve of common sensation be stimulated, the outgoing response from the centre is by way of removing the tonicity of the arteries of the part, so that they dilate and transmit much more blood. This outgoing influence is assumed to travel by a special set of fibres called, for convenience, ‘depressor fibres,” because the effect has been to take off the tonic contraction of the arteries. The same effect is strikingly seen (although it is there accompanied by a conscious mental state) in the rising wattles of a cock, for which elass of erectile effects the nerves are called “nervi erigentes.”

But if this kind of turgescence is the best physiological analogy for the redness of inflammation it goes but a little way with us into the morbid condition. The tonic contraction of the arteries is no doubt taken off, and the vessels become distended with blood passing through them ; but the next event is peculiar to inflamma- tion,—the current of blood becomes slower, slow even to a stop in some of the numerous cross-channels of the capillarics. There is nothing in the mechanics of the circulation to account for this dallying of the blood at the seat of injury. The further discussion of the subject will be mado easicr by a reference to slight degrees of inflammation set up experimentally in transparent and delicate parts where the process can be watched through the microscope,— in a piece of frog’s mesentery drawn out through an aperture of the abdomen, or in the everted membrane-like tongue of the same animal, When the microscope was first applied to the study of inflammation these same effects were often observed

by Paget and Wharton Jones in the wing of the bat, an animal which has the advantage of being comparatively warm-blooded.

Experimental Study of Inflammation.—The frog having been Experi- paralysed by curare, a loop of the intestine is pulled out through a ment in slit in the abdomen, and its mesentery stretched over a ring of inflam- cork, so that the light may be reflected to it from the mirror of the mation.

microscope. It hardly wants an irritant, such as a drop of weak acid, to produce the inflammatory effects on this thin membrane ; mere exposure to the air suffices. In ten or fifteen minutes the arteries begin to dilate and then the veins, and the vessels go on dilating for the next two hours, when they will have reached about twice their ordinary calibre. They remain so dilated, and in an hour or two the current of the blood becomes slower in them. In the older observations on the bat's wing acceleration of the current through the dilated vessels was first noted ; then came the transi- tion to the peculiar inflammatory action, namely, slowing of the current, the vessels still remaining dilated. This slowing of the stream is most obvious close to the injured point, where there may be complete stagnation in the capillaries, the crowded corpuscles giving the central area a brilliant carmine appearance. Farther away from this area the streams are more rapid ; and at the farthest limits there is the unusually full and rapid flow of normal hyper- emia. The fulness of these dilated vessels exhausts their elasticity, so that the pulse-wave of the blood, which should be felt only in larger vessels, becomes perceptible also in the smallest.

In the area of retardation in the frog the blood-disks and the white corpuscles cling to the sides of the capillaries and small veins, instead of forming, as usual, a procession in the central line of the tube. Most of all do the colourless corpuscles adhere to the walls, in the experiment on the frog, until they forma kind of outlined mosaic on the side of the vessel. Then, if a particular spot be watched for several hours continuously, it will be found that some of these cells have actually worked their way slowly through the wall of the small vein. This is the important phenomenon of emi- gration of the cells of the blood, known to Gendrin and W. Addison, accurately followed by Waller, and rediscovered by Cohnheim.

Ineontinenee of the Vessel-walls.—The incontinence of the vascular Incon-
walls in inflammation is proved, not only by this emigration of tinence but
also by the escape of red blood-disks of vessel- from the capillarics, and by
the familiar and old-established fact walls.

cells from the small veins,

of exudation of the fluid part of the blood,—the plasma or scrosity. In the words of Alison: ‘‘ First, the surrounding textures are loaded with a serous fluid ; but gradually changes take place in this fluid, which indicate that other constituents of the blood have exuded from the vessels ; or part of the fluid effused assumes a gelatinous consistence, and forms flakes or layers which gradually become solid. In the semi-fluid matter first effused, according to Gendrin and others, decolorized globules of the blood may often be per-

Suppura- tion.

ceived ; and in many cases globules of pus, known by their larger size and freer motion on one another (and, when observed in mass, by their yellow colour), soon appear in this effused matter ; and it assumes more or less rapidly, and more or less generally, the form of purulent matter. . . . Along with the semi-fluid lymph effused in the earlier stage of inflammation there is often extravasation of

the colouring matter of the blood, and somctimes of entire blood.” |

This, then, is the central fact of inflammation,—the incontinence of the vessels and the exudation from them.

Addison adopted the theory that the pus of inflammation was nothing but the colourless cells of the blood that had been washed out with the plasma; and that doctrine has been revived by Cohnheim with little or no reserve. There have been serious objections to this doctrine of the origin of pus; practical surgeons have always failed to understand how all the pus could come from the blood, which has not only a mere trace of colourless cells in

it, but, moreover, contains neither more nor less of these cells during suppuration than at other times. Again, in cases of leukemia, where the number of them is cnormously increased, the course of inflammation does not appear to be affected thereby. Lastly, it is pointed out that we cannot infer altogether fully from the extremely susceptible transparent membranes of the frog to the subcutaneous and other connective tissues which are the usual seats of the in- flammations met with in practice. So far, then, we are justified in admitting only the incontinence of the vessel-walls, the escape of some colourless cells, and of plasma, the latter yielding fibrin under some circumstances, in combination with the paraglobuliu and the ferment known to reside in the white corpuscles.

The cause of the incontinence of the vessel-walls naturally engrosses attention. In an expcriment of Cohnheim's a similar condition was produced in the vessels of the frog's tongue by liga- turing the tongue bodily at the root, so as to stop the circulation in it altogether. If the ligature were kept on for six days the tongue began to mortify, and the circulation showed no power to re-establish itself; if it were removed after forty-eight hours the current slowly, resumed its flow, the arteries returned from their dilated condition, but not the veins, and the colourless cells began to escape from the latter; on removing it after twenty-four hours only, the circulation quickly resumed its normal course without any transient emigration of cells. The conclusion was that the walls of the vesscls suffered a certain loss of "integrity" if the circulation through them were stopped beyond a certain limit of time, and this loss of integrity seemed to be analogous to the altera- tion of the vessel-walls under the blow of an inflammation. On the other hand, it has been pointed out that not the vessel-walls only, but the cells in closest proximity to and in intimate nutri- tive relation with them, are affected by the stroke of inflammation ; where such cells have processes, and can be seen, they are found to draw in their processes under an irritant. In the exposition of Cohnheim, however, these changes in the cells of an inflamed part are not admitted to be other than regressive or passive ; according to him, the walls of the vessels only are affected, and affected in their molecular constitution.

Suppuration.—Wc have seen that there still remains the difficulty of accounting for the large quantity of pus ; and it will probably be found that

to account for the pus we shall have to ascribe a more than passive attitude to the connective-tissue corpuscles of the inflamed area. Where the suppuration is diffuse, as in phlegmon, and still more where it is discontinuous, as in secondarily inflamed lymphatic glands, it is not to be supposed that the pus is a mere aggregate of blood-cells brought thither. Something from the primary seat of inflammation has caused the more distant parts, whether they be continuous or discontinuous, to take on the in- flammatory and suppurative action; but it is quite clear, if we examine a lymphatic gland beginning to suppurate, that its own cells yield the pus. There has been an action of presenee on the parenchyma of the lymphatie gland; and it will be difficult to account for the production of pus in acute primary inflammation without assuming the same action of presence. In inquiring after the catalytic agent suspicion falls on the substances exuded from the vessels, and mostly upon the emigrated colourless cells. Sup- puration, when it occurs, is subsequent to and secondary to the exudation. When no suppuration occurs, as in what is called adhesive inflammation, which is the commonest kind on free sur- faces, the exuded blood-plasma simply coagulates, forming a fibrin- ous layer, in the meshes of which are a larger or smaller number of colourless blood-corpuscles. In the further development these blood-cells are probably themselves the active elements ; they pro- duce the tissue of adhesions, which is a form of the tissue of repair. In situations which arc not free surfaces—that is to say, in the subcutancous tissue, or more generally in the tracts or planes of the common binding tissue—the exuded substances are less apt to coagulate or to take the adhesive fibrinous course. It is in these deeper situations that we ordinarily get suppuration, an event subsequent to exudation and undoubtedly dependent thereon. It is true that “inflammation” may be excited on the surface of articular cartilages and in the cornea, where there are no blood-

vessels to yield an exudation ; but the inflammation is not of the ordinary kind, and in particular there is no true suppuration until the nearest blood-vessels have projected their systein as far as, or close up to, the irritated area. Artificial keratitis has been the chosen ground of controversy to determine whether it is the vessels or not rather the cells, of the part that are

primarily and actively concerned in the inflammatory process; but it will probably be found that the two sides of the controversy correspond to two dif- ferent sets of facts. The transparent superficial ulcer of the cornea has hardly anything to do with inflammation ; it does not sup. purate, although there is some formative action in the cells of the part to enable it to heal. Whenever there is true inflammation of the cornea it is accompanied by or preceded by extension of the nearest vessels to the transparent and non-vascular surface. Changes in the Connective Tissue.—In the events of true inflam. mation, therefore, exudation from the vessels precedes suppuration ; and it ean hardly be doubted that they are cause and effect, to the extent, at least, that exudation is a necessary antecedent. At the same time the connective-tissuc cells of the part can hardly haye escaped that molecular injury, or injury to their nutrition, which the elements of the vascular wall would appear themselves to haye suffered ; they are, as Rindfleisch points out, intimately bound up with the plasmatic circulation or the ultimate diffusion of the juices ; they are in closest relation with the terminal nerve-plexuses; and, histogenetically, they are the remains of that “ parablastic”

embryonic tissue from which the blood-channels themselves were —

made. It would be surprising, indeed, if they escaped the shock which had deeply affected the integrity of the cells in the vascular wall. A concurrent altcration, at least, must be postulated for them ; but that can hardly account for more than a preparedness in them to form pus. According to Stricker, the elements of the connective tissue revert to an embryonic character before pus is formed from them. Ifthe hardness of the central core ofan inflam- mation under the skin be analysed, it will be found to depend, says Stricker, upon the following things: the tissue is thickened, the network of cells in it is swollen, the intercellular substance is re- duced, the network of cells has broken up into independent pieces of nucleated protoplasm. This is the swelling of the tissues which precedes abscess-softening ; it is essentially a return to a more pro- toplasmic and less fibrillar state, and accordingly to a more embryonic state. Of this power of reversion to an embryonic state, which the common binding tissue of the body retains as a memory of develop- ment, we have already had illustrations in the processes of repair, of tumour formation, and of cancerous infection. In all these cases the tissue falls back upon a more elementary condition, or we

may say that it retreats to broader ground, where, however, it cannot stand still. Its special destiny is settled for it in each case by the circumstances, and, for the particular case of inflammation (as dis- tinguished from the process of repair), its special destiny is to form pus. If the analogy adduced in the section on “repair” has any value, pus is the by-product of a kind of blood-making from the embryonic cells, a heematoblastic activity in which no red disks are formed, but only pus-corpuscles and a fluid, the corpuscles stand- ing for the residual nucleus of the hematoblast (with evidence of cleavage in it) and the diguor puris for both the red disks and the plasma. This hematoblastic doctrine of pus would correspond, in form at least, to Hunter’s conjecture that “the new-formed matter peculiar to suppuration is a remove further from the nature of the blood.” So long as the intensity of the process lasts, the connective tissue uses its reacquired embryonic powers only to make pus; when the effects of the blow have subsided (or if they have been from the first slight, as in the reparative process) the formative powers of the tissue make granulation-cells and new blood-vessels (including even new blood within the vessels), and so the incident ends in repair. The pus of a granulating surface would tlms differ from the pus of acute inflammation only in degree. In like manner, common inflamrmation with a moderate degree of fever differs only in degree from phlegmon, or diffuse suppuration, with its peculiar fever. The diffuse suppuration of phlegmon is the case where the infection or action of presence extends by continuity along the tracts of connective tissue ; the implication of lymphatic glands (it may be at the outset) is the case where the infection is carried to a distance by the lymph-drainage of the tissues. Contrasting with such cases, the area of suppuration in a healthy subject (where there has becn no extrinsic poison introduced) is a limitcd one; but, however limited the focus, it seems necessary to resort to infection of the connective tissue for an explanation if the exuded fluid turn to pus or the inflammatory swelling turn to abscess. It is in this seuse that every inflammation may be said to be infective. _ Assuming, then, that pus-formation is due to an infective influ- ence impressed upon the protoplasmic connective tissue, and kuow- ing, as we do, that the exudation from the blood-vessels is an Invart- able antecedent, the role of infecting cells would precisely suit those clements of the exudation about whose share in the inflammatory process there has becn much controversy, namely,

the cmigrated colourless cells of the blood. As a material contribution to the pus all the cells that escape from the blood would go but a little

way ; as infecting cells they might be the agents of much suppura- tion, and, through their wandering propensities, of suppuration at discontinuous points. They would thus have a power in inflam- mation analogous to that which has been elaimed in a former sec- tion for catarrhal and other epithelial cells of a mucous membrane (or of a gland) which had found their way into the supporting connective tissue.

Among the things that determine the degree and course of an – inflammation, besides the kind and extent of the injury, may be mentioned the florid or anemic habit of body, the gouty habit, the alcoholic dyscrasia, the diabetic cachexia, the scrofulous inherited coustitution, and the syphilitic taint. There are even cases where the predisposing cause 1s, as it were, strong enough to dispense with all but the slightest exciting cause ; where, accordingly, the inflam- mation would be called idiopathic. But, however much the “crasis”’ of the blood or infiuence of the nerve-force may determine the degree and kind of inflammation, it is clear that the stagnation of the blood, the incontinence of the vessel-walls, the exudation, and the suppuration may all follow an injury where the crasis and the general nervous control are perfectly normal. The significance of micro-organisms in the inflamed area must be judged from the same point of view; all the events of inflammation may happen without them, but they may help to determine the kind and extent of the inflammatory effects.!

§ 15,—INFECTIVENESS.

One of the most dreaded results of a wound, or an infammation from other causes, happily rarer in modern surgical practice than in former times, is pyzemia, septic- emia, or purulent infection. About a week, more or less, after the injury, the patient has a shivering fit followed by a perspiration ; he may feel comparatively comfortable for a time, but, there soon begin to be grave symptoms of constitutional disturbance. He becomes uneasy, has pains in the limbs, a weak and quick pulse, fever, loss of appetite and thirst, a dry and brown tongue, a somewhat jaundiced skin, and sometimes diarrhea. The shivering fit returns at intervals followed by the sweating, the tem- perature rising to a great height and falling rapidly to a corresponding

degree. Death usually ensues, sometimes not for two, three, or four weeks, being preceded by mut- tering delirium and unconsciousness. A curious symptom accompanying these phenomena is the sweetish odour of the breath. Meanwhile the wound, where there is one, will have ceased to discharge pus freely, becoming dry and brownish and yielding only a thin ichor; at a dis- tance from the wound one or more joints may become swollen and painful, or an abscess may form at one or more points under the skin, or there may be pustules and discoloured patches on the skin.

th the examination after death the secondary abscesses may be ~~vely various in their seat, oftenest perhaps in the lungs, under certain circumstances in the liver, or in one or more joints, or in the substance of the heart, or at the back of one or both wrists. The parotid glands are peculiarly liable to diffuse secondary in~~ flammation. In a class of cascs called septicemic for distinction, no secondary inflammations or products of inflammation can be discovered anywhere ; in these cases the periodical shivering fits are not marked, although there may be profuse sweatings from

time to time. In another class of cases, to which Pagct has called special attention, the course of the disease is very protracted, being

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particles of it, get washed off, carried into the blood-stream, and lodged as embola in the small vessels of a terminal vascular area of the lungs or other organ or part, where an unhealthy form of inflammation arises secondarily. These events will become more intelligible by reference to a particular case.

_A woman undergoes an operation for internal piles—saccular dilatations of the inferior hemorrhoidal veins. The hemorrhoids had been ligatured, and for some reason there ensues an altogether unusual course of events. In a few days the patient has symptoms of pyemia, and death follows in a fortnight. At the examination the inferior mesenteric vein, all the way up from its ligatured inferior hemorrhoidal branch to where it joins the splenic on its way to the liver, is found much dilated, lying along the left side of the lumbar vertebree as thick as the little finger, of a greyish appearance

externally, and filled with greyish puriform detritus. In the liver, to which this vein conducts, there are a number of in- flammatory centres, some of them merely dark-red or livid circular areas, others of them purulent centres or true pyzemic abscesses.

In this-case the wall of the ligatured vein had taken on some action which had affected the clot formed naturally within it ; instead of the clot organizing, it had become a semi-fluid mass of puriform detritus ; it had extended by continuity far up the main trunk of the inferior mesenteric vein, the puriform softening follow- ing it; particles or larger pieces of this unnatural clot had passed into the portal vein, and had become impacted in certain capillary territories of the liver, where they had infected the elements of the part (probably the connective tissue exclusively) to take on an inflammatory and suppurative action.

It is questioned by some whether there may not be a class of Infective pyemic and septicemic cases in which no thrombosis (with puriform throm- softening of the thrombus) of peripheral veins occurs ; but it can- bosis.

not be doubted that this kind of thrombosis, and the discharge of particles or pieces of the thrombus into the general circulation, are very general accompaniments of pyzmia and septicemia, puer- peral and other. The interest centres in the state of the vein-wall, which causes the blood to clot within it, where it would not other- wise have clotted, and causcs the clot to undergo a puriform degeneration, or to acquire an infective power. The state of the primary wound must be held answerable in general for all the secondary events, from the thrombosis onwards. In the wound the ordinary products of inflammation cease to be formed, and, instead of them, there is an ichorous foul-smelling discharge, or a dry and semi-gangrenous condition of the parts; whiatever this action may be, it communicates itself to the walls of the vessels, and the throm- bosis (with detachment of the puriform particles) follows.

There are certain well-understood circumstances in which wounds take on such an action: the crowding of a number of cases of suppurating wounds in a limited space withont adequate attention to the removal of the putrid discharges from the wounds, great nervous prostration of the subjects of wounds, the coexistence of kidney-disease, and such-like constitutional

states personal to the case. The situation of the wound or exposed surface comes also into account ; thus injuries of the bones (as in compound fractures), and especially injuries of the cranial bones, are more liable to take the pyemic direction. Above all, the surface of the uterus after delivery, or contuscd wounds of the labia, or other lacerations, will take on an unhealthy action, either from the circumstances of the patient, or owing to a very minute quantity of infective substance (cadaveric or other) having reached it from without, or from the putrescence of portions of retained placenta. The liabilities of child-bed are increased by the circumstance that the blood in the puerperal condition is unusually liable to clot in the veins, even when their walls are in good condition, and also by the fact that the venous sinuses of the uterus after delivery are such as to afford opportunities for stagnation of the blood in them (unless the vigor- ous contraction of the organ have practically obliterated them), in which respect they resemble the venous sinuses of the dura mater.

Experimental Septicemia.—The injection of small quantities of Experi-

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are found to be in proportion to the chronicity.

In the pathology of these cases attention has always been fixed on the state of the veins leading from the wounded part, and of the blood in them. The old doctrine was that the veins secreted pus from their walls, which was carried into the blood-stream. his pre-microscopic opinion has given way to the modern doctrine of thrombosis and infective embolisms elaborated by Virchow. Not only the veins leading from an external wound, but the veins of the uterus after delivery, and other internal veins under various ritcumstances, may become lined by a layer of coagulum, or even blocked in their entire lumen ; the coagulum undergoes puriform (although not purulent) degeneration ; pieces of it, or molecular I TSUION | Pieces eae ee

b See Paget, Surg. Path.; Simon, “Inflammation,” in Holmes’s yst. of Surg., vol. i., 2d ed.; Sanderson, 2., vol. v.; Cohnheim, wae Untersuchungen iiber die Entziindung, Berlin, 1872 ; Stricker, orles. tiber allg. und exper. Pathologie, Vienna, 1878-83, and in

shurst’s Internat. Encycl. of Surg., vol. i., Philad. and Lond., 18825 an Buren, ibid.

produces symptoms of septic poisoning corresponding somewhat to septie- In this experimental septic- emia.

the symptoms as observed in practice. emia, as well as in the septic processes of man, there are many facts to show that bacteria are concerned. How these micro-organ- isms are concerned is another and much more difficult question. According to one view the lowered vitality of the tissues in a certain class of injuries, or in the injuries of a certain class of subjects, gives these ubiquitous organisms their opportunity. In this view the organisms initiate nothing ; they are incidental to the morbid state of the tissues, and their presence in large numbers is rather the index of the liability to septic infection than the cause of any septic infection that may occur. The most extreme claim made for these organisms in purulent and _septicemic infection (as well as in erysipelas, ulcerative endocarditis, and diphtheria) is that their physiological activity (if not even their mechanical presence) determines the nature of the morbid process, including the tissue-changes, the type of constitutional disturbance, and, in general, the development, course, and termination of the infection. In judging

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Tumour- infection.

Melan- otie in- fection.

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between the two extreme positions it should be remembered that there is nothing morphologically distinctive in these organisms found in diseascd or injured tissues, that their so-called physio- logical activity in disease is merely begging the question, and that their mechanical presence, even if they were always present in sufficient numbers, has not yet been brought into any intelligible relation with the symptoms and the morbid anatomy. On the other hand, there cannot be the slightest doubt that one of the

greatest desiderata of surgical practice is to keep them out of wounds (see SURGERY).

Tumour-infection.—This subject has already been treated of in the section on ‘‘cancer,” but it will be convenient to add a few re- marks on the parallelism between tumour-infection and purulent infection. In both cases we have a primary seat of morbid action and a secondary infection, and in each case the seats of sccondary infection correspond on the whole closely. The closest correspond- cence is perhaps with sarcomatous tumours, which have the same relation to veins that primary infective inflammations havc, and the same predilection forthe lungs. Again, where the liver becomes the seat of secondary tumours, the first steps of the process of infection are on the whole parallel with those that may be observed in multiple abscesses of that organ, that is to say, the liver-tissues at a number of points undergo changes which are practically simul- taneous Within a certain radius, leading to a circumscribed abscess in the one case and to a circumscribed tumour-nodule in the other. Both the abscess-area and the tumour-area may be found at half-way stages of their development, the former being often recognizable in the section of a pyeemic liver as a somewhat livid circular spot. In the tumour-process the morphological characters are aiways very definite, and the exciting agent has plainly come from the primary disease, carrying the structural marks of the pri- mary disease in it. The primary inflammatory process wants the definite structural characters of the primary tumour-process, and still more does it want the endless variety of the latter ; but it is still a textural process of the body, and its secondary processes arc like it. The tumour-analogy, therefore, is strongly in favour of the idea that purulent infection, and inflammatory infection in general, has an autochthonous origin in the life of the cells and tissues.

Mclanosis.—The term “melanosis” is used in pathology in at least two distinct senses. It is applied, in the first place, to the general- ization or secondary extension of a primary tumour (usually sar- comatous), containing black or brown pigment ; and, in the second place, it has reference to a remarkable generalization or widespread deposition of black pigment in the bone-marrow and elsewhcre in the horse, particularly in those horses which are apt to lose what- ever hair-pigment they may have

had. Each of these two very dif- ferent cases has its interest for general pathology.

The generalization of a melanotic tumour, even a very small one, is one of the most remarkable facts of infection. It is not unfre- quently seen in the case of the spindle-celled sarcomatous tumours which grow from the pigmented connective-tissue cells of the choroid tunic of the eye (not the choroidal epithelium of the retina). In such cases the primary tumour is serious enough from its pressure effects, but it is infinitely more serious from its infect- iveness. The liver may be full of large tumour-masses, black throughout or in part, and there may be other secondary growths elsewhere. Even more striking is the generalization which is apt to ensue from a subcutaneous melanotic sarcoma, or from a small spot of pigmented new growth on the basis of an old pigmentary mole, or nevus, or mother-mark (melanotic alveolar sarcoma). The secondary tumours occur at other points under the skin, often widely remote from the primary, and in the axilla, in the membranes of the spinal cord, in the liver, in the lungs, and even on the serous membranes. We have here to do with the ordinary considerations of tumour-infection, as already spoken of; but the presence of pigment in the cells and partitions of the new growth raises a further consideration. If we collect all the secondary tumours from a case where infection has been extensive, and express from them all the pigment, we should get a very considerable quantity, perhaps half a pint, of a thick black fluid not unlike printers' ink. The source of all this pigment has been perhaps a small speck of melanotic tumour-tissue in the skin, or, to mention a particular case, in the granulation-like tumour-tissue in the bed of the thumb- nail after an injury. How is it that from so small a source so much of this black substance has been produced ?

The pigment is, of course, contained within the individual cells of the secondary tumours ; these cells are a mimicry of the primary tumour-elements, and, as they reproduce the form and size of these, so also they reproduce their pigment-granules. So stated, there is nothing remarkable in the quantity of black fluid that may be collected from a case of generalized melanotic sarcoma. The primary tumour impresses the type of its own life upon a number of distant centres of cellular activity, so that these grow to be tumours, their cells at the same time becoming each a laboratory for the

manufacture of pigment, extracting it from the blood for their erratic purpose. The true suggestiveness of these events is really in the way of analogy for another class of infections. It is often

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said that, in an infection like smallpox, the virus must be an independent living organism, because it multiplies within the body during the evolution of the disease, the body which had received a most minute quantity of virus becoming in its turn a centre from which a thousandfold of the virus may issue. But, if a small speck of melanosis may yield half a pint of inky fluid by so impressing the cells of the body that they become so many laboratories of black' pigment, then we can understand. how, in smallpox, the cells of the skin at many points become laboratories in like manner, not indeed yielding black pigment, but supplying that which has to the primary contagion of a case of small- pox the same relation that the generalized pigment of melanosis has to the primary speck or nodule of pigmented spindle-celled or alveolar sarcoma. It is not necessary @ priori to go so far afield as the ferment-action of living organisms for an analogy of this thousandfold multiplication ; there is an analogy nearer home in the marvellous mctabolic capabilities of the body's own protoplasm.

Melanosis of the Horse.—It sometimes happens that we find, im Mela the carcase of an aged grey or white horse which had been originally osis brown or black or other shade of colour, that the marrow of all the horse

bones in its body is changed into a uniform black inky pulp or fluid, that the clusters of lymphatic glands are full of the same in a drier form, and that there are black patches on the more exposed parts of the mucous membranes. This remarkable malady is not found except in horses whose coat had lost its originally abundant hair-pigment. Trousseau and Leblanc, who investigated the facts on a large scale at the Paris horse-knackers', were of opinion that in every horse which had turned white, more particularly ifit had been originally black or brown or roan, the inguinal lymphatic glands were full of black pigment; and they concluded that the pigment there deposited was the equivalent of the colouring matter that the hair had lost, and that the blood being, as it were, overcharged with colouring matter, had deposited pigment in unusual places.

It is difficult to suppose that the melanosis in these cases is a mere quantitative equivalent of the pigment lost from the hair. The pigment of melanosis is more probably a true metabolic pro- duct of cells; and it is significant that it is most abundant, in the horse, in the old seats of hemoglobin-formation, namely, the red bone-marrow. The bone-marrow (with other tissucs as well) takes on a pigment-making activity, coincidently with the blanch- ing of the horse's coat, and vicariously thereto. The melanosis of the horse is a striking instance of a constitutional malady, that is to say, it illustrates the very important pathological doctrine that an crror in one part or function of the organism entails vital consequences elsewhcre.}

~ § 16.—Sprctiric INFECTIONS.

Infective disease of one kind or another stands fora very large part of the total sickness and mortality of man- kind. It is entitled, therefore, to a larger space im a nosological outline than a single section at the end of an article. Each infective disease has to be considered by itself, from the natural-history point of view, and the salient facts of its history, geography, and ethnology, and its other particular circumstances to be taken along with its morbid anatomy and clinical history. It will be necessary, for the present purpose, to adopt a much more restricted programme, and to indicate little more than the place of the specific infections in the general scheme of disease.

Of diseases that have the property of infectiveness we have already dealt with cancers and other malignant tumours, and with the common infective inflammations. Reference has also been made to erysipelas, which is sometimes not merely infective as regards the individual body in which it arises, but a source of infection (or contagion) also for other bodies through conveyance of a virus. In the communicable class of infections we have to include so ordinary and simple a malady as a common cold, which is notoriously apt to go through @ whole household, having been acquired in the usual way by some one member of it. The great historical epidemics of influenza which have overrun whole continents from time to time are held by some to be little else than colossal

1 See Virchow, Gesanunelte Abhandl. aus dem Gebiete der wissensch. Med., Frankfort, 1856, Cellular-pathologie, chaps. x. and x1, and Krankhaften Geschwiilste, vol. i. chap. 8, and vol. ii. (* Melanosis ie; Billroth, Allgemeine chirurgische Pathologie, 8th ed., Berlin, 187 6 (Engl. transl, New Syd. Soc., 2 vols., 1877); R. Koch, Aetiologie

der Wundinfections – Krankheiten, Leipsic, 1878 (Engl. transl., New Syd. Soc., 1880).

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developments of those catarrhal epidemics which we meet with on a homely scale within single households. Another example of the same kind of communicability of a simple catarrhal affection of a mucous membrane is the Egyptian form of “cold in the eye” or ophthalmia, which was brought to England by a few of the troops returning from the expedition of 1801, and which spread by contagion for several years through the home-garrisons with a viru- lence quite unknown in the Egyptian climate, so that more than two thousand soldiers had to be pensioned for total blindness due to it.

In such instances a common and, it may be, trivial malady becomes a species of disease; it acquires the remarkable power of reproducing itself in persons who had not been exposed to the primary exciting causes. Not one in a hundred of the soldiers who were blinded by ophthalmia during the first ten years of the century had ever been in Egypt, just as, in a household where catarrh has become prevalent, perhaps not more than one member of it had sat in a draught, or been caught in the rain, or otherwise been subject to the conditions that ordinarily bring on a common cold. It is the acquired catarrhal condition that spreads from person to person, being faith- fully reproduced in each new victim. The morbid con- dition becomes a kind of individual thing, of which the seminal particles are scattered abroad and induce the same morbid condition where they find a favouring soil or a favourable lodgment.

If all the instances of infection could be reduced to the same category as these, we should simply have to regard the specific infective diseases as the spreading or com- municable forms of morbid conditions of the body other-wise accounted for—as states of disease leading a kind of independent life, but traceable in the last resort each to its origin in certain structural and functional errors of the body. The great problem of the species of disease would thus become an evolutional problem. While this evolu- tional problem would always have underlying it the unique difficulty of conceiving how a morbid state of the body could be integrated to become a semi-independent exist- ence, with the power of reproducing itself by its germs as in the generation of living things, the interest for each specific disease would be to follow up, historically, geo- graphically, ethnologically, sociologically, and otherwise, the conditions of body out of which the complex natural history of the disease-species had grown.

Proceeding, then, in the natural-history manner, and attempting, in the first instance, a grouping of the species of disease, the broad lines of division are into the chronic and the acute, and, among the acute themselves, into exo-genous and endogenous.

Acute Infective Diseases—Exogenous and Endogenous.—The endo-

much as, over and over again, it has been from the emanations of dysenteric dejecta of the negro (who can hardly take yellow fever)

and not necessarily from the effluvia of pre-existing yellow fever cases, that the infective power has proceeded. The vicariousness

of yellow fever brings it into close relation with typhus fever, which Typhus is not otherwise counted as an infection of the exogenous group. fever,

No attempt to trace all cases of typhus to pre-existing cases of the same fever can possibly succeed ; the succession has been broken repeatedly, and repeatedly started anew, amidst well-known cireum- stances of cold, hunger, filth, and general misery. In the larger proportion of typhus eases it is the miserable themselves who have suffered from the diseasc in addition

to their other miseries ; but there are numerons classical instances in which the more wretched of mankind have imparted typhus to their more comfortable fellows without themselves exhibiting the symptoms of the disease. The best-known historical cases are the Black Assizes, when prisoners who were brought into court from filthy dungeons so tainted the air of the court-house that the judges, the members of the bar, the jurymen, and the public were seized with a virulent typhus infec- tion. If, in such cases, it should be contended that the prisoners carried the specific efiluvia of typhus about their persons, although they themselves did not suffer with the specific symptoms of the fever, there are other cases where such a contention is entirely in- admissible. Perhaps the most remarkable of these is the case of

the Egyptian ship-of-war which brought an epidemic of typhus to

Liverpool in 1861. (Hpidem. Trans., i. p. 246, 1862.) More usually, however, it is the miserable themselves who first develop this morbus misert#, afterwards communicating it to the physicians and others who enter their dwellings or otherwise come near them. The de novo development of the symptoms of typhus, and subsequently of the independent contagion of typhus, has been abundantly illus- trated in the naval and military history down to the close of the Napoleonic wars. The writings of Huxham, Lind, Pringle, D. Monro, Blane, and others, who served in the great typhus period, are full of evidence of that kind ; the doctrine of the continuous reproduction of the typhus virus always from pre-existing cases is a purely academical affair, which dates from the ingenious dialectic of Bancroft's Essay on the Yellow Fever, &c., 1811. The rational doctrine of this kind of infective disease, based upon the practical experience of all times, is that which is stated by Pliny: "* Primo, temporis ac loci vitio, et xgri erant et moriebantur ; postea, curatio ipsa et contactus egrorum vulgabat morbos " (xxv. 26).

Relapsing Fever.—Closely related to typhus in the circumstances Relaps- of its origin is relapsing fever, which has extremely slight power of ing fever.

spreading among the well-to-do. Its synonym of famine fever is on the whole a sufficiently accurate designation of its cireumstances of origin. Its more recently-acquired synonym, spirillum fever, is derived from the

presence in the blood of a minute spiral living organism, as to which the standing question arises whether it is there because the particular state of fever is favourable to it, or whether the fever is there because the organism has, for some reason, invaded the body. Here, again, the conflict arises between academical dialectic and the more tangible facts of experience. It is maintained that relapsing fever can be given to the monkey by injecting the spirilla; but that circumstance by no means serves to show that the pre-existing cases of relapsing fever had occurred because spirilla had invaded the bodies of a certain number of persons. Relapsing fever is sometimes, though rarely, conveyed by infection to those who had not been living na state of over- crowding and of semi-starvation ; and such an incidence of the disease is so entirely arbitrary that even the spirilla, if they came from other cases, might be accepted as the active agents. The spirilla would have a real interest if it could be shown that they could initiate relapsing fever proprio motz. As the case stands, the predisposing causes of relapsing fever completely overshadow all other elements in the causation. ‘The disease is always and every-

nd genous species of disease are those in which the infecting particles 3en-pass directly from the sick body to the sound, giving rise in the cute latter to a morbid statc which follows the same order of unfold- ses, Ing, and attains the same type as in the former. The exogenous species of disease are those in which the infecting or germinal particles have an intermediate state of ripening in the soil, or in water, or amidst other favouring conditions, producing a definite set of morbid phenomena in the exposed body, but a set of pheno- mena which may be, and often are, different in important respects from those of the primarily-ailing subject. These contrasts between the endogenous and the exogenous infections may be illustrated by a reference to smallpox on the one hand and to cholera on the other. Any person whose skin is covered with the drying crusts of smallpox pustules may give off infecting particles which will set up the same disease if they find a lodgment in a susceptible person, the contagiousness of such a case of smallpox being some- What heightened, no doubt, by a close atmosphere and the like. But for cholera, speaking generally, much more than this is wanted for the development of the communicated disease ; the infecting particles have in most cases to undergo an intermediate stage of Mpening in

the soil or in other outside media. Yellow fever is even more than an exogenous infection ; it is also vicarious, inas-

where morbus pauperum, and very often it is typhus Samelieus. ; Typhoid Wiser. This fever holds a peculiar place in the history of Typhoid. specific diseases. It is unquestionably a far more common disease at present than it was fifty years ago, and it is certain that it was prevalent in Paris for some time before it began to occur, except as a rarity, in London and Edinburgh. The evidence of Christison and of other highly observant pathologists may be implicitly accepted that, while Louis and others in Paris were finding ulceration of the small intestine in fatal cases of typhus-like fever, no such lesion was ordinarily found in the Edinburgh practice. More generally, it may be said that typhoid fever has been a prominent factor in the mortality during the periods when typhus has been an insignificant one. The coincidence of decided typhoid years with the cholera ycars is perhaps irrelevant. But there can be little doubt that there is a close connexion between the rise of typhoid and the more or less considerable diminution of intermit- tent fever ; there is indeed much evidence in a certain number of localities in favour of the opinion of Boudin, that malarial fever and typhoid fever arc mutually exclusive in a given place. : Typhoid fever is undoubtedly a disease associated with the manner of disposal of human excrement. Whether the typho-

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Measles.

Searlet fever.

Syphilis.

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malarial fever of the American Civil War, and of Rome, Naples, and other localities, is also an excrementitious infection is not so clear. The ordinary typhoid is peculiarly bound up with the modern system of water-closets and

sewers, and with the faulty construc- tion of the same ; it was a familiar observation in Edinburgh that the Old Town, with its closes and huge tenement-houses, without the water-closet system, remained practically free from typhoid for many years after the disease began to be common in the New Town. The association with faulty sewerage is, however, not an invariable one. The disease occurs among remote and primitive communities, such as Norfolk Island in the Pacific, in Fiji, in Greenland, and elsewhere.

According to the contention of Murchison, and of many other living authorities, typhoid fever may, and often does, develop de novo in an individual who has received, either by the breath or in his food or drink, some peculiar or not altogether ordinary product of fecal decomposition. It is not alleged by this school that fecal decomposition under ordinary circumstances (especially under the free access of air) is attended with the risk of typhoid fever ; but that a virulent property may, and often does, develop under gome peculiar concurrence of circumstances, especially when fecal matters percolate and accumulate where little air reaches. If the process of typhoid fever be so induced in an isolated case, the de- jecta of the patient are specifically virulent ; and from one such case many may be poisoned ‘by means of specifically tainted water or milk distributed in common. ‘The possibility of a de novo origin of typhoid fever now and then is vehemently objected to by the more doctrinaire school of pathologists ; according to them there is always a pre-existing case, the virus of typhoid having been continuously reproduced ab xlerno.

The Exanthemata.— Another class of acute infections is those

which are virtually independent of external circumstances, which affect all classes equally, and which pass by direct contact from the sick to the sound. The chief diseases of this class are small- pox, measles, and scarlet fever. As to smallpox, it has been con- tended, on the historical and geographical evidence, that it is primarily an African and Indian skin-disease which has acquired spreading power; and there is really no rival hypothesis of its origin. For measles the evolutional clue would appear to be en- tirely lost. The old notion about it, expressed in the name “ mor- billi,” was that it corresponded to a lesser kind of smallpox. There can be no doubt, however,

of its present absolute nosological distinctness. It is as universal in its distribution as smallpox, sparing no race, and, like smallpox, committing its greatest ravages among virgin communities and among the dark-skinned. The natural history of scarlet fever is altogether different. It is peculiarly a disease of northern Europe ; it is practically unknown as an epidemic throughout the whole continent of Asia (except Asia Minor), and the whole of Africa (except Algiers); and in North and South America and Australasia it seems to have fol- lowed the European immigration. One of the most remarkable facts concerning it is that it may occur in quite sporadic or isolated cases in extra-Kuropean countries. Some favourable concurrence of cireumstances had given it a permanent hold in Europe, or had enabled an occasional erythema of the skin, with fever, to develop into a species of disease, in which the almost diphtheritic affection of the throat, the brawny swelling of the neck (with tendency to sloughing), and the acute affection of the kidneys may be so pro- nounced in certain individuals, and in all the cases of certain epidemics, or of the epidemics of certain localities, that the simple type of disease is obscured and the line of evolution lost. Perhaps one clue to the development of scarlatina from non-specific states of the body may be found in the cases of scarlet rash in children, in the surgical wards of hospitals. The evidence seems to show that in such cases there is something different from a merely heightened predisposition to the specifte scarlatinal poison, on the supposition that the latter is ubiquitous ; that there is, in fact, an inherent liability in some children to develop a scarlet rash, with fever, near a wound or sore, the condition so developed becoming communicable to others, as in the analogons case of erysipelas. _ Chronie Infeetive Diseases. —The greatest of the chronic infections is syphilis, unless, indeed, we admit tubercle unreservedly into the same class. Its enormous prevalence in modern times dates, with- out doubt, from the European libertinism of the latter part of the 15th century. It is almost certain that the same disease, with symptoms of constitutional infection, had developed in various parts of the ancient world under similar circumstances ; but it is not less certain that a great redevelopment came in about the year 1490 in France, Italy, and Spain, so that we do not even require to assume a continuity of the virus from carlier times. The his- torical evidence may be read, in a convenient abridgment, in the third volume of Hiser’s Geschichte der Medicin wnd der epidemischen Krankheiten.

Two forms of sore are described concurrently in all writings upon syphilis, and, although it has been usual during the last thirty years to regard only one of these as truly syphilitic, there has always been a certain inability in the profession at large to apprehend the reason

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for making a radical distinction. One of the forms is a considerable

and quickly-developed ulceration, sometimes multiple and with a

marked tendency to extend its borders ; it heals under treatment. like any other ulcer, and in many cases there are no after-effects throughout the body generally. The same person may develop such sores repeatedly. Fora considerable time after the establish- ment of the doctrine of “true” or indurated infecting sore it was taught that these simple ulcers were never followed by constitu- tional infection ; but it is now very generally admitted that such teaching is too rigid or dogmatic, not according with the facts of experience. A recent writer on the subject in Berlin, who has kept records of his private practice, estimates that no fewer than 40 per cent. of all the cases which developed constitutional symptoms were consequent on primary ulcerations that would not have been included in the definition of “true” or Hunterian sores. It is not seriously disputed that these simpler ulcerations may arise inde- pendently of conveyance, as the direct results of gross personal negligence. Itis at the same time admitted that they may become inveterate, that the process of healing may become irregular, and that they may gradually acquire that character of “induration” which is distinctive of the “true” sore. The various circum- stances under which this change of type or development of char- acters may take place have, for obvious reasons, escaped being recorded with scientific accuracy; but of the fact of some such evolution there can be hardly any doubt.

The “true” or Hunterian sore is usually at first a small indurated papule, which breaks after a time, but causes little trouble in heal- ing. ‘The after-effects are, in their severity and long-continuance, in striking contrast to the disease at the outset. This form of the disease is an affair of infection from beginning to end, from the primary papule to the “gummatous” internal nodules years after ; there is no evolution in the individual of an infective

virus out of a common and unclean ulceration. The simple sore, the result of common inflammation under circumstances of gross per- sonal negligence is not without a degree of infectiveness of its own. It has a tendency to spread, to enlarge its borders by including the margin of sound tissue in the ulcerative process, and it has also a tendency to infect the nearest packet of lymphatic glands with a suppurative action. Further, it is highly communicable to the persons of others by contact, reproducing one or more sores very like itself, and such communication is accountable for its wide distribution. But that degree of infectivencss is a very dif- ferent thing from the truc and full syphilitic infection. The latter is often an affair of years, and, it may be, of a lifetime, and it passes directly to the offspring. Its earlier constitutional manifestations are in the throat, the skin, and the hair; its later in the bones, some muscular structures and some of the viscera, and more particularly in their blood-vessels, or in the blood-vessels of their coverings. It infects the lymphatic glands with an indura- tive rather than a suppurative process, and not only the nearest packet of them but also the lymph-glands in the neck and else- where.

In seeking for the beginnings of this profound constitutional taint, for the first steps in the evolution of the infection out of a common morbid state of the body, we naturally arrive at that irregular process of healing, or the inveterate soreness which the granulations of a simple ulcer (due to personal uncleanness or con- tact with the same) sometimes assume. ‘The tissue of syphilitic formations, wheresoever occurring, has been named by Virchow “ ovanuloma,” being a persistent state of granulation -like tissue, not proceeding to ordinary cicatrization, but to indurative and degenerative changes. In true syphilis, as we have said, this kind of formation is from first to last the product of an infective virus, equally the primary hard papule, the indurated lymph-glands, the thickening and destrnction of mucous surfaccs, the nodes and inflammatory products in the periosteum, and the gummata in and upon the viscera. But the type of all this mimetic formative action must have been somewhere acquired or evolved ; and we shall prob- ably not err if we seek for the acquisition of the granulomatous type in the inveteracy and irregular healing of the granulations of an ordinary foul sore under the peculiar circumstances of its own degree of local infectiveness, and in the continuous reproduction of such sores. In this way we should have granulations becommg specifically infective towards

the body, or its distant parts, just as the products of simple acute inflammation may be infective to a distance, or as melanotic and other slight primary tumours are apt to propagate their texture and characters far and wide, or even as a common granulating sore under certain circumstances of irritation may develop the characters of tumour-tissue and a high degree of tumour-infectiveness. The products of syphilis have a near affinity to new growths of the tumour kind ; and it is with justice that Virchow includes them among tumours as one of the granulomata, and Klebs makes provision for them, along with tubercle, glanders, lupus, &c., in a class of “infective tumours.” If we take the primary type to be the granulation-tissue of repair we shal] assig? it an intermediate position, and, at the same time, do justice to the circumstances in which this infective granulation-like new growt

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probably had its origin, namely, the reparative process in inveterate or neglected ulcers of common and every-day origin, but with a contagiousness of their own, and with a certain infectiveness of their own towards the adjoining tissues and the nearest packet of lymphatic glands.

The most characteristic form of the generalized syphilitic infec- tion, which may not manifest itself for several years after the reception of the virus, is a nodular or infiltrating new growth in various organs—in the liver, in the testes, in or upon the brain, in the muscles (tongue and jaw-muscles especially), in the peri- osteum, and in the lungs. These nodules are called gummata from the somewhat tenacious, firm, opaque brownish appearance of the fresh-cut surface. The structure, where its vascularity is perfect, consists of small round cells lying mostly in rows among thin fibres, and it closely resembles granulation-tissue, only that the cells are smaller and the-intercellular substance (fibres) harder or denser. Molecular death, or necrosis, overtakes this new forma- tion at various central points, owing to the inadequacy or suppres- sion of the blood-supply. One of the most remarkable features of the process is the enormous overgrowth of cells in the inner coat of the arteries within the affected area, leading to an

accumulation of elongated cells and intercellular substance, whicli may even obliterate the channel of the vessel altogether.

Over the later products of syphilitic infection, both the nodular and the infiltrated, there are two drugs, mercury and iodide of potassium, which have a remarkable power, causing their absorp- tion and conducting the infective process to a safe issue. Syphilis has been compared by Hutchinson to a very prolonged fever, with its stages separated by intervals of months ; like a fever, it burns itself out, so that a time comes in the course of years, if the patient have not succumbed to the effects, when the system is practically free of the virus, just as it is free of the virus of smallpox in three weeks. In a certain proportion of cases only the secondary symp- toms occur, and not the tertiary, the virus having presumably exhausted itself in the earlier manifestations.

In the syphilis of the offspring it is necessary to distinguish two classes of effects. On the one hand, there are the effects of general intra-uterine mal-nutrition, due to the placental syphilis of the mother ; and, on the other hand, there are the true specific effects acquired by inheritance from either parent and conveyed, along with all other inherited qualities and tendencies, in the sperm- elements or in the ovum. These two classes of cffects are com- mingled in such a way as not to be readily distinguished ; but it is probable that the erroneous growth of bone, at the epiphysial line in the long bones (sometimes amounting to suppuration), and on the surfaces of the membrane-bones of the skull, is a result of general placental mal-nutrition, like the corresponding errors of growth inrickets. The rashes and fissures of the skin, the snufiles, and such-like well-known symptoms in the offspring of syphilitic parents are to be counted among the true mimetic effects of the Specific taint ; so also the peculiar nuclear overgrowth in the sup- porting tissue of the liver, the interstitial pneumonia alba of the lungs, and the like. As in rickets, it is in many cases some months after birth before the congenital syphilitic effects show themselves, while other effects, such as interstitial keratitis, the mal-formations of the permanent teeth, and the rarer occurrence of laryngitis, come to light during childhood and youth. Injury to a syphilitic child is apt to have unusual consequences; thus a blow on the arm may be followed by a gummatous growth in one of the muscles.

Tubercle and Serofula.—Tubercle and scrofula are among the cominonest and most fatal diseases of mankind. No ehapter in pathology has a more pressing interest ; none is surrounded by so much theoretical difficulty, or concluded by so much practical failure. It is not only in Europe, but in America and the British colonics, as well as throughout the whole inter-tropical zone, that this remarkable wasting disease is found. The most considerable degree of immunity is said to be in Iceland and on the Asiatic steppes. While the mortality from this disease is very great, in some European countries amounting to one-seventh of the death- tate, and that, too, among the youth and flower of the people, there is everywhere evidence that a very much larger proportion had incurred a slight degree of the malady and had survived it. Nothing is more common in the course of post-mortem examinations than to find traces of “obsolete tubercle” in the lungs and lymph- atic glands. Cohnheim recalls with some approval a saying that used to be current at Greifswald, that almost every one proved to have been “a little bit tuberculous”; and Rindfleisch bases his pathology of the disease on the assumption that a tuberculous dis- position has become practically universal throughout the human Stock, so that inflammations, under certain aggravated circum- stances, may light up the disease in almost any one. It is peculiarly common in prisons, barracks, and workhouses ; and, in the last- Mentioned, tubercle and scrofula are not rare among the aged. There are instances within the knowledge of most people where the Marriage of first cousins, and still more certainly of double cousins, has been followed by a very pronounced consumptive tendency in

the offspring, even if there had been no very clear history of con- sumption on either side before. No disease runs more in families than tubercle. While there are all these evidences of a widespread constitutional liability to tubercle, it is at the same time clear that the victims of the hereditary taint are only here and there,—perhaps one out of a large family, or one member of a family in childhood and another in the second half of life, according as they had been exposed to sufficient exciting causes. In the most extreme cases of heredity, which are not so rare but that one or more are familiar to every circle, the members of a family fall into consumption one after another as they grow up, as if by an inevitable fate.

The relation of scrofula to tubercle is a subject of much intricacy. The familiar instances of scrofula are the enlarged clusters of lymph- atic glands of the neck in boys and girls, who are either of the fair and delicate type or of the dark and coarse type. Another large class of scrofulous cases are subject to white swellings or other chronic diseases of joints, usually the knee, hip, or elbow. But many slighter conditions, such as eczema of the head and face in children, are set down to scrofula. Again, serious visceral disease leading to a fatal result, especially in the kidneys, testes, ovaries, and bladder, is for some reason reckoned scrofulous rather than tubercular. But this latter class of cases is certainly tubercular, as much as anything can be said to be tubercular. A great part of all that is reckoned scrofulous may be said to be inherited tubercle, affecting the lymphatic glands of the neck most conspicuously, running a very chronic course, often disappearing at puberty, and associated with a delicate skin, fair hair, large eyes, and other features of a well-known type. Of the cases of scrofulous discase in the genito-urinary system and in the joints there may be some in which the disease had been inherited, but there are others in which it had been acquired. The senile scrofula of workhouses and the like is almost certainly an acquired condition. Whether as an inherited disease or as an acquired, scrofula can be separated from tubercle by no very definite line.

Tubercle, as the name implies, is a small tuber or round nodule ; the nodules are often “miliary” or the size of millet-seed. For the variety of diffuse or “infiltrated” tubercle, which is often found in the lungs, it has been made a question whether it should be reckoned as tubercle at all, by reason of its wanting from first to last the character of distinct small nodules. Tubercles are some- times large, especially the tubercles of the genito-urinary organs and of the brain ; and these are generally made up of a number of smaller nodules fused together, and surrounded by a common cap- sule. ‘The larger tubercular masses, or conglomerates of tubercles, are those that have been claimcd as in a peculiar sense scrofulous. The fusion of numerous small tubercular centres into one large arca can often be seen in lymphatic glands in all its stages under the nicroscope. The prevalent modern opinion is that all these vari- ous manifestations are due to the infective action of a virus, Just as in syphilis; and, as the effects of the syphilitic virus include not only gummatous nodules but also “inflammations ’of the skin, mucous membranes, periosteum, and other textures, so the effects of the tubercular

virus include not only “tubercles,” properly so called, but also a variety of diffuse “inflammatory ” conditions.

The most common seat of the tuberculous process is the lungs, so that tubercle and phthisis pulmonalis have almost come to be synonymous. In a certain proportion of cases the tubercles and tuberculous “infiltrations” are found in the lungs only; but in many cases the pulmonary tuberculosis is only a part of a general infection which includes the serous membranes and lymphatic glands, the intestine, the liver, the spleen, the kidneys, the brain-membranes, the choroid coat of the eye, the bones, and the joints. Cases have been described also of tuberculous ulcers of the tongue and stomach, and of tubercles in and around the thoracic duct. On the assumption that tubercle is due to an introduced virus, it has been attempted to classify the cases according to the probable way of ingress of the virus; those with the pulmonary condition most prominent would have received the infection with the breath, while another class, including the numerous cascs where miliary tubercles are found in the liver when carefully looked for with the microscope, would have absorbed the virus along with the food from one part or another of the digestive mucous membrane ; the tuberculous kidney (with ureters and bladder), again, would be explained on the hypothesis of that organ attempting to eliminate the virus from the system. But even among the pulmonary cases there are some in which the tubercles had arisen from infection brought by the venous plood, just as in the dissemination of sarco- matous tumours; it has been shown by the very elaborate dissec- tions of Weigert that tubercles may grow into the walls of veins, the tuberculous substance so getting carried into the blood-current, wherein the first resting-place would be the pulmonary capillaries, except when the vein was tributary to the portal system.

It is difficult to say what is the most characteristic structure of a tubercle. In the class of small grey translucent tubercles, all the same (miliary) size, the cells are practically granulation-cells ; these are not uncommon in childhood and youth, where the attack ig sudden and the progress rapid. In another kind, which Rind-

Bovine tubercle.

fleisch would regard as distinctively “scrofulous,” the substance is opaque and yellowish-white ; there are many epithelial-like cells, or cells with a considerable zone of protoplasm round the nucleus, and, mixcd with these, giant-cells or cells with many nuclei, usually marginal. Except in the most acute cases of miliary tuberculosis, the new formation, whether in the shape of isolated nodules or continuous tracts of “ infiltration,” undergoes changes. Sometimes it becomes a fibrous substance, but by far the most common change is into a yellow cheesy matter. This degeneration is comparable to the gummatous change in syphilitic formations, but in tubercle the degenerate tissue 1s much less cohesive, more friable, drier, more apt to fall into a molecular detritus. The caseous change is the distinctive degeneration of tubercle, the more occasional fibrous and calcareous changes being either its associates or its modifications. The reason of this change is the insufficient blood-supply of the new formation. Nothing so clearly accounts for the structural as well as the degenerative characters of tubercle as growth of tissue without adequate provision for admitting the blood into it.

Bovine Tubercic.—In the corresponding disease of the domesti- eated bovines—a very common disease of cows in town dairies—the characters of the new formations are equally determined by the kind and degree of blood-supply. In this form of tubercle the nodules are, in the first instance, on the serous membranes of the thorax and abdomen; they often attain a considerable size, and sometimes the size of quite large tumours; the vascularity of their surface is very considerable, and it is around their periphery that they grow, as in the case of sarcomatous tumours; but the blood-vessels do not go all through the nodules, their central parts being either calzareous, or caseous, or reduced to a thick mortar-like substance. The chief differences between this form of tubercle and the varieties ordinarily met with in man are that it is a more vascular structure, more like a sarcomatous or fibromatous tumour, with a power of growth from its surface (where the vessels are numerous), and some- times attaining a great size, often suspended from the serous mem- brane by a vascular stalk or pedicle, and, in the interior of organs such as the lung, surrounded by a translucent capsule of vascular tissue, or excavated into a smooth-walled cavity, the thick trans- lucent capsule being all that remains of the original nodule.

The origin of these peculiar multiple new formations in the domesticated bovines is a more likely subject of inquiry than the origin of human tubercle. The bovine disease is generally admitted to have its nodules referable to two distinct classes—primary and secondary: the primary are the multiple nodular tumour-like growths of the serous membranes, and the secondary are the in- fective descendants of these in the lymphatic glands, the lungs, the liver, spleen, kidneys, Fallopian tubes, bones, and joints. The secondary infectiveness of primary new growths is otherwise intel- ligible, according to analogies, and the interest therefore centres in the conditions of origin of the primary, parent, or infecting growths on the serous membranes. They occur by far most fre- quently in the cows of town dairies, that is to say, in animals closely confined for long periods, deprived of pure air and sunlight, forced in their feeding and milking, and altogether placed under such conditions of nutrition as commend themselves, not to an intelligent acquaintance with ruminant requirements, but to the short-sighted maxims of profit and loss which govern the policy of the cowkeeper. The vicissitudes of nutrition are pretty clearly indicated as the starting-point of tubercle in the cow.

In human tubercle we have no such indications of a division into primary new formations arising out of errors.or vicissitudes of nutrition in some tissue, and into secondary new formations due to the infectiveness of the primary. On the other hand, the various new formations in a case of tubercle in man would appear to be co-ordinate, or all of them due toa common cause. Human tubercle is not by any means a multiple nodular eruption on the serous membranes first and in the lymphatic glands and lungs afterwards ; if the disease occur in these three localities it is necessary to assume the same infective cause for it in them all. Most usually the first indications of human tubercle are at the apex of one or both lungs, and, in a considerable proportion of cases, the disease never goes beyond the lungs. But it is not on that account a purely pul- monary disease. For some reason the lungs are most apt to become the seat of the infection ; but there are many cases in which the infection locates itself elsewhere as well, and there are some cases in which it avoids the lungs altogether. An infective virus has to be assumed, and yet we are unable, as in bovine tubercle, to dis-

cover any primary source of it in the physiological aberrations of.

the human body itself. The problem of human tubercle, therefore, may be said to be: Does the infection reach the body from with- out ? and, ifso, whence are its structural or morphologically mimetic characters originally derived? While some such question as that has to be stated for human tubercle in the last resort, it has to be kept in mind that a very large part of the sum-total of human tuberculous discase is an affair of strong hereditary predisposition, and even of direct inheritance. In bovine tubercle itself, which is often acquired de novo by cows subjected to grossly artificial con-

ditions of life, inheritance is credibly estimated to be answerable for more than one-half of its present very considerable total.

The pathology of tubercle (bovine and other) has had much light thrown on it by caperiments to produce it artificially in animals by inoculation of minute quantities of tuberculous matter under the skin, or by mixing considerable quantities of tuberculous matter with the food for a length of time, or by feeding with the milk of tuberculous cows. A very suggestive proportion of all such experiments have succeeded. It has been boldly alleged by Koch that the active agent in the inoculative production of tubercle is not the tuberculous matter from a previous case, but a minute rod-like living parasite belonging to the order of schizo- mycctes (see SCHIZOMYCETES). According to this view tubercle js from first to last an affair of a parasite, equally the human tubercle and the bovine, although these two forms of tubercular disease are widely different in their anatomy. The weak point in the experimental evidence of Koch is that we are not sufficiently assured of the absolute separation of the tuberculous matter from the parasites. There.is not reason enough to suppose, from the pub- lished details of these experiments, that the original tuberculous matter had all been got rid of ; and there is thercfore not reason enough to suppose that the induced tuberculous infection is due to anything but that matter itself, whose infective power, although not initiated by the organisms present, would probably be multi- plied by their cultivation.

In the same class with syphilis and tubercle should be taken Other glanders, primarily a disease of the horse, but now and then com- chroni municated to man. There are various tropical and sub-tropical infec- granulomatous infections of great scientific interest which can only tions, be mentioned,

such as yaws, verruga Peruviana, Aleppo boil, Delhi boil. There is also the button-sewrvy of Ireland, now probably extinct. Lupus holds a peculiar place in this class of diseases. The position of Jceprosy also is an intermediate one, and its patho- logy the most difficult of all the constitutional endemic infective diseases. It was with reference to leprosy, and with particular reference to its enormous medieval prevalence and subsequent extinction in most parts of Europe, that Sir James Y. Simpson Simps) wrote as follows in 1841 (‘‘ Antiquarian Notices of Leprosy and on the Leper Hospitals in Scotland and England,” Edin. Med. and Surg. origin Journ., vol. lvi.):— ‘The generatio de novo of a really new species of diseas), disease,’ says Dr Mason Good (Study of Med., i. pref. p. xxiii.), ‘is speciey perhaps as much a phenomenon as a really new species of plant or of animal.’ Dr Good’s remark is probably too sweeping in its princi- ple ; for, if necessary, it might be easy to show that, if the particular diseases of particular animal species are liable to alteration at all, they must necessarily alter more frequently than those animal species themselves. In pursuing such an inquiry the pathologist labours under comparative disadvantages. The physiologist can, by the aid of gcological research, prove that the individual species of plants and animals inhabiting this and other regions of the earth have agai and again been changed. The pathologist has no such demonstra- tive data to show that, in the course of time, the forms and species of morbid action have undergone great mutations, like the forms and species of normal life. But still we have strong grounds for believing that, in regard to our own individual species alone, the diseases to which mankind are subject have already undergone, in some respects, marked changes within the historic cra of medicine, ” +

§ 17.—Toxic DIsEAsEs.

In various parts of the world and at various periods there have been widespread outbreaks of sickness due to

1 See Hirsch, Mandbuch der historisch-geographischen Pathologie, vols. i, and ii, 2d ed., Berlin, 1881-83 (Engl. transl. vol. iL, New Syd. Soc., Lond., 1888); Hiser, Lehrbuch der Geschichte der Medicm und der epidemischen Krankheiten, vol. iti., 8d ed., Jena, 1882; Robert Williams, On Aforbid Poisons, 2 vols., Lond., 1836-41 ; Mur- chison, The Continued Fevers of

Great Britain, 2a ed., Lond., 18/ 3; G. Gregory, Lectures on the Eruptive Fevers, Lond., 1848 ; Christison on “ Fevers’? and ‘Continued Fever,” in Tweedie’s Library of Medi- cine, vol. i., Lond., 1840; La Roche, Yellow Fever, 2 vols., Phila- delphia, 1855; Audouard, Recueil de Mémoires sur le Typhus nautque, ou Fiévre jaune, Paris, 1825; John Simon, “On Filth Diseases, Report of the Med. Officer of the Privy Council for 1874; J. Hutchin- son, Clinical Memoirs . . . on inherited Syphilis, &c., Lond., 1863, and “Constitutional Syphilis,” in Reynolds’s System of Medicine, vol. i., 1866; Virchow, Ueber die Natur der constitutionell-syphilitischen Affectionen, Berlin, 1859, and in his Krankhaften Geschwiilste, vol, il., chapter on “Granuloma”; Klebs, “ Ucber die Entstehung der Tuber- culose und ihre Verbreitung im Kiérper,” Virchow’s Archiv, vol. xliv.,) 1868; Colnheim, Die Tuberculose vom Standpunkte der I nfectionslehre, Leipsic, 1880; Walley, Zhe Four Bovine Scourges, chapter on “ Bovine Tuberculosis,” Edin., 1879 ; Lydtin, ‘Die Perlsucht,” in 4 rehiv fi wissensch. und pract. Thierheilkunde for 1884 (Engl. ed. by Fleming) ; R. Koch, “ Die Aetiologie der Tuberculose,” Berl. Alin. Wochenschrift, April 1882.

certain toxic or poisonous substances mixed with the staple food of the people. Perhaps the best known of these is gangrene caused by ergot of rye. One form of the disease is characterized by acute pain and gangrenous destruction of the skin, the gangrene sometimes spreading to the deeper structures and to the bones, and leading to loss of the limbs. At times the mortality from this disease has been great. Numerous epidemics of it have occurred in France (rarely during the present century); in other parts of the continent of Europe (Sweden, Norway, Russia) the effects of ergotism have taken the form of a nervous (convulsive) disease called “ Kriebelkrankheit.” The effects are those due to ergot, the compact mycelium of Claviceps purpurea, produced within the pales of the common rye. This substance, well known in medicine, is accidentally ground with the rye, and produces gangrene by contract- ing the muscular coats of the arteries of the skin so as to seriously diminish the amount of blood sent to it, or it affects the nervous system. (See ERcor.)

Another toxic effect closely allied to ergotism is the pellagra of Lombardy. (See PELLAGRA.)

A third disease of the same kind is acrodynia, having a resem- blance to ergotism on the one hand and to pellagra on the other. It appears to be somehow connected with bad grain, but the actual poison has not been traced, as in the case of ergot. The observa- tions relating to it have been mostly made in France, and in the French army in Syria, in Algicrs, and in Mexico. The succession of symptoms is somewhat complex, including disorders of the stomach and intestine, conjunctivitis, oedema of the face, disorders of sensibility and locomotion, and erythematous rashes, mostly on the hands and feet.

In Colombia (South America) a peculiar disease, characterized by the hair coming out (pelade), is traced to the ergot- parasite of maize.

In the prairie Statcs of the American Union there is a disease of cattle (and sheep) called “the trembles,” supposed to be due to some toxic substance in the pasturage. In the human subject in those localities there is a corresponding malady called “the milk-siekness,” and suspected of being caused by partaking of the milk or flesh of cows which had been primarily aficcted.

Among toxic diseases we have to include also lead eolie, or “dry .belly-ache,” to which workers in the various compounds of lead are liable, as well as communities here and there whose food or drink, in the course of its preparation or storage, has been con- taminated by lead. Workers with phosphorus, also, are liable to necrosis of the lowcr jaw. More occasional effects are produced by some other chemical elements used in manufacture.

By far the most important toxic agent is aleohol, which is often sold in public-houses when it has all the powerfully in- juious properties of new spirit in it. The enormous excise duty of 10s. per gallon is apt to make us forget the coarse and cheap nature of the alcohol often sold as whisky; this product of distillation may be purchased new from distilleries at as low a rate

as 1s. 6d. per gallon. The retailing of such new whisky is answer- able for an amount of disease—to say nothing of violence and crime —which an equal quantity of mellowed spirit would by no means produce. There are some not uncommon forms of kidney-disease and of liver-disease which are, in the great majority of cases, the direct results of raw spirits. Both in the liver and the kidney the effect of such spirits is to cause an active growth of the support- ing tissue of the organ at the expense of its proper metabolic or glandular tissue. In the case of the liver it causes cirrhosis or hobnailed liver, which is accompanied by abdominal dropsy ; in the case of the kidney it causes a contracted condition, to which the name of cirrhosis is also applied, being one of the forms of Bright's disease. Besides these organs the stomach is apt to become affected by coarse spirits taken frequently ; it falls into a state of chronic catarrh, on the basis of which cancer is apt to plant itself.

_ § 18.—Parasitic DISEASES.

Reference has been made to the occurrence of a spiral micro-organism in the blood in cases of relapsing fever, to the so-called "bacillus of tubercle," and to the occurrence of micrococci in erysipelas and infective inflammations. For the splenic fever and other anthraceous diseases of the domestic animals, very conclusive experimental evidence has been brought forward by Pasteur and others that the virus somehow goes with or resides in the bacilli which are apt to swarm in the blood. These bacilli also occur in the malignant pustule and wool-sorters' disease of man, —forms of anthrax which are produced by handling the hides and fleeces of animals. In diphtheria and ulcerative endocarditis micrococci are abundant in the tissues of the affected localities. They are also described for malignant osteo- myelitis, and a peculiar double form (diplococcus) has been discovered in pneumonia. The doctrine of infective para- sitism is applied by some pathologists to the whole of the specific infective diseases, acute and chronic, as well as to malarial fevers, which are non-communicable. There can be no doubt of the occurrence of very various forms of micro-organisms in the tissues after death from diseases, specific and other, and in the blood and tissues during the course of some diseases, and even in states of fair health. It is premature to call all these bacteria " pathogenic." Their

significance in morbid states of the body will be considered, along with their natural history, in the article ScHIZOMYCETES.

The animal parasites infesting the human body and the fungi concerned in some skin-diseases and in actinomycosis are treated of in the articles ParasitisM, NEMATOIDEA,

and TAPEWORM.

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PATIALA, one of the cis-Sutlej states, Punjab, India, lying between 29° 23’ 15” and 30° 54’ N. lat., and be- tween 74° 40’ 30” and 76° 59’ 15” E. long., has an area of 5887 square miles, and a population (1881) of 1,467,433. The estimated gross revenue is £471,624. The larger portion of the state is situated in the plain south of the Sutlej, while the other is hill country stretching up to Simla, which formerly belonged to Patidla. The usual cereals form the principal agricultural products. The ruling family are Sikhs of the Sidhu Jat tribe.

PATMOS (now pronounced by the natives Patino”), an island in the east of the AZgean Sea, one of the group of the Sporades, about 28 miles south-south-west of Samos. It lies in 37° 20’ N. lat and 26° 35’ E. long. Its greatest length from north to south is about 10 miles, its greatest breadth 6, its circumference, owing to the winding nature of the coast, about 37. The island, which is volcanic, is bare and rocky throughout; the hills, of which the highest rises to about 950 feet, command magnificent views of the neighbouring sea and islands. The woods which once covered the island have disappeared ; of the palms, from which it formerly received its Italian

name of Palmessa, not more than one is left. Some poor olive trees and a few specimens of the mulberry, the fig, the orange, the lemon, the carob, the cypress, the oak, and the pine here and there refresh by their verdure an eye wearied by the prospect of barren mountains, only relieved in places by scrubby bushes or clumps of thyme. The skill of the natives as seamen is proverbial in the archipelago. The deeply-indented coast, here falling in huge cliffs sheer into the sea, there retiring to form a beach and a harbour, is favourable to commerce, as in former times it was to piracy. Of the numerous bays and harbours the chief is that of La Scala, which, running far into the land on the eastern side, divides the island into two nearly equal portions, a northern and a southern. A narrow isthmus separates La Scala from the Bay of Merika on the west coast. On the belt of land between the two bays, at the junction between the northern and southern half of the island, stood the ancient town. To judge from its traces, it may have contained 12,000 to 13,000 inhabitants. On the hill above are still to be seen the massive remains of the citadel, built partly in the polygonal style known as Cyclopean. The modern town stands on a hill-top in the southern half of the island. A steep paved road leads to it in about twenty minutes from the port of La Scala. The town clusters at the foot of the monastery of St John, which, crowning the hill with its towers and battlements, resembles a fortress rather than a monastery. Of the 600 MSS. once possessed by the library of the monastery only 240 are left, badly preserved, and none of them of value. The houses of the town are better built than those of the neighbouring islands, but the streets are narrow and wind- ing. The population is about 4000. The port of La Scala contains about 140 houses, besides some old well- built magazines and some potteries. Scattered over the island are about 300 chapels.

Patmos is mentioncd first by Thucydides (iii. 83) and afterwards by Strabo and Pliny. From an inscription it has bcen inferred that the name was originally Patnos. There are some grounds for the conjecture that the island was first colonized by Carians. Another ancient inscription seems to show that the Ionians also settled there at an early date. The chief, indeed the only, title of the island to fame is that it was the place of banishment of St John the Evan- gelist, who according to Jerome (De Ser. Ill., c. 9) and others, was exiled thither under Domitian in 95 a.p., and released about eighteen months afterwards under Nerva. Here he is said to have written the

Apocalypse; to the left of the road from La Scala to the town, about half-way up the hill, a grotto is still shown (rd o7jAatov Tis “AmoxadvYews) in which the apostle is said to have received the heavenly vision. It is reached through a small chapel dedicated

toSt Anne. In the library of the monastery there is a Greek MS. containing a curious history of St John, purporting to be by Pro-

chorus, one of his disciples but apparently composed in the 4th century. It narratcs the miracles wrought by the apostle durin lis stay on the island, but, strangely enough, while describing how the Gospel was revealed to him in Patmos, it does not so much as mention the Apocalypse. During the Dark Ages Patmos seems to have been entirely deserted, probably on account of the pirates In 1088 the emperor Alexis Comnenus, by a golden bull, which is still preserved, granted the island to St Christodulus for the pur. pose of founding a monastery. This was the origin of the monastery of St John, which now owns the greater part of the southern half of Patmos, as well as farms in Crete, Samos, and other neighbouring islands. The embalmed body of the saintly founder is £6 be seen to this day in a side chapel of the church. The number of the monks, which amounted to over a hundred at the beginning of last century, is now much reduced. The abbot (7yovmevos) has the rank of a bishop, and is subject only to the patriarch of Constantinople. There is a school in connexion with the monastery which formerly enjoyed a high reputation in the Levant. The lay population was originally confined by St Christodulus to the northern part of the island, but at the beginning of the 18th century the people received permission to build their houses near the monastery for protection against the pirates. Hence arose the modern town, It was recruited by refugees from Constantinople in 1453, and from Crete in 1669, when these places fell into the hands of the Turks. The trade of the island seems to have been considerable. It was in intercourse with Genoa and Venice that the port received its modern name of La Scala ; its ancient name seems to have been Phora. The island is subject to Turkey ; the governor is the pasha of Rhodes. The ’ population is Greek. The women, who are handsome, are chicfly« engaged in knitting

cotton stockings, which, along with some pot- tery, form the chief exports of the island.

See Tournefort, Relation dun Voyage du Levant, Lyons, 1717; Walpole, Memoirs (relating to Turkey), London, 1820; Ross, Reisen auf den gricchischen

Inseln, Stuttgart and Halle, 1840-52; and especially Guérin, Description de UIle de Patmos, Paris, 1856.

PATNA, a district in the heutenant-governorship of Bengal, and in the division or commissionership of Patna, lying between 24° 58’ and 25° 42’ N. lat., and between 84° 44’ and 86° 5’ E. long., is bounded on the N. by the river Ganges, which separates it from Sdéran, Muzaffarpur, and Darbhangah, on the E. by Monghyr, on the 8. by Gay4, and on the W. by the Son, which separates it from Shahabéd. Patna district, with an area (1881) of 2079 square miles, is, throughout the greater part of its extent, a level plain; but towards the south the ground rises into hills. The soil is for the most part alluvial, and the country along the bank of the Ganges is peculiarly fertile. The general line of drainage is from west to east; and high ground along the south of the Ganges forces back the rivers flowing from the district of Gay&. The result is that, during the rains, nearly the whole interior of the district south of a line drawn parallel to the Ganges, and 4 or 5 miles from its bank, is flooded. There are no forests or jungles of any extent, but fine groups of trees are found in many places. In the south-east are the Rajagriha Hills, consisting of two parallel ridges running south-west, with a narrow valley between, intersected by ravines and passes. These hills, which seldom exceed 1000 feet in height, are rocky and clothed with thick low jungle, and contain some of the earliest memorials of Indian Buddh- ism. Hot springs are common on the Réjagrihd Hills. The chief rivers are the Ganges and the Son. The total length of the former along the boundary of Patna is 93 miles. The Son first touches the district near Mahibalipur village, and flows in a northerly direction for 41 miles, till it joins the Ganges. -The only other river of any con sequence is the Punpun, which is chiefly remarkable for the number of petty irrigation canals which it supplies. So much of the river is thus diverted that only a small portion of its water ever reaches the Ganges at Fatwa. Great changes have from time

to time taken place in the course of the Ganges, and the point at which the Son

1 The division of Patna lies between 24° 17’ 15” and 27° 29″ 45″ N. lat., and between 83° 23’ and 86° 46’ E. long., and comprises the districts of Patna, Gay4, Shahdbad, Darbhangah, Muzaffarpur, Saran, and Champaran. The area (1881) was 23,647 square miles, and the population 15,063,944, viz., Hindus 18,327,728, Mohammedans 1,730,098, Christians 5875, and “others” 248.

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joined this river was once several miles east of its present

osition. Large game is not abundant except on the Rajagriha Hills, where bears, wolves, and jackals are com- mon, and hyzenas are sometimes seen. Of smaller game, duck, quail, and ortolan are abundant, and partridges and wild geese are also found.

The census of 1881 returned the population at 1,756,856 persons (males 858,783, and females 898,073). Hindus numbered 1,541,061, Mohammedans 213,141, Christians 2588, and ‘‘others” 66. Of high-caste Hindus there are 47,041 Brahmans and 64,332 Rajputs. Ranking next to these two castes are the Babhans, a class who number 121,381 in Patna district, and whose origin is much dis- puted. They assert themselves to be Sarwaria Brahmans, but, although they are held in high respect, this rank is not generally accorded to them. Among the Sudras the most numerous are the Goalas or Ahirs, the great herdsman class, of whom there are 217,845; and the Kurmis, an agricultural caste, who number 194,222, Among the semi-Hinduized aboriginal tribes the Dosddhs, the or- dinary labouring class of Behar, number 99,976. The Wahabis form the most interesting section of the Mohammedan community. They are a numerous body, and include several wealthy traders, though the majority belong to the lower classes. The following towns in the district contained a population in 1881 exceeding 10,000—Patna city (170,654) ; Behar (48,968) ; Dinapur, including the cantonment (37,893); Barh (14,689); Khagaul (14,075) ; Mukama (13,052); Fatwa (10,919).

Rice, which forms the staple of the district, is divided into two great crops —the kartikd or early rice, sown in June or July and reaped in October or November ; and the aghdnt or winter rice, sown after the commencement of the rains and cut in November or December. The boro or spring rice is also cultivated to a limited extent, being sown in November or December and reaped in April or May. By far the most important of these is the aghdnt crop, of which forty-six varieties are named. Among the other principal crops are wheat and barley, Lhesdrt, gram, pease, cotton, tobacco, sugar-cane, a little indigo and mustard, several other oil-producing plants, and poppy. _ All the poppy grown in the province of Behar is manufactured at Patna city.

Patna is subject to blights, floods, and drought, but seldom to such an extent as to seriously interfere with the general harvest. There are abundant facilities for importations of grain in case of distress. The trade of the district centres in Patna city, which, next to Calcutta, is the largest river-mart in Bengal. The total length of district and provincial roads is 454 miles. The East Indian Railway tra- verses the entire length of the district for 86 miles. Several news- papers are published at Patna, the most important being the Behar Herald, published weekly and conducted by the native pleaders of the Patna bar.

Patna is one of the two places in British India where opium is manufactured. The poppy cultivated is exclusively the white variety (Papaver somniferum album), and the crop requires great attention, The amount of produce from various lands differs con- siderably. Under favourable circumstances of soil and season, the out-turn per acre may be as high as 41 Ib of standard opium (ie., containing 70 per cent. of pure opium and 30 per cent. of water), paid for by the Government at the rate of 5s. per Ib; but the aver- age is from 21 to 27 tb per acre. The opium is made up into cakes weighing about 4 tb, and containing about 3 tb of standard opium. These cakes are packed in chests (forty in each), and sent to Cal- cutta for exportation to China. The price which they fetch varies every year; the average rate per chest in 1880-81 was about £135 and the cost £89.

The net revenue of Patna in 1882-83 amounted to £278,550, of –

which £147,205 was derived from the land-tax. In 1874-75 there were, exclusive of the Patna college, 309 Government and aided schools with 9003 pupils ; by 1877-78 the number had risen to 816, and the pupils to 16,396. The Patna college was founded in 1862, and is the only institution for superior instruction in Behar ; the total number of pupils in 1881-82 was 166. The climate of Patna is considered remarkably healthy. The average annual rain- fall is 85°66 inches.

PATNA, chief city of the above district, is situated in 29° 37′ 15” N. lat. and 85° 12’ 31” E. long., on the right or south bank of the Ganges, and adjoining Bankipur, the civil station and administrative headquarters of the dis- trict. Its central position at the junction of three great Nvers, the Son, the Gandak, and the Ganges, where the trafic of the North-Western Provinces meets that of Bengal, Sives it great natural advantages. The city proper com- prises the large business quarters of Marufganj, Man- Strganj, the Kila or fort, the Chauk, with Mirchaiganj, Mahardjcanj,SAdikpur, Alabakhshpur, Gulzdrbagh, Colonel-

ganj, and other petty bazaars extending westwards as far as Bankipur civil station. According to the census of 1881 its population was 170,654 — Hindus 127,076, Mohammedans 43,086, “others” 492.

History.—Patna city has been identified with Pataliputra (the Palibothra of Megasthenes, who came as ambassador from Seleucus Nicator to Chandragupta about 300 B.c.). Megasthenes describes Palibothra as being the capital city of India. He adds that its length was 80 stadia, and breadth 15, that it was surrounded by a ditch 30 cubits deep, and that the walls were adorned with 570 towers and 64 gates. According to this account the circumference of the city would be 190 stadia or 254 miles. When Hwen T’sang visited the place in 687 a.D. the kingdom of Magadha was subject to the rule of Kanauj. The old city had then been deserted for a long time, and was in ruins, although a new Pataliputra had sprung u close to it. In the south-east of Patna district, in the Rajagriha Hills, are found some of the earliest remains of Indian Buddhism. During the early years of Mohammedan rule the governor of the province resided at Behar town in

the south-east of the district. During Sher Shah's revolt against the Mughals, Patna became the

| capital of an independent state, which was afterwards reduced to

subjection by Akbar. The two events in the modern history of the district are the massacre of Patna (1763) and the Sepoy Mutiny in 1857. The former occurrence, which may be said to have settled the fate of Mohammedan rule in Bengal, was the result of a quarrel between the nawab, Mir Kasim, and the English authorities re- garding transit duties, which ultimately led to open hostilities. The company's sepoys, wlio had occupied Patna city by the orders of the company's factor, were driven out by the nawab's troops and nearly all killed. The remainder afterwards surrendered, and were put into confinement, together with tlhe European officers and the entire staff of the Kasimbazar factory, who had also been arrested on the first outbreak of hostilitics. Mir Kasim was defeated in two pitched battles at Gheria and Udhanala (Oodeynullah) in August and September 1763, and in revenge ordered the massacre of the whole of his prisoners, which was carried out with the help of a Swiss renegade in his employment, named Walter Reinhardt (afterwards the husband of the famous Begam Samru). About sixty English prisoners were murdered on this occasion, the bodies being thrown into a well belonging to the house in which they were confined.

At the outbreak of the mutiny in May 1857 the three sepoy regiments stationed at Dinapur (the military cantonment of Patna, adjoining the city) were allowed to retain their arms till July, when, on an attempt being made to disarm them, they broke into open revolt, Although many who attempted to cross the Ganges in boats were fired into and run down by a pursuing steamer, the majority crossed by the Son river into Shahabad, where they joined the rebels under Kuar Sinh, who were then besieging a small European community at Arrah. —

PATNA, a native state in the Central Provinces of India, lying between 20° 5' and 21° N. lat., and between 82° 45' and 83° 40' E. long., has an estimated area of 2399 square miles, of which 550 are under cultivation, and other 950 are returned as cultivable. The country is an undulating plain, rugged and isolated, with ridges of hills crossing it here and there, and shut in on the north by a lofty irregular range. Rice forms the staple produce, but

pulses, oil-seeds, sugar-cane, and cotton are also grown, A vast forest extends for 30 miles around Patna village containing valuable large timber, but infested by tigers, leopards, and other wild animals. Iron ore exists in many parts of the state, but no mines are regularly worked. The only means of communication are a few bullock or pony tracks. The estimated population in 1881 was 957,959, nearly all of whom were Hindus. Patna was formerly the most important of the cluster of chiefships known as the Athéra Garhjdt (The Eighteen Forts), but under its later rulers it greatly declined. Since 1871, however, when it was taken under direct British manage- ment, it has gradually been regaining prosperity.

PATRAS, or Patra (Ital. Patrasso, Turkish Balia- badra), a fortified city of Greece, the principal port of the Morea, and the chief town of the nomos of Achaia and Elis, lies on the north coast of the Morea on the east side of the Gulf of Patras, which opens into the Gulf of Corinth by the Little Dardanelles, marked by forts Kastro Moreas and Kastro Rumelias. Since the War of Independence Patras has been one of the most prosperous cities in the

kingdom ; the quarters of the new town are well laid out; its old harbour being considered hardly safe in winter, a new harbour defended by a breakwater was commenced in 1880; new roads (to Kalavryta, for example) are opening up communication with the interior ; a railway to connect the city with Corinth and Athens is in process of con- struction (1884); and the proposed cutting of the canal across the isthmus of Corinth would add new elements to its commerce. The population, which had sunk to 8000 at the time of the war, was 16,641 in 1870, and 24,993 in 1879. Patras is the seat of one of the four courts of appeal in the kingdom, and the residence of the arch- bishop of Patras and Elis. The custom-house is the most important in all Greece. Like the ancient city, the modern Patras previous to the revolution occupied the high ground of Scatovuni (a hill connected with Mount Voidia or Pan- achaicum, the dominant summit in this region), but since then it has spread out over the plain towards the sea. The two most interesting buildings are the castle, a medieval structure on the site of the

ancient acropolis, and the cathedral of St Andrew, which is highly popular as the reputed burial-place of the saint, and has been rebuilt since the revolution. The commerce of Patras consists mainly in the export of currants, valonia, olive-oil, wine, and sheepskins (value in 1881, 19,369,270 francs, of which 18,104,046 francs were for currants alone), and the import of cotton and woollen goods, grain, flour, and colonial wares (value in 1881, 16,560,600 francs). Great Britain and Austria almost divide the foreign shipping trade, with a preponderance in favour of the former country, which takes more than half of the currants. August and September are the months when the port is at its busiest with British vessels. Famous even in antiquity for its flax manufactures (whence the number of females in the city was double that of the males), Patras at present contains several steam factories with about 4000 spindles producing coarse cotton twist from cotton grown in north- ern Greece; and there are also sulphur-crushing mills, flour and macaroni mills, and an iron-foundry. Gas-works and water-works were constructed about 1874.

The foundation of Patras goes back to prehistoric times, the legendary account being that Eumelus, having been taught by Triptolemus how to grow grain in the rich soil of the Glaucus valley, established three townships, Aroe (7.¢., plonghland), Antheia (the flowery), and Mesatis (the middle settlement), which were united by the common worship of Artemis Triclaria at her shrine on the river Meilichus. The Achaians having strengthened and enlarged Aroe called it Patra as the exclusive residence of the ruling families. In 419 zc. the town was, by the advice of Alcibiades, connected with its harbour by long walls in imitation of those at Athens. The whole armed foree of Patre was destroyed by Metellus after the defeat of the Achaians at Scarpheia, and many of the remain- ing inhabitants forsook the city ; but after the battle of Actium Augustus restored the ancient name Aroe, introduced a military colony of veterans from the 10th and 12th legions (not, as is usually said, the 22d), and bestowed the rights of coloni on the inhabitants of Rhype and Dyme, and all the Locri Ozole except those of Am- phissa. Colonia Augusta Aroe Patrensis became one of the most populous of all the towns of Grecce ; its colonial coinage extends from Augustus to Gordian III. That it was the seene of the martyrdom of St Andrew is purely apocryphal, but, like Corinth, it was an early and effective centre of Christianity ; its archbishop is mentioned in the lists of the council

of Sardica in 347. In 551 Patre was laid in ruins by an earthquake. In 807 it was able without external assistance to defeat the Slavonians (Avars), though most of the credit of the victory was assigned to St Andrew, whose church was enriched by the imperial share of the spoils, and whose archbishop was made superior of the bishops of Methone, Lacedemon, and Corone. Captured in 1205 by William of Champlitte and Ville- hardouin, the city became the capital and its archbishop the primate of the principality of Achaia. In 1587 De Heredia, grand- master of the order of the Hospital at Rhodes, endeavoured to make himself master of Achaia, and took Patras by storm. At the close of the 15th century the city was governed by the arch-bishop in name of the pope ; but in 1428 Constantine, son of John VI., managed to get possession of it for a time. Taken by a Spanish fleet under Andrea Doria in 1532, sacked by another

Spanish fleet in 1595, and again sacked by the knights of Malta in 1608, Patras was at length in 1687 surrendered by the Turks to the Venetians, who made it the seat of one of the seven fiscal boards into which they divided the Morea. Greek revolution began in 1821; but the Turks, confined to the

It was at Patras that the

citadel, held out till 1828, when the French troops took possession of the Morea.

See 0. I. L., vol. iii. 1; Bursian, Geogr. von Griechenland and Finlay’s Hist of Greece. ‘

PATRIARCH (zarpidpxys, lit. the head or ruler of a

watpid, tribe, family, or clan) occurs four times in the New Testament, being applied to Abraham, the twelve

sons of Jacob collectively, and David, and several times in the LXX., where the word is used to denote the officials called by the chronicler “princes of the tribes of Israel,” ‘‘ princes of hundreds,” ‘chiefs of the fathers.” Under the late Roman empire the title was officially applied down to the 5th

century to the chief rabbi in Palestine (see Cod. Theod., xvi. 8, 1; and comp. Israzt, vol. xiii. p. 428); the head of the synagogue at Babylon appears also to have been known as patriarch until 1038. The title at an early date passed over into the Christian church as an honorific though not official designation of all bishops ; thus Gregory of Nyssa (Or. Fun. in Mel.) alludes to the fathers assembled in council at Constantinople as “these patriarchs.” After- wards the Easterns showed a tendency to limit the appella- tion to the occupants of the more important sees, just as in the West the so-called ‘“ metropolitans” began to receive more definite recognition. At the present day the heads of the various extant churches and sects in the East are very commonly called patriarchs (see vol. xi. p. 154 sq.), and in the West the Roman Church gives the honorary title to several dignitaries, such as the archbishops of Lisbon and Venice. In a strictly technical sense, how- ever, that church recognizes only five patriarchates, those of Constantinople, Alexandria, Jerusalem, Antioch, and Rome. This peculiar restriction of the word, which may be said to date from the council of Chalcedon in 401, can be traced downwards from the time of Constantine, when the altered political circumstances and the civil division of the empire into four prefectures (Orientis, Illyrici Orientalis, Italie, Galliarum), each containing a number of “dioceses,” gave a new importance to ques- tions of ecclesiastical jurisdiction. Thus the council of Nice (can. 6) adjusted the jurisdiction of the “bishop .

of Alexandria so as to include Libya and Pentapolis as well as Egypt, the ancient rights of Rome, Antioch, and the other “eparchies” being at the same time con- served. The third canon of the council of Constantinople assigned precedence to the “bishop” of Constantinople immediately after the “bishop” of Rome; and by the 28th of Chalcedon the ‘ metropolitans” of Thrace, Pontus, and Asia were appointed to receive their consecration at his hands. The same council invested the bishop of Jerusalem, formerly under the jurisdiction of the metro politan of Antioch, with supremacy over the whole of Palestine. Thenceforward a certain co-ordinate primacy Was thus accorded to Rome, Constantinople, Antioch, Alexandria, and Jerusalem ; but it is to be observed that in no official document belonging to this period is the title “patriarch” given to the bishop of any one of these sees, though the word “eparch” or ‘“exarch” is occasionally employed. We find Theodosius, however, so designating the bishop of Rome, and not only is it

given to the bishop of Com stantinople in the Wovelle of Justinian, but we find Mennas in 536 claiming to be called 6 oixovpevexds TAT pUpX7Ss not, of course, without violent protest in the West. After the fall of Jerusalem (637), Antioch (638), and Alexandria (640) into the hands of the Saracens, the importance of these sees became of course nominal merely, and it grew easier for Rome, at the head of the unbroken Western church, to give practical expression to its claims of supet

ority over its sole surviving Eastern rival. Finding it difficult, however, to avoid the appearance of equality that was involved in the name of " patriarch," now convention- ally bestowed on the occupants of other ancient and apostolic sees, the bishops of Rome rather avoided the title, preferring the more colourless designation of papa or pope (see PoP).

PATRICIAN. The history; in the Roman state, of the hereditary patrician order (patricit, patres, house-fathers, goodmen) who originally constituted the entire populus Romanus has been traced in the article Nopitity (vol. xvii. pp. 525-6). With the transference of the imperial capital to Byzantium under Constantine, the title patricius became a personal and not an hereditary distinction ; the name was held to denote a fatherly relation to the emperor, and those who bore it stood first among the VII. The title was abolished by Pope Eugenius III. in 1145.

PATRICK, Sr. In one of the incursions of the Scots and Picts upon the neighbouring Roman province south of the wall of Severus, probably that of 411 a.p., the year after Honorius had refused aid to the Britons, a youth of about fifteen was carried off with many others from the district in the neighbourhood of the wall at the head of the Solway, and sold asa slave on the opposite coast of Ireland in the territory of the Irish Picts called Dal Araide.1 This youth was the future apostle of the Irish. As his name implies, he was of noble birth, and he tells us so himself. He was the son of the deacon Calpurnius, who was the son of Potitus, a priest. His father was a decurio or magistrate, and, as Patrick according to tradi- tion was born at Nemthur,? he must have exercised his functions of magistrate at that place, but on the with- drawal of the Roman garrisons from Britain probably

1 The province of Valentia, reorganized by Theodosius I., was com- prised between the wall of Antoninus, which extended from the Clyde tothe Firth of Forth, and the wall of Severus, which extended from the Solway to Tynemouth. Although the destruction of the pagan temples was decreed in 381, and the pagan religion prohibited in 390, that is, a few years after the restoration of Roman power in Britain and the reorganization of this province by Theodosius, the greater part of the Romanized population of Britain seems to have been pagan at the end of the 4th century, and especially in Valentia, where Patrick Was born about 396. Amidst the many evidences of Roman occupa- tion that have been found there not a relic of Roman Christianity has, so far as we know, been yet discovered. In the south-west part of Valentia, along the north shore of the Solway Firth from the Nith to the Irish Channel, Ptolemy placed the tribe of the Novante, its principal dun or oppidum being on the west side of Wigtown Bay, and called by him Leukopibia, a name still preserved in Whithorn. During the great displacements of tribes consequent upon the Roman conquests and the inroads of the Scots and Picts, the British Novante disappear, and in their place we find at the end of the 4th century Goidelic Cruithni or Picts. Their position in the midst of a British population, pee their contiguity to the part of Ulster occupied by the Irish

Tuithni or Picts, clearly indicate that the Picts of Galloway were part of the Ulidian or Irish Picts pressed out of Iveland by the intru- i of the Scots. This settlement of the Irish Picts in Galloway

orded an excellent vantage-ground for such attacks as that spoken oD the text. & There can be no doubt that Nemthur was situated at the Clyde

nd of the wall of Antoninus, where Dumbarton now is. It is called

Nevtur in the Old Welsh MS. known as the ‘‘ Black Book of Car-Marthen,”?

retired for safety south of the wall of Severus, where, as Patrick tells us, he had a small country place (villula) near the town (vicus) of Bannavem Taberniz, whence Patrick was carried off. The country along the south of the wall, especially near the Solway, was a region of camps or military posts to which the designation Tabernia would be appropriate. Bannavem

seems to be a Romanized form of a British name signifying “river foot,” and most probably was the Banna of the Chorography of Ravenas, and of the inscription on an altar said to have been found at Birdoswald (the Romano-British Amboglanna), and now at Lanercost Priory. The name also occurs on the well- known bronze cup found about two hundred years ago at Rudge in Wiltshire, which dates from about 350. Banna must have been near Petriana, the former being probably the vicus or town, and the latter the military station proper. Towards the end of the 4th century, before the withdrawal of the Roman garrisons, there were along the wall 10,300 foot and 1500 horse according to the Wotitia Imperit, so that Bannavem Taberniz, or Bannavem of the military posts or encampments, was descriptive of the district, and the office of decurio in such a place one of considerable dignity.

The youth Succat or Patrick remained in hard slavery

for six years, tending cattle, probably on Slemish Mountain

in the county Antrim. He seems to have been of an enthusiastic temperament, and much given to prayer and meditation. Learning of a means of escape, it so filled his mind as to give rise to visions. The bays and creeks of the west and north-west of Ireland, especially Killala Bay, were much frequented in ancient times, for they afforded secure retreats to sea-rovers when they crept round the coast of Ireland and swooped down on that of Roman Britain. Ptolemy’s town of Nagnata was probably on the bay just named; it is celebrated in the stories of Foniorians, Norsemen, and other sea-rovers. The kindred of the Ard Ri or paramount king of Ireland of the time, Dathi or rather Athi, one of the greatest leaders among the invading Scots, dwelt there; it was consequently a place which offered facilities for going to Britain, and from that place most probably Patrick succeeded in escaping. After his escape he appears to have conceived the noble idea of devoting himself to the conversion of the Irish, and to have gone somewhere for a few years to prepare himself for the priesthood. His biographers take him to Tours to St Martin, who was then dead several years, afterwards to the island of Lerins in the Mediterranean, and lastly to Rome, where he received a mission from Pope Celestine. For all this there is no evidence whatever, the whole story being the result of the confusion of

Palladius with the real Patrick. The tradition of some connexion between the Irish apostle and St Martin of Tours, the monastic type of the earliest Irish Church, the doubts as to Patrick's fitness for the work which led to his writing his Confession, and indeed all the difficulties that beset the question of the origin of the Irish Church, receive a simple and satisfactory explanation upon the hypothesis of Patrick having pre- pared himself for the priesthood at Candida Casa, the monastic institution founded by St Nuvian (¢7.2.).

Patrick tells us that after a few years (2.e., after his escape) he was among the Britons with his kindred, who received him as a son. He was evidently bent upon his mission, for they besought him after such tribulations not to part from them again. Full of it, he dreams that a man whose name was Victoricus came to him bearing innumerable epistles, one of 'which he received and read ; the beginning of it contained the words, "The voice of the Irish"; whilst repeating these words he says, "I imagined that I heard in my mind (in mente) the voice of those who were near the wood of Fochlad, which is near

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the western sea, and thus they cried: We pray thee, holy youth, to come and henceforward walk amongst us." The wood here referred to, which was in the neighbourhood of Killala Bay, was most probably the place where he remained concealed when waiting for a boat to make his escape from slavery. This dream was followed by others, which shows how completely his mission occupied his mind, Patrick was about twenty-two years of age when he escaped from slavery, and, if we allow seven or eight years for the "few ycars'" preparation, he probably was not more than thirty years of age when he entered on his mission about 425. There is a passage in his Confesscon which shows that he was still a young man when he commenced his work: "You know and God knows how I have lived among you from my youth up." Probus, the author of the fifth life published by Colgan, who has many claims upon our confidence, supports this view that Patrick began his mission while still a priest. We see in Patrick's own authentic acts that he must have sought among his friends in Britain to be made a bishop, for he complains in his Confession that a friend to whom he

had communicated some fault he had committed when about fifteen years old had urged this thirty years after as a reason against his being consecrated to the higher office. This proves that he was only about forty-five years old when made bishop. If we assume that 411 was the year he was carried off as a slave, his consecration as bishop would fall in about 441, the fifteenth year of his mission, a date which corresponds with the results of Dr Todd's speculations based on a close analysis of all available chronological data. Compare in general on the conversion of Ireland what has been said in vol. xiil. p. 247 sq.

The date of St Patrick's death is as uncertain as that of every other event connected with him. The Annals of the Four Masters give 493, with which Ussher agrees ; Tirechan's Annotations, on the other hand, state that Loegaire, son of Niall, king of Ireland, lived from two to five years after St Patrick. According to this account the death of St Patrick took place in 469, and that of Loegaire in 471 or 474, after a reign of thirty-six years, so that Loegaire's reign began either in 435 or 438. The Annals of the Four Masters record the death in 457 of Senn Patraice, or Old Patrick, and of Loegaire in the following year, 458. The Patrick who died in 493 is a fiction due to the fusion of the acts of the two real Patricks, Palladius Patrick and Senn Patraicc, doubtless so called because he was the Patrick known as a priest before the arrival of the Roman bishop. Assuming Tirechan's statement as correct, and that St Patrick died in 469, his mission as priest and bishop lasted about forty-four years.

The materials for a life of the apostle of Ireland arc very scanty ; they consist indced of only two Latin pieces—one the so-called Confession and the other an Epistle about a certain Coroticus. Some persons, apparently in Britain or Gaul, scem to have accused Patrick of presumption in having undertaken so great a work as the Christianizing of Ireland, and of incapacity for the task; the Confession is a defence of himsclf against these charges, and is a kind of autobiographical sketch. 'The Epistle is a denunciation of a British chief called Coroticus, supposed to be Caredig or Ceredig, son of Cynedda, conqueror of North Wales, who had ravaged the coast of Ireland, killed a number of Christian neophytes on the very day of their baptism while still clad in white garments, carried off others into slavery, and scoffed at a deputation of clergy Patrick had sent to ask their

release. There is a copy of the Confession in the MS. called the ‘‘ Book of Armagh,” written about the year 807, and apparently made from Patrick’s autograph, which the scribe several times complains of being then obscure. There are copies in other MSS. which contain nearly as much additional matter not in the “ Book of Armagh” as would, if put together, be nearly equal to the text of the MS. just named. Are these additions part of the original work of Patrick omitted by the scribe because they were illegible, or for some other reason, or are they interpolations ?

Judging by many examples in other Irish MSS., the former appears to be the better interpretation, for they are written in the same

rude and archaic style, exhibit the same peculiarity of grammatical] construction somewhat like Irish, and are not inconsistent with the rest. He modestly tells us himself that he is unlearned (indoctus) and very rustic (rusticissimus). The Hpistle is not in the ‘Book of Armagh,” but both pieccs possess all the characteristics of the time and place, and may be regarded as genuine documents, and have been so regarded by nearly all scholars who have written on the subject.

There are also several old lives of the saint, seven of which haye been published by Colgan in his 7’rias Thawmaturga, the last of which, known as the Tripartite life, is the most copious. These lives are based upon the two gennine documents above mentioned and are a tissue of legends and miracles, and, though no doubt containing a few genuine traditions, are only of value for manners and customs, and even for this purpose require much care in their. use.

The place, time, and circumstances of Patrick’s labours have largely contributed to the obscurity which surrounds him. His very name has helped to increase it. Vatricius, like Augustus, seems to have been commonly used, cven down to the 7th century, in the sense of nobleman or gentleman; thus Dynamius, who lived in the beginning of the century just referred to, is described as ‘Vir illustris ac patricius Galliarum.” [atrick’s real name, according to tradition, was Succat, but in his own writings he calls himself Patrick, There was, however, another Patrick who under the name of Palladius was unquestionably sent as bishop to Ireland by Pope Celestine in the year 431, that is, the year before the other Patrick commenced his mission according to the generally received accounts. Irish writers also mention a third Patrick, Senn Patraicc, or Old Patrick, the head of St Patrick’s community (caput sapientum seniorum ejus) according to one account, and his tutor according to another. The three Patricks have sorely puzzled hagiologists, and created so much confusion and conjecture in the history of the early church that some have doubted the existence of

such a personage as St Patrick at all. The absence of any con- temporary reference to him, or of any mention of him by Colum- banus, Bede, and indeed with very few exceptions by any writers outside of Ircland before the 9th ceutury, adds very much to the uncertainty and obscurity of the subject. (W. K. §.)

PATRICK, St, ORDER or. See KnicurTHoop, vol. xiv. pp. 123-24.

PATRICK, Stmon (1626-1707), bishop of Chichester, and afterwards of Ely, author of a number of works in practical divinity, was born at Gainsborough, Lincolnshire, on 8th September 1626, entered Queens' College, Cam- bridge, in 1644, and, after taking orders in 1651, became successively chaplain to Sir Walter St John, and vicar of Battersea, Surrey. He was afterwards (1662) preferred to the rectory of St Paul's, Covent Garden, London, where he continued to labour during the year of the plague. Dean of Peterborough from 1678, he became bishop of Chichester in 1689, in which year he was employed, along with others of the new bishops, to settle the affairs of the church in Ireland. In 1691 he received the bishop- ric of Ely, which he held until his death, 31st May 1707.

His sermons and devotional writings, which are very numerous, were held in high estimation in last century, and_his edifying Commentary on the Historical and Poetical Books of the Old Testa ment, in 10 vols., brought down as far as to the Song of Solomon, has been reprinted comparatively recently (1853). His Friendly Debate between a Conformist and a Nonconfornust was a contro- versial tract which excited considcrable feeling at the time of its publication in 1668, but he lived long enough to soothe by his moderation and candour the exasperation it had caused. The first collected edition of his works appeared at Oxford in 1859 (9 vals., 8vo); a small Autobiography was published also at Oxford in 1889.

PATRON anp CLIENT. Clientage appears to have been an institution of most of the Greeco-Italian peoples in early stages of their history; but it is in Rome that we can most easily trace its origin, progress, and decay. Until the reforms of Servius Tullius, the only citizens proper were the members of the patrician or gentile houses; they alone could participate in the solemnities of the national religion, take part in the government and defence of the state, contract quiritarian marriage, hold property, and enjoy the

protection of the laws. But alongside of them was a gradually increasing non-citizen population conl- posed of slaves and clients. Some historians class amongst the latter, as clients of the state, those vanquished com-

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munities which, having made an unconditional submission, were allowed to retain a quasi-corporate existence under the protection of Rome. But the name (derived from cluere, «Avev, to obey) was common before Rome had made any conquests, and was usually applied to indi- viduals who had attached themselves in a condition of dependence to the heads of patrician houses as their patrons, in order thereby to secure a de facto freedom. The relationship was ordinarily created by what, from the client's point of view, was called adplicatio ad patronum, from that of the patron, swsceptio clientis,—the client being either a person who had come to Rome as an exile, who had passed through the asylum, or who had belonged to a state which Rome had overthrown. According to Diony- sius and Plutarch, it was one of the early cares of Romulus to regulate the relationship, which, by their account of it, was esteemed a very intimate one, imposing upon the patron duties only less sacred than those he owed to his children and his ward, more urgent than any he could be called upon to perform towards his kinsmen, and whose neglect entailed the penalty of death (Zellumons sacer esto). He was bound to provide his client with the necessaries of life; and it was a common practice to make him a grant during pleasure of a small plot of land to cultivate on his own account. Further, he had to advise him in all his affairs; to represent him in any transactions with third parties in which, as a non-citizen, he could not. act with effect; and, above all things, to stand by him, or rather be his substitute, in any litigation in which he might be- come involved. The client in return had not only gener- ally to render his patron the respect and obedience due by a dependant, but, when he was in a position to do so and the circumstances of the patron required it, to render him pecuniary assistance. As time advanced and clients amassed wealth, we find this duty insisted upon in a great variety of forms, as in contributions towards the dowries of a patron's daughters, towards the ransom of a patron or any of his family who had been taken captive, towards the payment of penalties or fines imposed upon a patron, even towards his maintenance when he had become reduced to poverty. Neither might give evidence

against the other, —a rule we find still in observance well on in the 7th century of the city, when C. Herennius declined to be a witness against C. Marius on the ground that the family of the latter had for generations been clients of the Herennii (Plut., Mar. 5). The client was regarded as a mninor member (gentzlicius) of his patron's gens; he was entitled to assist in its religious services, and bound to contribute to the cost of them; he had to follow his patron to battle on the order of the gens; he was subject to its jurisdiction and discipline, and was entitled to burial in its common sepulchre. And this was the condition, not only of the client who personally had attached himself to a patron, but that also of his descendants ; the patronage and the clientage were alike hereditary. In much the same position as the clients, in the earlier centuries of Rome at least, were the freedmen ; for originally a slave did not on enfranchisement become a citizen; it was a de facto freedom merely that he enjoyed ; his old owner was always called his patron, while he and his descendants were sub- stantially in the position of clients, and often so designated. In the two hundred years that clapsed before the Servian constitutional reforms, the numerical strength of the clients, Whether in that condition by adplicatio, enfranchise- Ment, or descent, must have become considerable ; and 1 was from time to time augmented by the retainers of distinguished immigrants admitted into the ranks of

€ patriciate. That all these, concurrently with the un- attached plebeians, must have been admitted by Servius to nominal citizenship can hardly be doubted. They

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probably were included in the four urban tribes; but, being incapable as yet of owning land, they could have no admission to the higher centuries, paid no census- tribute, were not qualified to serve in the legion, and most likely ranked no higher than accensi. With the institution of the assemblies of the plebeians of the tribes they must, thanks to their numbers, have gained in influence politic- ally. But it was only with the enactment of the XII. Tables that their relations to their patrons were sensibly affected. For, while that code still denied them, in common with the plebeians generally, the right of intermarriage with the patrician families, it conferred upon them most of the

other private rights of citizens; in particular, it entitled them to hold and acquire property, to enter into contracts on their own responsibility, and to litigate in person on their own behalf. The relation of patron and client, it is true, still remained; the patron could still exact from his client respect, obedience, and service, and he and his gens had still an eventual right of succession to a deceased client's estate. But the fiduciary duties of the patron were greatly relaxed, and practically little more was expected of him than that he should continue to give his client his advice, and prevent him falling into a con- dition of indigence ; sacer esto ceased to be the penalty of protection denied or withheld, its application being limited to fraus facta, which, in the language of the Tables, meant positive injury inflicted or damage done. So matters re- mained during the 4th and 5th centuries. In the 6th a variety of events, social and political, contributed still further to modify the relationship. The rapacity of patrons was checked by the Cincian law, which prohibited their taking actual gifts of money from their clients ; marriages between patron and client gradually ceased to be regarded as unlawful, or as ineffectual to secure to the issue the status of the patron father; political changes opened to the clients the rural tribes and the higher centuries, and qualified them for the legion, the magistracy, and the senate ; hereditary clientage ceased when a client attained to a curule dignity ; and, in the case of the descendants of freedmen enfranchised in solemn form, it came to be limited to the first generation. Gradually but steadily one feature after another of the old institution disappeared, till by the end of the 7th century it had resolved itself into the limited relationship between patron and freedman on the one hand, and the unlimited honorary relationship between the patron who gave gratuitous advice on questions of law and those who came to consult him on the other. To have a large follow- ing of clients of this class was a matter of ambition to every man of mark in the end of the republic ; it increased his importance, and ensured him a band of zealous agents in his political schemes. But amid the rivalries of parties and with the venality of the lower orders, baser methods had to be resorted to in order to maintain a patron's influ. – ence; the favour and support of his clients had to be purchased with something more substantial than mere advice, And so arose that wretched and degrading client- age of the early empire, of which Martial, who was not ashamed to confess himself a first-rate specimen of the breed, has given us such graphic descriptions ; gatherings of miserable idlers, sycophants, and spendthrifts,

at the levees and public appearances of those whom, in their fawn- ing servility, they addressed as lords and masters, but whom they abused behind their backs as close-fisted upstarts,— and all for the sake of the sportula, the daily dole of a dinner, or of a few pence wherewith to procure one. With the middle empire this disappeared ; and, when a reference to patron and client occurs in later times, it is in the sense of counsel and client, the words patron and advocate being used almost synonymously. It was not so in the days of the great forensic orators. The word advocate, it is said,

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occurs only once in the singular in the pages of Cicero ; and by advocati was generally understood at that time the body of friends who stood by a litigant in a great cause to give him in any shape their countenance and support. The orator who then appeared in the comitia or before a judge was almost invariably called patron, though the name of client was not so commonly given to the litigant he represented. But ata later period, when the bar had become a profession, and the qualifications, admission, numbers, and fees of counsel had become a matter of state regulation, advocati was the word usually employed to designate the pleaders as a class of professional men, each individual advocate, however, being still spoken of as patron in reference to the litigant with whose interest he was entrusted. It is in this hmited connexion that patron and client come under our notice in the latest monuments of Roman law. .

Literature. —On the clientage of early Rome, see Mommsen, ‘‘ Die Roémische Clientel,” Rom. Forschungen, vol. i. p. 355 (Berlin, 1864) ; Voigt, ‘‘ Ueber die Clientel und Libertinitat,” in Ber. d. phil. histor. Classe d. Kénigl. Sachs. Gescllsch. d. Wissenschaften (1878, pp. 147- 219); Marquardt, Privatleben d. Romer, pp. 196-200 (Leipsic, 1879); Voigt, Die XII. Tafeln, vol. ii. pp. 667-679 (Leipsic, 1883). Earlier literature is noted in Willems, Le Droit Public Romain, 4th ed., p. 26 (Louvain, 1880). On the clientage of the early empire, see Becker, Gallus, vol. ii, Excursus 4; Friedlander, Sztten- Gesehichte Roms, vol. i. pp. 207-219 (Leipsic, 1862) ; Marquardt, op. cit., pp. 200-208. On the latest clientage, see Grellet-Dumazeau, Le Barreau Romain (Paris, 1851). (a, ai)

PATTESON, Jon CoLeripGE (1827-1871), bishop of Melanesia, was the eldest son of Justice Patteson and Frances Duke Coleridge, a near relation of Samuel Taylor Coleridge, and was born in Gower Street, Bedford Square, 2d April 1827. He was educated at Ottery St Mary, and at Eton, where he greatly distinguished himself on the cricket-field. He entered Balliol College, Oxford, in 1845, and graduated B.A. in 1848. After spending some time on the Continent in the capacity of tutor, he in 1852 became a fellow of Merton College. In 1853 he became curate of Alfington, Devon, and in the following year he was ordained priest and joined the mission to the Mela- nesian islands in the South Pacific. There he laboured with great success, visiting the different islands of the group in the mission ship the “Southern Cross,” and by

is due to its climate, which makes it a great winter health- resort. The most striking characteristic is the stillness of the air, resulting from the peculiarly sheltered situation, The town is built on a sandy soil, and the line of the streets running east and west is favourable to ventilation, The average rainfall is about 40 inches, and the mean winter temperature is 44°, the mean for the year being 62°.

Apart from an export flour-trade and some manufactures of chocolate and Béarn linen, the inhabitants of Pau depend entirely on their four thousand winter-visitors. Place Royale (in the centre of which, instead of the older statue of Louis XIV., now stands Raggi’s statue of Henry IV., with bas-reliefs by Etex) is admired for the view which it affords over the valley of the Gave and the Pyrenees; it is con- nected by a fine boulevard with the castle gardens. Be yond the castle a park of thirty acres planted with beech trees stretches along the high bank of the Gave. The castle is bounded on the north and west by the Hédas, on the south by a canal drawn from the Gave, and on the east by a moat 30 feet deep; access is obtained by three bridges, that across the Hédas being of ancient construction. The castle is flanked by six square towers: south-east is that of Gaston Phcebus (113 feet high) ; north-east is the tower of Montauset or Montoiseau, so called because reached by removable ladders; east, the new tower; north-west, that

of Billéres ; and on the west are those of Mazéres. Another to the south is named after the mint in which Calvin used to preach.

In the gardens to the west of the castle stand a statue of Gaston Phcebus by Triquety and two porphyry vases presented by Bernadotte king of Sweden, who was born at Pau. In the castle court is a well 223 feet deep, with 100 feet of water; but it has been closed since 1855 On the ground-floor is the old hall of the estates of Béarn, 85 feet long and 36 feet wide, adorned with a white marble statue of Henry IV., and magnificent Flemish tapestries ordered by Francis I. Several of the upper chambers are adorned with Flemish, Brussels, or Gobelin tapestry, with tables in Swedish porphyry, Sévres vases, fine coffers (notably a Gothic coffer from Jerusalem), arm-chairs of the 16th century, Venetian and St Gobain glass, &e. ; but the

his good sense and unselfish devotion winning Gres the esteem and affection of the natives. In 1861 he was consecrated bishop of Melanesia, and in this capacity did much to promote the Christianization of the islands until his premature death by the hand of a native, 20th September 1871. .

See Life by Charlotte M. Yonge, which first ap- peared in 1878, and has gone through several editions.

PAU, a city of France, formerly the capital of Béarn, and now the chief town of the de- partment of Basses Pyrénées, and the seat |& of a court of appeal, is situated in 48° 17’ Sa See N. lat. and 0° 23’ W. long., on the edge of BSS a plateau 130 feet above the right bank of < the Gave de Pau (a left-hand affluent of the Ss Adour), at a height of about 620 feet above the sea. It thus enjoys an admirable view of the Pyrenees, which rise about 25 miles to the south. A small stream, the Hédas, 2 flowing in a deep ravine and crossed by several bridges, divides the city into two parts. The older and larger is enclosed between the Hédas, the Gave, and its other tributary the Ousse, and ends with the castle in the west, while the new districts stretch northward in the direction of the Jandes of Pont-long. The modern importance of Pau

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Plan of Pau.

most interesting room is that in which Henry TV. was born, still containing his mother's bed (from the castle of

Richelieu) and his own cradle made of a tortoise-shell. In the keep is a library of 6000 volumes, mainly of works relating to Henry IV. The two Gothic churches of St Jacques and St Martin are both modern ; but the latter is of note for the height and elegance of its tower, its stained lass, and the fine Pyrenean marbles used in- the high altar, the baldachin, and the sanctuary. Besides the state Protestant church (Kglisc Francaise Réformée) there are Presbyterian, Anglican, and Russian places of worship. The population of Pau (about 6000 at the close of the 18th century) was 27,300 in 1871, and 29:971 im 1881. Pau derives its name from the "' pale" (in Langue d'Oc " pati") or salisade surrounding the old eastle mentioned in the fors of Ossau

in 1221. By the erection (1363) of the present castle Gaston Phoebus made the town a place of importance, but the viscounts

" CYAUL, who is also (called) Paul," was a "Hebrew

of the Hebrews," z.¢, of pure Jewish descent unmixed with Gentile blood, of the tribe of Benjamin (Rom. xi. 1; 2 Cor. xi, 22; Phil. iu. 5). In the Acts of the Apostles it is stated that he was born at Tarsus in Cilicia (ix. 11, xxi. 39, xxii. 3); but in the 4th, century there still lingered a tradition that his birthplace was Giscala, the last of the fortress-towns of Galilee which held out against Rome (Jerome, De vir, illustr. c. 5; Ad Philem. v. 23). The fact that he was called by two names has been accounted for in various ways. Saul (the Aramaic form, used only as a vocative, and in the narratives of his conversion, Acts ix. 4, 17, xxii. 7, 13, xxvi. 14; else- where the Hellenized form, ZatAos) was a natural name for a Benjamite to give to his son, in memory of the first of Jewish kings ; Paul is more difficult of explanation. It is first found in the narrative of the conversion of Sergius Paulus, the proconsul of Cyprus (Acts xiii. 9), and it has sometimes been supposed either that Paul himself adopted the name in compliment to his first Gentile convert of distinction (Jerome, Olshausen, Meyer, Ewald), or that the writer of the Acts intended to imply that it was so adopted (Baur, Zeller, Hausrath). Others have thought that it was assumed by Paul himself after the beginning of his ministry, and that it is derived from the Latin paulus in

the sense either of “least among the apostles” (St Augustine) or “little of stature” (Mangold, with reference to 2 Cor. x. 10; Gal. iv. 13). But these and many similar conjectures may probably be set aside in favour of the supposition that he had a double name from the first, one Aramaic or Hebrew and the other Latin or Greek, like Simon Peter, John Mark, Simeon Niger, Joseph Justus; this supposition is confirmed by the fact that Paul was not an uncommon name in Syria and the eastern parts of Asia Minor (instances will be found in the Index Nominum to Boeckh’s Corp. Inscr. Grec.). Whatever be its origin, Paul is the only name which he himself uses of himself, or which is used of him by others when once he had entered into the Roman world outside Palestine. The Acts speak of his having been a Roman citizen by birth (xxii, 28; cf. xvi. 17, xxiii. 27), a statement which also has given rise to several conjectures, because there is no clue to the ground upon which his claim to citizenship was based. Some modern writers question the fact, consider-

of Béarn eontinued to reside at Orthez till the reign of Gaston XI, when the states of Béarn were united at Pau. Gaston’s grand- son and suceessor Franeis Phoebus, beeame king of Navarre in 1479. Margaret of Valois, who married Henry d’Albret, embellished the castle and gardens, and made her eourt one of the most brilliant of the time. In the religious disturbances under her daughter, Jeanne d’Albret, several Catholic nobles were put to death in the eastle as rebels. In 1572, while a prisoner, Henry (afterwards IV. of France) restored the Catholic religion in Béarn, but the provineial estates met at Pau and rejeeted the decree, whieh Henry himself eancelled when he obtained his freedom. Pau eontinued to be the capital till 1620, though in 1614 the states of Franee demanded the union of Béarn and Basse Navarre with the Freneh erown. When Louis XIII. entered the town in 1620 he restored the Cathohie elergy to their privileges and possessions, disbanded the forees of Béarn, and eaused the parliament of Pau to register the edict of union. The castle was occupied by Abd-el-Kader during part of his captivity.

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great seat of learning, is a possible inference from his use of some of the technical terms which were current in the Greek schools of rhetoric and philosophy ; but, since the cultivation of a correct grammatical and rhetorical style was one of the chief studies of those schools, Paul's imperfect command of Greek syntax seems to show that this education did not go very far. That he received the main part of his education from Jewish sources is not only probable from the fact that his family were Pharisees, but certain from the whole tone and character of his writings. According to the Acts, his teacher was Gamaliel, who as the grandson of Hillel took a natural place as the head of the moderate school of Jewish theologians; nor, in spite of the objection that the fanaticism of the disciple was at variance with the moderation of the master, does the statement seem in itself improbable. A more important difficulty in the way of accepting the statement that Jeru- salem was the place of his education is the fact that in that case his education must have been going on at the time of the preaching and death of Jesus Christ. That he had not seen Jesus Christ during His ministry seems to be clear, for a comparison of 1 Cor. ix. 1 with xv. 8 appears to limit his sight of Christ to that which he had at his conversion, and the "knowing Christ after the flesh" of 2 Cor. v. 16 is used not of personal acquaintance but of "carnal" as opposed to "spiritual" understanding ; nor does the difficulty seem to be altogether adequately ex- plained away by the hypothesis which some writers (¢.9., Neander, Wieseler, Beyschlag) have adopted, that he was

/temporarily absent from Jerusalem at the times when

Jesus Christ was there. Like all Jewish boys, he learnt a trade, that of tent-making ; this was a natural employment for one of Cilician origin, since the hair of the Cilician goat was used to make a canvas (cilicia) which was specially adapted for the tents used by travellers on the great routes of commerce or by soldiers on their campaigns (cf. Philo, De anim. sacrif. idon., i, vol. ii. p. 288, ed. Mang.) Whether he was married or not is a question which has been disputed from very early times; his expressions in 1 Cor. vii. 8, ix. 5, were taken by Tertullian to imply that he was not, and by Clement of Alexandria and Origen to imply that he had once been, but that he had become a widower.

The beginning of his active life was doubtless like its

maturity; it was charged with emotion. He himself gives and

; ree s ; g outer life a graphic sketch of its inner history. His conversion to . phan.

Christianity was not the first great change that he had ccc,

ing the statement to be part of the general colouring which the writer of the Acts is supposed to give to his narrative ; amd some also question the fact, which is generally con-

ce sidered. to support it, of the appeal to the emperor. That | undergone. “I was alive without the law once” (Rom. ‘he received part of his education at Tarsus, which was a | Vil. 9), He had lived in his youth a pure and guileless MER casian Bhionite Gander tant he life. He had felt that which is at once the charm and the

- It was an Ebionite slander that he was not a Jew at all, but a

Greek (Epiphan., Her., xxx. 16). force of such a life, the unconsciousness of wrong. But,

Conver- sion to Chris- tianity.

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while his fellow-disciples in the rabbinical schools had been content to dissect the text of the sacred code with a minute anatomy, the vision of a law of God which transcended both text and comment had loomed upon him like a new revelation. And with the sense of law had come the sense of sin. It was like the first dawn of conscience. He awoke as from adream. ‘The commandment came.” It was intended to be “unto life,” but he found it to be “unto death”; for it opened up to him infinite possibili- ties of sinning: ‘I had not known lust except the law had said, Thou shalt not lust.” And the possibilities of sinning became lures which drew him on to forbidden and hated ground: “sin, finding occasion through the

commandment, beguiled me and through it slew me” (Rom. vii. 7-11). This was his inner life, and no man has ever analysed it with a more penetrating and graphic power. In his out- ward life this sense of the law of God became to him an overpowering stimulus. The stronger the consciousness of his personal failure the greater the impulse of his zeal. The vindication of the honour of God by persecuting heretics, which was an obligation upon all pious Jews, was for him a supreme duty. He became not only a persecutor but a leader among persecutors (Gal. 1. 14). What he felt was a very frenzy of hate; he ‘‘breathed threatening and slaughter,” like the snorting of a war-horse before a battle, against the renegade Jews who believed in a false Messiah (Acts ix. 1, xxvi. 11). His enthusiasm had been known before the popular outbreak which led to Stephen’s death, for the witnesses to the martyr’s stoning “laid down their clothes” at his feet (Acts vu. 58), and he took a prominent place in the persecution which followed. He himself speaks of having “made havoc” of the com- munity at Jerusalem, spoiling it like a captured city (Gal. i. 18, 23); in the more detailed account of the Acts he went from house to house to search out and drag forth to punishment the adherents of the new heresy (viii. 3). When his victims came before the Jewish courts he tried, probably by scourging, to force them to apostatize (xxvi. 11); in some cases he voted for their death (xxi. 4, xxvi. 10). The persecution spread from Jerusalem to Judea and Galilee (ix. 31); but Paul, with the same spirit of enterprise which afterwards showed itself in his missionary journeys, was not content with the limits of Palestine. He sought and obtained from the ecclesiastical authorities at Jerusalem letters similar to those which, in the 13th century, the popes gave to the “militia Jesu Christi contra hereticos.” The ordinary jurisdiction of the synagogues was for the time set aside ; the special commissioner was empowered to take as prisoners to Jerusalem any whom he found to belong to the sect known as “The Way” (Acts ix. 2, xxii. 4, xxiv. 14; it is possible that the phrase was used of Christians by themselves, like the phrase “The Cause” among some of the nonconforming churches of England). Of the great cities which lay near Palestine Damascus was the most promising, if not the only field for such a commission, At Antioch and at Alexandria, though the Jews, who were very numerous, enjoyed a large amount of independence and had their own governor, the Roman authorities would probably have interfered to prevent the extreme measures which Paul demanded. At Damascus, where also the Jews were numerous and possibly

had their own civil governor (2 Cor, xi. 32), the Arabian prince Aretas (Haritha), who then held the city, might naturally be disposed to let an influential section of the population deal as they pleased with their refractory members.

On Paul's way thither an event occurred which has proved to be of transcendent importance for the religious history of mankind. He became a Christian by what he believed to be the personal revelation of Jesus Christ.

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His own accounts‘of the event are brief, but they are at the same time emphatic and uniform. "It pleased God . . . to reveal His Son in me" (Gal. i. 16); "have I not seen Jesus Christ our Lord" (1 Cor. ix. 1); "last of all He was seen of me also as of one born out of due time" (1 Cor. xv. 8, where 6¢6y kapoi must be read in the sense of the parallel expressions 6¢6y Kya, &c. ; in other words Paul puts the appearance to himself on a level with the appearances to the apostles after the resurrection), These accounts give no details of the circumstances. St Paul's estimate of the importance of such details was probably different from that which has been attached to them in later times. The accounts in the Acts of the Apostles are more elaborate ; they are three in number, one in the con- tinuous narrative, ix. 3-19, a second in the address on the temple stairs, xxii. 6-21, a third in the speech to Agrippa, xxvi. 12-18; they all differ from each other in details, they all agree in substance; the differences are fatal to the stricter theories of verbal inspiration, but they do not constitute a valid argument against the general truth of the narrative.!

It is natural to find that the accounts of an event which lies so far outside the ordinary experience of men have been the object of much hostile criticism. The earliest denial of its reality is found in the Judeo-Christian writings known as the Clementine Homilies, where Simon Magus, who is made to be a caricature of Paul, is told that visions and dreams may come from demons as well as from God (Clem. Hom., xvii. 13-19). The most import- ant of later denials are those of the Tiibingen school, which explain the narratives in the Acts either as a trans- lation into the language of historical fact of the figurative expressions of the manifestation of Christ to the soul, and the consequent change from spiritual darkness to light (e.g.,

Baur, Paul, E.T., vol. i. p. 76; Zeller, Acts, HIT iaae i. p. 289), or as an ecstatic vision (Holsten, Das Hvangelium des Paulus, p. 65). But against all the difficulties and ap- parent incredibilities of the narratives there stand out the

clear and indisputable facts that the persecutor was suddenly ~

transformed into a believer, and that to his dying day he never ceased to believe and to preach that he had “seen Jesus Christ.”

Nor was it only that he had seen Him; the gospel which he preached, as well as the call to preach it, was due to this revelation. It had “pleased God to reveal His Son in him” that he “might preach Him among the Gentiles” (Gal. i. 12, 16). He had received the special mark of God’s favour, which consisted in his apostleship, that all nations might obey and believe the gospel (Rom. i. 5, cf. xii. 3, xv. 15, 16). He had been entrusted with a secret (wvorjptov) which had “been kept in silence through times éternal,” but which it was now his special office to make known (Rom. xi. 25, xvi. 25, 26; and even more proml-

nently in the later epistles, Eph. i. 9, iii, 2-9, vi. 19; Col.

i. 26, 27, iv. 3). This secret was that “the Gentiles are fellow-heirs, and fellow-members of the body, and fellow- partakers of the promise in Christ Jesus through the gospel.” This is the key to all his subsequent history. He was the “apostle of the Gentiles,” and that “not from men, neither through man” (Gal. i. 1); and s0 thoroughly was the conviction of his special mission wrought into. the fibres of his nature that it is difficult to give full credence to statements which appear to be at variance with it.

Of his life immediately after his conversion he himself ee eee

1 For a clear and concise summary of the points of agreement and difference between the three accounts, reference may be made to an article by F. Zimmer, ‘‘ Die drei Berichte der Apostelgeschichte iiber die Bekehrung des Paulus,” in Hilgenfeld’s Zeitschr. iis wissensch. Theol., 1882, p. 465 sq.

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gives a clear account: *T conferred not with flesh and blood, neither went I up to Jerusalem to them which were apostles before me; but I went away into Arabia” (Gal. i. 16,17). The reason of his retirement, whether it was to the Hauran (Renan) or to the Sinaitic peninsula (Holsten), is not far to seek. A great mental no less than a great bodily convulsion naturally calls for a period of rest; and the consequences of his new position had to be drawn out and realized before he could properly enter upon the mission-work which lay before him. From Arabia he returned to Damascus (Gal. i. 17), and there – began not only his preaching of the gospel but also the long series of “perils from his own countrymen,” which constitute so large a part of the circumstances of his sub- sequent history (Acts ix. 23-25; 2 Cor. xi. 32, 33).

It was not until “after three years,” though it is un- certain whether the reckoning begins from his conversion or from his return to Damascus, that he went up to Jeru- salem; his purpose in going was to become acquainted with Peter, and he stayed with him fifteen days (Gal. i. 18), Of his life at Jerusalem on this occasion there appear to have been erroneous accounts current even 1n his own lifetime, for he adds the emphatic attestation, as of a witness on his oath, that the account which he gives is true (Gal. i. 20). The point on which he seems to lay emphasis is that, in pursuance of his policy not to “ confer with flesh and blood,” he saw none of the apostles except Peter and James, and that even some years afterwards he was still unknown by face to the churches of Judea which were in Christ.

From Jerusalem he went “into the regions of Syria and Cilicia,” preaching the gospel (Gal. i. 21, 23). How much that brief expression covers is uncertain; it may refer only to the first few months after his departure from Jerusa- lem, or it may be a summary of many travels, of which that which is commonly known as his “‘first missionary journey ” isa type. The form of expression in Gal. ii. 1 makes it probable that he purposely leaves an

interval between the events which immediately succeeded lis conversion and

termination which had been employed for the followers of Sulla, of Pompey, and of Cesar. It is improbable that this would have been the case unless the Christian com- munity at Antioch had had a large Gentile element; and it is an even more certain and more important fact that in this first great mixed community the first and greatest of all the problems of early Christian communities had been solved, and that Jews and Gentiles lived a common life (Gal. ii. 12), What place Paul himself had in the forma- tion of this community can only be conjectured. In the Acts he is less prominent than Barnabas ; and, although it must be gathered from the Epistle to the Galatians that he took a leading part in the controversies which arose, still it is to be noted that he never elsewhere mentions Antioch in his epistles, and that he never visited it except casually in his travels. It may be supposed that from an early period he sought and found a wider field for his activity. The spirit of the Pharisees who “ compassed sea and land to make one proselyte” was still strong within him. The zeal for God which had made him a persecutor had changed its direction but not its force. His conversion was but an overpowering call to a new sphere of work. It is consequently difficult to believe that he was content to take his place as merely one of a band of teachers elected by the community or appointed by the Twelve. The sense of a special mission never passed away from him. “Necessity was laid upon him” (1 Cor. ix. 16). Inferior to the Twelve in regard to the fact that he had once ‘persecuted the church of God,” he was “not a whit behind the very chiefest apostles” (2 Cor. xi. 5) in regard both to the reality and the privileges of his commission, and to the truth of what he preached (le Cors ixed-6; 2 Com tiel-Gye@al. ind2). vais also difficult to believe that he went out with Barnabas simply as the delegate of the Antiochean community ; whatever significance the laying on of hands may have had for him (Acts xiii. 3), it would be contrary to the tenor of all his writings to suppose that he regarded it as giving him his commission to preach the gospel.

The narrative of the incidents of the single journey Journey which is recorded in detail, and which possibly did not a occupy more than one summer, has given rise to much ~7?““S

vores and Asia controversy. Its general credibility is supported by the yfinoy.

the conference at Jerusalem. For this interval, assuming it to exist, or in any case for the detail of its history, we have to depend on the accounts in Acts xi. 20-30, xii. 25 to xiv. 28. These accounts possibly cover only a small

part of the whole period, and they are so limited to Paul’s relations with Barnabas as to make it probable that they were derived from a lost ‘Acts of Barnabas.” This sup- position would probably account for the fact that in them the conversion of the Gentiles is to a great extent in the background,

The chief features of these accounts are the formation of a new centre of Christian life at Antioch, and a journey which Paul, Barnabas, and for part of the way John Mark took through Cyprus and Asia Minor. :

The first of these facts has a significance which has sometimes been overlooked for the history not only of Paul himself but of Christianity in general. It is that the mingling together, in that splendid capital of the civilized East, of Jews and Syrians on the one hand with Greeks and Romans on the other furnished the conditions which made a Gentile Christianity possible. The religion of Jesus Christ emerged from its obscurity into the full glare of contemporary life. Its adherents attracted enough attention to receive in the common talk and intércourse of men a distinctive name. They were treated, not as a Jewish sect, but asa political party. To the Greek equiva- lent for the Hebrew « Messiah,” which was probably con- Sidered to be not a title but a proper name, was added the one different account of this visit to Jerusalem is given in Acts ix.

17.9] XXvi. 20; the account of the trance in the temple, Acts xxii. “*) 18 1n entire harmony with Paul’s own words.

probability that in the first instance Paul would follow an ordinary commercial route, on which Jewish missionaries as well as Jewish

merchants had been his pioneers. For his letters to his Gentile converts all presuppose their acquaintance with the elements of Judaism. They do not prove monotheism, but assume it. According to the narrative, Paul and his companions went first to Cyprus, the native country of Barnabas, and travelled through the island from its eastern port, Salamis, to its capital, Paphos. At Paphos a Jewish sorcerer, Bar Jesus, was struck with blindness, and the proconsul, Sergius Paulus, was converted. From Cyprus, still following a common route of trade, they went into the south-east districts of Asia Minor, through Pamphylia to Antioch in Pisidia. At Antioch, on two successive Sabbaths, Paul spoke in the synagogue ; the genuineness of the addresses which are recorded in the Acts has been disputed, chiefly because the second of them seems to imply that he " turned to the Gentiles," not as a primary and unconditional obli- gation, but owing to the rejection of the gospel by the Jews. Expelled from Antioch, they went on to Iconium (where the apocryphal 'Acts of Paul and Thekla" place the scene of that improbable but not ungraceful romance), and thence to Lystra, where the healing of a cripple caused the simple and superstitious Lycaonians to take them for gods. Their farthest point was the neighbouring town of Derbe, from whence they returned by the route XVII — 53

His rela- tion to the Twelve.

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by which they had come to the sea-coast, and thence to Antioch in Syria.

But, although the general features of the narrative may be accepted as true, especially if, as suggested above, its basis is a memoir or itinerary not of Paul but of Barnabas, yet it must be conceded that this portion of the Acts has large omissions. It is difficult to believe that the passionate zeal of an apostle who was urged by the stimu- lus of a special call of Jesus Christ was satisfied, for the long period of at least eleven years, with one short missionary journey, and that, with the exception of a brief visit to Jerusalem (Acts xi. 30), he remained quietly ai Tarsus or at Antioch (xi. 25, xii, ljeav. 28) Tn this period must fall at least a portion of the experiences which he records in 2 Cor. xi. 24-27, and for which no place can be found in the interval between the conference at Jeru- salen and the writing of that epistle. The scourging in the synagogues, the beating with the lictor's rods in the

Roman courts, the shipwrecks, the “night and day in the deep,” the “perils of robbers,” and “perils in the wilder- ness” belong no doubt to some of the unrecorded journeys of these first years of his apostolic life. A more important omission is that of some of the more distinctive features of his preaching. It is impossible to account for his atti- tude towards the original apostles in his mterview with them at Jerusalem (Gal. ii. 1-10) except on the supposi- tion that before that interview, no less than after it, he was that which he had been specially called to be, the “apostle of the Gentiles” and the preacher of the “ gospel of the uncircumcision.”

At the end of fourteen years, either from his conversion or from his visit to Peter at Jerusalem, the question of the relation of the communities which he had formed, and of the gospel which he preached, to the original Christian communities, and to the gospel of the Twelve, came to a crisis. His position was unique. He owed neither his knowledge of the gospel nor his commission to preach it to any human authority (Gal. i. 1, 11,12). As Jesus Christ had taught and sent forth the Twelve, so had He taught and sent forth Paul. He was on equal terms with the Twelve. Until a revelation came to him he was apparently at no pains to co-operate with them. But between their respective disciples there was evidently a sharp contention. The Jewish party, the original disciples and first converts, maintained the continued obligation of the Mosaic law and the limitation of the promises to those who observed it ; the Pauline party asserted the abrogation of the law and the free justification of all who believed in Jesus Christ. The controversy narrowed itself to the one point of cir- cumcision. If the Gentiles were without circumcision members of the kingdom of God, why was the law obli- gatory on the Jews? If, on the other hand, the Gentiles had to be circumcised, the gospel had but a secondary im- portance. It seemed for a time as though Christianity would be broken up into two sharply-divided sects, and that between the Jewish Christianity, which had its seat at Jerusalem, and which insisted on circumcision, and the Gentile Christianity, which had its seat at Antioch, and which rejected circumcision, there would be an irreconcil- able antagonism. It was consequently “by revelation ” (Gal. ii. 2) that Paul and Barnabas, with the Gentile con- vert Titus as their ‘‘minister” or secretary, went to confer with the leaders among the original disciples, the “pillars” or “them who were of repute,” “James, and Cephas, and John.” He put the question to them: Was it possible that he was

spending or had spent his labour in vain? (uqros . . . epapov in Gal. ii. 2 form a direct question depending on évcOéunv). He laid before them the "gospel of the uncircumcision." They made no addition to it (Paul says of himself dve@éunv, and of "them who were of re-

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1878, p. 141; Schenkel, Das Christusbild der

pute" ovdev rpooavéevro, Gal. ii. 2, 6), but accepted it as Paul preached it, recognizing it as being a special work of God, and as being on the same level of authority with their own (Gal. ii, 7-9). The opposition was no doubt strong; there were "false brethren " who refused to eman- cipate the Gentile world from the bondage of the law; and there was also' apparently a party of compromise which, admitting Paul's general contention, maintained the necessity of circumcision in certain cases, of which the case of Titus, for reasons which are no longer apparent, was typical. But Paul would have no compromise. From his point of view compromise was impossible. " Justifica- tion" was either "of faith" or "by the works of the law"; it was inconceivable that it could be partly by the one and partly by the other. And he succeeded in maintaining his position at all points. He received "the right hand of fellowship," and went back to Antioch the recognized head and preacher of the "gospel of the uncircumcision." With- in his own sphere he had perfect freedom of action; the only tie between his converts and the original community at Jerusalem was the tie of benevolence. Jew and Gentile were so far "one body in Christ" that the wealthier Gen- tile communities should 'remember the poor." !

When Paul returned to Antioch Peter followed him, Pete and Pau! nt:

and for a time the two apostles worked in harmony. Peter '¢ did eat with the Gentiles." He shared the common table

Sige aie So ae 1 Few passages of the New Testament have been more keenly de-

bated of late years than the accounts of this conference at Jerusalein Con: in Acts xv, 4-29 and Gal. ii. 1-10. The only writers of eminence in ence recent

times who think that the two accounts refer to separate events Jert are Caspari, who identifies the visit to Jerusalem mentioned in Gal. sale ii. 1-10 with that of Acts xi. 30, xii. 25, and Wieseler, who identifies

it with that of Acts xviii. 21, 22; both theories are chronologically impossible. Almost all writers agree in thinking that the two accounts refer to the same event, but no two writers precisely agree as to the extent to which they can be reconciled. (1) The differences between them were first insisted on by Schwegler, Das nachapostolische Leit- alter, 1845, vol. i. 116; then by Zeller, Die A postelgeschichte, E.'T., vol. ii. 8; Baur, Paulus, E.T., vol. i. 109; Hilgenfeld, Der Gala- terbrief, 1852, p. 52, and in his Hinleitung in das Neue Testament, 1875, p. 227, &c.; Krenkel, Paulus, 1869, p. 62; Lipsius, s.. " Apostelkonvent," in Schenkel's Bibel-Lexikon, 1868, vol. i. 194; Overbeck, in his edition of De Wette's Apostelgeschichte, 1879, p. 216; Pfleiderer, Paulinismus, 1873, E.T., vol. ii. 5 and 284, and also in his " Paulinische Studien," in the Jahrb. f. prot. Theol., 1889, No. 2; Weizsiicker, in the Jahrb. f. deutsche Theol., 1878, p. 191; Hausrath, Neutestamentliche Zeityeschichte, 2d ed., vol. iii, 151, vol. iv. 249; Holsten, Zum Evangelium des Paulus und Petrus, pp. 241, 292, Das Evangelium des Paulus, p. 143; Holtzmann, "Der Apos- teleonvent," in Hilgenfeld's Zeitschr. f. wissensch. Theol., 1882 p. 436, 1883 p. 129 (to which articles the writer is indebted for several of the references here given). (2) The harmony of the two accounts is maintained, mostly in opposition to the above-named writers, by Neander, Gesch. d. Pflanzung, 5th ed., 1862, p. 158; Ewald, Gesch. d. Volkes Israel, 3d ed., 1868, vol. vi. 470; Ritschl, End. d. altkath. Kirche, 2a ed., 1857, p. 128; Lechler, Das apostol. U. nachapostol. Zeitalter, 2d ed., 1857, p. 397; Baumgarten, Die Apostelgeschichte, 2d ed., 1859, i. 461; Pressensé, Hist. des trois premiers siécles, d ed., 1868, vol. i. 457; Weiss, Lehrb. d. bib. Theol. (des N.T.), 2d ed., Apostel, 1879, p. 835 K. Schmidt, s.v. " Apostel-Konvent," in Herzog's Real- Encyklopiae, 2d ed., vol. i. 575; Lightfoot, Galatians, p. 123; Wendt, in his edition of Meyer's Apostelgesch., 1880, p. 311; Sieffert, in Meyer's Brief an die Galater, 1880, p. 84, &c.; Zimmer, Galaterbrief und Apostel- geschichte, 1882; Nésgen, Comm. iber die Apostelgeschichte, 1882, p. 287. (8) A compromise between the two accounts is attempted by Renan, St Paul, 1869, p. 81; Reuss, Die Gesch. d. heil. Schr, N.T., 5th ed., 1874, p. 57;

Keim, “Der Apostelconvent,” in his Aus dem Urchristenthum, 1878, p. 64; Grimm, “ Der Apostelconvent,

in Studien u. Kritiken for 1880, p. 405.

The main points of difficulty in the two accounts are these. (1) The Acts say that Paul went up by appointment of the brethren at Antioch ; Paul himself says that he went up “by revelation.” (2) In the Acts Paul has a subordinate position; in his own account he treats with “the three” on equal terms. (3) In the Acts Peter and James are on Paul’s side from the first ; in Galatians they are SO only at the end of the conference, and after a discussion. (4) The Acts make the conference result in a decree, in which certain observances are imposed upon the Gentiles ; Paul himself expressly declares that the only injunction was that they “should remember the poor.

was probably

life. wish

in social Lord’s Supper.

jv, Gal. ii. 11). His argument was that the freedom from the law was complete, and that to attach merit to obedience to the law was to make disobedience to the law a sin, and, by causing those who sought to be justified by faith only to be transgressors, to make Christ a “minister of sin.” Obedience to any part of the law involved recognition of the whole of it as obligatory (Gal. v. 3), and consequently “made void the grace of God.”

The schism in the community at Antioch was probably never healed. It is not probable that Paul’s contention was there victorious; for, while Paul never again speaks of that city, Peter seems to have remained there, and he was looked upon in later times as the founder of its church. But this failure at Antioch served to Paul as the occasion for carrying out a bolder conception. The horizon of his mission widened before him. The “fulness of the Gentiles ” had to be brought in. His diocese was no longer Antioch, but the whole of the Roman empire. The years that followed were almost wholly spent among its great cities, “preaching among the Gentiles the unsearchable riches of Christ ” (Eph. iii. 8). He became the spiritual father

of many communities, and he watched over then with a father’s constant care. He gathered round him a company of faithful disciples, who shared with hii his missionary work, and whom he sent sometimes to break new ground, sometimes to arrange disputes, sometimes to gather con- tributions, sometimes to examine and report. Of his travels, whether with them or alone, no complete record has been preserved ; some of them are minutely described in the Acts, others within the same period are known only or chiefly from his epistles. In giving an account of them it is necessary to change to some extent the historical perspective which is presented in the Acts ; for, in working up fragments of itineraries of Paul’s companions into a consecutive narrative, many things are made to come into the foreground which Paul himself would probably have disregarded, and many things are omitted or thrown into the shade to which, from his letters, he appears to have attached a primary importance.!

The first scene of his new activity, if indeed it be allow- able to consider the conference at Jerusalem and the subse- quent dispute at Antioch as having given occasion for a new departure, was probably the eastern part of Asia Minor, and more particularly Galatia. Some of it he had visited before ; and from the fact that the Galatians, though they had been heathens (Gal. iv. 8), were evidently acquainted with the law, it may be inferred that he still went on the track of Jewish missionaries, and that here, as elsewhere, Judaism had prepared the way for Christianity. Of his preaching he himself gives a brief summary ; it was the vivid setting forth before their eyes of Jesus as the crucified

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i The most important instance of this is probably the almost entire omission of an account of his relations with the community at Corinth ; one of his visits is entirely omitted, another is also omitted, though it May be inferred from the general expression “he came into Greece” (xx. 2); and of the disputes in the community, and Paul’s relations to them, there is not a single word.

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at which the Jewish distinctions of meats were disregarded. He thereby accepted Paul's position. But when " certain came from James" he drew back. The position of James that, even if the law had ceased to be valid as a means of justification, it was still valid as a rule of

For reasons which are not apparent, possibly the not to break with the community at Jerusalem, not only Peter but Barnabas and the whole of the Jewish party at Antioch accepted that position, with its consequent obligation of separation from the Gentile brethren, not only life, but probably also in the partaking of the Paul showed that the position of Peter was illogical, and that he was self-convicted (kareyvao pévos

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Messiah, and it was confirmed by evident signs of the working of the Spirit (Gal. ili. 1, 5). The new converts received it with enthusiasm ; he felt for them as a father ; and an illness (some have thought, from the form of ex- pression in Gal. iv. 15, that it was an acute ophthalmia) which came upon him (assuming this to have been his first visit) intensified their mutual affection. What we learn specially of the Galatians is probably true also of the other Gentiles who received him; some of them were baptized (Gal. iii, 27), they were formed into communities (Gal. i, 2), and they were so far organized as to have a distinc- tion between teachers and taught (Gal. vi. 6).

But an imperative call summoned him to Europe. The western part of Asia Minor, in which afterwards were formed the important churches of Ephesus, Colossx, Hierapolis, and Laodicea, was for the present left alone. He passed on into Macedonia. from Asia to Europe. he had preached only in small provincial towns. Hence- forward he preached chiefly, and at last exclusively, in the great centres of population. He began with Philippi, which was at once a great military post and the wealthy entrepot of the gold and silver mines of the neighbouring Mount Pangeus. The testimony of the eye-witness whose account is incorporated in Acts xvi. 12-18 tells us that his first convert was a Jewish proselyte, named Lydia; and Paul himself mentions other women converts (Phil. iv. 2). There is the special interest about the community which soon grew up that it was organized after the manner of the guilds, of which there were many both at Philippi and in

other towns of Macedonia, and that its administrative officers were entitled, probably from the analogy of those guilds, “bishops” and “ deacons.”

In Europe, as in Asia, persecution attended him. He was “shamefully entreated” at Philippi (1 Thess. ui. 2), and according to the Acts the ill-treatment came not from the Jews but from the Gentile employers of a frenzied prophetess, who saw in Paul’s preaching an element of danger to their craft. Consequently he left that city, and passingover Amphipolis, the political capital of the province, but the seat rather of the official classes than of trade, he went on to the great seaport and commercial city of Thessalonica. His converts there seem to have been chiefly among the Gentile workmen (1 Thess. ive 11 ;°2eEheseein. 10-12), and he himself became one of them. Knowing as he did the scanty wages of their toil, he “worked night and day that he might not burden any of them” (1 Thess. ii, 9; 2 Thess. iii, 8). But for all his working he does not seem to have earned enough to support his little com- pany ; he was constrained both once and again to accept help from Philippi (Phil. iv. 16). He was determined that, whatever he might have to endure, no sordid thought should enter into his relations with the Thessalonians ; he would be to them only what a father is to his children, behaving himself “holily and righteously and unblameably,” and exhorting them to walk worthily of God who had called them (1 Thess. ii. 10-12). But there, as elsewhere, his preaching was “in much conflict.” The Jews were actively hostile, According to the account in the Acts (xvii. 5-9), they at last hounded on the lazzaroni of the city, who were doubtless moved as easily as a Moslem crowd in modern times by any cry of treason or infidelity, to attack the house of Jason (possibly one of Paul’s kinsmen, Rom. xvi. 21), either because Paul himself was lodging there, or be- cause it was the meeting-place of the community. Paul and Silas were not there, and so escaped ; but it was thought prudent that they should go at once and secretly to the neighbouring small town of Bercea. Thither, however, the fanatical Jews of Thessalonica pursued them ; and Paul, leaving his companions Silas and Timothy at Bercea, gave

The change was more than a passage In Mace- Hitherto, if Antioch be excepted, donia.

At Athens.

up his preaching in Macedonia for a time and went south- wards to Athens.

The narrative which the Acts give of his stay at Athens is one of the most striking, and at the same time one of the most difficult, episodes in the book. What is the meaning of the inscription on the altar? What is the Areopagus? How far does the reported speech give Paul's actual words? What did the Athenians understand by the Resurrection? These are examples of questions on which it is easy to argue, but which, with our present knowledge, it is impossible to decide. One point seems to be clear, both from the absence of any further mention of 'he city in Paul's writings and from the absence of any permanent results of his visit, that his visit was a comparative failure. Tt was almost inevitable that it should be so. Athens was the educational centre of Greece. It was a great university city. For its students and professors the Christianity which Paul preached had only an intellectual interest. They were not conscious of the need, which Christianity presupposes, of a great moral reformation ; nor indeed was it until many years afterwards, when Christianity had added to itself certain philosophical elements and become not only a religion but a theology, that the educated Greek mind, whether at Athens or elsewhere, took serious hold of it. Of Paul's own inner life at Athens we learn, not from the Acts, but from one of his epistles. His thoughts were not with the philosophers but with the communities of Macedonia and the converts among whom he had preached with such different success. He cared far less for the world of mocking critics and procrastinating idlers in the chief seat of culture than he did for the enthusiastic artisans of Thessalonica, to whom it was a burning ques- tion of dispute how soon the Second Advent would come, and what would be the relation of the living members of the church to those who had fallen asleep. He would fain have gone back to them, but "Satan hindered him" (1 Thess. ii. 17, 18); and he sent Timothy in his stead "to comfort them as concerning their faith," and to prevent their relapsing, as probably other converts did, under the pressure of persecution (1 Thess. iii. 2, 3).

From Athens he went to Corinth, the capital of the Roman province of Achaia, and the real centre of the busy life of Greece. It was not the ancient

Greek city with Greek inhabitants, but a new city which had grown up in Roman times, with a vast population of mingled races, who had added to the traditional worship of Aphrodite the still more sensuous cults of the East. Never before had Paul had so vast or so promising a field for his preach- ing; for alike the filthy sensuality of its wealthy classes and the intense wretchedness of its half-million of paupers and slaves (tiv BdeAupiay Tov Exeive mrrovctwv Kal TOV meviitov &OAvoTyTa, Alciphr. iii, 60) were prepared ground upon which his preaching could sow the seed, in the one case of moral reaction, and in the other of hope. At first the greatness of his task appalled him: ‘I was with you in weakness, and in fear, and in much trembling” (1 Cor. ii. 3). But he laid down for himself from the first the fixed principle that he would preach nothing but “Jesus Christ, and him crucified” (1 Cor. ii. 2), compromising with neither the Jews, to whom “the word of the cross,” i.e., the doctrine of a crucified Messiah, was ‘‘a stumbling- block,” nor with the Gentile philosophers, to whom it was “foolishness ” (1 Cor. i. 18, 23). It is probable that there were other preachers of the gospel at Corinth, especially among the Jews, since soon afterwards there was a Judaizing party; Paul’s own converts seem to have been chiefly among the Gentiles(1 Cor. xii. 2). Some of them apparently belonged to the luxurious classes (1 Cor. vi. 11), a few of them to the influential and literary classes (1 Cor. i. 26); but the majority were from the lowest classes, the “‘ foolish,”

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the “weak,” the “base,” and the “despised” (1 Cor, i. 27, 28). And among the poor he lived a poor man’s life, It was his special “ glorying” (1 Cor. ix. 15; 2 Cor. xi. 10) that he would not be burdensome to any of them (1 Cor, ix. 12; 2 Cor. xi. 9, xii. 13). He worked at his trade of tent-making; but it was a hard sad life. His trade was precarious, and did not suffice for even his scanty needs (2 Cor. xi. 9). Beneath the enthusiasm of the preacher was the physical distress of hunger and cold and ill-usage (1 Cor. iv. 11). But in “all his distress and affliction” he was comforted by the good news which Timothy brought him of the steadfastness of the Thessalonian converts ; the sense of depression which preceded it is indicated by the graphic phrase, “ Now we live, if ye stand fast in the Lord” (1 Thess. iii. 6-8). With Timothy came Silas, both of them bringing help for his material needs from the

communities of Macedonia (2 Cor. xi. 9; Acts xvii. 5; perhaps only from Philippi, Phil. iv. 15), and it was apparently after their coming that the active preaching began (2 Cor. 1. 19) which roused the Jews to a more open hostility.

Of that hostility an interesting incident is recorded in the Acts (xviii. 12-16); but a more important fact in Paul's life was the sending of a letter, the earliest of all his letters which have come down to us, to the community which he had founded at Thessalonica. Its genuineness, though perhaps not beyond dispute, is almost certain. Part of it is a renewed exhortation to steadfastness in face of perse- cutions, to purity of life, and to brotherly love ; part of it is apparently an answer to a question which had arisen among the converts when some of their number had died before the Parousia ; and part of it is a general suminary of their duties as members of a Christian community. It was probably followed, some months afterwards, by a second letter ; but the genuineness of the Second Epistle to the Thessalonians has been much disputed. It proceeds upon the same general lines as the first, but appears to correct the misapprehensions which the first had caused as to the nearness of the Parousia.

After having lived probably about two years at Cormth Paul resolved, for reasons to which he himself gives no clue, to change the centre of his activity from Corinth to Ephesus. city with a vast mixed population; it afforded a similar field for preaching, and it probably gave him increased facilities for communicating with the communities to which he was a spiritual father. It is clear from his epistles that his activity at Ephesus was on a much larger scale than the Acts of the Apostles indicate. Probably the author of the memoirs from which this part of the narrative m the Acts was compiled was not at this time with him; consequently there remain only fragmentary and for the most part unimportant anecdotes. His real life at this time is vividly pictured in the Epistles to the Corinthians. It was a life of hardship and danger and anxiety : "' Even unto this present hour we both hunger and thirst, and are naked, and are buffeted, and have no certain dwelling- place; and we toil, working with our own hands ; being reviled, we bless; being persecuted, we endure; being defamed, we intreat ; we are made as the filth of the world, the offscouring of all things even until now" (1 Cor. iv. 11-13). It was almost more than he could bear: "We were

weighed down exceedingly, beyond our power, inso- much that we despaired even of life” (2 Cor. i. 8). He went about like one condemned to die, upon whom the sentence might at any moment be carried out (2 Cor. 1. 9). Once, at least, it seemed as though the end had actually come, for he had to fight with beasts in the arena (1 Cor. xv. 32); and once, if not on the same occasion, he was only saved by Prisca and Aquila, “who for his life laid down their own necks” (Rom. xvi. 4). But that which

Like Corinth, Ephesus was a great commercial q ae

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filled a larger place in his thoughts than the “perils” of either the past or the present was the “care of all the churches.” He was the centre round which a system of communities revolved; and partly by letters, partly by sending his companions, and partly by personal visits, he kept himself informed of their varied concerns, and en- deavoured to give a direction to their life.

His most important relations were those with the communities of Asia Minor and of Corinth.

(A) It is probable that from Ephesus he went to the churches of g Galatia. Before writing to the Galatians he had paid them at least two visits (Gal. i. 9, iv. 13), and, although it is conceivable that poth visits may belong to his earlier journeys, yet the tone of his letter implies that no great interval had elapsed since his last visit (Gal. i. 6). The Acts mention that soon after his arrival at Ephesus he went to Syria, and returned “through the region of Phrygia and Galatia in order, stablishing all the disciples” (xviii. 28); and, although the motive which is assigned for that journey has been called in question, the journey itself is not inconsistent with the statemeuts of his epistles. He appears to have been followed by vigorous opponents, who denicd his authority as a Christian teacher, and who taught “another gospel” (Gal. i. 6, 7). He consequently wrote a letter, the Epistle to the Galatians, which, from its marked antithetical character, throws greater light upon the essential points of his preaching than any other which has come down to us. It ig mainly directed to three points: first, to assert that what he preached had its origin in a direct revelation to himself, and was consequently of divine authority ; secondly, to show that the bless- ings of the gospel were

not limited to the seed of Abraham, but were given to all that believe; thirdly, to maintain that submis- sion to the requirements of the law was not mercly unnecessary, but an abandonment of the gospel. To this he adds the practical exhortation that they should not “use their freedom for an occa- sion to the flesh,” but “walk by the Spirit,” from whom their new life came.

It is also probable that during his stay at Ephesus several com- munities were formed in the western corner of Phrygia, in the valley of the Lycus, at Laodicea, Colosse, and Hierapolis. If the testimony of the Epistle to the Colossians be accepted, they were formed, a Paul himself, but by Epaphroditus (Col. i. 7, ii. ie 12, 13).

(B) His relations at this time with the community at Corinth may for the most part be clearly inferred from his epistles, but, since they are ignored in the Acts and since the words of the epistles are in some cases ambiguous, there are some points of comparative uncertainty. The following is the most probable account of them. (1) Corinth, soon aftcr Paul left it, was visited by Apollos, who is described in the Acts as an Alexandrian Jew, “a learned man” and “mighty in the Scriptures” (xviii. 24). Paul had “ planted,” and Apollos “watered” (1 Cor. iii. 6); to the unrhctorical and unphilosophical gospel of the one was added the rhetorical and philosophical preaching of the other ; they both preached in effect the same gospel, but between their followers there soon came to be ativalry; and it is probably in contrast to Apollos that Paul sub- sequently protests that his own preaching was “not in persuasive words of wisdom, but in demonstration of the Spirit and of power” (1 Cor. ii. 4). (2) It is probable that Paul then went to Corinth a second time; since his next visit was his third (2 Cor. xiii. 1, which, however, has sometimes been understood of an unfulfilled intention). (3) The Corinthians afterwards wrote to ask his advice on several points, viz. on marriage, on virgins, on things sacrificed to idols, on spiritual gifts, on the collection for the poor, and on his relations with Apollos (it is probable that the sections of Paul’s letter which begin with the preposition zepi, “concerning,” are the direct answers to the letter of the Corinthians). He also received news of the state of affairs at Corinth from the slaves of Chloc, who told him of the divisions in the community (1 Cor. i. 11), and from Stephanas, Fortunatus, and Achaicus, who not only gave him better

news, but probably also brought him material help (1 Cor. xvi. 17). He probably also learnt something from Apollos, who | iri ees

1 It has been customary to give this visit to Syria a factitious im- portance by representing it as constituting the point of division be- tween the secotid and the third missionary journeys. But the arrange- ment of Paul's active life into '"' missionary journeys " is artificial and unsatisfactory. The so-called "first missionary journey " is, as has been pointed out above, only a single episode in at least eleven years of work ; and, even if it be allowed that the conference at Jerusalem constitutes a sufficiently important epoch in his life to warrant a break in his biography, there is no solid reason whatever for fixing upon this particular visit to Syria as constituting such an epoch. If the latter part of his biography be broken up into chapters at all, it Would be much more useful to divide it according to the centres at Which he settled from time to time, and from which his activity Tadiated, Corinth, Ephesus, Cxsarea (probably), and Rome.

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had come to him (1 Cor. xvi. 12). (4) He then sent Timothy to them (1 Cor. .iv. 17, xvi. 10, 11), possibly by way of Macedonia, and with Erastus (Acts xix. 22). It has been thought that Timothy never reached Corinth (Neander, De Wette, Hausrath, partly on the ground that he would have been mentioned in 2 Cor. xii. 17) ; but, on the other hand, since his intended visit was mentioned in the first letter, his non-arrival would probably have been expressly accounted for in the second (Heinrici, Holtzmann). (5) Before Timothy reached Corinth Paul addressed to the Corinthians the first of the two letters which have come down tous. (6) Afterwards, possibly in consequence of the news which Timothy brought to him at Ephesus, he sent a second letter, which has not been pre- served ; this is an inference from 2 Cor. ii. 3, 4, vii. 8-12, where the description of a letter written "with many tears," which made the Corinthians "sorry," docs not seem applicable to the existing 1 Cor. (Hausrath thinks that this intermediate letter is to be recognized in 2 Cor. x.~~xiii.; but his hypothesis is rejected by Hilgenfeld, Beyschlag, Klépper, Weizsiicker, Holtzmann, and others). (7) Then he sent Titus, probably with a view to the col~~ lection of alms jor the poor Christians in Palestine (2 Cor. viii. 6, xii. 17, 18; 1 Cor. xvi. 1-3). (8) After this,

without waiting for the return of Titus, he resolved to carry out the intention which he had for some time entertained, but which he had abandoned or postponed, of going again himself (1 Cor. xvi. 5, 6; 2 Cor. i. 15, 93; it may be noted that, while in the first epistle his intention was that which he actually carried out, viz., to go first to Mace- donia and then to Corinth, in the second epistle the order of his intended route is altered). ;

An émeute which took place at Ephesus was, according to the Acts, the occasion if not the cause of his leaving that city ; “a great door and effectual had been opened unto him” there (1 Cor. xvi. 9), and the growth of the new religion had caused an appreciable diminution in the trade of those who profited by the zeal of the worshippers at the temple (Acts xix. 23 to xx. 1). He went overland to Troas, where, as at Ephesus, “a door was opened unto him in the Lord” (2 Cor. ii. 12); but the thought of Corinth was stronger than the wish to make a new com- munity. He was eager to meet Titus, and to hear of the effect of his now lost letter; and he went on into Mace- donia. It is at this point of his life more than at any other that he reveals to us his inner history. At Ephesus he had been hunted almost to death; he had carried his life in his hand; and, “even when we were come into Macedonia, our flesh had no relief, but we were afflicted on every side; without were fightings, within were fears” (2 Cor. vii. 5). But, though the “outward man was decaying, yet the inward man was renewed day by day”; and the climax of splendid paradoxes which he wrote soon afterwards to the Corinthians (2 Cor. vi. 3-10) was not a rhetorical ideal, but the story of his actual life. But after a time Titus came with news which gladdened Paul’s heart (2 Cor. vii. 7). He had been well received at Corinth. The letter had made a deep impression. The admonitions had been listened to. The Corinthians had repented of their conduct. They had rid themselves of

“him that did the wrong,” and Paul was “of good courage concerning them” (2 Cor. vii. 8-16). He then

wrote the second of his extant letters to them, which was sent by Titus and the unknown “brother whose praise in the gospel is spread through all the churches,” and who had been elected by the churches to travel with Paul and his company (2 Cor. viii. 18, 19). It was probably in the course of this journey that he went beyond the borders of Macedonia into the

neighbouring province of Tlyricum (Rom. xv. 19); but his real goal was Corinth. For the third time he went there, and, overcoming the scruples of his earlier visits, he was the guest of Gaius, in whose house the meetings of the community took place (Rom. xvi. 23).

Of the incidents of his visit no record remains; the Acts do not even mention it. But it was the culminating point of his intellectual activity ; for in the course of it he wrote the greatest of all his letters, the Epistle to the Romans. And, as the body of that epistle throws an invaluable light upon the tenor of his preaching at this

In Mace- donia again.

Titus comes from

Corinth.

At Corinth again.

time to the communities, among which that of Rome can hardly have been singular, so the salutations at the end, whether they be assumed to be an integral part of the whole or not, are a wonderful revelation of the breadth and intimacy of his relations with the individual members of those communities. But that which was as much in his mind as either the great question of the relation of faith to the law or the needs of individual converts in Collec- the Christian communities was the collection of alms "for tion of the poor among the saints that were at Jerusalem " (Rom. aed a xv. 26). The communities of Palestine had probably ner =" never ceased to be what the first disciples were, communi- ties of paupers in a pauperized country, and consequently dependent upon external help. And all through his mis- sionary journeys Paul had remembered the injunction which had sealed his compact with "the three" (Gal. i1. 10). In Galatia (1 Cor. xvi. 1), among the poor and persecuted churches of Macedonia (Rom. xv. 26; 2 Cor. viii. 1-4), at Corinth, and in Achaia (1 Cor. xvi. 1-3; 2 Cor. viii. and ix.), the Gentiles who had been made partakers with the Jews in spiritual things had been successfully told that "' they owed to them also to minister unto them

in carnal things” (Rom. xv. 27). The con- tributions were evidently on a large scale; and Paul, to prevent the charges of malversation which were sometimes made against him, associated with himself “in the matter of this grace” a person chosen by the churches themselves (2 Cor. viii. 19-21, xii. 17, 18); some have thought that all the persons whose names are mentioned in Acts xx. 4 were delegates of their respective churches for this purpose. He resolved to go to Jerusalem himself with this material testimony of the brotherly feeling of the Gentile communi- ties, and then, “having no more any place” in Greece, to go to the new mission fields of Rome and the still farther West (Rom. xv. 23-25). He was not certain that his peace-offering would be acceptable to the Jewish Christ- ians, and he had reason to apprehend violence from the Sets out unbelieving Jews. His departure from Corinth, like that for Jeru- from Ephesus, was probably hastened by danger to his salem. 2 : : : : : life; and, instead of going direct to Jerusalem (an intention which seems to be implied in Rom. xv. 25), he and his companions took a circuitous route round the coasts of the Aigean Sea. His course lay through Philippi, Troas, Mitylene, Chios, and Miletus, where he took farewell of the elders of the community at Ephesus in an address of which some reminiscences are probably preserved in Acts xx, 18-34. Thence he went, by what was probably an ordinary route of commerce, to the Syrian coast, and at last he reached the Holy City. The narrative which the Acts give of the incidents of

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What colouring of a later time, derived from later con- troversies, has been spread over the original outline of the history cannot now be told. While on the one hand the difficulties of the narrative as it stands cannot be over- looked, yet on the other hand no faithful historian will undertake, in the absence of all collateral evidence, the task of discriminating that which belongs to a contempo- rary testimony and that which belongs to a subsequent recension. From this uncertainty the general concurrence of even adverse critics excepts the “we” section (Acts xxvii, 1, xxviii. 16); whoever may have been the author of those “we” sections, and whatever may be the amount of revision to which they have been subjected, they seem to have for their basis the diary or itinerary of a companion of Paul,

and the account of the voyage contains at least the indisputable fact that Paul went to Rome.

But his life at Rome and all the rest of his history are enveloped in mists from which no single gleam of certain light emerges. Almost every writer, whether apologetic or sceptical, has some new hypothesis respecting it; and the number and variety of the hypotheses which have been already framed is a warning, until new evidence appears, against adding to their number. The preliminary ques- tions which have to be solved before any hypothesis can be said to have a foundation in fact are themselves ex- tremely intricate ; and their solution depends upon con- siderations to which, in the absence of positive and deter- mining evidence, different minds tend inevitably to give different interpretations.

name, which, if they be his, must be assigned to the later: period of his life, viz., those to the Philippians, Ephesians, and Colossians, to Philemon, to Timothy, and to Titus. As these epistles do not stand or fall together, but give rise in each case to separate discussion, the theories vary accord- ing as they are severally thought to be genuine or false. The least disputed is the Epistle to Philemon ; but it is also the least fruitful in either doctrine or biographical details. Next to it in the order of general acceptance is the Epistle to the Philippians. The Epistles to the Ephe- sians and to the Colossians have given rise to disputes which cannot easily be settled in the absence of collateral evidence, since they mainly turn partly on the historical probability of the rapid growth in those communities of certain forms of theological speculation, and partly on the psychological probability of the almost sudden develop- ment in Paul’s own mind of new methods of conceiving and presenting Christian doctrine. The pastoral epistles, viz., those to Timothy and to Titus, have given rise to still graver questions, and are probably even less defensible.

The chief of these preliminary Gennine

questions is the genuineness of the epistles bearing Paul’s ae auline

epistles,

his life there is full of grave difficulties. It leaves alto- gether in the background that which Paul himself mentions as his chief reason for making the visit; and it relates that he accepted the advice which was given him to avail

But, even if this preliminary question of the genuine- Diflieul- ness of the several epistles be decided in each instance in Lo the affirmative, there remains the further question whether i,

they or any of them belong to the period of Paul's imprison- Jater life

himself of the custom of vicarious vows, in order to show, by his conformity to prevalent usages, that "there was no truth" in the reports that he had told the Gentiles 'not to circumcise their children, neither to walk after the customs" (Acts xxi. 20-26). If this narrative be judged by the principles which Paul proclaims in the Epistle to the Galatians, it seems hardly credible. He had broken with Judaism, and his whole preaching was a preaching of the "righteousness which is of faith," as an antithesis to, and as superseding, the "righteous- ness which is of the law." But now he is represented as resting his defence on his conformity to the law, on his being "(a Pharisee and the son of Pharisees," who was called in question for the one point only that he

believed, as other Pharisees believed, in the resurrection of the dead.

ment at Rome, and, if so, what they imply as to his history. It is held by many writers that they all belong to an earlier period of his life, especially to his stay at Caesarea (Acts xxiv. 23, 27). It is held by other writers that they were all sent from Rome, and with some such writers it has become almost an article of faith that he was im- prisoned there not once but twice. It is sometimes further supposed that in the interval between the first and second imprisonments he made his intended journey to Spain (Rom. xv. 24, which is apparently regarded as an accom- plished fact by the author of the Muratorian fragment) ; and that either before or after his journey to Spain he visited again the communities of the Aigean seaboard which are mentioned in the pastoral epistles.

The place and manner and occasion of his death are not less uncertain than the facts of his later life. The

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only fragment of approximately contemporary evidence is a vague and rhetorical passage in the letter of Clement of Rome (c. 5): “Paul . . . having taught the whole world righteousness, and having come to the goal of the West (emt 7d Téppa Tis dicews), and having borne witness (uap- zupyoas) before the rulers, so was released from the world and went to the Holy Place, having become the greatest example of patience.” The two material points in this passage, (1) “the limit of the West,” (2) “having borne witness,” are fruitful sources of controversy. The one may mean either Rome or Spain, the other may mean either “having testified” or “having suffered martyrdom.” It is not until towards the end of the 2d century, after many causes had operated both to create and to crush traditions, that mention is made of Paul as having suffered about the same time as Peter at Rome ; but the credibility of the assertion is weakened by its connexion in the same sentence with the erroneous statement that Peter and Paul went to Italy together after having founded the church at Corinth (Dionysius of Corinth, quoted by Eusebius, 7. £., ii. 25). A Roman presbyter named Gaius speaks, a few years later, of the martyr-tombs of the two apostles being visible at Rome (quoted by Eusebius, J. c.); but neither this testimony nor that of Tertullian (De prescr. 36, Scorp. 15, Adv. Mare. iv. 5) is sufficient to establish more than the general probability that Paul suffered martyrdom. But there is no warrant for going beyond this, as almost all Paul’s biographers have done, and finding an actual date for his martyrdom in the so-called Neronian persecu- tion of 64 A.D.}

The chronology of the rest of his life is as uncertain as the date of his death. We have no means of knowing when he was born, or how long he lived, or at what dates the several events of his life took place. The nearest approach to a fixed point from which the dates of some events may be calculated is that of the death of Festus, which may probably, though by no means certainly, be placed in 62 A.D. ; even if this date were certainly known, new evidence would be required to determine the length of time during which he held office ; all that can or could be said is that Paul was sent to Rome some

time before the death of Festus in 62 a.p. How widely opinions differ as to the rest of the chronology may be seen by a reference to the chronological table which is given by Meyer in the introduction to his Commentary on the Acts, and after him by Farrar, St Pawl, vol. ii. p. 624.?

Of his personality he himself tells us as much as need ‘be known when he quotes the adverse remarks of his opponents at Corinth: “his letters, they say, are weighty and strong ; but his bodily presence is weak, and his speech of no account” (2 Cor. x. 10). The Christian romance- writer elaborated the picture, of which some traits may have come to him from tradition: ‘‘a man small in stature, bald-headed, bow-legged, stout, close-browed, with a slightly prominent nose, full of grace; for at one time he seemed like a man, at another time he had the face of an angel” (“Acta Pauli et Thecle,” c. 3, ap. Tischendorf, Acta Apos- tolorum Apocrypha, p. 41); and the pagan caricaturist speaks of him in similar terms, as “bald in front, with a slightly prominent nose, who had taken an aerial journey

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1 The Martyrium Pauli in Zaeagni, Coll. mon. vet. eeel., Rome, 1698, p. 535, gives not only details but an exact date, viz., 29th June 66 A.D. ; the day has been adopted by the Latin Church as the eommon anniversary of St Peter and St Paul. All the early evidence which bears upon the point has been eolleeted by Kunze, Preeipua patrum eeelesiasticorum testimonia que ad mortem Pauli apostolt spectant, Gottingen, 1848.

2 The literature of the subject is extensive ; the most eonvenient summary of the discussions, for English readers, will be found in the introduction to Meyer’s Commentary, whieh is mentioned above, and of which there is an English translation.

into the third heaven” (pseudo-Lucian, Philopatris, c. 12). Some early representations of him on gilded glasses and sarcophagi still remain ; accounts of them will be found in Smith and Cheetham, Dict. Chr. Ant., vol. ii. p. 1621; Schultze, Die Katakomben, Leipsic, 1882, p. 149. That he was sometimes stricken down by illness is clear from Gal. iv. 13 (some have

thought also from 2 Cor. ii. 4); and at his moments of greatest exaltation "there was given to him a stake in the flesh . . . that he should not be exalted overmuch" (2 Cor. xii. 7). The nature of this special weakness has given rise to many conjectures ; the most probable is that it was one of those obscure nervous disorders which are allied to epilepsy and sometimes mis- taken for it.?

Of the writings which are ascribed to him in the current lists of Pseudo- the canonical books of the New Testament, and also of the Epistle nymous to the Hebrews, accounts will be found in separate articles under writings. their respective titles. The writings which are ascribed to him outside the canon, and which are all unquestionably pseudonymous, are the following. (1) The Epistle to the Laodiceans. This is sup- posed to be the letter mentioned in Col. iv. 16 ; it has been recog- nized as apocryphal from early times (Jer., Catal. seript. cecl., ¢. 5; Theodoret on Coloss. iv. 16, &c.), but it is found in many Latin MSS. of the New Testament. The text, which is a cento from genuine Pauline epistles, will be found, ¢.g., in Anger, Ueber den Laodicenerbrief, Leipsic, 1843 ; Lightfoot, Colossians, p. 274, who also gives a convenient summary of the views which have been held respecting the letter which is actually mentioned. (2) 4 Third Epistle to the Corinthians, t.e., the letter mentioned in 1 Cor. v. 9. This is found in an Armenian version, together with an equally apo- eryphal letter of the Corinthians to Paul; it has beeu several times printed, the best edition of it being that of Aucher, Armenian and English Grammar, Venice, 1819, p. 183. An English translation will be found in Stanley, Epistles of St Paul to the Corinthians, p. 593. (3) Letters between Paul and Seneca. 'These are first nientioned by Jerome, Catal. seript. eceles., c. 12, and Augustine, Epist. 54 (153), ad Macedonium, and have given rise to interesting discussions as to the possibility of personal relations having actually existed be- tween the two men. The letters will be found in most editions of Seneca, ¢.g., ed. Hasse, vol. iii. 476 ; for the questions which have been raised concerning them reference may conveniently be made to Funk, '' Der Briefwechsel des Paulus nut Seneca," in the Theol. Quartalschr., Tiibingen, 1867, p. 602, and Lightfoot, Philippians, p. 327. Besides these apocryphal letters there are several apocry- phal works which profess to add to our information respecting his life ; the most importaut of these are (1) Zhe Aets of Peter and Paul, (2) The Aets of Paul and Thecla, (3) The

Apocalypse of Paul ; the first two are printed in Tischendorf's Acta A 'postolorum Apocrypha, pp- 1, 40, the third iu his Apocalypses Mosis, Esre, Pauli, p. 34; all three will be found in an English version in The Apocryphal Gospels, Acts, and Revelations, translated by A. Walker, Edinburgh, 1870; an elaborate and trustworthy account of them will appear in the not yet completed work of R. A. Lipsius, Die apokryphen Apostelgeschichten und Apostellegendcn.

Pauline Theology.

The consideration of Paul's theology is rendered difficult by Diffieul- several circumstances. Some of these circumstances attach to the ties at- theology itself. (1) It has two elements, the logical and the mysti- taching cal, which are seldom altogether separable from each other ; it to his cannot be stated in a consecutive series of syllogisms, nor can any theology. adequate view of it leave out of sight elements which belong to another order of thought than that within which the modern world ordinarily moves. (2) He belonged to an age In which abstract conceptions had a greater power over men's ntinds than they have now; the extreme tendency of that feature of his age 1s seen In Gnosticism, which not only gave abstract ideas an independent existence but endowed them with personality ; and, although he was not a Gnostic, yet he lived at a time at which Gnosticism was conceivable, and some of his own expressions are not out of har- mony with it. (8) Since he was in some instances attaching new meanings to words which were already in use, and since In such a ease it is difficult for even the most rigidly logical writer to keep the new meaning entirely distinct from the old, it is natural to find that a writcr of Paul's temperament, especially when writing as he did under different circumstances and to different classes of people, should sometimes use the same word in different senses.

Other circumstances arise from the manner in which his theology

3 See Krenkel, ' Das kérperliche Leiden des Paulus," in the Zettsehr. Sf. wissenseh. Theol., 1873, p. 238; and for various views, Lightfoot, Galatians, p. 188; Farrar, St Paul, vol. i., Exeurs. x. p. 652.

Sin, the funda- mental concep- tion.

has been treated. (4) It has proved to be difficult for most writers to avoid attaching to some of the words whieh he uses, and which are also used by writers of other parts of the New Testament, ideas which may be true in themselves, and which were probably in the minds of those other writers, but which do not o> to have entered into Paul's own system of thought (5) It has proved to be difficult for most writers to keep Paul's own ideas clear from their later accretions. Augustinianism, of Thomism, and of Lutheranism ; and, since one or other of these systems of theology, or some modification of it, forms part of the edueation of most theological students, and is embodied in the catechism or confession with whose words, if not always with their meaning, every member of a Christian community is more or less familiar, it is not unnatural to find that almost all

writers have approached the subject with a certain amount of

prepossession in favour of some particular interpretation or com- bination of Paul's phrases. (6) Another kind of difficulty arises from the very limited extent to which it is possible to apply to his theology the method of comparison. If it were possible to recover a sufficient amount of current Palestinian theology for the purpose, any exposition of Paul's theology would begin by setting forth the main points of the system of ideas in which he was educated, and would proceed to show how far they were affected by the new elemeuts which were introduced into that system by his conversion. Much light is thrown upon some points by the large knowledge of current Alexandrian theology which may be obtained from Philo ; but, although Palestinian and Alexandrian theology had many elements in common, they seem to have differed most of all in those respects in which a knowledge of the former would have thrown light upon Panl. It becomes necessary, in the absence of most of the materials which would have been valuable for comparison, to content ourselves with putting together the predicates which he attaches to the several terms which he employs, with disentangling the winding threads of his arguments, and with endeavouring to ascertain wliat conceptions will best account for the several groups of his varying metaphors. The danger of stating the results of these processes in a systematic form is partly that, without the checks and side-lights which are

afforded by a knowledge of their antecedents and surroundings, any such statement is liable to have a false perspective, by making prominent that which was subordinate and giving to unimportant phrases a disproportionate value ; and partly that Paul's own variety and complexity of expression re- flect the variety and complexity of the spiritual truths with which he deals, and for which any single form of statement is inadequate.

The most fundamental conception, both historically in the de- velopment of Paul's own thought, and logically as the ground from which the rest of his theology may be deduced, is that of sin. The word is used sometimes to denote the actual doing of a wrong action, or the consciousness of having done it, and sometimes to denote the tendency to do such actions, or the quality of such actions in the abstract. This tendeney or quality is conceived as a quasi-personal being, which dwells in men (Rom. vii. 20), which exercises dominion over them (Rom. y. 21, vi. 12, 14), to which they are slaves (Rom. vi. 13, 17 sg., vii. 14), which pays them wages (Rom. vi. 23), which imposes its law upon them (Rom. vii 23, 25, vill. 2), which keeps them shut up in prison (Gal. iii. 22), or which, in less metaphorical language, causes evil desires (Rom. vii. 8). It is not precisely defined, but, since it is the opposite of obedience (Rom. vi. 16), its essence may be regarded as disobedience. No such definition was at the time necessary, for neither in his belief in the existence of sin nor in his conception of its nature did he differ from the great mass of his countrymen. His pecu- liarity was that he both believed in its universality and made that fact of its universality the basis of his teaching. In the early chapters of the Epistle to the Romans he rests the proof of the fact on an appeal to common experience. But the proof is rather of rhetorical than of logical validity. It was easy in addressing a congregation of Gentiles to point to the general and deep depravity of the society which surrounded them, and in addressing Jews not only to show that they fell short of their own standard, but also to clench the argument by an appeal to Seripture, which deelared that ‘‘there is none righteous, no not one" (Ps. xiv. 1 ; Rom. iii. 10; cf. Gal. iii. 22). But the general prevalence of depravity did not show its universality, and the appeal to Scripture was not convineing toa Gentile. These arguments are not further insisted on, and a More cogent proof is found in the fact of the universality of death ; for it was a fixed Jewish belief that ‘God created man to be immortal" (Wisd. ii. 23), and the fact that all nen died showed that all

men sinned (Rom. v. 12). Nor was even this proof suffi- cient. What had to be shown, for the purposes of his further arguments, was not merely that sin was universal but that it was so inevitably. This is done by showing that sin is inseparable from human nature on tivo grounds, the relation of which to each other is neither elear in itself nor clearly explained by Paul. (1) The one is that mankind as a race were involved in the sin of Adam (Rom. Vv. 12-19; 1 Cor. xv. 21, 22). '*Through the one man's disobedience the many were made sinners' (Rom. v. 19) is

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Those ideas form the basis alike of

a8 Paul gathered from his own experience, which he took to be

an alternative expression with 'through the trespass of the one the many died" (Rom. v. 15). But as to the mode in which the '* disobedience" or '' trespass" of Adam affected the whole human race no information is given, and the question has been one of the chief puzzles of Christian theology in all ages. It is a point upon which, more than perhaps upon any other, light would be thrown by a fuller knowledge of contemporary Jewish theology (cf. Ecclesi- asticus, xxv. 24, ''of the woman came the beginning of sin and through her we all die" ; the question is complicated by the men- tion of Adam in 1 Cor. xv. 47 as '"'of the earth, earthy," and apparently corruptible by virtue of his earthy nature, without reference to his trangression), (2) The second ground is at once more prominent and more intelligible to a modern mind. It is that human nature consists of two elements, and that one of them,

identieal in this respect with the universal experience of mankind, is constantly suggesting sinful actions. Whether it does so because it is in itself essentially sinful, or because sin has effected a perma- nent lodgment in it, is a question which has been vigorously debated, and which is the more difficult of solution because some of Paul's expressions appear to favour the former view and some the latter. To this element of human nature he gives the name ''flesh,"' apparently including under it not only the material body but also, and more especially, the affections and desires which spring out of the body, such as love and hate, jealousy and anger ; its

tendency or “mind” (¢pévnua) is always in antagonism at once to the higher element or “spirit” (Gal. v. 17) and to the law of God, so that “they that are in the flesh cannot please God” (Roin. viii. 7, 8).

So far, in his conception of the dualism of human nature, of the inevitable tendency of the lower part to prevail over the higher, and of the consequent universality of wrongdoing, Panl did not differ from the majority of those who have at any time reflected either upon themselves or upon mankind. The idea of sin was common to him with the Stoics. But it was impossible for him to stop where the Stoics stopped, at the exhortation to men to live by the rule of what was highest in them, and so to “follow God,” For he was not a philosopher but a theologian; he was not a “citizen of the world” but a “ Hebrew of the Hebrews.” God had stood to his race in an especially close relation ; He had given ita code of laws, and that code of laws was to a Jewish theologian the measure not only of duty but of truth. How was the conception of the universality of sin consistent with the existence of “statutes” aud “judgments, which if a man do he shall live in them” (Lev. Xvili. 5, quoted in Rom. x. 5; Gal. iii, 12)? That statement of Scripture clearly implied, and most of his countrymen believed, that the perfect observance of the law was possible, and that soa man might be “righteous before God.”

It was at this point that he broke off, not only from the majority His con- of his countrymen, but from his own early beliefs. The thought ception came to him with the overwhelming power of a direct revelation, of the that the law not only had not been, but could not be, perfectly law. observed. In one sense he seems to have held even to the end of his life that there was “a righteousness that is in the law” (Phil.

lii. 6). But in another and truer sense such a righteousness was impossible. “ By the works of the law shall no flesh be justified” (Gal. ii. 16), and that not only in fact but of necessity. For the law went deeper than was commonly supposed.! It touched not only the outer but also the inner life, and in doing so it inevitably failed from the very constitution of human nature. The existence in that nature of the “fleshly” element was of itself a constant breach of the law. The “mind,” the “inner man,” might delight in the law of God, but the “flesh,” even if it were not inherently sinful, was in perpetual

“captivity to the law of sin.” And for this state of things the law had no remedy. On the one hand, it was external to men; it could not give them the force of a new life ({womorfoa, Gal. iii. 21). On the other hand, the flesh was too strong for it (Rom. viii. 3). Its failure had been foreseen and provided for. The blessing of which, before the law, God had spoken to Abraham was to come, not by observance of the law, but as the result of “promise” on the part of God, and of “faith” on the part of men (Rom. iv. 13-14; Gal. iii. 11-18). And when the question naturally presented itself, Why, if the law was an inevitable and predestined failure, it had been given at all? two answers suggested themselves ; the one was that “it was added because of transgressions,” 7.¢., probably to make men’s sins and their failure to avoid. them more apparent (Gal. iii. 19), since “through the law came the knowledge of sin” (Rom. iii. 20) ; the other was that the law came in “that the trespass might abound ” (Rom. v. 20), and that so “through the commandment sin might

1 It must be noted that there appears to be a constant interchange in his mind between the conception of the Mosaic law and the ideal conception of law in the abstract; but it is difficult to maintain that the two conceptions may always be distinguished by the presence or absence of the Greek article. 1 Cor. ix. 20, Phil. iii. 5, seem of themselves sufficient to make such a distinc- tion untenable, but the contrary view is maintained in an excellent discussion of the point by Dr Gifford, ‘‘Introduction to the Epistle to the Romans,” Pp. 41 sq., in the Speaker’s Commentary on the New Testament.

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become exceeding sinful” (Rom. vii. 13; so 1 Cor. xv. 56, “the strength of sin is the law”). It was consequently a jailer and “tutor,” keeping men under restraint and discipline, until they were ready for that which God had purposed to give them in due time (Gal. iii. 28, 24).

For “in due season, when the fulness of the time was come, God gent forth His Son,” “in the likeness of sinful fiesh and for sin,” to do that which “the law could not do” (Rom. v. 6, vill. 3; Gal. iv. 4). This was a “free gift” of God (Rom. iii. 24, v. 15). The constant expression for it, and for the sum of the blessings which flow from it, is “grace” or “favour” (xdpes), a term which was already becoming specialized in an analogous sense in Hellen-

istic Greek (e.g., Wisd. iii. 9, iv. 15, "'grace and mercy is to His saints"; Philo, vol. i. p. 102, ed. Mang., "the beginning of crea- tion . . . is the goodness and grace of God"). 'Two corollaries followed from it; in the first place, the law, having failed, was superseded, and, so far from the performance of its requirements being necessary to ensure peace with God, "if ye receive circum- cision, Christ will profit you nothing" (Gal. v. 2); in the second place, the distinction between Jew and Gentile was abolished, " for ye are all one in Christ Jesus" (Gal. iii. 28).

This was ''the gospel of the grace of God" (Acts xx. 24), which it was his special mission to preach ; he speaks of it sometimes as "my gospel " (Rom. ii. 16, xvi. 25), or the *' gospel of the uucircum- cision" (Gal. ii. 7), as well as in a special sense ''the gospel of fod" (Rom. i. 1, xv. 16; 2 Cor. xi. 7; 1 Thess. ii. 2, 8, 9), or "the gospel of Christ" (Rom. i. 9, xv. 19; 1 Cor. ix. 12, 18; 2 Mn 12, ix, 13, x. 14; Gal. i. 7; Phil. i 27; 1 Thess. ii. 2; 2 Thess. i. 8), or ''the gospel of the glory of Christ" (2 Cor. iv. 4) ; and elsewhere he speaks of it as his special ''secret " or '' mystery" (Rom. xvi. 25 ; 1 Cor. ii. 1[Codd. &, A, C], and more emphatically in the later epistles, Eph. i. 9, iii. 8-9, vi. 19, Col. i. 26, 27; iv. 8).

Of this gospel Christ is the beginning and the end: theology and Christology are blended into one. Sometimes He is represented as having been 'sent forth" (Rom. viii. 3), or ''set forth" (Rom. iii, 25), or ''given up" (Rom. viii. 32), by God; sometimes, on the other hand, it is said that He ''gave Himself" (Gal. 1. 4), or 'save Himself up" (Gal. ii. 20; Eph. v. 2), or ''made Himself poor " (2 Cor. viii. 9), or ''emptied Himself" (Phil. ii. 7-8). The act by which He accomplished what He designed or was designed to do was His death on the cross (Rom. v. 6, 8, vi. 10, viii. 34, fees; 1 Cor. viii. 11, xv. 3; 2 Cor, v. 14,15; Gal. i, 21; 1 Thess. v. 10). The ''blood" of Christ (Rom. iii. 25, v. 9; 1 Cor. xi. 25; Eph. i. 7, ii. 18; Col. i. [14], 20), the ''cross" of Christ meer. i 17; Gal. v. 11, vi. 12, 14; Phil. ii. 8, iii. 18; Eph. i, 16; Col. i. 20, ii. 14), 'Christ crucified" (1 Cor. i. 28, i. 2; Gal. iii. 1), are therefore used as concise symbolical expressions for His entire work.1 The act by which the completion of that work was ratified and made manifest was His resurrection from the dead (Rom. i. 4; ef. Acts xiii. 88, 34, xvii. 31); hence "' He was delivered up for our offences and raised again for our justification " (Rom. iv. 25). The resurrection is thus the guarantee of the

truth of the gospel; without it there is no certainty that God has for- given us; ‘‘if Christ be not risen then is our preaching vain, and your faith is also vain” (1 Cor. xv. 14). What quality there was in the death of Christ which gave it efficacy is probably indi- cated in Rom. v. 19, Phil. ii. 8, where it is spoken of as an act of “obedience.” The precise force of the expressions, ‘‘ being made a curse for us” (Gal. iii. 13), ‘‘He made Him to be sin for us” (2 Cor. v. 21), which probably also refer to the efficacious quality of the death of Christ, is less obvious.

The death of Christ was a death on our behalf (iaép quay, Rom. fae, 8, Vill. 82, xiv. 15; 1 Cor. i. 13 [Codd. &, A, CO], [v. 7], xl 24; 2 Cor. v.15; Gal. ii. 20, iii. 18; 1 Thess. v. 10 [Codd. &, B]; ef, Eph. v. 25), or on behalf of our sins (1 Cor. xv. 3; Gal. i 4 [Cod. B]), or on our account (ep! judy, 1 Cor. i. 18 (Codd. B, D]; 1 Thess. v. 10 (Codd. A, D]), or on account of our sins (Gal. i. 4 [Codd. &, A, Dj), or of sin in general (Rom. viii. 8), or because of us or our transgressions (dd 7a mapamrdpara, d¢ atrév, Rom. iv. 25; 1 Cor. viii. 11; cf. 2 Cor. viii. 9). These general expressions are expanded into more explicit statements in various ways ; for the nature of the work which the death of Christ effected was capable of being regarded from several points of view, nor was any one metaphor or form of words adequate to express all its relations either to God or to mankind.

(1) The nature of Christ’s work is sometimes expressed in lan- guage which is relative to the idea of sacrifice ; and it is conceivable that, if the conteinporary conception of sacrifice were better known to us, most of the other expressions would be found to be relative to the ideas which were connected by that of sacrifice (1 Cor. v. tp “Christ our passover is sacrificed ” [some MSS. add ‘‘ for us”) ; the uncertain expression tdacripiov, Rom. iii. 25, probably belongs to oS eee eee

_1 This view of the place of the death of Christ in the economy of redemp- tion is so constant and integral a part of Paul’s teaching as to outweigh and set aside the inference which some writers have drawn from Rom. viil. 3, that 4 “sending” of Christ—i.e., His incarnation—was itself sufficient for the end in view,

the same group of ideas ; the expressions with saép and rep, whi have been quoted above, are sometimes mere as ane = ‘ail cases primarily sacrificial).

(2) It is sometimes expressed in language which is relative to the conception of sin as rebellion or enmity against God; what God effected through Christ was a reconciliation (karadrayh, Rom. v. 10, 11; 2 Cor. v. 18, 19), or peace (Rom. v. 1; Eph. i, 14: hence the special force of the salutation ‘‘Grace to you and peace from God,” which is prefixed to every epistle).

(8) It is sometimes expressed in language which is relative to the idea of deliverance or ‘‘salvation” (ca@ferOat, swrnpla, Rom. Ty ALG}, v. 9, and in all the epistles ; dwroAvrpwous,? Rom. ili. 24; 1 Cor. i. 80; Eph. i. 7; Col. i. 14). The idea was originally Messianic, and referred to national deliverance from foreign oppres- sion ; but it had been raised into a higher sphere of thought, that from which men are saved being conceived to be the ‘‘ wrath” of God, 7.c., His punishment of sin (Rom. v. 9).

(4) It is sometimes expressed in language which is relative to the idea of purchasing a slave (1 Cor. vi. 20, vii. 28, and probably Rom. xiv. 8, 9). That to which men were in bondage was the law (Gal. iv. 5), which cursed those who did not fully obey it (Gal. in. 10, 13), or the ‘‘elements of the universe” (Gal. iv. 8, 9), t.e., the sun and stars and other material things (cf. Wisd. xiii. 2), which are spoken of in a later epistle as ‘“‘ principalities and powers” over which Christ ‘‘triumphed” by rising from the dead (Col. 11. 15). Hence, probably, Paul’s own description of himself as the ‘‘slave of Jesus Christ” (Rom. i. 1).

(5) It is sometimes expressed in language which is relative to the conception of God as the supreme lawgiver and judge. Sin is regarded as affording ground fora charge (€y«Anmua, cf. Rom. viii. 38) against the sinner, and, sin being universal, all the world was liable to the judgment of God (Rom. iii. 19). But it was possible for the Judge, for certain reasons which He considered valid, 1.¢., on account of the sufficient exhibition or declaration of His righteousness in the death of Christ, not to take account of the offences charged, but to acquit (d:catoty) instead of pronouncing sentence of condemnation ; by this acquittal the person acquitted was placed in the position of one against whom no charge existed (Sixacoe katracradjoovrar, Rom. v. 19); and, since the acquittal might be regarded in

its different relations as a consequence of either the favour of God, or the death of Cliist, or the trust in God which made it valid for the individual, men are said in various passages to be acquitted by God's favour (Rom. iii. 24), or by the blood of Christ (Rom. v. 9; ef. Gal. ii. 17), or by faith (Rom. iil 98, v. | yxGaltili. 8, 24).*

(6) It is sometimes expressed in language which is relative to the conception of a mystical union between Christ and the human race, or part of it, of such a kind that when He died men also died, and that when He rose again they also rose with Him (Rom. vi. 3-10; Gal. ii. 20; and also in the later epistles, Eph. ii. 5, 6; Col. ii, 12)am,. 3):

Some of these expressions are occasionally combined ; for example, the ideas of acquittal and reconciliation (Rom. v. 1; 2 Cor. v. 19), those of acquittal and deliverance (Rom. v. 9), and those of sacrifice, in which Christ is conceived as dying on men's behalf, and of mystical union in which they die with Him (2 Cor. v. 14). The facts both of their variety and of their combination afford a strong argument against treating any one mode of expression as though it stood alone and gathered up into a single metaphor the whole of the new relations of God to men.

The effect of Christ's work upon mankind is also expressed in Christ's Sometimes it is expressed under the form of an work.

various ways. for imparted attribute, sometimes under that of a new condition of life or a new relation to God. It is most frequently spoken of as (1) righteousness, or (2) life, or (3) sonship. (1) When spoken of as righteousness, it is sometimes said to have been given to men (Rom. vy. 17); sometimes it is reckoned to them or placed to their account (Rom. iv. 6, 11; Gal. ii. 6) ; sometimes it is a power to which they have become, or ought to become, subject (Rom. vi. 18, x. 3); sometimes it is regarded as a quality which men already possess by virtue of Christ's death (Rom. v. 17); sometimes it 1s still to be attained (Rom. iv. 24, vi. 16; Gal. v. 5). (2) When spoken of as life, the conception also seems to vary between that of a life which men have already received, or into which they have already entered (Rom. vi. 4, viti. 10), and that of a life which is future (Rom. v. 17; Gal. vi. 8; cf. Col. ili. 3, 4, where it is conceived as being now

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2 This word seems to have lost its etymological sense of “ransoming,” and to have connoted only ‘“‘ deliverance,” ¢.g., in the LXX., Dan. iv. 29 (31), Nebuchadnezzar speaks of 6 xpévos Tis dmoduTpwoews jou, “the time of my deliverance”; in Treneus, i. 9, 5, it is used of the disinissal of the

tators in a theatre. ; “Ett is difficult to estimate the mischief which has been caused by the fact

that justificare was adopted from early times as the translation of Otxatovy, and the consequent fact that a large part of Western theology has been based upon the etymological signification of justificare rather than upon the mean- ing of its Greek original. One of the clearest instances of the meaning of Sixacooy in Biblical Greek is LXX. Exod. xxiii. 7, ob ducanwoers Tov aceBh ‘thou shalt not acquit the wicked man for bribes.”

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Faith a state of mind.

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“hid with Christ in God,” to be manifested at His coming) ; and similarly sometimcs men are regarded as having already died with Christ (Rom. vi. 6-11), and sometimes the Christian’s life is regarded as a prolonged act of dying in the “ mortification” of the “deeds of the body” (Rom. viii. 13; cf. Col. iii. 5). (3) When spoken of as sonship, the conception also varies between that of a perfected and that of a still future “adoption”; on the one hand “we have received a spirit of adoption” (Rom. viii. 15), so that we are “all sons of God through faith in Christ Jesus” (Gal. iti. 26), and on the other hand we are still “ waiting for the adoption, the deliverance of our body” (Rom. vili. 23).

For, although Christ died for all men (Rom. v. 18 32 Cor. v. 14, 15 ; so in the pastoral epistles, 1 Tim. ii. 4, 6; Tit. i. 11), it docs not therefore follow that all men are at once in full possession of the benefits which His death made possible to them. Their righteous- ness or life or sonship is rather potential than actual. It becomes actual by the co-operation of their own mind and will, that is, by the continuous existence in them of the state of mind called trust or "faith."1 For this view of the place of trust or " faith" St Paul finds support, and may perhaps have found the original suggestion, in the Old Testament. Abraham had believed that God both could and would perform His promises, and this belief "was counted to him as righteousness" (Gen. xv. 6; Rom. iv. 3; Gal. ili. 6); Habakkuk had proclaimed that "the just shall live as a consequence of his faith'? (Hab. ii. 4; Rom. i. 17; Gal. ii. 11) ; and another prophet had said, "whosoever believeth in Him shall not be put to shame" (Rom. ix. 33, x. 11). The object of this trust or faith is variously stated to be " Him that raised Jesus our Lord from the dead" (Rom. iv. 24; x. 9), "Him that justifieth the ungodly" (Rom. iv. 5), or "Jesus Christ" (Rom. iii. 22; Gal. 11. 16, &c.), or His "blood" (Rom. iii. 25 probably). Hence the statement, that the gospel is "the power of God unto salvation," is limited by the condition "to every one that believeth"? (Rom. i.16). Hence, also, since this state of mind is that by which the death of Christ becomes of value to the individual, while he is said on the one hand to be acquitted or justified by Christ's blood (Rom. v. 9), he is said on the other hand to be acquitted or justified as a result of his faith (Rom. v. 1). Hence, also, the new relation of "righteousness" in which men stand to God,—while on the one hand it is "God's righteousness," as being a relation which is established by His favour and not by their merit (Rom. i. 17, iti. 21, 22, v. 17), it is on the other hand a "righteousness which results from faith" (4 éx mliorews Sixacootvy, Rom. x. 6). From another point of view it is an act of obedience or state of submission (Rom. i. 5, vi. 16, 17,

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into being "'is created after God in righteousness and true holiness" (Eph. iv. 24). In another sense this mystical dying with Christ and living with Him is rather an ideal towards which the believer must be continually striving ; it affords a motive for his resisting the tendency to sin: "reckon ye also

yourselves to be dead indeed unto sin, but alive unto God in Christ Jesus our Lord ; let not sin therefore reign in your mortal body" (Rom. vi. 11, 12). (8) A third answer, which, though less directly given, is even more constantly implied, is that faith is followed by, if it be not coincident with, an immediate operation of God upon the soul which becomes for it a new moral power. For, although in the "natural man" there is an element, ''the flesh," over which sin has such an especial dominion as to be said to dwell in it, there is also another element, the ''mind" (voids), or "spirit" (veya), or "inner man" (6 éow dv@pwos), which is the slave, not of the "law of sin," but of the "law of God."? Against this the flesh wages a successful war and "brings it into captivity to the law of sin" (Rom. vii. 22-25). The result is that the mind may become "reprobate" (ddéxceuos, Rom. i, 28; cf. Col. ii. 18, where the "mind" is so completely under the dominion of the flesh as to be called "the mind of the flesh"'), or it may become defiled and ultimately lost (2 Cor. vii. 1; 1 Cor. v. 5). It is upon this part of man's nature that God works. By means of faith (Gal. iii. 14), or as a result of faith (Gal. iii. 2, v. 5), God gives and men receive His own Spirit (1 Thess. iv. 8) or the Spirit of Christ (Rom. viii. 10; Gal. iv. 6; Phil. i. 19). Some- times the Spirit of God is said to "dwell in" them (Rom. viii. 9; 1 Cor. iii. 16), and once the closeness of the union is expressed by the still stronger metaphor of a marriage: "he that is joined to the Lord is one spirit" (1 Cor. vi. 17). This indwelling of, or union with, the Spirit is for the believer a new life ; Christ has become for him "a life-giving spirit" (1 Cor. xv. 45); this is a fact of his spiritual nature which will in due time be manifest even in the quickening of his mortal body (Rom. viii. 11), but in the mean- time it becomes, like the facts of emancipation from sin and of union with Christ, a ground of moral obligation. "If we live by the Spirit, by the Spirit also let us walk" (Gal. v. 25); and the freedom from spiritual death is conditional on the " mortifying of the deeds of the body " (Rom. viii. 13).

It will be evident that, although Paul nowhere defines his conception of faith, he did not conceive it as a mere intellectual assent ; it was a complete self-surrender to God (Gal. ii. 20), and on its human side it showed its activity in the great ethical prin- ciple of "love," which is the sum of a man's duties to his fellow- men (Gal. v. 6, 14).

But, as his conception of the effects of Christ's death, and of the Eschato nature of faith by which these effects are appropriated by the indi- logical vidual, has, so far as the present life is concerned, chiefly a moral functio aspect, and connects itself with practical duties, so, on the other of faith

x. 16, xvi. 19, 26; 2 Cor. x. 5, 6), being the acceptance by men of God's free gift as distinguished from "seeking to establish their own righteousness," ¢. ¢., to attain to a freedom from sin which their fleshly nature renders impossible (Rom. x. 3).

It is obvious that such a doctrine as that of acquittal from the guilt of wrongdoing by virtue of an act or state of mind, instead of by virtuc of a course of conduct, is " antinomian," not merely in the scnse that it supersedes the law of Moses, but also because it appears to supersede the natural law of morality. It was no wonder that some men should infer, and even attribute to Paul himself the inference, " Let us do evil that good may come" (Rom. iii. 8). The objection was no doubt felt to be real, inasmuch as it is more than once stated and receives more than one answer. (1) Onc of the answers which Paul gives to it (Rom. vi. 15 sq.) is due to his conception of both sin and righteousness as external forces. He had regarded sinful acts as the effects of the dominion of a real power residing within men and compelling them to do its will. He now points out that, to those who believe, this dominion is at anend. The believer is not only acquitted from the guilt of sin, but also emancipated from its slavery. He has become a slave to righteousness or to God (Rom. vi. 18, 22). This is stated partly as a fact and partly asa ground of obligation (Rom. vi. 18, 19); and the disregard of the obligation, or "building up again those things which I destroyed," brings a man again under the cognizance of God's law as a transgressor (Gal. ii. 18). (2) Another answer is due to the conception which has been mentioned above of the mystical union between Christ and mankind. This also is stated partly as a fact and partly as a ground of obligation. In one sense the believer has already died with Christ and risen with Him: "our old man was crucified with Him" (Rom. vi. 6), ''they that are Christ's have crucified the flesh" (Gal. v. 24), "the life which I now live in the flesh I live in faith, the faith in the Son of God, who loved me and gave Himself for mc" (Gal. ii. 20); so that on the one hand Christ is said to be in the believer (2 Cor. xiii. 5), and on the other hand the believer is said to be "in Christ."

Whichever mode of conceiving the Christian life be adopted, a life of sin is jmpossible to it: “if any man be in Christ, he is a new creature” (2 Cor. v. 17), and the “new man” which thus comes pS ee ea a

1 “Faith” is not detined by Paul, but his use of the term so mearly re-sembles Philo’s as to be explicable by it. With Philo it is the highest form of eee iy ee ae more certain than either that which comes from

nses or that which comes from reasoning; ef., e.g., D it, i c. 5, vol. ii. p. 412, ed. Mang. : iat

hand, it comprehends the whole physical and spiritual being of man, and connects itself with his eschatology. The resurrection of Christ is not merely the type of moral resurrection from sin to holiness, but at once the type and the cause and the pledge of the actual resurrection of the body. “Ifwe believe that Jesus died and rose again, even so them also that are fallen asleep in Jesus will God bring with Him” (1 Thess. iv. 14) ; “He which raised up the Lord Jesus shall raise up us also with Jesus” (2 Cor. iv. 14); “if we died with Christ, we believe that we shall also live with Him” (Rom. vi. 8). Sometimes the new life of the body is viewed in relation to the mystical union of the believer with Christ: “we which live are alway delivered unto death for Jesus’ sake, that the life also of Jesus may be manifested in our mortal flesh” (2 Cor. iv. 11); and it follows from the conception of the “last Adam” asa “life-giving spirit” that, “as we havc bortie the image of the earthy, we shall also bear the image of the heavenly” (1 Cor. xv. 49; this will follow from the context, even if with most uncial MSS. we read “let us also bear”). Sometimes this new life is viewed asa result of the present indwelling of the Spirit: “ifthe Spirit of Him that raised up Jesus from the dead dwellcth in you, He that raised up Christ Jesus from the dead shall also quicken your mortal bodies through” (or ‘‘ because of”) ‘‘His Spirit that dwelleth in you” (Rom. viii. 11). This redemption or deliverance of the body from the “bondage of corruption” is the complction of the “adoption,” “the liberty of the glory of the children of God” (Rom. viii. 21, 23); but the nature of the new body is not clearly explained. Sometimes the language seems to imply that this mortal body will be “quickened” or “transformed” (Rom. viii. 11; Phil. iii, 21), and the analogy afforded is that of a seed which

after being buried reappears in a new form (1 Cor. xv. 36, 37); sometimes, on the

2 The relation of vols to mve0ua has been much discussed ; among contemporary theologians Holsten and Weiss deny the existence of a mveSua in the natural man, Liidemann and Pfleiderer allow it. It is certain that the two words are used in the same sense by Philo; and it is most probable that they are also so uséd by Paul. One of many proofs is that in quoting Isa. xl. 18 in 1 Cor. ii. 13 he adopts vody from the LXX. as the translation of MV (whereas avedua is the more usual translation), and proceeds to use the phrase voy Xpicrod for mveDua Xpiorod, which the argument requires, and with which it must be identical.

other hand, it seems to be implied that the earthly body will be dissolved, and that what awaits us is a new body, ‘a building of God, a house not made with hands, eternal in the heavens” (2 Cor. v. 1).

This change will come to all believers at the “advent” (rapoveia, 1 Cor. [i. 9, Cod. D.] xv. 23; 1 Thess. ii. 19, &c.), or “revelation” (droxadvyrs, 1 Cor. i. 7; 2 Thess. i. 7), or “manifestation” (ém- gdvera, 2 Thess. ii. 8, and afterwards in the pastoral epistles) of Jesus Christ. Some of them will have “fallen asleep in Christ,” in which state he seems to conceive that they are “at home with the Lord” (2 Cor. v. 8) ; and others, among whom, in the language of confident hope, he includes himself, will be still alive (1 Thess. iv. 15-17). For “the day of our Lord Jesus Christ’”’ (1 Cor. i. 8, vy. 5; 2 Cor. i, 14, &c.) was conceived to be not far distant: “the night is far spent, the day is at hand” (Rom. xiii. 12), and “the mystery of lawlessness,” which was to be revealed before that day could come, was already at work (2 Thess. ii. 3-7). But the “day” itself is variously conceived ; sometimes the eternal life of believers in and with Christ appears to begin at the very moment of the Advent (1 Thess. iv. 17), and hence the day is spoken of as “the day of deliverance” (Eph. iv. 30); but more frequently “thc day of the Lord” is also the day of judgment (Rom. ii. 5, 16), according to the eschatological ideas which had for some time been current among the Jews ; in it all men, believers and unbelievers alike, are represented as standing before the judgment-seat of God (Rom. xiv.

“to the righteousness of God” (Rom. x. 3). God had now carried out another part of His purpose. He had “called” the Gentiles, In the earlier epistles Paul spoke of this calling as having been not only part of God’s purpose, but also expressly announced from time to time by the prophets (Rom. ix. 25, 26, x. 20); but in the doubtful later epistles it is spoken of as a “mystery which hath been hidden from all ages and generations” (Col. i. 26), but now had been “made known through the church” “unto the principali- ties and the powers in the heavenly places” (Eph. iii. 9, 10). But as with the Jews so with the Gentiles, the divine call was not only a fact but also a ground of obligation. While, on the one hand, “we are His workmanship, created in Christ Jesus for good works which God afore prepared that we should walk in them” (Eph. ii. 10), yet, on the other hand, the Ephesians are entreated to “walk worthily of the calling wherewith ye were called” (Eph. iv. 1). In the Epistle to the Romans a still further part of God’s purpose is indicated. The salvation which had come to the Gentiles by the fall of the Jews was ‘to provoke them to jealousy” (xi. 11); as in time past the Gentiles “were disobedient to God but now have obtained mercy” by the disobedience of the Jews, “even so have these also now been disobedient, that by the mercy shown to you they also may now obtain mercy” (xi. 30, 31). And so not only would “the fulness of the Gentiles come in,” but also “all Israel shall be saved” (xi. 25, 26); “for God hath shut up all unto dis- obedience that He might have mercy upon all” (xi. 32).

10) or of Christ (2 Cor. v. 10) to give account of themselves to God, and to receive the reward of the things done in the body, whether good or evil. There is a similar variety of view in regard to what will happen after the Advent. The language which is used somc- times leads to the inference that the destruction of the enemies of

But, just as the apparent fatalism of the theory of absolute pre- The destination without reference to works stands side by side with the “called” obligation of men to “work out their own salvation with fear and or the trembling” (Phil. ii. 12), so this apparent universalism stands side “saints.”

the cross will be immediately effected (2 Thess. i. 9, ii. 8), and sometimes to the inference, which was also in accordance with current eschatological

ideas, that there will be a Messianic reign, during which Christ will “put all enemies under His feet” (1 Cor. xy. 25). And, while in some passages unbelievers or evildoers are said to be punished with “eternal destruction from the face of the Lord” (2 Thess, i. 9; cf. Rom. ii. 8, 9), the view elsewhere seems to be that “in Christ shall a2? be made alive,” the universality of the life in Christ being coextensive with the universality of the death in Adam (1 Cor. xv. 22).

It is difficult to reconcile these conceptions with one another, and still more so to reconcile some of them with other parts of Paul’s doctrine of salvation, except perhaps on the hypothesis that even after his conversion many of the apocalyptic ideas which were current among his countrymen remained in his mind; this hypo- thesis is made the more probable by the fact that in the later and the probably post-Pauline epistles the apocalyptic elements are rare, and that the most definite eschatological statement which they contain is in full harmony with the conception of the believer’s mystical union with Christ, “when Christ, who is our life, shall appear, then shall ye also appear with Him in glory’”’ (Col. iii. 4).

Such are thc main elements of Paul’s soteriology. To most of the philosophical questions which have since been raised in con- nexion with it he neither gives nor implies an answer. It is possible that many of such questions did not even suggest them- selves tohim. The chief of all of them, that of the necessity of sacrifice, was probably axiomatic toa Jewish mind, and its place in Paul’s system must be accepted with all the difficulties which such an acceptance involves. But there is one such philosophical ques- tion which even in Paul’s time had begun to have a fascination for Oriental thinkers. What is the relation of free will to God? or in other words, Is what men do the result of their own choice, or is it determined for them; and, if it be determined for them, how can God punish them as though they had been free (Rom. ili. 5, ix. 19)? The answer is given in the form of an antinomy, of which the thesis is the sovereignty of God and the antithesis the respon- sibility of mien. The sovereignty of God is absolute. Instead of entertaining the objection which has since been raised, that God, having created rational and moral agents, has placed Himself under an obligation to deal with them as such, he makes the dependence of men upon God to be unconditioned, and the alleged rights of men as against God to be

as non-existent as those of an earthenware vessel against the potter who has given it shape (Rom. ix. 20-21). Some men are “vessels of wrath fitted unto destruction,’ some are “vessels of mercy .. . prepared unto glory” (Rom. ix. 22, 28) ; aud God’s dealings with them are as little conditioned by necessity as His original creation of them: “He hath mercy on whom He will, and whom He will He hardeneth” (Rom. ix. 18). But, over against this view of God’s sovereignty, and without any endeavour to reconcile the difficulties which suggest themselves, he places the fact of human responsibility. The purpose of God worked itself out in his- tory, but not without men’s co-operation. He had first “called” the Jews; and though, on the one hand, “God gave them a spirit of stupor, eyes that they should not see, and ears that they should not hear” (Rom. xi. 8), yet, on the other hand, they were “a disobedient and gainsaving people” (Rom. x. 21), “seeking to establish their own righteousness,” and not subjecting themselves

by side with the fact that all men do not receive the gospel. Out of the mass of men some, whether Jews or Gentiles, are “called.” They constitute a separate class. As from one point of view they are the “called according to God’s purpose” (Rom. viii. 28), or “called to be saints” (Rom. i. 7; 1 Cor. i. 2), or simply “called” (1 Cor. i. 24; it is to be noted that the expression does not occur in the later epistles), or “choscn” (Rom. viii. 38; Col. iii. 12), so, on the othcr hand, they are “they that believe” (Rom. iil. 22; IeCongi de xiv Gale Wile 22) Ephee Or Mulicssr tm jellen 0, 13; 2 Thess. i. 10); the call and the belief are complementary of each other, and therefore the terms are used as convertible (1 Cor. i, 21, 24). But the more frequent terms are those which came to Paul from his earlier associations. The Jews had known one another, and had spoken of themselves, in contrast to the rest of the world, as “brethren” (¢.g., Deut. xv. 12, xvii. 15; Philo, ii. 285, ed. Mang.) or “saints” (¢.g., Deut. xxxiii. 3; Dan. vii. 21). Paul applies these terms to the new “people of God”; they are “brethren” (¢.g., Rom. i. 13, most commonly as a term of address), and “the saints” (e.g., Rom. xii. 18, xv. 25; 1 Cor. vi. 1). As such they are regarded as forming collectively a unity or society, which Paul, adopting a current Latinism, calls a “body” (corpus is frequently used in this sense ; oGua is its Hellenistic translation in, ¢.g., the letter of Mark Antony in Joseph., Ant. Jud., xiv. 12, 3, 7d rhs Actas cGua). A more important and permanent application of the view that those who believed in Jesus took the place of the Jews, and stood to God in the same

special relation in which the Jews had stood, was the use of the term “congregation” or “assembly ” (Heb. gahal, which the LXX. renders by both owa- ywyh and éxxdyola; in the Epistle of James (11. 2») the former of these words is used of a particular Christian congregation ; Paul uses the latter only, and the English translators render it invariably by “church”) to designate the mass of believers regarded as a unity. The use of the word éxkAyoia in this sense in the undis- puted epistles is rare,—probably only in 1 Cor. xv. 9, Gal. 1. 18, in each of which passages it is qualified, as in, ¢.g., Deut. xxiii. 1, Nehem. xiii. 1, as “God’s congregation.” But either towards the end of his life, or, according to many modern critics, only among his followers after his death, this conception of Christians as forming a congregation was idealized. The common metaphor of a “body” by which that congregation had been designated, and which had already been elaborated as indicative of the diversity of parts and functions in the several Christian communities (1 Cor. xii. 12-30), is elaborated in the Epistles to the Ephesians and Colossians as indicative of the relation of the aggregate of believers to Christ. They are conceived, not as forming a society which bears Christ’s name, .but as bearing to Him partly the relation which the several members of an organized body bear to the head (Eph. i. 22, iv. 15, 16; Col. i. 18, 24), and partly the relation of a wife to a husband (Eph. v. 28-32). Ina phrase of difficult and doubtful meaning the congregation of Christians, or “ church,” is spoken of as His “ fulness” (wAjpwua, Eph. i. 238), and the progress in Christian virtues is represented partly as the growth of an organism to its full stature (Eph. iv. 14-16 ; Col. ii. 19), and partly as the filling out or realization of that which is empty or imperfect h. iii. 19; Col. i. 9). rds: Rie by side with this conception of the “called” or “saints as collectively forming a “body” or “congregation, | which was the Christian counterpart and fulfilment of the Jewish “congre-

Christian form communities.

gation," was the fact that wherever the gospel was preached, especially in the great cities of the empire, the converts tended to Such communities, whether for religious or

commu- non-religious purposes, were among the commonest phenomena

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of theage. How far Paul himself encouraged the formation of such communities among his converts is uncertain ; but many considera- tions lead to the inference that where they were so formed they were formed rather upon the Gentile than upon the Jewish model. Out of several names which were in current use to designate them, that which Paul used was common to both Gentile and Jewish com- munities, and it was also that which he continued to use in another sense to designate the whole body of Christians. Hence has arisen the confusion which pervades almost all Christian litera- ture between the use of the word éxxAyola, or ‘‘ church," to denote the whole multitude of those who will be saved regarded as an ideal aggregate, and the use of the same word to denote a visible community of professing Christians in any one place or country.

The raison détre of these communities was mutual help in the spiritual, the moral, and the outward life. Every member of a community had received the new life of the Spirit, and the diver- sities of character and opportunity which exist between man and man were conceived as diversities of manifestation (¢avépwois) of the Spirit who lived within them, or, from another point of view, as diversities of gifts (yaplouara). ‘“ But to each one was given the manifestation of the Spirit to profit withal" (1 Cor. xii. 7). When the community met in assembly some of its members “ prophesied," preaching as though with a divine inspiration ; some spoke in such ecstasy that their words seemed to be those of an unknown tongue and needed an interpreter; some taught again the lessons which they had learned from Paul; some had “a psalm"; some had “a revelation" (1 Cor. xiv. 26 sg.). Sometimes the aim was rather moral than spiritual “edification." They exhorted one another, and “admonished" one another (Rom. xv. 14).

Sometimes on points of practice they carried this “judging” of one another farther than Paul approved. The Christian liberty, which was no less a bond of union than the recognition of the new Christian law, was in danger of being overthrown; and more than once Paul thought it necessary to insist that they should not judge one another any more, but rather strive not to put a stumbling-block in each other’s way (Rom. xiv. 10 sg.; 1 Cor. x. 25 sg.). If, however, the offence of any member were gross and open, the assembly became a court of discipline. To the community at Corinth, which had been slow to recognize the necessity of being thus ‘‘children of God without blemish in the midst of a crooked and perverse genera- tion,” Paul wrote peremptorily “not to keep company, if any man that is called a brother be a fornicator, or covetous, or an idolater, or a reviler, or a drunkard, or an extortioner” (1 Cor. v. 11). In one flagrant case they were bidden to “put away the wicked man from among themselves” (1 Cor. v. 13); but the right of the community to deal with such cases at their discretion was also recognized ; for, when the guilty person had on his repentance been forgiven, or punished with a lesser punishment, instead of being expelled, Paul wrote again that the action of the majority was sufficient and had his approval (2 Cor. ii. 6, 10). But all such action was subordi- nated to the general rule, which is repeated in many forms, “let all that ye do be done in love” (1 Cor. xvi. 14). A not less promi- nent aim of these communities was mutual help in the material and outward life. Some of their members were necessitous or sick ; and the duty of helping all such was discharged partly by giving contributions to the common fund and partly by distri- buting it. Sometimes also the members of other communities came as strangers, travelling as men did, “quorum cophinus fenumque supellex”’ (Juvenal, iii 14, of Jews). For such men, who probably brought, as in later times, letters of recommendation from one community to another (2 Cor. iii. 1), there was an ungrudging hospitality ; and not long afterwards, if not in Paul’s own time, it was a necessary qualification for a widow who wished to be placed as such on the roll of the community that she should not only have “used hospitality ’’ but also herself have “washed the feet” of the tired travellers as they came in (1 Tim. v.10). In Thessa- lonica, where the community was probably both poor and small, it seems probable that the members worked together at common trades, making contributions to a common fund and sharing a common table. It was natural that some should presume on the goodness of their brethren, and try to share the latter without making

contributions to the former. Paul made a special rule that this should not be the case, and he himself, though he had the right to exemption, yet, for the sake of example, would not

eat bread for nought at any man's hand, but in labour and travail worked night and day" that he might not burden the slender resources of the brethren (2 Thess. iii. 8; 1 Thess. ii. 9).

In such communities, where the " gift" of each member was used for the common good, organization had not the importance which it had in an ordinary secular society. All work which the members of the community did for one another, including that which was done by the apostle himself, was a "ministry" (dtaxovla), and every one who did such work was, so far forth, a " minister " (dtaxovos). The

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names which ultimately came to be appropriated by special officers, appointed to do delegated work, were at first common to the whole body of members. As is natural in all communities, there were some who devoted themselves to the work with especial zeal; and the most rudimentary form of organization is found at Thessalonica, where certain persous are spoken of as devoting themselves to the special works of " labouring," 7.¢e., probably attending to the material needs of the poorer brethren, ''admonishing,"' 7.¢., probably bring- ing back erring brethren to the right way, and " presiding," or more probably (though the word is of uncertain meaning) "acting as protector," like a Roman " patronus,"' against oppression from with- out. The community are enjoined to recognize such persons, "and to esteem them very highly in love for their work's sake " (1 Thess, vy. 12, 18). In a similar way at Corinth, where the democratical character of the community is even more apparent, Paul beseeches the brethren to "be in subjection" to those who had "set them- selves to minister unto the saints" (1 Cor. xvi. 15, 16). But this recognition of the special zeal of certain members was very far from being a recognition or appointment of officers assuch. The functions which came in time to be regarded as giving those who discharged them an exceptional status, were only regarded as

“gifts,” resembling in kind and not surpassing in excellence those of the other members of the community. In the Epistle to the Romans, “he that ruleth” (or “protecteth ”) is in the same rank as “he that giveth” and ‘“‘he that exhorteth ” (Rom. xii. 8) ; and in the First Epistle to the Corinthians “helps” and “ governments” are not prominent above “miracles,” “healings,” and “divers kinds of tongues” (1 Cor. xii. 28). It is not until the later period, and probably also the different circumstances, of the Epistle to the Philippians that officers are found with definite titles, and probably also with a distinct status ; Paul there writes “to all the saints . . . with the bishops and deacons” (Phil. i. 1). Still later, in the Epistle to the Ephesians, it seems probable that those who are spoken of as “apostles,” “ prophets,” “evangelists,” “pastors and teachers,” are distinct from the great body of the community (Eph. iv. 11, 12). But it is to be noted that in no certainly authentic epistle does Paul make any mention of “presbyters.” The view of Grotius and Vitringa that the “church” took the place of the “synagogue” seems, as far as the Pauline communities are concerned, to lave little foundation. Those communities had a much closer resem- blance to the Greek and Roman associations in the midst of which they grew ; they stood side by side with the Jewish communities, but distinct from them, as “the churches of the Gentiles” (Rom. xvi. 4).

Admission to the tommunity, or at least to full membership of Baptism,

the community, seems to have been effected by the rite of baptism: “in one spirit were we all baptized into one body” (1 Cor. xii. 18). So important was this form of admission conceived to be that when a believer died before baptism another appears to have been baptized vicariously for him (1 Cor. xv. 29). It wasa baptism “into Christ Jesus” (Rom. vi. 3; “into Christ,” Gal. iii. 27),—-a phrase which must probably be interpreted by the analogous expressions in 1 Cor. i. 18, 15, to mean that the name of Jesus Christ alone was used (that the name of the Trinity was not invariably used in early times is clear from St Ambrose, De Spirttu Saneto, i. 3). But in the teaching of the apostle baptism was more than an initiatory rite, and baptism “into Christ Jesus” had for him a special signi- The immersion of the body in water was a “being buried with Christ,” and that not only symbolically but in a real, though mystical, sense ; the rising out of the water was in a similar sense an actual rising with Christ into a new life, “that, like as Christ was

raised from the dead through the glory of the Father, so we also might walk in newness of life” (Rom. vi. 4, where the word twhs, “life,” must be taken in its customary sense of actual or physical, not metaphorical or moral, life). It was otherwise ex- ee as the ‘putting on” of Christ, é.e., the being endowed with

is nature (Gal. iii. 27, where the same word is used as in 1 Cor. xv. 58, “this mortal must put on immortality”). In the later form of Paul’s doctrine an analogy was drawn between baptism and cir- eumcision (Col. ii. 11, 12), the point of the analogy apparently being, not merely that each was an initiatory rite, but that, as in circumcision there was a “putting off” of a part of the body, so in baptism the whole “body of the flesh” was destroyed and the” “new man” put on. There was the further significance in the rite that by baptism “into one body” the distinctions of race were obliterated. The baptized became “one man in Christ Jesus,” so that there could no longer be either Jew or Greek, bond or free, male or female (Gal. iii. 28; cf. 1 Cor. xii. 13). The differences between the several members were merely the differences of functions which result from the diversity of parts in an organic whole ; and thereby the foundations of a world-wide society were laid.

The most significant act of the community when it met together The was the common meal.

together. Thiscommon meal was a sacred meal ; it was “ the Lord’s Supper’; it continued and commemorated the Paschal supper at which the Lord had bidden His disciples to eat the bread which was

Like the members of most contemporary Lord’s associations, the members of the Christian communities dined Supp’

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His body, and to drink of the cup which was the “new covenant in His blood,” in remembrance of Him; it thereby “ proclaimed the Lord’s death till He come” (1 Cor. xi. 24-26). Possibly owing to the double sense of the word xowwvia, viz., “partaking,” and “sharing in common,” two views seem to be mingled together in the significance which Paul attached to the

rite. The one is that, as in “Israel after the flesh” “they which eat the sacrifices” had “communion with the altar,” and as those who partook of the heathen sacrifices had “communion with demons” (7.e., with the false gods to whom the sacrifices were offered), so to those who “nartook of the table of the Lord” the “cup of blessing” was “a participation in the blood of Christ” and the “bread which we break” was “a participation in the body of Christ” (1 Cor. x. 16- 91). The other view is that in thus partaking in common of the “body of Christ” the members of the community realized and con- solidated their unity; “seeing that it is one bread, we who are many are one body” (1 Cor. x. 17). Both views must be regarded in relation to his couception of the mystical union of Christ with those who were baptized into His name, and of their consequent union with one another.

Literature.—The literature which bears upon St Paul is so extensive that a complete account of it would be as much beyond the compass of this article as it would be bewildering to its readers. The books which are here mentioned are the more important modern books which, without being in all cases con- clusive or satisfactory, will enable a student to learn the nature of the main questions which have been raised. I. Lire :—Neander, Geschichte der Pflanzung a. Leitung der christlichen Kirche durch die Apostel (vol. i., 4th ed., Hamburg, 1847, Eng. tr. in Bohn’s Standard Library); Baur, Paulus der Apostel Jesu Christi (Leipsic, 1845, Eng. tr. in Theological Translation Fund Library); Renan, Les Apétres (Paris, 1866), and Saint Paul (1869); Krenkel, Paulus der Apostel der Heiden (Leipsic, 1869); Hausrath, Der Apostel Paulus (2d ed., Heidelberg, 1872), and art. ‘‘ Paulus,” in Schenkel’s Bibel-Lexicon ; Straatmann,

PAUL tue Deacon. See PauLus Draconus.

PAUL or Samosata, bishop of Antioch from about 260 a.p., is famous in church history as the author of the last attempt to replace the doctrine of the essential (phy- sical) divinity of Christ by the old view of the human personality of the Redeemer. ‘The effort was not success- ful even within his own community. At an Oriental general council, held at Antioch as early as the year 264, his teaching was investigated ; but no conclusion was come to because it was alleged Paul had been cunning enough to disguise his real opinions. A second synod was equally abortive ; but at a third (probably in

the year 268), after a discussion between Paul and a presbyter named Mal- chion—a sophist of Antioch, and head of a scholastic institution—the metropolitan was excommunicated and his successor appointed. Under the protection of Zenobia, however, Paul continued in his office for four years longer; and the church of Antioch was split into two factions. In the year 272 the city was taken by the emperor Aurelian, who decided in person that the church- building belonged to the bishop who was in epistolary communication with the bishops of Rome and Italy. This decision of course proceeded on political considerations ; and indeed it is probable that behind the theological con- troversy there had been all along a political disagreement, the opponents of Paul being enemies of Zenobia and ad- herents of the Roman party. About the life of Paul we know scarcely anything. His enemies, indeed, describe him as an unspiritual prelate, an empty preacher, an arro- gant man of the world, and a crafty sophist ; but this portrait must not be too readily accepted. We are told that he preferred the title of Ducenarius to that of bishop. This probably implies that he actually was a procurator ducenarius, a civil post of considerable dignity, and we may well believe that he was very conscious of his posi- tion, maintained its formalities with some pride, and used it to give effect to his peculiar views. As an acconiplished theologian he strenuously opposed the old expositors, 7.¢., the theologians of Alexandria, and prohibited the use In public worship of all those church hymns in which the essential divinity of Christ found expression.

His doctrine was no novelty, but merely a development of primitive Christian belief as represented, €.J-y by Her- mas, and at a later time by the so-called Alogi in Asia

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Paulus de Apostel van Jezus Christus (Amsterdain, 1874); Beyschlag, in Ri
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Handwirterd. des bibl. Alterthums ; — Schmidt, in ke Rellonoyll Ga ed.); and, in English, Conybeare and Howson, The Life and Epistles of St Paul g Farrar, 1 he Life and Work of St Paul; Lewin, The Life and Epistles of St Paul. Detailed discussions of most of the important points will also be found in books upon the Acts of the Apostles; e.g., in Overbeck's edition of De Wette's Kuregefasstes exegetisches Handbuch (Leipsic, 1870; the Introduction is translated and prefixed to the translation of Zeller's Die Apostelgeschichte in the Theolo- gical Translation Fund Library); Wendt's edition of Meyer's Kritisch-exegetisches Handbuch (Gottingen, 1880); and K. Schmidt, Die Apostelgeschichte (vol. i., Erlangen, 1882, the best modern book on the apologetic side). II. THroLocy :— The books which first opened up the study of St Paul's theology in distinction from that of other writers of the New Testament were Usteri's Die Entwickelung des paulinischen Lehrbegriffs (Gurich, 1824, 6th ed. 1851), and Dahne's book with the same title (Halle, 1835). The most important books on the subject which have since appeared (in addition to some of those which have been mentioned above) are Ritschl, Die Entstehung der altkatholischen Kirche (2d ed., Bonn, 1857); Reuss, Histoire de la théologie chrétienne au siécle apostolique (Strasburg, 3d ed., 1864); Holsten, Zum Evangelium des Paulus u. Petrus (Rostock, 1868), and Das Ivangeliwm des Puulus dargestellt (part i., Berlin, 1880); Pfleiderer, Der Paulinismus (Leipsic, 1873, Eng. tr. in the Theological Translation Fund Library); Sabatier, Dapétre Paul (2d ed., Paris, 1881); Menegoz, Le Péché et la Redemption d'aprés S. Paul (Paris, 1882); Ernesti, Die Ethik des Apostels Paulus (3d ed., Gdttingen, 1882). English literature is singularly deficient in works on St Paul's theology, as distinguished from the philological and archeological questions which arise out of his life and epistles; almost the only important contributions to the subject are contained in the essays appended to Jowett's Epistles of St Paul to the Thessalonians, Galatians, and Romans (2d ed., 1859). Further information as to the literature of the subject, and especially as to the numerous monographs and magazine-articles on special points, will be found in the books which deal with New Testament literature in general; especially, for the older literature, Credner, Hinleitung in das N. T. (Halle, 1836), and, for more recent literature, Reuss, Die Geschichte der heiligen Schriften N. T.'s (4th ed., Brunswick, 1874); Mangold's edition of Bleek's Hinleitung in das N. T. (Berlin, 1875); Hilgenfeld, Historische- kritische Einleitung in das N. T. (Leipsic, 1875); Weiss, Lehrbuch der biblischen

Theologie des N. T.’s (8d ed., 1880, Eng. tr. in Clark’s Foreign Theological Library). (E. HA.)

Minor, and the Theodotians and Artemonites in Rome. Even in Syria it was not extinct at the end of the 3d century (see the Acta Archelat) ; but in the great churches of’ the empire—especially in the West and in Egypt—the Logos- Christology was already in the ascendant. And, since the previous state of things had passed from memory, it soon came to be regarded as “heresy” and “innovation” to think of Christ as most Christians had thought in the 2d century. It was chiefly Origen and his philosophical dis- ciples, however, who had brought about the victory of the Logos-Christology, and discredited contrary opinions not only as unchurchly but also as unscientific. Thus the under- taking of Paul was no longer in harmony with the times. And yet his much-abused doctrine, as is now more and more clearly perceived, deserves the highest respect, inasmuch as it is an attempt to express the significance of Christ’s person without the aid of cosmology or philosophical theories. The leading outlines of his Christology are as follows. God is to be conceived as one person; from Him, however, there proceeds eternally as force a Logos (copia), who may be called “Son.” _ This Logos worked in the prophets, and at last, in the highest degree and in a unique manner, in Jesus. Jesus 1s in His own nature a man, originating in time ; He is “from beneath.” But, by means of inspiration and indwelling, the divine Logos worked upon Him “froin above.” A physical union is out of the question, because the Logos Himself is no “vous.

To this divine endowment of Jesus corresponds His tried moral perfection. Through the unchangeableness of His mind and will He became like God; through love He be- came one with Him. For, said Paul, “the: only kind of unity which can exist between two persons 1s that of dis- position and direction of will, which comes to pass through love; only that which results from love has value, what- ever is physical is worthless.” Thus during all His life the Redeemer moved steadily onward, the Father enabling Him to perform mighty works, and finally He proved His indissoluble union in love with God by His death. As the reward of victory for His love and for His work among men He has received from God the name which is above every name; God has invested Him with divine honour, so that now we may call Him “the God born of the virgin.

Since Jesus was eternally foreordained by God, we may even speak of a pre-existence of Christ; and Paul goes

so far as to use these words: "‘ By the grace of God, and through progressive development under trial, Christ be- came God."

Although Paul was excommunicated, his teaching did not remain altogether without effect in the church. It had a marked influence on Lucian, and through him on Arianism. But it is in the Christological statements of Theodore of Mopsuestia, of Diodorus, and of Theodoret that we can most clearly recognize the influence of the teaching of Paul of Samosata.

Sources. —Euseb., H. E., vii. 27-30. Compare also the collection in Routh, Relig. Sacr., iii. pp. 286 sg., 300 sg., 326 sg. Literature.— 3ernhardt, Geschichte des rim. Reiches seit dem Tode Valerian's, pp. 170 sg., 178 sq., 806 sq.; Hefele, Conctliengesch., 2d ed., p. 135; Lipsius, Chronologie der rim. Bischéfe (1869); Feuerlin, De herest Pault Sam. (1741); Ehrlich, De erroribus Pault Sam. (1745) ; Schwab, Diss. de Pauli Sam. vita atque doctrina (1889) ; Harnack, art. ‘‘Monarchianismus," in Realencykl. f. Theol. u. Kirche, 2d ed., x. p. 178 sq. (A. HA.)

PAUL, the name of five popes.

Pav I., pope from 757 to 767, succeeded his brother Stephen ITI. on 29th May 757. His pontificate was chiefly remarkable for his close alliance with Pippin, king of France, to whom he made a present of books highly significant of the intellectual poverty of the times, and for his unsuccessful endeavours to effect a reconciliation with the iconoclastic emperor of the East, Constantine Copronymus. He died on 28th June 767, and received the honour of canonization, which he seems to have merited by his piety and virtues. His successor was Stephen IV.

Pau II., Pietro Barbo, pope from 1464 to 1471, was born at Venice, 28th February 1418. He was on the mother's side the great-nephew of Gregory XII. and the nephew of Eugenius IV., to whose favour he owed his elevation to the cardinalate at the early age of twenty-two. He seems, however,

to have made no especial figure at the papal court until the death of Calixtus III. in 1458, when we hear of his interfering actively to protect the late pope's nephew, Pietro Luigi Borgia, from the vengeance of the Roman nobility, and escorting him safely to Civita Vecchia. Upon the death of Pius II. he was unanimously and unexpectedly elected his successor, 31st August 1464. Vain of his personal appearance, he wished to take the name of Formosus, and afterwards that of Mark in honour of the patron saint of his native city, but, being dissuaded from both, called himself Paul. He abandoned his prede- cessor's projects for a crusade, which he saw to be impractic- able, and made it his leading objects to preserve peace in Italy and to enhance the dignity of the papal see by a dis- play of outward magnificence. He embellished the costume of the cardinals, collected jewels for his own adornment, entertained the Roman people with shows and banquets, and introduced the sports from which the Corso takes its name to this day. If the spirit of his pontificate was secular, its administration was in general prosperous, and no serious reproach would rest upon his memory but for his violent persecution of the humanists and scholars who adorned his court, the truth respecting which it is exceed- ingly difficult to discover. Whether actuated by a per- ception of the incompatibility between Renaissance culture and traditional Christianity, or by a panic fear of imaginary conspiracies against his own person, he appears to have acted with much arbitrary severity, and to have exhibited himself in the unamiable light of a comparatively illiterate man persecuting letters and learning. At the same time, his severities have been without doubt considerably ex- aggerated by the sufferers, from whom our knowledge of them is almost entirely derived, and his own official acts and documents give a much more favourable view of his character, confirmed by the tranquillity of Italy in his day. He was undoubtedly not a man of quick parts or enlarged

views, but he must have possessed considerable administra- tive ability, and his lavish ostentation, not in itself wholly impolitic, was frequently accompanied by displays of charity and munificence. He died very suddenly, probably of apoplexy, on 28th July 1471. The inventory of his

per- sonal effects, recently published by M. Eugéne Miintz, is a valuable document for the history of art. He was suc- ceeded by Sixtus IV.

Pau III., Alessandro Farnese, pope from 1534 to 1549, was born 28th February 1468, of an ancient and noble Roman family. He received an excellent education, but his youth was dissolute and stormy, and he owed his promotion to the cardinalate (September 1493) to the ad- miration of Alexander VI. for his beautiful sister Giulia, whence he was derisively nicknamed Cardinal Petticoat. He soon showed himself, however, to be a man of ability and character, and his reputation and influence went on steadily increasing until, upon the death of Clement VIL., being at the time senior cardinal of the sacred college, he was unanimously elected pope after a conclave of only two days, having been in a manner nominated by his prede- cessor (13th October 1534).

Succeeding the most unfortunate of the popes, at the most critical period in the history of the church, the part assigned to Paul IIT. was one of no common difficulty. But he also possessed no common qualifications,—prudence increased and vigour tempered by age, learning, modera- tion, and a prolonged experience of affairs. It was his misfortune to be not altogether a man of his own day: deeply penetrated with the ambitious, luxurious, and secular spirit of the Renaissance, he found it difficult to adapt himself personally to the changed circumstances of the times by entering into the Catholic Puritanism which, however disagreeable to a man of taste and refinement, was an indispensable necessity in combating the Reforma- tion. The want was in a manner supplied by the men whom, conscious perhaps of his own deficiencies, he called around him. No pope has made so many distinguished cardinals, and his promotions included both men of evan- gelical piety inclined to the new doctrines like Contarini, and fanatical devotees of the old system like Caraffa. The latter group, though Paul had probably little personal inclination for them, triumphed in his councils. The bull instituting the order of the Jesuits (1540) marks the commencement of the Roman counter-reformation ; two years afterwards the Roman Inquisition was established, Contarini died with strong suspicions of poison, Ochino was hunted from Italy, and a persecution broke out which soon exterminated Protestantism inside the Alps. Another memorable measure extorted from Paul by the necessities of his position was the convocation of

the council of Trent in 1545; but he soon found means to suspend its sittings, which were not resumed for many years. His brief condemning slavery (1537) ranks among the most honourable actions of his reign. As a politician Paul con- tinually strove to trim between Charles V. and Francis L, and to preserve the peace of Italy as far as compatible with his darling aim of procuring an establishment for his natural son. All these objects were accomplished. Paul's contemporaries respected and courted him, Italy in general enjoyed tranquillity, and the monster who brought such disgrace upon him acquired the principalities of Parma and Piacenza. After, however, the murder of this unworthy son, the ingratitude of his grandsons broke Paul's heart, and, overcome by a sudden fit of passion, he expired on 10th November 1549,—enjoying the rare distinction of being one of the very few popes who have died lamented by their subjects. His character was in many respects a very fine one, but in every respect the character of a prince and a scholar, not of an ecclesiastic. He was a munificent

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patron of learning, was versed in science, and had an especial weakness for judicial astrology. The arts also owed much to him. Michelangelo's Last Judgment and other works of the first rank were completed under his auspices, and he greatly improved and beautified the city of Rome. Julius III. was his successor.

Pauu IV., Giovanni Pietro Caraffa, pope from 1555 to 1559, born 28th June 1476, was the nephew of Car- dinal Oliviero Caraffa, by whose interest he became at an early age chamberlain to Pope Alexander VI., and subse- quently, though contrary to his own inclination, archbishop of Chieti. He was afterwards nuncio in England and Spain, both of which missions he discharged with credit ; but in 1524, under the influence of strong religious im- pressions, he resigned his archbishopric, distributed his goods among the poor, and retired from the world to direct the monastic order of Theatins, founded by himself. In 1536 the fame of his sanctity induced Paul III. to call him to his court and confer the dignity of cardinal upon him, notwithstanding his own reluctance. He now be- came the head of the reactionary party at Rome, bent on crushing all tendencies to religious innovation, while in- sisting on reforms in discipline and moral deportment.

Such was unquestionably the policy required by the times from the exclusive point of view of the interests of the church, and it was thoroughly incarnate in Caraffa, in whom the spirit of the Dominican exterminators of the Albigenses seemed to revive. Having taken an important part in two conclaves, he was himself unexpectedly elected pope on 23d May 1555, after the death of Marcellus I1., notwithstanding his personal unpopularity and the positive veto of Charles V. Raised to the pontifical throne, Paul showed himself a man of extreme counsels in every respect. He endeavoured to efface the prejudice against his former austerity by excessive magnificence. He rushed into politics, and evinced himself as rash in his partisanship as his predecessors had been dexterous and ambiguous. His open espousal of the cause of France brought upon him a Spanish invasion which would have destroyed his temporal sovereignty but for the superstition of Philip I]. and his general Alva, who embraced the first opportunity of making peace. He called his nephews to court and trusted them with blind confidence, but unhesitatingly disgraced them when convinced of their unworthiness. He refused to acknowledge Ferdinand as emperor of Germany, maintain- ing that Charles had no right to abdicate or Ferdinand to succeed without his own permission. Amid all these agitations he never lost sight of the main purpose of lis life: he struggled incessantly against heresy, and was the first pope to issue a full official Index Librorum Prohabit- orum (see vol. xii. p. 730). He died, on 18th August 1559, recommending the Inquisition to the cardinals with his last breath, and leaving the character of a pope of rare energy of body and mind, upright in all his thoughts and actions, but intoxicated with fanaticism and the pride of office, and more perverse, obstinate, and impracticable than any occupant of the papal chair since Urban VI. His memory was so detested by the Roman people that the hawkers of glass and earthenware were compelled for a time to discontinue their usual cry of “carafe” and cry “ampolle.” He was succeeded by Pius IV.

Paut V., Camillo Borghese, pope from 1605 to 1621, was born in Rome, 17th September 1552, of a noble family. He followed the study of canon law, and after having filled various important offices was made a cardinal in 1596. He succeeded Leo XI. on 16th May 1605, after an unusually long and stormy conclave, the vicissitudes of Which are dramatically narrated in Mr T. A. Trollope’s Paul the Pope and Paul the Friar. No one, till the last

moment, had thought of Borghese, who owed his election

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to his supposed inoffensiveness and the inability of the leaders of the factions to agree upon any other man- Scarcely had he been elected ere he gave convincing proof that his character had been very much mistaken. He showed himself harsh, domineering, impatient of advice, fanatical in his devotion to the secular as well as the spiritual prerogatives of the church, and inflexible in his resolution to uphold them. He began by successfully re- pressing numerous encroachments of the civil power in various Roman Catholic countries, and thus became tempted to embark in a contention with the republic of Venice, which inflicted a deeper wound on Rome than anything that had taken place since the Reformation. The dispute was occasioned by the claim of the Venetians to try eccle- siastical culprits before the lay tribunals, and by the ex- tension of old laws forbidding the unauthorized formation of religious corporations and the acquisition of property by ecclesiastics to the entire territory of the republic. Paul protested and menaced (October 1605), and, when the Venetians refused to yield, he launched (April 1606) a bull of excommunication against them, and placed the whole republic under an interdict. The Venetians set him at defiance, forbidding their clergy to pay the least attention to the papal censures, and banishing those who disobeyed from their dominions. A vehement literary controversy arose, in which the famous Father Sarpi, the chief coun- sellor of the Venetian senate, especially distinguished him- self. Paul found himself impotent, and, disappointed in his expectations of material aid from Spain, was thankful to escape from the difficulty by the mediation of France, whose representative, Cardinal Joyeuse, negotiated a com- promise in April 1607. The Venetians made some nominal concessions, but gained every substantial point at issue ; the main result of the contention, however, was to demon- strate the inefficacy of the spiritual weapons on which Rome had go long relied, and the disrepute into which papal pretensions had fallen even among Catholic nations. Throughout the remainder of his long pontificate Paul acted with comparative moderation, maintaining, never- theless, the character of a zealous pontiff intent on combat- ing heresy, and especially active in his encouragement of foreign missions. He ranks among the popes who have contributed most to the

embellishment of Rome ; the nave, facade, and portico of St Peter’s were completed by him ; he also erected the sumptuous Borghese chapel in Santa Maria Maggiore, and greatly benefited the city by improv- ing streets and constructing public fountains. He died on 28th January 1621, and was succeeded by Gregory ney, (R. G.) PAUL (1754-1801), emperor of Russia, son of Peter III. and of Catherine, was born on the 2d of October 1754. During the early part of his life he was treated with great harshness by his mother, who had usurped the throne and did not allow him to take any part in the government. There is little doubt that she did not intend him to succeed, but her will was burnt by one of Paul’s adherents. His days were spent in retirement, with the exception of a tour which he made in the west of Europe in the year 1780. He was twice married, first, in 1773, to Augusta, princess of Hesse Darmstadt, who died three years afterwards, leaving no issue ; secondly, in 1776, to Dorothea Sophia, princess of Wtrtemberg, who was received into the Greek Church as Maria Feodorovna. Paul Petrovich ascended the throne on the death of his mother Catherine, 17th November 1796. One of his first acts was to cause the body of his father to be exhumed from the Nevski monastery and buried with the empress his wife in the Petropavlovski church among the rest of the czars. Orloff and the other persons implicated in Peter’s assassination were compelled to follow the coffins,

and afterwards banished the empire for ever. The chief ministers of the new emperor were Rostopchin and Arak- chéeff. Paul now gave signs of a benevolent disposition ; among other acts of generosity he set at liberty Kosciusko, who had been detained a prisoner at St Petersburg. He, however, revived many obsolete imperial privileges which were offensive to the nobility, and became unpopular by introducing German regulations into the army. He altered the oukaz (ukase) of Peter the Great which made the succession to the throne dependent upon the will of the reigning sovereign, and declared it inherent in the eldest son. In 1798 he was appointed grand-master of the order of the Knights of Malta. Alarmed at the progress of the French Republic, he joined Turkey, England, Austria, and Naples in a coalition against Bona- parte. To command the Russians, the veteran Suwaroff was summoned from his rural retreat, to which he had been

banished in consequence of making some satirical verses on the new regulations which had been introduced by Paul. For the campaigns of the Russian general, the article Russta may be consulted. It may suffice to say here that he, triumphant at first, was eventually compelled to retreat, and was recalled by Paul. He died in disgrace in the year 1800. Soon afterwards the capricious emperor completely changed his plans. Having been flattered by Bonaparte, he secretly made overtures to him and quarrelled with England, seizing English vessels and goods which hap- pened to be in the Russian ports. Bonaparte now entered into an agreement with Paul, whereby they should simul- taneously invade the English possessions in India. But the coalition was broken up by the assassination of the Russian emperor in the night of 23d to 24th March 1801, which Bonaparte had the meanness to declare in the Monitewr had been planned by the English. The story of his death is well known': he was strangled in the Mikhailovski Palace by Zouboff, Pahlen, and other conspirators. Their original object appears to have been only to make him abdicate. An interesting account of the events immediately preceding the emperor's death has been given by General Sabloukoff, who was on duty that evening at the palace. The empress Maria survived till

1828.

The solution of the incongruities of the character of Paul seems to lie in the fact that he was more or less insane. Hence his outbursts of cruelty in such cases as those of the pastor Seidler and Kotzebue, alternating with generosity, as in his treatment of Kosciusko and other Poles. Englishmen are familiar with some of his mad pranks from the highly interesting travels of Edward Clarke, who suffered from the despot's caprice. Among other whimsicalities, Kotzebue tells us that he seriously proposed that the sovereigns of Europe should settle their differences by single combat. He had so imperilled the position of the country by his extravagance and eccentric policy that his death, however unjustifiable the means, seemed almost a necessity. All Russia breathed afresh when Alexander IT. ascended the throne.

The only event of the reign of Paul of permanent im- portance to Russia was the annexation of Georgia in 1799. PAUL, Sr Vincent or. See Vincent

or PAUL, ST.

PAULDING, James Kirke (1778-1860), in his day a successful politician, and a writer of some distinction, was born in Dutchess county, New York, United States, on 22d August 1778, and, after a brief course of edu- cation at the village school, removed to New York city in 1800, to reside with his brother-in-law, William Irving, a brother of Washington Irving. In connexion with the latter Paulding began in 1807 a series of brief lightly humorous articles, which, under the title of “The Salmagundi Papers,” soon became popular, and continued

to appear until 25th June 1808, when they terminated with the twentieth number. Six years later he published a political pamphlet, The United States and England, which attracted the notice of President Madison, who in 18]4 appointed the author secretary to the Board of N avy Com- missioners. Subsequently Paulding was for twelve years navy agent in New York city, and from 1837 to 1841 secre- tary of the navy, under President Van Buren. Although much of his literary work consisted of political contributions to the press, he yet found time to write a large number of essays, poems, and tales. His marriage in 1818, the death of his wife, and his own withdrawal from public life in 1841, with his death on 5th April 1860, comprise the chief remaining facts of his useful, honourable, and uneventful career.

From his father, who was an active revolutionary patriot, Pauld- ing inherited strong anti-British sentiments, which colour much of his satire, but otherwise he was a just and genial critic, and a deli- cate and kindly humorist. Of a reserved disposition and hasty temper, with many prejudices, and of extreme political views, he was yet an eminently upright man; of an affectionate nature and

.a forgiving disposition ; a hater of debt, lies, and shams ; and an

absolutely incorruptible official, who, in every relation of life, was inspired by a lofty, if sometimes mistaken, sense of honesty and honour. In literature he merits notice chiefly as a pioneer, and, though his place was never high, and will certainly not be per- manent, he was among the first distinctively

American as opposed to English writers, and protested more vigorously than any of his contemporaries against intellectual thraldom to the mother-country. As a prose writer he is chaste and elegant, with a fine negligence, which is sometimes the result of art, more frequently of haste ; and, while not so elaborate as Irving, so diffuse as Cooper, or so frank as Neal, he is generally just, neat, fanciful, and realistically descrip- tive. Among his short stories perhaps the best are Dyspepsy and The Politician, among the long The Dutehman's Fireside. Asa poet he is gracefully commonplace,—a weak reflexion of Thomson, with a dash of the prairie and the backwoods. His longest and most ambitious poem is—or was, for it is now forgotten— The Baek- woodsman, which is ill-constructed and tedious, and the only lines of Paulding's which survive in popular memory are the familiar—

'* Peter Piper picked a peck of pickled peppers; Where is the peck of pickled peppers Peter Piper picked?" which may be found in Koningsmarke.

The following is a list of his writings :—The Diverting History of John Bull and Brother Jonathan (1812); The Lay of the Scottish Fiddle; a Tale of Havre de Grace, supposed to be written by Walter Scott Esq. (1818), a good-natured parody on The Lay of the Last Minstrel written with the special intention of ridi- culing certain American follies and exposing the excesses of the British in the Chesapeake ; The United States and England (1814); Letters from the South (1817); The Backwoodsman; a Poem (1818); Salmagundi, second series (1819-20); A Sketch of Old England, bya New England Man (1822); Koningsmarke, the Long Finne (1823), a quiz on the romantic school of Scott; John Bull in America ; or the New Munchausen (1824), a broad caricature of the early type of British traveller in Anierica; The Merry Tales of the Three Wise Men of Gotham (1826); The New Mirror for Travellers (1828); The Tales of the Good Woman, by a Doubi- ful Gentleman,—otherwise James K. Paulding (1829); Chronicles of the City of Gotham, from the papers of a retired Common Councilman (1830); The Lion of the West ; a Comedy (1831); The Dutchman's Fireside (1831); Westward Ho! (1832) ; A Life of Washington (1835), ably and gracefully written ; Slavery in the United States (1836); The Book of Saint Nicholas, a series of stories of the old Dutch settlers (1837); A Gift from Fairyland (1838); The Old Continental; or the Price of Liberty (1846);

American Comedies, the joint production of himself and his son William J. Paulding (1847); and The Puritan and his Daughier (1849). The same son also published a posthumous volume by his father, entitled A Book of Vagaries, which is included in an edition of Paulding's Select Works (4 Vols., 1867-68), and a most unsatisfactory biography, mostly ade up of long extracts from Paulding's writings, called Literary Life of James K. Paulding

(1867).

PAULI, Retnworp (1823-1882), historian, was born at Berlin on 25th May 1823. From his mother, who was of Huguenot descent, he derived a vivacious temperament ; from his father, a minister of the Reformed Church, sprung of a family of clergymen and theological professors, he inherited strong religious convictions. He spent his boy- hood in Bremen, from whose republican citizens he early imbibed a hearty admiration of liberal self-government, moral discipline, and extensive sea-trade. With the ex- ception of two semesters when he heard Dahlmann at Bonn, he studied at the university of Berlin (1842-46), where he acquired a lifelong predilection for the Hohenzollerns and for the civil service and army of Prussia. Ranke was young Pauli's model historian, but he had far too much individu- ality to bind himself slavishly to any school. After having taken his degree and passed the public schoolmaster's ex-

amination, he became in 1847 private tutor in the family

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of Mr Bannatyne, a solicitor in Glasgow, and stayed seven years in Great Britain. During 1849-52 he served as private secretary to the Prussian ambassador Bunsen in London, and made the acquaintance of many eminent politicians of the day and of distinguished antiquaries, such as Kemble, Thorpe, and Hardy. Never a mere book-scholar, he saw various parts of England with an observant eye, and followed public questions with warm interest. He now conceived the plan of investigating the history of England in its original sources. In this way he was the first faith- fully to copy some of the Anglo-Saxon annals , but, as soon as he learned that

Thorpe was going to edit them for the Master of the Rolls, he liberally committed his transcripts tohim. The roots of Great and Greater Britain appeared to him to lie in Anglo-Saxon, not in Celtic, institutions, and therefore his first book was Konig Aelfred (Berlin, 1851). Though critically destroying many long-cherished legends, he described his hero's character and times in warm colours. The book was twice translated into English, and Lappenberg, the best judge then living, declared its author worthy to continue his own Geschichte von England. Not without material privations Pauli continued his stay in England, and between 1853 and 1858 published three large volumes, comprising the period from Henry IT. to Henry VII. In 1855 he became privat-docent at Bonn, and he obtained a professorship at Rostock in 1857. Thence he removed in 1859 to Tiibingen, where, however, in 1866 he offended the Wiirtemberg Government by vehemently de-nouncing its Austrian policy in an essay which appeared. during the Prussian war in the Preussische Jahrbiicher. Exiled to a remote country seminary, he preferred to resign. He now returned to his native country and obtained in 1867 a post in the university of Marburg, which he once represented in the Prussian Upper House. In 1870 he found an honourable position at Gottingen, where the former dynastic union of Hanover with Great Britain had left a splendid English library, and where Waitz had brought together a flourishing historical school.

Pauli's later life was chiefly devoted to modern history, and the Geschichte Englands 1814-52, in 3 vols. (Leipsic, 1864-75) made his name widely known. He fulfilled his duties as a teacher and examiner and as a fellow of different learned societies with punctual accuracy ; he became member of the academies of Gottingen, Munich, and Berlin, and honorary doctor of Oxford and Cambridge. He helped friends and pupils with untiring kindness; in his happy and social home he was often visited by distinguished English scholars. And he was for a whole generation a living link between the historical literature of England and Germany, "those two columns of the Teutonic world, which, for the benefit of human progress he firmly believed in, he fondly hoped would never be torn asunder." When suddenly called away by a stroke of apoplexy on 3d June 1882, he was deeply lamented on both sides of the Channel.

Pauli’s History of England was remarkable for its research. Never before had the records, then piled up in the Tower without calendars or indexes, been used in so full a way; never before had the chronicles and memoirs been so thoroughly criticized. The short review of these original sources, given in the appendices, formed a guide to the medieval historiography of England, and was later on, when better editions appeared, supplemented by Pauli’s critiques contributed to German periodicals. The main narrative follows the king, but at the end of each reign the literary, religious, social, economical, and especially the commercial features of the period are cleverly grouped together. Though Pauli was no regular jurist, even the development of the constitutional side of his subject was then superior to the general standard. Indeed these parts, and these only, Pauli lived to see without jealousy superseded by Gneist and Stubbs, while in every other respect his work, then an_immiense advance upon Lingard, still remains the most solid ofits kind. It has never been translated, perhaps on account of its almost: annal- istic form, and its contempt for the popular attractions of moralizing temarks, philosophical speculation, or picturesque style. To gain

new facts, to show the way for further investigation, seem Pauli a worthier task than to amuse the patie with a ilar story. The history is remarkable for the completeness with which the author has used all reports, letters, and memoirs he could lay his hands upon. He was also allowed to inspect private papers of Cobden and of the Prussian ambassadors Biilow and Bunsen ; and he knew something by personal recollection. Still he openly con- fessed that this contemporary history could be only preliminary on account of the wide gaps in our knowledge of the secret policy, and because ‘‘he felt, in dealing with the flowing formless mass of living characters, as if he were touching hot lava that could not yet be shaped into constructive material.” Nevertheless the carefully – weighed judgment and the profound understanding of the manifold and tangled tendencies of modern strife are simply astonishing, if we consider that the author was a foreigner. Abroad no guide through the English history of the 19th century can rival this work, while the English reader will find at least the chapters on foreign policy to contain much that is new, and will be sure to admire the impartial views of a distant but lofty and noble observer. Pauli had learned to love the organic

growth of the English consti- tution, and could not look without misgivings on the radical de- struction of its aristocratic basis.

Besides a great many essays on the Middle Ages, of which only the popular ones have been collected in Bilder aus Alt-England (Gotha, 1860; 2d ed. 1876, translated 1861), and in Aufsétze zur Englischen Geschichte (Leipsic, 1869 ; Newe Folge, edited by Hartwig, Leipsic, 1883), Pauli published two monographs: “Grosseteste und Marsh,” in the Tiibingen Program for 1864, and Simon von Montfort (Tiibingen, 1867). From a literary point of view these biographies are the best things Pauli wrote, and in them he was successful in creating figures of impressive character ; but his general histories also usually centre round a hero, ¢.g., Canning and Peel in his history of England in our own times. Well versed in paleography, Pauli discovered scveral important memorials, and never despised the humbler task of an editor ; he edited Gower’s Confessio Amantis (1857), The Libell of Englishe Policye of 1436 (1878), and three tracts on political economy of the time of Henry VIII., Zransactions of the Géttingen Socicty, 1878. For the Monumenta Germanie Historica he furnished a quantity of MS. collations, and extracted conjointly with Liebermann pieces of interest for Germany out of English historians before 1300 a.p., which appeared in part in vol. xiii. (1881), and in part will fill vol. xxvii. For the Berlin Academy he selected and copied a mass of records relating to Germany, mainly of the 14th century, which did excellent service for the Hanseatic publications. For the Camden Society he had prepared the account book of the Prussian crusade of Henry Earl of Derby in 1392, which, it is hoped, will be edited by an eminent English historian. He contributed numberless reviews and dctailed, often exhaustive, essays on minor subjects of English history to Sybel’s Historische Zeitschrift, Preussische Jahrbiicher, Grenzboten, Rundschau, Im Neuen Reich, Forschungen zur Deutschen Geschichte, Archiv fir diltere deutsche Geschichtskunde, Hansische Geschichtsblitter, Zeit- schrift fiir Kirchenrecht, Deutsche Litteraturzcitung, Gottingische Nachrichten, Gottingische Anzeigen. These articles posscss in some respects a very high value as material for future scholars. Pauli’s last studies on Henry VIII. and the Hanoverian succession, based on the discovery of the papers of Robethon, the elector’s agent, are printed in the Aufsdtze, Neue Folge.

Hartwig prefixed a sketch of Pauli's life to the Auwfsdtze, Newe Folge, and Frensdorff delivered a lecture upon him, printed in the alas uo we

Gdttingen Society (1882).

PAULICIANS (IIavAuKctavor), the name of a religious sect which sprang up in Armenia in the latter half of the 7th century. Their founder was Constantine, belong- ing to a village near Samosata called Mananalis, where a dualistic, perhaps Marcionite, community had long sub- sisted. About 660 A.D. his attention had been drawn to the New Testament, and especially to the epistles of Paul, whence he derived a set of opinions which, in their com- bination at least, were quite peculiar to himself, and under their inspiration he forthwith came forward as a reforming preacher. The scene of his first efforts was Cibossa, in the district of Colonia in Armenia Prima, where, in token of his Pauline discipleship, he called himself Sylvanus and his flock Macedonians. He died about the year 684, but had a succession of like-minded followers— Simeon (called Titus), Paul, Gegnesius (Timothy), Joseph (Epaphroditus)—under whom the sect continued to spread 'ito Asia Minor, ultimately taking up its headquarters 1n Phanerxa in Helenopontus. According to Petrus Siculus, whose Historia Manicheorum was written about 870, they held the ordinary dualistic doctrine common to all the

Manichzeans, expressly distinguishing the Being to whom the present world owes its creation and government from the maker and ruler of that which is to come; further, besides being quite out of sympathy with the Catholic doctrine as to the Theotokos, they rejected the Old Testament, the sacraments, the symbol of the cross, and the ordained ministry of the church. The morals of the followers of Constantine seem to have been for the most part unex- ceptionable, tending to severity, but one of his remoter successors, Baanes by name, gave way to such excesses as to earn for himself the surname of 6 purapds ; and Sergius (Tychicus), about the beginning of the 9th century, found so great scope for a moral reformation and was so success- ful in his efforts for this end that he is sometimes

spoken of, not extravagantly, as the second founder of the sect. Their aversion to images made them specially obnoxious to persecution by both parties during the iconoclastic con- troversy,—the iconoclasts specially finding it necessary to give practical demonstration of their antipathy to the Paulician heretics. The violence of Leo the Armenian in particular compelled many of their number, and Sergius among them, to seek refuge in the Saracen part of Ar- menia, where the emir of Melitene assigned them a seat in the little town of Argaum ; from this settlement, not- withstanding the remonstrances of their head, they made frequent and damaging inroads on the Byzantine territory. After the death of Sergius in 835 their government be- came more political and republican, until the violence of Theodora drove new reinforcements to their camp, includ- ing an able military leader named Carbeas, who presently placed himself at their head. The sect continued to grow and to found new settlements, among which Tephrica is specially mentioned by the Byzantine historians as a cause of embarrassment. At the head of an army composed of Paulicians and Moslems, Carbeas more than once invaded the territory of the empire and inflicted defeat on the opposing forces. Chrysocheir, his stepson and successor, was still more successful ; sweeping all opposition before him, he overran the whole of Asia Minor, pillaging Nice and Nicomedia, Ancyra and Ephesus,—Basil the Macedonian vainly appealing now to arms and now to negotiation. At last, however (871), he was surprised and slain, and his followers were driven back to their mountain fastnesses. In 970 John Zimisces succeeded in removing a large colony of them, as guardians of the frontier, to the region about Philippopolis in Thrace, where full religious liberty was guaranteed them. Here they continued to flourish in virtual independence for more than a century, until Alexius Comnenus inflicted chastisement on them for having de- serted his standard in the course of the Norman war. In 1115 that emperor fixed his winter quarters in Philippo- polis to use for their conversion the various powers of persuasion at his command, and the orthodox city of Alexiopolis was founded in the immediate neighbourhood. The sect, however, called “ Popelicans ” by Villehardouin, continued to subsist in Thrace until at least the beginning of the 13th century, as did also the Euchites, afterwards Bogomili, who had been attracted to the locality by the toleration of Zimisces. Meanwhile, branch societies of Paulicians had established themselves in Italy and

France, and reappear in history there under various names, such as Bulgari, Patareni, Cathari, and Albigenses.

The Paulicians are the subject of a monograph by F. Schmidt (Historta Paulicianorum Orientalium, Copenhagen, 1826); and the Historia of Petrus Siculus, already referred to, has been edited (Gottingen, 1846) by Gieseler, whose "' Untersuchungen iiber die Geschichte der Paulicianer," in Stud. wu. Krit. (1829), as well as the relative sections of his Church History, deserves special mention. See also vol. iii. of Neander's Kirchengeschichte.

PAULINUS, Sz, or Nota. Pontius Meropius Anicius Paulinus, who was successively a consul, a monk, and a

bishop, was born at Bordeaux in 353 a.pv. His father, prefectus preetorio In Gaul, was a man of great wealth, so that Augustine could speak of Paulinus, who inherited it, as "'opulentissimus dives," and Ausonius, himself a man of property, could speak of his estates as "regna." The literary education of the future saint was entrusted to his elder contemporary and townsman Ausonius, and how con- siderable was the degree of culture to which he attained as a writer both in prose and verse can yet be seen from his extant works, though it is of course impossible for any one in cold blood to concur in all the friendly praises of Ausonius and Jerome, the latter of whom compares him as a letter-writer to Cicero. In 378 he was raised to the rank of consul suffectus, and in the following year he appears to have been sent as consularis into Campania. Here, whether in an official capacity or not, he certainly remained for some time; and, according to his own account, it was at this period, while present at a festival of St Felix of Nola, that he first entered upon his lifelong devotion to the cultus of that saint. Probably before this time he had married a wealthy Spanish lady named Therasia; the union appears to have been a sympathetic and happy one, though not unclouded by domestic sorrows, among which may be mentioned the death in infancy of their only child, —a bereavement which, combined with the many disasters by which the empire was being visited, did much to foster in them that world-weariness to which they afterwards gave such emphatic expression. From Campania Paulinus re- turned to his native place and came into correspondence or personal intimacy with men like Martin of

Tours and Ambrose of Milan, whose example could not fail to keep before him the claims of Christianity as conceived by them; and ultimately (about 389) he was formally received into the church by Bishop Delphinus of Bordeaux, whence shortly afterwards he withdrew with his wife beyond the Pyrenees. This withdrawal from the pursuits and pleasures of the world called forth the playful banter and serious remon- strances with which alternately he was plied by Ausonius ; all appeals, however, to the common memories of an old friendship and to the claims of patriotism and of ambition were made in vain. It is impossible, of course, to say what precise amount of truth may underlie the poet's hint at an undue feminine ascendency over his friend, which is implied in the expression "Tanaquil tua." Therasia was certainly at least not behind her husband in eagerness to have done with the fast-failing friendship and help of "the world"; but Paulinus is unflinching in his reply to every reproach and entreaty: ""Negant Camcenis, nec patent Apollini dicata Christo pectora. . . . Nunc alia mentem vis agit, major deus. . . . O beata injuria, displicere cum Christo." The personal asceticism of Paulinus and his liberality towards the poor soon brought him into great repute among all the devout of the region in which he had settled; and while he was spending Christmas at Barcelona the enthusiasm of the people rose to such a pitch that they insisted on his being forthwith ordained to the priesthood. The irregularity of this step, however, was resented by many of the clergy, and the occurrence is still passed lightly over by his Roman Catholic panegyrists. In the following year he went into Italy, and after visit- ing Ambrose at Milan and Siricius at Rome—the latter of whom, however, jealous probably of the growing monkish spirit and mindful also of the irregular ordination, received him somewhat coldly—he proceeded into Campania, where, in the neighbourhood of Nola, he settled among the rude structures which on his former visit he had caused to be built around the tomb and relics of his " dominsedius" (lord of the edifice) and patron saint. Along with Ther- asia (now a sister, not a wife), while leading a life of rigid asceticism, he devoted the whole of his vast wealth to the

entertainment of needy pilgrims, to payment of the debts of the insolvent, and to public works of utility or ornament ; besides building basilicas at Fondi and Nola, he provided the latter place with a much-needed aqueduct. At the next vacancy, not later than 409, he succeeded to the bishopric of Nola, and this office he held with ever-increas- ing honour until his death, which occurred shortly after that of Augustine in 431. He is commemorated by the Church of Rome on 22d June.

The extant writings of Paulinus consist of some fifty Epistole, addressed to Sulpicius Severus, Delphinus, Augustine, Jerome, and others; thirty-twc Carmina in a great variety of metre, including a series of hexameter ‘‘natales,” begun about 393 and continued annually in honour of the festival of St Felix, metrical epistles to Ausonius and Gestidius, and paraphrascs of three psalms; and a Passio S. Genesii. They reveal to us a kindly and cheerful soul, well versed in the literary accomplishments of the period, but without any strength of intellectual grasp and peculiarly prone to superstition, The somewhat conspicuous place in church history occupied by Paulinus is chiefly due to the effect his great influence had in promoting the practice of pilgrimage, relic- hunting, and picture-worship, as well as the uncritical acceptance of every alleged miracle ; to the intellectual development of Christianity he contributed nothing and it may well be questioned whether the manner in which he discharged the stewardship of his wealth was as judicious and beneficial as it certainly was generous.

His works were edited by Rosweyde and Fronton le Duc in 1622 (Antwerp, 8vo), and their text was reprinted in the Bibl. max. patr. (1677). The next editor was Le Brun des Marettes (Paris, 1685, 2 vols. 4to), whose text was reproduced in substance by Muratori (Verona, 1736), and reprinted by Migne.

PAULUS, Herricn EserHarp Gorton (1761-1851), the distinguished representative of the rationalistic school of German theologians of the beginning of this century, was born at Leonberg, near Stuttgart, Ist September 1761. His father, the Lutheran clergyman at Leonberg, was convinced of the immortality of the soul by spirit- ualism, and was deprived of his living in consequence of his belief in the intercourse of departed spirits with men. He likewise required of his children unconditional obedi-

ence, and commanded them to believe the doctrines of religion without asking wherefore. The father's spiritual- ism and dogmatism drove the son by natural reaction to the rationalism which prevailed at the time, and of which, in its application to Biblical history, Paulus became the most famous representative. He was educated at Tiibingen, was three years headmaster of a German school, and then spent two years in travelling through England and the principal countries of the Continent. He subse- quently published interesting passages from the journal of his tour. In 1789 he was chosen ordinary professor of Oriental languages at Jena. In addition to the studies of his own department he prosecuted especially mathe- matics, as the best preparation for clear thinking. At Jena he lived in close intercourse with Schiller, Goethe, Herder, and the most distinguished literary men of the time. In 1793 he succeeded Doederlein as professor of theology. His special work was the exposition of the Old and New Testaments in the light of his great Oriental learning and according to his characteristic principle of "natural explanation." He held that miracles in the strict sense were impossible, that the events recorded in the Bible took place naturally, and that the narratives of the Gospels are the true reports of men who either were eye- witnesses or had obtained information from such as were. From a purely apologetic motive he sought to remove what other interpreters regarded as miracles from the Bible by distinguishing between the fact related and the author's opinion of it, by seeking a naturalistic exegesis of a narrative, ¢.g., that ém ris Oaddoons (Matt. xiv. 25) means by the shore and not on the sea, by supplying circum- stances omitted by the author, by remembering that the author produces as miracles occurrences which can now be explained otherwise, ¢.g., exorcisms. The chief exegetical works of Paulus are his Philologisch-kritischer und hastor-

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ischer Commentar tiber das Neue Testament (4 vols., 1800- 1804), Clavis tiber die Psalmen (1791), and Clavis diber Jesaias (1793), and particularly his Hxegetisches Handbuch tiber die dre ersten Evangelien (3 vols., 1830-33 ; 2d ed. 1841-42). His Life of Jesus (2 vols., 1828) is a synop- tical translation of the Gospels, prefaced by an account of the preparation for the Christ and a brief summary of His history, and accompanied by very short explanations inter- woven in the translation. The form of the work was fatal

to its success, and the subsequent Fxegetisches Handbuch rendered it quite superfluous. In the latter work Paulus really contributed much to a true interpretation of the Gospel narratives, notwithstanding his entire failure to ex- plain the miracles away. The historical and geographical excursuses and dissertations interwoven in his comment- aries are of considerable value. He was particularly well acquainted with the conditions of Oriental life. In the year 1803 Paulus left Jena on account of his health, and filled various posts in south Germany until 1811, when he became professor of exegesis and ecclesiastical history at Heidelberg. It was there that he found the freest scope for his great learning and tutorial abilities. He filled this chair until 1844, when he retired on account of his great age. He died, faithful to his first rationalistic position, a staunch friend of intellectual and political free- dom and light, 10th August 1851, in his nineticth year.

The literary labours of Paulus were not confined to exegesis. He edited a collected small edition of Spinoza's works (1802-1803), a collection of the most noted Eastern travels (1792-1803), Schel- ling's Vorlesungen tiber die Offenbarung (1848), &c. He was also the author of Skizeen aus meiner Bildungs- und Lebensgeschichte (1839), and he left behind him the materials for a biography, which was published by Professor Reichlin-Meldegg, under the title H. E. @. Paulus wnd seine Zeit (1858).

PAULUS, Junius. See Roman Law.

PAULUS (or Pavtuvs), Lucrus Aminius, a dis- tinguished Roman general, of the patrician family of the ZEmilii, was born about 229 B.c. He was the son of the consul of the same name who fell at Cannx. As curule seedile in 192 he gave a proof of his integrity by prose- cuting the persons who made an. illegal use of the public pastures. His first laurels were won in Further Spain, whither he was sent as pretor in 191. Though at first defeated with loss, he finally overthrew the enemy in a bloody battle (189) and tranquillized Spain. In 182 he was consul, and in the following year subdued the Ingauni, a piratical tribe of Liguria, dismantling their towns and carrying off their ships. For this service he was granteda triumph. After a period of retirement from public life he was elected consul a second time, for 168, and entrusted with the command in the Macedonian war, which the incapacity of previous Roman generals had allowed to drag on without

success for three years. Paulus brought the war to a speedy termination by the battle of Pydna, fought on 22d June (Julian calendar) 168. The battle decided the fate of Macedonia, which was henceforward a Roman province. The Macedonian king Perseus surrendered shortly afterwards and met with a courteous reception from the Roman general, Paulus now availed himself of his position to make the tour of Greece, visiting with an intelligent interest the places immortalized in Greek history and legend. Afterwards, assisted by ten Roman commissioners, he arranged the affairs of Macedonia. In obedience to the orders of the senate, on his return through Epirus to Italy he gave up seventy towns to pillage and carried off 150,000 of the inhabitants as slaves. A magnificent triumph, graced by the presence of the captive king Perseus and his three children, rewarded the con- queror of Macedonia (167). But his public glory was closely attended by private misfortune; of the two sons borne him by his second wife one died a few days before,

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the other a few days after, his triumph. . The ‘veteran was thus left without a son to bear his name; for of his two sons by his first wife Papiria, the eldef had been adopted

“by Quintus Fabius Maximus, Hannibal’s great opponent,

and the younger by the:son of Scipio Africanus. The latter, known as P: Cornelius Scipio A’milianus, was the conqueror of Carthage and Numantia. Paulus was censor ‘in 164, and died in 160, At the funeral games exhibited in his honour the Hecyra of Terence was acted for the second and the Adelphi for the first time.

Paulus was a fine specimen of a Roman noble. An aristocrat to the backbone, he was yet beloved by the people, whose favour he never deigned to court by unworthy means. His integrity was perfect ; of the vast sums brought by him into the Roman treasury from Spain and Macedonia he kept not a penny to himself. At his death his property with difficulty sufficed to pay his wife’s dowry. As a general he was a strict disciplinarian ;

as an augur he dis- charged the religious duties of his office with conscientious care and exactness. His piety passed into superstition, as when before the battle of Pydna he sacrificed to the moon, then under cclipse. His sympathy with Greek learning and art is attested by the Greek masters whom he procured for his sons, as well as by his travels in Greece, the works of art he brought home, and his friendship for the historian Polybius. His nobility, of nature won him the affec- tion and esteem of all who knew him, of his enemies no less than of his countrymen. An affecting proof is the fact recorded by Plutarch that his body was carried to the grave by volunteers from all the nations he had conquered, while old men from Spain, Liguria, and Macedonia followed lamenting the man who (accord- ing to them) was at once their conqueror and their saviour.

There is a life of him by Plutarch, but his campaigns in Liguria and Mace-

- donia are more fully described by Livy (xl. 25-28; xliv. 17-xlv. 41).

PAULUS AIGINETA. See Aicinera, vol. i. p. 181, and MeEpicing, vol. xv. p. 804.

PAULUS DIACONUS, the historian of the Lombard dominion in Italy, flourished in the 8th century (see LoMBaRDS, vol. xiv. p. 813). An ancestor of his named Leupichis entered Italy in the train of Alboin and received an allotment of lands at or near Forum Julii (Friuli). By an invasion of Avars all the five sons of this warrior were swept off into Illyria, but one, his namesake, returned through many perils and restored the ruined fortunes of his house. His grandson was Warnefrid, who, by his wife Theodelinda, became the father of Paulus. The future historian (born about 720 or 725) received an education unusually good for his times, possibly in part conducted at the court of King Ratchis in Pavia. From a teacher named Flavian he received at least the rudiments of Greek. In middle life, probably, he retired into the great Benedictine monastery of Monte Cassino, which his patron King Ratchis had entered in 749. The ruin which befell the Lombard monarchy in 774 at the hands of Charles the Great may have caused him to take this step. In this ruin was involved his brother Arichis, whose estates were confiscated, himself confined in prison for seven years, and his wife and children reduced to beggary. About 781 Paulus left his monastery and travelled to France, probably in order to intercede for this

brother, and after considerable delay his request was granted. Meanwhile, his literary gifts had come to be highly appreciated by the Frankish king. The letters and the verses which passed between Charles (employing the pen of a secretary) and Paulus give a pleasant idea of the relation between the two parties, and remind us of the intercourse between the Italian princes and the scholars of the Renaissance. After some years' residence in France Paulus returned to ltaly and to his convent, and died, probably between 790 and 800, at his beloved Monte Cassino. His surname, Diaconus (or Levita), shows that he took orders as a deacon, no doubt during his residence in the monastery.

_The chief works of Paulus are his Continuation of Eutropius and his Lombard History. The former (one of his earliest works) was written at the request of Adelperga, wife of the duke of Benevento.

Paulus recommended her to read the Roman history of Eutropius, but, as she complained that this heathen writer said nothing of

church affairs, and stopped short at the death of Jovian, Paulus interwove some extracts from the ecclesiastical historians, and added six books (xi.~~xvi.), bringing down the history to 553 a.p. At this point his Lombard History, in six books, written in the later years of his life and cut short by his death, takes up the tale which is told henceforward from the point of view of a Lombard patriot. The sagas of the Langobardic warriors, plentifully inter~~ spersed, give to the narrative a wild barbaric interest. The document called the Origo Gentis Langobardice and the lost his- tory of Sccundus of Trient furnished some of his materials. He also makes free use of Gregory of Tours, Bede, Isidore, and others, In some aspects Paulus naturally suggests a comparison with Jordanes, that other historian of a barbarian nation falling into ruin, but in learning and literary honesty the Lombard is greatly the superior of the Goth. His style is, for his age, wonderfully good, though his grammar shows the breaking down of the old Latin inflexions into the lingua volgare.

Paulus wrote also a history of the bishops of Metz, some homilies, and several small poems, some rhythmical, some metrical. His works were frequently copied in the Middle Ages. Of the Lombard History there are more than a hundred MSS. extant, those of Assisi, Cividale, and St Gall

being the most important. The edition of his histories published as part of the Monumenta Germania Historica (1878-79) supersedes all others. For further informa- tion, the student may consult G. Waitz's. preface to the Lombard History in that edition, and F. Dahn's Langobardische Studien, an able monograph, but perhaps too negative in its conclusions. The English reader will find an excellent sketch of Paulus's life and ea in Ugo Balzani's Early Chroniclers of Italy (London,

883).

PAUPERISM. See Poor Laws.

PAUSANIAS, the general who led the Greeks to vic- tory at Platea, was a Spartan and a member of the Agid branch of the royal house. In 479 3B.c. he succeeded his father Cleombrotus as regent and guardian of his cousin the youthful king Plistarchus, and in the same year he was appointed, by virtue of his rank, to lead the army despatched by the Spartans to help the Athenians against the Persians under Mardonius. He commanded the united Greek army at the memorable battle of Platea (479), which for ever secured the freedom of Greece against the Persians. The credit of that great victory belongs to the soldiers rather than to their general, for Pausanias seems to have acted without any settled plan, and to have given battle only when he was forced to do so by the enemy. Indeed, his attempt to withdraw the Spartan contingent from the post of honour on the right, in order to avoid encountering the native Persian troops under Mardonius, savours of positive cowardice. But, if he feared the living, he respected the dead; a proposal made by a Greek after the battle to avenge the death of Leonidas by mutilating the corpse of the gallant Mardonius received from Pausanias a stern rebuke. After the expul- sion of the Persians from Greece Pausanias led a Greek fleet (478 or 477) to Cyprus and thence to Byzantium, which he captured from the Persians. But the successes he had hitherto enjoyed only fed without satisfying his ambition. He conceived the design of making himself master of all Greece, and with this view he opened a corre- spondence with Xerxes, offering to marry his daughter and reduce Greece toa Persian province. The proposal was hailed with delight by the Persian monarch. Puffed up with these hopes, Pausanias now assumed by anticipation the airs and state of a tyrant, and by his overbearing manners

offended the Greeks so deeply that in disgust they transferred the leadership of the allied forces from Sparta to Athens,—a momentous step, from which sprang the maritime empire of Athens. Pausanias was recalled to Sparta and tried, but, though convicted and punished for minor offences, the evidence was insufficient to sub- stantiate the charge of treason, and he was acquitted. Having afterwards the folly to return to Byzantium in a private capacity and reopen communications with Persia, he was again recalled and put on his trial. There was strong suspicion of his treason, but no positive evidence. It was known, too, that he had incited the Helots to revolt,

promising them freedom and citizenship if they would join him ; but, with characteristic caution, the authorities declined to accept the evidence of a Helot against a Spartan, and Pausanias might, after all, have been acquitted if it had not been that a messenger to whom he entrusted a letter for Artabazus, the Persian satrap, opened it, and, finding in it a direction to put the bearer to death, carried it to the ephors. But not until they had contrived to over- hear a conversation between Pausanias and his messenger were the ephors satisfied of his guilt ; and then they pro- ceeded to arrest him. Foreseeing their intention, Pausanias took refuge in the temple of Athene of the Brazen House. The ephors took off the roof, blocked up the doors, and starved him. When on the point of death he was dragged out, that his corpse might not defile the sanctuary. This happened about 467.

The principal authorities for the life of Pausanias are Herodotus (ix. 10 sg.) and Thucydides (i. 94, 95, 128-184). There is a biography of him by Cornelius Nepos. See also Diodorus, xi, 29- 34, 44-46; Pausanias, iii. 4, 7 and 26.17, 7; Plutarch, Themistocles, 93; Id., Aristides, 11, 14-20, 28; Aristodemus, ii. iv. vi.-viil. (in Miiller’s Fragm. Hist. Gree., vol. v.); Justin, 2, 14.

PAUSANIAS, a prose-writer (Aoyoypddos) of Greek traditions, mythical and historical, and a critic of Greek art. His important work, in ten books, called *EAAdSos Ilepujynors, usually known as Pausamex Descriptio Grecie, has come down to us entire. It is strictly an itinerary through the Peloponnesus, including Attica, Bceotia, and Phocis, with a rather slight mention of the adjacent islands and some of the principal towns on the

Asiatic coast. It was evidently compiled by one whose interest was mainly centred in making notes of art-collections as they existed in the Greek temples and public places in the time of the Antonines. In connexion with these he expatiates on the myths and legends locally preserved, and thus he has handed down to us much valuable mythological material which would otherwise have been lost. A large portion of his work, however, is devoted to Greek history, properly so ealled, though, after the manner of Herodotus and the early logographers, he draws no distinction between legend and history. Ina general sense he may be styled an antiquary rather than an art-critic, a man of industry rather than of genius, and one who deserves praise more from the matter of his work than for the manner of it. Of the personal history of Pausanias nothing is recorded. He lived during the prosperous times of the Roman empire under Hadrian, whom he often mentions by name, and his successors An- toninus Pius and Marcus Aurelius, the latter of whom be- came emperor in 161 a.p. His wars against the German Marcomanni are alluded to,! and Antoninus Pius? is also named in reference to his successful contest with the Moors. Mention is also made of the "wall" raised be- tween the Forth and the Clyde by the elder Antonine to keep off the assaults of the Brigantes. About himself and

his birthplace the author is singularly reticent. Nor has his work any formal introduction or conclusion. He com- mences abruptly with a description of Attica: "The

mainland of Hellas off the Cyclades and opposite the Zigean Sea is called Attica, the jutting headland of which is Sunium. There is a harbour when you have sailed past this foreland, and a temple of Athena the Sunian goddess on the height." He goes on to describe Athens at consl- derable length, and gives a valuable though too brief account of the Parthenon and the great bronze statue of

1 Deser. Gr., viii. (Arcadica), 43, 6.

2 viii, 48, 5, rodrov EtoeBh rov Baotréa éxddecav of "Pwpaiot, Sidr. TH és 7d Ociov Tiw# uddaora epalvero xpHuevos. The epithet is usually attributed to the affection shown to the memory of Hadrian, by whom he had been adopted.

31,289. This statue is referred to by Aristophanes (Zz., 1172) and Euripides (Herc. Fur., 1008).

spear and ‘helm of which were visible to those sailing into the harbour from Sunium. On the ivory and gold statue of the goddess in the Parthenon (c. 24) he writes very briefly ; on the Erechtheum and its antiquities he expa- tiates more largely. The great temple of Ephesus, the very site of which was lost till Mr Wood’s explorations betwéen 1863 and 1874, appears to have been.perfect in his time, but he does not describe it; he merely says* that “Ionia contains temples such as are not elsewhere to be seen, and first of all that of the Ephesian goddess, remarkable for its size and its wealth in general.”

Like Herodotus and Strabo, Pausanias was a traveller and an inquirer. In some respects it is probable that he imitates the manner of Herodotus, as in his credulity® and the affectation of reserve in sacred matters. But, while geography and ethnology chiefly engaged the atten- tion of Strabo, art and antiquities generally form the staple of Pausanias’s work. The passion of the Romans for securing specimens of Greek art had long been fed by the plunder of temples and the removal of statues from the towns of the Greek provinces, so graphically described in the orations against Verres. Pausanias comments on the great antiquity of this kind of sacrilege. ‘‘It is clear,” he remarks,® “that Augustus was not the first who estab- lished the custom of carrying away offerings from the temples of conquered nations, but that he merely followed a very old precedent.” And he quotes many examples of statues removed by right of conquest, as from Troy, from Brauron and Branchide by Xerxes, from Tiryns by the Argives, &c.

In the age of the Antonines special attention was directed to the works of art still remaining in the Greek cities. The work known as Antonine’s Jéinerary, which is a kind of handbook of the whole Roman empire and its complex system of roads and colonies, may have suggested to Pausanias a “Description of Greecc,”,on the lines laid down by Herodotus and Strabo ; but we have no exact date of the composition of either work. Leland compiled his Itinerary or tour through Britain on much the same principles, and his record of churches and castles as they remained in the later years of

Henry VIII. is a survey of medieval art which resembles the notes of Pausanias formed from his own inquiry and observation.

The vast wealth of the Greek cities in statuary and sculpture, which had been accumulating from the 5th century s.c. till the capture of Corinth by Mummius, may be judged of by the records of the plunderings of Verres and _the costly purchases of Cicero? and his successors to the time of Nero, and even of Hadrian, which are matters of history. Nevertheless, after the drain of more than three centuries, “Pausanias,” says Mr Westropp,° “was able to describe 2827 statues.” ;

Whether Pausanias had any real taste or enthusiasm for or judgment of fine art does not appear from his somewhat matter- of-fact accounts. He reminds us of a catalogue of goods made with the view of a sale, minus the auctioneer’s “ puffing.” Nor is his motive much more apparent; he may have written to let connoisseurs know what was yet to be had, or to put on record existing works, with the names of the artists, as a protest against further spoliation, or he may have been commissioned by imperial authority to make a list of the art-treasures still cxhibited to travellers in the Roman provinces. In the century from Augustus to Trajan Greek education in art, literature, and philosophy was much affected by the rich and well-born Romans, and collections of Creek bronzes and real or spurious articles of antiquity were keenly competed for, as we know from many of the epigrams of Martial.°

Pausanias does not usually say that an object is beautiful ; he tells us what it is, where it is, and who executed it; that is gencrally all. Occasionally he remarks that a statue is “worth

4 vii. (Achaica), 5, 2. ;

5 As when he says, as if seriously (viii. 2, 4), that it seems to him quite credible that Lycaon was changed into a wolf and Niobe into a stone in the good old times when the gods conversed with men on earth, 6 viii. 46, 2.

7 Often referred to in his letters to Atticus.

8 The Cycle of Development of the Art of Sculpture in Greece and Rome, \cct. v. p. 166.

9 Propertius has a curious critique on the relative merits of the Greek sculptors and painters (iv. 8, 9-16). In elegy 4 of the same book, ver. 6, he disclaims the character of a wealthy collector, “nec miser era paro clade, Corinthe, tua.”

looking at,” Oéas déov, but criticism, in the true sense of the word, is hardly ever attempted. In ii, 27, 5 he speaks highly of Polyclitus as an architect, and says that none can rival him for beauty or proportion. In vii. 5, 2 he says the temples of Hera in Samos and of Athena at Phocea “were objects of admiration,” though they had been burned and greatly injured by the Persians. Occasionally (as vii. 5, 4; 26, 6) he guesses the name of an un-known artist from the style of a sculpture; in vii. 25, 4 he describes some marble statues of women as showing a good style of art, éxovcat Téxvys ef. His descriptions of a scries of designs, like thosc painted by Polygnotus in the Lesche at Delphi,! are dry and without a glimpse of discrimination, — mere lists of names and sub- jects, like modern “ guides” to a gallery or museum of art. At the same time the minuteness of observation and the careful record of all the inscribed names are most commendable, and the value of the account to us from a literary point of view, as showing what subjects were regarded as “ Homeric” in the time of Polygnotus, a contemporary of Pericles, cannot be overrated. The same re- marks apply to the account of the famous “chest of Cypselus,” preserved at Olympia, and claiming a great antiquity from the inscriptions being written Boverpodndér, alternately from left to right and right to left.2 He ends his description of scenes chiefly taken from the Zroiea with these words:3 “Who the maker of this chest was we had no means of forming any conjecture. The inscriptions upon it may perhaps be by another hand; but our general impression was that the designer was Eumelus of Corinth, mainly on account of the processional hymn which he composed for Delos.” This Eumelus is believed to have flourished about 750 B.C. The suspicion of Pausanias that the inscriptions were later make it probable that the whole design and workmanship were imitative on an archaic model.

Recent explorations, especially those at Olympia, are largely indebted to the careful and detailed accounts of Pausanias.4 The temples at Ephesus, Branchidz, Claros, Samos, and Phocwa he merely mentions, his researches being limited to the cities of western Greece.? His notes on the topography of Athens, though he passes over several of the more important buildings, as the great theatre and the Odeum, with little more than a mere reference, are stil] the principal authority confirming the allusions in early writers. He seems, indeed, to have admired objects more for their antiquity than for their beanty. He often diverges into long details of his- tory, largely mixed with legend, as in his long account of the Mes- scnian wars in book iv.; indeed, mythology and history proper stand with Pausanias in precisely the same category. Hedoes not show any great advance in this respect from the times of Hecateus or Pherecydes of Syros.

The style of Pausanias is simple and easy, but it is wanting in the quaintness and vivacity of Herodotus, and it has not the florid eloquence of Plato or Lucian. The simple and genuine credulity of Herodotus seems foolish or affected in a writer who lived in a much more advanced period of human knowledge. Thus he gravely tells us that the water of the Styx will break crystal and precious stones and vessels of clay, and cause metals, even gold, to decay, and can only be kept in a horse’s hoof.

The titles of the several books are taken from the divisions of the Peloponnesus, together with the three lying immediately north of the isthmus; the first book being devoted to Attica, the ninth to Beotia, and the tenth to Phocis. The remainder are (1i.) Cor- inthiaca, (iii.) Laconica, (iv.) Messeniaca, (v. and vi.) Eliaca, (vil.) Achaica, (viii.) Arcadica. In adopting this nomenclature he prob- ably followed the T’roica, Persica, &c., of Hellanicus. A vast mass of information is contained in these several books, which may be closely compared in their treatment and in the great variety of subjects with English ‘county historics.”

Without the sustained interest and the genial humour which characterize the work of Herodotus, composed as it evidently was for recital and not for private reading, Pausanias is an accurate and diligent recorder of what he saw and knew. He copied inscrip- tions, and, like Herodotus, he often quotes oracles ; in ascertaining the names of artists he is particularly

careful. That he had made great research into the history and topography of Greece is abun- dantly shown ; but he is rather chary in his reference to previous authors. Of Herodotus he makes mention in eight or nine places, of Plutarch in one (i. 36, 4), of Plato in four. Thucydides is referred to once (vi. 19, 5), Acusilaus once (ii. 16, 4), Hellanicus

1 x. (Phocica), 25-31. * v. (Eliaca), 17-19. 3 19, 2) p27.

e Eliaca (II.), book vi., the later chapters of which give a very full description of Olympia and its buildings and statues.

5 vii. 5,4. Here occurs one of the few faint expressions of pleasure or praise that the writer indulges in. “You would be pleased,”’ he says, “‘also with the temple of Hercules at Erythre, and that of Athena at Priene, the latter on account of the statue, the Heracleum for its antiquity.” These remarks show that he had visited and knew something of the temples in Ionia. The tomb of Mausolus at Hali-

carnassus he mentions in terms approaching to praise, viii. 16, 4 § viii. (Arcadica), 18, 5. a

‘about 34 miles enclose an area of 400 acres.

twice, Hecatzus four times, Strabo nowhere. Of the poets, epic,

lyric, and dramatic, he displays a good knowledge, as well as of

Pindar, whom he frequently quotes. It is clear, therefore, that Pausanias was a literary man, and perhaps it is more an idiosyn- crasy than a fault that he is cold and prosaic in his descriptions. Of the author’s birth, family, or country there are no indications, The name is Doric, but the style is the Attic of Plutarch, Strabo, and Lucian.

The best editions of Pausanias are those of Siebelis (5 vols. 8vo, Leipsie, 1822-28), and of Schubart and Walz (8 vols. 8vo, Leipsic, 1838-40). Schubart’s text was reprinted in the Triibner series (2 vols. 12no, Leipsic,

1862), with brief introductory critical notes and a very careful and complete index. This is an excellent and accurate edition, and one which leaves nothing to be de- sired. (. AR eS)

PAUSILIPO, or Posinurp0. See NaPLes, vol. xvii. p.

187.

PAVIA, a city of Italy, the chief town of a province, and a bishop's see, is situated at a height of 270 feet above the sea-level, 224 miles by rail south of Milan, on the left bank of the Ticino, about 2 miles above its junction with the Po. The railway from Milan to Genoa, which is there joined by lines from Cremona, &c., crosses the river on a fine bridge constructed in 1865; and, farther down, the city is connected with the suburban village of Ticino by a remarkable brick-built covered bridge dating from the 14th century. Though it has lost its importance as a fortified town, and no longer deserves the designation of "City of the Hundred Towers," Pavia is still for the most part surrounded by its ramparts, which in a circuit of Several of its buildings are of great architectural interest. The basilica of San Michele is one of the finest specimens ex- tant of the Lombard style (cf. Arcnrrecrury, vol. ii, p. 435), and as it was within its walls that the crown was placed on the head of the "kings of Italy," from whom the house of Savoy claims to be descended, it has received the legal title of Basilica Reale (royal decree of 1863). A careful restoration has since been effected. The cathedral of San Stefano, of which the first stone was laid by Bishop Ascanio Sforza in 1488, is still unfinished, the original design by Cristoforo Rocchi, a pupil of Bramante, consist- ing of a central octagon from which four arms projected so as to form across. In the interior is the tomb of St Augustine, a remarkable specimen of 14th-century sculp- ture, which presents the saint life-size in pontifical robes, and is surrounded by a profusion of bas-reliefs and minor figures representing saints of his order, liberal arts, and cardinal virtues—in all, 420 heads. The relics which it enshrines are said to have been brought from Hippo to Sar- dinia by African refugees, purchased in 724 by Liutprand, and deposited in the now ruined church of San Pietro in Ciel d'Oro, and thence transferred to the cathedral subse- quent to their rediscovery in 1695. Beneath the high altar is the tomb of Boetius, whose

remains were also brought from San Pietro; and from the roof of the building is suspended the lance of Roland (Orlando).? Of

7 The famous Certosa of Pavia, one of the most Inagnificent monas- teries in the world, is not situated within the city, but at a distance of about 5 miles towards the north. Its founder, Gian Galeazzo Visconti (to whom we also owe the Milan cathedral), laid the first stone on 27th August 1396, and the building was nominally finished in 1542. A parallelogram, about 140 yards long by 110 broad, is surrounded on all sides by a lofty cloister formed of 128 arches. The church, whose marble fagade is more richly decorated than any other in north Italy, is in the form of a Latin cross, 258 feet long by 177 feet wide, with three naves and a vast octagonal dome. In the south transept stands the mausoleum, in Carrara marble, of Gian Galeazzo Visconti, designed by Galeazzo Pellegrini in 1490; and in the north transept are the marble statues of Lodovico Sforza il Moro and his consort Beatrice by Cristoforo Solari. The Carthusian monks, to whom the monastery was entrusted from the first by its founder, were bound to employ a certain proportion of their annual revenue in prosecuting the work till its completion ; and even after 1542 they voluntarily continued to expend large sums on further decoration. The Certosa of Pavia is thus a practical text-book of Italian art for well-nigh three centuries (see Durelli, La Certosa di Pavia, Milan, 1823; and Gruner's Fresco. De- corations, 1854, and Terra Cotta Architecture in North Italy, 1867).

secular edifices in Pavia the most noteworthy is the palace 'or castle of the Visconti, begun in 1360 for Galeazzo IT. It is a vast quadrangle, presenting to the outside heavy fronts of massive masonry, but in the 15th and 16th centuries it was as remarkable for sumptuousness as for strength. Originally there was a square tower at each corner; two were destroyed by the French artillery in 1527.1 The university of Pavia (formally constituted in 1361 by the emperor Charles IV., but claiming to have its first origin in a school founded by Charlemagne) has faculties of law, medicine, and science. The professors number between forty and fifty, but the students have de- creased from 1475 in 1860 to 604 in 1881-82. Among its subsidiary establishments are two colleges—the Borromeo and the Ghislieri—founded respectively

by Archbishop Borromeo (1563) and Pope Pius V. (1569) for the gratuitous maintenance of a certain number of poor students ; a museum of natural history, instituted in 1772 under Spallanzani; a botanical garden, commenced in Leis am agricultural garden, bestowed on the university by Napo- leon in 1806; and the oldest anatomical cabinet in Italy. The university library was founded by Maria Theresa in 1754; the famous collection of books which Gian Galeazzo brought together by the aid of Petrarch was carried off to Blois by the French in 1500. The civil hospital of San Matteo is a large and flourishing institution, dating from 1449; like the Borromeo and Ghislieri colleges, it has large landed estates in the circondario. Comparatively few manufactures are prosecuted in Pavia, but there is considerable trade by water as well as by rail, barges being able to pass down the Po to the Adriatic and along the canal to Milan. The population of the city was 27,885 in 1871 and 27,792 in 1881, or, including the suburbs Ticino, Calvenzano, and Borgorato, 29,836 ; that of the commune

was 29,618 in 1871 and 29,941 in 1881. History.—Ticinum—it was not till the close of the 7th century that the city was called Papia or Pavia—was a place of some import- ance under the Roman empire, having, according to Pliny, been founded by two Gallic tribes at the time of the first Gallic immigra- tion into Italy. It was at Ticinum that Augustus met the funeral procession of Drusus ; and Claudius II. was first saluted emperor by the garrison in the city. Ravaged by Attila in 452 and by Odoacer in 476, Ticinum was, after 489, raised to much more than its former position by Theodoric the Goth, who restored its fortifi- cations and made it the seat of a royal palace. From Theodoric’s successors it was recovered for the Eastern empire by Narses ; but the imperial garrison, after a siege of more than three years, was obliged by famine to surrender to the Lombards in 578, and Ticinum- Pavia became, as the capital of the Lombard kingdom, one of the leading cities of Italy. By the conquest of Pavia and the capture of Desiderius in 774 Charlemagne completely destroyed the Lom- bard supremacy ; but the city continued to be the centre of the Carolingian power in Italy, and a royal residence was built in the neighbourhood (Corteolona on the Olona). It was in San Michele Maggiore in Pavia that Berengar of Friuli and his quasi-regal successors down to Berengar II. and Adalbert II. were crowned “kings of Italy.” Under the reign of the first the city was

sacked and burned by the Hungarians, and the bishop was among those who perished in the flames. At Pavia was celebrated in 951 the marriage of Otto I. and Adelheid (Adelaide), which exercised so important an influence on the relations of the cmpire and Italy ; but, when the succession to the crown of Italy came to be dis- puted between the emperor Henry II. and Harduin of Ivrea, the city sided strongly with the latter. Laid in ruins by Henry, who was attacked by the citizens on the night after his coronation in 1004, it was none the less ready to close its gates on Conrad the Salic in 1026. The jealousy which had meanwhile been growing up between Pavia and Milan having in 1056 broken out into open war, Pavia in the long run had recourse to the hated emperors to aid her against her now more hated rival; and for the most part

The Carthusians were expelled in 1782, and, after being held for a time by Cistercians (1784) and Carmelites (1798), the monastery was closed in 1810; but it was restored to the Carthusians in 1848, and was exempted from confiscation in 1866. The lead was all stripped from the roof in 1797 by order of the French Directory ; but the building as a whole is still in excellent preservation.

1 See Professor Magenta's monograph, I Visconti e gli Sforza nel Castello di Pavia, Milan, 1884, 2 vols., folio.

she remained, through all the broils and revolutions o i attached to the Ghibelline party till the latter part nie ae century. From 1360, when Galeazzo was appointed imperial vicar by Charles IV., Pavia became practically a possession of the Visconti family, and in due course formed part of the duchy of Milan. For the success which attended its insurrection against the French garrison in 1499 it paid a terrible penalty in 1500, being both given over to pillage and forced to furnish a contribution of 50,000 gold crowns. Having been strongly fortified by Charles V. the city was in 1525 able to bid defiance to Francis I., who was 50 disastrously beaten in the vicinity ; but two years later the French under Lautrec subjected it to a sack of seven days. In 1655 Prince Thomas of Savoy invested Pavia with au army of 20,000 French- nien, but had to withdraw after fifty-two days' siege. During the 18th century the city had its full share of the wars. The

Austrians under Prince Eugene occupied it in 1706, the French in 1733, and the French and Spaniards in 1745 ; and the Austrians were again iu possession from 1746 till 1796. In May of that year it was seized for the French republic by Napoleon, who, to punish it for an insurrection, condemned it to three hours' pillage. The revolu- tionary movement of February 1848 was crushed by the Austrians and the university was closed ; and, though the Sardinian forces obtained possession in March, the Austrians soon recovered their ground, It was not till 1859 that Pavia passed with the rest of Lombardy to the Sardinian crown.

At several periods Pavia has been the centre of great intellectual activity. It was in a tower which, previous to 1584, stood near the church of Dell' Annunziata that Boetius wrote his De Consolatione Philosophi#; the legal school of Pavia was rendered celebrated in the 11th century by Lanfranc (afterwards archbishop of Canter- bury) ; Christopher Columbus studied at the university about 1447 ; and printing was introduced in 1471. Two of the bishops of Pavia have been raised to the papal throne as John XIV. and Julius III. Lanfranc, Pope John XIV., Porta the anatomist, and Cremona the mathematician were born in the city.

See Breventano, Istoria di Pavia, 1570; Marroni, De ecclesia et episcopis papiensibus commentarius, 1757; Capsoni, Mem. stor. di Pavia, 1782; Carpa- nelli, Compendio istorico delle cose pavest, 1817; and various monographs by the local antiquarians Magenta and Dell' Acqua.

PAVLOGRAD, a town of European Russia, at the head of a district in the government of Ekaterinoslaff, on the river Voltch'ya, 13 miles from its junction with the Samara (a tributary of the Dnieper), and a short distance to the left of the railway from Kharkoff to Sebastopol. It dates from the latter half of the 18th century, and was originally known as Luganskoe Selo. It was made a district town of Ekaterinoslaff in 1784. Its population increased from 8653 in 1865 to 11,400 in 1870; and it is the seat of three annual fairs, and has a large trade in cattle.

PAWNBROKING. See PLEDGE; also UsuRY AND Usury Laws.

PAWTUCKET, a town of the United States, in Provid- ence county, Rhode Island, 4 miles north-east of Providence by the Providence and Worcester

Railroad, is situated on both sides of the navigable Pawtucket river (Blackstone river above the falls), which falls about 50 feet at this point, affording abundant water-power. At Pawtucket in 1790 Samuel Slater erected the first water-power cotton-factory in America. In the early part of the present century Paw- tucket was the seat of shipbuilding and of considerable commerce. It is now a place with nearly 100 different industries, including the Conart Thread Works (employ- ing over 2000 hands), large manufactories of cotton and woollen cloths, steam-engines, fire-engines, &c. The exports and imports amount to several million dollars annually. In 1862 Pawtucket, originally belonging to Massachusetts, became part of Rhode Island. The population in 1880 was 19,030, and in 1884 (estimated) about 23,000.

PAXO, or Paxos, one of the Iontan IsLANps (9.2), about 8 miles south of the southern extremity of Corfu, is a hilly mass of limestone 5 miles long by 2 broad, and not more than 600 feet high. Though it has only a single stream and a few springs, and the inhabitants were often obliged, before the Russians and English provided them with cisterns, to bring water from the mainland, Paxo 1s well clothed with olives, which produce oil of the very highest quality. Gaion (or, less correctly, Gaia), the prin- cipal village, lies on the east coast, and has a small har-

bour. Towards the centre, on an eminence, stands Papandi, the residence of the bishop of Paxo, and throughout the island are scattered a large number of churches, whose belfries add greatly to the picturesqueness of the views. On the west and south-west coasts are some extensive and remarkable caverns, of which an account will be found in Davy’s Lonian Islands, vol. i. pp. 66-71. Ancient writers— Polybius, Pliny, &c.—do not mention Paxos by itself, but apply the plural form Paxi (IIa£o/) to Paxos and the smaller island which is now known as Antipaxo (the Propaxos of the Antonine Itinerary). Compare Pan, p. 208 above. PAXTON, Sir JoszepH (1803-1865), architect and orna- mental gardener, was born of humble parents at Milton Bryant, near Woburn, Bedfordshire, and was educated at the grammar-school of that town. Having served his apprenticeship as gardener, he obtained employment at Chiswick, the seat of the duke of Devonshire,

and eventually became superintendent of the duke's gardens and grounds at Chatsworth, and manager of his Derbyshire estates. The design according to which he remodelled the gar- dens and grounds has awakened the general admiration of landscape gardeners; and he also built a grand con- servatory, in which he introduced various improvements of great value in construction and arrangements. To this edifice there attaches a peculiar interest from the fact that it formed the model for the Great Exhibition building of 1851. The happy suggestion of Paxton solved a difficulty which threatened to render it impossible to hold the exhi- bition, and in recognition of his great services he received the honour of knighthood. On the formation of the Crystal Palace Company he was invited to prepare the design for the building at Sydenham, and was also appointed director of the gardens and grounds. Subsequently he received several commissions as an architect, his most important design being that for the mansion of Baron James de Rothschild at Ferritres in France. His versa- tility of invention was also shown by his organization of the Army Work Corps which served in the Crimea. In 1854 he was chosen M.P. for Coventry, which he continued to represent till his death, which occurred at his residence near the Crystal Palace, 8th June 1865. Paxton was elected in 1826 a Fellow of the Horticultural Society, in 1833 a Fellow of the Linnean Society, and in 1844 he was made a knight of the order of St Vladimir by the em- peror of Russia. He is the author of several contributions to the literature of horticulture, including a Practical

Treatise on the Culture of the Dahlia (1838) and a Pocket'

Botanical Dictionary (1st ed., 1840). He also edited the Cottage Calendar, the Horticultural Register, and the Botanical Magazine.

PAYMENT, in English law, is one of the modes of per- formance of an obligation, and consists in the discharge of a sum due in money or the equivalent of money. In order that payment may extinguish the obligation it is necessary that it should be made at a proper time and place, in a proper manner, and by and to a proper person. If the sum due be not paid at the appointed time, the creditor is entitled to sue the debtor at once, in spite of the readiness of the latter to pay at a later date, subject, in the case of bills and notes, to the allowance of days of grace. In the common case of sale of goods for ready money, a right to the goods vests at once upon sale in the

purchaser, a right to the price in the seller; but the seller need not part with the goods till payment of the price.

Payment may be made at any time of the day upon which it falls due, except in the case of mercantile contracts, where the creditor is not bound to wait for payment beyond the usual hours of mercantile business. If no place be fixed for payment, the debtor is bound to find, or to use reasonable means to find, the creditor, unless the latter be

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abroad. Payment must be made in money which isa legal tender (see below), unless the creditor waive his right to payment in money by accepting some other mode of pay- ment, as a negotiable instrument or a transfer of credit. If the payment be by negotiable instrument, the instrument may operate either as an absolute or as a conditional dis- charge. In the ordinary case of payment by cheque the creditor accepts the cheque conditionally upon its being honoured ; if it be dishonoured, he is remitted to his original rights. The creditor has a right to payment in full, and is not bound to accept part payment unless by special agreement. Part payment is sufficient to take the debt out of the Statute of Limitations. It is a technical rule of English law that payment of a smaller sum, even though accepted by the creditor in full satisfaction, is no defence to a subsequent action for the debt. The reason of this rule seems to be that there is no consideration for the creditor foregoing his right to full payment. In order that payment of a smaller sum may satisfy the debt, it must be made by a person other than the person originally liable, or at an earlier date, or at another place, or in another manner than the date, place, or manner contracted for, Thus a bill or note may be satisfied by money to a less amount, or a money debt by a bill or note to a less amount; a debt of £100 cannot be discharged by payment of £90 (unless the creditor execute a release under seal), though it may be discharged by payment of £10 before the day appointed, or by a bill for £10. Payment must in general be made by the debtor or his agent, or by a stranger to the contract with the assent of the debtor. If payment be made by a stranger without the assent of the debtor, it seems uncertain how far English law regards such payment as a satisfaction of the debt. If the debtor

ratify the pay- ment, it then undoubtedly becomes a satisfaction. Pay- ment must be made to the creditor or his agent. A bona Jide payment to an apparent agent may be good, though he has in fact no authority to receive it. Such payment will usually be good where the authority of the agent has been countermanded without notice to the debtor. The fact of payment may be presumed, as from lapse of tiie. Thus payment of a testator's debts is generally presumed after twenty years. A written receipt is only presumptive and not conclusive evidence of payment. If payment be made under a mistake of fact, it may be recovered, but it is otherwise if it be made under a mistake of law, for it is a maxim of law that ignorantia legis neminem excusat. Money paid under compulsion of law, even though not due, cannot generally be recovered where there has been no fraud or extortion.

Appropriation of Payments.—Wherc the creditor has two debts duc to him from the same debtor on distinct accounts, the general law as to the appropriation of payments made by the debtor is that the debtor is entitled to apply the payments to such account as he thinks fit. Solvitur in modum solventis. In default of appropria- tion by the debtor the creditor is entitled to determine the applica- tion of the sums paid, and may appropriate them even to the dis- charge of debts barred by the Statute of Limitations. In default of appropriation by either debtor or creditor, the law implies an appropriation of the earlier paymcuts to the earlier debts.

Payment into and out of Cowrt.—Money is gencrally paid into court to abide the result of pending litigation, as in intcrpleader proceedings, or where litigation has already begun, as security for costs or as a defence or partial defence toa claim. Payment into court does not necessarily (except in actions for libel and slander) operate as an admission of liability. Money may sometimes be paid into court where no litigation is pending, as under the Trustee Relief Act, 1847. Payment of money out of court is obtained by the order of the court upon petition or summons or otherwise, or simply on the request or the written authority of the person entitled to it.

Payment of Wages.—By the "Truck Act," 1 and 2 Will. IV. ¢. 37 (which applies to Great Britain), the payment of wages to most kinds of labourers and workmen otherwise than in coin is prohi- bited. This Act does not apply

to domestic or agricultural scrvants. The provisions of the Act are extended to the hosicry trade by 37

and 38 Vict. c. 48. Payment of wages in public-houses (except in the case of domestic servants) is illegal by the combined effect of 35 and 36 Vict. cc. 76 and 77, and 46 and 47 Vict. c. 31.

Tender. —This is payment duly proffered to a creditor, but ren- dered abortive by the act of the creditor. In order that a tender may be good in law it must asa rule be made under circumstances which would make it a good payment if acccpted. The money tendered must be a legal tender, unless the creditor waive his right to a legal tender, as where he objects to the amount and not the mode of tender. Bank of England notes are legal tender for any sum above £5, except by the bank itself, 3 and 4 Will. IV. c. 98, s. 6. Gold is legal tender to any amount, silver up to 40s., bronze up to Is., 83 and 34 Vict. c. 10. By 29 and 380 Vict. c. 65 the gold coinage of colonial mints may be made legal tender by pro- clamation. Under the powers of this Act the gold coinage of the Sydney mint has been declared to be legal tender. The effect of tender is not to discharge the debt, but to enable the debtor, when sued for the debt, to pay the money into court and to get judg- ment for the costs of his defence.

Seotland.—The law of Scotland as to payment agrces in most points with that of England. Where a debt is constituted by writ payment cannot be proved by witnesses; where it is not consti- tuted by writ, payment to the amount of £100 Scots may be proved by witnesses ; beyond that amount it can only be proved by writ or oath of party. The term tender seems to be strictly applied only to a judicial offer of a sum for damages and expenses made by the defender during litigation, not to an offer made by the debtor before litigation. Bank of England notes are not a legal tender in Scot- land, 8 and 9 Vict. c. 88, s. 15, or in Ireland, 8 and 9 Vict. c. 37, s. 6.

United States.—In the United States the law as a rule does not materially differ from English law. In some Statcs, however, money may be recovered, even when it has been paid under a mis- take of law. The question of legal tender has been an important one. In 1862 Congress passed an Act making

treasury notes legal tender. After much litigation, the Supreme Court of the United States finally decided in 1870 in favour of the constitutionality of this Act, both as to contracts made before and after it was passed (see 1 Kent's Comm., p. 252). These notes are legal tender for all purposes except duties on imports and interest on the public debt. All gold coins, silvcr dollars, and silver coins below the value ofa dollar coined before 1854 are legal tender to any amount. Silver coins below the value of a dollar of 1854 and subsequent years are legal tender for sums not exceeding five dollars. Silver three-cent pieces of the dates 1851 to 1853 are legal tender for sums not exceed- ing thirty cents, those of subsequent years for sums not exceeding five dollars. Cents and foreign coins are not legal tender. Postage currency is not legal tender for private debts (Bouvier's Law Diet., "Tegal Tender"). It falls exclusively within the jurisdiction of Congress to declare paper or copper money a legal tender. By the constitution of the United States, "no State… shall make anything but gold and silver coin a tender in payment of debts" fart. 1. s, 10).

PAYSANDU, formerly San Bento, a port and depart- mental town of Uruguay, is situated on the left bank of the river Uruguay in 32° 20'S. lat. and 58° 1' W. long., 270 miles by river from Montevideo, and 120 miles by road from Durazno, the present terminus of the railway. The long streets run east and west at right angles to the river, and the slope of the ground makes drainage easy. Paysandu has been a great battle-ground: in 1846, for instance, it was held by Oribe and bombarded by Rivera, and in 1865 it was captured by the Brazilians after a twenty-eight days' siege. But the name is best known in Europe for the ox- tongues, &c., preserved in its extensive saladeros. In 1868 the population was about 9000, and it has since consider- ably increased. Taking Paysandu to mean Father Sandu or Alexander, the inhabitants call themselves Sanduséros.

PAYTA, or Parra, a town of Peru, in the province of Piura, with only 2390 inhabitants in 1876, but of im- portance as the northmost harbour of the Peruvian coast, the port of the city of Piura (San Miguel de), with which it is connected by rail, a regular calling-place for steamers, and a great rendezvous for whaling vessels. It consists of a single narrow street of reed and wattle houses, but there are a good harbour and an iron custom-house. The great drawback of the place used to be want of water, previous to the

construction by the Government of an aqueduct from the Chira river. Straw hats, cattle, hides, and cotton are exported. Formerly a rich and flourishing place, Payta has never recovered from the effects of Lord Anson's

attack in 1741, when only two of its churches were spared. There is a raised beach at Payta 300 feet high ; the slate and sandstone are covered by conglomerate sand and a gypsum formation containing shells of living species.

PAZ DE AYACUCHO, La. See La Paz.

PEA (Pisum), a genus of Leguminose, consisting of herbs with compound pinnate leaves ending in tendrils, by means of which the weak stems are enabled to support themselves, and with large leafy stipules at the base. The flowers are typically "' papilionaceous," with a 'standard " or large petal above, two side petals or wings, and two front petals below forming the keel. The stamens are ten,—nine united, the tenth usually free or only slightly joined to the others. The ovary is prolonged into a long, thick, bent style, compressed from side to side at the tip and fringed with hairs. The fruit is a characteristic "legume" or pod, bursting when ripe into two valves, which bear the large globular seeds (peas) on their edges. These seeds are on short stalks, the upper extremity of which is dilated into a shallow cup or aril; the two cotyledons are thick and fleshy, with a radicle bent along their edges on one side. The genus is exceedingly close to Lathyrus, being only distinguished technically by the style, which in the latter genus is compressed from above downwards and not thick. It is not surprising, therefore, that under the general name "'pea" species both of Pisum and of Lathyrus are included. The common field or grey pea with compressed mottled seeds and two to four leaflets is Pisum arvense, which is cultivated in all temperate parts of the globe, but which, according to the Italian botanists, is truly a native of central and southern Italy. The garden pea, P. sativum, is more tender than the preceding, and its origin is not known. It has not been found in a wild state anywhere, and it is considered that it may be a form of P. arvense, having, however, from four to six leaflets to each leaf and globular seeds of uniform colour.

P. sativum was known to Theophrastus ; and De Candolle points out that the word ‘pison ” or its equivalent occurs in the Albanian tongue as well as in Latin, whence he concludes that the pea was known to the Aryans, and was perhaps brought by them into Greece and Italy. Peas have been found in the Swiss lake-dwell- ings of the bronze period. The garden peas differ considerably in size, shape of pod, degrec of productiveness, form and colour of seed, &c. The sugar peas arc those in which the inner lining of the pod is very thin instead of being somewhat horny, so that the whole pod can be eaten. Unlike most papilionaceous plants, pea- flowers are perfectly fertile without the aid of insects, and thus do not intercross so freely as most similar plants do. On the other hand, a case is known wherein the pollen from a purple-podded pea applied to the stigma of one of the green-podded sugar peas produced a purple pod, showing that not only the ovule but even the ovary was affected by the cross. The numerous varieties of peas in cultivation have been obtained by cross-fertilization, but chiefly by selection. Peas constitute a highly nutritious article of diet from the large quantity of nitrogenous materials they contain in addition to starchy and saccharine matters. :

The Sweet Pea, cultivated for the beauty and fragrance of its flowers, is not a true Piswm, but a species of Lathyrus (L. odoratus), a native of southern Europe. The Chick Pea (Cicer arietinum), not cultivated in England, is still farther removed from the true peas. The Everlasting Pea of gardens is a species of Lathyrus, with very decp fleshy roots, bold foliage, and beautiful but scentless flowers. L. datifolius, a British wild plant, is the source of most

of the garden varieties.

PEABODY, a town of the United States, in Essex county, Massachusetts, 5 miles north-west of Salem. In- corporated as South Danvers in 1855, it adopted its pre- sent name in 1868 in honour of the philanthropist George Peabody, who was born in the township, and in 1852 erected there the Peabody Institute, which now contains various memorials of its founder, the portrait of herself presented by Queen Victoria, the Congress medal, &c. Peabody contains a large number of leather and morocco factories, and

several glue-works, print-works, &e. Its ‘nhabitants numbered 7343 in 1870 and 9028 in 1880.

PEABODY, Grorcr (1795-1869), philanthropist, was descended from an old yeoman family of Hertfordshire, England, named Pabody or Pebody, who, six generations before his birth, had emigrated to New England. He was born at Danvers (now Peabody), Massachusetts, 18th February 1795. The only regular education he received was at the district school, and when only eleven years of age he became apprentice at a grocery store. At the end of four years he became assistant to his brother, who kept a dry goods shop, and a year afterwards, on the shop being burned, to his uncle, who had a business in George Town, District of Columbia. After serving as a volunteer at Fort Warburton in the short war between Great Britain and the United States in 1812, he became partner with Elisha Riggs in a dry goods store, Riggs furnishing the capital, while Peabody had the practical management. As bagman he travelled through the western wilds of New York and Pennsylvania and the plantations of Maryland and Vir- ginia. Through his energy and skill the business increased with astounding rapidity, and on the retirement of Riggs about 1830 Peabody found himself at the head of one of the largest mercantile concerns in the world. About 1837 he established himself in London as merchant and money-broker at Wanford Court, City, and in 1843 he withdrew from the concern in America. It is, however, as a sagacious and generous philanthropist that Peabody has made his name a household word. While holding aloof from the strife of politics in the United States, he was ready to give his native country the benefit of his business skill and the aid of his wealth in its financial difficulties. The number of his great benefactions to public objects is too great for bare mention here. It must suffice to name among the more important a gift of £25,000 for educational purposes at Danvers; of £100,000 to found and endow an institution for science in Baltimore, a sum afterwards increased by a second donation of £100,000 ; of various sums to Harvard University ; and of £350,000 for the erection of dwelling-houses for the work- ing-classes in London, which sum was increased by his will to half a million. If

this last benefaction has failed to produce the good results anticipated, this has been due to causes for which Peabody was not responsible, and which do not at all detract from the wise beneficence of the gift. He received from the Queen the offer of a baronetcy, but declined it. In 1867 the United States Congress awarded him a special vote of thanks for his many large gifts to public institutions in America. He died at Eaton Square, London, 14th November 1869.

PEACH. By Bentham and Hooker the peach is in- cluded under the genus Prunus (Prunus persica), and its resemblance to the plum is indeed obvious; others have classed it with the almond, Amygdalus; while others again have considered it sufficiently distinct to constitute a genus of its own under the name Persica.

In general terms the peach may be said to be a medium- sized tree, with lanceolate, stipulate leaves, borne on long, slender, relatively unbranched shoots, and with the flowers arranged singly, or in groups of two or more, at intervals along the shoots, The flowers have a hollow tube at the base bearing at its free edge five sepals, an equal number of petals, usually concave or spoon-shaped, pink or white, and a great number of stamens. The pistil consists of a single carpel with its ovary, style, stigma, and solitary ovule or twin ovules. This carpel is, in the first instance, free within the flower-tube, but, as growth goes on, the flower- tube and the carpel become fused together into one mass, the flesh of the peach, the inner layers of the carpel be- coming woody to form the stone, while the ovule ripens into the kernel or seed. This is exactly the structure of the plum or apricot, and differs from that of the almond,

which is identical in the first instance, only in the circum. stance that the fleshy part of the latter eventually becomes dry and leathery and cracks open along a line called the suture.

The nectarine is a variation from the peach, mainly characterized by the circumstance that, while the skin of the ripe fruit is downy in the peach, it is shining and destitute of hairs in the nectarine. That there jis no essential difference between the two is, however, shown by the facts that the seeds of

the peach will produce nectarines, and wee versa, and that it is not very uncommon, though still exceptional, to see peaches and nectarines on the same branch, and fruits which combine in themselves the characteristics of both nectarines and peaches. The blossoms of the peach are formed the autumn previous to their expansion, and this fact, together with the peculiarities of their form and position, requires to be borne in mind by the gardener in his pruning and training operations, as mentioned in HortrcuLrure (vol. xii. pp. 272, 273). The only point of practical interest requiring mention here is the very singular fact attested by all peach-growers, that, while certain peaches are liable to the attacks of a para- sitic fungus known as mildew, others are not, showing a difference in constitution analogous to that observed in the case of human beings, some of whom will readily succumb to particular diseases, while others seem proof against their attacks. In the case of the peach this peculiarity is in some way connected with the presence of small glandular outgrowths on the stalk, or at the base of the leaf. Some peaches have globular, others reniform glands, others none at all, and these latter trees are much more subject to mil- dew than are those provided with glands.

The history of the peach, almond, and nectarine is interesting and important as regards the question of the origin of species and the production and perpetuation of varieties. As to the origin of the peach two views are held, that of Alphonse de Candolle, who attributes all cultivated varieties to a distinct species, probably of Chinese origin, and that adopted by many naturalists, but more especially by Darwin, who looks upon the peach as a modification of the almond. The importance of the subject demands that a summary of the principal facts and inferences bearing on this ques- tion should be given. In the first place, the peach as we now know it has been nowhere recognized in the wild state. In the few instances where it is said to have been found wild the probabilities are that the tree was an escape from cultivation. Aitchison, how- ever, gathered in the Hazardarakht ravine in Afghanistan a form with different-shaped fruit from that of the almond, being larger and flatter. “The surface of the fruit,” he observes, “resembles that of the peach in texture and colour; and the nut is quite distinct fron that of 419 [the wild almond]. The whole shrub resembles more what one might consider a wild form of the peach than that of the almond.” It is admitted, however, by all competent botan- ists that the almond is wild in the hotter

and drier parts of the Mediterranean and Levantine regions. Aitchison also mentions the almond as wild in some parts of Afghanistan, where it is known to the natives as ‘‘bédam,” the same word that they apply to the cultivated almond. The branches of the tree are carried by the priests in religious ceremonies. It is not known as a wild plant in China or Japan.

As to the nectarine, of its origin as a variation from the peach there is abundant evidence, as has already been mentioned ; it is only requisite to add the very important fact that the seeds of the nectarine, even when that nectarine has been produced by bud- variation from a peach, will gencrally produce nectarines, or, as gardeners say, “come true,”

Darwin brings together the records of several cases, not only of gradations between peaches and nectarines, but also of intermediate forms between the peach and the almond. So far as we know, however, no case has yet been recorded of a peach or a nectarine producing an almond, or vice versa, although if all have had a com- mon origin such an event might be expected. Thus the botanical evidence seems to indicate that the wild almond is the source of cultivated almonds, peaches, and nectarines, and conscquently that the peach was introduced from Asia Minor or Persia, whence the name Persica given to the peach; and Aitchison’s discovery in Afghanistan of a form which reminded him of a wild peach lends additional force to this view.

On the other hand, Alphonse de Candolle, from philological and other considerations, considers the peach to be of Chinese origin.

PHA—PEA

The peach has not, it is true, been found wild in China, but it has been cultivated there from time immemorial ; it has entered into the literature and folk-lore of the people; and it is designated by 4 distinct name, “ to” or “tao,” a word found in the writings of Confucius five centuries before Christ, and even in other writings dating from the 10th century before the Christian era. Though now cultivated in India, and almost wild in some parts of the north- west, and, as we have seen, probably also in Afghanistan, it has no Sanskrit name; it is not mentioned in the Hebrew text of the Scriptures, nor in the earliest Greek times. Xenophon makes no mention of

the peach, though the Ten Thousand must have traversed the country where, according to some, the peach is native, but Theophrastus, a hundred years later, does speak of it as a Persian fruit, and De Candolle suggests that it might have been introduced into Greece by Alexander. According to his view, the seeds of the peach, cultivated for ages in China, might have been carried by the Chinese into Kashmir, Bokhara, and Persia between the period of the Sanskrit emigration and the Greco-Persian period. Once established, its cultivation would readily extend westward, or, on the other hand, by Cabul to north-western India, where its cul- tivation is not ancient. While the peach has been cultivated in China for thousands of years, the almond does not grow wild in that country, and its introduction is supposed not to go back farther than the Christian era.

On the whole, we should be inclined to attribute greater weight to the evidence from botanical sources than to that derived from philology, particularly since the discovery both of the wild almond and of a form like a wild peach in Afghanistan. It may, however, well be that both peach and almond are derived from some pre- existing and now extinct form whose descendants have spread over the whole geographic area mentioned ; but of course this is a mere speculation, though indirect evidence in its support might be ob- tained from the nectarine, of which no mention 1s made in ancient literature, and which, as we have seen, originates from the peach and reproduces itself by seed, thus offering the characteristics of a species in the act of developing itself. (M. T. M.)

PEACOCK (the first syllable from the Latin Pavo, in Anglo-Saxon Pawe, Dutch Pawuw, German Pfau, French Paon), the bird so well known from the splendid plumage of the male, and as the proverbial personification of pride. A native of the Indian peninsula and Ceylon, in some parts of which it is very abundant, its domestication dates from times so remote that nothing can be positively stated on that score. Setting aside its importation to Pales- tine by Solomon (1 Kings x. 22; 2 Chron. ix. 21), its assignment in classical mythology as the favourite bird of Hera or Juno testifies to the early acquaintance the Greeks must have had with it ; but, though it is mentioned by Aristophanes and other older writers, their knowledge of it was probably very slight until after the conquests of Alexander. Throughout all succeeding time, however, it has never very freely rendered itself to

domestication, and, retaining much of its wild character, can hardly be accounted an inhabitant of the poultry-yard, but rather an ornamental denizen of the pleasure-ground or shrubbery ; while, even in this condition, it is seldom kept in large numbers, for it has a bad reputation for doing mischief in gardens, it is not very prolific, and, though in earlier days highly esteemed for the table,! it is no longer considered the delicacy it was once thought.

As in most cases of domestic animals, pied or white varieties of the ordinary Peacock, Pavo cristatus, are not unfrequently to be seen; and, though lacking in propor- tion the gorgeous resplendence for which the common bird stands unsurpassed, they are valued as curiosities. Greater interest, however, attends what is known as the “japanned” Peacock, often erroneously named the Japanese or Japan Peacock, a form which has received the name of P. nigripennis, as though it were a distinct species. In this form the cock, besides other less conspicuous differ- ences, has all the upper wing-coverts of a deep lustrous blue instead of being mottled with brown and white, while

1 Classical authors contain many allusions to its high appreciation at the most sumptuous banquets ; and medizeval bills of fare on state occasions nearly always include it. In the days of chivalry one of the most solemn oaths was taken ‘on the Peacock”, which seems to have been served up garnished with its gaudy plumage.

with dull yellowish-brown near the base of the neck and shoulders. It “breeds true”; but occasionally a presum- ably pure stock of birds of the usual coloration throws out one or more having the “japanned” plumage, leading to the conclusion that the latter may be due to “reversion to a primordial and otherwise extinct condition of the species”, and it is to be observed that the “‘japanned” male has in the coloration of the parts mentioned no little resemblance to that of the second indubitably good species, the P. muticus (or P. spicifer of some writers) of Burma and Java, though the character of the latter’s crest—the feathers of which are barbed along their whole length instead of at the tip only—and its golden-green neck and breast furnish a ready means of distinction. The late Sir R. Heron

was confident that the “japanned” breed had arisen in England within his memory,? and Darwin (Anim. and Plants under Domestication, i. pp. 290-292) was inclined to believe it only a variety ; but its abrupt appear- ance, which rests on indisputable evidence, is most suggest- ive in the light that it may one day throw on the question

- Japanned ” or “ black-shouldered ” Peafowls.

of evolution as exhibited in the origin of ‘species ”. It should be stated that the “japanned” bird is not known

to exist anywhere as a wild race. The accompanying woodcut is copied from a plate drawn by Mr Wolf, given

in Mr Elliot’s Monograph of the Phasiamde.

The Peafowls belong to the group Galling, from the normal members of which they do not materially differ in structure ; and, though by some systematists they are raised to the rank of a Family, Pavonide, most are content to regard them as a Subfamily of Phasianide: (PHEASANT, 9.2.). Akin to the genus Pavo is Poly- plectrum, of which the males are armed with two or more spurs on each leg, and neat them is gencrally placed the genus Argusianus, containing the Argus-Pheasants, remarkable for their wonderfully ocellated plumage, and the extraordinary length of the secondary quills of their wings, as well as of the tail-feathers, It must always be remembered that the so-called ‘‘tail” of the Peacock is formed not by the rectrices or true tail-feathers, but by the singular development of the tail-coverts, a fact of which any one may be satisfied by looking at the bird when these magnificent plumes are erected and expanded in disk-like form as 1s his habit when dis- playing his beauty to his mates. _ (A. N.)

PEACOCK, Georce (1791-1858), mathematician, was

born at Thornton Hall, Denton, near Darlington, 9th April

2 This is probably not the case. The present writer has a distinct recollection of having seen a bird of this form represented in an old Dutch pieture, though when or where he cannot state.

1791. He was educated at Richmond, Yorkshire, and entered Trinity College, Cambridge, in 1809. He was second wrangler in the mathematical tripos of 1812 (Sir J. F,. W. Herschel being senior), was elected fellow of his college in 1814, and became assistant tutor and lecturer in 1815, full tutor in 1823, and sole tutor of “his side” in 1835. Peacock distinguished himself by his business capacity, and by his broad views of the duties and func- tions of the educational institution in whose management he had so large a share.

Peacock was all his life an ardent educational reformer. While still an undergraduate he formed a league with Herschel, Babbage, and Maule to conduct the famous struggle of ‘‘d-ism versus dot-age,” which ended in the introduction into Cambridge of the Continental notation (3) in the infinitesimal calculus to the exclusion of the fluxional notation (y) of Newton. This was an import- ant reform, not so much on account of the mere change of notation (for nowadays mathematicians follow Lagrange in using both these notations), but because it signified the opening to the mathematicians of Cambridge of the vast storehouse of Continental discoveries. Up to that time Cambridge mathematicians had been resting supinely under the shadow of Newton, despising the Continental methods, but doing nothing to demonstrate the power of their own. The analytical society thus formed in 1813 published vari- ous memoirs, and translated Lacroix’s Differential Calculus in 1816. Peacock powerfully aided the movement by pub- lishing in 1820 A Collection of Examples of the Application of the Differential and Integral Calculus, which remains a valuable text-book to this day. He also took a great in- terest in the general question of university education. In 1841 he published a pamphlet on the university statutes, in which he indicated the necessity for reform; and in 1850 and 1855 he was a member of the commission of inquiry relative to the university of Cambridge.

In 1837 he was appointed Lowndean professor of astronomy. In 1839 he took the degree of D.D., and the same year was appointed by Lord Melbourne to the deanery of Ely. Without in any way neglecting his university duties, Peacock threw himself with character- istic ardour into

the duties of this new position. He improved the sanitation of Ely, published in 1840 Ob- servations on Plans for Cathedral Reform, and carried out extensive works of restoration in his own cathedral. He was twice prolocutor of the lower house of convocation for the province of Canterbury.

This list by no means exhausts the sphere of Peacock's activity. He was a prime mover in the establishment of the Cambridge Astronomical Observatory, and in the founding of the Cambridge Philosophical Society. He was a fellow of the Royal, Royal Astronomical, Geological, and other scientific societies. In 1838, and again in 1843, he was one of the commissioners for standards of weights and measures ; and he also furnished valuable information to the commissioners on decimal coinage, a matter in which he took great interest. He died on the 8th November 1858, before the university commission, in whose work he took so great an interest, had finished its labours.

It will excite little surprise that a man of so many occupations should have left more mark upon the men of his own day than upon the science of the succeeding generation. Although Peacock was most distinguished and will be longest remembered as a mathe- matician, it would be diffieult to point to much work of his which is of importance at the present day. His original coutributions to mathematical seienee were concerned chiefly with the philosophy of its first principles. He did good service in systematizing the operational laws of algebra, and in throwing light upon the nature and use of imaginaries. His work in this field was, however, thrown

into the shade by the later and farther-reaching discoveries of Hamilton and Grassmann. Two great services he did for mathema-

tical edueation which deserve especial mention. He published, first in 1830, and then in an enlarged form in 1842, a Treatise on Algebra, in' which he applied his philosophical ideas concerning algebraical analysis to the elucidation of its elements. This text. book was probably too far ahead of his age, for it does not seem to have come into very general use ; at all events, it might with great advantage be studied by the teachers of

elementary mathematics at the present day, and is very much superior in method and arrange- ment to any of the English text-books at present in vogue. The second great service was the publication in the British Association Reports for 1838 of his ‘‘ Report on the Recent Progress and Present State of certain branches of Analysis.” English mathematicians of this gencration will doubtless find on reading this brilliant summary a good many dieta which they will call in question, and they will see a good deal of evidence that Peaeock did not always fully appre- ciate, or perhaps always quite understand, the work of the foremost Continental mathematicians of his time ; but they will be ready to condone these shortcomings when they remember that they were carried on the shoulders of Peacock and his ‘‘d-istic league” out of the mire into which English mathematics had fallen, and that it is but natural that they should catch a better view of the sur- rounding scenery than did their bearer. Whatever its defects may be, Peacock’s report remains a work of permanent value, one of the first and one of the best of those valuable summaries of scientific progress which have enriched the annual volumes of the British Association, and which would have justified its existence had it done nothing else for the advancement of science.

PEACOCK, Tomas Love (1785-1866), novelist and poet, was born at Weymouth, 18th October 1785. His father, a glass merchant in London, died soon after his son’s birth, and young Peacock received his education at a private school at Englefield Green, where he distinguished himself by unusual precocity. After a brief experience of business he elected to devote himself to study and the pursuit of literature, living with his mother on their private means. His first books were poetical, The Monks of St Mark (1804), Palmyra (1806), The Genius of the Thames (1810), The Philosophy of Melancholy (1812),— works of no great merit. He also made several dramatic attempts, which did not find their way to the stage. He served for a short time as secretary to Sir Home Popham at Flushing, and paid several visits to Wales. In 1812 he became acquainted with Shelley, who made him his executor together with Lord Byron. In 1815 he evinced his peculiar power by writing Headlong Hall, the proto- type of all his subsequent novels. It was published in 1816, and Melincourt followed in the ensuing year. During 1817 he lived at Great Marlow, enjoying the almost daily society of Shelley, and writing Wightmare Abbey and Lthododaphne, by far the best of his long poems. In 1819 he received the appointment of assistant

examiner at the India House, at the same time as Mill and Strachey. Peacock’s nomination appears to have been due to the influence of his old schoolfellow Peter Auber, secretary to the East India Company, and the papers he prepared as tests of his ability were returned to him with the high encomium, “ Nothing superfluous and nothing wanting.” This was characteristic of the whole of his intellectual work; and equally characteristic of the man was his marriage about this time to a Welsh lady, to whom he pro- posed by letter, not having seen her for eight years. His official duties greatly interfered with independent com- position. Maid Marian nevertheless appeared in 1822, The Misfortunes of Elphin in 1829, and Crotchet Castle in 1831; and he would probably have written more but for the death in 1833 of his mother, to whom he was deeply attached. He also contributed to the Westminster Review and the Examiner. His services to the East India Com- pany, outside the usual official routine, were considerable. He defended it successfully against the attacks of Mr J. S. Buckingham and the Liverpool salt interest, and made the subject of steam navigation to India peculiarly his own. He represented the company before the various parliamentary committees on this question; and in 1839 and 1840 superintended the construction of iron steamers,

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which not only made the voyage round the Cape success- fully, but proved very useful in the Chinese war. He also framed instructions for the Euphrates expedition, pro- nounced by General Chesney to be models of sagacity. In 1836 he succeeded Mill as chief examiner, and in 1856 he retired upon a pension. During his later years he contributed several papers to Fraser’s Magazine, including reminiscences of Shelley. He also wrote in the same magazine his last novel, Giryll Grange (1860), inferior to his earlier writings in humour and vigour, but still a surprising effort for a man of his age. He died 23d January 1866 at Lower Halliford, near Chertsey, where, so far as his London occupations would allow him, he had resided for more than forty years.

Peacock’s position in English literature is unique. There was nothing like his type of novel before his time ; though there might have been if it had occurred to Swift to invent a story as a vehicle for the dialogue of his Polite

Conversa- tion. But, while Swift's interlocutors represent ordinary types, Peacock's are highly exceptional ; while the humour of the former consists in their stereotyped conventionality or unconscious folly, the talk in Peacock's novels is brilliant ; and, while Swift's characters utter proverbs, Peacock's are equipped from the author's own stores of humorous observa- tion or reflexion. He speaks as well in his own person as through his puppets; and perhaps no writer since Pope has enriched English literature with such an abundance of quotable things. This pithy wit and sense, combined with remarkable grace and accuracy of natural description, atone for the primitive simplicity of plot and character. There ig just enough of both to keep the story going, and the author's plan required no more. Of his seven fictions, Nightmare Abbey and Crotchet Castle are perhaps on the whole the best, the former displaying the most vs comaca of situation, the latter the fullest maturity of intellectual power, and the most skilful grouping of the motley crowd of "perfectibilians, deteriorationists, statu- quo-ites, phreno- logists, transcendentalists, political economists, theorists in all sciences, projectors in all arts, morbid visionaries, romantic enthusiasts, lovers of music, lovers of the pictur- esque, and lovers of good dinners," who constitute the dramatis persone of that comedy in narrative, the Pea- cockian novel. Jfaid Marian and The Misfortunes of Elphin are hardly less entertaining, but are somewhat cramped by the absence of portraiture from the life and the necessity for historical colouring. Both contain de- seriptive passages of extraordinary beauty. Melincourt is a comparative failure, the excellent idea of an orang- outang mimicking humanity being insufficient as the sole groundwork of a novel. Headlong Hall, though more than foreshadowing the author's subsequent excellence, is marred by a certain bookish awkwardness characteristic of the recluse student, which reappears in Gryll Grange as the pedantry of an old- fashioned scholar, whose likes and dislikes have become inveterate and whose sceptical liberalism, always rather inspired by hatred of cant than enthusiasm for progress, has petrified into only too earnest conservatism. Pianos and perspective equally with com- petitive examinations and " panto-pragmatism" are the objects of the writer's distaste, and for the first time in his career we feel inclined to laugh at him, being no longer able to laugh with him. The book's quaint resolute paganism, however, is very refreshing in an age eaten up with introspection; it is the kindliest of Peacock's writings, and contains the most beautiful of his poems, " Years

Ago,” the reminiscence of an early attachment. In general the ballads and songs interspersed through his tales are models of exact and melodious diction, and instinct with true feeling. His more ambitious poems are worth little, except Rhododaphne, attractive as a story and perfect as a

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composition, but destitute of genuine poetical inspiration. His critical and miscellaneous writings are always interest- ing, especially the restorations of lost classical plays in the Hore Dramaticx, but the only one of great mark is the witty and crushing exposure in the Westminster Review of Moore's ignorance of the manners and belief he has ven- tured to portray in his Hpicurean. Peacock resented the misrepresentation of his favourite sect, the good and ill of whose tenets were fairly represented in his own person. Somewhat sluggish and self-indulgent, incapable of enthu- siasm or self-sacrifice, he yet possessed a deep undemon- strative kindliness of nature; he could not bear to see any one near him unhappy or uncomfortable; and his sym- pathy, no less than his genial humour, gained him the attachment of children, dependants, and friends. His feelings were steady rather than acute; he retained throughout life with touching fidelity the memory of an early affection. In official life he was upright and conscien- tious ; his judgment was shrewd and robust, and the quaint crotchets and prejudices which contrasted so curiously with his usual sagacity were in general the exaggeration of sound ideas held with undue exclusiveness. As a candidate for literary immortality he should be safe. The same causes which restrict his popularity ensure his perma- nence. His novels depend but slightly on temporary phases of manners, but are vitally associated with standard literature, and with general tendencies innate in the human mind. Neither his intellectual liberalism nor his constitu- tional conservatism will ever be out of date; and what Shelley justly termed "the lightness, strength, and chastity" of his diction secures him an honourable rank among those English writers whose claims to remembrance depend not only upon matter but upon style.

Peacock's works were collected, though not completely, and pub- lished in three volumes in 1875, at the expense of his friend and former protégé, Sir Henry Cole, with an excellent memoir by his grand-daughter Mrs Clarke, and a critical cssay by Lord Houghton. Other criticisms have been written, by Mr Spedding in the Edin- burgh Review and by James Hannay in the North British Review. For an interesting personal notice, see 4 Poet's Sketch Book, by R. W. Buchanan, 1884. (RaGs)

PEAR (Pyrus communis). The pear has essentially the same floral structure as the apple. In both cases the so- called fruit is composed of the flower-tube or upper end of the flower-stalk greatly dilated, and enclosing within its cellular flesh the five cartilaginous carpels which constitute the “core” and are really the true fruit. From the upper rim of the flower-tube or receptacle are given off the five sepals, the five petals, and the very numerous stamens. The form of the pear and of the apple respectively, although usually characteristic enough, is not by itself sufficient to distinguish them, for there are pears which cannot by form alone be distinguished from apples, and apples which cannot by superficial appearance be recognized from pears. The main distinction is the occurrence in the tissue of the fruit, or beneath the rind, of clusters of cells, filled with hard woody deposit in the case of the pear, constituting the “grit,” while in the apple no such formation of woody cells takes place. ‘The appearance of the tree—the bark, the foliage, the flowers—is, however, usually quite char- acteristic in the two species. Cultivated pears, whose number is enormous, are without doubt derived from one or two wild species widely distributed throughout Europe and western Asia, and sometimes forming part of the natural vegetation of the forests. — In England, where the pear is sometimes considered wild, there is always the doubt that it may not really be so, but the produce of some seed of a cultivated tree deposited by birds or other- wise, which has degenerated into the wild spine-bearing tree known as Pyrus cOmMMUNAS.

The cultivation of the pear extends to the remotest

antiquity. Traces of it have been found in the Swiss lake- dwellings ; it is mentioned in the oldest Greek writings, and was cultivated by the Romans. The word “pear” or its equivalent occurs in all the Celtic languages, while in Slavonic and other dialects different appellations, but still referring to the same thing, are found,—a diversity and multiplicity of nomenclature which leads De Candolle to infer a very ancient cultivation of the tree from the shores of the Caspian to those of the Atlantic. A certain race of pears, with white down on the under surface of their leaves, is supposed to have originated from P. nivalis, and their fruit is chiefly used in France in the

manufacture of Perry (q.v.). Other small-fruited pears, distinguished by their precocity and apple-like fruit, may be referred to P. cordata, a specics found wild in western France, and in Devonshire and Cornwall.

The late Professor Karl Koch considercd that cultivated pears were the descendants of three species—P. persica (from which the bergamots have descended), P. cleagrifolia, and P. sinensis. De- caisne, who made the subjcct one of critical study for a number of years, and not only investigated the wild forms, but carefully studied the peculiarities of the numerous varieties cultivated in the Jardin des Plantes, refers all cultivated pcars to one species, the individuals of which have in course of time diverged in various directions, so as to form now six races :—(1) the Celtic, including P. cordata ; (2) the Germanic, including P. communis, P. Achras, and P. piraster ; (8) the Hellenic, including P. parviflora, P. sinaica, and others; (4) the Pontic, including P. eleagrifolia; (5) the Indian, comprising P. Pasche ; and (6) the Mongolic, represented by P. sinensis. With reference to the Celtic race, P. cordata, it is interesting to note its connexion with Arthurian legend, and the Isle of Avalon or Isle of Apples. An island in Loch Awe has a Celtic legend containing the principal features of Arthurian story ; but in this case the word is ‘‘berries” instead of ‘‘apples.” Dr Phené visited Armorica (Brittany) with a view of investigating these matters, and brought thence fruits of a small berry-like pear, which were identified by the writer with the Pyrus cordata of western France, as well as with a tree which had then been recently discovered in some parts of Devonshire and Cornwall by Mr Briggs. (For cultivation of pears sce HorticunrurE, vol. xii. p. 274.)

PEARL. Pearls are calcareous concretions of peculiar lustre, produced by certain molluscs, and valued as objects of personal ornament. It is believed that most pearls are formed by the intrusion of some foreign substance between the mantle of the molluse and its shell, which, becoming a source of irritation, determines the deposition of nacreous matter in concentric layers until the substance is com- pletely encysted. The popular notion that the disturbing object is commonly a grain of sand seems untenable ; according to Dr Gwyn Jeffreys and some other concho- logists, it is in most cases a minute parasite; while Dr Kelaart has suggested that it may be the frustule of a diatom, or even one of the ova of the pearl-producing molluse itself. The experience of pearl-fishers shows that those shells which are

irregular in shape and stunted in growth, or which bear excrescences, or are honeycombed by boring parasites, are those most likely to yield pearls.

The substance of a pearl is essentially the same as that which lines the interior of many shells, and is known as “mother-of-pearl.” Sir D. Brewster first showed that the iridescence of this substance was an optical phenomenon due to the interference of rays of light reflected from micro- scopic corrugations of the surface—an effect which may be imitated by artificial striations on a suitable medium. When the inner laminated portion of a nacreous shell is digested in acid the calcareous layers are dissolved away, leaving a very delicate membranous pellicle, which, as shown by Dr Carpenter, may retain the iridescence as long as It 1s undisturbed, but which loses it when pressed or stretched.

Although a large number of molluscs secrete MoruEr- or-PEaRt (9.2.), only a few of them yield true pearls. The finest are obtained from the so-called “pearl oyster,” the Avicula (Meleagrina) margaritifera, Linneeus, while fresh-

water pearls are procured chiefly from the “pearl mussel,” Unio (Margaritana) margaritiferus, L.1 These river-pearls are generally of dull leaden hue, and inferior in beauty to those of marine origin.

It is obvious that if a pearl presents a perfectly spheri- cal form it must have remained loose in the substance of the muscles or other soft tissues of the mollusc. Fre- quently, however, the pearl becomes cemented to the in- terior of the shell, the point of attachment thus interfering with its symmetry. In this position it may receive suc- cessive nacreous deposits, which ultimately form a pearl of hemispherical shape, so that when cut from the shell it may be flat on one side and convex on the other, forming what jewellers know as a “‘perle bouton.” In the course of growth the pearl may become involved in the general de- posit of mother-of-pearl, and be ultimately buried in the substance of the shell. It has thus happened that fine pearls have

occasionally been unexpectedly brought to light in cutting up mother-of-pearl in the workshop.

When a pearl oyster is attacked by a boring parasite the molluse protects itself by depositing nacreous matter at the point of invasion, thus forming a hollow body of irregular shape known asa “blister pearl.” Hollow warty pearl is sometimes termed in trade “coq de perle.” Solid pearls of irregular form are often produced by deposition on rough objects, such as small fragments of wood, and these, and in fact all irregular-shaped pearls, are termed “‘perles baroques,” or “‘barrok pearls.” It appears that the Romans in the period of the Decline restricted the name unio to the globular pearl, and termed the baroque margaritum. It was fashionable in the 16th and 17th centuries to mount curiously-shaped baroques in gold and enamel so as to form ornamental objects of grotesque character. A valuable collection of such mounted pearls by Dinglinger is preserved in the Green vaults at Dresden.

A pearl of the first water should possess, in jewellers’ language, a perfect “skin” and a fine “orient”; that is to say, it must be of delicate texture, free from speck or flaw, and of clear almost translucent white colour, with a subdued iridescent sheen. It should also be perfectly spherical, or, if not, of a symmetrical pear-shape. On re- moving the outer layer of a pearl the subjacent surface is generally dull, like a dead fish-eye, but it occasionally happens that a poor pearl encloses a ‘lively kernel,” and may therefore be improved by careful peeling. The most perfect pearl in existence is said to be one, known as “La Pellegrina,” in the museum of Zosima in Moscow; it is a perfectly globular Indian pearl of singular beauty, weigh- ing 28 carats. The largest known pearl is one of irregu- lar shape in Mr Beresford Hope’s collection at the South Kensington museum. This magnificent pearl weighs 3 oz., has a circumference of 44 inches, and is surmounted by — an enamelled and jewelled gold crown, forming a pendant of great value. |

Pearl Fisheries—The ancients obtained their pearls chiefly from India and the Persian Gulf, but at the present time they are also procured from the Sulu seas, the coast of Australia, the shores of Central America, and some of the South Pacific islands. The ancient fisheries of Ceylon (Taprobane) are situated in the Gulf of Manaar, the fishing-

1 Meleagrina margaritifera, L., belongs to the family Aviculide of most zoologists, to the family Aviculacea, order Monomya, of article Moutuusca. Meleagrina is merely a sub-genus of Avicula. The animal which produces fresh-water pearls in Britain and other parts of Europe was named Unio margaritiferus by Retzius in Nova Gen. Test., and this is the name adopted by most modern zoologists ; the animal was placed in a separate genus, Margaritana, by Schumacher for insuffi- cient reasons. It belongs to the order Isomya, family Unionacew. The molluscs from which river-pearls are obtained in the United States and other parts of the world are mostly species of Unio or Anodonta. The above are all Lamellibranchs.

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banks lying from 6 to 8 miles off the western shore, a little to the south of the isle of Manaar. The Tinnevelly fishery +s on the Madras side of the strait, near Tuticorin. These Indian fishing-grounds are under the control of Govern- ment inspectors, who regulate the fisheries, and permit fishing only when they consider the banks to be in a satis- factory condition. The oysters yield the best pearls at about four years of age. Fishing, when permitted, gener- ally commences in the second week in March, and lasts for from four to six weeks, according to the season. The boats are grouped in fleets of from sixty to seventy, and start usually at midnight so as to reach the oyster-banks at sunrise. Each boat generally carries ten divers. On reaching the bank a signal-gun is fired, and diving com- mences. ‘To facilitate the descent of the diver, a stone of granite weighing about 40 Ib is attached to the cord by which he is let down. The divers work in pairs, one man diving while the other watches the signal-cord, drawing up the sink-stone first, then hauling up the baskets of oysters, and finally raising the diver himself. On an average the divers remain under water from fifty to eighty seconds, though some can endure a much longer submergence, and exceptional instances are cited of men remaining below for as long as six minutes. After resting for a minute or two at the surface, the diver descends again; and so on, until exhausted, when he comes on board and watches the rope, while his comrade relieves him as diver. Using neither diving dress nor bell, the native descends naked, carrying only a girdle for the sup- port of the basket in which he places the pearl-oysters. {n his submarine work the diver makes skilful use of his toes for prehensile purposes. To arm

himself against the attacks of the sharks and other fishes which infest the Indian waters, he carries spikes of ironwood; and the genuine Indian diver never descends without the incanta- tions of shark-charmers, one of whom accompanies the boat while others remain on shore. Not only is the diver exposed to the danger of attack by sharks, but his exciting calling, in a tropical climate, is necessarily ex- – hausting, and asa rule he is a short-lived man.

The diving continues from sunrise to about noon, when a gun is fired, and the work stopped. On the arrival of the fleet at shore, the divers carry their oysters to a shed, where they are made up into four heaps, one of which 1S taken by the diver as his remuneration. The oysters are then sold by auction in lots of 1000 each. The pearls, after removal from the dead oysters, are "classed" by passing through a number of small brass cullenders, known as "baskets," the holes in the successive vessels being smaller and smaller. Having been sized in this way, they are sorted as to colour, weighed, and valued. (For the history and production of the Ceylon fishery, see CEYLON, vol. v. p. 364.)

Since the days of the Macedonians pearl-fishing has been carried on in the Persian Gulf. It is said that the oyster-beds extend along the entire Arabian coast of the gulf, but the most important are on sandbanks off the islands of Bahrein. According to Colonel Pelly's report in 1863, there were 1500 boats belonging to Bahrein alone, and the annual profit from the pearl-fishery was about £400,000. The chief centre of the trade is the port of Lingah. Most of the products of this fishery are known as "Bombay pearls," from the fact that many of the best are sold there. The shells usually present a dark colour about the edges, like that of "smoked pearl." The yellow- tinted pearls are sent chiefly to Bombay, while the whitest go to Baghdad. Very small pearls, much below a pea size, are generally known as "seed-pearls," and these are valued in India and China as constituents of certain electu- aries, while occasionally they are calcined for chunam, or

lime, used with betel as a masticatory. There is a small pearl-fishery near Kurrachee on the coast of Bombay.

From the time of the Ptolemies pearl-fishing has been prosecuted along the coast of the Red Sea, especially in the neighbourhood of Jiddah and Koseir. This fishery is now insignificant, but the Arabs still obtain from this district a quantity of mother-of-pearl shells, which are shipped from Alexandria, and come into the market as “ Kgyptians.”

Very fine pearls are obtained from the Sulu Archipelago, on the north-east of Borneo. The mother-of-pearl shells from the Sulu seas are characterized by a yellow colour on the border and back, which unfits them for many orna- mental purposes. Pearl-oysters are also abundant in the seas around the Aru Islands to the south-west of New Guinea. From Labuan a good many pearl-shells are occasionally sent to Singapore. They are also obtained from the neighbourhood of Timor, and from New Caledonia. The pearl-oyster occurs throughout the Pacific, mostly in the clear water of the lagoons within the atolls, though fine shells are also found in deep water outside the coral reefs. The Polynesian divers do not employ sink-stones, and the women are said to be more skilful than the men. They anoint their bodies with oil before diving. Fine pearl-shells are obtained from Navigators’ Islands, the Society Islands, the Low Archipelago or Paumota Isles, and the Gambier Islands. Many of the Gambier pearls present a bronzy tint.

Pearl-fishing is actively prosecuted along the western coast of Central America, especiallyin the Gulf of California, and to a less extent around the Pearl Islands in the Bay of Panama. These pearls are obtained from the Meleagrina californica, Cpr., and the mother-of-pearl shell is known in commerce as “Panama” or “bullock” shell, The fishing-grounds are in water about 40 feet deep, and the season lasts for four months, An ordinary fishing-party expects to obtain about three tons of shells per day, and it is estimated that one shell in a thousand contains a pearl. The pearls are shipped in barrels from San Francisco and Panama, Some pearls of rare beauty have been obtained fron the Bay of Mulege, near Los Coyetes, in the Gulf of California ; and in 1882 a pearl of 75 carats, the largest on record from this district, was found near La Paz in California. The coast of Guayaquil also yields pearls. Columbus found that pearl-fishing was carried on in his time in the Gulf of Mexico, and pearls are still obtained from the Caribbean Sea. These are produced chiefly by Meleagrina squamulosa,

Lam. ; and the mother-of-pearl shells are known as “ blue-edged” or “ black-lipped,” these being less valuable than the “ silver-lipped” shells of India. In the West Indies the best pearls are obtained from St Thomas and from the island of Margarita, off the coast of Venezuela. From Margarita Philip II. of Spain is said to have obtained in 1579 a famous pearl of 250 carats.

Of late years pearl-fishing has been started with con- siderable success in the Australian seas. Good pearls are found in Shark’s Bay, on the coast of West Australia, especially in an inlet termed Useless Harbour. Mother- of-pearl shells are also fished at many other points along the western coast, between the 15th and 25th parallels of south latitude. An important pearl-fishery is also estab- lished in Torres Strait and on the coast of Queensland. The shells occur in water from four to six fathoms deep, and the divers are generally Malays and Papuans, though sometimes native Australians. On the western coast of Australia the pearl-shells are obtained by dredging rather than by diving. Quite recently (1884) pearl-shells have been found at Port Darwin. Pearls have also been found in Oakley Creek, New Zealand.

River-pearls are produeed by the fresh-water mussels inhabiting

the mountain-strcams of temperate climates in the northern hemi- sphere,—especially in Scotland, Wales, Ireland, Saxony, Bohemia, Bayaria, Lapland, and Canada. The pearls of Britain are men- tioned by Tacitus and by Pliny, and a breastplate studded with British pearls was dedicated by Julius Cesar to Venus Genetrix. As early as 1355 Scotch pearls are referred to in a statute of the goldsmiths of Paris; and in the reign of Charles II. the Scotch pearl trade was sufficiently important to attract the attention of parliament. Writing in 1705, John Spruel says, “I have dealt in pearls these forty years and more, and yet to this day I could never sell a necklace of fine Scots pearl in Scotland, nor yet fine pendauts, the generality seeking for Oriental pearls, because farther fetched. At this very day J can show some of our own Scots pear! as finc, more hard and transparent, than any Oriental” (dn Account Current betwixt Scotland and England, Edinburgh, 1705). The Scotch pearl-fishery, after having declined for years, was revived in 1860 by a German named Moritz Unger, who visited Scotland and bought up all

the pearls he could find in the hands of the peasantry, thus leading to an eager search for more pearls the following season. It is estimated that in 1865 the produce of the season's fishing in the Scotch rivers was worth at least £12,000. This yield, however, was not maintained ; the rivers were over- fished, and the industry was discouraged inasmuch as it tended to iiterfere with the salmon-fishery, and in some cases injured the banks of the streams. At the present time only a few pearls are obtained at irregular intervals by an occasional fisherman.

The principal rivers in Scotland which have yielded pearls are the Spey, the Tay, and the South Esk; and toa less extent the Doon, the Dec, the Don, the Ythan, the Teith, the Forth, and many other streams. In North Wales the Conway was at one time cele- brated for its pearls; and it is related that Sir Richard Wynn, chamberlain to the queen of Charles II., presented her.with a Con- way pearl which is believed to occupy a place in the British crown. In Ireland the rivers of Donegal, Tyrone, and Wexford have yielded pearls. It is said that Sir John Hawkins the circumnavigator had a patent for pearl-fishing in the Irt in Cumberland, Although the pearl-fisheries of Britain are now neglected, it is otherwise with those of Germany. The most important of these are in the forest- streams of Bavaria, between Ratisbon and Passau. The Saxon fisheries are chiefly confined to the basin of the White Elster, and those of Bohemia to the Horazdiowitz district of Wotawa. For more than two centuries the Saxon fisheries have been carefully re- gulated by inspectors, who examine the streams every spring, and determine where fishing is to be permitted. After a tract has been fished over, it is left to rest for ten or fifteen years. The fisher folk open the valves of the mussels with an iron instrument, and if they find no pearl restore the mussel to the water.

River-pearls are found in many parts of the United States, and have been systematically worked in the Little Miami river, Warren county, Ohio. The season extends from June to October. Japan produces freshwater pearls, found especially in the Anodonta japonica, But itis in China that the culture of the pearl-mussel is carried to the greatest perfection. The Chinese also obtain marine pearls, and use a large quantity of mother-of-pearl for decorative purposes. More than twenty-two centuries before our era pearls are enumerated as a tribute or tax in China; and they are mentioned as products of the western part of the empire in the Lh'ya, a dictionary

compiled earlier than 1000 B.c. A process for promoting the artificial formation of pearls in the Chinese river- mussels was discovered by Ye-jin-yang, a native of Hoochow, in the 13th century; and this process is still extensively carried on near the city of Teh-tsing, where it forms the staple industry of several villages, and is said to give employment to about 5000 people. Large numbers of the mussels are collected in May and June, and the valves of each are gently opened with a spatula to allow of the introduction of various foreign bodies, which are in- serted by means of a forked bamboo stick. These ‘‘matrices” are generally pellets of prepared mud, but may be small bosses of bone, brass, or wood. After a number of these objects have been placed in convenient positions on one valve, the unfortunate mollusc is turned over and the operation is repeated on the other valve. The mussels are then placed in shallow ponds connected with the canals, and arc nonrished by tubs of night-soil being thrown in from time to time. After several months, in some cases two or three years, the mussels are removed, and the pearls which have formed over the matrices are cut from the shells, while the molluscs themselves serve as food. The matrix is generally extracted from the pearl and the cavity filled with white wax, the aperture being neatly sealed up so as to render the appearance of the pearl as perfect as possible. Millions of such pearls are annually sold at Soo-chow. ae most curious of these Chinese pearls are those which present the form of small seated images of Buddha. The figures are cast im very thin lead, or stamped in tin, and are inserted as previ- ously described. As many as twenty may sometimes be seen, ranged in _parallel rows, in the valves of a single individual. Covered with nacreous matter, closely adherent to the shell, they have all the appearance of natural objects, aud, exciting the wonder

of the ignorant, are prized as amulets. Specimens of these Buddha pearls in the British Museum are referred to the species Dipsas plicata, It should be mentioned that Linneus, probably ignorant of what had long been practised in China, demonstrated the pos: sibility of producing artificial pearls in the freshwater mussels of Sweden.

Pink pearls are occasionally found in the great conch or fountain shell of the West Indies, Strombus gigas, L. ; but these, thongh much prized, are not nacreous, and their tint is apt to fade. They are also produced by the chank shell, Turbinella scolymus, L. Yellowish-brown pearls, of little or no value, are yielded by the Pinna squamosa, and bad-colourcd concretions are formed by the Placuna placcnta.* Black pearls, which are very highly valued, are obtained chiefly from the pearl-oystcr of the Gulf of Mexico.

Artificial pearls were first made in western Europe in 1680 by Jacquin, a rosary-maker in Paris, and the trade is now largely carried on in France, Germany, and Italy. Spheres of thin glass are filled with a preparation known as ‘‘essence d’oricnt,” made from the silvery scales of the bleak or ‘‘ablette,” which is caused to adhere to the inner wall of the globe, and the cavity is then filled with white wax. The scales are in some cases incorporated with celluloid. Many imitation pearls arc now formed of an opaline glass of nacre- ous lustre, and the soft appearance of the pearl obtained by the judicious use of hydrofluoric acid. An excellent substitute for black pearl is found in the so-called ‘‘ironstone jewellery,” and consists of close-grained hematite, not too highly polished ; but the great density of the hematite immediately destroys the illusion. Pink pearls are imitated by turning small spheres out of the rosy part of the conch shell, or even out of pink coral.

See W. H. Dall, ‘‘ Pearls and Pearl Fisheries,” in American Naturalist, xvii., 1883, p. 549 ; P. L. Simmonds, The Commercial Products of the Sea (London, 1879); Clements R, Markham, ‘‘ The Tinnevelly Pearl Fishery,” in Journ. Soc. Arts, xv., 1867, p. 256; D. T. Macgowan, ‘‘ Pearls and Pearl-making in China,” ibid. ii., 1854, p. 72; I’. Hague, “On the Natural and Artificial Production of Pearls in China,” in Journ. R. Astatic Soc., xvi., 1856; H. J. Le Beck, ‘‘ Pearl Fishery in the Gulf of Manar,” in Asiatic Researches, v., 1798, p. 393; T. Von Hessling, Die Perlmuschel und thre Perlen (Leipsic, 1859); K. Mébius, Die echten Perlen (Hamburg, 1857). (EF R.

PEARSON, Joun (1612-1686), a learned English bishop, was born at Great Snoring in the county of Norfolk, on the 28th of February 1612. After attending Eton, he entered Queens’ College, Cambridge, 10th June 1631,

and was elected a scholar of King's in April following and a fellow in 1634. Entering holy orders in 1639, he was collated to the prebend of Nether-Avon, in the church of Sarum. In 1640 he was appointed chaplain to the lord-keeper Finch, by whom he was presented to the living of Thorington in Suffolk during the same year. In 1650 he was made preacher of St Clement's, Eastcheap, in London. Seven years later he and Peter Gunning had a dispute with two Roman Catholics upon the subject of schism, a one-sided account of which was printed at Paris by one of the Roman Catholic disputants, under the title Schism Unmasked, 1658. In 1659 Pearson published at London his celebrated Exposition of the Creed, dedicated to his parishioners of St Clement's, Eastcheap, to whom the substance of that now standard work had been preached several years before, and by whom he had been desired to make it public. The same year he likewise published the Golden Remains of the ever-memorable Mr John Hales of Eton, to which he prefixed a preface con- taining a character of that eminent man, with whom he had been acquainted for many years, drawn up with great elegance and force. Pearson had also a principal share in the editing of the Critici Sacri, first published in 1660. Soon after the Restoration he was presented by Juxon, then bishop of London, to the rectory of St Christopher's in that city; and he was also in 1660 created doctor of divinity at Cambridge, in pursuance of the king's letters mandatory, installed prebendary of Ely, archdeacon of Surrey, and made master of Jesus College, Cambridge. In 1661 he was appointed Lady Margaret professor of divinity

1 Strombus gigas, 1., is a Gastropod belonging to the family Strom- bide, of the order Azygobranchia. Turbinella scolymus, Lam., is a Gastropod belonging to the family Muricida, of the same order.

2 Placuna placenta, L., belongs to the family Ostreid# of the manuals (family Ostracea of article Mouiusca); it is found on the shores of North Australia. Pinna sqguamosa, Gmelin, belongs to the

Mytilide (the Mytilacewx of article Motnusca); it occurs in the Medi- terranean, Both are Lamellibranchs.

in that university; and on the first day of the ensuing year he was nominated one of the commissioners for the review of the liturgy in the conference held at the Savoy. On the 14th of April 1662 he was elected master of Trinity College, Cambridge, and in August resigned his rectory of St Christopher's and his prebend of Ely. In 1667 he was admitted a Fellow of the Royal Society. In 1672 he published at Cambridge Vindicrw Hpistolarum S. Ignatia, in 4to, in answer to Daillé, to which is subjoined Lsaace Vossii Epistolx dux adversus Davidem Blondellum. . Upon the death of Dr. Wilkins in 1672, Pearson was appointed his successor in the see of Chester. In 1682 his Annales Cyprianici were published at Oxford, with Fell's edition of that father's works. Pearson was disabled from all public service by ill health a considerable time before his death at Chester on the 16th of July 1686. His last work, the Two Dissertations on the Succession and Times of the First Bishops of Rome, formed the principal part of his Opera Posthuma, edited by Henry Dodwell in 1688.

See the memoir in Biographia Britannica, and another by Edward Churton prefixed to the edition of Pearson's Minor Theological Works, 2 vols., Oxford, 1844.

PEAT. See Fust, vol. ix. p. 808.

PECCARY. Under this name are included two species of small pig-like animals forming the genus Dicotyles of Cuvier, belonging to the section Swina of the Artiodactyle Ungulates (see Mammatta, vol. xv. p. 430). They are peculiar to the New World, and in it are the only surviv- ing members of the large group now represented in the Old World by the various species of swine, babirussas, wart-hogs, and hippopotami.

The teeth of the peccaries differ from those of the true pigs (genus Sus) numerically, in wanting the upper outer incisor and the anterior premolar on each side of each jaw, the dental formula being 7 2, ¢ 4, p 3, m 3, total 38. The upper canines have their points directed downwards, not outwards or upwards as in the boars, and they are very sharp, with cutting hinder edges, and completely covered with enamel until worn. The lower canines are large and directed upwards and outwards, and slightly curved backwards. The premolar and molar teeth form a continuous series, gradually increasing in size from the first to the last. The true molars have square

quadricus- pidate crowns. The stomach is much more complex than in the true pigs, almost approaching that of a ruminant. In the feet the two middle (third and fourth) metapodial bones, which are completely separate in the pigs, are united at their upper ends, as in the ruminants. On the fore foot the two (second and fifth) outer toes are equally de- ~~veloped as in pigs, but on the hind foot, although the inner (or second) is present, the outer or fifth toe is entirely wanting, giving an unsymmetrical appearance of the mem~~ ber, very unusual in Artiodactyles, As in all other exist- ing Ungulates, there is no trace of a first digit (pollex or hallux) on either foot. As in the pigs, the snout is trun- cated, and the nostrils are situated in its flat, expanded, disk-like termination. The ears are rather small, ovate, and erect ; and there is no external appearance of a tail. The surface is well covered with thick bristly hair, and rather behind the middle of the back is a large and pecu- liar gland, which secretes an oleaginous substance with a powerful musky odour. This was mistaken by the old travellers for a second navel, a popular error which sug- gested to Cuvier the name of Dicotyles. When the animal is killed for food, it is necessary speedily to remove this gland, otherwise it will taint the whole flesh so as to render it uneatable.

There are two species, so nearly allied that they will breed together freely in captivity. Unlike the true pigs, they hever appear to produce more than two young ones at abirth.

The collared peccary (D. tajacu, Linn., torquatus, Cuvier) ranges from the Red river of Arkansas through the forest

Peccary.

districts of Central and South America as far as the Rio Negro of Patagonia. Generally it is found singly or in pairs, or at most in small herds of from eight to ten, and is a comparatively harmless creature, not being inclined to attack other animals or human beings. Its colour is dark grey, with a white or whitish band passing across the chest from shoulder to shoulder. The length of the head and body is about 36 inches. The white-lipped peccary or warree (D. labiatus, Cuvier) is rather larger, being about 40 inches in length, of a blackish colour, with the lips and lower jaw white. Its range is less extensive; it is not found farther north than British Honduras or south of Paraguay. It is generally met with in large droves of from fifty to a hundred

or more individuals, and is of a more pugnacious disposition than the former species, and capable of inflicting severe wounds with its sharp tusks. A hunter who encounters a herd of them in a forest has often to climb a tree as his only chance of safety. Both species are omnivorous, living on roots, fallen fruits, worms, and carrion; and when they approach the neighbourhood of villages and cultivated lands they often inflict great devastation upon the crops of the inhabitants.

Fossil remains of extinct species of peccaries of the Pleistocene period have been found in the caves of Brazil, and also as far north as Virginia and South Carolina. They have also been traced backwards in time, with apparently little modification of structure, to the Upper Miocene formations of Oregon.

PECS. See FUNFEIRCHEN, vol. ix. p. 827.

PEDOMETER is an apparatus in the form of a watch, which, carried on the person of a traveller, indicates the number of paces made, and thereby approximately the distance travelled. The ordinary form has a dial-plate with chapters for yards and miles respectively, but in some, miles and their fractions only are indicated, while others are divided for kilometres, &c. The registration 1s effected by the fall of a heavy pendulum, caused by the percussion of each step. The pendulum is forced back to a horizontal position by a delicate spring, and with each stroke a fine-toothed ratchet-wheel attached to it is moved round a certain length. The ratchet communicates with a train of wheels which govern the dial-hands. In using the apparatus a measured mile or other known distance 1s walked, and the indication thereby made on the dial-plate observed. According as it is too great or too small, the stroke of the pendulum is shortened or lengthened by a screw which correspondingly affects the ratchet motion,

and thereby regulates the indication to the average pace. Obviously the pedometer is little better than an ingenious toy, depending even for rough

measurements on the uni- formity of pace maintained throughout the journey measured.

PEDRO (Peter), the name borne by several sovereigns of Aragon, Castile, and Portugal. Three of them were contemporaries, and, to add to the confusion to which this has given rise, each of them was the son and successor of an Alphonso.

Aragon.—Prpro IV. (1317-1887), surnamed “the Ceremonious,” succeeded his father Alfonso IV. in 1336, placing the crown upon his own head at Saragossa to make it quite plain that he did not hold of the pope. In 1344 he deposed his brother-in-law Jayme from the throne of Majorca, and again made the Balearic Isles, Cerdagne, and Roussillon directly subject to the crown of Aragon. In 1346 jealousy of his brother Jayme led him to alter the succession in favour of his daughters, but two powerful unions or leagues in Aragon and Valencia compelled him in the following year anew to recognize the legitimate heir-presumptive. The victory of Epila, however, in 1348 enabled him to triumph over his factious nobles and to cancel the privileges they had extorted from him. In 1351 Pedro, desiring to strengthen his precarious hold upon the island of Sardinia, entered into an alliance with Venice, and began hostilities against Genoa, which, carried on at inter- vals for many years, were definitively terminated only by his successor. In 1356 a breach of neutrality by some Catalan ships at San Lucar led to a war with the king of Castile, which was carried on with occasional suspensions until 1375, when the infanta Leonora of Aragon was married to Don Juan (afterwards John I.) of Castile. In 1377 Pedro succeeded in reconquering Sicily after the death of Frederick ITI., but, to avoid the threatened inter- dict of Urban VI, he ceded the island to Martin, his grandson, retaining the suzerainty only. In 1382 he sent troops to Greece to seizc, on his behalf, the duchy of Athens. Pedro died at Barcelona on 5th January 1387, and was succeeded by his son John I. He left a curious history of his reign, written in Catalan, which has been printed by Carbonell in his Chroniques de Espanya (1547).

Three other kings of Aragon bore this name. Prpxo I. suc- ceeded his father Sancho Ramirez on the throne of Aragon and Navarre in 1094, and died in 1104. The leading event of his reign was the conquest of Huesca (1096).

Prpro II. (1174-1213) succeeded his father Alphonso II. in 1196. In November 1204 he was crowned in St Peter's, Rome, by Innocent III., in return for which honour he declared his kingdom feudatory of the Roman sec and promised an annual tribute, not, however, without a strong protest on the part of his subjects, whose hostile demonstrations in the following year he had difficulty in repressing. In 1209 he purchased peace with Sancho VII. of Navarre, and in 1212 he, along with that sovereign, gave valuable help to Alphonso of Castile in securing the splendid victory over the Arabs at Navas de Tolosa. In the following year, having taken up arms on behalf of his brother- in-law, Count Raymond of Toulouse, he was slain in the disastrous battle of Muret (12th September 1213). He was succeeded by his only son, Jayme I., "el Conquistador." Prpro III. (1236-1285), son of Jayme I. and grandson of Pedro IT., succeeded to the crowns of Aragon, Catalonia, and Valencia in 1276. married Constance, daughter of Manfred, king of the Sicilies, and on the strength of this alliance he took advantage of the Sicilian Vespers to lay claim to the kingdom of Sicily. This involved him in a ruinous war, in the course of which his dissatisfied subjects united to assert their ancient "fueros" or privileges, exacting from him at Saragossa in 1283 the Privilegio General", which in spirit and import may be compared to the English Great Charter. Charles of Valois, invested by the pope with the crown of Aragon, sought to invade the kingdom, but was repulsed both by land and sea.

Charles's death in 1285, which terminated the war, was followed by that of Pedro in the saine year,

Castile and Leon.—Pepro I. (1333-1369), commonly surnamed "the Cruel," but sometimes referred to as "the Justiciary," was the only legitimate son of Alphonso XI., and was born at Burgos on 30th August 1333. When

In 1262 he had

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raised to the throne at Seville by his father's premature death before Gibraltar (29th March 1350), Pedro was a mere lad, with exceptionally small experience of courts and camps, having lived in comparative retirement along with his mother, Dofia Maria of Portugal, in the Andalu-

cian capital, while his illegitimate brothers, the children of Leonora de Guzman, the eldest of whom were Don Enrique (Henry), count of Trastamara, and Don Fadrique (Frederick), grandmaster of Santiago, had remained beside Alphonso, and had accompanied him on his warlike expeditions. At the beginning of his reign he was thus, almost of necessity, compelled to abandon the conduct of affairs to more experienced hands; by the skilful policy, accord- ingly, of the powerful and ambitious Juan Alonso de Alburquerque, who had been his father's chancellor and prime minister, his many enemies and rivals were, for a time at least, successfully kept at bay. The king, how- ever, soon began to assert his independence ; whereupon the minister, remembering how helpful a royal mistress had been for the furtherance of his own ends during the preceding reign, did not scruple to encourage Pedro's passion for the young, well-born, and beautiful Maria de Padilla, even after his marriage with Blanche de Bourbon had been arranged. His experiment proved a disastrous one, and not least so to himself. The influence of Maria and of her relations, which rapidly became great, was soon turned against the too politic Alburquerque ; and, as a first step towards his dismissal from power, they succeeded in making him seem less indispensable by effecting a superficial reconciliation between the king and his brothers, Then, on the minister's remonstrating against the conduct of Pedro in deserting Blanche for his mistress almost immediately after his marriage at Valladolid in June 1354, a complete change of administration took place, and Alburquerque retired to his estates. Shortly afterwards he was joined by the king's brothers Enrique and Fadrique in raising the standard of revolt in Castile ; in this formidable movement they were speedily joined by Pedro's cousins, the infantes of Aragon, as well as by increasing numbers of the ricos hombres and caballeros of the kingdom, and by several of the towns, their grievances being his repudiation of Blanche, his deposition of Alburquerque, and the murder of Juan Nufiez de Prado, the master of Calatrava, for which he was believed to be responsible. The cortes of Toro accordingly asked him to take back his queen and dismiss the Padillas; and so general was the national feeling in this matter that even his own mother deserted his cause, and on his giving evasive replies he found himself before the end of the year practically stripped of all his real authority, surrounded by officials of his enemies' choosing, and virtually a prisoner in their hands. He succeeded, however, in making his escape from Toro to Segovia with a

handful of followers in the following year, and the divergence of interest that soon arose to separate the Aragonese princes from the bas- tard sons of Alphonso XI. so wrought in his favour that he was soon able (1356) to recover all the authority he had ever had, and to secure at least a transitory peace by the policy of reckless assassination which years previously he had inaugurated while Alburquerque was still his minister, and which he brought to a climax in the cold-blooded murder of his brother Don Fadrique at Seville in 1358, the tragedy to which he is said to have been specially indebted for his unenviable surname. In 1356 he already found himself strong enough to enter upon a war with his namesake Pedro IV. of Aragon, and, with inconsiderable intervals of truce brought about through the intervention of the papal legate, he continued to carry it on for several years. In 1365 he was still campaigning beyond the borders of his kingdom when Castile was invaded by the “free companies” of French and English troops under Du Guesclin and

Calverley on behalf of Don Enrique, whose cause had now been espoused by France. He returned only to find him- self practically unthroned, and towards the close of 1366 he sailed from Corufia for Guienne almost unaccompanied, save by his three daughters, but taking with him a con- siderable quantity of money and jewels. He was befriended in his exile by the Black Prince, and by liberal promises obtained his alliance and assurances of material help; the English troops accordingly crossed the Pyrenees in the following spring, and, by the bloody victory of Najera or Navarrete near Logrofio (13th April 1367), once more restored him to his kingdom. Pedro, however, was unwilling or unable to implement the bargain he had made, and by his arrogant demeanour soon alienated his chivalrous ally; before the close of the year Don Enrique had again begun to collect his forces, while the Black Prince, injured and indignant, turned his face home- wards. A final battle between Pedro and his brother took place at Montiel (13th March 1369), with the result that the former was driven for shelter into the fortress. Ten days afterwards he was induced to visit the camp of Enrique by illusory hopes of a favourable treaty through Du Guesclin ; the brothers, who had not seen each other for fifteen years, met for the last time; angry words passed between them, soon they came to

blows, and in the desperate struggle that ensued Don Pedro met his death. Pedro was in no way remarkable either as a soldier or as a ruler of men, and his character, so odious in the one feature expressed by his only too well deserved surname, presents singularly few redeeming traits ; it is not even picturesque. The best that can be alleged by way of apology for him and excuse for his barren reign is the untowardness of the circumstances of his birth, education, and accession. ‘To a narrow and uncultivated mind like his “the tyrant’s plea” could hardly ever have appealed with greater plausibility. It is significant, however, that in Spain itself there are two nearly opposite points of view from which Pedro appears not as “el Cruel” but as “e] Justiciero.” On the one hand, the common people of Andalucia among whom he lived, the Jews whose com- merce he encouraged, the Moors whom his very want of religion enabled him to tolerate, have helped to keep alive the tradition of the substantial if occasionally capricious and whimsical justice he often delighted personally to administer. ‘The other point of view is that of such mon- archs as Isabella “la Catolica” and Philip II., who could not but be grateful to him for all he had done to weaken the power of the nobles of Castile.

The chief source for the incidents of the reign of Don Pedro is the Chronicles of Castile, by Pero Lopez de Ayala, of which there are two redactions known as the Vulgar and the Abreviada. These form the basis of Prosper Mérimée’s Histoire de Don Pedre, Premier Roi de Castille (1848; 2d ed. 1865; Eng. trans., anon., 1849).

Portugal.—Pxpro I. (1320-1367) was the son of Al- phonso IV. and Beatrice of Castile, and in 1339 married Constance, daughter of the duke of Peijiafiel and marquis of Villena. The story of his passion for Inez de Castro, of his supposed marriage with her, of her cruel murder in 1355, and of the exhumation and coronation of her dead body has been told elsewhere (see vol. v. Pp. 202). He succeeded to the throne in 1357 and died in 1367, after a peaceful and comparatively uneventful reign of ten years.

For other sovereigns bearing this name see BRAZIL and PORTUGAL.

PEEBLES, a midland county of Scotland, is bounded N. and N.E. by Midlothian, E. and S.E. by Selkirk, S. by Dumfries, and W. by Lanark. Its outline is somewhat irregular, the greatest length from north to south being

about 30 miles, the greatest breadth about 20, and the smallest about 10. The area is 226,899 acres, or about 355 square miles.

From the fact that the county lies within the upper valley of the Tweed, it is sometimes known as Tweeddale. The surface consists of a succession of hills broken by the vale of the Tweed, which in some parts attains considerable breadth, and by the narrow valleys forming the courses of numerous “waters” and smaller streams. The lowest point above sea-level is about 450 feet, but the hills generally vary in height from 900 to 1500 feet, while several attain an altitude considerably over 2000 feet. The highest summits are Broad Law (2754 feet), Cramalt Craig (2723 feet), and Dollar Law (2680 feet). The hills for the most part are rounded in form. The scenery is thus generally devoid of very striking or picturesque features, and its quiet pastoral character has a pleasing effect, while the exuberant plantations which clothe the sides and summits of the hills in the neighbourhood of the Tweed, with the well-cultivated fields adjoining its banks, lend to this district an aspect of rich luxuriance.

The Tweed has its source in a small fountain named Tweed’s Well at the base of a hill on the south-western border called Tweed’s Cross, from the farther side of which flow the Annan and the Clyde. It rises about 1300 feet above sea-level, and, with waters of sparkling clearness and purity, justly entitling it to the name of the “silver Tweed,” flows with rapid course north-eastwards to the town of Peebles, receiving continual accessions from mountain streamlets, the principal being the Biggar Water from the west at Drumelzier, the Lyne from the north-west at Lyne, the Manor Water from the south near Edderston, and the Eddlestone Water from the north at Peebles. After passing Peebles the river bends in a more easterly direction, receiving, before it leaves the county, the Quair Water from the south and the Leithen from the north. The Megget Water flows eastwards into St Mary’s Loch, which forms, for a very short distance, the south-eastern boundary of the county with Selkirkshire. The Medwin Water separates a portion of the south-western boundary of Linton parish from Lanarkshire. Peebles is, perhaps, more resorted to by anglers than any other county in Scotland, and it would be difficult to find anywhere else in the kingdom,

within an equal area, so many streams and rivers affording such good sport and so unhampered by restrictions. Apart from St Mary's Loch, on the borders of the county, there are no sheets of water of much extent.

Geology.—Peeblesshire is included in the Silurian table- land of southern Scotland, and consists chiefly of Upper Silurian rocks, having generally a north-western dip. The strata have been thrown into great flexures by volcanic action, and are frequently mingled with igneous rocks, such as trap, felspar, and porphyry. In the valley of the Tweed, where there is a great anticlinal flexure, slates with thin beds of anthracite are found, and also limestone. In a slate-quarry near Traquair graptolites, trilobites, and shells are met with, but nowhere else in the county have fossils been discovered. There are evidences of glacial action in the rounded forms of the hills, the frequent groovings along their flanks, and the large number of striated boulders. In the northern part of the county, in the parishes of Linton and Newlands, the Silurian rocks dip beneath the Carboniferous strata of the West of Scot- land coal-field. In Peeblesshire the strata consist of sandstone and coal-beds. Ironstone is also found, and lead- ore occurs in thin beds near the Leithen. Limestone and marl are abundant, and at Stobo there is a quarry of excellent blue slate.

Climate, Sotl, and Agriculture—In the uplands the climate, though colder than that of the Lothians, is gener- ally pure and dry, and remarkably healthy. 'The average rainfall is about 29 inches, On the summits and slopes of

the hills frequent showers occur when it is quite fair in the valleys. The reflexion of the "slanters" on the hillsides sometimes greatly increases the heat in the valleys and assists the early ripening of the crops. The character of the soil varies considerably, moss, gravel, and clay being all represented. The flat lands consist generally of rich loam, composed of sand and clay.

As may be supposed from its hilly character, the county is pastoral rather than agricultural. The old system of small farms is nearly completely broken up, the average size of the holdings being now about 200 acres of arable land, with pasturage for 600 to 800 sheep attached. According to the

agricultural returns of 18838, of the total area only 42,433 acres, or a little less than a fifth, were under cultivation, corn crops occupying 9832 acres, green crops 5716, rotation grasses 12,078, and permanent pasture 14,763. There were 10,177 acres under woods, 11 acres of market-gardens, and 6 of nursery-grounds. The most common rotation of crops is a six-course shift of (1) turnips, (2) barley or oats, (3), (4), and (5) grass or pasture, and (6) oats. The principal crops are oats, which in 1883 occupied 8797 acres, or about nine-tenths of the total area under corn crops, and turnips, for which the soil is specially well adapted, and which occupied 4679 acres, or about four-fifths of the total arca under green crops. Horses in 1883 numbered 1142, cattle 5664, and sheep 192,122. The horscs are frequently Clydes- dales, and many are bred in the county. The most cominon breed of cattle in the county is a cross between Ayrshire and shorthorns, the cows being principally Ayrshire. Yorkshire calves and stirks are occasionally bought for feeding. The pasture, on account of the hilly character of the land, is better adapted for shcep than for cattle. On the green grassy pasture Cheviots and half-breds are the sheep most commonly preferred, and the heathery ranges are stocked with blackfaced. Crosses of blackfaced, Cheviot, and half-bred ewes with Leicestershire rams are common.

According to the latest return, the land was divided among 708 proprietors, possessing 232,410 acres, with an annual valuation of £142,614, the annual average value per acre being about 12s, 3d. Of the owners, 532, or about 75 per cent., possessed less than one acre each. The following possessed over 5000 acres each :—earl of Wemyss and March, 41,247; Sir G. G. Montgomerie, 18,172; Sir J. Murray Nasmyth, 15,485; John Miller, 18,000; James Tweedie, 11,151; trustces of the late earl of Traquair, 10,778 ; Colonel James M‘Kenzie, 9403 ; Sir Robert Hay, 9155 ; Sir W. H. G. Carmichael, 8756; John White, 6366; George Graham Bell, 6600; James Wolfe Murray, 5108.

Manufacturcs.—Although the county has the advantage of con- venient railway communication both by the North British and Caledonian systems, and possesses also abundant water – power, the only textile industries are the weaving of tweeds and shawls at Peebles and Innerleithen. The other manufactures are con- nected with the immediate wants of an agricultural population.

Administration and Population.—The county includes sixteen parishes, and one royal burgh, the county town. Along with the neighbouring county of Selkirk it forms a parliamentary county, which returns onc member to parliament. Within the last fifty years the population of Peebles has increased about onc-third, and, while in the first decade, between 1831 and 1841, there was a decrease from 10,578 to 10,499, the rate of increase has since then augmented in every succceding decade. In 1861 the population amounted to 11,408, in 1871 to 12,330, and in 1881 to 13,822, of whom 6626 were males and 7196 females. In 1831 females werc ina minority, being only 5236 to 5342 males. The county includes two towns, Peebles (3495) and Imnerleithen (2313), and two villages, Walkerburn (1026) and West Linton (434). The town population in 1881 numbered 5808, the village 1460, and the rural 6554,

History and Antiquities.—There are a great number of British remains, including five circular British camps and numerous sepulchral tombs, where many cists and stone coffins have been dis- covered, somctimes containing armille of gold, and stone axes and hammers. The standing-stones of Tweedsmuir and the remarkable earthen terraces on the hillsides, especially at Purvis Hill near Innerleithen and at Romanno, also deserve notice. The only im- portant Roman remains are traces of a camp on the Lyne, which some suppose to be the Coria of Ptolemy. The district was included in the old kingdom of Northumbria, and passed to the kingdom of Scotland in the 11th century. By David I. it was made a deanery in the archdcaconry of Peebles, and it was subsequently included in the diocese of Glasgow. About the middle of the 12th century it was placed under the jurisdiction of two sheriffs, one of whom was settled at Traquair and the other at Pecbles. There are a considcrable number of old castles, some of special interest, as N eidpath Castle on the Tweed, about a mile west from Peebles, originally a N orman keep, built about the time of David I., and enlarged for a baronial residence by the Hays, who came into pos- session of it in the 15th century ; Horsburgh Castle, a picturesque

ruin near Innerleithen, once the seat of the Horsburghs, hereditary sheriffs-depute of Peebles; and the mansion-house or palace of Traquair, frequently resided in by the Scottish kings when they came to hunt in Ettrick Forest.

‘See Pennecuick, Description of Tweeddale, 1715; Peeblesshire, 1864.

PEEBLES, the county town of Peeblesshire, is finely situated at the junction of the Eddlestone Water and the Tweed, and on the North British and Caledonian Railways, 22 miles south of Edinburgh. The new town, consisting of a main street (High Street) with several streets diverging, is situated on the south side of the Eddlestone Water; and the old town, consisting now of only a small number of houses, is on the north side; while a number of villas cover the elevated ground on the south of the Tweed. The Tweed is crossed by a bridge of five arches, lately widened and improved, and the Eddlestone Water by two bridges. Among the modern public buildings are the town-hall, the corn exchange, and the hydropathic estab-lishment. At the beginning of the present century Peebles possessed manufactures of fine cottons, but the industry is now discontinued. The town possesses woollen mills and meal and flour mills ; it is also a centre of agriculture and has attractions as a summer residence. The popula- tion in 1801 was 2088, which had increased in 1831 to 2750, and, although in 1871 it had diminished to 2631, by 1881 it had increased to 3495. The population of the royal burgh in 1881 was 2609.

The castle of Peebles had disappeared about the beginning of the 18th century, and its site is now occupied by the parish church. There are still, however, numerous antique architectural relics, including some portions of the old town wall; the ruins of the church of the Holy Cross, founded in 1261, and of St Andrew’s parish church, founded in 1195, both in the old town; vaulted cellars of the 16th and 17th centuries, situated in a close behind Mungo Park’s laboratory, and built for security against Border freebooters. Queensberry Lodge, formerly the town residence of the duke of Queensberry, a building in the old style of Scottish domestic architecture, was purchased by the late William Chambers of Edinburgh, and, after being fitted up as a public reading-room, museum, and gallery of art, was presented by him to his native town under the name of the Chambers’

Institution (opened in 1859). The ancient cross of Peebles now occupies the centre of the court- yard of the institution.

Peebles was at a very early period a favourite residence of Scottish kings, who came to hunt in the neighbouring Ettrick Forest. It received its original charter in all probability from Alexander IIL, who built and endowed the church of the Holy Cross, and also founded a monastery for red friars. It was created a royal burgh in 1367. In 1545 the town and the ancicnt churches were de- stroyed by Protector Somerset, and in 1604 it suffered severely from accidental fire. Its charter was extended by Jaines VI., but after the union of the English and the Scottish crowns it lost its early importance.

PEEKSKILL, a manufacturing village of the United States in Cortlandt township, Westchester county, New York, lies on the east bank of the Hudson, 43 miles above New York city, with which it has communication by rail and (in summer) by river. Besides iron-smelt- ing, it carries on the manufacture of railings, stoves, and fire-bricks. A church, dating from 1767, and the Van Cortlandt mansion are among its principal buildings. Incorporated in 1816, Peekskill had 6560 inhabitants in 1870 and 6893 in 1880.

PEEL, Sir Rozerr (1788-1850), twice prime minister and for many years the leading statesman of England, was born 5th February 1788 in a cottage near Chamber Hall, the seat of his family, in the neighbourhood of Bury (Lan- cashire),—Chamber Hall itself being at the time under repair. He was a scion of that new aristocracy of wealth which sprang from the rapid progress of mechanical dis- covery and manufactures in the latter part of the 18th century. His ancestors were Yorkshire yeomen in the district of Craven, whence they migrated to Blackburn in Lancashire. His grandfather, Robert Peel, first of Peelfold, and afterwards of Brookside, near Blackburn, was a calico-

W. Chambers, History of

PEEL

printer, who, appreciating the discovery of his townsman Hargreaves,took to cotton-spinning with the spinning-jenny and grew a wealthy man. His father, Robert Peel, third son of the last-named, carried on the same business at Bury with still greater success, in partnership with Mr Yates, whose daughter Ellen he married. He made a princely fortune, became the owner of Drayton Manor and member of parliament for the neighbouring borough of Tamworth, was a trusted and honoured, as well as ardent, supporter of Pitt, contributed magnificently towards the support of that leader's war policy, was rewarded with a baronetcy, and founded a rich and powerful house, on whose arms he emblazoned, and in whose motto he commemorated, the prosperous industry from which it sprang. The example and precepts of the father took early effect upon his eldest son, whom from the first he destined and prepared to serve his country in public life. At Harrow, according to the accounts of his contemporaries, Peel was a steady industrious boy, the best scholar in the school, fonder of solitary walks than of the games of his companions, but ready to help those who were duller than hiniself, and not unpopular among his fellows. At Christ Church, where he entered as a gentleman commoner, he studied hard, and was the first who, under the new examination statutes, took a first class both in classics and in mathe- matics. an academical ovation in presence of a numerous audience, who came to hear the first man of the day; and a relation who was at Oxford at the time has recorded that the triumph, like both the triumphs and reverses of after life, was calmly borne. From his classical studies Robert Reel derived not only the classical, though somewhat pompous, character of his speeches and the Latin quotations with which they were often happily interspersed, but something _ of his lofty ideal of political ambition. Nor did he ever cease to love these pursuits of his youth; and in 1837, when elected lord rector of Glasgow university, in his inaugural speech he passed a glowing eulogy on classical education. To his mathematical training, which was then not common among public men, he no doubt owed in part his method, his clearncss, his great power of grasping steadily and working out difficult and complicated ques- tions. His speeches show that, in addition to his academi- cal knowledge, he was well versed in English literature, in history, and in the principles of law. While reading hard he did not neglect to develop his tall and vigorous frame, and fortify his strong constitution, by manly exer- cises; and, though he lost his life partly through his bad riding, he was always a good shot and an untiring

walker after game. Sprung from the most religious class of English society, he grew up and remained through life a religious man, and from that source drew deep conscien- tiousness and tranquillity under all difficulties and in all fortunes. His Oxford education confirmed his attachment to the Protestant Church of England. His practical mind remained satisfied with the doctrines of his youth ; and he never showed that he had studied the great religious con- troversies, or that he understood the great religious move- ments of his day.

‘In 1809, being then in his twenty-second year, he was brought into parliament for the close borough of Cashel, which he afterwards exchanged for Chippenham, and commenced his parliamentary career under the eye of his father, then member for Tamworth, who fondly saw in him the future leader of the Tory party. Pitt, Fox, and Burke were gone. Sheridan shone with an expiring ray. But in that House of Commons sat Wilberforce, Windham, Tierney, Grattan, Perceval, Castlereagh, Plunkett, Romilly, Mackintosh, Burdett, Whitbread, Horner, Brougham, Par- nell, Huskisson, and, above all, George Canning. Lord

His examination for his B.A. degree in 1808 was.

Palmerston entered the house at the same time, and Lord John Russell a few years afterwards. Among these men young Peel had to rise. And he rose, not by splendid eloquence, by profound political philosophy, or by great originality of thought, but by the closest attention to all his parliamentary duties, by a study of all the business of parliament, which made him at length familiar with the whole range of public questions and public interests, and by a style of speaking which, owing its force not to high flights of oratory, but to knowledge of the subject in hand, clearness of exposition, close reasoning, and tact in dealing with a parliamentary audience, backed by the character and position of the speaker, improved with his information, practice, station, and experience till it gave him an unrivalled command over the House of Commons. The Tory party was then all-powerful at home; while abroad Europe was at the feet of Napoleon. But Napoleon’s for- tune was about to turn ; and, with the close of the struggle against revolutionary France, political progress in England was soon to

resume the march which that struggle had arrested. Young Peel's lot, however, was cast, through his father, with the Tory party. In his maiden speech in 1810, seconding the address, he defended the Walcheren expedition, which he again vindicated soon afterwards against the report of Lord Porchester's committee. It is said that even then Lord Liverpool discerned in him a dangerous tendency to think for himself, and told his father that he must be put at once into the harness of office. At all events he began official life as Lord Liver- pool's private sccretary, and shortly afterwards, in 1811, was made under-secretary for the colonies by Perceval. In 1812 he was transferred by Lord Liverpool to the more important but unhappy post of secretary for Ireland. There he was engaged till 1817 in maintaining, by insur- rection Acts and other repressive measures, English and Protestant ascendency over a country heaving with dis- content, teeming with conspiracy, and ever ready to burst into rebellion. A middle course between Irish parties was impossible. Peel became, by the necessity of his situa- tion, "Orange Peel," and plied the established engines of coercion and patronage with a vigorous hand. At the same time, it was his frequent duty to combat Grattan, Plunkett, Canning, and the other movers and advocates of Catholic emancipation in the House of Commons. He, however, always spoke on this question with a command of temper wonderful in hot youth, with the utmost courtesy towards his opponents, and with warm expressions of sym- pathy and even of admiration for the Irish people. Nor was the ground he took against the Catholics that of religious principle never to be abandoned, but that of political expediency, which political necessity might over- come. He also, thus early, did his best to advocate and promote secular education in Treland as a means of recon- ciling sects and raising the character of the people. He materially improved the conduct of ordinary business in his office, and gave great satisfaction to merchants and others with whom he had to deal. But his greatest service to Ireland as secretary was the institution of the regular Irish constabulary, nicknamed after him " Peelers," for the protection of life and property in a country where both were insecure. His moderation of tone did not save him from the violent abuse of O'Connell, whom he, young, hot-tempcred (though his temper was generally under con- trol), and sensitive on the point of honour, was ill advised enough to challenge,—an affair which covered them both with ridicule. In 1817 he obtained the highest parlia- mentary distinction of the Tory party by being elected member for the

university of Oxford,—an honour for which he was chosen in preference to Canning on account of his hostility to Catholic emancipation, Lord Eldon lending

him his best support. In the following year he resigned the Irish secretaryship, of the odious work of which he had long been very weary, and remained out of office till 1822. But he still supported the ministers with official zeal, even in the question of the "'Peterloo massacre." In the affair of Queen Caroline, however, he stood somewhat aloof, disapproving some steps taken by the Government, and sensitive to popular opinion; and when Canning retired on account of this affair Peel declined Lord Liverpool's invitation to take the vacant place in the cabinet. During this break in his tenure of office he had some time for reflexion, which there was enough in the aspect of the political world to move. But early office had done its work. It had given him excellent habits of business, great knowledge, and a high position ; but it had left him somewhat stiff, somewhat punctilious, somewhat too cold and reserved to win the hearts of those whose confidence he might command, and somewhat over anxious for formal justifications when he might well have left the essential patriotism and probity of his conduct to the judgment of men of honour and the heart of the people. At the same time he was no pedant in business; in corresponding on political subjects he loved to throw off official forms and communicate his views with the freedom of private corre- spondence ; and, where his confidence was given, it was given without reserve.

At this period he was made chairman of the bullion committee on the death of Horner. He was chosen for this important office by Huskisson, Ricardo, and their fellow-economists, who saw in him a mind open to con- viction, though he owed hereditary allegiance to Pitt's financial policy, and had actually voted with his Pittite father for a resolution of Lord Liverpool's Government denying the existence of any depreciation in the paper currency. The choice proved judicious. Peel was con- verted to the currency doctrines of the economists, and proclaimed his conversion in a great speech on the 24th of May 1819, in which he moved and carried four reso- lutions embodying the recommendations of the bullion committee in favour

of a return to cash payments. This laid the foundation of his financial reputation, and his co-operation with the economists tended to give a liberal turn to his commercial principles. In the course he took he somewhat diverged from his party, and parti- cularly from his father, who remained faithful to Pitt's depreciated paper, and between whom and his schismatic son a solemn and touching passage occurred in the debate. The author of the Cash Payments Act had often to defend his policy, and he did so with vigour. The Act is some- times said to have been hard on debtors, including the nation as debtor, because it required debts to be paid in cash which had been contracted in depreciated paper ; and Peel, as heir to a great fundholder, was even charged with being biassed by his personal interests. But it is answered that the Bank Restriction Acts, under which the depreciated paper had circulated, themselves contained a provision for a return to cash payments six months after peace.

In 1820 Peel married Julia, daughter of General Sir John Floyd, who bore him five sons and two daughters. Three of his sons, Robert, Frederick, and Arthur, have followed him in holding parliamentary office, the youngest being now (1884) speaker of the House of Commons : while another, William, the sailor, has run a bright course in another sphere, and found a glorious grave. The writers who have most severely censured Sir Robert Peel as a public man have suspended their censures to dwell on the virtues and happiness of his private and domestic life. He was not only a most loving husband and father but a true and warm-hearted friend. In Whitehall Gardens or at

Drayton Manor he gladly opened his mind, wearied with the cares of state, to the enjoyments of a circle in which it was his pleasure and his pride to gather some of the most distinguished intellects of the day. He indulged in free and cheerful talk, in which he showed a keen sense of the ridiculous, and a dry sarcastic humour, which often broke out also in his speeches in the House of Commons. He sought the conversation of men of science ; he took delight in art, and was a great collector of pictures ; he was fond of farming and agricultural improvements ; he actively promoted useful works and the advancement of knowledge; he loved making his friends,

dependants, tenants, and neighbours happy. And, cold as he was in public, even to those whom he desired to win, yet in his gay and social hour few men whose minds were so laden could be more bright and genial than Sir Robert Peel.

In 1822 Peel consented to strengthen the enfeebled ministry of Lord Liverpool by becoming home secretary ; and in that capacity he had again to undertake the office of coercing the growing discontent in Ireland, of which he remained the real administrator, and had again to lead in the House of Commons the opposition to the rising cause of Catholic emancipation. In 1825, being defeated on the Catholic question in the House of Commons, he wished to resign office, but Lord Liverpool pleaded that his resigna- tion would break up the Government. He found a happier and more congenial task in reforming and humanizing the criminal law, especially those parts of it which relate to offences against property and offences punishable by death. The five Acts in which Peel accomplished this great work, the first step towards a complete and civilized code, as well as the great speech of 9th March 1826, in which he opened the subject to the House, will form one of the most solid and enduring monuments of his fame. Criminal law reform was the reform of Romilly and Mackintosh, from the hands of the latter of whom Peel received it. But the masterly bills in which it was embodied were the bills of Peel,—not himself a creative genius, but, like the founder of his house, a profound appreciator of other men's creations, and unrivalled in the power of giving them practical and complete effect. This great measure, beyond the sphere of party, was probably also another step in the emancipation of Peel's mind.

In 1827 the Liverpool ministry was broken up by the fatal illness of its chief, and under the new premier, George Canning, Peel, like the duke of Wellington and other high Tory members of Lord Liverpool's cabinet, refused to serve. Canning and Peel were rivals; but we need not interpret as mere personal rivalry that which was certainly, in part at least, a real difference of connexion and opinion. Canning took a Liberal line, and was supported by many of the Whigs; the seceders were Tories, and it is difficult to see how their position in Can- ning's cabinet could have been otherwise than a, false one. Separation led to public coolness and occasional approaches to bitterness on both sides in debate. But there seems no ground

for exaggerated complaints against Peel's conduct. Canning himself said to a friend that "Peel was the only man who had behaved decently towards him." Their private intercourse remained uninterrupted to the end; and Canning's son afterwards entered public life under the auspices of Peel. The charge of having urged Catholic emancipation on Lord Liverpool in 1825, and opposed Canning for being a friend to it in 1827, made against Sir Robert Peel in the fierce corn-law debates of 1846, has been withdrawn by those who made it.

In January 1828, after Canning's death, the duke of Wellington formed a Tory Government, in which Peel was home secretary and leader of the House of Commons. This cabinet, Tory as it was, did not include the impracti-

cable Lord Eldon, and did include Huskisson and three more friends of Canning. Its policy was to endeavour to stave off the growing demand for organic change by ad- ministrative reform, and by lightening the burdens of the people. The civil list was retrenched with an unsparing hand, the public expenditure was reduced lower than it had been since the Revolutionary war, and the import of corn was permitted under a sliding scale of duties. Peel also introduced into London the improved system of police which he had previously established with so much success in Ireland. But the tide ran too strong to be thus headed. First the Government were compelled, after a defeat in the House of Commons, to acquiesce in the repeal of the Test and Corporation Acts, Peel bringing over their High Church supporters, as far as he could, through Dr Lloyd, bishop of Oxford, his tutor at Christ Church, and now his beloved friend and the partner of his counsels in political matters affecting the interests of the church. Immediately afterwards the question of Catholic emancipation was brought to a crisis by the menac- ing power of the Catholic Association and the election of O'Connell for the county of Clare. Peel expressed to the duke of Wellington his conviction that the Catholic question must be settled. The duke consented. The consent of the king, which could scarcely have been obtained except by the duke and Peel, was extorted, withdrawn (the ministers being out for a few hours), and again extorted ; and on the 5th of March 1829 Peel pro- posed Catholic

emancipation in a speech of more than four hours, which was listened to with unflagging atten- tion, and concluded amidst cheers which were heard in Westminster Hall. The apostate was overwhelmed with obloquy. Having been elected for the university of Oxford as a leading opponent of the Catholics, he had thought it right to resign his seat on being converted to emancipation. His friends put him again in nomination, but he was defeated by Sir R. H. Inglis, though the great majority of distinction and intellect was on his side. He took refuge in the close borough of Westbury, whence he afterwards removed to Tamworth, for which he sat till his death. Catholic emancipation was forced on Peel by circumstances ; but it was mainly owing to him that the measure was complete, and based upon equality of civil rights. This great concession, however, did not save the Tory Government. The French Revolution of July 1830 gave fresh strength to the movement against them, though, schooled by the past, they promptly recognized King Louis Philippe. The parliamentary reform movement was joined by some of their offended Protestant supporters. The duke of Wellington committed them fatally against all reform, first by cashiering Huskisson for voting in favour of giving the forfeited franchise of Hast Retford to Bir- mingham, and then by a violent anti-reform declaration in the House of Lords. The elections went against them on the demise of the crown; they were compelled, by popular feeling, to put off the king's visit to the city ; they were beaten on Sir H. Parnell's motion for a com- mittee on the civil list, and resigned.

While in office, Peel succeeded to the baronetcy, Dray- ton Manor, and a great estate by the death of his father 3d May 1830. 'The old man had lived to see his fondest hopes fulfilled in the greatness of his son; but he had also lived to see that a father must not expect to fix his son's opinions,—above all, the opinions of such a son as Sir Robert Peel, and in such an age as that which followed the French Revolution.

The ability and obstinacy of Sir Robert Peel's resistance to the Reform Bill won back for him the allegiance of his party. His opposition was resolute, but it was temperate, and not such as to inflame the fierce passions of the time,

delay the return of civil peace, or put an insurmountable

barrier between his friends and the more moderate among

their opponents. Once only he betrayed the suppressed fire of his temper, in the historical debate of the 22d April 1831, when his speech was broken off by the arrival of the king to dissolve the parliament which had thrown out reform. He refused to join the duke of Wellington in the desperate enterprise of forming a Tory Government at the height of the storm, when the Grey ministry had gone out on the refusal of the king to promise them an un- limited creation of peers. By this conduct he secured for his party the full benefit of the reaction which he no doubt knew was sure to ensue. The general election of 1832, after the passing of the Reform Bill, left him with barely 150 followers in the House of Commons; but this handful rapidly swelled under his management into the great Conservative party. He frankly accepted the Reform Act, stamped it as final, taught his party to register instead of despairing, appealed to the intelligence of the middle classes, whose new-born power he appreciated, steadily supported the Whig ministers against the Radicals and O'Connell, and gained every moral advantage which the most dignified and constitutional tactics could afford. The changes which the Reform Act necessarily drew with it, such as municipal reform, he rather watched in the Conservative interest than strongly opposed. To this policy, and to the great parliamentary powers of its author, it was mainly due that, in the course of a few years, the Conservatives were as strong in the reformed parliament as the Tories had been in the unreformed. It is vain to deny the praise of genius to such a leader, though his genius may have been of a practical, not of a speculative or imaginative kind. The skill of a pilot who steered for many years over such waters may sometimes have resem- bled craft. But the duke of Wellington's emphatic eulogy on him was, "Of all the men I ever knew, he had the greatest regard for truth." The duke might have added that his own question, " How is the king's Government to be carried on in a reformed parliament?" was mainly solved by the temperate and constitutional policy of Sir Robert Peel, and by his personal influence on the debates and proceedings of the House of Commons during the years which followed the Reform Act.

In 1834, on the dismissal of the Melbourne ministry, power came to Sir Robert Peel before he expected or desired it. He hurried from Rome at the call of the duke of Wellington, whose sagacious modesty knew his superior in politics and yielded him the first place, and became prime minister, holding the two offices of first lord of the treasury and chancellor of the exchequer. He vainly sought to include in his cabinet the two recent seceders from the Whigs, Lord Stanley and Sir James Graham. A dissolution gave him a great increase of strength in the House, but not enough. He was outvoted on the election of the speaker at the opening of the session of 1835, and, after struggling on for six weeks longer, was finally beaten, and resigned on the question of appropriat- ing the surplus revenues of the church in Ireland to national education. His time had not yet come ; but the capacity, energy, and resource he displayed in this short tenure of office raised him immensely in the estimation of the House, his party, and the country. Of the great budget of practical reforms which he brought forward, the plan for the commutation of tithes, the ecclesiastical commission, and the plan for settling the question of dissenters' marriages bore fruit, then or afterwards. His scheme for settling the question of dissenters' marriages, framed in the amplest spirit of liberality, was a striking 'nstance of his habit of doing thoroughly and without reserve that which he had once made up his mind to do.

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From 1835 to 1840 he pursued the same course of patient and far-sighted opposition, the end of which, sure though distant, was not only office but power. In 1837 the Conservative members of the House of Commons, with victory now in sight, gave their leader a grand banquet at Merchant Taylors' Hall, where he proclaimed in a great speech the creed and objects of his party. In 1839, the Whigs having resigned on the Jamaica Bill, he was called on to form a Government, but failed, through the refusal of the queen, by advice of Lords John Russell and Palmer- ston, to part with the ladies of her bedchamber, whom he deemed it necessary to replace by ladies not connected with his political opponents. His time was not even yet fully come. In 1840 he was hurried, it is believed by the ardour of his followers, into a premature motion of want of confidence, which was brought forward by Sir John Yarde Buller and failed. But in the following year a similar

motion was carried by a majority of one, and the Whigs were compelled to appeal to the country. The result was a majority of ninety-one against them on a motion of want of confidence in the autumn of 1841, upon which they resigned, and Sir Robert Peel, becoming first lord of the treasury, with a commanding majority in both Houses of Parliament, the country in his favour, and many colleagues of the highest ability and distinction, grasped with no doubtful hold the reins of power.

The crisis called for a master-hand. The finances were in disorder. For some years there had been a growing deficit, which for 1841 was upwards of two millions, and attempts to supply this deficit by additions to assessed taxes and customs duties had failed. Distress and discon- tent reigned in the country, especially among the trading and manufacturing classes. The great financier took till the spring of 1842 to mature his plans. He then boldly supplied the deficit by imposing an income-tax on all in- comes above a certain amount. He accompanied this tax with a reform of the tariff, by which prohibitory duties were removed and other duties abated on a vast number of articles of import, especially the raw materials of manu- factures and prime articles of food. The increased con- sumption, as the reformer expected, countervailed the reduction of duty. The income-tax was renewed and the reform of the tariff carried still further on the same prin- ciple in 1845. The result was, in place of a deficit of upwards of two millions, a surplus of five millions in 1845, and the removal of seven millions and a half of taxes up to 1847, not only without loss, but with gain to the ordi- nary revenue of the country. The prosperous state of the finances and of public affairs also permitted a reduction of the interest on a portion of the national debt, giving a yearly saving at once of £625,000, and ultimately of a million and a quarter to the public. In 1844 another great financial measure, the Bank Charter Act, was passed and, though severely controverted and thrice suspended at a desperate crisis, has ever since regulated the currency of the country. In Ireland O’Connell’s agitation for the repeal of the Union had now assumed threatening propor- tions, and verged upon rebellion. The great agitator was prosecuted, with his chief adherents, for conspiracy and sedition ; and, though the conviction was quashed for in- formality, repeal was quelled in its chief. At the same time a healing hand was extended to Ireland. The Chari- table Bequests Act gave Roman Catholics a share in the administration of charities and legal power

to endow their own religion. The allowance to Maynooth was largely Increased, notwithstanding violent Protestant opposition. Three queen's colleges, for the higher education of all the youth of Ireland, without distinction of religion, were founded, notwithstanding violent Opposition, both Protest- ant and Roman Catholic. The principle of toleration, once

accepted, was thoroughly carried out. The last remnants of the penal laws were swept from the statute-book, and justice was extended to the Roman Catholic Church in Canada and Malta. In the same spirit Acts were passed for clearing from doubt Irish Presbyterian marriages, for settling the titles of a large number of dissenters' chapels in England, and removing the municipal disabilities of the Jews. The grant for national education was trebled, and an attempt was made, though in vain, to introduce effective education clauses into the factory bills. To the alienation of any part of the revenues of the Established Church Sir Robert Peel never would consent; but he had issued the ecclesiastical commission, and he now made better provi- sion for a number of populous parishes by a redistribution of part of the revenues of the church. The weakest part of the conduct of this great Government, perhaps, was its failure to control the railway mania by promptly laying down the lines on a Government plan. It passed an Act in 1844 which gave the Government a right of purchase, and it had prepared a palliative measure in 1846, but was compelled to sacrifice this, like all other secondary measures, to the repeal of the corn laws. It failed also, though not without an effort, to avert the great schism in the Church of Scotland. Abroad it was as prosperous as at home. It had found disaster and disgrace in Afghanistan. It speedily ended the war there with honour. By the hand of its governor-general of India the invading Sikhs were destroyed upon the Sutlej. Guizot has said that the ob- jects—not only the ostensible but the real objects—of Sir Robert Peel's foreign policy were peace and justice among nations. The angry and dangerous questions with France, touching the right of search, the war in Morocco, and the Tahiti affair, and with the United States touching the 'Maine boundary and the Oregon territory, were happily settled by frank and patient negotiation. In this and in other parts of his administration Sir Robert Peel was well seconded by the ability of his colleagues, but the premier himself was the soul of all.

Yet there was a canker in all this greatness. There were malcontents in Sir Robert Peel's party whose presence often caused embarrassment and twice collision and scan- dal. The Young Englanders disliked him because he had hoisted the flag of Conservatism instead of Toryism on the morrow of the Reform Bill. The strong philanthropists and Tory Chartists disliked him because he was a strict economist and an upholder of the new poor law. But the fatal question was protection. That question was being fast brought to a crisis by public opinion and the Anti- Corn-Law League. Sir Robert Peel had become in prin- ciple a free-trader. Since his accession to power a new responsibility had fallen on him, which compelled him to think less of a class and more of the people. He had expressed to Guizot a deep, nay, a passionate conviction that something must be done to relieve the suffering and precarious condition of the labouring classes. He had lowered the duties of the sliding scale, and thereby caused the secession from the cabinet of the duke of Buckingham. He had alarmed the farmers by admitting foreign cattle and meat under his new tariff, and by admitting Canadian corn. He had done his best in his speeches to put the maintenance of the corn laws on low ground, and to wean the landed interest from their reliance on protection. But to protection the landed interest fondly clung; and it is hard to say how far Sir Robert Peel himsclf dreaded the consequences of repeal to the steadiness of prices and to mortgaged estates. The approach of the Irish famine in 1845 decisively turned the wavering balance. The ports must be opened, and, being opened, they could not again be closed upon the same conditions. The Clare election and Catholic emancipation were played over again. Sir

Phy 1a Tae

Robert proposed to his cabinet the repeal of the corn laws. Lord Stanley and the duke of Buccleuch dissented, and Sir Robert resigned. But Lord John Russell failed to form a new Government. Sir Robert again came into office; and now, with the consent of all the cabinet but Lord Stanley, who retired, he, in a great speech on 27th January 1846, brought the repeal of the corn laws before the House of Comnions. In the long and fierce debate that ensued he was overwhelmed, both by political and personal enemies, with the most virulent invective, which he bore with his wonted calmness, and to which he made no retorts. His measure was carried; but immediately

afterwards the offended protectionists, goaded by Lord George Bentinck and Disraeli, coalesced with the Whigs, and threw him out on the Irish Coercion Bill. He went home from his defeat, escorted by a great crowd, who un- covered as he passed, and he immediately resigned. So fell a Conservative Government which would otherwise have probably ended only with the life of its chief. Those who overthrew Sir Robert Peel have dwelt on what they natur- ‘ally believe to have been the bitterness of his fall. It is certain that he was deeply pained by the rupture with his party, but it is doubtful whether otherwise his fall was so bitter. of toil; he had the memory of immense labours gone through, and of great things achieved in the service of the state; he had a kingly position in the country, great wealth, fine tastes, and a happy home.

“Though out of office he was not out of power. He had “lost a party, but won a nation.” The Whig ministry which succeeded him leant much on his support, with which he never taxed them. He joined them in carrying forward free-trade principles by the repeal of the naviga- tion laws. He joined them in carrying forward the prin- ciple of religious liberty by the bill for the emancipation of the Jews. One important measure was hisown. While in office he had probed, by the Devon commission of inquiry, the sores of Ireland connected with the owner- ship and occupation of land. In 1849, in a speech on the Trish Poor Laws, he first suggested, and in the next year he aided in establishing, a commission to facilitate the sale of estates in a hopeless state of encumbrance. The Encum- bered Estates Act made no attempt, like later legislation, to secure by law the uncertain customary rights of Irish tenants, but it transferred the land from ruined landlords to solvent owners capable of performing the duties of pro- perty towards the people. On the 28th of June 1850 Sir Robert Peel made a great speech on the Greek question against Lord Palmerston’s foreign policy of interference. This speech, being against the Government, was thought to show that he was ready to return to office. It was his last. On the following day he was thrown from his horse on Constitution Hill, and mortally injured by the fall. Three days he lingered in all the pain which the quick nerves of genius can endure. On the fourth (2d July 1850) he took the sacrament, bade a calm fare- well to his family and friends, and died; and a great sorrow fell on the whole land. All the tributes which respect and gratitude could pay were paid to him by the sovereign, by parliament, by public men of all parties, by the

country, by the press, and, above all, by the great towns and the masses of the people to whom he had given “bread unleavened with injustice.” He would have been buried among the great men of England in Westminster Abbey, but his will desired that he might be laid in Drayton church. It also renounced a peerage for his family, as he had before declined the garter. for himself when it was offered him by the queen through Lord Aberdeen.

Those who judge Sir Robert Peel will remember that he

For evening had begun to steal over his long day |

was bred a Tory in days when party was a religion ; that he entered parliament a youth, was m office at twenty-four and secretary for Ireland at twenty-five ; that his public life extended over a long period rife with change ; and that his own changes were all forwards and with the advancing intellect of the time. They will enumerate the great practical improvements and the great acts of legislative justice of those days—Catholic emancipation, freedom for dissenters, free trade, the great reforms in police, criminal law, currency, finance, the Irish Encumbered Estates Act, even the encouragement of agricultural improvement by loans of public money—and note how large a share Sir Robert Peel had, if not in originating, in giving thorough practical effect to all. They will observe that of what he did nothing has been undone. They will reflect that as a parliamentary statesman he could not govern without a party, and that it is difficult to govern at once for a party and for the whole people. They will compare his admin- istration with those that preceded and those that followed, and the state and fortunes of his party when. he was at its head with its state and fortunes after his fall. They will consider the peace and goodwill which his foreign policy diffused over Europe. They will think of his ardent love of his country, of his abstinence from intrigue, violence, and faction, of his boundless labour through a long life devoted to the public service. Whether he was a model of statesmanship may be doubted. Models of statesman- ship are rare, if by a model of statesmanship is meant a great administrator and party leader, a great political philosopher, and a great independent orator, all in one. But if the question is, whether he was a ruler loved and

trusted by the English people, there is no arguing against the tears of a nation.

Those who wish to know more of him will consult his own post- humous memoirs, edited by his literary executors Karl Stanhope and Viscount Cardwell; the four volumes of his speeches; a sketch of his life and character by Sir Lawrence Pcel ; an historical sketch by Lord Dalling ; Guizot's Sir Robert Peet (1857) ; Kiinzel's Leben und Reden Sir Robert Peel's (1851)$ Disraeli's Life of Lord George Bentinek (1858) ; Morley's Life of Cobden; and the general histories of the time. (G. 8.—C. S. P.)

PEELE, Grorce (1558-1598), was one of the group of university poets with whom Shakespeare entered 'Into competition at the beginning of his career. His exact age has been ascertained and the facts of his life diligently searched out by Mr Dyce, the editor of his works. It appears from a deposition made by him at Oxford that he was twenty-five years old in 1583. He took his bachelor's degree at Oxford in 1577, and his master's degree two years afterwards. Before he reached middle age, Peele was "driven to extreme shifts" for a living, and he be- came so notorious for disreputable practical jokes that a body of "merrie conceited jests" was fathered upon him ; but he began life brilliantly. He was "a noted poet at the university." He married a woman of property. When a distinguished foreigner was entertained at Christ Church with elaborately-mounted plays and pageants, Peele was entrusted with the superintendence of the show. He was complimented in Latin pentameters on his trans- lation of one of the plays of Euripides. He wrote The Arraignment of Paris, a bright little comedy with pretty songs, for representation before Queen Elizabeth. This was published in 1584; and in 1587 his friend Nash declared him to be "the chief supporter of pleasance now living, the atlas of poetry, and primus verborum artyfex." From this brilliant height the reckless poet quickly slid down to a much less respectable position, and acquired renown of a different kind by his clever tricks on creditors, tavern-keepers, and " croshabells." He began to write for the common players, whose ingratitude to gentlemen of education was bitterly deplored by his friend Greene. Ov

Special character of the British peerage.

these productions the following have been preserved and edited by Mr Dyce :—TZhe Chronicle History of Edward I. (published in 1593); The Battle of Alcazar (1594) ; The Old Wives' Tale (1595); David and Bethsabe (1599); Sir Clyomon and Sir Clamydes (1599). These plays, which are very different in kind, testify to Peele's versatility and adroitness, but do not entitle him to much considera- tion either as a poet or as a dramatist. Quickness of wit

PEERAGE

T was remarked in the article Nopruity (vol. xvii. pp. 529, 530) that the existence of the peerage, as that word is understood in the three British kingdoms, is something altogether peculiar to those kingdoms, and that it has actually hindered them from possessing a nobility of the Continental type. Before we try to trace out the history of the British peerage, it will be well to show more fully than was done in that article in what the insti- tution consists, and in what it differs from those institu- tions in other countries which are most like it. And to this end we must define what we understand by the word peerage in the British sense. In its historical use it takes in all the members or possible members of the House of Lords and no other persons. But modern usage and modern decisions seem to limit the use of the name on one side, and to extend it on another. There is no kind of doubt that, according to the earliest precedents—pre- cedents reaching up to the earliest official use of the word peer—the spiritual lords are equally peers with the temporal. But it has been held, at least from the 17th century, that the spiritual lords, thougli lords of parliament equally with the temporal lords, are not, like them, peers. Again, in earlier times no peers were heard of except members of the House of Lords, but membership of that House, even as a temporal lord, was not necessarily hereditary. But a decision of the present reign has ruled that a life-peerage is possible, but that the holder of such a peerage has no right to a seat as a lord of parliament. And an Act of the present reign of later date has actually called into being a class of lords who, it would seem, may possibly be either lords of parliament without being peers, or peers without being lords of parliament. These doctrines, some of which trample all the facts of history under foot, but

which must be supposed to declare the modern law, establish the possibility of peers who are not lords of parliament, as well as of lords of parliament who are not peers. The question whether all lords of parliament were peers has been debated for several centuries; that all peers were in esse or in posse lords of parliament, that the right to a seat in parliament was the essence of peerage round which all other rights have grown, was surely never doubted till the year 1856.

Still these later doctrines, though founded on altogether wrong historical grounds, give us a definition of peerage which is intelligible and convenient. Setting aside the possible peers who are not lords of parliament, the two decisions between them rule that the parliamentary peer- age is confined to the temporal lords, and that, except in the case of the very modern official lords, their peerage is necessarily hereditary. This definition is convenient in practice, because it is the hereditary temporal peerage whose growth and constitution is of that unique kind which distinguishes it from all other bodies which bear the same name or which present any likeness to it in other ways. It will save trouble in this inquiry if we use the word peerage in what—with the possible exception of the last- created official lords—seems now to be its legal sense, as meaning the hereditary temporal peerage only.

and fancy and a certain neatness of versification are their highest qualities. As Peele lived through the transition from the first tentative essays to the full maturity of the great Elizabethan drama, his works have an_ historical interest as showing what an ingenious man of culture could do with the common stock of theatrical characters, situations, and imagery. His comedies are often pretty, but his tragedies are inflated and preposterous,

In this sense then the peerage of England—continued Defni- after the union between England and Scotland in the peerage tion of of Great Britain, and after the union between Great Britain 2279 and Ireland in the peerage of the United Kingdom—is a body of men possessing privileges which are not merely personal but hereditary, privileges which descend in all cases

according to some rule of hereditary succession, but which pass only to one member of a family at a time. In this the peerage differs from nobility strictly so called, in Its dis- which the hereditary privileges, whatever they may con- tinction” sist in, pass on to all the descendants of the person first — created or otherwise acknowledged as noble. The essen. tial and distinguishing privilege of the peer, as defined above, is that he is an hereditary lord of parliament, that he has, by virtue of his birth, a right to a summons from the crown to attend personally in every parliament and to take his seat in the House of Lords. He is thus, by right of birth, a member of the great council of the nation, an hereditary legislator, and an hereditary judge. Whatever other privileges, substantial or honorary, the peer may pos- sess, they have all gathered round this central privilege, which is that which distinguishes the peer from all other men. The peer of parliament thus holds a different position from the lords spiritual, equally lords of parliament with himself, but holding their seats by a different tenure from that of an hereditary peerage. He holdsa different position from the possible non-parliamentary peers implied in the decision of 1856. He holds a different position from the official lords of parliament created by the last Act. The number of the peerage is unlimited ; the crown may raise whom it will to any of its ranks; but it is now understood that, in order to make the persons so raised peers in the full sense, to make them lords of parliament, the creation must extend to their heirs of some kind as well as to themselves.

The special character of the British peerage, as distin- guished from privileged orders in any other time or place, springs directly from the fact that the essence of the peerage is the hereditary right of a personal summons to parliament. To determine the origin of the peerage is thus to determine how a certain body of men came to possess this hereditary right of summons. But, before we enter on this inquiry, one or two remarks will be needful which are naturally suggested by the definition of peerage which has just been given.

It has been said above that the holder of a peerage as Position defined is a lord of parliament in esse or in posse. It has och become necessary during the present and last centuries to, jrish add these last words to the definition. For it is plain peers that, since the successive unions of England and Scotland and of Great Britain and Ireland, an hereditary peerage has not

always in practice carried with it a seat in the House of Lords (cf. the Lords' Report on the Dignity of a Peer, ii. 16). For since those unions certain persons, namely those peers of Scotland and Ireland who are not representative peers and who do not hold peerages of Eng- land, of Great Britain, or of the United Kingdom, have been : | undoubted peers, they have enjoyed some or all of the per-

ime of rs,

PEERAGE

sonal privileges of peerage, but they have had no seats in the

Houseof Lords. But thisis a modern accident and anomaly.

The persons spoken of hold peerages which entitled their holders to seats in the parliaments of Scotland and Ireland

And

as long as those parliaments were distinct bodies. their present holders, if not members of the House of Lords in esse, are such in posse,

other persons. Their membership of the House is rather suspended than altogether taken away. Their rather anomalous case hardly affects the general principle that, as far as the hereditary peerage is concerned, peerage and membership of the House of Lords are the same thing.

A few words are also needed as to the effect of the earlier doctrine which rules that peerage is an attribute of the lords temporal only and not of the lords spiritual (see Lords' Report, i. 323, 393 ; il. 75). This is doubtless

-meant to imply a certain inferiority on the part of the

spiritual lords, as not sharing in that nobility of blood which is looked on as the special attribute of the heredi- tary peerage. But the inferiority thus implied, as it has nothing to do with parliamentary powers, has also nothing to do with precedence. The lords spiritual as a body are always mentioned first; one class of them, namely the archbishops, take precedence of all

temporal peers who are not of the royal family, as the other bishops take preced- ence of the temporal barons. What the distinction is con- cerned with is simply certain personal privileges, such as the right of being tried by the court of our lord the king in parliament, that is by the House of Lords or some part of it, instead of in the ordinary way by a jury. The doctrine which denies “peerage” to the spiritual lords is altogether contrary to earlier precedents ; but the way in which it came about is one of the most curious parts of our inquiry. It was the natural result of the ideas under whose influence the temporal peerage grew up and put on its distinguishing character.

The use of the word peers (pares) to denote the members of the House of Lords first appears in the 14th century, and it was fully established before the end of that century. The name seems to be rather a direct importation from France than anything of natural English or even Norman growth. In the 12th and 13th centuries the great men of the realm appear under various names, English, Latin, and French, witan, sapientes, magnates, proceres, grantz, and the like; they are pares only incidentally, as other men might be. In the Great Charter the word pares, in the phrase judiciwm parium, has simply the general meaning which it still keeps in the rule that every man shall be tried by his peers, the peer (in the later sense) by his peers and the commoner by his. In the 13th century this seems to have still been the only meaning of the word in England. This is illustrated by the story of Peter des Roches, bishop of Winchester (see R. Wendover, iv. 277; M. Paris, ed. Luard, ili, 252; Stubbs, Const. Hist., ii. 48, 183), when in 1233 the right of being tried by their peers was asserted on behalf of Richard earl Marshall, and others. The bishops and other lords exhort the king to make peace with certain of his nobles and other subjects, “‘quos absque judicio parium exsulaverat,” &e. The Poitevin bishop, either through ignorance or of set purpose, misunderstood the phrase, and answered that in England there were no peers (pares) as there were in France, and that therefore the king might deal with all his subjects as he chose by means of his own justices only.! The word pares is here clearly used in one sense and understood in another. The English lords used

1 «Quod non sunt pares in Anglia, sicut in regno Francorum, unde

licet regi Anglorum per justitiarios quos constituerit quoslibet de . . sos , regno suo exulare et mediante judicio condemnare.’

They have a capacity for being chosen to seats in that House which is not shared by

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the word in its older general sense ; Peter des Roches used it in the special sense which it bore in France. Neither used it in the sense which it took in the next century. It was perfectly true that there was in England no body of men answering to the peers of France, of whom we shall speak presently. But there is every likelihood that the name, as describing a particular body of men in England, was borrowed from the peers of France.

But the thing is more important than the name. What- ever view may be taken of the constitution of the ancient Witenagemédt, we may safely assume that that assembly, with whatever change in its constitution, is personally continued in the House of Lords. of two classes of men who have never lost their right

That house consists House of Lords;

to a personal summons, together with certain other classes oa a who have acquired that right in later times. Two Sete

classes of men, namely earls and bishops, have, with a tion; the

certain interval in the 17th century, in the councils of the nation from the earliest times. These two classes are those whose presence connects the earliest and the latest English assemblies. From the time when the House of Lords began to take anything like its present shape, other classes of men, spiritual and temporal, were summoned as well as the bishops and earls, but not with the same regularity as they were. Some abbots were always summoned from the beginning, and a few other churchmen afterwards obtained the same right. But, while every bishop—except in a few cases of personal enmity on the part of the king—was summoned as a matter of course, there was great irregularity in summon- ing of abbots. So some

barons were always summoned as well as the earls; but, while every earl was—with a few such exceptions as in the case of the bishops—summoned as a matter of course, there was great irregularity in sum- moning the barons. The bishops and earls in short were personages too great to be left out; so were a few of the greatest abbots. Lesser men, spiritual or temporal, might be summoned or not according to a hundred reasons of convenience, caprice, or accident. But it is only the common tendency of things that the occasional summons should grow into the perpetual summons, and that the perpetual summons should, wherever it was possible, that is, in the case of the temporal lords, grow into the hereditary sum- mons,

sat continuously bishops and earls.

In other words, the doctrine was gradually estab- Growth

lished that, when a man was once summoned, a right of of the

summons was created for him and his heirs for ever. The ei. establishment of this doctrine called into being a new order trine.

of men, of lower rank than the bishops and earls but of equal parliamentary power, namely the class of barons having an hereditary right to seats in parliament. Pre- sently, in the course of the 14th and 15th centuries, the ranks of the temporal peerage were increased by the in- vention of new orders, those of duke, marquess, and vis- count, the two former classes taking precedence of the ancient earls.

It is easy to see how the growth of these several classes New of hereditary lords of parliament tended to strengthen the position

notion of the temporal peerage as a body by itself, apar from all other men, even from those lords of parliament ? whose seats were not hereditary. Here were five classes of men who were not peers in the sense of strict equality among themselves, for they were divided by rigid rules of precedence, but who were peers in the sense of having eacli of them an equal right to something peculiar to themselves, something which was so far from being shared with any who were not lords of parliament that it was not shared by all who were. The archbishop took precedence of the duke, the bishop took

precedence of the baron; but duke and baron alike shared in something which archbishop and bishop had not, the hereditary right to a summons to

t of the

eerage.

Doctrine of the en- nobling

of blood.

Position of the judges.

Peerage hinders nobility.

parliament. The peerage of the temporal lord came to be looked on as something inherent in the blood, something which could not, like the official seat of the churchman, be resigned or lost by any means except by such legal pro- cesses aS involved “corruption of blood.” The parlia- mentary powers, the formal precedence, of the spiritual lords were not touched, but the idea silently grew that they were not the peers of the hereditary members of the House. In short, the doctrine grew that the temporal lords alone were peers, as alone having their blood ‘ cnnobled,” which is the herald’s way of saying that they held their seats by hereditary right. The extinction of so many temporal peerages in the Wars of the Roses, the creation of so many new peerages under the Tudors, while in one way they lowered the strength and dignity of the order, in another way helped more and more to mark it out as a separate order, distinct from all others.

But the spiritual lords were not the only class that lost by the growth of the doctrine of hereditary peerage. No doctrine about blood or peerage could get rid of the fact that the parliamentary position of the bishops and the greater abbots was as old as that of the earls, far older than that of the barons, to say nothing of the ranks more lately devised. But there was another body of men whom the growth of the hereditary doctrine hindered

from _be- coming peers, and from becoming lords of parliament in any full sense. These were the judges. As the judges grew to be a distinct and recognized class, they came to be sum- moned to parliament like the barons. The same reason which made it expedient to summon bishops, earls, and barons, made it expedient to summon judges also. It would not have been unreasonable if, in the many shiftings and experiments which took place before the constitution of the two Houses finally settled itself, the judges had come to hold official seats in the House of Lords in the same way as the bishops. But the growth and strengthening of the hereditary doctrine hindered the judges as a body from ever winning the same position in parliament as the bishops and abbots. They had not the same antiquity ; they had not the same territorial position; their tenure was less secure ; the spiritual lord might lose his office by resigna- tion or bya legal process ; the judge might lose his by the mere arbitrary will of the sovereign. The bishops then could be denied the right of personal peerage ; they could not be denied their full parliamentary position, their seats and votes. But the same feeling which deprived the bishop of his personal peerage hindered the judge from ever obtaining the personal peerage, and even from obtain- ing a full seat and vote in parliament. Owing to these influences, the judges have ever held an anomalous position in parliament ; they came to be in a manner in the House of Lords but not of it, to be its counsellors and assessors, but not its members.

The growth of the hereditary doctrine pressed hardly, we must allow, on both bishops and judges. But its working on either of those classes has been of small moment indeed compared with the effect on the nation at large. There is no institution for which England has greater reason to be thankful than for her hereditary peerage ; for, as we began by saying, it has saved her from the curse of a nobility. Or rather, to speak more accurately, the growth of the peerage with its comparatively harmless privileges hindered the real nobility from keeping or winning privileges which would have been anything but harmless. If the word nobility has any real meaning, it must, according to the analogy of lands where there is a real nobility, take in all who bear coat-armour by good right (see Nositity). It is a remark which has been made a thousand times, and no remark can be truer, that countless families which would be reckoned as noble any-

where else are not reckoned as noble in England. That is to say, though they may be rich and ancient, though they may claim an illustrious pedigree and may be able to prove their claim, yet they have nothing to do with the peerage. In England no family is looked upon as noble unless its head isa peer. In other words, the idea of peerage has altogether displaced the older idea of nobility. The growth of the order of peers has hindered the growth of any nobility apart from the peerage. The hereditary dignity of the peer, the great political position which it carries with it, stands so immeasurably above any hereditary dignity which attaches to the simple gentleman by coat- armour, that the gentleman by coat-armour—the noble of other lands —ceased in England to be looked on, or rather perhaps never came to be looked on, as noble at all. In other words, the growth of the peerage saved the country from the curse of a nobility after the fashion of the nobility of France or of Germany. The difference in this respect between England and other lands is plain at first sight, and there really seems no other way to explain the differ- ence except that every notion of hereditary dignity and privilege gathered so exclusively round the hereditary peerage as to leave nothing of any account to gather round any smaller hereditary position.

But, while the growth of the peerage thus hindered the growth of a nobility of which every gentleman should be a member, it was still possible that a real nobility might have grown up out of the peerage itself. That is to say, it might have come about that, while none but the descend- ants of peers were privileged, all the descendants of peers should. be privileged. A nobility might thus have been formed, much smaller than a nobility taking in_all lawful bearers of coat-armour, but still a nobility by no means small. But in England no such nobility has ever grown up. No one has any substantial privilege except the peer himself. No one in short is noble but the peer himself. Even in common speech, though we speak of a noble family, we do not personally apply the word noble to any other member of that family, unless, in the case of the higher ranks of the peerage, to a few immediate descendants of the peer. In short, while the blood of the peer is said to be ennobled, it is ennobled with a nobility so high and rare that it cannot pass to more than one at a time even of his own descendants (see the plain speaking of Dr Stubbs, Const, Hist., iii. 443). The eldest son of a duke is

legally a commoner ; the children of his younger sons are not only legally but socially undistinguishable from other commoners. That is to say, the hereditary possession of the peer is not nobility at all in the sense which that word bears in other lands. It is a fiction to say that the peer's blood is ennobled, when the inheritors of his blood are not inheritors of his nobility. In short, as there is no nobility outside the families whose heads are peers, neither is there any real nobility within those families. As the growth of the hereditary peerage made nobility impossible outside the families of peers, so the particular form of its growth made true nobility impossible even within those families.- For, after all, the essence of peerage is simply that the peer becomes by birth what other men become either by royal nomination or by popu- lar election. The official origin of the peer still cleaves to him. The best description of his position is that he holds a great hereditary office. His place as legislator and judge is in itself as strictly official as the dignity of the bishop or the sheriff; but, as, unlike the dignity of the bishop and the sheriff, it has becoine hereditary, something of the magic sentiment of hereditary descent has spread itself over its actual holder and over a few of his immediate descendants. But, as the dignity is in itself official, the hereditary sentiment has not been-able to go further than

this ; it has not prevailed so far as to establish any nobility or any privilege of any kind for all the descendants of the hereditary legislator and hereditary judge. f This result was further strengthened by the peculiar nature of the office which became hereditary in the peers ~ of England ; it is an office which can be discharged only ..in concert with others; the very essence of the peerage is the summons to take part in the proceedings of an assembly. In itself nothing is more natural than the growth of nobility out of office; it is as one of the chief ways in which nobility has come into being. And, to take a position higher than that of mere nobility, men in other lands whose dignity was in its beginning yet more _ purely official than that of the peers of England, say the

of the peer, hereditary membership of the great council of the nation, was on the one hand so transcendent as to extinguish all other hereditary dignities; on the other hand, as resting on membership of an assembly, it could not well grow into nobility in the strictest sense. The peerage therefore, the office of hereditary legislator and hereditary judge, passed, and such nobility as it conferred passed with it, to one member only of the family at a time. The other members had no share in the office, and therefore had no share in the nobility which it conferred.

It was then in this way that the peerage, growing out of the hereditary summons to parliament, hindered the growth of any nobility outside the families of peers and by the same means hindered the growth of any real nobility within their

si dukes and counts of Germany, contrived, not only to make t- their offices hereditary but to make at least their honorary privileges extend to all their descendants for ever and ever. That is to say, they grew into a nobility—a nobility to be

families. To the existence of the peerage then, more than Equality

to any other cause, England owes its happy freedom from °f all be-

the curse of a really privileged class, the h oe a really privileged class, the happy equality in

actual – the eye of the law of all men who are not actually pecrs,— cl

sure within a wider nobility—in the strictest sense. Why did not the English peerage do the same? For two reasons, which are in truth different forms of the same reason, different results of the fact that the royal power was so much stronger in England than it was in Germany. One is because the growth of the dukes and counts of Germany belongs to a much earlier state of things than the growth of the English peerage, to a state of things when national unity and the royal authority, though much stronger than they were afterwards, were much less firmly established than they were in England in the age when the hereditary peerage grew up. But partly also, and chiefly, because the dignity and authority of the German duke or count was mainly

a local and personal dignity and authority, a dignity and authority which he held in himself and exer- cised apart from his fellows, while the dignity and autho- rity of the English peer was one which he could hold and exercise only in partnership with his fellows. To the German duke or count his position in the national assembly was the least important part of his powers; to the English

an equality which reaches so high that the children of the sovereign himself, whatever may be their personal honours and precedence, are, unless they arc formally created peers, in the eye of the law commoners like other men. The privileges of the actual peerage have been a small price to pay for such a blessing as this. But we must remember that this happy peculiarity, like all other features in the English constitution, came about by accident, or more truly by the silent working of historical circumstances.

should be two Houses of Parliament and not one, three, or ° four—as no lawgiver ever decreed in so many words that one of these Houses should be elective and the other here- ditary or official—so no lawgiver ever decreed in so many words that the children of the hereditary lord of parliament should be in no way partaker of his privileges. All these things came of themselves ; we cannot point to any parti- cular enactment which established any of them, or to any particular moment when they were established. Like everything else, they grew by usage, not by enactment ;

As no Silent English lawgiver ever decreed in so many words that there growth

peerage.

later enactments confirmed them or took them for granted

(see Lords' Report, i. 47, 483; ii. 25). But we can see

that the rule which has established but one form of real Constitu- distinction among Englishmen, that which parts the actual pes peer and the commoner, grew out of the way in which Seas the elements of the parliament finally settled themselves. gradu.

The parliamentary line was in the end drawn between the allyfixed.

peer it was the essence of his whole position. After the purely official character of the earldoms had died out, the English peer was nothing apart from his brother peers. His greatness was the greatness of the member of a power- ful assembly. He might be hereditary legislator and hereditary judge ; but he could not act as either except in concert with all the other hereditary legislators and here-

ditary judges. The earls and bishops of England, each by himself, might, if the royal authority had been weaker, have grown into princes, like the dukes and bishops of Germany. The earls, after the change in their character, and the other ranks of peerage from their beginning, were shown to be simple subjects by the very nature of their dignity and power. ‘The position of the German duke or count doubtless came from a royal ‘grant; but it was from a royal grant of some distant age. The position of the English peer rested altogether on a writ from the crown, and that not a writ of past ages, but a writ which, though it could not be refused, needed to be renewed in each successive parliament. In other lands the assembly of the nobles was great and powerful because it was an assembly of great and powerful men ; in England the peer was great and powerful because he was a member of a great and powerful assembly. A parliamentary dignity of this kind, even when it became strictly hereditary, was very different from the quasi princely position of the great

baron and the knight. One is rather surprised that it was drawn at that point. The gap between the earl and the baron, and again the gap between the knight and the citizen, might either of them seem wider than the gap between the baron and the knight. Yet in the end the barons were lifted up to the fellowship of bishops and earls, while the knights were thrust down to the fellowship of citizens and burgesses. This must have done much to hinder the knightly families, families which in any other land would have ranked as noble, from keeping or claiming any strictly hereditary privilege. On the other hand, as we have al- ready seen, the nature of that privilege of peerage which the barons were admitted to share hindered the baronial families from claiming any fresh hereditary privilege be- yond the hereditary transmission of the peerage itself.

Such is a general view of the nature and origin of peerage in England, following at greater length the lines already traced out in the article ENGLAND. This view

may now be confirmed by a few of the special facts and The Wit- dates which stand out most conspicuously in that course °Rase- of events which ied to the received doctrine of peerage. ea We assume the House of Lords as the personal continua- jp the tion of the ancient Witenagemét, Mycel Gemét, Magnum House

Concilium, by whatever name we choose to call that im- of Lords.

nobles of other lands. And, though the peer commonly had a great local position, sometimes an almost princely position, it was not as peer that he held it. Whatever might be his local dignity and local rights, they had nothing to do With his peerage ; they were shared in his degree by the smallest lord of a manor. In short, the hereditary dignity

memorial body which, whatever was its constitution, was certainly not representative in the sense of being elective. Alongside of this older body grew up that newer repre- sentative and elective body which became the House of The Commons. We may best place the beginnings of the barons. peerage at the point when we can distinctly see that barons are personally summoned to the one House, while knights find their way into the other only by election. It hardly needs to be explained that the word baron, originally meaning simply man, has in itself nothing to do with peerage or with seats in parliament. Survivals of its earlier and wider meaning may still be traced in the titles of the Barons of the Exchequer and the Barons of the Cinque Ports, and in other uses of the word, more common perhaps in Scotland and Ireland than in England. Baro often translates the older English thegn, and perhaps neither of these names is very easy to define. By the 13th century the name baron had come specially to mean the highest class among the king’s lay tenants-in-chief under the rank of earl ; the baron was the holder of several knight’s fees. In a wider and vaguer sense, the word often takes in both the earls and the spiritual lords. In its narrower sense it means those who were barons and not more tlian barons. As the

practice of personal summons to parliament came in, the barons formed a class of men who might reasonably hope or fear, as the case might be, that the personal summons might come to them; and to many of them it did come. And its coming or not coming established a Greater distinction between two classes of barons. A distinction and between greater and lesser barons is implied in the Great na Charter (c. xiv.), which asserts the right of the “ majores arons. ” . barones” to a personal summons along with the arch- bishops, bishops, abbots, and earls, while the other tenants- in-chief—among them by implication such barons as did not come under the head of majores—were to be summoned generally by the sheriff. And this ordinance must be taken in connexion with the earlier writ of 1215 (Selden, Titles of LTonour, 587; Stubbs, Select Charters, 278, and Const. [ist., i. 568), in which the sheriff is bidden to summon the knights in arms, and the barons without arms, and also four discreet men from each shire, “‘ad loguendum nobiscum de negotiis regni nostri,” that is, in other words, toa parliament. The Charter thus secures to the greater barons, as a separate class, the right of being personally summoned by the king, and not by the sheriff along with other men. It parts them off from other tenants-in-chief and puts them along- side of the prelates and earls. These two documents be- tween them may be taken as giving us at once the first distinct approach to the notion of peerage and the first distinct approach to the notion of representation. The ‘‘majores barones” are not defined ; but the summons snp- plied the means of defining them, or rather it became a means of making them the only barons. As the summons became hereditary, barons came more and more to be looked on simply as a class of men who had seats in the House of Lords. The word came to mean a rank in the peerage, and it was gradually forgotten that there ever had been territorial barons who had no claim to seats in parliament. But it was only by slow degrees that the hereditary ae. summons, or even the necessary summons of every man mons, WHO had once been summoned, became the established rule. Throughout the 13th century the language in which the national assembly is spoken of is wonderfully shifting. Sometimes its constitution seems more popular, sometimes less so. Sometimes its more dignified members are spoken of vaguely under such names as magnates, without dis- tinction into particular classes. But, when particular classes are reckoned up, the barons always form one class among them ; but the number of barons summoned varies greatly.

The greater barons sum- moned person- ally.

Irregu-

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summons ; but the majores barones are not as yet a defined

i

The Charter gives the majores barones the right of personal

and undoubted class of men like the bishops and earls, None but the holder of a barony in the territorial sense was likely to be summoned ; but the king still had a wide choice as to whom among the holders of such baronies he would acknowledge as majores barones ; and we find that dissatisfaction was caused by the way in which the king exercised this power. In 1255 there is a remarkable notice in Matthew Paris (v. 520, ed. Luard ; cf. Hallam, Middle Ages, ii. 153) where the “magnates” complain that all of their number had not been summoned according to the Charter, and they therefore decline to grant an aid in the absence of their peers. It is possible that some bishops or earls may, for some personal reason, have been left unsummoned, but the complaint is far more likely to have come from the barons specially so called. Here the word pares is still used in its more general sense, but it is used in a way that might easily lead to its special use. On the other hand, it has been alleged that, by a statute of the later years of Henry III, it was formally ordained that no barons, or even earls, should come to parliament, except those whom the king should specially summon (see Selden, Z%tles of Honour, 589; Hallam, Middle Ages, ii. 142; Stubbs, Const. Hist., ii. 203). The existence of such a statute may be doubted ; but, as far as the barons are concerned, the story fairly expresses the facts of the case. Under First Edward I. an approach, to say the least, is made to the sigusil creation of a definite class of parliamentary barons. Drea Stubbs marks the year 1295 as “the point of time from guppnon which the regularity of the baronial summons is held to involve the creation of an hereditary dignity, and so to distinguish the ancient qualification of barony by tenure from that of barony by writ” (Const. Hist., iii. 437). In another passage (ii. 183) he thus marks the general result of Edward’s reign—

“The hereditary summoning of a large proportion of great vassals was a middle course between the very limited peerage which in France coexisted with an enormous mass of privileged nobility,

and the unmanageable, ever-varying assembly of the whole mass of feudal tenants as prescribed in Magna Carta.”

It may be thought that the hereditary nature of the barony is here put a little too strongly for the days of Edward I. One may certainly doubt whether Edward, when he summoned a baron to parliament, meant positively to pledge himself to summon that baron’s heirs for ever and ever, or even necessarily to summon the baron himself to every future parliament. The facts are the other way ; the summons still for a while remains irregular (see Nicolas, HMistorie Peerage, xxiv., xxv., ed. Courthope ; Lords’ Report, ii. 29, 290). But the perpetual summons, the hereditary summons, gradually became the rule, and that rule may in a certain sense be said to date from 1295. ‘That is, from that time the tendency is to the perpetual summons, to the hereditarysummons ; from that time anything else gradually becomes exceptional (cf. Const. Hist., ii. 203 with iii. 439); things had reached a point when the lawyers were sure before long to lay down the rule that a single summons implied a perpetual and an hereditary summons. It is not too much to fix the reign of Edward I. as the time when the hereditary parliamentary baronage began, without rigidly ruling that the king could not after 1295 lawfully refuse a summons to a man who had been summoned already.

From this time then we may look on the class of pat- oe liamentary barons with succession as beginning and steadily i. growing. And the admission of the barons had a great) ontary ~~ paronag’

1 “Responsum fuit, quod omnes tune temporis non fuerunt juxta tenorem magne carte sux, et ideo sine paribus suis tunc absentibus nullum responsum dare vocati auxilinm concedere aut prestare.”

PEERAGE

‘effect on the position of the older members of the House,

the prelates and earls. It was in fact their admission

(Lords? Report, i. 313; Stubbs, Const. Hist., ti. 389), when Rights of Archbishop Stratford secured the right of the peers (“ piers the peers

\ which gave the English peerage its distinctive character. | de la terre”) of both orders to be tried only by their peers Sed ie A house of earls, bishops, and great. abbots would have | in parliament (“en pleyn parlement et devant les piers ou pte 5 remained an official house. The earldom might pass from | le roi se fait partie”). It is worth noticing that at this

4 father to son; but it would pass as an hereditary office, | point the Lords’ Report stops to comment at some length

j entitling its holder to a seat by virtue of his office, just like | on the special position of the peerage now established. As

those lords who held their seats by virtue of offices which | the committee puts it,

did not pass from father to son. Indeed we must not forget the meaning of the word hereditary in early times. It is applied to whatever goes by succession, whether that succession is ruled by natural generation, by election or nomination, or by any other way. The office and estate of the bishop or abbot is hereditary in this sense; it must pass to some successor, and it is therefore often spoken of as hereditary. Indeed, as long as the earl was appointed, his office was hereditary only in the same sense as that of

whose seats were first purely personal and then purely hereditary in the modern sense, which helped more than

| anything else to do away with the official character of the

earls. And in so doing it helped to widen the gap between the spiritual and temporal lords. The earl and the baron

“The distinction of the peers of the rcalm as a separate class, by privileges confined to themselves personally as peers, and not extending to any others, but throwing at the same time all the rest of the free population into one

class, having all equal rights, is a singularity which marks the constitution of the English govern- ment, and was first apparently clearly established by this statute to which all the other subjects of the realm gave their assent.”

And again they remark (p. 314) that

“the confinement of the privilege of pcerage to those called the peers of the realm, as a personal privilege, giving no privilege or

! the bishop. The only difference was that the office of the | cven legal rank to their families, and moulding all who had not : bishop could not possibly become hereditary in the modern fee however high their birth, into the mass of the 4 , : : ‘ , has been considered an important feature in the consti- | sense, while the office of the earl easily might, and there- | tution of the government of England. It may have prevailed, and q fore did. But, if the earls had continued to have no fellows | probably did in some degree prevail, before; but by this statute 1 in the Upper House except the prelates, the earldom could | 1t was clearly and distinctly recognized.”

4 hardly have sunk into a mere rank. It was the addition | This is true; yet the object of the statute is not to shut i of a class which had no official position—save that which | out the peers’ children from privilege, but to assert the | their seats in parliament conferred upon them—a class | disputed privilege of the peers themselves. The exclusion

of the peers’ children from privilege is a mere inference, though a necessary one. No legislator ever decreed in so many words the exclusion of the children of peers from privilege, because no legislator ever decreed in so many words the privileges of the peers themselves.

By this time we may look on the position of the peerage The posi- as fully established. It is now fully received, as at least tion of the ordinary rule, that the baron who was once summoned the peer- should be always summoned, and that his right to the oo

summons should pass to his representative after him (Lords’ lished.

alike came to be looked on as sitting by some hereditary virtue of descent; their blood was said to be ennobled, while the bishop and the abbot still sat only by what might seem to be in some sort the lower claim of holding an elective office.

It is then to the days of Edward I. that we are to look, not strictly for the creation of peerage in the modern sense, but for the beginning of a system out of which peerage in that sense very naturally grew. In the words of the great . constitutional historian, Edward I. must,

“in the selection of a smaller number to be the constant recipi- ents of a summons, have introduced a constitutional change scarcely inferior to that by which he incorporated the representatives of the commons in the national council; in other words, he created the House of Lords as much as he created the House of Commons.”

That is to say, he did not create the first elements of either, which existed long before, nor did he give either its final shape, which neither took till afterwards; but he established both in such a shape that all later changes may be fairly looked on as merely changes in detail.

The succession of regular parliaments in the established sense of the word thus begins in 1295, and from that time we have a House of Lords consisting of prelates, earls, and barons, of whom the barons afe fast becoming hereditary as well as the earls. But the body so formed is still spoken of by various names (see Lords’ Report, i, 273, 277, 279, 302, 316 —where we find the word nobles—et al.).

itt ise The earliest use of the word peer in anything like its present

sense is found in the Act against the Despensers, 1322 (Lords’ Report, i. 281), where, as Bishop Stubbs says (Const. Hist., ii, 183), “it is used so clumsily as to show that it was in this sense a novelty.” The words are “prelatz, countes, baronnes, et les autres piers de la terre,” and again “nous piers de la terre, countes et barouns.” It comes again in the act of deposition of Richard IJ. (Lords’ Report, i. 349) in the form “pares et proceres regni Anglise, spirit- uales et temporales.” Nothing therefore can be plainer than that the spiritual lords were looked on as peers no less than the temporal.

The point indeed was formally settled at an intermediate time, namely by the Act of 1341

Report, ii. 28). In short the parliamentary position of baron has become successive, a word answering pretty well to hereditary in the older sense. A question might now arise as to the nature of the succession, a question which could not arise as long as the person summoned had no certainty that he would be summoned again. In other words, was it necessarily hereditary in the later sense of that word?

That is to say, the question of peerage by tenure, or rather Peerage the question whether the succession to a peerage might be heal

by tenure, now sprangup. Did the right to the summons, u

and hereby the right to the peerage, go with the territorial barony itself, or did it go according to the line of natural descent from the first baron? There was a good deal to be said for the first view. We cannot doubt that barony by writ arose out of barony by tenure, that is, that the writ of summons was originally sent only to persons who held by barony, and, as the phrase ‘“ majores barones” implies, not to all of them. If then the barony and the natural line of descent of the first baron should be parted from each other, it was by no means unreasonable to argue that the writ, a consequence of the tenure, should go with the actual barony rather than follow the line of natural descent. And the same notion seems implied in the ancient practice of sending writs to the husbands of heiresses, even, by the courtesy of England, after the death of their wives (see Stubbs, Const. Hist., iii. 438 ; LZest. Peerage, AXXVIU.). (On the other hand the natural feeling in favour of direct hereditary succession would tell the other way, especially as soon as the doctrine of the ennobling of the blood had fully come in. It is that doctrine more than anything else which has got rid alike of peerages by tenure, of peerages for life, and of peerages held by the husbands of heiresses. If the peerage could pass by marriage or purchase, the doc- trine of nobility of blood was set aside. Till that doctrine was fully established, there was nothing unreasonable in

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either practice. Again, as the hereditary right to the summons became the rule, writs, held to be no less heredi- tary than those issued to the barons by tenure, began, even under Edward I., to be issued to persons who had no baronial tenure at all (see Stubbs, Const. Hist., ii. 204; His- toric Peerage, xxvi.). This practice would of course tell in favour of strict hereditary succession and against succes- sion by tenure. The result has been that hereditary suc- cession became the rule, but that the claim of succession by tenure was brought forward in some particular cases, as the earldom of Arundel and the baronies of Abergavenny, Berkeley, and others. The case of the earldom of Arundel (more truly of Sussex) is discussed at length in the Lords' Report (i. 405 sq.), and it is held (ii, 320) to be the only case in which peerage by tenure has been allowed. Yet nothing can be more contrary to all ancient notions of an earldom than that it should follow the possession of certain lands and buildings, as the castle and honour of Arundel. What is chiefly proved is that by the eleventh year of Henry VI. the ancient notion of an earldom had passed away, and that the earldom had sunk to be a mere rank. The succession to the earldom of Arundel was settled by Act of Parliament in 1627 (Lords' Report, ii. 242), an Act whose preamble seems to acknowledge the fact of the earldom by tenure. But succession by tenure seems as distinctly agreeable to the oldest notion of a barony as it is contrary to the oldest notion of an earldom. The tend- ency of later times has been against it, because it contra- dicts the fancy about "ennobling" of blood; yet those who have at different times claimed a place in the peerage by virtue of baronies by tenure have not been without strong arguments in the way of precedent. The latest claim of the kind, that to the barony of Berkeley, was not formally decided. The facts and arguments will be found at great length in Appendix III. to Sir Harris Nicolas's Report on the Barony of Lisle. His conclusion is against the claim by tenure; yet it certainly seems that, when the castle of Berkeley, the tenure of which was said to carry with it the barony and peerage, was separated from the direct line of succession, as specially when the castle was held by the crown in the 16th century (see pp. 821-327), the heirs were not summoned to parliament, or were summoned as a new creation (see on the other hand Lords' Report, ii. 143). There is no strictly legal decision Order in of the general question ; but an order in council in 1669 council (Lords' Report, ii. 242) declares against barony by tenure, on T68°: regen ven grounds of expediency than of law. It was declared in the case of the barony of Fitzwalter that "barony by

tenure had been discontinued for many ages, and was not then in being, and so not fit to be revived or to admit any pretence of right to succession thereon.” And the Lords’ Committee (p. 241) give their own opinion that “the right of any person to claim to be a lord of parliament, by reason of tenure, either as an earl or as a baron, supposing such a right to have existed at the time of the charter of John, may be considered as abrogated by the change of circumstances, without any distinct law for the purpose.” That is to say, the claim was as legal as any other claim of peerage, resting equally on usage ; but it was inconvenient according to the new doctrine about blood being “ ennobled.” The same age which saw the earls and barons put on e shape of an hereditary peerage was also that which saw the order enlarged by the creation of new classes of peers. The ancient earls of England now saw men placed over their heads bearing the French titles of duke and marquess. Neither title was absolutely new in England ; but both were now used in a new sense. Duke and earl were in truth the same thing ; dua, afterwards supplanted by comes, was the older Latin translation of the English

New classes of th peers.

ealdorman or eorl, and eorl was the English word commonly used to express the dukes as well as the counts of other lands. So the marchio, markgraf, marquis, was known in England in his official character as the lord marcher. But now, first dukes and then marquesses come in as distinct ranks of peerage higher than earl. That the earls of England put up with such an assumption was most likely owing to the fact that the earliest dukes were the king’s own sons and near kinsmen, the first of all being the eldest son of Edward III. He was created duke of Cornwall in 1337, a duke dom to which the eldest son of the reigning sovereign is born. Marquesses began under Richard II. in 1386, when Robert Vere, earl of Oxford, was created marquess of Dub- lin and directly afterwards duke of Ireland (Lords’ Fifth Steport, 78, 79). Lastly, in the next century, the tale of the ranks of the temporal peerage was made up by the in- sertion of another French title, that of viscount, between the earl and the baron. John Beaumont was in 1440 created Viscount Beaumont (Lords Fifth Report, 235). The choice of a

title, as concerned England, was a strange one, since, at least from the Norman Conquest onwards, viscount, wcecomes, had been the everyday French and Latin description of the ancient English sheriff (see Stubbs, Const. Hist., iii. 486, andthe patent of creation in Lords' Report, v. 235, where the new viscount is placed "super omnes barones regni"). Since that time no title conveying the rights of peerage has been devised. The Lords' Committee (i. 470) look on it as doubtful whether such a power abides in the crown, and a decision in the spirit of the Wensleydale decision would most likely rule that such a creation would at least give no right to a seat in the House of Lords. Yet, if the crown be, as lawyers tell us it is, the fountain of honour, it is hard to see why its streams should not flow as readily in one age as in another. If Henry VI. could give his new invention of viscounts seats in parliament with precedence over barons, it is hard to see why James I. might not, if he had chosen, have given his new invention of baronets seats in parliament with precedence over dukes.

lished in the order of duke, marquess, earl, viscount, baron, the wor) But it must be noticed that duke, marquess, and viscount, " are strictly speaking titles in a sense in which baron is not. Baron in truth is very seldom used as a personal deserip- tion (Stubbs, Const. Hist., iii, 440), gxcept in two or three special cases which 'are hard to accofint for, those chiefly of the baronies of Stafford and Greystock (see Lords' Report, i, 261, 394; ii. 185). The baron is commonly described by some of the endless forms of senior, or as chivaler, or sometimes—doubtless if he held that particular dignity—as banneret, To this day, though in familiar speech all ranks of peerage under duke are often confounded under the common description of lord, yet the names marquess, earl, and viscount are all far more commonly heard than the name baron, which is hardly ever used except in the most formal language. As for bannerets, though they seem sometimes to be mentioned along with various ranks of peerage (Lords' Report, i. 328), it does not appear (see Stubbs, Const. Hist., iii. 446) that banneret ever really was a rank of peerage, like the others from baron up to duke. The invention of these new ranks of peerage undoubtedly helped to strengthen the notion of the temporal peerage as an order distinct both from all who are not lords of parliament and from the spiritual lords also. Another novelty also came in along with the dukes and marquesses. The right of the earls was immemorial; the right of the 17 barons had grown up by usage. Edward III.

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in 1328. This bestowal of an earldom as an hereditary rank is another process from granting an earldom, conceived as an office or even as anestate. Later in the century, in 1387, Richard II. began to create barons also by patent Historic Peerage, p. xlii.), and this form of creation gradu- ally supplanted the ancient peerage by writ. The object of this change seems to have been (see Historie Peerage, p. xxviii.) the better to mark the dignity as hereditary (for the hereditary nature of the barony by writ was after all only a matter of usage or inference), and at the same time to define the line of succession. This, in the baronies by writ, is said to be in the heirs-general of the grantee— words to be understood, as it would seem, of the heirs-general of his body only; in a barony or other peerage conferred by patent the line of succession may take any shape that the crown chooses, the most common limitation being to the heirs-male of the body of the grantee. Very

singular lines of succession have sometimes been chosen (Historic Peerage, xlv.), as specially in the case of the dukedom of Somerset in 1547, in which the line of the eldest son was placed after that of the second. And the manifest right of the crown to name no line of succession at all, that is, to create a life-peerage only, was often exer- cised in the first days of dukes and marquesses. A duke of Exeter was created for life as late as 1416. Perhaps the strangest case of all is the patent of the barony of Lisle in 1444, which may be called the creation by patent of a barony by tenure. The whole story of the Lisle barony has been dealt with by Sir Harris Nicolas in a separate volume (see also Lords' Report, ii. 199 sg. ; Stubbs, Const. LHist., iii. 437); but it is only this patent that concerns us. It seems to grant a barony with a seat in parliament to the grantee John Talbot and his heirs and assigns, being lords of the manor of Kingston Lisle (see the document, the language of which varies in different parts, in the Lords' Report, ii. 199; v. 243). This is certainly strange ; but, if we once grant the royal power to create peerages and to limit their succession at pleasure, it seems necessarily to follow that the crown may exercisé that power in any way that it chooses, whether by limiting it to the grantee personally or giving any kind of remainder that it is thought good.

The temporal peerage being thus fully established on its present ground in the course of the 15th century, we come in the course of the next two centuries to see the effect of the theories under which it had grown up. A series of deductions are gradually made, naturally enough as deductions from the premises; but then the premises can be admitted only by trampling ancient precedents under foot. First of all, we have the denial already spoken of of some of the personal privileges of peerage to the spiritual lords. This was silently brought about in the Tudor times, when Bishop Fisher and Archbishop Cranmer—one might perhaps add Abbot Whiting—were tried by juries in de- fiance of the principle laid down by Archbishop Stratford under Edward III. Against this course no remonstrance seems to have been made; indeed the times were not favourable for remonstrances, least of all for remonstrances made by spiritual persons. The doctrine that the spirit- ual lords were lords of parliament but not peers was estab- lished by a standing order of the House of Lords older than 1625, as it is referred to in the journals of the House in that year. It was then referred to a

committee of privi- leges for further consideration, but no report is recorded (cf. Coke's Institutes, ii. 30).

Presently all the powers both of the spiritual and the temporal lords were for a while extinguished, and those of the spiritual lords by an undoubted legislative act. The Act of 1642, by which the bishops lost their seats In par- liament, stands distinguished, as a real and lawful act of

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the legislature, from the process by which so much of the so-called law on the subject grew up through a series of resolutions, dictated mostly, we may venture to say, neither by precedent nor by written law, but by the prejudices and assumptions ofa particular class of men. The exclusion of the bishops by the regular Act of 1642 was followed in 1649 by the less regular exclusion of the temporal lords also. 'The House of Lords was abolished by a vote of the House of Commons only. The essence of peerage was thus taken away, but the peers kept their titles and pre- cedence, and they were allowed to be chosen to seats in the House of Commons. When the old parliamentary con- stitution revived in 1660, the Act of 1649 was naturally treated as null, while the Act of 1642 was of course treated as valid. In 1660 therefore a House of Lords again sat which consisted of temporal lords only. But the bishops were restored to their seats by an Act of the next parlia- ment in 1661, and the lords again ordered a committee 'to consider of an order in the standing orders of this House which mentions the lords the bishops to be only lords of parliament and not peers, whereas several Acts of Parlia- ment mentions them to be peers." Nothing came of the labours of this second committee, and the doctrine which it was to consider has since been held for law. Both the doctrine and the reason for it have raised the indignation, not only of the two great constitutional historians, one of them himself a churchman, but of at least one great legal authority (see Blackstone, book i. c. 12, vol. i. p. 401, ed. Christian ; and contrast Stephen, Vew Commentaries, 11.590, and Kerr's Blackstone, i. 407 ; cf. Hallam, Iftddle Ages, i1. 138; Lords' Report, ii. 323, 339). The attack on the rights of the spiritual lords was carried yet further by the Com- mous in the case of the earl of Derby in 1679, when they objected to their voting on an impeachment even in its pre- liminary stages. Their right to take a

part inall such pro- ceedings up to the question which might involve life or death (a share in which on the part of churchmen would be con- trary to canon law) is asserted by the eleventh article of the Constitutions of Clarendon (Stubbs, Select Charters, 133). The question now raised, which was decided in favour of the bishops, according to the terms of the Constitutions, did not directly touch the question of the peerage of the bishops, but it had an indirect connexion with it. The denial of the bishops' peerage implied that they had no right to be tried as peers in the court of the king in par- liament, as not being, as the phrase goes, '"'of trial by nobility." It might therefore be plausibly argued that they had no right to be judges in that court. The right of the bishops to vote on a bill of attainder, which, on any canonical ground, would seem quite as objectionable as their voting on an impeachment, was never denied, because a bill of attainder is a legislative act, and does not touch the question of peerage. Indeed, we may say that the law is still far from clear on the whole matter. The statute of 1696 (7 and 8 Will. TIL.) for "regulating of Trials in cases of Treason and Misprision of Treason" speaks of "trials of peers" and of "all the peers who have a right to sit and vote in parliament," without distinctly defining whether the word peer is meant to apply to the lords temporal only.

In the same century another step in the development of the theory of peerage was taken by the resolutions of the lords in 1640 and 1678 that a peer could not relin- quish his peerage. This inference also, whatever may be thought of it, though distinctly against earlier precedents, follows (see Lords' Keport, ii. 25, 26, 48) directly from the doctrine of "ennobling of blood."

The next point in the history of the peerage is one which, like the exclusion of the bishops in 1642, was a matter of real legislation, as distinguished from mere

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of the House of Lords,

Question of the bishops' peerage.

Bishops’

votes on

impeach- ment.

Aliena- tion of peerages for- bidden.

The peers of Scotland.

Peerage Bill of IAS

decisions and resolutions. This was the change in the theory of peerage which followed on the union of England and Scotland in 1707. By the treaty of union the peerage of Scotland was to be represented by sixteen of its number chosen for each parliament by the Scottish peers them- selves. This amounted, as has been already set forth, to the creation of a class of men who are peers as concerns their personal privileges, but who are lords of parliament only in posse and not im esse. The Scottish peers were made incapable of sitting in the House of Commons, and the Scottish peerage was doomed to gradual extinction, as no new peers of Scotland were to be created. And further, by a resolution of the lords in 1711, it was held during the greater part of the last century that a patent of peerage of the United Kingdom granted to a Scottish peer did not give him a seat in parliament. Presently an attempt at legislation with regard to the peerage was made which, if carried, would have altogether changed its character. This was the Peerage Bill of 1719. That bill was not carried, but its proposals are worth notice, not only because they would, if they had become law, have altogether changed the nature of the peerage as a political institution, but also because they illustrate the way in which, like everything else in English constitutional history, the peer- age and everything belonging to it had grown up gradually by force of precedent. The right of the crown to create peers at pleasure, and to entail their peerages on any line of succession that it thought good, had never been disputed, but neither had it ever been the subject of any legislative enactment. The proposed bill, in limiting both powers, would have given them their first being by formal legisla- tion. The

proposal was that the peerage of the United Kingdom should, after a creation of six peers, be confined to its existing number, with an exception in favour of members of the royal family. For the future, with that exception, no peerage could be created, except when one had become extinct. Instead of the sixteen elective peers of Scotland, the king was to bestow hereditary seats on twenty-five members of the Scottish peerage, and the number was to be kept up by a new promotion whenever any of the twenty-five peerages became extinct. It was forcibly remarked at the time that this would place the re- mainder of the Scottish peerage in a condition politically inferior to that of all other British subjects, as they would have been incapable both of sitting in either house of parlia- ment and of choosing those who should sit in either. But the general effect of the bill on the constitution of the country would have been far more important. The crown would have lost one of its chief powers, and the relations between the peers and the rest of the nation would have been altogether changed. They would not have come any nearer to the strict notion of a nobility, for it was not pro- posed to confer direct privilege on any but the peers them- selves. But the bill would have placed both the peers and their families in a wholly new position. They would have become a body into which no one could be raised, except in the occasional case of a peerage becoming extinct. It would have been impossible to move a statesman from the Commons to the Lords at any moment when it might be for the public good that he should be moved. Even the lord chancellor, the speaker of the House of Lords, could not have received a peerage unless one chanced to be extinct at the needful time. It is plain that the peers, if they did not become a nobility, would have become an oli- garchy, a close body, cut off both from the crown and from the mass of the people in a way in which they had never been cut off before.

The next change in the peerage was that which followed the union with Ireland in 1800. The terms of that union, as regarded the peerage, differed a good deal from those of

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the union with Scotland. The twenty-eight representative The peers of Ireland are chosen for life, and the other Irish peerso peers are capable of

sitting in the House of Commons for Melani) constituencies in Great Britain ; only by so doing they loge the privileges of peerage (other than mere titles and pre- cedence) so long as they are members of that body. The Trish peerage is not doomed to extinction as well as the Scottish ; one Irish peerage may always be created when- ever three have become extinct, and the Irish peerage is always to be kept up to the number of one hundred, not counting those who hold peerages of the United Kingdom.

The changes with regard to the lords spiritual intro- trisha duced by the union with Ireland, by the disestablishment Englisi) of the Irish Church, and by the increase in the number bishop: of English bishoprics have affected the character of the House of Lords, but not that of the hereditary temporal peerage. By the Act of Union one Irish archbishop and four bishops—afterwards only three—were entitled to seats in rotation, changing, not from parliament to parliament, but from session to session. This arrangement was probably practically more convenient ; but it seems contrary to the nature of a summons, which must surely be a summons for the whole life of a parliament. Each Irish bishop was thus an in posse lord of parliament, like the Scottish and Irish temporal peers, only with the certainty of a seat some time, if he lived long enough. By the Act of Disestablishment in 1869 the Irish bishops lost their seats altogether. And by two Acts of the present reign the English prelates, except the holders of the two archiepiscopal sees and those of London, Durham, and Winchester, have their position completely changed. The number of bishops has been in- creased, but not the number of spiritual lords. The bishop therefore who holds any see but one of those five waits for his summons to parliament till he reaches it by seniority. Till then he too is a lord of parliament in posse.

In our own day too we come, in 1856, to the case of Life. the Wensleydale peerage, which has been already referred peers) to (see May, Constitutional History, i. 291-298). James Parke was by letters-patent created a peer for life Case « only, and a summons to parliament was issued to him accord- Lord ingly. This was a return to the ancient practice of the 14th b and 15th centuries ; but the power does not appear to have = been exercised in later times except in the case of peeresses (see Nicolas, Historic Peerage, xlvi.; May, i. 292). One hardly knows what to make of such creations as those of Lord Hay in 1606 and Lord Reede in 1644, the accounts of which in the

Historic Peerage (xlvi. 243, 394) seem some- what contradictory. But, if the creation of Lord Hay was a real creation of a peer for life, but without the right to a seat in parliament, it was so defined by a clause in the patent itself, which would seem to imply that, without such a clause, the creation would have given a right to a seat in parliament. The right of the crown to create life-peers, though not exercised, was constantly asserted by the best lawyers, and it is admitted even in the Lords' Report (ii. 37; see May, i. 294). Yet in 1856 the House of Lords took upon itself, in defiance of the whole history of their order, to refuse admission to a baron lawfully created, law- fully summoned, merely because the crown had not bound itself, in the 19th century any more than in the 13th or 14th, to summon the representatives of the baron so created for ever and ever. This decision seems to be now accepted as law; yet it is hard to see how, except when they have been taken away by Act of Parliament, any powers which were exercised by Edward I. can be refused to Queen Victoria. In short, the rights of the crown, the reasonand expediency of the case, were all sacrificed to the supersti- i tion about "ennobling of blood." And Sir T. E. May, re- cording the resolution with admiration (i. 296), tells us that "by constitutional usage, having the force of law, the House

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toa seat in parliament." out that the House of Lords contained other members whose seats were not "'hereditary" in the modern sense, and we can hardly think that he used that word in its ancient meaning. The crown yielded to the pretensions of the lords; Lord Wensleydale received a fresh creation by a patent extending to his imaginary heirs, and it is to be presumed that he was thereby "ennobled in blood" to the satisfaction of those with whom he had to sit. While

rds of the question of life-peerage was left in abeyance, the official

peerages referred to at the beginning of this article were created by an act of 1876. These are the Lords of Appeal in Ordinary, paid officers who hold their office, hike other judges, during good behaviour, who are lords of parliament, with a right to a writ of summons to sit and vote so long as they hold office, and who rank for life as barons with such titles as the crown may appoint. In the case therefore of the resignation or removal from office

of a lord of appeal we should have the non-parliamentary baron revived. Whether in such a case he would be entitled to be tried in the king's court in parliament does not appear. Nor does the Act rule whether the lord so created is a peer, either while he is a lord of parliament or after he ceases to be such. The doctrine of "ennobling of blood" would seem to imply that, as his title is not hereditary, he is not a peer. It would follow then that a lord of appeal who has resigned or has been removed, though "entitled to rank as a baron for life," is a baron who is neither a peer nor a lord of parliament.

A peerage, by the decisions of 1640 and 1678 (Lords' Report, ii. 25, 49) cannot be either surrendered to the erown or alienated to any other person. It can be for- feited only by attainder or by Act of Parliament. Of this last process there seems to be only one case, that of George Neville, duke of Bedford, degraded by parliament in the reign of Edward IV., as not being wealthy enough to support his dignity. This of course, like attainder by Act of Parliament, comes under the general principle that parliament may do anything. It is further held (Historec Peerage, \xviii.) that, while an attainder for high treason extinguishes a peerage of any kind, an attainder for felony only extinguishes a peerage by writ, but not a peerage by patent. A peeress in her own right by descent or creation has all the privileges of a peer, except that of sitting in parliament, which is suspended while the peerage is held by a female, but revives when it passes to a male heir. The wife or widow of a peer, not being a peeress in her own right, has also the same privileges ; but she loses them if she marries a commoner. By social usage she keeps her title, but, if charged with treason or felony, she is tried by a jury and not by the lords. Ifa peerage which passes to heirs-general, like the ancient baronies by writ, is held by a man who leaves no son, but more than one daughter, the peerage goes into abeyance ; that is, it is held by no one till the abeyance is terminated. If there comes to be only one person representing the claims of all the sisters, he can claim the termination of the abeyance as a matter ofright. The crown also can terminate it at any moment in favour of any of the persons between whom it is in abeyance, that is, in favour of the representative of any of the sisters. It is by this transmission through females that the ancient baronies have mainly lived on, often overshadowed by higher but more modern titles. Those peers who can show a direct succession in the male line from 1295 are few indeed. By female succession also the titles of these and other ancient baronies have in

most cases got parted from the original surnames of the holders. This seems to

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of Lords had been for centuries a chamber consisting of hereditary councillors of the crown," and that "the crown could not change its constitution by admitting a life-peer Three pages further on he found

A67 have led to the practice, which of late has been rather the rule than the exception, of creating peers with fancy titles, often very strange ones, sometimes neither their own surnames nor the name of any place with which they have anything todo. Yet, by a survival of the ancient notion of barony, the baron is always created Lord A of B (per- haps more strictly Lord A, Baron of B), though the place named is by no means always his own manor. The earl of course could originally be only the earl of a shire—the name of the shire and of the shire-town being often used indifferently. But, as the order of earls became more numerous, and as the official character of the earldom was quite forgotten, men were made earls of places of all kinds, and in modern times a surname has often been the title of both earls and marquesses. It is needless to say that the titles of marquesses, when territorial, have had no necessary reference to the original meaning of the title, as keeper of amarch. The titles of dukedoms seem always to have been territorial, unless in the singular case of "Duchess Dudley" in the reign of Charles I. Dudley was the lady's surname ; she does not seem to have been in any sense duchess of the town of Dudley. Clarendon always talks of "Duke Hamilton"; but here the surname is taken from a place. Viscounts take their titles both from names and places; but the viscount who has a territorial title is never spoken of as viscount of A, as the duke is always, and the marquess and the earl in language which is at all formal.

Children of peers have a definite precedence and an Position

elaborate system of courtesy titles and epithets which perplexes foreigners and sometimes natives. The eldest son of a peer ranks immediately after peers of the rank next below that of his father ; the younger sons rank after peers of the next degree below that. Thus a duke's eldest gon ranks next after marquesses ; a marquess's eldest son ranks next after earls, and a

duke’s younger son next after eldest sons of marquesses. The precedence of daughters follows the general principle, the principle implied in the doctrine of abeyance, that all daughters rank with the eldest son. Then again the eldest sons of dukes, mar- quesses, and earls bear by courtesy the second title of their fathers, and the eldest sons of the eldest sons of dukes and marquesses bear what may be called the grand- father’s third title. All these, though called by a title of peerage, are, as we have already had need to insist, legally commoners ; but the eldest sons of peers have been not uncommonly summoned to the House of Lords by the title of some barony held by their fathers. Their pre- cedence is in no way affected by the title which they may happen to bear. The eldest son of a duke always ranks next after marquesses, whether his courtesy title, that is the second title of his father, is marquess or baron. The younger sons of dukes and marquesses bear the courtesy title of Lord with the Christian and surname, and, on the principle which regulates the precedence of daughters, the title of Lady extends to the daughters of earls as well as to those of dukes and marquesses. The daughter of a peer married to a commoner keeps her rank ; but, if she marries a peer, she takes the rank of her husband, whether that be higher or lower than the rank which she has by birth. In all these matters the substantial privileges of the peerage and its mere honorary titles and precedence are often at curious cross purposes with one another. All sons of peers are esquires of right. By courtesy all children of peers who do not bear any higher title are entitled to the conventional epithet of “honour- able”; “noble” they are not in any, even conventional, sense. The style formerly was, with perfec correctness, “Hon. A B, Esq.” The “Esq.” is now left out; it is not easy to see why.

of children of peers.

The Twelve Peers of France.

It is curious to compare the peerage of England, and the peerages of Scotland and Ireland formed after its model, with the famous body of the twelve peers of France, from which we cannot doubt that the name pares was transferred to the English assembly of witan, magnates, or proceres, The twelve were the archbishop and duke of Rheims, the bishops and dukes

of Langres and Laon, the bishops and counts of Beauvais, Noyon, and Chalons, the dukes of Bur- gundy, Normandy, and Aquitaine, the counts of Flanders, Toulouse, and Champagne. The list of the spiritual peers, a little startling at first, is easily understood when we take in the circumstances of the French kingdom in the 12th century. The six prelates are those who held of the king of the French as king; the other great churchmen of the Western Kingdom held either of one of the vassal princes (as the archbishop of Rouen did of the duke of the Nor- mans) or of the king as duke, as did among others the bishop of Paris, whom at first sight we might have looked for on the list. The institution of this body is commonly attributed to the age of Philip Augustus, and indeed to that king personally ; and it can hardly be doubted that it had its origin in the romances of Charlemagne. The twelve peers are said to have appeared at Philip's corona- tion, and also to have formed the court by which John, duke of the Normans and king of the English, was deprived of the lands that he held in fief of the French crown. But it is certainly hard to see them all in the character of twelve peers on either occasion, though it is certain that some of them were present at Philip's corona- tion in 1179, and among them the then duke of the Nor- mans and husband of the duchess of Aquitaine, Henry king of the English.!_ Nor does the exact name of pares seem to be given by any contemporary writer to the body by which John is said to have been condemned, though it is so used in the next century (see Preclara Francorum Lacinora, ap. Duchesne, er. Franc. Script., v. 764). But

PEGASUS, a famous horse of Greek fable, was said to have sprung from the trunk of the Gorgon Medusa when her head was cut off by Perseus. Bellerophon caught him as he drank of the spring Peirene on the Acrocorinthus at Corinth, or (according to another version) received him tamed and bridled at the hands of Athene. Mounted on Pegasus, Bellerophon slew the Chimera and overcame the Solymi and the Amazons, but when he tried to fly to heaven on his back the horse threw him and continued his heavenward course. Arrived in heaven, Pegasus served Zeus, fetching for him his thunder and lightning. Hence some have thought that Pegasus is a symbol of the thunder- cloud. In later legend he is the horse of Eos, the Morning. Pindar and later poets represent him as winged. The name is from wyyds, "compact," "stout." The erroneous derivation from 7yy7%, "a spring of water," may have given birth to the legends which

connect Pegasus with water, as that his father was Poseidon, that he was born at the springs of Ocean (like the fabulous Indian horse Uééaihs- ravas, prototype of horses, produced at the churning of Ocean), and that he had the power of ‘making springs gush from the ground by a blow of his hoof. This was said to have been the origin of Hippocrene (Horse-spring), the fountain of the Muses on Mount Helicon, as well as of another spring of the same name at Trcezen. But there are facts that speak for an independent mythological con- nexion between horses and water, e.g., the sacredness of the horse to Poseidon, the epithets Hippios and Equester

1 See Rigordus, De Gestis Philippi Augusti, ap. Duchésne, Hist. Franc. Seript., V.; Will. Arm., 74. 101; Ben. Petrib. 242, ed. Stubbs ; Matthew Paris, ii. 658, ed. Luard; cf. Sismondi, Mistoire des Fran- cats, 1., 863, 489-492,

that there was an acknowledged body of peers of France in the 13th century is shown, if by nothing else, by the speech of Peter bishop of Winchester quoted above. Gradually all the temporal peerages became united with the crown, save only Flanders, which was released from vassalage when the emperor Charles V. was its count. It therefore became need- ful on ceremonial occasions that, while the spiritual peers appeared in person, the temporal peers should be repre- sented by persons who were created peers for the occasion, The later peerage of France, those dukes, counts, and barons The er who were distinguished as peers, dates from the 14th cen- French tury. The duchies so distinguished were at first confined Peerage. to the royal family, and in some sort represented the ancient peerage; but the title of duke and peer was atfter- wards extended to others, among them in 1674 to at least

one prelate, that of Paris, then become an archbishopric.

The counties and baronies distinguished as peerages were

but few, and most of them were reunited to the crown;

they are therefore much less known than the duchies. In

the more modern use of the word, the Chamber of Peers The dates from the charter of Louis XVIII. in 1814. It was a Chamber body of hereditary members created by the crown after the % Peers model of the temporal peerage of England. After the revolu-

tion of 1830 this was changed into a Chamber of Peers for

life, which ‘ceased to exist” at the revolution of 1848.

The fullest account of the origin and growth of the English peer- age will be found in the five volumes of the Reports of the Lords’ Committees towehing the Dignity of a Peer of the Realm (1820-1829). The mass of information brought together is wonderful, and, though the prejudices of the order sometimes peep through, the general treatment of the subject is on the whole fair and highly creditable, especially when we remember that the inquiry was begun before any light had been thrown on the subject by modern research. Besides this, the works of Selden, Hallam, Nicolas, and Stubbs have been, as will have been remarked, constantly referred to throughout the article. But it is sometimes curious to compare the point of view of a professional antiquary like Sir Harris Nicolas with that of the two great constitutional historians. (E. A. F.)

applied to Poseidon and Neptune, the Greek fable of the origin of the first horse (produced by Poseidon striking the ground with his trident), and the custom in Argolis of sacrificing horses to Poseidon by drowning them in a well. (The Illyrians similarly sacrificed horses by drowning.) From his connexion with Hippocrene Pegasus has come to be regarded as the horse of the Muses and hence as a symbol of poetry. But this is a modern attribute of Pegasus, not known to the ancients, and dating only from the Orlando Innamorato of the Italian poet Boiardo.

PEGU, a division of British Burmah, comprising the districts of Rangoon, Hanthawaddy, Tharawadi, and Prome, has an area of 9159 square miles, with a population (in 1881) of 1,162,393. The province of Pegu was annexed by the British after the second Burmese war in 1852-53.

PEcU, an ancient town in the Rangoon district of British Burmah, is situated on the Pegu river, 20 miles west of the Tsit-toung, in 17° 20’ N. lat.

and 96° 30’ E. long. It was founded in 573 a.p., and was for a long time the capital of the Talaing kingdom, overthrown by Aloung-bhura in the middle of the 18th century. Early European travellers describe the city as of great size, strength, and magnificence. Modern Pegu lies close to the river-side, and had a population in 1881 of 5891.

PEHLEVI. See Pannavi.

PEIRCE, Bensamin (1809-1880), mathematician and astronomer, was born at Salem, Massachusetts, 4th April 1809. Graduating at Harvard College in 1829, he be- came mathematical tutor there in 1831 and professor in 1833. He had already assisted Bowditch in his transla- tion of the Mécanique Céleste, and now produced a series of mathematical text-books characterized by the brevity

‘following the example set him by preceding

the eyes of the succeeding sovereign Yung- ¥

and terseness which marks all his work and made his teaching unattractive to inapt pupils. To young men of real talent, on the contrary, his teaching and warm personal interest in their work were of the greatest advantage, and he holds a most honourable place in the development of American mathematics. After Bowditch’s death in 1838 Peirce stood at the head of American mathematicians ; but the first work that gave him a wider fame was his com- putation of the general perturbations of Uranus and Nep- tune (Proc. Amer. Acad., 1848). In 1849 he became con- sulting astronomer to the American Nautical Almanac, and for this work he prepared new tables of the moon (1852). Another piece of important astronomical work was his discussion of the equilibrium of Saturn’s ring, in which he showed that a fluid ring was necessarily unstable as well as a solid one. From 1867 to 1874 he was super- intendent of the coast survey; in 1857 he published his largest and most characteristic work, the System of Ana- lytical Mechanics. He himself, however, seems to have thought most of his Linear Associative Algebra (lithographed privately in a few copies, 1870 ; reprinted in the American Journ. of Math. 1882). His death took place at Cam- bridge, United States, on 6th October 1880.

PEKING or Pexin, the capital of the Chinese empire, is situated in 39° 54’ 36” N. lat. and 116° 27’ E. long, and stands on the northern extremity of the great al- luvial delta which extends southwards from its walls for 700 miles. For the last nine centuries Peking, under vari- ous names and under the dominion of successive dynasties, has, with some short intervals, remained an imperial city. Its situation near the north- “s ern frontier recommended it to the Tatar invaders ag a convenient centre for their power, and its peculiarly fortunate position as regards the supernatural terrestrial influ- ences pertaining to it has inclined succeeding Chinese monarchs to accept it as the seat of their courts. In 986 it was taken by an in- vading force of Khitan Tatars, who adopted it as their headquarters and named it Nan- king, or the “southern capital.” During the early part of the 12th century the Chinese recaptured it and reduced it from the rank of a metropolis to that of a provincial city of the first grade, and called it Yen-shan Foo. In 1151 it fell into the hands of the Kin Tatars, who made it a royal residence under the name of Chung-tu, or “central capital.” Less than a century later it became the prize of Jenghiz Khan, who, having his main in- terests centred on the Mongolian steppes, declined to move his court southwards. To

During the periods above mentioned the extent and boundaries of the city varied considerably. Under the Kin dynasty the walls extended to the south- west of the Tatar portion of the present city, and the foundations of the northern ramparts of the Khan-balik of Kublai Khan are still to be traced at a distance of about 2 miles in a northerly direction beyond the existing walls. The modern city consists of two parts, the nw: ch’ing, or inner city, commonly known to foreigners as the “Tatar city,” and the wat ching, or outer city, known in the same way as the “‘ Chinese city.” These names are somewhat mislead- ing, as the inner city is not enclosed within the outer city, but adjoins its northern wall, which, being longer than the nut ch’ing is wide, outflanks it considerably at both ends, as may be seen in the accompanying plan. The outer walls of the double city contain an area of about 25 square miles, and measure 30 miles in circumference. Unlike the walls of most Chinese cities, those of Peking are kept in perfect order.

Those of the Tatar portion, which is the oldest part of the city, are 50 feet high, with a width of 60 feet at the base and 40 feet at the top, while those of the Chinese city, which were built by the emperor Kea-tsing in 1543, measure 30 feet in height, and have a width of 25 feet at the base and 15 feet at the top. The terre-plein is well and smoothly paved, and is defended by a crenellated parapet. The outer faces of the walls are strengthened by square buttresses built out at intervals of 60 yards, and on

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his great successor Kublai Khan (1280-1294), however, the establishment of a capital within the frontiers of China became a necessity, and,

sovereigns, he made choice of Yenking, as he rechristened the city. With his usual magni- ficence, he rebuilt the town, which became J known in Chinese as Ta-tu, or “great capi- f tal,” and in Mongolian as Khanbalik, or “city | of the khan.” During the reign of the first (4 emperor of the dynasty (1368-1399) which jj succeeded that founded by Jenghiz Khan the)\4 court resided at the modern Nanking, but in | €

lo (1403-1425) the political advantages of a northern residence appeared so obvious that he transferred his court to Peking (i.¢., the northern capital), which has ever since been the seat of government,

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Plan of Peking. (Scale, one mile and a half to an inch.)

the summits of these stand the guard-houses for the troops on duty. Each of the sixteen gates of the city

is protected by a semicircular enceinte, and is surmounted with a high tower built in galleries and provided with countless loopholes.

The population of Peking is reckoned to be about 1,000,000, a number which is out of all proportion to the immense area enclosed within its walls. This disparity is partly accounted for by the facts that large spaces, notably in the Chinese city, are not built over, and that the grounds surrounding the imperial palace, private residences, and temples are very extensive. Viewed from the walls Peking looks like a city of gardens. Few crowded neigh- bourhoods are visible, and the characteristic features of the scene which meets the eye are the upturned roofs of temples, palaces, and mansions, gay with blue, green, and yellow glazed tiles, glittering among the groves of trees with which the city abounds. Enclosed within the Tatar city is the Hwang ch'ing, or "Imperial city," which in its turn encloses the Z'sze-hin ching, or " Purple For- bidden city," in which stands the emperor's palace. On the north of the Tsze-kin ch'ing, and separated from it by a moat, is an artificial mound known as the King shan, or "Prospect Hill." This mound, which forms a prominent object in the view over the city, is about 150 feet high, and is topped with five summits, on each of which stands atemple. It is encircled by a wall measuring upwards of a mile in circumference, and is prettily planted with trees, on one of which the last emperor of the Ming dynasty (1644), finding escape from the Manchu invaders impos- sible, hanged himself. On the west of Prospect Hill is the Se yuen, or '' Western Park," which forms part of the palace grounds. This park is tastefully laid out, and is traversed by a lake, which is mainly noticeable from the remarkably handsome marble bridge which crosses it from east to west. Directly northwards from Prospect Hill stand the residence of the Titu, or '"' governor of the city," and the Bell and the Drum Towers, both of which have attained celebrity from the nature of their contents,—the first from the huge bell which hangs in it, and the second from the appliances it contains for marking the time. The bell is one of five which the emperor Yung-lo ordered to be cast. In common with the others, it weighs 120,000 tb, is 14 feet high, 34 feet in circumference at the rim, and is 9 inches thick. It is struck by a wooden beam swung on the outside, and only at the changes of the night- watches, when its deep tone may be heard in all parts of the city. In the Drum Tower incense-sticks, specially prepared by the Astronomical Board, are kept burning to niark the passage of time, in which important

duty their accuracy is checked by a clepsydra. Another of Yung-lo's bells is hung in a Buddhist temple outside the north-west angle of the city wall, and is covered both on the inside and outside with the Chinese texts of the Lankdvatdra Sutra, and the Saddharma pundarika Sitra.

Turning southwards we again come to the Purple For- bidden city, the central portion of which forms the imperial palace, where, in halls which for the magnificence of their proportions and barbaric splendour are probably not to be surpassed anywhere, the Son of Heaven holds his court, gives audience to ambassadors from tributary states, and receives the congratulations of his ministers at the annual seasons of rejoicing. In the eastern and western portions of this city are situated the residences of the highest dignitarics of the empire; while beyond its confines on the south stand the offices of the six official boards which direct the affairs of the eighteen provinces. It was in the "yamun" of one of these boards—the Le Pu or board of rites—that Lord Elgin signed the treaty at the conclusion of the war in 1860,—an event which derives especial interest from the fact of its having been the first occasion on which a European plenipoten-

tiary ever entered Peking accompanied by all the pomp

and circumstance of his rank.

Outside the Purple Forbidden city the most noteworthy building is the Temple of Heaven, which stands in the outer or Chinese city. Here at early morn on the 22d of December the emperor offers sacrifice on an open altar to Shang-ti, and at periods of drought or famine presents prayers for relief to the same supreme deity. The altar at which these solemn rites are performed "consists of a triple circular marble terrace, 210 feet wide at the base, 150 in the middle, and 90 at the top." The uppermost surface is paved with blocks of the same material forming nine concentric circles, the innermost consisting of nine blocks, and that on the outside of. eighty-one blocks. On the central stone, which is a perfect circle, the emperor kneels, 'surrounded first by the circles of the terraces and their enclosing walls, and then by the circle of the horizon." In the same temple stands the altar of prayer for good harvests, which is surmounted by a triple-roofed circular

structure 99 feet in height. The tiles of these roofs are of glazed porcelain of the most exquisite deep- blue colour, and add a conspicuous element of splendour to the shrine, which even without their aid would inspire admiration by the grace of the design and the rare beauty of the materials employed in its construction.

The other powers of nature have shrines dedicated to them at the altar to Earth on the north of the city, the altars to the Sun and Moon outside the north-eastern and north-western angles respectively of the Chinese city, and the altar of Agriculture inside the south gate of the Chinese city. Next to these in religious importance comes the Confucian temple, known as the Awo-tsze-keen. Here there is no splendour ; everything is quite plain ; and one hall contains all that is sacred in the building. There the tablets of ‘‘the soul of the most holy ancestral teacher, Confucius,” and of his ten principal disciples stand as objects of worship for their countless followers. In one courtyard of this temple are deposited the celebrated ten stone drums which bear poetical inscriptions commemor- ative of the hunting expeditions of King Suen (827-781 B.C.), in whose reign they are believed, though erroneously, to have been cut; and in another stands a series of stone tablets on which are inscribed the names of all those who have obtained the highest literary degree of Z’sin-sze for the last five centuries.

In the south-eastern portion of the Tatar city is the observatory, which was built by order of Kublai Khan in 1296. During the period of the Jesuit ascendency in the reign of K’ang-he (1661-1721), the superintendence of this institution was confided to Roman Catholic missionaries, under whose guidance the bronze instruments now existing were constructed. Unlike the thoroughfares in the cities of central and southern China, the streets of Peking are wide and open, but, being unpaved and the soil being light and alluvial, they easily become almost impassable from mud in wet weather and ankle-deep in dust in dry weather. ° The inhabitants of Peking being consumers only, and in no way producers, the trade of the city is very small, and the article of the European treaties which prohibits foreign merchants from trading within the walls is, therefore, to be regretted only as an instance of the narrow-mindedness of the Chinese Government.

E. Bretschneider, Archeological and Historical Researches on Peking and its Environs (1876); 8. Wells Williams, The Aliddle Kingdom (1884); Edkins, Peking (1870). (R. K. D.)

PELAGIA, Sr. An Antiochene saint of this name, a virgin of fifteen years, who chose death by a leap from the housetop rather than dishonour, is mentioned by Ambrose (De Virg., iii. 7, 33 sq., Ep. xxxvii. ad Simpl.), and is the subject of two sermons by Chrysostom. More famous is

the story of another Pelagia of Antioch, a famous ballet- girl of the town, who, in the full flower of her beauty and guilty sovereignty over the youth of the city, was suddenly converted by the influence of the holy bishop Nonnus, whom she had seen and heard for a moment as he preached in front of a church which she happened to pass with her gay train of attendants and admirers. She sought out Nonnus, and her tears of genuine penitence overcame his canonical scruples ; she was baptized, and, disguising her- self in male attire and in the dress of a penitent, she retired to the grotto on the Mount of Olives which still bears her name, and there died after three years of strict penance. This story, which seems to combine with the name of the older Pelagia some traits from an actual history referred to by Chrysostom (om. lxvii. in Mat. § 3), is preserved in a narrative bearing the fictitious name of John, a deacon of the equally fictitious Nonnus, which by internal evidence is assigned by Usener to the second quarter of the 5th century. Usener, however, has shown that the very popular legend has a much older basis, and that, in common with a number of other female saints, including Marina or Marearira (q.v.), and Pelagia of Tarsus, whose story is closely akin to the Marina legend, Pelagia is only a Christianized travesty of an old local form of Aphrodite. The name of Marina or Pelagia is an epithet of Aphrodite ; the parallel figure of Anthusa in Seleucia of Cilicia bears a name to be explained by the Anthera of Cnossus; the corresponding saint at Tyre is Porphyria, corresponding to Venus Purpurissa, The contradictory attributes of a pure virgin and a penitent are explicable in legends proper to the Syrian coast, where Astarte-Aphrodite had corre- spondingly opposite forms and character; the masculine garb of the converted Pelagia is to be explained from the

hermaphrodite Aphroditus-Aphrodite of western Asia, the Cyprian Amathusia.

See Usener, Legenden der heiligen Pelagia, Bonn, 1879, and Gildemeister's edition of the Syriac version of the legend of Pelagia of Antioch, Bonn Univ. Progr. of 22d March 1879.

PELAGIUS. Of the origin of Pelagius almost nothing is known. The name is supposed to be a Grecized form of the Cymric Jforgan (muir, sea; gin, begotten). His contemporaries understood that he was of British birth, and gave him the distinctive appellation Brito. a large ponderous person, heavy both in body and mind, if we are to believe Jerome (‘“‘stolidissimus et Scotorum pultibus preegravatus”). Born during the second half of the 4th century, he was influenced by the monastic enthu- siasm which had been kindled in Gaul by Athanasius (336), and which, through the energy of Martin of Tours (361), rapidly communicated itself to the Britons and Scots. For, though Pelagius remained a layman throughout his life, and though he never appears in any strict connexion with a ccenobitical fraternity, he yet adhered to monastic disci- pline (“veluti monachus”), and distinguished himself by his purity of life and exceptional sanctity (“egregie Chris- tianus”). He seems to have been one of the earliest, if not the very earliest, of that remarkable series of men who issued from the monasteries of Scotland and Ireland and carried back to the Continent in a purified form the religion they had received from it. Coming to Rome in the be- ginning of the 5th century (his earliest known writing is of date 405), he found a scandalously low tone of morality prevalent. From his extant Commentaries on the Epistles of St Paul it may be gathered that men were encouraged to rely on a profession of the Christian creed, and on the magical efficacy of the sacraments, while they entirely neglected to cultivate a Christian character. This state of things Pelagius denounced. But his remonstrances were met by the plea of human weakness (‘‘durum est, arduum est, non possumus, homines sumus, fragili carne circum-

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dati”). Toremove this plea by exhibiting the actual powers of human nature became his first object. It seemed to him that the Augustinian doctrine of total depravity and of the consequent bondage of the will both cut the sinew of all human effort and threw upon God the blame which really belonged to man. Unless men had the power to do God’s will, it was vain for Him to declare it. And, if men believed they were incapable of virtue, they would make no effort to reach it. His favourite maxim was, “If I ought, I can.” Accordingly, he expressed unmeasured disapproval when he heard a bishop at Rome quoting with approbation the characteristic words of Augustine: ‘Give what Thou commandest, and command what Thou wilt.”

The views of Pelagius did not originate in a conscious reaction against the influence of the Augustinian theology, although each of these systems was developed into its ultimate form by the opposition of the other. Neither must too much weight be allowed to the circumstance that Pelagius was a monk, for he was unquestionably alive to the delusive character of much that passed for monkish sanctity. Yet possibly his monastic training may have led him to look more at conduct than at character, and to believe that holiness could be arrived at by rigour of dis- cipline. This view of things suited his natural tempera- ment, which was essentially matter-of-fact and somewhat shallow. Judging from the general style of his writings, his religious development had been equable and peaceful, not marked by the prolonged mental conflict, the spiritual turmoil, the hand-to-hand wrestling with God, the abrupt transitions, which characterized the experience of his great opponent. With no great depth of mind, he saw very clearly the thing before him, and many of his practical counsels are marked by sagacity, and are expressed with the succinctness of a proverb (‘‘corpus non frangendum, sed regendum est”), His interests were primarily ethical ; hence his insistence on the freedom of the will and his limitation of the action of divine grace.

The peculiar tenets of Pelagius, though indicated in the commentaries which he published at Rome previous to 409, might not so speedily have attracted attention had they not been adopted by Ceelestius, a much younger and bolder man than his teacher. Ccelestius had been trained as a lawyer, but abandoned his profession for an ascetic life. When Rome was sacked by the Goths (410) the two friends crossed to Africa. There Pelagius once or

twice met with Augustine, but very shortly sailed for Palestine, where he justly expected his opinions would be more cordially received. Ccelestius remained in Carthage with the view of receiving ordination. But Aurelius, bishop of Carthage, being warned against him, summoned a synod, at which Paulinus, a deacon of Milan, charged Ceelestius with holding the following six errors :—(1) that Adam would have died even if he had not sinned; (2) that the sin of Adam injured himself alone, not the human race ; (3) that new-born children are in the same condition which Adam was before the fall; (4) that the whole human race does not die because of Adam's death or sin, nor will the race rise again because of the resurrection of Christ ; (5) that the law gives entrance to heaven as well as the gospel; (6) that even before the coming of Christ there were men who were entirely without sin. To these propositions a 7th is sometimes added, " that infants, though unbaptized, have eternal life," a corollary from the third. Ccelestius did not deny that he held these opinions, but he maintained that they were open questions, on which the church had never pronounced. The synod, notwithstanding, condemned and excommunicated him. Ceelestius, after a futile appeal to Rome, repaired to Ephesus, and there received ordination.

In Palestine Pelagius lived unmolested and revered,

until in 415 Orosius, a Spanish priest, came from August- ine to warn Jerome against him. 'The result was that in June of that year Pelagius was cited before John, bishop of Jerusalem, and charged with holding that man may be without sin, if only he desires it. This prosecution broke down, and in December of the same year Pelagius was summoned before a synod of fourteen bishops at Diospolis (Lydda). The prosecutors on this occasion were two Gallican bishops, Heros of Arles and Lazarus of Aix, but on account of the illness of one of them neither could appear. The proceedings, being conducted in various lan- guages and by means of interpreters, lacked certainty, and justified Jerome's application to the synod of the epithet "miserable." But there is no doubt that Pelagius repu- diated the assertion of Ccelestius, that "the divine grace and help is not granted to individual acts, but consists in free will, and in the giving of the law and instruction." At the same time he affirmed that a man is able, if he likes, to live without sin and

keep the commandments of God, inasmuch as God gives him this ability. The synod was satisfied with these statements, and pronounced Pelagius to be in agreement with Catholic teaching. Pelagius natur- ally plumed himself on his acquittal, and provoked August- ine to give a detailed account of the synod, in which he shows that the language used by Pelagius was ambiguous, but that, being interpreted by his previous written state- ments, it involved a denial of what the church understood by grace and by man's dependence on it. The North- African church as a whole resented the decisions of Dios- polis, and sent up from their synods of Carthage and Mileve (416) an appeal to Innocent, bishop of Rome, who decided the question in favour of the African synods on "the broad, popular, and unanswerable ground that all Christian devotion implies the assistance of divine grace, that it is admitted in every response of the service, in every act of worship." And, though his successor Zosimus wavered for a time, influenced partly by his Greek training, which led him to consider the points in dispute as idle, and partly by the Confession of Faith which Pelagius had addressed to the see of Rome, he at length fell in with what he saw to be the general mind of both the ecclesiastical and the civil powers. For, simultaneously with the largely attended African synod which finally condemned Pelagian- ism in the West, an imperial edict was issued at Ravenna on 30th April 418, peremptorily determining the theological question and enacting that not only Pelagius and Ceelestius but all who accept their opinions shall suffer confiscation of goods and irrevocable banishment. Thus prompted, Zosimus drew up a circular inviting all the bishops of Christendom to subscribe a condemnation of Pelagian opinions. To this document signature was refused by nineteen Italian bishops, among whom was Julian of Ec- lanum (Apulia), a man of good birth, approved sanctity, and great capacity, who now became the recognized leader of the movement. But not even his acuteness and zeal could redeem a cause which was rendered hopeless when the Eastern Church (Ephesus, 431) confirmed the decision of the West.

Pelagianism.

The system of Pelagius is a consistent whole, each part involving the existence of every other. Starting from the idea that "ability limits obligation," and resolved that men should feel their responsi- bility, he

insisted that man is able to do all that God commands, and that there is, and can be, no sin wherc the will is not absolutely free,—able to ehoose good or evil. The favourite Pelagian formula, ‘Si necessitatis est, peecatum non est; si voluntatis, vitari potest,” has an appearance of finality which imposed on superficial minds. Ihe theory of the will involved in this fundamental axiom of Pelagianism is that which is commonly known as the “liberty of indifference,” or ‘‘power of contrary choice,”—a theory which affirms the freedom of the will, not in the sense that the individual is self- determined, but in the sense that in each volition and at each

moment of life, no matter what the previous career ~~of the indi~~ vidual has been, the will is in equipoisc, able to choose good or evil. We are born characterless (non pleni), and with no bias towards good or evil (ut sine virtute, ita et sine vitio). It follows that we are uninjured by the sin of Adam, save in so far as the evil example of our predecessors misleads and influences us (non propagine sed exemplo). There is, in fact, no such thing as original sin, sin being a thing of will and not of nature ; for if it could be of nature our sin would be chargeable on God the creator. This will, capable of good as of evil, being the natural endowment of man, is found in the heathen as well as in the Christian, and the heathen may therefore perfectly keep such law as they know. But, if all men have this natural ability to do and to be all that is required for perfect righteousness, what becomes of grace, of the aid of the Holy Spirit, and, in a word, of Christianity? Pelagius vacillates considerably in his use of the word “grace.” Sometimes he makes it equivalent to natural endowment. Indeed onc of his most careful statements is to this effect: “We distinguish three things—the ability, the will, the act (posse, velle, esse). The ability is in nature, and must be referred to God, who has bestowed this on His creature ; the other two, the will and the act, must be referred to man, because they flow from the fountain of free will” (Aug., De Gr. Christi, c. 4). But at other times he admits a much wider range to grace, so as to make Augustine doubt whether his meaning is not, after all, orthodox. But, when he speaks of grace “sanctifying,” “assisting,” and so forth, it is only that man may “more easily’ accomplish what he could with more difficulty accomplish without grace. A decisive passage occurs in the letter he’ sent to the sce of Rome

along with his Confessio Fidei: ‘‘ We main- tain that free will cxists generally in all mankind, in Christians, Jews, and Gentiles ; they have all equally received it by nature, but in Christians only is it assisted by grace. In others this good of their original creation is naked and unarmed. They shall be judged and condemned because, though possessed of free will, by which they might come to the faith and merit the grace of God, they make an ill use of their freedom; while Christians shall be rewarded because, by using their frce will aright, they merit the grace of the Lord and keep His commandments” (db., c. 38, 34). Pelagius allowed to grace everything but the initial determining movement towards salvation. He ascribed to the unassisted human will power to accept and use the proffered salvation of Christ. It was at this point his departure from the Catholic creed could be made apparent: Pelagius maintains, expressly and by implication, that it is the human will which takes the initiative, and is the determining factor in the salvation of the individual; while the church maintains that it is the divine will that takes the initiative by renewing and enabling the human will to accept and use the aid or grace offered.

Semipelagianism.

It was easy for Augustine to show that this was an ‘‘impia opinio” ; it was easy for him to expose the defective character of a theory of the will which implied that God was not holy because He is necessarily holy ; it was easy for him to show that the positions of Pelagius were anti-Scriptural (see AUGUSTINE) ; but, though his arguinents prevailed, they did not wholly convince, and the rise of Semipelagianism—an attempt to hold a middle course between the harshness of Augustinianism and the obvious errors of Pelagianism —is full of significance. This earnest and conciliatory movement discovered itself simultancously in North Africa and in southern Gaul. Inthe former ehurch, which naturally desired to adhere to the views of its own great theologian, the monks of Adrumetum found themselves either sunk to the verge of despair or provoked to licentiousness by his predestinarian teaching. When this was reported to Augustine he wrote two elaborate treatises to show that when God ordains the end He also ordains the means, and if any man is ordained to life eternal he is thereby ordaincd to holiness and zealous effort. But meanwhile some of the monks themselves had struck out a via media which ascribed to God sovereign

grace and yet left intact man's responsibility. A similar scheme was adopted by Cassian of Marseilles (hence Semipelagians are often spoken of as Afassilians), and was afterwards ably advocated by Vincent of Lerins and Faustus of Rhegium. These writers, in opposition to Pelagius, maintained that man was damaged by the fall, and seemed indeed disposed to purchase a certificate of ortho- doxy by the abusive epithets they heaped upon Pelagians (rane, musce moriture, &c.). The differentia of Semipelagianism is the tenet that in regeneration, and all that results from it, the divine and the human will are co-operating (synergistic) coefficient factors. After finding considerable acccptance, this theory was ultimately condemned, because it retained the root-principle of Pelagianism,— that man has some ability to will good and that the beginning of salvation may be with mau. The councils of Orange and Valence (529), however, which condemned Semipelagianism, did so with the significant restriction that predestination to evil was not to be taught,—a restrietion so agreeable to the general feeling of the church that, three centuries after, Gottschalk was sentenced to be

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degraded from the priesthood, scourged, and imprisoned for teaching reprobation. The questions raised by Pelagius continually recur, put, without tracing the strife as sustained by Thomists and Jansenists on the one side and the Jesuits and Arminians on the other, this article can only indicate the general bearing of the con- troversy on society and the church.

The anthropology of Pelagius was essentially naturalistic. It threatened to supersede grace by nature, to deny all immediate divine influence, and so to make Christianity practically useless. Pelagius himself did not carry his rationalism through to its issues ; but the logical consequence of his systein was, as Augustine

perceived, the denial of the atonement and other central truths of

revealed religion. And, while the Pelagians never existed as a sect separate from the church catholic, yet wherever rationalism has infected any part of the church there Pelagianism has sooner or later appeared ; and the term "' Pelagian" has been continued to denote views whieh minimize the effects of

the fall and unduly magnify man's natural ability. These views and tendencies have appeared in theologies which are not in other respects rationalistic, as, ¢.g., in Arminianism ; and their presence in such theologies is explained by the desire to remove everything which might seem to discourage human effort.

It is not easy to determine how far the vices which ate so deeply into the life of the church of the Middle Ages were due to the sharpness with which some of the severer features of the Augustin- ian theology were defined during the Pelagian controversy. The pernicious belief in the magical efficacy of the sacraments and the consequent defective ethical power of religion, the superstitious eagerness to accept the church's creed without examining or really believing it, the falsity and cruelty engendered and propagated by the idea that in the church's cause all weapons were justifiable, these vices were undoubtedly due to the belief that the visible church was the sole divinely-appointed repository of grace. And the sharply-accentuated tone in which Augustinianism affirmed ~~. man's inability quickened the craving for that grace or direct agency of God upon the soul which the church declared to be need~~ ful and administered through her divinely-appointed persons and sacraments, and thus brought a decided impulse to the development of the sacerdotal system.

Again, although it may fairly be doubted whether, as Baur sup- poses, Augustine was permanently tainted with the Maniehan notion of the inherent evil of matter, it can scarcely be questioned that his views on marriage as elicited by the Pelagian contro- versy gave a considerable impulse to the already prevalent idea of the superiority of virginity. When the Pelagians declared that Augustine's theory of original sin discredited marriage by the impli- cation that even the children of the regenerate were born in sin, he could only reply (De Nuptiis et Concupiscentia) that marriage now cannot partake of the spotless purity of the marriage of unfallen man, and that, though what is evil in concupiscence is made a good use of in marriage, it is still a thing to be ashamed of, —not only with the shame of natural modesty (which he does not take into aceount) but with the shame of guilt. So that, even although he is careful to point out the advantages of marriage, an indelible stigma is still left even on the lawful procreation of children.

The remark of Milman, that ‘‘all established religions subside into Pelagianism, or at least semi-Pelagianism,” is unexpected, but the converse remark, that ‘‘no Pelagian ever has or ever will work a religious revolution,” may be easily substantiated. It has indeed become a commonplace of historical science that in order to do or to endure great things men must believe in one form or other of predestination. They must feel confident that they are made use of by God to accomplish things that to Him seem worthy, and. that until these be accomplished no earthly power can defeat or harm them. They must feel that their will is embraced in the divine and empowered by it. And it is the consciousness of their own inipotence that leads men to yield themselves as instruments of the divine power. Pelagianism is the creed of quiet times and commonplace people; Augustinianism is the inevitable faith of periods that are dangerous and eventful, and in which men must exhibit some heroism.

Of the writings of Pelagius there have been preserved to us in the works of Jerome (5th vol. of Martianay’s ed., and 11th vol. of Vallarsi’s ed.) :—(1) Com- mentarii in Epistolas Pauli; (2) Epistola ad Demetriadem (also published sepa- rately by Semler, Halle, 1775); (3) Libellus Fidei. But in Augustine’s various Writings against Pelagianism (in the 10th vol., Bened. ed.) many passages are cited from the writings of Pelagius ; and in the appendix of the same volume a valuable collection of documents connected with the controversy will be found. In the ordinary histories of the chureh other authorities are mentioned, and reference need here be made only to Wiggers, Versuch. . . . des Augustinismus und Pelag. (Hamburg, 1833; translated by Emerson, Andover, 1840); Worter, Der Pelagianismus (2d ed., Freiburg, 1874); Guizot, Histoire de la Civilisation en

France, 5 legon); Mozley, Augustinian Doctrine of Predestination (London, 1855); and Cunningham, Historical Theology (Edin., 1863). Gi. D))

_PELAGIUS LI. pope from 555 to 560, was a Roman by birth, and first appears in history at Constantinople in the rank of deacon, and as apocrisiarius of Pope Silverius, whose overthrow in favour of Vigilius his intrigues pro-

moted. Vigilius continued him in his diplomatic appoint- ment, and he was sent by the emperor Justinian in 542 to Antioch on ecclesiastical business ; he afterwards took part in the synod at Gaza which deposed Paul of Alex- andria. In his official position he had amassed some wealth, which on his return to Rome he so employed among the poor as to secure for himself great popularity ; and, when Vigilius was summoned to Byzantium in 544, Pelagius, now archdeacon, was left behind as his vicar, and by his tact in dealing with Totila, the Gothic invader, succeeded in saving the citizens from murder and outrage. He appears subsequently to have followed his master to Constantinople, and there to have taken part in the Three Chapters controversy ; in 553, at all events, he signed the "constitutum" of Vigilius in favour of these, and for refusing, along with him, to accept the decrees of the fifth general council (the 2d of Constantinople, 553) shared his sentence of exile. Like Vigilius, he afterwards, how- ever, condemned the chapters, and accordingly, when the citizens of Rome, through the mediation of Narses, begged for the restoration of the pope and his clergy, both were ~ recalled from banishment. 'The emperor now asked the Roman representatives whom they should prefer—Vigilius or Pelagius—and it may safely be presumed that their reply, to the effect that they would not choose the latter as long as the former was alive, was hardly such as Justinian had expected or wished. Both set out for Rome, but Vigilius died mysteriously on the way at Syracuse. Pelagius, as the nominee of Justinian, at once succeeded on his arrival in Rome, but most of the clergy, suspecting his orthodoxy, and believing him to have had some share in the unlooked- for removal of his predecessor, shunned his fellowship, and only two bishops and one presbyter could be got to take part in his ordination to the pontificate. He enjoyed, however, the support of Narses, and, after he had publicly purged himself of the charge of complicity in Vigilius's death by solemn oath in the church of St Peter, he met with toleration, at least so far as his own inmediate diocese was concerned, the populace remembering his former charities and his success in dealing with Totila. The rest of the Western bishops, however, still held aloof

'from the man who, by condemning the Three Chapters,

had put a slight, as they thought, upon the council of Chaleedon; and the episcopate of Tuscany caused his name to be removed from the diptychs.

This elicited from him a circular, in which he asserted his loyalty to the four general councils, and declared that in their action against the holy see the hostile bishops had been guilty of schism. The bishops of Liguria and Aimilia, headed by the archbishop of Milan, and those of Istria and Venice, headed by Paulinus of Aquileia, also withheld their fellow- ship from one who had taken part in the council of Con- stantinople ; but Narses resisted the appeals of Pelagius, who would fain have invoked the secular arm. Childebert, king of the Franks, also, even after the pope had sent a confession of his faith, refused to interfere. Pelagius died on 3d March 560, and was succeeded by John CUE PELAGIUS IL, a native of Rome, but of Gothic descent, was pope from 578 to 590, having been conse- erated successor of Benedict L, without awaiting the sanction of the emperor, on 27th November of the former year. To make his apologies for this irregularity he sent deacon Gregory, who afterwards became Pope Gregory the Great, as his apocrisiarius to Constantinople. In 585 he sought to heal the schism which had subsisted since the time of Pelagius I. in connexion with the Three Chapters controversy by writing to the bishops of Istria with the exhortation to “avoid foolish and unlearned questions,” but his efforts as a peacemaker were without success. In 588 John, patriarch of Constantinople, by reviving the XVIII. — 60

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old and disputed claim to the title of cecumenic patriarch, elicited a vigorous protest from Pelagius, but the decretal which professes to convey the exact words of the docu- ment is now known to be false. He died in January 590, and was succeeded by Gregory I.

PELARGONIUM. See Geranium, vol. x. p. 439, and HORTICULTURE, vol. xii. pp. 263-4.

PELASGI. See Greercs, vol. xi. p. 90, and Iraty, vol. xii. p. 444.

PELEW, PELLEW, Pauav, or Patao, ISLANDS, a group in the western Pacific at the intersection of 134° 30’ E. long. by 7°, 8°, and 9° N. lat., which, as it is often con- sidered part of the Caroline Archipelago, has been described in the article CAROLINE IsLANDs, vol. v. pp. 125, 126. The name Islas Palaos, by which the islands are first designated, is of doubtful

but certainly not of native origin, and was originally applied by the Spaniards in an indefinite way to all the islands east of Mindanao (Philippines). The English form ‘‘ Pelew” may be a corruption either of Palao or of Peleliu (Pellelew), the proper name of one of the southern islands. According to Miklukho-Maklay (Jzvyest- zya of the Imp. Russian Geogr. Soc., 1878, pp. 257-297 ; cf. Zeitschr. f. Hthnol., Berlin, 1878) the ordinary nomen- clature on our maps is often erroneous, the correct forms being Babeltop, Kayangel (not Yanguel or Kiangle), N’yaur (not Angaur or Angour), Arkledeu (not Korph), Namalakal (not Amanakal), &c. The men vary in height from 5 feet to 5 feet 7 inches, the women from 4 feet 9 to 5 feet 2. The character of the hair differs greatly in different indi- viduals ; both sexes wear it wound up in a back-knot. Tattooing (but not of a very elaborate type) is in vogue, especially among the women, by whom the operation is always performed. The skull shows a strong tendency to brachycephalism. Adults of both sexes have their teeth carefully blackened by te/dalek (a kind of earth). Sir John Lubbock (Zhe Origin of Civilisation) places the Pelew Islanders among the peoples destitute of religion ; but Miklukho-Maklay found among them a well-developed Shamanism, every village having a kalit, or shaman, and the group containing five high kalits with an extensive jurisdiction. The ornithology of the Pelew Islands has been investigated by Dr Otto Finsch (Journal des Museum Godefroy, 1875), who enumerates fifty-six species, of which twelve are peculiar to the group. The occurrence of Gallus bankiva and the Nicobar pigeon and the absence of parrots and finches are points of interest.

PELHAM, Sir Henry (1696-1754), prime minister of England, was the younger brother of Thomas Holles Pel- ham, duke of Newcastle, and was born in 1696. He was educated bya private tutor and at Christ Church, Oxford, which he entered in July 1710. As a volunteer he served in Dormer’s regiment at the battle of Preston in 1715; subsequently he spent some time on the Continent, and in 1718 entered parliament for Seaford, Sussex. Through strong family influence and the recommendation of Walpole he was chosen in 1721 a lord of the treasury. The follow- ing year he was returned for Sussex county. In 1724 he entered the cabinet as secretary of war, but this office he exchanged in 1730 for the more lucrative one of paymaster of the forces. He made himself conspicuous by his support of Walpole on the question of the excise, and during the subsequent

attacks, which ultimately led to his resignation in 1742. In the following year a union of parties resulted in the formation of the administration of which Pelham was prime minister, with the additional office of chancellor of the exchequer. Being strongly in favour of peace, he carried on the war with languor and indifferent success, but the country, wearied of the interminable struggle, was disposed to acquiesce in his foreign policy almost without amurmur. The king, thwarted in his favourite schemes,

made overtures in 1746 to Lord Bath, but his purpose was upset by the sudden resignation of the Pelhams, who, how- ever, at the king's request, immediately resumed office, His very defects were, in the peculiar condition of parties, among the chief elements of Pelham's success, for one with a strong personality, moderate self-respect, or high concep- tions of statesmanship could not have restrained the dis cordant elements of the cabinet for any length of time. Moreover, he undoubtedly possessed the important re- quisites of considerable practical tact and a thorough acquaintance with the details of business and the forms of the House. Whatever quarrels or insubordination might exist within the cabinet, they never broke out into open revolt, and during his administration there was seemingly a complete lull in the strife of parties. Nor can a high degree of praise be denied to his financial policy, especially his plans for the reduction of the national debt and the simplification and consolidation of its different branches. He died 6th March 1754.

See Coxe, ALemoirs of the Pelham Administration, 2 vols., 1829.

PELIAS, PELIADES. Pelias, a celebrated character in Greek fable, was the son of Poseidon and Tyro, daughter of Salmoneus. Because Tyro afterwards married her father's brother Cretheus, king of Iolcus in Thessaly, to whom she bore Aison, Pheres, and Amythaon, Pelias was by some thought to be the son of Cretheus. He and his twin-brother Neleus were exposed by their mother, but were found and nurtured by a herdsman, who called one of them Pelias, because his face was discoloured by a blow from the hoof of a mare, and the other Neleus, because a bitch had out of pity suckled him. When grown to man- hood they discovered their mother, and Pelias slew Sidero, Tyro's stepmother, on the altar of Hera, whither she had fled,

because she had ill-used their mother. On the death of Cretheus Pelias made himself master of the kingdom of Ioleus. (According to others, after the death of his half-brother ‘son, he ruled as regent for Ason’s son Jason.) He had previously quarrelled with his brother Neleus, who went to Messenia, where he founded Pylus. Pelias married Anaxibcea, daughter of Bias, or, according to others, Philomache, daughter of Amphion, and became the father of a son, Acastus, and of daughters, Pisidice, Pelopea, Hippothoe, and Alcestis; to these daughters (called Peliades after their father) others add Amphinome, Evadne, Asteropzea, and Antinoe. In order to rid himself of Jason Pelias sent him to Colchis in quest of the golden fleece, and he availed himself of the absence of the son in order to put to death his father A’son together with his mother and brother. When Jason returned with the golden fleece he cast about how he should avenge the death of his parents. In this he was helped by Medea, who persuaded the Peliades to cut in pieces and boil their father Pelias, assuring them that he would thus be restored to youth. Acastus drove out Medea and celebrated far- famed funeral games in honour of his father. The Peliades fled to Mantinea in Arcadia, where their graves were shown in the time of Pausanias.

The tragic death of Pelias was the subject of Sophocles’s drama Lhizotomoi (Root-cutters), and in the 7’yro he treated another portion of the legend. Peliades was the name of Euripides’s first play.

PELICAN (Fr. Pélican, Lat. Pelecanus or Pelicanus), a large fish-eating water-fowl, remarkable for the enormous pouch formed by the extensible skin between the lower jaws of its long, and apparently formidable but in reality very weak, bill. The ordinary Pelican, the Onocrotalus of the ancients, to whom it was well known, and the Pelecanus onocrotalus of ornithologists, is a very abundant bird in some districts of South-eastern Europe, South-western Asia, and North-eastern Africa, occasionally straying, it is

believed, into the northern parts of Germany and France ; put the possibility of such wanderers having escaped from confinement is always to be regarded,! since few zoological gardens are without examples which are often in the finest condition. Its usual haunts are the shallow margins of the

larger lakes and rivers, where fishes are plentiful, since it requires for its sustenance a vast supply of them, pursuing them under water, and rising to the surface to swallow those that it has captured in its capacious pouch. The nest is formed among the reeds that border the waters it frequents, placed on the ground and lined with grass. Therein two eggs, with white, chalky shells, are commonly laid. The young during the first twelvemonth are of a greyish-brown, but this dress is slowly superseded by the growth of white feathers, until when mature almost the whole plumage, except the black primaries, is white, deeply suffused by a rich blush of rose or salmon-colour, passing into yellow on the crest and lower part of the neck in front. A second and somewhat larger species, Pelecanus crispus, also inhabits Europe, but in smaller numbers. This, when adult, is readily distinguishable from the ordinary bird by the absence of the blush from its plumage, and by the curled feathers that project from and overhang each side of the head, which with some differences of coloration of the pill, pouch, bare skin round the eyes, and irides give ita wholly distinct expression.? Two specimens of the humerus of as many Pelicans have been found in the English fens (Ibis, 1868, p. 363; Proc. Zool. Sonety, 1871, p. 702), thus proving the former existence of the bird in England at no very distant period, and one of them being that of a young example points to its having been bred in this country. It is possible from their large size that they belonged to P. crispus. Ornithologists have been much divided in opinion as to the number of living species of the genus Pelecanus (cf. op. cit., 1868, p. 264; 1869, p. 571; eeylp p. 631)—the estimate varying from six to ten or eleven ; but the former is the number recognized by the latest author on the subject, M. Dubois (Bull. Mus. de Belgique, 1883). North America has one, P. erythrorhynchus, very similar to P. onocrotalus both in appearance and habits, but remarkable for a triangular, compressed, horny excres- cence which is developed on the ridge of the male’s bill in the breeding season, and, as ascertained by Mr Ridgway (Ibis, 1869, p. 350), falls off without leaving trace of its existence when that is over. Australia has P. conspicillatus, easily distinguished by its black tail and wing-coverts. Of more marine habit are P. philippensis and P. fuscus, the former having a wide range in Southern Asia, and, it is said, reaching Madagascar, and the latter common on the coasts of the warmer parts of both North and South America.

The genus Pelecanus as instituted by Linneus included the Cormorant (vol. vi. p. 407) and Ganner (vol. x. p. 70) as well as the true Pelicans, and for a long while these and some other distinct groups, as the SNAKE-BIRDS (q.2.), FRIGATE-BIRDS (vol. ix. p. 786), and TRopPIC-BIRDS (g.2.), which have all the four toes of the foot connected by a web, were regarded as forming a single Family, Pelecanide ; but this name has now been restricted to the Pelicans only, though all are still usually associated under the name Steganopodes (OnNiTHOLOGY, p. 46). It may be neces- sary to state that there is no foundation for the venerable legend of the Pelican feeding her young with blood from (OI 1 =I aS ———— ———— EeEE—

1 This caution was not neglected by the prudent, even so long ago as Sir Thomas Browne's days; for he, recording the occurrence of a Pelican in Norfolk, was careful to notice that about the same time one of the Pelicans kept by the king (Charles II.) in St James's Park had been lost.

2 Tt is also said to have twenty-two rectrices, while the ordinary Species has only eighteen.

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her own breast, which has given it an important place in ecclesiastical heraldry, except that, as Mr Bartlett has suggested (Proc. Zool. Society, 1869, p. 146), the curious

bloody secretion ejected from the mouth of the Flamingo

may have given rise to the belief, through that bird having been mistaken for the "Pelican of the wilderness." (a. N.)

PELIGNI. See ITAty, vol. xiii. p. 444.

PELISSIER, Jean Jacquus Amante (1794-1864), duke of Malakhoff, marshal of France, was born 6th November 1794 at Maromme (Seine Inférieure), where his father was employed in a powder-magazine. After attend- ing the military college of La Fléche and the special school of St Cyr, he in 1815 entered the army as sub-lieutenant in an artillery regiment.

A brilliant examination in 1819 secured his promotion to the staff. He served as aide-de- camp in the Spanish campaign of 1823, and in the expedi- tion to the Morea in 1828-29, at the conclusion of which he received the grand cross, In 1830 he took part in an expedition to Algeria, and on his return was promoted to the rank of major. Nine years later he was again sent to Algeria as chief of the staff with the rank of lieutenant-colonel, and remained there in active service till the Crimean war, taking a prominent part in many important operations, and, by gradual promotion, advancing to the rank of general of division. The merciless severity of his conduct in suffocating a whole Arab tribe in a cavern, where they had taken refuge and refused to surrender, awakened in 1846 such a strong feeling of indignation in Europe that Marshal Soult, the French minister of war, expressed in the chambers his regret at its occurrence; but Marshal Bugeaud, the governor-general of Algeria, not only gave it his approval but shortly afterwards secured for Pélissier further promotion. On the declaration of war with Russia Pélissier was sent to the Crimea, where on 16th May 1855 he succeeded Marshal Canrobert as com- mander-in-chief of the French forces before Sebastopol. After the capture of the fortress he was, on the 12th September, promoted to be marshal. On his return to Paris he was named senator, created duke of Malakhoff (22d July 1856), and rewarded with a grant of 100,000 francs per annum. From March 1858 to May 1859 he acted as French ambassador in London, whence he was re-called to take command of the army of observation on the Rhine. In 1860 he was appointed governor-general of Algeria; and he died there 22d May 1864.

See AtcERIA (vol. i. pp. 568, 569); Marbaud, Ze daréchal Pélissier, 1863 ; Castille, Portraits Historiques, 2d series, 1859.

PELL, Jon (1610-1685), mathematician, was born on Ist March 1610 at Southwick in Sussex, where his father was minister. He was educated at the free school of Steyning, and entered Trinity College, Cambridge, at the age of thirteen. During his university career he made him- self an accomplished linguist, and even before he took his M.A. degree (in 1630) he was engaged in learned corre- spondence with Briggs and other mathematicians. His great reputation and the influence of Sir William Boswell, the English resident, with the States-General procured his election in 1643 to the chair

of mathematics in Amsterdam, whence he removed in 1646, on the invitation of the prince of Orange, to Breda, where he remained till 1652.

From 1654 to 1658 Pell acted as Cromwell's political agent to the Protestant cantons of Switzerland. On his return to England he took orders and was appointed by Charles IL. to the rectory of Fobbing in Essex, and in 1673 he was presented by Bishop Sheldon to the rectory of Laindon in the same county. His devotion to mathe- matical science seems to have interfered alike with his advancement in the church and with the proper manage- ment of his private affairs. Cheated, it is said, by his tenants and relations, he was reduced to the utmost

poverty. For a time he was confined as a debtor in the King's Bench prison. He lived, on the invitation of Dr Whistler, for a short time in 1682 at the College of Physi- cians, but died 12th December 1685 at the house of Mr Cothorne, reader of the church of St Giles in the Fields. He was buried at the expense of the rector of this church and of Dr Busby, the master of Westminster School. Many of Pell's manuscripts fell into the hands of Dr Busby, and afterwards came into the possession of the Royal Society ; they are still preserved in something like forty folio volumes, which contain, not only Pell's own memoirs, but much of his correspondence with the mathe- maticians of his time.

The Diophantine analysis was a favourite subject with Pell; he lectured on it at Amsterdam; and he is now best remembered for his solution of the indeterminate equation, ax?—y?=1, which is now known by his name, and which had been proposed by Fermat as a challenge to the English mathematicians. His chief works are Astronomical History of Observations of Heavenly Motions and Appearances, 1634; Ecliptiea Prognostica, 1634; Controversy with Longomontanus coneerning the Quadrature of the Circle, 1646 (?) ; An Idea of the Mathematics, 12mo, 1650; Branker's Translation of Rhonius's Algcbra, much altered and augmented, 4to, 1668; A Table of Ten Thousand Square Numbers, fol., 1672.

PELLA. See Maceponta, vol. xv. p. 187.

PELLAGRA (Ital. pelle agra, smarting skin) is the name given, from one of its early symptoms, to a peculiar disease, of comparatively modern origin, occurring among the peasantry in Lombardy and other provinces of northern Italy, and in the Asturias (mal de la rosa), Gascony, Roumania, and Corfu. It is a progressive disease of nutri- tion tending towards profound paralytic and mental dis- orders, and is associated to a very significant extent, if not even invariably, with a staple diet of damaged maize along with other peculiarly wretched and hopeless con- ditions of living. Although Lombardy is the garden of Italy, its peasantry are over-worked, under-paid, and under- fed ; instead of a diet suited to their severe labour, their sustenance consists largely of the more worthless kinds of Indian corn of their own growing, the produce of poorly- cultivated ground, sown late, harvested before maturity, and stored carelessly in its wet state; even if they grow a certain proportion of good maize-corn the millers, to whom they are often in debt, are more likely to grind the worst samples for the peasants' own use. The flour is either made into a kind of porridge—the " polenta" of Italy, the "cruchade" of Gascony, or the ''mamaliga" of Roumania— or it is made into loaves, without yeast, baked hastily on the surface only or on one side, and raw and wet within, large enough to last a week, and apt to turn sour and mouldy before the week is out.!

That pellagra is not a morbus miseriz pure and simple, wanting some more specific cause, will be at once apparent when we consider that the misery of living is as old as the human race, whereas pellagra is a disease of the last hundred years or so, and that in Ireland, Russia, Upper Silesia, Galicia, or other headquarters of the morbi miserizx,

1 Of the peasantry of the Asturias, Townsend, a traveller of the last century, says:

"They eat little flesh, they drink little wine; their usual dict is Indian corn, with beans, peas, chestnuts, apples, pears, melons, and cucumbers ; and even their bread, made of Indian corn, has neither barm nor leaven, but is unfermented, and in the state of dough ; their drink is water" (ii. 14).

The following is the most recent account (by Dr Petit) of the condition of the peasantry in the pellagrous district of the Gironde :

“The cultivation of this district consists of millet, rye, a small quantity of maize, and a few rare vineyards. The soil does not suffice for the nourishment of the miserable population who cultivate it. They are slovenly, and slecp in their clothes ; their labour is in general of the severest kind, and they are very illfed. Their food is mostly a porridge of millet; maize is rarely part of their diet [elsewhere he says, “in all these provinces the flour of maize enters largely into the food of the people”, which includes a little rye-bread, sour most of the time, a few sardines, and rancid lard. Meat is almost exclnded from their food ; sometimes on féte-days one may see a quarter of mutton or veal at the repast. Their usual drink is water, and mostly bad water ; wine is not drunk except in well-to-do families. Their dwellings are deplorable ; they are low- roofed and damp, built of wattle, and constantly enveloped in reek. It often

happens that man and beast live together. Pellagra rages as an endemic among these populations.”

pellagra is unknown. The special factor is undoubtedly maize as an article of diet or as the staple diet; but it is, on the other hand, perfectly clear that there is nothing in a maize diet itself to induce pellagra. Compared with the enormous extent of the maize-zone both in the western and eastern hemispheres, the pellagra-area is a mere spot on the map ; excluding Corfu, it lies between the parallels of 46° and 42° N.; and the exception of Corfu is a signi- ficant one. It is only since 1856 that pellagra has become endemic in that island. Maize has always thriven well there ; but wine-growing has displaced it toa great extent, and the maize, which is still largely in request with the peasantry, is now mostly imported; it is in fact chiefly Roumanian maize of an inferior kind, and all the more deteriorated owing to its long water-transit by way of the Danube and Black Sea. Again, in the Danubian provinces themselves the peasantry of Transylvania, who are by no means well off, are free from pellagra, notwithstanding their addiction to polenta, having long ago learned the art of husbandry from the Saxon part of the population; they allow the maize to ripen to the utmost, and then let it dry on the ground and afterwards in barns, whereas the Wallack peasantry of Roumania, who are subject to pellagra, gather the corn before it is ripe, and

shoot it into pits where it becomes musty. In other countries where the conditions of climate and soil are somewhat trying for maize, as in Burgundy, Franche Comté, and the Bresse in France, and in Mexico, the greatest care is taken to dry the Indian corn before it is stored; and it may be said that wherever these precautions are taken pellagra does not follow. It has happened. on several occasions, after a particularly bad maize-harvest, that pellagra has risen almost to an epidemic. Again, its prevalence within its actual endemic area varies much from province to province or from commune to com- mune, being always last where the maize-diet is supple- mented by wheaten flour, rice, beans, chestnuts, potatoes, or fish.

Characters of the Disease.—The indications of pellagra usually begin in the spring of the year, declining towards autumn, and recurring with increasing intensity and per- manence in the spring seasons following. A peasant who is acquiring the malady feels unfit for work, suffers from headaches, giddiness, singing in the ears, a burning of the skin, especially in the hands and feet, and diarrhcea. At the same time a red rash appears on the skin, of the nature of erysipelas, the red or livid spots being tense and painful, especially where they are directly exposed to the sun. About July or August of the first season these symptoms disappear, the spots on the skin remaining rough and dry. The spring attack of the year following will probably be more severe and more likely to leave traces behind it; with each successive year the patient becomes more like a mummy, his skin shrivelled and sallow, or even black at’ certain spots, as in Addison’s disease, his angles protruding, his muscles wasted, his movements slow and languid, and his sensibility diminished. Meanwhile there are more special symptoms relating to the nervous system, including drooping of the eyelid, dilatation of the pupil, and other disorders of vision, together with symptoms relating to the digestive system, such as a red and dry tongue, a burning feeling in the mouth, pain on swallowing, and diarrheea, Peasants with this progressive malady upon them come to the towns spring after spring seeking relief at the various hospitals, and under a good regimen and a permanently improved diet the malady is often checked. But after a certain stage the disease is confirmed in a pro- found disorganization of the nervous system ; spasms of the limbs begin to occur, and contractures of the joints from partial paralysis of the extensor muscles and pre- ponderant action of the flexors; melancholy, imbecility,

and a strong suicidal tendency are common accompani- ments. A large number of pellagrous peasants end their days in lunatic asylums in a state of drivelling wretched- ness or raving madness ; many more drag out a miserable existence in the communes where their working years had been spent, sometimes receiving the communal relief to which the law entitles them; while the cases that are reckoned curable are in Italy received into the various endowed hospitals, of which there are a large number. Cases that are rapidly fatal end in delirium or a state, of typhoid stupor ; the more protracted cases are cut off at last by rapid wasting, colliquative and ill-smelling sweats, profuse diarrhoea, and dropsy. After death a variety of textural changes are found, which may be referred in general to trophic disorders, or disorders of tissue-nutrition ; =n a considerable number the kidneys are in the contracted state corresponding to the clinical condition of Bright's disease without albuminuria; another condition often remarked is thinning of the muscular coats of the intes- tine; deposits of pigment in the internal organs are also characteristic, just as the discoloration of the skin is during life.

Treatment.—There is hardly any doubt as to the remedy for pellagra, just as there is hardly any doubt as to its cause. The question is mainly one of the social condition of the peasantry, of their food and wages ; it is partly, also, a question of growing Indian corn ona soil or in a climate where it will not mature unless with high farming. There is nothing in the resources of medicine proper to cure this disease ; as the cause is, so must the remedy be.

Affinities of Pellagra.—The disease has the general characters of a tropho-neurosis. The carly involvement of certain areas of the skin, especially in exposed places such as the hands and feet, suggests leprosy ; as in that disease, there is first hyperesthesia and then loss of sensibility, sometimes a thickening of the surface and discolora- tions ; and, although in pellagra the onset each successive spring and the subsidence towards autumn are distinctive, yet in leprosy also the cutaneous disorder is apt to come and go at first, reappearing at the same spots and gradually becoming fixed. The grand difference in leprosy, at Icast in the nodular variety of it, is that a new

growth of a granulomatous kind arises at these spots in the skin and around the nerves. The occasional deep discoloration of the pellagrous skin in certain spots has suggested a resemblance to Addison's disease of the suprarenals, and has cven made the diagnosis difficult. But after the cutaneous disorders the course of pellagra is something sui generis ; the melancholy, imbecility, or mania, as well as the mummified state of the body, are peculiar to it. With ergotism the points of resemblance are more perhaps in the causation than in the nosological characters ; both diseases are specifically due to damaged grain, ergotism being caused by the presence of an actual bulky parasitic mould on ryc, whereas pellagra is more probably caused by fermentation and decomposition within the proper sub- stance of the maize-corn. As regards heredity, it is much less marked in pellagra than in leprosy, but there arc good grounds for believing that the disease is in fact inherited sometimes by the offspring; infants at the breast may show the symptoms of it, but that fact is not in itself conclusive for heredity, for the reason that infants at the breast are partly fed on the household polenta. – As regards contagiousness, there is no more proof of it in pellagra than there is in leprosy.

Geographical Distribution and History.—Pellagra is peculiarly a discase of the peasantry, being hardly ever seen in residents of the towns. In Italy the number of peasants affected by it was estimated in 1879 at 100,000, the distribution being as follows :—Lombardy, 40,838 ; Venetia, 29,386 ; Piedmont, 1692 ; Liguria, 148 ; Aimilia, 18,728 ; Tuscany, 4382 ; the Marches and Umbria, 2155 ; Rome, 76. In Lombardy the worst centres are in the provinces of Brescia, Pavia, Piacenza, and Ferrara. In Italy the disease has increased very considerably within the last thirty years; thus, in the pro- vince of Vicenza the number of persons known to be pellagrous in 1853-55 was 1380, in 1860 it was 2974, and in 1879 it had risen to 3400. There arc no accurate returns from the Asturias and other affected provinces of Spain, but the malady there is said to have declined very materially of late. In Gascony, where it did not begin until about fifty years ago, it is somewhat common, more 1 the Landes than in the Gironde ; in one district of the latter Petit estimates that there are 200 cases in a population of 6000. In Roumania the total number is given at 4500, Moldavia having a larger share than Wallachia. In Corfu it exists in 27 out of the

117 cominunes, the proportion of cases for the whole island being 3°2 per 1000 inhabitants.

Maize was grown in Europe for many years before pellagra showed

itself (sce Maize); but the outbreak of the disease corresponds on the whole closely in time (particularly in Gascony and Roumania) with the introduction of an inferior kind of maize as the staple coe of the peasantry. The first accounts of pellagra come from

pain. the name of mal de la rosa ; it is said to have been noticed first in

Casal in 1762 described the disease in the Asturias under

1735 around Oviedo, being then confined within very narrow limits. The Asturias are still its headquarters in Spain, but it is prevalent

also in Burgos, Navarra, Zaragoza, Lower Aragon, Guadalajara, and Cuenca, and it is met with in other provinces as well. it was first reported from the vicinity of Lago Maggiore, and a few years later (in 1750) it broke out simultaneously in the districts of

In Italy

Milan, Brescia, Bergamo, and Lodi, extending afterwards to Como, Cremona, Mantua, and Pavia, and to the whole of Lombardy before the end of the century. It became cndemic also in Venetia on the one side and in Piedmont on the other, almost contemporaneously with this. Within the present century it has extended its area southwards into Amilia and into Tuscany, while it has become more prevalent in its earlier seats at the same time. There is very little of it in central Italy, while southern Italy with Sicily, is absolutely exempt, notwithstanding the common use of Indian corn in the form of bread and macaroni. The first authentic in- formation of its existence in Gascony came from near Arcachon in 1818, after which it spread along thie coast of the Gironde and the Landes. It has extended subsequently along the left bank of the Garonne and towards the Pyrenees ;

but around Dax it is said to have decreased considerably of late. In Roumania, where the medical profession is unanimous in tracing it to the use of damaged maize, it dates from about 1833-46. It is only since 1856 that it

has become endemic in Corfu, under the circumstances already

mentioned.

Literature.—La Pellagra in Italia, Rome, 1880 (official report, with appendices relating to France, Spain, and Roumania, and a copious bibliography extending to fifteen pages). An article on ‘‘The Pellagra in Italy,” in the Hdin. Rev. for April 1881, is based on this report. The authority for Corfu is Typaldos. The best inquiries on the toxic properties of damaged maize are those of Lombroso. See also Hirsch, Historisch-geographische Pathologie, vol. ii., 2d. ed., Stuttgart, 1883 (Engl. trans.). (Cc.

PELLICANUS, Cowrap (1478-1556), one of the most interesting minor figures in German theology and scholar- ship in the great age of the Reformation, was born at Ruffach in Alsace in the winter of 1478. His paternal name was Kiirsner, his father’s father having been a currier of Wyl in the Black Forest. The Latin name of Pellicanus was chosen for him by his mother’s brother Jodocus Callus, an ecclesiastic connected with the univer- sity of Heidelberg, who gave his nephew sixteen months at the university at the cost of some fourteen florins in 1491-92. Pellican’s parents were worthy people, but very poor ; the boy was eager for learning, but had no books ; at school at Ruffach, where he had learned well, “with much fear and many a scourging,” it was only the richer boys who had a copy of the Ulm Donatus of 1485. So when lis uncle tired of him and he came back to Ruffach, with some knowledge of the great Latin classics as well as of the usual bachelor’s course, he was glad to teach gratis in the Minorite convent school that he might borrow books from the library, and in his sixteenth year he resolved to become a friar. This step helped his studies, for he was sent to Tiibingen in 1496 and became a favourite pupil of the guardian of the Minorite convent there, Paulus Scriptoris, a man of considerable general learning and of much boldness and honesty, who anticipated Luther in his open preaching on such topics as vows, indulgences, and the sacraments.

There seems to have been at that time ‘1 south-west Germany a considerable amount of sturdy independent thought among the Franciscans, and more genuine conformity to the original ideas of the order than is often supposed ; Pellicanus himself became a Protestant very gradually, and without any such revulsion of feeling as marked Luther’s conversion; at the moment when he went to Zurich and threw off the cowl he was pleased to think that the good St Francis would not abhor him for his change of dress, and for learning for the first time at the age of forty-eight the difference between crowns, florins, and batzen. At Tubingen the future “apostate in three

languages” was able to begin the study of Hebrew. He had no teacher and no grammar; but Paulus Scriptoris carried him a huge codex of the prophets on his own shoulders all the way from Mainz. He learned the letters from the transcription of a few verses in the Star of the Messiah of Petrus Niger, and, with a subsequent hint or two from Reuchlin, who also lent him the grammar of Moses Kimhi, made his way through the Bible for himself with the help of Jerome’s Latin. He got on so well that he was not only a useful helper to Reuchlin but anticipated the manuals of the great Hebraist by composing in 1501 the first Hebrew grammar in a European tongue. It was printed in 1503, and afterwards included in Reysch’s Margarita Philosophica. Hebrew remained a favourite study to the last. Pellican’s autobiography is full of interesting details as to the gradual multiplication of accessible books on the subject, which he hunted up in every journey; and ultimately he not only studied but translated a vast mass of rabbinical and Talmudic texts. With a cooler judgment than Reuchlin, however, he was not deceived as to the true value of the later Hebrew wisdom, and his interest in Jewish literature was mainly philological. In linguistic knowledge he reached a high standard for that time,—certainly higher than that of his better-known pupil, 8. Miinster. The chief fruit of these studies is the vast Biblical commentary published at Zurich in his later years (1532-39, 7 vols.), which shows a remarkably sound judgment on questions of the text, and a sense for historical as opposed to typological exegesis, such as soon disappeared from the Protestant Church and was hardly equalled by any in his own day. Pellicanus became priest in 1501 and continued to serve his

order at Ruffach, Pforzheim, and Basel till 1526. At Basel he did much laborious work for Froben's editions, and acquired a thorough knowledge of the early fathers, through which his dissatisfaction with current dogma gradually ripened into conviction that the church taught many doctrines of which the early doctors of Christendom knew nothing. He spoke his views frankly, but he disliked polemic, and was happy in his convent or in long journeys in the service of his order, which carried him over all south Germany and through Italy as far as Rome; he found also more toleration than might have been expected, even after he became active in circulating Luther's books. Thus, sup- ported by the civic authorities, he remained guardian of the convent of his order at Basel from 1519 till 1524, and, even when he had to give up this post, remained in the monastery for two years, professing theology in the university and always toiling with indefatigable zeal. At length, when the position was becoming quite untenable, he received through Zwingli a call to Zurich as professor of Hebrew, and, formally throwing off his monk's habit, entered on a new life. Here he remained till his death in 1556, falling into his new surroundings with the ease of a simple affectionate nature, happy in the friendship of Zwingli and Bullinger, hospitably entertaining the many learned strangers who visited Zurich or the poor students who crowded to its school, avoiding religious controversy, and always deep in his books. The step in life which cost him most thought was his marriage, but this also proved so happy an experiment that he lived to be married a second time. In his later years he was afflicted with the stone, the torture of so many of the older scholars, but he continued active till the last.

_Pellican's scholarship, though not brilliant, was really extensive ; his sound sense and his singularly pure and devoted character gave him a great influence, as is apparent even in the too modest auto- biography which he wrote for his son. He was curiously free from the pedantry of the time for a man who had lived so much among

books ; his views about the use of the German vernacular as a vehicle of culture (Chron., 185, 86) are a striking proof of this.

As a theologian his natural affinities were with Zwingli, with whom in his smaller sphere he shared the advantage of having grown up to the views of the Reformation, without any sudden and violent mental struggle, by the natural progress of his studies and religious life. Thus he never lost his sympathy with humanism and with its great German representative, Erasmus. ‘The Reformed Church might have had a happier course if it had longer kept to the lines of the first Zurich doctors. Pellican’s Latin autobiography (Chronicon C. P. R.) is one of the most interesting documents of the period. It was first published by Riggenbach in 1877, and in this volume the other sources for his life are registered.

PELLICO, Sirvio (1788-1854), Italian dramatist, was born at Saluzzo in Piedmont on 24th June 1788, the earlier portion of his life being passed at Pinerolo and Turin under the tuition of a priest named Manavella. A taste for the drama, fostered by private theatrical recitals, showed itself at the age of ten in the composition of a tragedy under the inspiration of Ceesarotti’s translation of the Ossianic poems. On the marriage of his twin sister Rosina with a maternal cousin at Lyons he went to reside in that city, devoting himself during four years to the study of French literature. His patriotism having been re-awakened by the reading of Foscolo’s Det Sepolcri, he returned in 1810 to Milan, where he became professor of French in the Collegio degli Orfani Militari. The appearance of Carlotta Marchionni on the Milan stage induced him to compose for her the tragedy Francesca da Rimini, which, despite the adverse criticism of Foscolo, was brought out with success on the return of the actress to the city a few years later. Its publication was followed by that of the tragedy Hufemio da Messina, but the representation of the latter was forbidden. Pellico had in the meantime continued his work as tutor, first to the unfortunate son of Count Briche, and then to the two sons of Count Porro Lambertenghi. In this capacity he was brought into contact with many of the foremost men of the day and threw himself heartily into an attempt to weaken the hold of the Austrian despotism by indirect educational means. Of the powerful literary executive which gathered about Counts Porro and Confalonieri, Pellico was the able secretary,—the management of the Conciliatore, which appeared in 1818 as the organ of the association, resting largely upon him. But the paper, under the relentless censorship of the Austrian officials, ran for a single year only, and the society itself was broken up by the more vigorous action of the

Government consequent upon the formation of the constitution of Naples. In October 1820 Pellico was arrested on the charge of carbonarism and conveyed to the Santa Mar- gherita prison. Occupied at first in preparing his defence and in religious meditation, he found means, after his removal to the Piombi at Venice in February 1821, to resume literary work, composing there several Cantiche and the tragedies Hster d'Engaddi and Iginia d Asti. The sentence of death pronounced on him in February 1822 was finally commuted to fifteen years carcere duro, and in the following April he was placed in the Spielberg at Briinn. His chief work during this part of his imprisonment was the tragedy Leonero da Dertona, for the preservation of which he was compelled to rely on his memory. After his release in 1830 he commenced the publication of his prison compositions, of which the ster was played at Turin in 1831, but immediately suppressed. In 1832 appeared his Gismonda da Mendrizo, Erodiade, and the Leonero, under the title of Tre nuovi Tragedie, and in the same year the work which gave him his European fame, Le Mre Prigioni. The last gained him the friendship of the Marchesa di Barolo, the reformer of the Turin prisons, and in 1834 he accepted from her a yearly pension of 1200 francs. His tragedy Tommaso Moro had been published in 1833, his most important subsequent publication being the Opere Inedite in 1837. On the decease of his parents in 1838 he was received into the Casa Barolo, where he

is

remained till his death, assisting the marchesa in her charities, and writing chiefly upon religious themes. Of these works the best known is the Det Doveri degli Uomina, a series of trite maxims which do honour to his piety rather than to his critical judgment. A fragmentary biography of the marchesa by Pellico was published in Italian and English after her death. He died 31st January 1854, and was buried in the Campo Santo at Turin. His writings, whether in prose or verse, are chaste and graceful, but defective in virility and breadth of thought, and his tragedies display neither the insight into character nor the constructive power of a great dramatist. It is in the simple narrative and naive egotism of Le Ave Prigioni that he has

established his strongest claim to remembrance, winning fame by his misfortunes rather than by his genius.

Cf. Piero Maroncelli, Addizioni alle Mie Prigioni, Paris, 1834 ; the biographies by Latour ; Gabriele Rosselli ; Didier, Revue des Deux Mondes, September, 1842 ; De Loménie, Galerie des Contemp. Illustr., iv., 1842; Chiala, Turin, 1852; Nollet-Fabert, 1854 ; Giorgio Briano, 1854; Bourdon, 1868 ; and the life of the Mar- chesa di Barolo.

PELOPIDAS, a distinguished Greek general, who, in conjunction with Epaminondas, raised his native city Thebes to a pitch of power such as she never attained to before or afterwards. He was the son of Hippoclus and member of an illustrious Theban family. The large property to which he succeeded in his youth, and which he seems to have in- creased by a brilliant marriage, was liberally employed by him in the relief of the destitute. persuade his friend Epaminondas to share his wealth, he imitated that great man in the stern simplicity and fru- gality of his life and in his cheerful endurance of hard- ships. Though his taste for hunting and gymnastics, and his fiery temper, contrasted with the studious habits and the “gentle and majestic patience” of his friend, no one appreciated better than Pelopidas the greatness of Epami- nondas, to whom, if inferior as a general and a statesman, he was equal in romantic courage and unselfish devotion to his fatherland. Their friendship continued unbroken till death. It was cemented by a battle in which Epami- nondas saved the life of Pelopidas. When the Spartans under Pheebidas seized the Cadmea or citadel of Thebes (summer of 383 or 382 3.c.), Pelopidas, as a member of the democratic club which was opposed to the Spartans, was forced to flee. Along with other exiles he found a refuge at Athens. Epaminondas, protected from suspicion by his poverty and his studies, was suffered to remain in Thebes. Though a very young man, Pelopidas took a lead- ing part in persuading his fellow-exiles to strike a blow for the liberation of Thebes. Having concerted a plan With their friends in Thebes, Pelopidas, with a few com- panions, entered the city in disguise, surprised and slew the magistrates favourable to Sparta, and roused the people to attack the Spartan garrison in the citadel.. But the Spartans capitulated and marched out. This happened in the early winter of 379. Pelopidas and two others of the liberators were elected “bceotarchs,” or chief magistrates of Beeotia, an office which had been in abeyance for

some years. Henceforward to the end of his life Pelopidas was annually elected to one of the chief offices of the state. The treacherous attempt made soon afterwards by the Spartan Sphodrias to seize the Pireus was said, with little probability, to have been instigated by Pelopidas in order to embroil Sparta with Athens. The liberation of Thebes was followed by some years of desultory warfare with Sparta. At Tanagra, however, Pelopidas defeated the enemy and slew the Spartan governor. Still more brilliant was the victory gained by him at Tegyra over a numerically superior force of two Spartan divisions. His success was due chiefly to the disciplined valour of the

When he could not.

Sacred Band, a picked regiment of 300 men, whom Pelopidas led to glory on many a bloody field. The battle of Tegyra, as the first occasion on which the Spartans had ever been worsted by an inferior force, made a deep impression on Greece. At the great battle of Leuctra (July 371), which permanently crippled the power of Sparta, Pelopidas and the Sacred Band were again conspicuous. Pelopidas was one of the generals in command of the Theban army which invaded the Peloponnesus in 370-369, and he joined with Epaminondas in persuading their colleagues to prosecute the campaign even after the expiry of their year of office. For this the two friends were tried for their life, but acquitted. Soon afterwards (apparently in 369), in response to a petition of the Thessalians, Pelopidas was despatched with an army to Thessaly against Alexander, tyrant of Phere. After occupying Larissa and freeing the Thessalians from the oppression of the tyrant, Pelopidas marched into Macedonia, where, at the request of the belli- gerents, he acted as arbitrator between Alexander king of Macedonia and the pretender Ptolemeus. Having con- cluded an alliance with the Macedonian king, he brought back to Thebes, amongst other hostages, the youthful Philip, brother of the king and afterwards father of Alex- ander the Great. In the following year (368), Pelopidas returned to Thessaly as ambassador and without an army. Learning that Ptolemeus had killed Alexander of Mace- donia and seized the throne, he collected a body of mer- cenaries and marched against him. Ptolemzus induced the troops of Pelopidas to desert their leader, but he was too prudent to press his advantage, and agreed to act as regent for the brothers of the late king and to be an ally of Thebes. On his return from Macedonia Pelopidas was seized and detained by Alexander of Phere. From this captivity, in which his scornful bearing excited the wonder of his captor, he was released by a Theban force under Epaminondas. By the exertions of Epaminondas and Pelopidas, Thebes had by this time become the most powerful state in Greece ; and that she might be formally recognized as such Pelopidas was sent as ambassador (367) to the Persian court. Favourably impressed by the renown and still more by the personal character of the envoy, the Persian king, Artaxerxes, loaded him with marks of honour and ratified all his proposals. These were, that Messene should be independent, that Athens

should lay up her warships, and that any city which declined to follow the leadership of Thebes should be treated as an enemy by Persia. The purpose of the treaty, to strengthen Thebes by weakening Athens and Sparta, was obvious. It found no favour with the Greek states and remained a dead letter. In 364 the Thessalian towns once more appealed to Pelopidas for help against their old enemy Alexander of Phere. Disregarding an ominous eclipse of the sun, Pelopidas pushed on with a handful of troops, leaving the main body to follow. At the heights of Cynoscephalz, near Pharsalus, he came up with the tyrant Alexander at the head of a much superior force. The valour of Pelopidas secured another victory, but it was his last,—catching sight of his hated foe, he rushed on him single-handed and fell covered with wounds. The Thes- salians, in whose cause he died, requested and received the honour of carrying the hero to his last home, and the crowns, trophies, and golden arms by which the coffin was surrounded bore witness to the love and sorrow of a whole people. His friend did not long survive him. He too was to die fighting his country's battles in a foreign land. The pre-eminence of Thebes was the work of these two men alone, and with them it passed away.

Our chief authority is Plutarch's Life of Pelopidas. Xenophon

was a contemporary, and his history covers the whole period of the life of Pelopidas, but, with his usual malignity to the enemies of

Sparta, he only mentions Pelopidas in connexion with his fruitless embassy to Persia. There is a meagre life by Cornelius Nepos. See also Diod. Sic., xv. 62, 67, 71, 75, 80, 81.

PELOPONNESUS. See GREECE.

PELOPS, a hero of Greek mythology, was the grand- son of Zeus, son of Tantalus and Dione, and brother of Niobe. His father's home was on Mount Sipylus in Asia Minor, whence Pelops is spoken of as a Lydian or a Phrygian, or even as a Paphlagonian. Tantalus was a friend and companion of the gods, and one day he served up to them his own son boiled and cut in pieces. The gods detected the crime, and none of them would partake

except Demeter (according to others Thetis), who, dis- tracted by the loss of her daughter Persephone, ate of the shoulder. The gods restored Pelops to life, and the shoulder consumed by Demeter was replaced by one of ivory. Wherefore the descendants of Pelops had a white mark on their shoulder ever after. This tale is perhaps a reminiscence of human sacrifice, of which numerous traces remain in Greek legend and history. Poseidon admired Pelops, the beautiful boy, and carried him off to Olympus, where he dwelt with the gods, till, for his father's sins, he was cast out from heaven. Then, taking much wealth with him, he crossed over from Asia to Greece. He went to Pisa in Elis as suitor of Hippodamia, daughter of King (Enomaus, who had already vanquished in the chariot- race and slain many suitors for his daughter's hand. But by the help of Poseidon, who lent him winged steeds, or of Ginomaus's charioteer Myrtilus, whom he or Hippodamia bribed, Pelops was victorious in the race, wedded Hippo- damia, and became king of Pisa. »Pelops's race for his wife was a favourite subject of Greek poetry and art. It may be a confused recollection of the custom of wife-snatching prevalent in early times. When Myrtilus claimed his promised reward, Pelops flung him into the sea near Gereestus in Eubcea, and from his dying curse sprang those crimes and sorrows of the house of Pelops which supplied the Greek tragedians with such fruitful themes. Among the sons of Pelops by Hippodamia were Atreus, Thyestes, and Chrysippus. According to others Chrysippus was his son by a different mother. Atreus and Thyestes were jealous of Chrysippus and murdered him, wherefore Pelops drove them out. According to another story it was Hippodamia who murdered him and fled, but after- wards her bones were brought back to Olympia, where she had a temple, in which the women offered her a yearly sacrifice. From Pisa Pelops extended his sway over the neighbouring Olympia, where he celebrated the Olympian games with a splendour unknown before. He warred against and treacherously slew Stymphalus, king of Arcadia. His power and fame were so great that henceforward the whole peninsula was known to the ancients as Peloponnesus (Isle of Pelops). In after times Pelops was honoured at Olympia above all other heroes; a temple was built for him by Heracles, his descendant in the fourth generation, in which the annual magistrates sacrificed to him a black ram. During the Trojan war the Greeks were told that Troy could not be taken until they fetched a bone of Pelops. Soa shoulder-blade of Pelops was brought from Pisa. When it was being brought

back again the ship carrying it was wrecked off Eubcea. Many years after- wards the bone was taken up by Damarmenus, a fisher- man, in his net. Astonished at its size, he went to inquire of the Delphic oracle. There he met envoys from Elis come to discover a remedy for a pestilence. The oracle bade them recover the bone of Pelops, and commanded Damarmenus to restore it to them. He did so, and he and his descendants were appointed custodians of the bone. Some thought that the Palladium was made of the bones of Pelops. This belief in the miraculous efficacy of

the bones of heroes was common in Greece (witness, e.g., the story of the bones of Orestes in Herodotus). From the great size of the bones they may sometimes have been those of large extinct animals.

From the reference to Asia in the tales of Tantalus, Niobe, and Pelops it has been conjectured with some probability that Asia was the original seat of these legends, and that it was only after emigration to Greece that the people amongst whom they were current localized a part of the tale of Pelops in their new home. In the time of Pausanias the throne of Pelops was still shown on the top of Mount Sipylus. The story of Pelops is told in the beautiful first Olympian ode of Pindar. The prosaic version of the story found in Nicolaus Damascenus (17) differs in several points from the usual legend.

PELOUZE, Tstopuite Juzzs (1807-1867), French chemist, was born on 26th February 1807 at Valognes in Normandy, where his father was manager of a porcelain manufactory. The elder Pelouze was a man of great ability and energy, but of a peculiarly susceptible tempera- ment, which made it impossible for him to remain long in any position. He gave up his post at Valognes, and found employment successively at the glass-works of St Gobain, the iron-works at Charenton, and in gas-works. This moving life was unfavourable for the family finances, but doubtless gave young Pelouze opportunities of seeing and becoming familiar with a great variety of chemical operations on a large scale. He studied pharmaceutical chemistry first at La Fére, and afterwards, under Chevalier, at the Ecole de Pharmacie in Paris. He then became a clinical clerk under Magendie in the Salpétriere hospital. One day, when returning from a visit to his father at Charenton, he

was surprised by a heavy shower, and seeing what he took to be a public carriage—the omnibus of the period—he hailed it. It contained only one passenger, but the driver, instead of stopping for another fare, drove on without taking the least notice. Pelouze rushed up and stopped the horse. On this the solitary passenger, who was Gay-Lussac, explained that he had hired the veliicle for his own use, but that he would be glad of the company of the new-comer. The result of this accidental introduction was that Pelouze abandoned medicine and continued thestudy of chemistry in Gay-Lussac's laboratory. From 1827 to 1829 he acted as assistant to Gay-Lussac and Lassaigne, and in 1830, on the recommendation of Gay-Lussac, he was appointed professor of chemistry at Lille. Returning to Paris, he was appointed in 1831 pro- fessor of chemistry at the Ecole Polytechnique and at the Collége de France, in 1833 assayer to the mint, and in 1848 president of the Mint Commission. In 1850 he succeeded Gay-Lussac as chemical adviser to the glass- works of St Gobain. He was elected a member of the Institute of France in 1837. He died, after a short illness, on the 31st of May 1867.

Along with Frémy, Pelouze published a Treatise on Chenustry (1849-50; 2d ed. 1854-56). His numerous chemical papers were published in the Annales de Chimie et de Physique and in the Conuptes rendus. Among these the most important are :—"On Beetroot Sugar" (1831), "On Salicine " (1830 and 1831), " On the Transformation of Hydrocyanic Acid and Water into Formiate of Ammonia" (1831), 'On Lactic Acid" (with Gay-Lussac, 1833), "On Tannin, Gallic Acid, Pyrogallic Acid, &. " (1833), "On the Product of the Distillation of Organic Acids" (1834), "On Nitro- sulphates" (1835), "On Butyric Acid" (with Gélis, 1844), "On Guu-cotton" (1846 and 1847), "On the Effect of Light on the Colour of Glass" (1865 and 1867).

PELTIER, Jean CHARLES ATHANASE, was originally a watchmaker, but retired from business about the age of thirty and devoted himself to experimental and observa- tional science. He was born at Ham (Somme) in February 1785 ; his death took place at Paris in October 1845.

His great experimental discovery was the heating or

cooling of the junctions in a heterogeneous circuit of metals according to the direction in which an electric current is made to pass round the circuit (1834). This reversible effect is proportional directly to the strength of the current, not to its square, as is the irreversible genera- tion of heat due to resistance in all parts of the circuit. Tt is found that, if a current pass from an external source through a- circuit of two metals, it cools one junction and heats the other. It cools the junction if it be in the same direction as the thermo-electric current which would be caused by directly heating that junction. In other words, the passage of a current from an external source produces in the junctions of the circuit a distribution of temperature which leads to the weakening of the current by the superposition of a thermo-electric current running in the opposite direction. The true importance of this so-called “Peltier effect” in the explanation of thermo- electric currents was first clearly pointed out by Joule; and Sir W. Thomson (see vol. viii. p. 97) further extended the subject by showing, both theoretically and experimentally, that there is something closely analogous to the Peltier effect when the heterogeneity is due, not to difference of quality of matter, but to difference of temperature in contiguous portions of the same material. Shortly after Peltier’s discovery was published, Lenz effected by means of it the freezing of small quantities of water by the cold developed in a bismuth-antimony junction when a voltaic current was passed through the metals in the order named.

Peltier’s other papers, which are numerous, are devoted in great part to atmospheric electricity, waterspouts, cyanometry and polarization of sky-light, the temperature of water in the spheroidal state, and the boiling-point at great elevations. There are also a few devoted to curious points of natural history. But his name will always be associated with the thermal effects at junctions in a voltaic circuit, a discovery of importance quite comparable with those of Seebeck and Cumming.

PELUSIUM, an ancient city of Egypt, at the mouth of the most easterly (Pelusiac) branch of the Nile, was the key of the land towards Syria and a strong fortress, which, from the Persian invasion at least, played a great part in all wars between Egypt and the East. It has not, however, been satisfactorily identified with any place mentioned in the hieroglyphic monuments, and the conjecture of Jerome, who supposes it to be the Sin of

Ezekiel xxx. 15, 16, though admirably suited to the context and certainly preferable to the Sais of the LXX., cannot be positively established. Pelusium is the Farama of the Arabs; the neighbouring place still called Tina is hardly to be identified etymologically with Sin. The country about Pelusium was noted for the production of flax; the fame of the Pelusian linen is, perhaps, still preserved in the word “blouse.” The whole district has now relapsed into sand and marsh, and the site has not yielded any important remains.

PEMBERTON, an urban sanitary district of Lanca- shire, England, situated on the Lancashire and Yorkshire Railway, 24 miles west from Wigan. Near the town are stone quarries and collieries, and the town itself possesses cotton-mills, chemical works, and iron-foundries. At a short distance is Hawkley Hall, an ancient timber house. At Ancliff in the township of Pemberton there was, accord- ing to ancient records, a burning well of considerable fame, but the name Ancliff has now disappeared, and the site cannot be verified. The population of the urban sanitary district (area 2894 acres) in 1871 was 10,374, and in 1881 1t was 13,762.

PEMBROKE, the most westerly county of South Wales, lies to the west of the counties of Cardigan and Carmar- then, and is bounded on three sides by the ocean—on the S. by the Bristol Channel, on the W. by St George’s

Channel, and on the N. by Cardigan Bay. Its length from Strumble Head to St Gowan’s Head is about 30 miles, and its average breadth a little over 20. The area is 393,682 acres, or about 615 square miles.

The coast-line is extremely irregular and extends to over 100 miles, the principal inlets being Newport Bay ; Fish- guard Bay, 3 miles in breadth, with an average depth of from 30 to 70 feet, and possessing a good anchorage-ground of mud and sand; St Bride’s Bay, 8 miles long by 8 broad ; and Milford Haven, a splendid landlocked natural harbour, having a length of about 20 miles, and including numerous small bays and creeks. A considerable number of islands adjoin the coast, the largest being Ramsey, which (except- ing some small rocks) includes the most westerly land in Wales; Skomer and Stockham, between St Bride’s Bay and Milford Haven;

and Caldy, south of Tenby. The southern coast, consisting of bare, broken, and beetling limestone cliffs, in many cases 200 feet in height, is exposed to the full force of the Atlantic, which in several places has hollowed out long funnel-shaped cavities into which the sea has entrance, the most remarkable being Bosheston Mere, near St Gowan's Head. Owing to the ocean storms the county is almost bare of trees, and the bareness is not relieved or atoned for by mountains, although in many parts of the coast the scenery is wildly picturesque. For the most part the surface is gently undulating, the small rounded hills rising in height towards the north, until they merge in the Preseley range, which runs from east to west and divides the county into two parts, the highest summits being Cwm-Cerwyn, 1754 feet, in the centre of the chain, the lesser eminences of Moel Trigarn and Carn-meyn in the east, and Bwlch-gwnt and Foel Eryr in the west. The principal rivers are the Teifi, which forms for a short distance the north-eastern boundary of the county with Cardiganshire; the Cleddy or Cleddou, of which there are two branches, an eastern and a western, both flowing south and "mingling their waters in Milford Haven; the Nevern, which flows north into Newport Bay; and the Gwaen, which flows through a narrow and beautifully- wooded glen to Fishguard Bay.

Geology and Minerals.—Three-fourths of the county, including the northern portion stretching westwards to the western Cleddou river, and, with certain exceptions, to the Channel, is formed of Llandeilo flags. The Carbonifer- ous strata from the South-Wales coal-field extend across the centre of the county from east to west, their area narrowing towards the west. The Pembrokeshire coal-field differs entirely from the South-Wales coal-field both in the lie of the strata and in the character of its beds, due to the occurrence of volcanic action. It is separated also from the main field by an interpolation of Old Red Sand- stone. North, east, and north-west it is bounded by beds of mountain limestone and millstone grit, and on the south by Cambrian beds and by the ocean, below which the Coal-measures extend. 'The strata are composed of Coal-measures, Carboniferous Limestone, and Old Red Sand- stone, and are frequently extremely contorted. Igneous stratified rocks also occur in the Preseley range, and in the neighbourhood of St David's Head. The coal is anthracite, and when put on the fire in a wet state emits a blue flame without smoke. About 80,000 tons are now dug annually, the coal being used for furnaces and for

smelting and brew- ing purposes. There is a lead mine at Llanfyrnach, from which a considerable yield of silver is obtained, the annual value of the ore raised being about £15,000. In caves explored near Tenby and on Caldy Island there have been found remains of various species of extinct mammals.

Climate, Soil, and Agriculture.—Although Pembroke- shire is exposed to frequent violent gales from the south- west, the climate in the south is very mild and warm ; and

flowers, fruits, and vegetables are earlier than in most other districts of the United Kingdom. Towards the north, especially on the higher ground, it is much colder, and damp fogs and rain are frequent. The most common soil is a dark-grey loam, which is much improved by admixture with lime and sand. The sandstone and limestone forma- tion in the south produces an excellent quick soil, admir- ably adapted for horticulture, which is generally pursued in this district. In the more northerly and higher regions more attention is given to cattle-rearing and dairy-farming than to the raising of crops or sheep-farming. The farm- houses and buildings, which formerly were rude and primi- tive in construction, with low mud-walls, are now generally built of stone on improved methods. The cottages of the peasants are, however, still for the most part uncom- fortable huts built of a clay and straw compound called “clom.” Great improvements have lately taken place in farming, owing in great part to the enlightened encourage- ment of the landlords.

From 5935 in 1875 the number of holdings had increased to 5999 in 1880 (the latest return). Nearly four-fifths, 4222, were not above 50 acres cach in extent, 837 were between 50 and 100 acres, 853 between 100 and 300, and only 87 above 300 acres. In 1883 there were 305,644 acres, or about 77 per cent. of the total area, under tillage, corn crops occupying 55,011 acres, green crops 13, 266, rotation grasses 28,409, permanent pasture 206,052, and fallow 2906. The principal cereals are barley occupying 24,799 acres and oats (of which the black species occupy a large area) 25,494 acres,

wheat oecupying only 4604 acres. Potatoes were grown on 38042 acres, turnips and swedes on 8038, and mangolds on 1322. Horses in 1883 numbered 14,383 (of which 8665 were used solely for purposes of agriculture), cattle 83,436 (of which 31,779 were cows and heifers in milk or in calf), sheep 91,901, and pigs 27,623. The prineipal breed of cattle are the native Castlemartins, black in colour, and well suited to the climate and the system of farm- ing, as they both fatten readily and yield large supplies of milk. Herefords and Alderneys have lately been introduced on many farms, but the old breed is still the favourite.

According to the latest return the land was divided among 3121 owners, possessing 356,699 acres, at an annual valuation of £389,701, or about £1 1s.10d. per acre. The estimated amount of common or waste land was 11,260 acres. Of the owners, 1492, or about 44 per cent., possessed less than one acreeach. The following owned over 5000 acres each; viz., C. E. G. Phillips, 18,729 acres; earl of Cawdor, 17,736; Sir Owen Scourfield, Bart., 11,248 ; Lord Kensington, 6537; bishop of St David's, 5651; George Harries, 5173; and M. A. Sawin, 5168.

Manufactures.—Flannels are woven in various towns, and are the principal textile manufacture of the county; there are also rope and sail works, and hat-making is practised. Many of the inhabitants are engaged in coal-mining and in fishing. At Pater there is a very extensive dockyard, and shipbuilding is carried on at several other ports. Since the opening up of railway communi- cation the shipping trade, and the mining and other industries, have made extensive progress, but the railway connexion is still somewhat imperfect.

Administration and Population.—The county includes seven hundreds ; the municipal boroughs of Haverfordwest (6398), Pem- broke (14,156), and Tenby (4750), and part (2058) of the municipal borough of Cardigan, the remainder of which is in Cardiganshire. In addition to Haverfordwest, Pembroke, and Tenby, there are four other market towns,—Fishguard (2009), Milford (8812), Nar- berth (2334), and Newport (1504). The county is divided into three poor-law unions—Haverfordwest, Pembroke, and Narberth. It is included in the south-western circuit. It has one court of quarter-sessions, and is divided into seven petty and special sessional

divisions. One member is returned to parliament for the county, one for the Haverfordwest district of boroughs, consisting of Fish- guard, Haverfordwest, and Narberth, and one for the Pembroke district of boroughs, consisting of Milford, Pembroke, Tenby, and Wiston. Pembrokeshire contains 153 civil parishes, with part of one other. It constitutes the archdeaconry of St David's in the diocese of the same name, and forms part of the province of Canterbury. From 56,280 in 1801 the population had increased in 1821 to 74,009, in 1851 to 94,140, but in 1871 it had diminished to 91,998, and in 1881 to 91,824, of whom 48,449 were males and 48,375 females. The number of inhabited houses in 1881 was 19,462, the average number of persons to an acre 0°28, and of acres to a person 4°26.

History, &c.—Although the limestone caves of Pembrokeshire abound with relics of the Pleistocene fauna, no traces have as yet been discovered of Paleolithic man. Neolithic remains are plenti-

ful. In caves, cliff-castles, bogs, kitchen-middens, &c., implements of the polished stone age are frequently found, but, strange to say, the long barrows typical of this period are wanting; dolmens or cromlechs, however, are very common: the ordnance map gives eighteen, but this is by no means an exhaustive list. Liech-y- Drybedd near Nevern, Pentre Evan near Newport, another one in the same town, Longhouse near Mathry, Tre Liys on Pencair, are magnificent specimens of Megalithic work. Stone circles, cairns, monoliths, and earthworks abound in the county ; what proportion of these are attributable to the dolichoeephalie non-Aryan Silures who used stone implements it is impossible to say.

The Goidel or Gaelic branch of the Celtic family has the credit of having introduced bronze and round tumuli with cremated bodies ; of these latter there are a great number in Pembrokeshire, and considerable quantities of bronze implements have been dis- covered. A mixture of Silures and Goidels seem to have held the country uutil they were conquered by the Romans about the year 70 a.p. Roman remains are but scantily represented in Pembrokeshire. Via Julia terminated at St David's, but no traces of the peculiar Roman roadmaking exist. Fenton, the county historian, fancied he

discovered the station Ad Vigesimum of the spurious Itinerary of Antonine at Ambleston, and there can be no doubt that a large Ronian building of some sort did exist at that place. The late Professor Rolleston and Mr E. Laws discovered Samian ware in the cave of Lougbury near Tenby, and Roinan coins, ranging from Vespasian, 78 A.D., to Constantine IL., 340 A.p., have been found very plentifully in the county.

When the Saxons pressed the Cymric tribe of Brythonic Celts in Cumbria, the latter appear to have migrated into Wales, and to have conquered the inhabitants ; the Pembrokeshire Goidels secm to have held out for some time. During this troubled period there was a great incursion of missionaries, both Goidel and Cymric ; to these we owe the nomenclature of many villages. To this period must be attributed the sepulchral inscriptions in that strange char- acter which has been called Ogam. Of these so many are to be found in Pembrokeshire that it has been considered probable they were invented in the district. They are usually in base Latin ; good specimens are to be seen on Caldy Island, St Dogmel's, Cwmgloyne near Nevern, and Treffgarne near Haverfordwest. Most of the crosses must be attributed to this period, though probably the inscribed ones at Carew and Nevern are of later date.

After Wales had been completely conquered by the Cymry, Rhodri Mawr divided it among his sons, and Pembrokeshire fell to Cadell in 877. From that period until its complete incorpora- tion with England it suffered terribly from the family feuds of the Welsh princes. The Scandinavians also proved a fearful scourge. Their first incursion, according to the Brut-y-Tywysogion, took place in 795. The creeks of Pembrokeshire were peculiarly adapted to the wants of the vikings, and they seem to have formed a strong colony in the county, of which such names as Asgard, Fishguard, Grafsholm, Freystrop, Goodwich, Milford Haven (Mid- fjord Havn), Haverfordwest (Havards Fjord), &., are an abiding evidence.

During the reign of William Rufus, Arnulph de Montgomery, son of Roger de Belesme, invaded the southern portion of the county with the king's sanction ; he gained a district and built Pembroke Castle ; Manorbier was most likely erected at the same time. In 1107 a colony of Flemings was sent into Pembrokeshire by the king (Henry I.); they settled at Haverford and

Tenby. A second party of Flemings and other adventurers was despatched to Pembroke by Henry II. ; these were mercenaries who had served in the civil war between Stephen and Maud. In April 1170 a party of Pembrokeshire men invaded and overran the eastern shores of Ireland.

In 1405 Owen Glendower harried the country ; he occupied Tenby with 10,000 Welshmen, and was joined by a French force of 12,000 men who had landed in Milford Haven. In 1456 Henry VII. was born in Pembroke Castle, the residence of his uncle Jasper Tudor, earl of Pembroke. After a long exile he landed at Brunt near Dale with French troops; here he was joined by Sir Rhys ap Thomas at the head of a large number of Welshmen, with whom he marched to Bosworth field. When the church property was disposed of under Henry VIII., Lamphey Court, once a bishop's seat, fell to the Devereux family, and it was the residence of the three Devereux carls of Essex. These noblemen were extremely popular, and it was most likely in consequence of the political views held by Robert the third earl that when the civil war broke out Pembrokeshire was found to be "'the most seditious county in all Wales, or rather of England, for the inhabitants were like English corporations, unlike loyal Welshmen" (J/ercurius Aulicus, 29th week, 20th July 1644). Pembroke and Tenby held out until 1648, when the Presbyterians rebelled against the Independents ; then under Mayor and Colonel Poyer the royal standard was hoisted on Pembroke keep. Cromwell himself besieged Pembroke, which yielded to him on 17th July 1648.

Besides the ruins of the fine castle of Pembroke, many others are to be found in the county, —Manorbier, Carew, Lamphey, Narberth,

Llawhaddon, Haverford, Roch, Newport; but Newport has been turned into a modern dwelling-house. Most of these are Edwardian erections on Norman work, some of them having Tudor additions.

The most important ecclesiastical building is the cathedral of St David's. Some sort of church existed on the site from the 6th century, but the earliest work now remaining is that of Bishop Peter de Leia (1180). This was seriously injured by the fall of the tower in 1220; the damage had scarcely been repaired when the church was wrecked by an earthquake in 1248. In

1828 Henry Gower succeeded to the bishopric, the most munificent benefactor the church of St David's ever saw; he transformed the cathedral, introducing the Decorated style throughout the edifice. After the Reformation the building was permitted to fall gradually into de- cay, until it had become little better than a ruin. the edifice, more especially the tower, was thoroughly restored under the late Sir Gilbert Scott.

PEMBROKE, a municipal and parliamentary borough of South Wales, is picturesquely situated on an elevated ridge at the head of Pennar Mouth Creek, on the south side of Milford Haven, 30 miles south-west of Carmarthen. The ruins of the ancient castle, originally founded by Arnulph de Montgomery in 1094, occupy the summit of the ridge. The castle was one of the strongest of the ancient fortresses of Wales. Beneath it is an enormous natural cavern, called "The Wogan," 70 feet long and 50 feet wide. At the beginning of the Civil War the castle was held for the Parliament, but, the commandants having gone over to the Royal cause, it was taken by Cromwell after six weeks' siege. Near the castle are the ruins of Monkton Priory church, in the Norman style, containing a long vaulted nave in good preservation. The church of St Mary, in the Early Pointed style, possesses a massive steeple. At Pater, 2 miles west of Pembroke, is Pembroke dock, an important Government dockyard, surrounded with very strong fortifications. The dock is 70 acres in extent, and the yard affords employment to about 24,000 artisans. There are also artillery and infantry barracks. Pembroke possesses a town-hall, assembly rooms, a mechanics' insti- tute, an infirmary, and several charities. The town was incorporated by Strongbow, earl of Pembroke, in the reign of Stephen, but the earliest charter preserved is one granted by John, which was confirmed by successive sovereigns. The population of the municipal borough (area, 5626 acres), which includes the two wards of Pater and Pembroke, in 1871 was 13,704, and in 1881 it was 14,156. The popu- lation of the parliamentary borough (area, 6298 acres) in the latter year was 16,339.

PEMPHIGUS. See Sxin, DIsHAsEs oF.

PEN, an instrument for writing or for forming lines with an ink or other coloured fluid. The English word, as well as its equivalents in French (plume) and in German (Feder), originally means a wing-feather, but in

ancient times the implements used for producing written charac- ters were not quills. The earliest writing implement was probably the stylus (Gr. oréAos), a pointed bodkin of metal, bone, or ivory, which, however, was only used for produc- ing incised or engraved letters. The calamus (Gr. xéAapos) or arundo, the hollow tubular stalk of grasses growing in marshy lands, was the true ancient representative of the modern pen; hollow joints of bamboo were similarly employed. The use of such pens can be traced to a remote antiquity among the civilized nations of the East, where reeds and canes are to this day in common use as writing instruments. The earliest specific allusion to the quill pen occurs in the writings of St Isidore of Seville (early part of the 7th century).! But there is no reason to assume that the quill pen was not in use at an earlier period, and, indeed, remains have been found which prove that even metal pens were not altogether unknown to the ancient Romans.

1 “Tnstrumenta scribe calamus et penna; ex his enim verba paginis

infiguntur ; sed calamus arboris est, penna avis, cujus acumen divi- ditur in duo.”

But in 1863:

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The quills, formerly in exclusive use, and still largely employed among Western communities as writing instru- ments, are obtained principally from the wings of the goose. Swan-quills are also highly prized, and for special purposes crow-quills and the wing-feathers of certain other birds are adopted. For the method of preparing quills, &c., see FEaTuers, vol. ix. p. 60. In 1809 Joseph Bramah, the famous inventor, devised and patented a machine for cutting up the quill into separate nibs by dividing the barrel into three or even four parts, and cutting these transversely into ‘‘two, three, four, and some into five lengths.” Bramah’s invention first familiarized the public with the appearance and use of the nib and holder in place of the complete quill or barrel, and in that sense he anti- cipated the form of pen now most commonly used. In 1818 Charles Watt obtained a patent for gilding and pre- paring quills and pens by manual labour and chemical means, which may be regarded as the precursor of the gold pen. Buta more

distinct advance in this direction was effected in 1822, when Hawkins and Mordan patented the application of horn and tortoise-shell to the formation of pen-nibs, the points of which were rendered durable by impressing into them small pieces of diamond, ruby, or other very hard substance, or by lapping a small piece of thin sheet gold over the end of the tortoise-shell, and by various other ways securing a hard unalterable point to the pen.

Metallic pens, though perhaps not altogether unknown even in classical times, did not come into use till the pre- sent century, and indeed did not become common till near the middle of the century. At the meeting of the British Association in Birmingham in 1839 steel pens were scarcely known; ten years later the manufacture had become an important local industry. In 1803 a steel pen was made and sold in London by a Mr Wise, which was in the form of a tube or barrel pen, the edges meeting to form the slit with sides cut away as in the case of an ordi- nary quill. These sold at about five shillings each, and as they were hard, stiff, and unsatisfactory instruments they were not in great demand. In 1808 a metallic pen was patented by Bryan Donkin, made of two separate parts, flat or nearly so, with the flat sides opposite each other forming the slit of the pen, or, as an alternative, of one picce, flat and not cylindrical as in the usual form, bent to the proper angle before being inserted into the tube which forms its holder. In Birmingham a steel pen was made by a split- ring manufacturer, Harrison, for Dr Priestley towards the end of the 18th century. Harrison in after years became associated in the split-ring business with Josiah Mason, who was one of the great pioneers of the steel-pen trade. Mason developed the manufacture on the basis of an in- vention by James Perry, who in 1830 obtained a patent for improvements which must be regarded as the founda- tion of the steel-pen industry. Perry's improvements consisted in producing pens from hard, thin, and elastic metal, the most suitable material being described as the very best steel brought to a spring temper. The necessary flexibility was given to the pen by a central hole formed in the pen between the nib and the shoulder in connexion with a central slit, and by making between the nib and the shoulder one or more lateral slits on each side of the central slit. Joseph Gillott, who divides with Mason and Perry the credit of perfecting the metallic pen, does not appear as a patentee till 1831, when he patented an im- provement which consisted in forming elongated points on the nibs of pens. These early pens lacked softness, flexi- bility, and

smoothness of action, and subsequent inventions of Perry, Gillott, Mordan, and others were largely devoted to overcoming such defects. Metals other than steel were also frequently suggested by inventors, those most commonly

proposed being silver, zinc, German silver, aluminium, and aluminium bronze, the last-named having at one time come into extensive use. The development of the gold pen can- not be traced through the patent records in the same way as some others. Dr Wollaston, it is recorded, used a gold pen composed of two thin slips of gold tipped with rhodium, made apparently on the principle patented by Donkin in 1808. Messrs Mordan of London have the credit of being the earliest regular makers of gold pens with tips of osmium- iridium alloy, and that manufacture was subsequently de- veloped by Messrs Wiley of Birmingham. ‘The gold pens now made are provided with iridium tips, and their manu- facture is a special industry, requiring processes and machines different from those used in the steel-pen industry.

Fountain pens and penholders in which considerable reservoirs of ink could be carried ready for use were intro- duced by a patented invention of the ingenious Joseph Bramah. Of his several plans for a fountain pen one proposal was a hollow tube of silver or other metal, the tube being made so thin that it could readily be compressed out of shape and so cause an escape of ink to the nib, and another plan was to fit the tube with a piston which might slide down the interior and so force out ink. John Scheffer in 1819 patented a device consisting of a reservoir in the holder operated on by a stud, which, when pressed by the thumb, yielded a flow of ink to the nib. Many forms of attachment and modifications of the shape of the pen have also been introduced with the view of enabling the pen itself to carry a considerable supply of ink, and to discharge it in writing in a safe and equal manner. A highly original and comparatively successful form of fountain pen of recent introduction is known as the stylograph, in which the ordinary form of nib is dis- pensed with, and connected with the barrel or reservoir is a finely-tapered point tipped with iridium pierced with a fine aperture. Into the aperture is fitted an iridium needle or plug attached internally to a

delicate gold spring, and the act of writing sufficiently pushes back the needle to allow the escape of the requisite flow of ink by the aperture. The two principal forms of stylograph are that of Mac- kinnon, patented first in the United States in March 1879, and that of Cross, the United States patent for which was secured in January 1878.

The finish which the common steel pen now shows, and the low price at which it can be sold, are triumphs of manufacturing skill, the credit of which is largely due to Birmingham. For the fraction of a farthing there can now be purchased an article incomparably superior to that which in the early years of the century cost five shillings. The metal nsed consists of rolled sheets of cast steel of the finest quality, made from Swedish charcoal iron. These sheets are cut into strips of suitable width, annealed in a mufile furnace, and pickled in a bath of dilute sulphuric acid to remove the oxidized scale from the surface. The strips so cleaned are next rolled between steel rollers till they are reduced to ribbons the thickness of the pens to be made. At this stage the raw material is ready for the series of manufacturing operations, most of which are performed with the aid of hand fly-presses, moving suitable cutting, staniping, and embossing attachments. The pen blanks are first cut out of the ribbon so as to leave as little scrap as possible. These blanks are next pierced, that is, the central perforation and the side or shoulder slits by which flexibility is secured are made at one operation. After again annealing, they are marked and em-bossed with maker’s name, trade-mark, or any of the endless variety of marks by which pens are distinguished from each other. Up to this point the blanks are flat; they are now raised or rounded into the semi-cylindrical form in which pens are used. At this stage the pens are tempered by heating in iron boxes in a mufile, plunging in oil, and heating over a fire in a rotating cylindrical vessel till their surfaces attain the dull blue colour characteristic of spring steel elasticity. They are then scoured and polished by being revolved in large tin cylinders, in which they are mixed with sand, pounded crucibles, or such substances. The grinding of the points next follows, an operation performed by small rapidly- revolving emery-wheels, on which the points are first ground lengthwise and then across the nib, the object of the process being to increase the elasticity of the point. The slitting process which

follows—that is, the cutting of the pen-slit from the perforation to the point —is effected with a chisel-cutter worked by a hand screw- press. On the precision with which the slit divides the point depends the perfection of the pen, to finish which it now only re- mains to colour the surface in a revolving cylinder over a charcoal fire, and to varnish it in a solution of shellac.

Birmingham, which was the first home of the steel-pen industry, continues to be its principal centre, but steel pens are also made in the United Statcs and in France and Germany. (J. PA.)

PENANCE. The word “penance” (pendtentia) has a double signification,— its strict legal meaning of a penalty inflicted by the formal sentence of a spiritual authority in

‘punishment of an offence, and with the primary object of

amending and so benefiting the offender; and its wider and more popular sense of any ascetic practice adopted, whether voluntarily or under compulsion, for the expiation of sin or for advance in spiritual attainment. Broadly speaking, no trace of such a theory is visible in classical paganism, from which the idea of sin as a moral defile ment is almost absent. There are faint marks discernible in the Greek heroic legends of something analogous to penance, when we read of a hero being driven into exile for some crime (most usually unpremeditated homicide), and not permitted to return till he had found some one able and willing to purify him with certain lustral sacrifices. In the historical period these lustral sacrifices continue, but the accompanying penalty disappears. Punishments for religious offences, and of a very severe kind, extending to death itself, as in the case of Socrates, are frequent, but they are not of the nature of penance, not having the amendment of the offender in view, but only the safety of the state, to be secured by an act of vengeance designed to avert the anger of the gods and to prevent the repetition of the crime believed likely to invoke it. The Oriental religions, contrariwise, teem with the ascetic principle, and personal austerities form a large part of the Zoroastrian, Buddhist, and Brahman systems. Yet, with the exception of the pilgrimages, which enter

so deeply and widely into the religious habits of the peoples professing these creeds, and involve much toil and suffering in the case of the poorer pilgrims, these austerities are not of general inci- dence, but are confined to a comparatively small, and, so to say, professional body of devotees, such as the Indian Jogis, who are entirely distinct from the main body of their co-religionists. Islam had originally nothing even remotely like the practices in question, save in so far as the annual fast of Ramadan and the hajj to Mecca and other sacred places necessitated self-denial ; and it is even on record that Mohammed himself directly discouraged an ascetic spirit which displayed itself in some of his trustiest companions and disciples, such as ‘Omar, “Ali, Abu-Dharr, and Abt-Horeirah. But the reaction of conquered Persia, long the home of Zoroastrian asceticism, on the Arab victors was marked and early, and an inner body of austere devotees arose in the midst of Mohammedanism within a century and a half of the Flight, though having no justifi- cation in the Koran or in the body of early tradition for their tenets and usages. They were in almost every instance of Persian origin, and the most famous of them all, the converted robber Fodheil Abu ‘Ali Zalikhani, the Benedict of Islam, who first organized the scattered ascetics into the brotherhood of dervishes, was himself a Khorasani of pure descent. But, like the Indian Jogis, the Moham- medan dervishes and fakirs have continued as an isolated class, and have never exerted the kind of influence which Christian monachism, especially in the West, has done. Nor has the principle of penance ever formed an import ant integer of the Jewish religion. The Levitical code enjoins the performance of various lustral sacrifices in expiation of certain sins; but the cost of the victims is the only element of penalty, being virtually a money fine

on the offender. The prophets, while dwelling much on the necessity of repentance, of a moral change in the sinner, are almost entirely silent as to any accompanying acts and observances of an ascetic nature; and, though occasional references to prolonged fastings and to the wearing of sackcloth as penitential exercises are found, yet they appear as exceptional and spontaneous, and not as part of an accredited system, nor as enjoined by any authority external to the devotee or penitent himself. Even under the Talmudic code there is no organized system of penance. The three degrees

of excommunica- tion, niddui, cherem, and shammata, ascending from mere exclusion from the congregation for a month, through the stage of anathema, to that of public and ignominious expulsion from fellowship in Israel (and that at first irrevocably, though the penalty was afterwards relaxed), practically exhaust the code, since there are no formal provisions for inflicting other penalties, whatever voluntary observances may at any time have been superadded.

The Christian theory of penance ultimately rests on the view that the Christian church is the precise analogue of the Jewish people under the elder dispensation. As the Jews were the one family on earth in direct covenant with God, so that it became necessary for all Gentiles who desired to be brought into the like relation to abandon their own proper nationality and to become Jews by adop- tion, forsaking their former habits and associations together with their creed; and as various offences against the law of Moses were punished with temporary or final exclusion from fellowship in the Hebrew polity ; so was it from a very early period in the Christian church. One marked difference between the Rabbinical and the Christian dis- cipline is indeed visible from the first, that the former in- volved the suspension or deprivation of civil rights, whereas the latter, in all the earlier centuries at any rate, was a purely spiritual penalty. But they are agreed in com- bining two ideas, one wholly foreign (as already observed) to paganism, and the other but vaguely shadowed therein, —the aim of healing the offender himself and the need of his making public satisfaction to the society whose rules he had broken, and which might suffer in reputation and influence by reason of his misconduct. It is this notion of satisfaction which has led to the extension of the word “penance” itself from its more restricted and legal meaning to its wider use as covering the whole range of ascetic practices. And, as it soon came to be accepted that the inward sorrow for sin would be attended with an outward token of that sorrow, involving pain or humilia- tion in some form or other, there are four distinct stages in the ecclesiastical use of the word “ poenitentia,”—first, as denoting the change of mind due to sorrow for sin ; next, the external penalty attached to each offence ; thirdly, the discipline of the church in dealing with all spiritual offences ; and lastly, any piece of austerity practised with a religious motive; and the fact of the Latin language having no doublets like the English “ penitence” and “ penance” to express the

distinct though allied ideas of the mental attitude and the outward action has powerfully conditioned Latin theology and practice.1

There is naturally but little to be found in the New Testament on the subject of discipline; but the whole principle is provided for and anticipated in one saying of

1 The Greek word merdvoa, which stands both for repentance and for the sacrament or mystery of penance, has undergone a singular degeneration of meaning in ecclesiastical language, being often used to denote an obeisance of head and body, because that gesture is one which Was enjoined upon penitents as part of the outward expression of sorrow for sin. But this ambiguity has had no theological results ; because the penalty imposed in the confessional is not called perdvota, but érityuia, and thus no confusion can arise, especially as the context always shows clearly when mwerdvoca stands for a mere gesture.

Christ—that which directs that he who neglects to hear the church as arbiter in a dispute shall be regarded as a heathen man and a publican, and which goes on to con- fer upon the apostles the power of binding and loosing (Matt. xviii. 17, 18),—words which they, with their Jewish experience and associations, must needs have interpreted as authorizing, and even enjoining, the infliction of pen- alties, and notably that of excommunication, upon members of the new society. Accordingly, the leading example of such discipline, the case of the incestuous Corinthian, attests plainly some form of trial, a sentence of excom- munication, some proof of repentance, and the consequent reconciliation and restoration of the offender (1 Cor. v. ; 2 Cor. ii. 6-10); and it is most probable that some such method was pursued in the sub-apostolic church, each case being dealt with locally, and on its separate merits, long before any formal system or code came into existence. The penalties seem at first to have been very simple and lenient, leaving out of account the difficult problem of the phrase ‘delivering to Satan,” twice found in this connexion (1 Cor. v. 5; 1 Tim. i. 20), which may mean merely relegating to heathen fellowship by exclusion from the society of Christians, but also may cover much more ground. Exclusion from the eucharist itself, exclusion from non-communicating

attendance at the eucharist, and exclusion from all religious assemblies for even the minor offices of worship are the only censures discoverable in the earlier period, though it is not long before certain additional penalties accompanying these grades of separa- tion begin to appear. The following broad rules govern all cases of penitential discipline in the ancient church. (1) Penance related only to baptized and communicant Christians. Even catechumens were not held capable of it, to say nothing of Jews or Pagans. (2) It was ex- clusively spiritual, and in no way touched the civil con- dition of the penitent, even after the conversion of the empire. (8) It was not compulsory, but spontaneous ; nay, so far was it from being imposed, that it had to be sought as a favour. Of course, where it was not so sought the excommunication of the offender remained in force, but this excommunication was not regarded as in itself a penance in the later use of that term. (4) The most usual rule allowed of penance but once. The relapsing offender had no second opportunity granted him. (5) It was always preceded by confession (e£oporsynous), a term which, however, even as early as Tertullian's time, was already extended to include, over and above the oral acknowledgment of guilt, the external acts of mortification accompanying it (De Pon.,c. 9). (6) There was a careful classification of the offences involving penance, and after a time a corresponding classification of penitents into certain fixed grades, through which it was in many cases necessary to pass, from the lowest to the highest, before receiving absolution and being restored to full communion.

The case dealt with by St Paul establishes one point, that of the comparative brevity of the time of penance, even for very grave offences, since three years is the longest period which can have elapsed between the two epistles to the Corinthians ; whereas under the later system periods of fifteen and twenty years are not rarely to be found, and in some cases penance was for life, however protracted. The earlier method can be shown to have come into wide acceptance far within the 2d century, because it forms the subject of a charge made against the church by Tertullian in one of his Montanist treatises (De Pudicitia) ; and the more stringent discipline of the succeeding era appears to be due to the nearly simultaneous action of two causes,—the great success which attended the persecution set on foot by the emperor Decius in 249, resulting as it did in a far larger propor-

tion of apostasies and compromises than any of the others, and the rise of Novatianism within two years, in protest against the leniency exercised towards the lapsed. Although the church rejected the extreme theories of rigid discipline which Novatian formulated, yet it was tacitly admitted that he did but exaggerate a truth, and the reins began to be drawn tighter from that time forward. Much in- formation regarding the practical working of the system in the third century can be gathered from the epistles of Cyprian, and from his treatise On the Lapsed; but the fact that he had to struggle against a lax party in Africa, at the very time when laxity was preponderant in the Italian Church, proves that no uniform system had yet been evolved. The 4th century is the period when broad general rules, intended to apply to all cases, begin to be laid down, and when the distribution of penitents into fixed classes or grades is clearly evident. The Eastern Church took the lead in this development, and canons of Ancyra and Neo-Cesarea in 314 refer to the grades of penance in terms which imply their general recognition as already established. They are first defined in an epistle ascribed to Gregory Thaumaturgus about the year 258, and are as under: (1) Weepers, forbidden to enter a church, and permitted merely to assemble at the doors to ask the prayers of those entering; (2) Hearers, suffered to come in for the Scripture lessons and the minor offices, but obliged to depart before the eucharistic office began ; (3) Kneelers, allowed to attend the earlier part of the eucharistic office, as far as the close of the introductory portion, but obliged to withdraw then along with the catechumens ; (4) Standers, who might remain throughout the entire rite, but were not suffered to communicate. This minute subdivision does not seem to have made good a footing in Western Christendom, where the first of these degrees is not found on record (Morinus, De Penitent., vi. 8), nor did it hold its ground very long in the East itself, disappearing as it does during the 5th century. The penitential observances usually imposed on those who were admitted to these grades were public confession of their offence in presence of the congregation, and that, in the case of the lowest grade, several times over ; the disuse of all ornaments, and the assumption of a sackcloth garb, with the strewing of ashes on the head (Euseb., H. £., v. 28); men had to cut off their hair and shave their beards ; women to wear their hair dishevelled and to adopt a special veil; all had to abstain from baths, festivals, and, gener- ally

speaking, all physical enjoyments, and fasting on bread and water was often enjoined ; they were bound to much more frequent and regular attendance at all religious assem- blies than the faithful or the catechumens (Conc. Carthag. IV., c. 81); if possessed of means, they were required to give largely in alms, or to assist actively in works of charity ; and they were, for the first ten centuries, incapable of being admitted to ordination. One result of the crowds of peni- tents which had to be dealt with after the lull that followed the Decian persecution was that the bishops were no longer sufficient in numbers to deal with each case separately, though under the earlier system the bishop alone (even when the presbyters acted as his assessors) could put to penance, as he continued for a long time to be the only officer who could reconcile and readmit those who had per- formed their appointed penance. A practice arose, therefore, of appointing certain presbyters to confer with all persons applying for admission to penance, and to receive their confessions privately, in order to prepare them for the public confession which made an integral part of penance, and indeed to decide whether they could be admitted thereto at all. These officers, known as “ penitentiaries,” were abolished in the church of Constantinople by the patriarch Nectarius about 390 (Socrat., 1. Z., v.19; Sozom., ZZ. #,,

vii. 16), and his example was followed throughout nearly the whole East ; but the office continued in the West, with various modifications necessitated by the gradual change of discipline.

The main difference between the earlier and later systems lies in the fact that penance was for some centuries restricted to certain very grave sins, to wit, idolatry, adultery, and murder, with such lesser offences as were closely allied (as, for instance, the delivery of the sacred books to pagan inquisitors, that traditio which has given the words “treason” and “traitor” to modern diction) ; nor does it appear that any distinction was made between the treatment of those penitents whose guilt was notorious and those whose own voluntary confession alone made it manifest. Minor offences were punished with suspension of communion and with refusal of oblations at the hands of the offender, and many were left wholly to the indi- vidual conscience. But the catalogue of canonical offences was much enlarged at

the time when the penitential system was developed and codified,—theft, usury, false witness, polygamy, habitual drunkenness, and some others being included amongst those which had to be publicly expiated., Yet it was this increased severity which led to the almost total abrogation of public penance, because of the scandal given by the publication of the numerous offences on the new list, whereas the cases under the older rule were necessarily few, however serious. It is clearly stated by both Socrates and Sozomen that the motive of Nectarius in abolishing the office of penitentiary was to avoid the recurrence of an uproar occasioned by the public confession of a lady of high rank, implicating others in a disgraceful fashion, so that he judged it better to leave the question of communion to be settled in private by penitents with their religious advisers, and not to be made matter of general publicity. This became the rule at once in the East, but public penance held its place in the West for many centuries longer, and in fact has never become entirely obsolete. There was, however, a considerable innovation introduced after the 7th century, in that offences privately committed were put in a different category from public sins, and were no longer made liable to public penance, but might be, and soon were, dealt with by private confession and penance only. Not only so, but, whereas the accusation of any person to the bishop as an offender was the usual mode of bringing his case under ecclesiastical cognizance in the earlier Christian centuries, on the other hand the discipline introduced in the Middle Ages was to exact public penance from such alone as had been convicted on trial before secular judges. The first beginnings of this innovation on Western usage are attributed by Morinus with much probability to Theodore of Tarsus, the Greek archbishop of Canterbury, who sat from 668 to 690, and whose Penitential (or code of ecclesiastical discipline), though not the earliest even now extant in the British Isles, soon achieved wide acceptance throughout the West, not- withstanding that it followed the then long-established Eastern usage in favour of private as opposed to public confession. A more serious innovation, fraught with dangerous consequences, made its appearance somewhat later, that of buying off a penance by a money payment to be expended in alms, a system in full force in the 9th century, as attested by the capitularies of Hincmar of Rheims and Hérard of Tours. Another custom which tended to break down the efficiency of the earlier discipline was that of resorting to Rome to have the more serious cases adjudicated on by the pope. At first this was an

exceptional mode of dealing with difficult matters, regarded as too serious or too intricate for local decision, but by the 11th century it had become a fashion, so that offenders of any rank or wealth refused habitually to submit to

penance at the hands of the local authorities, and betook themselves to Rome, where they stated their case in their own way, with no evidence to check them, so that they were enabled either to evade the canonical penances altogether or to get them much lightened. This abuse was combated by various councils, notably that of Seligen- stadt in 1022, which decreed in its eighteenth canon “that no indulgences obtained from the Roman pontiff should avail for penitents, unless they had first fulfilled the penances set them by their own priests according to the degree of their offence ; and, if they chose to go then to Rome, they must procure a permit from their own bishop, and letters on the matter in question to be carried to the pope.” But this attempt to check the practice was unsuccessful, and it became established that, just as certain cases of conscience were reserved to the bishop, and could not be dealt with by ordinary parish priests, so certain other cases were withdrawn from the cognizance of the bishops themselves, and reserved for the hearing and decision of the pope alone. Many alterations in the nature and incidence of penances were made in the course of the later Middle Ages, but the details are unimportant except for specialists ; it will suffice to mention such ex- amples as imprisonment in monasteries, penitential pil- grimages, and flagellations, the last having been introduced by the hermit Dominic the Cuirassier (died 1060).

It is time to speak of the position occupied by penance in the theological systems of the Latin and Greek Churches. Both of them account penance, taken in its widest sense of the method of dealing spiritually with sins by confession, discipline, and absolution, as a sacrament, but there are various differences in their theories and methods. The Greek and Armenian Churches are in full agreement with the Latin Church in regarding confession as an integral and essential part of penance, of which they consider it the outward and visible sign, while the spiritual part of the sacrament consists in the form of absolution, whether precatory or declaratory, pronounced by the priest. And they lay down that the external acts of asceticism per- formed by the penitent are not strictly part of the

sacra- ment itself, but merely the fulfilment of the church's injunctions, and tokens of that repentance which should attend the confession of sins. And confession, though recommended as a religious observance, is not a matter of formal ecclesiastical precept in the Eastern Church, but is left to the individual conscience, though it is usual to practise it at least once a year, prior to the Easter communion. There are also certain public penances some- times enjoined in the East for sins of exceptional gravity, publicly or legally proved, but they do not form part of the normal system, one part of which, in strict agreement with ancient usage, consists in suspending heinous offenders from communion for some years, during which they can receive only the dvriéwpov or blessed bread. And in all cases the Easterns deny that penances are in any sense satisfactions or expiations of sins made to appease divine justice.

In the Latin Church the first noticeable divergence from Oriental usage is that the old public form of penance, technically known as "solennis," still survives in a docu- mentary fashion in the Pontifical, though it has dropped into virtual abeyance. It consists of two distinct and correlative parts,—the public expulsion of penitents from church on Ash Wednesday and their reconciliation and readmission on Maundy Thursday following. As these rites preserve in essentials the traditions of very early Western usage, it is well to give some account of them here.

On Ash Wednesday, then, those penitents whose names are

Written down on a list for the purpose assemble, in coarse raiment and barefoot, at the cathedral of their diocese at nine o clock A.M.

Their penances are then assigned them severally by the penitentiary or some other officer deputed for the purpose, after which they are sent out of the church, and bidden to wait at the doors. 'The bishop, attended by the clergy and choir, takes his seat in the uviddle of the nave, facing the doors, having previously blessed ashes for the coming rite. The penitents are next admitted, and kneeling before the bishop, have ashes sprinkled on their

heads by him or by some other dignitary present, and sackcloth is also laid upon them in similar fashion. The penitcntial psalms and the litanies are then said, all kneeling ; after this the penitents stand up to hear a sermon from the bishop, at the close of which he takes one of them by the right hand, and leads him towards the doors, followed by all the other penitents, each grasping another's hand, and also holding lighted tapers, when they are ejected in a body. They kneel outside, and are again addressed by the bishop, enjoining them to spend the time of penance in prayers, fastings, almsdeeds, and pilgrimages, and to return on Maundy Thursday for reconcilia- tion. 'The church-doors are then shut in their faces, and the bishop proceeds to celebrate mass.

The office on Maundy Thursday begins with the penitential psalms and the litanies, said by the bishop and clergy in church, while the penitents wait, barefoot and with unlighted tapers, out- side the doors. After some preliminary ceremonies, a deacon goes to the penitents with a lighted candle, and kindles their tapers. The bishop then seats himself, as in the former rite, and the peni- tents are presented to him collectively by the archdeacon with a formal address. The bishop then riscs, and with his immediate attendants advances to the doors, where he delivers a short address to the penitents, which ended, he returns into the church, still keeping near the doors, and, while a psalm is sung, the penitents enter and kneel before him; then the archdeacon or archpriest petitions for their reconciliation, and, having replied to the bishop's question as to their fitness, recites certain versicles and responses alternately with the choir, while the bishop takes hold of the hand of one of the penitents, who in his turn takes that of another, till all form a chain, and thus they are led by the bishop to the middle of the church, where he recites a form of absolution over them. Psalms and prayers, closing with another absolutory form and a benediction, end the office, after which the penitents resume their ordinary dress, laying aside that which they had worn during Lent.

A further difference between the Eastern and Latin Churches is that the latter has made confession a formal precept ever since the canon of the Lateran council under Innocent III. in 1215, Omnis utriusque sexus, which enjoins all those arrived at years of discretion to confess at least once a year to their own parish priest, or to another priest with consent of the parish

priest, the act being no longer left optional. And the choice of a confessor is limited also by the rule that absolution is not accounted valid unless pronounced by a priest having local jurisdiction and faculties. The chief divergence, however, between East and West on the sacrament of penance is due to the remarkable developments both in the doctrinal and the disciplinary aspects of the rite which took place in Latin Christendom during the Middle Ages. The former of these is mainly concerned with the new application, in the 12th century, of the system of indulgences, from its original character of a relaxation of the duration or severity of the temporal penalties annexed to offences by the canons to the remission of purgatorial chastisement of departed souls in the intermediate state—a tenet which seems to have been first developed by Hugh and Richard of St Victor—which gave rise to the practice of penitential observances by persons not lying under any censure, with the aim of acquiring the advantages thus held out to them for themselves or others, living or departed, to whom they are at liberty to transfer them. The latter is due to the legal, methodizing, and codifying temper which forms such a marked peculiarity of the Latin mind, in contrast with the more speculative Greek. Hence has arisen a copious literature, beginning with those Penitentials, or codes of disciplinary canons, already mentioned, but amplified at a later time into a vast system of moral theology and casuistry, mainly elaborated in the 16th and 17th centuries (see Licuort), whereby the whole modern administration of penance in the Latin Church is regulated. The Oriental churches have no corresponding

| system or text-books, and continue to observe the less

methodized and determinate order in use during the 6th and immediately succeeding centuries. There is no theo- logical difference between them, however, in respect of their view of absolution, although in the one case a declaratory, and in the other a precatory, form is employed. Buta distinction in practice is maintained hereupon, for even the United Greeks are obliged, in virtue of an instruction issued by Clement VIII. in 1595, to use only the declaratory form when pronouncing absolution. In Latin theology the matter of the sacrament of penance is distinguished as “remote” and

“proximate,” as “‘ exterior ” and “ interior,” as “necessary” and “sufficient.” The remote and exterior matter of penance is all post-baptismal sin, with the remis- sion and correction of which penance has to do. The class of mortal sins are the necessary exterior matter, because confession is the only recognized mode of obtaining their remission. Venial sins are sufficient or voluntary matter of penance, because confession of them is not compulsory, and remission may be otherwise had. The contrition, confession, and satisfaction of the penitent are the proxi- mate and interior matter of penance, with this further distinction, that the two former are “‘essential” and insepar- able parts of it, while satisfaction, though an “integral ” part, is not essential, being capable of dispensation. The form of the sacrament is the absolution pronounced by the priest. And, as before stated, the acts of bodily or spiritual mortification enjoined on the penitent as parts of his satisfaction, are called penances.

In the Church of England, penance, governed by pre- Reformation canons and statutes, has continued to be inflicted by sentence of the ecclesiastical courts down to very recent times,—one of its commonest forms being that of standing at the church-door clad in a white sheet. Pre- cautions were taken by constitutions of Cardinal Othobon and Archbishop Stratford against the abuse of money com- mutations of penance; and the right of the spiritual courts to deal with cases involving penance, whether corporal or pecuniary, was protected against writs of prohibition by the statutes Circumspecte agatis, 13 Edward I. st. 4,and Articul: Clerr, 9 Edward IT. st. 1,¢. 2. The Reformatio Legum provided that ecclesiastical penances should not be com- muted for money, save for some grave and necessary cause, and that such money should be applied to the relief of the poor, while a repeated offence should admit of no com- mutation. This same question came up frequently, having been dealt with under Queen Elizabeth, Charles I., William ITI., and Queen Anne, on the last occasion by Convocation, which laid down rules that no commutation-money should be allowed by any ecclesiastical judge without the consent of the ordinary in writing, nor disposed of without the like consent. ‘The commination office in the Book of Common Prayer makes reference to the solemn Lenten penance described above, as a thing desirable to be restored ; but no action has ever been taken for the purpose.

In the Lutheran communion, penance, though at first amongst the usages intended to be maintained, and acknowledged in the Articles of Schmalkald, and also in the Apology for the Confession of Augsburg, has never held an effective place, being in truth incompatible with the doctrines and polity elaborated by Luther himself; so _ that, although confession and absolution continue as sur- vivals in the Lutheran system, they are not associated with any regular discipline. Far otherwise is it with Calvinism. The twelfth chapter of the fourth book of Calvin's Institutes is mainly taken up with the question of ecclesiastical discipline, whose necessity is broadly stated, and alleged to extend to the whole body, clerical and lay alike, and to be derived from the power of the Keys. No precise rules are laid down, beyond saying that censures may begin with private monition, but should ascend in

severity in proportion to the gravity and notoriety of offences; but, in point of fact, the system raised on this basis by most of the Calvinist societies was a stringent and searching one. In particular, the Pirst and Second Books of Discipline, put forth by John Knox and by the second generation of Scottish Reformers, lay down the principles for dealing with offenders against religion and morals with much clearness and precision, and the Form of Process in the Judicatories of the Kirk, as approved by the General Assembly in 1707, prescribes the manner of proceeding to inflict the several penalties enacted against a variety of offences and scandals. These at one time covered a wide area, but in later times only certain forms of immorality have continued to be brought under ecclesi- astical cognizance for public censure and penalties. All the other more important Protestant sects have their own systems of discipline, more or less stringent, but they are virtually restricted in operation to suspension of communion with the body, or to expulsion from membership, no other penalties being provided.

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PENANG. See Prince or WaLzEs ISLAND.

PENARTH, a seaport of Glamorganshire, Wales, is picturesquely situated on rising ground on the south side of the mouth of the Taff opposite Cardiff, from which it is four miles distant by rail and two by steamer. It was a small and unimportant village until an Act was passed in 1856 for making a tidal harbour. The docks (1865-84) are on a very extensive and complete scale, and the town is now an important shipping port for the minerals of South Wales, especially alabaster, coal, and iron. In 1883 there entered 1130 steamers and 567 sailing-vessels with an aggregate registered tonnage of 1,316,265 tons. The total quantity of coal and coke shipped in the same year was 2,274,003 tons. A line of rails 4 miles in length connects the docks with the Taff Vale Railway. The town is frequented in summer as a bathing-place, and the Rheetic beds at the head are of special interest to geologists. The principal buildings are the custom-house and dock-offices, and the church of St Augustine, in the Early English style, erected by the Baroness Windsor, who also built national schools. The population of the urban sanitary district (area, 2202 acres) in 1871 was 3104, and in 1881 it was

6228.

PENATES, Roman gods of the store-room and kitchen, derived their name from penus, “eatables, food.” The store-room over which they presided was, in old times, beside the atriwm, the room which served as kitchen, parlour, and bedroom in one; but in later times the store- room was in the back part of the house. It was sanctified by the presence of the Penates, and none

but pure and chaste persons might enter it, just as with the Hindus the kitchen is sacred and inviolable. The family hearth, which anciently stood in the atriwm, was their altar ; on it were placed their images, two in number, for the Penates were always in pairs—the name does not occur in the singular.

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They had no individual names, but were always known under the general designation, Penates. Closely associated with the Penates were the Lares, another species of domestic deity, who seem to have been the deified spirits of deceased ancestors (see Lares). But while each family had two Penates it had but one Lar. In the household shrine the image of the Lar (dressed in a toga) was placed between the two images of the Penates, which were represented as dancing and elevating a drinking-horn in token of joy and plenty. The three images together were sometimes called

Penates, sometimes Lares, and either name was used meta—

phorically for “home.” The shrine stood originally in the atrium, but when the hearth and the kitchen were sepa- rated from the atriwm and removed to the back of the house, and meals were taken in an upper story, the position of the shrine was also shifted. In the houses at Pompeii it is sometimes in the kitchen, sometimes in the rooms. In the later empire it was placed behind the house-door, and a taper or lamp was kept burning before it. But the worship in the interior of the house was also kept up even into Christian times ; it was forbidden by an ordinance of Theodosius (392 a.p.). The old Roman used, in company with his children and slaves, to offer a morning sacrifice and prayer to his household gods. Before meals the blessing of the gods was asked, and after the meal, but before dessert, there was a short silence, and a portion of food was placed on the hearth and burned. If the hearth and the images were not in the eating-room, either the images were brought and put on the table, or before the shrine was placed a table on which were set a salt-cellar, food, and a burning lamp. ‘Three days in the month, viz., the Calends, Nones, and Ides (i.c., the first, the fifth or seventh, and the tairteenth or fifteenth), were set apart for special family worship, as were also the Caristia (22d February) and the Saturnalia in December. On these days as well as on such occasions as birthdays, marriages, and safe

returns from journeys, the images were crowned and offerings made to them of cakes, honey, wine, incense, and sometimes a pig. As each family had its own Penates, so the state, as a collection of families, had its public Penates. Intermediate between the worship of the public and private Penates were probably the rites (sacra) observed by each clan (gens) or collection of families supposed to be descended from a common ancestor. The other towns of Latium had their public Penates as well as Rome. The sanctuary of the whole Latin league was at Lavinium. To these Penates at Lavinium the Roman priests brought yearly offerings, and the Roman consuls, pretors, and dic- tators sacrificed both when they entered on and when they laid down their office. To them, too, the generals sacri- ficed before departing for their provinces. Alba Longa, the real mother-city of Latium, had also its ancient Penates, and the Romans maintained the worship on the Alban Mount long after the destruction of Alba Longa. The Penates had a temple of their own at Rome. It was on the Velia near the Forum, and has by some been identified with the round vestibule of the church of SS. Cosma e Damiano. In this and many other temples the Penates were represented by two images of youths seated holding spears. The Penates were also worshipped in the neigh- bouring temple of Vesta. To distinguish the two wor- ships, it has been supposed that the Penates in the former temple were those of Latium, while those in the temple of Vesta were the Penates proper of Rome. Certainly the worship of the Penates, whose altar was the hearth and to whom the kitchen was sacred, was closely connected with that of Vesta, goddess of the domestic hearth.

The origin and nature of the Penates was a subject of much discussion to the Romans themselves. They were traced to the mysterious worship of Samothrace ; Dar-

danus, it was said, took the Penates from Samothrace to Troy, and after the destruction of Troy Aineas brought them to Italy and established them at Lavinium. From Lavinium Ascanius carried the worship to Alba Longa, and from Alba Longa it was brought to Rome. Equally unsatisfactory with this attempt to connect Roman religion with Greek legend are the vague and mystic speculations in which the later Romans indulged respecting the

nature of the Penates. Some said they were the great gods to whom we owe breath, body, and reason, viz., Jupiter representing the middle ether, Juno the lowest air and the earth, and Minerva the highest ether, to whom some added Mercury as the god of speech (Servius, on dn., ii. 296; Macrobius, Sat. i. 4, 8; Arnobius, Adv. Nat., iii. 40). Others identified them with Apollo and Neptune (Macrob., ili. 4, 6; Arnob., Zc.; Serv., on 4in., iii. 119). The Etruscans held the Penates to be Ceres, Pales, and Fortuna, to whom others added Genius Jovialis (Serv., on 4n., il. 325; Arnob., /.c.). The late writer Martianus Capella records the view that heaven was divided into sixteen regions, in the first of which were placed the Penates along with Jupiter, the Lares, &c. More fruitful than these misty speculations is the suggest- ion, made by the ancients themselves, that the worship of these family gods sprang from the ancient Roman custom (common to many savage tribes) of burying the dead in the house. But this would account for the worship of the Lares rather than of the Penates. A comparison with other primitive religious beliefs suggests the conjecture that the Penates may be a remnant of that fetishism or animism (i.e, the attribution of life, thought, and feeling to all objects animate and inanimate) in which many savage tribes exist to this day, and through which the higher races have probably passed at some period of their history, whether we suppose animism to be the primitive state of the human mind, or to be itself a development from the worship of ancestors, as Mr Herbert Spencer believes, or from some lower form of belief. The Roman geni seem certainly to have been fetishes, and the Penates were per- haps originally a species of geniv. Thus the Penates, as simple gods of food, are probably much more ancient than deities like Jupiter, Neptune, Apollo, and Minerva, whose wide and varied attributes represent a power of abstraction and generalization in the minds of their worshippers such as is not possessed by very primitive men. With the Penates we may compare the kindly household gods of old Germany ; they too had their homie on the kitchen hearth and received offerings of food and clothing. In the castle of Hudemithlen (Hanover) there was a kobold for whom a cover was always set on the table. In Lapland each house had one or more spirits. The souls of the dead are regarded as house-spirits by the Russians ; they are represented as dwarfs, and are served with food and drink. Each house in Servia has its patron-saint. In the mountains of Mysore every house has its bhuta or guardian deity, to whom prayer and sacrifices are offered. The Chinese god of the kitchen presents some curious analogies

to the Penates : incense and candles are burnt before him on the first and fifteenth of the month; some families burn incense and candles before him daily ; and on great festivals, one of which is at the winter solstice (nearly corresponding to the Saturnalia), he is served with cakes, pork, wine, incense, &c., which are placed on a table before him.

See Hartung, Die Religion der Romer ; Hertzberg, De dtis Roman. patr.; Preller, Rim. Mythol. ; Marquardt, Rom. Staats- verwalt., vol. iii. For household gods of other peoples see Bastian, Der Mensch in der Geschichte, iii. p. 202 sq. (J. G. FR.)

PENCIL (Lat. penicillus, a small tail), a name originally applied to a small fine-pointed brush used in painting, and still employed to denote the finer camel's-hair and sable

brushes used by artists, has, in English, come commonly to signify solid cones or rods of various materials used for writing and drawing. Some method of producing black or

coloured markings with rods of solid material on parchment,'

paper, wood, and other like smooth surfaces must have been known from time immemorial, but the ordinary so-called black-lead pencil does not possess a very high antiquity. It has been asserted that a manuscript of Theophilus, attributed to the 13th century, shows signs of having been ruled with a black-lead pencil; but the first distinct allusion to the common form of the instrument occurs in the treatise on fossils by Conrad Gesner of Zurich (1565), who describes an article for writing formed of wood and a piece of lead, or, as he believed, an artificial composition called by some stimmi anglicanum (English antimony). The famous Borrowdale mine in Cumberland having been discovered about that time, it is probable that we have here the first allusion to that great find of graphite which for so long supplied the world with its best lead pencils. While the supply of the Cumberland mine lasted, the material for the highly-esteemed English

pencils consisted simply of the native graphite as taken from the mine. The pieces were sawn into thin veneers, which again were cut into the slender square rods forming the “lead” of the pencil. These leads were either cased in pencil cedar (the wood of the Virginian cedar, Juniperus wirginiana), forming ordinary pencils, or they were, by an ingenious and delicate process of turning, in which ruby-cutters were used, rendered circular to supply the “‘ever-pointed pencils,” which, however, are of comparatively modern origin.

Strenuous efforts were made on the Continent and in England to enable manufacturers to become independent of the product of the Cumberland mine. In Nuremberg, where the great pencil factory of the Faber family was established in 1761, pencils were made from pulverized graphite cemented into solid blocks by means of gums, resins, glue, sulphur, and other such substances, but none of these preparations yielded useful pencils. About the year 1795 Conté of Paris devised the process by which now all black-lead pencils, and indeed pencils of all sorts, are manufactured. In 1843 Mr Brockedon patented a process for compressing pure black-lead powder into solid compact blocks by which he was enabled to use the dust, fragments, and cuttings of fine Cumberland lead. He sub- mitted the powdered substance to enormous pressure, and, by concurrently exhausting the air from the dies and the block of graphite in process of compression, he succeeded in forming a dense compact and uniform cake which could be treated in the same way as natural massive graphite from the mine. Brockedon’s process would have proved successful and important had the supply of fine English black lead continued, but the exhaustion of the Borrowdale supplies and the excellence of Conté’s process have rendered it more of scientific interest than of commercial value.

The pencil leads prepared by the Conté process consist of a most intimate mixture of graphite and clay, both first brought to a con- dition of the finest subdivision. The graphite is reduced to fine powder in a mortar ; it is sifted and sometimes treated with mineral acid, to free it from iron, &c,, then washed, and thereafter calcined at a bright-red heat. To get it in the condition of fine division, it is mixed with water and poured into a vat, where the heavier particles sink. From this vat the water bearing the lighter particles passes into another at a lower level, and so into one or two more,

in each of which the comparatively heavy particles sink, and only the still finer particles are carried over. That which sinks in the last of the series is in a condition of extremely fine division, and is used for pencils of the highest quality. The clay, which must be free of sand and iron, is treated in the same manner, and brought to a state of great uniformity and smoothness. Clay and graphite so prepared are mixed in varying proportions from about equal parts to two of clay for one of graphite according as the pencils are to be hard or soft. They are thoroughly incorporated and ground to- gether, then placed in bags and squeezed in a hydraulic press till

they have the consistency of stiff dough, in which condition they are ready for forming pencil rods. For this purpose the plastic mass is placed in a strong upright cylinder of brass, into which a plunger or piston works, moved by a powerful screw-press. The bottom of the cylinder consists of a thick bronze plate having in it a number of small apertures the section and size of the leads to be made. By the application of pressure to the plunger the graphite mixture is squeezed in continuous threads through the holes, and these threads are received and arranged in straight continuous lengths on a board, on which they are left to dry for some hours, For further drying by gentle heat they are placed in straight grooves in a grooved board, covered with another board, in which position they harden to stiff rods. These are afterwards cut into lengths for pencils, which are packed with charcoal in a covered crucible and submitted toa high furnace-heat. The two elements which regulate the comparative hardness and blackness of pencils are the proportions of graphite and clay in the leads and the heat to which they are raised in the crucible. According as the proportion of graphite is greater and the heat lower the pencil is softer and of deeper black streak.

The cedar in which pencils are cased is cut into two sets of rectangular slips of unequal thickness ; but so that a thick anda thin slip put together form in section a square. In the thick or body piece is formed the groove or depression to receive the lead, which perfectly fits and fills it. The thinner covering piece is glued on and the pencil rounded between revolving cutters working at great speed. The cutters leave the rounded surface perfectly smooth, and it only remains to stamp the finished pencil with name and

grade, &c. Very many pencils—but not usually good English qualities—are lacquered or varnished, and have the names, &c., stamped in gold letters.

Black pencils of an inferior quality are made from the dust of graphite melted up with sulphur and run into moulds. Such, with a little tallow added to give them softness, are the pencils commonly used by carpenters. Coloured pencils consist of a mixture of clay, with appropriate mineral colouring matter, wax, and tallow, treated by the Conté method as in making lead pencils. In the indelible and copying pencils which have come into use in recent years, the colouring matter is an aniline preparation mixed with clay and gum. The mixture not only makes a streak which adheres to the paper, but, when the writing is moistened with water, it dissolves and assumes the appearance and properties of an ink.

Nuremberg is the great centre of the pencil trade, possessing twenty-six factories which give employment to 5500 persons, the annual output of pencils numbering not less than 250 millions, of a value of upwards of £400,000. (J. PA.)

PENDULUM. See Cutocxs, vol. vi. p. 14, and MeEcuHANICs, vol. xv. pp. 705, 718, 768.

PENELOPE, the faithful wife of the Greek hero Odys- seus (Ulysses), immortalized by Homer in the Odyssey. She was the daughter of the Spartan Icarius and Peribcea. Shortly before Odysseus left his native island of Ithaca to war against Troy, Penelope bore him a son, Telemachus. _ When her husband tarried long many chieftains of Ithaca and the islands round about wooed her to wife; they behaved wantonly, wasting the substance of Odysseus, insulting his son, and corrupting the maidservants. The heart of Penelope yearned for Odysseus, and, to rid herself of the importunities of the wooers, she bade them wait till she had woven a winding-sheet for old Laertes, the father of Odysseus. But every night she undid the piece which she had woven by day, so that the web was always un- finished. This she did for three years, till her maids revealed the secret to the wooers. Robbed of her pretext for delay she was in sore straits, till she was relieved by the arrival of Odysseus after an absence of twenty years. He slew the wooers, and the long-parted husband and wife were united once more.

Such is the story of Penelopein Homer. Later writers add other particulars about her. She was won by Odysseus in a race proposed by Icarius to his daughter's suitors. When Icarius would fain that Odysseus should bide with him in Sparta, or at least leave him his daughter, and Odysseus let Penelope choose whether she would go with him to Ithaca or stay with her father in Sparta, she silently drew her veil over her face. ,Her father understood her and let her go (Pausan., iii. 12, 20). Some said that she bore a sou, Ptoliporthes, to Odysseus after his return from Troy. Others (mar- ring Hoier's picture of her as a true and loving wife) said that in

her husband's absence she bore Pan to Hermes or the suitors. Another story was that on his return Odysseus repudiated her as

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unfaithful, that she went to Sparta and thence to Mantinea, where she died and where her tomb was shown (Pausan., vill. 12). Ac- cording to others, after the death of Odysseus she married Telegonus (son of Odysseus and Circe) in Afzea, or in the Islands of the Blest. The name is connected with wfvos, rivy, '' woof," and hence means ''weaver." The Homeric form is Penelopeia.

PENGUIN, the name (of very uncertain origin) of a flightless sea-bird,' but, so far as is known, first given to one inhabiting the seas of Newfoundland, as in Hore's "Voyage to Cape Breton," 1536 (Hackluyt, Researches, iil. pp. 168-170), which subsequently became known as the Great Auk or GarE-FowL (vol. x. p. 78); and, though the French equivalent Pingowin? preserves its old application, at the present day, the word Penguin is by English ornitho- logists always used in a general sense for certain Birds inhabiting the Southern Ocean, called by the French Man- chots, the Spheniscidz of ornithologists, which in some respects form perhaps the most singular group of the whole Class, or at least we may say of the Carinate Subclass. For a long while their position was very much misunderstood, some of the best of recent or even living systematists having placed them in close company with the Alcide or Auks, to which they bear only a relationship of analogy, as indeed had been perceived by a

few ornithologists, who recognized in the Penguins a very distinct Order, Jmpennes. The view of the latter is hardly likely to be disputed in future, now that the anatomical researches of MM. Paul Gervais and Alix (Journ. de Zoologie, 1877, pp. 424-470), M. Filhol (Bull. Soc. Philomathique, ser. 7, vi. pp. 226-248), and above all of Prof. Watson (Zoology, Voy. Challenger, part xviii.) have put the independent position of the Spheniscidx in the clearest light. The most conspicuous outward character presented by the Penguins is the total want of quills in their wings, which are as incapable of flexure as the flippers of a Cetacean, though they move freely at the shoulder-joint, and some at least of the species occasionally make use of them for progressing on land. In the water they are most efficient paddles, and are usually, if not always, worked alternately with a rotatory action. The plumage which clothes the whole body, leaving no bare spaces, generally consists of small scale-like feathers, many

1 Of the three derivations assigned to this name, the first is by Drayton in 1613 (Polyolbion, Song 9), where it is said to be the Welsh pen gwyn, or “white head”; the second, which seems to meet with Littre’s approval, deduces it from the Latin pingwis (fat); the third supposes it to be a corruption of “pin-wing” (Ann. Nat. History, ser. 4, iv. p. 183), meaning a bird that has undergone the operation of pinioning or, as in one part at least of England it is commonly called, “ pin-winging.” In opposition to the first of these hypotheses it has been urged (1) that there is no real evidence of any Welsh dis- covery of the bird, (2) that it is very unlikely for the Welsh, if they did discover it, to have been able to pass on their name to English navigators, and (3) that it had not a white head, but only a patch of white thereon. To the second hypothesis Prof. Skeat (Dictionary, p. 433) objects that it “ will not account for the suffix -in, and is therefore wrong; besides which the ‘Dutchmen’ [who were asserted to be the authors of the name] turn out to be Sir Francis Drake” and his men. In support of the third hypothesis Mr. Reeks wrote (Zoologist, ser. 2, p. 1854) that the people in Newfoundland who used to meet with this bird always pronounced its name “ Pin wing.” Prof. Skeat’s inquiry (loc. cit.), whether the name may not after all be South-American, is to be answered in the negative, since, so far as evidence goes, it was given to the North-American bird before the South-American was known in Europe.

‘ 2 Gorfou has also been used by some French writers, being a corrup- tion of Geirfugl or Gare-fowl.

3 Though the present writer cannot wholly agree with the conclusions of the last of these investigators, his remarks (pp. 230-232) on the “ Origin of the Penguins” are worthy ofall attention. He considers that they are the surviving members of a group that branched off early from the primitive “avian” stem, but that at the time of their separation the stem had diverged so far from Reptiles as to possess true wings, though the metatarsal bones had not lost their distinctness and become fused into the single bone so characteristic of existing Birds. _The ancestral Penguin, Prof. Watson argues, must have had functional wings, the muscles of which, through atrophy, have been converted into non-contractile tendinous bands.

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of them consisting only of a simple shaft without the development of barbs; but several of the species have the head decorated with long cirrhous tufts, and in some the tail-quills, which are very numerous, are also long. In standing these birds preserve an upright position, gener- ally resting on the “tarsus”® alone, but in walking or running on land this is kept nearly vertical, and their weight is supported by the toes alone.

The most northerly limit of the Penguins’ range in the Atlantic is Tristan d’Acunha, and in the Indian Ocean Am- sterdam Island, but they also occur off the Cape of Good Hope and along the south coast of Australia, as well as on the south and east of New Zealand, while in the Pacific one species at least extends along the west coast of South America and to the Galapagos; but north of the equator none are found. In the breeding season they resort to the most desolate lands in higher southern latitudes, and indeed have been met with as far to the southward as navigators have penetrated. Possibly the Falkland Islands may be regarded as the locality richest in species,° though, what- ever may have been the case once, their abundance there

King-Penguin (Aptenodytes pennanti).

as individuals does not now nearly approach what it is in many other places, owing doubtless to the ravages of man, whose advent is always accompanied by massacre and devastation on an enormous scale—the habit of the help- less birds, when breeding, to congregate by hundreds and thousands in what are called “ Penguin-rookeries ” contri- buting to the ease with which their slaughter can be effected. Incapable of escape by flight, they are yet able to make enough resistance or retaliation (for they bite powerfully

4 The pterylographical characters of the Penguins are well described by Mr Hyatt (Proc. Boston Soc. Nat. History, 1871). Mr Bartlett has observed (Proc. Zool. Society, 1879, pp. 6-9) that, instead of moulting in the way that birds ordinarily do, Penguins, at least in passing from the immature to the adult dress, cast off the short scale-like feathers from their wings in a manner that he compares to “the shedding of the skin in a serpent.” ;

5 The three metatarsals in the Penguins are not, as in other birds, united for the whole of their length, but only at the extremities, thus preserving a portion of their originally distinct existence, a fact probably attributable to arrest of development, since the researches of Prof. Gegenbaur shew that the embryos of ail birds, so far as is known, possess these bones in an independent condition.» More recently Prof. Marsh has found that in the Dinosaurian genus Ceratosaurus the metatarsals acquire a condition very similar to that which they present in the Penguins (Am. Journ. Science, Aug. 1884). a

6 An interesting account of the Penguins of these islands is given by Capt. Abbott (Ziis, 1860, p. 336).

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when they get the chance) to excite the wrath of their murderers, and this only brings upon them greater destruc- tion, so that the interest of nearly all the numerous accounts of these “rookeries” is spoilt by the disgusting details of the brutal havoc perpetrated upon them.

The Spheniscidx have been divided into at least eight genera, but three, or at most four, seem to be all that are needed, and three can be well

distinguished, as pointed out by Dr Coues in the Philadelphia Proceedings for 1872 (pp. 170-212), by anatomical as well as by external characters. They are (1) Aptenodytes, easily recognized by its long and thin bill, slightly decurved, from which Pygoscelis, as Prof. Watson has shewn, is hardly distinguishable; (2) Eudyptes, in which the bill is much shorter and somewhat broad ; and (3) Spheniscus, in which the shortish bill is compressed and the maxilla ends in a conspicuous hook. Aptenodytes contains the largest species, among them those knownas the “Emperor” and “ King” Penguins, A. patagonica and A. longirostris..| Three others belong also to this genus, if Pygoscelis be not recognized, but they seem not to require any particular remark. Hudyptes, containing the crested Penguins, known to sailors as “‘ Rock-hoppers” or ‘‘ Maca- ronis,” would appear to have five species, and Spheniscus four, among which S. mendiculus, which occurs in the Galapagos, and therefore has the most northerly range of the whole group, alone needs notice here. The generic and specific distribution of the Penguins is the subject of an excellent essay by Prof. Alphonse Milne-Edwards in the Annales des Sciences Naturelles for 1880 (vol. ix. art. 9, pp. 23-81), of which there is a German translation in the Mittheilungen of the Ornithological Union of Vienna for 1883 (pp. 179-186, 210-222, 238-241). (A. N.)

PENN, Witui1am (1644-1718), the Quaker, was the son of Admiral William Penn and Margaret Jasper, a Dutch lady, and was born at Tower Hill, London, on 14th October 1644. During his father’s absence at sea he lived at Wanstead in Essex, and went to school at Chigwell close by, in which places he was brought under strong Puritan influences. Like many children of sensitive temperament, he had times of spiritual excitement; when about twelve he was “suddenly surprised with an inward comfort, and, as he thought, an external glory in the room, which gave rise to religious emotions, during which he had the strongest conviction of the being of a God, and that the soul of man was capable of enjoying communication with Him. He believed also that the seal of divinity had been put upon him at this moment, or that he had been awakened or called upon to a holy life.” It would indeed have been unnatural if a mind so disposed had not, when the time came, seized with avidity upon the distinctive doctrine of the Friends, that of the “inward light.”

Upon the death of Cromwell, Penn’s father, who, like Monk, was purely an adventurer, and had served the Pro- tector because there was no other career open, and who, according to Clarendon, had previously offered to bring over the fleet to Charles, remained with his family on the Irish estates which Cromwell had given him, of the value of £300 a year. On the deposition of Richard Cromwell he at once declared for the king and went to the court at Holland, where he was received into favour and knighted ; and at the elections for the Convention Parliament he was returned for Weymouth. During these events young Penn studied under a private tutor on Tower Hill until, in October 1660, he was entered as a gentleman commoner at Christ Church. He appears in the same year to have contributed to the Threnodia, a collection of elegies on the death of the young duke of Gloucester.

- An example, presumably of the former species, weighing 78 ib,

was, according to Dr M ‘Cormick (Voyages of Discovery, i. p. 259 obtained by the “Terror” in J anuary i842, a oni :

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The rigour with which the Anglican statutes were revived, and the Puritan heads of colleges supplanted, roused the spirit of resistance at Oxford to the uttermost, With this spirit Penn, who was on familiar terms with John Owen, and who had already fallen under the influ- ence of Thomas Loe the Quaker, then at Oxford, actively sympathized. He and others refused to attend chapel and church service, and were fined in consequence. So far did the young enthusiasts proceed in the expression of their hatred to the Anglican regulations that it is said they fell upon the students who were clothed in surplices and violently tore the hated vestments from them. How far his leaving the university resulted from this cannot be clearly ascertained. Anthony Wood has nothing regarding the cause of his leaving, but says that he stayed at Oxford for two years, and that he was noted for proficiency in manly sports. There is no doubt that in January 1662 his father was anxious to remove him to Cambridge, and consulted Pepys on the subject; and in later years he speaks of being “banished” the college, and of being whipped, beaten, and turned out of doors on his return to his father, in the anger of the latter at his avowed Quakerism. A reconciliation,

however, was effected; and Penn was sent to France to forget this folly. The plan was for a time successful. Penn appears to have entered more or less into the gaieties of the court of Louis XIV., and while there to have become acquainted with Robert Spencer, afterwards earl of Sunderland, and with Dorothy, sister to Algernon Sidney. What, however, is more certain is that he somewhat later placed himself under the tuition of Moses Amyraut, the celebrated president of the Protestant college of Saumur, and at that time the exponent of liberal Calvinism, from whom he gained the patristic knowledge which is so prominent in his controversial writings, and whose example, doubtless, stimulated the tolerant views he already entertained. He afterwards travelled in Italy, returning to England in August 1664, with “a great deal, if not too much, of the vanity of the French garb and affected manner of speech and gait.” ?

Until the outbreak of the plague Penn was a student of Lincoln’s Inn. For a few days also he served on the staff of his father—now great captain commander—and was by him sent back in April 1665 to Charles with despatches. It will be observed that his letters to his father even at this time are couched in quaintly devout phraseology. Return- ing after the naval victory off Lowestoft in June, Admiral Penn found that, probably from the effect upon his mind of the awful visitation of the plague, his son had again become settled in seriousness and Quakerism. To bring him once more to views of life not inconsistent with court preferment, the admiral sent him in February 1666 with introductions to Ormonde’s pure but brilliant court in Ireland, and to manage his estate in Cork round Shannan- garry Castle, his title to which was disputed. Penn appears also later in the year to have been “clerk of the cheque” at Kinsale, of the castle and fort of which his father had the command. When the mutiny broke out in Carrick- fergus Penn volunteered for service, and acted under Arran so as to gain considerable reputation. The result was that in May 1666 Ormonde offered him his father’s company of foot, but, for some unexplained reason, the admiral demurred to this arrangement. It was at this time that the well-known portrait was painted of the great Quaker in a suit of armour; and, strangely enough, it was at this time, too, that the conversion, begun when he was a boy, accord- ing to Penn’s own account, by Thomas Loe in Ireland, was completed at the same place by the same agency.®

On 3d September 1667 Penn attended a meeting of

2 Pepys, 30th August 1664. 3 Webb, The Penns and Penningtons, 1867, p. 174.

Quakers in Cork, at which he assisted to expel a soldier who had disturbed the meeting. He was in consequence, with others present, sent to prison by the magistrates. From prison he wrote to Lord Orrery, the president of Munster, a letter, in which he first publicly makes a claim for perfect freedom of conscience. He was immediately released, and at once returned to his father in London, with the distinctive marks of Quakerism strong upon him —the use of the "thee" and "thou," and the refusal to remove his hat. So staunch on the hat question was he that he could not accept even the compromise suggested by his father, viz., that he should uncover before the king, the duke of York, and himself.

Penn now became a minister of the denomination, and at once entered upon controversy and authorship. His first book, Truth Hxalted, in which he summons to trial princes, priests, and people, was '"'a short but sure testi- mony against all those religions, faiths, and worships that have been formed and followed in the darkness of apo- stacy," and declared Quakerism to be "'the alone good way of life and salvation." Its tone and language were violent and aggressive in the extreme. The same offensive per- sonality is shown in The Guide Mistaken, a tract written in answer to John Clapham's G'ucde to the True Religion. It was at this time, too, that he appealed, not unsuccess- fully, to Buckingham, who on Clarendon's fall was posing as the protector of the Dissenters, to use his efforts to procure parliamentary toleration.

Penn's first public discussion was with Thomas Vincent, a London Presbyterian minister, who had reflected on the "damnable" doctrines of the Quakers. In this he appears to have acted as second to George Whitehead.! The dis- cussion, which had turned chiefly upon the doctrine of the Trinity, ended uselessly, and Penn at once published The Sandy Foundation Shaken, a tract of ability sufficient to excite Pepys's astonishment, in which orthodox views on the Trinity, plenary satisfaction, imputed righteousness, and other doctrinal points were so offensively attacked that, at the instance of the bishop of London, Penn was placed in the Tower, where he remained

for nearly nine months. The imputations upon his opinions and good citizenship, made as well by Dissenters as by the church, he repelled in Innocency with her. Open Face, in which he asserts his full belief in the divinity of Christ, the atonement, and justification through faith, though insisting on the necessity of good works. It was now, too, that he published the most important of his books, Vo Cross, no Crown, which, besides the lessons of constancy and resignation indicated by the title, contained an able defence of the Quaker doc- trines and practices, and a scathing attack on the evils of the age, especially the loose and unchristian lives of the clergy.

While completely refusing to recant or to yield to the persuasions of Stillingfleet, who, it is stated on doubtful authority, was sent to argue with him, Penn addressed a letter to Arlington in July 1669, in which, on grounds of religious freedom, he asked him to interfere. It is note- worthy, as showing the views then predominant, that he was almost at once set at liberty.

An informal reconciliation now took place with his father, who had been impeached through the jealousy of Rupert and Monk (in April 1668), and whose conduct in the operations of 1665 he had publicly vindicated ; and Penn was again sent on family business to Ireland. There 1s good reason for thinking that the extent of the differences between him and his father have been much exaggerated.” While there he regularly attended Quaker meetings, and was active in intercession for imprisoned Friends. At the desire of his father, whose health was fast failing, Penn

1 Sewel’s Hist. of Friends, p. 172. Pp 2 Granville’s Memorials of Sir W. Penn, vol. ii. p. Bigflie

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| on this occasion worthy of remembrance.

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returned to London in 1670, and was immediately involved in fresh trouble. Having found the usual place of meeting in Gracechurch Street closed by

soldiers, Penn, as a protest, preached to the people in the open street. With William Mead he was at once arrested and indicted at the Old Bailey ou 1st September for preaching to an unlawful, seditious, and riotous assembly, which had met together with force and arms. The Conventicle Act not touch- ing their case, the trial which followed, and which may be read at length in Penn's People's Ancient and Just Inberties Asserted, was a notable one in the history of trial by jury. The prisoners and the jury were alike brow- beaten and threatened by the bench, and particularly by the recorder. With extreme courage and skill Penn ex- posed the illegality of the prosecution, while the jury, for the first time, asserted the right of juries to decide in opposition to the ruling of the court. They brought in a verdict declaring Penn and Mead " guilty of speaking in Gracechurch Street," but refused to add "to an unlawful assembly"; then, as the pressure upon them increased, and as they were sent back time after time without food, light, fire, or tobacco, they first acquitted Mead, while returning their original verdict upon Penn, and then, when that verdict was not admitted, returned their final answer "not guilty" for both. The court fined the jurymen 40 marks each for their contumacy, and, in default of payment, imprisoned them, whereupon they vindicated and estab- lished for ever the right they had claimed in an action before the Court of Common Pleas, when all twelve judges unanimously declared their imprisonment illegal.

Penn himself had been fined for not removing his hat in court, had been imprisoned on his refusal to pay, and had earnestly requested his family not to pay for him. The fine, however, was settled anonymously, and he was released in time to be present at his father's death on 16th September 1670, at the early age of forty-nine. Penn now found himself in possession of a fortune of £1500 a year, and a claim on the crown for £15,000, lent to Charles II. by his father. The admiral appears, from a later statement of Penn, to have asked the king and James to become his son's protectors, and James accepted and acted up to the engagement in a special manner. Upon his release Penn at once plunged into controversy, challenging a Baptist minister named Ives, at High Wycombe, to a public dispute and, according to the Quaker account, easily defeating him. No account is forthcoming from the other side. Hearing at Oxford that students who attended Friends' meetings were rigorously used, he wrote a vehement and abusive remonstrance to the vice-chancellor in defence of religious freedom. This

found still more remarkable expression in the Seasonable Caveat against Popery (January 1671), in which, while refuting the arguments of Roman Catholics, he urges, far in advance of his age and of all other sects, entire and unlimited toleration of faith and worship,—not, be it observed, on the grounds of expediency or of Scripture, but upon the distinctively Quaker doctrine of the "inward light." in the beginning of 1671 Penn was again arrested for preaching in Wheeler Street meeting-house by Sir J. Robinson, the lieutenant of the Tower, formerly lord mayor, and known as a brutal and bigoted churchman. Legal proof being wanting of any breach of the Conventicle Act, and the Oxford or Five Mile Act also proving inapplicable, Robinson, who had some special cause of enmity against Penn, urged upon him the oath of allegiance. This, of course, the Quaker would not take, and consequently was imprisoned for six months. A saying is recorded of Penn Robinson had ordered a corporal and some soldiers to take him to prison. "No, no," said Penn, 'send thy lacquey. T know the way

to Newgate." During this imprisonment Penn wrote several works, the most important being The Great Case of Liberty of Conscience (February 1671), a noble defence of complete toleration. Upon his release he started upon a missionary journey through Holland and Germany ; at Emden he founded a Quaker Society, and established an intimate friendship with the princess palatine Elizabeth. In his letters written during this journey will be found a full exposition of the doctrine of the "inward light."

Upon his return home in the spring of 1672 Penn married Gulielma Springett, daughter of Mary Pennington by her first husband, Sir William Springett; she appears to have been equally remarkable for beauty, devotion to her husband, and firmness to the religious principles which she had adopted when little more thanachild.1 He now settled at Rickmansworth in Hertfordshire, and gave himself up to controversial writing. To this year, 1672, belong the Treatise on Oaths and England's Present Interest Considered, in the latter of which, written immediately after the withdrawal of the Declaration of Indulgence, is contained an able statement of the arguments against comprehension and for toleration. It should not be omitted by any one who desires to understand the state of feeling on the

sub- ject. In the year 1673 Penn was still more active. He secured the release of George Fox, addressed the Quakers in Holland and Germany, carried on public controversies with Hicks, a Baptist, and Faldo, an Independent, and published his treatise on the Christian Quaker and his Divine Testimony Vindicated, the Discourse of the General Rule of Faith and Practice,? Reasons against Railing (in answer to Hicks), Counterfeit Christianity Detected, and a Just Rebuke to One-and-twenty Learned Divines (an answer to Faldo and to Quakerism no Christianity). His last public controversy was in 1675 with Richard Baxter, in which, of course, each party claimed the victory. During this year his active sympathies were enlisted on behalf of imprisoned Quakers at Aberdeen. At this point Penn's connexion with America begins.

The province of New Jersey, comprising the country between the Hudson and Delaware rivers on the east and west, had been granted in March 1663-64 by Charles II. to his brother; James in turn had in June of the same year leased it to Lord Berkeley and Sir G. Carteret in equal shares. By a deed, dated 18th March 1673/74, John Fenwick, a Quaker, bought one of the shares, that of Lord Berkeley (Stoughton erroneously says Carteret's) in trust for Edward Byllinge, also a Friend, for £1000. This sale was confirmed by James, after the second Dutch war, on 6th August 1680. Disputes having arisen between Fenwick and Byllinge, Penn acted as arbitrator ; and then, Byllinge being in money difficulties, and being compelled to sell his interest in order to satisfy his creditors, Penn was added, at their request, to two of themselves, as trustee. The disputes were settled by Fenwick receiving ten out of the hundred parts into which the province was divided,? with a considerable sum of money, the remaining ninety parts being afterwards put up for sale. Fenwick sold his ten parts to two other Friends, Eldridge and Warner, who thus, with Penn and the other two, became masters of West Jersey, West New Jersey, or New West Jersey, as it was indifferently called. The five proprietors appointed three commissioners, with instructions dated from London 6th August 1676, to settle disputes with Fenwick (who

4 For a very charming account of her, and the whole Pennington ge ON see Maria Webb's The Penns and Penningtons.

See on this Stoughton's Penn, p. 113.

3 The deed by which Fenwick and Byllinge conveyed New West Jersey to Penn, Gawry, and Nicholas is dated 10th February 1674/75.

4 The line of partition was " from the east side of Little Egg Harbour, straight north, through the country, to the utmost branch of Delaware river.

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had bought fresh land from the Indians, upon which Salem was built, Penn being himself one of the settlers there) and to purchase new territories, to survey and divide them, and to build a town,—New Beverley, or Burlington, being the result. For the new colony Penn drew up a constitution, under the title of '' Concessions," which he himself thus describes: ''There we lay a foundation for after ages to understand their liberty as men and Christians, that they may not be brought in bondage but by their own consent ; for we put the power in the people."

The greatest care is taken to make this constitution "as near as may be conveniently to the primitive, ancient, and fundamental laws of the nation of England." But a" democratic element is introduced, and the new principle of perfect religious freedom——" that no men, nor numbers

of men upon earth, hath power or authority to rule over

men's consciences in religious matters "-—stands in the first

place (chap. xvi.). With regard to the liberty of the

subject, no one might be condemned in life, liberty, or

estate, except by a jury of twelve, and the right of

challenging was granted to the uttermost (chap. xvii).

Imprisonment for debt was not abolished (as Dixon states),

but was reduced to a minimum (chap. xviii.), while theft

was punished by twofold restitution either in value or in

labour to that amount (chap. xxviil.). The provisions of

chap. xix., taking their rise doubtless in Penn's own trial

at the Old Bailey in 1670, deserve special notice. All causes were to go before three justices, with ajury. 'They,

the said justices, shall pronounce such judgment as they shall receive from, and be directed by the said twelve men,

in whom only the judgment resides, and not otherwise.

And in case of their neglect and refusal, that then one of the twelve, by consent of the rest, pronounce their own

judgment as the justices should have done." The justices and constables, moreover, were elected by the people, the former for two years only (chap. xli.). Suitors might plead in person, and the courts were public (chap. xxii.).

Questions between Indians and settlers were to be arranged by a mixed jury (chap. xxv.).

An assembly was to meet yearly, consisting of a hundred persons, chosen by the inhabitants, freeholders, and pro- prietors, one for each division of the province. The election was to be by ballot, and each member was to receive a shilling a day from his division, “that thereby he may be known to be the servant of the people.” The executive power was to be in the hands of ten commissioners ® chosen by the assembly. Such a constitution, which is in marked contrast with Locke’s aristocratic one for Carolina, settled eight years previously, soon attracted large numbers of Quakers to West Jersey.

It was shortly before these occurrences that Penn in- herited through his wife the estate of Worminghurst in Sussex, whither he removed from Rickmansworth. He now (25th July 1677) undertook a second missionary journey to the Continent along with George Fox, Robert Barclay, and George Keith. Of this journey a full account, published seventeen years later, will be found in his selected works. He visited particularly Rotterdam and all the Holland towns, renewed his intimacy with the princess Elizabeth at Herwerden, and, under considerable privations, travelled through Hanover, Germany, the lower Rhine, and the electorate of Brandenburg, returning by Bremen and the Hague. It is worthy of recollection that the American settlers from Kirchheim, one of the places which responded in an especial degree to Penn’s teaching, are noted as the first who declared it unlawful for Christians to hold slaves. Penn reached England again on 24th October.

5 Penn’s letter of 26th August 1676 says twelve, and Clarkson has followed this ; but the Concessions, which were not assented to by the inhabitants until 3d. March 1676/77, say ten.

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His attention was at once taken up both with the disputes which had arisen within the Quaker body itself on questions of discipline, and still more with an endeavour to secure some decent measure of toleration for the Friends. He tried to gain the insertion in the Bill for the relief of Protestant Dissenters of a clause enabling Friends to affirm instead of taking the oath, and twice addressed the House of Commons’ committee with considerable

eloquence and effect. The Bill, however, fell to the ground at the sudden prorogation.

In 1678 the Popish Terror came to a head, and to calm and guide Friends in the prevailing excitement Penn wrote ‘his Epistle to the Children of Light in this Generation. A far more important publication was An Address to Pro- testants of all Perswasions, by William Penn, Protestant, in 1679. In the first part of this work he inveighs against the five crying evils of the time so far as they are ‘‘under the correction of the civil magistrates,” with. an address to the magistrates for redress of those evils; the second part deals siniilarly with “the five capital evils that relate to the ecclesiastical state of these kingdoms”; the whole work is a powerful exposition of the doctrine of pure toler- ance and a protest against the enforcement of opinions as articles of faith. This was succeeded, at the general election which followed the dissolution of the pensionary parliament, by an important political manifesto, Hngland’s Great Interest in the Choice of this New Parliament, in which he insisted on the following points :—the discovery and punishment of the plot, the impeachment of corrupt ministers and councillors, the punishment of “ pensioners,” the enactment of frequent parliaments, security from Popery and slavery, and ease for Protestant Dissenters. Next came One Project for the Good of England, perhaps the most pungent of all his political writings. A single sentence will show the homely style of illustration which Penn usually adopted. ‘ But since the industry, rents, and taxes of the Dissenters are as current as their neighbours’, who loses by such narrowness niore than England, than the Government, and the magistracy? . . . Till it be the interest of the former to destroy his flock, to starve the horse he rides and the cow that gives him milk, it cannot be the interest of England to let a great part of her sober and useful inhabitants be destroyed for things that concern another world.” But he was not merely active with his pen. He was at this time in close intimacy with Algernon Sidney, who stood successively for Guildford and Bamber. In each case, owing in a great degree to Penn’s eager advocacy, Sidney was elected, only to have his elec- tions annulled by court influence. Toleration for Dissenters seemed as far off as ever. The future of English politics must have appeared to Penn well-nigh hopeless. Encouraged by his success in the New Jersey provinces, he again turned his thoughts to America. In repayment of the debt men- tioned above Penn now asked from the crown,

at a council held on 24th June 1680, for “a tract of land in America north of Maryland, bounded on the east by the Delaware, on the west limited as Maryland [i.e., by New Jersey], north- ward as far as plantable” ; this latter limit Penn explained to be “three degrees northwards.” This formed a tract 300 miles by 160, of extreme fertility, mineral wealth, and richness of all kinds. Disputes with James, and with Lord Baltimore, who had rights over Maryland, delayed the Matter until 24th March 1681, when the grant received the royal signature, and Penn was made master of the province of Pennsylvania. His own account of the name is that he suggested “Sylvania,” that the king added the “Penn” in honour of his father, and that, although he strenuously objected and even tried to bribe the secretaries, he could not get the name altered. It should be added that early in 1682 Carteret, grandson of the original pro-

prietor, transferred his rights in East Jersey to Penn and eleven associates, who soon afterwards conveyed one-half of their interest to the earl of Perth and eleven others, It is uncertain to what extent Penn retained his interest in West and East Jersey, and when it ceased. The two provinces were united under one government in 1699, and Penn was a proprietor in 1700. In 1702 the government of New Jersey was surrendered to the crown.

By the charter for Pennsylvania Penn was made proprie- tary of the province. He was supreme governor; he had the power of making laws with the advice, assent, and appro- bation of the freemen, of appointing officers, and of grant- ing pardons. The laws were to contain nothing contrary to English law with a saving to the crown and the English council in the case of appeals. Parliament was to be supreme in all questions of trade and commerce ; the right to levy taxes and customs was reserved to England; an agent to represent Penn was to reside in London; neglect on the part of Penn was to lead to the passing of the government to the crown (which event actually took place in 1692); no correspondence might be carried on with countries at war with Great Britain. A clause added at the last moment illustrates curiously both the strength and the jealousy of the Anglican Church at the time. The importunity of the bishop of London extorted the right to appoint Anglican ministers, should twenty members of the colony

desire it, thus securing the very thing which Penn was anxious to avoid,—the recognition of the principle of an establishment.

Having appointed Colonel Markham, his cousin, as deputy, and having in October sent out three commis- sioners to manage affairs until his arrival, Penn proceeded to draw up proposals to adventurers, with an account of the resources of the colony. He negotiated, too, with James and Lord Baltimore with the view, ultimately successful, of freeing the mouth of the Delaware, wrote to the Indians in conciliatory terms, and encouraged the formation of companies to work the infant colony both in England and Germany, especially the 'Free Society of Traders in Pennsylvania," to whom he sold 20,000 acres, absolutely refusing, however, to grant any monopolies. In July he drew up a body of "conditions and con- cessions." This constitution, savouring strongly of Har- rington's Oceana, was framed in consultation with Sidney, though to what extent is doubtful. The inferences drawn by Hepworth Dixon from a single letter of Penn to Sidney, given at length by Stoughton, are quite unjustifiable. This sketch of a constitution was democratical in the purest sense. Until the council of seventy-two (chosen by universal suffrage every three years, twenty-four retiring each year) and the assembly (chosen annually) were duly elected, a body of provisional laws was added.

It was in the midst of this extreme activity that Penn was made a Fellow of the Royal Society. Leaving his family behind him, Penn sailed with a hundred comrades from Deal in the "'Welcome" on Ist September 1682. His Last Farewell to England and his letter to his wife and children contain a beautiful expression of his pious and manly nature. He landed at Newcastle on the Dela- ware on 27th October, his company having lost one-third of their number by smallpox during the voyage. After receiving formal possession, and having visited New York, Penn ascended the Delaware to the Swedish settlement of Upland, to which he gave the name of Chester. The assembly at once met, and on the 7th December passed the "Great Law of Pennsylvania." The idea which informs this law is that Pennsylvania was to be a Christian state on a Quaker model. Only one condition is made necessary for office or citizenship, viz., Christianity. The constitu- tion is purely democratic; all offices, for example, are elective. In many other provisions Penn showed him-

self far in advance of his time, but in none so much as where the penalty of death was abolished for all offences except murder. Lawsuits were to be superseded by arbi- tration, always a favourite idea with Penn. Philadelphia was now founded, and within two years contained 300 houses and a population of 2500. At the same time an Act was passed, uniting under the same government the territories which had been granted by feoffment by James in 1682. Realistic and entirely imaginative accounts (¢/. Dixon, p. 270), inspired chiefly by Benjamin West's picture, have been given of the treaty which there seems no doubt Penn actually made in November 1682 with the Indians. His connexion with them was one of the most successful parts of his management, and he gained at once and retained through life their intense affection. At his death

they sent to his widow a message of sorrow for the loss |

of their "brother Onas," with some choice skins to form a cloak which might protect her "while passing through the thorny wilderness without her guide."

Penn now wrote an account of Pennsylvania from his own observation for the "Free Society of Traders," in which he shows considerable power of artistic description.

Tales of violent persecution of the Quakers, and the necessity of settling disputes which had arisen with Lord Baltimore, his neighbour in Maryland, brought Penn back to England (2d October 1684) after an absence of two years. In the spring of 1683 he had modified the original charter at the desire of the assembly, but without at all altering its democratic character.) He was, in reference to this alteration, charged with selfish and deceitful dealing by the assembly. Within five months after his arrival in England Charles IT. died, and Penn found himself at once in a position of great influence. His close connexion with James, dating from the death of his father, was rendered doubly strong by the fact that, from different causes, each was sincerely anxious to establish complete liberty of conscience. Even before his coronation James had told Penn that "he desired not that peaceable men should be disturbed for their religion." Penn now took up his

abode at Kensington in Holland House, so as to be near the court. His influence there was great enough to secure the pardon of John Locke, who had been dismissed from Oxford by Charles, and of 1200 Quakers who were in prison. At this time, too, he was busy with his pen once more, writing a further account of Pennsylvania, a pam- phlet in defence of Buckingham's essay in favour of tolera- tion, in which he is supposed to have had some share, and his Persuasive to Moderation to Dissenting Christians, very similar in tone to the One Project for the Good of England. When Monmouth's rebellion was suppressed he appears to have done his best to mitigate the horrors of the western commission, opposing Jeffreys to the uttermost ;? and he stood by Cornish and Elizabeth Gaunt at their execu- tions. He says himself in a letter dated 2d October 1685, "About 300 hanged in divers towns in the West, about 1000 to be transported. I begged twenty of the king."

Macaulay, the grotesqueness of whose blunders on this matter is equalled only by the animus that inspired them, and by the disingenuousness with which he defended them, has accused Penn of being concerned in some of the worst actions of the court at this time. His complete refutation by Forster, Paget, Dixon, and others renders it unneces- sary to do more than allude to the cases of the Maids of Taunton, Alderman Kiffin, and Magdalen College (Oxford).

In 1686, when making a third missionary journey to Holland and Germany, Penn was charged by James with an informal mission to the prince of Orange to endeavour to gain his assent to the removal of religious tests. Here

i Dixon, p. 276. 2 Burnet, iii. 66; Dalrymple, i. 282.

he met Burnet, from whom, as from the prince, he gained no satisfaction, and who greatly disliked him. On his return he went on a preaching mission through England, His position with James was undoubtedly a compromising one, and it is not strange that, wishing to tolerate Papists, he should, in the prevailing temper of England, be once more accused of being a Jesuit, while he was in con- stant antagonism to their body. Even Tillotson

took up this view strongly, though he at once accepted Penn's vehement disavowal. It was in reference to this that Penn wrote one of his pithy sentences: ''I abhor two principles in religion, and pity them that own them; the first is obe- dience upon authority without conviction ; and the other, destroying them that differ from me for God's sake. Such a religion is without judgment, though not without teeth."

In 1687 James published the Declaration of Indulgence, and Penn probably drew up the address of thanks on the part of the Quakers. It fully reflects his views, which are further ably put in the pamphlet Good Advice to the Church of England, Roman Catholics, and Protestant Dis- senters, in which he showed the wisdom and duty of repealing the Test Acts and Penal Laws.

At the Revolution he behaved with courage. He was one of the few friends of the king who remained in London, and, when twice summoned before the council, spoke boldly in his behalf. He admitted that James had asked him to come to him in France; but at the same time he asserted his perfect loyalty. During the absence of William in 1690 he was proclaimed by Mary as a dan- gerous person, but no evidence of treason was forthcom- ing. It was now that he lost by death two of his dearest friends, Robert Barclay and George Fox. It was at the funeral of the latter that, upon the information of the notorious informer Fuller, an attempt was made to arrest him, but he had just left the ground; the fact that no further steps were then taken shows how little the Govern- ment believed in his guilt. He now lived in retirement in London, though his address was perfectly well known to his friends in the council. In 1691, again on Fuller's evidence, a proclamation was issued for the arrest of Penn and two others as being concerned in Preston's plot. He might, on the intercession of Locke, have obtained a pardon, but refused to do so. He appears to have especially felt the suspicions that fell upon him from the members of his own body. In 1692 he began to write again, both on questions of Quaker discipline and in defence of the sect. Just Mea- sures in an Epistle of Peace and Love, The New Athenians (in reply to the attacks of the Athenian Mercury), and A Key opening the Way to every Capacity are the principal publi- cations of this year. i

Meantime matters had been going badly in Pennsyl- vania. Penn had, in 1687, been obliged to make changes in the composition of the executive body, though in 1689 _ it reverted to the original constitution; the legislative bodies had quarrelled ; and Penn could not gain his rents. He was closely concerned also in this year with a dispute between East and West Jersey regarding the dividmg line, in which he espoused the cause of the former (and richer) province. The chief difficulty, however, in Penn- sylvania was the dispute between the province—z.e., the country given to Penn bythe charter—and the "territories," or the lands granted to him by the duke of York by feoff- ment in August 1682, which were under the same Govern- ment but had differing interests. No sooner had Penn by a skilful compromise settled this. matter than the colony was torn by the religious schism caused by George Keith. The difficulties which Quaker principles placed in the way of arming the colony—a matter of grave importance in the existing European complications—fought most hardly against Penn's power. On 21st October 1692 an order of

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council was issued depriving Penn of the governorship of Pennsylvania, and giving it to Colonel Fletcher, the governor of New York.1 To this blow were added the ilIness of his wife and a fresh accusation of treasonable correspondence with James. In his enforced retirement he wrote the most devotional and the most charming of his works,—the collection of maxims of conduct and reli- gion entitled The Fruits of Solitude. In December, thanks to the efforts of his friends at court, among whom were Buckingham, Somers, Rochester, and Henry Sidney, he received an intimation that no further steps would be taken against him. The accusation, however, had been public, and he insisted on the withdrawal being as public. He was therefore heard in full council before the king, and honourably acquitted of all charge of treason. It was now that he wrote an Lssay towards the Present and Iuture Peace of Europe, in which he puts forth the idea of a great court of arbitration, a principle which he had already carried out in Pennsylvania.

In 1694 (23d February) his wife Gulielma died, leaving two sons, Springett and William, and.a daughter Letitia, afterwards married to William Aubrey. Two other daughters, Mary and Hannah, died in infancy. He con- soled

himself by writing his Account of the Rise and Progress of the People called Quakers, The coldness and suspicion with which he had been regarded by his own denomination had now ceased, and he was once more regarded by the Quaker body as their leader. About the same time (20th August) he was restored to the governor- ship of Pennsylvania ; and he promised to supply money and men for the defence of the frontiers. In 1695 he went on another preaching mission in the west, and sent a peti- tion to parliament praying that affirmations might be sub- stituted for oaths. ‘This year and the next were busily occupied with preaching and writing, one of his auditors being no less a person than Peter the Great. In March 1696 he formed a second marriage, with Hannah Callow- hill, his son Springett dying five weeks later. In this year he wrote his work On Primitive Christianity, in which he argues that the faith and practice of the Friends were those of the early church. In 1697 Penn removed to Bristol, and during the greater part of 1698 was preaching with great success against oppression in Ireland, whither he had gone to look after the property at Shannangarry.

In 1699 he was back in Pennsylvania, landing near Chester on 30th November, where the success of Colonel Quary, judge of the admiralty in Pennsylvania, who was in the interests of those who wished to make the province an imperial colony, and the high-handed action of the deputy Markham in opposition to the crown, were causing great difficulties. Penn carried with him particular instructions to put down piracy, which the objections of the Quakers to the use of force had rendered audacious, and concern- ing which Quary had made strong representations to the home Government, while Markham and the inhabitants ap- parently encouraged it. Penn and Quary, however, came at once to a satisfactory understanding on this matter, and the illegal traffic was vigorously and successfully attacked. The next question he took up was slavery, and his attitude towards it is curious. In 1696 the Phila- delphian yearly meeting had passed a resolution declaring it contrary to the first principles of the gospel. Penn, how- ever, did not venture upon emancipation ; but he insisted on the instruction of negroes, permission for them to marry,

1 Colonel Fletcher’s commission recites “that by reason of great neglect and miscarriage in the government of Pennsylvania Her Majesty found it

necessary to take the government into her hands and under her immediate protection.” The attorney-general and the solicitor- general were of opinion (on 12th July 1694) that, when the aforesaid Yeasons failed or ceased, the right of government belonged to the petitioner,

repression of polygamy and adultery, and proposed regula- tions for their trial and punishment. The assembly, how- ever, a very mixed body of all nations, now refused to accept any of these proposals except the last-named.

His great success was with the Indians ; by their treaty with him in 1700 they promised not to help any enemy of England, to traffic only with those approved by the governor, and to sell furs or skins to none but inhabitants of the province. At the same time he showed his capacity for legislation by the share he took with Lord Bellomont at New York in the consolidation of the laws in use in the various parts of America.

Affairs now again demanded his presence in England. The king had in 1701 written to urge upon the Pennsylvania Government a union with other private colonies for defence, and had asked for money for fortifications. The difficulty felt by the crown in this matter was a natural one. A Bill was brought into the Lords to convert private into crown colonies. Penn's son appeared before the committee of the House and managed to delay the matter until his father's return. On 15th September Penn called the assembly to- gether, in which the differences between the province and the territories again broke out. He succeeded, however, in calming them, appointed a council of ten to manage the province in his absence, and gave municipal institutions to Philadelphia. In May 1700, experience having shown that alterations in the charter were advisable, the assembly had, almost unanimously, requested Penn to revise it. On 28th October 1701 he handed it back to them in the form in which it afterwards remained. An assembly was to be chosen yearly, of four persons from each county, with all the self-governing privileges of the English House of Commons. Two-thirds were to form a quorum. The nomination of sheriffs, coroners, and magistrates for each county was given to the governor, who was to select from names handed in by the freemen. Moreover, the council was no longer elected by the people, but nominated by the governor, who was thus practically left single in the execu- tive. The assembly, however, who, by the first charter, had not the right to propound laws, but might only amend

or reject them, now acquired that privilege. In other respects the original charter remained, and the inviolability of con- science was again emphaticallyasserted. Penn reached Eng- land in December 1701. The accession of Anne appears to have put an end to the Bill in the Lords, and to his troubles on this score. He once more assumed the position of leader of the Dissenters and himself read the address of thanks for the promise from the throne to maintain the Act of Toleration. He now too took up his abode again at Kensing- ton, and published while here his More L'ruts of Solitude.

In 1703 he went to Knightsbridge, where he remained until 1706, when he removed to Brentford, his final resi- dence being taken up in 1710 at Field Ruscombe, near Twyford. In 1704 he wrote his Life of Bulstrode White- locke. He had now much trouble from America, The terri- torialists were openly rejecting his authority, and doing their best to obstruct all business in the assembly ; and matters were further embarrassed by the injudicious conduct of Go- vernor Evans in 1706. Moreover, pecuniary troubles came heavily upon him, while the conduct of his son William, who became the ringleader of all the dissolute characters in Philadelphia, was another and still more severe trial. This son was married, and had a son and daughter, but appears to have been left entirely out of account in the settlement of Penn's proprietary rights on his death.

Whatever were Penn's great qualities, he was deficient in judgment of character. This was especially shown in the choice of his steward Ford, from whom he had borrowed money, and who, by dexterous swindling, had managed, at the time of his death, to establish a claim for £14,000

against Penn. Penn, however, refused to pay, and spent nine months in the Fleet rather than give way. He was released at length by his friends, who paid £7500 in composition of all claims. Difficulties with his govern- ment of Pennsylvania continued to harass him. Fresh disputes took place with Lord Baltimore, the owner of Maryland, and Penn also felt deeply what seemed to him the ungrateful treatment which he met with at the hands of the assembly. He therefore in 1710 wrote, in earnest and affectionate

language, an address to his “old friends,” setting forth his wrongs. So great was the effect which this produced that the assembly which met in October of that year was entirely in his interests; revenues were properly paid; the disaffected were silenced and com- plaints were hushed ; while an advance in moral sense was shown by the fact that a Bill was passed prohibiting the importation of negroes. This, however, when submitted to the British parliament, was cancelled. Penn now, in February 1712, being in failing health, proposed to sur- render his powers to the crown. He appears, from Dixon’s work (p. 413), to have offered previously, just before he was arrested by the Fords, to give up his government for £20,000, but with stipulations which rendered the crown unwilling to take it. On the present occasion the com- mission of plantations. recommended that Penn should receive £12,000 in four years from the time of surrender, Penn stipulating only that the queen should take the Quakers under her protection ; and £1000 was given him in part payment. Before, however, the matter could go further he was seized with apoplectic fits, which shat- tered his understanding and memory. A second attack occurred in 1713, and from that time until his death his powers gradually failed, although at times his intellect was clear and vigorous. He died on 30th May 1718, leaving three sons by his second wife, John, Thomas, and Richard, and was buried along with his first and second wives at Jourdan’s meeting-house, near Chalfont St Giles in Bucking- hamshire. It has finally to be mentioned that in 1790 the proprietary rights of Penn’s descendants were bought up for a pension of £4000 a year to the eldest: male descend- ant by his second wife, and that this pension was commuted in 1884 for the sum of £67,000. (0. A.)
PENNANT, Tuomas (1726-1798), naturalist and anti- quary, was descended from an old Welsh family, who for many generations had resided at Downing, Flintshire, where he was born 14th June 1726. He received his early education at Wrexham and Fulham, and afterwards attended Queen’s and Oriel Colleges, Oxford, but did not take a degree. At twelve years of age he was inspired with a passion for natural history through obtaining a present of Willughby’s Ornithology; and a tour in Corn- wall in 1746-47 after leaving Oxford awakened his strong interest in minerals and fossils. In 1750 his account of an earthquake which he felt at Downing was inserted in the Philosophical Transactions, where there also appeared in 1756 a paper on several coralloid bodies he had col- lected at Coalbrook Dale, Shropshire. In the following year, at the instance of Linnzeus, he was

elected a member of the Royal Society of Upsala. In 1766 he published a folio volume entitled British Zoology. The work is meritorious rather as a laborious compilation than as an original contribution to science, but that it served a good purpose is evidenced by the nuinber of editions (see ORNI-THOLOGY, p. 9 above) through which it passed. During its progress he visited the Continent and made the acquaint- ance of Buffon, Voltaire, Haller, and Pallas. In 1771 was published his Synopsis of Quadrupeds, afterwards extended into a History of Quadrupeds. At the end of the same year he published A Zour in Scotland in 1769, which proving remarkably popular was followed in 1774 by an

account of another journey in Scotland published in two volumes, afterwards distinguished as the second and third Tour. In these works he manifested the rare faculty of investing with interest details of antiquarian lore, while they have also proved invaluable as preserving the record of important antiquarian relics which have now perished, In 1778 he brought out a similar Zour in Wales, which was followed by a Journey to Snowdon (part i. 1781, part ii. 1783), afterwards forming the second volume of the Zour. In 1782 he published a Journey from Chester to London, He brought out Arctic Zoology in 1785-87. In 1790 appeared his Account of London, which has gone through a large number of editions, and has justly been termed ‘‘the most popular book ever written on the subject.” Three years later he published the Literary Life of the late 7’. Pennant, written by himself. In his later years he was engaged on a work entitled Outlines of the Globe, vols. i. and 11. of which appeared in 1798, and vols. iii. and iv; edited by his son David Pennant, in 1800. He was also the author of a number of minor works, some of which were published posthumously. He died at Downing 16th December 1798. Pennant was in 1767 elected a member of the Royal Society, and he was a member of many other learned societies, both home and foreign. In 1771 he received the degree of D.C.L. from the university of Oxford.

PENNI, Granrrancesco (1488-1528), Italian painter, surnamed ‘“I] Fattore,” from the relation in which he stood to Raphael, whose favourite disciple he

was after Giulio Romano, was a native of Florence, but spent the latter years of his life in Naples. He painted in oil as well as in fresco, but is chiefly known for his work in the Loggie of the Vatican.

PENNSYLVANIA, one of the original thirteen States Plate VL

of the North American Union, lying between 39° 43’ and 42° 15′ N. lat., and between 74° 40’ and 80° 36’ W. long, is 160 miles wide, and more than 300 miles long from east to west. Its northern, southern, and western border-lines were meant to be straight ; the eastern follows the course of the Delaware river. It is bounded by the States of New York and New Jersey on the N. and E., by Ohio on the W., and by Delaware, Maryland, and West Virginia on the 8. At its north-west corner a small triangular addition gives it a shore-line of 40 miles, with one good harbour, on Lake Erie. At its south-eastern corner, a circle of 10 miles radius (struck from the court-house at New- castle) throws a small area into the State of Delaware. Its surface, subdivided into sixty-seven counties, measures nearly 28,800,000 acres or 45,000 square miles ; less than one-half of its acreage is in cultivated farms, and only 1,000,000 of the people live in separate farm-houses. Out of a population of 4,283,000, nearly 2,000,000 lived in towns and cities in 1880, and more than 2,000,000 in country hamlets or factory villages, at iron mines and furnaces, at coal-mines and coke-ovens, at lumber-camps and oil-wells, or along the many lines of canal and railroad which traverse the State in all directions.

Physical Features.—Pennsylvania is topographically divi- sible into three parts: a south-east district, the open country between the South Mountains and the sea; a middle belt of parallel valleys separated by low parallel mountain-ridges; and a northern and western upland, behind the escarpment of the Alleghany Mountain. One and a half millions of its people inhabit the fertile and highly-cultivated south- eastern triangle, which is nowhere more than 600 or 700 feet above the level of the sea. One million inhabit the middle belt of higher-lying valleys, rich in iron ore and anthracite coal. One and a half millions occupy the great bituminous coal and oil regions of the northern and western counties, elevated from 1000 to 2500 feet above the sea,

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which constitute at least one-half of the State, and drain, not eastward into the Atlantic, but northward into the St Lawrence and westward into the Mississippi.

The valleys of the middle belt are of two characters, dis- tinguished by the farming population of the Atlantic States as “rich valleys” and “‘ poor valleys.” The former, whether large or small, are completely enclosed and comparatively level arenas of limestone land, surrounded by rocky and wooded barriers, less than 1000 feet high, through narrow gaps in which streams enter or issue. A curiously sculptured slate-terrace, half the height of the encircling mountain, overlooks each of these secluded valleys. Their entire limestone floor has been under cultivation for a century, and the best iron-ore deposits of the State and its oldest mines are situated in them. They are gardens of fertility, yielding heavy crops of wheat, rye, and maize to the frugal, thrifty, and laborious descendants of their early settlers. Innumerable caverns ramify beneath the surface; sink- holes receive the drainage of the fields; many of the water- courses appear and disappear beneath sunken arches of limestone ; and wells are the chief source of supply. Old orchards and great planted trees abound, and more pictur- esque landscapes cannot be found. Nittany, the largest of these isolated valleys, occupies the centre of the State. It is 60 miles long, but its greatest width is only 10 miles ; and it is subdivided at its north-eastern end by long pro- jecting mountain-spurs into narrow parallel coves, each of which is known by a special name, Brush valley, Penn’s valley, &c. Sinking Spring valley is at its south-western end, and here it is traversed by the Little J uniata river, along the banks of which runs the Pennsylvania Railroad. A narrow valley, called Canoe valley, leads southward into Morrison’s cove, which is half as large as Nittany valley. The next largest limestone valley is Kishicoquilis, 40 miles long by 5 miles wide, ending southward in a point, and split at its north-east end into three. German Amish (Mennonite sect) and Scotch-Irish Presbyterian settlers, separated by an ideal cross line, have made this valley famous for its loveliness and wealth. Farther south is M‘Connell’s cove, west of this Friend’s cove, and still farther west Millikin’s cove. Two little oval holes in the mountains north-east of Nittany valley, Nippenose valley and’ Oval valley, and two long slit-like depressions in Tuscarora and Black Log Mountains conclude the short list of these remarkable limestone threshing-floors of Pennsylvania.

Across the whole State, however, stretches the Great Valley in a wide and gentle curve from east to south, one- half its surface covered with the soil of the terrace-slate, the other half with the same limestone soil which causes the exceptional fertility of the isolated valleys above enumerated. This very remarkable feature of the Atlantic side of the continent extends in an unbroken line for nearly 1000 miles, from eastern Canada to the low- lands of the Gulf of Mexico, only 150 miles of its length being in Pennsylvania, where its average width may be called 15 miles. Everywhere on its north-west side rises a sharp and regularly level-crested ridge, about 1000 feet high, heavily timbered. On its other or southern side a range of irregular mountain-land completely secludes the Great Valley from the seaboard, except for about 50 miles in Pennsylvania. This mountain-range is known in Vermont as the Green Mountains, in Massachusetts as the Taconic Mountains, in New York and New Jersey as the Highlands, in Pennsylvania and Maryland as the South Mountains, in Virginia as the Blue Ridge, in North Carolina as the Unaka or Smoky Mountains. In their northern extension they rise to heights of 3000 and 4000 feet; in the southern States they have summits from 4000 to 7000 feet above the sea. In Pennsylvania few parts of the range exceed 1500 fect; and at the broken

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gap of 50 miles already mentioned the Great Valley lime- stone land protrudes southward through the interrupted range, to nake of Lancaster the richest agricultural county in the State. Before the era of railways Lancaster county made the markets of Philadelphia the cheapest and most luxurious in the world. It was on this exceptional out- spread of the Great Valley limestone that the Germans of the first immigration settled. The limestone plain of Lancaster spreads west across the Susquehanna river into York county, and east into Berks and Chester counties to within 20 miles of Philadelphia. The whole plain swarms with life ; the houses are small, but the stone barns are of colossal size, 100 and even 150 feet long and from 30 to 50 feet high, the barnyard-wall supported on ranges of heavy columns, while on the other side of the building an earthen slope ascends to the great barn door.

The eight counties which lie along the face of the South Mountains, in the south-eastern region of the State, are in the highest state of cultivation, and resemble the most picturesque rural districts of England,—a country of rolling hills and gently sloping vales, with occasional rocky dells of no great depth, and low cascades utilized for grist- mills, factories, and machine shops; a country of wheat, rye, maize, potatoes, tobacco, turnip-fields, orchards, meadows, and patches of woodland; a country of flowing water, salubrious, fertile, and wealthy; dotted with hamlets, villages, and towns, and with the country-seats of affluent citizens. But the region as a whole is divisible into at least four districts, differing as much in population as in soil and situation. The counties of York and Adams, lying west of the Susquehanna river along the Maryland line, are inhabited by Germans, who for the most part still use the patois of their fatherland, mixed with English words and phrases. The counties of Montgomery and Bucks, lying between the Schuylkill and Delaware rivers, have a mingled population of the descendants of Germans, Quakers, and French Huguenots. The hilly district of northern Chester is also partly German. Southern Lan- caster, southern Chester, and Delaware counties support the most intelligent and virtuous population in the State, largely composed of the descendants of Penn's colonists, who have mostly escaped the narrowing and enervating influences of the city, and enjoy the mental and physical activity, the simplicity of manners, and the loyalty to truth, justice, and charity which characterized the Quakers at the origin of the sect in England. The district which they inhabit is a veritable fairyland, and its principal town, Westchester, has been for a long time one of the notable centres of scientific life in the State.

Climate.—The climate of so great a State is necessarily various, and is made more variable by its situation on the eastern side of the continent facing the Gulf Stream. The north-west wind is dry and cold in winter, the south-west wind always mild and rainy, and the south-east ocean wind wet and sultry in summer; but the dreaded north-easters of New England lose much of their rigour by the time they reach the Delaware. The northern highlands of the State are buried under 4 or 5 feet of snow four months of the year. The southern middle counties enjoy genial weather the whole year round, interrupted only by a few short intervals of intense heat or cold, never lasting more than three consecutive days. The midland valleys are

very hot in midsummer and very cold in mid-winter, the thermometer ranging between 0° and 100,° with a not unfrequent sudden fall after a sultry week of 30° or 40° in a few hours, ending with thunderstorms, and followed by dry, clear, cool weather, with winds from the north-west. The climate of the south-western counties is comparatively dry and equable, but with a sufficient annual rainfall, and plenty of snow in winter, productive of great river-floods

in spring. The average annual rainfall ranges from 36 inches in the western counties to 42 inches at Philadelphia. Destructive “freshets” descend the eastern rivers when the ice breaks up; for the Delaware and Susquehanna rivers are almost every year frozen over from tide- water to their sources; thunderstorms happen in the midst of winter ; the January thaw is always to be apprehended ; and when heavy rains break up the ice and it accumulates in the gaps of the mountains, the main river-channels become scenes of inevitable disaster. In 1837 the valley of the Lehigh was swept clean for 60 miles, the dams and locks of the canal were all destroyed, and every bridge and mill disappeared. Along the lower Susquehanna the floating ice has often been piled upon the railroad embank- ment to the height of several yards. Even in midsummer a heavier downpour than usual in 1836 carried destruction through the valley of the Juniata. But the affluents of the Ohio river in the western part of the State are subject every year to this danger.

Geology.—For unknown geological reasons Pennsylvania is peculiar for exhibiting the Paleozoic system in its

Upper productive Coal-measures Fos measures

Lower productive Coal-measures 12. Pottsville conglomerate 11. Mauch Chunk red shale 10. Pocono grey sandstone

9. Catskill red sandstone ; Upper Devonian. Chemung and Portage shales ; Middle Devonian. Tennessee, Hamilton, and Mar- cellus

Upper Helderberg limestone 7. Oriskany sandstone. 6. Lower Helderberg limestones 5. Clinton shales

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{ Permian, or Upper Carboniferons.

13.

Middle Carboniferous.

} Lower Carboniferous.

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| rowe Devonian.

t Upper Silurian. Medina and Oneida sandstones Hudson river and Utica slates

Trenton and Great Valley lime- \ power Silurian. stones

Potsdam sandstone.

The geology of south-eastern Pennsylvania is not under- stood, There can be no doubt that the copper-bearing porphyritic Huronian system is well represented in the South Mountains, south of the Chambersburg fault, on the borders of Maryland; but the systematic age of the gneisses, mica schists, garnetiferous schists, serpentine and chrome iron rocks, of the Philadelphia belt, commencing at Trenton,

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New York, Ohio, and Virginia.

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maximum development, that is, from the Permian forma, tion down to the base of Murchison’s Lower Silurian, with a total thickness of more than 40,000 fect at the eastern outcrops, diminishing to half that amount in the western counties. As all the formations are thrown into great anticlinal and synclinal folds, and cut through trans- versely by the rivers, they can be

measured along numerous continuous and conformable section lines. Near Harris. burg, at Pottsville, and at Mauch Chunk the Carboniferous, Devonian, and Upper Silurian rocks, standing vertical, show a cross section 5 miles thick. At the Delaware and Lehigh water-gaps the Lower Silurian slates are 6000 feet thick. In Canoe valley the underlying Lower Silurian limestones have been measured 6500 feet thick. In the south-western corner of the State about 1000 feet of Permian rocks overlie the Coal-measures proper. Thus the following Palzeozoic column can be studied with peculiar advantages in Pennsylvania, many of its more important stages either becoming greatly attenuated or wholly dis- appearing when followed into the neighbouring States of

crossing the Schuylkill river on a section line 15 miles wide, and extending through Delaware and Chester counties into Maryland, is still under discussion, some geologists considering them of pre-Cambrian age and others regard- ing them as metamorphosed Silurian rocks. They contain minute quantities of gold and are evidently a prolongation of the great gold-bearing belt of Virginia and the Carolinas.

_ Minerals.—The mineral resources of Pennsylvania have never been exaggerated except by those who compare its iron-mines with those of other States. It possesses a virtual monopoly ef anthra- cite, The output of rock-oil is still amazing. The bituminous, coking, and block coal district is only one large part of an enormous area which includes eastern Ohio, West Virginia, middle Tennes- see, and northern Alabama; and the ranges of iron-ores extend through New Jersey and New York into New England and Canada, and through Maryland, Virginia, North Carolina, and eastern Tennessee into Alabama, with no sensible difference of quantity or quality in either direction. But Pennsylvania has the advan- tage over other States of a first plant, both in iron-works and coal- mines, and in a consequent multiplication and concentration of capital for these industries, which must keep her facile princeps in this respect for a long time to come. Sooner or later she must take a second rank in iron, but never in coal and coke. It is possible that the oil-fields of the three States to the south and west of her may become as productive as her own, although no signs of such an event are visible yet to geologists ; but no contingency of events can affect her iba control of the anthracite market.

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Three anthracite coal-regions in castern Pennsylvania are recog- nized by railroad men, coal-dealers, and statisticians ; but they do not exactly correspond to the three anthracite eoal-fields of the gcological survey reports. (1) By the Schuylkill region is meant all the surfaee of coal-land which is drained by that river, with two small additions from the upper water-basins of the Shamo- kin and Swatara rivers, affluents of the Susquehanna. In 1822 it supplied the Philadelphia market with 1480 tons of coal ; in 1880 it distributed, in all directions along the lines of the Reading Rail- road, 9,500,000 tons. (2) By the Lehigh region is meant all the coal-lands on that river, furnishing in 1821 1073 tons, and in 1882 5,700,000, chiefly to the city of New York. (3) By the Wyoming region is meant the isolated valley of the Susquehanna (north branch) and Lackawanna rivers, commencing its shipments in 1829 with 7000, and sending in 1882 14,000,000 tons of coal eastward, north- ward, and westward, to Boston, Montreal, and Chicago. In 1883 these three regions shipped a total of 31,800,000 tons.

The three anthracite coal-fields into which the region divides itself geologically—the southern, the middle, and the northern—are three groups of narrow parallel basins filled with crumpled Coal- measures. Each field has a characteristic grouping of its basins different from the other two: the southern in perfectly straight lines, except at its western end, which has a long fork or fish-tail ; the middle in échelon ; the northern in a long sweeping curve from west by east to north. The southern field has for its southern border a sharp low mountain-ridge, 62 miles long, bearing about N. by 60° E., and ending abruptly westward near the Susquehanna river and eastward at the Lehigh river. It is gapped in four places, by the Swatara, by the Schuylkill, and by its two principal branches, giving passage to three railways and two canals, one of which has been abandoned and the other is little used. In this mountain the lower Coal-measures descend vertically to a depth of 3000 feet below tide-level, and then rise again in a series of waves to the top of a much higher mountain which borders the field upon the north. From the top of this broad mountain the Coal-measures have been

swept away. They are next seen descending steeply northward into the middle field, where they sink to various depths of 1000 or 2000 feet below sea-level, rolling six times so as to make that number of mining basins, and then rise into the air, along a bounding mountain at the northern edge of the field, not to de- scend again to the present surface of the earth for 40 miles. Only the lowest beds, however, appear there in narrow strips upon the highest plateau of the State, and not as anthracite, but as bitu- minous coal. This description, however, only applies to the western division of the middle field. Its eastern division has a very different character. On the broad rolling top of the Beaver Meadow Moun- tains, west of the Lehigh river, lie a group of closely-folded parallel troughs, in which the coal-beds descend steeply to depths of 1000 or 2000 feet, and rapidly rise again to the surface, each trough being pointed at both ends and disappearing on the summits of mountain-spurs, which look down upon deeply-indented red-shale valleys. The collieries of this eastern division of the middle field are all on very high land, from 1600 to 1800 feet above the sea; and branch railroads descend from them by steep gradients to the two rival main lines, which follow the banks of the Lehigh and Dela- ware rivers to the Atlantic coast.

The northern field corresponds exactly to the Wyoming region. It is a moon-shaped trough, 50 miles long by 6 miles wide, tapering toa point both ways. Its eastern half is drained by the Lacka- wanna river westward into the Susquehanna river, where the latter breaks through the northern mountain-wall and begins to meander westward through the Kingston flats in the centre of the coal-field made famous by the incidents of Indian warfare. A few miles farther on the river breaks half through the northern wall, split- ting it lenethwise, and then cuts off the western point of the basin, leaving a little patch of it capping the isolated spur. This magni- ficent coal-field is traversed diagonally by anticlinal and synchnal folds in the Coal-measures in such 2 manner as to subdivide it into more than thirty small coal-basins, all connected underground, the deepest of whieh hold more than 3000 feet of Coal-measures ; so that in a hilltop near Wilkcsbarre fossil-shells of the Permian formation, the uppermost division of the Carboniferous system, have been collected. ;

Until the maps of the anthracite section of the State Geological Survey have been completed, the area of anthracite coal-land in all three fields cannot be

accurately statcd. The total number of coal-beds cannot be stated, because some are hardly noticeable ; others are composed of several layers separated elsewhere by 50 or 100 feet of intervening rock. The identification of the beds across the intervals which separate the fields, and even from colliery to colliery, is not in all cascs satisfactory. It may, however, be Said generally that the whole column of Coal-measures contains more than a hundred coal-beds. Less than one-fourth of these have hitherto been considcred of desirable size and quality for mining. Most of the output in past years and at present comes rom five or six of them, from the Lykens valley bed, from the Buck Mountain bed, especially from the Mammoth bed—all of

them white ash—and from two or three red ash beds next higher in the series. The first quantities of eoal which were sent to the market came from an open quarry on the summit of the mountain at Mauch Chunk, where the Mammoth bed is 60 fect thick. In subsequent years a long range of extensive collieries were created on the Mine Hill slope of the bed behind Pottsville. Later still the Mahanoy and Shenandoah collieries were established behind the Broad Mountain. From early years the great bed was worked in the Wyoming region by the Baltimore Company. Other corporations have extensively exploited it throughont the valley. Old mines in this bed are worked on a great scale also at Hazelton and Beaver Meadow, and later plants were made at Jeanesville, Clifton, and elsewhere. A choice though smaller bed, called the Buck Mountain vein, extends through all three fields, and is largely mined in many places, sometimes in tunnel-connexion with the Mammoth and somctimes alone. The Lykens valley bed, holding 10 and 12 feet of exceedingly choice coal, lies near the bottom of the Millstone grit (the base of the Coal-measures), but is scarcely workable anywhere except at the western end of the southern field.

The waste in mining anthracite coal is enormous, although it has been somewhat diminished by the concentration of most of the coal-properties under the control of a few railway companies, who employ competent engineers and superintendents. But the markets demand the delivery of the coal in sizes. Iron furnaces alone accept the run of the mine. The “breaker,”

an anthracite inven- tion, and a monster of destruction, is an edifice of wood and iron 100 feet high, furnished with slopes and lifts to take the mine- cars to the top, with rollers set with teeth to crush the larger lumps, with bolting screens to separate the sizes, with picking banks and boys to throw out slate descending the shoots, and with bays or pockets from which the coal is drawn at will to fill railway trains passing underneath. The waste is carted off to a neighbour- ing hillside. Hills of this “dust,” 100 feet high and hundreds of feet long, encumber the country, and awaken the anxiety of proprietors respecting its future disposal. All plans for utilizing it cheaply on a large scale have as yet failed, and no serious ehange in the situation can take place until the supply in the earth begins to fail. The time for that is distant. The annual output can reach 50,000,000 tons, and, in spite of the waste, can continue at that figure for three centuries. An exact calculation of solid con- tents in the ground, of waste in mining and breaking, and of quantity sent to market has been made for only one division of one field.

At the eastern end of the southern ficld, for instance, six beds, as yet locally worked by only thirteen collieries (four of them now abandoned), contained originally 1,033,000,000 tons, of which only 54,000,000 have been extracted (between 1820 and 1882), leaving 979,000,000 tons still untouched. The output in 1820 was less than 400 tons, that of 1849 nearly 400,000 tons, that of 1882 838,000. Ina few years it will reach 2,000,000, and might con- tinue at that rate five centuries.

The number of working collierics in the anthracite region is con- stantly changing. The list for 1881-82, reported by the official mine inspectors, numbers 141 in the northern field, 51 in the eastern middle, 91 in the western middle, and 70 in the southern field, 353 collieries in all. The fuel they send to market is both white coal from the lower and red-ash coal from the higher beds of the series, the market sizes being designated egg, stove, chestnut, pea, and buckwheat. By sampling carefully the contents of five cars from one colliery carrying each a different size of coal, and analysing the samples, it was found that, while there was little difference in the percentage of water (say 1°7), of sulphur (say 0°7), and of volatile matter (say 4°0), the percentage of ash regularly increased as the size diminished (egg 5°662, stove 10°174, chestnut 12°666, pea 14°664, buckwheat 16°620), showing the finer breakage of the slaty layers, and the mixture of

slate-dust with the smaller sizes of coal. The percentage of solid carbon, of course, diminished directly with the size, from 88°5 in egg-coal to 76°9 in buckwheat. The coal- dust of the heaps about the mines, before alluded to, is therefore, no doubt, still lower in solid carbon ; yet Captain Wootten's dust- burning locomotives on the Reading Railroad have been a success ; and the dust or " braize" of the Philadelphia coal-yards is sold for use in fire-boxes of suitable construction. ;

The bituminous coal-region of Pennsylvania covers the western third of the State, the greatest thiekness of Coal-measures being in the south-western corner. Six wide parallel basins sweep round from the boundary-line with New York State south-westward into Ohio and West Virginia. The summit of the Alleghany Mountain, containing the lowest coals, limits the region | towards the south- east ; an irregular line parallel with and 30 miles distant from the shore of Lake Erie limits it on the north-west. The basins all gradually deepen going south-west, and are all subdivided into smaller local basins by gentle rolls. In one or two neighbourhoods the coal-beds dip as much as 30°; but over almost the entire area they are so nearly horizontal that a dip of 2° or 3° is exceptionally great. Over thousands of square miles they lie as flat as geologieal formations can ever lie, considering the accidents of original deposi-

tion in the quiet Carboniferous sea. There is a striking uniformity in the composition of the whole formation, which is naturally divisible into: (1) upper (Permian) barren-measures ; (2) upper (Pittsburgh) productive Coal-measures ; (8) lower barren-measures ; (4) lower productive Coal-measures; (5) Millstone grit (Pottsville conglomerate) ; (6) Mauch Chunk shale and mountain limestone ; (7) Pocono sandstone and lowest (worthless) eoal-beds. These rest on more than 10,000 feet of Devonian rocks.

The area of the State actually covered by one or more workable bituminous coal-beds is about 9000 square miles. Dr H. M. Chance's caleulation of area, thickness, content, &c. (in a paper read before the Am. Inst. Min. Eng., October 1881), is the most trustworthy yet made. He assumes sixteen important eoal-beds, none workable over the whole area of thirty-one eounties,—only the lowest beds being preserved in ten, and the principal

upper beds only in seven of ‘these counties. Beds less than 2 feet thick are ignored. Beds from 2 to 3 feet thick are estimated only from outcrop down to water-level ; beds from 3 to 5, to 150 feet below water-level ; beds over 5, to 400 feet below water-level. Allowing 1650 gross tons per foot to the acre (less 11 per cent. for slate, bone, and sulphur partings, say 1500 gross tons) the mass of beds over 6 feet is 11,000,000,000 tons; of beds between 6 and 3 feet, 19,500,000,000 ; and of beds under 8 feet, 3,000,000,000,—making a total of 33,500,000,000 gross tous, 75 per cent. of which can be mined, 2.¢., 25,000,000,000 tons; of this 10,500,000,000 are in the Pittsburgh bed. An exaggerated statement was eurrent thirty years ago that the Pittsburgh eoal-bed within the limits of the State of Pennsylvania would equal the whole annual British coal-trade (then 100,000,000 tons) for 2000 years. According to our present knowledge such an output would exhaust it in a single eentury.

The upper productive Coal-measures, about 300 feet thick, eon- tain four workable beds, of which the lowest (Pittsburgh) is the mainstay of the eoke and iron interests of the seven south-western counties, furnishing to 77 collieries in Allegheny eounty 4,000,000 tons, to 50 in Fayette eounty 1,566,000, to 45 in Westmoreland county 2,335,000, to 31 in Washington county 798,000, to 14 in Somerset eounty 200,000,—total nearly 9,000,000 tons mined out of 217 collieries, most of them mere adits into the hillsides, at various levels (from 30 to 300 feet) above the water-level of the Ohio river, or its main branch, the Monongahela river, and its branch the Youghuogheny river. Along these streams railroad stations and slack water pools receive the coal let down by trestle-work slopes from the adits. A few shafts are sunk to the bed where, for short distances, it sinks a few yards beneath water-level.

The iron-ores of Pennsylvania formerly sufficed for stocking the furnaces of the State ; but for more than twenty years past large outside supplies have been in demand,—the red hematites of Michigan, the magnetic ores of Canada, northern New York, and especially of northern New Jersey, and the limonites of Virginia, not to speak of numerous cargoes of Algerian ore. To understand the native ores it will be necessary to refer to the schedule of the geological formations of the State (see p. 500 above). The more recent formations—the Tertiary and the Cretaceous—poor in iron ores, are not

found in Pennsylvania, being eonfined to the Atlantic seaboard. ‘The next older formation—the Trias—also poor in iron ore, makes an independent belt across the State through Bucks, Montgomery, Chester, Lancaster, York, and Adams counties. Hence we have only to consider five sources of supply,—(a) the earbonate ores of the Coal-measures, with brown hematite outcrops ; (6) the lower Devonian brown hematites ; (c) the Upper Silurian red fossil-ore ; (¢) the Lower Silurian brown hematites ; and (e) the Azoic magnetites, some of them apparently in Cambrian rocks, overlaid by Trias, and the rest of them interbedded with the oldest (Laurentian ?) gneisses.

The ordinary ironstone of the Coal-measures oecurs in ball or plate layers throughout the bituminous coal-region, but is almost wanting in the anthracite region. Brown hematite deposits, always connected with the limestone beds in the Coal-measures, were formerly extensively mined, but the supplies of Carboniferous ore of both kinds are far from meeting the present demand, and the make of charcoal iron from them has been virtually abandoned. At the base of the Devonian series the Marcellus still yields eon- siderable quantities of brown hematite from the outcrop of a fer- ruginous clay-bed, but only in two or three noteworthy localities. The Clinton beds of red fossil-ore (soft and rich at the outcrop, hard and lean lower down) at Danville and Bloomsbury, at Frankstown and Hollidaysburg, at Bloody Run and Bedford, kept furnaces going for a good many years, and are still used as mixtures at Johnstown and elsewhere. The Lower Silurian brown hematite mines, however, have becn the chief dependence of the industry. They are very numerous in the isolated limestone valleys and along the whole course of the Great Valley. Some of these open quarries are of vast size, and between 100 and 200 feet deep; furnishing shot and ball and pipe ore of the finest quality, both eold-short and red-short ; and the high reputation of American or Juniata iron is based upon the history first of the charcoal and then of the an- thracite make of pig-mctal from these spccial ores. Railroads now

carry them long distanees to the present centres of the iron manu- facture, in the heart of the bituminous coal-region, or in front of the anthracite region, on the Lehigh, Schuylkill, and Susquehanna rivers, where they ean be

mixed with the subcrystalline iron ores of the South Mountains or of the Highlands of New Jersey. The South Mountains of Pennsylvania, however, cannot be said to be rich in these last-mentioned deposits, a few of which are indced mined toa considerable extent ; but no thorough exploration of the range has yet been undertaken to see if the deep-lying strata contain the Canadian and New York magnetites which are to be expected. Some of the oldest and largest mines are situated at the edge of the Trias belt, and were formerly supposed to be of Trias age; but it seems now probable that they belong to a Cambrian slate forma- tion covered by the Trias; and in all cases they are touched or surrounded by trap-dykes, which eut the Trias or trap-beds that interlie the Trias. The most remarkable of these mines is the "Cornwall" near Lebanon, where great quantities of cupriferous magnetite are obtained by stoping the walls of a vast open quarry.

The iron industry of Pennsylvania has always competed with the eotton growth of the southern States and the cotton industry of the eastern States for political power in Congress, to save itself against a foreign importation of rolled iron. 'The iron-masters of Pennsylvania have led in every debate upon a proteetive tariff. Pennsylvania has always furnished one-half of the total amount of pig-iron cast in the United States. In 1883 it made 2,638,891 tons out of a total of 5,146,972 tons made in twenty-four States and one Territory. Of these 1,416,468 tons were anthracite pig, 1,184,108 coke and raw coal pig, and only 88,349 were charcoal pig; and the number of furnaces at the end of 1883 was 142 in blast and 129 out of blast. In like manner Pennsylvania has always rolled more than one-half of the iron and steel rails of American manufac- ture,—in 1883, for instance, 857,818 tons out of a total of 1,360,694, and of these 819,544 were Bessemer. So of crucible-steel ingots Pennsylvania in 1883 made 63,687 out of a total of 80,455 ; open- hearth steel ingots, 72,333 of a total of 133,679 ; in a word, of all kinds of rolled iron, 1,081,163 tons out of a total of 2,348,874. The petroleum statistics for 1882, partly mixed with those of an adjoining district in New York, show a product of 30,541,740 barrels (of 42 gallons).

Vegetation.—The vegetation of the State corresponds in variety with the variety of elevation and distance from the seaboard. The mountains are clad with forests of pine, hemlock, oak, beech, maple, walnut, wild cherry, eucumber, dogwood, and laurel, and eultivated apple, eherry, pear, and

peach trees grow in the clearings, Wild grapes grow in sheltered places ; wild huekleberries, straw- berries, and blackberries flourish. Oats, barley, and timothy grass yield heavy crops. The original forest remains only here and there in secluded spots. All its white-pine timber has been cut, and none grows to replace it. The spruce-pine, hemlock, and oak woods have been girdled by settlers, or barked by tanners and left to die. Extensive iron-furnace tracts have been systematically eut several times ; the deserted charcoal grounds in the anthracite and coke districts have beeome covered with a dense low growth of oak, maple, bireh, dogwood, and other deciduous vegetation. Two other motives have eo-operated for the destruction of the original forest,—the demand for railway sleepers and the still greater demand for timber and slabs in mines. The annual forest fires, sometimes of enormous magnitude, help to keep the size of forest- wood small, and to cover the uncultivated part of the State with brushwood. The early settlers of the low country also cut with- out mercy and without fear; no shadow was allowed to fall on a field. The traditional practice lasted long; but the scarcity of wood at length made itself felt. The last generation began to plant; the present cherishes and multiplies trees, in and around fields, along roads, and on rough ground. The old settled parts of the State are beeoming again well wooded. The mountain-ridges will always remain so, for outerops of sandstone make them rocky, and the terracing of their steep slopes is not yet to be thought of. In the north-western eounties the discovery of petroleum in 1859 produced a great demand for derrick lumber, and the ephemeral wooden cities which sprang up during the succeeding twenty-five years caused a rapid bringing under cultivation of at least 5000 square miles, lying between 1000 and 2000 feet above the level of the sea.

Two hundred and eighty-four genera and 544 species of plants are enumerated as growing on the platcau of Wayne county, m the north-cast eorner of the State, a typical portion of the whole upland region, covered with glacial drift-sand and gravel, with innumerable lakes, ponds, and small swamps, lying at various elevations fron 1100 to 2000 feet above the sea.

Fauna.—The zoology of Pennsylvania exhibits that transition stage of its history in which we live. The elk has disappeared ; but the panther (puma) and the small wolf are occasionally met with. The black bear is not by any

means extinct, and can always find its way anew into the State from West Virginia. The wild cat is common in the least settled counties. Hedgehogs, ground- logs, weasels, poleeats, squirrels of three species, mice of several

species, and musk-rats abound; but the beaver, which has given name to so many mountains, rivers, ereeks, and swamps all over the State, no longer exists. The wild turkey is practically exter- minated, but is oceasionally shot on the mountains. Owls, wood- doves, thrushes, and other birds are abundant. Harmless snakes of various species arc innumerable, especially a constrictor, the black snake, which grows to a length of 5 or6 feet. Two venomous snakes are still numerous, the eopper-hcad in the half-eultivated distriets and the rattlesnake in the mountains. The latter, in spite of all efforts to exterminate it, breeds with incredible rapidity. In summer it descends into the valleys. But, while the more dreaded copper-head is active and malicious and bites without warning, the rattlesnake is always sluggish and timid, and takes so mueh time to get into coil, and is so noisy about it, that it is an object more of contempt than of apprehension. The black snake is its worst enemy and is always victorious; the deer also bounds around it, leaps upon it, and scatters it in pieees; the hog feeds upon it; and yet half the State is infested with it. Poisonous insects are almost unknown; but infinite swarms of gnats torment cattle and men in the forest counties. During a short season in summer mosquitoes abound along the tidal rivers, when the south wind blows. Fleas havo only reeently been im- ported ; but tieks arc common in the lowland woods, and the native bed- bug, which breeds under the bark of the hemlock, has become domiciled throughout the State, and is the curse not only of the traveller but of a large part of the resident population. Government. —The constitution of 1874 gives the right to vote to évery male citizen over twenty-one years of age who has been a citizen of the United States one month, resident in Pennsylvania one year, and in his clection distriet two months; but, if over twenty-two ycars old, he must have paid a tax at least two months before the day of election. The legislative power is vested in a general assembly of two houses, —fifty senators elected by the people for four years and two hundred representatives for two years. There are strong constitutional guards against special legislation. The executive department consists of a

governor, lieutenant-gover- nor, and seeretary of internal affairs, elected each for four years, an auditor for three, and a treasurer for two, together with a seerctary of state, an attorney-general, and a superintendent of public in- struetion, each appointed for four years by the governor with cou- sent of the senate. The judiciary consists of a supreme eourt of seven judges elected for twenty-one years ; forty-three district courts of common pleas each with one or more judges elected for ten years, and exercising probate jurisdiction except in eities where there are orphans' courts ; and local magistrates of minor jurisdiction. The State sends twenty-seven representatives to the national Congress ; and federal courts for the eastern districts are held at Philadelphia, and for the western district at Pittsburgh, Williamsport, and Erie. Population.—The population was estimated in 1755 at 200,000. The results of subsequent censuses are shown in the following table—

Census. Males. | Females. Total ae 1790 222,810 211,563 434,373 9°6 1800 309,507 292,358 602,365 13°4

1810 413,575 896,516 810,091 18:0 1820 532,432 517,026 1,047,507 23:3

1830 684,378 664,455 1,348,233 30°0 1840 867,556 856,477 1,724,033 38°3

1850 1,168,103 1,143,683 2,311,786 514

1860 1,454,419 1,451,796 2,906,215 64°6

1870 1,758,499 1,768,452 3,521,951 78:2

1880 2,136,655 | 2,146,936 4,282,891 95°2

Of the last total 85,535 were coloured ; 587,829 were of foreign birth, ineluding 80,102 English, 236,505 Irish, 20,785 Scotch, 29,447 Welsh, and 168,426 Gernians.

Education. —In 1880 but 4°6 per cent. of the population over teu years old were unable to read,and 7°1 per eeut. unable to write. The State is divided into 2215 districts, which hold school property valued at $28,341,560, and

maintain 19,188 schools, of which 7812 are graded. Directing boards elected by the people appoint county superintendents. -The State superintendent has two deputies. The teachers numbcr 21,289, of whom 12,778 are women, the average Imonthly wages for men being $35°12, and for women $28 °89. There are fourtecn normal sehools, ten being under State patronage. The total school expenditure for 1882 was $8,262,244, ineluding $1,000,000 of State aid, given every year. The sehools are free to all persons from six to twenty-one years of age; and this “school population” in 1880 numbered 1,422,377. In 1883 there were 945,345 on the registers; the average attendance was 611,317. There are twenty-eight colleges giving four-year courses, but only five eonfine themselves strictly to college work, viz., university of Pennsylvania at Philadelphia, Lchich university at South Bethle- hem, Lafayette college at Easton, Haverford college at Haverford, and Dickinson college at Carlisle. The grounds, buildings, and apparatus of twenty institutions are valued at $3,186,000, and they hold $3,951,000 in produetive funds. Swarthmore college and eight others admit both sexes to equal privileges. The pecu-

liar industries of the State have led to extensive provisions for teehnieal and scientific instruction. There are seventeen theological schools, a law department in the university of Pennsylvania, five medical colleges, all in Philadelphia, an academy of fine arts, and about two hundred aeademies of various grades.

Prisons, d:e.—There are two penitentiaries, the Eastern, at Phil- adelphia, on the separate-eell system, with about 1000 conviets, and the Western, at Allegheny, on the eongregate system, with about 650 conviets. The reform school at Morganza (eottage system) and the house of refuge at Philadelphia receive youthful offenders who in both institutions average over 1000. An industrial reforma- tory at Huntingdon, with room for 500 youthful criminals sentenced for first offences, is near eompletion (1884), There arc 69 county jails, eosting annually $750,000; the commitments for the year ending 30th September 1883 were 2328, and the inmates 1127.

Pauperism, Insanity, &e.—On 30th September 1883 there were 38 county almshouses, containing 8313 inmates, costing for the year $1,296,945, to whieh add $203,830 for township poor and $226,000 for outdoor relief. A law of 1883 forbids the retention of children over two and under sixteen in almshouses with adult paupers for more than sixty days. Charitable institutions and societies are numerous. Sinee 1879 a society for organizing charity has been operating in Philadelphia to prevent indiscriminate and duplicate giving, and mendicaney. There are five State hospitals for insane, —at Harrisburg, Danville, Warren, Dixmont, and Norristown. These with three other prominent cstablishments had 3575 inmates on Ist October 1882, of whom 2220 were indigent. In one year 5107 cases were treated, 1552 newly admitted, 968 persons dis- charged, 368 died. In 1880 there were 3884 blind persons in the State ; in January 1884 there were 373 in institutions assisted by the State. Of those discharged about two-thirds have a fair pro- spect of self-support. In institutions for deaf and dumb there were Of 404 children in the institute for feeble-minded at Media only 100 were dcemed incapable of improvement.

Agriculture. —By the ecnsus of 1880 there were 301,112 persons engaged in agriculture, and 1,154,955 in all other oeeupations. The number of farms was 213,542, averaging 93 acres each. There were under improvement 13,423,007 aercs, an inerease of 1,907,042 since 1870; the value of produets was $129,760,476. The principal erops are wheat, maize, hay, and tobacco, the cultivation of the last having greatly inereased of late, so that Pennsylvania ranks third among the tobacco-raising States of the Union, its produet in 1880 being 36,943,272 tb. It is most largely grown in Lancaster county. There isa large yield of honey and maple sugar, and the butter product of 1880 was 79,336,012 Ib.

Manufactures.—The manufacturing industry has more than trebled since 1860. In 1880 the eapital invested in 31,232 estab- lishments was $474,510,993, the cost of material used in a year $465,020,563, the total sum paid in wages $134,055,904,—the number of persons employed being 387,072, and the value of pro- duct $744,818,445, or nearly one-seventh of the total produet of manufactures in the United States ($5,369,579,191), Iron and steel take the lead; textile fabries, ineluding earpets, cottons, woollens, silks, yarns, hosiery, and hats make a large item; 333 tanneries

yield in leather $23,735,814; flour and grist mills doa large business ; the lumber interest centres at Williamsport and glass-making at Pittsburgh, and there are salt-wells at Allegheny.

Communications. —Connexions between the navigable rivers were effeeted in former years at a cost of over $50,000,000, by a system of canals now chiefly used for the carriage of eoal, subordinate to the mining and railway corporations, which are closely related. There are about 5500 miles of railroad in the State belonging to numerous eompanies, but the Pennsylvania Railroad system and the Phil- adelphia and Reading system are by far the most important. The Pennsylvania has not only consolidated under its management mauy lines within the State but has gained control by purchase or lease of trunk lines and branches leading through other States, east, west, north, and south, ineluding in all over 6000 miles of road, Of these 2555 belong to the Pennsylvania division, of which the gross earnings in 1883 were $32,017,818, and the uet earnings $13,696,399. The Philadelphia and Reading owns or controls 1583 miles of road, and along with a heavy passenger business (18,195,264 earried in 1883) is largely oceupied with transporta- tion of coal from the mines to Philadelphia and New York. Its gross earnings in 1883 were $29,797,927, its net earnings $14,464,070, exclusive of rentals of leased lines and interest. In eonjunction with the Reading Coal and Iron Company, a separate corporation, it eontrols seventy-four eollieries, covering 163,317 aeres of anthra- eite coal lands. The gross earnings of the Coal and Iron Company for 1883 were $17,038,858, and the net earnings $921,771. Other companies eontrol lines leading from the eoal and iron regions to New York eity. The railroad interest gives employment to over 76,000 men, besides the 3000 employed by the Baldwin Locomo- tive Works in Philadelphia.

Finance.—For the year ending 30th November 1882 the State re- venue, exclusive of a loan of $9,360,120, was $7,068,529, of which over $4,000,000 came from taxes on corporations, and nearly all the

rest fron various business licences, The State imposes no tax on real estate, but collects $437,776 from. taxes on money at interest, watehes, and earriages. The expenditure, exclusive of payment on debt, was $5,024,766.

The debt was $20, 225,083, with $7,992,983 of assets in the sinking fund. Thirty-eight counties report debts aggregating $76,301,876, and there are heavy municipal debts. The value of real estate reported in 1882 was $1,598,430,041, of which $110,000,126 were legally exempt from taxation.

Militia.—Distributed over the State and organized into regiments and brigades are 137 volunteer companies, containing 8220 men and officers, and called collectively the “national guard.” They include three batteries of artillery, three companies of cavalry, and 131 of infantry, and are armed, equipped, and supplied by the State at an annual expense of about $242,000.

History. —The grant of the extensive territory called Pennsyl- vania, made by Charles II. in 1681 to William PENN (q.v.), carried with it full proprietorship and dominion, saving only the king’s sovereignty. Penn at once created a quick market for lands by publishing in England and on the Continent his liberal scheme of governinent and his intention to try the ‘‘holy experiment” of ‘Ca free colony for all mankind.” In 1682, when he erossed the sea to take possession, he found the western bank of the Delaware already occupied by nearly 6000 Swedes, Dutch, and English, the Swedes having begun a settlement in 1638. ‘To these, as to settlers from all nations, he coneeded equal liberties. The desire to escape from spiritual and temporal despotisms, and the chance of acquir- ing rich lands in a salubrious climate on easy terms, drew thousands of immigrants: English Quakers, Seottish and Irish Presbyterians, German Mennonites, French Huguenots, men of all religions, were alike welcome ; the population increased for a few years at the rate of one thousand a year; then morc rapidly, so that at the end of seventy-five years it exeecded 200,000. Penn twiee visited Penn- sylvania, staying each time two years. In December 1682 he summoned delegates to mcet him at Upland (now Chester) to eon- fer about government ; the land was divided into counties, and in March following representatives chosen by the people of these dis- tricts agreed ona constitution, based upon popular suffrage, and guaranteeing liberty of conscience. All magistrates and offieers were to be chosen by the people, Penn surrendering all claim for revenue by taxation, and retaining for himself and his deputies only the governorship. For his further connexion with Pennsyl- vania, see Penn. In 1682 PHILADELPHIA (q.v.) was

founded. The failure to settle the boundary-line between Pennsylvania and Maryland, in dispute between Lord Baltimore and Penn, long eaused great irritation among the settlers, who were liable to double taxation ; but in 1750 Lord Hardwiek's deeree in Chancery con- firmed the original claims of Penn, and in 1763-67 Mason and Dixon definitely fixed and marked 246 miles of the line, sinee made famous as the separation between free and slave States.

For over sixty years the predominanee of the Quakers in the assembly had prevented any legislation for publie defenee,—of which, indeed, there was little need so long as Indians and whites kept their covenant. But in 1744 the Indians beeame allies of the French, then at war with Great Britain. Freneh military posts established in western Pennsylvania not only violated the integrity of the provinee but threatened to confine the English to the east of the Alleghanies, and perhaps to crowd them off the continent. The party of non-resistance was overborne by a sense of public danger, which found strong expression in a pamphlet by Franklin ; and in 1747 the assembly permitted volunteer organization. One hundred and twenty companies werc soon enrolled, ten of them, of a hundred men each, in Philadelphia. But there was no efficient manage- ment nor hearty co-operation with adjacent eolonies. Braddoek's defeat in 1754 intensified the alarm ; Fort Duquesne (site of Pitts- burgh), which he aimed to reduee, was held by the French till 1758. The peaee of Paris in 1763 did not quiet the Red Men. Pontiae, a famous saehém, united the western tribes in a war of extermina- tion, only ended when the whites had proved their mastery. The royal council, displeased with self-governing tendencies, annulled the militia law of Pennsylvania; but the pressure of common danger and the dread of tomahawk and torch not only led to the offer of a bounty of $130 for Indian scalps, but taught the lessons of comradeship and co-operation, and nourished the self-reliant courage of the generation which was to strike for independence. Though stout against the Stamp Aet of 1765 and other parliamentary encroachments, Pennsylvania was not swift to move ; the assembly sought to mediate between the parliament and the colonies, but the course of events soon made neutrality impossible. A long adjournment was construed as abdication ; a committee of safety seized the reins till the people could speak through a representative convention. The convention espoused the revolution ; in Septem- ber 1776 a State constitution was

promulgated ; in 1778 the old charter was formally annulled and the Penn claims silenced by payment of £130,000. During the war Pennsylvania was the scene of important events,—the deliberations of the Congress and the Declaration of Independence in 1776; the battles of Brandy- wine and Germantown in 1777; the British oeewpation of Phil-

adelphia, and the encampment of Washington at Valley Forge, in 1777-78.

PENRITH, a market-town of Cumberland, England, is situated near the river Eamont, and on the Lancaster and Carlisle section of the London and North-Western Railway, 18 miles south of Carlisle, and 5 north-east of Ullswater. The town consists chiefly of one long and wide street. To the west once stood an ancient castle, erected as a protection against the Scots, on the site of an old Roman encampment. But it was dismantled by Charles L ; the ruins still remain. The principal public buildings are the grammar-school, founded by Queen Elizabeth in 1566, the. agricultural hall, the mechanics' institute, and the working-men's literary institute. There are breweries, tanneries, and saw-mills, but the town depends chiefly on agriculture. The population of the urban sanitary district in 1871 was 8317, and in 1881 it was 9268.

Old Penrith, the Bremetenracum of the Romans, was about 5 miles north by west of the present town. At the Conquest the honour of Penrith was a royal franchise ; but it was alternately in the pos-

session of the English and Scottish kings until given to Anthony — 'Beck, bishop of Durham, by Edward I.

The town more than once lapsed to the crown. In 1696 it was granted to William Bentinek, earl of Portland, and in 1788 it was sold by the duke of Portland to the duke of Devonshire.

PENSACOLA, a city of the United States, capital of Escambia county, Florida, on the north-west coast of Pensacola Bay. The harbour has recently

been improved so as to secure a uniform depth of 24 feet. Pensacola is the terminus of three railway lines which connect it with Mobile, Montgomery, Jacksonville, and Millview, the start- ing-place of steamers plying to Cedar Keys, &c., and the seat of a large trade in lumber (mainly pitch pine), early vegetables, and winter fruits. About 7 miles west of Pen- sacola lies a United States navy-yard. The value of the exports to Great Britain and the British colonies in 1882 was $1,481,702, to other foreign countries $1,091,113, and to the United States $535,225. The total imports were only $169,082. In 1850 the population was 2164, in 1870 3347, and in 1880 6845; and it has since in- creased to upwards of 8000.

Pensacola Bay is said to have been discovered by Narvaez in 1528. French, and afterwards Spanish, colonists settled on the site of the town in the close of the 17th century. In 1719 it was captured by Bienville, in 1723 restored to the Spaniards, in 1763 occupied by the British, in 1781 captured by General Galvez, in 1814 taken from the British by the United States general Jackson, and again in 1818 taken by the same general from the Spaniards. In 1821, according to the treaty of 1819, it beeame, with the rest of Florida, part of the United States territory.

PENTATEUC H

PENTATEUCH anp JOSHUA. The name Penta- teuch, already found in Tertullian and Origen, corresponds to the Jewish Mminn ‘wan Awon (the five-fifths of the Torah, or Law); the several books were named by the Jews from their initial words, though at least Leviticus, Numbers, and Deuteronomy had also titles corresponding to those we use, viz., DID NWN, oNpan won (Apperdexwderp, Origen, in Eus., HW. £., vi. 25), and mn nw. = The Pentateuch, together with Joshua, Judges, and Ruth, with which it is usually united in Greek MSS., makes up the Octateuch ; the Pentateuch and Joshua together have recently been named the Hexateuch. The date of the division of the Torah into five books cannot be made out ; it is probably older than the Septuagint translation.

Moses is already taken for the author of the Pentateuch in 2 Chronicles xxv. 4, xxxv. 12 sq.; only the last eight verses of Deuteronomy are, according to the rabbins, not from his pen. From the synagogue belief in the Mosaic

the previous question of the composition of the Pentateuch.

Jean Astruc has the merit of opening the true path of Astruc.

this investigation. He recognized in Genesis two main sources, between which he divided the whole materials of the book, with some few exceptions, and these sources he distinguished by the mark that the one used for God the name Elohim (Gen. i., v.; comp. Exod. vi. 3) and the other the name Jehovah (Gen. ii.-iv.).2_ Astruc's hypothesis, fortified by the observation of other linguistic differences which regularly corresponded with the variation in the names of God, was introduced into Germany by Eichhorn's Linleitung in d. A.T., and proved there the fruitful and just point of departure for all further inquiry. At first, indeed, it was with but uncertain steps that critics advanced from the analysis of Genesis to that of the other books, where the simple criterion of the alternation of the divine names was no longer available. In the hands of the Scotsman Geddes and the German Vater the Pentateuch resolved

authorship passed to the church, and is still widely pre-

1 te itself into an agglomeration of longer and shorter fragments, Frag-
valent among Christians. At an early date, indeed, doubts

between which no threads of continuous connexion could mentary

suggested themselves as to the correctness of this view, but it was not till the 17th century that these became so strong that they could not be suppressed.1_ It was ob- served that Moses does not speak of himself in the first person, but that some other writer speaks of him in the third,—a writer, too, who lived long after. The expression of Gen. xii. 6, "the Canaanite was then in the land," is spoken to readers who had long forgotten that a different nation from Israel had once occupied the Holy Land; the words of Gen. xxxvi. 31, "these are the kings that reigned in Edom, before there reigned any king over the children of Israel," have no prophetic aspect ; they point to an author who wrote under the Hebrew monarchy. Again, the "book of the wars of Jehovah " (Num. xxi. 14) cannot possibly be cited by

Moses himself, as it contains a record of his own deeds; and, when Deut. xxxiv. 10 (comp. Num. xii.) says that “there arose not a prophet since in Israel like unto Moses,” the writer is necessarily one who looked back to Moses through a long series of later prophets.

At the same time attention was drawn to a variety of contradictions, inequalities, transpositions, and repetitions of events in the Pentateuch, such as excluded the idea that the whole came from a single pen. Thus Peyrerius re- marked that Gen. xx. and xxvi. stand in an impossible chronological context ; and on the incongruity of Gen. 1. and ii., which he pressed very strongly, he rested his hypo- thesis of the Preadamites. Such observations could not but grievously shake the persuasion that Moses was the author of the Pentateuch, while at the same time they directed criticism to a less negative task—viz., the analysis of the Pentateuch. For this, indeed, the 17th century did not effect anything considerable, but at least two conclusions came out with sufficient clearness. The first of these was the self-contained character of Deuteronomy, which in these days there was a disposition to regard as the oldest book of the Pentateuch, and that with the best claims to authenticity. And in the second place the Pentateuchal laws and the Pentateuchal history were sharply distin- guished; the chief difficulties were felt to lie in the narrative, and there seemed to be less reason for question- ing the Mosaic authorship of the laws.

Spinoza’s bold conjecture that in their present form not only the Pentateuch but also the other historical books of the Old Testament were composed by Ezra ran far ahead of the laborious investigation of details necessary to solve

1 Hobbes, Leviathan, chap. xxxiii. ; Peyrerius, Syst. theol. ex Pre-adamitarum Hypothesi, iv. 1, 2; Spinoza, Tr. Theologico-pol., chap. vii. ; R, Simon, Hist. Crit, du V. T., i. 5-7; Le Clerc, Sentimens de quelques théologiens de Hollunde (Amst., 1685), lett. 6.

be traced 3 (“‘ Fragmentary Hypothesis”). The fragment- Bene.

ary hypothesis was mainly supported by arguments drawn from the middle books of the Pentateuch, and as limited to these it long found wide support.

an inconsistency, for his fundamental idea was to show throughout all parts of the Pentateuch traces of certain common tendencies, and even of one deliberate plan ; nor was he far from recognizing the close relation between the Elohist of Genesis and the legislation of the middle books.

De Wette's chief concern, however, was not with the literary but with the historical criticism of the Pentateuch, and in the latter he made an epoch. In his Diss. Critica of 1805 (Opuse. Theol., pp. 149-168) he placed the composi- tion of Deuteronomy in the time of King Josiah (arguing from a comparison of 2 Kings xxii., xxiii., with Deut. xii), and pronounced it to be the most recent stratum of the Pentateuch, not, as had previously been supposed, the oldest. In his Critical Enquiry into the Credibility of the Books of Chronicles (Halle, 1806) he showed that the laws of Moses are unknown to the post-Mosaic history; this he did by instituting a close comparison of Samuel and Kings with the Chronicles, from which it appeared that the variations of the latter are not to be explained by the use of other sources, but solely by the desire of the Jewish scribes to shape the history in conformity with the law, and to give the law that place in history which, to their surprise, had not been conceded to it by the older historical books. Finally, in his Criticism of the Mosaic History (Halle, 1807) De Wette attacked the method then preva- lent in Germany of eliminating all miracles and prophecies from the Bible by explaining them away, and then ration- alizing what remained into a dry prosaic pragmatism. De Wette refuses to find any history in the Pentateuch; all is legend and poetry. The Pentateuch is not an authority for the history of the time it deals with, but only for the time in which it was written ; it is, he says, the conditions of this much later time which the author idealizes and throws back into the past, whether in the formot narrative or of law.

De Wette's brilliant début, which made his reputation for the rest of his life, exercised a powerful influence on his contemporaries. For several decennia all who were open to critical ideas at all stood under his influence. Gramberg, Leo, and Von Bohlen wrote under this influence ; Gesenius in Halle, the greatest Hebraist then living, taught under it; nay, Vatke and George were guided by De

2 Conjectures sur les mémoires originaux, dont w paroit que Moyse s’est servi pour composer le livre de la Genése (Brussels, 1758). Comp. Journ. des Scavans, October 1767, pp. 291-305.

3 J, §. Vater, Commentar tiber den Pentateuch, Halle, 1802-1805.

Even De Wette De started from it in his investigations; but this was really Wette.

Positive literary criticism.

Hupfeld,

Noldeke.

Wette’s ideas and started from the ground that he had conquered, although they advanced beyond him to a much more definite and better established position, and were also diametrically opposed to him in one most important point, of which we shall have more to say presently.

But meantime a reaction was rising which sought to direct criticism towards positive rather than negative re- sults. The chief representatives of this positive criticism, which now took up a distinct attitude of opposition to the negative criticism of De Wette, were Bleck, Ewald, and Movers. By giving up certain parts of the Pentateuch, especially Deuteronomy, they thought themselves able to vindicate certain other parts as beyond doubt genuinely Mosaic, just in the same way as they threw over the Davidic authorship of certain psalms in order to strengthen the claim of others to bear hisname. The procedure by which particular ancient hymns or laws were sifted out from the Psalter or the Pentateuch had some resemblance to the decretum absolutum of theology ; but up to a certain point the reaction was in the right. The youthful De Wette and his followers had really gone too far in applying the same measure to all parts of the Pentateuch, and had been satisfied with a very inadequate insight into its composi- tion and the

relation of its parts. Historical criticism had hurried on too fast, and literary criticism had now to overtake it. De Wette himself felt the necessity for this, and from the year 1817 onwards—the year of the first edi- tion of his Hinlectung—he took an active and useful part in the solution of the problems of Pentateuchal analysis. The fragmentary hypothesis was now superseded ; the con- nexion of the Elohist of Genesis with the legislation of the middle books was clearly recognized ; and the book of Joshua was included as the conclusion of the Pentateuch. The closely-knit connexion and regular structure of the narrative of the Elohist impressed the critics ; it seemed to supply the skeleton which had been clothed with flesh and blood by the Jehovist, in whose contributions there was no such obvious conformity toa plan. From all this it was naturally concluded that the Elohist had written the Grundschrift or primary narrative, which lay before the Jehovist and was supplemented by him (“Supplementary Hypothesis ”).? ;

This view remained dominant till Hupfeld in 1853 pub- lished his investigations on Zhe Sources of Genesis and the Method of their Composition. WHupfeld denied that the Jehovist followed the context of the Elohistic narrative, merely supplementing it by additions of his own. He pointed out that such Elohistic passages in Genesis as clearly have undergone a Jehovistic redaction (¢.g., chaps. XX., XX1., xxii.) belong to a different Elohist from the author of Gen.i. Thus he distinguished three independent sources in Genesis, and he’ assumed further, somewhat inconse- quently, that no one of them had anything to do with the others till a fourth and later writer wove them all together into a single whole. This assumption was corrected by Néldeke, who showed that the second Elohist is preserved only in extracts embodied in the Jehovistic book, that the Jehovist and second Elohist form one whole and the Grundschrift another, and that thus, in spite of Hupfeld’s discovery, the Pentateuch (Deuteronomy being excluded) was still to be regarded as made up of two great layers. Néldeke had also the honour of having been the first to

- H. Leo, Vorlesungen iiber die Geschichte des jiidischen Staats, Berlin, 1823). GaP Ww Gramherg, MKritische Geschichte der Religions- tdeen des A.T., Berlin, 1829-30; P. v. Bohlen, Die Genesis, Konigs- berg, 1835; W.

Vatke, Biblische Theologie, Berlin, 1885; J. F. L. George, Die dlteren jiidischen Feste, Berlin, 1835.

co Bleek, in Roscnmiiller's Repertorium, 1822, and in Stud. wnd Krit., 1831 ; Ewald, Stud. u. Arit., 1831; Tuch, Kommentar ib. d.

Genesis, Halle, 1838 ; especially De Wette in the various editions of his Hinlcituang.

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trace in detail how the Elohistic Grundschrift runs through the whole Hexateuch, and of having described with masterly hand the peculiar and inflexible type of its ideas and language. In this task he was aided by the commentary of Knobel, whose industry furnished very valuable materials for men of judgment to work upon.

Thus the investigation into the composition of the Penta- teuch had reached a point of rest and a provisional con- clusion. The results may be thus summarized. The five books of Moses with Joshua form one whole ; and it is not the death of Moses but the conquest of the promised land which forms the true close of the history of the patriarchal age, the exodus, and the wanderings in the wilderness ; it

is therefore more correct to speak of the Hexateuch than of The the Pentateuch. From this whole it is most easy to detach Hexa- the book of Deuteronomy, and accordingly its independence tuch

was very early recognized. Of the other elements, that which has the most marked individuality is the work of

the Elohist, which we shall in the sequel call the Priestly The This too, like Deuteronomy, is a law-book, but it Priestly % has an historical setting. Its main stock is Leviticus, with ™® 4%

Code.

the cognate parts of the adjacent books, Exod. xxv.-xl. (except chaps. xxxii.-xxxiv.) and Num. i.-x., xv.~~xix., xxv.~~ XXXVI, (with some inconsiderable exceptions). This law- book does not, like Deuteronomy, embrace precepts for civil life, but is confined to affairs of worship, and mainly to the esoteric aspect of public worship, that is, to such points as belonged to the function of the priests as distinguished from the worshipping people. The legal contents of the Code are supported on a scaffolding of history, which, however, belongs to the literary form rather than to the substance of the work. It is only where some point of legal interest is involved that the narrative acquires any fulness, as it does in the book of Genesis in connexion with the three preparatory stages of the Mosaic covenant attached to the names of Adam, Noah, and Abraham. Generally speaking, the historical thread is very thin, and often (Gen. v., xi.) it becomes a mere genealogical line, on which is hung a continuous chronology carried on from the creation to the exodus. The Priestly Code is charac- terized by a marked predilection for numbers and measures, for arrangement (titles to sections) and formality of scheme, by the poverty and inflexibility of its language, by standing repetitions of certain expressions and phrases such as are not elsewhere found in old Hebrew. Thus its distinguish- ing marks are very pronounced, and can always be recog- nized without difficulty. If now Deuteronomy and the Priestly Code are successively subtracted from our present

Pentateuch the Jehovistic history-book remains, distin- Jeho-

guished from both the others by the fact that it is essentially Mf ne

narrative and not law, and by the pleasure it takes in bringing out details of the historical tradition, so that individual points of the story receive full justice and are not sacrificed to the interests of the general plan, The patriarchal history belongs almost entirely to this docu- ment, and forms the most characteristic part of it; here that history forms no mere epitomized introduction to more important matter, as in the Priestly Code, but is treated in all fulness as a subject of first-rate importance. Legis- lative elements are incorporated in the Jehovistic narrative only at one point, where they naturally fall into the his- torical context, viz., in connexion with the law-giving on Sinai (Exod. xx.-xxiii., xxxiv.).

These, then, are the three main component parts of the Hexateuch—Deuteronomy, the Priestly Code, and the Jehovist. But the Jehovist has woven together in his history-book two sources, one of which uses the name

3 Knobel, Die Genesis erkldrt (Leipsic, 1852), Exodus und Leviticus (1857), Nwmeri, Deuteron., und Josua (1861) ; Néldeke, Untersuchungen zur Kritik des A.T. (Kiel, 1869).

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Elohim (Hupfeld's younger Elohist), while the other says Tahweé, as does the Jehovist himself. So, too, the Priestly Code is not a perfeetly incomposite strueture ; it has one main stock marked by a very definite historical arrange- ment and preserved with little admixture in the book of Genesis ; but on the one hand some older elements have been ineorporated in this stoek, while on the other hand there have been engrafted on it quite a number of later novell, whieh in point of form are not absolutely homo-geneous with the main body of the Code, but in point of substance are quite similar to it, refleeting the same tendencies and ideas and using the same expressions and mannerisms, so that the whole may be regarded as an historical unity though not strietly as a literary one.

The very namc of Deuteronomy shows that from the earliest times it has been regarded as at least possessing a relative inde- pendence ; the only difficulty is to determine where this section of the Pentateuch begins and ends. In recent times opinion has in- elined more and more to the judgment of Hobbes and Vater, that the original Deuteronomy must be limited to the laws in chaps. xii.-xxvi.

The reasons that compel us to distinguish the Priestly Code from the Jehovist, and the relation that subsists between these two elements, may be exemplified and illustrated by the first nine chapters of Genesis. We begin by eomparing Gen. i. 1 to ii. 4a with Gen. ii. 40 to iii. 24. The history of the first man in paradise . has nothing to do with the preeeding record of the ereation of the world in six days, which is neither referred to nor

presupposed. “Tn the day that Jehovah made thc earth there was as yet no plant of the field upon the carth, and no herb grew in the field ; for Jehovah had not eaused it to rain upon the earth, and there was not a man to till the ground. Buta mist went up from the earth and watered the whole face of the ground. And Jehovah formed man of the dust of the ground and breathed into his nostrils the breath of life.” It might be supposed that the picture drawn in ehap. i. is here briefly referred to in order to add a particular feature which had not been fully brought out there. But there is no situation in ehap. i. which this scene fits. There man is inade last of all, but here first of all, before vegetation, and according to ii. 19 sq. also before the beasts. There man and woman are created together, here at first the man is alone. There vegetation and wet stand opposed, the plants spring up as soon as there is dry land ; here the condition of vegetation is the moistening of the dry land—it must first rain; the carth, therefore, was originally not water but a parched desert,—the same conception as in the book of Job, where the sea bursts forth from the womb of the hard earth. The conceptions of the two narratives are different all through, as appears equally in what follows. ‘Jehovah planted a garden eastwards in Eden, at the place where the four chief rivers of the world are parted from a common source. Here among other goodly trees grew the tree of life and the tree of knowledge. In this garden Jehovah set the man, to dress it and to keep it, to eat of all the fruits save only that of the tree of knowledge.” In ehap. i. man receives from the first as his portion the whole great earth as he now ocenpies it, and his task is a purely natural one ; “be fruitful and multiply, and fill the earth and subdue it.” But in ehap. ii. the first man is placed in a mysterious garden of God, with a very limited sphere, where all is supernatural and marvellous. To speak generally, the ideas of God and man in ehap. i. are rational and enlightened, but bare and prosaic ; in chaps. 1i.~~iiil. they are childlike and primitive, but full of meaning. The point of the contrast is mainly this: in Gen. ii., iti., man is in faet forbidden to lift the veil of things and know the world, represented by the tree of knowledge ; in Gen. i. this is his primary task, to rule over all the earth, for sovereignty and knowledge come to the same thing. There nature is to man altogether a marvel; here it is a mere thing, an object for him. There it is robbery for man to seek to be as God ; here God from the first created man in His own image, after His likeness, and appointed him His vicegerent on earth. With these incongruities in the substance and spirit of the two sections we must take also the differences of~~

~~form and language observable alike in the whole manner of the narrative—which in Gen. i, is con~~ fined by a preeise and formal seleme, while in Gen ii., iii., it has a free poetic movement—and in individual expressions. Thus Gen. i. has Elohim, Gen. ii., iii., Jehovah ;1 Gen. i. has the technical word N13, “create,” while the other narrative uses the ordinary words MWY, “make,” 7¥”, “form;” and so forth.

The contrast between the two records appears in a somewhat different way when we go on to compare Gen. v. with Gen. iv. 17 sq. The elements of the genealogy of ten members in the Priestly Code

and that of seven members in the Jehovist correspond, save that the former adds Noah after Lamceh, and that at the beginning Adam-Cain is doubled and beeomes Adam -Scth – Enosh-Cainan. Adam and Enosh both mean “man,” so that the latter series is equi- valent to Adam-Seth-Adam-Cainan ; in other words Enosh-Cainan is the beginning of a series corresponding to that in chap. iv., and Adam-Seth is a parallel and variation. Linguistically chap. v. is

distinguished from chap. iv. by the use of yn in plaee of abt,

In Gen. i.-v. we find the two narratives lying side by side in eontinuous pieces and without intermixturc; in Gen. vi.-ix., on the other hand, we have a kind of mosaic, in whieh elements taken from each are interwoven to forma single narrative. The narrative of the Priestly Code is preserved entire in vi. 9-22, vii. 11, 13-16 (except the last clause of ver. 16), 19-22, 24, viii. 1-5 (with one sinall exception), 18, 14, ix. 1-17. The Jehovistic narrative, on the other hand, is curtailed to prevent repetition ; it would not have done to relate twice over the building of the ark and the divine command to do so, or to give the ordinance of the rainbow once after viii, 22, and then again in ix. 9 sg. The hand that fused the two sources together into one continuous account is very plainly recognized in vii. 8, 9, as compared on the one side with vi. 19, 20, and on the other with vii. 2.

The justice of Hupfeld’s observation, that besides the first Elohist (our Priestly Code) there is a seeond author who uses thie’ same name of God,

can be best proved from Gen. xx.-xxii., where this second Elohist appears for the first time. According to the Priestly Code Ishmael was fourteen years old at the birth of Isaae, and thus would be seventeen when some three years later isaac was weaned, But how does this aceord with xxi. 9 sgy., where Ishmael appears not as a lad of seventeen but asa child at play (PNY, ver, 9), who is laid on his mother's shoulder (ver. 14), and when thrown down by her in her despair (ver. 15) is quite unable to help himself? Similar inconsistencies appear if we attempt to place chap. xx. in the context of the Priestly Code ; it was already observed by Peyrerius that it is ''non vero simile, regem Gerare voluisse Saram vetulam cui desierant fieri muliebria." We come, then, to ask what is the relation betwcen this second Elohistic writing, from which the greater part of Gen. xx.-xxii. is derived, and the Jehovistic history. In their matter, their points of view, and also in language— apart from the names of God—the two are on the whole similar, as may be seen by comparing ehap. xx. with ehap. xxvi., or chap. xxi. with chap. xvi. Moreover, the Elohistic history is preserved to us in a Jehovistic setting, as ean be plainly diseerned, partly by certain slight changes (xxi. 33, xxii. 11-14), partly by larger additions (xx. 18, xxi. 1, 320, xxii. 15-18). But we cannot suppose that it was the principal narrator of the Jehovistie history—the author of the main mass of ehaps. xii., xiii., xvi., xviii., xix., xxiv., xxvi.—who ineor- porated ehaps. xx.~~xxii.in his own book. For how can we imagine anything so absurd as that, before or after, he should have chosen to tell again in his own words and with full detail and important variations almost all the stories which he borrowed from another work? Rather must we eonelude that the union of the Klohistie work (E) with the main Jehovistic narrative (J) was aeeomplished byathird hand. This third author is most conveniently designated as the Jchovist, and his work is eompendiously eited as JE; the authors of its two component parts are frequently called for dis~~ tinction the Jahvist and the Elohist. The editorial hand of the Jehovist can be traced uot only in E but in his main souree J (the source which uses the name Iahwe) ; eonrpare, for example, Gen. xvi. 8-10 with Gen. xxv. 15, 18. ~ ian

Still more complicated than the work of the Jehovist 1s the Priestly Code, at least in its main section, the ritual legislation of the middle books. It is conceded on all hands that the collection of Jaws in Lev. xvii.-xxvi. was originally a small independent eode, though it has now been worked into

the Priestly Code by the aid of very considerable editorial treatment. It is equally undeniable, though not as universally admitted, that—to take one example— Exod, xxx. and xxxi. cannot be placed in the same line with Exod. XXV.-xxix., but form a supplement to the last-named section. No reason ean be assigned why the author of Exod. xxv.-xxix., if he intended to mention the golden altar of incense at all, should have failed to include it in the passage where he describes all the other furniture within the tabernacle, —the ark, mercy-seat, golden table, and candlestick ; that the altar of incense is first mentioned in Exod. xxx. 1-10 is only to be understood on the assumption that chaps. xxx. and xxxi, were added by a later author.

Such are the main lines of the view now most prevalent as to the composition of the Hexateueh. We eome next to consider the date and mutual relations of the several sourees. As regards Deuteronomy and the Jehovist there

is tolerably complete agreement among eritics. Some, indeed, attempt to date Deuteronomy before the time of Date of Josiah, in the age of Hezekiah (2 Kings xviii. 4, 22), Deutero- or even still earlier; but on the whole the date originally ——

1 The addition of Elohim, which produces the un-Hebrew form Jehovah Elohim, in Gen. ii., iii., is due to an editor who desired to soften the abrupt transition from the Elohim of the one narrator to the Jehovah of the other.

assigned by De Wette has held its ground. That the author of Deuteronomy had the Jehovistic work before him is also admitted ; and it is pretty well agreed that the latter is referred, alike by the character of its language and the circle of its ideas and by express refercnces (Gen. xii. 6, xxxvi. 31, xxxiv. 10; Num. xxii. sg.; Deut. xxxiv. 10), to the golden age of Hebrew literature, the same which has given us the finest parts of the books of Judges, Samuel, and Kings, and the oldest extant prophetical writings,—the age of the kings and prophets, before the dissolution of the sister states of Israel and Judah.

On the other hand, the datc of the Priestly Code is disputed. Till pretty recently it was commonly regarded as the oldest part of the Hexateuch. The fact that it is mainly legal seemed to give it the priority over the history of the Jehovist; for Moses was a lawgiver, not a narrator. Again, the priestly legislation has reference to worship, and regulates all points of ritual with great exactness; and by the rule that the earliest forms of religion lay most weight on ceremonies of worship and all matters of form, this fact seemed to mark the Priestly Code as older than Deuteronomy, where affairs of ritual wor- ship are less prominent than precepts of ethical conduct. Once more, the demands made by Deuteronomy for the maintenance of the priesthood and ritual service are much less heavy than the corresponding demands of the Priestly Code ; and here again it was natural enough to argue that practical difficulties had led to the abolition or modifica- tion of the heavier burdens. And these conclusions were confirmed by the prevalent impression that the final redaction of the Pentateuch, and still more of the book of Joshua, was Deuteronomic, and that the same Deuteronomic redaction could be traced also in the other historical books. But even more weight than was laid on these really plausible arguments was held to attach to another point which seemed not merely to prove the priority of the Priestly Code but to indicate that it was at least partly of Mosaic origin. Alike in the Jehovistic Book of the Covenant and in Deuteronomy the legislation is expressly constructed on the supposition of a nation no longer nomadic but settled in the land of Canaan. The Priestly Code, on the contrary, is throughout directcd to Israel as it lived encamped during the wilderness wanderings, and never makes anticipatory reference to later conditions. So also in Genesis the Priestly Code strictly observes the difference between the patriarchal age and later times, and is careful not ‘to transfer Mosaic institutions to the times of the Hebrew forefathers. This air of antiquity, combined with a corresponding severe simplicity in the style and form, and a cast of language which differs profoundly from classical Hebrew, and was conjectured to be of an older mould, was the principal feature relied on as evidence that the Priestly Code deserved the title of the Grundschrift, the original and fundamental part of the Hexateuch.

But, in point of fact, it was none of these arguments which really gave rise to the doctrine of the priority of the Priestly Code; that doctrine had its veritable source in the supplementary hypothesis described above. After the

supplementary hypothesis was given up, the infer- ences originally drawn from it continued to hold their ground ; though it was made out that the Jehovist did not presuppose the existence of the Priestly Code, critics still assumed without question that the latter was the older work of the two. Critical analysis made steady pro- gress, but the work of synthesis did not hold even pace with it; this part of the problem was treated rather slightly, and merely by the way. Indeed, the true scope of the problem was not realized ; it was not seen that most im- portant historical questions were involved as well as ques- tions merely literary, and that to assign the true order of

the different strata of the Pentateuch was equivalent to a reconstruction of the history of Israel. As regards the narrative matter it was forgotten that, after the Jehovistic, Deuteronomic, and priestly versions of the history had been felicitously disentangled from one another, it was necessary to examine the mutual relations of the three, to consider them as marking so many stages of an historical tradition, which had passed through its successive phases under the action of living causes, and the growth of which could and must be traced and historically explained. Still greater faults of omission characterized the critical treatment of the legal parts of the Pentateuch. Blecek, the oracle in all such matters of the German school of “ Vermittelungstheologen” (the theologians who tried to mediate between orthodoxy and criticism alike in doctrine and in history), never looked beyond the historical frame- work of the priestly laws, altogether shutting his eyes to their substance. He never thought of instituting an exact comparison between them and the Deuteronomic law, still less of examining their relation to the historical and pro- phetical books, with which, in truth, as appears from his Introduction, he had only a superficial acquaintance. Ewald, on the other hand, whose views as to the Priestly Code were cognate to those of Bleek, undoubtedly had an intimate acquaintance with Hebrew antiquity, and under- stood the prophets as no one else did. But he too neglected the task of a careful comparison between the different strata of the Pentateuchal legislation and the equally neces- sary task of determining how the several laws agreed with or differed from such definite data for the history of religion as could be collected from the

historical and prophetical books. He had therefore no fixed measure to apply to the criticism of the laws, though his conception of the history suffered little, and his conception of prophecy still less, from the fact that in shaping them he Icft the law practically out of sight, or only called it in from time to time in an irregular and rather unnatural way. Meanwhile, two Hegelian writers, starting from the original position of De Wette, and moving on lines apart from the beaten track of criticism, had actually effected the solution of the most important problem in the whole sphere of Old Testament study. Vatke and George have the honour of being the first by whom the question of the historical sequence of the several stages of the law was attacked on a sound method, with full mastery over the available evidence, and with a clear insight into the far- reaching scope of the problem. But their works made no permanent impression, and were neglected even by Reuss, although this scholar had fallen at the same time upon quite similar ideas, which he did not venture to publish.!

1 The following propositions were formulated by Reuss in 1833 (or, as he elsewhere gives the date, in 1834), though they were not published till 1879. 1. L'élément historique du Pentateuque peut et doit ctre examiné 4 part et ne pas étre confondu avec I'dlément légal. 2. L'un et lautre ont pu exister sans rédaction écrite. La mention, chez d'anciens écrivains, de certaines traditions patriarcales ou mosaiques, ne prouve pas l'existence du Pentateuque, et une nation peut avoir un droit coutumier sans code écrit. Les traditions nationales des Israélites remontent plus haut que les lois du Pentateuque et la rédac- tion des premiéres est antcrieure A celle des secondes. 4. L'intérét principal de Vhistorien doit porter sur la date des lois, parce que sur ce terrain il a plus de chance d'arriver 4 des résultats certains. Il faut en conséquence proccder 4 l'interrogatoire des témoins. 5. L'his- toire racontée dans les livres des Juges et de Samuel, et méme en partie celle comprise dans les livres des Rois, est en contradiction avec des lois dites mosaiques; done celles-ci étaient inconnues a l'époque de la rédaction de ces livres, 4 plus forte raison elles n'ont pas existe dans les temps qui y sont décrits. 6. Les prophétes du 8° et du 7° siécle ne savent rien du code mosaique. 7. Jérémie est le premier prophcte qui connaisse une loi écrite et ses citations rapportent au Deutéronome. 8. Le Deutéronome (iv. 45-xxviii. 68) est le livre que les prétres prétendaient avoir trouvé dans le temple, du

temps du roi Josias, Ce code est la partie la plus ancienne de la législation (rédigée) comprise dans le Pentateuque. 9. L'histoire des Israélites,

Reuss.

The new ideas lay dormant for thirty years, when they were revived through a pupil of Reuss, K. H. Graf. He too was deemed at first to offer an casy victory to the weapons of "critical analysis," which found many vulner- able points in the original statement of his views. For, while Graf placed the legislation of the middle books very late, holding it to have been framed after the great captivity, heat first still held fast to the doctrine of the great antiquity of the so-called Elohist of Genesis (in the sense which that term bore before Hupfeld's discovery), thus violently rend- ing the Priestly Code in twain, and separating its members by an interval of halfa millennium. This he was compelled to do, because, for Genesis at least, he still adhered to the supplementary hypothesis, according to which the Jehovist worked on the basis laid by the (priestly) Elohist. Here, however, he was tying himself by bonds which had been already loosed by Hupfeld ; and, as literary criticism actu- ally stood, it could show no reason for holding that the Jehovist was necessarily later than the Elohist. In the end, therefore, literary criticism offered itself as Graf's auxiliary. Following a hint of Kuenen's, he embraced the proffered alliance, gave up the violent attempt to divide the Priestly Code, and proceeded without further obstacle to extend to the historical part of that code as found in Genesis those conclusions which he had already established for its main or legislative part. Graf himself did not live to see the victory of his cause. His Goel, to speak with the ancient Hebrews, was Professor A. Kuenen of Leyden, who has had the chief share in the task of developing and enforcing the hypothesis of Graf.

The characteristic feature in the hypothesis of Graf is that the Priestly Code is placed later than Deuteronomy, so that the order is no longer Priestly Code, Jehovist, Deuteronomy, but Jehovist, Deuteronomy, Priestly Code. The method of inquiry has been already indicated ; the three strata of the Pentateuch are compared with one another, and at the same time the investigator seeks to place them in their proper relation to the successive phases of Hebrew history as thése are known to us from other and

undisputed evidence. The process may be shortened if it be taken as agreed that the date of Deuteronomy is known from 2 Kings xxii.; for this gives us at starting a fixed point, to which the less certain points can be referred. The method can be applied alike to the historical and legal parts of the three strata of the Hexateuch. For the Jehovist has legislative matter in Exod. xx.~~xxlil., Xxxiv., and Deuteronomy and the Priestly Code embrace historical matters ; moreover, we always find that the legal stand~~ point of each author influences his presentation of the history, and vice versa. The most important point, how- ever, is the comparison of the laws, especially of the laws about worship, with corresponding statements in the his- torical and prophetical books.

The turning-point in the history of worship in Israel is the centralization of the cultus in Jerusalem by Josiah (2 Kings xxii., xxiii). Till then there were in Judah, as there had been before in Samaria, a multitude of local

en tant qu'il s'agit du développement national déterminé par des lois écrites, se divisera en deux périodes, avant et apres Josias. 10. Ezéchiel est antérieur 4 la rédaetion du eode rituel et des lois qui ont définitivement organisé la hi¢rarehie. 11. Le livre de Josué n'est pas, tant s'en faut, la partie la plus récente de l'ouvrage entier. 12. Le rédaeteur du Pentateuque se distingue clairement de l'ancien prophete Moyse. (L'histoire sainte et la loi, Paris, 1879, pp. 23, 24,)

1K. H. Graf, Die geschichtlichen Bicher des A.T., Leipsic, 1866 ; essays by Graf, in Merx's Archiv, i. 225 sq., 466 sqg.; A. Kuenen, "De priesterlijke Bestanddeelen van Pentateuch en J ozua," in Theol. Tijdschrift, 1870, p. 891 sq., and De Godsdienst van Tsrael, 2 vols., Haarlem, 1869-70. See also J. Wellhausen, Prolegomena zur Geschichte Israels, 2d ed., Berlin, 1883 (Eng. tr., Edinburgh, A. & C. Black, 1885); the first edition appeared in 1878 as Geschichte Israels, vol. i.

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sanctuaries, the legitimacy of which no one dreamt of dis- puting. If Hezekiah made an attempt to abolish these local shrines, as we are told in 2

Kings xviii. 4, 22, it is yet plain that this attempt was not very serious, as it had been quite forgotten less than a hundred yearslater. Josiah's reforms were the first that went deep enough to leave a mark on history. Not, indeed, that the high places fell at one blow; they rose again after the king's death, and the attachment to them finally disappeared only when the Babylonian exile tore the nation from its ancestral soil and forcibly interrupted its traditional customs. The returning exiles were thoroughly imbued with the ideas of Josiah's reform, and had no thought of worshipping except in Jerusalem ; it cost them no sacrifice of their feelings to leave the ruined high places unbuilt. From this date all Jews understood as a matter of course that the one God had only one sanctuary. Thus we have three distinct historical periods,—(1) the period before Josiah, (2) the transition period introduced by Josiah's reforms, and (3) the period after the exile. Can we trace a correspondence between these three historical phases and the laws as to worship ?

1. The principal law-book embodied by the Jehovist, the First so-called Book of the Covenant, takes it for granted in Exod. period.

xx, 24-26 that altars are many, not one. Here there is no idea of attaching value to the retention of a single place for the altar; earth and rough stones are to be found everywhere, and an altar of these materials falls into ruins as easily as it is built. Again, a choice of materials is given, presumably for the construction of different altars, and Jehovah proposes to come to His worshippers and bless them, not in the place where he causes His name to be cele- brated, but at every such place. The Jehovistic law there- fore agrees with the customary usage of the earlier period of Hebrew history ; and so too does the Jehovistic story, according to which the patriarchs wherever they reside erect altars, set up cippi (magceboth), plant trees, and dig wells. The places of which these acts of the patriarchs are related are not fortuitous, they are the same places as were afterwards famous shrines. This is why the narrator speaks of them ; his interest in the sites is not antiquarian, but corresponds to the practical importance they held in the worship of his own day. The altar which Abraham built at Shechem is the same on which sacrifices still con- tinued to be offered ; Jacob's anointed stone at Bethel was still anointed, and tithes were still offered at it in fulfil- ment of vows, in the writer's own generation. The things which a later

generation deemed offensive and heathenish —high places, mageeboth, sacred trees, and wells—all appear here as consecrated by patriarchal precedent, and the narra- tive can only be understood as a picture of what daily took place in the first century or thereabout after the division of the kingdoms, thrown back into the past and clothed with ancient authority.

2. The Deuteronomic legislation begins (Deut. xii.), Second just like the Book of the Covenant, with a law for the period.

place of worship. But now there is a complete change ; Jehovah is to be worshipped only in Jerusalem and no- where else. The new law-book is never weary of repeating this command and developing its consequences in every direction. All this is directed against current usage, against “what we are accustomed to do at this day”; the law is polemical and aims at reformation. This law therefore belongs to the second period of the history, the time when the party of reform in Jerusalem was attack- ing the high places. When we read, then, that King Josiah was moved to destroy the local sanctuaries by the discovery of a law-book, this book, assuming it to be preserved in the Pentateuch, can be none other than the legislative part of Deuteronomy, which must once have had a separate exist-

ence in a shorter form than the present book of Deutero- nomy ; this, too, is the inference to which we are led by the citations and references in Kings and Jeremiah.

his sons as the sons of Aaron stand above the Levites, He has not only the highest place, but a place quite unique, Position like that of the Roman pontiff; his sons minister under of high

Third 3. In the Priestly Code all worship depends on the | his superintendence (Num. iii. 4); he himself is the only Priest period. tabernacle, and would fall to nothing apart from it. The | priest with full rights; as such he wears the Urim and tabernacle is simply a means of putting the law of unity | Thummim, and the golden ephod; and none but he

can of worship in an historical form; it is the only legitimate | enter the holy of holies and offer incense there. Before sanctuary ; there is no other spot where God dwells and | the exile there were, of course, differences of rank among shows Himself, no other where man can approach God and | the priests, but the chief priest was only primus inter seek His face with sacrifice and gifts. But, while Deutero- | pares; even Ezekiel knows no high priest in the sense of nomy demands, the Priestly Code presupposes, the limitation | the Priestly Code. The Urim and Thummim were the of worship to one sanctuary. This principle is tacitly | insignia of the Levites in general (Deut. xxxiii. 8), and assumed as the basis of everything else, but is never | the linen ephod was worn by them all, while the golden asserted in so many words; the principle, it appears, is | ephod was not a garment but a gold-plated image such as now no novelty, but can be taken for granted. Hence we | the greater sanctuaries used to possess (Judges viii. 27 ; conclude that the Priestly Code builds on the realization of | Isa. xxx. 22). Moreover, up to the exile the temple at the object aimed at in Deuteronomy, and therefore belongs | Jerusalem was the king’s chapel, and the priests were his to the time after the exile, when this object had been fully | servants ; even Ezekiel, who in most points aims at secur- secured, An institution which in its origin must necessarily | ing the independence of the priests, gives the prince a ~ have had a negative significance as an instrument in the | weighty part in matters of worship, for it is he who hands of polemical reformers is here taken to have been | receives the dues of the people, and in return defrays the from the first the only intelligible and legitimate form | sacrificial service. In the Priestly Code, on the other hand, of worship. It is so taken because established customs | the dues are paid direct to the sanctuary, the ritual service always appear to be natural and to need no reason for their | has full autonomy, and it has its own head, who holds his existence. place by divine right. Nay, the high priest represents Priest- The abolition of the local shrines in favour of Jerusalem | more than the church’s independence of the state; he hood.

necessarily involved the deposition of the provincial priest- hood in favour of the sons of Zadok in the temple of Solomon. The law of Deuteronomy tries to avoid this consequence by conceding the privilege of offering sacrifices at Jerusalem to the Levites from other places; Levites in Deuteronomy is the general name for priests whose right to officiate is

hereditary. But this privilege was never realized, no doubt because the sons of Zadok opposed it. The latter, therefore, were now the only real priests, and the priests of the high places lost their office with the destruc- tion of their altars ; for the loss of their sacrificial dues they received a sort of eleemosynary compensation from their aristocratic brethren (2 Kings xxiii. 9). The displacing of the provincial priests, though practically almost inevitable, went against the law of Deuteronomy ; but an argument to justify it was supplied by Ezekiel (Ezek. xliv.). The other Levites, he says, forfeited their priesthood by abusing it in the service of the high places ; and for this they shall be degraded to be mere servants of the Levites of Jerusalem, who have not been guilty of the offence of doing sacrifice in provincial shrines, and thus alone deserve to remain priests. If we start from Deuteronomy, where all Levites have equal priestly rights, this argument and ordinance are plain enough, but it is utterly impossible to understand them if the Priestly Code is taken as already existing. Ezekiel views the priesthood as originally the right of all Levites, while by the Priestly Code a Levite who claims this right is guilty of baseless and wicked presumption, such as once cost the lives of all the company of Korah. And the position of the Levites which Ezekiel qualifies as a punishment and a degradation appears to the Code as the natural position, which their ancestors from father to son had held from the first. The distinction between priest and Levite, which Ezekiel introduces expressly as an innovation, and which elsewhere in the Old Testament is known only to the author of Chronicles, is, according to the Code, a Mosaic institution fixed and settled from the beginning. Ezekiel’s ideas and aims are entirely in the same direction as the Priestly Code, and yet he plainly does not know the Code itself. This can only mean that in his day it did not exist, and that his ordinances formed one of the steps that prepared the way for it.

The Priestly Code gives us an hierocracy fully developed,

exercises sovereignty over Israel. Though sceptre and sword are lacking to him, his spiritual dignity as high priest makes him the head of the theocracy. He alone is the responsible representative of the commonwealth ; the names of the twelve tribes are written on his shoulders and his breast. Offence of his inculpates the whole people and demands the same expiation as a national sin, while the sin-offerings prescribed for the princes mark them

out as mere private persons compared with him. His death makes an epoch ; the fugitive manslayer is amnestied, not on the death of the king, but on the death of the high priest. On his investiture he receives a kingly unction (whence his name, “the anointed priest”); he wears the diadem and tiara of a monarch, and is clad in royal purple, the most unpriestly dress possible. When now we find that the head of the national worship is as such, and merely as such—for no political powers accompany the high priesthood—also the head of the nation, this can only mean that the nation is one which has been deprived of its civil autonomy, that it no longer enjoys political existence, but survives merely as a church. In truth the Priestly Code never contemplates Israel as a nation, but only as a religious community, the whole life of which is summed up in the service of the sanctuary. The community is that of the second temple, the Jewish hierocracy under that foreign dominion which alone made such an hierocracy possible. The pattern of the so-called Mosaic theocracy, which does not suit the conditions of any earlier age, and of which Hebrew prophecy knows nothing, even in its ideal descriptions of the commonwealth of Israel as it ought to be, fits post-exilic Judaism to a nicety, and was never an actual thing till then. After the exile the Jews were deprived by their foreign rulers of all the functions of public political life; they were thus able, and thus indeed compelled, to devote their whole energies to sacred things, in which full freedom was left them. So the temple became the one centre of national life, and the prince of the temple head of the spiritual common- wealth, while, at the same time, the administration of the few political affairs which were still left to the Jews them- selves fell into his hands as a matter of course, because

| the nation had no other chief.

The material basis of the hierarchy was supplied by the Sacred

such as existed after the exile. Aaron stands above | sacred dues. In the Priestly Code the priests receive all @u®

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sin-offerings and guilt-offerings, the greater part of the cereal accompaniments of sacrifices, the skin of the burnt-offering, the breast and

shoulder of thank-offerings. Further, they receive the male firstlings and the tithe of cattle, as also the firstfruits and tithes of the fruits of the land. Yet with all this they are not even obliged to support at their own cost the stated services and offerings of the temple, which are provided for by a poll-tax. The poll-tax is not ordained in the main body of the Code, but such a tax, of the amount of one-third of a shekel, began to be paid in the time of Nehemiah (Neli. x. 32), and in a novel of the law (Exod. xxx. 15) it is demanded at the higher rate of half a shekel per head. That these exorbitant taxes were paid to or claimed by the priests in the wilderness, or during the anarchy of the period of the judges, is inconceivable. Nor in the period of the kingship is it conceivable that the priests laid claim to contributions much in excess of what the king himself received from his subjects ; certainly no such claim would have been supported by the royal author- ity. In 1 Sam. viii. 15 the tithes appear as paid to the king, and are viewed as an oppressive exaction, yet they form but a single element in the multiplicity of dues which the priests claim under the Priestly Code. But, above all, the fundamental principles of the system of priestly dues in the Code are absolutely irreconcilable with the fact that as long as Solomon's temple stood the king had the power to dispose of its revenues as he pleased. The sacred taxes are the financial expression of the hierocratic system ; they accord with the condition of the Jews after the exile, and under the second temple they were actually paid accord- ing to the Code, or with only minor departures from its provisions.

Before the exile the sacred gifts were not paid to the priests at all but to Jehovah ; they had no resemblance to taxes, and their religious meaning, which in the later system is hardly recognizable, was quite plainly marked. They were in fact identical with the great public festal offerings which the offerers consumed in solemn sacrificial meals before Jehovah, that is, at the sanctuary. The change of these offerings into a kind of tax was connected with an entire transformation of the old character of Israel's worship, which resulted from its centralization at Jerusalem. In the old days the public worship of the nation consisted essentially in the celebration of the yearly

tcrious feasts ; that this was so can be plainly seen from the pro-

phets,—from Amos, but especially from Hosea. And accord- ingly the laws of worship are confined to this one point in the Jehovist, and even in Deuteronomy. After the exile the festal observances became much less important than the taémid, the regular daily and weekly offerings and services ; and so we find it in the Priestly Code. But, apart from this, the feasts underwent a qualitative change, a sort of de- generation, which claims our special attention. Originally they were thanksgiving feasts in acknowledgment of Jehovah's goodness in the seasons of the year. The ex- pression of thanks lay in the presentation of the firstlings and firstfruits, and these constituted the festal offerings. The chief feast, at the close of the old Hebrew year, was the autumn feast of ingathering (Feast of Tabernacles),— a thanksgiving for the whole produce of the winepress and the corn-flour, but especially for the vintage and the olive harvest. Then, at the beginning of the summer half-year, came the feast of unleavened bread (Maccdth, Easter), which in turn was followed by the harvest feast (Pente- cost). Between the two last there was a definite interval of seven weeks ; hence the name " Feast of Weeks" (Exod. xxxiv.). In Deut. xvi. 9 the seven weeks are explained as "seven weeks from such time as thou beginnest to put the sickle to the corn." The Easter feast, therefore, is the commencement of the corn harvest, and this throws light

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on its fixed relation to Pentecost. The one is the end of the harvest, the other its commencement in Abib (the month of '"corn-ears") ; between them lie the " determined weeks of harvest" (Jer. v. 24). The whole of this tempus clausum is one great time of gladness (Isa. ix. 3), bounded by the two feasts. According to Lev. xxiii. 9-22 the dis- tinguishing ceremony at Easter is the presentation of a sheaf of barley, before which no one is allowed to taste the new corn ; the corresponding rule at Pentecost is the pre- sentation of leavened wheaten bread. The barley of course is the first and the wheat the last grain ripe; at the be- ginning of harvest the firstfruits are presented in the sheaf, and men also partake of the new growth in the shape of parched ears of corn (Lev. xxiii. 14; Josh. v. 11); at the end of harvest the firstfruits take the form of ordinary bread. We now see the meaning of the "unleavened bread." Unleavened cakes are quickly prepared, and were used when bread had to be furnished suddenly (1 Sam. xxvili. 24); here it is the

new meal of the year which is hastily baked into a sort of bannock without waiting for the tedious process of leavening. The unleavened bread contrasts with the Pentecostal cake in the same way as the barley sheaf and the parched ears do, and so, as we see from Josh. v. 11, parched corn may be eaten instead of unleavened bread,—a point worthy of notice.

Thus the three feasts are all originally thanksgivings The for the fruits of the ground, and in all of them the offering Passover.

of firstfruits is the characteristic feature. Quite similarly the Passover, which was celebrated at the same season as the Easter feast of unleavened bread, is also a thanks- giving feast; but here the offerings are not taken from the fruits of the ground but from the male firstlings of the cattle (sheep and oxen). The Jehovistic tradition in Exodus still exhibits this original character of the Pass- over with perfect clearness. Jehovah demands that His people shall go forth and celebrate His feast in the wilder- ness with sacrifices of sheep and oxen ; and, because Pharaoh refuses to allow the Hebrews to serve their God by offer- ing the firstlings of cattle that are His due, He takes from the king the firstborn of his subjects. The feast, therefore, is older than the exodus, and the former is the occasion of the latter, not vice versa. In the Priestly Code the true significance of the feasts appears only dimly in particular details of ritual; their general character is entirely changed. They no longer rest on the seasons and the fruits of the season, and indeed have no basis in the nature of things. They are simply statutory ordinances resting on a positive divine command, which at most was issued in commemoration of some historical event. Their relation to the firstfruits and firstlings is quite gone; indeed these offerings have no longer any place in acts of worship, being transformed into a mere tax, which is holy only in name. This degeneration of the old feasts is carried furthest in the case of the Passover. An historical reason is assigned to the Passover as early as Deuteronomy and the Deuteronomic redaction of the Jehovist, but in these writings the real character of the feast remains so far unchanged that it is still celebrated by the sacrifice of the firstlings of oxen and of sheep. But in the Priestly Code the paschal sacrifice has quite lost its old character, and consists of a yearling sheep or goat, while the firstlings have no more connexion with the Passover, but are a mere due to the priests without any properly religious character. The other feasts have also lost

their individuality by being divorced from the firstfruits and celebrated instead by stated sacrifices, which are merely the témid on a larger scale, and have uo individuality of meaning. All this is a consequence of the centralizing process which took the observances of worship away from their natural soil, spiritualized them, and gave them a stereotyped reference to

Jehovah's relation with Israel as a whole, and to the sacred history. This centralization, indeed, was not the work of the Priestly Code but of the prophets; but in the Code we find all its consequences fully developed, while even in Deuteronomy the process is still quite in an early stage. Jewish practice after the exile is guided by the Priestly Code, not in every detail, but quite unquestionably in its main features. In the time of Christ no one thought of any other kind of Passover than that prescribed in the Code; the paschal lamb had obliterated all recollection of the sacrifice of the firstlings.

The conclusions which we have reached by comparing the successive strata of the laws are confirmed by a com- parison of the several stages of the historical tradition embodied inthe Pentateuch. The several threads of nar- rative which run side by side in the Pentateuch are so distinct in point of form that critics were long disposed to assume that in point of substance also they are independ- ent narratives, without mutual relation. This, however, is highly improbable on general considerations, and is seen to be quite impossible when regard is paid to the close correspondence of the several sources in regard to the arrangement of the historical matter they contain. It is because the arrangement is so similar in all the narratives that it was possible to weave them together into one book; and besides this we find a close agreement in many notable points of detail. Here too analysis does not exhaust the task of the critic; a subsequent synthesis is required. When he has separated out the individual documents the critic has still to examine their mutual relations, to com- prehend them as phases in a living process, and in this way to trace the gradual development of the Hebrew historical tradition. In the present article, however, we cannot say anything of the way in which the Deuteronomist views the Hebrew history, nor shall

we attempt to char- acterize the differences between the two sources of the Jehovist, but limit ourselves to a general comparison be- tween the Jehovistic narrative and that of the Priestly Code. :

Bleek and his school viewed it as a great merit of the latter narrative that it strictly observes the difference between various ages, mixes nothing Mosaic with the patriarchal period, and in the Mosaic history never forgets

Codecon- that the scene lies in the wilderness of wandering. They

trasted.

also took it as a mark of fidelity to authentic sources that the Code contains so many dry lists, such a mass of un- important numbers and names, such exact technical descriptions of details which could have no interest for posterity. Against this view Colenso, in the first part of his Pentateuch and Book of Joshua critically examined (Lond., 1862), proved that just those parts of the Hexa- teuch which contain the most precise details, and so have the air of authentic documents, are least consistent with the laws of possibility. Colenso, when he wrote, had no thought of the several sources of the Hexateuch, but this only makes it the more remarkable that his criticisms mainly affect the Priestly Code. Néldeke followed Colenso with clearer insight, and determined the character and value of the priestly narrative by tracing all through it an artificial construction and a fictitious character. In fact the supposed marks of historical accuracy and depend- ence on authentic records are quite out of place in such a narrative as that of the Pentateuch, the substance of which is not historical but legendary. This legendary character is always manifest both in the form and in the substance of the narrative of the Jehovist ; his stories of the patriarchs and of Moses are just such as might have been gathered from popular tradition. With him the general plan of the history is still quite loose; the individual stories are the important thing, and they have a truly living

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individuality. They have always a local connexion, and we can still often see what motives lie at the root of them ; but even when we do not understand these legends they lose none of their charm; for they breathe a

sweet poetic fragrance, and in them heaven and earth are magically blended into one. The Priestly Code, on the other hand, dwells as little as possible on the details of the several stories ; the pearls are stripped off in order that the thread on which they were strung may be properly seen. Love and hate and all the passions, angels, miracles, and theo- phanies, local and historical allusions, disappear ; the old narrative shrivels into a sort of genealogical scheme,—a bare scaffolding to support a pragmatic construction of the connexion and progress of the sacred history. But in legendary narrative connexion is a very secondary matter ; indeed it is only brought in when the several legends are collected and written down. When, therefore, the Priestly Code makes the connexion the chief thing, it is clear that it has lost all touch of the original sources and starting- points of the legends. It does not, therefore, draw from oral tradition but from books; its dry excerpts can have no other source than a tradition already fixed in writing. In point of fact it simply draws on the Jehovistic narrative. The order in which that narrative disposed the popular legends is here made the essential thing; the arrange- ment, which in the Jehovist was still quite subordinate to the details, is here brought into the foreground ; the old order of events is strictly adhered to, but is so em- phasized as to become the one important thing in the history. It obviously was the intention of the priestly narrator to give by this treatment the historical quint- essence of his materials, freed of all superfluous additions. At the same time, he has used all means to dress up the old naive traditions into a learned history. Sorely against its real character, he forces it into a chronological system, which he carries through without a break from Adam to Joshua. Whenever he can he patches the story with things that have the air of authoritative documents, great lists of subjects without predicates, of numbers and names which could never have been handed down orally without being put in writing, and introduces a spurious air of learned research in the most unsuitable places. Finally, he rationalizes the history after the standard of his own religious ideas and general culture ; above all, he shapes it so that it forms a framework, and at the same time a gradual preparation for the Mosaic law. With the spirit of the legend, in which the Jehovist still lives, he has nothing in common, and so he forces it into conformity with a point of view cntirely different from its own.

The greater part of the narratives of the Pentateuch cannot be measured by gn historical standard ; but within certain limits that standard can be applied to the epical age of Moses and Joshua. Thus we can apply historical criticism to the several versions of the way in which the tribes of Israel got possession of the land of Canaan. The priestly narrator represents all Canaan as redueed to a tabula rasa, and then makes the masterless and unpeopled land be divided by lot. The first lot falls to Judah, then come Manasseh and Ephraim, then Benjamin and Simeon, and lastly the five northerly tribes, Zebulon, Issachar, Asher, Naphtali, Dan. ‘«These are the inheritances which Eleazar the priest and Joshua the son of Nun and the heads of the tribes of Israel apportioned by lot at Shiloh before Jehovah at the door of the tabernacle.” According to the Jehovist (Josh. xiv. 6) Judah and Joseph seem to have had their portions assigned to them while the Israelite headquarters were still at Gilgal—but not by lot—and to have gone forth from Gilgal to take possession of them.

tives, in common with which it speaks of the Angel of Jehovah. It isin truth not a continuation of but a parallel to the book of Joshua, presupposing the conquest of the lands east of the Jordan, but not of western Canaan. ‘The latter conquest is what it relates, and in a way quite different from the book of Joshua. From Gilgal, where the Angel of Jehovah first set up his camp, the tribes go forth singly each to conquer a land for itself, Judah going first and Joseph following. It is only of the movements of these two tribes that we have a regular narrative, and for Joseph this is limited to the first beginnings of his conquests. There is no men- tion of Joshua; a commander-in-chief of all Israel would indeed be out of place in this record of the conquest, but Joshua might have appeared in it as commander of his own tribe. The incom- pleteness of the conquest is frankly admitted ; the Canaanites con- tinued to hold undisturbed the cities of the plain, and it was only in the time of the kingship, when Israel was waxen strong, that they became subject and tributary. From all that we know of the subsequent history there can be no doubt that this account of the conqnest is vastly nearer to the facts than that which prevails in

the advocates of that hypothesis is that in earlier times the ritual was not the substructure of an hierocracy, that there was in fact no hierocracy before the exile, but that Jehovah's sovereignty was an ideal thing and not visibly embodied in an organization of the commonwealth under the forms of a specifically spiritual power. The theocracy was the state; the old Israelites regarded their civil con- stitution as a divine miracle. The later Jews assumed the existence of the state as a natural thing that required no explanation, and built the theocracy over it as a special divine institution.

There are, however, some more serious objections taken to the Grafian hypothesis. It is, indeed, simply a mis- statement of facts to say that the language of the Priestly Code forbids us to date it so late as post-exilic times.

On the other hand, a real difficulty lies in the fact that, Difi- while the priestly redaction extends to Deuteronomy (Deut, culties of i. 3), it is also true that the Deuteronomic redaction CT"

extends to the Priestly Code (Josh. xx.). The way out of ee

the book of Joshua, where everything is done with systematic completeness, and the whole land dispeopled and then divided by lot. This latter and less historical view is most consistently carried through in the priestly narrative, which accordingly must be the narrative most remote from the origin of the Hebrew tradition.

The same conclusion may be drawn from the fact that the priestly writer never names the tribe of Joseph, but always the two tribes of Ephraim and Manasseh, which, moreover, do not reccive nearly so much notice as Judah, although Joshua, the leader of Ephraim, is retained in the character of leader of all Israel from an old and originally Ephraitic tradition.

The middle position which the legal part of Deuteronomy holds between the Jehovist and the Priestly Code is also characteristic of the Deuteronomic narrative, which is founded throughout on the narrative of the Jehovist, but from time to time shows a certain leaning to the points of view characteristic of the priestly narrator. The order of the several parts of the Hexateuch to which we have been led by all these arguments is confirmed

by an examination of the other historical books and the books of Chronicles. The original sources of the books of Judges, Samuel, and Kings stand on the same platform with the Jehovist ; the editing they received in the exile presupposes Deuteronomy; and the latest construction of the history as contained in Chronicles rests on the Priestly Code. This is admitted and need not be proved in detail; the conclusion to be drawn is obvious.

We have now indicated the chief lines on which criticism must proceed in determining the order of the sources of the Hexateuch, and the age of the Priestly Code in parti- cular,—though, of course, it has not been possible at all to exhaust the argument. The objections that have been taken to Graf's hypothesis partly rest on misunder- standing. It is asked, for example, what is left for Moses if he was not the author of the Torah. But Moses may – have been the founder of the Torah though the Penta- teuchal legislation was codified almost a thousand years later ; for the Torah was originally not a written law but the oral decisions of the priests at the sanctuary—case-law, in short, by which they decided all manner of questions and controversies that were brought before their tribunal ; their Torah was the instruction to others that came from their lips, not at all a written document in their hands guaranteeing their own status, and instructing themselves how to proceed in the sacrificial ritual. Questions of clean and unclean belonged to the Torah, because these were matters on which the laity required to be directed ; but, speaking generally, the ritual, so far as it consisted in ceremonies performed by the priests themselves, was no part of the Torah. But, while it was only ata late date that the ritual appeared as Torah as it does in the Priestly Code, its usages and traditions are exceedingly ancient, going back, in fact, to pre-Mosaic and heathenish times. It is absurd to speak as if Graf's hypothesis meant that the whole ritual is the invention of the Priestly Code, first put into practice after the exile ; all that is affirmed by

this dilemma is to be found by recognizing that the so- called Deuteronomic redaction was not a single and final act, that the characteristic phrases of Deuteronomy became household words to subsequent generations, and were still current and found application centuries after the time of Josiah, Thus, for example, the traces of Deuteronomic redaction in Josh. xx. are

still lacking in the Septuagint ; the canonical text, we see, was retouched at a very late date indeed. Of the other objections taken to the Grafian hypothesis only one need be mentioned here, viz., that the Persians are not named in the list of nations in Gen. x. This is certainly hard to understand if the passage was written in the Persian period. But the difficulty is not insuperable; the Persians, for example, may have been held to be included in the mention of the Medians, and this also would give the list the archaic air which the priestly writer affects. At any rate, a residue of minute difficulties not yet thoroughly explained cannot outweigh the decisive arguments that support the view that the Priestly Code originated in and after the exile. Kuenen observes with justice that "'it is absolutely necessary to start with the plain and unambiguous facts, and to allow them to guide our judgment on questionable points. The study of details is not superfluous in laying down the main lines of the critical construction, but, as soon as our studies have supplied us with some really fixed points, further pro- gress must proceed from them, and we must first gain a general view of the whole field instead of always working away at details, and then coming out with a rounded theory which lacks nothing but a foundation."

Finally; it is a pure petitio principi, and nothing more, to say that the post-exilic age was not equal to the task of producing a work like the Priestly Code. The posi- tion of the Jews after the exile made it imperative on them to reorganize themselves in conformity with the entire change in their situation, and the Priestly Code corresponds to all that we should expect to find in a consti- tution for the Jews after the exile as completely as it fails to correspond with the conditions which a law-book older than the exile would have had to satisfy. After the final destruction of the kingdom by Nebuchadnezzar, they found in the ritual and personnel of the temple at Jerusalem the elements out of which a new commonwealth could be built, in conformity with the circumstances and needs of the time. The community of Judea raised itself from the dust by holding on to its ruined sanctuary. The old usages and ordinances were reshaped in detail, but as a whole they were not replaced by new creations ; the novelty lay in their being worked into a system and applied as a means to organize the "remnant" of Israel. This was the origin of the sacred constitution of Judaism. Religion

in old Israel had been a faith which gave its support to the natural ordinances of human society; it was now set forth in external and visible form as a special institution, within an artificial sphere peculiar to itself, which rose far above the level of common life. The necessary presup-
position of this kind of theocracy is service to a foreign empire, and so the theocracy is essentially the same thing as hierocracy. Its finished picture is drawn in the Priestly

Composi- Code, the product of the labours of learned priests during

tion and the exile.

When the temple was destroyed and the ritual

iperes interrupted, the old practices were written down that they

tion of

Priestly might not be lost.

Code.

Thus in the exile the ritual became matter of teaching, of Torah ; the first who took this step, a step prescribed by the circumstances of the time, was the priest and prophet Ezekiel. In the last part of his book Ezekiel began the literary record of the customary ritual of the temple; other priests followed in his footsteps (Lev. xvii.~~xxvi.) ; and so there arose during the captivity a school of men who wrote down and systematized what they had formerly practised. When the temple was restored this theocratic zeal still went on and produced further ritual developments, in action and reaction with the actual practice of the new temple; the final result of the long~~ continued process was the Priestly Code.

This Code, incorporated in the Pentateuch and forming

the normative part of its legislation, became the definitive Mosaic law. As such it was published and put in action in 444 B.c. by the Babylonian priest and scribe Ezra. Ezra had come to Jerusalem as early as 458, at the head of a considerable body of zealous Jews, with full authority from Artaxerxes Longimanus to reform the community of the second temple in accordance with the law of God in his hand. But Ezra did not introduce this law immediately on his arrival ; it took him fourteen years to effect his purpose. The external circumstances of the young community, which were exceedingly unfavourable, made it at first undesirable to introduce legislative innovations ; perhaps, also, Ezra needed time to correct the product of Babylonian learning by the light of Judean practice, and wished, moreover, to train assistants for his task. The chief reason of the delay seems, however, to have been that, in spite of the royal favour, he could not get any energetic support from the local representatives of the Persian Government, and without this he could not have given authority to his new law. But in 445 a kindred spirit, Nehemiah b. Hakkeleiah, came to Jerusalem as Persian governor of Judea. LEzra's opportunity had now arrived, and he was able to introduce the Pentateuch in agreement with the governor. The record of this step is contained in Neh, viii-x.; it is closely analogous to the narrative of the introduction of the Deuteronomic law under Josiah in 2 Kings xxii. Just as we are told there that Deuteronomy became known in 621 B.c., having been unknown previously, so we are told here that the Torah in the rest of the Pentateuch became known in 444, and was unknown till that date. This shows us, in the first place, that Deuteronomy contains an earlier stage of the law than the priestly Torah. And further, as the date of Deuteronomy can be inferred from the date of its publi- cation and introduction under Josiah, so in like manner the date of the composition of the Priestly Code can be inferred from its publication and enforcement by Ezra and Nehemiah. _ The establishment of the right date for the written law is of the highest importance for our understanding of the prophets, and for our whole conception of the history of Israel, See the articles Israzt and PRopHEr. (3. WE.)

PENTECOST, a feast of the J ews, Was in its original meaning, as has been explained in PENTATEUCH (supra, p. 511), the closing feast of the harvest gladness, at which,

according to Lev. xxiii. 17, leavened bread was presented at the sanctuary as the firstfruits of the new cereal store, Hence the names “Feast of Harvest” (Exod. xxiii. 16), “Day of Firstfruits” (Num. xxviii. 26); but the com- moner Old Testament name (Exod. xxxiv. 22; Deut. xvi, 10, 16; 2 Chron. viii. 13) is “ Feast of Weeks,” because it fell exactly seven weeks (Deut. xvi. 9), or, on the Jewish way of reckoning an interval by counting in both termini, just fifty days (Lev. xxiii. 16) after the offering of the first sheaf of the harvest at the Feast of Unleavened Bread, Pentecost or “ Fiftieth ” day is only a Greek equivalent of the last name (wevrnxoo7} in the Apocrypha and New Testament). The orthodox later Jews reckoned the fifty days from the sixteenth of Nisan, cutting the ritual sheaf on the night of (that is, on our division of days, the night preceding) that day (see Passover). In Deuteronomy Pentecost, like the other two great annual feasts, is a pil- grimage feast (Deut. xvi. 16), and so it was observed in later times; but, unlike the others, it lasts but one day, agreeably to its character (expressed in the name Mnr¥y,

‘Acap@é, given to it by Josephus and the later Jews) as merely the solemn closing day of harvest-time. Like the other great feasts, it came to be celebrated by fixed special sacrifices. The amount of these is differently expressed in the earlier and later priestly law (Lev. xxiii. 18 sq. ; Num. xxviii. 26 sq.) ; the discrepancy was met by adding the two lists. The later Jews also extended the one day of the feast to two. Further, in accordance with the tend- ency to substitute historical for economic explanations of the great feasts, Pentecost came to be regarded as the feast commemorative of the Sinaitic legislation.

To the Christian church Pentecost acquired a new sig- nificance through the outpouring of the Spirit (Acts ii.). See WHITSUNDAY.

PENZA, a government of eastern Russia, bounded on the N. by Nijni Novgorod, on the E. by Simbirsk, and on the S. and W. by Saratoff and Tamboff, and having an area of 15,000 square miles. The surface is undulating, with deep valleys and ravines, but even in its highest parts it does not reach more than 600 to 900 feet above sea- level. It is chiefly made up of Cretaceous sandstones, sands, marls, and chalk, covered in the east by

Eocene deposits. Chalk, potter's clay, peat, and iron are the chief mineral products, in the north. The soil is a black earth, more or less mixed with clay and sand; the only marshes of any extent occur in the Krasnoslobodsk district ; and considerable sand-areas appear in the broad valleys of the larger rivers. There are extensive forests in the north, but the south shows the characteristic features of a steppe- land. The government is watered by the Moksha, the Sura (both navigable), and the Khoper, belonging respectively to the Oka, Volga, and Don systems. Timber is floated down several smaller streams, while the Moksha and Sura are important means of conveyance for grain, spirits, timber, metals, and oils. The climate is harsh and continental, the average temperature at Penza being only 39°-8 (12°°2 in January and 68°°5 in July).

The population—1,356,600 in 1881, and in 1884 estimatea at about 1,465,000—consists principally of Russians, mixed to some extent with Mordvinians; there are also about 150,000 Mordvinians who are toa large extent Russified ; some 40,000 Mescheryaks, who have undergone the same process still more fully; and 60,000 Tatars, who still keep their own religion, language, and customs. The Russians profess the Greek faith, and very many, especially in the north, are Raskolniks. Somewhat less than 10 per cent. of the population (133,250 in 1881) live in towns ; the chief occupation of the inhabitants is agriculture, 61 per cent. of the soil being arable. Wheat and millet are raised only to a limited extent, the chief crops being rye, oats, buckwheat, hemp, potatoes, and beetroot. The averages for 1870-77 were 3,900,000 quarters of corn and 1,779,200 bushels of potatoes. The chief centres of corn export are Penza, Narovtchat, and Golovinshtchina. Market-gardening is successfully

carried on in several districts, and improved varieties of fruit-trees are being introduced through the imperial botanical garden at Penza and a private school of gardening in the Gorodishtche district. Fourteen per cent. of the area is under meadows or grazing land; and in 1881 there were within the government 244,000 head of cattle, 383,000 horses, and 235,000 pigs. Sheep-breeding is especially developed in Tchembar and Insar (670,000 sheep, including 72,000 of finer breeds, in 1881). The Mordvinians are very

partial to bee- keeping. The forests (620,000 acres) are a considerable source of wealth, especially in Krasnoslobodsk and Gorodishtche, whence timber, a variety of wooden wares, and also pitch and tar are ex- ported to the south. As many as 30 per cent. of the adult male population leave the government in search of employment, either on the Volga or in southern Russia.

The manufactures are few, employing only 18,300 hands. The yearly returns in 1879 did not exceed 13,325,000 roubles (£1,332,500). The distilleries come first (£973,200), followed by the woollen cloth industry (£237,000), the paper industry (£37,200), tanncries, soap-works, glass-works, machine-works, iron-works, and beetroot-sugar factories. Trade, which has heen favoured by the completion of the railway from Tula to Samara, is still limited to the export of corn, spirits, timber, hemp-seed oil, tallow, hides, honey, wax, some woollen cloth, potash, and cattle, the chief centres for trade being Penza, Nijni Lomoff, Mokshan, Saransk, Krasnoslobodsk, and Golovinshtchina.

The government is divided into ten districts, the chief towns of which are :—Penza (41,650), Gorodishtche (3200), Insar (5230), Kerensk (12,450), Krasnoslobodsk (7000), Mokshan (13,050), Narovtchat (5150), Nijni Lomoff (10,500), Saransk (13,450), and Tehembar (5320). Troitsk (5700), Verkhnii Lomoff (7300), and Sheshkéeff (3500) also have municipal institutions.

The present government of Penza was formerly inhabited by Mordvinians, who had the Mescheryaks in the west, the Bulgars in the north, and the Burtases in the south. In the 13th century these populations fell under the dominion of the Tatars, with whom they fought against Moscow. As early as the 14th century they possessed the town of Narovtchat. The Russians penetrated into the country in the 16th century, founding the town of Mokshan in 1535, and several others in the course of that and the following

eenturies. Penza was foundcd in the beginning of the 17th century,.

the permanent Russian settlement dating as far back as 1666. Its wooden fort, on the site of the present cathedral of the Saviour, protected the neighbourhood against risings of the Mordvinians and Mescheryaks. In

1776 it was taken by Pugatcheff. The town was almost totally destroyed by the great conflagrations of 1836, 1839, and 1858.

PENZA, capital of the above province, is situated 440 niles by rail south-east from Moscow. It is mostly built of wood, on the slopes of a plateau 730 feet above the sea, at the confluence of the little Penza with the navigable Sura. The Spasopreobrajensky cathedral was built in the end of the 17th century, the monastery of the same name, which formerly adjoined it, being now in the suburbs. A few educational and philanthropic institutions, a theatre which has played some part in the history of the Russian stage, and a municipal bank are the chief buildings of Penza, which derives its importance chiefly from its being the seat of the provincial authorities and the see of a bishop. The great bulk of the inhabitants are peasants, who support themselves by agriculture or fishing in the Sura, some artisans, and a few merchants. An imperial botanical garden is situated within 2 miles of the town. Apart from a paper-mill and two steam flour-mills, the manufacturing establishments (producing soap, candles, wax-candles, cosmetics, machinery), distilleries, breweries, and saw-mills are small. ‘Trade in corn, oil, tallow, and spirits is on the increase. There are two fairs where cattle and horses are sold for export, grocery and manufactured wares being the corresponding imports. The population in 1881 had reached 41,650.

PENZANCE, a seaport and municipal borough of Corn- wall, and the westernmost borough of England, is finely situated on gently rising ground on the north-western shore of Mount Bay, at the terminus of the Great Western Railway, 10 miles east-north-east of Land’s End and 20 west-south-west of Truro. It is the nearest port to the Scilly Isles, which are about 40 miles distant to the west- south-west. The market-place is in the centre of the town, and near it the four principal streets intersect each other at

right angles. The southern arm of the pier was built in 1772, the Albert or new pier on the east in 1845. The plers are connected by a wharf, viaduct, and swing-bridge (1882) ; and a dock is being at present constructed at a cost of £60,000, which will extend to about 3 acres. The limits of the port have lately (1884) been extended. The churches are St Mary’s, constructed

of cut granite, in the Perpendicular style, with lofty pinnacled tower and peal of eight bells ; St Paul's, of cut and rubble granite, in the style of the 13th century (1843); and St John's, of stone, Early English (1881). The public buildings, erected of granite in the Italian style in 1867, include the town-hall and council-chambers, St John's Hall for public meetings, the lecture-hall, the public library (upwards of 16,000 volumes), the news-rooms, the masonic hall, the museum of the Penzance Natural History and Antiquarian Society, and the museum and other rooms of the Geological Society of Cornwall. The market-house (1837), in the Grecian style, with a central dome, includes a meat-market on the ground-floor with a corn-market above, and in the east end of the building is the grammar-school, founded in 1789. In front of the east end is a marble statue of Davy. Somewhat east of. the market-house are the post and tele- graph offices, completed in 1883. Among the benevolent institutions is the West Cornwall Infirmary (1874), which includes the dispensary (1809). The town has a con- siderable shipping trade, the total number of vessels which entered the port in 1882 being 1829 of 197,933 tons burden, the number which cleared 1774 of 187,569 tons. The exports include tin, copper, granite, serpentine, and fish, and the imports coal, timber, and provisions. Large quantities of pilchard are annually exported to Italy. Fruits, flowers, and vegetables are grown in the neighbour- hood for the London market. On account of its sheltered situation and its remarkably mild and equable climate, the town has a high repute as a winter residence for persons suffering from pulmonary complaints ; and on account of its fine scenery it is also becoming a favourite watering- place. The population of the municipal borough in 1871 was 10,414, and in 1881 it was 12,409.

Penzance is said to mean ‘‘holy head,” the name being derived from a chapel dedicated to St Anthony, formerly situated on a head- land now forming the base of the old pier, around which a few fishermen built their huts and thus originated the town. A castle built by the Tyes, possessors of the manor of Alwarton or Alverton, is supposed to have occupied the present site of St Mary's Church. Alice de Lisle, sister and heiress of the last Baron Tyes, obtained for the town the grant of a weekly market from Edward TI. In the 15th century Penzance was known as a “place of ships 4nd merchandise ;” and on the 16th March 1512 it received from Henry VIII. a charter granting to the inhabitants all profits arising from ships

visiting the harbour upon condition that the quays and bul- warks of the town were kept in repair. In 1595 the town was burned and pillaged by the Spaniards, and in 1644 sacked by Fairfax. In 1614 it was incorporated by James I. ; and in 1663 it obtained a coinage charter,—a privilege it retained till 1838. On account of the usurpation of its chief magistrate its municipal charter was forfeited in the beginning of the reign of Queen Anne,

but was restored in1706. By the Municipal Act of 1835 the govern- ment was made to consist of a mayor, six aldermen, and eighteen

councillors. ; Lach-Szyrma, History of Penzance, 1878 ; Millett, Penzance Past and Present,

1876-1880.

PEONY. See Pony.

PEORIA, a city of the United States, capital of Peoria county, Illinois, lies on the edge of a rolling prairie at the lower end of the so-called Lake Peoria, an expansion of the Illinois river, and is connected by the Michigan Canal with Chicago. It isa flourishing place, the meeting- point of nine railway lines, the trading centre for an exten- sive district, and the seat of a large grain traffic and of various manufactures ; 117,158,670 proof gallons of high wines were made in 1883. From 5095 in 1850 its popu- lation increased to 14,045 in 1860, 22,849 in 1870, and 29,259 in 1880. Though its permanent settlement dates

only from 1811 and its city charter from 1844, Peoria was one of the trading ports established by La Salle (1680), and was long known as a point of some importance on the route between Canada and Louisiana.

PEPPER, a name applied to several pungent spices known respectively as Black, White, Long, Red or Cayenne, Ashantee, Jamaica, and Melegueta Pepper, but derived from at least three different natural orders of plants.

Black pepper is the dried fruit of Piper mgrum, L., a perennial climbing shrub indigenous to the forests of Travancore and Malabar, from whence it has been intro- duced into Java, Sumatra, Borneo, the Malay Peninsula, Siam, the Philippines, and the West Indies. It is one of the earliest spices known to mankind, and for many ages formed a staple article of commerce between India and Europe,—Venice, Genoa, and the commercial cities of ecn- tral Europe being indebted to it for a large portion of their wealth. Tribute has been levied in pepper; one of the articles demanded in 408 by Alaric as part of the ransom of Rome was 3000 ib of pepper. Pepper-corn rents pre- vailed during the Middle Ages, and consisted of an obliga- tion to supply a certain quantity of pepper, usually 1 ib, at stated times; and the term still lingers in use at the

present day. The 2. price of the spice @

during the Middle Ages was exorbi- tantly high, and its excessive cost was one of the in- ducements which led the Portu- _. guese to seek a \ sea-route to India. The discovery of § the passage round £9 the Cape of Good #5 X7 95° Hope led (1498) © <

to a considerable :

fall in the price, and about the same time the cultivation of the plant was extend- ed to the western islands of the Ma- lay. Archipelago. Pepper, however, remained a monopoly of the Portuguese crown as late as the 18th century. In Great Britain it was formerly taxed very heavily, the impost in 1623 amounting to 5s., and as late as 1823 to 2s. 6d. per hb.

The largest quantities of pepper are produced in Penang, the island of Rhio, and Johore near Singapore,—Penang affording on an average about half of the entire crop. Singapore is the great emporium for this spice in the East, the largest proportion being shipped thence to Great Britain. In 1880 the imports into England from Singa- pore amounted to 21,179,059 tb, valued at £385,108, and from other countries 559,909 tb, valued at £12,979, the re-exports being 12,925,886 tb, chiefly to Germany, Italy, Russia, Holland, and Spain. The varieties of black pepper met with in commerce are known as Malabar, Aleppy or Tellicherry, Cochin, Penang, Singapore, and Siam. The

average market value in the London market is—Malabar, 3}d to 54d per Ib; Penang, 22d to 43d; Singapore, 34d to 43d.

Pepper owes its pungency to a resin, and its flavour to a volatile oil, of which it yields from 1°6 to 2°2 per cent. The oil agrees with oil of turpentine in composition as well as

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Piper nigrum. a, Twig with fruit; 6, longitudinal section of flower ; c, section of fruit.

in specific gravity and boiling point. In polarized light it deviates the ray, in a column 50 mm. long, 1°:2 to 3°-4 to the left. Pepper also contains a neutral crystalline substance, called piperin, to the extent of 2 to 8 per cent, This substance has the same empirical formula as morphia, C,,.H,.NO,, but differs in constitution and properties. It is insoluble in water when pure, is devoid of colour, flavour, and odour, and may be resolved into piperic acid, C,,H,,0,, and piperidin, C,H,,N. The latter is a liquid colourless alkaloid, boiling at 106° C., has an odour of pepper and ammonia, and yields crystallizable salts. A fatty oil is found in the pericarp of pepper, and the berries yield on incineration from 4°1 to 5-7 of ash. The only use of pepper is as a condiment. Notwithstanding its low price and the penalty of £100 to which the manufacturer, possessor, or seller of the adulterated article is liable, powdered pepper is frequently diluted with starch, sago, meal, and other substances, which can be readily detected under the microscope.!

In the south-west of India, where the pepper-plant grows wild, it is found in rich, moist, leafy soil, in narrow valleys, propagating itself by running along the ground and giving off roots into the soil. The only method of cultivation adopted by the natives is to tie up the end of the vines to the neighbouring trees at distances of at least 6 feet, especially to those having a rough bark, in order that the roots may easily attach themselves to the surface. The underwood is then cleared away, leaving only sufficient trees to provide

shade and permit free ventilation. The roots are manured with a heap of leaves, and the shoots are trained twice a year. In localities where the pepper does not grow wild, ground is selected which permits of free drainage, but which is not too dry nor liable to inundation, and cuttings are planted at about a foot from the trees either in the rainy season in June or in the dry season in February. Sometimes several cuttings about 18 inches long are placed in a basket and buried at the root of the tree, the cuttings being made to slope towards the trunk. In October or November the young plants are manured with a mixture of leaves and cow- dung. On dry soils the young plants require watering every other day during the dry season for the first three years. The plants bear in the fourth or fifth year, and if raised from cuttings are fruitful for seven years, if from seed for fourteen years. The pepper from plants raised from cuttings is said to be superior in quantity and quality, and this method is in consequence most frequently adopted. Where there are no trees the ground is made into terraces and enclosed by a mud-wall, and branches of Erythrina indica are put into the ground in the rainy season and in the course of a year are eapable of supporting the young pepper plants. In the mean- time mango trees are planted, these being preferred as supports, since their fruit is not injured by the pepper plant, while the Erythrina is killed by it in fourteen or fifteen years.

In Sumatra the ground is cleared, ploughed, and sown with rice, and cuttings of the vine are planted in September 5 feet apart eaeh way, together with a sapling of quiek growth and rough bark. The plants are now left for twelve or eighteen months and then entirely buried except a small picce of bent stem, whence new shoots arise, three or four of which are allowed to elimb the tree near which they are planted. These shoots generally yield flowers and fruits the next year. Two erops are collected every year, the principal one being in December and January and the other in July and August, the latter yielding pepper of inferior quality and in less quantity. Two or three varieties are met with in cultivation ; that yielding the best kinds has broadly ovate leaves, five to seven in number, nerved and stalked. The flower-spikes are opposite the leaves, stalked and from 3 to 6 inches long; the fruits are sessile and fleshy.

1 Hassall, Food and its Adulteration (1855), p. 42, and Evans, Pharm. Journ., [2] i. p. 605.

White pepper is obtained from the same plant as the black, and differs only in being prepared from the ripe fruits. These, after collection, are kept in the house three days and then bruised and washed in a basket with the hand until the stalks and pulpy matter are removed, after which the seeds are dried. It is, however, sometimes pre- pared from the dried black pepper by removing the dark outer layer. It is less pungent than the black but possesses a finer flavour. It is chiefly prepared at the island of Rhio, but the finest comes from Tellicherry. The Chinese are the largest consumers. In 1877 Singa- pore exported 48,461 piculs (a picul=133} tb) to that country. The London market value is about 43d to 7d per tb. White pepper affords on an average not more than 1-9 per cent. of essential oil; but, according to Cazeneuve, as much as 9 per cent. of piperin, and of ash not more than 1-1 per cent.

Long pepper is the fruit-spike of Piper officenarum,C.DC., and P. longum, L., gathered shortly before it reaches maturity and dried. The former is a native of the Indian Archipelago, occurring in Java, Sumatra, Celebes, and Timor. It has oblong, ovate, acuminate leaves, attenuated to the base, which are pinnate and veined. The latter is indigenous to Ceylon, Malabar, eastern Bengal, Timor, and the Philippines ; it is distinguished from P. officinarum by the leaves being cordate at the base and five-veined. Long pepper appears to have been known to the ancient Greeks and Romans under the name of zrézreps paxpdv ; and in the 10th century mention is made of long pepper, or macropiper, in conjunction with black and white peppers. The spice consists of a dense spike of minute baccate fruits closely packed around the central axis, the spike being about 14 inch long and } inch thick ; as met with in commerce they have the appearance bf having been limed. In Bengal the plants are cultivated by suckers, which are planted about 5 feet apart on dry rich soil on high ground. An English acre will yield about 3 maunds (80 Ib) the first year, 12 the second, and 18 the third year ; after this time the yield decreases, and the roots are there- fore grubbed up and sold as pipli mul, under which name they are much used as a medicine in India.

After the fruit is collected, which is usually in January, the stem and leaves die down to the ground. Long pepper contains piperin, resin, and volatile oil, and yields about 8 per cent. of ash. Penang and Singapore are the principal centres in the East for its sale. In 1871 Singapore shipped 3366 ewt., of which 447 were sent to Great Britain. Penang exports annually about 2000 to 3000 piculs. The value in the London market is from 37s. to 45s. a cwt.

Ashantee or West African pepper is the dried fruit of Piper Clusii, C. DC., a plant widely distributed in tropical Africa, occurring most abundantly in the country of the Niam-niam. It differs from black pepper in being rather smaller, less wrinkled, and in being attenuated into a stalk, like cubebs, to which it bears considerable resemblance ex- ternally. The taste, however, is pungent, exactly like that of pepper, and the fruit contains piperin. It was imported from the Grain Coast by the merchants of Rouen and Dieppe as early as 1364, and was exported from Benin by the Portuguese in 1485; but, according to Clusius, its importation was forbidden by the king of Portugal for fear it should depreciate the value of the pepper from India. In tropical Africa it is extensively used as a condiment, and it could easily be collected in large quantities if a demand for it should arise.

Jamaica pepper is the fruit of Pimenta officinalis, Lindl., an evergreen tree of the Myrtle family. It is more correctly termed “ pimento,” or “allspice,” as it is not a true pepper.

Melegueta pepper, known also as “Guinea grains,” “grains of paradise,” or “alligator pepper,” is the seed of

Amomum Melegueta, Roscoe, a plant of the Ginger family ; the seeds are exceedingly pungent, and are used as a spice throughout central and northern Africa. See vol. vi. p. 36.

For Cayenne pepper, see vol. v. p. 280. (E. M. H.)

PEPPERMINT, an indigenous perennial herb of the natural order Labiatx, and genus Mentha, the specific name being Mentha Piperita, Huds., is

distinguished from other species of the genus by its stalked leaves and oblong- obtuse spike-like heads of flowers. It is met with, near streams and in wet places, in several parts of England and on the Continent, and is also extensively cultivated for the sake of its essential oil in England, in several parts of continental Europe, and in the United States. Yet it was only recognized as a distinct species late in the 17th century, when Dr Eales discovered it in Hertfordshire and pointed it out to Ray, who published it in the second edition of his Synopsis Stirpium Britannicarum (1696). The medicinal properties of the plant were speedily recog- nized, and it was admitted into the London Pharmacopoeia in 1721, under the name of Mentha piperitis sapore.

Two varieties are recognized by growers, the one being known as white and the other as black mint. The former has purplish and $e the latter green Yep stems ; the leaves are more coarsely serrated in the white. The black is the variety more generally —culti- vated, probably because it is found to yield more oil, but that of the green variety is considered to have a more delicate /7 odour, and obtains # a higher price.‘ The green is the kind chiefly dried for herbalists; 4 it is said to be Fic. 1.—Mentha Piparites a, Flowering branch ; of less vigorous b, flower showing form of calyx teeth, growth than the black. The annual yield of peppermint oil from all parts of the world has been estimated at 90,000 1b, but this is probably much below the mark, without taking into consideration the Chinese and Japan- ese oils of peppermint, which, however, are obtained from a different species of mint.

Peppermint oil varies considerably in commercial value, that of Mitcham commanding nearly three times the price of the finest American. The flavour varies to a slight extent even with particular plots of land, badly drained ground being known to give unfavourable results both as to the quantity and quality of the oil. That of the Japan- ese and Chinese oil also differs slightly from the English, and is thus distinguishable by experts. In America the oil is liable to be injured in flavour by aromatic weeds which grow freely among the crop, the most troublesome of these being Zrigeron canadense, L., and Hrechthates hieracifolia, Raf. When pure the oil is nearly colourless and has an agreeable odour and powerful aromatic taste, followed by a sensation of cold when air is drawn into the mouth. It hasa specific gravity of 0°84 to 0°92, and boils at 365° Fahr. Mitcham oil, when

examined by polarized light in a column 50 mm. long, deviates from 14°-2 to 10°°7

1 Near Mitcham in Surrey (219 acres in 1864), Wisbeach in Cambridgeshire, Market Deeping in Lincolnshire (150 acres in 1881), and Hitchin in Hertfordshire.

to the left, the American 4°°3. When oil of peppermint is cooled to 4° C. it sometimes deposits colourless hexagonal prisms of menthol, C,,H,,O, which are soluble in alcohol and ether, almost insoluble in water, and fusible at 92° Fahr. The liquid portion of the oil appears to consist chiefly of the compound C,,H,,0, but it has not been thoroughly investigated. Oil of peppermint is often adul- terated with a third part of rectified spirit, which may be detected by the milkiness produced when the oil is agitated with water. Oil of rosemary and rectified oil of turpen- tine are sometimes used for the same purpose. If the oil contains turpentine it will explode with iodine. If quite pure it dissolves in its own weight of rectified spirits of wine. Peppermint oil is largely distilled at Canton, a considerable quantity (about 300 catties annually) being sent to Bombay, also about 600 catties of menthol. The exports from Canton in 1883 amounted to about 1200 hb. The species cultivated in the neighbourhood of Canton, and probably at Shanghai also, is Mentha arvensis, var. glabrata. Peppermint is chiefly culti- vated in the province of Keang-se; and according to native statements as much as 40 piculs of oil of peppermint are sent annually to ports on the coast. In Japan also the distillation of oil of pepper- mint forms a considerable N : industry, the plant cultivated Pye Mens armen van pipe being /. arvensis, var. piper- calyx showing form of teeth. ascens (see Ph. Journ. [3] vol. ii. p. 324), of which both a purplish and a white form appear to be grown. The oil, under the name of hakka no abura, is exported from Hiogo and Ozaka, but is said to be frequently adulterated. Since 1872 the peppermint camphor or menthol has been largely exported in the separate state from Japan to Germany and Great Britain. The menthol is obtained by subjecting the oil to a low temperature, when it crystallizes out and is separated. The two varieties of Jf. arvensis just named yield much more menthol than M. Piperita. It is re- markable, however, that the J. arvensis,

var. javanica, Blume, growing in Ceylon, has not the flavour of pepper- mint but that of garden mint, while the typical form of M. arvensis grown in Great Britain has an odour so different from peppermint that it has to be carefully re- moved from the field lest it should spoil the flavour of the peppermint oil when the herb is distilled. M&M. incana, Willd., cultivated near Bombay as a herb, also possesses the flavour of peppermint. In the form in which menthol is imported it bears some resemblance to Epsom salts, with which it is said to be sometimes adulterated. It is usually not entirely free from the essential oil, and consequently undergoes purification and recrystallization in England and on the Continent. The amount of menthol imported by a large firm at Leipsic between September 1883 and April 1884 is stated by them to have been 6380 ib, while it 1s certain that at least an equal quantity is imported into England from Yokohama. Although the Japanese pepper- mint plant has been imported by a London merchant, no attempt has as yet been made to cultivate the plant in order to manufacture menthol in England. Menthol is now (1884), however, manufactured from I. Piperita in the United States, where also I. arvensis, var. piperascens, is cultivated.

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PEP PRB MONT

Oil of peppermint is used in medicine as an antispasmodic for the relief of griping pains in the alimentary canal, to expel flatulence, to relieve nausea, to hide the taste of other medicines, and to act as an adjunct to purgatives. The dose is usually from one to three minims. It forms a

most valuable remedy in diarrhcea, acting as an antiseptic,

and as a stimulant to the circulation, and as an anodyne, The oil rubbed over the head is used in China to cure sun- stroke. Menthol has lately come largely into use as a remedy for neuralgia, being moulded by heat into the form of small cones, which are rubbed over the part affected. A small portion placed on the tongue frequently relieves headache, and catarrh and coryza if placed in the nostril, The largest consumption of the oil is in the manufacture of peppermint lozenges.

The following mode of cultivation is adopted by Mr Holland, at Market Deeping. A rich friable soil, retentive of moisture, is selected, and the ground is well tilled 8 to 10 inches deep. The plants are propagated in the spring, usually in April and May. When the young shoots from the crop of the previous year have attained a height of about 4 inches they are pulled up and trans- planted into new soil. They grow vigorously the first year, and throw out numerous stolons on the surface of the ground. After the crop has been removed these are allowed to harden or become woody, and then farmyard manure is scattered over the field and ploughed in. In this way the stolons are divided into numerous pieces, and covered with soil before the frost sets in. If the autumn is wet they are liable to become sodden, and rot, and the next crop fails. In the spring the fields are dressed with Peruvian guano. In new ground the peppermint requires hand-weeding two or three times, as the hoe cannot be used without injury to the plants. Moist heavy weather in August is apt to cause the foliage to drop off and leave the stems almost bare. Under these circum- stances rust (Puccinia Mentha) also is liable to attack the plants. This is prevented to a certain extent by a rope being drawn across the plants, by two men walking in the furrows, so as to remove excessive moisture. The average yield of peppermint is about 165 ewt. per acre. The first year's crop is always cut with the sickle to prevent injury to the stolons. The herb of the second and third year is cut with scythes, and then raked by women into loose heaps ready for carting. The field is then gleaned by boys, who add what they collect to the heaps. The plants rarely yield a fourth crop on the same land. The harvest usually commences in the beginning or middle of August, or as soon as the plants begin to flower, and lasts for six weeks, the stills being kept going night and day. The herb is carted direct from the field to the stills, which are made of copper, and contain about 5 cwt. of the herb. Before putting the peppermint into the still water is poured in to a depth of about 2 feet, at which height a false bottom is placed, and on this the herb is thrown and trodden down by men. The lid, which fits into a water-joint, is then let down by pulleys and fastened by two bars, any excess of pressure or temperature being indicated by the water that is ejected at the joint. The distillation is conducted by the application of dircct heat at the lowest pos- sible temperature, and is continued for about four and a half hours, When this operation is completed, the lid is removed and a rope is attached to.a hook on the false bottom, which, as well as the herb resting on it, is raised bodily by a

windlass and the peppermint carricd away in the empty carts on their return journey to the fields, where it is placed in heaps and allowed to rot, being subsequently mixed with the manure applied in the autumn as above stated.

At Mitcham extra payment is given to the reapers to induce them to keep the mint free from corn mint (Mentha arvensis) and other herbs, which would injure or spoil the flavour of the oil if not removed before distillation. The usual yield of oil, if the season be warm and dry, is said to be 1 oz. from 5 fb of the fresh flowering herb, but, if wet and unfavourable, the product is barely half that quantity. Mr Holland estimates the yield of a charge of the still at from 1 Tb 12 oz. to5 ib. The oil improves in mellow-ness even if kept as long as ten or fourtecn years. The green colour sometimes present in the oil is stated to be due to a quantity of water larger than necessary having been used in the distillation ; on the other hand, if the herb be left in the still from Saturday to Monday, the oil assumes a brown tint.

In France peppermint is cultivated on damp rich ground at Sens, in the department of the Yonne. In Germany it is grown in the neighbourhood of Leipsic, where the little town of Colleda produces annually as much as 40,000 ewt. of the herb. In the United States peppermint is cultivated on a most extensive scale, chiefly in southern Michigan, the west districts of New York State, and Ohio. The amount of peppermint oil now produced in the United States has been estimated at 70,000 tb annually, of which 30,000 ib are exported, about two-thirds of this quantity being produced in

New York State and the remaining one-third in Michigan. The yield averages from 10 to 30 ib per acre. The cultivation of pepper- mint has recently been extended to the southern States. In Michi- gan the plant was introduced in 1855, and in 1858 there were about 9100 acres under cultivation, and 100 distilleries yielding 15,000 tb of oil. In 1870 one of the best-known growers of New York State is said to have sent out as much as 57,365 ib. In 1876 the United States exported to Hamburg 25,840 fb of peppermint oil against 14,890 Ib sent by Great Britain to the same port. (H. M. H.)

PEPPER TREE. The tree usually so called has no real consanguinity with the true pepper (Piper), but is a member of the Anacard family known botanically as Schinus Molle or Muth, the latter epithet representing, it is said, the Peruvian name of the plant. It is a small tree with unequally pinnate leaves, the segments linear, entire or finely saw-toothed, the terminal one longer than the rest, and all filled with volatile oil stored in large cells or cysts, which are visible to the naked eye and appear like holes when the leaf is held up to the light. When the leaves are thrown upon the surface of water the resinous or oily fluid escapes with such force as violently to agitate them. The flowers are small, whitish, arranged in terminal clusters, and polygamous or unisexual, with five sepals, as many petals, ten stamens (as large as the petals in the case of the male flower, very small in the female flower, but in both springing from a cushion-like disk surrounding the base of the three-celled ovary). The style is simple or three-cleft, and the fruit a small, globose, pea-like drupe with a bony kernel enclosing a single seed. The fleshy portion of the fruit has a hot aromatic flavour from the abundance of the resin it contains, and to this circumstance the tree probably owes its popular name. ‘The resin is used for medicinal purposes by the Peruvians, and has similar properties to mastic. The Japan pepper tree is Xanthoxylum piperitum, the fruits of which have also a hot taste. Along the Riviera the tree known as Melia Azedarach, or the “ Pride of India,” a very ornamental tree with elegant foliage and dense clusters of fragrant lilac flowers, is also incorrectly called the pepper tree by visitors.

PEPSIN. See Nurririon, vol. xvii. p. 675 sq.

PEPYS, SamMveL (1633-1703), was the fifth child of John Pepys and Margaret (Perkins? Diary, 17th Septem- ber 1663), and was born on 23d February 1632/3. His family was of the middle class, and at this time was in humble circumstances, his father being a tailor in London, while an uncle and an aunt, named Perkins, lived in poverty in the Fens near Wisbeach. His father’s elder brother Robert had a small property at Brampton in Huntingdonshire, and Samuel was at school at Hunting- don about 1644. Thence he went to St Paul’s, London, and on 21st June 1650 was entered as a sizar at Trinity College, Cambridge, but was transferred on Ist October in the same year to Magdalene, where he became pensioner on 4th March following. On 3d April 1651 he was elected scholar on the Spendluffe

foundation, and on 4th October 1653 on that of Dr John Smith. Exactly a fortnight afterwards he was admonished by the registrar before all the fellows in residence for being ‘“ scandalously overserved with drink the night before.” His love of drink, so constantly illustrated in the early pages of his Diary, would have been a serious drawback to his advance- ment, had not his love of work and order been a still stronger impulse. The crisis was reached on Sunday, 29th September 1661, when he was too drunk to trust himself to read prayers to the household. After that he makes resolute vows against wine, which he often breaks, and with regard to which he displays curious powers of self-deception.

Nothing more is known of Pepys’s college career, though he tells us that he was addicted to writing romances. He became a moderate classical scholar; it is, however, a curious commentary upon the university training of those

days that, after his appointment tothe navy board, he is found busy with the multiplication table, which he speaks of as entirely new to him, and of his daily progress in which he is not a little proud. After this he becomes en- amoured of arithmetic and teaches his wife the science also.

In October! 1655 Pepys married Elizabeth St Michel, a girl of fifteen, of great beauty, whose father, a Hugue- not refugee in England, was at this time in very poor circumstances. She was a good cook and a good house- keeper, and was both clever and warm-tempered ; Pepys, vain, quarrelsome, fussy, and pedantic, was unfitted, save by a general goodness of heart, to manage a high-spirited girl; and the pages of the Diary are full of bickerings and downright quarrels arising out of trifles, the entries of which, though often amusing, are as often extremely pathetic. Pepys and his wife, who were destitute of funds, were received by Sir Edward Montagu, afterwards earl of Sandwich, whose mother had married Pepys’s grandfather. Pepys probably acted as Montagu’s secretary. He was successfully cut for the stone on 26th March 1657/8, an anniversary which he always notes with gratitude. In March 1658/9 he accompanied Montagu and Algernon Sidney to the Sound on board the “Naseby” (afterwards the “ Charles”). To this he more than once refers as the beginning of his fortunes. On his return he was

employed as a clerk in the army pay-office of the exchequer under Downing, afterwards Sir George Downing.

In January 1659/60 Pepys began to keep his Diary. He was at this time living in Axe Yard, Westminster, in a small house with one servant, on straitened means. On 29th January he can count but £40; his great object is to get on and to “put money in his purse ;” and by 24th . May 1661 he is worth £500. Political principles he had none, though his personal attachment to James (II.) makes him call himself a Tory; but it is noticeable that even before the Restoration he regularly attended the Church of England service carried on by Peter Gunning, afterwards successively bishop of Chester and of Ely. Of active religious convictions Pepys leaves no trace, but he was ever a steady church-goer ; and the epithets he applies to the sermons are very happy in their causticity. In February he went to Cambridge to settle his brother in his old college. One side of what was distinctly a coarse-grained nature is exhibited in an entry during this week, where he describes himself (as on many other occasions) as ‘‘ playing the fool with the lass of the house.” His views of women, indeed, are almost always vulgar; he was given to clumsy gallantry, and he was certainly unfaithful to his wife. In March Montagu gave Pepys the post of secretary to the generals at sea. While the fleet lay off the Dutch coast he made a short journey into Holland. At this time he secured the favour of the duke of York; and he retained it through life. On 28th June he became clerk of the acts of the navy, an office which Montagu had procured for him against powerful competition. A salary of a little over £100 a year, afterwards increased to £350, was attached to the post, but Pepys had to pay an annuity of £100 to his predecessor in office, On 23d July he became clerk of the privy seal, the fees from which, at any rate for a time, brought him in an additional £3 a day (Diary, 10th August 1660). In this month he took his M.A. degree. On 24th September he was sworn in as J.P. for Middlesex, Essex, Kent, and Southampton. He now lived in Seething Lane, in front of the navy office, Crutched Friars. In July 1661, on the death of his uncle, the Brampton estate, worth £80 a year, came to his father, and on the latter’s

1 Pepys himself gives 10th October as the date ; the registers of St Margaret’s church (Westminster) say that the banns were published on 19th,

22d, and 29th October, and that he was married on 1st December. See Notes and Queries, 30th August 1884.

death in 1680 to Pepys himself. In July 1662 he was made a younger brother of the Trinity House.

Pepys's untiring industry in office, his prudence, his unfailing usefulness, his knowledge of business, which he was ever diligent to increase, and his general integrity secured him the greatest confidence at headquarters. As early as August 1662, when placed on the Tangier com- mission, he had found himself "a very rising man." In March 1664/5 he was made treasurer to the commission, and received also the contract for victualling the garrison, both lucrative appointments ; and in October, through the influence of Sir W. Coventry, he was further made sur- veyor-general of the victualling office, a post which he resigned at the conclusion of the peace. His conduct during the Great Plague, when, alone of all the navy board, he stayed in the city of the dead and carried on the whole administration of the navy, was admirable. During the Fire also his readiness and presence of mind were of the greatest service in staying the conflagration.

In the spring of 1667/8, in the blind rage at the national disgrace generally termed the miscarriage of Chatham, the whole navy board were summoned before the House of Commons to give an account of their con- duct. Pepys was deputed by his colleagues to conduct the defence, and he did so with complete success on 5th March in a speech of three hours' duration, which gained him great reputation.

In 1669 the increasing weakness of his eyesight com- pelled him to discontinue the Diary, his last entry being on 3lst May. What was to us an irremediable misfortune was to Pepys "almost as much as to see myself go into the grave." He now took leave of absence and spent some months in travelling through France and in revisiting Holland. On the day of his return his wife fell ill, and died in the early spring, before 3d March 1669/70. In July 1669 Pepys stood as the duke of York's nominee, backed by the Howard influence, for the borough of Aldborough in Suffolk, but was defeated. In November 1670 we find him engaged in a quarrel with the

Swedish resident, which was likely to have been followed by a duel, as Pepys, doubt- less to his exceeding comfort (for he was a great coward), received an order from the king neither to send nor accept a challenge. In 1672 he was promoted to the secretary- ship of the admiralty ; and, when James resigned his office of lord high admiral, Pepys did all the work until the commission was appointed. He was placed also upon the new commission for Tangier.

In June 1673 he was chosen at a by-election, again as James's nominee, for Castle Rising, a Howard borough, but a vote of the committee of privileges declared the election void. Pepys, on the authority of Sir J. Banks and the earl of Shaftesbury, was denounced before the House of Commons as being a Papist; but, when these persons were called upon, they denied any definite knowledge of the altar and crucifix which he was charged with having in his house. The parliament being prorogued, he retained his seat, and is recorded as speaking on 17th May and 26th October 1675, on the latter occasion against the pro- posal made, in distrust of the crown, to lodge the money for the ships in the chamber of London instead of in the exchequer; and again on 11th May 1678, in the debate on the king's message to quicken supply for the navy, when he was sharply reproved by Sir R. Howard for speaking "rather like an admiral than a secretary, 'I' and 'we,' " an amusing instance of how completely Pepys had obtained control of the business of the navy and had identified himself with the work. He was afterwards, in 1678/9, returned for Harwich (see a note on p. 122 of vol. vi. of Bright's edition of the Diary). In the list, however, of members of the parliament which met on 6th

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March in that year, which is given by the Parliamentary History (vol. iv. p. 1082), the members for Harwich are recorded as being Sir Anthony Deane and Siz Thomas Pepys. An investigation of the records of Harwich leaves no doubt that the Parliamentary History is wrong upon this point, and that Pepys did sit for the borough during this parliament.

On 7th August 1677 Pepys was elected master of the Clothworkers' Company, who still possess the silver cup he gave them on the occasion. He continued to hold the secretaryship until 1679, when fresh complaints of

mis- carriages in the navy were made before the House. The country was then in the throes of the popish terror. Pepys was accused, on the evidence of one Colonel Scott, an in- famous character, ‘“‘a very great vindicator of the Sala- manca doctor” (Intelligencer, 20th May 1681), of sending secret information regarding the English navy to France (Intelligencer, 23d May 1681), and was again charged with being a Papist. On 22d May he was sent, nominally on the first charge, though really on the second, to the Tower, with his colleague Sir Anthony Deane. As he himself wrote to James on 6th May, “‘a papist I must be, whether I will or no, because favoured by your royal highness.” On 2d June he appeared before the King’s Bench, and was remanded three times, bail being refused by Jones, the attorney-general. At length Pepys was allowed out on bail for £30,000. The trial was four times postponed, in the hope that evidence would be obtained, and at last on 12th February 1680 he was released only because Scott refused to swear to his depositions, and no prosecutor ap- peared, and because his old servant, who had given evidence against him, being now on his deathbed, confessed that it was utterly false. This illustrates admirably the wild in- justice that prevailed during that feverish time.

In April 1680 Pepys attended the king by command to Newmarket, and there took down in shorthand from his own mouth the narrative of his escape from Worcester. His post had meantime been abolished, or at any rate the con- stitution of the navy board changed. We find him writing to James on 6th May 1679, asking leave to lay down “this odious secretaryship,” and to be placed on the commission of the navy. James urged his claims upon Charles, but the imprisonment in the Tower probably put an end to the affair. In May 1682 Pepys accompanied James when he took the government of Scotland, and while there made with Colonel Legge a tour of the chief towns. In the autumn of 1683 he sailed with the same Colonel Legge, then Lord Dartmouth, on the expedition to destroy the fortifications of Tangier, though not aware when he started of the object of the expedition. The ships reached Tangier on Friday, 14th September. Here he stayed, with the exception of a short visit to Spain, until 5th March, and arrived in London on 6th April.

On his return Pepys was again made secretary to the admiralty. In this same year (1684) he was elected pre- sident of the Royal Society. At the

coronation of James II. he figured as one of the barons of the Cinque Ports; and he sat in James's parliament for his old seat of Har- wich along with his former colleague Sir Anthony Deane, —a fact which illustrates how completely the crown had regained possession of political power in the boroughs. He lost both his seat and his secretaryship at the Revolu- tion, though he was consulted on navy matters to the time of his death. Having been rejected at Harwich in the new elections, he tried in vain to find another seat. His well-known intimacy with and regard for James made him a special object of suspicion to the Government, and in 1690, in common with others suspected for similar reasons, though without cause, he was suddenly arrested and sent to the Gate House, but was almost immediately released,

15th October, on bail (see his letter, Bright, vol. vi. p. 169). He was, however, afraid of fresh attacks as late as Easter 1692 (Letter to Evelyn, Bright, vi. p. 173). It was about this time that he published his long-intended Memours of the Navy. He gave, as in former years, great attention to the government of Christ's Hospital, and especially to the mathematical foundation ; and he was concerned with the establishment of Sir William Boreman's mathematical school at Greenwich. He was, too, a benefactor of his old school of St Paul's, and of Magdalene College.

Tn the spring of 1700, being very ill with the breaking out of the wound caused by the operation of 1658, he removed to the house of his old clerk William Hewer, at Clapham, and, against the urgent advice of his doctors (Bright, Preface), gave himself up to indefatigable study, feeling that his health was restored by the change. He himself, however, on 7th August 1700, wrote in a charm- ing letter! that he was doing "nothing that will bear naming, and yet I am not, I think, idle; for who can, that has so much of past and to come to think on as I have? And thinking, I take it, is working." And he speaks of himself in September as making several country excursions. He was, immediately after this, confined entirely to the house with his old disease of stone, and gradually failed. He bore his long and acute sufferings with extreme fortitude, and died, in reduced circumstances (though he claimed a balance of £28,007 2s 1d against the crown), on 26th

May 1703. He was buried by the side of his wife in St Olave's, Crutched Friars, London, on 5th June. His library of 3000 volumes, which he had collected with much labour and sacrifice, and which he would not allow to be divided, was bequeathed to Magdalene College.

The last fact to be recorded of Pepys is that on 18th March 1884, two centuries after his official employment, a monument was unveiled in the church where he was buried to the "Clerk of the Acts and Secretary to the Admiralty" (Times, 19th March 1884).

The importance of Pepys's Diary, historically speaking, may be summed up by saying that without it the history of the court of Charles IJ. could not have been written. We do not, it is true, gain from it any information as to what was going on in the country. Utterly destitute of imagination or political knowledge, Pepys could only record the sights and the gossip that were evident to all. It is because he did record these, without hesitation or concealment, that from his Diary we can understand the brillianey and wickedness of the court, as well as the social state and daily life of the bourgeois class. Viewed in another light, it is unique as the record of a mind formed of inconsistencies. 'Io him especi- ally would his own motto apply, " Mens cujusque, is cst quisque." Probity in word and integrity in office, along with self-confessed mendacity and fraud ; modesty, with inordinate self-conceit ; inde- pendence of mind, with the vulgarest striving after and exultation at the marks of respect which he receives as he rises in the world, and at little advantages gained over others; high-mindedness, with sordid spite ; dignity, with buffoonery ; strong common sense, with great superstition ; kindness, with brutality ; the eager pursuit of money, with liberality in spending it,—such are a few of the more obvious contrasts. He gained his reputation by fair means, and yet was willing enough to lie in order to increase it; he practised extreme respectability of deportment before the world, while he wor- shipped the most abandoned of Charles's mistresses, and now and again gave loose rein to his own very indifferent morals ; and he combined with courage amid difficulties and devotion to duty in the face of almost certain death a personal poltroonery to which few men would eare to confess. The best tribute to him as a man is that in his later years Evelyn became his firm and intimate

friend, and that he died amid universal respect. 7

Authorities.—Diary (Bright's edition ; compared with which other editions are of slight value); Rev. J. Smith, Life, Journals, and Correspondence of Pepys (1841); Parliamentary History, vol. iv.; Journals ofthe House of Commons ; Evelyn, Diary; Wheatley, Samuel Pepys and the World he Lived in (1880); and articles In various magazines and reviews. (O, A.

PERA. See ConsraNTINOPLE, vol. vi. p. 306.

PERAA. See GriEap, vol. x. p. 595.

PERAK. See Matay PENINSULA, vol. xv. p. 320 sq., and Straits SETTLEMENTS.

1 He carried on an active correspondence with literary friends, among them being Dryden, Sloane, and Evelyn.

PERCEVAL, Amanp-Prerre Caussin px (1795-1871), Orientalist, was born at Paris, where his father was. pro- fessor of Arabic in the Collége de France, on 13th J anuary 1795. In 1814 he went to Constantinople as a student interpreter, and afterwards travelled in Asiatic Turkey, spending a year with the Maronites in the Lebanon, and finally becoming dragoman at Aleppo. Returning to Paris, he became professor of vulgar Arabic in the school of living Oriental languages in 1821, and also professor of Arabic in the Collége de France in 1833. In 1849 he was elected to the Academy of Inscriptions. He dicd at Paris during the siege, 15th January 1871, regretted not only for his ripe scholarship but for the gentleness and modesty of a character which represented the best features of the old school of French savants. .

Caussin de Pereeval published a useful Grammaire Arabe vulgaire, whieh passed through several editions (4th ed. 1858), and edited and enlarged Boethor's Dictionnaire Francais-Arabe (8d ed. 1864) ; but his great reputation rests almost entirely on one book, the Essai sur Vhistoire des Arabes (8 vols., Paris, 1847-48), in which the native traditions as to the

early history of the Arabs, down to the death of Mohammed and the complete subjection of all the tribes to Islam, are brought together with wonderful industry and set forth with much learning and lucidity. One of the principal MS. sources used is the great Kitéb al-Aghdny, which has since been published in Egypt; but no publication of texts can deprive the #ssai, which is now unhappily very searee, of its value as a trustworthy guide through a tangled mass of tradition.

PERCEVAL, Spencer (1762-1812), prime minister of England from 1809 to 1812, was the second son of John, second earl of Egmont, and was born in Audley Square, Lon- don, in November 1762. He was educated at Harrow and at Trinity College, Cambridge, where he graduated M.A. in 1781. He ~~was called to the bar at Lincoln's Inn in 1786. A very able speech in connexion with a famous forgery case having drawn attention to his talents, his success was from that time rapid, and he was soon regarded as the leading counsel on the Midland circuit. Entering parlia~~ ment for Northampton in April 1796, he distinguished himself by his speeches in support of the administration of Pitt. In 1801, on the formation of the Addington administration, he was appointed solicitor-general, and in 1802 he became attorney-general. An ardent opponent of Catholic emancipation, he delivered in 1807 a speech on the subject which helped to give the deathblow to the Grenville administration, upon which he became chancellor of the exchequer under the duke of Portland, whom in 1809 he succeeded in the premiership. Notwithstanding that he had the assistance in the cabinet of no statesman of the first rank, he succeeded in retaining office till he was shot by an assassin, perhaps a madman, named Bel- lingham, in the lobby of the House of Commons, 11th May 1812. Perceval will be chiefly remembered for his strenuous opposition to Catholic emancipation, an opposi- tion due to a conscientious dread of the political evils that might result from it. He was a vigorous debater, specially excelling in replies, in which his thorough mastery of all the details of his subject gave him a great advantage.

PERCH (Perca fluviatilis), a freshwater fish generally distributed over Europe, northern Asia, and North America, and so well known as to have been selected for the type of an entire family of spiny-rayed fishes, the Percedx, which is represented in European freshwaters by several other

fishes such as the pope (Acerina cernua) and the pike-perch (Lucioperca). It inhabits rivers as well as lakes, but thrives best in waters with a depth of not less than 3 feet ; in large deep lakes it frequently descends to depths of 50 fathoms and more. It occurs in Scandinavia as far north as the 69th parallel, but does not extend to Iceland or any of the islands north of Europe. In the Alps it ascends to an altitude of 4000 feet.

The shape of its body is well proportioned, but many

variations occur, some specimens being singularly high- backed, others low and long-bodied ; sometimes such varia- tions are local, and Agassiz and other naturalists at one time thought it possible to distinguish two species of the common perch of Europe; there are not even sufficient grounds, however, for separating specifically the North- American form, which in the majority of ichthyological works is described as Perca jflavescens. The brilliant and

The Perch, Perca fluviatilis. striking colours of the perch render it easily recognizable even at a distance. A rich greenish-brown with golden reflexions covers the back and sides, which are ornamented with five or seven dark cross-bands. A large black spot “occupies the membrane between the last spines of the dorsal fin; and the ventral, anal, and lower part of the caudal are bright vermilion. In the large peaty lakes of north Germany a beautiful variety is not uncommon, in which the golden tinge prevails, as in a gold-fish.

The perch is strictly carnivorous and most voracious ; it wanders about in small shoals within a certain district, playing sad havoc among small fishes, and is therefore not to be tolerated in waters where valuable fry is culti- vated. Perch of three pounds in weight are not unfre- quently caught in suitable localities; one of five would now be regarded as an extraordinarily

large specimen, although in older works we read of individuals exceeding even that weight.

Perch are good wholesome food, and highly esteemed in inland countries where marine fish can be obtained only with difficulty. The nearly allied pike-perch is one of the best European food-fishes. The perch is exceedingly prolific ; it begins to spawn when three years old, in April or in the first half of May, depositing the ova, which are united by a viscid matter in lengthened or net-shaped bands, on water plants.

PERCIVAL, James Gatxs (1795-1856), an American writer of many-sided activity, but chiefly remembered by his verses, was born at Berlin, Connecticut, on 15th Sep- tember 1795, and studied at Yale, graduating in 1815, and taking a medical degree in 1820. His life was straitened by poverty and divided among a variety of occupations. He was by turns an army surgeon, professor of chemistry at West Point, a recruiting surgeon at Boston, geological surveyor of Connecticut (writing a Report pub- lished in 1842), and State geologist of Wisconsin, where he died at Hazel Green, 2d May 1856. The intervals of these employments were filled up with literary work of a miscellaneous kind. An edition of his collected poems appeared at Boston in 1859 (2 vols. 8vo). Some of his miscellaneous and patriotic verses hold a high place in American poetry.

_ PERCY. This family, whose deeds are so prominent in English history, claimed descent from one Manfred de Perci, who was said to have come out of Denmark into Normandy before the adventure of the famous Rollo. But it 18 More certain that two brothers, William and Serlo de Perey, came into England with William the Conqueror, who endowed his namesake the elder with vast possessions in Hampshire, Lincolnshire, and Yorkshire, among which were Topcliffe in the North Riding and Spofforth in the

West Riding, the principal seats of the family for many ages afterwards. This William deserves special notice besides, since he refounded the noble abbey of Whitby, which had been destroyed by the Danes,—obtaining a grant of the lordship from Hugh, earl of Chester. Yet his piety would seem to have been of a rather unsteadfast character, for, having endowed the

abbey with certain lands, he resumed them in order to reward a faithful dependant, till his brother Serlo, the abbot, complained to King William, and caused him to make restitution.

The family, however, did not really descend in a direct male line from this William ; for in the reign of Henry II. his male descendants became extinct, and the inheritance was divided for a time between two sisters, though by failure of issue of one of them it was reunited in the next generation. Agnes, the sister from whom all the subse- quent Percies were descended, accepted as her husband Josceline, a son of Geoffrey, duke of Louvain, on the ex- press condition that he and his posterity should bear the surname of Percy, and assume the arms of her family, re- linquishing their own. This Josceline was a brother of Adelais or Alice of Louvain, the second queen of Henry L, and by an arrangement with his sister, confirmed by Henry II. when duke of Normandy, he became possessed of the honour of Petworth in Sussex. He was also castellan at Arundel, and held several other important posts in the south of England. His son Richard and Richard's son William were among the barons who rose in arms against John and Henry III. respectively ; but the grandson made his peace with his sovereign, and had his lands restored to him. It should be remarked, however, as a feature of the times, that Richard de Percy was not the eldest but the youngest son of Josceline, and that, according to modern notions, he was really a usurper, who occupied the inheritance of a nephew; his right, however, passed undisputed. He was one of the twenty-five barons ap- pointed to enforce the observance of Magna Charta.

The next important member of the family is Henry de Percy, whom Edward I., after the deposition of John Baliol, appointed governor of Galloway, and who was one of his most active agents in the subjugation of Scotland, till the success of Robert Bruce drove him out of Turnberry Castle, and made him withdraw into England. He was rewarded by Edward II. with the barren title of earl of Carrick, declared to be forfeited by the Scottish hero; and the same king appointed him governor of the castles of Bamborough and Scarborough. But he himself made his position strong in the north of England by purchasing lands from Anthony Beck, bishop of Durham, among which was the honour of Alnwick, the principal seat of the family ever since. His son, another Henry, took part in the league against Edward

II.’s favourites the Despensers, was in favour with Edward III., and obtained from Edward Baliol as king of Scotland grants of Lochmaben, Annan- dale, and Moffatdale, which he surrendered to the English king for the castle and constableship of Jedburgh or Jed- worth, with the forest of Jedworth and some neighbouring towns. A few years later, in fuller recompense of the unprofitable gift of Baliol,a grant of 500 marks a year was made to him out of the old customs at Berwick ; and in 1346 he did splendid service to his sovereign by defeat- ing and taking prisoner David, king of Scotland, at the battle of Neville’s Cross.

To him succeeded another Henry Percy, a feudal baron like his predecessors, who fought at Crécy during his father’s lifetime; and to him another Henry, who was made earl of Northumberland at the coronation of Richard II. It may be remarked incidentally that the succession of the name of Henry in this family is altogether extraor- dinary. For three generations before this first earl of

Northumberland, and for five different descents after him (making altogether a period of 238 years), the head of the house invariably was a Henry. Such a remarkable con- tinuance of a single Christian name would have been less surprising in later and more peaceful times, when we might reasonably have expected the eldest born to succeed his father quietly through many generations. But the first four earls of this family were all slain in battle or in civil tumult, and the heir-apparent of the first, a Henry like the rest, was cut off in the same way during his father’s lifetime. Was it that the incessant activity due to Border raids and moonlight expeditions created in these men a physical vigour of constitution which protected them to a large extent against disease and infirmity ? .

The first earl of Northumberland, certainly, had led a busy life enough, not only on the Borders but elsewhere. He had been in the French wars of Edward III. ; he had been at times a warden of the marches against Scotland, or a commissioner to treat for peace with that country. He had ravaged the lands of the earl of Dunbar and had won Berwick. Powerful in the south as well as in the north, he was the Lord Henry Percy who protected Wickliffe when cited before the archbishop at St Paul’s. As earl of

Northumberland he exhibited his independence of Richard II. in a way characteristic of a northern baron. Sent for to court, he neglected to come, was disgraced and banished, and thereupon fled to Scotland. He repaired to Henry of Lancaster soon after his landing at Ravenspur, and helped treacherously to decoy Richard II. into his hands at Conway. Naturally he received great honour from Henry after he had become king. He was made constable of England for life, and received a gift of the Isle of Man and a number of important offices in Cheshire, Wales, and the borders of Scotland. He was even appointed one of the commissioners for the marriage of the king's daughter Blanche with Louis, duke of Bavaria ; and for the first three years of the reign both he and his family seemed faithful to the new dynasty which they had greatly helped to establish. In 1402 he and his brave son Henry, the celebrated Hotspur, won the battle of Homildon Hill and took the earl of Douglas prisoner. But immediately afterwards Harry Hotspur, whose character is so well known through Shakespeare's play of Henry the Fourth, resenting the king's injustice to his brother-in-law, Sir

Edmund Mortimer, who had been taken prisoner by the.

Welsh, and whom Henry, for reasons of policy, declined to ransom, entered into a league with Owen Glendower, in whose custody Mortimer was, for a combined war against the king.

The whole family of the Percies seem to have felt that their services to Henry of Lancaster were ill requited. The earl himself joined the conspiracy. His brother Thomas Perey, earl of Worcester (so created by Richard IL.), stood also to all appearance in high favour with the king, who had entrusted him with the care of his son Henry, prince of Wales. But he suddenly left the court and joined his nephew in the north, both sending forth proclamations and raising the country. The rebellion was crushed in the battle of Shrewsbury (1403), in which Hotspur was slain, and the earl of Worcester was beheaded just after the fight, while Northumberland was marching southwards to join with them. Having taken no active part in the movement, the earl pretended that he had really been going to assist the king, and had wished to avert hostilities. He after- wards went peaceably to the king at York, and was placed in custody; but such was his power and influence that next year he was acquitted of treason in full parliament, and

had all his honours and possessions restored to him. All confidence, however, between him and the king was at an end, and in 1405 he joined the insurrection of Arch-

bishop Scrope, who, after being beheaded as a rebel, was venerated as a martyr over the whole north of England. Then he fled to Scotland, afterwards to Wales, and in the end, returning to his own country, perished in a new rebellion at Bramhani Moor.

The title and estates were thus forfeited. But, by an act no less gracious than politic, Henry V. restored them to this earl's grandson, then a prisoner with the Scots, whose liberation he had no difficulty in procuring from the duke of Albany during the time of James I.'s captivity. From that day the loyalty of the family to the house of Lancaster was steadfast and undeviating. The second earl died fighting for Henry VI. at the first battle of St Albans in 1455; the third was slain in the bloody field of Towton (1461) ; the fourth was killed in quelling an insurrection in the time of Henry VII. So strong was the Lancastrian feeling of the family that even Sir Ralph Percy, a brother of the earl who fell at Towton, though he had actually submitted once to Edward IV., turned again, and when he fell at Hedgley Moor consoled himself with the thought that he had, as he phrased it, 'saved the bird in his bosom."

No wonder, then, that in Edward IV.'s days the title and estates of the family were for a time taken away and given to Lord Montagu, brother of Warwick the king- maker. But the north was so accustomed to the rule of the Percies that in a few years Edward saw the necessity of restoring them, and did so even at the cost of alienating still further the powerful family of the Nevilles, who were then already on the point of rebellion.

A crisis occurred in the fortunes of the family in the reign of Henry VIII. on the death of the sixth earl, whose two brothers, much against his will, had taken part in the great insurrection called the "Pilgrimage of Grace." A thriftless man, of whom it is recorded that in his youth he was smitten with the charms of Anne Boleyn, but was forced to give her up and marry a woman he did not love, he died childless, after selling many of the family

estates and granting the others to the king. The title was forfeited, and was granted by Edward VI. to the ambitious Dudley, earl of Warwick, who was attainted in the succeeding reign. It was restored in the days of Queen Elizabeth to Thomas Perey, who, being a staunch Catholic, was one of the three earls who took the lead in the celebrated " Rising in the North," and was beheaded at York. His brother Henry, who succeeded him, was no less unhappy. Involved in Throgmorton's conspiracy, he was committed to the Tower, and was supposed to have shot himself in bed with a pistol found beside him; but there were grave suspicions that it had been discharged by another hand. His son, the next earl, suffered like his two predecessors for his attachment to the religion of his forefathers. The crown lawyers sought in vain to implicate him in the Gunpowder Plot ; but he was imprisoned for fifteen years in the Tower and compelled to pay a fine of £30,000. The son who next succeeded was a Parliamentary general in the Civil War. At length, in 1670, the male line of this illustrious family became extinct, just five hundred years after the marriage of Agnes de Percy with J osceline of Louvain,

Not one of the English noble houses is so distinguished as the Percies throughout the whole range of English history. It is remarkable alike for its long unbroken line, its high achievements, its general culture of arts and of letters. Pre-eminent also, as remarked by Sir Harris Nicolas, for its alliances among the peerage, it continues to this day, though represented once more by a female branch. The present dukedom of Northumberland was created in 1766 in the family of Smithson, who assumed. the name of Percy and have borne it ever since. Sir Hugh Smithson, who became the first duke, married a granddaughter of a daughter of the last earl. (3. GA.)

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PERCY, Tuomas (1729-1811), bishop of Dromore, the editor of the Percy Reliques, was born at Bridgnorth 13th April 1729 and baptized at St Leonard's Church 29th April. His father, Arthur Lowe Percy, a grocer by trade, lived in a large house at the bottom of the street called "The Cartway," and acquired sufficient means to send his son, who had received the rudiments of his education at Bridgnorth grammar-school, to Christ Church, Oxford, in 1746. He graduated in 1750 and proceeded M.A. in

1753. In the latter year he was appointed to the vicarage of Easton Maudit, Northamptonshire, and three years later instituted to the rectory of Wilby in the same county, benefices which he retained until 1782. On the 24th of April 1759 Percy was married at Desborough, N orth- amptonshire, to Anne, daughter of Barton Gutteridge. During his residence in the delightful but secluded neigh- bourhood of Easton Maudit most of the literary work for which he is now remembered—including the Relsqgues— was completed. When his name became famous through his publications he complied with the request of the duke and duchess of Northumberland that he would reside with them as their domestic chaplain, and was tempted into the belief that he belonged to the illustrious house of Percy. Through this connexion he became dean of Carlisle in 1778 and bishop of Dromore in Ireland in 1782, from which date he was a constant resident in his adopted country. His wife predeceased him at Dromore Palace, 30th December 1806 ; the good bishop, blind but otherwise in sound health, lived until 30th September 1811 ; both of them were buried in the transept which he added to Dromore Cathedral.

For many years Dr Percy enthusiastically laboured in the fields of literature. He translated the Song of Solomon and published a key to the New Testament, a work often reprinted; he edited poetry from the Icelandic language and translated Mallet's Northern Antt- quities. His reprint of The Houschold Book of the Earl of Northum- berland in 1512 is of the greatest value for the illustrations of domestic life in England at that period. But all of these works are of little estimation when compared with the Reliques of Ancient finglish Poetry, a publication which has entranced successive gen- erations of schoolboys and students since its first appearance in February 1765. It was based on an old manuscript collection of poetry, but, unfortunately for the editor's peace of mind, it was modernized in style, a circumstance which exposed him to the sneers and suspicions of Ritson. The work as originally issued by Percy has been re-edited by many British antiquaries, whilst selec- tions have been issued for boys and girls, and the manuscript on which he worked has been edited in its complete form by J. W. Hales and F. J. Furnivall. The bishop was possessed of great poetic feeling. His ballad of ''The Hermit of Warkworth " was 'too simple for the austere taste of Dr Johnson, but it has always and deservedly been popular; and his song now generally known as 'OQ Nanny, wilt thou gang wi' me?"

is a universal favourite, from its own merits as well as from the musical setting of an Irishman called Thomas Carter. The greater part of the seventh volume of Nichols's Zllustrations of the Literary History of the 18th Century is filled with Bishop Percy's correspondence.

PERDICCAS, son of Orontes, a distinguished Mace- donian general under Philip and Alexander the Great, and regent of the empire from the death of the latter till he perished in a mutiny in 321 B.c. See MacEDonraN Empire, vol. xv. p. 142, and Persia, infra, pro)

The same name was borne by three kings of Macedonia : Perpiccas I., whom Herodotus calls the founder of the monarchy of Macedon; Perpiccas II., the enemy of Athens in the Peloponnesian War (died c. 414 B.c.); and PERDiccas III. (died 359 3.c.).

PEREKOP, a town of European Russia, in the Crimea, 60 miles south-east of Kherson on the isthmus which con- nects the peninsula with the continent, and, as its name (perekop, & cutting) indicates, commanding the once de- fensive ditch and dyke which cross from the Black Sea to the Sivash lagoon. It was formerly an important place, with a great transit trade in salt (obtained from the great salt lakes of the immediate neighbourhood), which occupied

so large a place in popular estimation that the Tatars of the Crimea were usually styled the "Perekop horde" and their khans the ‘‘ Perekop khans." Since the opening of the railway route to the Crimea it has greatly declined. In 1865 the population of Perekop and its mercantile suburb (Armyanskii Bazar, 3 miles to the south) was only 4927, and the number has slightly decreased since,

In ancient times the isthmus was crossed (about 14 miles south of the present town) by a ditch which gave the name of Taphros to a Greek settlement. This line of defence having fallen into decay, a fort was erccted and a new ditch and dyke constructed in the 15th century by Mengli Girai

and his son and successor Sahib Girai. The fort, known as Kapu or Or-Kapi, became the nucleus of the town. In 1736 Perekop was captured by Field-Marshal Mimnich, and in 1738 by Field-Marshal Lascy, who blew up the fort and de- stroyed a great part of the dyke. In 1754 the fort was rebuilt by Krim Girai ; but the Greek and Armenian inhabitants of Perekop preferred to form a new scttlement at Armyanskii Bazar (Armenian Market). Captured by the Russians in 1771, the town passed into Russian possession with the rest of the Crimea in 1783.

PEREYASLAFF, a town of European Russia, in the Poltava government, 175 miles west-north-west of Poltava, at the junction of the Trubezh and the Alta, which reach the Dnieper 5 miles lower down at the town's port, the village of Andrushi. Besides the town proper there are three considerable suburbs. Though founded in 993 (by Vladimir Svyatoslavitch in memory of his signal success over the Petchenegs), Pereyaslaff has now few remains of antiquity ; while the original erection of some of the churches goes back for many hundred years (that of the Assumption, e.g., to 1010), the actual buildings are not older than the 17th century. The town has trade in grain, salt, cattle, and horses, and some manufactures —tallow, wax, tobacco, &c. The population was 10,835 in 1865 and 9300 in 1870.

From 1054 Pereyaslaff was the chief town of a principality which passed from one prince to another of the Mstislavitches, Vladimir- ovitches, and Olgovitches. Asa southcrn outpost it often figures in the 11th, 12th, and 18th centuries; in later times it was one of the great centres of the Cossack movement; and in 1628 the neighbourhood of the town was the scene of the extermination of the Polish forces known as "Taras's Night." It was by the treaty of Percyaslaff that in 1654 Bogdan Khmyelnitzkii and the Cossacks

acknowledged the supremacy of Alexis. At that time the town contained from 25,000 to 30,000 inhabitants.

PEREYASLAVL, or Pernstavn (called Zalyesskii, or ''Beyond the Forest," to distinguish it from the older town in Poltava after which it was named), is one of the earliest and most interesting cities in north-west Russia, situated in Vladimir government, 87 miles east of Moscow on the road to Yaroslavl, and on both banks of the Trubezh near its entrance into Lake Pleshtcheevo. Pereyaslavl was formerly remarkable for the number and importance of its

ecclesiastical foundations (there were in 1764 no fewer than eleven monasteries in the town and neighbourhood, and the churches about the same period numbered thirty- seven), Among those still standing are the 12th-century cathedral of the Transfiguration (with ancient wall-paint- ings and the graves of Demetrius, son of Alexander Nev- skii, and other princes), and the church of the Birth of John the Baptist, founded by Euphrosyne, wife of Demetrius Donskii, in the close of the 14th century. It is by its extensive cotton manufactures (the spinning factory alone employing 1700 hands and producing to the annual value of £195,000) that Pereyaslavl is now best known through- out Russia; and it also manufactures linen, leather, and tobacco. The fisheries on the lake (20 square miles in extent and 175 feet deep) have long been of great value. The population was 6253 in 1864, 7210 in 1870, and 8700 in 1880.

Founded in 1152 by Yurgii (George) Vladimirovitch Dolgoruki, prince of Suzdal, Pereyaslavl soon began to play a considerable part in the history of the country. From 1195 till 1302 it had

princes of its own; and the princes of Moscow, to whom it was then bequeathed, kept it (apart from some temporary alienations

in the 14th century) as part of their patrimony throughout the 15th and 16th centuries. The town enjoyed a great many privi- leges, and in return was bound to furnish the court with fish. Its earthen walls, from 20 to 50 feet in height and 7260 feet in circuit, remained till 1759. Lake Pleshtcheevo was the scene of Peter the Great’s first attempts at creating a fleet.

PEREZ, Antonio (c. 1540-1611), for some years the favourite minister of Philip IT. of Spain and afterwards for many more the object of his unrelenting hostility, was by birth an Aragonese. His reputed father, Gonzalo Perez, an ecclesiastic, has some place in history as having been secretary both to Charles V. and to Philip IL. and in litera- ture as author of a Spanish translation of the Odyssey (La Ulyxea de Homero, Antwerp, 1556). Antonio Perez, who was legitimated by an imperial diploma issued at Valladolid in 1542, was, however, believed by many to be in reality the son of the well-known Ruy Gomez, prince of Eboli, to whom, on the

completion of a liberal education at home and abroad, he appears at least to have owed his first introduction to a diplomatic career. In 1567 he became one of the secretaries of state, receiving also about the same time the lucrative appointment of protonotary of Sicily, and in 1573 the death of Ruy Gomez himself made room for Perez's promotion to be head of the ''despacho uni- versal," or private bureau, from which Philip attempted to govern by assiduous correspondence the affairs of his vast dominions. Another of the king's secretaries at this time, though in a less confidential relation, was a friend and contemporary of Perez, named Juan de Escovedo, who, however, after the fall of Tunis in 1574, was sent off to supersede Juan de Soto as secretary and adviser of Don John of Austria, thus leaving Perez without a rival. Some time after Don John's appointment to the governorship of the Netherlands Perez accidentally became cognizant of his inconveniently ambitious "empresa de Inglaterra," in which he was to rescue Mary queen of Scots, marry her, and so ascend the throne of England. This secret scheme the faithful secretary at once carried to Philip, who char-

acteristically resolved to meet it by quietly removing his.

brother's aider and abettor. With the king's full cognizance, accordingly, Perez, after several unsuccessful attempts to poison Escovedo, succeeded in procuring his assassination in a street of Madrid on 31st March 1578. The imme- diate effect was to raise Perez higher than ever in the royal confidence and favour, but, wary though the secretary had been, he had not succeeded in obliterating all trace of his connexion with the crime, and very soon a prosecution was set on foot by the representatives of the murdered man. For a time Philip was both willing and able to protect his accomplice, but ultimately he appears to have listened to those who, whether truly or falsely, were con- tinually suggesting that Perez had had motives of his own, arising out of his relations with the princess of Eboh, for compassing the assassination of Don John's secretary ; be this as it may, from trying to screen Perez the king came to be the secret instigator of those who sought his ruin. The process, as such matters often are in Spain, was a slow one, and it was not until 1589 that Perez, after more than one arrest and imprisonment on a variety of charges, seemed on the eve of being convicted and condemned as the murderer of Escovedo. At this juncture he succeeded

in making his escape from prison in Castile into Aragon, where, under the ancient “fueros” of the kingdom he could claim a public trial in open court, and so bring into requisition the documentary evidence he possessed of the king’s complicity in the deed. This did not suit Philip, who, although he instituted a process in the supreme tri bunal of Aragon, speedily abandoned it and caused Perez to be attacked from another side, the charge of heresy being now preferred, arising out of certain reckless and even blasphemous expressions Perez had used in connexion with

his troubles in Castile. But all attempts to remove the accused from the civil prison in Saragossa to that of the Inquisition raised popular tumults, which in the end led to Perez s escape across the Pyrenees, but unfortunately also furnished Philip with a pretext for sending an army into Aragon and suppressing the ancient “fueros” altogether (1591). From the court of Catherine de Bourbon, at Pau, where he was well received, Perez passed to that of Henry IV. of France, and both there and in England his talents and diplomatic experience, as well as his well-grounded enmity to Philip, secured him much popularity. While in England he became the “intimate coach-companion and bed-companion ” of Francis Bacon, and was also much in the society of the earl of Essex. The peace of Vervins in 1598 greatly reduced his apparent importance abroad, and Perez now tried to obtain the pardon of Philip IIL, that he might return to his native country. His efforts, how- ever, proved vain, and he died in comparative obscurity in Paris on 3d Noveniber 1611. Some years afterwards his wife and family were relieved from the ban of the Inquisi- tion, under which, along with himself, they had been laid.

Perez’s earliest publication was a small quarto, dedicated to the earl of Essex, written and apparently printed in England about 1594, entitled Pedazos de Historia, and professedly published at Leon. A Dutch translation appeared in 1594, and in 1598 he pub- lished his Relaciones, including the Memorial del Hecho de su Causa, drawn up in 1590, and many of his letters. The Paris edition is dedicated to Henry IV., but apparently another issue was inscribed to the pope. Both dedications are given in the fullest reprint, that of Geneva (1654), which includes a

collection of ‘‘aphorisms” culled from the author’s writings. The literary performances of Perez owe their importance almost exclusively to the fascination of his personal narrative, which, however, gives no great impres- sion of simplicity and straightforwardness ; the letters, though admittedly models of idiomatic Castilian, are somewhat tedious reading. Much has recently been done, by Mignet (Antonio Perez et Philippe IT., 1845, 4th ed., 1874) and by Froude (‘‘ An Unsolved Historical Riddle,” Nineteenth Cent., 1883) among others, towards the elucidation of various difficult points in Perez’s somewhat per- plexing story.

PERFUMERY is the art of manipulating odoriferous substances for the gratification of the sense of smell. Perfumes may be divided into two classes, the first of which includes all primitive or simple odoriferous bodies derived from the animal or vegetable kingdom, as well as the definite chemical compounds specially manufactured, while the second comprises the various “bouquets” or ‘“‘mélanges” made by blending two or more of the fore- going in varying proportions,—toilet powders, dentufrices, sachets, and the like. To the former class belong (1) the animal products, ambergris, castor, civet, musk ; (2) essential oils (more properly called attars), mostly procured by distillation ; (3) the philicome butters or oils, which are either solid or liquid fats charged with odours by the processes of inflowering or maceration ; (4) the odori- ferous gum-resins or balsams which exude naturally or from wounds in the trunks of various trees and shrubs, such as benzoin, opoponax, peru, tolu, storax, inyrth ; (5) a few chemical bodies, similar in odour to or identical in odoriferous active principle with certain plants, ¢.g., nitro- benzol, called attar of mirbane or false almond, vanillin or methyl-protocatechuic aldehyde, coumarin or coumaric anhydride, and a few others. Ammonia and acetic acid are used respectively as smelling salts and in the prepara- tion of aromatic vinegar, but can scarcely be considered as perfumes. The second class contains the endless combina- tion of tinctures for scenting the handkerchief sold under fancy names which may or may not afford a clue to their

OFES, Als be 92 66 Pr) ‘composition, such as “‘comédie francaise,” ‘eau de senteur,

“eau de Cologne,” ‘“lavendre ambrée,” ‘‘blumengeist.” These are sometimes made upon a quasi-scientific basis, namely, that of the odophone or gamut of odours of the late Dr Septimus Piesse. Their numbers may be almost

infinite; one large firm in London is known to manufacture several hundreds.

Sources and Commercial Values.—For the sources of the various animal perfumes the reader is referred to the articles AmBrrGRis! (vol. i. p. 660), Buaver? (vol. ili. p. 476), CrvEr? (vol. v. p. 796), and Musx* (vol. xvii. p. 106). The sources of the attars are the different parts of the plants which yield them,—the wood (lign aloe, santal, cedar), the bark (cinnamon, cascarilla), the leaves (patch- ouli, bay, thyme), the flowers (rose, lavender, orange- blossom), the fruit (nutmeg, citron), or the seeds (caraway, almond). Some plants yield more than one, such as lemon and bergamot. They are mostly obtained by distilling with water that part of the plant in which they are con- tained ; but some few, as those from the rind of bergamot (from Citrus bergamia), lemon (citron zeste, from C. Limonum), lime (C. Limetta), by “expression.” The outer layer of the cortex is rasped off from the unripe fruits, the raspings placed in a canvas bag, and squeezed in a scréw or hydraulic press. The attars so obtained are separated from the admixed water by a tap-funnel, and are then filtered (see Orns, EssENTIAL, vol. xvii. p. 748). Certain flowers, such as jasmine, tuberose, violet, cassia, either do not yield their attars by distillation at all, or do it so sparingly as not to admit of its collection for commercial purposes ; and sometimes the attar, as in the case of orange (neroli), has an odour quite different from that of the fresh blossoms. In these cases the odours are secured by the processes of inflowering (enfleurage), or by maceration. Both depend upon the remarkable property which fats and oils possess of absorbing odours. ‘The former process has already been described in the article JASMINE (vol. xiii. p. 595). Maceration consists in soaking the flowers in heated fat; in due time they are strained off and re- placed by fresh ones, as in the enfleurage process. The whole of the necessary meltings and heatings of the per- fumed greases are effected by means of

water-baths, whereby the temperature is kept from rising too high. For the manufacture of perfumes for the handkerchief the greases now known as pomades, butters, or philocomes are treated with rectified spirit of wine 60° overproof, 7.¢., containing as much as 95 per cent. of absolute alcohol by volume, which practically completely abstracts the odour.

The gum-resins have been employed as perfumes from the earliest ages ; manyare referred to in the Old Testament ; see INCENSE (vol. xii. p. 718) and FRANKINCENSE (vol. ix.

“p. 709). They are largely used in the manufacture of perfumes, both for burning as pastilles, ribbon of Bruges, incenses, &c., and in tinctures, to which they impart their characteristic odours, affording, at the same time, a certain fixity to other perfumes of a more fleeting nature when mixed with them. The chemical perfumes are relatively new. Vanillin, the odoriferous principle of vanilla (V. planifolia), was first artificially prepared by Tielman and Hermann in Germany, who obtained it from the sap of certain kinds of fir, and established its composition. Their research was afterwards remarkably verified by Dr C. R. Alder Wright, who prepared it from crude opium. It is a pale straw-yellow crystalline substance, smelling exactly like vanilla, and said to be forty times stronger. Its value commercially is about 23s. per oz. Coumarin, the odori- ferous principle of Tonquin beans (Dipterix odorata), is also artificially prepared. In appearance it resembles vanillin, and is valued at 9s. per oz. Some similar bodies with faney names, such as “‘hemerocalle,” ‘ bromelia,”

aubépine,” are in the market, but have scarcely yet found

: The present (1884) value of ambergris is about 90s. per oz. he present value of eastoreum is about 32s. per ib.

3 Its price is about 9s. per oz.

- Average value about £5 per oz.

PHEe FUNDY

their way into the perfume manufactory. Nitro-benzol, before mentioned, is employed only for imparting an almond-like odour to inferior soaps. The various com- pound ethers called artificial fruit essences, from their resemblance to the odours of certain fruits (jargonelle pear, pine-apple, plum, &c.), find no place in perfumery, though largely used in confectionery for flavouring.

As before stated, the bouquets constituting the second class of perfumes are but alcoholic solutions, 7.¢., tinctures of some of the foregoing blended together in various pro- portions, of which the following well-known recipes are

examples :— “ Rondeletia.” “ Bouquet du Roi.” Heats (Vamilllla. ...2saueevees 2 imts.| Hak. Meroli. .ss…..220 2 pints. Pp uilUisIMR cpaneendaanouces ae: spa MMIROSG: 35, access eee 2 sO letitts. .cacacr ce: yy.) ppm MAU cae be ace t » Attargose …q2c.c.5.-enes 1 oz. | sy, Vemillilat <2. hae k o4 », Mitcham Lavender! ,, i Aste DIaNOSC te aysc ncn oscuaanens 1 dram.

The Odophone.—The late Dr Septimus Piesse endeavoured to show that a certain scale or gamut cxisted amongst odours as amongst sounds, taking the sharp smells to correspond with high notes and the heavy smells with low. He illustrated the idea by classifying some fifty odours in this manner, making each to corre- spond with a certain note, one-half in each clef, and extending above and below the lines. For example, treble clef note E (4th space) corresponds with Portugal (orange), note D (1st space below clef) with violet, note F (4th space above clef) with ambergris. It is readily noticed in practice that ambergris is much sharper in smell (higher) than violet, while Portugal is intermediate. He asserted that properly to constitute a bouquet the odours to be taken should correspond in the gamut like the notes of a musical chord,—one false note among the odours as among the music destroying the harmony. Thus on his odophone, santal, geranium, acacia, orange-flower, camphor, corresponding with C (bass 2d line below), C (bass 2d space), E (treble ist line), G (treble 2d line), C (treble 3d space), constitute the bouquet of chord C.

Other Branches of Perfuwmery.—¥or the preparation of scented soaps two methods are in use; both start with a basis either of fine yellow soap (which

owes its odour and colour to the presence of resin), or of curd soap (which is hard, white, and odourless, and is prepared without resin), In one process the soap is melted by super- heated steam, and while still hot and semi-filuid mixed by means of

.a T-shaped stirrer of wood with iron cross-bar, technically called a

“crutch,” with the attars and colouring matter. It is then removed from the melting pan to a rectangular iron mould or box, the sides of which can be removed by unscrewing the tie-rods which hold them in position ; when cold the mass is cut into slabs and bars with a thin brass wire. In the other or cold process the soap is first cut into chips or shavings by a plane or “chipping machine,” then the colouring matters are added and thoroughly incorporated _ by passing the soap between granite rollers driven by steam-power ; the tinted soap emerges in a continuous sheet but little thicker than paper. ‘The attars are then added, and after standing for about twelve hours the soap is again sent through the rolling machine. It is next transferred to a bar-forming machine, which consists of an Archimedean screw with tapering thread revolving in a box; the soap in sheets is roughly squeezed through a hopper over the widest threads of the screw and is forced, as this revolves, towards the distant end of the box, to an opening of the required size, through which it emerges in a continuous bar almost as hard as wood. Soap thus worked contains less than 10 per cent. of water; that prepared by melting contains 20 and even 30 percent. The amount of attars added depends upon the nature of the perfume, and amounts usually to about 7 or 8 percent. The finest soaps are always manufactured by the cold process. Toilet powders are of various sorts. They consist of rice-starch or wheat-starch, with powdered orris-root in varying proportions, and with or without the addition of oxide of zinc, oxide of bismuth, or French chalk. The constituent powders, after the addition of the attars, are thoroughly incorporated aud mixed by sifting through a fine sieve. Violet powder for the nursery should consist eutirely of powdered violet root (Iris florentina), from the odour of which the powder is named. It is of a yellowish tint, soft, and pleasant to the touch. The white comnion so-called “violet powders” consist of starch only scented with attar of bergamot, and are in every seuse inferior. Tooth powders consist for the most part of mixtures of powdered orris-root with precipitated chalk, and some other con- stituent destined to

particularize it as to properties or flavour, such as charcoal, finely-pulverized pumice, quassia, sugar, camphor, &c. The perfume of the contained orris-root is modified, if required, by the addition of a little of some attar. Tooth pastes are not much in vogue ; they are formed of the same constituents as the powders, and are worked into a paste by the addition of a little honey or glucose-

syrup, which substances are usually believed ultimately to have an injurious effect on the teeth. Perfume sachets consist either of a powder composed of a mixture of vanilla, musk, Tonquin beans, &c., one or other predominating as required, contained in an ornamental silk sac ; or of some of the foregoing substances spread upon card or chamois leather or flannel after being made into a paste with mucilage and a little glycerin. When dry the card so prepared is daintily covered with various party -coloured silks for sale. Where the ingredients employed in their manufacture are of good quality these cards, known as “peau d’Espagne”’ sachets, retain their odour unimpaired for years.

Aduiterations.—There is, as might be expected, considerable scope for the adulteration of the ‘‘ matieres premiéres” employed in perfumery, and it is to be stated with regret that many unscrupulous dealers avail themselves of the facilities offered for this dishonourable practice. Thus, in the case of musk, the “ pods” are frequently found to be partially emptied of the grain, which has becn replaced by hide or skin, while the weight has been increased by the introduction of lead, &c. In other instances the fraud consists in the admixture of refuse grain, from which the odour has. been exhausted with spirit, with dried blood, and similar substances, whilst pungency is secured by the addition of carbonate of ammonia. Attar of rose is diluted down with attar of Palma rosa, a variety of geranium of only a quarter or a fifth of the value. The main adulterant of all the attars, however, is castor oil. This is a bland neutral body, practically odourless, and completely soluble in alcohol ; it therefore presents all the requisites for the purpose. Its detection is difficult even by chemical analysis, which is obviously inapplicable in most instances ; the safeguard of the purchaser is the knowledge resulting from experience.

Statistics.—In Europe, flower-farming for perfumery purposes is almost exclusively confined to that triangular portion of the valley of the Var (France) which has Grasse for its apex and the Mediter- ranean shore between Nice and Cannes for its base, with an area of about 115,000 English acres. Itis here that the jasmine, tuberose, cassia, rose, and violet grow to such perfection, and that the processes of enfleurage and maceration are commercially worked. Subjoined is an estimate! of the weight of flowers annually employed.

Tons. Harvest Time.

Orange blossoms …..... 1860 20th April to 3lst May.

LB&S s6@o00MengonOobe ae 930 May. ROMS sss cer cde cietens 147 15th January to 15th April. Bee PUIVC a8 fers cislcte\sysiets ateteiee 147 20th July to 10th October. MIMIGEROSE .... 0.50 60-5 05. 74 August, September, and October. ‘CLS 2 eC eee | 30 October, November, and December. BRAPEONULDL, (5)55a(010\ eressiceiemv aver” * { 15 February and March.

Great praise is due to the pioneers of flower-farming in the British colonies of South Africa and Australia, and especially to Colonel Talbot in Jamaica, whose efforts in this direction bid fair to meet with complete commercial success.

The attars from peppermint (Afentha Piperita), thyme (T. vul- garis), and lavender (Lavandula vera), the finest in the world, are distilled from plants grown in the neighbourhood of Mitcham in Surrey. It is estimated that between 8000 and 10,000 ounces of musk are annually imported from all sources, while the quantity of aleohol employed in the manufacture of perfumes is calculated

to exceed 60,000 gallons. See Piesse’s Art of Perfumery, 4th ed., 1880. (C. H. P.)

PERGAMUM, an important city of Teuthrania, a dis- trict in Mysia; it is usually named Iépyapov by Greek writers, but Ptolemy has the form Ilépyapos. The name, which is related to the German burg, is appropriate to

the situation on a lofty isolated hill in the broad and fertile valley of the Caicus, about 120 stadia, less than 15 miles, from its mouth. According to the belief of its inhabitants, the town was founded by Arcadian colonists, led by Tele- phus, son of Heracles. Auge, the mother of Telephus, was priestess of Athena Alea at Tegea, and daughter of Aleus ; fleeing from Tegea, she became the wife of Teuthras, the eponymous king of Teuthrania, and her son Telephus succeeded him. Athena Polias was the patron-goddess of Pergamum, and the legend combines the ethnological record of the connexion claimed between Arcadia and Pergamum with the usual belief that the hero of the city was son of its guardian deity, or at least of the priestess who represented her. Nothing more is recorded of the city till the time of Xenophon, when it was a small fortified town on the summit of the hill. Its importance began under

1 Kindly furnished by M. Bruno Court, head of the well-known house of Notre Dame des Fleurs of Grasse.

Lysimachus, who deposited his treasures, 9000 talents, in this strong fortress under the charge of a eunuch Phil- eterus of Tium. In 283 B.c. Phileterus rebelled, Lysi- machus died without being able to put down the revolt, and Pergamum became the capital of a little principality, Partly by clever diplomacy, partly through the troubles caused by the Gaulish invasion and by the dissensions among the rival kings, Philetzerus contrived to keep on good terms with his neighbours on all sides (283-263 B.c.). His nephew Eumenes (263-241) succeeded him, increased his power, and even defeated Antiochus of Syria in a pitched battle near Sardis. His successor Attalus I. (241- 197) won a great battle over the Gauls, and assumed the title of king. The other Greek kings who aimed at power in Asia Minor were his natural enemies. On the other hand, the influence of the Romans was beginning to make itself felt in the East. Attalus perceived the advantage of their alliance against his Greek rivals, connected himself with them from the first, and shared in their continuous success. Under the reign of Attalus Pergamum became the capital of a considerable territory and a centre of art and regal magnificence. Sculptors were attracted by the wealth of the state and the king’s desire to celebrate his victories by monuments of

art, and thus arose the so-called "'Pergamenian school" in sculpture. The Pergamenian kings appear to have been far more truly Hellenic, and to have admitted far less of the '' barbarian" Oriental char- acter to their court, than the other Hellenistic sovereigns, whose habits and surroundings were those of Eastern sultans with a thin surface-gloss of Greek manners. We hear more of the munificence of Attalus towards Athens, then the educational centre of Greece, than to his own capital. The splendour of Pergamum was at its height under Eumenes II. (197-159). He continued true to the Romans during their wars with Antiochus and Perseus, and his kingdom spread over the greater part of western Asia Minor, including Mysia, Lydia, great part of Phrygia and Caria. To celebrate the great achievement of his race, the defeat of the barbarian Gauls, he built in the agora a vast altar to Zeus Soter, adorned with sculptures and especially with a gigantic frieze, in which the symbolic theme of the defeat of the barbarian giants by the gods was treated on such a scale, and with such wealth of de- tail and perfection of technical skill, as made the monu- ment one of the marvels of the ancient world. He devoted great care to the improvement and embellishment of the city. It is not certain when the old Doric temple of Athena Polias and Nicephorus on the Acropolis was re- placed by a more magnificent marble temple, but Eumenes planted a grove in the Nicephorion, the sacred precinct of the goddess, and established libraries and other great works in the city. He left an infant son, Attalus (IIL), and a brother, Attalus II. (Philadelphus), who ruled 159-138, and was succeeded by his nephew, Attalus ITI. (Philometor). The latter died in 133, and bequeathed his kingdom to the Romans, who erected it into a province under the name of Asia. Pergamum continued to rank, with Ephesus and Smyrna, as one of the three great cities of the province, and the devotion of its former kings to the Roman cause was continued by its citizens, who erected on the acropolis a magnificent temple to Augustus. It was the seat of a conventus, including the cities of the Caicus valley and some of those in the northern part of the Hermus valley. Under the Roman empire Pergamum was one of the chief seats of the worship of Asclepius ; invalids came from dis- tant parts of the country to ask advice from the god and his priests. The temple and the curative establishment of the god were situated outside the city. Pergamum was one of the early seats of Christianity, and one of the seven churches enumerated in the Revelation was situated

there. Two tributaries of the Caicus, named Selinus and Cetius, flowed through or near the city. The ancient

name is still preserved under the form “ Bergamo.”

The excavations conducted by the Prussian Government at Per- gamum under the direction of Humann and Bohn have disclosed many of the buildings with which the acropolis was adorned, the temples of Athena and Augustus, the Stoa, &c., have recovered great part of the frieze on the altar of Zeus, and have given materials of every kind for the elucidation of Pergamenian history and Greek antiquities generally, which it will take years to classify and place before the public (see the preliminary reports published by Conze, Bohn, and Humann).

PERGOLESI (or PrrconesE), Giovanni Batrista (1710-1736), Italian musical composer, was born at Jesi, Ancona, 3d January 1710, and educated at Naples in the Conservatorio dei Poveri di Gesu Cristo, where he studied the violin under Domenico de Matteis, and coun- terpoint under Gaetano Greco, Durante, and Francesco Feo. While learning all he could from these great teachers he struck out from the very first a style of his own, and brought it prominently forward in his earliest known composition, an oratorio, called La Conversione di S. Guglielmo, performed in the church of 8. Agnello in 1731, in which year he also produced his first opera, Sallustia, at the Teatro Fiorentino. After receiving fur- ther instruction from Vinci he produced another opera, Recimiro, which failed lamentably. This disappointment led him to devote his chief attention to church music; and his next great works—two masses, one for two and the other for four choirs, with double orchestra—established his reputation as a genius of the highest order, and proved that he was at least as great in his newly-adopted style as in his dramatic pieces. Nevertheless, the greatest success that he was ever destined to attain was reserved for his celebrated intermezzo!—or, as we should now call it, operetta —La Serva Padrona, This delightful work, fairly success- ful on the occasion of its first production in 1731 or 1733, became after Pergolesi’s death a recognized favourite at every theatre of importance in Europe. In 1746 it found its way to Paris, and had a long run at the Théatre Italien, followed in 1752 by an equally successful one at the

Académie. Two years later it was translated into French, and ran for 150 successive nights. As late as 1867 it was revived in this form at the Opéra Comique; and in 1873 it was revived in London at the Royalty Theatre. The libretto by Nelli is unusually bright and sparkling; and so fresh is the music that it still sounds as if composed but yesterday. In this characteristic, indeed, lies the secret of its extraordinary success, for the scale on which it is written is of the smallest imaginable dimensions. The dramatis persone consist of three characters only, one of them being mute, and the orchestra is limited entirely to the stringed band, unrelieved by a single wind instrument. But the fire of genius breathes in every bar, and the whole work has the character of a continuous inspiration.

In 1734 Pergolesi was appointed maestro di cappella at Loreto. Soon after this his health began to fail rapidly, but he worked on incessantly to the end. His last com- positions were a cantata for a single voice, Orfeo ed Huri- dice; a lovely Salve Regina, also for a singlé voice; and his famous Stabat Mater, for two female voices. For this last-named work—the best known of all his sacred com- positions—he received in advance ten ducats (£1 15s.), and thought the price enormous. He was barely able to finish it before his death, which took place at Pozzuoli, 16th March 1736.

Pergolesi's works comprise fourteen operas and intermezzi, nine- teen sacred compositions, and many charming pieces of chamber

music,—a long list, when one remembers that he died at the age of 26 years and 3 months. The purity of his style has not been ex-

Barve light buffo piece, the acts of which were interpolated, for the sake of relief, between those of a serious opera.

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ceeded by any composer of the Italian school ; and in his orchestra] effects and other points of little less importance he shows himself immensely in advance of all his predecessors.

PERIANDER was born about 665 B.c. and succeeded his father Cypselus as despot of Corinth in 625 B.c. His rule appears to have been at first mild and beneficent, but evil advice or domestic calamity converted him into a cruel tyrant. There runs a well-known story that he sent to ask the advice of Thrasybulus, tyrant of Miletus, who, in- stead of replying, walked with the messenger through a cornfield and struck off as he walked the tallest and fairest of the ears. Periander took the hint, and proceeded to exterminate the most eminent of his subjects! Whatever the cause, there seems no reason to doubt that the latter part of the despot's life was darkened by crime. Goaded by the slanders of concubines, he murdered his beloved wife Melissa, daughter of Procles, tyrant of Epidaurus, and then, in a fit of remorse, burned the slanderers alive.2? The murder of his wife alienated from the tyrant the affection of his favourite son Lycophron, whom, failing to move either by rigour or blandishments, he banished to Corcyra, then a dependency of Corinth. At last, enfeebled by age, Periander offered to resign the tyranny to his son and to retire himself to Corcyra; but the prospect alarmed the Corcyreans, and they put Lycophron to death. The tyrant took his revenge by sending three hundred of the noblest Corcyrean youths to Alyattes, king of Lydia, to be made eunuchs of; they were rescued, however, by the Samians. Periander did not long survive his son; he fell into a deep despondency, and died either of grief or by violence volun-

tarily incurred in 585 B.c., at the age of eighty.

The accounts of Periander's character are at first sight discrepant. One writer (Heraclides) describes him as just and moderate, an enemy of vice and luxury, which he severely repressed. But more com- monly he appears as cruel and oppressive. He surrounded himself with a body-guard, and, according to Aristotle, reduced tyranny to a system by putting down eminent and aspiring citizens, impover- ishing the rich, maintaining spies, and sowing distrust between classes and individuals. His costly offerings to the gods drained the resources, while his public works and constant wars taxed the energies and distracted the attention of the citizens. The privilege of settling in Corinth was placed by him under certain restrictions. On the other hand, he not only patronized literature in the person of the poct Arion but was himself the author of a collection of moral maxims in 2000 verses.

His reputation for wisdom stood so high that he was commonly reckoned amongst the seven wise men, though some, as Plato, denied his claim. Amongst the wars to which he owed his military fame were successful expeditions against Epidaurus and Corcyra. He built a fleet and scoured the seas on both sides of the isthmus, through which it is said that he meditated cutting a canal. To him were due the Greek colonies of Apollonia, Anactorium, and Leucas. On the whole, Periander would appear to have becn one of those brilliant despots whose personal vices havc not destroyed their literary and artistic sense, and who by their abilities have raised the states which they governed to a high pitch of outward prosperity and power. Certain it is that with the close of his dynasty, which happened a few years after his death, when his successor Psammetichus perished in a popular rising, the golden age of Corinthian history came to an end.

There was another Periander, tyrant of Ambracia, said to have been a relative of the tyrant of Corinth. He was deposed by the people, probably not long after the death of the latter.

The chief authorities for the life of Periander are Herodotus (iii. 48-535 y. 92), Aristotle (Pol., v. 11, 12), Heraclides Ponticus (v.), Nicol. Damase. (59, 60), Diog. Laert. (i. 7). The letters in Diogenes ascribed to Periander are no doubt spurious.

1 In Aristotle’s version of the story the rdles of Periander and Thrasybulus are reversed.

2 The relations of Periander to his dead wife form the subject of a curious tale. It is said that he got a necromancer to call up the spirit of Melissa (as Saul called up Samuel), in order to question her about a hidden treasure, just as people in Wiirtemberg used to call up ghosts in churchyards for a similar purpose. But the ghost refused to answer. “For,” said she, “I am cold; I cannot wear the garments laid in my grave, because they have not been burned.” So Periander called to- gether all the women of Corinth in their best attire as for a festival, stripped them, and burned their garments on the grave of his wife, that her ghost might not go naked. Similar to this is the story in Lucian of the ghost of a dead wife appearing to her husband and begging him to find and burn one of her golden sandals which had fallen underneath the chest and so had not been burned with the other.

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PERICLES, a great Athenian statesman, and one of the most remarkable men of antiquity, was the son of Xanthippus, who commanded the Greeks at the battle of Mycale in 479 3.c. By his mother Agariste, niece of Clisthenes, who reformed the democracy at Athens after the expulsion of the Pisistratide, he was connected both with the old princely line of Sicyon and with the great but unfortunate house of the Alemzonide.! The date of his birth is unknown, but his youth must have fallen in the stirring times of the great Persian war. From his friendship with the poet Anacreon, lis father would seem to have been a man of taste, and as he stood in relations of hospitality to the Spartan kings his house was no doubt a political as well as literary centre. Pericles received the best education which the age could supply. For masters he had Pythoclides and the distinguished musician Damon, who infused into his music lessons a tincture of philosophy, whereby he incurred the suspicions of the vulgar, and received the honour of ostracisni.2 Pericles listened also to the subtle dialectics of the Eleatic Zeno. But the man who swayed him most deeply and permanently was the philosopher Anaxagoras. The influence of the speculative genius and dignified and gentle character of the philosopher who resigned his property that he might turn his thoughts more steadily to heaven, which he called his home, and who begged as his last honour that the school-children might have a holiday on the day he died, can be traced alike in the intellectual breadth and the elevated moral tone of the pupil, in his superiority to vulgar superstitions, and in the unruffled serenity which he preserved through- out the storms of political life? It was probably the grand manner of Pericles even more than his eloquence that won him the surname of Olympian Zeus. In his youth he distinguished himself in the field, but eschewed politics, fearing, it is said, the suspicions which might be excited in the populace not only by his wealth, high birth, and powerful friends, but by the striking resemblance to the tyrant Pisistratus which old men traced in his personal appearance, musical Voice, and flowing speech. But, when the banishment of Themistocles> and the death of Aristides had somewhat cleared the political stage, Pericles came forward as the champion of the democratic or progressive party, in opposition to Cimon, the leader of the aristocratic or conservative party. The two leaders differed hardly less than their policies. Both indeed were men of aristocratic birth and temper, honourable, brave,

and generous, faith- ful and laborious in the service of Athens. But Cimon was a true sailor, blunt, jovial, freehanded, who sang a capital song, and was always equally ready to drink or fight, to whose artless mind (he was innocent of even a smattering of letters®) the barrack-room life of the bar- barous Spartans seemed the type of human perfectibility, and whose simple programme was summed up in the

geilerod., vi. 131.

2 Plut., Per.,4; cp. Plato, Laches, pp. 180, 197, 200, and Rep., 400, 424.

8 If the statement reported by Diogenes Laertius (ii. 3, 7), that Anaxagoras spent thirty years at Athens, is correct, he probably arrived there about 462, and Pericles must have reached maturity before he inet him (see Zeller, Die Philosophie der Griechen, i. p. 865 sq.).

4 It is said that once, when Pericles was transacting business in public, a low fellow railed at him all day long, and at nightfall dogged him to his house, reviling him in the foulest language. Pericles took no notice of him till he reached his own door, when he bade one of the servants take a torch and light the man home.

5 Variously placed in 476 (Kriiger), 471 (Clinton), and 470 (Cur- tins). Considerable divergence of opinion prevails as to the dates of most events between the Second Persian War and the outbreak of the Peloponnesian War (see Pierson, in Philologus, 1869 ; Classen's Thucy- dides, book i. Anh.). Pericles, who died in 429, is said to have had a public life of forty years ; hence he probably began to take part in politics about 469, ab.

6 Plut., Cim., 4. It is amusing to read of this stout old salt sitting In judgment on the respective merits of Aischylus and Sophocles (ib., 8).

maxim 'fight the Persians." Naturally the new ideas of political progress and intellectual development had no place in his honest head ; naturally he was a sturdy sup- porter of the good old times of which, to the popular mind, he was the best embodiment. Pericles, grave, studious, reserved, was

himself penetrated by those ideas of progress and culture which he undertook to convert into political and social realities; philosophy was his recrea- tion ; during the whole course of his political career he never accepted but once an invitation to dinner, and he was never to be seen walking except between his house and the popular assembly and senate-house. He husbanded his patrimony and regulated his domestic affairs with rigid economy that he might escape both the temptation and suspicion of enriching himself at the public expense.

The steps by which he rose to the commanding position which he occupied in later life cannot be traced with cer- tainty. According to Plutarch, Pericles, whose fortune did not allow him to imitate the profuse hospitality by which Cimon endeared himself to the people, sought to outbid him by a lavish distribution of the public moneys among the poorer classes; this device was suggested to him by Damonides, says Plutarch on the authority of Aristotle. We may doubt the motive alleged by Plutarch, but we cannot doubt the fact that Pericles did extend, if not originate, the practice of distributing large sums among the citizens either as gratuities or as payment for services rendered,—a practice which afterwards attained most mis-chievous proportions. According to Plato (Gorgias, 515 E), it was a common saying that Pericles, by the system of payments which he introduced, had corrupted the Athenians, rendering them idle, cowardly, talkative, and avaricious. It was Pericles who introduced the payment of jurymen, and, as there were 6000 of them told off annually for duty, of whom a great part sat daily, the disbursement from the treasury was great, while the poor and idle were encouraged to live at the public expense. But the payment for attendance on the public assembly or parliament (of which all citizens of mature age were members), though probably suggested by the payment of the jurymen, was not intro- duced by Pericles, and indeed does not seem to have existed during his lifetime.’ It was he who instituted the payment of the citizens for military service,°“—a measure but for which the Athenians would probably not have prolonged the Peloponnesian War as they did, and in particular would not have been so ready to embark on the fatal Sicilian expedition. There was more justifica- tion, perhaps, for the practice, originated by Pericles, of supplying the poorer citizens from the public treasury with the price of admission to the theatre. For in an age when the study of the poets formed a chief element of education, and when

the great dramas of A‘schylus, Sophocles, and Euripides were being put on the stage in all their freshness, such a measure may almost be regarded as a state provision for the education of the citizens. It was part of the policy of Pericles at once to educate and delight the people by numerous and splendid festivals, processions, and shows. But the good was mixed with seeds of evil, which took root and spread, till, in the days of Demosthenes, the money which should have been spent in fighting the enemies of Athens was squandered in spectacles and pageants. The Spectacular Fund or Theorr-Zon has been called the cancer of Athens. Vast sums were further spent by Pericles in adorning the city with those buildings which even in their ruins are the wonder of the world. Amongst these were the Parthenon, or Temple of the Virgin (Athene), and the Erechtheum, i en mes a

7 See Boeckh, Staatsaushaltung der Athener, 1. p. 320 ; Curtius, Griech. Gesch., ii. pp. 227, 842. 8 Ulpian on Demosth., wept cwrdé., 50 A, ap. Boeckh, i. Bille

both on the Acropolis, the former completed in 438,1 the latter left unfinished at Pericles's death; the magnificent Propylea or vestibule to the Acropolis, built 437-432 ; and the Odeum or music-hall, on the south-eastern slope of the Acropolis, completed before 444. The musical contests instituted by Pericles, and for which he himself laid down the rules and acted as judge, took place in the Odeum. Many artists and architects were entrusted with the execution of these great works, but under the direction of the master-mind of Phidias, sculptor, architect, painter,— the Michelangelo of antiquity. But Pericles fortified as well as beautified Athens. It had been the policy of Themistocles to make her primarily a naval and commercial power, and to do so he strengthened the marine, and gave to the city as far as possible the advantages of an insular situation by means of fortifications, which rendered both it and its port (the Pirseus) impregnable on the land side. By thus basing the Athenian state on commerce instead of, like Solon, on agriculture," he at the same time transferred the political predominance to the democratic or progressive party, which is as naturally recruited from a commercial as a conservative or aristocratic party is from an agricul- tural population. This policy was fully accepted and carried out by Pericles. It was in his time and probably by his advice that the Long Walls were built, which, con- necting Athens with Pirzeus, converted the capital and its seaport into one vast fortress.2 Further, in order to train the Athenians in seamanship, he kept a fleet of sixty ships at sea eight months out of every year. The expenses entailed by these great schemes were chiefly defrayed by the annual tribute, which the confederates of Athens originally furnished for the purpose of waging war against Persia, but which Athens, as head of the league, subse- quently applied to her own purposes. If, as seems prob- able, the transference of the treasury of the league from Delos to Athens, which sealed the conversion of the Athenian headship into an empire, took place between 460 and 454, the step was probably suggested or supported by Pericles, and at all events he managed the fund after its transference.* But, though the diversion of the fund from its original purpose probably did not begin with Pericles, yet, once established, he maintained it unwaver- ingly. The Athenians, he held, fulfilled the trust committed to them by defending their allies against all comers, and the tribute (increased during his administration from 460 to 600 talents annually) was their wages, which it was their right and privilege to expend in works which by employ- ing

labour and stimulating commerce were a present benefit, and by their beauty would be "'a joy for ever." That Athens ruled by force, that her empire was in fact a

1 The date of the commencement of the Parthenon is variously put at 444 (Leake), 454 (Michaelis), and 460 (Wachsmuth). From an inscription it would seem that the building of the temple extended at least as far back as 447. See Curtius, Gr. Gesch., ii. p. 852.

2 Solon's classification of the citizens for political purposes rested exclusively on the possession of cultivated land.

3 There were three of these walls, of which the northern (to Pireus) and the southern (to Phalerum) were completed after the battle of (&nophyta (Thucyd., i. 108) in 456. The foundation of these two walls seems to have been laid by Cimon (Plut., Cim., 13) about 462. See Leake's Topography of Athens, i. p. 424. Some scholars, relying on an interpretation of Thucydides (i. 107, 108), suppose that these walls were begun in one year and finished in the next. But considering the length of the walls (8 miles) and their massiveness (as shown by their remains) this seems quite impossible. 'The middle wall, which ran parallel to the northern wall and at no great distance from it, was built later (it was not begun before 449, Andocides, De pace cum Laced., 7, and the progress was slow, Plut., Per., 13), and there is no doubt that Pericles advised its construction (Plato, Gorgias, 455 EH). The wall to Phalerum seems afterwards to have fallen into decay, and the middle wall then went by the name of the southern, and it and the northern were known as the Long Walls (Harpocration, s.v. 6d bégov Telxous ; Leake, i. p. 427).

4 Justin, iii. 6, 4; Diod., xii. 38 ; Curtins, Gr. Gesch., ii. 168, 837.

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tyranny, he fully admitted, but he justified that tyranny by the high and glorious ends which it subserved.®

The rise of Pericles to power, though it cannot be followed step by step, has an obvious and sufficient explana- tion in his combined wisdom and eloquence. Plato traces his eloquence largely to the influence of Anaxagoras ; in- tercourse with that philosopher (he says) filled the mind of Pericles with lofty speculations and a true conception of the nature of intelligence, and hence his oratory possessed the intellectual grandeur and artistic finish characteristic of the highest eloquence (Phedrus, 270 A). The range and compass of his rhetoric were wonderful, extending from the most winning persuasion to the most overwhelming denunciation. The comic poets of the day, in general very unfriendly to him, speak with admiration of his oratory; “ oreatest of Grecian tongues,” says Cratinus; “‘ persuasion sat on his lips, such was his charm,” and ‘he alone of the orators left his sting in his hearers,” says Eupolis; “he lightened, he thundered,” says Aristophanes. His speeches were prepared with conscientious care; before rising to speak he used to pray that no inappropriate word might fall from his lips. He left no written speeches,’ but the few sayings of his which have come down to us reveal a passionate imagination such as breathes in the fragments of Sappho. Thus, in speaking of those who had died in war, he said that the youth had perished from the city like the spring from the year.2 He called the hostile island of /Augina “the eye-sore of the Pirzeus,” and declared that he saw war “lowering from Peloponnesus.” Three of his speeches have been reported by Thucydides, who may have heard them, but, though their substance may be correctly recorded, in passing through the medium of the historian’s dispassionate mind they have been shorn of the orator’s imaginative glow, and in their cold iron logic are hardly to be distinguished from the other speeches in Thucydides. An exception to this is the speech which Thucydides reports as having been delivered by Pericles over the slain in the first year of the Peloponnesian War. This speech stands quite apart from the others; and as well in particular touches (¢.g., the saying that ‘“the grave of great men is the world”) as in its whole tenor we catch the ring of a great orator, such as Thucydides with all his genius was not. It is probably a fairly close report of the speech actually delivered by Pericles.

The first public appearance of Pericles of which we have record probably fell about 463. When Cimon, on his return from the expedition to Thasos, was tried on the utterly improbable charge of having been bribed by the Macedonian king to betray the interests of Athens, Pericles was appointed

by the people to assist in conduct- ing the prosecution ; but, more perhaps from a conviction of the innocence of the accused than, as was said, in compliance with the entreaties of Cimon's sister Elpinice, he did not press the charge, and Cimon was acquitted. Not long afterwards Pericles struck a blow at the conservative

5 Op. Thucyd., i. 148, and ii. 63, 64; Plut., Per., 12.

8 Compare the story in Plutarch (De educ. puer., 9), that on one occasion, though repeatedly called on by the people to speak, he declined to do so, saying that he was unprepared.

7 Plut., Per., 8. In the time of Cicero there were some writings bearing his name (Brutus, 7, 27;. De Or., ii. 22, 93), but they were no doubt spurious. Cp. Quintilian, iii, 1, 12; xii. 2, 22 and 10, 49.

8 Cope (on Aristotle, Rhetoric, i. 7, 34) denies that Pericles was the author of the saying. His only plausible ground is that a similar saying is attributed to Gelon by Herodotus (vii. 162). But from the clumsy way in which the simile is there applied it has all the appear- ance of being borrowed, and Herodotus, who long survived Pericles, may have borrowed it from him. It is more open to question whether the simile occurred in the funeral speech delivered at the close of the Samian War, or in that during the Peloponnesian War, but the former is more probable. In Thucydides's report of the latter speech the simile does not occur.

party by attacking the Areopagus, a council composed of lifemembers who had worthily discharged the duties of archon. The nature of the functions of the Areopagus at this period is but little known ; it seems to have had a general supervision over the magistrates, the popular assembly, and the citizens, and to have exercised this supervision in an eminently conservative spirit. It sat also as a court for the trial of certain crimes, especially murder. Pericles seems to have deprived it of nearly all its functions, except its jurisdiction in cases of murder.! The poet AXschylus composed his Humenides in vindica- tion of the ancient privileges of the Areopagus. Though Pericles was the real author of the attack on the Areo- pagus, the

measure was nominally carried by Ephialtes. It was, indeed, part of Pericles's policy to keep in the background, and to act as far as possible through agents, reserving himself for great occasions. Ephialtes, a friend of Pericles, and a patriot of inflexible integrity, paid dearly for the distinction; he fell by the hand of an assassin employed by the oligarchical party,—an event the more striking from the rarity of political assassinations in Greek history. The popular party seems to have immediately followed up its victory over the Areopagus by procuring the ostracism of Cimon,? which strengthened the hands of Pericles by removing his most influential opponent (461). Pericles took part in the battle of Tanagra (457) and bore himself with desperate bravery. After the battle Cimon was recalled from banishment, and it was Pericles who proposed and carried the decree for his recall. In 454 Pericles led an Athenian squadron from the port of Pegz on the Corinthian Gulf, landed at Sicyon, and defeated the inhabitants who ventured to oppose him ; then, taking with him a body of Acheans, he crossed to Acarnania, and besieged the town of Giniade, but had to return home without capturing it. Not long afterwards? Pericles con- ducted a successful expedition to the Thracian Chersonese, where he not only strengthened the Greek cities by the addition of 1000 Athenian colonists, but also protected them against the incursions of the barbarians by fortifying the isthmus from sea to sea. This was only one of Pericles's many measures for extending and strengthening the naval empire of Athens. Colonies were established by him at various times in Naxos, Andros, Oreus in Eubcea (in 446), Brea in Macedonia (about 443), and Aigina (in 431). They served the double purpose of establishing the Athenian power in distant parts and of relieving the pressure of population at Athens by providing the poorer citizens with lands. Somewhat different were the famous colonies established under Pericles's influence at Thurii in Italy, on the site of the ancient Sybaris (in 443), and at Amphipolis on the Strymon (in 437), for, though planted under the conduct of Athens, they were not exclusively Athenian colonies, other Greeks being allowed, and even invited, to take part in them. This was especially true of Thurii, which was in a manner a national Greek colony, and never stood in a relation of subjection to Athens. On one occasion (some time apparently between 454 and 449) *

1 Cp. Philochorus, 141 b, in Miiller's Fragm. Hist. Grac., vol. i. 5 Plut., Per., 9, and Cim., 15; Aristotle, Pol., 1274 a, 7; Thirlwall's Hist. of Greece, ii. pp. 458, 459.

2 The ostracism of Cimon lasted between four and five years (Theo-pompus, 92, in Fr. Hist. Gr.; cp. Corn. Nep., Cimon, 3). Hence, if his recall took place shortly after the battle of Tanagra (Plut., Cim., 17, and Per,, 10), say at the beginning of 456, he must have been ostracized about the middle or latter part of 461. Diodorus (xi. 77) places the attack on the Areopagus in 460; but, if that attack preceded (as Plutarch implies) the banishment of Cimon, it would be necessary, In order to harmonize Diodorus and Theopompus, to place the recall of Cimon in 455 or 454—i.e., between one and two years after the battle of Tanagra—and this seems forbidden by Plutarch's narrative.

> In 453, according to Diod., xi. 88. ;

4 The expedition is only recorded by Plutarch (Per., 20), and is

Pericles sailed at the head of a splendid armament to the Black Sea, where he helped and encouraged the Greek cities and overawed the barbarians. At Sinope he left a force of ships and men under the gallant Lamachus, to co-operate with the inhabitants against the tyrant Timesi- leus, and on the expulsion of the tyrant and his party he carried a decree for the despatch of 600 Athenian colonists to Sinope, to occupy the lands vacated by the exiles. But, with the sober wisdom which characterized him, Pericles never allowed his plans to exceed the bounds of the pos- sible ; he was no political dreamer like Alcibiades, to be dazzled with the vision of a universal Athenian empire in Greece, Italy, and Africa, such as floated before the minds of many in that and the following generations.° The disastrous expedition which the Athenians sent to Egypt, to support the rebel Inarus against Persia (460-455), received no countenance from Pericles.

When Cimon died in 449 the aristocratical party sought to counterbalance the power of Pericles by putting forward Thucydides, son of Melesias, as

the new head of the party. He seems to have been an honest patriot, but, as the event proved, he was no match for Pericles. The Sacred War in 448 showed once more that Pericles knew how to defend the interests of Athens. The Phocians, under the protec- tion of Athens, had wrested the control of the Delphic oracle from their enemies the Delphians. The latter were friendly to Sparta, and accordingly the Spartans marched into Phocis and restored the oracle to the Delphians. When they had departed, Pericles, at the head of an Athenian force, placed the oracle once more in the hands of the Phocians. As the seat of the great oracle, Delphi was to ancient Greece much what Rome was to medizval Europe, and the friendship of the god, or of his priests, was no small political advantage. When the Athenians despatched a small force under Tolmides to crush a rising in Beeotia, they did so in spite of the warnings of Pericles. These warnings were soon justified by the unfortunate battle of Coronea (447), which deprived Athens at a blow of the continental dominion she had acquired a few years before by the battle of Ginophyta (456). The island of Eubcea now revolted from Athens, and hardly had Pericles crossed over with an army to reduce it when word came that the Megarians had massacred the Athenian garrison, and, in league with Corinth, Sicyon, and Epidaurus, were up in arms, while a Peloponnesian army under King Plistoanax was on the point of invading Attica. Pericles recrossed in haste to Attica. The Peloponnesians returned home, having advanced no farther than Eleusis and Thria. It was said that Pericles had bribed Cleandridas ; certain it is that both Cleandridas and Plistoanax were charged at Sparta with having misconducted the expedition and were found guilty. Having saved Attica, Pericles returned to Eubcea, reduced it to subjection, expelled the Histizeans, and settled the Athenian colony of Oreus (446) on their lands. The thirty years' peace, concluded soon afterwards (445) with Sparta, was probably in large measure the work of Pericles. The Athenians had evacuated Bootia immediately after the battle of Coronea, and by the terms of the peace they now renounced their other continental possessions, —Acheea, Troezen, Niswa, and Pege. The peace left Pericles at liberty to develop his schemes for promoting the internal welfare of Athens, and for making it the centre of the intellectual and artistic life of Greece. But first he had to settle accounts with his political rival Thucydides ; the struggle was soon decided by the ostracism of the latter in 444. Thenceforward to the end of his life Pericles

ee ee ee ee mentioned by him immediately after the expedition against (iniade (454) and before the Sacred War (449). .

5 Thucyd., vi. 15, 90; Diod., xii. 54; Plut., Per., 20, and Alcid., 17; Pausan., 1. U1) 7.

guided the destinies of Athens alone ; in the words of the historian Thucydides, the government was in name a de- mocracy, but in fact it was the rule of the first citizen. The unparalleled ascendency which he wielded so long over the fickle people is one of the best proofs of his extraor- dinary genius. He owed it entirely to his personal character, and he used it for the wisest and purest purposes. He was neither a vulgar demagogue to truckle to the passions and caprices of the mob, nor a vulgar despot to cow it by a hireling soldiery ; he was a citizen among citizens, who obeyed him because they trusted him, because they knew that in his hands the honour and interests of Athens were safe. The period during which he ruled Athens was the happiest and greatest in her history, as it was one of the greatest ages of the world. Other ages have had their bright particular stars; the age of Pericles is the Milky Way of great men. In his lifetime there lived and worked at Athens the poets /Uschylus, Sophocles, Euripides, Cratinus, Crates, the philosophers Anaxagoras, Zeno, Pro- tagoras, Socrates, the astronomer Meton, the painter Poly- gnotus, and the sculptors Myron and Phidias. Contem- porary with these, though not resident at Athens, were Herodotus, the father of history ; Hippocrates, the father

of medicine; Pindar, “the Theban eagle”; the sculptor

Polyclitus ; and the philosophers Empedocles and Demo- critus, the latter joint author with Leucippus of the atomic theory. When Pericles died other stars were rising or soon to rise above the horizon,—the historians Thucydides and Xenophon, the poets Eupolis and Aristophanes, the orators Lysias and Isocrates, and the gifted but unscru- pulous Alcibiades. Plato was born shortly before or after the death of Pericles. Of this brilliant circle Pericles was the centre. His generous and richly-endowed nature responded to all that was beautiful and noble not only in literature and art but in life, and it is with justice that the age of Pericles has received its name from the

man in whom, more than in any other, all the various lines of Greek culture met and were harmonized. In this perfect harmony and completeness of nature, and in the classic calin which was the fruit of it, Pericles is the type of the ideal spirit, not of his own age only, but of antiquity.

It seems to have been shortly after the ostracism of Thucydides that Pericles conceived the plan of summon- ing a general congress of all the Greek states to be held at Athens. Its objects were the restoration of the temples which the Persians had destroyed, the fulfilment of the vows made during the war, and the establishment of a general peace and the security of the sea. Invitations were sent to the Greeks of Asia, the islands from Lesbos to Rhodes, the Hellespont, Thrace, Byzantium, Bceotia, Phocis, Peloponnesus, Locris, Acarnania, Ambracia, and Thessaly. The aim of Pericles seems to have been to draw the bonds of union closer between the Greeks and to form a national federation. The beneficent project was defeated by the short-sighted opposition of the Spartans. But, if in this scheme Pericles rose above the petty jealousies of Greek politics, another of his measures proves that he shared the Greek prejudices as to birth. At an early period of his career (apparently about 460) he enacted, or perhaps only revived,! a law confining the rights of Athenian citizenship to persons both of whose parents were Athenian citizens. In the year 444, on the occasion of a scrutiny of the list of citizens, nearly 5000 persons claiming to be citizens were proved to be aliens under this law, and were ruthlessly sold into slavery.

The period of the thirty years' peace was not one of uninterrupted tranquillity for Athens. In 440 a war broke out between the island of Samos (a leading member

~1 See Schimann's Antiquities of Greece, } 357, Eng. tr. ; Hermann's Staatsalterthiimer, § 118. es » Hung. UF. 5

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of the Athenian confederacy) and Miletus. Athens sided with Miletus; Pericles sailed to Samos with an Athenian squadron, and established a

democracy in place of the previous oligarchy. After his departure, however, some of the exiled oligarchs, in league with Pissuthnes, satrap of Sardis, collected troops and, crossing over to Samos, overpowered the popular party and revolted from Athens, In this revolt they were joined by Byzantium. The situa- tion was critical ; the example set by Samos and Byzantium might be followed by the other confederates. Pericles discerned the danger and met it promptly. He led a squadron of sixty ships against Samos ; and, after detach- ing some vessels to summon feinforcements from Chios and Lesbos, and others to look out for the Phoenician fleet which the Persians were expected to send to the help of Samos, he gave battle with forty-four ships to the Samian fleet of seventy sail and defeated it. Having received reinforcements of sixty-five ships, he landed in Samos and laid siege to the capital. But, when he sailed with sixty ships to meet the Phoenician vessels which were reported to be near, the Samians sallied out with their vessels, defeated the besiegers, and remained masters of the sea for fourteen days. On his return, however, they were again blockaded, and were compelled to surrender, nine months after the outbreak of the war (spring of 439).

Though Pericles enjoyed the confidence of the people as a whole, his policy and opinions could not fail to rouse the dislike and suspicions of many, and in the last years of his life his enemies combined to assail him. Two points in particular were singled out for attack, his administration of the public moneys and his religious opinions. With regard to the former there must always be a certain number of persons who will not believe that others can resist and despise a temptation which to themselves would be irresistible; with regard to the latter, the suspicion that Pericles held heretical views on the national reli- gion was doubtless well grounded. At first, however, his enemies did not venture to impeach himself, but struck at him in the persons of his friends. In 432? Phidias was

accused of having appropriated some of the gold destined

for the adornment of the statue of Athene in the Par- thenon. But by the prudent advice of Pericles the golden ornaments had been so attached that they could be taken off and weighed, and when Pericles challenged the accusers to have recourse to this test the accusation fell to the ground. More

dangerous, for more true, was the charge against Phidias of having introduced portraits of himself and Pericles into the battle of the Amazons, depicted on the shield of the goddess: the sculptor appeared as a bald old man lifting a stone, while Pericles was represented as fighting an Amazon, his face partly concealed by his raised spear. To the pious Athenians this seemed a desecration of the temple, and accordingly Phidias was clapped into gaol. Whether he died there or at Elis is uncertain.' Even more deeply was Pericles wounded by the accusation levelled at the woman he loved. This was the famous Aspasia, a native of Miletus, whose talents won for her general admiration at Athens. Pericles divorced his wife, a lady of good birth who had borne him two sons, Xan- thippus and Paralus, but with whom he was unhappy, and attached himself to Aspasia. With her he lived on terms of devoted affection to the end of his life, though, as she was a foreigner, their union was not a legal marriage. She enjoyed a high reputation as a teacher of rhetoric, and

2 A scholiast on Aristoph., Pax, 605, places the condemnation of Phidias seven years before the outbreak of the Peloponnesian War, OF in 438 (according to Palmer's correction) ; see Miiller ad U., in Frog. Jeli Chay Yo Oo 18s

3 Different views of the fate of Phidias are taken by scholars. PHIDIAS.

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seems to have been the centre of a brilliant intellectual

society, which included Socrates and his friends. The comic poet, Hermippus, brought her to trial on the double charge of impiety and of corrupting Athenian women for the gratification of Pericles. A decree was further carried by a religious fanatic named Diopithes, whereby all who denied the existence of the gods or discussed the nature of the heavenly bodies were to be tried as criminals. This blow was aimed directly at the aged philosopher Anaxagoras, but indirectly at his pupil Pericles as well as at Aspasia. When this decree was passed, and apparently while the trial of Aspasia was still pending, Pericles him- self was called upon by a decree of

the people to render an account of the money which had passed through his hands. The result is not mentioned, but we cannot doubt that the matter either was dropped or ended in an acquittal. The perfect integrity of Pericles is proved by the unim- peachable evidence of his contemporary, the historian Thucydides. Aspasia was acquitted, but not before Pericles had exerted all his eloquence in her behalf. Anaxagoras, tried on the charge of impiety, was obliged to quit the city.!

It was in the same year (432) that the great contest between Athens and Sparta, known as the Peloponnesian War, broke out. We may dismiss as a vulgar calumny the statement, often repeated in antiquity," but quite unsup- ported by Thucydides, that the war was brought about by Pericles for the purpose of avoiding a prosecution. The war was in truth inevitable; its real cause was Sparta's jealousy of the growing power of Athens; its immediate occasion was the help lent by Athens to Corcyra in its war with Corinth. At first, with a hypocritical regard for religion, the Spartans demanded as a condition of peace that the Athenians should expel the race of the Alemzon- ide (including, of course, Pericles), whose ancestors had been guilty of sacrilege about two centuries before. The Athenians retorted in kind, and, after a little more diplo- matic fencing, the Spartans were constrained to show their hand by demanding bluntly that Athens should give back to the Greeks their independence,—in other words, renounce her empire and abandon herself to the tender mercies of Sparta. Pericles encouraged the Athenians to reject the demand. He pointed out that Athens possessed advan- tages over the Peloponnesians in superior wealth and greater unity of counsels. He advised the Athenians, in case of war, not to take the field against the numerically superior forces of the Peloponnesians, but to allow the enemy to ravage Attica at will, while they confined them-

selves to the defence of the city. Through their fleet they.

would maintain communication with their island empire, procure supplies, and harass the enemy by sudden descents on his coasts. By pursuing this defensive policy without attempting to extend their empire, he predicted that they would be victorious. The people hearkened to him and replied to the Spartan ultimatum by counter-demands, which they knew would not be accepted. Pericles had not neglected in time of peace to prepare for war, and

Athens was now well equipped with men, money, and ships. In June of the following summer (431) a Pelo- ponnesian army invaded Attica. By the advice of Pericles the rural population, with their movables, had taken refuge in the city, while the cattle had been sent for safety to the neighbouring islands. The sight of their country ravaged under their eyes excited in the Athenians a long ing to march out and meet the enemy, but in the teeth of popular clamour and obloquy Pericles steadily adhered to

1 The accounts of the issue of the trial are somewhat discrepant ; see Zeller, Die Philosophie der Griechen, i. p. 872.

2 Aristophanes, Paz, 605 sqg., with schol. ad 1.3; Diod., xii. 38- 40; Plut., Per., 31, 32; Aristodemus, xvi. ; Suidas, s.v. “ bevdias.”

his defensive policy, content to protect the suburbs of Athens with cavalry. Meanwhile, Athenian fleets retaliated upon the enemy’s coasts. About the same time, as a punishment for the share that they were supposed to have had in bringing on the war, the whole population of Aigina was expelled from their island to make room for Athenian colonists. This measure, directed by Pericles, relieved to some extent the pressure in the overcrowded capital, and secured a strong outpost on the side of the Peloponnesus. In the autumn, after the Peloponnesian army had been obliged by want of provisions to quit Attica and disband, Pericles conducted the whole available army of Athens into the territory of Megara, and laid it waste.

It was a custom with the Athenians that at the end of a campaign the bones of those who had fallen in battle should be buried with public honours in the beautiful suburb of Ceramicus, the Westminster of Athens, and the vast crowd of mourners and spectators gathered about the grave was addressed by a citizen chosen for his character and abilities to pay the last tribute of a grateful country to its departed brave. On the present occasion the choice fell on Pericles. Once before, at the close of the Samian War, it had been his lot to discharge a similar duty. The speech which he now delivered, as reported to us by Thucydides, is one of the noblest monuments of antiquity. It is indeed the creed of Athens and of Greece. In its aristocratic

republicanism—recognizing at once the equal legal rights and the unequal intrinsic merits of individuals —it differs alike from the monarchical spirit of medizval and modern Europe, with its artificial class distinctions, and from that reactionary communism which preaclies the natural as well as the legal equality of men. In its frank admiration of art and letters and all the social festivals which humanize and cheer life it is as far from the sullen asceticism and the wild debauchery of the East, as the grave and manly simplicity of its style is removed from the. fanciful luxuriance of Oriental rhetoric. Finally, in the words of comfort and exhortation addressed to the bereaved, the speech—to adopt Thirlwall's description of another great effort of Athenian oratory ®—'" breathes the spirit of that high philosophy which, whether learnt in the schools or from life, has consoled the noblest of our kind in prisons, and on scaffolds, and under every persecution of adverse fortune."

The fortitude of the Athenians was put toa still severer test in the following summer (430), when to the horrors of war (the Peloponnesians had again invaded Attica) were added the horrors of the plague, which spread havoc in the crowded city. Pericles himself escaped the scourge,* but many of his relations and best friends, amongst them his sister and his two sons Xanthippus and Paralus, were struck down. With the elder of his sons, Xanthippus, a worthless young man, the father had been on bad terms, but the death of his surviving son, at an interval of a few days, affected him deeply, and, when he came to lay the wreath upon the corpse, though he struggled hard to maintain his habitual calm, he broke down, and for the first time in his public life burst into a passion of weeping." But neither private grief nor public calamity shook for a moment the lofty courage and resolution with which he continued to the last to oppose a firm front alike to enemies without and to cravens within. While refusing as before to

3 The speech of Demosthenes "On the Crown."

4 Plutarch, admitting that Pericles was not attacked by the plague in its acute form, believes that it so far affected him as to throw him into a lingering decline. But we do not gather from Thucydides's description of the plague that it ever had this effect.

5 Not inconsistent with this are the accounts of the general fortitude with which he bore his bereavement (Plut., Consol. ad Apoll., 33 ; #lian, Var. Hist., ix. 6; Val. Max., v. 10).

to devastate at pleasure, he led in person a powerful fleet against Peloponnesus, ravaged the coast, and destroyed the town of Prasie in Laconia. But the Athenians were greatly disheartened ; they sued for peace, and when their suit was rejected by Sparta they vented their ill-humour on Pericles, as the author of the war, by subjecting him to a fine. However, they soon repented of this burst of petulance, and atoned for it by re-electing him general? and placing the government once more in his hands. Further, they allowed him to legitimate his son by Aspasia, that his house might not be without an heir. He survived this reconciliation about a year, but his name is not again mentioned in connexion with public affairs. In the autumn of 429 he died. We may well believe that the philosophy which had been the recreation of his happier days supported and consoled him in the clouded evening of his life. To his clement nature it was a peculiar consolation to reflect that he had never carried political differences to the shed- ding of blood. Indeed, his extraordinary, almost fatherly, tenderness for the life of every Athenian citizen is attested by various of his sayings? On his deathbed, when the friends about him were telling his long roll of glory, rous- ing himself from a lethargy into which he had fallen, he reminded them of his fairest title to honour: ‘‘ No Athenian,” he said, “ever put on black through me.”

He was buried amongst the great dead in the Ceramicus, and in after years Phormio, Thrasybulus, and Chabrias slept beside him.* In person he was graceful and well made, save for an unusual height of head, which the comic poets were never weary of ridiculing. In the busts of him which we possess, his regular features, with the straight Greek nose and full lips, still preserve an expression of Olympian repose.

The chief, perhaps the only trustworthy, authority for the life of Pericles is the history of his contemporary Thucydides. The bio- graphy by Plutarch is compiled from Thucydides, Ephorus, Ion, Stesimbrotus, Duris of Samos, Aristotle, Idomeneus, Aschines, and Heraclides Ponticus, together with the

comic poets Cratinus, Teleclides, Hermippus, Plato, Eupolis, and Aristophanes. Ephorus, a pupil of Isocrates, must have had plenty of means of ascertaining the facts, but how little his judgment is to be trusted is shown by his account of the origin of the Peloponnesian War,—an account also followed by Diodorus Siculus, whose history adds nothing of importance to the narratives of Thucydides and Plutarch. [on and Stesimbrotus were contemporaries of Pericles, but, as both were admirers of Cimon and opposed to the policy of Pericles, their accounts have to be received with caution. (J. G. FR.)

PERIDOTE, a name applied by jewellers to the green transparent varieties of olivine. When yellow, or yellowish- green, the stone is generally known as "'chrysolite." The colour of the peridote is never vivid, like that of emerald, but is usually some shade of olive-, pistachio-, or leek-green. Although sometimes cut in rose-forms and en cabochon, the stone displays its colour most advantageously when it is worked in small steps. Unfortunately the peridote is the very softest of gem-stones, its hardness being only about 6°5, or but little above that of glass; hence the stone, when polished, rapidly loses its lustre, and readily suffers abrasion by wear. There is considerable difficulty in polishing the peridote ; the final touch is given on a copper wheel moistened with sulphuric acid, yet, curiously enough, the mineral is soluble in this medium. The peridote is a silicate of magnesium and iron, having a specific gravity of about 3:4, and crystallizing in the orthorhombic system (see fig. 468, Minzratocey, vol. xvi. p. 410). Good crystals,

- There were ten generals at Athens annually elected by the votes of the people. They seem to have had civil as well as military duties, and the importance of the office must have increased in proportion to

the degradation of the offices which were filled by lot. After the ostracism of Thucydides Pericles was elected to the office again and again.

= Plut., Per., 18, 33, 88; Reg. et imp. Apoph. ; Precept. ger. Reip., xvii. 4.

3 Pausan., i. 29, 3; ep. Cic., De Fin., v. 2.

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however, are extremely rare, the mineral being usually found as rolled fragments. The localities for peridote and chrysolite are Egypt, Ceylon, Pegu, and Brazil, while the dull varieties of olivine enjoy a world-wide distribution in various eruptive rocks and in serpentine. Olivine is found also in meteorites.

There can be little doubt that the ancient "‘ topazion" was our peridote or chrysolite, and that the mineral now called topaz was unknown to ancient and medieval writers, The earliest mention of the word "peridote" is said to occur in the Wardrobe Book of 27 Edward I., where, among the jewels of the bishop of Bath and Wells which had escheated to the crown, mention is made of "unus annulus auri cum pereditis." The origin of the word has given rise to much speculation, some authorities deriving it from wepidords, "a-wager," and others from zepideros, "banded," while others, again, refer it toan Arabic origin.

For the history of the stone see King's Natural History, Ancient and Modern, of Precious Stones, 1865.

PERIGORD, an old province of France which formed part of the military government of Guienne and Gascony, and was bounded N. by Angoumois, E. by Limousin and Quercy, S. by Agenais and Bazadais, and W. by Bordelais and Saintonge. It is now represented by Dordogne and part of Lot-et-Garonne. The capital was PhRIGUEUX (¢.v.).

PERIGUEUX, formerly capital of Périgord, now chief town of the department of the Dordogne, France, situated on the slope of an eminence commanding the right bank of the Isle, one of the tributaries of the Dordogne. It is 310 miles by rail south-south-west of Paris and 79 miles east-north-east of Bordeaux. Périgueux is divided into three distinct parts. In tle middle, on the slope of the hill, is the town of the Middle Ages, with narrow, crooked, and dirty streets, above which rises the cathedral of St Front ; higher up comes the modern town, its houses separated by gardens and public walks; and at the foot of the hill and lying along the Isle are small houses of modern con- struction, built on the fine ruins of the Roman town. Three bridges connect Périgueux with the left bank of the Isle, where stood Vesunna, the capital of the Petrocorii. Hardly a trace of this old Gallic oppidum remains, but not far off, on the Plateau de la Boissiére, the rampart

of the old Roman camp, 1970 feet long and half as wide, is still to be recognized. On the right bank of the Isle, in the Roman city, there have been discovered some baths of the 1st or 2d century, which had a frontage of 200 feet, and were supplied by an aqueduct 4 miles long, which spanned the Isle. In several places numerous mosaics have been found, some of which have been placed in the museum. A circular building, called the ‘‘ Tower of Vesunna,” 68 feet in diameter and 89 feet in height, stands at what was formerly the centre of the city, where all the chief streets met. It is believed to have been originally the cella or main part of a temple, of which the peristyle has disappeared, prob- ably dedicated to the tutelary deities of Vesunna. Of the amphitheatre there still remain huge fragments of wall built of pebbles and cement, staircases, vomitories, and partly uncovered vaults. The building, which held 40,000 spectators, had a diameter of 1312 feet, that of the arena being 876 feet; judging from its construction it must be as old as the 3d or even the 2d century. The counts of Périgueux used it for their chateau, and lived in it from the 12th to the end of the 14th century. In 1644 it was given over by the town to the Order of the Visitation, and the sisters took from it the stones required for the con- struction of their nunnery. At present it is private pro- perty. The most remarkable, however, of the ruins of old Vesunna is the Chateau Barriére. It rests on stones of great size, and dates in part from a very remote period. Two towers date from the 3d or 4th century, and formed part

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of the fortified enceinte ; the highest tower is of the 10th century ; and the part now inhabited is of the 11th or 12th century, and was formerly used as a burial chapel. The bulk of the chateau is of the 12th, and some of the windows of the 16th century. Lastly, there are still to be traced the two tiers of wall of the enceinte, built round the city in the 5th century; but these are partly hidden by restorations of a later date. Numerous courses of stone are also to be seen, shafts of columns, and marbles of various shapes and sizes. Of the medieval town the feature most worthy of notice is the cathedral of St Front, which is indeed (or rather was) one of the most interesting of

sacred buildings. It bears a striking resemblance to the Byzantine churches and to St Mark's at Venice, and was built from 984 to 1047, contemporaneously with the latter (977-1085). It consists of five great cupolas, arranged in the form of a Greek cross, and conspicuous from the outside. The arms of the crass are 69 feet in width, and the whole is 184 feet long. 'These cupolas, 89 feet high from the keystone to the ground, and supported on a vaulted roof with pointed arches after the manner characteristic of Byzantine architecture, served as models for many other churches in Aquitania; thus St Front is entitled to a prominent place in the history of art. The pointed arches imitated from it prepared the way for the introduction of the Gothic style. The restoration of the edifice, begun in 1865, resulted, unfortunately, in an almost complete reconstruction, in which the old features have been largely lost. The belfry of St Front is the only one in the Byzantine style now extant ; it dates from the 11th century, and is composed of two massive cubes, placed the one above the other in retreat, with a circular colonnade surmounted by a dome. The interior of the church has a fine altar-screen of carved oak. Near St Front are the ruins of the old basilica built in the 6th century. The bishop's palace, in the grounds of the ancient abbey, has a curious subterranean cloister of the 12th, 13th, and 14th centuries. Périgueux has several old and curious houses of the medizval and Renaissance periods ; a large prefecture of some architectural merit, built at great expense a few years ago in the style of the Renaissance

and of the 18th century; a museum which is singularly rich in Roman, Frank, Egyptian, and pre-Celtic antiquities ; and a library of 30,000 volumes. In the squares are statues of Montaigne, Fénelon, General Daumesnil, the defender of Vincennes (1814-15), and Marshal Bugeaud. The town has iron and copper foundries, serge and bom- basin factories, tanneries, and dye-works. It does a large

trade in flour, wine, brandy, 'hides, poultry, and in the

celebrated patés du Périgord. It is the junction of the railway from Paris to Agen with that from Bordeaux to Lyons wa Clermont. The population in 1881 was

25,036.

Vesunna, as has already been said, was the capital of the Petrocorii, allies of Vercingetorix when Cesar invaded Gaul. The country was afterwards occupied by the Romans, who built a second city of Vesunna on the right bank of the Isle opposite the site of the Gallic oppidum. It contained public buildings, and Roman roads led from it to Limoges, Agen, Bordeaux, and Saintes. The barbarian invasion brought this prosperity to a close. In the 6th century St Front preached Christianity here, and over his tomb there was raised in the 10th century an abbey, which became the centre of the new town, called Puy St Front. The latter soon began to rival the old city in importance, and it was not until 1269 that they were united by asolemn treaty. After the time of Charlemagne Périgord was governed by a line of counts. During the Hundred Years' War Périgueux was twice attacked by the English, who took the forti- fied town in 1356 ; and the town was ceded to them by the treaty of 'Bretigny, but returned to the French crown in the reign of Charles V. 'The county passed by marriage into the hands of Anthony of Bourbon, father of Henry IV., and was converted by the latter into royal domain. During the Huguenot wars Périgueux was frequently a Calvinist stronghold, and it also suffered during the troubles of the Fronde.

PERINTHUS, a town of Thrace, on the Propontis, 22 miles to the west of Selymbria, strongly situated on a small peninsula on the Bay of Perinthus, on the site of the modern Eski Eregli. It is said to have been a Samian colony, and to have been founded about 599 B.c. Accord- ing to Tzetzes, its original name was Mygdonia ; later it was called Heraclea (Heraclea Thracize, Heraclea Perinthus). It figures in history chiefly by its stubborn and success- ful resistance to Philip of Macedon in 340, at which period it seems to have been even more important than Byzantium itself. A number of extant coins of Perinthus show that it was the seat of large and celebrated festivals.

BHRIGDICALS

ERIODICALS may be broadly divided into two classes, the one chiefly devoted to general literature, apart from political and social news (a subject dealt with under the heading of Newspapers), and the other more exclusively to science and art, or to particular branches of knowledge or

trade. The former class, and those of general interest only, will be principally dealt with in this article, where an endeavour is made to trace briefly the history of the rise and progress of that vast and increasing body of printed matter which, under the different names of re- views, magazines, &c., forms so large a part of current literature.

BRITISH. The first literary periodical in English was the MJercurvus

(1680), a mere catalogue, followed by Weekly Memorials for the Ingenious (16th January 1681/82 to 15th January 1683), which was more of the type of the Jowrnal des Savants, whence it borrowed many contributions, and by the Bibliotheque Universelle et Historique (January 1 686-93), begun by Jean Leclerc, continued with the assistance of J. de la Crose, and carried on during the last six years of its existence by J. Bernard. Of the History of Learning (1691; another with the same title in 1694) only a few

numbers appeared, as the conductor, De la Crose, started the Works of the Learned (August 1691 to April 1692), devoted principally to Continental scholarship. The Com- pleat Library (1692 to December 1693) was aventureof John Dunton; the Memoirs for the Ingenious (1693) ran to six monthly numbers, and another with the same title appeared in the following year, only to enjoy an equally brief career. The first periodical of merit and influence was the History of the Works of the Learned (1699-1712), largely consisting of descriptions of foreign books. The Jemours of Litera- ture, the first English review consisting entirely of original matter, published in London from 1710 to 1714, had for editor Michel de la Roche, a French Protestant refugee, who also edited at Amsterdam the Bibliotheque Anglorse (1717-19), and subsequently Mémoires Inttéraires de la Grande Bretagne (1720-24). Returning to England in 1725, he recommenced his New Memoirs of Literature (1725-28), and in 1730 a Literary Journal. Dr Samuel Jebb started Bibliotheca Literaria (1722-24), which dealt with medals and antiquities as well as with literature, but only ten numbers appeared. The Present State of the Republick of Letters was commenced by Andrew Reid in January 1728, and completed in December 1736. It contained not only excellent reviews of English books but papers from the works of foreigners, and, as well as the Historia Lnterarva

(1730-34) of Archibald Bower,! was very successful. The Bee (1733-34) of the unfortunate Eustace Budgell, and the Literary Magazine (1735-36), with which Ephraim Chambers had much to do, were very short-lived. In 1737 the History of the Works of the Learned appeared again, and was continued without intermission until 1743, when its place was taken by A Literary Journal (Dublin, 1744-49), the first review published in Ireland. The Afusewm (1746) of R. Dodsley united the character of a review of books with that of a literary magazine. Although England can show nothing like the Journal des Savants, which has flourished almost without a break for 220 years, a nearly complete series of reviews of English literature may be made up from 1681 to the present day.

After the close of the first quarter of the 18th century the literary journal began to assume more of the style of the modern review, and in 1749 the title and the chief features were united in the Monthly Review, established by Ralph Griffiths,? who conducted it until 1803, whence it was edited by his son down to 1825. It came to an end in 1845. From its commencement the Rewew dealt with science and literature, as well as with literary criticism. It was Whig in politics and Nonconformist in theology. The Tory party and the established church were defended in the Critical Review (1756-1817), founded by Archibald Hamilton and supported by Smollett, Johnson, and Robert- son. Johnson took a considerable part in the Lzterary Magazine (1756-58). The reviews rapidly increased in number towards the end of the century. Among the prin- cipal were the London Review (1775-80), A New Renew (1782-86), the English Renew (1783-96), incorporated in 1797 with the Analytical Review (1788-99), the Anti- Jacobin Review and Magazine (1798-1821), and the British Critic (1793-1843), the organ of the High Church party, and first edited by Archdeacon Nares and Beloe.

These periodicals had now become extremely numerous, and many of the leadmg London publishers found it con- venient to maintain their own particular organs. It is not a matter of surprise, therefore, that the authority of the reviews should have fallen somewhat in public estima- tion. The time was ripe for one which should be quite independent of the booksellers, and which should also aim at a higher standard of excellence. As far back as 1755

Quarter- Adam Smith, Blair, and others had endeavoured to carry

lies.

on such a quarterly without achieving success, and in 1773 Gilbert Stuart and William Smellie issued during three years an Hdinburgh Magazine and Review. To the northern capital is also due the first high-class critical journal which has kept up its reputation to the present day. The Hdin- burgh Renew was established in 1802 by Jeffrey, Scott, Horner, Brougham, and Sydney Smith. It created a new era in periodical criticism, and assumed from the com- mencement a wider range and more elevated tone than any of its predecessors. The first editor was Sydney Smith, then Jeffrey for many years, and afterwards Macvey Napier. At one time 20,000 copies are said to have been published, but the circulation declined in 1832 to less than 9000. Scott, being dissatisfied with the new review, persuaded John Murray to start its brilliant Tory competitor, the Quarterly Review (1809), first edited by William Gifford, then by Sir J. T. Coleridge, and subsequently by J. G. Lockhart. The Westminster Review (1824), established by the disciples of Jeremy Bentham, advocated radical reforms

- Archibald Bower (1686-1766) was educated at Douai, and be- came a Jesuit. He subsequently professed himself a convert to the Anglican Church, and published a number of works, but was more esteemed for his ability than for his moral character.

“ The biographers of Goldsmith have made us familiar with the

name of Griffiths, the prosperous publisher, with his diploma of LL.D.

granted by an American university, and with the quarrels between him and the poet.

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in church, state, and legislation. In 1836 it was joined to the London Review (1829), founded by Sir William Molesworth, and then bore the name of the London and Westminster Review till 1851, when it returned ‘to the original title. The other quarterly reviews are the Hclectic Review

(1805-68), edited down to 1834 by Josiah Conder and supported by the Dissenters; the British Review (1811- 25); the Christian Remembrancer (1819-68) ; the Retro- spective Review (1820-26, 1828, 1853-54), for old books; the Foreign Quarterly Review (1827-46), afterwards incor- porated with the Westminster; the Foragn Review (1828- 29); the Dublin Review (1836), still continued as the organ of the Roman Catholics ; the Foreign and Colonial Quar- terly Review (1843-47) ; the Prospective Review (1845-55), given up to theology and literature, previously the Christian Teacher (1835-44); the North British Renew (1844-71) ; the British Quarterly Review (1845), successor to the British and Foreign Renew (1835-44) ; the New Quarterly Review (1852-61); the Scottish Rewew (1853-62), published at Glasgow; the Wesleyan London Quarterly Review (1853); the National Renew (1855-64); the Diplomatic Review (1855-81); the Lrish Quarterly Review (1851-59), brought out in Dublin; the Home and Foreign Review (1862-64); the Fine Arts Quarterly Review (1863-65); the New Quar- terly Magazine (1873-80); the Catholic Union Review (1863-74) ; the Anglican Church Quarterly Review (1875) ; Mind (1876), dealing with mental philosophy ; the Modern Review (1880) ; and the Scottish Review (1882).

The monthly reviews include the Christian Observer Month. (1802-57), conducted by members of the established church lies. upon evangelical principles, with Zachary Macaulay as the first editor ; and the Monthly Repository (1806-37), origin- ally purely theological, but after coming into the hands of the Rev. W. J. Fox made entirely literary and political. The Fortnightly Review (1865) was intended as a kind of English Revue des Deux Mondes. Since 1866 it has appeared monthly. The Contemporary Renew (1866) and the Nineteenth Century (1877) are similar in character, consisting of signed articles by men of mark of all opinions upon questions of the day. The National Review (1883) was brought out to supply the demand for an exclusively Conservative review, and Modern Thought (1879) for the free discussion of political, religious, and social subjects.

The weekly reviews dealing generally with literature, Week- science, and art are the Literary Gazette (1817-62), first lies. edited by William Jerdan, which had for many years a circu- lation of 6000 copies; the Athenzum (1828), established by Silk Buckingham, but which was not very success-

ful until it was taken over by C. W. Dilke; and the Academy (1869), founded, and at first edited, by Dr Appleton. Those which also include political and social topics are the Examiner (1808-81), the Spectator (1828), the Saturday Review (1855), and the Chronicle (1867-68).

The reviews in the Academy are signed.

Soon after the introduction of the literary journal in England, one of a more familiar tone was started by the eccentric John Dunton inthe Athenian Gazette, or Casuistical Mercury, resolving all the most Nice and Curious Questions (1689/90 to 1695/96), a kind of forerunner of Motes and Queries, being a penny weekly sheet, with a quarterly critical supplement. In the last part the publisher an- nounces that it will be continued “as soon as ever the glut of news is a little over.” Defoe’s Review (1704-13) dealt chiefly with politics and commerce, but the introduction in it of what its editor fittingly termed the “scandalous club” was another step nearer the papers of Steele and the periodical essayists, the first attempts to create an organized popular opinion in matters of taste and manners. . These little papers, rapidly thrown off for a temporary purpose, were destined to forma very important part of

itler,

‘one half bearing colourable imitations of the title.

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the literature of the 18th century, and in some respects its most marked feature. Although the frequenters of the clubs and coffee-houses were the persons for whom the essay-papers were mainly written, a proof of the increas- ing refinement of the age is to be found in the fact that now for the first time were women specially addressed as part of the reading public. The Zatler was commenced by Richard Steele in 1709, and issued thrice a week until 1711. The idea was at once extremely popular, and a dozen similar papers were started within the year, at least Addi- gon contributed to the Tatler, and together with Steele established and carried on the Spectator (1710-14), and subsequently the Guardian (1713). The newspaper tax enforced in 1712 was a sore blow. Before this time the daily issue of the Spectator had reached 3000 copies ; it then fell to 1600; the price was raised

from a penny to twopence, but the paper came to an end in 1714, Dr Drake (Essays illustr. of the Rambler, &c., ii. 490) drew up an imperfect list of the essayists, and reckoned that from the Zatler to Johnson's Rambler, during a period of forty-one years, 106 papers of this description were pub- lished. Dr Drake continued the list down to 1809, and described altogether 221 which had appeared within a hundred years. The following is a list of the most con- siderable, with their dates, founders, and chief contri- butors.

Tatler (12th April 1709 to 2d January 1710/11), Steele, Addison, Swift, Hughes, &c. ; Spectator (Ist March 1710/11 to 20th December 1714), Addison, Steele, Budgell, Hughes, Grove, Pope, Parnell, Swift, &e.; Guardian (12th March 1713 to Ist October 1713), Steele, Addison, Berkeley, Pope, Tickell, Budgell, &c. ; Rambler (20th March 1750 to 14th March 1752), Johnson ; Adventurer (7th No- vember 1752 to 9th March 1754), Hawkesworth, Johnson, Bathurst, Warton, Chaponc; World (4th January 1753 to 30th December 1756), E. Moore, earl of Chesterfield, R. O. Cambridge, earl of Orford, Soame Jenyns, &c. ; Connoisseur (31st January 1754 to 30th Sep- tember 1756), Colman, Thornton, Warton, earl of Cork, &c. ; Idler (15th April 1758 to 5th April 1760), Johnson, Sir J. Reynolds, and Bennet Langton ; Bee (6th October 1759 to 24th November 1759), O. Goldsmith ; Mirror (23d January 1779 to 27th May 1780), Mackenzie, Craig, Abercromby, Home, Bannatyne, &c. ; Lownger, (5th February 1785 to 6th January 1787), Mackenzie, Craig, Aber- cromby, Tytler ; Observer (1785 to 1790), Cumberland ; Looker-on (10th March 1792 to 1st February 1794), W. Roberts, Beresford, Chalmers.

As from the "pamphlet of news" arose the weekly paper wholly devoted to the circulation of news, so from the general newspaper was specialized the weekly or monthly review of literature, antiquities, and_ science, which, when it included essay-papers, made up the maga- zine or miscellaneous repository of matter for information and amusement. Several monthly publications had come into existence since 1681, but perhaps the first germ of the magazine is to be found in the Gentleman's Journal (1691-94) of Peter Motteux, which, besides the news of the month, contained miscellaneous prose and poetry. In 1722 Dr Samuel Jebb included antiquarian notices as well as literary reviews in his Bibliotheca Literaria (1722-24), but the Gentleman's Magazine, founded in 1731, fully

established, through the tact and energy of the publisher Edward Cave, the type of the magazine, from that time so marked a feature of English periodical literature. This magazine, so long a source of fortune to its successive

owners, was vainly offered during four years to different

publishers before Cave was able to start it himself. The first idea is due to Motteux, from whom the title, motto, and general plan were borrowed. The chief feature in the newventure at first consisted of the analysis of the journals, which Cave undertook personally. Prizes were offered for poetry. In April 1732 the leading metropolitan publishers, jealous of the interloper Cave, started the London Maga- zine, or Gentleman's Monthly Intelligencer (1732-84), which

had a long and prosperous career. The new magazine closely copied Cave's title, plan, and aspect, and bitter war was long waged between the two. The rivalry was not without benefit to the literary public, as the conductors of each used every effort to improve their own review. Cave introduced the practice of giving engravings, maps, and portraits, but his greatest success was the addition of Johnson to the regular staff. This took place in 1738, when the latter wrote the preface to the volume for that year, observing that the magazine had "given rise to almost twenty imitations of it, which are either all dead or very little regarded." The plan was also imitated in Denmark, Sweden, and Germany. Cave edited his magazine down to his death in 1754, when it was continued by his brother- in-law David Henry, afterwards by John Nichols and his son. The specially antiquarian and historical features were dropped in 1868, and it was changed to a miscellany of light literature.

Many other magazines were produced in consequence of the success of these two. It will be sufficient to mention the following. The Scots Magazine (1739-1817) was the first published in Scotland; from 1817 to 1826 it was styled the Hdinburgh Magazine. The Universal Magazine (1747) had a short, if brilliant, career; but the Luropean Magazine, founded by James Perry in 1782, lasted down to 1826. Of more importance than

these, or than the Royal Magazine (1759-71), was the Monthly Magazine (1796- 1843), with which Priestley and Godwin were originally connected. During thirty years the Jfonthly was con- ducted by Sir Richard Phillips, under whom it became more statistical and scientific than literary. Class maga- zines were represented by the Edinburgh Yarmer's Maga- zine (1800-25) and the Philosophical Magazine (1798), established in London by Alexander Tilloch ; the latter at first consisted chiefly of translations of scientific articles from the French. The following periodicals, all of which date from the 18th century, are still published :—the Gentleman's Magazine (1731), the Gospel Magazine (1768), Wesleyan Methodist Magazine (1778), Curtis's Botanical Magazine (1786), Evangelical Magazine (1793), Methodist New Connexion Magazine (1797), Philosophical Magazine

Ags). a increased influence of this class of periodical upon the public opinion of our own era was first apparent in Blackwood's Edinburgh Magazine, founded in 1817 by the publisher of that name, and carried to a high degree of excellence by the contributions of Scott, Lockhart, Hogg, Maginn, Syme, and John Wilson, the editor. It is still issued, and has always remained Liberal in literature and Conservative in politics. The New Monthly Magazine is somewhat earlier in date. It was founded in 1814 by the London publisher Colburn, and was edited in turns by Campbell, Theodore Hook, Bulwer Lytton, and Ainsworth. Many of Carlyle's and Thackeray's pieces first appeared in Fraser's Magazine (1830), long famous for its personalities and its gallery of literary portraits. The Metropolitan Magazine was started in opposition to Fraser, and was first edited by Campbell, who had left its rival. It subsequently came into the hands of Captain Marryatt, who printed in it many of his sea-tales. The British Magazine (1832-49) included religious and ecclesiastical information. From Treland came the Dublin University Magazine (1833). The regular price of these magazines was half a crown; the first of the cheaper ones was Yait's Edinburgh Magazine (1832-61) at a shilling. It was Radical in politics, and had Roebuck as one of its founders, Bentley's Miscellany (1837-68) was exclusively devoted to novels, light liter- ature, and travels. Several of Ainsworth's romances, illustrated by Cruikshank, first saw the light in Bentley. The Nautical Magazne (1832) was addressed specially to XVIII.

Cheap publica- tions.

Statis- tics.

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sailors, and Colburn's United Service Journal (1829) to both services. The Asiatic Journal (1816) dealt with Oriental subjects.

From 1815 to 1820 a number of low-priced and unwhole- some periodicals flourished. The Mirror (1823-49), a two- penny illustrated magazine, begun by John Limbird,' and the Mechanics Magazine (1823) were steps in a better direction. The political agitation of 1831 led to a further popular demand, and a supply of cheap and healthy serials for the reading multitude commenced with Chambers's Edinburgh Journal (1832), the Penny Magazine (1832-45) of Charles Knight, issued under the patronage of the Society for the Diffusion of Useful Knowledge, and the Saturday Magazine (1832-44), begun by the Society for Promoting Christian Knowledge. The first was published at 1}d. and the last two at 1d. Knight secured the best authors and artists of the day to write for and illustrate his magazine, which, though at first a commercial success, may have had the reason of its subsequent discontinuance in its literary excellence. At the end of 1832 it had reached a sale of 200,000 in weekly numbers and monthly parts. It came to an end in 1845 and was succeeded by Knight's Penny Magazine (1845), which was stopped after six monthly parts. These periodicals were followed by a number of penny weeklies of a lower tone, such as the Family Herald (1848), the London Journal (1845), and Lloyd's Miscellany ; the two former are still thriving. In 1850 the sale of the first of them was placed at 175,000 copies, the second at 170,000, and Lloyd's at 95,000. In 1846 fourteen penny and three halfpenny magazines, twelve social journals, and thirty-seven book-serials were produced every week in London. A further and permanent improvement in cheap weeklies for home reading may be traced from the foundation of Howittt's Journal (1847-49), and more especially Household Words (1850), conducted by Charles Dickens, All the Year Round (1859), by the same editor, and afterwards by his son, Once a Week (1859), and the Leisure Hour (1852). The plan of Wotes and Queries (1849), for the purpose of intercommunication among those interested in special points of literary and anti- quarian character, has led to

the adoption of similar depart- ments in a great number of newspapers and periodicals, and, besides several imitators in England, there are now parallel journals in Holland, France, and Italy.

Recent shilling monthlies began with Jfacmillan (1859), the Cornhill (1860), and Temple Bar (1860). The Corn- hill, first edited by Thackeray, was known for its specially literary tone down to 1883. St James's Magazine (1861), Belgravia (1866), St Paul's (1867-74), London Society (1862), and Zinsley's (1867) are devoted chiefly to novels and light reading. The sixpenny illustrated magazines commenced with Good Words (1860) and the Quiver (1861), both religious in tendency. In 1882 Fraser changed its name to Longman's Magazine, and was entirely popularized and reduced to sixpence. The Cornhill followed the same example in 1883, reducing its price to sixpence and devot- ing its pages to light reading. The Hnglish Illustrated Magazne (1883) was brought out in competition with the American [/arper and Century. Of the artistic period- icals we may signalize the Art Journal (1849), long known for its line engravings, the Portfolio (1870), which has done much to popularize etching, and the Magazine of Art (1878).

The following statistics furnish an idea of the marvel- lous increase in the number of periodicals issued at different times during the last fifty years. In figures submitted

1 John Limbird, to whom even before Chambers or Knight is due the carrying out the idea of a cheap and good periodical for the people, died so recently as 31st October 1883, without having achieved the worldly prosperity of his two followers.

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to the House of Commons in 1864 Sir Edward Baines estimated the circulation of the monthly magazines in 1831 at no more than 125,000 copies; when he spoke the number had increased to 3,609,350. The weeklies might be reckoned in 1831 at about equal to the monthlies in circulation, and the miscellanéous serials at 120,000, amounting altogether to 420,000 copies. In 1864 the circulation of weeklies and monthlies reached a total of 6,094,950 (Journal of Statist. Soc., 1864, pp. 410-412),

Concurrently with this increase in the whole number pub- lished there may be observed an equally regular decrease in the average cost of each. In 1831 there were issued in London alone 177 monthlies, costing £17, 12s. 6d., or an average of 2s. apiece. At the end of 1833 there were 236 of the same class, costing £23, 3s. 6d., and the average price had decreased to 1s. 114d. Twenty years later, in 1853, there were 362 monthlies, costing £14, 17s. 6d., the average cost of each being now only 94d. (Knight's Old Printer and Modern Press, 263).

In London itself the increase of the weeklies, monthlies, and quarterlies at different periods has been as follows :—

Weekly. Monthly. Quarterly. Total. |

1833 21 236 25 282 1837 50 136 84 220 1844 60 227 38 325

1853 y 56 % 862 50 468 Included in 1863 Ba t 458 75 528 | 1874 50 462 84 596

1884 110 669 126 905

Extending the inquiry to the whole of the United Kingdom, and including every description of periodical, with the exception of annuals and newspapers, May's British and Irish Press Guide for the years 1874 and 1884 supplies this comparison :—

1874. | 1884. | 1874. | 1884.

IMetrGpOls….. ec… ne 541 fiddle |W aiillivansni cre cree steers net 1 12 Pe sie esenacersvern see 66 154 || Three timesa week….] .. 2 RVVAOS: 3s. sicaisneievese crane 15 26 I" Weellliy: fs cccoe vs o0.c.0 cs 53 114 SCO UUaTN rere elaine

Total….| 662 | 1041 || Half-yearly ……..... 4 16

Hameomlar aie ees cies. 28 47

Motalls.,.|) G62 1041

The chief classes into which the same periodicals may be divided are :—

Religious. Illustrated. Juvenile. Trade-organs. 1863 196 ye rs

1874 297 175 59 64 1884 350 333 100 137

Among the different periodicals issued in 1884 there were also 73 advocating temperance, 28 devoted to agri- culture, 57 family magazines, 31 financial, 15 insurance, 18 medical, 7 secularist, 9 tailoring, and 7 bicycling.

Indexes to English Periodicals.—Lists of the separate indexes to particular series are given in H. B. Wheatley's What ts an Index? 1879, and List of Bibliographies in the Reading Room of the British Musewm, 1881. The valuable and elaborate work of W. F. Poole, Index to Periodical Lit., Boston (Massachusetts), 1882, supplies an exhaustive alphabetical index to the titles of articles in 6205 volumes of Enghsh and American serials of the present century. Monthly supplements appear in the Library Journal.

Authorities.—'* Periodicals," in the British Museum catalogue ; Lowndes, Bibliographer's Manual, by Hy. G. Bohn, 1864; Cat. of Periodicals in the Bodl. Lib., part i., '' English Periodicals," 1878; Cat. of the Hope Collection of Early News- papersand Essayists in the Bodl. Lib., 1865; Scudder, Cat. of Scientisic Serials, 1879 ; Andrews, Hist. of Brit. Journalism, 1859; Cucheyal Clarigny, Hist. de la Presse en Angleterre et aux Etats Unis, 1857; Madden, Hist. of Irish Period. Lit., 1867; J. Grant, The Great Metropolis, ii. pp. 229-327; '' Periodical Essays of the Age of Anne," in N. American Rev., xlvi.; Drake, Ussays on the '' Spectator," "Tatler," &c., 1810-14; Courthope, Addison (''Engl. Men of Letters"), 1884; '¢Forgotten Periodical Publications," in Notes and Queries, ser. iii., vol. ix. 58 5 " Account of Periodical Literary Journals from 1681] to 1749," by S. Parkes, in Quart. Journ. of Sc., Lit., &c., xiii. 36,289; 'Last Century Magazines," in Fraser's

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fii. 43, &e., iv. 211; Timperley, Ency. of Lit. Anec., 1842; C. Knight, The Old Printer and the Modern Press, 1854, and Passages of a Working Life, 1864-65; Memoir of Robert Chambers, 1872; The London Cat, of Periodicals, Newspapers, &c., 1844-84; Mitchell, Newspaper Press Directory, 1846-84; May, British and Irish Press Guide, 1874-84; The Bookseller, Feb. 1867, June and July 1868, Aug. 1874, J uly

1379.

India and the British Colonics.—The first Indian periodical was the Calcutta Monthly Register (1790), which lasted but a short time. A Calcutta Literary Gazette came out in 1830. In 1844 appeared the first number of the Calcutta Review (1844), whieh is still the most important serial of the Indian empire. The Bombay Quarterly Review was founded in 1855. Madras had a Journal of Literature and Science and the Oriental Magazine and Indian Hurkuru (1819). The Keligious and Theological Magazine was produced at Colombo in 1833. The Christian College Magazine was commenced in 1883. At Singapore the Journal of the Indian Archipelago appeared from 1847 to 1855. The Chinese Repository (1832), edited at Canton by Morrison, dealt with the farther East.

See ‘‘ Periodical Literature in India” in Dark Blue, 1872-73.

Hubbard (Newspaper Directory) estimates the existing periodicals (omitting newspapers) of British North Ameriea at 652.

The number of weekly, monthly, and quarterly publications of Australia, Tasmania, and New Zealand is placed by the same authority at 570. The Melbourne Review (1876) deserves special mention.

ForeEIcn.

France.—We owe the literary journal to France, where it soon attained to a degrce of importance unapproached in any other country. The first idea may be traced in the Bureau d’ Adresse of Théophraste Renaudot, giving the proceedings of his conferences upon literary and scientific matters (1633-42). About the year 1663 Mézeray obtained a privilege for a regular literary periodical, which came to nothing, and it was left to Denis de Sallo,

counsellor of the parliament of Paris and a man of rare merit and learning, to actually carry the projeet into effect. The first number of the Journal des Savants appeared on 5th Jannary 1665, under the assumed name of the sieur d'Hédouville. The prospectus promised to give an account of the chief books published throughout Europe, obituary notices, a review of the progress of science, besides legal and ecclesiastical information and other matters of interest to cul- tivated persons. The criticisms, however, wounded alike authors and the clergy, and the journal was suppressed after a carcer of three months. Colbert, seeing the public utility of such a periodical, ordered the abbé Gallois, a contributor of De Sallo's, to re-establish it, an event which took place on 4th January 1666. It lingered mine years under the new editor, who was replaced in 1675 by the abbé de la Roque, and the latter in his turn by the president Cousin in 1686. From 1701 commenced a new era for the Journal, which was then acquired by the chancellor de Pontchartrain for the state and placed under the direction of a commission of learned men. Just before the Revolution it developed fresh activity, but the troubles of 1792 caused it to be diseontinued until 1796, when it again failed to appear after twelve numbers had been issued. In 1816 it was definitively re-established and replaced under Government patronage, remaining subject to the chancellor or garde-des-sceaux until 1857, when it was transferred to the control of the minister of public instruction. The present organization much resembles that of an academy. The menibers of the commis- sion are elected, approved of by the minister, and divided into assistants and authors, the latter furnishing at least three articles per annum at a fixed and modest rate of payment. All communica-tions are discussed at fortnightly conferences.

Louis Auguste de Bourbon, sovereign prince of Dombes, having transferred his parliament to Trévoux, set up a printing press, and was persuaded by two Jesuits, Michel le Tellier and Philippe Lalle- man, to establish the Mémoires pour servir al' Histoire des Sciences et des Arts (1701-67), more familiarly known as the Journal de Trévoux, long the best-informed and best-written journal in France. One feature of its career was its constant appeal for the literary assistance of outsiders. It was continued in a more popular style as Journal des Sciences et des Beaux-Arts (1768-75) by the abbé Aubert and by the brothers Castilhon (1776-78), and as Journal de littérature, des Sciences, et des Arts (1779-82) by the abbé Grosier.

The first legal periodieal was the Journal du Palais (1672) of Blondeau and Guéret, and the first devoted to medicine the Vowvelles Découvertes dans toutes les Parties de la Médecine (1679) of Nicolas ue Blegny, frequently spoken of as a charlatan, a term which some- times means simply a man of many ideas. Religious periodicals date from 1680 and the Journal Ecclésiastique of the abbé de la Roque. The prototype of the historico-literary periodical may be discovered m La Clef du Cabinet des Princes de 0 Europe (1704-6), familiarly known as Journal de Verdun, and carricd on under various titles down to 1794. ,

Literary criticism was no more free than political discussion, and

no person was allowed to trespass either upon the domain of the Journal des Savants or that of the Mercure de France without the payment of heavy subsidies. This was the origin of the clandestine press of Holland, and it was that country whieh for the next hundred years supplied the ablest periodical criticism from the pens of French Protestant refugees. During that period thirty-one Journals of the first elass proceeded from these sources. From its commencement the Journal des Savants was pirated in Holland, and for ten years a kind of joint issue made up with the Journal des Trévoux appeared at Amsterdam. From 1764 to 1775 miscel- laneous articles from different French and English reviews were added to this reprint. Bayle, a born journalist and the most able critic of the day, conceived the plan of the Nowvelles de la Répub- lique des Lettres (1684-1718), which at once became entircly success- ful and obtained for him during the three years of his control the dictatorship of the world of letters. He was succeeded as editor by La Roque, Barrin, Bernard, and Leclere. Bayle's method was followed in an equally meritorious periodical, the Histoire des Ouvrages des Savants (1687-1704) of H. Basnage de Beauvyal. Another continuator of Bayle was Jean Leclere, one of the most learned and acute eritics of the 18th century, who carried on three reviews, the Bibliotheque Universelle et Historique (1686-93), the Bibliotheque Choisie (1703-18), and the Bibliotheque Ancienne et Aloderne (1714-27). They form one scrics, and, besides valuable estimates of new books, include original dissertations, articles, and biographies like our modern learned

magazines. The Journal Littéraire (1713-22, 1729-36) was founded by a society of young men, who made it a rule to discuss their contributions in com- mon. Specially devoted to English literature were the Bibliotheque Anglaise (1716-28), the Mémoires Littératres de la Grande Bretagne (1720-24), the Bibliotheque Britannique (1733-34), and the Journal Britannique (1750-57) of Maty,! who took for his prineiple, ‘‘ pour penser avec liberté il faut penser seul.” One of these Dutch- printed reviews was L’ Ewrope Savante (1718-20), founded chiefly by Themiseul de Saint-Hyacinthe, with the intention of plaeing each separate department under the care of aspecialist. The Bibliothéque Germanique (1720-40) was established by Jacques Lenfant to do for northern Europe what the Bibliotheque Britannique did for England. It was followed by the Nouvelle Bibliotheque Germanique (1746-59). The Bibliotheque Raisonnée des Ouvrages des Savants (1728-58) was supplementary to Leclerc, and was succeeded by the Bibliotheque des Scienees et des Beauaz-Arts (1754-80). Nearly all of the preced- ing were produced either at Amsterdam or Rotterdam, and, although out of place in a precise geographical arrangement, really belong to France by the close ties of language and of blood.

Taking up the exaet chronological order again, we find the success of the English essay-papers led to their prompt introduction to the Continent. An incomplete translation of the Syectator was published at Amsterdam in 1714, and many volumes of extracts from the Zatler, Spectator, and Guardian were issued in France early in the 18th century. Marivaux brought out a Syeetateur Lranceis (1722), which was coldly received ; it was followed by fourteen or fifteen others under the titles of La Spectatrice (1728- 30), Le Radoteur (1775), Le Babillard (1778-79), &c. Of a similar eharactcr was Le Pour et le Contre (1723-40) of the abbé Prévost, which contained anecdotes and criticism, with special reference to Great Britain. Throughout the 18th century, in France as in England, a favourite literary method was to write of social subjects under the assumed character of a foreigner, generally an Oriental, with the title of Turkish Spy, Lettres Chinoises, &c. These produc- tions were usually issned in periodical form, and, besides an immense amount of worthless tittle-tattle, contain some valuable matter.

During the first half of the eentury France has little of import- ance to show in periodical literature. The Nouvelles Keclésias- tiques (1728-1803) were first printed and circulated secretly by the Jansenists in opposition to the Constitution Unigenitus. The Jesuits retaliated with the Supplément des Nowvelles Lcclésiastiques (1734-48). The promising title may havc had something to do with the temporary success of the Mémoires Secrets de la République des Lettres (1744-48) of the marquis d'Argens. In the Observations sur les Eerits Modernes (1735-48) Desfontaines held the gates of Philistia for eight years against the Encyclopedists and even the redoubtable Voltaire himself. It was continued by the Jugements sur quelques Ouvrages nowveausz (1744-45). The name of Freron, perhaps the most vigorous enemy Voltaire ever encountered, was long connected with Lettres sur quelques Ecrits de ee Temps (1749- 54), followed by L' Année Littéraire (1754-90). Among the con- tributors of Fréron was another manufacturer of criticism, the abbe de la Porte, who, having quarrelled with his confrere, founded Observations sur la Littérature Moderne (1749-52) and L' Observateur Littéraire (1758-61). .; ;

A number of special organs came into existence about this period. The first treating of agriculture and domestic economy was the Journal Econoniyue (1761-72); a Journal de Commerce was founded

1 Matthew Maty, M.D., born in Holland, 1718, died principal librarian of the British Museum, 1776. He settled in England in,1740, published several books, and wrote the preface to Gibbon's first work, Etude de la Littérature.

in 1759 ; periodical biography may be first seen in the Nécrologe des Hommes Célébres de Franee (1764-82); the political economists established the Ephémérides du Citoyen in 1765 ; the first Journal d' Education was founded in 1768, and the Courrier de la Afode in the same year; the theatre had its first organ in the Journal des Thédtres (1770); in the same year were produced a Journal de Musique and the Eneyclopédie Militaire; the sister service was supplied with a Jowrnal de Marine in 1778. We have already noticed several journals specially devoted to one or other foreign literature. It was left to Fréron, Grimm, Prévost, and others in 1754 to extend the idea to all foreign productions, and the Journal Etranger (1754-62) was founded

for this purpose. The Gazette Littéraire (1764-66), which had Voltaire, Diderot, and Saint- Lambert among its editors, was intended to swamp the small fry of criticism; the Jowrnal des Dames (1759-78) was of a light magazine class ; and the Journal de Monsieur (1776-83) had three phases of existence, and died after extending to thirty volumes. The Mémoires Secrets pour servir a UV Histoire de la République des Lettres (1762-87), better known as Mémoires de Bachawmont, from the name of their founder, furnish a minute account of the social and literary history for a period of twenty-six years. Of a similar character was the Correspondance Littéraire Secréte (1774-93), to which Métra was the chief contributor. JZ' Esprit des Journaux (1772-1818) forms an important literary and historical collection, which is rarely to be found complete.

The movement of ideas at the close of the century may best be traced in the Annales Politiques, Civiles, et Littéraires (1777-92) of Linguet. The Décade Philosophique (year V. or 1796/97), founded by Ginguené, is the first periodical of the magazine class which appeared after the storms of the Revolution. It was a kind of resurrection of good taste; under the empire it formed the sole refuge of the opposition. By a decree of 17th January 1800 the consulate reduced the number of Parisian journals to thirteen, of which the Déeade was oue; all the others, with the exception of those dealing solely with science, art, commerce, and advertise- ments, were suppressed. A report addressed to Bonaparte by Fiévée ! in the year XI. (1802/3) furnishes a list of fifty-one of these periodicals. In the year XIII. (1804/5) only seven non-political serials were permitted to appear.

Between 1815 and 1819 there was a constant struggle between freedom of thought on the one hand and the censure, the police, and the law-officers on the other. This oppression led to the device of ''semi-periodical" publications, of which Za Minerve Francaise (1818-20) is an instance. It was the Satire Meénippéc of the Restoration, and was brought out four times a year at irregular intervals. Of the same class was the Bibliotheque Historique (1818- 20), another anti-royalist organ. The censure was re-established in 1820 and abolished in 1828 with the monopoly. It has always seemed impossible to carry on successfully in France a review upon the lines of those which have become so nuinerous and important in England. The short-lived Revwe Francaise (1828-30), founded by Guizot, Rémusat,

De Broglie, and the doctrinaires, was an attempt in this direction. The well-known Revue des Dewx Mondes was established in 1829 by Ségur-Dupeyron and Mauroy, but it ceased to appear at the end of the year, and its actual existence dates from its acquisition in 1831 by Francois Buloz,? a masterful editor, under whose energetic management it soon achieved a world- wide reputation. The most distinguished names in French litera- ture have been among its contributors, for whom it has been styled the ‘‘ vestibule of the Academy.” It was preceded by a few months by the Revue de Paris (1829-45), founded by Veron, who introduced the novel to periodical literature. In 1834 this was purchased by 3uloz, and brought out concurrently with his other Revue. While the former was exclusively literary and artistic, the latter dealt more with philosophy. The Levue Indépendante (1841-48) was founded by Pierre Leroux, George Sand, and Viardot for the democracy. The times of the consulate and the empire were the subjects dealt with by the Revwe de I Empire (1842-48). In Le Correspondant (1843), established by Montalembert and De Falloux, the Catholics and Legitimists had a valuable supporter. The Revue Contemporaine (1852), founded by the comte de Belval as a royalist organ, had joined to it in 1856 the Athenzum Francais. The Revue Germanique (1858) exchanged its exclusive name and character in 1865 to the Revue Moderne. The Revue Huropéennc (1859) was at first subventioned like the Revue Contemporaine, from which it soon withdrew Government favour. The Revue Nationale (1860) appeared quarterly, and succeeded to the Magazin de Libraire (1858).

The list of current periodicals, to which should be added the

_1 The novelist and publicist Joseph Fiévée (1767-1839), known for his rela- tions with Napoleon I., has been made the subject for a study by Sainte-Beuve (Causeries, v. 172).

2 This remarkable man (1804-1877) began lifeasa shepherd. Educated through the charity of M. Naville, he came to Paris as a compositor, and by translating from the English earned sufficient to purchase the moribund Revue des Deux Mondes, which acquired its subsequent position in spite of the tyrannical editorial behaviour of the proprietor. M. Monod (Academy,

20th Jan. 1877) states that latterly Buloz enjoyed an income of 365,000 francs from the Revue.

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Revue des Deux Mondes and the Correspondant, include the following. Among those devoted to literature and criticism nay be mentioned the Revue Britannique (1825) ; the Revue Critique d' Histoire et de Littérature (1856), oue of the first of Kuropean weekly reviews ; Revue Politique et Littératre, saccessor to the Kevue des Cours Littér- aires (1863), also weekly ; Le Livre (1880), confined to bibliography and literary history, monthly ; and the Nowvelle Revue (1879), already a serious rival of the Revwe des Deux Mondes, which it resembles in character and mode of publication, although distinctly Republican in politics. History and archeology are represented by the Bibliotheque de U Ecole des Chartes (1839), which deals especially with the Middle Ages, and is published every two months; the Cabinet ITistorique (1855), a monthly, devoted to MSS. and un- published documents ; the Revwe Historique (1876), two-monthly ; and the monthly Revue Archéologique (1860). The fine arts are cared for by the Gazette des Beaux-Arts (1859), monthly, and L' Art (1875), published weekly. We may also mention the Revue Philosophique (1876), monthly, and Le Tour du Monde (1860), an illustrated weekly, consisting entirely of voyages and travels.

In 1883, apart from political newspapers, there were published in Paris 1379 periodicals of all kinds. They may be classified in the following order :—theology 96, jurisprudence 130, reviews 75, popular reading 169, history and geography 37, political economy and finance 248, science generally 26, mathematics 6, medicine 101, natural science 21, military 14, naval 12, fine arts 75, fashion 81, education 46, technology 137, agriculture 46, sport 24, miscellaneous 40.

Authorities. —The subject of French periodicals has been exhaustively treated in the valuable works of Eugene Hatin,—Histoire de la Presse en France, 1859-61, 8 vols. ; Les Gazettes de Hollande et la Presse Clandestine awx 17e et 18¢ Siecles, 1865 ; and Bibliographie de la Presse Périodique Francaise, 1866. See also Catalogue de ' Histoire de France, 1855-79, 11 vols. ; V. Gébé, Catalogue des Journaux, ctc., publiés & Paris, 1879; Brunet,

Manuel du Libraire, avec Supple- ment, 1860-80, 8 vols.; H. Le Soudier, Catalogue-tarif des Journaux, Revues, et

Publications ,Périodiques parus en Paris jusqu'en 1883, 1888; F. Mege, Les Journaus et Ecrits Périodiques de la Basse Auvergne, 1869.

Germany.—The earliest trace of the literary journal in Germany German)

is to be found 'in the Hrbauliche Monatsunterredungen (1663) of the poet Johann Rist and in the Miscellanea curiosa medico- physica (1670-1704) of the Academia nature curiosoruam Leopoldina-Caro- lina, the first scientific annual, uniting the features of the Journal des Savants and of the Philosophical Transactions. D.G. Morhof, the author of the well-known Polyhistor, conceived the idea of a monthly serial to be devoted to the history of modern books and learning, which came to nothing. While professor of morals at Leipsie, Otto Mencke planned the Acta Eruditorum, with a view to make known, by means of analyses, extracts, and reviews, the new works produced throughout Europe. In 1680 he travelled in England and Holland in order to obtain literary assistance, and the first number appeared in 1682, under the title of Acta Erudi- torum Lipsiensiwm, and, like its successors, was written in Latin. Among the contributors to subsequent numbers were Lcibnitz, Seckendorf, and Cellarius. A volume came out each year, with supplements. After editing about 30 volumes Mencke died, leaving the publication to his son, and the Acta remained in the possession of the family down to 1745, when they extended to 117 volumes, which form an extremely valuable history of the learning of the period. A selection of the dissertations and articles was published at Venice in 7 vols. 4to, 1740. The Acta soon had imitators. The Ephemerides Litterariz (1686) came out at Hamburg in Latin and French. The Nova Litteraria maris Balthici et Septentrionis (1698- 1708) was more especially devoted to north Germany and the univer- sities of Kiel, Rostock, and Dorpat. Supplementary to the preceding was the Nova Litteraria Germanie collecta Hamburgi (1703-9), which from 1707 widened its field of view to the whole of Europe. At Leip- sic was produced the Teutsche Acta Eruditorum (1712), an excellent periodical, edited by J. G. Rabener and C. G. Jécher, and continued from 1740 to 1758 as Zuverldssige Nachrichten. It included portraits. The brilliant and enterprising Christian

Thomasius brought out periodically, in dialogue form, his Monatsgcsprdche (1688-90), written by himself in the vernacular, to defend his novel theories against the alarmed pedantry of Germany, and, together with Strahl, Buddeus, and others, Observationes selecta ad rem litterariam spectantes (1700), written in Latin. W. E. Tenzel also published Monatliche Untcrredungen (1689-98), continued from 1704 as Curt- cuse Bibliothek, and treating various subjects in dialogue form. After the death of Tenzel the Bibliothek was carried on under difier- ent titles by C. Woltereck, J. G. Krause, and others, down to 1721. Of much greater importance than these was the Afonatlicher Auszug (1701), supported by J. G. Eccard and Leibnitz. Another periodical on Thomasius's plan was Newe Unterredungen (1702), edited by N.H.Gundling. The Gundlingiana of the latter person, published at Halle (1715-32), and written partly in Latin and partly in German by the editor, contained a miscellaneous collection of juri- dical, historical, and theological observations and dissertations. _ Nearly all departments of learning possessed their several special periodical organs about the close of the 17th or the beginning of the 18th century. The Anni Franciscanorwm (1680) was edited by the Jesuit Stiller; and J. S. Adami published, between 1690 and 1713, certain theological repertories under the name of Delici#.

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Historical journalism was first represented by Electa Juris Publict (1709), philology by Neue Acerra Philologica (1715-23), philosophy by the Acta Philosophorum (1715-27), medicine by Der patriotische Medikeus (1725), music by Der musikalische Patriot (1725), and edu- cation by Die Matrone (1728). Reference has already been made to the Miscellanea curiosa medico-physica (1670-1704) ; the Aonatliche Erzdhlungen (1689) was also devoted to natural science.

Down to the early part of the 18th century Halle and Leipsic were the headquarters of literary journalism in Germany. Other centres began to feel the need of similar organs of opinion. Hamburg had its Niederstichsische neue Zeitungen, styled from 1731 Nieder- sachsische Nachrichten, which came to an end in 1736, and Mecklen- burg owned in 1710 its Neuer Vorrath, besides others brought out at Rostock. Prussia owes the foundation

of its literary periodicals to G. P. Schulze and M. Lilienthal, the former of whom began with Gelehrtes Preussen (1722), continued under different titles down to 1729; the latter helped with the Hrldutertes Preussen (1724), and was the sole editor of the Acta Borussica (1730-32). Pomerania and Silesia also had their special periodicals in the first quarter of the 18th century. Franconia commenced with Nova Litteraria, and Hesse with the Kurze Historie, bothin 1725. In south Germany appeared the Wiirttembergische Nebenstunden (1718), and the Par- nassus Boicus, first published at Munich in 1722. The Frankfirter gelehrte Zeitungen was founded in 1736 by S. T. Hocker, and existed down to 1790. Austria owned Das merkwiirdige Wien.

In 1715 the Nene Zeitungen von gelehrten Saehen was founded by J. G. Krause at Leipsic and carried on by various editors down to 1797. It was the first attempt to apply the form of the weekly political journal to learned subjects, and was imitated in the Ver- mischte Bibliothek (1718-20), and the Bibliotheca Novissima (1718- 21), both founded by J. G. Fraucke in Halle. Shortly after the foundation of the university of Gottingen appeared Zeitungen von gelehrten Sachsen (1789), still famous as the Géttingische gelchrte Anzeigen, which during its long and influential career has been conducted by professors of that university, and among others by Haller, Heyne, and Eichhorn.

Influenced by a close study of English writers, the two Swiss Bodmer and Breitinger established Die Discurse der Maler (1721), and, by paying more attention to the matter of works reviewed than to their manner, commenced a critical method new to Germany. The system was attacked by Gottsched, who, educated in the French school, erred in the opposite direction. The war between tne two parties gave fresh life to the literature of the country, but German criticism of the higher sort can only be said really to begin with Lessing. The Berlin publisher Nicolai founded the Bibliothek der schinen Wissenschaften, and afterwards handed it over to C. F. Weisse in order to give his whole energy to the Briefe, die neueste Literatur betreffend (1759-65), carried on by the help of Lessing, Mendelssohn, and Abbt. To Nicolai is also due the Allgemeine deutsche Bibliothek (1765-1806), which embraced a much wider field and soon became extremely influential. Herder founded the Kritische Wélder in 1766. Der deutsche Merkur (1773-

89, revived 1790-1810) of Wieland was the solitary representative of the French school of criticism. A new era in German periodical literature began when Bertuch brought out at Jena in 1785 the Allgemeine Literaturzeitung, to which the leading writers of the country were contributors. On being transferred to Halle in 1804 it was re- placed by the Jenaische allgemeine Literaturzettung, founded by Eichstidt. Both reviews enjoyed a prosperous carecr down to the year 1848,

At the commencement of the present century we find the Erlanger Literaturzeitung (1799-1810), which had replaced a Gelehrte Zeitung (1746) ; the Leipziger Literaturzeitung (1800-34) ; the Heidelbergische Jahrbiicher der Literatur (1808); and the Wiener Literaturzeitung (1813-16), followed by the Wiener Jahrbiteher der Literatur (1818- 48), both of which received Government support and were like the Quarterly Review in their Conservative politics and high literary tone. Hermes, founded at Leipsic in 1819 by W. T. Krug, was dis- tinguished for its erudition, and came out down to 1831. One of the most remarkable periodicals of this class was the Jahrbiicher fur wissenschaftliche Kritik (1827-46), first published by Cotta. The Hallische Jahrbticher (1838-42) was founded by Ruge and Echter- meyer, and supported by the Government. The Repertorium der gesammten deutschen Literatur, established by Gersdorf in 18384, and known after 1848 as the Leipziger Repertorium der deutschen und auslindischen Literatur, existed to 1860. Buchner founded the Literarische Zeitung at Berlin in 1834. It was continued by Brandes down to 1849. The political troubles of 1848 and 1849 Were most disastrous to the welfare of the literary and miscellaneous periodicals. Gersdorf’s Repertorium, the Gelehrte Anzeigen of Gottin- gen and of Munich, and the Heidelberg Jahrbiicher were the sole survivors. The Allgemeine Monatsehrift fir Literatur (1850), con- ducted after 1851 by Droysen, Nitzsch, and others, continued only down to 1854; the Literarisches Centralblatt (1850) had a longer existence. The Blatter fur literarische Unterhaliung sprang out of the Literarisches Wochenblatt (1818), founded by Kotzebue ; since 1865 it has been edited by R. Gottschall with considerable

success. Many of the literary journals did not disdain to occupy themselves with the fashions, but the first periodical of any merit specially devoted to the subject was the Bazar (1855). The first to popularize science was Natur (1852). The Hauwsbldtter (1855), a bi-monthly magazine, was extremely successful. The Salon (1868) followed more closely the type of the English magazine,

About this period arose a great nuinber of serials for popular reading, known as “Sontagsblitter,” of which the Gartcnlaube (1858) and Daheim are cxamples. Of a more solid character are the Deuisches Musewm (1851-57) of Prutz and Frenzel; the Grenzboten ; the Preussische Jahrbiicher (1858); the Berliner Revue (1855); Unsere Zeit (1857), at first only a kind of supplement to Brockhaus’s Conversationslexikon, but now an important review of matters of contemporary interest ; Die Gegenwart (1872); the new Literatur- zettung (1874) of Jena; the Deutsche Rundschau (1874), conducted upon the method of the Revue des Deux Mondes ; and many others.

Periodicals have been specialized in Germany to an extent perhaps unequalled in any other country. Those of a really high class have become so numerous and form so marked a feature in the current literature that it may be useful to give a classified list of the chief of them, including the many Jahresberichte which supply summaries of the works published annually in particular departments. BIBLIOGRAPHICAL AND LITERARY :—FPetzholdt’s newer Anzeiger ; Centralblatt fiir Bibliothekswissenschaft ; Allgemeine Bib- liographie fiir Deutschland ; Bibliographie und literarische Chronik der Schweiz; Polytechnische Bibliothek ; Blatter fiir literarische Un- terhaltung, cd. by Rud. von Gottschall ; Literarisches Centralblatt fiir Deutschland; Dte Gegenwart, Die Grenzboten; Deutsche Rund- schau; Im neuen Reich; Preussische Jahrbicher ; Magazin fir die Literatur des In- wnd Auslandes; Die neue Zeit; Archiv f. Literaturgeschiehte ; Westermann’s tllustrirte deutsche Monatshefte. THEOLOGY :—Der Katholik ; Theologisehe Literaturzeitung; Theo- logische Studien und Kritiken ; Theologische Studien aus Wirttem- berg; Theologische Quartalschrift ; Zeitschrift fir Kirchengeschichte ; Neue evangelische Kirchen-Zeitung ; Protestantische Kirehen-Zeitung ; Monatsschrift fiir Geschichte d. Judenthums. aw,

POLITICAL Economy, &c. :—Jahrbueh f. Gesetzgcbung ; Jahrbuch der deutsehen Gerichtsverfassung ; Zeitschrift fiir Rechtsgeschichic ; Jahrbuch der preussischen Gerichtsverfassung ; Annalend. Reichsgeriehts ; Seuffert's Archiv fiir Entscheidung der obersten Gerichte ; Seuffert's Blatter f. Reehtsanwendung ; Jahrbuch fiir das deutsche Versicherungswesen ; Jahrbiicher fiir Nationalékonomie wnd Statistik ; Zeitschrift f. ge- sammte Staatswissenschaft; Vierteljahrsschrift fir Volkswirischaft ; Statistisehe Monatsschrift. MmEpICINE AND SuRGERY :— Archiv fiir Anthropologie; Archiv f. experimentelle Pathologie ; Schmidt's Jahrbiteher der in- und auslindischen ges. Medicin ; Zeitschrift f. klin. Medicin; Archiv fiir Anatomie und Physiologie; Morpho- logisehes Jahrbuch ; Archiv fiir Gyndkologie ; Deutsche Zeitschrift fir Chirurgie; Archiv f. klin. Chirurgie; Gracfe's Archiv ; Viertel- jahrssehrift fiir geriehtl. Medicin. NatuRAL ScrENcE :—Archw fiir Anatomie u. Physiologie; Archiv fiir Naturgeschichte ; Annalen der Physik und Chemie; Annalen der Mathematik und Physik ; Botanischer Jahresbericht ; Botan. Jahrbiicher ; Flora ; Botanische Zeitung ; Zoologischer Jahresbericht ; Zeitschrift fiir wissenschafil. Zoologie; Jahresbericht tiber d. Fortschritte d. Chemie ; Liebig's Annalen d. Chemie. Puttosopay :—Philosophische Monatshefte ; Zeitschrift fiir Philosophie, Epucation :—Lheinische Blitter ; Neue Jahrbiicher fiir DPhilologie; Pédagogischer Jahresbericht. JUVENILE LITERATURE :—Herzblatichens Zeitvertreib; Deutsche Jugend, CLASSICAL ARCHEOLOGY AND PHILOLOGY :—Jahrbiicher fiir elass. Philologie ; Hermes ; Rheinisches Museum ; Philologus ; Archiologische Zeitung; Jahresberichte ub. d. Fortschritie d. class. Alterthumswissenschaft. ORYENTAL LITERATURE :— Zeitschrift d. deutschen morgenlindischen Gesellschaft ; Zeitschrift f. Vilkerpsycho- logic. MopErN LANGUAGES :—Anglia ; Archiv f. d. Studium d. neueren Sprachen; Germania; Zeitschrift f. deut. Alterthum. History, &c.:—Sybel's hist. Zeitschrift ; Jahresberichte der Ge- schichtswissenschaft; Archiv f. Anthropologie ; Archiv f. oesterr. Geschichte; Das Staatsarchiv; Forschungen 2. deug. Geschichte ; Baltische Studien ; Zeits. f. Muscologie ; Zeits. f. Numismatik. GEO- GRAPIY:—Geogr. Jahrbuch; Globus; Das Ausland ; Petermann's Mitteilungen; Zeitschrift f. Ethnologie. MATHEMATICS AND ASTRO- NomMy :—Jahrbuch tb. d. Fortschritte d. Mathematik; Archiv d. Mathematik u. Physik; Journal f. d. reine u. angewandte Math. ; Zeitschrift f. Mathematik ; Astronomische Nachrichten.

ARMY AND Navy :—Jahresberichte ub. d. Verinderungen im Mirlitarwesen , Deutsche Heeres-Zeitung ; Jahrbiicher f. d. deut. Armee wu. Marine ; Militar -Literaturzeitung ; Militdr -Wochenblatt ; Strefleur's dsterr. Militér-Zeitschrift. Trape Orcans, Xe. :—Bérsenblatt f. d. deut. Buchhandel ; Deutsches Handelsarchiv; Stammer, Jahresbericht i. d. Zuckerfabrikation; Gewerbchalle Polytechn. Notizblatt. ARCHI- TECTURE, ENGINEERING, &c. :— Allgemeine Bauzecitung ; Der Civil- ingenieur ; Dingler's polytechnisches Journal ; Zeitschrift f. Baw- wesen ; Osterr. Zeitschrift f. Berg.- u. Hiittenwesen ; Jahrbuch der Erfindungen auf d. Gebieten der Physik u. Chemie, der Teehnologie, u.s.w. RAILWAYS, TELEGRAPHY, SHIPPING, &. :—Hansa ; Mit- teilungen aus d. Gebiete d. Seewesens ; Elektrotechnische Zeitschrift ;

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Nauttisehes Jahrbuch; Der Maschinenbauer. ForESTRY AND SPort- ING : —orstliche Blatter ; Allg. Forst-u. Jagdzettung ; Zeitschrift J Forst- u. Jagdwesen. AGRICULTURE, GARDENING, &c. :—Bienenzeit- ung; Forschungen auf d. Gebiete d. Agrikulturphysik ; Landwirth- schafiliche Jahrbiicher ; Allg. Zeitung fir deut. Land- u. Forstwirthe ; Gartenjlora ; Neubert's deut. Gartenmagazin, Deut. allg. Zeitung J. Landwirthsehaft, u.s.w. THEATRES :—Newer Theaterdiener ; Miinehener Theater-Journal. Finn Arts :—Jahrbuch d. k. preuss. Kunstsammlungen ; Die graphisehen Kiinste ; Zettsehrift f Kunst- und Antiquitdtensammler. Music :—Neue Berliner Musikzettung ; Neue Zetisehrift 7. Musik. Fiction :—Deut. Romanzettung. STENO- GRAPHY :—Jahrbueh d. Schule Gabelsbergers ; Alig. dewtsehe Steno- grafenzettung. PorputarR READING :—Daheim; Die Gartenlaube ; Ueber Land und Meer; Vom Fels zum Meer. FREEMASONRY :— Freimaurerzeitung. Humorous:—Fliegende Blatter; Kladder- adatseh. CHESS:— Deutsehe Sehaehzeitung. Misceuu. ILLvs- TRATED :—Zllustrirte Zeitung. ; 7

There were in Austria in 1848 22 literary and 41 special period- icals, and in 1873 110 literary and 413 special periodicals (see the extremely valuable

statistical inquiry of Dr Johann Winckler, Die period. Presse Oesterreiehs, 1875). Germany possessed in 1848 about 947 periodicals (Deutseher Zeitungs-Katalog, 1848), and in 1884 1550 (Gracklauer's Deutseher Journal- Katalog fiir 1884). According to the Deutseher Zeitsehriften-Katalog, 1874, there were published in Austria, Germany, and Switzerland in 1874 2219 periodicals in the German language.

Authorities—For the general history of the subject consult C. Juncker, Schediasma de ephemeridibus eruditorum, Leipsic, 1692; H. Kurz, Geschichte der deutschen Literatur, Leipsic, 1852; R. Prutz, Geschichte des deutschen Jour- nalismus, vol. i., 1845—unfortunately it does not go beyond 1713; H. Wuttke, Die deutschen Zeitschriften, 1875; and P. E. Richter, Verzeichniss der Periodica im Besitze der k. off. Bibl. zu Dresden, 1880.

Switzerland.—The Nova Litteraria Helvetica (1703-15) of Zurich is the earliest literary periodical which Switzerland can show. From 1728 to 1734 a Bibliotheque Italique, and towards the end of the century the Bibliotheque Britannique (1796-1815), dealing with agriculture, literature, and science, in three separate series, were published at Geneva. The latter was followed by what still re- mains the leading periodical of French-speaking Switzerland, the Bibliotheque UOniverselle (1816), which also has a scientific and a literary series. The Revwe Suisse (1838) was produced at Neuchatel.

Jtaly.—Prompted by M. A. Ricci, Francesco Nazzari, the future cardinal, established in 1668 the Giornale de' Letterati wpon the plan of the Journal des Savants. His collaborateurs each agreed to undertake the criticism of a separate literature, while Nazzari re- tained the general editorship and the analysis of the French books. The journal was continued to 1675, and another series was carried on to 1769. Bacchini brought out at Parma (1688-90) and at Modena (1692-97) a periodical with a similar title. A much better known Giornale was that of Apostolo Zeno, founded with the help of Maffci and Muratori (1710), continued after 1718 by Pietro Zeno, and after 1728 by Mastraca and Paitoni. Another Giornale, to which Fabroni contributed, was published at Pisa in 1771 ; it has been continued almost down to our own times. The Galleria di Minerva was first published at

Venice in 1696. One of the many merits of the antiquary Lami was his connexion with the Novelle Letterarie (1740-70), founded by him, and after the first two years almost entirely written by him. Its learning and impartiality gave it much authority. The Frusta Letteraria (1763-65) was brought out at Venice by Giuseppe Baretti under the pseudonym of Aristarco Scannabue. The next that deserve mention are the Giornale Enct- elopedico (1806) of Naples, followed by the Progresso delle Seienze (1833-48) and the Museo di Scienze e Letteratura of the same city, and the Giornale Areadico (1819) of Rome. Among the contributors to the Poligrafo (1811) of Milan were Monti, Perticari, and some of the first names in Italian literature. The Biblioteca Italiana (1816-40) was founded at Milan by the favour of the Austrian Govern- ment, and the editorship was offered to and declined by Ugo Foscolo. It rendered service to Italian literature by its opposition to the Della-Cruscan tyranny. Another Milanese serial was the Concilia- fore (1818-20), which, although it only lived two years, will be remembered for the endeavours made by Silvio Pellico, Camillo Ugoni, and its other contributors to introduce a more dignified and courageous method of criticism. After its suppression and the falling off in interest of the Biblioteca Ttaliana the next of any merit to appear was the Antologia, a monthly periodical brought out at Florence in 1820 by Gino Capponi and Giampetro Vieusseux, but suppressed in 1833 on account of an epigram of Tommaseo, a principal writer. Some striking papers were contributed by Giuseppe Mazzini. Naples had in 1832 Progresso of Carlo Troya, helped by Tommaseo and Centofanti, and Palermo owned the Giornale di Statistica (1834), suppressed eight years later. The Archivio Storico, consisting of reprints of documents with historical dissertations, dates from 1842, and was founded by Vieusseux and Gino Capponi. The Civilta Cattoliea (1850) is still the organ of the Jesuits. The Rivista Contemporanea (1852) was founded at Turin in emulation of the Revue des Deux Mondes, which has been the type followed by so many Continental periodicals; it still appears. The Politeenieo

(1839) of Milan was suppressed in 1844 and revived in 1859. The Nuova Antologia (1866) has already acquired a well-deserved reputa- tion as a high-class review and magazine. Its rival, the Rivista Europea, is now considered the special organ of the Florentine men of letters. The Rasseyna Settimanale was a weekly political and literary review, which after eight

years of existence gave place to a daily newspaper, the Rassegna. The Archivio Trentino (1882) is the organ of “Italia Irredenta.” The Rassegna Nazionale, con- ducted by the marchese Manfredo di Passano, a chief of the moder- ate clerical party, the Nuova Rivista of Turin, the Fanfulla della Domeniea, and the Gazzetta Letteraria may also be mentioned, During the last few years Italy has been showing such vigour in her periodical literature that it may be worth while to append the titles of the chief of those which are now appearing: Annali di Matematiea (1867); Annuario di Giwrisprudenza (1883) ; Archivio dt Statistiea (1876); Archivio storieo Lombardo (1874); Archivio Veneto (1871); Archivio per lo Studio delle Tradiziont popolart; Archivio per la Zoologia; Il Bibliofilo; Bollettino di Archeologia eristiana; Il Filangiert (1876); La Natura (1884); Nuovo Giornale botanieo (1869) ; Grornale degli Eruditi (1883) ; Giornale di Filologia Romanza ; Giornale storieo della Letteratura Italiana (1883) ; Nuova Rivista internazionale (1879) ; Il Politeenteo (1858) ; La Rassegna Italiana (1881) ; Rivista storica Italiana (1884) ; Revue Internationale (1888).

Not counting political newspapers, there were published in Italy in the year 1871 133 literary periodicals, 43 devoted to the fine arts, 132 commercial, 49 scientific, 19 administrative, 20 humorous, &e. showing a total of 416. Ten years later, in 1881, the number had increased to 892, of which 46 were religious, 23 administrative, 114 scientific, 52 agricultural, 36 humorous, &c.

Authorities.See G. Ottino, La Stampa periodica in Italia, Milan, 1875; Raccolta dei periodici presentata all’ Esposizione in Milano, 1881; A. Roux, La littérature contemporaine en Italie (1873-83), Paris, 1883.

Belgyium.—The Journal Eneyelopédique (1756-93), founded by Belginr P. Rousseau, made Liége a propagandist centre for the philosophical party. In the same city was also first established L’ Esprit des Journaux (1772-1818), styled by Sainte-Beuve “cette considérable et excellente collection,” but “journal voleur et compilateur.” The Journal historique et littéraire (1788-90) was founded at Luxem- burg by the Jesuit De Feller ; having been suppressed there, it was transferred to Liége, and subsequently to Maestricht. It is one of the most curious of the Belgian periodicals of the

18th century, and contains most precious materials for the national history. “A complete set is very rare and much sought after. The Revue Belge (1835-43), in spite of the support of the best writers of the kingdom, its successor the Revue de Liége (1844-47), the Trésor Nattonal (1842-43), published at Brussels, and the Revue de Belgique (1846-51) were all shortlived. The Revue de Bruzelles (1837-48), supported by the nobility and the clergy, had a longer career. The Revue Nationale was the champion of Liberalism, and came to an end in 1847, The Messager des Seiences historiques (1833), which still comes out at Ghent, has been much more successful, and is in repute on account of its historical and antiquarian character. The Revwe Catholique is also still published by the pro- fessors of the university of Louvain. In 1846 it began a contro- versy with the Journal historique et littéraire of Kersten (1834) upon the origin of human knowledge, which lasted for many years and excited great attention. The Revue Trimestrielle was founded at Brussels-by Van Bemmel in 1854, The Athenewm Beige (1868) did not last long.

Among Flemish serials may be mentioned the Nederduitsehe Flemis| Letteroefeningen (18384) ; the Belgiseh Museum (1836-46), edited by Willems ; the Broederhand, which did not appear after 1846 ; the Taalverbund of Antwerp ; the Kunst- en Letterblad (1840-43) ; and the Viaemsehe Rederyker (1844). ‘

The Annales des Travaux Publies (1843), the Bulletin de U Indus- trie (1842), the Journal des Beaux-Arts (1858), the Catholic Précis historiques (1852), the Protestant Chrétien Belge (1850), Van Bene- den’s Arehives de Biologie, the Revue de Belgique (1868), and the Revue de Droit international are represcntative of their several respective classes.

It has been calculated that in 1860 there were 51 periodicals published in Belgium. In 1884 the number had increased to 412.

See U. Capitaine, Recherches sur les jowrnaua et les écrits périodiques Liégeois, 1850; Relevé de tous les écrits périodiques qui se publient dans le royaume de Belgique, 1875; Catalogue des journaux, revues, et publications périodiques de la Belgique, 1883; Annuaire de la libraire Belge, 1884.

Holland.—This country occupies a distinguished position in the Hollan history of the periodical literature of the 18th century, from the labours of the French refugees already referred to (see p. 539). The first serial written in Dutch was the Boekzaal van Huropa (1692-

1708, and 1715-48), which had several changes of name during its long life. The next of any note was the Republijk der Geleerden (1710-48). The English Spectator was imitated by J. van Effen in his Misanthrope (1711-12), written in French, and in the Hollandsehe Speetator (1731-35), in Dutch. An important serial was the long- lived Vaderlandsehe Letteroefeningen (17 61). The Algemeene Kumnst- en Letterbode (1788) was long the leading review of Holland ; in

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1860 it was joined to the Nederlandsch Spectator (1855). Of those founded in the present century may be mentioned the Recensent (1803) and Niewwe Reecnsent ; the Nederlandsch Musewm (1835) ; the Gids (1837) ; the Tijdstroom (1857); the Tijdspiegel, a literary journal of Protestant tendency; The Theologisch Tijdschrift (1867), the organ of the Leyden school of theology; and the Déetsehe Warande, a Roman Catholic review devoted to the national anti- quities. Colonial interests have been cared for by the Tijdschrift voor Nederlandsch Indie (1848). The Nederlandish Magazin and Minerva are still published.

See Alphabetische Naamlijst van Boeken (1790-1875), Amsterdam, 1835-78.

Scandinavia.—Harly in the 18th century Denmark had the Nye Tidender (1720), continued down to 1836 under the name of Dansk- literaturtidende. The Minerva (1785) of Rahbek was carried on to 1819, and the Skandinavisk Museum (1798-1803) was revived by the Litteratur-Selskabs Skrifter (1805). These were followed by the Lerde Hfterretninger (1799-1810), afterwards styled Litteratur- Tidende (1811-86), the Athene (1813-17), and Historisk Tidsskrift (1840). In more modern times appeared Tidsskrift for Litteratur og Kritik (1832-42, 1843); Maanedsskrift for Litteratur (1829-38) ; Nord og Syd (1848-49) of Goldschmidt, succeeded by Ude og Hjemme, still published ; and the Dansk Maanedsskrift (1858) of Steenstrup, with signed historical and literary articles. One of the most note-worthy Scandinavian periodicals has been the Nordisk Universitets Tidsskrift (1854-64), a bond of union between the universities of Christiania, Upsala, Lund, and Copenhagen.

See Revue des Deux Mondes, 1st August 1861.

Iceland has had the Islenzk Sagnabléd (1817-26), Skirnir (1827), still published, VY Fjelagsrit (1841-73), and Gefn (1870-78).

See T. Mobius, Cat. libb. Island. et Norvegicorum, Leipsic, 1856-80.

The first trace of the serial form of publication to be found in Norway is in the Ugentlige korte Afhandlinger (1760-61), ‘‘ Weekly Short Treatises,” of Bishop Fr. Nannestad, consisting of moral and theological essays. The Afaanedlige Afhandlinger (1762), “Monthly Treatises,” was supported by several writers and devoted chiefly to rural economy. These two were followed by Politik og Historie (1807-10); Saga (1816-20), a quarterly review edited by J. S. Munch ; Den Norske Tilskwer (1817-21), a miscellany brought out at Bergen ; Hermoder (1821-27), a weekly esthetic journal ; Jduna, (1822-23), of the same kind but of less value ; Vidar (1832-84), a weekly scientific and literary review; Nor (1840-46), of the same type; Norsk Tidsskrift for Videnskab og Litteratur (1847-55) ; Lllusireret Nyhedsblad (1851-66), ‘Illustrated News”; Norsk Maanedsskrift (1856-60), ‘ Monthly Review for Norway,” devoted to history and philology ; and

Norden (1866), a literary and scientific review. Popular serials date from the Skilling Magazin (1835), which first introduced wood-engraving, and is still published. The

Norsk Familjeblad is a current weekly of the same class. See P. Botten-Hansen, La Norvége Littéraire, Christiania, 1868; Norsk Bog- Fortegnelse (1814-72).

The Swenska Argus (1738-34) of Olof Dalin is the first contribution of Sweden.to this subject. The next were the Tidningar om den Liirdas Arbeten (1742) and the Larda Tidningar. The patriotic journalist C. C. Gjérwell established about twenty literary pcriod- icals, of which the most important was the Swenska Alercurius (1755-89). Atterbom and some fellow-studcents founded about 1810 a society for the deliverance of the country from French pedantry, which with this end carried on a periodical entitled Phosphoros (1810-13), to propagate the opinions of Schlegel and Schelling. The Svensk Literatur – Tidning (1818-25) of Palmblad and the Polyfem (1810-12) had the same objects. Among more recent periodicals we May mention Skandia (1833-37) ; Literaturbladet (1838-40) ; Stall-ningar oeh Forhallanden (1838) of Crusenstolpe, a monthly review of Scandinavian history ; Tidskrift for Litteratur (1850); Norsk Tidsskrift (1852), weekly, still published ; Forr och Nu; and the Hievue Suédoise (1858) of Kramer, written in French. The Vy ilus- trered Tidning and Hemvdnnen are current illustrated weeklies ; the Svenska Veckoblad is also weekly.

See Revue des Deux Mondes, 1st August 1861. ;

Spain and Portugal.—Spain owcs her intellectual emancipation to the monk Benito Feyjéo, who in 1726 produced a volume of dissertations somewhat after the fashion of the Spectator, but on graver subjects, entitled Teatro Critico, which was continued down to 1739. His Cartas Eruditas (1742-60) were also issued periodically. The earliest critical serial, the Diario de los Literatos (1737-42), kept up at the expense of Philip V., did not long sur-Vive court favour. Other periodicals which appeared in the 18th century were Mafier’s Mercurio (1738) ; the Diario Notietoso (1758- 81); Hl Pensador (1762-67) of Joseph Clavijo y Fajardo ; Hl Belianis Literario (1765), satirical in character; the Semanario Erudito (1778-91), a clumsy

collection of documents ; El Correo Literario de la Europa (1781-82) ; El Censor (1781) ; the valuable Memorial Literario (1784-1808) ; El Correo Literario (1786-91), devoted to literature and science ; and the special organs El Corrco Mercantil (1792-98) and El Semanario de Agricultura (1797-1805). In the present century we have Variedades de Ciencias, Literatura, y Artes (1803-5), among whose contributors have been the distin- Suished names of Quintana, Moratin, and Antillon ; Mvsceldnea de

Comereto (1819); and Diario general de las Cicnctas Medieas. The Spanish refugees in London published Ocios de Espaitoles Refugiados (1823-26) and Miscelénea hispano-americana (1824-28), and at Paris Misceldnea eseojida americana (1826). The Crénica cientéfica y literaria (1817-20) was afterwards transformed into a daily news- paper. Subsequently to the extinction of EZ Censor (1820-23) there was nothing of any value until the Cartas Espaiiolas (1832), since known as the Revista Espaftola (1882-36) and as the Revista de Madrid (1838). Upon the death of Ferdinand VII. periodicals had a new opening ; in 1836 there were published sixteen journals devoted to science and art. The fashion of illustrated serials was introduced in the Semanario pintoresco Espanol (1836-57), notice- able for its biographies and descriptions of Spanish monuments. El Panorama (1839-41) was another literary periodical with engravings. Of more recent date have been the Revista Ibérica (1861-63), conducted by Sanz del Rio; La America (1857-70), specially devoted to American subjects and edited by the brothers Asquerino ; and the Revista de Catalusia, published at Barcelona. The chief of those published at the present time are the Revista de Lispatia, the Revista Oontempordnea, the Revista Europea, and the Revista de Arehivos.

Apart from newspapers, there were issued at Madrid in 1867 47 periodicals, of which 10 were religious, 32 literary, 17 official, 7 satirical, &c. In 1882 the number of periodicals issued in Spain was 377—24 legal, 24 agricultural, 35 commercial, 15 army and navy, 14 theatrical, 45 illustrated, 36 literature and science, 52 medical, 11 fashions, 51 education, 44 religion, 26 miscellaneous.

See G. Ticknor, History of Spanish Literature, New York, 1872; G. Hubbard, Histoire de la littérature contemporaine en Espagne, Paris, 1876; E. Hartzen-

busch, Periodicos de Madrid, 1876; Lapeyre, Catalogo-tarifa de los periodicos, revistas, y tlustraciones en Espana, 1882.

Portugal could long boast of only one review, the Jornal Enct- Portugal.

elopedico (1779-1806), which had many interruptions ; then came the Jornal de Coimbra (1812-20) ; the Panorama (1836-57), founded by Herculano ; the Revista Universal Lisbonense (1841-538), estab- lished by Castilho; the Jnstdtuéo (1853) of Coimbra; the Archivo Pittoresco (1857) of Lisbon; and the Jornal da Sociedadc dos Amigos das Letteras, In 1868 a review called Voz Kemenina, and con- ducted by women, was established at Lisbon. I. F. Da Silva, Diccionario Bibl. Portuguez, 1858.

Greece.—The periodical literature of modern Greece commences Greece.

with ‘O Aéytos ‘Epujs, brought out at Vienna in 1811 by Anthimos Gazi and continued to 1821. A philological serial with the same title is still published. In Aigina the Alywata appeared in 1831, edited by Mustoxidis ; and at Corfu, in Greek, Italian, and English, the ’Av@odoyla (1834). After the return of King Otho in 1833 a literary review called Ips was commenced. Le Spectateur de? Orient, in French, pleaded the national cause before Europe for three years from 1853. A military journal was published at Athens in 1855, and two years later the archeological periodical conducted by Pittakis and Rangavi. For many years Havddépa (1850-72), edited by Rangavi and Paparrigopoulos, was the leading serial. Among existing periodicals Pos deals with natural science, the I’ewrovixa

with agriculture, and the ‘Iepouy7juwv with theology. nated See A. R. Rangabé, Hist. littéraire de la Gréce Moderne, Paris, 1879; R. Nicolai, Geschichte der neugriechischen Literatur, 1876.

Russia.—The historian Miller made the first attempt to establish Russia,

periodical literature in Russia in his Vejem'yesyatehniya Sotchineniya (1755-64), or "Monthly Works." In 1759 Sumarakoff founded the Trudolyubivaya Ptcheld, or " Industrious Bee," giving translations from the Speetator, and, for the first time, critical essays. Karamsin brought out in 1802 the V'yestutk Evropi, an important review with Liberal tendencies, which is still appearing. The Conservative Russkoi V'yestnik (1808) was revived at Moscow in 1856 by Kattkoff, and is also published now. The romantic school was supported by Sin Otetehestva (1812), "Son of the Fatherland," united in 1825 to the Severnot Arkhiv (1822), which dwindled and came to an end soon after 1839. One of the most successful Russian reviews has been the Bibliotcka dl'ya Tehtenia (1834), or " Library of Read- ing." The Slavophile party is represented by the Russkaya Missi, "Russian Thought," published in Moscow. ; Finland has had Suomi (1841), written in Swedish.

See C. Courriére, Histoire de la littérature contemporaine en Russie, Paris, 1875, and the bibliographical works of Méjoff.

Slavonie Countries—Bohemia has had the Casopis Ceskeho Bohemia,

Museum (1827), founded by Palacky; Ziva (1853), a review of natural history; and the Samatky Archeologiske.

Hungary can show the Ungrisches Magazin (1781-87, 1791), Hungary.

published at Pressburg, and the Magyar Muzewm (1788). The Tudomdnyos gytijetémény (1817-41) and the Figyelmezd (1887-43) deserve mention. Uj Magyar Muzewm was a scientific magazine, and the Budapesti Szemle (1857) of a more general character.

Before the revolution of 1830 Poland had the Pamietnik War- Poland.

szawski of Lach Szyrma. Among other reviews may be mentioned the Dziennik Ltteracki of Lemberg, the Biblioteka Warszawska of Warsaw, and the Przegland Polski of Cracow.

Roumania commenced with the Magasinal istorica pentru Dacia Rou- (1845), containing valuable historical documents, and Moldavia mania.

with Dacia Litcraria (1840) and Archiva Romanesca (1841).

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The best literary review Servia has had was the Wa, edited by Novakovic.

See A. Bourgeault, Histoire des littératures étrangeéres, 1876, 3 vols.; D. Iarcu, Bibliografia ehronologica romana, 1873.

UNITED STATES.

Spurred by the success of the Gentleman’s Magazine in England, Benjamin Franklin printed and published the earliest miscellany in America, under the title of the General Magazine (1741), at Philadelphia, which, owing to want of support, expircd after six monthly numbers had appeared. Franklin’s

rival, John Webbe, brought out in opposition the American Magazine (1741), which ran only to two numbers. Further attempts at Philadelphia in 1757 and 1769 to revive periodicals with the same name were both fruitless. The other pre-revolutionary magazines were the Boston American Magazinc (1748-47), in imitation of the London Magazine ; the Boston Weekly Magazine (1748) ; the Christian History (1743- 44); the New York Independent Reficetor (1752-54); the New England Magazine (1758-60), a collection of fugitive pieces ; the Boston Royal American Magazine (1774-75); and the Pennsylvania Magazine (1775-76), which, founded by R. Aitken, with the help of Thomas Paine, came to an untimely end upon the commencement of the war. The Columbian Magazine (1786-90) was continued as the Uni- versal Asylum (1790-92). Matthew Carey brought out the Ameri- can AMusewm in 1787, and it lasted until 1792. Five or six more magazines ran out a brief existence before the end of the century. One of the most successful of them was the Farmer's Museum (1793-99), supported by perhaps the most brilliant staff of writers American periodical literature had yet been able to show, and edited by Dennie, who in 1801 commenced the publication of the Portfolio, carried on to 1827 at Philadelphia. For five years it was a weekly miscellany in quarto, and afterwards an octavo monthly ; it was the first American serial which could boast of so long an existence. The Literary Magazine (1808-8) was established at Philadelphia by C. B. Brown, who, with Dennie, may be considered as having been the first American professional man of letters. The Anthology Club was founded at Boston in 1803 by Phineas Adams for the cultiva- tion of literature and the discussion of philosophy. Ticknor, Everett, and Bigelow were among the members, and were con- tributors to the organ of the club, the Afonthly Anthology (1803-11), the forerunner of the North American Review. In the year 1810 Thomas (Printing in America, ii. 292) informs us that 27 periodicals were issued in the United States. The first serious rival of the Portfolio was the Analectic Magazine (1813-20), founded at Phil- adelphia by Moses Thomas, with the literary assistance of W. Irving (for some time the editor), Paulding, and the ornithologist Wilson. In spite of a large subscription list it came to an end on account of the costly style of its production. The first southern serial was the Monthly Register (1805) of Charleston. New York possessed no periodical worthy of the city until 1824, when the Atlantic Magazine appeared, which changed its name shortly afterwards to the New York Monthly Review, and was supported by

R. C. Sands and W. C. Bryant. For many years Graham's Magazine was the leading popular miscellany in the country, reaching at one time a circulation of about 35,000 copies. The first western periodical was the Jllinois Monthly Magazine (1830-32), published, owned, edited, and almost entirely written by James Hall, who followed with his Western Monthly Magazine (1833-36), produced in a similar manner. In 1833 the novelist C. F. Hoffman founded at New York The Knickerbocker (1833-60), which soon passed under the control of Timothy Flint and became extremely successful, most of the leading native writers of the next twenty years having been contributors. Equally popular was Putnam's Monthly Magazine (1858-57, 1867-69). The Dial (1841-44), Boston, the organ of the transcendentalists, was first edited by Margaret Fuller, and subsequently by R. W. Emerson and G. Ripley. Among other extinct magazines may be mentioned the American Monthly Magazine (1833-38), the Southern Literary Messenger (1834), Richmond, the Gentleman's Magazine (1837-40), and the International Magazine (1850-52), edited by R. W. Griswold. The Yale Literary Magazine dates from 1836. The Merchants' Magazine was united in 1871 with the Commercial and Financial Chronielc. Foremost among existing magazines come Harper's Monthly Magazine (1850) and Seribner's Monthly (1870), now The Century, both famous for their unrivalled wood- engraving and literary excellence. 'Within the last few years the circulation of these two periodicals has increased to a remarkable degrce both at home and abroad. Not less admirable in their way are the Atlantic Monthly (1857), Lippincott's Magazine, and the Manhattan.

The first attempt to carry on an American review was made by Robert Walsh in 1811 at Philadelphia with the American Review of History and Politics, which lasted only a couple of years. Still more brief was the existence of the General Repository and Review (1812), brought out at Cambridge by Andrews Norton with the help of the professors of the university, but of which only four numbers appeared. Niles's Weekly Register (1811-48) was political, historical, and literary. The North American Review, the oldest and most prosperous of all the American reviews, dates from 1815,

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and was founded by William Tudor, a member of the previously- mentioned Anthology Club. After two years' control Tudor handed over the review to the club, then styled the North American Club, whose most active members were E. T. Channing, R. H. Dana, and Jared Sparks. On his return from Europe in 1819 E. Everett became the editor; his elder brother Alexander acquired the pro- perty in 1829. The roll of the contributors to this review numbers almost every American writer of note. Since January 1879 it has been published monthly. The American Quarterly Review (1827- 37), established at Philadelphia by Robert Walsh, came to an end on his departure for Europe. The Southern Revicw (1828-32), con- ducted by H. Legaré, S. Elliott, and G. W. Simms in defence of the politics and finance of the South, enjoyed a shorter career. It was resuscitated in 1842, and lived another ten years. These two were followed by the Democratic Review (1838-52), the Ameri- can Review, afterwards the American Whig Review (1845-52), the Massachusetts Quarterly Revicw (1847-50), and a few more. The New Englander (1843), the Biblical Repertory and Princeton Review (1825), and the National Quarterly Review (1860) are still published. The critical weeklies of the past include the New York Literary Gazette (1884-35, 1839), De Bow's Review (1846), the Literary World (1847-53), the Criterion (1855-56), the Round Table (1863- 64), the Citizen (1864-73), and Applcton's Journal (1869). The leading weeklies of the day include the Nation (1865), the Literary World (1870), and the Critic (1881).

Religious periodicals have bcen extremely numerous in the United States during the last hundred years. The earliest was the Theological Magazine (1796-98). The Christian Examiner dates from 1824 and lasted down to 1870. The Panoplist (1805), changed to the Missionary Herald, still represents the American Board of Missions. The Alcthodist AMfagazine dates from 1818 and the Christian Disciple from 1813. The American Biblical Repost- tory (1831-50), a quarterly, was united with the Andover Bibliotheca Sacra (1848) and with the Thcological Eclectic (1865). Brownson's Quarterly Review began as the Boston Quarterly Review in 1838, and did much to introduce to American readers the works of the modern French philosophical school. Among more recent serials of this class we may notice the Protestant Episcopal Quarterly Review (1854), the Presbyterian Magazine (1851-60), the Catholic World (1865), the Southern Review (1867), the New Jerusalem Magazine (1827), American Baptist

Magazine (1817), the Church Review (1848), the Christian Review (1836), the Universalist Quarterly (1844). Among historical periodicals may be numbered the American Register (1806-11), Stryker's American Register (1848- 51), Edwards's American Quarterly Register (1829-43), the New England Historical and Genealogical Register (1847), Folsom's Historical Magazine (1857), the New York Genealogical Record (1869), and the Magazine of American History (1877).

For many years the leading English periodicals have becn regularly reprinted in the United States, and many scrial publica- tions have been almost entirely made up of extracts from English sources. Perhaps the earliest example is to be found in Select Views of Literature (1811-12). The Kelectic Magazine (1844) and Littcll's Living Age (1844) are still published.

In 1817 America possessed only one scientific periodical, the Journal of Mineralogy. Professor Silliman established the journal known by his name in 1818. Since that time the American Journal of Scienee has enjoyed unceasing favour. Among other special periodicals of the day may be mentioned the American Naturalist, the American Journal of the Medical Sciences, the Amcrican Jour- nal of Speculative Philosophy, the American Journal of Philology, the American Ratlroad Journal, the Bankcr's Magazine, the Index Medicus, and the Journal of the Franklin Institute.

The number of periodicals devoted to light literature and_to female readers has been, and still remains, extremely large. The earliest in the latter class was the Lady's Magazine (1792) of Phil- adelphia. The name of the Lowell Ofering (1841), written chiefly by factory girls, is well known in England. Godey's Ladies' Book is still issued. Children's magazines originated with the Young Misses' Magazine (1806) of Brooklyn; St Nicholas is a modern high-class representative of this kind; another current example is the Child's Paper (1852).

The following estimate of the number of periodicals now appear- ing in the United States is taken from G. P. Rowell and Co.'s American Newspaper Record (1883). Weeklies, and those pub- lished more frequently than once a week, are omitted on account of the difficulty of distinguishing them from-

newspapers. The numbers given are—bi-weeklies 47, semi-monthlies 175, monthlies 1034, bi-monthlies 12, quarterlies 59 ; total 1327.

See an excellent article on the subject in Ripley and Dana's American Cyclo- pedia; Cucheval Clarigny, Histoire de la presse en Angleterre et aux Etats Unis, 1857: H. Stevens, Catalogue of American Books in the Library of the British Museum, 1866, and American Books with Tails to em, 1873; I. Thomas, History of Printing in America, Albany, 1874; J. Nichol, American Literature (1620- 1880), 1882; Pettengill's Newspaper Directory for 1878; G. P. Rowell and Co.'s American Newspaper Directory, New York, 1869-83; Hubbard's Newspaper Directory of the World, New York, 1882-84. The leading periodicals of the United States are indexed in W. F. Poole's Index, Boston, 1882, and Library Journal. (H. R. T.)

FuRTPA rea Tics

PERIPATETICS was the name given in antiquity to the followers of Aristotle, from their master's habit of walking up and down as he lectured conversationally to his pupils. Others derive the name from the wepizaros, or covered walk of the Lyceum. Anaccount of the Aristotelian philosophy will be found in the articles AristoTLx, Erxics, Logic, and Merapuysic. Here it must suffice to recall those features of the system which mainly conditioned the development of the school. Aristotle's central conception is the correlative opposition of form and matter. This may be called the supreme category under which he views the world; it is the point where, as Zeller puts it, Aris- totle's system at once refutes and completes the Platonic doctrine of the ''idea" in its relation to phenomena. But Aristotle did not succeed in expelling the dualism which he blamed in Plato. His deity is pure form, and dwells in abstract self-contemplation withdrawn from the actual life of the world. The development of the world remains, therefore, unrelated to the divine subject. In Aristotle's doctrine of man, precisely the same difficulty is experienced in connecting the active or passionless reason with the in- dividual life, the latter being a process of development bound up with sense, imagination, and desire. The soul is originally defined as the entelechy of the body, and, more- over, not of body in general but of its particular body, It is impossible, therefore, from this point of view to speak of soul and body as separate entities. Yet Aristotle holds that besides the

individual mind, which is all things potentially —which becomes all things —there is superinduced upon the process of development the active or creative reason, the pure actuality (évépyeva) which the development pre- supposes as its necessary prius, just as the world-process presupposes God. This reason is “separable,” and is said to enter “from without” when it unites itself to the pro- cess of individual life. It must therefore exist before the individual, and it alone outlasts the death of the body ; to it alone properly belong the titles of ‘immortal ” and “divine.” But its relation to the universal divine reason was not handled by Aristotle at all. The question was destined to become the crux of his commentators. In general it is evident that, if reason in man be identified with the process of natural development (and there is Aristotelian warrant for declaring these to be simply two aspects of the same thing), we drift into a purely naturalistic or materialistic doctrine. On the other hand, the doctrine of the “‘active reason” may be maintained, but what Aristotle left vague may be further defined. The rational soul of each indi- vidual may be explicitly identified with the divine reason. This leads to the denial of individual immortality and the doctrine of one immortal impersonal reason, such as we find, for example, in the rationalistic pantheism of Averroes. A third position is possible, if the statements of Aristotle be left in their original vagueness. Aristotle may then be interpreted as supporting monotheism and the immortality of separate rational souls. This was the reading adopted by the orthodox scholastic Aristotelians, as well as by those early Peripatetics who contented themselves with para- phrasing their master’s doctrine.

Aristotle’s immediate successors, Theophrastus, who pre- sided over the Lyceum from 322 to 288 B.c., and Eudemus of Rhodes, were distinguished by a learned diligence rather than by original speculative power. They made no inno- vations upon the main doctrines of their master, and their industry is chiefly directed to supplementing his works in minor particulars. Thus they amplified the Aristotelian logic by the theory of the hypothetical and disjunctive syllogism, and added to the first figure of the categorical syllogism the five moods out of which the fourth figure was afterwards constructed. The impulse towards natural science and the systematizing of empirical details which

distinguished Aristotle from Plato was shared by Theo- phrastus. His two works on the History of Plants and Causes of Plants prove him to have been a careful and acute observer. The same turn for detail is observable in his ethics, where, to judge from the imperfect evidence of the Characters, he elaborated still further Aristotle's portraiture of the virtues and their relative vices. In his doctrine of virtue the distinctive Peripatetic position regarding the importance of external goods was defended by him with emphasis against the assaults of the Stoics. He appears to have laid even more stress on this point than Aristotle himself, being doubtless led to do so, partly by the heat of controversy and partly by the importance which leisure and freedom from harassing cares naturally assumed to a man of his studious temperament. The metaphysical aropiat of Theophrastus which have come down to us show that he was fully alive to the difficulties that start up round many of the Aristotelian definitions. But we are ignorant how he proposed to meet his own criticisms ; and they do not appear to have suggested to him an actual departure from his master's doctrine, much less any radical transformation of it. In the difficulties which he raises with reference to the relation of the active and the passive reason, as well as in his ascription of the physical predicate of motion to the activity of the soul, we may perhaps detect a leaning towards a naturalistic interpreta- tion. The tendency of Eudenius, on the other hand, is more towards the theological or Platonic side of Aristotle's philosophy. The Hudemian LHithics (which, with the possible exception of the three books common to this treatise and the Nzcomachean Kthics, there need be no hesitation in ascribing to Eudemus) expressly identify Aristotle's ultimate ethical ideal of Gewpia with the know- ledge and contemplation of God. And this supplies Eudemus with a standard for the determination of the mean by reason, which Aristotle demanded, but himself left vague. Whatever furthers us in our progress towards a knowledge of God is good ; every hindrance is evil. The same spirit may be traced in the author of the chapters which appear as an appendix to book i. of Aristotle's Metaphysics. They have been attributed to Pasicles, the nephew of Eudemus. For the rest, Eudemus shows even less philosophical independence than Theophrastus. Among the Peripatetics of the first generation who had been personal disciples of Aristotle, the other chief names are those of Aristoxenus of Tarentum and Diczarchus of Messene. Aristoxenus, 'the musician," who had formerly belonged to the Pythagorean school, maintained the posi- tion, already combated by Plato in

the Phezdo, that the soul is to be regarded as nothing more than the harmony of the body. Dicearchus agreed with his friend in this naturalistic rendering of the Aristotelian entelechy, and is recorded to have argued formally against the immortality of the soul.

The naturalistic tendency of the school reached its full expression in Strato of Lampsacus, who succeeded Theo- phrastus as head of the Lyceum, and occupied that posi- tion for eighteen years (287-269 B.c.). His predilection for natural science earned for him in antiquity the title of “the physicist.” He is the most independent, and was prob- ably the ablest, of the earlier Peripatetics. His system is based upon the formal denial of a transcendent deity. Cicero attributes to him the saying that he did not require the aid of the gods in the construction of the universe ; in other words, he reduced the formation of the world to the operation of natural forces. We have evidence that he did not substitute an immanent world-soul for Aristotle’s extra-mundane deity; he recognized nothing beyond natural necessity. He was at issue, however, with the atomistic materialism of Democritus in regard to its twin assump-

tions of absolute atoms and infinite space. His own specu- lations led him rather to lay stress on the qualitative aspect of the world. The true explanation of things was to be found, according to Strato, in the forces which pro- duced their attributes, and he followed Aristotle in de- ducing all phenomena from the fundamental attributes or elements of heat and cold. His psychological doctrine explained all the functions of the soul as modes of motion, and denied any separation of the reason from the faculties of sense-perception. He appealed in this connexion to the statement of Aristotle that we are unable to think without a sense-image.

The successors of Strato in the headship of the Lyceum were Lyco, Aristo of Ceos, Critolaus (who, with Carneades the Academic and Diogenes the Stoic, undertook in 155 B.c. the famous embassy to Rome, more important in its philosophical than in its political bearings), Diodorus of Tyre, and Erymneus, who brings the philosophic succession down to about the year

100 B.c. Other Peripatetics belonging to this period are Hieronymus of Rhodes, Pry- tanis, and Phormio, the delirus senex who attempted to instruct Hannibal in the art of war. Sotion, Hermippus, and Satyrus were historians rather than philosophers. Heraclides Lembus, Agatharchides, and Antisthenes of Rhodes are names to us and nothing more. The philo- sophic unfruitfulness of the school during this whole period is expressly charged against it by Strabo, who explains it by his well-known story of the disappearance of Aristotle's writings after the death of Theophrastus. But it is im- possible that this story should be true in the shape in which it is told by Strabo; and a sufficient explanation of the barrenness of the school may be found in the general circumstances of the time. From the outset the character- istic of the Aristotelian philosophy had been its disinter- ested scientific character; but the age was one for which speculation as such had lost its attractiveness. At such a time it was natural, therefore, that the Peripatetic school should suffer more than the others. It had also in practical matters taken up a mediatizing position, so that it lacked the attractions which, in the case of extreme views, enlist supporters and inspire them with propa- gandist zeal. The fact, at all events, isnot to be denied that, after Strato, the Peripatetic school has no thinker of any note to show for about 200 years. With Strato, moreover, the scientific activity of the school has an end ; when it received a new infusion of life its activity took another direction. Strato accuses the Peripatetics of this period of devoting themselves to the tricking out of commonplaces. This seems in great measure true of those who still occupied themselves with philosophy ; they culti- vated ethics and rhetoric, and were noted for the elegance of their style. But the majority followed the current of the time, and gave themselves up to the historical, philological, and grammatical studies which mark the Alexandrian age.

Early in the 1st century B.c. all the philosophic schools began to be invaded by a spirit of eclecticism. This was partly the natural result of the decay of speculative interest and partly due to the unconscious influence of Rome upon the philosophers. The Roman mind measured philosophy, like other things, by the standard of practical utility. As an instrument of education, and especially as the inculcator of moral principles, the Roman welcomed and appreciated philosophy ; but his general point of view was naively put by the proconsul Gellius (about 70 B.c.), who proposed to the

representatives of the schools in Athens that they should settle their differences amicably, at the same time offering his personal services as mediator. Though the well-meant proposal was not accepted, this atmosphere of indifference imperceptibly influenced the attitude of the

contending schools to one another. Thus Boethus the Stoic deserted the pantheism of his school and assigned the deity, as Aristotle had done, to the highest sphere, He likewise embraced the Peripatetic doctrine of the eternity of the world. A similar approximation to Peri- pateticism is seen in Panetius. About the same time, Antiochus of Ascalon,founder of the so-called fifth Academy, tried to combine Plato, Aristotle, and Zeno, asserting that they differed only in words. Meanwhile the Peripatetic school may be said to have taken a new departure and a new lease of life. The impulse was due to Andronicus of Rhodes, the well-known editor of Aristotle's works, who presided over the Lyceum towards the middle of the Ist century B.c. His critical edition indicated to the later Peripatetics the direction in which they could profitably work, and the school devoted itself henceforth almost exclusively to the writing of commentaries on Aristotle. Boethus of Sidon and Aristo of Alexandria carried on the work of interpretation begun by Andronicus. Boethus appears, like many of his predecessors, to have taken the naturalistic view of Aristotle's doctrines, and even in some respects to have approximated to the Stoic materialism. Staseas, Cratippus, and Nicolaus of Damascus need only be named as belonging to this century. The most interesting Peripatetic work of the period is the treatise De Mundo, which has come down to us under Aristotle's name, but which internal evidence obliges us to assign to a date later than the writings of the Stoic Posidonius. The interest of the treatise lies in the evidence it affords within the Peripatetic school of the eclectic tendency which was then in the air. The admixture of Stoic elements is so great that some critics have attributed the work to a Stoic author; but the writer's Peripateticism seems to be the more fundamental constituent of his doctrine.

Our knowledge of the Peripatetic school during the first two centuries of the Christian era is very fragmentary ; but those of its representatives of whom anything is known confined themselves entirely to commenting upon the

different treatises of Aristotle. Thus Alexander of Age, the teacher of Nero, commented on the Categories and the De Cezlo. In the 2d century Aspasius and Adrastus wrote numerous commentaries. The latter also treated of the order of the Aristotelian writings in a separate work. Somewhat later, Herminus, Achaicus, and Sosigenes com- mented on the logical treatises. Aristocles of Messene, the teacher of Alexander of Aphrodisias, was the author of a complete critical history of Greek philosophy. This second phase of the activity of the school closes with the compre- hensive labours of Alexander of Aphrodisias, the exegete par excellence, called sometimes the second Aristotle. He became head of the Lyceum during the reign of Septimius Severus, some time between 198 and 211 a.p. Alexander's interpretation proceeds throughout upon the naturalistic lines which have already become familiar to us. Aristotle had maintained that the individual alone is real, and had nevertheless asserted that the universal is the proper object of knowledge. Alexander seeks consistency by holding to the first position alone. The individual is prior to the universal, he says, not only "for us," but also in itself, and universals are abstractions which have merely a sub- jective existence in the intelligence which abstracts them. Even the deity must be brought under the conception of individual substance. Such an interpretation enables us to understand how it was possible, at a later date, for Aristotle to be regarded as the father of Nominalism. Form, Alexander proceeds, is everywhere indivisible from matter. Hence the soul is inseparable from the body whose soul or form it is. Reason or intellect is bound up with the other faculties. It exists primarily in man only as a disposition or capacity—vovs bAckds Kai dvoxds—and

is afterwards developed into actual intelligence—vots éxixtntos—the intellectus acquisitus of the Scholastics. The active reason—vovs rountexds —which effects this develop- ment is, according to Alexander, no part of the soul, but simply the divine reason acting upon it. The influence of God upon nature is elsewhere reduced by Alexander, as far as possible, toa mechanical process. Aristotle's ethico- mystical conception of God as the ultimate and tran- scendent object of desire is set aside ; and the influence of the deity is represented simply as a diffusion of force, first into the heavens and thence downwards, each lower element receiving less according to its greater distance from the source. The commentaries of the

Aphrodisian formed the foundation of the Arabian and Scholastic study of Aristotle. Soon after Alexander's death the Peripatetic school was merged, like all others, in the Neoplatonic. Neoplatonists like Porphyry, Iamblichus, Themistius, Dexippus, Syrianus, Ammonius, Simplicius, and Philoponus carried on the work of commenting on Aristotle till the final disappearance of Greek philosophy. For the further history of Aristotelian- ism, see ARABIAN PHILOSOPHY and SCHOLASTICISM.

The authorities on whom we depend for our knowledge of the Peripatetics are collected and sifted with exhaustive care by Zeller in the relative sections of his Philosophie der Grieehen (ii. 2 and iii. 1). (A. SE.)

PERIPATUS. See Myriapopa, vol. xvii. p. 116.

PERITONITIS, inflammation of the peritoneum or membrane investing the abdominal and pelvic cavities and their contained viscera. It may exist in an acute or a chronic form, and may be either localized in one part or generally diffused.

Acute peritonitis may attack persons of both sexes and of any age. It is sometimes brought on, like other inflain- mations, by exposure to cold, but it would appear to arise quite as frequently in connexion with some antecedent injury or disease in some of the abdominal organs, or with depraved conditions of the general health. It is an occasional result of hernia and obstructions of the bowels, of wounds penetrating into the abdomen, of the perfora- tion of viscera by disease (¢.g., in ulcer of the stomach and in typhoid fever), of the bursting of abscesses or cysts into the abdominal cavity, and also of the extension of inflammatory action from some of the abdominal or pelvic organs. Not unfrequently it is at first localized, and then, spreading onwards, becomes general.

The changes which take place in the peritoneum are similar to those undergone by other serous membranes when inflamed, viz., (1) congestion ; (2) exudation of lymph in greater or less abundance, at first greyish in colour and soft, thereafter yellow and becoming tough in consistence, causing the folds of intestine to adhere together; (3) effusion of fluid, either clear, turbid, bloody, or purulent ; (4) absorption more or less complete of the fluid and lymph. Occasionally shreds or bands of unabsorbed lymph

remain, constituting a subsequent danger of strangu- lation of the bowel. The symptoms usually begin by a rigor, together with vomiting and pain in the abdomen of a peculiarly severe and sickening character, accompanied with extreme tenderness, so that the slightest pressure causes a great aggravation of suffering. The patient lies on the back with the knees drawn up, and it will be noticed that the breathing is rapid and shallow and per- formed by movements of the chest only, the abdominal muscles remaining quiescent, unlike what takes place in healthy respiration. The abdomen becomes swollen by flatulent distension of the intestines, which increases the patient's distress. There is usually constipation. The skin is hot, although there may be perspiration ; the pulse is small, hard, and wiry; the urine is scanty and high- coloured, and passed with pain. The patient's aspect 1s

one of anxiety and suffering. These symptoms may subside in a day or two, but if they do not the case is apt to go on rapidly to a fatal termination. In such an event the pain and tenderness subside, the abdomen becomes more distended, hiccough and vomiting of brown or blood- coloured matter occur, the temperature falls, the face be- comes pinched, cold, and clammy, the pulse exceedingly rapid and feeble, and death takes place from collapse, the patient's mental faculties generally remaining clear till the close. When the peritonitis is due to perforation, as may happen in the case of the gastric ulcer, or the ulcers of typhoid fever, the above-mentioned symptoms and the fatal collapse may all take place in from twelve to twenty- four hours. Further, the puerperal form of this disease, which comes on within a day or two after parturition, is always very serious and is often rapidly fatal. The symp- toms are similar to those already described, but in addition there are generally superadded those of septicemia (blood-

poisoning).

Chronic peritonitis occurs in two forms—(1) as a result of the acute attack ; (2) as a tubercular disease. In the former case, the acute symptoms having subsided, abdominal pain to some extent continues, and along with this

there is considerable swelling of the abdomen, corresponding to a thickening of the peritoneum, and it may be also to fluid in the peritoneal cavity. Occasionally a condition of this kind appears to develop slowly without there having been any preceding acute attack. In this form of peritonitis there is considerable constitutional disturbance, together with loss of strength and flesh; nevertheless, although the disease is essentially a chronic one, it is often recovered from. The tubercular form of peritonitis occurs either alone or associated with tuberculous disease of the lungs or other organs. The chief symptoms are abdominal pain and distension, along with disturbance of the functions of the bowels, there being either constipation or diarrhcea, or each alternately. Along with these local manifestations there exist the usual phenomena of tuberculous disease, viz., high fever, with rapid emaciation and loss of strength. Cases of this kind are of grave import, and their tendency is to a fatal termination.

In the treatment of acute peritonitis the remedy upon which most reliance is to be placed is opium, which affords relief to the pain, and appears to exercise a certain controlling influence upon the inflammatory process. It requires to be given in considerable quantity, yet with due care, so as to avoid its narcotic action. The old plan of covering the abdomen with leeches is now seldom resorted to; nevertheless a moderate abstraction of blood by this means in a previously healthy person may contribute to the relief of the pain. Hot fomentations with turpentine or opium applied over the abdomen are of value. The strength must be maintained by milk, soups, and other light forms of nourishment. _ It is not in general desirable that the bowels should act, and this is one of the benefits obtained by the internal administration of opium. In the simple chronic form the use of iodine externally and of tonics with cod-liver oil internally will be found of service ; while in the tuber- cular form remedies are as a rule of little value, but such symptoms as pain, fever, diarrhea, &c., must be dealt with by palliative measures appropriate to these conditions.

PERIZONIUS, Jacop (1651-1715), classical scholar, the most distinguished member of a learned Dutch family of that name (Voorbroek in the vernacular), was the cldest son of Anton Perizonius, author of a once well-known treatise, De ratione studit theologici, and was born at Dam in Groningen on 26th October 1651. He received his school education at Dam

and Deventer, and afterwards studied in the university of Utrecht, where he came under the influence of Grevius and abandoned theology for pure literature. The death of his father and other un- toward circumstances involved him in a struggle with various outward difficulties, but the influence of Heinsius and Grevius, who already appreciated him highly, and expected great things from him, ultimately procured for

him in 1682 the appointment to the chair of eloquence and history at Franeker, where his expositions of Cicero, Terence, Florus, and Suetonius, as well as his lectures on general history, attracted a large and increasing number of hearers. In 1693 he was promoted to the corresponding chair at Leyden, where he succeeded F. Spanheim in 1701. His death took place in that city on 6th April 1715.

The works of Perizonius both as an author and as an editor were very numerous, and by universal consent entitle him to a place of the highest rank among the scholars of his age. Special interest attaches to his edition of the Minerva of Sanctius or Sanchez (1st ed. 1687, 4th ed. 1714), which may be said to be one of the last developments of the study of Latin grammar while in its pre- scientific stage, when the phenomena of language had not yet ceased to be regarded as for the most part disconnected, conventional, or fortuitous. Mention must also be made of his Animadversiones historice, in quibus quam plurima in priscis Romanarum rerum sed utriusque linguxe auctoribus notantur, mulia etiam illustrantur atque emendantur, varia denique antiquorum rituum eruuntur et ubertus explicantur (1685), a work which Bayle has characterized as deserving to be entitled “The Errata of scholars and critics,” and of his Dissertationes due de Republica Romana, alluded to with honour by Niebuhr in the preface to his Roman History (4th ed., 1833) as marking the beginning of that new era of classical study with which his own name is so closely associated.

PERJURY is an assertion upon an oath duly admin- istered in a judicial proceeding, before a competent court, of the truth of some matter of fact, material to the question depending in that proceeding, which assertion the assertor does not believe to be true when he makes it, or on which he knows

himself to be ignorant (Stephen, Digest of the Criminal Law, Art. 135). In the early stages of legal history perjury seems to have been regarded rather as a sin than as a crime, and so subject only to supernatural penalties. The injury caused by a false oath was supposed to be done not so much to society as to the Divine Being in whose name the oath was taken (see OaTH). One of the practical effects of this view was to make perjury so common in the Middle Ages that the probable reason for preserving trial by combat was the difficulty of securing a just cause against the perjury of witnesses (Hallam, Jfiddle Ages, ch. ix. pt. 1). The almost universal existence of compurgation was no doubt another explanation of the frequency of perjury. In cases of compurgation, or in cases where wager of law was allowed, it is difficult to imagine that the defence could as a rule have been an honest one. In Roman law, even in the time of the empire, the perjurer fell simply under divine reprobation, and was not dealt with as a criminal, except where he had been bribed to withhold true or give false evidence, or where the oath was by the genius of the emperor. In the latter case punishment was no doubt inflicted more for the insult to the emperor than for the perjury. False testi- mony leading to the conviction of a person for a crime punishable with death constituted the offence of homicide rather than of perjury. In England, perjury, as being a sin, was originally a matter of ecclesiastical cognizance. Ata later period, when it had become a crime, the jurisdiction of the spiritual courts became gradually confined to such perjury as was committed in ecclesiastical proceedings, and did not extend to perjury committed in a temporal court. The only perjury which was for a long time noticed at common law was the perjury of jurors. Attaint of jurors (who were originally rather in the position of witnesses than of judges of fact) incidentally subjected them to punishment for perjury. Criminal jurisdiction over perjury by persons other than jurors seems to have been first assumed by the Star Chamber, acting under the powers supposed to have been conferred by 3 Hen. VII. ch. 1. After the abolition of the Star Chamber by the Long Parlia- ment in 1641 and the gradual diminution of the authority of the spiritual courts, perjury (whether in the strict sense of the word or the taking of a false oath in non-judicial

proceedings) practically fell entirely within the jurisdiction of the ordinary criminal tribunals. The jurisdiction of the spiritual courts over perjury may now be considered obsolete. An unsuccessful attempt was made as lately as 1876 to induce the Court of Arches to entertain a criminal suit against a layman for a false oath taken before a surro- gate (Phillimore v. Machon, Law fep., 1 Prob. Div., 481). See further, for the history of the law of perjury, Stephen, History of the Criminal Law, vol. ii. p. 408; vol. iii. p, 240. At common law only a false oath in judicial pro- ceedings is perjury. But by statute the penalties of perjury have been extended to extra-judicial matters, ¢g., false declarations made for the purpose of procuring marriage (19 and 20 Vict. c. 119, s. 18), and false affidavits under the Bills of Sale Act, 1878 (41 and 42 Vict. c.31,s.17). False affirmation by a person permitted by law to affirm is perjury (32 and 33 Vict. c. 68, s.4; 33 and 34 Vict. ¢. 49). In order to support an indictment for perjury the prosecu- tion must prove the authority to administer the oath, the occasion of administering it, the taking of the oath, the substance of the oath, the materiality of the matter sworn, the falsity of the matter sworn, and the corrupt intention of the defendant. ‘The indictment must allege that the perjury was wilful and corrupt, and must set out the false statement or statements on which perjury is assigned, subject to the provisions of 23 Geo. IT. c. 11 (which also applies to subornation of perjury). By that Act it is sufficient to set out the substance of the offence, without setting forth the bill, answer, &c., or any part of the record, and without setting forth the commission or authority of

‘the court before whom the perjury was committed. The

matter sworn to must be one of fact and not of mere belief or opinion. It is not homicide, as in Roman law, to procure the death of another by false evidence, but the Criminal Code, ss. 118, 164, proposes to make such an offence a substantive crime of greater gravity than ordinary perjury, and punish- able by penal servitude for life. It is a rule of evidence, founded upon obvious reasons, that the testimony of a single witness is*insufficient to convict on a charge of per- jury. There must be corroboration of his evidence in some material particular. Perjury is a common law mis- demeanour, not triable at quarter-sessions. Proceedings may also be taken under 5 Eliz. c. 9, but this Act is of little practical iniportance, as the

common law is more extensive than the statute. Most persons in a judicial position have the right of directing the prosecution of any witness, if it appears to them that he has been guilty of perjury (14 and 15 Vict. c. 100, s. 19). The provisions of the Vexatious Indictments Act (22 and 23 Vict. c. 17) extend to perjury and subornation of perjury. By that Act no indictment for either of such offences can be pre- ferred unless the prosecutor or accused is bound by recog- nizance, or the accused is in custody, or the consent of a judge is obtained, or (in the case of perjury) a prosecution is directed under 14 and 15 Vict. c. 100.

Subornation of perjury is procuring a person to commit a perjury which he actually commits in consequence of such procurement. If the person attempted to be suborned do not take the oath, the person inciting him, though not guilty of subornation, is liable to fine and corporal punish- ment. Perjury and subornation of perjury are punishable at common law with fine and imprisonment. By the combined operation of 2 Geo, IT. c. 25 and later statutes, the punishment at present appears to be penal servitude for any term, or imprisonment with or without hard labour for a term not exceeding seven years (see Stephen, Digest, Art. 137). Perjury or prevarication committed before a committee of either House of Parliament may be dealt with as a contempt or breach of privilege as well as by prosecution. As to false oaths not perjury, it is a

misdemeanour at common law, punishable by fine and imprisonment, to swear falsely before any person author- ized to administer an oath upon a matter of common con- cern, under such circumstances that the false swearing, if committed in judicial proceedings, would have amounted to perjury. There are some cases of making false declara- tions which are punishable on summary conviction, ¢.g., certain declarations under the Registration of Births and Deaths Act, 1874, and the Customs Consolidation Act, 1876. A conviction for perjury subjects the person con- victed to certain disqualifications. He cannot hold a parish office (4 and 5 Will. IV. c. 76, s. 48). If a solicitor, and he attempt to practise after conviction, he is liable on summary conviction by a judge to seven years' penal servitude (12 Geo. I. c. 29, s. 4). If the prosecution be under the

statute of Elizabeth, the person convicted is disabled from giving evidence for the future (5 Eliz. c. 9, s. 2). The provisions of the last two Acts may, however, be regarded as virtually obsolete. The perjury of a witness may be a ground for pardon where the perjury has taken place in a criminal trial in which accused was convicted, or for a new trial in a civil action. In order to procure a pardon or a new trial it is generally necessary to show that the witness was a material one, and also that the perjurer has been prosecuted to conviction.

In Scotland the law, as a general rule, agrees with that of Eng- land. Perjury may be committed by a party on reference to oath as well as by a witness. A witness making a false affirmation is guilty of perjury (28 Vict. c. 9). The Acts 14 and 15 Vict. c. 100 and 22 and 23 Vict. c. 17 do not extend to Scotland. The trial, though usually by the Court of Justiciary, may be by the Court of Session if the perjury is committed in the course of an action before that court. The punishment is penal servitude or imprison- ment at the discretion of the court. Formerly a person convicted of perjury was disabled from giving evidence in future ; this dis- ability was abolished by 15 Vict. c. 27, s. 1.

In the United States the common law has been extended by most States to embrace false affirmations and false evidence in proceedings not judicial. Perjury in the United States courts is dealt with by an Act of Congress of 3d March 1825, by which the maximum punishment for perjury or subornation of perjury is a fine of $2000 or imprisonment for five years. The jurisdiction of the States to punish perjury committed in the State courts is specially preserved by the same Act. Statutory provisions founded upon 23 Geo. II. c. 11 have been adopted in some States, but not in others. In the States which have not adopted such provisions, the indictment must set out the offence with the particularity necessary at common law. (J. Wt.)

PERKINS, Jacos (1766-1849), inventor and physicist, was born at Newburyport, Massachusetts, in 1766, and ap- prenticed toa goldsmith. He- soon made himself known by a variety of useful mechanical inventions, and in 1818 came over to England with a plan for engraving bank-notes on steel, which, though it did not find acceptance at once, ultimately proved a signal success, and was carried out by Perkins in partnership with the

English engraver Heath during the rest of his long business life. Perkins con- tinued to be fertile of inventions, and his steam-gun, exhibited in 1824, attracted much attention, though the danger attending the use of highly-compressed steam pre- vented its practical adoption. His chief contribution to physics lay in the experiments by which he proved the compressibility of water and measured it by a piezometer of his own invention; see vol. vii. p. 801, and Phil. Trans., 1820, 1826. He retired in 1834, and died in London, 30th July 1849.

PERM, a government of Russia, on both slopes of the Ural Mountains, with an area of 128,250 square miles. Though Perm administratively belongs entirely to Russia in Europe, its eastern part (about 57,000 square miles) is situated in Siberia, in the basin of the Obi. It is traversed from north to south by the Ural range, a low ridge, from 30 to 45 miles in width, thickly covered with forests, and deeply excavated by rivers. The highest summits do not

rise above 3600 feet in the northern section of the range (the Vogulian Ural); in the central portion, between 59° and 60° 30’ N. lat., they once or twice exceed 5000 feet (Denezhkin, 5027 feet, and Konzhakovskii Kamen, 5135 feet) ; but the chain soon sinks towards the south, where it barely attains an elevation of 3000 feet. Where the great Siberian road crosses the ridge the highest point is 1400 feet. Westward the plain of the river Kama is still 500 feet above sea-level at a distance of 120 miles from the main watershed, but to the east the secondary ridges and spurs of the central chain fall away somewhat more rapidly,—Kamyshloff, 100 miles distant, being situated amidst the lowlands of the Obi at an altitude of less than 200 feet.

The geology of Perm has been the subject of very many investigations since the journeys of Humboldt and Mur- chison ; but several parts of the government still remain unexplored. Granites, diorites, porphyries, serpentines, and Laurentian gneisses and limestones, containing iron, copper, and zinc ores, constitute the main axis of the Ural chain; their western slope is covered by a narrow strip of Huronian crystalline slates, which disappear in the east under the Post-Tertiary deposits of the Siberian

lowlands, while on the west narrow strips of Silurian limestones, quartzites, and slates, and separate islands of Devonian deposits appear on the surface. These in their turn are covered with Carboniferous clays and sandstones, containing Coal-measures in several isolated basins. The Permian deposits extend as a regular strip, parallel to the main ridge, over these last, and are covered with the so- called “variegated marls,” which are now considered as Triassic, and which appear only in the western corer of the territory. Perm is the chief mining region of Russia, owing to its wealth in iron, silver, platinum, copper, nickel, lead, chrome ore, and auriferous alluvial deposits. Many rare metals, besides, such as iridium, osmium, rhodium, and ruthenium, are found along with the above, as also a great variety of precious stones, such as sapphires, jacinths, beryls, phenacites, chrysoberyls, emeralds, aquamarines, topazes, amethysts, jades, malachite. Salt-springs appear in the west; and the mineral waters, though still little known, are also worthy of mention.

The government is very well watered by rivers belonging to the Petchora, Tobol (affluent of the Obi), and Kama systems. The Petchora itself rises in the northern corner of the government, and its tributary the Volosnitsa is sepa- rated by a distance of only 4900 yards from the navi- gable Vogulka, a tributary of the Kama,—a circumstance of some commercial importance. The tributaries of the Tobol (Sosva, Tura, Isset, and Ui) are far more important. Their sources, which approach those of the tributaries of the Kama very closely, early became a link between Russia and Siberia, and the first section of the Siberian railway (completed for 312 miles from Perm to Ekaterinburg) has been planned to connect the Kama at Perm with the Tura at Tumen, whence there is a navigable route by the Siberian rivers to the very heart of western Siberia at Tomsk. The chief river of Perm is, however, the Kama, whose great navigable tributaries the Tchusovaya, Sylva, and Kolva are important channels for the export of the heavy iron goods to Russia,—5,000,000 cwts., valued at upwards of £2,000,000, being annually shipped on these rivers to the Volga. Timber also is floated down many of the smaller streams. Altogether, the rivers supply to some extent the want of roads or the defects of those which exist, the great Siberian highway even (wa Kazan, Okhansk, Perm, Ekaterinburg, and Tumen) being usually in a bad state.

The government is dotted with a great number of lakes of comparatively trifling size, and marshes also are extensive

in the hilly tracts of the north. No less than 45,750,000 acres are forest; of this large area only 2,175,600 acres are under proper forest administration. ‘The forests are distributed very unequally, covering 95 per cent. of the area in the north, and only 25 per cent. in the south-east. Fir (Abies sibirica, Picea obovata), pine (Pinus sylvestris), cedar (Pinus Cembra), larch (L. sibirica), birch, alder (Alnus), and line are the most common woods; the oak appears only in the south-west. The flora of Perm (956 Phanero- gams) presents a mixture of Siberian and Russian species, several of which have their north-eastern or south-western limits within the government. The climate is severe, the average temperature at different places being as follows :—

; Yearly | J Jul io a aa. ayetmees omed | – Feet. Fahr. Fahr. Fahr. | Bogoslovsk …... 59° 45 630 20508 8°°0 62°°6 Usolie (Kama)...} 59° 25’ 300 34°°0 4°°5 63°°8 | Nijne-Taghilsk | 57° 55’ 590 33°°1 2°°0 64°°9 | Ekaterinburg “el DG 48k 890 329 2°°5 63°°5

The population in 1881 amounted to 2,520,100, of which number

106,500 lived in towns. It consisted chiefly of Great Russians, Bashkirs (about 100,000, including Mescheryaks and Teptyars), about 65,000 Permyaks or Permians, 25,000 Tatars, 8000 ‘Tchere- misses, and some 2500 Voguls. More than a million of the Great Russians are Nonconformists, their number having rapidly inercased within the last twenty years. Except in the northern districts, which are covered with marshes and tundras, and in a zone 70 miles wide, which includes the higher and stony parts of the Ural Mountains to the north of the 58th parallel, agriculture is the general occupation of the inhabitants, who are favoured with a very fertile soil in the southern districts. Nevertheless, only 8,000,000 acres are under crops, the proportion of arable land ranging from 2 to 34 per cent. of the area in different districts. Rye, oats, barley, and hemp are raised in all parts, and wheat, millet, buckwheat, and flax in the south. The average crops in recent

years have been 4,198,000 quarters of grain and 1,866,400 bushels of potatoes.

Cattle-breeding is specially developed in the south-east among the Bashkirs, who have large numbers of horses, but is at present decreasing. In 1881 there were 837,000 horses, 820,000 horned cattle, 1,055,000 sheep, and 267,000 pigs. These figures vary, however, from year to year, in consequence of the murrains that periodically destroy great numbers of horses and cattle. Agriculture is widely spread among the Bashkirs, Teptyars, and Tcheremisses, and the chase is still a source of wealth, especially among the Voguls. Shipbuilding is developed on the Kama, Vishera (a tribut- ary of the Kama), Sylva, and Tchusovaya; and large amounts of timber, pitch, and tar, as also wooden implements, are exported to the Volga. Some 100,000 hands find occupation in connexion with the mining industry, and a number are engaged in the transport trade to and from Siberia, or in shipping. Mining increases every year, especially since private enterprise has been allowed to develop freely. In 1879 the total production of metals on the mining- works of the crown and of private individuals was (in ewts.) :—gold, 102°7; copper, 12,913; pig-iron, 4,457,000; iron, 2,704,000; steel, 599,600; salt, 8,750,000. The working of coal, although recent, promises to be most valuable. In 1865 the aggregate of all manu- factures connected with mining hardly exceeded 15,000,000 roubles (£1,500,000) in value. In 1879 it was :—copper, 879,800 roubles ; pig-iron, 14,076,000 ; iron, 9,077,900; and steel, 2,218,000. The ageregate of other manufactures, employing 7400 hands, in the same year reached 20,962,000 roubles, against 5,802,000 in 1865. The first place is taken by flour-mills (£978,500), followed by distil- leries (£566,500) and tanneries (£212,300) ; next in order come the manufactures of spirits, saddlery, woollen cloth, ropes, oils, cakes, paper, chemicals, candles, tallow, soap, matches, wax-candles, glass, pottery, &c. The cutting of precious stones is extensively carried on throughout the villages on the eastern slope of the Ural Moun- tains, the chief market for them being at Ekaterinburg. Besides, a varicty of petty trades are carried on, the manufacture of carpets in the south-east (Tumen carpets), as also that of boots at Kungur, being especially worthy of mention. :

An active trade, greatly favoured by the easy communication of the chief centres of the mining industry with the great market of Nijni Novgorod on the one side and with the great network of Siberian rivers on the other, is carried on in metals and metal wares, minerals, timber and wooden wares, tallow, skins, cattle, furs, corn, and linseed. Large ‘caravans descend the affluents of the Kama every spring, and reach the great fairs of Laisheff and Nijni Novgorod, or descend the Volga to Samara and Astrakhan 2 while Ekaterinburg is an important centre for the trade with

PERM

Siberia. The fair at Irbit, second in importance only to that of Nijui Novgorod, is a great centre for supplying Siberia with grocery and manufactured wares, as also for the purchase of tea, of furs for Russia, and of corn and cattle for the mining districts. About 180 other fairs are held every year within the government. The chief commercial centres are Kkaterinburg, Irbit, Perm, Kamyshloff, Shadrinsk, Tcherdyn, and several iron-works (zavody).

Perm is more largely provided with educational institutions and primary schools than most of the governments of central Russia. Besides the usual lyceum and ecclesiastical seminary at Perm, there are a mining school at Ekaterinburg and lower mining schools at Bogoslovsk and Kushva, and two lyceums for women at Perm and Ekaterinburg. The number of primary schools in 1881 was 621 (89,778 scholars, including about 8000 girls). The Nonconformists are very diligent in teaching reading (in Old Slavonian) to their girls. The Ural Society of Naturalists, at Ekaterinburg, issues valuable scientific serials, and there are within the government two first-rate meteorological and magnetic observatories, at Ekater- inburg and Bogoslovsk.

Perm is divided into twelve districts having for their chief towns (with populations in 1879)—Perm (32,350), Kungur (14,000), Krasnoufimsk (8700), Okhansk (1650), Osa (2850), Solikamsk (16,900), and Tcherdyn (8260) in Europe ; Ekaterinburg (25,150), Irbit (4250), Kamyshloff (2160), Shadrinsk (11,550), and Ver- khoturie (8900) in Asia. Alapaevsk (5450), Dalmatoff (4350), and Dedyukhin (3900, with importaut salt-works) have also municipal institutions. The iron-works form the following important

towns: —WNijne-Taghilsk (80,000 in 1881), Neviansk (14,000), Kyshtym (12,850), Revdinsk (9950), Upper and Lower Turinsk (9750), Nyazepetrovsk (9000), Verkh-Issetskii (7000), Nijne – Issetskii, Sysertskii (5900), Bogoslovsk (4500), Verkhne-Taghilsk (8850), and Suksunsk (8150). The salt-works of Usolie (7700) and Lenva (3250) may also be mentioned.

History.—Remains of Paleolithic man, everywhere very scarce in Russia, have not yet been discovered in the upper basins of the Kama and Obi, with the exception, perhaps, of a single human skull found in a cavern on the Tchanva (basin of Kama), together with a skull of Ursus spelwus. Neolithic remains, on the other hand, are met with in immense quantities on both Ural slopes throughout the territory of Perm. Still larger quantities of imple- ments belonging to an early Finnish, or rather Ugrian, civiliza- tion are found everywhere in the basin of the Kama, even in its northern parts, the present district of Tcherdyn. Even Herodotus speaks of the richness of this country inhabited by the Ugrians, who kept up a brisk traffic with the Greek colony of Olbia, and with the Bosphorus by way of the Sea of Azoff aud the Volga. The precise period at which the Ugrians left the district for the southern steppes of Russia (the “ Lebedia ” of Constantine Porphyro- genitus) is not known. In the 9th century the Scandinavians were acquainted with the country as Biarmia, and Byzantine annalists knew it as Permia. Nestor describes it as a territory of the Perm, a Finnish people, some 50,000 of whom still remain, and whose name seems to have been derived from parma, a Finnish word denoting hilly tracts thickly covered with forests.

The Russians penetrated into this region at an early date. In the 11th century Novgorod levied tribute from the Finnish in- habitants, and undertook the colonization of the country, which in the treaties of the 13th century is dealt with as a separate territory of Novgorod. In 1471, after the fall of Novgorod, Perm was annexed to Moscow, which in the following year erected a fort to protect Russian settlers and tradesmen from the Voguls, Ostyaks, and Samoyedes. Tcherdyn, the oldest town of Perm, was already in existence in the 15th century. The mineral wealth of the country soon attractcd the attention of the Moscow princes, and Ivan III. sent two Germans to scarch for ores ; these they succceded in finding south of the upper Petchora. A great impulse to colon- ization and mining was given by the Strogonoffs, when in the 16th century they received immense tracts of

land on the Kama and Tchusovaya. They founded the first salt and iron works, built forts, and colonized the Ural region. Solikamsk, Osa, Okhansk, and Verkhoturie were founded during this century. By the latter part of the century the Russian colonies had spread beyond the Ural Mountains ; and in this direction the Strogonoffs continued to extend their mining operations. The rapidly-growing trade with Siberia gave anew impulse to the development of the coun- try. This trade had its centres at Perm and Solikamsk, where merchandise brought up the Kama was unshipped and transported by land to Verkhoturie, at that time the first Siberian town and custom-house on the great highway. Kungur, too, attained some commercial importance. The fair of Irbit in the 17th century became the chief seat of the trade in merchandise, brought both from Russia to Siberia and from Siberia and Bokhara to Russia. Communication with Siberia having taken a northern route, the southern parts of the territory were not colonized until the next century, when Ekaterinburg, Krasnoufimsk, and Alapaevsk were fonnded. In 1780 the provinees of Perm and Ekaterinburg were instituted, but were soon united into one. (PPARs)

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PE R—

PERM, capital of the above government, stands on the left bank of the Kama, on the great highway to Siberia, 930 miles north-east from Moscow. During summer it has regular steam communication with Kazan, 685 miles distant, and it is connected by rail with Ekaterinburg. The town is mostly built of wood, with broad streets and wide squares, and has a somewhat poor aspect, especially when compared with Ekaterinburg. It isthe see of a bishop, and has an ecclesiastical seminary and a military school. The manufactures are few; the Government manufactory of steel guns and munitions of war, in the immediate neigh- bourhood of the town, turns out about 1600 tons of guns annually. The aggregate production of the private manu- factories of all kinds did not exceed £165,000 in 1879; they included tanneries (£78,600), distilleries (£61,000), rope-works (£9500), brick-works, breweries, soap and candle works, iron-wire and copper-ware works. Numerous flour-mills and several oil-works occur within the district. The town derives its commercial importance as being the chief place of storage

for merchandise to and from Siberia (tea, metals and metal-wares, skins, leather, butter, wool, bristles, tallow, cedar nuts, linseed, &c.), which is un- shipped here from the steamers coniing up the Kama, and despatched by rail or on cars and sledges to Siberia, or wice versa. The trade is chiefly in the hands of Nijni Nov- gorod, Kazan, Ekaterinburg, and Siberian merchants. The population of Perm in 1879 was 32,350.

The present site of Perm was occupied, as early as the year 1568, by a settlement named Brukhanovo, founded by one of the Strogo- noffs ; this settlement seems to have received the name of Perm in the 17th century. The Yagozhikhinsky copper- work was founded in the immediate neighbourhood in 1723, and in 1781 it received officially the name of Perm, and became an administrative centre both for the country and for the mining region. The mining

- authorities left Perm for Ekaterinburg in 18380. –

PERMUTATIONS. See Atcrpra, vol. i. p. 560.

PERNAMBUCO, or Recirs, a city and seaport of Brazil and the chief town of the extensive province of Pernam- buco. As it is situated on the coast in 8° 3’ 27” §. lat. and 34° 50’ 14” W. long. (Fort Picao), not far from the point where the continent begins to trend towards the south-west, it is naturally the first port visited by steamers from Lisbon to Brazil. The reef, which can be traced more or less distinctly along the Brazilian seaboard for several hundred miles, rises at Pernambuco into a perfectly straight artificial-looking wall, 3} miles long, with even

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Plan of Pernambuco.

Enflish Yards Fee eT

sides and a smooth and almost level top from 30 to 60 yards in width. It is of a hard pale-coloured sandstone, breaking with a very smooth fracture ;

and a tough layer of calcareous matter, generally several inches thick, pro-

duced by the successive growth and death of the small shells of Serpule with some few barnacles and nullipores, proves so effectual a protection of the outer surface that though it is exposed to the full force of the waves of the open Atlantic the oldest pilots know of no tradition of change in its appearance.! The belt of water within the reef is about a mile in width and forms a safe but rather shallow harbour ; vessels drawing 194 feet can enter, and there is abundant room for mooring along the shore and reef, but mail-steamers usually anchor in the roads and discharge by means of lighters. Sir John Hawkshaw's scheme for the improvement of the harbour (1874) was rejected by the Government as too costly ; but extensive dredging operations are being prosecuted. The city of Per- nambuco lies low, and is surrounded by a swampy stretch of country, with no high ground nearer than the hill on which Olinda is built, 8 miles to the north. It used to be considered the most pestilential of Brazilian seaports ; but its sanitary condition has greatly improved, partly owing to drainage-works executed by an English company. There are three natural divisions in the city—Recife ('the Reef "), situated not on the reef proper but on an island forming the southern end of a sandbank that stretches north towards Olinda ; Sant' Antonio, on a peninsula separated from the island by the united waters of the Capibaribe and the Biberibe; and Boa Vista, the fashionable residential district on the mainland opposite Sant' Antonio. In Recife the streets are narrow and crooked and many of the houses are of great age and present Dutch characteristics; but Sant' Antonio has broad straight streets, with well-paved side-walks, tramways (worked by mules), and modern- looking houses. Among the public buildings in Pernam- buco it is enough to mention the governor's palace, the episcopal palace, the hospital of Pedro IT. (5000 patients per annum, with French sisters of mercy as nurses), the foundling hospital, the poorhouse, the new lunatic asylum (1881), the university (18 professors and 530 students in 1879), the normal school, and the provincial library (13,000 vols., 11,581 readers, in 1880). The great commercial staple is sugar, and the brown sticky mud of the streets owes its peculiar character to the juice of the cane ; 825,711 bags of sugar were brought to the market in 1875-76 and 1,715,637 bags in 1879-80. Cotton,

which was first ex- ported in 1778 and continued a small item till 1781, now holds the second place,—130,925 bales in 1875-76 and 60,117 in 1879-80. Coal began to be imported in 1834,— 25,314 tons in 1879-80. The total value of the exports and imports has greatly increased.

1816. 1836. 1856. 1870. 1880.

Tmiporte. ..4…<0— £193,923 | £952,120 | £1,517,493 | £1,821,104 | £2,478,823 Bxporta ….nc-0+- £629,794 | £047,608 | £1,507,019 | £1,508,058 | £2,021,518

The port was opened to British vessels in 1808, and goods, which formerly had to pass through Portugal, began to be brought to England direct. A cemetery for British subjects was opened in 1814, a British hospital in 1821, and a British chapel in 1836. In 1880, out of a total of 1047 vessels (674,227 tons) calling at Pernambuco 451 (249,912 tons) were British. Pernambuco is connected with Olinda by a steam-tramway line and with Caxanga (84 miles) by a mule-tramway ; the Recife and San Francisco Railway (1856-62) runs 78 miles to Una, and is continued by a narrow-gauge line to Garanhuns ; and another narrow line strikes up the Capibaribe 52 miles to Limoeciro. In 1878 the population of the town and immediate suburbs was 94,493.

The name of Pernambuco (pera, ‘‘a stone,” nambuco, ** pierced”) appears to have been originally applied to Itamaraca (a town in

1 See Darwin’s account in Lond., Edinb., and Dubl. Phil. Mag., vol. xix., 1841, p. 257; and Natwralist’s Voyage, p. 498.

7° 44’ S. lat., now decayed, but formerly the capital of an independ- ent captaincy), where also there is an opening in the reef. In 1532 Duarte Coelho founded the city of Olinda, which continued to be the capital of the captaincy of Pernambuco till 1710. When in 1580 the country passed into the hands of Spain it had 700 stone houses, 4000 to 5000 negro slaves were employed in its sugar-planta- tions, and from 40 to 50 vessels came annually to load with sugar and Brazil wood, often called simply

Pernambuco or Fernambuk. Recife, which was a mere collection of fishers' huts when occupied by the French under Villegagnon in 1561, shortly afterwards began to attract attention as a port. It was captured and held for thirty- four days in 1595 by Sir James LANCASTER (q.v.), who did not, however, succeed in his attack on Olinda. In the 17th century this part of Brazil was the scene of a great struggle between the Spaniards and the Dutch. Olinda and Recife were captured by the Dutch under Admiral Loncq in 1630, and in the following year, when they were obliged to retreat to the reef, they left Olinda in flames. Fort Brun was built in 1631. In 1639 (Recife already con- taining 2000 houses) Count Maurice laid out a new town (Maurits- stad) on the island of Antonio Vaz, and built himself a palace (Vrijburg or Sans Souci) of materials obtained by the demolition of Olinda. A bridge was thrown across from Recife to Mauritsstad, and another from Mauritsstad to the mainland, where the count had his summer palace of Schoonzigt or Boa Vista. An observa- tory was erected under Marcgraf and De Laet. In 1654 the Dutch garrison, neglected by the authorities at home, who were at war with Cromwell, was obliged to capitulate to the Portuguese (26th

January).

See J. B. Fernandes Gama, Mem. hist. da Prov. de Pernambuco (Pernambuco, 1844); Barleus, Rerum in Brasilia gestarum historia (1660); and Netscher, "' Les Hollandais au Brésil," in Le Moniteur des Indes Orient. et Occid. (1848-49).

PERNAU, in Russian PERNOFF, a seaport town and watering-place of European Russia, in the government of Livonia, is situated in 58° 23' N. lat. and 24° 30' E. long,, 155 miles north of Riga, on the left bank of the Pernau or Pernova, which about half a mile farther down enters the Bay of Pernau, the northern arm of the Gulf of Riga. The town proper is well and regularly built, and contains two public gardens and two public parks (Salon Park and Bade Park), a town-house, a hospital, and a public library. On the right side of the river lies the suburb of Bremer- seite. The harbour is small, and the depth of water on the bar under 10 feet. The exports, which consist mainly of flax (to Great Britain, France, and Portugal), linseed (to Germany), mats, and cereals, had a value of 8,220,421 silver roubles in 1880, and of

5,427,465 in 1881 (a bad year). The population was 6690 in 1863, 9525 in 1867, and 12,918 in 1881.

Founded on the right side of the river in 1255 by one of the bishops of Oesel, Pernau, with its walls and castle, soon became a flourishing place. In the 16th century it was occupied in succession by the Swedes, the Poles, and the knights of the Teutonic order. After 1599 the Poles transferred the town to the left side of the river ; and in 1642 the Swedes, who had been in possession since 1617, strengthened it with regular‘fortifications. In 1710 it was be- sieged and taken by the Russians, and the fortress is now demolished.

PERNE, Anprew (1519-1589), a notable character in 16th-century history, was born at East Bilney in Nor- folk in 1519. He received his education at St John’s College, Cambridge, was afterwards a fellow of Queens’ College, and finally master of Peterhouse in the same university. He is best known asa remarkable example of the tergiversation in reference to religious profession which, owing to the sudden changes in the prescribed theological belief of the state, was only too common in his age. In the reign of Henry VIII. he defended the adora- tion of saints, but subsequently abandoned this doctrine in the reign of Edward VI., and became distinguished as an active promulgator of Reformation tenets. In the reign of Mary he subscribed the Roman Catholic articles, and when the remains of Martin Bucer and Paulus Fagius, —two Protestant professors in the university—were ex- humed and burnt, he preached on the occasion. He was rewarded for his subservience by being promoted to the deanery of Ely. Notwithstanding this discreditable com- pliance, he succeeded in gaining Elizabeth’s favour on her accession ; he signed the grace for restoring the names of Bucer and Fagius in the lists of honours and dignities

PRR ER

from which they had been expunged ; and he was elected by the university to the office of vice-chancellor. He thus, like Symond Symonds, the vicar of Bray, was twice a Papist and twice a Protestant. During the remainder of his career he was known as a moderate supporter of Church of England doctrine against the Puritan party. ‘““What bishop or politician in England,” asks Gabriel Harvey, “‘was so great a temporizer as he?” The wags of the

university invented a verb, perno, which, they de clared, meant, “I rat,” “I change often.” Yet the satirist, notwithstanding, admits his many excellent qualities and eulogizes him for his urbanity and singular tact in his intercourse with men of every class and shade of opinion. To this latter characteristic we must attribute the fact that, while, throughout his life, Perne preserved the friendship of austere churchmen like Whitgift, he was popular with critics of a very different stamp, such as the dissolute Thomas Nash, who declares that ‘“‘few men lived better.” It is not a little to Perne’s credit that the social influence which he thus acquired was uniformly exerted to bring about the ends which he had in view as a philan- thropist and a true lover of learning. He was a dis- tinguished benefactor of the university in which his life was mainly passed, and its library was restored chiefly through his efforts. His own library at Peterhouse was said to be the best at that time in England. Dr Perne died in 1589 while on a visit to Archbishop Whitgift, on whose gratitude he had established a lasting claim by the protec- tion he accorded him during the persecution under Mary. He belongs to the class of men whose influence during their lives is felt rather than seen; and the services he rendered to his generation become increasingly apparent in proportion as this period of English history is more closely studied.

PERONNE, chief town of an arrondissement of the department of the Somme, France, and a fortified place on the right bank of that river at its confluence with the stream called the Doingt or Cologne, lies 94 miles north- north-east of Paris on the railway from Paris to Cambrai. Wet moats surround the ramparts, which are built of brick. The church of St Jean (1509-1525) was greatly damaged during the bombardment of 1870-71, but has since been restored. The castle of Péronne, in one of the bastions of the enceinte, was partially destroyed by fire in 1877; it still retains four large conical-roofed towers dating from the Middle Ages, one of which is said to have been the prison of Louis XI., when he had his famous encounter with Charles the Bold (1468). The town-hall, which was built in the 16th century, has an elegant campanile of modern construction. The population of Péronne in 1881 was 4696.

The Frankish kings had a villa at Péronne, which Clovis IT. gave to Erchinoaldus, mayor of the palace. The latter founded a monastery here,

and raised in honour of St Furcy a collegiate church, which was a wealthy establishment until the Revolution ; it is the burial-place of Charles the Simple, who died of starvation in a dungeon in Péronne, into which he had been thrown by the count of Vermandois (929). After the death of Philip of Alsace Péronne, which he had inherited through his wife, escheated to the French crown (1199), and in 1209 reccived a charter with municipal privileges from Philip Augustus. By the treaty of Arras (1485) it was given to the Burgundians; bought back by Louis XI., it passed again into the hands of Charles the Bold in 1465. On the death of Charles, however, in 1477, Louis XI. resumed possession. In 1536 the emperor Charles V. besieged Péronne, but without success ; in its defence a woman called Marie Fourré greatly distinguished herself, and the anniversary of the raising of the siege was celebrated at Péronne for many years. It was the first town after Paris at which the League was proclaimed in 1577. Péronne's greatest misfortunes occurred during the late Franco-German war. It was invested on 27th December 1870, and bombarded from the 28th to the 9th of the following January, upon which date, on account of the suffer- ings of the civil population, among whom smallpox had broken out, it was compelled to capitulate. Out of 700 houses 600 were

more or less injured and eighty-two buildings set on fire ; the tower of the church of St Jean was also burnt, its roofing and timber-work destroyed, and the bells melted by the flames. This damage has since been repaired.

PEROUSE. See La Pirovuss, vol. xiv. p. 298.

PERPETUAL MOTION, or Perpetuum Mosizs, in its usual significance does not mean simply a machine which will go on moving for ever, but a machine which, once set in motion, will go on doing useful work without draw- ing on any external source of energy, or a machine which in every complete cycle of its operation will give forth more energy than it has absorbed. Briefly, a perpetual motion usually means a machine which will create energy.

The earlier seekers after the "perpetuum mobile" did not always appreciate the exact nature of their quest; for we find among their ideals a clock that

would periodically rewind itself, and thus go without human interference as long as its machinery would last. The energy created by such a machine would simply be the work done in over- coming the friction of its parts, so that its projectors might be held merely to have been ignorant of the laws of friction and of the dynamic theory of heat. Most of the perpetual motionists, however, had more practical views, and ex- plicitly declared the object of their inventions to be the doing of useful work, such as raising water, grinding corn, and soon. Like the exact quadrature of the circle, the transmutation of metals, and other famous problems of antiquity, the perpetual motion has now become a vener- able paradox. Still, like these others, it retains a great historical interest. Just as some of the most interesting branches of modern pure mathematics sprang from the problem of squaring the circle, as the researches of the alchemists developed into the science of modern chemistry, so, as the result of the vain search after the perpetual motion, there grew up the greatest of all the generalizations of physical science, the principle of the conservation of energy.

There was a time when the problem of the perpetual motion was one worthy of the attention of a philosopher. Before that analysis of the action of ordinary machines which led to the laws of dynamics, and the discussion of the dynamical interdependence of natural phenomena which accompanied the establishment of the dynamical theory of heat, there was nothing plainly unreasonable in the idea that work might be done by the mere concatenation of machinery. It had not then been proved that energy is uncreatable and indestructible in the ordinary course of nature; even now that proof has only been given by in- duction from long observation of facts. There was a time when wise men believed that a spirit, whose maintenance would cost nothing, could by magic art be summoned from the deep to do his master’s work; and it was just as reasonable to suppose that a structure of wood, brass, and iron could be found to work under like conditions. The disproof is in both cases alike. No such spirit has ever existed, save in the imagination of his describer, and no such machine has ever been known to act, save in the fancy of its inventor.

The principle of the conservation of energy, which in one sense is simply a denial of the possibility of a perpetual motion, rests on facts drawn from every branch of physi- eal science ; and, although its full establishment is

not half a century old, yet so numerous are the cases in which it has been tested, so various the deductions from it that have been proved to accord with experience, that it is now regarded as one of the best-established laws of nature. Consequently, on any one who calls it in question is thrown the burden of proving his case. If any machine Were produced whose source of energy could not at once be traced, a man of science (complete freedom of investi- gation being supposed) would in the first place try to

trace its power to some hidden source of a kind already known ; or in the last resort he would seek for a source of energy of a new kind and give it a new name. Any assertion of creation of energy by means of a mere machine would have to be authenticated in many instances, and established by long investigation, before it could be received in modern science. The case is precisely as with the law of gravitation ; if any apparent exception to this were observed in the case of some heavenly body, astro- nomers, instead of denying the law, would immediately seek to explain the occurrence by a wider application of it, say by including in their calculations the effect of some dis- turbing body hitherto neglected. If a man likes to indulge the notion that, after all, an exception to the law of the conservation of energy may be found, and, provided he submits his idea to the test of experiment at his own charges without annoying his neighbours, all that can be said is that he is engaged in an unpromising enterprise. The case is otherwise with the projector who comes for- ward with some machine which claims by the mere in- genuity of its contrivance to multiply the energy sup- plied to it from some of the ordinary sources of nature and sets to work to pester scientific men to examine his supposed discovery, or attempts therewith to induce the credulous to waste their money. This is by far the largest class of perpetual-motion-mongers nowadays. The interest of such cases is that attaching to the morbid anatomy of the human mind. Perhaps the most striking feature about them is the woful sameness of the symptoms of their madness. As a body perpetual-motion seekers are ambi- tious, lovers of the short path to wealth and fame, but wholly superficial. Their inventions are very rarely char- acterized even by mechanical ingenuity. Sometimes in- deed the inventor has simply bewildered himself by the complexity of his device ; but in most cases the machines of the perpetual motionist are of

child-like simplicity, remarkable only for the extraordinary assertions of the inventor concerning them. Wealth of ideas there is none; simply assertions that such and such a machine solves the problem, although an identical contrivance has been shown to do no such thing by the brutal test of standing still in the hands of many previous inventors. Hosts of the seekers for the perpetual motion have attacked their insoluble problem with less than a schoolboy's share of the requisite knowledge ; and their confidence as a rule is in proportion to their ignorance. Very often they get no farther than a mere prospectus, on the strength of which they claim some imaginary reward, or offer their precious discovery for sale ; sometimes they get the length of a model which wants only the last perfection (already in the inventor's brain) to solve the great problem; sometimes fraud is made to supply the motive-power which their real or pretended efforts have failed to discover.

It was no doubt the barefaced fallacy of most of the plans for perpetual motion that led the majority of scien- tific men to conclude at a very early date that the " per- petuum mobile" was an impossibility. We find the Parisian Academy of Sciences refusing, as early as 1775, to receive schemes for the perpetual motion, which they class with solutions of the duplication of the cube, the trisection of an angle, and the quadrature of the circle. Stevinus and Leibnitz seem to have regarded its impossibility as axi- omatic; and Newton at the beginning of his Principia states, so far as ordinary mechanics are concerned, a prin- ciple which virtually amounts to the same thing (see Mecuanics, vol. xv. p. 715).

The famous proof of De la Hire simply refers to some of the more common gravitational perpetual motions, to which we shall refer shortly. The truth is, as we have said already, that, if proof is to be given, or considered XVIII. — 70

necessary, it must proceed by induction from all physical phenomena.

Tt would serve no useful purpose here to give an exhaustive historical account of the vagaries of mankind in pursuit of the " perpetuum mobile." The reader may consult on this subject the two volumes by Henry Dircks,

C.E., published by E. and F. N. Spon, London, 1861 and 1870, from which, for the most part, we select the follow- ing facts to give the reader some idea of this department of the history of human fallibility.

By far the most numerous class of perpetual motions is that which seeks to utilize the action of gravity upon rigid solids. We have not read of any actual proposal of the kind, but the most obvious thing to imagine in this way would be to procure some substance which intercepts gravitational attraction. If this could be had, then, by introducing a plate of it underneath a body while it was raised, we could elevate the body without doing work ; then, removing the plate, we could allow the body to fall and do work; eccentrics or other imposing device being added to move the gravitation intercepter, behold a perpetual motion complete! The great difficulty is that no one has found the proper material for an intercepter.

Fig. 1 represents one of the most ancient and oftenest- repeated of gravitational perpetual motions. The idea is that the balls rolling in the compartments between the felloe and the rim of the wheel will, on the whole, so com- port themselves that the moment about the centre of those on the descending side exceeds the moment of those on the ascending side. Endless devices, such as curved spokes, levers with elbow- joints, eccentrics, d&c., have been proposed for effecting this impossibi- lity. The modern student of dynamics at once con- vinces himself that no machinery can effect any such result; because, if we give the wheel a com- plete turn, so that each ball returns to its ori- ginal position, the whole work done by the ball will, at the most, equal that done on it. If we were to start the wheel and balls in the most general way possible, we should doubtless have a very pretty problem to solve ; but we know that, if the laws of motion be true, in each step the kinetic energy given to the whole system of wheel and balls is equal to that taken from the potential energy of the balls less what is dissipated in the form of heat by frictional forces, or vice versa, if the wheel and balls be losing kinetic energy,—save that the friction in both cases leads to dissipation. So that, whatever the system may lose, it can, after it is left to itself, never gain energy during its motion.

The two most famous perpetual motions of history, viz., the wheels of the marquis of Worcester and of Councillor Orffyreus were probably of this

type. The marquis of Worcester gives the following account of his machine in his Century of Inventions (art. 56).

_“To provide and make that all the Weights of the descending side of a Wheel shall be perpetually further from the Centre than those of the mounting side, and yet equal in number and heft to the one side as the other. A most incredible thing, if not seen, but tried before the late king (of blessed memory) in the Tower, by my directions, two Extraordinary Embassadors accompanying His Majesty, and the Duke of Richmond, and Duke Hamilton, with most of the Court, attending Him. The Wheel was 14. Foot over, and 40. Weights of 50. pounds apiece. Sir William Balfore, then Lieutenant of the Tower, can justify it, with several others. They all saw, that no sooner these great Weights passed the Diameter-

Fig. 1.

line of the lower side, but they hung a foot further from the Centre, nor no sooner passed the Diameter-line of the upper side but they hung a foot nearer. Be pleased to judge the consequence.”

Orffyreus (whose real name was Bessler) also obtained distinguished patronage for his invention. His last wheel, for he appears to have constructed more than one, was 12 feet in diameter and 1 foot 2 inches broad; it consisted of a light framework of wood covered in with oil-cloth so that the interior was concealed, and was mounted on an axle which had no visible connexion with any external mover. It was examined and approved of by the land- grave of Hesse-Cassel, in whose castle at Weissenstein it is said to have gone for eight weeks in a sealed room. The most remarkable thing about this machine is that it evidently imposed upon the mathematician ’s Gravesande, who wrote a letter to Newton giving an account of his examination of Orffyreus’s wheel undertaken at the request of the landgrave, wherein he professes himself dissatisfied with the proofs theretofore given of the impossibility of perpetual motion, and indicates his opinion that the in- vention of Orffyreus is worthy of investigation. He him- self, however, was not allowed to examine the interior of the wheel. The inventor seems to have destroyed it himself. One story is that he did so on

account of difft- culties with the landgrave’s Government as to a licence for it; another that he was annoyed at the examination by ’s ravesande, and wrote on the wall of the room containing the fragments of his model that he had destroyed it because of the impertinent curiosity of Professor ’s Gravesande.

The history of this case is noteworthy, because it con- tains all the characters that usually appear in such comedies even now,—the fraudulent paradoxer, the illustrious and intelligent patron, the simple-minded, unbiassed, scientific witness.

It is worthy of remark that the overbalancing-wheel perpetual motion seems to be as old as the 13th century. In his second series Dircks quotes an account of an inven- tion by Wilars de Honecort, an architect whose sketch-book is still preserved in the Ecoles des Chartes at Paris. De Honecort says, “ Many a time have skilful workmen tried to contrive a wheel that shall turn of itself; here is a way to do it by means of an uneven number of mallets, or by quicksilver.” He thereupon gives a rude sketch of a wheel with mallets jointed to its circumference. It would appear from some of the manuscripts of Leonardo da Vinci that he had worked with similar notions.

Another scheme of the perpetual motionist is a water- wheel which shall feed its own mill-stream. This notion is probably as old as the first miller who experienced the difficulty of a dry season. One form is figured in the Mathematical Magic of Bishop Wilkins (1614-1672) ; the essential part of it is the water-screw of Archimedes, which appears in many of the earlier machines of this class. Some of the later ones dispense with even the subtlety of the water-screw, and boldly represent a water-wheel

well-known inventor of the digester, exposes one of these in the Philo- sophical Transactions for 1685. The most naive of these devices is that illustrated in fig. 2, the idea of which is that the larger quantity of water in the wider part of the vessel weighing more will over- balance the smaller quantity in the

Fig. 2. narrower part, so that the water will run over at ©, and so on continually.

Capillary attraction has also been a favourite field for

the vain quest; for, if by capillary action fluids can be made to disobey the law of never rising above their own level, what so easy as thus to produce a continual ascent and overflow, and thus perpetual motion? Various schemes of this kind, involving an endless band which should raise more water by its capillary action on one side than on the other, have been proposed. The most celebrated is that of Sir Wil- liam Congreve, who invented the rockets that bear

his name. EFG (fig. 3) is an inclined _ plane

over pulleys; at the top and bot- tom travels an endless band of Fig. 3.

sponge, abcd, and over this again an endless band of heavy weights jointed together. The whole stands over the surface of still water. The capillary action raises the water in ab, whereas the same thing cannot happen in the part ad, since the weights squeeze the water out. Hence, inch for inch, ad is heavier than ad; but we know that if ab were only just as heavy inch for inch as ad there would be equilibrium, if the heavy chain be also uniform; there- fore the extra weight of ab will cause the chain to move round in the direction of the arrow, and this will go on continually,

The more recondite vehicles of energy, such as electricity and magnetism, are more seldom drawn upon by perpetual- motion inventors than might perhaps be expected. In- stances do occur, but devices of this kind have not become acommon part of the folklore of nations like the over- balancing wheel and the self-sufficient water-mill. Gilbert, in his treatise De Magnete, alludes to some of them, and Bishop Wilkins mentions among others a machine “wherein a loadstone is so disposed that it shall draw unto it on a reclined plane a bullet of steel, which, still as it ascends near to the loadstone, may be contrived to fall through some hole in the plane and so to return unto the place whence at first it began to move, and being there, the loadstone will again attract it upwards, till, coming to this hole, it will fall down again, and so the motion shall be perpetual.” The fact that screens do exist whereby elec- trical and magnetic action can be cut off would seem to

open a door for the perpetual-motion seeker. Unfortu- nately the bringing up and removing of these screens involves in all cases just that gain or loss of work which is demanded by the inexorable law of the conservation of energy. A shoemaker of Linlithgow called Spence pre- tended that he had found a black substance which inter- cepted magnetic attraction and repulsion, and he produced two machines which were moved,y

as he asserted, by the agency of permanent magnets, thanks to the black substance. The fraud was speedily exposed, but it is worthy of remark that Sir David Brewster thought the thing worth mentioning in a letter to the Annales de Chimie, 1818, wherein he states “that Mr Playfair and Captain Kater have inspected both of these machines and are satisfied that they resolve ‘ the problem of perpetual motion.” i ae

Not very long ago the writer of this article received by post an elaborate drawing of a locomotive engine which

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was to be worked by the agency of permanent magnets. He forgets the details, but it was not so simple as the plan represented in fig. 4, where M and N are permanent magnets, whose attraction is “screened” by the wooden blocks A and B from the upper left and lower right quad- rants of the soft iron wheel W, which consequently is attracted round in the same direction by both M and N, and thus goes on for ever.

One more page from this chapter of the book of human folly; the author is the famous John Bernoulli. We translate his Latin, as far as possible, into modern phraseo-

logy.

In the first place we must premise the following (see fig. 5).

1. If there be two fluids of different densities whose densities are in the ratio of G to L, the height of equiponderating cylinders on equal bases will be in

the inverse ratio of L to G.

2. Accordingly, if the height AC of one fluid, contained in the vase AD, be in this ratio to the height EF of the other liquid, which is in a tube open at both ends, the liquids so placed will remain at rest.

3. Wherefore, if AC be to EF in a greater ratio than L to G, the liquid in the tube will ascend; or if the tube be not sufficiently long the liquid will overflow at the orifice E (this follows from hydrostatic principles).

4. It is possible to have two liquids of different density that will mix.

5. It is possible to have a filter, colander, or other separator, by means of which the lighter liquid mixed with the heavier may be separated again therefrom.

Construction.—These things being presupposed, I thus construct a perpetual motion. Let there be taken in any (if you please, in equal) quantities two liquids of different densities mixed together (which may be had by Hyp. 4), and let the ratio of their densities be first determined, and be the heavier to the lighter as G to L, then with the mixture let the vase AD be filled up to A. This done, let the tube EF, open at both ends, be taken of such a length that AC: EF>2L:G+1L; let the lower orifice F of this tube beA stopped, or rather covered with the filter or other material scparating the lighter liquid from the heavier (which may also be had by Hyp. 5); now let the tube thus prepared be immersed to the bottom of the ves- sel CD; I say that the liquid will C continually ascend through the ori- fice F of the tube and overflow by the orifice E upon the liquid below. ¢

Demonstration.—Because the ori- fice F of the tube is covered by the b Vic 5 filter (by constr.) which separates 1B ‘ the lighter liquid from the heavier, it follows that, if the tube be immersed to the bottom of the vessel, the lighter liquid alone which is mixed with the heavier ought to rise through the filter into the tube, and that, too, higher than the surface of the surrounding liquid (by Hyp. 2), so that AC: EF=2L:G+L; but since (by constr.) AC: EF>2L:G+L it necessarily follows (by Hyp. 3) that the lighter liquid will flow over by the orifice E into the vessel below, and there will meet the heavier and be again mixed with it; and it will then penetrate the

filter, again ascend the tube, and be a second time driven through the upper orifice. Thus, therefore, will the flow be continued for ever. Q.E.D. ‘

He then proceeds to apply this theory to explain the perpetual rise of water to the mountains, and its flow in rivers to the sea, which others had falsely attributed to capillary action,—his idea being that it was an effect of the different densities of salt and fresh water.

One really is at a loss with Bernoulli’s wonderful theory, whether to admire most the conscientious statement of the hypothesis, the prim logic of the demonstration, so care- fully cut according to the pattern of the ancients, or the weighty superstructure built on so frail a foundation. Most of our perpetual motions were clearly the result of too little learning ; surely this one was the product of too much. (G. CH.)

PERPIGNAN (Spanish, Perpifian), the ancient capital of Roussillon, and now the chief town of the department

of Pyrénées Orientales, France, and a first-class fortress,

stands about 66 feet above sea-level, on the right bank of the Tet, 7 miles above the point where it falls into the Mediterranean. The streets of Perpignan are narrow and crooked, and the houses have no architectural pretensions. The cathedral of St Jean, in the Third Pointed style, was commenced in 1324 by the bishop of Elne, and carried on by Sancho II., king of Majorca. The chancel, built when Louis XI. was master of Roussillon, bears the arms of France. The nave is 259 feet long, 64 wide, and 89 high. The most noteworthy feature in the building is an immense reredos of white marble, begun in 1618 by Bar- tholomew Soler of Barcelona. The tomb of Louis de Mont- mor, first French bishop of Elne after the annexation of Roussillon to France, is also worthy of notice; the black marble sarcophagus is supported by four white marble lions, and surmounted by the recumbent figure of the bishop. The bede-tower, built over a small Romanesque chapel, is crowned by an iron cage which dates from 1742. The Place de la Loge, which derives its name from the Spanish

word Jonja (market or bazaar), was built in 1396 in a Pointed style suggestive of the Moorish, and was in-

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Plan of Perpignan,

tended for a cloth-exchange. The gate-house adjoining the Narbonne road, built in the time of Louis XI., has elegant turrets. The fortifications of the citadel, which is large enough to contain 2000 men, are of various times. The kings of Majorca had a castle on the terrace commanding the town, of which all that now remains is the keep. The chapel is remarkable as being a mixture of the Romanesque, Pointed, and Moorish styles; the top of its tower com- mands a view of the whole plain of Roussillon, with its flourishing market-gardens and vineyards, overhung on the south-west by Mount Canigou, and bounded by the Corbiéres on the north, the Albéres on the south, and the Mediterranean on the east. The ramparts surround- ing the citadel are the work of Louis XI., Charles V., and Vauban. The sculptures and caryatides still to be seen on the gateway were placed there by the duke of Alva. Perpignan was the seat of a university founded by the kings of Aragon, and the town still possesses an inter- esting museum of sculptures and pictures, where are to be seen the first photographic proofs produced by Daguerre, a natural history collection, and a library containing 30,000 volumes. In one of the squares of the town is the statue of Arago, unveiled in 1879. The manufactures of Perpignan are cloth-making, cork-cutting, tanning, and cooperage, and it has a large trade in wine, brandy, honey, fine wool, fruit, and vegetables. The population in 1881 was 31,735.

Perpignan had its origin in a Benedictine monastery, and its name first appears in charters of the 10th century. The place had

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already grown into a town when Philip the Bold, king of France, died there in 1285, as he was returning from an unsuccessful expedi- tion into Aragon. At that time it belonged to the kingdom of Majorca, which was created in 1262, and its sovereigns resided there until, in 1344, that small state reverted to the possession of the kings of Aragon. When Louis XI. occupied Roussillon ag security for money advanced by him to the king of Aragon, Per- pignan resisted the French arms for a considerable time, and only yielded through stress of famine (15th March 1475). Roussillon was restored to Aragon by Charles VIII., and Perpignan was again besieged in 1542 by Francis I., but without success. Later on, however, the inhabitants, angered by the tyranny and cruelty of the Spanish governor, surrendered the town to Louis XIII. ‘The citadel held out until the 9th of September 1642, and the place has ever since belonged to France, to which it was formally ceded by the treaty of the Pyrenees.

PERRAULT, Caries (1628-1703), the most pro- minent author of France in a specially French kind of literature—the fairy tale—and one of the chief actors in the famous literary quarrel of ancients and moderns, was born at Paris on 12th January 1628. His father, Pierre Perrault, was a barrister, all whose four sons were nien of some distinction,—Claude, the second, who was first a physician and then an architect, being the best known next to Charles the youngest. The latter was brought up at the Collége de Beauvais, until he chose to quarrel with his masters, after which (an incident rather rare at the time when patriarchal government of families was in full fashion) he was allowed to follow his own bent in the way of study. He took his degree of “licencié en droit” at Orleans in 1651, and was almost immediately called to the Paris bar, where, however, he practised for a very short time. In 1654 his father bought himself the post of receiver-general at Paris, and made Charles his clerk. After nearly ten years of this employment he was, in 1663, chosen by Colbert as his secretary in a curious and not easily describable office. Put shortly, Perrault’s duties were to assist and advise the minister in matters relating to the arts and sciences, not forgetting literature. The protection of Colbert procured a place in the Académie Frangaise for his protégé in 1671, and Perrault justified his election in several ways. One was the orderly arrange- ment of the business affairs of the Academy, another was the suggestion of the custom (which more than anything else has given the institution a hold on the French

public) of holding public séances for the reception of candidates. Colbert's death in 1683 put an end to Perrault's official career, but even before that event he had experienced the morose and ungenerous temper which was the great draw- back of that very capable statesman. He now gave him- self up to literature, in which, like most men of his time, he had made some experiments already. The famous dispute of ancients and moderns is said to have arisen in consequence of some words used by Perrault in one of the regular academic discourses, on which Boileau, with his usual rudeness, commented in violent terms. Perrault, though a very good-natured man, had ideas and a will of his own, and the Paralléle des Anciens et des Modernes, which appeared between 1688 and 1696, was the result. The well-known controversy that followed in its train raged hotly in France, passed thence to England, and in the days of La Motte and Fénelon broke out again in the country of its origin. As far as Perrault is concerned, he was inferior to his adversaries in learning, but decidedly superior to them in wit. It is not known what, except the general popularity of the fairy tale in the last decade of the century, drew Perrault to the composition of the only works of his which are still read. The first of them, Griselidis, which is in verse, appeared in 1691, Peau d' Ane and Les Souhaits Ridicules, also in verse, in 1694. But Perrault was no poet, and the merit of these pieces is entirely obscured by that of the prose tales, Za Belle au Bois Dormant, Petit Chaperon Rouge, La Barbe Bleue, Le

Chat Botté, Les Fées, Cendrillon, Riquet & la Houppe, which, after being published in a miscellany during 1696 and 1697, appeared in a volume with the last-named year on the title-page, and with the general title of Histoires du Temps Passé. No criticism of these famous productions is necessary, and it is scarcely less superfluous to observe that Perrault has no claim to the invention of the subjects. His merit is that he has treated them with a literary skill in adapting style to matter which cannot possibly be ex- ceeded. Of his other work some Mémoires and academic Eloges need alone be mentioned. He died on 16th May

1703.

Except the tales, Perrault's works have not recently been re- printed. Of the tales the best recent editions are those of Giraud (Lyons, 1865) and Lefévre (Paris, 1875).

PERRONE, Giovanni (1794-1876), Roman Catholic theologian, was born at Chieri (Piedmont) in 1794, studied theology at Turin, and in his twenty-first year went to Rome, where he joined the Society of Jesus, and, after his ordination to the priesthood, became a teacher in the Col- legium Romanum. From Ferrara, where he was rector of the Jesuit college after 1830, he returned to his teaching work in Rome, being made head of his old college in 1850. He died on 26th August 1876. He was the author of numerous dogmatic works, which, as clearly and faithfully reflecting the prevailing tendencies of Roman theology, obtained wide currency and were extensively translated. They may still be regarded as representing most nearly the modern orthodoxy of his church. The Prelectiones Theologice may be specially named (1st ed. 1835, 31st ed. 1866).

PERRY, an alcoholic beverage, obtained by the fermenta- tion of the juice of pears. The manufacture is in all essentials identical with that of CrpER (¢.v.), though there are some variations in detail arising from the more abund- ant mucilage of the pear. The clearest and most concise account of making cider and perry is contained in the fourth part of the Herefordshire Pomona for 1881 (p. 133 sq.). The fruits are either taken at once to the crushing mill or allowed, like apples, to remain in heaps so as to ripen uniformly; they are then crushed between rollers of granite or millstone grit, and the must or juice poured into casks. In making the better kinds of perry only the best sorts of pears are used without admixture; but for ordinary purposes pears of various kinds are mixed indis- criminately, although, as in the case of the apple, the fruits used for the manufacture of perry are not those which are the most suitable for dessert. It is con- sidered better not to crush the pips, as the flavour of the perry is thereby deteriorated. The most scrupulous clean- liness is absolutely requisite, and all the metal-work of the machinery should be sedulously kept bright, otherwise the acids of the juice dissolve the oxides, and, in the case of lead, produce poisonous salts. Pear-juice contains grape- sugar, tannic, malic, and tartaric acids, albumen, lime, pectin, mucilage, and other ingredients. The quantity of potash and phosphoric acid in the juice is relatively large. At a temperature ranging

from 50° to 80° the juice undergoes natural fermentation without the addition of yeast. This fermentation, however, is brought about by the agency of a “ferment” (saccharomyces), which feeds on the grape-sugar of the juice, decomposing it, and causing the rearrangement of its constituents in the form of alcohol, carbonic-acid gas, glycerin, &e. The saccharomyces fer- ments in the first instance absorb oxygen and liberate car- bonic acid, as in the process of respiration, but the air of the fluid in which they live speedily becomes exhausted of its oxygen, and then the ferments obtain further supplies from the glucose, in effecting the decomposition of which they set free more oxygen than they require, and this,

uniting with the hydrogen and the carbon, forms the pro- ducts of fermentation.

_ In practice the pulp is removed from the mill and placed in open vats for forty-eight hours or longer. Gentle fermentation sets in, as shown by the formation of froth and bubbles of carbonic-acid gas. The pulp is then placed in layers separated by hair-cloths, which act as sieves or filters when the mass is placed in a press like a cheese- press. The pressure is gradual at first and afterwards increased. The juice or must is poured into hogsheads, leaving an unfilled space as “ullage.” The hogsheads are placed in a cool cellar, when fermentation begins as above explained, and a thick scum forms on the surface called the “upper lees.” At the same time mucilage and ferment-cells with the more solid particles sink to the bottom and form the “lower lees” at the bottom of the barrel. When the fermentation has subsided the liquor between the upper and lower lees should be bright, but in the case of perry, owing to the large quantity of mucilage, the juice has to be filtered through filters of Forfar linen, — a tedious process. The clear liquor is now racked off into clean casks, not quite filled, but leaving space for “‘ullage,” and kept uncorked at a low temperature. A better practice is to close the cask with a bung, through which a curved siphon-like tube is passed, one end of it being in the “‘yllage” and the portion of it outside the cask being bent downwards and then upwards ; then either the bend of the tube may be filled with one or two tablespoonfuls of water, or the outer end of the bent tube may be plunged in a cup of water,—the object in all cases

being to provide for the escape of gas from the cask and to prevent the passage of air into it. In a week or so the fermentation ceases or nearly so, the liquor becomes clear and quiet, when isinglass is added in the proportion of one ounce to a hogshead of 100 to 115 gallons. (In Devonshire, the hogshead con- tains uniformly fifty gallons.) In January or February the bungs are driven in firmly. While fermentation is going on, a temperature of 50° to 70° is most propitious, but after the liquor has been racked off it should be kept in a uniformly cool cellar as near to 40° Fahr. as can be done. When it is desirable to restrain over-violent or hasty fermentation, sulphur or salicylic acid is employed. The latter, being the simpler and cleaner, is the better agent to be adopted. An ounce or an ounce and a half to a hundred gallons should be poured into the fermenting liquor immediately after it has been racked. It is very effectual, and leaves no sensible effects on the liquor if carefully used, being tasteless and free from smell. Great care should be taken, however, not to allow the acid to come into contact with any metal such as iron, or a black colour will result. Perry contains about 7 per cent. of alcohol, and will keep in casks if well made for three or four years, or longer if in bottle. It does not, however, travel well.

PERSEPHONE. See PROSERPINE.

PERSEPOLIS. In the interior of Persia proper, some 40 miles north-east of Shiraz, and not far from where the small river Pulwdr flows into the Kur (Kyrus), there is a large terrace with its east side leaning on Kuhi Rahmet

‘the Mount of Grace”). The other three sides are formed by a retaining wall, varying in height with the slope of the ground from 14 to 41 feet; and on the west side a magnificent double stair, of very easy steps, leads to the top. On this terrace, which is not perfectly level, stand and lie the ruins of a number of colossal buildings, all constructed of exquisite dark-grey marble from the adja- cent mountain. The stones were laid without mortar, and many of them are still i situ, although the iron clamps by which they were fastened together have been stolen or destroyed by rust. The mason-work is excellent, and the.

style of the lofty palaces, colonnades, and vestibules most imposing. Especially striking are the huge pillars, of which a number still stand erect. No traveller can escape the spell of these majestic ruins! It is impossible to give a minute account of them here; the reader must refer to the numerous descriptions and illustrations in the works of ancient and modern travellers? It is to be observed that several of the buildings were never finished. Stolze has shown that in some cases even the mason's rub- bish has not been removed, and remarks accordingly that in those early times, just as at the present day, an Oriental prince would rather commence a new building of his own than complete the unfinished work of his predecessor.

These ruins, for which the name Chzhil mendre or "the forty minarets"? can be traced back to the 13th century,* are now known as Z'akhti Jamshid, "the throne of Jamshid" (a mythical king). That they represent the Persepolis captured and partly destroyed by Alexander the Great has been beyond dispute, at least since the time of Pietro della Valle.5 Amongst the earlier scholars the fanciful notions of the Persians, who are utterly ignorant of the real history of their country before Alexander, often re- ceived too much attention; hence many of them were of opinion that the buildings were of much higher antiquity than the time of Cyrus; and even those who rightly regarded them as the works of the Achzmenians were unable to support their theory by conclusive evidence.® The decipherment of the cuneiform Persian inscriptions found on the ruins and in the neighbourhood has put an end to all doubt on this point. We now read with absolute certainty that some of the edifices are the work of Darius I, Xerxes, and Artaxerxes ITI. (Ochus), and with equal certainty we may conclude that all the others were built under the Achzemenian dynasty.

Behind Takhti Jamshid are three sepulchres hewn out of the rock in the hillside, the facades, one of which is incomplete, being richly ornamented with reliefs. About 8 miles to the north-north-east, on the opposite side of the Pulwar, rises a perpendicular wall of rock, in which four similar tombs are cut, at a considerable height from the bottom of the valley. The modern Persians call this place Nakshi Rustam ("the picture of Rustam") from the Sasanian reliefs beneath the opening, which they take to be a representation of the mythical hero Rustam. That the occupants of these seven tombs were kings might be inferred from the sculptures, and one of those at Nakshi

Rustam is expressly declared in its inscription to be the tomb of the great Darius, concerning whom Ctesias relates

1 See the descriptiou of Mas‘udi (ed. Barbier de Meynard, iv. 76 sq.), written 944 a.pD.; and that of Makdisi (Mokaddasi, ed. De Goeje, p. 444), written forty years later.

> See especially Chardin, Kaempfer, Niebuhr, and Ouseley. Niebuhr’s drawings, though good, are, for the purposes of the architectural student, inferior to the great work of Texier, and still far more to that of Flandin and Coste. Good sketches, chiefly after Flandin, are given by Kossowicz, Inscriptiones palwo-persice, St Petersburg, 1872. In addition to these we have now the photographic plates in Stolze’s Persepolis (2 vols., Berlin, 1882). Stolze’s ‘‘ photogrammetric ” plan surpasses all previous attempts in accuracy. The numerous reliefs found in this group of ruins (especially on the great double stair), executed in a very remarkable style of art, were first brought within the scope of accurate examination by these works, since, with some individual exceptions (as in Ouseley), the drawings of the figures in the older works were quite inadequate.

3 Neither “the forty towers” nor “the forty pillars” is a correct rendering of the expression. The round pillars with their heavy capitals have a much closer resemblance to the turrets of the Moham- medan mosques than to our church towers. An older name for all the splendid ruins through the Pulwér valley is hazdér sutin, “the thousand pillars” (Hamza Isp., ed. Gottwaldt, p. 38). A thousand is, of course, like forty, a round number.

4 Sir W. Ouseley, Travels, ii. 369,

5 Lettera xv. (ed. Brighton, 1848, ii. 246 sq.).

8 See the discussion of this question in Ouseley.

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that his grave was in the face of a rock, and could be reached only by means of an apparatus of ropes, Ctesias mentions further, with regard to a number of Persian kings, either that their remains were brought és Ilépoas, “to the

Persians," or that they died there.? Now we know that Cyrus was buried at Pasargade, the modern Murgéb, two days' journey north-east from Persepolis,§ and if there is any truth in the statement that the body of Cambyses was brought home "to the Persians" hig burying-place must be sought somewhere beside that of his father. In order to identify the graves of Persepolis we must bear in mind that Ctesias assumes that it was the custom for a king to prepare his own tomb during his lifetime. Hence the kings buried at Nakshi Rustam are probably, besides Darius, Xerxes J., Artaxerxes I, and Darius II. Xerxes II., who reigned fora very short time, could scarcely have obtained so splendid a monunient, and still less could the usurper Sogdianus. The two com- pleted graves behind Takhti Jamshid would then belong to Artaxerxes JJ. and Artaxerxes III. The unfinished one is perhaps that of Arses, who reigned at the longest two years, or, if not his, then that of Darius ITI. (Codo- mannus), who is one of those whose bodies are said to have been brought "to the Persians." 9

Another small group of ruins in the same style is found at the village of Haji Abad, on the Pulwar, a good hour's walk above Takhti Jamshid. These formed a single building, which was still intact 900 years' ago, and was used as the mosque of the then existing city of Istakhr. For there is no other place that can have answered to the description of the eminent geographer Makdis{, who was himself in this neighbourhood, when he says: 'The chief mosque (jémz') of Istakhr is situated beside the bazaars. It is built after the fashion of the principal mosques in Syria,!° with round pillars. On the top of each pillar is a cow. Formerly it is said to have been a fire-temple. The bazaars surround it on three sides" (p. 436).

In the time of its greatest prosperity the Persian metro- polis must undoubtedly have covered a great 'part of the extremely fertile valley of the Pulwdr. It is not at all necessary to suppose that its limits are determined by the two heaps of ruins. The great bulk of the houses would, of course, be built in the wretched manner which is all but universal in the East.

Since Cyrus was buried in Pasargade, which moreover is mentioned in Ctesias as his own city,!2 and since, to judge from the inscriptions, the buildings at Persepolis commenced with Darius L, it was probably under this king, with whom the sceptre passed to a new branch of the royal house,

that Persepolis became the capital? At least it is probable that the great city, in the original home of the dynasty, with its lordly palaces and royal sepulchres, was theoretically considered the metropolis of the whole empire. But certainly, as a residence for the rulers of such extensive territories, a remote place in a

7 This statement is not made in Ctesias (or rather in the extracts of Photius) about Darius II., which is probably accidental; in the case of Sogdianus (Sekydianus), who as a usurper was not deemed worthy of honourable burial, there is good reasou for the omission.

8 See art. Persta (p. 567 below). The complete proof will be found in Stolze's work already mentioned, and in his paper cited below.

® Arrian, ili. 22, 1.

10 This refers only to its solidity and magnificence, and perhaps also to some of its minor features, but not to its general style. These Moslems had no great discernment in matters of style. For instance, Makdisi and others compare the ruins of Takhti Jamshid to those of Palmyra and Baalbek.

1 Capitals formed of recumbent animal figures are peculiar to the buildings of the Achemeuians.

12 Cf. also in particular, Plutarch, Artaz., iii., where Pasargade is distinctly looked on as the sacred cradle of the dynasty.

13 The story of Alian (7/7. A., i. 59), who makes Cyrus build his royal palace in Persepolis, deserves no attention.

difficult alpine region was far from convenient. The practical capitals were Susa, Babylon, and Ecbatana.

This, at the same time, accounts for the fact that the Greeks were not really acquainted with the city until it was taken by Alexander.! Ctesias must certainly have known of it; and it is possible that he may have named it

simply Ilépoa:,? after the people, as is undoubtedly done by certain writers of a somewhat later date.? But whether the city really bore the name of the people and the country is another question. And it is extremely hazardous to assume, with Sir H. Rawlinson and Oppert, that the words ané Péarsd, ‘in this Persia,” which occur in an inscription on the gateway built by Xerxes (D. lin. 14), signify ‘in this city of Parsd,” and consequently prove that the name of the city is identical with the name of the country.

The name Persepolis appears to have been first used by Clitarchus, one of the earliest, but unfortunately one of the most imaginative annalists of the exploits of Alexander. The word was no doubt meant to allude to the ‘‘ Persians,” but apparently he preferred this extraordinary form* to the regular “‘ Persopolis”® for the sake of a play on the destruction (zépoxs) which he relates. Later writers have followed him in the use of the name Persepolis.6 For information about the capture and treatment of the city by Alexander we are almost entirely dependent on narratives which are based on Clitarchus, since Arrian unfortunately disposes of this episode in a very summary fashion. The course of events may be traced somewhat as follows.

Alexander, having crushed the resistance of the Persian army under Ariobarzanes at the ‘“ Persian Gates,”’ marched rapidly on the capital. Ariobarzanes had made his way thither with a few followers, but was refused admission by Tiridates, the commandant of the citadel, who had already commenced negotiations with Alexander, arid at last surrendered the place with its immense treasures to the conqueror. In a subsequent battle Ariobarzanes was killed.8 Alexander then ordered a general massacre, and gave up the city to be plundered. In the citadel he placed a garrison of 3000 men under Nicarchides,® and then caused

1 Aschylus, whose knowledge of the world is certainly not very extensive, takes the “city of the Persians” to be Susa. Cf. especially Pers., v. 15 with v. 761 (768 &otv Zovcwv). Herodotus does not mention the capital of Persis at all.

2 The only expression that could be interpreted in this sense is és Tlépoas, “to the Persians.” But perhaps és Ilépoas, with him, means only “to the land of Persis.”” No doubt, when he says that the body of Cyrus was conveyed és Ilépeas, this might be explained on the supposition that he wrongly

imagined that Cyrus was buried in Perse- polis. Xenophon, who knew of Pasargadx from Ctesias, calls it [lépoa {Cyr., viii. 5, 21); but, as he was not acquainted with the country, this goes for nothing. Of more importance is the fact that Plutarch, Artaz., iii. (probably after Dinon), places Pasargade év Ilépoas, where the expression applies to the country and not to the city.

3 So undoubtedly Arrian (iii. 18,1, 10), or rather his best authority, King Ptolemy. So, again, the Babylonian Berosus, shortly after Alexander. See Clemens Alex., Admon. ad gentes, c. 5, where, with Georg Hoffmann (Pers. Mdartyrer, 187), kat is to be inserted before Tiépca:s, and this to be understood as the name of the metropolis.

4 Tlepoémrods means strictly “city-destroying.” [epaatmons, a well-authenticated reading in Strabo and Ailian (J.c.), is no improvement.

5 This form is actually restored by later scholars, and seems to have been used by the geographer Ptolemy (vi. 4).

6 Besides the historians who draw upon Clitarchus (Diodorus, Curtius, Justin, Plutarch in Alexander), Strabo (79 sq., 727 sq.), Pliny (vi. 115, 213), and several others. Justin (i. 6, 8) introduces the name Persepolis in an account which is based on Ctesias, just as Arrian (vii. 1, 1) once employs it, although he can scarcely have got it from his excellent sources.

7 On this locality, see the paper of Fr. Stolze in the Verhand- lungen der Gesellschaft fir Erdkunde in Berlin, 1883, Nos. 3 and 6.

8 This is mentioned by Curtius only, but it has great intrinsic prob- ability. The massacre at the taking of the city appears to be confirmed by Plutarch (Alex., 37) from the letters of the king.

® This again is only found in Curtius. Alexander was in the heart of a country which he had laid waste, but by no means thoroughly subdued, which hated him bitterly, and which was the native land of the dynasty ; he was amongst a people who still felt themselves to be

the royal palaces to be set on fire,—certainly not in a drunken freak, but apparently with deliberate calculation on the effect it would produce on the minds of the Asiatics.!°

Now it has hitherto been universally admitted that “the palaces” or ‘“‘the palace” (ra. BaoiAeca) burned down by Alexander are those now in ruins at Takhti Jamshid, as already described. From Stolze’s investigations it appears that at least one of these, the castle built by Xerxes, bears evident traces of having been destroyed by fire The locality described by Diodorus after Clitarchus corresponds in important particulars with Takhti Jamshid, for exaniple, in being supported by the mountain on the east.12 And, if there are other details, such as the triple wall, which it is difficult to reconcile with the existing state of things, we must bear in mind on the one hand the great destruction that must have been wrought in the course of thousands of years, and on the other that small inaccuracies are not to be wondered at in a writer like Clitarchus, who is constantly straining after effect. There is, however, one formidable difficulty. Diodorus says that the rock at the back of the palace containing the royal sepulchres rises so steep that the bodies could be raised to their last resting-place only by mechanical appliances. This is not true of the graves behind Takhti Jamshid, to which, as Stolze expressly observes, one can easily ride up; on the other hand, it is strictly true of the graves at Nakshi Rustam. Stolze has accordingly started the theory that the royal castle of Persepolis stood close by Nakshi Rustam, and has sunk in course of time to shapeless heaps of earth, under which the remains may be concealed. He and Andreas, our highest authorities on the topography of this district,!° consider this spot peculiarly adapted for the site of a citadel, while the water-supply would suffice for a numerous court-retinue and garrison, and for a royal residence with its palaces and gardens. Nevertheless we are unable to adopt this suggestion. The vast ruins of Takhti Jamshid, and the terrace constructed with so much labour, appear to us of more importance than any number of doubts and conjectures. These remains can hardly be anything else than the ruins of palaces and the other belongings of a kingly residence ; as for temples, the Persians had no such thing, at least in the time of Darius and Xerxes. And it can hardly be supposed that such solid structures were much more numerous in former times, and that these alone have survived owing to their peculiar situation on the terrace. or, in the first place, it is evident at a glance that the situation

itself is of an excep- tional kind. Moreover, Persian tradition at a very remote period knew of only three architectural wonders in that region, which it attributed to the fabulous queen Humai (Khumai)—the grave of Cyrus at Murgab, the building at Haji Abad, and those on the great terrace.!4 It is safest therefore to identify these last with the royal palaces destroyed by Alexander. Clitarchus, who can scarcely have visited the place himself, has simply, with his usual

the dominant race, and knew that their king was still alive. That in these circumstances he should have a strong garrison under a trust- worthy Macedonian was simply a matter of course. Nicarchides after- wards commanded a trireme in the fleet that sailed from the Indus to the Tigris (Arrian, Indica, xix. 5; after Nearchus).

10 See art, Persta (p. 582 below). é

11 Dr Stolze has kindly explained to the writer of this article that the layer of charcoal in the “hall of a hundred pillars ” is apparently the result not of a conflagration but of gradual decomposition. ;

12 The name of this mountain too, BaciAcxdv Spos, is identical with Sh4hkth, which is at least tolerably well established by Ouseley (ii. 417) as a synonym of Kéhi rahmet. ;

13 We are here again indebted to private communications from Stolze, as well as to his published papers.

14 See especially Hamza Isp., 38 ; Tabari, i. 690, 816 (cf. Noldeke, Geschichte der Perser… aus… Tabari, p. 8). The ruins at Takhti Jamshid are alluded to as the work of Humai, in connexion with an event which occurred shortly after 200 a.D.

recklessness of statement, confounded the tombs behind the palaces with those of Nakshi Rustam ; indeed he appears to imagine that all the royal sepulchres were at the same place. It is possible, however, that the discrepancy ori- ginated with Diodorus, who often makes his extracts in a very perfunctory manner.!

If it should prove that, after all, the terrace is not large enough to have contained the treasure-houses and the barracks of the garrison, in addition to the palaces, or that Alexander could not have set fire to the latter without en- dangering the former and the safety of the whole fortress, then we should have to assume that a separate citadel (dxpa) stood somewhere outside of the terrace with the palaces. There are many positions naturally adapted for defence in the vicinity. But, as far as yet appears, such an assump- tion is scarcely required. Of course we need not suppose that the number 3000 represents the actual strength of Alexander’s garrison ; and we must consider that, when Darius, in the height of his power, laid out this place in the heart of his empire, he was thinking more of regal magnificence than of security. A high wall and a guard of 200 men would suffice for the protection of the treasures

at a time when battering engines were unknown.

In 316 g.c. Persepolis is still the capital of Persis as a province of the great Macedonian empire (see Diod., 19, 21 sq., 46 ; probably after Hieronymus of Cardia, who was living about 316). The city must have gradually declined in the course of time; but the ruins of the Achemenians remained as a witness to its ancient glory.

It is probable that the principal town of the country, or at least of the district, was always in this neighbourhood. About 200 a.p. we find there the city Istakhr? as the seat of the local governors, There the foundations of the second great Persian empire were laid, and once more there arose round the tombs of the Ache- mecnians what was for ccnturies the theoretical metropolis of a great monarchy whose administrative capitals lay far to the west. Istakhr acquired special iniportance as the centre of priestly wisdom and orthodoxy. In its most flourishing days it was probably as large as Persepolis had been, whose ruins undoubtedly furnished much of the material for its houses. The peaceable resident, intent on building his house or hut, has too often proved more destructive to ancient buildings than a foreign invader or even the disintegrat- ing forces of nature. The Sasanian kings have covered the face of the rocks in this neighbourhood, and in part even the Ache- menian ruins, with their sculptures and inscriptions, and must themselves have built largely here, although never on the same scale of magnificence as their ancient predecessors. The Romans knew as little about Istakhr as the Greeks had done about Perse- polis, and this in spite of the fact that for four hundred years they maintained relations, friendly or hostile, with the empire, while their own sway extended far into the heart of Asia. So remote is Persis !

At the time of the Arabian conquest Istakhr offered a desperate resistance, which was renewed again and again before the place was finally subdued. Blood flowed like water in these struggles for religion and liberty. Nevertheless the city was still a place of considerable importance in the first century of Islam, although its greatness was speedily eclipsed by the new metropolis Shiraz. In the 10th century Istakhr had become an utterly insignificant place, as may be seen from the descriptions of Istakhri, a native (c. 950), and of Makdisi (¢. 985). At this time the little town

occupied approximately the site assigned to it on Flandin's map, near the present village of Haji abad, surrounding the ruined structure of the Achzinenians, and principally on the left side of the stream. During the following centuries Istakhr gradually declined, until, as a city, it ceased to exist. This fruitful region, however, was covered with villages till the frightful devastations of last century ; and even now it is, comparatively speaking, well cultivated.

The "castle of Istakhr" played a conspicuous part several times during the Mohammedan period as a strong fortress. It was the middlemost and the highest of the three steep crags which rise from the valley of the Kur, at some distance to the west or north- west of Nakshi Rustam.? We learn from Oriental writers that one

i Curtius repeatedly confounds the palace with the metropolis (both being 74 Bacikea), and so speaks of the city being set on fire.

z Properly Stakhr, as written in Pahlavi; on the coins of the Sasanids "st" stands as an abbreviation for the name. The Armenians write Stahr. The form with the prosthetic vowel Istakhr is New Persian, the Syrians used at a still earlier time the form Isfahr or Istahr.

3 This height is now called, from its situation, Miydnkala (middle fortress). Older writers and travellers give other names, the nonien- clature of all this part of Persia having greatly altered ; but the name "castle" or "hill of Istakhr " appears not to have entirely disappeared.

of the Buwaihid sultans in the 10th century of the F light con- structed the great cisterns, which may yet be seen, and have been visited, amongst others, by James Morier and Flandin.4 Ouseley, who has extracted a vast amount of information from Persian authors about the ruins of Persepolis and about Istakhr,* points out that this castle was still used in the 16th century, at least asa state prison. But when Della Valle was there in 1621 it wag already in ruins. (TH. PERSEUS, a hero of Grecian fable, son of

Danax (4.2) and Zeus. When Perseus was grown to manhood Poly. dectes, the wicked king of Seriphus, cast his eye on Danae; and, that he might rid himself of the son, he exacted of him a promise that he would bring him the head of the Gorgon Medusa. Now the dreadful Goreons (¢.v.) dwelt with their sisters the Grae (the Gray Women) by the great ocean, far away in the west. Guided by Hermes and Athene, Perseus came to the Gree. They were three hags, with but one eye and one tooth between them, which they handed one to the other. Perseus stole the eye and tooth, and would not restore them till the Gree had guided him to the Nymphs, from whom he received the winged sandals, the wallet («{Bxs), and the cap of invisibility. These he put on, and, being armed by Hermes with a scimitar (p7n), came upon the Gorgons as they slept and cut off Medusa's head, while with averted eyes he looked at her image on his brazen shield lest he should be turned to stone. Perseus put the Gorgon's head in his wallet and fled. Coming to Aithiopia he delivered and married ANDROMEDA (q.v.). With her he returned to Seri- phus in time to rescue his mother and Dictys from Poly- dectes, whom he turned to stone along with all his court by showing them the Gorgon's head. The island itself was turned to stone, and was still and lonely ever after; the

| very frogs of Seriphus (so ran the proverb) were dumb.

Perseus then gave the head of Medusa to Athene, who put it on her shield, and, with Danae and Andromeda, he hastened to Argos to see his grandfather, Acrisius, once more. But he, fearing the oracle, had gone to Larissa in Thessaly. Thither his grandson followed him, but at some games given by Teutamias, king of Larissa, he threw a quoit which lighted on his grandfather's foot and caused his death. Ashamed to return to Argos, Perseus gave his kingdom to Megapenthes, and received from him Tiryns in return. There he reigned and founded Midea and the famed Mycenz, and became the ancestor of the Persides, amongst whom were Eurystheus and Heracles.

The legend of Perseus was a favourite theme of Greek poetry and art. Sophocles and Euripides had each several dramas on the sub- ject, and sculptor and painter vied with each other in depicting the rescue of Andromeda from the sea-monster. The story was localized in various

places. Italy claimed that the ark with Danae and Perseus had drifted to the Latin coast (Servius on Virg., 4’n., vii. 372, and viii. 345). The Persian kings were said to have sprung from a son of Perseus (Apollod., ii. 4, 5; Herod., vii. 61); and, according to Pausanias Damascénus, Perseus taught the Persians to worship fire, and founded the Magian priesthood. The tale of the rescue of Andromeda by Perseus from the sea-beast is akin to that of Heracles and Hesione. Both have been interpreted of the sun slaying the darkness, Andromeda or Hesione being the moon, whom the darkness is about to devour. According to one version Heracles rescued Hesione from the sea-beast by leaping into its mouth, from which he came forth after three days spent in the belly of the beast. This points to a connexion with the Semitic story of Jonah and the fish. Greek sculptures of Andromeda’s monster were the models for Jonah’s fish in early Christian art, and on a rock at Joppa they showed the chains which had bound Andromeda, and the bones of the sea-beast (Pliny, H. W., v. 13; Mela, i. 11). ‘Tarsus in Cilicia was said to have been founded by Perseus, who appears on coins of the city, as well as on coins of Pontus and Cappadocia. r

4 See the plans and sketches in Flandin, to whom it was stated that the castle-rock was called Kalai sarv, “castle of the cypress,” from a solitary cypress growing there. It is unfortunate that for this particular locality the newest map of Hausknecht (Berlin, 1882) is quite unreliable.

5 These references are still very useful, although we have now the advantage of knowing the extremely valuable Arabian sources of many of his Persian narratives from printed texts.

ite VII.

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PERSIA

ERSIA, or frAn. In modern political geography these two terms are synonymous; the kingdom which we call Persia the Persians themselves call fran. But each of the words has a somewhat complicated history, a brief sketch of which will best explain the connexion between the several

subjects which, in an encyclopedic treatment, naturally demand notice under one or other of the names which head this article.

Persia, or rather Persis (Greek exclusively [epcis), is the Latinized form of a name which originally and strictly designated only the country bounded on the N. by Media and on the N.W. by Susiana, which of old had its capital at Persepolis or Istakhr, and for almost twelve centuries since has had it at Shiraz. This country and its people were anciently called Parsa (now Pars or Fars). The oldest certain use of the name is in Ezekiel (xxvii. 10, xxxviii. 5). The Greek form Ilépca:, with é for a, which all Euro- pean languages follow, seems to have come from the Ionians, who disliked to pronounce &@ even in foreign words. Thus Tépoo: would stand for IIjpca:, which in turn stands to Parsa as M7joot to Mada.

The name of Persian was naturally extended to the great monarchy of the Achzemenians who came forth from Persis ; and so again, when a second great empire, that of the Saésdnians, arose from the same land, all its subjects began to be called Persians, and Persis or Persia was sometimes used of the whole Sdsdnian lands (Ammianus, xxiii. 6, 1). The prevalent language of this empire (see PAHLAV!) had a still better right to be called Persian, for it seems to have had its basis in the language of the old Persis. = The same thing is true of the so-called New Persian, which has been a literary language for the last thousand years.

Historically, then, the term Persian is fitly applied to the two great empires which rose in Pars or Persis—the form Persis will be used in this restricted sense throughout the present article—and not unfitly to the modern state which embraces Persis and its sister lands, and in which a descendant of the ancient tongue of Persis is still the official and literary language.

The name fran, on the other hand, was originally of much wider signification than Persia, and the whole upland country from Kurdistan to Afghanistan may, in accordance with the native use of its ancient inhabitants, be called the Iranian upland. The inhabitants of this upland, together with certain tribes of the same race in adjacent lands, shared with their near kinsmen in India the name

| of Aryans (Ariya, Airya of the Avesta; Sk. Arya). King

Darius calls himself “Persian son of a Persian, Aryan son of an Aryan,” and Herodotus (vii. 62) knows “Apvou as an old name of the Medes. The ancient nobles affected names compounded with Arya,—Ariyaramna (Apiapéprys), Ario- barzanes, and the like. The lands of the Aryans, as a whole, were called Ariydna (Airiyana of the Avesta) ; Eratosthenes and after him Strabo and others are cer- tainly wrong in limiting ’Apiavy, ’“Apsavol, to eastern Tran (Afghanistan, Baluchistan, &c.).1

_ Ardashir, the first SAsdnian, is called on coins and inscriptions “king of the kings of Eran,” his son Shdptr or Sapor is “king of the kings of Eran and not-Erdn.” Now Ardashir, as well as his son, had non-Aryan subjects, the main population of Babylonia and other provinces being of Semitic race; Eran and not-Erdn therefore must here be used not ethnographically but in a definite politico- geographical sense. The official name of the empire, how- ever, was always Erdn, and the great officers of state had such titles as Er4n-Spdhpat, “general of Eran,” Erdn- Anbarakpat, ‘‘store-master of Eran.” 2

For the last 500 years most Persians have pronounced

ran instead of Eran (more recently also Irén, frin), and this is the official title of the kingdom which once had Ispahan, and now has Teherdn, as capital. Modern Tran, or Persia, does not embrace nearly the whole Iranian upland, still less all men of Iranian nationality, that is, all who speak an Iranian dialect akin to Persian. On the other hand, the modern kingdom of fran has many subjects who are not Iranians ethnographically, but come originally from Central Asia or Arabia, and speak Turkish or Arabic.

PART I—ANCIENT IRAN.

Section I.—Mepo-Persian EMPIRE.

The Babylonian Berosus, writing soon after Alexander the Great, states that at a very early time, which we must place somewhat over two thousand years before Christ, the Medes conquered Babylonia, and that eight Median kings reigned thereafter in Babylonia for a space of 224 years.® This is an early instance of the occupation of the rich low- lands by warlike tribes of the neighbouring highlands ; and indeed the contrast between the plain of

the Euphrates and Tigris, peopled mainly by Semites, and the tableland of the Iranians, surrounded by lofty mountains, is a very important factor in the whole history of wide regions of Asia. But it is, to say the least, not certain whether Berosus means the Iranian people afterwards called Medes. The expression might have a merely geographical significa- tion, and it is at all events possible that at that distant period tribes of different descent dwelt in the land. In any case, we have here no Iranian empire, but only a Babylonian dynasty founded by foreigners.

Be this as it may, it is certain that at an early period there were regular monarchies of some size even in the distant Iranian lands. Unmistakable traces lead us to

1 Less careful writers, like Pliny, confuse Ariana with Aria, properly Haria, the land of Haraiva, the later Harév, Haré, Hari; Arabic Herat.

assume an old empire in Bactria—the Iranian land far to the east, in the region of the Oxus, beyond the great table- land—which must have developed a tolerably high civiliza- tion. But we have no exact information about it.

The series of the great Iranian monarchies begins for Medes.

us with the Median empire of Ecbatana. Unfortunately we possess but little trustworthy information about its history, being almost wholly dependent on what two Greeks, Herodotus and Ctesias, who wrote long after the fall of the kingdom, report from the mouths of Orientals. These two authorities differ so widely that their statements are to a great extent mutually exclusive. Nevertheless careful investigation has shown that many of the state- ments of Ctesias (which are only preserved through the medium of later writers, like Diodorus) rest on the same basis as those of Herodotus. This common basis included an artificially arranged chronology. According to Herod-

2 S4sdnian inscriptions in Chaldaic Pahlavi still show the ancient form Arian (JR”IS8), and Greek inscriptions of the older kings have the genitive pl. “ApavGv. But the corresponding common Pahlavi inscriptions and the

coins already show the form Eran (XS), fol- lowing an established law of phonetic decay.

3 The information is preserved by Eusebius, who took it from Alex- ander Polyhistor ; see Eusebius, Chronicon, ed. Schoene, 25.

4 See Hupfeld, Hxercitationes Herodotew Spec. II.: sive de vetere Medorum regno, Rinteln, 18438.

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¢.715-634, otus the Medes freed themselves from the Assyrians, and

lived for a time without a master till Deioces obtained the kingly power by stratagem. There reigned then

Deioces 58 years

Phraortes 22 ,, ee 150 years C yaxares 40 or) 7 5 \ : , Astyages 35 ”? i

The totals show how the figures are arranged on an artificial system. The duration of the kingdom is exactly a century and a half, divided into two exactly equal por- tions, each of which is occupied by the reigns of two kings. But further, according to Herodotus, the rule of the Medes over Upper Asia, @.¢. the land east of the Halys, lasted 128 years, save only (répe€) the twenty-eight years during which the Scythians ruled. It is easy to see that “save only” means “minus,” and that thus the foreign supre- macy of the Medes is reckoned at exactly 100 years, or two-thirds of the total duration of the kingdom. Obvi- ously such figures can at most be only approximately correct. .Nowthe number 128 is got by adding the reigns of the first king and the last two. This number is certainly due to an error on the part of Herodotus, who has com- mitted similar mistakes in arithmetic elsewhere ; in adding up he took the reign of Deioces for that of Phraortes. We may conjecture that the original statement received by Herodotus was that the supremacy, represented by the last three reigns, lasted a century, a round number being put for 97 (22+ 40+ 35). With regard to the indi- vidual

items, it is somewhat suspicious that the second half (75 years) is divided into its two most convenient fractions, 40 and 35. Consequently we cannot place much reliance on the figures representing the reigns of the first two rulers either, especially as it can be made probable that they also rest on an artificial basis.

Now it can be proved that Ctesias's list of nine or properly ten kings was based on that of Herodotus, but with all the numbers doubled. Probably this lst of Ctesias assigned 350 years as the total duration of the empire, which is the number given in Justin, i. 6, 17. The Mede from whom Ctesias derived his information, or the Median source on which his informant drew (there is no mistaking the Median colouring which pervades Ctesias's narrative), wished to glorify the empire of his people by the length of its duration, hence the doubling. The source from which the names of the Median kings in Ctesias are derived is still a mystery; they are quite different from those of Herodotus. Even Oppert's hypothesis, that the names of the last four kings in Ctesias are the Iranian translation of the non-Iranian names in Herodotus and belong to the language of the second kind of cuneiform writing, though perhaps plausible at first sight, is on close examination untenable. In general there is no warrant for the assumption that as late as the time of the Median and Persian empires there was a large non-Iranian popula- tion in Media,—an assumption which conflicts with all tradition and originates solely in the difficulty of finding a home for the second kind of cuneiform writing. But the names of the kings in Herodotus are now all authenti- cated, directly or indirectly, by the inscriptions lately dis- covered. Probably too the reckoning of the total duration of the empire at a century and a half is about right. Indeed such chronological systems sometimes correspond better, on the whole, with the facts than their artificiality would lead us to expect.

_ Ctesias's narrative opens with a highly-coloured descrip- tion of a real event, namely, the destruction of Nineveli by the leader of the Medes, called by him Arbaces, with the helpof the Babylonian Belesys(the historical Nabopolassar). But the fact that by this event the position of Media as a great power was for the first time assured is mixed up by

Ctesias with the beginning of the monarchy itself. In addition, he grossly exaggerates the duration of the empire; so that we arrive at the monstrous result that between 606 or 607, the real date of the destruction of Nineveh, and 550, the year of the fall of the Median supremacy, more than 300 years are supposed to have elapsed.

Down to the destruction of Nineveh we must ignore Ctesias almost completely and follow Herodotus alone.

We will not repeat Herodotus's naive story of the founda- Deioces,

tion of the Median kingdom by Deioces, son of Phraortes,

.a story in which Greek and Oriental colours are charm-

ingly blended. We may assume as certain that Deioces possessed a principality, the central point of which was Ecbatana (or Agbatana; Old Persian Hagmatdna, now Hamadan), a place which for thousands of years has held the rank of a capital. This principality probably never embraced the whole of Media (z.e., nearly the present provinces of Irak Adjemi and Azerbijan with a portion of Turkish Kurdistan), but by his successors it was enlarged into the great Median empire. Of course there was no smooth and formal con- stitution, no fixed frontier, no exact determination of the prerogatives of different chiefs in the particular districts, From of old the Assyrians had made frequent attempts to subjugate the country of the Medes, but perhaps never quite possessed the whole land with its numerous inaccess- ible mountains and warlike robber tribes. Nevertheless they made successful expeditions into the interior of Media even down to the time at which Herodotus regards Media as independent.! Neither the liberation of Media nor the foundation of the monarchy is an event which can be limited to a particular year, the thing took place gradu- ally. In the period not long before Deioces, according to Herodotus's reckoning, very many tributary Median chief- tains are mentioned in the Assyrian inscriptions; this confirms, in some measure at least, the statement that "anarchy" then prevailed.2 In 715 B.c. there was carried off as prisoner one Dajaukku ; this is certainly the same name, perhaps the same person (for his captivity may

have been brief), as Daiokés, which appears in Herodotus in the Ionic form Déiokés. We can certainly identify Herod- otus's first king with the prince whose land, called Bit Dajaukku, 7.¢., land of Dajaukku, King Sargon of Assyria conquered in 713 B.c. The man who thus gave his name to the land must have occupied a high station. The date is not very remote from that assigned by Herodotus to Deioces; for we get from Herodotus as the date of Deioces 709-656, or, if we correct his error in dating the end of the empire, 700-647. Deioces was not a king of kings; he was forced to bow to the Assyrians repeatedly, but he was the founder of the empire. Three kings followed him. It is possible that there were really more, and that in the summary list the shorter reigns are passed over. Nor can we place much reliance on Herodotus's assertion that each successive ruler was the son of his predecessor.

In perfect harmony with the conditions of development Phra of a small state into a great power is the statement of Herod- T

otus that the second king of the Medes, Phraortes (/rawartz; according to Herodotus's reckoning 656-634 [647-625)]), extended his sway beyond the limits of Media and first of all subjugated Persis, or Persia proper, the secluded moun- tain-land south-east of Media. During all this time indeed, as we learn from Darius's great inscription, Persis had kings of its own; but these were simply vassals of the sultan

1 For this and what follows compare, besides the works of the Assyrio- logists, A. v.Gutschmid, Newe Bettrage zur Geschichte des alten Orients, 87 sq.

2 That parts at least of Media were subject to Assyria at that period is further shown by 2 Kings xvii. 6, xviii. 1l1—surer evidence than that of the inscriptions, which may not always be rightly interpreted, and contain, besides, many exaggerations.

who had his seat in Ecbatana. After conquering the Persian, Phraortes, says Herodotus, subjugated piece after piece of Asia, until he was discomfited and slain in the attempt to conquer the Assyrians in Nineveh, whose empire

was by that time completely lost. Allowing for some exaggerations with respect to the extent of the empire, there is nothing in these statements that need excite sus- picion. Independent evidence seems to show that towards the middle of the 7th century the Assyrian empire had fallen very low ;! and that the inhabitants of the cluster of vast cities to which Nineveh belonged were able to repel the first attack of an enemy who could hardly have been their match in the art of siege-warfare is perfectly natural. Besides, the stability of the Median military, political, and court institutions, which were afterwards taken over un- altered by the Persians, must surely have required for its development a longer time than some modern inquirers, following exclusively the cuneiform inscriptions, have assumed for the actual duration of the Median empire. Phraortes's successor Cyaxares (Huwakhshatara; accord- ing to Herodotus's reckoning 634-594 [625-585]) brought the empire to the highest pitch of power. He is said to have introduced fixed tactical arrangements into the army. It was to him that the pretenders whom Darius had to over- come traced their descent, as he tells us himself. Cyaxares, according to Herodotus, took the field successfully against Nineveh, but as he was besieging the city the inroad of the "Scythians" compelled him to forego for a time all the fruits of victory. Who these Scythians were is unknown. Herodotus took them for the people tolerably familiar to the Greeks, whose true name was Scolotz ; but his evidence does not go for much, since he often falls into the popular misuse of the term "Scythian" as a name for all the peoples of the steppes, and brings the inroad of these Scythians into a most unlikely connexion with the desolating raids of Thracian tribes (the Trares or Treres, commonly called Cimmerians) in Asia Minor. We must content ourselves with assuming that we have here one of those irruptions of northern barbarians into Iran of which we hear so often in later times. Probably these nomads came, as Herodotus indicates, through the natural gate between the Caucasus and the Caspian Sea, the pass of Derbend, though it is quite possible that they came from the east of the Caspian, from the steppes of Turkestan. Whether these Scythians are really the same people who made their way as far as Palestine and Egypt? is, indeed, far from being as certain as is commonly supposed, nor can the date of the irruption into these countries be deter- mined, At any rate, the barbarians overthrew the Medes and flooded the whole empire. From what we know of the doings of Huns, Khazars, Turks, and Mongols in later times we can infer how these Scythians behaved in Iran. Cyaxares

must have come to some sort of terms with them ; and at last herid himself of them in a truly Eastern fashion, by inviting most of them—i.e., of their chiefs—to a feast, where he made them drunk and slew them at their wine.* It is not in the least surprising that Cyaxares afterwards had Scythians in his service ; savages like these have no steady national feeling, and serve any potentate for pay. With the Scythian disorders we might combine the contests which, according to Ctesias, the Parthians and Sac (i.¢., the inhabitants of the Turkoman desert, who are also called “Scythians” by the Greeks) waged with

1 The Assyrian inscriptions break off abruptly with the year 644; Gutschmid, op. cit., 89.

2 Herod., i. 105; compare Trogus, in Justin, ii, 3, and Jordanes, De orig. Get., 6, whose account perhaps goes back to Dinon.

3 Between the years 1030 and 1040 a.p. we know three cases where princes of Iranian lands despatched inconvenient Turkomans in exactly similar fashion ; see Ibn Athir, ix. 266 sq., 272.

Cyaxares or Astibaras, as Ctesias calls him. not safe to do so, as the whole narrative is only the frame- work for a pretty romance.

Cyaxares marched a second time against Nineveh and Nineveh destroyed it about 607. Not only Ctesias but also Berosus 5 taken.

asserts that the king of the Medes achieved this great success in league with the king of Babylon. That the Median tradition represented the Mede and the Babylonian tradition the Babylonian as suzerain, and the other king as a vassal, is not surprising. The more powerful of the two was doubtless the Median, the richer the Babylonian. Unfortunately Herodotus’s work does not include the ‘Assyrian memoirs,” in which he intended to give a fuller account of the fall of Nineveh,—probably because he died before completing the task. In order to protect himself against his ally, who by the

fall of the Assyrian empire had grown too powerful, the Chaldean king had recourse to a double precaution : he married his son, afterwards the potent Nebuchadnezzar, to Amyite or Amyitis, daughter of the Median king ; but he also erected extensive fortifica- tions. After the fall of Nineveh, Nebuchadnezzar made himself master of Syria and Palestine, and Cyaxares acquired most of the rest of the Assyrian territory. Prob- ably Assyria proper belonged to him also, and we can thus explain Xenophon's error that the Assyrian cities before iy, destruction belonged to the Medes (Anab., iii. 4, 7-

10):

though he probably did not acquire them until after he had got rid of the Scythians and destroyed Nineveh. The pretext for the war was afforded by the flight of some Scythians in Cyaxares's service to Alyattes,® king of Lydia ; but the real cause was doubtless thirst of conquest. The war lasted for five years with varying fortune, and was ended by the battle during which the eclipse of the sun, said to have been predicted by Thales, took place. The terrified combatants saw in this a divine warning and hastily concluded peace. An impression so profound could be produced by nothing short of a total eclipse. Now, according to Airy's calculation, of all the eclipses of that period the only one which was total in the east of Asia Minor (where we must necessarily look for the seat of war) was that of 28th May 585. Ancient writers' also place the eclipse in this year. But this only proves that learned Greeks of a much later age calculated the year of an eclipse which they took to be that of Thales ; yet in this case they have hit the truth. More exact calculations have shown that the eclipse of 30th September 610, formerly regarded as that mentioned by Herodotus, was total only to the north of the Black Sea. Besides, it is inconceivable that this war and the new grouping of states which it involved should have taken place before the destruction of Nineveh. The 28th of May 585 is perhaps the oldest date of a great event which can be fixed with perfect certainty down to the day of the month, The conclusion of peace which followed affords us a remarkable instance of diplomatic mediation in

4 See Diod., ii. 34; Nicol. Dam., 6; Anonymus de mulieribus.

5 See Euseb., Chronicon, pp. 80, 35, 37, and Syncellus, 210B. The first passage refers to Abydenus, who made use of Berosus. He names the Median king ’Aorudyns, which Gutschmid regards as a corruption of Agrudpys=‘AoriBdpns. This is acute, but it seems better to suppose that Abydenus or an excerptor confused Cyaxares with the last king of the Medes.

6 He reigned, according to Herodotus’s regkoning, from 618 to 561. As this is narrated by Herodotus in his history of Lydia, he probably has it from Lydian sources, and we may regard this as a welcome con- firmation of what we are told on Median authority about the destruc- tion of the Scythians.

7 Pliny, H. N., ii. § 58, and other passages ; compare Gelzer, in Rhein. Museum fiir Philologie, N. F., xxx. 264 sg. An astronomer, a friend of the writer of this article, has by independent calculations confirmed the dates assigned in the text for both eclipses.

But it is 634-585,

When Cyaxares afterwards began the war with the Warwith Lydians he was already master of Armenia and Cappadocia, Lydians.

585-550.

Astyages.

State of Median empire,

very ancient times. The peace was brought about by Syennesis, prince of Cilicia, and Nebuchadnezzar, king of Babylon! Astyages, son of Cyaxares, married Aryenis, daughter of Alyattes. But according to Herodotus’s cal- culation the above date does not fall within the time of Cyaxares ; and even with the necessary correction (of nine years ; see below) Astyages ascended the throne in this same year. We might suppose that the battle fell in the father’s, the peace in the son’s time. But, as we saw above, the dates of

these reigns are not of a sort in which we can place much confidence, and it is more likely that the reign of Astyages did not last so long as tradition asserts. Thus Cyaxares probably died after 585.

Of the reign of his son Astyages (in Ctesias Astyigas, in a Babylonian inscription Jshtweigu) we have no par- ticulars. It is not even certain that he was cruel, for Herodotus's account of him and of the revolt of Cyrus is not impartial, based as it is on the narratives of the de- scendants of Harpagus, who had an interest in portraying in unfavourable colours the prince whom their ancestor had betrayed. On the other hand, Ctesias's Median authority (Nicolaus Dam., 64 sq.), which sets Astyages in a very favourable light, has no better claim to credence on this point.

The Median empire must at this time have reached a tolerably high degree of civilization. As remarked above, the political and military institutionsof the Persians are sub- stantially those of the Medes ; even the dress(of the Persian troops) was borrowed from the Medes.2 Of buildings erected by the Median kings there are, so far as we know, no remains. The colossal lion, still to be seen, though in a sadly mutilated state, at Hamadan, and about which Arabian writers have all sorts of wonderful tales, is perhaps a monument of the Median age. The fortifications of Kcbatana must certainly have been magnificent ; according to Herodotus's description, they showed strong traces of the influence of the star-worship practised by the neighbouring Babylonians, whose civilization was of a much earlier date.* It may be that careful explorations in the neighbourhood of Hamadan or excavations will one day bring to light traces of that distant age, perhaps even some distinct inscriptions of Median kings. Such inscriptions would be of the highest value; and we might almost conjecture that the language and writing would be identical with those of the Persian kings. Since the Magi are expressly described by Herodotus as a Median tribe, and since in the age of the Achzmenians the Persian priests were drawn as exclusively from the Magi as in later times, it is highly probable that the Median kings established the Zoroastrian religion as the state religion, and appointed this Median tribe to be the priests. The religion itself arose in the far east, probably in Bactria. It is often assumed nowadays to have originated in Media, but the fact that its sacred books know nothing of the Magi tells particularly against this view. How firmly the Median Magi were in posses-

sion of the priesthood in Persia proper (Persis) about the year 522 we learn from the circumstance that they main- tained their position in spite of the catastrophe of the false Smerdis. They must therefore have already held it for some time, and this carries us back almost necessarily to the influence of the Median empire. If this is correct, the Median empire has an extraordinary importance in the history of religions. The consideration enjoyed by the Median monarchy is proved by the fact that in Western

lands which never came in contact with it at all its name SS SS ee

1 For the latter Herodotus wrongly substitutes his successor Labynetus (Nabunaid ; Persian Nabunaita).

2 Herod., vii. 62.

3 See Sir H. Rawlinson, in G. Rawlinson's Herodotus, i. 98, and Joh. Brandis, in Hermes, ii. 264.

was so familiar that more than a hundred years after its fall the Persians were still mostly called Medes by the Greeks ; in particular the wars of independence with the Persians still went at a much later date simply by the name Ta Mydcxa.4

Nor was the Median empire properly destroyed by Cyrus; it was only transformed. Another race of the Iranian people and another dynasty stood at the head of the Iranian empire and carried out, as far as it was at all possible, Cyaxares's scheme for the conquest of Asia and the border-lands. That .the Persian empire was the direct heir of the Median was known both to the Greeks—for only on this supposition were the above-mentioned expres- sions possible—and to the Hebrews (Isa. xiii. 17; Ezra i, 9,400.).

We possess three accounts of the mode in which the transition was effected, that of Herodotus, that of Ctesias, (of which that of Dinon, preserved only in some fragments and vestiges, is merely a variation), and that of

Xenophon in the Cyropxdia. Though Xenophon had before him the works of both Herodotus and Ctesias, we must, with Niebuhr,® regard his book as nothing more than an ex- tremely: silly romance; the attempts to employ it as an in- dependent historical source have always failed. Herodotus probably got his charming narrative directly or indirectly from the descendants of Harpagus, a man who undoubtedly played a chief part in transferring the supremacy from the Medes to the Persians. Ctesias's' narrative, which we are obliged to piece together from Nicolaus Damascenus, Photius, Justin, Polyzenus, and Diodorus, is highly coloured, but in parts very pretty, and has, in contradistinction to Xenophon's romance, a genuinely Oriental stamp. It appears to be based on the account of a Mede, who gave a marked preference to his own people, and represented the founder of the Persian empire in as unfavourable a light as it was possible for a Persian subject (and probably an official) to do. There was no denying the fact of Cyrus's final victory, but in Ctesias's narrative he achieves his greatest successes by cunning and deceit. He is a genuine herds- man's son, takes early to robbery, and discharges menial services, in the course of which, significantly enough, he gets plenty of hard knocks. His accomplice (bares is a cowardly rascal. Astyages defeats Cyrus in Persis itself and pursues him to his home, Pasargadee ; he is only saved by the intervention of the women. On the other hand, Astyages magnanimously spares Cyrus's father, who had fallen into his power. It is particularly significant that over the corpse of Astyages, who had been left by stratagem

-to pine in the wilderness, a royal guard of lions kept watch

and ward. Of course all this does not exclude the sup- position that this partisan narrative is founded on a genuine Persian legend. For the rest, the narrative of Ctesias agrees in some particulars, and even in some names, with that of Herodotus.

That Cyrus (Kuru, nominative Kurush, or rather Kiiru, Krush ®) was not of lowly descent but of a princely house was long ago seen to be a necessary supposition. Popular legend loves the elevation of sons of the people to the throne, but as a matter of fact national kingdoms are not easily founded anywhere, and least of all amongst primitive peoples, except by persons of

distinguished birth. A know- ledge of the Persian inscriptions has put it beyond a doubt

4 It is noteworthy, however, that Auschylus in the Perse says “ Persians” almost exclusively, but “ Medes” only exceptionally (ver. 236, 791, and so in his epitaph) ; perhaps the poet chose “ Persians” as the less usual expression.

5 Lectures on Ancient History, i. 96, Eng. tr.

6 The uw is long, as is shown by the agreement of Képos, Aischyl., Pers., 768, and W7\3 of the Old Testament. The long wu makes it impossible to identify the name with the Indian Kuru, as Spiegel proposes.

Fall of Median empire.

Cyrus.

EMPIRE. |

that Cyrus was of royal blood. A cylinder with an in- scription of his, found lately at Babylon,! affords us fuller information. Cyrus’s father was, just as Herodotus tells us, Cambyses (Kambujiya), his grandfather Cyrus, his great-grandfather Sispis (7.e., the Persian Chaispi, Greek Teispes). We can combine the contents of this cylinder, on the one hand with the list of Darius’s ancestors in Herodotus (vii. 11), and on the other hand with Darius’s own statements in the great Behistun inscription. The last list is shorter by three than that of Herodotus ; but, as Darius says that eight of his family were kings, and that they reigned in two lines, while neither he nor his successors in their inscriptions give the title of king to his immediate predecessor, we must assume that the Be- histun list of ancestors is somewhat curtailed ; and we can with some probability draw out the complete list in exact harmony with Herodotus. We shall indicate the kings by figures and_give the names in the ordinary Greek form.

Achemenes. 1. Teispes. 2. Cambyses. 3. Cyrus. 4. Teispes. — | | ‘

(5. Cyrus. Ariaramnes, ; . o EI | 6. Cambyses. Arsames. a . | : Ss : 4 | 7. Cyrus (great king). Hystaspes. 8 — 7)

9)

8. Cambyses (great king). 9. Darius (great king).)

Acheemenes (Persian Hakhémanz), ancestor of the whole family, is perhaps not an historical personage, but a heros eponymus. According to our calculation Teispes, the first king, flourished about the year 730, therefore somewhat earlier than the foundation of the Median empire, but somewhere about the time which Herodotus assigns for the beginning of the independence of Media. Perhaps the rise of the provincial dynasty is connected with the weakening of the Assyrian power in Iran. Now on the eylinder Cyrus calls himself and his forefathers up to Teispes not kings of Persia but kings ‘“‘of the city Anshan.” Similarly on a lately-discovered monument of still greater importance, a Babylonian tablet,® he is called ‘king of Anshan,” but also “king of Persia.” Anshan has been looked for, without sufficient grounds, in the direction of Susiana. Even if it be true that Anshan, written as here in two ways, elsewhere means Susiana—and this Oppert emphatically denies—we should still have to regard this only as a Babylonian inexactitude of expression. It is far more likely that Anshan was a place in Persis, the proper family seat of the Achemenians, therefore perhaps near Pasargade or identical with it. An attempt has even been made, in consequencé of this designation, to deny that. Cyrus was a Persian at all, although Darius calls himiself an Aryan and a Persian, and therefore regarded Cyrus and Cambyses as such ; indeed he expressly desig- nates them members of his family. It may be that the Acheemenians ruled in a part only of Persis; but we have just as good a right to assume that, as Herodotus and Ctesias assert, Cyrus’s father at least was governor of the whole province. His mother, according to Herodotus, was the daughter of Astyages. This may very well be historical,

1 Trans. of the Roy. As. Soc., N. 8., xii. 70 sq. (Sir H. Rawlinson).

2 See Biidinger, Die newentdeckten Inschriften iiber Cyrus, p. 7 (Vienna, 1881). The pedigree is almost certain, though possibly it may be incomplete and may not contain all “kings.” :

5 Transactions of the Soc. of Bible Arch., vii. 189 sg. (Pinches).

though the confirmation by the oracle which describes him 550-547,

asa “mule” (Herod., i. 55) does not go for much, since these oracles are tolerably recent forgeries, and it is con- ceivable that we have here nothing more than an exam- ple of the well-known tendency of lords of new empires in the East to claim descent, at least in the female line, from the legitimate dynasty. Ctesias indeed tells us that Cyrus afterwards married a daughter of the dethroned Astyigas, Amytis (which was also the name of Astyages’s sister, wife of Nebuchadnezzar). Of course this does not absolutely exclude the possibility of Cyrus being the son of another daughter of the king.

Stripped of its romantic features, Herodotus’s narrative Cyrus’s of the rise of Cyrus is in fundamental harmony with conquest

the new document which we possess on the subject, in the shape of annals inscribed on a Babylonian tablet. According to Herodotus, Cyrus and the Persians revolted ; Harpagus the Mede, who was in league with him, was despatched against him. A part of the Median army fought, but another part went over to Cyrus or fled. In a second battle Astyages was defeated and taken prisoner. Now the tablet tells us among other things: “and against Cyrus king of Anshan, ... went and… Ishtuvigu, his army revolted against him and in hands took, to Cyrus they gave him.” Thereupon, it proceeds, Cyrus took Ecbatana and carried off rich booty to Anshan. This summary account of the Babylonian annalist by no means excludes the supposition that Cyrus had fought a previous battle against Astyages. Both accounts say that the treachery and faithlessness of the army procured Cyrus the victory. We might even harmonize the Babylonian document with Ctesias’s narrative that Cyrus was at first hard pressed and driven back as far as Pasargadke, if there were not other grounds, quite apart from its fabulous embellishments, which render this account improbable. The date of the overthrow of Astyages and the taking of Ecbatana is, according to the

Babylonian tablet, the sixth year ; and, as it is in the highest degree probable that the years in this memorial are those of the Babylonian king Nabunaid, we must place these events in the year 550. Hitherto it has been supposed, following Herodotus, that the reign of Cyrus (559-530) was to be reckoned from the fall of the Median empire, and that accordingly the latter event was to be placed in 559. But now we see that Cyrus numbered his years from the time when he ascended the throne in Persia. Whether the revolt against Astyages began when he ascended the throne, we do not know. We may very well believe Herodotus (i. 130), that Cyrus

treated Astyages well down to his death. On this point

Ctesias agrees with Herodotus.

After the taking of Ecbatana, which made Cyrus the great king, he must have had enough to do to subdue the lands which had belonged to the Median empire. Little reliance can be placed on Ctesias'saccount of these struggles. Herodotus (i. 153) states that the Bactrians, who accord- ing to Ctesias were soon subdued, were, like the Sacze, not subjugated until after the conquest of Babylon.

of Media.

The next war was against the powerful and wealthy king War

Croesus of Lydia, who ruled over nearly the whole western ®

half of Asia Minor. It was a continuation of the war be- tween the Medes and Lydians which had been broken off in 585. Here again the story in Herodotus is embellished with many marvellous incidents, and is employed to exem- plify moral doctrines. If Croesus really began the war, he assuredly did so not frivolously but deliberately, in order to anticipate the inevitable attack. A fierce struggle seems to have taken place in Cappadocia (Herod., i. 76, and especially Polyenus, vii. 8, 1 sg.), which already be- longed to Cyrus. Croesus retreated to prepare for another campaign, but Cyrus followed hard after him, routed him

gainst

roesus.

547-539,

Warwith Asiatic Greeks

‘required military service.

‘alive.}

566

when he offered battle, and captured his capital Sardis after ashort siege. Not only Herodotus but also apparently his contemporary Xanthus the Lydian, quite independently of Herodotus, told how Cyrus would have burned Croesus The statements of Ctesias and Xenophon to the same effect are borrowed from Herodotus. But there is also a vase of the time of Pericles representing Croesus seated on a pyre and majestically pouring out a libation.? We may not of course infer from this that Croesus offered himself as a willing sacrifice; but it certainly shows that a hundred years later there was a general belief that Croesus had stood upon the pyre. And it is by no means inconceivable that Cyrus, whom we must picture to our- selves, not as the chivalrous and sentimental hero of Xeno- phon, but as a savage conqueror, should have destined such a punishment for a vanquished foe, against whom he may personally have been especially embittered. No doubt to pollute the fire with a corpse was even in those days an impiety in the eyes of the Persians, but who knows whether Cyrus in his wrath paid much more heed to such religious maxims than did his son Cambyses? However, Croesus was pardoned, after all, perhaps because some external circumstance interposed (because a sudden shower pre- vented the fire from burning ?), or because the conqueror changed his mind before it was too late. The pious and believing saw in the event a direct intervention of Apollo on behalf of the man who had honoured the Delphic shrine so highly.?

The date of Croesus’s fall is not quite certain. It may have been 547 or 546. When Cyrus had marched away, the Lydian Pactyas, whom Cyrus had appointed guardian of the treasures, raised a revolt, but it was speedily put

down by the king’s generals. From that time forwards the Lydians never made the slightest attempt to shake off the Persian rule.

But now began that struggle of the Persians with the Greeks which has had so much importance for the history of the world. The Lydian kings had subdued a number of Greek cities in Asia Minor ; but even these latter shrank from submitting to the still barbarous Persians, whose rule was far more oppressive, inasmuch as they ruthlessly But Harpagus and other Persian leaders quickly took one Greek town after the other ; some, like Priene, were razed to the ground. Some of the Tonians, such as the Teians, and most of the Phoceeans, avoided slavery by emigrating. Miletus alone, the most flourishing of all these cities, had early come to an under- standing with Cyrus, and the latter pledged himself to lay no heavier burden on it than Croesus had before him. In most of the cities the Persians seem to have set up tyrants, who gave them a better guarantee of obedience than democratic or aristocratic governments. In other respects they left the Greeks alone, just as they left their other subjects alone, not meddling with their internal affairs so long as they paid the necessary contributions, and supplied men and ships for their wars. Most of the other peoples in the west of Asia Minor submitted without much resistance, except the freedom-loving Lycians. Driven into Xanthus, the capital, they perished in a body rather than surrender.* Some Carian cities also defended themselves stoutly. This

1 See Nicolaus Dam., 67 (apparently put together from Herodotus and Xanthus).

2 Mon. de UInst. Arch., i. 54.

3 Croesus’s good repute amongst the Greeks of the mainland (see Pin- dar, Pyth., i. 184 [94]) was due to his liberality to the Delphians. Even 400 years afterwards the Delphians appealed to their old friendship with the people of Sardis (i.e, with Croesus). Builletin de corresp. hellénique, v. 383, 889 sg. That Croesus could also be inhuman enough is shown by Herod., i. 92.

4 About 500 years later the inhabitants of Xanthus followed their example in the struggle with that champion of freedom, Brutus.

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[MEDO-PERSIAN

may have given a Persian here and there an inkling even then that the little peoples on the western sea were, after all, harder to manage than the nations of slaves in the interior of Asia. Sardis became and remained the mainstay of the Persian rule in western Asia Minor. The governor- ship was one of the most influential posts in the empire, and the governor seems to have exercised a certain supre- macy over some neighbouring governorships.

Though Cyrus had made, and continued to make, con- Babylon quests in the interior of Asia, he was still without the true taken.

capital of Asia, Babylon, the seat of primeval civilization, together with the rich country in which it lay, and the wide districts of Mesopotamia,® Syria, and the border- lands over which it ruled. Now that we know the two Babylonian memorials mentioned above we can dispense with most of the various, often very fabulous, accounts which Greek writers give of the conquest of Babylon; but when these documents are rightly understood the diver- gence between them and the account of Berosus § is, on the main points, not very great. Before the capture of the city, in the summer of 539, a great battle took place, in consequence of which Cyrus occupied the capital without any further serious fighting, since the Babylonian troops had mutinied against their king. Late in the autumn of 5397 Cyrus marched into Babylon, Nabunaid, the king, having previously surrendered himself. According to Berosus, Cyrus appointed Nabunaid governor of Carmania, east of Persis®; but in the annals inscribed on the tablet it is said to be recorded that Nabunaid died when the city was taken. If both memorials represent Cyrus as a pious worshipper of the Babylonian gods, if, according to the cylinder, the Babylonian god Merodakh, wroth with the king of Babylon because he had not served him aright, actually himself led and guided Cyrus, such a piece of priestly diplomacy ought not to impose on any student of history. The priests turned to the rising sun, whether they had been on good or bad terms with Nabunaid. Cyrus certainly did not put down the Babylonian worship, as the Hebrew prophets expected; he must even have been impressed by the magnificence of the service in the richest city of the world, and by the vast antiquity of the rites. But he was no more an

adherent of the Babylonian religion, because the priests said he was, than Cambyses and the Roman emperors were worshippers of the Egyptian gods, because Egyptian monuments represent them as doing reverence to the gods exactly in the style of Egyptian kings. Sayce doubts whether Cyrus could read their documents ; we doubt whether Cyrus understood their lan- guage at all, and regard it as inconceivable that he learned their complicated writing ; indeed, on the strength of all analogies, we may regard it as scarcely probable that he could read and write at all.® The countries subject to

5 We always use “ Mesopotamia ” in the sense in which alone this geographical conception ought to be used, viz., as equivalent to the Arabic Jazira, z.e., to denote the cultivated land between the middle Euphrates and the Tigris, which is separated by the Mesopotamian desert from the totally different ‘Irak (Babylonia).

6 In Josephus, c. Ap., i. 20. On many particular points in these memorials the Assyriologists themselves hold different opinions ; but the part which concerns us most seems to be free from doubt.

7 On 8d Marheshwan, which month corresponds nearly to our November, The year which begins with 5th January 588 is, in the astronomical canon, the first year of Cyrus as king of Babylon. I, as the strict rule requires, we make the small remainder of the year after the taking of the city to be the first year of Cyrus’s reign, then the events in the text fall in 538. But probably the remainder of the year was not reckoned in, and for this there are analogies. (See below.)

8 This statement is further supported by that of Abydenus, doubt- less taken from Berosus, that Darius drove Nabunaid out of Carmania (Euseb., Chron., p. 41). This is certainly not an invention. At the most, the former king of Babylon might have been confounded with another Babylonian prince.

9 Even the comparatively simple Persian cuneiform writing was certainly always the secret of a few; otherwise it could not have

th of Cus.

Babylon seem to have submitted without resistance to the Persians. The fortress of Gaza alone, in the land of the Philistines, perhaps defended itself for a time.t On the other hand, the Pheenician cities, some of which offered a sturdy resistance to other conquerors, submitted immedi- ately, and remained steadily obedient to the Persians down almost to the end of the empire. It seems, however, that, as the real prop of the naval power of Persia, they were almost always treated with special consideration by the latter. In the very first year of his reign in Babylon? (538) Cyrus gave the Jewish exiles in Babylon leave to return home (2 Chron. xxxvi. 22 sq. =Ezra i. 1 sq.). Compara- tively few availed themselves of this permission, but these few formed the starting-point of a development which has been of infinite importance for the history of the world.

How far to the east Cyrus extended his dominion we do not know, but it is probable that all the countries to the east which are mentioned in the older inscriptions of Darius as in subjection or rebellion were already subject in the time of Cyrus. In this case Chorasmia (Kharezm ; the modern Khiva) and Sogdiana (Samarkand and Bokhara) belonged to him. Agreeably with this, Alexander found a city of Cyrus (Cyropolis)* on the Jaxartes, in the neighbour- hood of the modern Khékand. He doubtless ruled also over large portions of the modern Afghanistan, though it is hardly likely that he ever made his way into the land of the Indus. The story of his unsuccessful march on India‘ seems to have been invented by way of contrast to Alexander’s fortunate expedition.

Different accounts of Cyrus’s death were early current. Herodotus gives the well-known didactic story of the battle with Tomyris, queen of the Massagetz, as the most prob- able of many which were told. If we accept Herodotus’s statements, we must look for the Massagetz beyond: the Jaxartes. In Ctesias Cyrus is mortally wounded in battle with the Derbices, who probably dwelt near the middle or upper Oxus. A fragment of Berosus® says that Cyrus fell in the land of the Dai (Dahe), 7.¢., in the modern Turkoman desert, perhaps in the southern or south-western portion of it; this account may very well be derived from contem- porary Babylonian records. Be that as it may, Cyrus met his death in battle with a

savage tribe of the north-east. The battle was probably lost, but the Persians rescued his body, which was buried at Pasargadz in the ancient land of his race. To this day there is to be seen at Murghab, north of Persepolis (on the telegraph line from Abushehr to Teheran), the empty tomb and other remains of the great mausoleum, which Aristobulus, a companion of Alexander, described from his own observation ®; and on some pillars there the inscription is to be read: “I am Cyrus, the king, the Achemenian.” Till lately the same inscription was also to be found high on the pillar which bears in bas-relief a winged figure of a king. This figure is furnished with a “yshent,” i.c., such an ornamented crown as is worn by kings and gods on Egyptian monuments.” This was no happened that, e.g., the Behistun inscriptions of Darius should have been described to Ctesias as those of Semiramis (Diod., ii. 13).

1 According to the conjecture of Valesius in Polyb., xvi. 40, ri IepoGy, which, though not absolutely certain, is still the best emenda- tion of the passage.

2 This statement goes to show that the small remainder of the year after the taking of Babylon was not reckoned in Cyrus’s first year. For he had at that time something more important to do than to trouble himself straightway about the Israelites.

3 Arrian, iv. 2 sq. ; Curtius, vii. 6, 16, vii. 6, 20; Strabo, ily ¢ Ptol., vi. 12; Steph. Byz. ; Plin., vi. 49; Solinus, xlix. 4.

4 Nearchus, in Arrian, vi. 24, 2; Strabo, 686, 742.

5 Euseb., Chron., p. 29.

8 See Strabo, 730; Arrian, vi. 29, 4 sq.

7 See the copies in the great works of Texier and of Flandin and Coste. The most exact representations are those from photographs in

Stolze, Persepolis (Berlin, 1882), tab. 128 sq., 182 sq. The proof that this is really the grave of Cyrus is given in Stolze’s Introduction, as

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doubt meant by Cambyses as a special mark of honour to his 539-525,

father, whose monument must have required years to finish. It is quite natural that the ancient art of Egypt should have made a deep impression even upon those of its conquerors who in other respects had little liking for Egyptian ways. –

If one could accept without question the judgment of the His Persians as recorded by Herodotus (iii. 89, 160), expanded character.

by Xenophon, and repeated by later writers (from Plato downwards), Cyrus must have been the most perfect model of a ruler. But we must view with great suspicion a tribute of praise like this paid to the founder of an empire by those who reaped the fruits of his labours. The founder of the Sasa4nian empire is also described as a paragon of wisdom and virtue, though his deeds strikingly belie such an estimate. We must be content to know that we are no better informed about the character of many other great men of the past than about that of Cyrus. That he was a very remarkable man and a great king is a matter of course. Whether he deserves the reputation of a great statesman, which even in modern times has been accorded to him, we cannot say. Certain it is he left the empire stillin a very unformed condition. To expend the immense treasures of Ecbatana, Sardis, and Babylon for the benefit of the empire was to be sure an idea which certainly would never have entered into the head of any Eastern conqueror. The treasures simply became the property of the king, though of course a large part went to the leading Persians and Medes who filled the most important offices.

Cyrus died in the beginning of the year 529. He left behind him two sons, Smerdis® (Persian Bardiya) and Cambyses (Kambujiya) ; their common mother was accord- ing to Herodotus an Achzemenian, according to Ctesias the daughter of the Median king. The great inscription’

of Darius states that Cambyses caused Smerdis to be put Cam- From this byses.

to death without the people being aware of it. it follows that the partition of the kingdom between the two brothers, of which Ctesias speaks, can hardly have taken place ; for the murder of a king or consort could not have remained concealed. Besides, in both the Baby- lonian inscriptions, of which mention has been frequently made, Cambyses is spoken of in a way which distinctly shows him to have been heir-apparent. This fratricide, the true motives of which we do not know, was the fore-— runner of many similar horrors in the dynasty. The inscription proves, as against Herodotus, that the deed was done before the expedition to Egypt. Nothing else is told us about the earlier part of the reign of Cambyses.

It is only when we come to his conquest of Egypt that Conquest The pretexts for the of Egypt.

we have more exact information. Egyptian war need not detain us. The riches of Egypt had from of old allured the lords of the neighbouring lands, and Herodotus takes it for a matter of course that Cyrus had occupied himself with plans against Egypt. According to the statements of Manetho 9 and of the Egyptian monu- ments, the conquest of Egypt took place in the spring of 525. Vast warlike preparations preceded the expedition. The Greeks of Asia Minor, the Cyprians, who had just submitted, and the Phcenicians had to furnish the fleet. A countryman of Herodotus, the mercenary captain Phanes of Halicarnassus, deserted from the Egyptians to the in pm tN

well as in his paper in the Verhandl. der Gesellschaft fir Erdkunde zu Berlin, 1883, Nos. 5 and 6 (p. 19 sg. of the separate edition).

8 So Herodotus (the name being assimilated to a genuine Greek name Smerdies, Smerdes), Auschyl., Pers. 774, has Mardos ; Justin, i. 9, 9 sq., Mergis ; the scholium on Alsch., /. ¢., Merdias.

9 See Wiedemann, Geschichte Algyptens von Psammetich I. bis auf Alexander den Grossen, p. 218 sg.; comp. too Diod., i. 68. For what follows, and for all that concerns the relations between Egypt and Persia, the work of Wiedemann is to be consulted. At the same time the assumption of the year 525 as the date of the conquest is ope to some objections ; there are many arguments in favour of 527.

525-521. Persians and made himself very useful in the conquest. It

seems that only one great battle was fought, at Pelusium, the gateway of Egypt. The Egyptians, utterly beaten, fled to Memphis, which soon fell into the enemy's hands. Thus Egypt became a province of Persia ; and a pretext was soon found for executing the captured king Psammenitus. This was followed by the submission of the neighbouring Libyans and the princes of the Greek cities of Cyrene and Barca. The peculiar religious feelings of the Egyptians were almost as easily wounded as those of the Jews were in later times. The Persians, flushed with victory, recked little of Egyptian wisdom or folly, least of all recked the brutal king. It is true that even Egyptian inscriptions represent him as a pious worshipper of the Egyptian gods, but this is only the courtly ecclesiastical style, which the Egyptians, partly from servility, partly from long habit, can never drop. And, even if Cambyses did once in a way gratify a pious Egyptian, ¢.g., by ordering his troops to quit a temple which they had occupied as a barrack, no great importance is to be attached to the fact. No doubt the Egyptian priests grossly exaggerated the king's wicked- nesses, but enough remains after all deductions. The dreadful hate which again and again goaded the naturally patient and slavish nation into revolt against the Persians dates from this time ; Darius could not atone for the guilt of Cambyses. The brutality of the latter began with maltreating and burning the mummy of the former king Amasis, who had personally insulted him or his father ; to the Persians, as Herodotus expressly says, the burning of the body was no less an impiety than to the Egyptians. From Egypt he sent an expedition to the shrine of Ammon in the Libyan Desert, but, caught presumably in a simoom, 'it was never heard of again. He led in person a great expedition to Nubia ("' thiopia"). It does not seem to have been such an utter failure as one might at first infer from Herodotus's narrative, for some districts to the south of Egypt were conquered; but the results purchased by hecatombs of men who perished by fatigue or were buried in the sands were far from contenting the king. Returning to Memphis, he found the people exulting over the discovery of anew Apis. Their joy did not fall in with his mood. In a fury, or perhaps out of a tyrant's caprice, he inflicted with his own hand a mortal wound on the sacred steer and instituted a massacre among its worshippers. We may well

believe Herodotus that from that time his barbarity to the Egyptians showed itself in ever darker colours. He spared not even the Persians. Ctesias too calls him bloodthirsty. Added to this was his drunkenness. But his marriage with one or two sisters, at which Herodotus takes offence, was really, according to Persian notions, an act of piety. Similarly, when he put to death a corrupt judge of the highest family and caused his skin to be made into a covering for the seat on which his son was to sit and administer justice, the act was one which all Orientals recognized as truly kingly (Herod., v. 25). The empire was extended in another direction, when Polycrates, the powerful tyrant of Samos and the neighbour- ing islands, sought safety in submission to the great king.

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-of Nisa in Media.

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Magian, gave himself out as Smerdis (spring of 522) and formally assumed the government. Even Darius's account lets us see that Cambyses was very unpopular, and the same thing appears from the fact that everybody sided with the new king. Cambyses seems to have marched against him as far as Syria, but there he put an end to himself,—an end plainly affirmed by the great inscription, and quite in keeping with the wildly passionate nature of the man. Gaumata reigned, universally acknowledged, and, as it seems, beloved, because he granted extensive remissions of taxes. He appeared in the character of Smerdis, son of Cyrus, and therefore as Persian king. This is enough to show that there can be here no question of a political opposition of the Medes to the Persians, such as Herodotus imagines, nor yet of a religious opposition to the Persians by the Magians. The changes for the worse now intro- duced, and abolished again by Darius when he ascended the throne,? seem to imply no more than a very intelligible disregard of the leading Persian families, whom Gaumata could not but fear, since they knew much better than the people that he was an impostor. He fell, not through the patriotic indignation of the Persian people, but through the enmity of these families. Seven persons conspired against him ; their names, each with that of his father, are given by Darius in full agreement with Herodotus, while the list of Ctesias presents somewhat more

divergence.4 No doubt they were members of the seven most illustrious houses, but certainly not the actual heads of these houses ; for such a life-and-death enterprise, where all depended upon energy and silence, could not be entrusted to persons who happened to be heads of families and some of them perhaps old men. Moreover, Darius himself, who was undoubtedly from the outset the real leader, was certainly not the head of his house, for his father Hystaspes (Visht- aspa) was still alive and in full vigour, since he afterwards governed a province and fought the rebels. But the ring- leaders would choose one out of each of the seven families in order to commit the families themselves. The conspiracy was completely successful ; and the seven killed Gaumata in the fortress Sikathahuvati near Ecbatana, in the land This happened in the beginning of 521. Darius was then made king. He was probably the only one of the seven who was qualified to be so, for he alone belonged to the royal family, of which, it is true, there may have been many members more nearly related to Cambyses. At any rate there was hardly another can- didate for the crown as able as he.

Darius (Dérayavahu, in the nominative Dérayavahush) Darius]

was then, according to Herodotus (i. 209), about thirty years of age. Amongst other measures for securing himself and adding to his dignity he took to wife Atossa, daughter of Cyrus, who had already been married to her brother Cambyses and to the false Smerdis. He soon showed that His six comrades were not his peers by executing Intaphernes, who had forgotten the respect due to the king, together with his whole family. That at first his seat on the throne was far from firm is intimated by Herod-

otus (ii. 127), who also mentions cursorily an insurrection of the Medes against him (i. 130), but it is only from the king’s great inscription that we learn the gigantic nature of the task he undertook when he ascended the throne. He had first to unite the empire again; one province after Insure the other was in insurrection; the west alone remained ions°

quiet, but it was partly in the hands of governors off,

The false Suddenly, however, the empire rang with the news that Smerdis. the king’s brother Smerdis had seized the crown in Persis. We are now in possession of Darius’s own account of these events, and can fairly dispense

with the Greek narratives ; but we may note that here again, in spite of his poetical colouring, Herodotus stands the test much better than

Ctesias.? Gaumata (in Ionic form Gémétés, Justin, i. 9), a

1 Herodotus's Persian informants told him much of the real or pre-

tended virtues of their people, but concealed things which would have |

offended him.

? Small remains of another ancient and trustworthy account are to be found in Justin.

3 Unfortunately in this interesting passage of the great Behistin inscription the particulars are very obscure.

4 In Ctesias the name of a son is twice given for that of the father. It is obvious that we are here dealing with the ancestors of the seven great families, and one generation could very easily be named by mistake for another.

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doubtful loyalty. Darius gives the day of the month for the most important events, but unfortunately not the year. Moreover, in consequence of the mutilation of the Babylonian text it is only of some of the Persian months that we can say with certainty to what parts of the year they roughly correspond.! Thus the particular chronology of these insurrections remains in many points quite un- certain, especially as it can be seen that many events nar- rated as successive were contemporaneous. In any case Darius acted very energetically and promptly; and the chief provinces were undoubtedly again reduced to sub- jection in the first three years of his reign. The insur- rection of Athrina in Susiana was promptly suppressed by a Persian army. More dangerous was the revolt in Babylon of Nidintubel (Vadintabaira), a real or pretended member of the Babylonian royal house

who assumed the august name of Nabukadrachara (Nebuchadnezzar). Darius hastened thither and defeated him in several battles. But the long siege after which, according to Herodotus, the rebel city fell into the hands of Darius, cannot have taken place then.2 While Darius was in Babylon a whole series of revolts broke out. ‘That of Martiya in Susiana, who called himself Imani, and appeared in the character of king of that country, was indeed soon put down with the help of the people of Susiana them- selves, but in Media, the heart of the monarchy, the situa- tion was much more grave. Phraortes (/rawarti), who

gave himself out to be a scion of the old royal house of |

Media, was made king of Media, and the Parthians and Hyrcanians to the eastward, whose satrap was Hystaspes, father of Darius, sided with him. The king’s generals could effect nothing decisive against Phraortes ; at last he was overthrown by the king in person. Like all rebels who deduced their descent rightly or wrongly from: the old dynasties, he was put to death with circumstances of especial cruelty. In the meantime one of Darius’s generals had put down a second false Nebuchadnezzar in Babylon ; others had to suppress insurrections in two regions of Armenia, which were, perhaps, connected with the revolt of Phraortes, and a rising in the distant Margiana (the district of Merv). Even Persis had risen. Another false Smerdis, Vahyazddta, appeared in the east while Darius was in Babylon, and crowds flocked to him. His power increased so much that he was even able to send an army to Arachosia (a part of western Afghanistan). While Darius in person took the field against Phraortes, he despatched against Vahyazdata a general who at last over- threw the rebel. Arachosia, too, was reduced to subjection. So, too, was the nomad tribe of the Sagartiil (perhaps on the northern or north-eastern frontier of Persis), with Chitratahma at their head, who also claimed to be of the royal house of Media. Afterwards Gobryas (Gaubruva), one of the seven, suppressed a third revolt in Persis. The king in person reconquered the Sacee, who had been in subjection before. The generals employed by Darius were Persians and Medes ; but there was one Armenian among them. His faithful army was composed of Persians and Medes, but his adversaries were also supported in part by Persians and Medes. Darius must have been a great ruler to conquer them all. Picture his position when he took

! The obvious assumption that the strange name Andmaka, t.e., “anonymous,” for a month means an intercalary month would compel us to infer that all the events falling in this month belonged to one and the same year, for two successive years or every other year cannot each have an intercalary month. But a careful consideration of the particulars shows that all these events could not fall in the same year. Another obstacle to regarding Anamaka as an intercalary month is the circumstance that it corresponds to the tenth Babylonian month Tebet, ze, probably to December or January, whereas intercalary months usually follow the twelfth or sixth month.

- See below under Xerxes.

the field against Phraortes ; Babylonia was his once more, 521-515.

and its wealth must have supplied him with the means of war, but almost the whole of Iran and Armenia was in the hands of men whom he calls rebels and liars, but some of whom, at least, had perhaps more right than he to the sovereignty, and whose people were devoted to them. No sooner had he reached Media than Babylon was again in arms. Nothing but great energy and circumspection could have carried him safely through all his difficulties.

The satrap of Sardis, Orcetes, had not revolted, but his conduct was that of an independent prince. Him Darius put out of the way by stratagem (Herod., iii. 120 sq.). At the same time Samos became definitively a Persian province, after a royal army had, with much bloodshed, set up as tyrant Syloson, brother of Polycrates, whom Orcetes had put to death. The removal of Aryandes,? governor of Egypt, who assumed, even at that date, the royal privi- lege of minting money, seems to have followed not long afterwards. He had extended his power westwards. But we see from Herodotus that to the west of the last mouth of the Nile the Persian rule was always precarious; and that he can have conquered Carthage, whose naval power was perhaps a match for that of the whole Persian empire, is quite

incredible. At the most it is possible that the prudent leaders of that commercial state may in negotia- tions and treaties have occasionally recognized the king in ambiguous phrases as their lord.

The experience gained by Darius in the first unsettled Organi- years of his reign must have been in part the occasion of zation of

his introducing numerous improvements into the organiza- tion of the empire. Governors with the title of satraps (khshathrapdvan, i.e., land-rulers) there had been before, but Darius determined their rights and duties. Vassal princes of dangerous power were tolerated only with reluctance. The satrap had indeed the power and splendour of a king, but he was nevertheless under regular control. The court received from special officials direct reports of the conduct of the governors, and from time to time royal commissioners appeared with troops to hold an inspection. The satrap commanded the army of his province, but the fortresses he was obliged to leave in the hands of troops directly under the king. But the most important part of the reform was that Darius regulated the taxes and imposed a fixed sum upon each province, with the exception of the land of his fathers, which enjoyed immunity. The Persians were discontented at this, and dubbed Darius in consequence “higgler” (kéandos) ; but this is doubtless only the ery of high officials, to whom any regulated fiscal system was objectionable, as making it somewhat more difficult for them to fleece their subordinates. It is not at all to be supposed that the irregular contributions (“ presents,” Herod., iii. 89) previously levied were less burdensome to the subjects. However imperfect the Persian state system was, and however illusory the measures of control may often have been, still the organization introduced by Darius marks a great step in advance over the thoroughly rude old Asiatic system.

In the Behisttin inscription, which is placed not long after the conclusion of the great revolts, India does not as yet appear as a province, though it does in the later inscriptions of Persepolis, and in the epitaph of Darius. Herodotus says that Darius caused the Indus to be explored from the land of the Pactyans (Pakhtu, Afghans) to its mouth by Scylax, a Greek or rather Carian, and then con- quered the country. But in any case this Persian “ India” was only one portion of the region of the Indus. If this

conquest was somewhat adventurous, much more so was i 3 Polyenus, vii. 10, 7, calls him Oryandres. 4 Wiedemann, op. cit., p. 236, fixes as the date the year 517; but

his grounds are not conclusive. XVIII. — 72

empire.

Expedi- tion to India.

570

515-500. the enterprise against the Scythians. Profound motives for this expedition have been sought for, but it no doubt

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PERSIA

The eyes of the Persians were now turned towards Persian Greece proper. While the Greek coast of Asia Minor was ?elations indispensable to the power which held the interior, the Greece.

Scythian expedi- tion.

sprang simply from the longing to conquer unknown lands. That Darius, an energetic and valiant Eastern prince, always hitherto favoured by fortune, should have been free from lust of conquest is in itself very unlikely. The expedition against the Scythians falls about 515. With regard to the preparations and the beginning of the expedition up to the crossing of the Danube we are well informed. The Greek subjects, of whom even by this time there were many on the European (Thracian) side— such as the inhabitants of Byzantium and the Thracian Chersonese—were obliged to supply the fleet. Mandrocles of Samos built a bridge over the Bosphorus. The Persians must soon have found how useful the skill of the Greeks might be to them, without suspecting the dangers with which the Greek spirit threatened them. The king’s march may be followed as far as the Danube ; it lay pretty nearly due north, the warlike Getz, a Thracian people, being

subdued on the way. With the entry into the Scythian country itself Herodotus's narrative becomes completely fabulous. His chief error is in leaving out of sight the enormous distances in these regions (the southern part of modern Russia) and the great rivers. Hence he represents the native tribes and Darius as marching the distance between the Danube and the Don, or even the Volga, twice in not more than two months, as if the distances were aS in Greece. Darius, who passed the Danube by a bridge in the neighbourhood, perhaps, of Isaktchi, can hardly have crossed even the Dniester. Strabo, who either possessed more exact accounts of the expedition, or drew correct inferences from the disaster which afterwards over- took King Lysimachus in this neighbourhood, forms a very intelligent judgment on these matters. The expedition failed, not through the superior tactics of the Scythians, who behaved just as might be expected of such nomads, with a mixture of timidity and audacious greed of booty, but through the impassable and inhospitable nature of the country, through hunger and thirst, through exhaustion and disease. After sustaining heavy losses Darius was obliged to retreat across the Danube. The king, or at all events his army, was saved by the Greek tyrants, especially Histizeus of Miletus, who refused to follow the advice of their colleague Miltiades to break down the bridge. But the damage to the prestige of the empire was great; the Greeks had seen their lord and master in distress, Never- theless the district south of the Danube was retained. That the Scythians immediately followed up their enemy, or that they even opened negotiations with the Spartans, as Herodotus states,! is not to be supposed. Moreover, Megabyzus, whom Darius on his return left behind in Europe, subdued great districts of Thrace along with the Greek cities on the coast. The king of Macedonia also acknowledged the great king as his liege lord. The cities on the Hellespont,? which after the failure of the expedi- tion made no secret of their feeling towards the Persians, and in part expressed their hostility in overt acts against them, received sharp punishment. The islands of Lemnos and Imbros were occupied. At the mouth of the Hebrus (Maritza) Doriscus was converted into a fortress with a standing garrison.?

1 The story of the dealings of King Cleomenes with the Scythians (Herod., vi. 84) rests on a joke,—he drank immoderately, "like a Scythian."

2 This expression is used to designate the towns lying on the Helles- pont, Propontis, and Bosphorus,

® To the same time may be referred the foundation on the Asiatic side of Dareium, named after Darius, just as Harpagium probably has its name from Harpagus. It is to be observed that in the district of Old Phrygia such towns called after persons are found from of old, as Midzium, Gordixium, Dascylium, and others.

possession of the mother-country of Hellas was, as we can easily see, not only unnecessary but positively dangerous to the Persians, especially as they were themselves absolutely unfitted for the sea. But to the Persians of those days, absorbed in schemes of universal empire, considerations such as these could not present themselves. Besides, the enterprises of the Persians against the Greeks were to a large extent suggested and furthered by the Greeks them- selves. Repressed factions, tyrants in exile or in danger, were but too ready to invoke the help of the foreigner at the price of slavery. When the Persians attacked a Greek state there was always another at enmity with it which at once took their side. Even the inconsiderable enter- prise which was the outward occasion of the Ionian revolt, namely, the attack of the Persians on Naxos, was brought about by the banished aristocrats of the island, who applied to Aristagoras, lord of Miletus, and hence to his superior, Artaphernes, the king's brother and satrap of Sardis. The enterprise failed, and in his embarrassment Aristagoras gave the signal for the revolt which he and his father-in-law Histizus, the proper tyrant' of Miletus, who was detained at the court of Susa, had planned long before.

The great rising of the Ionians and other Greeks and Revoltof non-Greeks shows a vigorous love of freedom, and much Ionian,

individual boldness and skill on the side of the insurgents ; but, quite apart from the vast odds against them and the unfavourableness of their geographical situation, their enterprise was from the outset doomed to failure, because they did not form a compact party, because not even the Ionian cities practised that discipline and subordination which for war are indispensable, and lastly because Arista- goras and Histizeus were adventurous intriguers and tyrants, but without the gifts of rulers or generals. Of the history of the revolt, in addition to the excellent accounts

which he derived from Hecatzeus of Miletug a contemporary and actor in the events he describes, Herodotus has all sorts of popular fables to tell, The chronology is uncertain; probably the revolt began in 500 or 499, and was substan- tially ended by the capture of Miletus in 495 or 494 (six years later, Herod., vi. 18). Aristagoras made himself master of the fleet on its return from Naxos, took prisoner the tyrants on board at the head of the contingents of their cities, and restored the republic in Miletus, only of course with the view of thereby ruling the confederacy. The Spartans, admittedly at that time the first power of Greece, were sober enough to refuse the help requested. But the Athenians, who had already excited the wrath of the Persians by refusing to comply with the demand of Artaphernes that they should receive back Hippias as tyrant, had the courage or rather the foolishness to de- spatch twenty ships to the help of the Ionians. They thus mortally insulted the Persians without really benefiting their friends. The Athenians shared in the march on Sardis. The confederates burned the city, but could not capture the citadel; on the contrary, they were obliged to beat a hasty retreat, and were after all routed at Ephesus. However, the Persian army did not as yet per- manently take up quarters in Ephesus. The Athenians, who may have dreamed of pressing forward into the interior of Asia, returned home with their illusion dis- pelled, and Athens took no further part in the war. But the impression produced by this unsuccessful expedition upon a modern critic is very different from that which it produced upon the Asiatics of those times. They said: “The Jonians have risen against the king; the Jonians from beyond the sea have come to their help; they have

burned the king’s capital,” and many added, “It is all over with the king’s supfemacy!” Not only did the Hel- lespontine cities, with Byzantium at their head, join the Jonians, but also a great part of the Carians, the Greeks in the Troad, and almost the whole of the very flourishing island of Cyprus. By this time the possession of these lands was really endangered by the revolt. But now the Persians came with a great fleet to Cyprus. The Ionians sailed to meet them, beat them at sea off Salamis in Cyprus, but were beaten by the Persians on land. After great struggles, which are described in an almost epic style, befitting the primitive state of the island, Cyprus came

once more under the power of the Persians, after being free only one year. This was the first heavy blow to the insurrection. Much fighting took place on the mainland ; and most of the Persian enterprises were success- ful, but not all. In particular the Carians, who in general displayed great gallantry in this war, annihilated a whole Persian army under a son-in-law of Darius. But the longer the war lasted, the more marked became the progress made by the Persians. Aristagoras left the seat of war, and withdrew to his possessions of Myrcinus on the Lake of Prasias in the south of Thrace, near what was afterwards Amphipolis, but was there slain by natives as early as 497.1 Darius then despatched Histizeus, whoin he still continued to believe faithful, to Ionia, probably in order to open negotiations. He availed himself of the oppor- tunity to seek to regain the lordship of Miletus and put himself at the head of the whole revolt, but the Milesians would have nothing more to do with him or with Aris- tagoras. The great intriguer had connexions on all sides, but no one trusted him in the long run. He became at last a pirate on his own account; and after many adven- tures he fell into the hands of the Persians and was crucified.

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the same time he caused the land to be surveyed, and estab- 500-485.

lished fixed imposts.2 These were not higher than before the war, but naturally they now pressed much harder on the impoverished Ionians. Thereupon the young Mardonius, son of the Gobryas who has been mentioned before, and brother-in-law and son-in-law of the king, established de- mocracies in all Ionian cities. The weakened communities might well seem to the Persians at that time less dangerous than ambitious tyrants. However, this measure apparently applied only to the Ionians of the mainland, not to the islanders nor to the other Greeks of the mainland.

Mardonius cherished great designs. He wished to con- quer Greece itself. He did actually conquer Greeks and non-Greeks in the north-west of the Archipelago, but at the promontory of Athos his fleet was shattered by a storm.

The second expedition against Greece was on a greater Expedi- Under the conduct of the Mede Datis and the tion

scale. younger Artaphernes, son of Darius’s brother of the same name, the Persians took Naxos, and destroyed Eretria in Eubcea, the inhabitants of which had sent five ships to help the Ionians at the beginning of the revolt. But at © Marathon they were utterly defeated by the Athenians and Plateeans (September or October 490). They quickly renounced the project of subjecting Athens to Hippias as tyrant and to Darius as suzerain, and departed home. Miltiades, who, as lord of the Thracian Chersonese, had once been the king’s vassal and had afterwards been obliged to fly, had taken the measure of the Persian. By his victory Athens had rendered immortal service to Europe and the cause of civilization. It was the first great victory of the Greeks over the Persians in the open field; the moral impression had an immense effect in the sequel, when the danger was much greater.

The south-west of the empire alone had hitherto re- Relations mained free from rebellion against Darius. Darius, who with had been with Cambyses in Egypt (Herod., iii. 139), treated PS¥Pt-

It is a noteworthy fact that Histizeus had actually concerted a conspiracy with the Persians in Sardis, against Artaphernes and Darius, the discovery of which cost many their head.

Fidelity has never been an Iranian virtue.

The decisive struggle was concentrated about Miletus. There, at the little island of Lade, as Grote points out, the odds against the Greek fleet (600 triremes against 353) were ot so unfavourable as they were at Salamis, and the want of unity of leadership was not much greater than it was there ; but the Ionians and Lesbians were not, or were no longer, the equals of the European Greeks in bravery and warlike skill. A complete overthrow was the result, in which treachery on the Greek side had itsshare. Miletus long defended itself by sea and land, but was at last taken and destroyed; the women and children were sold as slaves. The captured Milesians were carried off into the heart of Asia and settled at Susa. Miletus, up to that time by far the most important of all Greek cities in Asia, though it afterwards

recovered, still never regained its old position. The most important city of the coast was henceforward Ephesus, which took no part in the battle of Lade, and perhaps had at that time already submitted amicably to the Persians.

The subjugation of the rest of the Greeks of the main- land and islands, as well as of the Carians, now rapidly followed, not without dreadful massacres and devastations. The Phcenicians, who formed the main body of the Persian fleet, seem to have been especially zealous in the work of destruction. The old bitterness between the Canaanites and the Hellenes, so vividly shown during these centuries in Sicily, cannot have died out in the east. In ruined Ionia a frightful state of things must have prevailed, so that at last Artaphernes saw himself obliged to undertake a regu- lar organization to ensure the peace of the country. At

1 Thue., iv. 102.

the Egyptians with forbearance, and in return loyal priests praised him to fellow-countrymen and Greeks. Ifa notice of Polyzenus is to be trusted, he must have gone in person to Egypt in the year 517,° in order to lighten the burdens of the people. Amongst other measures which promoted the material wellbeing of the land, he made a canal from the Nile to the Red Sea, as an inscription of the king himself testifies to this day. But the hatred of the Egyp- tians to the Persians was too great. In the year 486 (Herod., vii. 1, 4) the first great insurrection of the Egyp- tians against the Persians took place. From an inscription we know that during it Khabbash or Khabash was king of Egypt. Darius did not live to see the revolt put down, for he died in the following year, 485.

Darius is the most remarkable king of the dynasty of Darius’s the Achzmenians, and perhaps the most remarkable of all character.

the native kings of Iran. So far as we know, only the Sasanid Khosrau I. in the 6th and the Safavid Abbds the Great in the 17th century A.D. can be compared with him. He was as energetic as he was prudent. He was of course a despot, and could be ruthless and even cruel, but on the whole he was inclined to be mild. We lay especial weight on the testimony of /ischylus, who had himself fought at Marathon against the army of Darius,

and who shared the exasperation of the Athenians against the Persians, but nevertheless in his Perse expresses very high respect for the king. This, then, was the judg- ment of educated Greeks on the prince who had brought such untold misery upon their nation. To such a judgment great weight is to be attached. In harmony with it are the particulars which we know of the doings and ordi-

2 Herod., vi. 42; Diod., x. 59. 3 See Wiedemann, op. cit., p. 237.

485-479.

Xerxes I.

Babylon revolts.

Invasion of Greece.

nances of Darius. He seems, too, to have shown a correct insight in his choice of the persons to whom he entrustcd important positions.

He was succeeded, apparently without any disturbance, by his son Xerxes (Khshaydrshd) I., who, as son of Atossa, elder daughter of Cyrus, had probably always been regarded as heir-apparent.! The time was not yet come when claim- ants to the throne and suspects were assassinated. On the contrary, the king’s blood-relations played under Xerxes as under Darius a great réle as leaders and counsellors. But the whole generation was probably deeply degenerate, though the difference could hardly anywhere have been so great as that between Darius and Xerxes, who begins the series of weak and unworthy kings.

The subjugation of Egypt was effected in 484 (Herod., vii. 7). The measures taken by Khabbash to protect the mouths of the Nile against the “fleet of the Asiatics” had thus been unsuccessful. According to Herodotus a much harder yoke was laid on Egypt than before. The king’s own brother Achzemenes was made satrap of the country.

Babylon too seems to have again risen in revolt. Ctesias assigns to this date the revolt with which the well-known story of Zopyrus? is connected, naming instead of Zopyrus his son Megabyzus. The long siege of which Herodotus speaks does not, as we saw, fit in with the revolt under Darius ; it belongs, perhaps, to the time of Xerxes. Ctesias gives us to understand that Xerxes wounded the religious feelings of the Babylonians, and Herodotus speaks ex- pressly of the desecration of their sanctuaries by the same king (i. 183). To the victorious Macedonians, who em- phatically asserted that they were come to avenge the destruction of Greek temples by Xerxes, the Babylonian priests afterwards told many tales of the outrages he perpetrated on their sanctuaries.? Doubtless they grossly exaggerated, but they did not invent everything. Of course such sacrileges may equally well have taken place when the city was reconquered, or have been the occasion of a revolt.

Darius was firmly resolved to wipe out the disgrace of Marathon, and to bring the whole of Greece under the yoke. His mighty preparations for the march thither had been interrupted by the revolt of Egypt, and, if our con- jecture is right, of Babylon. They were now vigorously recommenced ; and provision was made for the mainte- nance of the army, at least within the limits of the Persian domain. Xerxes himself went to Sardis, the first great rendezvous. From there he set forward in the spring of 480. We will not further describe the great expedition, which, after the dearly-bought successes at Thermopyle and Artemisium, ended with the defeats of Salamis (Sep- tember 480) and Platea (479)—all this belongs rather to the history of Greece—but we will briefly discuss the causes which procured for the disunited and far from numerous Greeks a victory over the mighty power of the great empire. It may very well be said that it would have been possible to subdue even Hellas, and to put an incalculable check upon the Greek spirit, if the great enter- prise had been conducted with more sagacity. There was no lack of Greek traitors, nor even of traitor states, from which the king might have learned how to set about the business. But the blind arrogance of the Asiatic king was bent on bearing down everything by the sheer weight of his masses, and when he failed in this his arrogance passed at once into childish cowardice. The fleet certainly mus- tered over 1200 sail at the beginning of the war, and even

1 In spite of the anecdote in Herod., vii. 2-4; Justin, ii. 10; Plut., De frat. amore, p. 488, and Reg. apophth., p. 178.

2 This story, with all sorts of variations, is very widely spread in the East, but it can hardly rest on an historical fact.

3 Arrian, vii. 17, 2; Strabo, 738.

after the heavy losses by storms at Eubcea, losses, however, which the Greeks no doubt exaggerated, it must with rein- forcements have numbered fully 1000 ships of war,—a force too large to operate, at least in a single mass, in the narrow Greek seas. Moreover, it was without an able head. If the ships furnished by the Pheenicians and the subject Greeks were fairly a match for those of the free Greeks, on the other hand the Persians, Medes, and Sacee who manned the fleet as soldiers probably cut but a sorry figure, and the Persian officers associated with the native ship captains cannot have contributed to the more efficient working of these powerful engines of war. Again, the army, which in any case numbered over a million men, was far too numerous to find sufficient sustenance for any length of time, in spite of the frugal habits which mostly characterize Asiatics. To this must be added the circum- stance that the levies were drawn from peoples many of whom were totally unused to the Greek climate. Famine and pestilence must have wrought dreadful havoc among the soldiers. By far the most of them were a useless rabble, Of the Asiatics proper probably only some Persian and Median regiments of guards were well armed, but even they. were not to be compared, man for man, with the heavy-armed soldier-citizens of Greece. Moreover, in the use of their weapons on land the Greeks, and above all the Spartans, were far superior to all the Persians. Even the Greeks on the Persian side were no match for the Greeks of Europe; some of them fought half-heartedly, and an anxious watch was kept on them, so that they were more a hindrance than a help. If the Persians were kept well informed of the enemy’s affairs by means of traitorous Greeks, much more so were the Greeks through deserters and friends in the enemy’s camp. Even when the Persians were driven by necessity to take the resolution of sending back all

worthless troops, and when the king had fled, Greece was still in great danger, for an able man, Mar. donius, now stood with the best part of the army in the heart of the country. But even with a defeat at Plateza all would not have been over, for the enemy was without his fleet. Add to all this the excellent bearing of those Greeks who remained faithful to their fatherland. Exem- plary above all was the conduct of Athens; she durst not allow the laurels won at Marathon to wither. The Spartans, too, with their morbidly exaggerated sense of military honour, earned immortal renown. Even petty Greek communities like Thespie, Tegea, and Aigina caine glori- ously to the front. At the head of the Greeks stood many distinguished men, above all Themistocles. On the whole, we may say that here Greek intellect, Greek valour, and Greek virtue triumphed over the spiritless and helpless hordes of Asiatic slaves.

Here and there a modern# has expressed the opinion that the conquest of the Grecks by the Persians would have been no such great misfortune after all, inasmuch as the intellectual superiority of the former would have asserted itself even under a foreign dominion, especially as the Persians were not regular barbarians; but this opinion is entirely false. Only in a free country could the Greek spirit fully unfold itself, only in democratic Athens could it accomplish its highest work and achieve imperishable results for all time. In the externals of civilization the Asiatics might, in some respects, be actu- ally the superiors of the Greeks ; but genuine free human culture first arose among the latter, and if there was one pride that was justified it was that of the cultivated Greeks as against all barbarians. ‘The Greeks themselves had no inkling of the high sense in which the watchword at Salamis, “All is at stake” (Aischyl., Pers., 405), was ap- plicable to the whole of human culture.

4 K.g., Maspero, Hist. ancienne des peuples de UOrient, chap. xiv.

EMPIRE. |

King Xerxes had shown himself in the war a thoroughly commonplace Eastern despot, as boastful as he was effemi- nate. The dreadful sacrifice described by Herodotus (vii. 114) may be excused on the ground of religious supersti- tion, but the mutilation of the corpse of Leonidas and the decapitation of the Phoenicians who commanded the fleet show the spirit of

the man. His disgraceful flight must have been welcome to Mardonius. The latter fell like a man at Platzea; indeed the battle of Platza did honour toa large part of the vanquished. Of course great masses of the vast army returned to Asia, several doubtless still in good order, but many, very many, must have perished in Greece, and in Thrace, where the savage Thracians cut off large numbers of the fugitives.

The Greek fleet did not at first venture to pursue the Persians to Asia, but afterwards it crossed at the request of the Greek islanders. At the headland of Mycale, not far from Miletus, the remainder of the Persian fleet was annihilated just about the time of the battle of Platza. The liberation of the islands and of the greater part of the Greek cities on the coast of Thrace followed. Thrace and Macedonia regained their independence without any effort of their own. The whole of the islands were per- manently wrested from the Persians, and the liberation of the Asiatic coast was already begun.

We stand here at the decisive turning-point of Persian history. Henceforward Greece might be coveted and designs against it cherished, but no enterprises were under- taken. The Persians were thrown back upon the defensive.

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the Persian monarch. who had held a command under Mardonius, received the satrapy of Hellespontine Phrygia (where his family retained the power thenceforward down to the fall of the empire), for the purpose of conducting the negotiations. The definite statements of Thucydides leave no doubt as to Pausanias’s guilt. In particular the king’s letter (i. 129) bears every mark of genuineness. Happily he proved himself a clumsy intriguer, and when long afterwards in Sparta retribution at last overtook him he had ceased to be dangerous, at least for the freedom of Greece as a whole. The conduct of Pausanias, together with a want of inclination and capacity for distant naval expeditions, caused the Spartans to resign the conduct of the maritime war against Persia. They withdrew, and the command passed into the hands of the Athenians (476). The naval power of Sparta was quite insignificant, and was certainly surpassed by that of some of her allies, such

as Aigina and Corinth ; and the advantage to Persia of the absence of the Peloponnesian fleet was far more than counter- balanced by the circumstance that the Greek naval forces were now under a single energetic leadership, which aimed at nothing less than the exclusion of the enemy from all Greek seas and coasts. The war lasted for a long time, but few of its details are known to us, though the scanty statements of the Greek writers are partly illustrated by Attic inscriptions. The European coast was soon completely cleared. ion fell after an arduous siege (about 470). Doriscus alone continued for long to be a Persian possession.

Artabazus, son of the Pharnaces 479-464.

Though they often afterwards exercised an influence on the history of Hellas by means of money or diplomacy,

The most brilliant episode of this period of the war is the Cimon's

great naval expedition of Cimon.? He liberated the Greek naval 1 exploits.

still the respect for their fighting power was gone, and so far it is possible to regard Alexander's expedition as a result and continuation of the old struggles, and the saying of Aischylus, "In Salamis the power of the Persians lies buried," may be called prophetic.1

Xerxes was still in Sardis when his full brother Masistes came thither with the beaten forces from Mycale. Dis- quieted probably by the neighbourhood of the victors, the king retired into the depths of Asia. About the same time he deeply offended Masistes on a point of family honour; in revenge Masistes intended to go to his province of Bactria and there raise a revolt, but was cut down by horsemen despatched after him (Herod., vii. 108 sq.). This story (like that told by Herodotus in iv. 13) exhibits all those horrors of a later age which Ctesias loves to paint. The idea of a revolt, nioreover, was not far to seek after the profound humiliation inflicted by the Greek war and the dreadful losses of men,—how many Sogdianians, Indians, and Nubians can have returned to their homes? The in- habitants of distant frontier lands may even then have severed their connexion with Persia, and even then mountain and desert tribes in the very heart of the empire may have regained their full independence.

Unfortunately the work of Herodotus breaks off abruptly with the battle of Mycale, and with it our only continuous ancient history of the empire comes to an end. The frag- ments of Ctesias and the occasional statements of other writers can only, to a small extent, supply the deficiency. Henceforward we possess tolerable information on the shifting relations between the Persian empire and the Greek states, but on little else.

Under the conduct of Pausanias, the victor of Plateea, the Greeks sailed (477) first to Cyprus and then to By- zantium. At the capture of the latter many distinguished Persians fell into their hands, and Pausanias, who must have appeared to Xerxes as a sort of king of Greece, took advan-

1 Aschyl., Pers., 596 sg. The brevity and simplicity of the expres- sion éye: ra Iepody cannot be rendered in any modern language.

cities of the Carian and Lycian coast, and took the bilingua towns, which were occupied by a Persian force ; all were incorporated in an Attic maritime league. ‘The important Phaselis on the borders of Lycia and Pamphylia also fell into hishands. At the mouth of the Eurymedon the Persian fleet, under a son and a nephew of Xerxes, was defeated and destroyed, and a land-victory for the Greeks followed im- mediately. Upon this Cimon sailed hastily for Cyprus, where he captured eighty ships. Here for once the Greeks were numerically superior, but nevertheless it was a great exploit to have advanced victoriously so far beyond their own waters.

About this time Xerxes was assassinated. From various Xerxes

writers we can piece together an account of this event by eee h °

Ctesias, and another by Dinon,? which differ from eac other in numerous particulars; a third version is given by Aristotle (Pol., p. 1311 b). For such scenes, occurring in the interior of the seraglio, an outsider is not a trust- worthy authority, but this much is clear: Xerxes was killed by Artabanus, captain of the body-guard > “is youngest son Artaxerxes, in league with the murderer, put to death his elder brother Darius, who had a better title to the throne. It does not, however, follow with certainty that Artaxerxes was a parricide. We have here a change of sovereign of the sort which abounds in Oriental history. Artabanus was soon afterwards put out of the way by

Artaxerxes. Later chronologists represent him as actually reigning for seven months, but this is probably a

mistaken interpretation of expressions used by Dinon.

Artaxerxes (Artakhshathra*) I. came to the throne in Arta- His surname “Longhand” (Maxpéxetp), which *°*°s

464.

seems to have been first mentioned by Dinon, has no doubt a symbolical meaning, “ of far-reaching power,” but later Greek writers took it literally. Ctesias tells of a

2 About 465. Perhaps it falls within the reign of Artaxerxes.

3 He wrote in ihe time of Alexander.

4 A second form, Artakhshasht, is represented by Hebrew and Egyptian forms, and by ’Apratécons on a Greek inscription (Le Bas and Waddington, No. 1651).

464-445. rising of the Bactrians immediately after his accession to the throne, which may have been instigated by Hystaspes, the king’s elder brother, who was then in his satrapy of Bactria (Diod., xi. 69). Two battles took place, the second of which ended in a decisive victory for the royalists, so that Bactria was once more reduced to sub- jection.

In the early part of the reign of Artaxerxes falls the appearance of Themistocles at the Persian court ; so say the contemporary Charon of Lampsacus (Plut., Themist., 27), and also Thucydides (i. 137); to their authority that of all later writers, who here mention Xerxes, must give way. On calmly weighing the trustworthy accounts and taking into consideration the circumstance that even ata later time Themistocles as a “traitor” was refused a grave in Attic earth, we can hardly avoid concluding that the gifted saviour of Greece, the founder of the Attic sea- power, a man far

superior intellectually to Pausanias, but of boundless ambition, and with a strong propensity to intrigue, was really guilty of entering into traitorous communication with the Persians in his own interest. Certainly he knew admirably how to give himself out as an old friend of the Persians,! and to hold out to them the prospect of still doing them valuable service against his countrymen. The king gave him Magnesia on the Meander in Lydia and two other towns; as the tyrant of these places under Persian supremacy the victor of Salamis lived some time longer.? Like this illustrious fugitive, other Greek exiles or adventurers came to the Persian court from time to time, and played there occa- sionally a certain réle.

Second Hardly was Artaxerxes seated on the throne when the

Egyptian second great revolt of Egypt broke out. Inarus, son of

revolt. Psammetichus, a Libyan prince, placed himself at the head of the Egyptians and was madc king of the whole country. The satrap Achzmenes, son of Darius, fell in battle. Inarus summoned to his aid the Athenians, who were still at war with the Persians, and the Athenians were rash enough to involve themselves in the struggle (about 460). They had just come once more to Cyprus with 200 ships. They sailed to Egypt, and with the help of the Egyptians shut up the Persians and the Egyptians who sided with them in the castle of Memphis. Persia had recourse to diplomacy : an embassy was sent to Sparta in order to stir up the Spar- tans to make a vigorous diversion against Athens. When this attempt failed, a large army was at last despatched under Megabyzus, son of Zopyrus, which subdued the country after hard fighting ; for, with all their hatred of the Persians, the Egyptians were no match for them in battle. The Athenians in Egypt were annihilated (prob- ably 455); the same fate befell a reinforcement of fifty ships. Inarus fell by treachery into the hands of the Persians and was crucified. His son Thannyras, however, received (Herod., iii. 15) his original province (probably the Libyan nome), which points to the war having been concluded by a treaty, of which Ctesias also makes mention. In the swamps of the Delta Amyrteeus (Amun-art-rut) maintained himself as an independent king; and by him the Athenians were once more invited to Egypt (450 or 449). Cimon, who was again at Cyprus with 200 ships, despatched sixty to his help, but they soon returned, probably without

accomplishing much. Cimon died during the siege of Citium, one of the most important cities of Cyprus, and the mainstay of the Pheenician nationality on

1 But the letter in Thuc., i. 137, cannot be regarded as an authentic document.

2 Here, too, he coined money. Of the two specimens known to us, one is plated, ‘‘which seems to show that with the coinage the cunning Athenian combined a financial speculation,”’ Brandis, Miinz-, Mass-, und Gewichtwesen V orderasiens, p. 459.

that island. The Athenians raised the siege, but achieved on their retreat once more a brilliant victory by sea and land.

These are the last contests of the Athenians and their Peace allies with the Persians. Peace must have been concluded between shortly afterwards. We cannot here enumerate and criticize Persians the arguments which have often been adduced for and Athen;

: Onno Mans, against the supposition that a regular peace (though not a “peace of Cimon”) was concluded. No one probably would have questioned the reality of such a peace were it not that the Attic orators of the 4th century, by grossly exaggerating the terms of a treaty which in their time had long been a dead letter, had rendered the very existence of the treaty open to suspicion, and that the able historian Theopompus, moved apparently by dislike of the Athenian democracy and a desire to gratify his powerful patron, King Alexander, had attempted by false though learned arguments to disprove the genuineness of the original treaty of peace, of which only a copy was extant in his time. The text of the original document was given by the best authority on Attic decrees, Craterus.4 It is hardly conceivable that the great war should have died out of itself without the Athenians getting some security that their possessions and their widely ramifying commerce would be left unmolested. Moreover, all that we are

told « or can infer as to the contents of the treaty agrees perfectly with the political relations of the time. The treaty was not at all in the spirit of the high-flying plans of Cimon's party ; for, while the Persians acknowledged the independ- ence of the Greek towns on the west coast, including the Lycian, and pledged themselves to send no ships of war into Greek waters, the Athenians in return renounced all rights in the eastern seas. The most sagacious of the Athenians had perceived that Cyprus, and much more Egypt and Phoenicia, lay outside the natural sphere of Athenian power. We can understand, however, that Callias, the author of the treaty, earned the dislike of the Athenians for his pains. The balance of advantages secured by the peace was on the side of Athens, but the Persians resigned nothing which they actually possessed, and they were now secured against Athenian raids. It was certainly anomalous that the great empire which owned the rest of Asia Minor should have no rights over the narrow strip of coast, which could everywhere be overlooked from the interior, Even the capital of the Hellespontine-Phrygian satrapy, Dascyl- ium, from which that province is sometimes called Dascyl- itis, Was now a member of the Attic naval confederacy. The satraps were still obliged as before to pay to the king the taxes due from the coast-lands, and this must have been a constant incitement to them to reconquer those lands. There was no Persian fleet in the Black Sea. The Greek towns on its coast were free, and some of them belonged to the Athenian league and were occasionally visited by Athenian war-ships. At most a portion of the natives of the countries round about the Black Sea were in a state of loose dependence on the Persian empire. In Lycia and Caria there were districts which obeyed neither the king nor Athens, or at least were not closely dependent on any foreign power.

The condition of Egypt at this time is very obscure. Amyrteus had no doubt been finally overthrown by the Persians, but his son Pausiris was left by them in posses- sion of his father's kingdom. In the year 445 we find an Egyptian or Libyan king, Psammetichus, who presented the Athenians with a great quantity of corn. This was .

> The epigram which Diodorus (xi. 62) wrongly applies to the battle : of the Eurymedon refers to this battle. 4 Shortly after Alexander. > Compare Thuc., ii. 69 ; iti. 19. . § Philochorus, in schol. Aristoph. Vesp., 716; schol. Aristoph. Plut., 178 ; Plut., Pericles, 37.

perhaps another son of Inarus. more of him and his reign.

The conclusion of peace did not prevent the Persians, or at least individual satraps, from occasionally supporting enemies of Athens. Samian oligarchs, with the help of Pissuthnes, satrap of Sardis, made themselves masters of the island (440 or 439), and estranged it from Athens. The Athenians feared that a Phcenician fleet might come to the help of the oligarchs, but not a Persian interfered when they reduced the island once more to subjection. About 430 Colophon was made over to Itamenes (no doubt a Persian general or governor) and the barbarians by a party among the inhabitants favourable to Persia, and thereupon Notium,! a dependency of Colophon, was also occupied by the royalists, for thither also Pissuthnes despatched Persian troops, who entrenched themselves in the town. Amongst these troops were Arcadian mercenaries. This is the first undoubted mention of Greek mercenaries in Persian pay; henceforward they play a very great part in the history of the empire. The Persian rulers had observed how far superior the Greeks were to the Asiatics, and in Greece there were always plenty of stout fellows who were impelled by political events, the love of adventure, or poverty to enter foreign service as soldiers of fortune. Most of them came from the Peloponnesus, presumably from the mountains of Arcadia, which yielded but a scanty sub- sistence to its inhabitants. The Athenian party in Notium ealled in the Athenian admiral Paches; by shameful per- fidy he made himself master of the entrenchments, and put the garrison to the sword. With Notium, Colophon was now once more a member of the Athenian league. No further consequences followed from these hostilities.

During the early years of the Peloponnesian War. the Spartans repeatedly held communications with the Persians, whose assistance they desired against Athens. These negotiations were, for the time being, without result. The Spartan diplomatists were unskilful, and the Persian authorities were cowardly, indolent, ignorant, and selfish.? The impecunious Peloponnesians wished above all for Persian gold, and, moreover, for the Phoenician war-ships. The Athenians also tried to tap the inexhaustible source of wealth for their own benefit, but of course in vain.®

Of the internal state of the empire during the long reign of Artaxerxes I. we know very little. Ctesias, or rather the extract of him made, not always carefully, by Photius, tells us indeed various stories, but he jumbles together fact and fiction, history and anecdote. Of most importance is the quarrel of Megabyzus, conqueror of Egypt, with the Persian court; he maintained a rebellion for several years in Syria, till at last, after several conflicts, a full pardon was assured him by treaty. It is not im- probable that this war was the occasion of the destruction of the walls and gates of Jerusalem lamented by Nehemiah (in the year 445). According to Ctesias, Megabyzus after- wards fell into disgrace again, but was again taken into favour. In all these complications an important part is played by those cruel, intriguing, dissolute women, the queen-mother Amestris, daughter of Otanes, of whose character we get a very unpleasing view from Herodotus (vii. 114; ix. 109 sg.), and her daughter Amytis, wife of Megabyzus. Even without an exact knowledge of the circumstances, we can well understand how it was that Zopyrus, son of Megabyzus, came to take refuge in Athens.

1 In addition to purely political opposition, the local jealousy be- tween Notium and its “superior town” Colophon had its share in the matter. See Aristot., Pol., p. 13803 b.

freee Thuc., ii. 673 iii. 31; iv. 50.

3 Aristophanes, in the Acharnians (represented January B.C.)

ridicules these long and fruitless negotiations of the Greeks with the Persian king.

But we know nothing

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to capture Caunus (in Caria), which had revolted. His 445-410,

grandmother Amestris got the Carian who had killed him into her power and had him crucified.

From Nehemiah’s memoirs we see that in those days one who was not a Persian might not only fill the tolerably high office of cupbearer ¢ in the royal household, but might also become deputy-governor over his fellow-countrymen.

The history of Ctesias, untrustworthy as it is in par- ticulars, shows us the manner of life at court. Artaxerxes I. was a very weak man, and women and favourites took the government out of his hands, Still, he may have deserved the praise, often bestowed on him, of good-nature. He may also have been of stately presence ; as an Iranian chief he was doubtless an excellent huntsman®; but his “incredibilis virtus belli” (Nepos, De regibus, 1) is precisely “incredibilis.” In reading the eulogies of Persian kings we must always remember that the ultimate sources of writers like Ctesias and Dinon are court news, wherein even the deceased kings are spoken of in a courtly tone.

Artaxerxes died in 424. His successor, Xerxes II., the Xerxes

only one of his eighteen sons who was legitimate,® was H. murdered after a month anda half by his brother Secy- dianus or Sogdianus. But after six and a half months’ the murderer was in his turn overthrown by his brother Ochus, satrap of Hyrcania, and, in violation of solemn oaths, put to death. Ochus assumed the name of Darius, ascending the throne about the beginning of the year 423.9

Darius II. is called Nothus or Syrus,!© because his mother Darius From the first mention of I.

was a Babylonian concubine. him by Ctesias his wife and sister Parysatis appears as the prompter of all his acts and all his crimes; and this mis- chievous woman possessed the greatest influence for many years. The king’s full brother Arsites, in conjunction with another son of Megabyzus, Artyphius, raised the standard of revolt, probably in Syria. But his Greek soldiers were bribed, and thus he fell into the hands of the royalists, and, in violation of the oath, was put to death at the instigation of Parysatis. The same fate befell some of those who had taken part in the murder of Xerxes II. Darius had presumably come forward from the beginning as his avenger. Soon after 410 the great revolt of the Egyptians was successfully

accomplished. The first independent king was called Amyrteeus, and was presumably a grandson or other relative of the former Amyrteus. The deep decay of the Persian military power is proved by the fact that for sixty years it failed to reduce the unwarlike Egyptians, though the latter were frequently divided amongst themselves by internal dissension and double rulers.

The above-mentioned Pissuthnes, satrap of Sardis, had also revolted. Tissaphernes, who here appears for the first time, put down the rebellion by the usual means of bribery and perjury; the Athenian Lycon, leader of Pissuthnes's Greek mercenaries, plays a far from honourable part in the affair. The events fall after 424, and at least some years before 412. But Pissuthnes's son Amorges continued

4 Cp, Herod., iii. 34, and Nicol. Damasc. (i.e, Ctesias), 64.

5 Cp. the anecdote of Ctesias in Photius about his lion hunt.

6 This probably means that the wife who bore him was of a noble Persian family. ;

7 No reliance is to be placed on these numbers in Ctesias. Others assign to the two monarchs two and seven months respectively. In any case they did not together reign a full year, since the astronomical canon ignores them.

8 Cp. also Pausanias, vi. 5, 3, where probably we should read 2éy- doy with Bekker.

9 The beginning of 411 falls, according to the document in Thue., viii. 58, in his thirteenth year; this is probably a reckoning which begins the year with the spring, and accordingly reckons his first year (or rather the year in which he came to the throne) from the spring of 424 to 423. The astronomical canon begins the year of his accession with 7th December 424.

10 Hypothesis of Alschyl., Pers., and schol. on v. 6.

410-401. the revolt in Caria, and was supported therein by the Athenians, perhaps because they already knew for certain that Tissaphernes was preparing to help the Spartans.1

Relations When the power of Athens seemed annihilated by the

with dreadful catastrophe in Sicily, the Persians expected to

BEHEuE: regain the whole sea-coast. Tissaphernes, satrap of Sardis, and. his rival Pharnabazus, satrap of Hellespontine Phrygia, vied with each other in invoking the help of the Spartans. The party hostile to Athens in the cities of the mainland and in the islands displayed great zeal in bringing about the alliance. Moreover, the no less able than infamous Alcibiades strained every nerve to secure so favourable an opportunity of distinguishing himself personally and injuring his native city. Not without reluctance the Spartans resolved on a decisive step. They might have known beforehand that they would only receive real sup- port from the Persians on condition of surrendering to them a great portion of the Greek cities which had once been freed by Athens, though now mostly hostile to her. They chose to attach themselves to the more powerful but, as it soon appeared, wholly untrustworthy Tissaphernes rather than to Pharnabazus. Of course the confederates did the Athenians much damage, and wrested from them a great part of their domain. The Lacedsemonians actually

completely won his affection, all the money he wanted, and when after Lysander’s temporary recall the relations with Sparta were disturbed, because the noble Callicratidas did not care to play the courtier to the barbarians, the return of Lysander sufficed to put everything on its former footing. When Cyrus was summoned to the bedside of Darius (either really ill or pretending to be so), he left his Spartan friend the most abundant resources and the fullest authority. With this help Lysander succeeded in at last compelling Athens, now completely isolated, to accept the melancholy peace of March 404.: Even after all the mis- fortunes of Athens it was only Persian gold which enabled the Spartans to humble her.

According to Ctesias, Terituchmes revolted against King Darius, caused his wife Amestris, daughter of the king and Parysatis, to be put to death, but was himself slain by treachery. This event, garnished in the usual manner

with a full measure of perfidy and cruelty, is perhaps to be connected with the unsuccessful revolt of the Medes mentioned by Xenophon (/fedl., i. 2, 19) under the year 410/409. In the fall of Terituchmes his sister Statira, wife of the king's eldest son Arsicas,? was nearly involved ; thenceforward the bitterest hatred subsisted between Pary- satis and her daughter-in-law Statira.

served the satrap as catchpolls against Amorges, who About the time of the conclusion of peace between Arta resided in Jassus near Miletus, and so he could be taken | Athens and Sparta Darius II. died. Arsicas ascended xeries captive and carried alive to the king. But the Athenians | the throne under the name of Artaxerxes (II). The sur- _ still exhibited astonishing endurance and resource. It is | name '"Mnemon" (the mindful) seems again to have been

true that neither of the confederates meant honestly by | first mentioned by Dinon.t The younger and much abler

the other. Whether from avarice or mere whim, Tissa- | son Cyrus, preferred by Parysatis, came with 300 Greek Cyms,

phernes supplied the Peloponnesians in insufficient measure | mercenaries, no doubt to seize the throne, but he was too . satrap,

with money and stores, and without these they were not | late. Tissaphernes, professedly the friend of Cyrus,

in a position to wage war in Asia. The intrigues of Alci- biades contributed to sow mistrust and confusion. The Spartan leaders repeatedly concluded treaties with the satrap, but they were not ratified. At last it was agreed that the whole mainland of Asia, and therefore all the Greek cities there, should belong to the king, but that in return for this the Persians should give the Spartans effective help. If Tissaphernes had rapidly and energetic- ally carried out the terms of this treaty, the war might perhaps have been ended quickly enough. But to keep faith was contrary to the nature of the man. Moreover, he had probably promised more than he could perform: to bring up the great Phcenician fleet was not quite in his power. The Pheenicians themselves, and perhaps high Persian lords also, had certainly little desire to

engage again the Attic galleys which had handled them so roughly at the Eurymedon and at Cyprus. Pharnabazus supported the Spartans much more honourably and effectively. This he showed especially when the Athenians were again mak- ing steady progress (410) under the leadership of Alcibiades after his return. The Athenians now devastated the king's territory in various places, and Pharnabazus had at length to engage to forward Athenian envoys to the king for the purpose of conducting negotiations for a peace (409) at the court itself. But events now took a decisive turn. Cyrus, the king's son, was made satrap of Lydia, Great Phrygia, and Cappadocia, and commander- in-chief of all the troops in Asia Minor, Tissaphernes retaining only the coast-cities (408). Cyrus possessed burn- ing ambition, and longed to avenge the defeats which his house had experienced at the hands of the Athenians. Hence he sought to unite himself closely with the Spartans. J ust at this time the command fell to the cunning, ener- getic, and unscrupulous Lysander. These two men were the ruin of Athens. Cyrus granted Lysander, who had

1 On the other hand, Andocides (De pace, p. 27), twenty years later,

it is true, Tepresents the support given to Amorges rather as the cause of the king's enmity to the Athenians,

warned the king against him, and with good reason. Cyrus was arrested, but at the instance of Parysatis he was released and sent back to his satrapy,—a very unwise measure, for his ambition was only inflamed by his imprisonment and by his exasperation against Tissaphernes.

Meantime Lysander lorded it over the Greeks, He even possessed sufficient influence to induce Pharnabazus, who in other respects was remarkably respectable > for a satrap, to violate the law of hospitality by causing Alcibiades to be put to death. But even the patience of Pharnabazus was at last worn out by Lysander; he urgently demanded the recall of the latter, and the Spartans, who had allowed the atrocities of Lysander towards the Greeks to pass unnoticed, respected the satrap's demand, and re- called their admiral (402 or 401).

No sooner was Cyrus in his satrapy again than he began to make great encroachments. He gained over the Ionian cities which belonged to the

province of Tissaphernes and laid siege to Miletus, which adhered to Tissaphernes. On Orontes, a partisan of the latter, he made open war. Mean-time he collected under false pretexts an army of Greek mercenaries, and in 401 set out with the real purpose of seizing the throne. He had with him nearly 13,000 Greek mercenaries commanded by Clearchus, a Spartan exile, and a vast host of Asiatics. But Tissaphernes hastened into the interior before him to carry the tidings. Of this expedition we have the well-known account by Xenophon, who took part in it.6 The Spartans favoured

- Arsikas is the form in Ctesias ; Plut., Art., 1. From this Photius has wrongly made Arsakes. Dinon called him Oarses. ‘The initial sound was perhaps w.

3 At the very beginning of the new reign Ctesias has again some dreadful stories of murder and intrigue to tell. As court physician of Parysatis he had seen only too much of such things, which are charac- teristic of the Persian court.

4 See Plut., dc.

5 But the worth of his character has been often over-estimated ; the contrast with the baseness of Tissaphernes is apt to place Pharnabazus in too favourable a light.

§ Good supplementary information is given by Diodorus, who has

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the enterprise of their friend, but without openly breaking with the king. Cyrus advanced boldly, confident in the military superiority of the Greeks ; but he had some trouble in carrying them with him as far as Syria and Babylonia, for they were not engaged for so distant a goal. He made his way without difficulty into the heart of the empire. Neither the passes of the Taurus leading from Cappadocia into Cilicia nor those of the Amanus from Cilicia into Syria were blocked. The vassal-prince of Cilicia, Syennesis, put a good face on a bad business and let him through. Even the line of defence between Babylonia and the Mesopota- mian desert was unoccupied. At Cunaxa, 500 stadia from Babylon,! they came upon the mighty royalist

army. The Greeks carried everything before them; the king proved a miserable coward and fled. But, in fighting the Asiatic rabble, Clearchus seems to have adhered too pedantically to the cautious Spartan tactics, and not to have dashed with sufficient rapidity at the enemy's centre. Cyrus, however, rushed foolhardily into the mélée and there fell.

Even if we deduct much from Xenophon's idealistic portrait, we must still admit that Cyrus was a very able and in many respects honourable man, far worthier of the throne than his brother. From his grim mother he probably inherited his spirit and energy. Certainly none of the kings after Darius I. can be compared with him, except perhaps Artaxerxes III. But for Greece, as Grote shows, it was very fortunate that at that time the kingdom of Persia did not fall to a man whose most ardent endeavour it would have been to bring the Greeks into subjugation to himself, and who had learned in the school of Lysander and elsewhere the best means of accomplishing that object.

Cyrus's Greeks were an object of terror to the king's troops. All the deception and crimes employed against them had their source in cowardice. The king's hosts were reinforced by the army of Cyrus, which after their leader's fall passed over to the enemy; but all these Asiatics trembled before the dauntless Greek mercenaries, comparatively few in number as they were and strangers to the country. It is characteristic of the state of the empire that Tissaphernes allowed the Greeks to plunder the villages which were the special property of Parysatis ; he probably thought that with the death of her favourite son her power was broken, while he himself had succeeded in appearing as the deliverer of the empire. After elect- ing fresh leaders in place of those who were foully assas- sinated, the "ten thousand" made themselves a way through wild mountains and wild peoples; they had to endure a thousand dangers and hardships, but from the king's forces they experienced no serious hindrance.

This expedition revealed to the Greeks the weakness of the empire and the cowardice of its rulers and defenders. – Cyrus had penetrated to its centre without striking a blow, and an army of ordinary Greek mercenaries proved itself more than a match for the power of the whole empire. It was perceived howhelpless the colossus was ; it was perceived that great

territories, which had been regarded as royal provinces, were completely independent.? Independent at that time were the predatory Mysians (in Olympus), Pisidians, and Lycaonians ;? the Lycians (entirely?) and the Bithynians and Paphlagonians half and half,—the last two peoples had kings of their own; further, the Greek

SE eee a a ae indirectly made use of the narrative of another writer who shared in the expedition.

1 So says Ctesias, who knew the country. Xenophon says 360 stadia. These figures are equal to nearly 58 and 42 English miles respectively,—-about 93 and 67 kilometres.

2 On the effect produced by the expedition, see Xenophon, Feil., vi. 1, 12; Isocrates, passim.

3 At least in part ; such mountain peoples did not, of course, form integral wholes, and, if one tribe was independent, another may have obeyed the satrap.

cities on the Euxine ; finally, the Carduchi and other wild peoples in the south and north-west of Armenia.

The death of Cyrus widened the breach between Parysatis and Statira. The former could not forget her darling, and succeeded in bringing to a cruel end one after another all who had participated in his death. Statira was exultant ; but she was eventually poisoned by her mother-in-law. Artaxerxes was indignant at this deed and banished Pary- satis for ever from his sight ; but he could not live without the firm guidance of his mother, and soon recalled her.

Tissaphernes succeeded to all the privileges of the post which Cyrus had occupied. This could not but hasten the inevitable conflict with Sparta, which now, at the height of her power, could not bring herself to fulfil the

treaty and resign to the Persians all the Greek cities of Asia Minor. The Greeks expected to be protected by Sparta against Tissaphernes, who was already enforcing his rights with the strong arm, and the war which the Spartans began in 401 against the Persians in Asia Minor was no doubt popular, but as a land-power with limited resources they were not in a position to conduct much more than a purely predatory war. The state of lonia and Aolis must have changed very much for the worse since the termination of the Attic supremacy, and the Asiatic Greeks were now perhaps for the most part unworthy of the blood that ran in streams on their behalf. Tissaphernes and Phar- nabazus sought each to shift upon the other the burden of the war, the conduct of which was not essentially altered when the command of the Spartans devolved on Agesilaus (396), who strove in vain to give the struggle the prestige of a Pan-hellenic enterprise. But, when Agesi- laus had gained a great victory close to Sardis, Tissaphernes, who had meantime, more from cowardice than treachery, remained inactive in Sardis, was quietly displaced by a successor in the person of Tithraustes, who succeeded in seizing and executing him.* The real cause of his fall was the hatred of Parysatis. The game of treaties, which neither side meant to keep, and the efforts of the one satrap to thrust the Spartans upon the other, began afresh. In course of time Agesilaus certainly gained ground rapidly. But his successes were in part much exaggerated even by contemporaries.» On the whole, they were predatory ex- peditions on a large scale, which showed with ever greater clearness the weakness of the empire, but did not directly affect its stability. Even after his great victory, Agesilaus did not venture to attack Sardis—a striking contrast to the speed and thoroughness with which Alexander took possession of these lands. In 394 Agesilaus was recalled, for Sparta needed him in Europe more than in Asia ; the intolerable nature of the Spartan supremacy had done more than Persian gold to rouse even the proved allies of Sparta, such as the Thebans and Corinthians, into leaguing them- selves with Athens in revolt. When Agesilaus reached the frontier of Boeotia he heard the dreadful tidings of Cnidus.

After the decisive defeat at A°gospotami the admiral of the Athenian fleet, Conon, had fled to Evagoras, prince of Salamis in Cyprus. Evagoras, a tyrant of the “grand” type like Pisistratus or Gelo, favoured Conon’s efforts to enter into relations with the Persian king with a view to raise Athens

from her fall. When the war between Persia and Sparta broke out, Pharnabazus had made it clear to the court that it was absolutely necessary to raise a fleet, and that no better commander could be found for it than the tried sailor-hero of Athens. Under the leadership of such a man the Persians actually dared to send Phoenician ships once more into those Greek waters which they had long anxiously avoided. But Conon's successes, such espect-

ally as the revolt of Rhodes from Sparta (probably in 396),

4 See Diod., xiv. 80; Plut., Art., 23; Polysnus, vii. 16, 1. 5 Tsocrates, Paneg., 70. XVIII. — 73

401-394.

War with Sparta.

394-376.

Peace of Antal- cidas,

were crippled by the miserable Oriental administration, e.g., the tardiness in paying the men. Hereupon Conon went himself to the king at Babylon, obtained a grant of the necessary money and powers and the king's consent to bestow the nominal command of the fleet upon the trust- worthy Pharnabazus. Then at the head of the Persian fleet the Athenian admiral utterly defeated the Spartans at Cnidus (beginning of August 394). In a short time nearly all the islands and cities on the Asiatic coast were freed from the Spartan prefects (" harmosts"), and Conon carried his point of nowhere occupying the citadels with Persian garrisons. The Spartan sovereignty of the seas, after lasting ten years, was over for ever. Pharnabazus sailed to the Peloponnesus (393), and at Corinth was joy- fully greeted by the Greeks gathered for the war with Sparta. He supplied them liberally with money and then returned home, while Conon restored the marine fortifi- cations of Athens. Thus as a matter of fact a Persian fleet now ruled the Archipelago, but it was a menace and danger to Greek

freedom no more. It was only with Greek help, under the leadership of a man like Conon, that the king's ships could still achieve much.

As the land-war in Greece dragged on for a long time, the Spartans had again recourse to diplomacy. The new satrap in Sardis, Tiribazus, who in some measure revived the vacillating policy of Tissaphernes, met their advances. He overthrew Conon, who escaped death at his hands only with extreme difficulty and fled to Evagoras, at whose court he must have died soon afterwards! But Tiribazus soon received in the person of Struthas a successor more favourably disposed to Athens. Many conflicts of Greeks against Greeks still took place by land and sea, but all the belligerents were exhausted, at least financially. So, when the Spartans at last succeeded through their ambassador Antalcidas and through Tiribazus in bringing about a peace, all the more important states of Greece found themselves obliged to accede to it, however unwillingly. This is the notorious peace of Antalcidas, which Tiribazus laid before the delegates of the Greeks at Sardis or Ephesus in 387. It is not a mutual compact but a simple edict of the king. It sets forth that in the king's opinion all cities of the Asiatic mainland, as well as the islands of Clazomenz and Cyprus,'ought to belong to him; that, on the other hand, all other Greek states, even the petty ones, ought to be independent, with the single exception of Lemnos, Imbros, and Scyros, which should continue as of old to belong to Athens. If any one refused to accept this decision, upon him the king and his allies (particularly the Spartans) would wage war with all their power.

It is hardly likely that the true import of this document was understood at the Persian court. That the great king should issue a simple order was there regarded as a inatter of course, but the Persian statesmen, who really knew the state of affairs, may have had trouble in securing the acknowledgment of the freedom of the islands. By this peace the Spartans personally gained a great success ; for they gave up nothing which they still possessed, while by the declaration of the independence of even the pettiest communities they secured this advantage, that the cities which had hitherto ruled over wider areas were restricted to their own special domain, that, eg., Thebes, hitherto head of Beeotia, now remained only one of many independ- ent Boeotian cities. Thus Greece was split up into a thou- sand petty communities, which Sparta, who did not dream of extending the

independence to her own subjects, could with ease dominate collectively. Through this peace the Spartans gained for about sixteen years a much greater EEE ee

1 This follows, in opposition to other statements, from Lysias, Pro

bonis Aristoph., p. 155 ; ep. Isoer., Paneg., 78, and Dinon in Nepos's Conon, at the end,

possessed before, and they ruthlessly turned it to account, Athens, slowly regaining her strength, was appeased by the three' islands, but nowhere was '"' the peace sent down by the king" felt to be a disgrace more keenly than at Athens. In that peace the king issued orders to the Greeks as to his subjects, and the express and definitive surrender of all the Greeks on the Asiatic coasts was felt all the more bitterly in the intellectual capital of Greece : because there was no prospect of ever again freeing them |

power over the Greek mainland than they had ever | | t

as in the days of Xanthippus and Cimon. And yet it was known that the Persian empire was now much weaker than it had been then, and that it was only maintained by Greek mercenaries.? The real gain to Persia by the | peace was a firm hold on the sea-coast. The domineering } attitude towards the other Greeks was a mere appearance, ' In the following decades the king repeatedly commanded peace, even after Thebes had completely broken the power of Sparta (371). The powers for the time being employed | Persian intervention as a means to their own ends, and

there were plenty of diplomatic negotiations with the king,

but Persia had no advantage from them. Moreover, now one, now another Greek state supported rebel satraps and vassals. They all, the king as well as the rebels, procured mercenaries from Greece.?

Meantime another enemy had arisen to the Persian Eva. supremacy in the west—an enemy who, if Athens, hig goms. friend and sympathizer, had at that time been once more a great naval power with an aggressive policy, might perhaps have excluded the Persians from all the western seas.

Evagoras of Salamis had made himself the almost independent lord of Cyprus, relying on the ancestral an- tagonism of the Greek to the Phcenician element in the island. As early as 390 forces were levied against him. Athens, under obligations to him on Conon's account, sup- ported him openly, although she was at that time still formally leagued with the Persians against Sparta. After the peace of Antalcidas Persia made great efforts to reduce Evagoras again to subjection. He was in league with Egypt, scoured the seas far and wide, and had even for some time maintained a siege of Tyre. The cunning Cypriot also kept up a secret correspondence with the vassal princes of Caria. After a ten years' struggle he had ; to yield to superior force, but by skilful negotiation with the satraps he was able to procure a tolerable peace. Soon |

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afterwards he was murdered, but his descendants long con- tinued to be princes of different towns in Cyprus.

About this time probably the expedition of Artaxerxes Cadusian against the Cadusians took place, of which Plutarch, after expet Dinon, has given us a detailed account.4 The Cadusians "°™ are the inhabitants of the modern Gildan, who were prob- ably never completely subdued, and who certainly by their raids inflicted much annoyance on the neighbouring terri- tory of the king. Darius IT. had taken the field against them shortly before his death,® and the repeated mention ; in the fragments of Ctesias of the Cadusians at the time of the Median empire is presumably a reflex of the state of things in his own day. Artaxerxes's campaign turned out disastrously. The king probably thought to crush the wild mountain tribes—who, however, are only to be caught by . small and skilfully led armies—by masses of troops; but

he fell into an ambush, from which he was only saved by

2 Compare many passages in the orators and Plato. Especially interesting is the passage in Isocr., Hist. ad Archid., p. 436, on the wild doings of the Greek mercenaries, who were specially burdensome to the Greek cities under Persian rule.

3 We are told that the king desired the internal peace of Greece, because he hoped thereby to procure mercenaries all the more easily from that country (Diod., xv. 38).

4 Artax., 24; ep. Diod., xv. 8, 10.

5 Xenophon, Hell., ii. 1, 13.

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the negotiations which Tiribazus astutely opened with the rebel chieftains. No doubt he had to pay a large sum for his liberation.

Meanwhile the war with Egypt was never quite ata standstill. Even before the subjugation of Evagoras much fighting took place, but without result. Our knowledge of the particulars, even of the chronology, is very inexact. After the conquest of Cyprus the war was renewed. The Egyptian king invited the Athenian Chabrias to take the command, but Pharnabazus contrived that the Athenians should recall him (376/375). Pharnabazus, who by this time must have been about seventy years old, was placed at the head of the army which was being mustered at Accho on the Phcenician coast. The Athenian mercenaries were commanded by Iphicrates, who had been sent from Athens. The campaign opened successfully, but dissen- sions arose between Iphicrates and Pharnabazus, whose proceedings were much too slow to suit the dashing free- lance, for Pharnabazus had to report everything to court and to ask instructions from the same quarter. This, along with other circumstances, saved Egypt once more (374). There is the old story, too, of the difficulties of the wars of this period—a mutiny amongst the mercenaries for arrears of pay. The third of the great Athenian condottieri, Timotheus, son of Conon, who fought in the king's service against Egypt in 372, seems also to have been unable to effect anything.

The last part of the reign of Artaxerxes IT. is filled with revolts of the satraps and chiefs of Asia Minor, of which we have numerous but mostly isolated and, to a large extent, inexact accounts, It is impossible to deter- mine the connexion of events. We do not even know in all cases whether

the same names designate the same persons; and we are nowhere exactly informed of the motives which induced the individuals to revolt. It is the more difficult to form a judgment on the events because sometimes: the same persons side now with, now against the king. These revolts, which lasted in part into the reign of Artaxerxes JII., must have weakened immensely the imperial power in the western provinces, and prepared the way for the Macedonians. Rich Greek cities and energetic tyrants probably won for themselves at that time a tolerably independent position. At the head of those who remained faithful to the king we find Autophradates, satrap of Lydia. He fought the rebels repeatedly. Never- theless Diodorus (xv. 90) names him among the rebels ; and it is, after all, possible that there is here no confusion, but that Autophradates was also a rebel for atime. If we omit some smaller risings, such as that of Tachos, who established himself in a fortress on the Jonian coast (after 380), the series begins with Ariobarzanes, successor of Pharnabazus in the Hellespontine satrapy, and no doubt a near relative. Before the beginning of the revolt (about 367) he had formed connexions with Sparta and with Athens, which again stood at the head of a naval confederacy, and he was supported, at least indirectly, by both states. Accordingly, by the diplomatic intervention of Sparta, Autophradates and Mausolus of Caria were in- duced to raise the siege of Assus (in the Troad), into which Ariobarzanes had thrown himself. The satrap fell by the treachery of his own son Mithradates into the hands of the royalists and was crucified (probably about 365).

Mausolus (or rather, according to the inscriptions and coins, Maussollos, MavaowA dos), a native hereditary prince of part of Caria (probably 375-3512), had extended his

1 Xen., Cyrop., viii. 8,4 ; Aristot., Pol.,1812a ; Harpocration, s.v. “ApwoBaptdvys. He is to be distinguished from Ariobarzanes (about 362-337), ancestor of the kings of Pontus, who, however, seems to have belonged to the same house, and was probably heir to a district on the Propontis. 2 See Pliny, xxxvi. 30, 47.

power tolerably far. the title of satraps, were in point of fact but little depend- ent on Persia, and were watched by the Persians with great mistrust. In their cunning and in the sagacity with which they profited by circumstances they recall the Mace- donian , kings of that period, whom they also resemble in their patronage—often perhaps ostentatious—of Greek art and manners. Mausolus appears to have once been in open conflict with his suzerain; but, though nothing de- finite is known on the subject, there is no doubt that he came off without serious harm.

Datames, satrap of Cappadocia, of Carian race, had ren- dered many good services ; in particular he had reduced the nearly independent Paphlagonians once more to sub- jection to the great king. But at last he also revolted in league with Ariobarzanes. He was a man of great shrewd- ness and versatility, whose stratagems and adventures af- forded much entertainment even to later generations. He long kept the king’s troops in check, till he was at last treacherously murdered by Mithradates, son of Ariobar- zanes,—the same Mithradates probably whom we found above betraying his father.

The command of the rebel forces was entrusted to Orontes, satrap of Mysia.4 From the confused accounts it is unfortunately impossible to determine whether he is identical with one or other of the persons of that name who are elsewhere mentioned. Further, we have no clear conception of the position which he occupied in the revolt, nor of the way in which he came to betray his comrades. We read, moreover, of the treachery of a less conspicuous confederate. The rebels had despatched Rheomithres to Tachos, king of Egypt, who sent them fifty war-ships and much money. Rheomithres summoned the commanders to a rocky fortress on the northern coast of Ionia, bound them, and delivered them up to the king.

In the year 361 Tachos actually assumed the offensive Tachos On his side he had once more of Egypt.

against the Persians. Chabrias as leader of mercenaries, and the aged Agesilaus, officially sent by the Spartans, who were bitterly enraged at the Persians because they had now, after the destruc- tion of the Spartan power by Epaminondas, recognized the independence of Messenia, though in doing so they only carried out the letter of the peace of Antalcidas. But,

when Tachos was engaged in Pheenicia, his nephew Nectanebus set himself up as rival king, and Tachos was obliged to take refuge with the Persians. If the Persians had been still energetic they would have used the oppor- tunity, when the legitimate king of Egypt had fled to them and two claimants were struggling for the throne, to subjugate the country. But they did nothing of the kind, even when Chabrias had returned to Athens and Agesilaus had died on the way home (probably 360).

At the instigation of Parysatis Artaxerxes had mar- Intrigues She used her interest of Ochus.

ried his own daughter Atossa. to secure the succession for the energetic and violent Ochus, who is said to have promised to marry her; the Persian religion approved marriage not only with a sister but also with a daughter, and even with a mother. The elder son Darius was already invested with the succession and the royal title, but having engaged in a conspiracy against his father he was tried and executed, and Ochus, it is said, found means of getting rid of his other brothers, who stood in his way. Soon afterwards the aged Arta- xerxes died after a reign of forty-six years (in the course of the year 358). Many stories are told of his mildness 3 The Greek cities on the southern coast of the Euxine, which Xenophon about 400 found quite free, were again subjugated at this time. Datames comed money in Sinope, as did also his (probably indirect) successor Ariarathes.

4 Diod., xv. 91. Mysia is not otherwise known as a satrapy proper. But at any rate Asia Minor was the scene of his exploits.

These Carian potentates, who bore 376-358.

358-344. and affability, but, even if they are true, they have little significance. The contempt for his brother which Cyrus exhibited was perfectly justified; under the effeminate king the empire gradually fell to pieces.

But his successor, Ochus, who took the title of Artaxerxes (IIL), was of a different stamp. True, it is not perfectly certain that the great restoration of

the empire is to be ascribed to his personal influence; it may be that the whole merit belongs to some of his officials, and that he only lent it his name, but it is much more probable that the initiative was his. He was, it appears, one of those great despots who can raise up again for a time a decayed Oriental empire, who shed blood without scruple and are not nice in the choice of means, but who in the actual position of affairs do usually contribute to the welfare of the state asa whole. At the very beginning of his reign he secured himself on the throne by a massacre of his nearest relatives, though no doubt the statement of Curtius (x. 5, 23) is exaggerated! The judgment of the Greek writers on Artaxerxes III. was too much influenced by such deeds as found an historian in Dinon, as well as by the hatred of the Egyptians, whom he humbled and mortally offended ; hence it was one-sided and unjustly unfavourable.

But for a while the empire was in a state of absolute dis- solution. Artabazus, satrap of the Hellespontine Phrygia, very probably a son of Pharnabazus and immediate suc- cessor of Ariobarzanes, had fought against Autophradates as early as 865 and been taken prisoner by him. At that time the Athenians had acted against him openly enough, at least towards the end.? But it is not clear how far Artabazus then rebelled against the king, who was father to his mother, Apama. But at the time of the so-called Social War (about 355) he fought against the king's sa- traps and was powerfully supported by the Athenians. Chares won for him a great victory over Tithraustes. And, when, at the king's threats, Athens left him in the lurch, he was able, being well furnished with money, to procure the services of the Theban Pammenes, and main- tained himself for a long time. The turn in his fortune seems to have come from the Thebans also entering into an understanding with the king. About 350 we find Arta- bazus a fugitive at the court of Philip of Macedonia, and with him his brother-in-law, the Rhodian Memnon. How- ever, after the subjugation of Egypt, Memnon's brother Mentor, who, like Memnon, was one of the most distin- guished generals of his time, succeeded in procuring pardon for both, and thenceforward Artabazus remained loyal down to the overthrow of the empire.

Revolt of _ The revolt of Orontes (or Orontas) fell somewhat later. Orontes. Probably he is the same whom we found above betraying his comrades. He

may very well have received the rule over a wide coast district 3 as the price of his treachery (see Diod., xv. 92). He is mentioned in 354 by Demosthenes

1 More distant relatives were left alive, as he who was afterwards Darius II. and his brother, Oxyathres. A son of the Darius who was executed appears in Arrian, i. 16, 3 (834 B.c.). Thus the king did not extirpate even the branch that was most dangerous to him. It is to be remembered that even Alexander the Great, after ascending the throne, put several near relatives out of the way.

? Owing to the inconstant nature of the foreign policy of Athens at that time —a policy too often influenced by the personal interests of the great captains of mercenaries—as well as to the shifting atti- tude of the satraps, it is impossible for us to form a clear conception of these events from the isolated statements of contemporaries (like Demosthenes and Aineas Tacticus) and later writers. It is to be observed that in these decades violent revolutions took place in some Greek cities under Persian supremacy, and that they even made war on each other. With the restless character of the Greeks such things were not to be averted unless each town was occupied by a Persian garrison, which was certainly not the case.

3 There are coins ascribed to Lampsacus and to Clazomenz bearing the name of an Orontes,

Arta- xerxes WG

Defec- tion of Arta- bazus.

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(De symmoriis, 186) as an enemy of the king. In 349/348 the Athenians formed an alliance with him. From the fragmentary inscription in which this is recorded it does not follow with certainty that at that time he was still in rebellion, About his end we know nothing, but perhaps he was removed after the restoration of Artabazus.

That from the outset Artaxerxes ITI. was believed to be a person of greater activity than his father may perhaps be inferred from the rumour current in 354/353 that the king was preparing a great expedition against Athens and Greece. Many Greek states may certainly have had a guilty conscience towards the king on account of their wavering policy and the purely mercenary support which they had repeatedly lent to rebellious satraps. Demosthenes warned the Athenians against taking up a hostile attitude to the king on the ground of mere rumours.

The war in Egypt still went on. And now the cities of Phe. Pheenicia, previously so trustworthy, also revolted, and so Bieia did the kings of Cyprus. Even in Judea there must have SY tet. been an insurrectionary movement. The revolted Sidonians showed such exasperation that we can hardly avoid the supposition that Persian rulers had wounded their religious feelings,—the sensitive side of Semitic peoples. The satraps Mazzeus (Mazdai) of Cilicia and Belesys of Syria were driven back by Mentor, whom Nectanebus, king of Egypt, had sent to the help of Tennes, king of Sidon. But, when } the great king himself took the field at the head of a | powerful army, which included 10,000 Greek mercenaries,® Tennes and Mentor made terms. Sidon surrendered — though probably only after a severe siege—and was fear- fully punished. More than 400,000 men are said to have burned themselves in Sidon on this occasion. The fate of the first-born of Canaan quickly brought the rest of the Pheenicians to their knees. At this time much blood was shed in Judzea also, though we have only scattered notices of the fact.© Mentor now went over to the king’s side and fought against his former employers. It was to him and not to the Persian eunuch Bagoas that the king chiefly owed his success; but undoubtedly the royal presence contributed much to the result by facilitating rapid deci- Egypt sions and preventing dangerous jars. Mentor succeeded © H in everywhere sowing dissension between the Greek mer- 4″ cenaries of the Egyptian king and the Persians; and even more by intimidation than by the sword Egypt was, after long independence, again made a Persian province (344).7 Artaxerxes seems to have made the “‘vee victis” thoroughly clear to the Egyptians, and to have treated even their religion with little more respect than Cambyses before 4 him: temples were desecrated and sacred animals slaugh- tered. For a time the Egyptians had to satisfy their rage with nicknaming the king, after the unclean Typhonian

beast, “Sass.” Cyprus, too, was again reduced. The en- Cypms terprise was conducted by the prince of Caria, Idricus, ue The Greek mercenaries were led by the well-known

4 In the speech De symmoriis. Similarly in the speech De Rhodiorum | libertate (191 sq.) he advises the Athenians not to offend the king frivolously (351 B.c.).

®> Through Diodorus and some statements of others we possess by exception fairly good information about these struggles. :

6 Josephus, Arch., xi. 7, 1; by Eusebius’s canon 1657 from Abr., and his copiers ; Solinus, xxxv.4. The king at that time settled a num- ber of Jews in Hyrcania. Judza was forcibly pacified, perhaps by Orophernes (or Olophernes), brother of the then satrap of Cappadocia. Orophernes distinguished himself in this war (Diod., xxxi. 28); the assumption that it was he who reduced Judea would explain why in the book of Judith—mere romance though it is—an Olophernes appears as the wicked commander who fights against the Jews.

” So Manetho, who makes Ochus reign six years in Egypt. In harmony with this we learn from Isocrates (Phzl., 102) that in 347/346 Egypt was not yet subdued, while according to the letter of King Philip (Demosth., p. 160) in 340 the reduction of Egypt and Phoenicia had long been effected.

_ EMPIRE. |

Athenian Phocion,! and with him was a pretender Evagoras, of the family of the famous Cyprian prince of that name.

Thus by force and policy the old state of the monarchy was restored in all the western lands. Mentor, the real conqueror of Egypt, was splendidly rewarded. He received the satrapy of the west coast of Asia Minor, and quickly removed by cunning and treachery Hermias, tyrant of Atarneus and the friend of Aristotle, who had concluded treaties like an independent prince ? and stood in suspicious relations to King Philip of Macedonia. It has been already mentioned that Mentor procured the pardon of his brother-in-law Artabazus and his brother Memnon. It is not im- probable that the

bestowal of this province on the skilful general and diplomatist, and the restoration of Artabazus to his hereditary satrapy, may be connected with the attention which the king paid to the plans of the Mace- donian, which were gradually disclosing themselves more and more. Of course no one thought of danger to Asia Minor, much less to the whole empire, but Philip's efforts to secure the mastery of the Bosphorus and Hellespont were enough in themselves to excite grave anxiety.

As early as 350 the story went that Philip had sent an embassy to the king,? and it is definitely stated that he concluded a treaty with Ochus.4 The pacific intentions of the Persians, at least for the moment, were no doubt sincere; not so those of Philip, who had to subdue Greece before he could put into execution his designs on Asia Minor, a circumstance overlooked by the honest but politically short-sighted Isocrates in his exhortation to Philip to attack Persia (347/346). Probably Demosthenes was not alone in perceiving that the safety of Greece now lay in an alliance with the Persians against Philip. Negotia- tions went on busily between Athens and the king, who at all events sent subsidies repeatedly for the conflict with Macedonia. In the year 340 Persia interfered actively by rescuing, in conjunction with Athens, the town of Perinthus on the Propontis (and therefore close to Persian territory), which was besieged by Philip ; and the Macedonians could perhaps with some right assert that with this step the war between the Persians and them had begun.' But the Persians did not see, what to us is obvious from the result, that it was necessary for them to prevent the subjugation of Greece ; or, if they saw it, they lacked the energy to act.

Artaxerxes probably did not reach the battle of Che- ronea (August 338), which made Philip master of Greece. So far as we can judge, however, it was a great misfor- tune for the empire that this king, the first since Darius I. who had in person energetically conducted a great ex- pedition and restored the empire, died just at this critical moment. Probably he was murdered by Bagoas, who placed Arses, the youngest of the sons of Artaxerxes, on the throne. But, when Arses was preparing (so it is said) to punish Bagoas, the latter put him and his children to death (335). We know nothing further of this king. Under his reign (spring 336) a Macedonian army first crossed into Asia, after Philip had previously caused himself to be nominated general of the Greeks against the Persians. The Macedonians

gained some not unimportant successes, but the undertaking was checked in the very same year by the assassination of Philip. The commander Parmenio re- turned to Europe, and Memnon, who after Mentor's death commanded in these regions, probably won back from the

1 Diod., xvi. 42; the sources from which our biographers of Phocion (Plutarch and Nepos) draw did not mention this fact, which does not accord very well with the pattern of philosophic virtue which they Inade out Phocion to be.

2 Cp. the treaty with Erythre, Le Bas and Waddington, No. 1535.

3 Demosth., Phil. I., p. 54.

4 Arrian, ii. 14, 2. 5 Arrian, ii. 14, 5. ;

5 In Plut., De fort. Alex., p. 336 sq., he is called Oarses. The Persian form of the name is not known.

Macedonians nearly all their conquests in Asia, though it 344-338,

is likely that Abydus, commanding the passage of the Hellespont, and perhaps one or two more strong places, remained in their hands.

In order to rule securely Bagoas placed on the throne, not Darius a near relation of the murdered man,' but Codomannus,$ II.

who reigned as Darius (III.), a great-grandson of Darius II., and a man of about forty-five years of age.? But the king-maker was caught in his own snare, for Darius soon put him out of the way.

Over the last of the Acheemenians misfortune has thrown a halo of romance, but sober criticism can see in him only an incapable despot like so many whom the East has pro- duced. It may be true that in earlier life, under Artaxerxes ITL., he once proved his personal bravery in the war

against the Cadusians, and was rewarded with the satrapy of Armenia ;!° as a king he always behaved like a coward in the moment of danger. Vast attempts and a shameful flight, feeble or rather effeminate behaviour combined with braggart pride, lack of intelligence, especially in the conduct of war,—these are features which fully justify Grote in comparing him with Xerxes, It is no reproach that he was not a match for perhaps the greatest general in history, but an Ochus would doubtless have made the task a some- what harder one, and would scarcely have been guilty of the folly of beheading, in a fit of bad temper, so useful a man as the old condottiere Charidemus, who thoroughly under- stood the mode of fighting the Macedonians.

The history of Alexander the Great is given under the Alex- articles ALEXANDER THE GREAT and MAcEDONIAN EMPIRE; ander's

here we can only enumerate the chief steps in the down- fall of the Persian empire. We see how great is the force of cohesion in such an empire, even after all the shocks it has received, and under an incapable ruler. What the giant powers of Alexander achieved in a few years might never have been accomplished at all by the qualities and resources of an Agesilaus.

After placing a terrible curb on the Greek love of freedom by the destruction of Thebes, Alexander crossed the Hellespont in the beginning of spring 334. A few weeks later, on the Granicus, he annihilated the great Persian army which should have barred his onward march. Sardis, the capital, at once fell into his hands. Here, for the first time, we see the miserable spectacle of a high Persian officer going over to the enemy and surrendering to him the town or district committed by his king to his charge. At the beginning of winter the whole coast as far as Pamphylia was Alexander's ; Miletus and Halicarnassus were the only places which he had had seriously to besiege, and it was only the narrowly-enclosed citadel of the latter town which yet withstood all attacks. But there was still a great danger. The Rhodian Memnon, who had been joint-commander at the Granicus, undertook with all his might to kindle a conflagration in Alexander's rear, and to force the king to cross over to Greece. The Persian fleet, which he commanded, ruled the sea; several of the most important islands were occupied; and from the Greek mainland thousands of patriots

were looking for Memnon’s arrival in order to rise against the Macedonians. But Memnon died suddenly. The death of this man, his only worthy adversary, is perhaps the greatest of those pieces of luck which so highly favoured the great Alexander. His successor Pharnabazus, son of Artabazus, continued, it is true, the naval operations, but he was not able to carry out Memnon’s plans. Meanwhile Alexander secured

7 We read of a son of Ochus in 380 (Arrian, iii. 19, 4). We had above a grandson of Artaxerxes II. Thus Bagoas had not killed all “the brothers” of Arses, and the king’s family was not extinct, as

Diodorus asserts (xvii. 5). 8 The name is given only by Justin (from Dinon), x. 3. 9 Arrian, iii, 22, 6. 10 Justin, dc. ; Diod., xvii. 6.

338-331. the most important parts of Asia Minor, and then set out

Over-

throw of

Persian empire.

Bessus.

on his forward march. At the farthest extremity of Cilicia Darius in person met him at the head of a huge army, but the field of battle was so badly chosen that the numerical superiority of the Persians did not come into full play. The brilliant victory of Issus (about November 333) and the flight of Darius threw wide regions into the power of Alexander, who, with all his daring, was also cautious, and did not follow the Persian king in his flight into the in- terior. He sought first to make himself master of the whole Phoenician coast, in order to cut off from the Per- sians every possibility of annoying him any longer at sea. And in reality the fleet, which was chiefly furnished by the Phoenicians, melted away when Alexander had taken possession of their country. The Cyprian ships, too, re- turned home, and Cyprus also submitted. But Tyre with- stood the great conqueror for seven months! (332), and had to pay a dreadful penalty for its resistance. Gaza, too, defended itself bravely. Egypt welcomed exultingly the Macedonian who freed them from the hated Persians. After the acquisition of Egypt Alexander possessed a territory large and strong enough to be able to survive, if need be, a reverse. In the spring of 331 he left Egypt and marched through Syria and Mesopotamia to Assyria proper, where Darius awaited him at the head of vast masses of troops, and this time in a favourable position. But on Ist October 331 Alexander defeated the king at Gaugamela so decisively that henceforward the Persian empire, as such, was shattered. Darius fled to Media. Without striking another blow Alexander captured the capitals, Babylon and Susa, with their vast treasures. In vain the wild independent Uxians (better ‘“ Huxians ”) barred a difficult mountain-pass against him, in vain did a Persian army do the same: he quickly forced a passage through the mountains and marched into Persia proper. Pasargadz and Persepolis, the cradle of the monarchy, were his. Persepolis, in the immediate neighbourhood of which another conflict took place, was given up by him to his soldiers to plunder; the royal palace he caused to be burned.? In this act we discern, in opposition to the usual view, a well-considered measure, excellently calcu- lated to work upon the

Asiatic mind. The burning of the royal castle was meant to show the Asiatics that their empire was utterly overthrown, and that Alexander was their only lord. Besides the Greeks might see in the step an act of vengeance for the destruction of the Greek temples by Xerxes, as the official phrase ran.

Thereupon Alexander hastened to Media in pursuit, once for all, of Darius. The latter fled eastwards. He had still a considerable army with him, but only the Greek mercen- aries were absolutely true to him, like the Swiss guard to Louis XVI. At last Bessus, satrap of Bactria (and Sogdiana apparently), seized the person of the king, in order either to make use of him for his own ambitious purposes or to put him out of the way. Asa matter of fact, he murdered him in Parthia, just when the pursuing Alexander had nearly overtaken him (July or August 330). Such was the melancholy end of the last of the Achemenian great kings.

Bessus thereupon hastened into his satrapy and assumed the title of king and the name of Artaxerxes (IV.). We know that he was a “kinsman” of Darius; perhaps in his case this means more than that he was merely con- nected with him by marriage, and this satrap of Bactria

1 The resistance of the Tyrians is certainly not explained by their attachment to the Persians, scarcely either by their love of freedom. We suspect here again a religious motive. Alexander desired to offer sacrifice in the temple of Heracles, and probably the pious Canaanites

would as little allow this as the Jews would have permitted any foreign ruler to enter their temple.

2 Cp. the article PERSEPOLIS,

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may have actually belonged to the race of the Achzemenians, like his predecessors the princes Masistes and Hystaspes. It would thus be more easy to explain why various grandees favoured his undertaking, and why he was recog- nized as king, e.g., by the satrap of Aria (the district of Herat), and vigorously supported. That he enjoyed the royal title for some time is

due only to the circumstance that Alexander first made himself securely master of eastern Iran before he marched into Bactria and Sogdiana, After many adventures Bessus fell into Alexander's power on the farther side of the Oxus, and was put to death. After the return from India the satrap of Media con- ducted in.chains to Alexander a certain Baryaxes, who during Alexander's absence had declared himself king of the Persians and Medes. Of course he was executed. He is said to have been a Mede, not a Persian. Certainly his movement had never even a momentary importance ; he is only once mentioned (Arrian, vi. 29, 3). But such | last throes of a mighty monarchy are, after all, worthy of a7 attention. : Literaturc.—Rawlinson, The Five Great Monarchics, vols. ii., iii. | (2d ed., London, 1871), gives a useful account of the Medo-Persian history down to Alexander, as does also vol. ii. of Fr. Spiegel's Erénische Alterthumskunde (Leipsic, 18738). Neither work is ex- haustive, and in both we frequently miss true historical criticism. : For the time down to Xerxes Duncker's Geschichtc des Alterthums, | vol.iv.(5th ed., Berlin, 1880; Eng. tr. by Abbot, 1877-83), is recom- mended by its very careful use of all the sources and its acute mode of combining them, though the latter quality often leads to some- : what arbitrary construction. Owing to the close contact between |

Persian and Greek history the larger works on the latter are obliged

to cover much of the same ground as the former. In this department

Grote 6 wdvv is to be named above all; unfortunately at the time

he wrote it was not in his power to make use of the important Persian inscriptions. (TH. N.)

Section IL.—GREEK AND PARTHIAN EMPIRES.

After the decisive battle of Gaugamela (331 B.c.) Alex- | ander proclaimed himself king of Asia. He never ac- cepted the compromise recommended by Parmenio, which would have left to the Persians the upper satrapies east of Mount Zagrus, and established a sharply-marked natural | and ethnographic frontier. Soon a symbolic act, the burning of the palace of Persepolis, announced to the Asiatics that the Achzsmenian monarchy was dead, and | that Alexander claimed its whole inheritance. The punish- . ment of Bessus,

exactly modelled on that inflicted on 1 pretenders by Darius I., showed that Alexander claimed to be the legal heir of the Achzmenians. Bessus's ears i and nose were cut off, and he was brought to Ecbatana for execution before the assembled Medes and Persians, for "this Bessus lied and said, Iam Artaxerxes king of | Persia." |

After Alexander had by his rapid and effective move- Comple |

ments taken actual possession of the whole empire, Media a

was swiftly traversed, but the eastern frontier was not noc,

subdued and secured so easily. Crossing the mountain- wall that separates the southern margin of the Caspian from the rest of Iran, Alexander received in person thie homage of the coast-lands. Khordsdn and the region of the Oxus were traversed by his armies in all directions ; from Bactria the march was obliquely through Sogdiana to the Jaxartes on the farthest limits of the empire, and an onslaught was even made on the Scythians beyond that river.* Alexander was determined to secure a frontier so important for the trade of Central Asia, and to free the peaceful industry of Iran from the incursions of its here-

3 Plut., Alex., 34, 87, does not prove that there was another, still less a preferable account of the date of this occurrence.

- Here perhaps occurs the first trace in history of the Turkish race. Carthasis, the brother of the Scythian king in Curtius (vii. 7, 1), may be, as Néldeke observes, Turkish kardashy, "'his brother," from dash, of which fash is the older form.

EMPIRE. |

ditary enemies the Turanian nomads. Prestige rather than material advantage was gained by the rapid fall of the supposed impregnable rocky nests of Arimazes in Sogdiana, of Chorienes or Sisimithres in the mountain region of the upper Oxus,! and, above all, of the Indian fortress Aornus. Though usually clement to the conquered, Alexander was terrible to those who rose against him—to the Arians, for example, and to the strong cities

that headed the insur- rection in Sogdiana ; when the movement was crushed, he laid the land waste far and wide and slew all the males; 120,000 Sogdians are said to have thus lost their lives. Alexander too, like Cesar, did not shrink from a breach of faith if it served his purpose ; this was seen in the massacre of the Indian mercenaries who had defended Massaga, which was meant to spread terror before him as he entered India.? The Achzmenian power at its climax had never erossed the Indus ; Alexander passed the river and pushed into India proper. This adventurous march was under- taken wholly for the sake of prestige, and was specially meant to impress the imagination of the Greeks, to whom India was a land of marvels. Alexander proposed to reach the Ganges and the ends of the habitable earth; and it was sorely against his will that his own soldiers forced him to confine his plans to the rational scope of securing the Indus as his frontier and adding to his realm its com- mercially important delta? Alexander had now accom- plished what, in the eyes of the Arian peoples, was neces- sary to give the last stamp of legitimacy to the new empire ; he had led his armies round all the frontiers and taken personal possession of his lands. To close the circle he had still to march back through Gedrosia and Car- mania. But it may well be doubted if he would have faced this last exploit had he known beforehand the full terrors of the burning desert; not a fourth part of the forces that began the march from India survived a jour- ney which has been fitly compared with the retreat from Moscow.

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know only two by name, though we are told that in the 331-398.

first two districts there were really a large number of such towns, seemingly inconsiderable places. In the east of Iran the settlements were more important, and twenty-six can be enumerated in Aria, the country of the Paropanisus, Bactria, Sogdiana, India, and the land of the Oritee,— Bactria and Sogdiana alone claiming eight of these.6 The composition of these settlements is illustrated by the details given for Alexandria in the Indian Caucasus; according to Diodorus, the city and one or more minor settlements within a day’s journey of it received 7000 barbarians, 3000 camp-followers, and as many of the mercenaries as volunteered to stay ; but

Curtius, who cer- tainly reproduces the common source more accurately than Diodorus, names 7000 Macedonian veterans and a number of mercenaries whose engagement had expired. The Greek element in this colony must have been large, for the town still keeps its Greek name (Alasadda) in an Indian book of the 4th century a.p. Alexandria on the Tanais (Jaxartes), again, was partly peopled by Sogdian insur- gents, forcibly transplanted from their homes, which the conqueror had destroyed. Some of Alexander's last orders refer to the founding of cities and the transplanting of Europeans to Asia and Asiatics to Europe, a measure designed to promote the assimilation of all parts of the empire. Macedonia alone did not suffice for this gigantic scheme of colonization, and it was chiefly Greeks who were planted in the most eastern satrapies, in Bactria and Sogdiana. At such a distance from home the Greeks could have no other interest than loyalty to Macedon ; it was the same policy as dictated to the Romans the establishment of Latin colonies in their new conquests. But the antagonism between Greeks and Macedonians was too great to allow the former to forget that they were, after all, really men deported by the great king (dvéo7agror) ; and so even from the first there were seeds of discord between them and the rest of the empire.

Alexander's capital was Babylon, the natural centre of Satrapies an empire that embraced both Iran and the West, and and recommended also by its command of the great lines of 8°"

international traffic, and by its historical traditions of ;

A series of minor expeditions completed the work of the great campaigns by reducing a number of mountain tribes, which had shaken off the weak yoke of the Achzemenians, exacted tribute at the chief passes, and in their irreclaim-

able savage habits of plunder were like the modern Kurds, the born foes of the Iranian peasant. Such were the Uxians, the Mardians in Persis, and the people of the same name to the south of the Caspian, and finally the Cosseans, whom Alexander disposed of in his last cam- paign in forty mid-winter days. The future obedience of these brigands was secured by planting fortresses at the most difficult points of the roads, and they were compelled to settle down and take to husbandry.*

These vast results were only obtained by the aid of continual fresh levies in Europe, and strong garrisons had * to be left in the conquered lands. Alexander's work could not last unless the European occupation became perma- nent ; and therefore he planned a great network of new cities, in which colonies of Greek or Macedonian soldiers were planted. According to Plutarch (De Alex. fort., 1. 5, p. 328 F) more than seventy cities owed their origin to Alexander ; some forty of these can still be traced.® In Media, in the Cosszean neighbourhood, and in Carmania we

1 The last two places are identical. All the sources know only two fortresses taken by Alexander in these regions : those which mention Sisimithres omit Chorienes and vice versa; and the essential points are the same in Arrian (iv. 21) and Curtius (viii. 2, 19-38).

_ * Diod., xvii. 84. The official Macedonian account in Arrian (iv. 27) ignores the treachery.

3 As the Greeks then knew India only from Ctesias, whose geography is of the vaguest, Alexander probably under-estimated the vast size of the peninsula.

' Arrian, Ind., 40, 8.

5 See the careful enumeration in Droysen, Gesch. d. HHellenismus, 2d ed., vol. iii, pt. 2, p. 187 sg.

empire. The Achemenian system of satrapies was re- tained ; kingships were left only in the exceptional case of India.' The satrapies of the upper country seem to have been fourteen: Persis, Paraetacene, Carmania, Media, Tapuria with the Mardian country, Parthia with Hyrcania, Bactria, Aria with Drangiana, Gedrosia with the Oritz,® Arachosia, the Paropanisus country (which probably was quite independent under the later Achzemenians, and was first placed under a satrap by Alexander), India on this side the Indus, India beyond the Indus (from the Bactrian frontier to the confluence of the Indus and the Acesines), and beyond this the province of the lower Indus extending tothe sea. The last three satrapies were also new. Alex- ander retained the old satraps of Darius in three provinces ; in Parsetacene and Tapuria it would have been impossible to drive the old rulers from their

mountains without a tedious campaign, and in Aria Satibarzanes was confirmed in his post to detach him from Bessus. But in all three

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6 Strabo, xi. p. 517. Alexandria on the Tanais and twelve other towns are spoken of by Justin (xii. 5, 16), but xii. is perhaps a cor- ruption of vii.

7 Oxyartes is sometimes called king by a mere inaccuracy. Dexippus, ap. Phot., cod. 82, p. 64, b. xxii. (Bekker), makes Alexander give Oropius the Doydtavav Bacidelay. The geographical order, and the fact that Sogdiana has been mentioned before, demand the correction Zovotavay, and for Kowés we must read kolvos ; see Justin, xiii. 4,14. Oropius was the successor of Abulites. The province seems to have been officially designated a kingdom, but that does not make its governor a king.

8 This province was perhaps formed by Alexander ; it was after- wards joined to Arachosia.

331-323. cases the old satraps were superseded on the first oppor- tunity. Most new appointments, however, were given to Persians; at first there were Macedonian satraps only in rebellious Arachosia, Gedrosia, and the three new Indian provinces. This policy helped the subjects to fall in with the new rule; but on second appointments Mace- donians generally took the place of Persians, and at Alexander’s death there were Persians only in Media (from which Atropates, as the sequel proved, could not have been removed without a fight), in Parthia, and in the Paropanisus, which was held by Alexander’s father-in-law. The power of the satraps was considerably reduced ; in Parthia, Aria, and the Paropanisus there seems to have always been a Macedonian resident (éricKozos) beside the satrap, with the control of the military. Indeed in all the provinces the command of the forces seems to have been separated from the office of satrap, though it was not always entrusted to a single officer. The satraps also lost the right to engage mercenaries and to coin; and in the western countries, of which we know most, a single officer —always a Macedonian—was sometimes charged with the tribute of several provinces. Perfect order and an exact

definition of the functions of every officer could not be attained from the very first; yet even in this period of transition the finances of the empire improved. At Alex- ander's death 50,000 talents (£11,288,515) lay in the treasury, and the annual tribute was 30,000 talents, or six and three-quarters millions sterling. What was of more consequence, the treasures of the East were no longer hoarded in the old Oriental fashion, but put in circulation and applied toa number of great and useful enterprises. Such were the exploration of the course and mouths of the Indus; the voyage of Nearchus, which opened the sea- road between the Indus and the Euphrates; the restora- tion of the trade of Babylon by removing the weirs which obstructed navigation, and by works on the canals and the Pallacopas; the attempt to discover a sea-way round Arabia, in which Hiero of Soli explored the east coast of the peninsula; and the commission given to Heraclides for exploration of the Caspian.

Alexander sought to assure the permanence of the em- pire by fusing Greeks and Persians into one mass. Thirty thousand Persians, the so-called ériyovo., were armed and disciplined like Macedonians, and Persians were received on equal footing in the Macedonian corps and even, to the disgust of the Macedonian nobles, in the corps Wélite of the cavalry, in which the latter served. Macedonia, in truth, was not populous enough to keep the cadres full. Alexander adopted the regal robes of Persia and the regal state. The court was served by eunuchs, and men kissed the ground before the great king. It was a strange sight for Hellenes when a poor wretch from Messene was ordered to execution because he had inadvertently sat on the kingly throne.!

To the Greeks a union with a barbarian was no regular marriage ; but the Bactrian Roxana was Alexander's queen. His friends were urged to follow his example; eighty of his courtiers married Persians on the occasion of the great wedding at Susa, and 10,000 soldiers who had chosen Asiatic wives received gifts on the occasion. Still more startling was the introduction of polygamy ; the king took a second wife, Statira, daughter of Darius, and a third, Parysatis, daughter of Ochus.

All this was Persian fashion; but when Alexander claimed divine honours as the son of Jupiter Ammon he asked both Persians and Macedonians to

adopt from the Egyptians the most perfect model of devout submission to their sovereign. Could this compound of nationalities prove more than akingdom of iron and clay? The answer

Plt Alen, 73,

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lay in the attitude of that part of its subjects which stil] retained a vigorous life. The western nations, long schooled to slavery, were passive under the change of rule. The Persians, too, and all western Iran acquiesced after the first conflict was decided. In the east it was not so. Here the northern province of Chorasmia had been independent of the later Achemenians, and its kings had ruled the great plains as far as the north-east slopes of the Caucasus. Bactria, Sogdiana, Aria, Arachosia, Drangiana, and the borderlands towards India had obeyed Persian satraps, but Bessus and his partisans did not forfeit their allegiance by the murder of Darius. These eastern Iranians, who had no close connexion with Persia, opposed the most obstinate resistance to the conqueror: the Arians rose again and again ; and an energetic chief like Spitamenes could always stir up a party in Sogdiana. These risings began in the castles of the numerous chieftains (drapxor), but it was a national spirit that made them so obstinate and bloody; the Iranians of Sogdiana and Bactria had acquired in their constant wars with the Turanians a sense of self-respect which the effeminate Medes and Persians wanted. Their situation, too, favoured their resistance ; for their ancient enemies in the desert had a common interest with them in opposing a strong central government, and were easily persuaded to lend them succour or shelter. Saca and Dahe fought for Bessus, and Spitamenes found refuge with the Massagetz ; the wilderness offered a retreat where regular troops could not follow, and from which a petty warfare could always be renewed. In India the Brdhmans had been the soul of a still more vigorous resistance ; they preached revolt to the rajahs of the lower Indus, and were the object of Alexander’s special severity. Eastern Iran was the cradle and always remained the chief support of Zoro- astrianisin,® and religion must have had its part in the patriotic resistance of Bactria and Sogdiana. Alexander forbade the practice of throwing the dying to the dogs (Onesicritus, ap.

Strabo, xi. p. 517), which the Bactrians certainly took from the Avesta; and this was just the

kind of decree which drives an Oriental people to despera-

tion. The Macedonians did pay some attention to Iranian

thought ; a magian Osthanes is said to have been in the

train of Alexander, and Theopompus, a contemporary of

the conqueror, shows the first traces of acquaintance with

the Avesta. The Persian tradition that Alexander burned t the twenty-one nosks of the original Avesta, and that only 7 one part of the holy book was subsequently recovered from

memory, is of course not historical, but it rests on a very

true feeling that the new order of things was at irrecon- ;

cilable war with the old faith.*

Alexander desired to fuse the Greeks and barbarians Ale together, but the practical means directed to this ideal ™° aim were such as brought him into conflict with the natural — leaders of the new state. By asking the Greeks as well as the barbarians to worship him as divine he destroyed the whole effect of the theatrical arts in which he was a master, and by which he hoped to recommend his mission as an eminently Hellenic one to the masses ; even Callis- thenes, the enthusiastic herald of the new era, was bitterly undeceived, and, turning against Alexander, fell a victim to the despotism of the man who had been his idol. But, what was still more fatal, the net result of his efforts at a fusion of races was not to Hellenize the Persians but to teach the Macedonians to exchange their old virtues for the effeminacy and vices of the East. It is not fair to say that if the Macedonians had possessed a riper civilization they

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2 So in the Middle Ages Kharezm and Kipchak stood under the same sovereign, and were not included in the realm of Jagatai.

3 Sisimithres's wife was his own mother, a union which the Avesta specially approves.

4 See Spiegel, 7. D. M. G., ix. 174.

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might have resisted the foreign influence ; their numbers were too small, and Alexander pushed his plans too hastily and with too exclusive regard to surface-effect, to make any other issue possible. it so, and there was no surer path to his favour than to wear a Persian coat and talk broken Persian like the schem- ing Peucestas. Alexander liked Oriental splendour and the Oriental ceremony which placed an infinite distance be- tween the king and his highest subjects ; great statesmen

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Nay, Alexander wished to have –

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lude of what was to come (326 B.c.). in Bactria and Sogdiana rose against the Macedonians on a false rumour of Alexander's death. Three thousand of them seized the citadel of Bactra, gained the support of the natives, and, crowning their leader Athenodorus, pro- posed to make their way home. Athenodorus was assassin- ated, but his followers remained unmolested, and joined the mass of their countrymen in the general rising of the Greek military stations after Alexander's death.

The Greeks settled 331-312.

generally love to be absolute, and Alexander enjoyed Oriental despotism and mechanical obedience much more than councils of state and discussions of policy with the

One Macedonian custom Alexander had retained, that Death of

of carousing with his generals. A series of debauches in =e ander.

Macedonian soldier-nobility, whose sturdy independence was always asserting itsclf, and whose kings, unless in virtue of great personal qualities, had never been more than prime inter pares. Then, too, Alexander, in the splendour and magnitude of his conquests, lost touch of the movements that were going on at home. The true task of Macedonia in the world's history was to unite Greece under its hege- mony,—a task clearly marked out, and one which Philip had pursued with masterly skill. But the completion of this task called for a modest and unsensational line of action quite foreign to Alexander's spirit ; Antipater's hard- won victory at Megalopolis, but for which his father's work would have fallen to pieces behind him, was received with a characteristic sneer on the war of mice which seemed to be going on in Arcadia! Philip's old generals judged otherwise and judged better ; it was not blindness to the conqueror's genius, but a just perception of what was practicable and desirable, and an instinctive dread of the unknown issues of the king's plans, which gradually estranged from him his truest councillors ; and it was an evil sign that his only close friend was a poor creature like Hephestion, who could not boast of a single service. Then came the first conspiracy and the murder of the aged Parmenio, whose son Philotas was mixed up with it,— a crime to which Alexander was led simply through fear. The wild extravagances of grief that marked the death of Hephestion, and of which a pyre worth two and a half millions sterling was the least, show how Alexander lost him- self more and.more as he broke with the Macedonian char- acter. His last orders, cancelled at his death by Perdiccas, included an invasion of Carthage by land and sea, with a further view to Spain, and the erection to King Philip of a tomb surpassing the Great Pyramid. The extravagance of these plans was as palpable to the Macedonian soldiery as to their leaders, and they too shared the growing aliena- tion from the monarch. There were mutinies as well as conspiracies ; the soldiers were tired of following from adventure to adventure, and at the Hyphasis they had their way. In his later days Alexander was repeatedly wounded, a fact significant of a change in the spirit of the troops, for no great general would expose himself as Alexander did—for example, in storming the city of the Malli—unless his men required this stimulus.

The want of coherence in the empire was seen even while Alexander was in India. Many satraps broke all restraint, renewed the old oppressions of the Persian time, hired mercenaries again, and only awaited a fit moment for open rebellion; the generals of the army that lay in Media committed sacrilege and crimes of every kind; the treasurer Harpalus violated his trust and escaped with his plunder. Alexander, on his return, soon restored order with terrible severity, but the ferment was still at work, especially in the west, and was increased through the dis- banded mercenaries of the satraps who returned to the coast. There is one event of the time of anarchy when Alexander was in India which, though passed over in the official sources of Arrian, deserves special notice as a pre- — T Plut., Agesil., 15.

the malarious climate of Babylon brought on a violent fever, which ended in his death (13th June 323).2 The object of his life, the fusion of Macedonians and Persians, was not attained. The Persians still felt themselves subject to a foreign power, and in eastern Iran this feeling was bitter. The Macedonians again had been carried by Alex- ander's genius far out of their true path of development into a giddy career, in which a capable and valiant nation found its ruin. Alexander did not die too soon, if he was not to see the collapse of his work.

Terrible civil wars broke out at once on Alexander's Civil death, and lasted almost unbroken for forty-two years, 4":

tearing his work to pieces, and scattering to the winds Macedonia's claims to universal empire. There was no legitimate heir, but the name of ''king" was borne by Philip (323-317), a bastard of the elder Philip, and by Alexander IL, Alexander's posthumous son by Roxana (323-311). The real power lay at first with Perdiccas, who as regent Per- governed the whole empire from Babylon, and, after Per- diccas was killed in a mutiny in the Egyptian canipaign of 321, passed for the moment to Pitho and Arrhidzeus, till in the same year the regency fell to Antipater. As he ruled from Macedonia, the eastern satrapies were pretty much left to themselves, but Pitho, who held the chief of these —that of Media—took the first place, and soon appears as strategus of all the upper satrapies. But his ambition united the satraps against him, and he was driven not only out of Parthia, which he had occupied after murdering the satrap Philip, but out of Media too. The

satraps now joined hands with Eumenes and _ placed themselves under his leadership when he came to Susa in 316 as the king's strategus at the head of the argyraspids. Pitho had meantime fled to Seleucus, satrap of Babylon, and with him sought help from Eumenes's great enemy, Antigonus. A war in Media and Susiana ensued, and Eumenes, whose military successes were constantly frustrated by disobedi- ence and treason in his followers, was betrayed to Antigonus and put to death in 315, Antigonus, already furnished with a commission as strategus from Antipater, now lorded it over all. Pitho, still greedy of power, and thinking of conspiracies to recover it, was executed ; the Persian satrap, Peucestas, who had led the allies against Pitho, was super- seded, and Seleucus fled to Ptolemy. other potentates united against the threatening power of 1. Antigonus, and in the war that followed Seleucus, with some help from Ptolemy's soldiers, repossessed. himself of his satrapy of Babylon,—an important event, which forms the epoch of the Seleucid era (1 Sel. = 312 /3113.c.). Presently a victory over Nicanor, who held Media for Antigonus, made Seleucus master of Media and the adjoining provinces. Antigonus had still some temporary successes, but at the end of the war Seleucus was acknowledged lord of Baby- lonia and the upper satrapies.

In these conflicts we can distinguish two main interests, represented by the cavalry and the infantry, or, what is

2 The exact date in our calendar, which cannot be calculated from the Macedonian date 27 or 29 Desius, is found by the aid of Pseudo-Callisthenes (Cod. A in C. Miiller's ed., p. 151; Arm. Tr. in Zacher,

Pseudo-Cal., p. 100). XVIII. — 74

diccas.

Soon, however, the Seleucus

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312-280. the same thing, by the higher and lower nobility respect-

Satra- pies.

ively. The former fought for the unity of the realm of Alexander, the latter for the national traditions of Macedon. In the first years the mass of the army made its wishes very distinctly felt, ¢.g., in the rising against Perdiccas ; even the esprit de corps of a single body like the argyraspids had often a decisive influence on general politics. The fall of Perdiccas was reallythe end of the Perso-Macedonian empire founded by Alexander, as was made manifest by the fact that Babylon ceased to be the capital, and Antipater with the kings passed into Europe. On the ruin of Alexander's political structure the ruin of his house directly followed ; all the political and military talent of Eumenes, its one sincere defender, could not avert the catastrophe, for Eumenes, who as a Greek was always looked on with suspicion, soon fell a victim to Macedonian jealousy. With him the kingship really came to an end, though the empty name of it lasted a little longer. The later conflicts have a different character; a certain number of leaders had risen gradually above the mass of the officers, attaching to their parties the less prominent men, and it was the con- flicting interests of these leaders which were now repre- sented in politics and war. Last of all, the particular interests of the subject provinces came to find expression in the conflicts of their chiefs, and the signal was given for the formation of distinct kingdoms. In the wild struggles for supremacy the last remains of Macedonian loyalty disappeared ; when we are told that the strategi and satraps of the upper provinces were still faithful to the royal house, and that Antigonus, as late as 315, counted on it in making war against Cassander, the loyalty can hardly be regarded as a genuine sentiment, but was merely a cover for the pride of chieftains who were willing to acknowledge a distant and merely nominal sovereign, but not to obey men who had lately been their equals. And in truth the sentiments of the upper satrapies were of little consequence. The power to give them effectual expression was lacking, and these lands, till much later, reccived all their political impulses from the west.

To make up for this, Iran was little touched by the civil wars ; only Media and Parthia were seats of war, and that for a short time. Among the satraps Peucestas of Persia, Tlepolemus of Carmania, and Stasanor of Bactria are re- presented as good rulers, beloved by the natives; when Antigonus deposed Peucestas, a Persian notable told him to his face that the Persians would obey no one else, and lost his life for his frankness. Antigonus's

realm was less than Alexander’s by Egypt, Syria, Thrace, and Mace- donia, and the tribute from it was 11,000 talents (two and a half millions sterling). The ordinary taxes, therefore, had not been raised; but Antigonus raised special war- taxes also, 5000 talents at one time in Susiana and as much in Media.

The list of satrapics at this period is known from the records of the partitions of Babylon (323), Triparadisus (321), and Persepolis (315). There were twelve upper satrapies, Persis, Carmania, Great Media, Lesser Media, Parthia with Hyrcania, Bactria with Sogdiana, Aria with Drangiana, Arachosia with Gedrosia, the Paropanisade, India from the Paropanisade to the Indus, India between the Indus and Hydaspes, India on the lower Indus with Pattala. Of Alcxander’s satrapies we miss Paretacene, included in Persis, and Tapuria, which Alexandcr himself secms to have joined to Parthia. The only new satrapy is Lesser Media. 1t was thought proper to place Media, the most important Iranian province, in the surer hands of the Macedonian Pitho, son of Crateuas, but the north-west part of the province was left to the old satrap Atropatcs, whom Alexander had sent to Media in 328. He was father-in-law of

Perdiccas, and so claimed consideration, but probably he could not have been displaced if it had been tried.1 At the new division on

1 On Atropates see Arrian, iv. 18, 3, and Pseudo-Oal. in C. Miller, p. 149, where after Ilevxéory read ’Arpardryv ’Ofvodrny peracrioa dmé Tis Mydias. His eonnexions in north-east Media are illustrated

by the faet that he had with him at Gaugamela Cadusians, Albanians, and Saeesine,

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the death of Perdiccas (321) Pitho was confirmed in Media as far as the Caspian Gates, but nothing is said of Lesser Media, which was really no longer part of the empire. Thus Atropates was the founder of a small separate kingdom, whieh theneeforth eontinued

to bear his name, in Greek Atropatene, in Arabic and Persian Adhar-Atropa. baijan, and in Armenian (more nearly conformed to the original) tene,

Atrpatakan. It was never a very important state, but is worth notice as the first new native realm within the empire of Alexander and the first symptom of the Iranian reaction against Hellenism,?

Except in the case of Media the partition of Babylon made no change in the holders of the upper satrapies. So we are expressly told (Curt., x. 10, 4, and Just., xiii. 4, 19, where for wlteriore read ulteriusque), and the apparent exceptions to the principle are per- haps merely due to our ignorance of previous changes. The most remarkable of these is that Pitho, son of Agenor, who under Alex- ander shared with a Persian the satrapy of the lower Indus, is now found in India Citerior in room of Nicanor, while his old satrapy has fallen to no other than King Porus.? We may be sure that the Macedonians sanctioned this extension of the power of the Indian king only because they could not help it, and it is probable that Porus had usurped the province in the troubles that broke ont in India as soon as Alexander left it in 326 (Arr., vi. 27, 2). Thus one more province was now only nominally attaehed to the empire. Porus, indeed, was assassinated through Macedonian intrigue be- tween 321 and 315, but the country never again came permanently under their power.

The partition of 321 was less conservative. Nicanor was removed from Aria to Bactria, and Philip from Bactria to Parthia, super- seding Phrataphernes. These ehanges had probably some con- nexion with the rising of the Greeks in Bactria and Sogdiana after Alexander’s death. No Persian satraps now remained except Atropates and Oxyartes, who had connexions by marriage with the conquerors. Antigonus, to please the natives, changed this policy, and even put the Mede Orontobates in the great province of Media, but he returned at the same time to Alexander’s policy of limiting the satraps’ power. We hear nothing of strategi in the satrapies from 321 to 315, so it is probable that Perdiccas and his immediate successors had allowed the satraps to hold also the military eom- mand in their provinces. Antigonus again appointed strategi, who were always Macedonians.

In a time of civil war it is not surprising that the old disorders of the Acheemenian period reappeared. During the wars of Eumenes and Antigonus the Uxians and Cosszans again appear as independent, and as plundering travellers. But a much more serious outbreak was that of the Greek settlers in the north-east against the Macedonians. On the news of Alexander's death in 323 the military colonies rose under Philo, the Aunian, and with 20,000 foot and 3000 horse attempted to fight their way home. They were met by Pitho, governor of Media, and defeated by an inferior force through the treachery of one of their chiefs. Pitho granted them terms if they would lay down their arms and return home, but the Macedonians refused to respect the convention; they knew Perdiccas had or- dered the extermination of the rebels, and, falling on the disarmed foe, they massacred them and divided their spoil.

Such a catastrophe could not fail to embitter the rela- tions between eastern and western Iran, betwecn Greeks and Macedonians. It is hardly accidental that the only notice we have as to how Seleucus Nicator (reigned 312- 280) came into possession of the upper satrapies is that he subdued Bactria by force of arms. To his Asiatic subjects Seleucus appeared as a king from the first ; officially, and among the Greeks, he received this title only in 306. His first care was directed to India, where, probably during the wars of Eumenes and Antigonus, the Macedonian officials had been slain and obedience transferred to Chan- dragupta, founder of the Maurya kingdom. Seleucus crossed the Indus, but Chandragupta obtaincd peace on favourable terms, giving Seleucus five hundred war- elephants, but increasing his dominions by the parts of the Paropanisadse, Arachosia, and Gedrosia that lay towards

2 The hypothesis that Atropatene was an important plaee as a refuge for the fire-worshippers has no other basis than a false etymology, Adharbaijan= Fireland. It became important politically only in the later Middle Ages, when it was the gateway of the Turkish migration westward and reeeived a Turkish population.

% This is certain from Arrian, ap. Phot., eod. 92, p. 71, b. xl. (Bekker), where Pattala is said to have obeyed Porus,

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the Indus. The kings swore to this treaty and became lasting allies.

Instead of the twenty-one Asiatic satrapies of the parti- tions Seleucus divided his empire into seventy-two, thus diminishing the dangerous strength of the individual governors. But the old arrangement was restored later, and at the beginning of the reign of Antiochus III. we

find Media, Persia, Susiana, and the district of the Ery-.

threean Sea (separated off from Babylonia) standing each under one head (Polyb., v. 40-54). Apparently an eparch came to be appointed with military command over all the sections of each old satrapy, and gradually drew to himself all the functions of the satraps in the old régime, so that he could be spoken of indifferently as satrap or strategus.

Seleucus had built for himself a new capital, Seleucia on the Tigris, but in process of time his chief attention came to be more and more engrossed by the affairs of the west, and the seat of power was shifted to Antioch in Syria, A kingdom like that Sf Seleucus could hardly be governed from Syria, which lay so far from its natural centre, and about 293 or a little later Seleucus found it advisable to make over the upper satrapies to Antiochus, his son by his first marriage with Apama, daughter of Spitamenes, giving him Seleucia as his capital and his stepmother Stratonice as wife. Seleucus, ike Antigonus, dreamed of regaining the whole monarchy of Alexander, and fancied himself within reach of his goal after the fall of Lysimachus, when he was himself removed by assassination. Antiochus – Soter (280-261) was prudent enough to be content with what he possessed and acquiesce in the actual division of the empire into three realms, practically correspouding to the three continents.

No one had been so zealous as Seleucus in extending Alexander’s schemes of colonization; he is said to lave founded seventy-five cities. Among such of these as we know an unusual proportion lies in Media—the breast of Tran, as the Orientals call it—where it was doubly import- ant to strengthen the Macedonian element. A Greek settle- ment in Ecbatana and the cities of Laodicea, Apamea near Rhage, and Europus were his foundations; Alexandria Eschata, in the extreme north-east, was strengthened by new recruits ; and even beyond this city, as it seems, in the land of the Scythians,

an Antioch was founded. ‘These last undertakings probably came after the association in the empire of Antiochus, who, through his grandfather Spitamenes, had special reasons for interest in these parts. Tt was then that Demodamas crossed the Jaxartes and raised altars beyond it to the Apollo of Didyma, the patron god of the dynasty. Then, too, Alexander’s plan of explor- ing the Caspian was resumed; the admiral Patrocles made a voyage of discovery, and got only just far enough to be confirmed in the false notion of a north-east passage to India,—probably, therefore, to the extremity of the penin- sula of Mangishlak. It was seen, on the other hand, that the Caspian was not connected with the Meotis; but Seleucus shortly before his death still entertained a plan for a canal from the Caspian to the Cimmerian Bosphorus. Antiochus carried on his father’s work of founding cities, and built Laodicea in the east of Persis; but he gave more attention to castern Iran. A wall of 1500 stadia (about 172 miles) was carried round the oasis of Merv, and there, at the confluence of the Margus and the Zothales, the ruined city Syriana was rebuilt as Antioch, with a circuit of 8 miles. In Aria Antiochus Soter founded Sotira, his general Achzeus Achaia; the older chief towns Artacabane and Alexandria on the Arius received new walls, the latter with a circuit of from 3 to 6 miles, Alexandropolis in Arachosia had been similarly strengthened by Seleucus. With all these efforts, however, Hellenism made no such deep 1m- pression on Iran as on the west, nor did the loosely-jointed

empire attain to anything higher than a Hellenistic repro- 280-250.

duction of the kingdom of the Achemenians. Even in the fragmentary records that we possess we hear from the first of rebellions little favourable to consolidation of the realm; Seleucus, like Alexander, still had an army of Macedonians and Persians together, while the later Seleucids, at least in their western wars, used natives sparingly and only as bow- nien, slingers, or the like, and preferred for these services the wild desert and mountain tribes of Iran. Of the Persian troops of Seleucus we read that 3000 rebelled, and were mastered and destroyed only by treachery ; another and seemingly connected story speaks of a rising of 3000 Macedonians (Polyzenus, vii. 39,

40). Antiochus himself executed his eldest son, Seleucus, on suspicion of conspiracy against his life; the heir of the kingdom was his second son,

Antiochus IT. Theos (261-246), a drunken and dissolute Anti- prince, who neglected his realm in the society of unworthy ochus I.

favourites.

This king is mentioned in a remarkable contemporary Indian inscription. The Seleucids were constant allies of the great Maurya (Magadha) kingdom. Between 311 and 302 Megasthenes repeatedly went as ambassador from Seleucus to Chandragupta, and Daimachus went in like manner from Antiochus to the court of Chandragupta's successor, Ami-traghdta (280-276). The next king, Asoka, became a Buddhist about 263. He then founded hospitals for men and beasts throughout his realm, planted places where nothing had grown before, and provided wells and grew trees along the roads for the refreshment of man and beast. Further, he tells us, he caused his example in these things to be followed by his neighbours, whether southern or western. Among the latter Antiochus, king of the Greeks, has the first place.

Under the weak Antiochus IT. north-eastern Iran was lost to the empire. While the Seleucids were busy elsewhere, probably in the long war with Ptolemy Philadelphus, which occupied Antiochus's later years, Diodotus, viceroy of Bactria, took the title of king. The new kingdom included Sogdiana and Margiana from the first, while the rest of the East, with a single exception scarcely noticed at the time, adhered to the Seleucids.2 Now the formation of a strong local kingdom, heartily supported by the Greek colonies, and likely to control the neighbouring nomads and protect its own frontiers with strictness, was by no means agreeable to the chiefs of the desert tribes who, like the modern Turcomans, had been wont to pillage the settled lands, and raise blackmail with little hindrance from the weak and distant central authority at Antioch.? Accord-

ingly two brothers, Arsaces and Tiridates, whose tribe, Arsaces

the Parnians, a subdivision of the Dah, had hitherto! pastured their flocks in Bactria, on the banks of the Ochus, moved west into Seleucid territory near

Parthia. An in- sult offered to the younger brother by the satrap Pherecles moved them to revolt; Pherecles was slain, and Parthia freed from the Macedonians. Arsaces was then proclaimed first king of Parthia (250 z.c.). Such is the later official tradition, and we possess no other account of the beginnings of the Arsacid dynasty. But when the official account transforms Arsaces, who, according to genuine tradition, was the leader of a robber horde and of uncertain descent, into a Bactrian, the descendant of Phriapites, son of Artaxerxes II. (who was called Arsaces before his accession), and makes him conspire with his brother and five others, like the seven I EyELE—E—Ee ee

1 See the accounts of the army of Antiochus III. in Polyb., v. 79,

and Livy, xxxvii. 40. 2 Justin, xli. 4, 5, exaggerates rhetorically, on the basis of some such expression as that used by Strabo, in speaking of the event. ’ 3 These brigands had destroyed two of Alexander’s cities, Alexandria in Margiana and Heraclea in Media, before the time of Antiochus Ne;

Pliny, W. ., vi. 47, 48.

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Seleucus

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Arsaces Tiridates in ; Parthia.

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who slew the false Smerdis, we detect the inventions of a period when the Arsacids had entered on the inheritance of the Achzemenians, and imitated the order of their court. The seven conspirators are the heads of the seven leading noble houses to whom, beyond doubt, the Karen, the Suren, and the Aspahapet belonged. And further, genuine tradi- tion does not know the first Arsaces as king of Parthia at all, and as late as 105 2.c. the Parthians themselves reckoned the year (autumn) 248/247 as the first of their empire.” But 248 is the year in which Arsaces I. is said to have been killed,

after a reign of two years, and succeeded by his brother, who, like all subsequent kings of the line, took the throne-name of Arsaces. The first Arsaces must have existed, for he appears as deified on the reverse of his brother's drachmez, but he was not king of Parthia. Nay, we have authentic record that even in the epoch-year 248/247, the year of the accession of Tiridates, Parthia was still under the Seleucids. These contradictions are solved by a notice of Isidore of Charax (Geog. Gr. Afin., 1. 251), which names a city Asaak, not in Parthia, but north-west from it, in the neighbouring Astauene, where Arsaces was proclaimed king, and where an everlasting fire was kept burning. This, therefore, was the first seat of the mon- archy, and Pherecles was presumably satrap of Astauene, not eparch of Parthia.

The times were not favourable for the reduction of the rebels. When Antiochus IT. died, the horrors that accom- panied the succession of his son Seleucus II. Callinicus (246-226) gave the king of Egypt the pretext for a war, in which he overran almost the whole lands of the Seleucids as far as Bactria. Meantime a civil war was raging between Seleucus and his brother Antiochus Hierax, for whom the Galatians held, and at the great battle of Ancyra in 242 or 241 Seleucus was totally defeated and thought to be slain. At this news Arsaces Tiridates, whom the genuine tradition still represents as a brave robber-chief, broke into Parthia at the head of his Parnians, slew the Macedonian eparch Andragoras, and took possession of the province.' These Parnian Dahze were a branch of the Dahz who lived beyond the Sir Darya and the Sea of Aral (the Tanais and Meotis of Strabo, x1. p. 515, and Curt., vi. 2, 18, 14), and were called Xandians or Parnians; but, in consequence of internal dissensions, they had migrated at a remote date to Hyrcania and the desert adjoining the Caspian. Here, and in great measure even after they conquered Parthia, they retained the peculiarities of Scythian nomads. The Parthian language is described as a sort of compound between Median and Scythian ; and, since the name of the Dahe and those of their tribes (Strabo, xi. p. 511) show that they belonged to the nomads of Iranian kin, who in antiquity were widely spread from the Jaxartes as far as the steppes of south Russia, we must conclude that the mixed language arose by the action and reaction of two Tranian dialects, that of the Parthians and that of their masters.° Their nomad costume the Parnians in

Parthia gradually gave up for the Median dress, but they kept their old war-dress, the characteristic scale-armour, com-

1 Moses of Chorene (ii. 28) knows-only these three lines besides the Arsacids. Other Armenian historians, however (Langlois, i. 109, 199), know four lines of Arsacids which may have taken the place of lost families,

- See the cuneiform tablet in G. Smith, Assyrian Discoveries, p. 389, which agrees with Euseb., Chron., p. 299 (Aucher).

® Justin, xli. 4, 2, What is said of Andragoras in xii, 4, 12, rests ou a slip of the memory.

4 The common tradition connects the migration with the conquests of the Scythian king Tandysus, a contemporary of Sesostris. It adds that Parthian means ‘‘fugitive” or ‘‘exile” (Zend, p%rttu). But the name Parthava is found on the inscriptions of Darius long before the immigration of the Parnians,

5 An idea of the difference between the two may be got from the fragments of Kharezmian, preserved by Bérini.

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pletely covering man and horse. The founder of the empire appears on coins in this dress, with the addition of a short mantle, and so again does Mithradates II. The hands and feet alone are unprotected by mail; shoes with laces, and a conical helmet with flaps, to protect the neck and ears, complete the costume. The conquerors of Parthia continued to be a nation of cavalry ; to walk on foot was a shame for a free man; the national weapon was the bow, and their way of fighting was to make a series of attacks, separated by a simulated flight, in which the rider discharged his shafts backwards. Many habits of the life they had led in the desert were retained, and the Parthian rulers never lost connexion with the nomad tribes on their frontiers, among whom several Arsacids found temporary refuge. Gradually, of course, the rulers were assimilated to their subjects; the habitual faithlessness and other qualities ascribed to the Parthians by the

Romans are such as are common to all Iranians. The origin of the Parthian power naturally produced a rigid aristocratic system: a few freemen governed a vast population of bondsmen; manumission was forbidden, or rather was impossible, since social condition was fixed by descent; the 10,000 horsemen who followed Surenas into battle were all his serfs or slaves, and of the 50,000 cavalry who fought against Antony only 400 were freemen.

Arsaces Tiridates soon added Hyrcania to his realm and raised a great host to maintain himself against Seleucus, but still more against a nearer enemy, Diodotus of Bactria. On the death of the latter, however, the common interests of the Parthians and Bactrians as against the Seleucids brought about an alliance between Arsaces Tiridates and Diodotus IJ. With much ado, Seleucus had got the better of his foreign and intestine foes and kept his king- dom together, and in 238 or a little later, having made peace with Egypt and silenced his brother, he marched from Babylon into the upper satrapies. Tiridates at first retired and took shelter with the nomadic Apasiacz, but he advanced again and gained a victory, which the Par- thians continued to commemorate as the birthday of their independence. Seleucus was unable to avenge his defeat, being presently called back by the rebellion stirred up by his aunt Stratonice at Antioch. This gave the great Hellenic kingdom in Bactria and the small native state in Parthia time to consolidate themselves. ‘‘Tiridates used the respite to strengthen his army, to fortify towns and | castles, and to found the city of Dara or Dareium in the smiling landscape of Abévard. Tiridates, who on his coins appears first merely as Arsaces, then as King Arsaces, and finally as “ great king ” (probably in imitation of Antiochus Magnus), reigned thirty-seven years, dying in 211/10. His nation ever held his memory in almost divine honour.

Seleucus III. Soter (226-223) died early, and was

followed by Antiochus ITI. Magnus (223-187), who in his Anti brother’s lifetime had ruled from Babylon over the upper ochustll

satrapies. Molon, governor of Media, supported by his brother Alexander in Persis, rose against him in 222 and assumed the diadem.’? The great resources of his province, which followed him devotedly, enabled Molon to take the offensive and even to occupy Seleucia after a decisive battle with

the royal general Xencetas. Babylonia, the Erythreeau district, all Susiana except the fortress of Susa, Parapotamia as far as Europus, and Mesopotamia as far as Dura were successively reduced. But the young king soon turned the fortunes of the war. Crossing the Tigris in person, he

8 Mithradates I. was the first to adopt the robes of a Persian great king.

7 The coins of “4 King Molon” show that his rebellion has nothing to do with the King Antiochus of C. /. G., 4458. The latter, appearing in a list of deified kings arranged in the order of their deitication or death, is the eldest son of Antiochus III., who died in 193.

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penetrated into Apolloniatis and cut off Molon’s retreat. Molon was forced to accept battle near Apollonia ; his left wing passed over to the enemy, and, after a crushing defeat, he and all his kinsmen and chief followers died by their own hands (220). Antiochus now marched to Seleucia to regulate the affairs of the East. He used his victory with moderation, mitigating the severities of his minister Hermias ; but he had effectually prevented the rise of a new kingdom in the most important province of Iran. In the same year, before he returned to Syria, he marched across Mount Zagrus against the aged Artabazanes, the most powerful of the native princes, who ruled not only Atropatene but the neighbouring lands, especially east Armenia (Polyb., v. 55, 7), and by the terror of his approach extorted-an advantageous treaty.

A period followed in which the king was fully occupied in the west, but after this he began a campaign of several years in the upper satrapies, to which his contemporary renown was mainly due. First he regulated the affairs of the Armenian kingdom of Arsamosata, whose king, Xerxes, had fallen by the intrigues of his own wife, a sister of Antiochus.1_ Then, descending the Euphrates by ship to Seleucia, ppeared in Media in 209, hardly as an enemy, though hé*Seized the gold and silver decorations of the temple of the goddess A‘ne in Ecbatana. Thence with 100,000 foot and 20,000 horse he marched against the new Parthian king, Arsaces II.,? son

and successor of Tiridates. Crossing the desert obliquely to Hecatompylus, he forced his way into Hyrcania over Mount Labus (the eastern part of the Elburz mountains), defeating the Parthians on the summit, and besieged the fugitives in Sirynea. The Parthians planned an escape by night, and massacred the Greek residents to prevent its betrayal; but the plan failed. The city yielded, and the war ended in a treaty which left Arsaces his kingdom, but beyond question reduced him to a vassal. In 208 began the much more serious war with Bactria. Here the successors of Diodotus had been dethroned by a usurper, Euthydemus of Magnesia, whose coins indicate a long reign. Euthydemus tried to defend the line of the Arius (Herirud), but Antiochus effected a passage a little west of the city Guriana,? inflicted a decisive defeat on the hostile cavalry, and forced Euthy- demus to retreat to Zariaspa. But the siege of Bactra, the capital, proved tedious, and the war made little progress. Antiochus himself opened negotiations and was impressed by the declaration of the Bactrian king, that if he were reduced to extremities he must call in the help of the nomads, which would be fatal to the Greek civilization of the land. At length, in 206, a peace was arranged, and Antiochus was visited in his camp by Demetrius, the youthful son of Euthydemus, who pleased the king so well that he betrothed to him his daughter ; Huthydemus was left on his throne, and the two powers swore an alliance offensive and defensive, which cost Bactria no more than certain payments of money, the victualling of the Mace- donian troops, and the surrender of the war-elephants. The Bactrian Greeks were grateful for this moderation ; their Meniorial coins place Antiochus Nicator with Euthydemus Theos, Diodotus Soter, and Alexander Philippi among the founders of their political existences Antiochus next

1 John of Antioch, in Miiller, iv. 557.

2 This king seems to have had Arsaces as his proper name, for Justin always uses the proper name of Parthian kings. Vaillant’s conjecture, which gives him the name of Artabanus I., has no basis.

3 For Tayouptav, Polyb., x. 49, where all editors adopt the geograph- ically impossible Tazrovplay of Reiske, read Ta Vouplava, comparing Biol, vi. 10, 4.

4 That Antiochus Nicator is Antiochus III. Magnus follows from Malalas, i. 261 ; if the style of his Bactrian coins, resembling as they do those of Diodotus, really demands an earlier date, they must belong

to the last of the Diodotides not mentioned by the authors, not, as the numismatists suppose, to Antiochus II.

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crossed the Paropanisus into the valley of Cabul, renewing 220-164.

the friendly relations of his dynasty with the Indian king Subhagaséna, and receiving from him 150 war-elephants. The return march was through Arachosia and Drangiana, the winter being spent in Carmania. Thus it appears that south of the Paropanisus- political relations had remained unchanged for a hundred years, and the successes of Antiochus in Upper Asia, together with the prudent limita- tion of his schemes to what was practicable, did much to give permanence to the empire in the East, notwithstand- ing its many points of weakness. The series of victorious campaigns was concluded by a maritime excursion in 205 against the rich merchant-community of Gerrha on the Arabian shore of the Persian Gulf, in which Antiochus again showed his moderation, receiving from the Gerrheans a gift, 500 talents of silver, 1000 talents of incense, and 200 talents of oil of myrrh, but leaving them the freedom they had enjoyed from time immemorial.

Under very different circumstances did Antiochus revisit the eastern lands eighteen years later, his prestige broken by the war with Rome, and his position as a great power shattered in a way that could not fail ultimately to react on his Asiatic subjects. His most urgent difficulty, how- ever, lay in an exhausted treasury, and the demands of Rome for a heavy war-tribute. Antiochus came to Susa in search of money and seized a pretext to plunder the rich and famous temple of Bel in Elymais ; but the attempt was fatal to its author, who was destroyed, together with his followers, by a rising of the Elymeans (187). This, no doubt, was the moment when Elymais became

independent and formed a small separate kingdom in the upland part of Susiana.

Antiochus was followed in the kingdom by his sons, first the weak Seleucus IV. Philopator (187-175), and

then the gifted Antiochus IV. Epiphanes (175-164), who Anti- had a clear insight into the evils that were sapping the ochuslV.

empire, but attempted to cure them and bind the loose complex of provinces more closely to the centre with such impatience and violence that he only hastened the fall of his dynasty. He too, like all the later Seleucids, was in chronic want of money, and it was chiefly to raise tribute that he marched into the East in 166. He first made for Greater Armenia and the neighbouring Sophene, which had never paid much more than nominal allegiance to Macedon, and after the defeat of Antiochus the Great by Rome (189) had formed themselves into kingdoms under Artaxias and Zadriades, the former strategi. Antioclius penetrated into Armenia and took Artaxias prisoner, but restored him to his kingdom. He was next called by urgent affairs to the shores of the Persian Gulf. Over the Persians we read that his lieutenant in Mesene gained a double victory in one day, by sea and by land, at the pro- montory of Naumachzea® over against the Carmanian coast. This victory, however, implies that Persis had already cast off the Macedonian yoke,® and that the new kingdom had already extended its sway over the opposite coast of ‘Oman, as we know to have been the case about 70 a.p.’ At the mouth of the Tigris Antiochus restored an old city of Alexander’s and called it Antioch ;* it had been destroyed by an inundation, a sign that the negligent government of the later Seleucids had let the canal system,

5 Pliny, vi. § 152; but one is tempted to suspect a corruption of the text and read Drymatina, Mace; horum, &c.

6 Strabo, xv. p. 786, gives a general confirmation of the existence of a kingdom here in the time of the Macedonians.

7 Peripl. M. Er. (Geog. Gr. Min., i, 283). The connexion of the opposite coasts is natural; in the 10th century the Buwaihids ruled over ‘Oman.

8 Pliny, V. H., vi. 139, says “ Antiochus quintus regum,” reckon- ing Antiochus Hierax. We call Eupator Antiochus V., but he cannot be meant, and there is no way of counting which would make Sidetes the 5th Antiochus.

restored by Alexander, fall again into ruin. Another of Epiphanes’s measures directed to the strengthening of the Hellenic element in the East was the occasion of the change to Epiphanea of the name of the Median capital. But against these useful efforts must be’set the plundering of the temples of the barbarians, a sure way to exhaust Oriental patience, and one which involved the king in a catastrophe so like to that of his father that we should suspect some confusion were the accounts not so well con- firmed.! The king, we are told, heard of a rich temple of the goddess Naneza in Elymais stored with the gifts of many generations ; he marched out to plunder it, but was driven back by the natives to Babylon. In Persis he received tidings of the formidable rising in Judzea, excited by similar acts of violence; apparently he was then on his way against the Persian rebels, but on the journey he died of consumption in the Persian town of Tabze (164). Antiochus had given Mesene with its capital, Antioch, to a native dynast, Hyspaosines, as satrap; and, when Antioch, like its predecessor Alexandria, was soon ruined by floods,

191-171. ‘“‘ Arsaces Philadelphus,” perhaps because he had married a sister, and (first of all Parthian kings) Philhellen.® By the last title he presents himself, at a time when the Seleucid power was sinking, as the protector of his present and future Greek subjects. His eldest son and successor, Phraates I. (Arsaces Theopator of the coins), conquered Phraates the brave Mardian highlanders and transplanted them tol. Charax in the neighbourhood of the Caspian Gates, a proof

that the Parthians had already detached Comisene and Choarene® from Media (Strabo, xi. 514), probably just after

the death of Antiochus the Great.

About 171 Phraates died and left the crown not to his Mithn. sons but to his brother Mithradates (Arsaces Epiphanes and dates apparently also, on tetradrachms of 139, 138, Arsaces Phil-/ hellen), a prince of remarkable capacity, who made Parthia the ruling power in Iran. His first conquests, it would seem, were made at the expense of Bactria.

The kingdom of Bactria had made vast advances under Deme- Euthydemus, whose son Demetrius crossed the Indian triusof Caucasus and began the Indian conquests, which soon Pata

Chara- of Characene, which probably became independent at the | himself marched down the course of the Indus, conquered cene. death of Antiochus. Thus the Seleucid empire was now | Pattala and the kingdoms of Saraostes (Surdshtra) and quite cut off from the Persian Gulf by a circle of small | Sigerdis, probably the district of the commercial city native states.? Barygaza. The object, it is plain, was to reach the sea Now followed the troubled reign of the child-king | and get a share in the trade of the world ; and it is possible Antiochus V. Eupator (164-162), which was cut short by | that the extension of the power of the Bactrian Greeks Deme- Demetrius Soter (162-150). The latter was constantly | over Chinese Tartary as far as the Seres and Phaunians trius I. persecuted by the Romans, who raised enemies against him | had a similar object, viz., to protect the trade-route with on every side, and so the times seemed to invite a renewal | China along the Tarym river. For the Seres are the of the enterprise of Molon. Since the time of Epiphanes | Chinese, and the Phauni, according to Pliny,' lay west of the satrap of Media had been one Timarchus of Miletus, | the Attacori (the mythical people at the sources of the brother of the intriguing and influential treasurer Hera- | Hoang-ho) and east of the Tochari, whose earlier settle clides, and, like the latter, a favourite of the late king, who | ments were east of Khoten. They occupied, therefore, the had often sent him to Rome. Knowing the ground there, | very region which, according to Chinese sources, was then he went to Rome, and easily persuaded the senate to grant | held by a nomadic pastoral people, the Tibetan No-kiang. him the title of king (161).2 He made a treaty with | History shows that Chinese Tartary is easily conquered Artaxias of Armenia against Demetrius, compelled the | from the Oxus and Jaxartes, but very hard to hold, and neighbours of Media to acknowledge him, and extended | there is thus no

reason to doubt the truth of the Bactrian his power as far as Zeugma, and finally over Babylonia.* | advance in this direction. Strabo, unluckily, does not tell But he fared in the end no better than Molon. The | us whether the campaign was made by Demetrius ; it must Babylonians were oppressed and hated him, and the self- | have fallen before 177, when the great conquests of conceived majesty of Timarchus, who on his coins called | the Hiung-nu began, but after 201, when the founder of hiniself “the Great,” soon broke down in conflict with | the Han dynasty regained the country as far as the Great Demetrius, one of the most gifted princes of a highly- | Wall, and put China in a position to take part in the trade gifted dynasty. Timarchus was slain, his brother fled, | of inner Asia. This is precisely the period of the greatest and the victor was saluted as “saviour” (Soter) by the | power of the Greeks in Bactria. Demetrius, having suc- grateful Babylonians (160). It was a great victory for | ceeded his father, was displaced in Bactria by the able | Demetrius; he had saved the best part of Iran for his | usurper Eucratides, some time between 181 and 171.8 A Enera- monarchy, and he had shown all who speculated on the | thousand cities obeyed Eucratides, and both he and his #4 support of Rome that the decrees of the republic were rival Demetrius sought to extend the Greek settlements, powerless in regions to which its arm could not reach. the one founding Eucratidia in Bactria, the other Deme- The true danger for the Macedonian monarchy came not trias in Arachosia. Now Justin tells us that the Bactrians from rebellious lieutenants but from the ever stronger re- | were so exhausted by wars with the Sogdians, Arachosians, action of the Oriental element, of which the little state of | Drangians, Arians, and Indians that they at length fell Parthia was the most vigorous champion. The kings of | an easy prey to the weaker Parthians; but Eucratides he Parthia had long kept quiet after the war with Antiochus the | describes as a valiant prince, who once with 300 men held Arsaces Great. Phriapatius, successor of Arsaces II., who reigned | out during five months, though besieged by 60,000 men of ee fifteen years (c. 191-c. 176), calls himself on his coins | Demetrius, king of India, and then, receiving succours,

the city was removed to an artificial hill and protected by an embankment. Under the name of Spasinu Charax (Hyspaosines’s pile-town) the new city rose to commercial prosperity, and became the capital of the petty kingdom

1 Comp. Gran. Licinian., p. 9, with the first confused account in the letter of the Jews to Aristobulus, 2 Mac. i. 10 sq.

2 Hyspaosines was not an Arab, as Pliny states, vi. § 189. The Iranian names of the older kings of Characene justify Juba's account of their extraction.

3 The corrupt passage of Diodorus, Hxe. Escur., 18, ought to run thus, Tyudpyy é&etvar cal adr@ Baoidéa elvar.

4“ In Diod., l.c., read rs BaBvdwvlas for THs Bactdelas. Hence the error of Appian, who does not mention Media at all,

carried the Greeks far beyond the farthest point of Alex- ander. ‘The Punjab was reduced and the city of Cakala, under the name of Euthydemia, became the capital of the Indian conquests; but besides this it appears that Demetrius

subdued India.

° For these and other Parthian coins P. Gardner's work is the authority. One of them is dated 125 Sel. =187 3.c.

6 Choarene contains the only Greek city in the older conquests of the Parthians, and the coin with Greek date and title is of the year of Antiochus's death.

7 N. H., vi. 55, where read ‘‘ Phuni et Thocari.”

8 Sallet's numismatic arguments, which place Eucratides about 200 B.C., are not conclusive, and do violence to the other testimonies.

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This implies that besides the kingdom of Bactria and that of Demetrius—the latter now confined to India and probably to the lands east of the Indus—there were independent states in various districts still Seleucid in 206. Justin's statement is confirmed by the coins, which also show that Eucratidcs came forth as victor from a series of wars with the lesser states.

Sogdiana, accord- ing to Chinese authorities, was occupied by the Scythians in the lifetime of Eucratides ;; Antimachus, to judge from a naval victory recorded on his coins, once rcigned on the lower Indus ; the prin- cipal place where coins of him and his successor Antialcides have been found is the Cophen valley ; the latter prince, who borrows from Antiochus Epiphanes the title ‘‘ Nicephorus,” may be viewed as his younger contemporary. The neighbouring realm of Plato was ephemeral, but his money is unique as giving a date by the Seleucid era (165 B.c.). Pantaleon and Agathocles, whose coins are chiefly to be found in Begram, Cabul, Ghazni, Kandahar, and Sistan, were doubtless kings of Arachosia and Drangiana. Before this these countries belonged to Demctrius, aud even, as the coins show, to his father Euthydemus, who cannot have been contem- porary with the last years of Antiochus the Great, so that they were probably given as a dowry to his daughter when she marricd Demetrius. This marriage really took place, for the Seleucid name Laodice is found among the Bactrian Greeks. The victorics of Eucratides are proved by his surfrappé coins. Thus he restruck coins of Antialcidcs and appears posthumously as ‘‘God of the city Karici”? on money of Apollodotus, king of the Indians. Heliocles, co-regent and successor of Eucratides, and Strato, apparently the successor of Apollodotus, restruck cach the money of the other, and Heliocles’s name also appears over what is perhaps a coin of Philo- xenus, who reigned in the region of Peshawar.”

On his way back from the conquest of India Eucratides was murdered by his son and co-regent, probably Helio- cles.? The date of this murder may be fixed by that of Demetrius, who must have been born not later than 224, and may be taken to have lost his kingdom not later than 159. lEucratides cannot, according to Justin’s account, have lived many years longer. This would givec, 155 3B.c. as the lowest possible date for the death of Eucratides. A little before this time notable signs of concession to the rising spirit of the.natives appear on the coins. The medals of the older Greek kings follow the Attic standard and have only Greek legends, but from the time of Deme- trius the reverse bears a legend in the Indian language spoken in the Cabul valley and in the so-called Arianian character, a letter derived from the Semitic. At the same time we begin to find square coins, and in the later part of the reign of Eucratides a new native standard begins to prevail.*

In the midst of the civil wars, which became more serious after the death of Eucratides, Mithradates of Parthia * began to extend his dominions at the expense of Bactria ; even in the lifetime of Eucratides he succeeded in annexing the satrapies of Aspiones and Turiua. These seem to have covered Aria, for the Hindu-Kush is named as the eastern boundary of the Parthians (Justin, xli. 6, 8),—whence perhaps the mention of Arians aniongst the foes of Eucra- tides. Another account makes Mithradates rule as far as India, and declares him to have obtained without war the old kingdom of Porus, or the rule over all nations be- tween the Indus and the Hydaspes.° The two accounts are reconciled by Chinese records, which tell that c. 161 B.C. the nomad people Sse broke into the valley of the Cophen and founded a kingdom in the very place of the

! Te, Charis, a Greek town, which Appian, Syr., 57, placed in Parthia with two other towns which really lay in Aria.

2 See in general, A. v. Sallet's " Nachf. Alex. d. Gr.," in Zeitschr. J. Num., vi., and Cunningham, Num. Chron., ix. x.

3 This is the usual assumption, for Heliocles appears on coins both as contemporary and as successor of Eucratides, and there is a surfrappé coin of his which was originally struck by Eucratides for the marriage of Heliocles with Laodice (perhaps a daughter of Demetrius by his Seleucid queen). But there is much to be said for the view of Cunningham (Journ, As. S. Beng., 1840, p. 869; Num. Chron., ix 239), that the murderer was Apollodotus, whose title ¢ Philopator " always points to a co-regency.

4 Sallet, op. cit., p. 25 sq.

5 This account goes back through Oros., v. 4 (following Livy), and Diod., p. 597, to the excellent authority of Posidonius.

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Parthian conquests in India, which must therefore have 164-138.

been ephemeral. This fact has its importance, as illustrat- ing the way in which the internal wars of the east Iranian Greeks helped to prepare the ground for the Scythian in- vasion. After this success in the east Mithradates turned his attention to the west, where the chances of success were not less inviting. Demetrius had at length fallen before a coalition of the neighbouring sovereigns, powerfully sup- ported by the Romans through their instrument the exile Heraclides. A pretender, who called himself son of Anti- ochus Epiphanes, was put up as king by the coalition; he appeared in Syria in 152, and slew Demetrius in battle in 150. The pretender, who took the name of Alexander Theopator Euergetes, proved quite incompetent, and lost the support of Ptolemy Philometor, who in 147 put up Demetrius, the son of Dentetrius, against him. At length, in 145, Alexander, utterly defeated by Ptolemy, was slain in his flight by an Arab chieftain. Demetrius II. Nicator, however, soon made himself bitterly hated, and a certain

Diodotus of Casiana, in the region of Apamea, a man of Deme- mean origin, was able first to set up against him Alexander's trius H.

young son Antiochus Epiphanes Dionysus, and then to murder his puppet and proclaim himself as King Trypho. Five years of fighting drove Demetrius out of the greater part of Syria. Such was the state of the empire when war broke out between Media and Parthia, and was finally decided in favour of the latter. Mithradates left Bacasis in Media and turned to Hyrcania. Media in this account appears as independent, and that this was so is confirmed by the notice in Diod., Fyre. £sc., 25, that a certain Dionysius ''the Mede" raised Mesopotamia in 142 against Trypho to avenge the murder of the young Antiochus. Dionysius must be a son of Timarchus; Heraclides, when he installed Alexander in Syria, must have thought also of his own family, and raised it again to the throne of Media, which the senate had already recognized as a separate king- dom. But the short-lived independence of Media was, as we have seen, soon cut short by Mithradates, who did not lose the opportunity afforded by the civil wars of Syria in 147. Babylonia followed the fate of Media; Demetrius's lieutenant was defeated, and the whole province, with its capital Seleucia, fell into the hands of the Parthians. Thus the East was finally lost to the Macedonians.

The change of rule was not well received by the new subjects of Parthia, least of all by the Greeks and Mace- donians of the upper provinces, who sent embassy after embassy to Demetrius. That prince, who had now little to lose in Syria, at length accepted their invitation to come and take the rule over them, hoping that if he could secure the upper satrapies they would help him against Trypho. In 140 he marched into Mesopotamia, and thence by Babylon to the upper provinces. He was well received by the natives, and even the small native states made common cause with him against the proud barbarians, whose neighbourhood they felt as oppressive. He was joined by the Persians and Elymezans, and the Bactrians helped him by a diversion, appearing now for the last time as an independent people. At first things went well, and the Parthians were defeated in several battles, but in Media in 139 Demetrius was surprised by the lieutenant of Mithradates during negotiations for peace; his forces were annihilated, and he himself taken prisoner and dragged in chains through the provinces that had joined his cause. The Parthian king received his captive with favour and assigned him a residence and suitable establishment in Hyrcania. He even gave him his daughter Rhodogune, and promised to restore him to his kingdom, but this plan was interrupted by death.

Mithradates's last campaign was against the king of Elymais, Demetrius's ally; the rich temples of Elymais,

 that of Athena, and that of Artemis or Nanza in Azara yielded him a booty of 10,000 talents (£2,258,000), and the great town of Seleucia on the Hedyphon was taken! (Strabo, xvi. p. 744). The country was brought under Parthia, but continued to have its own kings. The coins make it likely that Mithradates simply set up a new dynasty, a branch of his own house.? Mithradates died in a good old age in 138, or a little later.? His memory was

: reverenced almost equally with that of the founder of his house, but his real glory was much greater, for it was he who made Parthia a great' power. He is praised as a just and humane ruler, who, having become lord of all the lands from the Indian Caucasus to the Euphrates, intro- duced among the Parthians the best institutions of each country, and so became the legislator of his nation.

Parthian The divisions of the empire which he founded can be sketched

“king- by the aid of an excerpt from the itinerary of Isidore of Charax

doms.” (at the beginning of the Christian era) and of Pliny (1. Z., vi. 44, 112). The empire was divided into the upper and lower kingdoms, separated by the Caspian Gates. The lower kingdoms were seven —(1) Mesopotamia and Babylonia, (2) Apolloniatis, (3) Chalonitis,* (4) Carina,® (5) Cambadene, (6) Upper Media, (7) Lower or Rhagian Media.6 The upper kingdoms were eleven —(8) Choarene, (9) Comisene,’ (10) Hyrcania, (11) Astauene, (12) Parthyene, (13) Apauarcticene,® (14) Margiana, a part of Bactria, (15) Aria, (16) the country of the Anauans (a division of Aria), (17) Zarangiana,® (18) Arachosia, now called ‘‘ White India.” The eighteen Parthian kingdoms thus correspond to six old satrapies ; the new divisions were probably derived from the provinces of Seleucus Nicator (see especially Posidonius in Strabo, xvi. p. 749). But upper and lower provinces have changed their meaning ; apart from Arachosia, the upper provinces are the old conquests of the Parthians before they occupied Media and became lords of Iran, and the lower all the later conquests in the west. The Parthians, we see, gave much less attention to the west than did their predecessors, and they still left Mesopotamia as the only great satrapy, and perhaps first added Babylonia to it when Ctesiphon became the residence of the Arsacids. We note also that they cared little for reaching the sea, which they can have touched only for a little way at the mouth of the Euphrates ; and even here they allowed the petty Characenc quite to outstrip them in competing for the great sca-trade. As compared with the older Macedonian empire, the Parthian realm lacked the east Iranian satrapies, Bactria with Sogdiana, and the Paropanisade, andalsothe three Indian ones, which, with Paretacenc, or, as it was afterwards called, Sacastane, remained under the Bactrian Greeks and their successors. In the north they lacked Lesser Media, which had long been an independent state, and in the south they lacked Susiana, which now belonged to Elymais, and the satrapies of Persis and Carmania, which the Persians held along with the

1 In giving this order of events it is assumed that the capture of Demetrius, omitted in Justin’s epitome of Trogus, xli. 6, comes after § 7, not, as has been assumed since Vaillant, after § 8. When Trogus meutions such

unimportant events as the nomination of Bacasis to Media and the visit of Mithradates to Hyrcania, we must suppose that these facts bore on others of more note, that Bacasis was the captor of Demetrius, and that the royal court was in Hyrcania when the captive was brought before the Parthian king.

2 Coins of the venerable Camnascires, whom Pseudo-Lucian Afacrobit calls a Parthian, but separated from the great kings by Armenia and Characene, have been brought from Baghdad and Shuster, and can hardly have been struck elsewhere than in Elymais. He was preceded by an Arsaces, not one of the main Parthian line. See Sallet, in 7. Sj. Num., viii. 207 sq.

3 Denietrius had married Rhodogune when Antiochus VII. married his deserted wife Cleopatra in 138, and there were children by the marriage, though not earlier than the time of Demetrius's second attempt to escape; hence both attempts must have been after the death of Mithradates.

4 These three make up the old satrapies of Mesopotamia (with Arbelitis) and Babylonia. The whole land between the Euphrates and the Tigris was now put together, and the countries to the east of the Tigris detached, Apolloniatis being taken from Babylonia, and Chalonitis from Arbelitis.

® In Isid., § 4 (Geog. Min., i. 250), read 'EvretOev Mydla cal yadpa Kdpwa, iris caréxer sxolvovs KB',) dpxy adbrar.

® Nos. 4 to 7 are all parts of the old satrapy of Media.

7 The two most eastern parts of Media that were the first Parthian conquests.

8 Nos. 10 to 13 form the old satrapy of Parthia and Hyrcania.

® Nos. 15 to 17 belong to the old satrapy of Aria with Drangiana. Sacastane, another part of this satrapy, was not Parthian, but, as Isidore remarks, belonged to the Sace.

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western part of Gedrosia (Per. Mar, Hr., § 37). In the extreme west they lacked Arbelitis proper, which formed a small kingdom under the name of Adiabene, first mentioned in 69 B.c. (Plut., Laeullus, 27). The kingdom of Mannus of Orrha (Mdvvou “Oppas, so read) in north Mesopotamia, which according to Isidore (§ 1) reached a good way south of Edessa, seems also to have beenindepend- ent, and, like Adiabene, probably existed before the Parthian time. From these small kingdoms the Parthians asked only an acknowledg- ment of vassalship. When Parthia was vigorous the vassalship was real, but when Parthia was torn by factions it became a mere name (Strabo, xvi. p. 732). The relation was always loose, and the political power of Parthia was therefore never comparable to the later power of the Sasanians. Arsaces Tiridates and his successors called them- selves “great king.”’ Mithradatcs, as overlord of the minor kingships, first bore the title “great king of kings.” The title seems to have been conferred, not assumed in mere boastfulness ; for (apart from a single usurper in times of disorder who calls himself “king of kings’’) none of his successors bears it until Phraates III., seventy years later,—a fact clear from the coins, but hitherto unnoticed. The nobility had great influence in all things, and especially in the nomination of the king, who, however, was alwaysan Arsacid. Next to the king stood the senate of prodwli,! from whom all generals and lieutenant-governors were chosen. They were called the king’s kin, and were no doubt the old Parnian martial nobility. A second senate was composed of the Magians and wise men, and by these two senates the king was nominated (Posidonius, ap. Strabo, xi. p. 515), The Parthians were, in fact, very pious, conscientious in observing even the most troublesome precepts of Zoroastrianism as to the dis- posal of dead bodies, which were exposed to birds of prey and dogs, the bare bones alone being buried (Justin, xli. 3, 5, 6). When the Parthian prince Tiridates visited Nero he journeycd overland that he might not be forced to defile the sea when he spat, and his spiritual advisers the Magians travelled with him (Plin., xxx. 17). The Magiaus were not, indeed, so all-powerful as under the Sasanians, but it is quite a mistake to think that the Parthians were but lukewarm Zoroastrians.

The complete annihilation of the Macedonian empire in Falla Tran was closely followed by the destruction of Greek in-&n dependence in eastern Iran, north of the Paropanisus. The™ last mention of independent Bactria is in 140; no king of Bactria and Sogdiana is known from coins after the parri- cide Heliocles. Classical writers give only two laconic accounts of the catastrophe. Strabo says that “the no- madic peoples of the Asti, Pasiani, Tochari, and Sacarauce (so read for ZaxdpavAot xaé in xi. p. 511), dwellers in the land of the Sac, beyond the Jaxartes [in its middle course], opposite to the Sacee and Sogdians, came and took Bactria from the Greeks.” Trogus (Prol., xli.) names the Scythian peoples Sarauce and Asiani.! Fortunately the lively interest taken by the Chinese in the movements of the nomads of Central Asia enables us to fill up this meagre notice from the report of the: Chinese agent in Bactria in 128, as recorded a little later by the oldest Chinese historian, and from other notices collected by the Chinese after the opening of the regular caravan route with the west, about 115, and embodied in their second oldest history.!2_ According to these sources the Yue-chi, a nomad Chinet © people akin to the Tibetans, lived aforetime between 8” Tun-hoang (2.¢., Sha-cheu) and the Kilien-shan moun- tains, and about 177 were subjugated, like all their neigh- bours, by the Turkish Hiung-nu. Between 167 and 161 they renewed the struggle without success; Lao-shang, the great khan of the Hiung-nu, slew their king Chang-

10 For populorum (Just., xli. 2, 2) a synonym of senatus (xlii. 4, 1) is wanted ; write, therefore, probulorum.

Ul Modern writers since Bayer make the Greek kingdom in Bactria fall before the Parthians, appealing to Just., xli. 6, 3. But the epi- tome here contradicts its source, and confounds the fall of the king- dom with the earlier loss of two satrapies to the Parthians under Eucra- tides. The right account is to be found elsewhere in Justin himself, ah, Weise sy Ge :

Comp. the Sseki of Ssematsien (100 B.c.), tr. by Brosset, Nour. Journ, As., ii. 418 sq., and the Annals (of the first Han) of Panku (80 A.D.), excerpts from which are given by Ritter, Hrdk., pt. vii. bk. 3, pp. 604-728 ; Deguignes, Hist. des Huns, 1, 2, p. lxiv. sq., 41 sq., and “Recherches sur quelques événements,” &c., in Além. Ac. Inscr., XX¥- 17 sq.; Abel Rémusat, on the Fo&-kouwe-ki, p. 37 sg. The account given in the text is

based wholly on the two oldest sources, without reference to the newer Chinese encyclopedias. Comp. further Richt- hofen, China, p. 447.

lun, and made a drinking-cup of his skull,! and the great mass of the vanquished people (the great Yue-chi) left their homes and moved westward, and occupied the land on Lake Issyk-kul, driving before them another nomad race, the Sse. The Sse took the road by Utch and Kash- gar, ultimately reaching and subduing the kingdom of Kipin (the Cabul valley), while their old seats were occu- pied by the Great Yue-chi, till they in turn were soon attacked by the Usun, who lived west of the Hiung-nu, and forced to move farther west (160 or 159), The older Chinese account ignores the residence of the Yue-chi at Lake Issyk-kul, which can at most have lasted only for a few years ; the later account goes on to say that, moving westward, they conquered the Ta-hia, ¢.¢., the Bactrians. The language of the older narrative has been held to imply that they went by way of Ferghana and remained there for some time ; but in reality it only says that they retired beyond Ferghana and conquered the Ta-hia, thereupon pitching the royal camp north of the Oxus, and so it ap- pears that in 159 they moved straight on Sogdiana, reach- ing that land just at the time when internal wars were undermining the might of Eucratides. The conquest, how- ever, may have been gradual, since Bactria is still named as independent in 140.

When the Yue-chi were already settled in their new homes the king of China sent a certain Chang-kien to urge them to return and help him to clear the caravan-road by thrusting back the Hiung-nu. He was arrested on his way by the latter, but escaped in 129 to Ferghana, and thence was led to the Yue-chi through the land of the Khang-kiu, on the middle course of the Jaxartes. But the Yue-chi were too happily settled in a rich and peaceful land to listen to his representations, and after a year’s residence (128-127) he returned to China, which he reached in 126, after falling again into the hands of the Hiung-nu on the way. From him are derived almost all the accounts of the country and its inhabitants given by the Chinese historians. There were, we are told, settled and agricultural peoples in Great Wan (Ferghana), Ta-hia (Bactria), and An-si (Parthia). All the races from

Ferghana to Parthia had deep-set eyes and strong beard and moustache; their dialects varied, but as they all understood each other all must have been Iranian in speech. Their manners, too, were much alike; they paid great respect to women, and the men were very complaisant to their wives. This is almost exactly what Bardesanes says of the position.of women in his time among the Kushan in Bactria ;2 but it was quite otherwise in Parthia, where the Oriental seclusion of women was carried to the extreme (Just., xli. 3, 1, 2). They were all knowing traders, and understood the preparation of silk and lac, but not metallurgy till they were taught that art by Chinese agents and deserters. They then imported the precious metals from China and made gold and silver vessels, but not money, being in this respect behind the Parthians. Great Wan probably corre- sponds to the Ovapyo of Ptolemy (though he misplaces them) and the Varena of the Vendidad; it was a separate kingdom, with a popula- tion estimated at 300,000 souls in the 1st century B.c., and seventy subject cities. The king, probably a native who had risen on the fall of the Greeks, lived in Kuei-shan (probably Khojend, at the mouth of the Ferghana valley), and could call out an army of 60,000 men,—lancers, archers, and mounted bowmen. The land was famous for its wine and for horses of divine race which sweated blood, and for the possession of which China went to war with Great Wan in 104-108, and again in 102-98. Lucerne and grapes were exported to China; the name of the latter, “po-tao,” is held to be the Greek Bérpus, which would show that the vine was introduced by the Greeks of Alexandria Eschata. outh of the Wei or Oxus lies Ta- hia (probably Zend Dahvyu, the land‘). Here there was no king, but the several cities were the seats of chiefs, a state of things Such as Alexander had found in the country and as reappeared under the Turks in the 7th century a.p. Chang-kien estimated the population at a million ; they were bad and cowardly soldiers, but excelled in trade, and the chief town, Lan-shi, had rich bazaars of many wares. This town must be one of the commercial cities on the river Bactrus, along which lay the trade-route from India to the north (Pliny, vi. 52), ¢.¢., either Bactra or Eucratidia (which, according to Ptolemy, vi. 11, 8 [Codd. B., E., Pal. 1], lay lower down the stream on the left bank). In the latter case Lan- shi may stand for “EAAqves. North of Ta-hia lay the Great Yue-chi,

1 The Lombards had the same custom, learned, no doubt, in the childhood of the race from their Avarian neighbours.

- See Langlois, Coll. d. hist. de V Arménie, i. 84.

3 Ssematsien, in Ritter, vii. 3, p. 642.

- Certainly not Dah, for they were never in Bactria.

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and west of the latter was An-si towards the Oxus. very great country, whose length might be 1000 li (358 miles), and it had 100 cities great and small. The first caravan from China to An-si passed on its way from the east frontier to the capital (called in the Ist century B.c. Fan-teu, t.c., probably Parthau), a dozen walled cities, which lay almost close together, so dense was then the population of the fertile part of Khorasan. The merchants of An-si visited the neighbouring lands with waggons or with ships for distances of several thousand li. The coinage was silver, with the image of the king, and was called in and restamped on a new accession.® Writing was on skins in horizontal lines. Now, though the money as here described fits Parthia, the mercantile character of the race does not at all correspond to that of the Parthian aristocracy. Both here and in the general description given above, which also contains features not applicable to the Parthians, we see that the Chinese did not distinguish the ruling race from their subjects, and inainly described the latter, who were in point of fact very similar to the people of Bactria and Ferghana. As An-si extends to the Oxus the description is taken from the inhabitants of Margiana, a country which must have been then subject to Parthia. A later Chinese account, referring to the period 24-220 a.D., places on the east frontier the city Mo-lu or Little An-si, which is plainly the Mouru of the Vendidad, modern Merv- i-rud, and the Greek Antioch 4 évvdpos; An-si is a corruption of the last name, just as the Persians call the Syrian Antioch Andiv, and so came to be a name for the Parthian rulers of the city. West of An-si, on the western (Caspian) sea, lay Tiao-chi (Media), an agri- cultural country with a dense population, a dependency of An-si, and in part governed by tributary chiefs. Chang-kien is thinking less of the central parts of Media than of. Gilan and Mazandaran, for he speaks of the warm moist climate where rice is produced. And in this quarter there were really various petty states ; not

only Atropatene but Dilem had its own king, as appears for the year 65 B.c. from Plutarch, Pomp., 86 (where for “EAXvpalwy read Aehupalwy), and the Gele and Cadusians doubtless stood under their own mountain chiefs as they had done under the later Acheménians, and did again under the first Sasanians. It is a proof of the solid power of the empire founded by Mithradates that Parthia was able to assert some kind of supremacy over these hardly accessible districts. North of An-si lay Li-kan (Hyrcania), whose wizards, with those of Tiao-chi, had great reputation. It is clear from this whole account that the centre of the empire was still in the old Parthian lands, and that the lower satrapies were viewed as mere dependencies, “outer lands.”’ In the following century the Chinese obtained knowledge of the west by the caravan-route which passed through Kipin (the Cabul valley) to U-ghe-shan-li (Arachosia) ; and now we find a changed state of affairs; these two countries are bounded on the west by Tiao-chi, whose powerful king has his capital a hundred days’ journey from the frontier. An-si is now only mentioned incidentally as reached from Arachosia by going first north and then east, which is correct if we take the name in its original sense of the subjects of Parthia in Margiana and its capital Antioch. But the empire of Parthia, which now had its centre in Media and the western lands, is certainly Tiao-chi, a word that is probably connected with the word for “land” in the official lan- guage of the Achemenians, old Persian dahydus. be: As nomadic peoples Chang-kien names the Great Yue-chi in Sogdiana, the Khang-kiu on the middle course of the Jaxartes, and the Yen-tsai in Chorasmia. The Yue-chi could put from 100,000 to 200,000 bowmen in the field ; later they were reckoned at 100,000 warriors and their families. The royal camp had been north of the Oxus even after the conquest of Bactria, but they finally withdrew entirely to this district. Their capital is called Lan-shi; and the name of Ta-hia disappeared before that of “Land of the Great Yue-chi.” At the conquest they had a single king ; afterwards they formed five principalities. The fifth of these corresponds to Cabul, so that the division is younger than the Scythian invasion of Asia after the death of Phraates I]. Imme- diately north of Ferghana, but separated from the Yue-chi in the south and the Hiung-nu in the east by a series of small kingdoms, were the pasture-grounds of the Khang-kiu on both sides of the Jaxartes ; their force was 80,000 to 90,000 bowmen. North-west of these were the Yen-tsai on the Aral, the northern neighbours of the An-si, and east of Hyrcania, that is, in Chorasmia. If there is no error in the writing of the

number they mustered but 10,000 warriors; then again considerable changes had taken place when the Chinese made war on the Khang-kiu in 44 B.c. The small kingdoms south and east of the latter have disappeared, so that the Khang-kiu border on the Hiung-nu and the great Yue-chi; but the latter have now moved south, and now, too, the Khang-kiu are the northern neighbours of An-si, and not the Yen-tsai; the latter are their dependants, and a tribute of mouse-skins is even drawn from the kingdom of Yen beyond the Yen-tsai. Such a tribute cannot have come ‘rom any place south of the Mukhajar moun-

5 On this point the younger Chinese account falls into a confusion with the coins of the kings of Kipin. XVIII. — 75

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138-128.

Phraates If.

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tains. The Khang-kiu have risen in number as the Yue-chi fall, and have now 120,000 bowmen, or a population of 600,000 souls. Like the Yue-chi, they are divided into principalities, which are five in number, and the king is the prince of Su-hiai, with his winter residence in a place of that name east of Ferghana, and his summer court much farther west at Lo-yuei-ni. The east of the Khang-kiu country was often subject to the Hiung-nu, and the pressure of this Turkish tribe seems to have been the cause which pushed the Khang-kiu and Yen-tsai farther west. The latter have now at least 100,000 bowmen, and extend westwards to the limits of Great Tsin or the Roman empire. This compels us to conclude that the Yen-tsai are the Aorsi, the western part of whom ranged between the lower Don and the west coast of the Caspian, while the older upper Aorsi were round the north coast, and so on to the neighbourhood of the lower Jaxartes (Strabo, xi. p. 506; Ptol., vi. 14, 10). When Pharnaces ruled on the Bosphorus (63-47 8.c.) both parts of the Aorsi intervened in the affairs of the neighbouring kingdom with large armies, and as Pharnaces was a client of Rome the Chinesc statement is intelligible. Later Chinese accounts relating to the first

Christian century give A-lan-na as the later name of the Yen-tsai, which agrees with the fact that the Aorsi appear last in history in 49 a.p. (Tac., Ann. xii. 15 sqg.), and that Lucan, ten or fifteen years later, is the first to name the Alans, who succeed to their geographical place. When we understand the Chinese data we can speak with more definiteness about the four nations to whom Strabo ascribes the fall of Greek Bactria, and which Ptolemy also seems to name from a source relating to the time when the invasion began. From these data, compared with our Chinese sources, we can be sure that the ochari are the great Yue-chi, the former being probably the name of the nation and the Iatter that of the leading horde. The Asii of Strabo, Asiani of Trogus, Jatii of Ptolemy, will then be all attempts to render the difficult name of the horde which the Chinese call Yue-chi. But, while the classical writers place the Sacarauce in the west to balance the Tochari in.the east, the Chinese know no second great nation between the latter and the Parthians in Margiana. We must therefore suppose that the Sacarauce are the Scythians who occupied part of the Greek lands, and were in turn conquered by Parthia according to Strabo (xi. 515); that this part was Margiana is known from a drachma of Phraates IJ. (Gardner, Parthian Coinage, p. 83); the conquest must have taken place a good while before 128, when Chang-kien visited Sogdiana, since by that time the Parthians had again displaced them. But he must have known and mentioned the Sacarauce in some form, and thcy can hardly be other than the most powerful nation known to him in Trans- oxiana, the Khang-kiu. These, like the Sacarauce, came from beyond the Jaxartes; they were the northern neighbours of Parthia just at the time when the Sacarauce are so described. The only other tribe that can be thought of, the Yen-tsai, are known to the Greeks and Romans by a different name, as the Aorsi; and Trogus (Prol., xlii.) mentions the fall of the Sacarauce as one of the latest events in Scythian history, which, as he wrote soon after 2 B.c., agrees with the fact that the last mention of the Khang-kiu in Chinese history is in 11 B.c. ; while the Aorsi are mentioned much later. Khang-kiu seems to be properly the name of a country identical with the Katigha of the Khorda-Avesta and the Gangdiz of Firdausi. Finally, the Pasice or Pasiani are the same as the Apasiace of the earlier Parthian history ; the Sacarauce will have conquered them and swept them with them as the Mongols did with many Tatar tribes. The conquest of Bactria probably fol- lowed soon after the last hopes of the Eistcrn Greeks in Demetrius II. came to nothing. It is very remarkable that

Chang-kicn notices no difference between the Greeks who had been rulers and the Iranians who were their subjects. This implies not merely some lapse of time but a marked decrease in the number of the Greeks, and probably also that here, as in other Eastern parts, they had become more and more completely Orientalized.

Phraates IJ.,1 who succeeded his father in 138, and continued his work, wresting Margiana from the Scythians of Bactria in an expedition commemorated on extant coins, had also to meet the last and most formidable attempt to restore the sovereignty of the Seleucids. Antiochus VIL, one of the ablest kings of his race, had put down the civil wars in Syria, even taking Jerusalem and compelling the Jews to acknowledge his might by paying him military service, and in 130 he marched eastward at the head of a force of 80,000 combatants, swollen by camp-followers to a total of 300,000. Many of the small princes, on whom the hand of Parthia lay heavy, joined him as they had joined his brother; the enemy was smitten on the Great Zab, and in two other battles ; Babylon and then Ecbatana

1 In coins Arsaces Theopator Euergetes Epiphanes Philhellen.

opened their gates to the conqueror; and the subject-nations rose against the Parthians, who, when Antiochus took up his winter quarters in Media, were again confined to their ancient limits. When the snows began to melt, an embassy from Phraates appeared to ask for peace; but the terms demanded by Antiochus—the liberation of Demetrius, the surrender of all conquests, and the payment of tribute for the old Parthian country—were such as could not be accepted without another appeal to the fortunes of war, Demetrius, indeed, was released and sent to Syria, but only to stir up a hostile party in his brother’srear. During the winter the Syrian host had been dispersed over a wide range of cantonments; the disorderly insolence of the soldiers, for which the general Athenzeus was held to be mainly responsible, and of the levies raised in the towns had disgusted the natives; the Medes made secret terms with Parthia, and all the cantonments were attacked by concert on a single day. Hastening to relieve the nearest corps, Antiochus was met by the

Parthian with a superior force of 120,000 men ; he refused the advice of his officers to fall back to the neighbouring mountains, and accepted battle on a field too narrow for the evolution of his troops. The Syrian soldiers, enervated by luxury, were readier to imitate the flight of Athenzeus than the valour of his master; the whole host was involved in the rout and annihilated. Antiochus himself escaped wounded from the fray and cast himself from a rock that he might not be taken alive. This catastrophe (February 129) freed the Parthians for ever from danger from Syria.

Phraates paid funeral honours to the fallen king, and afterwards sent his body to Syria in a silver coffin. He entertained his captive family royally, married one of the two daughters, and sent the eldest son Seleucus to Syria to claim the sovereignty, and so serve future plans of his own; for an attempt to follow and recapture Demetrius, made immediately after the battle, had proved too late. But dangers in the east soon turned the Parthian's attention away from enterprises in the west. In his distress he had bribed the Scythians? to send him help; as they arrived too late he refused to pay them, and they in turn began to ravage the Parthian country. Phraates marched against them, leaving his charge at home to his favourite, the Hyrcanian Euhemerus, who chastised the countries that had sided with Antiochus, made war with Mesene, and treated Babylon and Seleucia with the utmost cruelty. But the Scythian war proved a disastrous one; the enemy overran the whole empire, and for the first time for five hundred years Scythian plunderers again appeared in Mesopotamia'; in a decisive battle Phraates was deserted by the old soldiers of Antiochus, whom he had forced into his service and then treated with insolent cruelty; the Parthian host sustained a ruinous defeat, and the king himself was slain (spring 128, or somewhat later).®

Artabanus I.° (third son of Phriapatius), who now became Arts d anus

king, was an elderly man. 'The Scythians, according to? the too favourable account by our chief authority, were con- tent with their victory, and moved homewards, ravaging the country. But we know from John of Antioch (66, 2) that the successor of Phraates paid them tribute ; and the southern part of Drangiana must now have been per-

2 The date is fixed by Livy, who, according to Orosius, v. 10, and Obseq., De Prodig., 28, places the expedition in the consular year 130. With this it agrees that Antiochus came to the throne in 138 and reigned nine years. Too much weight is often attached to Porphyry's dates by Olympiads, which are merely calculated from the years of reigns.

3 Justin, xlii. 2, 1-2, plainly distinguishes these Scythians from the Tochari, so the Sacarauce must be meant.

4 Jo. Ant., in Miiller, iv. 561.

5 The remains of Antiochus reached Syria in the reign of Alexander II., who came to the throne in 128 (Justin, xxxix. 1, 6).

6 Arsaces Theopator Nicator of the coins.

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manently occupied by the Scythian tribes, who gave it the name of Sacastane (Sistan), for that name appears in Isidore of Charax (1 B.c.), which implies that the Scythian occupa- tion was even then of long standing. Finally, the coins reveal the existence of Arsacids who were rival kings to

EMPIRE. | 595 Artabanus IT. was the next monarch,® but after him the 128-66.

style of king of kings was taken by the Armenian Tigranes,

one of the most dangerous foes Parthia ever had. In Tigranes

86 it was still a reason for choosing Tigranes as king of 4r-

of part of Syria that he was in alliance with Parthia ™!*

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Artabanus I. and Mithradates I]., and perhaps borrow from individual successes against the Scythians the proud titles which so strongly contrast

with the really wretched condition of the empire. One of these pretenders, Arsaces Euergetes Dicaios Philhellen, resumes the style “king of kings,” which had lapsed since Mithradates I.; and his title “the just,” which seems to be imitated from the Bactrian Heliocles, suggests that he may have come with the Scythians from the land where Heliocles once reigned. Meanwhile it would appear that the men of Seleucia, driven to desperation, had seized the tyrant Euhemerus and put him to a cruel death! Artabanus, when they sought his pardon, threatened to put out the eyes of every man of Seleucia, and was prevented only by his death, in battle with the Tochari, after a very short reign.

His son and successor, Mithradates II. the Great,? was the restorer of the empire. We are briefly told that he valiantly waged many wars with his neighbours, added many nations to the empire, and had several successes against the Scythians, so avenging the disgrace of his predecessors. His successes, however, must have been practically limited to the recovery of lost ground, and the eastern frontier was not advanced. It has been common to connect with his successes the appearance of Parthian names among the Indo-Scythian princes of the Cabul valley ; but this must be false, for even Candahar (U-ghe-shan-li), which lies so much farther west, is repre- sented by the Chinese as an independent kingdom in.the middle of the 1st eentury B.c. On the other hand, Mithra- dates, if not the first to conquer Mesopotamia, was the first to fix the Euphrates as the western boundary of the empire, and towards the end of his reign he was strong enough to interfere with the concerns of Great Armenia and place Tigranes IT. on the throne in a time of disputed succes- sion (94), accepting in return the cession of seventy Armenian valleys. Now, too, the Parthians, as lords of Mesopotamia, came for the first time into contact with Rome, and in 92, when Sulla came to Cappadocia as propretor of Cilicia, he met on the Euphrates the ambas- sador of Mithradates seeking the Roman alliance.+ This embassy was no doubt connected with the Parthian schemes against Syria; Mithradates about this time was at war with Laodice, queen of Commagene or some neigh- bouring part; and her cousin, Antiochus X.,° who supported her, fell in battle with the Parthians. A few years later Strato, tyrant of Bercea, called in the Arab phylarch Azizus and the Parthian governor of Mesopotamia, Mithradates Sinaces, against Demetrius ITI., who reigned at Damascus. The Seleucid was compelled to surrender with

his whole army and ended his life as a captive at the Parthian court. Mithradates the Great seem: to have died just after this event ; there is no reason to suppose that he lived to see the disasters which followed so close on his great successes.

1 In Diod., Exc. Vat., p. 107, there can be little doubt that éviov is a corruption of Evnpépov.

2 On coins Arsaces Theos Euergetes Epiphanes Philhellen.

3 The time of his accession follows approximately from the date 123 on a coin of his rival, Arsaces Nicephorus.

4 The ambassador allowed Sulla to take the place of honour, and on his return was punished for this by death.

5 The queen rév TadtxnyGv of Jos., Ant., xiii, 13, 4 (Leyden MS.— the usual text has “queen of Gilead”), is doubtless the Laodice Thea Philadelphos, daughter of Antiochus VIII. of Syria, who, as Mommsen has shown (Mitth. Arch. Inst. Athen., i. 32), was ancestress of the later sovereigns of Cominagene. The word in Josephus is not perhaps a corruption of Commagene but of some neighbouring place—say Kadduyixnvav,

(Just., xl. 1, 3), but very soon the latter state was so ruined by civil and foreign war that it was no match for Armenia (Plut., Ducullus, 36). Of the details in this history we know only the last act. In 77 the Arsacid Sinatruces’ returned from the land of the Sacarauce to take the throne at the age of eighty, and reigned seven years, There were probably other usurpers; the silence of the coins does not prove the contrary, but rather that the times were so bad that no money was struck, a case of which Parthian numismatics offer other examples. Tigranes conquered Media—primarily, that is, Atropatene —but he also entered Great Media and destroyed the city of Adrapanan, 7 miles west of Ecbatana, “the castle of those who have their seat in Batana” (Ecbatana),® 7.¢., of a line of the Arsacids, for, though Mithradates I. had had his seat in Hyrcania, Phraates II. and his successors down to Mithradates III. held their court in Media (Diod., Zac. Vat., p. 603). The seventy valleys which had been the price of his throne were restored to

Tigranes, and he also ravaged the country of Arbela and Nineveh, and compelled the cession of Adiabene, hitherto a Parthian dependency, and of Mesopotamia, with the fortress of Nisibis. This last war was against Sinatruces,? and was probably going on in 73 when Mithradates Eupator of Pontus made a vain appeal for help to both combatants (Memnon, in Photius, p. 234 b, 27).

Phraates ITI. succeeded his father Sinatruces a little Phraates before the arrival of Lucullus in the East in 70,!° and in U!-

69 refused a second invitation to give help against Rome which Mithradates and Tigranes addressed to him jointly, the latter offering to reward him by giving up all that he had taken from the Parthians. His hatred of Tigranes made him more disposed to alliance with Rome ; and after a period of hesitating neutrality Phraates accepted the overtures of Pompey and prepared to invade Armenia (66), guided by the younger Tigranes, who had quarrelled with his father and taken refuge in Parthia, where he wedded the daughter of the king. Tigranes the elder fled to the mountains; and, after forming the siege of Artaxata, which proved tedious, Phraates turned home- ward, leaving young Tigranes with part of the army to continue the war. The latter, who alone was no match for

his father, fled after an utter defeat to Pompey, who was Pompey just preparing to invade Armenia, and to whom the elder in Ar-

Tigranes presently surrendered at discretion. The Roman, however, gave him very good terms, altogether abandon- ing his son’s cause and even casting him into chains.

6 In Trogus, Prol., 41, the sentence “successores deinde cius Artabanus et Tigranes cognomine Deus a quo subacta est Media et Mesopotamia dictusque in excessu Arabie situs” is wrongly referred (after Vaillant) to Mithradates I. of Parthia. It can really refer only to the famous Tigranes, and in that case must have originally belonged to Prol., 42, having dropped out by homoioteleuton, and been restored from the margin ina false place. Artabanus II., therefore, followed Mithradates II., and his probably are the base coins of Arsaces Euergetes Epi- phanes Philhellen, which according to Gardner, p. 88, seem to belong to this time.

7 On coins Arsaces Autocrator Philopator Epiphanes Philhellen,

8 sid. Char., in Geog. Gr. Min., i. 250.

9 Sallust, Hist., iv. fr. 19, § 3.

10 So Memnon, ir Photius, p. 239 a, 18, confirmed by Phlegon, z7d., p. 84 a, 15. These sources, being independent, have more weight than Appian, Afithr., 104, and Dio Cassius, xxxvi. 45, who speak of the arrival of Pompey. Phraates III. is the ‘‘king of kings, Arsaces Dicaios Epiphanes Theos Eupator Philhellen,” whose coins Gardner wrongly ascribes to Mithradates III. We have express testimony that Phraates was styled “king of kings” and had the epithet “Theos ” (Plut., Pomp., 38; Dio Cass., xxxvii. 6; Phlegon, wd sup. ME

66-53 B.c.

Orodes I.

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Meantime Phraates had occupied the Parthian conquests of Tigranes, which the Romans had promised him, and invaded Corduene (Beth-Kardo, now Jezirat beni “Omar), whence he sent an embassy to Pompey to intercede for his son-in-law. But the Romans had no further occasion for Parthian help; and, instead of granting his request, Pompey commanded him to leave Corduene, and followed up the command by sending Afranius to clear the coun- try and restore it to Tigranes. Immediately afterwards Pompey’s officer marched into Syria through Mesopotamia, which by treaty had been expressly recognized as Parthian ; and it was another grievous insult that Pompey in writing to Phraates had withheld from him the style of “king of kings.” This no doubt was done out of regard to Tigranes, who claimed the sole right to the title, and had probably enforced his claim upon the weak predecessors of Phraates. Of the four subordinate kingships, the patronage of which was held to give a right to the title, Atropatene, Adiabene, Corduene are known, and the fourth was probably Or- rhoene. All these had once stood under Parthian suzerainty, and, now that Phraates had recovered the lost territory of his predecessors including these states, he resumed, as

his coins show, the proud title which had dropped since the ‘days of Mithradates I., and to which Tigranes had lost his real claim. Nevertheless Phraates at first contented him- self with again sending a fruitless embassy to demand that Pompey would observe the treaty and acknowledge the Euphrates as the Parthian frontier, and it was only when Pompey had gone to Syria (64) that he again attacked and defeated Tigranes. Pompey declined to interfere by force and burden himself with a Parthian war while Mithradates of Pontus was still under arms, but, as both sides appealed to him, he sent umpires to settle the dis- pute (which probably turned on the possession of Cor- duene), and a peaceable solution was effected.!_ The Romans had done more than enough to irritate Parthia and not enough to inspire respect, but, as the Parthians were only beginning to recover from the inner and outer troubles of the last two decennia, they were not yet prepared to enter on a struggle with Rome.

For a century and a half up to the death of Mithradates the Great there had been an unusual degree of unity in the house of the Arsacids; but the corruptions to which every Eastern dynasty ultimately falls a prey appeared at length. About 57 Phraates, the restorer of the empire, was murdered by his two sons, one of whom, Orodes or Hyrodes I. (Zend, Huraodha), took the throne, while his brother Mithradates IIT. got Media ;? but the latter ruled so cruelly that he was expelled by the Parthian nobles, and Orodes reigned alone. Mithradates, with a loyal follower, Orsanes, fled to Gabinius, proconsul of Syria, who had already crossed the Euphrates to restore him by force when he was summoned by Pompey to restore Ptolemy XI. to the throne of Egypt (55). Mithradates, dismissed by the Romans, now tried what he could do without help. Orodes had at first to flee, but soon regained his position, mainly through the help of Surenas, a young noble who had the hereditary right of crowning the king, and was the second person in the empire in point of wealth, nobility, and

1 Dio, using in xxxvii. 6 a different source from that which lay before him at xxxvi. 51, has not observed that the former recapitulates the whole story from the beginning, including the rebellion and defeat of the younger Tigranes as related above.

2 This is Dio’s account, and, though other writers dissent, it is justified by the coins. Thecolns of Arsaces Philopator (or Theopator) Euergetes Epiphanes Philhellen belong to Mithradates, —not, as Gardner thinks, to his father, for Theopator denotes a king whose father was Arsaces Theos, and these coins call him only “ great king,’”’ while Orodes (Arsaces Philo- pator—or Euergetes—Dicaios Epiphanes Philhellen) is called “king of kings.” Both princes, it will be observed, ultimately give up the

title of Philopator, which marks them as colleagues or recognized heirs of their father,—an indirect confirmation of their guilt as parricides.

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[PARTHIAN

influence, and the first in courage and political skill, Surenas took Seleucia by storm ; Babylon received Mithra- dates, but was reduced by famine; Mithradates then sur- rendered to his brother and was killed before his eyes. These events carry us far into the year 54.

Meantime Crassus, hoping for a rich and easy prey, Cam. had invaded Mesopotamia without a shadow of pretext, paign of had defeated a small Parthian force at Ichne, and occu- Crssus.

pied a number of large towns, such as Nicephorium, Ichnee, Carrhe, whose Greek inhabitants welcomed the Romans as liberators. As Mithradates was at this time in arms in Babylonia, we can understand why Crassus was blamed for a grave error of judgment in not march- ing direct from Nicephorium on Seleucia and Babylon (Plut., Crassus, 17). Instead of this, he retired to winter- quarters in Syria, leaving 7000 foot and 1000 horse to garrison the Mesopotamian cities. Thus his hands were tied for the following campaign, and he could not accept the invitation of Artavasdes II. of Armenia to advance through his country and have his co-operation. A Par- thian embassy appeared in Syria in spring to remonstrate against the faithlessness of Rome, but at the same time the Parthians were ready for war. Surenas, with Silaces, satrap of Mesopotamia, was pressing the Roman garrisons, and prepared to confront Crassus with an army wholly composed of cavalry, while Orodes in person invaded Armenia. In the spring of 53

Crassus crossed the Euphrates at Zeugma with seven legions and 8000 cavalry and light troops, making up a total of 42,000 or 43,000 men,? and was persuaded by Abgar of Orrhoene to leave the river and march straight across the plains against Surenas. At mid- day, 6th May (9th June as the calendar then stood) the Romans had crossed the Balissus (Nahr Belik) and met Surenas half way between Carrhe and Ichne, or a little nearer the latter town. They were not, therefore, in the desert—as the older account represents—for it begins be- yond the Chaboras.* Surenas kept the mass of his troops concealed by a wooded hill, showing only the not very numerous vanguard of cataphracts till the Romans were committed to do battle. The Roman cavalry under Publius Crassus, son of the proconsul, charged the enemy to pre- vent a threatening flank movement, and were drawn away from the mass of the army by the favourite Parthian man- ceuvre of a simulated flight, and then surrounded and cut to pieces. The mass of the Roman host lost courage at this disaster, and already had suffered terrible loss from the light-armed hordes of Parthian serfs who hovered round the enemy at a safe distance and galled it with arrows shot with deadly precision. The legionaries serried their ranks and covered themselves with their shields; but in this close order they were easily broken by the charge of the Parthian freemen with their long heavy lances and almost impenetrable suits of complete armour. The heat, too, thirst, and dust oppressed the Romans, and this first day would have decided their fate but that the Parthians withdrew before evening, true to their rule of encamping

3 Florus says eleven legions and Appian 100,000 men; but Appian has made the mistake of adding to the legion its auxiliaries and count- ing the whole at the higher footing adopted under the empire. Seven such legions with the 8000 cavalry and light troops, and the 8000 men in garrison, make up his total. For the campaign of Crassus we have two independent narratives preserved in Plutarch and Dio; Plutarch’s is the older account, full of colour and valuable detail, but lacking in topographical precision ; in this respect Dio’s source is much to be preferred, but it has suffered from that author’s somewhat arbitrary way of meddling with his materials. The accounts based on Livy (Perioche lib., 106; Florus, iii, 11; Festus Rufus, Brev., 17, and Orosius, vi. 13) agree in all essential points with Plutarch, who, how- ever, draws not from Livy but from some Greek writer, perhaps Nicolaus of Damascus.

- Plutarch himself speaks of marshes (cap. 25); the only modern account that agrees with the facts is that of G. Rawlinson, p. 163 sg.

at a distance from the foe. Crassus retired at night, leav- ing all who were badly wounded behind him, and reached Carrhe safely ; but his army was sadly demoralized, and he himself lost his head, and, though fairly secure at Carrhe, thought only of immediate retreat to Syria.1 He marched by night northwards towards the mountains; the several divisions lost one another and each sought only to shift for itself. The questor Cassius, one of Crassus's best officers, returned to Carrhe and thence regained Syria in safety. Crassus himself, after getting dangerously en- tangled in marshy ground, had almost reached the moun- tains when he was induced, by the despair of his troops rather than by error of his own judgment, to yield to treacherous proposals of Surenas and descend again into the plain. As he mounted the horse which was to convey him to a meeting with the enemy's general the gestures of the Parthians excited suspicions of treachery, a struggle ensued, and Crassus was struck down and slain. Scarcely 10,000 men out of the whole host reached Syria by way of Armenia (Appian, B. C., ii. 18); 20,000 had fallen and 10,000 captives were settled in Antioch, the capital of Margiana. The token of victory, the hand and head of Crassus, reached Orodes in Armenia just as he had made peace with Artavasdes and betrothed his eldest son Pacorus to the daughter of the Armenian king. The Roman disaster was due primarily to the novelty of the Parthian way of assault, which took them wholly by sur- prise, and partly also to bad generalship ; but the Romans always sought a traitor to account for a defeat, and in the present case threw the blame partly on Andromachus of Carrhe, who really did mislead Crassus in his retreat, and was rewarded by the Parthians with the tyranny of his native town (Nic. Dam., in Athen., vi. p. 252 D),? but had no great influence on the disaster, and partly on Abgar, whose advice was no doubt bad, but not necessarily treach- erous,® while the silence of the older account disposes of Dio's improbable assertion that the men of Orrhoene fell on the rear of the Romans. That the Parthians did not count Abgar their friend and punished him with deposi- tion may be fairly inferred from the list‘ of kings of Edessa given by Dionysius of

Telmahar, which shows that the reign of Abgar IT. ended in 53, and was followed by a year of interregnum.

Surenas, the victor of Carrhe, whose fame was now too great for the condition of a mere subject, was put to death a little later, the victim of Orodes's jealousy ; the victory itself was weakly followed up. Not till 52 was Syria invaded, and then with forces so weak that Cassius found

'the defence easy. In July 51 (Sextilis, according to the

old calendar) the attack was renewed with greater forces ; the Romans were still weak in troops, their harshness and injustice had alienated the provincials, and some districts— as Judzea—openly sympathized with the foe. Thus all the chances were still favourable to the Parthians, who indeed overran the open country, but were too unskilled in Siege to take Antioch. As they drew off, Cassius stopped their way at Antigonia and inflicted on them a defeat in which Osaces, the real leader of their host under the young prince Pacorus,was mortally wounded (August 51). Pacorus wintered in Cyrrhestica, the Romans under the new pro- consul Bibulus not venturing beyond the walls of Antioch ;

1 That he waited for the new moon—+.e., some twenty days, as Dio Says—seems to be a mistake. Perhaps it is due to Dio himself; at all events, the older account is preferable. -™

- The Parthians leaned much on the despots of the Greek cities. Zenodotia, the only Mesopotamian town that Crassus had to storm, had a despot, Apollonius.

3 The alternative of a march along the Euphrates was also open to Serious military objections.

4 It must be remembered that a correction of four years has to be applied to all the dates in this list.

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but, the satrap of Mesopotamia’ having raised a revolt 53-88 3.0,

against Orodes in the name of Pacorus, the latter was recalled by his father and Syria was entirely evacuated by May 50.

Orodes avoided the threatened breach with his son by associating Pacorus in the empire;® but the Parthians took little advantage of the civil wars that preceded the fall of the Roman republic. They occasionally stepped in to save the weaker party from utter annihilation, but even this policy was not followed with energy, and Orodes refused to help Pompey in his distress because the Roman would not promise to give him Syria. The Pompeian Cexcilius Bassus was saved from Ceesar’s general Antistius Vetus by the sudden appearance of a Parthian force under Pacorus, which, however, retired when winter came on (December 45). In 43, again, Cassius had a force of mounted Parthian bowmen with him in Syria, but dismissed them when he marched to join Brutus and face the triumvirs. Labienus was with Orodes negotiating for help on a larger scale when the news of Philippi arrived, and remained with him till 40, when he was at last sent back to Syria, together with Pacorus and a numerous host. The Roman garrisons in Syria were old troops of Brutus and Cassius, who had been taken over by Antony ; those in the region of Apamea joined Labienus; Antony’s legate Decidius Saxa was defeated, and fled from the camp afraid of his own men. Apamea, Antioch, and all Syria soon fell into the hands of the Parthians, and Decidius was pursued and slain. Pacorus advanced along the great coast road and received the submission of all the Phoenician cities save Tyre. Simultaneously the satrap Barzaphranes appeared in Galilee; the patriots all over Palestine rose against Phasael and Herod (see Israzt, vol. xiii. p. 425); and five hundred Parthian horse appearing before Jerusalem were enough to overthrow the Roman party and substitute Antigonus for Hyrcanus. The Parthian administration was a favour- able contrast to the rule of the oppressive proconsuls, and the justice and clemency of Pacorus won the hearts of the Syrians. Meantime Labienus had penetrated Asia Minor as far as Lydia and Ionia; the Roman governor Plancus could only hold the islands ; most of the cities opened their gates to Labienus, the ‘“ Parthicus Imperator,” Stratonicea alone resisting and successfully standing a siege. But Rome even in its time of civil divisions was stronger than Parthia; in 39 Ventidius Bassus, general for Antony, suddenly appeared in Asia and drove

Labienus and his provincial levies before him without a battle as far as the Taurus. Here the Parthians came to Labienus's help, but, attacking rashly and without his co-operation, they were defeated by Ventidius, and Labienus's troops were involved in the disaster. Labienus himself escaped to Cilicia, but was captured and executed by the Egyptian governor of Cyprus. In the passes of the Amanus the Romans were again in danger, but Ventidius at length gained a decisive victory at Trapezon, north of the Orontes valley, where Phranipates, the ablest lieutenant of Pacorus, fell ; and the Parthians evacuated Syria. Before Ventidius had com- pleted the resettlement of the Roman power in Syria and Palestine, and while his troops were dispersed in winter- quarters, the Parthians fell on him again with a force of more than 20,000 men and an unusually large proportion of free cavaliers in full armour. Ventidius, however, gained time to bring up legions from Cappadocia by de- ceiving a dynast of Cyrrhestica, who was Pacorus's spy. Then a battle was fought near the shrine of Hercules at Gindarus in Cyrrhestica, on the anniversary, it is said, of the defeat of Crassus (9th June 38), and the Parthians were

5 The name was Orondapates, corrupted to "Opvodamrdyrn in Dio,

xl. 30. ® So the coins show, Gardner, p. 41.

utterly routed and Pacorus himself slain. His head was sent round to the cities of Syria which were still in revolt to prove to them that their hopes had failed. There was no further resistance save from Aradus and Jerusalem.

Orodes, now an old man and sorely afflicted by the death of his favourite son, nominated his next son, Phraates, as his colleague, and the latter began his reign by making away with brothers of whom he was jealous as the sons of a princely mother, daughter of Antiochus of Commagene, and then strangling his father, who had not concealed his anger at the crime (37). The

reign of Orodes was the culminating point of Parthian greatness, and all his successors adopted his title of “king of kings, Arsaces Euergetes” (taken from Phraates II.) “Dicaios” (first borne by the pretendant spoken of at p. 595, who was perhaps father of Sinatruces, and so ancestor of the succeeding princes) ‘“Epiphanes” (like Mithradates I.) “Philhellen ”! (like Phriapatius). It was he who moved the capital westward to Seleucia, or rather to Ctesiphon (Taisefun), its eastern suburb.?

Phraates IV. continued his reign in a series of crimes, murdering every prominent man among his brothers, and even his own adult son, that the nobles might find no Arsacid to lead their discontent. Many of the nobles fled to foreign parts, and Antony felt encouraged to plan a war of vengeance against Parthia.? Antony had no hope of forcing the well-guarded Euphrates frontier, but since the death of Pacorus Armenia had again been brought under Roman patronage, and he hoped to strike a blow at the heart of Parthia through Atropatene. Keeping the Parthians in play by feigned proposals of peace while he matured his preparations, he appeared in Atropatene in 36 with 60,000 legionaries and 40,000 cavalry and auxiliary troops, and at once formed the siege of the capital Phraaspa (Takht-i-Suleiman). The Median king Artavasdes, son of Ariobarzanes,* had marched to join Phraates, who looked for the attack in another quarter. Phraates had only 40,000 Parthians, including but 400 freemen who never left the king, and probably 10,000 Median cavalry ;> but these forces were well handled, and the two kings had reached the scene of war before Antony was joined by his baggage and heavy siege-train, and opened the campaign by capturing the train and cutting to pieces its escort of 7500 men under the legate Oppius Statianus. Antony was still able to repel a demonstration to relieve Phraaspa, but his provisions ran short, and the foraging parties were so harassed that the siege made no progress ; and, as it was now October, he was at length forced to open negotia- tions with Phraates. The Parthian promised peace if the Romans withdrew, but, when Antony took him at his word, abandoning the siege-engines, he began a vigorous pursuit, and kept the Romans constantly on the defensive, chastising one officer who hazarded an engagement by a defeat which cost the Romans 3000 killed and 5000 wounded. Still

1 Orodes indeed knew Greek and cared for Greek literature. The Bacchse was performed at his son's betrothal.

2 Ctesiphon was capital at the time of Crassus's invasion, and Amunianus (xxiii. 6, 23) calls Pacorus the second founder of the city, the first Vardanes being perhaps a mythical person. A coin of Orodes with the title xréorys (Gardner, 39) may refer to this,

- Of this war we have three accounts, all based on one source, prob- ably a monograph by Dellius. The best is Plutarch's (Ant., 37 sq., favourable to Antony). The later minor historians (who drew from Livy) and Dio (xlix. 23 sq.) are hostile to Antony (Octavianist) ; but the former, while sharing Dio's general point of view, approach Plutarch in many points of detail. Plutarch drew from the original source, indirectly perhaps through Nic. Dam.; Dio used Livy, but not exclu- sively. The point in the story where the mutual relations of the several narratives come out most clearly is in what is said of the adviser who saved the Romans from utter destruction.

4 Mon. Ancyr., col. vi. 1. 12.

@ Plut., Ant., 44; Justin, xli. 2, 6. The number 10,000 is given by Apollonides in Strabo, xi. p. 523.

greater were the losses by famine and thirst and dysentery ; and the whole force was utterly demoralized and had lost a fourth part of its fighting men, a third of the camp- followers, and all the baggage when, after a retreat of twenty-seven days from Phraaspa to the Araxes by way of Mianeh (276 miles), they reached the Armenian frontier,

Eight thousand more perished of cold and from snow-

storms in the Armenian mountains ; the mortality among the wounded was terrible; the Romans would have been undone had not Artavasdes of

Armenia allowed them to winter in his land. The failure of the expedition was due partly to the usual Roman ignorance of the geo- graphical and climatic conditions, partly to a rash haste in the earlier operations, but very largely also (as in the case of Napoleon's Russian campaign) to the lack of dis- cipline in the soldiers of the Civil War, which called for very stern chastisement even during the siege of Phraaspa, and culminated at length in frequent desertions and in open mutiny, driving Antony to think of suicide. The Romans laid the whole blame on Artavasdes, but without any adequate reason. At the same time the disaster of Antony following that of Crassus seemed to show that within their own country the Parthians could not safely be attacked on any side, and for a century and a half Roman cupidity left them alone.

The Median Artavasdes, whose little country had borne the whole brunt of the war, fell out with the Parthians about the division of booty, and made overtures to Antony for alliance with Rome; and in 33, when the Romans had treacherously seized the person of the Armenian Arta- vasdes and occupied his land, a treaty was actually con- cluded by which Symbace, which had once been Median, was again detached from Armenia, and Roman troops were sent to co-operate with the Median king in repelling the efforts of the Parthians to reseat on the throne of his fathers Artaxes, son of the deposed king of Armenia. These troops, however, were recalled before the battle of Actium, and then Media and Armenia fell before the Parthians ; the Romans who were still in the country were slain, and Artaxes II. was raised to the Armenian throne (30). In the very next year, however, the course of Par- thian affairs led Artaxes to make his peace with Rome.®

Phraates's tyranny had only been aggravated by his successes, and open rebellion broke out in 33. We have coins of an anonymous pretender dating March to June 32."

To him succeeded Tiridates II., whose rebellion was at a Tiridate | climax during the war of Actium. Towards the end of Il

30 Tiridates succumbed and fled to Syria, where Octa- vian, who was wintering in the province, allowed him to

remain. A fresh attempt made from this side, with the help

perhaps of the Arabs of the desert, and by crossing the Euphrates at the island now called Koha, had better success. The order of events here given is that deduced by Vaillant and Longuerue, combining the Roman history of Dio with the Parthian of Trogus,—Lachmann, who makes Tiridates be expelled only once and supposes a mistake on the part of Trogus as to place and date of his meeting with Augustus, assigning Ist March 29 as the date of Horace, Carm., ili. 8; but the chronological difficulties of this view are insuperable. Phraates was taken by surprise and fled, slaying his concubines that they might not fall a prey to his victor (Isid. Char., 1); Tiridates seated him- self on the throne in June 27,8 and Phraates wandered for some time in exile till he persuaded the Scythians to undertake his cause.

6 See coins in Eckhel, vi. 82, compared with Dio, li. 16, and the reference in Horace, Carm., ii. 9, 20-22.

7 Ascribed to Tiridates I]. by Gardner, p. 44 sq.

8 Desius, 285 Sel. In this month there are coins of Phraates and also of an Arsaces Kuergetes Autocrator Epiphanes Philhellen, who must be Tiridates I.

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To understand who his helpers were we must take up again the thread of the history of the far Eastern lands. It was now a century since the Tibetan races who had supplanted the Greeks to the north of the Hindu Kush had first exercised a decisive influence on western affairs, and during most of that time there had been little change in the boundaries of empire in eastern Iran. Since the time of Eucratides the centre of Greek influence had lain more to the south of the Hindu Kush and in India proper, and this was perhaps one reason why Sogdiana and Bactria were lost so early; since that loss Greek power and culture had their chief and most lasting seat in the Cabul valley, where colonies of Alexander were particularly numerous.

The places where coins have been found—and these are almost our only source of knowledge 1—prove that on the death of Eucra- tides the Indian country fell to Apollodotus and Bactria to Heliocles. Each of these held for a time the greater part of east Iran, but Apollo- dotus was the last Greek

king who ruled over Kandahar and Sistan. For a time there were also separate kingdoms in the Cabul valley under Antialcides, and in the district of Peshawar under Lysias, but after a period of civil wars they were all merged in one great Greco- Indian realm extending from Cabul to the Sutlej, and at times as far south as Barygaza; the capital was (akala (officially called Euthy- demia). Eight Yavana kings, says the Véyu-Purdna, rcigned eighty- two years, and just eight names? are found on coins whose distri- bution justifies us in attributing them to kings whose sway extended over the whole Greek realm. This confirms the historical value of the Indian source, and the eighty-two years will have to be reckoned from the time when Demetrius was driven out of Bactria and fixed his residence in the Punjab (c. 175), so that the end of the kingdom will fall about 98. Menander, the most important of the eight (ec. 125-c. 95 2),3 carried his arms farther than any of his predecessors, crossed the Hypasis, and pushed as far as the "Isamus," a locality which must be sought much farther east than used to be supposed, since his coins are common as far as Mathura (Muttra) and Rampur, and Indian sources tell us that the Greeks subducd Ayodhya, the land of the Panchala, and Mathura, and even took the old capital, Pataliputra. The Greeks were too few to hold these exorbitant conquests without much concession to native habits and prejudices, and we learn without very great surprise from a Buddhist book that Menander became a Buddhist. The same source? tells us that Menander was born at Alasanda (Alexandria ad Caucasum) or at the (neighbouring ?) village of Kalasi. Buddhism was strong ir this quarter at an early date, and a Buddhist stupa appears as type on a coin of Agathocles, who reigned in Arachosia and Drangiana about 180-165 (Sallet, op. cit., p. 95). A Greek source praises Men- ander's just rule ; the Milinda-prasna says, "In the whole of Jam- budipa there was no one comparable to Milinda Raja. . . he was endowed with riches . . . and guarded by military power in a state of the utmost efficiency " (Jour. As. Soc. Beng., v. 5382). When he died in the camp he received every honour paid to a deceased " chakravartti,'' and his ashes were divided, as Buddha's had been, in cenotaphs erected in every town. Perhaps political mingled with pious motives ; the struggle for the dust of Menander mentioned by a Greek writer may be compared with that among the ''diadochi " for the bones of Alexander, and so will be one phase of the many and long divisions among the Indian Greeks testified to by the coins. In little less than a century we have the names of twenty-three kings

all later than Eucratides, and nine of them apparently later than Menander. Thcy appear to belong to four kingdoms, the upper and lower Cabul valley, Peshawar, and the Punjab, and as there are but two names common to more than one king we may conclude that the rapid changes were often violent, that these were not fixed dynasties, perhaps that the kings rose by military election. All this confirms the Indian source (in Kern, wt supra, p. 38), “the fiercely-fighting Greeks did not stay in Madhyadega ; there was a cruel dreadful war in their own kingdom between themselves.”

All the time that the Greek kingdom lasted there was beside it another whose kings bear Scythian or Parthian names ; their coins belong chiefly to the western Punjab the outrunners of the Kashmir Himalayas, and west of the Indus, ajawar, and sometimes Bamian. The founder of this kingdom was Maues, a younger contemporary of Demetrius and Apollodotus, whose types are imitated on his coins. The coins confirm the Chinese notice that the Sse, driven from their seats at Balkash and Issi-kul, founded a kingdom in Kipin (Cabul valley) about 161, with the correction that the kingdom did not at once extend so far west, the coins of Maues being found only in the Punjab. Now this is just the country (between the Indus and Hydaspes) which is said to have submitted

1 For the facts used in this paragraph see especially Cunningham, in Num. Chron., new series, x., xii.

2 Demetrius, Eucratides, Apollodotus, StratoI., Strato II., Zoilus, Menandcr, Dionysius.

3 He must have had a long reign; see Sallet, Nachfolger Al. d. Gr., p. 34.

4 “Gérei-Sanhita,” in Kern, Vardha-Mihira, p. 87. This is an astronomical work of the Ist century of our era. The Isamus of Strabo, x1. p. 516, is probably the Sambus of Arr., Ind., 4, 4. The name is presumably corrupt, and Cunningham’s conjecture, Dodvov (the Céna) for “Ioduov, would suit best

but for the graphical difficulty it involves. ; 5 ‘‘Milinda-prasna,” in Hardy, Manual of Buddhism, pp. 516, 440.

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without a war to Mithradates I. of Parthia, and we must probably ¢.175-32 assume that it was the Sse who put themselves under the Parthian B.c.

empire, but that the arrangement was not a lasting one, the parties to it lying so far apart.

The kings of the Sse do not seem to have been Parthians,® but Kings of the nation was one of the many Iranian nomad tribes that once the Sse.

roamed over the steppes north of Sogdiana, while their coins show that they were influenced by the culture of the Indian Greeks, from whom they copied the titles of “satrap” and “strategus.”” The kingdom lay north of the Greeks, roughly bounded by the Cabul river and a line continuing eastward in the same latitude, and it is one of the unsolved puzzics of this obscure history how such a strip of mountain-land ever became so prosperous and powerful as it did under the second king, Azes, and how it was able to resist the might of Menander. We know from the Periplus that on the lower Indus the Parthians who fixed themselves there in the first Christian century had been preceded by a Scythian kingdom of sufficient permancncy to leave to the district the name of Scythia or Indo-Scythia. But that the Sse were the founders of this remote kingdom is not so certain as is usually supposed ; it is quite as possible that at the time when the Scythians overran Iran the founders of the Indo-Scythian kingdom advanced from Sacas- tane through the Bolan Pass. The Sse certainly did not force themselves wedge-like between the Greek settlements, and the chronology of the coins precludes the easy solution that their power developed only after the fall of the Greeks. The coins name five supreme kings—Maues, Azes, Azilises, Onones, Spalirises ; the dynasty began about 161 ; Azes, the second king, restruck coins of Apollodotus ; and there is not the least reason to doubt that he directly followed him, and that the power of the Sse under Azes fell in the time before Menander, when the Greeks were weak and divided. It was probably Menander who again drove the Scythians within narrower limits. ‘The coins show further a lack of unity in the later days of the Scythian kingdom, and, taking this fact with the smallness of the total number of names, we cannot con- clude that it lasted much later than the Greek realms.

Hermeus, the last of the Greek kings, held the lower valley of Chinese the Cabul river and Peshawar with the district around it and the annals.

belt of the Punjab opposite, and he reigned, as the effigies on his coins show, from youth to old age. These last days of Greek rule in the East fortunately receive light from the Chinese Annals (of the first Han).? After the opening of trade with the West about 105 p.c. the Chinese also visited Kipin, but their agents in this remote realm were repeatedly plundered by the King U-to-lao (between 105 and 87). At length, under the son of the latter, the Chinese commander on the frontier joined In-mo-fu, sou of the king of Yung-khiu, in a sudden attack on the king of Kipin, who was slain and In-mo-fu installed in his place. Difficulties arose between the new king and China, and when In-mo-fu ultimately tried to make his peace the emperor Hiao-yuan-ti had just resolved to break off all connexion with the distant western lands. As the Chinese kept no military guard of the western frontier till 59 B.c.,° and the new policy of Hiao-yuan-ti began soon after 49," In-mo-fu must have begun to reign in Kipin some time between 59 and 51. In 32 he again, but still in vain, sent tribute and attempted to reopen the profitable commerce with China. The coins keep us so well in- formed of the names of rulers in this period that In-mo-fu must be capable of identification, and no ruler can be meant but Hermeus, who in the commonest dialect of Prakrit would be Hermaid, a word necessarily mutilated by Chinese inability to pronounce 7. Yung- khiu is therefore Yonaki "' the city of the Greeks." The dethroned king of Kipin and his father U-to-lao must, from what the Chinese records tell of the origin of their power, be kings of the Sse ; U-to-lao is probably Azo Rad, '' king Azes."

We have Chinese accounts of the eastern lands of Iran in the time of open trade along the great south road from Phi-shan on the Chinese frontier over the Hanging Pass (beside Lake Yashil-Kul at the west end of the Alichur Pamir),!° and so south-west to Hian-tu (the Indians), and then to the fruitful and temperate plain of Kipin. The king of Kipin, a mighty lord, resided at Siin-Siin (perhaps Avovicou, Dionysopolis or Nagara, now Jalalabad). The inhabitants were industrious and ingenious in carving, building, weaving, and embroidery, and in silk manufacture ; vessels of gold and silver, utensils of copper and tin, were found in their bazaars. 'Their coins of gold

and silver had a horseman on one side and a human head on the other. The silver pieces here described may be those of Hippostratus, or of any other of the later Greek, or of the Scythian kings; but as none of these kings struck gold the pieces of

6 Mains differs only by a formative syllable from Mavéxys, leader of the Sace at Gaugamela (Arr., iii. 8, 3). *Ovdyys is a Parthian name, but really identical with that of Eunones, king of the Aorsi (Tac., Ann., xii. 15); the

names can hardly be Parthian. ; Ot eee Ritter, Erdkunde, wait, 8, 682 sq.; and Abel Remusat, Nouveaux Mélanges Asiatiques, i. 205 sq. –

8 Abel Rémusat, Mém. del Ac., viii. (1827) p. 119. oa

9 See what is related for the year 46 in Hist. Gén. de la Chine, iil. 161.

10 This identification is obtained by comparing the old description of the Hanging Pass (Rémusat, Nouv. Mél., 1. 209) with that of the pass traversed by the Chinese expedition to Badakhshan in 1759 (Hist. Gén., xi. 572).

27 B.c.- Eucratides with his bust on one side and the mounted Dioscuri

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on the other will still have had course. South-west of Kipin lay the hot plain of U-ghe-shan-li (Kandahar and Sistan), where the southern road ended (necessarily at a considerable commercial town, therefore at Alexandria in Arachosia). Hence a road leads to An-si (in its original sense, supra, p. 593), first northward (to Herat) and then east (to Merv). The inhabitants of U-ghe-shan-li, which was too remote to be often visited from China, hated blood- shed and had weapons adorned with gold and silver. Their coins are described in the same terms as those of Kipin ; and probably the latter had course, and there was no native mint. But there was an independent kingdom ; and, asit is certain that Drangiana and Arachosia were not at this time (middle of 1st century B.c.) subject to the Greeks—no coins of the successors of Apollodotus having been found there—we conclude that this

kingdom was that of the Sace, who overran Iran in 128. Later Chinese writers say that the country was subject to An-si (Parthia), and Isidore of Charax (1 B.c.) makes Arachosia a Parthian satrapy. It was prob- ably under Orodes that Arachosia was conquered and the Sace confined to Sacastane.

The latest coins of Hermeus bear also the name of a king, Kujula- Kaso, first in the Arianian and finally also in the Greek legend (Kofovdo-Kad¢gifov). Now the Chinese tell us (Afém. de U'Ac., xxv. 27, 29) that about a century after the Tochari (Yue-chi) conquered Bactria—t.e., 89-27 —Kieu-tsieu-khio, prince of Kuei-shuang, conquered the other four principalities of the Tochari and named his whole kingdom Kuei-shuang (Kashan). He then warred against the Parthians and took the great land of Kao-fu (Cabul), which had been subject to India, Kipin, and Parthia, as well as the neigh- bouring lands of Po-ta (north of U-ghe-shan-li; to be identified

'with the Pactyes or Patans originally settled in Ghér) and Kipin.

Wars and anarchy,

The last fact shows that Kicu-tsieu-khio is none other than Kofovdo-Kaddifov, who indeed is called on the coins Kashana- Yavugo, ''king of Kashan," and ''steadfast in the faith," d.¢., in Buddhism, which early found entrance among the Tochari. With this account of the conquest of Cabul it agrces that Isidore names Arachosia but not Cabul as Parthian. Now the war of the king of Kashan with the Parthians is none other than that undertaken by the Scythians to restore Phraates to the throne. Trogus had an excursus in this connexion on the Asianic kings of the Tochari and the fall of the Sacarauce (doubtless before the increased might of the realm of the Tochari). These intestine conflicts of the Scythians seem to have been at their height during the exile of Phraates, aud their issue decided his fortunes. The Romans followed these movements with attention because they threatened Tiridates, and Horace has repeated references to them of a kind that is more than poetic fancy (Carm., i. 26, 8 sg., and especially ill. 29, 26 sg.,—"' Tanais discors," wars of Tochari and Sacarauce ; '"plans of the Seres,"' the Chinese stood in close relation to these lands and had powerfully intervened in the affairs of the Sacarauce in 44),

Before the great host of the Scythians Tiridates retired without a contest. On Ist March 261 the news of this had not reached Rome; but in June, as the coins prove," Phraates again held the throne. 'Tiridates fled to Augustus, who refused to give him up, but agreed not to support him, and restored to Phraates a son whom Tiridates had carried off and placed in his hands as a hostage. The Parthian in return promised to give up the captives and ensigns taken from Crassus and Antony, and fulfilled his promise in 20, when Augustus was in Syria. He would hardly have done so perhaps had not his throne been again insecure; there is a break in the Parthian coinage after October 23, and it is not resumed for many years —a Sure sign of inner troubles, There is just one coin known of Phraates's later years (October 10 B.c.; Gardner, p. 62), which probably marks his return from a second exile; for we know from Josephus (Ant., xvi. 8, 4) that between 12 and 9 B.c. Mithradates IV. was on the throne of the Arsacids, and that Herod of Judea was accused of plotting with him against Rome? The revolt of Media Atropatene, which asked a king from Rome some time between 20 B.c. and 2 a.p., and received Ario- = ee ee ee ee

1 Hor., Cats ii, 19-20, belongs to this year, as appears from Phraates's coinage of Desius, 286 Sel. The reduction of the Can- tabrians refers to Augustus's personal presence in Spain in the end of 27 (Dio, liii. 22), not to their second reduction in 25, which could hardly be known in Rome on 1st March. The retreat of the Scythians refers to the Sarmatian war (Florus, iv. 12, 20).

2 Prokesch-Osten, Monnaies des Rois Parthes, p. 37.

3 Vaillant having missed this passage, no later writer cites it.

barzanes II., son of Artavasdes, was probably about this time (Aon. Anc., vi. 9). In 10 or 9 B.c. Phraates took the precaution of sending his family to Rome so that the rebels might have no Arsacid pretender to put forward, keeping only and designating as heir his youngest son by his favourite wife Thea Musa Urania, an Italian slave-girl presented to him by Augustus. This

was mainly a scheme of Urania's, and she and her son crowned it by murdering the old tyrant. Phraates V., or as he is usually called Phraataces (diminutive), was thus the third Arsacid, in successive generations, to reach the throne by parricide.4

Phraates V., whose first coin is of May 2 B.c., tried an Phrases energetic policy, expelling Artavasdes III. and the Roman V.

troops that supported him from Armenia, and seating on the throne Tigranes IV., who had been a fugitive under Parthian protection. Ariobarzanes of Atropatene was probably expelled at the same time; a little later we find him in exile at Rome, and (in spite of Strabo, xi. p. 523, who perhaps had not the latest news) the old line of Atropates seems now to have been superseded by a line of Parthian princes. As Augustus did not wish to extend the empire, and Phraates was not very secure on his throne, neither party cared to fight, and an agreement was patched up after some angry words, Phraates resigning all claim on Armenia and leaving his brothers as hostages in Rome (1 4.D.). Phraates now married his mother, who appears with him on coins from April 2 a.p.,a match probably meant to conciliate the clergy, as he knew that the nobles hated him. In fact he was soon driven by a rebellion (after October 4 a.D.) to flee to Roman soil, where he died, it seems, not long afterwards.

The Parthians called Orodes II. from exile to the throne. Civil Of him we have a coin of autumn 6 a.p.: but his wild wars

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and cruel temper soon made him hated, and he was

murdered while out hunting. Anarchy and bloodshed now gaining the upper hand, the Parthians sent to Rome (before 9 a.D.), and received thence as king Vonones, the eldest of the sons of Phraates IV., a well-meaning prince, whose foreign education put him quite out of sympathy with his country. He preferred a litter to a horse, cared nothing for hunting and carousals, liked to be with Greeks, and relaxed the stringent etiquette that barred approach to the sovereign, and at the same time he tried to check peculation. A strong reaction of national feeling took place, and the main line of the Arsacids

being now exhausted by death or exile, Artabanus, an Arsacid on the mother’s side, who had grown up among the Dahe and had after- wards been made king of Media (Atropatene), was set up as pretendant in 10 or 1] a.p. Artabanus was defeated at first,° but ultimately gained a great and bloody victory and seated himself in Ctesiphon. Vonones fled to Armenia and was chosen as king of that country (16 a.p.), but Tiberius, who was anxious to avoid war, and did not wish

to give Artabanus III. any pretext to invade Armenia, Arta- By and by he was banus interned in Cilicia, and in 19 a.p. lost his life in an

persuaded Vonones to retire to Syria.

attempt to escape.

The clearest proof of the miserable results of continual civil war in Parthia at this time is that a Jewish robber state maintained itself for fifteen years in the marshes of Nearda and the Babylonian Nisibis a little after 21 a.p.,

4 Of the Beni Jelldb, who reigned in Tugurt till after the middle of the present century, every sultan is said to have murdered his father, and Mahmud Shah of Guzerat (1538-54) made all his wives procure abortion as the only possible protection for a king against attempts of sons on his life,

> A drachma of King Vonones when he had conquered Artabanus is one of the earliest examples of the use of the personal name of the king instead of the throne name. The practice became common, and marks an era of disputed successions, when it was necessary to indi- cate to which pretendant a coin belonged.

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and that, when some satrapies were in revolt and others threatened it, the great king made a pact with the bandits to keep Babylonia in control in his

absence. Yet amidst such constant rebellions Artabanus III., shrewd and energetic, not merely held his own but waged successful foreign wars, set his son Arsaces on the throne of Armenia, and challenged Rome still more directly by raising claims to lordship over the Iranian population of Cappadocia. Through the whole first century of the Roman empire all relations to Parthia turned on the struggle for influence in Armenia, and, much as he loved peace, Tiberius could not suffer this disturbance of the balance of power to pass un- noticed. He persuaded Pharasmanes, king of Iberia, to put forward his brother Mithradates as claimant to the Armenian throne. The Iberians, after having procured the assassination of Arsaces, advanced and took Artaxata, the capital ; and, when the Parthians came against them under Orodes, another son of Artabanus, Pharasmanes strengthened himself by opening the Caucasian Gates to the Sarmatians,! whose chiefs were easily gained to fight where there was money or booty to be got. A bloody battle ensued; Orodes was wounded in single combat with Pharasmanes, and his troops fled, believing him to be dead. In 36 Artabanus himself took the field, but a widespread revolt, long prearranged by Tiberius with a Parthian party led by Sinnaces, rose behind him in the name of Tiridates, a grandson of Phraates IV., who had been chosen as pretendant from the Parthian princes at Rome, and Artabanus retired to Hyrcania to resume his old relations with the adjacent nomads. The Roman legate of Syria, Lucius Vitellius, with his legions, led Tiridates into Parthia, where his followers joined him; Mesopo- tamia, Apolloniatis, and Chalonitis did homage; and the Syrian and Jewish population of Seleucia, which hated the party of Artabanus (the oligarchy of the 300 “adi- ganes” drawn from the old Greek families), were grati- fied by democratic institutions. In Ctesiphon Tiridates was crowned by Surenas, but without waiting for Phraates and Hiero, satraps of two chief provinces (Upper and Rhagian Media?), who became his enemies for this slight. Nor were they alone in their jealousy of the absolute court-influence of Sinnaces and his father Abdagases. Artabanus was called back and appeared from Hyrcania with an auxiliary force of Dahz and Sacz ; Tiridates re- tired to Mesopotamia, where his party was strongest, but his army melted away, and in 36 a.p. he took refuge in Syria. Much as Artabanus hated the Romans, his insecure position at home drove him in 37 to make an accommoda- tion on terms favourable to them and send his son Darius as hostage to Tiberius. Indeed, he was again for a short time an exile with Izates of Adiabene, who, however,

effected his restoration and was rewarded by the transference of Nisibis to him from Armenia, which the Parthians had again got in their hands, taking advantage of the foolish policy of Gaius Cesar, who had tempted Mithradates of Armenia to Rome and imprisored him there. Artabanus died soon after his second restoration, probably in 40 A.D., as Josephus (Ant., xviii. 7, 2) still mentions him in 39.

In Artabanus's lifetime the second place in the empire had been held by one Gotarzes, who appears to have been his colleague in the upper satrapies, and perhaps his lieu- tenant in his flight to Adiabene. But there is monumental evidence? that he was not, as Josephus says and Tacitus

1 Josephus, Ant., xviii. 4, 4 (according to the MSS.), says Alans ; SxvOas is an interpolation. In modern as in ancient times Tberian kings have repeatedly followed the same dangerous policy to increase their strength. The power of the Christian kings of Georgia in the 12th century rested wholly on alliance with the mountain tribes.

2 On a Greek inscription at Bisutun he is "satrap of satraps and T'edrro8 pos" (son of Géw); on a coin he probably appears as Goterzés, king of the kings of the Areani (east Iranians), son of Ge, "kalymenos A

implies, Artabanus's son (except by adoption), and so we 21-45 a.p.

find that the succession first fell to Vardanes, who coined money in September 40. But in 41 Gotarzes appears as king. The cruelties of Gotarzes gave Vardanes an oppor- tunity of return; in two days he rode 345 miles, and taking his rival by surprise forced him to flee, and occupied the lower satrapies, where he coins regularly from July 42 onwards. Vardanes now laid siege to Seleucia, which had been in rebellion since it opened its gates to Tiridates in 36, but was presently called away to meet Gotarzes, who had secured the aid of the Hyrcanians and Dahe. The renewal of civil war enabled the emperor Claudius, with the aid of the Iberians, to drive the Parthian satrap Demonax from Armenia and reseat Mithradates on the throne.? Meantime Gotarzes and Vardanes were face to face in the plain of western or Parthian Bactria, but an attempt on the life of the latter having

been disclosed by his foe they made peace, and Gotarzes withdrew to Hyr-
cania, while Vardanes, confirmed in his empire, returned to Seleucia and
took it in 43 after a siege of seven years.

Seleucia was then a city of vast resources; in the time of Pliny Seleucia.

it reckoned 600,000 souls, and the neighbourhood of Ctesiphon had: not
ruined it as Seleucia had ruined Babylon. Indeed Strabo (xvi. p. 748) is
probably to be believed when he says that Ctesiphon was founded as the
winter residence of the Parthian kings mainly out of consideration for
Seleucia, whose merchants would have been incommoded by the quartering
on them of the rude hordes of nomads who formed the larger part of the
army which surrounded the court. The friendship of the Parthians was
necessarily impaired by the long rebellion and the insolence of the
Seleucians,; in 41 the Syrians and Greeks put aside their own quarrels and
united to slaughter the Jews; the survivors fled to Ctesiphon, and even here
the hatred of the Seleucians followed them in despite of the great king.
Probably, therefore, it was as a rival to Seleucia that Volagases (or
Vologeses) I. founded a little later Vologesocerta (near Hira) on a site very
favourable for commerce. From the middle of the first Christian century
Greek influence declined, and Orientalism revived in Parthia. The types of
the Arsacid drachme —the imperial money—grow more and more barbaric
from the time of Artabanus III. ; and Pahlavi legends, first found on coins
of Volagases I., become predominant with Mithradates VI., the con-
temporary of Trajan. . Vardanes was deterred from an attempt on Armenia
by the threatening attitude of Vibius Marsus, legate of Syria from 42 to 44,
and the rest of his reign was fully occupied by internal affairs. In February
45 Gotarzes had renewed

his pretensions and struck money, supported by the re-

bellious nobles, and Vardanes, after defeating him at the Var- passage of the
Erindes,* pursued him eastwards through anes.

the deserts, driving the nomads before him as far as the Sindes (‘Tejend),
which divided the Dahe from the Arians, and returned boasting “that he had
reduced nations who never before had paid tribute to an Arsacid.” The glory
that was held to surround these exploits on a stage scarcely different from

that on which the oldest Parthian history had been enacted is a striking proof of the neglect of the original home of the monarchy under the pressure of Western affairs; but that Vardanes was a great king is plain from the high praise of Tacitus and the attention which the greatest of Roman historians bestows on a reign which had no direct relations to Rome. Vardanes, whose last coin is of August 45, was murdered while huntmg—a victim, we are told, to the hatred produced by his severity to his subjects. But in judging of the charges brought against him and his two predecessors we must remember that the rise of a new dynasty like that of Artabanus is of Artabanus. ‘The last title seers to mean “alter ego” ; it appears miswritten Tadtpevos in Dio, xl. 12, as applied to Silaces, whom Orodes I. sent against Crassus; comp. New Persian kaherman, agent.” Philostratus, in his life of Apollonius, which contains much that is useful for this period, regards the expulsion of Gotarzes as a restoration

of the Arsacids. 3 In the chronology of what follows Longuerue’s arrangement has been brilliantly confirmed by the coins. 4 Or Charindas (Ptol., vi. 2, 2), now the Kerind, which separates Mazandaran from Astarabad. xvi — 76

45-75 A.D.

Gotarzes.

Vola- gases I.

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always accompanied by deeds of violence, and that the oppressed subjects are simply the utterly unruly Parthian nobles who had lost all discipline in the long civil wars, and could only be controlled by force.

After another period of dispute we now find Gotarzes again on the throne and coining regularly from September 46 onwards. But his qualities had not improved, and in 47 a secret embassy of malcontents was at Rome asking Claudius to send them as king Meherdates, son of Vonones. In 49 the legate, Gaius Cassius, did in fact conduct Meher- dates (Mithradates V.) as far as Zeugma, where he was met by divers Parthian magnates, and ultimately,

after a detour through the snows of Armenia, got as far as Nineveh and Arbela. But his only real strength lay in Carenes, satrap of Mesopotamia ; Abgar V. and Izates, the kings of Orrhoene and Adiabene, pretended to be with him, but were in private understanding with Gotarzes, and deserted before the decisive battle in which Carenes was surrounded and Meherdates taken (50 a.p.). Gotarzes cut off his rival's ears, but spared his life—an act of leniency most unusual in the East, which proves how much the national feeling of the Iranians despised the pretenders foisted on them by Rome.

Gotarzes died of a sickness, not before June 51, and was followed by Vonones IT., who had been king in Atro- patene, and was probably a brother of Artabanus III. According to the coins his short reign began before Sep- tember 51 and did not end before October 54.1 He was succeeded by his eldest son, Volagases I., the brothers acquiescing in his advancement, although his mother was only a concubine from Miletus (comp. Tac., Ann., xii. 44, with Plut., Crassus, 32), and receiving their compensation by being nominated to kingdoms which gave them the second and third places after the " king of kings,"—Pacorus to Media or Atropatene and Tiridates to Armenia,? which the Parthians invaded (in 52 ?) to expel the usurper Rada- mistus, murderer of King Mithradates. Radamistus was not finally disposed of till 54, when his own people rose against him. The Armenians now offered no resistance to the Parthians, but the Romans were not content to lose their influence in the land, and their plans were favoured by the rising of a new pretendant, the son of Vardanes, against Volagases. The latter had marched to chastise Izates of Adiabene, whose conduct had been very ambiguous in previous embroilments with Rome, when a great army of Dahze and Sace entered Parthia. Of the son of Vardanes 8 we have coins from December 55 to July 58, and as the series of coins of Volagases begins only in 61 it was prob- ably not till then that he had quite mastered his more powerful rival and consolidated his own authority. At first he had to evacuate Armenia, and in 55 he even gave up the chief Arsacids as hostages to Domitius Corbulo, Nero's commissioner on the frontier. In 58, however, Volagases was again able to commence great operations in Armenia, though direct war between Parthia and Rome was still avoided, both sides accepting the fiction that what was done in Armenia was the private affair of Tiridates. The Parthians, indeed, were still

in no condition for a great war ; the intestine discords continued, and in 58 Hyrcania,

? Gardner (p. 51) is wrong in ascribing this coin to Volagases I. Tacitus makes Volagases come to the throne in 52 or 53, but if this is right he must have been associated in the empire under Vonones.

2 Tac., Ann., xv. 2. There was at this time a fourth monarchy under a Parthian king in east Iran and on the Indus, and a fifth among the Scythians (or rather the Maskhuth) on the northern slopes of the Caucasus, where an Arsacid reigned in 19 a.p. (Tac., Ann., ii. 68). As the Median kingdom was subsequently united to the chief empire, the later Armenian historians, Agathangelus (Langlois, i. 109) and Sebéus (

3 His name was probably Nanes, for BNANO on a copper coin (Gardner, p. 51) must be read Blacihéws] Navo[v].

one of the oldest Parthian lands, revolted and sent an embassy to seek alliance with Rome. In the same year,

and in that which followed, Corbulo was able with little resistance to destroy Artaxata, occupy Tigranocerta, and

set on the Armenian throne, supported by Roman troops, Tigranes V., a prince of that branch line of the Herods which had been established in Cappadocia. At length,

in 61, Volagases made peace with the Hyrcanians, ac- knowledging their independence ; then, solemnly crowning Tiridates as king of Armenia, he directed his whole forces against Tigranes. Open war with Rome, however, was still delayed by negotiations with Corbulo, who proposed

a peace with a secret condition that the Roman troops should be withdrawn from Armenia. He felt, no doubt, that Tigranes, who had inherited the

servility but not the vigour of his ancestor Herod, was not strong enough to secure the obedience of a population which greatly pre- ferred the rule of the Parthians as their brethren in faith, manners, and descent. But Rome refused to confirm the treaty, and war was declared.4 The first year of the war (62) was unfortunate for the Romans, and ended with the capitulation of Czsennius Pzetus (who now commanded in Armenia) at Randea, on the southern bank of the Arsanias (2.e., Aradzani, the Armenian name for the upper Euphrates), near Arsamosata. The Romans evacuated Armenia and had also to build the Parthians a bridge over the Arsanias. Corbulo meantime was in Syria, and had purposely left Petus in the lurch, contenting himself with securing the passages of the Euphrates and guarding them by castles

on Parthian soil. He now came to an agreement with the Parthian general, Monzses, to raze the castles in return

for the evacuation of Armenia by the Parthians till Rome should be again consulted. Next year the war was re- sumed, and Corbulo, crossing the Euphrates at Melitene, had penetrated into Sophene when the Parthians earnestly sought peace. It was agreed that Tiridates should lay down his diadem and go to Rome in person to receive it again from the emperor, which was done accordingly in

66. The real advantage of the war lay more with Parthia than with Rome, for, if the Roman suzerainty over Armenia

was admitted, the Parthians had succeeded, after a contest which had lasted a generation, in placing an Arsacid on

the Armenian throne. After Nero’s death Volagases formed very friendly relations with Vespasian, which endured till

75. Meantime all Iran was sorely troubled by the Alans, Alan | who had spread themselves a little before over the plains inroad.| on the north-west slopés of the Caucasus as far as the Don and the Sea of Azoff. In 72 the king of Hyrcania opened the pass of Derbend to these barbarians, who ravaged Media and drove King Pacorus into the recesses of his mountains, even capturing his harem. Armenia was also plundered, and the bandits

retired laden with booty. In 75 the Alans entered Parthia itself and pressed Vola- gases so hard that he made an ineffectual application for help to Vespasian.> Vespasian's refusal very nearly led to war, and Trajan, who was now governor of Syria, was pre- pared for a Parthian invasion,' but Vespasian's pacific firmness ultimately averted an outbreak.'

We have the evidence of Tacitus (Ann., xi. 8) and J osephus (Ant., xx. 4, 2) that Bactria was the eastern limit of the Parthian empire

4 Tacitus and Dio in this part of the history are both dependent on the very mendacious memoirs of Corbulo. Tacitus, as appears from Ann., xv. 16, distrusted his source and followed it with more discrimi- nation than Dio, but is still more favourable to Corbulo than a criticism strictly proceeding on the known facts can admit to be right.

> It must have been against the Alans that Vespasian in this year, according to a Greek inscription of Metskheta (Journ. As., ser. 6, xii, 93), fortified the castles of the Iberian Mithradates and of the Jamasdaites.

S This is all that is meant by " Parthica laurus," Plin., Paneg., 14,

7 In Victor, Cxs., 9, 10, read "ab illo" for "ac bello," comparing the epitome.

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in 42 and 54 A.D., but in 59 the Hyrcanian ambassadors were able to return home from a port on the Persian Gulf without touching Parthian soil (Tac., Ann., xiv. 25). This implies that all the upper satrapies had been lost to the empire. The Hyrcanians were still independent ¢. 155 during the reign of Antoninus Pius (Victor, Epit., 15, 4). In 72 they held the whole southern coast of the Cas- pian, and for a time at least bordered on a Parthian kingdom which had succeeded that of the Scythians in Sacastane at a date subse- quent to that of Isidore of Charax (1 B.c.). The names of seven kings of this dynasty, beginning apparently with an Arsaces Dicxus, are known from coins. The most powerful of these was the Gon- dophares under whom, according to the legendary Acta Thome,} the apostle Thomas came to India in 29 a.p.; he reigned over a great territory, which in large part had

formerly belonged to Par- thia, his coins being found mainly in Herat, Sistan, and Kandahar, but also in Begram and sometimes in the Punjab; an inscription at Takht-i-Bahi, north-cast of Peshawar, makes his twenty-sixth year the hundredth of an era which is probably that of the intro- duction of Buddhism in the Cabul valley.2_ The dynasty of Gon- dophares, however, was but loosely constituted : we often find two kings at one time ; and the Periplus (70 a.p.), which tells us of the possession of old Indo-Scythia by these Parthians, says that one king was constantly displacing another, a sure symptom of a mori- bund condition. One of the last kings, Sanabares, reigned a little after 78 A.D. (Sallet, op. cit., p. 158). The author of the Periplus had also heard of the independent and very warlike nation of the – Bactrians, ¢.¢., the Tochari, whose greatest conquests fall at this time. Kieu-tsieu-khio, the founder of their power, died, according to Chinese accounts, at the age of eighty, and was succeeded by his son Yen-kao-chin, who conquered the Indus lands. The Tochari were then more powerful than ever, and ruled as far as Shao-ki or Oude. The coins, on the other hand, lead us to distinguish between Kozola-Kadaphes, the immediate successor of Kozulo-Kadphizu (who borrows the latter's name and titles, and whose copper money found at Manikyala in the Punjab may be dated by its offering a close imitation of the head of Augustus on denarii struck between 4 B.c. and 2 A.D.), and the real conqueror of India, Ooémo-Kad- phisés (Ar. Hima Kapi¢d), who reigned from about the middle of the 1st century 4.D., and whose might is proved by his striking gold, which no one had done since Eucratides. His coins, frequent in Kabulistan and the Punjab, have been found as far as Benares. This evidence is reconciled with the Chinese account by an Indian notice in Kern, Vardéha-Mthira, p. 89, which shows that the con- quests of the Tochari were for a time interrupted. It speaks of a robber (aka king who was very powerful (z.¢., Yen-kao-chin, or Kozola-Kadaphes), after whom there were five native kings. Of these the first four reigncd but a few years, while the fifth, who is unnamed, had a reign of twenty years over a happy land, after which

in earnest but for the disorders of the times, indicated by 75-115 a.p.

a break in the Parthian coinage between 84 and 93, in which latter year Pacorus appears as sole king.§

At this time the political horizon of Parthia was very wide, and its intercourse with the farthest East was livelier than at any other date. In 90 the Yue-chi had come to war with the governor of Chinese Tartary and been reduced to vassalship; in 94 a Chinese expedition slew their king, and, advancing to the “North Sea”

| (Lake Aral), subdued fifty kingdoms.? The Tochari, one

sees, like the Greeks before them, had neglected the lands north of the Hindu-Kush in their designs on India ; even of Ooémo-Kadphisés no coins are found north of that range. In 97 Chinese envoys directed to Rome actually reached the Mediterranean, but were dissuaded from going farther by Parthian accounts of the terrors of the sea voyage, and in 101 Muon-kiu, king of the An-si (Parthians), sent lions and gazelles of the kind called “fu-pa” (BotBados) to the emperor of China. Muon-kiu reigned in Ho-to, ae, Carta or Zadracarta in Hyrcania; he was therefore a king of the Hyrcanians, who also held the old Parthian lands east of the Caspian Gate, and may be identical with a king, rival to Pacorus, who struck copper coins in 107 and 108, if the latter is not identical with the later monarch Osroes. But anyhow the representative of the Parthian power in the west was still Pacorus IL, who in 1108 sold the crown of Edessa to Abgar VII. bar Izat, and died soon after, making way for his brother Osroes, who coins in the same year, but had to reckon with two rivals, viz., Volagases II. (who reappears after an interval of thirty-three years), from 112 onwards, and Meherdates (Mithradates) VI. The latter was a brother of Osroes, and so probably was the former. None of the three was strong enough to conquer the others, and continual war went on between them till Osroes was foolish enough to provoke Roman intervention by taking Armenia from Exedares, son of Pacorus, to whose appointment Rome had not objected, and transferring it to another son of Pacorus called Parthamasiris.

Trajan, who had quite thrown over Trajan’s the principle of the Julii and Flavii, that the Danube and ©°n- the Euphrates were the boundaries of the empire, and was 1¢*-

the Cakas began their depredations again. The unnamed king may be identified with a king wearing earrings, and therefore Indian,

whose coins, found by sackfuls in Begram, and occasionally in the Punjab, Malwa, and even farther east, mark him as a neighbour and probably contemporary of Gondophares ; they bear no name, but only the title “king of kings” and “great saviour.”? The Tecommencement of the Caka conquest will thus begin with Ooémo-Kadphisés, who was the immediate predecessor of Kanérki or Kanishka, the founder of the Turushka dynasty, whose accession in 79 A.D. is the epoch of the (aka era (Oldenberg, Z. f. Nwm., Vili, 290 sq.), and marks the consolidation of affairs in the East.

Volagases I. died soon after the Alan wars, leaving a just reputation by his friendly relations to his brothers—a thing so long unknown—his patient steadfastness in foreign war and home troubles, and his foundation of a new capital. Perhaps also he has the merit of collecting ‘from fragments or oral tradition all that remained of the Avesta. From June 78 we find two kings coining and reigning together, Volagases II. and Pacorus II., probably brothers. From 79 there isa long break in the coins of the former, and Artabanus IV. takes his place with a coin struck in July 81. This Artabanus appears as the pro- tector of a certain Terentius Maximus, who pretended to be Nero®; he threatened to restore him and displace Titus by force, and, though the pretender was at length given up, the farce, which was kept up till 88, might have ended

1 See WV. Rhein. Mus., xix. 161 sq.

- This was 500 years after Buddha (Z. f. K. d. Morgenl., iii. 129), Which would give the date 57 a.p. j

3 This is perhaps the king gud regnavit sine nomine of Suetonius, De Regibus (Auson., Ep., 19).

4 Dinkart, in Haug, Pahl.-Paz. Gloss., p. 144, calls the king who did this only Valkosh (7.e., Volkash), descendant of Ashkan.

5 Zonaras, xi. 18; Orac. Sib., iv. 124, 137.

fully embarked on the old Chauvinist traditions of the republic, would not let such an occasion slip; and, refus- ing an answer to an embassy that met him at Athens, he entered Armenia and took Arsamosata® without battle, after receiving the homage of western Armenia (114). Parthamasiris submitted himself to the emperor, but Trajan declared that Armenia must be a Roman province, appointed an escort to see the Parthian over the border, and when he resisted and tried to escape ordered his execution,— a brutal act, meant to inspire terror and show that the Arsacids should no longer be treated with on equal terms. Armenia and the neighbouring kings to the north having given in their submission, Trajan marched back by Edessa, receiving the homage of Abgar. The campaign of 115 was in Mesopotamia, and the burden of it fell on Mebar- sapes of Adiabene and his ally Mannus of Singara. At

6 There is a naive personal character about all the feelings of the Arsacids towards the Caesars. Artabanus III. orders deep mourning for Germanicus, and sends Tiberius an insulting letter, advising him to escape the hate of his subjects by suicide. Volagases I. urges the senate to honour the memory of Nero. In the support given to the pseudo- Nero legitimist sympathies with the Julii may have combined with

| the wish to pay back in their own coin the Romans who had so often

backed Parthian pretendants. 7 Hist. Gén. dela Chine, iii. 393 sq.

8 The third year of Abgar VII. was the fifteenth of Trajan (Cureton, Ane. Syr. Doc., p. 41); this involves a correction of +23 years applied to all Dionysius of Telmahar’s dates for the later kings of Edessa, as well as a blank of nineteen years before Abgar VII.

9 Read péxpis “Apsapoocdrwy in Dio, lxviii. 19. Samosata was a Roman town, and if they had lost it first this would have been mentioned.

115-191. its close Mesopotamia was made a Roman province ; the

Cardueni and the Marcomedi! of the Armenian frontier had also been reduced, and Trajan received the title of “Parthicus.” In 116 the Tigris was crossed in face of the enemy (probably at Jezirat ibn ‘Omar), and a third new province of Assyria absorbed the whole kingdom of Mebarsapes. Once more the Tigris was crossed and Babylonia invaded, still without resistance from the Parthians, whose intestine disorders continued. A Roman fleet descended the Euphrates and the ships were conveyed across on rollers to the Tigris, to co-operate with the army ; and now Ctesiphon fell and Osroes fled to Armenia, the north-east parts of which cannot have been thoroughly subdued. The Roman fleet descended the Tigris and received the submission of Mesene ; but now, while Trajan was engaged in a voyage of reconnaissance in the Persian Gulf—plainly aiming at Bahrein—all the new provinces revolted and destroyed or expelled the Roman garrisons. The rebels, whose centre was in Mesopotamia, set Meher-

dates VI. at their head ;? and, when he died by a fall from”

his horse in a foray on Commagene, his son, Sinatruces II., took his place, and was aided by an army which Osroes sent from Armenia under his son Parthamaspates. The reconciliation of the Arsacids among themselves was rewarded by the defeat and death of the Roman general Maximus; but jealousy now sprang up between the cousins, and of this Lusius, a second general sent by Trajan from Babylon, took advantage to draw Parthamaspates to the Roman side by a promise of the Parthian throne. Sina- truces was defeated and slain, Nisibis retaken, Edessa stormed and destroyed, and the whole rebellion put down ; but Trajan now saw what it would cost to maintain direct Roman rule over such wide and distant conquests, and Parthamaspates was solemnly crowned in the great plain by Ctesiphon in the presence of Romans and Parthians (winter 117). An unsuccessful siege of Atra (Hatra) in the Mesopotamian desert was Trajan’s next undertaking ; illness and the revolt of the Jews prevented him from resuming the campaign, and after Trajan’s death (7th August 117) Hadrian wisely withdrew the garrisons from the new provinces, which would have demanded the con- stant presence of the imperial armies, and again made the Euphrates the limit of the empire. Parthamaspates too had soon to leave Parthia, and Hadrian gave him Orrhoene.® Thus Trajan’s Chauvinist policy had no other result than to show to the world the miserable weakness to

which discord had reduced the Parthians. And the discord did not cease even now, for, though Osroes was restored, Vola- gases still continued to coin, whether as rival or as partner of his rule, in some part of the realm. Hadrian continued to preserve peace, though a war threatened in 123,> and in 130 he restored to Osroes his daughter taken captive by Trajan at Ctesiphon. Osroes died soon after, and Volagases II. became sole monarch, dying in November 148 at the age of about ninety-six, after a reign of seventy-one years.®

1 Rutr., viii. 3; Festus Rufus, Brev., 20. Marcomedi are the Medes called Markh, the plural of Mar, “ Mede” in Armenian.

2 ‘What follows is drawn from Malalas, who has two passages (i. 351- 352 and 357-358) drawn from Arrian’s Parthica, but placed in a wrong context.

3 He is the Parnathsapat who was king of Edessa from 119 to 128 ; this fact and its relation to Spart., Hadr., 5, has escaped notice owing to the false chronology of Dion. Telm.

4 A proof of this is that very few silver drachmez and no tetra- drachms were struck between 96 and 120.

> See Diirr, Reisen des K. Hadrian, p.48. The removal of Partha- maspates and restoration of the old dynasty of Osrhoene may have been a concession made on this occasion.

6 The Volagesus who appears in connexion with an Alan invasion of Media, Armenia, and Cappadocia in 185 is from the context a different person, viz., the unnamed king of Armenia who was appointed

by Hadrian in 117 (Spart., Hadr., 21), and whose successor took the throne between 140 and 143 (Eckhel, Doct. num. vet., vii. 14).

PHRSITA

Volagases ITI., who succeeded, had designs on Armenia, Vola. | but an interview between him and Antoninus Pius (spring 8asesI.

155) delayed for a time the outbreak of war.’ However, martial preparations went on, and on the death of Antoninus Volagases entered Armenia (162),° expelled the Arsacid Sohzemus, who was a client of Rome, and made Pacorus king. The destruction of a Roman legion under the legate of Cappadocia (Atlius Severianus), who fell on his own sword, laid Cappadocia and Syria open to the Parthians ; Attidius Cornelianus, legate of Syria, was routed, and the provincials were in such distress that they even began to speak of revolt from Rome. When late in the year Adlius Verus arrived from the capital he found the troops so demoralized by defeat that he was ready to offer peace; but, when Volagases refused to treat, the able lieutenants whom Verus directed from Antioch soon changed the face of affairs. The war had two theatres, and was officially called the Armenian and Parthian war.® Armenia was regained and Sohzmus restored by Statius Priscus and Martius Verus (163, 164), while Avidius Cassius drove Volagases from Syria in a bloody battle at Europus, and, entering north Mesopotamia, took Edessa and Nisibis, though not without serious opposition.!° At length, deserted by his allies (¢.e., by the local kings, who were becoming more and more independent), Volagases abandoned Meso- potamia, and Cassius entered Babylonia, where, on a frivo- lous pretext, he gave up to rapine and fire the friendly city of Seleucia, still the first city of the East, with 400,000 inhabitants. The destruction of Seleucia was a hideous crime, a mortal wound dealt to Eastern Hellenism by its natural protectors ; that Cassius next, advancing to Ctesi- phon, razed the palace of Volagases to the ground may, on the other hand, be defended as a symbolical act calcu- lated more than anything else to impair the prestige of the Parthian with his Oriental subjects. Cassius returned to Syria in 165, with his victorious army uch weakened through the failure of the commissariat and by the plague, which, breaking out in Parthia immediately after the fall of Seleucia, spread over the whole known world. In the same year Martius Verus won hardly less considerable successes in Media Atropatene, then apparently a separate kingdom.!!_ The peace which followed in 166 gave Meso- potamia to Rome. This was the greatest of all wars between Rome and Parthia, alike in the extent of the lands involved and the energy of attack shown by the Parthians. The Romans used their

victory with modera- tion, but Parthia, after this last effort, continued steadily to sink.

The Romans at the same time made an effort to compete with Parthia for the Chinese trade (especially in silk), which the latter had jealously kept in their own hands, and in 166 an envoy of An-thun (M. Antoninus) reached the court of the emperor Huan-ti, via the sea and Tong- king. But the effort to establish a direct trade with China was unavailing, and the trade still flowed in its old channels when a second Roman agent reached China in 226, a little before the fall of the Parthian empire. The Chinese tell us that with India also the Parthians drove a considerable trade.!?

? Aristides, Or. Sacra, i. 498, Cant.; cp. Waddington, in Mém. Ac. Inscer., xxvi. (1867) p. 260 sq.

8 For this war cp. the excellent monograph of E. Napp, De rebus imp. M. Aur. Ant. in Or. gestis, 1879.

9 CI. L., vi. Nos. 1877, 1457, 1497. Lucian, De Consc. Hist., 30.

10 Details in Suidas, s.v. Zefyua; Luc., op. cit., 29; Fronto, Epp. ad Verum, ii. 1, 121, Naber.

11 This seems to follow from the fact that both emperors, who were already called ‘‘ Armeniacus” and “ Parthicus Maximus,” also call them- selves “ Medicus” (on a coin earlier than 28th August 165), Eckhel, iv. 76; inser. of Signia, Orelli, No. 859.

2 The “ Annals of the Second Han,” in Deguignes, Afém. Ac. Inscr.,

For the order of events cp.

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Volagases IIT. died in 191, having reigned forty-two years without civil war, and was succeeded by Volagases IV. During the civil troubles of Rome which preceded the establishment of the military empire this prince maintained friendly relations with Pescennius Niger; and his vassal Barsenius of Atra was permitted to supply a force of bowmen, who took part in the fighting against Septimius Severus at Nicza (194). When Niger's cause declined, however, Volagases allowed his clients of Adiabene to join with Orrhoene, now in revolt against the Roman power. The strongholds of Mesopotamia were taken, and their garrisons put to the sword; Nisibis itself was besieged. In truth, the Parthian could no longer pretend to control the policy of the princes on his frontier, who felt them- selves their own masters since they had borne the chief brunt of the last two Roman wars. But in summer 195 Severus appeared in Mesopotamia, received the submission

igas of of Abgar VIII. of Orrhoene, and from Nisibis (which, with

true insight into its strategic importance, he raised to a colony and great military station) directed two successful campaigns against Adiabene! (196) and the Arabs of the Singara district, incorporating the latter in the province of Mesopotamia.? The Parthians made no movement till Severus was busy with Albinus, when they ravaged Meso- potamia and besieged Laetus in Nisibis; but in 198 Severus was again on the scene of war, and they fell back without fighting, leaving the emperor free to prepare for next year a campaign on a great scale. In 199 a fleet on the Euphrates co-operated with the Roman army, and Severus, taking up an unaccomplished plan of Trajan, dredged out the old Naarmalca canal, through which his ships sailed into the Tigris, and took the Parthians wholly by surprise. Seleucia and Coche? were deserted by their inhabitants ; Ctesiphon was taken by the end of the year with terrible slaughter, 100,000 inhabitants: being led cap- tive and the place given up to pillage, for the great king had fled powerless at the approach of the foe. Severus, whose force was reduced by famine and dysenteries, did not attempt pursuit, but drew off up the Tigris. The army was again in its quarters by Ist April 200 (C.Z.Z., vi. 225 a), and for some time thereafter Severus was occupied in Armenia. But in 201 he undertook a carefully organ- ized expedition against Atra, from whose walls the Romans had been repulsed with great loss when Severus, returning from the Tigris in the previous year, had attempted to carry it by a coup de main.

This city, which in Trajan’s time was neither great nor rich, was now a wealthy place, and the sun-temple contained vast treasures. The classical authors call Atra Arabian, but the king’s name is Syriac, Barsenius, z.¢e., Bar Sin, son of the moon, and we may suppose that it was really an Arameean principality,* which, like Palmyra, had its strength from the surrounding Arab tribes that it could call into the field. Severus lay before Atra for twenty days, but the enemy’s cavalry cut off his foraging parties, the admirable archers galled the Roman troops, a great part of the siege train was burned with naphtha; and, when, in addition, two assaults had been repulsed with tremendous loss on two successive days, the emperor was compelled to raise the siege,—a severe blow to Roman prestige in the East, and one that greatly raised the name of Atra and its prince, but did not help the decay- ing power of Parthia in the least. xxxii. (1768), p. 358; Pian-i-tian, in Mém. Ac. Inscr., vill. (1827) p. 124 sg.; and Journ. As., ser. 3, viii. 278, 280 sg.

1 In Dio, lxxv. 3, read rhv ’ApBydirw for Thy apx7yr.

2 Not only Herodian, iii. 9, but Capitol., Macrinus, 12, implies that these Arabs were Yemenites ; the great migration of southern Arabs, which led to the foundation of the kingdom of Hira, had therefore

already taken place. : 3 Dio, Exc., xxv. 9, has Babylon, but it was a mere heap of ruins

in the beginning of the 2d century a.D. 4 Cp. Noldeke, Tabart, p. 34.

In 209 Volagases IV. was succeeded by his son Volagases 191-219.

V., under whom in 212 the fatal troubles in Persis began, while in 213 his brother Artabanus rose as rival claim- ant of the kingship ;° and the civil war lasted for many years. A fresh danger arose when Tiridates, a brother of Volagases IV., who had long been a refugee with the Romans and had accompanied Severus’s campaign of 199, escaped, in company with a

Cilician adventurer, the Cynic Antiochus, to the court of his nephew Volagases ; for the emperor Antoninus (Caracalla) demanded their surrender, and obtained it only by a declaration of war (215). About

the same time Artabanus gained the upper hand, and in Arta- 216 he held Ctesiphon and its district ; but Volagases stil] banus.

held out in the Greek cities of Babylonia, as his tetra- drachms prove (till 222). Artabanus's strength lay in the north ; the Arab histories of the Sds4nians make him king of the Median region, and agreeably with this he coins only drachme.® Presently Artabanus had a war with Rome on his hands; the pretext was that he had refused his daughter to Antoninus, but the emperor was mindful of his father's dying advice to enrich the soldiers and despise all other classes, and saw a prospect of rich booty. In 216 the Romans penetrated to Arbela by way of Carduene and Calachene,' and violated the graves of the kings of Adiabene, which they falsely took for those of the Arsacids. Thus far the Parthians, who had been taken by surprise in full peace, had offered little or no resistance, but Antoninus was murdered (8th April 217) while he was preparing for a new foray, and his successor Macrinus at once found that Artabanus was now armed, and was not the man to let the insult to his territory pass with im- punity. An overwhelming Parthian force fell on Mesopo- tamia and refused to be appeased by the restoration of the captives of the previous year ; Macrinus was beaten in two engagements® and compelled to retire to Syria, abandoning the Mesopotamian plain; and in the winter of 217/218 he was glad to purchase peace for an indemnity of 50,000,000 denarii (£1,774,298). In or about 222 Artabanus must also have displaced his brother in Babylonia, for he was a patron of Rab Abba, who became head of the Jewish school of Sura in 219.9

Persis, which dealt the last blow to the Arsacids, had Persis.

through the whole Parthian period held an isolated position, and is so seldom mentioned that our knowledge of its history and native princes is almost wholly due to recently-

found coins.1°

These embrace a triple series of silver coins and a class of copper pieces. The oldest of the latter class bears the name of Camnascires, and his is the only name in the class known to us from other sources, for Hyrodes and Phraates (each of which names was borne by two kings of the series) are not Arsacid great kings, as their title is only “king,” not “king of kings” (against Mordtmann). Nor do they seem to have ruled in the same quarter with the kings who struck silver ; the latter were native kings of Persis, the former rather Elymeans, who in the times after Camnascires were forced back in a south-east direction (as appears from the places in which the coins are found), and ruled parts of Persis side by side with the nr

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5 According to Mani, in the book Skaburkan, the 4th year of Ardhab4n = 216/217 ; see Al-Béruni, tr. by Sachau, pp. 121, 190. This proves that in 216 Artabanus was the recognized sovereign in the district of Ctesiphon to which Mardinu (on Habl Ibrahim) belongs ; cf. Noldeke, Tabart, p. 16.

6 See above, p. 601. 7 Dio says they invaded Media, but Antoninus had not such a hold

of Armenia as to open to him the route of the triumvir Antony, and a march from Gazaca to Arbela over Mount Zagrusisincredible. But, if Media at this time extended so far west as to include Arrapachitis and Calachene (the Marcomedians of Trajan’s wars), the campaign is intelligible, and Spartian’s mention of the Cadusians and Babylonians can be explained as a misreading of Kapdovaias kal *ApBiAwy in a Greek source.

8 The lacuna in Dio, Ixxviii. 26, is to be supplied by a passage of Xiphilinus, not given in recent editions.

9 Jost, Gesch. d. Jud., ti, 139.

10 See Mordtmann in Z. f. Num., iv. 152 sq., vii. 40 sq.

219-228. native princes.

Indo- Iranian frontier.

Camnascires appears as an old man on coins of 82 and 81 B.c., and his ten successors whom we know from the coins carry us down to 36 a.D., the latest date at which the Elymzans are mentioned as independent (Tac., dnn., vi. 44). The older coins have Greek inscriptions and often figures of Greek gods, but under the fifth successor of Camnascires, 7.¢., about the time of Christ, Pahlavi takes the place of Greek and Mithras of Serapis.

The silver class, again, has in all three series Pahlavi legends and the fire-altar on the reverse. The first series has seven princes with the unexplained title " Feritkara," the second has three kings (Malka), the third ten kings; the names are throughout either Achemenian (Artahshetr, Daryav), pointing perhaps to a claim of Acheemenian descent, or sacred names like those common with the Sasanians (Nerseh, Yezdikert), or are taken from sacred legend (Minuchetr). The second and third series appear to be continuous (against Mordtmann) ; the last king of the second series is Zaturdat (II.), the first of the third Daryav (I.) son of Zaturdat. With Daryav I. the kings assume a Parthian costume, and his son Artahshetr II. is the only king of that name who from the number and various types of his coins can be fairly identified with the Artaxerxes of Isidore of Charax, who reigned " in the time of his fathers" (c. 80-50 B.c.), and was slain at the age of ninety-three by his brother Gosithres. As Daryav I. must also have reigned for a considerable time this datum places him about the commencement of the Parthian supremacy, which naturally explains his Parthian dress. Then the princes of the first silver series will be Seleucid vassals, and the shorter series of kings before Daryav independent princes falling between the Seleucid and Parthian suzerainty. Finally Gosithres, brother of Artahshetr II., has the same name as Gozihr, the last Bazrangi king before the rise of the Sdsanians, so that it was probably one dynasty. The eight kings, in at least six different generations, who appear on coins between Artahshetr II. and Tirdat IL, will carry us roughly to the middle of the second Christian century, leaving a space sufficient for Gézihr, the last Bazraugian, and the anarchy of the first days of the Sasanians.

The emblems on the coins show that Persis was always loyally Zoroastrian, and at Istakhr stood the famous fire- temple of the goddess Andhédh. Its

priest was Sdsdn, whose marriage with a Bazrangian princess, Rambehisht, laid the foundation of the greatness of his house, while priestly influence, which was very strong, doubtless favoured its rise. PAbak, son of Sdsdn, and Ardashir, son of Pabak, begin the history of the Sdsd4nian dynasty, which occupiés the next section of this article. Artabanus did nothing to check the use of the new power till Ardashir had all Persis in his hand (224) and had begun to erect a palace and temple at Gor (Firuzabad). Nirdfar, king of Elymais, was then sent against him, but was defeated, and now Ardashir passed beyond Persis and successively reduced Ispahan (Pareeta-cene), Ahwaz (Elymais), and Mesene.! After this victory Ardashir sent a challenge to Artabanus himself; their armies met by appointment in the plain of Hormizdjan, and Artabanus fell (28th April 227). Ctesiphon and Babylonia must have fallen not much later, though Vola- gases V. seems to have re-established himself there on his brother's death, and a tetradrachm of 539 Sel. shows that he held the city till autumn 227. The conquest of Assyria and great part of Media and Parthia is assigned by Dio expressly or by implication to the year 228, and so the Parthian empire was at an end.

The part of Parthia of which Dio speaks can only be Choarene and Comisene ; it was only in a later expedition that Ardashir reached Sacastane, Hyrcania, Nishapur, and Merv, and these do not seem to have been Parthian. Indeed, from 58 4.p. Comisene appears to have been the most eastern satrapy of the Arsacid empire. Eastern Iran was in this period very flourishing under the Tochari of the dynasty which Indian sources call Turushka, and which can be traced on inscriptions till 213 and 259 (or 359). Kanishka, the founder of the dynasty, is said to have ruled Cabul and all Hindustan, and in fact his coins extend over all northern India. The empire of which Kashmir was a main province was wider than that of the Greeks had been, and also more consolidated, for strategi took the place of the native kings (Journ. As., ser. 3, viii. 264, and ser. 4, x. 95). So,

1 The flourishing state of Mesene had, as its coins show, been long sinking into barbarism ; the latest date they supply is 167 (Z. f. Num., Viil. 212 sq.). A little earlier, in 148, they are associated with coins of Meredates, son of Phobas, king of the Omanians. The latter, already known to Pliny as

dwelling in the desert west of Charax, must be the Azd from ‘Oman, a part of whom shared the great migration and finally settled in Anbar and Hira.

SIA

too, Kanishka banished the native language from his coins, using Greek letters and his own foreign language. His predecessor had supplanted the Greek gods, except Helios, by Oriental divinities, and now Helios too gives way to the Iranian Mupo or Miopo. The motley pantheon on the coins of Kanishka and his successors gives an interesting glimpse of the faiths of the Indo-Iranian frontier, We find here the old Iranian popular deities: Mao, the moon-god ; Mupo, the sun-god ; Nava, the goddess of war ; Oado, the wind-god ; OpAayvo, 4.¢., Verethraghno (see Benfey, Z. D. M. G., viii. 459) ; Aupo, identical with the Zoroastrian Ahura-mazda ; we find also abstrac- tions like the Izeds of the heavenly hierarchy in official Zoroastrian- ism, ¢.g., Ovep, t.¢e., Aniran, the eternal self-created lights, and @appo (Pers., farr ; synonymous with Zend, hvaránd), the royal majesty, side by side with Indian deities, such as Siva, and a number of un- known deities with barbarous names brought from the old homes of the Tochari. Heracles and Helios appear transformed by barbarous pronunciation or epithets, and Zaparo is the cosmopolitan Serapis, probably introduced, asin Elymais, by Alexandrian sailors. Buddha, too, appears (Sallet, Machf. Al., p. 189 sq.). The Buddhists were the most active religious body in the kingdom, and the king, if not actually a convert, as the legend claims, showed them such favour as gave their faith a wide missionary field and unparalleled success. The kings built many Buddhist meeting-houses, monasteries, and shrines, and it was Kanishka who called together in Kashmir the council of 500 fathers that finally redacted the Tripitaka collection. Ptolemy (vii. 1, 47) speaks of Tochari as the Kaomipato ; the Chinese bear witness to their might in 159 ; and from 220 to 265 their empire retained its old compass (Journ. As., ser. 3, viii. 268, 268). Kashmir was lost in the course of the 3d century, but the western provinces remained. About 100 .D. Greek ceased to be understood in east Iran, and from this time we can trace a growing Iranian influence on the coins of the Tochari, especially in the Sasanian period. The latest coins of the Tochari come mostly from Balkh, so that they seem to have been gradually pushed backwards to the point from which they started. Finally,

their empire was overthrown by another branch of their own race, for, early in the 5th century, those of the Great Yue-chi who had remained in their old homes, a little west of Badakhshan, were compelled, by the pressure of the Juan- juan of Tartary, to move west to Po-lo or Balkh, and thence, under their warlike king Ki-to-lo (Kidara ; whence they are called Cidaritic Huns by Priscus, in Fr. H. Gr., iv. 102), crossed the Hindu-Kush and destroyed the old empire of the Tochari, founding in its place the kingdom of the Little Yue-chi. The date of this invasion can, from a variety of data, be fixed as c. 430, just about the time when the Sasdnians, in 429, destroyed the last of the Arsacids in Armenia ; and with this agrees the Indian statement that eighteen (aka kings reigned 380 years (50-430 a.p.). Their successors were still powerful in India about 520, and in their old homes their empire fell in 562.

[PARTHIAN EMPIRE,

Sources.—1, For THE Macepontan Prrtop.—For Alexander the sources are of two classes. (1) Arrian, and for the most part Plutarch also, drew from official Macedonian sources, especially the works of King Ptolemy and Aristo- bulus of Cassandrea, (2) An unofficial history, written by a Greek Clitarchus for the Greeks, is faithfully excerpted by Diodorus. Curtius and Justin (or rather Trogus) drew from a later work based on the same source but supplemented by extracts from a book of the first class and another book hostile to Alexander and of very indifferent authority. Droysen follows the writings of the first class exclusively, and indeed for military and historical points they alone are to be trusted. Grote uses also the works of the second class, which, though rhetorical, romantic, and uncritical, have the advantage of telling us many things that the official histories pass over, and, though they show little judg- ment themselves, are rich in materials to guide our judgment. The historian must deal with the material as a philologist would deal with a book preserved in two classes of MSS., one good, the other interpolated but independent. One must first restore as nearly as may be the archetype of the second class and then use it to correct the text—or here the history—based on the first class. For the immediate successors of Alexander, Diodorus, the excerpts from Arrian in Photius, and Plutarch’s lives of Eumenes and Demetrius are our best guides, all three drawing from the excellent Hieronymus of Cardia. Trogus (Justin) makes a

defective use of indifferent sources, and is good for little. Droysen's is the best modern book ; Grote is useful because he does not take so purely Macedonian a standpoint, but he deals mainly with the West. We have no really continuous ancient account for 301-220 B.c., for Justin's narrative is even less worthy of the name of a history than in the preceding period. The scattered material is best collected by Droysen. From 220 onwards we have the excellent work of Polybius, at first complete and then in large excerpts. There are some good modern monographs, but nothing that can be called even a tolerable general history of the latest period of Macedonian rule in Asia.

2. For THE PARTHIAN Periop.—The only continuous account of Parthian and Bactrian history which has reached us is Justin's abridgment of Trogus Pompeius, ending with 9 B.c., and having also a lacuna, due to Justin's care- lessness, between 94 and 55 B.c. For the wars with Rome in 53 and 36 B.c., Plutarch's Crassus and Antonius give full accounts. Under the early Cesars the Parthians were, in a sense, viewed as sharing the empire of the world with Rome (Strabo, xi. p. 515; Just., xli. 1, 1), and Roman historians began briefly to note events in Parthian history which had no direct connexion with Roman affairs. Thus, from 69 B.c. to 72 a.p., Dio, Josephus, and Tacitus give us pretty complete accounts. Between 94 and 69 B.c. and between 72 and 227 a.p. the history is very much lost. The coins are most valuable, especially after 37 B.C., when they begin to be dated; for the later period they are our chief aid, the excerpts from Dio not helping us much.

Aids.—Foy Vaillant, Arsacidarum impertum (Paris, 1728), and Du Four de Longuerue, Annales Arsacidarum (Strasb., 1732), are still indispensable compila- tions, to which G, E. J, Guilhem de Sainte-Croix, ''Mém. sur le gouvernement des Parthes," Mém. Ac. Inscr., 1. 48 sq., 755 sq., gives a good supplement. The most important modern books are those that explain the coins historically—

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SASANIAN EMPIRE. |

E. Q. Visconti, Icon. Gr., iii.; Bartholomei, "Rech. sur la num. Arsac.," Mém. Soc. Arch., ii.; A. de Longpérier, Mém. sur la chron. et Viconogr. des

rois Parthes Arsac. (Paris, 1853}—and the catalogues of coins in Prokesch-Osten's Monnaies des rois Parthes (Paris, 1874-75) and P. Gardner's Parthian Coinage (London, 1877). There are also recent histories of Parthia by Rawlinson, Schneiderwirth, and Spiegel, and a book on the coins by Lindsay… As regards Bactria Bayer's Historia (Petersb., 1738) is poor, and quite upset by recent finds of coins. The Chinese inaterial is still best given by Deguignes in Mém. Ac. Inser., XXv. 7 sg. Of recent books see H. H. Wilson, Ariana Antiqua (London, 1841); Lassen, Zur Gesch. der Griech. und Indoskyth. Kénige (Bonn, 1838) and Ind. Alterthumsk., ii. Prinsep, Essays on Ind. Antiquities, ii. 173 sq.; A. Cunningham, in Num. Chron., vols. vili.-xii.; and Sallet, Nachfolger Alexanders des Gr. in Baktrien and Indien (Berlin, 1878). (A. v. G.)

Section III.—SAsANIAN Empire,

Of the minor kings who ruled in Persis, in the Arsacid period, in real or nominal allegiance to the Parthian "king of kings" we know some names from coins or ancient writers, but we cannot tell whether they were all of one dynasty. In the beginning of the 3d century the kings, who then belonged to a dynasty of which the name prob- ably was Bazrangik, had lost much of their power ; lesser potentates ruled in various parts of the land, which, by being all mountainous, falls naturally into ill-connected sections. One of these local princes was PApak, or, in the more modern pronunciation, Pabak,! son or descend- ant of Sasan, a native of the village of Khir on the southern margin of the great salt lake east of Shiraz. Pabak overthrew Gdézihr, the last prince of the Bazrangik, and became master of the district of Istakhr (Persepolis), and the coins and inscriptions of his son give him the title of king. His legitimate heir was his son Shdpur, for whom Pabak is said to have asked recognition from the Arsacids ; but on Pébak's death a second son, Ardashir, refused to acknowledge his brother, and was in arms against him when Shdpur died suddenly, and hardly by mere accident. That Ardashir's claims were opposed by his brothers and that he put them to death are not to be doubted, as we have these facts from a tradition of strictly legitimist tendency.

Tradition names various local princes conquered by Ardashir for himself or for his father, and perhaps Pabak before his death was already lord of all

Persis. Ardashtr, at least presumably, was so when he struck the coins still extant.2 Ardashir, who is to the Sds4nian what Cyrus was to the Achemenian empire, probably came to the throne in 211/212 a.p.3 From the first he plainly leaned on the clergy of the Zoroastrian faith, which all through the Macedonian and Parthian eras had undoubtedly continued to be the religion of the people in Iran proper, and especi- ally in Persis. The Parthian monarchs were Zoroastrians, but probably often very lukewarm in the faith. Ardashtr, on the contrary, ostentatiously placed symbols of fire-wor- ship on his coins, and on his inscriptions boasts himself a " Mazdayasn," or orthodox Zoroastrian. From his days onward the often fanatical and persecuting clergy enjoyed great power in the Sds4nian empire, and the hierarchical organization of the state church, so similar to that of the Christian clergy, probably dates from Ardashir; it is referred to, at least, on the inscriptions of his immediate successors. Popularity and a certain religious prestige were the natural fruits of this orthodox zeal on the part of Ardashtr, but his success was essentially the fruit of his energy and

1 The Arabs, having no p, pronounce Babak ; but this is not Persian. Th general the forms of proper names followed in this article give the More recent pronunciation, which may have prevailed about the end of the Sasdnian period.

- These show a full-face portrait with the legend " Artakhshathr king." The reverse has his father's portrait in profile with the legend "son of the divine Papak." The older form of Ardashir's name, Artakhshathr, is the ancient Achxmenian name, which the Greeks write Artaxerxes, and which, singularly enough (together with the name Darius, Dary4v, Dérdb, Dard), had survived in the home of the Ache- Menians, although genuine Persian tradition had lost all memory of

the old empire. ® See A. v. Gutschmid, in Z.D. M.G., xxxiv. 734.

PERSi «A

The best works on the coins are by Thomas, in his edition of

valour. Slowly and not without toil he rose from king 212-233, of Persis to be king of the kings of Iran. He began by subduing successively Kiran, Susiana, and the petty states – at the mouth of the Tigris. But after this he came into conflict with the great king, whom, according to the con- temporary account of Dio Cassius, he smote in three battles. The decisive engagement with Ardavan (Artabanus) in which the last Parthian monarch fell, and where Ardashir gained the title of “king of kings,” seems to have been on 28th April 224 (or 227, according to A. v. Gutschmid), and was probably fought in Babylonia or Susiana, for the next enterprise of Ardashir was an unsuccessful attack on the strong walls of Hatra, which perhaps was not taken and destroyed till the reign of his successor. Ardashir con- quered Media, where an Arsacid prince was his adversary, and gained the greater part of the Iranian highlands, but failed in Armenia, whither a son of Ardavan had fled.

The Romans saw with concern the rise of a prince who already directed his aims against their Asiatic possessions, and seems to have had some success in this quarter, till in 233 he was smitten by Alexander Severus in a great battle.4 Henceforth, though peace was often made between the two powers, they remained constant rivals,—and rivals on equal terms, for, though under able rulers and when the inner condition of the empire was not greatly disturbed, the Europeans of Rome or Byzantium were still too strong for the Asiatics, the tables were not seldom turned, and Rome sustained many a shameful defeat. This struggle fills the chief place in the political history of the Sdsdnians : and the inner development of the empire, its martial and political institutions, its art and industry, were also most powerfully influenced by the superior civilization of the

. West.

The nominal capital was always at Istakhr, where, for Sasdnian example, the holy ‘‘pyreum” of the royal house stood, and SW4Y- where the heads of conquered foreign kings were hung up. But the real metropolis was the Arsacid capital of Ctesiphon, with Ardashir’s new foundation of Veh-Ardashir, just across the Tigris on the site of the old Seleucia. The rich alluvial land that surrounded these twin cities was no part of Irén proper,

and its inhabitants were mainly Sem- ites ; but old example, and probably its vicinity to Roman soil, marked it out for the true seat of government.

The extent of the empire at the time of Ardashir's death is uncertain, for the national tradition ascribes to him some conquests that were really made by his successors, and others which the Sésdnians never made at all. Shapur, his son, calls himself on his inscriptions king of the kings of Iran and non-Iran, where his father says only "of Iran" ; so that it was the son who first extended the realm beyond the bounds of what was then known as Iran. Non-Iran may refer to districts in the far East, where, however, the Sdsan-ian power never reached so far as that of the Achzmenians, and it may also include Armenia. At any rate, Ardashir won a great empire and consolidated it, so that it held to- gether for four centuries. He gave a powerful blow to the system of vassal states, which had become more and more prevalent under the Arsacids, and reduced most of these states to provinces. In this sense he is justly viewed by tradition as the restorer of the unity of Irdn ;> but the

4 Lampridius, Al. Sev., 56. His statement rests on documentary evidence, and is accepted by Tillemont and by Clinton, who confirms it from coins. The attachment of the troops from Orrhoene for Alexander (Capitol., Afaximinus, ii.) was probably connected with his liberation of their country from the Persians, Rawlinson's and Spiegel's preference for the statement of the romancer Herodian, that the Per- sians were the victors, is pseudo-criticism.

5 It must not be supposed that the Persians had a clear recollection of the might and breadth of the Achemenian empire, though Western writers, who knew the old history from books, sometimes make Per- sians speak as if they sharcd in that knowledge. No doubt a Sdsdnian would sometimes hear from a Greek or Syrian how his predecessors

233-282.

Shapur I.'s wars with Rome.

unity, of course, was not such as in a modern European state. The great barons in particular were still very powerful, and were more than once a danger to the kings. At bottom they were a continuation of the Parthian nobility, falling into divers classes, headed, as in the Achemenian empire, by the seven noblest houses. There was also a numerous minor nobility. Later generations looked back upon the founder of the empire as the best of lawgivers and the ideal monarch ; and, of course, so great a patron of Zoroastrianism left a high reputation for piety. A man of mark he certainly was, but the fratricide that opened his reign, and such a barbarity as tradition itself relates of his conduct to the conquered Ardavan, whose head he spurned with his feet, show him to have been very far from a pattern character. It is interesting to find his memory intertwined with similar romantic legends to those told of Cyrus. He was born of (we are told) a mean father, and lived as a page at the court of Ardavan, as Cyrus lived at that of Astyages, and so forth. Dreams and portents figure in the later as in the earlier legend, and even a mythical conflict with a dragon is recounted. Fortunately a much more historical picture has been preserved by genuine tradition.

Ardashir is said to have adopted his son Shapur as partner of his throne, and this is confirmed by coins on which a youthful head appears along with Ardashir's like- ness. He died late in 241 or early in 242. Shaptr IL. (older form Shahpuhr ; Sapor or Sapores of the Westerns) was probably crowned on 20th March 242. Legendary tradition makes his mother an Arsacid princess taken at the capture of Ctesiphon ; but, according to a more probable account, Shaptr was already able to bear arms in the decisive battle with Ardavan. Nor can he have been a mere stripling when his reign began, as his prowess against Rome shows ; for in Ardashir's last years, in the reign of Maximin (236-238), the war had been renewed, and Nisibis and Carrhz (Haran), two fortresses which constantly re- appear in this history, had been taken. In 242 Shapur had penetrated to Antioch, before Gordian ITIL. or rather his father-in-law Timesitheus, drove him back and retook the Mesopotamian strongholds. The Persians were defeated at Réshaind, and Gordian proposed to march on the capital by way of the Euphrates, as Julian subsequently did; when almost on the frontier, a little below the junction of the Euphrates and Chaboras, he was murdered by Philip the Arab (244), who concluded a humiliating peace with Shapur, and is said—

for the details are obscure—to have given up to him Armenia and Mesopotamia. Our whole knowledge of the Perso-Roman wars in the 3d century is very defective ; but there seems now to have been a lull for some years, till in 251 or 252 Shapur again was in motion, now at length effecting an occupation of Armenia and com- pelling its king to flee to Roman soil. The Roman world was at this period so shaken that Syria was again and again invaded,—how often we can hardly say; nay, a Syrian, Cyriades, himself led the Persians to Antioch and assumed the purple under their protection. At last the emperor Valerian took the field in person ; but, after pro- tracted operations in Mesopotamia, fortune turned against the Romans and Valerian himself became Shapur's captive (260), under unknown circumstances, and, according to

had reigned as far as Constantinople, but this was not living tradition. Western scholars again sometimes mixed up the old and the new State, as when Libanius supposes that Susa, the residence of Xerxes and Artaxerxes, must also be the residence of his contemporary Sapor (Shdptr). The Sdsdnians, however, regarded themselves as successors of the mythical kings of Irdn.

? An abridged extract of the romantic history of Ardashir has been preserved in the original Pahlavi, and has been published by Noldeke (see p. 185, note 1, above). 'The same legendary material is used by Firdausi ; ep. also Z7.D.M.G., xxxiv. 585, 599.

Roman accounts, through treachery, but certainly not till he had entered into negotiations and vainly sought to purchase a free retreat for his army with gold. Shapur now pene- trated with an invading host far into Roman territory towards Asia Minor, but he met with not unsuccessful opposition. The general Ballista cut off many Persians ; but a heavier blow was struck by Odzenathus at the head of his Palmyrenes, who, in this or a subsequent campaign, smote the retreating Persians and even captured the royal harem ; nay, once, if not twice, he laid siege to Ctesiphon itself (for details see Panmyra). Presumably now as in later times the Persian empire proved

unable to sustain the cost of prolonged campaigns. These Oriental kingdoms are on the whole poor, though they include some fertile regions, and though the kings accumulate large stores of treasure. The Persians had no great standing army like the Romans, and the levies summoned to the standard could not long be kept together; hence so many brilliant débuts in warfare without lasting result. Shdpur effected no permanent gain of territory, for even Armenia seems now to have fallen again under Roman suzerainty.? But Valerian was not delivered, and died in captivity. The figures of the victorious king and the captive Czesar are still to be seen hewn, perhaps by Roman subjects, on the rocks of Persis, and Persian tradition, which preserves so few historical facts as to the immediate successors of Ardashir, has not forgotten this crowning humiliation of Rome. Some of the traditional deeds of Shapur I. really belong to Shaépur IL, but we may accept him as the author of the great irrigation works at Shushtar, and it was he who built Gundév Shapur (Ar. Jundai-Sdébur, Syr. Béth Lapat), which was often used by the kings as their second residence, and stood to Ctesiphon as its neighbour Susa in Achemenian times did to Babylon. Shaptr's sway over non-Ir4nian peoples has been already referred to; but the Augustan historians are certainly right in speaking of the Bactrians as a nation still independent and often hostile to Persia, and the same is true of the Cadusians (Pollio, Val., ch. i.), 2.¢., the Délamites of Gilan, who were never subdued by the Sdsd4nians. At the very beginning of Shaptr's reign Mani, founder of the Manichzan sect (see MaNicH@IsM), began to preach, against which the Persian priests fought for centuries as vigorously as against the various sections of Nicene Christians.

The close of Shdépur's reign saw great changes in the Roman east (see Patmyra). At the fall of Palmyra Shapur was probably no longer alive.

previously been governor of Khorasan. hero," appears to have been gained by prowess against the Romans before his accession, for his reign of one year gave little time for great deeds.

His successor, Bahram (Varahrdn) I., was not his son as tradition represents, but, according to an inscription, his brother. He is said to have been a weak prince, given to pleasure. The execution of Mani falls within his reign, which (subject to a possible error of as much as two years, which affects all

dates of reigns between Bahram I. and Sh4pur II.) may be dated between 274 and 277.

Of his son, Bahram II. (c. 277-294), Persian tradition has next to nothing to tell. To him may be probably ascribed two long but ill-preserved inscriptions, religious in content, almost sermonizing, and of very clerical colour. He had wars with Rome, of which we only know that they were terminated by a peace with Probus (276-282),3 and that Probus was murdered before he could renew the con-

2 See an essay by Gutschmid, 7. D.M.G., xxxi. 51, which is instruct ive as to the relations between Persia and Armenia generally.

3 Vopiscus, Probus, 17, who, as Tillemont remarks, wrongly puts “ Narseus ” for ‘‘ Bahram.”

His son Hormizd 8u)* (Ohkrmazd) I. came to the throne in 272 or 273, having 8) His title, “the” |

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flict. Carus, however, in 283 led his army as far as the hostile capital, and had taken Ctesiphon and Coche (a part

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buildings. To break up congregations he often constrained 282-368. prominent church members to stone their own priests.

of Seleucia) when he suddenly died (by lightning, it is said), and the Romans drew off. Carus is said to have been favoured by intestine disorders, which at this period

The Persian priests, of course, used the opportunity to gratify their hatred of the Christians, and other impure passions Increased the cruelty of Shaptir’s hard measures,

were certainly common in Persia.- In 291 a rhetorician mentions the rebellion of a certain Hormizd (Ormies) against his brother the king, in alliance with barbarians. A youthful son, who appears opposite the queen on coins of Bahram IT., seems never to have ascended the throne,

The Christians on their part showed much heroic courage mixed with not a little cowardice,

Roman sources tell us that the war was begun by the Shéptr Persians with an invasion of Mesopotamia. Constantine IL's con-

died on 22d May 337, before he could march against them. aha.

‘

which was probably contested between Bahram III. (a son of Hormizd I. 1) and Narseh (according to an inscrip- tion, son of Shaptr L.). Bahram III, called Sagan Shah, because he had been governor of Sagastan (Sistan), reigned, or at least held the capital, for a very short time; Narseh reigned from c. 293 to 303, and, following up Shdpur's policy, occupied Armenia and defeated Galerius (probably in 297) between Carrhz and Callinicus (Rakka) in Meso- potamia. But under Diocletian's wise rule Galerius soon restored the honour of the Roman arms, totally defeating Narseh in Armenia and taking his wives and children. A brilliant peace (298) rewarded the victors ; to recover his family the Persian ceded Armenia and Mesopotamia, and even some districts east of the Tigris as far as Kurdistan. The peace lasted forty years.

Narseh's son, Hormizd IT., came to the throne about 303 _and was succeeded early in 310 by his son, Adharnarseh, "who was soon deposed, and probably slain, ostensibly for

his cruelty. The nobles now held the reins of power, and, having blinded one brother of the fallen king and im-

‘ Shéptr prisoned another (Hormizd),! crowned Shapur IT., the new- ie

born (or unborn) son of Queen Ifra (1) Hormizd (310). The rule of the queen-mother and nobles was what may be readily imagined in an Oriental empire, which above all things needs a strong man at the head; but such a man young Shapur, one of the greatest princes of the dynasty, soon proved himself to be. Persian tradition preserves few really historical notices of Shéptr II., but is full of stories of astounding campaigns against the Arabs, highly coloured by hatred of that race; and there is no doubt that Shapur did devote himself with energy to the always important task of repelling the plundering Bedouins from the civilized lands on which their deserts border. Another notable undertaking was the new foundation of Susa after it had rebelled and been chastised by total demolition, the very ground being stamped down by the king's elephants. Niswdptr (q.v.);¢.¢., Wév-shdhpuhr, may be his foundation, or that of Shapur I.

In Shapur's youth fell the victory of Roman Christian- ity over paganism under Constantine, and the Christians of Persia at once threw in their sympathies with the Christian state. These feelings were openly shown when Shapur in 337 or 338 began a Roman war, as appears in a homily of the Syrian bishop Aphraates, a subject of Persia. The bishop of the capital, too, ventured to use language against the king which no Oriental prince, least of all

Acts of Persian Martyrs give a lively picture,—instructive, too, for the light cast on persons and affairs in the realm. Shapur was no fanatic, as even the Acts of the martyrs show, and he did not molest the Jews, whom his priests hated quite as much as the Christians. But, like Diocle- tian, he wished to destroy the organization of the church, and therefore used the utmost rigour against the lower as well as the higher clergy, and destroyed the ecclesiastical

t Hormizd escaped to the Romans in 323 and remained with them

all his life. As late as 368 he shared the Roman campaign against his half-brother Shapur.

But Shapur's great preparations, as we learn from Aphraates, fell in the year that begins with autumn 337. With many vicissitudes and long pauses the war endured for twenty- five years, but only for its second part do we

possess fuller accounts by contemporaries and in part eye-witnesses. Shaptr's aim was to drive the Romans from the upper Tigris, where they were dangerously near Ctesiphon, and especially to seize Nisibis, and then to reduce Armenia,' that old apple of discord between East and West. Three times Nisibis victoriously resisted a severe siege (338, 346, 350), and other sieges occupy a great place in the story of the war. Constantius, when he took the field in person, was always defeated, as in 348 at the great battle of Sin- gara (Shingdr, Ar. Sinjar). Yet Shapur's successes bore little fruit, mainly perhaps because Diocletian and Con- stantine had put the fortresses in the best condition, and in all respects had made wise provisions to cover the threatened districts. Even when victorious the Persians could hardly penetrate into western Mesopotamia, and if Shéptr had taken all the strong places he could hardly have garrisoned them. Thus he took Amida (Amid) after long and costly sieges, and in the very next year (360) the Romans found it ungarrisoned. The Romans were helped, too, by the trouble which Shaptr had with barbarous ene- mies ; the third siege of Nisibis was all but successful when the Persian was called away to Khordsén by urgent affairs there. These eastern conflicts were the prelude to a long pause in the contest (350-358), broken only by small forays. When, however, the Romans opened negotiations (356 to 358) Shadpur had made peace in the east and offered no conditions that could be accepted. In 359 and 360 the war was again hotly renewed, and Shdpur took several im- portant fortresses. Then there was a lull till 363, when the warlike, active, and ambitious Julian, now sole emperor, resolved to strike at the capital of the enemy, as Trajan, Severus, and Carus had done. He left Antioch for Meso- potamia in March and swiftly descended the Euphrates, wasting the enemy's land with fire and sword and taking several cities by short sieges, among others the royal city of Mahéz Malka, not far from Ctesiphon. Julian now occupied Seleucia, but, finding he was not strong enough to take Ctesiphon, the fortified capital on the opposite bank of the Tigris, he ordered a retreat along the left bank. And now for the first time Shaptr's troops began to harass him, but the army might have regained Roman soil without seri- ous loss had not Julian fallen mortally wounded in a skir-

| Perseeu- one like Shapur, could submit to. And so almost simul- | mish (26th June 363). The army chose Jovian emperor, ae taneously with the Roman war a terrible persecution of | a man too weak for such an occasion,

who managed his ioe the Christians broke out (339/340), of which the Syrian | soldiers and the negotiations so badly that a shameful peace

was the result, and Shapur regained the lands east of the Tigris lost to Galerius, and part of Mesopotamia with Nisibis and Singara. Nisibis was the gravest loss, for in all future wars it was to the Persians a sure base for advance and a bulwark for defence. But a still more shameful condition was that the Romans should not help their ally Arsaces of Armenia against Shapur. The Persian, nevertheless, did not find Armenia an easy con- quest. He took Arsaces captive, but this did not decide the fate of the whole country, divided as it was by nature into a number of separate regions under almost independent

captains. The Christian Armenians leaned on the whole towards Rome, while the Zoroastrians, who still formed a large part of the nation, inclined to Persia, and the personal interests of the great barons, who preferred to recognize no lord, inclined them now to this side, now to that. Papa, son of Arsaces, fled to the Romans and got help from them, first secretly and then openly ; but he was only their tool in the design of reducing Armenia to a province. Con- flicts between the rival empires took place also to the north of Armenia in Iberia, and after five years they were practically again at war. In 371 Shaéptr was openly met by Roman troops in Armenia, which both parties were determined to have by force or by fraud. Once and again negotiations failed, but a general war was still averted by external circumstances (on Rome’s part by the Gothic war) and considerations of prudence.

Shaptr IL, who is justly celebrated by the later tradi- tions, died towards the end of the summer of 379, and was succeeded by his brother, Ardashir II., an old man, who was perhaps chosen king for similar reasons to those which governed the choice of Shaptr as an infant. As prince and governor of Adiabene Ardashir had taken an active part in the suppression of Christianity in 344 and as late as 376, but with his accession the persecution ceased —whether of purpose or merely from the Oriental lack of persistency we cannot tell—and a bishop was again ad- mitted even in the capital. Ardashir was deposed in 383 or 384, having taken strong measures against the nobles and put some of them to death.

His successor, Shaptr III., son of Shépur IL., at once sent ambassadors to Constantinople and made a definite treaty of peace (384). In 388 or 389 he was murdered by the nobles. His successor (a son, or perhaps a brother), Bahram IV., called Kirman Shéh,! kept peace with Rome and was clement to the Christians. In 390 Armenia was divided by treaty, much the larger part becoming a vassal state of Persia and the rest falling to Rome. The division, with various modifications and vicissitudes, lasted into Arab times. Bahrdm was shot by a band of “miscreants” in the summer of 399.

Yazdegerd I., son of Shapur IT. or Shépur ITT., seems to have been designated heir to the throne while Bahram IV. was still alive, or at least he held such high dignity that his name appears on coins of his predecessor. Persian tradition makes him wise but very wicked. Christian witnesses, on the other hand, speak very favourably of him, and it appears certain that his surname, “the Sinner,” was gained by a severity, perhaps tyrannical, towards the grandees, by tolerance towards the Christians, and little favour shown to the priests. In 410 the Christians were even allowed to hold a regularly constituted synod in the capital, and the king employed the “‘ Catholicus ”—z.¢., the primate of the church, a functionary possessed of full religious autonomy—on a mission to the emperor, and even in settling differences with his own brother, who governed Persis. Yazdegerd had no personal inclination towards Christianity, and he severely punished the fanaticism of Bishop ‘Abda, who had insulted a Zoroastrian sanctuary in Susiana, but his habitual tolerance was enough to make him hated of the Persian priests. The warlike nobles also found cause for dissatisfaction in his earnest endeavours to keep on quiet terms with Rome, with whom he

made a treaty of peace and friendship in the summer of 408, when he seems to have pledged himself to support the throne of Theodosius II. during his minority. Over Persian Armenia he set his own son Shaptir. We have every reason to deem Yazdegerd an excellent prince for the time and circum-stances, but he was not well pleasing to the god of the

i ee Rag : ae He had ruled in Kirman, and from him two towns, in Kurdistan and in Kirman, take the name Kirmdnshahan.

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Persians, who smote him with sudden and miraculous death in distant Hyrcania. The explanation of the miracle is no doubt that he was murdered by the magnates (probably late in summer 420).

Shapur, hurrying from Armenia on the news of his father’s death, was slain by the grandees, who had resolved altogether to exclude from the throne the seed of the hated Yazdegerd. A distant relation, Khosrau, was made king, but had to contest the throne with another son of Yazdegerd, Bahrém, who in his father’s lifetime had dwelt apparently in a sort of exile, with the powerful vassal prince Al-Mondhir (Alamundaros) of Hira, on the borders of the desert to the west of the Euphrates. Mondhir energetically supported the claims of his guest-friend, and appeared with a vast Arab horde before the gates of Ctesiphon, which is only three or four days’ march from Hira. As Bahram doubtless had support among the Persians also, Khosrau gave way, and Bahram took the throne, but with a promise to reign in a different spirit from his father and please the magnates and the priests. This is the first important intervention of the Arabs in the affairs of Persia.

Bahram V., surnamed Gér or Wildass, is the favourite Bahra hero of Persian tradition, which tells many incredible V-

stories about him. He came to the throne young, and was always a jolly prince, very fond of women, and whose personal strength and prowess as a

huntsman, perhaps also in war, blinded men's eyes to the real weakness of his sway. The change of policy was at once announced in a systematic persecution of the Christians and in war For the latter there were pretexts enough on both sides, but the Romans would not have begun the war merely because the Christians were persecuted ; its real authors were presumably the Persian nobles. The chief seat of war was the north of Persian Mesopotamia and the mountain-land above. The Persians were led by one of the greatest nobles, Mihr Narseh, whom Persian tradition represents as taking Constantinople, while we know that he really sustained heavy defeat at the very commencement of the war (August 421). Nisibis was attacked by the Romans, but relieved after a siege of some length. In 422 both parties were glad to make peace ; religious freedom was given to Christians in Persia and to Zoroastrians in the Roman empire. There seems to have been no change of frontier, but the Romans promised to receive no Arabs who wished to change their allegiance,? and to pay an annual sum towards the maintenance of the defences of the Caucasian Gates (the pass of Dariel), which protected both powers from the inroads of the northern barbarians. This last condition reappears in almost all treaties and always caused soreness. For, how- ever carefully the provision was worded, both sides looked on the contribution as a tribute, of which the Romans evaded payment whenever they could.

The Persians, we may suppose, were the readicr to make peace that they were again embroiled with the nation of Kushdn or Haitél, the Hephthalites or "white Huns," who then ruled in Bactria and the surrounding lands. Constant wars of Persia with this people went on during the 5th century and gave the Romans repose, and we are hardly bound to believe the Persian tradition that Bahram had a glorious victory over the Hephthalites.

A movement for freedom had taken place in Persian

Armenia during the Roman war; but after the peace Bahram established a new vassal king, till in 429 the conduct of the selfish Armenian nobles led the Persians

2 The Bedouin tribes, "nec amici nobis unquam nec hostes optandi" (Ammian., xiv. 4, 1), and the petty states that had been formed out of them,

under Roman or Persian suzerainty, were a constant trouble to both empires in war and in peace.

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1 Yazde- gerd II.

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to make Armenia a province,—a change which was sup- ported by a strong party among the Armenians themselves. But the Persian governors had as much trouble with barons and clergy as the old kings had had.

Bahram, dying in 438 or 439, was succeeded by his son, Yazdegerd I1., of whom little good can be said. He per- secuted both Jews and Christians, abolished the audiences on the first day of each month on which every man of posi- tion could approach the king with petitions or complaints, and is recorded to have married his daughter (that, of course, was no crime in a Zoroastrian) and then murdered her.

In 441 he very nearly came to war with Rome, but peace was concluded without further conflict than some harrying of the marches, and it was provided (as in later and probably in earlier treaties) that no new fortresses should be erected on the border by either party. Yazdegerd was much in Khorasan, where he sustained repeated defeats from the Hephthalites; and in 450/451 he had to deal with a serious rebellion in Armenia, mainly produced by persecution of the Christians, which was not quelled till he promised complete freedom of Christian worship.

On the death of Yazdegerd II. (457) the throne was for two years contested between his two sons by Dinak 1— Hormizd, prince-governor of Sagastén, and Péréz. The latter, who was the younger, proved successful by aid of the

Hephthalites and the energy of Rahdm of the house of Mihran, and put his brother and three others of the nearest royal kin to death. Péréz was again a persecutor of Jews and Christians, but had political wisdom enough to favour the reception of Nestorianism by his Christian subjects when that party was driven from the Roman empire. At the synod of Béth Lapat (483 or 484) the old Christian church of Persia adopted the Nestorian confession, and was thus separated from Byzantium by a wide breach. But in truth Christianity in Persia had never been really much of a danger to the state.?

The Hephthalites and Péréz soon fell out about the reward for their services, and fierce fighting ensued, in which Péréz gained several victories ; but the seat of war was a desert very unfavourable to his operations, and twice he had to make peace on disadvantageous terms, while at least once he was himself taken prisoner and released on heavy ransom, leaving his son Kavadh a hostage for its payment for the space of two years. But Péréz always broke faith again with the foe, and at length, in 484, he was among the missing after a terrible battle, in which his daughter was taken captive and placed in the harem of the Hephthalite king. The conquerors now overflowed Persia, which for a time was without a monarch till order was restored by Zarmihr, of the great house of Ka4ren, who at the time of Péréz's death had been successfully dealing with a revolt in Armenia, and now hastened to the capital and made Baldsh, Péréz's brother, king. The Hephthalites seem to have been bought off by a yearly tribute. Baldsh's brother, Zareh, who also claimed the crown, was vanquished and put to death. But the new king had little power, and secured the obedience of the Armenians only by granting that the Persian state religion should be wholly excluded from their land. The clemency of Baldsh is praised by the Syrians and Armenians, possibly for no other reason than that his relations with the Persian priesthood were unfriendly. Their enmity proved fatal to him ; his treasuries were empty, so that he could neither

1 Dinak's likeness is preserved on agem; see B. Dorn, in Compite- rendu dela Com. Arch. pour 1878, 1879, p. 162 sq. (St Petersburg).

2 The Armenians, on the other hand, joined the Monophysites, who had a large party in the Roman empire and often had the upper hand there,

3 Persian tradition makes Sékhré (i.e., Zarmihr) humble the enemy and compel them to restore their booty.

gain a party among the nobles nor secure the support of 429-526,

an army, and in 488 or 489 he was deposed and blinded.

His nephew and successor, Kavadh I., son of Péréz, Kavédh

found the land in a very disturbed state; there were I. rebellions among the barbarous mountain tribes and there was another rising in Armenia. Now Kavddh was not disposed to be the humble servant of the priests and nobles to whom he owed the crown, and to humiliate them he played the dangerous game of encouraging Mazdak, the energetic priest of a new religion, which demanded in the name of justice that he who had a superfluity of goods and several wives should impart to those who had none. This theory was actually put in practice to some consider- able extent, but then the nobility and clergy rose, deposed Kavadh, and imprisoned him in the “Castle of Oblivion,” 4 placing his brother Jamasp on the throne (c. 496). But Kavadh escaped to the Hephthalites, where he had once lived as a hostage, received in marriage the daughter of the king (whose mother was the captive sister of Kavadh), and with his help expelled Jaémasp and recovered his king- dom (498 or 499). Kav4dh held severe judgment on the traitors, and it was probably at this time that he gave up Zarmihr into the hands of his most dangerous rival, Shapur of the house of Mihran. He does not seem to have carried his Mazdakite experiment farther, and he had put the realm into fair order when he began a war with Rome.

Between Rome and Persia there had been such a series of negotiations and compacts, none of which had been scrupulously observed, that either side could find a casus bella at will. Kavddh had the will, and in summer 502 he opened that era of hideous strife between Rome and Persia which so exhausted both powers as to pave the way for the new empire of the Arabs. In August he seized without a fight Theodosiopolis (Karin, Erzerum),

capital of Roman Armenia. On 10th January 503 Amida fell after a siege of three months and was cruelly chastised for its resistance, tens of thousands of the inhabitants being put to the sword. The Romans acted with little energy or unity of plan, and in the course of the war Mesopotamia suffered terribly. Amida was restored to the Romans by compact, or rather by purchase, after a long siege in 504; and after much fighting a peace was concluded in the autumn of 506, leaving things as they were before the war. The Persians, we are told, were ready for peace because they had on their hands a war with the ‘‘Huns,”—a very vague word in the mouth of a Greek. But Kavddh must have been in considerable difficulty, for he tamely submitted to a gross breach of the treaty when Anastasius raised the village of Dara to a great fortress to hold Nisibis in check. There was no more war while Anastasius was emperor, but Justin I. (518-527) seems to have ceased the payment for the Caucasian Gates again stipulated in the peace of 506, to which Kavadh replied by letting loose his Arabs on the empire, and the Romans retaliated by forays in Persian Armenia. There were also serious disputes about the suzerainty of the lands between Caucasus and Pontus, but . Kavadh was still anxious to avert war, from which pre- sumably he saw that no permanent advantage could flow. At the same time he was very eager to secure the succes- sion for his favourite son, Khosrau, who was not his eldest ; and he thought that if he could induce the emperor to adopt Khosrau as his own son this would form a sort of guarantee and greatly impress the Persians. A nego-

4 Identified by Sir H. Rawlinson as Gilgerd in northern Susiana,

5 Kavddh’s escape and restoration seem to have been favoured by some of the greatest nobles, and Persian tradition, which, however, is very confused in this whole chapter, makes Zarmihr the companion of his flight.

6 Of this war we have good accounts in contemporary Syriac sources.

526-546,

Mondhir of Hira.

Khosrau 178 itis ternal rule.

tiation on this and other matters at Nisibis (525 or 526) seems, however, to have been badly managed on both sides, and its failure cost the Roman ambassador his place and the Persian his head. War now began on the borders in 527 before Justin's death (7.¢., before 1st August). A Roman attack on Nisibis and a Persian on Dara failed. Fighting, broken by negotiations, went on for several years, and in it Belisarius first came to the front as a general.

An important episode in this war is the invasion of Syria by Mondhir of Hira. This prince seems to have been more powerful than was safe for Persia, and Kavadh had stripped him of all or part of his possessions and given them to Harith, a scion of the widespread house of the kings of the Kinda. When war broke out Mondhir, who was an expericnced warrior, was restored to his old sway, and in 529 he fell on Syria, pillaging and holding captives to ransom as far as Antioch. Mondhir was a savage heathen, who on one day sacrificed 400 nuns of a Syrian cloister to his goddess 'Uzza (the planet Venus). In the same year he slew Harith in battle and exccuted in Hira a number of captives of the Kinda house. For half a century he was the terror of the subjects of Rome, little recking whether they were at peace or at war with his master, till in 554 he fell in battle with a Roman vassal, EHérith ibn Jabala, whose son he had also sacrificed to 'Uzza.

Under Mondhir's influence Kavddh in 531 undertook a regular campaign against Syria, the first since centuries. The Persians crossed the Euphrates and had pressed far to the north when Belisarius compelled them to turn back. In a battle at Rakka Belisarius was defeated, but the Persians found it expedient to continue their retreat (19th April.531). In Mesopotamia the Persians were this year successful, and had almost reduced the great fortress of Martyropolis (Maiferkat, Arab. Maydfdrikin) when news came of Kavaddh's death, and a truce was made.

In 528 or 529 Kavddh, through his son Khosrau, had made a bloody end of the Mazdakites, whose success proved too dangerous to society to be longer endured.

Kavadh died, eighty-two years old, 13th September 531, and was succeeded by his destined heir, Khosrau (Chosroes), surnamed Anésharvan, “the Blessed,” whom his father is said to have caused to be crowned as he lay on his death- bed.? Khosrau I. was a great king, and deserved the title of “the Just,” though he was not the ideal prince that Eastern writers make him. By carrying out the regula- tion of the land-tax already commenced by his father, and by measures to control the collection of taxes, he benefited his subjects as well as the treasury. In Babylonia at least, the richest province, his fiscal ordinances proved productive, and, according to an Eastern standard, not too oppressive, down to the fall of the Sasd4nian empire ; the Arabs themselves contrast the old Persian system with the oppressive taxation of Moslem times, which was ruinous to the finances of the state as well as to the inhabitants. The public welfare, too, was served by the construction or repair of bridges, canals, embankments, and the like. The priests favoured Khosrau for his extirpation of the Mazdakites, which he completed at the beginning of his reign; but they were not permitted to rule his policy. He managed the great nobles with tact, rather strengthen- ing than weakening the aristocratic basis of the realm, but making it serviceable to himself. Measures were taken to relieve the insecurity which the Mazdakites had introduced in relations of property and the family, and the army was the object of special care. Khosrau had a decided leaning to Western civilization ; and, though an Oriental despot could not be expected to sympathize with the highest fruits of Hellenic genius at a time when they

1 The principal sources for this war are Procopius and the Syrian account in Land, Anecdota, iii. ay That the nomination of Khosrau surprised the Persian nobles is simply impossible. Procopius, it must be remembered, drew for the events at Khosrau’s accession on the tales of the (true or false) pre- tendant Kavadh, son of Jam, and grandson of King Kavadh. But it 1s quite possible that such things as the removal of princes and the execution of valuable officials took place under Khosrau.

were little appreciated even in Europe, and the heathen

philosophers who came to Persia to seek a philosophic

state soon returned undeceived, it is to his honour that | the Persian secured for them the free exercise of their

faith by a clause in the treaty of 549. The Christians,

so long as they obeyed the laws, were unmolested ; nay,

Khosrau helped to maintain the worship not only of the Nestorians but even of the Monophysites, who had much

more friendly relations to the Roman empire. Apostasy

from Zoroastrianism was forbidden by ancient law, and

proselytizing by Christians was strictly prohibited, yet the Monophysite abbot Ahudemmeh, who had got a large

contribution from the king to build his monastery, and

thereafter baptized a son of Khosrau, who presently fled

to the Romans, was punished only by a mild imprisonment,

in which he was allowed to see his scholars. Nor did

the Christians suffer for their sympathy with the rebellious prince Andshazidh ; and yet Khosrau was no weakling,

but energetic, warlike, and on occasion cruel.4

The negotiations begun in 531 issued in September 532

in a “perpetual peace,” the Romans promising a large annual subsidy and other concessions, while the Persians

gave back certain castles in Lazistén at the eastern end of the Black Sea. Khosrau had need of peace, and used it

probably to protect the frontiers from divers barbarous foes, for tradition speaks of his measures for the safety of

the borders towards the Caucasus and on the east. Un- manageable tribes, too, were moved to new homes. Ina few years he was strong enough to go to war again, feel- ing perhaps that Justinian's successes in Africa and Italy

had made the hereditary foe too strong. This danger, no doubt, was forcibly set before him by the emissaries of the Gothic king Vitiges, and a tempting opportunity was

presented by an appeal which came to him fron: the rebel

nobles of Roman Armenia, Christians though they were.

Pretexts for war were never lacking, if only through the

Arab subjects of the two powers.

Syria as Shd4pur I. had done, and marched through the land to the shore of the " Roman sea," taking and pillaging such strong cities as did not buy him off. Antioch in particular yielded an enormous booty ; it was burned and the inhabitants carried captive. Turning homewards, the Persian traversed north Syria and Mesopotamia from west to east, levying a contribution even from the hated fortress of Dara. Carrhz alone, whose population was still mainly heathen, and so presumably inclined to the non-Christian empire, escaped scot free. Ctesiphon was reached at the close of summer, the whole campaign having come off without a single pitched battle. Khosrau, still more than Shapur IT., sought in the barbarous old usage of whole- sale captivities a means of appropriating to his own service the culture and technical skill of the West. Thus he made for the captive Antiochians a new municipality (Khosrau-Antiochia, or "the Roman town") hard by the royal residence, which was a notable tribute to the superiority of Roman culture and life. The town was made as Western in character as could be, and the inhabit- ants were established in comfort, and had religious freedom, and evena Christian mayor. They retained their national manners till the fall of the empire. Chariot-races, for example, were as popular as they had been in old Antioch.

Next year Khosrau was invited to Lazistan by the natives, and penetrated to the Black Sea and took the strong place of Petra. In Mesopotamia war went on for several “3 ‘This is known from an unprinted Syrian biography by a disciple of Ahudemmeh, who manages to make the king a tyrant by inventing a silly miracle to explain his clemency. Ahudemmeh died, after two years’ imprisonment, 2d August 575.

4 Procopius naturally speaks unfavourably of so dangerous an enemy of the Romans.

But Khosrau certainly War w} desired the war, and early in 540 he set forth to attack Rome.

Second Roman war,

EMPIRE. |

years with chequered fortune. In 546 the Romans paid a large sum for a five years’ truce, and another five years’ truce followed in 553, though Lazistan was excluded from both truces until 556, when the Romans had gained successes there; but during all this time the Persian and Roman Arabs never laid down their arms. At length, about Christmas 562, a fifty years’ peace was concluded, the Romans again promising a considerable yearly subsidy, and the Persians withdrawing their claims on Lazistdn, though the possession of the neighbouring Suania was left an open question. The treaty also provided for religious freedom to the Persian Christians, while all proselytizing among Zoroastrians was strictly forbidden.

During the truces (546-562) great changes had taken place in the East, where a powerful empire had been formed in the northern steppes by the Turks, whose name then, for the first time, became known in the West. The khakan of the Turks, whom the Greeks call Silzibulos and the Arabs (after the Persians) name Sinjibi, took from the Hephthalites the right bank of the Oxus, while Khosrau (seemingly in alliance with the khakan, whose daughter he wedded) occupied the left bank (c. 560). Thus Bactria, from which the Sdsdnians had suffered so much, was at length embodied in their empire, and Péréz was fully avenged.! But the friendship of Turks and Persians was soon changed to that hostility which has long made the rulers

of Turkestan and the deserts appear the natural enemies of the lords of Khords4n. Khosrau must have made other conquests about the same time, for in the negotiations with Rome the Persian representative boasts that his master had conquered ten nations, and tradition enumerates the conquest, or rather recovery, of seven eastern lands. These statements must be taken with some discount, and it is not to be believed that Khosrau really ruled in Afghanistan or Sind, as tradition says, though he doubtless widened and secured the eastern limits of the empire."

About 570 an expedition was sent against Yemen, which the Christian Abyssinians had conquered in 525. A native prince invited Khosrau to expel the Blacks, and, after some hesitation, he sent a small force under Vahriz which easily effected this object. Persian rule was nominally maintained in Yemen till the time of Islam, and tribute was paid more or less irregularly ; but, as the Persians were not a seafaring people, this remote province beyond the waters was of no practical use to them in the way of diverting trade from the hands of the Romans. Khosrau had presumably hoped otherwise, for affairs of trade, especially the overland silk trade in inner Asia, had considerable influence on Sdsdnian policy.

About 551 Khosrau had to deal with a rebellion of his son Andéshazadh, who was then in disgrace in Susiana ; hearing that his father was dangerously ill, he claimed the crown, leaning on the Christians, whose religion was that of his mother. The rebel was easily overpowered and taken; his punishment was not death, but such a partial blinding as made him unfit to reign.

In his last years Khosrau had again to face the Romans. The Roman alliance with the Turkish khakan, the efforts of Khosrau to hamper their intercourse with that potent- ate, now his dangerous foe, the annoyance of the Christian empire at the fall of the Christian realm in Yemen, and the refusal of Justin II. (565-578) to pay the stipulated subsidy were all pretexts for war, but the decisive thing was that all Armenia suddenly threatened to become Roman. There were already plans of rebellion among the

1 A curious proof of the late character of Persian tradition is that it regards the Oxus as having always divided Iran and Turdn, and the Turks as having always been next neighbours of Persia.

2 Purely fabulous exploits, like the conquest of Ceylon, mean only that to the Persians Khosrau, like Bahram V., was lord of the whole world.

Armenian nobles when an outburst of popular fanaticism 546-589,

was caused by the attempt to erect a fire-temple in the capital Dovin, and the.Persian Surén? was slain (spring 571). The rebels and the king of Iberia turned to Con- stantinople, and were taken under the protection of the incapable emperor, who fancied that he could regain both countries. This, of course, was a declaration of war. The events that followed are known from good contemporary sources, but cannot be arranged in clear chronological order. One of the first operations was an unsuccessful siege of Nisibis by the Romans. Khosrau, on the other hand, took Dara in 573, after a siege of six ,months, and. was joined beneath its walls by his captain Adharmahan, returning from a successful campaign in Syria on the model of that of 540, in which he had destroyed Apamea.‘ Tiberius, who with the empress Sophia held the reins of power in Constantinople and was recognized as co-regent in the end of 574, desired peace; but Armenia was ex- cluded from the three years’ truce that he procured. In 575 Khosrau penetrated through that country into Cappa- docia, and, though he had to retire before the Romans and leave his camp to be pillaged, he escaped safely, burning Sebastia and Melitene on the way. The Romans pressed forward and spent the winter in Persian Armenia, but were driven back next year; they had not even secured the sympathy of the Monophysite population. Even beyond Armenia the war broke out again before the truce had expired, and the Romans conducted it with no more humanity than the Persians, leading captive the Christian inhabitants of Arzanene, and making it a special favour to give them a place in Cyprus (577). Negotia- tions for peace were frequent; the Romans saw that it was vain to try to hold Armenia and Iberia, and might even have consented to give up the temporal and spiritual heads of the rebellion who had taken refuge at Constan- tinople, but they very naturally would not make peace without recovering Dara. So things stood when Tiberius became sole emperor, and some months later Khosrau died (c. February 579).

Hormizd IV., son of Khosrau by the Turkish princess, Hormizd The Greeks speak ill of LV-

was a proud enterprising prince. him, and indeed were much offended from the first that he neglected the usual courtesy of formally announcing his accession at Constantinople. Persian tradition makes him ill-disposed and a shedder of blood, and we know that he put his brothers to death when he took the throne, but that, as the contemporary Christian narrator says, was a Persian custom. On the other hand, tradition acknowledges the strict impartial justice with which he upheld the cause of the poor against the great. It was the great man who felt his severity. In the army, too, he was careful of the plebeian troops, and lowered the status of the aristocratic cataphracts. Much to his honour is his reply to the priests when they asked him to withdraw his favour from the Christians. “As our royal throne,” he said, “cannot stand

| on its front legs alone, so our rule cannot stand and be

firm if we turn against us the Christians and members of other alien religions. Cease, therefore, your attacks on the Christians and follow zealously good works, that the Christians and others of alien faith may see them, and give praise and be drawn towards your faith.” In many respects Hormizd seems to have resembled Yazdegerd L., whose fate, too, he shared ; the misfortune was that he had not his father’s tact in managing the nobles and the clergy.

The war with Rome went on throughout his reign with varying fortune. There was a serious war, too, with the Turks, but over these, or rather over one of their vassals, the Persian general Bahram Chébin gained so complete

3 A member of the same house with the conqueror of Crassus. 4 Part of the captive Apameans were settled in New Antioch.

589-623.

a victory that he is said to have made the Turks pay instead of receiving tribute. Bahram was next sent into the lands south of the Caucasus to strike a great blow at Ronie (589), but here he was utterly defeated, and Hor- mizd was foolish enough to dismiss him with disgrace. The general, who was head of the great house of Mihran, replied by open revolt, feeling, no doubt, that he could reckon on the discontent of the nobles and the other armies. The troops in Mesopotamia which had been driven back on Nisibis by the Romans and were afraid of punishment did in fact mutiny and open communication with Bahram, who marched against the capital and reached the Great Zab. An army sent forth against him also mutinied, but declared for Hormizd's son, Khosrau, who was on bad terms with his father. Next, part of the troops rose in Ctesiphon, whither Hormizd had hurried from Media. Bindée, Khosrau's maternal uncle, was in prison there, and his brother Bist4m (Vistahm) set him free by force. Hormizd was deposed and soon after put to death, and Khosrau, who had probably consented to a crime he could not prevent, was proclaimed king (summer

590).

PHBRSILA

[SASANIAN

disorders were ruinous. Nor was Khosrau II. the king fit for such times. A weak coarse-minded nian, at once boastful and timid, avaricious and fond of luxury and splendour, he was at best a very ordinary Oriental despot. He found the treasury empty and left it full, while the empire was impoverished by wars. And in these he won no' glory; his victories were those of his generals. To the Christians he long extended protection and favour, and even built them churches; for he fancied that not only the Christian empire but St Sergius himself, the chief saint of the Roman Syrians and Arabs, had a share in his restoration, and he was much under the influence of a Christian wife, Shirin, and of some other Christians, such as his physician Gabriel.2 But in later years his disposition toward the Christians was altogether reversed.

When Maurice fell by treason and the hideous tyrant Phocas seized the throne (November 602) Khosrau felt himself called to avenge his "father"

and protect Maurice’s supposed son, Theodosius, who had fled to the Persian court. Narses too, the commandant of Edessa, called for help against Phocas. Khosrau accordingly imprisoned the ambassadors who came to announce the new accession,

Civil Khosrau IT. Parvéz, “the conqueror,” had now to deal | and a war began, early in 604, which for twenty years laid

war. with Bahram, who sought the crown, or at least the regency, | the Roman lands open to such ravages as had never before for himself. But the pusillanimous king could not inspire | been known; so helpless was the empire under the bad | his troops with courage to face the experienced general; | rule of Phocas and through the pressure of Avars and he was deserted in the first shock of battle, and fled to | other barbarians. Khosrau was present at the taking of Circesium to cast himself on the aid of the emperor | Dara (604),? but had no personal share in the war after Maurice, who undertook to restore Khosrau, but, able | that event. After a few years the Persian armies were prince as he was, missed the great opportunity of securing | seen as far west as Chalcedon over against Constantinople. an adequate equivalent for the service. Himself a man | Yet the real weakness of the Sdésd4nian realm was strikingly of obscure descent, he seems to have been flattered by the | exposed in these very years (604-610) in the battle of idea of posing as “father” of a legitimate king of ancient | Dhi Kar, a small affair in itself, but very significant. stock. The enterprise was not very difficult, for though | Khosrau had abolished the kingdom of Hira and put King Bahram had seized the crown and begun to coin in his | No‘man to death, thus ridding himself of a troublesome own name the nobles would not submit to one of their | vassal, but at the same time losing a very useful own peers, and the people were still stricter legitimists | means of influencing and checking the desert tribes. than they had been under the Arsacids. In their view the | And soon after No‘man’s fall the tribe of Bakr ibn Wail royal majesty (farrahi kaydnik) was innate in the house actually defeated a regular army at Dhu Kar near the of Ardashtr, and none outside of it could be king. Bahram | Euphrates, but a few days’ journey from Ctesiphon, and had to put down an insurrection in Ctesiphon itself, and | maintained themselves on the soil in spite of the Persians. Bindée escaped and took up his nephew’s cause. In the | Arabic vanity greatly exaggerated

this success, and the beginning of 591 a Roman host drew near, and Khosrau | result was a notable increase of self-confidence on the part caused the gates of Martyropolis! and Dara to be opened | of the Arabs, by which the Moslems ultimately benefited to them. He was now joined by the Persian army of | when they came to attack Persia. Nisibis, and Persian and some Armenian grandees came in The Romans still had the worst of the war when in to him day by day. The other armies took the same side. | October 610 Phocas gave place to the valiant Heraclius. In Atropatene Bist&ém, Bindéde's brother, gathered a host | The new emperor, hard pressed on all sides, vainly asked against Bahrdm, while the united Persian and Roman | for peace. In 613 Damascus was taken, and the country forces advanced along the left bank of the Tigris and | round it, on which the Persians had never before set foot, smote him in a decisive battle near the Z4b (summer 591). | was ravaged in a way of which countless ruins bear wit- Seleucia, Ctesiphon, and New Antioch had already been | ness to this day. In June 614 Jerusalem fell, and, to the taken by troops sent through the Mesopotamian desert. | horror of all Christendom, the "precious and life-giving

oe Thus Khosrau was restored, and peace with Rome followed | cross" went into captivity. Next Egypt was conquered,

of course. The Romans ceased to pay tribute, but only recovered their old frontier, Nisibis still remaining Per- sian, Bahrdm fled to the Turks and was honourably re-

and Asia Minor swept as far as Chalcedon. Heraclius was Cam- — not able to strike a counter blow till 622, when an ex- er pedition towards Armenia and the Pontine territories from {2 |

clius, Khosrau

ceived, but was murdered not long afterwards. was still so insecure that he asked a bodyguard of 1000 Romans, and now he set himself to remove all dangerous persons, especially Bindée and the other conspirators who had overthrown his father and set himself on the throne, Bistém was not so easily reached. When he saw himself condemned he made himself king in Media, and held out for almost six years with the help of the remnants of

Bahram’s forces and in alliance with Turks and Délamites. He fell by treachery probably in 595 or 596.

To a land already weakened by long wars all these

u This towu had been betrayed to the Persians, and the Romans had lain before it for some time,

the Gulf of Issus restored respect for the Roman arms. His great campaigns began in the following year and carried him deep into the Persian country, often quite cut off from his base, in a way that could not have succeeded with any leader who was not a great politician as well as a great general. In the first year of these campaigns he destroyed one of the holiest of Persian shrines, the fire-temple of Ganjak, near Lake Urmiyah, and so

- Shirin and the king even took part in the quarrels of Nestorians and Monophysites, and foolishly took the side of the latter, who were the minority and less Persian in sympathy. ‘There are good contem- porary Syriac records of all this which in part are still unused.

3 Land, Anecd. Syr., i. 15.

Anarchy.

EMPIRE. |

avenged Jerusalem. Now we find him near the Caucasus, now in eastern Asia Minor, now again in Mesopotamia, never beaten, often victorious, but oftener perhaps out- witting superior forces by adroit movements. In 626 Khosrau attempted a diversion by sending his best gene- ral, Shahrbaraz, with a great force directly against Chal- eedon. It was an anxious summer in Constantinople, with the Avars behind and the Persians in front, and the emperor almost lost in the depths of Asia. But in the beginning of August the Avars drew off, the Persians, who had no ships, having failed to cross the Bosphorus and effect a junction with them. Heraclius replied by drawing the Kwazars (¢.v.) down into Persian territory, and in 627 he ventured to strike a blow at the heart of the monarchy. The feast of 6th January 628 he cele- brated in Dastagerd, which was but some three days’

march from Ctesiphon, and had been Khosrau's usual residence for twenty-four years. Jhosrau had fled in terror, and did not deem himself safe till he and his harem were over the bridge of Ctesiphon. The capital was, of course, too strong to be carried by the small forces that the Roman had been able to lead by a rapid march from the Caucasus, and Heraclius turned swiftly before any great army could be gathered against him, and cut his way through the enemy's country back to Ganjak over the Kurdish Alps amid the snows of February and March,—an exploit almost unparalleled in the history of war.

Meantime there was revolution in Ctesiphon. Khosrau's tyranny and greed had offended high and low; his panic flight had made him contemptible ; and, to crown all, his legitimate heir Kavadh and most of his brothers were pining in prison to leave the heirship open to Mardanshah, son of Shirin, who, even in advanced years, had retained absolute command of her husband, in spite of his thousands of other wives. Certain nobles liberated Kavadh and pro- claimed him king (25th February 628), and Khosrau, deserted by all, was dragged from his hiding-place and executed (29th February). Thus miserably perished a prince whose armies had covered almost the whole breadth of the Achemenian empire. No hand was raised to help

him, and the Christians, who had never forgiven the insult

to the true cross, were the first to welcome the elevation of the parricide Kavddh, in which, indeed, one of their own number, Shamta, son of the farmer-general Yazdin, had a leading part.

The first act of Kavadh II. Shéréde was to murder some eighteen brothers, his second to ask peace from the Romans. A truce was conceded, but Heraclius was too much master of the situation to agree to a final peace at once. Persian troops were recalled from Roman soil, but, when Heraclius, after a hasty reorganization of Mesopotamia, had gone on to Syria, he learned that the Persian king was already dead after a reign of but six months, in which the chief occurrence was a terrible pestilence.

Ardashir ITL., son of Kavddh, was now crowned at the age of seven. An era of distress and trouble followed, in which children or women sat on the

throne, and the nobles disputed with one another for the reality of power. The holy cross was sent back from Ctesiphon through the primate of the Nestorians; and the feast of the Elevation of the Cross still commemorates the joyful day (14th September 629) when Heraclius solemnly re-erected it in Jerusalem. The Government at Ctesiphon was powerless ; the Khazars harried the empire ; and it was perhaps at this time that Khosrau, son of Kavadh, and grandson of Hormizd IV., who had been brought up among the Turks, sought to make himself king in Khordsdn, but was slain after a few months. A more dangerous pretendant was the victorious general Shahrbar4z, who met with Hera- clius in June 629 at Arabissus in Cappadocia, and prob-

Pine 1 «&

615

ably there obtained an approval of his enterprise from the 623-634.

emperor, who naturally favoured the cause of disorder in Persia. Shahrbaraz took Ctesiphon with a small force aided by treason within ; Ardashir was put to death (27th April 630); and robbery, murder, and every terror raged in the royal city. But Shahrbaraz, too, fell on the 9th of June a victim to the envy of his peers and the spirit of legitimism. His body was dragged through the streets, and tradition speaks with grotesque irony of the man who sought to be king but could not, because he was not of the lawful house.

Boran, daughter of Khosrau IL., now sat for a time on the throne (till about autumn 631), and appears to have closed the treaty of peace with Heraclius. The conditions are not recorded, but were probably the same as in the peace with Maurice; at all events the Persians kept Nisibis. Bérdn was followed in Ctesiphon by her sister

Azarmidokht, probably after a short interval in which a

certain Péréz reigned. But in Nisibis the soldiery of theslain Shahrbaraz put forward Hormizd V., a grandson of Khosrau II., and he maintained himself in that quarter for a time (631-32). Azarmidokht was dethroned by Rustam,

the powerful hereditary marshal of Khords4n, whose father’s death she had procured. Our confused records of this age of disorder do not permit us to give a clear chrono- logical or geographical view of all pretenders who arose in the capital and provinces; but in Ctesiphon, we know, * there reigned for a time a certain Ferrukhzadh (or Khor- rezidh) Khosrau, apparently a child! But another child,

Yazdegerd III., son of Shahriydr, and so a grandson of Yazde- Khosrau II., was put forward by certain nobles in Persis, gerd HI.

and crowned in the fire-temple of Ardashir (second half of 632 or first half of 633). Soon Khosrau was slain and Yazdegerd acknowledged in the capital, and without much resistance in the provinces also.

Fond hopes could now be entertained that the wounds of the monarchy might be healed under a legitimate prince unstained by descent from the parricide Shérde, conse- crated in the cradle of the monarchy, and upheld by the strong hand of Rustam. Some temporary recovery seems actually to have taken place ; but a new foe more danger- ous than Julian or Heraclius was already knocking at the gates of the monarchy. That Yemen and some tracts in north Arabia had already been lost by Persia to the Moslems had scarcely been observed at Ctesiphon amidst so many greater disasters. But now the Moslems already hovered on the frontier. Mothanna, one of the boldest leaders of those Bedouins who since Dhu Kar had made frequent forays on Persian soil, accepted Islam, and had its strength at his back. These attacks became bolder and bolder.

562), appeared with a small force on the lower Euphrates to take the lead of these Bedouins. Persian troops and their Arab allies were repeatedly beaten in small engage- ments, and soon a number of frontier-posts were in the hands of the Moslems.2. The inhabitants of the western bank of the lower Euphrates, who were all Christians and had little attachment to Persia, submitted themselves and promised to supply the victors with intelligence. Soon the Arabs ventured to cross the river and plunder the villages west of the Tigris.? In the early summer of 634, however, Khalid was called away to Syria; his successor, Abt ‘Obaid of Taif, though strengthened by reinforce-

1 He appears beardless on his only known coin. By some accounts he was the only son of Khosrau IJ. who had escaped massacre.

2 The history of the conquest is here given mainly after Beladhori, whose short notices stand examination much better than Tabari and the historians who follow him. The chronology is in many points

uncertain. 3 Baghdad, then such a village, was plundered on a fair tide.

Presently Khalid, in all the prestige of his victory Moslem over the revolt of the Arabs against Islam (see vol. xvi. p. invasion.

Plate VIII.

ments, was utterly defeated and slain on his first meeting with a regular Persian host in the hard-fought “ battle of the bridge” at the Euphrates, and Mothanndé had great difficulty in saving the remains of the army (26th Novem- ber 634). Not without hesitation the caliph ‘Omar resolved to send a greater force to ‘Irak, calling on his Arabs to win for themselves the treasures of the Khosraus and paradise ; and now for the first time a considerable Persian army was defeated at Bowaib (635 or 636), with the loss of its general, a prince of the house of Mihran. In Sa‘d ibn Abi Wakkas the Moslems had now an ener- getic and cautious leader, and the Persian court began to see its danger, especially when the news arrived of the battle of Yarmuk, by which Syria was lost to Heraclius. Rustam in person placed himself at the head of a great army, over which, in sign of the gravity of the enterprise, was borne the venerable sacred banner of the empire (dirafshi kéviydn). Sad fell back before the Persian advance and posted himself at Kadisfya on the edge of the desert south or south-west of Hira, where the armies lay facing each other for months. The Arab force must have been inferior in strength, for no great army could have long held such a barren post nourished only by forays and what the caliph could send from Medina, At length, towards the close of the year 636, or in 637, battle was jomed and raged for several days, Sa‘d giving orders to his men in spite of a sickness under which he laboured. The Persians were better armed, but the Arabs fought with desperate energy. The elephants, which formed part of

every regular Persian army, greatly terrified them at first, but ultimately these huge beasts, getting out of com- mand, only aided the discomfiture of the Persians. Of the mass of a Persian host no great bravery was to be expected ; yet it was only after a hard fight that the victory was de- cided, Rustam slain, and the sacred banner taken.

The battle of Kadisiya virtually decided the fate of the Tigris valley ; but there was still some fighting on the plains of Babylonia, at Birs (Borsippa), and Seleucia was not taken without a lengthy siege. Then the Arabs crossed the Tigris and fell on Ctesiphon, Yazdegerd fleeing before them to Holwdn on the Medo-Babylonian frontier. At Jaltilé on the road to Holwdn the Arabs gained a fresh victory over Rustam's brother, Khorrezddh, and Yazdegerd continued his flight. Meantime another body of Arabs had occupied Lower 'Irak and entered Susiana. A strong and wise leader might still perhaps have saved Iran proper, and "Omar, as energetic as cautious, was in fact slow to allow his armies to assail the highlands. It was not till some time between 640 and 642 that the

Prime tA

[SASANIAN EMPIRE,

"victory of victories," as the Arabs rightly call it, was gained at Nehdvend (a little south of the old high road from Babylon to Ecbatana), and the last great army of

the Persians was shattered by N: oman, who fell on the Over. Even now many indi- throw vidual provinces and cities did not yield without stubborn "™Pir

field, and the Meccan Hodhaifa.

resistance, and in many places rebellion after rebellion had to be crushed, especially in the region around Istakhr, the cradle and sacred hearth of the fallen monarchy, Everywhere the great local barons and even the lesser nobility dealt with the Arabs as independent chiefs, and in many cases came to peaceful terms with them.

Yazdegerd fled from one to another of his lieutenants without venturing himself to strike a blow for his crown and his life. He still retained the forms of sovereignty, and coins were still struck in his name; but one host after another dismissed him as a burdensome guest, and at length he was miserably murdered in the remote dis- trict of Merv, not, it would appear, without the conniv- ance of Mahée, governor of that province (651 or 652).

The great similarity in the ends of the Achemenian and Sdsdnian empires is no mere accident, but significant of the internal resem- blance between the two. Granicus which showed the reality of the danger, Issus which lost Darius his western provinces, Gaugamela which broke up the monarchy and yet did not at once give pos- session of the several lands of the realm, have their parallels a thousand years later at Bowaib, Kadisiya, and Nehdvend, The flight of Darius to the farthest north-east, and his death by the hand of traitors, not of the foe, are repeated in the fate of Yazde- gerd, who resembles Darius also in his lack of heroism. The nobles showed more loyalty and patriotism against the Arabs than against Alexander, and indeed religious antipathy and the bar- barism of the Arabs made it less easy in the later case for a Persian to accept the foreign yoke; yet even now there were too many traitors and deserters among the nobles high and low. Fully to subdue the Persian monarchy cost the Arabs a much longer time than it had cost the Macedonians; but the conquest went far deeper, —Hellenism never touched more than the surface of Persian life, but Iran was penetrated to the core by Arabic religion and Arabian ways. See MoHAMMEDANISM.

A fragment of the Sdsdnian empire lasted for a considerable time in the mountains of Tabaristan (Mazandaran), to which the here- ditary generals (Spdhpat, Ispehbedh) of Khorasan, of the house of Karen, withdrew, and wherc they reigned for over a hundred years, though sometimes paying tribute to the caliphs. They remained faithful to Zoroastrianism, and apparently viewed themselves as direct successors of Yazdegerd, since the cra employed on their coins seems to have his death as its epoch.

Literature.—G. Rawlinson, The Seventh Great Oriental Monarchy (London, 1876), is inadequate. Fuller but stil] inadequate use of Oriental sources is imade by Spiegel, Eranische Alterthtimer, vol. iii. (Leipsic, 1878). The docu- mentary evidence is mostly collected in Néldeke’s translation of

Tabari (Geschichte der Perser, &c., Leyden, 1879). For the relations of the Sasanians with Rome, Tillemont, Hist. des Emperewrs, and Clinton, Fasti Romani, must be used, and Saint – Martin's notes to Lebeau, Hist. du Bas-Empire (Paris, 1828-36), are still useful. A great deal of serviceable matter is to be found in Hoffmann's translation of excerpts from the Syriac Acts of Persian Martyrs (Syrische Akten Persischer Martyrer, Leipsic, 1880). (TH. N,)

PART IL—MODERN PERSIA.

SECTION I.—GEoGRAPHY AND STATISTICS.

Lone prior to the Christian era the satrapies of Cyrus comprehended roughly an immense range of territory, from the Mediterranean to the Indus and from the Caucasian chain and Jaxartes to the Persian Gulf and Arabian Ocean. In the 17th and 18th centuries a.p. the conquests of "Abbas and Nadir kept up these boundaries

more or less on the east, but failed to secure them on the –

west, and were limited to the Caucasus and Oxus on the north. Persia of the present day is not only, in the matter of geographical definition, far from the vast empire of Sacred Writ and remote history, but it is not even the less extensive, though very expansive dominion of the Safawi kings and Nadir Shah. It may be said, however, to comprise now quite as much settled and consolidated territory as at any period of its political existence of which we can speak with the authority of intimate acquaintance.

If it has less extent of land than before its latest disastrous war with Russia, there is certainly within its recognized limits less rebellion and more allegiance. And, if the true interests of Persia, considered as a living power, were only understood by her kings and ministers, she might reason- ably seek to attain a state of security which would amply compensate for the loss of precarious and profitless ex- panse.

Boundaries.—The region of Ararat presents a good starting-point for the definition of a western and northern boundary to the kingdom of

NAsruw’d-Din Sh4h. East of the Greater Ararat a short oblique line from the Arras to the south-west divides it from Russia. Below this

more than twenty-five years, has been rather a careful delineation of the disputed tract than the delimitation of

an exact boundary, while the cession of Kotur to Persia, though part of the general question, must, if carried out at all, be looked upon as a separate result, due only to later diplomacy. The territorial claims of Turkey and Persia bear chiefly upon Kurdistan and the respective tribes which inhabit the plains and valleys of that exten- sive mountain region. They are founded upon the treaty of Sultan Murad IV. with Sh4h Sufi in 1639, a later one of Nadir Shah with Sultan Mahmud LI. in 1736, and one more recent still between Fath ‘Ali Shah and Mahmud II. in 1823,—the last two maintaining the status quo established by the first. But, when the Anglo-Russian commission first met, the boundary of possession fell far short of Turkish pretensions. These would have extended the pashalik of Baiyazid (Bayazid) in the province of Arzrum (Erzeroum) to a line including Maku, chief place in the district, and situated on the bank of the river of that name.! Farther south, again, the sultan insisted on increasing the area of the province of Van by the forcible annexation of Kotur. Such an act, after the assembly of a commission for the demarcation of the disputed frontier, was neither justified by precedent nor could it enhance the merits of the Turkish claim, and the reason alleged, that Kotur was essential to the Ottoman Government for stra- tegical reasons—in other words, that it gave the Turk free access into his neighbour’s territory—could scarcely be taken to account in the estimation of their opponents. The question was submitted on behalf of Persia to ~~the Berlin Conference in 1878, and a special Anglo~~ Russian commission appointed to consider it in July 1880. The proposed cession, if accepted, would substitute for the present curve eastwards a line more direct but with a westerly inclination, whereby the fort and _ station of

within the Ottoman territory the border-fort of Sardasht, on the left bank of the Aksu.

Continuing the line of disputed frontier to the southward, the same difficult country still presents itself to perplex the decisions of commissioners or arbitrators, but from the warmly-contested district of Zohab in the province of Karmanshah up to Dizful on the Diz river the mountains may be said generally to indicate Persian and the plains Turkish territory. Luristan and Khizistan (with Arabistan) are the frontier provinces of the shah, and the Hamrin Hills, with Hawizah, Muhamrah, and the east bank of the Shattu ’l-‘Arab, show the Persian possessions to the head of the gulf.

The want of a determined line of demarcation between the two countries for the 700 miles from Ararat to the Shatt, or outlet into.the sea of the waters of the Tigris and Euphrates, may have political advantages, but is inconvenient to the geographer and most unfavourable to the cause of order and good government. Even without the evidence of open conflict, it may be assumed that there are few inhabited sections of the strip of disputed frontier (from 20 to 40 miles in breadth) where mutual ill feeling is not the rule, and where the Turkish Sunni does not abstain from friendly association with the Persian Shi‘ah. More recently attempts have been made, and apparently with success, to reconcile differences by British and Russian mediation, and a renewal of the days need not be antici- pated when telegraph-posts were torn up or destroyed, lands laid waste, and villages plundered, owing to the prevalence of the old spirit of hostility.

From the already-adverted-to point on the Arras east of Russo- the Greater Ararat the river itself supplies a northern Persian boundary to Persia up to the fortress of ‘Abbasabad, where “tier

Kotur become embodied in Persian territory. This section of frantier is overlooked on the north by the

mountains Bebi Kourgui, Guerdi Beranan, and Khidhr line.

Baba, passes through Tépé Avristan on the west to the Turkish road to Kotur, follows this road to the west for half a mile, and then turns due south between Mount Kevlik and the river Shiva Resh to the sources of the latter,

whence it zigzags to the eastward to re- join the general boundary-line overlooked by the Kara Hisar, Mir ‘Omar, Guéré-Sourava, and Guéré-Berian Mountains. Sir Henry Rawlinson saw difficulty in de- fining a line of frontier from Ararat to Kotur; for the country was not only intersected by ranges running in every possible direction, but it wanted a fixed population, and was, moreover, liable to the incursions of wild Kurdish tribes, who would have no respect for boundary-marks. Below Kotur, and south-west of the important Persian town of Khof, the old line of possession inclined consider- ably’to the westward, but Turkey claimed a more advan- tageous line running nearly north and south to the passes between Sik Bulak and Rowandiz, one of which was crossed in 1875 by Thielmann, who gives an interesting account of the surrounding country. The plain of Lahijan on the Persian side—-some 20 miles long and 20 niiles broad—he describes to be at an elevation of 5650 feet, “watered by the two sources of the Little Zab, which, several miles after their junction, traverses the mountain range through a deep rent… and then flows towards the Tigris.” On the west of this district is the “ gigantic wall of the Zagros Mountains, the frontier-line between Turkey and Persia.” Hence, to the latitude of Sulimaniya, or for more than 100 miles, the Turks claimed farther than the ancient limits assigned to them, and sought to include

1 Under the treaty of San Stefano (8d March 1878) the old Perso- Turkish became the Perso-Russian frontier as far south as to include the post-road below Baiyazid ; but the territory so taken from the Turks was restored under the later treaty of Berlin.

a cession of strategical works to Russia is noted by a loop on the southern bank. Thence the line is generally matked by the bed of the Arras for a distance of about 180 miles, descending as low as 38° 50’ N. lat., and rising again to 39° 30’ north-east of the steppe of Moghan. An oblique line running south-east to the Bulgaru, Chai makes that stream the southern boundary for 13 miles to the conflu- ence of the Adina Baz4r and Sairkamish, the former of which then limits the Persian territory on the east. From the source of the Adina Bazar the crest of the mountains towering over the more distant Russian ports on the western shores of the Caspian, and separating the Talish from the Arsha, marks the division of the two territories up to the river of Astara, the port of which name completes the

demarcation on the sea-coast. Thus far the result of the treaty of Turkmanchai, dated 10 [22] February 1828, which involved Persia in a serious loss. To the southward all is Persian, and the two large maritime provinces of Gilan and Mazandaran, both laved by the waters of the Caspian, represent the northernmost parts of the shah's dominions be- tween the 49th and 54th meridians of E. long. In the south- eastern corner of the Caspian the island of Ashurada in the Bay of Astrabad was appropriated by Russia in 1842 as a convenient post for overawing the Turkmans (Turkomans).

Eastward of the Caspian, from the Hasan Kuli Gulf, North- the line of Persian territory cannot be indicated with east

absolute certainty, because the Russian maps do no correspond with those prepared by the war department in England; and if need hardly be added that the former give to Russia far more land than do the others. Accord- ing to Colonel Stewart, an officer for some time resident in the vicinity of the Atak, or skirt of the mountains fronting the Black Sand Desert, the line follows the Atrak (Atrek) from its mouth to Shatt, where it leaves the river XVIUL — 78

t frontier-

and passes obliquely west of the Simbar to a point within 15 miles of Kizil Arvat,! and then turns towards the Tekke range to Darahgaz, which district it includes in an outer curve, passing on to the Tajand at Sarakhs. The Russian official map, however, brings the line south and east of the Simbar, and otherwise impoverishes Persia to the benefit of her powerful neighbour. But the first article of the Russo-Persian treaty signed in December 1881 at Tehran (Teheran) thus describes the situation :—

"From Chat (Shatt?) the frontier-line follows in a north-easterly direction the ridges of the Songou Dagh and Sagirim ranges, thence extending northward to the Chandir river, reaching its bed at Cha- kan Kala. From this point it runs in a northerly direction to the mountains dividing the Chandir and Simbar valleys, and extends along the ridge of these in an easterly

direction, descending into the bed of the Simbar at the spot where the Ak-Agayan stream falls into it. Hence, eastward, the bed of the Simbar marks the frontier as far as the ruins of Masjid Damanah, where a local road forms the boundary to the ridge of the Kopet Dagh, along which the frontier extends south-eastward, turning south among the mountain heights which divide the valley of the Simbar from the source of the Garmab. Taking a south-easterly course across the summit of the Misino and Chubest Mountains, it then strikes the road between Garmab and Ribat at a distance of less than a mile north of the latter, and, following a high ridge, procecds in a north-easterly direction to the boundaries of Giuk Kaital. Hence, after crossing the gorge of the river Firuzé, it turns south-east till it reaches the summits of the mountain range, bounding the valley on the south, through whieh the road from the Russian station of Askabad to Firuzé passes, and pursues its course along the crest of these moun- tains to the most easterly part of the range. The frontier-line now crosses over to the northernmost summit of the Aselm range, whence it seeks out the junction of the mountains called Ziri Kuh and Kizil Dagh, extending south-castward along the summits of the former until it issues into the valley of the Baba Durmaz stream. It then takes a northerly direction and reaehes the oasis at the road from Gawars to Lutfabad, leaving the fortress of Baba Durmaz to the east.”

The distance from Baba Durmaz to Sarakhs is about 185 miles, and the intervening boundary is that of the ataks of Darahgdz and Kelat, both of which districts belong to Persia. The word “atak,” signifying “skirt,” apples to the whole hill-country separating Persia from the Turkman desert, though these mountains and their passes and valleys are not all within the shah’s present dominion. That they present a formidable barrier and remarkable geographical features may be inferred from the ascertained height of the loftier peaks, which, though in- ferior to those situated some 50 miles to the south, can still boast a figure varying from 5000 to 10,000 feet. In the

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querors to continue the unchecked exercise of their infamous profession in Khurdsan (Khorasan).

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Special mention of Sarakhs, the extreme outpost of Sarakh

Persia in the north-east, appears to be appropriate, both on account of its geographical position and of its political importance. This place, situated on the plain of the same name," was fifty years ago a mere outpost of Maz- duran, the frontier hill-station on the shortest of three roads (and somewhat more than midway) between Mashhad the capital of Khurdsan and Sarakhs. It was visited in 1860 by M. de Blocqueville, who found there a recently- con- structed Persian fort, with strong walls and protected by a ditch. Some of the towers contained as many as ten guns. He says nothing of the ruins of the old town on the east of the Tajand, though he forded the river; but Burnes, who in 1833 put up in a ruined tomb amid the Turk- man tents or "khargahs" in that particular locality, had been equally silent regarding it. The last-named traveller speaks of the shrine of a Muhammadan saint, of a small weak fort, and of a few mud-houses only, and states that, at the third mile after leaving his encampment to enter

- Persia, he crossed the Tajand,—not supposing it, however,

to be the Herat river. Sir Charles Macgregor was at New Sarakhs in 1879. He describes the fort as immense,—an irregular polygon, with eleven bastions, and citadel attached. It had a garrison of some 700 infantry, with a few horse- men, and eleven guns of more or less use. From its walls he reviewed the surrounding country. On the north stretched one vast plain almost unbroken by tree, bush, mound, or undulations, for the bed of the Tajand winding round to the north-west was too low to be visible. On the north-east lay the road to Merv stretched out beyond the dark tamarisk foliage of the river. To the east all was clear; south-east were undulating rounded ridges extending towards the Murghab; south was Mazduran ; and north of west was a confused mass of rugged hills in the direction of Kelat- i-Nddiri. Lastly, we have the testi- mony of Lessar, the Russian engineer, who, visiting the place in 1882, found it extensively fortified and occupied by a battalion of Persian infantry ; the armament of the fortification, however, consisted only of six old guns, which were never discharged, while the artillerymen were igno- rant of their duties, and neither drilled nor exercised. Water was supplied from wells inside the walls and by canal from the Tajand.®

Hazar Masjid range is one of 10,500. Adopting Rawlin- son's divisions and distances, the whole Atak, or " Daéman-i- Kuh," as the Persians call it, is divided into three districts:

To define the eastern boundary of Persia, the lower Easter course of the Hari Rud, under its name of Tajand, may be boun

ary.

the Akhal Atak, extending for 160 miles, from Kizil Arvat to Darahgaz, the last Tarkman camp (obah) in which is at Gawars; the Darahgdz Atak, 70 miles, to Abiverd; and the Kelat Atak, 60 miles, to Mehna. Thence to Sarakhs another 70 miles may be reckoned, to accomplish which the traveller leaves the mountains on his right and the wonderful natural fortress of Kelat-i-Nadiri in his rear, to strike the Tajand at the crossing point between Merv and Mashhad (Meshed).

The subjection by Russia of the Turkman tribes and the planting of her standard in the hill-country on the western side of the Atak have immensely strengthened her power in the region east of the Caspian. These new Cos- sacks of the Black Sand Desert will be a great acquisition to her force, though their antecedents denote propensities rather aggressive than protective. In one respect the Persians should be gainers by the encroachment. It is hardly probable that under the new arrangements in the Atak the north-east frontier of Persia will be so frequently the scene of plunder and invasion as it has been of old, or that the marauders will be allowed by the Russian con- SS eee

1 5 . ie ; Probably a plural or perversion of ribdt, a caravansara.

accepted generally up to Pul-i-Khattn, whence to Tuman Agha the line is continued by the river in its own name. From this point it runs*due south across the mountain range overtopped by the conical peak of the Sang-i-Dukhtar, and through the edge of the Salt Desert, leaving Kuhsan and Zangi Suwar, villages near the Hari Rud, and the more important Ghurian in Afghan territory.4 Again crossing the ranges which intersect the desert from the north-east, the line, inclining somewhat to the west of south, is continued to Chah Sagak (the "'dog's well"), an elevated spot on the old

caravan route between India and Persia, as far as which the Afghans have the right of pasturage. To the westward is the Persian province of Kaiyan. The surrounding country bears the significant name of Dasht-i-Na-Umaid, or “ Waste of Hopelessness.” For 8 miles south-east, 8 miles due east, and 24 miles south, in all about 40 miles, the line is carried to the

? West of the Tajand, ealled by Dr Wolff the ‘‘ Dariya” (or sea) of Sarakhs,

3 Other modern travellers have written of Sarakhs, among them an intelligent Indian, Daud Khan, but they give no information additional to that of the authorities quoted.

4 When Mr Forster was at Khaf in 1783, Timur Shah, the ruler in Afghanistan, had his boundary between that place and Turshiz.

Siy4h Kuh, or “Black Hill,” on the border of the district of Nehbandan. Here begins the line of frontier determined by the Sistan arbitration of 1872. The British commis- sioner (Sir F. Goldsmid) decided that an oblique line drawn from the Siy4h Kuh to the southern limit of the reedy marsh called “ Naiz4r,”.and prolonged to the main outlet of the Helmand, would fairly separate and dis- tinguish the possessions of the two states respectively in the north of Sistan. On the east the bed of the Helmand itself would be the boundary up to Kuhak, where was the large “band” or dam which diverted the waters of the river into the more fertile lands to the west. From Kuhak a line south-west to the Kuh Malik Siy&h completed the delimitation by leaving the two banks of the Helmand in the hands of the Afghans, and placing a large tract of partly desert and partly inundated country between the litigants. Subsequent surveys by Sir Charles Macgregor have thrown new light upon the large and little-populated tract to the far south of Sistan, and are suggestive of an Aighan-Baluch as well as of a Perso-Afghan frontier.

In whatever light it be regarded, the line of Persian frontier from the Kuh Malik Siydh to the sea rather con- cerns Baluchistan than Afghanistan ; but,

though roughly delineated by St John and Macgregor, it cannot be described with scientific accuracy until it reaches the district of Jalk,

or after a south-easterly passage of 170 miles through the

deserts of Pir Kaisar and the Mashkel or Mashkid,—names used as the more likely to identify the region traversed. From Jalk the Perso-Kelat boundary begins, as determined by Major-General Goldsmid, the British commissioner in 1871, and verified in the subsequent year by Captain (now Sir Oliver) St John, R.E. The state of Kelat (Khelat), it should be explained, is now that of western Baluchistan, the western half of that country having become annexed to Persia by a process of gradual encroachment. It was this action of Persia, and the disquiet and mischief which it occa- sioned in Makran and other parts of Baluch and Brahui territory, that brought about the British mediation.

From Jalk to the sea is about 150 miles as the crow flies. By the line laid down it is very much farther, as the nature of the country and of the claims of the con- tending parties did not admit of other than a tortuous course. The small district of Kuhak, lying south-east of Jalk, should, in a geographical sense, have been included among the lands on the Persian side, but the evidence of right and possession was insufficient to warrant its separa- tion from Kelat, and, whatever may have been its subse-

quent fate, it was not made over to the shah's governors

by the original decision, which was expressed in the following terms :— :

"The territory of Kelat is bounded to the west by the large Persian district of Dizak, composed of many dehs or minor districts, those on the fronticr being Jalk and Kalagin. Below these two last- named is Kuhak, including Kunarbasta and Isfandar. This small district belongs to the Naushirwanis, and, as its chief pays no tribute, cannot be included among the conquests of Persia. It therefore remains as a tract of country within the Kelat frontier. Adjoining Kuhak to the east is the district of Panjgur, with Parum and other dependencies, which are in the possession of Kelat ; while on the Persian side Bampusht is the frontier possession. Below Panjgur the frontier possessions of Kelat to the sea are Bulaida, including Zamran and other

dependencies, Mand, and Dasht. Within the Persian line of frontier are the villages or tracts belonging to Sarbaz and Bahu Dastiari. The boundary of Dasht is marked by a line drawn through the Drabol hill, situated betwcen the rivers Bahu and Dasht, to the sea, in the bay of Gwatar.”

The boundaries of the frontier districts or village-lands named are well known, and may be distinguished by mlountains, hills, hillocks, rivers, streams, or cultivation. In some places desert tracts occur which can offer no in- ducement for encroachment on either side, but through which a line may at any time be declared, if necessary, both by geographical computation and the erection of pillars.

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The frontiers of Persia on the west, north, and east have Southern now been described. The southern, or more strictly the coast- south-western merging into the southern boundary, is the !™*

coast-line of the Persian Gulf and Arabian Ocean. This extends from the Khor Abdullah west to the port of Gwatar east, and may be held to be comprised between the meridians 49° and 61° 30’ E. long. It will be observed that the Caspian Sea boundary, on the immediate north of Persia, is only two-fifths of this extent. On the Persian shores of the gulf are the ports of Bushahr (Bushire), Lingah, and Bandar-‘Abbds, with the islands of Karag, Shaikh Sh‘ab, Hindarabi, Kais, Kishm, Hangim, Hormuz (Ormus), and Larak, of which the last four are habitually held in lease by the im4m of Maskat (Muscat). On the Perso-Baluch coast are the telegraph stations of Jask and the quasi-ports of Charbar (or Chahbar) and Gwatar. In some parts of the generally dry and barren coast are ranges of rugged mountains, sometimes rising to a very considerable height.

Physical Geography.—Major (now Sir Oliver) St John, R.E., is perhaps the latest recognized authority on the physical characteristics of the large extent of country comprised within the boundaries just described. He has himself surveyed or travelled over no insignificant portion, and has carefully studied the labours of his colleagues and predecessors in a similar field. In

the following adapta- tion of that officer's account of its orography and hydro- graphy attention has been given to the results of independ- ent observation, as well as to those theories put forward by other travellers which seem to merit acceptance.

Persia—that is, modern Persia—occupies the western and larger half of the great Iranian plateau which, rising to a height of from 4000 to 8000 feet between the valleys of the Indus and Tigris, covers in round numbers more than a million square miles. Taking the Kuren Dagh and Kopet Dagh to form the northern scarp of this plateau east of the Caspian, we find a prolongation of it in the highlands north of the political frontier on the Arras, and even in the Caucasus itself. In St John's own words :—" The Caucasian provinces of Russia are but an excrescence of the great elevated mass to the south-east ; differing from it only in characteristics produced by the more bounteous rainfall which has scooped out the valleys to a greater depth." On the north-west Persia is united by the high- lands of Armenia to the mountains of Asia Minor ; on the north-east the Paropanisus and Hindu Kush connect it with the Himalayas of ancient India. The lines of boundary on the western and eastern faces are to be traced amid high ranges of mountains broken here and there by deserts and valleys. These ranges lie for the most part north- west and south-east, as do those in the interior, with a marked exception between Tehran (Teheran) and Bujnurd, and in the more recently acquired territory of Baluchistan, where they lie rather north-east and south-west, or, in the latter case, sometimes east and west. The real lowlands are the tracts near the sea-coast belonging to the forest- clad provinces of the Caspian in the north and the shores of the Persian Gulf below Basrah and elsewhere.

With regard to the elevation of the Persian mountains, Moun- the Russian Caspian survey gives to the highest, Damavand, tains.

18,600 feet, and to Mount Savalan in Adarbaijan (Azer- bijan) 14,000. St John estimates the Kuh Hazar and summits of the Jamal Bariz in the province of Karman (Kirman) at a greater figure than the last, but he believes the chain of the Kuh Din4r—snow-clad mountains in Fars, visible from the sea at a distance of 130 miles, and over ranges known to be 10,000 feet high—to present the highest continuous range in Persia. To the Kuru

range, between Ispahan and Kashan, he gives an elevation of above 11,000 feet, and notes the absence of prominent spurs in all ranges

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except the Alburz (Jilburz), and to a lesser extent in the |

Khurasan hills.

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The three rivers belonging essentially to Persia, in reference to the Caspian watershed, are the Kizil Uzain or

Plains. The Khuzistan delta is cited as the only plain of extent | Safid Rud on the south-west and the Atrak and Gurgan and importance at sea-level. In the north-west, that part | at the south-eastern corner of that inland sea. The first of the Moghan steppe which belongs to Persia and the | is stated by St John to drain about 25,000 square miles delta of the Safid Rud are large and fertile tracts. St | of country east and south of the Urmiya basin. According John writes :— to Colonel Stewart, the Atrak has its source in the Hazar

“Inland the long and narrow plains between the ridges rise gradu- | Masjid range of mountains, a distance, probably, of 250 ally from 1000 feet to eight times that height in the valleys between | miles as the crow flies, from the river mouth. The Gurgan a Saami aoe o os ee ee ee rises to the west of it and passes to the sea south of the

: ains ? ; : ; ave aid esac polis Me.about 6000 feet ; that of Karman somewhat | Atrak. Observing that the Tajand, taking a sweep round higher. The valleys of Adarbaijan present alluvial slopes furrowed | Sarakhs, forms a swamp in the Atak about the 58th by torrents, and the only extensive tableland in Persia, that of | meridian, the same authority explains that as far south Sultaniah, ag 30° N. lake ite Bees ae Wier aad Chee Ae Te an ee a “the eastern slopes of the ranges which shut off the valley of ; : en Fe vee the Helmand from the deserts of eastern Persia drain directly replaced by

gravelly deserts, which culminate in wastes of shifting | towards the Sistin Lake. South of that parallel the surplus water sand. The valley between Abadah and Yazd, a prolongation of the flows by several channels in a south-easterly direction, or away from Zaindamnd valley) con tause) thestinat of tiese sen aes le the lake. About latitude 29°, the water-parting of the Baluchistan ee GB Asphalt scl agus wae Que sieeelly mountain-system, running east and west, changes the direction of ee cultivated. tracts. The original city of these streams, and collects them into a single channel, which, under ee ee of Tehran, is said to have been abandoned on the name of the Mashkid river, bursts through the northern scarp : ‘ : : of the Baluch hills into the Kharan desert. Here it takes a north-

River Estimating the extent of Persia proper at 610,000 square | westerly course, thus revérsing the original direction of its waters,

drainage. miles, St John thus distributes the drainage :—(1) into the | which are lost in the desert not far from their most northern sources. Arabian Sea and Persian Cult, 190;000; (2) imo gine, Caspian and Aral Seas, 100,000 ; (3) into the Sistan Lake, | °° fen ee i : a — hi h 7 1 be File pct –

y ‘2 ; southern o e€ Tce depressions which, unite y flood-waters,

40,000 ; (4) into the large lake of Urmfya or Orumtyah, form the HA4miun or Sistan Lake.”

20,000 ; (5) interior drainage, 320,000. No. (1) comprises The great central area of Persia, included in the water-

the south-west provinces and the whole of the coast-region | sheds he has described, “forms a figure nearly triangular,

up to the small port of Gwatar in Baluchistan ; (2) relates | with a base running south-west about 1000 miles long,

to the tracts south, south-west, and south-east of the Cas- | and nearly equal sides north and east of 700 miles.”

pian ; (3) is the tract adjudicated to Persia, including the St John observes that the streams draining southern Streaw

Haémun and part of the Helmand basin ; (4) is a compara- | and western Persia into the sea diminish regularly in im- of Wes

tively small area on the western frontier containing the | portance from north-west to south-east. He notes the an

basin of Lake Urmiya, shut off from the rest of the inland | Diydlah and Karkhah flowing into the Tigris from the ,

draining of Persia; (5) takes in Ispahan, Karman, and | mountains of Kurdistan ; the Diz and Karin, which unite

the province of Khurdsan, with the Dasht-i-Kavir, or | below Shustar (Shuster), and reach the Shattu ’l‘Arab at

“Great Salt Desert.” He points out that the area draining | Muhamrah; and the Jardhi and Tab, which with the

into the ocean consists of a long strip nearly parallel to | Karin form “the delta of Persian Arabistan, the most

the Tigris and sea-coast without a single protrusion in- | extensive and fertile plain in Persia.” After these he lays

land, but is uncertain whether an outlet exists from the | stress upon the fact that not a single stream unfordable at

Bampur plain in Persian Baluchistan to the sea. A later | all seasons bars the passage of the traveller along the coast

traveller, Floyer, mentions the names of two rivers de- | till he reaches the Indus. Those rising amid the high

bouching on the coast, namely the Sadaich and Gabrig, | mountains north of Bushahr and Bandar-‘Abbas are, with

which might represent such outlets, but their courses have | the exception of the Mira, which debouches at 60 miles

not been traced with sufficient completeness to supply a | below Bushahr, nameless in the most trustworthy maps ;

solution to the problem. If the native evidence taken by | and in Persian Baluchistan we have the Jagin, Gabrig,

Major Goldsmid at Fanoch in 1866 can be relied on, the | Sadaich, Rabij, Kair, and Kaju.

river entering the pass of that name from the highlands of The Kartin merits especial notice as a navigable river

Bampur, after undergoing two or three changes of nomen- | for small steamers up to within a mile or two of Shustar,

clature, passes out into the ocean as the Kalig. though not favourable to the establishment of a regular on According to St John, a narrow strip of land, not more | service, owing to the existence of rapids at Ahwaz. By

than 30 to 50 miles wide, along the southern coast of the Caspian, drains into that sea, On the west it suddenly widens out to a depth of 250 miles, meeting the watershed of the Tigris on the one side and that of the Euphrates and Lake Van on the other, and embracing between the two the basin of Lake Urmiya, which forms with the basin of Lake Van what may be termed the supplementary plateau of Armenia, differing only from the Persian and Helmand basins in its superior altitude and smaller area. On the east the watershed of the Caspian gradually in- creases in breadth, the foot of the scarp extending con- siderably to the north of the south-east angle of that sea, three degrees east of which it turns to the south-east, parallel to the axis of the Kuren and Kopet ranges, which, as before stated, are a prolongation of the Caucasus. A little short of Herat the Caspian water-parting turns east- ward, separating the valleys of the Hari Rud and Hartt rivers. West of Herat the desert plateau of Khaf divides the Caspian from the Helmand basin.

land there are perhaps somewhat more than 100 miles from Muhamrah to Shustar; and Colonel Champain, an excellent authority, states that from Shustar to Ispahan the distance is as nearly as possible the same as from Shiraz to Ispahan, the high road for ordinary travellers passing to and fro between Tehran and the sea-coast. Little need be said on the streams having no outlet to the sea, the water of which is utilized by cultivators both before they reach the alluvial plain between the ranges and afterwards in irrigating the banks. Referring to these St John notes the constant affluents which prevent the rapid exhaustion of water, and the salt swamps or lakes formed by the rivers at points far removed from their source. Six of these inland streams he mentions by name, viz., the Aji Chai and Jaghatu, flowing into the salt-lake of Urmtya ; the Hamadan Rud or Kara St and the Shurdb, flowing eastwards to the Salt Desert ; the Zainda Rud, a river of Ispahan, lost in an unexplored swamp; and the Kur or Bandamir, which forms the salt-lake of Niris. He sees

Rainfall and winds.

Kavirs,

GEOLOGY. |

cause for believing the lakes of Shiraz and Kazrun to be fed mainly by springs. ;

St John writes further :—

“Tt will be readily believed that the rainfall on the Oceanic and Caspian watersheds is far in excess of that on the interior. Whcrever the water-parting is formed, as it is in most parts, by a lofty moun- tain ridge, it intercepts the moisture-bearing clouds from the sea which are discharged from its outer slopes. The Alburz chain, which shuts off the plateau from the Caspian, may be taken as the typical instance of this. Its northern face is furrowed into deep valleys by the constant and heavy showers which have clothed them in forests of almost tropical luxuriance, while the southern generally presents a single abrupt scarp, rising above long gravel slopes, unchannelled by anything worthy the name of a river, and bare of any vegetation rising to the dignity ofa tree. At the most moderate estimate the

rainfall of Gilan and Mazandaran may be taken as five times that of the adjoining districts across the ridges to the south.

‘‘In other parts, however, we find the water-parting consider- ably below the level of the summits farther inland; and here the interior has a more plenteous rainfall than the coast. This is par- ticularly the case in south-eastern Persia, where the Khurasan, Sarhad, and Dizak hills, far exceeding in altitude the ranges to the south, attract to themselves the major portion of the scanty supply of moisture borne inland from the sea. Again the rainfall differs very much in different parts of the country, under apparently similar conditions as regards mountains and distance from the sea ; the east and south being far drier than the north and west, while the dampest parts of the Tigris valley have not half the rainfall of the southern and south-eastern shores of the Caspian.

“Two palpable causes unite to produce the prevailing winds throughout Persia and the Persian Gulf. These are, with an extraor- dinary uniformity, north-west or south-east. The first cause is the position of the Black Sea and Mediterranean on the north-west, and of the Arabian Sea on the south-east. The second is the bear- ing of the axes of the great mountain chains, which lie mainly in the same direction, and thus tend to guide the currents of air in a uniform course. The south-west, moreover, is not felt, cxcept as moderating the temperature of the Makran coast inside a line from Ras-al-Hadd, south of Maskat, to Karachi.

‘*The effect of the sun on the great Iranian plateau is to produce a heated stratum of air, which, when it rises, is succeeded by a current from the colder atmospheres above the seas to the south- east or north-west. Naturally the latter is the colder, and there- fore, as might be expected, north-west winds are most prevalent. But in southern Persia and the gulf it often occurs that the two currents meet, and that a north-westerly gale is raging at Bushahr while a south-easter is blowing at Bandar-Abbas. This latter wind is the rain-bearer throughout the greater part of Persia, the excep- tion being the north-west, where occasional rain-clouds from the Black Sea and the Caspian find their way across the Kurdish mountains or the Albtrz. It is true that it often rains even on the gulf during a north-

wester, but only when this has followed a succession of south-easterly gales, the moisture borne by which is returned from the opposite quarter.”

There are no sufficient statistics available accurately to estimate the rainfall in Persia, but St John, himself a resident of some years in the country, was of opinion that in no part of it excepting the watersheds of the Caspian and Persian Gulf (north of 28° lat.) and their immediate reverse slopes, with perhaps the Urmfya basin, is there an average of 10 inches, taking mountain and hill together. He believed that throughout the greater part of central and south-eastern Persia and Baluchistan the annual rain- fall could not be much more than five inches, and that, were it not for the snow stored on the lofty hills, nine- tenths of the country would be the arid desert which one- half was found to be when he wrote (1876). Cultivation is carried on mainly by artificial irrigation, the most approved arrangement being an underground tunnel called “kanat,” whereby wells are connected and supplies of water ensured. ;

One remarkable feature in the plains of Persia which naturally engaged St John’s attention was the salt-swamp called “kavir.” He applied the term to those bogs of slimy mud found in the lowest depressions of the alluvial soil, where the supply of water, though constant, was insufficient to form a lake. In winter they are covered with brine, and in summer with a thick crust of salt. The principal kavir is that in Khurdsan, and marked in the maps as the Great Salt Desert. St John describes

it as “the eastern part of what is probably the most extensive plain in Persia, that intercepted between the Alburz and its parallel ridges on the one hand and the heads of the ranges of the central plateau which run south- east on the other. Westward, it is divided into two valleys, originating, one in the Sultaniah plateau, and the other north of and near Hamadan. These are drained by rivers named respectively the Shurab and the Kara Su, which, with another considerable affluent from Turshiz, on the east, unite to form the great kavir.” He was unable to determine the altitude of this extensive

swamp further than that it might be below the level of the sea, but could not be much above it.

Other kavirs he finds in the Sarjan or Sayidd4bad plain west of Karman and in the neighbouring valley of Kutru. Among ordinary kavirs, which are “innumerable,” he con- siders the largest to be on the south of Khaf, and the best known that north of Kum.

It is clear, from the description given, that the range of these particular salt-swamps or kavirs is confined to the actual depres- sion which has been directly affected by the passage of water, and that the term is not intended to apply to the surrounding wastes. But it seems to have been otherwise understood by the generality of travellers, and the better-known writers on Persia have seldom made the actual distinction here implied. Malcolin in 1800 crossed a salt-desert” between Pul-i-Dallak and Hauz-i-Sultan, which, he says, was called Dariya-i-Kabir, or “the great sea.” Morier, nine years later, calls the place the “swamp of kaveer, ... part of the great desert which reaches unto Khurasan, the soil of which is composed of a mixture (at least equal) of salt and earth.” Colonel Johnson, passing over precisely the samc road in 1817, describes it as leading “over a saline plain, leaving here and there hollows of considerable magnitude, white with salt; ... eastward it stretches as far as the eye can see, and is said to reach to Mausila, distant 40 miles.” ‘The writer would probably have been surprised to learn that it extended for at least ten times the distance named. He does not, however, use the word “kavir,” which, while duly recorded as a Persian word in the dictionary, meaning salsuginous ground, is strangely like the Arabic adjective “kabir,” which Malcolm, as just mentioned, has coupled with “dariya” in his Sketehes of Persia. St John states that in the south the salt-swamps are called “kafeh.”’

The last writer asserts that but one European, Dr Biihsé, a Russian, had seen the true kavir, having crossed it in about 34° lat., when going from Damghan to Yazd. Sir Charles Macgregor must have been close upon this traveller’s track in 1875, for in the district of Biabanak (the “little desert”), which he visited, one of the eight villages, Jandak, is marked in St John’s map as an oasis just above the parallel mentioned. Biabanak is, according to Macgregor, situ- ated “south of the kaveer,” but it is joined to Semnan (on

the Tehran-Mashhad highway) by a “regular road” which “crosses a bit of kaveer of about 80 miles without water.”

The drier deserts of Karman and Bampur cannot be included in the category of swamps; and the term “ut,” made use of by the Russian geographer Khanikoff in reference to the former, whatever its original derivation, must simply be accepted as the common local expression, in eastern Persia and western Baluchistan, for a waste waterless tract.

Geology.—Mr W. T. Blanford has given us an interest- Geology.

ing sketch of the geology of Persia. He found that by far the greater number of those who had treated the same subject before him had restricted their inquiries to the north-western provinces, and that few had penetrated east of Damavand or south of Tehran. Mr Loftus had imparted a fair knowledge of western Persia, and Russian and German explorers had made students tolerably acquainted with Adarbaijan, Gilan, and Mazandaran. Khurdasan and eastern Persia generally were, however, in a geological sense unknown, and the south was almost equally a terra incognita, unless exception were made for certain stray observations on the shores of the Persian Gulf. The fol- lowing passages are extracted from his paper.

‘‘The most striking circumstance noticed during a journey in Persia is the great prevalence of formations, such as gravel, sand, and clay, of apparently recent origin ; the whole of the great plains, covering at least one-half the surface of the country, consist either

of a fine, pale-coloured alluvial loam, which covers the lowest portion of the surface, or of gravel, fine or coarse, which usually forms a long gentle slope from the surrounding hills to the alluvial flat, and fills up with long slopes the broad valleys opening into the larger plains. All these deposits are more conspicuous than they are in most countries in consequence of the paucity of vegeta- tion and the absence of cultivation throughout the greater part of the surface. Nor is this prevalence of recent or sub-recent de- trital accumulations confined to the plains, for the slopes of the hills up to a considerable elevation are in some cases composed of similar

unconsolidated formations, from which only occasional peaks of solid rock emerge. This, however, is by no means uni- versally the case, many ranges consisting entirely of rock. Again, the descent in Baltchistan from the plateau to the sea-coast is over broad terrace-like flats of gravel and sand, separated from each other by ranges of hills running parallel to the coast-line. :

‘The mountains and hill-ranges of Persia comprise a consider- able variety of geological formations, a few of which, however, prevail over large areas of country. So far as our knowledge at present extends, the great mass of the Zagros chain (the term being used in the widest sense for the whole inountain-range from Mount Ararat to Shiraz, together with the numerous parallel minor ranges north-east of the main chain) consists of cretaceous (hippuritic) and tertiary formations, the former constituting the north-east half of the range and its slope towards the central plain of Persia, whilst the nummulitic and later formations prevail almost exclusively on the-south-west watershed overlooking the Tigris valley. Older rocks occur, but they are of subordinate importance, and it appeared probable, both to Mr Loftus and myself, that part at least of the altered rocks which form no inconsiderable portion of the range to the north-east is very probably of cretaceous origin. Old granite rocks, however, form a great band, extending from Lake Urumiah to a point nearly due west of Isfahan, and the same crystalline masses appear in the ranges between Isfahan and Kashan.”

The general direction of the Persian mountains north-west to south-east has already been noticed. Speaking of these, Blanford says that, so far as they have been examined, ‘‘they have the saine geological features as the Zagros, and consist similarly in the main of cretaceous and nummulitic rocks, the former prevailing to the north-east towards the desert, the latter to the south-west near the sea. Here, again, metamorphic rocks occur, some of them granite, others but little altered, and closely resembling in facies the cretaceous beds in their neighbourhood. Volcanic formations also occupy an extensive arca, and whilst some appcar of very late origin, others are possibly contemporaneous with the cretaceous epoch.”

vor the southern bordcr-land of the Persian plateau he writes— ‘Where crossed by Major St John and myself, between Gwadar and Jalk, it

consisted of low ranges running east and west, and, except near the sea, was almost entirely composed of unfossiliferous sandstones and shales, associated with a few beds of nummulitic limestone. So far as could be ascertained, these ranges appear to belong entirely to the older tertiary epoch. Here and there a few isolated masses of basaltic igneous rock have been introduced through the strata, but their occurrence is exceptional. Along the sea-coast, however, from the fronticr of Sind to the Persian Gulf, and probably throughout a large portion of the north-east shores of the gulf, a newer series of rocks rests upon the nummulitics. This newer series is easily recognized by the presence of thick beds of hardened clay or marl; it is of great thickness, and abounds in fossils, a few of which appear to be living forms, whilst others are extinct. The exact age has not been ascertained; the mineral character is very different from that described by Loftus as charac- teristic of the gypseous series, and it is therefore premature to class these beds of the Persian coast, for which I have proposed the name of Makran group, more definitely than as newer tertiaries. It is highly probable that they represent a portion at least of the gypseous scries. Along the coast itself are a few mud-volcanoes."

Remarking that hippuritic limestone had not been noticed on the eastern frontier, he turns to north-western Persia, a region " widely explored by various Russian and German travellers."

"There would appear, both in Adarbaijan and the Alburz range, to be a greater development of older Mesozoic and Palozoie forma- tions than in any other parts of western or in southern Persia. From the very brief visits I was enabled to pay to the Alburz and the small area examined, I can form but an imperfect conception of the range as a whole, but the impression produced by my visits is that the geological composition of this mountain-chain presents a striking contrast to that of all other parts of Persia which I had previously seen. It appears probable that a very considerable portion of this range consists of carboniferous and Devonian beds, and that Jurassic or Liassic rocks are also extensively developed. The same formations extend to Adarbaijan, but here, as well as in the eastern parts of the Alburz, cretaceous and nummulitic rocks are also found. Metamorphies (granite, &c.) exist in several places,

1 Jt has since been found extensively in southern Afghanistan and around Kwatta.

PERSIA

[GEOGRAPHY,

whilst volcanic outbursts occupy a considerable area, and the highest mountain in Persia, Damavand, in the Alburz chain, about 60 miles east-north-east of Tehran, is a voleano which, although dormant in the historical period, is of recent formation, and still gives vent to heated gases. The volcanic masses of Ararat, Sahend, south of Tabriz, and Savalan are also, in great part at least, of geologically recent origin.”

Minerals, &c.—Of the value and extent of minerals in Persia Minera Iron and lead are to be &e,

much still remains a matter of surmise. found, copper and coal also, but gold and silver have not yet become substantial results, and the turquoise is perhaps the only product of high price and estimation. This gem, however, is not readily procurable at Nishapur, its birthplace, but should rather be sought for at Tehran or Ispahan, where it comes into the market with other cxotics. The mines are situated at the base of the hill of Sulaimaniyah, lying north of Zamdnabad, a village on the high- road from Mashhad to Tehran. When the Sistan mission was at Nishapur in 1872 they were farmed by the Government for 8000 “‘tumans ” per annum, or about £3200 in English money.

In Malcolm’s days, though coining was held to be a choice privi- lege of royalty, foreign piastres and ducats were in considerable vogue. Accounts are kept in “tumans,” ‘“krans,” and “shahis,” of which the value of the first has deteriorated to 8s., the second is barely the French franc, and the third is about a halfpenny. Less than the last is called “pul-siyah,” or black money. The ‘‘shahi” and the “panabat,” a silver coin worth about 5d., have for long been in common circulation. In late years the manufacture of false money and forging the royal seals had become such common practices that the old rough hammer-struck coinage was called in, and medals in gold and silver

with milled edges were substituted. But these also were counterfeited, and a head of police was called in from Austria to endeavour to check the evil.

The Yazd marble has a watered appearance with yellowish tinge. A handsome specimen is to be seen in the tomb of Hafiz at Shiraz. There is a quarry on the road from Yazd to Karman. The petri- factions called Tabriz or Maragha marble are found on the road between those two places.

Eastwick describes the coal obtained from the pits at Hit, in the hill-country west of Tehran, as light, brittle, glittering, and with occasional red stains. There were no large blocks visible.

Though petroleum and naphtha appear indigenous to Persia, and Floyer visited an oil-spring in Bashakard, the produce of which was burnt in lamps at Minab near Bandar- Abbas, the produce of the oil-wells at Baku has found its way to Mashhad, and meets there with a ready sale. In connexion with this circumstance, Lovett states that a great number of lamps of the most trumpery German manufacture are imported into Khurasan and sold at large profits.

Dr Bellew, referring to the twelve divisions of the district of Nishapur, and to its 1200 villages and hamlets, mentions the report that it possesses also twelve different mines, yielding turquoise, salt, lead, copper, antimony, iron, together with marble and soap-stone. The statement needs, however, verification.

Climate.—The climate of Persia varies much according Climat!

to locality. In the Caspian provinces, where rain is fre- quent, it is hot, humid, and unhealthy for the greater part of the year. In the tablelands it is intensely cold in win- ter, and, though it is hot in summer, its dry clear heat is temperate in comparison with that of Sind and the Punjab. The spring and autumn are the best seasons. In the south and south-west, towards the Persian Gulf and in Baluch- istan, the heat is intense throughout the summer and often in the spring and autumn. The three regions of Nearchus and the old travellers—illustrated by parching heat, sand, and barrenness in the south, a temperate climate, pastures, and cultivation in the centre, and severe cold with bare or snow-clad mountains in the north—may still be

accepted as conveying a fairly accurate descrip- tion of the tracts lying generally between Bushahr and Tehran ; but of course there are seasons and seasons, and it may be very hot as well as very cold in the north as elsewhere. In June the traveller, starting from the former place en route to the capital (Tehran), will for more than 50 miles, or up to the bridge of Ddlaki, experience a fierce heat during the day, and not always find relief in a cool night. Reaching the plateau of Kundér Takhtah, 12 miles farther, at an elevation of 1800 feet, he will not then necessarily have escaped the influence of hot winds and a thermo- meter ranging to 100°. Some 50 miles farther he will have felt a most agreeable change at an altitude of 7000 feet ; and in another 24 miles, at Khan-i-Zanian, he will

have had every cause to be grateful for a delightful tem- perature. Shirdz, though some 4750 feet above sea-level, and in respect of climate so belauded by the native poets, can be hot enough in the summer, and is subject to drought, scarcity, and other contingencies of Persia.

Mounsey considers May the finest month, when the plains are fresh and green, the gardens filled with roses and nightingales, the cherries ripe, and the green almonds in vogue. Binning, writing from Ispahan on the 1st of July, had not seen the thermometer higher than 87° in his room ; in the morning at sunrise it was generally 70°. Sleeping, as others, on the roof of his house, he described the air to be very dry, and the nights clear and bright, the little dew which fell being so pure as to be innocuous. He expected hotter weather towards the close of the month, but a long autumn would make amends for a little heat. Many years before Binning, Mr Jukes had recorded that, from the average of 27 days, including the end of May and beginning of June, the thermometer at Ispahan at sunrise was 56°, at 2 p.m. 87°, and at 9p.m. 67°. Sir John Malcolm remarked that this city appeared to be placed “in the happiest temperature” that Persia could boast. Lady Sheil, whose experi- ences were chiefly gained in Tehran, limits the “ glorious weather of Persia” from the “ Nau-ruz” or New Year (21st March) to the middle of May ; but most persons would perhaps prefer the autumn in the highlands of the north, as in many other parts of the country. September and October are beautiful months. The blue sky, with its tempering haze, as

it were a veil of reflected snow gathered from the higher peaks and ridges of continuous mountain chains, is too exquisite a sight to be readily forgotten ; and the enjoyment is all the more complete when the temperature is that of October. To those who come from India direct, or to whom an Indian heat is habitual, the change to Persia is most grateful. In the late spring, fashion moves out a few miles from Tehran to the “yalaks of Shamiran,” or cooler residences near the hills, and summer rendezvous of the various foreign legations, returning in the late autumn to the precincts of the capital, which, it may be noted, have been considerably extended of late years, and are de- signed for yet further extension. On the 5th of June 1871 the thermometer in Tehran was at 1 A.M. at 62° and at 2 P.M. at 75°. On the two following days it was at 6 A.M. at 62° and at 2 P.M. at 80°. In February the traveller across the plains of Sulimaniya, ‘or approaching the capital from Tabriz, will sometimes expericnce the most bitter cold.

Bushahr and the Caspian provinces have already been mentioned, but the heat of the former place is fairly shared by other ports on the seaboard to the south,—among them, Lingah, Bandar-“Abbas, and Charbaér. When the Sistan mission was at Bandar“Abbaés in December 187], malarious fevers were prevalent, and enlarged spleen was acommon complaint. The average maximum temperature was then only 72° and the minimum 52°; but the summer and winter heats are in this locality extreme. More than a month later the officers of the mission slept out on the desert plains south of Sistan, and woke in the morning to find their beds and bedding covered with frost and icicles. With reference to the Caspian provinces the consular report to the English Foreign Office for 1881 is available. Major Lovett, remarking that the “minimum isotherms passing through the north of continental Europe are deflected con- siderably to the south on approaching the longitude of the Caspian,” calls attention to the fact that, while during the winter the northern part of that large inland sea is frozen over, farther south, at only 10° distance, the climate of Astrabad (if there be no wind from the north and the sun shine) is like that of Madeira at the same time of the year. Though the preceding cold season had been un- usually severe, and heavy snow had fallen at Baku and lower down, the lowest reading of the thermometer was 25° Fahr., and the maximum during the months of December, January, and February was 62° in the shade.

The following extract from the report is interesting, as it bears on the products as well as the climate of the north of Persia.

“It must be remembered, in connexion with the influence the Caspian Sea has on the climate of its shores, that its surface is 84 feet below the level of the ocean; and, consequently, the superin- cumbent strata of air being denser than, exteris paribus, elsewhere, it is also more capable of absorbing solar heat and moisture than the air at ocean-level. This partly accounts for the mildness as well

as for the dampness of the climate. I cannot give the amount of rainfall, having no gauge ; but it rained, during the 245 days of recorded observations, forty-five times, and the sky was overcast seventy times besides. This tolerable proportion of rain and cloud is doubtless due to the action of cold northerly blasts impinging on the warm and moisture-laden air shrouding the slopes of the Elburz, and hemmed in, as it were, between them and the icy northern wind. Currents thereupon are set up from the central region of the southern shores of the Caspian that blow to the east and to the west. The central region is a zone of much greater rainfall than the districts moreremote. ‘The westerly current, passing over this province, has its fertilizing influence expended on reaching the Goklan hills, 100 miles from the sea. The breadth and intensity of this moisture- bearing current is well marked by the gradually proportionate denseness of the vegetation extending from the sands of the Atrak steppe to the mountain summits. The action of these damp winds is distinctly traceable on all portions of the mountain-range exposed to the sea-breeze, even by the channels afforded by the valleys of the rivers that debouch on to the Caspian. Such are densely clothed with forest of a type similar to that found in southerly temperate climates. The flora is distinctly not tropical. In addition to the trees already mentioned, I should add that wild hops and plums are to be found. In the spring the hillsides are covered with thick excellent pasture. In the gardens and orchards of Astrabad are to be found vines, fig trees, orange trees, pome- granate, and lemon trees, and the vegctables chiefly cultivated are melons, pumpkins, marrows, lettuce,

aubergines, &c., that form at their seasons food-staples for the people. Tobacco, used for manu- facturing cigarettes, is also grown hcre on a small scale.

“The Turkman steppe lying north of Astrabad is, as far as the Atrak, a prairie of exceeding fertility. Wheat reproduces itself more than a hundredfold without artificial irrigation or any trouble beyond sowing.”

Soil and Products—Where there is irrigation the pro- ductiveness of the soil in Persia is remarkable, but un- fortunately there is too much truth in the notion that two-thirds of the tablelands of the country are sterile from want of water. The desert is the rule, fertility the exception, and generally in the form of an oasis. wheat, barley, and other cereals are grown in great per- fection ; there are the sugar-cane and rice also, especially in Mazandaran, where the soil is favourable and water pro- curable ; opium, tobacco, and cotton, madder roots, henna, and other dyes, are as well-known exports as the woollen goods of Persia; and the first may become of importance in its bearing upon the Indian market.!_ In Gilan, famous for its mulberry plantations, silk has been one of the most valuable of products. Yazd and Mazandaran contribute also the same material, but of late years the worm has comparatively failed to do its office, and disease has de- stroyed crop after crop. According to Mr Secretary Dickson’s report of August 1882 the peasants of Gilan had turned their attention to the cultivation of rice, and, though a marked improvement was perceptible in the silk produce, they were not disposed to revert to this branch of culture on the former large scale. ‘Silk, once the staple produce of Persia, upon which it mainly depended for repaying the cost of its imports, is not likely,” he fears, “to resume its former importance. In its flourishing days about 20,000

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bales, or 1,400,000 tb, representing a value of £700,000, were annually exported. Now not more than a fourth of that quantity can be obtained.” Rice was found to suit the cultivators better; it gave them less trouble and pro- vided them with an article of daily food. The production of silk, on the other hand, profited the richer landed pro- prietors, and subjected the cultivators to oppression.

Consul Beresford Lovett, in his report before quoted, says that at Astrébad the soil is so productive, and subsistence is practicable on so small a piece of land and with so little labour and expense, that many very poor emigrants come

1 In 1881 the crop at Karmanshah yielded about 13,500 fb; Ispa- han claimed to have produced 3000 chests; in Khurasan it was re- ported that the cultivation of the poppy had increased tenfold, and so extended was the area that the opium realized was estimated at an eighth of the whole produce of the province, the yield for 1882 being reckoned at 33,750 Tb. At Yazd it was largely cultivated, at Tehran to a small extent only.

Yet Products.

there to settle from distant parts of Persia, Afghanistan, and the Indian border. “Rice,” he writes, ‘is husked under tilt-hammers worked by a water-wheel apparatus, a rude and clumsy contrivance, but strong, simple, and cheap. Corn and barley are ground by water-mills of primitive construction ; the best wheat-flour produced is inferior to English ‘middlings.’ They are careless as to the use of rusty corn; the effect of eating bread made with flour containing any of the noxious element is to render those unused to it very giddy.”

Sir John Malcolm considered the shores of the Persian Gulf to be sandy and unproductive in comparison with the rich clayey soil on those of the Caspian. Yet at Bushahr, and elsewhere on the lowlands of the southern border, patches of luxuriant vegetation may be found and a soil producing wheat and barley.

ornaments of the European parterre. Of the roses, Lady Sheil observes that they are so profuse during the spring at Tehran that some are cultivated in

fields as an object of trade to make rosewater. The double-coloured orange rose at Nishapur is exceptionally attractive and fragrant.

As with fruits and flowers, so also with vegetables for Vege. If the parsnip be excepted, which is probably tables.

the table. not found because not wanted, all those commonly used in England are to be had in Persia.

Fauna.—Mr W.T. Blanford has described with great care and minuteness the zoology of Persia. In company with Major St John, R.E., he made a large collection of the verte- brate fauna in a journey from Gwatar to Tehran in 1872. Having added to this a previous collection made by the same officer with the assistance of a native from Calcutta, he had before him the principal materials for his work.

Wines. Vines are abundant, and the Persian grapes are not only | Before commencing his analysis he adverted to his prede- of a good flavour and kind, but the wines made from them | cessors in the same field, 7.e., Gmelin (whose travels were by the Jews and Armenians have more than a mere local | published in 1774-84), Olivier (1807), Pallas (1811), reputation. That of Shiraz is the most universally known | Ménétries (1832), Belanger (1834), Eichwald (1834-41), and celebrated ; but a description of port manufactured at | Aucher Eloy (1851), Loftus, Count Keyserling, Kok- Ispahan is equally palatable and less astringent. It might | schy, Chesney, the Hon. C. Murray, De Filippi (1865), not, however, bear the vicissitudes of export. A light | Hume (1873), and Professor Strauch of St Petersburg. wine made at Hamadan, diluted with water, is found very | All of these had, more or less, contributed something to drinkable by European visitors and residents. Other | the knowledge of the subject, whether as writers or cities in Persia could be cited where the juice of the grape | as collectors, or in both capacities, and to all the due is turned to similar account. Samuel Gottlieb Gmelin, | meed of credit was assigned. Blanford divided Persia into who explored the southern shores of the Caspian in 1771, | five zoological provinces : (1) the Persian plateau, or from Zoolog) observed that the wines of Gilan and Mazandaran were | the Kopet Dagh southwards to nearly 28° N. lat., includ- cal pre all made from the wild grape only. ing all Khurdsan to the Perso-Afghan border, its western “2°

Forests. _ /lora.—Eastwick refers to the trees in the low country | limit being indicated by a long line to the north-west from of Gflan as “part of that great forest which extends some | near Shiraz, taking in the whole upper country to the 400 miles from Astarabad to Talish.” No longer do the | Russian frontier and the Alburz; (2) the provinces south sparse olive and occasional plantation of fruit-trees here | and south-west of the Caspian; (3) a narrow strip of wooded meet the eye of the traveller descending from the Persian | country south-west of the Zagros range, from the Diyah plateau, but his path will be through dense thickets of | river in Turkish Arabia to Shiraz; (4) the Persian side of ‘“jangal,” amid which the birch and the box and many | the Shattu’l-‘Arab, and Khizistan, east of the Tigris ; and familiar friends are recognized. There is an oak-forest | (5) the shores of the Persian Gulf and Baluchistan. The in the vicinity of Shirdz, but no part of the country is so | fauna of the Persian plateau he described as “ Palearctic, thickly wooded as the tract south of the Caspian. For the | with a great prevalence of desert forms 3 or, perhaps more greater part of the province of Astrabéd, Lovett surmises | correctly, as being of the desert type with Palearctic that nine-tenths of the surface is covered with forest. He | species in the more fertile regions.” In the Caspian pro- excepts the pasture-lands of Shah Kuh, a high mountain- | vinces he found the fauna, on the whole, Palearctic also, range between Shah Rud and the sea. The trees are | “most of the animals being identical with those of south- mostly deciduous. He had counted forty different kinds, | eastern Europe.” But some were essentially indigenous, including shrubs, but was unable to identify all. There | and he observed “a singular character given to the fauna were the oak, beech, elm, walnut, plane, sycamore, ash, | by the presence of certain Eastern forms, unknown in other yew, box, and juniper, but no pine, fir, or cedar,—though | parts of Persia, such as the tiger, a remarkable deer of the these last were said to exist in the dense forests of Fin- | Indo-Malayan group, allied to Cervus axis, and a pit viper derisk, and on the slopes of the Goklan Hills to the east- | (Halys).” Including the oak-forests of Shiraz with the ward. He applies to the oak, beech, and elm used in | wooded slopes of the Zagros, he found in his third division building the native names of “ mazt,” “nts,” and “azad.” | that, however little known was the tract, it appeared to

Fruits. Fruits and flowers are abundant, and are fully appre- | contain, like the second, “a Palearctic fauna with a few ciated in Persia. Poets sing of them, and prince and | peculiar species.” As to Persian Mesopotamia, he con- peasant delight in them. Of fruits the variety is great, | sidered its fauna to belong to the same Palearctic region and the quality, though not always the best, is in some | as Syria, but could scarcely speak with confidence on its cases unrivalled. There is perhaps no melon in the world | characteristic forms. The fifth and last division, Baluch- superior to that of Nusrabad, a village between Kashan | istan and the shores of the Persian Gulf, presented, and Kum. It were easier to name the few English fruits | however, in the animals common to the Persian highlands —such as the gooseberry, strawberry, raspberry, currant, | “for the most part desert types, whilst the characteristic and medlar—that are seldom, if at all seen, than the | Palearctic species almost entirely disappear, their place many that are commonly enjoyed by Persians. Apples | being taken by Indian or Indo-African forms.” Blan- and pears, filberts and walnuts, musk-melons and water- | ford adds: “Just as the fauna of the Persian plateau has melons, grapes, peaches, plums, nectarines,—all these are | been briefly characterized as of the desert type with a to be had in profusion and so cheap as to be within reach large admixture of Palearctic forms, that of Baluchistan

- of the poorest inhabitant. and the shores of the Persian Gulf may be described as

owers,

Among the flowers are roses of many kinds, the mari-

being desert with a small admixture of Indian species.”

gold, chrysanthemum, hollyhock, narcissus, tulip, tube- rose, convolvulus, aster, wallflower, dahlia, white lily (much valued), hyacinth, violet, larkspur, pink, and many

irrespective of scientific classification and detail, it may be Domes

stated that among the tame animals of Persia the horse, animals mule, and camel occupy an important position, and, jointly

perhaps with oxen (used for tilling purposes), are first and foremost in usefulness to man. The Persian-Gulf Arab, though not equal to the pure Arabian, is a very serviceable animal, and has always a value in the Indian market. Among others, the Kashgais, or those wandering semi- Turkish tribes brought down from Turkestan to the neigh- bourhood of Shirdz, have the credit.of possessing good steeds. The Turkman horse of Khurdsan and the Atak is a large, bony, and clumsy-looking quadruped, with marvellous power and endurance. Colonel C. E. Stewart speaks of a ‘“‘splendid breed of camels” in the north- eastern district, of which Radkan, a small town of 4000 inhabitants with a deputy-governor, is the capital. He also states that the Khurasan camel is celebrated for its size and strength, that it has very long hair, and bears cold and exposure far better than the ordinary Arabian or Persian camel, and that, while the ordinary Persian camel only carries a load of some 320 ib and an Indian camel one of some 400 ib, the Khurasan camel will carry from 600 to 700 ib. The best animals, he notes, are across between the Bactrian or two-humped and the Arabian or one- humped camel. Sheep, goats, dogs, and cats are good of their kind ; but not all the last are the beautiful creatures which, bearing the name of the country, have arrived at such distinction in Europe. Nor are these to be obtained, as supposed, at Angora in Asia Minor. Lake Van or Ispa- han is a more likely habitat. The cat at the first place, called by the Turks “Van kedisi,” has a certain local reputation.

Among the wild animals are the lion, tiger, leopard, – lynx, wolf, jackal, fox, hare, wild ass, wild sheep, wild cat, mountain-goat, gazelle, and deer. The tiger is peculiar to the Caspian provinces. Lovett says they are plentiful in Astrabad ; “they do not attack men, but hardly a week passes but some cow belonging to this town is reported to have fallen a victim to the tiger’s rapacity.” He measured two specimens, one 10 feet 8 inches, the other 8 feet 10 inches from the tip of the nose to the end of the tail. Lynxes and bears were to be found in the same vicinity, and the wild pig was both numerous and destructive.

Poultry is good and plentiful, and the game birds, if not of many varieties, have admirable representatives in the “durrdj” (black partridge) and the three kinds of partridge called respectively the ‘“‘kabk,” “kabk darah,” and “tihu.” The ‘“hubara,” a kind of bustard, is well known to the sportsman in northern India.

Commerce, d:c.—The most direct and accurate information obtain- able in England on the trade of Persia must be looked for in the reports of the secretary of H.M. Legation at Tehran, the resident at Bushahr (Bushire), and the consul-gencral at Tabriz.

Mr Seerctary Dickson’s report of the 30th August 1882 is hopeful as to the general prospects of trade and improvement of the condition of the people. There had been a good harvest ; but money was scaree at the capital, cash sales were difficult operations, and considerable failures had occurred to render the native bankers cautious. Man- chester goods, however, still sold well at Ispahan and elsewhere.

The comparative failure of silk had given an impetus to the culti- vation of opium, the greater part of which, when prepared for the market, was shipped to China. Carpets had found new favour in Europe, and the value of those exported was estimated at ten times the amount of former days. But a fear was expressed that the introduction of European designs and dimensions, and deterioration in quality of the articles supplied, would eventually prove prejudicial to the trade.

The larger traffic in opium effected both in 1880 and immediately

preceding years is remarkable, and will be seen in the following table—

Number| Value in r Number! Value in

Peer, of Cases.| Rupees. Feat. of Cases.| Rupees.

1871-72 870 696,000 1876-77 2570 2,313,000 1872-73 1400 1,120,000 1877-78 4730 4,730,000 1873-74 2000 1,600,000 1878-79 5900 5,900,000 1874-75 2030 1,625,000 1879-80 6100 6,100,000

1875-76 1890 1,701,000 || 1880-81 | 7700 8,470,000

Persian opium was, it appears, first exported from Ispahan in

1853. Since that period it has been grown in several parts of the country. The destination is usually China. In 1879, for instance eighteen steamers took 49714 chests from Bushahr, of which all but 236—for London—were for Hong-Kong. Exeept in Ispahan there is every probability of extended cultivation, and that the production will increase to an appreciable degree year by year. In the statement of a private firm, quoted by Mr Baring in his report from Tehran in September 1881, is the following passage :— “The Persian drug has already succeeded in throwing out Turkish sorts from the China market, and, with due abstinence from adul- teration, it can at any moment command a large outlet in Europe, America, and in the Dutch colonies.” Mr Baring himself says: ‘Whether the Persian opium trade in its present conditions con- stitutes a danger to the Indian revenue is, of course, a question to which I can furnish no reply. It depends upon circumstances respecting which I have no information. As matters at present stand, we have a trade that has been increasing steadily for several years past, and which the majority of persons think will continue to Increase. The cultivation pays, and the limit of land and labour has not yet been reached. There are so many reasons, in fact, why it should extend, so few why it should fall off.”

Carriageable roads were still a desideratum, and the want of these Commu- On the other hand, it was nication.

obstructed the development of trade. remarked that a fair road had been constructed between Kazvin and Tehran, a supply of carriages and carts had been obtained from Russia, and postal stations had been built at regular distances of 12 miles from each other. In the capital also the streets had been put into repair, and the palace, square, aud main streets lit with gas ; and there was a greater number of private carriages. A concession had been granted for a railway from Rasht to Tehran ; Mr Dickson, while approving of this line as a step in the right direction, was very strongly in favour of another to join Tehran to Baghddd. A branch from Karmanshah or Hamadan to Shistar or Dizful, whence goods could be exported by the Karin, would, he argued, give Persia an independent outlet for her commerce ; but he doubted whether Baghdad, with its prestige and advantages of climate, would not be accepted as the niain commercial entrepdt. The navigability of the Karun river has been already noticed.

The Bushahr reports on the trade of the Persian Gulf for 1880 Imports show that, as regards southern Persia, the year was unfavourable and from a commercial point of view. Large imports from India served exports.

to avert famine ; but the seed so provided for 1881 was not at hand in time to allow full advantage being taken of an unusually good rainfall in autumn and winter. Increased imports in sugar from France and Java, the introduction of tea from Japan, and a decrease in exports of cotton and other ordinary produce owing to drought were all noticed.

The table showing the total estimated value of imports into Bushahr during the year 1882 gives a total of 10,188,980 rupees, —say something less than £1,000,000. Of this about four-ninths are from England and more than a third is from India. Of the exports, amounting to 6,566,220 rupees, —say £650,000—more than two-fifths are for China, not a fifth is for England, and more than a fifth is for India. The most valuable items of import are the piece-goods and brass, —the last from England and India only ; and of export, opium, of whieh just three-fourths go to China, and wheat, of which more than two-thirds go to England.

As regards the trade of Lingah, the year 1882 showed a decrease. The total value of imports was 6,922,000 rupees, of which pearls formed the largest portion. These were brought ehiefly from Bahrain and the Arab eoast, but some from the Persian Gulf and Makran and Aden. Rice, almost wholly from India, was the next most valuable item. The total value of exports was 5,999,945 rupees. In this also pearls formed by far the largest item. Next in value mother-of-pearl shells exemplified a traffic almost entirely carried on with England. ;

From Gez on the Caspian, Consul Lovett gives to the exports of 1881 a value of £86,280. These consisted of silk, cotton, wools, furs and skins, dried fruits, rice, corn, and miscellaneous articles. Silk represented nearly the half, and furs and skins nearly a quarter of the total figure. The imports he valued at £287,640, of which the amount for piece goods was entered at £256,000. The remain- ing articles specified were sugar, tea, 1ron, copper, steel, crockery, hardware, and brass utensils.

Manufactures, &c.—The handbook on Persian art published by Manu- Colonel Murdoch Smith, R.E., in 1876, with reference to the collection factures.

purchased and sent home by him for the South Kensington Museum, has an instructive account of the more common manulfaetures of the eountry. They are classified under the respective heads of “porcelain and earthenware,” ‘‘ tiles,” ‘‘arms and armour,” “‘ textile fabrics,’ ‘needlework and embroidery,” ‘“ metal-work,” ‘‘ wood carving and mosaic-painting,” “manuscripts,” “enamel,” “jewelry,” and “musical instruments.” Specimens of the greater number are not only to be procured in England, but are almost familiar to the ordinary Londoner. It need scarcely be said that the tiles have rather in- creased in value than deteriorated in the eyes of the connoisseur, that the ornamentation of metal-work, wood carving and inlaying,

XVII. — 79

Carpets.

Shawls.

gem and seal engraving, are exquisite of thcir kind, and that the carpets manufactured by the ‘‘ustads” or skilled workmen of local repute, when left to themselves and their native patterns, are toa great extent unrivalled. One shown to Colonel Goldsmid at Karman, under preparation for the tomb of Shah Niy‘amat Ullah, situated at the neighbouring village of Mahun, would have been greatly prized in Europe. In company with Murdoch Sinith that offieer visited the carpet manufactories of the city in 1865. Of this interesting branch of Persian art Smith writes :—‘“‘Carpets are now made in many parts of Persia, but chiefly in Kurdistan, Khurasan, Feraghan (in Irak), and Karman ; each of these districts producing a distinctive kind both in texture and style. The finest are unques- tionably those of Kurdistan, of which good specimens exist in the museum. The pattern does not represent flowers, bouquets, or other objects thrown up in relief from a uniform ground, like so many of the inappropriate designs of Europe, but looks more like a layer of flowers strewn on the ground, or a field of wild flowers in spring ; a much more suitable style of ornament for a fabric meant to lie under foot. The borders are always well marked and usually of brighter colours than the centre. Besides the ordinary ‘ kali,’ or pile carpet, others, called ‘do-ru,’ very thin and smooth and alike on both sides, are made in Kurdistan, of which there is a specimen in the museum. These ‘do-ru,’ from their portability, are much used in travelling for spreading by the roadside during the halts for pipes and tea. The carpets of Feraghan resemble those of Kurdistan in style, although the texture is looser and the pattern simpler. They are consequently much cheaper and in more general use. . . . The Khurasan carpets arc somewhat supcrior in texture to those of Feraghan, but the patterns are generally more realistic ; the flowers, &c., being represented as standing out of the ground. There is a fine Khurasan carpet in the museum made by the Kurdish settlers on the Turkman frontier. Karman carpets are the next in value to those of Kurdistan, but the designs are usually still more realistic than those of Khurasan. Besides flowers, figures of men and animals are not uncommon.” Referring to the Turkman carpet he says: ‘‘The texture is very good and the pile is pecu- liarly velvety to the touch. The design, however, is crude, and the colours although rich are few in number. Still it is astonishing to think that, such as they are, these carpets are woven in the tents of a wild nomadic race like the Turkmans. Of

late years there has been unfortunately a slight importation from Europe into Persia both of colours and designs which are far from being an improve- ment. The carpets of every description are made without even the simplest machinery, the loom being simply a frame on which the warp is stretched. The woof consists of short threads woven into the warp with the fingers without a shuttle. -When a row of the woof is thus completed, a sort of comb is inserted into the warp and pressed or hammered against the loose row of woof until it is sufficiently tightened to the rest of the web. The pile is formed by merely clipping the ends of the woof until an even surface is obtained. The weaver sits with the reverse side of the web towards him, so that he depends solely on his memory for the formation of the pattern. . . .

"'Felts or namads are made in many parts of Persia, but chiefly at Ispahan and Yazd. The material consists of all kinds of wool mixed together, that of the camel predominating. The colour is generally brown, but the surface on one side, and sometimes on both, is ornamented with geometric and other designs in different colours which are inlaid (so to speak) in the namad, and not simply stamped on the surface.

'*The shawls of Karman are not much inferior to those of Kash- mir. They are woven by hand similarly to the carpets. The material called 'kirk' of which the shawls are made is the under wool of a particular kind of white goat: numerous flocks of this animal are in the neighbourhood of Karman. Like the merino sheep in Spain, these flocks migrate annually according to the season, in which respect they are like almost all the flocks and herds of Persia. I therefore made cnquiries at Karman why the 'kurk '- producing goats were only to be found in that neighbour- hood, and was informed that in that district the rapid descent froin the high plateau of Persia to the plains near the sea afforded the means of keeping the flocks throughout the year in an almost even temperature and in abundant pastures, with a much shorter dis- tance between the summer and winter quarters than in other parts of Persia, and that such an even climate without long distances to traverse in the course of migration was necessary to the delicate constitution of the animal, or rather to the softness of its wool. The whole of the 'kurk' is not made use of in the looms of Karman, a large quantity being annually exported to Amritsar in upper India, where it is manufactured into false

Kashmir shawls. Besides the ordinary long shawls of which men's and women's tunics are made, others of a single colour are made at Karman, which are afterwards richly ornamented with needlework. Of these there are in the museum several specimens, in which the softness of the shaw] and the riehness of the embroidery are both to be admired. Shawls of a coarser kind are also made at Yazd, of whieh a speci- men may be seen in the museum in a pair of door curtains."

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[GEOGRAPHY,

Political Divistons.—According to the latest information obtained, or up to 1884, the 36th year of the reign of Nasru 'd-Din Shah, Persia is found to be portioned out into four large divisions and six smaller governments, of which governors-general or governors are appointed by the king. The four divisions are :—(1) Adarbaijan (Azerbijan) in the west; (2) the North Central Districts; (3) Khurasan in the east, including Sistan; (4) Southern Persia, or from the Shattu '1- Arab to the Mashkid. 'The minor governments are :—(5) Astrabdd, (6) Mazandaran, (7) Gilan, (©) Khamsah with Zanjan, (9) Kazvin, (10) Gerrus.

Adarbaijan, the ancient Atropatene, is under the " wali-'ahd," or Adar. heir-apparent, Muzaffaru'd-Din Mirza, second son of the shah, who baijar

resides at Tabriz, and appoiuts governors to the several districts within hisrange. Among the more important of these are Ardabil, Sarab, and Khalkhal towards the Caspian, Maku, Khot, and Urumiya in the west, Maragha in the centre, and Solduz, Saujbulak, and Sain Kalah in the south. Adarbaijan is about 250 miles in length from the Little Ararat to Sardasht, and the same distance in breadth from Kotur to the Talish. It is separated from Armenia in the north by the Arras, which rises in the mountains to the westward, and from 'Irak in the south by the Kizil Uzain, which, after a long winding course from Kurdistan, and union with other streams, empties itself into the Caspian under the name of Safid Rud. On the west it is enclosed by the Kurdish mountains, and to a great extent on the east by those overlooking the Caspian shores. It is a land of mountains, ravines, plains, and plateaus. Lake Urumiya, about 75 miles in length by an average

breadth of 30, is one of its most remarkable geographical fcatures. In parts it is fertile, and produces wheat, barley, and maize, also cotton and tobacco. Markham says that its villages “are embosomed in orchards and gardens, which yield delicious fruits,” and that its most picturesque and flourishing portion is around the towns of Urumiya (west of the lake) and Khoi. Tabriz, the capital, has long been the most populous city of Persia. The other chief towns of the province are Ardabil, Urumiya, Khoi, and Maragha.

The North Central Districts isa name given to the country under Nort the immediate supervision of the naibu ’s-sultanah, or “deputy of Cent) the kingdom,” the shah’s third son, who appoints governors to Dist

Tehran and Firuzkuh in the north, to Zarand, Sawah, Kum, Kashan, and Natanz, south of Teliran, and to Mahalat, Sultanabad in ‘Irak, Malaiyir, Nahawand, Hamadan, and Tisirkan, west of Kum and Kashan. The places named will serve to indicate the range of this division, one of some 150 miles in length, but of very irregular breadth. There are included in it remarkable centres of popu- lation, besides Tehran. Kum is held in high repute as a sacred city, second in importance to Mashhad only. It contains the tomb of Fatima, the sister, or, as some affirm, the daughter of the imam Riza, and the bones of thousands of Muhammadans, bequeathed to its honoured soil by the affection or superstition of sorrowing friends and relatives. It is a large, straggling, ill-kept, seimi- ruined, uninviting place, relieved by patches of a new and well- built bazaar. The many domes of Kum recall it readily to memory, but they are more characteristic than striking. Kashan has not much more attraction as a residence, but is held in good estimation for its silks, and is deservedly famous, above all towns in Persia, for its tiles and potteries.

The large province of Khurasan is perhaps not less than 500 Khu) ~ miles in length from the Perso-Turkman frontier to the southern asan/

limit of Persian Sistan. In breadth it is irregular, but from Pul-i- Khatun or the Lady’s Bridge on the Tajand to Pul-i-Abrishm or the Bridge of Silk on the Kal Mura—a fair limitation for Khurasan proper, exclusive of Sistan—it is about 260 miles. The mountainous character of its northern frontier has been noticed in the descrip- tion of the gencral boundaries of Persia. It is, however, worthy of remark that the supposed connexion of the Alburz

range and that of the Parapanisus does not prevent an easy passage into Herat by the valley of the Hari Rud. The mention of rivers east and west of Khurdsan must not Iead to the inference that the water- supply is abundant; one, the Tajand, has to fertilize the desert tracts of the Persian Atak ; at the other, the Kal Mura, the bridge is often useless, owing to the dryness of the river-bed. Central and southern Khurdsan are more or less a vast desert with kavirs. Parts of Kaiyan and Sistan on the Afghan bordcr are fertile, though barren mountains and desert plains abound in the former, and the second has no lack of wastc, notwithstanding the proximity of the Helmand.

The principal city in Khurdsan proper is Mashhad, the capital, which may be said to contain, without contradiction, the most venerated and popular shrine in the whole of Persia, that of the eighth imam, Riza. A pilgrimage to this spot has, owing to its convenient site, become a duty more essential if not more important than one to Karbala in Turkish Arabia, or even to Mecca aud Medina; and the thousands who year by year win the privilege of becoming “ Mashhadis”’ testify to the value set upon it. Mashhad, built on the perpetual Persian plain, and admirably situated as to roads of trafic with Bukhara (Bokhara), Khiva, Herat, and Kandahar, has little in its general exterior, except the imam’s golden dome, to dis-

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tinguish it from other cities in the shah’s territory; but it can boast also the tomb of the famous Harun al-Rashid and of Ganhar Shah Agha, the favourite wife of Shah Rukh; and its canal and quays

POPULATION. |

627

Astrabad is a town and district near the entrance of the bay of Minor the same name on the Caspian. In 1884 it was governed by govern- Habib Ullah Khan, the “sa‘idu ’I-daulah,” or “arm of the state.” ments.

nerit at least a passing remark from their rarity. It is divided into two towns, the sacred and the secular, each of which has its distinct governor—the first called the “ mutawali,” the second being also governor of the whole province of Khurasan, and often a prince of the blood-royal. After Mashhad, among the chief towns of Khurasan are Nishaptir and Sabzawar on the highroad to Tehran, the first an ancient city within walls, the second notable for its surrounding cultivation ; Bujnurd on the north, which in Burnes’s time was “a rather large place standing in a spacious valley” ; Tirbat-i-Haidari, the chief town of a populous district with ten villages, visited by Conolly in 1830, by Goldsmid in 1872, and by Stewart in 1880; Sultanabad, capital of the Turshiz district (in which there is uo specific “Turshiz”), called by Colonel Stewart “a small and flourishing town of some 5000 inhabitants” ; Kaiyan, once capital of the district of that name, and still a town of some importance, much frequented by “mullas” and “ saiyids”; Tun, which Macgregor describes as “decidedly a picturesquely situated town, surrounded by a wall (of irregular outline), which goes outside all the houses, and encloses besides a space—-quite equal to that occupied by the houses—taken up with cultivation and gardens. Thus it is,” he adds, “that Tun may be said to be a town 4 miles in circum- ference, though, if only the space occupied by houses was calculated, it would dwindle to one-eighth of this. There are no buildings of any note in the place, but a few mosques and colleges are to be found, while most of the better houses, of which there is a total of about 1500, have badgirs.”1 Conpled with Tun is Tabas, to which the same writer gives no importance ; then come Birjand, pictur- esque and clean, with a better class of mud buildings, well situated at the foot of hills, and having rather high mountains to the west- ward, the modern capital of the Kaiyan district ; and finally, Sikuha, the true but somewhat insignificant chief town of Sistan, here chosen in preference to Nasrabad, its military headquarters. Mr Rozario, medical attaché to the mission of 1872, described Sikuha as “‘ com- posed of 200 arch-roofed mud-built houses, connected with each other without any kind of woodwork about them,” the land wanting in rice and timber, but producing wheat, barley, beans, and cotton in abundance.

The fourth, Southern Persia, is a very extensive division, cm- bracing not only the whole seaboard between 48° and 61° 30’ E. long. but a great part of the country as far north as 32° 40’, the parallel of Ispahan. Nothing could better illustrate the arbitrary and uncertain mode of parcelling out a kingdom than the separa- tion of natural and the combination of abnormal elements of union to be found in this vast territory entrusted to the charge of the “7i)i-sultan,” or ‘“‘shadow of the monarch,” the title given to the shah’s eldest son. That such an arrangement ean work at all is one of many strange truths which are intelligible only to persons acquainted with the centralizing power exercised in Tehran. General Schindler, an officer of great local knowledge and experience, has guaranteed the correctness of the statement that the prince-gover- hor or governor-general of Southern Persia—residing himself at Shiraz (or at Ispahan)—appoints governors to the following places :—Kurdistan, Karmanshah, Luristan, Burujird, Dizful, Shistar, Muhamrah, Behbahan, and Ram Hormuz in the west ; the tracts occupied by the Bakhtiaris, Gulpaigan, Khonsar, Fari- dun, Chahér Mahal, Yazd (with Nain, Baft, and Shahr-i-Babek) ; Fars (with Fasa, Darab, Lar, Parum, and Kazarun) in the centre ; Bushahr and Lingah on the coast ; and Karman (with Bam, Bam- pur, Rafsinjan, Khabis, Sirjan, Jiruft, and Rudbar) to the east. Among the more prominent cities or towns within this range are: —Ispahan, a fine city, still worthy from its site, buildings, gar- dens, river, ‘and surroundings to be the royal residence ; Shiraz, happily situated with pleasant neighbouring resorts and the ordi- nary requirements of a first-class Persian town,—possessing, more- over, a special national prestige for high and low, yet not a genial residence for strangers, who can accomplish its lions in a couple of days; Yazd, a large and fairly populated city, with one remark- able mosque and a handsome new bazaar, but somewhat gloomy in character and drearily situated on a flat plain in an amphitheatre of hills; Karman, a place of pleasant recollection to those English travellers who experienced the genuine kindness and hospitality of the wakilu ’l-mulk, Muhammad Ismail Khan, its governor In 1865-66, and not wanting in material attractions of its own ; lastly, Bam and Bampir, visited by Lieutenant Pottinger in 1810, more than half a century afterwards by Colonel Goldsmid, and later still by Majors St John and Lovett,—the one a froiitier town with associations of border warfarc, the other a mere Perso – Baluch cantonment with a fort and mud buildings, long the residence of Ibrahim Khan, a chief of notoriety serving the interests of Persia.

Muhamrah, Bushahr, Lingah, and Bandar“ Abbas are ports, but there is no real harbour between Féo at the mouth of the Shattu Arab and Karachi (Kurrachee) in British India.

1 Literally ‘‘ wind-catchers,”—towers erected on the roofs of houses for pur- poses of ventilation.

Mazandaran and Gilan are the Caspian provinces, par of Persia. General Schindler rasken en TccutL peat but they appear to have once formed part of the northern division under the prince-governor.

Khamsah, a district on the high road between Tabriz and Tehran of which the chief town, Zanjan, isa place of some importance. The governor’s name in 1884 was Nasr Kult Khan, the ‘‘‘amidui ‘l-mulk,” or “prop of the kingdom.” ~

Kazvin, a considerable town, with surrounding district, in the plains south of the Alburz, and not a hundred miles from Tehran, was governed in 1884 by Mirza Riza, the ‘‘mu’‘ayinu ’l-sultanah,” or ‘‘ helper of the kingdom.”

Gerrus is a district on the south of Khamsah.

Population.—Although the present section deals with statistics only, the following well-considered remarks of Mr Robert Grant Watson, formerly a secretary in the Persian legation, form an appropriate preface to the record of population.

“Persia is peopled by men of various races. portion of the population is composed of wandering tribes, that is, of a large number of families who passa portion of the year on the hills. It is in this sense only that they can be considered wanderers, They invariably occupy the same pasture-grounds one year after another. Their chiefs are possessed of great authority over the tribesmen, and all dealings between the Government and the tribes are carried on through the heads of these divisions. Through the chief the taxes, whether in money or in kind, are paid, and through him the regiments which his tribe may furnish are recruited. ‘Ihe office of chief is hereditary. The tents in which the tribesmen dwell are for the most part composed of a light framework of the shape of a beehive. This is covered with a coating of

reeds, and above it is placed a thick black felt. It has but one door, and no window or chimney. This is the Turkman tent, which is used by the Shahsavand and other tribes, but the Iliyats in central Persia make use of tents of another construction, with flat or slightly-sloping roofs.

“The provinces near the Persian Gulf contain many Arabs and men of Arab extraction. Such are for the most part the inhabitants of Laristan and of the country lying to the left of the Shattu’l-Arab and of the lower part of the Tigris. The Bakhtiari mountains, between the valley of the lower Tigris and the plain of Ispahan, are the dwelling-place of tribes of another race, and of whom and their country very little is known. The mountains of Kurdistan give birth to a warlike people, who are attached to their own tribe- chiefs, and who never go far from the borders of Turkey and of Persia, sometimes proclaiming themselves subjects to the Porte, and sometimes owning allegiance to the Shah. At the foot of one part of these mountains, on the borders of the lake of Urimtia, there is a plain on which dwell many Christian families who hold the tenets of Nestorius. At Ispahan, at Tehran, at Tabriz, and in other parts of Persia, there is a more or less considerable popu- lation of Armenians. At Hamadan, at Ispahan, at Tehran, at Mashhad, at the town of Damavand, and elsewhere in Persia, Jews are found in considerable numbers. The province of Gilan is in- habited by a race of men peculiar to itself, the descendants of the ancient Gele. The people of Mazandaran speak, as do the Gileks, a dialect of their own. The province of Astrabad is partly inhabited by Turkmans; and in the districts claimed by Persia, which border on Afghanistan and Baluchistan, the Afghan and Baluch elements are prominent in the population. At Karman a few Hindtis reside, and at Yazd there are about 2000 families of the original fire-worshippers of Iran.? But the two principal races to be met with in Persia are the Turks and the Persians or Mongols. The former are, as a general rule, spread over the northern pro- vinces; the latter over the southern. The Persians of Mongol extrac- tion for the most part speak only the Persian language, while those of Turkish race spcak the Turkish language in preference to Persian.

“The inhabitants of Persia may be divided into two classes,— those who inhabit the towns and villages, and those who dwell exclusively in tents. The former class remain stationary during the greater part of the year, the

richer orders only leaving the towns for two months during the summer heats, when it is possible to obtain cool air in the hills or upper grounds close by. The tribes who dwell in tents move from place to place with the varying scasons of the year. In the springtime they drive their flocks and herds to their accustomed pasture-grounds, and if they havea right to the pasture of mountains which are inaccessible in spring, they move up to their summer quarters as soon as the snow disappears. Winter finds them on the plains, prepared, in their black tents, to brave its utmost rigour. These Iliyat tribes serve each a separate chief. For the Iliyats of Fars there is a hereditary chief called the Ilkhanf, to whom they all owe allegiance ; from whom they receive the laws that rule their eonduct ; and to whom they pay the revenue imposed upon them. They contribute a certain number

2 Since greatly reduced in numbers.

A very great pro- Races.

Statisties

of popu- lation.

Adminis- tration.

of soldiers to the Shah's army. Very little is known as to the numbers and the peculiarities of, these nomads. 'The Iliyat tribes of Turkish descent have an Ilkhani appointed by the Shah. Besides these tribes there are wanderers who are less numerous, and who occupy a less prominent position,—the gipsies common to so many countries."

It is difficult to form an estimate of the population of Persian towns or districts. In the first place, opinion is divided upon the approximate figure to be accepted for the kingdom at large. Accord- ing to St John, the discrepancy is between ten and four millions ; and if the smaller one were made a basis there would be but a scanty number indeed for partition among the cities and principal centres. The famine of 1870 was, moreover, severe and fatal enough to eause aconsiderable diminution in the totals

calculated prior to its occur- rence. When returning through Mashhad in the spring of 1872 the British commissioner for the Sistan boundary settlement was informed that no less than 100,000 persons had been carried off within the limits of the prinee-governor's rule, of whom 24,000 were from the city itself, where, exclusive of passing pilgrims, reckoned by thousands, a population of 70,000 might well be sup- posed. In Yazd and Ispahan the losses were also very great, and must have sensibly affected the figures.

The official estimate for 1881 is recorded as follows :—inhabitants of cities, 1,968,800 ; wandering tribes, 1,909,800 ; inhabitants of villages and country, 3,780,000; total, 7,658,600. It is probable that 8,000,000 would be a fair estimate in round numbers; and this should include the comparatively new accessions of territory in Sistan and western Baluchistan.

The population of eertain cities may be recorded as follows. Those figures marked with an asterisk are from the official returns given in the Statesman's Year Book for 1884. Tehran, *100,000 ; Astrabad (city), 8000 —in the province, 26,000 (Lovett, 1881); Tabriz, *120,000 ; Urumfya, *40,000; Hamadan, *30,000; Kar- manshah, 25,000; Rasht, 20,000; Kazvin, 25,000; Zanjan or Zanjanah, 20,000 (Eastwick, 1860) ; Kim, 20,000 (Euan Smith said in 1871 that out of 20,000 houses which it originally possessed only 4000 were then habitable) ; Ispahan, 60,000; Shiraz,*80,000; Bush- ahr, 11,000; Yazd, *40,000; Karman, 40,000 ; Birjand, 12,000 (Sis- tan mission, 1872); Ardakan (Khurasan desert), 20,000 (Colonel Stewart, 1880) ; Bam, 600C (Goldsmid, 1866-72).

With regard to three interesting places in eastern Persia visited by Macgregor in 1875, this active explorer gives no clue to the population of Tabas, beyond the fact that it is a wall-enclosed town about half a mile in length by a quarter in breadth, with an "ark" or citadel, but no bazaars; of Tun, lis 1500 " better houses " may imply about 6000 well-to-do people only ; and Bashruyah, between Tabas and Tun, he calls a village of some 600 houses, equivalent to a population of between'3000 and 4000.

Government.—The shah is regarded as vicegerent of the Prophet, and, as such, claims implicit obedience so long as his commands do not go against the Koran and the sacred law. 'The executive government is carried on by a ministry of which the personnel is subject to constant change, and the

distribution of duties depends much upon the standing in royal favour of individual ministers. It may be said, as a rule, that those who fill the more important functions and do the most real work are better known by their family names than the official titles accorded them. The some- what common prefix ‘‘mirza” is usually taken by high function- aries of state,—a word which invariably denotes a member of the royal house when used as an affix.)

The division of the country for administrative purposes has been mentioned above, p. 626. Provinces are further subdivided into districts under ‘‘hakims,” or chiefs, who eollect the revenue as well as exercise a general superintendence. In villages the “kat- khuda,” or magistrate, administers justice.

Of the Armenians under Persian rule there are said to be 43,000, chiefly in Julfa near Ispahan, and of Nestorians and Chaldeans 23,000, chiefly in Urumiya and Salmas. There are probably 70,000 Christians of every denomination. The number of Jews given is 19,000, and of Gabars (Guebres) or Parsis 8000. Perhaps the Nes- torians have been under- estimated ; but the Parsis have greatly dim- inished in recent years. However tolerant the declared principles of the Government towards aliens in religion, there is no doubt that much could yet be done to improve the condition of the shah’s non- Moslem subjects in respeet of taxation, civil and social rights, and general treatment by local authorities. Efforts on behalf of the Nestorians have from time to time been made in late years, with the support of the British Government, and special agents have been deputed to Urumtya to report upon supposed grievances

1 In 1884 the following were among the more prominent ministers :— War. —Naibu ’s-Saltanah, Kamran Mirza. Interior and Finance.—Mustofiu ’1-Mamdlik, Mirza Yusuf Khan. Foreign Affairs.— Nasru 1-Mulk, Mirza Mahinid Khan. Justice.—Mushira *d-Daulah, Mirza Abdul Wahab. Worship and Teleyraphs.—Makhbaru ’d-Daulah, ‘Ali Kuli Khan. z a ode gona a wale “nasru ’l-mulk,” had been minister in ondon. is predecessor in the cabinet had been always kno i Mirza Satid han, os enauaaiinaitiaas ¢

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with a view to their alleviation or removal. The temporary appointment of a Christian governor was an indieation of the shah's good wishes, but can hardly be said to have attained the desired end. It is just possible that the desire awakened in England in the second half of the 19th century to know more of the Eastern churehes may result in the exercise of a beneficial influence over the fortunes of a people who have suffered various forms of oppression for five centuries or more. See Nesronrays, vol. xvil. p. 357 sg., where statistics, &c., are given.

Army.—Military service is not popular, and could not be pro- Amy.

vided for at all but by compulsory enrolment. Pay is always kept in arrears, generally for two or three years ; and, when issued, it is reduced from its legitimate amount by the exaetions of distri- buting officers, from the ‘‘sarhang,” or lieutenant-eolonel, down- wards. The native officers are, as a rule, incapable and ignorant of military affairs; and the European drill-instructors, whatever their local rank, have no actual command in the native army. The common ‘‘sarbaz,” or Persian infantry soldier, might with good officers and good training be made very efficient. In the perform- ances of his long marches—24 or even 40 miles a day—he has very often a companion, his donkey, without which adjunct no picture of a Persian infantry soldier would be complete. Setting such aid aside, the marching and endurance of the sarbaz are wonderful, and, though better food might in some respects improve his physique, his frugality is such as to aceount in some measure for his bodily strength. Ifwanting in the discipline that is eonsidered in England essential to the well-being of the service, the fault is that of his superiors, by whom he is ill-commanded, ill-taught, and ever accursed with an evil example. In fact, the moral value of the soldier deteriorates as the social grade rises. It is much the same in Turkey, where the state of things is perhaps Oriental rather than national. The post of ‘‘ wakil,” or non-commissioned officer, beconies thus the first step to demoralization. Above this person is the ‘‘naib,” or lieutenant, corresponding to the Turkish ‘‘imulazim” ; then comes the ‘‘sultén,” or captain, the Turkish “‘yuzbashi” ; “ yawar,” or major, the Turkish “binbashi”; “ sar- hang,” or lieutenant-colonel, the Turkish ‘‘k4im-makdm”;

and the ‘‘sartip,” or colonel, the Turkish ‘‘ mir-alai’’; sueh are roughly the respective grades which represent the commissioned ranks.

The most business-like cavalry the present writer can recall in the shah’s dominions were the stray horsemen met with in the Karman province. Their dress, brown from top to toe, with the xupBacia of Herodotus and the earbine slung over the back, ap- peared simple and soldier-like; and nothing but hereditary aptitude could make the horseman so fitted to the horse. Both in 1866 and in 1871 the governor of Bampur, in Baluchistan, had good stuff to diseipline into irregular cavalry in his mounted Baluehis as well as Persians ; and the same remark applies to the Persian governor of Sistan in 1872. The “‘istikbal,” or motley troop of cavaliers, sent out to meet the writer by either chief, presented a singular specimen of rough but sufficiently formidable-looking satellites— men who had, clearly, fighting propensities, and might be moulded, without much effort, into very serviceable soldiers. Colonel (now Sir Charles) Macgregor found the few irregular cavalry incidentally brought under his observation in Khurdsan very fairly mounted in a working sense. Over the saddle and behind it they seemed to carry all that belonged to them. With less than £2 year in pay, over and above a grain allowance, he says truly of these cava- liers, that, ‘‘if not the best light horsemen in the world, they are the very cheapest.” At Mashhad he saw several Persian regiments encamped outside the city. They were composed of men generally of fine physique, hardy and muscular; but their small pay of seven ‘‘tumans” (not £2, 16s.) per annum was seldom realized up to half the amount, and they had to subsist chiefly on their rations. Their uniform consisted of a black lamb’s-wool busby, with a lion and sun in brass on the front, a dark-blue tunic, on the European model, with white bands across the breast, blue trousers with red stripe, and shoes (if they like to wear them). They had “‘clumsy percussion, smooth-bore muskets and bayonets, with locks of French manufacture”; but they did not clean them, and it was probable that more than half were unfit for actual use. The artillery he states to be probably the most efficient branch of the service, not smart, but rough and ready.

Although there were no English officers employed in training the Persian troops during any of the present writer’s visits to Tehran, there were two Englishmen connected with the arsenal to whoin the local Government was

indebted for useful service. The ehief control of the arsenal, however, and indeed the direction of the whole Persiau artillery, was in the hands of an Armenian ; the two principal drill-instructors were Italians, a Florentine and a Neapolitan ; while that vital part of the public works department comprising roads and bridges was under an Austrian officer hold- ing the rank of general. There were, besides, two or three other Europeans holding quasi-military posts.

Sir Henry Rawlinson, who was for five years in the shah's army, believes that, "if the Persian material were placed at the disposal of a European power who would encourage and take care of the

Nationa] character,

men, and develop their military instincts, a fine working army, very superior to anything that Turkey could produce, might be obtained in a very short period of time."

It is difficult to rely on statistics in the present case, but the following are found in the latest and most trustworthy records, 1

"The Persian army, according to official returns of the minister of war, numbers 105,500 men, of whom 5000 form the artillery, 58,900 the infantry, 31,000 the cavalry, regular and irregular, and 7200 militia. Of these troops, however, only one-third are em- ployed in active service, the standing army of Persia consisting, on the peace footing, of a total of 30,000 men. By a decree of the Shah, issued in July 1875, it was ordered that the army should for the future be raised by conscription, instead of by irregular levies, and that a term of service of twelve years should be substi- tuted for the old system, under which the mass of the soldiers were retained for life ; but the decree has not been enforced to any ex- tent. The organization of the army is by provinces, tribes, and dis- tricts. A province furnishes several regiments ; a tribe gives one, and sometimes two, and a district contributes one battalion to the army. The commanding officers are almost invariably selected from the chiefs of the tribe or district from which the regiment is raised. The Christians, Jews, and Guebres in Persia are

exempt from all military service. In recent years the army has been under the training and organization of European officers.”

Revenue.—According to the Statesman’s Year Book for 1884 the revenue and expenditure of the Government are known only from estimates. If we accept these as based on consular reports, the total receipts of the Government amounted, on the average of the years 1872 to 1875, to £1,900,000 per annum, while the expendi- ture during the same period was at the rate of £1,756,000 per annum. The receipts of the year 1882 amounted to £1,600,000 in money, besides £280,000 in kind, consisting of barley, wheat, rice, and silk, making the total revenuc equal to £1,880,000; and of this sum £1,520,000 came from direct taxes and £353,600 from customs. The expenditure amounted to £1,800,000, of which £760,000 was for the armiy ; £360,000 for the regal court ; the priest- hood, &c., £240,000; foreign affairs, £28,000; other departments, £60,000; education, £12,000. The surplus is paid into the shah’s treasury. About one-fourth of the receipts are constituted by pay- mentsin kind, mostly reserved for the use of the army and the shah’s own household. The whole revenue is raised by assessinents upon towns, villages, and districts, each of which has to contribute a fixed sum, the amount of whicli is changed from time to time by tax-assessors appointed by the Government. Almost the entire burthen of taxation falls npon the labouring classes, and among these upon the Muhammadan subjects of the shah. The amount of revenue collected from the Christian population, the Jews, and the Gabars is reported to be very small. The Government has no public debt. The Almanach de Gotha adds to the above items of expenditure in 1882 the sum of £80,000 for the priesthood, &c.

In 1868 the revenue demanded from each province, under the divisions then made, was :—Adarbaijan, £248,000 ; Gilan, £176,000 ; Ispahan, £168,000; Fars, £152,000; Khurasan, &c., £88,000; Arabistan, £86,000; Tehran, &c., £84,000; Karman, £84,000; Karmanshah, &c., £80,000; Khamsah, £72,000; Yazd, £68,000; Mazandaran, £44,000 ; Kazvin, £28,000 ; Kashan, £28,000 ; Buru- jird, £24,000; Gulpaigan, £24,000; Kurdistan, £20,000; Hamadan, £12,000; Astrabdd, £10,000; Kim, £6000; total, £1,502,000. The customs were £214,664, and the value of income reccived in kind was £220,336,—making a total revenue of £1,937,000, or something less than two millions.

A prince-royal appointed to a province is often little more than a nominal ruler. On the other hand, some governors, such as Muhammad Isma‘il Khan, the late wakilu ’1-mulk of Karman, attend to even the minute details of administration, and pay especial attention to the collection of revenue. It is not always an easy matter to pay into the royal treasury the sum insisted on, or even voluntarily offered for the government of a province.

National Character.—Maleolm’s Sketches and Morier’s Hajjt Baba are still, after more than half a century, unsuperseded as standard records of accurate information on the manners and customs of an Oriental people. A clever volume? published in 1883, which is also worth quoting, contains, aniong many other faithful delineations, the following.

“The character of the Persian is that of an easy-going man with a wish to make things pleasant generally. He is hospitable, obliging, and specially well disposed to the foreigner. His home virtues are many : he is very kind and indulgent to his children, and, asa son, his respect for both parents is excessive, developed in a greater degree to his father, in whose presence he will rarely sit, and whom he is in the habit of addressing and speaking of as ‘master.’ The full stream of his love and reverence is reserved for his mother ; he never leaves her to starve, and her wishes are laws tohim. The mother is always the most important member of the household, and the grandmother is treated with veneration. The

1 Statesman’s Year Book, 1884, pp. 796, 797. 2 Wills, In the Land of the Lion and Sun, 1883.

presence of the mother-in-law is coveted by their sons-in-law. who look on them as the guardians of the virtue of their wives. The paternal uncle is a much nearer tie than with us ; while men look er oer first cousins on the father’s side as their most natura]

ss Black slaves and men-nurses or ‘Jallaks’ are much respected ; the ‘dyah’ or wet nurse is looked on as a second mother and usu. ally provided for for

life. Persians are very kind to their servants – a master will often be addressed by his servant as his father, and the servant will protect his master's property as he would his own. A servant is invariably spoken to as ' bacha' (child). The servants expect that their master will never allow them to be wronged. The slaves in Persia have a good time; well fed, well clothed, treated as spoiled children, given the lightest work, and often given in marriage to a favourite son or taken as 'segah' or con- cubine by the master himself, slaves have the certainty of a well- cared-for old age. They are looked on as confidential servants, are entrusted with large suins of money, and the conduct of the most important affairs; and seldom abuse their trust. The greatest punishment to an untrustworthy slave is to give him his liberty and let him earn his living. They vary in colour and value: the 'Habshi' or Abyssinian is the most valued ; the Suhali or Somali, next in blackness, is next in price ; the Bombassi, or coal-black negro of the interior, being of much less price, and usually only used as a cook. The prices of slaves in Shirdz are, a good Habshi girl of twelve to fourteen £40, a good Somali same age, half as much ; while a Bombassi is to be got for £14, being chosen merely for physical strength. They are never sold, save on lnportation, though at times they are given away. . . . I have never seen a Persian unkind to his own horse or his slave, and when overtaken by poverty he will first sell his shirt, then his slave.

""In commercial morality, a Persian merchant will compare not unfavourably with the European generally. . . . To the poor, Persians are unostentatiously generous; most of the rich have regular pensioners, old servants, or poor relations who live on their bounty; and though there are no workhouses, there are in ordinary times no deaths from starvation ; and charity, though not organized, is general. . . . Procrastination is the attribute of all Persians, 'to-morrow' being ever the answer to any proposition, and the 'to-morrow' means indefinite delay. A great dislike is shown gener- ally to a written contract binding the parties to a fixed date ; and, as a rule, on breaking it the Persian always appeals for and expects delay and indefinite days of grace… .

'*Persians are clean in their persons, washing themselves and their garments frequently. The Persian always makes the best of his appearance ; he is very neat in his dress, and is particular as to the sit of his hat and the

cut of his coat. All Persians are fond of animals, and do not treat them badly when their own property.

“Cruelty is not a Persian vice ; torture and punishments of an unusual and painful nature being part of their judicial system. There are no vindictive punishments, such asa solitary confinement, penal servitude for long terms of years, &c. Seldom, indeed, is aman imprisoned more thau twelve months, the rule being that there is a general jail delivery at the New Year. Royal clemency is frequently shown, often, perhaps, with want of judgment.”

The close adherence to ceremony and etiquette, the ready adaptation to foreign habits, together with the capacity for using and love of receiving the grossest forms of flattery—which in the days of Herodotus were found to be notable features of the national character—are still to be seen in the 19th century.

Morier, in his Sccond Journey through Persia, relates how on arrival at Bombay his fellow-traveller, the Persian ambassador, returning from a mission to the court of St James’s, would not call at Government House until the governor had visited him, on the plea that, when in London, the chairman and deputy-chairman, whom he styled the father and grandfather, of the Hast India Company, as well as the “viziers” and “grand vizier” himself (Mr Spencer Perceval), had made the first call upon him,—clothed, moreover, in the very dress they had worn before their own sove- reign! The present writer, when discussing the necessary conduct of British diplomatists accredited to Persia, said:3 “In some courts

. . there is a meaning in ridiculous minuti#, the comprehension of which is of vital importance to the envoy and the cause he advocates. . . . A chair pushed one iuch or two forward or back- ward, so as to transgress the border of a particular carpet marked for its limit, may cause serious offence ; a cup of tea, or a tobacco pipe missing from the conventional number offered to a guest, may awake hostile feelings, there may be hidden mischief in a misapplied word of welcome or farewell, in a clumsy gesture, in a new-fashioned article of wearing apparel. Trifles could hardly go further in the way of puerility ; but it is a part of common-sense diplomacy

to acknowledge with gravity things which are to all sceming the most opposed te common-sense.” ; a”

Forms of compliment and adulation are in such constant requisi- tion with him that a Persian is never at fault to find occasion for their use. If the following example be too characteristic to be

3 Lecture at the Royal United Service Institution, 26th May 1876.

admitted, be it understood that it indicates a grosser kind of pro- cedure than that which, at the present day, is known to the higher classes. It is a common custom on the arrival at the gate of a town ofa distinguished traveller for some duly appointed official to strike off the head of a sheep, and roll it, with the blood drip- ping, across the path of the new-comer. Morier gives a revolting ulustration of the length to which this ceremony was carried on the arrival of the shah at the halting-place of Morehikar. The head man of the village went so far as to strip his own son naked from the waist upwards, and, having tied the lad’s hands behind his back, to lift his knife as though to cut the victim’s throat. The conclusion of the story is not told ; but it is tu be hoped that the shah exercised his prerogative of preventing any cvil results.

Costwme.—The costume ! of the Persians may be shortly described.

as fitted to their active habits. The men invariably wear an un- starched shirt of cotton, sewn with white silk, often, particularly in the south of Persia, elaborately embroidered about the neek. It fastens in front by a flap, having two small buttons or knots at the left shoulder, and seldom comes below the hips. It has no collar, and the sleeves are loose. The lower orders often have it dyed blue ; but the servant and upper classes always prefer a white shirt. Silk shirts are now seldom seenonmen. Among the very religious during the mourning month (“Muharram”) the shirt is at times dyed black. The “zir- jamah,” or trousers, are of cloth among the higher classes, particularly those of the military order, who affect a garment of a tightness approaching that

worn by Europeans. The ordinary “zir-jamah” are of white, blue, or red cotton, very loose, and are exactly similar to the “ pai-jamahs” worn by Europeans in India. They are held up by a thin cord of red or green silk or cotton round the waist, and the labouring classes, when engaged in heavy or dirty work, or when running, generally tuck the end of these garments under the cord, which leaves their legs bare and free to the middle of the thigh. The amplitude of this part of his attire enables the Persian to sit without discomfort on his heels ; chairs are only used by the rich, great, or Europeanized. Over the shirt and ‘‘zir-jamah’’ comes the “arkhdalik,” generally of quilted chintz or print, a closely-fitting garment, collarless, with tight sleeves to the clbow, whenee, to the wrist, are a number of little metal buttons, fastened in winter, but not in summer. Above this is the “kamarchin,” a tunic of coloured calico, cloth, Kashmir or Karman shaw], silk, satin, or velvet (gold embroidered, or otherwise), according to the time of year and the purse and position of the wearer. This, like the ‘‘arkhalik,” is open in front, and shows the shirt. It sometimes has a small standing collar, and is double-breasted. It has a pocket-hole on either side, giving access to the pockets which are always in the “arkhdalik,” where also is the breast-pocket in which watch, money, jewels, and seals are kept. The length of the “kamarchin” denotes the class of the wearer. The military and official classes and the various servants wear it short, to the knee, while fops and sharpers wear it even shorter. Priests, merchants, villagers, especially about Shiraz, townsmen, shopkeepers, doctors, and lawyers wear it’ very long, often nearly to the heels. Over the “kamarchin” is worn the “kulajah,” or coat. This is, as a rule, cast off in summer, save

on formal occasions, and is often borne by a servant, or carried over

the shoulder by the owner. It is of eloth, shawl, or camel-hair cloth and is lined with silk or cloth, flannel or fur. It has, like the Turkish frockcoat, a very loose sleeve, with many plaits behind. It has lapels, as with us, and is trimmed with gold lace, shawl, or fur, or is worn quite plain. It has a roll collar and false pockets. Besides these garments there are others: the long “jubba,” or cloth cloak, worn by “ mirzas”’ (secretaries), Government employés of high rank, as ministers, farmers of taxes, courtiers, physicians, priests ; the “abba,” or camel-hair cloak of the Arab, worn by tra- vellers, priests, and horsemen ; the “pustin,” or Afghan skin-cloak, used by

travellers and the sick or aged ; the “nimtan,” or commou sheepskin jacket, with short sleeves, used by shopkeepers and the lower class of servants, grooms, &c., in winter; the “ydpanjah,” or woollen Kurdish cloak, a kind of felt, having a shaggy side, of immense thickness, worn generally by shepherds, who use it as greatcoat, bed, and bedding. ‘There is also the felt eoat of the villager, very warm and inexpensive, the cost being from 5 to 15 krans (a kran=10d.). The “kamarband,” or girdle, is also charac- teristic of class. Itis made of muslin, shawl, or cotton cloth among the priests, merchants, bazaar people, the secretary class, and the more aged Government employés. In it are carried, by literati and merchants, the pen-case and a roll of paper ; its voluminous folds are used as pockets; by the bazaar people and villagers, porters and merchants’ servants, a small sheath knife is stuck in it; while by “farrashes,” the carpet-spreader class, a large “khanjar,” or curved dagger, with a heavy ivory handle, is carried. The headgear 1s very distinctive. The turban worn by priests is generally white, consisting of many yards of muslin. When the wearers are “sdiyid ” of the Prophet, a green turban is worn, also a “kamarband” of green muslin, or shawl or cotton cloth. Merchants generally wear a turban of muslin embroidered in colours, or of a yellow pattern on straw-

1 Dr. Wills’s instructive volume again supplies this information.

coloured muslin, or of calico, or shawl. The distinctive mark of the courtier, military, and upper servant class is the belt, generally of black varnished leather with a brass clasp ; princes and courtiers often replace this clasp by a huge round ornament of cut stones, The “kulah,” or hat, is of cloth or sheepskin on a frame of paste- board. The fashions in hats change yearly. The Ispahan mer- ehant and the Armenian at times wear the hat very tall. (The waist of the Persian is generally small, and he is very proud of his fine figure and broad shoulders.)

The hair is generally shaved at the crown, or the entire head js shaved, a ‘‘kakul,” or long thin lock, being sometimes left, often 2 feet long, from the middle of the crown. This is to enable the prophet Muhammad to draw up

the believer into paradise. ‘The lower orders generally have the hair over the temporal bone long, and brought in two long locks turning backwards behind the ear, termed ‘“‘zulf”; the beaux and youths are constantly twisting and combing these. The rest of the head is shaven. Long hair, however, is going out of fashion in Persia, and the more civilized affect the cropped hair worn by Europeans, and even have a part- ing in it. The chin is never shaved, save by “ beauty men,” or ‘‘kashangs,” though often clipped, while the moustache is usually left long. At forty a man generally lets his beard grow its full length, and cherishes it much ; part of a Persian’s religious exercises is the combing of his beard. Socks, knitted principally at Ispahan, are worn ; they are only about 2 inches long in the leg. The rich, however, wear them longer. They are of white cotton in summer and coloured worsted in winter. Villagers only wear socks on state occasions. Shoes are of many patterns. The ‘‘umissi,” or Russian shoe, is the most common ; next, the ‘‘kafsh” or slipper of various kinds. The heel is folded down and remains so. The priests wear a peculiar heavy shoe, with an ivory or wooden lining at the heel. Green shoes of shagreen are common at Ispahan. Blacking is un- known to Persians generally. Boots are only used by horsemen, and are then worn much too large for ease. Those worn by couriers often come up the thigh. With boots are worn ‘‘shalwars,” or baggy riding breeches, very loose, and tied by a string at the ankle ; a sort of kilt is worn by couriers. Pocket-handkerchiefs are seldom used, save by the rich or the Tehranis. Most Persians wear a ‘‘shab kulah,” or night hat, a loose baggy cap of shawl or quilted material, often embroidered by the ladies.

Arms are usually carried only by tribesmen. The natives of the south of Persia and servants carry a ‘‘kammah,” or dirk. The soldiery, on or off duty, always carry one of these or their side- arms, sometimes both. They hack but never thrust with them. On the road the carrying of weapons is necessary.

The costume of the women has undergone considerable change in the last century. It is now, when carried to the extreme of fashion, highly indecent and must be very uncomfortable. The garment doing duty as a chemise is called a ‘‘pirdhan”; it is, with the lower orders, of white or blue calico, and comes down to the middle of the thigh, leaving the legnude. Among the upper classes it is frequently of silk. At Shiraz it is often of fine cotton, and

elaborately ornamented with black embroidery. With the rich it is often of gauze, and much embroidered with gold thread, pearls, &c. The head is usually covered with a "'char-kadd," or large square of embroidered silk or cotton, folded so as to display the corners, and fastened under the chin by a brooch. It is often of eonsider- able value, being of Kashmir shawl, embroidered gauze, &e. A "'jika," a jewelled feather-like ornament, is often worn at the side of the head, while the front hair, cut to a level with the mouth, is brought up in love-locks on either cheek. Beneath the ''char- kadd " is generally a small kerchief of dark material, only the edge of which is visible. The ends of the ''char-kadd" cover the shoulders, but the gauze ''pirahan" is quite transparent. A pro- fusion of jewellery is worn of the most solid description, none hollow; silver is worn only by the very poor, coral only by negresses. Neck- laces and bracelets are much affected, and chains with seent-caskets attached, while the arms are covered with clanking glass bangles ealled "'alangu," some twenty even of these being on one arm. Jewelled '' bazibands," containing talismans, are often worn on the upper arm, while among the lower orders and south Persian or Arab women nose-rings are not uncommon, and bangles or anklets of beads.

The face on important occasions is usually much painted, save by young ladies in the heyday of beauty. The colour is very freely applied, the eheeks being as much riddled as a clown's, and the neck smeared with white, while the eyelashes are marked round with ''kuhl." This is supposed to be beneficial to the eyes, and almost every woman uses it. The eyebrows are widened and painted till they appear to meet, while sham moles or stars are painted on the ehin and cheek ; even spangles arestuck at times on the chin and forehead. Tattooing is common among the poor and in villages, and is seen among the upper classes. The hair, though generally hidden by the "char-kadd," is at times exposed aud plaited into innumerable little tails of great length, while a coquettish little skull-cap of embroidery, or shawl, or coloured silk is worn. False hair iscommon. The Persian ladies' hair is very luxuriant, and never cut ; it is nearly always dyed red with henna, or with indigo

Geogra- phical sum-

mary.

to a blue-black tinge ; it is naturally a glossy black. Fair hair is not esteemed. Blue eyes are not uncommon, but brown ones arc the rule. A full-moon face is much admired, and a dark com- plexion termed ‘ namak ”’ (salt) is the highest native idea of beauty. Most Persian women are small, with tiny feet and hands. The figure is always lost after maternity, and no support of any kind is worn.

A very short jacket, of gay colour, quite open in front, having tight slecves with many metal buttons, is usually worn in summer, and a lined outer coat in cold weather. Jn winter a pair of very short white cotton socks are used, and tiny shppers with a high heel; in summer in the house ladies go often barefoot. The rest of the costume is composed of the “tumbun” or “shalwar,” short skirts of great width, held by a running string,—the outer one being usually of silk, velvet, or Kashmir shawl, often trimmed with gold lace, or, among the poor, of loud-patterned chintz or print. Beneath are innumerable other garments of the same shape, varying in tex- ture from silk and satin to print. The whole is very short, among the women of fashion extending only to the thigh. In winter an over-mantle like the “kulajah,” or coat of the man, with short siceves, lined and trimmed with furs, is worn. Leg-coverings are now being introduced. In ancient days the Persian ladies always wore them, as may be seen by the pictures in the South Kensington Muscum. Then the two embroidered legs, now so fashionable as Persian embroideries (“nakoh”’), occupied a girl from childhood to marriage in making; they are all sewing in elaborate patterns of great beauty, worked on muslin iu silk. The outdoor costume of the Persian women is quite another thing. Enveloped in a huge blue sheet, with a yard of linen asa veil perforated for two inches square with minute holes, the feet thrust into two huge bags of coloured stuff, a wife is perfectly unrecognizable, cven by her hus- baud, when out of doors. The dress of all is the same ; and, save in quality or costliness, the effect is similar.

As for the children, they are always when infants swaddled ; when they can walk they are dressed as httle men and women, and with the dress they generally ape the manners. It is a strange custom with the Persian ladies to dress little girls as boys, and little boys as girls, till they reach the age of

seven or eight years ; this is often done for fun, or on account of some vow, —oftencr, to avert the evil eye.

A summary of personal impressions of Persia may serve to convey a tolerably correct idea of the country, without the necessity of serious study or the aid of science and statistics. The reader is asked to suppose a tableland dropping to the Caspian Sea for nearly one-third of its northern frontier, and to the Persian Gulf for its southern limit. The lowlands, naturally, are the coast-tracts. In the north these are covered with forest, and the climate there is damp, feverish, relaxing ; in the south they are dry and barren, and the winds are hot and violent, yet a relief to the scorching summer atmosphere. In the central highlands (that is, Persia generally) there are few rivers, and the country is either composed of parallel mountain-ranges and broad intervening plains, or of irregular moun- tain-masses with fertile valleys, basins, and ravines. One plain on the last is of exceptionally large extent, and is called the Salt Desert of Khur4san. The theory that this was once a sea is supported by the circumstance that at one of its extreme edges is the village of Yunsi, so called because the prophet Jonah (Yunas) is locally believed to have been cast up there by the whale. For irrigation the plains and valleys depend on the mountains, and at the base of these are “kandts,” or underground canals, with watercourses on the surface. Yet where rain and snow fail during the year there is scarcity of water, and where both are wanting there is always distress and sometimes famine. The valleys and ravines are more fertile than the plains, affording often bright, picturesque, and grateful prospects, while the latter are for the most part barren and sandy wastes, scored or streaked, as it were, rather than orna-mented with patches of green oases. Forests are rare and, except in Gilan, not dense; numerous gardens are com- monly found in the neighbourhood of large towns, not cared for as in Europe, yet pleasant in their wildness ; and there are many beautiful trees usually also near the centres of population. Persian cities are not like cities in Europe. The passing stranger sees no street or house in any of them at all comparable to a respectable street or building, as

‘writings of Timur.

England, France, or Germany rate structural respectability. Blank mud-walls and narrow ill-paved thoroughfares are the rule ; the windowed or terraced front of a Persian house is for the inner court or inner precincts of the abode, and not for the world without. Some mosques are handsome, some caravansaras solid, some bazaars highly creditable to the designer and builder; but everything is irregular, nothing is permanent, and architectural ruin blends with architect- ural revival in the midst of dirt, discomfort, and a total disregard of municipal method. Even Constantinople and Cairo cannot bear the ordeal of close inspection. Beautiful and attractive as they may be from without—and the first – has a charm beyond description, while the second is always interesting in spite of her barbarous boulevard—they are palpably deficient in completeness within ; and yet Tehran, Baghdad, Ispahan, Tabriz, Mashhad, Shiraz are far behind them in civilized construction and order. Sources.—Indcpendently of original sources, information has been obtained from official and parliamentary records, to which access' was kindly facilitated under authority ; from Lastern Persia, 2 vols. (1876) ; and various books of travel by authors already named. The writer has also to express his thanks to General Schindler, in the service of the shah, to Mirza Hasan 'Ali Khan, attaché to the Russo- Afghan boundary commission ; to Colonel Bateman-Chanipain, R.E., Mr W. T. Blanford, Mr Andrews (of the Indo-European

telegraph), and others, who have more or less favoured him with special information, written or oral.

Section IT.—History.

Oriental history, as told by Oriental historians, is for the majority of readers in Europe a study of little attrac- tion. Its genealogies and oft-repeated names are weari- some ; its stories of battle, murder, and rapine are mono- tonous and cast in one mould; the mind cannot readily impart life to the dry bones of the more prominent dramatis persone by conceiving for them any flesh-and- blood individuality. The court-chronicler of an Eastern potentate writes to order, and in accordance with a pre- cedent which fetters style and expression ; and even the painter of state-portraits strives rather to turn out a con- ventional and model monarch than the likeness of an original human

being. In the palace of Kirich, near Tehran, is a picture of Fath ‘Ali Shah and his sons. There may be a certain waxwork beauty in some of the faces, but they give no more signs of innate character or mental idio- syncrasy than do the kings and knaves of a pack of cards.

The Timurides in these respects were exceptionally fortu- nate. Timur himself, their great progenitor, though not the distinct figure of an English king as delineated by Macaulay, has been handed down to us in some kind of personality in the history called Zafarnéma,! in his Malfizdt or utterances, and in the Tuzikdt or institutes.” There are, moreover, portraits of him in existence which are professed likenesses. Babar, Akbar, and Jahdngir were either their own chroniclers or had comparatively competent men to write for them ; and, to illustrate the period in which they lived, we obtain—in addition to records of events—biography, memoirs, and something also of the current sayings, writings, and doings. But the reigns of these three monarchs rather concern the annals of India than of Persia, whereas Timur has so much to do with the latter that a brief retrospect of the career of that conqueror and his immediate descendants as it affected the countries generally south of the Caspian will be an appropriate opening to the present history.

1 Unfortunately, perhaps, there are two histories bearing this title. In the one, as Sir William Jones explains, “the Tartarian conqueror is represented as a liberal, benevolent, and illustrious prince”; in the other he is ‘‘as deformed as impious, of a low birth and detestable principles.” The authenticity of the Malfizdt is disputed.

2 Both these last terms, however, are indifferently applied to the Tuzuk is the passive participle of tuzmak, ‘to arrange,” hence tuzdkdt, “ arrangement.”

1405-1506.

Timur.

Timur’s success- ors.

The Timurides and Tiérkmans (1405-1499),—Timur died in 1405, when in the seventieth year of his age and about to enter upon a new war,—an invasion of China. Besides exercising sovereignty over Transoxiana and those vast regions more or less absorbed in Asiatic Russia of the 19th century, inclusive of the Caucasus, Astrakhan, and the lower Volga, and overrunning Meso- potamia, Syria, Asia Minor, Afghanistan, and India, he had at this time left his indelible mark upon the chief cities and provinces of Persia. Khurdsan and Mazandaran had submitted to him in 1381, Adarbaijan had shortly after followed their example, and Ispahan was seized in 1387. If the chroniclers are to be trusted, the occupation of this place was accompanied by the slaughter of 70,000 inhabitants, —a number in excess of its whole population as officially estimated in 1868. From Ispahan he passed on to Shir4z, and thence returned in triumph to his own capital of Samarkand. Five years later his cruel hand was stretched out to subdue a formidable resistance in Mazandaran, and later still he was again at Shiraz, having effected the subjugation of Luristan and other provinces in the west. It may be said that from north to south, or from Astrabad to Hormuz, the whole country had been brought within his dominion.

The third son of Timur, Miran Shah, had ruled over part.of Persia in his father's lifetime ; but he was said to be insane, and his incapacity for government had caused the loss of Baghdad and revolt in other provinces. His claim to succession had been put aside by Timur in favour of Pir Muhammad, the son of a deceased son, but Khalil Shah, a son of the discarded prince, entered the lists against the nominee and won the day. The reign of this chief, however, was not of any duration. His lavish waste of time and treasure upon a fascinating mistress named Shadu 'l-Mulk, the "delight of the kingdom," soon brought about his ruin and deposition, and in 1408 he gave way to Shah Rukh, who, with the exception of Miran Shah, was the only surviving son of Timur. In fact the uncle and nephew changed places,—the one quitting his government of Khurdasan to take possession of the Central- Asian throne, the other consenting to become governor of the vacated Persian province and abandon the cares of the empire at Samarkand. In the following year Khalil Shah died ; and the story goes that on his death Shadu '1- Mulk stabbed herself and was buried in the same tomb with her royal lover at Rhé, one of the towns which his grandfather had passed through and partly destroyed.

Shah Rukh, the fourth son of Timur, reigned for thirty- eight years, and appears to have been a brave, generous, and enlightened monarch. He removed his capital from Samarkand to Herat, of which place he rebuilt the citadel, restoring and improving the town. Merv also profited from his attention to its material interests. Sir John Malcolm speaks of the splendour of his court and of his encourage- ment of men of science and learning. He sent an embassy to China; and an English version of the travels to India of one of his emissaries, ‘Abdu r-Razzak, is to be found in the volumes of the Hakluyt Society. As regards his Persian possessions, he had some trouble in the north-west, where the Turkmans of Asia Minor, known as the Kara Koiytn,! or “ Black Sheep,” led by Kara Yusuf? and his sons Iskandar and Jahan Shah, had advanced upon Tabriz, the capital of Adarbaijan, a province in which they had supplanted the settlers of Halaku, called, after him, ‘I]khant. The distance from Herat—supposing that city to represent eT ee, eee

1 They were commonly called Kara Koiytin-li and the “White Sheep” Turkmans Ak Koiyun-lu, the affix “14” signifying possession, t.€., possession of a standard bearing the image of a black or white sheep.

2 According to Erskine, this chief killed Miran Shah, whose dwelling- place was Tabriz.

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the centre of imperial power —was favourable to intrigue and revolt in these parts. On the death of Shah Rukh in 1446 he was succeeded by his son Ulugh Bey, whose taste for scientific pursuits and active patronage of scientific men are practically demonstrated in the astronomical tables bearing his name, quoted by European writers when determining the latitude of places in Persia. He was, moreover, himself a poet and patron of polite literature, and built a college as well as an observatory at Samarkand, On the other hand, there is no evidence to show that he did much to consolidate his grandfather’s conquests south of the Caspian. Ulugh Bey was put to death by his son ‘Abdu ’l-Latif, who, six months later, was in his turn slain by his own soldiers. Babar—not the illustrious founder of the

Mughal dynasty in India, but an elder member of the same house—next obtained possession of the sovereign power, and established himself in the govern- ment of Khurdsan and the neighbouring countries. He did not, however, achieve any special reputation, and died after a short rule, from habitual indulgence in intemperate habits,—an abuse which he had vainly striven to check by the registry of a solemn vow. After him Abt Sa‘id, grandson of Miran Shah, and once governor of Fars, became a candidate for empire, and was to a great extent successful. This prince allied himself with the Uzbek Tatars, seized upon Bukhara, entered Khurdsan, and waged war upon the Turkman tribe aforesaid, which, since the invasion of Adarbaijan, had, under Jahan Shah, over- run ‘Irak, Fars, and Karman, and pillaged Herat. But he was eventually taken prisoner by Uzun Hasan, and killed in 1468. It is difficult to assign dates to the few events recorded in Persian history for the eighteen years following the death of “Abdu ’1-Latif; and, were it not for the happy intervention of chance European missions, the same diffi- culty would be felt in dealing with the period after the death of Abi Sa‘id up to the accession of Isma‘il Suff in 1499. Nor can the chain of events within the range of Persia proper be connected with certainty for the period specified by the aid of native annals or histories. Sultan Ahmad, eldest son of Abu Sa‘id, reigned in Bukhara; his brother, ‘Umar Shaikh, in Farghana; but the son of the latter, the great Babar, was driven by the Uzbeks to Kabul (Cabul) and India. More to the purpose is it that

Sultan Husain Mirza, great-grandson of ‘Umar Shaikh, Husatr His Mirza. | |

son of Timur, reigned in Herat from 1487 to 1506. siege and capture of the fort of that city are incident- ally told in Babar’s Commentaries, where he is described as an old and experienced soldier. learned men, and as such his reign is remarkable for many brilliant names inscribed as visitors to his court. Among others are those of the historians Mirkhund and Khiun- damir, and the poets Jami and Hatifi. But at no time could the control exercised by this scion of a far-famed stock have extended over central and western Persia. The nearest approach to a sovereignty in those parts on the death of Abi Sa’id is that of Uzun Hasan just mentioned, who achieved his greatness by individual prowess and the force of circumstances. He was the leader of the Ak Koiytin, or “White Sheep” Tiurkmans, and conqueror of

the “Black Sheep,” whose chief, Jahan Shah, he defeated and slew. Between the two tribes there

had long been a deadly feud. Both were composed of Uzun 1 settlers in Asia Minor, the “Black Sheep” having con- Has™.

solidated their power at Van, the “White” at Diarbekir.

Sir John Malcolm states that at the death of Abu Sa‘id, Sultan Husain Mirza “made himself master of the empire,” and, a little later, that “‘Uzun Hasan, after he had made himself master of Persia, turned his arms in the direction of Turkey”; but the reader is left to infer

He was a patron of |

‘ |

HISTORY. |

for himself what was the real “empire” of Husain Mirza, and what the limit of the “ Persia” of Uzun Hasan. The second could not well be included in the first, because the Turkmans were in possession of the greater part of the Persian plateau, as understood in modern geography, while the “sultan” was luxuriating in Herat, to which Khurdsan belonged. It may be assumed as a broad fact that an empire like that acquired by Timur could not long be maintained by his descendants in its integrity, even though separate kingdoms or sovereignties were formed in its more important divisions. The retention of particular provinces, or groups of provinces, must have depended not only on the loyalty but on the capability of particular rulers and their subordinate governors ; and it was manifestly impos- sible for an emperor at Samarkand or Herat to know what revolutions were taking effect at Baghdad, Tabriz, or similarly remote places, mland or on the seaboard, which passed away from the original “empire” through the weakness or treachery of unfit agents, even when these were lineal descendants of its distinguished founder.

The Turkish adjective uzun, .) ajo! “long,” applied to Hasan, the Tirkman monarch of Persia (called also by the Arabs Hasanu ’t-Tawil), is precisely

the qualifying

Persian word i) used in the compound designation of Artaxerxes Longimanus ; and Malcolm quotes the state-

enetian ment of a Venetian envoy in evidence that Uzun Hasan avoys. was ‘“‘a tall thin man, of a very open and engaging counte-

nance.” This reference, and a further notice in Markham’s more recent history, supply the clue to a store of valuable information on the place and period made generally avail- able by the publications of the Hakluyt Society. The narratives of Caterino Zeno, Barbaro, and Contarini, envoys from Venice to the court of Uzun Hasan, are in this respect especially interesting, and throw much light on the personality of one who was a genuine shah of Iran. Zeno was sent in 1471 to incite this warlike ruler against the Ottoman sultan, and succeeded so far in his mission as to bring the two powers into open warfare. That the result was disastrous to the shah is not surprising, but the whole affair seems to hold a comparatively unimportant place in the annals of Turkey.

Uzun Hasan had married Despina (Gr. Aéczovva), daughter of the emperor of Trebizond, Calo Johannes of the house of the Comneni; and Zeno’s wife was niece to this Christian princess. The relationship naturally strengthened the envoy’s position at the court, and he was permitted to visit the queen in the name of the republic which he represented. Barbaro and Contarini met at Ispahan in 1474, and there paid their respects to the shah together. The description of the royal residence—‘“ in the middle of a field, through which a river flowed, in a very delightful locality ”—recalls the palaces in that city, such as the Haft Dast, where strangers of distinction are lodged in the present day. Moreover, the continual and excessive instalments of “ good confections ” brought to satisfy the travellers’ appetites show that the lavish hospitality of the local authorities is a time-honoured institution. Kum and Tauris or Tabriz (then the capital) were also visited by the Italian envoys following in the royal suite ; and the incidental notice of these cities, added to Contarini’s formal statement that “the extensive country of Ussun-cassan [sic] is bounded by the Ottoman empire and by Caramania,” and that Siras (Shir4z) is comprehended in it, proves that at least Adarbaijan, ‘Irdk,

and the main part of the provinces to the south, inclusive of Fars, were within the dominions of the reigning monarch.

There is good reason to suppose that Jahan Shah, the Black Sheep Turkman, before his defeat by Uzun Hasan, had set up the standard of royalty ; and Zeno, at the

outset of his travels, calls him “king of Persia”! in 1450, 1468-1499.

Chardin alludes to him in the same sense 3 but, even ad- mitting the validity of his precarious tenure, the limits of his sovereignty were too confined to warrant more than casual mention of his name in an historical summary. Hasan the Long is a far more prominent figure, and has hardly received justice at the hands of the historian. Indeed, his identity seems to have been lost in the various modes of spelling his name adopted by the older chroniclers, who call him indiscriminately? Alymbeius, Asembeius, Asembec, Assimbeo, or Ussan Cassano. He is said to have earned the character of a wise and valiant monarch, to have reigned eleven years, to have lived to the age of seventy, and, on his death in 1477 or (according to Krusinski and Zeno) 1478, to have been succeeded on the throne of Persia by his son Ya‘kub. This prince, who had slain an elder brother, died by poison, after a reign of seven years. ‘The dose was offered to him by his wife, who had been unfaithful to him and sought to set her paramour on his throne. Krusinski thus tells the story.

“Notwithstanding the assurance she put on at the very moment she was acting the crime, the king her husband fancying he saw an air of confusion in her countenance, had a suspicion of her, and required her to drink first. As she could not get off of it without condemning herself, she swallowed the poison with an affected intrepidity ; which deceived the king, and so encouraged him that after he had drunk of it himself, he commended it to the lips of the prince his son, then with him, who was eight years of age. The poison was so quick, that all three died of it that night in the year 1485.”

Writers differ as to the succession to Ya‘ktb. Zeno’s Anarchy.

account is that a son named Allamur (called also Alamut, Alvante, El-wand, and Alwung Bey) was the next king, who, ‘besides Persia, possessed Diarbekir and part of greater Armenia near the Euphrates.” On the other hand, Kru- sinski states that, Ya‘kub dying childless, his relative Julaver, one of the grandees of the kingdom, seized the throne and held possession of it for three years. Baisingar, it is added, succeeded him in 1488 and reigned till 1490, when a young nobleman named Rustan (Rustam ?) obtained the sovereign power and exercised it for seven years. This account is confirmed by Angiolello, a traveller who followed his countrymen Barbaro and Contarini to Persia; and from the two authorities combined may be gathered the further narration of the murder of Rustam and usurpation of the throne by a certain Ahmad, whose death, under torture, six months afterwards, made way for Alamut, the young son of Hasan. These discrepancies can be reconciled on reference to yet another record bound up with the narratives of the four Italians aforesaid, and of much the same period. In the Zravels of a Alerchant in Persia the story of Ya‘kub’s death is supplemented by the statement that “the great lords, hearing of their king’s decease, had quarrels among themselves, so that for five or six years all Persia was in a state of civil war, first one and then another of the nobles becoming sultan. At last a youth named Alamut, aged fourteen years, was raised. . to the throne, which he held till the succession of Shaikh Ismail.” Who this young man was, is not specified ; but other writers call Alamut and his brother Murad the sons of Ya‘kub, as though the relationship were unquestioned Now little is known, save incidentally, of Julaver or Rustam ; but Baisingar is the name of a nephew of “Umar Shaikh, king of Farghéna (Ferghana) and contemporary of Uzun Hasan. There was no doubt much anarchy and confusion in the interval between the death of Ya‘kub and the restoration, for two years, of the dynasty of the White Sheep. But the tender age of Alamut would, even in civilized countries, have necessitated a regency; and it may be assuined that he was the next legitimate and more

2 Knolles, Purchas, Zeno.

1 See also Ramusio’s preface.

1480-1499. generally recognized sovereign.

Shaikh Sufi.

Shaikh Haidar.

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Markham, in designating this prince the last of his house, states that he was de- throned by the renowned founder of the Safawi dynasty. This event brings us to one of the most interesting periods of Persian history, any account of which must be defective without a prefatory sketch of Isma‘il Sufi.

The Sifi or Safawt Dynasty (1499-1736).—Shaikh Saifu ’d-Din Izhak!—lineally descended from Musa, the seventh imém—was a resident at Ardabil, south-west of the Caspian, some time during the 14th century. It is said that his reputation for sanctity attracted the attention of Timur, who sought him out in his abode, and was so charmed by the visit that he released, at the holy man’s request, a number of captives of Turkish origin, or, as some affirm, Georgians, taken in the wars with Baiyazid, who had been probably reserved for some more cruel end. The act ensured to the shaikh the constant devotion and gratitude of these men,—a feeling which was loyally maintained by their descendants for the members of his family in success- ive generations. Morier’s description of the mausoleum erected to the memory of Shaikh Sufi in Ardabil enables the reader to form some idea of the extraordinary venera- tion in which he was held. Among the offerings on the tomb,? which was covered with brocades and shawls, bunches of feathers, ostrich eggs, and other ornaments, was a golden ewer set with precious stones, said to have been presented by the Indian emperor Humdaiyun.

His son Sadru ’d-Din and grandson Kwajah ‘Ali (who visited Mecca and died at Jerusalem) retained the high reputation of their pious predecessor. Junaid, a grandson of the last, and not a whit less prominent in the pages of history, married a sister of Uzun Hasan, and by her had a son named Shaikh Haidar, who married his cousin Martha, daughter of Uzun Hasan and Queen Despina. Three sons were the issue of this marriage, Sultan ‘Alf, Ibrahim

Mirza, and the youngest, Isma‘il, the date of whose birth is put down as 1480 for reasons which will appear here- after. So great was the influence of Shaikh Haidar, and so earnestly did he carry out the principles of conduct which had characterized his family for five generations, that his name has become, as it were, inseparable from the dynasty of his son Isma‘fl; and the term “ Haidari” (leonine) is applied by many persons to indicate generally the Safawis of Persia. As to the nature of his teaching, and the peculiar tenets professed, this is hardly the place for their discussion; but it may be broadly stated that the outcome was a division of Muhammadanism vitally momentous to the world of Islam. The Persian mind was peculiarly adapted to receive the form of religion prepared for it by the philosophers of Ardabil.

The doctrines presented were dreamy and mystic ; they rejected the infallibility of human wisdom, and threw suspicion on the order and arrangement of human ortho- doxy. They breathed in harmony with the feelings of a people who, partly in the Athenian spirit and wholly with Athenian perversity, were ever ready “to tell or to hear some new thing.” There was free scope given for the indulgence of that poetical imagination which revels in revolution and chafes at prescriptive bondage. As Malcolm truly and happily remarks, “the natives of Persia are enthusiastically devoted to poetry; the meanest artisan of the principal cities of that kingdom can read or repeat some of the finest passages from their most admired

1 According to Langlés, the annotator of Chardin, his real designa- tion was Abt ’l-Fath Izhdk, the Shaikh Saifu ’‘l-Hakk wu ’d-Din or “pure one of truth and religion.”

; 2 Langlés finds 1334 to be the year of his death. This is impos-

sible if he was contemporary with Timir, who was born in 1336. Malcolm’s opinion, derived from the Zubdatu t-tawdrikh, that the conqueror’s visit was paid to Sadru ’d-Din, is, however, the more credible theory.

writers ; and even the rude and unlettered soldier leaves his tent to listen with rapture to the strain of the minstrel who sings a mystic song of divine love, or recites the tale of a battle of his forefathers." And he adds, "the very essence of Sufi-ism is poetry… the Masnavi. . . the works of the celebrated Jami… the book of moral lessons of the eloquent Sa'di, and the lyric and mystic odes of Hafiz . to them they (the Sufis) continually refer ; and the gravest writers who have defended their doctrine take their proofs from the pages of these and other poets whom they deem to have been inspired by their holy theme." Those authorities who maintain that Ya'kub Shah left no son to succeed him consider valid the claim to the vacant throne of Shaikh Haidar Sufi. At any rate, he could not be otherwise than formidable to a usurper such as Rustam, both from relationship to the deceased monarch and position as one of the most noted of Sufi teachers. Purchas says that Ya'kub himself, "jealous of the multitude of Aidar's disciples and the greatness of his fame, caused him to be secretly murthered" ; but Krusinski attributes the act to Rustam a few years later. Zeno, the anonymous merchant, and Angiolello affirm that the devotee was defeated and killed in battle,—the first making his conqueror to be Alamut, the second a general of Alamut's, and the third an officer sent by Rustam named Sulaiman Bey. Malcolm, following the Zubdatu 't-tawdrikh, relates that Shaikh Haidar was vanquished and slain by the governor of Shirwan. The subsequent statement that his son, Sultan 'Ali, was seized, in company with two younger brothers, by Ya'kub, "one of the descendants of their grandfather Uzun Hasan, who, jealous of the numerous disciples that resorted to Ardabil, confined them to the hill fort of Istakhr in Fars," seems to indicate a second interpretation of the passage just extracted from Purchas, and that there is confusion of persons and incident somewhere. One of the sons here alluded to was Isma'il, whom Malcolm makes to have been only seven years of age when he fled to Gilan in 1492. Zeno states that he was then thirteen, which is much more probable,? and the several data available for reference are in favour of this supposition.

The life of the young Sufi from this period to his assump- Isma't] |

tion of royalty in 1499 was full of stirring adventure ; and lis career as Isma'il I. was a brilliant one for the annals of Persia. According to Zeno, who seems to have carefully recorded the events of the time, he left his

temporary home on an island of Lake Van before he was eighteen, and, passing into Karabagh,* between the Arras and Kur, turned in a south-easterly direction into Gilan. Here he was enabled, through the assistance of a friend of his father, to raise a small force, with which to take pos- session of Baku on the Caspian, and thence to march upon Shumakhi in Shirwan, a town abandoned to him without a struggle. Hearing, however, that Alamut was advancing to meet him, he was compelled to seek new levies from among the Jengian Christians and others. In this he — was quite successful. Finding himself at the head of an army of 16,000 men, he thoroughly routed his opponents, and, having cleared the way before him, marched straight upon Tabriz, which at once surrendered. He was soon after proclaimed shah of Persia (1499), under the designation which marked the family school of thought.

Alamut had taken refuge at Diarbekir ; but his brother Murad, at the head of an army strengthened by Turkish auxiliaries, was still in the field with the object of con- testing the paternal crown. Isma‘{l lost no time in moving against him, and won a new victory on the plains of Tabriz. Murad fled with a small remnant of his soldiers to Diar-

3 So thinks the editor and annotator of the Italian Travels in Persia,

Mr Charles Grey. * Possibly Kara-dagh, as being the more direct road.

bekir, the rallying-point of the White Sheep Turkmans. One authority (Zeno) states that in the following year Isma‘il entered upon a new campaign in Kurdistan and Asia Minor, but that he returned to Tabriz without accom- plishing his object, having been harassed by the tactics of Alau’d-Daulah, a beylarbey, or governor in Armenia and parts of Syria. Another, ignoring these movements, says that he marched against Murdd Khan in ‘Irdk-‘Ajmi

not being in a position to oppose the shah in the field, 1499-1514,

repaired to Merv, where he could obtain sufficient rein- forcements, or whence he could, if hard pushed, retire across the Oxus. Isma‘il quickly followed him there, and enticed him out to battle by the use of taunt and reproach at his remaining within walls. Shaibini was defeated and fled, but was overtaken in his flight, surrounded, and put to the sword, together with numerous relatives and

(Trak-“Adjemi) and Shiraz. This last account is ex- tremely probable, and would show that the young Turkman had wished to make one grand effort to save Ispahan and Shiraz (with Kazvin and the neighbouring country), these

companions (see Moncozs, vol. xvi. p. 749).

The next remarkable event in Isma‘il’s reign is his war War with Sultan Salim I. Its origin may be traced to the with Ottoman emperor’s hatred and persecution of all heretical S#4™ 1

being, after the capital Tabriz, the most important cities of Uzun Hasan’s Persia. His men, however, apparently dismayed at the growing prestige of the enemy, did not support him, and he was defeated and put to flight. One writer says that he was slain in battle; and, since he appears to have made no further attempt on Persia, the statement is perhaps correct. There is similar evidence of the death of Alamut, who, it is alleged, was treacher- ously handed over to be killed by the shah’s own hands.

Isma‘il returned again to Tabriz (1501) “and caused _ great rejoicings to be made on account of his victory.” ‘In 1503 he had added to his conquests Baghdad, Mosul, and Jazirah on the Tigris. The next year he was called to the province of Gilan to chastise a refractory ruler. Having accomplished his end, he came back to his capital and remained there in comparative quiet till 1507. Malcolm’s dates are somewhat at variance with the above, for he infers that Baghdad was subdued in that particular year; but the facts remain. All writers seem to agree that in 1508 the king’s attention was drawn to an inva- sion of Khurdsan by Shaibdni, or Shahi Beg, the Uzbek,a descendant of Jenghiz and the most formidable opponent of Babar, from

whom he had, Seven years before, wrested the city of Samarkand, and whom he had driven from Turkestan to Kabul. Since these exploits he had obtained great successes in Tashkand, Farghana, Hissar, Kunduz, and Khwarizm (Kharezm), and, at the time referred to, had left Samarkand intent upon mischief south and west of the Oxus, had passed the Murghab, and had reached Sarakhs. Isma‘il encamped on this occasion at Ispahan, and there concentrated the bulk of his army,—strengthening his northern (and probably north-eastern) frontier with large bodies of cavalry. Zeno’s statement that the royal troops were kept for the whole year in a state of suspense and preparation for encountering their powerful adversaries derives a colour of truth from the circumstance that, before the Uzbek army of invasion could have quite overrun the Khurdsan of Husain Mirza, it found occupation to the eastward in Herat and Kandahar ; and it must have been represented, even in Mashhad, Nishapur, Astrabad, and Turshiz—all named as the scenes of conflict—rather by lieutenants than by the leader in person. Such diversion from any direct invasion of his own territories may have caused the shah to maintain an attitude of simple watch- fulness. In 1510, when Shaibani had invaded Khurasan the second time, and in person, and had entered the fine province of Mazandaran—then in the possession of an inde- pendent chief—it was discovered that his troops, in the wantonness of success, had ravaged the Persian province of Karman. Shah Isma‘il had asked for redress, referring to the land encroached on as “hereditary” ; and Shaibani had replied that he did not understand on what was founded the claim “to inherit.” Mutual taunt and recrimination followed ; and eventually the Persian troops Were put in movement, and the Uzbeks, having been divided into small detachments scattered over the country, fell back and retreated to Herat. Their leader, however, i 1 Angiolello.

Moslems in his dominions, and the shah’s anger at the fanaticism which had urged him to the slaughter of 40,000 Turks suspected to have thrown off the orthodox Sunni doctrines. The declaration of war sent by Salim in the form of a letter is one of the most singular of documents, and breathes the true spirit of the age: ‘I, the glorious Sultan . . . address myself to thee, Amir Isma‘il, chief of the Persian troops, who art like in tyranny to Zohak and Afrasiab, and art destined to perish like the last Dara.” Words such as these might well provoke a less haughty potentate than the Sufi; and, when to them was added the accusation of iniquity, perjury, blasphemy, impiety,

heresy, and schism, it is not surprising that the response was a ready resort to arms? As a preliminary, however, to this decisive step Isma‘il replied to the sultan in a calm and dignified letter, denying the existence of a casus belli, expressing willingness to resume peaceful relations, and regretting the mode of address it had been thought fit to adopt towards himself; but he nullified the conciliatory passages by the ironical conclusion that the sultan’s com- munication must have emanated from the brain of a secre- tary who had taken an overdose of narcotics,—a remark the significance of which was aggravated by the accom- paniment of a box of opium, and the popular belief that Salim was addicted to the use of the drug.

The sultan’s army advanced into Adarbaijan and western Persia through Tokat and Arzinjan. Isma‘il had at this time the greater number of his soldiers employed in his newly-conquered province of Khurdsan, and was driven to raise new levies in Kurdistan to obtain a sufficient force to resist the invasion. It is asserted by some that his frontier then extended westward to Sivas, a city situated in a large high plain watered by the Kizil Irmak, and that thence to Khoi, 90 miles west of Tabriz, he followed the approved and often successful tactics of ravaging and retreating, so as to deprive his advancing enemy of sup- plies. There is good evidence to show that the Turkish janissaries were within an ace of open revolt, and that but for extraordinary firmness in dealing with them they would have abandoned their leader in his intended march upon Tabriz. In fine, at or near Khoi, the frontier-town of Adarbaijan, the battle (1514) was fought between the two rival monarchs, ending in the defeat of the Persians and the triumphant entry of Salim into their capital.

There are stirring accounts of that action and of the gallant deeds performed by Salim and Isma‘tl, both person- ally engaged in it, as well as by their generals.* Others maintain that Isma‘il was not present at all* It is tolerably

2 Creasy’s History of the Ottoman Turks.

3 Knolles, Malcolm, Creasy, Markham, &c.

4 Zeno. Angiolello says that “the Sophi monarch had left for Tauris [Tabriz] in order to assemble more troops.” Krusinski infers much to the same effect, for he notes that. ‘Selim came in person and took Tauris from Ismail, but at

the noise of his approach was obliged to retreat with precipitation.” The battle must thus have been fought and the victory gained when the shah was himself absent. Yet Markham quotes a journal which thus records his feats of prowess : ‘Tt was in vain that the brave Shah, with a blow of his sabre, severed a chain with which the Turkish guns were fastened together to resist the shock of the Persian cavalry.”

1514-1561.

Ismail’s character.

Shah Tahmasp.

certain that the Turks won the day by a better organization of the arms of the military service, superiority of numbers, and more especially the use of artillery. On the side of the Persians the force consisted of little more than cavalry.

Salim remained at Tabriz no more than eight days. Levying a contribution at that city of a large number of its skilled artisans, whom he sent off to Constantinople, he marched thence towards Karabagh with intent to fix his winter quarters in those parts and newly invade Persia in the spring, but the insubordination of his troops rendered necessary his speedy return to Turkey. His expedition, if not very glorious, had not been unproductive of visible fruits. Besides humbling the power of an arrogant enemy, he had conquered and annexed to his dominions the pro- vinces of Diarbekir and Kurdistan.

From 1514 to 1524, although the hostile feeling between the two countries was very strong, there was no serious nor open warfare. Salim’s attention was diverted from Persia to Egypt; Isma‘il took advantage of the sultan’s death in 1519 to overrun and subdue unfortunate Georgia, as Jahan Shah of the “Black Sheep” had done before him; but Sulaiman had not won without cause his attri- bute of “great,” and was too strong a successor to the imperial throne to admit of retaliatory invasion being carried out with impunity at the cost of Turkey.

In 1524 Isma‘il died! at Ardabil when on a pilgrimage to the tomb of his father. ‘The Persians dwell with rapture on his character,” writes Sir John Malcolm, for they deem him ‘not only the founder of a great dynasty, but the person to whom that faith in which they glory owes its establishment as a national religion. He is styled in their histories Shah Shian, or ‘king of the Shiahs,’ an appellation which marks the affection with which his memory is regarded. Though he may not be entitled to their extravagant praises, he certainly was an able and valiant monarch.” And he quotes a note handed down by Purchas from a contemporary European traveller which reports of him thus. ‘ His subjects deemed him a saint, and made use of his name in their prayers. Many dis- dained to wear armour when they fought under Ismail ; and so enthusiastic were his soldiers in their new faith that they used to bare their breasts to their enemies and court death, exclaiming, ‘Shiah! Shiah!’ to mark the holy cause for which they fought.”

The proposition has been already laid down that Oriental celebrities, whether heroes or tyrants, as depicted by native limners, bear commonly so strong a family resemblance one with another that the European reader is unable to discriminate between the ‘Abbdses and Akbars, the Timurs and the Nadirs; and it cannot be pleaded that Isma‘il Shah Suff is an exception to the rule. He is belauded and reviled according to the lights or prejudices of his historian. “ Reputed one of the greatest and most famous kings that ever ruled in the East,” ? he is at the same time charged with acts of the greatest cruelty and most flagrant vice. Purchas, apparently guided by the “Italian mer- chant” and Angiolello, has described him as “of faire countenance, of reasonable stature, thicke and large in the shoulder, shauen al but the mustaches ; left-handed, and stronger than any of his nobles.”

Shah Tahmasp,‘ the eldest of the four sons of Isma‘il,

1 Malcolm says 1528, Krusinski 1525; Angiolello heard of his death at Cairo in August 1524. ‘Krusinski adds that he was forty- five years of age.
2 Krusinski.

3 See chaps. xiv. and xxii. of Travels of a Merchant in Persia, Hak-

luyt reprint, 1873.

- Angiolello calls him “Shiacthemes.” As an instance of the absurd transliterating current in France as in England the word ““Ach-tacon”” may be mentioned. It is explained in Chardin’s text to mean “les hépitaux a Tauris: c’est-a-dire leux ou l’on fait profusion de vivres.” Chardin’s editor remarks, “lua derniére partie de ce mot

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succeeded to the throne on the death of his father. The principal occurrences in his reign, placed as nearly as possible in chronological order, were a renewal of war with the Uzbeks, who had again invaded Khurdasan, and the overthrow of their army (1527); the recovery of Baghdad from a Kurdish usurper (1528); the settlement of an internal feud between Kizil-bash tribes (Shamlu and Tukulu), contending for the custody of the royal person, by the slaughter of the more unruly of the disputants (1529); the rescue of Khurdsan from a fresh irruption, and of Herat from a besieging army of Uzbeks (1530); a new invasion of the Ottomans, from which Persia was saved rather by the severity of her climate than by the prowess of her warriors (1533) ; the wresting of Baghdad from Persia by the emperor Sulaiman (1534); the king’s youngest brother’s rebellion and the actual seizure of Herat, necessitating the recovery of that city and a march to Kandahar (1536); the temporary loss of Kandahar in the following year (1537), when the governor ceded it to

‘Prince Kamran, son of Babar; the hospitable reception

accorded to the Indian emperor Humdiytn (1543); the rebellion of the shah’s brother next in age, Ilkhds, who, by his alliance with the sultan, brought on a war with Turkey (1548) ;® and finally a fresh expedition to Georgia, followed by a revengeful incursion which resulted in the enforced bondage of thousands of the inhabitants (1552).

Baiyazid, a son of the Turkish emperor, rebelled, and his army was beaten in 1559 by the imperial troops at Koniah in Asia Minor. He fled to Persia and took refuge with Shah Tahmasp, who pledged himself to give him a permanent asylum. Sulaiman’s demand, however, for extradition or execution was too stern and peremptory for refusal; the pledge was broken, and the prince was delivered up to the messengers sent to take him. Another

account ignores the pledge and makes the surrender of the guest to have been caused by his own bad con- duct. Whatever the motive, the act itself was highly ap- preciated by Sulaiman, and became the means of cement- ing a recently-concluded peace between the two monarchs, which theretofore, perhaps, had been more formal than real. Perhaps the domestic affliction of the emperor and the anarchy which in his later years had spread in his dominions had, however, more to do with the maintenance of tranquillity than any mere personal feeling. It is to be feared that at this time not only was there religious fana- ticism at work to stir up the mutual hatred ever existing between Sunni and Shi‘ah, but the intrigue of European courts was probably directed towards the maintenance of an hostility which deterred the sultan from aggressive operations north and west of Constantinople. “Tis only the Persian stands between us:and ruin” is the reported saying of Busbecq, ambassador at Sulaiman’s court on the part of Ferdinand of Austria; “the Turk would fain be upon us, but he keeps him back.”

In 1561 Anthony Jenkinson arrived in Persia with

est méconnaissable, et je ne puis deviner quel mot Persan signifiant profusion a pu donner naissance a la corruption qu’on voit ici.” In other words, the first syllable “ach” (Anglice ash) was understood in its common acceptance for “food” or “victuals”; but “tacon” was naturally a puzzler. The solution of the whole difficulty is, however,

to be found in the Turco-Persian 1S Kis khastah khénah, pro-

nounced by Turks hasta hona, or more vulgarly asta khon and even to a French ear ash-tacon, a hospital, literally a sick-house. This word is undoubtedly current at Tabriz and throughout northern Persia.

® The other brothers were Ilkhds, Bahram, and S4m Mirza, each having had his particular apanage assigned him.

§ Professor Creasy says that “Suliman led his armies against the Persians in several campaigns (1533, 1534, 1535, 1548, 1553, 1554), during which the Turks often suffered severely through the difficult nature of the countries

traversed, as well as through the bravery and activity of the enemy.” All the years given were in the reign of Tahmasp I.

War with Turkey,

HISTORY. |

a letter from Queen Elizabeth to the shah. He was to treat with his majesty of “Trafique and Commerce for our English Marchants,” 1 but his reception was not encour- aging, and led to no result of importance.

Tahmasp died in 1576, after a reign of about fifty- two years. He must have been some sixty-six years of age, having come to the throne at fourteen. Writers describe him as a robust man, of middle stature, wide- lipped, and of tawny complexion. His long reign was hardly a profitable or glorious one to Persia, especially in respect of the losses to Turkey. He was not wanting in soldierly qualities; but his virtues were rather negative than decided. While one writer acquits him of any re- markable vices, and even calls him prudent and generous, another taxes him with love of ease, avarice, and injustice. If it be true that he abandoned his old capital, Tabriz, for Kazvin because the former was too close to Ardabil, his birthplace, and reminded him too keenly of the mean con- dition of his grandfather, Shaikh Haidar, his morale must have been low indeed.

The deceased shah had a numerous progeny, and on his death his fifth son, Haidar Mirza, proclaimed himself king, supported in his pretensions by the Kizil-bash tribe of Ustujulu. Another tribe, the Afshar, insisted on the succession of the fourth son, Isma‘il. Had it not been that there were two candidates in the field, the contention would have resembled that which arose shortly after Tahmasp’s accession. As it was, the claim to guardian- ship of the royal person was put forward, but each tribe declared for its own particular nominee. Finally Isma‘il, profiting from his brother’s weak character and the in- trigues set on foot against him, obtained his object, and was brought from a prison to receive the crown.

The reign of Isma‘il II. was a short one,—less than two years. He was found dead in the house of a confectioner in Kazvin, having left the world either drunk, drugged, or poisoned. No steps were taken to verify the

circumstances, for the event itself was a cause of general relief and joy. He has been represented as a tyrant of the worst type, but it is only right to observe that his youth and part of his manhood had beenembittered by injustice and ill-treatment. A prisoner in a dreary fort for years, if his accession to power was marked by cruelties such as disgraced the name of Tiberius, he had, like Tiberius, been brutalized by a hard and continuous provocation.

He was succeeded by his eldest brother, Muhammad Mirza, otherwise called Muhammad Khudabanda, whose claim to sovereignty had been originally put aside on the ground of physical infirmity. A few words will dispose of this prince's career as a sovereign of Persia. Historians are divided as to his qualities, though he certainly failed to prove, in any shape, equal to the opportunity opened to him. He had the good sense to trust his state affairs almost wholly to an able minister ; but he was cowardly enough to deliver up that minister into the hands of his enemies. His kingdom was distracted by intestine divi- sions and rebellion, and the foe appeared also from without. On the east his youngest son, 'Abbas, held possession of Khurdsan ; on the west the sultan's troops again entered Adarbaijan and took Tabriz. His eldest son, Hamza Mirza, nobly upheld his fortunes to the utmost of his power, reduced the rebel chieftains, and forced the Turks to make peace and retire ; but he was stabbed to death by an assas- sin, On the news of his death reaching Khurasan, Murshid Kuli Khan, leader of the Usttjulu Kizil-bash, who had made good in fight his claims to the guardianship of "Abbas, at once conducted the young prince from that province to Kazvin, and occupied the royal city. The object was ev1- dent, and in accordance with the popular feeling. "Abbas,

1 Purchas. 2 Krusinski.

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who had been proclaimed king by the nobles at Nishapur 1561-1609, some two or three years before this occurrence, may be said to have now undertaken in earnest the cares of sovereignty. His ill-starred father, at no time more than a nominal ruler, was at Shiraz, apparently deserted by

soldiers and people. Malcolm infers that he died a natural death, but when? or where is not stated. Alluding to him at this period, he writes, '"He was never afterwards mentioned." The stories originated by Olearius that Hamza and a second son, Isma'il, each reigned a few months may refer to attempts on the part of the Kizil-bésh chiefs to assert, for one or the other, a share of sovereign power, but do not seem to merit particular consideration.

Shah 'Abbas, the Great, commenced his long and glorious 'Abb4s reign (1586) by retracing his steps towards Khurasan, which the had been reinvaded by the Uzbeks almost immediately after ae his departure thence with the Kizil-bash chief. They had besieged and taken Herat, killed the governor, plundered the town, and laid waste the surrounding country. "Abbas advanced to Mashhad, the provincial capital and great resort of Persian pilgrims as the burial-place of Imém Riza, but owing to internal troubles he was compelled to return to Kazvin without going farther east. In his absence 'Abdul Munim Khan, the Uzbek commander, attacked the sacred city, obtained possession of it while the sh4h lay helplessly ill at Tehran, and allowed his savage soldiers full licence to kill and plunder. The whole kingdom was perplexed, and 'Abbés had much work to restore confidence and tranquillity. But circumstances rendered impossible his immediate renewal of the Khurdsan warfare. He was summoned to Shirdz to put down re- bellion in Fars; and, that being over, before he could give his individual attention to drive out the Uzbeks, he had to devise the best means of securing himself against Turkish inroads threatening from the west. He had been engaged in a war with Murad III. in Georgia. Peace was con- cluded between the two sovereigns in 1590 ; but the terms were unfavourable to Persia, who lost thereby Tabriz and one or more of the Caspian ports. A somewhat offensive stipulation was included in the treaty to the effect that Persians were not to curse any longer the first three khalits, —a sort of privilege previously enjoyed by Shiahs as part and parcel of their religious faith.

In 1597 'Abbas renewed operations against the Uzbeks, and succeeded in recovering from them Herat and Khurasan. Eastward he extended his dominions to Balkh, and in the south his generals made the conquest of Bahrain (Bahrein), on the Arabian side of the Persian Gulf, and the territory and islands of the Persian seaboard, inclusive of the moun- tainous province

of Lar. He strengthened his position in Khurdsan by planting colonies of Kurdish horsemen on the frontier, or along what is called the “atak” or skirt of the Turkman mountains north of Persia. In 1601 the war with the Ottoman empire, which had been partially renewed prior to the death of Sultan Murad in 1595, with little success on the Turkish side, was now entered upon by “Abbas with more vigour. Taking advantage of the weak- ness of his ancient enemy in the days of the poor volup- tuary Muhammad III, he began rapidly to recover the provinces which Persia had lost in preceding reigns, and continued to reap his advantages in succeeding campaigns under Ahmad I., until under Othman II. a peace was signed restoring to Persia the boundaries which she had obtained under the first Isma‘fl. On the other side Kandahar, which Tahmasp’s lieutenant had yielded to the Great Mughal, was recovered from that potentate in 1609. The following slightly abridged extract from Clements Markham’s history of Persia, relating to dis- tinguished Englishmen of the period, will be an appro-

3 Krusinski says in 1585.

1598-1641.

European

envoys.

Charac- ter aud power of “Abbas.

priate conclusion of the narrative of events as above summarized,

“In 1598 Sir Anthony and Robert Shirley, two English gentle- men, arrived at the Shah’s court at Kazvin with a numerous retinue. They were well received, and after some months Sir Anthony returned to Europe with credentials to several Christian princes. Robert, with five Englishmen, remained at the court of the Shah. He married a Circassian lady named Teresia, and in 1607 was sent by ‘Abbas as his ambassador to James I. of England. After travelling through Europe and remaining a long time at

Madrid, Sir Robert Shirley and his Circassian wife landed in his native country in 1611, and was received by James I. with every respect, as the ambassador of a powerful sovereign. His object was to open a trade between England and Persia, but he did not meet with success, owing to the opposition of the Levant mer- chants. He sailed from Dover with his wife in 1613, and after visiting the court of the Great Mogul, reached Isfahan in 1615. He was soon afterwards sent as ambassador to Spain, where he re- mained until 1622. In 1618, while Shirley was residing at Madrid, the government of Philip III. of Spain seut an embassy to Persia, at the head of which was Don Garcia de Silva y Figueroa, an able and learned diplomatist, who madc good use of his time in collect- ing information, and in writing a detailed account of his mission and of Persia, including a Life of Timur. Garcia de Silva landed at Ormuz, and proceeded thence to Shiraz, where he was most hospitably entertained. The ambassador was forwarded to Kazwin in June, and had an audicnce of the Shah, who received him very graciously. Many conversations afterwards took place between ‘Abbas and the stately Spaniard, touching Spanish victories over the Turks, and other matters of state. But the main object of the embassy, namely, security for Ormuz, which was now, through the absorption of Portugal, a Spanish possession, was not obtained. Garcia de Silva returned home by way of Aleppo, and embarked at Tripoli for France on 12th November 1619, devoutly praying that his friend the Shah might be victorious over the Grand Turk.

‘‘In the meanwhile Shah ‘Abbas was occupied in establishing and regulating the important trade of the Persian Gulf. Lar had previously been completely subdued ; and Fars was ruled by one of the Shah’s most trusty and faithful servants. In 1622 the Shah determined on the expulsion of the Portuguese from the Persian Gulf. They had seized upon the Isle of Ormuz in 1507, under the famous Albuquerque, and in their hands it had attained great prosperity, and become the emporium of all the commerce of the gulf. But they were quite independent of the Shah of Persia, Whose jealousy and resentment they excited. Assisted by the English East India Company, ‘Abbas collected a fleet at Gombroon, and embarked a Persian forec under Imam Kuly Khan. They laid siege to Ormuz, and the Portuguese, having no hope of succour, were forced to surrender. The island is now covered with desolate heaps of ruins. The port of Gombroon, on the mainland, and

sheltered by the islands of Kishm and Ormuz, rose on the fall.of the Portuguese city. It received the name of Bandar ‘Abbds, and both the English and Dutch were allowed to establish factories there.

“In 1623 Sir Robert Shirley again arrived in England on an embassy from the Shah ; and in 1627 sailed for Persia, in company with Sir Dormer Cotton, who was sent as envoy from Charles I. of England to the Shah of Persia. They landed at Gombroon in 1628, and Sir Dormer obtained a very gracious reception from ‘Abbas, at Kazvin, where he soon afterwards dicd. Sir Robert Shirley had now grown old in the service of Persia. On his return he was slighted by the Shah and his favourite, Muhammad ‘Aly Beg, and he died at Kazvin in July 1628. Of all the brave and gallant adven- turers of the glorious age of Elizabcth, Sir Robert Shirley was by far the greatest traveller, with the exception, perhaps, of Anthony Jenkinson.”

At the age of seventy, after a reign of forty-two years, ‘Abbas died at his favourite palace of Farahabad, on the coast of Mazandaran, on the night of the 27th January 1628. Perhaps the most distinguished of all Persian kings, his fame was not merely local but world-wide. Ispahan was his capital, and he did much: for its embellishment and enlargement. At his court were ambassadors from England, Russia, Spain, Portugal, Holland, and India. To his Christian subjects he was a kind and tolerant ruler, His conquests have been already mentioned ; but there are few sovereigns of an age so closely following the medizval who have done such real good to their country by material improvement and development of resources. The establish- ment of internal tranquillity, the expulsion of interlopers and marauders like Turks and Uzbeks, the introduction of salutary laws, and the promotion of public works of utility—

these alone would render remarkable his two-score years of enlightened government. Even in the last quarter of the 19th century the gratified traveller admires the magni- ficent caravansards which afford him rest and shelter, and the solid bridges which facilitate his “ chapar” (posting), and of which, if he ask particulars, he invariably hears that they were constructed

by Shah ‘Abbds.1_ With a fine face, ‘‘of which the most remarkable features were a high nose and a keen and piercing eye,”? he is said to have been below the middle height, robust, active, a sportsman, and capable of much endurance. It is, however, to be regretted that this monarch’s memory is tarnished by more than one dark deed. The murder of his eldest son, Sufi Mirza, and the cruel treatment of the two younger brothers, were stains which could not be obliterated from the page of history by an after-repentance. All that can be now said or done in the matter is to repeat the testimony of historians that his grief for the loss of Sufi Mirza was profound, and that, on his death-bed, he nominated that prince’s son (his own grandson) his successor. Krusinski adds that, on being told at that time by his confidential officers of a prophecy which some astrologers had made to the effect that the new king would reign but three months at most, he replied, ‘Let him reign as long as he can, though it be but three days. Ishall be glad of the assurance that one day, at least, he will have that crown upon his head which was due to the prince, his father.”

Sam Mirza was seventeen years of age when the nobles, Shéh in fulfilment of the charge committed to them, took him Sti.

from the “haram ” and proclaimed him king under the title of Shah Sufi. He reigned fourteen years, and his reign was a succession of barbarities, which can only be attributed to an evil disposition acted upon by an education not only wanting the ingenux artes but void of all civilizing elements and influences. Taught to read and write, his diversions were to shoot with the bow and ride upon an ass. There was a rumour, moreover, that his father, to stunt the possible growth of wit, ordered him a daily supply of opium. When left to his own devices, he became a drunkard and a murderer, and is accused of the death of his mother, sister, and favourite queen, Among many other sufferers Imam Kulf Khan, conqueror of Lar and Ormuz, the son of one of ‘Abbas’s most famous generals, founder of a college at Shiraz, and otherwise a public benefactor, fell a victim to his savage cruelty. During his reign the Uzbeks were driven back from Khurdsan, and a rebellion was suppressed. in Gilan; but Kandahar was again handed over to the Mughals of Dehli (Delhi), and Baghdad retaken from Persia by Sultan Murdd,—both serious national losses, Tavernier, without charging the shah with injustice to Christians, mentions the circumstance that “the first and

only European ever publicly executed in Persia was in his reign.” He was a watchmaker named Rodolph Stadler, who had slain a Persian on suspicion of intrigue with his wife. Offered his life if he became a Moslem, he resolutely declined the proposal, and was decapitated. His tomb is to be recognized at Ispahan bythe words “Cy git Rodolphe” on a long wide slab. Shah Suff{ died (1641) at Kashan and was buried at Kum.

His son, ‘Abbas II., who succeeded him, appears to‘Abbis

have possessed some good qualities, and to have been I actuated by liberal sentiments; but his accession to the throne in extreme youth, and the restraint put upon him by his advisers, were fatal to healthy development, and on arriving at an age which should have been that

1 It would be unfair, however, to forget that there are, in parts of Persia, especially Karman, some fine caravansar4s whose construction is due to the munificence of governors or private individuals, ‘Abbas seems certainly to have set the example, and to have furnished the best specimens, 2 Malcolm.

julai- nan.

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of discretion he became wilfully indiscreet. Beyond the credit of regaining Kandahar, an operation which he is said to have directed in person when barely sixteen, there is not much to mark the period of his life to the outer world. As to foreign relations, he received em- bassies from Europe and a deputation from the French East India Company ; he sought to conciliate the Uzbeks by treating their refugee chiefs with unusual honour and sumptuous hospitality; he kept on good terms with Turkey ; he forgave the hostility of a Georgian prince when brought to him a captive; and he was tolerant to all re- ligions,—always regarding Christians with especial favour. But he was a drunkard and a debauchee, and chroniclers are divided in opinion as to whether he died from the effects of drink or licentious living. That he changed the system of blinding his relatives from passing a hot metal over the open eye to an extraction of the whole pupil is indicative of gross brutality. ‘Abbas II. died (1668) at the age of thirty-eight, after a

reign of twenty-seven years, and was buried at Kum in the same mosque as his father.

‘Abbas was succeeded by his son, Shah Sufi IT., crowned a second time under the name of Shah Sulaiman.

Sir John Malcolm remarks that from the middle of the reign of “Abbas IT. till the elevation of Nadir Shah, or for about eighty years, there are but few Persian histories which give particular or authentic accounts of current events ; and he attributes this circumstance to the absence for nearly a century of any one political event of magni- tude. “And yet,” he writes—

“this extraordinary calm was productive of no advantage to Persia. The princes, nobles, and high officers of that kingdom, were, it is true, exempt from the dangers of foreign or internal war; but their property and their lives were the sport of a succession of weak, cruel, and debauched monarchs. The lower orders were exposed to fewer evils than the higher, but they became every day more unwarlike ; and what they gained by that tranquillity which the state enjoyed, lost almost all its value when they ceased to be able to defend it. This period was distinguished by no glorious achievements. No characters arose on which the historian could dwell with delight. The nation may be said to have existed upon the reputation which it had before acquired till all it possessed was gone, and till it became, from the slow but certain progress of a gradual and vicious decay, incapable of one effort to avert that dreadful misery and ruin in which it was involved by the invasion of afew Afghan tribes, whose conquest of Persia affixed so indelible

a disgrace upon that country, that we cannot be surprised that its historians have shrunk from the painful and degrading narration.”

Though weak, dissolute, and cruel, Sulaiman is not with- out his panegyrists. Chardin, whose testimony is all the more valuable from the fact that he was contemporary with him, relates many stories characteristic of his temper and habits. The statement that on one occasion he compelled his grand wazir to drink to intoxication, and on another to have his hair cut by a barber after the unorthodox fashion of the day, contrary to the old man’s religious prejudices, belongs to the record of unworthy and disgraceful acts.

He kept up a court at Ispahan which surprised and delighted his foreign visitors, among whom were ambassadors from European states ; and one learned writer, Kaempfer, credits him with wisdom and good policy. Aw reste, during his reign Khurdsan was invaded by the ever-encroaching Uzbeks, the Kapchak Tatars plundered the shores of the Caspian, and the island of Kishm was taken by the Dutch ; but the kingdom suffered otherwise no material loss. He died in 1694, in the forty-ninth year of his age and twenty-sixth of his reign.

About a year before his death he is described by Sanson,' & missionary from the French king Louis XIV., as tall, strong, and active, "a fine prince, —a little too effeminate for a monarch," with "a Roman nose very well proportioned to other parts," very large blue eyes, and "a midling mouth, a beard painted black, shav'd round, and

1 Present State of Persia, London, 1695.

well turn'd, even to his ears." but nevertheless majestic"; he had a masculine and agree- able voice, and sweet manner of speaking, and was "so very engaging that when you but bow'd to him he seem'd in some measure to return it by a courteous inclining of his head, and which he always did smiling." The same writer greatly praises him for his kindness to Christian missionaries.

Krusinski's menioir is full of particulars regarding Shah Husain.

Husain, the successor of Sulaiman. He had an elder and a younger brother, sons of the same mother, but the eldest had been put to death by his father's orders, and the youngest secreted by maternal precaution lest a similar fate should overtake him. There was, however, a second candidate for power in the person of a half-brother, 'Abbas. The latter prince was the worthier of the throne, but the other better suited the policy of the eunuchs and those noblemen who had the right of election. Indeed Sulaiman himself is reported to have told the grandees around him, in his last days, that "'if they

were for a martial king that would always keep his foot in the stirrup they ought to choose Mirza ‘Abbas, but that if they wished for a peace- able reign and a pacific king they ought to fix their eyes upon Husain.” But he himself made no definite choice.

Husain was selected, as might have been anticipated. On his accession (1694) he displayed his attachment to religious observances by prohibiting the use of wine,— causing all wine-vessels to be brought out of the royal cellars and destroyed, and forbidding the Armenians to sell any more of their stock in Ispahan. The shah’s grand- mother, by feigning herself sick and dependent upon wine only for cure, obtained reversal of the edict; and the process by which the venerable lady made her son, in pure regard to herself, drink the first glass with her (and there- by become a confirmed tippler) is woven into a story good enough to attract a writer of vaudevilles. or the follow- ing account of Shéh Husain and his successors to the accession of Nadir Shah, Markham’s abstract history has been mainly utilized.

The new king soon fell under the influence of mullas, and was led so far to forget his own origin as to persecute the Sufis. Though good-hearted, he was weak and licentious; and once out of the hands of the fanatical party he became ensnared by women and entangled in harem: intrigues. For twenty years a profound peace prevailed throughout the empire, but it was the precursor of a terrible storm destined to destroy the Safawi dynasty and scatter calamity broadcast over Persia. In the mountainous districts of Kandahar and Kabul the hardy tribes of Afghans had for centuries led a wild and almost independent life. They were divided into two great branches—the Ghilzdis of Ghazni and Kabul and the Saduzais of Kandahar and Herat. More than one fanciful explana- tion is given of the etymology of the first name ; the most probable one is perhaps that which connects them with a Turki tribe of Khalji or Khilagi, a word not impossibly derived from the Turkish kilij, “a sword,” the affix “chi” or “ji” always denoting posses- sion. ‘The second take their name from Sadu, their leader in the time of Shah ‘Abbas. In 1702 a newly-appointed governor, one Shah Nawdz, called Gurji Khan from having been “wali” or ruler of Georgia, arrived at Kandahar with a tolerably large force. He was a clever and energetic man, and had been instructed to take severe measures with the

Afghans, some of whom were suspected of intriguing to restore the city to the Dehli emperor. At this time Kandahar had been for sixty years wninterruptedly in the shah's possession. The governor appears to have given great offence b the harshness of his proceedings, and a Ghilzai chief named Mir Wa'iz, who had complained of his tyranny, was sent a prisoner to Ispahan. This person had much ability and no little cunning. He was permitted to go on a pilgrimage to Mecca, and on his re- turn in 1708 he so gained upon the confidence of the Persian court that he was allowed to go back to his country. At Kandahar he planned a conspiracy against the Government, slew Gurji Khan and his retinue, seized the city, defeated two Persian armies sent against him, and died a natural death in 1715. His brother, Mir 'Abdallah, succeeded him in the government of the Afghans; but after a few months, Mahmud, a son of Mir Wa'iz, a very young man, murdered his uncle and assumed the title of a sovereign prince.

In the meanwhile dark clouds were rising all round the horizon

His air was "affable, 1641-1715.

1715-1736.

Afghan invasion.

" by twenty-four field-pieces.

Mah- mud's usurpa- tion.

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ready to overwhelm the doomed Safawi dynasty. The Saduzai tribe revolted at Herat, and declared itself independent in 1717 ; the Kurds overran the country round Hamadan ; the Uzbeks deso- lated Khnrasan ; and the Arabs of Maskat seized the island of Al- Bahrain and threatened Bandar-'Abbdés. Thus surrounded by dangers on all sides the wretched shah was bewildered. He made one vain attempt to regain his possessions in the Persian Gulf; but the Portuguese fleet which had promised to transport his troops to Al-Bahrain was defeated by the imam of Maskat and forced to retreat to Goa. :

The court of Ispahan had no sooner received tidings of this disaster than Mahmud, with a large army of Afghans, invaded Persia in the year 1721, seized Karman, and in the following year advanced to within four days' march of the city of Ispahan. The shah offered him a sum of money to return to Kandahar, but the Afghan answered by advancing to a plaee called Gulnabad, within 9 miles of the capital. The effeminate and luxurious courtiers were taken completely by surprise ; no preparation had been made, and the capital was unprovided with either provisions or ammunition. The ill-disciplined Persian army, hastily collected, advanced to attack the rebels. Its centre was led by Shaikh 'Ali Khan, covered The wali of Arabia commanded the right, and the 'itimddu' d-daulah, or prime minister, the left wing. The whole force amounted to 50,000 men, while the Afghans could not count half that number.

On 8th Mareh 1722 the richly-dressed hosts of Persia appeared before the little band of Afghans, who were scorched and disfigured by their long inarches. The wali of Arabia commenced the battle by attacking the left wing of the Afghans with great fury, routing it, and plundering their camp. The prime minister immediately afterwards attacked the enemy's right wing, but was routed, and the Afghans, taking advantage of the confusion, captured the Persian guns and turned them on the Persian centre, who fled in confusion without striking a blow. The wali of Arabia escaped into Ispahan, and Mahmud the Afghan gained a complete victory. Fifteen thousand Persians remained dead on the field.

Turkey and Russia were not slow to take advantage of the cala- mities of Persia. The Turks seized on Tiflis, Tabriz, and Hamadan, while Peter the Great, whose aid had been sought by the friendless Tahmasp, fitted outa fleet on the Caspian.? The Russians occupied Shirwan, and the province of Gilan on the south-west corner of the Caspian® ; and Peter made a treaty with Tahmasp II. in July 1722, by which he agreed to drive the Afghans out of Persia on condition that Darband (Derbend), Baki, Gilan, Mazandaran, and Astrabad were ceded to Russia in perpetuity. These were all the richest and most important northern provinces of Persia.

Meanwhile the cruel invader was deluging Ispahan with the blood of its citizens. Dreading rebellion, in 1723 he invited three hundred of the

principal Persian nobility to a banquet and massacred them. To prevent their children rising up in vengeance they were all murdered also. Then he proceeded to slaughter vast numbers of the citizens of Ispahan, until the place was nearly depopulated. Not content with this, in February 1725 he assem- bled all the captives of the royal family, except the shah, in the courtyard of the palace, and caused them all to be murdered, com- mmencing the massaere with his own hand. The wretched Husain, a aS Sere i ee

1 We have an aceount of the Afghan invasion and sack of Ispahan from an eye-witness, Father Krusinski, proeurator of the Jesuits at that place, whose interesting work was translated into English in the last century.

_” In 1721 Sultan Husain sent an embassy to the Russians, seeking aid against the Afghans. In May 1722 a flotilla descended the Volga commanded by Czar Peter, and on 19th July the Russian flag first waved over the Caspian. Glan was oeeupied by 6000 men under General Matuschkin.

e The Russians remained in Gflan until 1734, when they were obliged to evaenate it, owing to the unhealthiness of the climate.

Pi Res ee

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frantic with grief, rushed to this scene of horror, and was himself wounded in endeavouring vainly to save his infant son, only five years of age. All the males of the royal family, exeept Husain himself, Tahmasp, and two children, are said to have perished. At length the inhuman misereant Mahmud died, at the early age of twenty-seven, on 22d April 1725. With scarcely any neck, he had round shoulders, a broad face with a flat nose, a thin beard, and squinting eyes, which were generally downcast.

Mahmud was sueceeded in his usurpation by his first cousin Ashraf, the son of Mir ‘Abdallah. He was a brave but cruel Afghan. He gave the dethroned shah a handsome allowance, and strove, by a mild policy, to acquire popularity. In 1727, after a short war, he signed a treaty with the Turks,

acknowledging the sultan as chief of the Moslems. But the fortunate star of Tahnidsp II. was now beginning to rise, and the days of Afghan usurpation were numbered. He had collected a small army in Mazandaran, and was supported by Fath ‘Ali Khan, the powerful chief of the Kajar tribe. In 1727 the fugitive shah was joined by Nadir Kil, a robber chief, who was already famous for his undaunted valour, and who was destined to become the mightiest conqueror of the age. He murdered Fath ‘Ali, and, having easily appeased the shah, received the command of the royal army.

Nadir at Damghan, and forced to retreat. The Persian general followed close in his rear, and again eutirely defeated him outside Ispahan in November of the same year. The Afghans fled through the town ; and Ashraf, murdering the poor old shah Husain on his way, hurried with the wreck of his army towards Shiraz. On 16th November the victorious Nadir entered Ispahan, and was soon followed by his master, the young shéh Tahmasp II., who burst into tears when he beheld the ruined and defaced walls of the palace of his ancestors. His mother, who had escaped the numerous massacres by disguising herself asa slave, and performing the most degrading offices, now came forth and threw herself into his arms. Nadir did not give his enemies time to recover from their defeat. He followed them up, and again utterly routed them in January 1730. Ashraf tried to escape to Kandahar almost alone, but was murdered by a party of Baluch robbers; and thus, by the genius of Nadir, his native land was delivered from the terrible Afghan invaders.

The ambition of Nadir, however, was far greater than his loyalty. On the pretext of incapacity he dethroned Tahmasp IT. in 1732, and sent him a prisoner into Khurdsan, where he was murdered some years afterwards by Nadir’s son, while the conqueror was absent on his Indian expedition. For a short time the wily usurper placed Tahmasp’s sou on the throne, a little child, with the title of ‘Abbas ITI., while he contented himself with the office of regent. the year 1736, and Naddir then threw off the mask. claimed shah of Persia by a vast assemblage on the plain of Moghan.

By the fall of the Safawi dynasty Persia lost, as it were, her race of national monarchs, considered not only in respect of origin and birthplace but in essence and in spirit. The Persians have never been governed by more truly

representative kings than Isma‘il, Tahmasp, and ‘Abbas ; and, whatever their faults and failings, they were Persian and peculiar to Persians. Thoroughly to realize this truth we must endeavour for a moment to change our own for the Oriental standpoint, and accept even the murders and excesses committed as an outcome of the age, place, and circumstances, and as natural as are the freaks of unrestrained childhood. Regarded in a sober English spirit, the reign of the great ‘Abbas is rendered mythical by crime. No sovereign could be great in the estimation of civilized Europe who acted as he did on certain occasions. No victory or healthy legislation could compensate for moments of madness, which, under Western orthodoxy, must mara whole career. But something liberal in the philosophy of their progenitors threw an attractiveness over the earlier Safawi kings which was wanting in those who came after them. In course of time the old philo- sophical element disappeared ; and one of Shah Husain’s immediate predecessors not only disavowed all sympathy with Sufism but threatened to crush it where detected. The fact is that, two centuries after Shah Isma‘il’s acces- sion to the throne, the Safawi race of kings was effete ; and it became necessary to make room for a more vigorous if not a more lasting rule. Nadir was the strong man for

In 1729 Ashraf Expul- | beeame alarmed at these formidable preparations in the north, and sion of led an Afghan army into Khurdsan, where he was dcfeated by Afghan:

Poor little ‘Abbas died at a very convenient time, in Fall of } He was pro- Safawis.

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the hour and occasion. He has been designated a “robber chief”; but his antecedents, like those of many others who have filled the position, have redeeming points of melodramatic interest. He was driven to this mode of

life by injustice, and raised to consideration above ordi- nary banditti by ability as much as by physical force. It was the repute he had thus obtained which caused Saifu ’d-Din Beg, a general of Shah Tahmasp, and chief of a tribe, to unite his fortunes to Nddir’s, and so enable him to rise on the ladder of his ambition. That Nadir misused his advantages by acts of treachery is not to be denied. Such was, unfortunately, one of the visible roads to success in those barbarous times.

A map attached to Krusinski’s volumes (see Plate VIII.) illustrates the extent of Persian territory in 1728, or one year before Ashraf was finally defeated by Nadir, and some eight years prior to the date on which Nadir was himself proclaimed king. It shows, during the reign of the Safawis, Tiflis, Erivan, Khoi, and Baghdad to have been within the limits of Persia on the west, and in like manner Balkh and Kandahar to have been included within the eastern border. There is, however, also shown, as a result of the Afghan intrusion and the impotency of the later Safawi kings, a long broad strip of country to the west, including Tabriz and Hamadan, marked “conquests of the Turks,” and the whole west shore of the Caspian from Astrakan to Mazandaran marked “conquests of the czar of Muscovy ”; Makran, written Mecran, is designated “a warlike inde- pendent nation.” If further allowance be made for the district held by the Afghan invaders as part of their own country, it will be seen how greatly the extent of Persia proper was reduced, and what a work Nadir had before him to restore the kingdom to its former proportions.

But the former proportions had been partly reverted to, and would doubtless have been in some respects exceeded, both in Afghanistan and the Ottoman dominions and on the shores of the Caspian, by the action of this inde- fatigable general, had not his sovereign master, Tahmasp IT., acting on his own account, been led into a premature treaty with the Turks. Nadir’s anger and indignation had been great at this weak proceeding; indeed, he had made it the ostensible cause of the shah’s deposition. He had addressed letters to all the military chiefs of the country, calling upon them for support; he had sent an envoy to Constantinople insisting upon the sultan’s restora- tion of the Persian provinces still in his possession—that is, Georgia and part of Adarbaijan,—and he had threatened Baghdad with assault. As regent, he had failed twice in taking the city of the khalifs, but

on the second occasion he had defeated and killed its gallant defender, Topal ‘Othman, and he had succeeded in regaining Tiflis, Kars, and Erivan.}

Russia and Turkey, naturally hostile to one another, had taken occasion of the weakness of Persia to forget their mutual quarrels and unite to plunder the tottering kingdom of the Safawi kings. A partition treaty had been signed between these two powers in 1723, by which the ezar was to take Astrabad, Mazandaran, Gilan, part of Shirwan and Daghistan, while the acquisitions of the Porte were to be traced out by a line drawn from the Junction of the Arras and Kur rivers, and passing along by Ardabil, Tabriz, and Hamadan, and thence to Karman- shah. Tahmdsp was to retain the rest of his paternal kingdom on condition of his recognizing the treaty. The Ingenious diplomacy of Russia in this transaction was manifested in the fact that she had already acquired the greater part of the territory allotted to her, while Turkey had to obtain her share by further conquest. But the combination to despoil a feeble neighbour was outwitted

1 Malcolm.

by the energy of a military commander of remarkable 1728-1738.

type.

Nadir Shéh.—Nadir, it has been said, was proclaimed Nadir’s Mirza Mahdi ©orena- relates how this event was brought about by his address to i”

shéh in the plains of Moghan in 1736.

the assembled nobles and officers on the morning of the * Nau-ruz,” or Persian New-Year’s Day, the response to that appeal being the offer of the crown. In the spirit of the third English Richard, he refused to accept the high dignity, but eventually suffered his petitioners, on certain conditions, to “buckle fortune on his back.” The conditions were that the crown should

be hereditary in his family, that the claim of the Safawis was to be held for ever extinct, and that measures should be taken to bring the Shi‘ahs to accept uniformity of worship with the Sunnis. The mulla bashi (or high priest) objecting to the last, NAdir ordered him to be strangled, a command which was carried out on the spot. On the day following, the agreement having been ratified between sovereign and people, he was pro- claimed emperor of Persia. At Kazvin the ceremony of inauguration took place. Having girt on the royal scimitar and put the crown on his head, he took the accustomed oath. The edict expressing the royal will on the religious question is dated in June, but the date of coronation is uncertain. From Kazvin Nadir moved to Ispahan, where he organized an army for a proposed expedition against Kandahar, then in the possession of a brother of Mahmud, the conqueror of Shah Husain. But before setting out for Afghanistan he took measures to secure the internal quiet of Persia, attacking and seizing in his stronghold the chief of the marauding Bakhtidris, whom he put to death, retaining many of his men for service as soldiers. With an army of 80,000 men he marched through Khur- dsan and Sistan to Kandahar, which city he blockaded ineffectually for a year; but it finally capitulated on the loss of the citadel. Balkh fell to Riza Kuli, the king’s son, who, moreover, crossed the Oxus and defeated the Uzbeks in battle. Besides tracing out the lines of Nadirabad, a town since merged in modern Kandahar, Nadir had taken advantage of the time available and of opportunities pre- sented to enlist a large number of men from the Abdali and Gnhilzai tribes. It is said that as many as 16,000 were at his disposal. His rejection of the Shi‘ah tenets as a state religion seems to have propitiated the Sunni Afghans, and it is not to be otherwise wondered at that a man of his war- like habits should have succeeded in attaching many of the rough mountaineers to his person. Such a force, in addi- tion to his own army, rendered him a truly formidable foe, and the prospect which now opened out before him must have fired his heart and the hearts of his warriors witli restless exultation.

He had sent an ambassador into Hindustan requesting Invasion the Mughal emperor to order the surrender of certain of India.

unruly Afghans who had taken refuge within Indian terri- tory, but no satisfactory reply was given, and obstacles were thrown in the way of the

return of the embassy. The Persian monarch, not sorry perliaps to find a plausible pretext for encroachment in a quarter so full of promise to booty-seeking soldiers, pursued some of the fugitives through Ghazni to Kabul, which city was then under the immediate control of Nasr Khan, governor of eastern Afghanistan, for Muhammad Shah of Dehli. This function- ary, alarmed at the near approach of the Persians, fled to Peshawar. Kabul had long been considered not only an integral part but also one of the main gates of the Indian empire ; notwithstanding a stout resistance on the part of its commandant, Shir or Shirzah Khan, the place was stormed and carried (1738) by Nadir, who, after slaugh- tering the greater part of the garrison, took possession of it and moved on to the eastward. Mirza Mahdi relates

1738-1747. that from the Kabul plain he addressed a new remonstrance

North- ern con- quests.

to the Dehli court, but that his envoy was arrested and killed, and his escort compelled to return by the governor of Jalalabad. The same authority notes the occupation of the latter place’ by Persian troops and the march thither from Gandamak. There are some doubts as to the exact route now taken, but it was probably through the Khaibar (Khyber) Pass that he passed into the Peshawar plain, for it was there that he first defeated the imperial forces.

The invasion of India had now fairly commenced, and its successful progress and consummation were mere questions of time. It will not do to cite a triumphal march of an irresistible horde in example of what may still be achieved by an inroad upon modern Hindustan. The prestige of this Eastern Napoleon was immense. It had not only reached but had been very keenly felt at Dehli before the conquering army had arrived. There was no actual religious war; all sectarian distinction had been disavowed ; the contest was between vigorous Muhammadans and effete Muhammadans. Nadir had not, like Cesar, come, and seen, and conquered. His way had been prepared by circumstances, and as he progressed from day to day his army of invaders increased. There must have been larger accessions by voluntary recruits than losses by death or desertion. The victory on the plain

of Karnal, whether accomplished by sheer fighting or the intervention of treachery, was the natural outcome of the previous situation ; it was the shifting of the scene as anticipated and prepared, and the submission of the emperor followed asa matter of course. But the coming and going of Nadir are studies quite as interesting and instructive as the coming and going of Alexander, and belong to compara- tively recent days.

Dehli must have experienced a sense of relief at the de- parture of its conqueror, whose residence there had been rendered painfully memorable by carnage and riot. The marriage of his son to the grand-daughter of Aurangzib and the formal restoration of the crown to the dethroned emperor, both prominent parts of the first pageant, were doubtless politic, and his parting counsels to the wretched Muhammad Shah were, it is probable, good and appro- priate ; but the descendant of Babar could not easily forget how humiliating a chapter in history would remain to be written against him. The return march of Nadir to Per- sia is not recorded with precision. On the 5th May 1739 he left the gardens of Shalimar, north of Dehli, to proceed, by Lahore and Peshawar, through the passes to Kabul. Thence he seems to have returned to Kandahar and, either in person or by his lieutenants, to have recrossed the Indus into Sind. But the subjection of Nur Muhammad, the Kalhora chief then ruling in that province, would hardly have been a sufficient inducement to bring back the great Nadir Kuli so far as “Umarkot; and in May 1740—just one year after his departure from Dehli—he was in Herat displaying the imperial throne and other costly trophies to the gaze of the admiring inhabitants. Sind was cer- tainly included in the cession to him by Muhammad Shah of “all the territories westward of the river Attok,” but only that portion of it, such as Thattah (Tatta), situated on the right bank of the Indus.

From Herat he moved upon Balkh and Bukhara, and at a short distance from the latter city received the sub- mission of Abu ’l-Faiz Khan, the Uzbek ruler, whom he restored to his throne on condition that the Oxus should be the acknowledged boundary between the two empires. The khan of Khwarizm was his next opponent; and, as this chief rejected conciliation, and had given serious cause of offence by repeated depredations in Persian terri- tory, he was made prisoner and doomed, with some of his officers, to execution. Nadir then visited the strong

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fortress of Kelat, a place which now bears his name and to which he was greatly attached as the scene of his boyish exploits, and Mashhad, which he constituted the capital of his empire. Here he spent three months in festivity ; and if extension of dominion be a cause for gratulation he could well justify the demonstration, for he had extended his boundary on the east to the Indus, and to the Oxus on the north.

On the south he was restricted by the Arabian Ocean Wars and Persian Gulf; but the west remained open to his im the |

further progress. He had in the first place to revenge the death of his brother Ibrahim Khan, slain by the Lesghians ; and a campaign against the Turks might follow in due course, The first movement was unsuccessful, and indirectly attended with disastrous consequences. Nadir, when hastening to the support of some Afghan levies who were doing good service, was fired at and wounded by a stray assailant; suspecting his son, Riza Kuli, of complicity, he commanded the unfortunate prince to be seized and deprived of sight. From that time the heroism of the monarch appeared to die out. He became morose, tyrannical, and suspicious. An easy victory over the Turks gave him but little additional glory ; and he readily concluded a peace with the sultan which brought but insignificant gain to Persia.! Another battle won from the Ottoman troops near Diarbekir by Nasr Ullah Mirza, the young prince who had married a princess of Dehli, left matters much the same as before. “It was agreed that prisoners on both sides should be released, that Persian pilgrims going to the holy cities of Mecca and Medina should be protected, and that the whole of the provinces of Irak and Adarbaijan should remain with Persia, except an inconsiderable territory that had be- longed to the Turkish Government in the time of Shah Ismail, the first of the Suffavi kings.’’? .

The last years of Nadir’s life were full of internal trouble. On the part of the sovereign, murders and executions ; on that of his subjects, revolt and conspiracy,—these were the ordinary topics of common interest throughout the country. Such a state of things could not last, and certain proscribed

persons plotted together for the destruction of a sovereign who had now become a half-demented tyrant. He was despatched by Salah Bey, captain of his guards, to whom, with three others, was committed the work of his assassina- tion (1747). He was some sixty years of age, and had reigned eleven years. About the time of setting out on his Indian expedition he was described as a most comely man, upwards of 6 feet high, well-proportioned, of robust make and constitution ; inclined to be fat, but prevented by the fatigue he underwent ; with fine, large black eyes and eye- brows ; of sanguine complexion, made more manly by the influence of sun and weather; a loud, strong voice; a moderate wine-drinker ; fond of simple diet, such as pildos and plain dishes, but often neglectful of meals altogether, and satisfied, if occasion required, with parched peas and water, always to be procured.?

Malcolm winds up a long account of his idiosyncrasies with the following.

“The character of this wonderful man is, perhaps, exhibited in its truest colours in those impressions which the memory of his actions has left upon the minds of his countrymen. They speak of him as a deliverer and a destroyer; but while they expatiate with pride upon his deeds of glory, they dwell with more pity than horror upon the cruel enormities which disgraced the lattcr years of his reign ; and neither his crimes, nor the attempt he made to

abolish their religion, have subdued their gratitude and veneration for the hero, who revived in the breasts of his degraded countrymen

1 Professor Creasy says the war broke out in 17438, but was termi- nated in 1746 by a treaty which made little change in the old arrange- ments fixed under Murad IV.

2 Malcolm. 3 Fraser’s History of Nadir Shah (1742).

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jnarchy- death of Nadir Shah something like anarchy prevailed for

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a sense of their former fame, and restored Persia to her independence as a nation.”

During the reign of Nadir an attempt was made to establish a British Caspian trade with Persia. The names of Jonas Hanway and John Elton were honourably con- nected with this undertaking; and the former has left most valuable records of the time and country.

From Nadir Shaéh to the Kajér Dynasty.—After the

thirteen years in the greater part of Persia as it existed under Shah ‘Abbas. No sooner had the crime become known than Ahmad Khan, chief of the Abdali Afghans, marched off rapidly with his men to Kandahar and took possession of that city and a certain amount of treasure. The chief of the Bakhtidris, Rashid, also with treasure, fled to the mountains, from which his people had been drawn prior to the Indian expedition ; and the conspirators who had done the murderous deed invited ‘Ali, a nephew of the deceased monarch, to ascend the vacant throne. By the action of Ahmad Abdali, Afghanistan was at once lost to the Persian crown, for this leader was strong enough to found an independent kingdoni. The Bakhtiari encouraged his brother, ‘Alf Mardan, to compete for the succession to Nadir ; and the nominee of the disaffected party hastened from Sistan to Mashhad to take advantage of his nomina- tion. The prince was welcomed by his subjects; he told them that the murder of his uncle was due to his own instigation, and, in order to conciliate them towards him in a practical manner, remitted the revenues of the current year and all extraordinary taxes for the two years following.

Taking the title of ‘Adil Shah, or the “just” king, he commenced his reign by putting to death the two princes Riza Kuli and Nasr Ullah, as well as all relatives who could, in his estimation, be considered his competitors, with the exception of Shah Rukh, son of Riza Kuli, whom he spared in case a lineal descendant of Nadir should at any time be required by the people. His calculations proved, however, no wiser than beneficent. He had not removed all dangerous members of the royal house, nor had he gauged the temper of the times or people. ‘Adil Shah was soon dethroned by his own brother, Ibrahim, and he in his turn was defeated by the adherents of Shah Rukh, who made their leader king.

This young prince had a better and more legitimate title than that of the grandson of Nadir, whose usurpa- tion was too recent an occurrence to have eradicated and supplanted a comparatively ancient dynasty of national kings. He was also grandson, on the mother's side, of the Safawi Shah Husain. Amiable, generous, and liberal-

ture Ahmad Shah Abdali reappeared in Persian Khurdsan 1747-1759.

from Herat ; he attacked and took possession of Mashhad, slew Mir 'Alam, and, pledging the local chiefs to support the blinded prince in retaining the kingdom of his grand- father, he returned to Afghanistan. But thenceforward this unfortunate young man was a mere shadow of royalty, and his purely local power and prestige had no further influence whatever on Persia as a country.

The land was partitioned among several distinguished Further persons, who had of old been biding their opportunities, confu-

or were born of the occasion. Foremost among these was Muhammad Hasan Khan, hereditary chief of those Kajars who were established in the south-east corner of the Caspian. His father, Fath 'Ali Khan, after sheltering Shah Tahméasp IL. at his home in Astrabad, and long acting as one of his most loyal supporters, had been put to death by Nadir, who had appointed a successor to his chiefdom from the "Yukari" or "upper" Kajars, instead of from his own, the " Ashdgha," or "lower."! Muhammad, with his brother, had fled to the Turkmans, by whose aid he had attempted the recovery of Astrdbad, but had not succeeded in regaining a permanent footing there until Nadir had been removed. On the murder of the tyrant he had raised the standard of independence, successfully resisted Ahmad Shah and his Afghans, who sought to check his progress in the interests of Shah Rukh, and eventually brought under his own sway the valuable pro- vinces of Gilan, Mazandaran, and Astrab4d,2— quite a little kingdom in itself. In the large important province of Adarbaijan, Azad Khan, one of Nadir's generals, had established a separate government; and 'Ali Mardan, brother

of the Bakhtiari chief, took forcible possession of Ispahan, empowering Shah Rukh's governor, Abu '1-Fath Khan, to act for the new master instead of the old.

Had 'Ali Mardan declared himself an independent ruler he would have been by far the most important of the three persons named. But such usurpation at the old Safawi capital would have been too flagrant an act for general assent ; so he put forward Isma'il, a nephew of Shah Husain, as the representative of sovereignty, and himself as one of his two ministers,—the other being Karim Khan, a young chief of the Zend Kurds. Shah Isma'il, it need scarcely be said, was a mere nominal king, and possessed no real authority; but the ministers were strong men in their way, and the Zend especially promised to be useful in his generation, for he had many high and excellent qualities. After a time 'Ali Mardan was assassinated, and Karim Khan became the sole living power at Ispahan. The story of the period is thus told by Watson.

"The three rivals, Karim, Azad, and Muhammad Hasan, pro- Struggle ceeded to settle, by means of the sword, the question as to which of of the them was to be the sole master of Persia. A threc-sided war then three ensued, in the course of which each of the combatants in turn rivals.

minded, and of prepossessing exterior, he proved to be a popular prince. But his friends and supporters had done well to have left him in honourable obscurity ; for he was

neither of an age nor character to rule over a people led hither and thither by turbulent and disaffected chiefs, ever divided by the conflicting interests of personal ambition. No sooner had his claim to succession been admitted than his authority was subverted. Sa'id Muhammad, son of Mirza Daud, a chief mulla at Mashhad, whose mother was the reputed daughter of Sulaiman, collecting a body of men, and assuming the name of his maternal grandfather, declared himself king, and imprisoned and blinded Sh4h Rukh. Yusuf 'Ali, the general command- ing the royal troops, came to the rescue, defeated and slew Sulaiman, and replaced his master on the throne, reserving to himself the protectorship or regency. A new combina- tion of chiefs, of which Ji'afir the Kurd and Mir 'Alam the Arabian are the principal names handed down, brought about the death of Yusuf 'Ali and

the second imprisonment of Shth Rukh. These events were followed by a quarrel terminating in the supremacy of the Arab. At this June-

seemed at one time sure to be the final conqucror. Karim, when he had arranged matters at Ispahan, marched to the borders of Mazandaran, where the governor of that province was ready to meet him. After a closely-contested battle victory remained with Muhammad Hasan ; who, however, was unable to follow up the foe, as he had to return in order to encounter Azad. That leader had invaded Gilan, but, on the news reaching him of the victory which. the governor of Mazandaran had gained, he thought it prudent to retrace his steps to Sultaniyah. Karim reunited his shattered forces at Tehran, and retired to Ispahan to prepare for a second campaign. When he again took the-field it was not to measure himself once more with the Kajar chief, but to put down the pre- tensions of Azad. The wary Afghan, however, shut himself up in Kazvin, a position from which he was enabled to inflict much. in- jury on the army of Karim, while his own troops remained unharmed

1 There were three branches of the Kajar tribe, z.e., the Suldus, Tingkut, and Jalaiyar. The last, according to Watson, became settled in fran and Turan, and seem at first to have given their name to all the tribe. ‘ :

2 Watson. Malcolm says that Gilan was under one of its own chiefs, Hidéiyat Khan.

behind the walls of the town. Karfm retired a second time to Ispahan, and in the following spring advanced again to meet Azad. A pitched battle took place between them, in which the army of Karim was defeated. He retreated to the capital, closely pressed by the foe. Thence he continued his way to Shirdz, but Azad was still upon his traces. He then threw himself upon the

mercy of the Arabs of the Garmsir, or hot country, near the Persian Gulf, to whom the name of the Afghans was hateful, and who rose in a body to turn upon Azad. Karim, by their aid, once more repaired his losses and advanced on Ispahan, while Muhammad Hasan with fifty thousand men was coming from the opposite direction, ready to encounter either the Afghan or the Zend. The Afghan did not await his coming, but retired to his government of Tabriz.

‘The Zend issued from Ispahan, and was a second time defeated in a pitched battle by the Kajar. Karfm took refuge behind the walls of Shiraz, and all the efforts of the enemy to dislodge him were ineffectual. Muhammad Hasan Khan in the following year turned his attention to Adarbaijan. Azad was no longer in a posi- tion to oppose him in the field, and he in turn became master of every place of importance in the province, while Azad had to seek assistance in vain—first from the Pasha of Baghdad, and then from his former enemy, the Tsar of Georgia. Next year the conquering Kajar returned to Shiraz to make an end of the only rival who now stood in his way. On his side were 80,000 men, commanded by a general who had twice defeated the Zend chief on an equal field. Karim was still obliged to take shelter in Shiraz, and to employ artifice in order to supply the place of the force in which he was deficient. Nor were his efforts in this respect unattended with success: seduced by his gold, many of the troops of the Kajar began to desert their banners. In the meantime the neighbour- hood of Shiraz was laid waste, so as to destroy the source from which Muhammad Hasan drew his provisions ; by degrees his army vanished, and he had finally to retreat with rapidity to Ispahan with the few men that remained to him. Finding his position there to be untenable, he retreated still further to the country of his own tribe, while his rival advanced to Ispahan, where he re- ceived the submission of nearly all the chief cities of Persia. The ablest of Karim’s officers, Shaikh ‘Ali, was sent in pursuit of the Kajar chief. The fidelity of the commander to whom that chief- tain had confided the care of the pass leading into Mazandaran, was corrupted ; and, as no further retreat was open to him, he found himself under the necessity of fighting. The combat which ensued resulted in his complete defeat, although he presented to his followers an example of the most determined valour. While attempting to effect his escape he was recognized by the chief of the other branch, of the Kajar tribe, who had

deserted his cause, and who had a blood-feud with him, in pursuance of which he how put him to death.

‘* For nineteen years after this event Karim Khan ruled with the title of wakil, or regent, over the whole of Persia, excepting the province of Khurasin. He made Shiraz the seat of his government, and by means of his brothers put down every attempt which was made to subvert his authority. The rule of the great Zend chief was just and mild, and he is on the whole, considering his educa- tion and the circumstances under which he was placed, one of the most faultless characters to be met with in Persian history.”

Karim Khan died at his capital and favourite resi- dence in 1779 in the twentieth year of his reign, and, it is said, in the eightieth of his age. He built the great bazaar of Shir4z, otherwise embellishing and im- proving the city, had a tomb constructed over the re- mains of Hafiz, and repaired the “tirbat” at the grave of Sa‘di, outside the walls. He encouraged commerce and agriculture, gave much attention to the state of affairs along the shores of the Persian Gulf, and carefully studied the welfare of the Armenian community settled in his dominions. In his time the British factory was removed from Gombroon to Bushahr (Bushire). It would be plea- sant, if space allowed, to repeat the anecdotes creditable to his memory; for it is unusual to find so worthy a figure in Oriental annals, 3

On Karim’s death a new period of anarchy supervened. His brother, Zaki, a cruel and vindictive chief, and withal a pardoned rebel—for, when governor of Ispahan, he had revolted against Karim—assumed the government. At the same time he proclaimed Abu ’l-Fath Khan, second son of the deceased monarch, and his brother Muhammad ‘Alf, Joint-successors to the throne. The seizure of the citadel at Shiraz by the adherents of the former, among whom were the more influential of the Zends, may have induced him to

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adopt this measure as one of prudent conciliation. But the garrison held out, and, to avoid a protracted siege, he had recourse to treachery. The suspicious nobles were solemnly adjured to trust themselves to his keeping, under promise of forgiveness. They believed his professions, tendered their submission, and were cruelly butchered. Zaki did not long enjoy the fruits of his perfidious dealing. The death of Karim Khan had raised two formidable adver- saries to mar his peace, who could not fail to bring ona dénotement of some kind seriously affecting his interests,

Agha Muhammad, son of Muhammad Hasan, the Kajar chief of Astrabad, a prisoner at large in Shirdz, was in the environs of that city awaiting intelligence of the old king's decease, and, hearing it, instantly escaped to Mazandaran, there to gather his tribesmen together and put himself in a condition to compete for the crown of Persia. 'Taken prisoner by Nadir and barbarously mutilated by "Adil Shah, he had afterwards found means to rejoin his people, but had surrendered himself to Karim Khan when his father was killed in battle. On the other hand, SAdik, brother to Zaki, who had won considerable and deserved repute by the capture of Basrah from the Turkish governor, abandoned his hold of the conquered town on hearing of the death of Karim, and appeared with his army before Shiraz. To provide against the intended action of the first, Zaki detached his nephew, 'Alf Murad, at the head of his best troops to proceed with all speed to the north; and, as to the second, the seizure of such families of SAdik's followers as were then within thé walls of the town, and other violent measures, struck such dismay into the hearts of the besieg- ing soldiers that they dispersed and abandoned their leader to his fate. From Karman, however, where he found an asylum, the latter addressed an urgent appeal for assistance to "Ali Murad. This chief, encamped at Tehran when the communication reached him, submitted the matter to his men, who decided against Zaki, but put forward their own captain as the only master they would acknowledge. 'Ali Murad, leaving the pursuit of Agha Muhammad, then re- turned to Ispahan, where he was received with satisfaction, on the declaration that his one object was to restore to his lawful inheritance the eldest son of Karim Khén, whom Zaki had set aside in favour of a younger brother. The sequel is full of dramatic interest. Zaki, enraged at his nephew's desertion, marched out of Shir4z towards Ispahan. On his way he came to the town of Yezdikhast,—a singular place, steep and rugged,

something like a section, or three upper stories, of the old town of Edinburgh set upon a natural foundation of crumbling stone. It comes upon the traveller as an abrupt elevation in a dreary vale, and the surrounding scenery savours of the weird and romantic. Here he demanded a sum of money from the inhabitants, claiming it as part of secreted revenue; the demand was refused, and eighteen of the head men were thrown down the precipice beneath his window ; a “saiyid,” or holy man, was the next victim, and his wife and daughter were to be given over to the soldiery, when a suddenly-formed con- spiracy took effect, and Zaki’s own life was taken in retribu- tion for his guilt (1779).

When intelligence of these events reached Karman, Sadik Khan hastened to Shiraz, proclaimed himself king in place of Abu ’l-Fath Khan, whom he declared incompetent to reign owing to dissipation and indolence, and put out the eyes of. the young prince. He despatched his son Ji‘afir to assume the government of Ispahan, and watch the move- ments of “Ali Murad, who appears to have been then absent from that city; and he gave a younger son, ‘Ali Naki, com- mand of an army in the field. A campaign ensued with success from time to time on either side, but ending in the

capture of Shiraz and assumption of sovereignty by ‘Ali’

Murad, who caused Sadik Khan to be put to death.

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From this period up to the accession of Agha Muhammad Khan the summarized history of Markham will supply the principal facts required.

‘Ali Murad reigned over Persia until 1785, and carried on a successful war with Agha Muhammad in Mazandaran, defeating him in several engagements, and occupying Tehran and Sari. He died on his way from the former place to Ispahan, and was suc- ceeded by Ji‘afir, son of Sadik,1 who reigned at Shiraz, assisted in the government by an able but unprincipled ‘‘ kalantar,” or head magistrate, named Hajji Ibrahim. This ruler was poisoned by the agency of conspirators, one of whom, Saiyid Murad, succeeded to

the throne. Hajji Ibrahim, however, contriving to maintain the loyalty of the citizens towards the Zend reigning family, the

utf ‘Ali usurper was killed, and Lutf ‘Ali Khan, son of Ji‘afir, proclaimed

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king. He had hastened to Shiraz on hearing of his father’s death and received a warm welcome from the inhabitants. Hajji Ibrahim became his chief adviscr, and a new minister was found for him in Mirza Husain Shirazi. At the time of his accession Lutf ‘Ali Khan was only in his twentieth year, very handsome, tall, graceful, and an excellent horseman. ‘To his fearless bravery and indomitable perseverance he united the nobler virtues of generosity and mag- nanimity. He formed many enduring friendships ; and, though false-hearted traitors forsook him in the hour of adversity, others loyally stood by him to the last. While differing widely in character, he was a worthy successor of Karim Khan, the great founder of the Zend dynasty. Lutf ‘Ali Khan had not been many months on the throne when Agha Muhammad advanced to attack him, and in- vested the city of Shiraz, but retreated soon afterwards to Tehran, which he had made the capital of his dominions. The young king then enjoyed a short period of peace. Afterwards, in the year 1790, he collected his forces and marched against the Kajars, in the direc- tion of Ispahan. But Hajji Ibrahim had been intriguing against his kind young sovereign, to whose family he owed everything, not only with his officers and soldiers but also with Agha Muhammad, the chief of the Kajars, and arch-enemy of the Zends. Lutf ‘Ali Khan was suddenly deserted by the whole of his army, except seventy faithful followers; and when he retreated to Shiraz he found the gates closed against him by Hajji Ibrahim, who held the city for the Kajar chief. Thence falling back upon Bushahr, he found that the shaikh of that town had also betrayed him, Surrounded by treason on every side, basely deserted alike by his dearest friends and by those who had been raised from the dust by his family, yet, still undaunted by the black clouds that gathered round him, with his little band he boldly attacked and routed the chief of Bushahr and blockaded the city of Shiraz. His uncon- querable valour gained him many followers, and he defeated an army sent against him by the Kajars in 1792.

Agha Muhammad then advanced in person against his gallant young rival. He encamped with an army of 30,000 men on the plain of Mardasht, near Shiraz. Lutf ‘Ali Khan, in the dead of night, suddenly attacked the camp of his enemy with only a few hundred followers. The Kajars were completely routed and thrown into confusion ; but Agha Muhammad, with extraordinary presence of mind, remained in his tent, and at the first appcarance of dawn his “muazzin,” or public crier, was ordered to call the faithful to morning prayer asusual. Astonished at this, the few Zend cavaliers, thinking that the whole army of Kajars had returned, fled with precipitation, leaving the field in possession of Agha Muhammad. The successful Kajar then entered Shiraz, and promoted the traitor Hajji Ibrahim to be his wazir. Lutf ‘Ali Khan took refuge with the hospitable chief of Tabas in the heart of Khurasan, where he succeeded in collecting a few followers; but, advancing into Fars, he was again defeated, and forced to take refuge at Kandahar.

In 1794, however, the undaunted prince once more crossed the Persian frontier, determined to make a last effort, and either regain his throne or die in the attempt. He occupied the city of Karman, then a flourishing commercial town, half-way between the Persian Gulf and the province of Khurasan. It had a very fine bazaar and was well fortified. Agha Muhammad besieged it with a large army in 1795, and, after a stout resistance, the gates were opened through treachery. For three hours the gallant young warrior fought in the streets with determined valour, but in vain. When he saw that all hope was gone he spurred his faithful horse against the ranks of thé enemy and, with only three followers, fought his way through the Kajar host and escaped to Bam-Narmashir, the ‘pi eastern district of the province of Karman on the borders of Sistan.

Furious at the escape of his rival, the savage conqueror ordered a general massacre ; 20,000 women and children were sold into slavery, and 70,000 eyes of the inhabitants of Karman were brought to Agha Muhammad on a platter. The monster counted them with the point of his dagger, then, turning to his minister, he exclaimed, ‘‘If one had been wanting I would have made up the

1 A five days’ usurpation of Bakir Khan, governor of Ispahan, is not taken into account.

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number with your own eyes.” from the effects of this fiend’s atrocities,

Lutf “Ali Khan took refuge in the town of Bam ; but the gov- ernor of Narmashir, anxious to propitiate the conqueror, basely surrounded him as he was inounting his faithful horse Kiran to seek a more secure asylum. The young prince fought bravely ; but, being badly wounded and overpowered by numbers, he was secured and sent to the camp of the Kajar chief. The spot wherc he was seized at Bam, when mounting his horse, was marked by a pyramid, formed, by order of his revengeful enemy, of the skulls of the most faithful of his adherents. The most hideous indignities and atrocities were committed upon his person by the cruel Kajar, in whose breast not one spark of generous or humane feeling had ever found a place. Finally, the last reigning prince of the house of Zend was sent to Tehran and murdered, when only in his twenty- sixth year. Every member of his family and every friend was ordered to be massacred by Agha Muhammad ; and the successful but guilty miscreant thus founded the dynasty of the Kajars, at the price of all the best and noblest blood of Iran.

The Zend is said to be a branch of the Lak tribe, dating from the time of the Kaianian kings, and claims to have been charged with the care of the Zend-Avesta by Zoroaster himself.2_ The tree attached to Markham’s chapter on the dynasty contains the names of eight members of the family only, z.e., four brothers, one of whom had a son, grandson, and great-grandson, and one a son. Four of the eight were murdered, one was blinded, and one cruelly mutilated. In one case a brother murdered a brother, in another an uncle blinded his nephew.

Kajér Dynasty.—Agha Muhammad was undoubtedly Agha one of the most cruel and vindictive despots that ever Muham-

disgraced a throne. But he was not without care for the honour of his empire in the eyes of Europe and the outer world, and his early career in Mazandaran gave him a deeply-rooted mistrust of Russia, with the officers of which power he was in constant contact. The following story, told by Forster,? and varied by a later writer, is charac- teristic. A party of Russians having obtained permission to build a ‘‘counting-house” at Ashraf, in the bay of that name, erected instead a fort with eighteen guns. Agha Muhammad, learning the particulars, visited the spot, ex- pressed great pleasure at the work done, invited the officers to dine with him, imprisoned them, and only spared their lives when they had removed the whole of the cannon and razed the fort to the ground. As this occurrence must have taken place about 1782, when he was engaged in family feuds, and the sovereign power was vested in the hands of ‘Alf Murad, it may be received as an illustra- tion not only of his patriotism but of the independent action he was ever ready to exercise when opportunity offered.

Forster was travelling homeward by the southern shores of the Caspian in January 1784, and from him we gather many interesting details of the locality and period. He calls Agha Muhammad chief of Mazandaran, as also of Astrabad and “some districts situate in Khurasan,” and describes his tribe, the Kajar, to be, like the Indian Rajput, usually devoted to the profession of arms. Whatever hold his father may have had on Gilan, it is certain that this province was not then in the son’s possession, for his brother, Ji‘afir Kul, governor of Balfrush (Balfroosh), had made a recent incursion into it and driven Hidaiyat Khan, its ruler, from Rasht to Enzali, and Agha Muhammad was himself meditating another attack on the same quarter. The latter’s palace was at Sari, then a small and partly fortified town, thickly inhabited, and with a plentifully- supplied market. As “the most powerful chief in Persia” since the death of Karim Khan, the Russians were seeking to put their yoke upon him, and he was naturally averse to the infliction. It is not clear, however, from the context

2 Markham. Morier says of Karim Khan’s family, “it was a low branch of an obscure tribe in Kurdistan.”

3 Journey from Bengal to England (1798), vol. ii. p. 201; see also Markham, pp. 341, 342.

Karman has never fully recovered 1779-1783.

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what Forster means when he writes that Agha Muhammad is “the only Persian chief bordering on the Caspian Sea whom the empire of Russia has yet made tributary, or rendered subservient to its policy.”

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holy city the generals of Timur Shah, king of the Afghans, had made three expeditions on Shah Rukh’s behalf. Mash- had had been taken and retaken as though he were not a resident in it, much less its de jure king. Moreover, his two

Cam- As Agha Muhammad’s power increased, his dislike and | sons Nadir Mirza and Wali Ni‘amat had been long waging, Paige t jealousy of the Muscovite assumed a more practical shape. | one with the other, a predatory war, and the former was Carin His victory over Lutf ‘Alf was immediately followed by an | practically in 1796 the actual ruler of the place. Three expedition into Georgia. After the death of Nadir the | years before Timur had died, and his third son, Zaman wali or prime ruler of that country had looked around him | Shah, by the intrigues of an influential sardar, Paiyanda for the safest and surest means of shaking off the offensive | Khan, had been proclaimed his successor at Kabul. yoke of Persia ; and in course of time an opportunity had Agha Muhammad’s entry into Mashhad was effected offered of a promising kind. In 1783, when the strength | without a struggle on the part of those in possession. The of the Persian monarchy was concentrated upon Ispahan | Kajar shah walked on foot to the tomb of Im4m Riza, and Shiraz, the Georgian czar Heraclius entered into an | before which he knelt and kissed the ground in token of agreement with the empress Catherine by which all con- | devotion, and was recognized as a Shi‘ah of Shi‘ahs. Shah nexion with the shah was disavowed, and a quasi-vassal- | Rukh submissively followed in his train. Then began the age to Russia

substituted,—the said empire extending her | last act of the local tragedy. The blind king’s gradual eegis of protection over her new ally. Agha Muhammad | revelation, under horrible torture, of the place of conceal- now demanded that Heraclius should return to his position | ment of his several jewels and treasures, and his deporta- of tributary and vassal to Persia, and, as his demand was | tion and death (of the injuries thus received, at Damaghan, rejected, prepared for war. Dividing an army of 60,000 | en route to Mazandaran), must be classed among the darkest men into three corps, he sent one of these into Daghistan, | records of Oriental history. another was to attack Erivan, and with the third he him- From Mashhad Agha Muhammad sent an envoy to self laid siege to Shishah in the province of Karabagh. The | Zaman Shah, asking for the cession of Balkh, and explain- stubborn resistance offered at the last-named place caused | ing his invasion of Khurasan; but the Afghan monarch him to leave there a small investing force only, and to | was too perplexed with the troubles in his own country move on with the remainder of his soldiers to join the corps | and his own insecure position to do more than send an Varmée at Erivan. Here, again, the difficulties presented | unmeaning reply. It is not shown what was the under- caused him to repeat the same process and to effect a junc- | stood boundary between the two countries at this particular tion with his first corps at Ganja, the modern Elisabethpol. | period ; but Watson states that on the shah’s departure At this place he encountered the Georgian army under | he had received the submission of the whole of Khurasan, Heraclius, defeated it, and marched upon Tiflis, which he | and left in Mashhad a garrison of 12,000 men. pillaged, massacring and enslaving! the inhabitants. Then Agha Muhammad had now fairly established his capital Death he returned triumphant to Tehran, where (or at Ardabil on | at Tehran. On his return thither in September 1796 he andcha the way) he was publicly crowned shah of Persia. Erivan | dismissed his troops for the winter, directing their re- i surrendered, but Shishah continued to hold out. These | assembly in the following spring. The reinvasion by Mohan proceedings caused Russia to enter the field. Darband | Russia of the provinces and districts he had recently mad. was taken possession of by Imhoff, Baku and Shumakhi | wrested from her west of the Caspian had made great were occupied, and Gilan was threatened. The death of | progress, but the circumstance does not seem to have the empress, however, caused the issue of an order to | changed his plans for the army. Olivier, who had in retire,

and Darband and Baku remained the only trophies | those days come to the Persian court on a commercial and of the campaign. political mission from the French republic, and whose Opera- In the meantime Agha Muhammad's attention had | book is quoted by Watson, expressed his surprise to the es ™ been called away to the east. Khurdsan could hardly | prime minister that, while his majesty thought it necessary a be called an integral part of the shah's kingdom so long | to strangle some twenty-seven Russian sailors sent in as

as it was under even the nominal rule of the blind grand- son of Nadir. But the eastern division of the province and its outlying parts were actually in the hands of the Afghans, and Mashhad was not Persian in 1796 in the sense that Dehli was British at the outbreak of the Indian mutiny. Shah Rukh held his position, such as it was, rather under Ahmad Shah and his successors in Afghanistan than under any other sovereign power. Agha Muhammad determined to restore the whole province to Persia, and, after a brief residence in Tehran on his return from the Georgian expedition, he set out for Mashhad. It is im- portant to note that on the occasion of his coronation he had girded on the sabre consecrated at the tomb of the founder of the Safawis,—thus openly pledging himself to support the Shi'ah faith.

But there had been continual dissatisfaction in the capital of Khurdsan, and there had been constant inroads upon it from without, which the powerless royal puppet was unable to prevent. His popularity was real, but wholly wanting in political vigour. It never seemed to have effect outside the limited sphere of personal sympathy and regard. Owing to the frequent revolutions in the

? Lady Sheil says (1849) : 'I saw a few of these unhappy captives,

who all had to embrace Mahommedanism, and many of whom had risen to the highest stations, just as the Circassian slaves in Constantinople. "'

prisoners, he took no immediate measures to check the Muscovite forces in the field. The reply was that there was no hurry in the matter. Although, when the spring arrived and the shah led his forces to the Arras, the Russians had, it is true, retreated, yet territory had been regained by them as

far south as the Talish. Agha Muhammad had now arrived at the close of his career. He was enabled, with some difficulty, to get his troops across the river, and take possession of Shishah, which had given them so much trouble a year or two before. There, in camp, he was murdered (1797) by his own personal attendants,— men who, singularly enough, were under sentence of death, but allowed to be at large. He was then fifty-seven years of age, and had ruled over part of Persia for more than eighteen years,— over the kingdom generally for about three years, and from his coronation for about one year only.

The brutal treatment he had experienced in boyhood under the orders of ‘Adil Shah, NAdir’s wretched nephew, and the opprobrious name of “eunuch” which attached to him, and with which he was taunted by his enemies, no doubt contributed to embitter his nature. His vindic- tiveness and inhumanity were notorious, and exemplified at almost every period of his life. On the other hand, his contempt of luxury and frugality of diet, his avoidance

of hyperbole and dislike of excessive ceremony, his pro- tection to commerce and consideration for his soldiers, the reluctance with which he assumed the crown almost at the close of his reign, his positive refusal to wear any royal headgear but the small circular pearl-adorned diadem in which he is commonly represented by the native painter,—all these would have been praiseworthy in another man ; but the fearful weight of evil on the other side of the scales made them of comparatively small con- sideration, and on his death the memory of his atrocious tyranny alone survived. Those who have seen his portrait once will recognize the face wherever presented. “ Beard- less and shrivelled,” writes Sir John Malcolm, “it re- sembled that of an aged and wrinkled woman, and the expression of his countenance, at no time pleasant, was horrible when clouded, as it very often was, with indigna-

of age, and died at sixty-eight, after a reign of thirty-six years. 1797-1809,

The period was an eventful one. It was that of George III. G

1V., and William IV. in England, of N apoleon I. ae first conte to emperor, of the restoration of the Bourbon kings and the inter- position of the house of Orleans, in France. The sons of Paul

Alexander and Nicholas, were emperors of Russia; and, except for the last few years of Salim IL, the second Mahmid ruled over the Turkish dominions. No other European nations had any direct concern with Persia. In Afghanistan it was the epoch of the revolution which broke up its short-lived unity as a kingdom. The struggles of Mahmud Shéh and Shuj‘au ’l-Mulk enabled them to be quasi-sovereigns for a time; but Kabul was divided from Kandahar, and Kandahar from Herat, and the work of Ahmad Abdali was all undone. Among the governors-general of India in those days are the distinguished names of Welleslcy, Cornwallis, Hastings, and William Bentinck.

Persia’s great aim was to recover in the north-west, as in the north- east of her empire, the geographical limits obtained for her by the Safawi kings ; and this was no easy matter when she had to contend with a strong European power whose territorial limits touched her

tion. He was sensible of this, and could not bear that any one should look at him.” Agha Muhammad had made up his mind that he should

own. Fath ‘Ali Shah undertook, at the outset of his reign, a con- War test with Russia on the western side of the Caspian, which became with constant and harassing warfare. Georgia was, clearly, not to revert Russia.

to a Muhammadan suzerain.

be succeeded by his nephew Fath ‘Ali Shah, son of his full brother, Husain Kuli Khan, and governor of Fars, a young prince with whom he had always been on good terns, and to whom he had proved himself exceptionally well disposed. There was a short: interval of confusion after the murder. The remains of the sovereign were exposed to insult, the army was disturbed,

the recently- captured fort on the left bank of the Arras was abandoned ; but the wisdom and resolution of the minister, Hajji Ibrahim, and of Mirza Muhammad Khan Kajar, a high functionary, prevailed to secure order and acceptance of the duly-appointed heir. The first, proclaiming his own allegiance, put himself at the head of a large body of troops and marched towards the capital. The second closed. the gates of Tehran to all comers until Fath ‘Ali Shah came himself from Shiraz. Though instantly proclaimed on arrival, the new monarch was not crowned until the spring of the following year (1798).

The so-called rebellions which followed were many, but not of any magnitude. Such as belong to local history are three in number, 7.¢., that of SAdik Khan Shakaki, the general whose possession of the crown jewels enabled him, after the defeat of his army at Kazvin, to secure his personal safety and obtain a government; of Husafn Kulf Khan, the shah’s brother, which was compromised by the mother’s intervention ; and of Muhammad, son of Zaki Khan, Zend, who was defeated on more than one occasion in battle, and

In 1800 its czar, George, son and successor of Heraclius, notwithstanding his former professions of allegiance to the shah, renounced his crown in favour of the Russian emperor. His brother Alexander indignantly repudiated ‘the act and resisted its fulfilment, but he was defeated by General Lazeroff on the banks of the Lora. Persia then re-entcred the field. Among the more notable occurrences which followed were a three days’ battle, fought near Etchmiadzin near Erivan, between the crown prince, ‘Abbas Mirza, and General Zizianoff, in which the Persians suffcred much from the enemy’s artillery, but would not admit they were defeated ; unsuccessful attempts on the part of the Russian cominander to get possession of Erivan ; and a surprise, in camp, of the shah’s forces, which caused them to disperse, and necessitated the king’s own presence with reinforcements. On the latter occa- sion the shah is credited with gallantly swimming his horse across the Arras, and setting an example of energy and valour. In the following year ‘Abbas Mirza advanced upon Shishah, the chief of which place and of the Karabagh, though an old foe to Agha Muhammad, had declared for Russia; much fighting ensued, and Erivan was formally taken possession of in the name of the shah. The Russians,

morcover, made a futile attempt on Gilan by landing troops at Enzali, which returned to Baku, where Zizianoff fell a victim to the treachery of the Persian governor. Somewhat later Ibrahim Khalil of Shishah, repenting of his Russophilism, deter- mined to deliver up the Munscovite garrison at that place, but his plans were betrayed, and he and his relatives put to death. Reprisals and engagements followed with varied success ; and the crown prinee of Persia, after a demonstration in Shirwan, returned to Tabriz. He had practically made no progress; yet Russia, in securing possession of Darband, Baku, Shirwan, Sheki, Ganja, the Talish, and Moghan, was probably indebted to gold as well as to the force of arms. At the same time Persia would not listen to the overtures of peace made to her by the governor-general who had succeeded Zizianoff.

Relations had now commenced with England and British India. Relations A certain Mahdi ‘Ali Khan had landed at Bushahr, entrusted by with the governor of Bombay with a letter to the shah. His mission England, had reference to the politics of Afghanistan, aud appears to have India, been fairly successful ; but he was followed shortly by an English and envoy from the governor-gencral, Captain Malcolm of the Madras France.

fled into Turkish territory. There may have been other names mixed up with these, but of aiders and abettors rather than principals. Later, Sadik Khan, having again incurred the royal displeasure, was seized, confined, and

mercilessly bricked up in his dungeon to die of starvation.

Another adversary preserited himself in the person of Nadir Mirza, son of Shah Rukh, who, when Agha Muhanimad appeared before Mashhad, had taken refuge with the Afghans. This prince, hearing of the death of his father’s destroyer, gathered around him a military force and made a show of independence. Fath ‘Ali sent to warn him of the consequences of his act, but without the desired effect. Finally, he advanced into Khurdsan with an army which appears to have met with no opposition save at Nishaptir and Turbat, both of which places were taken, and when it reached Mashhad Nadir Mirza tendered his submission, which was accepted. Peace having been further cemented by an alliance between a Kajér general and the prince’s daughter, the shah returned to Tehran.

Now that the narrative of Persian kings has been brought up to the period of the consolidation of the Kajar dynasty and commence- ment of the 19th century, there remains but to summarize the principal events in the rcigns of Fath ‘Ali Shah and his immediate Successors, Muhammad Shah and Nasru ’d-Din Shah.

Fath ‘Ali Shah came to the throne at about thirty-two years

army. He had not only to talk about the Afghans but about the French also, and the trade of the Persian Gulf. The results were a political and commercial treaty, and ‘a return mission to India from Fath ‘Alf Shah. To him France next sent her message. In 1801 an Amcrican merchant from Baghdad had appeared as the bearer of credentials from Napolcon, but his mission was mistrusted and came to nothing. .Some five years afterwards Jaubert, after detention and imprisonment on the road, arrived at Tehran and went back to Europe with a duly-accredited Persian ambassador, who concluded a treaty with the French emperor at Finkenstein. On the return of the Persian diplomatist, a mission of many officers under General Gardanne to instruct and drill the local army was sent from France to Persia. Hence arose the counter-mission of Sir Harford Jones from the British Government, which, on arrival at Bombay in April 1808, found that it had been anticipated by a previously-sent mission from the governor-general of India, under Malcolm again, then holding the rank of brigadier-general. The home mission, however, proceeded to Bushahr, and Malcolm’s return thence to India, from pressure of circumstances, enabled Sir Harford to move on and reach the capital in February 1809.

1809-1830.

Renewal of Rus- sian war.

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concluded a treaty with Persia the month after his arrival at the capital ; but the Government of India were not content to leave matters in his hands: notwithstanding the anomaly of a double mission, Malcolm was in 1810 again despatched as their own parti- cular envoy. He brought with him Captains Lindsay and Christie to assist the Persians in the war, and

presented the shah with some serviceable field-pieces ; but there was little occasion for the exercise of his diplomatic ability save in his non-official intercourse with the people, and here he availed himself of it to the great advantage of himself and his country.' He was welcomed by the shah in camp at, Ujani, and took leave a month afterwards to return via Baghdad and Basrah to India. The next year Sir Harford Jones was relieved as envoy by Sir Gore Ouseley. ;

Meanwhile hostilities had been resumed with Russia: the crown prince vainly attempted to penetrate Georgia ; and one or two en- gagements ensued with more or less assertion of success on either side. In 1812 the British envoy used his good offices for the restora- tion of peace between the belligerents, and a Russian officer of high rank was sent to the Persian camp to propose the appointment of deputies. But there was no possibility of agreement, and the endeavour failed. To add to the Persian difficulty, it so happened that in July of this year a treaty was concluded between England and Russia "for re-establishing the relations of amity and good understanding between the two kingdoms respectively"; and this circumstance caused the envoy to direct that British officers should take no further part in Russo-Persian military operations. Christie and Lindsay, however, resolved to remain at their own risk, and advanced with the Persian army to the Arras. On the 31st October the force was surprised by an attack of the enemy, and retreated ; the next night they were again attacked and routed at Aslanduz. Christie fell bravely fighting at the head of his brigade ; Lindsay saved two of his nine guns; but neither of the two Englishmen was responsible for the want of proper disposition of the troops which mainly caused the disaster. Lankuran was taken by Persia, but retaken by Russia during the next three months; and on the 13th October 1813, through Sir Gore Ouseley's intervention, the treaty of Gulistan put an end to the war. Persia formally ceded Georgia and the seven provinces before named, with Karabagh.

On the death of the emperor Alexander in December 1825 Prince Menschikoff was sent to Tehran to settle a dispute which had arisen between the two Governments regarding the prescribed frontier. But, as the claim of Persia to a particular district tlen occupied by Russia could not be admitted, the special envoy was given his congé, and war was

recominenced. The chief of Talish struck the first blow, and drove the enemy from Lankuran. The Persians then carried all before them ; and the hereditary chiefs of Shirwan, Sheki, and Baku returned from exile to co-operate with the shah's general in the south. In the course of three weeks the only advanced post held by the governor-general of the Caucasus was the obstinate little fortress of Shishah. But before long all was again changed. Hearing that a Russian force of some 9000 men was concentrated at Tiflis, Muhammad Mirza, son of the crown

plaints of Persian travellers, merchants, and pilgrims culminated in a declaration of war. This made 'Abbas Mirza at once seize upon the fortified places of Toprak Kal'ah and Ak Sarai within the limits of the Ottoman empire, and, overcoming the insufficient force sent against him, he was further enabled to extend his inroads to Mush, Bitlis, and other known localities. The Turkish Government retaliated by a counter-invasion of the Persian frontier on the south. At that time the pasha of Baghdad was in command of the troops. He was defeated by Muhammad 'Ali Mirza, then prince- governor of Karmanshah, who drove his adversary back towards his capital and advanced to its immediate environs. Being attacked with cholera, however, the Persian commander recrossed the frontier, but only to succumb under the disease in the pass of Kirind. In the sequel a kind of desultory warfare appears to have been prosecuted on the Persian side of Kurdistan, and the shah himself came down with an army to Hamadan. Cholera broke out in the royal camp and caused the troops to disperse.

In the north the progress of 'Abbas Mirza was stopped at Baiyazid by a like deadly visitation ; and a suspension of hostilities was agreed upon for the winter season. At the expiration of four months the sardar of Erivan took possession of a Turkish military station on the road to Arzrum (Erzeroum), and the crown prince marched upon that city at the head of 30,000 men. The Ottoman army which met him is said to have numbered some 52,000; but victory was on the side of their opponents. Whether the result was owing to the defection of 15,000 Kurds or not the evidence adduced is insuffi- cient to decide. In the English records of the period it is stated that

“the defeat of the Turks was complete; the greater part of their army fled in disorder from the field, abandoning all their tents and baggage, and fourteen pieces of artillery.” It is added: “the prince royal followed up his successes, and advanced within two days’ march of Arzrum, but the cholera morbus is said to have again broken out in his army, and in such a manner as effectually to arrest its further advance.” ?

Profiting from this victory, ‘Abbas Mirza repeated an offer of peace before made without avail to the pasha of Arzrum ; and, in order to conciliate him more effectually, he retired within the old limits of the dominions of the shah, his father. But more troubles arose at Baghdad, and other reasons intervened to protract negotiations for a yearanda half. At length, in July 1828, the treaty of Arzrum closed the war between Turkey and Persia. It may be remarked that this document is sensible and business-like, and provides especially against a recurrence of the proved causes of war, such as interference in one another’s fronticr districts, extorting taxes from Persian travellers or pilgrims, disrespect to the ladies of the royal harem and other ladies of rank proceeding to Mecca or Karbala (Kerbela), irregular levies of custom-duties, non-punishment of Kurdish depredators transgressing the boundary, and the like. Fath ‘Ali Shah in it is styled ‘‘ King of kings, the Sultan son of a Sultan— the Conqueror,” and Mahmud II. is ‘‘ Protector of the Faith, Guardian of the Holy Cities, Ruler by Sea and Land, the Sultan son of a Sultan —the Conqueror.”

prince, advanced to meet them on the banks of the Zezam. He was defeated ; and his father, seeking to repair the loss, was routed more seriously still at Ganja. The shah made great efforts to renew

With respect to the eastern boundaries of his kingdom, Fath ‘Ali The Shéh was fortunate in having to deal with a less dangerous neigh- Afgbal) bour than the Muscovite of persistent policy and the Turk of questic

the war ; but divisions took place in his son’s camp, not conducive to successful operations, and new proposals of peace were made. Ardabil, and even Tabriz, had been threatened, and, although the threat had been rather signified than expressed, the presence of Russian troops south of the Arras was calculated to strike terror in Adarbaijan. But Russia demanded Erivan and Nakhtchivan (Nakhichevan) as well as the cost of the war; and in 1827

the campaign was reopened. Briefly, after successive gains and losses, not only Erivan was taken from Persia but Tabriz also, and finally, through the intervention of Sir John Macdonald, the English envoy, a new treaty was concluded at Turkmanchai, laying down the boundary between Russia and Persia very much as it has been formed in 1884. Among the hard conditions for the latter country were the cession in perpetuity of the khanates of Erivan and Nakh- tchivan, the inability to have an armed vessel in the Caspian, and the payment of a war indemnity of some £3,000,000.

precarious friendship. The Afghan was neither a contemptible foe nor a sure ally, but he was not tainted with that fictitious civiliza- tion of semi-Oriental people which makes duplicity the essence of diplomatic intercourse. He had scen too little of Europeans to imitate them in their worst and weakest points; and, though equal to the Persian in physical force and prowess, he was his inferior in worldly knowledge and experience. Quite as dishonest as his neighbours and more treacherous than most, he had not the polished ingenuity to conceal his dishonesty and double-dealing. Moreover, the family divisions among the ruling houses of Afghanistan grew from day to day more destructive to that patriotism and sense of nationality which Ahmad Shah had held out to his countrymen as the sole specifics for becoming a strong people.

The revolt of Nadir Mirza had, as before explained, drawn the shah’s attention to Khurasan in the early part of his reign ; but, although quiet had for the moment been restored at Mashhad by

War After Russia, the neighbouring state next in importance to the | the presence of the royal camp, fresh grounds of complaint were with wellbeing of Persia was Turkey, with whom she was united on the | urged against the rash but powerless prince, and recourse was had Turkey. west by a common line of frontier. Fath ‘Ali Shah was fortunate in | to extreme measures. Charged with the murder of a holy saiyid,

having had but one war with the sultan during his whole reign, and that one of no duration. Salim had not scrupled, it is true, in 1804 and 1805, to allow the Russians to make free use of the south-eastern coasts of the Black Sea, to facilitate operations against the shah’s troops ; and there had been a passage of arms between the king’s eldest son, Muhammad ‘Ali Mirza, and

Sulaiman Pasha, son-in-law of the governor-general of Baghdad, which is locally credited as a battle won by the former. But there was no open rupture between the two sovereigns until 1821, when the frontier disputes and com-

aie "'wakilu 'l-mulk," governor of Karman, told Colonel Goldsmid, when his guest in 1866, that "his father had been Sir John Maleolm's Mihmandar,. There never Was such a man as 'Malcolm Sahib.' Not only was he generous on the part of his government, but with his own money also" (Telegraph and Travel, p. 585).

his hands were cut off and his tongue was plucked out, as part of the horrible punishment inflicted on him,

It does not appear that Nadir Mirza's cause was ever seriously espoused by the Afghans, nor that Fath 'Ali Shah's claim to Mash- had, as belonging to the Persian crown, was actively resisted. But the large province of Khurasan, of which Mashhad was the capital, and which included Darahgaz and Kelat-i-Nadiri in the north and Kaiyan in thesouth, had never been other than a nominal dependency of the crown since the death of Nadir; and in the autumn of 1830

2 Annual Register, '* History of Europe" (1822), There is a note in connexion with the text from which these extracts are taken, on the state of Anglo-Persian relations and the predominance of Russian influence at Tehran, well worthy the reader's perusal.

the shah, under Russian advice, assembled a large force to bring into subjection all turbulent and refractory chiefs on the east of his kingdom. Yazd and Karman were the first points of attack ; Khurasan was afterwards entered by Semnan, or the main road from Tehran. The expedition, led by 'Abbas Mirza, involved some hard fighting and much loss of life. A considerable extent of ground was traversed ; several forts and places were captured, among them Kabushan and Sarakhs ; and it may be concluded that the objects contemplated were more or less attained. An English officer, Colonel Shee, commanded what was called the '' British detach-

ment” which accompanied the prince. Thus far as regards Yazd, Karman, and Khurasan. It was otherwise with Herat.

Hajji Firizu’d-Din, son of Timur Shah, reigned undisturbed in that city from 1800 to 1816. Since Fath ‘Ali Shah’s accession he and his brother Mahmud had been, as it were, under Persian protection ; and, when the king retraced his steps homeward after his expedition to Mashhad, at the commencement of the century, it is supposed that he did so at the request of an ambassador from Zaman Shah of Kabul. Persia claimed the principality of Herat as part of the empire of Nadir, but her pretensions had been satisfied by payments of tribute or evasive replies. Now, however, that she marched her army against the place, Firazu ’d-Din called in the aid of his brother Mahmud Shah of Kabul, who sent to him the famous wazir, Fath Khan Barakzdi. The latter, intriguing on his own account, got possession of the town and citadel ; he then sallied forth, engaged and defeated the Persian forces, and forced them to retire into their own country. ‘There are various accounts of this action, and the Persian story is that the Afghans were defeated ; but no one dis- putes the result, ¢.¢c., the retreat of the invading army. In 1824, on a solicitation from Mustafa Khan, who had got temporary hold of Herat, more troops were despatched thither, but, by the use of money or bribes, their departure was purchased. Some eight or nine years afterwards ‘Abbas Mirza, when at the head of his army in Mashhad, invited Yar Muhammad Khan of Herat to discuss a settlement of differences between the two Governments. The meeting was unproductive of good. Again the Persian troops advanced to Herat itself under the command of Muhammad Mirza, son of ‘Abbas ; but the news of his father’s death caused the com- mander to break up his camp and return to Mashhad.

Sir Gore Ouseley returned to England in 1814, in which year Mr Ellis, assisted by Mr Morier—whose ‘‘ Hajji Baba”’ is the un- failing proof of his ability and deep knowledge of Persian character —negotiated on the part of Great Britain the treaty of Tehran. England was to provide troops or a subsidy in the event of unpro- voked invasion, while Persia was to attack the Afghans should they invade India. Captain Willock succeeded Mr Morier as chargé d’affaires in 1815, and since that period Great Britain has always been represented at the Persian court. It was in Fath ‘Ali Shah’s reign that Henry Martyn was in Persia, and completed his able translation of

the New Testament into the language of that country. He had met Malcolm and Mackintosh at Bombay, and Sir John had recommended him to Sir Gore Ouseley, to whose mission he officiated as chaplain prior to departure from Shiraz in 1812. Martyn died at Tokat in Asia Minor, on his homeward

journey. Little more remains to be here narrated of the days of

Fath ‘Ali Shah. Among the remarkable occurrences may be noted the murder at Tehran in 1828 of M. Grebayadoff, the Russian envoy, whose conduct in forcibly retaining two women of Erivan pro- voked the interference of the mullas and people. To repair the evil consequences of this act a conciliatory embassy, consisting of a young son of the crown prince and some high officers of the state, was despatched to St Petersburg. Shortly afterwards the alliance with Russia was strengthened, and that with England slackened in proportion. There were reasons why this should be the outcome of the previous situation, some of which will be self- evident to the reader of blue-books, while others will remain mere matters of opinion.

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each side are two square pillars, on which are perched birds, probably intended 1830-1836.

for peacocks, studded with precious stones of every description, and holdi each a ruby in their beak. The highest part of the iron composed of . oval ornament of jewelry, from which emanate a great number of diamond rays.

_One passage may be added as not only significant of the indi- vidual monarch but also of the national character. __ When the audience was finished, the king desired one of his ministers to inquire from Ji‘afir ‘Ali Khan (the English Agent) what the foreigners said of him, and whether they praised and admired his appearance.”

Fath ‘Ali Shah had a numerous family. Agreeably to the Persian custom, asserted by his predecessors, of nominating the heir-apparent from the sons of the sovereign without restriction to seniority, he had passed over the

eldest, Muhammad ‘Ali, in favour of a junior, ‘Abbas ; but, as the nominee died in the lifetime of his father, the old king had proclaimed Muhammad Mirza, the son of ‘Abbas, and his own grandson, to be his successor. Why a younger son had been originally selected, to the prejudice of his elder brother, is differ- ently stated by different writers. The true reason was probably the superior rank of his mother. Markhain’s estimate of the char- acter of the crown prince, based upon conflicting evidence, but apparently correct, is that “he possessed enlightened views,” was “desirous of improving the condition of his country,” yet “was deficient in talent, rather weak-minded, and loved flattery.”

It is worthy of remark that the selection of Muhammad Mirza was made with the express concurrence of the British and Russian Governments, communicated to their respective representatives at the shah’s court ; and the British minister at St Petersburg was in- structed to express to the Government of the czar the gratification of his own Government at finding that the two powers were “ acting with regard to the affairs of Persia in the same spirit,” and were “equally animated by a sincere desire to maintain not only the ee pendualagy but also the independence and integrity of

ersia.’

Muhammad Shah was twenty-eight years old when he came to Muham- the throne in 1834. He died at the age of forty-two, after a reign maa of about thirteen and a half years. His accession was not publicly Shéh.

notified for some months after his grandfather’s death, for it was necessary to clear the way of all competitors, and there were two on this occasion, — one ‘Ali Mirza, governor of Tehran, who actually as- sumed a royal title, and one Hasan ‘Ali Mirza, governor of Shiraz. Owing to the steps taken by the British envoy, Sir John Camp- bell, assisted by Colonel Bethune, at the head of a considerable force, supplied with artillery, the opposition of the first was neu- tralized, and Muhammad Shah, entering Tehran on 2d January, was proclaimed king on the 31st of the same month. It cost more time and trouble to bring the second to book. Hasan ‘Ali, “ farman- farma,” or commander-in-chief, and his brother and abettor, had an army at their disposal in Fars. Sir Henry Lindsay Bethune marched his soldiers to Ispahan to be ready to meet them. An engagement which took place near

Kumishah, on the road between Ispahan and Shiraz, having been successful, the English com- mander pushed on to the latter town, where the two rebel princes were seized and imprisoned. Forwarded under escort to Tehran, they were, according to Watson, ordered to be sent on thence as state prisoners to Ardabil, but the farman-farma died on the way, and his brother was blinded before incarceration. Markham, however, states that both ‘Ali Mirza and Hasan ‘Ali were allowed to retire with a small pension, and that no atrocities stained the beginning of the reign of Muhammad Shah. It is presumed that the fate of the prime minister, or “ kdim-makam,” who was strangled in prison, was no more than an ordinary execution of the law. This event, and the prevalence of plague and cholera at Tehran, marked somewhat gloomily the new monarch’s first year. , The selection of a premier was one of the first weighty questions for solution. .A member of the royal family, the ‘‘asafu ’d-daulah,” governor of Khurasan, left his government to urge his candidature for the post. The king’s choice, however, fell on Hajji Mirza Aghasi, a native of Erivan, who in former years, as tutor to the

ath As an Oriental despot Fath ‘Ali Shah was neither cruel nor un- | sons of ‘Abbas Mirza, had gained a certain reputation for learning lis just, but acts of cruelty and injustice were committed under his | and a smattering of the occult sciences, but whose qualifications larac- sanction. The treatment of Nadir Mirza has been mentioned. That | for statesmanship were craftiness and suspicion. Such a counsellor t, &c. of the old minister, Hajji Ibrahim, was perhaps more barbarous still. | was hardly fitted for Muhammad Shah, whose natural bigotry

His fondness for sport and his literary tastes gave him the capacity of suiting his conversation to visitors of different kinds; but the love of money was a drawback to the exercise of his sympathies, and the loss of territory to Russia, involving as it did loss of revenue,

could scarcely fail to accept the short-sighted policy which the minister would be sure to advocate. As might have becn antici- pated, the hajji fell into the hands of Russia, represented by Count Simonich, who urged him to a fresh expedition into Khurasan and

the siege of Herat. There was no doubt a plausible pretext for both Expedi- proposals. The chiefs, reduced to temporary submission by ‘Abbas tion Mirza, had again revolted ; and Shah Kamran, supported by his against wazir, Yar Muhammad, had broken those engagements and pledges Herat. on the strength of which Fath ‘Ali Shah had withdrawn his troops.

was not calculated to arouse any strong sentiment of friendship towards the czar’s European allies. Morier’s description of the king’s person was thus given in 1809.

‘He isa man of pleasing manners and an agreeable countenance, with an aquiline nose, large eyes, and very arched eyebrows. His face is obscured by c Be renee Pr nes te Inioe my aie gre Bepevery beeen me ee In addition to these causes of offence he had aphopratcl ne when he talks and smiles that his mouth is discovered. is voice : : igh, Petes hadi lou atessed to ho been fine, and is still harmonious ; though now hollow, and obviously that of | province of Sistan, over pie c Theiee ay oe to go farther a man who has led a free life… . He was seated on a species of throne | the rights of suzerainty. _ Bu e king Po, called the takht-i-tdzis, or the throne of the peacock, which is ise ey frau than retaliation or chastisement. He pied to rie any the ground, and appears an oblong square of 8 feet broad an et i separate government whatever on the part of the Afghans. could see the bust mg of his majesty, as the rest of his body was hidden by right to sepa 8 iP : an elevated railing, the upper work of the throne, at the corners of which were placed several ornaments of vases and toys. The back is much raised; on

1 Correspondence relating to Persia and Afghanistan, London, 1839.

1836-1848. and Kandahar and Ghazni were to be recovered, as belonging to

Siege of Herat.

the empire of the Safawi dynasty. The advice of the British envoy was dissuasive in this respect, and therefore distasteful. seam Sir John Campbell, in less than a year after the sovcreign's

installation, went home, and was succeeded as British envoy by .

Mr Henry Ellis. The change in personnel signified also a transfer of superintendence of the Persian legation, which passed from the Government in India to the authorities in England. In 1836, on the return home of Mr Ellis, Mr M'Neill became chargé d'affaires.

About this time the arrangements for the expedition were matured. It was to commence with a campaign against the Turkmans,—Herat being its later destination. The king would command in person, and the army would be formidable in numbers and war material. Such counter-proposals as Mr Ellis had suggested for consideration, in his earnest endeavours to divert the shah from his purpose, had

been politely put aside, and the counscls of the war-party had pre-.

yailed. Should the main operations designed be successful, and Herat fall to Persia, it was impossible to foretell the result; and the case was now more than ever complicated by the action of the Barakzai chiefs of Kandahar, who had sent a mission to Tehran to offer assistance against their Saduzai rival at Herat. Fresh provo- cation had, moreover, been given to the shah's Government by the rash and incapable Kamran.

About the close of the summer the force moved from Teliran. The royal camp was. near Astrabad in November 1836. Food was scarce: barley sold

for ten times the usual price, and wheat was not procurable for any money. The troops were dissatisfied, and, being kept without pay and on short rations, took to plundering. There had been operations on the banks of the Gurgan, and the Turkimans had been driven from one of their strongholds; but little or no progress had been made in the subjection of these marauders, and the Heratis had sent word that all they could do was to pay tribute, and, if that were insufficient, the shah had better march to Herat. A military couneil was held at Shahrud, when it was decided to return to the eapital and set out again in the spring. Accordingly the troops dispersed, and the sovereign's presence at Tehran was taken advantage of by the British minister to renew his attempts in the cause of peace. But rcmonstrance was vain, and, although on the present occasion Count Simonich ostensibly aided Mr M 'Neill, no arguinent was of any avail to divert the monarch from his pur- pose. He again set out in the summer, and, invading the Herat territory in November 1837, began the siege on the 23d of that month.

Not until September in the following year did the Persian army withdraw from before the walls of the city ; and then the move- ment only took place on the action of the British Government. Ordinary pressure and argument had failed. It had become neces- sary to use strong language, and to resort to strong measures, the purport of which could not be mistaken. Mr M'Neill, who had joined the Persian camp on 6th April, left it again on 7th June. He had in this interval done all in his power to effect a reasonable agreement between the contending parties by personal communi- cation with Afghans in Herat as well as with the shah and his minister ; but both in this respect and in the matter of a com-

mercial treaty with England, then under negotiation, his efforts had –

been met with evasion and latent hostility, and this last feeling had been notably evinced in the seizure and violent treatment of a messenger bearing an official communication from a foreign Govern- ment to the British minister at Tehran. The Russian envoy, who had appeared among the tents of the besieging army almost simul- taneously with his English colleague, no sooner found himself alone in his diplomacy than he resumed his aggressive counscls, and little more than a fortnight had elapsed since Mr M'Ncill's departure when a vigorous assault, planned, it is asserted, by

Count Simonich himself, was made upon Herat. The Persians attacked at five points, at one of which they would in all likelihood have been successful had not the Afghans been aided by Eldred Pottinger, a young Englishman, who with the science of an artillery officer combined a courage and determination which inevitably influenced his subordinates. Through his exertions the assailants were beaten back, as they were also independently at the other points noted. Still the garrison was disheartened; and, had not Colonel Stoddart's arrival on 11th August to threaten the shah with British inter- vention put a stop to further action, there is no knowing what mischief might have resulted from the incompetence and intrigues of Kamran and his advisers. As it happened, Colonel Stoddart's firm attitude and refusal to allow any but British mediators to decide the pending dispute won the day ; and that officer was able to report that on 9th September Muhammad Shah had "mounted his horse" and gone from before the walls of the beleaguered city. The siege of Herat was the great event in the reign of Muhammad Shah. It lasted for nearly ten months; and the story of its pro- gress 1s a strange record of a desultory campaign in which intrigue and conspiracy were the continuously working agencies, while military action was spasmodie. The British expedition in support of Shah Shuj'a, which may be called its natural consequence, in- volves a question foreign to the present narrative. Persia's cou-

nexion with Afghanistan can only be partial, and confined to Herat, Kabul, Kandahar, or one section of the country only. A united Afghanistan would always be distasteful to her. —

The remainder of the king's reign was marked by new difficul- ties with the British Government; the rebellion of Agha Khan Mahlati, otherwise known as the chief of the Assassins; a new rupture with Turkey; the banishment of the asafu 'd-daulah, governor of Khurasan, followed by the insurrection and defeat of his son; and the rise of the sect of the Babis. The first of these only calls for any detailed aecount.

In the demands of the British Government was included the Difi- cession by Persia of places such as Ghurian, Farah, and Sabzawar, culty which had been taken during the war from the Afghaus, as well as with

reparation for the violence offered to the courier of the British legation. The shah, in ill-humour at his fruitless expedition to Herat, deferred compliance with these requisitions, and indeed sought to evade them altogether. M‘Neill gave a certain time for decision, at the end of which, no satisfactory reply having reached him, he broke off diplomatic relations, ordered the British officers lent to the shah to proceed towards Baghdad en route to India, and retired to Arzrum with the members of his mission. On the Persian side, charges were made against M‘Neill, and a special envoy, sent to England to support them, was instructed to represent the so- called injuries which British diplomatic action had inflicted on the shah. An endeavour was at the same time made to interest the cabinets of Europe in influencing the British Government on behalf of Persia. The envoy managed to obtain an interview with the minister of foreign affairs in London, who, in July 1839, supplied him with a statement, fuller than before, of all English demands upon his country. Considerable delay ensued, but the outcome of the whole proceedings was not only acceptance but fulfilment of all the engagements contracted. In the meantime the island of Karak had been taken possession of by an expedition from India. On 11th Oetober 1841 a new mission arrived at Tehran from London, under Mr (now Sir) John M‘Neill, to renew diplomatic relations. It was most cordially received by the shah, and it nced scarcely be added that, as one of its immediate results, Karak was evacuated by the British-Indian troops. There had been a long diplomatic correspondence in Europe on the proceedings of Count Simonich and other Russian officers at Herat. Among the papers is a very important letter from Count Nesselrode to Count Pozzo di Borgo in which Russia declares herself to be the first to counsel the shah to acquiesce in the demand made upon him, because she found ‘‘ justice on the side of England” and ‘‘wrong on the side of Persia.” She withdrew her agent from Kandahar and would “not have with the Afghans any relations but those of commerce, and in no wise any political interests.” She recalled to the English cabinet her wishes before expressed. “To re-establish promptly the relations of friendship between the courts of London and of Tehran; to put_an end to the hostile measures adopted in the Persian Gulf; to abstain

from disturbing the tranquillity of the people of the centre of Asia by nourishing their animosities ; to be contented with competing in industry in those vast countries, but not to engage there in a struggle for political influence ; to respect the independence of the intermediate countries which separate" her own from British territory. Such, it was emphatically stated, was "'the system which England and Russia have a common interest invariably to pursue, in order to prevent tlie possibility of a conflict between these two great powers, which, that they may continue friends, require to

remain each within its own limits, and not to advance against each other in the centre of Asia." 1

Agha \han's rebellion was fostered by the defection to his cause of a large portion of the force sent against him ; but he yielded at last to the local authorities of Karman and _fled the province and country. He afterwards resided many years at Bombay, where, while maintaining among natives a quasi-spiritual character, he is better known among Europeans for his doings on the turf.

The quarrel with Turkey, though specific in the case of indi- vidual actors, was generally about frontier relations and trans- gressions of the border. . Eventually the matter was referred to an Anglo-Russian commission, of which Colonel Williams (since Sir Fenwick Williams of Kars) was president. .A massacre of Persians at Karbala might have seriously complicated the dispute, but, after a first burst of indignation and call for vengeance, an expression of the regret of the Ottoman Government was accepted as a sufficient apology for the occurrence.

The rebellion of the asafu 'd-daulah, maternal uncle of the shah, was punished by exile, while his son, after giving trouble to his opponents, and once gaining a victory over them, took shelter with the Turkmans.

Sa'id Muhammad 'Ali, founder of the Babis, was born at The Shiréz about 1810.2 Adopting a life of seclusion, and practising Babis

a kind of exaggerated Sufism, he followed for some time the call- ing of a dervish, and when at Kazimain near Baghdad he openly asserted his pretensions as a prophet. The Turkish authorities

1 Correspondence relating to Persia and Afghanistan, London, 1839. The annexation of Sind and the Panjab will, it is. presumed, be given as excuses for the partial absorption of Turkestan. But the cases are in no way analogous, The occupation by Russia of the Persian island of Ashurada in the south-east corner of the Caspian followed the British reverses in Kabul of 1841.

2 Lady Sheil. Gobineau says 1824.

would have put him to death, but the Persian consul, claiming him as a subject, saved his life, and sent him to his native place. Thenceforward his career is strange and adventurous; and even when he himself had been committed to prison his agents were

employed in promulgating his doctrine, with sufficient success to _

occasion the issue of a decree making it a capital crime to profess the tenets of Babism. More will be said on the subject shortly.

Before closing the reign of Muhammad Shah note should be taken of a prohibition to import African slaves into Persia, and a commercial treaty with England,—recorded by Watson as gratifying achievements of the period by British diplomatists. The French missions in which occur the names of MM. de Lavalette and de Sartiges were notable in their way, but somewhat barren of results.

In the autumn of 1848 the shah was seized with the malady, or combination of maladies, which caused his death. Gout and erysipelas had, it is said,! ruined his constitution, and he died at his palace in Shamiran on 4th September. He was buried at Kum, where is situated the shrine of Fatima, daughter of Imém Riza, by the side of his grandfather, Fath ‘Ali, and other kings of Persia. In person he is described as short and fat, with an aquiline nose and agreeable countenance.?

On the occasion of his father’s death, Nasru ’d-Din Mirza, who

had been proclaimed wali ‘ahd, or heir-apparent, some years before, was absent at Tabriz, the headquarters of his province of Adar- baijan. Colonel Farrant, then chargé d’affaires on the part of the British Government, in the absence of Coloncl Sheil, who had succeeded Sir John M‘Neill, had, in anticipation of the shah’s decease and consequent trouble, sent a messenger to summon him instantly to Tehran. The British officer, moreover, associated himself with Prince Dolgorouki, the representative of Russia, to secure the young prince’s accession ; and there was no doubt in the minds of the wiser lookers-on that, if the two diplomatists were really of one mind in the matter, they would attain their end in spite of all obstacles.

They did soafter a time, and with the aid of the queen-mother, who, as president of the council, showed much judgment and capacity in conciliating adverse parties. But the six or seven weeks which passed between the death of the one king and the coronation of the other proved a disturbed interval, and full of stirring incident.

The old minister, Hajji Mirza Aghasi, incurred the displeasure of | the influential part of the community by shutting himself up in,

the royal palace with 1200 followers, and had to take refuge in the sanctuary of Shah ‘Abdu ’l-‘Azim near Tehran. On the other hand Mirza Agha Khan, a partisan of the asafu ’d-daulah, and himself an ex-mninister of war, whom the hajji had caused to be banished, was welcomed back to the capital. At Ispahan, Shiraz, and Karman serious riots took place, which were with difficulty sup- pressed. While revolution prevailed in the city, robbery was rife in the province of Yazd ; and from Kazvin the son of ‘Ali Mirza, otherwise called the ‘‘zillu ’s-sultan,” the prince-governor of Tehran, who disputed the succession of Muhammad Shah, came forth to contest the crown with his cousin, the heir-apparent. The last-named incident soon camc to an inglorious termination for its hero. Buta more serious revolt was in full force at Mash- had when, on the 20th of October 1848, the young shah entercd his capital and was crowned at midnight king of Persia.

The chief events in the long reign of the present shah, Nasru ’d-Din, may be reviewed under four heads: (1) the insurrection in Khurasan, (2) the insurrection of the Babis, (8) the fall of the amiru ’n-nizam, and (4) the war with England.

It has been stated that the asafu’d-daulah was a competitor with Hajji Mirza Aghasi for the post of premier in the cabinet of Muhammad Shah, that he was afterwards, in the same reign, exiled for rising in rebellion, and that his son, the salar, took shelter with the Turkmans. Some four months prior to the late king’s decease the latter chief had reappeared in arms against his authority ; he had gained possession of Mashhad itself, driv- ing the prince-governor, Hamza Mirza, into the citadel; and so firm was his attitude that Yar Muhammad of Herat, who had come to help the Government officials, had retired after a fruitless co-operation, drawing away the prince-governor also. The salar now defied Murad Mirza, Nasru ’d-Din’s uncle, who was besieging the city ; he found secret means of obtaining money and supplies ; and, by occasionally repelling an assault or effecting a skilful sortie, he kept up a prestige of power, which, added to his personal popu- larity, commanded the sympathy and good wishes of the multitude. In April 1850, after a siege of more than eighteen months, fortune turned against the bold insurgent, and negotiations were opened between the citizens and besiegers for the surrender of the town and citadel. Treachery may have had to do with the result, for when the shah’s troops entered the holy city the salar sought refuge in the mosque of Imam Riza, and was forcibly expelled. Je and _ his brother were seized and put to death, the instrument used being, according to Watson, “the bowstring of Eastern story.” The con- queror of Mashhad, Murad Mirza, became afterwards himself the prince-governor of Khurasan.

1 Watson. 2 Markhani.

Lady Sheil has written a graphic account of the death of Sa‘id 1848-1851.

Muhaminad ‘Ali. After repeated arrests and warnings to no pur- pose the spread of his doctrines had become so rapid among all classes that it was thought necessary to remove him by the severest punishment of the law. He was conveyed to Tabriz, and brought out in the great square for execution.

“A company of soldiers was ordered to despatch Bab by a volley. When the smoke had cleared away BAb had disappeared from sight. It had so happened that none of the balls had touched him, and, prompted by an impulse to preserve his life, he rushed from the spot. Had Bab possessed sufficient presence of inind to have fled to the bazar . . . he would in all probability have succeeded in effecting his escape. A miracle palpable to all Tabriz would have been performed, and a new creed would have been established. But he turned in the opposite direction, and hid himself in the guard-room, where he was immediately discovered, brought out, and shot. His body was thrown into the ditch of the town, where it was devoured by the half-wild dogs which abound outside a Persian city. Bab possessed a mild and benignant counte- nance, his manners were composed and dignified, his eloquence was impressive, and he wrote rapidly and well.”

Later on she wrote—

“This year (1850) seven Babis were executed at Tehran for an alleged con- Spiracy against the life of the prime minister. Their fate excited general sym- pathy, for every one knew that no criminal act had been committed, and suspected the accusation to be a pretence. ... Previously to decapitation they received an offer of pardon, on the condition of reciting the kalama (or Muhammadan creed). . . . It was rejected, and these visionaries died stedfast in their faith. . . . In Zanjan the insurrection, or the religious movement, as the Babis termed it, broke out with violence. This city is only 200 miles from Tehran, midway to Tabriz. At its head was a mulla of repute and renown, who, with his associates, retired into an angle of the city, which they strength- ened as best they could. For several months they defended themselves witli unconquerable resolution against a large force in infantry and guns, sent against them from Tehran. Jt was their readiness to meet death that made the Babis so formidable to their assailants. From street to street, from house to house, from cellar to cellar, they fought without flinching. All were killed at their posts, excepting a few who were afterwards bayoneted by the troops in cold blood.” ;

_ In the summer of 1852 his majesty was attacked, while riding in the vicinity of Tehran, by four men, one of whom fired a pistol and slightly wounded him. This man was killed, and two others were captured by the

royal attendants; the fourth jumped down a well. The existence of a conspiracy was then discovered, in which some forty persons were implicated ; and ten of the con- spirators (one a young woman) were put to death,—some under cruel torture. A short reign of terror then ensued which is well

illustrated in the following extract from Watson's History.

"The prime minister . . . was fearful of drawing down upon himself and his family the vengeance of the followers of the Bab; and, in order that others might be implicated in these executions, he hit upon the device of assigning a criminal to each department of the state; the several ministers of the Shah being thus compelled to act as executioners. The minister for foreign aflairs, the minister of finance, the son of the prime minister, the adjutant-general of the army, and the master of the mint, each fired the first shot, or made the first cut with a sabre, at the culprits assigned to their several departments, respectively. The artillery, the infantry, the camel-artillery, and the cavalry, eachi had a victim.3. . . But the result of all this slaughter was, as might have been expected, to create a feeling of sympathy for the Babis, whose crime was lost sight of in the punishment which had overtaken them. They inet their fate with the utmost firmness, and none of them cared to accept the life which: was offered to them on the simple condition of reciting the Muslim creed. While the lighted candles were burning the flesh of one follower of the Bab, he was urged by the chief magistrate of Tehran to curse the Bab and live. He would not renounce the Bab; but he cursed the magistrate who tempted hiin to do so, he cursed the Shah, and even cursed the prophet Muham- mad, his spirit rising superior to the agony of his torture." d

The movement, however, was not only felt in Tehran and Zanjan but also in Mazandaran, Fars, Karman, and Tabriz ; and, in spite of the fearful punishments with which the professors of the doctrine have been visited, the complete extinction of Babism by fire and sword is a consummation hardly to be set within the range of

human probability. —_ Mirza Taki, the amiru 'n-nizim (vulgarly amir nizam), or com-

Perse- cution of the Babis.

Fall of

mander-in-chief, was a good specimen of the self-made man of Mirza

Persia. Shaéh's brother, and he had filled high and important offices of

state and amassed much wealth when he was made by the young shah Nasru'd-Din, on his accession, both his brother-in-law and his prime minister. The choice was an admirable one ; he was honest, hard-working, and liberal according to his lights ; and the services of a loyal and capable adviser were secured for the new regime. For the rebellion in Khurdsan and all emergencies that occurred during his three years' tenure of office, he was the same active and intelligent mentor that he had been when associated with the prince in his government of Adarbaijan. Unfortunately, he did not boast the confidence of the queen-mother ; and this circumstance greatly strengthened the hands of those eneinies whom an honest minister must ever raisc around him in a corrupt Oriental state. For a time the shah closed his eyes to the accusations and insinuations breathed against him; but at last he fell under the evil influence of designing counsellors, and acts which should have redounded to the minister's credit became the charges on which he lost his office and his life. He was credited with an intention to grasp in his own hands the royal power ; his influence over the army was

3 "'Hyen the Shah's admirable French physician, the late lamented Dr Cloquet, was invited to show his loyalty by following the cxample of the rest of the court. He excused himself, and pleasantly said that he killed too many men professionally to permit him to increase their number by any voluntary hoimi-

cide on his part" (Lady Sheil).

He was the son of a cook of Bahrdém Mirza, Muhammad Taki.

1851-1872.

cited as a cause of danger; and on the night of 138th November 1851 he was summoned to the palace and informed that he was no longer premier. Mirza Agha Khan, the "'itimadu 'd-daulah," was named to succeed him, and had been accordingly raised to the dignity of ''sadr'azim."' As the hostile faction pressed the neces- sity of the ex-minister's removal from the capital, he was offered the choice of the government of Fars, Ispahan, or Kum. He declined all; but, through the mediation of Colonel Sheil, he was afterwards offered and accepted Kashan. It is not probable that Mirza Taki, once fallen from his high estatc, would have long survived, or rather would have been long suffered by his rivals or foes to survive, this crisis in his carecr. For intriguers and ehar- latans he was too real a character to be harmless, and means would have doubtless been devised to get rid of him altogether. As it happened, opportunity was taken of an ill-timed if well-meant interference on his behalf of the Russian legation, and the shah's ire was aroused more than ever against him.

'Once having got him out of the way," writes Major Euan Smith from information gathered on the scene of the tragedy he is recounting, "'his enemies had full play, and, forty days after his banishment, prevailed upon the king to issue orders for his execution. . .. The executioners arrived at Fin, and, seeing the ex-minister, told him that they had been sent by the shah to ask after his health. Mirza Taki Khan at once saw that his fate was sealed; he merely asked that, instead of having his throat cut, he might be allowed to die in his own way. The request was granted; he went into the hammdm, where the king's barber opened the two principal arteries in each arm, and he quietly sat there and bled to death." !

Po its Wee

| HISTORY.

'This occurred_in December, the same month in which the British envoy quitted Tehran. In the first week of 1856, negotiations were opened at Constantinople, when the Persian chargé d'affaires in that city related his version of the quarrel to our well-known ambassador there. Discussion was prolonged for some months in 1856, during which an 'ultimatum' from Lord Clarendon had been put forward without avail; and in October, a plenipotentiary nained Farrukh Khan arrived at the Porte with the Shah's

instructions to settle the whole matter in dispute. But although this personage went so far as to signa declaration that Herat should immediately be evacuated by the troops of his sovereign, other engagements were required from him which he could not undertake, and the attempt at a settlement failed. Lord Stratford presented a new ‘ultimatum’ on November 22d; but it was then too late to avert an out- break. The news that Herat had been captured on October 26th, and that three proclamations declaring war against Persia had been issued by the governor-general of India on November Ist, soon reached Constantinople, and Farrukh Khan’s occupation was, for the moment, gone.”

In less than three weeks after issue by the governor-general of India of the proclamation of war with Persia the Sind division of the field force left Karachi (Kurrachee). On 18th January following the Bombay Government orders notified the formation of a second division under Lieutenant-General Sir James Outram. Before the general arrived the island of Karak and part of Bushahr had both been occupied, and the fort of Rishir had been attaeked and car- ried. After the general’s arrival the march upon Barazjin and the engagement at Khushab—two places on the road to Shiraz— and the operations at Muhamrah and the Karun river deeided the campaign in favour of England. On 5th April, at Muhamrah, Sir James Outram received the news that the treaty of peace had

Rupture | When England was engaged in the Crimean War of 1854-55 her | been signed in Paris, where Lord Cowley and Farrukh Khan had with alliance with a Muhammadan power in no way added to her popu- | conducted the negotiations. The stipulations regarding Herat were England, larity or strengthened her position in Persia. The Sunni Turk | much as before; but there were to be apologies made to the mission

was almost a greater enemy to his neighbour the Shi‘ah than the formidable Muscovite, who had curtailed him of so large a section of his territory west of the Caspian. Hence during the war Persia coquetted with Russia as to a possible secret alliance, rather than

with France or England. Moreover, since Sir John M‘Neill’s arrival ‘

in Tehran in 1841, formally to repair the breach with Muhammad Shah, there had been little differences, demands, and explanations, which were portentous of a storm in the future ; and these symptoms had culminated in 1856, the year of the peace with Russia. As to Afghanistan, the wazir Yar Muhammad had in 1842, when the British troops were perishing in the passes, or otherwise in the midst of dangers, caused Kamran to be suffocated in his prison. Since that event hc had himself reigned supreme in Herat, and, dying in 1851, was succeeded by his son Sa‘id Muhammad. This chief soon entered upon a series of intrigues in the Persian interests, and, among other acts offensive to Great Britain, suffered one ‘Abbas Kult, who had, under guise of friendship, betrayed the cause of the salar at Mashhad, to occupy the citadel of Herat, and again place a detachment of the shah’s troops in Ghurian. Colonel Sheil remoustrated, and obtained a new engagement of non-interference with Herat from the Persian Government, as well as the recall of ‘Abbas Kuli. In September 1855 Muhammad Yusuf Sdduzai seized upon Herat, putting Sa‘id Muhammad to death with some of his followers who were supposed accomplices in the murder of lis uncle Kamran.

About this time Kohan Dil Khan, one of the chiefs of Kandahar, died, and Dost Muhammad of Kabul annexed the city to his terri- tory. Some relations of the deceased chief made their escape to Tehran, and the shah, listening to their complaint, directed the prince-governor of Mashhad to march across to the eastern frontier and occupy Herat, declaring that an invasion of Persia was imminent. Such was the situation when the Hon. Mr Murray was fulfilling his second year of duty at the legation in Tehran. He had relieved Mr Taylour Thomson, Colonel Sheil’s locwm tenens, at a time when relations were somewhat strained, and coolness and want of con- fidence were daily becoming more apparent between the British representative and the court to which he was accredited. The following passage is from a recently-published work treating of the place and period.?

“At the end of 1855, our relations with the court of Tehran were anything but satisfactory. Even the outward semblance of civility towards the English representative was disregarded, and, in like manner, the veneer of courtesy was wanting in the official communications bearing the sign-manual of the Shah or

his responsible minister. So great was the tension of ill-feeling occasioned, that our envoy withdrew to Baghdad, declining to resume the functions of his

for past insolence and rudeness, and the slave trade was to be sup- pressed in the Persian Gulf.

With the exception of a small force retained at Bushahr under General John Jacob for the three months assigned for execution of the ratifications and giving effect to certain stipulations of the treaty with regard to Afghanistan, the British troops returned to India, where their presence was greatly needed, owing to the out- break of the mutiny. The envoy retraced his steps from Baghdad to Tehran, to receive the excuses of the shah's minister. Before Mr Murray's arrival, however, an act of so-called retaliation, but savouring rather of sheer revenge, had been perpetrated, which could not have commended itself to the mind of an English diplo- matist on the spot. One of the articles of the treaty of peace pro- vided for the release of all prisoners taken by the Persians at Herat. Among these was the ex-ruler Muhammad Yusuf, who, having resisted the besieging army, had been brought captive to Tehran. The provision of merey was in his case tantamount to a sentence of savage death, for the relatives of Sa'id Muhammad (whom he had slain in return for the murder of his uncle Shah Kamran) awaited his release literally to hew him to pieces in front of the Kasri Kajar, a royal palace about 5 miles from the walls of the capital. When Colonel Taylor and the officers deputed with him to certify the evacuation of Herat by the Persian soldiers reached their destination, they were received by a newly-appointed governor, Sultan Ahmad Khan, better known as Sultan Jan, nephew and son-in-law of the amir Dost Muhammad. It is unnecessary to refer to other than the political reasons of the war. They soon ceased to interest the minds of even European residents in Persia ; and the war became a thing of the past. Mr Murray was succeeded in 1859 by Sir Henry Rawlinson as British envoy. No more popular nomination could have been made than that of this justly ~~dis~~ tinguished Oriental statesman; but he barely remained a year at the work. Retiring at his own request, he was succeeded by Mr Charles Alison, whose marvellous acquaintance with Turks and their language had rendered him an invaluable secretary at Constantinople.

It now only remains to mention those incidents which have engaged the attention of the British Government, or in which British officers have had to play a part. Such are the establishment of a telegraph, the settlement of the Perso-Baluch, and the arbi- tration on the Perso-Afghan frontier. The proceedings of Russia in the countries east of the Caspian and bordering on the Oxus have, moreover, a bearing morc or less direct on the interests of Great Britain, with especial reference to her Indian empire.

office until ample apology lad been made, by certain persons named, for certain offences charged, after a manner detailed by himself. A crisis such as this may, it is true, be brought about in Persia by ourselves, through defective diplomacy and ignorance of the native character, ways, prejudices, and, to some extent, language; butit may also arise from many other causes—among others,

The question of constructing a telegraph in Persia as a link in Anglo-}) the overland line to connect England with India was broached in Indian} Tehran by Colonel Patrick Stewart and Captain Champain, officers telegra), of engineers, in 1862, and an agreement on the subject con-lime |}

a wilful pre-determination on the part of the local government. Once instructed to give offence to strangers and provoke a rupture, the Persian is a wonderful adept in fulfilling his instructions; and will prove as capable in bandying insult and innuendo as inthe more complex and refined game of compliment and cajolery. In the present instance, there was in the attitude of Persia evidence of wilfulness and an exhibition of more than ordinary temper; for not only were the Shah’s own words full of insult, but his expressions were supplemented by deeds. Finally, by sending a large military expedition under his royal uncle, Prince Murad Mirza, to take possession of Herat, he showed his contempt of treaties, and aimed a blow at England’s Eastern policy in the most sensitive part.

1 Eastern Persia, vol. i. p. 156. The palace of Fin, near Kashan, was the residence of the amir nizim.

2 James Outram: a Biography, vol. ji., London, 1880.

cluded by Mr Edward Eastwick, when ehargé d'affaires, at the close of that year. Three years later a more formal convention, including a second wire, was signed by Mr Alison and the Persian foreign minister ; meantime the work had been actively carried on, and communication opened on the one side between Bushahr and Karachi and the Makran coast by cable, and on the other between Bushahr and Baghdad via Tehran. The untrustworthy character of the line through Asiatic Turkey caused a subsequent change of direction ; and an alternative line—the Indo-European—from London to Tehran, through Russia and along the eastern shores of the Black Sea, was constructed, and has worked well since 1872,

in conjunction with the Persian land telegraph system and the Bushahr-Karachi line.}

The Sistan mission, under Major-General (afterwards Sir Fred- eric) Goldsmid, left England in August 1870, and reached Tehran on 3d October. Thence it proceeded to Ispahau, from which city it moved to Baluchistan, instead of seeking its original destina- tion. Difficulties had arisen both in arranging the preliminaries to arbitration and owing to the disordered state of Afghanistan, and it was therefore deemed advisable to commence operations by set- tling a frontier dispute between Persia and the Kelat state. Unfor- tunately, the obstructions thrown in the way of this settlement by the Persian commissioner, the untoward appearance at Bampur of an unexpected body of Keldtis, and the absence of definite instructions marred the fulfilment of the programme sketched out; but a line of boundary was proposed, which has since been accepted by the litigants, and which, except perhaps in the case of a small district on the north, has, it is believed, been generally respected. In the following year the same mission, accompanied by the same Persian commissioner, proceeded to Sistan, where it remained for more than five weeks, prosecuting its inquiries, until joined by another mis- sion from India, under Major-General (afterwards Sir Richard) Pollock, accompanying the Afghan commissioner. Complications then ensued by the determined refusal of the two native officials to meet in conference ; and the arbitrator had no course available but to take advantage of the notes already obtained on the spot, and return with them to Tehran,

there to deliver his decision. This was done on 19th August 1872. The contending parties appealed to the British secretary of state for foreign affairs, as provided by previous understanding ; but the decision held good, and was event- ually accepted on both sides (see above, p. 619).

The Russo-Persian boundary question of 1881 might have been considered to belong to history, but has been treated elsewhere. It is, however, a strictly pacific arrangement, and has nothing in common with the treaties of Gulistan or Turkmanchai.

Mr Alison died at Tehran in April 1872. Mr Ranald Thomson, whose experience of Persia is of thirty-five years' duration, then

became chargé d'affaires, and held the post until relieved by his brother, Mr (since Sir) Taylour Thomson from Chili. On the re- tirement of the latter in April 1879, Mr (sinceSir Ranald) Thomson succeeded as envoy. During the later years of the reign of Nasru'd- Din several Englishmen have distinguished themselves as explorers in the north-east. Among them the names of O'Donovan, Napier, Baker, Gill, Clayton, and Stewart will be readily remembered. Colonels Bateman-Champain, Murdoch Smith, Sir Oliver St John, Beresford Lovett, and the late Major Pierson, all enginecr officers connected with the telegraph, have made their mark in the country. Nasru'd-Din Shah, unlike his predecessors, has paid two visits to Europe,—one in 1873 and one in 1879. On the first occasion only he extended his journey to England, and was then attended by his ''sadr 'azim," or prime minister, the late Mirza Husain Khan, an able and enlightened adviser, withal a Grand Cross of the Star of India. His second visit was to Russia, Germany, France, and Austria, but he did not cross the Channel. Among the shah's latest projects are the possession of a little fleet in the Persian Gulf, and of some vessels on the Karin. In 1884 it was stated that a thousand-ton steamer (the "' Persepolis") and a smaller one for river ee were actually in course of construction. The route by the Karun was to be opened, and a carriageable road constructed from Shustar to Tehran, viv Dizful, Khuramabad, Burujird, Sultanabad, and Kim. Orders had been given for

building two tugs to pull native craft up the Karin. The arrangements for the road, transport, and administration from Muhamrah to Tehran were confided to General Houtum Schindler, the inspector-general of Persian telegraphs.” The works which have been mainly followed and quoted in the above his- torical sketch are Sir Jolin Malcolm’s History of Persia; the more modern histories by Robert Grant Watson and Clements Markham; the Travels of Venetians in Persia, edited by Lord Stanley of Alderley, printed for the Hakluyt Society (1873); and the History of the late Revolutions in Persia, taken from the memoirs of Father Krusinski, procurator of the Jesuits at Ispahan (1733). Those which have contributed information in a minor degrec are Lady Sheil’s Diary in Persia; Erskine’s Buibar; Chardin’s Travels, annotated by Langlés ; Professor Creasy’s History of the Ottoman Turks; Ferrier’s History

of the Afghans; Telegraph and Travel (1874); and others mentioned in the footnotes. (F. J. G.)

PART IIL.—LANGUAGE AND LITERATURE.

Section I.—Prrstan (IRANIAN) LANGUAGES.

Under the name of Persian is included the whole of that great family of languages occupying a field nearly coincident with the modern Iran, of which true Persian is simply the western division. It is therefore common and more correct to speak of the Iranian family. The original native name of the race which spoke these tongues was Arian. King Darius is called on an inscriptio. “‘a Persian, son of a Persian, an Arian of Arian race”; and the followers of the Zoroastrian religion in their earliest records never give them- selves any other title but Airyavs danghavé, that is to say, “* Arian races.” The province of the Iranian language is bounded on the west by the Semitic, on the north and north-east by the Ural-altaic or Turanian, and on the south-east by the kindred language of India.

The Iranian family of languages is one of the seven great branches of the Indo-European stem, and was first recognized as such by Sir William Jones and Friedrich Schlegel. Whatever uncertainty still remains as to the exact relationship between all the several branches of the Indo-European family, it is at least certain that Indian and Persian belong together more closely

than the rest, and that they continued to develop side by side for a long period after the other branches had been already severed from the parent stem.

The common characteristics of all Iranian languages, which dis- tinguish them especially from Sanskrit, are as follows.

(1) Change of the original s into the spirant h. Thus—

Sanskrit. Zend, Old Persian. New Persian. sindhu (Indus) hindu hindu hind sarva (all) haurva haruva har sama (whole) hama hama ham santi (sunt) henti hantiy hend.

(2) Change of the original aspirates gh, dh, bh (=x, 9, ¢) into the corresponding medials—

Sanskrit. Zend. Old Persian. New Persian. bhuimi (earth) bumi bumi bum dhita (Gerés) data data dad gharma (heat) garema garma garm.

(3) %, t, p before a consonant are changed into the spirants kh,

?

Sanskrit. Zend. Old Persian. New Persian. prathama (first) fratema fratama fradum (Parsi) kratu (insight) khratu ano khirad.

(4) The development of soft sibilants—

1 The Indo-European Telegraph Company have now (1884), on rather more than 450 miles of ire, from i ulfa on tle Arras to Tehran, in what is called the “Maintenance Department,” six stations with fifteen employés; the ‘‘com- mercial” stations, with twenty employés, are at Tabriz and Tehran only. The Persian telegraph system, under British officers, has fourteen stations in all, the chief being at Teliran, Ispahan, Shiraz, and Bushahr. The official staff numbers between thirty-five and forty. The number of paid words passing through these lines has steadily inereased from 305,485 in 1877 to 1,177,412 in 1883. The average time taken by a message from

London to Calcutta via Tehran varies from one and a half to two and a half hours.

Sanskrit. Zend. Old Persian. New Persian. Asuré Medhas 3 Ahuro Mazdéo Auraniazda Ormuzd bahu (arm) bazu ete bazu

hima (hiems) zima oaae zim.

Our knowledge of the Iranian languages in older periods is too fragmentary to allow of our giving a complete account of this family and of its special historical development. It will be sufficient here to distinguish the main types of the older and the more recent periods. From antiquity we have sufficient knowledge of two dialects, the first belonging to eastern Iran, the second to western.

1. Zend, or Old Bactrian.—Neither of these two titles is well Zend.

chosen. The name Old Bactrian suggests that the language was limited to the small district of Bactria, or at least that 1t was spoken there,—which is, at the most, only an hypothesis. Zend, again (originally dzaintish), is not the name ofa language, as Anquetil Duperron supposed, but means “interpretation ” or “explanation,” and is specially applied to the medieval Pahlavi translation of the Avesta. Our “Zend-Avesta” does not mean the Avesta in the Zend language, but is an incorrect transcription of the original expression “ Avistak va zand,” é.¢., “ the holy text (Avesta) together with the translation.” But, since we still lack sure data to fix the home of this language with any certainty, the convenient name of Zend has become generally established in Europe, and may be provisionally retained. But the home of the Zend language was certainly in eastern Iran ; all attempts to seek it farther west—e.9., in Media 4—must be regarded as failures.

Zend is the language of the so-called Avesta,® the holy book of the Persians, containing the oldest documents of the religion of Zoroaster. Besides this important monument, which is about twice as large as the Iliad and Odyssey put together, we only possess very scanty relics of the Zend language in medieval glosses and scattered quotations in Pahlavi books. These remains, however, suffice to give a complete insight into the structure of the language. Not only amongst Iranian languages but amongst all the

languages of the Indo-European group, Zend takes one of the very highest places in

2 In the transcription of proper names in Part II. an endeavour to render the pronunciation current in Persia has caused the modification of the more conventional, and perhaps the more strictly correct, mode elsewhere followed inthis work. On this principle it is that the e is replaced by @ and a, and the o by u, as in Makran for Mekran, Rigan for Regan, Khurasan for Khorasan, &e. In Arabic words, however, the w is not exchanged for v, nor is the y necessarily used for the (5, except where the repetition of ¢ would be confusing, as in sdiyid. Asa general rule the system of spelling Indian words, accepted for official correspondence, has been applied to the transliteration of Persian. When a final a is not accented it represents ah, as kara for kdrah, and so forth.

3 Name of the supreme,god of the Persians. :

4 Cp. I. Darmesteter, Etudes Iraniennes, i. 10 (Paris, 1883).

5 As was said above, this, and not Zend-Avesta, is the correct title for the original text of the Persian Bible. The origin of the word is doubtful, and we cannot point to it before the time of the Sasanians. Perhaps it means “announcement,” “revelation.”

importance for the comparative philologist. In age it almost rivals Sanskrit ; in primitiveness it surpasses that language in many points ; it is inferior only in respect of its less extensive literature, and because it has not been made the subject of systematic gram- matical treatment. The age of Zend must be examincd in connexion with the age of the Avesta. the work of a single author or of any one age, but embraces collec- tions produced during a long period. “The view which became current through Anquetil Duperron, that the Avesta is throughout the work of Zoroaster (in Zend, Zarathushtra), the founder of the religion, has long been abandoned as untenable. But the opposite view, which is now frequently accepted, that not a single word in the book can lay claim to the authorship of Zoroaster, also appears on closer study too sweeping. In the Avesta two stages of the language are plainly

distinguishable, for which the supposition of local dialectic variation is not sufficient explanation, but which appear rather to be an older and a younger stage in the development of the same language. The older is represented in but a small part of the whole work, the so-called Gdthds or songs. These songs form the true kernel of the book Yasna!; they must have been in existence long

before all the other parts of the Avesta, throughout the whole of

which allusions to them occur. These gathas are what they claim to be, and what they are honoured in the whole Avesta as being, — the actual productions of fhe prophet himself or of his time. They bear in themselves irrefutable proofs of their authenticity, bringing us face to face not with the Zoroaster of the legends but with a real person, announcing a new doctrine and way of salvation, no super- natural Being assured of victory, as he is represented in later times, but a mere man, often himself despairing of his final success, and

struggling not with spirits and demons but with human conflicts of

every sort, in the midst of a society of fellow-believers which was yet feeble and in its earliest infancy. It is almost impossible that a much later period could have produced such unpreteutious and

almost depreciatory representations of the deeds and personality of

the prophet ; certainly nothing of the kind is found outside the gathas. If, then, the gathds reach back to the time of Zoroaster, and he himself, according to the most probable estimate, lived as early as the 14th century B.c., the oldest component parts of the Avesta are hardly inferior in age to the oldest Vedic hymns. The gathas are still extremely rough in style and expression ; the lan- guage is richer in forms than the more recent Zend ; and the voca- bulary shows important differences, The predominance of the long vowels is a marked characteristic, the constant appearance of a long final vowel contrasting with the preference for a final short in the later speech.

Sanskrit. Gathd, Later Zend. abhi (near) aibi aiwi tha (work) izha, izha.

The clearest evidence of the extreme age of the language of the gathds is its striking resemblance to the oldest Sanskrit, the language of the Vedic poems. The gatha language (much more than the later Zend) and the language of the Vedas have a close resemblance, exceeding that of any two Romanic languages ; they seem hardly more than two dialects of one tongue. Whole strophes of the gathas can be turned into good old Sanskrit by the applica- tion of certain phonetic laws ; for example—

“mat vao paddish ya frasruta izhay4o pairijasai mazda ustanazasto at vao asha aredrahyaca nemangha at vao vanghéush mananghd hunaretata,” becomes in Sanskrit—

The language of the other parts of the Avesta is more modern, but not all of one date, so that we can follow the gradual decline of Zend in the Avesta itself. The later the date of a text, the simpler is the grammar, the more lax the use of the cases. We have no chronological points by which to fix the date when Zend

Persian tradition at least regards the collection and arrangement of the holy texts as At that period they are said to have been already written out on dressed cowhides and preserved in

a very imperfect knowledge of the original language. Its value for modern philology has been the subject of much needless contro-

Visparad, 8 collection of prayers and forms fur divine service ; (2) Vendidad,

2 “With verses of my making, which now are heard, and with prayerful

hands, I come before thee, Mazda, and with the sincere I ility of i man and with the believer’s song of praise.” ie a

PERS 1 &#

In its present forni the Avesta is not

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versy amongst European scholars. It is only a secondary means towards the comprehension of the ancient text, and must be used with discrimination. A logical system of comparative exegesis, aided by constant reference to Sanskrit, its nearest ally, and to the other Ivanian dialects, is the best means of recovering the lost sense of the Zend texts. i h

The phonetic system of Zend consists of simple signs which express the different shades of sound in the language with great precision. In the vowel-system a notable feature is the presence of the short vowels ¢ and 0, which are not found in Sanskrit and Old Persian ; thus the Sanskrit santi, Old Persian hantiy, becomes henti in Zend. The use of the vowels is complicated by a tendency to combinations of vowels and to epenthesis, 7.¢., the transposition of weak vowels into the next syllable; e.g., Sanskrit bharatt, Zend baraiti (he carries); Old Persian margu, Zend méurva (Mery) ; Sanskrit rinakti, Zend irinakhtt. Triphthongs are not uncommon; é.g., Sanskrit agvebhyas (dative plural of agva, a horse) is in Zend aspaéibyé ; Sanskrit krnoti (he does), Zend kerenaoiti. Zend has also a great tendency to insert irrational vowels, especially near liquids ; owing to this the words scem rather inflated 5 2.9.5 SAVvYA (on the left) becomes in Zend hdvaya; bhrdjati (it glitters), Zend bardzattt ; gnd (-yurj), Zend gend. In the consonantal system we are struck by the abundance of sibilants (s and sh, in three forms of modification, z and zh) and nasals (five in number), and by the complete absence of 7. A characteristic phonetic change is that of rt into sh; e.g., Zend asha for Sanskrit rla, Old Persian arta (in Artaxerxes) ; fravashi for Pahlavi fravardin, New Persian Server (the spirits of the dead). The verb displays a like abundance of primary forms with Sanskrit, but the conjugation by periphrasis is only slightly developed. The noun has the same eight cases as in Sanskrit. In the gathds there is a special ablative, limited, as in Sanskrit, to the “a” stems, whilst in later Zend the ablative is extended to all the stems indifferently.

We do not know in what character Zend was written before the time of Alexander. From the Sasanian period we find an alpha- betie and very legible character in use, derived from Sasanian Pahlavi, and closely resembling the younger Pallavi found in books. The oldest known manuscripts are of the 14th century A.D.

Although the existence of the Zend language was known to the Oxford scholar Hyde, the Frenchman Anquetil Duperron, who went to the East Indics in 1755 to visit the Parsi priests, was the first to draw the attention of the learned world to the subject. Scientific study of Zend texts began with E. Burnouf, and has since then made rapid strides, especially since the Vedas have opened to us a knowledge of the oldest Sanskrit.

2. Old Persian.—This is the language of the ancient Persians Old properly so called,* in all probability the mother-tongue of Middle Persian. Persian of the Pahlavi texts, and of New Persian, We know Old Persian from the rock-inscriptions of the Achemenians, now fully deciphered. Most of them, and these the longest, date from the time of Darius (Old Persian, Darayavaush) ; but we have specimens as late as Artaxerxes Ochus. In the latest inscriptions the language is already much degraded; but on the whole it is almost as antique as Zend, with which it has many points in common. For instance, if we take a sentence from an inscription of Darius, as—

“ Auramazda hya imam bumim ada hya avam asmanam ada hya martiyam ada hya siyatim ada martiyahya hya Darayavaum khshayathiyam akunaush aivam paruvnam khshayathiyam,” it would be in Zend—

“‘Ahur6 mazddo yé imam bimim adat yé aom asmanem adat yo mashim adat y6 shaitim addt mashyahé yé dérayatvoham khshaétem akerenaot oytim pouru- nam khshaétem.” 5

The phonetic system in Old Persian is much simpler than in Zend ; we reckon twenty-four letters in all. The short vowels e, oare wanting; in their place the old “a” sound still appears as in Sanskrit, ¢.g., Zend bagem, Old Persian bagam, Sanskrit bhagam ; Old Persian hamarana, Zend hamerena, Sanskrit samarana. As regards consonants, it is noticeable that the older z (soft s) still preserved in Zend passes into d,—a rule that still holds in New Persian ; compare—

Sanskrit. Zend. Old Persian. New Persian. hasta (hand) zasta dasta dast jrayas (sea) zrayo daraya darya aham (1) azem adam

Also Old Persian has no special 7. Final consonants are almost entirely wanting. In this respect Old Persian goes much farther than the kindred

idioms, ¢.g., Old Persian abara, Sanskrit abharat, Zend abarat, pepe ; nominative baga, root-form baga-s, Sanskrit

3 Grammar by Spiegel (Leipsic, 1867) ; Dictionary by Justi (Leipsic, 1864); edition of the Avesta by Westergaard (Copenhagen, 1852), translation into German by Spiegel (Leipsic, 1852), and into English by Darmesteter (Oxford, 1880) in the Sacred Books of the Eust. F

4 And perhaps of the Medes. Although we have no record of the Median language, we cannot regard it as differing to any great extent from the Persian. The Medes and Persians were two closely-connected races. There is nothing to justify us in looking for the true Median language either in the cuneiform writings of the second class or in Zend.

5 “Ormnzd, who created this earth and that heaven, who created man and man’s dwelling-place, who made Darius king, the one and only king of many.

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bhagas. The differences in declension between Old Persian and Zend are unimportant.

Old Persian inscriptions are written in the cuneiform character of the simplest form, known as the “first class.’ Most of the inscriptions have besides two, translations into the more complicated kinds of cuneiform character of two other languages of the Persian empire. One of these is the Assyrian; the real nature of the second is still a mystery. The interpretation of the Persian cunei- form, the character and dialect of which were equally unknown, was begun by Grotefend, who was followed by Burnouf, Rawlinson, and Oppert. The ancient Persian inscriptions have been collected in a Latin translation with grammar and glossaries by Spiegel (Leipsic, 1862). The other ancient tongues and dialects of this family are known only by name; we read of peculiar idioms in Sogdiana, Zabulistan, Herat, &c. It is doubtful whether the languages of the Scythians, the Lycians, and the Lydians, of which hardly anything remains, were Iranian or not.

After the fall of the Achainenians there is a period of five centuries, from which no document of the Persian language has come down to us.

Under the Arsacids Persian nationality rapidly declined ; all that remains to us from that period—namely, the inscriptions on coins —is in the Greek tongue. Only towards the end of the Parthian dynasty and after the rise of the Sasanians, under whom the national traditions were again cultivated in Persia, do we recover the lost traces of the Persian language in the Pahlavi inscriptions and literature.

3. Middle Persian.—The singular phenomena presented by Pah- . lavi writing have been discussed in a separate article (see PAHLAV!). The language which it disguises rather than expresses— Middle Persian, as we may call it—presents many changes as compared with the Old Persian of the Achemenians. The abundant gram- matical forms of the ancient language are much reduced in number ; the case-ending is lost; the noun has only two inflexions, the singular and the plural; the cases are expressed by prepositions, —e.g., ruban (the soul), nom. and ace. sing., plur. rubdndn; dat. val or avo ruibdn, abl. min or az ribdn. Even distinctive forms for gender are entirely abandoned, ¢.g., the pronoun avo signifies “he,” “she,” “it.” Inthe verb compound forms predominate. In this respect Middle Persian is almost exactly similar to New Persian.

4, New Persian.—The last step in the development of the lan- – guage is New Persian, represented in its oldest form by Firdausi. In grammatical forms it is still poorer than Middle Persian ; except English, no Indo-European language has so few inflexions, but this is made up for by the subtle development of the syntax. The structure of New Persian has hardly altcred at all since the Shdh- néma ; but the original purism of Firdausi, who made every effort to keep the language free from Semitic admixture, could not long be maintained. Arabic literature and speech exercised so powerful an influence on New Persian, especially on the written language, that it could not withstand the admission of an immense number of Semitic words. There is no Arabic word which would be refused acceptance in good Persian.. But, nevertheless,-New Persian has remained a language of genuine Iranian stock.

Among the changes of the sound system in New Persian, as con- trasted with earlier periods, especially with Old Persian, the first that claims mention is the change of the tenues &, ¢, p, ¢, into

g, d, b, 2. Thus we have—

Old Persian or Zend. Pahlavi. New Persian. mahrka (death) mark marg Thraétaona Fritin Feridun – Ap (water) ap hvatd (self) khoét khod raucah (day) roj ruz haca aj az.

Amongst modern languages and dialects other than Persian which Modern must be also assigned to the Iranian family may be mentioned— dialects,

_ 1. Kurdish, a language nearly akin to New Persian, with which it has important characteristics in common. It is chiefly dis- tinguished from it by a marked tendency to shorten words at all costs, ¢.g., Kurd. berd (brother) = New Persian birddar ; Kurd. dim (I give) = New Persian diham; Kurd. spt(white) = New Persian sipéd.

2. Baluch, the language of Baluchistan, also very closely akin to New Persian, but especially distinguished from it in that all the old spirants are changed into explosives, e. g-, Baluch véb (sleep) = Zend hoafna ; Baluch kap (slime)=Zend kafa, New Persian kaf ; Baluch hapt (seven) = New Persian haft.

3. Ossetic, true Iranian, in spite of its resemblance in sound to the Georgian.

4. Afghan, which has certainly been increasingly influenced by the neighbouring Indian languages in inflexion, syntax, and vocabu- lary, but is still at bottom a pure Iranian language, not merely intermediate between Iranian and Indian.

The position of Armenian alone remains doubtful. Some scholars attribute it to the Iranian family ; others prefer to regard it as a separate and

independent member of the Indo-European group. Many words that at first sight seem to prove its Iranian origin are only adopted from the Persian.® (K. G.)

Section I].—Mopern Persian Literature.

Persian historians are greatly at variance about the origin of their national poetry. Most of them go back to the 5th Christian century and ascribe to one of the Sasanian kings, Bahramgur or Bahram V. (420-439), the invention of metre and rhyme ; others mention as author of the first Persian poem a certain Abulhafs of Soghd, near Samarkand. In point of fact, there is no doubt that the later Sasanian rulers fostered the literary spirit of their nation (see Paniavi). Pahlavi books, however, fall outside of the present subject, which is the literature of the idiom which shaped itself out of the older Persian speech by slight modifications and a steadily increasing mixture of Arabic words and phrases in the 9th and 10th centuries of our era, and which in all essential respects has remained the same for the last thousand years. The national spirit of Iran, although smothered and stifled by the Arab con- quest, could not be entirely annihilated. The system of centralization was at no time very strong in the extensive dominions of the Omayyad and ‘Abbasid dynasties ; and the more their power and influence decayed the more they lost their hold on Persia, especially since the native element began to aspire to governorships and to take the political management into its own hand. The death of Hartn al-Rashid in the beginning of the 9th century, which marks the commencement of the decline of the caliphate, was at the same time the starting-point of movements for national independence and a national litera- ture in the Iranian dominion, and the common cradle of the two was in the province of Khorasan, between the Oxus and Jaxartes. In Merv, a Khorasdnian town, a

certain ‘Abbés composed in 809 a.D. (193 a.H.), accord- Earliest

ee oe ing to the oldest biographical writer of Persia, Mohammed modern

Old Persian or Zend. Pahlavt. New Persian. : i Z Persian kaufa (mountain) kof – ‘Aufi, the first real poem in modern Persian, in honour of ee athu (place), Z. gatu as g : : eee: t) ° Ginese (four) : ate cihar the ‘Abbasid

prince Ma’mun, Harun al-Rashid’s son, who oy con bandak Lan had himself a strong predilection for Persia, his mother’s

spada (arm oo sipa Zi : 5

dadami (I give) ~— diham. native country, and was, moreover, thoroughly imbued with

Old d and dh frequently become y—

Old Persian or Zend. Pahlavi. New Persian. madhu (wine) Bo mal baodh6 (consciousness) béd. boi padha (foot) noo pal kadha (when) 4 kai.

Old y often appears as 7: Zend ydma (glass), New Persian jam ; yavan (a youth), New Persian javén. Two consonants are not allowed to stand together at the beginning of a word ; hence vowels are frequently inserted or prefixed, ¢g., New Persian sitédan or istédan (to stand), root sté ; birddar (brother), Zend and Pahlavi brdtar.)

1 Grammars of New Persian, by Lumsden (Calcutta, 1820), Chodzko (Paris, 1852), Vullers (Giessen, 1870). For the New Persian dialects see Fr. Miiller, in the Sitzungsber. der Wien. Akad., vols. Ixxvii., lxxviii.

the freethinking spirit of his age. Soon after this, in 820 (205 a.u.), Tahir, who aided Ma’mtn to wrest the caliphate from his brother Amin, succeeded in establishing the first semi-independent Persian dynasty in Khorasan, which was overthrown in 872 (259 a.H.) by the family of the Saffa- rids, founded by Ya‘ktb b. Laith, originally a brazier in Sistan or Zabulistan.

The development of Persian poetry under these first native dynasties was slow. Arabic language and literature had gained too firm a footing to be supplanted at once

2 Compare Hiibschmann, in Kuhn’s Zeitschrift, xxiv. 396. 3 Compare P. de Lagarde, Armenische Studien (Gottingen, 1877) ; H. Hiibschmann, Armenische Studien (Leipsic, 1883).

by a new literary idiom still in its infancy ; nevertheless the few poets who arose under the Téahirids and Saffarids show already the germs of the characteristic tendency of all later Persian literature, which aims at amalgamating the enforced spirit of Islamism with their own Aryan feelings, and reconciling the strict deism of the Moham- medan religion with their inborn loftier and more or less pantheistic ideas; and we can easily trace in the few fragmentary verses of men like Hanzalah, Hakim Firuz,

Forms ofand Abu Salik those principal forms of poetry now used Fastern. in common by all Mohammedan nations—the forms of

poetry.

Minstrels and sciences in his dominions.

of 10th

the kasida (the encomiastic, elegiac, or satirical poem), the ghazal or ode (a love-ditty, wine-song, or religious hymn), the rubdé% ov quatrain (our epigram, for which the Persians invented a new metre in addition to those adopted from the Arabs), and the mathnawi or double-rhymed poem (the legitimate form for epic and didactic poetry). The first who wrote such a mathnawi was Abu Shukur of Balkh, the oldest literary representative of the third dynasty of Khorasan, the Sdmdnids, who had been able in the course of time to dethrone the Saffarids, and to secure the government of Persia, nominally still under the supremacy of the caliphs in Baghdad, but in fact with full sovereignty. The undisputed reign of this.family dates from the accession of Amir Nasr IT. (913-942 ; 301-331 .u.), who, more than any of his predecessors, patronized arts The most accomplished minstrels of his time were Mohammed Fardladi; Abu

century. *1*Abbas of Bokhara, a writer of very tender verses; Abt

Tabart.

1-Muzaffar Nasr of Nishépur; Abu ‘Abdall4h Mohammed of Junaid, equally renowned for his Arabic and Persian poetry; Ma‘naw1, full of

original thoughts and spiritual subtleties ; Khusrawani, from whom even Firdausi condescended to borrow quotations ; Abt ’l-Hasan Shahid of Balkh, the first who made a diwan or alphabetical collection of his lyrics ; and Master Rudagi, the first classic genius of Persia, who impressed upon every form of lyric and didactic poetry its peculiar stamp and individual character (see RUpacf). His graceful and captivating style was imitated by Hakim Khabbaz, a great baker, poet, and quack; Abi Shu’‘aib Salih of Herat, who left a spirited little song in honour of a young Christian maiden; Raunaki of Bokhar4; Abu’l-Fath of Bust, who was also a good Arabic poet; the amir Abt Hasan “Alf Alagatchi, who handled the pen as skilfully as the sword ; “‘Umarah of Merv, a famous astronomer ; and Kisa‘i, a native of the same town, a man of stern and ascetic manners, who sang in melodious rhythm the praise of “Alf and the twelve imams. All these poets flourished under the patronage of the Sdménid princes, who also fostered the growing desire of their nation for historical and antiquarian researches, for exegetical and medical studies. Mansur I., the grandson of Rudagt’s patron, ordered (963 ; 352 a.u.) his wazir Bal‘ami to translate the famous universal history of Tabar{ (224-310 a.n.) from Arabic into Persian; and this Ta’rikh-i-Tabari, the oldest prose work in modern Persian, is not merely remarkable from a philological point of view, it is also the classic model of an easy and simple style. The same prince employed the most learned among the ulema of Trans- oxiana for a translation of Tabart’s second great work, the Tafsir, or commentary on the Koran, and accepted the dedication of the first Persian book on medicine, a phar- macopceia by the physician Abi Manstir Muwaffak b. ‘Alf of Herat (edited by Seligmann, Vienna, 1859), which forms a kind of connecting link between Greek and Indian medi- cine. It was soon after further developed by the great Avicenna (died 1037; 428 a.n.), himself a Persian by birth, and author of pretty wine-songs, moral maxims, psychological tracts, and a manual of philosophic science, the Ddnishnémai-Ald’%, in his native tongue.

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A still greater impulse was given, both to the patriotic feelings and the national poetry of the Persians, by Mansur’s son and successor, Prince Nuh

IT., who ascended the throne in 976 (865 a.u.). Full of enthusiasm for the glorious past of the old Iranian kingdom, he charged his court poet

Dakiki, who openly professed in his ghazals the Zoroastrian Dakiki,

creed, to turn the Parsi collection of the venerable legends and traditions of the heroic ages of Iran, the Khodd@'indma, or "Book of Kings" (which had been translated from the Pahlavi under the Saffarid Ya'kub b. Laith), into Per- sian verse. Shortly after commencing this work Daktki was murdered in the prime of life; and the fall of the minstrel was soon followed by that of the Samanid dyn- asty itself, which was supplanted by the younger and more vigorous house of Sabuktagin, the founder of the Ghaznawids, who had rapidly risen from the rank of a common Turkish soldier to that of an independent ruler of Ghazna (Ghazni, Ghuznee)and all the surrounding countries, including a considerable portion of India. But Dakikd's great enterprise was not abandoned ; a stronger hand, a higher genius, was to continue and to complete it, and this genius was found in Firdausi (940-1020; 328-411 a.n.), with whom we enter the golden age of the national epopee in Persia (see Frrpousf). In 1011, after thirty-five years of unremitting labour, he accomplished his gigantic task, and wrote the last distichs of the immortal Shdhndma, that "glorious monument of Eastern genius and learning," as Sir W. Jones calls it, '' which, if ever it should be gener- ally understood in its original language, will contest the merit of invention with Homer itself." And, although it was not he, the unrivalled master of epic art, but his old friend and patron, the less-renowned 'Unsurt, who officiated as '"king of poets" in the court of Mahmtd of Ghazna (998-1030 ; 388-421 a.u.), who had continued his father Sabuk- tagin's conquests, and founded an empire extending from the Caucasus to Bengal and from Bokhardé and Kashgar to the Indian Ocean, he was nevertheless the central sun round which all the minor stars revolved, those four hundred poets who formed the famous "Round Table" in the sultan's magnificent palace. Firdausi's fame eclipsed that of all his contemporaries (however well founded their claim upon literary renown),—men like "Unsuri, Farrukhi, Asjadi, Ghada'irl, Minutchehri, and others, whose eloquent praises of Mahmud have come down to us in very scarce copies, and even that of his own teacher Asad{, who survived his great pupil, and established a reputation of his own by introducing into Persian literature the novel form

of the mundzarah or strife-poem, the equivalent of the Provencal tenson and the English estrif or joust.

irresistible fascination upon all minds that there was soon a keen competition among the younger poets as to who should produce the most successful imitation of that classic model ; and this competition has gone on under different forms through all the following centuries, even to the most recent times. First of all, the old popular traditions, so far as they had not yet been exhausted by Firdausi, were ransacked for new epic themes, and a regular cycle of national epopees gathered round the Book of Kings, drawn almost exclusively from the archives of the princes of Sistan, the family of Firdausi's greatest hero, Rustam. The first and most ambitious of these competitors seems to have been Asadi's own son, "Ali b. Ahmad al-Asadi{, the author of the oldest Persian glossary, who completed in 1066 (458 A.H.), in upwards of 9000 distichs, the Garshdspndma, or marvellous story of the warlike feats and love-adventures of Garshasp, one of Rustam's ancestors. The heroic deeds of Rustam's grandfather were celebrated in the Sémndma, which almost equals the Shdéhndma in length; those of Rustam's two sons, in the Jahdngirndma and the Fard-

The Shdéhndma, Imite-

from the very moment of its appearance, exercised such an _

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murendma ; those of his daughter, an amazon, in the Brunhild style of the German Nibelunge, in the Band Gushdspndéma ; those of his grandson, in the Barseindma 2 those of his great-grandson, in the Shahriydrndma (ascribed to Mukhtari and dedicated to Mas'ud Shah, who is probably identical with Mas'id b. Ibrahim, Sultan Mahmud's great- grandson, 1088-

1114 ; 481-508 a.4.); and the wonderful exploits of a son of Isfandiydr, another hero of the Shdéh- ndma, in the Bahmanndma.

When at last these old Iranian sources were almost entirely exhausted, the difficulty was met in various but equally ingenious ways. Where some slight historical re- cords of the heroic age—no matter how doubtful their authenticity—were still obtainable, poetical imagination seized upon them at once, and filled the wide gaps by its own powerful invention; where no traditions at all were forthcoming, fiction pure and simple asserted its indisputable right ; and thus the national epopee gave way to the epic story, and—substituting prose for verse—to the novel and the fairy tale. Models of the former class are the various Iskandarndmas, or "Books of Alexander the Great," the oldest and most original of which is that of Nizdmi (com- pleted about 1202; 599 a.u.); the latter begins with the Kitdb~-Samak 'Iydr, a novel in three volumes (about 1189 ; 585 a.u.), and reaches its climax in the Biustén-i-Khaydi, or "Garden of Imagination," a prose romance of fifteen large volumes, by Mohammed Taki Khayal, written between 1742 and 1756 (1155 and 1169 a.u.). Many aspirants to poetical fame, however, were not satisfied with either of these expedients : they boldly struck out a new path and explored hitherto unknown regions, and here again a twofold tendency manifested itself. Some writers, both in prose and verse, turned from the exhausted fields of the national glory of Persia to the comparatively original soil of Arabian traditions, and chose their subjects from the chivalrous times of their own Bedouin conquerors, or even from the Jewish legends of the Koran. Of this description are the Anliydndma, or history of the pre-Mohammedan prophets, by Hasani Shabistari 'Ayani (before the 8th century of the Hijra); Ibn Husdm's Khdwarndma (1427; 830 a.H.), or the deeds of 'Ali; Badhil's Tamla-i-Ilaidart, which was completed by Najaf (1723; 1135 a.u.), or the life of Mohammed and the first four caliphs; Kazim's Far- ahndma-i-Fdtima, the book of joy of Fatima, Mohammed's daughter (1737 ; 1150 a.u.),—all four in the epic metre of the Shdhndma ; and the prose stories of [/détim 7@%, the famous model of liberality and generosity in pre-Islamitic times ; of Amir /Tamzah, the uncle of Mohammed ; and of the Mu'jizét-i-Musawi, or the miraculous deeds of Moses, by Mu'in-almiskin (died about 1501; 907 a.x.).

Quite a different turn was taken by the ambition of another class of imitators of Firdausi, especially during the last four centuries of the Hijra, who tried to create a new heroic epopee by celebrating in rhythm and rhyme stirring events of recent date. The gigantic figure of Timur inspired Hatiff (died 1521; 927 a.n.) with his Témdrndma ; the stormy epoch of the first Safawi rulers, who succeeded at last in reuniting for some time the various provinces of

the old Persian realm into one great monarchy, furnished ’

Kasimi (died after 1560 ; 967 a.u.) with the materials of his Shdhndma, a poetical history of Shah Isma‘il and Shah Tahmdsp. Another Shdhndma, celebrating Shah ‘Abbas

of Poonah by the English in 1817. In India especially this kind of epic versification has flourished since the beginning of Huméyin’s reign (1530-1556); the court- poets of the great Mogul emperors of Delhi, as well as of all the minor dynasties, vied with one another in glorifying the exploits of their respective sovereigns, as is sufficiently proved by the Zafarndéma-t-Shdhjahdni by Kudst (died 1646 ; 1056 a.1.); the Shdhinshdhndéma by Talib Kalim (died 1651 ; 1061 a.u.), another panegyrist of Shah J ahan ; Atasht’s ‘Adilnéma, in honour of Shah Mohammed ‘Adil of Bijapur, who ascended the throne in 1629 (1039 ASE)! the Tawérikh-i-Kuli Kutbshah, a metrical history of the Kutb shahs of Golkonda; and many more, down to the Fath- ndma-t-Tipa Sultén by Ghulam Hasan (1784 ; 1189 A.H.).

But the national epopee, with both its legitimate and its illegitimate offspring, was not the only bequest the great Firdausi left to his nation. This rich genius gave also the first impulse to the higher development of those other branches of poetical art which were to flourish in the following ages —particularly to romantic, didactic, and mystic poetry ; and even his own age produced powerful co-operators in these three most conspicuous departments of Persian literature.

A.H.) brilliant pictures of the struggles and passions in the human heart (see NizAmi, vol. xvii. pp. 521, 522), sent forth its first tender shoots in the numerous love-stories of the Shdhndma, the most fascinating of which is that of Zal and Rudabeh, and developed almost into full bloom in Firdausi's second great mathnawi Ydsuf u Zalikhd, which the aged poet wrote after his flight from Ghazna, and dedicated to the reigning caliph of Baghdad, Alkadir- billah. It represents the oldest poetical treatment of the Biblical story of Joseph, which has proved so attractive to the epic poets of Persia, among others to 'Am'ak of Bokhara (died 1149), who was the first after Firdausi to write a Yusuf «u Zalikhd (which can be read in two dif- ferent metres), to Jami (died 1492), Mauji Kasim Khan, Humaytn's amir (died 1571), Nazim of Herat (died 1670), and Shaukat, the governor of Shiraz under Feth 'Alf Shah. Perhaps prior in date to Firdausi's Yaésuf was his patron 'Unsuri's romance Wdamik u Adhrd, a popular Iranian legend of great antiquity, which had been first written in verse under the Téhirid dynasty. This favourite story was treated again by Fasihi Jurjani (in the course of the same 5th century of the Hijra), and by many modern poets,—as Damiri, who died under the Safawi Shah Mohammed (1577-1586 ; 985-994 a.u.), Nami, the historiographer of the Zand dynasty, and Husain of Shiraz under Feth "Ali Shah, the last two flourishing towards the beginning of the present century. Another love-story of similar anti- quity, which had originally been written in Pahlavi, formed the basis of Fakhr-uddin As'ad Jurjani's Wis u Rédmin, which was composed in Isfahin (Ispahdn) about 1048 (440 a.H.),—a poem remarkable not only for its high artistic value but also for its close resemblance to one of the epic masterpieces of medizval German literature, Gott- fried von Strasburg's Tristan und Lsolt.

The last-named Persian poet was apparently one of the earliest eulogists of the Seljuks, and it was under this Turkish dynasty, which soon became a formidable rival both of the Ghaznawids and of the Arabian caliphs of

Romantic fiction, which achieved its Romantic highest triumph in Niz4m{ of Ganja's (1141-1203; 535-599 fiction.

Baghdad, that lyrical romanticism—that is, panegyrical Encomi- and satirical poetry—rose to the highest pitch. What a cs Firdausi, in his exalted descriptions of royal power and :

the Great, was written by wamali of Sabzawar ; and even the cruelties of Nadir Shah were duly chronicled in a

pompous epic style in ‘Ishrati’s Shdéhndma-i-Nddirt (1749; 1162 a.u.). But all these poems are surpassed in length by the 33,000 distichs of the Shdhinshdhnéma by the poet-laureate of the late Feth ‘Ali Shah of Persia, and the 40,000 distichs of the Georgendma, a poetical history of India from its discovery by the Portuguese to the conquest

dignity, and the court-poets of Sultan Mahmid, in their unbounded praise of the great sovereign and protector of arts, had commenced, what other encomiasts under Mahmiud’s successors—for instance, Abt ’l-Faraj Runi of Lahore and Mas‘td b. Sa‘d b. Salman (under Sultan XVIII. — 83

Didactic and mystic poetry.

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Ibrahim, 1059-1088)—had successfully continued, reached its perfection in the famous group of panegyrists who gathered in the first half of the 6th century of the Hijra round the throne of Sultan Sanjar, and partly also round that of his great antagonist, Atsiz, shah of Khwarizm. This group included Adib Sabir, who was drowned by order of the prince in the Oxus about 1145 (540 a.n.), and his pupil Jauhari, the goldsmith of Bokhér4; Amir Mu‘izzi, the king of poets at Sanjar’s court, killed by a stray arrow in 1147 (542 a.u.) ; Rashid Watwat (the Swallow), who died in 1172 (568 a.u.), and left, besides his kasidas, a valuable treatise on poetry (odd ik-essihr) and a metrical transla- tion of the sentences of “Ali; ‘Abd-alwaési‘ Jabali, who sang at first, like his contemporary Hasan Ghaznawi (died 1169; 565 a.u.), the praise of the Ghaznawid shah Bahram, but afterwards bestowed his eulogies upon Sanjar, the con- queror of Ghazna ; and Auhad-uddin Anwari, the most cele- brated kasida-writer of the whole Persian literature. Anwari (died between 1191 and 1196; 587 and 592 A.H.), who in early life had pursued scientific studies in the madrasah of Tus and who ranked among the foremost astronomers of his time, owes his renown as much to the inexhaustible store of poetical similes and epitheta ornantia which he showered upon Sanjar and other royal and princely personages as to his cutting sarcasms, which he was careful enough to direct, not against special

individuals, but against whole classes of society and the cruel wrongs worked by an in- exorable fate,—thus disregarding the more manly example of Firdausi, whose bold attack upon Sultan Mahmud for having cheated him out of the well-earned reward for his epopee is the oldest and, at the same time, most finished specimen of personal satire. This legitimate branch of high art, however, soon degenerated either into the lower forms of parody and travesty—for which, for instance, a whole group of Transoxanian writers, Sizani of Samar- kand (died 1174 ; 569 a.w.) and his contemporaries, Abt ‘Alf Shatranji of the same town, Lami of Bokhara, and others gained a certain literary reputation—or into mere comic pieces and jocular poems like the “Pleasantries ” (Hazliyydt) and the humorous stories of the “Mouse and Cat” and the “Stone-cutter” (Sangtarash) by ‘Ubaid Zékant (died 1370; 772 a.n.), Anwart’s greatest rival was Khakani (died 1199 ; 595 a.x.), the son of a carpenter in Shirwan, and panegyrist of the shahs of Shirwdn, usually called the Pindar of the East on account of the difficult and enigmatic style of his verses. Oriental critics, of course, greatly admire the obscure allusions, far-fetched puns, and other eccentricities with which the otherwise energetic and harmonious language, both of his laudatory odes and of his satires, is loaded; to European taste only the shorter epigrams and the double-rhymed poem Tuhfat- ulirdkain, in which Khakant describes his journey to Mecca and back, give full satisfaction. Among his numerous contemporaries and followers may be noticed Mujir-uddin Bailakani (died 1198; 594 a.u.), Zahir Farydbi (died 1202; 598 a.u.), and Athir Akhsikat{ (died 1211; 608 A.H.,),— all three panegyrists of the atabegs of Adharbaijan (Azer- bijan), and especially of Sultan Kizil Arslan —Kamal-uddin Isfahdn{, tortured to death by the Moguls in 1237 (635 A.H.), who sang, like his father J amal-uddin, the praise of the governors of Isfahan, and gained, on account of his fer- tile imagination, the honorary epithet of the “creator of fine thoughts ” (Khall4k-ulma‘anf) ; and Saif-uddin Isfarangt (died 1267 ; 666 a.x.), afavourite of the shdhs of Khwérizm. _ Fruitful as the 6th and 7th centuries of the Hijra were in panegyrics, their literary fame did not rest upon these alone ; they attained an equally high standard in two other branches of poetry, the didactic and the mystic, which after a short period of separate existence entered into a close and henceforth indissoluble union. The origin of

both can again be traced to Firdausi and his time. In the ethical reflexions, wise maxims, and moral exhortations scattered throughout the Shdhndma the didactic element is plainly visible, and equally plain in it are the traces of that mystical tendency which was soon to pervade almost all the literary productions of Persian genius. Sufic pantheism, which tends to reconcile philosophy with revealed religion, and centres in the doctrine of the universality and absolute unity of God, who is diffused through every particle of the visible and invisible world, and to whom the human soul during her temporary exile in the prison-house of the body strives to get back through progressive stages till she is purified enough to be again absorbed in Him, is already hinted at in the numerous verses of the " Book of Kings" in which the poet cries out against the vanity of all earthly joys and pleasures, and expresses a passionate desire for a better home, for a reunion with the Godhead. But the most characteristic passage of the epopee is the mysterious disappearance of Shah Kaikhosrau, who suddenly, when at the height of earthly fame and splendour, renounces the world in utter disgust, and, carried away by his fervent longing for an abode of everlasting tranquillity, vanishes for ever from the midst of his companions. The first Persian

who devoted poetry exclusively to the illustration of Sufic Sufic doctrines was Firdausi's contemporary, the renowned poets |

sheikh Abu Sa'id b. Abt 'l-Khair of Mahna in Khords4n (968-1049; 357-440 a.n.), the founder of that specific form of the ruba'i which gives the most concise expression to religious and philosophic aphorisms,—a form which was further developed by the great freethinker 'Omar Bz. Kuayydm (g.v.), and Afdal-uddin Kashi (died 1307 ; 707 A.H.). The year of Abu Sa'id's death is most likely the same which gave to the world the first great didactic mathnawi, the Rishan@indéma, or "Book of Enlighten- ment," by NAsir B. Kuosrav (g.v.), a poem full of sound moral and ethical maxims with slightly mystical tendencies. About twenty-five years later the first theoretical handbook of Stifism in Persian was composed by 'Ali b. 'Uthman al-jullabi al-hujwiri in the Kashf-ulmahjib, which treats of the various schools of Sufis, their teachings and observ- ances. A great saint of

the same period, Sheikh ‘Abdallah Ansari of Herat (1006-1089 ; 396-481 a.H.), assisted in spreading the pantheistic movement by his Mundjdt or in- vocations to God, by several prose tracts, and by an import- ant collection of biographies of eminent Suiffs, based on an older Arabic compilation, and serving in its turn as ground- work for Jamt’s excellent Vafahdt-aluns (completed in 1478; 883 a.H.). He thus paved the way for the publication of one of the earliest text-books of the whole sect, the adékat- ulhakikat, or “Garden of Truth” (1130; 525 a.n.), by Hakim Sand’f of Ghazna, to whom all the later Stific poets refer as their unrivalled master in spiritual knowledge. In this extensive mathnawi in ten cantos, as well as in his smaller poetical productions, he skilfully blended the purely didactic element, which is enhanced by pleasant stories and anecdotes, with the chief tenets of higher theosophy,—an example which has been strictly adhered to by all the following Stific poets, who only differ in so far as they give preponderance either to the ethical or to the mystical side of their writings. As the most uncompromising Stfis appear the greatest pantheistic writer of all ages, Jelal- uddin Rumi (1207-1273 ; 604-672 a.u.; see RUmf), and his’ scarcely less renowned predecessor Farid-uddin ‘Attar, who was slain by the Moguls at the age of 114 lunar years in 1230 (627 a.u.). This prolific writer, originally a druggist (‘attar) in Nishdpur, after having renounced all worldly affairs and performed the pilgrimage to Mecca, devoted him- self to a stern ascetic life, and to the composition of Sufic works, partly in prose, as in his valuable “ Biography of eminent Mystic Divines,” but mostly in the form of math-

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nawis (upwards of twenty in number), among which the Pandnéma, or “ Book of Counsels,” and the Mantik-uttair, or the “‘Speeches of Birds,” occupy the first rank. In the latter, an allegorical poem, interspersed with

moral tales and pious contemplations, the final absorption of the Sufi in the deity is most ingeniously illustrated, and the seven valleys through which the birds travel on their way to the fabulous phcenix or simurg (literally thirty birds), and in which all except thirty succumb, are the seven stations of the mystic road that leads from earthly troubles into the much-coveted Fana or Nirvana.

In strong contrast to these advanced Sufis stands the greatest moral teacher of Persia, Sheikh Sa‘di of Shiraz (died about 110 lunar years old in 1292; 691 a.n.; see Sa‘Di), whose two best known works, the Bistdn, or “ Fruit-garden,” and the C’ulistén, or ‘“ Rose-garden,” owe their great popularity both in the East and the West to the purity of their spiritual thoughts, their sparkling wit, charming style, and the very moderate use of mystic theories. However, both have found comparatively few imitations,—the former in the Dastéirndéma of Nizari of Kohistan (died 1320 ; 720 a.u.), in the Dah Bab, or “Ten Letters,” of Katibi (died 1434; 838 a.u.), and in the Gulzdr of Hairati (murdered 1554 ; 961 a.u.); the latter in Mu‘in- uddin Juwaini’s Wigdristén (1335; 735 a.u.) and Jémt’s Bahdristdn, or ‘“Spring-garden” (1487 ; 892 a.u.); whereas an innumerable host of purely Sufic compositions followed in the wake of Sand’i’s, ‘Attar’s, and Jelél-uddin Rumt’s mathnawis. They consist partly of mere expositions of doctrines with or without illustrations by tales and anec- dotes, partly of complete Stific allegories, often disfigured by the wildest eccentricities. It will suffice to name a few of the most conspicuous in each class. To the former belong the Lama‘dt, or “Sparks,” of ‘Iraki (died between 1287 and 1309; 686 and 709 a.u.), the Zéd-ulmusdjirin, or “Store of the Wayfarers,” by Husain{ (died 1318; 718 A.H.), the Gulshan-t-Rdz, or “ Rose-bed of Mystery,” by Mahmud Shabistari (died 1320 ; 720 a.u.), the Jém-2-Jam, or “Cup of Jamshid,” by Auhadi (died 1338; 738 a.u.), the Anjis-ul ‘Arifin, or “Friend of the Mystics,” by Kasim ɨ Anwar (died 1434; 837 a.u.), and others; to the latter ‘Assar’s Mihr u Mushtari, or “Sun and Jupiter” (1376 ; 778 a.u.), ‘Arifi’s Gadi u Chaugdn, or “The Ball and the Bat” (1438; 842 a.u.), Lusn u Dil, or “Beauty and Heart,” by Fattahi of Nishapur (died 1448; 852 a.n.), Sham‘ u Parwdna, or “The Candle and the Moth,” by Ahli of Shiraz (1489 ; 894 a.u.), Shah u Gadd, or ‘King and Dervish,” by Hilali (put to death 1532; 939 a.n.), Baha-uddin “A mili’s (died 1621 ; 1030 a.u.) Nan u Halwa, or “Bread and Sweets,” Shir u Shakar, or “ Milk and Sugar,” and many more.

During all these periods of literary activity, lyric poetry, pure and simple— z.e., the ghazal, in its legitimate form— had by no means been neglected ; alniost all the renowned poets since the time of Rudagi had sung in endless strains the pleasures of love and wine, the beauties of nature, and the almighty power of the Creator ; but, however rich the ghazals of Sa‘di in lofty thoughts and pious feelings, how- ever sublime the hymns of Jelal-uddin Rumi, it was left to the incomparable genius of Hafiz (died 1389 ; 791 .A.H.; see HAriz) to give to the world the most perfect models of lyric composition ; and the lines he had laid down were more or less strictly followed by all the ghazal-writers of the 9th and 10th centuries of the Hijra, —by Salman of Sawa (died about 1377; 779 a.u.), who excelled besides

- in kasida and mathnawi; Kamal Khujandi, Hafiz’s friend,

and protégé of Sultan Husain (776-784 a.u.); Mohammed Shirin Maghribi (died at Tabriz in 1406 ; 809 a.H.), an inti- mate friend of Kamal ; Ni‘mat-ullah Wali (died 1431 ; 834 A.H.), the founder of a special religious order; Kasim-1-

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Anwar (see above) ; Amir Shahi (died 1453 ; 857 A.H.), of the princely family of the Sarbadars of Sabzawar ; Banna’ (died 1512; 918 a..), who also wrote a romantic poem, Bahrém u Bihriz; Baba Fighant of Shiraz (died 1519; 925 .u.), usually called the “Little Hafiz” ; Nargis (died 1531; 938 a.n.); Lisdni (died 1534; 941 4.u.), who himself was imitated by Damiri of Isfahan, Muhtasham Kashi, and Wahshi Bafiki (all three died in the last decade of the 10th century of the Hijra); Ahli of Shiraz (died 1535; 942 A.H.), author of the Sihr-i-Haldl, or “ Lawful Witchcraft,” which, like Katibt’s (died 1434; 838 a.u.) Jf ajma‘-ulbahrain, or the ‘“‘ Confluence of the Two Seas,” can be read in two different metres ; Nau’‘i (died 1610 ; 1019 A.H.), who wrote the charming romance of a Hindu princess who burned herself in Akbar’s reign with her deceased husband on the funeral pile, styled Siviz u Guddz, or “Burning and Melt- ing,” &c. Among the immediate predecessors of Hafiz in the 8th century of the Hijra, in which also Ibn Yamin, the great kit‘ah-writer,! flourished, the highest fame was

gained by the two poets of Delhi, Amir Hasan and Amir Khosrau. The latter, who died in 1325 (725 a.u.), two years before his friend Hasan, occupies the foremost place among all the Persian poets of India by the richness of his imagination, his graphic style, and the historical interest attached to his writings. Five extensive diwdns testify to his versatility in all branches of lyric poetry, and nine large mathnawis to his mastership in the epic line. Four of the latter are poetical accounts of contemporary events during the reigns of the emperors of Delhi, ‘Ald-uddin Mohammad Shah Khiljf (1296-1311), his predecessor Fi{ruz Shah, and his successor Kutb-uddin Mubarek Shah,— the Miftah-ulfutih, or “ Key of Mysteries,” the Kirdn-ussa‘- dain, or “The Conjunction of the Two Lucky Planets,” the Nuh Sipihr, or “Nine Spheres,” and the love-story of Khidrkhdén u Duwalrdni. His other five mathnawis

formed the first attempt ever made to imitate NizAmi’s

famous Khamsah, or five romantic epopees, and this attempt turned out so well that henceforth almost all epic poets wrote quintuples of a similar description. Khwaji Kirmani (died 1352; 753 a.H.) was the next aspirant to Nizdmi’s fame, with five mathnawis, among which Humdi u Humdytin is the most popular, but he had to yield the

palm to ‘Abd-urrahman Jami (1414-1492 ; 817-898 a.H.), Jdémi the last classic poet of Persia, in whose genius were summed and later

up, as it were, all the best qualities of his great predecessors, and who combined, in a manner, the moral tone of Sa‘di with the lofty aspirations of Jelal-uddin Rumi, and the graceful ease of Hafiz’s style with the deep pathos of Nizdmi, to whose Khamsah he wrote the most successful counterpart (see his Yeisuj u Zalikhd mentioned above). Equally renowned are his numerous prose works, mostly on Sufic topics, and his three diwans, Many poets followed in Jamt’s footsteps, first of all his nephew Hatifi (see above), and either wrote whole khamsahs or imitated at least one or other of Nizdmti’s epopees; thus we have a Laid u Majnin, for instance, by Maktabi (1490), Hilali (see above),and Ruh-ulamin (died 1637). But their efforts could not stop the growing corruption of taste, and it was only at the court of the Mogul emperors, particularly of the great Akbar (1556-1605), who revived Sultan Mahmtd’s “round table,” that Persian literature still enjoyed

some kind of “Indian summer” in poets like Ghazali of Mash- had or Meshed (died 1572); ‘Urfi of Shiraz (died 1591), who wrote spirited kasidas, and, like his contemporaries Wahsht and Kauthari,a mathnawi, Farhdd u Shirin ; and Faidi (died 1595), the author of the romantic poem, Val u Daman, who also imparted new life into the ruba‘i. In Persia proper

1 A kit’ah or mukatta‘ah is a poem containing moral reflexions and differs from the kasida and ghazal only by the absence of a matla‘ or initial distich.

The drama,

His- torical works.

only Zulali, whose clever romance of “ Sultan Mahmud and his favourite Ay4z” (1592) is widely read in the East, S#’ib (died 1677), who is commonly called the creator of a new style in lyric poetry, and, among the most modern, Hatif of Isfahan, the singer of sweet and tasteful odes (died about 1785), deserve a passing notice.

But we cannot conclude our brief survey of the national literature of Persia without calling attention to the rise of quite a novel form of Iranian poetry, the drama, which has only sprung up in the beginning of the present century. Like the Greek drama and the Mysteries of the European Middle Ages, it is the offspring of a purely religious cere- mony, which for centuries has been performed annually during the first ten days of the month Moharrern,—the recital of mournful lamentations in memory of the tragic fate of the house of the caliph ‘Alf, the hero of the Shi‘itic Persians. Most of these passion-plays deal with the slaughter of ‘Ali’s son Hosain and his family in the battle of Kerbela. But lately this narrow range of dramatic subjects has been considerably widened; Biblical stories and even Christian legends have been brought upon the Persian stage; and there is a fair prospect of a further develop- ment of this most interesting and important movement.

In the various departments of general Persian literature, not touched upon in the foregoing pages, the same wonder- ful activity has prevailed as in the

realm of poetry and fiction, since the first books on history and medicine ap- peared under the Samdnids (see above). The most im- portant section is that of historical works, which, although deficient in sound criticism and often spoiled by a highly artificial style, supply us with most valuable materials for our own research, especially when they relate contemporary events in which the authors took part either as political agents or as mere eye-witnesses. Quite unique in this respect are the numerous histories of India, from the first invasion of Sultan Mahmud of Ghazna to the English con- quest, and even to the first decades of the present century, most of which have been described and partly translated in the eight volumes of Elliot's History of India (1867-78). Persian writers have given us, besides, an immense variety of universal histories of the world, with many curious and noteworthy data (see, among others, Mirkhond's and Khwandamfr's works under MirKHonp, vol. xvi. p. 499) ; histories of Mohammed and the first caliphs, partly translated from Arabic originals, which have been lost ; detailed accounts of all the Persian dynasties, from the Ghaznawids to the still reigning Kajars, of Jenghiz Khan and the Moguls (in Juwaint's and Wassdf's elaborate Twrikhs), and of Timur and his successors (see an account of the Zafarndéma under PETIS DE LA Crorx); histories of sects and creeds, especially the famous Dabistdn, or "School of Manners" (translated by Troyer, Paris, 1843) ; and many local chronicles of Iran and Turan. Next in importance to history rank geography, cosmography, and travels (for instance, the Vuzhat-ulkulib, by Hamdalla4h Mustaufi, who died in 1349, and the translations of Istakhri's and Kazwint's

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Arabic works), and the various tadhkiras or biographies of Sufis and poets, with selections in prose and verse, from the oldest of "Aufi (about 1220) to the last and largest of all, the Makhzan-ulghard'b, or "Treasure of Marvellous Matters" (completed 1803), which contains biographies and specimens of more than 3000 poets. We pass over the well-stocked sections of philosophy, ethics, and politics, of theology, law, and Sufism, of mathematics and astronomy, of medicine (the oldest thesaurus of which is the "Treasure of the sh4h of Khwarizm," 1110), of Arabic, Persian, and Turkish grammar and lexicography, and only cast a part-

ing glance at the rich collections of old Indian folk-lore Indian and fables preserved in the Persian versions of Kalilah y folk-lore

Dimnah (see RuDact), of the Sindbddndma, the Tvitindma, or “Tales of a Parrot,” and others, and at the translations of standard works of Sanskrit literature, the epopees of the Ramdyana and Mahdbhérata, the Bhagavad-Gitd, the Yoga-Vasishtha, and numerous Purdnas and Upanishads, for which we are mostly indebted to the emperor Akbar’s indefatigable zeal.

A complete history of Persian literature is still a desideratum. Hammer’s Schéne Redekiinste Persiens, Vienna, 1818, is altogether unsatisfactory and obsolete. Concise sketches of Persian poetry are contained in Ouseley’s Biographical Notices ; in Fltigel’s article in Ersch and Gruber’s Allgemeine Encyklopddie (1842) ; in Bland’s papers in the Journal of the Roy. Asiatic Society, vol. vii. p. 845 sq. and vol. ix. p, 122 sq.; and in Barbier de Meynard’s Poésie en Perse, Paris, 1877. Real mines of information are the catalogues of Sprenger, Calcutta, 1854; Morley, London, 1854; Fliigel, 3 vols., Vienna, 1865; and Rieu, 3 vols, London, 1879-83. For the first five centuries of the Hijra compare Ethé’s editions and metrical translations of “ Rudagi’s Vorliufer und Zeitgenossen,” in Morgenldndische Forschungen, Leipsic, 1875; of Kisd’i’s songs, Firdausi’s lyrics, and Abt Sa‘id b. Abt ’1-Khair’s ruba‘is, in Sitz- ungsberichte der bayr. Akademie (1872, p. 275 sq.; 1878, p. 622 sq.; 1874, p. 188 sq.; 1875, p. 145 sg.; and 1878, p. 88 sq.); of Avicenna’s Persian poems, in Géttinger Nachrichten, 1875, p. 555 sq.; and of Asadi and his munazarat, in “ Persische Tenzonen,” Verhandlungen des 5icn Oricntalisten-Congresses, Berlin, 1882, part ii., first half, p. 48 sg.; Zotenberg’s Chronique de Tabari, Paris, 1867-74; Jurjani’s Wis u Ramin, edited in the Bibl. Indica, 1864 (trans- lated into German by Graf in Z. D. M. G., xxiii. 875 sq.); and Kasi- mirski’s Spécitmen du diwdn de Menoutchehri, Versailles, 1876. On Khakani, see Khanykoff’s ‘‘ Mémoire,” in Journal Asiatique, 6th series, vol. iv. p. 187 sg. and v. p. 296 sg., and Salemann’s edition of his ruba‘is, with Russian transl., Petersburg, 1875; on Farid- uddin ‘Attar, Sacy’s edition of the Pandndma, Paris, 1819, and Garcin de Tassy’s Mantik-uttair, Paris, 1857 ; on the Gulshan-i-rdz, E. H. Whinfield’s edition, London, 1880; and on Amir Khosrau’s mathnawis, the abstracts given in Elliot’s History of India, vol. iii. p- 524 sg. German translations of Ibn Yamin were published by Schlechta-Wssehrd,

Bruchstiicke, Vienna, 1852; of Jami's minor poems, by Rosenzweig, Vienna, 1840; by Riickert, in Zeitschrift fir die Kunde des Morgenlandes, vols. v. and vi., and Zeitschrift der. D. Morgenl. Gesellsch., vols. ii., iv., v., Vi., XXiV., XXV., and xxix. ; and by Wickerhauser, Leipsic, 1855, and Vienna, 1858; German trans- lation of Yusuf u Zalikhd, by Rosenzweig, Vienna, 1824, English by Griffith, London, 1881; French translation of Latlé u Majnin, by Chézy, Paris, 1805, German by Hartmann, Leipsic, 1807; Hilali's ‘‘ Konig und Derwisch," by Ethé, in Morgcnland. Stud., Leipsic, 1870, p. 197 sy. On the Persian drama, compare Gobineau's Religions et Philosophies de lV Asie centrale, Paris, 1866; Chodzko's Théétre persan, new ed., Paris, 1878; and Ethé, ‘‘ Persische Pas- sionspiele," in Aforgenldnd. Stud., p. 174 sq. (H. E.)

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PERSIGNY, Jean Gitperr Vicror Fiauin, Duc DE (1808-1872), the most devoted servant of Napoleon III., who with the duc de Morny and Marshal Saint-Arnaud formed the triumvirate which established the second em- pire, was born at Saint-Germain Lespinasse (Loire) on 11th January 1808. He came of a ‘90d family, but not a noble one, and, as his father had been killed at the battle of Sala- manca in 1812, he was brought up by an uncle, who sent him to be educated at the college of Limoges. He entered the 3d Hussars in 1825, the cavalry school at Saumur in 1826, and became maréchal des logis in the 4th Hussars in 1828. He was at this time a Legitimist, but was soon made a Republican by his captain, and he helped to persuade his regiment to assist in the insurrection of 1830. For this service he expected great rewards, but got none, and was eventually dismissed from the army for insubordination in 1831. Finding himself without resources, he took to journalism, and assisted in editing the Temps, and in 1833, by which time he had become a profound Bonapartist, he issued a solitary number of a new journal, the Occident francais, in which he proclaimed his political creed. This number was sent to Queen Hortense

at Arenenberg, and when M. Fialin followed it in person, calling himself the vicomte de Persigny, he met with a warm reception, and soon became indispensable to Louis Napoleon. He had two qualities which gave him ascendency over the young prince, fidelity and audacity. He it was who planned the attempt on Strasburg in 1836, and that on Boulogne in 1840. For his share in the last escapade he was sentenced to imprisonment in a fortress for twenty years, which was commuted into detention at Versailles, where he wrote a curious book to prove that the Pyramids were built to keep the Nile from silting up. When the Revolution of 1848 broke out he laboured indefatigably for the Bona- partist cause, securing the election of Louis Napoleon to the Constituent Assembly in June and in September 1848, and to the presidency in December 1848. His own prosperity was now secured ; he was made aide-de-camp to the prince president, and elected to the Legislative Assembly in May 1849 for the department of the Loire. He then became one of the secret plotters of the coup d'état, and was at first designed for the office of minister of the interior, but a man of more capacity, De Morny, was chosen for this post, and Persigny only accompanied Colonel Espinasse to take possession of the hall of the assembly. On securing the throne Napoleon ITI. hastened to reward his most faithful personal adherent. Persigny became minister of the interior in the place of De Morny in January 1852, and a senator in December 1852. He resigned office in 1854 and became ambassador in London, with but one short interval (1858-59), from May 1855 to November 1860, when he again became minister of the interior. His second tenure of office lasted till June 1863, when he resigned in disgust at the influence which M. Rouher was attaining over the mind of the emperor, and was made duc de Persigny in September 1863. As a minister he showed very little capacity, and throughout the years of his political influence he never seemed to understand, like De Morny, the real bases of the existence of the second empire. He, however, from dislike of Rouher, supported Ollivier in 1869, and defended the plébiscite, and when the empire fell in 1870 escaped to England. He did not long survive the overthrow of the idea which he had so strenuously supported, and died at Nice on 11th January 1872. Fialin de Persigny was certainly only an adventurer, but he had one merit, which the other founders of the second empire did not possess, fidelity to his master.

For Persigny's life, see a most eulogistic biography by Delaroa

(Le duc de Persigny et lcs doctrines de Vempire, 1865); a short biography in Mirecourt's Portraits contemporains (18 58); and Cas-

tille's Portraits politiques et historiques (1859). His own curious book, De la destination et de Vutilité permanente des Pyramides ad' Egypte et de Nubie, was published in 1845, and he wrote various political pamphlets, of which the most interesting relates to the Strasburg attempt, Relation de Ventreprise du prince Napoléon Lowis (Lond. 1837). For his political career under the empire, see Taxile Delord's Histoire du second empire (1868-75).

PERSIMMON, the name given to the fruits of Diospyros virginiana in the United States. The tree which bears them belongs to the order Hbenacex, and lias oval entire leaves, and moneecious flowers on short stalks. In the male flowers, which are numerous, the stamens are sixteen in number, arranged in pairs, and with the anthers opening by slits. The female flowers are solitary, with traces of stamens, and have a glabrous ovary with one ovule in each of the eight cells,—the ovary being surmounted by four styles, which are hairy at the base. The fruit-stalk is very short, bearing a subglobose fruit an inch or rather more in diameter, of an orange-yellow colour, and with a sweetish astringent pulp. It is surrounded at the base by the persistent calyx-lobes, which increase in size as the fruit ripens. The astringency renders the fruit somewhat unpalatable, but, after it has been subjected to the action of frost, or has become partially rotted or "'bletted" like a medlar, its flavour is improved. In some of the south- ern States the fruit is said to be kneaded with bran, made into cakes, and baked. From the cakes a fermented liquor is made with the aid of yeast. The tree is cultivated in England, but rarely if ever ripens its fruit, and in the States it is said not to ripen north of New Jersey.

The Chinese and Japanese cultivate another species, the Diospyros Kaki, of which there exist numerous ill-defined vavieties, which, according to Mr Hiern in his exhaustive monograph of the Ebcnacew, all belong to one species. The fruits are larger than those of the American kind, variable in shape, but have similar properties. Some varieties have been introduced into Great Britain, and have produced their fruits in orchard-houses. The fruit is in appearance something like that of the apricot, but very astringent to the

taste. After ‘‘bletting,” however, 1t becomes sweet and agreeable. Some specimens analysed by Dr Voelcker for the scientific committee of the Royal Horticultural Society contained, roughly, 84 per cent. of water, 24 per cent. of tannic acid, and 9°8 of sugar, pectin, &c., with small quantities of woody, albuminoid, and mineral matters.

PERSIUS (A. Persrus Fiaccus) stands third in order of time of those recognized by the Romans as their four greatest satirists. These represent four distinct periods of the national development—the revolutionary era of the Gracchi, the years immediately preceding the establishment of the monarchy, the first years of the reign of Nero, the age of Domitian and the dawning of the better era which followed on the accession of Nerva. Their relative value consists in the truth, freedom, and power with which they expressed the better spirit of their time, commented on its vices and follies, and described the actual personages, the prevailing types of character, and the fashions and pur- suits—the “quicquid agunt homines”—by which it was marked. Of these four representatives of the most dis- tinctly national branch of Roman literature— Luciltus, Horace, Persius, and Juvenal—Persius is the least im- portant. He is indeed inferior to none of them in the purity and sincerity with which he expresses the best spirit of his age; but he was inferior in literary originality and vigour to Lucilius, in literary art to Horace and Juvenal,—less powerful in his denunciation of evil than Lucilius and Juvenal, less searching in his criticism than Horace,—less true to life in his delineation of men and manners than the two earlier satirists, less powerful in his effects than the latest among them. This inferior- ity is to be ascribed partly to the circumstances of his age. Its literature was more artificial, and also more opposed to the true principles of art, than that of any other stage in the development of Roman letters. The generation which succeeded the Augustan age—the generation which. lived

under Tiberius, Gaius, and Claudius—had not the genius to originate a literature of its own nor the sense of security which would enable it to perpetuate the literary accomplish- ment of the preceding age. No period between the Cicer- onian era and the reign of Hadrian was so unproductive. The accession of the young emperor, in whom were ulti- mately realized the

worst vices of the tyrant along with the most despicable weaknesses of the letterateur and artiste— "'scenicus ille-" is the term of contempt applied to him in Tacitus—gave a fresh impulse to that fashion of verse- making which Horace remarked as almost universal among his educated contemporaries, and which was stimulated by the rhetorical education of the day. But the writers of the Neronian age had neither the genius nor the true sense of art which distinguished the Ciceronian and Augustan ages, nor had they acquired the cultivated appreciation and good taste of the later Flavian era, nor were they animated by that sense of recovered freedom of speech and thought which gave to Roman literature its two last great repre- sentatives. The writing of the Neronian age was, for the most part, a crude and ambitious effort to produce sensa- tional effects by rhetorical emphasis. Of its representatives four can still be read with a certain though by no means an unmixed pleasure,—Seneca, Lucan, Petronius, and Persius. Of these Persius had least of the true literary gift. He had neither the smooth and fluent elegance of Seneca, the "ingenium amcenum et auribus illius temporis accom- modatum " attributed to him by Tacitus, nor the rhetorical passion of Lucan, nor the cynical realism and power of representation which enabled Petronius to originate a new form of literature. Persius could not have become a satirist of the type of Petronius or of Martial: he could not have treated human degradation in a spirit of cynical sympathy or of amused tolerance. On the other hand earnest satire directed against its legitimate objects, the emperor and his favourites, could not at such a time express itself openly. '""Pone Tigellinum" is an expressive reminder that it was safer to write sickly sentimentalism about " Phyllis and Hypsipyle" than to assume the réle of Lucilius.

But apart from the influence of his time and the natural limitations of his genius, the personal circumstances of Persius were unfavourable to success in the branch of literature to which he devoted himself. The shortness of his life and the retirement in which it was spent, his studious tastes, his delicate health, and that which is most admirable in him, his exceptional moral purity, all con- tributed to keep him ignorant of that world which it is the business of a satirist to know. Lucilius, Horace, Petronius, Martial, Juvenal, were all men of the world, who knew the life of their day by close personal contact with it, and had no need to imagine it through the medium of impressions received from literature, or situations in- vented as themes for

rhetorical exercises. Some aspects of his time, such as the outward signs of literary affectation and effeminacy, did come within the range of Persius's observation, and these he describes with no want of the pungency, "Italum acetum," characteristic of his race. But from any intimate knowledge, even through the medium of conversation, of the vices and vulgarities from which Petronius lifts the curtain he was debarred by the purity alike of his moral instincts and of his taste. Thus his satire, while able to lash "the sickly morals" of his time ("pallentes radere mores ") in fervid generalities, cannot perform the more important function of probing them through living examples.

But Roman satire had another function besides the re- presentation and criticism of men and manners. More than any other branch of literature it was the expression of the writer's own nature and convictions. The frank sincerity with which these were expressed was a great cause

of the personal hold which Lucilius had on his readers ; it is still one of the secrets of the personal charm of Horace, The sympathy with which Persius was read in the early days of Christianity and the enthusiasm which many readers have felt for him in modern times are mainly due

to the impression of character which he produces. But he is to be regarded further, not as an isolated specimen of purity in an impure age, but as an important witness of that undercurrent of moral 'and spiritual sentiment which gathered force as a protest against the corruption and tyranny of the first century of the empire. The conscious- ness of moral evil which became intensified during that period is very apparent when we compare the spirit of Cicero and Horace, men in their own day seriously con- cerned with questions of conduct, with that of Tacitus and Juvenal. This great inward change was stimulated and directed by the teaching of Stoicism; and it was in the reign of Nero that Stoicism gained its chief ascendency over educated men, and supplanted among the adherents of the republic the fashionable Epicureanism of the days of Lucretius and Horace. Of the Stoical spirit of that time, represented also by Seneca and Lucan, Persius is the purest representative. His chief claim to consideration is, not that he is a great poet, satirist, or humorist, or even an agreeable writer, but that he is one of

the earliest, and, amongst classical writers, one of the most sincere preachers of a pure personal morality based on a spiritual conception of religion.

The impression of him produced by his writings is confirmed by the accounts transmitted of his life, for which we are indebted to the contemporary grammarian, Valerius Probus of Berytus. Written when the impression left by him was fresh on the memory of his friends, it may be accepted as trustworthy in regard both of outward facts and of the sentiments which he inspired.

Well born and well connected, and the inheritor of a good estate, Persius lived the uneventful life of a student, and was chiefly remarkable for his affection for his friends, his teachers, and his family. He was a native of Etruria, a district which contributed less than any other in Italy to the literary distinction of Rome. And it is noticeable that, while Persius has all the characteristic moral fervour of the more serious Roman writers, he shows less, compared with those who have an important place in the national litera- ture, of that sensuous vivacity and susceptibility to beauty in art and nature with which the purely Italian race was pre- eminently endowed. He was born at Volaterre: in the year 34 A.D., and received his early education there. His father died when he was six years of age, and his mother, Fulvia Sisennia, whose latter name by its termination is indicative of an Etruscan stock, married a second time and was soon again left a widow. In one of the satires he speaks of the eagerness with which his father used to bring his friends to listen to his recitation of the dying speech of Cato. It is not likely that at the age of six he could have been so far advanced in his rhetorical education, and perhaps, though he uses the word “pater,” this reminiscence, which is told not without satirical colouring, may be a testi- mony to the interest which his stepfather took in watching his progress. The nature of the lesson—‘ morituri verba Catonis”—is suggestive of an early direction towards Stoicism given in his teaching ; but by what he tells us of his way of shirking his lessons and of his healthy pre- ference of play to work, he seems to have done what he could to escape the doom of becoming a precocious prodigy. He was taken at the age of twelve to Rome, and continued his education under the two most famous grammarians and rhetoricians of the day, Remmius Palemon and Virginius.

Flavus. The decisive influence of his life was his friend- ship with the Stoic philosopher, Annzeus Cornutus, whose

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pupil he became on assuming the “ toga virilis” at the age of sixteen. To the charm of this man’s conversation and teaching Persius attributes his escape from the temptations to a life of pleasure, to which youths of good position and fortune were exposed at Rome. Besides his friendship with Cornutus, he enjoyed during ten years of his life the inti- mate friendship of Thrasea Peetus, the noblest specimen of Stoicism which the Roman world produced in the first century of the empire. This intimacy was probably due, in the first place, to the relationship of Persius to the younger Arria, the wife of Thrasea. Though a much younger man, he gained so completely the affection of Thrasea that he often went with him as the companion of his travels. The knowledge that he was an intimate mem- ber of the circle of Thrasea and Helvidius gives an addi- tional interest to the opinions of Persius on literature and conduct, and also to the indications of his attitude towards the reigning power. He was introduced also to Seneca, but was not much attracted by his genius. The influence of Thrasea may have had something to do with this want of sympathy. The true Stoic, who “kept as holidays the birthdays of the two Brutuses and of Cassius,” was not likely to have been among the admirers of the apologist for parricide.}

He was also intimate with some of the younger poets of the time, especially with Cesius Bassus, to whom he addresses his sixth satire. He was acquainted with his younger and more famous contemporary, Lucan, who is said, with the generous impulses which seemed to have been mixed with the fatal weaknesses of his character, to have been carried away by great enthusiasm when he first heard Persius reciting some of his verses. His biographer tells us that the impulse to writing satire was derived from reading a book of Lucilius. He was evidently a diligent student both of him and of Horace. He himself justifies his adoption of this mode of writing by his natural tendency to satiric criticism,—“sum petulanti splene cachinno.” But his satire shows as little of the humorous amusement in contemplating the comedy of life, which is one of the motives of the satire of Horace, as of

the fierce indigna- tion which the tragic spectacle of its crimes produced in Juvenal. We should rather be inclined to conclude that, as his Stoicism was a protest against the vices and tyranny of the time, so his adoption of that masculine national form of literature which took its subjects from the actual expe- rience of Roman life was a protest against the effeminate style and exotic themes which were then fashionable with the social class to which he belonged.

There is no trace in his writings of any participation in the active interests of public or professional life. More than any other Roman writer, except perhaps Lucretius, he chose the "secretum iter et fallentis seniita vite" (the flowery path that winds by stealth). But his life, if appa- rently much happier, was not enriched by the fulness of contemplative interest and of delight in nature which lightened up the gloom of the older poet. His latest satire, addressed to his friend Cesius Bassus, is written from the port of Luna on the Gulf of Genoa; but, while celebrating the mildness of its winter climate, grateful to him as an invalid, he is silent about the charm of its natural beauty. He died at the age of twenty-eight, on one of his own estates on the Via Appia, within eight miles of Rome. His satires were revised by Cornutus, and edited at his own request by Cesius Bassus. The former is said to have altered into a vague generality an expression re- flecting on the poetical gifts of Nero, a subject as danger- ous to deal with as his vices and tyranny. Dying in the

1 Cf. "Ergo non iam Nero, cuius immanitas omnium questus anteibat, sed Seneca adverso rumore erat, quod oratione tali confessionem scrip- sisset'"' (Tac., Ann., xiv. 11).

year 62 a.p., Persius did not witness the worst crimes of that reign, and escaped the fate which awaited Seneca, Lucan, and Thrasea.

His character is thus summed up by his biographer. "He was of a most gentle disposition, of maidenly modesty, handsome Jn person, and marked by exemplary affection towards his mother, sister, and aunt. He lived soberly and chastely." The characteristic of "virginalis pudicitia" it 1s natural to associate with the pure family atmosphere in which he lived ; and

the existence of cultivated women who could exercise such an influence is a warning not to Judge Roman society, even in its worst time, altogether from the representation of Juvenal. The letters of Pliny amply confirm the belief that the world was not all so bad as if appears in that representation. The tone of the biographer as well as his explicit statements attest the warm affection which Persius inspired in his lifetime. Mere asceticism unaccompanied by other graces of character cannot account for this sentiment of affection; and the Roman world had a keen eye to detect insincere professions of austerity. But, while there are many signs of inexperi- ence of life and much forced and artificial writing in Persius, there is in the expression of his deepest convictions an unmistakable ring of genuineness. He seems to love virtue without effort, because his nature finds in the love and practice of virtue the secret of happiness. There is also in the personal addresses to his friends, as in that to Macrinus, a tone of genial sympathy with the innocent enjoyments of life. In the expression of affection for those whom he loved no ancient writer is so cordial and single-minded, except one, as much separated from him by the licence of his life as by the force of his genius, who also died in early youth, the ardent true-hearted poet of Verona.

Persius is said to have written slowly and seldom, and, though he seems to have composed, probably before he devoted himself to satire, a tragedy on a Roman subject, an account in verse of some of his travels, and some lines on the elder Arria (none of which were ever given to the world), the only result of his literary activity is the short book of six satires which we now possess. The contrast between the small amount of his contributions to literature and the reputation which he enjoyed is noticed by two ancient writers, who indicate their appreciation of his value, Quintilian and Martial. The satires are not only fewer in number than those of Horace and Juvenal, but they are for the most part shorter. Only one of them, the first, fulfils the proper function of satire by representing any phase of the life of the time and pointing its moral. It exposes by personal sketches and representative imitations the fashionable taste in poetry, and marks its connexion with the luxury and effeminacy of the age. The satire was believed in ancient times to be aimed at the emperor ; and this is confirmed, not only by the tradition of the substitution by Cornutus of the vague generality “quis non ” for the pointed ‘‘ Mida rex,” but also by the parody ‘‘Torva Mimal- loneis

implerunt cornua bombis," &c., which is in keeping with the account we have in Tacitus and other writers of the style of the emperor's compositions. In an age abounding in informers it would have been dangerous to have published or even to have read before a circle of friends a more direct comment ; but the attitude of Pcrsius towards the absolute ruler of the day may be inferred from other references in the satires, as from the passage lil. 35, be- ginning " Magne pater divum" ; and again ativ. 20, in the words, 'Ast ego Dinomaches," we may suspect a protest against the de- gradation of the Roman world in submitting to be governed by the son of Agrippina. Even in the abstinence from one single word of compliment to the ruling power we enjoy an agreeable contrast to the time-serving of Seneca and the adulation of Lucan.

While the first satire is, like most of those of Lucilius, Horace, and Juvenal, essentially representative, and has its motive in the desire to paint in satiric colours a prevailing fashion and some of the actual personages or types of character of the day, all the rest are essentially didactic and have their motive in the desire to enforce and illustrate some lesson of morality or tenet of Stoicism. The second is an admirable sermon on prayer, and illustrates by ex- amples that union of worldliness and covetousness with religious faith and practice which has not been absolutely confined to Pagan- ism. The third is aimed at the exposure and correction of the weakness of character which, in spite of good resolutions, succumbs to the attacks of sloth and pleasure. The fourth, suggested by the first Alcibiades of Plato, though perhaps also written with covert reference to one whose " Greek levity' may have prompted him to

pose as a Roman Alcibiades, is directed against the arrogant claims of a sensual youth to deal, on the ground of his hereditary distinc- tion, with affairs of state and to govern men. The fifth, the most elaborate of all, illustrates the Stoical doctrine of the difference between true and false freedom, and shows the power of avarice, luxury, the passion of love, ambition, and superstition to make men slaves. It is the same subject as that which Horace treats in the third satire of the second book ; but it is treated with neither the irony nor the direct knowledge of life which Horace applies

to it. The last satire is chiefly devoted to a subject which played a large part in the satire of Horace and Lucilius,—the proper use of money. In all these latter pieces the subjects are the common- places of satire and moral disquisition, illustrated rather by new versions of old characters than by pictures of the living men and women of the day. Though he expresses admiration for the spirit of Lucilius and the old comedy, he seems to keep clear of all personality and detraction. He professes ‘‘ingenuo culpam defigere ludo,” and, whatever may be thought of his humour, he at least always writes in the spirit of a gentleman. So far as there is real contact with life in his satires, it is with the vanity and weakness of the class to which he himself belonged that he shows familiarity. Other sketches, however, show original observation, as that of the pro- vincial zdile, of the brawny centurion who laughs at all philosophers, and, the most elaborate of all, that of the man torn asunder by his avarice and his love of luxury, who shrinks from the hard roughing of a sea-voyage, to which he is prompted by his cupidity (i. 129, li. 76-87, v. 141-150).

In point of form he aims at reproducing the dialogue of the old ‘‘satura,” to which Horace finally adhered. But for the dramatic vivacity of ordinary speech he substitutes the curt questions and answers of Stoicaldisquisition. This isa great source of the obscurity of his writing. Some of his satires take the form of a familiar epistle, but in them also there is a large intermixture of dialogue. In style, while he protests against other modes of affectation, he can- not escape the perverse fashion of forced and exaggerated expression. While disclaiming imaginative inspiration and avoiding poetical ornament, he falls into the opposite extreme of excessive realism, and disguises his plain meaning under contortions of metaphor, taken from the forge, the potter’s wheel, the carpentcr’s rule, the baker’s oven, &c. He is fond, too, of the realism of physical ex- pression to denote states of mind and feeling, such as ‘‘fibra,” “*pulpa,”’ ‘‘ gluto,” &¢.; and this tendency, combined perhaps with the wish to imitate Lucilius, has led him occasionally to disfigure the purity of his pages with unnecessary coarseness. It is only rarely, and when he is at his best, that we are not conscious of a constant strain to express his meaning with unnecessary emphasis. Though single phrases of forcible condensation can be quoted from him, yet almost every period and paragraph seems to have been made harsh and obscure with the purpose of arresting attention. In the pictures

which he draws from life, as in that of the reciting poet in the first satire, he strives by minuteness and exaggeration of dctail to produce a strong sensational impression ; and this is still more observable in those numerous cases where he distorts and cari- catures the temperate and truthful effects of Horace's sketches. No Latin writer is less natural. His works have engaged the industry of many commentators both in ancient and modern times. None could claim less the praise which Martial claims for his own, of " pleasing grammarians without needing the aid of their interpretation."

It is not, accordingly, among writers but among moralists that he holds a high place. Among the professors of Stoicism some were better writers, others were greater men ; no one was purer in all his instincts, more sincere in all his nature, or inspired with a more genuine enthusiasm for virtue. It is when he gives expression to this enthusiasm and to his single-hcarted affection for his friends that he is able for a few lines to write with simple force and with impassioned earnestness. Such lines as these—

" Compositum ius fasque anime, sanctosque recessus Mentis, et incoctum generoso pectus honesto" (ii. 73, 74); "* Quid sumus et quidnam victuri gignimur. . . -.. que te deus esse Jussit et humana qua parte locatus es in re" (iii. 66-72), &c.; are in a strain more in accordance with the best modern ideas of man's highest duty and his true position in the world than anything to be found in the other satirists of Rome. The aim of Lucilius was to make men good citizens. He judged their life by the standard of public virtue and utility. The aim of Horace's satire was to make men happier in themselves and more agreeable in their intercourse with one another. He judged them by the standard of good sense, good feeling, and good manners. The aim of Juvenal—so far as it was sincere—was to raise human life from the degradation into which it had fallen. The standard by which he judged the men of his day was that of the manliness and dignity realized in the best ages of the republic. The aim of Persius was to make men live in accordance with the dictates of a pure conscience. His standard was that ideal of human conduct

which has arisen out of the aspirations and convictions of an en- lightencd theism.

The best recent editions of Persius are those of O. Jahn and of Professor Conington. The edition of Mr Pretor is also to be named. All of these contain, in their introductions, important contributions to the critical estimate of Persius. An excellent account of his life, character, and writings is to be found in Martha's Les Moralistes Romains, and an interesting, though some- what disparaging, criticism of him as a writer is contained in Nisard's Poétes Latins de la Decadence. W. Y. 8.)

PERSONAL ESTATE. Strictly speaking, the term Estate (g.v.) is confined in English law to the extent of interest which can exist in real property. But 'personal estate" is a term often conveniently, if not accurately, applied to all property that is not real property. The division of property into real and personal represents in a great measure the division into immovable and mov- able incidentally recognized in Roman law and generally adopted since. "The only natural classification of the objects of enjoyment, the only classification which corre- sponds with an essential difference in the subject-matter, is that which divides them into moveables and immove- ables" (Maine, Ancient Law, ch. viii.) " Things personal," according to Blackstone, ''are goods, money, and all other moveables which may attend the owner's person wherever he thinks proper to go" (Comm., vol. ii. p. 16). This identification of things personal with movables, though logical in theory, does not, as will be seen, perfectly express the English law, owing to the somewhat anomal- ous position of chattels real. In England real property is supposed to be superior in dignity to personal property, which was originally of little importance from a legal point of view. This view is the result of feudal ideas, and had no place in the Roman system, in which immov- ables and movables were dealt with as far as possible in the same manner, and descended according to the same rules. The law of personal property has developed more rapidly and freely than that of real property, as it is of more modern growth and has not been affected by the notion of tenure. The main differences between real and personal property which still exist in England are these. (1) In real property there can be nothing more than limited ownership (see Estate); there can be no estate properly so called in personal property, and it may be held in complete ownership. There is nothing correspond- ing to an estate-tail in personal property ; words which in real property would create an estate-tail will give an absolute interest in personalty. A life-interest may, however, be given in

personalty, except in articles quz tpso usu consumuntur. Limitations of personal property, equally with those of real property, fall within the rule against perpetuities. (See Reat Estarr.) (2) Personal property is not subject to various incidents of real property, such as rent, dower, or escheat. (3) On the death of the owner intestate real property descends to the heir ; personal property is divided according to the Statute of Distribu- tions. (4) Real property as a general rule must be trans- ferred by deed ; personal property does not need so solemn a mode of transfer. (5) Contracts relating to real pro- perty must be in writing by the Statute of Frauds, 29 Car. I]. c. 3,s. 4; contracts relating to personal property need only be in writing when it is expressly so provided by statute, as, for instance, in the cases falling under s. 17 of the Statute of Frauds. (6) A will of lands need not be proved, but a will of personalty or of personal and real property together must be proved in order to give a title to those claiming under it. (7) Devises of real estate fall as a rule within the Mortmain Act, 9 Geo. IIL. c. 36 (see CHARITIES, CORPORATION); bequests of personal pro- perty, other than chattels real, are not within the Act. (8) Mortgages of real property need not generally be registered ; mortgages of personal property for the most part require registration under the Bills of Sale Acts (see PLepGE ; and Birt or Sats, vol. iii. p. 674).

Personal estate is divided in English law into chattels

real and chattels personal ; the latter are again divided into choses in possession and choses in action. Chattels real are personal interests in real estate, which, though they are annexed to land, still descend ,1n the same manner as personal estate. Blackstone speaks of them as being “ of a mongrel amphibious nature.” Examples are a term of years, the next presentation to a benefice, an estate pur autre vie, and money due upon a mortgage. Under the head of chattels personal fall all kinds of property other than real estate and chattels real. In cases of bequest to a charity the terms pure and impure or mixed personalty are often used. The latter class is almost conterminous with chattels real. It falls as a rule within the Mortmain Act. A chose in action denotes the right of recovery by legal proceedings of that which, when recovered, becomes a chose in possession.

Choses in action were before the Judicature Acts either legal, as debts (whether arising from contract or tort), recoverable in a court of law, or equitable, as legacies (residuary personal estate of a deceased person), or money in the funds. A legal chose in action was not assignable. A consequence of this view was that until 1875 (subject to one or two statutory ex- ceptions, such as actions on policies of insurance) an action on an assigned chose in action must have been brought at law in the name of the assignor, though the sum recovered belonged in equity to the assignee, and in equity he might have sued in his own name, making the assignor a party as co-plaintiff or as defendant. The Judicature Acts have made the distinction drawn between legal and equitable choses in action of no importance. The Judicature Act, 1873, 36 and 37 Vict. c. 66, s. 25, (6), enacts that the legal right to a debt or other legal chose in action may be passed by absolute assignment in writing under the hand of the assignor. The old law as to the reduction into possession by a husband of his wife's choses in action (see Huspanp AND Wire) seems to have been practically rendered obsolete by the Married Women's Property Act, 1882. Blackstone, who is followed by Mr Joshua Williams (Law of Personal Property), recognizes a further division of encorporeal personal property, standing between choses in action and choses in possession, and including personal annuities, stocks and shares, patents, and copyrights,

Interest in personal property may be either absolute or qualified. The latter case is illustrated by animals fere nature, in which property is only coextensive with detention. Personal estate may be acquired by occupancy (including the accessio, commixtio, and confusio of Roman law), by invention, as patent and copyright, or by transfer, either by the act of the law (as in bankruptcy, judgment, and intestacy), or by the act of the party (as in gift, con- tract, and will).

There are several cases in which, by statute or other- Wise, property is taken out of the class of real or personal to which it seems naturally to belongs By the operation of the equitable doctrine of conversion money directed to be employed in the purchase of land, or land directed to be turned into money, is in general regarded as that species of property into which it is directed to be converted. An example of property prima facie real which is treated as personal is an estate pur autre vie, which, since 14 Geo. Il. ¢. 20, s. 9 (now

replaced by 1 Vict. c. 26, s. 6), is distributable as personal estate in the absence of a special occupant. Examples of property prima facie personal which is treated as real are FrxrurEs (q.v.), heirlooms, such as deeds and family portraits, and shares in some of the older companies, as the New River Company, which are real estate by statute. In ordinary cases shares in com- panies are personal estate, unless the shareholders have individually some interest in the land as land.

The terms heritable and movable of Scotch law to a great extent

correspond with the real and personal of English law. The main points of difference are these. (1) Leases are heritable as to the succession to the lessee, unless the destination expressly exclude heirs, but are movable as to the fisk. (2) Money due on mortgages and securities on land is personalty in England. At common law in Scotland debts secured on heritable property are themselves heritable. But by 31 and 82 Vict. c. 101, s. 117, heritable securi- ties are movable as far as regards the succession of the creditor, unless executors are expressly excluded. They still, however, remain heritable quoad fiscwm, as between husband and wife, in computing legitim, and as far as regards the succession of the debtor. (8) Up to 1868 the heir of heritage succeeded to certain movable goods called heirship movables,.which bore a strong likeness to the heirlooms of English law. This right of the heir was abolished by 81 and 82 Vict. c. 101, s. 160. (4) Annuities, as having tractwm Suturi temporis, are heritable, and an obligation to pay them falls upon the heir of the deceased (Watson, Law Dict., s.v. “ Annuities”). The law in the United States agrees in most respects with that of England. Heirlooms are unknown, one reason being, no doubt, that the importance of title-deeds is much less than it is in England, owing to the operation of the Registration Acts. Long terms in some States have annexed to them the properties of freehold estates. Thus in Massachusetts, if the original term be a hundred or more years, it is deemed a fee as long as fifty years remain unexpired (Mass. Gen. Stat., c. 90, §20). In the same State estates pur autre vie descend like real property (Gen. Stat., c. 91,§ 1). In New York and New Jersey an estate pur autre vie is deemed a freehold only during the life of the grantee; after his death it

becomes a chattel real. In other States the heir has a scintilla of interest as special occupant (Kent, Comm., vol. iv. p. 27). In some States railway rolling-stock is considered as purely personal, in others it has been held to be a fixture, and so to partake of the nature of real property. Shares in some of the early American corporations were, likc New River shares in England, made real estate by statute, as in the case of the Cape Sable Company in Maryland (Schouler, Law of Personal Property, vol. i. p. 619). In Louisiana animals employed in husbandry are, and slaves were, regarded as immovables. Pews in churches are generally real property, but in some States they are made personal property by statute, ¢.g., in Massachusetts (Gen. Stat., c. 80, § 38). The assignment of choses in action is generally permitted, and is in most States regulated by statute. The circuit court has no jurisdiction in the case of an assigned chose in action unless a suit might have been prosecuted in that court if no assignment had been made (Revised Stat. of VY. S., tite xm. § 629). (amity)

PERSPECTIVE. See PRoJEcTION.

PERTH, an inland county of Scotland, is situated almost in the centre of the country between 56° 4’ and 56° 57’ N. lat., and between 3° 4’ and 4° 50’ W. long. The larger part of its border-line is formed of natural bound- aries, the Grampians separating it on the west and north from Argyll, Inverness, and Aberdeen; while the Ochils and the Firth of Tay in the south-east divide it from Kinross, Clackmannan, and Fife. In the south the river Forth forms a large portion of the boundary with Stirling, but the boundary with Forfar in the north-east is almost at no point defined either by rivers or mountains. The county is of an irregular circular form, the diameter being about 70 miles. A small portion in the south-east is separated from the main portion at the junction of Clackmannan and Fife, and another small portion is sur- rounded by Stirlingshire. Perthshire is the fourth largest county in Scotland, the total area being 1,617,808 acres, or 2528 square miles. Situated on the Highland border, Perthshire embraces characteristics scarcely combined in any other county of Scotland, and it excels them all in the picturesqueness and multiform variety of its scenery. The finest passes into the Highlands are Killiecrankie, Leny, and the Trosachs. With hardly any exception the rivers and streams flow east and south and reach the ocean either by the Forth or the Tay. They generally issue from large elongated lochs formed by

depressions at the foot of the mountains. The Ericht in the extreme north-west unites Loch Ericht and Loch Rannoch ; and from the latter flows the Tummel, which, after passing through Loch Tummel and forming a series of rapids and falls, joins the Tay. The Tay, which rises on the borders of Argyllshire, passes through Loch Dochart and Loch Tay, and in its course

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of rather over 100 miles receives nearly the whole drainage of the county, discharging a larger volume of water to the sea than any other river in Great Britain; its principal tributaries are the Tummel at Logierait, the Bran near Dunkeld, the Isla near Kinclaven (after its junction with the Ericht), the Almond near Perth, and the Earn from Loch Earn, at the borders of Fifeshire. The Forth from Loch Ard skirts the southern boundary of the county, and receives the Teith from Lochs Katrine, Achray, Vennacher, Voil, and Lubnaig, the Goodie Water from Loch Menteith, and the Allan, which rises in the Ochil Hills. Loch richt, partly in Inverness-shire, and Loch Tay are each more than 14 miles in length, Loch Rannoch is 9 miles long, Lochs Earn and Katrine are 7 each, and Lochs Ven- nacher, Lubnaig, and Voil each between 5 and 3. There are an immense number of small lochs varying in length from 1 to 3 miles, among which may be mentioned Garry, Tummel, Lows, Lyon, Dochart, Freuchie, Ard, and Men- teith. The lochs and rivers abound in salmon and varieties of trout; and scarcely any of the streams have been per- ceptibly injured by the pollution of manufactures. About four-fifths of the surface of the county, chiefly in the west and north-west, is occupied by the Grampians, or encroached on by their ridges or by isolated summits, among the highest of the chain in Perthshire being Ben Lawers (3984 feet), north of Loch Tay; Ben More (3843) and Stobinnain (3821), south of Loch Dochart ; Ben-y-Gloe (3690), and other peaks, near Glen Tilt; Schiehallion (3547), south of Loch Rannoch; and Ben Voirlich (3180), south of Loch Earn. The Ochils, occupying a consider- able area in the south-east, attain in many cases a height of over 2000 feet, and the Sidlaws, practically a con- tinuation of the Ochils running into Forfarshire, reach a height of about 1500 feet. The lowland districts consist chiefly of the straths and river-valleys, as Strathtay ; Strath- more, extending into

Forfarshire ; Strathearn, stretching across the county from west to east, and bounded on the south by the Ochils ; the district of Menteith between the Teith and the Forth; and the Carse of Gowrie between the Sidlaws and the Firth of Tay.

Geology and Minerals.—As regards its geology Perth- shire consists of two distinct areas, that differ from each other entirely in the rocks of which they are composed and consequently in their scenery. The larger of these regions comprises the mountainous ground and occupies the northern and by much the larger part of the county. The rocks in this region belong to the series of crystal- line schists, and include varieties of gneiss, mica-schist, clay-slate, hornblende-rock, &c., with important bands of quartzite, quartz-schist, and limestone. These rocks are arranged in approximately parallel folds, the axes of which range in a general sense from south-west to north- east, the same groups of strata being repeated again and again by successive plications. The quartzites from their durability and whiteness form specially marked zones across the county, as in the ranges of Schiehallion and Ben-y-Gloc. The limestones also from their persistence afford excellent horizons for interpreting the geological structure. A notable band of them runs along the valley of Loch Tay, plunging under Ben Lawers and rising up again in Glen Lyon, whence it continues across Strath Tummel into Glen Tilt. These various crystalline rocks are believed to be prolongations of the schistose series that overlies the Lower Silurian rocks of Sutherland 3 but they have not yet yielded fossils. They are here and there pierced by masses of granite, porphyry, or other eruptive rocks.

The southern (or more correctly south-eastern) limit of the mountain ground is defined by a line drawn from the foot of Loch Lomond by Aberfoyle, Pass of Leny, Comrie,

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a little below Dunkeld, and Bridge of Cally, to Lintrathen, On the southern side of this line the ground presents distinctively lowland scenery. It is occupied by the Lower Old Sandstone with its included conglomerates, flagstones, and voleanic rocks. A remarkable dislocation, which nearly coincides with the line just traced, separates the younger series of formations from the older rocks of the mountains. But here and there on the

north side of the fracture, in bay-like hollows of the hills, the massive conglomerates of the Old Red Sandstone can be seen rest- ing upon the upturned edges of the schists. These con- glomerates with their associated strata appear to have been laid down in a large lake or inland sea which lay across central Scotland and northern Ireland, and was tenanted by the peculiar Old Red Sandstone fishes (Cephalaspis, &c.). A long line of active volcanoes extended through this lake. Their sites are still traceable in the Ochil and Sidlaw Hills. See GroLoey, vol. x. p. 343 sg. Much of the lower ground is covered with the clays, gravels, and sands left by the ice- sheets and glaciers that once occupied the surface. Raised beaches marking recent upheaval of the land are seen in the Firth of Tay. The larger rivers present a succession of three or more alluvial terraces. Copper ore is found in the southern Ochils and coal at their base. Ironstone is wrought at Culross. Lead and other metals are found sparingly in the neighbourhood of Tyndrum, Ben Ledi, and Glen Lyon. Roofing slates are quarried at Birnam. In many valleys there are large deposits of peat.

Agriculture.—The climate and soil of Perthshire present greater varieties than in any other county of Scotland. In the higher western regions it is very moist ; and long stretches of exposed uplands alternate with finely-sheltered valleys. The arable land is chiefly in the drier eastern districts. For the most part the soil is sharp and fertile. The county, agriculturally, may be classed in four divisions: deer-forests, chiefly the wilder mountain districts ; grazing and pasture lands on the hills, embracing about four-fifths of the total area; light soils in the lower undulating dis- tricts, including the north portion of Menteith and the upper portion of the principal river-valleys, specially suited for oats, barley, turnips, and potatoes ; clay and carse land, chiefly in the Carse of Gowrie, which extends to about 100,000 acres, in the Carse of Stirling north of the Forth and in the lower part of Strathearn below and above Bridge of Karn. The Carse of Gowrie has as its basis the boulder clay, above which rests the blue clay proper, or peat, or the carse clay,—a mixture of sand and clay, ranging from the finest clay soil to poor whitish “end clay.” The best heavy carse land is very rich and productive, but requires to be thoroughly wrought, limed, and manured. The dis- trict is well adapted for wheat, although the area sown is decreasing. A considerable area is occupied by orchards, the light quick soil on Tayside and in the upper districts of Menteith being admirably adapted for apples.

Between 1875 and 1880 the number of holdings decreased from 5296 to 5123, although their area increased from 331,890 to 344,728 acres. Of the holdings 179 in 1880 were above 300 acres in extent, 1033 between 100 and 800 acres, 786 between 50 and 100 acres, and 3125 did not exceed 50 acres each. There are a large number of small holdings in the Highland valleys and in the neighbourhood of the villages and small towns. According to the agricultural returns for 1883 there were 344,240 acres, or only a little less than a fifth of the total area, under cultivation, 103,050 acres being under corn crops, 50,799 acres green crops, 100,631 rotation grasses, 87,064 permanent pasture, and 2696 fallow. Of the corn crops, 70,424 acres were under oats, 22,770 acres barley and bere, 6238 wheat, and 3087 beans; and of the green crops, 31,059 acres were under turnips and swedes and 18,611 under potatoes. The number of horses was 13,651, of which 10,524, chiefly Clydesdales, were used solely for agricultural purposes. Cattle numbered 73,097, of which 18,755 were cows and heifers in milk or in calf. Although dairy-farming is not in itself an im- portant industry, a large number of cows are generally kept on the lowland farms. The cows are principally Ayrshires, but the West

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Highland or Kyloe breed of cattle is common in the straths and lower grounds adjoining the Highlands. Shcep in 1883 numbered 696,640. All the pasturage in the Grampians, not in deer-forests, is occupied by sheep, and there are also large sheep-runs on the Ochils. The blackfaced are principally kept in the Grampians, but there are also a large number of Cheviots, and in the lower grounds South Downs and Leicesters are common. In 1812 there were 203,880 acres under wood, of which 61,164 were planted and 142,716 natural. The area under woods in 1884 was 94,563 acres, in addition to which 424 acres were under orchards, 535 acres market-gardens, and 113 acres nurseries. In Breadalbane and Menteith there are still extensive remains of the old forest.

According to the latest return (1872-73) the land was divided among 5737 proprietors, possessing 1,612,001 acres at an annual value of £959,365, or about 11s. 10d. an acre. Of the proprictors 4680, or nearly four-fifths, possessed less than onc acre each. The follow- ing possessed upwards of

20,000 acres each, viz., duke of Athole, 194,640; earl of Breadalbane, 193,504; Baroness Willoughby d'Eresby, 76,837 ; trustees of marquis of Breadalbane, 40,662 ; earl of Moray, 40,553 ; Hon. Lady Menzies, 35,500; Sir A. D. Drummond Stewart, 33,274; trustees of R. Stewart Menzies, 33,000; Sir Robert Menzies, 32,784 ; duke of Montrose, 32,294; earl of Mans- field, 31,197; D. R. Williamson, 29,494; C. H. Drummond Moray, 24,980; Mrs Mary Stuart Robertson, 24,000; W. M. Macdonald, 22,600; David Carnegie, 22,205; and Lieutenant-Colonel Far- quharson, 20,056.

Manufactures.— The manufacture of coarser linen fabrics is largely carried on in the towns and villages, and there are a con- siderable number of flour-mills. Cotton-works exist at Deanston and Stanley ; hand-loom weaving is carried on at Auchterarder, Dunblane, Doune, Crieff, and elsewhere, and in several places the manufacture of shawls, blankets, and other fabrics. For the indus- tries of the city of Perth see below.

Railways.—The lowland districts of the county are intersected by branches of the principal railway lines of Scotland, supplying convenient communication between all the principal towns ; and by the Highland and Oban railways, supplemented by coaches and steamers on the larger lochs, the finest scenery in the county has been rendered easy of access.

Administration and Population. Anciently the county was divided into the hereditary jurisdictions of Athole in the north, Balquhidder in the south-west, Breadalbane in the west, Gowrie in the east, Menteith in the south, Perth in the south-east, Rannoch in the north-west, and Stormont and Strathearn in the middle. These jurisdictions were abolished by the Act of 1748, aud in 1795 an Act was passed dividing the county for administrative purposes into the ten districts of Auchterarder, Blairgowrie, Carse of Gowrie, Crieff, Culross, Coupar-Angus, Dunblane, Dunkeld, Perth, and Weem. The sheriffdom is divided into an eastern and a western district, the seat of the one being Perth and of the other Dunblane. The eounty is represented in parliament by one member, the city of Perth by one member, and Culross is included in the Stirling dis- trict of burghs. Perthshire embraces eighty-one parishes, and con- tains three ancient cities, Perth, formerly the capital of Scotland, and Dunkeld and Dunblane, formerly the seats of bishoprics, as

_ was also Abernethy. The zveyeh burghs are Perth (27,207) and

Culross (380); and Auchterarder, Abernethy, and Dunblane formerly held this rank. The police burghs are Abernethy (906), Alyth (2377), Blairgowrie (4537), Callander (1522), Coupar-Angus (partly

in Forfarshire), Crieff (4469), Dunblane (2186), Perth (26,951), and

Rattray (2533). The population of the county in 1831 was 142,166, which by 1851 had diminished to 138,660, and by 1871 to 127,768; but in 1881 it had increased to 129,007, of whom 61,552 were males and 67,455 females. The increase has been wholly in the town population, from 44,250 (in 1871) to 49,642 (in 1881), there being a decrease in the village population from 23,321 to 22,349, and in the rural from 60,197 to 57,016. The number of persons speaking Gaelie was 14,505, or more than one-ninth of the total population.

History and Antiquities.—In the 2d eentury the district was divided, according to Ptolemy, among three tribes. The Damnonii inhabited Menteith, Strathearn, and Forthryfe (including the western part of Fife), and had three principal oppida—Alauna, at the junction of the Allan and Forth, guarding the entrance to the Highlands from the south ; Lindum, at Ardoch ; and Victoria, at Loch Orr in Fife. The Venicones inhabited part of Fife and the adjoining district of Perthshire, with the town of Orrea, probably Abernethy, at the junction of the Earn and Tay, the nearest Roman station to which was at Ardargie. The Vacomagi skirted the High- land region, and had the towns of Tamea in Inchtuthil (an island in the Tay), where remains still exist, and Banatia, at Buchanty on the Almond, where therc was a strong Roman station. In 83 A.D. Agricola explored the country beyond the Forth, and in the following ycar probably carried his legions to the foot of the Gram- pians. At Mons Graupius or Granpius, whose site is not ascertained, but which is, according to the most probable conjecture (Mr Skene’s), in the district of Stormont in Perthshire, amongst the outliers of

the Grampians near Meikleour, where the Cleavers Dyke and Buzzard Dykes perhaps mark the camps of Agricola and Galgacus and the Hill of

Blair the scene of battle, the Romans (according to their own accounts) defeated the tribes of Caledonia with great slaughter ; but they dcemed it imprudent to pursue the victory. Perthshire was accordingly left in the possession of its native tribes till its invasion by Severus in 207. The Roman road of Severus passed by Alauna to Lindum at Ardoch, where there are extensive remains of a Roman station, and thence by Strageath near Auchterarder, Dalgin Ross near Comrie, where there were prominent remains a century ago, and Buchanty, where one branch passed eastwards to the coast, and the other turned northwards over the Grampians.

As Severus renewed the wall of Antoninus, he does not appear to have retained possession of the county north of the Forth and the Clyde. Perthshire was included in the kingdom of the Southern Picts, who had their capital first at Abernethy and afterwards at Forteviot. On the burning of Forteviot by the Northmen in the 8th century the seat of the Government was changed to Scone, which continued to be the capital of Albany, the chief royal resi- dence in Scotland, and the place where its kings were crowned, though circumstances led to James II., James III., and Mary being crowned elsewhere. But, as Perth increased in population, it became the seat of the parliament, and the favourite residence of the kings, until it was succeeded by Edinburgh in the reign of James II. In the early history of the county fall the defeat of the Danes at Luncarty in the 10th century and of Macbeth by Earl Siward at Dunsinane in 1054. To its later history, apart from incidents connected with the eity of Perth, belong the removal of the coronation stone from Scone to Westminster by Edward I.; the battle of Dupplin, where Edward Baliol defeated the earl of Mar ; the rout of the troops of General Mackay at Killiecrankie by the Highlanders under Dundee, 17th July 1689; and the indecisive battle at Sheriffmuir, 13th November 1715, between the adherents of the Pretender under the earl of Mar and the forces of the Govern- ment under Argyll. Apart from the camp at Ardoch Roman remains are not important. Of hill-forts the most remarkable is that on Dunsinane Hill. Among other relics of an early period are a ship-barrow of the vikings ou the Hill of Rattray ; weems in the parishes of Monzie, Alyth, and Bendochy ; the witchstone near Cairnbeddie, where Macbeth is said to have met the witches,—pro- bably a sepulchral memorial of some old battlefield ; another stone in Meigle parish

called Macbeth’s Stone; a group of standing stones near Pitlochrie; and a number of sculptured stones at Mcigle.

Abernethy, originally founded by the Pictish king Nertan in the 5th century, and refounded by St Columba in the 6th, succeeded Iona as the seat of the primacy of Scotland, afterwards transferred to St Andrews. The round tower in the churchyard, resembling those in Ireland, is supposed to have been built in the time of Kenneth Macalpine. The Culdees had monastic churches at Dun- blane, Dunkeld, Abernethy, and Muthill. DunBLANE (g.v.) and DUNKELD (q.v.) were subsequently erected into bishoprics. The Canons Regular had an abbey at Scone, founded in 1124 and burned in 1559, its site being now occupied by a modern mansion ; a priory at Loch Tay, 1114; a priory at Inchafray, 1200 ; a priory at Strath- fillan, 1314; and a priory at Abernethy, 1273. The Dominicans had a convent at Perth, 1231, where there was also a Carthusian monastery, 1429, and a Greyfriars monastery, 1460. Culross abbey, of which the tower and the Gothie choir still remain, was founded by the Cistercians in 1217, and there was also an abbey of Cistercian nuns at St Leonards, Perth, founded in 1296. A Carmelite convent was founded at Tulliallan in 1267. There were collegiate churches at Methven and Tullibardine. Ofthe old castles of the chiefs mention may be made of Elcho Castle on the Tay, 4 miles south of Perth; Blair Castle, garrisoned by Montrose in 1644, stormed by Croniwell in 1653, occupied by Claverlouse in 1689, dismantled in 1690, and restored in 1870; Castle Huntly, built in 1452 by Lord Grey, master of the household to James II.; the ruins of Castle Dhu, near Moulin, once a stronghold of the Campbell family; the ruins of Finlarig Castle, Killin, the cradle of the Breadalbane family ; Cluny Castle, on the island in the loch of the same name between Dunkeld and Blairgowrie ; and Doune Castle, on the Teith, a pic- turesque ruin of very old date, rebuilt by Murdoch, duke of Albany. Among modern mansions the principal are Keir House, the seat of the late Sir W. Stirling-Maxwell; Blair Drummond House, the seat of the Drummonds; Blair Castle, duke of Athole; Taymouth Castle, earl of Breadalbane; Doune Lodge, earl of Moray ; Dupplin Castle, earl of Kinnoul ; Scone Palace, earl of Mansfield ; Gleneagles, earl of Camperdown; Strathallan Castle, Viscount Strathallan; and Drummond Castle, Baroness Willoughby d’Eresby. ; ’

PERTH, an ancient city, a royal and parliamentary burgh, and the chief town of the above county, is beauti- fully situated at the foot of Kinnoul Hill, chiefly on the west bank of the Tay, about 40 miles north of Edinburgh

and about 20 west of Dundee. It is substantially built

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of stone, and contains a number of good public buildings, while the lower slopes of Kinnoul Hill are studded with villas embosomed in woods. To the north and south of

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in cargo and in ballast that entered the port in 1883 was 124 of 9767 tons, that cleared 124 of 9731 tons. are Baltic timber, coal, salt, and manure, and the exports corn,

the town along the banks of the Tay are the extensive meadows of the North and South Inches. The Tay is crossed by a stone bridge forcarriagetraflic, erected in 1771 and widened in 1869, and by a stone and iron rail- |, way bridge with a footway. Notwithstanding its importance in early times, the city now re- tains almost no relics of anti- quity. The religious houses were razed by the mob after jp John Knox preached his famous |} sermon in St John's church || against the idolatries of Romie. | The Dominican or Blackfriars | monastery, founded by Alex- ander II. in 1231 and a residence of the Scottish kings, occupied a site near the west end of the present bridge; the site of the Carthusian monastery, founded by James I. in 1429, and where he and his queen, and Margaret queen of James lV.,were buried, has since 1750 been occupied by the hospital founded by James VI.; Greyfriars monas- tery, founded in 1460, stood on the present Greyfriars church- yard ; and a little west of the town was a house of the Carmelites or Whitefriars, founded in 1260. The parliament house, where the ancient parlia- ments of Scotland were held, was cleared away in 1818, and was succeeded by the Freemasons' Hall ; Earl Gowrie's palace, founded in 1520, was removed in 1805 to make way for the county buildings; the Spey tower near the Spey gate, a mural fortress long used as a prison, was taken down about fifty years ago. The cross, erected in 1668 in place of that

demolished by Cromwell, was removed in 1807. The old church of St John is said to have been founded in the 5th century; the transept and nave of the existing structure date from the early part of the 13th century and the choir in its present state from the 15th; the building is now divided into an east, a middle, and a west church. Among other public edifices the principal are the county buildings (erected 1819-20 at a cost of £32,000, and enlarged in 1866), the general prison for Scotland (originally erected in 1812 as a depét for French prisoners, remodelled as a convict prison in 1840, and enlarged in 1858 and 1881), the city and county jail (1819), the military barracks (1793-94), the public seminaries (1807), Marshall Museum and Library (1823), Murray's Royal Lunatic Asylum (1827), the infirmary (1836), the general railway station (1848), the new public hall (1881), the Boys' and Girls' Religious Society hall (1881), the new municipal buildings (1881), —a fine range in the Tudor style, cost £13,000.

Some of the most extensive bleach-fields in the kingdom are in the immediate neighbourhood of Perth on the banks of the Tay and the Almond. Perth itself has manufactories of gauge glasses, muslins, ginghams, imitation India shawls and scarfs, union goods, and boots and shoes ; and there are rope-works, coach-building yards, iron-foundries, breweries, and distilleries. The Tay has valuable salmon fisheries. The navigation of the river is considerably obstructed by sand. In 1834 an Act was obtained for constructing a harbour and docks and enlarging the quays, which were further extended in 1856. In 1840 Perth was made an independent port ; vessels of 200 tons can unload at its quays. The number of vessels

_by Edward I. in 1298.

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Plan of Perth.

potatoes, timber, and slates. The population of the parliamentary burgh in 1851 was 23,835 ; this had increased by 1861 to 25,250, and by 1881 to 28,949, of whom 13,453 were males and 15,496 females,

History.—Perth is stated to have been anciently called Bertha, and to have been situated at the junction of the Almond and Tay, whence it was removed to its present site after an inundation in 1210. In any case the church of St John was founded long before this ; and a variety of Roman remains seem to indicate that there was a Roman station on the present site of the city. The obscurity of its early history is accounted for by the fact that its records were removed by Edward I. Perth is stated to have been a burgh as earlyas1106. The charter granted it by James VI. makes mention also of another granted by David I., and the charter of King David was renewed by William the Lion, by whom Perth was created a royal burgh. It was fortified by the last-named king in 1210 and again It was attacked without success by Robert Bruce in 1306, but in 1311 he succeeded in scaling its walls one dark night. It was captured by Edward III. in 1335 and retaken by the Scots in 1339. The earl of Cornwall is stated by Fordun to have been stabbed in 1336 by his brother Edward III. before the great altar in the parish church of St John. In 1396 a famous combat took place on the North Inch, between Clan Chattan and Clan Kay, which has been made familiar to English readers by Sir W. Scott in his Fair Maid of Perth. The Blackfriars monastery, where the kings then resided, was the scene in 1437 of the murder of James I. by Walter, earl of Athole, and Gowrie House in 1600 of, a mysterious conspiracy against James VI. Perth succeeded Scone as the capital of Scotland, but after the murder of James I. the parliament and courts were transferred to Edinburgh, which was declared the capital in 1482. The city was visited by the plague in 1512, 1585-87, 1608, and 1645, by the cholera in 1832, and by inundations in 1210, 1621, 1740, 1773, and 1814. It was taken by Montrose in 1644, capitulated to Cromwell in 1651, and was occupied by Dundee in 1689 ; it was recovered by Argyll from the adherents of the Pretender in 1715, and was occupied by Prince Charles Edward in 1745. The famous articles of Perth were agreed to at a meeting of the General Assembly in the parish church of St John, 25th August 1618.

Scott, Statistical Accownt of the Town and Parish of Perth, 1796 ; Maidment, The Chronicle of Perth from 1210 to 1668, 1831; Penney, Traditions of Perth, 18863 Lawson, The Book of Perth, 1847; Peacock, Perth, its Annals and Archives, 1849.

PERTH, a city of Australia, capital of the colony of Western Australia, is picturesquely situated on the Swan

The principal imports |

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PE R—PER

river, 31° 57’ 10” S. lat., 115° 52’ 20” E. long., 12 miles above Freemantle and 1700 west-north-west of Melbourne. The streets are wide and regular, and the houses are built chiefly of brick and stone. It is the seat of an Anglican and of a Roman Catholic bishop. In addition to the cathedrals the principal buildings are the town-hall, built entirely by convict labour, the mechanics’ institute, the governor’s palace, and the high school. Perth was founded in 1829, received a municipal constitution in 1856, and was created a city in 1880. In the same year railway communication was opened up by means of the Eastern Railway. The population of the city, including the military, in 1871 was 5007, and in 1881 it was 5044.

PERTHES, Friepricu CuristopH (1772-1843), German publisher, was born at Rudolstadt on 21st April 1772. At the age of fifteen he became an apprentice in the service of Bohme, a bookseller in Leipsic, with whom he remained about six years. In Hamburg, where he settled in 1793 as an assistant to the bookseller Hoffmann, he started in 1796 a bookselling business of his own, in developing which he soon gave evidence of remarkable tact, energy, and intelligence. In 1798 he entered into partnership with his brother-in-law, J. H. Besser, with whose aid he rapidly succeeded in forming an establishment which commanded universal confidence and respect. By his marriage with a daughter of the poet Matthias Claudius (in 1797) he was brought into intimate relation with a group of Protestant writers, who, although of a liberal tendency, retained a strong belief in the essential doctrines of Christianity ; and they exercised a powerful influence on the growth of his religious opinions. This, however, did not prevent him from being on friendly terms with a number of eminent Roman Catholic authors. Perthes was an ardent patriot ; and during the period of Napoleon’s supremacy he distinguished himself by his steady resist- ance to French pretensions. His zeal for the national cause led him to

issue (in 1810-11) Das Deutsche Museum, to which many of the foremost publicists in Germany contributed. For some time the French made it impos- sible for him to live in Hamburg ; and when, in 1814, he returned, he found that his business had greatly fallen off and that it would have to be thoroughly reorganized. In 1821, his first wife having died, he left Hamburg, trans- ferring his business there to his partner, and went to Gotha, where he established what ultimately became one of the first publishing houses in Germany. Among other important works issued by him may be named the 7Z'heo- logische Studien und Kritiken and the Geschichte der europdischen Staaten, the latter conducted in the first instance by Heeren and Ukert, afterwards by Giesebrecht. Perthes died at Gotha on 18th May 1843.

Of the three sons of Perthes, the youngest, A. H. T. Perthes, succeeded him asa publisher. The eldcr sons became authors of some eminence, and one of them, C. T. Perthes, wrote an excellent biography of his father, Friedrich Perthes' Leben. In 1785 a pub- lishing house was founded in Gotha by the uncle of F. C. Perthes, J. G. Justus Perthes, whose son Wilhelm became distinguished as a publisher of works relating to geography. Bernhard Wilhelm,

Wilhelm's son, who succeeded to the business in 1853 and died in 1857, greatly extended its operations. In 1854 he established a geographical institute, and the Mittheilungen aus Justus Perthes' geographischem Institut, conducted by A. Petermann, soon gained a European reputation. This house issues the Almanaeh de Gotha, and has published the maps and writings of many of the most eminent German geographers and travellers.

PERTINAX, Hetvivus, Roman emperor, was the son of a charcoal-burner, and was born in 126 a.p. in Liguria, or at Villa Martis among the Apennines. From being a teacher of grammar he rose through many important offices, both civil and military, to the consulate, which he held twice. Chosen on 31st December 192 to succeed the murdered Commodus, he was himself assassinated in a mutiny of the soldiers after a reign of eighty-six days.

PERTZ, Grore Hernricn (1795-1876), editor of the Monumenta Germaniz Historica, was born at Hanover on 28th March 1795. From 1813 to 1818 he studied at Gottingen, chiefly under Heeren. His graduation thesis, published in 1819, on the history of the Merovingian mayors of the palace, attracted the attention of Baron Stein, by whom he was engaged in 1820 to edit the Caro- lingian chroniclers of the newly-founded Historical Society of Germany. In search of materials for this purpose, Pertz made a prolonged tour through Germany and Italy, and on his return in 1823 he received at the-instance of Stein the principal charge of the entire work of the society, which was to be the publication, under the title of Monwmenta Germanizx Historica, of accurate texts of all the more im- portant historical writers on German affairs down to the year 1500, as well as of laws, imperial and regal archives, and other valuable documents, such as letters, falling within this period. In the discharge of this, the principal task of his life, Pertz made frequent journeys of exploration to the leading libraries and public record offices of Europe, pub- lishing notes on the results of his explorations in the Archiv der Gesellsch. f. Deutsche Geschichtskunde (1824-72). In 1823 he had been made secretary of the archives, and in 1827 principal keeper of the royal library at Hanover ; from 1832 to 1837 he edited the Hannover- ische Zeitung, and more than once sat as a representative in the Hanoverian Second Chamber. In 1842 he was called as chief librarian to Berlin, where he shortly after- wards was made a privy councillor and a member of the Academy of Sciences. Failing health and strength led to the resignation of all his appointments in 1874, and on 7th October 1876 he died at Munich while attending the sittings of the historical commission.

The Monumenta, with which the name of Pertz is so closely asso- ciated, began to appear in 1826, and at the date of luis resignation 24 volumes (“Scriptores,” “ Leges,” “Diplomata”) had appeared. The work, which for the first time made possible the existence of the modern school of scientific historians of medieval Germany, continues to be carried on under Waitz, Wattenbach, Diimmler, and others. In connexion with the MJonwmenta Pertz also pub- lished Scriptores rerum Germaniearum in usum Seholarum ; among his other literary labours may be mentioned an edition of the Gesammelte Werke of Leibnitz,and a life of Stein (Leben des Ministers Freiherrn vom Stein, 6 vols., 1849-55; also, in an abridged form, Aus Stein’s Leben, 2 vols., 1856).

BER has, in different periods, included areas of terri-

tory of varying extent. The empire of the Yncas and the Spanish viceroyalty were not conterminous with the modern republic nor with each other. In the present article the sections relating to physical geography and the moral and material condition of the people will be confined to the limits of the republic, while in the historical section there will necessarily be references to events which took place beyond the existing limits of the country.

Extent.—The republic of Peru is situated between the Extent.

equator and the Tropic of Capricorn, yet, owing to the differences of elevation, it includes regions with every variety of climate. It lies between the parallels of 3° 21’S. and 19° 10’ S. and between 68° and 81° 20’ 45” W. long., and has an area of about 480,000 square miles.1 The

1 Before the war with Chili the southern limit of Peru was in 22°

23’ S. lat., the coast-line measured 1400 miles, and the area was 504,000 square miles (see p. 679 below).

Bound- aries.

Physical regions.

The coast.

length along the Pacific coast is 1240 miles, while the width ranges from 300 to 400 miles.

Boundaries.—The republic is bounded on the W. by the Pacific Ocean, on the E. by Brazil and Bolivia, on the N. by Ecuador, and on the S. by Chili. The northern boundary commences at the village of Santa Rosa, near the southern shore of the Gulf of Guayaquil, whence it passes southwards to the river Macara, a tributary of the Chira, which falls into the Pacific. It takes

the course of the Macara, up the ravine of Espindula, to its source in the cordillera of Ayavaca; in the Amazonian basin it follows the river Cauches to its junction with the Chinchipe, and the Chinchipe to the Maraiion. The Maraiion then forms the boundary until the first Brazilian town is reached at Tabatinga. The frontier with Brazil was determined by article ii. of the treaty of San Ildefonso in 1777. A treaty dated 23d October 1851 further settled the boundary, which was fixed by the commissioners who explored the Yavari in 1866 and 1871. It first follows the course of the Yavari from the point where it falls into the Amazon, in 4° 13’ 21”S., up to a point near its source in 7° 1’17”S. ; from this it forms a straight line to a point in 6° 52’ 15” S. on the left bank of the Madeira, being half the distance between the mouth of the Mamoré and that of the Madeira. This is the point’ where the frontiers of Peru, Brazil, and Bolivia meet. The Peru-Bolivian frontier, within the basin of the Amazon, has not been accurately defined. It follows the Madeira to the mouth of the Mamoré, then the Beni and its tributary the Madidi to the junction of the latter with a stream called the Pablo-bamba, ascending the ravine of the Pablo-bamba to the source of that stream in the eastern Andes. The line then crosses the Andes in a straight line southwards to the village of Conima on the shore of Lake Titicaca. Thence it passesacross the lake in another straight line to the isthmus of Yunguyo, and thence to the mouth of the Desaguadero. From the Desaguadero the frontier takes a south-south-west direction to the source of the river Mauri, and then, until the recent war with Chili, it ran south along the watershed of the Maritime Cordillera to the source of the river Loa, which falls into the Pacific. The southern boundary separating the Peruvian province of Tarapaca from the Bolivian province of Atacama was formed by the ravine of Duende, south of the Loa, to the coast of the Pacific in 22° 23’ S. near Tocapilla. This part of the frontier was carefully delineated in 1628, and the boundary marks are recorded in a document which is still extant. But the Chilians conquered and in 1884 annexed the Peruvian province of Tarapaca.

Physical Geography.—Peru is divided longitudinally into three well-defined regions, the coast, the sierra, and the montaiia. The coast, extending from the base of the Maritime Cordillera to the Pacific Ocean, consists of a safidy desert crossed at intervals by rivers, along the banks of which there are fertile valleys. The sierra is the region of the Andes, and is about 250 miles in width. It con- tains stupendous chains of mountains, elevated plains

and tablelands, warm and fertile valleys, and ravines. The montana is the region of tropical forests within the valley of the Amazon, and skirts the eastern slopes of the Andes,

The coast has been upraised from the ocean at no very distant geological epoch, and is still nearly as destitute of vegetation as the African Sahara. It is, however, watered by fifty streams which cross the desert at intervals, Half of these have their origin in the summits of the Andes, and run with a permanent supply of water into the ocean. The others, rising in the outer range, which does not reach the snow-line and receives less moisture, carry a volume of water to the sea during the rainy season, but for the rest of the year are nearly dry. The absence of rain here is caused by the action of the lofty uplands of

PERU

the Andes on the trade-wind. The south-east trade-wind blows obliquely across the Atlantic Ocean until it reaches Brazil. By this time it is heavily laden with vapour, which it continues to bear along across the continent, depositing it and supplying the sources of the Amazons and La Plata, Finally, the trade-wind arrives at the snow-capped Andes, and here the last particle of moisture is wrung from it that the very low temperature can extract. Coming to the summit of that range, it rushes down as a cool and dry wind on the Pacific slopes beyond. Meeting with no evaporating surface, and with no temperature colder than that to which it is subjected on the mountain-tops, this wind reaches the ocean before it becomes charged with fresh

coast is from the south. From November to April there on coast

are usually constant dryness, a clear sky, and considerable, though by no means oppressive, heat. From June to September the sky is obscured for weeks together by fog, which is often accompanied by drizzling rain called “garua.” In 1877 the maximum temperature at Lima was 782° Fahr. in February and the minimum 614° Fahr. in July. At the time when it is hottest and driest on the-coast it is raining heavily in the Andes, and the rivers are full. When the rivers are at their lowest, the “‘garua” prevails on the coast.

The climate of various parts of the coast is, however, modified by local circumstances.

The deserts between the river-valleys vary in extent, the largest being upwards of 70 miles across. On their western margin steep cliffs generally rise from the sea, above which is the “tablazo” or plateau, in some places slightly undulating, in others with ridges of considerable height rising out of it, the whole apparently quite bare of vegetation.

The surface is generally hard, but in many Sand-

places there are great accumulations of drifting sea-sand, hills.

The sand usually forms isolated hillocks, called “medanos,” of a half-moon shape, having their convex sides towards the trade-wind. They are from 10 to 20 feet high, with an acute crest, the inner side perpendicular, the outer with a steep slope. Sometimes, especially at early dawn, there is a musical noise in the desert, like the sound of distant drums, which is caused by the eddying of grains of sand in the heated atmosphere, on the crests of the “ medanos.” Appa-

rently the deserts are destitute of all vegetation ; yet three Coast kinds of herbs exist, which bury themselves deep in the flora.

earth, and survive long periods of drought. One is an amar- anthaceous plant, whose stems ramify through the sand- hills ; the other two area Martynia and an Aniseia, which maintain a subterranean existence during many years, and only produce leafy stems in those rare seasons when suffi- cient moisture penetrates to the roots. Ina few hollows which are reached by moisture the trees of the desert find support, the “algarrobo” (Prosopis horrida), a low tree of very scraggy growth, the ‘“‘vichaya” (Capparis crotonoides), and “zapote del perro” (Colicodendrum scabridum), mere shrubs. Far away towards the first ascents to the Andes a tall branched cactus is met with, and there are Salicornias and Salsolas near the coast. But, when the mists set in, the low hills near the coast bordering the deserts, which are called “lomas,” undergo a change as if by magic. A blooming vegetation of wild flowers for a short time covers the barren hills. Near Lima one of the low ranges is brightened by the beautiful yellow lily called

“amancaes” (Ismene Amancaes). The other flowers of the “lomas” are the “papita de San Juan” (Begonia geranifolia), with red petals contrasting with the white inner sides, valerians, the beautiful Bomarea ovata, several species of Oxalis, Solanum, and crucifers. But this carpet of flowers is very partially distributed and lasts but a short time. Generally the deserts present a desolate aspect, with no sign of a living creature or of vegetation. Only in the very loftiest

moisture. The constantly prevailing wind on the Peruvian

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regions of the air the majestic condor or the turkey buzzard may be seen floating lazily; perhaps a lizard will dart across the path; and occasionally a distant line of mules or a solitary horseman seems to shimmer weirdly in the refraction on the distant horizon.

The valleys form a marvellous contrast to the surround- ing desert. A great mass of pale-green foliage is usually composed of the “algarrobo” trees, while the course of the river 1s marked by lines or groups of palms, by fine old willows (Salix humboldtiana), fruit-gardens, and fields of cotton, maize, sugar, and lucerne. In some valleys there are expanses of sugar-cane, in others cotton, whilst in others vineyards and olive-yards predominate. The woods of “algarrobo ” are used for pasture, cattle and horses greedily enjoying the pendulous yellow pods.

For purposes of description the coast-region of Peru may be . divided into six sections, commencing from the north :—(1) the Piura region ; (2) the Lambayeque and Truxillo section ; (8) the Santa valleys; (4) the section from Lima to Nasca; (5) the Are- quipa and Tacna section ; (6) Tarapaca.

(1) The great desert-region of Piura extends for nearly 200 miles from the Gulf of Guayaquil to the borders of the Morrope valley, and is traversed by three rivers—the Tumbez, Chira, and Piura, the two former receiving their waters from the inner cordillera and breaking through the outer range. It is here that the coast of South America extends farthest to the westward until it reaches Capes Blanco and Pariiia, and then turns southward to the Bay of Payta. The climate of Piura is modified by the lower latitude, and also by

the vicinity of the forests of Guayaquil. Fog and ‘‘garua” are much less frequent than in the coast-region farther south, while positive rain sometimes falls. At intervals of about ten years there are occasional heavy showers of rain from February to April. (2) The second section of the coast-region includes the valleys of the Morrope, the Chiclayo, and Lambayeque, the Safia, the Jequc- tepeque, the Chicama, Moche, Viru, and Chao. With the inter- vening deserts this section extends over 200 miles. All these valleys, except Morrope and Chao, are watered by rivers which have their sources far in the recesses of the mountains, and which furnish an abundant supply in the season when irrigation is needed. (8) The third section, also extending for 200 miles, contains the valleys of Santa, Nepefia, Casma, Huarmcy, Fortaleza, Pativilca, Supé, and Huaura. The river Santa, which rises in the lake of Conococha, 12,907 feet above the sea, and has an entire length of 180 miles, is remarkable for its long course betwecn the outer and central ranges of the Andes, in a trough known as the “Callejon de Huaylas,” 100 miles in length. It then breaks through in a deep gorge, and reaches the sea after a course of 35 miles over the coast-belt, and after fertilizing a rich valley. The Santa and Nepefia valleys are separated by a desert 8 leagues in width, on the shores of which there is a good anchorage in the bay of Ferrol, where the port of Chimbote is to be the terminus of a projected railway. The Nepefia, Casma, Huarmey, Fortaleza, and Supe rivers rise on the slope of an outer range called the Cordillera Negra, and are consequently dry during the great part of the year. Wells are dug in their beds, and the fertility of the valleys is thus maintained. The Pativilca (or Barranca) river and the Huaura break through the outer range from their distant sources in the snowy cordillera, and havea perennial supply of water. There are 9 leagues of desert between the Nepefia and Casma, 16 between the Casma and Huar- mey, and 18 between the Huarmey and Fortaleza. The latter desert, much of which is loose sand, is called the ‘‘ Pampa de Mata Cavallos,” from the number of exhausted animals which die there. Betwecn the Supé and Pativilca is the desert called the “ Pampa del Medio Mundo.” (4) The next coast-section extends for over 300 miles from Chancay to Nasca, and “includes the rivers of Chancay or Lacha, of Carabayllo, Rimac, Lurin, Mala, Cafiete, Chincha, Pisco or Chunchanga, Yea, and Rio Grande. Here the maritime range approaches the ocean, leaving a narrower strip of coast, but the fertile valleys are closer and more numerous. Those of Carabayllo and Rimac are connected, and the view from the Bay of Callao

extends over a vast expanse of fertile plain bounded by the Andes, with the white towers of Lima in a setting of verdure. Lurin and Mala are smaller valleys, but the great vale of Cafiete is one grcen sheet of sugar-cane ; and narrow strips of desert separate it from the fertile plain of Chincha, and Chincha from the famous vineyards of Pisco. The valleys of Yca, Palpa, San Xavier, and Nasca are rich and fertile, though they do not extend to the sea; but between Nasca aud Acari there isa desert 60 miles in width. (5) The Arequipa and Tacna section extends over 350 miles, and comprises the vallcys of Acari, Atequipa, Atico, Ocota, Majes or Camana, Quilca, with the interior valley of Arequipa, Tanibo, Ylo or Moquegua, Ite or Locumba, Sama, Tacna, and Azapa or Arica. Here the Maritime Cordillera recedes, and the important valley of Arequipa, though

on its western slope, is 7000 feet above the sea, and 90 miles from the coast. Most of the rivers here have their sources in the central range, and are well supplied with water. The coast-valleys through which they flow, especially those of Majes and Locumba, are famous for their vineyards, and in the valley of Tambo there are extensive olive plantations. (6) The most southern coast-section is that of Tarapaca, extending, between the cordillera and the Pacific, in a narrow strip from the ravine of Camarones, south of Arica, to the former southern frontier of Peru. Only two rivers reach the sea in Tarapaca, the Tiliviche in the north of the province, and the Loa in the extreme south. The other strcams are lost in the desert soon after they issue from their ravines in the Andes. The reason of this is that in Tarapaca there is an arid range of hills parallel with the sea-shore, which is about 30 miles in width, and covered with sand and saline substances. Between this coast-range and the Andes is the great plateau called the “ Pampa de Tamarugal,” from 3000 to 3500 feet above the sea, which is about 30 miles wide, and extends the whole length of Tarapaca. This plateau is covered with sand, and contains vast deposits of nitrate of soda. Here and there a few “tamarngas” or acacia trees are met with, which give their name to the region.

The coast of Peru has few protected anchorages, and Islands.

the headlands are generally abrupt and lofty. These and the few islands are frequented by myriads of sea-birds, whence come the guano-deposits, the retention of ammonia and other fertilizing properties being due to the absence of rain. The islets off the coast are all barren and rocky. The most northern is Foca, in 5° 18’ 30” S., ncar the coast to the south of Payta. The islands of Lobos de Tierra and Lobos de Afuera (2), in 6° 27’ 45” S. and 6° 56’ 45” S. respectively, are off the desert of Sechura, and contain deposits of guano. The two Afuera islands are 60 and 36 miles from the coast at the port of San José. The islets of Macabi, in 7° 49’ 20”S., also have guano-deposits, now nearly exhausted. . The two islets of Guafiape, surrounded by many rocks, in 8° 34’S., contain rich deposits. Chao rises 450 feet above the sea, off the coast, in 8° 46’ 30”S. Corcobado is in 8° 57’ S. La Viuda is off the port of Casma, in 9° 23’ 30’ S. ; and Tortnga is 2 miles distant to the north. Santa Islet lies off the bay of Cosca, in 9° 1’ 40”, and the three high rocks of Ferrol in 9° 8’ 30” S. Farther south there is the group of islets and rocks called Huaura, in 11° 27’ S., the chief of which are El Pelado, Tambillo, Chiquitana, Bravo, Quitacalzones, and Mazorque. The Hormigas are in 11° 4’ S. and 11° 58’, and the Pescadores in 11° 47’S. The island of San Lorenzo, in 12° 4’S., is a lofty mass, 43 miles long by 1 broad, forming the Bay of Callao; its highest point is 1050 feet. Off its south-east end lies a small but lofty islet called Fronton, and to the south-west are the Palomitas Rocks. Horadada Islet, with a hole through it, is to the south of Callao Point. Off the valley of Lurin are the Pachacamac Islands, the most northern and largest being half a mile long. The next, called San Francisco, is like a sugar-loaf, perfectly rounded at the top. The others are mere rocks. Asia Island is farther south, 17 miles north-west of Cerro Azul, and about a mile in circuit. Pisco Bay contains San Gallan Island, high, witha bold cliff outline, 24 miles long by 1 broad, the Ballista Islets, and farther north the three famous Chincha Islands, whose vast guano- deposits are now exhausted. South of the entrance to Pisco Bay is Zarate Island, and farther sonth the white level islet of Santa Rosa. The Infiernillo rock is quite black, about 50 feet high, in the form of a sugar-loaf, a mile west of the Point of Santa Maria, which is near the mouth of the Yea river. Alacran is a small islet off the lofty “morro” of Arica. A low island protects the anchorage of Iquique on the coast of Tarapaca, and farther south are the three islets of Patillos in 20° 46’ 20” S., and the Pajaros, with guano- deposits, in 22° 6’

4”S. All these rocks and islets are barren and uninhabitable, mere outworks of the desert headlands.

The more common sea-birds, which haunt the islets and Sea- birds Tr eo

headlands in countless myriads, are the Sula variegata o guano-bird, a large gull called the Larus modestus, the Pelecanus thayus, and the Sterna Ynca, a beautiful tern with curved white feathers on each side of the head. The rarest of all the gulls is also found on the Peruvian coast, namely, the Xema furcatum.! The immense flocks of birds, as they fly along the coast, appear like clouds, and one after another is incessantly seen to plunge from a height into the sea to devour the fishes, which they find in extraor- dinary numbers. The guano-deposits are in layers from 40 to 50 feet thick, of a greyish-brown colour outside, and more and more solid from the surface downwards, owing to the gradual deposit of strata and evaporation of fluid par-

AS gle ee eee ee 1 The third known example was shot in Paraccas Bay, near Pisco, by Captain Markham, in 1881.

Earth- quakes.

The sierra.

Maritime

Cor- dillera,

ticles. Sea-lions (Otaria forsteri) are common on the rocky islands and promontories. These large creatures frequent particular islets for the purpose of breathing their last, the wounded or aged being helped there by their companions.

The Maritime Cordillera, overhanging the Peruvian coast, contains a long line of volcanic mountains, most of them inactive, but their presence is probably connected with the frequent and severe earthquakes, especially in

the southern section of the coast. Since the year 1570 there have been seventy violently destructive earthquakes recorded on the west coast of South America, but the register is of course incomplete in its earlier part. The most terrible was that of 1745, which destroyed Callao. There had been subterranean noises for some days previ- ously ; the first shock was at 10.30 p.m. on 28th October, and there were 220 shocks in the following twenty-four hours. The town was overwhelmed by a vast wave, which rose 80 feet ; and the shocks continued until the following February. On 13th August 1868 an earthquake nearly destroyed Arequipa, and great waves rolled in upon the ports of Arica and Iquique. On 9th May 1877 nearly all the southern ports were overwhelmed. These fearful catastrophes are in greatest force where there are vol- canoes, whether active or extinct, in the vicinity. That of 1877 had its origin in the voleanic mountains near the frontier of Peru and Bolivia, and spent its chief fury near its centre of origin, gradually working itself out as it went north. Usually the line of disturbance is meridional and along the coast, but in some instances the line takes a seaward direction at an angle with the mountain-chains.

The most important part of Peru is the region of the cordilleras of the Andes divided into “puna” or lofty unin- habited wilderness, and “sierra” or inhabitable mountain slopes and valleys. This great mountain-system, running south-east to north-west with the line of the coast, consists of three chains or cordilleras. The two chains which run parallel, and near each other on the western side, are of identical origin, and have been separated by the action of water during many centuries. On these chains are the volcanoes and many thermal springs. The narrow space between them is for the most part, but not always, a cold and lofty region known as the “puna,” containing alpine lakes,—the sources of the coast-rivers. The great eastern chain, rising from the basin of the Amazon and forming the inner wall of the system, is of distinct origin. These three chains are called the Maritime Cordillera, the Central Cordillera, and the Andes. Paz Soldan and other Peruvian geographers give the name of Andes, par excellence, to the eastern cordillera.

The Peruvian Maritime Cordillera contains a regular chain of volcanic peaks overlooking the coast-region of Tarapaca, which attain a height of 16,000 to 18,000 feet. Chief among them are the snowy peak of Lirima over

the ravine of Tarapaca, the voleano of Isluga overhanging Camiiia, the unmeasured peak of Sehama, and Tacora near the Bolivian frontier. “In rear of Moquegua there is a group of volcanic peaks, clustering round those of Ubinas and Huaynaputina. A great eruption of Huaynaputina commenced on 15th February 1600 and continued until the 28th. An incessant rain of fine white sand was poured over the surrounding country for a distance of 40 miles, accompanied by a mighty subterraneous roaring sound. But generally these volcanoes are quiescent. Farther north the Misti voleano rises over the city of Arequipa in a perfect cone to a height of over 18,000 feet, and near its base are the hot sulphur and iron springs of Yura. As the maritime chain advances northward it fully main- tains its elevation. The peak of Sarasara, in Parinacochas (Ayacucho), is 19,500 feet above \the sea, and in the mountains above Lima the passes attain a height of more

than 15,000. In latitude 10° §. the maritime chain separates into two branches, which run parallel to each other for 100 miles, enclosing the remarkable ravine or Callejon de Huaylas,—the eastern or main branch being known as the Cordillera Nevada and the western as the Cordillera Negra. On the Nevada the peak of Huascan reaches a height of 22,000 feet, according to the trigo- nometrical measurement of the railway engineer Hindle, The Huandoy peak, above Carhuaz, reaches to 21,088 feet; the Hualcan peak, overhanging the town of Yungay, is 19,945 feet high ; and most of the peaks in this part of the chain reach a height of 19,000 feet. During the rainy season, from October to May, the sky is generally clear at dawn, and the magnificent snowy peaks, with sharply-defined outlines, stand out in lovely contrast to the deep-blue background. But as the day advances the clouds collect, and the whole is shrouded in a dense veil. In most parts of the Peruvian Andes the line of perpetual snow is at 16,400 feet above the sea ; but on the Cordillera Nevada, above the Callejon de Huaylas, it sinks to 15,400 feet. This greater -cold is obviously caused by the intervention of the Cordillera Negra, which intercepts the warmth from the coast. As this lower chain does not reach the snow-line, the streams rising from it are very scantily supplied with water, while the Santa, Pativilca, and other coast-rivers which break through it from sources in the snowy chain have a greater volume from the melted snows. At the point where the river Santa breaks through the Cordillera Negra that range begins

to subside, while the Maritime Cordillera continues as one chain to and beyond the frontier of Ecuador.

The Central Cordillera is the true water-parting of the Central system. Noriver, except the Marajion, breaks through it Cor- either to the east or west, while more than twenty coast- ‘illet streams rise on its slopes and force their way through the maritime chain. The Central Cordillera consists niainly of crystalline and volcanic rocks, on each side of which are aqueous, in great part Jurassic, strata thrown up almost vertically. In 14° 30’S. lat. the central chain is connected with the Eastern Andes by the transverse mountain-knot of Vilcafiota, the peak of that name being 17,500 feet above the sea. The great inland basin of Lake Titicaca is thus formed. The central chain continues to run parallel with the Maritime Cordillera until, at Cerro Pasco, another transverse knot connects it with the Andes in 10° 30’ 8, lat. It then continues northward, separating the basins of the Marafion and Huallaga ; and at the northern frontier of Peru it is at length broken through by the Maraiion flowing to the eastward.

The Eastern Andes is a magnificent range in the southern Eastern part of Peru, of Silurian formation, with talcose and clay Andes. slates, many quartz veins, and eruptions of granitic rocks, Mr Forbes says that the peaks of Illampu (21,470 feet) and Illimani (21,040 feet) in Bolivia are Silurian and fossiliferous to their summits. The eastern range is cut through by six rivers in Peru, namely, the Marafion and Huallaga, the Perene, Mantaro, Apurimac, Vilcamayu, and Paucartambo, the last five being tributaries of the Ucayali. The range of the Andes in south Peru has a high plateau to the west and the vast plains of the Amazonian basin to the east. The whole range is highly auriferous, and the thickness of the strata is not less than 10,000 feet. It is nowhere disturbed by volcanic eruptions, except at the very edge of the formation near Lake Titicaca, and in this respect it differs essentially from the Maritime Cordil- lera. To the eastward numerous spurs extend for varying distances into the great plain of the Amazons. It is here that the majestic beauty of the Andean scenery is fully realized : masses of dark mountains rise for thousands of feet, with their bases washed by foaming torrents and their

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summits terminating in sharp peaks or serrated ridges; the lower slopes are covered with dense vegetation ; and everywhere there is flowing water in cascades or rushing torrents, the condensed moisture of the trade-winds hurry- ing back to the Atlantic. The Andes lose their majestic height to the northward; and beyond Cerro Pasco the eastern chain sinks into a lower range between the Hual- laga and Ucayali. But throughout the length of Peru the three ranges are clearly defined,

For purposes of description the sierra of Peru may be conveni- ently divided into four sections, each embracing portions of all three ranges. The first, from the north, comprises the upper basins of the Marafion and the Huallaga, and is 350 miles long by 100 broad. The second extends from the Knot of Cerro Pasco to Aya- cucho, about 200 miles, including the Lake of Chinchay-cocha and the basin of the river Xauxa. The third or Cuzco section extends 250 miles to the Knot of Vilcaitota with the basins of the Pampas, Apurimac, Vilcamayu, and Paucartambo. The fourth is the basin of Lake Titicaca, about 150 miles in length and breadth.

The Lake of Chinchay-cocha, in the second section, is 36 miles long by 7 miles broad, and 18,000 feet above the sea. Its marshy banks are overgrown with reeds and inhabited by numerous water- fowl. From this lake the river Xauxa flows southwards through a populous valley for 150 miles before entering the forests. Lake Titicaca, in the fourth or most southern section, is about 80 miles long by 40 broad, the frontier of Bolivia passing across it diagonally. It is 12,545 feet above the sea by the railroad-levels. The drainage is carried off southwards by the river Desaguadero to the great swampy Lake of Aullagas in the south of Bolivia, while it is fed by streams from the Andes and the Central Cordillera. The largest is the Ramiz, formed by the two streams of Pucara and Azangaro, both coming from the Knot of Vilcafiota to the north. The Suchiz, formed by the Cavanilla and Lampa streams, falls into the lake on the north-west side, as well as the Yllpa and Ylave. Much of the water flows out by the Desaguadero, but a great

proportion is taken up by evaporation in the dry season from April to September. The waters are gradually receding undcr the combined influenee of evaporation and the sediment brought down by the rivers. The decpest part of the lake is on the Bolivian side; in other parts it is very shoaly, and along the shore there are many acres of tall reeds. The principal islands are Titicaca and Coati (at the south end near the peninsula of Copacabana), Campanaria (9 miles from the east shore), Soto, and Esteves. There are two other lakes in the Collao, as the elevated region round Titicaca is called. Lake Arapa, a few miles from the northern shore of Titieaca, is 80 miles in circumference. Lake Umayo is on higher ground to the west- ward. The lake in Peru which is third in size is that of Parina- cochas on the coast watershed, near the foot of the snowy peak of Sarasara. It is 12 miles long by 6 broad, but has never been visited and described by any modern traveller. The smaller alpine lakes, often forming the sources of rivers, are numerous.

The great rivers of the sierra are the Marafion, rising in the Lake of Lauricocha and flowing northward in a deep gorge between the Maritime and Central Cordilleras for 350 miles, when it forces its way through the mountains at the famous Pongo de Mauseriche and enters the Amazonian plain. The Huallaga rises north of Cerro Pasco, and, passing Huanuco, flows northwards on the other side of the Central Cordillera for 300 miles. It breaks through the range at the Pongo de Chasuta and falls into the Marafion. The other great rivers are tributaries of the Ucayali. The Pozuzu, flowing eastward from the Knot of Cerro Pasco, joins the Pachitea, which is the most northern important affluent of the Ucayali. The Xauxa, becoming afterwards the Mantaro, receives the drainage of Xauxa, Huancavelica, and Ayacucho. The southern valleys of this part of the sierra furnish streams which form the main rivers of Pampas, Pachachaca, and Apurimac. These, uniting with the Mantaro, form the Ene, and the Ene and Perene (which drains the province of Tambo) form the Tambo. The elassic river of Vilcamayu rises on the Knot of Vilcafiota, flows north through a lovely valley, receives the Yanatilde and Paucartambo on its right bank, and, uniting with the Tambo, forms the Ucayali. Most of these main streams flow through profound gorges in a tropical climate, while the upper slopes yield products of the temperate zone, and the plateaus above are cold and bleak, affording only pasture and the hardiest cereals.

The great variety of elevation within the sierra produces vege- tation belonging to every zone. There is a tropieal flora in the dcep gorges, higher up a sub-tropical, then a temperate, then a sub-arctic flora. In ascending from the eoast-valleys there is first an arid range, where the great-branched eacti rear themselves up among the rocks. Farther inland, where the rains are more plenti- ful, is the native home of the potato. Here also are other plants with edible roots—the “oca” (Oxalis tuberosa), “ulluca ’ _ (Ullueus tuberosus),“ massua ” (T’ropwoluim tuberosum), and “learcd ” (Polym-

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nia sonchifolia). Among the first wild shrubs and trees that are met with are the “ehilca” (Baccharis Feuillei), with a pretty yellow flower, the Mutisia aewminata, with beautiful red and orange flowers, several species of Senecio, caleeolarias, the Schinus Molle, with its graceful branches and bunehes of red berries, and at higher elevations the “lambras” (Alnus acuminata), the “saueo” (Sambucus peruviana), the “ quetiuar” (Buddlcia ineana), and the Polylepis racemosa. The Buddicia, locally called “oliva silvestre,” flourishes at a height of 12,000 feet round the shores of Lake Titicaca. The temperate valleys of the sierra yield fruits of many kinds. Those indigenous to the country are the delicious “chiri- moyas,” “paltas” or alligator pears, the “ paccay,” a species of Inga, the “lucma,” and the “granadilla” or fruit of the passion- flower. Vineyards and sugar-cane yicld crops in the warmer raviues ; the sub-tropical valleys are famous for splendid crops of maize ; wheat and barley thrive on the mountain slopes ; and at heights from 7000 to 13,000 feet there are crops of “ quinua” (Cheno- podium Quinua). In the loftiest regions the pasture chiefly con- sists of a coarse grass (Stipa Ychu), of which the Mamas eat the upper blades while the sheep browse on the tender shoots beneath. There are also two kinds of shrubby plants, a thorny Composita called “ecanlli” and another called “tola,” which is a resinous Baccharis, and is used for fuel.

The animals whieh specially belong to the Peruvian Andes are Fauna.

the domestie llamas and alpacas and the wild vieufias. There are deer, called “taruco”’ (Cervus antisensis), the “viseacha,” a large rodent, a species of fox called “atoc”; and the “puma” (Felis eoneolor) and “ucumari” or black bear with a white muzzle, when driven by hunger, wander into the

loftier regions. The largest bird is the condor, and there is another bird of the vulture tribe, with a black and white wing feather, formerly used by the Yneas in their head-dress, called the “coraquenque ” or “alcamari.” The “‘pito” is a brown speckled creeper which flutters about the rocks. There is a little bird, the size of a starling, with brown back striped with black, and white breast, which the Indians call “ ynea- hualpa” ; it utters a monotonous sound at each hour of the night. A partridge called “yutu” frequents the long grass. On the lakes there is a very handsome goose, with white body and dark-green wings shading into violet, called “huachua,” two kinds of ibis, a large gull (Larus serranus), frequenting the alpine lakes in flocks, flamingoes called “parihuana,” ducks, and water-hens. Many pretty little finches fly about the maize-fields and fruit-gardens, and a little grecn parakeet is met with as high as 12,000 feet above the sea.

The third division of Peru is the region of the tropical Montafia.

forests, at the base of the Andes, and within the basin of the Amazons. It is traversed by great navigable rivers. The Maraiion, having burst through the defile of the Pongo de Mauseriche, and the Huallaga through that of Chasuta, enter the forests and unite after separate courses of about 600 and 400 miles, the united flood then flowing eastward to the Brazilian frontier. After 150 miles it is joined by the Ucayali, a great navigable river with a course of 600 miles. The country between the Huallaga and the Ucayali, traversed by the eastern cordillera, is called the Pampa del Sacramento. The forests drained by the Maraiion, Huallaga, and Ucayali form the northern portion of the Peruvian montafia. The southern half of the mon- taiia is watered by streams flowing from the Eastern Andes, which go to form the river Madre de Dios or Amaru-mayu, the principal branch of the river Beni, which falls into the Madeira. The region of the Peruvian montaiia, which is 800 miles long from the Maraiion to the Bolivian frontier, is naturally divided into two sections, the sub- tropical forests in the ravines and on the eastern slopes of the Andes and the dense tropical forests in the Amazonian plain. The sub-tropical section is important from the value of its products, and interesting from the grandeur and beauty of its scenery. Long spurs run off from the Andes, gradually decreasing in elevation, and it is sometimes a distance of 60 or 80 miles before they finally subside into the vast forest-covered plains of the Amazon basin. Numerous rivers flow through the

valleys between these spurs, which are the native home of the quinine-yielding chinchona trees. The most valuable species, called C. Cali- saya, is found in the forests of Caravaya in south Peru and in those of Bolivia. The species between Caravaya and the head-waters of the Huallaga yield very little of | the febrifuge alkaloid. But the forests of Huanuco and XVIII. — 85

Popula- tion.

Political divisions.

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Huamalies abound in species yielding the grey bark of commerce, which is rich in chinchonine, an alkaloid effica- cious as a febrifuge, though inferior to quinine. With the chinchona trees grow many kinds of Melastomaceex, especi- ally the Lasiandra, with masses of purple flowers, tree-ferns, and palms. In the warm valleys there are large planta- tions of coca (Erythroxylon Coca), or Cuca (see vol. vi. p. 684), the annual produce of which is stated at 15,000,000 fb. The other products of these warm valleys are most ex- cellent coffee, cocoa, sugar, tropical fruits of all kinds, and gold in great abundance. In the vast untrodden forests farther east there are timber trees of many kinds, incense trees, a great wealth of india-rubber trees of the Hevea genus, numerous varieties of beautiful palms, sarsaparilla, vanilla, ipecacuanha, and copaiba. The abundant and varied fauna is the same as that of the Brazilian forests.

Population.—The earliest reliable enumeration of the people of Peru was made in 1793, when there were 617,700 Indians, 241,225 mestizos (Indian and white), 136,311 Spaniards, 40,337 negro slaves, and 41,404 mulattos, giv- ing a total of 1,076,977 souls, without counting the wild Indians of the montafia. The ecclesiastics numbered 5496, including 1260 nuns. This tells a sad story of depopu- lation since the fall of the Yneas, to which the abandoned terraces on the mountain-sides, once highly cultivated, bear silent testimony. In 1862 the population was officially esti- mated at 2,487,716. The latest census was taken in 1876 with much care. The result was 2,673,075 souls (males 1,352,151, females 1,320,924); of these 57 per cent. were Indians, 23 per cent. mestizos, and 20 per cent. of Spanish descent, negroes, Chinese, and foreigners ; so that Peru is still the country of the Ynea people.

Political Divisions.—The empire of the Yncaswas divided into four main divisions, Chinchay-suyu to the north of Cuzco, Anti-suyu to the east, Colla-suyu to the south, and Cunti-suyu to the west, the whole empire being called Ttahuantin-suyu, or the four governments, Each was ruled by a viceroy, under whom were the “ huaranca-camayocs,” or officers ruling

over thousands, and inferior officers, in regular order, over 500, 100, 50, and 10 men. All disorders and irregularities were checked by the periodical visits of the ‘‘tucuyricocs ” or inspectors. The Spanish conquest threw this complicated system out of gear. In 1569 the governor, Lope Garcia de Castro, divided Peru into “ corregimientos ” under officers named “corregidors,” of whom there were 77, each in direct communication with the Government at Lima. An important administrative reform was made in 1784, when Peru-was divided into 7 “ intendencias,” each under an officer called an “intendente.” These “intendencias” included about 6 of the old “corregimientos,” which were called “partidos,” under officers named “* sub-delegados.” Thus the number of officers reporting direct to Lima was reduced from 77 to 7, a great improvement. The republic adopted the same system, calling the “intendencias” “departments” under a prefect, and the “partidos ” “provinces ” under a sub-prefect. Peru is divided into 18 departments, 2 littoral provinces, and what is called the constitutional province of Callao. The departments contain 95 provinces. The Government recognizes 65 cities, 70 towns, 1337 smaller towns, 641 villages, 40 hamlets on

the sea-coast, and 600 in the rural districts, The depart- ments (going from north to south) are :— Coast. Sierra. Montatia.

Piura. Caxamarca. Amazonas and Loreto.

Lambayeque. Huanuco. |

Libertad. Junin.

Ancachs. Huancavelica.

Lima. Ayacucho.

iWicae Apurimae.

Arequipa. Cuzco.

Moquegua. Puno.

Tacna.

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from the seashore. Pizarro in 1532, is on the river of the same name, The towns in all parts of Peru are built on the same plan where the ground will allow of it, in squares or "'quadras," with the streets at right angles, and a quadrangular open space or "plaza," one side being occupied by the principal church, near the centre. The church usually has an orna- mental fagade in the Renaissance style, with two towers, The houses on the coast are flat-roofed, with folding doors to the street, leading to a court or "patio," with rooms opening on it. Piura is a town of this class, Farther south are the cities of Lambayeque, Chiclayo, and Saiia. Truxillo, founded by Pizarro in 1535, is of more importance. It is of oval shape, and was surrounded by walls with fifteen bastions, built in 1686, which have recently been demolished, Besides the cathedral, seat of a bishopric founded in 1609, there are three churches, and formerly four monasteries and a Jesuit college. Truxillo is the most important city north of Lima.

To the north of Lima there are five principal ports and thirteen smaller ones. Payta has a good anchorage and exports the cotton of the Chira and Piura valleys, the anchorages of Tumbez to the north and Sechura to the south being subsidiary to it. Pimentel is the port for the valleys of Lambayeque and Chiclayo, and Eten for that of Ferretiafe, the older port of San José having been abandoned as more dangerous. Pacasmayo, also a pre- carious anchorage, is the port which taps the rich valley of Jequetepeque, Farther south Malabrigo is the port for the valley of Chicama. Huanchaco was formerly the port for Truxillo, but Salaverry, a few miles to the south, has been substituted as affording a safer anchorage. San- tiago de Chao and Guafiape in the Viru district are lesser ports, the latter being resorted to by ships loading with guano at the adjacent islands. Chimbote, in the bay of Ferrol, has a good anchorage, and is important as the principal outlet for the Santa valley and the department of Ancachs. Farther south are the lesser ports of Santa, Samanco, Casma, Huarmey, Supé, Huacho, Chancay, and Ancon,

Lima, the capital (see vol. xiv. p. 644), according to the census of 1876, had a population of 100,046, of whom 33,020 were of European descent, 23,010

half-castes, 19,630 Indians, 15,378 foreigners, and 9008 negroes. South of Lima are the cities of Chincha and Yea, with the principal seaport of Pisco, whence the wines and spirits of the adjacent valleys are exported. The small ports of Cerro Azul and Tambo Mora export the sugars of the Caiiete and Chincha valleys. Farther south the exposed port of Chala, with a bad anchorage, is used for the valley of Acari and the province of Parinacochas in the mountains. South-east of Yca are the charming agricultural towns of Palpa and Nasca. AREQUIPA (see vol. ii. p. 484), the most important coast-city south of Lima, was founded by Pizarro in 1536. South of Arequipa is the littoral province of Moquegua, with a pleasant town, the centre of a vine-growing industry. The cities of Tacna, Arica, and Iquique are in the Chilian province of Tarapaca. The ports of Arequipa were formerly Quilca, then Islay, and now Mollendo. Ylo and Pacocha, in the same bay, are the ports of Moquegua; Safia, under the lofty headland of the same name, is a port where landing is impossible except in “balsas,” and it is little

j used. Arica was a very important port before the Chilian

invasion, as through it passed all the trade to Bolivia. Iquique and Pisagua are the chief ports of Tarapaca, the others being Junin, Mexillones, Molle, Chucumata, Patillos.

In the sierra there is the same regularity in intention in laying out the plan of the towns, but it is often interfered

Powns and Seaports.—The principal towns on the coast, Towns except Payta, Callao, and Arica, are always some distance and San Miguel de Piura, founded by S¢aports,

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with by the irregularity of the ground. High-pitched red tiled roofs take the place of the flat roofs of the coast. The upper stories often recede, leaving wide corridors under the overhanging eaves, and in the “ plazas” there are frequently covered arcades. Fruit-gardens and fields waving with lucerne

and barley encircle the towns, and there is almost always a background of mountain-ranges. The principal interior towns in the north of Peru are Caxamarca, Huaraz, Huanuco, Cerro Pasco, the centre of the great silver-mining industry, 13,200 feet above the sea, Tarma, and Xauxa. Huancavelica owed its existence to the famous quicksilver mine. Ayacucho, formerly Guamanga, founded by Pizarro in 1539, is a charming abode amidst lovely scenery. Be- tween Ayacucho and Cuzco are the pleasant towns of Andahuaylas and Abancay. Cuzco (see vol. vi. p. 744), the centre of Peru, the old capital of the Yncas, lies at the foot of the famous hill of Sacsahuaman. South of Cuzco are many delightful places in the vale of Vilcamayu, and the towns in the Collao, the chief being Puno on the shore of Lake Titicaca.

Commerce.—The resources of Peru consist of its mineral wealth, its flocks, yielding valuable wool, its crops, and the products of its virgin-forests. Silver-mines extend along the whole length of the cordilleras from Hualgayoc to Puno. The mines are worked here and there, the great centre of this industry being at Cerro Pasco, where 1,427,592 ounces of silver were produced in 1877. Thc value of the silver exported from Peru in that year was £575,000, of copper £330,000; of gold there is no return. The exportation of guano from the Chincha Islands began in 1846 and continued until 1872. Between 1853 and 1872 there were 8,000,000 tons shipped from these islands. The deposits on the Guafiape Islands were first worked in 1869, and from that year to 1871 as many as 838,853 tons were shipped, — 460,000 tons remaining. On the three Macabi Islands there were 400,000 tons of guano in 1872, and large deposits on the Lobos Islands. But the most important discoveries of guano- deposits, since the exhaustion of the Chincha Islands, have been on the coast of Tarapaca. In 1876 the quantity at Pabellon de Pica was calculated at 350,000 tons, at Punta de Lobos 200,000 tons, at Huanillos 1,000,000 tons (buried under huge boulders of rock), at Chipana 250,000 tons. The total quantity of guano on islands north of Lima may be 600,000 tons, and on the coast of Tarapaca 1,800,000 tons.

Since 1830 nitrate of soda has been exported from the southern ports of Peru, the deposits being found on the western side of the Pampa de Tamarugal in Tarapaca. This region contains sufficient nitrate for the supply of Europe for ages. From 1830 to 1850 the export from Iquique amounted

to 239,860 tons; in 1875 the annual export reached its maximum (826, 869 tons).

The sugar cultivation in the coast-valleys is a great source of wealth. In 1877 the yield was estimated at 85,000 tons, valued at £1,360,000 ; of this quantity 63,370 tons went to Great Britain. Cotton, an indigenous product of the coast-valleys, is next in im- portance to sugar, the estates being worked with intelligence and a due outlay of capital. The cultivation of the vine is also a pro- fitable industry,—a well-known spirit and excellent wine being made in the valleys of Pisco and Yea, and in the districts of Majes and Moquegua. Rice-crops are raised at Ferrefiafe ; olives are grown largely in the Tambo valley ; and the silk-worm and cochineal insect have been successfully cultivated. In the sierra large quantities of wheat, barley, and potatoes are raised, and millions of pounds of alpaca and sheep's-wool are exported. From the forests of the montafia come chinchona bark, coca, coffee of the finest quality, cocoa, india-rubber, and some medicinal roots.

Communication.—Scveral railroads have bcen constructed of late years to connect the coast-towns and valleys with their seaports. That from Payta to Piura, contracted for in 1872, is 63 miles long ; onc from the port of Pimentel to Chiclayo and Lambayeque has a length of 45 miles. There are 50 miles of railway from Eten to Ferrefiafe, 93 from Pacasmayo to Magdalena, 25 from Malabrigo to Ascope and the Chicama valley, 85 from Salaverry to Truxillo, 172 from Chimbote to Huaraz (only 52 finished). Several short lines radiate from Lima.

tunnels the Andes at a height of 15,645 feet. There are sixty-three tunnels, and the bridge of Verrugas spans a chasm 580 feet wide, resting on three piers, the centre one being 252 feet high, made of hollow wrought-iron. This great work is completed (1884) as far as Chicla, a distance of 863 miles. Another railroad across the Andes connects Arequipa with Puno on the shores of Lake Titicaca. The summit is crossed in a cutting only 6 feet deep, 14,660 feet above the sea. The first locomotive reached Puno on Ist J anuary 1874. The line is 282 miles long, and is to be prolonged to Cuzco. The cost of the Oroya line has been £4,625,887, and of the Arequipa and Puno line £4,346, 659.

Two steamers were launched on Lake Titicaca in March 1874, which carry the traffic from Bolivia to Puno. Extensive harbour- works have been completed at Callao since 1870 ; and iron piers have been constructed at other ports. Steam communication connects the Peruvian ports on the Huallaga and Maraiion with the Brazilian line at Tabatinga.

_ Lducation and Literature. Universities and colleges were founded Educa- in Peru very soon after the conquest, and there was intellectual tion.

progress both among the Indians and the families of Spanish descent. The university of San Marcos at Lima is the most ancient in the New World, having been created by order of Charles V.in 1551. The college of San Carlos was founded in 1770, and the school of medicine in 1792. At Cuzco the university of San Antonio Abad was founded in 1598, and the college of San Geronimo at Arequipa in 1616. Since the independence there has been very considerable intellectual and educational progress in the country. ‘there is a university of the first rank at Lima, 5 lesser universities, 33 colleges for boys and 18 for girls, 1578 schools for boys and 729 for girls, besides private schools.

of an epic poem called Lima Fundada and many other works. Towards the latter end of the last century scientific studies began to receive attention in Peru. M. Godin, a member of the French com- mission for measuring an are of the meridian near Quito, became professor of mathematics at San Marcos in 1750; and the botanical expeditions sent out from Spain gave further zest to scientific re- search. Dr Gabriel Moreno (died 1809), a native of Huamantanga in the Maritime Cordillera, studied under Dr Jussieu, and became an eminent botanist. Don Hipolito Unanue, born at Arica in 1755, wrote an important work on the climate of Lima and contributed to the Mercurio Peruano. This pcriodical was commenced in 1791 at Lima, the contributors forming a society called ‘‘ Amantcs del Pais,” and it was completed in eleven volumes. It contains many valuable articles on history, topography, botany, mining, commerce, and statistics. An ephemeris and guide to Peru was commenced by the learned geographer Dr Cosme Bueno, and continucd by Dr Unanue, who brought out his guides at Lima from 1793 to 1798. In 1794 a nautical school was founded at Lima, with Andres Baleato as instructor and Pedro Alvarez as teacher of the nse of instruments.

Baleato also constructed a map of Peru. A list of Peruvian authors in viceregal times occupies a long chapter in the life of St Toribio! by Montalvo ; and the bibliographical labours of the Peruvian Leon Pinelo are still invaluable to Spanish students.

The topographical labours of Cosme Bueno and Unanue were ably continued at Lima by Admiral Don Eduardo Carrasco, who compiled annual guides of Peru from 1826. But the most eminent Peruvian geographer is Dr Don Mariano Felipe Paz Soldan, whose Geografia del Peru appeared in 1862. His still more important work, the Diccionario geografico estadistico del Peru (1877), is a gazetteer on a most complete scale, displaying an immense amount of labour, research, and literary skill. In 1868 appeared his first volume of the Historia del Peru Independiente, and two others have since been published. The earlier history of Peru has been written in three volumes by Sebastian Lorente; Mariano Rivero has ably discussed its antiquities ; and Manuel Fuentes has edited six interesting volumes of memoirs written by Spanish viceroys. But the most valuable and important historical work by a modern Peruvian is undoubtedly General Mendiburu's Diccionario Historico- Biografico del Peru, a monument of patient and conscientious re- search, combined with critical discernment of a high order, which has certainly secured for its accomplished author a permanent place in the history of literature. As laborious historical students, Don José Toribio Polo, the author of an ecclesiastical history of Peruvian dioceses, and Don Enrique Torres Saldamando, the historian of the Jesuits in Peru, have great merit. Among good local annalists may be mentioned Juan Gilberto Valdivia, who has written a history of Arequipa, and Pio Benigno Mesa, the author of the Annals of Cuzco.

The leading Peruvian authors on constitutional and legal sub- jects are Dr José Santistevan, who has published volumes on civil and criminal law; Luis Felipe Villaran, author of a work on con-

1 The city of Lima produced two saints, the archbishop St Toribio, who flourished from 1578 to 1606, and Santa Rosa, the patron saint – of the city of the kings (1586-1616), whose festival is celebrated on 26th August.

2 for g The most prolific Litera- author in Spanish times was Dr Pedro de Peralta y Barnuevo, author ture.

stitutional right; Dr Francisco Garcia Calderon (late president of Peru), author of a dictionary of Peruvian legislation in two volumes ; Dr Francisco Xavier Mariategui, one of the fathers of Peruvian inde- pendence ; and Dr Francisco de Paula Vijil (died 1875), orator and statesman as well as author, whose work Defensa de los Globiernos is a noble and enlightened statement of tlic case for civil govern- ments against the pretensions of the court of Rome. Manuel A. Fuentes, an able statistician and the author of the Estadistiea de Lima, has also written a inanual of parliamentary practice.

On the whole, Peruvian literature since the independence has attained to highest merit in the walks of poetry andromance. The Guayaquil author Olmedo, who wrote the famous ode on the victory of Junin, and the Limenians Felipe Pardo and Manuel Segura are names well known wherever the Spanish language is spoken. Pardo, as well as Segura, wrote in a satirical vein. Both died between 1860 and 1870. The comedies of Segura on the customs of Lima society, entitled Un Paseo a Amaneaes and La Saya y Manto, have no equal in the dramatic literature of Spanish Amcrica and few in that of modern Spain. From 1848 date the first poetical efforts of Arnaldo Marquez, Manuel Nicolas Corpancho, Adolfo Garcia, Clemente Althaus, Pedro Paz Soldan (better known under his nom de plume of “Juan de Arona”), Carlos Augusto Salaverry, a son of the ill-fated general, Luis Benjamin Cisneros, Trinidad Fernandez, Constantino Carrasco, Narciso Arestegui, José Antonio Lavalle, Ricardo Palma, and Numa Pompilio Llona. Marquez is undoubtedly the most correct in diction and the most richly endowed with ima- ginative sentiment among Peruvian poets of the present generation. Corpancho was a dramatist of the romantic school and author of a bright little volume of poems entitled Brevas. He perished in a shipwreck off the coast of Mexico when barely thirty years old. Adolfo Garcia is the poet of most robust and vigorous thought, and he has written much, but only one voluine of his select poems has been published (Havre, 1870). Among other productions of great merit this book contains a sonnet to Bolivar, which is one of the most beautiful that has appeared from the muse of Peru. Althaus (d. 1880) was a poet, imaginative, tender, elegant,

and very careful as regards rhythm and diction. Paz Soldan, a good classical scholar, has published three volumes of poems. Salaverry is one of Peru's best lyrical poets ; and the novels of Cisneros, entitled Julia and Hdgardo, have secured him a lasting reputation. Fer- nandez and Carrasco were two poets of merit who died very young. The principal work of Carrasco was his metrical version of the Quichua drama of Ollantay. Lavalle and Arestegui are chiefly known as novelists. Palma has published three books of poetry, entitled Armonias, Verbos y Gerundos, and Pasionarias. Since 1870 he has devoted his great literary powers to writing the his- torical traditions of Peru in prose, of which six volumes have already appeared. They display great research, and are written in a graceful and agreeable style. Palma is a member of the Spanish Academy, a distinction shared, among Peruvian poets, with Felipe Pardo, The collected poems of Llona have recently been pub- lished ; his Canto de la Vida is highly spoken of for its depth of thought and elegance of diction.

Peruvians have not neglected their early history and the study of the literature and language of the Yncas. Several have followed in the footsteps of Rivero. José Sebastian Barranca, the naturalist and antiquary, and Gavino Pacheco Zegarra, a native of Cuzco, have published translations of the ancient Ynca drama of Ollantay.

Among Peruvian naturalists since the independence the most distinguished have been Rivero, the geologist and mineralogist, and his friend and colleague 'Nicolas de Picrola, author of Memorial de Ciencias Naturales. Dr Cayetano Heredia, rector of the college of medicine in Lima from 1845 to his death in 1861, was an ardent patron of medical science. His successor, Dr Miguel de los Rios, has followed in his footsteps ; and since 1856 many valuable con- tributions have been published by Peruvian physicians in the Gaceta Medica de Lima.

The most prominent publicists of Peru have been Mariategui, Vijil, Reynaldo and Cesareo Chacaltana, Ricardo Heredia, José Casimiro Ulloa, Toribio Pacheco, and Luciano Cisneros,

The Peruvian priesthood, though justly accused of tyranny in their relations with the Indians in early times, and of immorality in many instances, can point to numerous learned and upright pre- lates, to devoted parish priests,

to noble-minded teachers and ardent patriots, in their body. Founded in 1541, and raised to archiepis- copal rank in 1545, the see of Lima has been ruled by twenty-three prelates. The first was a Dominican friar, Dr Geronimo de Loaysa (1542-1575), who was more a politician than a priest. But the second, Dr Toribio Mogrovejo (1581-1606), devoted himself to the welfare of his flock, and died in the odour of sanctity, being finally canonized as StToribio. Since the independence, Archbishop Luna Pizarro has added lustre to the see by his learning and ability. The bishopric of Cuzco was founded by Pope Paul ITI. in 1537, and has had twenty-seven prelates. Among them, Dr Gorrichategui (1771-76) was an excellent Quichua scholar and preacher and a devoted friend of the oppressed Indians; Dr Moscoso y Peralta (1777-89) was a prelate of corisummate virtue and learning. The

bishoprics of Arequipa, Guamanga (Ayacucho), and Truxillo were created in 1609. The missionary bishopric of Maynas or Chachapoyas was founded in 1802, those of Huanuco and Puno in recent times, The Jesuits were once very powerful and wealthy in Peru, and both Jesuits and Franciscans, while working at their calling as mission- aries, achieved much valuable geographical work on the rivers and in the forests of the montafia. Since the independence the religious orders have been gradually suppressed, yet monks as well as priests were in the front rank in advocating the cause of liberty. The ecclesiastical seminary at Lima, founded by St Toribio in 1601, was removed to part of the monastery of San Francisco in 1859, where it still flourishes, and where youths intended for holy orders are educated. The priests oceupya very important position in the social system, and much of the teaching is in their hands. Such men as Luna Pizarro and Vijil have performed their duties in a singularly faithful and enlightened spirit. Unfortunately there is still deplorable laxity among parish priests, though there are many noble exceptions.

Inhabitants. —The early inhabitants of Peru originally consisted Native of several distinct nations, subdivided into many tribes, which were inhabit. The principal ants,

eventually combined in the empire of the Yncas. trace was that of the imperial Yncas themselves, inhabiting the two central sections of the sierra, from the Knot of Cerro Pasco to that of Vilcafiota, a distance of 380 miles. Here nature has worked on her grandest and most imposing scale. The scenery is magnificent, the products of every zone are collected in the valleys and on the mountain-sides ; but the difficulties in the way of advancing civilization, caused by the obstacles of nature, are such as to tax man's ingenuity to the utmost. A country like this was well adapted for the cradle of an imperial race. Six nations originally peopled this central mountain-region—the Yncas in the valley of the Vilcamayu and surrounding platcaus, the Canas round the sources of the Apurimac, the Quichuas along the upper courses of the Pachachaca and the Apurimac, the Chancas, a very warlike people, from Guamanga to the Apurimac, the Huancas in the valley of the Xauxa, and the Rucanas round the summits and on the slopes of the Maritime Cordillera. These six nations were divided into "ayllus" or tribes, the most distinct of which were the still famous Morochucos and Yquichanos, brave mountaineers of the Chanca nation. There are reasons for believing that these nations once spoke different languages, especially the Chancas, but, excepting a few words imbedded in the general language of the Yncas, they are now lost.

In the basin of Lake Titicaca there was another race, anciently called Colla, but now better known as Aymara. Their language survives, and, though closely allied grammatically, the vocabulary differs from that of the Yncas. Within the Colla region, but differing from the rest of the inhabitants both in language and physical appearance, there was a savage tribe called Urus, inhabit- ing the reed-beds and islands in the southern part of Lake Titicaca. In the region north of the Knot of Cerro Pasco comprising the basin of the Marafion there were many warlike tribes speaking a language which the Yncas called Chinchaysuyu. The most important of these tribes were the Conchucos, Huamachucos, and Ayahuecas far to the north.

The Peruvian coast appears originally to have been inhabited by a diminutive race of fishermen called Changos, a gentle and hos- pitable people, never exceeding 5 feet in height, with flat noses. They fished in boats made of inflated seal-skins, lived in seal-skin huts, and slept on heaps of dried seaweed. Vestiges of this early race may be traced in the far south,

as well as at Eten, Morrope, and Catacaos in the north. The later and more civilized coast- people were a very different and an extremely interesting race. They appear to have formed distinct communities in the different valleys each under a chief, of whom the most civilized and powerful was the Chimu, who ruled over the five valleys of Pativilca, Huarmey, Santa, Viru, and Moche, where Truxillo now stands. The subjects of this prince made great advances in civilization, and his vast palaces near Truxillo now form extensive ruins. The irrigation works of this coast-people were most elaborate ; every acre of cul- tivable ground was brought under cultivation, and water was con- veyed at high levels from great distances. The Yncas called these people Yuncas, but they have entirely passed away, giving place to the negroes and Chinese labourers who now swarm in the coast-valleys. There is no dictionary of the Yunca language, but there is a grammar and a short list of words written in 1644, before it had entirely ceased to be spoken.

The Ynea or Quichua tribes of the Andes of Peru average a height of 5 feet.to 5 feet 6 inches. They are of slender build, but with well-knit muscular frames, and are capable of enduring great fatigue. Their complexions are of a fresh olive-colour, skin very smooth and soft, beardless, hair straight and black, the nose aquiline. They are good cultivators, and excel as shepherds by reason of their patience and kindness to animals. They are natur- ally gentle, most affectionate to their families, with an intense love of home ; but at the same time they are enduring and brave. The Aymaras are more thick-set than the Yncas, and their chief phy-

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sical peculiarity is that the thigh, instead of being longer, is rather shorter than the leg. The whole build is admirably adapted for mountain-climbing.

The policy of the Yncas was to enforce the use of their language, called by the earliest Spanish grammarian ‘‘Quichua,” among all the conquered tribes. Hence its very general use throughout the mountainous part of Peru, the only differences being the survival of words in some of the districts from the language or dialect that was superseded. Quichua was the language ofa people far advanced in civilization ; it was assiduously cultivated by learned men for several centuries ; not only songs but elaborate dramas and rituals were composed in it; and it is still the language of the majority of the people of Peru. Aymara, which is a closely-allied tongue, is spoken along the shores of Lake Titicaca.

The wild Indians of the montafia, except a few tribes on the skirts of the Andes, do not belong to the Peruvian family. They are part of the great Tupi group of nations, and belong to the region of the Amazons. On the banks of the Huallaga are the Cocomas, Cholones, Panos, and Motilones; and on the Ucayali the wild tribes of the Cashibos, Capahuanas, Remos, Amajuacas, and Mayorunas. The Conibos, Pirros, Sencis, Setebos, and Shipibos are peace- ful traders. The Antis or Campas form a large and important tribe on the upper course of the Ucayali, with probably a large share of Ynca blood in their veins. The savage Indians on the tributaries of the Beni are called Chunchos. It is, however, to another family of the American race that the tribes of the Amazons mainly belong.

History.—Cyclopean ruins of vast edifices, apparently never com- pleted, exist at Tiahuanaco near the southern shore of Lake Titicaca. Remains of a similar character are found at Huaraz in the north of Peru, and at Cuzco, Ollantay-tambo, and Huifiaque between Huaraz and Tiahuanaco. These works appear to have been erected by powerful sovercigns with unlimited command of labour, possibly with the object of giving employment to subjugated people, while feeding the vanity or pleasing the taste of the conqueror. Their unfinished state seems to indicate the break-up of the Government which conceived then: and which must have held sway over the whole of Peru, and the occurrence of Aymara words, especially in the names of places over the whole area, points to an Aymara origin for this lost and prehistoric empire. It is ccrtain that for ages afterwards the country was again broken up into many sepa- rate nations and tribes. Then the most civilized and most powerful people, the Yncas of Cuzco and the Vilcamayu,

began slowly to build wp and cement together a later and more civilized empire. This great work, which probably occupied five centuries, was just completed when the Spaniards discovered Peru. The history of Ynea civilization has yet to be written. Our knowledge even of the Spanish writers who collected information at the time of the conquest is still very incomplete. Much that is esscntial for a correct appreciation of this interesting subjcct is still inedited and in manuscript. But, to comprehend it, a knowledge is also neccs- sary of the people, of their country and languages. Without such qualifications for the task, the numerous traditions, customs, and beliefs cannot be understood nor assigned to the particular epochs and nationalities to which each belonged. With our existing imperfect knowledge the subject cannot be adequately treated with- out a detailed and critical examination of conflicting evidence which would be foreign to the purpose of the present article.

The great Ynea Huayna Ccapac died in 1527, the year when Pizarro first appeared on the coast. His consolidated empire extended from the river Ancasmayu north of Quito to the river Maule in the south of Chili. The Yneas had an elaborate system of state-worship, with a ritual, and frequently recurring festivals. History and tradition were preserved by the bards, and dramas were enacted before the sovereign and his court. Roads with post- houses at intervals were made over the wildest mountain-ranges and the bleakest deserts for hundreds of miles. A well-considered system of land-tenure and of colonization provided for the wants of all classes of the people. The administrative details of govern- ment were minutely and carefully organized, and accurate statistics were kept by means of the “quipus” or system of knots. The edifices displayed marvellous building skill, and their workmanship is un- surpassed. The world has nothing to show, in the way of stone- cutting and fitting, to equal the skill and accuracy displayed in the Ynca structures of Cuzco. As workers in metals and as potters they displayed infinite variety of design, though not of a high order, while as cultivators and engineers they in all respects excelled their European conquerors.

The story of the conquest has been told by Prescott and Helps, who give ample references to original authorities; it will be sufficient here to enumerate the dates of the leading events. On 10th March 1526 the contract

for the conquest of Peru was signed by Almagro and Luque, Gaspar de Espinosa supplying the funds. In 1527 Francisco Pizarro, after enduring fearful hardships, first reached the coast of Peru at Tumbez. In the following year he went to Spain, and on 26th July 1529 the capitulation with the crown for the conquest of Peru was executed. Pizarro sailed from

San Lucar with his brothers in January 1530, and landed at Tumbez in 1532. The civil war between Huascar and Atahualpa, the sons of Huayna Ceapac, had been fought out in the meanwhile, and the victorious Atahualpa was at Caxamarca on his way from Quito to Cuzco. On 15th November 1532 Francisco Pizarro with his little army entered Caxamarca and in February 1533 his colleague Almagro arrived with reinforcements. The murder of the Ynca Atahualpa was perpetrated on 29th August 1533, and on 15th Nov- ember Pizarro entered Cuzco. He allowed the rightful heir to the empire, Manco the legitimate son of Huayna Ccapac, to be solemnly crowned on 24th March 1534. Almagro then undertook an expe- dition to Chili, and Pizarro founded the city of Lima on 18th January 1535. In the following year the Yncas made a brave attempt to expel the invaders, and closely besieged the Spaniards in Cuzco during February and March. But Almagro, returning from Chili, raised the siege on 18th April 1537. Immediately afterwards the dispute arose between the Pizarros and Almagro as to the limits of their respective jurisdictions. An interview took place at Mala, on the sea-coast, on 18th November 1537, which led to no result, and Almagro was finally defeated in the battle of Las Salinas near Cuzco on 26th April 1538. His execution followed. His adherents recognized his young half-caste son, a gallant and noble youth generally known as Almagro the Lad, as his successor. Bitterly discontented, they conspired at Lima and assassinated Pizarro on 26th June 1541. Meanwhile Vaca de Castro had been sent out by the emperor, and on hearing of the murder of Pizarro he assumed the title of governor of Peru. On 16th September 1542 he defeated the army of Almagro the Lad in the battle of Chupas near Guamanga. The ill-fated boy was beheaded at Cuzco.

Charles V. enacted the code known as the “‘ New Laws” in 1542. Civil “ Encomiendas,” or grants of estates on which the inhabitants were wars.

bound to pay tribute and give personal service to the grantee, were to pass to the crown on the death of the actual holder; a fixed sum was to be assessed as tribute ; and forced personal service was for- bidden. Blasco Nunez de Vela was sent out, as first viceroy of Peru, to enforce the “New Laws.” Their promulgation aroused a storm among the conquerors. Gonzalo Pizarro rose in rebellion, and entered Lima on 28th October 1544. The viceroy fled to Quito, but was followed, defeated, and killed at the battle of Anaquito on 18th January 1546. The “New Laws” were weakly revoked, and Pedro de la Gasca, as first president of the Audiencia (court of justice) of Peru, was sent out to restore order. He arrived in 1547, and on 8th April 1548 he routed the followers of Gonzalo Pizarro on the plain of Xaquixaguana near Cuzco. Gonzalo was executed on the field. La Gasca made a redistribution of “encomiendas”’ to the loyal conquerors, which caused great discontent, and left Peru before his scheme was made public in January 1550. On 23d September 1551 Don Antonio de Mendoza arrived as second viceroy, but died at Lima in the following July. The country was then ruled by the judges of the Audiencia, and a formidable insurrection broke out, headed by Francisco Hernandez Giron, with the object of maintaining the right of the conquerors to exact forced service from the Indians. In May 1554 Giron defeated the army of the judges at Chuquinga, but he was hopelessly routed at Pucara on 11th October 1554, captured, and on 7th December executed at Lima. Don Andres Hurtado de Mendoza, marquis of Caftete, entered Lima as third viceroy of Peru on 6th July 1555, and ruled with an iron hand for six years. He at length brought the turbulent conquerors to their knees. All the leaders in former disturbances were put on board a ship at Callao and sent toSpain. Corregidors, or governors of districts, were ordered to try summarily and execute every tur- bulent person within their jurisdictions. All unemployed persons were sent on distant expeditions, and moderate “encomiendas’ were granted to a few deserving officers. The previous anarchy was thus completely stamped out. At the same time the viceroy wisely came to an agreement with Sayri Tupac, the son and successor of the Ynca Manco, and granted him a pension. He took great care to supply the natives with priests of good conduct, and pro- moted measures for the establishment of schools and the founda- tion of towns in the different provinces. The cultivation of wheat, vines, and olives, and European domestic animals were introduced. The next viceroy was the Conde de Nieva (1561-64). His successor, the

licentiate Lope Garcia de Castro, who only had the title of governor, ruled from 1564 to 1569. From this time there was a succession of viceroys until 1824. The viceroys were chief magis- trates, but they were not supreme. In legal matters they had to consult the Audiencia of judges, in finance the Tribunal de Cuentas, in other branches of administration the Juntas de Gobierno and

de Guerra.

Don Francisco de Toledo, the second son of the count of Oropesa, Toledo's Fearing that adminis-

the little court of the Ynca Tupac Amaru (who had succeeded his tration.

entered Lima as viceroy on 26th November 1569.

brother Sayri Tupac) might become a formidable focus of rebellion, he sent troops to seize the young prince, and unjustly beheaded the last of the Yncas in the square of Cuzco in the year 1571. After a minute personal inspection of every province in Peru, he, with the experienced aid of the learned Polo de Ondegardo

Vice- royalty.

Peru inde- pendent

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and the judge Matienza, established the system under which the native population of Peru was ruled for the two succeeding cen- turies ; and future viceroys referred to hin as the great master of statesmanship who was their guide, and to his ordinances as their acknowledged text-book. His Libro de Tasos fixed the tribute to be paid by the Indians, exempting all men under eighteen and over fifty. He found it necessary, in order to secure efficient government, to revert in some measure to the system of the Yncas. The people were to be directly governed by their native chiefs, whose duty was to collect the tribute and exercise magisterial functions. The chiefs or "curacas" had subordinate native officials under them called " pichea-

pachacas ” over 500 men, and “pachacas” over 100 men. The office of curaca (or “ cacique ”) was made hereditary, and its possessor enjoyed several privileges. Many curacas were descended from the imperial family of the Yncas, or from great nobles of the Yncarial court. In addition to the tribute, which was in accordance with native usage, there was the “mita,” or forced labour in mines, farms, and manufactories. Toledo enacted that one-seventh of the male population of a village should be subject to conscription for this service, but they were to be paid, and were not to be taken beyond a specified distance from their homes.

In their legislation the Spanish kings and viceroys showed a desire to protect the people from tyranny, but they were unable to prevent the rapacity and lawlessness of distant officials. The country was depopulated by the illegal methods of enforcing the mita, and an air of sadness and desolation spread over the land. Toledo was succeeded in 1581 by Don Martin Henriquez, who died at Lima two years afterwards. The subsequent history of the vice- royalty is well worthy of detailed attention by students of history in all countries possessing a colonial empire. ‘The Spanish colonies suffered from the strict system of monopoly and protection, which was only slightly relaxed by the later Bourbon kings, and from the arbitrary proceedings of the Inquisition. Between 1581 and 1776 as many as fifty-nine heretics were burned at Lima, and there were twenty-nine “autos,” but the Inquisition affected Europeans rather than natives, for the Indians, as catechumens, were exempted from its terrors. The curacas sorrowfully watched the gradual extine- tion of their people by the operation of the mita, protesting from time to time against the exactions and cruelty of the Spaniards. At length a descendant of the Yneas, who assumed the name of Tupac Amaru, rose in rebellion in 1780. The insurrection lasted until July 1783, and the cruel executions which followed its sup- pression failed to daunt the people. The death of Tupac Amaru shook the power of Spain and made it totter to its fall. From that time both Indians and Peruvians of Spanish descent began to think for themselves, and to entertain ideas of liberty and pro- gress. Tupac Amaru was followed by Dr Pedro José Chavez de la Rosa, the Spanish bishop of Arequipa, and Dr Toribio Rodriguez de Mendoza, rector of the university of San Carlos at Lima, whose pupils, among whom were the future republican statesmen Drs Luna Pizarro and Vijil, became ardent advocates of reform. When, on 3d August 1814, Mateo

Garcia Pumacagua, a Peruvian chief, raised the cry of independence at Cuzco, he was joined by many Peruvians of Spanish descent, but was defeated in the battle of Umachiri (12th March 1815), taken, and executed. At the same time the youthful and enthusiastie poet Melgar suffered death in the cause of his country.

Peru was the centre of Spanish power, and the viceroy had his military strength concentrated at Lima. Consequently the more distant provinces, such as Chili and Buenos Ayres, were able to throw off the yoke first. But the destruction of the viceroy's power was essential to their continued independent existence. The conquest of the Peruvian coast must always depend on the command of the sea. A fleet of armed ships was fitted out at Valparaiso in Chili, under the command of Lord Cochrane and officered by Englishmen. It convoyed an army of Argentine troops, with some Chilians, under the command of the Argentine general San Martin, which landed on the coast of Peru in September 1820. San Martin was enthusiastically received, and the independence of Peru was proclaimed at Lima on his entrance, after the viceroy had withdrawn (28th July 1821). On 20th September 1822 San Martin resigned the protectorate, with which he had been invested, saying that the "presence of a fortunate soldier is dangerous to a newly- constituted state," and on the same day the first congress of Peru became the sovereign power of the state. After a short period of government by a committee of three, the congress elected Don José de la Riva Aguero to be first president of Peru on 26th F ebruary 1823. He displayed great energy and capacity as an administrator, but the aid of the Colombians under Bolivar was sought, and the native ruler was unwisely deposed. Bolivar arrived at Lima on Ist September 1823, and began to organize an army to attack the Spanish viceroy in the interior. On 6th August 1824 the cavalry action of Junin was fought with the Spanish general Canterac near the shores of the lake of Chinchay-cocha. It was won bya gallant charge of the Peruvians under Colonel Suarcz at the critical moment, Soon afterwards Bolivar left the army to proceed to

'the coast, and the final battle of Ayacucho (9th December 1824)

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with the viceroy and the whole Spanish power was fought by his second in command, General Sucre. The Spaniards were com- pletely defeated. The viceroy and all his officers were taken prisoners, and Spanish power in Peru came to an end,

General Bolivar now showed that he was actuated by personal ambition ; he intrigued to impose a constitution on Peru, with himself as president for life. He failed, and left the country on 3d September 1826, followed by all the Colombian troops in March

1827. General Lamar, who commanded the Peruvians at Ayacucho, Karly was elected president of Peru on 24th August 1827, but was deposed, presi. after waging a brief but disastrous war with Colombia, on 7th June dents,

1829. General Gamarra, who had been in the Spanish service, and was chief of the staff in the patriot army at Ayacucho, was elected third president on 81st August 1829.

For fifteen years, from 1829 to 1844, Peru was painfully feeling her way to a right use of independence. The officcrs who fought at Ayacucho, and to whom the country felt natural gratitude, were all-powerful, and they had not learned to settle political differences in any other way than by thesword. From 1837 to 1839 there was a lawless and unprincipled intervention on the part of Chili which increased the confusion. Three men, during that period of proba- tion, won a prominent place in their country's history, Generals Gamarra, Salaverry, and Santa Cruz. Gamarra, born at Cuzco in 1785, never accommodated himself to constitutional usages ; too often he made his own will the law ; but he attached to himself many loyal and devoted friends, and, with all his faults, which were mainly faults of ignorance, he loved his country and sought its welfare according to his lights. Salaverry was a very different character. Born at Lima in 1806, of pure Basque descent, he joined the patriot army before he was fifteen and displayed his audacious valour in many a hard-fought battle. Feeling strongly the necessity that Peru had for repose, and the guilt of civil dissension, he wrote patriotie poems which became very popular, Yet he too could only see a remedy in violence. He seized the Supreme power, and perished by an iniquitous sentencc on 18th February 1836.1 Andres Santa Cruz was an Indian statesman. His mother was a lady of high rank, of the family of the Yncas, and he was very proud

of his descent. Unsuccessful as a general in the field, he nevertheless possessed remarkable administrative ability and for nearly three years (1886-39) realized his lifelong dream of a Pceru-Bolivian confederation.2 But Peruvian history is not confined to the hostilities of these military rulers. Three constitutions were framed, in 1828, 1838, and 1839. There were lawyers, statesmen, and orators who could defend the rights and liberties of the people. On 7th November 1832 Dr Vijil, the deputy for Tacna, rose in his place in congress and denounced the unconstitutional acts of President Gamarra in a memorable speech of great eloquence. Nor should a much humbler name ever be omitted in writing the history of republican Peru. Juan Rios, a private soldier, was sentry at the door of congress when Gamarra illegally sent his troops to disperse the members. He defended his post against two companies, and fell mortally wounded.

In 1844 General Ramon Castilla restored peace to Peru, and was elected constitutional president on 20th April 1845. Ten years of peace and increasing prosperity followed. In 1849 the regular pay- ment of the interest of the public debt was commenced, steam com- munication was established along the Pacific coast, and a railroad was made from Lima to Callao. “After a regular term of office of six years of peace and moral and material progress Castilla resigned, and General Echenique was elected president. But the proceedings of Echenique’s government in connexion with the consolidation of the internal debt were disapproved by the nation, and, after hos- tilitics which lasted for six months, Castilla returned to power in January 1855. From December 1856 to March 1858 he had to contend with and subdue a local insurrection headed by General Vivanco, but, with these two exceptions, there was peace in Peru from 1844 to 1879, a period of thirty-five years.

Slavery and the Indian tribute were abolished ; by its provisions the president is elected for four years, and there are two vice- presidents. The congress consists of a scnate and chamber of deputies. The senators are clected by departments and the deputies by the people, every 80,000 inhabitants having a representative. When congress is not sitting there is a permanent commission of the legislature, elected at the end of each session, and consisting of seven senators and eight deputies. The chamber of deputies may accuse the president of infractions of the constitution and the

senate passes judgment. The president appoints the prefects of depart- ments and sub-prefects of provinces; the prefects nominate the governors of districts. In each province there is a judge; a superior court of justice sits at the capital of each department; and there is

1 The romance of his life has been admirably written by Manuel Bilbao (1st ed., Lima, 1853 ; 2d ed., Buenos Ayres, 1867).

2 The succession of presidents and supreme chiefs of Peru from 1829 to 1844 was as follows :—1829-33, Agustin Gamarra; 1834-35, Luis José Orbegoso; 1835-36, Felipe Santiago Salaverry; 1836-39, Andres Santa Cruz; 1839-41, Agustin Gamarra ; 1841-44, Manuel Menendez.

The existing consti- os tution was framed in 1856, and revised by a commission in 1860, tion.

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an appeal to the supreme court at Lima. Castilla retired at the end of his term of office in 1862, and died in 1868. On 2d August 1868 Coloncl Balta was elected president. Before his time the public debt had been moderate, amounting to £4,491,042, and the interest had been regularly paid since 1849. But Balta's govern- ment increased it to £49,000,000, the payment of the interest of which from the ordinary revenues was simply impossible. The creditors, as security, had the whole of the guano and nitrate de- posits assigned to them. With the vast sum thus raised President Balta commenced the execution of public works, principally rail- roads on a gigantic scale. His period of office was signalized by the opening of an international exhibition at Lima. He was succeeded (2d August 1872) by Don Manuel Pardo, an honest and enlightened statesman, who did all in his power to retrieve the country from the financial difficulty into which it had been brought by the reckless policy of his predecessor, but the conditions were not capable of solution. He regulated the Chinese immigration to the coast- valleys, which, from 1860 to 1872, had amounted to 58,606. He paid great attention to statistics, promoted the advance of educa- tion, and encouraged literature. He was the best president Peru has ever known, and his death in

1878 was a public calamity. On 2d August 1876 General Prado was elected, and his term of office saw the commencement of that calamity which has since overwhelmed his country.

On 5th April 1879 the republic of Chili declared war upon Peru, the alleged pretext being that Peru had made an offensive treaty, directed against Chili, with Bolivia, a country with which Chili had a dispute ; but the publication of the text of this treaty made known the fact that it was strictly defensive and contained no just causc of war. The true object of Chili was the conquest of the rich Peruvian province of Tarapaca, the appropriation of its valu- able guano and nitrate deposits, and the spoliation of the rest of the Peruvian coast.

After the capture of the ‘‘ Huascar”’ off Point Angamos on 8th October 1879 by two Chilian ironclads and four other vessels, the Peruvian coast was at the mercy of the invaders, and Tara- paca, surrounded by trackless deserts, yet open to the sea, though bravely defended for some time by the Peruvian army, fell into the hands of the enemy after the hotly-contested battle of Tarapaca on 17th November 1879.

Chili then landed an army farther north, and on 26th May 1880 the battle of Tacna was fought, followed by the capture of the port of Arica on 7th June. In these combats the Peruvians lost 147 officers alone. The possession of the sea enabled the Chilian ships to desolate the whole coast; and, the Peruvian army having been almost annihilated, only a force of volunteers and raw recruits could be assembled for the defence of the capital. After the two desperately-contested battles of Chorrillos and Miraflorcs on the 13th and 15th of January 1881, Lima was entered on the 17th, and was not evacuated by the invaders until 22d October 1883. During that period General Caceres, the hero of the defence, carried on a gallant but unequal struggle in the sierra. At last a provi- sional Government, under General Iglesias, signed a treaty with the Chilians on 20th October 1883, by which the province of Tarapaca was ceded to the conquerors, Tacna and Arica were to be occupied by the Chilians for ten years, and then a vote by plebiscitum is to decide whether they are to belong to Peru or Chili; and there are clauses respecting the sales of guano ; while all rights to the nitrate deposits, which are hypothecated to the creditors of Peru, have been

appropriated by the Chilian conquerors. This most disastrous war has brought ruin and misery on the country, and has thrown Peru back for many years. The country contains the elements of

recovery, but it will be a work of time.

Bibliography.—The history of Ynea civilization is to be found in works con- temporaneous with the conquest or written in the succeeding century, in the native literature, and in the modern descriptions of ruins and other remains. The highest authority is Pedro de Cieza de Leon, whose Chronicle, which bears the stamp of impartiality, accuracy, and intelligence, was written within twenty years of the conquest (Eng. tr. of parts i. and ii. by the Hakluyt Society, 1864, 1883). The valuable writings of the learned lawyer Polo de Ondegardo, which discuss the polity and administrative rule of the Yneas, have been edited in Spanish, and one of his intcresting reports has been translated and issued by the Hakluyt Society. Cristoval de Molina, the priest of the hospital of Cuzco, has described the rites, ceremonies, and ritual of the Yncas in great detail ; he wrote in 1580, but his manuscript was not translated and issued (by the Hakluyt Society) until 1873. It has since been ably edited in Spanish, at Madrid. Miguel Balboa, who was in the country from 1566 to 1586, wrote an excellent historical work, which is translated into French in the series of M. Ternaux Compans. The Natural History of the Indies, by the Jesuit José de

Acosta, is a work of considerable repute, first published in 1590. An English version, which originally appeared in 1604, was reprinted and edited for the Hakluyt Society in 1880. The famous commentaries of Garcilasso de la Vega were published in 1609; and the first part, relating to the Yncas, was trans- lated and issued by the Hakluyt Society in 1869. The Suma y Narracion de los Yncas, by Juan de Betanzos, is certainly one of the most valuable of the earlier authorities, as the author was an excellent scholar, well acquainted with the Ynea language, and a citizen of Cuzco. But most of his work is lost. The remainder was edited in Spanish by Sefior Espada in 1880. The works of Avila, Arriaga, and Ramos give accounts of local superstitions and beliefs soon after the conquest. In the 17th century valuable labours on Ynea history were given out by Fernando Montesinos,

whose work was translated into French in the Ternaux Compans edition, and by a native named Juan de Santa Cruz Saleamayhua. The latter curious narrative has been edited in Spanish recently, and issued in a translated form by the Hakluyt Society. General accounts of Ynea civilization have been written by Robertson, Prescott, and Helps, none of whom, however, were acquainted with more than a portion of these author- ities, or with the native languages, and none had been in the country. A valuable modern work on Peruvian antiquities is the Antiguedades Peruanas, by Don Mariano,Rivero, published at Vienna in 1851, and translated into Eng- lish at New York. Markham's Cuzco and Lima (1855) contains the results of a personal visit to the coast and to the ruins in and round Cuzco. D'Orbigny has described the ruins near Lake Titicaca ; but the best modern work treat- ing of architectural remains throughout Peru, as they may be seen now, is E. G. Squier's Peru (1877). Pérou et Bolivie, by Charles Wiener (1880), is also a valuable work. The language and literature of the Yncas have been treated of by Rivero, who gives a list of earlier grammars and vocabularies; in the Quichua grammar and dictionary, and the translation of the drama of Ollantay, by Markham ; in Dr Von Tschudi's Kechua Sprache (1853), and in his subsequent critical work published in 1875; and by Gavino Zegarra in the fourth volume of Collection Linguistique Americaine (1878). Don Vicente Lopez of Buenos Ayres has also written a learned work on the subject entitled Races Aryennes.

The career of Pizarro and the conquest of Peru are recounted in the general histories of Herrera and Gomara, and in Garcilasso de la Vega (part ii.). The best accounts of the first part of the conquest are by Francisco de Xeres, the conqueror's secretary, and by Hernando Pizarro. Both have been translated into English and issued by the Hakluyt Society. The narrative of Pedro Pizarro has only recently been edited at Madrid, and, as the author was one of the conquerors and an eye-witness, it is very important. Agustin de Zarate, who was employed in Peru very soon after the conquest, wrote ahistory which is valuable, especially the latter portion relating to events of which he was an eye-witness. The history of the Quito war by Cieza de Leon remained in manuscript until 1877, when it was admirably edited by Sefior Espada. These authorities (excepting the last) were made use of by Robertson, Prescott, and Helps. But none of the three brings the narrative down to the conclusion of the civil wars in Peru and the settlement of the

country. An account of the last rebellion, led by Francisco Hernandez Giron, and of the final settlement, is given by the Palencian Diego Fernandez in his history of Peru (Seville, 1571). There is no translation of this work. There is no history of the colonial period ; there are, however, abundant materials for it in the laws and ordinances, in the detailed reports of successive viceroys, in the histories of religious orders, and in innumerable memoirs, biographies, and reports both printed and in manuscript. Stevenson, in his narrative (3 vols., 1823), gives some account of the last years of viceregal government. A mass of documents relating to the great rebellion of the Ynea Tupac Amaru was published by Don Pedro de Angelis at Buenos Ayres in 1836. The work of Don Gregorio Funes, dean of Cordova, published in 1817, contains further information, and the diary of the governor of La Paz, while besieged by the Indians, will be found in Temple's Travels in Peru. There are narratives of the rebellion in the Voyage dans le nord de Bolivie by Weddell, and in the Travels in Peru and India (1862) by Markham. The events which led to the final achievement of Peruvian independence have been traced out in an interesting work by Don Benjamin Vicufia Mackenna, entitled La Historia de la Independencia del Peru, 1809-1819 (Lima, 1860). The events of the war of independence are narrated by the Spaniards Garcia Camba and Terrazas, and in English in the charming Memoirs of General Miller, and, as regards naval affairs, in the autobiography of the earl of Dundonald. Three volumes of the history of the republic have been published by Dr Don Paz Soldan. There are useful materials for history in the two anonymous volumes published in 1858 and signed ‘‘ Pruvonena,” in the lives of Lamar by Villaran, of Salaverry by Bilbao, and in the history of the campaign of Yungay by Placencia. The works of Colonel Espinosa, especially his Diccionario Repub- licano, and of Dr Vijil arc also important. Histories of the war between Peru and Chili have been hurriedly published by two Chilians, Diego Barros Arana and Vieufia Mackenna. The former is a mere partisan production of no value asahistory. The latter, though prejudiced, is honestly written, and is useful as containing many original documents. Another history will be written by Paz Soldan; and meanwhile narratives have been published in English by Markham, and in Italian by Caivano. :

The most valuable geographical and topographical works on Peru are by Peruvians, including the writings of Cosine Bueno and Unanue, articles in

the Mercurio Peruano, and the works already mentioned of Dr Paz Soldan. Some papers by Haenke, Miller, Bollaert, Raimondi, Pentland, and Markham will be found in the Journais of the Royal Geographical Society. | But the most import- ant of all is the great official work by Don Antonio Raimondi, three volumes of which have already appeared, besides the same author's geographical account of the department of Ancachs. The natural history of Peru has been described in the German works of Dr Von Tschudi, and briefly in the English translation of his travels (1847). The first great work on Peruvian botany was the Flora Peruviana by Riuz and Pavon, followed by the Chloris Andina of Dr Weddell, which forms two volumes of the great work of Castelnau. In his Quinologie Weddell describes the quinine-yielding chinchona trees of Peru and Bolivia, and further information on the chinchona genus, as well as on coca cultivation, Cuzco maize, and quinoa, will be found in Markhain's Peruvian Bark (1880). Besides the works already mentioned, Dr A. Smith published a book giving useful information respecting the climate of Lima and other parts of Pern entitled Peru as it is (1839); and there are some other books of travel of no

special value. (C. R. M.)

PERU, a city of the United States in La Salle county, Illinois, lies 68 miles above Peoria at the head of naviga- tion on the Illinois river, is a station on the Chicago, Rock

1 The succession of presidents of Peru, since the establishment of peace by Castilla in 1844, has been as follows :—1845-51, Ramon Castilla ; 1851-55, José Rufino Echenique ; 1855-62, Ramon Castilla ; 1862-63, Miguel San Roman (died 3d April 1863); 1863-65, Jose Antonio Pezet (vice-president) ; 1865-68, Mariano Ignacio Prado ;

Island, and Pacific Railroad, and is connected by a tramway (1 mile) with La Salle, the terminus of the Llnois and Michigan Canal. Flour-mills, a plough-factory, and zinc- works are among the chief industrial establishments ; coal- 1868-72, José Balta; 1872-76, Manuel Pardo; 1876-79, Mariano Ignacio Prado; 1879-81, Nicolas de Pierola (supreme chief); 1881 (12th March), Francisco Garcia Calderon; 1883 (20th October), General Iglesias.

mining is largely prosecuted in the vicinity ; and 125,000 tons of ice are yearly despatched to the southern markets. The population was 3132 in 1860 and 4632 in 1880 (township, 5053).

PERUGIA, a city of Italy, the chief town of the pro- vince of Perugia (formerly Umbria), lies 1550 feet above the sea on a beautiful and green-clad hill, which affords a magnificent view over a wide sweep of the Apennines and the great Umbrian plain through which the Tiber flows. The railway station at the foot of the ascent, more than a mile from the city-gate, is 484 miles south-east of Arezzo and 152 miles north of Rome. The walls, which follow a very irregular ground-plan, have a circuit of 8300 yards, and the length from Sant' Angelo in the north-west to Porta San Costanzo in the south-east is 2500 yards. Of the forty-two towers which could be counted in the 14th century only three or four—the Torre degli Scalzi, &ce.— remain; but away from the line of the present enceinte there are several relics of the ancient Etruscan and Roman fortifications, notably the so-called arch of Augustus, a magnificent gateway in the Piazza Grimana, with the ancient inscription AvevsTaA Prervsta on the archivolt and a beautiful Renaissance loggia boldly crowning one of its towers. The Cittadella Paolina—a great fortress erected by Paul III. on a site previously occupied by ten churches, two monasteries, the palaces of the Baglioni, and a number of private houses—was destroyed by the citizens in 1848, and its place has been partly taken by a substan- tial block of public offices (the museum, é&c.). In modern Perugia the great centre of interest is the Piazza del Duomo at the north end of the Corso. On one side stands the cathedral of San Lorenzo, a Gothic structure of the 14th and 15th centuries, in the plan of a Latin cross 5 On the other side is the Palazzo Pubblico, presenting a fine Gothic facade of the first half of the 14th century with the figures of the Perugian griffin and the Guelf lion above the outside stair ; and in the centre rises the great marble fountain constructed about 1277 by Bevignate, Frate Alberto (both Perugians), and Boninsegna (a Venetian), and adorned by statues and statuettes sculptured by Niccold and Giovanni Pisano. The cathedral contains the burial- place of the three popes, Innocent III., Urban IV., and Martin IV., and a reputed relic of great celebrity in ltaly— the Virgin's wedding-ring ; and at the north-west corner, in the Piazza del Papa, is a

sitting statue! of Pope Julius III. by Vincenzio Danti, erected about 1555 by the people of Perugia in gratitude for the restoration of their civic privileges. On the decoration of the Sala del Cambio or old exchange, contiguous to the Palazzo Pubblico, Perv- GINO (7.v.) put forth the full force of his genius. Most of the movable paintings for which Perugia is famous have since 1863 been collected in the Pinacoteca Vannucci, established in the same Monte Morcino monastery of the Olivetans which now accommodates the university ; besides a considerable number of pieces by Perugino, there are specimens of Pinturicchio, Niccold Alunno, Bonfigli, é&e. This centralization has somewhat impaired the interest of several of the churches; but others remain with undimi- nished wealth. San Domenico, a Gothic edifice originally designed by Giovanni Pisano, but rebuilt in 1632, contains that artist's magnificent monument of Pope Benedict XI., and in its east front a beautiful stained- glass window by Bartolommeo da Perugia. San Pietro de' Casinensi (out- side the Porta Romana) is a basilica with a triple nave, founded in the beginning of the 11th century by Vincioli, and remarkable for its conspicuous spire, its granite and marble columns, its walnut stall-work designed by Raphael, and its numerous pictures (by Perugino, Parmigiano, Ra- phael, &c.). The Chiesa Nuova (formerly San Giovanni

1 See Hawthorne's description in the Murble Faun.

Rotondo) possesses the tombs of Baldassare Ferri, the Perugian musician, and Vermiglioli, the leading Perugian antiquary. The university, which is not one of the " royal universities," though it dates from 1307 and has faculties of law, science, and medicine, numbers only seventy-nine students (1881-82). Other educational and benevolent institutions are a botanical garden, a meteorological obser- vatory, a commercial library founded in 1582 by Prospero Podiani,? the Santa Margherita lunatic asylum, and the hospital of Santa Maria. Woollens, silks, wax candles, and liqueurs are manufactured on a small scale. The popula- tion of the city was 16,708 in 1871, and 17,395 in 188ig that of the commune 49,503 and 51,354 respectively.

A notice of ancient Perugia (Perusia) has been given under Etruria, vol. viii. p. 635. After the disasters of the Perugian war (41 B.c.) the city was rebuilt by Augustus and took the title Augusta ; and at a later date it became a regular colony, Colonia Vibia. Its recovery from the Goths by Belisarius in 587, its pro- tracted siege and sack by Totila (549), its restoration to the Eastern empire by Narses in 552, and its long occupation by the Lombards are the main points in the history of Perugia previous to the 9th century. At that time, with the consent of Charles the Great and Louis the Pious, it passed under the supremacy of the popes; but for many centuries the papal authority existcd rather in name than in reality, and the city continued to maintain an independent and enterprising life, warring against its enemies and subduing many of the neighbouring lands and cities,—Foligno, Assisi, Spoleto, Montepulciano, &c. It remained true for the most part to the Guelfs. On various occasions the popes found a personal asylum within its walls, and it was the meeting-place of the conclaves which elected Honorius II. (1124), Honorius IV. (1285), Celestine V. (1294), and Clement V. (1805). But Perugia had no mind simply to subserve the papal interests. At the time of Rienzi's unfortunate enterprise it sent ten ambassadors to pay him honour ; and, when papal legates sought to coerce it by foreign soldiery, or to exact contributions, they met with vigorous resistance. In the 15th century the real power, after passing from despot to despot, was at last concentrated in the Baglioni family, who, though they had no legal position as rulers or magistrates, defied all other authority, and filled the streets of the city with their broils and butcheries. Gian Paolo Baglioni was lured to Rome in 1520, and beheaded by Leo X. ; and in 1584 Rodolfo, who had slain a papal legate, was defeated by Pier Luigi Farnese, and the city, captured and plundered by his soldiery, was deprived of its privileges and given over to the "'worse tyranny of priests and bastards." In 1797 Perugia was occupied by the French; in 1882, 1838, and 1854 it was visited by earthquakes ; in May 1849 it was seized by the Austrians ; and, after a futile insurrection in 1859, it was finally united, along with the delegation, to Piedmont in 1860.

See B. Rossi Scotti, Guida di Perugia; Bonazzi, Storia di Perugia (1875, &e.); J. A. Symonds, Sketches in Greece and Italy (1874).

PERUGINO, Przrro (1446-1524), whose correct family name was VANNUCCI, one of the most advanced Italian painters immediately preceding the era of Leonardo da Vinci and Raphael, was born in 1446 at Citta della Pieve in Umbria, and belongs to the Umbrian school of painting. The name of Perugino came to him from Perugia, the chief city of the neighbourhood. Pietro was one of several children born to Cristoforo Vannucci, a member of a re- spectable family settled at Citta' della Pieve. Though respectable, they seem to have been poor, or else, for some reason or other, to have left Pietro uncared for at the opening of his career. Before he had completed his ninth year the boy was articled to a master, a painter at Perugia. Who this may have been is very uncertain ; the painter is spoken of as wholly mediocre, but sympathetic for the great things in his art. Benedetto Bonfigli is generally surmised ; if he is rejected as being above mediocrity, either Fiorenzo di Lorenzo or Niccold da Foligno may possibly have been the man. Pietro painted a little at Arezzo; thence he went to the headquarters of art, Florence, and frequented the famous Brancacci Chapel in the church of the Carmine. It appears to be sufficiently established that he studied in the atelier of Andrea del Verrocchio, where Leonardo da Vinci was also a pupil. He may have learned perspective, in which he particularly

- See the curious history in The Fortnightly Review, 1866.

excelled for that period of art, from Pietro della Francesca. The date of this first Florentine sojourn is by no means settled ; some authorities incline to make it as early as 1470, while others, with perhaps better reason, postpone it till 1479. Pietro at this time was extremely poor, and his prospects of rising in his art, save by the exercise of incessant diligence day and night, were altogether dim ; he had no bed, but slept on a chest or trunk for many months, and, bent upon making his way, resolutely denied himself every creature-comfort.

Gradually Perugino rose into notice, and in the course of some years he became extremely famous not only throughout all Italy but even beyond her bounds. He was one of the earliest Italian painters to practise oil- painting, in which he evinced a depth and smoothness of tint which elicited much remark; he transcended his epoch in giving softness to form and a graceful

spacious- ness to landscape-distances, and in perspective he applied the novel rule of two centres of vision. The Florentine school advanced in amenity under his influence. Some of his early works were extensive frescos for the Ingesati fathers in their convent, which was destroyed not many years afterwards in the course of the siege of Florence; he produced for them also many cartoons, which they executed with brilliant effect in stained glass. Though greedy for gain, his integrity was proof against temptation ; and an amusing anecdote has survived of how the prior of the Ingesati doled out to him the costly colour of ultra- marine, and how Perugino, constantly washing his brushes, obtained a surreptitious hoard of the pigment, which he finally restored to the prior to shame his stingy suspicious- ness. Another (and possibly apocryphal) anecdote, to show that he was not incapable of rising superior to all sordid considerations, is that he painted some excellent frescos for the oratory annexed to 8. Maria de' Bianchi and would only accept an omelette as a gratuity. A third anecdote (but it belongs to a late period of his life) is that, as he would trust no one, he was accustomed to carry his money about with him in travelling after he had received a pay- ment, and on one occasion was robbed and had a narrow escape of his life; eventually, however, the bulk of the money was recovered. A good specimen of his early style, in tempera, is the circular picture in the Louvre of the Virgin and Child enthroned between Saints.

Perugino returned from Florence to Perugia, and thence, towards 1483, he went to Rome. The painting of that part of the Sixtine Chapel which is now immortalized by Michelangelo's Last Judgment was assigned to him by the pope; he covered it with frescos of the Assumption, the Nativity, and Moses in the Bulrushes. These works were ruthlessly destroyed to make a space for his suc- cessor's more colossal genius, but other works by Perugino still remain in the Sixtine Chapel, — Moses and Zipporah (often attributed to Signorelli), the Baptism of Christ, and Christ giving the keys to Peter. This last work is more especially noted, and may be taken as a typical example both of Perugino's merits and of his characteristic defects, —such as formal symmetry of composition, set attitudes, and affectation in the design of the extremities. Pintu- ricchio accompanied the greater Umbrian to Rome, and was made his partner, receiving a third of the profits; he may probably have done some of the Zipporah subject.

Pietro, now aged forty, must have left Rome after the completion of the Sixtine paintings in 1486, and in the autumn of that year he was in Florence. Here he figures by no means advantageously in a criminal court. In

July 1487 he and another Perugian painter named |

Aulista di Angelo were convicted, on their own confession, of having in December waylaid with staves some one (the mame does not appear) in the street near S. Pietro

Maggiore. Perugino limited himself, in intention, to assault and battery, but Aulista had made up his mind for murder. The minor and more illustrious culprit was fined ten gold florins, and the major one exiled for life. The next recorded incident in his career is also not wholly honourable to Perugino,—that of his undertaking but not fulfilling a contract to paint in Orvieto ; as the commission fell through we need not pursue the details.

Between 1486 and 1499 Perugino resided chiefly in Florence, making one journey to Rome and several to Perugia. He had a regular shop in Florence, received a great number of commissions, with proportionate gain and fame, and continued developing his practice as an oil- painter, his system of superposed layers of colour being essentially the same as that of the Van Eycks. One of his most celebrated pictures, the Piet& in the Pitti Gallery, belongs to the year 1495. From about 1498 he became increasingly keen after money, frequently repeating his groups from picture to picture, and leaving much of his work to journeymen. In 1499 the guild of the Cambio (money-changers or bankers) of Perugia asked him to undertake the decoration of their audience-hall, and he accepted the invitation. This extensive scheme of work, which may have been finished within the year 1500, com- prised the painting of the vault with the seven planets and the signs of the zodiac (Perugino doing the designs and his pupils most probably the executive work), and the representation on the walls of two sacred subjects—the Nativity and Transfiguration—the Eternal Father, the four Virtues of Justice, Prudence, Temperance, and Forti- tude, Cato as the emblem of wisdom, and (in life-size) numerous figures of classic worthies,

prophets, and sibyls. On the mid-pilaster of the hall Perugino placed his own portrait in bust-form. It is probable that Raphael, who in boyhood, towards 1496, had been placed by his uncles under the tuition of Perugino, bore a hand in the work of the vaulting ; but, besides Raphael, the master had many and distinguished scholars acting as his assistants. The Transfiguration in this series has often been spoken of as the latest work of eminent excellence produced by Peru- gino, and from about 1500 he declined in a marked degree ; this, however, is not to be accepted as true without some qualification, as we shall see in the sequel. It may have been about this time (though some accounts date the event a few years later) that Vannucci married a young and beautiful wife, the object of his fond affection ; he loved to see her handsomely dressed, and would often deck her out with his own hands. He was made one of the priors of Perugia in 1501.

While Perugino, though by no means stationary or unprogressive as an executive artist, was working con- tentedly upon the old lines, and carrying out, almost to their highest point of actual or potential development, the ancient conceptions of subject-matter, treatment, style, and form, a mighty wave of new art flooded Florence with its rush and Italy with its rumour. Michelangelo, twenty- five years of age in 1500, following after and distancing Leonardo da Vinci, was opening men's eyes and minds to possibilities of achievement as yet unsurmised. Vannucci in Perugia heard Buonarroti bruited abroad, and was impatient to see with his own eyes what the stir was all about. In 1504 he allowed his apprentices and assistants to disperse, and he returned to Florence. It was not in the nature of things that he should simply swell the chorus of praise. Though not openly detracting, he viewed with jealousy and some grudging the advances made by Michel- angelo; and Michelangelo on his part replied, with the intolerance which pertains to superiority, to the faint praise or covert dispraise of his senior and junior in the art. On one occasion, in company, he told Perugino to

his face that he was "a bungler in art" (goffo nell' arte). This was not to be borne, and Vannucci brought, with equal indiscretion and ill success, an

action for defamation of character. Put on his mettle by this mortifying trans- action, he determined to show what he could do, and he produced the chef-d'ceuvre of the Madonna and Saints for the Certosa of Pavia. The constituent parts of this noble work have now been sundered. 'The only portion which remains in the Certosa is a figure of God the Father with cherubim. An Annunciation has disappeared from cog- nizance ; three compartments—the Virgin adoring the infant Christ, St Michael, and St Raphael with Tobias— are among the choicer treasures of the London National Gallery. The current story that Raphael bore a hand in the work is not likely to be true. This was succeeded in 1505 by an Assumption, in the Cappella dei Rabatta, in the church of the Servi in Florence. The painting may have been executed chiefly by a pupil, and was at any rate a failure: it was much decried; Perugino lost his scholars; and towards 1506 he once more and finally abandoned Florence, going to Perugia, and thence in a year or two to Rome.

Pope Jtilius IT. had summoned Perugino to paint the Stanza in the Vatican, now called that of the Incendio del Borgo; but he soon preferred a younger competitor, that very Raphael who had been trained by the aged master of Perugia; and Vannucci, after painting the ceiling with figures of God the Father in different glories, in five medallion-subjects, found his occupation gone; he retired from Rome, and was once more in Perugia from 1512. Among his latest works one of the best is the extensive altar-piece (painted between 1512 and 1517) of 8. Agostino in Perugia; the component parts of it are now dispersed in various galleries.

Perugino's last frescos were painted for the monastery

of S. Agnese in Perugia, and in 1522 for the church of Castello di Fontignano hard by. Both series have dis- appeared from their places, the second being now in the South Kensington Museum. He was still at Fontignano in 1524 when the plague broke out, and he died. He was buried in unconsecrated ground ina field, the precise spot now unknown. 'The reason for so obscure and unwonted @ mode of burial has been discussed, and religious scepti- cism on the painter's own part has been assigned as the cause; the fact, however, appears to be that, on the sudden and widespread outbreak of the plague, the panic-struck local authorities ordained that all

victims of the disorder should be at once interred without any waiting for religious rites. This leads us to speak of Perugino's opinions on religion, Vasari is our chief, but not our sole, authority for saying that Vannucci had very little religion, and was an open and obdurate disbeliever in the immortality of the soul. Gasparo Celio, a painter of the 16th century, cites Niccolo delle Pomarance (whose wife was related to Perugino's wife) as averring that the aged master on his deathbed rejected the last sacraments, and refused to confess, saying he was curious to know the final fate of an unconfessed soul, and therefore he was buried in uncon- secrated ground. For a reader of the present day it is easier than it was for Vasari to suppose that Perugino may have been a materialist, and yet just as good and laudable a man as his orthodox Catholic neighbours or brother-artists; still there is a sort of shocking discrepancy between the quality of his art, in which all is throughout Christian, Catholic, devotional, and even pietistic, and the character of an anti-Christian contemner of the doctrine of immortality. It is difficult to reconcile this discrepancy, and certainly not a little difficult also to suppose that Vasari was totally mistaken in his assertion ; he was born twelve years before Perugino's death, and must have talked

with scores of people to whom the Umbrian painter had been well known. in 1494 painted his own portrait, now in the Uffizi Gallery

We have to remark that Perugino

of Florence, and into this he introduced a scroll lettered "Timete Deum." That an open disbeliever should inscribe

himself with "Timete Deum" seems odd 3 one's first im- pression is either that he cannot have been a disbeliever

or else that he must have been a hypocrite as well, which,

however, is still inconsistent with Vasari's account of the

facts. It is possible, after all, that a man might fear God and yet have no confidence in immortality, or in many of the things which seemed in 1494 to be essentials of religion, The portrait in question shows a plump face,

with small dark eyes, a short but well-cut nose, and sensuous lips; the neck is thick, the hair bushy and frizzled, and the general air imposing. The later portrait in the Cambio of Perugia shows the same face with traces of added years. Perugino died possessed of coniderable property, leaving three sons.

The character of Perugino's art is, as we have just said, through- out religious, although, in some instances already indicated, he strayed outside the circle of Christian history and tradition. His art is reserved, self-contained, not demonstrative, yet conspicuously marked by a tendeney to posing and balance, and to little artifices wherein the graceful merges in the affected. He had a particular mastery over abstracted purism of expression ; this appears con- stantly in his works, and, while it carries the finer of them toa genuinely ideal elevation, it leaves upon raany a mincing and mawkish taint which it is not easy to view without some impatience, Perugino did not recruit his strength from study of the antique; his drawing, though frequently solid and able, is unequal, and there is a certain littleness of style in his forms, especially (with rare exceptions) the nude. His technical attainment was excep- tional, and in colour he may be regarded as standing first in his generation in central Italy if we except Francia. Perugino does not leave upon us the impression of personal greatness ; he does not seem to have had struggling within him a profounder message to convey than he succeeded in conveying. There is neither massiveness of thought, nor novel initiative, nor glowing intensity, though there is some fervour of inspiration. Still, within his own province, he is a rare and excellent master.

Among the very numerous works of Perugino a few not already named require mention. Towards 1501 he produced the picture of the marriage of Joseph and the Virgin Mary (the "Sposalizio ") now in the museum of Caen; this served indisputably as the original, to a great extent, of the still more famous Sposalizio which was painted by Raphael in 1504, and which forms a leading attraction of the Brera Gallery in Milan.

Our account of Perugino follows in its main lines that given by Crowe and Cavalcaselle in their History of Painting in Italy, vol. iii. Vasari is, as usual, by far the most graphic narrator, but lax in his facts (though not so much so as in several other instances). Other leading authorities are Orsini, Vita, &c.,

di Pietro Perugino e degli Scolari, 1804, and Mezzanotte, Vita, &c., di Pietro Vannucci, 1836, (W. M. R.)

PERUVIAN BARK. See Crncrona and QUININE.

PERUZZI, BatpassarE (1481-1536), architect and painter of the Roman school, was born at Ancajano, in the diocese of Volterra, and passed his early life at Siena, where his father resided. While quite young Peruzzi went to Rome, and there studied architecture and painting ; in the latter he was at first a follower of Perugino. The choir-frescos in San Onofrio on the Janiculan Hill, usually attributed to Pinturicchio, are by his hand. One of the first works which brought renown to the young architect was the villa on the banks of the Tiber in Rome now

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known as the Farnesina, originally built for the Sienese Agostino Chigi, a wealthy banker. This villa, like all Peruzzi's works, is remarkable for its graceful design and the delicacy of its detail. It is best known for the frescos painted there by Raphael and his pupils to illustrate the stories of Psyche and Galatea. One of the loggie has frescos by Peruzzi's own hand,—the story of Medusa, a work of considerable decorative beauty. On account of his success in this building Peruzzi was appointed by Leo X. in 1520 architect to St Peter's at a salary of 250 scudi, a handsome sum for that time ; his design for its completion was not, however, carried out. During the sack of Rome in 1527 Peruzzi was taken prisoner, and barely escaped with his life, on condition of his painting the portrait of Constable de Bourbon, who had been killed during the siege (see Vasari). From Rome he escaped to his native city Siena, where he was made city architect, and designed fortifications for its defence, a great part of which still exist. Soon afterwards he returned to Rome, where he made designs for a palace for the Orsini family, and built the palaces Massimi and Vidoni, as well as others in the south of Italy. He died in 1536, and was buried by the side of Raphael in the Pantheon.

Peruzzi was an eager student of mathematics and the science of perspective ; he was also a fair classical scholar, and was much influenced by the treatise of Vitruvius. Like many of the great artists of his time, he was remark- able for the varied extent of his knowledge and skill. A most able architect, a fair painter, and a scientific engineer, he also practised minor arts, such as stucco-work in relief, sgraffito, and the decorative painted arabesques which the influence of Raphael did so much to bring into use. His best existing works in fresco are in the Castel di Bel- caro and the church of Fontegiusta in Siena. Tor Siena cathedral he also designed a magnificent wooden organ- case, painted and gilt, rich with carved arabesques in friezes and pilasters; he also designed the high altar and the Cappella del Battista.

His chief pupil was the architect Serlio, who, in his work on architecture, gratefully acknowledges the great debt he owed to Peruzzi's instruction. The English National Gallery possesses an interesting drawing by his hand (No. 167). The subject is the Adoration of the Magi, and it is of special value, because the heads of the three kings are portraits of Michelangelo, Raphael, and Titian. The Uffizi and the library at Siena contain a number of Peruzzi's designs and drawings, many of which are now of priceless value to the student of Roman anti- quities, as they show ancient buildings which have been destroyed since the 16th century.

Vasari, Vita di Baldassare Peruzzi (Milanesi's ed., vol. iv. p. 489, 1882) ; Milizia, Memorie degli Architetti (1781, vol. i. pp. 210-215); Della Valle, Lettere Sanesi (1782-86); Gaye, Carteggio inedito ad' Artisti (1839-40); Lanzi, Storia Pittorica (1804); and Platner, Beschreibung der Stadt Rom (1830-42).

PERVIGILIUM. See Vier.

PERVIGILIUM VENERIS, the Vigil of Venus, a short Latin poem, in praise of spring as the season of love and flowers. Written professedly in early spring on the eve of a three-nights' festival (Vigil) in honour of Venus (probably April 1-3), it describes in warm and poetical lan- guage the annual awakening of the vegetable and animal world in spring through the all-pervading influence of the foam-born goddess, whose birth and connexion with Rome and the Cesars are also touched upon. The joyous

tone which runs through the poem passes suddenly at the close into one of lyric sadness: ‘The nightingale is singing, but Iam silent. When comes my spring?” It consists of ninety-three verses in trochaic tetrameter catalectic and is divided into strophes of unequal length by the re- frain, “Cras amet qui nunquam amavit ; quique amavit

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cras amet.” ‘The author, date, and place of composition are unknown. Formerly it was ascribed to Catullus, but from its late Latinity, approximating in some points to Italian,’ it can hardly have been earlier, and was prob- ably later, than the latter half of the 2d century A.D. It is certainly earlier than Fulgentius (about 480-550 A.D.), who imitated it. The references to Hybla and Etna (or Enna), from which some have thought that the poem is Sicilian, need be no more than poetical allusions to Sicily as the flowery land. Virgil’s description of spring (Georg., i. 323-342) is imitated somewhat closely; compare especi- ally verse 62 with Virgil’s 327; again, v. 85 is a copy of Ameid, xi. 458, This seems to disprove Bernhardy’s con-

| jecture that the poem is a translation from the Greek.

From its exuberant rhetoric Orelli ascribes it toan African poet of the 3d or 4th century a.p. Biicheler places it between Florus and Nemesianus, 2.e., in the 2d or 3d century A.D. Wernsdorf suggested as its author Annius Florus in the time of Hadrian; Heidtmann conjectured Appuleius ; Baehrens refers it to Tiberianus, a poet of the 4th century. But there are not data enough to determine the authorship.

The Pervigilium is preserved in the Paris MSS. 10318 (Codex Salmasianus) and 8071 (Codex Thuaneus or Pithoeanus); the former (the better of the two) belongs to the 7th or beginning of the 8th century, the latter to the 9th or beginning of the 10th. They differ too much to have been copied from the same original. The age of the MSS. refutes the theory, sometimes broached, that the poem is modern. The first edition was published by Lipsius at Antwerp in 1611; and there are modcrn editions by Wernsdorf (Poetex Latini Minores, vol. iii.), Orelli (1832), Biicheler (1859), Baehrens (1877). There are translations into English verse by Thomas Stanley (1651)

and Parnell, into prose by W. K. Kelly; a French translation by Sanadon ; a German one by Kircliner.

PESARO, a city and seaport of Italy, the capital of the province of Pesaro and Urbino, les on the coast of the Adriatic 36 miles north of Ancona and 203 south of Rimini on the right bank of the Foglia, the ancient Pisaurus. The ground on which it is built is only from 10 to 40 feet above the sea, but it is surrounded by hills,— on the east by Monte Ardizio, on the west by Monte Accio or San Bartolo, which derives one of its names from the Roman dramatist L. Attius, born and buried on the spot. The city walls, which were strengthened by bastions and moat and made a circuit of about a mile, were in 1830 transformed into a public promenade. Besides the ancient cathedral of the Annunciation (restored since 1860) the more conspicuous buildings are the prefecture (a palace originally erected by the Sforza, and restored by Francesco Maria della Rovere), the seminary, the Rossini theatre (opened in 1818), the fortress or Rocca Costanzia (built by Costanzo Sforza in 1474), the harbour-fort (due to Napoleon I), and the large lunatic asylum. Rossimi, who was a native of Pesaro, left all his fortune to found a musical lyceum in the city, and his statue by Marochetti (1864) stands near the railway station. The Olivieri library (established by the antiquary of that name, author of Marmora Pisaurensia, &c.) contains about 14,000 volumes, MSS. of Tasso's, &c., various antiquities, and a fine collection of majolica from the old Urbino manufactory. Among the industries of Pesaro are the growing, spinning, and weaving of silk, tanning, iron-founding, and the manufacture of glass and pottery. The harbour is of no great importance, and the aggregate burden of the 437 vessels entering or clearing in 1883 was less than 12,000 tons. The population of the city and port in 1870 was 11,952 and in 1880 12,913; that of the commune 19,691 and 20,909 in the same years.

The ancient Pisaurum in the territory of the Galli Senones became a Roman colony in 184 B.c. and soon grew to be a flourish-

1 Thus de is very frequently used like Italian di; tote (v. 22) in- stead of omnes, Ital. tutti ; and mane (7.) in the sense of "to-morrow, Ital. domant.

ing town. It was recruited with a body of military colonists by Mark Antony, and after the disastrous earthquake of 31 3.c. re- ceived another accession from Augustus and took the title Colonia Julia Felix, Destroyed by Vitiges the Goth, it was restored and strengthened by Belisarius, and afterwards along with Ancona, Fano, Sinigaglia, and Rimini formed the Pentapolis Maritima. In the course of the 13th century Pesaro was sometimes under the govern- ment of the popes, sometimes under that of the emperors; but the Malatesta family, whieh first took root in the city about 1285, gradually became the real masters of the place. In 1445 they sold their rights to Francesco Sforza ; and in 1512, through the influence of Julius IJ., the Sforza were supplanted by his nephew Francesco Maria, duke of Urbino. Leo X. took the city away from Francesco and gave it to Lorenzo de' Medici ; but on Lorenzo's death Fran- cesco was restored and Pesaro became the ordinary residence of the dukes of Urbino till the death of Francesco Maria II. in 1631, when it reverted to the States of the Church. It has formed part of the present kingdom of Italy since 1860. Terenzio Manziani della Rovere, poet and statesman, was born at Pesaro in 1800.

PESHAWAR,! or PresHAwur, a district in the lieu- tenant-governorship of the Punjab, with an area of 2504 square miles, situated in the extreme north-western corner of British India, between 33° 50' and 34° 30' N. lat. and 71° 30' and 72° 50' E. long. Except on the south-east, where the Indus flows, it is encircled by mountains, and is bounded on the N. by the Mohmand, Utman Khel, and other hills, E. by the Indus, S. by the Khatak and Afridi Hills, and W. by the Khyber Mountains. It forms an important part of the frontier of the Punjab, being crossed by the great route from India to Cabul. The only hills of any consequence in the district are the Khatak Hills, a continuation of the Afridi Hills, which are themselves a spur of the great Sufed Koh range. The plain consists of alluvial deposits of silt and gravel, and throughout the whole valley its surface is studded with water-worn shingle or boulders. The district presents, especially in its western and central portions, an appearance of great beauty: it is covered with luxuriant vegetation, which is relieved by the meanderings of the numerous canals and set off by its bare stony surroundings and the far distant snowy peaks. Its rivers, all tributaries of the Indus, are the Cabul, Swat, Bara, Budni, and Ludnai. The district is naturally fertile and well watered, and the valley is entirely drained by the Cabul river. The temperature ranges from a

minimum of 17° in February to a maximum of 137° in July. The average rainfall is about 14 inches.

According to the census of 1881 the population was 592,674, of whom 329,524 were males and 263,150 females. The people are mostly Afghans and almost entirely of the Moslem religion, no less than 546,117 being Mohammedans, while Hindus numbered only 39,321, Christians 4088, Sikhs 3103, and others 45. The largest tribe in the district is that of the Pathans, of whom in 1881 there were 276,656. The Moslem portion of the population is occupied chiefly in agriculture and the rearing of cattle, while the Hindus are engaged in trade as bankers, merchants, and shop- keepers. The prevailing languages are the Urdu and Pushtu.

Out of the total area of 2504 square miles 1414 are cultivated and 470 are returned as cultivable. The chief products are wheat, barley, maize, millet. Peshawar also produces some of the finest rice in the world, known as “ Bara rice,” named after the river by which the ground yielding it is irrigated. Since the district came into British possession its trade has increased considerably. The principal foreign markets with which it deals are Cabul and Bok- hara ; the imports from the former are chiefly silk, nuts and fruits, skins, timber, dyes, and spices, and from the latter gold bullion and gold thread, which go principally to Bombay. The exports consist mainly of piece goods, tea, fancy wares, sugar, salt, and spices. The chief manufactures are Peshawar scarves, celebrated throughout India for their fine texture and tasteful colouring, leather goods, cutlery, the preparation of snuff, and a great deal of broadcloth, The gross revenue of the district in 1882-83 was £95,931, of which the land revenue contributed £68,201.

Peshawar in 1881 had five towns with a population exceeding 5000, namely Peshawar (see below) ; Nowshera, 12,963; Tangi, 9037; Maira Parang, 8874; and Charsadda, 8363.

1 The division of this name comprises the three districts of Peshawar, Kohat, and Hazara, with an area of 8381 square miles. In 1881 it had a population of 1,181,289—males 649,509, females 531,780. By religion 1,101,095 were Moslems, 68,992 Hindus, 6724 Sikhs, 4390 Christians, and 88 others.

History.—The first authentic record of the tribes seated about Peshawar is in the time of Mahmud. What little is heard of them before then points to their being a bold and independent race, Buddhism was introduced into the district in the reign of Asoka, 263 B.c., and one of his rock edicts still exists. From the time of Sabuktagin, governor of Khorasan, in 978 a.D., who took possession of the country up to the Indus, Peshawar became the scene of fierce contests. Mahmud, his son, was the first Moslem conqueror of Hindustan, and succeeded in converting the Pathans to the Moham- medan faith ; and this tribe remained true to him in all his subse- quent engagements with the infidels. The last decisive battle of Mahmud with the Hindus was fought on the plains of Chach in Rawal Pindi, where he totally defeated Anang Pal, the last cham- pion of the Hindu creed and nationality in the north. For a century and more after Mahmud's death (1028) Peshawar continued to be a province of Ghazni; and under his numerous successors it acquired great importance, becoming the centre of their dominions, which were extended to Lahore. Timur's invasion of India at the close of the 13th century did not disturb the district or the tribes about it, but a century later the Khakhai Pathans, a body of roam- ing adventurers, invaded the district in three main clans—the Yusafzai, Gigianis, and Muhammadzai—and obtained permission from the Dilazaks, who then held it, to settle on a portion of their waste lands. Quarrelling with the Dilazaks, they routed them and swept them into the neighbouring district of Hazara. The Gigianis then settled in the fertile strip of land about the confluence of the Swat and the Cabul ; the Muhammadzai took Hashtnagar, and the Yusafzai the remainder of the country north of the Cabul river. For some time these tribes remained unmolested, but in 1519 Babar, fifteen years after his capture of Cabul, allied himself with the in- jured Dilazaks and subdued the Afghans of Peshawar. After his death in 1530 the country was the scene of constant feuds, which ended in the Dilazaks being completely ousted. The year 1553 marks the last immigration of Afghans into the district. In 1587 Akbar came to the throne. During the next three reigns the valley rendered an unwilling allegiance to the central authority, and in the reign of Aurangzeb the Pathans succeeded in freeing themselves from Mogul supremacy. In 1738 Nadir Shah held pos- session of the district, and under the succeeding Durani dynasty it was often the residence of the Cabul court.

On the death of Timur Shah in 1793 the throne was left to be contended for by his sons, whose adventurous enterprises and varied fortunes form a romantic page in Oriental history. In 1818 the Sikhs advanced into the valley and overran the whole district to the foot of the hills; and the country continued to be ravaged by them until it at last fell into their hands, when they ruled it with their usual severity. In 1848 the district became an integral portion of British India, and, except for its eonnexion with the mutiny in 1857, there is little else of importance to notice.

PESHAWAR, chief town in the above district, situated in 34° 2’ N. lat. and 71° 37’ E. long., is about 14 miles east of the Khyber Pass, and distant from Lahore 276 miles and from Cabul 190 miles. Its population in 1881 was 79,982 (50,322 males, 29,660 females). It is built on a plain 1068 feet above the sea, and is surrounded by a mud wall 10 feet high. Among the chief buildings of the town are the Ghor Khatri, originally a Buddhist monas- tery, afterwards rebuilt as a Hindu temple, and now used asa serai, Peshawar is commanded by a mud-fort to the north-west, built on the ruins of Bala Hissar; and it is well watered, and said to be one of the best-drained cities in the Punjab.

PESSIMISM is a word of very modern coinage, employed to denote a mode of looking at and estimating the world, and especially human life, which is antithetical to the estimate designated by the term (a much older one) “Optimism.” Both terms have a genetal as well as a special application. In their non-technical usage they denote a composite and ill-defined attitude of mind which gives preponderating ‘importance to the good or to the evil, to the joys or to the sorrows, respectively, in the course of experience. The optimist sees everything in couleur de rose ; the pessimist always turns up the seamy side of things. But in their special and technical employment, optimism and pessimism denote specific theories elaborated by philo- sophers,—the former to show that the world is the work of an author of infinite goodness and wisdom, and is, all things considered, conducive to the happiness of its sentient life; the latter, that existence, when summed up, has an

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enormous surplus of pain over pleasure, and that man in particular, recognizing this fact, can find real good only by abnegation and self-sacrifice. As a speculative theory optimism is chiefly associated with the 7héodicée of Leib- nitz (1710), while pessimism is the work of Schopenhauer (Die Welt als Wille und Vorstellung, 1st ed. 1819) and Von Hartmann (Philosophie des Unbewussten, 1st ed. 1869). In either case, however, the modern doctrines have their pre- decessors. The Stoics and the Neoplatonists were earlier labourers in the cause of optimism, in their attempt to exhibit the adaptations in nature for the welfare of its supreme product man. And in the metaphysical dogmas of Brahmanism, as well as in the practical philosophy of the Buddhists, the creed of the modern pessimist, that the world is vanity and life only sorrow, is found preluded with startling sameness of tone.

Though later as a philosophical creed in the European world, pessimism is far earlier than optimism as a mood of feeling in mankind at large. The ordinary human being, so long as he is engrossed with action and identified with his immediate present, is neither optimist nor pessimist. But in proportion as reflexion awakens—as the fulness of life and vigour of will give place to the exhaustion of age or to brooding thoughtfulness—there comes a sense of doubt as to the value of the aims on which energy is spent and as to the issue of the struggle with nature. It is failure that excites meditation: the obvious disproportion between desire and attainment impresses the poet and thinker, as they scan the page of human life, with the pre- dominant darkness of the record. The complaint is heard from every land and in every language that the days of man are few and evil, that the best lot of all is not to be born at all, and next in order is the fate of those cut off by early death. Even the great king himself (says Socrates in the Apology, xxxii.), far less any private man, as he reviews the course of his past life, cannot point to any better or happier time than a night of dreamless sleep ; and Byron bids us—

‘Count o’er the joys thine hours have seen, Count o’er thy days from anguish free, And know, whatever thou hast been, Tis something better not

to be.”

Inareligious form this pessimism appears as a belief that man is a creature at the mercy of more potent agents, to whom his wishes and fears are of slight importance. Called into existence by instrumentalities over which he has no control, he is involved in a lifelong conflict with forces, natural and supernatural, which work out their inevitable issues with utter indifference to his weal or woe. The wheels of the universe are deaf to the cry of human hearts. There is a hopeless sense of inequality in the struggle between the petty self-centred will of man and the capri- cious and irresistible forces of nature.

This natural and instinctive pessimism is contempo- raneous with the non-theistic religions of the world,—with all the forms of nature-worship, from the grossest and most trivial polytheism to the abstrusest schemes of naturalistic pantheism. In such a state of belief man tries to obtain relief from the burden of troubles in various ways. There is first of all the vulgar method of adulation and sacrifice. The powers of the unknown which lie ready to thwart the plans of man, and which he conceives in the likeness of beings with vaster forces but with passions and susceptt- bilities like his own, may be bribed by gifts or placated by flattery. Hence the common practices of superstitious worship. A second means of escape from the burden of life is given by what may be called Epicureanism. While not denying the divine, it explains away the gods of popular religion, and at the same time rejects the attempt to trans- form the idea of necessary connexion from a principle for

the explanation of phenomena into a controlling agency at the summit of the universe. Within the limits fixed by his natural conditions it represents man as free to work out his own welfare without interference from superior powers. But it is forced to admit that the happiness which man can obtain is after all only negative,—all plea- sure is but the withdrawal of pain, and the utmost range of pleasure lies in varying the methods of such deliverance. Epicureanism is pessimistic; but it is an egoistic pessimism which is content to aim at the maximum of painlessness for the individual, and which

ignores the metaphysics of universal pain and of universal relief from that pain.

The third method of relief from the troubles of existence Buddh- has a closer analogy with the pessimism of modern times, istic It is the Buddhism of the East. Buddhism, whatever be a

the uncertainty attaching to its founder's personal story, is to all intents a shoot which has been cut off from the main tree of Brahmanism. Its theory rests on the metaphysics of the Brahmanical schools; its scheme of life is one out of the many phases of Hindu asceticism. Buddhism left the parent stock of Hindu religion at a time when the metaphysicians had carried up the polytheism of their country into a unified pantheism, when the philosophy of the Upanishads had worked up the comparatively rude theology of the Vedic hymns into a compact doctrine. The fundamental dogma presented by this system is the contrast between the true self or permanent reality of the world and the changes and plurality of the phenomenal scene in which men live or seem to live. On the one hand is Brahma, or Atman: from one side, the universe, the All, and everything,—from another, the true self, the Ego, the absolute, whose name is the No, No, because no words can describe him, the very reality of reality. On the other hand is the world of growth and decay, of sorrow and death,—the world, as it was subsequently called, of illu- sion, Maya, where the semblance of firm reality is deceit- fully assumed by the phantoms of creation. And as in the universe, so is the contrast in the human soul. There is the unredeemed soul, which desire and action (the will in posse and in esse) hold fast in the bonds of changeable existence, in the mutations of metempsychosis ; there is also the redeemed soul, which by ascetic virtues, by renun- ciation of domestic ties, by the continued practice of self- denial and mortification, has found its way from the world of illusory semblances to its true and abiding self.

It is on some such conception of the world, in which over against Brahma in his eternal quiet there stands man suffering and yearning for relief, that Buddhism ultimately reposes. But, while the speculative theories of the Brah- mans put in the foreground the august mystery of the Alone, Buddha starts from the other side of the picture, from the actual experience of life.

The four truths of Buddhism, which are the foundation of its religious creed and the recurring burden of its teachings, leave the meta- physical basis out of sight. AI life is sorrow, says the first: birth, age, disease, death, is sorrow ; and the cause of this sorrow, adds the second truth, is the thirst which leads from birth to birth,—the thirst for pleasures, for existence, for power. The third is, that sorrow can only be removed by the complete annihilation of desire ; and the fourth prescribes the means of word and act forming the eight parts of the way which frees from sorrow. The practical need is everything; the theoretical basis, the Brahma, which the orthodox schools presented as the sole reality, is so completely lost sight of that the modern critics are at variance with each other as to how far the goal of Buddhist endeavour can be described as anything positive. That all life is pain is the one perpetual refrain of Buddh- ism. The search for pleasure is vain and ends in increased misery. But the true Buddhist does not allow the per-

ception of this fact to cause, still less to perpetuate, a feel- ing of melancholy. It only urges him to have compassion on his suffering brothers, and to look forward joyously to

the goal of release which he has set before himself.

For further details reference may be made to the article It is enough to say here that the chief point of Buddhist theory is to see in all apparent being only a process of becoming: events happen, nothing is :

on BUDDHISM.

the only permanence can be but the law of their occurrence. The cosmic philosophy of Buddha is like that of Heraclitus. “All things flow; nothing abides”;

of man is thereby rendered vain.

Brahma, not felicity in a higher and better world. It is,

to cast off the conditions which trammel existence, the consciousness which leads to desire and action, the body and all its appurtenances ; it is, to attain death in life, to have so mortified flesh and spirit that the individual can He has attained, when so perfected, what is called Nirvana, “the

no longer be in the ordinary sense said to exist.

land of peace where transitoriness finds rest.”

Religious recon- ciliation.

philosophy. It is in the belief of a moral God—a good and

Wise creator and governor of the universe—that the opti-

mistic problem and theory finds its chief origin. When the idea of God has been purged of its naturalism and identified with the ideal of wisdom, goodness, and justice, there soon arises for thinking minds the necessity of a “théodicée,”—a justification of providence. Can the evil and misery found upon earth, the disproportion between

merit and recompense, be explained on the hypothesis of

a wise and beneficent ruler in heaven? One of the most familiar and typical instances of such a feeling is given by the book of Job. In the later times of Israel, when the vigour of creative faith was undermined by a critical spirit, born of bitter fates and foreign influences, voices were heard, like those of the writer of Ecclesiastes, giving utter- ance to pessimistic doubt. The story of Job is another and more edifying presentation of the same theme. How, it is asked, can the misfortunes of the just man be har- monized with the idea of a righteous God? Is suffering the penalty of sin, and must virtue be always paid its wages in pleasure ?

The difficulty, it is evident, arises with the perception of the antagonism between the natural and the moral, and implies a desire to bridge over the gulf between them. With the gradually deepening conviction that the central principle of the universe is a moral principle, the need is felt for explaining the immorality (so to speak) of the natural laws, fo? reconciling the

unconditional imperative of the word of duty with the indifference to right and wrong displayed in the facts of life. Sometimes we are referred for answer to another world, which shall compen- sate for the mistakes of the present. At other times it is suggested that physical evil has the function of a moral discipline, that suffering teaches nobility, that misfortunes are blessings in disguise.

Leib- The optimism of Leibnitz is of a different cast, and goes nitz's op- more boldly to face the real difficulty of the situation. It timism. argues against the common estimate of moral and physical evil, and seeks to reduce them both to little more than privations of good,—to mere absence of good, to a defect rather than a blemish, to what is called metaphysical evil.

only this flux of everything serves to emphasize the fact that the happiness The end which Buddha seeks is the redemption of man from this toilsome world of birth and death. It is not absorption in the unity of

Before discussing the development of this pessimistic ethics in modern days, it remains to notice a fourth issue from the evil that is in the world. This view of life and of the universe is specially connected with Hebrew mono- theism and its later developments in Mohammedan as well as Christian doctrine under the potent stimulus of Greek

PESSIMISM

The world, it is admitted, is far from perfect, but it is as good as it could be made if all the good which it contains was to be realized. Like everything else, it is not free from the defects of its qualities. It is, we may be sure, the best of possible worlds. But this is far from saying that it is a good world. Ignorant as we are of the limits of what is possible, it is not for us to say that the quality of the best, under the given circumstances, is at all distin- guishable from what is really very bad. The defence of theism which Leibnitz thus undertook against the sceptical suggestions of Bayle is only the common argument that the work must be judged as a whole, that it is unfair to pronounce judgment on an isolated event or thing apart from the question how it is affected by its interdepend- ence. But, unfortunately, in the case before us, in the problem of the universe, we do not know the

whole, and can only grope our way tentatively from point to point, feebly endeavouring to forecast the plan of the total structure. ’

But Leibnitz goes farther than this assertion of inter. connexion or adaptation. It is the ultimate assumption of his argument that the forces of the universe are in the hands of a perfectly wise intelligence, that, as in man there is a rational power of initiation and guidance, so in the world as a macrocosm there is a primal reason which governs its movements and co-ordinates them to a desirable end. The actual phases of existence only carry out in palpable shape and successive or simultaneous manifesta- tions an ideal or rational plan, which is their original and sufficient reason. The world at large is somewhat of a machine, or a congeries of machines, which run down according to their own internal and innate conditions of existence ; but these machines are wound up by one supreme machinist, who has predetermined the aim and object of their combined movements. Thus the doctrine of the pre-established harmony, while on the one hand it is an apotheosis of logic by the emphasis it lays on the necessary causal interdependence of the several partial movements, is on the other hand, by its principle of suffi- cient reason—the principe du meilleur or de convenance—— a doctrine of teleology, whereby an ideal principle of de-sign interpolates the contingent and subordinates necessity to freedom. The world is not a mere group of causes and effects governed by the logic of contradiction and identity ; over and above the necessitarian logic is a mind which looks behind and before, and combines all events, not reck- lessly or necessarily, but in the bands of reciprocal subser- vience to the greatest good of which they admit.

In this argument Leibnitz is open to the criticism of Kant, that he has passed from a legitimate conception presiding over the synthesis of phenomena to the illegiti- mate idea of a self-subsistent and personal principle, which, far from being a mere ideal of complete synthesis, itself creates and predetermines that synthesis. To the logical scientist the phenomena are merely connected by a formal unity ; to the theist like Leibnitz this unity is identified with a cosmical mind, an intelligent power which regulates the evolution of things and subordinates them all to the fulfilment of its original plan. Leibnitz thus manipulates two ideas, the logical and the religious, as if they were interchangeable, though in reality they lie in different planes. The

reason which at one time is treated as an abstract principle of self-consistency is at another time clothed in the concrete mental life associated with it under its human aspects. Mere reason, says Aristotle, can initiate no change ; it neither chooses nor commands, but simply asserts. But human reason is always in the long- Tun wrapped up with some aim, is always (in the technical sense) practical, ‘and only for moments of abstraction ever merely theoretical. ‘Thus the reagon in the universe was

spoken of as God, and conceived anthropomorphically after the pattern of human personality.

The optimism of Leibnitz found its well-sounding but somewhat misleading phrase that all is for the best in this best of possible worlds bitterly satirized in Voltaire’s Candide, and painfully commented upon by the earthquake of Lisbon. But the real object of the Frenchman’s wit was the baser optimism of the age which sheltered its vulgar features under the mask of the Leibnitian Théodicée, An easy-going generation had settled down in the pleas- ing faith that their barns were filled with good things for many years, and that they might eat, drink, and be merry. The creed found in England a prophet of solemn pomp in Pope, whose Lssay on Man has fixed in pregnant lines the main half-truths of the Leibnitian theory, which the poet had probably learned from Bolingbroke. The same optimism appears in Shaftesbury (“’Tis good which is predominant”), and shows its presence in Paley. Some opposition to the current eudzemonism is found in the well-weighed and all but sceptical judgments pronounced by Butler, as well as in the cynical pessimism that tried to raise its voice in Mandeville. But the great instance against the comfortable view of life is the striking passage which Hume in his Dialogues concerning Natural Religion has put in the mouth of Demea, beginning ‘The whole earth, believe me, Philo, is cursed and polluted. A _per- petual war is kindled amongst all living creatures,” &c.

In Germany, under the head of Natural Theology, the ordinary optimism flourished amain. The whole range of

thus taught bore fruit. At first indeed idealism with its optimistic interpretations returned. The double-faced

dictum of Hegel, that the real is the rational and the Hegel's rational the real, was often understood to justify the prin- ideal op- The net of Hegelian !™s™.

ciple that, whatever is, is right. thought seemed to grasp everything; everything fell as it were naturally into its place, and seemed to be justified by the symmetry of its position in the logical evolution. For in idealism we find the true home of optimism. The world as experienced in sense and feeling is full of discords and defects, and the more we abstract each part of the whole into its "beggarly elements," the greater seems the weakness and the triviality. But, when we rise in thought to the contemplation of the unity and order, these real discords pale before the spectacle of ideal harmony. The formal symmetry carries the day. The corpse may be hideous and yet the theory of the anatomist has its beauty. The sorrows of the hero do not make impossible the plea- sure of the spectator in the drama. Just as the hardships long ago endured are sweet to remembrance, so the indi- vidual sufferings are lost in the conception of the universal ends they subserved. The real pain is compatible with a formal pleasure ; reason can find commendable and good what is torment to flesh and blood.

But, while the life-work of Hegel had been to show that at bottom the principle of being and the principle of thought were the same, that nature and history were the incarna- tions of reason, the succeeding philosophy of Schopenhauer . reverted to the distinction of Kant, which it emphasized,

between thought and existence. Schopenhauer dethroned Schopen- reason and claimed to have discovered the real root of that at a being which we know as an idea. This root of existence V¥) the

is what he called Will. The source of the reality which aie

creation was ransacked to show how well man had been provided for by God. The poetry of Brockes (the translator of Pope) is full of the theme,— the laudation of the many gifts we owe to Providence, of the multifarious uses to

which each animal and plant can be put. It is an anthro- pocentric optimism which thus makes man's welfare the main end of the creation, and which, above all, finds that welfare in what we eat and drink and wherewithal we are clothed. The good which Leibnitz had spoken of was understood as material prosperity, comfort, happiness. God's goodness was measured by the amount of worldly wellbeing which He bestows upon us.

The great Kant, as late as 1759, when he printed a – short sketch On Optimism, was still inclined to keep terms with this base caricature of a great theory, and spoke with full agreement of that theory itself. But here as elsewhere Hume's influence was potent upon him, and in a paper published in 1791 (On the Failure of all Philosophical Attempts in Theodicy) he had altered his tone. Our intelli- gence, he argues, is absolutely powerless to discover the proportion in which the world, at least as known to us in experience, stands to the supreme wisdom. And to the grounds adduced to prove that the pleasures of life far exceed its pains his reply is: take a man of sound mind, who has lived long enough and thought enough on the value of life to be able to form a judgment on the subject, and ask him whether he would like to play out the game of life once more (not on the same terms, but) on any terms he pleases, be it only in this terrestrial world of ours, and not in fairy land. In one direction indeed Kant may be called optimist (or at least meliorist),—in his belief in the ample possibilities of moral and political improvement, and in his enthusiastic hopes for the cessation of some chief causes of human misery.

But in one way Kant had laid the axe to the chief root of optimism. That root is the utilitarian or eudemonistic theory of conduct,—the theory which seeks to explain morality away into a sort of magnified selfishness, and regards the authority of moral rules as due to their origin in counsels of prudence. The moral law, said Kant, is the one clear utterance of the Absolute. And the lesson

we cognize——the secret essence which is objectified in the forms of the universe as it presents itself to our concep- tions—is Will. By this Will he meant a blind but irre- sistible effort to exist, a craving of inexpugnable strength towards life and objective being, an unconscious lusting after the pleasure of manifesting itself as something acting here and now. It is

something less than Will, as we know will, and yet something more than force. Under every known kind of actions and phenomena in space-and-time— phenomena, known by their reciprocal relations—there is an unknown but felt something, an endless, aimless, limitless struggle to be upraised into the light of existence. This ultimate basis of will-foree we must assume as the fact presupposed by all specific causal explanations. But in its generic basis the Will has no definite aim; it is the will to be everything in general and nothing in particular,— the will to be, to do, to act. End or purpose supervenes only with the rise of consciousness. Intelligence comes forward at first as a mere organ in the service of the Will; it is only a means for the preservation of the individual and the species. It is observable first in the animal, where the purely instinctive stimuli fail to procure sufficient material for subsistence, where the food has to be selected, and the motions of the animal are accordingly dependent on motives, 7.e., on conceptions of objects to be attained. It is this need which occasions the development of the brain ; with the brain intelligence rises upon the scene ; and thus the world now comes to see itself, not in its reality, but in its phenomenal objectification, as the realm of causes and effects in the element of space and time. This conscious knowledge, which at first consists merely in momentary and individual perceptions, attains higher powers, as abstract and general reason, by the aid of speech.

Now intelligence, which originally came with the forma- tion of brain-tissue as a mere tool of the Will in the more complex forms of its objectification, may rise at length, according to Schopenhauer, to be the liberator of the

human race from the restless tyrant which works in them now, as it erewhile brought them to the birth. For, firstly, knowledge in its own character emancipates ; it lets its possessor know that he suffers and why he suffers. Such is the first prerogative of reason. But, secondly, in the occasional intervals when the storm of Will is laid to rest, the mind, instead of striving in the interests of practical intelligence to detect the causal relations of things, can concentrate itself exclusively on a single isolated object. A

transformation is thus accomplished whereby the object, ceasing to be a mere particular, becomes the type-idea, the

Will and eternal form, the generic and adequate embodiment of

Will in a special grade; while, on the other hand, the in- dividual who has become absorbed in such contemplation is no longer a mere individual, but has become the “ will- less, painless, timeless subject of knowledge.” It is this power of rising above the prosaic requirements which science gratifies, of seeing the permanent and one reality in the dependent and disunited phenomena of the particu- lars, which what we call Art imitates by production. The artist produces the eternal types which the blind Will only realizes in many imperfect and particular adumbrations ; he conquers nature by fixing in a single image the traits which constitute the true and permanent meaning con- fusedly presented by her in many exemplars. For the mind which can see that idea in the natural forms, or which beholds it in the works of art, for him who contem- plates without reference to the Will, “the wheel of Ixion stands still; freed from the prison-house of blind desire, he enjoys the sabbath of esthetic beatitude.”

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“And,” adds Schopenhauer (§ 67), “I think I may assume that along with the highest manifestation of will the feebler counterpart of it in the animal kingdom would also dis. appear.” Man, by ascetic mortification of the will, and by sanctity of beneficence, becomes the redeemer even of the rest of the animated creation.

The contrast between nature and grace, between the physical and the moral, the life of the flesh and the life of the spirit, stands out in these outlines as the central doctrine of pessimism. It is in essentials the same doctrine which was preached by Buddha, which is put into the mouth of Socrates in the Phedo (philosophy is a rehearsal of death : perernpa Savdrov) ; it is the doctrine which stands indelible in the early archives of Christianity, and was proclaimed as the better and more excellent way by myriads of the noblest Christian teachers for more than ten centuries of the church. The pessimistic ethics of Schopenhauer casts aside the feeble compromises by which it is alternately asserted that morality makes for happiness and happiness — is morality ; it rejects the postulates by which Kant tried to lighten for human nature the burden of imperative duty; it goes behind the

social sanctions which see in good conduct acts subservient to the good of a human

community. In pessimistic ethics—and the pessimism of -—

Schopenhauer has essentially an ethical aim—we have the wreck left on the wastes of time by Hegelianism. Hegel- ianism had taught, or seemed to teach, that God was in the beginning by Himself as a Logos, or self-evolving idea, which uttered itself in the unconscious forms of nature, till in the conscious spirit of man He gradually realized Him-

Schopen- But the relief obtained in art is only for blessed | self in moral and intellectual life, in art and religion. — moments. Perennial consolation can be found only in the | Schopenhauer stripped this cycle of its first period. There

ethical life, and in an ethics of asceticism and self-sacrifice. True life begins only when we have learnt that happiness is impossible by means of gratifying the cravings of desire. Each satisfaction of the will is only a starting-point for fresh effort ; the achievement of the desired object sug- gests a new want. “Alles Leben ist Leiden.” At every point desires are thwarted ; even when they gain their end the satisfaction is merely negative. The weary Titan of humanity knows no repose ; his feeble pleasures are drops in a sea of pain. Thus the central principle of pessimism asserts that in the order of nature, 7.e., so long as the will to live remains unbroken, happiness in the true sense is impossible, Life as life necessarily involves misery. No doubt the man of the world may turn round and declare that notwithstanding this he means to gather the rose without the thorn. Undismayed by the analysis of the consequences involved in will, he affirms the will to life. Adopting the principles of the Cyrenaic hedonists, he closes his eyes to far-reaching eventualities and lives in the moment ; he turns life in every portion into art ; he revels in the inspiring sense of action without care for past obli- gations and future anxieties. It is otherwise with the man who has surveyed all the issues of things, who looks at the net result of life as a whole and in all individuals, For him it isa duty to deny and abjure this will to life. He must, in other words, renounce the works of egoism and of injustice. He must see through the illusion of the principium individuationis, must recognize that his very self, his will, is identical in

essence with every creature, even with the suffering. When he has done this, and is in love and sympathy with all around him, “the veil of Maya” has for him become transparent. In every way he proceeds (over and above cultivating in active love com- passion for others) to deny the exercise of the will to life in his individual case, in his own body. He will, above all, according to Schopenhauer, perpetually keep the vow of chastity ; he will by fasting and penance so mortify his body that the will to life shall be utterly broken in him.

was no idea, no logical machinery, at the basis of things; nature began out of a blind impulse; and it was only in man’s intelligence that the vague longing of the heaving world knew itself to be. But that intelligence has for its supreme aim—not, as in Hegel, to enter into and carry on the great process which is the absolute, but—to deny its creator and annihilate the principle of being. The world of Will, in its process of objectification, has thus given birth to a child which in the fulness of time will destroy the womb that bore it.

It will be apparent that in Schopenhauer’s system we can distinguish two parts,—the first, the doctrine of the positivity of pain, and that life is always and only pain; the second, the ethical condemnation of the principle of such a world, and the method for correcting the evil which it had introduced. In the latter lies his chief and charac- teristic achievement,—in what we may call his metaphysic of ethics. Man by morality (ascetical morality) is to be the redeemer of the world. In this conviction Schopen- hauer shows himself the descendant of the metaphysical systems of the past, which find in man the key to the mystery of the universe. It is a strange and a weary way of redemption which he delineates; the cross is heavier than humanity seems able to bear. Yet the suggestion to deliver ourselves shows that the old belief in human spontaneity, in the primacy of the moral principle, in the possibility of noble deeds and of a victory over egoism, was still vigorous in his mind. Another pessimism neglects this ethical element altogether. To this ignoble pessimism man is in truth only an animal like the rest, and the distinction on which he prides himself—his moral nature—is but a confused and illusory product of simpler animal experiences. He has knowledge of wider range, it is true ; but knowledge is powerless to change his nature. His acts in every case are necessarily determined ; his fancied

freedom is found on examination to be no whit more spon- taneous than the fall of the unsupported stone. The necessitarianism of evolution did away with the independ-

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ent existence of morality, and reduced it to conventional stereotyping of natural symbols, with forgetfulness and misinterpretation of their meaning and applications.

To an age so minded the consolations of pessimism sounded faint and unreal. They had lost the old wot ora, —the optimistic creed that man was the undisputed head of creation. They saw themselves no longer a select race, favourites of God, but as engaged in the struggle for life with thousands of other species. The rdle of saviour of the world was not for them. And so, turning a deaf ear to the high words of Schopenhauer, they sought easier con- solations in the common and casual pursuits and pleasures in the world ; they determined to make the best of this vale of tears,—even in Pandemonium there might be shady spots and cool retreats. A few spirits who had drunk more deeply at the wells of suffering, and who were alike without the mental energy of Schopenhauer and the comfortable inconstancy of the mass of men, could not rise beyond the ever-present sense of the emptiness and in- felicitv of life. There are many such types in literature ; but perhaps no more perfect expression has been given to the strange abysmal melancholy of a withered life than by

with no unskilful or incompetent hand the vague and in- coherent tendencies of the cultivated masses. The world which has lost hold of, and perhaps broken with, the faith of its fathers is on the look-out for a “ Weltanschauung ” ; it wants to know the metaphysical inferences to be gathered from the recent advances of scientific theory. Not merely had Darwinism, as may be seen from the character of Hackel’s Natural History of Creation, caught the public ear more widely in Germany than in England, but the deductions from its principles had been carried to far greater lengths. Amid the decay of distinctively Chris- tian beliefs, and even of theism, the doctrine of pessimism attracted a sort of religious fervour. The

prevalent sense of dissatisfaction and baffled endeavour was met by a theory that the principle of the universe was radically per- verse, and could not be amended. And, if it be urged that it is difficult to believe in the genuineness of a pes- simism when its professors take their ease and mirthfully jeer the stranger who expected to find people not clad in soft raiment nor dwelling in kings' houses, it may be replied that pessimism is not the only temporizing creed. The moral indignation (Hntriistungs-Pessimismus) of a

tee the Italian poet-scholar Leopardi. At one time dallying | Carlyle or a Juvenal, which pours its vials of scorn on the perdis lovingly with the idea of death, at another finding only | selfish meanness of mankind, and the churchly exhibition in deception and illusion in love, liberty, progress, and all | of the sores and frailties of human flesh and blood in

human ideals, and almost always with irony, bitterness, and hopelessness living in the sense of an inexorable destiny, a malign nature, which calmly motions man to

which books like the De Contemptu Mundi of Innocent IIT. revel, alike overshoot their mark and leave the world un- convinced of its nothingness.

destruction, Leopardi presents pessimism in its naked It is out of place here to enter into any lengthened ex- Von

terrors. For him there are no consolations, either base or | position of Hartmann's metaphysics. This world, accord- ae noble. Man is at the mercy of a pitiless nature ; he must | ing to him, is the work of an Unconscious, a being which 7 vy) :

endure a thousand deaths daily. This mood of Leopardi's, | is at once will and intelligence,—a will urging to be and physics.

Various pessim- istic

writers,

however he himself protested against the suggestion, was unquestionably to a main extent due to the tremendous disproportion in which his mental and esthetic nature stood to the circumstances of his life, and not a little to the general political condition of his country.

When the first edition of Schopenhauer's great work appeared in 1819 it did not attract much immediate attention. Pessimism was in the air: the Romantic school in Germany, and especially Heine and Lenau, Byron in England, and Chateaubriand in France,—not to mention many other names, —all in their several ways gave expression to the "Weltschmerz." Yet it was not till 1844 that a second and much enlarged edition of the work appeared, followed by a third in 1859, By this time the doctrines of Schopenhauer had found many enthusiastic followers, and a flood of literary works poured from the press in criticism or support of them. With the year 1866 the title " Pessimism" began to show itself in books which discuss his views. And in 1869 appeared the Philosophy of the Unconscious, by E. von Hartmann. The popularity of this work was enormous. In the ten years which elapsed between its publication and that of Hartmann's next systematic work (The Phenomenology of the Moral Con- sciousness) it had run through eight editions. The lesser works of Hartmann, his articles in reviews, the pamphlets by friends and opponents during the last fifteen years, are truly named legion. The question "Is life worth living?" has become a question of the day, to which the problems of socialism, liberalism, and religion contribute their quota. The novels of Turgenieff and Sacher-Masoch are full of the ideas of Schopenhauer's pessimism.

Hartmann's first work was written when its author was twenty-five. It bears traces of the paradox and exaggera- tion which sometimes go with youthful talent, and occa- sionally pays the tribute of imitation to the naturalistic pruriency and sensationalism of the contemporary novel. The style is cumbersome and pretentious. And yet its popularity proves that its author has the faculty of directing

to do somewhat and an intelligence which adapts means to ends. But the will is only instinct, and the intelligence is the unconscious reason which guides the somnambulist or the clairvoyant. Thus there is wisdom in the frame of the world, but the original resolution to exist was the work of a

blind will. Reason did not prompt the initial act, yet at every movement towards existence an unconscious reason effectively correlates the elements into united action. The various individuals seem indeed to be acting of them- selves: they pursue aims of their own; but they are only puppets in the hand of nature, the unconscious intelligence and will. Apparently, there are many agents, each in some degree independent ; really, there is only one source of action, the union of will and idea in instinctive adapta- tion and unwitting design.

With man at length consciousness awakes, and the pos- sibility is laid for a new relation between the two elements in the universal principle. Knowledge, however, 1s not an end in itself; it is not enough to know the process of the world. The consciousness which is generated at length by the unconscious reason out of the workings of will has its function marked out for it beforehand by its uncon- scious author. Its final purpose is to revoke the effects of that irrational step by which the unconscious will in its eagerness to exist dragged the idea with it in its service. The hour of vengeance may come some day. The intelli- gence which has become conscious in man may at length induce his will to take the backward step, to retire nto non-existence even as it erewhile rose into existence. In that day when the force of will has been mainly accumu- lated in the province where intelligence prevails, it is prob- able that a successful act of suppression of the will to life on the part of human reason vould entail the utter prostration and annihilation of the will to life throughout the universe. By the act of its intelligent portion, in which the major part both of the cosmical will and intelli- gence has been gradually accumulated, the world, as a whole, will commit suicide.

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Von Hart- mann’s ethics.

Critical remarks,

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But Hartmann is not merely a metaphysician ; he pro- poses to supply inductive proof for his propositions. The question of the preponderance of

pleasure or pain in the world is to be worked out by observation of facts and summation of figures. So far differing from Schopenhauer, he admits the positivity of pleasure, but maintains nevertheless that pleasure and pain are representable by quantities of the same denomination, prefaced respectively by the plus or minus sign. When the accounts of debt and credit are drawn out, it appears that the balance is enormously on the side of pain. To him who has once perceived the surplus of pain it is an obvious duty to extinguish the source whence sprang the unmitigated evil. Yet inankind in the past has shrunk from the acceptance of this conclusion, and sought refuge in three successive illusions: (1) the naive illusion of the natural mind that happiness is to be found in this present world; (2) the illusion that happiness, though a failure here, will be realized in the world beyond the grave; (3) the illusion which puts its hopes on the amelioration of humanity in the future history of the world. One after another these illusions are shown to be vanity. A little taste of pleasure, amid the insipidity and bitterness of life, is snatched by a select few from the consolations of art and science. But at last, as wisdom grows and the hopeless monotony of grief is more acutely felt by the race, humanity will rise

up boldly to the last great act of despairing suicide, and.

reduce the unconscious to its primeval nullity.

If we pass from this grandiose drama of the birth and destruction of the universe to consider the ethical doctrine which Hartmann supposes himself to base upon his meta- physical theory, we find ourselves on safer ground. For, apart from the method by which he reaches it, his moral principle is not very different from the general view on such subjects. The basis of morality in his theory is the relation of the individual consciousness to the Absolute in which consists its true being. It is in this ultimate identity of the individual with the All-one—not merely in the preservation of his phenomenal welfare, or of the

welfare of the society he belongs to, or the furtherance.

of some one ideal good—that the obligation to be moral is to be sought. On the other hand, there is nowhere in the universe a surplus of pleasure; and therefore the moral agent cannot either here or elsewhere look for happi-

ness in a positive sense as the reward of his virtue. Ego- ism of every range —from the more materialistic to the more religious pleasures—is incompatible with genuine virtue. The aim of morality is the redemption of the whole world from the evil into which its initial act has plunged it. And in this act of redemption—the result of which will not be joy, but rest, the quietude of the universe—man by his intelligence and will is the main worker, the fellow-worker of the Absolute; it is by him that God works out the redemption of himself and of the universe. ‘‘ Real existence,” so closes the Phenomenology of the Moral Consciousness, “is the incarnation of the God- head ; the world-process is the story of the Passion of the God who has become flesh, and at the same time the way to the redemption of Him who is crucified in the flesh; but morality is the co-operation towards shortening this way of suffering and redemption.”

It would be vain to criticize in detail these speculations, out of which a few principal points have been adduced, and which, besides being in themselves vague, are pliable in the hands of their author. But a few remarks may be made on some main issues involved in the dispute. It may be admitted in the first place that the doctrine of the origin of existence in an a-logical principle is but an extra- vagant way of stating that the intelligence when it awakes to consciousness finds itself in presence of another world of

nature and custom which seems irrational and antagonistic —a world which is outside of us and seems to mock our puny individual efforts for its improvement. Secondly, it may be admitted that there is no evidence for the thesis that the world was intended to suit the convenience of man, or of any species whatever. As a matter of fact, there is abundance of misery in the world. But, quite apart from the reducibility of the amount by the application of intelligent means, it seems certain that no attempt to draw up a balance-sheet of absolute cosmic misery or hap- piness is ever likely to be successful. It is as irrational to pronounce this to be the worst of all possible worlds as the best. ‘The superlatives employed in the terms “ optimism ” and “pessimism” betray a passionate estimate of things. Life, one has said, would be tolerable but for its pleasures. Even those who, like Leopardi, have declared themselves in love with death, show, by still electing to live,

that life has something not measurable by pleasures, yet chosen even amid mental tortures and extreme ill-health. As Aristotle said long ago, we are not unbiassed judges in re Pleasure v. Pain. Thirdly, if it were worth while, it might be urged that the main terms of the pessimists are ex- — tremely vague. The “ Will” and the “ Unconscious” can- not be tied down to a definite meaning without losing their power ; the contrast between the positivity and negativity of pleasure and pain shows an ignorance of logic; and, above all, the habit of transferring the terms of religion to express what are supposed to be analogous ideas in pessimistic metaphysics is misleading.

The pessimistic theories of modern times are in part a commendable protest against the common compromises which slur over the antithesis between the moral and the natural. They show tolerably conclusively that the world is not a felicific institution, and that he who makes happi- ness the aim of his life is on the wrong tack. But, when they proceed to dogmatize that existence has a root of bitterness and life is a burden of pain, they fall into the common error of exaggerating a statement relatively true into an absolute principle. You cannot tell if life is worth living, so long as life is held to be the sum or difference of pains and pleasures. If pains and pleasures were only and always such, the argument might be admitted ; if they were permanent real entities, not liable to be transformed into each other, not constantly associated in the same act, it might be possible to treat them as ultimate and irreversible standards for our estimate of life and the guidance of our conduct. If pleasure and pain are unequally and unfairly distributed, it is probable that this is a fault which human agency can cure to an unspeakable degree, quite without the desperate remedy of self-torture or cosmic suicide. If pessimism can teach the world that the highest reward of virtue is self-respect, and that there is no pleasure available anywhere to bribe us to be good, it has done well. It has also done well if it points out the barriers to happiness in this world, so long as these barriers prevent true life and can be removed by wise methods. But in the meanwhile, till the burden of existence has become universally unbear- able, it may be well to remember that we shall be as likely to benefit the Absolute by doing our work well as by macerating ourselves, and that the sum of existence is a big thing, of which it were rash to predicate either that it is altogether and supremely good or altogether and supremely bad.

The works on pessimism have been numerous lately. Most of them, however, deal with it mainly in connexion with the two German philosophers, and of these several treat exclusively of the special metaphysical and psychological theories. For Buddhism, see BUDDHISM, vol. iv. p. 424 sg., and also Oldenberg's Buddha (1881), since translated into English. An account of Schopen-

hauer was given by R. Adamson in Mind for 1876, and in Miss Zimmern's Life of Schopenhauer (1876) ; the first account of Hart-

mann to English readers was given in an article by E. Wallace in the Westminster Review (1876). In 1877 there was published a full discussion of the subject by J. Sully, Pessimism: a History and a Criticism. There are chapters on the question in many recent works ; among the latest Tulloch, Modern Theories in Philosophy and Religion (1884). In France we have Ribot, Schopenhauer (1874) ; Caro, Le Pessimisme au XIX* Siéele (1878), who gives an account of Leopardi, Schopenhauer, Hartmann. In Italian may be mentioned Barzelotti, Ii pessimismo dello Schopenhauer (1878). The books published in Germany are countless, ¢.9., Diihring, Der Werth des Lebens (1865); Bahnsen, Zur Philosophie der Geschichte (1872) and Pessimisten-Brevier (1879); Hartmann, Philosophische Abhandlungen (1872); Meyer, Weitelend uw. Weltschmerz (1872); Taubert, Der Pessimismus und seine Gegner (1873) ; Volkelt, Das Unbewusste u. der Pessimismus (1878); E. Pfleiderer, Der Moderne Pessimismus (1875); Gass, Optimismus u. Pessimismus (1876) ; Huber, Der Pessimismus (1876); Rehmke, Die Philosophie des W eilt- schmerzes (1876); Sommer, Der Pessimismus und die Sittenlehre (1883) ; Pliimacher, Der Pessimismus in Vergangenheit u. Gegenwart, gesch. w. kritisch. (1884). There is a list of books on the subject up to 1880 in Laban's Schopenhauer Litteratur. For LEOPARDI, see vol, xiv. p. 464 sg. Schopenhauer's Welt als Wille und Vorstellung is in course of translation by Haldane and Kemp (vol. i., 1883) ; and Hartmann's Philosophie des Unbewussten has becn translated by W. Coupland, 3 vols. (1883). (W. W.)

PESSINUS, or Prstnus (Ilecowots, Ieowots), an ancient city of Galatia in Asia Minor, situated on the southern slope of Mount Dindymus. It stood on

the left bank of the river Sangarius, about 150 stadia (17 miles) from its source, and 16 miles south of Germa on the road from Ancyra to Amorium. It was the capital of the Tolistobogii and the chief commercial city of the district. It was famous for its worship of the mother of the gods (Cybele), who here went by the name of Agdistis. Her priests were anciently princes as well, but in the time of Strabo (1st century B.c.) their privileges were much diminished. The kings of Pergamum built a new temple adorned with porticos of white marble. The image of the goddess, a stone (or piece of wood) said to have fallen from heaven, was taken to Rome in 204 B.c., in compliance with an oracle in the Sibylline books to the effect that the foreign foe could be driven from Italy if the Idzan Mother (Cybele) were brought from Pessinus to Rome. But the goddess continued to be worshipped in her old home as well as at Rome ; her priests, the Galli, went out to meet Manlius on his march in 189 B.c., and ata later age the temple was visited by Julian the Apostate. In the division of the empire under Constantine, Pessinus was made the capital of the province Galatia Salutaris. _ It was also the seat of a metropolitan bishopric. After the 6th century the town disappears from history. The Tuins discovered by Texier occupy three hills near the village of Bala-Hissar, 9 or 10 miles south-east of Sevri- Hissar. They include a theatre in partial preservation and numerous fragments of marble columns, friezes, &c. The modern town of Sevri-Hissar is built at the height of about 3000 feet on the southern base of a steep granite rock, half-way up which are the ruins of a castle.

PESTALOZZI, Jonann Hernricn (1746-1827). See Epucartion, vol. vii. p. 677.

PESTH, the chief town of Hungary and the second of the Austrian-Hungarian monarchy, is situated on the left bank of the Danube, 140 miles to the south-east of Vienna, in 47° 29’ 10” N. lat. and 19° 2’56” E. long. Since 1873 it has formed one municipality with Bupa (g.v.) on the opposite bank, and the joint city, officially styled Buda- pest (Ger. Pest-Ofen), is the capital of Hungary, the second residence of the Austrian emperor, the seat of the Hungarian ministry, diet, and supreme courts, and the headquarters of the commander of the Honvéds or Hun- garian landwehr.

The imposing size of the Danube, here somewhat wider than the Thames at London, and the sharp contrast of the two banks, place Budapest among the most finely-situated

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of the larger towns of Europe. On the one side is a flat sandy plain in which lies Pesth, modern of aspect, regularly laid out, and presenting a long frontage of handsome white buildings to the river. On the other the ancient town of Buda straggles capriciously over a series of small and steep hills, commanded by the fortress and the Blocksberg, and backed by spurs of the vine-clad mountains beyond. The Danube is crossed by three bridges; the fine suspension bridge constructed by the brothers Clark in 1842-49, at a cost of £440,000; the iron Margarethenbriicke, a little farther up, dating from 1872-76; and a long railway bridge at the lower end of the town.

Budapest is divided into ten municipal districts, three of which are on the right bank and belong to Buda. The nucleus of the town on the left bank 1s 1ormed by the inner town or old Pesth on the Danube, in a semicircle round which lie the districts of Leopoldstadt, Theresien- stadt, Elisabethstadt, Josephstadt, and Franzstadt, while

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Plan of Pesth.

1. New Building. 7. Town House. 13. Academy of Music. 2. Academy. 8. National Museum. 14. Exhibition.

3. Exchange, 9. National Theatre. 15. Ludoviceum.

4. Redoute. 10. Custom House. 16. Synagogue.

5. Carl’s Barracks. 11. Opera House. 17. Post Office.

6. Parish Church. 12. Leopold Church. 18. Palace.

19, Arsenal.

to the east of these is the outer district of Steinbruch. Perhaps the most attractive part of Pesth is the line of broad quays on the Danube, which extend for a distance of 24 miles, from the Margarethenbriicke to the custom- house, and are lined with imposing white buildings. The inner town, part of which is somewhat irregularly built, is separated from the other quarters by a ring of spacious boulevards on the site of the old wall, and the lines of demarcation between the different districts also consist of wide tree-shaded streets, mostly paved with asphalt. Most of the larger public buildings are in the Leopoldstadt, which shares in the fine frontage on the Danube, or in the handsome new Radial Strasse, which traverses the Theresienstadt, with a width of 100 to 150 feet. Pesth covers more ground than most towns of a similar popula- tion on account of the large number of one-storied houses, which form 70. per cent. of its buildings (as compared with 8 per cent. in Paris, 3 per cent. in Leipsic, &c.). Though of ancient origin, Pesth has nothing to show in the shape of venerable buildings ; and the modern edifices may perhaps be described as more noticeable for the

general air of prosperity they diffuse than for marked individual merit. The oldest ecclesiastical edifice is the parish church, dating from 1500, while the university church and those of the Leopoldstadt and the Franzstadt are the best of the more modern structures. The synagogue, however, is finer in many respects than any of its Christian rivals. The long range of substantial buildings fronting the Danube

includes the new houses of parliament, the academy, the exchange, the redoute, a large structure in a mixed Romanesque and Moorish style, erected for balls and other social purposes, the Greek church, the parish church, the old town-house, the extensive custom-house at the lower end of the quays, and several fine hotels and insurance offices. In the Radial Strasse are the new opera-house, the academy of music, the exhibition build- ing, and the national drawing-school. The largest building in Pesth is the so-called New Building, in the Leopoldstadt, erected by Joseph II., and covering as much ground as an ordinary London square. It is at present used as artillery barracks ; and the Carl's Barracks in the inner town, also used for housing troops, are little inferior in size. Another large military establishment is the Ludoviceum, or officers' college, at the south-east end of the town. The remaining buildings remarkable for their size or interest are the new town-house, the post-office, the national museum, the theatres (of which there are about half a dozen), and the palaces of several of the Hungarian magnates. To the south-east of the town lie the new slaughter-houses, which are admirably fitted up, and, with the adjacent cattle market, cover nearly 30 acres of ground.

The artistic and scientific culture of Pesth, and indeed of Hungary, finds its most conspicuous outward expression in the academy of sciences and the national museum, two large and handsome modern buildings. The academy, founded for the encouragement of the study of the Hungarian language and the various sciences, possesses a library of 100,000 volumes, and harbours the national picture gallery, a good collection of 700 to 800 works, formed by Prince Eszterhazy, and purchased for £130,000. The national museum contains extensive collections of antiquities, natural history, and ethnology, a gallery of mediocre paintings, and a library of 150,000 printed volumes

and 12,000 documents. Pesth also possesses numerous societies for the cultivation of science and art, most of which, however, limit their usefulness by publish- ing their proceedings in the Magyar tongue alone. The university of Pesth, the only one in Hungary proper, was established at Tyrnau in 1635, removed to Buda in 1777, and transferred to Pesth in 1783. It is attended by up- wards of 2000 students, and possesses the usual medical and scientific collections, an admirable chemical labora- tory, a botanic garden, and a library of 120,000 volumes. Pesth also contains a Protestant theological college and a rabbinical institute. The second place among the educa- tional establishments of the town is taken by the Poly- technic Institute, with its three faculties of applied chemistry, engineering and architecture, and mechanics ; it is attended by about 1000 students. The other schools comprise six gymnasia, six normal seminaries, and a large number of special and elementary schools, in spite of which 32 per cent. of the adult population were unable to read or write in 1880. The charitable institutions of the city are on a liberal scale. Characteristic of Budapest is the large number of its public baths, the most interest- ing of which are at Buda.

In commerce and industry Budapest is by far the most important town in Hungary, and in the former, if not also in the latter, it is second to Vienna alone in the Austrian- Hungarian monarchy. The chief articles of manufacture are machinery, railway plant, carriages, gold and silver wares, chemicals, cutlery, starch, tobacco, and the usual articles produced in large towns for home consumption. The great staple of trade is grain, of which about 4} million bushels are brought into the town annually. One-fourth of this amount merely passes through Pesth, while most of the remainder is ground into flour and exported in this form. Other important articles of commerce are wine, wool,

cattle, timber, hides, honey, wax, and “slivovitza,” an in- ferior spirit made from plums. The imports, so far as they do not belong to the transit trade, consist chiefly of manu- factured articles and colonial produce. The four annual fairs, formerly attended by many thousand customers, have now lost much of their importance. The swine market of Steinbruch is the largest in

Hungary, about half a million animals being annually disposed of. The trade of Pesth is in great part carried on by the Danube, the navigation of which has increased enormously since the introduction of steamboats in 1830; but the town is also connected by railway with all the chief places of Austria and Hungary.

The largest and most popular of the public gardens and promenades in Pesth itself is the Stadtwildchen on the north-east side, with its pleasant lake and trees. A still more delightful resort, however, is the Margaret Island, a long narrow island in the Danube, laid out in the style of an English park, with fine trees, velvety turf, and a group of villas and bath-houses.

Few European towns have grown so rapidly as Pesth during the present century, and probably none has witnessed such a thorough transformation in the last twenty years. In 1780 Pesth was still a badly-built town of the third rank, with only 13,500 inhabitants, and it was not till 1799 that its population (29,000) surpassed that of Buda (24,000). By 1840, however, Buda had added but 14,000 souls to its population, while that of Pesth had more than doubled ; and of the joint population of 270,000 in 1869 fully 200,000 fell to the share of Pesth. In 1880 the population of Budapest was 370,767 souls, including a garrison of 10,000 men, showing an increase since 1869 of 32 per cent., and since 1800 of an average of 6 per cent. perannum. Of this total 198,746 were returned as having Hungarian for their mother-tongue, 119,902 as Germans, and 21,581 as Slovaks. Divided according to. religious sects, we find 242,981 Roman Catholics, 70,879 Jews, 42,254 Protestants, and 3014 members of the Greek Church. Of these the Jews show the greatest relative increase since 1869 (56 per cent.) and the Roman Catholics the least. Of the gross increase of population in Hungary between 1869 and 1880 no less than two-thirds are due to Budapest alone, which in the same interval rose from the twenty- third to the fifteenth place among the towns of Europe. About 25 per cent. of the population are supported by trade and industry, 20 per cent. are engaged in service, and 4 per cent. belong to the pro- fessional and official classes. Nearly 50 per cent., including women and children, are returned as belonging to the non-working classes, but less than 1 per cent. are described as living on their capital or property. In spite of the large proportion of one-

storied houses, the ratio of inhabitants to each dwelling-house is somewhat high (33, as compared with 8 in London, 35 in Paris, and 59 in Vienna).

As Paris is sometimes said to be France, so may Pesth with almost greater truth be said to be Hungary. Its composite population is a faithful reflexion of the heterogeneous elements in the empire of the Hapsburgs, and the trade and industry of Hungary are centralized at Pesth in a way that can scarcely be affirmed of any other Euro- pean capital. In virtue of its museum and academy it is also the scientific centre of Hungary, and nine-tenths of all books in the Magyar tongue are published here. The average rate per head of imperial taxation is five or six times as great in Pesth as in the rest of Hungary. The recent patriotic movement in favour of Magyarizing all institutions has found its strongest development in Pesth, where the German names have all been removed from the streets and buildings. It is found, too, that the children of German parents born in Pesth easily become Magyarized, while a survey of Hungary at large during the last sixty years shows a relative increase of barely 1 per cent. in the Hungarian as opposed to the German tongue. The inhabitants are good-natured, hos- pitable, and fond of luxury and display. The upper classes are much addicted to sports of all kinds, and cultivate horse-racing, fox-hunting, and rowing with energy and success. Almost the only popular festival of importance is that of St Stephen on the 20th August, when thousands of people flock to inspect the relics of that saint in the palace-church of Buda.

History.—The origin of Pesth proper is obscure, but the name, apparently derived from the old Slavonic “ pestj,” a stove (like Ofen, the German name of Buda), seems to point to an early Slavonic settlement. The Romans never gained a foothold on this side of the river, though Aquincum, on the site of old Buda, is believed, from the extant remains, to have contained about 80,000 inhabit- ants. When it first appears in history Pesth was essentially a German settlement, and a chronicler of the 13th century describes it as “Villa Teutonica ditissima.” Christianity was- introduced early in the 11th century. In 1241 Pesth was destroyed by the Tatars, after whose departure in 1244 it was created a royal free

city by Bela IV., and repeopled with colonists of various national- ities. The succeeding period seems to have been one of consider- able prosperity, though Pesth was completely eclipsed by the sister- town of Buda with its fortress and palace. In 1526 Pesth was taken and pillaged by the Turks, and from 1541 to 1686 Buda was the seat of a Turkish pasha. Pesth in the meantime entirely lost its importance, and on the departure of the Turks was left little more than a heap of ruins. Its favourable situation and the renewal of former privileges helped it to revive, and in 1723 it became the scat of the highest Hungarian officials. Maria Theresa and Joseph II. did much to increase its importance, but the rapid growth which euabled it completely to outstrip Buda belongs entirely to the 19th century. A signal proof of its vitality was given in 1838 by the speed and ease with which it recovered from a disastrous inundation that destroyed 3000 houses. In 1848 Pesth becanie the seat of the revolutionary diet, but in the following year the insurgents had to retire before the Austrians under Windischgritz. A little later the Austrians had to retire in their turn, leaving a garrison in the fortress of Buda, and, while the Hungarians en- deavoured to capture this position, General Hentzi retaliated by bombarding Pesth, doing great damage to the town. The inhabit- ants to the number of 80,000 took refuge in the Stadtwaldchen. Between 1867 and 1873 Pesth is said to have doubled in size, and during the last four or five years the building activity has been

little if at all inferior.

See Hiuffier, ‘‘ Budapest,” Historische Skizzen, I. Abth. (1854); Hevesi, Buda- pest und seine Umgebungen (1873); Sturm, Kulturbilder aus Budapest (Leipsic, 1876); Heksch, Illustrierter Fuhrer durch Budapest (1882); Korési, Die Haup- stadt Budapest im Jahre 1881; publications of the Statistical Bureau in Buda- pest. (J. F. M.)

PETAU, Denys (1583-1652), better known in some departments of literature under the Latin form of his name as Dionysius Prravius, a highly-distinguished Catholic theologian and one of the most learned men of the 17th century, was born on 21st August 1583 at Orleans, where his father was a well-to-do merchant with some literary culture. Petau received his early education at Orleans, but finished his university course in Paris, where, after gradu- ating in arts, he attended theological lectures at the Sor-

bonne. By Isaac Casaubon, who had perceived his abilities, he was introduced to the MS. treasures of the Bibliotheque Royale; and, at the suggestion of that scholar, he began to work for the edition of Synesius which he afterwards published. In 1603, before he had completed his twentieth year, he received a teaching appointment in the faculty of philosophy at the university of Bourges ; here his leisure hours were devoted to his editorial labours and to a system- atic study of the ancient philosophers and mathematicians. Having come under the influence of the learned Jesuit Fronton le Duc, he was induced to resign his post at Bourges in order that he might. join the Society of Jesus, and in June 1605 he entered upon his novitiate at Nancy. After an interval of four years, he taught rhetoric success- ively at Rheims, La Fléche, and Paris, taking the four vows of the order at the last-named place in 1618; from 1621 to 1644 he was professor of positive theology in the college of the order. On account of growing infirmities and to secure leisure for his great work, to be mentioned below, he then retired from teaching duties, but retained the librarianship in the Collége de Clermont until his death, which took place on 11th December 1652.

The list of Pctau's literary labours bears witness to an extraor- dinary and many-sided activity, and includes several works which still enjoy the recognition of scholars. He edited Synesius (1611, 2d ed. 1631, 3d ed. 1633), Themistius (1613), Julian (1630), the Breviarium of Nicephorus (1616), and Epiphanius (1622) ; his Animadversiones on the last-named have been reprinted by Dindorf, as a still unexhausted mine of valuable material, in the fifth vol. of his Epiphanii Opera (1859). Carrying on and improving on the chronological labours of Scaliger, he published in two folio volumes an Opus de doctrina temporum (1627 ; frequently reprinted), followed in 1630 by Uranologion s. systema variorum authorum qui de sphera ac sideribus corumque motibus greee commentati sunt and Variarum dissertationum ad Uranologion libri VIII. Of the first-mentioned of these he made an abridgment, entitled Ration- ariwm temporwm, which passed through numerous editions, was translated into English and French, and in a recent reprint has been brought down to the year 1849. In theology proper Petau's

first appearance was polemical, and quite in the manner of that time,—a pseudouymous criticism on the recently-published com-

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mentary of Salmasius on Tertullian's De Pallio (Antonii Kerkoetti Aremorict animadversionum liber, 1622). The controversy was con- tinued in a series of replies and rejoinders, and was renewed in connexion with other publications of his distinguished antagonist. In particular, some references to the church doctrine as to the authority of bishops made by Salmasius in his De fenore trapezitico was the occasion of Petau's Dissertationwm ecelesiasticarum libri duo, in quibus de episcoporum dignitate et potestate deque aliis ecclesiasticis dogmatibus disputatur (1641) and also of his De ecelesiastica hierarchia libri V. (1641). Petau also had his share in the Jansenist controversy, and has the honour of being twice mentioned as a Jesuit authority in the Provinciales. His first appear- ance in the dispute was against Arnauld's De la fréquente communion, which he met with a treatise, De la pénitence publique et de la pré- paration & la convmuavion (1643) ; his subsequent works, viewed in the light of the struggle then at its height, explain themselves by their titles (De lege ct gratia libri IT. (1648), De Tridentini concilii interpretatione et S. Augustint doctrina (1649), De adjutorio sine quo non et adjutorio quo (1651). In his great but unfinished work, De theologiets dogmatibus (5 vols. fol., 1644-50), he deals with the doctrine of God, the Trinity, Creation, and the Incarnation ; his design had been to complete it by an exhaustive treatment of the sacraments and of the Christian graces and virtues. Its scope, which was to free theology from the subtleties of scholasticism and to rest the science on the simple and firm basis of Scripture, the councils, and the fathers, is well enough explained by his own avowal, ‘‘nova querant alii, nil nisi prisca peto.” The work is a treasury of well-digested learning, and justly entitles its author to the praise of Muratori, who speaks of him as ‘‘ the restorer of dog- matic theology.” By some of his fellow-Jesuits he was supposed to have been too ready to recognize the Jansenism of Augustine, and in various quarters his declaration that many of the ante-Nicene fathers were less orthodox than the decrees of the first council has been made a

matter of reproach. But in these charges the impar- tial critic will recognize only proof of his candour. Petau, it may be added, was a rigid ascetic, and in particular is said to have indulged in the discipline of self-flagellation to a degree that injured his health.

PETER. Simon Peter was “an apostle of Jesus Christ” (1 Peter i. 1). His two names are both found

in two forms: of the one the full form is Symeon (f¥Dv,

Svpedv, which is found in the speech of James, Acts xv. 14, and in most MSS. of 2 Peter i. 1), the shorter and more usual form being Simon; the other is found both in its Greek form Peter (Ilérpos) and in the Grecized form Cephas (Kndas) of the Aramaic Kepha (85°32). Simon is the name by which he is always addressed by Jesus Christ ; Peter is that by which he is most commonly spoken of in the Synoptic Gospels, the Acts of the Apostles, and subsequent ecclesiastical literature ; the combined name, Simon Peter, is found once in St Matthew, once in St Luke, and frequently in St John; sometimes Peter is expressly stated to be a surname (Matt. iv. 18, x. 2; Acts x. 5, 18, 32, xi. 13); St Paul, in 1 Cor. and in Gal. i. 18, ii, 11, 14 (according to the chief uncial MSS., except D), uses Cephas, but in Gal. ii. 7, 8, he uses Peter.1 The name of his father is also found in two forms, John (Iwavyys, Iwdvys, in most MSS. of John 1. 42, xxi. 15, 16) and Jonas (Iwvés, Matt. xvi. 17, and cod. In John i. 44 he is said to have been of Bethsaida, which was possibly the place of his birth ; but it appears from Mark i. 29 (= Matt. vill. 14; Luke iv. 38) that he and his brother Andrew had a house together at Capernaum. With the same brother, and with James and John as partners, he was engaged in what was probably the thriving business of a fisherman on the Lake of Genne- saret ; and from the fact that he went back to his business after the resurrection it has been inferred that, at least up to that time, he had never wholly left it. That he was married is clear from the mention of his wife’s mother

1 Throughout the New Testament the Peshito-Syriac uses Cephas where the Greek has Peter, and there is no reasonable doubt of the identity of the two names; but Clement of Alexandria, in a fragment preserved by Eusebius, HW. £., i. 12, 3, and the so-called ‘Two Ways ” (Harnack, Lehre der zwilf Apostel, p. 225, and Hilgenfeld, Nov. Test. extra Canonem receptum, fasc.

iv. p. 111) take them to refer to differ- ent persons, probably from an unwillingness to believe that Gal. ii. 11 really referred to Peter.

(Mark i. 30 and parallels), and that his wife accompanied him when he finally left his home to preach the gospel is implied by St Paul (1 Cor. ix. 5); there is an early tradi- tion, which is not inconsistent with probability, that she also suffered martyrdom, and that Peter called out to her as she was being led away, ‘“‘O wife, remember the Lord!” 1 The statement that he had children? is probably only an inference from the fact of his having been married ; the alleged name of his daughter, Petronilla, is as suspicious as the story of his having cured her of the palsy?; and the majority of commentators take the expression ‘ Mark, my son,” in 1 Peter v. 13, to refer only to spiritual kinship.

Of the beginning of his discipleship there are two accounts which have sometimes (by Baur, Keim, Holtzmann, and others), though without sufficient reason, been supposed to be inconsistent with each other.

(1) According to St John, he was brought to Jesus by his brother Andrew, who had been a follower of John the Baptist, but who, after the Baptist’s testimony, recognized in Jesus the promised Messiah (John i. 40-42). The fact that he was then not at Capernaum but in the Jordan valley, where John was baptizing, seems to indicate that he, like his brother, had been attracted by John’s preach- ing. It is not stated that he at once became one of those who followed Jesus, and there is consequently room for the supposition that he returned home ; and the statement that it was upon the occasion of this first meeting that he received his distinctive surname, Cephas or Peter, is not inconsistent with Mark iii. 16, Luke vi. 14, which men- tion the fact rather than the occasion, or with Matthew xvi. 18, which gives to an existing name a new application.

(2) According to St Matthew and St Mark, it was at the beginning of the Galilean ministry that Jesus called Simon and Andrew to become “fishers of men” (Matt. iv. 18-20; Mark i. 16-18). The manner of the call seems to imply a previous acquaintance, and is consequently not out of harmony with that of St John. It is less easy to determine whether the account in

Luke vy. 1-11 refers to the same or to a different incident; Schleiermacher, Neander, Bleek, and others treat it as the fuller and more accurate account ; Ewald, Weiss, Keim, and others regard the miraculous draught of fishes as a reminiscence of a later tradition, and probably identical with John xxi. 5-11.

From the time of his call Peter has a place in most of the important events of the Gospel narrative. It was to his house in Capernaum that Jesus went as if to a home (Matt. viii. 14; Mark i. 14, 33; Luke iv. 38), and it is consequently sometimes spoken of as simply “the house” (Matt. ix. 28, xiii. 1, 36, xvii. 25). He formed, with his two former partners, James and John, an apostolic trium- virate, which was admitted when all others were excluded, and to whom, with Andrew, was committed the great pro- phecy of the last days (Mark xiii. 3), The most important incident which is recorded of him between his call and the crucifixion , is that which happened at Cxsarea Philippi (Matt. xvi. 13-23; Mark viii. 27-33; Luke ix. 18-22; probably recorded in substance, though in a different form, in John vi. 66-69). The incident links itself closely with the history which had immediately preceded it. The ex- pectation which the Galilean peasantry had begun to form of Jesus had been disappointed ; the miracles of healing and feeding had not been followed by the assumption of the national leadership ; many of the disciples had begun to drift away, and those who were looking for the Messiah saw in Him only “one of the prophets.” Those who

a pc: Alex., Strom., vii. 10, p. 869, quoted by Eusebius, ZZ. Z., iii, 80, 2.

2 Clem. Alex., Strom., iii. 6, p. 585, quoted by Eusebius, zbid.

3 St Augustine, c. Adimant. Manich., c. 17 , vol. viii. 189, ed. Ben.

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remained were tested by a direct question; whether the form of the question was that of the Synoptists, “Whom say ye that lam?” or that of St John, “Will ye also go away?” it was Peter who answered for the rest, in words which have an equivalent meaning, whether they were in the form “ Thou art the Christ,” or in the form “ Lord, to whom shall we go? Thou hast the words of eternal life.” The further detail which St Matthew gives, xvi. 17-

19, has sometimes been thought to be a later addition, reflect- ing a fact of subsequent ecclesiastical history; but its absence from St Mark does not seem to be an adequate ground for rejecting it, and its substance is found in Justin Martyr (Tryph., c. 100). Round the words which St Matthew records many controversies have raged ; nor does it seem possible, with existing means of investigation, to fix to the sentence “upon this rock I will build My church ” a meaning that will be beyond dispute. Whatever may be its precise meaning, it seems at any rate to be in har- mony with other passages of the Synoptic Gospels, which indicate, not only that Peter was foremost among the apostles by virtue of natural force of character, but that he was also their ordinary leader and representative: the most important passage is Matt. x. 2, where the expression “the first,” which is applied to him, cannot be restricted to mere priority of enumeration in the list. It is possible that his colleagues James and John, or their more ambi- tious mother, endeavoured to dispute this position with him (Matt. xx. 20, 21; Mark x. 35-37), and it has been contended (Baur, Strauss, Holtzmann) that in the Fourth Gospel John holds the place which the Synoptists assign to Peter; but even if this contention were admitted it would merely afford one more argument to show that the priority of rank was limited by natural affection as well as by the law of equality among the Christian brotherhood (Matt. xxiii. 8-11; Mark ix. 33-35; Luke xxii. 24-27). But, although Peter was foremost in expressing the con- fident belief of the disciples that Jesus was the Messiah, it seems clear that in his conception of the Messiah he did not rise above the current ideas of his countrymen. “He that should come” was to be a national deliverer. This conception appears on two occasions especially—when Jesus first told the disciples of His coming sufferings, “Peter took Him and began to rebuke Him,” and received the answer, “Get thee behind Me, Satan,” as though this atti- tude of the disciples were a new temptation (Matt. xvi. 21-23; Mark viii. 31-33); and, when Jesus was actually in the power of His enemies, and no “legions of angels” appeared either to rescue or to enthrone Him, Peter’s natural hopefulness gave way to complete despondency, and he more than once “denied that he knew Him.”

In the earliest account of the resurrection (that of St Paul, 1 Cor. xv. 5) it is mentioned that Jesus appeared to Peter before and separately from the twelve; and the last chapter of the Fourth Gospel gives him an especial pro- minence : it adds one more example of the impulsive energy of his

character (ver. 7); it portrays more vividly than any other passage in the Gospels the depth of his attachment to his Master (vers. 15-17); and it forecasts the manner of his death (vers. 18, 19). His prominence in the early community at Jerusalem is proved by the testimony of St Paul; for it was to visit ‘“‘Cephas” that he made his first journey to Jerusalem after his conversion, and fourteen years afterwards, though James and John as well as Cephas “were reputed to be pillars,” it was the latter who stood out above the rest as the special preacher of “the gospel of the uncircumcision ” (Gal. i. 18, ii. 1-10). These facts undoubtedly confirm the general picture of the relations of Peter to the early church which is drawn in the Acts of the Apostles; at the same time no part of the New Testament has been more strongly attacked by modern

writers than the first twelve chapters of that book, in which the “Acts of Peter” are contained. The attack has been made (Baur, Schwegler, Overbeck, Zeller, and others) partly on the speeches and partly on the narrative. (1) It is alleged that the Petrine speeches form no exception to the general uniformity of phraseology and style which characterizes the Acts, and that they ignore the marked differences in the conception of Christianity between Peter and Paul. It must be admitted that the coincidences are such as to render it probable that the author of the Acts dealt freely with his materials, but at the same time the peculiarities are sufficiently numerous to support the view that these speeches contain a true representation of the primitive teaching.1 (2) The narrative passages which have been most keenly contested are those which relate to Simon of Samaria and to Cornelius. It is alleged that the account of the former is the mere reflex of the later legends in which the name of Simon Magus was substituted for that of St Paul as the representative of false Christ- lanity, and it is said of the latter that it is a mere attempt to claim for Peter the opening of the door to the Gentiles which was the special honour of Paul, and that it cannot be reconciled with the division of labour between the apostle of the circumcision and the apostle of the uncir- cumcision which is spoken of in the Epistle to the Gala- tians.? At the great crisis of early Christianity which is known as the conference or council of Jerusalem Peter advocated (according to the Acts), or accepted (according to Paul), the

policy of conciliation. Afterwards he went to Antioch, where Paul had preceded him, and there he carried out his acceptance of Gentile Christianity to the further point of eating at the common meals at which Gentiles were present. For this step the members of the original community at Jerusalem were not prepared ; and, when a deputation from them came to Antioch, Peter “drew back and separated himself” (Gal. ii. 12). There- upon followed an argument and a remonstrance on the part of Paul which has been fruitful of results to both ancient and modern Christianity. Peter was “withstood to the face” because of (1) inconsistency, (2) practical calumny of Christ, (3) transgression of the law, (4) making void the gift of God (Gal. ii. 14-21). It is altogether too much to assume that this remonstrance led to a permanent alien- ation of the two apostles from one another; it is more probable that with a character such as Peter’s, which had more energy than steadiness of resolution, it may even have been effectual. But it is upon the assumption of such an alienation that the Jewish party in the ancient church pictured Peter as the champion and hero of the faith, and Paul as its vanquished opponent, and also that in modern times the Tiibingen school have endeavoured to reconstruct not only early church history but also the New Testament.

This incident at Antioch is the last that is certainly known of Peter. The prophecy recorded in John xxi, Is, 19, is in harmony with early tradition in pointing to a violent death. But of the time and place of that death we know nothing with even approximate probability. The only historical mention of him for more than a hundred years afterwards is in Clement of Rome (£p., i. 5, 4), who sets before the Corinthians the example of “Peter, who through zeal undertook not one or two but numerous labours, and so having borne witness went to the place Se ee

? The question of the relation of their language to the rest of the Acts and to the Petrine epistles is discussed in detail with various Tesults by several writers, ¢.g., Mayerhoff and Weiss in the works mentioned below, and more fully Kahler in Studien u. Kritiken for 1873, p. 492 sq.

- The details of the discussion will be found in most recent books Which deal with the Acts ; on the negative side the most convenient book for

English readers is the translation of Zeller's Contents and Origin of the Acts of the A |postles, 1875.

that was due to him." It is sometimes supposed that an indication of the place in which he "bore witness" or "suffered martyrdom" is afforded by the phrase "among us," t.e., among the Romans, in the next chapter ; but this, though possible, is quite uncertain. Outside this state- ment, which if it were more definite would be conclusive, there is only the doubtful interpretation of " Babylon" in 1 Peter v. 13 as meaning "Rome," and the echo of a vague tradition in the apocryphal Petri et Pauli Predicatio.3 The testimony of the " presbyter" who is quoted by Papias in reference to Peter's connexion with Mark (Euseb., H. L., il. 39, 15) says nothing of the place at which they were together, and the coupling of the names of Peter and Paul by Ignatius (Ad Roman., c. 4) would not, even if the early date of Ignatius were established, afford a solid argument that "in their death they were not divided." But from the beginning of the last quarter of the 2d century the testimony to the presence and death of Peter at Rome is almost uniform ; the tradition, whatever may have been its foundation in fact, had firmly established itself. Diony- sius of Corinth (Euseb., H. £., ii. 25, 8) says that Peter and Paul founded the church at Corinth together and then proceeded to Italy. Irenzeus (Adv. Heres., iii. 1) speaks of Peter and Paul as having together founded the church at Rome; the Muratorian Fragment (not earlier than the end of the 2d century) refers to the "passion of Peter" a.¢., his martyrdom ; the presbyter Gaius (Euseb., H. Z., ii, 25, 7, early in the 3d century) says that he saw the tporata (whatever that may mean) of the two apostles Peter and Paul at Rome; in Tertullian (e.g., Scorp., c. 15 ; De Prescr., c. 24 and 36) the tradition is fairly established ; and no later Latin father expresses any doubt of it.

But, besides the fact that there is an interval of more than a hundred years between what must have been, in the ordinary course of nature even if not through violence, the approximate time of Peter's death and the first certain tradition of the place and manner of it, there are two other important considerations which render the ordinary patristic statements doubtful. (1) One stream of tradition, for the existence of which it is difficult to account

if the other tradition had been uniform, represents Peter as having worked at Antioch, in Asia Minor, in Babylonia, and in the "'country of the barbarians" on the northern shores of the Black Sea. This is in harmony with the geo- graphical details of the first of the two epistles which bear his name. That epistle is addressed to the "elect who are sojourners of the dispersion in Pontus, Galatia, Cappa- docia, Asia, and Bithynia," and the " Babylon" from which it is obviously written (v. 13) is best understood not as a cryptographic expression for Rome, but, like the other geographical names of the epistles of the New Testament, in a literal sense. All this, no doubt, is not inconsistent with the supposition that Peter went to Rome towards the end of his life, but it seems to exclude the theory that he made a lengthened stay there and was the founder of the Roman Church. (2) The other consideration is that the presence of Peter at Rome is almost inextricably bound up with a story of whose legendary character there can be little doubt, that of the Simon Magus of the Clementines.4 Under the name of Simon Magus the conservative Jewish Christians, who could never forgive the admission of the Gentiles to be " fellow-heirs" with the "children of the promise," seem to have represented Paul>; and, throwing

3 Hilgenfeld, Nov. Test. extra Can. rec., fasc. iv. p. 57.

4 Uhlhorn, Die Homilien u. Recognitionen des Clemens Romanus, Gottingen, 1852, makes an unsuccessful attempt to show that the two stories may be separated.

5 For the detailed proofs of this reference may be made to Baur, Church History, E. T., vol. i. p. 91; Zeller, The Acts of the A postles, E. T., vol. i. p. 250; and Hilgenfeld, in his Zeitschrift f. wissensch. Theologie, 1868, p. 367.

back into the lst century, and into the personal relations between the two apostles, the violent controversies between the catholic and the Jewish parties which came to a head in the 2d century, they framed a romance of which Peter was the hero, and in which, under the mask of Simon Magus, Paul played the part of the "false apostle." The romance in its original form has perished ; its substance is partly preserved and partly recast in the

Clementine Homilies and Recognitions, of which the former exist in their original Greek, the latter in an incomplete Latin translation. In course of time the original identity of Paul with Simon Magus was forgotten, and in the later forms of the legend (see the Acts of Peter and Paul below) Peter and Paul are joined together in the combat with the pretender. But in almost all later patristic accounts of Peter Simon Magus has an important place ; he is said to have gone to Rome in the time of Claudius, and Peter is said to have at once followed him in 42 A.D. ; hence, as Peter lived until the Neronian persecution in 67 there was room for an episcopate of twenty-five years. This last tradition can hardly be reconciled with the facts mentioned in the New Testament of his presence at Jerusalem and at Antioch (Acts xv.; Gal. li.); but Lipsius has endeavoured to show, not only that single points in the story must be given up, but that the whole tradition of the presence of Peter at Rome is a fiction which grew out of the Judeo-Christian attack upon Paul.

The probabilities of the case are evenly balanced ; on the one hand it is difficult to account, for the complete silence as to Peter in the Pauline epistles, and it is impos- sible with those epistles in sight to regard Peter as the founder of the Roman community; on the other hand, it is difficult to suppose that so large a body of tradition had no foundation in fact ; such a supposition, besides its general improbability, would assume that the extreme form of Judzo-Christianity which the Clementines reflect had a much greater influence over the conceptions of the 2d century than the evidence warrants.!

1 The question whether Peter was ever at Rome has been so much discussed that the following list of the chief treatises and articles on either side will be convenient for reference ; it is not exhaustive. The question was at first discussed as one between Protestants and Catholics. The earliest treatise on the Protestant side is probably that of Ulrich Vehlen (Velenus) in his Demonstratio contra Romani pape primatus JSigmentum, 1520, reprinted by M. Flacius Ilyricus in his Refutatio invective Bruni contra centurias historie ecclesiastice, p. 86; it was answered at the time by Bishop Fisher of Rochester in his Convulsio calumniarum Aldrichi Velent, reprinted in his works, ed. Wurzburg, 1597, p. 1299. The most complete account of the older arguments on the Lutheran side is that of Spanheim, Dissertatio de

ficta profectione Petri Apostoli in urbem Romam deque non una traditionis origine, 1679, reprinted in his works, Leyden ed., 1708, vol. ii. p. 831. In modern times the question has been discussed chiefly on literary grounds and without reference to its bearing on the Roman controversy. It was first stated on the negative side by Baur in the Tubingen Zeit- schrift fiir Theologie, 1831, p. 136, and in his Paulus, E. T., vol. i. p. 228. His most important follower has been Lipsius, whose two works, the Chronologie der rimischen Bischife, Kiel, 1869, and Die Quellen Aer rimischen Petrus-Sage, Kiel, 1872, are of great value apart from the results which they endeavour to establish; he also deals with the question more concisely in the Jahrbb. f. deutsche Theol., 1876, p. 561. On the same side are Mayerhoff, Historisch-kritische Einleitung in die petrinischen Schriften, Hamburg, 1835; Gundert, in the Jahrbb. f. deutsche Theol., 1869, p. 306 ; Holtzman, s.v. “ Petrus,” in Schenkel’s Bibellexicon ; Hausrath, NTliche Zeitgeschichte, vol. iii. p. 344; Zeller, in the Deutsche Rundschau, 1875, p. 215 (reprinted in his Vortrige u. Abhandlungen, 2te Samml., 1877), and in the Z. /. wissensch. Theol., 1876, p. 81. The truth of the early tradition has been maintained in opposition to these writers by Credner, Linleitung in das N. T., 1836, p. 628; Olshausen, Rémerbr., 1840, p. 40 ; Wieseler, Chronologie des apost. Zeitalters, 1848, p. 552; Ewald, Gesch. des Volkes Isract, vol. vi. p. 616 ; Hilgenfeld, in his 7. f. wissensch. Theol., 1872 p. 372, 1876 p. 57 (in answer to the article of Zeller in the same number mentioned above), 1877 p. 486 (in answer to the article of Lipsius mentioned above); Delitzsch, in Stud. und Krit., 1874, p. 213; Renan, L’ Antechrist, p. 186, and appendix; Seyerlen, Entstehung

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It would be inappropriate to enter in the present article into the causes and consequences of the enormous influence which the belief that Peter founded and presided over the first Christian community at Rome has exercised upon Christianity. It was no doubt natural, considering that influence, that curiosity should be largely exercised as to the details of his life and death at Rome, and that legends of respectable antiquity should express themselves in visible memorials. Modern Rome contains many such memorials. The chapel of 8. Pietro in Carcerc preserves the tradition that he was imprisoned

in the Tullianum, and that a spring of water issued from the ground that he might baptize his gaolers. The churches of S. Prassede and S. Pudenziana preserve the tradition that much of the later part of his life at Rome was spent in the house of Pudens on the Viminal Hill. The latest localization of a legend has built a church outside the old Porta Capena to mark the spot where, when he was fleeing from persecution, he met his Master going into Rome. “Lord, whither goest Thou?” (Domine, quo vadis?) was his question. ‘‘I go to Rome to be ¢rucified again” was his Mas- ter’s answer.” Besides these visible memorials of Petrine legends there are four annual feasts. (1) On 29th June is celebrated the Feast of St Peter and St Paul. The day is supposed to be that of their martyrdom ; it is in reality that of the reburial of their supposed remains in 258, which is recorded in the Kalendarium LInberianum of 354 (printed by Mommsen in the 4bhandlungen der konigl. séichs. Gesellschaft, phil.~~hist. Classe, 1850, p. 362). Those of Peter were then reburied ‘‘ad catacumbas,” 7.e., in the ceme~~ tery of St Sebastian on the Appian Way; they were afterwards said to have been transferred to the basilica which Constantine erected on the Vatican. (2) On 22d February is celebrated a feast in commemoration of Peter as bishop of Antioch (Festwm Cathedrz Petri Antiochenz), which also is mentioned as early as the Kalend. Liberianum. (8) On 18th January has been celebrated since the 8th century a feast in commemoration of his bishopric of Rome. (4) On Ist August has been celebrated since the 9th century a feast in commemoration of his imprisonment (Festum S. Petri ad Vincula), but whether of that by Herod which is mentioned in Acts xii., or of that by Nero, is uncertain.

Besides the two canonical epistles (see PETER, EPISTLES OF) the following works have either been (erroneously) attributed to him or bear closely upon his history.

1. The Gospel according to Peter.—Kusebius (H. #., vi. 12, 2-6) mentions that the public use of this Gospel was at one time allowed, but afterwards disallowed on the ground of its Docetism, by Sera- pion, the successor of Theophilus in the bishopric of Antioch (191- 213). It is mentioned by Origen (Hom. in Matt., x. 17, vol. iii. p. 462), by Jerome (De Vir. Illustr., c. 1), and by Theodoret (Heret. Fab., ii. 2). Hilgenfeld (Nov. Test. extra canon. rec., fase. iv. p. 89) thinks that it held a middle place between the Gospel

according to the Hebrews and the Gospel of the Ebionites. No certain fragments of it remain.

2. The Preaching of Peter (Ilérpov xipvypa) ; and.

3. The Journcys of Peter (Iérpov zreptoda).—These two works are mentioned together in the Epistle to James which is prefixed to the Clementine Recognitions ; the former appears to have been Judzo-Christian ; the latter was an attack on Paul under the guise of Simon Magus. Both works underlie the Clementine Recognitions and Homilies ; the patristic references to them will be found in Hilgen- feld, U.¢., p. 52, and Hinleitung, pp. 42, 155, 580, 613.

4. The Preaching of Peter and Paul.—This, in distinction from the preceding, belongs to the period at which Pauline and Petrine tendencies had become combined. The fragments of it and refer- ences to it are collected by Hilgenfeld, J.c., p. 56.

5. The Acts of Peter and Paul.—The history of this work is obscure ; in its present form (as printed by Tischendorf, Acta Apos- tolorum Apocrypha, pp. 1-39) it is probably a late recasting of an earlier work or works. Of such earlier work or works there are traces which are collected by Hilgenfeld, /.c., p. 66; in addition to these it has been thought that the Martyriwm Petri et Pauli of Symeon Metaphrastes contains part of the original Acts of Peter; but the section of the great work of Lipsius, Die apok. Apostelgesch. u. Apostelleg., which will probably unravel the present literary difficulties of these Acts has not yet (1884) appeared.

6. The Apocalypse of Peter.—This is mentioned as a deutero- canonical book in the Muratorian Fragment, by Clement of Alex- andria (ap. Euseb., H. £., vi. 14, 1), and by Eusebius (H. Z., iii. 25, 4). Methodius of Tyre placed it “among the inspired Scriptures ” (Sympos., ii. 6), and Sozomen (H. £., vii. 19) says that in some churches of Palestine it was publicly read once a year. A few short

und erste Schicksale der Christengemeinde zu Rom, 1874, p. 51; Schmid, Petrus in Rom, Lucerne, 1879 (which is a convenient summary of earlier literature and arguments rather than an independent contribution to the

subject); Langen, Geschichte der rémischen Kirche, 1881, p. 40; Sieffert, in Herzog-Plitt, R. H., s.v. “ Petrus.”

2 The story is first found in a sermon sometimes attributed to St Ambrose and printed in some editions of his works, e.g., ed. Paris, 1603, vol. v. p. 100.

fragments of it are collected by Grabe, Spicil., i. 74, and by Hilgen- feld, . ¢., p. 71. (The work under the same title which was partly translated by Jacobus de Vitriaco in the 13th century, and of which some MSS. still remain, e.g., an Arabic translation in the Bodleian library — MSS. Arab. Ohrist., xlviii.—is a much later composition.)

7. Epistle of Peter to James.—This is prefixed to the Clementine Homilies (ed. Lagarde, p. 1) ; according to Photius (Biblioth., cod. 42, 118) there was a similai letter, which is now lost, prefixed to the Recognitions. Its character and literary value are the same as those of the Clementines in general.

8. The Teaching of Simon Cephas in Rome.—This treatise exists in Syriac, and was first published and translated by Cureton, Ancient Syriac Documents, 1864, p. 35 (since by B. P. Pratten, in the Ante- Nicene Library, vol. xx.). (A. HA.)

PETER, Episties or, 1 Peter.—The first of the two canonical epistles which bear the name of St Peter is addressed “to the elect who are sojourners of the disper- sion in Pontus, Galatia, Cappadocia, Asia, and Bithynia.” Most commentators in both ancient and modern times (e.¢., of the former, Athanasius, Jerome, Epiphanius; of the latter, Lange, Weiss, and Beyschlag) have interpreted this phrase to refer primarily to Jewish Christians. But this interpretation creates a difficulty. The countries named were countries in which St Paul and his companions had been especially active, and in which they had formed many communities, chiefly from the Gentile population. If therefore “the sojourners of the dispersion ” be understood to refer to Jews, it becomes necessary to suppose the existence side by side in the same countries of two sets of communities, Pauline and Petrine, and further to suppose either (with Weiss) that the latter were already in exist- ence when

Paul preached, or (with the majority of writers) that Peter followed Paul upon his own ground. Both these suppositions are improbable, and it is preferable to understand the phrase of the “children of God that are scattered abroad” whether Jews or Gentiles. That some of the latter were included in it seems clear from i. 21, ii. 10, which imply that before they were Christians they knew not God, and from iii. 6, which implies that their wives had only now become daughters of Abraham.

The epistle was evidently written at a time when the Christians of Asia Minor were both calumniated (ii. 12, iii. 16, iv. 4, 14) and persecuted (i. 6, 7, iii. 14-17, iv. 12-19). It exhorts those to whom it was addressed not only to bear their trials patiently, and even to rejoice inasmuch as they were “ partakers of the sufferings of Christ ” (iv. 13), but also to give no occasion to the hostile world which surrounded them to reproach them as evil- doers (ii. 12, 15, iv. 14, 15), and it specializes this ex- hortation to well-doing by addressing separately servants (ii. 18-25), wives (ili. 1-6), and husbands @a 7). ‘This fact that Christianity had come to be persecuted, and also the fact, which is manifested in its whole tone, that Christians were in danger of retrograding, show that the epistle cannot be placed in the earlier part of the apostolic age. The time of the Neronian persecution is the earliest that will satisfy the required conditions; and some (e.g, Schwegler, Baur, Hilgenfeld) have thought that even this is too early for those conditions, and that it must be referred to the time of Trajan. It may, however, be said in reference to this latter view that the words of Tacitus in regard to the Christians under Nero, if they be not merely a reflexion from his own time, exactly suit the circum- stances to which this epistle refers; “quos per flagitia invisos vulgus Christianos appellabat ” (Ann., xv. 44).

Like most documents of the apostolic age, it deals less with doctrine than with practice. But, though the doctrine is incidental, it is clear; taken in connexion with the Petrine speeches in the Acts of the Apostles, with which it is on the whole in harmony, it probably gives a faithful transcript of the original apostolic teaching. The Messiah

of whom the prophets had spoken had been revealed (i. 10-12); He had come to suffer (i. 11) for sins (ii. 24, iii. 18), and by His sufferings He had

rescued the elect from their former evil life (i. 18-20) and brought them to God (ili. 18), and in His conduet under suffering left an example for them to follow (ii. 21-23). Belief in God who raised Him from the dead on the one hand is a purification of the soul and an obedience to the truth, and on the other it results in love of the brethren (i. 22); it constitutes a bond of brotherhood, like that which had existed between the children of Abraham, and made the elect, what the Jews had failed to be, “a royal priesthood, a holy nation ” (ii. 9, from Exod. xix. 6). But the fulfilment of the promise is not for this world ; Christians are “strangers and tra- vellers” (ii. 11); the end of all things is at hand Gv. 7), and that is the revelation of the glory of the Messiah in which those who believe in Him will be partakers (iviel35 v2 1):

The picture of the Christian communities which the epistle presents is of the simplest, and is in entire harmony with the general facts of the apostolic and sub-apostolic

age. The organization was that of the Jewish synedria ;

the “elders” were as shepherds of the flock, exercising over the younger members the control of a simple discipline. The ministering to the wants of those who needed help was the common and personal duty of all who had where- with to minister (iv. 10), and a special class of officers for the purpose was not yet needed. It is evident that “liberty of prophesying” prevailed; the only injunction on the point is, “if any man speak, let him speak as the oracles of God” (iv. 11).

The coincidences of thought and expression between some pass- ages of this epistle and some passages in the epistle of James and in both the disputed and undisputed epistles of St Pau] have given rise to much discussion. The chief coincidences are the fol- lowing :—(1) between 1 Peter and James, i. 6, 7, and i. 2, 3, i. 12 and i. 25, i. 22 and iv. 8, ii. 1 and i. 21, iv. 8 and v. 20, We B, O and iv. 6, 7, v. 6 and iv. 10; (2) between 1 Peter and Romans, i. 14 and xii. 2, ii. 5 and xii. 1, il. 6-10 and ix. 32, ii. 13 and xiii, il, iil. 9 and xii. 17, iii. 22 and viii. 34, iv. 3, 7, and xiii. iit, ey, the 9 and xiii. 13, iv. 10 and xii. 6; (3) between 1 Peter and Ephe- sians, i. 1 sg. and i. 3 sq., i. 14 and ii. 3, ii. 18 and vi. 5, iii. 1 and v. 22, iii. 22 and i. 20, v. 5 and v. 21. Of these coincidences several explanations have been given. Weiss

(Die petrinisehe Lehrbegriffe, 1855, and Biblieal Theology of the New Testament, E. T., vol. i. p. 167) holds that this epistle preceded the other epistles and gave rise to the expressions which they contain. The Tiibingen school hold that the contrary is the case, and that it represents either a late and weakened form of Panlinism (Baur, Zeller, Pfleiderer), or an attempt to mediate between the Pauline and Petrine parties by clothing the doctrines of the latter in the phraseology of the former (Schwegler). Others (notably Mayerhoff, Einleitung in die petr. Sehriften, 1835) consider that there is no copy- ing on either the one side or the other, but that all the coincidences of expression come from a common stock of apostolic teaching.

The epistle was nsed by Papias and is possibly referred to by Polycarp, and it is expressly quoted by Irenxus and Tertullian ; it is not mentioned in the Muratorian Fragment, but it is trans- lated in the Peshito version, and is included by Eusebius among the admitted books (homologowmena). Its genuineness was generally admitted until the present century ; and some of its peculiarities have been accounted for by the hypothesis of its having been originally written in Aramaic, and translated, or possibly amplified, by Mark or Silvanus. On the other hand there are some who hold that the attacks upon it by Schwegler, Baur, Pficiderer, Holtz- mann, and others have been stronger than the defence of it.

2 Peter—The second epistle is addressed to a wider circle than the first, 7.e., to Christians in general. Its aim is mainly polemical ; it is directed partly against a tendency towards libertinism, which was growing up and which took for one of its supports the Pauline doctrine of Christian freedom (ii. 1, iii. 16), and partly against the reaction which had set in against the earlier eschatology (iii. 3, 4). It protests in powerful language against the separation of Christianity from holy living, maintaining that Christ- lanity without holy living is worse than no Christianity at

all (c. ii.) ; and it reasserts the reality of the Second Coming, resting it upon the reality of the supernatural evidence of the First Coming (i. 16-18).

The correspondence between this epistle, especially c. 11., and that of Jude is too strong to be a mere coincidence. It was at one time supposed to be the original which Jude imitated (so Semler and Michaelis, and more recently Luthardt and Hofmann), but the preponderance of opinion in modern times is in favour of the opposite view (not only by those who question the authenticity of this epistle but by some also of those who maintain it, e.g., Weiss). A leading argument in favour of the latter hypothesis 1s that 2 Peter ii. 13-17 is an amplification (and some main- tain also a misapplication) of Jude 11, 12, and that 2 Peter ii, 11 requires Jude 9 for its explanation. An equally well-marked correspondence has recently been pointed out between this epistle and Josephus, and the balance of prob- ability is in favour of the priority of the latter.

The differences of style which distinguish the second from the first epistle have been noted since the tinie of Jerome (De Vir. Illustr., c. 1, and Epist. ad [Hedib., c. 11). They are sometimes explained on the ground of the epistles having had different purposes, or having been written at different times; they are more commonly used as indica- tions of a difference of authorship ; and, although the argu- ment from differences of style in comparatively short documents cannot be held to be decisive where the external evidence in their favour is strong, such is not the case with this epistle. The external evidence for it is singularly weak ; there are no certain traces of it earlier than the 3d century, when Origen (ap. Euseb., 77. £., vi. 25), who is the first to mention it, also mentions that it was questioned. It is not included in either the Muratorian Fragment or the Peshito-Syriac (though it is in the later Philoxenian). Eusebius (Z/. £,, iii. 3) ranks it among the disputed books (antilegomena), and Jerome, although he included it in his translation (which fact probably accounts for its general acceptance in the Western churches), méntions that many rejected it. These doubts of early writers, which were revived by Erasmus and Calvin, have been shared by a large proportion of those who have written on the book in modern times; at the same time it cannot be said that there is a consensus of opinion against it.

The best editions of both the epistles are those in the comment- aries of De Wette and Meyer, as revised the former by Briickner and the latter by Huther (this has been translated, with the rest of Meyer’s Commentary, into English) ; there is a convenicnt short English commentary by Dean

Plumptre in the Cambridge Bible Sor Schools. For the doctrinal and other questions which arise out of the two epistles reference may be made, in addition to the works mentioned in the course of the article, to Weiss, ‘‘ Die petrinische Frage,” in Stud. wu. Krit., 1865, p. 619; Grimm, “ Das Problem d. ersten Petrnsbr.,” 2bid., 1872, p. 657; Schmid, New T’es- tament Theology, translated in Clark’s Foreign Theological Library ; Messner, Die Lehre der Apostel, 1856; Farrar, Early Days of Christ- ianity, vol. i. pp. 121, 174; and Sieffert, s.v. “ Petrus,” in Herzog- Plitt’s Real-Eneyklopidie, 2d ed. vol. xi. (E. HA.)

PETER oF Biots, otherwise known as PETRUS BLESENSIS, a writet of the 12th century, was born at Blois in France about the year 1120. He studied theology at Paris, where one of his teachers was John of Salisbury, who exercised a considerable influence over him ; he afterwards resided for some time as a student of law at Bologna. He was then appointed preceptor to William II. of Sicily, and in 1167 made keeper of the privy seal (sigillifer) ; political occur- rences, however, compelled his return in the following year to France, whence he was invited into England by Henry IL., who made him his private secretary. About 1176 he withdrew from court and entered the household of Richard, archbishop of Canterbury, whose chancellor he became.

1 Abbott, in the Hzpositor, 1882, p. 49, and Farrar, The Early Days of Christianity, vol. i. p. 190.

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This office he also held under Baldwin, Richard’s successor, by whom he was sent to Rome in 1187 to support his cause in the controversy with the monks of Canterbury. Peter died about 1200.

His writings, which cover all the fields of intellectual activity then accessible, show him to have been one of the most widely and deeply learned men of his age. ‘They include a number of allegorizing sermons and edifying tracts, a hortatory address, De Jeresolymitana peregrinatione acceleranda, a discourse Contra per- jfidiam Judzorum, and, most interesting for its bearing on the political and ecclesiastical history of his time, a collection of 183 letters to Henry II., as well as to varions popes,

prelates, and scholars, including his old master John of Salisbury. The best edition of his works is that of Pierre de Goussainville, Paris, 1667, fol.

PETER tHe Hermit, the apostle of the first crusade, was born of good family, it is supposed, in the diocese of Amiens about the year 1050. His early history is obscure, but he appears to have seen some military service under the counts of Boulogne before his withdrawal from the world as a hermit. Huis crusading zeal originated in a pilgrimage he made to the Holy Sepulchre shortly before 1094, in which year he began to preach in the transalpine countries the immediate deliverance of Jerusalem from the infidel (see Crusapgs, vol. vi. p. 623 sq.). After the failure of the expedition headed by him in 1096, he founded and became first prior of the abbey of Neuf- moustier at Huy in the diocese of Liége, where he died on (th duly 1115.

PETER IL, ALExEIEevicH, surnamed THE Great (1672- 1725), czar of Russia, was born at Moscow on 11th June 1672. His mother, Natalia Narishkina, was the second wife of the czar Alexis. He was taught reading and writing, and the limited range of subjects which then con- stituted education in Russia, by the deacon Nikita Zotoff. He came to the throne in the year 1682, on the death of his elder brother Feodore; there was another brother, Ivan, who was six years his senior, but he was weak both in body and mind, Feodore therefore had wished Peter to succeed him, but Sophia, his sister, a woman of strong character and great ambition, was desirous that Ivan should rule, so that she might be proclaimed regent and in reality exercise the sovereignty. She therefore fomented a revolt of the ‘“streltzi,” or native militia, and the result was a compromise, whereby Ivan and Peter were to reign jointly. On the death of Ivan in 1696 Peter became sole ruler, and punished Sophia by incarcerating her for life in the Devichi monastery, where she died in 1704. .

With the aid of Lefort, a Swiss adventurer, and other foreigners, Peter commenced his remarkable reforms, for which see Russta. Here nothing more than a brief sum- mary of the leading events of his life is given. In the year 1696 he besieged and took Azoff, his great object being to give Russia a seaboard. In 1697 he made his first Continental tour, on which occasion he worked at the dockyards of Zaandam and Deptford. On leaving Eng-

land he took with him many ingenious men who wished to try their fortunes in a new country,—among them Perry the engineer, who has left us an interesting account of Russia at that time. From England Peter went to Vienna, where he studied the tactics of the imperial army, then enjoying 4 great reputation throughout Europe, and was meditating a visit to Italy when he heard of a revolt of the streltzi, fomented by the partisans of the old régime, in consequence of which he hurried back to Moscow, and on his arrival punished the rebels with the greatest severity.

In the year 1700 he joined Poland and Denmark against Sweden. Although defeated at Narva the same year, he pursued his plans unremittingly, and in 1709 won the battle of Poltava, after which Charles, the Swedish king, became a fugitive in Turkey. In 1703 the foundations of St Petersburg were laid. Peter had married in 1689

Eudoxia Lopukhin, but had divorced her in 1696; she bore him a son, Alexis. In 1711 he took as his second wife Martha Skavronska, whom he caused to be baptized in the Greek Church under the name of Catherine. In this year took place Peter's unsuccessful campaign in Turkey, which ended with the loss of Azoff. The well-known story of his being rescued by Catherine when on the point of being obliged to surrender to the enemy has been shown to be of very doubtful authority. In 1713 Peter had made himself master of a considerable strip of the Swedish coast. In 1716 he went on another European tour in the company of his wife ; on this occasion he visited, among other places, Amsterdam, Copenhagen, and Paris. During his absence his son Alexis, who had been a constant source of trouble to him, became more rebellious and estranged from his father. He was openly leagued with the reactionary party in Russia, who looked forward to his assistance in reversing the policy of Peter, as soon as he should succeed to the throne. Peter on his return in 1718 forced his son to renounce al] claim to the sovereignty. Alexis was after- wards tried for high treason and sentenced to death ; soon it was given out that he had died suddenly. The fate of this wretched young man has only been ascertained in modern times ; it seems tolerably clear that he sank under repeated inflictions of torture. His death is a dark stain upon the character of Peter. On 10th September

1721 the peace of Nystad was concluded, by which Sweden ceded Livonia, Esthonia, Ingria, Carelia, Viborg, and the adjacent islands to Russia. In 1724 Peter went to inspect the works on Lake Ladoga, and further weakened his constitution, which had long been in an unhealthy state on account of the continual excitement and arduous labours of his hfe. The czar died on 28th January 1725.

The character of Peter exhibits a strange congeries of opposed qualities. According to some he "'knouted" Russia into civilization ; others see in him the true "father of his country " and the founder of Russian greatness. In spite of his errors, no one will deny that he was a man of great genius; his was the " fiery soul that, working out its way," exhausted prematurely a vigorous physical organization. Although frequently cruel, on many occasions he showed humanity and tenderness, and even in his most violent fits of temper was amenable to advice, as he evinced in enduring the rebukes of Prince James Dolgoruki. All Russia seems but the monument of this strange colossal man. He added six provinces to her dominions, gave her an outlet upon two seas, a regular army trained in European tactics in lieu of the disorderly militia previously existing, a fleet, and a naval academy, and, besides these, galleries of paint- ing and sculpture and libraries. The title of "Great" cannot justly be refused to such a man.

PETER IL, Atexerevicy (1715-1730), son of Alexis and grandson of Peter the Great, was born at St Peters- burg in 1715, and ascended the throne in 1727. He was under the guardianship of Menshikoff, to whose daughter Mary he was betrothed. The faction of the Menshikoffs was overthrown, however, by the Dolgorukis, to a daughter of whose house the czar was now to be married. All these political plans were rudely broken by the death of Peter in January 1730. During his short reign this youth showed reactionary tendencies, and it seemed as if the capital of Russia was again to be transferred to Moscow. The young czar was buried in the cathedral of the Archangel in that city.

PETER III., Froporovicu (1728-1762), was son of Anna, daughter of Peter the Great, who had married the duke of Holstein. He was born at Kiel in 1728, his real names being Karl Peter Ulrich; he went to Russia in 1742 on

being named heir to the throne. In 1745 he married Sophia Augusta, princess of Anhalt-Zerbst, who,

on entering the Greek Church, took the name of Catherine. They lived very unhappily together. In January 1762 the ezarina Elizabeth dicd and Peter succeeded her. He soon became unpopular on account of his fondness for the. Prussians and the introduction of German regulations in the army. His wife took advantage of his unpopularity and caused herself to be crowned empress, July 1762. Peter showed great want of energy, and only attempted to stem the insurrection when it was too late. He was removed to Ropsha in the government of St Petersburg, and, after having been forced to sign a renunciation of all rights to the throne, was strangled by Orloff and others. He was first buried in the Alexandro-Nevski monastery, but his remains were removed in 1796 by Paul to the Petropavlovski church,

PETERBOROUGH, a city and municipal and parlia- mentary borough, chiefly in Northamptonshire, but partly in Huntingdonshire, is situated on the river Nene, 76 miles north of London by the Great Northern Railway. The town is also a station on the London and North-Western, the Great Eastern, and the Midland systems. It is built chiefly along the river on the north side, the streets being straight and wide, and containing many good houses. The first bridge over the Nene at Peterborough was erected in 1140, the present bridge in 1872. The cathedral of St Peter is the third church that has occupied the site; the first, founded by Peada, king of the Mercians, in 656, was entirely destroyed by the Danes in 870, and the second, founded by King Edgar in 971, was accidentally burnt in 1116. The present building, founded in the following year, was, inclusive of the west front, 120 years in build- ing, being consecrated on 4th October 1237. It is one of the three Norman cathedrals in England, and, though scarcely entitled to a place among cathedrals of the first rank, possesses special features rendering it second almost to none in point of architectural interest. It embraces in all eight periods of construction, and in no other building can the transition be better studied through the various grades of Norman to Early English, while the later addition is an admirable example of Perpendicular. The edifice proceeded as usual from east to west, and, while an increase in elegance and

elaboration is observable in the later parts, the character of the earlier buildings has been so carefully kept in mind that no sense of incongruity is produced. A series of uniform Decorated windows were added through- out the church in the 14th century, and the effect has been rather to enhance than detract from the unity of design. The choir, Early Norman, was founded on 12th March 1117 (or 7th March 1118) by John de Sez, and dedicated in 1140 or 1143; the aisles of both transepts and the whole of the south transept were built by Martin of Bec, 1140-55; the remaining portions of the transepts and the central tower, of three stories, were completed by Wilham de Waterville, 1155-75; the nave, Late Norman, was com- pleted by Abbot Benedict, 1177-93, who added a beautiful painted roof of wood; the western transepts, Transition Norman, were the work of Abbot Andrew, 1193-1200; the western front, with its magnificent triple arch, the unique feature of the building, and one of the finest specimens of Early English extant, must have been built between 1200 and 1250 ; but there exists no record of its construc- tion. The lady chapel, built parallel with the choir by William Parys, prior, was consecrated in 1290; the bell- tower was erected by Abbot Richard between 1260 and 1274; the south-west spire, the pinnacles of the flanking tower of the west portal, and the enlargement of the witidows of the nave and aisles were the work of Henry de Morcot in the beginning of the 14th century ; the new building or eastern chapel in the Perpendicular style, be- gun in 1438, was not completed till 1528. In 1541 the

church was converted into a cathedral, the abbot being made the first bishop. The extreme length of the building is 471 feet, and of the nave 211 feet, the breadth of the west front being 156; the height of the central tower, as reconstructed in the 14th century, was 150, that of the spires and tower of the west front is 156 feet. In 1643 the building was defaced by the soldiers of Cromwell, who destroyed nearly all the brasses and monuments, burnt the ancient records, levelled the altar and screen, defaced the windows, and demolished the cloisters. To obtain mate- rials for repairs the lady chapel was taken down. In the latter part of the 18th century the church was repaved. In 1831 a new throne, stalls, and choir-screen were erected and other restorations completed. On account of the in- secure state of the

central tower in 1883, it was taken down; but it is now (1884) being rebuilt. Catherine of Aragon was interred in the cathedral in 1536, and Mary queen of Scots in 1588, but the body of the Scottish queen was removed to Westminster Abbey in 1612. Of the mon- astic buildings there are some interesting remains. The cathedral is approached by a Norman gateway, above which is the chapel of St Nicholas, built by Abbot Bene- dict, and now used as the music school, and on the left the chapel of St Thomas a Becket, built by Abbot Ashton in the 15th century, and now used as the grammar-school. The gateway to the bishop's palace, formerly the abbot's house, was built by Abbot Godfrey de Croyland in 1319, and the deanery gate by Abbot Kirton in 1515. One of the canonry houses is formed partly from a hall of the 13th century. To the north of the cathedral is Touthill, said to have been erected for the defence of the monastery.

Peterborough is included for civil purposes in the parish of St John the Baptist, but for ecclesiastical purposes it is divided into four, the additional parishes being St Mary's Boongate (1857), St Mark's (1858), and St Paul's (1869). The old parish church of St John originally stood to the east of the cathedral, but was rebuilt on its present site in the centre of the city (1401-7) in the Perpen- dicular style. It consists of chancel, nave, aisles, and an embattled tower adorned with pinnacles. The educational establishments in- clude the Henry VIII. grammar or chapter school; the St Peter's training college for schoolmasters for the dioceses of Peterborough, Ely, and Lincoln, erected from designs of Sir Gilbert Scott (1864), and attended by forty-six pupils; the practising school attached to the training college, attended by 250 boys; and Deacons and Ireland's charity school, established in 1721 for the clothing and educating of twenty poor boys, but lately rcorganized. The prin- cipal public buildings are the market-house (1671), used as a town- hall, the corn exchange (1848) in the Italian style, the liberty jail and house of correction in the Norman style (erected in 1848 and enlarged in 1855 and 1870), the assembly rooms (1853), and the county court and probate office (1878). A cattle-market, 5 acres in cxtent, was opened in 1867, The benevolent institutions in- clude the dispensary and infirmary, several almshouses, and the union workhouse. The modern prosperity and rapid growth of the town are chiefly due to the trade caused by the junction of so many railway lines. Adjoining the town are extensive works and sheds connected with the Great Northern and Midland Railways.

Im- portant cattle-markets and fairs are held, and there is a large transit of meat and cattle to London and elsewhere. An extensive trade in corn, coal, and timber is also carried on. The principal manufacture is that of agricultural implements. The entire par- liamentary city of Peterborough has an area of 6558 acres (of which 6310 are.in Northamptonshire), with a population of 22,394 (of whom 20,123 are in Northamptonshire). The population of the municipal borough (area, 1818 acres) in 1871 was 16,310, and in 1881 it was 21,228. Since 1841 it has more than trebled.

The ancient name of Peterborough was Medeshamstede. The foundation of the great Benedictine abbey of St Peter was laid in 655 by Oswy, king of Northumbria, and Peada, the first Christian king of Mereia. It was the first of the Benedictine abbeys in Gyrwa land (Fenland). In 870 it was plundered by the Danes, after which it remained desolate till 966, when it was restored to its former splendour by Athwald, bishop of Winchester. From that time the town was called a borough, being probably then surrounded by walls; and under Abbot Leofric, nephew of Earl Leofric of Mercia, the abbey became one of the wealthiest in England. In 1169 it was plundered by Hereward. Since the first of Edward IV. the borough has returned two members to parliament. Until 1874 the city was included in the liberty or

soke of Peterborough, the government of which was vested in the lord paramount, the custos rotulorum, and magistrates appointed by the erown, with powers equal to those of judges of assize; a high bailiff of the city was appointed by the dean and elhapter as lords of the manor, who acted as returning officer till the incorpora- tion of the city in 1874. Peterborough is divided into three wards ; for municipal and sanitary purposes it is governed by a mayor, six aldermen, and eighteen councillors, but for magisterial and sessional purposes is still included in the liberty of Peterborough.

Gunton, History of the Church of Peterborough, 1686; Britton, History and Antiquities of the Abbey and Cathedral Church of Peterborough, 1828; Paley, Remarks on the Architecture of Peterborough Cathedral, 1849 ; Sweeting, Notes on Peterborough Cathedral, 1869.

PETERBOROUGH anp MONMOUTH, Cuaruzs Mor- DAUNT, Eart oF (c. 1658-1735), a man whose whole life was passed in the turmoil of excitement, was born about 1658. His father, John Mordaunt, was created Baron Mordaunt of Reigate, Surrey, in 1659; his mother was Elizabeth, the daughter and sole heiress of Thomas Cary, the second son of Robert Cary, earl of Monmouth. He entered upon a long career of warfare when only about sixteen years of age by joining Sir John Narborough's fleet in the Mediterranean, and won his first distinction in arms in Cloudesley Shovel's destruction of the dey's fleet under the very guns of Tripoli. On two subsequent occasions— the first in September 1678, the second in June 1680—he 'embarked in expeditions for the relief of Tangier, but the adventure met with little success, and that troublesome possession was soon after abandoned. His father died 5th June 1675, and Charles Mordaunt succeeded to the peerage. On his return from the second expedition to Tangier he plunged into active political life as a zealous Whig and an unswerving opponent of the duke of York. But his con- tinued hostility to James II. forced him to retire to Holland, when he proposed to William of Orange to invade England. The disposition of the cold and cautious William had little in common with the fierce and turbulent English peer. His plan was rejected, though the prudent prince of Orange deemed it judicious to retain his fiery adherent by his side. When William sailed to Torbay his friend accom- panied him, and when the Dutch prince was safely estab- lished on the throne of England honours without stint were showered upon Lord Mordaunt. He was sworn of the privy council 14th February 1689, made a lord of the bedchamber in the same month, created lord-lieutenant of Northamptonshire shortly after, and in April of the same year appointed first lord of the treasury and advanced in the peerage to be earl of Monmouth. In less than a year he was out of the treasury, but he still remained by the person of his monarch. He was with William in his dangerous passage to Holland in January 1691; and in June 1692, when crossing from England to the same country, he narrowly escaped shipwreck. Although the English king had refused his consent to a bill for triennial parliaments in the previous session, Lord Monmouth did not shrink from reintroducing it in December 1693. This led to a disagreement with the court, though the final breach did not take place until January 1697, when Mon- mouth was accused of complicity in Sir John Fenwick's con- spiracy and of the use of "undutiful words" towards the king. He was committed to

the Tower, staying in confine- ment until April 1697, and deprived of his employments. Some consolation for these troubles came to him in June of the same year, when he succeeded to the earldom of Peterborough. The four years after his release from the Tower were mainly passed in retirement at Parson's Green, Fulham, at a house long since pulled down, but famous for its "extraordinary good rooms" and its spacious gardens. At the close of William's reign Lord Peterborough emerged from his suburban retreat for a time to take part in the prosecution of Lord Somers, and on the accession of Anne he plunged into political life again with avidity. His first act was to draw down on himself in February 1702 the

censure of the House of Commons for the part which he took in the attempt to secure the return of his nominee for the borough of Malmesbury. In the same year he was appointed governor of Jamaica, but he never visited the island over which he ruled, preferring to remain in a part of the world where he could play a more active part in the government of affairs. Through the fear of the ministry that his restless spirit would drive him into opposition to its measures if he stayed at home, he was appointed early -in 1705 to command an expedition of English and Dutch troops in Spain. He was created sole commander of the land-forces and joint-commander with Sir Cloudesley Shovel of the fleet, and at the same time was reinstated a member of the privy council. His first exploit was to seize Denia in Valencia; then, with all the impetuosity of his char- acter, he urged upon the Austrian claimant to the throne the expediency of dashing for Madrid, less than 250 miles distant, only to find that he was overruled by his col- leagues in council. After this repulse he sailed for Bar- celona (August 1705) and commenced to besiege that town. For three weeks the siege languished, until, by a sudden night-attack on 14th September, Peterborough seized the outworks of Montjuich, and three nights later captured the citadel itself. On 14th October the city was his. This was his greatest feat, and in this enterprise he showed, what was usually wanting in his character, both tact and conciliation. After this victory Catalonia declared for the Austrian prince, and Peterborough advanced into Valencia with the object of reducing it to subjection. By threats, cajolements, intrigues, and plots he obtained pos- session of its chief towns, but the prince for whom he was

fighting allowed himself to be surrounded in Barcelona. Peterborough's advice, that Charles should travel by sea to Lisbon and march against Madrid with the allied force of 25,000 men, was disregarded, and the English commander with his little body of 2000 foot and 600 horse then advanced towards Barcelona, which was besieged by a greatly superior force of the enemy. The city was on the point of being captured, when Peterborough, warned of the approach of the English fleet—it is said that the signal of its arrival was a blank sheet of paper—put off in an open boat, and, after journeying to and fro, met with his country's vessels. On 8th May he brought the leading ships into the port of Barcelona, and three days later the French beat a retreat. Again did the English commander urge upon the Austrian claimant of the Spanish throne the expediency of imme- diately advancing to Madrid, and again was the advice rejected, although the capital was occupied by the allied forces under Galway and Das Minas. Charles remained at Barcelona for some weeks, and when at last he did move towards Madrid it was by a route which Peterborough dis- approved of. When difficulties beset Charles on his way the earl joined him, but he soon retired to Valencia in disgust, and then left the country to raise money at Genoa. In a short time he returned to Spain once more, but during his absence the prospects of the allied forces had passed from bad to worse. The leaders of the army differed in their views, and Lord Peterborough quitted the country for ever (March 1707).

On his return to England he allied himself with the Tories, and received his reward in being contrasted, much to his advantage, with the Whig victor of Blenheim and Malplaquet. The differences betwéen the three peers, Peterborough, Galway, and Tyrawley, who had served in Spain, formed the subject of angry debates in the Lords, when the majority declared for Peterborough ; after some fiery speeches the resolution that he had performed many great and eminent services was carried, and votes of thanks were passed to him without any division. His new friends were not desirous of detaining him long on English soil,

and they sent him on a mission where he characteristically engaged the ministry in pledges of which they disapproved. His resentment at this

disagreement was softened by the command of a cavalry regiment, and by his appointment as a Knight of the Garter. A few months before the close of Queen Anne's reign (November 1713) he was despatched as ambassador-extraordinary to the king of Sicily, but was recalled by the Whigs as soon as they obtained the reins of power. With the accession of George I. Lord Peter- borough's influence was gone. Hatred of Marlborough be- came the ruling passion of his mind. His last twenty years of life were passed with the recollection of disappointed hopes and with the continual presence of disease. Worn out with suffering, he died at Lisbon, 25th October 1735. His remains were brought to England and buried at Turvey in Bedfordshire, 21st November.

Lord Peterborough was short in stature and spare in habit of body. His activity knew no bounds. He was said to have seen more kings and postilions than any man in Europe, and the whole point of Swift's lines on " Mordanto" consisted in a description of the speed with which he hastened from capital to capital. Nature had bestowed many gifts upon him, but had denied him more. He was eloquent in debate and intrepid in war, but his influence in the senate was ruined through his inconsistency, and his vigour in the field was wasted through his want of union with his colleagues. He could do nothing like other men. His first wife, Carey, daughter of Sir Alexander Fraser of Mearns, died 13th May 1709, and was buried at Turvey 20th May. Some years later he married Anas- tasia Robinson, a dramatic singer of great beauty and sweetness of disposition ; but she was unrecognized as his wife, and lived apart from him at her mother's house at Parson's Grecn. Nor was it until a few months before his death that she was introduced to society as the countess of Peterborough. (W. P. C.)

PETERHEAD, a seaport, market town, burgh of barony, and parliamentary burgh of Aberdeenshire, Scotland, is situated on a rocky peninsula on the North Sea, about 30 miles north-north-east of Aberdeen and 2 north of Buchan Ness. It has railway communication by a section of the Great North of Scotland line, opened in 1862. The town is built of the red granite of the district. At the extrem- ity of the peninsula is the insular suburb of Keith-Inch. Among the principal buildings are the town-hall (1788), with a granite spire 125 feet high, the music hall, and the court-house. The reading society (1808) possesses a library with upwards of 5000 volumes, and the

mechanics’ insti- tute one with about 1000 volumes. The Arbuthnot Museum contains natural history specimens, a collection of coins, and objects of antiquarian interest. In front of the town-hall is a statue to Field-Marshal Keith (1696- 1758), presented to the burgh by William I. of Prussia in 1868. A market cross was erected in 1832 when the town was created a parliamentary burgh. Peterhead at an early period had an extensive trade with the ports of the Baltic, the Levant, and America. Formerly it was a bonding sub- port to Aberdeen, but was made independent in 1832. The north and south harbours lie between the town and Keith-Inch, and the isthmus dividing them is pierced by a canal, which is crossed by an iron swing-bridge. In the north harbour are two graving-docks. A new harbour was completed in 1878, and the south harbour has been deepened and enlarged. The south bay is to be converted into a national harbour of refuge. The Arctic seal and whale fishing, which in 1802 was prosecuted by only one vessel, employed in 1857 as many as 32 vessels, but since that time it has declined somewhat. The herring fishing, in which the port has long held a leading position (631 boats in 1883), was begun in 1818 by a joint-stock com- pany. The general trade is of considerable importance. The chief exports are herrings (£180,000 in 1883), granite, cattle, and agricultural produce. In 1883 the number of vessels that entered the port with cargoes and in ballast was 864 of 87,839 tons, the number that cleared 840 of 86,318 tons. The town possesses ship and boat building

yards, saw-mills, an iron-foundry, cooperages, agricultural implement works, woollen manufactories, breweries, and a distillery. In the neighbourhood there are extensive granite and polishing works. The limits of the police burgh and the parliamentary burgh are identical, with a population in 1871 of 8535 and in 1881 of 10,922.

The town and lands of Peterhead belonged anciently to the abbey of Deer, built by William Cumming, earl of Buchan, in the 13th century. When the abbey was ereeted into a temporal lordship in the family of Keith, the superiority of the town fell to the earl marischal, with whom it eontinued till the forfeiture of the earldom in 1715. The town and lands were purchased in 1720 by a fishing company in England, and on their failure by the Merehant

Maiden Hospital of Edinburgh for £3000, who are still the superiors of the town. Peterhead was made a burgh of barony in 1598 by George Keith, fourth earl marischal of Scotland. It was the seene of the landing of the Pretender, 25th December 1715. Peterliead is in- cluded in the Elgin district of burghs.

PETERHOF, a town of European Russia, in the govern- ment of St Petersburg, and 18 miles west of the capital, on the south coast of the Gulf of Finland, has grown up round the palace built by Peter the Great in 1711, was constituted a district town in 1848, and has increased its population from 7647 in 1866 to 14,298 in 1881. It is almost exclusively a residential town, but is garrisoned by a cavalry regiment and has the military schools lodged in its barracks for six weeks in the summer. The palace, which is still occupied by the imperial family during part of the summer, has undergone alterations and additions, but retains a distinct Petrine stamp. It is built on a height 60 feet above the sea. The gardens, which owe their magnificence to Alexander I. and Nicholas IL, are laid out in the Versailles style, with elaborate water-works. From the “Marly” summer-house Peter I. loved to watch his fleet beneath the Cronstadt batteries, and in that of ‘“ Mon- plaisir” he died. It was at Peterhof that the empress Alexandra used to celebrate her birthday by fétes at which more than 100,000 persons were present. Peterhof is connected with Oranienbaum on the west and with Strelma on the east by an uninterrupted series of gardens and villas.

PETERS, or Peter, Hueu (1598-1660), a man whose name has for three centuries been rarely mentioned except in terms of infamy, was the son of Thomas Dyckwoode alias Peters, by Martha, daughter of John Freftry of Fowey, Corn- wall, and was baptized in Fowey parish church 29th June 1598. His parents were in good circumstances, and they sent him to Trinity College, Cambridge, where he took the degree of B.A. in 1616 and M.A. in 1622. About the latter date he was licensed by Dr George Montaigne, bishop of London, to the lectureship at St Sepulchre’s, London, but his first definite post in the church was at Rotterdam (1623-32), as colleague of William Ames, whom he much admired, and who died “in his bosom.” In October 1635 he emigrated to Boston in New England, and in the following year became the minister of the first church at Salem in Massachusetts. His abilities soon gave him a prominent place in all the civil and ecclesiastical

affairs of the colony, and in 1641 his reputation was so |

great that he was sent to England as the best guardian of the colony's interests at home. His shrewd judgment, his ready wit, and his zeal for the cause of the Parliament endeared him to the army and its leaders ; he accompanied Fairfax and Cromwell on their campaigns, and described their achievements in numerous letters to the House of Commons. To the adherents of the vanquished cause Hugh Peters always lent his good offices. He was desirous that Laud should be banished, and not executed. It was through his influence that Juxon was permitted to attend Charles after his condemnation, and his acts of kindness to some of the Royalist clergy are mentioned in Walker's Sufferings of the Clergy. Through the favour of the Pro-

| £5 miles to the north-west of Belgrade.

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tector he filled several important offices. He was one of the twenty-one persons appointed to consider the abuses of the national laws; he was a judge for granting probates of wills, and a trier for licensing candidates to the ministry. At the Restoration he was seized and imprisoned in the Tower of London, where he composed his affecting tract, "A Dying Father's Last Legacy to an Only Child." His trial as a regicide took place on 13th October 1660, and he was, of course, condemned to death. Four days later he was drawn on a sledge to Charing Cross and there hanged and quartered, his head being set on a pole on London Bridge. Hugh Peters suffered his cruel death without any sign of wavering. For many years after his death the grossest charges against his memory were cir- culated in catchpenny pamphlets by his enemies, and his name was held up to general execration; but it is clear that these accusations are but the creation of party malice He was twice married ; his first wife was Elizabeth, said to have been the daughter of Thomas Cooke of Pebmarsh, Essex, and the widow of Edmund Read, who died at Wick- ford in the same county November 1623. She died about 1640, and he subsequently married Deliverance Sheffield, the mother of his only child, Elizabeth Peters. The writings of Hugh. Peters and the publications, in print and manuscript, relating to his life are described in the Bibliotheca Cornubiensis. He pleaded, in opposition to Prynne and others,

for the admission of the Jews into England. The chief blot on his fame is his advocacy of the burning of the records.

PETERSBURG, a city and port of entry of the United States, in Dinwiddie county, Virginia, lies 23 miles south of Richmond on the south side of the Appomattox river, which is navigable for large vessels from the James river up to the falls opposite the city, and for flat boats 107 miles above the falls to Farmville. Petersburg is an important railway junction, manufactures tobacco, cotton goods, and iron wares, and carries on a very extensive shipping trade in the export of tobacco, cotton, flour, and peanuts (groundnuts). Its public buildings comprise a court-house, a custom-house, and post-office, two markets, and a theatre; there are two public libraries and a public park (Poplar Lawn). The population was 14,010 in 1850, 18,266 in 1860, 18,950 (10,185 coloured) in 1870, and

21,656 in 1880.

Petersburg was laid out at the same time with Richmond (17388) by Colonel William Byrd, on the site of an Indian village destroyed in 1676. It was first incorporated in 1748. During the Revolu- tionary War it was twice the headquarters of the British under General William Phillips, who died while in possession of the town in1781. The bravery of the Petersburg volunteers on the Canadian frontier in 1812 procured it the title of Cockade City of the south. The terrible siege of Petersburg, lasting from June 1864 to 3d April 1865, was the final Scene of the Civil War.

PETERWARDEIN (Hungarian Petervérad, Servian Petrovaradin), a town and strong fortress of Hungary, is situated on a promontory formed by a loop of the Danube, It is connected with Neusatz on the opposite bank by a bridge of boats

800 feet long. The fortifications consist of the upper

fortress, on a lofty serpentine rock rising abruptly from the plain on three sides, and of the lower fortress at the northern base of the rock. The latter includes the town, which contains (1880) 3603 inhabitants, engaged in wine- growing, agriculture, and the manufacture of liqueurs (rosoglio) and

vinegar. The two fortresses can accom- modate a garrison of 10,000 men. The arsenal contains interesting trophies of the Turkish wars.

Peterwardein, the “Gibraltar of Hungary,” is believed to repre- sent the Roman Acumincum, and received its present name from Peter the Hermit, who here marshalled the levies of the first

erusade. It was captured by the Turks in 1526 and retained by them for 160 years. In 1716 it witnessed a signal defeat inflicted

onthe Turks by Prince Eugene. During the revolutionary struggles of 1848-49 the fortress was hcld by the insurgents for a short time.

PETION DE VILLENEUVE, Jerome (1753-1794), was the son of a procureur at Chartres, where he was born in 1753. He himself became an avocat in his native place in 1778, and at once began to try to make a name in litera- ture. His first printed work was an essay, Sur les Moyens de prévenir (Infanticide, which failed to gain the prize for which it was composed, but pleased Brissot so much that he printed it in vol. vii. of his Bibliothéque philosophique des Legislateurs. Pétion’s next works, Les Lois Civiles, and Essai sur le Mariage, in which he advocated the marriage of priests, confirmed his position as a bold reformer, and when the elections to the States-General took place in 1789 he was elected a deputy to the Tiers Etat for Chartres. Both in the assembly of the Tiers Etat and in the Con- stituent Assembly Pétion showed himself a radical leader. He supported Mirabeau on 23d June, attacked the queen on 5th October, and was elected president on 4th December 1790. On 21st June 1791 he was chosen one of three commissioners appointed to bring back the king from Varennes. After the last meeting of the assembly on 30th September 1791 Robespierre and Pétion were made the popular heroes and were crowned by the populace with civic crowns. Pétion received a still further proof of the affection of the Parisians for himself on 14th November 1791, when he was elected second mayor of Paris in succession to Bailly. In his mayoralty he exhibited clearly his republican tendency and his hatred of the old monarchy, especially on 20th June 1792, when he allowed the mob to overrun the Tuileries and insult the royal family. For neglecting to protect the Tuileries he was

suspended from his func- tions by the Directory of the department of the Seine, but the leaders of the Legislative Assembly felt that Pétion's cause was theirs, and rescinded the suspension on 13th July. On 3d August, at the head of the municipality of Paris, Pétion demanded the dethronement of the king, and on 10th August, while the monarchy was falling with the Tuileries, he patiently underwent a form of detention in his own mairie. He was still mayor of Paris when the mas- sacres of September in the prisons took place, and must bear the blame of not having endeavoured to interfere. He was elected to the Convention for Eure-et-Loir, and became its first president. Manuel then had the folly to propose that the president of the Assembly should have the same authority as the president of the United States ; his proposition was at once rejected, but Pétion got the nickname of 'Roi Pétion," which contributed to his fall. His jealousy of Robespierre allied him to the Girondin party, as did also his assiduous attention at Madame Roland's salon. With the Girondins he voted for the king's death and for the appeal to the people, as one of them he was elected to the first committee of general defence in March 1793, as their representative he attacked Robespierre on 12th April, and it is no matter of wonder, therefore, that his name was among those of the twenty-two Girondin deputies proscribed on 2d June. Pétion was one of those who escaped to Caen and raised the standard of provincial insurrection against the Convention ; and when the Norman rising failed he fled with Guadet, Buzot, Barbaroux, Salle, and Louvet to the Gironde, and hid in a grotto at St Emilion. At last, but a month before Robespierre's fall in June 1794, the escaped deputies felt themselves tracked down, and deserted the grotto ; Louvet found his way to Paris, Salle and Guadet to Bordeaux, where they were soon taken; Barbaroux committed suicide ; and the bodies of Pétion and Buzot were found in

a field, half-eaten by wolves. For Pétion's published works, see the cdition of his Guvres, 3 vols., 1792 ; for his life, see the ridiculous eulogy in J.J. Regnault-

Mémoires de Buzot ct de Barbarowx, with an introduction by C. A. Dauban, 1866 ; and for his last days and death, see C. Vatel, Char- lotte

Corday et ics Girondins, 3 vols., 1872.

PETIS DE LA CROIX, Francois (c. 1653-1713), the best representative of Oriental learning in France during | the last decades of the 17th century and the beginning of the 18th century, was born in Paris about 1653. He was son of the Arabic interpreter of the French court, and inherited this office at his father's death in 1695, after- wards transmitting it to his own son, Alexandre Louis Marie. At an early age he was sent by Colbert to the East ; during the ten years he spent in Syria, Persia, and Turkey he mastered Arabic, Persian, and Turkish, and also collected rich materials for future writings.1 He found, besides, opportunity to equip himself for those diplomatic missions which the French Government entrusted to him soon after his return to Paris in 1680. Having served a short time as secretary to the French ambassador in Morocco, he accompanied as interpreter the French forces sent against Algiers, and greatly contributed to the satis-factory settlement of the treaty of peace between the two countries, which was drawn up by himself in Turkish and ratified in 1684. Ina similar capacity he conducted the negotiations with Tunis and Tripoli in 1685 and those with Moroccoin 1687 ; and the zeal, tact, and linguistic knowledge he manifested in these and other transactions with Eastern courts were at last rewarded in 1692 by his appointment to the Arabic chair in the Collége Royal de France, which he filled until his death in 1713.

He published Contes Turcs, Paris, 1707, and Les Mille et un Jours, 5 vols., Paris, 1710-12, and proved his acquaintance with the Armenian and Ethiopic languages(a powerful impulse to the study of the latter having been given just at that time by the masterly works of Hiob Ludolf) in his Armenian Dictionary and his Aeeount of Ethiopia. But the lasting monument of his literary fame, the one standard work that has outlived many generations and still kecps a distinct merit of its own, is his excellent French version of Sharaf-uddin 'Ali Yazdi's Zafarndma, or History of Timur (completed 828 A.H.;

| 1425 a.p.), which was given to the world nine years after his dcath,

1722 (4 vols., Paris ; translated into English by J. Darby, London, 1728). This work, renowned throughout the East as a model of elegant style, and one of the rare specimens of a fairly critical history Persia can boast of, was

compiled under the auspices of Mirza Ibrahim Sultan, the son of Shah Rukh and grandson of the great Timur himself. This prince collected all the official records of Timur's reign, both in Turkish and Persian, collated and revised them, and had then an accurate text drawn up by his secretaries, which was turned by Sharaf-uddin into elegant and refined language and revised by Ibrahim Sultan himself (see Rieu's Cat. Persian MSS. in the Brit. Mus., i. p. 173 sqg.). The only error committed by Petis de la Croix in his otherwise very correct translation is that he erroneously ascribed the important share which Ibrahim Sultén had in the Zafarndma to Timur himself.

PETITION is an application for redress by a person aggrieved to an authority capable of relieving him. It may be made in the United Kingdom to the crown or its delegate, or to one of the houses of parliament.

The right of petitioning the crown was recognized in- directly as early as Magna Charta in the famous clause, Nulli vendemus, nulli negabimus aut differemus, rectum aut justitiam, and directly at various periods later, e.g., in the articles of the Commons assented to by Henry IV., by which the king was to assign two days in the week for petitions, it being an honourable and necessary thing that his lieges who desired to petition him should be heard (Rot. Parl., 8 Hen. IV., p. 585). The case of the seven bishops in 1688 confirmed the right, and finally the Bill of Rights in 1689 declared "that it is the right of the subjects to petition the king, and all commitments and prosecutions for such petitioning are illegal." Petitions to the crown appear to have been at first for the redress of

1 Many of these—as the account of Jerusalem, Modern and Ancient, the Travels through Syria and Persia, the Antiquities and Monuments of Egypt, the translations of Pseudo-Wakidt's Congwest of Syria and of Haji Khalfa's Dictionary, and the History of the Ottoman Empire—

Warin's Vie de Pétion, 1792, and Mémoires inédits de Pétion. et | still remain in manuscript.

private and local grievances, or for remedies beyond those possessed by the courts. As equity grew into a system, peti- tions of this kind tended to become superseded by bills in chancery (see CHANCERY). Statutes were originally drawn up by the judges at the close of the session of parliament from the petitions of the Commons and the answers of the crown. In the drawing up of the statutes frauds were at times committed, the judges not always reciting correctly the tenor of the petition or answer. To obviate this danger complete statutes in the form of bills began to be introduced into parliament in the reign of Henry VI. The crown could accept or reject them, but could not alter them (see Hallam, Middle Ages, ch. viii. pt. 3). A relic of the old form of the statute founded upon petition still remains in the preamble of Appropriation Acts and other statutes creating a charge upon the public revenue. It runs thus: “We, your majesty’s most dutiful and loyal subjects, the Commons of the United Kingdom . . . do most humbly beseech your majesty that it may be enacted; and be it enacted, &c.,” from this point following the en- acting words common to all statutes. Petitions to the crown from the House of Commons in other matters now usually take the form of addresses. The crown may refer petitions presented to it to be adjudicated upon by a dele- gated authority. This is the course pursued in the case of peerage claims, which are referred to the House of Lords, and by that House to the committee for privileges, and in the case of petitions to the crown in council, with which the judicial committee in most cases deals (see below); or the crown may delegate the power of receiving petitions in the first instance. Examples of petitions to the delegated authority are those addressed to a court of justice or those addressed to the home secretary for the pardon or mitigation of punishment of a convicted criminal. Petitions to the houses of legislature seem to have been later in origin than petitions to the crown. The political importance of petition- ing dates from about the reign of Charles I. The develop- ment of the practice of petitioning had proceeded so far in the reign of Charles IT. as to lead to the passing of 13 Car. II. c. 5 against tumultuous petitioning. This is still law, though it has ceased to be enforced. It provides that no petition or address shall be presented to the king or either house of parliament by more than ten persons; nor shall any one procure above twenty persons to consent or set their hands to any petition for alteration of matters estab- lished by law in church or state, unless with the previous order of three justices of the county, or the major part of the grand jury. Up to 1688 petitions usually

dealt only with some specific grievance; from that time dates the present practice of petitioning with regard to general measures of public policy. Since 1833 more than 700,000 petitions on public matters have been presented to the House of Commons. Petitions to the crown need not apparently be in any particular form, but no doubt they would not be received if couched in unbecoming language. Petitions to the Houses of Lords and Commons must be framel in a prescribed form. They must be properly superscribed, and must conclude with a prayer. They must be in writing (in the Commons), must contain none but genuine signatures, and must be free from disrespectful language or imputations upon any tribunal or constituted authority. They must be presented by a member of the House, except petitions to the House of Commons from the corporation of London, which may be presented at the bar by the sheriffs, and from the corporation of Dublin, which may be presented by the lord mayor. Though a petition is made to the House, in practice petitions to the Commons are referred to the committee on public peti- tions, under whose directions they are classified and analysed. In the Lords receivers and triers of petitions

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are still appointed, though their functions have long been obsolete. of either house, provided they fulfil certain conditions as to weight, &c. (see May, Parliamentary Practice, ch. xika

Petitions may be sent free by post to members

In the United States the right of petition is secured by Art. 1 of the Amended Constitution, which enacts that “Congress shall make no law abridging . . . the right of the people peaceably to assemble and to petition the Government for a redress of grievances.”

Petitions to a Court of Justice.—Strictly speaking these are no doubt an indirect mode of petitioning the crown, for in the theory of English law the crown is the fountain of justice. But it is more convenient to treat them sepa- rately, as they now form a part of the practice of the courts. Appeals to the House of Lords and the privy council are prosecuted by petition of appeal. The House of Lords has now no original jurisdiction in judicial matters ; the original jurisdiction of the privy council in such matters is

confined to petitions under certain statutes, such as the Endowed Schools Acts 1867 and 1873, the Public Schools Act 1868, the Universities Act 1877, and the Patents Act 1883. In most cases the petitions are referred to the judicial committee of the privy council. Petitions may be addressed to the lord chancellor in a few instances, such as the sealing of patents and the removal of coroners and county court judges. The most important use of petitions in England is in the Chancery Division of the High Court of Justice. They may be presented either as interlocutory proceedings in the course of an action, or as original proceedings where no litigation exists,—a petition being generally a more cheap and speedy form of remedy than an action. Petitions in the course of an action are usually presented to the court in which the action is brought. Examples of original petitions are those under the Lands Clauses Acts, the Trustee Acts, the Companies Acts. In a few cases they may be brought by way of appeal, ¢.g., under the Charitable Trusts Act 1860. Peti- tions are also modes of procedure in other courts with juris- diction in equity, as the chancery courts of the county palatine of Lancaster and the county courts, in the latter only in certain cases falling within the County Courts Act 1865, 28 and 29 Vict. c. 99, s. 1 (5) and (6). They are used to initiate proceedings in bankruptcy and divorce, but are almost unknown in the Queen's Bench Division ; the only case of procedure by petition in that division seems to be the petition to sue in forma pauperis. Evi- dence in support of a petition is usually given by affidavit.

In Scotland petitions in the Court of Session are either original or in a pending action. Original petitions are presented to one of the divisions of the inner house, unless they are included in any of the matters mentioned in 20 and 21 Vict. c. 56, s. 4, when they are brought before the junior lord ordinary, or unless, by special statutory provision, they may be brought before any lord ordinary, as in the case of petitions under the Conjugal Rights Act 1861, or the Trusts Act 1867. In the sheriff court actions are commenced by petition (39 and 40 Vict. c. 70, s. 6). A petition and complaint is a process of a quasi-criminal nature by which certain matters of extraordinary jurisdic- tion are brought under the notice of the Court of Session. It lies against magistrates and officers of the law for breach of duty, against parties guilty of contempt of court, &c. The concurrence of the lord advocate is necessary to a petition and complaint. A reclaiming

petition, obsolete in the Court of Session, is a form of process of appeal in the sheriff court. See 39 and 40 Vict. ¢. 70-8. 28, 36

In the United States petitions can be presented to the courts under much the same circumstances as in England. “Tt is a general rule in such cases that an affidavit should be made that the facts therein contained are true as far as

known to the petitioner, and that those facts which he states as knowing from others he believes to be true” (Bouvier, Law Dict.).

Election Petition.—The article ELEcTIOoNS must now be read subject to the Parliamentary Elections Act 1879 and the Judicature Act 1881. By the Act of 1879 the trial of an election petition is conducted before two judges instead of one, as before. If the judges differ in opinion as to whether the member petitioned against is duly elected or not, he is deemed to be duly elected. The Act of 1881 provides for the annual appointment of three judges of the Queen's Bench Division for the trial of election petitions, and makes the judgment of the High Court of Justice in election cases final unless leave be given to appeal to the Court of Appeal. No appeal lies to the House of Lords, nor can any judge who is a peer sit on the trial of an election petition.

Petition of Right is a term confined to English law. It is used in two senses. (1) It denotes the statute 3 Car. I. c. 1, a parliamentary declaration of the liberties of the people. (See ENGLAND, vol. viii. p. 345.) (2) It denotes a mode of prosecuting a claim against the crown by a sub- ject. This remedy is said to owe its origin to Edward I. It lies as a rule for obtaining possession of real or personal property, or for breach of contract, not for breach of public duty, as failure to perform treaty obligations, or for trespass, or for negligence of crown servants. The remedy where the crown is in possession of property of the sup- pliant, and the title of the crown appears-by record, as by inquest of office, is a somewhat different one, called mon- strans de droit. The procedure on a petition of right is either at common law or by statute. At common law the petition suggests such a right as controverts the title of the crown, and the crown indorses upon the petition Sozt droit fait al partie. Thereupon a commission is issued to inquire into the truth of the suggestion. After the return to the commission, the attorney-general pleads or demurs, and the merits are then determined as in actions between subject and subject. If the right be determined against the crown, judgment of ousterlemain or amoveas manus is given in favour of the suppliant. The Petitions of Right Act 1860 (23 and 24 Vict. c. 34, extended to Ireland by 36 and 37 Vict. c. 69) preserves to the suppliant his right to proceed at common law, but gives an alternative remedy. In proceedings under the statute the petition is left with the secretary of state for the home department for her majesty's consideration. She, if she think fit, grants her fiat that right be done, whereupon the fiat is served upon the

solicitor to the treasury, and a statement of defence is put in on behalf of the crown. The proceed- ings are thenceforth assimilated as far as possible to those in an ordinary action. A judgment in favour of the sup- pliant is equivalent to a judgment of amoveas manus. Costs are payable to and by the crown. A petition of right is tried in the Chancery or Queen's Bench Division, unless the subject-matter of the petition arises out of the exercise of belligerent right on behalf of the crown, or would be cognizable in a prize court if the matter were in dispute between private persons. In either of these cases the suppliant may at his option intitule his petition in the Admiralty Division (27 and 28 Vict. c. 25, s. 52). (3. wT.)

PETRA (7 Ilérpa, in ecclesiastical writers also ai Hérpaz), the capital city of the NAaBATHANS (q.v.), and the great centre of their caravan trade, is described by Strabo (xvi. p. 779) as lying in a level place, well supplied with water for horticulture and other uses, but encircled bya girdle of rocks, abrupt towards the outer side. The surrounding country was barren, especially towards Judzea ; the distance from Jericho was three to four days' journey, and from Phoenicum on the Red Sea, coast five (see plate VI., vol. vii.). Accord-

ing to Pliny (WV. #., vi. 144) the little valley of Petra is not quite 2 miles across, and lies at the junction of two roads, from Palmyra and Gaza respectively, 600 miles from the latter. These and other ancient notices leave no doubt as to the identity of the site with the modern Wady Musé in the mountains which form the eastern wall of the great valley between the Dead Sea and the Gulf of Akaba. Wady Musa lies just north of the watershed between the two seas, in 30° 19' N. lat. and 35° 31' E. long.! Travellers coming up the Arabah usually approach the ruins of Petra from the south-west by a rough path, partly of artificial construc- tion"; but the natural entrance is from the east down a narrow defile more than a mile long, called the Sik ("shaft"). The Sik is a contraction in the valley of a stream which comes down from the east, rising in a spring now known as the Fountain of Moses ('Ain Muséd),* and passing between the villages of Elji and 'Aireh (Palmer). Both these places are ancient; the latter is the fortress Wo'aira of YAkut,* while Elji, mentioned by Edrisi, is the "Gaia

urbs juxta civitatem Petram” of the Onomasticon.® Below these and above the ravine the characteristic rock- cut tombs and dwellings of the Nabatzans begin to appear. But to reach the city proper from these upper settlements one must traverse the whole length of the defile, which is simply a narrow waterway, in some places not more than 10 or 12 feet broad, and walled in by rich brown or red precipices rising from 60 to 120 feet (De Luynes; Stanley doubles this height) above the stream. In ancient times there was a paved path beside the channel, and remains of an arch spanning it are seen high in the air near the en- trance. Towards the lower end of the gorge, a turn in the dark path and the descent of a side valley admit a sudden flood of light, and here stands the most famous ruin of Petra, the so-called Khazna, or ‘treasury of Pharaoh,” with a rich facade of late Roman style, not built but hewn out of the rose-coloured limestone. The next turn gives room for a rock-cut theatre, and from this point the gorge begins to open out into the little plain described by Strabo, and gives perhaps the most striking view of the multi- plicity of grottoes with elaborate classical fagades which line the enclosing mountain-wall. The plain itself is strewn with ruins of temples and other buildings, and stairs once led up the rocky walls to higher structures, of which the most notable is now called the “convent” (Al-Deir). The grottoes are inhabited in cold weather by the Liyé- thina Fellahin, who also hold the upper part of the valley, and are so troublesome and extortionate that no thorough exploration of the district has yet been carried out. It is not even known where the torrent-bed leads on leaving the plain of Petra. De Luynes describes the water as wholly absorbed by the sands near the theatre, but there is an unexplored gorge to the south-west which is the con- tinuation of the valley.

The Nabatzeans, as we see from Diodorus, used Petra as a place of refuge and a safe storehouse for their treasures of frankincense, myrrh, and silver before they gave up their nomadic habits. But Petra was not only safe and well

1 The latitude and longitude are taken from De Luynes’s map. Ptolemy, who, according to Olympiodorus, spent some time in Petra, and doubtless owes to this fact his excellent information about the caravan-routes in Arabia, gives the latitude, with surprising accuracy, as 80° 20’.

2 Compare Diod., xix. 97, who describes the Nabatean fortress— it was not a town at the time in question (312 B.c.), for the Nabateans were still nomads when they were attacked by Antigonus—as ascended to by a single artificial path.

3 This seems to be the fountain mentioned by Nowairi, ap. Quatre- mére's Mélanges, p. 84, which flowed with blood and was changed to water by Moses. The name Od-dema, which gave rise to this legend, may possibly be a relic of the old name of Edom.

4 Perhaps also the Iram, OVY, of Gen. xxxvi. 43.

5 See Tuch's Genesis, 2d ed., p. 271, note.

watered, it lay close to the most important lines of trade. | s.a. ; Palmer, Desert of the Exodus, vol. ii., 1871; Stanley, Sinai

The modern pilgrim-road from Damascus to Mecca, which has taken the place of the old incense-route, passes indeed a little to the east by Ma'an. But to touch Petra involves no great detour even on this line, and in ancient times, when Gaza was the great terminus of the Arabian trade, Petra was the place where the Gaza road branched off from that to Bostra, Palmyra, and north Syria. The route from Egypt to Damascus is also commanded by Petra, and from it too there went a great route direct through the desert to the head of the Persian Gulf. Thus Petra became a centre for all the main lines of overland trade between the East and the West, and it was not till the fall of the Nabatean kingdom that PatmyRra (q.v.) superseded it as the chief emporium of north Arabia. Many Roman and other foreign merchants were settled here even in the time of Strabo, and he describes the caravans which

passed between it and Leuce Come on the Red Sea coast as comparable to armies.

Petra! is a Greek name which cannot have been that used by the Semitic inhabitants, and from Josephus (Axt., iv. 7,1; 4,7) and the Onomastica (ed. Lag., p. 286 sq.) it may be concluded that the natives called the place Rekem (aps), a designation probably derived from the variegated colours of the rocks about Wady Musa, to which all travellers refer with admiration.2 But Petra had yet another ancient name familiar from the Bible. The Biblical Sela (generally with the article ybpn), a city of

Edom (2 Kings xiv. 7 ; Isa. xvi. 1 ; also Judges i. 36, where E.V. has “the rock” ; perhaps also Isa. xi. 11), appears to be identified with Petra by the LXX., and certainly is so by the Onomastica. Petra, in fact, or the ‘‘rock,” seems to be simply a translation of Sela, but a somewhat loose one,—for the Hebrew name, corresponding to the Arabic Sal‘, is properly a hollow between rocks, just such a place as Petra is. The fortress of Edom, according to Obadiah 3, lay “in the clefts of the Sela,” and seemed impregnable. And that the name of Sela survived the Nabatzean occupation is known from Yakut, who places a fortress Sal‘ in Wady Mus& (comp. Néldeke in Z7.D.IL.G., xxv. 259). Petra, therefore, was a city before the Nabateans, and, occupying one of the few cultivable spots in the dis- trict, probably never wholly ceased to be inhabited. This identification disposes of another which was accepted alike by the Jewish and Christian Aramaic versions of the Old Testament, and, passing from the Aramzans to the Arabs, has given rise to the modern names Fountain and Wady of Moses (comp. Yakut, iv. 879). According to these versions Rkém, Rkaém, or more precisely Rkém of Gaid (that is, Elji), is Kadesh Barnea, where flowed the waters of Strife or “well of judgment” (Gen. xiv. 7; Num. xx. 1 sq., xxvil. 14), where Moses struck the rock. This view is ably supported by Greene (The Hebrew Migration from Egypt); others identify Kadesh with ‘Ain Kadifs (Kudais) on the south border of Judea.

Petra survived the fall of the Nabatean kingdom, and indeed most of the buildings may be dated from the 2d and 3d centuries. It appears from coins that Hadrian took it into favour and gave it his name. But Palmyra absorbed its trade with the Persian Gulf, and long before Islam the great ineense-

route was deserted and left Petra, like the more southern Nabatean city of Egra (Hijr), to fall into ruin. The ruins were an object of euriosity in the Middle Ages, and were visited by Sultan Bibars (Quatremére, J.c.). The first European to describe them was Burekhardt, and sinee his time they have often been visited. See the descriptions, plans, and views of Laborde and Linant, Arabie Petrée (Paris, 1830-34) ; the Due de Luynes, Voyage d'cxploration a& la mer morte, &e., Paris,

1 Arabia Petrea is not properly Stony Arabia, but the Arabia of which Petra is the centre—% xara Iérpay ApaBla of Agathemerus.

2 The rock-hewn city of Rakim (Istakhri, 64 ; éogr. d' Abulf., Fr. tr., i. 2, 5), which Schultens (Ind. Geog. in Vit. Sal.) proposes to Mee with Petra, is a different place, close to 'Amman (Mokaddasi, p. :

and Palestine; Guérin, Terre Sainte, 1888. (W. R. 8S.)

PETRARCH (1304-1374). Francesco Petrarca, eminent in the history of literature both as one of the four classical Italian poets and also as the first true reviver of learning in medieval Europe, was born at Arezzo on 20th July 1304. His father Petracco held a post of notary in the Florentine Rolls Court of the Riformagioni ; but, having espoused the same cause as Dante during the quarrels of the Blacks and Whites, Petracco was expelled from Florence by that decree of 27th January 1302 which condemned the poet of the Dzvine Comedy to lifelong exile. With his wife he took refuge in the Ghibelline township of Arezzo ; and it was here, on the very night when his father, in company with other members of the White party, made an unsuccessful attempt to enter Florence by force, that Francesco first saw the light. He did not remain long in his birthplace. His mother, having obtained permission to return from banishment, settled at Incisa, a little village on the Arno above Florence, in February 1305. Here Petrarch spent seven years of boyhood, acquiring that pure Tuscan idion1 which afterwards he used with such con- summate mastery in ode and sonnet. Here too, in 1307, his brother Gherardo was born. In 1312 Petracco set up a house for his family at Pisa ; but soon afterwards, finding no scope there for the exercise of his profession as jurist, he removed them all in 1313 to Avignon. 'This was a step of no small importance for the future poet-scholar. Avignon at that period still belonged to Provence, and owned King Robert of Naples as

sovereign. But the popes had made it their residence after the insults offered to Boniface VIII. at Anagni in 1303. Avignon was there- fore the centre of that varied society which the high pontiffs of Christendom have ever gathered round them. Nowhere else could the youth of genius who was destined to impress a cosmopolitan stamp on medieval culture and to begin the modern era have grown up under conditions more favourable to his task. At Incisa and at Pisa he had learned his mother-tongue. At Carpentras, under the direction of Convennole of Prato, he studied the humani- ties between the years 1315 and 1319. Avignon, at a distance from the party strife and somewhat parochial politics of the Italian commonwealths, impressed his mind with an ideal of civility raised far above provincial pre-judices. What Petrarch lost in depth and intensity he gained in breadth and serenity by this exile's education. That disengagement from local circumstance which marks his patriotic theories, that conception of self-culture as an end in itself which distinguishes the humanism he in-augurated, were natural toa man who had no country, and who found the spiritual city of his studies and his aspira- tions in all quarters of the habitable globe.

Petrarch's real name, according to Tuscan usage, was Francesco di Petracco. But he altered this patronymic, for the sake of euphony, to Petrarca, proving by this slight change his emancipation from usages which, had he dwelt at Florence, would most probably have been imposed on him. It does not appear that he was attached to either his father or his mother ; and, though he loved his brother Gherardo dearly, we recognize in him that type of character for which the self-chosen ties of friendship are more en-thralling than the piety of domestic affection. Petracco, who was very anxious that his eldest son should become an eminent jurist, sent him at the age of fifteen to study law at Montpellier. Like Ovid and many other poets, Petrarch felt no inclination for his father's profession. His intellect, indeed, was not incapable of understanding and admiring the majestic edifice of Roman law; but he shrank with disgust from the illiberal technicalities of practice. There is an authentic story of Petracco's flinging

the young student's books of poetry and rhetoric upon the fire, but saving Virgil and Cicero half-burned from the flames at his son's passionate entreaties. Notwithstanding Petrarch's firm determination to make himself a scholar and a man of letters rather than a lawyer, he so far submitted to his father's wishes as to remove about the year 1323 to Bologna, which was then the headquarters of juristic learning. There he stayed with his brother Gherardo until 1326, when his father died, and he returned to Avignon. Banishment and change of place had already diminished Petracco's fortune, which was never large ; and a fraudulent administration of his estate after his death left the two heirs in almost complete destitution. The most precious remnant of Petrarch's inheritance was a MS. of Cicero. There remained no course open for him but to take orders. This he did at once on his arrival in Provence ; and we have good reason to believe that he advanced in due time to the rank of priest. A great Roman noble and ecclesiastic, Giacomo Colonna, afterwards bishop of Lombez, now befriended him, and Petrarch lived for some years in partial dependence on this patron.

On the 6th of April 1327 happened the most famous event of Petrarch's history. He saw Laura for the first time in the church of St Clara at Avignon. Who Laura was remains uncertain still, That she was the daughter of Audibert de Noves and the wife of Hugh de Sade rests partly on tradition and partly on documents which the abbé de Sade professed to have copied from originals in the last century. Nothing is now extant to prove that, if this lady really existed, she was the Laura of the Canzon- zere, while there are reasons for suspecting that the abbé was either the fabricator of a romance flattering to his own family, or the dupe of some previous impostor. We may, however, reject the sceptical hypothesis that Laura was a mere figment of Petrarch's fancy ; and, if we accept her personal reality, the poems of her lover demonstrate that she was a married woman with whom he enjoyed a respectful and not very intimate friendship.

Petrarch's inner life after this date is mainly occupied with the passion which he celebrated in his Italian poems, and with the friendships which his Latin epistles dimly reveal to us. Besides the bishop of Lombez he was now on terms of intimacy with another member of the great Colonna family, the Cardinal Giovanni. A German, Lud- wig, whom he called Socrates, and a

Ronian, Lello, who received from him the classic name of Lelius, were among his best-loved associates. He probably owed his livelihood to the generosity of prelates, with whom he played the courtier or the secretary ; for we do not hear of his having occupied any benefice at this period. Avignon was the chief seat of his residence up to the year 1333, when he became restless, and undertook his first long journey. On this occasion he visited Paris, Ghent, Liége, Cologne, making the acquaintance of learned men and copying the manuscripts of classical authors. On his return to Avignon he engaged in public affairs, pleaded the cause of the Sealigers in their lawsuit with the Rossi for the lordship of Parma, and addressed two poetical epistles to Pope Benedict XII. upon the restoration of the papal see to Rome. His eloquence on behalf of the tyrants of Verona was successful. It won him the friendship of their ambas- sador, Azzo di Correggio,—a fact which subsequently in- fluenced his life in no small measure. At the same time his treatment of the papal question made him pose as an Italian patriot clinging to the ideal of Rome as the sovereign city of civilization. Not very long after these events Petrarch made his first journey to Rome, a journey memorable from the account which he has left us of the impression he received from its ruins.

It was some time in the year 1337 that he established

Yeu? himself at Vaucluse and began that life of solitary study heightened by communion with nature in her loneliest and wildest moods, which distinguished him in so remarkable a degree from the common herd of medieval scholars. Here he spent his time partly among books, neditating on Roman history, and preparing himself for the Latin epic of Africa. In his hours of recreation he climbed the hills or traced the Sorgues from its fountain under those tall limestone cliffs, while odes and sonnets to Madonna Laura were committed from his memory to paper. We may also refer many of his most important treatises in prose, as well as a large portion of his Latin correspondence, to the leisure he enjoyed in this retreat. Some woman, unknown to us by name, made him the father of a son, Giovanni, in the year 1337; and she was probably the same who brought him a daughter, Francesca, in 1343. Both children were afterwards legitimized by papal bulls. Meanwhile his fame as a poet in the Latin and the vulgar tongues steadily increased, until, when the first draughts of the

Africa began to circulate about the year 1339, it became mani- fest that no one had a better right to the laurel crown than Petrarch. A desire for glory was one of the most deeply-rooted passions of his nature, and one of the points in which he most strikingly anticipated the humanistic scholars who succeeded him. It is not, therefore, surprising to find that he exerted his influence in several quarters with the view to obtaining the honours of a public corona- tion. The result of his intrigues was that on a single day in 1340, the 1st of September, he received two invitations, from the university of Paris and from King Robert of Naples respectively. He chose to accept the latter, jour- neyed in February 1341 to Naples, was honourably enter- tained by the king, and, after some formal disputations on matters touching the poet's art, was sent with magnifi- cent credentials to Rome. There, in the month of April, Petrarch assumed the poet's crown upon the Capitol from the hand of the Roman senator amid the plaudits of the people and the patricians. The oration which he delivered on this occasion was composed upon these words of Virgil: '*Sed me Parnassi deserta per ardua dulcis Raptat amor."

The theme was well chosen ; and the ceremony, though we cannot but regard it with a somewhat pitying smile, was symbolical of much. According to medizval concep- tions, Rome, though abandoned by her emperor and pope, was still the mistress of the world; and the poet, who upon that April day uttered the passion for Parnassus which drew him through steep and desert regions, was destined to revive the arts and sciences in the midst of a barren age. The ancient and the modern eras met together on the Capitol at Petrarch's coronation, and a new stadium for the human spirit, that which we are wont to style Renaissance, was opened.

With the coronation in Rome a fresh chapter in the biography of Petrarch may be said to have begun. Hence- forth he ranked as a rhetorician and a poet of European celebrity, the guest of princes, and the ambassador to royal courts. During the spring months of 1341 his friend Azzo di Correggio had succeeded in freeing Parma from subjugation to the Scaligers, and was laying the foundations of his own tyranny in that city. He invited Petrarch to attend him when he made his triumphal entry at the end of May; and from this time forward for a con- siderable period Parma and Vaucluse were the two head- quarters of the poet. The one he called his

transalpine, the other his cisalpine Parnassus. The events of the next six years of his life, from May 1341 to May 1347, may be briefly recapitulated. He lost his old friend the bishop of Lombez by death and his brother Gherardo by the entrance of the latter into a Carthusian monastery. Various

small benefices were conferred upon him; and repeated offers of a papal secretaryship, which would have raised him to the highest dignities, were made and rejected. Petrarch remained true to the instinct of his own vocation, and had no intention of sacrificing his studies and his glory to ecclesiastical ambition. In January 1343 his old friend and patron Robert, king of Naples, died, and Petrarch was sent on an embassy from the papal court to his suc- cessor Joan. The notices which he has left us of Neapolitan society at this epoch are interesting, and it was now, perhaps, that he met Boccaccio for the first time. The beginning of the year 1345 was marked by an event more interestingin the scholar's eyes than any change in dynasties. This was no less than a discovery at Verona of Cicero's Familiar Letters. It is much to be regretted that Petrarch found the precious MS. so late in life, when the style of his own epistles had been already modelled upon that of Seneca and St Augustine. No one, not even Erasmus, would have profited more by the study of those epistolary masterpieces, or would have been better able to imitate their point and ease of diction, had he become acquainted with them at an earlier period.

In the month of May 1347 Cola di Rienzi accomplished that extraordinary revolution which for a short space revived the republic in Rome, and raised this enthusiast to titular equality with kings. Petrarch, who in politics was no less visionary than Rienzi, hailed the advent of a founder and deliverer in the self-styled tribune. Without considering the impossibility of restoring the majesty of ancient Rome, or the absurdity of dignifying the medieval Roman rabble by the name of Populus Romanus, he threw himself with passion into the republican movement, and sacrificed his old friends of the Colonna family to what he judged a patriotic duty. To follow the meteoric course of Rienzi through those months of mock supremacy, exile, and imprisonment at Avignon does not concern Petrarch's biographer. It will be enough to say that the poet con- tented himself with writing a rhetorical

exhortation to the Roman people on the occasion of the tribune's downfall, giving vent, as usual, through eloquence to emotions which men of more practical character strove to express in act.

Petrarch built himself a house at Parma in the autumn of 1347. Here he hoped to pursue the tranquil avocations of a poet honoured by men of the world and men of letters throughout Europe, and of an idealistic politician, whose effusions on the questions of the day were read with plea- sure for their style. But in the course of the next two years this agreeable prospect was overclouded by a series of calamities. Laura died of the plague on the 6th April 1348. Francesco degli Albizzi, Mainardo Accursio, Roberto de' Bardi, Sennuccio del Bene, Luchino Visconti, the car- dinal Giovanni Colonna, and several other friends followed to the grave in rapid succession. All of these had been intimate acquaintances and correspondents of the poet. Friendship with him was a passion ; or, what is more true perhaps, he needed friends for the maintenance of his intellectual activity at the highest point of its effectiveness, Therefore he felt the loss of these men acutely. We may say with certainty that Laura's death, accompanied by that of so many distinguished associates, was the turning-point in Petrarch's inner life. He began to think of quitting the world, and pondered a plan for establishing a kind of humanistic convent, where he might dedicate himself, in the company of kindred spirits, to still severer studies and a closer communion with God, Though nothing came of this scheme, a marked change was henceforth perceptible in Petrarch's literary compositions. The poems written In Morte di Madonna Laura are graver and of more religious tone. The prose works touch on retrospective topics or deal with subjects of deep meditation. At the

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same time his renown, continually spreading, opened to him ever fresh relations with Italian despots. The noble houses of Gonzaga at Mantua, of Carrara at Padua, of Este at Ferrara, of Malatesta at Rimini, of Visconti at Milan, vied with Azzo di Correggio in entertaining the illustrious man of letters. It was in vain that his correspondents pointed out the discrepancy between his professed zeal for Italian liberties, his recent enthusiasm for the Roman republic, and this alliance with tyrants who were destroying the

freedom of the Lombard cities. Petrarch remained an incurable rhetorician ; and, while he stigmatized the despots in his ode to Italy and in his epistles to the emperor, he accepted their hospitality. They, on their part, seem to have understood his temperament, and to have agreed to recognize his political theories as of no practical import- ance. The tendency to honour men of letters and to patronize the arts which distinguished Italian princes throughout the Renaissance period first manifested itself in the attitude assumed by Visconti and Carraresi to Petrarch. When the jubilee of 1350 was proclaimed, Petrarch made a pilgrimage to Rome, passing and returning through Florence, where he established a firm friendship with Boccaccio. It has been well remarked that, while all his other friendships are shadowy and dim, this one alone stands out with clearness. Each of the two friends had a distinguished personality. Each played a foremost part in the revival of learning. Boccaccio carried his admira- tion for Petrarch to the point of worship. Petrarch repaid him with sympathy, counsel in literary studies, and moral support which helped to elevate and purify the younger poet's over-sensuous nature. It was Boccaccio who in the spring of 1351 brought to Petrarch, then resident with the Carrara family at Padua, an invitation from the seigniory of Florence to accept the rectorship of their recently-founded university. This was accompanied by a diploma of re- storation to his rights as citizen and restitution of his patrimony. But, flattering as was the offer, Petrarch declined it. He preferred his literary leisure at Vaucluse, at Parma, in the courts of princes, to a post which would have brought him into contact with jealous priors and have reduced him to the position of the servant of.a com- monwealth. Accordingly, we find him journeying again in 1351 to Vaucluse, again refusing the office of papal secretary, again planning visionary reforms for the Roman people, and beginning that curious fragment of an auto- biography which is known as the Epistle to Posterity. Early in 1353 he left Avignon for the last time, and entered Lombardy by the pass of Mont Genévre, making his way immediately to Milan. The archbishop Giovanni Visconti was at this period virtually despot of Milan. He induced Petrarch, who had long been a friend of the Visconti family, to establish himself at his court, where he found employment for him as ambassador and orator. The most memorable of his diplomatic missions was to Venice in the autumn of 1353. Towards the close of the long struggle between Genoa and the republic of St Mark the Genoese entreated Giovanni Visconti to mediate on their behalf with the

Venetians. Petrarch was entrusted with © the office ; and on 8th November he delivered a studied oration before the doge Andrea Dandolo and the great council. His eloquence had no effect; but the orator entered into relations with the Venetian aristocracy which were afterwards extended and confirmed. Meanwhile, Milan continued to be his place of residence. After Giovanni's death he remained in the court of Bernabd and Galeazzo Visconti, closing his eyes to their cruelties and exactions, serving them as a diplomatist, making speeches for them on ceremonial occasions, and partaking of' the splendid hospitality they offered to emperors and princes. It was in this capacity of an independent man of letters,

highly placed and favoured at one of the most wealthy courts of Europe, that he addressed epistles to the emperor Charles IV. upon the distracted state of Italy, and en- treated him to resume the old Ghibelline policy of imperial interference. Charles IV. passed through Mantua in the autumn of 1354. There Petrarch made his acquaintance, and, finding him a man unfit for any noble enterprise, declined attending him to Rome. When Charles returned to Germany, after assuming the crowns in Rome and Milan, Petrarch addressed a letter of vehement invective and reproach to the emperor who was so negligent of the duties imposed on him by his high office. This did not prevent the Visconti sending him on an embassy to Charles in 1356. Petrarch found him at Prague, and, after plead- ing the cause of his masters, was despatched with honour and the diploma of count palatine. His student's life at Milan was again interrupted in 1360 by a mission on which Galeazzo Visconti sent him to King John of France. The tyrants of Milan were aspiring to royal alliances ; Gian Galeazzo Visconti had been married to Isabella of France ; Violante Visconti, a few years later, was wedded to the English duke of Clarence. Petrarch was now com- missioned to congratulate King John upon his liberation from captivity in England. This duty performed, he returned to Milan, where in 1361 he received news of the deaths of his son Giovanni and his old friend Socrates. Both had been carried off by plague.

The remaining years of Petrarch's life, important as they were for the furtherance of humanistic studies, may be briefly condensed. On 11th May

1362 he settled at Padua, from the neighbourhood of which he never moved again to any great distance. The same year saw him at Venice, making a donation of his library to the republic of St Mark. Here his friend Boccaccio introduced to him the Greek teacher Leontius Pilatus. Petrarch, who possessed a MS. of Homer and a portion of Plato, never acquired the Greek language, although he attempted to gain some little knowledge of it in his later years. Homer, he said, was dumb to him, while he was deaf to Homer ; and he could only approach the Jliad in Boccaccio's rude Latin version. About this period he saw his daughter Francesca happily married, and undertook the education of a young scholar from Ravenna, whose sudden disappear- ance from his household caused him the deepest grief. This youth has been identified, but on insufficient grounds, with that Giovanni Malpaghini of Ravenna who was destined to form a most important link between Petrarch and the humanists of the next age of culture. The public affairs of Italy and Europe continued to interest him; nor was he ever idle in composing letters and orations, some of which were not without political importance, while all of them contributed to form a style that had the greatest influence over successive generations of Italian chancellors and secretaries. Gradually his oldest friends dropped off. Azzo di Correggio died in 1362, and Lelius, Simonides, Bar- bato, in the following year. His own death was reported in 1365; but he survived another decade. Much of this last stage of his life was occupied at Padua in a contro- versy with the Averroists, whom he regarded as dangerous antagonists both to sound religion and to sound culture. A curious treatise, which grew in part out of this dispute and out of a previous duel with physicians, was the book Upon his own Ignorance and that of many others. At last, in 1369, tired with the bustle of a town so big as Padua, he retired to Arqua, a village in the Euganean hills, where he continued his usual train of literary occupations, employ- ing several secretaries, and studying unremittingly. All through these declining years his friendship with Boccaccio was maintained and strengthened. It rested on a solid basis of mutual affection and of common studies, the

different temperaments of the two scholars securing them against the disagreements of rivalry or jealousy. One of Petrarch's last compositions

was a Latin version of Boceaccio's story of Griselda. On 18th July 1374 his people found the old poet and scholar dead among his books in the library of that little house which looks across the hills and lowlands toward the Adriatic.

When we attempt to estimate Petrarch's position in the history of modern culture, the first thing which strikes us is that he was even less eminent as an Italian poet than as the founder of Humanism, the inaugurator of the Renaissance in Italy. What he achieved for the modern world was not merely to bequeath to his Italian imitators masterpieces of lyrical art unrivalled for perfection of workmanship, but also, and far more, to open out for Europe a new sphere of mental activity. Standing within the threshold of the Middle Ages, he surveyed the king- dom of the modern spirit, and, by his own inexhaustible indu:try in the field of scholarship and study, he deter- mined what we call the revival of learning. By bringing the men of his own generation into sympathetic contact with antiquity, he gave a decisive impulse to that European movement which restored freedom, self-consciousness, and the faculty of progress to the human intellect. The warm recognition which he met with in his lifetime and the extra- ordinary activity of his immediate successors prove indeed that the age itself was ripe for this momentous change. Yet it is none the less certain that Petrarch stamped his genius on the spirit of the time, that he was the hero of the humanistic effort. He was the first man to collect libraries, to accumulate coins, to advocate the preservation of antique monuments, and to collate MSS. Though he knew no Greek, he was the first to appreciate its vast importance ; and through his influence Boccaccio laid the earliest foundations of its study. More than this, he was the first to approach the great authors of antiquity with intelligence. It was not the extent but the lucidity of his erudition, not the matter but the spirit of his scholar- ship, that placed him at an immeasurable distance of superiority above his predecessors. When we compare the use which even Dante made of classical knowledge in his De Monarchia with Petrarch's touch upon the ancients in his numerous prose works, we perceive that we have passed from the medieval to the modern conception of literature. For him the authors of the Greek and Latin world were living men,—more real, in fact, than those with whom he corresponded; and the rhetorical epistles he addressed to Cicero, Seneca, and Varro prove that he dwelt with them on

terms of sympathetic intimacy. So far- reaching were the interests controlled by him in this capacity of humanist that his achievement as an Italian lyrist seems by comparison insignificant.

Petrarch's ideal of humanism was essentially a noble one. He regarded the orator and the poet as teachers, bound to complete themselves by education, and to exhibit to the world an image of perfected personality in prose and verse of studied beauty. Self-culture and self-effectuation seemed to him the highest aims of man. Everything which contributed to the formation of a free, impassioned, liberal individuality he regarded as praiseworthy. Everything which retarded the attainment of that end was contempt- ible in his eyes. The authors of antiquity, the Holy Scrip- tures, and the fathers of the church were valued by him as one common source of intellectual enlightenment. Emi- nently religious, and orthodox in his convictions, he did not seek to substitute a pagan for the Christian ideal. This was left for the scholars of the 15th and 16th centuries in Italy. At the same time, the Latin orators, historians, and poets were venerated by him as depositaries of a tradition only second in importance to revelation. For

him there was no schism between Rome and Galilee, be- tween classical genius and sacred inspiration. Though the latter took the first rank in relation to man's eternal wel- fare, the former was necessary for the perfection of his intellect and the civilization of his manners. With this double ideal in view, Petrarch poured scorn upon the French physicians and the Italian Averroists for their illiberal philistinism, no less than for their materialistic impiety. True to his conception of independent intellectual activity, he abstained from a legal career, refused import- ant ecclesiastical office, and contented himself with paltry benefices which implied no spiritual or administrative duties, because he was resolved to follow the one purpose of his life,—self-culture. Whatever in literature revealed the hearts of men was infinitely precious to him ; and for this reason he professed almost a cult for St Augustine. It was to Augustine, as to a friend or a confessor, that he poured forth the secrets of his own soul in the book De Contemptu Mundi.

In this effort to realize his truest self Petrarch was eminently successful. Much as he effected by restoring to the world a sound conception of learning, and by rousing that genuine love and curiosity which led to the revival, he did even more by impressing on the age his own full- formed and striking personality. In all things he was original. Whether we regard him as a priest who published poem after poem in praise of an adored mistress, as a plebeian man of letters who conversed on equal terms with kings and princes, as a solitary dedicated to the love of nature, as an amateur diplomatist treating affairs of state with pompous eloquence in missives sent to popes and emperors, or again as a traveller eager for change of scene, ready to climb mountains for the enjoyment of broad prospects over spreading champaigns; in all these divers manifestations of his peculiar genius we trace some contrast with the manners of the 14th century, some emphatic anticipation of the 16th. The defects of Petrarch's char- acter were no less striking than its qualities, and were indeed their complement and counterpart. That vivid conception of intellectual and moral self-culture which deterniined his ideal took the form in actual life of all- absorbing egotism. He was not content with knowing himself to be the leader of the age. He claimed autocracy, suffered no rival near his throne, brooked no contradiction, demanded unconditional submission to his will and judg- ment. His friends were treated by him as subordinates and vassals with exacting magnanimity. The preoccu- pation with himself, which makes his letters and prose treatises a mine of autobiographical information, rouses a certain contempt when we watch it degenerating into vanity, appetite for flattery, intrigues for the poet's crown, restless change from place to place in search of new admirers, desire for ceremonial pomp, and half-concealed detraction of superior genius. Petrarch was made up of contradictions. Praising solitude, playing the hermit at Vaucluse, he only loved seclusion as a contrast to the society of courts; while he penied dissertations on the futility of fame and the burden of celebrity, he was trimming his sails to catch the breeze of popular applause. No one professed a more austere morality, and few medieval writers indulged in cruder satire on the female sex ; yet he passed some years in the society of a concubine, and his living masterpiece of art is the apotheosis of chivalrous passion for a woman. These discords of an undecided nature displayed themselves in his political theories and in his philosophy of conduct. In one mood he was fain to ape the antique patriot ; in another he affected the monastic saint. He was

clamorous for the freedom of the Roman people ; yet at one time he called upon the popes to re-establish themselves in the Eternal City ; at another he besought the emperor to make it his

headquarters ; at a third he hailed in Rienzi the founder of a new republic. He did not perceive that all these plans were incompatible. His relations to the Lombard nobles were equally at variance with his professed patriotism ; and, while still a housemate of Visconti and Correggi, he kept on issuing invectives against the tyrants who divided Italy. It would not be difficult to multiply these antitheses in the character and the opinions of this singular man. But it is more to the purpose to remark that they were harmonized in a personality of potent and enduring force. Petrarch was essentially the first of the moderns, the ancestor of Hamlet and Faust, Rousseau and Childe Harold. That strange spirit of unrest and melancholy, of malady and isolation, which drove him from time to time into the desert, where he sought companionship with the great writers of the past, was the inner witness to an irresoluble contradiction between himself and the age in which he lived.

The point to notice in this complex personality is that Petrarch's ideal remained always literary. As philosopher, politician, historian, essayist, orator, he aimed at lucid and harmonious expression,—not, indeed, neglecting the import- ance of the material he undertook to treat, but approach- ing his task in the spirit of an artist rather than a thinker or a man of action. This accounts for his bewildering versatility, and for his apparent want of grasp on conditions of fact. Viewed in this light Petrarch anticipated the Italian Renaissance in its weakness,—that philosophical superficiality, that tendency to ornate rhetoric, that pre- occupation with stylistic trifles, that want of profound con- viction and stern sincerity, which stamp its minor literary products with the note of mediocrity. Had Petrarch been possessed with a passion for some commanding principle in politics, morality, or science, instead of with the thirst for self-glorification and the ideal of artistic culture, it is not wholly impossible that Italian humanism might have assumed a manlier and more conscientious tone. But this is not a question which admits of discussion ; for the con- ditions which made

Petrarch what he was were already potent in Italian society. He did but express the spirit of the period he opened ; and it may also be added that his own ideal was higher and severer than that of the illus- trious humanists who followed him.

As an author Petrarch must be considered from two points of view,—first as a writer of Latin verse and prose, secondly as an Italian lyrist. In the former capacity he was speedily outstripped by more fortunate scholars. His eclogues and epistles and the epic of Africa, on which he set such store, exhibit a comparatively limited command of Latin metre. His treatises, orations, and familiar letters, though remarkable for a prose style which is emi- nently characteristic of the man, are not distinguished by purity of diction. Much as he admired Cicero, it is clear that he had not freed himself from current medieval Latinity. Seneca and Augustine had been too much used by him as models of composition. At the same time it will be conceded that he possessed a copious vocabulary, a fine ear for cadence, and the faculty of expressing every shade of thought or feeling. What he lacked was that insight into the best classical masterpieces, that command of the best classical diction, which is the product of suc- cessive generations of scholarship. To attain to this, Giovanni da Ravenna, Colluccio Salutato, Poggio, and Filelfo had to labour, before a Poliziano and a Bembo finally prepared the path for an Erasmus. Had Petrarch been born at the close of the 15th instead of at the open- ing of the 14th century there is no doubt that his Latinity would have been as pure, as versatile, and as pointed as that of the witty stylist of Rotterdam.

With regard to his Italian poetry Petrarch occupies a

very different position. The Mame in Vita e Morte di Madonna Laura cannot become obsolete, for perfect metrical form has here been married to language of the choicest and the purest. It is true that even in the Can- zomere, as Italians prefer to call that collection of lyrics, Petrarch is not devoid of faults belonging to his age, and affectations which have imposed themselves with disastrous effect through his authority upon the literature of Europe. He appealed in his odes and sonnets to a restricted audi- ence already educated by the chivalrous love-poetry of Provence and by Italian

imitations of that style. He was not careful to exclude the commonplaces of the school, nor anxious to finish a work of art wholly free from fashion- able graces and from contemporary conceits. There is therefore a certain element of artificiality in his treatment; and this, since it is easier to copy defects than excellencies, has been perpetuated with wearisome monotony by versi- fiers who chose him for their model. But, after making due allowance for peculiarities, the abuse of which has brought the name of Petrarchist into contempt, we can agree with Shelley that the lyrics of the Canzoniere "are as spells which unseal the inmost enchanted fountains of the delight which is the grief of love." That is to say, Petrarch in this monumental series of odes and sonnets depicted all the moods of a real passion, and prescnted them in a style of such lucidity, with so exquisite a command of rhythmical resources, and with humanity of emotion so simple and so true, as to render his portrait of a lover's soul applicable to all who have loved and will love for ages. If space sufficed much might be written about the peculiar position held by Petrarch between the metaphysical lyrists of Tuscany and the more realistic amorists of succeeding generations. True in this respect also to his anticipation of the coming age, he was the first Italian poet of love to free himself from allegory and mysticism. Yet he was far from approaching the analysis of emotion with the directness of a Heine or De Musset. Though we believe in the reality of Laura, we derive no clear conception either of her person or her character. She is not so much a woman as woman in the abstract ; and perhaps on this very account the poems written for her by her lover have been taken to the heart by countless lovers who came after him. The method of his art is so general- izing, while his feeling is so natural, that every man can see himself reflected in the singer and his mistress shadowed forth in Laura. The same criticism might be passed on Petrarch's descriptions of nature. That he felt the beauties of nature keenly is certain, and he frequently touches them with obvious appreciation. Yet he has written nothing so characteristic of Vaucluse as to be inapplicable to any solitude where there are woods and water. The Canzoniere is therefore one long melodious monody poured from the poet's soul, with the indefinite form of a beautiful woman seated in a lovely landscape, a perpetual object of delightful contemplation. This dis- engagement from local circumstance without the sacrifice of emotional sincerity is a merit in Petrarch, but it became a fault in his imitators. Lacking his intensity of passion and his admirable faculty

for seizing the most evanescent shades of difference in feeling, they degenerated into colourless and lifeless insipidities made insupportable by the frigid repetition of tropes and conceits which we are fain to pardon in the master.

Petrarch did not distinguish himself by love-poetry alone in the Italian language. His odes to Giacomo Colonna, to Cola di Rienzi, and to the princes of Italy display him in another light. They exhibit the oratorical fervour, the pleader's eloquence in its most perfect lustre, which Petrarch possessed in no less measure than subjective pas- sion. Modern literature has nothing nobler, nothing more

harmonious in the declamatory style than these three patriotic effusions. Their spirit itself is epoch-making in the history of Europe. Up to this point Italy had scarcely begun to exist. There were Florentines and Lombards, Guelfs and Ghibellines ; but even Dante had scarcely con- ceived of Italy as a nation, independent of the empire, inclusive of her several component commonwealths. To the high conception of Italian nationality, to the belief in that spiritual unity which underlay her many discords and divisions, Petrarch attained partly through his disengage- ment from civic and local partisanship, partly through his large and liberal ideal of culture. It was the function of the Renaissance to bring all parts of the Italian peninsula into an intellectual harmony by means of common enthu- siasm for arts and letters. But it remained for the present century to witness the political consolidation of the Italian people under a single government.

The materials for a life of Petrarch are afforded in abundance by his letters, eollected and prepared for publieation under his own eyes. These are divided into Familiar Correspondence, Correspond- enee in Old Age, Divers Letters, and Letters without a Title; to which may be added the curious autobiographical fragment entitled the Epistle to Posterity. Next in importance rank the epistles and eclogues in Latin verse, the Italian poems, and the rhetorieal addresses to popes, empcrors, Cola di Rienzi, and some great men of antiquity. For the comprehension of his character the treatise De Contemptu Mundi, addressed to St Augustine and styled his Secret, is invaluable. Without attempting a complete list of Petrarch's works, it may

be well to illustrate the extent of his eru- dition and his activity as a writer by a brief enumeration of the most important. In the section belonging to moral philosophy we find De Remediis Utriusque Fortun#, a treatise on human happi- ness and unhappiness ; De Vita Solitaria, a panegyrie of solitude ; De Otio Religiosorum, a similar essay on monastic life, inspired by a visit to his brother Gherardo in his eonvent near Marseilles. On historical subjects the most considerable are Rerwm Memorandarum Libri, a miscellany from a student's commonplace-book, and De Virts illustribus, an epitome of the biographies of Roman worthies. Three polemical works require mention : Contra eujusdam anonymi Galli calumnias Apologia, Contra Medieum quendam Invectivarum Libri, and De sui ipsius et multorum Ignorantia,—controversial and sarcastic compositions, which grew out of Petrarch's quarrels with the physicians of Avignon and the Averroists of Padua. In this connexion it might also be well to mention the remarkable satires on the papal court, included in the Epistolz sine Titulo. Five public orations have been preserved, the most weighty of which, in explanation of Petrarch's conception of literature, is the speeeh delivered on the Capitol upon the occasion of his coronation. Among his Latin poems Africa, an epic on Scipio Africanus, takes the first place. Twelve Eclogues and three books of Zpisties in verse close the list. In Italian we possess the Canzoniere, whieh includes odes and sonnets written for Laura during her lifetime, those written for her after her death, and a miscellaneous section containing the three patriotic odes and three famous poetical invectives against the papal court. Besides these lyrical composi- tions are the semi-epical or allegorical Trionfi,—Triumphs of Love, Chastity, Death, Fame, Time, and Divinity, written in terza rima of smooth and limpid quality. Though these Triumphs, as a whole, are deficient in poetic inspiration, the second eanto of the Z'rionfo della Morte, in whieh Petrarch describes a vision of his dead love Laura, is justly famous for reserved passion and pathos tempered to a tranquil harmony.

The complete bibliography of Petrarch forms a considerable volunie. Such a work was attempted by Domenico Rossetti (Trieste, 1828). 1t will be enough here to mention the Basel edition of 1581, in folio, as the basis for all subsequent editions of his collected works. Two editions of the Canzoniere deserve especial notice,—that of Marsand (Padua, 1820) and that of Leopardi in Le Monnier's col- lection. Nor must Fracassetti's ltalian

version of the Letters (published in 5 vols. by Le Monnier) be neglected. De Sade's Life of the poet (Amsterdam, 1764-67) marks an epoch in the history of his numerous biographies ; but this is in many important points untrustworthy, and it has been superseded by Gustav Koerting's exhaustive volume on Petrarca's Leben und Werke (Leipsic, 1878). Georg Voigt's Wiederbelebung des classischen Alterthums (Berlin, 1859) contains a well-digested estimate of Petrarch's relation to the revival of learn- ing. Meziere's Petrarque (1868) is a monograph of merit. English readers may be referred to a little book on Petrarch by Henry Reeve, and to vols. ii. and iv. of Symonds's Renaissance in Italy. (J. A. 8.)

PETREL, the name applied in a general way to a group of Birds (of which more than 100 species are recognized) from the habit which some of them possess of apparently walking on the surface of the water as the apostle St Peter (of whose name the word is a diminutive form) is recorded (Matt. xiv. 29) to have done. Fora long while the Petrels were ranked as a Family, under the name of Procell-

artvidz,! and thought to be either very nearly allied to the Gulls, Laride, or intermediate between that Family and the Steganopodes ; but this opinion has gradually given way, and it is now hard to resist the conclusion that they have to be regarded as an ''Order," to which the name 7'ubinares has been applied from the tubular form of their nostrils, a feature possessed in greater or less degree by all of them, and by which each may at a glance be recognized. They have usually been subdivided into three groups or Sub-families, (1) Pelecanoidine (or Halodrominz), containing some three or four species known as Diving-Petrels, with habits very different from others of the Family, and almost peculiar to high southern latitudes from Cape Horn to New Zealand ; (2) Procellarune, or Petrels proper ; and (3) Diomedeinz, or Albatrosses (cf. MALLEMUCK, vol. xv. p. 334). Recently, however, the anatomy of the group has been subjected to very close examination by Garrod and W. A. Forbes, the latter of whom has summed up the results obtained by himself and his predecessor in an ela- borate essay, forming part ix. of the Zoology of the voyage of the " Challenger," which shew determinations that differ greatly from any that had been reached by prior

system- atists. According to these investigators, the Tubinares are composed of two Families, Procellaricdz and Oceanitidz, whose distinctness had never before been suspected 2—the latter consisting of four genera not very much differing in appearance from many others, while the former includes as Subfamilies the Albatrosses, Diomedeinx, with three genera, Diomedea, Thalassiarche, and Phebetria, and the true Petrels, Procellariinz, in which last are combined forms so different externally and in habit as the Diving-Petrels, above noticed, the Storm-Petrels, Procellaria, the Flat-billed Petrels, Prion, the FutmMar (vol. ix. p. 817), the SuEar-WATERS (g.v.), and others. Want of space forbids us here dwelling on the characters assigned to these different groups, or the means which have led to this classification of it, set forth at great length in the essay cited, where also will be found copious references to previous studies of the Petrels, among which may here be especially men- tioned those of MM. Hombron and Jacquinot (Comptes fiendus, 1844, pp. 353-358, and Zool. Voy. au Pol Sud, vol. iii.), Prof. Coues (Proc. Acad. Philadelphia, 1864, pp. 72-91, 116-144, and 1866, pp. 25-33, 134-197), and Mr Salvin (Orn. Miscellany, ii. pp. 223-238, 249-257; and Zoology, Voy. “ Challenger,” pt. viii. pp. 140-149). Petrels are dispersed throughout all the seas and oceans of the world, and some species apparently never resort to land except for the purpose of nidification, though nearly all are liable at times to be driven ashore, and often very far inland, by gales of wind.? It would also seem that during the breeding-season many of them are wholly noc- turnal in their habits, passing the day in holes of the ground, or in clefts of the rocks, in which they generally nestle, the hen of each pair laying a single white egg, sparsely speckled in a few species with fine reddish dots. Of those species that frequent the North Atlantic, the common Storm-Petrel, Procellaria pelagica, a little bird which has to the ordinary eye rather the look of a Swift or Swallow, is the “ Mother Carey’s chicken ” of sailors, and is widely believed to be the harbinger of bad weather P but seamen hardly discriminate between this and others

nearly resembling it in appearance, such as Leach’s or the eS ae ee ee

1 Most commonly but erroneously spelt Procellaride.

? It is due to Prof. Coues to state that in 1864 he had declared the genus Oceanttes, of which he only knew the external characters, to be “the most distinct and remarkable” of the ‘ Procellariex,” though he never thought of making it the type of a separate Family.

3 Thus (strelata hesitata, the Capped Petrel, a species whose proper home seems to be Guadeloupe and some of the neighbouring West-Indian Islands, has occurred in the State of New York, near Boulogne, in Norfolk, and in Hungary (bis, 1884, p. 202)!

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Fork-tailed Petrel, Cymochorea leucorrhoa, a rather larger but less common bird, and Wilson’s Petrel, Oceanites oceanicus, the type of the Family Oceanitidx mentioned above, which is more common on the American side, But it is in the Southern Ocean that Petrels most abound, both as species and as individuals. The Cape-Pigeon or Pintado

Petrel, Daption capensis, is one that has long been well

known to mariners and other wayfarers on the great waters, while those who voyage to or from Australia, whatever be the route they take, are certain to meet with many more species, some, as Ossifraga gigantea, as large as Alba- trosses, and several of them called by sailors by a variety of choice names, generally having reference to the strong smell of musk emitted by the birds, among which that of ‘‘Stink-pot ” is not the most opprobrious. None of the Petrels are endowed with any brilliant colouring —sooty- black, grey of various tints (one of which is often called “blue”), and white being the only hues their plumage exhibits; but their graceful flight, and their companion- ship when no other life is visible around a lonely vessel on the widest of oceans, give them an interest to beholders, though this is too often marred by the wanton destruction dealt out by brutal or thoughtless persons who thus seek to break the tediousness of a long voyage. The distri- bution of the several species of Petrels in the Southern Ocean has been ably treated by Prof. A. Milne-Edwards in the Annales des Sciences Naturelles for 1882 (ser. 6, Zoo- logve, vol. xiii. art. 4, pp. 1-22), of which essay a transla- tion will be found in the Mittheilungen des Ornithologischen Vereins in Wien for 1884. (A. WN.)

PETRIE, Georce (1790-1866), Irish antiquary, was the son of James Petrie, a native of Aberdeen, who had settled in Dublin as a portrait and miniature painter. He was born in Dublin in January 1790, and was educated to become a painter. Besides attaining considerable reputa- tion as a landscape painter of Irish scenes, he devoted much of his artistic skill to the illustration of the anti- quities of the country. Even in boyhood his love of archeology vied with his love of art and of nature. In 1828 he was appointed to conduct the antiquarian and historical section of the Ordnance Survey of Ireland, but this department of the work was not persevered in by the Government. In 1832 he became editor of the Dublin Penny Journal, a periodical designed to disseminate in- formation among the masses, to which he contributed numerous articles on the history of the fine arts in Ireland. Petrie may be regarded as the first scientific investigator of Irish archeology, his contributions to which are also in themselves of prime importance. His Essay on found Towers, for which in 1830 he received the prize of the Irish Academy, must still rank, whether or not his opinion be accepted that the round towers served the joint purpose of belfries and fortalices, as the standard work on the subject. A second edition was published in 1845. Among his other more important contributions to Irish archeology are his Essay on the Military Architecture of Ireland and his History and Antiquities of Tara Hill. In 1847 he received the degree of LL.D. from the university of Dublin, and in 1849 he was placed on the civil list for an annual pension of £300. He died 17th January 1866.

See the Life and Labours in Art and Archzxology of George Petrie, by William Stokes, 1868. —

PETROLEUM. The word “petroleum” (rock-oil ; Germ., erdél, steindl) is used to designate the forms of bitumen that are of an oily consistence. It passes by insensible gradations into the volatile and ethereal naph- thas on the one hand and the semi-fluid malthas or mineral- tars on the other.

INstory.—Petroleum has been known by civilized man

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from the dawn of history. Herodotus wrote of the springs of Zacynthus (Zante), and the fountains of Hit have been celebrated by the Arabs and Persians. Pliny and Dioscorides describe the oil of Agrigentum, which was used in lamps under the name of “Sicilian oil,” and mention is made of petroleum springs in China in the earliest records of that ancient people. The abundance of petroleum and the fire- temple at Baku on the Caspian have been frequently de- scribed by travellers who have gone overland from Europe to India, from the time of Marco Polo to recent years. Petro- leum in North America was first mentioned by a Franciscan missionary, Joseph de la Roche d’Allion, in a letter written in 1629 and published in Sagard’s Histoire du Canada in 1636. Peter Kalm described the springs on Oil Creek in his book of travels in North America, published in London in 1772. In 1750 the French commander at Fort Duquesne described them in a letter to General Montcalm, and later, towards the close of the last century, frequent mention is made of-oil-springs in correspondence relating to what is now western Pennsylvania, Ohio, West Virginia, and Ken- tucky. In 1765 and 1826 the British Government sent embassies to the court of Ava, in the reports of which mention is made of the petroleum springs and wells near Rangoon on the Irawadi. During the early years of the present century the occurrence of bitumen, and particularly of its liquid forms, was noticed by scientific men and travellers in various localities. In Europe, Boussingault’s researches upon the petroleum of Bechelbronn (Lower Alsace) and the discovery of paraffin by Reichenbach attracted much attention. Petroleum was observed and described as early as 1814 in Washington county, Ohio, in wells at that time being bored for brine. In 1819 a well bored for brine in Wayne county, Kentucky, yielded so much black petroleum that it was abandoned. It has continued to yield small quantities until the present time. In 1829 a well drilled for brine near Burkesville, Cumber- land county, Kentucky, yielded such a flow of petroleum that it was regarded as a wonderful natural phenomenon. This well is estimated to have yielded, up to 1860, 50,000 barrels of oil, the larger part of which was wasted. Of the rest a few barrels were bottled and sold as a liniment in the United States and Europe under the name of “ Ameri- can oil.”

About the year 1847 E. W. Binney of Manchester, Eng- land, called attention to the petroleum discovered at Rid- dings, near Alfreton in Derbyshire, and a few years later he, together with James Young and others,

commenced the manufacture of illuminating and other oils from it. The supply of crude material from this source soon became in- adequate, and they then commenced distilling the Boghead mineral that had been found near Bathgate in Scotland. The success attending this enterprise soon attracted atten- tion in the United States of America,and a number of estab- lishments were in operation in the course of a few years, some of them being licensed under Young's patents. In 1851, when petroleum on Oil Creek was worth 75 cents a gallon in the crude state, it was tested as a crude material for the manufacture of illuminating oil by Messrs William and Luther Attwood, and Joshua Merrill, at the United States Chemical Manufacturing Company's works at Waltham, near Boston, Massachusetts, and its merits for that purpose fully established. But its scarcity at that time prevented its use in commercial quantities, and the establishments at Boston and Portland, Maine, under the charge of Messrs Merrill and William Attwood, continued to use Boghead mineral and albertite for a number of years after petroleum was produced in sufficient quantity. Petroleum was refined and offered for sale in Pittsburgh, Pennsylvania, as early as 1855, but the quantity was too small to influence even the local trade ; it, however, created a small demand for the

crude oil. The well-known fact that brine-wells often pro- duced petroleum led those who sold the " American oil" to embellish the label on the bottles with a derrick and other accompaniments of a brine-well; and the story is told that the projector of the first well drilled exclusively for petro- leum was led to undertake it through reflecting upon this picture. Some oil from one of the natural springs near Titusville, Pennsylvania, was sent to Professor B. Silliman, junior, of Yale College, and he made a report upon it which has become a classic in the literature of petroleum. This report was so satisfactory that a company was organized in New Haven, and E. L. Drake was sent to drill a well upon land that was leased in the valley of Oil Creek, a short distance below the spot where the city of Titus- ville now stands. The region was then almost a wilder- ness, and many delays were experienced before he succeeded in getting his men and machinery in operation. He was at first thwarted by quicksands and water, but he finally drove an iron pipe 36 feet down to the rock. This device, said to have been

original with Drake, has been of great value in artesian boring ever since he used it. After drilling 33 feet on the 28th of August 1859, the drill fell suddenly 6 inches into a crevice, and was left until the next day, when the drill-hole was found to be nearly filled with petroleum. No spot in the entire territory where petroleum has since been obtained could have been selected where the oil was to be obtained nearer the surface. The success of this enterprise led to the immediate drilling of other wells, first in the valley of Oil Creek and its tributaries, and later over the higher land between Oil Creek and the Alleghany river below Tidioute. As this territory began to be exhausted, the region of the lower Alleghany, in Butler and Clarion counties, yielded wells of great richness, and finally the Bradford field in M‘Kean county became the centre of production. A careful com- parison of the situations of some of the most productive wells led to the discovery that the areas yielding oil were not irregular in outline, but extended across the country in narrow belts, without regard to the present configuration of the surface. The areas of these belts were in general parallel, and extended in a north-east and south-west direction, 15° to 20° from the meridian. As the exhaustion of the oil-fields of Butler and Clarion counties led pro- ducers to seek a more productive locality, lines were run by compass on the supposed axis of the oil-belt over forest- covered hills for many miles, until they reached the town of Bradford, near which wells had previously been drilled without success. Deeper wells were drilled, and oil was obtained, resulting in the development since 1875 of about 68,000 acres of the most uniformly productive and exten- sive oil-territory yet discovered.

In the province of Ontario, Canada, principally in the vicinity of Enniskillen, a territory of limited extent but great productiveness has been under development for the last twenty years. In the region about Baku and in the valley of the Kuban, at the eastern and western extrem1- ties of the Caucasus, petroleum has been obtained for an unknown period, and is now being produced from artesian borings in large quantities. In Galicia and Roumania it is also obtained in commercial quantities. These regions with the United States furnish the petroleum of commerce. Japan, China, Burmah, and Italy have yielded petroleum in quantities sufficient to supply a local demand, but the vast quantity of the American oil and low price at which it is furnished have rendered the production in these coun- tries unprofitable.

Geographical Distribution.—Petroleum “was found about one hundred years since in making the duke of Bridge- water’s tunnel at Worsley, at Wigan and West Leigh in the Lancashire coal-fields, at Coalbrookdale and Wellington

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in Shropshire and Riddings in Derbyshire, two other coal- fields ; also in a peat-bog at Down Holland, near Orms- kirk, in Lancashire, but never in commercial quantities. The greatest supply has not been more than fifty gallons a day, and even that soon diminished.” A tar-spring was known at Coalport, in Shropshire, early in the present century. Although there are extensive deposits of solid bitumen in eastern France and Switzerland, the petroleum springs that occur at Saint Boés, Basses Pyrénées, are un- important. In Alsace, at Lobsann and Bechelbronn, petro- leum has been obtained for many years for local uses. Although reported from many localities in Germany, the only point that has promised to be of any importance is the Liineburg heath, south of Hamburg. Petroleum is also reported near Holle, in Dithmarschen, Schleswig-Holstein. On the eastern shores of the Adriatic—in Dalmatia and Albania—and in the Jonian Islands, petroleum springs have been mentioned by the writers of classical antiquity. In Armenia and Persia petroleum has been used for un- known centuries, and it appears to be widely distributed in the mountains that surround the tableland of Iran. In Algeria, Egypt, Kashmir, the Punjab, Assam, Java, and other East Indian islands petroleum is reported. In North America the successful development of the petroleum-fields of north-west Pennsylvania following the completion of Drake’s well led in a few years to the drilling of wells in a great many localities where petroleum-springs had been observed. The following so-called “ petroleum-fields ” have produced oil in commercial quantities more or less valuable.

| Maximum

} arrels: | means: Dn 0 au c lees es Oil Creek, Venango county, Pennsylvania | 1862 | 35,517,297 |

Pithole, * – | 1866 8,816,289 | Central Alleghany, ,, se 1871 6,182,900 Lower Alleghany, Butler and Clarion 1874 37,342,978 | counties 96 Tidioute, Venango and Warren counties ,, 1874 4,674,345 Bullion, Venango county Ae 1877 2,312,090 Bradford, M‘Kean county a | 1881 | 44,574,921 Warren, Warren county | 1878 | 448,213 Smith’s Ferry, Beaver county 5p | 1879 | 889,631 Mecca, Trumbull county, Ohio …….) Grafton, Lorain county, ,, . —sses..ssesss

‘Macksburg, Washington county, ,, ...,

‘ Horse Neck, Pleasants county, W. Virginia

Volcano, Wood county, 5

_ Burning Spring, Wirt county, of

| Glasgow, Barren county, Kentucky …..... |

Santa Clara Valley, Ventura county, Cali- | fornia J

A continuous small production since 1865. No record.

Besides these localities petroleum has been observed over an area 1500 miles long by an unknown breadth in the valley of the Mackenzie and its tributaries, and in New Brunswick, Newfoundland, and other portions of eastern Canada. It also occurs at many different points along the Appalachian system of mountains from Point Gaspé on the St Lawrence to northern Alabama. It has been noticed in Kansas, Missouri, Wyoming, Colorado, and Texas in the United States, in southern Mexico, in the West India Islands, and in the northern states of South America, Petroleum is one of the most widely distributed substances occurring in nature, but an examination of the geograph- ical localities in which it chiefly occurs will show them to be intimately connected with the principal mountain-chains of the world.

Geological Relations.—It has been frequently remarked that petroleum occurs in all geological formations, from the Silurian up to the Tertiary.

While this is true as a general statement, it is misleading, for petroleum is not uniformly distributed through all formations, but occurs

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the Silurian and the lower half of the Tertiary. The vast accumulations along the principal axis of occurrence in the western hemisphere are found in Silurian and Devonian rocks ; the most productive axis of occurrence in the eastern hemisphere lies in the Eocene and Miocene of the Car- pathians, Transylvania, and the Caucasus. In England the small quantity of petroleum that has been observed has sprung from the Coal-measures. In the valley of the Rhone and in Savoy it is in Jurassic limestones. The bitumen of the Apennines, of Dalmatia and Albania, of Roumania, Galicia, and the Caucasus, issues for the most part from rocks that are Eocene. But little is known

respecting the geology of the bitumen of Asia Minor and —

Persia ; the Punjab is also Eocene, and the little that is known of the deposits in Burmah and the East Indian Islands indicates that they are of the same age. ast of the Mississippi river petroleum has been reported from localities that describe an ellipse upon the border of the Cincinnati anticlinal, which consists of an elevation of Silurian rocks extending from central Kentucky to Lake Erie, with the city of Cincinnati nearly in its centre, slop- ing beneath the newer formations in all directions. Start- ing at Great Manitoulin Island, in the northern part of Lake Huron, it is next reported at Port Huron, Michigan ; Chicago, Illinois; Terre Haute, and in Crawford county, Indiana; Henderson, Cloverport, Bowling Green, and Glasgow, Kentucky; and around Nashville, and south-east- wards to Chattanooga, Tennessee, where the Silurian rocks again reach the surface. Turning north, the line extends almost unbroken through the eastern counties of Kentucky into Ohio and West Virginia, into Pennsylvania and New York, the ellipse being completed by the petroleum-fields of Canada. At Great Manitoulin Island petroleum was obtained in the Trenton limestone, at Chicago and Terre Haute in the Niagara limestone, both of which are Silurian. The Kentucky geologists regard the great Devonian black slate as the source of the oil in that State. There it is found saturating sandstones at Glasgow, and in crevices at Burkesville and other points on

the Cumberland river. In the neighbourhood of Nashville, where the .Lower Silurian rocks reach the surface, petroleum occurs within geodes, which are enclosed in the solid mass of the blue limestone. North-east of Nashville the present location of the oil is found to be in rocks that lie in an ascending series. Around Burkesville it is found in the Upper Silurian, immediately beneath the Devonian black slate. Farther north it lies in the Devonian and Subcarbonifer- ous sandstones, which, in Johnson county, Kentucky, are now partly above the drainage-level of the country. The so-called “oil-break” of West Virginia and Ohio yields petroleum from sandstones that lie within the Coal- measures. Still farther to the north-east, in Pennsylvania and New York, the oil-sands are all found beneath the Coal-measures in the Upper Devonian, while in Canada they again descend to the Lower Devonian. “Petroleum exists in the Cretaceous rocks which extend along the eastern slope of the Rocky Mountains from British Colum- bia to Mexico, and in many of the interior valleys.” The bitumen of the Pacific slope, of Mexico, the West Indies, and South America, is Miocene in California and Eocene in Trinidad and Peru. From these statements it will be seen that there is a vast area in the Mississippi valley, estimated at 200,000 square miles, beneath which petroleum has been obtained, the formations of which are nowhere more recent than the Coal-measures. Another vast area, extending from California through Mexico to Peru, and including the West India Islands, yields petroleum from Tertiary rocks ; while on the eastern continent a belt of country extends from the North Sea to Java, the bitumen-bearing

principally in two epochs of geological history ; these are | rocks of which are Tertiary so far as is known, At present

the bulk of petroleum produced issues from rocks older than the Carboniferous, while the formations yielding bitumen, in by far the greater number of localities, are of Eocene age. In the great “oil-region” of the United States petroleum occurs in crevices to a very limited extent. In Canada and West Virginia it occurs beneath the crowns of anticlinals, and in Pennsylvania it saturates the porous portions of formations that lie far beneath the influence of superficial erosion, like sand-bars in a flowing

stream or detritus on a beach. These strata are not of any particular geological age, but run through a vast accumulation of sediments embraced in all the forma- tions between the Lower Devonian and Upper Carboniferous. ‘They lie conformably with the enclosing rocks, and slope gently to the south-west. The Bradford field in particular resembles a sheet of coarse-grained sandstone 100 square miles in extent, by from 20 to 80 feet in thickness, lying with its south-western edge lowest and submerged in salt water, and its north-eastern edge highest and filled with gas under an extremely high pressure. In Galicia the sandstones holding the oil are very much dis- turbed, while in the Caucasus the deposits of sand are erratic both in regard to position and extent, and lenticular in outline, being enclosed in a formation consisting of stiff blue clay.

Chemistry.—The first chemical research upon petroleum was conducted by Vauquelin in 1817 upon the naphtha of Amiano. Prior to the discovery of petroleum in commer- cial quantities, a number of European chemists had made determination of the atomic constitution of several different varieties, and it had become generally understood that the oil consisted of an equal number of atoms of carbon and hydrogen. It has since been determined that some varieties of petroleum contain nitrogen and others contain sulphur and oxygen. These last-named elements are, however, to be properly considered as components of impurities. The proximate principles of petroleum have been determined and examined chiefly by Schorlemmer in England, Pelouze and Cahours in France, and C. M. Warren and S. P. Sadtler in the United States. Many other chemists have contri- buted valuable assistance to the work. These researches have established the fact that Pennsylvania petroleum con- sists chiefly of two homologous series of isomeric compounds having the general formula C,H, +9, at one extremity of which marsh gas is found and solid paraffin at the other (see Pararrin). This oil also contains a smaller propor- tion of the olefine series, having the formula C,Ho,, with traces in the Bradford oil of the benzole series. Rangoon petroleum contains a larger proportion of both the olefine and the benzole series than Pennsylvania oil. It has been shown that Caucasian petroleum contains the additive compounds of the benzole group which have the same per- centage composition as the olefines and furnish an illumin- ating oil containing more carbon than Pennsylvania oils of the same specific gravity. The residues from the manu- facture of petroleum have been shown to

contain very dense solids and liquids of high specific gravity, having a large proportion of carbon and possessed of remarkable fluorescent properties. Some petroleums are easily cxidized into asphaltum and kindred products. Colourless illumin- ating oils under the action of light absorb oxygen, which is converted into ozone, and they become yellow and viscid and of greatly impaired quality when the action is prolonged.

Origin.—The origin of petroleum has been a subject of speculation among scientific men during the last half cen- tury. It is a subject involved in much greater obscurity than the origin of coal, for, unlike coal, it has no organic structure; hence it can only be inferred upon circumstantial evidence that it is of organic origin; yet such evidence is so strong that few competent judges have ventured to decide

otherwise. The arguments in favour of a chemical origin have been advanced almost wholly by a school of French chemists during the last twenty years, They are based upon the results of a class of experiments first inaugurated by Berthelot, in which powerful deoxidizing agents like the alkali metals or iron at a white heat are caused to react with steam and carbonic acid. The hydrogen of the water and the carbon of the carbonic acid, having been deprived of their oxygen, unite in the nascent state to form a mix- ture of oily fluids closely resembling petroleum. Sufficient quantities of these oils have been prepared to prove their identity with each other and with crude petroleum. Be- fore concluding from this circumstance that petroleum is the product of similar reactions, it is necessary to assume a condition of the earth’s interior concerning which we know nothing ; and, while the theoretical chemistry of the earth, based upon the nebular hypothesis, does not forbid such possibilities, there are other considerations relating to the origin of petroleum based upon the known rather than the possible that render the assumption that petroleum is of mineral origin forced and unnecessary. It is found that, when shale, coal, peat, wood, or animal matter, in fact any recent or fossil organic matter, is subjected to destructive distillation at low temperatures, there is ob- tained among other products an oily fluid which chemistry shows to consist chiefly of the same compounds of carbon and hydrogen as are found in Pennsylvania

petroleum. There are other petroleums, however, occurring in Canada, Tennessee, and other localities somewhat different in com- position, which are often found under conditions that make it extremely difficult to account for their origin upon any hypothesis that does not regard them as a product of the decomposition of animal remains. They fill the cavities of fossil corals and orthoceratites in Canada and of geodes in Tennessee, in all of which the oil appears to be hermetically sealed until the rock-mass is broken. The formation in which these oils occur consists of thickly-bedded Silurian limestones that were probably deposited in a deep sea at a somewhat high temperature, in which vast quantities of sea-animals perished and became buried. It is therefore most strictly in accordance with observed facts to assume that these oils, in whatever manner they may have been produced from the original animal remains, are indigenous to the rocks in which they are found. These indigenous oils do not occur locally in considerable quantity, although the aggregate amount scattered through any formation in which they occur can easily be shown to be large.

In those localities, notably north-western Pennsylvania and eastern Ohio, where petroleum occurs in large quan- tity, it occurs quite uniformly, saturating heavy beds of uncemented sandstone. This sandstone is overlaid with an impervious shell of slate, containing much silica, that holds down both the oil and gas within the sandstone under great pressure, not locally in cavities but over wide areas. The sandstone is also, so far as can be ascertained, underlaid with a vast formation of shale more than 1000 feet in thickness, containing large numbers of fossil animals and such a quan- tity of fossil sea-weeds that Dr J. 8. Newberry has suggested that the Silurian ocean here contained a veritable sargasso sea. This shale, so filled with the remains of fucoids, has been several times submitted to destructive distilla- tion, and has yielded as high as 50 gallons to the ton of distillate oil that was in many respects scarcely to be dis- tinguished from crude petroleum. During the present century the French chemical geologists have held that all forms of bitumen are the product of metamorphism. Prominent among these may be mentioned Daubrée, who in his Observations sur le Métamorphisme has shown the strict correspondence between his laboratory experiments, in which all forms of bitumen were produced, and the opera-

tions of nature. No evidence appears to be lacking to show that those operations of nature in which heat, pressure, and steam have joined, usually denominated by physicists ‘‘ metamorphism,” when acting upon strata containing organic remains, are an adequate origin for petro- leum as it occurs in the oil-regions of Pennsylvania and in Galicia. Petroleum occurs on the western slope of the Appalachian system from Point Gaspé on the Gulf of St Lawrence to northern Alabama, and there it is most abun- dant in the neighbourhood of strata in which there is the greatest accumulation of organic remains. The accumu- lations of sediment from which this mountam-system was constructed were deposited in a current whose course was parallel with the axis of the system, and, as has been so fully shown by Professor James Hall (Paleontology of New York, vol. iii., Introduction), these sediments were deposited in great thickness and of very coarse materials in the north-east, gradually thinning and increasing in fine- ness as they reached the Mississippi valley in the south- west. From the latest conclusions of American geologists it may be inferred that originally the eastern border of these deposits lay over a region now covered by the Atlantic Ocean. When the elevation took place that brought the metamorphic rocks of New England, New York, Pennsylvania, and Virginia to the surface, the eastern border remained submerged, while the western border was brought above the sea-level. The facts that concern petroleum are found in the comparatively un- disturbed and nearly level position of this western border, in which the rocks holding the petroleum lie at present, like sand-bars in a current, and the further evidence that they afford that the metamorphic action which has altered nearly all the formations of the eastern border became extinct along a plane that descended deeper and deeper from the surface as the western slope of the system is traversed. This evidence further shows that along the western borders of the system, although the rocks and the coal that they enclose are unaltered near the surface, at the same time vast areas of the fucoidal shale and even limestones containing indigenous petroleum may have been invaded by the heat-action and their volatile con- tents distilled at great depths. This distillate, being forced up by heat and hydrostatic pressure, would natur- ally accumulate in any overlying bed of rock porous enough to receive it. In Galicia, Roumania, and Tran- sylvania the metamorphic core of the Carpathians is flanked by beds of fucoidal shale rich in the remains of marine animals, which are intercalated with the beds of sandstone that

contain the oil. regards petroleum as a distillate, includes the facts as thus far observed, is in harmony with scientific possi- bilities, and is reasonable, as it does not require any ex- traordinary assumption of either chemical or geological con- ditions. While the maintenance of any particular theory concerning the origin of petroleum is primarily of very little practical value, it is indirectly of value to conclude whether by some deep-seated chemical action the oil is at present being prepared in the laboratories of nature, or whether its generation has been long since completed. If a correct interpretation of the phenomena observed in rela- tion to petroleum leads to the hypothesis that the fluid is in most instances a distillate, and especially in those localities where it is most abundant, then the conclusion is inevitable that the generation of petroleum is practically completed, and the deposits are vast natural storehouses which when once emptied are as completely removed from future production as a worked-out bed of coal.

Methods of Production.—While petroleum has been pro- duced for an immemorial period in Persia, China, Japan, Burmah, Baku, and Galicia, and while the primitive

This hypothesis, which

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methods employed in each country in its production fur- nish interesting subjects for study, it is scarcely possible in this article to do more than indicate in a general man- ner how the vast quantities produced at the present time in the United States and Canada are brought to the surface, stored, and transported. In both Galicia and the Caucasus, which, with Canada and the United States, now furnish the petroleum of commerce, the ancient methods of production are being rapidly superseded by those employed in America. In the United States the development of oil-territory has acquired a habit that has become well defined, and has been repeatedly exemplified during the last twenty years. The first step is the sinking of a test or “wild-cat” well outside the limits of any proved productive territory, the progress of such well being eagerly watched not only by those who pay for it but also by many others who hope to profit by the experi- ment. The striking of oil in such a well is the signal for a grand rush, and a speculative floating population invades the place. After a time the speculative phase is

succeeded by that of settled development. The oil-territory has be- come outlined. The sagacious ones have secured control of the most profitable tracts, while the floating element has moved on to a new field. Between the period of active development and absolute exhaustion comes that of decay, when the derricks are rotting and falling to wreck, and when property that has ceased to be productive has been sold at an extravagant price, and after accumulating debts has been abandoned. Finally the wave passes over and nature restores as she restores after the ruin of battle fields. A visit to.Pithole city, which in 1865 was, next to Philadelphia, the largest post-office in Pennsylvania, showed in 1881 fields of maize and timothy where some of the most famous wells had been, and of the city a score of houses tumbling to decay and not an inhabitant. It is not to be inferred, however, that any of the sections into which the oil-regions have been divided entirely cease to produce oil. There are wells now producing within sight of the spot where Drake drilled the first well; but large tracts cease to be centres of speculative investment, the old wells cease to be remunerative, and the new wells no longer hold out the possibilities of a grand lottery.

Wells are sometimes drilled by the owners of the land, but the larger part are drilled under leases. These leases are drawn with a great variety of conditions, but they usually stipulate that the lessor shall pay to the lessee a certain portion of the oil produced, the amount varying from one-tenth to one-fourth in proportion to the supposed richness of the territory. One well to five acres is considered as many as a judicious arrangement will allow, but many wells have been drilled much closer, and in some instances several wells have been drilled on one acre. The oil-sand of different localities varies as it occupies different geological horizons. The Venango oil-sand extends from Tidioute in Warren county to Herman Station in Butler county, Pennsylvania, a distance of 62 miles. It is uniformly a conglomerate of smooth white quartz pebbles, from a quarter to three-quarters of an inch in thickness. In other districts of the United States, Canada, and Galicia the oil-sand is a true sandstone of varying colour and texture. In the Caucasus the sand is fine, and resembles a quicksand, as it rises with the oil and accumulates around the wells.

When the location of a well has been determined, a derrick or “rig” is built, which consists of the derrick itself and a small house for an engine, with the

necessary foundation for both. This foundation is made of heavy timbers dovetailed and keyed together. The derrick consists of a framework firmly braced in the form of a truncated pyramid, and about 70 feet high At its base are two large reels, upon one of which the drilling cable is coiled and upon the other the sand-pump rope. At one side of the derrick a heavy post, called the Samson post, is framed into the main sill, upon the top of which rests the walking-beam, one end of it being connected with the engine of from 12 to 15 horse-power, whilst the other supports the drill. When the engine is in motion the walking- beam alternately raises and drops the drill. The boiler is made like the tubular boilers usually employed on locomotives, and is placed at a distance from the well to prevent the ignition of the gas that often accompanies the oil. The engine should be reversible, and so

PETROLEUM

placed that the driller in the derrick can easily control its motion

by the use of cords and pulleys. A string of is represented in fig. 1. First we have the a, which is attached directly to the end of beam, into the jaws of which the cable is set-screw b, and the long screw of which, ¢, is ward by the driller as the rock is penetrated. of the cable is fastened to the rope-socket screwed into the sinker-bar e, that 1s, a solid about 20 feet in length which serves to give tools. The sinker-bar is screwed into the the jars. The jars, f, consist of two links of of which are 21 inches long, with cross-heads 8 inches deep, in consequence of which the links have 13 inches of play. The lower link of the jars is screwed into another long iron bar called the auger-stem, g, which is in turn screwed to the bit or drill 2. The jars are the centre of action, and the manner in which they per-

Sea wos ne eae way. Suppose the tools to have been just run to the bottom of the well, the jars a eS SSS BE closed, and the cable slacked, 2 Sar = the men now reel up the Cees slack until the sinker-bar Qn See ‘ rises, the ‘‘ play” of the jars allowing it to come up 13 inches without lifting the Z

a Hos — ae OY

ag TEMPER SCREW

drilling tools temper – screw the walking- clamped by the worked down-
The free end d, which is bar of iron firmness to the upper link of () steel, the slots

auger-stem ; when the links =

come together they slack § back about 4 inches ando

clamp the cable into the®

temper-screw. If now the Q== vertical movement of the »

walking-beam is 24 inches,

the sinker-bar rises 4 inches,

when the cross-heads of the

links come together with a

smart blow ; then the auger-

stem is picked up and lifted

20 inches. On the down-

stroke the auger-stem falls

BOTTOM OF. ==

sing=—= =

20 inches, while the links

slide 4 inches carrying the

sinker-bar down 24 inclies.

The links are never allowed

to strike on the down-stroke,

RED SLATE or SHALE.

Nil

while the blow of the up-

(i

strake prevents the drill

from becoming wedged into

any seam or crevice into which its weight might drive it. When the tools are all ready for operation, cither a wooden conductor is placed perpendicularly in a sort of shaft sunk to the bed-rock, or an iron tube called a

TAT

PPP PPP m=

PPPE Pw rere: > bP PPPPRPP? wD PPP bP: PPE PPPPPPPPPPP

it through the soil. In either & case great care is taken tog start the well perpendicularly 9 to the derrick-floor. The

tools are swung into position , «

oc

05

On

from the top of the derrick, w~ and the free end of the cable is coiled around the shaft of @ the reel in such a manner

that when the free end is S tightened the tools are lifted, =

shaft revolves within the »%@eo°oSts coils. By holding the cable 6 33 5] # firmly the tools rise, and as

it is loosened they fall. The 2

well is started in this man- 4 5>934°> ner and carried down until 3 222.05

the string of tools can be == suspended beneath the walk-

Fig. 1.—String of Tools.

ing-beam,when acable as long as the supposed depth of the completed

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well is wound upon the reel, the end carried over a pulley at the top of the derrick and then fastened into the rope-socket, the temper- screw attached, and the drilling continued to the bottom of the well. Day and night the machinery is kept in motion, one driller and one engineer and tool-dresser work from noon until midnight, and another pair work from midnight until noon. The driller, with a short lever inserted in the temper-screw, walks round and round to rotate the drill. He watches the jars, and at intervals lets down the temper-screw. When the screw is run out or the drill needs sharpening, he arranges the slack cable so that it will run freely over the pulley and proceeds to ‘‘draw out.” The cable is unclamped from the temper-screw and the engine disconnected from the walking-beam and attached to the cable-reel. When all -is ready the long cable is reeled up and the = tools drawn out. The bit is replaced by one newly % sharpened, and after the well – has been sand-pumped the tools are again lowered and 2¢- drilling resumed. When the drilling proceeds without ac- = cident the work is exceed- = ingly monotonous. os From the top of the bed-

rock to a point below the S=—= surface-water of the region, = the well is drilled of the same diameter as the in- terior of the drive-pipe. This point is usually from = 300 to 400 feet below the surface. At this point the drill-hole is tapered, and a pipe armed with a steel shoe is ground into the tapered hole to a water-tight joint. = The inside diameter of this casing-pipe is 53 inches, and below.it the well is carried down 54 inches in diameter

OIL DELIVERY PIPE

FLOOR ————

SLA TA

2: PRESS

=e Se

CD SES S55 OE ON EF

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to the bottom. The casing 2 = | sort om or7/2 HOLE pipe excludes the fresh sur- = Bor ToMmor 5 % Casinc

face-water, and only water enough is put into the well = to wash out the drillings, == unless salt water is encoun- – tered. The casing-pipe be- – comes a permanent fixture, : into which is introduced the : 2-inch pipe, through which _ the oil flows or is pumped. [>> This 2-inch pipe may be in-

be

sty] | troduced or removed at plea- 25s2S3 S558 ae3 sure, without disturbing the to 9seel28 cot i . . S = 39 O’s Co9 S69 a0″ a eaeorn ce casing-pipe or drive-pipe, or Geqsoe.230828ou 3 S58 327 = 7 oO; = 2o°%° ° letting water into the well SocfS2=°5 2 i a ae ae reales me 5O Fa upon the oil. SB3BTS 2S Fas Soy 28 By rs ae ee im When drilling has ben Seep BESS

completed the well is tor- pedoed. From one to twenty- .~ five gallons of nitro-glycerin 4° are lowered into the well in >< tin cylinders and exploded, usually by percussion. The = effect of firing such a large

amount of this powerful = explosive is not apparent = at the surface, but soon. a <2 gurgling sound is heard ap- proaching from beneath ; the oil rises from the well and falls first like a fountain and

then like a geyser, forming sc =e les Sea a torrent of adie fluid, SSsz5222e5 | Fo 2-O ‘ t 2566405 82 2 Pr oD 2/0

accompanied by a rattle of small stones and fragments of the canister in a shower a ee pees See soem ome of spray 100 feet in height. Fig. 2.—Pumping Well. The generation of such an enormous volume of gas in a limited ‘ area, the walls of which are already under a very high gas-pressure,

230-On. SCOT

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and which is held down by 2000 feet of motionless air, must be followed by an expansion into the porous rock that drives both oil and gas before it, until a point of maximum tension is reached. The resistance then becomes greatest within the rock, and, reaction following, oil and gas are driven out of the rock and out of the well until the expansive force is Py

expended.

Figs. 2 and 3 show the general arrangement of pumping and flowing wells. After the well is torpedoed it is prepared for flowing. A section of 2-inch pipe, per- forated with holes, which serves as a strainer, is low- ered into the well and other sections coupled to it, until .- a sufficient length is intro- < duced to reach from the bot- : tom to a point above the oil- – sand. An indiarubber packer : is then attached in such a manner that within it = 2

ipe that is above it slides =sa=<— in that which is below it, S=—=seee and the rubber is forced < against the sides of the drill- = hole with the weight of 1200 — to 1800 feet of 2-inch pipe, thus making a gas-tight = joint. The pressure of the = gas within the oil-sand and S= below the packer forces the = oil to the surface. As the === flow diminishes, a pump- barrel is introduced to the bottom of the well and the oil is lifted to the surface. – Gas-pumps are also used to = remove the pressure of the = atmosphere from the well and rock. In some of the = older districts from twelve to – forty wells are attached to one engine, and pumped by – what is called a “sucker-

rod” = connexion. In West Vir- ginia five different horizons = of sandstone have yielded oil.

The average duration of =2%2 the profitable production of an oil-well is estimated at five years. This period is subject to great fluctuations, as there are wells in the Cole Creek district of the Bradford field that were abandoned in two years, while wells on Triumph Hill, Venango county, where the sand is 125 feet thick, have been pumped fifteen years. The yield of some single wells has been enormous. A well in Donegal township, Butler county, Pennsylvania, produced more

ae SSE, ff TO OIL TANK

a BOTTOM oF

| | | | ut OF DRIVE PIPE SECTION.

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BOTTOMor CASING SECTION.

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PETROLEUM

than 110,000 barrels in ten years, and twelve wells, of which this was one, on the same farm produced over 750,000 barrels. :

In Burmah and other Eastern countries petroleum was stored and transported in flasks and jars. In the United States it was for many years transported in barrels made tight for oil by being coated on the inside with a stiff solution of glue. Later, it was transported on the rivers in bulk barges, and on the railroads in tanks upon cars. These tanks were at first made of wood, but they have lately been made of iron. The usual form is a plain cylinder, 24 feet 6 inches long and 66 inches in diameter, having a capacity of from 4000 to 5000 gallons. These cars are also used in the Caucasus. At the present time, in all the regions pro- ducing petroleum in commercial quantities, the bulk of the crude oil is transported through pipe-lines, which consist of lines of pipe carried across the country, often for hunareds of miles, through which the oil is forced by powerful pumps under a pressure of from 1000 to 1600 tb to the square inch. Each well has a tank into which the oil flows from the well, and from which it is carried in a 2-inch pipe by gravity to a pumping station, where it is pumped into the “main line.” Main lines run out of the oil-regions of Pennsylvania to Cleveland (Ohio), Pittsburgh (Pennsylvania), Buffalo (New York), and New York, Philadelphia, and Baltimore on the Atlantic coast. They are constructed of 6-inch pipe, the joints of which are screwed into couplings like sections of gas-pipe. During recent years the production of petroleum in excess of any demand for it has led to the storage of vast quantities (30,000,000 barrels in 1882) in iron tanks of enormous size. Many of these tanks are owned by private individuals, but the majority belong to the pipe-lines. There are 1375 iron tanks connected with the united pipe-lines, ranging in capacity from 1000 to 38,000 barrels, and representing a total storage capacity of 38,000,000 barrels. These tanks are frequently fired by lightning or other accidents, and when burning present a spectacle of unsurpassed grandeur.

The bulk of the trade in crude petroleum in the United States is conducted through the pipe-lines and their certificates. When oil is received into the line from a well, the amount is ascertained and passed to the credit of the well-owner on the books of the comipany, less 3 per cent. to cover loss in handling. This oil is held like a bank-deposit, subject to transfer on a written order. When such an order has been ‘‘accepted” by an officer of the

company it becomes an ‘‘acceptance” or ‘‘certificate,” and is then negotiable like a certified cheque. As the exchanges deal only in certificates of 1000 barrels they are made of that amount so far as is possible. When oil is delivered by the pipe-lines a pipage charge of 20 cents per barrel is paid and a storage fee of $12°50 per 1000 barrels per month must be paid at least once in six months. The issuing of certificates by the pipe-lines has made speculation in oil, brokerage, and exchanges possible to an extent vastly beyond the requirements of any actual trade in the oil itself.

About 250,000,000 barrels of petroleum have been produced in the United States and Canada from 1859 to 1884. No reliable statistics are to be had of the production in other regions, but of late years the Caucasian fields have yielded about 5,000,000 barrels perannum. The total annual production for 1888 cannot be far from 35,000,000 barrels.

Technology.—The technology of petroleum is quite simple. In the crude state it enters largely into mixtures with other oils, tallow, lead, soap, graphite, &c., that are chiefly used for lubrica- tion. Crude petroleum is also filtered through charcoal. Crude oils that are too fluid for lubrication are reduced to the required consistence by partial evaporation, both by exposure to the sun in shallow tanks and also by distillation of the more volatile portion in stills. Such oils are called ‘‘reduced oils.” In the technology of petroleum by distillation a great variety of details are employed by different manufacturers, but in general they may be treated under the three heads of destructive distillation or ‘‘ cracking,” distilla- tion with superheated steam, and distillation im vacuo. The stills used vary greatly in respect of form and capacity. Formerly stills holding 80,000 gallons were used, but recently they have been constructed of a capacity of from 40,000 to 48,000 gallons. They are ordinarily made either in the form of plain cylinders 30 feet in length and 12 feet 6 inches in diameter, and set horizontally in banks of three or more, or there may be an upright cylinder 30 feet in diameter and 9 feet in height, set vertically with numerous fire- boxes arranged around the circumference. Another form of still is an upright cylinder holding about 1000 gallons, heated from beneath and furnished with a steam-coil immersed in the body of the oil. In this coil the steam is superheated to the tempera- ture of the oil, and is then allowed to escape into it, by which means the overheating of the oil is prevented and the distillation assisted by

the mechanical action of the steam in lifting the oil- vapour out of the still. Another form of still is a vacuum still, in which a partial vacuum is maintained by a pump. The top of the still is usually constructed with a high dome, into which the vapours rise and from which they escape into the condensers. The condensers usually consist of a large number of 2-inch pipes immersed in water contained ina long trough. The distillation

commenees at a very low temperature and proceeds at a constantly rising temperature, the distillate steadily increasing in specifie gravity. The last portions distil at nearly a red heat, and are nearly solid at ordinary temperatures, with a specific gravity above 900°. The oil is first allowed to settle in large tanks, when about 1 per cent. of water and sediment is removed. It is then pumped to stills into whieh “live” steam is introduced. Distillation com- mences at once and is allowed to proceed until the specific gravity of the distillate reaches ‘74 (60° B). ‘The oil in this condition is called “gas-oil,” and is used to a limited extent in the manu- facture of illuminating gas. The distillate is crude naphtha, and is redistilled and divided into (1) rhigolene or cymogene, having a specific gravity of *62 and boiling at 65° Fahr.; (2) gasolene, specific gravity °66 (90° to 80° B.); (8) C naphtha, specific gravity ‘70 (80° to 68° B.); (4) B naphtha, specific gravity °72 (68° to 64° B.) ; and (5) A naphtha, specific gravity °74 (64° to 60° B.). Below 60° goes to illuminating oil. The crude oil from which the naphtha has been removed is then put into a suitable still and distilled until the distillate has a specific gravity of °81 (40° B.). This distillate is crude illuminating oil. The oil remaining in the still may then be ‘‘cracked”’ by destructive distillation, or may be distilled for lubricating oil. If it is to be ‘‘cracked” the fires are slacked and the distillation allowed to proceed slowly, in consequence of which the vapours of the heavy oil are repeatedly condensed upon the dome of the still and made to fall back upon the hot oil beneath. The result is the production of a large volume of permanent gas, chiefly marsh gas and hydrogen, a distillate of suitable specific gravity for illuminating oil, and a heavy tarry residue, called ‘‘residuum,” that remains in the still. By this method of manipulation the crude oil is converted into crude naphtha, crude illuminating oil, and residuum, while the gas is burned as a waste product. The residuum is run

out of the still and sold to manufacturers of lubricating oil. If the oil is not to be cracked, the heavy oil, from which the illuminating oil and naphtha have been removed, is often distilled with superheated steam and treated for lubricating ol. If simply distilled and treated with chemicals after removal of the paraffin, the oil is called in the United States ‘‘ paraffin oil.” The crude paraffin oil is placed in barrels in an ice-house, and, after it has been several days at rest, paraffin crystallizes from it. The paraftin is removed by pressure, and may be purified by any of the methods described under PARAFFIN (p. 242 above). The oil from whieh the paraffin has been pressed may be subjected to a further distillation in a steam-coil or other suitable still, and deprived of certain oils that boil at a high temperature but have a pungent and offensive odour. When drawn off, the oil remaining in the still is found to be light-coloured and nearly tasteless and odourless. It is called ‘‘deodorized neutral heavy hydrocarbon oil,” and is found to be a very valuable lubrieating oil. The distillate above meutioned after treatment is called “mineral sperm,” and is used as an illu- minating oil on cars and steamboats, where a more volatile oil would be objectionable. Any of these distillates, from gasolene to the most dense lubricating oil, may be purified by filtration or by treatment with acids and alkalis. Filtration is usually applied to the different grades of naphtha to deprive them of disagreeable odour, for which purpose gravel and both wood and animal char- coal are used, either separately or together. Lubricating oils are often filtered through animal charcoal to deprive them of both colour and odour. The dense vacuum residues recently prepared under the name of cosmoline, vaseline, &c., are filtered through animal charcoal while hot and perfectly fluid. Oils are treated with chemicals in high cylindrical tanks of small diameter, where they are thoroughly mingled by means of air forced into the bottom of the tank under pressure. These agitators often hold 50,000 gallons. The illuminating oils are usually treated with 5 per cent. of oil of vitriol at a temperature of about 60° Fahr. The acid “sludge,” consisting of the oil of vitriol combined with the impuri- ties of the oil and forming a black tarry liquid, settles to the bottom of the tank and is drawn off. The oil is then agitated with water, then treated with a solution of caustic soda, and finally washed with water containing causticammonia. Hydrochloric acid is used toa limited extent, aud nitric and chromic acids are used to destroy fluorescence in dense oils. Those illuminating oils especially that are prepared by cracking are thrown after treatment, and while warm, in a thin

spray into a large tank. This causes a small amount of very volatile oil produced by cracking to be evaporated, and brings the oil up to test. Finally the oil is exposed under a skylight in large shallow tanks until it has become perfectly clear froin settling of all impurities. The acid “sludge” is for the most part sold to manufacturers of commercial fertilizers or restored by evaporation and used over again. More than 45,000 tons of oil of vitriol were used in 1880 by the manufaeturers of petroleum in the United States. The alkali sludge is thrown away. The following table shows the average percentage of commercial pro- duets obtained from crude petroleum of °79 (45° B.) from Pennsyl- vania, Ohio, &c.—

712

Per cent.

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If the oil is “cracked,” the yield is—

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884

GOSS ret (ere) s.ac. soe ee ee 114

100

Lubricating Oils.—Crude petroleum and the heavy distillates from petroleum, finished either by treatment or by filtration, have been slowly winning their way with consumers of lubricating oils for the last twenty years, and may now be said to havea recognized value. This result has been due as much to improved processes of manufacture, and consequently to improved quality of the pro- ducts, as to a recognition of their merits. When properly prepared, and exempt from volatile matter and offensive odour, they are found to be possessed of great endurance, to be free from a tendency to gun, and to be incapable of spontaneous combustion. When mixed with animal and vegetable oils liable to spontaneous combustion these oils prevent it. They are therefore now in large demand, a demand which is likely to increase as new applications are found for them and their quality is improved.

Illuminating Oils.—Oils of this class manufactured from petro- leum have nearly superseded the use of other illnminating fluids throughout the world. They are largely sold in Great Britain under the name of “paraffin oils”; in the United States they are called “kerosene,” and on the European continent “refined petroleum.” The different qualities are known as “water white,” “standard,” and “prime,” and are further distinguished as “low test” and “high test” oils. The characters chiefly relied on in the trade are “colour” and “test.” The colour should be as light and free from opalescence as possible. Colour is, however, a matter of little importance except as it indicates unskilful manufacture of the oil. The “test” is of paramount importance, and indicates the tempera- ture Fahr. at which the oil will give off a sufficient amount of vapour to ignite explosively when the oil is properly tested. While the methods of testing petroleum vary greatly, the apparatuses used for that purpose may be divided into three classes. The first class is designed to ascertain the tension of the vapour given off by a given sample at a certain fixed temperature ; these are chiefly uscd in France. The others are designed to show at what temperature a given amount of oil, usually half a pint, will give off a sufficient amount of vapour to form an explosive mixture with the air above the oil. These are divided into “open testers,” in which the oil is heated in an open vessel, and “closed testers,” in which the oil is heated in a closed vessel. The tester invented by Sir F. A. Abel (see PARAFFIN, p.239) has been adopted in Great Britain and hercolonies, while in the United States and on the

Continent a great variety are in use. The numerous accidents, many of a frightful nature, and involving great loss of property and often of human life, that have followed the use of illuminating oils which had not been properly freed from the volatile products of the petroleum, have led in most European countries and many of the Ameriean States to the enact- ment of stringent laws orbidding the sale or use of oils the test of which does not come within the prescribed legal limits. Very valu- able researches on the flashing of oils have been made by Dr C. F. Chandler of New York, and by other American chemists. Dr Chand- ler showed that oils burning in lamps of ordinary construction in a room the temperature of which was below 90° Fahr. failed to reach an average temperature of 100° Fahr. In metal lamps, particularly "student lamps," the average temperature was several degrees higher than in glass lamps, a fact which shows glass lamps to be safest in this respect. Dr C. B. White of New Orleans has examined illu- minating oils with respect to the amount of volatile material that, when added to good oil, will render it dangerous. He found that from 1 to 5 per cent. of the ordinary naphthas of commerce would render illuminating oil of the best quality extremely danger- ous. Five per cent. of crude naphtha reduced the flashing point from 118° to 70° Fahr. These researches have all demonstrated the wisdom of English legislation on this subject, but unfortunately have not been productive of equally good results in the United States. Petroleum legislation is there in a very unsatisfactory con- dition. The very worthless law passed by Congress in 1867 has long been repealed, and no other has been substituted for it. A number of the States (seventeen in 1880) are without legislation in reference to this subject, while legislation in other States is based upon local influence rather than fixed principles, and ranges in its

requirements from extreme laxity to unreasonable exaction, in con- sequence of the lack of intelligent national Governmental action. Nearly all the nations of continental Europe have petroleum laws in the main based upon an intelligent appreciation of the subject, and but little inferior to English legislation.

The Uses of Naphtha.—The lightest products obtained from petroleum are rhigolene, which is used in surgery, and cymogene, which is used as the volatile fluid in ice-machines. Gasolene is the lightest fluid obtained in considerable quantity, and is used in automatic gas-machines for the carburation of gas or air. The question of increasing the illuminating power of gas (see Gas, vol. x. p. 101), by causing it to absorb fluid hydrocarbons, was discussed as early as 1832, but it was only after petroleum furnished a cheap and suitable fluid that inventors succeeded in securing results of any value. While hundreds of machines have been patented in England, America, and continental Europe for accomplishing this purpose, it is only quite recently that an American inventor, Dr Walter M. Jackson, has succeeded in constructing a machine that satisfactorily meets all the requirements of the problem. His inetrical carburetter measures both the fluid and the gas or air in such a manner that the lcast amount of the hydrocarbon fluid required to produce the effect sought is furnished to the gas, and the whole is immediately absorbed. By this means a uniform carburation is secured, furnishing a gas of uniform quality, that never contains a sufficient amount of fluid to admit of condensation in any part of the apparatus. Both crude petroleum and the products of its manufacture have been used as a material for the manufacture of gas by distillation. The different qualities of naphtha are used in mixing paint, in the manufacture of oil-cloths for floors and of varnishes, as a solvent for gums and resins, in the preparation of alkaloids, in the manufacture of india-rubber, in washing wool, and in removing oils and grease from seeds and textile fabrics.

Petroleum as Fuel.—In the region of the Caucasus and on the Caspian Sea, where other fuel is scarce and dear and petroleum is plentiful and cheap, the latter is used with complete success on both steamships and locomotives. Petroleum and its products have been used with practical success in the manufacture of iron in the United States. Both illuminating oil and naphtha are now very widely used in stoves; but naphtha-stoves are extremely dangerous, and their’use should be prohibited by law. In the valley of the Euphrates, near Mosul, petroleum is used as a fuel in burning lime.

Petroleum in Medicine.—Although petroleum has been used as a remedial agent for an unknown period in the countries where it is a natural product, its physiological effects have never been very fully investigated. Barbados

tar, Haarlem oil, Seneca oil, and American oil, all consisting wholly or in large part of crude petroleum, were sold by apothecaries for years before petroleum was obtained by boring. They were mainly used as liniments for external application, particularly in rheumatism. The oil of the Alleghany valley early had a local reputation as an internal remedy for consumption, and it has lately been prescribed for bronchitis. The most volatile product of petroleum obtained by distillation, called rhigolene, has been used to produce local insensibility, by means of the intense cold resulting from its rapid evaporation ; and the same fluid when inhaled as vapour or the gas escaping from fresh oil will produce an intoxication or insensibility resembling the effects of laughing- gas, resulting in death if its action is pro- longed. The products of petroleum that have proved most valu- able in medicine are the filtercd paraffin residues sold under the names of cosmoline, vaseline, &c., that are now so widely used as ointments, either plain or medicated. They are of about the con- sistence of butter, with very little taste or odour, and will keep indefinitely without becoming rancid. These valuable properties have caused them to almost entirely supersede all other prepara- tions containing animal or vegetable fats.

Looking towards the past, it may be said that petroleum has attained universal diffusion as a lighting agent ; it is fast displacing animal and vegetable oils as a lubricator on all classes of bearings, from railroad ~~axles to mule~~ spindles, and also where other oils are liakie to spontaneous combustion ; it is very largely used as fuel for stoves, both for heating and cooking ; it is very successfully used for steam purposes when other fuel is scarce and petroleum plentiful; it is likely to be used for the production of pure iron for special purposes ; and it has become a necessity to the apothecary as petroleum ointment. Looking towards the future, what assur- ance have we that these varied wants, the creation of a quarter of acentury, will be satisfied? While it is not probable that the de- posits of petroleum in the crust of the earth are being practically Increased at the present time, there is reason to believe that the supply is ample for an indefinite period. Yet the fact is worthy of serious consideration that the production of petroleum as at present conducted is everywhere wasteful in the extreme.

There are very few works that treat exclusively of petroleum. An article in the Bull. de la Soc. Géol. de France, xxv., gives the best résumé of the

mention made by classical writers. Travellers overland to India and Persia have usually described Baku (see Kaempfer, 1712; Hanway, 1743; Foster, 1784; Kinnier,

1848). On the occurrence of petroleum in Burmah, see Journals of the Embassies to the Court of Ava, Symes (1795), Crawfurd (1826), Yule (1855); in Persia,

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Carl Ritter's Erdk. v. Asien, 1840; in Japan, B. 8. Lyman's Reports, Geolog. Survey of Japan,1874-75 ; in Galicia, Von Hauer (1853), Fotterle (1853, 1859, 1862), J. Noth (1873), Bruno Walter (1880), in Jahrbuch der K.-K. Geo. Reichsanstalt; in Roumania, Von Hauer, Geologie Siebenbiirgens, 1863; H. Coquand, Bul. Soe, Géol. de France, xxiv. 505, 1867; in Canada, T. Sterry Hunt, in Reports of Geol. Survey of Canada of various dates, 1863-73; in Pennsylvania, J. F. Carll, Reports, L, IL, and IIL, with maps, Second Geological Survey of Pennsylvania, 1874-1880. On the chemistry of petroleum, see CU. M. Warren, in American Journal of Science and Chemical News; Shorlemmer, in Quar. Journal of the Chemical Society; Pelouze and Cahours in Ann. de Chimie et de Physique; Berthelot in the same, all at various dates, 1863-1880. On the origin of petroleum, see Lesquereux, in Trans. Am. Phil. Soc., xili., 1866; J. S. Newberry, in Ohio Ag. Report, 1859; T. Sterry Hunt, in Chem. News, vi. 5 et sq.; Byasson, in Revue Industrielle, 1876 ; Mendeljeff, in Bull. Soc. Chim. de Paris, 1877. On testing petroleum, see John Attfield, in Chem. News, xiv. 257; F. Crace Calvert, Chem. News, xxi. 85; C. F. Chandler, in American Chemist, ii. 409 ; Boverton Redwood, in English Mechanic and World of Science, xxii. 335, 1875; F. A. Abel, in Chem. News, xxxv. 73. On the general subject, see T, Sterry Hunt, ‘‘ History of Petroleum or Rock Oil,” in Canadian Naturalist, [1], vi. 245; Chem. News, vi. 5; Report of Smithsonian Institution, 1862; J. Lawrence Smith, in Report to the Judges of the Centennial Exposition, Philadelphia, 1876; S. F. Peckham, monograph on petroleum, in- cluding bibliography of petroleum and allied subjects to 1881, in Reports of the Tenth Census of the United States. See also, for an account of wells at Baku, Engineering, 22d February to 16th May 1884, London. (8. F. P.

PETROLOGY. See Rocks.

PETRONIUS. Petronius Arbiter, although excluded from the list of classical writers available for the purposes of education, is one who enjoyed a great reputation, especi- ally in France, at a time when Latin authors were more read as literature than they are in the present day. A recent critic! of Petronius has stated, though with evident exaggeration, that no ancient writer except Aristotle has found so many interpreters. But there is perhaps none about whose history and era there has been so much controversy, nor is the controversy yet settled with abso- lute certainty. He hides himself so completely behind the mask of his fictitious personages that we learn nothing of his fortunes, position, or even of the century to which he belonged, directly from himself. He does not belong to any of the classes of "viri illustres" (poets, orators, historians, philosophers, grammarians, and rhetoricians) whose lives were written by Suetonius. Though he is mentioned by critics, commentators, and grammarians of a late date (such as Macrobius, Servius, and Priscian), the only hint we have of anything bearing on his personal position is contained in two lines of Sidonius Apollinaris, a writer of the latter part of the 5th century a.D., who associates him with the masters of Latin eloquence, Cicero, Livy, and Virgil, in the lines—

'¢ Et te, Massiliensium per hortos

Sacri stipitis, Arbiter, colonum

Hellespontiaco parem Priapo."' Tf these lines are to be construed as implying that Petronius lived and wrote his work at Marseilles, this inference could hardly be reconciled with the indirect evidence which leads to the identification of the author of the Satire with the C. Petronius of whom Tacitus has painted so vivid a picture in the sixteenth book of the Annals (ch. 18, 19), His place of residence in his later years at least was not Marseilles but Rome. There is nothing, however, in what Tacitus says incompatible with the sup- position that Marseilles was his birthplace ; or perhaps the allusion might be explained by the supposition—supported by a note of Servius on Virgil, /., iii. 57 that the scene in the early part of the long novel, of which two fragmentary books have been preserved, was laid at Marseilles. The chief personages of the story, as they appear in these fragments of books xv. and xvi., are evidently strangers in the towns of the

south of Italy where the adventures in which they share are supposed to take place. Their Greek- sounding names (Encolpius, Ascyltos, Giton, &c.), and their literary trainmg also, accord with the character- istics of the old Greek colony in the Ist century A.D. The high position among Latin writers assigned by Sidonius to Petronius, and the mention of him by Macro- bius in juxtaposition with Menander, when compared with the absolute silence of such writers as Quintilian,

1 J, N. M. De Guerle, Recherches Sceptiques sur le Satyricon.

Juvenal, and Martial, who might have been expected to have taken some notice of him if he had flourished imme- diately before their own day, seem adverse to the generally received opinion that the Satire was a work of the age of Nero. Yet the silence of Quintilian may be explained by the fact that Petronius is not one of those writers who were capable of being turned to use in the education of an orator. The silence of Martial and Juvenal may be accidental. Even if it is to be explained on the ground of want of ap- preciation, this would prove nothing more than that a work so abnormal in form and substance was more highly prized by later generations than by the author's contemporaries.

But, if we pass from these faint traces of external evi- dence to that afforded by the style of the book and the state of manners described in it, we are led to the inference that there is no other age to which it can be assigned on better grounds than the age of Nero. If, again, we compare the impression we form of the character, genius, and habits of the writer with the elaborate picture which Tacitus paints of a man who, so far as he plays any part in history, is merely one of the victims of an abortive conspiracy, we find grounds of probability for identifying them with one another. 'Tacitus does not tell us that he was the author of any important work, and this has been urged as con- clusive on the question. But Tacitus does not think it necessary in what he tells us of Germanicus or Claudius to mention their poetical and historical works. In intro- ducing Silius Italicus as the witness of a particular occur- rence he does not add that he was the author of the poem on the Punic War. He mentions that the poetical gifts and reputation of Lucan and Seneca were among the causes that excited Nero's jealousy,

but he does not mention the Pharsalia of the one or the Tragedies of the other. The prominence which Tacitus gives to the portrait of Petronius points to his enjoyment of greater notoriety than was due to the part he played in history. He paints him with the keen and severe eye with which he fastens on the traits of character and the manner of life illustrative of the moral corruption of the time, but at the same time with that appreciation of intellectual power which forces him to do justice to men who in other respects were detestable. Such a work as the Satire he could, from a moral point of view, have regarded with no other feelings than those of detestation ; yet he could not have refused his admiration to the unmistakable proof it affords of easy careless power, and of a spirit, if not courageous in any good sense, yet indifferent to death, and capable of meeting calamity with Epicurean irony.

The account he gives of C. Petronius is “that he spent his days in sleep, his nights in attending to his official duties or in amusement, that by his dissolute life he had become as famous as other men by a life of energy, and that he was regarded as no ordinary profligate, but as an accomplished voluptuary. His reckless freedom of speech, being regarded as frankness, procured him popularity. Yet during his provincial government, and later when he held the office of consul, he had shown vigour and capacity for affairs. Afterwards returning to his life of vicious indulgence, he became one of the chosen circle of Nero’s intimates, and was looked upon as an absolute authority on questions of taste (‘arbiter elegantiz’) in connexion with the science of luxurious living.” This ex- cited the jealousy of Tigellinus, and led to his condemnation. Petronius’s death is then described, which was in keeping with his mode of life and character. He selected the slow process of opening his veins and having them bound up again, while in conversing with his friends he avoided the serious subjects natural at such a time, and listened to their recitation of light odes and trifling verses. He then dined luxuriously, slept for some time, and, so far from

imitating the practice of others by flattering Nero or Tigellinus in his will, he wrote, sealed, and sent to the emperor a document which professed to

give, with the names of the partners of his vices, a detailed account of the scandalous life of the court.

That this portrait, drawn with such characteristic lines, and painted in such sombre colouring, is sketched from the life in Tacitus's most graphic manner is unquestionable. A fact confirmatory of its general truth is added by the elder Pliny (who calls him T, Petronius), who mentions that just before his death he destroyed a murrhine vase of great value to prevent its falling into the hands of Nero. The question arises whether there is ground for identifying the author of the fragment which we possess under the name of Satire with the person so minutely and faithfully described by Tacitus. Do the traits of this picture agree with that impression of himself which every writer of marked individuality unconsciously leaves on his work ? Further, is there any reason for supposing, as some have maintained, that in this fragment we possess the actual document sent to Nero? The last question may be at once dismissed. The only fragments connected by any kind of continuity which we possess profess to be extracts of the fifteenth and sixteenth books of a work that must have extended to a great length. It would have been impossible to have composed one-tenth part even of this fragment in the time in which Petronius is said to have composed his memorial to Nero. Those who find in the representation of the vulgar, ostentatious, illiterate, but tolerably good- natured Trimalchio a satire on Nero or Tigellinus are capable of finding any meaning they desire in any literary work of a pastage.! But at the same time it is legitimate to note that the author of the banquet of Trimalchio and of the lives of Encolpius and Giton had both the experience and the literary gifts which would enable him to describe with scathing mockery the

"Tuxuriam imperii veterem noctesque Neronis," and that he was not one to be restrained by any prudery from describing them in their most revolting details.

On the other hand, the arguments against identifying the writer of the fragment with the original of the portrait of Tacitus, based on the silence of the historian as to his authorship, may be explained by reference to the historian's practice in regard to the authors of other literary works. Unless these works had any bearing on the part which their authors played in

history, he did not feel himself called upon to mention them; and such a work as the Satire he would have regarded as especially beneath the dignity of history, of which he had so proud a consciousness. The impression of his personality produced by the author corresponds closely with that of the Petronius of the Annals, not only in the evidence it affords of intimate familiarity with the vices of the age, but in the union of an immoral'sensualism with a rich vein of cynical humour and an admirable taste, which we should expect to find in one who rose to favour by his social and convivial qualities, and who received the title of "elegantiz arbiter." The Epicurean maxims, such as—

"Vivamus dum licet esse bene,' quoted by his actors, and the frequent introduction of short poems into their conversations, are in conformity with the opinions and tastes of one who in his last hours "audiebat referentes nihil de immortalitate anime et sapientium placitis, sed levia carmina et faciles versus." Further, the name " Arbiter," by which he is mentioned in later writers, is not an ordinary Latin cognomen, but may have been bestowed on him by his contemporaries from the fact that his judgment was regarded as the criterion

! "Phe supposition of M. Gaston Boissier that the individual satirized

is Pallas, the freedman of Claudius, is much more probable.

of good taste, and Tacitus, in the phrase he perpetuates, may have fixed this as his designation for later writers.

The style of the work, where it does not purposely reproduce the solecisms, colloquialisms, and slang of the vulgar rich—for the most part freedmen of foreign origin—is recognized by the most competent critics as written in the purest Latin of the Silver Age. Coinci- dences of expression and thought with passages in the satires of Persius are not infrequent.1 The false taste in literature and expression fostered by the false style of education is condemned by Persius and Petronius on the same grounds. When the latter

speaks of the ‘“ mellitos verborum globulos” he may possibly have had Seneca in his eye. Again, there would have been no point in putting into the mouth of the old poet whom the adventurers pick up verses on the capture of Troy and the Civil War at any other era than that in which the Troica of Nero and the Pharsalia of Lucan were the fashionable poems. The pertinacity of the reciting poet, which is exposed with such quiet humour by Petronius, is a feature of the age, common to it with the age of Martial and Juvenal. But we learn from Tacitus that the luxury of the table, which appears so profuse and extravagant in the “dinner of Trimalchio,” reached its highest pitch under Nero, and afterwards fell out of fashion (Tac., Anm., iii. 55).

The internal evidence based on the style and character of the work thus appears to favour the opinion that the book was written in the time of Nero; nor is there any one more likely to have been its author than the C. Petronius whose manner of life and whose death are so elaborately described by Tacitus.

The work, of which there have been preserved 141 sections or chapters of a narrative, in the main consecutive, although interrupted by frequent gaps, must have been one of great originality as regards form, subject-matter, and mode of treatment. The name Satire, by which it is designated in the best MSS., indicates that it claims to be of the type of the original “satura” or “ miscellany” to which Varro, in imitation of the Greek writer Menippus, had given the character of a medley of prose and verse composition. But, while in the title and form of the work it belonged to a familiar type, yet from another point of view it is to be regarded as the earliest extant specimen of an original and most important invention in Roman liter- ature. We find in it indeed not only a medley of prose and verse composition, in which the former is much the most prominent element, but also much desultory matter, disquisitions on art and eloquence, stories and anecdotes, &c. But the novelty of form recognized in Petronius con- sists in the string of fictitious narrative by which these are kept together. The original Italian satura, superseded by the Latin comedy, had developed into the poetical satire of Lucilius and Horace, and into the miscellaneous prose and verse essays of Varro. In the hands of Petronius it assumed a new and most important phase in its develop- ment. The careless prodigal who gave his

days to sleep and his nights to pleasure was so happily inspired in his devices for amusing himself as to introduce into Roman literature, and thereby transmit to modern times, the novel

1 E.g., compare Persius, ii. 9, 10—

: . HORN Ebulliat patruus, preclarum funus, et O si Sub rastro crepet argenti mihi seria dextro Hercule”—

with Satire 88, “Alius domum promittit, si propinquum divitem extulerit, alius si thesaurum effoderit,” &c. The “ebulliat patruus” may be compared with a phrase in the dinner of Trimalchio, “homo bellus tam bonus chrysanthus animam ebulltit.” Persius has the phrase “Dives arat Curibus quantum non milvus oberrat,” which 1s a close parallel to Petr., 37, “fundos habet qua milvi volant.” Again, both Persius and Petronius use the rare word “ baro,” which occurs only two or three times elsewhere.

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based on the ordinary experience? of contemporary life,— the precursor of such novels of adventure and character as Gil Blas and Roderick Random. ‘There is no evidence of the existence of a regular plot in the Satire ; but we find one central figure, Encolpius, who professes to narrate his adventures, and to describe all that he saw and heard, while allowing various other personages to exhibit their peculiarities and express their opinions dramatically. From the nature of the adventures described there seems no reason why the book should not have gone on to an inter-

minable length.

The fragment opens with the appearance of the hero, Encolpius, who seems to be an itinerant lecturer travelling with a companion named Ascyltos and a boy Giton, in a portico of a Greek town, apparently in Campania. Encolpius delivers a lecture, full of admirable sense, on the false taste in literature, resulting from the prevailing system of education, which is replicd to by a rival de- claimer, Agamemno, who shifts the blame from the teachers to the parents. ‘he central personages of the story next go through a series of questionable adventures, in the course of which they are involved

in a charge of robbery. A day or two after they are present ata dinner given by a freedman of enormous wealth, Trimalchio, who had risen, as he boasted, “from a penny,” and who entertained with ostentatious and grotesque extravagance a number of men of his own rank, who had not been so prosperous in life. We see actually in flesh and blood specimens of those “Cappadocian knights” to whom we have many pointed references in Martial and Juvenal. We witness their feats of gluttony ; we listen to the ordinary talk of their guests about their neighbours, about the weather, about the hard times, about the public games, about the education of their children. We recognize in a fantastic and extra- yagant form the same kind of vulgarity and pretension which the satirist of all times delights to expose by pen or pencil in the illiter- ate and ostentatious millionaires of the age. Next day Encolpius separates from his companions in a fit of jealousy, and, after two or tliree days’ sulking and brooding on his revenge, enters a picture gallery, where he meets with an old poet, who, after talking sensibly on the decay of art and the inferiority of the painters of the age to the old masters, proceeds to recite in a public portico some verses on the capture of Troy, till his audience take to stoning him. The scene is next on board ship, where Encolpius finds he has fallen into the hands of some old enemies. They are shipwrecked, and Encol- pius, Giton, and the old poet get to shore in the neighbourhood of Crotona, where, with the view of attracting the attention of the inhabitants, notorious fortune-hunters, the adventurers set up as men of fortune. The fragment ends with a new set of question- able adventures, in which prominent parts are played by a beautiful enchantress named Circe, a priestess of Priapus, and a certain matron who leaves them her heirs, but attaches a condition to the in- heritance which even Encolpius might have shrunk from fulfilling.*

What, then, may be said to be the purpose of the book, and what is its ethical and literary value? It can hardly be called a satire in the ordinary, and certainly not in the Roman sense of the word. There is no trace of any purpose of exposing vice with any wish to correct it. If we can suppose the author to have becn animated by any other motive than the dcsire to amuse himself, it might be that of convincing himself that the world in general was as bad as he was himself. Juvenal and Swift are justly regarded as among the very greatest of satirists, and their estimate of human nature is perhaps nearly as unfavourable as that of Petronius ; but their attitude towards

human degradation is not one of compla- cent amusement but of indignant condemnation. They too, like Petronius, take pleasure in describing things most repugnant to all sense of delicacy with the coarsest realism, but theirs is the realism of disgust, not, like that of Petronius, a realism of sym- pathy. It might have been thought difficult to sink lower in the cynical tolerance of immorality than Martial occasionally has sunk. But there is all the difference in the world between Martial and Petronius. Martial does not gloat over the vices of which he writes with cynical frankness. He is perfectly aware that they are vices, and that the reproach of them is the worst that can be cast on any one. But further, Martial, with all his faults, is, in his affections, his tastes, his relations to others, essentially human, friendly, generous, true. There is perhaps not a single sentence in Petronius which implies any knowledge of or sympathy with the existence of affection, conscience, or honour, or even the most elementary goodness of heart, or of that amount of mutual confi- dence which is necessary to keep a band of brigands or a circle of

2 Tn this respect the work of Petronius seems to have differed from the Greek romances.

3 Omnes qui in testamento meo legata habent, preter libertos meos, hac conditione percipient que dedi, si corpus meum in partes conci- derint et astante populo comederint (141).

swindlers together. In estimating such a work, which in its spirit not less than in its form and its literary execution is essentially abnormal, it is necessary to bear in mind that it has reached us in so fragmentary and mutilated a shape that we may altogether have missed the key to it, and that it may have been intended by its author to be a sustained satire, written in a vein of reserved and powerful irony, of the type realized in our modern Jonathan Wild or Barry Lindon. But, if this is not the explanation, we must fall back on the more obvious but still diffieult solution that, in the entire divorce of intellectual power and insight from any element of right human feeling, the work is an exceptional phenomenon in literature. From an ethical and human point of view it is valuable only as a gauge of the degradation in whieh much of Roman society was sunk in the age when

Persius wrote his satires—a work more pervaded by a spirit of moral purity than any other in Latin litera- ture—and Christianity made its first converts in Rome,

But, as a work of original power, of humorous representation, of literary invention and art, the fragment deserves all the admira- tion which it has received. We recognize the ‘‘arbiter elegantiz ” in the admirable sense of the remarks scattered through it on education, on art, on poetry, and on eloquence. Though a better critie than a poet, yet he can write verse not only with good taste and simplicity, rare among the poets of that age, but with a true feeling of nature, as, for instance, in his description of a grove of plane-trees, cypresses, and pines—

“Has inter ludebat aquis errantibus amnis Spumeus et querulo vexabat rore lapillos.” And in some of his shorter pieces he anticipates the terseness and elegance of Martial. The long fragment on the Civil War does not seein to be written so much with the view of parodying as of enter- ing into rivalry with the poem of Lucan, but he has caught the tone and style of the author whom he censures. In the epigram extemporized by Trimalchio late on in the panquet, “ Quod non expectes, ex transverso fit— Et supra nos Fortuna negotia curat, Quare da nobis vina Falerna, puer,”

we have probably a more deliberate parody of the style of verses produced by the illiterate aspirants to be in the fashion of the day. We might conjccture that the chief gift to which Petronius owed his social and his literary success was that of humorous mimicry, in which the most intellectual and at the same time sensual among the Romans—as, for instance, Sulla—took a great delight. The man who could deseribe the dinner of Trimalchio and mimic the talk and peculiarities of the various guests with such humorous zest was just the man to keep the table in a roar during the pro- longed revels in the palace of Nero. If the old ‘‘vexata questio” of the distinction between wit and humour were to be revived, the critic who could determine by analysis what is the essence of the talent of Martial on the one hand and of Petronius on the other would go very near to solving it. He would have, however, to abandon the theory that humour is more essentially humane and sympathetic than wit. Petronius is perhaps the most strictly humorous among Latin writers, and humour is in him

combined with the rarer gift of conceiving and representing character. In Trimalchio and his various guests, in the old poet, in the culti- vated, depraved, and moody Encolpius, in the Chrysis, Quartilla, Polyznis, &c., we recognize in living examples the play of those various appetites, passions, and tendencies which satirists deal with as abstract qualities. Another gift he possesses in a high degree, which must have availed him in society as well as in literature,— the gift of story-telling ; and some of the stories which first appear in the Satire—e.g., that of the Matron of Ephesus —have enjoyed a great reputation in later times. His style, too, is that of one who must have been an excellent talker, who could talk sense when sense was wanted, who could have discussed questions of taste and literature with the most cultivated men of any time as well as amused the most dissolute society of any time in their most reckless revels. One phrase of his is often quoted by many who have never come upon it in its original context, ‘‘ Horatii curiosa felicitas.”

Perhaps next after a day spent in the ruins of Pompcii nothing else makes us feel so near the actual daily life 3f the Roinan world in all its petty details in the Ist century a.p. as this fragment of Petronius. Another obvious observation that is suggested by it is that of the superiority of the novel over any other form of literature for the purpose of literally reproducing the commonplace experience of actual life in every age. Opinions may differ as to the value or interest of the literal reproduction of the customs and manners of such an age as that of Nero.

Compared with the amount of attention which was given to Petronius both by scholars and men of letters in the 17th and 18th centuries, comparatively little has been done for him in recent times. The only good critical edition of the fragments is that of Biichler. An interesting chapter is devoted to him in M. Gaston Boissier’s L’Opposition sous empire. For those who wish to read him

in a modern translation, the French version by M. H. De Guerle is the one to be recommended. We Youisa)

PETROPAVLOVSK, a district town of western Siberia, in the government of Akmolinsk, is situated on the right bank of the Ishim river, 185 miles to the west of Omsk.

The old fort occupies a hill about 100 feet high, which slopes abruptly to the Ishim, while the wooden houses and the broad, unpaved, but regular streets of the town occupy partly the declivities of the hill and partly the (sometimes inundated) banks of the river. The fertile steppes to the east, west, and south of the town largely supply it with corn and cattle, and at the same time give great facilities for trade with the Kirghiz, with Turkestan, and with Bokhara. Its exports passing through the custom-house are estimated at an annual value of about £200,000, the chief items being cottons (upwards of £100,000), woollen stuffs, corn, metals, metallic wares, and spirits. The value of the cattle imports exceeds £150,000 annually, and the aggregate value of the skins, cotton goods, furs, tea, and wool imported reaches the same figure. The town has several tallow-melting houses, tanneries, and glue and soap works; and its industries are steadily increasing. The population (7850 in 1865) now exceeds 11,500.

The small fort of Petropavlovsk, consisting of an earthen palisaded wall, was founded in 1752, and was the military centre of the Ishim line of fortifications. It became at once a place of trade with the Kirghiz, and in 1771 had a population of 914 inhabitants. It received municipal institutions in 1807.

PETROPAVLOVSK is also the name of a Russian seaport in Kam- chatka, on the eastern shore of the Bay of Avateha in 53° N. lat. and 158° 44’ E. long. Its beautiful harbour, one of the best on the Pacific, is but little frequented, and the town eonsists merely of a few huts with some 500 inhabitants. Its naval institutions were transferred to Nikolaicvsk after the attack of the allies in 1854.

PETROPOLIS, a town of Brazil, in the province of Rio de Janeiro, lies at a height of 2400 feet above the sea on a beautiful and healthy plateau, surrounded by the wooded heights of the Serra da Estrella, which lie between it and the coast region. It is about 25 miles almost due north from Rio de Janeiro, and is reached by a railway (22 miles) from Maua; the last 103 miles are on the Rigi system. Founded by the emperor of Brazil as a colony for dis- tressed German immigrants, Petropolis has grown into an elegant and thriving town of 8000 or 10,000 inhabitants, and, besides the royal palace and park, has a number of good hotels and public buildings.

PETROVSK, a town of European Russia, in the pro- vince of Saratoff, lies on both banks of the Medvyeditza, a tributary of the Don, 64 miles north-north-west of Saratoff on the Volga by the highway to Moscow. It was founded by Peter I. in 1698 to defend the district from the en- croachments of the Kuban Tatars, and by the beginning of the 19th century it had become a place of 6921 inhabit- ants, with ten churches and a monastery (St Nicholas). In 1864 the population was 10,128, and it has since increased to upwards of 15,000.

This Petrovsk must not be confounded with (1) Petrovsk, a sea- port town of from 4000 to 5000 inhabitants in northern Daghestan, which possesses one of the best roadsteads on the west coast of the Caspian ; nor (2) with the crown iron-works of this name in Trans- baikalia, deserving mention for its convict establishment, where the ‘ Decembrists ” were kept for several years.

PETROZAVODSK, a town of Russia, capital of the government of Olonetz, lies on the western shore of Lake Onega, 300 miles to the north-east of St Petersburg. The small river Lososinka divides it into two parts,—the town proper and the iron-works. Two cathedrals built towards the end of last century, two lyceums for boys and girls, a mining school, an ecclesiastical seminary, and several primary schools are the chief public buildings and institu- tions. The Government cannon-foundry can turn out annu- ally more than 5000 tons of pig-iron, and the same weight of guns, gun-carriages, and ammunition, but its actual pro- duction is subject to great fluctuations. Within the district there are a few private iron-works as well as important saw- mills. The inhabitants engage in agriculture and fishing, and there is some trade with St Petersburg,—timber, fish, and furs being exported in exchange for corn, groceries,

and manufactured wares. The population (11,027 in 1865) was 11,970 in 1881.

Peter I., who was the first to give attention to the mineral re- sources of Olonetz, founded an iron-work, Petrovskii Zavod, on the Lososinka river, in 1703; the ‘‘zavod” prepared guns and arms, and within its walls a small

palace and a church were built for the czar. The iron-work continued in operation for only twenty-four years ; a copper-work, and subsequently a private iron-work, founded by Frenchmen, had no better success. The Government cannon- foundry was instituted in 1774; the settlement that sprang up was called Petrovsk, and received municipal institutions in 1777. Petrozavodsk became capital of the government of Olonetz in 1802.

PETTY, Sir Witt1am (1623-1687), statistician and political economist, and author of the Down Survey of Irish Lands, was born on 26th May 1623. He was the son of a clothier at Romsey in Hampshire, and received his early education at the grammar-school there. About the age of fifteen he went to Caen (Normandy), taking with him a little stock of merchandise, on which he traded, and so maintained himself whilst learning French, improving himself in Latin and Greek, and studying mathematics and other sciences. On his return to England he seems to have had for a short time a place in the royal navy. He went abroad again in 1643, and remained for three years in France and the Netherlands, pursuing his studies at Utrecht, Leyden, Amsterdam, and Paris. In the last- named city he read Vesalius with the celebrated Hobbes. The philosopher was then preparing his 7ractatus Opticus, and it is said that Petty drew the diagrams for him. In 1647 Petty obtained a patent for the invention of double writing, or, in other words, of a copying machine. In politics he espoused the side of the Parliament. His first

publication was a letter to Samuel Hartlib in 1648, en-

titled Advice for the Advancement of some Particular Parts of Learning, the object of which was to recommend such a change in education as would give it a more practical character. In the same year he took up his residence at Oxford, where he was made deputy professor of anatomy, and where he gave instruction in that science and in chem- istry. In 1649 he obtained the degree of doctor of physic, and was soon after elected a fellow of Brasenose College. He gained some notoriety in 1650 by restoring to life a woman who had been hanged for infanticide.

professor of music at Gresham College. to Ireland, having been appointed physician to the army

in that country. In 1654, observing that the admeasure-

ment and division of the lands forfeited in 1641 and granted to the soldiers had been (to use his own words) “most inefficiently and absurdly managed,” he entered into a contract to execute a fresh survey, which he com- pleted in thirteen months. and part of the money he invested profitably in the purchase of soldiers’ debentures. He thus became pos- sessor of so large a domain in the county of Kerry that, according to Aubrey, he could behold from Mount Man- gerton 50,000 acres of his own land. He set up iron-works in that neighbourhood, opened lead-mines and marble- quarries, established a pilchard-fishery, and commenced a trade in timber. In Macaulay’s History of England there is an account of the settlement which he founded at Ken- mare. Besides the office of commissioner of distribution of the lands he had surveyed, he held that of secretary to the lord lieutenant, Henry Cromwell, and was also during two years clerk of the council. In January 1658 he was elected to Richard Cromwell’s parliament as member for West Looe in Cornwall. He was accused by Sir Jerome Sankey before the House of Commons of malversation and fraud in the conduct of his survey; but the matter did not come to an issue in consequence of the dissolution of the parliament, and Petty afterwards published tracts in his defence. After the Restoration he returned to England

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and was favourably received and knighted by Charles IL, who was “much pleased with. his ingenious discourses,” and who, it is said, intended to create him earl of Kilmore, He obtained from the king a new patent constituting him surveyor-general of Ireland. notice by the success of his invention of a double-bottomed ship, which twice made the passage between Dublin and

In 1651 he

was made professor of anatomy at Oxford, and also became In 1652 he went

By this he gained £9000, .

Ff U

In 1663 he attracted much

Holyhead, but was afterwards lost in a violent storm. He was one of the first members of the Royal Society, and sat on its council. He died at London on the 16th of December 1687, and was buried in the church of his native place. His will, a curious and characteristic document, is printed in Chalmers's Biographical Dictionary.

Petty was a man of remarkable versatility, ingenuity, and re- source. Evelyn declared he had ''never known such another genius," and said of him, 'If I were a prince I would make him my second councillor at least." His character does not seem to have been an elcvated one, though Henry Cromwell, who knew him well, appears to have csteemed him highly.

The survey executed by Petty was, somewhat whimsically, called the '' Down Survey," because the results were set down in maps; it is called by that name in Petty's will. He left in MS. a full account of the proceedings in connexion with it, which was edited by the late Major-General Sir Thomas A. Larcom for the Irish Archeological Society in 1851. The maps, some of which were injured by a fire in 1711, are preserved in the Public Record Office, Dublin. The survey "stands to this day," says Larcom, "with the accompanying books of distribution, the legal record of the title on which half the land of Ireland is held; and for the pur- pose to which it was and is applied it remains sufficient." Petty's name is associated with the foundation, or, as it is safer to say, the successful prosecution of what has been somewhat too ambitiously termed "the science of political arithmetic." It is esseutially the same with what is called comparative statistics, In Petty's time trust- worthy numerical expressions of social facts could seldom be directly obtained, and thus large room was left for more or less probable inference from the available data. As we might have expected from his intellectual character, the expedients to which he resorts in seeking to arrive at determinations of this kind are very ingenious, but often unsatisfactory and even delusive. Whilst, however, he sometimes makes too much of the defective matcrials he could command, he strongly insists on accurate and continued observa- tion as the only sure basis.

Petty was not merely a statistician, he was also a political econo- mist, and one of no mcan rank. He is one of the first in whom we find a tendency to a view of industrial phenomena which was at variance with the then dominant mercantilist ideas, and he exhibits a statesmanlike sense of the elements in which the strength of a nation really consists. Roscher names him as having, along with Locke and Dudley North, raised the English school to the highest point it attained before the time of Huine. His Treatise of Taxes and Contributions has been recently pronounced to be “the first great work on economic theory, which it may fairly be said to have founded.” However this may be, it certainly contains a clear statement of the doctrine that price depends on the labour neces- sary for production. Petty is much concerned to discover a fixed unit of value, and he thinks he has found it in the necessary susten- ance of a man foraday. He understands the cheapening cffect of the division of labour. He states correctly the notion of “natural and true” rent as the remainder of the produce of land after pay- ment of the cost of production ; but he seems to have no idea of the “law of diminishing returns.” He has much that is just on the subject of money : he sees that there may be an excess of it as well as a deficiency, and regards the prohibition of its exportation as contrary to sound policy. But he errs in attributing the fall of the rate of interest which takes place in the progress of industry to the increase in the quantity of money. He protested against the fetters imposed on the tradc of Ireland, and advocated a union of that country with Great Britain. Whilst the general tendency in his day was to represent England as in a state of progressive decline— an opinion put forward particularly in the tract entitled Britannia Languens— Petty declared her resources and prospects to be not inferior to those of France.

A complete list of his works is given in the Athene Oxonienses. The most important are: the Treatise of Taxes and Contributions (1662, 1667, and 1685); Political Arithmetic, presented in MS. to Charles II., but, because it contained matter likely to be offensive to France, kept unpublished till 1691, when it was edited by Petty’s son Charles; Quantulumeunque, or a Tract concerning Money (1682); Observations upon the Dublin Bills of Mortality in 1681, and the State of that City (1683); Essay concerning the Multiplication of Mankind (1686) ; Political Anatomy of Ireland (1691). Several papers appearcd in the Philosophical Transactions. Itis much to be regretted, as M‘Culloch long since remarked,

that a complete and uniform edition of his writings has not been published.

PETUNIA. See Horricurrurg, vol. xii. p. 264. PEUTINGER, Conrap (1465-1547), a prominent and

PE W—PF E

useful citizen of Augsburg, remembered for his services to the new learning. He was one of the first to publish Roman inscriptions (see vol. xiii. p. 124), and his name remains associated with the famous Tabula Peutingeriana (see Maps, vol. xv. p. 517), which was in his hands when he died, and was found again among his MSS. in 1714. This important Roman itinerary table was first published as a whole by Scheyb (Vienna, 1753); the most elaborate edition is by Desjardins (Paris, 1869 and following years).

PEWTER! is a generic term for a variety of alloys, which all agree in this, that tin forms the predominating com- ponent. The finest pewter (sometimes called “tin and temper ”) is simply tin hardened by the addition of a trifle of copper. Ordinary pewter is tin alloyed with lead, which latter ingredient is added chiefly on account of its cheapness, and therefore often in excessive proportion. The law of France restricts the percentage of lead to 16°5, with a toleration of 1°5 per cent. of error, an alloy of this or a higher degreé of richness in tin being, according to an old investigation by Vauquelin, as proof against sour wine or vinegar as pure tin is. Higher percentages of lead are dangerous, and besides spoil the appearance of the alloy. The composition of an alloy containing only these two components can be ascertained approximately by deter- mining the specific gravity (see MrTats, vol. xvi. p. 67 sq.).

Plate pewter is a hard variety much used for plates and dishes ; a good quality is composed of 100 parts of tin, 8 of antimony, 2 of bismuth, and 2 of copper. Closely allied to it is the silver-white alloy called “Britannia metal,” which is much used in Great Britain for the making of tea- pots more especially. To give an idea of its very variable composition the following two analyses may be quoted :—

MUTE 55.0. naees 85°7 81°9 ATIIMONY ...2..200000025 10°4 16-2 CERNE: oii cesses sexes 10 0°0 ZMIN Geese were es ee tees aaaeen BAe

1:9

100°0 100°0

Pewter wares are shaped chiefly in three ways. Measures and spoons are cast in moulds of brass made of two closely- fitting but detachable halves, the surface of the mould being powdered over with sandarach, or painted over with white of egg or oil, before use to prevent adhesion. Plates and dishes are made preferably by hammering. In large establishments milk-jugs and similar articles are often produced by "'spinning," 7.e., by pressing a flat plate of pewter against a rapidly-revolving blunt tool, and thus raising it into the desired shape. (Cf. LzaD, vol. xiv. p.378.)

PFAFF, Curist1AN Hetnricu (1773-1852), chemist and physicist, younger brother of J. F. Pfaff noticed below, took his degree as doctor of medicine at Stuttgart in 1793. He travelled with a noble family as physician, and practised for a time at Heidenheim ; but he afterwards became pro- fessor (extraordinary in 1797, ordinary in 1801) of medi- cine, physics, and chemistry at the university of Kiel. He was a most prolific author of memoirs on sanitary and medical, and especially on chemical and physical, subjects. His work in chemistry was chiefly analytical and mineral- ogical. In physics he was distinguished as one of the earlier experimenters with the voltaic current, and had a considerable share in the experimental investigation of its properties. He also made important researches on the carrying power of magnets, more particularly on the effect of the extent of the attracting surface. Comparatively few of his memoirs are now quoted, owing to the fact that none of his results contained any capital discovery ; never- theless he deserves to be remembered as one of the ener- getic workmen who aided in raising the stately pile of modern experimental science.

1 Old Fr. peutre ; Ital. peltro ; comp. Eng. spelter.

PFAFF, Jowann Friepricn (1765-1825), German mathematician, was born on 22d December 1765 at Stutt- gart. He received his early education at the Carlsschule, where Schiller, afterwards his life-long friend, was a school-

companion. His mathematical capacity was early noticed ; and after leaving school he pursued his studies in that department at Gdttingen under Kastner, author of a History of Mathematics; and in 1787 he went to Berlin and studied practical astronomy under Bode. In 1788 Pfaff became professor of mathematics in Helmstadt, and so continued until that university was abolished in 1810. From that time till his death (20th April 1825) he held the chair of mathematics at Halle. Pfaff's researches bore chiefly on the theory of series, to which he applied the methods of the so-called Combinatorial School of German mathematicians, and on the solution of differential equa- tions. His two principal works are Disquisitiones analytice mamme ad calculum integralem et doctrinam serierum pertinentes (4to, vol. i, Helmstadt, 1797) and " Methodus generalis, zequationes differentiarum particularum, nec non zquationes differentiales vulgares, utrasque primi ordinis inter quotcumque variabiles, complete integrandi " in Adh, d. Berl. Acad. (1814-15). The former work con- tains Pfaff's discussion of the equation (a+ bx") x°d?y/dx* + (c+ ex") xdy/dx + (f + gx") y =X, which generally bears his name, but which had originally been treated in a less complete manner by Euler. The latter work contains an important addition to the theory of partial differential equations as it had been left by Lagrange.

An interesting review of Pfaff's memoir was published by Gauss in the Gottingen Gelehrte Anzeigen for 1815 (republished in vol. iv. of his complete works). For fuller details regarding Pfaff and his work, consult Gerhardt, Geschichte der Mathematik in Deutschland oe 1877, p. 198), and Pfaff s correspondence, edited by C. H.

ait,

Another brother of this family, JoHANN WiLHELM ANDREAS

PraFF (1774-1835), was professor of pure and applied mathematics successively at Dorpat, Nuremberg, Wiirzburg, and Erlangen.

PFALZBURG, a town of German Lorraine, lies high on the west slopes of the Vosges, 25 miles to the north-north- west of Strasburg. In 1880 it contained 3379 (mainly Roman Catholic) inhabitants. The principality of Pfalz- burg, originally a part of Luxemburg, afterwards belonged in turn to the bishop of Metz, the bishop of Strasburg, and the duke of Lorraine, and

passed into the possession of France in 1661. The town was of importance as com- manding the passes of the Vosges, and was strongly forti- fied by Vauban in 1681. The works resisted the Germans for four months in 1870, but have since been razed.

PFEIFFER, Franz (1815-1868), an eminent writer on medieval German literature and on old forms of the German language, was born at Solothurn on the 27th of February 1815. Having studied at the university of Munich, he went to Stuttgart, where in 1846 he became librarian at the royal public library. In 1857, having established his fame as one of the foremost authorities on his special subject, he was appointed professor of German literature and language at the university of Vienna; and in 1860 he was made a member of the Imperial Academy of Sciences. He died on the 29th of May 1868.

As an editor of medieval literature Pfeiffer was unsurpassed among the scholars of his day, and by his work in this department he did much to foster the critical study of writers who before his time were known only to specialists. Among the many writings edited by him may be mentioned the works of the German mystics of the 14th century, the Buch der Natur of Conrad of Megenberg, the Predigten of Berthold of Ratisbon, the Edelstein of Ulrich Boner, the Barlaam und Josaphat of Rudolf of Ems, and the poems of Walther von der Vogelweide. Of his independent writ- ings the most important are Zur deutschen Literaturgeschichte, Ueber Wesen und Bildung der héfischen Sprache in mittelhoch- deutscher Zeit, Der Dichter des Nibclungenliedes, Forschung wnd Kritik auf dem Gebiete des deutschen Alterthums, and Altdeutsches Uebungsbuch. Pfeiffer’s style is clear and vigorous, and on every

subject which he discussed he was able to throw fresh light. A biographical sketch of him by Bartsch occurs in Uhland’s Brief- weehsel mit Fretherrn von Lassberg, which Pfeiffer. edited.

PFEIFFER, Ipa Lavra (1797-1858), traveller, was born at Vienna, the daughter of a merchant named Reyer, 14th October 1797. Ida was the only sister of six brothers, and in her youth acquired masculine habits. Her training was Spartan, and accustomed her to the endurance of hard- ships and deprivations. On 1st May 1820 she married Dr Pfeiffer, a prosperous

advocate of Lemberg, twenty-four years older than herself. Through over-zeal in denouncing abuses her husband incurred official persecution, and ina few years after his marriage was reduced to the greatest poverty. Ida, living mostly apart from her husband, underwent great drudgery, but, through her own exertions, managed to educate her two sons. After being relieved of this responsibility she resolved to indulge her intense longing to travel, and, with the most limited means, succeeded in making a series of journeys which, in extent, are probably unparalleled in the case of any other woman. In 1842 Madame Pfeiffer visited Egypt and Palestine, and, with considerable hesitation, published an account of her journey in three small volumes, Reise einer Wienerin in das Heilige Land, in 1845. In the same year she set out again, this time to Scandinavia and Iceland, describing her tour in two volumes, Reise nach dem Skandinavischen Norden und der Insel Island (Pesth, 1846). In 1846 she started on her first. journey round the world, visiting Brazil, Chili, and other countries of South America, Tahiti, China, India, Persia, Asia Minor, and Greece, and reaching home in 1848. The results were published in three volumes at Vienna in 1850, under the title Zine Frauenfahrt um die Welt. For her next and most extensive journey she re- ceived the support of the Austrian Government to the small extent of £150. Starting in 1851, she went by London to South Africa, her purpose being to penetrate into the interior ; but, this proving impracticable, she pro- ceeded to the Malay Archipelago, spending eighteen months in the Sunda Islands and the Moluccas. After a visit to Australia, Madame Pfeiffer proceeded to California, Oregon, Peru, Ecuador, New Granada, the Missiones Territory, and north again to the American lakes, reaching home in 1854. Her narrative, Meine zweite Weltreise, was published in four volumes at Vienna in 1856. In May of the same year Ida set out to explore Madagascar, where at first she was cordially received by the queen. Unfortunately, she un- wittingly allowed herself to be involved in the plot of a Frenchman to overthrow the government, and, with brutal treatment, was expelled from the country. After being de- tained by her sufferings in Mauritius for some months, Ida returned by England to Vienna, where she died 27th October 1858. The Reise nach Madagascar was issued in 1861, with a biography by her son.

All Madame Pfeiffer’s narratives have been translated into English as well as other languages, and have maintained a steady popularity up to the

present time. Although Ida Pfeiffer can hardly be said to have Uroken up new ground in her travels, she certainly did much to increase our knowledge of countries about which our in- formation was most meagre. Moreover, her scientific collections— for she was as good a collector as observer—were of considerable extent, and great value and novelty, and were regarded as important acquisitions by the Vienna museum. She was made an honorary member of the Berlin and Paris Geographical Societies, and received from the king of Prussia the gold medal of science and art. Her travels altogether covered 150,000 miles by sea and 20,000 by land. Ida Pfeiffer was short in stature, and latterly slightly bent ; her manners were simple, unassuming, and womanly.

PF ORZHEIM, one of the chief industrial towns in the grand-duchy of Baden, is pleasantly situated at the con- fluence of the Nagold, the Wiirm, and the Enz, on the northern margin of the Black Forest, 15 miles to the south-east of Carlsruhe. The most prominent buildings are the old palace of the margraves of Baden-Durlach and

the Schlosskirche, the latter an interesting edifice of the 12th to the 15th centuries, containing the tombs and monu- ments of the margraves. The staple industry is the manu- facture of gold and silver ware and jewellery, which gives employment to nearly 10,000 workmen, besides which there are iron and copper works, and manufactures of chemicals, paper, leather, cloth, and other articles. A brisk trade is maintained in timber, cattle, and agricultural produce. In 1880 the population was 24,037, having almost doubled itself in twenty years. Four-fifths of the inhabitants are Protestants.

Pforzheim (Porta Hercyniz) is of Roman origin, and has belonged to Baden for 600 years. From about 1300 down to 1565 it was the seat of the margraves of the Baden-Durlach-Ernestine line, now extinct. The town was taken by the troops of the Catholic League

in 1624, and was destroyed by the French in 1689. The story of the 400 citizens of Pforzheim who sacrificed themsclves for their

prince after the battle of Wimpfen (1622) has been relegated by .

recent historical research to the domain of legend. The humanist Reuchlin was born at Pforzheim in 1455.

PHADROS, the author of five books of Latin fables in verse, lived in the reigns of Augustus, Tiberius, Cali- gula, and Claudius. To his literary vanity we owe most of our scanty knowledge of his life. He was born on the Pierian Mountain in Macedonia, but seems to have been brought at an early age to Italy, for he mentions that he read a verse of Ennius as a boy at school. According to the heading of the chief MS. he was a slave and was freed by Augustus. He incurred the wrath of Sejanus, the powerful minister of Tiberius, but on what grounds is not known. Devoting himself to literature, he lived in poverty and died at an advanced age. The first two books of his fables were published together; the third, fourth, and fifth appeared later, each by itself. The third book is dedicated to Eutychus, a wealthy man of business and probably a freedman, to whom the poet appeals for promised help. The fourth book is dedicated to Parti- culon, who seems to have dabbled in literature. From the fact that Seneca, writing in 43 or 44 a.p. (Consol. ad Polyb., 27), knows of no Latin writer of fables we may infer that Phzedrus published his fables after that time, but the exact date is unknown. His work shows little or no originality ; he simply versified (in iambic trimeters) the fables current in his day under the name of “sop,” in- terspersing them with anecdotes drawn from daily life, history, and mythology. He tells his fable and draws the moral with business-like directness and simplicity ; his language is classical, neat, and clear, but thoroughly prosaic, though it occasionally attains a dignity bordering on eloquence. He is fond of abstract words. From a literary point of view Phedrus is far inferior to those masters of fable-writing, Babrius and La Fontaine; he lacks the quiet picturesqueness and pathos of the former, and the exuberant vivacity and humour of the latter. Though he frequently refers to the envy and detraction which pursued him, Phzdrus seems to have attracted little attention in antiquity. He is mentioned by Martial (iii. 20, 5), who imitated some of his verses, and by Avianus. Prudentius must have read him, for he imitates one of his lines (Prud., Cath., vii. 115; cp. Phzedrus, iv. 6, 10).

The first edition of the five books of Phedrus was pub- lished by Pithou at Troyes in 1596. But, from the gaps in the books as well as from the

disproportionate short- ness of some of them, it is plain that this collection is incomplete. In the beginning of the 18th century there was discovered at Parma a MS. of Perotti (1430-1480), archbishop of Siponto, containing sixty-four fables of Phedrus, of which thirty-two were new. These new fables were first published at Naples by Cassitto in 1808, and afterwards (much more correctly) by Jannelli in 1811. Both editions were superseded by the discovery of a much

better preserved MS. of Perotti in the Vatican, which was published by Angelo Mai in 1831. For some time the authenticity of these new fables was disputed, but they are now generally accepted, and with justice, as genuine fables of Phzedrus. They do not form a sixth book, for we know from Avianus that Phzdrus wrote five books only, but it is impossible to assign them to their original places in the five books. They are usually printed as an appendix. Even thus it is probable that we have not the whole of Phzdrus.

In the Middle Ages Phedrus exercised a considerable influence through the prose versions of his fables which were current, though his own works and even his name were forgotten. Of these prose versions the oldest existing seems to be that known as the “ Anony- mus Nilantianus,” so called because first edited by Nilant at Leyden in 1709 from a MS. of the 10th or beginning of the 11th century. It approaches the text of Phedrus so closely that it was probably made directly from it. Of the sixty-seven fables which it contains thirty are derived from lost fables of Phedrus. But the largest and most influential of the prose versions of Phedrus is that which bears the name of “Romulus.” It contains eighty-three fables, is as old as the 10th century, and seems to have been based on a still ear- lier prose version, which, under the name of “ Aisop,” and addressed to one Rufus, may have been made in the Carlovingian period. The preface of Romulus, in which he professes to have translated the fables from the Greek, is a mere fiction of the copyist ; no such Romulus as this ever existed, although in the Middle Ages he was sometimes thought to have been a Roman emperor, and has still a place in the Biographie Universelle (1863). The collection of fables in the Weissenburg (now Wolfenbiittel) MS. is based on the same version (the

#sopus ad Rufum) as Romulus. These three prose versions contain in all one hundred distinct fables, of which fifty- six are derived from the existing and the remaining forty-four presumably from lost fables of Phedrus. Some modern scholars, as Burmann, Dressler, and L. Miiller, have tried to restore these lost fables by versifying the prose versions.

The collection bearing the name of Romulus became in its turn the source from which, during the second half of the Middle Ages, almost all the collections of Latin fables in prose and verse were wholly or partially drawn. A version of the first three books of Romulus in elegiac verse enjoyed a wide popularity, even into the Renaissance. Its author (generally referred to since the edition of Névelet in 1610 as the Anonymous of Névelet) was long unknown, but Hervieux has lately shown grounds for identifying him with Walther of England, chaplain to Henry II. and afterwards arch- bishop of Palermo. The version dates from the latter part of the 12th century. It was especially popular in Italy, where the Italian translation of Accio Zuccho (Verona, 1479) was frequently reprinted. Another version of Romulus in Latin elegiacs was made by Alexander Neckam, born at St Albans in 1157, and towards the end of his life (early part of 18th century) abbot of the Augustinian monastery at Exeter. Neckam knew and copied Walther's version, but his own never had the same popularity. Amongst the collections partly derived from Romulus the most famous is probably that in Freuch verse by MARIE DE FRANCE (q.v.). About 1200 a collection of fables in Latin prose, based partly on Romulus, was made by the Cistercian monk Odo of Sherrington; they have a strong medieval and clerical tinge. In 1370 Gerard of Minden wrote a poetical version of Romulus in Low German.

Since the first edition of Phedrus by Pithou in 1596 the editions and transla- tions have been very numerous; among the editions may specially be mentioned those of Burmann (1718 and 1727), Bentley (1726), Schwabe (1806), Berger de Xivrey (1830), Orelli (1832), Eyssenhardt (1867), L. Miller (1877), Hervieux, in his work Les Fabulistes Latins depuis le siécle d' Auguste jusqu'd la fin du moyen age, Paris, 1884. For the medieval versions of Phedrus and their de- rivatives see L. Roth, in Philologus, i. p. 523 sq. ; H. Oesterley, Romulus die Paraphrasen des Phedrus und die aesopische Fabel im Mittelalter, 1870 (untrust- worthy); E. Grosse, in

Jahrbb. f. class. Philol., vol. ev. (1872); and especially the learned work of Hervieux, who gives the Latin texts of all the medieval

imitators (direct and indirect) of Phedrus, some of these texts being now edited for the first time. (J. G. FR.)

PHAETHON (“the shining one”), in Homer an epithet of the sun, and used by later writers as a name for the sun, is more generally known in classical mythology as a son of the Sun and the ocean nymph Clymene. He persuaded his father to let him drive the chariot of the sun across the sky, but he lost control of the horses, and driving too near the earth scorched it; mountains were set on fire, rivers and seas dried up, Libya became a desert, and the fMthiopians were blackened by the heat. To save the earth from utter destruction Zeus killed Phaethon with a thunderbolt. He fell to earth at the mouth of the Eri- danus, a river of northern Europe (identified in later times with the Po), on the banks of which his weeping sisters

were transformed into poplars and their tears into amber. This part of the legend points to the mouth of the Oder or Vistula, where amber abounds. Phaethon was the sub- ject of a drama of Euripides, of which some fragments remain. The suggestion that the legend of Phaethon is a mythical expression of vast increases of temperature pro- duced at long intervals by changes in the relative position of the earth and the heavenly bodies was made by Plato (Timexus, 22 C, D).

PHALANGER. Among the anonymous additions to Charles l’Ecluse’s posthumous work Cure posteriores ; seu plurimarum non ante cognitarum aut descriptarum .. . ammalium nove descriptiones, published at Leyden in 1611, occurs the following :—

“In our third expedition, under Admiral Van der Hagen, there was seen at Amboyna a rare and truly marvellous animal. The ‘cousa,’ as it is called by the natives, is a reddish animal, a little larger than a cat, which has under its belly a kind of pouch in which the mamme are placed, and in this the young are born, and remain there hanging firmly on until large enough to be turned out by their mother. They return, however, continually to the pouch until

sufficiently developed to follow their mother and to find food for themselves. These animals live on grass, green leaves, and other vegetable food, and their flesh is eaten by the Portuguese and other native Christians, but not by the Moliammedans, who con- sider the cousa to be an unclean and forbidden animal, mainly on account of its want of horns.”

This early account forms the first mention of any of the numerous marsupials of the eastern hemisphere, as there can be no doubt that the animal called the cousa by the natives of Amboyna nearly 300 years ago was the Grey Cuscus (Cuscus orientalis), a member of the only marsupial genus occurring in any Eastern land then known to Euro- peans. About a hundred years afterwards the same animal was seen by the Dutch traveller Valentyn, also at Amboyna, and still later Buffon gave to a pair of cuscuses examined by him the name that heads this article, ‘‘ Phalanger,” on account of the peculiar structure of the second and third toes of the hind feet, which are united in a common skin up to the nails, a character now known to be present in a large proportion of the Australian marsupials. Later, Captain Cook in 1770 and 1777, Governor Phillip in 1788, and J. White in 1790 discovered various different kinds of phalangers, and now we know of not less than ten genera, with about thirty-five species, forming the sub-family Phalangistine of the family Phalangistidx, whose general characters have already been noticed in the article Mam- MALIA (vol. xv. p. 382). :

Phalangers as a whole are small woolly-coated animals, with long, powerful, and often prehensile tails, large claws, and, as in the American opossums, with opposable nailless great toes. Their expression seems in the day to be dull and sleepy, but by night they appear to decidedly greater advantage. They live mostly upon fruit, leaves, and blossoms, although some few feed habitually upon insects, and all relish, when in confinement, an occasional bird or other small animal. Several of the phalangers possess flying membranes stretched between their fore and hind limbs, by the help of which they can make long and sus- tained leaps through the air, like the flying squirrels; but it is interesting to notice that the possession of these flying membranes does not seem to be any indication of special affinity, the characters of the skull and teeth sharply dividing the flying forms, and uniting them with other species of the non-flying groups. Their skulls (see fig. 1) are as a rule broad and flattened, with the posterior part swollen out

laterally, owing to the numerous air-cells situated in the substance of the squamosals, The dental formula is very variable, especially as regards the pre- molars, of which some at least in each genus are reduced to mere functionless rudiments, and may even vary in number on the two sides of the jaw of the same individual. The

incisors are always 8, the lower one very large and pro- clivous, and the canines normally }, of which the inferior

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Fig. 1.—Skull of Naked-eared Cuseus (Cuscus gymnotis). After Peters.

is always minute, and in one genus generally absent. The true molars number either 4 or 3.

The genera, of which not less than ten must be allowed as valid, may be arranged as follows.

4 C 4 1. Molars with curved crests, Tt (A.) Pm.? minute or absent; pm.1 and pm.3 functional, the latter stand-

ing obliquely.

a. Canines separated from incisors; tail hairy…... 1. Phalangisia. b. Canines close to incisors; tail naked, scaly ….2. Cuscus. (B.) Pm.? functional; pm.3 forming an even series with the molars.

c. Without a flying membrane; first two anterior toes opposable to rest; tail prehensile …...3. Pseudochirus. ad. With a fiying membrane; toes normal; tail bushy, non-prehensile …….....00ceee cee 004. Petaurista. II. Molars with round or pointed cusps.

(C.) Molars >} Functional premolars aes

e. Lower premolar row interrupted; upper i.l directed forwards; pm.2 functionless …..... 5. Dactylopsila. jf. Lower premolar row continuous;

upper il directed downwards ; pm.2 functional. GAN PINE MEMPIABES Ly. 5.5 4.c0.6 21c.ciei0is ores od 6. Petaurus. B: No flying membrane…..,.....7. Gymnobvelideus.

(D.) Molars ‘.

g. Functional premolars sh ; tail round; no fly-

Hig’ HIGHIDTAHE 105/506 sisi Cieid nye deveeisisicjere ier ees 8. Dromicia. h. Functional premolars <=; taildistichous ; no fly-

II OMAN TICS, £2550, a.etzpars einiexessis oa coeteteiesienelelesers 9. Distoechurus. i. Functional premolars 4 ; tail distichous; a fly-

hives oars 8 Wao pocher socodhad coGc05 Sopnds 10. Acrobata.

1. Phalangista, Cuv.

Upper incisors forming a semicircular series. Upper i.’ scarcely larger than the others, parallel, its anterior surface flattened, point transversely truncated. Canines some way from and shorter than incisors, in front of the premaxillary-maxillary suture* Pm.! small, some way separated both from canine and pm.°; pm.” sup- pressed ; pm.® large, obliquely placed. Molars large, quadrangular, their summits with distinct crescentic ridges. Lower incisors large ; canines very small, but persistent ; pm.1 and pm.” small, or, com- monly, absent; pm.® large and obliquely placed ; molars like the

upper ones.

1 108. 1.2.3.4

Dental formula,>—i, eo C.> PM. reor5 ML. Fg 4 X 2= 34 to 38.

Skull low, without frontal sinuses ; bulle scarcely inflated ; pre- maxillary long ; the anterior palatine foramina almost confined to the premaxille ; mandible with no trace of an external opening into the inferior dental canal.

Feet normal; tail long and bushy, only naked for a few inches along the under-side of the tip.

Range.—The whole of Australia and Tasmania; not yet found in New Guinea. ;

This genus, by its somewhat elongated premaxille, restriction

- At the point of exit from the bone, but the roots are of course situated in the maxilla.

> In this special dental formula, necessitated by the peculiar develop- ment of the teeth of the phalangers, the numbers are those of each individual tooth,—the larger numbers representing fully-developed functional teeth, and the smaller the minute and functionless ones. An asterisk to one of the latter shows that the tooth is sometimes or commonly absent, though it should be remarked that the presence or absence of these minute teeth is not of any systematic importance.

of the palatine foramina to the latter bones, and by the shape of its upper pm.%, shows a certain tendency towards the kangaroos (Macropodidz), the family to which the Phalangistidw are un-

doubtedly most nearly allied.

The true phalangers, or opossums as they are called by the Aus- tralian colonists, consist of four or five hardly separable species, of which the best known is the Vulpine Phalanger (Ph. vulpecula), so common in zoological gardens, where, however, it is seldom seen, owing to its nocturnal habits. It is of about the size and general build of a small fox, whence its name ; its colour is grey, witha yellowish white belly, white ears, and a black tail. It is a native of the greater part of the continent of Australia, but is replaced in Tasmania by the closely allied Brown Phalanger (Ph. fuliginosa). Its habits are very similar to those of the Yellow-bellied Flying- Phalanger (Petaurus australis) described below,—except that, of course, it is unable to take the wonderful flying leaps so character- istic of that animal. Like all the other phalangers, its flesh is freely eaten both by the natives and by the lower class of settlers.

2. Cuscus, Lacép.

Upper incisor row angular in front. Upper i.) considerably longer than the others, round, pointed. Canines close against the last in- cisors, longer than any of the other teeth, placed apparently on the suture. Pm.’ well developed ; pm.? minute or absent ; pm.? large, rounded, its axis slightly oblique. Molars and all the lower teeth much as in Phalangista, but rather larger in proportion.

tae 4 123. Leese

Dental formula.—i. 75 ¢. 7 PM. Frgr3 M. Fogg X 2=84 to 40.

Frontal region of skull in adult animals markedly convex, owing to the presence of large frontal sinuses ; bulle not inflated ; pre- maxillary bones very short ; palatine foramen entering the maxilla; no external opening into the inferior dental canal.

Feet normal; tail long, naked and scaly for its terminal two- thirds, prehensile.

Range.—From Celebes to the Solomon Islands, and southwards through New Guinea to North Queensland.

The cuscuses are curious sleepy-looking animals, which inhabit the various islands of the East Indian archipelago as far west as Celebes, being the only marsupials found west of New Guinea. As already noted, it was a member of this genus, the Grey Cuscus (C. orientalis), a native of Amboyna, Timor, and the neighbouring islands, which was the first Australian marsupial known to European naturalists. There are altogether about eight species known, all of about the size of a large cat; their habits resemble those of other phalangers, except that they are said to be somewhat more carnivorous.

3. Pseudochirus, Ogilb.

Upper incisor row angular. First upper incisor but little longer than the others, but nevertheless the longest tooth in the jaw. Canine small, behind suture. Pm.! rather small; pm.? and pm? larger, each with two roots, neither placed at all obliquely. Molars quadrangular, with very distinct crescentic

ridges; all the teeth from the incisors backwards forming a nearly continuous series. Lower pm.* only forming part of the molar series.

vi28 3 1.2.8. 1.23.4 Dental formula.—i. =F C7 PW. 53M Fogg

x 2=86 to 40.

Skull without frontal sinuses; palatine foramina entering —

maxille, as in all the following genera except Dactylopsila ; bulla inflated ; palate generally complete; a minute external opening into the inferjor dental canal generally present in the position of the large vacuity characteristic of the Macropodida.

Ears large ; fore-feet with the first two toes together opposable to the remaining three ; tail thinly-haired, prehensile.

Range.—Tasmania, Australia, and New Guinea.

There are about four species of this genus known, of which the commonest is Cook’s Ring-tailed Phalanger (Pseudochirus caudt- volvulus), an animal discovered by Captain Cook during his first voyage, at Endeavour river, North Queensland.

4, Petaurista, Desm.

Teeth almost exactly as in Pscudochirus, except that the lower canine is generally absent, as well as the minute first and second premolars.

Dental formula.—i. 5 cg Pm. Fears m. ESE x 2=34 to 40.

Bulle inflated, but small; palate generally incomplete from the level of the second molar; a distinct external opening into the inferior dental canal.

Sides of the body with a broad flying membrane stretching from the elbow to just below the knee; ears large and hairy; claws long and sharp; tail bushy, round, and non-prehensile.

Habitat.—New South Wales.

The only species belonging to this genus is the large black Taguan Flying Phalanger (P. volans), an animal very similar to certain of the large Indian flying squirrels, and which fully agrees in its habits with the Yellow-bellied Flying-Phalanger described below. In its affinities it seems to be, so to speak, a highly- specialized

Pseudochirus, in which the teeth have become somewhat further diminished and the flying membrane has been developed. 5. Dactylopsila, Gray.

Upper i.1 very long, directed forwards. Canine shorter than i3, close to it. Pm.* minute or absent ; pm.® oval, in line with molars. Molars square-sided, forming a straight line, the third as

long as the second. All lower premolars small and deciduous.

Dental formula.—i. 3s cpm. teat m. oS x 2=32 to 40.

Palatal foramen in premaxilla; palate complete; bulle small ; no external opening into inferior dental canal.

Form normal ; fourth forc-toe very much longer than the others ; tail bushy, rounded.

Range.—From the Aru Islands through New Guinea to North Queensland.

Of this genus two closely-allied species are described. They are beautifully striped down the back with white and grey, and are said to be insectivorous in their habits.

6. Petaurus, Shaw.

Upper i} very long, directed downwards. Canine intermediate in length betweeni.tandi.2 Pm.? the smallest, but yet functional. Molars much rounded, as are those of all the succeeding genera ; m.? much smaller than m.? Lower premolars, though small, yet

permanent and forming an uninterrupted serics. 12.8 7 4 V2.8 ane. gt

Dental formula.—i. FFy CT PM. Fy M. Foz Xx 2= 40.

Palatal foramen entering maxilla; bulle inflated ; a small ex- ternal opening into the inferior dental canal.

Sides of body with a flying membrane stretching from the outside of the tip of the anterior fifth toc to the ankle; tail bushy ; ears large and nearly naked. ;

fange.—From New Ireland to South Australia, but not Tasmania.

This genus contains about five species, the largest of which is the Yellow-bellied Flying-Phalanger (P. australis), whose habits are recorded by Mr Gould as follows. “This animal is common in all the brushes of New South Wales, particularly those which stretch along the coast from Port Philip to Moreton Bay. In these vast forests trees of one kind or another are perpetually flowering, and thus offer a never-failing supply of the blossoms upon which it feeds; the flowers of the various kinds of gums, some of which are of great magnitude, are the principal favourites. Like the rest of the genus, it is nocturnal in its habits, dwelling in holes and in the spouts of the larger branches during the day, and displaying the greatest activity at night while running over the small leafy branches, frequently even to their very extremities, in search of insects and the honey of the newly-opened blossoms. Its structure being ill adapted for terrestrial habits, it seldom descends to the ground except for the purpose of passing to a ttee too distant to be

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Fi¢. 2.—Squirrel Flying-Phalanger (Petaurus seiureus)

attained by springing from the one it wishes to leave. The tops of the trees are traversed by this animal with as much ease as the most level ground is by such as are destined for terra firma. If

chased or forced to flight it ascends to the highest branch and performs the most enormous leaps, sweeping from tree to tree with wonderful address ; a slight elevation gives its body an impetus which with the expansion of its membrane enables it to pass to a considerable distance, always ascending a little at the extremity of the leap ; by this ascent the animal is prevented from receiving the shock which it would otherwise sustain.”

A second species, P. setureus, in some ways one of the most beautiful of all mammals, has been chosen for the accompanying cut (see fig. 2).

7. Gymnobelideus, M‘Coy.

Like Petaurus in every respect, but without any trace of a flying membrane.

Habitat.—Victoria.

8. Dromieia, Gray.

First upper incisor and canine very long. Pm.! and pm.? very minute ; pm.* large. Molars rounded; their series bowed inwards. Lower canine and first two premolars very small but persistent ;

pm.° either large and functional or minute. 2 oee 3 1*,2*.3 ss

Dental formula. —i. 1.00% 7 P™. 733 ors) ™- = x 2=82 to 36.

Palate incomplete ; bulle very large and inflated.

No flying membrane ; claws short, exceeded in length by the pads under them ; toes subequal ; tail thinly haired, prehensile.

Five species of Dormouse Phalangers are recorded, ranging from New Guinea to Tasmania. 9. Distoechurus, Peters.

Upper teeth much as in Aerobaia, but pm.* reduced, shorter than molars, and crowded obliquely out of the molar series. Lower teeth also as in Acrobata, but pm.* is entirely suppressed.

es a oh Dental formula.—i. re ey

[0,0 Cc. 7 pm. 1.5.0 m. 1.2.3 × 234.

Skull as in Acrobata.

No flying membrane ; tail distichous ; ears very short; claws well developed.

Habitat.—New Guinea only, whence a single species is known. 10. Aerobata, Desm. ‘ Upper it long. Canine proportionally more developed than in any other phalanger, pressed close against last incisor. Premolars all long, narrow, sharply pointed, and two-rooted. Lower pm.! minute, but always present; pm.? and pm. functional, shaped like the upper ones.

1.2.3 1.2.8

pm. 1.2.3 m. 23 × 2=36,

Palate incomplete ; bulle low and small ; palatal foramen nearly all in the maxillary ; a well-marked external opening into the in- ferior dental canal ; squamosals but little swollen by air-cells.

A flying membrane present, stretching from the elbow to the knee, but very narrow in its centre; tail distichous, probably slightly prehensile ; toes subequal; claws small and far surpassed by the very remarkable toe-pads, which are broad and ribbed, re- sembling those of a gecko, and evidently have a very definite adhesive power.

Range.—South and eastern Australia. ; ; ;

There is only one species in this genus, the beautiful little Pigmy Flying-Phalanger, not so big as a mouse, which feeds on the honey it can abstract from flowers, and on insects. Its agility and powers of leaping are exceedingly great, and itissaid by Mr Gould to make a most charming little pet. (0. T.)

PHALARIS, a Greek tyrant, who ruled Agrigentum (Acragas) in Sicily for sixteen years (probably between c. 571 and 549 B.c.). He was the son of Laodamas, and his family belonged to the Dorian island of Astypalea, near

Cnidus. Asa leading man in the new city (for Agrigentum had been founded by the neighbouring city of Gela only a few years before, 582 B.c.) Phalaris was entrusted with the building of the temple of Zeus Atabyrius on the citadel, and he took advantage of his position to make himself master of the city. Under his rule Agrigentum seems to have attained a considerable pitch of external prosperity. He supplied the city with water, adorned it with fine build- ings, and strengthened it with walls. His influence reached to the northern coast of the island, where the people of Himera elected him general, with absolute power, in spite of the warnings of the poet Stesichorus. Eastward on the coast he had fortified posts at Ecnomus and Phalarium, and he is said to have conquered Leontini; but that he ruled the whole of Sicily, as Suidas asserts, is unlikely. He was at last overthrown, apparently by a combination of the noble families, headed by the rich and distinguished Telemachus, and he was burned, along with his mother

XVIII. — 92

1.2.3 1

Dental formula.—i. [00 & 7

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and friends, in the brazen bull. A decree was carried that

no one should thereafter wear a blue dress, as blue had been the tyrant’s livery.

After ages have held up Phalaris to infamy for his excessive cruelty. In his brazen bull, invented, it is said, by Perilaus of Athens, and presented by him to Phalaris, the tyrant’s victims were shut up and, a fire being kindled beneath, were roasted alive, while their shrieks, conveyed through pipes in the beast’s nostrils, represented the bellowing of the bull. Perilaus himself is said to have been the first victim. There is hardly room to doubt that we have here a tradition of human sacrifice in connexion with the worship of the Pheenician Baal, such as prevailed at Rhodes, where Zeus Atabyrius was no other than Baal; when misfortune threatened Rhodes the brazen bulls in his temple bellowed. The Rhodians brought this worship to Gela,

which they founded conjointly with the Cretans, and from Gela it passed to Agrigentum. Human sacrifices to Baal were common, and, though in Pheenicia proper there is no proof that the victims were burned alive (see MoLocu), the Carthaginians had a brazen image of Baal, from whose down-turned hands the children slid into a pit of fire; and the story that Minos had a brazen man who pressed people to his glowing breast points to similar rites in Crete, where the child-devouring Minotaur must certainly be connected with Baal and the favourite sacrifice to him of children. So, too, we have the fire-spitting bull of Marathon which burned Androgeus. The stories that Phalaris threw men into boiling cauldrons and vessels filled with fire, and that he devoured sucklings, all tell the same tale. From this point of view we may perhaps reconcile with history the apparently con- tradictory tradition which seems to have prevailed in later times, that Phalaris was a naturally humane man and a patron of philo- sophy and literature. This is the view of his character which we find in the declamations ascribed to Lucian, and in the Ictters which bear Phalaris's own name. Plutarch, too, though he takes the unfavourable view, mentions that the Sicilians gave to the severity of Phalaris the name of justice and a hatred of crime. It is recorded that he once pardoned two men who had conspired against him. Phalaris may thus have been one of those men, not unknown in history, who combine justice and even humanity with a religious fanaticism which shrinks from no horrors believed to be demanded by the cause of God.

The letters bearing the name of Phalaris (148 in number) are now chiefly remembered for the crushing exposure they received at the hands of Bentley in his controversy with the Hon. Charles Boyle, who had published an edition of them in 1695. The first edition of Bentley's Dissertation on Phalaris appeared in 1697, and the second edition, replying to the answer which Boyle published in 1698, came out in 1699, From the mention in the letters of towns (Phintia, Alesa, and Tauromenium) which did not exist in the time of Phalaris, from the imitations of authors (Herodotus, Democritus, Euripides, Callimachus) who wrote long after he was dead, from the reference to tragedies, though tragedy was not yet invented in the lifetime of Phalaris, from the dialect, which is not Dorian but Attic, nay, New or Late Attic, as well as from absurdities in the matter, and the entire absence of any reference to them by any writer before Stobzus (who lived apparently about 500 a.p.), Bentley sufficiently proved that the letters were

written by a sophist or rhetorician hundreds of years after the death of Phalaris. Suidas admired the letters, which he thought genuine, and in modern times, before their exposure by Bentley, they were admired by some, e.g., by Sir William Temple, though others, as Politian and Erasmus, perceived that they were not by Phalaris.

There are editions of the epistles of Phalaris by Lennep and Valckenaer, Groningen, 1777 (re-edited, with corrections and additions, by Schaefer, Leipsic, 1823), and by R. Hercher, in Epistolographi Greci, Paris, 1873. The latest

edition of Bentley's Dissertation is that with introduction and notes by W. Wagner, London, 1883.

PHARAOH (nynp; @apad), which the Old Testament

oftea uses as if it were a proper name, applicable to any king of Egypt, though sometimes such a distinguishing name as Hophra (Apries; Jer. xliv. 30) or Nechoh (Nekos) (2 Kings xxiii. 29) is added, is really an Egyptian title of the monarch (Peraa or Phuro), often found on the monu- ments. Apart from Hophra and Necho the Biblical Pharaohs cannot, in the present state of Hebrew and Egyptian chronology, be identified with any certainty.

PHARISEES (a'v98, Papirator), the Jewish party of the scribes, the opponents of the Sadducees. See ISRAEL, vol. xiii. p. 423 sg., and MrssrauH.

PHARMACOPCIA (lit. the art of the dappaxorosds, or drug-compounder) in its modern technical sense denotes a book containing directions for the identification of simples and the preparation of compound medicines, and

published by the authority of a Government or of a medical or pharmaceutical society. The name has also been applied to similar compendiums issued by private individuals. The first work of the kind published under Government authority appears to have been that of Nuremberg in 1542; a passing student named Valerius Cordus showed a collection of medical receipts, which he had selected from the writings of the most eminent medical authorities, to the physicians of the town, who urged him to print it for the benefit of the apothecaries, and obtained for his work the sanction of the senatus. An earlier work, known as the Antidotarium Florentinum, had been pub- lished, but only under the authority of the college of medicine of Florence. The term “pharmacopeia”’ first appears as a distinct title in a work published at Basel in 1561 by Dr A. Foes, but does not appear to have come into general use until the beginning of the 16th century. Before 1542 the works principally used by apothecaries were the treatises on simples by Avicenna and Serapion ; the De Synonyms and Quid pro Quo of Simon Januensis ; the Liber Servitorts of Bulchasim Ben Aberazerim, which described the preparations made from plants, animals, and minerals, and was the type of the chemical portion of modern pharmacopeeias ; and the Antidotarium of Nicolaus de Salerno, containing Galenical compounds arranged al- phabetically. Of this last work there were two editions in use,—Nicolaus magnus and Nicolaus parvus; in the latter, several of the compounds described in the larger edition were omitted and the formule given on a smaller scale.

Until 1617 such drugs and medicines as were in common use were sold in England by the apothecaries and grocers. In that year the apothecaries obtained a separate charter, and it was enacted at the same time that no grocer should keep an apothecary’s shop. The preparation of physicians’ prescriptions was thus confined to the apothecaries, upon whom pressure was brought to bear, in order to make them dispense accurately, by the issue of a pharmacopeia in May 1618 by the College of Physicians, and by the

power which the wardens of the apothecaries received in common with the censors of the College of Physicians of examining the shops of apothecaries within 7 miles of London and destroying all the compounds which they found unfaith- fully prepared. This, which was the first authorized London Pharmacopoeia, was selected chiefly from the works of Mezue and Nicolaus de Salerno, with a few additions from those of other authors then in repute, but it was found to be so full of errors that the whole edition was cancelled, and a fresh one was published in the follow- ing December. At this period the compounds employed in medicine were often heterogeneous mixtures, some of which contained from 20 to 70, or more ingredients, while a large number of simples were used in consequence of the same substance being supposed to possess different qualities according to the source from which it was derived. Thus crabs' eyes, pearls, oyster-shells, and coral were supposed to have different properties. Among other disgusting ingredients entering into some of these formule were the excrements of human beings, dogs, mice, geese, and other animals, calculi, human skull and moss growing on it, blind puppies, earthworms, &c. Although other editions of the London Pharmacopeva were issued in 1621, 1632, 1639, and 1677, it was not until the edition of 1721, published under the auspices of Sir Hans Sloane, that any important altera- tions were made. In this issue many of the ridiculous remedies previously in use were omitted, although a good number were still retained, such as dog's excrement, earth- worms, and moss from the human skull; the botanical names of herbal remedies were for the first time added to the official ones ; the simple distilled waters were ordered

of a uniform strength; sweetened spirits, cordials, and ratifias were omitted as well as several compounds no longer used in London, although still in vogue elsewhere. A great improvement was effected in the edition published in 1746, in which only those preparations were retained which had received the approval of the majority of the pharmacopceia committee ; to these was added a list of those drugs only which were supposed to be the most efficacious. An attempt was made to simplify further the older formule

by the rejection of the superfluous ingre- dients which had been introduced during a succession of ages, and by retention of the known active ingredients. In the edition published in 1788 the tendency to sim- plify was carried out to a much greater extent, and the extremely compound medicines which had formed the principal remedies of physicians for 2000 years were dis- carded, while a few powerful drugs which had been con- sidered too dangerous to be included in the Pharmacopoia of 1765 were restored to théir previous position. In 1809 the French chemical nomenclature was adopted, and in 1815 a corrected impression of the same was issued. Sub- sequent editions were published in 1824, 1836, and 1851.

The first Edinburgh Pharmacopeia was published in 1699 and the last in 1841; the first Dublin Pharmacopeia in 1807 and the last in 1850.

The preparations contained in these three pharmacopceias were not all uniform in strength, a source of much incon- venience and danger to the public, when powerful pre- parations such as dilute hydrocyanic acid were ordered in the one country and dispensed according to the national pharmacopeeia in another. This inconvenience led to the insertion of a provision in the Medical Act of 1858, by which it was ordained that the General Medical Council should cause to be published under their direction a book containing a list of medicines and compounds, and such other matters and things relating thereto, as the General Council should think fit, to be called the British Pharmacopeia, which should for all purposes be deemed to be a substitute throughout Great Britain and Ireland for the several above-mentioned pharmacopeeias. Hitherto these had been published in Latin. The first British Pharmacopeia was published in the English language in 1864, but gave such general dissatisfaction both to the medical profession and to chemists and druggists that the General Medical Council brought out a new and amended edition in 1867. This dissatisfaction was probably owing partly to the difficulty met with in selecting a due propor- tion of formule from each pharmacopceia so as to avoid giving offence to national susceptibilities, and partly to the fact that the majority of the compilers of the work were men not engaged in the actual practice of pharmacy, and therefore competent rather to decide upon the kind of preparations required than upon the method of their manu- facture. The necessity for this element in the construc- tion of a

pharmacopceia is now fully recognized in other countries, in most of which pharmaceutical chemists are duly represented on the committee for the preparation of the legally recognized manuals.

National pharmacopeias now exist in the following countries : —

example, has a pharmacopeia dating from 1853; Modena, Parma, and Piacenza have one in common, published in 1839 ; in the States

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of the Church as well as in Tuscany and Lucca an unofficial com- pilation is in use entitled Orosi Farmacologia technica practica ovvero Farmacologia Italiana ; Naples has its Ricettario Farmaceutico Napolitano (1859); and Lombardy and Venice use the Austrian pharmacopeia. Although Switzerland has anational pharmacopeia, this does not possess Government authority, the French Codex being recognized in Geneva, and the canton of Ticino having a pharma- copeeia of its own. ;

The French Codex has probably a more extended use than any other pharmacopeeia outside the limits of its own country, being, in connexion with Dorvault's L' Officine, the standard for. druggists in a large portion of Central and South America ; it is also official in Turkey. The sum-total of the drugs and preparations it con- tains is about 2000, or more than double the average of other modern pharmacopeias. The progress of medical knowledge during the last two hundred years has led to a gradual but very perceptible alteration in the contents of the various pharmacopeias. The original very complex formule have been gradually simplified until only the most active ingredients have been retained, and in many cases the active principles have to a large extent replaced the crude drugs from which they were derived. From time to time such secret remedies of druggists or physicians es have met with popular or professional approval have been re 'esented by simpler official preparations.

International Pharmacopeia.—The increased facilities for travel during the last fifty years have brought into greater prominence the importance of an approach to uniformity in the formule of the more powerful remedies, such as the tinctures of aconite, opium, and nux vomica, in order to avoid danger

to patients when a prescrip- tion is dispensed in a different country from that in which it was written. Attempts have been made during the last few years by international pharmaceutical and medical conferences to settle a basis on which an international pharmacopeeia could be prepared, but, owing to national jealousies and the attempt to include too many preparations in such a work, it has not as yet been produced. At the fifth International Pharmaceutical Congress held in London in 1881, however, a resolution was passed to the effect that it was necessary that such a pharmacopeia should be prepared, and a commission consisting of two delegates from each of the countries represented was recommended to be appointed in order to pre- pare within the shortest possible time a compilation in which the strength of all potent drugs and their preparations should be equalized,—the work, when complete, to be handed over to their respective Governments or to their pharmacopceia committees. It appears probable that such a work will be presented for considera- tion by the commission at the forthcoming meeting of the con- gress at Brussels in 1885.

Several unofficial universal pharmacopeias have been published from time to time in England and in France, which serve to show the comparative strength of parallel preparations in different countries ; but the results of discussions which have taken place at the international conferences above alluded to indicate that the production and acceptance of an international pharmacopeia will be a work of time, and that in such a work the numerous drugs and preparations intended to meet an unprofessional demand rather than the wants of physicians will have to be omitted. The advances that have been made in this direction are as follows. The metric or decimal mode of calculation and the centigrade scale of temperature are adopted in all pharmacopceias except those of Great Britain, of India, and in some instances of Greece. The majority omit chemical formule. An alphabetical arrangement is followed in all except the French, Spanish, and Greek. The great increase of medical literature and international exchange of medical journals has led to the adoption in almost every country of all the really valuable remedial agents, and the more extended use of active principles has given rise to an approximation in strength of their solutions. The difficulty of nomenclature could probably be overcome by a list of synonyms being given with each article, and that of language by the use of

Latin. The greatest stumbling- blocks in the way of uniformity are the tinctures and extracts,—a class of preparations containing many very powerful drugs, but in which the same name does not always indicate the same thing ; thus, extract of aconite signifies an extract of the root in the pharmacopeeias of the United States, Austria, Hungary, and Russia, extract of the leaves in the Danish and Portuguese, inspissated Juice of the fresh leaves in the British, Indian, Spanish, and Greek, and dry extract of the leaves with sugar of milk in the Norwegian phar- macopeias. Itappears probable, however, that the growth of phar- maceutical chemistry will indicate clearly, in course of time, which of those in use form the most active and reliable preparations, while the general adoption of the metric system will lead to clearcr approxi- mation of strength than hitherto. The method adopted by the Portuguese pharmacopeeia comes nearest to that uniformity which is so desirable in such preparations, as the tinctures of the fresh plants are all prepared with equal parts of the drug and alcoholic inenstruum ; siniple tinctures in general, with unfortunately a few exceptions, with one part of the drug in five parts of alcohol of given

strength ; ethereal tinctures arc in the proportion of one part in

ten ; and the tinctures of the alkaloids and their salts contain one

part of the alkaloid in ninety-nine of menstruum. ; Homeopathic and eclectic practitioners as well as dentists have

also their special pharmacopeeias.

See Bell and Redwood, Progress of Pharmacy (London, 1880); Scherer, Literatura Pharmacopearum (Leipsic and Sorau, 1822); Flint, Report on the Pharmacopeias of all Nations (Washington, 1883); Report of the Proceedings of the Fifth International Pharmaceutical Congress (1881). (E. M. H.)

PHEASANT, Middle-English Fesaunt and Fesaun, German Fasan and anciently Fasant, French Faisan—all from the Latin Phasianus or Phasiana (sc. avis), the Bird brought from the banks of the river Phasis, now the

Rioni, in Colchis, where it is still abundant, and introduced by the Argonauts, it is said, in what passes for history, into Europe. Asa matter of fact nothing is known on this point ; and, judging from the recognition of the remains of several species referred to the genus Phasianus both in Greece and in France, it seems not impossible that the ordinary Pheasant, the P. colchicus of ornithologists, may have been indigenous to this quarter of the globe. If it was introduced into England, it must almost certainly have been brought hither by the Romans; for, setting aside several earlier records of doubtful authority,? Bishop Stubbs has shewn that by the regulations of King Harold in 1059 “unus phasianus” is prescribed as the alternative of two Partridges or other birds among the “ pitantiz” (rations or commons, as we might now say) of the canons of Waltham Abbey, and, as Prof. Dawkins has remarked (Ibis, 1869, p. 358), neither Anglo-Saxons nor Danes were likely to have introduced it into England. It seems to have been early under legal protection, for, according to Dugdale, a licence was granted in the reign of Henry I. to the abbot of Amesbury to kill hares and pheasants, and from the price at which the latter are reckoned, in various documents that have come down to us, we may conclude that they were not very abundant for some centuries, and also that they were occasionally artificially reared and fattened, as appears from Upton,? who wrote about the middle of the 15th century, while Henry VIII. seems from his privy purse expenses to have had in his household in 1532 a French priest as a regular “ fesaunt breder,” and in the accounts of the Kytsons of Hengrave in Suffolk for 1607 mention is made of wheat to feed Pheasants, Partridges, and Quails.

Within recent years the practice of bringing up Pheasants by hand has been extensively followed, and the numbers so reared vastly exceed those that are bred at large. The eggs are collected from birds that are either running wild or kept in a mew,‘ and are placed under domestic Hens; but, though these prove most attentive foster-mothers, much additional care on the part of their keepers is needed

1 These are P. archiaci from Pikermi, P. altus and P. medius from the lacustrine beds of Sansan, and P. desnoyersit from Touraine, see A. Milne-Edwards, Ois. foss. de la France (ii. pp. 229, 239-243),

? Among these perhaps that worthy of most attention is in Probert's translation of The Ancient Laws of Cambria (ed. 1823, pp. 367, 368), where?) extracts are given from Welsh triads, presumably of the age of Howel the Good, who died in 948. One of them is "There are three barking hunts: a bear, a squirrel, and a pheasant." 'The ex- planation is 'A pheasant is called a barking hunt, because when the pointers come upon it, and chase it, it takes toa tree, where it is hunted by baiting." The present writer has not been able to trace the manu- script containing these remarkable statements so as to find out what is the original word rendered " Pheasant" by the translator; but a reference to what is probably the same passage with the same mean- Ing is given by Ray (Synops. Meth. Animalium, pp. 213, 214) on the authority of Liwyd or Lloyd, though there is no mention of it in Wotton and Clarke's Leges Wallice (1730). A charter (Kemble, Cod. Dipiom., iv. p. 236), professedly of Edward the Confessor, granting the wardenship of certain forests in Essex to Ralph Peperking, speaks of 'fesant hen" and "fesant cocke," but is now known to be spurious.

3 In his De studio militari (not printed till 1654) he states (p. 195) that the Pheasant was brought from the East by "Palladius ancorista."'

- The writer is informed that, in 1883, 134,000 Pheasants' eggs were sold from one estate in Suffolk.

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DP to ensure the arrival at maturity of the poults ; for, being necessarily crowded in a comparatively small space, they are subject to several diseases which often carry off a large proportion, to say nothing of the risk they run by not being provided with proper food, or by meeting an early death from various predatory animals attracted by the assemblage of so many helpless victims. As they advance in age the young Pheasants readily take to a wild life, and indeed can only be kept from wandering in every direction by being plentifully supplied with food, which has to be scattered for them in the coverts in which it is desired that they should stay. Of the proportion of Pheasants artificially bred that "'come to the gun" when the shooting season arrives it is impossible to form any estimate, for it would seem to vary enormously, not only irregularly according to the weather, but regularly accord- ing to the district. In the eastern counties of England, and some

other favourable localities, perhaps three-fourths of those that are hatched may be satisfactorily accounted for ; but in many of the western counties, though they are the objects of equally unremitting or even greater care, it would seem that more than half of the number that live to grow their feathers disappear inexplicably before the coverts are beaten. The various effects of the modern system of Pheasant-breeding and Pheasant-shooting need here be treated but briefly. It is commonly condenined as giving encouragement to poaching, and, especially under ignorant management, as substituting slaughter for sport. Un- doubtedly there is much to be said on this score; but in reply to the first objection it has been urged that as a rule the poacher does not like visiting coverts that he knows to be effectively preserved, and that coverts con- taining a great stock of Pheasants, whose rearing has cost a considerable sum of money, are probably the most effectively preserved. As to the second objection it is to be observed that what constitutes sport is in great measure a matter of individual taste, and that the reasonable limit of a sportsman's "bag" is practically an unknown quantity. One man likes shooting a Pheasant rising at his feet or sprung by his spaniels, as it flies away from him through the trees and is still labouring to attain its full speed; another prefers shooting one that has mounted to its greatest height, and, assisted perhaps by the wind, is traversing the sky at a pace that almost passes calculation. If skill has to be considered in the definition of sport there can be no doubt as to which of these cases most requires it. In regard to cruelty—that is, the proportion of birds wounded to those killed—there seems to be little difference, for the temptation to take "long shots" is about equal in either case. The Pheasant whose wing is broken by the charge, if at a great height, is often killed outright by the fall, whereas, if nearer the ground, it will often make good its escape by running, possibly to recover, or more possibly to die after lingering in pain for a longer or shorter time. On the other hand, high-flying Pheasants, having their vital parts more exposed, are often hit in the body, but not hard enough to bring them down, though the wound they have received proves mortal, and the velocity at which they are travelling takes them beyond reach of retrieval. Formerly Pheasants were taken in snares or nets, and by hawking ; but the crossbow was also used, and the better to obtain a "'sitting shot," for with that weapon men had not learnt to "shoot flying"; dogs appear to have been employed in the way indicated by the lines under an engraving by Hollar, who died in 1677 :-—

“* The Feasant Cocke the woods doth most frequent, Where Spaniells spring and pearche him by the sent.” 5

> Quoted by the writer (Broderip ?) of the article “Spauiel ” in the Penny Cyclopedia. The lines throw light on the asserted Welsh prac- tice mentioned in a former note.

The use of firearms has put an end to the older practices, and the gun is now the only mode of taking Pheasants recognized as legitimate.

Of the many other species of the genus Phasianus, two only can be dwelt upon here. These are the Ring-necked Pheasant of China, P. torquatus, easily known by the broad white collar, whence it has its name, as well as by the pale greyish-blue of its upper wing-coverts and the light buff of its flanks, and the P. versicolor of Japan, often called the Green Pheasant from the beautiful tinge of that colour that in certain lights pervades almost the whole of its plumage, and, deepening into dark emerald, occupies all the breast and lower surface that in the confmon and Chinese birds is bay barred with glossy black scallops. Both of these species have been to a considerable extent introduced into England, and cross freely with P. colchicus, while the hybrids of each with the older inhabitants of the woods are not only perfectly fertile inter se, but cross as freely with the other hybrids, so that birds are frequently found in which the blood of the three species is mingled. The hybrids of the first cross are generally larger than either of their parents, but the superiority of size doe: not seem to be maintained by their descendants. White and pied varieties of the common Pheasant, as of most birds, often occur, and with a little care a race or breed of each can be perpetuated. A much rarer variety is some- times seen ; this is known as the Bohemian Pheasant, not that there is the least reason to suppose it has any right to such an epithet, for it appears, as it were, accidentally among a stock of the pure P. colchicus, and offers an ex- ample analogous to that of the japanned Peafowl already noticed (PEACOCK, supra, p. 443), being, like that breed, capable of perpetuation by selection. Toa small extent two other species of Pheasant have been introduced to the coverts of England—P. reevese from China, remarkable for its very long tail, white with black bars,! and the Copper Pheasant, P. semmerringi, from

Japan. The well- known Gold and Silver Pheasants, P. pictus and P. nycthemerus, each the type of a distinct section or sub- genus, are both from China and have long been introduced into Europe, but are only fitted for the aviary. To the former. is allied the still more beautiful P. amherstiz and to the latter about a dozen more species, most of them known to Indian sportsmen by the general name of ““Kaleege.” The comparatively plain Pucras Pheasants, Pucrasia, the magnificent Monauls, Lophophorus, and the fine Snow-Pheasants, Crossoptilum—of each of which genera there are several species—must, for want of space, be only mentioned here. All the species known at the time are beautifully figured from drawings by Mr Wolf in Mr Elliot’s grand Monograph of the Phasianide (2 vols., fol., 1870-72)—-the last term being used in a somewhat general sense. With a more precise scope Mr Tegetmeier’s Pheasants: their Natural History and Practical Manage- ment (4to, ed. 2, 1881) is to be commended as a very useful work. (a. N.)

PHENOL. See Cargoric Act, vol. v. p. 85.

PHERECRATES, one of the chief poets of the Old Attic Comedy, was a contemporary of Cratinus, Crates, and Aristophanes, being older than the last and younger than the two former. At first an actor, he seems to have gained a prize for a play in 438 3.c. The only other ascertained date in his life is 420, when he produced his play The Wild Men. Like Crates, whom he imitated, he abandoned personal satire for more general themes. Still in some.of the fragments of his plays we find him attacking Alcibiades and others. He was especially famed for his inventive imagination, and the elegance and purity

1 The introduction of this species by Lord Tweedmouth near Guisachan in Inverness-shire is said to have been remarkably successful.

of his diction are attested by the epithet drrioéraros (“most Attic”) applied to him by Athenzeus and the sophist Phrynichus. However, Meineke has shown from his remains that his language deviated considerably from the standard observed by the other comic poets of the day. There is genuine feeling in his address to old age (pre- served by Stobzeus, /lor., 116, 12). He

was the inventor of a new metre, which was called, after him, Pherecratean,? and frequently occurs in the choruses of Greek tragedies and in Horace.

Pherecrates is variously stated by ancient authorities to have com- posed eighteen and sixteen plays; Meineke reduces the list of his undoubted plays to thirteen. None of them are extant, but a con- siderable number of fragments have been preserved. These are given in Meineke, Fragmenta Comicorwm Grecorum, vol. ii. (1839), and in Bothe, Frag. Com. Gr. (Paris, 1855).

PHERECYDES oF Syros, one of the earliest Greek philosophers, was the son of Babys and a native of the island of Syros. The dates of his life are variously stated, but there seems to be no doubt that he lived in the 6th century B.C.; amongst his contemporaries were Thales and Anaximander. He was sometimes reckoned one of the Seven Wise Men, and a very uniform tradition repre- sented him as the teacher of Pythagoras. Many wonder- ful tales were told of him, e.g., that from drinking water drawn from a well he was able to predict an earthquake three days before it took place. The accounts of his death are very discrepant, but the commonest was that he died of the morbus pediculosus. But, if the minute description which Hippocrates gives of the death of Pherecydes refers to the philosopher, he would seem to have died of a viru- lent fever, perhaps spotted typhus. He is said to have been the first Greek author who wrote in prose, but per- haps the chronicler Cadmus of Miletus preceded him. The statements of late writers, that he drew his philosophy from secret writings of the Phoenicians, and that he was a disciple of the Egyptians and Chaldzeans, deserve little attention, made as they were at a time when it was the fashion to regard all wisdom as derived from the Kast. He was credited with having originated the doctrine of metempsychosis, while Cicero and Augustine even assert that he was the first to teach the immortality of the soul. Of his astronomical studies he left a proof in the “ helio- tropion,” a cave at Syros which served to determine the annual turning-point of the sun, like the grotto of Posillipo at Naples.

In his book, to which Suidas gives the name of érrduuxos Fro Oeoxpacta 4 Oeoyovla, he enunciated a system in which philosophy and mythology were

blended. In the beginning, according to Pherecydes, were Zeus, Chronos (Time) or Cronus, and Chthon (Earth) ; Chronos begat Fire, Wind, and Water, and these three begat numerous other gods. Siac

Another Puerecypes of Athens, an early Greek historian, was a native of the island of Leros, and lived in the former half of the 5th century Bo. Amongst his contemporaries were Hellanicus and Herodotus. Of his works “On Leros,” “On Iphigenia,” “On the festivals of Dionysus” nothing remains ; but numerous fragments of his great work on mythology, in ten books, have been preserved, and are collected by C. Miiller in his Fr. Hist. Gr., vol. 1.

PHIDIAS (®e.déas), the most famous of Greek sculptors, was born about 500 B.c., and began his artistic career, probably under the guidance of his father, Charmides of Athens, with the study of painting, an art which at that time had attained a singular largeness and dignity of style, while in sculpture these qualities were as yet being sought for with only a somewhat bold and rude result, as may be seen from the remains of it now at Olympia. To do justice to the art of sculpture in this direction there was need of a far greater mastery of tech- nical methods, and we may suppose it to have been with this end in view that Phidias, when he had determined to

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devote himself to sculpture, became a pupil of Ageladas of Argos. It is tempting to believe that it was still under the influence of this master that he executed (between 469 and 463) the Athenian monument at Delphi com- memorating the battle of Marathon; for Ageladas had sculptured at Delphi also a monumental group serving a similar purpose. In the group of Phidias was a portrait statue of Miltiades, and from this circumstance it is rightly inferred that the work had been commissioned at the time when Cimon, the son of Miltiades, was at the head of affairs in Athens. It was apparently at this same period that Phidias was employed to execute for the acropolis of Athens a statue of Athena. This statue, known in after times as “‘the Lemnian” and also as “‘the beauty,” seems to have represented the goddess

in the attitude of standing at rest, helmet in hand, as in a terra-cotta statuette from Cyprus in the British Museum.! When Pericles succeeded to the administration of affairs, and it was determined to erect new temples and other public buildings worthy of the new glory which Athens had acquired in the Persian wars, it was to Phidias that the supervision of all these works was entrusted, with an army of artists and skilled workmen under him. By 438 the Parthenon was com- pleted, with its colossal statue of Athena in gold and ivory by Phidias himself, and with its vast extent of sculp- ture in marble, executed at least under his direction and reflecting in most parts his genius.2, Meantime the enor- mous expense of these undertakings had involved Phidias in the public discontent which was growing up round Pericles (Aristoph., Peace, 605). The story related by Plutarch (Pericles, 31) is that Menon, a former assistant of Phidias, had brought a charge against him of having appropriated part of the gold and ivory allowed him for the statue of Athena, and that, being acquitted on this charge, he was next denounced for introducing portraits of himself and of Pericles on the shield of Athena, and in consequence of this charge died in prison, either a natural death or by poison. But these statements cannot be reconciled with the tradition that, after completing his Athena, he was invited to undertake at Olympia what proved to be the grandest work of his life, the colossal gold and ivory statue of Zeus in the newly-erected temple. According to this same tradition he died at Olympia, and it may be inferred that he died much honoured there from the fact that his workshop was preserved in after times as a show-place for visitors, and that his descendants obtained an hereditary right to look after the great statue of Zeus. As a means of reconciling these conflicting statements it has been supposed that the charge of appropriating the gold had been made before he went to Olympia, and the charge of sacrilege when he had returned thence to Athens. Others again prefer to accept the story of Plutarch as it stands, and to assign the stay of Phidias in Olympia to an early period of his life—-previous to 455. As to the charge of theft, it could never have reached a public trial, because every one acquainted with the management of the public treasures knew that the gold of the Athena was so sculptured that it could be removed annually and weighed by the officials of the treasuries. Pericles told the Athe- nians (Thuc., ii. 13) that it could be removed and utilized for the war. ‘The other charge of having placed portraits of himself as a bald-headed old man (438) and of Pericles on the shield of Athena is incredible. Pericles with the

helmet which he always wore was almost an ideal Greek In appearance. Among the Greeks fighting with the a See ; 1 See A. S. Murray, Greek Sculpt., ii. pl. 17 ; compare the Greek Inscription from the base of a statue of Athena in Cyprus, which says that she was made after the Phidian model, and had laid aside her

arms, Hirschfeld, Tituli statuar., No. 178, or C. I. Gr., No. 2073. > See A. S. Murray, op. cit., ii. p. 98 sg.

Amazons on the shield of Athena it was probably easy to find a figure not unlike him. The same may be said of the bald-headed old man who was identified with Phidias. But there is a wide difference between idle gossip and a criniinal charge. It is true that there is in the British Museum a marble fragment of what professes to be a copy of the shield, and on it there are portraits of Phidias and of Pericles; but these portraits answer so minutely to the description of Plutarch that there can hardly be a doubt of their having been produced subsequently to illus- trate some current story on which that description was founded. The workmanship is several centuries later than Phidias, and it would be strange if the portraits for which he had paid with his life had been left for so long a time on the shield, or had even been allowed at any moment to be perpetuated in a copy. In answer to this objection it was fabled that the portraits had been so fixed on the shield that they could not be removed without bringing down the whole work !

To obtain something like a fair judgment of the style of Phidias it is to the sculptures of the Parthenon now in the British Museum that we must turn (see ARCHAOLOGY, vol. ii. p. 356). Though executed in what was to him an inferior material, marble, it yet happened that the elevated position which these sculptures were to occupy on the temple was such as to give scope for the highest powers of composition, and so far they may be regarded as a worthy monument of his genius. Alike in the frieze, the metopes, and the remaining figures of the pediments we have the same perfect rendering of the true effects of light and shade, which above all reveals the artist who can com- pose his figures and his groups so as to make the spectator feel that nature would not have done otherwise had nature been a sculptor. For composition of this kind there was necessary a

most complete knowledge of form in all its details, since no part was so minute as not to affect the aspect of the whole. In this respect Phidias was famed in antiquity, and the Parthenon sculptures justify that fame. He must, however, have found finer opportunities in the colossal statues of gold and ivory, where the greater difficulty of duly distributing light and shade was rewarded with greater splendour of effect. In these statues the nude parts, such as the face, hands, and feet, were of ivory, the drapery of gold ; and in the statue of Zeus at Olympia the gold was enriched with enamelled colours, and the impression of the whole is described by ancient writers with unbounded praise (see vol. ii. p. 355, and A. S. Murray, Gr. Sculpt., ii. p. 123). Of the Athena in the Parthenon there exist two small copies in marble found in Athens, but so rude in execution as to be of no service in conveying a notion of the style of the original. On the acropolis, and not far from the Parthenon, stood a colossal bronze statue of Athena Promachos by Phidias, the attitude- and to some extent the type of which may be gathered from the small bronze found at Athens, and figured in vol. ii. p. 355. In Elis he executed a statue of Aphrodite in gold and ivory, and at Platzea a colossal Athena of wood gilt, with the face, hands, and feet of Pentelic marble. Bright but simple colours had been traditional in art before the time of Phidias. It is not supposed that he had sought to refine upon them as a colorist. What he did was to com- bine with their simplicity and brightness the ideal large- ness and dignity of conception which he shared with the great painters of his day, and the perfection of execution which he shared with the greatest of contemporary sculptors. A. 8. M.)

PHIGALIA (®cyéAea, also called Piadia), a city in the south-west angle of Arcadia, situated on an elevated rocky site, among some of the highest mountains in the Peloponnesus,—the most conspicuous being Mount Coty-

lium and Mount Eleum ; the identification of the latter is uncertain.

In 659 B.c. Phigalia was taken by the Lacedzemonians, but soon after recovered its Independence ; it was on the whole unfortunate during the Peloponnesian War; and, in common with the other cities of Arcadia, it appears from Strabo to have fallen into utter decay under the Roman rule.

The notices of itin Greek history are rare and scanty. Though its existing ruins of city-wall and forts and the

description of Pausanias show it to have been a place of

considerable strength and importance, yet no autonomous coins of Phigalia are known. Nothing now remains above ground of the temples of Artemis or Dionysus and the numerous statues and other works of art which still existed at the time of Pausanias's visit, about 170 a.p. A great part of the city-wall, built in fine Hellenic "isodo- mous" masonry, and a large square central fortress with a circular projecting tower, are the only remains now traceable,—at least without the aid of excavation. The walls, once nearly 2 miles in circuit, are strongly placed on rocks, which slope down to the little river Neda.

One very important monument of the wealth and artistic taste of the Phigalians still exists in a fairly perfect state ; this is a temple dedicated to Apollo Epicurius (the Pre- server), built, not at Phigalia itself, but at the village of Bassze, 5 or 6 miles away, on one of the peaks of Mount Cotylium ; it commemorates the aid rendered by Apollo in stopping the progress of a plague which in the 5th century B.C. was devastating Phigalia. This temple is mentioned by Pausanias (viii. 41) as being (next to that at Tegea) the finest in the Peloponnesus, "from the beauty of its stone and the symmetry of its proportions." It has also a special interest in having been designed by Ictinus, who, with Callicrates, was joint architect of the Parthenon at Athens. Though visited by Chandler, Dodwell, Gell, and other English travellers, the temple was neither explored nor measured till 1811-12, when Chas. Rob. Cockerell and some other archeologists spent several months in making excavations there. After nearly fifty years' delay, Professor Cockerell published the results of these labours, as well as of his previous work at A'gina, in Temples of 4igina and Basse (1860), one of the most careful and beautifully illustrated archzeological works that has ever been produced. The labours of Professor Cockerell and his companions were richly rewarded ; not only were suffi- cient remains of the architectural features discovered to show clearly what the whole design had been, but the internal sculptured frieze of the cella was found almost

perfect. This and other fragments of its sculpture are now in the British Museum.

Fig. 1 shows the plan of the temple, which is of the Doric order, but has an internal arrangement of its cella quite unlike that of any other known temple. It stands on an elevated and partly artificial plateau, which commands a most glorious and extensive view of the oak-clad mountains of Arcadia, reaching away to the blue waters of the Messenian Gulf. Unlike other Doric temples, which usually stand east and west, this is placed north and south ; but it has a side entrance on the east. Itis hexastyle, with fifteen columns on its flanks ; thirty-four out of the thirty-eight columns of the .peristyle arc still standing, with the greater part of their architrave, but the rest of the entablature and both pediments have fallen, together with the greater part of the internal columns of the cella. It will be seen from the plan that these are very strangely placed, apparently without symmetry, as regards the interior, though they are set, for what reason it is hard to say, regularly opposite the voids in the peristyle. :

With the exception of one at the south end, which is Corinthian, the internal columns are of the Ionic order, and are built, not free, but engaged with the cella-wall, forming a series of recesses, which may have been designed to contain statues. Another peculiarity of this interior is that these columns reach to the top of the cella in one order, not in two ranges of columns, one over the other, as was the usual Dorie fashion. These inner columns carried an Ionic entablature, of which the frieze now in the British Museum formed

apart. The pediments and external metopes of the peristyle appear to have contained no sculpture, but the metopes within the peri- style on the exterior of the cella had seulptured subjects ; only a [f few fragments of these were, how- ||: ever, discovered. The position occupied by the great statue of Apollo is a difficult problem. Cockerell, with much probability, places it in the vestibule of the cella, opposite the eastern side door, so that it would be lighted up by the rays of the rising sun. The main entrance is at the northern end through the pronaos, once defended by a door in the end of the cella and a metal screen, of which traces were found on the two columns of the pronaos. There was no door between the posticum | aud the cella. The

general pro- |} portions of the fronts resemble 8 those of the Theseum at Athens, ||; except that the entablature is less massive, the columns thicker, and the diminution less,—all propor- | || tionally speaking. In plan the temple is long in proportion to its width,—measuring, on the top of | |’<10° 4+ the stylobate, 125 feet 7 inches by | 48 feet 2 inches, while the Theseum (built probably halfa century earlier) is about 104 feet 2 inches by 45 feet 2 inches.

The material of which the temple is built is a fine grey limestone (once covered with painted stucco), except the roof-tiles, the capitals of the cella columns, the archi- traves, the lacunaria (ccilings) of the posticum and pronaos, and the sculpture, all of which are of white marble. The roof-tiles, specially noticed by Pausanias, are remarkable for their size, workmanship, and the beauty of the Parian marble of which they are made. They measure 2 feet 1 inch by 3 feet 6 inches, and are fitted together in the most careful and ingenious manner. Unlike

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Frc. 1.—Plan of the Temple at Basse.

those of the Parthenon and the temple of Agina, the dpuod or “‘joint-tiles ” are worked out of the same piece of marble as the flat ones, at a great additional cost of labour and material, for the sake of more perfect fitting and greater security against wet.

Traces of painting on various architectural members were found by Professor Cockerell, but they were too much faded for the colours

Fig. 2,—Oune slab of the Basse frieze ; combat of Greeks and Amazons.

to be distinguished. The designs are the usual somewhat stiff and E liciomcar Exonk patterns,—the fret, the honeysuckle, and the egg and dart. ’ : ;

The sculpture is of the greatest interest, as being an important example of the school of Phidias, designed to decorate one of the fincst buildings in the Peloponnesus in the latter half of the 5th century B.c. ; see Phigaleian Marbles, Brit. Mus. Publications.

The frieze, now in the British Museum, is quite complete ; it is nearly 101 feet long by 2 feet high, carved in relief on twenty-three slabs of marble 44 to 5 inches thick (see fig. 2). The subjects are the battle of the Lapithe and the Centaurs, and that between the Amazons and the Greeks, the two favourite subjects in Greek plastic art of the best period. They are designed with wonderful fertility of invention, and life-like realism and spirit ; the composition is arranged so as to forma series of diagonal lines or zigzags /W, thus forming a pleasing contrast to the unbroken horizontal lines

Plate X.

of the cornice and architrave. The various groups are skilfully united together by some dominant line or action, so that the whole subject forms one unbroken composition.

The relief is very high, more than 34 inches in the most salient parts, and the whole treatment is quite opposite to that of the Parthenon frieze, which is a very superior work of art to that at Basse. Many of the limbs are quite detached from the ground ; the drill has been largely used to emphasize certain. shadows, and

‘in many places, for want of due calculation, the sculptor has had

to cut into the flat background behind the figures. From this it would appear that no finished clay-model was prepared, but that the relief was sculptured with only the help ofa drawing. The point of sight, more than 20 feet below the bottom of the frieze, and the direction in which the light fell on it have evidently been carefully considered. Many parts, invisible from below, are left comparatively rough. The workmanship throughout is unequal, and the hands

of several sculptors can be detected. On the whole, it must be ad- |

mitted that the execution is not equal to the beauty of the design, and the whole frieze is somewhat marred by au evident desire to produce the maximum of effect with the least possible amount of

labour,—very different from the almost gem-like finish of the Par- |

thenon frieze. Even the design is inferior to the Athenian one ; most of the figures are ungracefully short in their proportions, and there is a great want of refined beauty in many of the female hands and faces. It is in the fire of its varied action and its subtlety of expression that this sculpture most excels. The noble move- ments of the heroic Greeks form a striking contrast to the feminine

weakness of the wounded Amazons, or the struggles with teeth |

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substratum of the city is a clay soil mixed with more or less sand and gravel.

The site of the present Philadelphia was originally settled by the Swedes, and so Penn found it when he came to lay

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and hoofs of the brutish Centaurs ; the group of Apollo and Artemis | R SA
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in their chariot is full of grace and dignified power. The marble in which this frieze is sculptured is somewhat coarse and crystalline; the slabs appear not to have been built into their place but fixed afterwards, with the aid of two bronze bolts driven through the face of each.

Of the metopes, which were 2 feet 8 inches square, only one exists nearly complete, with eleven fragments ; the one almost per- fect has a relief of a nude warrior, with floating drapery, overcom- ing a long-haired bearded man, who sinks vanquished at his feet. The relief of these is rather less than that of the fricze figures, and the work is nobler in character and supcrior in execution. The other pieces are too fragmentary to show what were their subjects.

No modern Greek village exists now on the site either of Basse or of Phigalia.

In addition to the works mentioned in the text the following may be con- sulted :—Leake, Morea (vol. i. p. 490, and ii. p. 319); Curtius, Peloponnesos (i. 319); Ross, Reisen in Peloponnesos ; Stackelberg, Der Apollo-Tempel zu Basse (1826); Lenormant, Bas-reliefs du Parthenon et de Phigalie (1834); and Frie- derichs, Geschichte der griechischen Plastik (1868). (J. H. M.

PHILADELPHIA, the name of several cities of anti- quity, of which the two most important have been noticed under ALA-SHEHR, vol. i. p. 443, and AMMONITES, vol. i. p. 743.

PHILADELPHIA, the chief city of Pennsylvania, and the second city in the United States of America, is situ-

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General Plan of Philadelphia.

out the city ; and many of the original patentees for town lots under him were descendants of these first settlers. The original city limits were from east to west 10,922 feet 5

ated (39° 57’ 7-5” N, lat., 75° 9’ 23-4” W. long.) on the | inches, and from north to south 5370 feet 8 inches, or more west bank of the Delaware river, 96 miles from the | than 2 square miles. The boundaries were Vine street on Atlantic and in a direct line 125 miles north-east of | the N., Cedar (now South) street on the S., the Delaware

Washington, D.C., and 85 miles south-west of the city of New York. Its greatest length north-north-east is 22 miles, its breadth from 5 to 10 miles, and its area 82,603 acres, or about 129 square miles (greater than that of any other city in America). The surface of the city between the rivers Delaware and Schuylkill—the latter running parallel with the Delaware and dividing the city about in half,~~east and west—is remarkably level. It varies, how~~ ever, in elevation from 244 feet above the sea to 440 feet, the latter in the northern and suburban sections. The eastern and western sections of the city are connected by eight bridges. The length of river-front on the Delaware is nearly 20 miles, and the length of wharves 5 miles. On both sides of the Schuylkill, to Fairmount dam, the front is 16 miles and the length of wharves 4 miles. The mean low-water mark of the Delaware is 24 feet, and the tide rises 6 feet, while the average depth of water at the city wharves is 50 feet. The wharf-line, which varies from 14 feet to 68 feet, gives extraordinary accommodation for ship- ping. The Delaware is navigable at all seasons of the year for vessels of the heaviest burden, and Philadelphia affords one of the best protected harbours in the country. The

river on the E., and the Schuylkill river on the W. And this was the city of Philadelphia from its foundation until the 2d day of February 1854, when what is known as the Consolidation Act was passed by the legislature of the ~ State, and the old limits of the city proper were extended to take in all the territory embraced within the then county of Philadelphia. This legislation abolished the districts of Southwark, Northern Liberties, Kensington, Spring Garden, Moyamensing, Penn, Richmond, West Philadelphia, and Belmont; the boroughs of Frankford, Germantown, Manayunk, White-Hall, Bridesburg, and Aramingo; and the townships of Passyunk, Blockley, Kingsessing, Roxborough, Germantown, Bristol, Oxford, Lower Dublin, Moreland, Bybery, Delaware, and Penn; and it transferred all their franchises and property to the consolidated city of Phil- adelphia under one municipal government. The present boundaries of the city are: on the E. the

Delaware, on the N.E. Bucks county, on the N.N.W. and W. Montgomery county, and on the W. and S. Delaware county and the Delaware. The greater part is laid out in parallelograms, with streets at right angles to each other. Each main parallelogram contains about 4 acres, or is 400 feet on each

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of its sides, divided by one or more small thoroughfares. Upon the city plans there are plotted 191,928 separate town lots. The main streets running north and south are num- bered from First or Front to Sixty-third streets, and those running east and west were formerly named after the trees and shrubs found in the province. Thus, while the principal street in the city is named Market street, other main streets are named Chestnut, Walnut, Spruce, Pine, &c.! The main streets of Philadelphia are 50 feet wide, with some few exceptions: Broad or Fourteenth street is 113 feet wide, and Market street is 100 feet wide. The streets are gener- ally paved with rubble stone, although square or Belgian blocks of granite are being extensively introduced. There are laid down on the city plans upwards of 2000 miles of streets, but at present (1884) only 10604 miles are opened, of which 573°54 miles are paved and 44°28 macadamized. The pavements are chiefly of brick, but some of the more prominent streets have flagstone sidewalks. Market street and Chestnut street, below Eighth street, and Front street are the localities where the main wholesale business of the city is conducted. Most of the retail stores are situated in the upper part of Chestnut street and Eighth street. The principal banking institutions are in Chestnut street, between Second and Fifth streets, and in Third street between Walnut and Chestnut streets. Walnut street in the southern section of the city, and Spring Garden and Broad streets in the northern section of the city, are the chief streets for large and luxurious private residences. There is not a street of any consequence which has not a tramway along it; and the tramway system has done a great deal to increase building, until now Philadelphia is emphatically 'the city of homes." There are upwards of 160,000 dwelling-houses, of which at least 110,000 are owned by the occupants. According to the returns for the census of 1880, there were 146,412 dwelling-houses in the city, which, taking the population as given by that census, 847,170, gave 5°79 persons to each house, while the num- ber of dwellings in New York to

the population gave 16°37 to each house. On the original plan of the city five squares, equidistant, were reserved for public parks. One of these, called Centre square, situated at the intersection of Broad and Market streets, has been taken for the erec- tion of the city-hall, and the remaining four, situated at Sixth and Walnut, Sixth and Race, Eighteenth and Walnut, and Eighteenth and Race, and named respectively Wash- ington, Franklin, Rittenhouse, and Logan, have a com- bined area of 29°06 acres. There are six other public squares in the city, with a total area of 18°90 acres. In addition to these public squares, Fairmount Park, with an area of 2791% acres, including 373 acres of the water-sur- face of the Schuylkill river, is the most extensive public park in the United States. It lies in the north-western section of the city, and the Schuylkill river and Wissa- hickon creek wind through the greater portion of it.2 In the park Horticultural Hall and Memorial Hall remain

1 The geometrical laying out of the city into parallelograms made easy the adoption of the decimal system of numbering for the houses, which is readily understood aud greatly helps strangers and citizens in finding their way about the streets. The houses in streets running east and west are numbered by hundreds, beginning at the Delaware and going west. Thus, from Delaware river to Front street the houses are numbered from 1 to 100; from Front street to Second street from 100 to 200 ; above Second street 200; above Third street 300; and soon. The even numbers are placed on the south side of the street and the odd numbers on the north side of the street. Mar- ket street is taken as a dividing line between north and south, and all the main streets stretching north and south, which lie north of Market street, are in the same way numbered running northerly, and those which lie south of Market street are numbered running southerly. The west side is given the even numbers and the east side the odd numbers.

2 There are 34°27 miles of footwalk, 30°46 miles of carriage-drives, and 7°82 miles of bridle-paths within the boundaries of the park.

as mementoes of the Centennial Exhibition held there in 1876. The garden of the Zoological Society, covering 33 acres, on the outskirts of the park, was opened Ist July 1874, as the pioneer of such enterprises in the United

States. Until within the last score of years the buildings in Philadelphia bore a singular resemblance to each other, especially the dwelling-houses. The predominant material for building was, and is, red brick, the soil affording the finest clay for brick found in the United States. The desire for uniformity in buildings, both in style and material, has happily undergone a change in recent years, although the danger now is of running to the other extreme, and thus giving the streets a decidedly bizarre appearance. There are 238} miles of sewers in Philadelphia, but the drainage of the city is wholly inadequate. The streets are lighted by 12,805 gas-lamps, and Chestnut street by the electric light. There are 748 miles of gas main, and the average daily consumption is 10,624,000 cubic feet.

Bualdings.—The old brick Swedes Church in Swanson street in the extreme south-eastern section, dedicated on the first Sunday after Trinity 1700, is the oldest building of character now standing in the city. When it was completed it was looked upon as a great masterpiece, and nothing was then equal to it in the town. The four other colonial buildings of importance still standing are Christ (Protestant Episcopal) Church, the old State House (Inde- pendence Hall), the Pennsylvania Hospital, and Carpenter's Hall, all of them built of red brick with black glazed headers. Dr. John Kearsley, a physician, was the archi- tect of the first-mentioned, and Andrew Hamilton, a lawyer, the architect of the second. Christ Church stands on the west side of Second street between Market and Arch streets, and its erection was begun in 1727, but it was not finished, as it now appears with tower and spire, until 1754. It was built on the site of a still older Christ Church, which was also of brick, erected in 1695. Queen Anne in 1708 presented a set of communion plate to the church, which is now used on great occasions. During his presidency Washington worshipped at this church, and his pew is still preserved, as is also that of Franklin. In 1882 the interior of the church was restored to its ancient character at an expense of about $10,000. 'The nave is 75 feet long by 61 feet in width and 47 feet high; the chancel is 15 feet by 24; and the spire is 196 feet 9 inches high. The old State House or Independence Hall, on the south side of Chestnut street between Fifth and Sixth streets, was commenced in 1731, and was ready for occupancy by the Assembly towards the close of 1735. It was the scene of almost all the great civil events of the Revolutionary War. It is 100 feet in length on Chestnut street by 44 feet in depth ; and prior to the

centennial celebration its exterior and interior were restored as nearly as possible to their original appearance. The Pennsylvania Hospital occupies the square of ground bounded by Spruce, Pine, Eighth, and Ninth streets, and the corner-stone of the building was laid on 28th May 1755. Carpenter's Hall, where the first Congress met, stands back from Chestnut street, east of Fourth street, and was begun in January 1770. These four buildings are all very simple in their construc- tion, but substantial and imposing, and are interesting specimens of colonial architecture. Among the notably fine buildings in Philadelphia are the old United States bank, now the United States custom-house, the Girard bank, the United States mint, and the Girard College, all of which, with the exception of the last-named, were built more than half a century ago. 'They are all of white marble and of the different orders of Grecian architecture, with porticos and high fluted columns. Other fine build-

3 The collection numbers 673 specimens,—mammals 251, birds 372, reptiles and batrachians 50, valued at $46,726.

ings are the Masonic Temple, the Ridgway branch of the Philadelphia library, the Pennsylvania Academy of Fine Arts, and the Academy of Natural Sciences. There are also very many beautiful churches. 'The two newest build- ings of magnitude are the new United States post-office, at the corner of Ninth and Chestnut streets, which is just completed (1884) at a cost of $8,000,000, and the new municipal buildings for the city of Philadelphia at the intersection of Broad and Market streets, which are in course of construction. The post-office, which is Roman- esque, is of granite, and was more than ten years in building, from October 1873 to March 1884. It has a frontage of 425 feet, a depth of 175 feet, and a height of 164 feet. The carrier delivery of the Philadelphia post- office covers the greatest territory of any city in the world, excepting London; it employs 900 men, of whom 448 are letter-carriers. The annual sales of stamps amount to $1,600,000. About half a million of letters, &c., pass through the post-office each day. The new public build- ings, as they are called, or city-hall, were begun in August 1871, and when completed will be the largest single build-

ing in America. It covers an area, including courtyards, of nearly 44 acres, the dimensions being 470 feet east and west and 486 feet north and south. The building will contain 520 rooms, and the topmost point of the dome, on the tower, will be 537 feet 4 inches above the courtyard, or the highest artificial construction in the world. The ex- terior structure is now roofed in and completed, with the exception of the tower. The total amount expended on this building to 31st December 1883 was $9,731,488-81, and the estimated total cost is $13,000,000. The archi- tecture is rather rococo in character.

Population.—Previous to the census of 1830 Philadel- phia was the most populous American city, but since then New York has taken the first place. In 1683 it was esti- mated that Philadelphia had 80 houses and 500 inhabitants. The next year the population increased 2000, and by the beginning of the last century there were 700 dwelling- houses and 4500 people. In 1800 there were 9868 dwell- ings and 81,009 inhabitants, and in 1820, the last census when Philadelphia stood first, she had a population of 119,325. By the census of 1880 the population of the city is placed at 847,170 (males 405,989, females 441,181), while in 1870 it was 674,022, and in 1860 565,529. About one-third of the population in 1880 were foreign born. In 1883 there were 21,237 births, of which 11,102 were males and 10,135 females. The number of emigrants landed in the year at Philadelphia was 23,473, of whom 13,899 were males and 9574 females,—a decrease of 9778 from 1882. Of these emigrants 7304 were from England, 6023 from Ireland, 5232 from Sweden and Norway, and 2991 from Germany. The mayor of Philadelphia in his annual message to councils in April 1884 places the popu- lation of the city at 1,023,000, while the Board of Health estimate it at 907,041. The death-rate of the city in 1883 was 22°13 per thousand. By the census of 1880 41 per cent. of the population were engaged in gainful occupa- tions, In 1884 there were in Philadelphia 1294 lawyers and 1637 physicians. The city has 622 places of worship, viz., Baptist 83, Hebrew 11, Lutheran 32, Methodist eae Moravian 5, Presbyterian 110, Protestant Episcopal 96, Quaker 15, Reformed Dutch 20, Reformed Episcopal 10, Roman Catholic 47, Swedenborgian 3, Unitarian 3, Uni- versalist 4, and 52 among 23 other different denomina- tions. There are 53 cemeteries and burial-grounds in the city.

Municipal Government.—By Penn's charter of 25th October 1701 Philadelphia was first created a borough city with a government of its own, separate from that of the province and county. Under

this charter, with many modifications, the city was governed until the Act of the legislature of the State incorporating the city was

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passed, 11th March 1789. This is the fundamental law governing the city to-day, but with such changes as have become necessary by the altered condition of affairs and the development of the entire country. The most important change was the Consolidation Act of 2d February 1854, already mentioned, whereby the old county of Philadelphia became the city of Philadelphia, the county of Phila- delphia being at the same time continued as one of the counties of. the State. The city is divided territorially and politically into thirty- one wards, and is governed by a mayor, elected by the people for three years, and by two bodies, called the select and common couneil. The upper branch is composed of one member from each ward elected for three years, who must have attained the age of twenty-five years and have been a citizen and inhabitant of the State for four years next before his election, and the last year thercof an inhabitant of the ward for which he shall be chosen. Each ward has a member of common council, elected for two years, for every 2000 taxable inhabitants ; he must be twenty-one years of age and have the other qualifications required for the upper body. The mayor is the executive chead of the city and the councils are the law-making power. The mayor has the right of veto upon the acts of the councils. Councils in joint meeting appoint all heads of depart- ments not elected, establish the rate at whieh all taxes shall be levied that are authorized by law, and fix the salaries of all muni- cipal officers elected by the people, as well as those they appoint. The city can make no binding contract or incur any debt unless authorized by law or ordinance and an appropriation sufficient to pay the same be previously made by councils. The sanitary care of the city is vested in a board of health composed of nine members appointed by the judges of the Courts of Common Pleas of the county, who have charge of the sanitary condition of the city and citizens. Among the duties of the board is that of keeping an ac- curate record of all

births, marriages, and deaths. The poor of the city are under the charge of a board of twelve guardians elected by councils. These several bodies, councils, board of health, and guardians of the poor all serve without pecuniary compensation. Edward Shippen was named in the charter of 1701 as first mayor of the city. The last mayor under the English crown was Samucl Powel, elected 3d October 1775, and he was also the first mayor under the United States, being re-elected 13th April.1789. During the interim of the Revolutionary War the municipal government was suspended, and the affairs of the city were carried on by the councils of safety and other loeal bodies.

Police, Fire, Water.—The mayor is the nominal head of the police of the city, and all the appointments and removals are in his hands. The force consists of 1415 men, of whoni 1225 are patrolmen. There are four captains and one chief of police; and the fire marshal is attached to the police department. The number of arrests made in 1883 was 45,612, and the number of commitments to the county prison 23,245.

The fire department is governed by a board of fire commissioners elected by councils, and consists of a chief engineer, six assistant engineers, and four hundred men. They are divided into twenty- nine steam-engine companies and five hook and ladder companies, with the addition of hose and hose-carriage to each. In 1883 there were 804 fires.

The largest portion of Philadelphia is supplied with water from the Schuylkill, and it was in great part for the preservation of the purity of this water-supply that Fairmount Park was created. The park has not, however, served its purpose in this respect, and the water supplied to the city is most impure. The supply also is hardly adequate to the demand, and many other sources have been suggested. The capacity of the present waterworks allows a daily aycrage pumpage of 90,000,000 gallons, and the seven reservoirs have a total capacity of 191,224,560 gallons. The total number of gallons of water pumped in 1883 was 25,182,775,641, or a daily average of about 69,000,000. There are 784 miles of pipe under ground to supply at least 170,000 buildings, of which 151,096 are (January 1884) dwelling-houses. The dwellings are charged for water according to the number and character of appliances in use, irrespective of the amount of water used or

the number of the occupants of the house. The streets have a number of fountains, erccted by the Philadelphia Fountain Society, for the use of horses, dogs, and men; and there are also 5752 hydrants for the use of the fire department; but these are wholly insufficient to protect the city.

Finances.—On ist January 1884 the-funded debt of the city of Philadelphia-was $66, 365,591°24, and the floating debt $689, 355° 36 or a total indebtedness of $67,054,946°60. The city assets at the same period were $28,096,394°75, so that the excess over assets was $38,958,551°85. This is a reduction of the city's debt from its highest point, 1st January 1880, when it amounted to $72,264,595°76. The assessed valuation of real estate in the city of Philadelphia, Ist January 1884, was $583,613,683, and the annual tax for the year amounted to $10,383,381°84. In 1883 the receipts from all sources for municipal purposes were $13,632,842°38. The various trust funds of the city are under the control of a board of directors of city trusts, composed of twelve prominent citizens appointed by the judges of the Courts of Common Pleas. The board has charge of the

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Girard Fund ; the Wills Hospital Fund, for the relief of indigent blind and lame; the Franklin Fund, for aiding young married artificers ; and sundry funds for furnishing the poor with fuel and other purposes,—amounting in the aggregate, on 31st December 1883, to $11,606,320°92.

There are thirty-two national banks in Philadelphia with an ageregate capital of $17,578,000, and for the week ending 30th June 1884 their loans and discounts were $78,525,885, deposits $64,436,411, and circulation $8,416,013. Their surplus on 31st December 1883 was $8,712,303, In addition to the national banks there are six banks chartered by the State with an aggregate capital of $714,600 ; eight trust and safe deposit companies, where deposits are received and a quasi banking business done, with a total capital of $8,625,000, and a surplus on 31st December 1883 of $4,589,732 ; and three saving funds without any capital, but where all the de- positors are interested in the profits, with total deposits on 31st December 1883 of $28,503,200°98. Philadelphia has fourteen joint- stock fire insurance companies, with a capital of $3,950,000; five joint-stock fire and marine companies, with a capital of $4,860,000 ; six mutual fire

insurance companies; and six life insurance com- panies. In addition to these there are a real estate title insurance company and a plate-glass insurance company, their objects being expressed in their titles.

Commerce.—Until within the last sixty years Philadelphia was the commercial emporium of the United States, but since that time her commerce has been gradually declining, until now she ranks fifth in the order of ports, being preeeded by New York, Boston, San Francisco, and New Orleans. At the same time her inanufactures have been steadily increasing, until she has become the great manufacturing centre of the country. On 30th June 1884 there were registered as belonging to the port of Philadelphia 854 vessels, having a tonnage of 197,491 tons, 295 being steamers. For the year ending 31st December 1883 724 coast-wise vessels having a tonnage of 418,625 tons entered, and 1213 with a tonnage of 576,719 tons cleared. During the same period there entered 1066 foreign vessels with a tonnage of 813,706 tons, and 942 cleared with a tonnage of 732,333 tons. For the six months ending 30th June 1884 there entered 290 American vessels with a tonnage of 134,807 tons, and 199 cleared with a tonnage of 101,908 tons. In the same period 285 foreign vessels entered with a tonnage of 263,577 tons, and 246 cleared with a tonnage of 238,929 tons. Statistics of the exports and imports of the city have been kept since 1821; and they show that the greatest exports in any one year were in 1876, the centennial year, when they amounted to $50,539,450. The greatest imports ($38,933,832) were in 1880. For 1883 the exports were $38,662,434 and the imports $32,811,045. For the six months ending 30th June 1884 the exports were $17,605,271, and the imports $18,245,733. The total receipts for duties at this port for the year 1883 were $11,834,014‘55, and for the six months ending 30th June 1884 $6,917,376°71. Lines of steamers run to Liverpool, Glasgow, New York, Boston, Baltimore, Savannah, Charleston, and other ports. Philadelphia is also the centre of the three great internal carrying lines of the State, the Pennsylvania Rail- road, the Lehigh Valley Railroad, and the Reading Railroad. The last two are principally coal-roads from the great anthracite coal- fields of Pennsylvania, while the first, with its numerons branches, is the main artery from the west for the transportation of its agricultural products. The gross receipts for 1883 of the Penn- sylvania Railroad, from all lines connecting directly with Phil- adelphia, were $57,512,766°36. The total tonnage moved

over these same lines was 57,879,115 tons, and the number of passengers for the same period was 36, 584,435, and the picces of baggage 1,774,192. The tonnage of the other two roads is proportionately large.

Industries. —The largest single classes of manufactures are the iron and steel and the textile industries. The first-named, which ineludes all forms of machinery and of iron and steel articles, em- ployed in 1883 31,917 persons in 712 establishments, producing articles valued at $58,608,781. The manufactures of wool, cotton, silk, &c., employed 60,897 persons in 1018 establishments, pro- ducing textile fabrics to the value of $102,087,128; and these figures are rather below than above the actual facts. In the earpet manufaeture alone, for which there are 216 establishments, there are 35,000,000 yards of carpet made annually. The census for 1880 gave Philadelphia 8567 manufacturing establishments, with a eapital of $187,148,857, employing 185,527 hands and producing articles valued at $324,342,935 per annum. 'The seven classes producing over $10,000,000 a year were—sugar-refineries (11), £24,294,929; factories of woollen goods (89), $21,349,810; men's clothing manufactories (426), $18,506,748; cotton-mills (145), $14,268,696; carpet manufactories (170), $14,263,510; foundry and machine shops (226), $13,455,238 ; drugs and chemicals manu- factories (54), $11,804,793. Since then, however, Philadelphia has nade great strides, and the close of 1882 showed 12,063 manufac- turing establishments, employing 147,137 men, 67,050 women, and 28,296 children under sixteen years of age, or a total of 242,483, and yielding products of the value of $481, 226,309. The large and important industry of brick-making, for which there are 63 yards,

produces annually about 350,000,000 bricks, of a market value of at least $3,500,000. The fine " pressed brick" of Philadelphia is used in all parts of the country, and of late years moulded bricks of various designs and of any size have been extensively and success- fully made.

Charities. —There are not less than 300 charities proper in Phil- adelphia, leaving out institutions of learning which come within the legal definition of the word. A few of them are municipal, but the majority are wholly private in their origin and conduct. Among the former may he classed the Blockley

Almshouse for the care of the indigent poor of the city, and the house of correction, employ- ment, and reformation at Holmesburg. This last is a mixed insti- tution, being a workhouse both for criminals and paupers, and in 1883 thero were received into it 7290 men, women, and children. On 31st December 1883 there were 1236 inmates, of whom 197 were females. 'The city bath-houses are another important municipal charity. There are twenty-two hospitals in Philadelphia, the most important being the Pennsylvania Hospital, projected in 1751 by Benjamin Franklin and Dr Thomas Bond. It is governed princi- pally by the Quakers, and is supported wholly by voluntary contri- butions. It has a capacity for 230 patients, and recent accident cases are always admitted. The insane department of this hospital is located on Haverford road, and was opened in 1841, since which time to January 1884 there have been 8852 patients. In addition to this hospital for the insane there is an insane department attached to the City Hospital at the Almshouse, and a Friends' Asylum for the Insane at Frankford. Other important charities are the Phil- adelphia Dispensary, Home for Consumptives, Home for Incurables, Preston Retreat (lying-in charity), Orphans' Society, Philadelphia Working Home for Blind Men, Sheltering Arms for Infants, the Sick Diet Kitchen, and the House of Refuge for Juvenile Delin- quents. This last receives children committed by the court of Oyer and Terminer upon conviction of a criminal offence, also vagrant, incorrigible, or vicious children committed by magistrates on complaint of the parent or any other person that the parent or guardian is incapable or unwilling to control them.

Education.—Penn in his fraine of government provided that a committee of manners, education, and art should be appointed, so that all "wicked and scandalous living may be prevented, and that youth may be trained up in virtue, and useful arts and knowledge." The first school in Philadelphia of which we have knowledge was opened the year following the foundation of the colony. At a ineeting of the provincial council held in Philadelphia "ye 26th of 10th month 1683" the governor and couneil, " having taken into serious consideration the great necessity there is of a schoolmaster for the instruction—and sober instruction—of youth in the town of Philadelphia, sent for Enoch Flower, an inhabitant of the said town, who for twenty years past hath been exercised in that care and employment in England," and engaged him to instruet the youth of the eity. In the year 1689 the first

public school in Pennsylvania was established at Philadelphia under the care of the celebrated George Keith. It was incorporated by the provincial council 12th February 1698, and was entitled "The Overseers of the Public Sehools founded in Philadelphia at the request, costs, and charges of the people of God called Quakers," and in 1711 received a charter from Penn. This sehool, although supported by the Quakers, was open to all, and for more than sixty years continued to be the only public place for instruction in the Pee It thrived and was held in high estimation, and its legitimate successor is still in operation in Philadelphia, where it maintains its ancient reputa- tion. In 1749 Franklin published his Proposals Relative to the Education of Youth in Pennsylvania, which resulted the next year in the establishment of the academy and eharitable sehool, which became a college in 1755, and in 1779 was incorporated as the university of Pennsylvania. The university at present occupies a site in Woodland avenue, in what was formerly West Philadelphia, and gives instruction in ten departments (Arts, Music, Medicine, Law, Dentistry, Philosophy, Auxiliary of Medicine, Veterinary Medi- cine, Towne Seientifie School, and Wharton School of Finance and Economy). 'The faculty consists of 132 professors, leeturers, and instructors in the various departments, and for the college year 1883-84 there were 1000 students.

The public school system of Pennsylvania was not really firmly fixed until] 1818, when by an Aet of the legislature Philadelphia was made the first school district of Pennsylvania with a distinct educational system from that of the State in general. This district is governed by a board of public education composed of 31] members, one from each ward of the city, who are appointed, one-third each year for three years, by the judges of the Courts of Common Pleas of the county. They have the finaneial control and general super- vision of schools, the selection of the books to be used, the over- sight of the teachers, and the building of the schoolhouses. In addition to this board there are the directors of the public schools, twelve from each ward, who have the local supervision of the schools in their respective sections. They are elected by the people, one- third each year for three years. The schools are divided into primary, secondary, and grammar schools, in addition to which

there is a central high school, a finishing school for boys, and a normal school which is a finishing sehool for girls, and where they can also be qualified to become teachers. There are 465 public schools in Philadelphia and 236 school-buildings of a value of $4,186,200. In 1883 the city appropriated $1,637,651°04 to educa- tion. During the same period 105,424 children attended the public schools, at an average cost per pupil of $15°35, and 82 male and 2086 female teachers are employed in their instruction. Another noted educational institution in Philadelphia is Girard College for orphans, endowed by Stcphen Girard in 1831 for the benefit of poor white male orphan children. By the will a prefer- enee is given first to orphans born in Philadelphia, second to those born in Pennsylvania, third to those born in New York city, and fourth to those born in New Orleans. To be qualified for admis- sion the orphans must be between six and ten years of age; anda child without a father, while the mother is living, is held to be an orphan entitled to admission. The buildings cost $1,933,821°78, and were formally opened in January 1848. The total value of the estate applicable to the purposes of the college was on 31st Deeember 1883 $10,138,268°10, and the gross receipts of income for the year 1883 were $976,961°06. During the same period there were 1105 boys inmates of the college. At Philadelphia are also the Pennsyl- vania Institution for the Instruction of the Deaf and Dumb; the Pennsylvania Institution for the Instruction of the Blind; the Pennsylvania Academy of the Fine Arts, founded in 1805, and the first art school in Ameriea ; the School of Design for Women ; the Pennsylvania Museum and School of Industrial Art; and the Jefferson Medical College.

Libraries.—Philadelphia was for many years not only the first city commercially in the country, but it was also the seat of letters. When the poet Moore visited America in 1804 he wrote to his mother, of Philadelphia, "it is the only place in America that can boast of a literary society." Unfortunately it has much degenerated in this respect in eighty years, and to-day but little attention is paid by its people to letters and literature. To Franklin, again, its first library is due. It grew out of the Junto, and in 1731 the Library Company of Philadelphia was established. In 1769 it absorbed the Union Library Company, which had been formed some few years before ; and in 1792 the Loganian Library, a valuable col-

lection of classical and other works provided for under the will of

James Logan, a friend of Penn, was transferred to the Philadelphia library. It subsequently acquired, by bequest, the libraries of the Rev. Samuel Preston of London and of Williain Mackenzie of Phil- adelphia, Among the rarities in the latter was a copy of Caxton's Golden Legend, 1486. In 1869 it was made the beneficiary, under the will of Dr James Rush, of an estate valucd at over a million dollars. It has two library buildings and possesses about 145,000 volumes, as well as valuable manuscripts and broadsides. The

Mercantile Library Association is the popular circulating library of

the city, and contains 149,000 volumes. Other libraries are the Atheneum, Apprentices' Library, Library of the Law Association, and Friends' Library.

*Learned Societies.—The American Philosophical Society is the oldest organized body for the pursuit of philosophical investigation in its broadest sense in America. It was founded also by Franklin, 25th May 1743, and incorporated 15th March 1780, with its founder as president. It began the publication of its transactions in 1773, and the 22d volume has been recently issued. The publication of the proceedings of this society was commenced in 1838, and still continues. Its library contains about 23,000 volumes, and the society also possesses valuable manuscript correspondence of Franklin. The Academy of Natural Sciences was organized in 1812, and its ornithological collection, which contains over 25,000 specimens, is claimed to be the finest in the world. It has a fine library of works on the natural scienccs, and publishes a journal and its proceedings. The Franklin Institute for the promotion of the mechanic arts started in 1824. It has a valuable library of over 20,000 volumes devoted to mechanics and kindred subjects, and has ever*sinee its organization published a monthly journal. The Historical Society of Pennsylvania was founded in 1824, and is devoted to the preservation of material relating to the history of the State. Its collections are of great historical value, and its library contains more than 20,000 volumes. The Numismatic and Antiquarian Society of Philadelphia, founded in 1858, was the first organization on the American continent to engage in the pursuit of numismatic science. It has a fine collection of eoins and a good library.*

Another notable body is the College of Physicians and Surgeons, with a medical library of 23,000 volumes and a fine museum of prepared specimens.

Newspapers.—The American Weekly Mercury was the first news- paper published in Philadelphia and the third in the colonies. It was started on 22d December 1719 by Andrew Bradford, a son of William Bradford, the first printer in the middle colonies, and this paper was the first newspaper in the same section. On 21st September 1784 the first daily newspaper in the United States was issued at Philadelphia. It was the American Daily Advertiser, subsequently published as Powlson's Daily Advertiser, and later

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merged into the North American and United States Gazette, which is thus by succession the oldest daily newspaper in the United

States. There are at present (July 1884) twenty daily newspapers

published in Philadelphia, eight of them being afternoon papers,

with an average circulation of 375,000, and seventy-seven weekly newspapers, chiefly religious and Sunday secular papers.

Social Life.—Among Philadelphia's claims to priority she has in her midst one of the oldest purely social clubs in existence,—the Colony or State in Schuylkill, which was formed in 1732. The other purely social clubs in the city are the Philadelphia Club, Social Art Club, and University Club. The Union League (Repub- lican) and Commonwealth (Democratic) are mixed social and poli- tical clubs. There are some organizations of a mixed social and charitable character, such as the St George Society (1772), the St David Society (1729), the St Andrew's Society (1749), and the Sons of St Patrick or Hibernian Society (1771). The First Troop of Philadelphia City Cavalry, formed in 1774, is a military organiza- tion of high social standing. There are also a gentlemen's driving park or racecourse and innumerable cricket and boat elubs. There is an opera-house capable of accommodating 3500 persons, and five first-class theatres, but Philadelphia as a community scems not to be a theatre-going people.

History.—Down to the War of Independence the history of Philadelphia is virtually that of PENNsyLVANtA (g.v.). The patent granted to William Penn (see PENN, p. 495) for the territory em- braced within the present Commonwealth of Pennsylvania was signed by Charles II. on the 24th of March 1681, and in the autumn of that year Penn appointed three commissioners to proceed to the new province and lay outa great city. This seems to havc been his chief thought in settling the province, and his instructions to his commissioners were to select a site on the Delaware where " it is most navigable, high, dry, and healthy; that is where most ships can best ride, of deepest draught of water, if possible to load or unload at the bank or key side without boating or lightering of it." These commissioners were William Crispen, Nathaniel Allen, John Bezar, and William Heage. Crispen, who was a kinsman of the proprietor, died on the voyage out, and the remaining com- missioners arrived toward the close of the year. They had been preceded by Penn's cousin, Captain William Markham, as deputy- governor, and were soon followed by the surveyor-general of the province, Thomas Holme, who, as may be understood from his office, was one of the most important men in the early history of the city and State. The site of the city was speedily determined upon, and Holme proceeded to lay it out according to the modified instructions of Penn, and his Portraiture of the City of Philadelphia tn the Province of Pennsilvania in Ameriea was published and sold by Andrew Sowle in Shoreditch, London, in 1683. This plan shows the old part of the city as it is to-day, covering between 1200 and 13800 acres. Unfortunately no date can be fixed, even ap- proximately, for the founding of the city; nor is the date known of Penn's first visit to the capital of his province. He landed at Newcastle on the Delaware on 27th October 1682, and two days later came up as far as Upland, now Chester, 13 miles south of Philadelphia. He doubtless did not remain long so near his pet scheme without viewing it, but when he did first come to Phila- delphia is now unknown.!

The seat of government was fixed in Philadelphia by the meeting of the governor and council on the 10th of Mareh 1683, and the General Assembly met two days later. For 117 years the city continued to be the capital of Pennsylvania and was the most important town, commercially, politically, and socially, in the colonies during nearly the whole of this period. In October 1685 the first printing press established in the middle

colonies was set up here by William Bradford ; the earliest specimen of his work which has survived to our day is his Kalendariwm Pennsylvaniense or America's Messenger, being an Almanaek for the year of Grace 1686. The printing press was followed in 1690 by a paper-mill, erected by William Rittenhousc, a Mennonite preacher, on the Wissahickon creek, a locality which has ever since remained a favourite for the manufaeture of paper. The one man, next to William Penn, whose influence was most deeply impressed npon Philadelphia as upon the affairs of the colony, was Benjamin Franklin, whose power was felt almost on his first landing in October 1723, when in his eighteenth year, and its impress is seen to-day. Four years after he settled here he formed a club for mutual improvement, which he called the "Junto," out of which subsequently grew the American Philosophical Society for the pro- motion of useful knowledge and the Library Company of Philadel- phia. He also originated the present university of Pennsylvania, organized the first fire-engine company in the city, and was instru- mental in founding the Pennsylvania Hospital. In March 1753

1 In Philadelphia for many years stood a famous elm tree, known as the treaty tree, and when it was blown down in 1810 a stone was placed to mark the spot. Tradition had it that under this tree Penn, on his first coming to Philadelphia, held a treaty of amity"and friendship with the Indians,—a treaty not sworn to and never broken. The light of investigation has dispelled this

tradition and relegated it to the category of mythology, along with the stories of William Tell and Captain Smith and Pocahontas.

the first Arctic expedition evcr sent out from America sailed from Philadelphia. The vesscl, called the " Argo," was commanded by Captain Swaine, but her voyage accomplished nothing of import- ance. In 1770 the first factory for the manufacture of fine porce- lain in the colonies was established at Philadelphia by a Swiss and an Englishman, but the difficulty of obtaining competent workmen forced its abandonment two years later. During the war of the re- volution Philadelphia was the virtual capital of the colonies and the scene of all the prominent civil events of those stirring

times. The first Congress met at Carpenter's Hall on 4th September 1774; on 24th May 1775 Congress reconvened in the old State house and 'here continued its sittings, except when the city was threatened by the enemy and in his possession. Ou 2d July 1776 the "resolutions respecting independency" were passed, and on the 4th July 1776 Philadelphia was the scene of the adoption of the Declaration of Independence ; and the old State house became ever afterwards Independence Hall. On 9th July 1778 "the articles of confedera- tion and perpetual union between the independent States of America" were here adopted and signed, and in the same place the convention to frame a constitution for the United States of America inet on 14th May 1787, with Washington as presiding officer, and continued its sessions until 17th September, when the work was finished and the fundamental law of the land given to the world. The affairs of state were thus placed on a firm foundation, while the affairs of the church had received the attention of the people the previous year. In June 1786 the clerical and lay delegates from the Protestant Episcopal churches in the United States met in Philadelphia and formally organized "the Protestant Episcopal Church in North America." The Congress of the United States had held its opening session in New York, but in December 1790 it reassembled at Philadelphia ; and for ten years the seat of govern- ment was at Philadelphia, until it was permanently removed to~ the District of Columbia. Here Washington delivered his farewell address to the people of the United States, and here he retired from public life. As in Philadelphia the first bank in the colonies had been opened—the bank of North America in 1781—so in Phil- adelphia the first mint for the coinage of the money of the United States was established in 1792. Both of these institutions are still in full operation. In April 1816 Congress incorporated the bank of the United States, which was the second banking institution of that name chartered by the Government, and fixed it at Philadel- phia. The affairs of this institution form a very important chapter in the history of the city, as indeed in the history of the whole country. It had an unsettled existence, until the final blow came from President Jackson, towards the close of his first term of office, in 1833. Being opposed to the continuance of the bank, he with- drew the public deposits, amounting to about $8,000,000, the result of which was widespread ruin and business depression, not only in Philadelphia but elsewhere.

The two events of greatest note which have taken place in the city in recent years have been the centennial celebration of the independence of the colonies in 1876, and the bi-centennial cele- bration of the landing of William Penn in 1882. The centennial celebration was of the greatest moment, owing to the Exposition of the Industries of All Nations, which was open from 10th May to 10th November ; the total admissions reached the number of 9,910,966 persons. ve (CR Here)

PHILA. See Eeyrt, vol. vii. p. 783 sq.

PHILEMON, the oldest poet of the New Attic Comedy, was the son of Damon, and was born at Soli in Cilicia, or, according to others, at Syracuse ; but early in life he settled at Athens. Since he died in 262 B.c. at an age variously stated at from 96 to 101 years, he must have been born somewhere about 360. He was thus older than his contemporary and great rival Menander, whom he fre- quently vanquished in poetical contests, and whom he long survived. Posterity, however, reversed the judgment of their contemporaries and assigned the palm to Menander. Philemon's first play was put on the stage about 330, while Menander did not exhibit until 321. It appears that, once being worsted in a poetical competition, Philemon went into exile. He certainly made a journey to the East, but whether on the occasion of his exile or in compliance with the invitation of Ptolemy, king of Egypt, we cannot say. On this journey, being driven by a storm to the coast of Cyrene, he was treated with cool contempt by Magas, king of Cyrene, whom he had satirized. From the various legends told about his death he would seem to have died in the full enjoyment and use of his poetical powers. Of the ninety-seven plays which he is said to have composed none are extant; the titles of fifty-three

'have composed fifty-four comedies.

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have been preserved, but some of these may have been the work of his son, the younger Philemon, who is said to The Merchant and The Treasure of Philemon were the originals respectively of the Mercator and Trinummus of Plautus. The New Attic Comedy, of which Philemon was in a sense the founder, dealt mainly with subjects drawn from private life, which were

worked up in elaborate plots and treated in a prosaic style, to the exclusion, on the whole, of the political tendency, stinging personal satire, and warm poetical colouring, which had marked the Old Attic Comedy. These characteristics of the New Comedy had already appeared, though in a less degree, in the Middle and even in the Old Attic Comedy; so that to Philemon belongs the credit, not of inventing, but of developing a style which had occasionally been employed before. In its absence of poetical idealism and restriction to the prosaic realism of daily life the New Comedy stands to the Old somewhat as the comedies of Moliére or Sheridan stand to those of Shakespeare. Its repertoire was limited to a few stock characters—the imprudent lover, the designing fair, the stingy father, the greedy parasite, the blustering swashbuckler—and its plots rang the changes on the well- worn theme of thwarted but faithful love, rescued from its difficulties by the discovery of a long-lost relative and ending in marriage. In the many fragments of Philemon preserved by Stobzeus, Athenzeus, and other writers there is much wit and good sense.

The fragments have been collected and edited by Meineke, Menandri et Philemonis Reliquiz, Berlin, 1823 ; and again in his

Fragmenta Comicorum Grecorum, vol. iv., Berlin, 1841. They are also appended to the Didot edition of Aristophanes (Paris, 1839).

PHILEMON, Epistie To. This, which is the shortest of the extant epistles of St Paul, stands to the other books of the New Testament in a relation similar to that of the book of Ruth to the other books of the Old Testament. It is an idyl of domestic life. Onesimus, the slave of one of Paul's converts in Asia Minor, had run away from his master, probably, as was often the case with runaways, after stealing some of his money. He had come to Paul, more probably at Rome than, as some have thought, at Czesarea, and Paul had converted him. Paul sends him back to his master, begging that he may be kindly treated as being now a brother Christian, and formally undertak- ing to repay what he owed. The epistle is addressed not only to Philemon but to Apphia, who was probably his wife, to Archippus (possibly the head of the community at Colossz or Laodicea, Col. iv. 17), and to the community which either, like some of the Roman collegia, consisted of Philemon's household or held its meetings in his house. It has sometimes been regarded

as an appendix to the epistle to the Colossians on the grounds (1) that Onesimus was sent with both letters (Col. iv. 9; Philem. 10-12), (2) that in both letters salutations are sent to Archippus (Col. iv. 17; Philem. 2), and (3) that the same persons are men- tioned in both letters as being with Paul at the time of writing (Col. i. 1, iv. 7-14; Philem. 1, 23, 24). This ap- parent connexion with the epistle to the Colossians is the basis of the chief arguments which have been used against its genuineness. Baur (Paul, E. T., vol. ii. p. 84) thinks that this "attractive, graceful, and friendly letter" is merely a practical commentary, in the form of a fiction, on the general conception of the relations of masters to Christ- ian slaves which is set forth in Col. iv. 1. But this view has few supporters. The genuineness of the epistle is almost universally admitted. The best modern works upon it are Bishop Lightfoot's Colosssans and Philemon (3d ed., London, 1879) and Holtzmann's essay, " Der Brief an Philemon," in the Zettschr. f. wissensch. Theol., 1873, p. 428.

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PHILETAS, a distinguished poet and critic of the Alexandrian school, was the son of Telephus and a native of the island of Cos. He lived in the reigns of Philip, Alexander the Great, and Ptolemy I. of Egypt, the last of whom appointed him tutor to his son Ptolemy Philadelphus. His life thus fell in the latter part of the 4th and early part of the 3rd century B.c. He was a contemporary of Menander, a friend of the poet Hermesianax of Cos, and lived into the time of Aratus. Amongst his pupils were Theocritus and Zenodotus. He was sickly and so thin that he was said to carry lead in his shoes to keep himself from being blown away. The story runs that he died from the excessive assiduity with which he sought the answer to the sophistical problem called "The Liar."!

The fame of Philetas rested chiefly on his elegiac verses, in which, however, he was esteemed inferior to the younger poet Callimachus. He is frequently mentioned by the Latin elegiac poets Propertius and Ovid. From Hermesianax and Ovid we gather that his verses were amatory and celebrated the praises of the fair Bittis or Battis, but her name does not occur in the existing frag- ments, which are of a melancholy rather than an amatory tone. In one of his poems (Demeter) he depicted the grief of

Demeter for the loss of Proserpine ; in another (Hcrmes) the love of Polymele for Ulysses. The latter poem appears from the fragments to have been composed in hexameter verse. Further, he wrote epigrams and poems called Ialyva. There is no evidence that he wrote bucolic poems, for the passage in Moschus formerly quoted to prove this is an interpolation of Musceus. Some iambic verses are attri- buted to him, probably by a mistake arising from a common con- fusion between names beginning with Phil. Besides his poems, Philetas was the author of a vocabulary explaining the meanings of rare and obscure words, including words peculiar to certain dialects. He also wrote notes on Homer. The work on Naxos (Nagiaxd), sometimes attributed to him, was perhaps rather by Philteas. The fragments of Philetas have been edited by Kayser, Gottingen, 1793, and by Bach, Halle, 1829.

PHILIDOR, Francois AnpRE Danican (1726-1795), See Cuzss, vol. v. p. 601.

PHILIP, one of the twelve apostles, mentioned fifth in all the lists (Matt. x. 3; Mark ili. 18; Luke vi. 14; Acts i. 13), isa mere name in the Synoptists, but a figure of some prominence in the Fourth Gospel. There he is said to have been "'of Bethsaida, the city of Andrew and Peter," and to have received his call to follow Jesus at Bethany, having previously been, it would seem, a disciple of the Baptist (John i. 43, 44). Philip was at that time the means of bringing Nathanael to Jesus (John i. 45), and at a later date he, along with Andrew, carried the request of the inquiring Greeks to the Master (John xii. 22). Philip and Andrew alone are mentioned by name in con- nexion with the feeding of the five thousand (John vi. 5, 7), and Philip is also one of the few interlocutors in John xiv, After the resurrection he was present at the election of Matthias as successor to Judas, but he does not again appear in the New Testament history; it is, however, implied that he still continued in Jerusalem after the out- break of the first. persecution.

According to Polycrates, bishop of Ephesus, in his controversial letter written to Victor of Rome towards the end of the 2d century (ap. Euseb., 1. £., iii. 31, v. 24), the graves of Philip, "one of the twelve," and of his two aged virgin daughters were in {the Phrygian] Hierapolis ; a third daughter, "who had lived in the Holy Ghost," was buried at Ephesus. 'Dialogue of

Caius," a writing of somewhat later date than the letter of Polycrates, mentions (ap. Euscb., H. E., iii, 31) "four prophetesses, the daughters of Philip at Hierapolis in Asia, whose tomb and that of their father are to be seen there." But Eusebius himself proceeds expressly to identify this Philip with the Philip mentioned in the Acts of the Apostles as living in Cesarea ; and in another place he alludes to Philip "the apostle" as having preached the gospel to the Ethiopian cunuch (H. #., ii. 1). Clement of Alexandria also (Strom., iii. 6 [52]) incidentally speaks of "Philip the apostle" as having begotten children and as having given daughters in marriage. In another place (Strom., iv. 973) Clement quotes, with concurrence, a passage from the Gnostic

1 The problem was this: If a man says he is telling a lie, does he speak truly or falsely ?

Proclus, one of the interlocutors in the –

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Heracleon, in which it is expressly said that Matthew, Philip, Thomas, and others died without "confession of the voice," or, in other words, were not, properly speaking, confessors or martyrs. A later stage of the tradition regarding Philip appears in various late apocryphal writings which have been edited by Tischendorf in his Acta Apostolorum Apocrypha, and in his Apocalypses Apocryphex. According to the Acta Philippi, this apostle, along with Bartholo- mew and Mariamne, the sister of the latter, came to Ophioryma or Hierapolis, where the success of their preaching, and more par- ticularly the conversion and miraculous healing of Nicanora, the wife of the governor, provoked bitter hostility. Philip was crucified head downwards, and invoked curses on his persecutors. His im- precations were heard, but the Lord Jesus immediately afterwards appeared to him and rebuked him for his want of meeknéss, further announcing his approaching death, and that on account of his sin he would be kept back forty days from the gates of paradise. The Acta Philippi in Hellade (7.c., "in the city of Athens, called Hellas") are still more fantastical. An apocryphal book, under the title Actus Philippi, is condemned in the canon of Gelasius. Since the 6th century Philip has been commemorated in the West, along with St James the Less, on Ist May, their relics being deposited in the same church

in Rome ; in the Eastern Chureh Philip's day is 14th November, and that of James the Less 23d October.

PHILIP, "the evangelist," is first mentioned in the Acts (vi. 5) as one of "the seven" who were chosen to attend to certain temporal affairs of the church in Jerusa- lem in consequence of the murmurings of the Hellenists against the Hebrews. After the martyrdom of Stephen he went to Samaria, where he preached with much success, Simon Magus being one of, his converts. He afterwards instructed and baptized the Ethiopian eunuch on the road between Jerusalem and Gaza; next he was "caught away" by the Spirit and "found at Azotus" (Ashdod), whence 'passing through he preached in all the cities till he came to Ceesarea" (Acts vill.). Here some years after- wards, according to Acts xxi. 8, 9, he entertained Paul and his companion on their way to Jerusalem; at that time 'he had four daughters which did prophesy." Ata very early period he came to be confounded with the sub- ject of the preceding notice (q.v.); the confusion was all the more easy because, while he undoubtedly could in a certain well-understood sense of the word be called an "apostle," writers naturally refrained from applying to him the more ambiguous designation of ' evangelist." " Philip the deacon" is commemorated on 6th June.

PHILIP, tetrarch of Itureea. See HErop Purxip, vol. can Ds (OHS

PHILIP, the name of five kings of Macedon. The greatest of these was Puruip II. (382-336 B.c.), the first founder of the MacreponiAn Empire (q¢.v.). After the death of Alexander the Great, Arrhideus, a bastard of Philip II., reigned as Putiip IIL, till he was put to death by Olympias in 317. Putte IV., son of Cassander, reigned only for a few months in 296. Pruip V., the last but one of the kings of Macedon and son of Demetrius II., was born in 237, and came to the throne on the death of his uncle, Antigonus Doson, in 220. In the course of the next three years he acquired a brilliant reputation by his ex- ploits against the Aitolians and their allies in the Pelo- ponnesus in the Social War; but after this, though his whole career was marked by military and even political ability, the bad sides of his character became predominant, and he appeared more and more as a perfidious, morose, and cruel tyrant, thus alienating the affections of the Greeks and ultimately even of his own subjects. His life was full of ambitious schemes,

but he made the cardinal error of siding with Carthage against Rome. His character made it easy for the Romans to raise against him a power- ful coalition of his neighbours, but Philip held his ground with vigour till the armies of the republic themselves appeared on the field. How he was finally driven out of Greece has been related under FLamininus. After 196 Philip for some time accepted his reverses and sought the friendship of Rome, helping the republic against Antiochus ;

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but his ambition and the jealousy of the senate gradually led to fresh complications, and a new war was imminent when Philip died in 179, mainly of remorse for the death of his younger son Demetrius, the favourite of Rome, whom he had executed on an accusation forged by his elder son and heir Perseus,

PHILIP I. (1052-1108), king of France, was the son of Henry I. and Anne of Russia, and was born in 1052. He was associated with his father on the throne in 1059, the consecration taking place at Rheims (23d May), and he succeeded to the undivided sovereignty in the following year (4th August 1060), first under the regency of his mother, and afterwards, from 1062 to 1067, under that of Baldwin V., count of Flanders. In 1072 he married Bertha, daughter of Robert the Frisian, at whose hands he had sustained a shameful defeat at Cassel in the pre- ceding year. His jealousy of William the Conqueror led him into an act of overt hostility in 1075, when his troops raised the siege of Dol, and a state of war, interrupted by inconsiderable intervals, continued thenceforward to subsist until the death of William. Philip afterwards supported, but ineffectually, the pretensions of Robert of N ormandy against William Rufus. In 1092 he brought himself into collision with the church by shutting up his wife Bertha with her three children in the castle of Montreuil, and espousing Bertrada of Montfort, whom he had induced to leave her husband, Fulk of Anjou. The marriage was indeed sanctioned after Bertha's death by a subservient council at Rheims in 1094, but led to the king's excom- munication by the council of Autun in the same year —a censure which was renewed by Pope Urban II. at Clermont in 1095. Having dismissed Bertrada early in 1097, he was forthwith absolved, but on a repetition of the offence three years afterwards the sentence was

re- newed, at Poitiers, and only removed by Paschal II. after Philip had once more submitted himself to the church. In 1100 he made his son Louis (afterwards Louis VIL.) joint king, and his death took place at Melun on 29th July 1108. See France, vol. ix. pp. 537-539.

PHILIP IL. (1165-1223), surnamed " Augustus," king of France, was the son of Louis VII., and was born in August 1165. When fifteen years old he was crowned joint king at Rheims on 1st November 1179. In the following year he was again crowned along with his newly-wedded wife, Margaret of Hainault, at St Denis (29th May 1180) ; the death of his father took place a few months afterwards. For an account of Philip II.'s character and of the leading events of his reign the reader is referred to FRANCE, vol. ix. pp. 540-542. He died at Mantes on 14th July 1223,

PHILIP IIT. (1245-1285), surnamed "the Rash," king of France, was born in 1245 and succeeded his father Louis IX. on 25th August 1270, at Tunis, where, after con- tinuing the siege for some time, he made a truce of ten years and embarked for France in the following November. He was twice married, first to Isabella of Aragon in 1258, and subsequently to Mary of Brabant. He died at Per- pignan on 5th October 1285. See FRANCE, vol. ix. p. 544.

PHILIP IV. (1268-1314), surnamed "the Fair," son of the preceding, was born at Fontainebleau in 1268, was married to Joanna, queen of Navarre, in 1284, accompanied his father into Aragon in 1285, and was proclaimed king of France at Perpignan on 6th October of that year. See FRANCE, vol. ix. pp. 544-545. He died at Fontainebleau on 29th November 1314.

PHILIP V. (1293-1322), surnamed "the Tall," second son of the preceding, succeeded his elder brother, Louis X., in January 1317, and was succeeded by his younger brother Charles IV. in January 1322.

PHILIP VI. (1293-1350) was the eldest son of Charles, count of Valois, the younger brother of Philip IV., and

was born in 1293. He succeeded his cousin Charles Iie in 1328, and died at Nogent-le-Roi near Chartres on 22d August 1350. See Francx, vol. ix. pp. 545-546.

PHEEIP T. (1478-1506), of Castile and Aragon, sur- named "the Handsome," was the son of the emperor Maximilian I. and Mary, the only child of Charles the Bold, last prince of the house of Burgundy, and was born at Bruges on 22d July 1478. He succeeded his mother in 1482, Maximilian being recognized as governor and guardian during the minority by all the provinces, except Flanders, the burghers of which took possession of Philip, and carried on the government in hisname, This arrange- ment subsisted until 1489, when a long struggle resulted in the triumph of Maximilian, who henceforth had the guardianship uncontrolled. In 1494 Philip received the homage of the various states of the Netherlands, and in 1496 he was married to Joanna (Juana la Loca), second daughter of Ferdinand and Isabella of Castile and Aragon, On the early death of the other children of these sovereigns the succession vested in Joanna, and Philip as her husband proceeded to Spain, where he was recognized as heir-pre- sumptive by the cortes of Toledo and Saragossa (represent- ing Castile and Aragon respectively) in 1502. He returned, however, to Flanders before the close of the year, and was still absent when, on the death of Isabella in November 1504, Ferdinand caused Joanna and Philip to be proclaimed sovereigns of Castile, but at the saine time assumed the regency to himself. It was only with difficulty that Ferdinand was induced to retire to Aragon and so make way for the new king in June 1506. Philp died three months afterwards (25th September 1506) at Burgos. His children by Joanna were Charles V., emperor, and king of Spain ; Ferdinand L., emperor ; Isabella, queen of Denmark ; Leonora, queen of Portugal and afterwards of France; Mary, queen of Hungary and governor of the Netherlands ; and Catharine, queen of Portugal.

PHILIP TI. (1527-1598), king of Spain, was the son of the emperor Charles V. and Isabella of Portugal, and was born at Valladolid on 21st May 1527. He was brought up in Castile under the care of his mother, who died when he was twelve years old. As Philip grew up, his father, though he rarely saw his son, watched carefully over his education and strove to fit him for political life. In 1543 Philip married Mary of Portugal, who died in 1545, soon after the birth of a son, Don Carlos. In 1548 Charles V. summoned Philip to Brussels, that he might gain some experience of the peoples whom he would be called upon to rule. He was not, however, popular with his future subjects. He had already formed his character upon the model of

Spanish haughtiness. He was cold, reserved, punctilious about decorum, and wanting in geniality. The Italians did not care for him ; the Flemings disliked him ; the Germans hated him. His appearance and manner did not further his father's plan of securing his election to the empire. The scheme failed, and Philip's presence was in no way helpful. In 1551 he returned to the more congenial task of governing Spain.

The death of Edward VI. of England opened out to Charles V. new prospects for his son. Queen Mary regarded the emperor as her only friend, and submitted herself entirely to his guidance. She received with joy a proposal for her marriage with Philip. The English opposition broke down with the failure of Wyatt's rebellion, and in 1554 Philip came to England to claim his bride. Charles V. resigned to him Naples and Sicily that he might not come as a needy prince. Philip was well sup- plied with Spanish gold, and was charged by his father to Spare no pains in conciliating the English. He tried his best ; but his cold, ungenial manner was a hopeless obstacle to his success. Mary was devotedly attached to her hus-

band, who exercised a moderating influence over the queen's zeal for the re-establishment of Catholicism. Charles V. wished to secure England as an ally, and subordinated religious to political considerations. Philip was not natur- ally fitted for conciliatory action, and was not happy in England. He found that his wife was destined to be childless and that he had no prospect of succeeding to the English crown. At the end of 1555 he joyfully obeyed lis father's summons to go to Brussels. Charles V., worn out by the fatigue of a long reign, resolved to abdicate in favour of his son, and this he did on 16th January 1556.

Philip II. was now king of Spain, Naples, and Sicily, duke of Milan, lord of Franche Comté and the Nether- lands, ruler of Tunis and the Barbary coast, the Canaries and Cape de Verd Islands, the Philippines and Spice Islands, large colonies in the West Indies, and the vast territories of Mexico and Peru. These great dominions had fallen into his father's hands and were united only by their dependence on their ruler. It was Philip's task to give them an organic unity and combine them into a system. First he had to face a threatening league against his power. Pope Paul IV., a Neapolitan, was

imbued with hatred of the Spanish rule, and formed an alliance with Henry II. of France. Philip sent the duke of Alva, who speedily reduced the intractable pope. But Philip was too good a Catholic to press his victory. He was content to leave the pope powerless, and Alva on his knees asked pardon for bearing arms against the church. The war against France was pursued with equal success and greater results. Philip's army, led by Philibert of Savoy, entered Picardy and besieged St Quentin. The French were defeated in an attempt to relieve the city, and St Quentin was stormed. The French retaliated by seizing Calais from England, and thence advanced into Flanders, where they were again defeated in the bloody battle of Grave- lines. Both Philip II. and Henry II. were destitute of resources and wished for peace; but Philip IT. was the better diplomatist. The treaty of Cateau Cambrésis in 1559 restored to him all that France had won by its long war- fare against Charles V. in Italy and the Netherlands.

Thus Philip began his reign with glory, and Europe saw that Charles V. had no unworthy successor. Yet Philip was not anxious for military glory. His finances were embarrassed and he felt the need of a period of peace. For the purpose of maintaining his political supremacy he proposed to continue his English alliance by marrying Elizabeth when she succeeded Mary on the English throne. Elizabeth did not at once reject the proposal; but she gradually entered upon a religious policy which made marriage with Philip impossible. The Spanish king rapidly changed his plans and cemented his alliance with France by a union (24th June 1559) with Isabella, daughter of Henry II. He made arrangements for the government of the Netherlands, and at the end of 1559 returned to Spain, where-he remained for the rest of his life.

The policy of Philip was steadily directed towards welding his dominions together in dependence on himself and extending his influence over Europe. The power of Charles V. had had no definite centre. The emperor had recognized the claims of his separate dominions upon him, and had striven to be neither German, Spanish, Flemish, nor Italian. Philip identified himself entirely with Spain. Castile was to be the seat of his monarchy, and that monarchy was to be absolute. He was devoted to Catholicism, and during his reign superseded the pope as the head of the Catholic party in Europe. But the interests of Catholicism were in his mind identified with his

own personal interests, and under the cover of zeal for the church he pursued the aggrandizement of Spain. In Spain itself his care for the maintenance of the Catholic

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faith accorded with the temper of the people. The long continuance of war against the Moors had identified ortho- doxy with purity of race, and heresy was regarded as a taint in the blood. The rigour of the Inquisition preserved the national honour ; the auto-da-fé was a means of ridding the land of dangerous elements. This uncompromising spirit of Spain in religious matters its king wished to extend to the rest of his dominions.

Philip had none of his father's personal activity. Though his mind was always engaged in the business of the state, he did not care for the excitement of personal conflict. He was no warrior, and never took the field, He felt himself best qualified to direct his policy from afar. He was resolved to make the fullest use of others, yet to keep the guidance of affairs in his own hands. He increased the number of councils for the managenient of the business of the different provinces of his realm, and in these councils natives of the various provinces had seats. But the general direction of affairs was in the hands of a privy council, entirely composed of Spaniards. At first this council consisted chiefly of the members of Philip's house- hold, the men whom he had known in early days. Fore- most amongst them were the duke of Alva and Ruy Gomez de Silva, prince of Eboli. Alva was a general, Gomez a courtier, and the two men were in permanent opposition. This exactly suited Philip's views. He was never present in person at the sittings of the council. All questions on which he wished for its opinion were reduced to writing and laid before it. Its recommenda- tions were similarly submitted to the king in writing. There was no initiative except by his pleasure, no decision which was not due to his personal approval. He gained, all the advantages of opposing views amongst his ministers without identifying himself with any. No minister could become a necessity to him, and he could withdraw his favour at will. Philip's regents and ministers in the several provinces had large authority, but were never allowed to forget their dependence on the central power. Every land was submissive except the Netherlands, where the nobles resented their exclusion from the

government, and saw with alarm the steady advance of Philip's system. A new ecclesiastical organization increased the number of bishops, who were all dependent on the king, and dimin- ished the revenues of the monasteries, which furnished provisions for the younger members of the noble families. The introduction of the Spanish Inquisition fhreatened to destroy entirely the political importance of the nobles. In the general discontent the Protestant feeling of the towns made common cause with the national jealousy of the nobles. A strong opposition was formed, and in 1566 the Netherlands were in revolt. For a time Philip wavered between a policy of conciliation and a policy of repression. At last he listened to the advice of the duke of Alva, and sent him to reduce the rebels. Alva treated the revolted provinces with merciless severity; he crushed, but he could not subdue. The Netherlands were still unpacified, while Alva's cruelty destroyed their commerce. Their wealth had been the chief source of revenue to Charles V.; Philip II. no longer found it flow into his coffers. For seven years Alva resolutely tried his policy of repression; but the spirit of the Netherlands remained unbroken, and round their slumbering revolt all the enemies of the Spanish monarchy began to gather. Alva was recalled and fell into disgrace. A more pacific successor, Don Luis de Requesens, was sent to try a more conciliatory policy.

In domestic life, meanwhile, Philip was unhappy. His son Don Carlos developed an ungovernable temper, and did not hesitate to condemn his father's caution as un- worthy of the traditions of his house. He wished to distinguish himself, and was on the point of quitting

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Spain when his father, as a measure of precaution, had him imprisoned. In prison Don Carlos yielded to sullen despair, and gave way to excesses, which Philip did not try to check. In consequence of this. unwholesome life Don Carlos died in 1568, and it was a bitter blow to the haughty king to inform foreign princes of the facts. It would seem that Philip was glad to be rid of one whom he could not manage ; he did not hasten the death of Don Carlos, but he took no steps to prevent it. A few months later died Queen Isabella, leaving Philip without a male heir. In 1570 he married his fourth

wife, Anne of Austria, his niece, who died in 1580. Only one of her sons survived to manhood, and he succeeded his father as Philip ITI.

Meanwhile the hopes of Spain were fixed on Philip's half- brother, Don John of Austria, who first showed his military skill by putting down a serious revolt of the Moriscos in the Alpuxarras, and was then sent to command the Spanish fleet in the joint expedition of the Mediterranean powers against the Turk. He commanded at the decisive battle of Lepanto in 1571, which stemmed the tide of Turkish conquest. Brave and ambitious, Don John longed for a kingdom, and offered to undertake the conquest of the African coast. But Philip did not wish his brother to gain too much military glory. He sent him in 1576 to succeed Requesens in the Netherlands. Don John was full of great schemes,—to pacify the Netherlands, invade England, release Mary Queen of Scots, and become her husband. But the Spanish treasury was exhausted. Philip would send no more supplies, and left Don John to temporize with the Netherlanders, a task for which he was entirely unfit. Overwhelmed with disappointment and the sense of failure, Don John died in 1578, leaving the work which he could not accomplish to be undertaken by the patient genius of Alexander Farnese.

Don John had had the art of impressing his great schemes on those around him. He sent his secretary, Escovedo, to urge his wishes on Philip, whose jealous mind was filled with suspicion. Escovedo awakened the personal dislike of Antonio Perez, and was murdered by that minister's instrumentality (see PEREz). The fall of the old parties in the council brought forward new men and inaugurated a new policy. Cardinal Granvella, Juan Idiaquez, and Chris- toval de Moura became the king's chief advisers. They were men who depended solely on his favour, and were not connected with the old nobility of Castile. Hitherto Philip's policy had been in the main pacific. He had aimed at the internal consolidation of the monarchy, and had striven by every means to overcome the revolt of the Netherlands. But the resolute temper of the Nether- landers was encouraged by hopes of foreign help. England, France, and even Austria in turn displayed their jealousy of Philip's power by helping to keep alive the insurrection. Round the revolt of the Netherlands centred the chief questions of European politics. Philip at length deter- mined to make the subjection of

the rebellious provinces part of a great scheme to extend the power of Spain over Europe. In the second period of his reign he came forward as the disturber of European peace, determined to reduce western Christendom to religious unity under his own rule. He interfered in the internal politics of every country and seized on every opportunity for pursuing his own schemes. His first step in the career of aggrandize- ment was taken in 1580 by the reduction of Portugal, when he claimed the vacant crown by right of his mother. The duke of Alva overran the country before any other power had time to interfere. The last of the great Spanish nobles, who had already felt the weight of the king's displeasure, was still a willing instrument in extending the royal despotism. Philip succeeded in im- pressing on Spain an unreasoning loyalty, which took

the place of its old chivalrous patriotism. In the Nether- lands he put William of Orange under the ban, and the assassination of William was the first sign of the fana- tical bitterness which Philip was ready to encourage and to use. In France he resolved to check the power of the court and obtain an influence over French affairs. The strongly Catholic party resented the favour shown by Henry IIT. to the Huguenots, and was anxious about the succession to the crown. Headed by the Guises, they formed a league with Philip in January 1585, which plunged France into long and bitter warfare. The rapid advance of the League in France and the successes of Alexander Farnese in the Netherlands awakened the alarm of England. 'Troops were sent to the Netherlands, and the English privateers redoubled their attacks upon the treasure-ships of the Indies in the Spanish Main. Resolved to remove all hindrances from his path, Philip undertook the reduction of England. THe trusted to the strength of the Spanish navy, the military skill of Alexander Farnese, and the discontent of the English Catholics. In 1588 the French king had become a mere instrument of the League, and Philip sent against England the "Invincible Armada." Its failure involved the failure of all his schemes, though this fact was not at first obvious. Philip bore his loss with resignation. "I sent my ships," he said, "against men, not against the billows. I thank God that IT can place another fleet upon the sea." But he was never able to renew his attack upon England. The murder of Henry III. of France raised the question of the

succession to the French crown, and Philip's protectorate over the titular Charles X. was admitted. On the death of Charles the Catholic party were willing to recognize Philip's daughter Isabella as their queen. But the resolute bearing of Henry of Navarre kindled anew the national feeling, and the discussions about Isabella's future husband brought political questions into the foreground and weakened the cohesion of the League. The death of Alexander Farnese in 1592 deprived Philip of the great general who alone could hold in check Henry of Navarre, and Henry's change of religion and absolution by the pope in 1593 did much to remove the religious difficulty to his recognition by all parties in France. Philip's schemes for a general European ascendency entirely failed. He could not even recover the Netherlands for the Spanish monarchy. The northern provinces, banded together as the United Nether- lands, made good their independence. The southern pro- vinces returned to their obedience, but were ceded by Philip to his daughter Isabella and her husband Albert of Austria. The English cruisers became more and more dangerous in the Spanish Main, and in 1596 the English fleet sacked Cadiz. Philip II.'s reign ended in general failure. His resources were exhausted, and in 1597 he repudiated his debts. His economic policy was disastrous. He checked commerce by unwise taxes, trusted unduly to the wealth of the Indies, and encouraged the indolent haughtiness of the Castilians. He raised Spain to a high position, but left it with a ruinous system of govern- ment, which could only end in financial decay. Yet he was resolute and persevering to the end. He bore with constancy a painful and lingering illness, and his last words were, "I die like a good Catholic, in faith and obedience to the Holy Roman Church." But he knew that he left a feeble successor. His jealous temper showed itself in the narrow education and secluded life which he prescribed for his son, and thereby intensified the boy's natural timidity. "God has not been pleased," he sadly said at the last, "'to grant ine a successor capable of ruling my great realm." He died at the Escorial in September

1598.

Philip TI.'s character is impressed on the great archi-

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tectural monument of his reign, the Escorial, built in the solitude of the Guadarrama hills. The mighty mass of buildings contained a monastery, a burying-place for the royal house, and a palace for the king. It was built in con- sequence of a vow made at the battle of St Quentin. The battle was fought on St Lawrence's day 1557, and this fact was commemorated by arranging the building in the form of a gridiron. The cloister of the monastery supplied the bars, and the royal palace projected like the handle. Philip loved solitude. It harnionized with his habits of quiet industry. He governed his dominions by means of des- patches, as a merchant seated in his office transacts com- mercial business in different quarters of the globe. All that could be done by patient industry, without political insight, Philip II. did. His strength lay in his steady persistency. During his reign he was the foremost figure in European history, but the only work which he accom- plished was the formation of the Spanish character into the definite shape in which it influenced European culture.

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PHILIP III. (1578-1621), king of Spain, son of Philip II. by his fourth wife, Anne of Austria, was born at Madrid on 14th April 1578, succeeded his father on 13th September 1598, married Margaret of Austria on 18th April 1599, and died at Madrid on 31st March 1621. In personal character he was weak and indolent, and his time was mostly spent at the Escorial in hunting and other pursuits of a private country gentleman, while the conduct of public affairs was left almost entirely in the hands of the duke of Lerma, who held the office of first minister from the king's accession until October 1618. See SParn.

PHILIP IV. (1605-1665), king of Spain, son of Philip IIT., was born at Valladolid on 8th April 1605, was married to Isabella of France on 25th November 1615, succeeded his father on 3lst March 1621, and died on 17th Sep- tember 1665. From 1621 to 1643 the well-known duke of Olivares held the reins of real power in the Peninsula ; he was afterwards succeeded by the duke of Carpio. See SPAIN,

*PHILIP V. (1683-1746), king of Spain, was the second son of the French dauphin, Louis, by his wife Maria Anna of Bavaria, and was born at Versailles on 19th De- cember 1683. In 1700 Philip, at that time duke of Anjou, was called by the testament of the childless Charles IT. to the throne of Spain. Quitting Versailles to take pos- session of his*inheritance on 4th December, he arrived at the Buen-Retiro palace in Madrid on 18th February of the following year. At their parting his grandfather, Louis XIV., who a few months previously had concluded with England and Holland a treaty for the partition of the Spanish dominions, exhorted him to be a good Spaniard, but never to forget that he had been born a Frenchman ; it was on the same occasion that he uttered the famous mot, "' Mon fils, il n'y a plus de Pyrénées." Philip's re- cognition as king by the other European powers did not take place until the war of the Spanish succession was brought to an end by the treaty of Utrecht in 1713. In 1702 he married Maria Louisa, daughter of Victor Ama- deus, duke of Savoy; shortly after her death in February 1714, which he felt deeply, he married Elizabeth Farnese (December), a step to which he was advised by the then*

all-powerful princesse des Ursins. The disgrace of the princess immediately followed, and her place in the royal counsels was taken by ALBERONI (9.v.), who remained in power till December 1719. In 1724 Philip, under the influence of a profound melancholy which had seized him, resigned the crown by royal decree, dated 14th January 1724, in favour of his eldest son, Louis, who, however, died after a short reign of only seven months. Philip died on 9th July 1746 and was succeeded by his son, Ferdinand VI. See SPAIN.

PHILIP. For the dukes of Burgundy of this name, surnamed respectively 'the Bold" (1342-1404) and "the Good" (1396-1467), see Burcunpy, vol. iv.

p. 536, and FRANcE, vol. ix. p. 548. For Archduke Philip, ‘the Handsome,” see Puruip I. of Castile and Aragon (p. 743).

PHILIP or Swasia (c. 1170-1208), rival of the em- peror Oruo IV. (¢.v.), younger son of the emperor Freder- ick I., was born about 1170. He was originally intended for the church, and, after being provost of Aix-la-Chapelle, was chosen bishop of Wiirzburg in 1191; but in 1195 his elder brother brought about his marriage with a Byzan- tine princess, Irene, on which occasion he was named duke of Tuscany and Spoleto. In the following year he received also the duchy of Swabia. On the death of his elder brother he was elected king by a large body of princes and prelates at Miihlhausen (March 1198) ; this, however, was not acquiesced in by those opposed to the continuance of the imperial crown in the house of Hohenstaufen, whose choice fell on Otho. The coronation of the latter at Aix- la-Chapelle in July was soon followed by that of his rival at Mainz, and a civil war ensued, which, carried on with varying fortunes for ten years, was only brought to an end by the murder of Philip by Otho of Wittelsbach at Bamberg on 21st June 1208.

PHILIPPI, a city of ancient Macedonia, on a steep hill near the river.Gangites (now the Angista), overlooking an extensive plain and at no great distance from the coast of the Aigean, on the highway between Neapolis (Kavalla) and Thessalonica. Originally called Crenides, or ‘ Foun- tains,” it-took the name by which it has become famous from Philip of Macedon, who made himself master of the neighbouring gold-mines of the Hill of Dionysus, and fortified the city as one of his frontier-towns. Octavius and Antony having in 42 B.c. gained a great victory over Brutus and Cassius in the plain of Pliulippi, the place received a Roman colony, Colonia Julia Philippensis, which was probably increased after the battle of Actium (Col. Aug. Julia Phil.). The inhabitants received the Jus Italicum, and Philippi was one of the cities specially de signated as “first cities” (tparn . . . wéAus, Acts xvi. 12; see Marquardt, Rom. Staatsverwaltung, vol. i. p. 187). It was the scene of a striking incident in the life of St Paul, and it was to his converts here that he addressed the epistle noticed below. The site of the city, now alto- gether uninhabited, is marked by a number of ruins—the substructions of an amphitheatre, parts of a great temple of Claudius, &c.—which have furnished a variety of inter- esting inscriptions.

At a little distance to the east is a huge stone monument, known to the Turks as Dikelitash and to the Greeks as the Manger of Bucephalus.

See Clarke's Travels, iii.; Hacket, in Bible Union Quarterly, 1860 ; Heuzey, Mission arch. en Macédoine, and C.J. L., ili. 1.

PHILIPPIANS, EpistLE To THE. 'This is one of the most characteristic of the letters of St Paul. It was ad- dressed to the community at Philippi (see above), the first important European city which St Paul had visited, where he had formed a community with the apparently new organization of "bishops" and "deacons," and with which he had relations of especial intimacy. The immediate occa- sion of his writing the letter was his receipt of money

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which the Philippians had sent by Epaphroditus to supply St Paul's personal wants. They were probably wealthier thau some of the other communities which he had founded, and consequently he had not the reluctance which he felt elsewhere to receive money from them; the money so sent was no doubt part of the offerings of the community which constituted the Christian sacrifice (iv. 18),—a fund which was administered by the officers of administration, 7.e., the bishops and deacons. It was consequently to those officers that he specially addressed his acknowledgment of it.

He begins by a warm recognition of their steadfastness in the faith and of their sympathy with him (i. 3-7), and, as he is certain that their steadfastness will continue, so he prays that their love may abound more and more in enlightened well-doing (i. 9-11).. He proceeds to tell them about himself and about other preachers of the gospel at Rome: as for himself, he is full of hope because his imprisonment has tended to make the gospel known, and has emboldened others to 'speak the word of God with- out fear"; as for other preachers (probably the Jewish Christians who denied his apostleship and disparaged his special teaching), though some of them preach insincerely and controversially, yet, whatever be their motive, 'Christ is proclaimed," and therein he finds cause of rejoicing (i. 12-18). His position is critical, for he may be condemned to death ; but, whether he

Hves or dies, Christ will be glorified through him, so that he cannot tell which he would prefer; for himself it would be far better "to depart and to be with Christ," but for the Philippians it is better that he should 'abide in the flesh" (i. 19-24). Hence he feels confident that he will hve, and that he will see the Philippians again ; and hence also he exhorts them not to be discouraged by persecutions, and to be at unity among themselves (i. 25, ii. 2). The reason for this second exhortation is uncertain: it may be that the differ- ences of race at Philippi, the mingling of Romans and Greeks, of Europeans and Asiatics, had led to the factious assertion by each race of its own superiority, or it may be, though less probably, that there as elsewhere the feud raged between Gentile and Jewish Christians. And, since faction comes of self-assertion, he urges as its antidote the cultivation of "lowliness of mind," which he enforces by the great example of Jesus Christ, who, so far from assert- ing the divinity which belonged to Him, emptied Himself of it and took the form of a bond-servant ; to this St Paul adds a strong appeal on his own account, that his work aniong them may not seem to have been in vain (ii. 3-18). He then, with an expression of regret that some of his fellow-workers are no longer with him, announces that he hopes to send Timothy to them as soon as he knows the issue of his coming trial; and he is hopeful that he may be able to go himself; however that may be, he sends back their own messenger, Epaphroditus, who after coming to Rome had almost sacrificed his life in the energy of his work (ii. 19-30). Then follows an abrupt transition to another subject, which has sometimes been thought to mark the commencement of a new letter. He suddenly begins to warn the Philippians in strong terms against false teachers, either Judaizing Christians, or, more probably, Jews, who were preaching the necessity of circumcision (Holsten thinks that there is a reference to the murder of James the Just) ; he maintains that, although he was him- self a "Hebrew of Hebrews," and therefore possessed whatever "confidence in the flesh" such a one might claim, yet he counted it all as "'loss" in order that he might gain "the righteousness which is of God by faith" ; and borrowing a metaphor from the Greek games he regards this as a prize which has to be won by a contiuu- ous effort (iii. 2-16). He urges the Philippians to follow him in this struggle towards moral perfection, in contrast

either to the Christians who had lapsed into Epicureanism or, as some think, to the antinomian Jews (iii. 17, iv. 1). He then gives some personal messages to Euodia and Syntyche (whom Schwegler considers to be personifications of the Jewish and heathen Christian parties respectively), and to Synzygus (or, if the word be not a proper name, an anonymous '"yoke-fellow" who has been variously supposed to be Paul's wife, Clement of Rome, St Peter, Lydia the purple-seller, or Epaphroditus), and mentions "Clement," about whom it has been much discussed, but to little purpose, whether he was a Philippian or a

Roman, and, if the latter, whether he was the same per-

son who figures in early legends as bishop of Rome, or whether, as Baur thinks, the name is really that of the Flavius Clemens who was condemned under Domitian for "atheism." The personal messages are followed by general exhortations to joyfulness, forbearance, trustful- ness, and steadfastness in Christian virtue; and then comes that which was probably the special occasion of writing, an acknowledgment of the money which they had sent to him (iv. 4-20).

It is the more probable opinion that the epistle was written from Rome, and not from Cesarea ; whether it was written in the earlier or the later period of his stay there is a question which has been much discussed, but which the scantiness of the evidence respecting that stay does not allow of being satisfactorily answered ; most writers (De Wette, Wieseler, Wiesinger, Meyer) place it in the later period, others (Bleek, Ewald, Beyschlag, Light-foot) in the earlier; the latter view is more probable on account of the general agreement of this epistle with the epistle to the Romans. It throws an interesting light on St Paul's external relations. He was a prisoner, probably in charge of the prefect of the pretorian guard, and conse- quently with opportunities of making the gospel known among the soldiers ; and the mention of Czesar's household, though no doubt that term covered a large number of scattered individuals, makes it possible that he was lodged near the imperial palace on the Palatine.

The genuineness of the epistle was attacked by Baur on three grounds, which he himself states to be (1) the appearance of gnostic ideas in ii. 6-11, (2) the want of anything distinctively Pauline, (3) the questionableness of

some of the historical data.1 The attack has been re- newed by one section of his followers ; but it is generally admitted even by critics who reject the epistles to the Ephesians and Colossians? that the attack upon this epistle has failed. The supposed gnosticism of ii. 5-11 is not proved ; the supposed identification of Clement (iv. 3) with Flavius Clemens, the cousin of Domitian, is merely an arbitrary guess ; and the list of expressions which are not found in other epistles of St Paul is not greater than may reasonably be expected from the differences in the subject- matter.?

The doctrinal importance of the epistle is considerable, for it contains a passage which, if it could be certainly understood, would be at once the key and the summary of St Paul's Christology. In 2 Corinthians viii. 9 he had

1 Paul, E. T., vol. ii. p. 453; Theol. Jahrb., 1849, 501, which is partly reprinted as an addendum in Paul, H. T., vol. ii. p. 64.

2 E.g., Hilgenfeld, Hinleitung, p. 333; Renan, St Paul, p. 63 Pfleiderer, Paulinism, HE. T., vol. i. p. 29.

3 Baur was followed in this attack by Schwegler (Das nachapost. Zettalter, vol. ii. p. 183) and Volkmar (in the Theol. Jahrb., 1856, p. 309); and he was answered by Liinemann (Pauli ad Philipp. Epist.

. . defendit, Gottingen, 1847), Bruckner (Hpist. ad Philipp… .« vindicata, Leipsic, 1848), Hilgenfeld (in the Zettschr. f. wissensch: Theol., 1871, p. 309). A new attack was made by Hinsch in the same Zeitschrift, 1873, p. 59 (criticized by Hilgenfeld, itid., p. 178), and by Holsten in the Jahrbb. f. prot. Theol. (1875, p. 425; 1876, p. 58), which has been met by the important treatise of P. W. Schmidt, Neutestamentliche Hyperkritik, Berlin, 1880.

said of Christ that "though He was rich yet for your sakes He became poor"; in Philippians ii. 5-7 this is expanded into the explicit declaration that "being in the form of God He counted it not a prize (?) to be equal with God, but emptied Himself, taking the form of a servant, being made in the likeness of men." Each phrase of the passage is of great significance, but it is also of great uncertainty of meaning: the main points of uncertainty are (1) whether the subject of the sentence is the incarnate or the pre-incarnate Christ ; (2) what is implied by the phrase "in the form of God," and what is its relation to the phrase "to be equal with God," some thinking that it implies an identity, others an inferiority of status; (3) what is meant by the word here rendered " prize" (apraypov), some thinking that this is the right rendering, and that the meaning is "He did not tenaciously cling to His divinity but surrendered it," others thinking that it should be rendered "an act of robbery," and that the meaning is 'He did not think it a usurpation to assert His divinity" ; (4) what is meant by "emptied Himself," whether He only divested Himself of the outward sem- blance of divinity, or whether He reduced Himself to the bare consciousness of personality in becoming

incarnate ; this last question, that of the nature of the kenosis, has bearings of especial importance on the general doctrine of the Person of Christ.

Discussions of these questions from various points of view will be found not only in commentaries on the passage (¢.g., Lightfoot) and works on New Testament theology (e.g., Weiss), but more particularly in Baur, Paul, E. T., vol. ii. p. 45 (who thinks that the conceptions arc gnostic and un-Pauline) ; Ernesti, in Studien wu. Kritiken, 1848, p. 889, and 1851, p. 602 (who thinks that dprayudy refers by way of contrast to the first Adam, who tried to seize what was not his own); Hilgenfeld, in the Zectschr. f. wissensch. Lheol., 1871, p. 192, and zbid., 1873, p. 178; Grimm, zbid., 1873, p. 83 ; Hinsch, 7bid., 1873, p. 59; R. Schmidt, Paulinisehe Christo- logic, 1870, p. 163 (whose explanation deserves especial considera- tion); Pfleiderer, Paulinism, E. T., vol. i. p. 146; and more recently Weiffenbach, Zur Auslegung der Stelle Phil., ii. 5-11, Karlsruhe, 1884. For the question as to the nature of the kenosis, see Gess, Die Lehre von der Person Christi, Basel, 1856, pp. 81, 294.

The best modern editions of the epistle are those of B. Weiss, Der Philipperbrief ausgelegt, Leipsic, 1859, and Lightfoot, The Epistle to the Philippians, 3d ed., London, 1873. (E. HA.)

PHILIPPICUS, or Purtepicus, emperor of Constanti- nople from December 711 to June 713, was the son of the patrician Nicephorus, and became distinguished as a soldier under Justinian II. His proper name was Bardanes. Relying on the support of the Monothelete party, he made some pretensions to the throne on the outbreak of the first great rebellion against Justinian ; these led to his relega- tion to Cephalonia by Tiberius Absimarus, and subsequently to his banishment, by order of Justinian, to Cherson. Here Bardanes, taking the name of Philippicus, success- fully incited the inhabitants to revolt against a prince who had made them the objects of one of his most vindictive expeditions, and on the assassination of Justinian in Asia Minor he atvonce assumed the purple. Among his first acts were the deposition of Cyrus, the orthodox patriarch of Constantinople, in favour of John, a member of his own sect, and the summoning of a " conciliabulum " of Eastern bishops which abolished the canons of the sixth general council, and restored to the diptychs the names of Sergius and

Honorius. Meanwhile Terbelis, king of the Bulgarians, attacked Constantinople, burning some of its suburbs and carrying off many prisoners and much booty, while shortly afterwards the Saracens made similar inroads from the Asiatic side. The short reign of Philippicus was brought to a close through a conspiracy headed by two of his generals, who caused him to be blinded in the hippodrome in June 713. Of the remainder of his life nothing is known. He was succeeded by his secretary, Artemius, known as Anastasius II. .

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PHI—PHI PHILIPPINE ISLANDS (Span. Jslas Filipinas), or Plate xr,

PHILIPPINES, an archipelago in the south-east of Asia, ex- tending from 4° 40’ to 20° N. lat., and from 116° 40’ to 126° 30’ E. long. On the west and north-west it is sepa- rated by the China Sea from China and the Indo-Chinese peninsula ; towards the east lies the Pacific ; on the north a number of smaller islands stretch out towards Formosa; and on the south, while a double connexion with Borneo is formed by the lines of the Palawan and Balabac and the Sulu Islands, the basin of the Celebes Sea, with a central depth of from 1000 to 2600 fathoms, extends, for a distance of 300 miles, between its southernmost island (Mindanao) and Celebes. As the number of the Philippines is believed to exceed 1400, and the larger islands are in several cases only beginning to be properly explored, it is impossible to give a definitive statement of their aggregate land-area. A measurement on Domann’s map (1882) resulted in 114,356 square miles. Nor is it in regard to the area alone that our knowledge is defective. Though for three centuries the greater part of the territory has been nomi- nally in Spanish possession, the interior of some of the larger islands has never been surveyed; several of the native tribes, especially in Mindanao, are altogether inde- pendent ; the geology of Luzon, the best known of all the archipelago, is to a large extent matter of conjecture ; and the visit of a passing botanist or naturalist is enough to add facts of primaryimportance to the register of flora and fauna. While none of the summits, with the exception perhaps of Apo! in Mindanao, exceeds 9000 feet—the loftiest prob- ably being Halcon in Mindoro (8865 feet), Malindang in Mindanao (8685 feet), Mayon in Luzon (8275 feet), and Malaspina in Negros (8190

feet)—all the islands may be described in general as mountainous and hilly. The prin- cipal ranges have a tendency to run north and south, with a certain amount of deflexion east or west, as the case may be, so that the orographic diagram of the archipelago as a whole would have a certain similarity to a fan with northern Luzon as its centre of radiation. The geologist finds his task in the Philippines exceptionally difficult, owing to so much of the surface being covered with a dense vegetation, which often obliges him to be contented with no better indication than the pebbles of the alluvium. Nowhere, almost, are there cuttings or excavations to open up the records of the rocks. It seems certain, from the frequency not only of large tracts of coral reef along the coasts but of raised beaches at a considerable distance and elevation inland, containing shells similar to those of the adjacent seas, that much of the archipelago has been heaved from below the sea-level within compara- tively recent times. As the neck of land between the Bay of Sogod and the Bay of Ragay or Guinayangan and that between this latter bay and the Bay of San Miguel consist of alluvium, tufis, and marls, with modern shells, it appears probable that the southern parts of Luzon were at no very distant date separate islands. According to Drasche, southern and central Luzon comprises (1) a group of chloritic slates and gneiss; (2) diabases and gabbros ; (3) Eocene limestones ; (4) volcanic minerals and tuffs; (5) recent formations with marine fossils—tuffs, limestones, clays, and marine and fluvial alluviums. In his travels through the more northern parts of the island the same geologist verified the existence of (1) diorite, gneiss, proto- genic and chloritic slates; (2) an extensive system of strati- fied conglomerates and sandstones ; (3) modern volcanic rocks (quartzose trachyte, amphiboliferous and sanidinic

1 According to the Spanish hydrographic maps, the height of this mountain is 8813 feet; but the barometer of Rajal and Montano's expedition (which ascended to the top in 1880) indicated 10,270 feet, and that used by Schadenberg and Koch in 1882 no less than 10,827 (see Bull. Soc. de Géogr., Paris, 1881, p. 566).

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trachyte, amphiboliferous andesite and dolerite) ; (4) tuffs and tufaceous sandstones, with banks of limestone and marl; (5) banks of coral and

breccia of coraliferous lime- stone, and recent volcanic products. The late origin of the coralliferous limestone is shown by the corals belonging to genera still existing in the Indian Ocean—Galazea, Favia, Meandrina, Porites,and Astracopora—and being specifically similar, though not identical. A remarkable feature is the stratification of the limestone.

Voleanic forces, as has been already implied, have had a great share in shaping the archipelago, and a large number of the mountains bear the stamp of their former activity. But those that still have the credit of being working volcanoes are comparatively few.

Monte Cagua (3910 feet), discovered by Claudio Montero on the north-eastern promoutory of Luzon, appears to discharge smoke con- tinually, and the Babuyanes group (to the north of Luzon) contains several orifices belonging to the same centre of eruption, —a regular volcano in Babuyan Claro, a solfatara in the Didica rocks, and a vol- canic island thrown up in 1856. Of greater importance are the three burning mountains of southern Luzon—Taal, Albay, and Bulusan. Taal lies 45 miles almost due south of Manila. Being only 850 feet high, it is reniarkable as one of the lowest volcanoes in the world. The present craters are situated in a small triangular island in the middle of Lake Bombon or Bongbong. 4 tradition exists (and has been accepted without question by many writers) that this lake, covering an area of 100 square miles, and having in the south and east a depth of 109 fathoms, was formed in 1700 on occasion of a terrible eruption, which undermined the whole mass of a gigantic mountain, 8000 or 9000 feet high ; and, whether (for this is extremely doubtful) the event took place within historic tines or not, the vast deposits of porous tuff in all the surrounding country appear to show that such a voleano must have existed. The water in the lake is now swect, but tradition again asserts that it was at one time salt, possibly through direct communication with the sea. As it is exposed to strong evaporation and discharges into the sea by the Pansipit without being recruited by any considerable affluent, it is probably fed by subterranean sources. To the east of Lake Bombon stands the extinct volcano of Maquiling, at whose foot are the hot springs of Los Bajios ; and about 15 miles farther east is Majaijai (7020 feet), of which the last eruption was in 1730. Away in the south-east of Luzon there is quite a series of high volcanic cones, —Isarog, Iriga, Mazaraga, and Albay or Mayon.

The last, one of the most active volcanoes in the archipclago, is extremely regular in form, rising gradually from a base about 50 miles in circuit. The first partial ascent was made by Esteban Solis in 1592, and the first complete ascent by Paton and Stewart, two young Scotchmen, in 1858.

1 Tt was supposed till quite recently that there were two mountains in this distriet,—one being Macaturing, the other Sugut, Polloe, or Cottabato.

partially destroyed by earthquakes. Apo, according to Schaden- berg and Koch, has three summits, in the midst of which lies the great crater, now extinct and filled with water. Considerable energy is still displayed by the solfataras and boiling springs lower down.

It is difficult to say how these various volcanoes are related to each other; José Centeno suggests with con- siderable probability that they form two lines of activity, an eastern comprising Isarog, Albay, Bulusan, Camiguin, Apo, and Butulan, and a western Buguias (extinct), Arayat (extinct), Taal, Canlaon, Macaturing. Three only of the larger islands, it will be observed, contain actual centres of eruption, and some of the larger volcanoes appear to be in the later stages of their activity,—Albay generally discharg- ing an incoherent form of lava, whilst Taal and others dis- charge nothing but ashes. Other phenomena usually associ- ated with volcanic activity are common enough throughout the archipelago: there is a great deposit of sulphur in the middle of the island of Leyte; inflammable gas bursts out in the south of Panay; and there are hot springs at Buguias, at Los Bafios or Maynit, already mentioned, at Pagsanghan, at San Luis or Maynit in Batangas, in the Taysan Moun- tains, at Tibi or Tivi, &c. At Los Bafios there was a regular bathing establishment erected by the Franciscans in 1671 ; but it was burned down in 1727, and, though rebuilt by public subscription in 1880, may be said to be in a chronic state of decay. The Tibi springs, described in detail by Jagor (Reisen, pp. 114, 115), are remarkable for beautiful cones produced by the deposit of siliceous material. The water in some cases is hot enough to cook food. They are situated on the east coast of Luzon on Lagonoy Bay.

Earthquakes.—Earthquakes are sufficiently frequent and violent in the Philippines to affect the style adopted in the erection of buildings ; in 1874, for instance, they were very numerous throughout the archipelago, and in Manila and the adjacent provinces shocks were felt daily for several weeks. The most violent earthquakes on record in the Philippines occurred in July 1880, when the destruction of property was immense, both in the capital and in other important towns of central Luzon.

Minerals.—Though hitherto little advantage has been taken of its existence, there appears to be in several of the islands a fair amount of mineral wealth. Two coal-fields are known to exist, one beginning in Caransan in the south of Luzon, and probably extending southwards across the Strait of San Bernardino to Catbalongan in Samar, and another occupying the western slopes of Cebu and the eastern slopes of Negros, and thus probably passing under the Strait of Taiion. In the first basin there is a bed from 10 to 20 feet thick cropping out at Gatbo, which has given good results as a fuel for steamboats ; in the second Centeno reports at least five beds of varying thickness and quality. The first discovery of the mineral was made in Cebu in 1827. Hitherto little success has attended the schemes of exploitation. Iron-ore of excellent purity occurs in various parts of Luzon, in Laguna, Bulacan, Pampanga, Camarines Norte, and notably in the Camachin Mountains between the Bulaon and the Garlan; but, with the excep- tion of a few small foundries in Bulacan province, there are no iron-works in the country. In this department there was actually more activity a century ago. Copper- mines are worked at Mancayan, Suyuc, Bumucum, and Agbao in the province of Lepanto, by the Cantabro- Philippine Company, founded in 1862; and the heathen natives of that region (perhaps having learned the art from Chinese or Japanese strangers) appear to have long been accustomed to manufacture copper utensils for their own use and for sale in the Christian settlements. The ore at Mancayan contains upwards of 16 per cent. of copper, 24 of sulphur, 5 of antimony, and 5 of arsenic. For a short time after 1847 copper-mines were worked

at Assit in the island of Masbate; and it is known that copper ores exist in the provinces of Tayabas and Camar- ines Sur (Luzon), Antique (Panay),

and the island of Capul. Gold is very generally distributed throughout the

archipelago, but mostly in insignificant quantities. From

the deposits in Camarines Norte (in Paracale, Mambulao, Labo), where it occurs in placers and in quartz and other rocks, about 30 oz. per month are obtained. Much more important are the gold-washings of Misamis and Surigao in Mindanao, the former of which yield about 150 oz. per month. Neither the mercury nor lead veins discovered at different tines have proved of economic value.! Climate.—As the north part of Luzon is as far from the south of the Sulu Islands as the north of England from the south of Italy, and as the archipelago is divided by the line of the ecliptic, the climate of one region differs considerably from that of another, though the general characteristics are everywhere tropical. The northern islands lie in the region of the typhoons. Three seasons are usually recognized,—a cold, a hot, and a wet. The first extends from November to February or March; the winds are northerly, and, though there is no need for fire, woollen garments can be worn with comfort in the morn- ings; the sky is for the most part clear and the atmo- sphere bracing ; and Europeans look forward to this period as the most enjoyable of the year. The hot season lasts fron March to June, and the heat becomes very oppressive before the beginning of the southerly monsoon. Thunder- storms, often of terrific violence, are of frequent occurrence in May and June. The wet season is usually ushered in by the heavy rains locally known as "collas." During July, August, September, and October the rain comes down in torrents and large tracts of the lower country are flooded. According to the observations of the Jesuits at Manila during the eight years 1870 to 1877 the total rain- fall (distributed over 113 days) amounted to 66°6 inches.

Cold. Hot. Wet. |

é Mean temperature…..... 72°32 87°26" | 84°°56 at { ar eee inches} 8°65} 10°47 | 36-01 Coon Mean temperature…..... 75°°02 | 86°23 | 75°°86 [Reprrnt eee eee Inches | 12°54 9:29 | 26°90

ies { Mean temperature…..... 8690) | 88270) e711 atrial ooo cessce-ceee inches | 16°53 39°27 | 32°15

Sain. ee temperature…….- 81°98 | 82°°97 | 83°0s 1is2500) | Ree inches | 15°74 Soren) | Tooeae

Fauna.—The mammals of the Philippines are strikingly few, especially when contrasted with those of such an island as Java; but their number may yet be slightly increased, and nine-tenths of them are peculiar species. Since Cyno- pithecus niger was struck out of the list, the only monkey known to science is Macacus cynomolgus (chongo of the Tagals), found in all the islands; but there are also pure white monkeys (not albinos) in Mindanao, and specimens are occasionally sold at Manila. The lemuroids are repre- sented by the'strange little Tarstus spectrum, the insecti- vora proper by Galeopithecus philippensis and a " tupaia," or squirrel-shrew. Of carnivora there are three species, two civets and a wild cat, as well as the ordinary domestic animal, The rodents comprise only a few squirrels, Sciurus phalippensis, &e., a porcupine, and two or three rats. Of bats there are between twenty and thirty species. The wild boar is regularly hunted in all the islands ; the natives throughout the archipelago keep large numbers of black

1 The best résumé of geological facts in regard to the Philippines is J. Roth, " Ueber die geologische Beschaffenheit der Philippinen," pub- lished as an appendix to Jagor's Reisen, but, like the other appendices, left out in the untrustworthy English translation. Drasche gives a good deal of fresh material in Fragmente zu einer Geologie der Insel Luzon, reproduced in Boletin de la Comision del Mapa Geologico de

Espatia, vol. viii., 1881. Perrey has collected information about the Philippine earthquakes in Afém. del' Acad. de Dijon, 1860, &c.

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pigs; and the Babuyanes group take their name from babuy, "a pig." Of deer there are three species, Cervus mariannus, C. philippensis, and C. Alfredi; and a chevrotain or mouse- deer (Tragulus) is found, more especially in Bataan. Tapa, or sun-dried deer's flesh, is a favourite food with the natives. The statement that the horse has become wild in the interior of several islands is founded on a mistake. The ordinary domestic variety, probably of Spanish, Chinese, and Japanese origin, is " generally

small, but well-shaped and hardy, the largest and best breeds coming from Batan- gas, Albay, and Camarines, the smallest and probably the hardiest from Ilocos" (D. M. Forbes). For all kinds of field work the buffalo ("'carabao") is employed ; ordinary cattle and goats are common enough, and some of the former are of great excellence. As there is a Tagalog name for it, it has been supposed that the elephant was at one time to be met with in the Philippines; and in the Sulu Islands, at least, it is said to have existed in the 17th century. The birds of the Philippines proper show the isolated character of the group by the absence of a large number of ordinary Malayan forms, and at the same time there is a con- siderable proportion of genera from Australia, India, and China. Viscount Walden (Z'rans. Zool. Soc., vol. ix., 1877) found the known species nunibered 219, and R. B. Sharpe, by the assistance of Professor Steere's collections, brought the total up to 287 species, of which 151 were peculiar to the Philippines. To these must be added several species hitherto only found in the Sulu Islands. Palawan has a strong Bornean element. It is enough here to mention a number of peculiar woodpeckers, beautiful little parakeets (Loriculus), a number of pigeons (including at least one peculiar genus, Phapitreron), cockatoos, mound-builders, and a peculiar hornbill, Penelopides, known from its note as "'calao" to the natives, who frequently tame it. The prin- cipal game bird is the jungle-fowl (Gallus bankiva).? Alligators abound in some of the lakes and rivers ; and turtles, tortoises, and various kinds of lizards are familiar enough forms; one of the last, the "chacon," is believed by the natives to be a defence against earthquakes. The beauty and variety of the butterflies and the destructiveness of the termites are obtrusive features of the insect life ; the land-shells are peculiar, numerous, and remarkable for delicacy of form and colour. Some of the molluscs attain gigantic dimensions ; the "taclobo" shell sometimes weighs 200 ib, and is used for baptismal fonts. One of the most valuable kinds of fish is the "dalag" (Ophiocephalus vagus), and one of the most peculiar the Hemiramphus vivipara. flora.—The flora of the Philippines is essentially Malay- an, intermixed with a Chinese element, but with sufficient individuality to constitute a sub-region. According to Llanos's edition of Manuel Blanco's Flora de Filipinas,3 4479 species are known belonging to 1223 genera and 155 orders. Among the dicotyledons the orders most abun- dantly represented are: Leguminose (77 genera), Rubiacez and Composite (each 41), Huphorbiacer (32), Urticacer (25), Acanthacezx (28),

Apocynacee (22), Asclepiadaceee (20), Sapindacee (20); and among the monocotyledons Orchid- acee (80), Palmzx (28), Aracez (27), Graminacez (72). Of . ferns there are 50 genera. The forests contain more than 200 kinds of wood thought worthy of trial in the arsenal at Manila. Among them may be mentioned the teak- like molave (Vitex altissima and geniculata); the dongon (Sterculia cymbiformas) ; the ipel (Eperua decandra), greatly prized for its hardness ; the lauan or lawaan (Dipterocarpus thurvfer), a light stringy wood, often used by the Malays for their canoes ; the bolongaeta (Diospyros pilosanthera), em- ployed for fine kinds of furniture. 2 See Wallace, Geogr. Distr. of Animals, and Island Life.

3 First ed., Manila, 1837 ; second ed., 1845 ; Llanos's ed., 4 vols., 1877-80 (summary in vol. ii.),

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Products.—Mangoes, plantains, mangosteen, jaek-fruit, medlars, and in general most of the Malayan fruits are to be met with ; the lanzon oecurs in the north, and the durian in the south, more especially in the Sulu Islands. Rice is the staple food of the natives, but, though it is extensively cultivated, the supply is uot always equal to the demand. Sweet potatoes (camote), a kind of yam (palawan), the ground-nut, and gourds are pretty generally grown, as well as occasionally peas, potatoes, and in the higher regions even wheat. The plants which are of primary commercial importance are tobacco, Manila-hemp, sugar-cane, coffee, and cocoa.

Tobacco was made a Government monopoly by Captain General José Basco y Vargas in 1781, and remained so till 1st July 1882. Though it was free to any one to grow the plant to any extent he pleased, the Governinent was the only purchascr, fixed its own price, and, paying its debts according to its own convenience, was sometimes three or four years in arrear. Besides, certain districts were bound to furnish a certain quantity of the leaf, and the pea- sant was thus often forced under severe penalties to devote himself to the tobacco erop when he would have obtained better results from something else. The best tobacco comes from the provinces of Isabela and Cagayan, and it is there that the cultivation is most systematically carried on; but the plant is also grown in other provinces of Luzon (Union, Ilocos, Lepanto, &c.) as well as in the Visayas Islands. The

average production in the ten years 1872-81 was 214,400 quintals (each 101°43 English Ib), of which 114,400 were from Isabela and Cagayan. About 25,000 quintals were sent to Spain as tribute, and another portion was sold by public auction for foreign export. For tobacco of the first class from Cagayan and Isabela the Government paid in recent years between 18 and 14 dollars per quintal, for the second class between 10 and 11, for the third between 7 and 8, and for the fourth between 6 and 7. About 280 million cigars were manufactured annually in six fac- tories employing 20,000 hands, 95 nmullions for foreign export and the rest for home consumption. Of the foreign cigars 50 millions went to Singapore, Java, the Moluccas, and India, 30 millions to China and Japan, 4 millions to Australia, and 11 millions to Europe. Hitherto tobacco-planting has been carried on (with few exceptions) only by people of small means; but since the abolition of the monopoly several companies have been started, and the whole con- dition of the industry will probably soon be greatly modified. Abaedt or MANILA-HEMP (g.v.) is best grown in the south-east of Luzon, in Samar, Leyte, and Bohol. Its cultivation requires little trouble, and the plantations, usually small, are each the property of a native family. Hand-labour and a few simple machines of native construction are all that is required in the preparation of the fibre. The abaca districts are generally very poor. Coffee was introduced, probably from Brazil, in the latter part of the 18th century, but the first plantation on a large scale was formed only in 1826. The cultivation is now pretty cxtensive. Philippine coffee appears in the European markets as Manila or Zamboanga coffee. The former, whieh comes from Batangas, Cavite, and Laguna to the amount of 70,000 piculs (a Spanish picul=140 fb) per annum, is a small but well-flavoured berry; the latter, princi- pally grown in Mindanao and Sulu, which send a good deal of their produce direct to Singapore, is in less repute, because, while the berry is larger, less care is bestowed on the gathering and sorting. Franee was at one time the only great purehaser of Philippine coffee, but about two-thirds of the crop now finds its way to Spain, Fngland, the Netherlands, and Austria. In general far too little care is given to the plantations. Sugar is extensively cultivated, and the export has increased from 1,399,434 piculs in 1871 to 3,382,664 in 1881. About a third of the whole is produced by Pampanga ; and Cavite, Laguna, Pangasinan, Buluean, and Bataan also contribute. About 1,200,000 piculs are exported from Iloilo, which collects from Panay and Negros, &c. 'The finest is

probably that from Capiz in Panay, where, as in this southern district generally, the violet-coloured cane is grown. Most of the larger plantations (some exceeding 1000 acres) are monastic property, and are leased out to Chinese half-breeds, who are said to succeed better than Europeans. The smaller are cultivated by the proprietors with the assistance of their families and relatives, and less fre- quently of bond or hired labourers. A tendency has shown itself

"since 1870 to create larger estatcs, and to import better machinery ; but it will be some time before the Philippine sugar-crop is gener- ally treated according to scientific methods. The finest Manila quality is sent to Spain, and the secondary qualities to England ; for the Iloilo sugars the United States are the principal destination.

Trade.—Before the conquest there was considerable commercial intercourse between the Philippines and China and Japan, but this, which would naturally have developed enormously if the Spanish trade between Manila and America (Navidad and Aeapulco) had been left frec, was interrupted, and at times almost completely stopped, by a series of absurd restrictions, devised in the supposed interest of the trade between Spain and Anierica. Fora long period only a single galleon, under Government supervision, was allowed to proceed yearly from Manila to Acapulco, the value of the cargo each way being bound not to exceed a certain sum. Direct trade

with Europe via the Cape was commenced in 1764; but, as if the exclusion of all exeept Spanish ships was not sufficient, a practical monopoly of this field of enterprise was in 1785 bestowed on the Royal Company of the Philippines. With the elose of the 18th century a certain amount of liberty began to be eonceded to foreign vessels ; the first English commercial house was established at Manila in 1809 ; and in 1834 the monopoly of the Royal Company expired. Manila remained the only port for foreign trade till 1842, when Cebu was also opened ; Zamboanga (Mindanao), Iloilo (Panay), Sual (Luzon), Legazpi or Albay (Luzon), and Tacloban (Leyte) are now in the same category, but only Manila, Iloilo, and Cebu have proved of real importance, as they are the only ports where foreign- bound vessels

have hitherto loaded. The following table shows how rapidly the trade of the country has recently developed.

Entered. Cleared.

Spanish. British.

Tons. |Vessels.| Tons. Vessels. | Tons. | Vessels.

Tons.

| Vessels.

341

eulil

356 445 458 – 542

235,418 216,785 251,417 303,420

317,069 |

449,937

222,613 224,442 249,649 305,168 325,695 459,145

245 241 226 314 318 328

| 391,312

The American trade increased in tlis period from 101 vessels (129,439 tons) to 164 (202,653). The value of the imports rose from $11,987,162 to $25,493,319 and of the exports from $14,837,796 to $23,450,285. In 1883 333 vessels (270,000 tons) entered at Manila alone, the Spanish numbcring 110 (93,000 tons) and the British 1382 (92,000 tons); .the exports in the same year were valued at $29,996,000.

The manufactures of the Philippines consist ofa variety of textile fabrics (pifia fibres, silk, cotton), some of great excellence and beauty, hats, mats, baskets, ropes, furniture, coarse pottery, carriages, and musical instruments.

Islands and Provinces.—The Batancs and Babuyanes, the most northerly of the Philippines, have an area of only 280 square miles, with 8700 inhabitants, who pay no tribute. The rearing of horses is the principal oceupation. The chief settlement is San José de Tbana in the island of Batan. Camiguin, the southernmost of the Babuyanes, is about 30 miles from the eoast of Luzon.

Luzon or Lucon, with an area of 40,885 square miles, is the largest island in the whole archipelago, and as the seat of the Government at Manila it is the most important. The northern trunk, so to speak, extends north and south for 340 miles. From the mountains known as Caraballos of Balar or Nueva Eeija two ranges bifurcate and stretcl: northward—the Sierra Oriental, skirt- ing the eastern coast till it ends at Cape Engafio, and the Sierra Oeeidental, keeping all the way at a distance of 25 or 30 miles from the western. Between these ranges lies the basin of the Rio Grande de Cagayan, which with its numerous affluents (Bangag, Nayon, Mayat, Pongul, Ibulao, &c., from the east ; Calao, Cabagan, Pinacananauang, and Tulay from the west) forms the largest river- system in the whole archipelago. On the western slopes of the Sierra Occidental rise two other large rivers—the Abra, which reaches the sea at Vigan or Villa Fernandina, and the Agno, which after a winding course falls into the Gulf of Lingayan. To the south-west of the mountains extends a comparatively flat region, which continues southwards to the Bay of Manila and forms one of the richest agricultural districts in the island. It is watered by the lower part of the Agno and its lower tributaries, and the Rio Grande de Pampanga with its affluents, which ultimately discharges into Manila Bay, and thus forms a convenient water-way for con- veying produce to the capital. There are also in these lowlands a number of extensive lagoons, such as that of Candava. To the west of the flat region the country rises into the considerable Cordillera de Zambales, which contains a number of peaks 5000 or 6000 feet high, and terminates northwards in a great peuinsula forming the Gulf of Lingayan and southwards in a similar promontory (Sierra de Mariveles)

which helps to form the Bay of Manila. To the east and south of this bay the general configuration is again hilly and even mountainous; but the large area of 350 square miles is occupied by the Laguna de Bay, connected with Manila by the Pasig, on which small steamers ply. The depth of this basin, though the southern side is bordered by a semicireular range of extinct volcanoes 6000 or 7000 feet high, seldom exceeds 4 fathoms. Two long eapes project from the northern side, the western one being continued by the island of Talim. From the south-east eorner of the trunk of Luzon there extends for 180 miles a very irregular peninsula formed by a series of cordilleras running in a north- westerly and south-easterly direction. The following are the pro- vinces and districts into which Luzon is divided, with their chief towns: Manila (258,274 inhabitants! in 1877), Manila; Bulacan (252,149), Bulacan; Pampanga (226,309), Bacolor ; Principe (4158),

1 The figures of the censuses may be trusted for the provinces of Luzon, &c., | but often give no idea of the actual native population of the remoter districts.

Baler; Bataan (49,999), Balanga; Zambales (94,551), Iba; Pan- gasinan (293,291), Lingayen; Union (113,370), 8. Fernando ; Ilocos Sur (201,049), Vigan ; Jlocos Norte (156,715), Laoag ; Abra (42,647), Bangued ; Cagayan (72,697), Tuguegarao ; Lsabela (38,616), Tumauini; Nueva Vizcaya (16,107), Bayombong; Nueva LHeija (123,771), San Isidro; Laguna (182,504), Santa Cruz; Cavite (132,064), Cavite ; Batangas (275,075), Batangas ; Tayabas (53,668), Tayabas ; Camarines Norte (30,661), Daet ; Camarines Sur (156,400), Nueva Caceres ; Albay (257,533), Albay.

To the south-east of Luzon lie the Visayas—Samar, Leyte, Bohol, Cebu, Negros, and Panay, with various smaller islands. :

Samar (area, 4367 square miles) is separated from the Albay penin- sula by the Strait of San Bernardino, 10 miles across. From north- west to south-east it is 120 miles long; its greatest breadth is 60 miles. The provincial capital is Catbalongan on the west coast, on a bay difficult of access. he island is watered by a number of considerable streams—the Catubig, Loquilocum or Ulut, Suribao, &c. At Nipa-Nipa on the south-west coast

there is a remarkable series of rock-caves in which the people were wont to deposit their dead in coffins.1 The narrow but extremely beautiful Strait of S. Juanico scparates Samar from the island of Leyte. The lesser islands of Buat, Parasan, &c., are included in the province of Samar (178,890 inhabitants). Leyte (2716 square miles) is 100 miles Jong and 30 miles wide. The chief town and port, Tacloban, lies at the eastern entrance of the Strait of S. Juanico. Sulphur for the Manila powder-factory is obtained from the solfatara at Monte Manacagan. According to Jagor, the east coast is rising and the west is suffering from the encroachments of the sea at Ormoc to the extent of fifty yards in six years, South-west of Leyte is Bohol (area, 1496 square miles); the chief town is Tagbilaran, at the south-west corucr. The province (226,546 inhabitants) comprises Siquijor and other islands. The important island of Cebu (2413 square miles; provincil population, 403,405) is 185 miles long from north to south, but only 30 miles broad at the most. The chief town, Cebu, is the capital of the Visayas group and is next to Iloilo in the matter of commerce. It is only along the coast that cultivation is easy, and none of the villages lie farinland. Parallel with Cebu and separated from it by a strait 15 miles wide, is Negros (4670 square miles ; population, 204,669), with large sugar planta- tions, but only one large town, Jimamaylan, and no good ports. Bacolod is the administrative centre. North-west of Negros lies Panay (4633 square miles), which is divided into the three pro- vinees of Antique (124,103), Iloilo (410, 430), and Capiz (248,244), in accordance with its physical conformation. Iloilo is the chief town and the seat of the sec of Jaro. Off the south-east coast of Panay lies the island of Guimaras (215 square miles).

In a line with the peninsula of Tayabas (Luzon) and the island of Leyte is Burias (190 square miles), which forms a province by itself (128 inhabitants), and Afasbate (1211 square miles) and Zicao (121 square miles), which, comparatively sterile and thinly peopled (17,170), are united together. West of these islands isa considcrable cluster, I. de Tablas (327 square miles), Sibuyan (159 square miles), Romblon, &c., constituting the province of Romblon (28,154). Mindoro (3934 square miles), one of the largest of the Philippines, lies only 10 miles south of Luzon, but its interior, peopled by about 30,000 Manguianes, a race of doubtful affinity, is practically unex- plored, and its cighteen “ Spanish ” villages are scattered along the coast at great distances from each other and with no proper

means of communication. The principal settlement is Calapan, on the north-east coast. Marinduque (348 square miles), included in the province of Mindoro (58,128), is a flourishing island with 48,000 inhabitants exporting various staples. South-west of Mindoro are the Calamianes (17,041 inhabitants), a great cluster of very small islands, the two largest being Busuanga (416 square miles) and Calamian ; and beyond these extends for 230 miles in a south- westerly direction the island Palawan or Paragua (4576 square miles), which nowhere exceeds a width of 30 miles and sometimes narrows to 10. It is little visited, and apart from Pucrto Princesa, the chief town (578 inhabitants), there are few Spanish posts. The Sulu or Jolé Archipelago? (948 square miles ; about 100,000 inhabitants), annexcd by Spain in 1878, consists of about 150 islands divided into the Balanguingui, Sulu, Tapul, Kecuapoussan, Tawi-Tawi, Tagbabas, and Pangutarang groups. Many of the smaller islands are uninhabited, but the larger are occupied by an industri- ous Mohammedan population. They formerly constituted, along with a portion of northern Borneo, an independent state with an hereditary sultan and a regular nobility of great political influence. The highest hill in the principal island, Buat Timantangis, or Hill of Tears, is so called because it is the last point visible to the natives as they sail away from their native land. Sulu, the present capital, lics on the north coast of the island of Sulu.? ee ee ee eee ee ee

1 For the antiquities diseovered there, see Z. fiir Ethnol., Berlin, 1869,

2 See for full deseription in Geographical Magazine, 1875, and B fe : Geo. de Madrid, 1878. © — oie ge as!

3 See the elaborate accounts of Koner in Z. der Ges, fiir Erdk., Berlin, 1867, pp. 105, 142, and of Garin in Bol. de la Soc. Geo. de Madrid, 1881, as well as the old report of Dalrymple in Oriental Repositor Y.

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PHEti Pre Ins

The whole chain of the Sulus is practically a continuation of the south-western promontory of Mindanao or Maguindanao (37,256 square miles), the second largest island of the archipelago, contain- ing the Spanish

provinces of Surigao (56,246), Misamis (88,376), Zamboanga (14,144), Davao (1695), Cottabatd (1282). Since about 1876 much light has been thrown on this interesting island? by the Jesuit missionaries. It is remarkably mountainous, and appears to be divided by the Rangaya or Sugut Cordillera, which runs north- west and south-east, and is continued throughout the great western peninsula of Zamboanga, and, at the other extremity, bends south to form the peninsula of Butulan. Between the Rangaya range and that of the Tiruray lies the valley of the Rio Grande, a river navi- gable as far as Matingcahuan (70 or 80 miles) and connected with two great lakes, Lingauasan and Buluan, which during the rainy season merge, or nearly merge, into one. On the north side of thc Rangaya range and connected with the sea by the river Iligan is the great crater-lake of Lanao, which with its little group of secondary erater-lakes probably gave rise to the name of the island, Maguin- danao, " Land of Lakes." Towards the east and sloping northwards extend the valleys of the Cagayan, the Tagoloan, and the Agusan. This last is the largest river in the whole island. Rising in the Kinabuhan Mountains in the south-east, it pursues a very sinuous course for more than 200 miles and falls into Butuan Bay; in the lower regions it is navigable for craft of considerable burden. Mindanao is throughout well peopled, much of it being occupied by independent Mohammedan sultanates.

Administration, &c.—The Philippines are subject to a governor- general with supreme powers, assisted by (1) a "junta of authorities" instituted in 1850, and consisting of the archbishop, the commander of the forces, the admiral, the president of the supreme court, &c.; (2) a central junta of agriculture, industry, and commerce (dating from 1866); and (3) a council of administration. In the provinces and districts the chief power is in the hands of alcaldes mayores and civico-military governors. The chief magistrate of a com- mune is known as the gobernadorcillo or capitan ; the native who is responsible for the collection of the tribute of a certain group of families is the cabeca de barangay. Every Indian between the ages of 16 and 60 subject to Spain has to pay tribute to the amount of $1:17—descendants of the first Christians of Cebu, new con- verts, gobernadorcillos, &c., being exempted. Chinese are subject to special taxes; and by a law of 1883 Europeans and Spanish half-castes are required to pay a poll-tax of $2°50.

Ecclesiastically the Philippines comprise the archbishopric of Manila and the suffragan bishoprics of Nueva-Caceres, Nueva- Segovia, Cebu, and Santa Isabel de Jaro, which were all constituted by the bull of Clement VIII., 14th August 1595, with the exception of the last, whose separation from Cebu dates only from the bull of Pius IX., 27th May 1865. The Agustinos Calzados were established in the Philippines in the year 1565, the first prelate being Andres Urdaneta, and they have convents in Manila, Cebu, and Guadalupe. The Franciscans date from 1577, and have convents at Manila and San Francisco del Monte; the Dominicans (1587) at Manila and San Juan del Monte; the Recollects or Strict Franciscans (1606) at Manila, Cavite, and Cebu. The Jesuits, restored in 1852, main-

tain the missions of Mindanao and Sulu ; and they have charge in –

Manila of the municipal atheneum, the normal school for primary teachers, and an excellent meteorological observatory. There are also sisters of charity, and nuns of the royal monastery of Santa Clara, founded in 1621.

Ldwcation.— A good deal has been done for the diffusion of primary education among the natives (every pueblo is bound to have a school), but the standard is not a high one. The press is under strict civil and ecclesiastical control, and all discussion of Spanish or general European politics is forbidden. Several daily papers, however, are published at Manila, El Diario de Manila dating from 1848.

Population.—As far as is known, the original inhabitants of the Philippines were the Aetas or Negritos,® so called from their dark complexion. They still exist sporadically, though in limited numbers (perhaps 25,000), throughout most of the archipelago, the Batanes, Babuyanes, Samar, Leyte, Bohol, and Sulu excepted. Their headquarters are the northern part of Nueva Ecija, the provinces of Principe, Isabela, and Cagayan. To their presence in Isla de Negros the island owed its name. They are dwarfish (4 feet 8 inches being the average stature of the full-grown man), thin and spindle-legged, have a head like a Negro's, with flattish nose, full lips, and thick frizzled black hair, and possess an extraordinary prehensible power in their toes. They tattoo themselves, and wear very little clothing. Cigars they often smoke with the buming end between the teeth—a practice occasionally observed among the civilized Indians. They have no fixed

abodes. Honey, game, fish, wild fruits, palm-cabbages, and roots of arums, &c., constitute their food ; they sell wax to Christians and Chinese in exchange for betel and tobacco. The dog is their only domestic animal.

1. *See Montano in Bull. Soc. de Géogr., Paris, 1882, and Blumentritt's mono- graph and map in Zeitseh. der Ges. fiir Erdk., Berlin, 1884. 5 In Mindanao they appear as Mamanuas.*

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PHI—PHI

The Negritos! seem to have been driven into the more inaceessible parts by successive invasions of those Malay tribes who in very different stages of civilization and with considerable variety of physical appearance now form the parti-coloured but fairly homo- geneous population of the islands.

First among these rank the Tagals. They are by preference inhabitants of the lowlands, and generally fix their pile-built dwell- ings near water. In Manila, Cavite, Batangas, Bulacan, Morong, Infanta, Tayabas, and Bataan they form the bulk of the population, and they also appear in Zambales, Principe, Isabela, Nueva Ecija, Mindoro, Marinduque, Polillo, &c. Their language (Tagalog) espcci- ally has made extensive encroachments on the other Philippine tongues since the conquest. The Tagal is physically well developed, has a round head, high cheek bones, flattish nose, low brow, thickish lips, and large dark eyes. The lines from the nose to the mouth are usually strongly marked. The power of smell is of extraordinary acuteness.

Before the arrival of the Spaniards they had an alphabet of their.

own (see Stanley's translation of Morga), and they still possess a body of lyrical poetry and native melodies. On the death of an adult a feast is sometimes held among the better families, but the funeral itself is conducted after the ordinary Roman Catholic fashion.

The Visayas inhabit all the islands to the south of Luzon, Mas- bate, Burias, Ticao, and Mindoro, and to the north of Borneo, Sulu, and Mindanao. In the 15th and 16th centuries they were called ""Pintados" (7.e., painted people)

by the Spaniards. ‘Though they had attained a considerable degree of civilization before the con- quest, they readily accepted Christianity and assisted in the subju- gation of the Tagals. The mountains in the interior of some of the Visaya Islands are occupied by savage Visayas, generally styled Infieles, Montesinos, or Cimarrones. The Calamianes, who inhabit the islands of that name, and the Caragus, who inhabit the east coast of Mindanao from Cape Surigao to Cape St Augustin, are usually classed with the Visayas.

The Igorrotes or Igolotes proper (for the name is by many writers very loosely applied to all the pagan mountain tribes of Luzon) inhabit the districts of Bangued, Lepanto, Tiagan, Bontoc. From their cranial eharacteristics they seem to be distinct from the Tagals and other “ Malay ” tribes, and they are said to show traccs of Chinese and even Japanese intermixture. Dirty and savage-like in person, they are none the less industrious agriculturists—laying out their fields on artificial terraces on the mountain sides, and constructing irrigation canals with remarkable skill; and they also excel as miners and workers in metal. In the matter of scxual morality they form a striking eontrast to the licentious Malays ;

_they are monogamists, allow no divorce, and inflict severe punish- ment for infidelity. Though an attempt to subdue the Igorrotes was made as early as 1660, it was not till 1829 that Spanish supremacy was acknowledged.

For details in regard to the other tribes of the Philippines—the Ilocanes, Pampangos, Pangasinanes, Ibanags or Cagayans, Tingu- ianes (Itanegas or Tingues), Apayaos, Catalanganes, Vicols, &e.— the reader is referred to Professor Ferd. Blumentritt’s monograph, Versuch einer Ethnographie der Philippinen, Gotha, 1882. No fewer than thirty languages are officially recognized. In 1865 it was estimated that Visaya was spoken by upwards of 2,000,000 persons, Tagalog by 1,300,000, Cebuano by 386,000, &c.

Chinese immigrants, in spite of massacres and administrative restrictions, form a powerful element in the Philippines; in Manila alone they numbered 30,000 in 1880, and there is hardly a pueblo of any size in which one or more of them is not to be found. The petty trade and banking are nearly all in their hands. Chinese mestizos or half-breeds (Mestizos de Sanglay, or Mestizos Chinos) are numer- ous enough to form separate communities ; in

1867 they were said to be 211,000 strong. The European element has never been numerically important—some 8000 or 9000 at the most ; but there has grown up a considerable body of Europcan mestizos. Traces of Indian sepoys are still seen in the neighbourhood of Manila, where sepoy regiments were quartered for about eighteen months after the conquest of Manila by the English. Owing partly to ep II.'s prohibition of slavery the Negro is eonspicuous by his absence.

There are no accurate statistics of the whole population of the Philippiues ; and even the number of the Spanish subjects was up till 1877 only estimated according to the number of those who paid tribute. Diaz Arenas in 1833 stated the total at 3,153,290, the

1 See Meyer, in Z. f. Hthn., vols. v., vi., vii.

ecclesiastical census of 1876 at 6,173,632, and the civil census of 1877 at 5,561,232; Moya y Jimenez, founding on certain calcula- tions by Del Pan, and admitting an annual increase of 2 per cent., brings the number up to 10,426,000 in 1882.

Hlistory.—The Philippine, or, as he called them, the St Lazarus Islands were discovered by Magellan on 12th March 1521, the first place at which he touched being Jomonjol, now Malhou, an islet in the Strait of Surigao between Samar and Dinagat. By 27th April he had lost his life on the island of Mactan off the coast of Cebu. The surrender of the Moluccas by Charles V. in 1529 tended to lessen the interest of the Spaniards in the Islas de Poniente, as they generally called their new discovery, and the Portuguese were too busy in the southern parts of the Indian Archipelago to trouble about the Islas de Oriente, as they preferred to call them. Villalo- bos, who sailed from Navidad in Mexico with five ships and 370 men in February 1543, accomplished little (though it was he who suggested the present name of the archipelago by ealling Samar Filipina); but in 1565 Legazpi founded the Spanish settlement of San Miguel at the town of Cebu, which afterwards became the Villa de Santisimo Nombre de Jesus, and in 1571 determined in large measure the future lines of conquest by fixing the capital at Manila. It is in a letter of Legazpi's in 1567 that the name Islas Filipinas appears for

the first timc. The subjugation of the islands, thanks to the exertions of the Roman Catholic missionaries and to the large powers which were placed in their hands by Philip, was effected, not of course without fighting and bloodshed, but without those appalling massacres and depopulations which characterized the conquest of South America. Contests with frontier rebellious tribes, attacks by pirates and reprisals on the part of the Spaniards, combine with volcanic eruptions, earthquakes, and tornadoes to break the comparative monotony of the subsequent history. Manila was captured by the English under Draper and Cornish in 1762, and ransomed for £1,000,000; but it was restored in 1764.

Professor Blumentritt published a Bibliographie der Philippinen in 1882; minor lists of authorities will be found in his Versuch einer Lthnographie, in Moya y Jimenez, &c. It is enough to mention Morga, Sucesos de las Islas Fili- pinas, Mexico, 1609 (English translation by Henry E. J. Stanley, Hakluyt Soe., 1868); Chirino, Relacion de las I. F., Rome, 1604; Combez, Hist. de las Islas de Mindanao, Jolé, &c., Madrid, 1667; Agustin, Conquistas de las I. Bs, Madrid, 1698; Juan de la Concepcion, Hist. general de Philipinas, Sampaloc, 1788; Zufiga, Hist. de Philipinas, Sampaloe, 1803 (English partial translation by John Maver, 1814); Comyn, Estado de lus I. F. en 1810, Madrid, 1820 (new edition, 1877); Mas, Informe sobre el Estado de las I. F. en 1842, Madrid, 1843; Mallat, Les Philippines, Paris, 1846; Diaz Arenas, Memorias hist. y estad., Manila, 1850; Buzeta and Bravo, Diccionario estad., &c., de las I. F., Madrid, 1850; La Gironniére, Vingt ans aux Philippines, 1853 ; Semper, Die Philippinen u. thre Bewohner, Wiirzburg, 1869 ; Ferrando, Hist. de los PP. Dominicanos en las I, F., &¢., Madrid, 1870; Jagor, Reisen in den Philippinen, Berlin, 1873; Scheidnagel, Las Colonias Espanolas de Asia, Madrid, 1880 ; Cafiamaque, Las Islas Filipinas, Madrid, 1880; Cavada, Guia de Filipinas, 1881; Francisco Javier de Moya y Jimenez, Las I. F. en 1882, Madrid, 1883. (HAP W:)

PHILIPPOPOLIS, Finipporet, and (Turkish) Feuis, a city of Thracia, previous to 1878 the chief town of a sanjak in the Turkish vilayet of Adrianople, and now the capital of the independent province of Eastern Roumelia and the chief town of one of the six departments, lies 112 miles west-north-west of Adrianople by rail and thus 309 miles from

Constantinople, mainly on the right bank of the Maritza (the ancient Hebrus). The railway runs farther up the river to Sarambey and Simcina, but has no direct connexion with the other railway systenis of Europe. High- ways, however, from Bulgaria, Servia, and Macedonia meet at Philippopolis, which, besides being the centre of an ex- tensive trade, carries on considerable manufactures of silk, cotton, and leather. The city is built partly on a striking group of granite eminences (whence the old Roman name, Trimontium) and partly on the low grounds along the river, which in the outskirts are occupied by rice-fields. On the left side of the river and connected with the city by a long bridge is the suburb of Karshiaka. The popula- tion, estimated at 24,000 to 28,000, consists of Bulgarians, and, in smaller proportions, of Greeks, Turks, Armenians, Jews, and Gipsies. A Greek archbishop has his see in the city, and among the public buildings are a number of Greek churches and a Greek lyceum (1868).

Eumolpia, a Thracian town, was captured by Philip of Macedon and made one of his frontier posts ; and, though the soldiers seem to have given it the title of " Poneropolis," or City of Hardships, and it was not long afterwards recovered by the Thracians, the name of Philip's City has stuck to it ever since. Under the Romans Philippopolis or Trimontium became the eapital of Thracia ; and, even after its destruction by the Goths, when 100,000 persons are said to have been slain, it continued to bea flourishing city till it was again laid in ruins by Joannes Romaioctonus, the Bulgarian king. It passed under Turkish rule in 1360; in 1818 it was

conflagration. During the war of 1877-78 the city was occupied by the Russians.

PHILIPPSBURG, a small town of the grand-duchy of Baden, situated on a sluggish arm of the Rhine, 15 miles to the north of Carlsruhe, was formerly an important fortress of the German empire, and played a somewhat conspicuous part in the wars of the 17th century. It originally belonged to the ecclesiastical principality of Spires, and was named Udenheim, but in

1618 it was forti- fied and re-christened by Bishop Philip von Sotern. At the peace of Westphalia (1648) the French remained in military possession of Philippsburg, but in 1679 it was restored to Germany, and though again captured by the French in 1688 it was once more restored in 1697. In 1734 the dilapidated fortress fell an easy prey to the French under Marshal Berwick, who, however, lost his life beneath its walls, and in 1800 the works were razed. The town was assigned to Baden in 1803. The population in 1880 was 2549.

PHILIPS, Ampross (1671-1749), English man of letters, was born of a good Leicester family in 1671. While at St John's College, Cambridge, he gave evidence of literary taste and skill, in verses forming part of a memorial tribute from the university on the death of Queen Mary. Going to London on the completion of his studies, Philips speedily became "one of the wits at Button's," and thereby a friend of Steele and Addison. He began to write for Tonson, working at such heterogeneous subjects as trans- lated "Persian Tales" and a summary of Hacket's Life of Archbishop Williams. The first product really character- istic of the author, after his settlement in London, is the series of Pastorals which opened the sixth volume of Tonson's Miscellanies (1709). Pope's Pastorals, curiously enough, closed the same volume, and the emphatic pre- ference expressed in the Guardian, in 1713, for Philips's pastoral style over all other successors to Spenser gave rise to Pope's trenchant ironical paper in No. 40 of the same periodical. The breach between these two wits speedily widened, and Philips was at length concerned in the great quarrel between Pope and Addison. He had come to bea man of some note both for literary work and political acti- vity. The Spectator had loaded with praises the drama of The Distress'd Mother, which Philips adapted from Racine's Andromaque and brought upon the stage in 1712, and he was thus a recognized member of Addison's following. There is some doubt as to the particular part he played in the notorious contest of the two chiefs, but, whether he threatened to beat Pope or not (with the rod which he is said to have hung up at Button's for that purpose), there is ample evidence to show that both Pope and _ his friends had a bitter feeling towards him. Not only is he honoured with two separate lines in the Dunciad, but he figures for illustrative purposes in Martinus Scriblerus, and he receives considerable attention in the letters of both Pope and Swift. The latter found occasion for special allusion to Philips

during Philips's stay in Ireland, whither he had gone as secretary to Archbishop Boulter. He had done good work in the Mreethinker (1711) along with Boulter, whose services to the Government in that paper gained him preferment from his position as clergyman in South- wark, first to the bishopric of Bristol and then to the primacy of Ireland. Up to this time Philips had shown disinterested zeal in the Hanoverian cause, though he had received no greater reward than the positions of justice of peace and commissioner of the lottery (1717). He had also written some of his best epistles, while in 1722 he published two more -dramatic works— The Briton and Humphry, Duke of Gloucester—neither of which has had the fortune, like their predecessor, to be immortalized by

destroyed by an earthquake ; and in 1846 it suffered from a severe | romantic criticism.

It was, no doubt, a grateful change for Philips to go to Ireland under the patronage of Arch- bishop Boulter, and to represent, through the same in- fluence, the county of Armagh in the Irish Parliament, while his sense of his own political worth must have been flattered when he became secretary to the lord chancellor in 1726, and in 1733 judge of the prerogative court. After the archbishop's death he by and by returned to London, and dedicated a collected edition of his works to the duke of Newcastle. He died in 1749,

While it can hardly be said that Philips's Pastorals show poetic quality of a high order, they must be commended—and perhaps the third in particular—for ease and fluency and rhetorical vigour. In these features they are not surpassed by the pastorals in The Shepherd's Week, which Gay wrote, at Pope's instigation, as a burlesque on Philips's work; but the grasp of rustie simplicity and the exquisite play of fancy possessed by Gay are manifest advantages in his performance. The six epistles evince dexterous management of the heroic couplet, an energetic directness of pur- pose, and (particularly the " winter piece" addressed to the earl of Dorset) a noticeable appreciation of natural beauty. Similar felicitous diction and sympathetic observation, together with a determined bias towards weakness of sentiment, are characteristic of the poet's odes, some of which—

addressed to children—gave oceasion for various shafts from both Swift and Pope, as well as for the nickname of " Namby-Pamby," coined by Henry Carey as a descriptive epithet for Philips. The epigrams, and the translations from Pindar, Anacreon, and Sappho, need merely be named as completing the list of the author's works.

See Johnson's Lives of the Poeis; Spence's Anecdotes; the Spectator; the

Works (especially the correspondence) of Pope and Swift; Stephen's Pope and Courthope's Addison, in English Men of Letters.

PHILIPS, Joun (1676-1708), English man of letters, son of Dr Stephen Philips, archdeacon of Salop, was born at Bampton in Oxfordshire in 1676. After receiving private education at home, he went to Winchester School, and in due course became a student of Christ Church, Oxford. At school he showed special aptitude for exact scholarship, and at the university, under Dean Aldrich, he became one of the most remarkable men of his time. He was an ardent and successful student of the ancient classics, and took special pleasure in making himself thoroughly familiar with Virgil. At the same time he was diligent in his scientific pursuits preparatory to the medical profession he intended to follow, and, although the botany and other branches he made himself familiar with were never actually turned to account in the business of life, his acquired knowledge gave him material' for literary purposes. But, over and above these studies, Philips was a careful and critical reader of the English poets that fell in with his tastes, and devoted much time to Chaucer, Spenser, and Milton. When he began to write, the influence of the two former told to some extent on his diction, and he was so enamoured of the strenuous movement and the resonant harmonies of Milton's blank verse that he adapted the form of all his original English writings to that supreme model. Were it for nothing else, John Philips will be remembered as the first to have a genuine literary appreciation of Milton. He was well known in his college for scholarship, taste, and literary resource long before publishing any of his writings, but the appearance of The Splendid Shilling, about the year 1703, at once brought him under the favourable notice of critics and readers of poetry. The Zatler (No. 250) hailed the poet as the writer of "the best burlesque poem in the British language," nor will the modern reader care to detract

much from this verdict, even granting that the model and the imitation, mutually constituting a great revelation to the literary dictators of the period, would cause them considerable surprise. Philips in this poem showed the dexterous ease that comes of long study and perfect familiarity, combined with fertility of resource and humorous ingenuity of application. One important result of the work was the interested notice of the earl of Oxford and Lord Bolingbroke. The poet went to London, and

was asked to celebrate the victory of Blenheim, which he did in his favourite manner, but without conspicuous suc- cess. The Blenheim, published in 1705, lacks, of course, the element of burlesque, and it is difficult to resist the impression that the poet must have felt himself restrained and hampered by the stern necessity of being seriously sublime. A year later (1706) Philips published, in two books, his didactic poem entitled C'yder, which is his most ambitious work and is written in imitation of Virgil's Georgics. While there is no denying the poet's admirable familiarity with his original, or his skilful employment of the Miltonic blank verse, or the sustained energy and grace of some of the episodes in the second part, or even his intimate knowledge of the minute details connected with the management of fruit, it cannot be said that the work is a notable contribution to English poetry. It is streaked with genius, but, like the Latin Ode to St John (and, for that matter, the author's other works as well), it is little more than the expression of a poetical scholar feeling his way outwards into life. Philips never got beyond the enjoyment of his pipe and his study, both of which figure prominently in all his poems. He was medi- tating a still further work on the Last Day, when he was cut off by consumption, in 1708, at the early age of thirty- two. His friend Edmund Smith, himself a distinguished scholar and poet, wrote an elegy on the occasion, which Johnson says "justice must place among the best elegies which our language can show." Philips was buried at Hereford, and a monument to his memory, with an in- scription from the pen of Atterbury, was erected between those of Chaucer and Drayton in Westminster Abbey.

See Johnson's Lives of the Poets, including Smith's Prefatory Dis- course ; Sewell's Life of Mr John Philips; the Tatler, &c.

PHILIPPUS, M. Juxrus, Roman emperor from 244 to 249 a.p., often called "' Philip the Arab," was a native of Bostra or the Trachonitis, who, exchanging the predatory life of the Arabs who hung on the desert borders of the empire for Roman military service, rose to be preetorian pre- fect in the Persian campaign of Gordian IIL., and, inspiring the soldiers to mutiny and to slay the young emperor, was raised by them to the purple (244). Of his reign little is known except that he celebrated the secular games with great pomp in 248. A rebellion broke out among the legions of Mcesia, and Decius, who was sent to quell it, was forced by the troops to put himself at their head. Philip was defeated near Verona and perished in or after the battle, leaving a very evil reputation. Eusebius knows a current opinion that Philip was a Christian; Jerome and later writers state this as a fact. But at best his Christianity must have been merely nominal and had no effect on his life or reign. With Philip perished his son and colleague, then a boy of twelve, who is known as Philippus IT.

PHILISTINES (D'nv 5), the name of a people which, in the latter part of the age of the Judges and up to the time of David, disputed the sovereignty of Canaan with the Israelites (see Israrz, vol. xiii. p. 402 sg.). The Philistine country (nye, Palestina ; the authorized version still uses the word in this its original sense as equivalent to Philistia) embraced the rich lowlands on the Mediter- ranean coast (the Shephelah) from somewhere near Joppa to the Egyptian desert south of Gaza, and was divided between five chief cities, Ashdod or Azorus (g.v.), GAZA (q.v.), and Askelon (Ashkelon, AscaLon, g.v.) on or near the coast, and Garu (q.v.) and Exron (q.v.) inland. The five cities, of all of which except Gath the sites are known,! formed a confederation under five "lords" (Seranim).?

1 Their modern names are Azdtd, Ghazza, 'Askalan, 'Akir.

2 The word seren, pl. seranim, means an axle, and seems to be ap- plied metaphorically like the Arabic Koto.

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Ashdod was probably the foremost city of the confedera- tion in the time of Philistine supremacy ; for it heads the list in 1 Sam. vi. 17, and it was to the temple of Dagon in Ashdod that the ark was brought after the battle of

Aphek or Ebenezer (1 Sam. v. 1). Hebrew tradition recognizes the Philistines as immigrants into Canaan with- in historical times, like the Israelites and the Arameans (Amos ix. 7), but unlike the Canaanites. They came, according to Amos, from Caphtor (comp. Jer. xlvii. 4), and Deut. 1. 23 relates that the Caphtorim from Caphtor dis- placed an earlier race, the 'Avvim, who were not city- dwellers like the Canaanites, but lived in scattered villages. The very name of Philistines probably comes from a Semitic root meaning "to wander"; the Septuagint calls them 'AAAddvaAo., "aliens." The date of their immigration cannot be determined with certainty.2 We are scarcely en- titled to take Gen. xxi., xxvi., as proving that the inhabit- ants-of Gerar in patriarchal times were identical with the later Philistines, and the other references in the Penta- teuch and Joshua are equally inconclusive. The first real sign of the presence of the Philistines is when the Danites, who in the time of Deborah were seated on the sea-coast (Judges v. 17), were compelled—obviously by the pressure of a new enemy—to seek another home far north at the base of Mount Hermon (Judges xviii.). This marks the commencement of the period of Philistine aggression, when the foreigners penetrated into the heart of the Israelite country, broke up the old hegemony of Ephraim at the battle of Ebenezer, and again at the battle of Mount Gilboa destroyed the first attempt at a kingdom of all Israel. The highest power of the Philistines was after the death of Saul, when David, who still held Ziklag, and so was still the vassal of Gath, reigned in Hebron, and the house of Saul was driven across the Jordan. But these successes were mainly due to want of union and discipline in Israel, and when David had united the tribes under a new sceptre the Philistines were soon humbled. After the division of the kingdom the house of Ephraim appears to have laid claim to the suzerainty over Philistia, for we twice read of a siege of the border fortress of Gibbethon by the northern Israelites (1 Kings xv. 27, xvi. 15); but the Philistines, though now put on the defen- sive, were able to maintain their independence. Philistia was never part of the land of Israel (2 Kings 1. 3, vill. 2 ; Amos vi. 2), and its relations with the Hebrews were embittered by the slave trade, for which the merchants of Gaza carried on forays among the Israelite villages (Amos i. 6). On the other hand, the trading relations between Gaza and Edom (Amos, wt sup.) probably imply that in the 8th century Judah, which lay between the two, was open to Philistine commerce (comp. Isa. i. 6); Judah under Uzziah had reopened the Red Sea trade, of which the

Philistine ports were the natural outlet. Soon, how- ever, all the Palestinian states fell under the great empire of Assyria, and Tiglath-Pileser, in 734 B.c., subdued the Philistines as far as Gaza. But the spirit of the race was not easily broken; they were constantly engaged in intrigues with Egypt, and had a share in every conspiracy and revolt against the great king. Of two of these revolts, first against Sargon in 711, and afterwards against Sennacherib on Sargon's death (705), a memorial is preserved in Isa. xx., xiv. 29 sg. In the latter revolt Hezekiah of Judah was also engaged ; it was to him that*

3 For some Egyptian evidence, see PHGENICIA.

4 The Chronicler, who represents the relations of Judah and Philistia as generally unfriendly, makes Uzziah subdue the latter country as wellas Edom, assuming perhaps that he was the fulfiller of the pro- phecy in Amos i., in which, however, it is the Assyrians who are really pointed to as the ministers of divine justice. The old history has no trace of pretensions of Judah to sovereignty in Philistia till the time of Hezekiah. Comp. Wellhausen, Prolegomena, p. 217.

Padi, kinglet of Ekron and a partisan of Assyria, was delivered for custody by the rebels. In 701 Sennacherib marched westward and reduced the rebel cities of Ascalon and Ekron ; kinglets faithful to his cause were established in both places, and the territories of these Philistine princes and of those of Gaza and Ashdod were enlarged at the cost of Judah. The Philistine war of Hezekiah spoken of in 2 Kings xviii. 8 was probably undertaken to regain the lost territory after the disaster of Sennacherib's army. Under Esarhaddon and Assurbanipal the inscrip- tions still speak of the cities of Philistia as governed by kinglets tributary to Assyria ; and, as the power of Nineveh declined and the monarchs of Egypt began to form plans of aggrandizement in Syria, the Philistine fortresses were the first that opposed their advance. According to Herodotus (ii. 157) Psammetichus besieged Ashdod for twenty-nine years, from which we may at least conclude that the Shephelah was the scene of a protracted conflict between the two great powers. The prophecy of Zeph- aniah ii. 4 sg. has by some been held to point to these events; but most recent writers prefer to connect

it with the invasion of the Scythians, who in the reign of Psammetichus ravaged the Phcenician. coast and plundered the famous temple of Aphrodite Urania (Astarte) at Ascalon (Herod., i, 105). The next king of Egypt, Necho, also made war in the Philistine country and smote Gaza (Jer. xlvii.), an event recorded also by Herodotus, who gives to Gaza (Ghazzat, Assyrian Khaziti) the name of Cadytis (Herod., ii. 159, comp. iii. 5).!_ Amidst all these calamities Philistia, like the other countries of Syria in the Assyrio-Babylonian period, must have lost great part of its old individuality. The Philistine towns continued to be important, and Gaza in particular became a great seat of international commerce —Herodotus estimates Cadytis as being almost as large as Sardis—but we can hardly speak further of a Philistine people. After the captivity Nehemiah speaks not of Philis- tines but of Ashdodites (iv. 7), speaking an " Ashdodite " dialect (xiii. 24), just as Strabo regards the Jews, the Idumeans, the Gazans, and the Ashdodites as four cognate peoples having the common characteristic of combining agriculture with commerce. In southern Philistia at least the population was modified by Arabian immigration. In the time of Cambyses the Arabs touched the sea immedi- ately south of Gaza (Herod., iii. 5), and this perhaps had something to do with the fact that Gaza was the only Syrian city that resisted Cyrus, just as the Persian and Arab garrison of Gaza offered to Alexander the only re- sistance that he found on his march from Tyre to Egypt. We have still to consider the much-vexed question of the origin of the Philistines. That they were a Semitic or at least a thoroughly Semitized people can now hardly be made matter of dispute. The short list of proper names derived from the Bible has been considerably enlarged from the Assyrian monuments, and suffices to prove that before as after the captivity their language was only dialectically different from that of the Israelites. The religion too was Semitic, and of that older type when the gods were not yet reduced to mere astral powers, but had individual types and special relations to certain animals. Thus Ekron had its local "Fly-Baal" (Baal-Zebub, 2 Kings i, 2 sq.), the fame of whose oracle in the 9th century B.c. extended as faras Samaria. The more famous Dagon, who had temples at Ashdod (1 Sam. v.; 1 Mae. x. 83) and Gaza (Judges xvi. 21 sq.), seems to have been more than a mere local deity ; there was a place called Beth-Dagon in Judea (Josh. xv. 41) and another on the borders of Asher (Josh. xix. 27). The name Dagon seems to come from 37, "fishy amd

1 The reference to Necho and Gaza is not in the Septuagint of Jer. xlvii. 1, and it would be more natural to think of Chaldea as the enemy from the north whom Jeremiah describes.

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that his idol was half-man half-fish is pretty clear from 1 Sam. v. 4, where, however, the text is hardly sound, and we ought probably to read, omitting one of two consecutive nuns, "only his fish-part was left to him."

There are two other views about Dagon. (1) Philo Byblius (Miiller, Fr, Hist. Gree., iii. 567 sg.) makes Dagon the inventor of corn and the plough, whence he was called Zeds 'Apérpios. This implies an etymology of a very improbable kind from the Hebrew and Phe- nician {1'T, "corn." But it is probable that, at least in later times, Dagon had in place of, or in addition to, his old character that of the god who presided over agriculture; for in the last days of paganism, as we learn from Marcus Diaconus in the Life of Porphyry of Gaza (§ 19), the great god of Gaza, now known as Marna (our Lord), was regarded as the god of rains and invoked against famine. That Marna was lineally descended from Dagon is probable in every way, and it is therefore interesting to note that he gave oracles, that he had a circular temple, where he was sometimes worshipped by human sacrifices, that there were wells in the sacred circuit, and that there was also a place of adoration to him situated, in old Semitic fashion, outside the town. Certain "marmora" in the temple, which might not be approached, especially by women, may' perhaps be connected with the threshold which the priests of Dagon would not touch with their feet (1 Sam. v. 5; Zeph. 1.9); (2) Schrader (K. A. 7., 2d ed., p. 181 sg.) identifies Dagon with the Assyrian god Dakan, and believes that the word is Accadian. We are here in a region of pure conjecture ; the attributcs of Dakan are unknown, save only that Berosus speaks of an Assyrian merman- god 'Q6dxw».

To the male god Dagon answers in the Bible the female deity Ashtoreth, whose temple spoken of in 1 Sam. xxxi. 10 is probably the ancient temple at Ascalon, which Herodotus regarded as the oldest seat of the worship of Aphrodite Urania. This Ashtoreth is the Derketo of Diodorus (ii, 4) and Lucian (De Dea Syr., 14), the Atargatis of Xanthus (fr. Hist. Grec., i. 155), whose sacred enclosure and pool were near Ascalon, and whose image had

a human head, but was continued in the form of a fish.2 The association of Ashtoreth with sacred pools and fish was common in Syria, and the sacred doves of Ascalon mentioned by Philo (cd. Mangey, ii. 646) belong to the same worship.' Of the details of Philistine religion in the Biblical period we know almost nothing. Their gods were carried into battle (2 Sam. v. 21), a usage found among other Semites ; their skill in divination is alluded to in Isa. ii. 6, and we have already seen that oracles were a feature in their shrines. The whole record shows a religion characteristically Semitic in type ; and it is also noteworthy that at the earliest date when the Philistines appear in history the great sanctuaries are all on the coast with deities of a marine type. This raises a presumption that the Philistines came from over the sea, and that Caphtor, their original home, was an island or maritime country.° In point of fact the Philistines must have entered their later seats either by sea or from the desert between Canaan and Egypt. In the latter case they come from Egypt, for a city-building people, which supplanted a race of villagers, cannot have been a tribe of Arabs. And so the theories about the origin of the Philistines reduce themselves to two, one class of writers holding that Caphtor must be sought across the Mediterranean, another placing it in the

- *The name Atargatis is a later compound, of which the first half is the Aramaic form of Ashtar ('Attar), and the second is NM.*

3 The Aphrodite of Gaza in Marcus, Vit. Porph., § 59, is rather Aphrodite Pandemos. She gave oracles by dreams in matters relating to marriage.

4 Schrader thinks that traces of Jehovah (Iahveh) worship among the Philistines are to be found in the Philistine names Padi, Mitinti, Sidké, &c., on the Assyrian inscriptions (see also Friedrich Delitzsch, Wo lag das Paradies? p.162sq.). It is probable enough that Sidk4 at least is a shortened form of a name in which the second element was that of a god ; but such Pheenician names as Kalba (side by side with Kalbélim), Hanno, Abda or Bodo, &c., show that the shortening does not in the least imply that the divine name was Iahveh.

° The expression "isle " (or coastland, Hebrew '®) of Caphtor in Jer. xlvii. is generally cited as conclusive to this effect ; but in the context it is by no means clear that it means anything more than the coastland of Philistia.

Delta. Ancient tradition gives no help ; for it takes Caphtor to be Cappadocia, led, it would seem, merely by a super- ficial similarity of the names. Of the two main theories the former is that which has recently found most support, and it has a definite point of attachment in the fact that the Philistines, or a part of them, are also called in the Bible Cherethites (1 Sam. xxx. 14; Ezek. xxv. 16; Zeph. ii. 5), while David's Philistine guards are in like manner called the Cherethites and Pelethites (2 Sam. viii. 18, xv. 18, &.). Cherethites (Krétim) can hardly be anything but Cretans, as the LXX. actually renders it in Ezekiel and Zephaniah, and Caphtor would thus be the island of Crete, —an identification which seems to satisfy the conditions of a reasonable hypothesis. For, though the points of contact between Crete or Cretan religion and the Philistine coast which have been sought in Greek and Latin writers (chiefly in Steph. Byzant., s.v. " Gaza") are very shadowy, there is no doubt that Crete had an early connexion with Pheenicia and received many Semitic inhabitants and a Semitic civilization before the Greeks gradually asserted themselves in the Augean and forced back the tide of Semitic influence (for details, see the article PHanicta). These facts give a reasonable explanation of the settlement on the Philistine coast within historical times of a mari- time people, cognate to the Pheenicians in so many points and yet having certain distinct characters, such as would naturally be produced in a place like Crete by the grafting of a Semitic stock and culture on ruder races not Semitic (the Eteocretans).1 The opposite view, which places Caphtor in the Delta, rests on more complicated but less satisfactory arguments. There were certainly many Semites in the Delta of Egypt, and so long as the history of the Hyksos (who were no doubt Semites) remains in its present obscurity it is always possible to suppose that their ex- pulsion from Egypt explains the settlement of the Philis- tines in Canaan. But it is very questionable if the dates will fit; the name Caphtor is connected with the Delta by no historical testimony, but only by elaborate hypotheses, as that Caphtor may mean in Egyptian Great Pheenicia, and that this again may have been a name for the Egyptian coast, where there was a large Semitic population ;? and the characteristic Philistine peculiarity of uncircumcision, intelligible enough on the Cretan theory, is scarcely con- ceivable in a race which had been long settled in Egypt. The mainstay of the Egyptian hypothesis is found in Gen. x. 13, 14,

—-verses which belong to the older part of the chapter (see Noax), and reckon in the very obscure list of descendants of Mizraim or Egypt "Casluhim (whence came forth Philistim) and Caphtorim." This account places Caphtorim in some relation to Egypt, but not necessarily in a very close relation, for the Ludim, who are also made descendants of Egypt, are scarcely different from Lud or Lydia, which appears at ver. 22, in the later part of the chapter, in another connexion. But further, if the text as it stands is sound, it gives a new account of the origin of the Philistines, which can be reconciled with the other Biblical evidence only by making Casluhim a halting-place of the Philistines on their way from Caphtor to Canaan. Accordingly the advocates of the Egyptian theory propose to identify Casluhim with the arid district of Mount Casius on the coast of the Egyptian desert. But this is false etymology. Mount Casius is named from the temple of Jupiter Casius, that is, the well-known Semitic

1 In 2 Sam. xx. 23, Ktib, and 2 Kings xi. 4, 19, the foreign mercenaries are called not Krethim but Kari, perhaps Carians. The Carian seamen and pirates had also a strong Semitic strain, and were at bottom the same race with the Eteocretans.

2 So Ebers, Aegypten und die Biicher Mosis, where the theory is supported by a very long and complex argument. Another etymology in support of the theory is given by Dietrich in Merz's Archiv, i. 318 sq.

God Ysp,? whose name as written in Semitic letters has no possible affinity to Casluhim. And in truth the statement that the Philistines came from Casluhim, presented with- out a hint as to their connexion with Caphtorim, which is mentioned immediately afterwards, lies under strong suspicion of being a gloss, originally set on the margin by a copyist who meant it to refer to Caphtorim. In this case the original author will have meant Caphtorim to denote, or at least include, the Philistines (who, as they are not Canaanites, and had close relations with Egypt in historical times, fall readily enough under the Egyptian group), and tells us nothing about the origin of the race. Literature. —UHitzig, Urgeschichte . . . der Philistder, 1845, where the now untenable hypothesis of a Pelasgic origin of the Philistines is maintained ; Ewald, Gesch. des V. Isracl, i. 848 sq.; and in*

general the books on Hebrew history and commentaries on Gen. x. and on Amos. A useful monograph is Stark's Gaza wnd die philistdische Kiiste, Jena, 1852. For the Assyrian evidence see especially Schrader, Keilinschriften und Altes Testament, 2d ed., Giessen, 1883. (W. B.S.)

PHILLIP, Jon (1817-1867), subject and portrait painter, was born at Aberdeen, Scotland, on 19th April 1817. His father, an old soldier, was in humble circum- stances, and the son became an errand-boy to a tinsmith of the place, and was then apprenticed to a painter and glazier. Meanwhile he was employing in the pursuit of art all the time he could spare from his daily duties, and, having received some technical instruction from a local artist named William Mercer, he began, at the age of about fifteen, to paint portraits. In 1834 he was enabled to make a very brief visit to London, where he studied with delighted interest in the Royal Academy Exhibition and the National Gallery. At this time, or shortly after- wards, he became assistant to James Forbes, an Aberdeen portrait-painter, under whose tuition he made considerable progress. Previously, however, he had gained a valuable patron. Having been sent to repair a window in the house of Major P. L. Gordon, his interest in the works of art which hung on the walls attracted the attention of their owner. He brought the young artist under the notice of Lord Panmure, who bought several of his productions, and in 1836 sent the lad to London, pro- mising to bear the cost of his art-education. At first Phillip was placed under T. M. Joy, but he soon entered the schools of the Royal Academy, where he worked dili- gently, but with no exceptional promise or success, for two years. In 1839 he figured for the first time in the Royal Academy Exhibition with a portrait and a landscape, and in the following year he was represented by a more ambitious figure-picture of Tasso in Disguise relating his Persecutions to his Sister. For the next ten years he supported himself mainly by portraiture and by painting subjects of national incident, such as Presbyterian Catechizing, Baptism in Scotland, and the Spaewife. His productions of this period, as well as his earlier subject- pictures, are reminiscent of the practice and methods of Wilkie and the Scottish genre-painters of his time, often possessing considerable grace of form, executed in a thin delicate style of painting, inclining to brownish tones of colour, and with the more powerful pigments introduced cautiously and with reserve The Letter-writer of Seville, shown in the Royal Academy of 1854, marks a distinct change of both style and subject. Three years previously the artist's health had shown signs of

delicacy, and his medical advisers had recommended a residence in a warmer climate. Spain was selected, and a fresh potency came to his art as well as to his physical frame. He was brought face to face for the first time with the brilliant sunshine and the splendid colour of the South, and it was in coping 3 See De Vogué, Syrie Centrale: Inscr. Sem., p. 103 sq.

4 So Olshausen, and Budde, Biblische Urgeschichte, p. 331, note. A mere transposition (so Ewald, Tuch, &c.) is much less probable.

with these that he first manifested his artistic individuality and finally displayed his full powers. In the Letter- writer, commissioned by the Queen at the suggestion of Sir Edwin Landseer, who had been greatly impressed by some of Phillip's Spanish sketches, we see the change of method in its initial stages rather than in its complete triumph. 'The artist is struggling with new difficulties in. the portrayal of unwonted splendours of colour and light, the draperies are somewhat crude and textureless, and the picture may justly be charged with a want of complete harmony and of a due sense of the finer gradations of nature. In 1857 Phillip was elected an associate of the Royal Academy, and in 1859 a full member. In 1855 and in 1860 other two visits to Spain were made, and in each case the painter returned with fresh materials to be embodied with increasing power and subtlety in the long series of works with which his name is exclusively associated in the popular mind, and which has won for him the title of "Spanish Phillip." His highest point of execution is probably reached in the La Gloria of 1864 and a smaller single-figure painting of the same period entitled El Cigarillo. These Spanish subjects were varied in 1860 by a rendering of the Marriage of the Princess Royal with the Crown Prince of Germany, executed by command of the Queen, and in 1863 by a picture of the House of Commons, subjects presenting extreme artistic difficulties, but treated with much skill and dexterity. During his last visit to Spain Phillip occupied himself in a.careful study of the art of Velazquez, and the copies which he made after that 'artist fetched large prices after his death, examples having been secured by the Royal and the Royal Scottish Academies, The year before his death he visited Italy and devoted much attention to the works of Titian. The results of this study of the old masters are visible in such of Phillip's works

as La Loteria Nacional, left uncompleted at his death. This and several other of his later works exhibit symptoms of a fresh change of method, and show signs that his art was again about to take a fresh departure. During this period he resided much in the Highlands, and seemed to be returning to his first love for Scottish subjects, painting several national scenes, and planning others that were never completed. His health had been always delicate, and his strength had been taxed by severe domestic affliction and by the very exceptional rapidity and quantity of his artistic production. In the end of 1866 his excessive application to work for the next year's exhibition induced an attack of bilious

fever, which was succeeded by paralysis, and the genial.

and talented artist expired at London on 27th February

1867 at the age of fifty.

In execution Phillip was singularly direct, forcible, and rapid. He was a noble colourist, a painter in the first and simplest sense of the word, concerning himself mainly with the visible and sen- suous beauties of his subjects, their purely artistic problems of colour, tone, lighting, and texture. His art dealt with the appear- ances of things, a sufficiently legitimate sphere for the painter, and was seldom permeated with any very deep human or dramatic in- terest. His works were collected in the International Exhibition of 1873, and many of them have been excellently reproduced by the engravings of T. Oldham Barlow. In addition to the paintings which we have already specified the following are among tle more important: —Life among the Gipsies of Seville (1853), El Paseo (1855), Collection of the Offertory in a Scotch Kirk (1855), a Gipsy Water-carrier in Seville (1855), the Prayer of Faith shall save the Sick (1856), the Dying Contrabandist (1856), the Prison Window (1857), a Huff (1859), Early Career of Murillo (1865), a Chat round the Brasero (1866).

PHILLIPS, Joun (1800-1874), one of the foremost of the early geologists of England, was born 25th December 1800 at Marden in Wiltshire. His father belonged to an old Welsh family, but settled in England as an officer of excise and married the sister of William Smith, the "Father of English Geology." Both parents dying when

he was a child, Phillips passed into the care of his uncle, Before his tenth year he had attended four schools, until he entered the old school at Holt Spa, Wiltshire, where he remained for five years, gaining among other acquisitions. that taste for classical learning which remained one of his distinguishing traits to the end. From school he went to the house of the Rev. B. Richardson, an accomplished naturalist, in whose charge he remained a year, and from whom he obtained not only much knowledge but the strong bent towards the study of nature which thenceforth became the master-pursuit of his life. His uncle, "Strata Smith," at that time lived in London, where he exercised the profession of a civil and mining engineer, though a very large part of his time and earnings was given to the preparation of those maps of England and the English counties on which his fame now rests. In his zeal for geological pursuits Smith often neglected his proper pro- fessional work, until, as his nephew said, "he had thrown into the gulf of the Strata all his patrimony and all his little gains." Eventually he gave up his London house and wandered about the country, as the requirements of his maps led him. From the time that young Phillips joined his uncle in London he remained constantly with him, sharing in every piece of professional work, in the preparation of every book and map, and in every tour for fresh geological information. A youth so trained could not fail to become a geologist. In the spring of 1824 Smith went to York' to deliver a course of lectures on geology, and his nephew accompanied him. This was the starting-point in Phillips's career. His extensive knowledge of natural science and especially of fossils was now turned to account. He accepted engagements in the principal Yorkshire towns to arrange their museums and give courses of lectures on the collections contained therein. York became his residence, where he obtained the situation of keeper of the Yorkshire Museum and secretary of the Yorkshire Philosophical Society. From that centre he ex- tended his operations to other towns beyond the county ; and in 1831 he included University College, London, in the sphere of his activity. In that year the British Association for the Advancement of Science was founded at York, and Phillips was one of the active minds who organized its machinery. He became the assistant general secretary, a post of great labour and proportionate use- fulness, which he held for upwards of thirty years. In 1834 he accepted the professorship of geology at King's

College, London, but retained his post at York, coming up to London every year to give a course of lectures there. This arrangement lasted for six years, until, in 1840, he resigned his charge of the York Museum and was appointed one of the staff of the Geological Survey of Great Britain under De la Beche. In this connexion he spent some time in studying the Paleozoic fossils of Devon, Cornwall, and west Somerset, of which he published descriptions and illustrations. Thereafter he made a detailed survey of the region of the Malvern Hills, of which he prepared the elaborate account that appears in vol. ii. of the Memowrs of the Survey. His direct connexion with the National Survey was but of short duration, for in 1844 | he accepted the professorship of geology in the university of Dublin. Nine years later, on the death of Strickland, who had acted as substitute for Dr Buckland in the readership of geology in the university of Oxford, Phillips succeeded to the post of deputy, and eventually, at the dean's death, became himself reader, a post singularly congenial to him, and which he held up to the time of his own death, which was almost tragic in its suddenness. He dined at All Souls' College on 23d April 1874, but in retiring slipped and fell headlong down a flight of stairs. Paralysis at once ensued, and he expired on the afternoon

of the next day. In 1864 he had been elected president of the British Association.

Phillips was distinguished among his contemporaries for the sweetness and bright cheerfulness of his nature. He had great fluency as a speaker, and always spoke in so pleasant and interest- ing a manner as to make him a welcome and indeed indispensable interlocutor at the annual gatherings of the British Association. His social gifts were not less conspicuous than his attainments in science. But he was not a mere geologist. His sympathies went actively forth into the whole domain of science, and he him- self contributed largely to astronomical literature as well as to meteorology.

From the time when he wrote his first paper in 1826 "On the Direction of the Diluvial Currents in Yorkshire" down to the last days of his life Phillips continued a constant contributor to the literature of his science. The pages of the Journal of the Geological Society, the Geological Magazine, and

other publications of the day are full of valuable essays by him. He was also the author of numerous separate works, some of which had an extensive sale and were of great benefit in extending a sound knowledge of geology. Among these may be specially mentioned: JJJustrations of the Ceology of Yorkshire (1835); A Treatise on Geology (1837 – 39); Memoirs of William Smith, the Father of English Geology (1844); The Rivers, Mountains, and Sea-Coast of Yorkshire (1853) ; Manual of Geology, Practical and Theorctical (1855); Life on the Earth : its Origin and Succession (1860); Vesuvius (1869); Geology of Oxford and the Thames Valley (1871). To these should be added his monographs in the Memoirs of the Geological Survey and the publications of the Paleontographical Society, and his geological sections and maps.

PHILLIPS, Samuer (1815-1854), an industrious and successful lettérateur, was the son of a Jewish tradesman in Regent Street, London, and was born in 1815. A somewhat precocious talent for mimicry and recitation had disposed his parents to train him for the stage; but they were afterwards induced, through the advice of the duke of Sussex, to send the lad to University College, London. After remaining a year at that institution Phillips pro- ceeded to the university of Gottingen. Having renounced the Jewish faith, he returned shortly afterwards to Eng- land and entered Sidney Sussex College, Cambridge, with the design of taking orders. His father's death, however, altered his plans; and, after an unsuccessful attempt, in conjunction with his brother, to carry on his father's busi- ness, he in 1841 took to literature as a profession. His first work, the novel of Caleb Stukely, appeared originally in the pages of Blackwood's Magazine, and he subsequently contributed other anonymous tales to that and to other periodicals. In 1845 he began, through the interest of Lord Stanley, to write political leaders for the Morning Herald; and about the same time he obtained an appointment as literary critic on the staff of the Times. In the following year he purchased the John Bull news- paper, which he edited for only a year; for, finding his strength, which was slowly wasting under the influence of confirmed consumption, quite unequal to such laborious work, he was constrained to abandon the undertaking. From that period till his death Phillips worked cheerfully and courageously as literary critic for the Times, and also wrote an occasional review for the Literary Gazette. Two

anonymous volumes of Hssays from the Times were pub-.

lished by him in 1852 and 1854. They are written in a light, dashing, picturesque style, sometimes eloquent, fre- quently bitter, and with a tolerable. show of fairness. Phillips took an active part in the formation of the Crystal Palace Company. He was appointed their literary director ; he wrote their Guide to the Crystal Palace and Park, and the Portrait Gallery of the Crystal Palace. In 1852 the university of Gottingen conferred upon him the honorary degree of LL.D. He died at Brighton on the 14th of October 1854. ; PHILLIPS, Tuomas (1770-1845), portrait and subject painter, was born at Dudley in Warwickshire on 18th October 1770. Having acquired the art of glass-painting at Birmingham, he visited London in 1790 with an intro-

duction to Benjamin West, who found him employment on the windows in St George's chapel at Windsor. In 1792 Phillips painted a view of Windsor Castle, and ere the two succeeding years had passed he exhibited the Death of Talbot, Earl of Shrewsbury, at the Battle of Castillon, Ruth and Naomi, Elijah restoring the Widow's Son, Cupid disarmed by Euphrosyne, and other pictures of that class. From the year 1796, however, he seems to have mainly confined himself to portrait-painting; and it was in this walk that he was destined to acquire his reputa- tion as an artist. It was not long before he became the chosen painter of men of genius and talent, notwithstand- ing the rivalry of Hoppner, Owen, Jackson, and Lawrence; and he has left behind him portraits of nearly all the illustrious characters of his day. His works of this kind are distinguished by simplicity, careful and finished hand- ling, and truth of portraiture, but in colour they are com- monly eold and feeble. In 1804 he was elected associate and four years later member of the Royal Academy. In 1824 Phillips succeeded Fuseli as professor of painting to the Royal Academy, an office which he held till 1832. During this period he delivered ten Lectures on the H astory and Principles of Painting, which were published in 1833. He likewise wrote a large number of the articles on the fine arts in Rees's Cyclopedia. He died on the 20th of April 1845.

PHILLIPS, Witrtam (1775-1828), an able mineralogist and geologist, who did much to foster in Britain the study of the sciences to which he was

devoted, was born in May 1775. His Outline of Mineralogy and Geology was pub- lished in 1815 and passed through several editions. His Introduction to the Knowledge of Mineralogy, published in 1816, was for upwards of forty years one of the standard text-books in that science. Successive editions of it were brought out under different editors after his death. It was specially distinguished by its elaborate crystallographic details, based upon measurements with Wollaston's reflect- ing goniometer. But it is chiefly the services rendered by Phillips to the science of geology, then in its infancy, that entitle his name to grateful recollection. In addition to the first work above-named, he published in 1818 a most useful digest of English geology, under the title of A Selection of Facts, from the best Authorities, arranged so as to form an Outline of the Geology of England and Wales. This little volume contained a geological map of the country, based on that of W. Smith and some horizontal sections. Its importance in geological literature is to be found mainly in the fact that it formed the foundation of the larger work undertaken by Phillips in conjunction with W. Conybeare, of which only the first part was published, entitled Outlines of the Geology of England and Wales ; and comparative Views of the Structure of Foreign Countries (1822), This volume made an era in geology. As a model of careful original observation, of judicious com- pilation, of succinct description, and of luminous arrange- ment it has been of the utmost service in the develop- ment of geology in Britain. Phillips was a member of the Society of Friends. He was a Fellow of the Royal, Geological, and other learned societies. He died in 1828.

PHILO, often called Putto Jupzxus, Jewish philo- sopher, appears to have spent his whole life at Alexandria, where he was probably born c. 20-10 3B.c. His brother Alexander was alabarch or arabarch (that is, probably, chief farmer of taxes on the Arabic side of the Nile), from which it may be concluded that the family was influential and wealthy (Jos., Ané., xviii. 8,1). Jerome's statement (De Vir. Iil., 11) that he was of priestly race is confirmed by no older authority. The only event of his life which can be exactly dated belongs to 40 a.p., when Philo, then a man of advanced years, went from Alexandria to Rome,

at the head of a Jewish embassy, to persuade the emperor | have been preserved by Clement of Alexandria and

Caius to abstain from claiming divine honour of the Jews. Of this embassy Philo has left a full and vivid account (De Legatione ad Caium). Various fathers and theologians of the church state that in the time of Claudius he met St Peter in Rome ;+ but this legend has no historic value, and probably arose because the book De vita contemplativa, falsely ascribed to Philo, in which Eusebius already recog- nized a glorification of Christian monasticism, seemed to indicate a disposition towards Christianity.

Though we know so little of Philo's own life, his numer- ous extant writings give the fullest information as to his views of the universe and of life, and his religious and scientific aims, and so enable us adequately to estimate his position and importance in the history of thought. He is quite the most important representative of Hellenistic Judaism, and his writings give us the clearest view of what this development of Judaism was and aimed at. Since the time of Alexander many Jews had been led to settle beyond Palestine either with commercial objects or attracted by the privileges conferred by the diadochi on the inhabit- ants of the cities they founded. In the great towns of Syria, Asia Minor, and Egypt there were Jewish communi- ties many thousands strong, but the Jews were most numerous in Alexandria, where from its first foundation they formed a considerable part of the population. The development of Judaism in the diaspora differed in im- portant points from that in Palestine, where, since the successful opposition of the Maccabee age to the Hellen-

ization which Antiochus Epiphanes had sought to carry

through by force, the attitude of the nation to Greek culture had been essentially negative. In the diaspora, on the other hand, the Jews had been deeply influenced by the Greeks ; they soon more or less forgot their Semitic mother-tongue, and with the language of Hellas they appropriated much of Hellenic culture. They were deeply impressed by that irresistible force which was blending all races and nations into one great cosmopolitan unity, and so the Jews too on their dispersion became in speech and nationality

Greeks, or rather " Hellenists." Now the distinguishing character of Hellenism is not the absolute disappearance of the Oriental civilizations before that of Greece, but the combination of the two with a preponderance of the Greek element. So it was with the Jews, but in their case the old religion had much more persistence than in other Hellenistic circles, though in other respects they too yielded to the superior force of Greek civilization. This we must hold to have been the case not only in Alexandria but throughout the diaspora from the com- mencement of the Hellenistic period down to the later Roman empire. It, was only after ancient civilization gave way before the barbarian immigrations and the rising force of Christianity that rabbinism became supreme even among the Jews of the diaspora. 'This Hellenistico- Judaic phase of culture is sometimes called " Alexandrian," and the expression is justifiable if it only means that in Alexandria it attained its highest development and flourished most. For here the Jews began to busy them- selves with Greek literature even under their clement rulers, the first Ptolemies, and here the law and other Scriptures were first translated into Greek ; here the pro- cess of fusion began earliest and proceeded with greatest rapidity ; here, therefore, also the Jews first engaged in a scientific study of Greek philosophy and transplanted that philosophy to the soil of Judaism. We read of a Jewish philosopher Aristobulus in the time of Ptolemy VI. Philometor, in the middle of the 2d century B.c., of whose philosophical commentary on the Pentateuch fragments

Euseb., Wf. E., ii. 17,13 Jer., ut supra; Phot., Bibl., Cod. 105 ; Suid., 5% "Bioy,"

Eusebius. So far as we can judge from these, his aim was to put upon the sacred text a sense which should appeal even to Greek readers, and in particular to get rid of all anthropomorphic utterances about God. Eusebius regards him as a Peripatetic. We may suppose that this philosophical line of thought had its representatives in Alexan- dria between the times of Aristobulus and Philo, but we are not acquainted with the names of any such. Philo certainly, to judge by his historical influence, was the greatest of all these Jewish philosophers, and in his case we can follow in detail the methods by which Greck culture was harmonized with Jewish faith. On one side he is quite a Greek, on the other quite a Jew. His

language is formed on the best classical models, especially Plato. He knows and often cites the great Greek poets, particu- larly Homer and the tragedians, but his chief studies had been in Greek philosophy, and he speaks of Heraclitus, Plato, the Stoics,; and the Pythagoreans in terms of the highest veneration. He had appropriated their doctrines so com- pletely that he must himself be reckoned among the Greek philosophers ; his system was eclectic, but the borrowed elements are combined into a new unity with so much originality that at the same time he may fairly be regarded as representing a philosophy of his own, which has for its characteristic feature the constant prominence of a funda- mental religious idea. Philo's closest affinities are with Plato, the later Pythagoreans, and the Stoics.2 Yet with all this Philo remained a Jew, and a great part of his writings is expressly directed to recommend Judaism to the respect and, if possible, the acceptance of the Greeks. He was not a stranger to the specifically Jewish culture that prevailed in Palestine; in Hebrew he was not pro- ficient, but the numerous etymologies he gives show that he had made some study of that language. His method of exegesis is in point of form identical with that of the Palestinian scribes, and in point of matter coincidences are not absolutely rare.¢ But above all his whole works prove on every page that he felt himself to be thoroughly a Jew, and desired to be nothing else. Jewish "philo- sophy" is to him the true and highest wisdom ; the know- ledge of God and of things divine and human which is contained in the Mosaic Scriptures is to him the deepest and the purest.

If now we ask wherein Philo's Judaism consisted, we must answer that it lies mainly in the formal claim that the Jewish people, in virtue of the divine revelation given to Moses, possesses the true knowledge in things religious. Thoroughly Jewish is his recognition that the Mosaic Scriptures of the Pentateuch are of absolute divine author- ity, and that everything they contain is valuable and significant because divinely revealed. The other Jewish Scriptures are also recognized as prophetic, ¢.¢., as the writings of inspired men, but he does not place them on the same line with the law, and he quotes them so seldom that we cannot determine the compass of his canon. The decisive and normative authority is to him the "holy laws" of Moses, and this not only in the sense that every- thing they contain is true but that all truth is contained in them. Everything that is right and good in the

- *The fathers of the church have specially noticed his Platonism and Pythagoreanism ; an old proverb even says, with some exaggeration, 7} Wdrov girrwviger } Pihwv TAaTwvlger (Jerome, Photius, and Suidas, ut supra). Clement of Alexandria directly calls him a Pythagorean. Eusebius (H. E., ii. 4, 3) observes both tendencies. Recent writers, especially Zeller, lay weight also on his Stoic affinities, and with justice, for the elements which he borrows from Stoicism are as numerous and important as those derived from the other two schools.*

3 See the list of these in Vallarsi's edition of Jerome (iii. 731-734), and compare Siegfried, " Philonische Studien," in Merz's Archiv, ii.

143-163 (1872).

- *See Siegfried, Philo, pp. 142-159.*

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doctrines of the Greek philosophers had already been quite as well, or even better, taught by Moses. Thus, since Philo had been deeply influenced by the teachings of Greek philosophy, he actually finds in the Pentateuch everything which he had learned from the Greeks. From these premises he assumes as requiring no proof that the Greek philosophers must in some way have drawn from Moses,—a view indeed which is already expressed by Aristobulus. To carry out these presuppositions called for an exegetical method which seems very strange to us, that, namely, of the allegorical interpretation of Scripture. The allegorical method had been practised before Philo's date in the rabbinical schools of Palestine, and he himself expressly refers to its use by his predecessors, nor does he feel that any further justification is requisite. With its aid he discovers indications of the profoundest doctrines of philosophy in the simplest stories of the Pentateuch.!

This merely formal principle of the absolute authority of Moses is really the one point in which Philo still holds to genuinely Jewish conceptions. In the whole substance of his philosophy the Jewish point of view is more or less completely modified—sometimes almost extinguished— by what he has

learned from the Greeks. Comparatively speaking, he is most truly a Jew in his conception of God. The doctrine of monotheism, the stress laid on the absolute majesty and sovereignty of God above the world, the principle that He is to be worshipped without images, are all points in which Philo justly feels his superiority as a Jew over popular heathenism. But only over popular heathenism, for the Greek philosophers had long since arrived at least at a theoretical monotheism, and their influence on Philo is nowhere more strongly seen than in the detailed development of his doctrine of God. The specifically Jewish (7.¢., particularistic) conception of the election of Israel, the obligation of the Mosaic law, the future glory of the chosen nation, have almost disappeared ; he is really a cosmopolitan and praises the Mosaic law just because he deems it cosmopolitan. The true sage who follows the law of Moses is the citizen not of a particular state but of the world. A certain attachment which Philo still manifests to the particularistic conceptions of his race is meant only "in majorem Judeorum gloriam." The Jewish people has received a certain preference from God, but only because it has the most virtuous ancestry and is itself distinguished for virtue. The Mosaic law is binding, but only because it is the most righteous, humane, and rational of laws, and even its outward ceremonies always disclose rational ideas and aims. And lastly, outward prosperity is promised to the pious, even on earth, but the promise belongs to all who turn from idols to the true God. Thus, in the whole substance of lis view of the universe, Philo occupies the standpoint of Greek philosophy rather than of national Judaism, and his philosophy of the world and of life can be completely set forth without any reference to conceptions specifically Jewish.

His doctrine of God starts from the idea that God is Being absolutely bare of quality. All quality in finite beings has limitation, and no limitation can be predicated of God, who is eternal, unchangeable, simple substance, free, self-sufficient, better than the good and the beautiful. To predicate any quality (zo.dryns) of God would be to reduce Him to the sphere of finite existence. Of Him we can say only that He is, not what He is, and such purely negative predications as to His being appear to Philo, as to the later Pythagoreans and the Neo-Platonists, the only way of securing His absolute elevation above the world. At bottom, no doubt, the meaning of these negations is that God is the most perfect being; and so, con-

1 For details, see Gfrorer, Fhilo, i. 68 sg. ; Zeller, Phil. der Gr., 3d ed., vol. iii., pt. ii. 846-852 ; Siegfried, PAzlo, 160 sg.

versely, we are told that God contains all perfection, that He fills and encompasses all things with His being.

A consistent application of Philo's abstract conception of God would exclude the possibility of any active relation of God to the world, and therefore of religion, for a Being absolutely without quality and movement cannot be con. ceived as actively concerned with the multiplicity of individual things. And so in fact Philo does teach that the absolute perfection, purity, and loftiness of God would be violated by direct contact with imperfect, impure, and finite things. But the possibility of a connexion between God and the world is reached through a distinction which forms the most important point in his theology and cos- mology; the proper being of God is distinguished from the infinite multiplicity of divine Ideas or Forces: God himself is without quality, but He disposes of an infinite variety of divine Forces, through whose mediation an active relation of God to the world is brought about. In the details of his teaching as to these mediating entities Philo is guided partly by Plato and partly by the Stoics, but at the same time he makes use of the concrete religious conceptions of heathenism and Judaism. Following Plato, he first calls them Ideas or ideal patterns of all things; they are thoughts of God, yet possess a real existence, and were produced before the creation of the sensible world, of which they are the types. But, in distinction from Plato, Philo's ideas are at the same time efficient causes or Forces (6vvdéyecs), which bring unformed matter into order conformably to the patterns within themselves, and are in fact the media of all God's activity in the world. This modification of the Platonic Ideas is due to Stoic influence, which appears also when Philo gives to the ideas or Suvdpers the name of Aoyou, #.¢., operative ideas,—parts, as it were, of the operative Reason. For, when Philo calls his mediat- ing entities Adyor, the sense designed is analogous to that of the Stoics when they call God the Logos, 2.e., the Reason which operates in the world. But at the same time Philo maintains that the divine Forces are identical with the 'demons " of the Greeks, and the "angels" of the Jews, a.¢., servants and

messengers of God by means of which He communicates with the finite world. All this shows how uncertain was Philo's conception of the nature of these mediating Forces. On the one hand, they are nothing else than Ideas of individual things conceived in the mind of God, and as such ought to have no other reality than that of immanent existence in God, and so Philo says expressly that the totality of Ideas, the xécpos vonrés, is simply the Reason of God as Creator (Qcov Adyos 75 Kogporo.otvTos), Yet, on the other hand, they are repre- sented as hypostases distinct from God, individual entities existing independently and apart from Him. This vacil- lation, however, as Zeller and other recent writers have justly remarked, is necessarily involved in Philo's premises, for, on the one hand, it is God who works in the world through His Ideas, and therefore they must be identical with God; but, on the other hand, God is not to come into direct contact with the world, and therefore the Forces through which He works must be distinct from Him. The same inevitable amphiboly dominates in what is taught as to the supreme Idea or Logos. Philo regards all indi- vidual Ideas as comprehended in one highest and most general Idea or Force—the unity of the individual Ideas— which he calls the Logos or Reason of God, and which is again regarded as operative Reason. The Logos, therefore, is the highest mediator between God and the world, the firstborn son of God, the archangel who is the vehicle of all revelation, and the high priest who stands before God on behalf of the world. Through him the world was created, and so he is identified with the creative Word of God in Genesis (the Greek Aéyos meaning both "reason "

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and "word"). Here again, we see, the philosopher is unable to escape from the difficulty that the Logos is at once the immanent Reason of God, and yet also an hypo- stasis standing between God and the world. The whole doctrine of this mediatorial hypostasis is a strange inter- twining of very dissimilar threads ; on one side the way was prepared for it by the older Jewish distinction between the Wisdom of God and God Himself, of which we find the beginnings even in the Old Testament (Job xxvill. 12 sg.; Prov. viii., ix.), and the fuller development in the books of Ecclesiasticus and

Wisdom, the latter of which comes very near to Philo's ideas if we substitute for the term "wisdom" that of (divine) "Reason." In Greek philosophy, again, Philo, as we have seen, chiefly follows the Platonic doctrines of Ideas and the Soul of the World,

and the Stoic doctrine of God as the Adyos or Reason opera-

tive in the world. In its Stoic form the latter doctrine was pantheistic, but Philo could adapt it to his purpose simply by drawing a sharper distinction between the Logos and the world.

Like his doctrine of God, Philo's doctrine of the world and creation rests on the presupposition of an absolute metaphysical contrast between God and the world. The world can be ascribed to God only in so far as it is a cosmos or orderly world ; its material substratum is not even indirectly referable to God. Matter (vAy, or, as the Stoics said, ovcia) is a second principle, but in itself an empty one, its essence being a mere negation of all true being. It is a lifeless, unmoved, shapeless mass, out of which God formed the actual world by means of the Logos and divine Forces. Strictly speaking, the world is only formed, not created, since matter did not originate with God.

Philo's doctrine of man is also strictly dualistic, and is mainly derived from Plato. Man is a twofold being, with a higher and a lower origin. Of the pure souls which fill airy space, those nearest the earth are attracted by the sensible and descend into sensible bodies; these souls are the Godward side of man. But on his other side man is a creature of sense, and so has in him a fountain of sin and allevil. The body, therefore, is a prison, a coffin, or a grave for the soul which seeks to rise again to God. From this anthropology the principles of Philo's ethics are derived, its highest maxim necessarily being deliverance from the world of sense and the mortification of all the impulses of sense. In carrying out this thought, as in many other details of his ethical teaching, Philo closely follows the Stoics. But he is separated from Stoical ethics by his strong religious interests, which carry him to very different views of the means and aim of ethical development. The Stoics cast man upon his own resources; Philo points him to the assistance of God, without whom man, a captive to sense, could never raise himself to walk in the ways of true wisdom and virtue. And as moral effort can bear fruit only with God's help, so too God Himself is the goal of that effort. Even in this

life the truly wise and virtuous is lifted above his sensible existence, and enjoys in ecstasy the vision of God, his own consciousness sinking and disappearing in the divine light. Beyond this ecstasy there lies but one further step, viz., entire liberation from the body of sense and the return of the soul to its original condition ; it came from God and must rise to Him again. But natural death brings this consummation only to those who, while they lived on earth, kept themselves free from attachment to the things of sense ; all others must at death pass into another body ; transmigration of souls is in fact the necessary consequence of Philo's premises, though he seldom speaks of it expressly.

Philo's literary labours have a twofold object, being directed either to expound the true sense of the Mosaic law, 2.€., the philosophy which we have just described, to his Jewish brethren, or to convince

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heathen readers of the excellence, the supreme purity and truth, of the Jewish religion whose holy records contain the deepest and most perfect philosophy, the best and most humane legislation. Thus as a litcrary figure Philo, in conformity with his education and views of life, stands between the Greeks and the J ews, seeking to gain the Jews for Hellenism and the Greeks for Judaism, yet always taking it for granted that his standpoint really is Jewish, and just on that account truly philosophical and cosmopolitan.

The titles of the numerous extant writings of Philo present at first sight a most confusing multiplicity. More than three-fourths of them, however, are really mere sections of a small number of larger works. Three such great works on the Pentateuch can be distinguished.

(I.) The smallest of these is the Zmriuara cal Woes (Questiones et solutiones), a short exposition of Genesis and Exodus, in the form of question and answer. The work is cited under this title by Eusebius (H. £., ii. 18, 1, 5; Prep. Ev., vii. 18), and by later writers, but the Greek text is now almost wholly lost, and only about one-half preserved in an Armenian translation. Genesis seems to have occupied six books.! Eusebius tells us that Exodus filled five books. In the Armenian translation, first published by

the learned Mechitarist Aucher in 1826, are preserved four books on Genesis and two on Exodus, but with lacune. A Latin frag- ment, about half of the fourth book on Genesis (Phil. Jud. CIL questt. . . . super Gen.), was first printed at Paris in 1520. Of the Greek we have numerous but short fragments in various Flori- legia. The interpretations in this work are partly literal and partly allegorical.*

(II.) Philo's most important work is the Néuwy tepav adAnyoplar (Euseb., H. E., ii. 18,1; Phot., Bibl., Cod. 103), a vast and copious allegorical commentary on Genesis, dealing with chaps. ii,~~iv., verse by verse, and with select passages in the later chapters. The readers in view are mainly Jews, for the form is modelled on the rabbinic Midrash. The main idea is that the characters which appear in Genesis are properly allegories of states of the soul (rpémox ris Wuyjs). All persons and actions being interpreted in this sense, the work as a whole is a very extensive body of psycho~~ logy and ethics. It begins with Gen. ii. 1, for the De mundi opificio, which treats of the creation according to Gen. i., ii., does not belong to this series of allegorical commentaries, but deals with the actual history of creation, and that under a quite different literary form. With this exception, however, the Néuwv adAryopiat includes all the treatises in the first volume of Mangey's edition, viz. :—

Nouwv iepSv adrnyopia rpGra rOv pera Thy é£atuepov (Legum alle- goriarum, lib. i., M. i, 43-65), on Gen. ii, 1-17. (2) Néu. iep. GAN. GevdTepar (Leg. ail., lib. ii, M. i. 66-86), on Gen. ii, 18-iii. la, (8) Nou. lep. add. Tplrat (Leg. all., lib. iii., M. i. 87-187), on Gen. iif. 8b-19, The commentaries on Gen. iii. 1b-8a, 20-23 are lost. (4) Ilepi r&v xepouBlu Kal rAs proylyys poupalas kal rod xricbévros mpurou e& dvOpmmrou Kdiv (De cherubim et fiammeo gladio, M. i. 138-162), on Gen. iii. 24 and iv. 1. (5) Ilepi Gy tepovp- yotou "ABed re kal Kdiv (De sacrifictis Abelis et Caint, M. i. 163-190), on Gen, iv, 2-4. The commentaries on Gen. iv. 5-7 are lost. (6) Ilept rod 7d xetpov r@ Kpelrrove gudeiy émiribec Oar (Quod deterius potiori insidiart soleat, M, i. 191- 225), on Gen. iv. 8-15. (7) Ilepi rv rot Soxnotsdpov Kdiv éyydver xal ds MeTavaorns yiverat (De posteritate Caint, &e., M. i. 226-261), on Gen. iv, 16-25 ; this book, which is wanting in editions prior to Mangey's, is incorrectly given by him, but much more correctly by Tischendorf, Philonea, pp. 84-143. None of the preceding is

mentioned by its special title by Euseb., H. £,, ii. 18, while he cites all that follow by their titles. The reason must be that all up to this point, and no farther, are included by him in the Néuwy lepSv addyoplat ; agreeing with this we find that these and these only are cited under that general title in the Florilegia, especially the so-called Johannes Monachus tneditus (see Mangey's notes before each book). We may therefore conclude with confidence that Philo published the continuous commentaries on Gen. ii.-iv. under the title Allegories of the Sacred Laws, and the following commentaries on select passages under special titles, though the identity of literary character entitles us to regard the latter as part of the same great literary plan with the former. (8) Ilept yeydvrwy (De gigantibus, M. i. 262-272), on Gen. vi. 1-4. (9)"Ort drper- Tov Td Oetov (Quod Deus sit immutabilis, M. i. 272-299), on Gen. vi. 4-12. (10) Ilept yewpylas (De agricultwra, M. i. 300-328), on Gen. ix. 20a. (11) Ilepl gpuroupyias N&e rd devrepov (De plantatione Noe, M. i. 329-356), on Gen. ix, 20b. (12) Ilept wé@ns (De ebrietate, M. i. 357-391), on Gen. ix. 21; the introdue- tion shows that this book was preceded by another which put together the views of the philosophers about drunkenness. (13) Ilept rod é&évnwe N&e (De sobrietate, M. i. 392-403), on Gen. ix, 24. (14) Ilepi cvyxtoews dtadéxrwv (De confusione linguarwm, M. i. 404-485), on Gen. xi, 1-9. (15) Ilepi adrroixlas (De migratione Abrahami, M. i. 436-472), on Gen. xii. 1-6. (16) Ilepl rod ris 6 TOY Oelwv mpaypdtwv Kdypovduos (Quis rerum divinarwm heres sit, M. i. 473-518), on Gen. xv. 1-18. (17) Ilepl rijs els ra mpomadeduara cuvddov (De congressu querend# eruditionis causa, M. i. 519-545), on Gen. xvi. 1-6. (18) Tlept puyddwy (De profugis, M. i. 546-577), on Gen. xvi. 6-14, (19) Tept rdv perovouagouévev Kal Gv evexa perovoudtovrar (De mutatione nominum, M. i, 578-619), on Gen. xvii. 1-22; in this work Philo mentions that he had

1 See, especially Mai, Scriptt. vett. nov. coll., vol. vii. pt. i. pp.

100, 106, 108. ; .

2 See Opp., ed. Mangey, ii. 648-680; Mai, op. czé., vol. vii. pt. i. 96 sg.; Euseb., Prep. Ev., vii. 18. A fragment on the cherubim, Exod, xxv. 18, has been published by Mai, Class. Auctt., iv. 480 sq., by Grossmann (1856), and by Tischendorf (p. 144 sq.).

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written two books, now wholly lost, [epi dsadyxe@v (M. i. 586). (20) Ilepi rob Oeoréumrous elvat rovs dvelpous (De somntis, lib. i., M. i. 620-658), on the two dreams of Jacob, Gen. xxviii. and xxxi. (21) Book ii. of the same (M. i. 659-699), on the dreams of Joseph, the chief butler, the chief baker, and Pharaoh, Gen. xxxvii. and xl., xli. Eusebius makes Philo the author of five books on dreams ; three, therefore, are lost.

(III.) A work of a very different kind is the group of writings which we may call " An Exposition of the Mosaic law for Gentiles," which, in spite of their very various contents, present on nearer examination indubitable marks of close connexion. In them Philo seeks to give an orderly view of the chief points of the Mosaic legislation in the Pentateuch, and to recommend it as valuable to Gentile readers. The method of exposition is somewhat more popular than in the allegorical commentaries, for, though that method of interpretation is not wholly excluded, the main object is to give such a view of the legislation as Philo accepted as his- torical. 'This work has three main divisions: (a) an Account of the Creation (xospomota), which Moses put first, to show that his legislation was conformed to the will of nature, and that thcrefore those who followed it were true cosmopolitans ; (5) the Biographies of the Virtuous,—being, so to speak, the living unwritten laws which, unlike written laws, present the general types of moral conduct ; (c) Legislation Proper, in two subdivisions—(a) the ten principal chapters of the law, (8) the special laws belonging to each of these ten. An appendix adds a view of such laws as do not fall under the rubrics of the decalogue, arranged under the headings of certain cardinal virtues.

The treatises which belong to this work are the following. THs Mwiicéws Kooporotias (De mundi opificio, M. i. 1-42) This work does not fall within the number of the allegorical commentaries. On the other hand, the introduction to the treatise De Abrahamo makes clear its im- inediate connexion with the De mundi opificio. The position of the De mundi opificio at the head of the allegorical commentaries, which is at present usual in the editions, seems indeed to go back toa very early date, for even Eusebius cites a passage from it with the formula dad Tol mpwrou r&v els Toy vdmov (Prep, Ev., viii. 12 fin., ed. Gaisford). The group of the Bio: copay is headed

by (2) Blos copot rot xara didacxadiay TrerewHévros 7} mepl vouwv aypapwy [a], 8 dort wept ABpadu (De Abrahamo, M. ii. 1-40). Abraham is here set forth as the type of didackadixny apeTy, %.¢., of virtue as a thing learned. This biography of Abraham was followed by that of Isaac as a type of pvotkh dpery, i.e., of innate or natural virtue, which in turn was succeeded by that of Jacob as representing doxynrikh dpeTy, i.e., virtue acquired by practice ; but both these are now lost. Hence in the editions the next treatise is (8) Blos modurixds Sep éorl rept "Iwan (De Josepho, M. ii. 41-79), where Joseph is taken as the pattern of the wisc man in his civil relations. The Biographies of the Virtuous are followed by (4) Ilepi rav déxa doyiwy & Kepadrata vduwv eiol (De decalogo, M. ii. 180-209) and (5) Ilept r&v dvadepo- pévow év cider vouew els Ta cuvTeivovTa Kepddata Tay Oéxa AOywv (De specialibus legibus ; the unabridged title is given by Eusebius, H. £., ii. 18, 5). Here under the rubrics of the ten commandments a systematic review of the special laws of the Mosaic economy is given; for example, under the first and second commandments (divine worship) a survey is taken of the entire legisla- tion relating to priesthood and sacrifice ; under the fourth (.c., the Sabbath law, according to Philo's reckoning) there is a survey of all the laws about feasts ; under the sixth (adultery) an account of matrimonial law; and so on. According to Eusebius the work embraced four books, which seem to have reached us entire, but in the editions have been perversely broken up into a considerable number of separate tractates. (a) The first book (on the first and second commandments) includes the following: De circumeisione (M. ii. 210-212); De monarchia, lib. i. Gi. 213-222); De monarchia, lib. ii. (ii. 222-232); De premiis sacerdotum (ii. 232-237); De victimis Gi. 237-250); De sacrificantibus, or De victimas offerentibus (ii. 251-264); De mercede meretricis non accipienda in sacrarium (ii. 264-269). (b) The second book (on the third, fourth, and fifth commandments, 1.e., on perjury, Sabbath observance, and filial piety) is incomplete in Mangey (ii. 270-298), the section De septenario (on the Sabbath and feasts in general) being imperfect, and that De colendis parentibus being entirely wanting. Mai to a large extent made good the defect (De cophini festo et de colendis parentibus, Milan, 1818), but Tischen- dorf was the first to edit the full text (Philonea, pp. 1-83). (c) The third book relates to the sixth and seventh commandments (adultery and murder; M. ii. 299-334). (d) To the fourth book (relating to the last three conimandments) belongs all that is found in

Mangey, ii. 335-374, that is to say, not merely the tractates De judice (ii. 344-348) and De concupiscentia (ii. 348-358), but also those De justitia (ii. 358-361) and De creatione principum (ii. 361-374). The last-named is, properly speaking, only a portion of the De justitia, which, how- ever, certainly belongs to the fourth book, of which the superscription expressly bears that it treats also wept dixatootyys. With this tractate begins the appendix to the work De specialibus legibus, into which, under the rubric of certain cardinal virtues, such Mosaic laws are brought together as could not be dealt with under any of the decalogue rubrics. The continuation of this appendix forms a book by itself. (6) Ilepl rpudv dperav rot wept dvdpelas kal diravOpwrlas Kal peravolas (De fortitudine, M. ii. 375-383 ; De caritate, ii. 883-405; De penitentia, ii. 405-407). Finally, in less intimate connexion with this entire work is another treatise still to be mentioned, (7) Ilepi &@Awy Kal éririyslewv (De premiis et penis, M. ii, 408-428) and Ilepl apay (De exe- crationibus, M. ii. 429-457), two parts which constitute a single whole and deal with the promises and threatenings of the law. rs

(IV.) Besides the above-named three great works on the Penta- teuch, Philo was the author of a number of isolated writings, of which the following have reached us either in their entirety or in fragments. (1) Iept Blov Mwoéws (Vita Mosis, lib. i-ili., M. i. 80-179). It is usual to group this, as being biographical in its character, with the Blo: copay, and thus to incorporate it Imme- diately after the De Joscpho with the large work on the Mosaic legislation. But, as has been seen, the Blo cop@v arc intended to represent the general types of morality, while Moses is by no means so dealt with but as a unique individual. All that can be said is

(1) Tlepi

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that the literary character of the Vita Mosis is the same as that of the larger work. As in the latter the Mosaic legislation, so in the former the activity of the legislator himsclf, is delineated for the benefit of Gentile readers. (2) Ilept rod mdyra omovoatoy elvat édevepov (Quod omnis probus liber, M. ii. 445-470). In the intro- duction to this treatise reference is made to an earlier book which had for its theme the converse proposition. The complete work was still extant in the time of Eusebius (Z. £,, ii. 18, 6): Ilepi rod

Sobor elvan wavta pairov, é&fs éorw 6 wept roo wdvra omovdatov €devOe pov elvat. The genuineness of the writing now possessed by us is not undisputed ; but see Lucius, Der Esscnismus (1881), pp. 18-28. (3) Eis ®ddxxov (Adversus Flaccum, M. ii. 517-544) and (4) Ilept dperay kal mpeoBelas mpds Tdiov (De legatione ad Caiwm, M. ii. 545-600). These two works have a very intimate connexion. In the first Philo relates how the Roman governor Flaccus in Alexandria, towards the beginning of the reign of Caligula, allowed the Alex- andrian mob, without interference, to insult the Jews of that city in the grossest manner and even to persecute them to the shedding of blood. In the second he tells how the Jews had becn subjected to still greater sufferings through the command of Caligula that divine honours should be everywhere accorded to him, and how the Jews of Alexandria in vain sought relief by a mission to Rome which was headed by Philo. But both together were only parts of a larger work, in five books, of which the first two and the last have perished. For itis clear from the introduction to the Adversus Flaccum that it had been preceded by another book in which the Jewish persecutions by Sejanus, under the reign of Tiberius, were spoken of, and the Chronicon of Eusebius (ed. Schoene, vol. ii. pp. 150, 151) informs us that these persecutions of Sejanus were related in the second book of the work now under discussion. But from the conclusion of the Legatio ad Caiuwm, which we still possess, we learn that it was also followed by another book which exhibited the radwwdta, or change of Jewish fortuncs for the better. Thus we make out five books in all,—the number actually given by Eusebius (H. #., ii. 5,1). (5) Tept rpovolas (De providentia). This work has reached us only in an Armenian translation, which has been edited, with a Latin translation, by Aucher (see below). It is mentioned by its Greek title in Eusebius (Z. £., ii. 18, 6; Prep. Ev., vii. 20 fin., viii. 13 fin., ed. Gaisford). The Armenian text gives two books, but of these the first, if genuine at all, at any rate appears only in an abridged and somewhat revised state. Eusebius (Prep. Hv., viii. 14) quotes from the second book to an extent that amounts to a series of excerpts from the whole.

The short passage in Prep. Ev., vii. 21, is also taken from this book ; aud it appears that Husebius knew nothing at all about the first. (6) 'AA€Eavdpos 4 mepl Toh Noyou éxew Td ddoya fHa (De Alexandro ct quod propriam rationem muta animalia habcant; so Jerome, De Vir. {il.,¢. 11) ; the Greek title is given in Euseb., H. £., ii. 18, 6. This also now exists only in an Armenian translation, which has been edited by Aucher. Two small Greek fragments occur in the Florilegium of Leontius and Johannes (Mai, Scr. vet. nov. coll., vii. 1, pp. 99, 100a). (7) 'Ymoerixd, a writing now known to us only through fragments preserved in Euseb., Prep. Ev., viii. 6, 7. The title, as Bernays? has shown, means "Counsels," " Recom- mendations," the reference being to such laws of the Jews as can be recommended also to non-Jewish readers. (8) Ilept "Tovdaiwy, a title met with in Euseb., H. £., ii. 18, 6. The writing is no doubt the same as 'H bép'lovéalwy dmondoyia, from which a quotation is given in Euseb., Prep. Ev., viii. 11. To this place also, perhaps, belongs the De nobilitate (M. ii. 487-444), which treats of that true noblesse of wisdom in which the Jewish people also is not wanting.?

(V.) Spurious works ascribed to Philo. (1) Iepi Blov Qewpyrixotd 4 ixer@v aperav (De vita contemplativa, M. ii. 471-486). That the Therapeutic life here praised is that of Christian monks was scen by Euseb., H. £., ii. 17 (who, however, accepted the book as Philo's), and the same view was long prevalent in the church. But, if the Therapeute are monks, the book cannot be genuine ; see especially Lucius, Die Therapceuten und thre Stellung in der Gesch. der Askesc, Strasburg, 1879. There arc, however, so many othcr objections to its genuineness that the book is now given up even by such as do not admit that the Therapeute are monks.® (2) Ilepl dp@apotas xécpou (De incorruptibilitate mundi, M. ii. 487-516). Bernays, who first showed that the reccived text is disordered by misplacement of leaves (Monatsh. Berl. Akad., 1863, p. 34 sq.), published a cor- rected text with German version in 40h. Berl. Akad., 1876. An unfinished commentary of the same critic was posthumously pub- lished in the Berlin Abhandlungen, 1882. (8) Ilept xéopouv (De mundo, M. ii. 601-624). That this collection of extracts from Philo, and especially from the De incor. mundi, is spurious has been long recognized. (4) Two orations, De Sampsone and De Jona, pub-*

i ee Dicls, Doxographi Greci, 1879, pp. 1-4; Zeller, Phil. d. Gr., ili. 2, p. 340 3d ed.). ‘ 2 Monatsb. d. Berl. Akad. (1876), pp. 589-609.

3 This conjecture is Dihne’s, Theol. Stud. u. Krit. (1833), pp. 990, 1037.

4 So still Montfaucon, the learned notes to whose French translation are still valuable (Paris, 1709).

5 Nicolas, in Rev. Théol., Strasburg, 1868, p. 25 sq. ; Kuenen, Godsdienst, ii. 440-444; Weingarten, “Monchtum,” in Herzog-Plitt, R. E., x.

lished from the Armenian by Aucher in 1826, are generally held to be spurious.! (5) The lexicon of Hebrew proper names with Greek interpretations (‘Epyyveia trav éBpaixay dvoudrwy), which Origen eompleted by adding the New Testament names, and which Jerome rewrote, was often ascribed to Philo. It appears from ancient testi- monies that it bore no author’s name, so that Philo’s part in it is at least very problematical ; nor does its original form seem to be extant (see Orig., Comm. in Joan., vol. ii. c. 27 ; Kuseb., ESE: ii, 18, 7; Jerome in the preface to his recension of the book). Various Greek and Latin recensions are given by Vallarsi and in Lagarde’s Onomustica saera, 1870 ; see also on this class of literature asa whole Fabricius-Harles, Bib. Gr., iv. 742 8q-, Vie 199 sq., vii. 226 sg. (6) Ona Latin work, De biblicis antiquitatibus, ascribed to Philo, see Fabr.-Harl., iv. 743. (7) For the pseudo – Philonic Breviariwm temporum, a forgery of Annius of Viterbo, see ibid. (8) The book On Virtue, published as Philo’s by Mai (Phil. Jud.

de virt. ejusque partibus, 1816), is a work of Gemistus Pletho. — Editions. —The first, very imperfect, edition of the Greek text of Philo is by Turnebus (Paris, 1552). Some additional pieces were given by Héschel (Frank- fort, 1587; Augsburg, 1614). Other editions are those of Geneva, 1613 ; Paris, 1640 ; Frankfort, 1691 (a page-for-page reprint of the Paris edition); but the best is still that of Mangey (2 vols., London, 1742), which alone is based on a nuinber of MSS. and gives a critical apparatus. Pfeitfer’s unfinished edition, vols. i.-v., appeared at Erlangen in 1785-95, 2d ed. 1820. An important supple- ment to Mangey is given by Aucher’s publications from

the Armenian— Phil. Jud. sermones tres inediti, Venice, 1822. Phil. Jud. paralipomena Armena, Venice, 1826. The Greek pieces newly published since Mangey are less exten- sive: The editions by Mai, Grossmann, and Tischendorf have been already noticed. Aucher's publications and Mai's of 1818 are contained in the con- venient edition of Richter (Leipsic, 1828-30) and in the Tauchnitz stereotype edition (1851-53). Of editions of particular works, J. G. Miiller's Des Juden Philo Buch v. d. Weltschépfung (Berlin, 1841), with commentary, claims special notice. Compare further for the editions and versions, Fiirst, Bibl. Jud.; Grasse, Trésor de livres rares et précieux, v. 269-271 (1864); and Eng. tr. by

Yonge, 4 vols., London, 1854-55. Literature.—{A.) On Philo's writings in general. Fabricius-Harles, Bibl. Gr.,

iv. 721-750. On the order of Philo's works, Gfrirer, Philo und die Alexan- drinische Theosophie, i. (1831); Dahne, in Stud. und Krit., 1833, p. 984 sq. ; Grossmann, De Phil. Jud. operum continua serie et ordine chronol., pts. i., ii., Leipsic, 1841-42. On the text, Creuzer, in Stud. und Krit., 1832, p.3 sq. J. G. Miller, Teateskritik der Schr. des Juden Philo, Basel, 1839, reprinted in his edition of the Weltschépfung, 1841. On Philo's language, method, and infiu- ence on posterity, see Siegfried, Philo von Alex. als Ausleger des A. T… ., Jena, 1875. On his knowledge of Palestinian legal tradition, B. Ritter, Philo und die Halacha, Leipsic, 1879. (B.) On Philo's teaching. Gfrorer, op. cit. ; Dihne, Gesch. Darstellung der jud.-alex. Religionsphilosophie, Halle, 1834: Zeller, Phil. d. Griechen, pt. iii. sect. ii. (8d ed., 1881),—this is on the whole the best geueral sketch; Gfrérer and Dahne give fuller material. On special points, see Keferstein, Philo's Lehre von dem géttlichen Mittelwesen, Leipsic, 1846; Heinze, Lehre vom Logos, 1872; Soulier, La doctrine du Logos chez Philon, Turin, 1876. (Gob Sie)

PHILO. A Jewish Hellenist of this name is the author of an epic poem in Greek hexameters on the History of Jerusalem, and lived at an earlier date than the philosopher, Alexander Polyhistor quoting several passages of his book about 80-60 B.c. From Alexander Eusebius derives these extracts from the poem (Prep. Hv., ix. 20, 24, 37). This is probably the Philo who is mentioned by Clemens Alex- andrinus (Strom., i. 21, 141) and Josephus (C.

Ap., i. 23). See Philippson's work on the Jewish poets Ezechiel and Philo (1830) and Miiller, /r. Hist. Gr., ili. 213 sq.

PHILO BYBLIUS, «.e., Philo of Byblus (Gebal, Jubeil), was born, according to Suidas, in 42 a.D., and lived into the reign of Hadrian, about which he wrote a book now wholly lost. He was a grammarian by profession and author of many books, of which those oftenest cited are: (1) a work About Cities and the Famous Men they have pro- duced, which was epitomized by Serenus, and (2) Phenician History. Of the latter there are very considerable frag- ments, chiefly preserved by Eusebius in the Preparatio Evangelica, and presenting a Euhemeristic réchauffé of Phoenician theology and mythology which is represented as translated from the Phoenician of Sanchuniathon. 'The fragments of Philo are collected in Miiller, Mr. Hist. Gr., 11. 560 sg. To the literature there cited add Ewald's essay in the Abhandlungen of the Royal Society of Gottingen, vol. v. (1853); Renan's in Mém. Acad. des Inscript., vol. Xxiii. (1858) ; and Baudissin, Studien zur semitischen Religions- geschichte, i. 3 sq.

PHILO or BYZANTIUM, author of a treatisé on mechanics, of which only two books now remain, flourished in the 2d or 3d century A.D. The extant books, which refer to machines used in war and to siege works, are

1 See Dihne, Stud. und Krit., 1833, p. 987 sq.; Freudenthal, Die

Fl. Joseph, beigelegte Schrift iiber die Herrsehaft der Vernunft, 1869, pp. 9 sg., 141 sg.

edited with a German translation in Kéchly and Riistow's Griechische Kriegsschriftsteller, vol. i. (Leipsic, 1853).

For a list of other Philos, see Fabricius, Bzbl. Greca, iv. p. 750sq., ed. Hiarl:

PHILOLAUS, next to Archytas the most illustrious of the Pythagorean philosophers, was born at Tarentum or, according to Diogenes Laertius, at Crotona.2 He was said to have been intimate with Democritus, and was

prob- ably one of his teachers. After the death of Pythagoras great dissensions prevailed in the cities of lower Italy, which were allayed only after the lapse of many years through the intervention of the Acheans. According to some accounts Philolaus was obliged to flee, and owed his escape to his youthful energy. He took refuge first in Lucania, then in Greece; he lived at Thebes, where he had for pupils Simmias and Cebes, who subsequently, being still young men (veavicxor), were present at the death of Socrates. Prior to this Philolaus had left Thebes and returned to Italy, where he was the teacher of Archytas. Pythagoras published nothing, nor did the other early Pythagoreans ; the members of the brotherhood, moreover, piously referred their discoveries back to their master ; hence many doctrines have been attributed to Pythagoras which were first propounded later in the school. He entered deeply into the number-theory, which constituted the dis- tinctive feature of the Pythagorean philosophy, and in particular dwelt on the properties inherent in the decad —the sum of the first four numbers, consequently the fourth triangular number, the tetractys—which he called great, all-powerful, and all-producing. The discovery of the regular solids is attributed to Pythagoras by Eudemus, and Empedocles is stated to have been the first who main- tained that there were four elements. Philolaus, con- necting these ideas, held that the elementary nature of bodies depended on their form, and assigned the tetra- hedron to fire, the octahedron to air, the icosahedron to water, and the cube to earth; the dodecahedron he assigned to a fifth element, ther, or, as some think, to the universe. This theory indicates considerable know- ledge of geometry on the part of its author; it gave, moreover, a great impulse to the study of that science, and many important results were arrived at, so that Aristzeus, who lived before Euclid, was able to write a book on the comparison of the five regular solids.

Philolaus was the first to propound the doctrine of the motion of the earth ; some, however, attribute this doctrine to Pythagoras, but there is no evidence in support of their view. Philolaus supposed that the sphere of the fixed stars, the five planets, the sun, moon, and earth, all moved round the central fire, which he called the hearth of the universe, the house of Zeus, and the mother of the gods ; but as these made up only nine revolving bodies he con- ceived, in accordance with his number-theory, a tenth, which he called counter-earth, dvtixOwv. He was the first who published a book

on the Pythagorean doctrines, a treatise of which Plato made use in the composition of his Timezus. This work of the Pythagorean, to which the mystical name Bd«yas is sometimes given, seems to have consisted of three books: (1) Iept xécpov, containing a general account of the origin and arrangement of the universe ; (2) [epi di'cews, an exposition of the nature of

numbers ; (3) Iept Yvyis, on the nature of the soul.

See Boeckh, Phzlolaos des Pythagercers Leluren webst den Bruch- stiicken seines Werkes (Berlin, 1819); also Fabricius, Bibliotheca Greea ; Zeller, History of Greek Philosorhy ; and Chaignet, Pythagore ct la Philosophie Pythagoricienne, conte . .nt les Fraginents de Philolaiis ct d' Architas (1873).

2 Boeckh places his life between the 70th and 95th Olympiads (496-396 B.c.). He was a contemporary of Socrates and Democritus, but senior to them, and was probably somewhat junior to Empedocles, so that his birth may be placed at about 480.

Divi- sions.

Nature of the science.

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Pei Lore ae

PART I.—SCIENCE OF LANGUAGE IN GENERAL.

HILOLOGY is the generally accepted comprehensive name for the study of the word ; it designates that branch of knowledge which deals with human speech, and with all that speech discloses as to the nature and history of man. Philology has two principal divisions, corre- sponding to the two uses of "word" or "speech," as signifying either what is said or the language in which it is said, as either the thought expressed—which, when recorded, takes the form of literature—or the instrument- ality of its expression: these divisions are the literary and the linguistic. Not all study of literature, indeed, is philological: as when, for example, the records of the ancient Chinese are ransacked for notices of astronomical or meteorological phenomena, or the principles of geometry are learned from the text-book of a Greek sage; while, on the other hand, to study Ptolemy and Euclid for the history of the sciences represented by them is philological more than scientific. Again, the study of language itself has its literary side: as when the vocabulary of a com- munity (say of the ancient Indo-Europeans or Aryans) is taken as a document from which to infer the range and grade of knowledge of its speakers, their circumstances, and their institutions. The two divisions thus do not admit of absolute distinction and separation, though for some time past tending toward greater independeiace. The literary is the older of the two; it even occupied until recently the whole field, since the scientific study of language itself has arisen only within the present century. Till then, literary philology included linguistic, as a merely subordinate and auxiliary part, the knowledge of a lan- guage being the necessary key to a knowledge of the literature written.in that language. When, therefore,

instead of studying each language by itself for the sake

of its own literature, men began to compare one language with another, in order to bring to light their relationships, their structures, their histories, the name 'comparative philology " naturally enough suggested itself and came into use for the new method; and this name, awkward and trivial though it may be, has become so firmly fixed in English usage that it can be only slowly, if at all, displaced. Continental usage (especially German) tends more strongly than English to restrict the name philology to its older office, and to employ for the recent branch of knowledge a specific term,

like those that have gained more or less currency with us also: as glottic, glossology, linguistics, linguistic science, science of language, and the like. It is not a question of absolute propriety or correctness, since the word philology is in its nature wide enough to imply all language-study, of whatever kind ; it is one, rather, of the convenient distinction of methods that have grown too independent and important to be any longer well included under a common name.

Philology, in all its departments, began and grew up as classical; the history of our civilization made the study of Greek and Latin long the exclusive, still longer the pre- dominant and regulating, occupation of secular scholar- ship. The Hebrew and its literature were held apart, as something of a different order, as sacred. It was not imagined that any tongue to which culture and literature did not lend importance was worthy of serious attention from scholars. 'The first essays in comparison, likewise, were made upon the classical tongues, and were as erroneous in method and fertile in false conclusions as was to be expected, considering the narrowness of view and the con- trolling prejudices of those who made them ; and the

admission of Hebrew to the comparison only added to the confusion. The change which this century has seen has been a part of the general scientific movement of the age, which has brought about the establishment of so many new branches of knowledge, both historical and physical, by the abandonment of shackling prejudices, the freedom of inquiry, the recognition of the dignity of all knowledge, the wide-reaching assemblage of facts and their objective comparison, and the resulting constant improvement of method. Literary philology has had its full share of advantage from this movement ; but linguistic philology has been actually created by it out of the crude observa- tions and wild deductions of earlier times, as truly as chemistry out of alchemy, or geology out of diluvianism. It is unnecessary here to follow out the details of the development ; but we may well refer to the decisive in- fluence of one discovery, the decisive action of one scholar. It was the discovery of the special relationship of the Aryan or Indo-European languages, depending in great measure upon the introduction of the Sanskrit as a term in their comparison, and demonstrated and worked out by the German scholar Bopp, that founded

the science of linguistic philology. While there is abundant room for further improvement, it yet appears that the grand features of philologic study, in all its departments, are now so distinctly drawn that no revolution of its methods, but only their modification in minor respects, is henceforth probable. How and for what purposes to investigate the literature of any people (philology in the more proper sense), combining the knowledge thus obtained with that derived from other sources; how to study and set forth the material and structure and combinations of a language (grammar), or of a body of related languages (comparative grammar) ; how to co-ordinate and interpret the general phenomena of language, as variously illustrated in the infinitely varying facts of different tongues, so as to exhibit its nature as a factor in human history, and its methods of life and growth (linguistic science),—these are what philology teaches. The first two subjects are mainly disposed of in this work in the various articles devoted to countries and races, with their literatures and dialects ; the last was briefly touched upon in the article ANTHRO- POLOGY, but requires fuller treatment here, along with a general view of the classification of languages, as thus far effected.

The study of language is a division of the general science of anthropology, and is akin to all the rest in respect of its objects and its methods. Man as we now see him is a twofold being: in part the child of nature, as to his capacities and desires, his endowments of mind and body ; in part the creature of education, by training in the knowledge, the arts, the social conduct, of which his predecessors have gained possession. And the problem of anthropology is this: how natural man has become culti- vated man; how a being thus endowed by nature should have begun and carried on the processes of acquisition which have brought him to his present state. The results of his predecessors' labours are not transmuted for his benefit into natural instincts, in language or in anything else. The child of the most civilized race, if isolated and left wholly to his own resources, aided by neither the example nor the instruction of his fellows, would no more speak the speech of his ancestors than he would build their houses, fashion their clothes, practise any of their arts, inherit their knowledge or wealth. In fact, he would

Relation to an- thropo-

possess no language, no arts, no wealth, but would have to go to work to acquire them, by the same processes which began to win them for the first human beings. One advantage he would doubtless-enjoy : the descendant of a cultivated race has an enhanced aptitude for the recep- tion of cultivation ; he is more cultivable; and this is an element that has to be allowed for in comparing present conditions with past, as influencing the rate of progress, but nothing more. In all other respects, it is man with the endowments which we now find him possessed of, but destitute of the gradually accumulated results of the exer- cise of his faculties, whose progress we have to explain. And it is, as a matter of necessity, by studying recent observable modes of acquisition, and transferring them, with due allowance for different circumstances, to the more primitive periods, that the question of first acqui- sition or origin is to be solved, for language as for tools, for arts, for family and social organization, and the rest. There is just as much, and just as little, reason for assuming miraculous interference and aid in one of these departments as in another. If men have been left to themselves to make and improve instruments, to form and perfect modes of social organization, by implanted powers directed by natural desires, and under the pressure of cir- cumstances, then also to make and change the signs that constitute their speech. All expressions, as all instruments, are at present, and have been through the known past, made and changed by the men who use them; the same will have been the case in the unknown or prehistoric past. And we command now enough of the history of language, with the processes of its life and growth, to determine with confidence its mode of origin—within certain limits, as will appear below.

It is beyond all question, in the first place, that the desire of communication was the only force directly im- pelling men to the production of language. Man's social- ity, his disposition to band together with his fellows, for lower and for higher purposes, for mutual help and for sympathy, is one of his most fundamental characteristics. To understand those about one and to be understood by them is now, and must have been from the very beginning, a prime necessity of human existence ; we cannot conceive of man, even in

his most undeveloped state, as without the recognition of it. Communication is still the univers- ally recognized office of speech, and to the immense majority of speakers the only one; the common man knows no other, and can only with difficulty and imperfectly be brought to see that there is any other; of the added dis- tinctness and reach of mental action which the possession of such an instrumentality gives him, he is wholly uncon- scious: and it is obvious that what the comparatively cultivated being of to-day can hardly be made to realize, can never have acted upon the first men as a motive to action. It may perhaps be made a question which of the two uses of speech, communication or the facilitation of thought, is the higher; there can be no question, at any rate, that the former is the broader and the more funda- mental. That the kind and degree of thinking which we do nowadays would be impossible without language-signs is true enough ; but so also it would be impossible without written signs. That there was a time when men had to do what mental work they could without the help of writ- Ms, a an art not yet devised, we have no difficulty in realizing, because the art is of comparatively recent device, and there are still communities enough that are working without it ; it is much harder to realize that there was a time when speaking also was an art not yet attained, and that men had to carry on their rude and rudimentary thinking without it. Writing too was devised for conscious purposes of communication only ; its esoteric uses, like

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those of speech, were at first unsuspected, and incapable of acting as an inducement; they were not noticed until made experience of, and then only by those who look beneath the surface of things. There is no analogy closer and more instructive than this, between speech and writ- ing. But analogies are abundant elsewhere in the history of human development. Everywhere it is the lower and more obvious inducements that are first effective, and that lead gradually to the possession of what serves and stimu- lates higher wants. All the arts and industries have grown out of men's effort to get enough to eat and pro- tection against cold and heat—just as language, with all its uses, out of men's effort to communicate with their fellows. As a solitary man now would never form even the beginnings of speech, as one separated from society unlearns his speech by disuse and becomes virtually dumb, so early man, with all his powers, would never have acquired speech,

save as to those powers was added sociality with the needs it brought. We might conceive of a solitary man as housing and dressing himself, devising rude tools, and thus lifting himself a step from wildness toward culti- vation ; but we cannot conceive of him as ever learning to talk. Recognition of the impulse to communication as the efficient cause of language-making is an element of primary importance in the theory of the origin of language. No one who either leaves it out of account or denies it will, however ingenious and entertaining his speculations, cast any real light on the earliest history of speech. To inquire under what peculiar circumstances, in connexion with what mode of individual or combined action, a first outburst of oral expression may have taken place, is, on the other hand, quite futile. The needed circumstances were always present when human beings were in one another's society; there was an incessant drawing-on to attempts at mutual understanding which met with occasional, and then ever more frequent and complete success. There inheres in most reasoning upon this subject the rooted assumption, governing opinion even when not openly upheld or con- sciously made, that conceptions have real natural names, and that in a state of nature these will somehow break forth and reveal themselves under favouring circumstances. The falsity of such a view is shown by our whole further discussion.

The character of the motive force to speech determined Begin- the character of the beginnings of speech. That was first nings of

signified which was most capable of intelligible significa- tion, not that which was first in order of importance, as judged by any standard which we can apply to it, or first in order of conceptional development. All attempts to determine the first spoken signs by asking what should have most impressed the mind of primitive man are and must be failures. It was the exigencies and possibilities of practical life, in conditions quite out of reach of our distinct conception, that prescribed the earliest signs of communication. So, by a true and instructive analogy, the beginnings of writing are rude depictions of visible objects; it is now thoroughly recognized that no alphabet, of whatever present character, can have originated in any other way; everything else is gradually arrived at from that—as, indeed, in the ingeniously shaping hands of man, from any central body of signs, though but of small extent, all else is attainable by processes

of analogy and adaptation and transfer. Now what is it that is directly signifiable in the world about us? Evidently, the separate acts and qualities of sensible objects, and nothing else. In writing, or signification to the eye, the first element is the rude depiction of the outline of an object, or of that one of the sum of its characteristic qualities which the eye takes note of and the hand is capable of intelligibly reproducing ; from that the mind understands the whole

Instru- mental- ities of expres- sion.

The voice.

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complex object itself, and then whatever further may in the circumstances of its use be suggested by it. So, for example, the picture of a tree signifies primarily a tree, then perhaps wood, something made of wood, and so on; that of a pair of outstretched wings signifies secondarily flight, then soaring, height, and whatever else these may lead to. No concrete thing is signifiable in its totality, or otherwise than by a facile analysis of its constituent qualities, and a selection of the one which is both sufti- ciently characteristic in itself and capable of being called up by a sign before the mind addressed.

And what quality shall be selected depends in great measure upon the instrumentality used for its signification. Of such instrumentalities, men are possessed of a consider- able variety. We must leave out of account that of depiction, as just instanced, because its employment belongs to a much more. advanced state of cultivation, and leads the way to the invention not of speech but of the analogous and auxiliary art of writing. There remain gesture, or changes of position of the various parts of the body, especially of the most mobile parts, the arms and hands; grimace, or the changes of expression of the features of the countenance (in strictness, a variety of the preceding) ; and utterance, or the production of audible sound. It cannot be doubted that, in the first stages of communicative expression, all these three were used to- gether, each for the particular purposes which it was best calculated to serve. The nearest approach to such action that is now possible is when two persons, wholly ignorant of one another's speech,

meet and need to communicate— an imperfect correspondence, because each is trained to habits of expression, and works consciously, and with the advantage of long experience, towards making himself un- derstood ; yet it is good for its main purpose. What they do, to reach mutual comprehension, is like what the first speechless men, unconsciously and infinitely more slowly, learned to do: face, hands, body, voice, are all put to use. It is altogether probable that gesture at first performed the principal part, even to such extent that the earliest human language may be said to have been a language of gesture-signs ; indeed, there exist at the present day such gesture-languages, as those in use between roving tribes of different speech that from time to time meet one another (the most noted example is that of the gesture-language, of a very considerable degree of development, of the prairie tribes of American Indians); or such signs as are the natural resort of those who by deafness are cut off from ordinary spoken intercourse with their fellows. Yet there never can have been a stage or period in which all the three instrumentalities were not put to use together. In fact, they are still all used together; that is even now an ineffective speaking to which grimace and gesture ("'action," as Demosthenes called them) are not added as enforcers ; and the lower the grade of development and culture of a language, the more important, even for intelligibility, is their addition. But voice has won to itself the chief and almost exclusive part in communication, insomuch that we call all communication "language" (1.¢., "' tonguiness")

'just as a race of mutes might call it ''handiness," and

talk (by gesture) of a handiness of grimace. This is not in the least because of any closer connexion of the thinking apparatus with the muscles that act to produce audible sounds than with those that act to produce visible motions; not because there are natural uttered names for conceptions, any more than natural gestured names. It is simply a case of "survival of the fittest," or analogous to the pro- cess by which iron has become the exclusive material of swords, and gold and silver of money: because, namely, experience has shown this to be the material best adapted to this special use. The advantages of voice are numerous

and obvious. There is first its economy, as employing a mechanism that is available for little else, and leaving free for other purposes those indispensable instruments the hands. Then there is its superior perceptibleness: its nice differences impress themselves upon the sense at a distance at which visible motions become indistinct ; they are not hidden by intervening objects; they allow the eyes of the listener as well as the hands of the speaker to be employed in other useful work ; they are as plain in the dark as in the light; and they are able to catch and command the attention of one who is not to be reached in any other way. We might add as the third advantage a superior capability of variation and combination on the part of spoken sounds ; but this is not to be insisted on, inasmuch as we hardly know what a gesture-language might have become if men's ingenuity in expression had been expended through all time upon its elaboration ; and the superiority, however real, can hardly have been obvious enough to serve as a motive: certainly, there are spoken languages now existing whose abundance of resources falls short of what is attainable by gesture. Oral utterance is the form which expression has inevitably taken, the sum of man's endowments being what it is; but it would be a mistake to suppose that a necessity of any other kind is involved in their relation. The fundamental conditions of speech are man's grade of intellectual power and his social instinct ; these being given, his expression follows, availing itself of what means it finds best suited to its purpose ; if voice had been wanting, it would have taken the next best. So, in certain well-known cases, a marked artistic gift, on the part of individuals deprived of the use of hands, has found means of exercise in the feet instead. But men in general have hands, instruments of exquisite tact and power, to serve the needs of their intellect ; and so voice also, to provide and use the tools of thought ; there is no error in maintaining that the voice is given us for speech, if only we do not proceed to draw from such a dictum false conclusions as to the relation between thought and utterance. Man is created with bodily instruments suited to do the work prescribed by his mental capacities ; therein lies the harmony of his endowment.

It is through imitation that all signification becomes Imita- The first written signs are (as already tion.

directly suggestive. noticed) the depictions of visible objects, and could be nothing else ; and, by the same necessity, the first uttered signs were the imitations of audible sounds. To repro- duce any sound of which the originating cause or the cir- cumstances of production are known, brings up of course before the conception that sound, along with the originator, or. circuinstances of origination, or whatever else may be naturally associated with it. There are two special direc- tions in which this mode of sign-making is fruitful: imitation of the sounds of external nature (as the cries of animals, and the noises of inanimate objects when in motion or acted on by other objects) and imitation of human sounds. The two are essentially one in principle, although by some held apart, or even opposed to each other, as respectively the imitative or onomatopoetic and the exclamatory or interjectional beginnings of speech ; they differ only in their spheres of significance, the one being especially suggestive of external objects, the other of inward feelings. There are natural human tones, indica- tive of feeling, as there are natural gestures, poses, modes of facial expression, which either are immediately intel- ligible to us (as is the warning cry of the hen to the day- old chicken), or have their value taught us by our earliest experiences. If we hear a cry of joy or a shriek of pain, a laugh or a groan, we need no explanation in words to tell us what it signifies, any more than when we see a sad face or a drooping attitude. So also the characteristic cry

or act of anything outside ourselves, if even rudely imi- tated, is to us an effective reminder and awakener of con- ception. We have no reason to question that such were the suggestions of the beginnings of uttered expression. The same means have made their contributions to language even down to our own day; we call words so produced "onomatopoetic " (7.¢., "'name-making"), after the example of the Greeks, who could not conceive that actually new additions to language should be made in any other way. What and how wide the range of the imitative principle, and what amount of language-signs it was capable of yielding, is a subject for

special investigation—or rather, of speculation, since anything like exact knowledge in regard to it will never be attained ; and the matter is one of altogether secondary consequence; it is sufficient for our purpose that enough could certainly be won in this way to serve as the effective germs of speech.

All the natural means of expression are still at our command, and are put to more or less use by us, and their products are as intelligible to us as they have been to any generation of our ancestors, back to the very first. They are analogous also to the means of communication of the lower animals; this, so far as we know, consists in observing and interpreting one another's movements and natural sounds (where there are such). But language is a step beyond this, and different from it. To make language, the intent to signify must be present. A cry wrung out by pain, or a laugh of amusement, though intelligible, is not language ; either of them, if consciously reproduced in order to signify to another pain or pleasure, is language. Soa cough within hearing of any one attracts his attention ; but to cough, or to produce any other sound, articulate or inarticulate, for the purpose of attracting another's attention, is to commit an act of language- making, such as in human history preceded in abundance the establishment of definite traditional signs for concep- tions. Here begins to appear the division between human language and all brute expression ; since we do not know that any animal but man ever definitely took this step. It would be highly interesting to find out just how near any come to it; and to this point ought to be especially directed the attention of those who are investigating the communication of the lower animals in its relation to human communication. Among the animals of highest intelligence that associate with man and learn something of his ways, a certain amount of sign-making expressly for communication is not to be denied ; the dog that barks at a door because he knows that somebody will come and let him in is an instance of it; perhaps, in wild life, the throwing out of sentinel birds from a flock, whose warning cry shall advertise their fellows of the threat of danger, is as near an approacii.to it as is anywhere made.

But the actual permanent beginnings of speech are only reached when the natural basis is still further abandoned, and signs begin to be used, not because their natural suggestiveness is seen in them, but by imitation, from

the example of others who have been observed to use the same sign for the same purpose. Then for the first time the means.of communication becomes something to be handed down, rather than made anew by each individual ; it takes on that traditional character which is the essential char- acter of all human institutions, which appears not less in the forms of social organization, the details of religious ceremonial, the methods of art and the arts, than in lan- guage. That all existing speech, and all known recorded speech, is purely traditional, cannot at all be questioned. It is proved even by the single fact that for any given conception there are as many different spoken signs as there are languages—say a thousand (this number is rather far within than beyond the truth), each of them intelli-

gible to him who has learned to use it and to associate it with the conception to which it belongs, but unintelligible to the users of the nine hundred and ninety-nine other signs, as these are all unintelligible to him ; unless, indeed, he learn a few of them also, even as at the beginning he learned the one that he calls his own. What single sign, and what set of signs, any individual shall use, depends upon the community into the midst of which he is cast, by birth or other circumstances, during his first years. That it does not depend upon his race is demonstrated by facts the most numerous and various; the African whose purity of descent is attested by every feature is found all over the world speaking just that language, or jargon, into the midst of which the fates of present or former slavery have brought his parents; every civilized community contains elements of various lineage, combined into one by unity of speech ; and instances are frequent enough where whole nations speak a tongue of which their ancestors knew nothing: for example, the Celtic Gauls and the Germanic Normans of France speak the dialect of a geographically insignificant district in central Italy, while we ourselves can hardly utter-a sentence or write a line without bringing in more or less of that same dialect. There is not an item of any tongue of which we know any- thing that 7s "natural" expression, or to the possession of which its speaker is brought by birth instead of by education; there is even very little that is traceably founded on such natural expression ; everywhere Gécus or human attribution reigns supreme, and the original dvous or natural significance has disappeared, and is only to be found by

theoretic induction (as we have found it above). It seems to some as if a name like cuckoo (one of the most striking available cases of onomatopeeia) were a “ natural ” one; but there is just as much @éovs in it as in any other name; it implies the observation of an aggregate of qualities in a certain bird, and the selection of one among them as the convenient basis of a mutual understanding when the bird is in question; every animal conspicuous to us must have its designation, won in one way or another ; and in this case, to imitate the characteristic cry is the most available way. If anything but convenience and availability were involved, all our names for animals would have to be and to remain imitations of the sounds they make. That the name of cuckoo is applied also to the female and young, and at other than the singing season, and then to related species which do not make the same sound—all helps to show the essentially conventional character of even this name. An analogous process of elimination of original meaning, and reduction to the value of conventional designation merely, is to be seen in every part of language, throughout its whole history. Since men ceased to derive their names from signs having a natural suggestiveness, and began to make them from other names already in use with an understood value, every new name has had its etymology and its historical occasion— as, for example, the name quarantine from the two-score (quarantaine) of days of precautionary confinement, or volume from its being rolled up, or book from a beech-wood staff, or copper from Cyprus, or lunacy from a fancied influence of the moon, or priest from being an older (peo Birepos) person, or butterfly from the butter-yellow colour of a certain common species: every part of our language, as of every other, is full of such examples—but, when once the name is applied, it belongs to that to which it is applied, and no longer to its relatives by etymology ; its origin is neglected, and its form may be gradually changed beyond recognition, or its meaning so far altered that comparison with the original shall seem a joke or an absurdity. This is a regular and essential part of the process of name-making in all human speech, and from

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the very beginning of the history of speech : in fact (as pointed out above), the latter can only be said to have begun when this process was successfully initiated, when uttered signs began to be, what they have ever since continued to be, conventional, or dependent only on a mutual understanding. Thus alone did language gain the capa- city of unlimited growth and development. The sphere and scope of natural expression are narrowly bounded ; but there is no end to the resources of conventional sign- making.

It is well to point out here that this change of the basis of men's communication from natural suggestiveness to mutual understanding, and the consequent purely conven- tional character of all human language, in its every part and particle, puts an absolute line of demarcation between the latter and the means of communication of all the lower animals. The two are not of the same kind, any more than human society in its variety of organization is of the same kind with the instinctive herding of wild cattle or swarming of insects, any more than human architecture with the instinctive burrowing of the fox and nest-building of the bird, any more than human industry and accumula- tion of capital with the instinctive hoarding of bees and beavers. In all these cases alike, the action of men isa result of the adaptation of means at hand to the satisfac- tion of felt needs, or of purposes dimly perceived at first, but growing clearer with gradually acquired experience. Man is the only being that has established institutions — gradually accumulated and perfected results of the exercise of powers analogous in kind to, but greatly differing in degree from, those of the lower animals. The difference in degree of endowment does not constitute the difference in language, it only leads to it. There was a time when all existing human beings were as destitute of language as the dog ; and that time would come again for any number of human beings who should be cut off (if that were prac- ticable) from all instruction by their fellows: only they would at once proceed to re-create language, society, and arts, by the same steps by which their own remote ancestors created those which we now possess ; while the dog would remain what he and his ancestors have always been, a creature of very superior intelligence, indeed, as compared with most, of infinite intelligence as compared with many, yet incapable of rising by the acquisition of culture, through the formation and development of traditional institutions. There is just the same saltus existent in the difference between man's conventional speech and the natural com-

munication of the lower races as in that between men's forms of society and the instinctive associations of the lower races ; but it is no greater and no other ; it is neither more absolute and characteristic nor more difficult to explain. Hence those who put forward language as the distinction between man and the lower animals, and those who look upon our language as the same in kind with the means of communication of the lower animals, only much more complete and perfect, fail alike to comprehend the true nature of language, and are alike wrong in their argu- ments and conclusions. No addition to or multiplication of brute speech would make anything like human speech ; the two are separated by a step which no animal below man has ever taken ; and, on the other hand, language is only the most conspicuous among those institutions the development of which has constituted human progress, while their possession constitutes human culture.

With the question of the origin of man, whether or not developed out of lower animal forms, intermediate to the anthropoid apes, language has nothing to do, nor can its study ever be made to contribute anything to the solution of that question. If there once existed creatures above the apes and below man, who were extirpated by primitive

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| man as his especial rivals in the struggle for existence, or

became extinct in any other way, there is no difficulty in supposing them to have possessed forms of speech, more rudimentary and imperfect than ours. At any rate, all existing human speech is one in the essential characteristics which we have thus far noted or shall hereafter have to consider, even as humanity is one in its distinction from the lower.animals; the differences are in non-essentials, All speech is one in the sense that every human being, of whatever race he may be, is capable of acquiring any existing tongue, and of using it for the same purposes for which its present possessors use it, with such power and effect as his individual capacity allows, and without any essential change in the mental operations carried on by means of speech—even as he may acquire any other of the items of culture belonging to a race not his own. The difference between employing one language and another is like that between employing one instrument and another in

mechanical arts; one instrument may be better than another, and may enable its user to turn out better work, but the human ingenuity behind both is the same, and works in the same way. Nor has the making of language anything whatever to do with making man what he is, as an animal species having a certain physical form and intel- lectual endowment. Being what he is by nature, man has by the development of language and other institutions become what he is by culture. His acquired culture is the necessary result of his native endowment, not the contrary. The acquisition of the first stumbling beginnings of a superior means of communication had no more influ- ence to raise him from a simian to a human being than the present high culture and perfected speech of certain races has to lift them up to something more than human, and specifically different from the races of inferior culture. It cannot be too absolutely laid down that differences of language, down to the possession of language at all, are differences only in respect to education and culture.

How long man, after he came into being such as he now is, physically and intellectually, continued to communicate with imitative signs of direct significance, when the pro- duction of traditional signs began, how rapidly they were accumulated, and how long any traces of their imitative origin clave to them—these and the like questions it is at present idle to try to answer even conjecturally : just as it is to seek to determine when the first instruments were used, how soon they were shaped instead of being left crude, at what epoch fire was reduced to service, andsoon. The stages of development and their successionare clear enough ; to fix their chronology will doubtless never be found prac- ticable. There is much reason for holding, as some do, that the very first items of culture were hardest to win and cost most time, the rate of accumulation (as in the case of capital) increasing with the amount accumulated. Beyond all reasonable question, however, there was a positively long period of purely imitative signs, and a longer one of mixed imitative and traditional ones, the latter gradually gaining upon the former, before the present condition of things was reached, when the production of new signs by imitation is only sporadic and of the utmost rarity, and all language-signs besides are traditional, their increase in any community being solely by variation and combination, and by borrowing from other communities.

Of what nature, in various respects, this earliest The root-

language-material was is sufficiently clear. The signs, in the first place, were of the sort that we call "roots." By this is only meant that they were integral signs, signifi- cant in their entirety, not divisible into parts, of which one signified one thing and another another thing, or of which one gave the main significance, while another was an added sign of kind or relation. In a language of XVIII. — 97

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developed structure like our own, we arrive at such "roots" mainly by an artificial stripping-off of the signs of relation which almost every word still has, or can be shown to have once had. In wun-cost-li-ness, for example, cost is the cen- trally significant element ; so far as English is concerned, it is a root, about which cluster a whole body of forms and derivatives ; if we could follow its history no farther, it would be to us an ultimate root, as much so as bend or sing or mean. But we can follow it up, to the Latin com- pound con-sta, a root sta with a prefixed formative element con. Then sta, which in slightly varied forms we find in a whole body of related tongues called " Aryan," having in them all the same significance "stand," is an Aryan root, and to us an ultimate one, because we can follow its history no farther; but there always remains the possibility that it is as far from being actually original as is the English root cost: that is to say, it is not within

our power ever to get back to the really primitive elements of speech, and to demonstrate their character by positive evidence. The reason for accepting a primitive root- stage of language is in great part theoretical: because nothing else is reconcilable with any acceptable view of the origin of language. The law of the simplicity of beginnings is an absolute one for everything of the nature of an institution, for every gradually developed product of the exercise of human faculties. That an original speech-sign should be of double character, one part of it meaning this and another part that, or one part radical and the other formative, is as inconceivable as that the first instruments should have had handles, or the first shelters a front room anda back one. But this theoretical reason finds all the historical support which it needs in the fact that, through all the observable periods of language- history, we see formative elements coming from words originally independent, and not from anything else. Thus, in the example just taken, the ~~le~~ of costliness is a suffix of so recent growth that its whole history is distinctly traceable ; it is simply our adjective like, worn down in both form and meaning to a subordinate value in combina- tion with certain words to which it was appended, and then added freely as a suffix to any word from which it was desired to make a, derivative adjective—or, later but more often, a derivative adverb. The ness is much older (though only Germanic), and its history obscurer ; it con- tains, in fact, two parts, neither of them of demonstrable origin ; but there are equivalent later suffixes, as ship in hardship and dom in wisdom, whose derivation from in- dependent words (shape, doom) is beyond question. The un- of uncostliness is still more ancient (being Aryan), and its probably pronominal origin hardly available as an illustration ; but the. comparatively modern prefix be-, of become, belie, &e., ccmes from the independent preposition by, by the same process as -ly or ~~li~~ from like. And the con which has contributed its part to the making of the quasi-root cost is also in origin identical with the Latin preposition cwm "with." By all the known facts of later language-growth, we are driven to the opinion that every formative element goes back to some previously existing independent word; and hence that in analysing our present words we are retracing the steps of an earlier synthesis, or following up the history of our formed words toward the unformed roots out of which they have grown. The doctrine of the historical growth of language-structure leads by a logical necessity to that of a root-stage in the

history of all language ; the only means of avoiding the latter is the assumption of a miraculous element in the former.

Of what phonetic form were the earliest traditional speech-signs is, so far as essentials are concerned, to be inferred with reasonable certainty. They were doubtless

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articulate: that is to say, composed of alternating con- sonant and vowel sounds, like our present speech ; and they probably contained a part of the same sounds which we now use. All human language is of this character ; there are no sounds in any tongue which are not learned and reproduced as easily by children of one race as of another ; all dialects admit a like phonetic analysis, and are representable by alphabetic signs; and the leading sounds, consonant and vowel, are even practically the same in all; though every dialect has its own (for the most part, readily definable and imitable) niceties of their pronuucia- tion, while certain sounds are rare, or even met with only in a single group of languages, or in a single language. Articulate sounds are such as are capable of being combined with others into that succession of distinct yet connectable syllables which is the characteristic of human speech- utterance. The name "articulate" belongs to this utter- ance, as distinguished from inarticulate human sounds and cries, and from the sounds made by the lower animals,

The word itself is Latin, by translation from the Greek,

and, though very widely misunderstood, and even deliber- ately misapplied in some languages to designate all sound,

of whatever kind, uttered by any living creature, is a most

happily chosen and truly descriptive term. It signifies

"jointed," or broken up into successive parts, like a limb

or stem; the joints are the syllables; and the syllabic

structure is mainly effected by the alternation of closer or consonant sounds with opener or vowel sounds. The simplest syllabic combination (as the facts of language show) is that of a single consonant with a following vowel ; and there are languages even now existing which reject any other. Hence there is much plausibility in the view that the first speech-signs will have had this phonetic form, and been monosyllabic, or dissyllabic only by repetition (reduplication) of one syllable, such as the speech of very young children shows to have a peculiar ease and natural-ness. The point, however, is one of only secondary import-ance, and may be left to the further progress of phonetic study to settle, if it can; the root-theory, at any rate, is not bound to any definite form or extent of root, but only denies that there can have been any grammatical struc- ture in language except by development in connexion with experience in the use of language. What particular sounds, and how many, made up the first spoken alphabet, is also a matter of conjecture merely ; they are likely to have been the closest consonants and the openest vowels, medial utterances being of later development.

As regards their significant value, the first language-Char- signs must have denoted those physical acts and qualities acter of which are directly

apprehensible by the senses; both Rect

; rae ., Speech. because these alone are directly signifiable, and because it was only they that untrained human beings had the power to deal with or the occasion to use. Such signs would then be applied to more intellectual uses as fast as there was occasion for it. The whole history of language, down to our own day, is full of examples of the reduction of physical terms and phrases to the expression of non- physical conceptions and relations ; we can hardly write a line without giving illustrations of this kind of linguistic growth. So pervading is it, that we never regard ourselves as having read the history of any intellectual or moral term till we have traced it back toa physical origin, And we are still all the time drawing figurative comparisons between material and moral things and processes, and call- ing the latter by the names of the former. There has never been any difficulty in providing for new knowledge and more refined thought by putting to new uses the earlier and grosser materials of speech.

As a matter of course, whatever we now signify by our simple expressions for simple acts, wants, and the like,

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was intended to be signified through the first speech-signs by the users of them. But to us, with our elaborated apparatus of speech, the sentence, composed of subject and predicate, with a verb or special predicative word to signify the predication, is established as the norm of expression, and we regard everything else as an abbreviated sentence, or as involving a virtual sentence. With a view to this, we must have "parts of speech": that is, words held apart in office from one another, each usable for such and such a purpose and no other, and answering a due variety of pur- poses, so that when they are combined they fit together, as parts composing a whole, and the desired meaning is made clear. Inflexions, too, lend their aid; or else

auxiliary words of various kinds answering the same pur- pose—namely, of determining the relations of the members of the sentence. But all our success in understanding the earliest stages of language depends upon our power to con- ceive a state of things where none of these distinctions were established, where one speech-sign was like another, calling up a conception in its indefinite entirety, and leay- ing the circumstances of the case to limit its application. Such a language is far below ours in explicitness; but it would suffice for a great deal of successful communication ; indeed (as will be shown farther on), there are many lan- guages even now in existence which are little better off. Soa look of approval or disgust, a gesture of beckoning or repulsion, a grunt of assent or inquiry, is as signifi- cant as a sentence, means a sentence, is translatable into a sentence, and hence may even in a certain way be called a sentence ; and in the same way, but only so, the original roots of language may be said to have been sentences. In point of fact, between the holophrastic gesture or uttered sign and the sentence which we can now substitute for it—for example, between the sign of beckoning and the equivalent sentence, "'I want you to come here "—lies the whole history of development of inflective speech. What has been this history of development, how the first scanty and formless signs have been changed into the immense variety and fulness of existing speech, it is of course impossible to point out in detail, or by demonstra- tion of facts, because nearly the whole process is hidden in the darkness of an impenetrable past. The only way to cast any light upon it is by careful induction from the change and growth which are seen to have been going on in the recent periods for which we have recorded evidence, or which are going on at the present time. Of some groups of related languages we can read the life for three or four thousand years back, and by comparison can infer it much farther ; and the knowledge thus won is what we have to apply to the explanation of periods and languages otherwise unknown. Nothing has a right to be admitted as a factor in language-growth of which the action is not demonstrable in recorded language. Our own family of languages is the one of whose development most is known, by observation and well-warranted inference ; and it may be well here to sketch the most important features of its history, by way of general illustration. ; Apparently the earliest class-distinction traceable in Aryan speech is that of pronominal roots, or signs of posi- tion, from the more general mass of roots. It 1s not a

formal distinction, marked by a structural difference, but, so far as can be seen, is founded only on the assignment by usage of certain elements to certain offices. Formal distinction began with combination, the addition of one element to another, their fusion into a single word, and the reduction of the one part to a subordinate value, as sign of a certain modification of meaning of the other. Thus, doubtless by endings of pronominal origin, were made the first verb-forms, or words used only when predi- cation was intended (since that is all that makes a verb),

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conveying at first a distinction of persons only, then of persons and numbers, while the further distinctions of tense and mode were by degrees added. 'To the nouns, which became nouns by the setting up of the separate and special class of verbs, were added in like manner distinctions of case, of number, and of gender. With the separation of noun and verb, and the establishment of their respective inflexion, the creative work of language-making is virtually done; the rest is a matter of differ- entiation of uses. For the noun (noun substantive) and the adjective (noun adjective) become two parts of speech only by a gradually deepened separation of use; there is no original or formal distinction between them ; the pro- nouns merely add the noun-inflexion to a special set of stems ; adverbs are a part of the same formation as noun- cases; prepositions are adverbs with a specialized construc- tion, of secondary growth ; conjunctions are the products of a like specialization ; articles, where found at all, are merely weakened demonstratives and numerals.

To the process of form-making, as exhibited in this history, belong two parts: the one external, consisting in the addition of one existing element of speech to another and their combination into a single word; the other internal, consisting in the adaptation of the compound to its special use and involving the subordination of one element to the other. Both parts appear also abundantly in other departments of language-change, and throughout the whole history of our languages; nothing has to be assumed for the earliest formations which is not plainly illustrated in the latest. For example, the last important addition to the formative apparatus of English is the common adverb-making suffix -ly, coming, as already pointed out,

from the independent adjective like. There was nothing at first to distinguish a compound like godly (godlike) from one like storm-tossed, save that the former was more adaptable than the other to wider uses; resem- blance is an idea easily generalized into appurtenance and the like, and the conversion of godlike to godly is a simple result of the processes of phonetic change described farther on. The extension of the same element to combination with adjectives instead of nouns, and its conversion to adverb-making value, is a much more striking case of adaptation, and is nearly limited to English, among the Germanic languages that have turned like into a suffix. A similar striking case, of combination and adaptation, is seen in the Romanic adverb-making suffix mente or ment, coming from the Latin ablative mente, "with mind." So, to make a Romanic future like donneraz, "I shall give," there was needed in the first place the pre-existing elements donner, "to give," and az, "I have," and their combination ; but this is only a part; the other indispensable part is the gradual adaptation of a phrase meaning "I have (some- thing before me] for giving" to the expression of simple futurity, ""donabo." So far as the adaptation is concerned, the case is quite parallel to that of j'az donné, "I have given," &c. (equivalent phrases or combinations are found in many languages), where the expression of possession of something that is acted on has been in like manner modified into the expression of past action. Parallel in both combination and adaptation is the past tense loved, from love-did, while we have again the same adaptation without combination in the equivalent phrase did love.

That these are examples of the process by which the whole inflective structure of Aryan language was built up admits of no reasonable question. Our belief that it is so rests upon the solid foundation that we can demonstrate no other process, and that this one is sufficient. It is true that we can prove such an origin for our formative elements in only a small minority of instances; but this is just what was to be expected, considering what we know

All formal elements once material.

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of the disguising processes of language-growth. No one would guess in the mere y of ably (for able-ly) the presence of the adjective like, any more than in the altered final of sent and the shortened vowel of Jed the effect of a did once added to send and lead. The true history of these forms can be shown, because there happen to be other facts left in existence to show it; where such facts are not within reach, we are left to infer by analogy from the known to the unknown. The validity of our inference can only be shaken by showing that there are forms incapable of having been made in this way, or that there are and have been other ways of making forms. Of the former there is evidently but small chance; if a noun-form meaning "with mind" can become the means of conversion of all the adjectives of a language into adverbs, and a verb meaning "have" (and, yet earlier, "seize") of signifying both future and past time, there is obviously nothing that is impossible of attainment by such means. As regards the latter, no one appears to have even attempted to demonstrate the genesis of formative elements in any other way during the historical periods of language ; it is simply

assumed that the early methods of language-making will |

have been something different from and superior in spon- taneity and fruitfulness to the later ones; that certain forms, or forms at certain periods, were made out-and-out, as forms ; that signs of formal distinction somehow exuded from roots and stems; that original words were many- membered, and that a formative value settled in some member of them—and the like. Such doctrines are purely fanciful, and so opposed to the teachings both of observa- tion and of sound theory that the epithet absurd is hardly too strong to apply to them. If the later races, of developed intelligence, and trained in the methods of a fuller expression, can only win a new form by a long and gradual process of combination and adaptation, why should the earlier and comparatively untrained generations have been able to do any better? The advantage ought to be, if anywhere, on our side. The progress of language in every department, accompanying and representing the advance of the race, on the whole, in the art of speaking as in other arts, is from the grosser to the more refined, from the physical to the moral and intellectual, from the material to the formal. The conversion of compounds into forms, by the reduction of one of their elements to forma- tive value, is

simply a part of the general process which also creates auxiliaries and form-words and connectives, all the vocabulary of mind, and all the figurative phraseology that gives life and vigour to our speech. If a copula, expressive of the grammatical relation of predication, could be won only by attenuation of the meaning of verbs signifying " prow," "breathe," "stand," and the like mit our auxiliaries of tense and mode all go traceably back to words of physical meaning (as have to "seize," may to 'be great or strong," shall to "be under penalty," and so on) ; if of comes from the comparatively physical of, and Jor from "before, forward" ; if relative pronouns are special- ized demonstratives and interrogatives ; if right means etymologically "straight," and wrong means "twisted " ; if spirit is "blowing," and intellect a " picking out among," and understanding a "getting beneath," and development an "unfolding"; if an event takes place or comes to pass, and then drops out of mind and is Jorgotten (opposite of gotten)—then it is of no avail to object to the grossness of any of the processes by which, in earlier language or in later, the expression of formal relations is won. The mental sense of the relation expressed is entirely superior to and independent of the means of its expression. He who, to express the plural of man, says what is equivalent to man-man or heap-man (devices which are met with in not a few languages) has just as good a sense of plurality

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as he who says men or homines; that sense is no more degraded in him by the coarseness of the phrase he uses to signify it than is our own sense of eventuality and of pastness by the undisguised coarseness of take place and have been. In short, it is to be laid down with the utmost distinctness and confidence, as a law of language-growth, that there is nothing formal anywhere in language which was not once material ; that tle formal is made out of the material, by processes which began in the earliest history of language and are still in action.

We have dropped here the restriction to our own or Laws of Aryan language with which we began, because it is evident change

that what is true of this family of speech, one of the most

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must be true of them, unless some valid evidence be found to the contrary. The unity of human nature makes human speech alike in the character of its beginnings and in the general features of its after-history. Everywhere among men, a certain store of expression, body of tradi- tional signs of thought, being given, as used by a certain community, it is capable of increase on certain accordant lines, and only on them. In some languages, and under peculiar circumstances, borrowing is a great means of increase ; but it is the most external and least organically important of all. Out-and-out invention (which, so far as we can see, must be of the kind called by us onomato- poetic) is found to play only a very insignificant part in the historical periods of language,—clearly because there are other and easier modes of gaining new expression for what needs to be expressed. In the course of phonetic change, a word sometimes varies into two (or more) forms, and makes so many words, which are differently turned to account. Everything beyond this must be the product of combination ; there is no other way, so far as concerns the externals of speech. Then, partly as accompanying and aiding this external growth, partly as separate from and supplementing it, there is in all language an internal growth, making no appearance in the audible part of speech, consisting in multiplication of meanings, their modification in the way of precision or comprehension or correctness, the restriction of words to certain uses, and soon. Along with these, too, a constant change of phonetic form constitutes an inseparable part of the life of language. Speech is no more stable with respect to the sounds of which it is composed than with respect to its grammatical forms, its vocabulary, or the body of concep- tions signified by it. Even nearly related languages differ as much in their spoken alphabets and the combinations of sounds they admit, and in their uttered forms of words historically the same, as in any other part; and the same is true of local dialects, and of class dialects within the same community. Phonetic change has nothing whatever to do with change of meaning; the two are the product of wholly independent tendencies. Sometimes, indeed, they chance to coincide, as in the distinction of minite “small,” and minute “moment” ; but it is only by chance, as the spoken accordance of second in its two meanings (“next” and “sixtieth of a minute ”) shows ; words that maintain their identity of value most obstinately, like the numerals, are liable to vary

indefinitely in form (so four, Jidvor, quatuor, técoap-es, &c., from an original katwar ; Jive, quinque, wévte, coic, &e., from penka—while, on the other hand, two and three show as striking an accordance of form as of meaning through all the same languages) ; what is far the most common is that the word becomes very unlike its former self in both respects, like priest from the Greek zpecBurepos (presbyter), literally "older man." Human convenience is, to be sure, the governing motive in both changes; but it is convenience of two different kinds: the one mental, depending on the fact

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(pointed out above) that a name when once applied belongs to the thing to which it is applied, to the disregard of its etymological connexions, does not need to be changed when the thing changes, and is ready for new application to anything that can be brought into one class with the latter ; and the other physical, depending on the organs of speech and their successive movements, by which the sounds that make up the word are produced. Phonetic convenience is economy of effort on the part of those organs ; and to no other law than that of economy of utterance have any of the phenomena of phonetic change been found traceable (though it is also to be noted that some phenomena have not hitherto been successfully brought under it, and that the way of effecting this is still unclear). " Euphony," which used to be appealed to as explanation, is a false principle, except so far as the term may be made an idealized synonym of economy. The ear finds that agreeable which the organs of utterance find facile. Economy in utterance is no isolated tendency ; it is the same that plays its part in all other kinds of human action, and in language appears equally in the abbreviation of the sentence by leaving out parts that can be spared without loss of intelligibility. It is an insidious tendency, always lying in wait, like gravitation, to pull down what is not sufficiently held up,—the holding-up force in language being the faithfulness of tradition, or accurate reproduction by the learner and user of the signs which he has acquired. No generation of men has any intention to speak otherwise than as its predecessor has spoken, or any consciousness that it is doing so; and yet, from generation to generation, words are shortened, sounds are assimilated to one another, and one element passes out of use while a new one is introduced. Abbreviation and assimilation are the most conspicuous

departments of phonetic change, and those in which the nature of the governing tendency is most plainly seen. Taken by itself, one sound is as easy as another to the person who has accustomed himself to it from childhood ; and those which the young child most easily acquires are not those which in the history of speech are least liable to alteration ; it is especially in the combinations and transitions of rapid speaking that the tongue, as it were, finds out for itself easier ways of performing its task, by dropping and slurring and adapting. To trace out the infinitely varied items of this change, to co-ordinate and compare them and discover their reasons, constitutes a special department of language- study, which is treated under the head of SpEEcH SouNDs. It only needs to be pointed out here that phonetic change plays a necessary part in the structural development of language, by integrating compound words through fusion and loss of identity of their component parts, and, what is of yet more importance, by converting them into forms, through disguise of identity of one of the parts and its phonetic subordination to the other part. It is this that turns, for example, the compound god-like into the deriva- tive godly, the compound Jdove-did into the verbal form loved. And yet one further result sometimes follows: an internal change is wrought by phonetic influence in the body of a word, which change then may in the further history of the word be left as the sole means of distinction between one form and another. It is thus that, in the most recent period, the distinction of led from lead and met from meet and so on has been made ; the added auxi- liary which originally made these preterites induced a shortening of the root-vowel, and this was left behind when the auxiliary disappeared by the usual process of abbreviation. It is in the same way that the distinctions of men from man, of were from was, of set from sit, with all théir analogues, were brought about: bya modification of vowel-sound (Ger. Umlaut) occasioned by the presence

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in the following syllable of an ¢-vowel, which in the older stages of the language is still to be seen there. And the distinctions of sing, sang, sung, and song, of bind, bound, band, and bond, are certainly of the same kind, though they go back so far in the history of our family of lan- guages that their beginnings are not yet clearly demon- strable; they were in their origin phonetic accidents, inorganic, mere accompaniments and results of

external combinations which bore the office of distinction of mean- ing and were sufficient to it; in some of our languages they have been disregarded and cffaced, in others they have risen to prominent importance. To regard these internal changes as primary and organic is parallel with assuming the primariness of the formative apparatus of language in general; like this, it ignores the positive evidence we have of the secondary production of such differences ; they are, like everything else in linguistic structure, the outcome of combination and adaptation. Borrowing, or the taking-in of material out of another lan- guage, has been more than once referred to above as some- times an important element in language-history, though less deep-reaching and organic than the rest. There is nothing anomalous about borrowing ; it is rather in essen- tial accordance with the whole process of language-acquisi- tion. All our names were adopted by us because they were already in use by others; and a community is in the same way capable of taking a new name from a community with which it comes in contact as an individual from individuals. Not that it seeks or admits in this way new names for old things; but it accepts new things along with the names that seem to belong to them. Hence any degree of intercourse between one community and another, leading to exchange of products or of knowledge, is sure to lead also to some borrowing of names; and there is hardly a language in the world, except of races occupying peculiarly isolated positions, that does not contain a certain amount of foreign material thus won, even as our English has elements in its vocabulary from half the other tongues in the world. The scale of borrowing is greatly increased when one people becomes the pupil of another in respect of its civilization: hence the abundant classical elements in all the European tongues, even the non-Romanic; hence the Arabic material in Persian and Turkish and Malay ; hence the Chinese in Japanese and Corean; and, as a further result, even dead languages, like the Greek and Latin and the Sanskrit, become stores to be drawn upon in that learned and conscious quest of new expression which in the school-stage of culture supplements or even in a measure replaces the unconscious growth of natural

~~*speech. So, in mixture of communities, which is a highly*~~

intensified form of contact and intercourse, there follows such mixture of speech as the conditions of the case deter- mine; yet not a mixture on equal

terms, through all the departments of vocabulary and grammar; the resulting speech (just as when two individuals learn to speak alike) is essentially that of the one constituent of the new com- munity, with more or less material borrowed from that of the other. What is most easily taken in out of another language is the names of concrete things ; every degree of removal from this involves additional difficulty—names of abstract things, epithets, verbs, connectives, forms. Indeed, the borrowing of forms in the highest sense, or forms of inflexion, is well-nigh or quite impossible ; no example of it has been demonstrated in any of the historical periods of language, though it is sometimes adventurously assumed as a part of prehistoric growth. How nearly it may be approached is instanced by the presence in English of such learned plurals as phenomena and strata. This extreme resistance to mixture in the department of inflexion is the ground on which some deny the possibility of mixture in

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Borrow. ing or mixing,

Isolating lan- guages.

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language, and hence the existence of such a thing as a mixed language. The difference is mainly a verbal one; but it would seem about as reasonable to deny that a region is inundated so long as the tops of its highest mountains are above water. According to the simple and natural meaning of the term, nearly all languages are mixed, in varying degree and within varying limits, which the circumstances of each case must explain.

These are the leading processes of change seen at work in all present speech and in all known past speech, and hence to be regarded as having worked through the whole history of speech. By their operation, every existing tongue has been developed out of its rudimentary radical condition to that in which we now see it. The variety of existing languages is well-nigh infinite, not only in their material but in their degree of development and the kind of resulting structure. Just as the earlier stages in the history of the use of tools are exemplified even at the present day by races which

have never advanced beyond them, so is it in regard to language also—and, of course, in the latter case as in the former, this state of things strengthens and establishes the theory of a gradual development. There is not an element of linguistic struc- ture possessed by some languages which is not wanting in others ; and there are even tongues which have no formal structure, and which cannot be shown ever to have ad- vanced out of the radical stage. The most noted example of such a rudimentary tongue is the Chinese, which in its present condition lacks all formal distinction of the parts of speech, all inflexion, all derivation ; each of its words (all of them monosyllables) is an integral sign, not divisible into parts of separate significance ; and each in general is usable wherever the radical idea is wanted, with the value of one part of speech or another, as determined by the connexion in which it stands: a condition parallel with that in which Aryan speech may be regarded as existing prior to the beginnings of its career of formal development briefly sketched above. And there are other tongues, related and unrelated to Chinese, of which the same description, or one nearly like it, might be given. To call such languages radical is by no means to maintain that they exhibit the primal roots of human speech, unchanged or only phonetically changed, or that they have known nothing of the combination of element with element. Of some of them, the roots are in greater or less part dissyl- labic ; and we do not yet know that all dissyllabism, and even that all complexity of syllable beyond a single con- sonant with following vowel, is not the result of combina- tion or reduplication. But all combination is not form- making ; it needs a whole class of combinations, with a recognized common element in them producing a recog- nized common modification of meaning, to make a form. The same elements which (in Latin, and even to some extent in English also) are of formal value in con-stant and pre-dict lack that character in cost and preach ; the same luke which makes adverbs in tru-ly and right-ly is present without any such value in such and which (from so-like and who-like) ; cost and preach, and such and which, are as purely radical in English as other words of which we do not happen to be able to demonstrate the composite character. And so a Chinese monosyllable or an Egyptian or Poly- nesian dissyllable is radical, unless there can be demon- strated in some part of it a formative value ; and a lan- guage wholly composed of such words is a root-language. N either is the possibility to be denied that a language like Chinese may have had at some period of its

history the weak beginnings of a formal developmeat, since ex- tinguished by the same processes of phonetic decay which im English have wiped out so many signs of a formal character, and brought back so considerable a part of the

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vocabulary to monosyllabism ; but it remains thus far a possibility merely ; and the development would need to have been of the scantiest character to be so totally destroyed by phonetic influences. In languages thus constituted, the only possible external alteration is that phonetic change to which all human speech, from the very beginning of its traditional life, is liable; the only growth is internal, by that multiplication and adaptation and im- provement of meanings which is equally an inseparable part of all language-history. This may include the reduc- tion of certain elements to the value of auxiliaries, particles, form-words, such as play an important part in analytical tongues like English, and are perhaps also instanced in prehistoric Aryan speech by the class of pronominal roots, Phrases take the place of compounds and of inflexions, and the same element may have an auxiliary value in certain connexions while retaining its full force in others, like, for instance, our own have. It is not easy to define the distinction between such phrase-collocations and the beginnings of agglutination ; yet the distinction itself ig in general clearly enough to be drawn (like that in French between donnerai and ai donné), when the whole habit of the language is well understood.

Such languages, constituting the small minority of human tongues, are wont to be called "isolating," 7.e., using each element by itself, in its integral form. All besides are "'agelutinative," or more or less compounded into words containing a formal part, an indicator of class- value. Here the differences, in kind and degree, are very great; the variety ranges from a scantiness hardly superior to Chinese isolation up to an intricacy compared with which Aryan structure is hardly fuller than Chinese. Some brief characterization of the various families of language in this respect will be given farther on, in connexion with their classification. The attempt is also made to classify the great mass of agglutinating tongues under different heads: those are ranked as simply "agelutinative " in which there is a

general conservation of the separate identity of root or stem on the one hand, and of formative element, suffix or prefix, on the other ; while the name "inflective," used in a higher and pregnant sense, is given to those that admit a superior fusion and integration of the two parts, to the disguise and loss of separate identity, and, yet more, with the development of an internal change as auxiliary to or as substitute for the original agglutination. But there is no term in linguistic science so uncertain of meaning, so arbitrary of application, so dependent on the idiosyncrasy of its user, as the term " inflective." Any language ought to have the right to be called inflective that has inflexion: that is, that not merely distinguishes parts of speech and roots and stems formally from one another, but also conjugates its verbs and declines its nouns; and the name is sometimes so used. If, again, it be strictly limited to signify the possession of inner Jlexion of roots and stems (as if simply agglutinated forms could be called "exflective "), it marks only a difference of degree of agglutination, and should be carefully used as so doing. As describing the fundamental and predominant character of language-structure, it belongs to only one family of languages, the Semitic, where most of the work of gram- matical distinction is done by internal changes of vowel, the origin of which thus far eludes all attempts at explana- tion. By perhaps the majority of students of language it is, as a generally descriptive title, restricted to that family and one other, the Indo-European or Aryan; but such a classification is not to be approved, for, in respect to this characteristic, Aryan speech ranks not with Semitic but with the great body of agglutinative tongues. To few of these can the name be altogether denied, since there is hardly a body of related dialects in existence that does

Agglu-

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not exhibit some items of “‘inflective” structure; the Aryan is only the one among them that has most to show. Out- side the Semitic, at any rate, one should not speak of inflective and non-inflective languages, but only of languages more inflective and less inflective.

To account for the great and striking differences of structure among human languages is beyond the power of the linguistic student, and will doubtless always continue so. Weare not likely to be able even to demonstrate a correlation of capacities, saying that a race which has done this and that in other departments of human activity might have been expected to form such and such a language. livery tongue represents the general outcome of the capa- city of a race as exerted in this particular direction, under the influence of historical circumstances which we can have no hope of tracing. There are striking apparent anomalies to be noted. The Chinese and the Egyptians have shown themselves to be among the most gifted races the earth has known ; but the Chinese tongue is of unsur- passed jejuneness, and the Egyptian, in point of structure, little better, while among the wild tribes of Africa and America we find tongues of every grade, up to a high one, or to the highest. This shows clearly enough that mental power is not measured by language-structure. But any other linguistic test would prove equally insufficient. On the whole, the value and rank of a language are determined by what its users have made it do. The reflex action of its speech on the mind and culture of a people is a theme of high interest, but of extreme difficulty, and apt to lead its investigators away into empty declamation ; taking everything together, its amount, as is shown by the instances already referred to, is but small. The question is simply one of the facilitation of work by the use of one set of tools rather than another; and a poor tool in skilful hands can do vastly better work than the best tool in unskilful hands—even as the ancient Egyptians, without steel or steam, turned out products which, both for colossal grandeur and for exquisite finish, are the despair of modern engineers and artists. In such a history of development as that of human speech a fortunate turn may lead to results of unforeseen value; the earlier steps determine the later in a degree quite beyond their own intrinsic importance. Everything in language depends upon habit and analogy ; and the formation of habit is a slow process,

while the habit once formed exercises a constraining as well as a guiding influence. Hence the persistency of

change from the first beginnings of human expression. Many of these separate lines we clearly see to converge and unite, as we follow them back into the past ; but whether they all ultimately converge to one point is a question quite beyond our power to answer. If in this immensity of time many languages have won so little, if everywhere language-growth has been so slow, then we can only differ as to whether it is reasonably certain, or probable, or only possible, that there should have been a considerable first period of human existence without tra- ditional speech, and a yet more cousiderable one before the fixation of so much as should leave abiding traces in its descendants, and that meanwhile the race should have multiplied and scattered into independent communities. And the mere possibility is enough to exclude all dogmatic assertion of the unity of origin of human speech, even assuming unity of origin of the human race. For to prove that identity by the still existing facts of language is utterly out of the question ; the metamorphosing effect of constant change has been too great to allow it. In point of fact, taking languages as they now exist, only those have been shown related which possess a common structure, or have together grown out of the more primitive radical stage, since structure proves itself a more constant and reliable evidence than material. And this is likely ever to be the case ; at any rate, to trace all the world's languages so far back toward their beginnings as to find in them evidences of identity is beyond the wildest hope. We must be con- tent with demonstrating for those beginnings a unity of kind as alike a body of formless roots. But, on the other hand, since this unity is really demonstrated, since all structure is the result of growth, and no degree of difference of structure, any more than of difference of material, refuses explanation as the result of discordant growth from identical beginnings, it is equally inadmissible to claim that the diversities of language prove it to have had different beginnings. That is to say, the question of the unity of speech, and yet more that of the unity of the race, is beyond the reach of the student of language; the best view he can attain is the hypothetical one, that, if the race is one, the beginnings of speech were perhaps one— but probably not, even then. This negative

conclusion is so clearly established as to leave no excuse for the still oft-repeated attempts to press language into service on either side of the controversy respecting human unity of race.

That all making and changing of language is by the Uncon- act of its speakers is too obvious to call for discussion. No ped other force capable of acting and of producing effects is St"

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work, The doctrine that language is an organism, growing uals.

language-structure : when a certain sum and kind of ex- pression is produced, and made to answer the purposes of expression, it remains the same by inertia; a shift of direction becomes of extreme difficulty. No other reason can at present be given why in historical time there has

Unity of most ancient recorded dialects.

been no marked development out of one grade of structure into another; but the fact no more shakes the linguistic scholar's belief in the growth of structure than the absence of new animal species worked out under his eyes shakes the confidence of the believer in animal development. The modifying causes and their modes of action are clearly seen, and there is no limit to the results of their action except what is imposed by circumstances.

It is in vain to attempt to use dates in language-history, to say when this or that step in development was taken, and how long a period it cost, especially now that the changed views as to the antiquity of man are making it probable that only a small part of the whole history is brought within the reach even of our deductions from the At any rate, for aught

origin of that we know or have reason to believe, all existing dialects

speech,

are equally old ; every one alike has the whole immeasur- able past of language-life behind it, has reached its present condition by advance along its own line of growth and

by its own inherent powers, exempt from the interference of those who use it, is simply an indefensible paradox. Every word that is uttered is so by an act of human will, at first in imitation of others, then more and more by a formed and controlling habit ; it is accessible to no change except by influences working in the speaker's mind, and leading him to make it otherwise. Not that he is aware of this, or directs his action knowingly to that end. The whole process is unconscious. If any implication of re- flective or intended action can be shown to inhere in any doctrine of linguistic science, it vitiates that doctrine. The attitude of the ordinary speaker towards his language is that of unreasoning acceptance; it seems to him that his names for things are their real names, and all others unintelligent nicknames ; he thinks himself to possess his speech by the same tenure as his sight or hearing; it is "natural" to him (or, if he reasons about it, he attributes it to a divine origin, as races beginning to philosophize are wont to ascribe their various social institutions to their

Dialectic varia- tion.

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gods); he knows nothing of its structure and relations ; it never occurs to him to find fault with it, or to deem it insufficient and add to or change it ; he is wholly unaware that it does change. He simply satisfies his social needs of communication by means of it; and if he has anything to express that is different from what has been expressed before, he takes the shortest way to a provision for the need; while any relaxation of the energy of utterance tends to a variation in the uttered combinations ; and thus changes come by his act, though without his knowledge. His sole object is, on the basis of what language he has, to make known his thought in the most convenient way to his fellow ; everything else follows with and from that. Human nature and circumstances being what they are, what follows actually is, as already shown, incessant growth and change. For it we have not to seek special disturbing causes in the history of the speakers, although such may come in to heighten and quicken the change ; we know that even

in a small community, on a narrow islet, cut off from all intercourse with other communities, the speech would grow different—as certainly, if not as rapidly, as anywhere in the world—and only by the action of its speakers : not that the speakers of a language act in unison and simultaneously to produce a given change. This must begin in an individual, or more or less accord- antly in a limited number of individuals, and spread from such example through the community. Initiation by one or a few, acceptance and adoption by the rest,—such is the necessary method of all linguistic change, and to be read as plainly in the facts of change now going on among ourselves as in those of former language. The doctrine of the inaccessibility of language to other action than that of its speakers does not imply a power in the individual speaker to create or alter anything in the common speech, any more than it implies his desire to do so. What he suggests by his example must be approved by the imitation of his fellows, in order to become language. The common speech is the common property, and no one person has any more power over it than another. If there are, for example, a thousand speakers of a certain dialect, each one wields in general a thousandth part of the force required to change it—with just so much more as may belong to his excess of influence over his fellows, due to recognized superiority of any kind on his part. His action is limited only by their assent ; but this is in effect a very narrow limitation, insuring the adoption of nothing that is not in near accordance with the already existing ; though it is also to be noted that he is as little apt to strike off into startling change as they to allow it ; since the governing power of already formed habits of speech is as strong in him as inthem. That change to which the existing habits naturally lead is easy to bring about ; any other is practically impossible. It is this tendency on the part of the collective speakers of a language to approve or reject a proposed change according to its conformity with their already subsisting usages that we are accustomed to call by the fanciful name "the genius of a language."

On the relation of the part played in language-change by the individual to that by the community, in combina- tion with the inevitableness of change, rests the explana- tion of the dialectic variation of language. If language were stable there would of course be no divarication 3 but since it is always varying, and by items of difference that proceed from individuals and become general by diffusion, there can be uniformity of change only so far

as diffu- Slon goes, or as the influences of communication extend. Within the limits of a single community, small or large, whatever change arises spreads gradually to all, and so becomes part of the general speech ; but let that com- munity become divided into two (or more) parts, and then

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the changes arising in either part do not spread to the other, and there begins to appear a difference in linguistic usage between them. It is at first slight, even to insig- nificance ; not greater than exists between the dialects of different localities or ranks or occupations in the same community, without detriment to the general unity of speech. This unity, namely, rests solely on mutual intel- ligibility, and is compatible with no small amount of individual and class difference, in vocabulary, in grammar, and in pronunciation ; indeed, in the strictest sense, each individual has a dialect of his own, different from that of every other, even as he has a handwriting, a countenance, a character of his own. And every item of change, as it takes place, must have its season of existence as a local or class or trade peculiarity, before it gains universal currency ; some of them linger long in that condition, or never emerge from it. All these differences in the speech of different sub-communities within the same community are essentially dialectic ; they differ not in kind, but only in degree, from those which separate the best-marked dialects ; they are kept down by general communication within the limit of general mutual intelligibility. Where that restraining influence ceases, the limit is gradually but surely overpassed, and real dialects are the result, From what we know of the life of language we can say posi- tively that continued uniformity of speech without con- tinued community is not practicable. If it were possible to divide artificially, by an impassable chasm or wall, a people one for ages, and continuing to occupy the same seats, the language of the divided parts would at once begin to be dialectically different; and after sufficient time had elapsed, each would have become unintelligible to the other. That is to say, whenever a community of uniform speech breaks up, its speech breaks up also ; nor do we know of any other cause of dialectic diversity.

In applying this explanation of dialectic growth we have to allow for modifying circumstances of various nature, which alter not indeed the fact

but the rate and kind of divarication. Some languages grow and change much more rapidly than others, with a corresponding effect upon divarication, since this is but a result of dis- cordant growth. Usually, when there is division of a community, the parts get into different external circum- stances, come in contact or mingle with different nelgh- bouring communities, and the like; and this quickens and increases their divergence of speech. But the modify- ing factor of by far the highest importance, here as elsewhere in the history of language, is civilization. Civilization in its higher forms so multiplies the forces of communication as to render it possible that the widely- divided parts of one people, living in circumstances and under institutions of very different character, should yet maintain a substantial oneness of speech ; of this there is no more striking example than the two great divisions of the English-speaking people on opposite sides of the Atlantic. On the other hand, a savage people cannot spread even a little without dialectic disunity ; there are abundant examples to be met with now of mutually un- intelligible speech between the smallest subdivisions of a race of obviously kindred tongue—as the different clusters of huts on the same coral islet. It is with linguistic unity precisely as it is with political unity, and for the same reasons. Before the attainment of civilization the human race, whether proceeding from one centre of dispersion or from several, was spread over the earth in a state of utter disintegration ; but every centre of civilization becomes also a centre of integration ; its influences make for unity of speech as of all other social institutions. Since culture has become incontestably the dominant power in human history, the unifying forces in language have also been

stronger than the diversifying ; and with culture at its | full height, and spread equally to every land and race, one universal language, like one universal community, is not an absurdity or theoretic impossibility, but only a Utopian or millennial dream.

Dialectic variation is thus simply a consequence of the movements of population. As the original human race or races, so the divisions or communities of later formation, from point to point through the whole life of

man on the earth, have spread and separated, have jostled and inter- fered, have conquered and exterminated or mingled and absorbed ; and their speech has been affected accordingly. Hence something of these movements can be read in the present condition of languages, as in a faithful though obscure record—more, doubtless, than can be read in any other way, however little it may be when viewed absolutely. Dialectic resemblances point inevitably back to an earlier unity of speech, and hence of community ; from what we know of the history of speech, they are not to be accounted for in any other way. The longer the separation that has produced the diversity, the greater its degree. With every generation, the amount of accordance decreases and that of discordance increases ; the common origin of the dialects is at first palpable, then evident on examination, then to be made out by skilled research, then perhaps no longer demonstrable at all; for there is plainly no limit to the possible divergence. So long, now, as any evidence of original unity is discoverable we call the languages "related dialects," and combine them into a "family." The term "family" simply signifies a group of languages which the evidence thus far at command, as estimated by us, leads us to regard as descended by the ordinary pro- cesses of dialectic divarication from one original tongue. That it does not imply a denial of the possibility of wider relationship is obvious from what has been said above. That there is abundant room for error in the classification represented by it is also clear, since we may take purely accidental resemblances, or the results of borrowing, for evidence of common descent, or may overlook or wrongly estimate real evidences, which more study and improved method will bring to light. Grouping into families is nothing more than the best classification attainable at a given stage in the progress of linguistic science ; it is in no small part provisional only, and is always held liable to modification, even sweeping, by the results of further research. Of some families we can follow the history by external evidences a great way back into the past; their structure is so highly developed as to be traced with con- fidence everywhere ; and their territory is well within our reach: such we regard with the highest degree of con- fidence, hardly allowing for more than the possibility that some other dialect, or group, or now-accepted family even, may sometime prove its right to be added on. But these are the rare exceptions; in the great majority of cases we have only the languages as they now exist, and in more or less scanty collections, of every degree of trust- worthiness ; and even their first

grouping is tentative and incomplete, and involves an adjournment of deeper ques- tions to the day of more light. To complete and perfect the work of classification by relationship, or the establish- ment of families and their subdivisions, is the first object of the comparative study of languages. No other classifi- cation has a value in the least comparable with it; that by grade of structure is a mere recreation, leading to no- thing ; that by absolute worth is of no account whatever, at any rate in the present state of our knowledge. On genetic relationship, in the first place, is founded all investi- gation of the historical development of languages ; since

it isin the main the comparison of related dialects, even in the case of families having a long recorded history, and

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elsewhere only that, that gives us knowledge of their earlier condition, and enables us to trace the lines of change. In the second place, and yet more obviously, with this classification is connected all that language has to teach as to the affinities of human races ; whatever aid linguistic science renders to ethnology rests upon the proved relationships of human tongues.

That a classification of languages, to which we have Recapit- now to proceed, is not equivalent to a classification of ulation.

races, and why this is so, is evident enough from the principles which have been brought out by our whole discussion of languages, and which, in their bearing upon this particular point, may well be recapitulated here. No language is a race-characteristic, determined by the special endowments of a race; all languages are of the nature of institutions, parallel products of powers common to all mankinid—the powers, namely, involved in the application of the fittest available means to securing the common end of communication. Hence they are indefinitely trans- ferable, like other institutions—like religions, arts, forms of social organization, and so on—under the constraining force of circumstances. As an individual can learn any language, foreign as well as ancestral, if it be put in his way, so also a community, which in respect to such a matter is only an aggregate of individuals. Accordingly, as individuals of very various race are often found in one community, speaking together one tongue, and utterly ignorant of

any other, so there are found great communi- ties of various descent, speaking the dialects of one common tongue, which at some period historical circumstances have imposed upon them. The conspicuous example, which comes into every one's mind when this subject is discussed, is that of the Romanic countries of southern Europe, all using dialects of a language which, 2500 years ago, was itself the insignificant dialect of a small district in central Italy ; but this is only the most important and striking of a whole class of similar facts. Such are the results of the contact and mixture of races and languages. If language- history were limited to growth and divarication, and race- history to spread and dispersion, it would be a compara- tively easy task to trace both backward toward their origin ; as the case is, the confusion is inextricable aud hopeless. Mixture of race and mixture of speech are coincident and connected processes ; the latter never takes place without something of the former; but the one is not at all a measure of the other, because circumstances may give to the speech of the one element of population a greatly disproportionate preponderance. Thus, there is left in French only an insignificant trace of the Celtic dialects of the predominant race-constituent of the French people ; French is the speech of the Latin conquerors of Gaul, mixed perceptibly with that of its later Frankish conquerors ; it was adopted in its integrity by the Norse conquerors of a part of the land, then brought into Britain by the same Norsemen in the course of their further con- quests, this time only as an element of mixture, and thence carried with English speech to America, to be the language of a still further mixed community. Almost every possible phase of language-mixture is traceable in the history of the abundant words of Latin origin used by American negroes. What events of this character took place in pre- historic time we shall never be able to tell. If any one chooses to assert the possibility that even the completely isolated dialect of the little Basque community may have been derived by the Iberian race from an_ intrusive minority as small as that which made the Celts of Gaul speakers of Latin, we should have to admit it as a possibility —yet without detriment to the value of the dialect as indicating the isolated race-position of its speakers. In strictness, language is never a proof of race, AVIIL. — 98

Classifi- cation.

Aryan.

Semitie.

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either in an individual or in a community; it is only a probable indication of race, in the absence of more authori- tative opposing indications ; it is one evidence, to be com- bined with others, in the approach towards a solution of the confessedly insoluble problems of human history. But Wwe must notice, as a most important circumstance, that its degree of probability is greatest where its aid is most needed, in prehistoric periods and among uncultivated races ; since it is mainly civilization that gives to language a propagative force disproportionate to the number of its speakers. On the whole, the contributions of language to ethnology are practically far greater in amount and more distinct than those derived from any

other source.

The genetical classification of languages, then, is to be taken for just what it attempts to be, and no more: prim- arily as a classification of languages only ; but secondarily as casting light, in varying manner and degree, on move- ments of community, which in their turn depend more or less upon movements of races. It is what the fates of men have left to represent the tongues of men—a record im- perfect even to fragmentariness. Many a family once as important as some of those here set down has perhaps been wiped out of existence, or is left only in an incon- spicuous fragment; one and another has perhaps been extended far beyond the limits of the race that shaped it,—which, we can never tell to our satisfaction.

We begin with the families of highest importance and nearest to ourselves.

1. Aryan (Indo-European, Indo-Germanic) Family.—To this family belongs incontestably the first place, and for many reasons : the historical position of the peoples speaking its dialects, who have now long been the leaders in the world's history ; the abundance and variety and merit of its literatures, ancient and modern, which, especially the modern, are wholly unapproached by those of any other division of mankind ; the period covered by its records, hardly exceeded in duration by any other; and, most of all, the great variety and richness of its development. These advantages

make of it an illustration of the history of human speech with which no other family can bear a moment's comparison as to value, however important various other families may be in their bearing on one and another point or department of history, and however necessary the combination of the testimony of all to a solution of the problems involved in speech. These advantages have made Aryan language the training-ground of comparative philology, and its study will always remain the leading branch of that science. Many inatters of importance in its history have been brought up and used as illus- trations in the preceding discussion ; but as its constitution and ascertained development call for a fuller and more systematie expost- tion than they have found here, a special section is devoted to the subject (see p. 781 sq. below).

2. Semitic Fumily.—This family also is beyond all question the second in importance, on account of the part which its peoples (Hebrews, Pheenicians, Assyrians, Syrians, Arabs, Abyssinians, &c.) have played in history, and of the rank of its literatures. For a special treatment of it see Semitic. Some of the peculiarities of the language have been alluded to above ; in the monotony and rigidity of its triliteral' roots, and in the extended use which it makes of internal vowel-change ("inflexion" in the special sense of that term) for the purposes of grammatical distinction, it is more peculiar and unlike all the other known families of language than these are unlike one another. There are, and perhaps will always be, those to whom the peculiarities just mentioned will seem original ; but if the views of language and its history taken above are in the main true, then that opinion is untenable ; Semitic language must have grown into its present forms out of beginnings accordant in kind, if not identical in substance, with those of other families ; and the only question remaining to be solved is, through what processes and under what governing tendencies Semitic speech should have arrived at its present state. And with this solution 1s most obviously and incontestably bound up that of the other interesting and much discussed question, whether the Semitic family can be shown to be related with other families, especially with our own Aryan. To some the possession in common of grammatical gender, or of the classification of objects in gencral as masculine and feminine, is of itself enough to prove such relation- ship ; but, though the fact is a striking one, and of no small Importance as an indication, this degree of value can by no means be

attributed to it in the present state of our knowledge—any more than to any other single item of structure among the infinite varicty

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of such, distributed among the multitude of human tongues, Many others compare the Semitic and Aryan "roots" with one another, and believe themselves to find there numerous indications of identity of material and signification ; but these also must pass for insufficient, until it shall prove possible by their aid to work out an acceptable theory of how Semitic structure should have grown out of such radical elements as underlie Aryan structure, or out of the accordant initial products of a structural growth that after- wards diverged into two so discordant forms. To show that, both the material and the method have been hitherto wanting, and any confident decision is at least premature ; but present probabilities are strongly against the solubility of the question. While many general considerations favour the ultimate unity of these two great civilized and civilizing white races of neighbouring homes, and no discordance of speech (as was shown above) can ever be made to prove their diversity of origin, it seems in a high degree unlikely that the evidence of speech will ever be made to prove them one. As regards the often-claimed relationship of Semitic with Hamitic language, see the following section.

3. Hamitic Family.—The is due to a single one of its members, the Egyptian ; in all other respects it is quite insignificant. It oceupies the north-eastern corner of Africa, with the border-lands of that continent stretching westward along the whole shore of the Mediterranean, and south- ward to beyond the equator. It falls into three principal divisions : (1) the ancient Egyptian, with its descendant, the more modern Coptic (itself now for some centuries extinct ; see Ecyrt, Corts) ; (2) the Libyan or Berber languages of northern Africa ; (8) the Ethiopic languages of eastern Africa. Its situation thus plainly suggests the theory of its intrusion from Asia, across the isthmus of Suez, and its gradual spread from that point ; and the theory is strongly favoured by the physical character of the Hamites, and the historical position especially of the Egyptians, so strikingly different from that of the African races in general. Linguistic evidences of the relationship of Hamite with Semite have also been sought, and by many believed to be

found; but the mainte- nance of the two families in their separateness is an indication that those evidences have not yet been accepted as satisfactory ; and such is indeed the case. The Egyptian is a language of extreme simplicity of structure, almost of no structure at all. Its radical words are partly monosylabic, partly of more than one syllable, but not in the latter case any more than in the former showing traceable signs of extension by formative processes from simpler elements. It has no derivative apparatus by which noun-stems are made from roots ; the root is the stem likewise ; there is nothing that can be properly called either declension or conjugation ; and the same pronominal particles or suffixes have now a subjective value, indicating use as a verb, and now a possessive, indicating use asanoun, There is no niethod known to linguistic science by which the relationship of such a tongue as this with the highly and peculiarly inflective Semitic can be shown, short of a thorough working out of the history of development of each family taken by itself, and a retracing in some measure of the steps by which each should have arrived at its present position from a common starting- point ; and this has by no means been donc. In short, the problem of the relation of Semitic with Hamitic, not less than with Aryan, depends upon that of Semitic growth, and the two must be solved together. There are striking correspondences between the pro- nouns of the two families, sueh as, if supported by evidences from other parts of their material, would be taken as signs of relation- ship ; but, in the absence of such support, they are not to be relied upon, not till it can be shown to be possible that two languages could grow to be so different in all other respects as are Egyptian and Hebrew, and yet retain by inheritance corresponding pronouns. And the possession of grammatical gender by Aryan, Semitic, and Hamitic speech, and by them almost alone, among all human languages, though an extremely noteworthy fact, is (as was pointed out above) in the present condition of linguistic science quite too weak a basis for a belief in the original identity of the three families,

Egyptian is limited to the delta and valley of the Nile, and is the only Hamitic language which has ancient records ; of the others the existing forms alone are known.

The Libyan or Berber division of the family occupies the inhabit- able part of northern Africa, so far as it has not been displaced by intrusive tongues

of other connexion—in later times the Arabie, which since the Mohammedan conquest has been the cultivated tongue of the Mediterranean coast, while the earlier Vandal, Latin, and Punic have disappeared, except in the traces they may have left in Berber dialectic speech. The principal dialects are the Kabyle, the Shilha, and the Tuarek or Tamashek, corresponding nearly to the ancient Numidian, Mauretanian, and Gztulian respectively. Some authorities add the Haussa, from farther south, while by others this is considered a Semitic, and by yet others a negro tongue,

The third or Ethiopic division includes as its chief members the Beja or Bisharin, the Saho, the Dankali, the Somali, and the more

prominent importance of this family Hamitie,

South- 4. Monosyllabic or South-ceastern Asiatic Family.—This body of | is, lacking that higher degree of integration which issues in internal eastern languages may well enough be the next taken up; and here again | change. Whether this degree is wholly wanting in Finnish and Asiatie. (as was the case with the preceding family) on account of the | Hungarian is made a question; at any rate, the languages named prominent importance of one of its dialects and of the people | have uo reason to envy the tongues technically called "inflective." speaking it—the Chinese people and language. The territory of | Of a value not inferior to that of inflective characteristics is one the family includes the whole south-eastern corner of Asia: China | that belongs to all the Ural-Altaic tongues, in varying measure and on the north-east, Farther India in the south, and the high plateau | form, and helps to bind them together into a single family—the of Tibet, with the neighbouring Himalayan regions, to the west- | harmonic sequence of vowels, namely, as between root and endings, ward. The ultimate unity of all these languages rests chiefly upon | or a modification of the vowels of the endings to agree with that the evidence of their form, as being all alike essentially mono- | of the root or its final syllable. syllabic and isolating, or destitute of formal structure ; the material While the physical race-characteristics known as Mongolian are correspondences among them, of accordant words, are not sufficient | wanting in the speakers of the western dialects of this family, they to prove them related.

The Chinese itself can be followed up, in | are conspicuously present in the people of Japan and Corea; and contemporary records, to a period not far from 2000 B.c., and the | hence the tendency of scholars to endeavour to connect the languages language, the people, and their institutions, are then already in | of the two latter countries, since they also are of agglutinative struc- the main what they have ever since continued to be (see CHINA); | ture (sce JAPAN and CorEA), with the family now under treatment, the other leading tongues come into view much later, as they | as also with one another. Neither connexion, however, can at: receive culture and religion from China on the one hand (the | present be regarded as proved. ‘ ; Anamites), or from India on the other (the Tibetans, Burmese, Other languages of north-eastern Asia, too little known to group, Siamese) ; and the territory includes great numbers of wild tribes | and too unimportant to treat as separate families, may be mentioned unknown until our own times, whose race-relations and language- | here by way of appendix to their neighbours of the most diversified relations are as yet very obscure. Current opinion tends to regard | and widespread Asiatic family. They are the Aino, of Yezo and the Anainites, Peguans, and Cambodians as forming a more nearly | the Kurile Islands with part of the neighbouring coast; the related group or division of the family, and as having been the | Kamchatkan; and the Yukagir and Tchuktchi, of the extreme earlier population of Farther India, in part dispossessed and | north-east. | ; driven forward by the later intrusion from the north of Siamese The opinion was recently held by many scholars that the agglutin- and Burmese, of whom the former are more nearly related | ative dialects—Accadian, Sumirian, &c.—of the presumed founders to the Chinese, and the latter to the Tibetans; but these group- | of Mesopotainian culture and teachers of the Assyrian Semites (see ings rest as yet upon too slender evidence to be accepted with | Banytonta) belonged to the Ural-Altaic family, and specifically confidence. — to its Finno-Hungarian branch; but it is believed to be now The character of the languages of this family, especially as in- | generally abandoned. The mere possession of an agglutinative stanced by its most important inember, the Cea has oe pretty Se ae cannot be taken as proving anything in the’ way of rth in the general discussions above. They are languages | relationship. — We iter ia tay, there is not demonstrable in any of their 6. Dravidian or South-Indian Family.—This is an important Dravi- words a formative part, limiting the word, along with others simi- | body of nearly and clearly

related tongues, spoken by about dian. larly characterized, to a certain office or set of offices in the formation | 50,000,000 people, doubtless representing the main population of the sentence. That the words are ultimate roots, come down | of all India at the time when the intrusive Aryan tribes broke in from the first period of language-making, we have no reason what- | from the north-west, and still filling most of the southern peninsula, ever to believe ; and they may possibly have passed through pro- | the Deccan, together with part of Ceylon. In an earlier article cesses of growth which equipped them with some scanty supply of (see INDIA) the names of the dialects have been given, with indica- forms: but no evidence to that effect has yet been produced. The tion of their locality and relative importance, and with some se Our indications relied on to show an earlier polysyllabism in the family | of their Icading features. They are languages of a high erade of (though already in Chinese reduced to monosyllabism before the | structure, and of great power and euphony ; and the principal li carliest historical appearance of the language, some 4000 years ago) have enjoyed a long eultivation, founded on that of the Sanskrit. are the comparatively recent loss of certain final mutes in Chinese As they obviously have no Aryan affinities, the attempt has been words, and the presence ou a considerable scale in Tibetan spelling made to connect them also with the Ural-Altaic or Turanian family, of added initial and final consonants, now silent in the literary | but altogether without success, although there is nothing in their dialect, but claimed to be still uttered in some parts of the country. style of structure that should make such connexion impossible. If the theory connecting these phenomena be established, Not all the tribes that. make up the non-Aryan population of the Tibetan will approve itself to be by far the most primitive India speak Dravidian dialects. The Santals and certain ae of the dialects of the family, furnishing the key to the history | wild tribes appear to be of another lineage, and are now generally of the rest. known as Kolarian. ; ae a For further details respecting the various tongues of the mono- 7. AMalay-Polynesian Family. —The islands, ee an — er; at syllabic family, the articles on the different divisions of its territory | lying off the south-eastern coast of Asia and those ee over Pol y: (BuRMAH, CHINA, SIAM, TIBET, &c.) may be consulted. The lan- | the Pacific, all the way from Madagascar to Easter Island, are nesian, guages all alike show an addition to the resources of distinction | filled with their own peculiar families of

languages, standing in no possessed by languages in general, in the use of tones: that is to | known relationship with those of the mainland. a le say, words of which the alphabetic elements are the same differ in | one among them is the great Malay-Polynesian aes y: a b alls meaning according as they are uttered in a higher or a lower tone, | into two principal divisions, Malayan and Polynesian. oe with the rising or the falling inflexion, and so on. By this means, | includes, besides the Malay proper (see MALAys), which enue for example 'the monosyllabic elements of the literary Chinese, | the Malaccan peninsula (yet doubtless not as original home o 1e numbering but 500 as we should write them, are raised to the | division, but by immigration from the islands), the languages also number of about 1500 words. ' of Sumatra, Java, Borneo, &c., of the Philippine Islands, of ae eee Ural 5. Ural-Altaic (Scythian, Turanian) Family.— China and Tibet | and of Madagascar, together with the coasts of Celebes and other Altaie are bordered on the north and west by the eastern brauches of | islands occupied in the interior by Papuans. The Polynesian division

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inland Galla; the first two lying along the Red Sea north of Semitic Abyssinia, the others south of it, to the equator. By some authoritics (Lepsius, Bleek) there is added to the Haimitic family as a fourth division a group from extreme southern Africa, the Hottentot and Bushman languages. The ground of this classifica- tion is the possession by the Hottentot of the distinction of gram- matical gender, and even its designation by signs closely corre- sponding to those used in the Ethiopic division. Others deny the sufficiency of this evidence, and rank the Hottentot as a separate group of African dialects, adding to it provisionally the Bushman, until better knowledge of the latter shall show whether it is or is not a group by itself. Ifthe Hottentot be Hamitic, we shall have to suppose it cut off at a very remote period from the rest of the family, and forced gradually southward, while all the time suffering mixture both of speech and of blood with the negro races, until the physical constitution of its speakers has become completely metaniorphosed, and of its original speech no signs are left save those referred to above ; and while such exceptional phon- etic peculiarities have been worked out as the use of the clicks or clucking sounds (see HOTTENTOTS): and this must be regarded as at least extremely difficult.

another immense family, which stretches through central and

northern Asia into Europe, overlapping the European border in Turkey, and reaching across it in Russia and Scandinavia to the very shore of the Atlantic. Usage has not so definitely determined as in the case of most other families by what name it shall be called ; Turanian is perhaps the commonest appellation, but also the most objectionable. Five principal branches are generally reckoned as composing the family. The two easternmost are the Tungusian, with the Manchu for its principal division, and the Mongol (see Mowneots). Of these two the language is exceedingly simple in structure, being raised but little above the formlessness of the Chinese. The three others are: the Turkish or Tatar, the dia- lects of which reach from the mouth of the Lena (Yakut) to Turkey in Europe ; the Samoyed, from the Altai down to the arctic shore of Asia, and along this to the White Sea—an unimportant congeries of barbarous tribes ; and the Finno-Hungarian, including the tongues of the two cultivated peoples from which it takes its name, and also those of a great part of the population of northern and central Russia, to beyond the Ural Mountains, and finally the Lappish, of northern Scandinavia. The nearer relation of the Samoyed is with the Finno-Hungarian. The Turkish is a type of a well-developed language of purely agglutinative structure: that

includes most of the tongues of the remaining scattered groups of

Aus- tralian.

Papuan.

Cau- casian.

Basque.

Etrus- can,

Bantu.

islands, and that of New Zealand. Probably to these are to be added, as a third division, the Melanesian dialects of the Melanesian Archi- pelago, of which both the physical and the linguistic peculiarities would in that case be ascribed to mixture with the black Papuan races, All these languages are extremely simple in phonetic form, and of a low grade of structure, the Polynesian branch being in both respects the lowest, and some of the Malayan dialects having reached a development considerably more advanced. The radical elements are much oftener of two syllables than of one, and reduplication plays an important part in their extension and variation. Malay literature goes back as far as to the 13th century, and there are Javan records even from the early centuries of our era, the result of religion and culture introduced into that island from Brahmanic India ; but none of these have yet been utilized, as they doubtless in time will be, for tracing out the special laws of historical develop- ment prevailing in the family. A

8. Other Occanie Fanilies.—At least two other families, un- connecte with the preceding and with one another, are found among the Pacific islands, and only there. The continental island of Australia, with its dependency Tasmania (where, however, the native tongue has now become extinct), has its own body of probably related dialects, as its own physical type. They have been but imperfectly investigated, their importance, except to the professed student of language, being nothing ; but they are not destitute of a rude agglutinative structure of their own. Still Jess known are the Papuan or Negrito languages, belonging to the black race with frizzled hair inhabiting most of New Guinea, and found also in the interior of some of the other islands, having been driven from the coasts by superior intruders of the Malay race.

9. Caueasian Languages.—Of the existing languages of Asia there remain to be mentioned only those of the Caucasian moun- tains and highlands, between the Black and Caspian Seas, pressed upon the north by Slavonians and Turks, upon the south by Armenians and Kurds and Turks. Its situation makes of the Caucasus a natural eddy in all movements of emigration between Asia and Europe ; and its linguistic condition is as if remnants of

many families otherwise extinct had been stranded and preserved there. The dialects north of the principal range—Circassian, Mitsjeghian, Lesghian, &c.—have not been proved to be related either to one another or to those of the south. Among the latter, the Georgian is much the most widespread and important (see GEORGIA), and, alone among them all, possesses a literature. The Caucasian dialects present many exceptional and difficult features, and are in great part of so high a grade of structure as to have been allowed the epithet inflective by those who attach special importance to the distinction thus expressed.

10. Remnants of Families in Europe. —The Basque people of the western Pyrenees, at the angle of the Bay of Biscay, are shown by their speech to be an isolated remnant of some race which was doubtless once much more widely spread, but has now everywhere else lost its separate identity ; as such it is of extreme interest to the ethnologist. The Basque language appears to be unrelated to any other on earth. It is of a very highly agglutinative structure, being equalled in intricacy of combination only by a part of the American dialects. Limited as it is in territory, it falls into a number of well-marked dialects, so that it also may not be refused the name of a " fainily."

The only other case of the kind worth noting is that of the Etruscan language of northern central Italy, which long ago became extinct, in consequence of the conquest and absorption of Etruria by Rome, but which stil] exists in numerous brief inscrip- tions (see ETRURIA). Many attempts have been made to connect the language with other families, and it has even quite recently been pronounced Aryan or Indo-European, of the Italican branch, by scholars of high Tauk ; yet it is altogether likely to be finally acknowledged, like the Basque, as an isolated fragment.

In order to complete this review of the languages of the Old World it only remains to notice those of Africa which have not been already mentioned. They are grouped under two heads : the languages of the south and those of the centre of the continent.

ll. South-African or Bantu Family.—This is a very extensive and distinctly marked family, occupying (except the Hottentot and Bushman territory) the whole southern peninsula of the conti- nent from some degrees north of the

equator. It has been already partly described under KAFFRARIA, and will be treatcd more in detail under the head of Zu). It is held apart from all other known families of language by a single prominent characteristic

‘of physical type as well as of speech in the central

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The pronominal determinants of the verb, both subject and object, also come before it; but the determinants of mode of action, as causative, &c., are mostly suffixed. The language in general is rich in the means of formal distinction. Those dialects which border on the Hottentots have, apparently by derivation from the latter, the clicks or clucking-sounds which form a conspicuous part of the Hottentot spoken alphabet. a 12. Central African Languages. —The remaining

the Bantu on the south and the Hamitic on the east and north, They are by no means to be called a family, but rathera great mass of dialects, numbering by hundreds, of varying structure, as to the relations of which there is great discordance of opinion even among the most recent and competent authorities. It is no place here to enter into the vexed questions of African linguistics, or even to report the varying views upon the subject ; that would require a space wholly disproportioned to the iinportance of African speech in the general sum of human language. There is no small variety belt ; and, partly upon the evidence of lighter tint and apparently higher endowment, certain races are set off and madca separate division of; such is the Nuba-Fulah division of F. Miller, rejected by Lepsius. The latter regarded all the varicties of physical and linguistic character in the central belt as due to mixture between pure Africans of the south and Hamites of the north and east ; but this is at present an hypothesis only, and a very improbable one, since it implies modes and results of mixture to which no analogies are quotable from languagcs whose history is known ; nor does it appear at all probable that the collision of two races and types of speech should produce such an immense and diverse body of trans- itional types. It is far from impossible that the present promi- nence of the South-African or Bantu family may be secondary, due to the grcat expansion under favouring circumstances of a race once having no more importance than belongs now to many of the Central-African races, and speaking a tongue which differed

from theirs only as theirs differed from one another, None of the Central-African languages is a prefix-language in the same degree as the Bantu, and in many of them prefixes play no greater part than in the world's languages in general ; others show special forms or traces of the prefix-structure ; and some have features of an extraordinary character, hardly to be paralleled elsewhere. One group in the east (Oigob, &c.) has a gender distinction, involving that of sex, but really founded on telative power and dignity: things disparaged, including women, are put in one class ; things extolled, including men, are put in the other. This is perhaps the most significant hint anywhere to be found of howa gender- distinction like that in our own Aryan languages, which we usually regard as being essentially a distinction of sex, while in fact it only includes such, may have arisen. Common among the African languages, as among many other families, especially the Ameri- can, is a generic distinction between animate beings and inanimate things.

13. American Languages.—With these the case is closely the Ameri- same as with the Central-African languages: there is an immense can,

number of dialects, of greatly varied structure, of which as yet even the nearer groupings are only in part made out, while the grade and kind of relationship between the groups, if such there exist, is wholly unclear. Some general statements respecting Amcrican languages have been given under AMERICA, and a detailed list and classification of them in the article INDIANS; hence it is un- necessary to go over the subject again in this place. What we most need to note is the very narrow limitation of our present knowledge. Even among neighbouring families like the Algonquin, Iroquois, and Dakota, whose agreement in style of structure (poly-synthetic), taken in connexion with the accordant race-type of their speakers, forbids us to regard them as ultiinately different, no material correspondence, agreement in words and meanings, is to be traced ; and there are in America all the degrees of polysynthetism, down to the lowest, and even to its entire absence. Such being the case, it ought to be evident to every one accustomed to deal with this class of subjects that all attempts to connect American languages as a body with languages of the Old World are and must be fruitless ; in fact, all discussions of the matter are at present

unscientific, and are tolerably certain to continue so through all time to come.

Literatwre.—Many of the theoretic points discussed above are treated by the writer with more fulness in his Language and the Study of Language (1867) and Life and Growth of Language (1875). Other English works to consult are M. Miiller's Lectures on the Science of Language; Farrar's Chapters on Language ; Wedgwood's Origin of Language; Sayce's Principles of Philology and Introduction to the Science of Language, &c. In German, see Paul's Principien der Sprachge- schichte (Halle, 1880) ; Delbriick's Finleitung in das Sprachstudium (Leipsic, 1880; there is also an English version); Schleicher's Deutsche Sprache; also the works of W. von Humboldt and of H.Steinthal. As to the classification and relation- ships of languages, sce Hovelacque's La Linguistique (Paris, 1876), and F. Miiller's Grundriss der Sprachwissenschajt (Vienna, still in progress). As to the – history of the study, see Lersch's Sprachphilosophie der Alten (1840); Stein- thal's Geschichte der Sprachwissenschaft bei den Griechen und Romern (1868) ;

Benfey's Geschichte der Sprachwissenschaft und Orientalischen Philologie in Deutschland (1869). (W. D. W.)

languages of Central Africa form a broad band across the centre of the continent, between African,

Histor- ical sketch.

Bopp aud J. Grimm.

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PART IL—COMPARATIVE PHILOLOGY OF THE ARYAN LANGUAGES.

The study of Aryan comparative philology has from its outset necessarily been in close connexion with the study of Sanskrit, a language unparalleled amongst its cognates in antiquity and distinctness of structure, and

consequently the natural basis of comparison in this field. It is there- fore not to be wondered at that we find no clear views of the mutual relationship of the individual members of the Aryan family or their position with regard to other lan- guages until Sanskrit began to attract the attention of European philologists, or that the introduction of Sanskrit as an object of study was closely followed by the discovery of the original community of a vast range of languages and

dialects hitherto not brought into connexion at all, or only'

made the objects of baseless speculations. We meet with the first clear conception of this idea of an Indo-European community of languages in the distinguished English scholar Sir William Jones, who, as early as 1786, expressed himself as follows: "The Sanskrit language, whatever may be its antiquity, is of wonderful structure; more perfect than the Greek, more copious than the Latin, and more exquisitely refined than either, yet bearing to both of them a stronger affinity, both in the roots of verbs and in the forms of grammar, than could have been produced by accident ; so strong that no philologer could examine all the three without believing them to have sprung from some common source which, perhaps, no longer exists. There is a similar reason, though not quite so forcible, for supposing that both the Gothic and the Celtic, though blended with a different idiom, had the same origin with the Sanskrit."! But neither Sir William Jones nor any of his older contemporaries who had arrived at similar con- clusions ever raised this important discovery from a brilliant apercu into a valid scientific theory through a detailed and systematic comparison of the languages in question. To have achieved this is the undoubted merit of the German, Franz Borr (q.v.), the founder of scientific philo- logy of the Aryan languages, and subsequently through this example also the founder of comparative philology in general, Next to him Jacob Grimm (q.v.) must be men- tioned here as the father of historical grammar. The first part of his famous Deutsche Grammatik appeared in 1819, three years after Bopp had published his first epoch-making book, Ueber das Conjugationssystem der Sanskritsprache. Bopp's results were here at once utilized, yet Grimm's whole system was entirely independent of that of Bopp, and had no doubt been worked out before Grimm knew of his illustrious predecessor. In fact, their scientific aims and inethods were totally different. Bopp's interest was

not concentrated in comparison as such, but chiefly inclined towards the explanation of the origin of gram- matical forms, and comparison to him was only a means of approaching that end.

In this more or less speculative turn of his interest Bopp showed himself the true son of a philosophical period when general linguistics received its characteristic stamp from the labours and endeavours of men like the two Schlegels and Wilhelm von Humboldt. Jacob Grimm's aims were of a less lofty character than those of Bopp, whose work, to his own mind, was crowned by his theory of the origin of inflexion through agglutination. In con- fining his task to a more limited range than the vast field of Aryan languages embraced in Bopp's researches, and thus fixing his attention on a group of idioms exhibiting a striking regularity in their mutual relationship, both where

1 For this quotation and the following historical sketch in general see Th. Benfey, Geschichte der Sprachwissenschaft, p. 438, Munich, 1869, and especially B. Delbriick, Zntroduction to the Study of Lan- guage, p. 1, Leipsic, 1882 (a second German edition appeared in 1884).

they coincide and where they differ, he made it his foremost object to investigate and illustrate the continuous progress, subject to definite laws, by which these languages had been developed from their common source. He thus raised the hitherto neglected study of the development of sounds to an equal level with the study of grammatical forms, which had so far almost exclusively absorbed all the interest of linguistic research. Grimm's discovery of the so-called "Lautverschiebung," or Law of the Permutation of Conson- ants in the Teutonic languages (which, however, had been partly found and proclaimed before Grimm by the Danish scholar Rask), became especially important as a stimulus for further investigation in this line. Grimm's influence on comparative philology (which is secondary only to that of Bopp, although he was never a comparative philologist in the sense that Bopp was, and did not always derive the benefit from Bopp's works which they might have afforded him) is clearly traceable in the work of Bopp's successors, amongst whom Friedrich August Pott is universally judged to hold the foremost rank. In his great work, Etymologische Forschungen auf dem Gebiete der indo-germanischen Sprachen, mut

besonderem Bezug auf die Lautumwandlung im Sans- krit, Grvechischen, Lateinischen, Littauischen, und Gothischen (Lemgo, 1833-36), we find Indo-Germanic etymology for the first time based on a scientific investigation of general Indo-Germanic phonology. Amongst Pott's contemporaries

Theodor Benfey? deserves mention on account of his Griech- Benfey.

- *Theodor Benfey was born on 28th January 1809 at Norten, Hanover, the son of a Jewish tradesman who had gained some reputa- tion as an acute and learned Talmudic scholar. At the early age of sixteen he entered the university of Gottingen (which he afterwards exchanged for Munich) to devote himself to the study of classical philology. It was not until after 1830, when he had settled in Frank- fort-on-the-Main as a private teacher, that his attention was drawn towards the study of Sanskrit. In 1834 he went back to Gottingen and began lecturing as a privat-docent. For some time his lectures extended over various branches of classical philology as well as of Oriental and comparative philology, but he soon began to concentrate himself on the latter departments. After he had joined the christian church he received, in 1848, an extraordinary professorship, and in 1862 he was appointed ordinary professor of Sanskrit and comparative philology. He died on 26th June 1881. Benfey also began his long and brilliant literary career in the field of classics. Besides his dis- sertation Observationes ad Anacreontis fragmenta genuina (Gottingen, 1829), his translation of the comedies of Terence (Stuttgart, 1837) deserves special notice. This was followed by his Wurzellexikon in 1839, and his quarto volume on "India"? in Ersch and Gruber's Fincyklopidie, 1840. Through these he at once gained a position of authority both in comparative and Indian philology. Of his other writings the more important are, Ueber die Monatnamen einiger alten Volker, insbesondere der Perser, Cappadocier, Juden, Syrer (written in conjunction with A. Stern), Berlin, 18386; Ueber das Verhdltniss der dgypt. Sprache zum semit. Sprachstamm, Leipsic, 1844 ; Die pers. Keilinschriften, mit Uebersetzung und Glossar, Leipsic, 1847 ; Die Hymnen des Samaveda, Leipsic, 1848 ; Vollstindige Grammatik der Sanskritsprache, Leipsic, 1852; Chrestomathte aus Sanskritwerken, Leipsic, 1853 ;*

Pantschatantra, 2 vols., Leipsic, 1859; Geschichte der Sprachwissenschaft und oriental. Philologie in Deutschland, Munich, 1869. Of his numerous contributions to the various scientific periodicals of the time, those published in the Abhandlungen der Gattinger Gesellschaft der Wissenschaften are especially meritorious : ~~— "Ueber die indog. Endungen des Gen. Sing.," vol. xix. ; " Hinleitung in die Grammatik der ved. Sprache," vol. xix. ; " Die quantititsver~~ schiedenheiten in den Samhita- und Padatexten der Veden," vols. xix. – xxvil.; "Das indog. Thema des Zahlworts 'Zwei' ist 'du,'" vol. xxi. ; "Hermes, Minos, Tartaros,"' vol. xxii. ; ' Alipers. mazdah=Zend mazdaonh=Skr. medhas," vol. xxiii. ; '" Hinige Derivate des indog. Verbums anbh=nabh," and 'Ueber einige Worter mit dem Binde- vocal ij im Rigveda," vol. xxiv. ; " Behandlung des auslautenden a in na 'wie' und na 'nicht' im Rigveda, nebst Bemerkungen iiber die urspr. Aussprache und Accentuierung der Worter im Veda," vol. xxvi. Some of his smaller articles in the Géttingcr Gelehrte Anzetgen were reprinted under the titles of Vedica und Verwandtes, Strasburg, 1877, and Vedica und Linguistica, ibid., 1880. As the preceding list shows, Benfey's interest had become more and more concentrated on Vedic studies towards the end of his days, and indeed he had planned, as the crowning work of his life, an extensive grammar of Vedic Sans-

Schleicher,

New lin- guistic School.

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isches Wurzellexicon (Berlin, 1839), a work equally remark- able for copiousness of contents and power of combination, yet showing no advance on Bopp's standpoint in its con- ception of phonetic changes.

A third period in the history of Indo-Germanic philology is marked by the name of August Schleicher, whose Com- pendium der verglerchenden Grammatik der indo-german- aschen Sprachen first appeared in 1861. In the period sub- sequent to the appearance of Pott's Htymologische Lorsch- ungen, a number of distinguished scholars, too large to be recorded here

individually,! had devoted their labours to the different branches of Aryan philology, especially assisted and promoted in their work by the rapidly progressing Vedic (and Avestic) studies that had been inaugurated by Rosen, Roth, Benfey, Westergaard, Miiller, Kuhn, Aufrecht, and others. Moreover, new foundations had been laid for the study of the Slavonic languages by Miklosich and Schleicher, of Lithuanian by Kurschat and Schleicher, of Celtic by Zeuss. Of the classical languages Greek had found a most distinguished repre- sentative in Curtius, while Corssen, Mommsen, Aufrecht, Kirchhoff, &c., had collected most valuable materials towards the elucidation of Latin and the cognate Italic idioms. In his Compendium Schleicher undertook and solved the difficult task of sifting down the countless details amassed since the days of Bopp and Grimm, and thus making the individual languages stand out clearly on their common background, while Bopp's attention had been especially occupied with what was common to all Indo-Germanic tongues. There are two prominent features which characterize this part of Schleicher's work,—his assumption and partial reconstruction of a prehistoric parent-speech, from which the separate Indo-Germanic languages were supposed to have sprung, and the estab- lishment of a long series of phonetic laws, regulating the changes by which that development of the individual idioms had taken place. On Schleicher's views of and contributions towards general comparative philology (which he erroneously proposed to consider as a branch of natural science) we need not enter here.

For some time after Schleicher's premature death (in 1868) Indo-Germanie philology continued in paths indi- cated by him and Curtius, with the exception, perhaps, of the school founded by Benfey, who had always stood on independent ground. The difference between the two schools, however, was less strikingly marked in their writings, because it chiefly concerns general views of language and the Indo-Germanic languages in particular, although the characteristic task of the period alluded to was that of working out the more minute details of compari- son ; but behind all this the general interest still clung to Bopp's old glottogonic problems. Lately, however, a new movement has begun, and a younger school of linguists has Sprung up who are united in their opposition to many theories of the older generation, yet often differ materially krit. Death, however, prevented him from completing more than the above-mentioned preliminary studies by means of

which he had intended to open the field for his greater work. (For fuller biographical details see Bezzenberger, in his Beitrdage, viii. 239 sq.)

1 The extensive progress made in this period is best illustrated by the foundation of two periodicals especially devoted to Aryan comparative philology, Kuhn's Zeuschrift fiir vergleichende Sprach-~ Sorschung, Berlin, from 1851 (now 27 vols.), and Kuhn's Beitrige zur vergleichenden Sprachforschung, Berlin, from 1858 (8 vols.), Benfey's school 18 More especially represented by the contributors to Benfey's Orient und Occident, Gottingen (3 vols.), from 1862, and subsequently through Bezzenberger's Beitrige zur Kunde der indogermanischen Sprachen, Gottingen (8 vols.), from 1877. France possesses two Periodicals of the same kind, the Revue de Linguistique, Paris, from 1868, and the Mémoires de la Société de Linguistique de Paris, also from 1868, while England is represented by the Proceedings and Trans-

actions of the Philological Society, and America by the Transactions of the American Philological Association (from 1868).

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both with regard to method and the solution of individual problems. In its present state this younger school (often branded with the name of Neo-Grammarians, "Junggram- matiker," by its opponents real and imaginary) is marked by certain distinct tendencies. In the first place, they are inclined more or less to abandon glottogonic problems as insoluble, if not for ever, yet for the present and with the scanty means that Aryan philology alone can furnish for this purpose. In this they are in opposition to the whole of the older school. In the second place, they object to the use of all misleading metaphorical compari- sons of processes in the history of language with processes of organic development,—comparisons used at all times, but especially cherished by Schleicher. In the third

place—and this has been of the greatest practical import- ance—they hold that our general views of language and our methods of comparison should be formed after a careful study of the living languages, because these alone are fully controllable in every minute detail, and can there- fore alone give us a clear insight into the working of the different motive forces which shape and modify language, and that the history of earlier periods of language, conse- quently, can only be duly illustrated by tracing out the share which each of these forces has had in every individual case of change. especially prominent—phonetic variation and formation by analogy. They generally work in turns and often in opposition to one another, the former frequently tending to

Of these forces two are found to be

differentiation of earlier unities, the latter to abolition of

earlier differences, especially to restoration of conformity disturbed by phonetic change.

There are, however, other important differences in the action of the two forces,

Phonetic change affects exclusively the pronunciation of a Phonetic language by 'substituting one sound or sound-group for change.

another. From this simple fact it is self-evident that phonetic changes as such admit of no exceptions. Pronun- ciation—that is, the use of certain sounds in certain cou- binations—is perfectly unconscious in natural unstudied speech, and every speaker or generation of speakers has only one way of utterance for individual sounds or their com- binations. If, therefore, a given sound was once changed into another under given circumstances, the new sound must necessarily and unconsciously replace its predecessor in every word that falls under the same rules, because the older sound ceases to be practised and therefore disappears from the language. Thus, for instance, the sound of the short so-called Italian in English has become exchanged for the peculiarly English sound in man, hat, &c., which is so exclusively used and practised now by English speakers that they feel great difficulty in pronouncing the Italian sound, which at an earlier period was almost as frequent in English as in any other language that has preserved the Italian sound up to the present day. Again, the sound of the so-called long English a in make, paper, &e., although once a monoplithong, is now pronounced as a diphthong, combining the sounds of the English short ¢ and 7, and no trace of the old monophthong is left, except where it was followed by 7, as in hare, mare (also azr, their, where, &c.), where the a has a broader sound somewhat approaching that of the short in hat. This last instance may at the same time serve to illustrate the restrictions made above as to sounds changing their pronunciation in certain groups or combinations, or under given circumstances only. We may learn from it that phonetic change need not always affect the same original sound in the same way in all its combinations, but that neighbouring sounds often influence the special direction in which the sound is modified, The different sounds of the English a in make and hare are both equivalents of the same Old English sound & (= the Italian short a) in macian, hara. The latter sound has

Ana- logical change.

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been split in two, but this process again has taken place with perfect regularity, the one sound appearing before 7, the other before all other consonants. It is easy to see that the common practice of comprising the history of the Old English in the one rule,—that it was changed into the sound of the a in make except when followed by an 7,—can only be defended on the practical ground that this rule is convenient to remember, because the words exhibiting the former change are more numerous than the instances of the latter ; apart from this there is nothing to justify the assumption that one of these changes is the rule and the other the exception. The fact is, that we have two inde- pendent cases of change, which ought to be stated in two distinct and independent rules according to the different positions in which the original stood before the splitting began. It is also easy to observe that the variety of modifying influences may be much more manifold than in the present instance of make and hare, and that the number of special phonetic rules in such cases must be increased in proportion to the progress made in the investigation of the said modifying powers. In this respect much stil] remains to be done, but what has been achieved is more than sufficient to prove the correctness of the statement from which we started above, that phonetic rules in them- selves are without exceptions, however often phonetic processes may have been crossed and more or less effaced by non-phonetic influences in actual (especially literary)

'language, such as mixture of dialects, formation by

analogy, and the like.

Analogical change, on the other hand, does not affect the pronunciation of a language as a whole in the way phonetic change does, but is confined to the formation and inflexion of single words or groups of words, and therefore very apt to bear an entirely arbitrary and irregular character. A few instances will be sufficient to illustrate this. In Old English a certain number of substantives formed their plurals by mutation of the root-vowels, as fét—fét or b6c— béc. In Modern English this system of inflexion has been preserved in some cases, as in foot—feet, and altered in others as book —books. Now, while foot, feet, and book are the regular modern phonetic

*equivalents of the old fé¢, fé, b6c, the plural books can in no way be phonetically traced back to the old béc, the phonetical equivalent of which in Modern English would be *beech. The only possible ex- planation of a form like books is that the older béc was at some date given up and replaced by an entirely. new forma- tion, shaped after the analogy of the numerous words with a plural in -s without modification of the root-vowel. That this should have been done in the case of book, but not in that of foot, is an accident, which must be accepted as a fact not allowing of any special explanation. Let us now" take another instance from the English verb. In Old English the different persons of the preterite indicative in the so-called strong (irregular) verbs were generally dis- tinguished by different root-vowels ; ridan, 'to ride," and bindan, "to bind," for instance, form their preterites thus: tc rdd, S& ride, hé rdd, wé, gé, hié ridon, and ic band, St bunde, hé band, wé, gé, hié bundon. In Modern English this difference in the root-vowels has been abandoned, and rode, bound now stand for all persons, rode being the modern phonetic equivalent of the 1st and 3d sing. rdd, while bound represents the u-forms of bindan. Inasmuch as a similar process of levelling has been carried through in all prcterites of Modern English, regularity prevails even here. But when we look to its results in the indi- vidual verbs we soon find that the choice amongst the different forms which might have served as starting-points has been entirely arbitrary. It is indeed impossible to say why the old singular form should have been chosen as a model in one case, as in rode, and the old plural form in*

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another, as in bound. From these and numerous similar instances we must draw the conclusion that it is beyond our power to ascertain whence analogical changes may start, and to what extent they may be carried through when once begun. All we can do is to carefully classify the single cases that come under our observation, and in this way to investigate where such changes are especially apt to take place and what is their general direction. As to the latter points, it has been observed before that levelling of existing differences is one of the chief features in ana- logical change (as in the case of rode and bound). As to the former, it must be borne in mind

that, before any analogical change can take place, some mental connexion must exist between the words or forms serving as models and those which are remodelled after the types suggested to the mind of the speakers through the former. Of such natural mental cOmbinations two classes deserve especial notice : the mutual relationship in which the different, say in- flexional, forms of the same word stand to each other, and the more abstract analogies between the inflexional systems of word-groups bearing a similar character, as, for instance, the different declensions of nouns and pronouns, or the different conjugations of verbs. The instance of rode, bound may serve to illustrate the former category, that of books the latter. In the first case a levelling has taken place between the different forms of the root- vowels once exhibited in the different preterite forms of ridan or bindan, which clearly constitute a natural group or mental unity in consequence of their meaning. 'The form of rode as a plural has simply been taken from the old singular, that of bound as a singular from the old plural. In the case of book—books for béc—béc, this explanation would fall short. Although we might say that the vowel of the singular here was carried into the plural, yet this would not explain the plural ~~*s. So it becomes evident that the old declension of béc—béc was remodelled after the declen*~~ *sion of words like arm—arms, which had always formed their plurals in -s. Isolated words or forms, on the other hand, which are no part of natural groups or systems, inflexional or formative, must be regarded as commonly safe from alterations through analogy, and are therefore of especial value with regard to establishing rules of purely phonetic development.*

It is true that the distinction between phonetic and analogical change has always been acknowledged in com- parative philology. At the same time it cannot be denied that analogical changes were for a long time treated with a certain disdain and contempt, as deviations from the only course of development then allowed to be truly "organic" and natural, namely, that of gradual phonetic change (hence the epithet "false" so constantly attached to analogy in former times). Amongst those who have recently contributed most towards a more correct evalua- tion of analogy as a motive-powcr in language, Professor Whitney must be mentioned in the first place. In Ger- many Professor Scherer (Zur Geschichte der deutschen Sprache, 1868) was the first to apply analogy as a prin- ciple of explanation on a larger scale, but in a wilful and unsystematic way. Hence

he failed to produce an immediate and lasting impression, and the merit of having introduced into the practice of modern comparative philo- logy a strictly systematic consideration of both phonetic and analogic change as co-ordinate factors in the develop- ment of language rests with Professor Leskien of Leipsic,

and a number of younger scholars who had more or less The New Amongst these Brug- School.

experienced his personal influence. mann, Osthoff, and Paul rank foremost as the most vigorous and successful defenders of the new method, the correctness of which has since been practically acknow- ledged by most of the leading philologists of all shades,

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who in point of fact follow it in their investigations, in spite of the lively theoretical protest which some of them continue to maintain against it, and in spite of the general feeling of hostility and inclination towards mutual distrust often but too clearly visible in recent linguistic publications, from whatever side they may come.!

From this historical sketch we may now proceed to a short examination of some of the chief results of Aryan comparative philology.

The most prominent achievement of the researches of Bopp and his followers was to prove that the majority of the European languages and dialects, together with a certain number of important languages spoken in Asia, form one great family,—that is, that they have sprung from one common source or parent-language. The name now mostly used in England for this community is Aryan languages. American and French scholars generally pre- fer to say Indo-European languages, while the name of Indo-

Germanic languages is still almost universally used in Germany. It is hard to decide for or against any of these names from a scientific point of view. The word Jndo- Germanic was not inappropriately coined by combining the names of the most easterly and westerly members of the family, the Indian and the Germanic or Teutonic group.? Indo-European seems to be a less lucky invention, as this combination of geographical names would erroneously point to all the languages of India and Europe as the constituents of our family, while a large number both of Indian and European idioms belong to entirely un- related groups of languages. Aryan would no doubt be the best name in itself, for it seems that the primitive forefathers of the Aryan nations used the word Aria as a national name themselves. We find at least the Sanskrit Arya thus used in India, and similarly the Old Persian Ariya (in the cuneiform inscriptions of Darius), Zend Airya in Persia (whence the later Eran, Irén), and per- haps Hriu, gen. Erenn, as the national name for Ireland. But before the word Aryan came to be applied in the sense defined above it had for some time been used, and it is still largely used, in a more restricted sense as the special collective name for the languages of the Indian and Persian or Iranian groups of the Indo-Germanic family. This ambiguity renders the use of the word Aryan less recommendable than it would be had its meaning been properly fixed from the beginning. It seems that outside of England Aryan will hardly gain ground ; some recent attempts to introduce the name into Germany have utterly failed, and in the same way the other nations who share in scientific research in this demesne cling to the older names.

This large Indo-Germanic or Aryan family, then, to re- vert to our principal task, consists of ten groups or sub-

1 The fullest systematical treatment of these questions of method will be found in Paul's Principien der Sprachgeschichte, Halle, 1880. See also Osthoff, Das physiologische und psychologische Moment in der sprachlichen Lormenbildung, Berlin, 1879, and Misteli, ' Laut- gesetz und Analogie," in Zeitschrife fir Vélkerpsychologie, xi. p. 365 sg. Of those who on principle stand in theoretical opposition, the several schools of Benfey (now especially represented by Fick), Scherer, and Johannes Schmidt may be mentioned.

2 The word Indo-Germanic, it is true, was invented before the Celtic languages were known to belong to the same family. But even after that discovery it was unnecessary to substitute the name Jndo- Celtic as some authors have tried to do; for certainly the most westerly branch of Indo-Germanic in Europe (disregarding the Aryan colonies in America) is Icelandic, an undoubtedly Germanic language. Other hames, such as Japhetic or Sanskritic, have hardly found any use in Scientific literature.

For particulars see Professor Max Miiller's Lect. on the Science of Lang., lect. vi. (first series), and ARYAN, vol. if. p. 672 sq.; for this etymology of Kriz see especially H. Zimmer, " Arisch," in Bezzen- berger's Beitr. 2. Kunde der indogerm. Sprachen, iii, p. 137 sq.

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*families of languages, three of which are located in Asia. while the rest belong to Europe.**

1. The Indian Family, in which Sanskrit, especially in its oldest form, preserved in the Vedic texts, stands fore- most inrank. Of the older stages of the language Prakrit and Pali may be mentioned here,—the former, in its various branches being the mother of the modern Indian dialects of Aryan descent (including also the Gipsy lan- guage), the latter (see above, p. 183) the idiom of the sacred books of the southern Buddhists.5

2. The Zranian or Persian Family, represented in the earliest period by Old Persian, scanty remnants of which have come down to us in the Achemenian cuneiform in- scriptions, and Zend, or, as it is also called, Old Bactrian, the language of the Zend-Avesta, the sacred books of the Zoroastrians. The chief modern representatives of this group are Persian, Afghan, Kurdish, and Ossetic.®

3. The Armenian Family, consisting of the different living dialects of Armenian. Armenian has but recently been proved to be an independent member of the Aryan family. It partakes of many peculiarities of the Iranian group, but at the same time shares several important characteristics of the

European languages, so that it cannot be classed as a subdivision of either of these groups."

4. The Greek Family, comprising the various old dialects of Greek, and the modern Romaic idioms, which have been developed out of the later xow7 that had gradually super- seded the old dialectal varieties.®

5. A fifth family, which may once have had a far larger extension, is now only represented by one surviving member, the Albanian language. As we have no old sources for this idiom, and only know it in its modern state of utter decay, it is extremely difficult to obtain definite results concerning its origin and position relatively to the sur- rounding languages. Bopp seems to have proved, however, that Albanian actually is an Aryan idiom.2 It is also certain that it belongs to the European type of Aryan, yet it is not particularly closely allied with Greek, as has often been assumed, but shows some remarkable coincidences with the northern European languages,10

6. The Italic Family. Its most important representative is Latin, from which the modern Romance languages have sprung. Closely connected with Latin was the Faliscan dialect, which is preserved in a few inscriptions only.

4 The fullest, yet now somewhat antiquated, account of all the members of the Aryan family will be found in the article " Indo-ger-

.manischer Sprachstamm," by A. F. Pott, in Ersch and Gruber's Ency-

klopddie (Leipsic, 1840). See also especially Th. Benfey, Geschichte der Sprachwissenschaft, pp. 601-683.

° For further particulars see SANSKRIT.

® See the articles PAHLAVI (supra, p. 134 sq.) and Persta (supra, p- 653 sq.), and for the linguistic characteristics of this group H. Hiibsch- mann, in Zeitschrift fir vergl. Sprachforschung, xxiv. p. 372 sq.

7 See H. Hiibschmann, "Ueber die Stellung des Armenischen im Kreise der indo-germanischen Sprachen," in Zeitschr. vergi. Sprachf., xxiii. p. 5 sg.,

where further references to earlier treatments of this question are given.

8 See GREECE, vol. xi. p- 129 sg. An exhanstive summary of all prior contributions towards linguistic elucidation of Greek is given in Gustav Meyer's excellent @riechische Grammatik, Leipsic, 1880, which must now be considered the standard book on Greek grammar, together with the well-known works of G. Curtius, quoted at vol. xi. p. 136.

9 Bopp, "Ueber das Albanesische in seinen verwandtschaftlichen Beziehungen," Berlin, 1855, in AUhandl. Berl. Akad.

10 See especially G. Meyer, "Die Stellung des Albanesischen im Kreise der indo-germ. Sprachen," in Bezzenberger's Beitrige, viii. p. 185 sqg., and Albanesische Studien, Vienna, 1883. For other refer- ences, cp. Benfey, Geschichte der Sprachwissenschaft, p. 643 Sq.

1 A sketch of the history of Latin is given under Latin LANGUAGE; a list of the chief books concerning the other dialects will be found in the appendix to Sayce's Intr. to the Scvence of Lang., vol. ii.

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remnants in the north-west of France and in the British islands. Among its extinct members the language of the Galatians in Asia Minor may be mentioned, of which little more is known than that it was Celtic. The earliest docu- ments of Celtic speech we possess are some inscriptions in the idiom of the Gallic inhabitants of France and northern Italy. The surviving branches of Celtic show a clear division into two groups: the Northern or Gaelic group, formed by Irish, Gaelic or Scotch, and Manx, and a Southern or Britannic group, consisting of Welsh or Cymric, Cornish (extinct since 1778), and Armorican or Bas Breton in Brittany. The fundamental authority for the comparative study of Celtic grammar is Zeuss, Grammatica Celtica, 1853 (2d ed. by H. Ebel, 1871). After Zeuss, Stokes and Rhys in England, Ascoli in Italy, Ebel, Windisch, and Zimmer in Germany, aud D'Arbois de Jubainville and H. Gaidoz in France have been the chief contributors to this field of research. The last-named is also the editor of a periodical especially devoted to Celtic studies, the Revue Celtique (Paris, from 1870).

8. The Germanic or Teutonic Family. This well-de- veloped family is divided into two main groups, which are now commonly denoted Eastern and Western Germanic. The members of the former are Gothic (see GotTHic Lancuacs, vol. x. p. 852 sq.) and Scandinavian, with an eastern and a western subdivision, the former compris- ing Swedish and Danish, the latter Norse and Icelandic. Western Germanic, on the other hand, consists of English, Frisian (these two seem to form a separate branch), Saxon or Low German, Frankish (including Dutch), and Upper German (see article GERMAN LANGUAGE). The dialects of the numerous other Teutonic tribes not mentioned here have died out without leaving sufficient materials for linguistic classification.

9. The Baltic Family, comprising three distinct idioms —Prussian, Lithuanian, and Lettish. Prussian became extinct in the 16th century. The few specimens of this highly interesting language which have been preserved are collected by Nesselmann, Die Sprache der alten Preussen (Konigsberg, 1845), and Hin deutschpreussisches Vocabul- arium (tbid., 1868). The same author has also published a dictionary, Thesaurus linguxe Prussice (Berlin, 1873). Amongst other contributions to Prussian grammar, Bopp's essay, Ueber die Sprache der Altpreussen (Berlin, 1853), is especially noteworthy. Of the two other branches, Lithu- anian is the more important for comparative philology. The chief grammars are those by Schleicher (7andbuch der litauischen Sprache, 2 vols., Prague, 1856-57) and Kurschat (Litauische Grammatik, Halle, 1876); the best dictionary is by Kurschat (Woérterbuch der lit. Sprache, 2 vols., Halle, 1878-83). Some of the oldest texts are now being re- printed by Bezzenberger.2, For Lettish, Bielenstein's grammar (Die lettische Sprache, 2 vols., Berlin, 1863-64) and Ulmann's dictionary (Settisches Wéorterbuch, Riga, 1872) are the first books to be consulted.

10. The Slavonie Family. There are two main branches of Slavonic. The so-called Southern or South-Eastern branch embraces Russian, Ruthenian (in Galicia), Bul- garian, Servian, Croatian, and Slovenian. The second branch is generally designated by the name of Western Slavonic. It is chiefly represented by Cechish or Bohemian and Polish. With the former the Sorbian dialects spoken

1 For further particulars see article CELTIC LITERATURE, and the very exhaustive critical and bibliographical study by Windisch, “ Kelt- ische Sprachen,” in Ersch and Gruber’s Encyklopddie. ‘

2 Litauische und Lettische Drucke des 16ten Jahrhunderts, Got- tingen, 1878 sq.; cp. also Beitrdge zur Geschichte der lit. Sprache, Gottingen, 1877, by the same author.

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7. The Celtic Family, once covering a large part of western Europe, but now reduced to comparatively scanty

in Lusatia are very closely connected, Polish, again, is sub- divided into Eastern Polish or Polish Proper and Western Polish, a few remnants of which now survive in the Kas- subian dialects of Prussia. About the extinct members of this last group, which are generally comprehended under the name of Polabian dialects, Schleicher’s Laut- und For- menlehre der polabischen Sprache (St Petersburg, 1871) and an article by Leskien in Lm neuen Reich, ii. p. 325, may be consulted. The oldest Slavonic texts, some of which go as far back as the 10th century, are a number of books destined for the use of the church. From this circum- stance the peculiar dialect in which they are written is often called Church Slavonic. Schleicher and others identify this dialect with Old Bulgarian, while Miklosich thinks it should be classed as Old Slovenian. For com. parative purposes as well as for Slavonic philology this idiom is the most important. The chief grammars are Schleicher, Mormenlehre der kirchenslavischen Sprache (Bonn, 1852); Miklosich, Laut- und Formenilehre der altsloven. eschen Sprache (Vienna, 1850) ; and Leskien, Zandbuch der altbulgarischen Sprache (Vienna, 1871). The fundamental works on comparative Slavonic philology are Miklosich, Vergleichende Grammatik der slavischen Sprachen (4 vols., Vienna, 1852-68 ; 2d ed. of vol. i., Lautlehre, 1879), and Lexicon Palxoslovenico-Greco-Latinum (Vienna, 1862-65). A large number of special contributions are collected in Jagié, Archiv fiir slavische Philologie (Berlin, from 1876). The mutual relationship of these ten families may be shortly characterized by saying that they are dialects of the primitive Aryan parent-speech, which at

an early period of its existence must have formed a linguistic unity, but subsequently became dissolved into these subdivi- sions. This fundamental view now seems to be universally admitted to be correct. But it is extremely difficult to go beyond it in attempts to trace out the history of the process of dissolution. One problem offering itself at the very outset of such an attempt (although more of an ethnological than philological character) must at once be dismissed as insoluble,—the question of the original home of our Aryan forefathers and the directions of the wander- ings that brought the single members of the great original tribe to the seats occupied in historical times by the several Aryan nations. There exist indeed no means for deciding whether they came from the north-eastern part of the Iranian plateau near the Hindu-Kush Mountains, as was once generally assumed, or whether Europe may boast of being the mother of the Aryan nationality, as some authors are now inclined to believe.? The chief philological diffi- culty lies in the fact that some of these ten families stand in closer relationship with certain others than with the rest, so that they seem to form separate independent groups, and yet these groups cannot be severed from the rest without overlooking important linguistic facts which seem to speak for the existence of a closer connexion between single members of one group and single members or the whole of another. Before attention was drawn to this latter point it was easy enough to account for the origin of the grouping alluded to. If everything that is Genea- common to all Aryan languages must have originated in logical the common parent-speech—and the correctness of this 8TCUP2& assumption can hardly be doubted—then everything that is common to all the families of one particular group, but strange to the others, must be assigned to a period when these families formed a unity by themselves and were dis- connected with the other stock. The fact, for instance, that all the European languages possess the three vowels a, é, 0, where the Indian and Iranian group show the uniform a, which was then believed to be the primitive

3 On this much vexed question see especially O. Schrader, Sprach- vergleichung und Urgeschichte, Jena, 1883, passim.

Genea- logical theory criticized,

sound, seemed to indicate that the primitive Aryan stock had once been split into two halves, one of which remained in Asia and retained the primitive a-sound, while the other half emigrated to Europe and_ there developed the new vowel-system, before any new divisions took place. The Aryan parent-speech would thus appear to have been spht into a European and an Asiatic " base-language." Similar facts in the history of the single European languages then led to the further assumption of a southern European base as the parent of Greek, Italic, and Celtic, and a northern European base for Germanic, Baltic, and Slavonic, and, with further subdivision, an Italo-Celtic and a Litu-Slavic base for Italic and Celtic on the one hand and for Baltic and Slavonic on the other. The prehistoric development of Aryan, according to this genealogical theory (which makes division of language dependent on division of nations), may be illustrated by the following genealogical table.

Aryan. Asiatic. as ll Indlan. oe Southern European. Northern European. | oe ae oe Greek. Italo-Celtic. Germanic. a ental le iL I. ; Italic. Celtic. Baltic. Slavonic.

*It may still be admitted that at least the mutual position of the ten families is not the same in all cases. It cannot be doubted that Indian and Iranian resemble each other more than either of them does any other family. The same may also be said of Baltic and Slavonic, and even of Italic and Celtic, however different the latter two may appear to be at first sight.2 But it is impossible to carry this system of genealogical grouping through. It will be observed that not all the ten families are represented in the genealogical tree given above ; Albanian and Armenian have not found a place in it, nor could they be introduced without disturbing the entire table. If we look at Ar- menian, for instance, we find that its structure and phono- logy on the whole follow the Asiatic type, and yet Armenian shares the European vowel-system alluded to before ; com- pare, for instance, Armenian berem, "I bear," with Greek épw, Latin fero, Old Irish berimm (and dobiur for *do-beru), Gothic baira (pronounced béra), Lith. bert, Slavonic bera, against Sanskrit bhdérami, Zend baramt. Armenian, then, is half European, half Asiatic, and if such an intermediate idiom exists it is impossible to make a*

strict distinction between Asiatic and European. Let us take another in- stance. All the Asiatic languages have changed the ori- ginal palatal / into sibilants, and the same change we find again in Slavonic and Baltic, both of which otherwise clearly belong to the European type ; compare, for instance, Sanskrit and Zend dacan, "ten," Armenian tasn, Slavonic deseti, Lith. dészimt, with Greek déxa, Latin decem, Old

1 This pedigree is the one ultimately given by Schleicher. Others have assumed more or less diffcrent degrees of relationship. Greek and Italic, for instance, were for a long time believed to be particularly near relations. A totally contrary view would come nearer the truth. Greek and Latin are about as different, both in phonology and gram- matical structure, as any two members of the Aryan family ; indeed there is nothing to recommend their combination but the intimate connexion in which the two nations and their literatures have stood within historical times, and the custom derived therefrom of studying the two classical languages together from our schooldays.

2 Amongst the characteristics of these two groups the general resemblance in the declension, and in the verb the formation of a future in 6 or f (Latin amabo, Old Trish carfa, ruo charb) and of a passive in r (Latin fertur, Old Irish carthir, &c.), are the most important.

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*Trish deich (for *dekim), Gothic taihun. In a similar way Litu-Slavic and Germanic are connected by the formation of a plural dative in m, as in Gothic waudfam, Lith. vilkams, Slavonic veékomd, against the Sanskrit -bhyas, Latin -bus, Trish* ~~*; andsoall round. The consequence is that every attempt at grouping the Aryan families of speech on the genealogical basis must fail, because it would have to cut asunder some of the natural ties that hold the single families together. It is true that some of the coincid*~~ *ences falling under this head may be due to mere chance, especially those in phonology ; for we often see the same phonetic processes going on in*

languages which stand in no connexion whatever at the time. Yet in the case before us the number of the actual coincidences is too large to allow of such an explanation, and the fact of their existence is made all the more striking from the circumstance that it is each pair of newghbouring families which shows these connecting links. If they prove anything (and it cannot be doubted that they do), we must necessarily come to the conclusion that every such link is a witness for at least a temporary connexion between the two languages or families it holds together. To assume such teniporary connexions in the time after a true division of nations had taken place (that is, to assume, for instance, that Slavonic had come into contact with the Asiatic languages after the Europeans had migrated from Asia to Europe, or the forefathers of the present Asiatic nations from Europe to Asia, as the case may be) seems impossible. It is likewise highly improbable that con- nexions intimate enough to leave distinct marks in lan- guage existed at a time when the original tribe had spread over the wide regions now covered by the Aryans, even sup- posing this spreading to have been so gradual as not to cause any break in the continuity of the Aryan population. And, even if we concede this, how are we to account for the fact that we have no longer the supposed continuity of speech, but well-defined single languages, whose separa- tion must, after all, be due to breaks in the continuity of intercourse between the respective speakers? These and similar reasons point to the assumption that the origin of the phenomena alluded to must be sought in a remote period, when the Aryan tribe had an extension small enough to permit continuity of intercourse, and yet large enough to allow of dialectic variations in its different districts. In other words, when the actual break-up of the Aryan tribe into different nations came to pass the Aryan parent-speech was no longer a homogeneous idiom, but the development of dialects had begun. On their following wanderings, then, those tribes or clans would naturally cling together which had until then lived in the closest connexion both of intercourse and dialect (for community of intercourse and of speech always go together), or, as we might also say, the old unity would naturally be broken up into as many parts as there had been dialectic centres. Transition dialects, which might have been spoken in the outlying parts of the old dialectic districts, would also naturally be then reduced to a common level in consequence of the general mixture of speakers that could not but have taken place on wanderings so extensive as those of the Aryan tribes must have been. Such an assumption would indeed

solve most of the difficulties mentioned above, especially the peculiar way in which the single families of Aryan are linked together. Each of these would then correspond to one of the main dialects of the parental language, and thcir mutual affini- ties would therefore be of the same kind as those of neigh- bouring dialects, say, of any living speech. And in these nothing is more common, nay even more characteristic, than the gradual transition from one to the other, so that each dialect of an intermediate position partakes of some

Stopped sounds.

LANGUAGES. |

of the peculiarities of its neighbours to the right and left. In Old English the Kentish dialect, for instance, in some respects goes with West Saxon against Mercian, in others with Mercian against West Saxon, sometimes West Saxon and Mercian combine against Kentish, and sometimes each of them stands by itself, as the following table will show.

West Saxon. Kentish, Mercian. hilpd hilpd HI helped (he) helps. Ledht leéht H léht light. ded HI déd déd deed. hierde I] hiorde hiorde (shep-)herd. dil { dél | dl deal. gylden { gelden | gylden golden. field lI Seld | faélicd (he) falls. wierpd NI weorpa | weorped (he) throws.

If the inhabitants of the old kingdoms of Wessex, Kent, and Mercia had separately left their English abodes and wandered back to different parts of the Continent after their dialects had developed in the way illustrated above, would not their dialects have gradually developed into independent languages exhibiting the same characteristic features of mutual relationship as those found in the Indo-Germanic idioms ?1

It remains to give a short review of the main character-

istics of Indo-Germanic, both phonetic and structural.

A. Phonology.—The eonsonant system of the Aryan parent-language was chiefly characterized by the prevalence of stopped (explosive) sounds and the scarcity of spirauts. The only representatives of the latter class were s,

and in a few cases z, while there is no trace of sounds so common in modern languages as the English /, th, sh, or the German ch. Besides stops and spirants the system comprised nasals, liquids, and semi-vowels.

The stops were either voiceless (surd), like the English g, ¢, &, or voiced (sonant), like the English },d,g, and either pure (unaspirated) or aspirated. By combining these two distinctions we arrive at four chief varieties of stops, which are generally thus symbolized : p, ph, b, bh for the labial, ¢, th, d, dh for the dental elass, &c. Here the », ¢, & denote unaspirated voiceless stops, ph, th, kh their aspirates ; 6, d, g voiced stops, and 06h, dh, gh their aspirates. In pronouncing these sounds English readers should be careful not to give the Aryan p, t, k the value of the English p, ¢, x, be- cause these are always slightly aspirated. The true unaspirated sound is still found in the Romance and the Slavonic languages, in modern Greek, &c. The aspirates ph, th, kh should be sounded with a strong escape of breath after the explosion of the stop, inserting a distinct A between the initial p, ¢,% and the following sound (as is often done in Irish pronunciation ; initial p, ¢, # in Danish may also be taken as examples). In the so-called medi b, d, g the voice should always be distinctly audible, as in French, or in English medial 8, d,g (initial 6,d,g in English are often voiceless). The pronunciation of the voiced aspirates bh, dh, gh is a very vexed question, as these sounds have disappeared from all the living Aryan languages except the modern Indian dialects, and these seem to show differences in the prouunciation of the aspirates which have not yet been sufficiently cleared up. The old Indian grammarians made their aspirates out to be voiced stops followed by a corresponding, that is voiced, aspiration, and this description seems to correspond with the observations of Mr Alex. Ellis, who found that in the Benares pronunciation of Sanskrit bha, dha, gha are distinguished from ba, da, ga merely by a somewhat stronger pronunciation of the vowel. It seems, however, that another pro- nunciation exists in the west, and that bia, for instance, in Bombay is actually pronounced as a distinctly voiced 6 followed by a common h; the voice is broken off simultaneously with the opening of the lips, so that no vocalic sound is inserted between the 6 and the h. If this pronunciation was not origiual in Aryan, it seems to have come in at an early period ; for it would be extremely difficult to explain the transition of original bh, dh, gh into the Greek voiceless*

1 A detailed history of the different views expressed with regard to the mutual relationships of the Indo-Germanie languages has been given by O. Schrader, Sprachvergleichung und Culturgeschichte, p. 66 sg.; cp. especiaily Joh. Schmidt, Dve Verwandschaftsverhalinisse der indog. Sprachen, Vienna, 1872; A. Fick, Die ehemalige Sprach- einheit der Indogermanen Furopas, Gottingen, 1873 (reviewed by Schmidt, in Jenaer Literaturzeitung, 1874, p. 201 sg.); A. Leskien, Die Deklination im Slavisch-Litawischen und Germanischen, Leipsic, 1876 (Introduction); Paul, Princtpien der Sprachgeschichte, ch. xii. ; K. Brugmann, " Zur Frage nach den Verwandtschaftsverhaltnissen der indog. Sprachen," in Techmer, [nicrnationale Zeitschrift fiir allgem. Sprachwissenschaft, i. (1884), p. 226 sq.

2 On Early English Pronunciation, iv. p. 1185 sq.

aspirates $, 0, x (as in Greck ¢épw, originally pronouneed p-héré, compared with Sanskrit bhdrdmi), unless we start from a voiceless aspiration.

With regard to their positions, the labials p, ph, b, bh do not seem to have differed from the common European labials of the present day. The so-ealled dentals ¢, th, d, dh were really dental, that is, formed by touching the lower rim or back of the upper teeth with the tip of the tongue (in the pronunciation of the English t, d the tongue is raised towards the upper gums). This purely dental pronunciation is still preserved in most of the Asiatic and some European languages. The supradental class represented in the Indian languages by the so-ealled cerebrals or linguals /, th, d, dh seems not to have existed in primitive Aryan, but was most prob- ably imported into Indian from the Dravidian idioms of southern India, where these sounds are very common. Of back consonants Aryan possessed two distiuct parallel sets, now generally symbolized by k', kh}, g}, gh! and k?, kh?, g?, gh? respectively.2 They may be charaeterized as front and back gutturals, or possibly as palatals and gutturals proper (compare the Semitie distinction of 3 and p). The distinction of the two series is best preserved in

*the Asiatic languages and Litu-Slavic, where the front gutturals or palatals passed into spirants, while the back gutturals (at least originally) retained their eharacter of explosives. In the other languages the difference is less elearly marked, as will be seen from the following table of correspondences.**

i Lith. | Greek. |

ae |Sans.| Zend. | Arm. | Slay. Lat. Trish. | Germ. kl ¢ s 8 8 me \ ie ¢ Cache [n (g) ie [lawl Be | eee

a k, ¢ ea kh k,Gc} k K,7(7T)| G ¢ Ss a0 h (w,9) ge? ie fos 7) bot lta 2 aa h g | to? oe

Of nasals there were four, correspouding to the four classes of stops, Nasals m, 2, and two guttural ones, which may be written 7! and 7; the and latter only occur before the corresponding explosives. Of liquids we liquids.

find 7 and Zin the individual languages, but frequently interchang- ing. Ithas been assumed, therefore, that Aryan had only one sound instead of the two, which was afterwards developed into either 7 or i. There seems to be sufficient reason, however, to believe that the later distinetion of 7 and 7 was founded on some parallel distinction in Aryan ; most probably we have to assume the cvexistence of two varieties of r-sounds ; the one which, at a later period, passed into 7 may have been a distinct trilled r, while the second, the ante- eedent of 2, may have been an untrilled variety. We find a similar

distinction in the semi-vowels y and w, each of which must have Semi- The first variety of y is in Greek vowels.

had two distinct varieties. represented by ‘, the second by § as in és, gvydv, compared with Sanskrit yds and yugdm, &e.; from these correspondences it would seem that the first y was a real semi-vowel, like the English y—that is, a non-syllabic 7—and the second a more spirant sound, like the North-German 7.

with vavdrdha, p. vavrdhis.' Here the transition of v into wu points to a semi-vocalie pronuneiation, asin English w. The other sound, which remains unaltered, may have been more like the spirant English v The sound of the sibilant s cannot be fixed exactly ; it may have been dental either like the French s, or more supra- dental as in English. The voiced z is of extremely rare occur- rence; it was confined to combinations of a sibilant with a voiced mute, such as 2d, zdh, zy; compare, for instance, Aryan mizdho-,*

3 This fact was first discovered by Ascoli, Corst di glottologia, 1870, p. 51 sg., and Fick, Die ehem. Spracheinhett der Indo-germanen Europas, p. 8 sq.3 cp. also Joh. Schmidt, in Jenaer Lit.~~Zeitung, 1874, p~~ 201 sg., and Zeitschr. f. vergl. Sprachf., xxv. p. 1 sg.; H. Hibsch- mann, in Zeitschr. f. vergl. Sprachf., xxiii. pp. 20 sq., 385 sg., xxiv. p. 372 sq.; H. Moller, Dic palatalreihe der indog. Grundsprache im Germanischen, Leipsie, 1875 ; H. Collitz, in Bezzenberger's Bevér., iti. p. 177 sq.; F. Kluge, Beitrdge zur Geschichte der german. Conjugation, Strasburg, 1879, p. 42 sq.

4 The voiceless aspirates are left out here because they are hardly frequent enough to enable us to make out exact rules of correspondence. It may be noticed here that in Sanskrit and Greek the old aspirates have been replaced by the corresponding unaspirated sounds (that is, b, d,g,j and 7, 7, x respectively) whenever they were followed by another aspirate. See especially Grassmann, in Zeitschr. f. vergl. Sprachf., xii. p. 81 sq. :

5 Compare also the parallel of Sanskrit cyaja, perfect of 4/yaj, and Greek dfouat, &-yos, with initial. The discovery of the two y-sounds was first made by G. Schulze, Ueber das Verhdltniss des ¢ zu den ent- sprechenden Lauten der verwandten Sprachen, Gottingen, 1867.

As to the w, the existence of a double sound Other seems to follow from the different way in which initial v is treated eonson- in Sanskrit reduplication ; compare perfects like wvdca, 3d plural acus ants.

Vocalic sounds,

Primitive

Qy0,0;

Syllabic r and 7.

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Sanskrit midha, Zend mizhda, Greek juc6és, Slavonic mizda, Gothic mizd6.1 }

Up to a very recent date the Aryan vowel-system was considered not to have contained more than the three " primitive " vowels a, i, uw, and the diphthongs ai and au (regardless of quantity). The sounds of e and 0, which are frequent in the European languages (and also in Armenian, as has been pointed out before), but do not oeeur in Sanskrit,? were regarded as later developments from the originala. We knownow that these views were erroneous. Aryan not only had the five common vocalic sounds a, ¢, 0,7, u, both long and short, but also often used the liquids and nasals r, 7, m, nm, 9, as vowels, that is, with syllabic value (as, for instance, in English battle, bottom, mutton, pronounced bat-tl, bot-tm, mut-tir), also both short and long. Besides these simple vocalic sounds, there were twelve diphthongs proper, at, e7, 07, wu, eu, ou, and Gi, 61, dt, Gu, &u, du, setting aside the similar combinations of a, é, 0, &c., with liquids and nasals. It will be observed at a glance that the Greek vowels and diphthongs

a € 0 Bh a 7 mo @ Ff a ea oa g n Q av ev ou au nu wu

are exactly those of the Aryan system. The only case, indeed, where Greek has changed the Aryan sounds is that of the syllabic liquids and nasals, as will be shown hereafter.

The first proofs for the priority of the European a, ¢, o in com- parison with the uniform Indo-Iranian were discovered independ- ently by Amelung and Brugmann.? Since then the number of proofs has been considerably increased. The most striking of all 1s perhaps the observation, made independently by Verner and Collitz, that the original back gutturals of Aryan are changed into palatals in Indo-Iranian when followed by ,y, or an corre- sponding to a European e, but are preserved without alteration when followed*

by other sounds, especially an a corresponding to a Euro- pean a oro. We thus find not only forms like Sanskrit eid corre- sponding to Greek 7, Latin guid, but also Sanskrit Ca, pafich, janas, &e., corresponding to Greek re, révre, yévos, Latin que, quingue, genus, while the old guttural is kept in words like Sanskrit katara, garbha=Greek mérepos (Ionian xérepos), Slavonic kotoryj, Gothic hwathar, and German kalb. A special instance of this Indo-Iranian law of palatalization is exhibited in the formation of the redupli- cative perfect, where initial gutturals are changed into palatals before the vowel of the reduplicative syllable, which is ¢ in Greek and elsewhere ; compare Sanskrit perfects like cakara, jagrdbha with Greek rérpoga, Nédourra, &c. If, then, the Indo-Iranian a(= European e) once had the same influence on preceding gutturals as the palatal vowel and semi-vowel ¢ and y, it must necessarily itself have had a similar palatal, that is ¢-like, pronunciation distinguishing it from the other a's that go along with the non-palatal European and 0. The proofs for the coexistence of a and o in primitive Aryan are no less convineing than those for the existence of the palatal "'a-vowel," that is ¢, but they are too complicated to be discussed here. 5

*The Aryan syllabic liquids and nasals were also discovered by Brugmann. In Sanskrit the short syllabic liquids are preserved in the so-called 7-vowel and i-vowel, as in krtd, klpté ; the long ones have passed over into ir or ur, as in stirnd, purnd, and gurti. These Sanskrit vocalic r and 7 are the only direct remnants of the whole class. In all other cases the original system has been more or less destroyed. Thus, to give only a few instances, the syllabic nasals appear as@in Sanskrit and Greek, as in Sanskrit tatd, Greek Tarés for tntd- (past part. of /ten, in Sanskrit tanémi, Greek retvw for *revjw), Sanskrit catd, Greek é-xaréy, "hundred" (for k'nté-m); or as an before vowels, as in Sanskrit tant, "thin," Greek ravds, for dissyllabic ¢n-4. In Latin and Celtic an ¢ has been developed before ' po Osthoff, in Zeitschr. f. vergl. Sprachf., xxiii. p. 87, and Kluge, ibid., xxv.*

2 It must be borne in mind that the Sanskrit sounds generall i

by e and o were originally diphthongs, = ai and au. sasdieiaibisee: 3 See A. Amelung, Die Bildung der Tempusstimme durch Vi ocalstetgerung, Berlin

1871, also in Zeitschr. f. vergl. Sprachf., xxii. p. 309, and Zeitsch. f. deutsches Alter.

thum, Xvi. p. 161 sg.; and Brugmann, in Curtius's Studien, ix. pp. 287, 363. In

his earlier publications Brugmann wrote ay, as, 3 for e, 0, a respectively : A was

te substituted for a3 by De Saussure ; others, again, introduced a® and a? for Trugmann's a) and ae, and simple @ for his az. The spelling e, 0, a, now gener-

r iii. p. 177 sg.; Verner's discover

iy Bee ee by Osthoff, in Morphologische heruah inane, Tgp. 1G, ana

Dy ti schmann, in Zettschr. f. vergl. Sprachf., xxiv. p. 409. See also the full See of this problem by Joh. Schmidt, ibid., xxv. p- 1 sq.

ai ees i oe given above, compare for this and the following especi-

a sf baie ooo cur, zur Geschichte der german. Conjugation, Strasburg, 1879 ;

Petersburg, 1879; F. de Saussure, Mémoire sur le systeme primttif des voyelles

1S Les Mahlow, Die langen Vocale 7 2 x ee tae europ. Sprachen, Berlin, 1879; Osthoff and Erase Morpho- ig : A ae ersuchungen auf dem Gebiete der indog. Sprachen, 4vols., Leipsie, 1878, ee oe eyer, Griechische Grammatik, Leipsic, 1880 ; and a long series of articles aoe co Brugmann, Meyer, Osthoff, Joh. Schmidt, in Zeitschr. f, vergl. me ee + XXill. sg.. and by Bezzenberger, Collitz, and Fick, in Bezzen- 3 ie ae i il. sq. 3 also Fick in Géttinger gelehrie Anzeigen, 1880, i. ie Ae 881, ii. p. 1418 ; Paul, in Paul

and Braune, Beitrdge zur Geschichte eutschen Sprache und Literatur, vi. p. 108; H. Méller, ibéd., vii. p. 482.

Pe Tee OG yy

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*the nasal, Latin centwm, tenu-is, Irish e¢t (for *eent), in Germanic a u, Gothic hund, Old High German dunnt. Original syllabic r and Z arc in the same way represented by Greek pa (ap) and da (ad), as in @paxov, Bpadis (for *upadis), that's (=Sanskrit ddream, mrdt, priht), and in Germanic by wr, ud (more seldom ru, 2), as il Gothic thaursus, "dry" (for *thursus), wulfs, "wolf" (=Sanskrit trshu, vfka), and so forth.*

"The most brilliant result, however, of these recent researches was not the more exact fixing of the phonetic values of the single Aryan vowels, and of the rules of correspondence between these and the vowels of the individual languages, but the discovery that the system of etymological vowel-change which pervades the whole of Aryan word-forma.ion and inflexion, and which had until then generally borne the name of vowel- gradation, was chiefly deve- loped under the infiuence of stress and pitch. It is well known how the theory by which the old Sanskrit grammarians tried to explain vowel-differences in words or forms derived from the same

"root" considered the shortest form of a root-syllable discernible Shortest in all its derivations as the most primitive shape of the root, and form let the fuller forms be devcloped from it through a process of of root.

increase, which Sanskrit grammar is accustomed to call guna and vrddhi. 'Taking, for instance, the inflexions of perfects like véda, véttha, véda (originally pronounced vaida, &c.), plur. vidind, vidd, vidis, or eakdra, cakdrtha, cakara, plur. cakrmd, eakrd, eakris, past part. krtd, they would start from vid and kr as "roots," and say that ved- (vaid-) and kar- in véda (vaida) and cakara, &e., were derived from these through guna, that is, through the insertion of an @ before the original root-vowels 7 and 7. This doctrine has been adopted by Bopp, and thus become one of the fundamental theories of comparative philology, although the objections that can be raised against it are both numerous and obvious. Even if we pass

over the difficulty of giving a satisfactory phonetic explana- tion of the assumed process of insertion, how are we to account for the fact that in cases like ydjamt, past part. ishthd, or perfects like jagrdébha, plur. jagrbhmd, the "inserted" a stands after the "root-vowel" instead of before it? Or, if we look at forms like paptimd, perf. plur. of pdtdmi, "I fly," or smds, sthd, sénti, plur. of dsmi, "I am," must we not take pt and s as the original roots, and is it possible to imagine that such roots could ever have existed ? All such difficulties disappear by assuming the new theory, that the fuller forms are more original. As the above instances show,

the fuller forms appear wherever the "root-syllable " is accentuated, Funetion that is, stressed ; the shorter ones are confined to stressless syllables. of stress.

What, then, more natural than to assume that the a of the fuller forms was the original " root-vowel," and that it was dropped in the shorter forms on account of their being unaccentuated ? Loss of stressless vowels is one of the most frequent phonetic phenomena in all languages, and we have only to look to modern English pro- nunciation to find the most striking analogies to the processes assumed above. Every-day pronunciations like p'tdto, S'ptémber for the written potato, September are exact parallels to the Sanskrit pa-ptimd, and the common mi(lérd), mi(lddy) against the usual full mg to the Sanskrit vidmd against vdida ; even the r-vowel is quite well known in rapid speech in forms like J prpdse, or histry, natshral for the written propose, history, natural,

So far the new theory of vowel-gradation may be summed up as follows. Every root-syllable originally contained one of the three primitive vowels a, ¢, 0, either short or long ; 7, w, the liquids and nasals, only occurred as semi- vowels or consonants, that is, form- ing monosyllabic (diphthongic) combinations with these vowels, which may either precede or follow the consonants. Thus, taking the combinations with the short vowels as an instance, we get the following table—

ai et ot and ya ye yo QU eu Ou 4, wa we wo areror ,, ra re ro an enon ,, n& ne no &e. In originally stressless syllables long vowels were shortened and short vowels dropped. If the original short vowel were sur- rounded by mutes, the mutes would come into contact through the loss of the vowel, as

*in Sanskrit pap-timd from *papatimd, or Greek ér-réuny from mérouat, or éo-xov from éxw (for *céyw). If, however, the root-vowel were combined with a semi-vowel (7, u, or y, w), liquid or nasal, the latter would, on account of their vowel-like character, become syllabic (that is, vocalic) if followed by another consonant, but remain consonants if followed by a vowel ; compare the follow- Ing instances taken from Sanskrit (for the sake of distinctness we write the original ai, au for the common é, 6). vdida —vidis [tutéuda—tutudis daddrea —dadrcé yajamt—ishthad~ vaktum —uktd { Jagrabha—jagrbhus Jigdya —jigyus cakéra —eakris tatina—tatd (for tntd, see above) » —tatniré*

*In the same way we find in Greek olda—ldetv, pev-yw—aquyely, d€pxopat—ébpaxor (for *dpxov = Sanskrit ddream ; see above), rpémw— étparoy (for *érprov), &c., and correspondingly in the other languages.*

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It is obvious that through these rules the existence of 3, %, 7, 1, 7 B. Grammatical Strueture.— cannot be explained, and yet they do exist. Osthoff has suggested here, as a full ClaraCeniStiS of rene poke Coa ee the explanation that they represent intermediate stages of shorten- | without entering into a mass of more or less ere details 2 ing between the full diphthongs and the short 7, w, &c., which were Since the days of Bopp comparative philologists have ‘on the Deriy sometimes kept under the influence of a sort of half-stress.1_ They | whole accepted the theory of the old Sanskrit paren held ti me may just as well be subsequent lengthenings of the shorts due to | all Indo-Germanic words and forms must be traced back to simple i some reason as yet unknown ; but this whole chapter is still very | no longer divisible, monosyllabic elements, which have been salted obscure, and it may be doubted if the point will ever be sufficiently roots. We cannot undertake here to discuss the question how far elucidated. _ ; _ | this theory, which has never becn uncontested and is beginning ‘ The principle of explanation by presence or absence of stress in | to be doubted more and more, is historically correct. However, roots” is also applicable to derivative or inflexional syllables. It | so much

*may be conceded that, after removing all the elements s evident that forms like the Greek édevs (for *wéAefes)—mdXs, or | which seem to serve in the formation of single words or forms yhuxets (for *yhuxéFes)—yhuxis, or rarépa, marépes—mratpdot—marpa&v | or the formation of groups of such only in contrast with the whole follow the same rule as Acimw—hureiv, petyw—agpvyeiv, dépxouac— | mass of-a system of cognate words or forms, there generally remains édpaxoy, &c. But analogy and change of stress from one syllable | a monosyllable, which for practical purposes we may take as a philo- to another (which even in root-syllables have often somewhat | logical starting-point, without asking whether these preparations obscured the original state of things) have done much to render | of the philological laboratory ever had an actual existencc of their i working of the old laws indistinct, so that no more than this | own or whether they are mere abstractions. The general means by tion 8 a hint can ee ae aes ; sei ; which words and forms are derived from these ‘‘roots,” or from a lere are yet other interchanges of vowels in Aryan, quite as | other ready-made words and forms, are partly external, partly pitch. important as those which find their explanation in presence or | internal, Cn the whole, Indo-Germanic derivation and inflexion, absence of stress, which do not seem to fall under the principle | looked at from this point of view, are based on a system of suffixes, applied here. Amongst these the change of ¢ and o or é and 6, | that is, individualizing formative elements added at the end of both in roots and derivative syllables, is the most frequent. Thus we | less compound and less individualized formations. Infixes instead have in Greek Adyw—eldoxa, Adyos; Ael@w—hédovtra, Nowwds ; éAev- | of suffixes occur only by exception, the chief instance being the Gopat—eihyjrovba ; dépxopar—dédopxa ; tpémw—rérpoda ; pyyvuui— | insertion of a nasal, especially in certain verbal formations (as in éppuwya ; or Nbyo-s—Dbye ; yévos—vyéveos (for -**yéver-os); pépo-uev— | Latin ju-n-go against jugum, Greek X\a-u-Bdvw against é\aBov, San- pépe-Te 5 TaThp—Himdrwp, ppatwp ; woujv—axuov, &e. It is abso- | skrit yu-ndjmi, yu-i-jmds against yugdém). The third external lutely incredible that difference of stress could have changed either | element we meet is reduplication. Prefixes in the proper***

sense do é into o, or o into ¢; for the greater or less effort in pronouncing a | not seem to occur; even the verbal augment, which is the only vowel can have nothing to do with the quality of the vowel uttered, | case of an apparently real prefix, most likely was once an inde- as vowel-quality is only regulated by the position of the tongue | pendent word, so that augmentation must be reckoned among the and lips. If, then, any distinguishing principle in the utterance | numerous cases of composition. As means of internal change we of human speech governs these changes —and that assumption is | may mention the shifting of stress and pitch over the different incvitable—it must have been difference of pitch. This explana- | syllables of words and forms, and the vowel-changes which, as we tion was suggested independently by Fick and Moller? some years | have seen, originally followed these variations of accent, yet may ago, but has not found its due share of attention, although it re- | soon have become independent formative principles. commends itself both upon physiological and philological grounds. As to inflexion, Indo-Germanic is known to hold the foremost Inflexion There zs a natural physiological connexion between the palatal e | rank among all inflective languages. The distinction of nouns, of noun. and high pitch and between the guttural o and low pitch; for in | pronouns, and verbs is fully developed. In the nouns the intro- uttering a high tone we generally raise the larynx above its normal | duction in the substantives of grammatical gender is especially level, and consequently push the tongue forward with it towards a | noteworthy. Substantives and adjectives were inflected in the more palatal position ; for a low tone the larynx is lowered, and | same way, though some of the individual languages have deviated the tongue follows this movement by sliding backwards, that | from this rule ; the pronouns, at least, in many cases had their own is, towards the position of the guttural vowels (as can easily be | inflexions; otherwise they agree with the nouns in the distinc- observed in singing the vowel a on different notes). On the other | tion of numbers and cases. There were three numbers—singular, hand, we know that in Sanskrit the stress syllables were uttered | dual, and plural. The number of original cases cannot be settled in a high tone (wddtta), and regularly followed by a low-pitch | with certainty. The highest number we find distinguished in any syllable (svarita). This combination of high tone + low tone | language is seven— nominative, accusative, genitive, dative, instru- again corresponds with

***the sequel of ¢ + 0 observable in a great | mental, and locative (besides the vocative or interjectional case). many types of Aryan words or forms, such as \éyw, yévos, dédopxa; | But, judging from the fact that the same cases often have different compare also Birdrwp against marnp, dxuwv against rouujy, &c. | endings in different declensions, one might be inclined to think So far this theory seems very' probable; yct several difficulties | that once a still greater variety of case-distinctions had existed. still remain. In the first place, the additional hypothesis must be | The single declensions are distinguished according to the various made, that not all "accentuated," that is stressed, syllables had | stem-suffixes immiediately preceding the case-endings. The two the high tone; if o is the characteristic vowel of low-pitch syllables, | chief subdivisions accordingly are the declensions of vocalic and words like \éyos, ¢épos must have had low pitch on their first | consonantal stems. It may be noticed in passing that the so-called syllable, while the ¢ of \éyw, ¢épw was uttered with the high tone. | 7 and w stems follow the type of the consonantal declension ; this, Strange as such an accentuation might sound to English or German | however, appears but natural if we consider that the final i and u ears, it involves no practical difficulty ; for there are at least some | of these stcms most probably arc reductions of older diphthongs living Aryan idioms which possess similar distinctions : in Servian, | ending ina semi-vocalic or consonantal element. For declensional for instance, the nominative véda is pronounced with a high rising | distinctions only one of the general external formative principles tone on the first and a falling tone on the second, the stress being | is used, namely, that of combining ready-made stems with snffixal nearly equally divided between the two syllables; the accusative | endings, at the same time expressing case and number. — vodu, again, has a well-marked stress on the first syllable, but is The verb, too, has in like manner its inflexional endings to ex- Inflexion pronounced in a low falling tone.** *In the second place, this theory | press the distinctions of number and person ; but it also makes use of verb. requires a supplementary inquiry into the relations of pitch and | of all the other formative principles, both internal and external. stress in Aryan, for it seems evident that stress and high pitch did The shifting of accent and the vowel-changes connected therewith not always go together. That the reduplicated perfccts like the | are nowhere more distinctly traceable than in the verb. Besides, Sanskrit daddrea, Greek dédopxe, for instance,*

originally had the | we find the use of special suffixes for the distinction of tenses and stress on the root-syllable is certain from the evidence of Germanic, | moods, sometimes the infixion of a nasal in the formation of tense- yet that same root-syllable has the low-pitch vowel 0, while the | stems, then again on a larger scale the use of reduplication, and unstressed reduplicative syllable shows the high-pitch vowel e. lastly, the use of the augment as a conimon sign for the different The original pronunciation of Aryan dedorke, therefore, must | tenses of the past. None of the individual languages seems to have = . preserved the original stock of Aryan verbal forms to its full extent. have been something like ® (, while afterwards the stress was | The oldest Sanskrit seems to come nearest to poe is os attracted by the hgh-tnealable ip Gres andthe high tone by | ee acre ony now the old stress-sy lable in Sanskrit. In this direction the investiga- forms, Eonie oi which still Poni to baffle all attempts at an tions of Fick and Méller cannot be considered more than an open- 1 : 5 : . : explanation. Germanic may serve as a type of the opposite ing of the field for further research ;. and the same must be salt of | character ; it has lost all but the old present and the old redupli- what has been done hitherto with regard to an explanation of other | sated perfect, but supplied the loss by the extensive cmployment vowel-changes of a similar character. S| of ausiliaries. The differences thus exhibited by the different 1 Morphologische Untersuchwngen, vol. iv., which treats of the Aryan? and | languages make it a difficult task to determine which formations 2 Fick, in Gittinger gelehrte Anzeigen, 1880, i. p. 417 sy., and Moller, in | hejong to the primitive Aryan stock and which were added at Paul and Braune, Beitrége, vii. p. 482 sq. later periods. General consent, however, seems to take the follow-

3 See L. Masing, “ Die Hauptformen des serbisch-chorwatischen Accents,” | + A ; ake : : in Afém. Acad. Imp. des aes, vol. xxiii., St Petersburg, 1876. ” | ing points for settled. Of the three voices distinguished in Greek,

only two are of primitive growth, the active and the middle voice, the passive voice being a later specialization of the middle. There were three moods, an indicative, a subjunctive, and an optative ; the difference of the latter two from the indicative lay partly in the inflexional endings, partly in the addition of a special mood-suffix before these terminations. There was also an imperative. The distinction of numbers was the same as in declension, —singular, dual, plural, each of which had three persons. The tenses may be divided into three groups. The first group comprises the present and perfect, the former of which is supposed to have been used originally as a general predicative form, being neither past, present, nor future, while the perfect was used to indicate the completion of the action signified by the root. The present is rarely formed

aorist either from the root simple or reduplicated (root-aorist, corresponding to the so-called second aorist in Greek), or by insert- ing an s between the root and the inflexional endings (sibilant, or sigmatic aorist, the first aorist of Greek). The existence of a plu- perfect derived from the perfect in a way similar to the derivation of the imperfect from the present is doubtful and not generally admitted. The last division is formed by the future, which, like the first aorist, inserts a sibilant after the root-syllable. None of the other formations of the future occurring here and there is believed to have existed in the parent-speech. Of participles there were three sets, belonging to the present, the perfect, and the aorist respectively. An infinitive had not yet been devcloped ; its place in Aryan was supplied by the use of verbal nouns.

C. Comparative Syntax,) to conclude with, is the youngest Com- branch of Aryan philology. Its chief object so far has been to parative settle the original meanings and the primitive rules of use of the syntax.

direct from the root, but more generally from a special tense- stem derived from the root by the addition of some special tense

suffix or infix, or reduplication. Of the different formations of the perfect met with in the individual languages only that through reduplication of the root-syllable is believed to be of Aryan origin. The second group is that of

the past tenses, the imperfect and two aorists. In all these the past sense is marked by the augment. The imperfect is regularly formed from the present stem, and the

PHILOMELA. See NicHTINGALE, vol. xvii. p. 499.

PHILOPGiMEN, 'the last of the Greeks" as he was called by an admiring Roman, was a leading champion of the Achzan League, which preserved in Peloponnesus a last shred of Greek freedom. Sprung from an illustrious Arcadian family, he was born at Megalopolis in Arcadia in 252 B.c. His father Craugis dying in his infancy, Philo- poemen was brought up by his father's friend Cleander, an exile from Mantinea. In his youth he associated with Ecdemus and Megalophanes, who had studied the Academic philosophy under Arcesilaus, and had proved themselves friends of freedom by helping to rid Megalopolis and Sicyon of tyrants. Philopcemen soon distinguished him- self in war and the chase. Hard-featured but of an iron frame, simple and hardy in his way of life, blunt and straightforward in speech and manner,? he was a born soldier, delighting in war and careless of whatever did not bear on it. Thus he would not practise wrestling because the athlete's finely-strung habit of body is ill-fitted to bear the strain of a soldier's life. He read books of a martial and stirring tone, like the poems of Homer, together with works on military history and tactics. Epaminondas was his pattern, but he could not school his hot temper into the unruffled patience of the Theban. Indeed we miss in this rugged soldier that union of refinement at home with daring in the field which had stamped the soldier-citizens of the best age of Greece. His leisure was devoted to the chase or to the cultivation of his farm, where he worked like one of his hinds. In 222, when Cleomenes king of Sparta made himself master of Megalopolis by a night attack, Philopcemen secured by his valour the retreat of the main body of the citizens to Messene, and encouraged them to refuse the insidious invitation of Cleomenes to return to their homes on condition of renouncing their connexion with the Achzan League.' Thus baffled, Cleo- menes laid the city in ruins and retired. At the battle of Sellasia (early summer 221), where Cleomenes was defeated by the combined Achwan and Macedonian forces under Antigonus, king of Macedonia, Philopcemen greatly distinguished himself by charging, without orders, at the head of the Megalopolitan cavalry and thus saving from

defeat the wing on which he fought. His conduct won the admiration of Antigonus, who offered him a command in the Macedonian army, but he declined it and went to the wars in Crete. Returning after some time with fresh laurels, he was at once chosen to command the Achzan cavalry, which, from an ill-mounted, raw, and cowardly

u A list of books concerning Aryan syntax will be found in the ap- pendix to Sayce's Introduction to the Science of Language, vol. ii.

**~ The simplicity of his manners is illustrated by a tale like that of Alfred and the cakes, Plut., hile oe*

different cases, moods, and tenses. Some attempts have also been recently made to fix the rules of primitive word-order. About all these questions we must refer the reader to the original investiga- tions of the different authors who have more especially cultivated this branch of research. (E. SL.)

body he soon turned into a highly-trained and thoroughly efficient force ; at the head of it he overthrew the Atolian and Elean horse, and slew their commander with his own hand (209). He was elected general of the Achzan League for the first time in 208. In this, the highest dignity of the confederacy, he infused greater vigour and independence into the councils of the League than had been shown by Aratus, who had leaned on Macedonia and trusted to diplomacy rather than the sword. Philopcemen entirely changed the equipment and tactics of the troops of the League, substituting complete armour, long lances and large shields for the lighter arms hitherto in use, and adopting the Macedonian phalanx as the fighting order. But he did more: by example and precept he turned a nation of dandies into a nation of soldiers, who now spent on arms and accoutrements the wealth they had before lavished on dinners and dress, With the army thus trans- formed he defeated Machanidas, tyrant of Sparta, at the battle of Mantinea. The tyrant fell by Philopcemen's hand, Tegea was taken, and Laconia ravaged. A bronze statue representing Philopcemen slaying Machanidas was set up at Delphi by the Acheans. At the Nemean festival which followed the battle Philopcemen, then general for the second time, was hailed by the people as the liberator of Greece. Jealous of the degree of independence to which Philopcemen had raised the League, Philip king of Mace- donia sent emissaries to murder him, but they were

foiled. So great was the terror of his name that at the bare report that he was coming the Beeotians raised the siege of Megara and fled. When Nabis, successor of Machanidas in the tyranny of Sparta, seized Messene, Philopcemen, though he held no office at the tine and the general of the League refused to stir, collected his fellow-townsmen and drove out the tyrant. In his third generalship (201-200) he mustered the Achean forces with great secrecy at Tegea and, invading Laconia, defeated the troops of Nabis. The Romans were now about to cross the sea for the war with Philip of Macedonia, and Philopcemen was the means of preventing the Acheans from concluding an alliance with Philip against Rome. At the expiry of his year of office he sailed once more to Crete, where he successfully led the troops of the Gortynians, beating the Cretans with their own weapons of craft and surprise. Philopcemen did not return to Peloponnesus till after the Romans under Flamininus had conquered Philip. He found the Romans and Achzans making war on Nabis and was again elected to the generalship (192). Nabis was besieging Gythium, which with the other towns on the Laconian coast had been wrested from him by the Romans, handed over by them to the Spartan exiles, and attached to the Achwan League. Being defeated in an attempt to relieve Gythium

by sea, Philopcemen landed and surprised a part of the tyrant's forces not far from that town, burned their camp, and slew many. After ravaging Laconia he marched on Sparta in the hope of compelling Nabis to raise the siege. But Nabis took Gythium and awaited the Achzans in a pass. Philopcemen was surprised, but by skilful general- ship he not only extricated himself but routed the Spartans and cut off most of the fugitives. When Nabis was assassinated Philopcemen hastened to Sparta and induced it to join the Achezan League. In the same year (192) Antiochus, king of Asia, crossed into Greece to fight the Romans. By the advice, or at least with the concurrence, of Philopcemen the Achzans rejected the king's proposal that they should remain neutral, and declared war against him and his allies the A'tolians. In the following year Diophanes, general of the League, hearing that Sparta showed signs of revolt, marched against it accompanied by Flamininus. Philopceemen had remonstrated in vain against this step, and he now boldly threw himself into Sparta, composed

the disturbances, and closed the gates against Diophanes and Flamininus. The grateful Spartans offered Philopcemen a splendid present, but he bade them keep such bribes for their enemies. In 189 Philopcemen, again general, proposed and carried in an assembly, which he summoned at Argos, a decree that the general assembly of the League should meet in all the cities of the League in rotation, instead of, as hitherto, at AZgeum only. This measure was obviously meant to deprive Achza of its position as head of the League, and to make the allied cities more equal. In the same year the Spartans made an unsuccessful attack on one of the maritime towns occu- pied by the exiles. As these towns were under Achean protection the League required Sparta to surrender the authors of the attack. Far from complying, the Spartans put to death thirty partisans of Philopcemen and re- nounced their connexion with the League. The Achzans declared war, and in the following spring (188) Philo- poemen, having been re-elected general, marched against Sparta, which was forced to pull down its walls, to expel the foreign mercenaries and the slaves whom the tyrants had freed, to exchange the laws and institutions of Lycurgus for, those of the Achzans, and, lastly, to receive back the exiles. It would seem that on this occasion Philopcemen allowed his hatred of the old enemy of Megalopolis to overpower his judgment ; his conduct was as unwise as it was cruel, for it afforded the Romans—what Philopcemen had hitherto been careful not to furnish them with—a pretext for meddling in the affairs of Greece. His treat- ment of Sparta was censured by the senate, and Roman officers in Greece remonstrated with the League on the subject. In 183, the last year of his life, Philopcemen was general for the eighth time (his seventh generalship perhaps fell in 187, but this is uncertain). He lay sick of a fever at Argos when word came that Messene, under Dinocrates, had revolted from the League. At first he despatched his friend and partisan Lycortas to put down the revolt, then growing impatient, in spite of the fever and his seventy years, he hurried in a single day to Megalopolis, and, taking with him the cavalry of his native town, entered Messenia and routed Dinocrates. But, the enemy being reinforced, he was compelled to fall back over broken ground. In his anxiety to cover the retreat of his troopers he was left alone, and, his horse stumbling, he was thrown to the ground and taken prisoner. He was conducted with his arms pinioned through the streets of Messene and cast into a dungeon. At nightfall on the second day an executioner was sent to him witha cup of poison. Seeing the light and the

executioner standing by, Philopceemen sat up with difficulty, for he was weak, and, taking the cup in his hand, he asked the man, What tidings of the

cavalry? Being told that they had mostly escaped, he bowed his head and said that it was well. Then he drained the cup and lay down to die. Swift vengeance overtook his murderers. The indignant Achzans, under Lycortas ravaged Messenia, and when the capital surrendered all who had had part in the murder of Philopcemen were obliged to kill themselves. Dinocrates had already com- mitted suicide. The body of Philopcemen was burned and his bones conveyed to Megalopolis with every mark of respect and sorrow, the urn, almost hidden in garlands, being borne by his fellow-townsman, the historian Polybius. Numerous statues were set up and honours decreed to him in the cities of the League. After the destruction of Corinth by Mummius some one proposed to destroy the statues of a man who had been no friend of the Romans ; but the Roman general rejected the base proposal. Philopeemen's lot was cast in evil days. Hardly were the Achzans freed by him from Macedonia when they had to submit to Rome. His policy towards the Romans was marked by a prudence and moderation hardly to be expected from one of his passionate nature. He saw that the final subjugation of Greece was inevitable, but he did his best to delay it, not by a war which would only have precipi- tated the catastrophe, but by giving the Romans no ground for interference, and by resisting their encroachments, so far as this could be done, by an appeal to reason and justice. Our authorities for the life of Philopcemen are Polybius, Livy, Plutarch, and Pausanias. Polybius's work on Philopcemen was in

three books, but it is lost. Plutarch's biography, like the account in Pausanias (viii. 49-51), is based on Polybius. (J. G. FR.)

PHILOSOPHY is a term whose meaning and scope have varied very considerably according to the usage of different authors and different ages ; and it would hardly be possible, even having regard to the present time alone, to define and divide the subject in such a way as to command the adhesion of all the philosophic schools. The aim of the present article will be, however, leaving controversial details as far as possible in the background, to state generally the essential nature of philosophy as

distinguished from the special sciences, and to indicate the main divisions into which, as matter of historical fact, its treatment has fallen.

Historical Use of the Term.—The most helpful introduc- tion to such a task is afforded by a survey of the steps by which philosophy differentiated itself, in the history of Greek thought, from the idea of knowledge and culture in general. These steps may be traced in the gradual specification of the term. The tradition which assigns the first employment of the word to Pythagoras has hardly any claim to be regarded as authentic ; and the somewhat self-conscious modesty to which Diogenes Laertius attri- butes the choice of the designation is, in all probability, a piece of etymology crystallized into narrative. It is true that, as a matter of fact, the earliest uses of the word (the verb ¢iAocodéw occurs in Herodotus and Thucydides) imply the idea of the pursuit of knowledge; but the distinction between the codos, or wise man, and the g:Adcodos, or lover of wisdom, appears first in the Platonic writings, and lends itself naturally to the so-called Socratic irony. The same thought is to be found in Xenophon, and is doubtless to be attributed to the historical Socrates. But the word soon lost this special implication. What is of real interest to us is to trace the progress from the idea of the philosopher as occupied with any and every department of knowledge to that which assigns him a special kind of knowledge as his province. A specific sense of the word first meets us in Plato, who defines the philosopher as one who appre- hends the essence or reality of things in opposition to the man who dwells in appearances and the shows of sense. The philosophers, he says, "are those who are able to grasp the eternal and immutable"; they are "' those who set their

affections on that which in each case really exists" (Rep., 480). In Plato, however, this distinction is applied chiefly in an ethical and religious direction ; and, while it defines philosophy, so far correctly, as the endeavour to express what things are in their ultimate constitution, it is not yet accompanied by a sufficient differentiation of the sub- sidiary inquiries by which this ultimate question may be approached. Logic, ethics, and physics, psychology, theory of knowledge, and metaphysics are all fused together by Plato in a semi-religious synthesis. It is not till we come to

Aristotle—the encyclopzdist of the ancient world— that we find a demarcation of the different philosophic dis- ciplines corresponding, in the main, to that still current. The earliest philosophers, or " physiologers," had occupied themselves chiefly with what we may call cosmology ; the onc question which covers everything for them is that of the underlying substance of the world around them, and they essay to answer this question, so to speak, by simple inspection. In Socrates and Plato, on the other hand, the start is made from a consideration of man's moral and intellectual activity ; but knowledge and action are con- fused with one another, as in the Socratic doctrine that virtue is knowledge. To this correspond the Platonic con- fusion of logic and ethics and the attempt to substitute a theory of concepts for a metaphysic of reality. Aristotle's methodic intellect led him to separate the different aspects of reality here confounded. He became the founder of logic, psychology, ethics, and esthetics as separate sciences ; while he prefixed to all such (comparatively) special in- quiries the investigation of the ultimate nature of existence

as such, or of those first principles which are common to,

and presupposed in, every narrower field of knowledge. For this investigation Aristotle's most usual name is " first philosophy"; but there has since been appropriated to it, apparently by accident, the title "metaphysics." " Philo- sophy," as a term of general application, was not, indeed, restricted by Aristotle or his successors to the disciplines just enumerated. Aristotle himself includes under the title, besides mathematics, all his physical inquiries. It was only in the Alexandrian period, as Zeller points out, that the special sciences attained to independent cultivation. Nevertheless, as the mass of knowledge accumulated, it naturally came about that the name "philosophy " ceased to be applied to inquiries concerned with the particulars as such. The details of physics, for example, were aban- doned to the scientific specialist, and philosophy restricted itself in this department to the question of the relation of the physical universe to the ultimate ground or author of things. This inquiry, which was long called "rational cosmology," may be said to form part of the general science of metaphysics, or at all events a pendant to it. By the gradual sifting out of the special sciences philosophy thus came to embrace primarily the inquiries grouped as " meta- physics" or "first philosophy." These would

embrace, according to the scheme long current, ontology proper, or the science of being as such, with its branch sciences of (rational) psychology, cosmology, and (rational or natural) theology. Subsidiary to metaphysics, as the central in- quiry, stand the sciences of logic and ethics, to which may be added esthetics, constituting three normative sciences, —sciences, that is, which do not, primarily, describe facts, but rather prescribe ends. It is evident, however, that if logic deals with conceptions which may be considered con- stitutive of knowledge as such, and if ethics deals with the harmonious realization of the highest known form of exist- ence, both sciences must have a great deal of weight in the settling of the general question of metaphysics.

Modern modifications of the above scheme will be pre- sently considered ; but it is sufficiently accurate as a start- Ing-point, and its acceptance by so many generations of

thinkers is a guarantee for its provisional intelligibility. Accordingly, we may say that "philosophy" has been under- stood, during the greater part of its history, to be a general term covering the various disciplines just enumerated. It has frequently tended, however, and still tends, to be used as specially convertible with the narrower term "meta- physics." This is not unnatural, seeing that it is only so far as they bear on the one central question of the nature of existence that philosophy spreads its mantle over psychology, logic, or ethics. The organic conditions of perception and the associative laws to which the mind, as a part of nature, is subjected, are nothing to the philosopher; and therefore the handing over of (empirical) psychology to special investigators, which is at present taking place, can be productive of none but good results. Similarly, logic, so far as it is an art of thought or a doctrine of fallacies, and ethics, so far as it is occupied with a natural history of impulses and moral sentiments, do neither of them belong, except by courtesy, to the philosophic pro- vince. But, although this is so, it is perhaps hardly desirable to deprive ourselves of the use of two terms instead of one. It will not be easy to infuse into so abstract and bloodless a term as "metaphysics" the fuller life (and especially the

inclusion of ethical considerations) suggested by the more concrete term " philosophy."

We shall first of all, then, attempt to differentiate philo- sophy from the special sciences, and afterwards proceed. to take up one by one what have been called the philosophical sciences, with the view of showing how far the usual sub- ject-matter of each is really philosophical in its bearing, and how far it belongs rather to the domain of science strictly so called. We shall also see in the course of this inquiry in what these various philosophical disciplines differ from one another, and how far they merge into another, or have, as a matter of fact, been confused at different periods in the history of philosophy. The order in which, for clear- ness of exposition, it will be most convenient to consider these disciplines will be psychology, epistemology or theory of knowledge, and metaphysics, then logic, «esthetics, and ethics. Finally, the connexion of the last-mentioned with politics (or, to speak more modernly, with jurisprudence and sociology) and with the philosophy of history will call for a few words on the relation of these sciences to general philosophy.

Philosophy and Science.—In distinguishing philosophy from the sciences, it may not be amiss at the outset to guard against the possible misunderstanding that philo- sophy is concerned with a subject-matter different from, and in some obscure way transcending, the subject-matter of the sciences. Now that psychology, or the observa- tional and experimental study of mind, may be said to have been definitively included among the positive sciences, there is not even the apparent ground which once existed for such an idea. Philosophy, even under its most discredited name of metaphysics, has no other subject-matter than the nature of the real world, as that world lies around us in everyday life, and lies open to observers on every side. But if this is so, it may be asked what function can remain for philosophy when every portion of the field is already lotted out and enclosed by specialists ? Philosophy claims to be the science of the whole ; but, if we get the knowledge of the parts from the different sciences, what is there left for philosophy to tell us? To this it is sufficient to answer generally that the synthesis of the parts is something more than that detailed knowledge of the parts in separa- tion which is gained by the man of science. It is with the ultimate synthesis that philosophy concerns itself

peat has to show that the subject-matter which we are all deal- ing with in detail really 7s a whole, consisting of articulated ‘members. Evidently, therefore, the relation existing be-

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tween philosophy and the sciences will be, to some extent, one of reciprocal influence. The sciences may be said to furnish philosophy with its matter, but philosophical criti- cism reacts upon the matter thus furnished, and transforms it. Such transformation is inevitable, for the parts only exist and can only be fully, «.¢. truly, known in their relation to the whole. A pure specialist, if such a being were possible, would be merely an instrument whose results had to be co-ordinated and used by others. Now, though a pure specialist may be an abstraction of the mind, the tendency of specialists in any department naturally is to lose sight of the whole in attention to the particular cate- gories or modes of nature’s working which happen to be exemplified, and fruitfully applied, in their own sphere of investigation ; and in proportion as this is the case it becomes necessary for their theories to be co-ordinated with the results of other inquirers, and set, as it were, in the light of the whole. This task of co-ordination, in the broadest sense, is undertaken by philosophy; for the philosopher is essentially what Plato, in a happy moment, styled him, ovvorrixds, the man who insists on seeing things together. The aim of philosophy (whether attain- able or not) is to exhibit the universe as a rational system in the harmony of all its parts ; and accordingly the philo- sopher refuses to consider the parts out of their relation to the whole whose parts they are. Philosophy corrects in this way the abstractions which are inevitably made by the scientific specialist, and may claim, therefore, to be the only concrete science, that is to say, the only science which takes account of all the elements in the problem, and the only science whose results can claim to be true in more than a provisional sense.

For it is evident from what has been said that the way in which we commonly speak of “facts” is calculated to convey a false impression. The world is not a collection of individual facts existing side by side and capable of being known separately. A fact is nothing except in its relations to other facts; and as these relations are multi- plied in the progress of

knowledge the nature of the so- called fact is indefinitely modified. Moreover, every state- ment of fact involves certain general notions and theories, so that the "facts" of the separate sciences cannot be stated except in terms of the conceptions or hypotheses which are assumed by the particular science. Thus mathe- matics assumes space as an existent infinite, without investi- gating in what sense the existence or the infinity of this "Unding," as Kant called it, can be asserted. In the same way, physics may be said to assume the notion of material atoms and forces. These and similar assump- tions are ultimate presuppositions or working hypotheses for the sciences themselves. But it is the office of philo- sophy, or theory of knowledge, to submit such conceptions to a critical analysis, with a view to discover how far they can be thought out, or how far, when this is done, they refute themselves, and call for a different form of statement, if they are to be taken as a statement of the ultimate nature of the real! The first statement may frequently turn out to have been merely provisionally or relatively true ; it is then superseded by, or rather inevit- ably merges itself in, a less abstract account. In this the same "facts" appear differently, because no longer sepa- rated from other aspects that belong to the full reality of the known world. There is no such thing, we have said, as an individual fact ; and the nature of any fact is not fully known unless we know it in all its relations to the

1 The revisional office which philosophy here assumes constitutes 'her the critic of the sciences. It is in this connexion that the mean- ing of the definition of philosophy as "the science of principles" can best be seen. vague, one of the least misleading.

This is perhaps the most usual definition, and, though |

system of the universe, or, in Spinoza's phrase, "sub specie eternitatis." In strictness, there is but one res completa or concrete fact, and it is the business of philosophy, as science of the whole, to expound the chief relations that constitute its complex nature.

The last abstraction which it becomes the duty of philo- sophy to remove is the abstraction from the knowing subject which is made by all the sciences,

including, as we shall see, the science of psychology. The sciences, one and all, deal with a world of objects, but the ultimate fact as we know it is the existence of an object for a sub- ject. Subject-object, knowledge, or, more widely, self-con- sciousness with its implicates—this unity in duality is the ultimate aspect which reality presents. It has generally been considered, therefore, as constituting in a special sense the problem of philosophy. Philosophy may be said to be the explication of what is involved in this relation, or, in modern phraseology, a theory of its possibility. Any would-be theory of the universe which makes its central fact impossible stands self-condemned. On the other hand, a sufficient analysis here may be expected to yield us a statement of the reality of things in tts last terms, and thus to shed a light backwards upon the true nature of our subordinate conceptions.

Psychology, Epistemology, and Metaphysics.—This leads to the consideration of our first group of subsidiary sciences —PsycwoLoey (q.v.), epistemology (theory of knowledge, Erkenntnisstheorie), and metaphysics (ontology; see Mzra- pHysic). A special relation has always existed between psychology and systematic philosophy, but the closeness of the connexion has been characteristic of modern and more particularly of English thought. The connexion is not diffi- cult to explain, seeing that in psychology, or the science of mind, we study the fact of intelligence (and moral action), and have, so far, in our hands the fact to which all other facts are relative. From this point of view we may even agree with Sir W. Hamilton when he quotes Jacobi's dictum—' Nature conceals God; man reveals God." In other words, as has just been said, the ultimate explana- tion of things cannot be given by any theory which excludes from its survey the intelligence in which nature, as it were, gathers herself up. But knowledge, or the mind as knowing, willing, &c., may be looked at in two different ways. It may be regarded simply as a fact, in which case the evolutions of mind may be traced and reduced to laws in the same way as the phenomena treated by the other sciences. This study gives us the science of empirical psychology, or, as it is now termed, psychology sans phrase. In order to give an adequate account of its subject-matter, psychology may require higher or more coniplex categories than are employed in the other sciences, just as biology, for example, cannot work with mechanical categories alone, but introduces the conception of development or growth.

But the affinities of such a study are manifestly with the sciences as such rather than with philosophy; and it has been already pointed out that the division of labour in this respect is proceeding rapidly. Since it has been taken up by specialists, psychology is being established on a broader basis of induction, and with the advantage, in some departments, of the employment of experimental methods of measurement. But it is not of mind in this aspect that such assertions can be made as those quoted above. Mind, as studied by the psychologist—mind as a mere fact or phenomenon —grounds no inference to any- thing beyond itself. The distinction between mind viewed as a succession of "states of consciousness " and the further aspect of mind which philosophy considers is very clearly put in a recent article by Professor Croom Robertson, who also makes a happy suggestion of two terms to designate the double point of view.

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"We may view knowledge as mere subjective function, but it has its full meaning only as it is taken to represent what we may call objective fact, or is such as is named (in different circumstances) real, valid, truc. As mere subjective function, which it is to the psychologist, it is best spoken of by an unambiguous name, and for this there seems none better than Intellection. We may then say that psychology is occupied with the natural function of Inéed/cetion, seeking to discover its laws and distinguishing its various modes (perception, representative imagination, conception, &c.) according to the various circumstances in which the laws are found at work. Philosophy, on the other hand, is theory of Knowledge (as that which is known)."—' Psychology and Philosophy," Afind, 1883,

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"a The confusion of these two points of view has led, and

still leads, to serious philosophical misconception. It is hardly an exaggeration to say that, in the English school since Hume, psychology superseded properly philosophical inquiry. The infusion of epistemological matter into the numerous analyses of the human mind rendered the sub-

stitution plausible and left men satisfied. And we find even a thinker with a wider horizon like Sir W. Hamilton encouraging the confusion by speaking of '" psychology or metaphysics,"! while his lectures on metaphysics are mainly taken up with what belongs in the strictest sense to psychology proper, with an occasional excursus (as in the theory of perception) into epistemology. That this con- fusion is on the way to be obviated for the future is largely due to the Kantian impulse which has been strongly felt of late in English thought, and which has acted in this matter on many who could not, by any laxity of termino- logy, be numbered as Kantians or Neo-Kantians. The distinction between psychology and theory of knowledge was first clearly made by Kant, who repeatedly insisted that the Critique of Pure Réason was not to be taken as a psychological inquiry. He defined his problem as the quad juris or the question of the validity of knowledge, not its quid facti or the laws of the empirical genesis and evolution of intellection (to use Professor Robertson's phraseology). Since Kant philosophy has chiefly taken the form of theory of knowledge or of a criticism of experience. Not, indeed, a preliminary criticism of our faculties or conceptions such as Kant himself proposed to institute, in order to determine the limits of their application ; such a criticism ab extra of the nature of our experience is essentially a thing im- possible. The only criticism which can be applied in such a case is the immanent criticism which the conceptions or categories exercise upon one another. The organized criti- cism of these conceptions is really nothing more than the full explication of what they mean and of what experience in its full nature or notion is. This constitutes the theory of knowledge, and lays down, in Kantian language, the con- ditions of the possibility of experience. These conditions are the conditions of knowledge as such, of self-conscious- ness in general, or, as it may be put, of objective conscious- ness. 'The inquiry is, therefore, logical or transcendental in its nature, and does not entangle us in any decision as to the conditions of the genesis of such consciousness in the individual. When we inquire into subjective conditions, we are thinking of facts causing other facts. But the logical or transcendental conditions are not causes or even factors of knowledge ; they are the statement of its idea. Hence the dispute at the present time between evolutionist and transcendentalist rests, in general, on an ugnoratio elencht ; for the history of the genesis of an idea (the his- torical or genetic method) does not contair' an answer to— though it may throw light on—the philosophic

question of its truth or validity. Speaking of this transcendental consciousness, Kant goes so far as to say that it is not

5 It is true that he afterwards modifies this misleading identification by introducing the distinction between empirical psychology or the phenomenology of mind and inferential psychology or ontology, 7.e.,

metaphysics proper. But he continues .to use the terms " philosophy," metaphysics," and "mental science" as synonymous.

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of the slightest consequence " whether the idea of it be clear or obscure (in empirical consciousness), no, not even whether it really exists or not. But the possibility of the logical form of all knowledge rests on its relation to this apperception as a faculty or potentiality" (Werke, ed. Hartenstein, ili. 578 note). Or, if we return to the distinction between epistemology and psychology, by way of illustrating the nature of the former, we may take the summing up of Mr Ward in a valuable article on "Psychological Principles" recently contributed to Mind (April 1883, pp. 166, 167). "Comparing psychology and epistemology, then, we may say that the former is essen- tially genetic in its method, and might, if we had the power to revise our existing terminology, be called biology; the latter, on the other hand, is essentially devoid of every- thing historical, and treats, sub specie aternitatrs, as Spinoza might have said, of human knowledge, conceived as the possession of mind in general."

Kant's problem is not, in its wording, very different from that which Locke set before him when he resolved to "inquire into the original, certainty, and extent of human knowledge together with the grounds and degrees of belief, opinion, and assent." Locke's Hssay is undoubtedly, in its intention, a contribution to the theory of knowledge, as any one may verify for himself by turning to the headings of the chapters in the fourth book. But, because time had not yet made the matter clear, Locke suffered himself to digress in his second book into the purely psychological question of the origin of our ideas, or, as Kant called it, the physiology of the human mind. Appearing thus, first, as the problem of perception (in Locke and his English successors), Widening its scope and becoming, in Kant's hands, the

question of the possibility of experience in general, epistemology may be said to have passed with Hegel into a completely articulated "logic," that claimed to be at the same time a metaphysic, or an ultimate ex- pression of the nature of the real. This introduces us to the second part of the question we are seeking to determine, namely, the relation of epistemology to metaphysics.

It is evident that philosophy as theory of knowledge must have for its complement philosophy as metaphysics or ontology. The question of the truth of our knowledge, and the question of the ultimate nature of what we know, are in reality two sides of the same inquiry ; and therefore our epistemological results have to be ontologically ex- pressed. But it is not every thinker that can see his way with Hegel to assert in set terms the identity of thought and being. Hence the theory of knowledge becomes with some a theory of human ignorance. This is the case with Herbert Spencer's doctrine of the unknowable, which he advances as the result of epistemological considerations in the philosophical prolegomena to his system. Very similar positions were maintained by Kant and Comte ; and, under the name of "agnosticism," the theory has popu- larized itself of late in the outer courts of philosophy, and on the shifting borderland of philosophy and literature. The truth is that the habit of thinking exclusively from the standpoint of the theory of knowledge tends to beget an undue subjectivity of temper. And the fact that it has become usual for men to think from this standpoint is very plainly seen in the almost universal description of philosophy as an analysis of "experience," instead of its more old-fashioned designation as an inquiry into "the nature of things." Now it is matter of universal agree- ment that the problem of being must be attacked indirectly through the problem of knowledge; and therefore this substitution certainly marks an advance, in so far as it implies that the fact of experience, or of self-conscious existence, is the chief fact to be dealt with. But if so, then self-consciousness must really be treated as existing,

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and as organically related to the rest of existence. If self-consciousness be treated in this objective fashion, then we pass naturally from epistemology to metaphysics or ontology. (For, although the term "ontology" has been as

good as disused, it still remains true that the aim of philo- sophy must be to furnish us with an ontology or a coherent and adequate theory of the nature of the existent.) But if, on the other hand, knowledge and existence be ab initio opposed to one another—if consciousness be set on one side as over against existence, and merely holding up a mirror to it—then it follows with equal naturalness that the truly objective must be something which lurks un- revealed behind the subject's representation of it. Hence come the different varieties of a so-called phenomenalism. The upholders of such a theory would, in general, deride the term "metaphysics" or "ontology"; but it is evident, none the less, that their position itself implies a certain theory of the universe and of our own place in it, and philosophy with them will consist, therefore, in the estab- lishment of this theory.

Without prejudice, then, to the claims of epistemology to constitute the central philosophic discipline, we may simply note its liability to be misused. The exclusive preoccupation of men's minds with the question of know- ledge during the last quarter of a century or more drew from Lotze the caustic criticism that "the continual sharpening of the knife becomes tiresome, if, after all, we have nothing to cut with it." Stillingfleet's complaint against Locke was that he was "'one of the gentlemen of this new way of reasoning that have almost discarded substance out of the reasonable part of the world." The same may be said with greater truth of the devotees of the theory of knowledge ; they seem to have no need of so old-fashioned a commodity as reality. Yet, after all, Fichte's dictum holds good that knowledge as knowledge—i.e., so long as it is looked at as knowledge—is, ipso facto, not reality. The result of the foregoing, however, is to show that, as soon as epistemology draws its conclusion, it becomes metaphysics ; the theory of knowledge passes into a theory of being. The ontological conclusion, moreover, is not to be regarded as something added by an external process ; it is an immediate implication, The metaphysic is the epistemology from another point of view—regarded as completing itself, and explaining in the course of its exposition that relative or practical separation of the indi- vidual known from the knowable world which it is a sheer assumption to take as absolute. This, not the so-called assumption of the implicit unity of being and thought, is the really unwarrantable postulate ; for it is an assumption which we are obliged to retract bit by bit, while the other offers the whole doctrine of knowledge as its voucher.

Logic, Aisthetics, and Ethics.—If the theory of know- ledge thus takes upon itself the functions discharged of old by metaphysics, it becomes somewhat difficult to assign a distinct sphere to logic. It has already been seen how the theory of knowledge, when it passed out of Kant's hands, and tried to make itself (a) complete and (0) pre- suppositionless, became for Hegel a logic that was in reality ametaphysic. This is the comprehensive sense given to logical science in the article Lore (q.v.) in this work; and it is there contended that no other definition can be made consistent with itself. It is, of course, admitted that this is not the traditional use of the term (see vol. xiv. p. 802). Ueberweg's definition of logic as "the science of the regu- lative laws of thought" (or "the normative science of thought ") comes near enough to the old sense to enable us to compare profitably the usual subject-matter of the science with the definition and end of philosophy. The introduction of the term "regulative" or "normative" is intended to differentiate the science from psychology as the

| science of mental events. In this reference logic does not

tell us how our intellections connect themselves as mental phenomena, but how we ought to connect our thoughts if they are to realize truth (either as consistency with what we thought before or as agreement with observed facts). Logic, therefore, agrees with epistemology (and differs from psychology) in treating thought not as mental fact but as knowledge, as idea, as having meaning in relation to an objective world. To this extent it must inevitably form a part of the theory of knowledge. But, if we desire to keep by older landmarks and maintain a distinction between the two disciplines, a ground for doing so may be found in the fact that all the main definitions of logic point to the investigation of the laws of thought in a subjective reference,—with a view, that is, by an analysis of the operation, to ensure its more correct performance. According to the old phrase, logic is the art of thinking. Moreover, the fact that ordinary logic investigates its laws primarily in this reference, and not disinterestedly as immanent laws of knowledge or of the connexion of con- ceptions, brings in its train a limitation of the sphere of the science as compared with the theory of knowledge. We find the logician uniformly assuming that the process of

thought has advanced a certain length before his exami- nation of it begins; he takes his material full-formed from perception, without, as a rule, inquiring into the nature of the conceptions which are involved in our perceptive ex- perience. Occupying a position, therefore, within the wider sphere of the general theory of knowledge, ordinary logic consists in an analysis of the nature of general state- ment, and of the conditions under which we pass validly from one general statement to another. But the logic of the schools is eked out by contributions from a variety of sources (e.g., from grammar on one side and from psychology on another), and cannot claim the unity of an independent science.

ESTHETICS (¢.v.) may be treated as a department of psy- chology or physiology, and in England this is the mode of treatment that has been most general. To what peculiar ex- citation of our bodily or mental organism, it is asked, are the emotions due which make us declare an object beautiful or sublime? And, the question being put in this form, the attempt has been made in some cases to explain away any peculiarity in the emotions by analysing them into simpler elements, such as primitive organic pleasures and prolonged associations of usefulness or fitness. But, just as psychology in general can in no sense do duty for a theory of knowledge, so it holds true of this particular application of psychology that a mere reference of these emotions to the mechanism and interactive play of our faculties cannot be regarded as an account of the nature of the beautiful. The substitution of the one inquiry for the other may doubtless be traced in part to the latent assumption—standing very much in need of proof—that our faculties are constructed on some arbitrary plan, with- out reference to the general nature of things. Perhaps by talking of "emotions" we tend to give an unduly sub- jective colour to the investigation ; it would be better to speak of the perception of the beautiful. Pleasure in itself is unqualified, and affords no differentia. In the case of a beautiful object the resultant pleasure borrows its specific quality from the presence of determinations essentially intellectual in their nature, though not reducible to the categories of science. We have a prima facie right, there- fore, to treat beauty as an objective determination of things. The question of zsthetics would then be formu- lated—What is it in things that makes. them beautiful, and what is the relation of this aspect of the universe to its ultimate nature, as that is

expounded in metaphysics ? The answer constitutes the substance of esthetics, con-

sidered as a branch of philosophy. But it is not given simply in abstract terms ; esthetics includes also an exposi- tion of the concrete phases of art, as these have appeared in the history of the world, relating themselves to different stages of the spirit's insight into itself and into things.

Of Erutcs (g.v.) it may also be said that many of the topics commonly embraced under that title are not strictly ethical at all, but are subjects for a scientific psychology employing the historical method with the conceptions of heredity and development, and calling to its aid, as such a psychology will do, the investigations of ethnology, and all its subsidiary sciences. To such a psychology must be relegated all questions as to the origin and development of moral ideas. Similarly, the question debated at such length by English moralists as to the nature of the moral faculty (moral sense, conscience, &c.) belongs entirely to psychology. This is more generally admitted in regard to the controversy concerning the freedom of the will, though that still forms part of most ethical treatises. If we ex- clude such questions in the interest of systematic correct- ness, and seek to determine for ethics a definite subject- matter, the science may be said to fall into two departments. The first of these deals with the notion of duty, as such, and endeavours to define the ultimate end of action; the second lays out the scheme of concrete duties which are deducible from, or which, at least, are covered by, this abstractly-stated principle. The second of these depart- ments is really the proper subject-matter of ethics considered as a separate science; but it is often conspicuous by its absence from ethical treatises. However moralists may differ on first principles, there seems to be remarkably little practical divergence when they come to lay down the particular laws of morality. Hence, as it must necessarily be a thankless task to tabulate the commonplaces of con- duct, the comparative neglect of this part of their subject is perhaps sufficiently explained. It may be added that, where a systematic account of duties is actually given, the connexion of the particular duties with the universal form- ula is in general more formal than real. It is only under the head of "'casuistry" that ethics has

been much cultivated as a Separate science. The first department of ethics, on the other hand, is the branch of the subject in virtue of which ethics forms part of philosophy. As described above, it merges in general metaphysics or ontology, and ought rather to be called, in Kant's phrase, the meta- physic of ethics, A theory of obligation is ultimately found to be inseparable from a metaphysic of personality. The connexion of ethics with metaphysics will be patent as a niatter of fact, if it be remembered how Plato's philosophy is summed up in the idea of the good, and how Aristotle also employs the essentially ethical notion of end as the ultimate category by which the universe may be explained or reduced to unity. But the neces- sity of the connexion is also apparent, unless we are to Suppose that, as regards the course of universal nature, man is altogether an imperium in imperio, or rather (to adopt the forcible phrase of Marcus Aurelius) an abscess or excrescence on the nature of things. If, on the con- trary, we must hold that man is essentially related to "a common nature," as the same writer puts it, then it is a legitimate corollary that in man as intelligence we ought to find the key of the whole fabric. At all events, this method of approach must be truer than any which, by restricting itself to the external aspect of phenomena as presented in space, leaves no scope for inwardness and life and all that, in Lotze's language, gives existence "value." Historically we may be said in an intelligible sense to explain the higher by showing its genesis from the lower. But in philosophy it is exactly the reverse; the lower is always to be explained by the higher. In the ethical

reference it has been customary to argue, as Sir W. Hamilton does, from man's moral being to "an Intelligent Creator and Moral Governor of the Universe." It is evident that the argument ex analogia hominis may sometimes be carried too far ; but if a '"' chief end of man" be discoverable —

Politics, Sociology, Philosophy of EHistory.—In Aristotle we can observe how ethics is being differentiated from politics, but this differentiation does not, and ought not to, amount toa complete separation. The difficulty, already hinted at, which individualistic systems of ethics experi- ence in connecting particular duties with the abstract prin- ciple of duty is a proof

of the failure of their method. For the content of morality we are necessarily referred, in great part, to the experience crystallized in laws and institutions and to the unwritten law of custom, honour, and good breeding, which has become organic in the society of which we are members. The development of society is therefore brought within the scope of philosophy. So far as this development is traced in a purely historical spirit, it will be simply a sequence of efficient causes, in which, starting with abc, we eventually arrive at A B C. But, if this sequence is to be philosophized, it must be shown that we have no means of knowing what abc is except in its relation to A B C, its resultant. We interpret the process, therefore, as the realization of an immanent end. The state, as the organism in whose play morality is realized, becomes an interest of reason; and the different forms of state-organization are judged accord- ing to the degree in which they realize the reconciliation of individual freedom and the play of cultured interests with stable objectivity of law and an abiding conscious- ness of the greater whole in which we move. So far as the course of universal history can be truly represented as an approximation to this reconciliation by a widening and deepening of both the elements, we may claim to possess a philosophy of history. (A. SE.)

PHILOSTRATUS, the eminent Greek sophist, was prob- ably born in Lemnos between 170 and 180 a.p. From his incidental statements respecting himself we learn that he studied at Athens, and was afterwards attached to the court of the empress Julia Domna, consort of Severus. Since he does not speak of her as living, while mentioning her as his patroness in his Lafe of Apollonius of T'yana, this work was probably written after her death. From some passages in it and his Lives of the Sophists, he would seem to have been in Gaul with Caracalla, and he may probably have accompanied that emperor on his progress through his dominions. The only other fixed date we possess for his life is afforded by his dedication of the Lives of the Sophasts to Antonius Gordianus as proconsul. Gordianus was consul in 230, and his proconsulship must have been between that year and 234. It seems to be implied that Philostratus resided in Rome, and, according to Suidas, he lived until the reign of Philip (244-249). His works now extant are a biography of Apollonius of Tyana, Lives of the Sophists, Heroicon, Imagines, and Epistles.

The Life of Apollonius of Tyana has been partly discussed under APoLLonius. It may be compared to the Cyropedia of Xenophon as a romance founded :on fact, treating of a distinguished historical person, not in an historical spirit, but as an ideal model for imitation. While, however, the

incidents of Xenophon's romance were mostly his own invention, Philostratus was indebted for his to the narrative attributed to Damis, Apollonius's travelling companion ; and many of the sayings ascribed to Apollonius, such as his bon-mots against Domitian and his protest against gladiatorial combats, are probably authentic. The rest of the work testifies to the increasing fondness of the age for the marvellous, which Lucian had vainly endeavoured to stem in the preceding generation, and to the tendency to set up semi-mythical sages like Pythagoras as prophets, at the expense of sober reasoners like Zeno and Epicurus. Philostratus, however, is careful to disclaim all connexion of his hero with mere vulgar thaumaturgy. The sorcerer, he expressly says, is a miserable person. Apollonius is the sage who foreknows the future not by incantations but by wisdom and conformity to the will of the gods,—a new Pythagoras, the prototype, we can now see, of Apuleius, Plotinus, and the other later Platonists, who, without wholly discarding philosophical method, coquetted with ecstasy and revelation. Philosophy, in truth, had become bank- rupt, physical science did not yet exist, and the best minds of the time were necessarily thrown back on the super- natural. Philostratus gives this tendency of the age a concrete expression, and there is no reason to conceive that his work was composed in any spirit of antagonism to Christianity, whose Founder, equally with Apollonius himself, was venerated by his patron Alexander Severus. Though a mass of fiction, it is still very valuable as de- lineating the ideal of the philosophic character as recog- nized in the 3d century. It is full of errors in geography and chronology, but possesses great literary merit, being varied, entertaining, animated, and lively and accurate in its pictures of character. Sophistice certe artis egregium dedit in hoc libro specimen, says Kayser. The distinction between a philosopher and a sophist is clearly laid down by Philostratus himself in his next important work, the Lives of the Sophists. The philosopher investigates truth independently ; the sophist embellishes

the truth, which he takes for granted. The distinction is much the same as that between the theologian and the preacher, or the jurist and the advocate, Philostratus, though by no means attempting detailed biography after the fashion of Diogenes Laertius, has given us interesting sketches of a number of distinguished ornamentsof the sophistical profession, mostly his immediate predecessors or contemporaries. He thus affords a lively picture of the intellectual standard of an age full of curiosity and intelligence, but unable to make progress in knowledge for want of a scientific method or a scientific spirit, living on old literary models which it was unable to emulate or vary, and hence compelled to prefer show to substance, and manner to matter. The Heroicon is a good specimen of the popular literature of the day. It may have arisen out of Caracalla's visit to Ilion, and the games celebrated by him in honour of Achilles. The subject is the injustice of Homer to Palamedes, which is expounded to a Phcenician merchant by a Thracian vine- dresser on the authority of the latter's tutelary demon, the hero Protesilaus. It was probably a common theme of declamation in the schools, to which Philostratus has contributed an elegant and graceful setting. The Zmagines, after the life of Apollonius the most entertaining of Philo- stratus's writings, is perhaps the most valuable of any from the light it throws on ancient art. The writer 1s introduced as living in a villa near Naples, which contains a collection of choice paintings. To please the son of his host and his young companions he undertakes to describe and explain the pictures, which are sixty-four in all, includ- ing mythological, historical, allegorical, and landscape sub- jects. The descriptions are exceedingly good, and reveal the skilful word-painter no less than the accomplished

connoisseur of art. As pointed out by M. Bougot, they either actually are or are intended to be taken for impro- visations, which explains some irregularities in the style. It has been much disputed whether they are genuine de- scriptions of actually existing works of art. The affirmative has been maintained by Goethe and Welcker, the negative by Heyne. In our days the controversy has been revived by two eminent German archeologists, Friederichs and Brunn, the former impugning, the latter maintaining the actual existence of the pictures. Their arguments are reviewed in a recent and valuable work by E. Bertrand, who sides with Brunn, as also does

Helbig. Perhaps the point is not of such extreme moment, for, if Philostratus had not actual pictures in his mind, he must nevertheless have described such as his hearers or readers were in the habit of seeing. The traces of improvisation, however, pointed out by M. Bougot afford a strong argument that he was lecturing upon a visible collection, and in any case his work is a most valuable guide to the manner in which heroic figures were delineated in ancient paintings, to the general grouping and arrangement of such works, and to the qualities which they were expected to possess. Philo- stratus's Hpistles are entirely artificial, and mostly amatory. The style is good, and the originals of some pretty conceits appropriated by modern poets may be found in them.

The first complete edition of the works of Philostratus was pub- lished by F. Morel, Paris, 1608. It is not much esteemed. 'That by Olearius (Leipsic, 1709) is much better; but the chief restorer of the text is C. F. Kayser, who, after having edited most of the writings of Philostratus, separately published a collective edition at Zurich in 1844, reissued in 1858, and again at Leipsic in 1870-71. There is a very good edition, with a Latin translation, by Wester- mann (Paris, 1849); this also contains Eunapius's Lives of the Sophists and the declamations of Himerius. 'The first two books of the Life of Apollonius were translated into English by the cele- brated and unfortunate Charles Blount in 1680; but the unortho- dox nature of the commentary, attributed in part to Lord Herbert of Cherbury, occasioned the work to be prohibited, and it was not continued. A complete translation by E. Berwick, an Irish clergyman, was published in 1809. A French translation by Chassang (Le Merveilleux dans l' Antiquité, Paris, 1862) contains some valuable notes. The most important works on the Jmagines are: Friederichs, Die Philostratischen Bilder, 1860; Brunn, Dze Philostratisehen Gemilde, 1861; A. Bougot, Une galerie antique, 1881; and E. Bertrand, Un critique d'art dans Vantiquité: Philo- strate et son éeole, 1882. (2aG>)

PHILOXENUS, one of the last of the dithyrambic poets of Greece, was born in 435 B.c., in the island of Cythera. When the island was conquered by the Athe- nians in 424 Philoxenus was sold as a slave to Agesylas, who gave him the name of Myrmex ("ant"). On the death of Agesylas he was bought by the dithyrambic poet Melanippides, who educated him, no doubt in his

own pro- fession. Philoxenus afterwards resided in Sicily, at the court of Dionysius, tyrant of Syracuse, whose bad verses he declined to praise, and was in consequence sent to work in the quarries. Being fetched back again and asked by the tyrant how he liked his verses now, the poet made no reply but "'Take me away to the quarries." He is said to have quitted Sicily in disgust at the luxury and vulgarity of the people, abandoning an estate which he owned in the island. From Sicily he seems to have gone to Tarentum, and thence perhaps to Corinth. He visited Colophon in Asia Minor and died at Ephesus in 380. According to Suidas, Philoxenus composed twenty-four dithyrambs and a lyric poem on the genealogy of the Alacide. In his hands the dithyramb seems to have been a burlesque drama in verse, which was acted and sung to the accom- paniment of elaborate instrumental music and enlivened

1 A younger Philostratus, also called the Lemnian, is several times mentioned by the elder as a contemporary sophist. He speaks of him as a friend, but does not say that he was a kinsman. Another and much inferior collection of Jmagines is extant under the name of this writer, who claims relationship with the elder Philostratus. It is probably a supposititious work.

with the dance,—in short, it was a sort of comic opera. The music, which Philoxenus himself composed, appears to have been of a debased, Offenbachian character. His masterpiece was the Cyclops or Galatea, a pastoral bur- lesque on the love of the Cyclops for the fair Galatea. Its general style may probably be gathered from the sixth idyl of Theocritus. The work must have been well known before 388, for it was parodied by Aristophanes in his play the Plutus, performed in that year. Another work of Philoxenus, sometimes attributed to a notorious parasite and glutton of the same name, is the Ae?rvoy (Dinner), of which considerable fragments have been preserved by Atheneus. This poem, of which the text is very obscure and corrupt, is little more than an elaborate bill of fare put into verse, and, as such, possesses more interest for cooks than scholars. In the time of Aristotle it was the one book read by the Athenian quidnuncs. The great popularity enjoyed by Philoxenus is attested not only by the allusions to him

in the comic poets of his day but also by a complimentary resolution passed by the Athenian senate in 393 on the motion of the dithyrambic poet Cinesias. The intention of the decree was doubtless mainly political—to propitiate Dionysius—but the poet was included in it. Nor was his popularity transient : the poet Antiphanes of the Middle Comedy spoke of Philoxenus as a god among men; Alexander the Great had his poems sent to him in Asia along with the tragedies of Alschylus, Sophocles, and Euripides; the Alexandrian grammarians received him into the canon; and down to the time of Polybius his works were regularly learned and annually acted by the Arcadian youth. The scanty frag- ments of his works are to be found in Bergk's Poete Lyrici Greci, vol. iit.

PHLEGON, of Tralles in Asia Minor, a Greek writer of the 2d century, was a freedman of the emperor Hadrian. His chief work was the Olympiads (chronicles, or col- lection of Olympic victories and chronicles), a universal history in sixteen books, from the 1st down to the 229th Olympiad (776 B.c. to 137 aD.). If we may judge from the sample preserved by Photius, the work contained lists of the victors in the Olympic games together with a bare and disjointed summary of the chief historical events oat is probable, however, that Photius quoted from an epitome in eight books which we know to have existed, and which, together with another epitome in two books, is ascribed by Suidas to Phlegon himself, Portions of another work of Phlegon, On Marvels, along with parts of another On Long-lived Persons, and the opening part of his Olympiads, are extant in a Heidelberg MS. of the 10th century.

The book On Marvels contains some ridiculous stories about ghosts, prophecies, and monstrous births. The work On Long-lived Persons includes a list, extracted by Phlegon from the Roman censuses, of persons who had lived a hundred yearsand upwards. He mentions two men aged 186 years each, one of whom he professes to have seen. Other works ascribed to Phlegon by Suidas are a description of Sicily, a work on the Roman festivals in three books, and a topography of Rome. Alius Spartianus tells us that a life of Hadrian was published in Phlegon's name, but that it was written by the emperor himself. A work on JW, omen Wise and Brave tn War has sometimes becn wrongly attributed to Phlegon. From his remains Phlegon is secn to have been credulous and superstitious to

absurdity, but his literary style deserves the re- mark of Photius that, without being pure Attic, it is not very bad. The complaint of Photius, that Phlegon wearied his readers by the numerous oracles which he dragged in, is fully borne out by the remains of his works. These remains are collected by Westermann

in his Seriptores rerum mirabilium Greci (1839) and by Miiller in his Fragmenta Historicorum Grecorum, vol. iii.

PHLOX, a considerable genus of Polemoniacezx, chiefly consisting of North-American perennial plants, with entire, usually opposite, leaves and showy flowers generally in terminal clusters. Each flower has a tubular calyx with five lobes, and a salver-shaped corolla with a long slender

tube and a flat limb. The five stamens are given off from the tube of the corolla at different heights and do not pro- trude beyond it. The ovary is three-celled with one to two ovules in each cell; it ripens into a three-valved capsule. Many of the species are cultivated for the beauty of their flowers ; and the forms obtained by cross-breeding and selection are innumerable. The garden varieties fall under three groups,—the annuals, including the lovely P. Drum- mondi from Texas and its many forms ; the perennials, including a dwarf section of alpine plants (forms of P. subulata), suitable, by reason of their prostrate habit and neat mode of growth, for the rockery; and the taller- growing decussate phloxes which contribute so much to the beauty of gardens in late summer, and which have probably originated from P. paniculata. The range of colour in all the groups is from white to rose and lilac.

PHOCEA, in ancient geography, was one of the cities of Ionia, on the western coast of Asia Minor. It was the most northern of the Ionian cities, and was situated on the coast of the peninsula that separates the Gulf of Cyme, which was occupied by olian settlers, from the Hermean Gulf, on which stood Smyrna and Clazomenz.! Its advantageous position between two good harbours, called Naustathmus and Lampter, is pointed out by Livy (xxxvii. 31), and was probably the cause which led the inhabitants to devote themselves from an early period to maritime pursuits. We are expressly told

by Herodotus that the Phoczans were the first of all the Greeks who undertook distant voyages and made known. to their countrymen the coasts of the Adriatic, as well as those of Tyrrhenia and Spain. In the latter country they estab- lished friendly relations with Arganthonius, king of Tartessus, who even invited them to emigrate in a body to settle in his dominions, and, on their declining this offer, presented them with a large sum of money. This they employed in constructing a strong wall of fortification around their city, a defence which stood them in good stead when the Ionian cities were attacked by Cyrus in 546. On that occasion they refused to submit when besieged by Harpagus, the general of Cyrus; but, mistrusting their power of ultimate resistance, they determined to abandon their city, and, embarking their wives and children and most valuable effects, to seek a new home in the western regions, where they had already founded several flourishing colonies, among others those of Alalia in Corsica and the important city of Massilia in the south of Gaul. A large part of the emigrants, however, relented, and, after having proceeded only as far as Chios, returned to Phocsea, where they submitted to the Persian yoke. The rest, however, having bound themselves by a solemn oath never to return, proceeded to Corsica, where they settled for a time; but, being afterwards expelled from the island, they founded the colony of Velia or Elea in southern Italy.

Phocea continued to exist under the Persian government, but greatly reduced in population and commerce, so that, although it Joined in the revolt of the Ionians against Persia in 500, it was only able to send three ships to the combined fleet that fought at Lade. Nor did it ever again assume a prominent part among the Ionian cities, and it is rarely mentioned in Greek history. But at a later period it was sufficiently powerful to oppose a vigorous resistance to the Roman pretor Amilius during the war against Antiochus in 191. On that occasion the town was taken and plundered, but it continued to survive, and we learn from its coins that it was a place of some importance throughout the Roman empire. The ruins still visible on the site bear the name of Palea Foggia, but they are of little interest. A small town in the im-

mediate neighbourhood, known as Nova Foggia, appears to date only from Byzantine times.

1 It was said to have been founded by a band of emigrants from Phocis, under the guidance of two Athenian leaders, named Philogenes and Damon, but it joined the Ionian confederacy by accepting the government of Athenian rulers of the house of Codrus,

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PHOCAS, emperor of the East from 602 to 610, was a Cappadocian of humble origin, and was still but a cen- turion when chosen by the army of the Danube to lead it against Constantinople. A revolt within the city soon afterwards resulted in the abdication of the reigning em- peror MAvRICE (q.v.) and in the speedy elevation of Phocas to the vacant throne (23d November 602). The secret of his popularity is hard to discover, but perhaps it is to be sought in the sheer recklessness of his audacity ; courage is nowhere imputed to him, and he is known to have been ignorant, brutal, and deformed. ‘ Without assuming the office of a prince he renounced the profession of a soldier ; and the reign of Phocas afflicted Europe with ignominious peace, and Asia with desolating war.” By the representa- tions of Theodosius, Maurice’s supposed son, and of Narses, the Byzantine commander-in-chief on the Persian frontier, Chosroes (Khosrau) II. was induced to take up arms against the emperor in 604 (see PERstA, above, p. 614). The failures of the generals of Phocas could not but tend to weaken his always insecure tenure of the imperial crown, and the appearance of the Persian armies as far west as Chalcedon in 609-610 made his deposition by HERAcLIUS (g.v.) an easy task. He was beheaded by his successful rival on 4th October 610.

PHOCION, an Athenian statesman, whose private virtues won him the surname of “the Good,” but whose mistaken policy fatally contributed to the downfall of Athens, was born about 402 B.c. His father, Phocus, was a pestlemaker, but would seem to have been a man of means, for Phocion in his youth was a pupil of Plato. If Plutarch is right in saying that he afterwards studied under Xenocrates, this implies that he kept up his philo- sophical studies in later life, for Xenocrates was his junior and did not succeed to the headship of the Academy until 339. As men of kindred character, they may well have been friends; we find them on one occasion serving on the same embassy. It was perhaps from the Academic philosophy

that Phocion learned that contempt for luxury and that truly Socratic simplicity and hardiness which characterized him throughout life. From Plato too he may have caught that scorn for the Athenians of his day which he often betrayed—a scorn harmless, perhaps, in the study, but fatal in the council and the camp. His words, though few, were pithy and forcible, his wit keen and caustic. Many of his trenchant sayings have been pre- served by Plutarch. He was the only orator whom Demosthenes feared ; when Phocion rose to speak Demo- sthenes used to whisper to his friends, " Here comes the chopper of my speeches." Gruff in manner, he was kind at heart, ever ready to raise the fallen and succour those in peril, even' when they were his enemies. Being once reproached for pleading the cause of a bad man, he replied that the good had no need of help. When other generals were sent by Athens to the allies, the people closed their gates against them and prepared for a siege, but if it was Phocion they went out to meet him and conducted him in joyful procession into their midst. In his youth he saw service under the distinguished general Chabrias, whose temper, by turns sluggish and impetuous, he alternately stimulated and repressed. He thus won the regard of his good-natured commander, and was introduced by him to public notice and employed on important services. When Chabrias defeated the Spartans in the sea-fight off Naxos (September 376) Phocion commanded with distinction the left wing of the Athenian fleet. After the death of Chabrias (357) Phocion cared for the relatives of his patron, patiently endeavouring to train to virtue his wild and wayward son. A consistent advocate of peace, he was yet a good officer, and held the annual office of general no less than forty-five times, though he never sought election.

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He was amongst the last of the Athenian leaders who combined the characters of statesman and soldier. In 351 Phocion and Evagoras, lord of the Cyprian Salamis were sent by Idrieus, prince of Caria, with a military and naval force to put down a revolt which had broken out against the Persians in Cyprus. The task was successfully accomplished. Next year! Phocion commanded a force which the Athenians sent to Eubcea in support of the tyrant Plutarch of Eretria. For a time the Athenians were in a dangerous position, but Phocion extricated him- self and defeated the

enemy on the heights above Tamyne. After the battle he humanely dismissed all his Greek prisoners, fearing the vengeance which the Athenians too often wreaked on their fallen foes. In 341 he returned to the island and put down Clitarchus, whom Philip, king of Macedonia, had set up as tyrant of Eretria. Demo- sthenes had long warned the Athenians against Philip, but there is nothing to show that in this he was backed by Phocion. On the contrary, from the opposition which he so often offered to Demosthenes, as well as from his subse- quent policy, we may infer that Phocion discredited rather than corroborated the warnings of his contemporary. But, when Philip laid siege to Byzantium, the Athenians, at last thoroughly aroused to their danger, sent Chares with an expedition to relieve it. He failed to do so, and Phocion took his place (340). The Byzantines had refused to admit Chares into their city, but they welcomed Phocion. Athenians and Byzantines fought side by side, and Philip was compelled to raise the siege and retire from the Hellespont. Phocion afterwards retaliated on the king's territory by raids, in one of which he was wounded. When the Megarians appealed to Athens for help,? Phocion promptly marched to their aid, fortified the port Nisza, and connected it with the capital by two long walls, thus securing Megara and its port against attacks by land.2 In spite of the successful issue of his expedition to Byzantium Phocion advised the Athenians to make peace with Philip. But the war party led by Demosthenes prevailed, and the battle of Chzronea (August 338), in which Philip over- threw the united armies of Athens and Thebes, converted Greece into a province of Macedonia. This brought Phocion and the peace party into power, but Phocion consulted the dignity of Athens so far as to advise the people not to take part in the congress of the Greek states summoned by Philip to meet at Corinth until they knew what terms Philip meant to propose. The Athenians soon had reason to regret that they did not follow this advice. When the

1 Diodorus (xvi. 46) speaks of Phocion as still in Cyprus in 350. But this can hardly be true if Phocion led the expedition to Eubea in Anthesterion (end of February and beginning of March) 350. See next note.

2 The dates and even the order of the events from the Cyprian down to the Megarian expedition are variously given by modern writers. The order in the text is that of Plutarch and Diodorus. The dates assigned to the

Cyprian, second Eubcean, and Megarian expeditions are those of Diodorus, The first expedition to Hubca (as to the date of which see Clinton's Fasti Hellenici, vol. ii.) and that to Megara are not mentioned by Diodorus. Plutarch mentions the Megarian after the Byzantine expedition. But the siege of Byzantium was not raised till the earlier half of 339, and Phocion afterwards spent some time in Macedonian waters. Thus he could hardly have been at Megara before midsummer 339. But Elatea was seized by Philip in the winter of 339/338, and its seizure was the occasion of a league between Athens and Thebes. Hence, as the motive assigned for the Megarian expedition was distrust of Thebes, that expedition cannot have taken place after the seizure of Elatea. But the six months between midsummer and winter 339 would hardly suffice for the con- struction of the Long Walls. Perhaps, then, Plutarch has misplaced the expedition to Megara, and it ought to be dated earlier. Thirlwall assigns it to 343.

3 The Athenians had rendered the same service to the Megarians more than a century before, but these first Long Walis had been destroyed by the Megarians themselves in the Peloponnesian War

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news of Philip's assassination reached Athens (336) Phocion vainly dissuaded the people from publicly expressing what he termed a dastardly joy. a After the revolt of Thebes and its destruction by Philip's son and successor Alexander the Great, Athens, having been implicated in the movement, was called on by Alex- ander to surrender the orators of the anti-Macedonian party, including Demosthenes (335). Phocion advised the men to give themselves up, but nevertheless by his intercession he induced the conqueror to relent.! Alex- ander conceived a high opinion of Phocion, and ever after- wards treated him with marked respect. He would have loaded him with presents, but Phocion steadily declined them, the only favour he asked being the release of some prisoners. When Harpalus, a Macedonian officer who had betrayed the confidence reposed in him by Alexander, fled for refuge to Athens, Phocion, though he contemptuously refused the bribes which Harpalus offered him, neverthe- less resisted the proposal to surrender the fugitive (324) ; and, after the death of Harpalus,

Phocion and his son- in-law cared for his infant daughter. The wild joy which the death of Alexander (323) roused at Athens was not shared by Phocion, and he had nothing better than scorn for that heroic effort to shake off the Macedonian yoke known as the Lamian War (323-322). When the news of Leosthenes's victory over Antipater, the regent of Macedonia, was greeted at Athens with enthusiasm (323), Phocion sneeringly asked, " When shall we have done con- quering?" Still, when a body of Macedonian and imer- cenary troops under Micion landed in Attica and ravaged the country, Phocion led out a force and defeated them with loss, After the battle of Crannon (322) Phocion's personal influence induced the victorious Antipater to spare Attica the misery of invasion, but he could not pre- vent the occupation of Munychia (one of the ports of Athens) by a Macedonian garrison. However, Menyllus, the commander of the garrison, was a friend of Phocion and respected the feelings of the Athenians. Further, the Athenians were required by Antipater to surrender the chief members of the anti-Macedonian party, amongst them Demosthenes and Hyperides, and to restrict their franchise by a property qualification. In consequence Hyperides was executed, Demosthenes died by his own hand, and over 12,000 citizens lost the franchise, many of them going into exile. These disfranchised citizens had afterwards an important influence on Phocion's fate. For some years Athens dwelt in peace, if not in honour, under the shadow of Macedonia. Phocion had the direction of affairs and filled the magistracies with respectable men. By his intercession with Antipater he procured for niany of the exiles a repeal or mitigation of their sentence, but he declined to petition Antipater to withdraw the garrison from Munychia. The presents offered him by Antipater and Menyllus he refused. In 318 Antipater died, leaving as his successor in the regency of Macedonia the veteran general Polysperchon, instead of his own son Cassander. The new regent, finding himself isolated and wishing to strengthen himself against his enemies, tried to attach the Greeks to his cause by proclaiming in the name of the young king Philip Arrhidzus that the oligarchies estab- lished by Antipater in the Greek cities should be abolished and the democracies restored, and that all exiles, with a few exceptions, should be allowed to return. A special letter to Athens in the king's name announced the restora- tion of the democracy. But Cassander was not to be set aside lightly ; he was naturally supported by all who a IR ois Sa age

_1 So Plutarch, Phocion, c.17. But Diodorus (xvii. 15) and Plutarch himself elsewhere (Demosth., c. 23) ascribe to Demades the credit of having mollified Alexander. Phocion's name is not mentioned in this connexion by Arrian (Anad., i. 10) nor by Justin (xi. 4).

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had benefited by his father's measures, 7.¢., by the oligar- chical and Macedonian party in the Greek states. Before the news of the death of Antipater got abroad Cassander sent Nicanor, an adherent of his own, to relieve Menyllus of the command in Munychia. Menyllus unsuspectingly resigned the command to him, and Nicanor held the place for Cassander. When, a few days later, the death of Anti- pater became known, there were angry murmurs at Athens that Phocion had been a party to the deception. Phocion heeded them not, but, following his usual policy, pro- pitiated Nicanor in favour of Athens. But the people were excited by the promises of Polysperchon ; Phocion could no longer hold them in. In a public assembly at which Nicanor was present an attempt was made to seize the obnoxious Macedonian, but he escaped. Warnings now poured in on Phocion to beware of him, but he confided in Nicanor's good intentions and would take no © precaution. So Nicanor was enabled to seize and intrench himself in Pirzeus, the chief port of Athens. The irritation against Phocion was intense. An attempt to treat with Nicanor failed; he simply referred the envoys, of whom Phocion was one, to Cassander. The arrival in Attica of Alexander, son of Polysperchon, revived the hopes of the Athenians. He came at the head of an army and brought in his train a crowd of the exiles, and it was thought that, along with the constitution, he would restore Muny- chia and Pirzeus to Athens. Far from doing so, it soon appeared that his intention was to seize and hold these ports for Polysperchon, and rumour said that to this step he was instigated by Phocion. The people were furious. In a public assembly they deposed the existing magis- trates, filled their places with the most pronounced demo- crats, and sentenced all who had held office under the oligarchy to exile or death. Among these was Phocion. With some of his companions in misfortune he fled to Alexander, who received the fugitives courteously and sent them to Polysperchon and the king, who were with an army in Phocis. Thither, too, came an embassy from Athens to accuse Phocion and his fellows before the king and to demand the

promised independence. Polysperchon resolved to propitiate the Athenians with blood ; so, after an audience disgraceful to all who took part in it except to Phocion, the refugees were packed in carts and sent to Athens to be tried by what Polysperchon called the now free people. A savage mob filled the theatre where the trial was to take place; the returned exiles mustered in force, and with them were women, aliens, and slaves. The prisoners were charged with having betrayed their country in the Lamian War and overturned the demo- cracy. Every attempt Phocion made to defend himself was drowned in a storm of hooting. At last, renouncing the attempt, he was heard to say that for himself he pleaded guilty, but the rest were innocent. 'Why," he asked, "will you kill them?" He was answered with a great shout, "Because they are your friends." Then Phocion was silent. All were condemned to die, the multi- tude rising to their feet like one man to give the verdict. A howling rabble followed them with curses to the prison. Phocion was the last to die (317), for he allowed his best friend Nicocles, as a last token of regard, to die before him. His old disdainful wit did not desert him. When his turn came there was not poison enough left, and he had to pay for more, remarking that at Athens a man could not even die for nothing. His body was cast out of Attic territory, but his faithful wife? secretly brought back his bones and interred them by the hearth. Afterwards the

2 The story that this service was rendered by a Megarian woman rests on a false reading in Plutarch, Phoc., c. 87, Meyapixy before yw? being the interpolation of an ignorant copyist who mistook the preceding rijs Meyapixjjs.

See vol. xi. plate I.

repentant Athenians buried them with public honours and raised a bronze statue to his memory.

The chief authorities for the life of Phocion are Diodorus (xvi. 42, 46, 74, xvii. 15, xviii. 18, 64-67) and the biographies of Plutarch and Nepos. (J. G. FR.)

PHOCIS was in ancient times the name of a district of central Greece, between Bceotia on the east and the land of the Ozolian Locrians on the west. It adjoined the Gulf of Corinth on the south, while it was separated on the north from the Malian gulf by the ridge of Mount Cnemis and the narrow strip of territory occupied by the Epi- cnemidian and Opuntian Locrians. In early times, indeed, a slip of Phocian territory extended between these two Locrian tribes to the sea, and the port of Daphnus, opposite to the Cenzean promontory in Eubcea, afforded the Phocians an opening in this direction; but in the time of Strabo Daphnus had ceased to exist, and its territory was incor- porated with Locris (Strabo, ix. 3, § 1).

Phocis was for the most part a rugged and mountainous country. In the centre of it rose the great mountain mass of Parnassus, one of the most lofty in Greece, attaining to the height of 8068 feet, and an underfall of this, Mount Cirphis (4130 feet), sweeps round to the Gulf of Corinth on the south, separating the Gulf of Crissa from that of Anticyra, both of which were included in the Phocian territory. The range of Mount Cnemis on its northern frontier was of less elevation (about 3000 feet), but rugged and difficult of access, while the upper valley or plain of the

Cephissus, which intervened between this and the northern |

slopes of Mount Parnassus, constituted the only consider- able tract of fertile and level country comprised within the limits of Phocis. The little basin adjoining the Crissaan gulf, though fertile, was of very limited extent, and the broad valley leading into the interior from thence to Amphissa (now Salona) belonged to the Ozolian Locrians. Besides the Cephissus, the only river in Phocis was the Pleistus, a mere torrent, which rose in Mount

Parnassus, and, after flowing past Delphi, descended through a deep ravine to the Crisszean gulf.

Phocis possessed great importance in a military point of view, not only from its central position with regard to the other states of northern Greece and its possession of the great sanctuary of Delphi, but from its command of the pass which led from the Malian gulf across Mount Cnemis to Elatea in the valley of the Cephissus, and afforded the only access for an invader who had already passed Thermopyle into Bceotia and Attica. Hence the alarm of the Athenians in 339 when it was suddenly announced that Philip had occupied Elatea. Again, the only practicable communication from Beeotia with Delphi and the western Locrians lay through a narrow pass known as the Schiste Hodos, between Mount Cirphis and the underfalls of Mount Helicon. From this point another deep valley branches off to the Gulf of Anticyra, and the Triodos or junction of the three ways was the spot celebrated in Greek story as the place where Gidipus. met and slew his father. ;

The most important city in Phocis after Delphi was Elatea, the position of which has already been described ; next to this came Abe, also in the valley of the Cephissus, near the Beeotian frontier, celebrated for its oracle of Apollo. In the same neighbourhood stood Daulis and Ambrysus ; while farther south, towards the Corinthian gulf, lay Anticyra, on the gulf of the same name. Crissa, which had been in early times one of the chief cities of Phocis, and had given name to the Crissean_ gulf, was de- stroyed by order of the Amphictyonic council in 591, and never rebuilt. The other towns of Phocis were places of

no importance, and their names scarcely appear in history. The whole extent of Phocis did not excced half that of Beotia, but it was broken up into a number of small townships—twenty-

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two in all—forming a confederacy, the deputies of which used to meet in a "synedrion" or council-chamber near Daulis. But from au early period the predominance of Delphi, owing to the influence of its celebrated oracle, threw all the others into the shade. At first (as has been already stated in the article DeLpHi) the Phocians were masters of the oracle, and of the town

that had grown up on its site ; but after the first Sacred War in 595 pz. c., and the destruc- tion of Crissa, Delphi became an independent city, and from this period a strong feeling of hostility subsistcd between the Delphians and the Phocians. The latter, however, thus deprived of their chief city, sank into a position of insignificance, and playcd but an unimportant part in the affairs of Greece. During the Persian War of 480 thcir territory was ravaged by the invader, and several of their small cities destroyed. In the Peloponnesian War they were zealous allies of the Athenians, and for a short timc recovered possession of Delphi, which was, however, soon after wrested from them ; and it maintained its independence from the peace of Nicias in 421 till the outbreak of the Sacred War in 357. On this occa- sion the Phocians, who had been sentenced by the Amphictyons to the payment of a heavy finc, rose in arms against the decree, which they attributed to the hostile influence of the Thebans, and, under the command of Philomelus, made themselves masters of Delphi, and seized on the sacred treasurcs of the temple. With the assistance of these resources they were able to maintain the contest, under the command of Onomarchus, Phayllus, and Phalezcus, for a period of ten years, not only against the Thcbans and their

allies but even after the accession of Philip, king of Macedonia,

to the side of their adversaries. This was the only occasion on which the Phocians bore a prominent part in Greek history. After their final defeat by Philip a decree was passed by the Amphictyons, in 346, that all the Phocian towns except Abe should be de- stroyed, and the inhabitants dispersed in villages. Notwithstand- ing the ruin thus brought upon their country, many of their towns seem to have been subsequently rebuilt, and the Phocians were able to take part with the Athenians in the final struggle for Greek indc- pendence at Cheronea, and in the Samian War. ‘heir last appcar- ance in history was in defence of Delphi against the attack of the Gauls in 279; but they still continued to subsist as a separate though obscure people in the days of Strabo.

Of the origin of the Phocians as a people we have no information. The earliest traditions conncct them with the pre-Hellenic Leleges, as was the case also with the Locrians, and this statement was probably intended to

convey the fact that the two nations were tribes of the same race. They first appear under the name of Phocians in the Homeric catalogue as having jointd the Greek armament against Troy under the command of the two sons of Iphitus (Z/iad, ii. 517), and were restored amongst the olic division of the northern Greeks.

For the ancient geography of Phocis, see Strabo (ix. 8) and Pausanias (x.). The country and the existing remains of anti- quity are described by Dodwell (vol. i. chaps. 6 and 7) and Leake (Northern Greece, vol. ii.).

PHGBUS (¢o?Bos, the bright or pure), a common epithet of APoLLo (q.v.). Artemis in like manner is called Phoebe; and in the Latin poets and their modern followers '"'Phoebus" and "Phebe" are often used simply for the sun and the moon respectively.

'PHGENICIA (Gr. Bowvixn) forms part of the seaboard of Syrra (¢.v.), extending along the Mediterranean (some- times called the Phceenician Sea) from the mouth of the Eleutherus in the north to Mount Carmel in the south, a distance of rather more than two degrees of latitude. In early times Phcenicians were settled beyond this district, but for the Persian period Dor may be taken approximately as the limit towards the south. In the north a strip of country on the other side of the Eleutherus (Nahr al-Kebir) was frequently reckoned to Pheenicia. Formed partly by alluvium carried down by perennial streams from the mountains to the east, and fringed by great sand-dunes thrown up by the sea, Phoenicia is covered by a very fertile vegetable soil. It is only at Eleutherus in the north, and near Acre (Akka) in the south, that this strip of coastland widens out into plains of any extent; a smaller plain is found at Beirtt (Beyrout). For the most part the moun- tains approach within not many miles of the coast, or even close to it, leaving only a narrow belt of lowland, which from remote antiquity has been traversed by a caravan- route. To the south of Tyre the cliffs sometimes advance so close to the sea that a passage for the road had to be hewn out of the rocks, as at Scala Tyriorum (Ras an-

Nakura), and farther north at Promontorium Album (Ras al-Abyad). It is not known how far inland the Phcenician territory extended; the limit was probably different at different times. Both the maritime district, partly under artificial irrigation, and the terraces, laid out with great care on the mountain-sides, were in antiquity in a high state of cultivation; and the country—more especially that portion which lies north of the Kasimfye (Litani) along the flanks of Lebanon—still presents some of the richest and most beautiful landscapes in the world, in this respect far excelling the Italian Riviera. The lines of the lime- stone mountains, running for the most part parallel to the sea, are pierced by deep river-valleys; those that debouch to the south of the Kasimiye have already been mentioned in the article PALESTINE; the most important of those to the north are the Nahr Zaherani, Al-Auwali, Damur (Tamy- ras), Nahr Beirtt, Nahr al-Kelb (Lycus), Nahr Ibrahim (Adonis), Nahr Abu Ali (Kaddisha). The mountains are not rich in mineral products; but it may be mentioned that the geologist Fraas has recently discovered indubitable traces of amber-digging on the Phcenician coast. The purple-shell (Murex trunculus and brandarvs) is still found in large quantities. The harbours on the Pheenician coast which played so important a part in antiquity are nearly all silted up, and, with the exception of that of Beirut, there is no safe port for the large vessels of modern times. A few bays, open towards the north, break the practically straight coast-line ; and there are a certain number of small islands off the shore. It was, in the main, such points as these that the Phcenicians chose for their towns; since, while affording facilities for shipping, theyalso enabled the Phceni- cians to protect themselves from attacks from the mainland, which was subject to them within but narrow limits.

ftace.—The ethnographic relations of the Phcenicians have been the subject of much debate. As in Gen. x., Sidon, the firstborn of Canaan, is classed with the Hamites, many investigators are still of opinion that, in spite of their purely Semitic language, the Phoenicians were a distinct race from the Hebrews. They attach great weight to the peculiarities that mark the course of Phcenician civiliza- tion, and, above all, to their political organization and colonizing habits, which find no analogies among the Semites. In favour of the opposite and more probable view, that the Phcenicians, like the Canaauites, are an early offshoot from the Semitic stock, it may be urged (1) that the account in Gen. x. is not framed on strict ethno- graphic

lines, and (2) that the absence from Pheenicia of all trace of an original non-Semitic form of speech cannot be reconciled with the theory of an exchange of language. The close connexion which existed from an early period between the Phcenicians and the Egyptians accounts for many coincidences in the matter of religion. Phoenician civilization, being on the whole of but little originality, may have been that of a Semitic people, who, from their situation on the narrow strip of country at the east end of the Mediterranean, were naturally addicted to trade and colonization.

Language.—Inscriptions, coins, topographical names pre- served by classical writers, proper names of persons, and the Punic passages in the Penulus of Plautus combine to show that the Phcenician language, like Hebrew, belonged to the north Semitic group. Even the Phenician which survived as a rustic dialect in north Africa till the 5th century of our era was very closely akin to Hebrew. Though it retained certain old forms obsolete in Hebrew, Pheenician, as we know, represents on the whole a later stage of grammatical structure than the language of the Old Testament. Its vocabulary, in like manner, apart from a few archaisms, coincides most nearly with later Hebrew. At a very early period Semitic words were

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adopted into Greek from Pheenician ; and it is also quite certain that the Phcenicians had at least a great share in the development and diffusion of the alphabetic character which forms the foundation of all European alphabets. We possess, however, only a few Phoenician inscriptions and coins of very early date. The longest and most im- portant of the inscriptions—that on King Eshmun‘azar’s tomb—is in letters which, while very ancient in certain of their features, present a series of important modifications of the original type of the Semitic alphabet, as it can be fixed by comparison of the oldest documents. Still more divergent from the ancient characters are the forms of the letters on the Pheenician, 7.e., Punic, monuments of north Africa. (A. 80.) Religion.—Considering the great part which the Pheeni- cians played in the movements of ancient civilization, it is singular how fragmentary are our sources of know- ledge for all the most essential elements of their his- tory. What we are told of

their religion is only in appearance an exception to this rule. Eusebius in the Przparatio Evangelica cites at length from the Greek of Philo of Byblus a cosmogony and theogony professedly translated from a Berytian Sanchuniathon, who wrote 1221 3.c. But that this work is a forgery appears from the apocryphal authorities cited, and the affinity displayed with the system of Euhemerus. The forger was Philo himself, for the writer borrows largely from Hesiod and was therefore a Greek ; he gives Byblus the greatest pro- minence in a history professedly Berytian, and was there- fore a Byblian ; and finally Philo was a fanatical Euhemer- ist, and the admitted object of the work was to make converts to that system. The materials used by Philo were, however, in all probability mainly genuine, but so cut and clipped to fit his system that they must be used with great caution and constantly controlled by the few scattered data that can be gathered from authentic sources. The two triads of Hannibal's oath to Philip of Macedon (Polyb., vii. 9, 2)—Sun, Moon, and Earth, and Rivers, Meadows, and Waters—contain the objects on which all Phcenician worship is based. Rivers were generally sacred to gods, trees to goddesses ; mountains, too, were revered as nearer than other places to heaven; and betylia or meteoric stones were held sacred as divine messengers. Philo's second generation of men (Genos and Genea) first worshipped the plants of the earth, till a drought ensued and they. stretched out their hands towards the sun as the Lord of Heaven or Beelsamén (Baal-Shamaim), —an indication that the worship of heavenly bodies was regarded as a later development of religion. Baudissin, on the other hand, has lately maintained that all Pheenician deities were astral and only manifested themselves in the terrestrial sphere, that the things holy to them on earth were symbols, not dwelling-places, of the gods. And there seems to be little doubt that this was the theory of later Phoenician theology, as appears in the legend of the fiery star of the queen of heaven that fell into the holy stream at Aphaca (Sozom., ii. 5, 5), in the coincidence of the names of sacred rivers with those of the celestial gods, and in the name Zets Oadrdooros (Hesych.) for a Sidonian sea-god. But surely this theory was devised to remove a contradiction which theologians felt to be involved in the popular religion. In the latter logical consistency is not necessarily to be presumed, and astral and terrestrial worships might well exist side by side. In historical times the astral element had the ascendency ; the central point in religion, and the starting-point in all Phcenician mythology, was the worship of the Sun, who has either the

Moon or (as the sun-god is also the heaven-god) the Earth for wife. In Byblus, for_which alone we possess some details of the local cult, El was the founder and

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lord of the town, and therefore of course had the pre-emi- nence in religion; and so the Byblian Philo makes El to be the highest god and the other élim or eldhim sub- ordinate to him. In the other towns also the numen patrium was a form of the sun-god, or else his wife, and enjoyed somewhat exclusive honour—a step in the direction of monotheism similar to the Moabite worship of Chemosh (cp. the Mesha stone). EI is represented as the first to introduce circumcision and the first who sacrificed an only son or a virgin daughter to the supreme god. He wanders over all the earth, westward towards the setting sun, and leaves Byblus to his spouse Baaltis—this is meant to explain why she had the chief place in the cult of Byblus; her male companion Eliiin, Shadid (or péysorros Oeéds), is conceived as her youthful lover, and El is transformed into a hostile god, who slays Shadid with the sword. Accord- ing to another legend the youthful god is killed by a boar while hunting, and the mourning for him with the finding of him again make up a chief part of Byblian worship, which at an early date was enriched with elements borrowed from Egypt and the myth of Osiris. In other places we find as spouse of the highest god the moon- goddess Astarte with the cow's horns, who in Tyre was worshipped under the symbol of a star as queen of heaven. With her worship as with that of Baaltis were associated wild orgies ; and traces of the like are not lacking even at Carthage (Aug., Civ. Dei, ii. 4), where theology had given a more earnest and gloomy character to the goddess. Astarte was viewed as the mother of the Tyrian sun- god Melkarth (Eudoxus, in Athen., ix. p. 392 D), or, as his full title runs, "our lord Melkarth the Baal of Tyre" (C.Z.S., No. 122). On account of his regular daily course the Sun is viewed as the god who works and reveals himself in the world, as son of the god who is above the world, and as protector of civil order. But, again, as the Sun engenders the fruitfulness of the earth, he becomes the object of a sensual nature-worship, one feature of which is that men and women interchange garments. A chief feast to his honour in Tyre was the "awaking of Heracles" in the month Peritius (February/March ; Menander of Eph., in Jos., Ant., viii. 5, 3), a

festival of the returning power of the sun in spring, probably alluded to in the sarcasm of Elijah (1 Kings xviii. 27). Peculiar to Berytus is the worship of Poseidon and other sea-gods, who are connected genealogically with Zeus Belus, a son of El, born beyond the Euphrates, and perhaps therefore connected with the Babylonian fish-gods. Berytus was also a chief seat of the worship of the Cabiri, the seven nameless sons of Sydek, with their brother Eshmin, who is the eighth and greatest of the Cabiri. Philo supplies for them a genealogy which is an attempt to present the growth of man from rude to higher civilization, and pre- sents analogies, long since observed, to the genealogy of the sons of Cain in Genesis. Not only their half-divine ancestors but the Cabiri themselves belong to a compara- tively recent stage of religious development. They are the patron deities of manual arts and civil industry, and as such are the great gods of the Phcenician land, specially worshipped in the federal centre Tripolis. On coins of this town they are called Syrian (i.e., perhaps Assyrian) gods,! which seems to imply that the Phcenicians them- selves regarded as not primitive the many Egyptian elements which were quite early introduced into the religion of the Cabiri, and especially of Eshman. On the other hand, a figure allied to Eshmin, Taaut, the inventor of the alphabet, is certainly borrowed from the Egyptian Tehuti. So, too, Onka (Steph., s.v. ‘’Oyxaias”) is prob- ably the Anuke of Sais, and it is possible that the whole

1 Eckhel, D.N.V., iii. 374.

cycle of gods who revealed and interpreted the sacred books is Egyptian ; some of the latter have the form of a serpent.

The Pheenicians did not set up anthropomorphic statues of the gods, but symbolic pillars of stone, or, in the case of the queen of heaven, of wood (ashérah). If an actual image was used, likeness to man was avoided by fantastic details: the god had two heads or wings, or some animal emblem, or was dwarfish or hermaphrodite, and soon. The sacrifices were of oxen and other male domestic animals— as explatory offerings also stags®—and for minor offerings birds. Human sacrifices were exceptionally offered by the state to avert great disasters; the victim was chosen from among the citizens and must be innocent, wherefore children were chosen, and by

preference firstborn or only sons. The same idea that the godhead demanded the holiest and most costly gift explains the prostitution of virgins at certain feasts in the sacred groves of the queen of heaven, and the temporary consecration of maidens or matrons as kédéshoth (iepddovdor). For this custom, as for that of human sacrifice, substitutes were by and by introduced in many places; thus at Byblus it was held sufficient that the women cut off their hair at the feast of Adonis (De Dea Syr., c. 6).

Origin of the Phenicians.—The oldest towns were held to have been founded by the gods themselves, who pre- sumably also placed the Pheenicians in them. Imitating the Egyptians, the race claimed an antiquity of 30,000 years (Africanus, in Syncellus, p. 31), yet they retained some memory of having migrated from older seats on an Eastern sea. Herodotus (vii. 89) understood this of the Persian Gulf; the companions of Alexander sought to prove by learned etymologies that they had actually found here the old seats of the Phoenicians. But all this rested on a mere blunder, and the true form of the tradition is pre- served by Trogus (Just., xviii. 3, 3), who places the oldest seats of the Phcenicians on the Syrium stagnum or Dead Sea—with which the Greeks before the time of the Dia- dochi had no acquaintance—and says that, driven thence by an earthquake, they reached the coast, and founded Sidon. This earthquake Bunsen has ingeniously identified with that which destroyed Sodom and Gomorrha, and with which Genesis itself connects the migrations of Lot. Perhaps it played much such a part in the mythic history of the peoples of Canaan as the breach of the dam of Marib does in the history of the Arabs.

In historical times the Pheenicians called themselves Canaanites and their land Canaan (Kéna‘an, Kéna‘; Xva in Hecatzeus, fr. 254), the latter applying equally to the coast which they themselves held and the inland highlands which the Israelites occupied. The Greeks call people and land Poivixes, Powiky ; the former is the older word, which in itself disposes of the idea that Phoenicia means the land of the date-palm, which the Greeks called dot, 2.¢., Phoenician.? In truth, Potvices, with an antique termination used in forming other names of nations (AtOixes, Opyexes), is derived from qouvds, “blood-red,” probably in allusion to the dark complexion of the race. ~

When the southern part of the coast of Canaan was occupied by the Philistines the region of Ekron became the boundary of Pheenicia to the south (Josh. xii. 3); the northern boundary in the time of the Persians was the town of Posidium and the mouth of the Orontes (Herod., ili. 91; Pseudo-Scylax, § 104). Under the Seleucids these limits contracted, the southern boundary being the Chorseus (Ptol., Codd. B. E., Pal. 1), which falls into the sea north of the tower of Straton, and the northern the river

2 For stags offered to Tanit see Clermont-Ganneau, Journ. As., ser. 7, vol. xi. p. 232 sq., 444 sq.

3 In reality the date-palm is not aboriginal in these regions, Hehn, Kulturpflanzen, &e., 3d ed., p. 233.

Eleutherus, so that Orthosia was the last town of Phcenicia and the whole region of Aradus was excluded.1_ Under the Roman empire the southern boundary was unchanged, but the northern advanced to a little south of Balanea.2 A still narrower definition of Canaan is that in Gen. x. 19 and Josh. xiii. 2-6, where Sidon or its territory is the northern limit ; but the reference is only to the land destined to be occupied by Israel, for a younger hand has added to Sidon (the firstborn of Canaan) and Heth a list of other nations, sons of Canaan, extending northwards as far as Hamath.?

It is a singular fact that alike in the Old Testament and in Homer, in the time of Tyre's greatest might, we con- stantly read of Sidonians and not of Tyrians. The explan- ation that Sidonians is a synonym of Pheenicians in general is defended on 1 Kings v. 1 [15] compared with ver. 6 [20], but is not adequate ; the same chapter distinguishes between the Sidonians and the Giblites or men of Byblus (E.V., 'stone squarers," ver. 18 [32]). And in Gen. x. we have besides Sidon the peoples of Arce, Sinna, Aradus, and Simyra enumerated in order from south to north—mostly unimportant towns afterwards absorbed in the land of Aradus—and yet Tyre is lacking, though one fancies that we could better miss even Aradus, which was a colony from Sidon (Strabo, xvi. p. 753), only Aradus was founded by fugitives, and so must, from the first, have been inde- pendent. Hence we may conjecture that the list in Genesis is political in principle; and this gives us a solution of the

whole difficulty, viz., that, during the flourishing period of Pheenicia, Sidon and Tyre formed a single state whose kings reigned first in Sidon and then in Tyre, but whose inhabitants continued to take their name from the old metropolis. The first unambiguous example of two dis- tinct kings in Tyre and Sidon is in the end of the 8th century B.C., On an inscription of Sennacherib (Schrader, K.A.T., 2d ed., p. 286 sq.), and there is every reason to think that the revolt of Sidon from Tyre about 726 spoken of by Menander (Jos., Ant. ix. 14, 2) was a revolt not from Tyrian hegemony but from the Tyrian kingdom. The several Pheenician cities had lists of their kings back to a very early date. Abedbalus reigned at Berytus in the time which Philo had ciphered out as that of the judge Jerubbaal, z.¢., about the beginning of the 13th century B.C., and in Sidon there is word of kings at the time to which the Greeks referred the rape of Europa (15th cen- tury ; see Leetus, in Tatian, Adv. Grecos, 58). The leading Phcenician towns are mentioned in connexion with the Syrian wars of the Pharaohs of the XVIIIth, XTXth, and XXth Dynasties (16th-13th century); thus under Thothmes III. we read of Berytus, Ace, Joppe, and repeatedly of Aradus, which is commonly spoken of along with Haleb (Aleppo) and other eastern districts. The mention of Tyre is less certain, as there were two cities which the Egyptians called T'ar ; but there is no mistake as to the city on the sea called "T'aru the haven" in the journey of an Egyptian of the 14th century (Rec. of the Past, ii. 107 sq.), —"' water 1s carried to it in barks, it is richer in fish than in sands" : the noble aqueducts therefore, of which the ruins are still seen, were not yet constructed.*

The oldest parts of Tyre were taken to be the town on the main- land, afterwards known as Paletyrus, and the so-called temple of Hercules built on a rocky islet, which Hiram by and by united with the insular part of the town. According to native historians this pa was more properly one of Olympian Zeus, that is, of Baal- 8 ae, the Lord of Heaven.' Herodotus, after inquiries made a Strabo, xvi. p. 753; Ptol., v. 15, 4, 5, both seemingly from

rtemidorus. The Eleutherus as boundary appears also in Jos., Ant., xv. 4, 1 e¢ sep.

- *Phin, iN. H.,y 69, 79; Itin. Hicros*

, Ste . Hreros., pp. 582, 585 (Wess.).

: See Wellhausen in Jahrb. f. d. Theol., 1876, p. 403. inal pee ene for "ASéABados, in Porphyry, ap. Euseb.,

° This appears by comparing Herod., ii. 44, with the mention of the same golden stele by Menander (Jos., Cont. Ap., i. 18).

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on the spot, fixes the founding of the city in 2756 B.c. ; but Tyre did not attain great importance till the later island city was built. According to Trogus (Justin, xvill. 3, 5) the Phoenicians (not the people of Sidon, as the passage is often misread to mean), who had been subdued by the king of Ascalon, took ship and founded Tyre a year before the taking of Troy. This goes well with the spread of the Philistine power in the time of the later Judges and with the fact that Ascalon was still a Canaanite town under Rameses IT. (c. 1385 B.c.), while in the eighth year of Rameses III. (c. 1246) the Pulosata made a raid into Kgypt.® Philistus (in Euseb., Can., No. 808) gives us without knowing it the era used in Tyre and in early times also in Carthage when he says that Zorus (7.c., Gér, Tyre) and Carchedon built Carthage in 1213 B.c., or rather, according to avery good MS. (Regin.), in 1209, which agrees with the date 1208 for the fall of Troy on the Parian marble, and also may be recon- ciled with the notice (taken from Philistus) in Appian, Punica, i., that the founding of Zorus and Carchedon was fifty years before tlie fall of Troy, if we suppose that Philistus took for the latter event the latest date we know of, viz., that assigned by Democritus.? Now Josephus (Ant., vill. 3, 1) counts 229 years from the building of Tyre to Hiram, and places the foundation of Carthage (Cont. Ap., i. 18) in the 155th year from Hiram's accession. The best authority for the last-named event is Timeus, who puts it in 814 B.c. This gives us for the founding of Tyre a date twelve years later than that of Philistus, but it is probable that Josephus in summing up the individual reigns between Hiram and the building of Carthage as given by Menander departed from the intention of his author in assuming that the twelve years of Astartus and the twelve of the contemporaneous usurper were not to be reckoned separately.? This hypothesis enables us to give a restored chronology which cannot be far from the truth (see infra).

Manufactures and Inventions.—The towns of the Pheeni- cian coast were active from a very early date in various manufactures. Glass work, for which the sands of the Belus gave excellent material, had its chief seat in Sidon ; embroidery and purple-dyeing were favoured by the preva- lence of the purple-giving murex all along the coast. The ancients ascribed to the Pheenicians the invention of all three industries, but glass-making seems to have been borrowed from Egypt, where this manufacture is of im- memorial antiquity ; and several circumstances indicate that the other two arts probably came from Babylon—in particular, the names of the two main tints of purple— dark red (argaman) and dark blue (tékhéleth)—seem not to be Phcenician. The Pheenicians, however, brought these arts to perfection and spread the knowledge of them. In other-particulars also the ancients looked on the Phceni- cians as the inventive people par excellence: to them as the great trading nation was ascribed the invention of arithmetic, measure, and weiglit, which are really Babylon- ian in origin, and also of writing, although it is not even quite certain that it was the Phcenicians who adapted the Egyptian hieroglyphic alphabet to Semitic use.2 Yet here again the Phcenicians have undisputedly the scarcely inferior merit of having communicated the art to all the nations of the Mediterranean basin.

Nangation, Trade, Colonies.—The beginnings of navi- gation lie beyond all human memory, but it is not hard to understand how the ancients made this also an inven- tion of the Pheenicians, whose skill as seamen was never matched by any ancient people before or after them. Even in later times Greek observers noted with admiration the exact order kept on board Pheenician ships, the skill with which every corner of space was utilized, the careful disposition of the cargo, the vigilance of the steersmen and their mates (Xen., Wc., viii. 11 sg.). They steered by the pole-star, which the Greeks therefore called the Pheenician star (Hyginus, Po. Ast., ii. 2); and all their

§ See Brugsch, Geschichte Aeqyptens, pp. 516, 598.

? If Democritus was born in 470 (Thrasyllus), his date for the fall of Troy is 1160.

8 He is contemporaneous on the reading Me6' of "Aorapros given by Theophilus, Ad Aufol., iii. 19. If Josephus took it so, then according to the

best readings he would get exactly 155 years.

® That the Semitic alphabet did not come from cuneiform writing may be taken as certain; but also it is not probable that it came from the hieratic character of the Egyptians.

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vessels, from the common round yavAos, to the great Tar- shish ships, the East-Indiamen—so to speak—of the ancient world, had a speed which the Greeks never rivalled. Of the extent of the Phcenicians' trade in the last days of Tyre's glory Ezekiel (xxvii. 12-25) has left a lively picture, which shows how large was the share they had in overland as well as in naval commerce. It was they, in fact, who from the earliest time distributed to the rest of the world the wares of Egypt and Babylon (Herod., i. 1). To the lands of the Euphrates and Tigris there were two routes : the more northerly passed obliquely through Mesopotamia and had on it the trading places of Haran (Carrhze), Canneh (Czenz), and Eden; the other, more southerly, had Sheba (Sabzea) for its goal, and led down the Euphrates, passing Asshur (Sura) and Chilmad (Charmande). There were other routes in the Persian and Macedonian period, but they do not belong to the present history.

Actual inland settlements of the Phcenicians seem to have been few; we know of one near the head of the northern trade road, Laish, which was lost to the Danites in the time of the judges (Judges xviii.), and one on the southern route, Eddana on the Euphrates (Steph. B., s.v.), which corresponds in name with Eden, but is not the same place, but perhaps rather the Giddan of Isidore of Charax (§ 1). In the Arabian caravan trade in perfume, spices, and incense for worship the Phcenicians had a lively interest (Herod., iii, 107). These wares were mainly pro- duced not in Arabia but in eastern Africa and India; but Sheba in Yemen was the emporium of the whole trade, and the active commerce of this rich and powerful state in the times before the Persian is seen better than by any direct testimony from the exact knowledge of the Sabzean lands shown in Gen. x., from the many references to Arabia and Sheba in the Assyrian monuments, and from such facts as Euting's discovery at Taima in the heart of Arabia of an Aramaic inscription of the 6th century B.c., composed by a man with an Egyptian name.

In Egypt Phoenician trade and civilization soon took firm root; they alone were able to maintain their Egyptian trade and profits in the anarchic times of the XXIIId to the XXVth Dynasties (825-650 B.c.), times like those of the Mameluke beys, in which all other foreign merchants were frightened away and the Greek legend of the inlios- pitable Busiris originated.? The Tyrians had their own quarter in old Memphis (Herod., ii. 112), but there never were real colonies of the Phcenicians in Egypt.

That in matters economic Syria and Palestine depended on Pheenicia might have been inferred even if we had not the express testimony of Ezekiel that these lands were in- cluded in the sphere of Tyrian trade; so too was Togarmah, an Armenian district.

Cilicia was important to the Phcenicians as the natural point of shipment for wares from the Euphrates regions ; and the opposite island of Cyprus attracted them by its store of timber for shipbuilding, and of copper. Both these countries were originally peopled by the non-Semnitic Kittim, who have left their name in the Cilician district Cetis and the Cyprian city Citium ; but they came under profound Semitic influences, mainly those of the Phoe- nicians, who on the mainland had settlements at Myri- andus (Xen., Anab., i. 4, 6) and Tarsus,? while in Cyprus Citium—which to the last remained the chief seat of the

2 XdABns, the herald of Bnsiris, is simply ab, "dog."

3 Tarsus was founded by Aradians, Dio Chr., xxxiii. 40. Aig, a city of the Phoenicians in Hecateus, fr. 259, is probably not Algz but Gaza.

writing in 346 B.c., knows Carpasia, Cerynea, and Lapethus as Phoenician ; but the view that Phoenician sway in Cyprus was very ancient and that the Phcenicians were gradually driven back by the Greeks appears not to be sound. On the contrary, the balance of power seems to have varied greatly ; the Assyrian tribute-lists of 673 and 667 (Schrader, KAT, p. 354 sq.) contain but two names of Phcenician cities in Cyprus, Silli (Soli) and Kartihadast- (probably New Paphos); not one of the later Phcenician kingdoms is mentioned, so that presumably none of them then existed, and not one of the

ten Cyprian kings mentioned appears to be Phcenician by name. Menander tells us (Jos., Axt., ix. 14, 2) that the kings of Tyre ruled over Cyprus at the close of the 8th century ; but a very clear proof that there was no ancient and uninterrupted political connexion with Pheenicia hes in the fact that the Cyprian Greeks took the trouble to frame a Greek cuneiform character modelled on the Assyrian.

The Homeric poems represent the Phoenicians as present in Greek waters for purposes of traffic, including the pur- chase and capture of slaves, but not as settlers. Tradition (see especially Thucyd., i. 8) is unanimous in representing the Carians and Phcenicians as having occupied the islands of the Augean before the migrations of the Greeks to Asia Minor, but so far as the Phoenicians are concerned this holds only of the southern islands—afterwards occupied by Dorians—where they had mining-stations, and also establishments for the capture of the murex and purple- dyeing. The most northerly of the Cyclades on which we can prove a Phcenician settlement is Oliarus (Steph., s.v.), which was occupied by Sidonians, probably with a view to the use of the marble quarries of Paros, which lies opposite. Similarly the Byblians occupied Melos (Steph., s.v.), which produced a white pigment (Melian earth), alum, and sulphur. Two great islands were held as main seats of the purple trade, Cythera (Herod., i. 105) and Thera, with the neighbouring Anaphe (Herod., iv. 147 ; Steph., s.v. " MeuBXtapos" '),—as also the town Itanus at the eastern extremity of Crete (Steph., s.v.). Specially famous was the purple of the Laconian waters,—the isles of Elishah of Ezekiel xxvii, 7. Farther east the Phoenicians were settled in Rhodes.® The Greek local tradition about the Phe- nicians seems, in Thera and Rhodes, to embody real his- torical reminiscences, and it is confirmed for Thera and Melos by the discoveries of Phceenician pottery and orna- ments in the upper strata of the tuff, and for other places by peculiar cults which survived among the later Dorian settlers. Thus the Aphrodite Urania of Cythera was identical with the Oriental goddess of love at Paphos, and Herodotus (i. 105) makes her temple to be founded from Ascalon ; the coins of Itanus (Mionnet, 11. 284 sq.) show a fish-tailed deity ; in Rhodes human sacrifices to Cronus were long kept up (Porph., De Abs., 11. 54). The legends of Rhodes and Crete have a character quite distinct from that of other Greek myths, and so give lasting testimony to the deep influence in both islands of even the most hideous aspects of

Phcenician religion; it is enough to refer in this connexion to the stories of the eight children of Helios in Rhodes, of Europa, the Minotaur, and the brazen Talos in Crete. The pre-Hellenic inhabitants of the islands, the Carians and their near kinsmen the Eteo- cretans or Mnditze (probably identical with the PHILISTINEs, q.v.), had no native civilization, and were therefore wholly under the influence of the higher culture of the Phcenicians. But on the Greeks too the Phoenicians had no small influ-

4 As an enormous supply of murex was needed for this industry, the conjecture of Duncker is probably sound, that the purple stations were the oldest of all Phoenician settlements.

5 Rodanim, 1 Chron. i. 7, by which Dodanim in Gen. x. 4 must be corrected ; see Ergias (2?) and Polyzelus, in Athen., viii. p. 360 D.

ence, as appears even from the many Pheenician loan-words for stuffs, utensils, writing materials, and similar things connected with trade! From the Phcenicians the Greeks derived their weights and measures; pva, the Hebrew maneh, became a familiar Greek word. From Pheenicia too they had the alphabet which unanimous tradition con- nects with the name of Cadmus, founder of Thebes. Hence Cadmus has been taken to mean "eastern" (from D7), and Thebes viewed as a Phoenician colony; but the Greeks did not speak Phoenician, and the Phcenicians would not call themselves Easterns. Further, an inland colony of Phoenicians is highly improbable; and all other traces seem to connect Cadmus with the north. But the Cadmeans, who traced their descent to Cadmus, colonized Thera, and it was they who, mingling with the Phcenicians left on the island, learned the alphabet. It was in Thera, where the oldest Greek inscriptions have been found, that the inven- tion of letters was ascribed to the mythic ancestor, and that he was made out to be a Pheenician. We now know better than we did a few years ago how much the oldest Greeks depended before the migrations on the movements of Eastern civilization, and can well believe that the Phe- nicians played a very important part in this connexion. Thus in the tombs of Mycenz we find Phoenician idols, objects of amber, and an ostrich egg side by side with rich jewels of gold, Oriental decoration, and images of Eastern plants and animals ; thus too the rock-

tombs of Hymettus closely resemble those of Phoenicia ; and above all we find on the Isthmus of Corinth, that most ancient seat of com- merce, the worship of the Tyrian Melkarth under the name of Melicertes. Yet with all these proofs of a lively trade there is no trace of Phoenician settlements on the Greek mainland and the central islands of the Algean; but in the north Thasus was occupied for the sake of its gold mines (Herod., vi. 47), and so probably was Galepsus on the opposite Thracian coast (Harpocr., s.v.), where also it was Phoenicians (Strabo, xiv. p. 680; from Callisthenes) who opened the gold mines of Pangeus. Beyond these points their settlements in this direction do not seem to have extended; the Tyrians, indeed, according to Ezekiel, traded in slaves and bronze-ware with the Greeks of Pontus (Javan), the Tibareni (Tubal), and Moschi (Meshech); but all supposed traces of actual settlements on these coasts prove illusory, and Pronectus on the Gulf of Astacus, which Stephanus attributes to the Phcenicians, lies so isolated that it was perhaps only a station of their fleet in Persian times.

The great centre of Phcenician colonization was the western half of the Mediterranean and the Atlantic coasts to the right and left of the straits. In especial the trade with Tarshish, that is, the region of the Tartessus (Guadal- quivir), was what made the commercial greatness of the Phoenicians ; for here they had not only profitable fisheries (tunny and murena) but above all rich mines of silver and other metals, to which the navigable rivers Guadiana and Guadalquivir gave easy access. The untutored natives had little idea of the value of the metals ; for long there was no competition, and so the profits were enormous ei: was said that even the anchors were of silver in ships re- turning from Spain (Diod., v. 35). Next the Phcenicians ventured farther on the ocean and drew tin from the mines of north-west Spain or the richer deposits of Cornwall; the tin islands (Cassiterides) were reached from Brittany, and are always distinguished from the British mainland, so that the old view which makes them the Scilly Islands 1s probably right. The tin was supposed to be produced where it was exchanged,—a very common case.2, Amber too was brought in very early times from the farthest north ; amber ornaments are often mentioned by Homer,

*1 See A. Miiller, in Beitr. z. K. d. indog. Spr., i. 278 sq. * See Lit. Centrbl., 1871, p. 528.*

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and have been found in the oldest tombs of Cumez and in those by the Lion gate at Mycenz. The Phceenicians can hardly have fetched the amber themselves from the Baltic or even from the North Sea (where it scarcely can have ever been common) ; it came to them by two trade routes, one from the Baltic to the Adriatic, the other up the Rhine and down the Rhone. But indeed a deposit of amber has been found in the Lebanon not far from Sidon,? and perhaps the Pheenicians worked this and only concealed, after their manner, the origin of the precious ware. Cer- tainly the ancients knew of Syrian amber, and knew also that amber could be dug from the ground. The rich trade with Spain led to the colonization of the west (Diod., ut supra). Strabo (i. 48) dates the settlements beyond the Pillars of Hercules soon after the Trojan War, in the time, that is, of Tyre's first expansion. Lixus in Maure- tania was older than Gades (Pliny, xix. 63) and Gades a few years older than Utica (Vell., i. 2), which again was founded 1101 B.c. (Pseudo-Arist., Aftr. ausc., 134; Bocchus, in Plin., xvi. 216). Most of the African colonies were no doubt younger; we have dates for Aoza (887-855, Men- ander) and Carthage (814, Timeus). Here, as generally in like.cases, the farthest points were settled first and the need for intermediate stations to secure connexion was felt later. The colonization was carried out on a great scale. Ophelas (Strabo, xvii. 826) may exaggerate when he speaks of 300 cities on the Mauretanian coast beyond the Pillars of Hercules; but the colonists and the Cartha- ginians after them stamped west Africa with a thoroughly Phoenician character, and their language was dominant, at least in the cities, far beyond the limits of their nation- ality, just as was the case with Latin and Arabic in later times. It is most likely that so great a mass of colonists was not wholly drawn from the narrow bounds of Pheenicia, but that the inland Canaanites, pushed back by Hebrews and Philistines, furnished many recruits; the supposed testimonies to this fact, however, are late, and certainly apocryphal.*

Surveying the great settlements of the Phcenicians from east to west, we find them first in Sicily, occupying, in a way typical of the commencement of all their settlements, projecting headlands

and neighbouring islets, from which they traded with the Siculi (Thueyd., vi. 2). Their chief seat seemingly was Macara (Hera- clides, Polit., 29), on the south coast, pd!) & on coins, Heraclea Minoa of the Greeks. Before the Greeks they retired to the north coast, where they held Motye, Panormus, and Soloeis, supported by their alliance with and influence over the Elymi, and by the neighbourhood of Carthage, which here and elsewhere succeeded to the heritage of Tyre, and gave protection to the Pheenician colonies. The islands between Sicily and Africa—Melite, with its excellent harbour and commanding position on the naval highway, Gaulus, and Cossura—were also occupied (Diod., v. 12), and a beginning was made with the colonization of Sardinia (ib., v. 35), where Caralis is said to bea Tyrian foundation (Claudian, B. Gild., 520) ; but real sovereignty over this island and Corsica was first exercised by the Carthaginians.5 It is uncertain if Phoenician trade with and influence on the Etruscans is older than the political alliance of the latter with Carthage; there were, at least, no Phenician colonies in Italy. On the east coast of Spain Barcino (Auson., Epist., xxiv. 68) and Old Carthage (Ptol., ii. 6, 64) are settlements apparently older than the Spanish empire of Carthage, but their origi is not therefore necessarily Phenician, especially as Old Carthage lies in- land ; they may date from the conflicts of Carthage and the Massa- liotes. In Tartessus, on the other hand, or Turdetania, as it was called later, all the important coast towns were Pheenician (Strabo, ili. 151, 156 sq., 169 sg. } —Abdera, Sex (which was regarded as one of the oldest of the Tyrian settlements in Spain), Malaca, Carteia, and, most famous of all, Gades, with its most holy shrine of Hercules ; it lay on an islet which had not even drinking water, but the posi- tion was a commanding one. Still farther off lay Onoba, where the Tyrians are said to have settled before they were in Gades. In Africa the most easterly settlement was Great Leptis, which is the only colony ascribed to Sidonians, driven from their home by

3 Fraas, Drei Mon. im Lib., p. 94, and Aus dem Orient, ii. 60 sq.

- *Pliny, V.H., xxxvii. 87, 40, reading with Detlefsen ex humo.*

> The Greeks of the 6th century had a very fantastic idea of the value of these islands (Herod., i. 170, v. 106, 124).

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civil tronbles (Sallust, Jug., 78), and is therefore presumably one of the oldest. Less certain are the accounts that the sister cities (ia and Sabratha were founded, the former by Phenicians from Sicily, the latter from Tyre (Sil. Ital., iii. 256 sq.). The district Emporia on the Lesser Syrtis was named from its many Pheenician trading towns. Here, on the river Cinyps, corn produced three- hundredfold, and a great trade-road led inland to the land of the Garamantes. That the commercial town of Tacape (Kabis) and the island of Meninx (Jirba), with its purple-dyeing trade, were Phee- nician is proved by inscriptions, and Capsa, in inland Numidia, was deemed a foundation of the Tyrian Hercules (Oros., v. 15). Among the Phenician towns in Africa proper Achulla was Melitan (Steph., s.v. ""AxoA\a'"'), Lesser Leptis and Hadrumetum Tyrian (Pliny, v. 76; Solin., 27, 9), as was also Aoza (Menander), that is, rather the Uzita of Strabo and Ptolemy (cp. Wilmanns on CRE» vill. 68), 55 miles inland from Leptis, than Auzia in inland Maure- tania. On the north coast Carthage and Utica are Tyrian colonies, and probably also Hippo Zarytus, though Sidon, on a coin, claims it and other Tyrian colonies as her daughters (Movers, Phénizier, ii, 2, p. 184). The unidentified town of Canthele and the island Eudeipne are called Liby-Pheenician (Steph., s.cv.), and this name in later times denoted the Pheenicians in Africa apart from and in contrast to Carthage. The Semitic populations were thickly sown over all this region, but we cannot generally distinguish Pheenician colonies, Carthaginian foundations, and native settlements that had become Punic. Chalce, on the coast east of Oran, in the country of the Masesyli, was Pheenician, but their great domain was the Atlantic coast of Mauretania. . Tingis and Zelis, if originally Berber, became thoroughly Pheenician cities (Mela, ii. 6, 9; Strabo, ili. 140); the chief colony here was Lixus (Ps.-Seylax, § 112), a city accounted greater than Carthage. Southward, on the so-called Kéd7os 'Europixés, and onwards to the mouth of the Dra river Tyrian colonies lay thick, and here a great trade-route went inland to the country of the Blacks. These colonies were ruined by the invasion of the Pharusii and Nigrita (Strabo, xvii. 826), who spread destruction just as did the Almoravids when they issued from the same region in the 11th century ; the Carthaginians saved the rem- nant of their kinsmen by sending Hanno to found the new colony of Thymiaterium and plant 30,000 Liby-Phcenicians in the old ports of Karikon Teichos, Gytte, Acra, Melitta, and Arambys. The most westerly point reached by the Phenicians was the For- tunate Island (the largest of

the Canaries, probably), which later fancy painted in glowing colours after intercourse with so distant a region had ceased (Diod., v. 20).

The trading connexions of the Phcenicians reached far beyond their most remote colonies, and it must have been their knowledge of Africa which encouraged Pharaoh Necho to send a Pheenician expedition to circumnavigate Africa, This greatest feat of ancient seamanship was actually accom- plished in 611-605 8.c., at a time when the mother-country had already lost its independence, and the colonial empire had but a shadow of its former splendour. The power of Tyre rested directly on her colonies, which, unlike the Greek colonies, remained subject to the mother-city ; we read of rebellions in Utica and Citium which were put down by arms. The colonies paid tithes of all their revenues and sometimes also of booty taken in war to the Tyrian Hercules, and sent envoys to Tyre for his chief feast. But Tyre was too remote long to exercise as effective a control over her dependencies as was possible to the more favourably placed Carthage ; the relation gradually became looser, and the more substantial obligations of the colonies ceased to be discharged ; yet Carthage certainly paid tithes to the Tyrian Hercules as late as the middle of the 6th century B.c,

Lragments of History.—Josephus (Ant., viii. 5, 3, and Ap., i. 17, 18) has fortunately preserved extracts of two Hellenistichistorians, Dius and Menander of Ephesus, which supply at least the skeleton of the history of the golden age of Tyre. From them we learn that Hiram (or rather Hirdm) I., son of Abibal, reigned from 980 to 946 B.c. He enlarged the insular town to the east by filling up the so-called evpvxwpov, united the temple of Baal-Shamaim with the main island by a mole, placed in it a golden pillar, and splendidly renewed the temples of Hercules! and Astarte. The inhabitants of Utica—so the text must be corrected

1 This is the Agenorium at the northern extremity of the island (Arr., ii. 24). Except in this point the topography of Renan (Miss. de Phén., p. 546 sq., and Pl. 1xix.) is here followed.

(Irvxatows)—having ceased to pay tribute, Hiram reduced them in a victorious expedition, after which he founded the feast of the awaking of Hercules in the month Peritius.

The Tyrian annals also mentioned the connexion of Hiram

with Solomon king of Jerusalem. The relations of Phoenj- cians and Israelites had been generally friendly before this ; it appears from Judges v. 17, Gen. xlix. 13, 20, that Asher,

Zebulon, and Dan acknowledged some dependence on Sidon, and had in return a share in its commerce; and the only

passage in the older period of the judges which represents Israelites as subject to Sidonians, and again casting off the yoke, is Judges x. 12, which perhaps refers to the time of

power of the Canaanites of Hazor (Graetz, i. 412). The

two nations drew closer together under the kings. Hiram built David's palace (2 Sam. v. 11), and also gave Solomon cedar and fir-trees, as well as workmen for his palace and temple, receiving in exchange large annual payments of oil and wine, and finally the cession of a Galilean district (Cabul), in return for the gold he had supplied to decorate the interior of the temple. The temple was quite in Phoe- nician style, as appears particularly in the two pillars Jachin and Boaz. Wemay also judge that it was Hiram's temples that led Solomon to propose to himself a similar work.2 One commercial result of the alliance with Solomon was the united expedition from Eziongeber on the Gulf of Akaba to Ophir (Malabar).3 ~The oldest known Phcenician inscription (C.Z.S., No. 5) is of a servant of "Hiram king of the Sidonians," a title which, as we have seen, 18 quite suitable for the king of Tyre. Hiram's grandson Abdas- tarte I. (929-920) was murdered by his foster-brothers, and the eldest took the regal title (920-908), but in the last twelve years of his reign he shared his throne with a scion of the old house, [Abd]Astarte IT. (908-896). His brother Astharym or Abdastharym (896-887) was murdered by a third brother Phelles, who, in turn, after a reign of but eight months, was slain by Ithobal I., priest of Astarte, whose reign (887-855) marks a return to more settled rule. Ithobal

was beloved of the gods, and his intercession put an end to a year of drought which Josephus recognized as that which is familiar to us in the history of Elijah and Ahab. In 1 Kings xvi. 31 Ithobal appears as Ethbaal, king of the Sidonians. At this time the Tyrians still continued to ex- pand mightily. Botrys in Phoenicia and Aoza in Africa are foundations of Ithobal ; the more famous Carthage owed its foundation to the civil discords that followed on the death of King Metten I. (849-820). According to the legend current in later Carthage (Justin, xviii. 4,3 – 6,9), Metten's son Phygmalion (820-773), who began to reign at the age of nine, slew, when he grew up, his uncle Sicharbas, the priest of Hercules and second man in the kingdom, in order to seize his treasures. The wife of Sicharbas was Elissa, Phygmalion's sister, and she fled and founded Carthage. Truth and fable in this legend are not easy to disentangle, but as Elissa is named also in the Tyrian annals she is probably historical.

From the time of Ithobal downwards the further progress of Phoenicia was threatened by a foreign power. The older campaigns of the empires of the Euphrates and Tigris against the Mediterranean coast had left no abiding results —neither that of the Chaldeans in 1535 or 1538 (Eus., Can., No. 481), nor that of Tiglath Pileser I. c. 1120 B.c.4

? The date 11 or 12 Hiram which Josephus gives for the building of the temple (Avdz., viii. 83, 1; Ap. i. 18) must in the Tyrian annals have referred to the cutting of wood in Lebanon for the native temples, which Josephus then misinterpretel by 1 Kings v. 620 sq.

3 So Caldwell, Comp. Gram. of Dravidian Languages, p. 66 ; Burnell, Indian Antiquary, 1872, p. 230. The decisive argument is that the Hebrew word for "peacocks" can only be the Tamil ¢é6kez [see, how- ever, OPHIR].

4 He had the control of the ships of the Aradians ; Ménant, Ann. des rots d' Assyrie, p. 50.

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More serious was the new advance of the Assyrians under Ashurnacirpal (c. 870), when this prince took tribute from the lords of Tyre, Sidon, Byblus,

Mahallat, Maiz, Kaiz, the Westland, and the island Aradus. A king of Aradus was one of the allies of Rammanidri of Damascus whom Shalman-eser IIT. smote at Karkar in 854 ; thereafter the Assyrian took tribute of Tyre in 842 and 839, and in the latter year also from Byblus. Again in 803 Rammanniraru boasted of exacting tribute from Tyre and Sidon, but thereafter there was a respite until Tiglath Pileser IT., the real founder of the Assyrian empire, to whom Tyre paid tribute in r4l, and again along with Byblus in 738. In Tiglath Pileser's Philistine campaign of 734 Byblus and Aradus paid tribute, but a heavy contribution had to be exacted from Metten of Tyre by an Assyrian captain. For the history of Elu- leeus, who reigned in Tyre under the name of Pylas? (ce. 728-692), we have a fragment of Menander. He sub- dued a revolt of the Cittzi in Cyprus, but thereafter was attacked by Shalmaneser IV.,? to whom Sidon, Ace, Palee- tyrus, and many other cities submitted, revolting from Tyre. A new kingdom was thus formed under a king [E]luh, whose name makes it likely that he was a relative of the Tyrian prince, and who presently appears on the monu-ments as lord of Great Sidon (the same name as in Josh, xix. 28), Lesser Sidon (= Paletyrus?), and other cities, But insular Tyre did not yield, and Shalmaneser had to make a second expedition against it, for which the jealous particularism of the other Phcenician cities supplied the ships. With much inferior forces the Tyrians gained a naval victory and the king drew off. But the blockade was continued, and seems to have ended after five years in a capitulation. This siege probably began about the same time with that of Samaria, and may be dated 724-720. About 715 Ionian sea-rovers attacked Tyre and were re- pulsed by Sargon (Schrader, K.A.7., p. 169), an affair in which we may find the historical basis of such legends as that in the Cyclic Cypria, that Sidon was taken by Priam's son Alexander. {[E]luli did not prove a faithful subject; Sennacherib attacked him, and he had to flee to Cyprus, Ithobal being set in his place (701). Among the Pheeni- cian kings who appeared to do homage to Sennacherib a prince of Tyre does not appear. One sees from all this how barbarous and ill-consolidated the Assyrian power in the west was; after the retreat of Sennacherib it was even for a time seriously threatened by the Ethiopian dynasty which then held Egypt; and this may explain the revolt of Abdimilkut, king of Sidon, which was visited by Esar- haddon with the destruction of the city, the captivity of part of the inhabitants, and the execution of the rebel king (680 B.c., Ménant, p. 241 sq.). Further unsuccessful revolts of Tyre (Baal I. being

king, 662 or later) and of Aradus are recorded in the reign of Ashurbanipal; but at last the war of this monarch with his brother seems to have enabled Phcenicia to throw off the yoke without a contest (c. 650).

The Assyrians had proved their inability to create any- thing ; but their talent for destruction was brilliantly ex- hibited in Phoenicia, and the downfall of Tyre was occa- sioned, if not caused, by their intervention in the west. For what Justin (xviii. 3, 6 sq.) relates of the Tyrians, that they were so reduced in number by protracted war with the Persians that, though they were at last victorious, their slaves were able to overpower and slay them to a man, all save Straton, whom a faithful servant saved, and whom the slaves chose, on account of his wisdom, to be king and founder of a new dynasty (Abdastarte IIT.), is only to be understood by reading Assyrians for Per-

1 So Codd. Samb. Big. The name may be Pil-eser.

2 The best MSS.—Paris, 1421, and Oxon.—offer (according to a private communication of Professor Niese) traces pointing to the read- ing éwi rovrov Ledduyas.

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sians.? The catastrophe must have occurred soon after the events already noticed ; and in the same period fallg the decay of the colonial power of Tyre, which we cannot follow in detail, though we can recognize some of its symptoms. After reaching the Mediterranean the Assyrians estab- lished themselves in Cyprus (709); in the Greek islands farther west the Phcenicians had before this time been gradually displaced by the Dorian migration, which, how- ever, must not be taken to be a single movement eastward in the 11th century, but a long course of colonizing ex- peditions, starting from Argos and continued for genera- tions, about which we can only say that the whole was over by the middle of the 8th century. Thasus, the most northern settlement in the Aigean, was already deserted by the Phcenicians when the father of the poet Archilochus led a Parian colony thither in 708. But the loss of the more western colonies seems to have been contemporary with the fall of Tyrian independence. About 701 Isaiah looks for a revolt of Tartessus (xxiii. 10), and the first Greek visitor, the Samian

Coleus (639), found no trace of Phcenician competition remaining there (Herod., iv. 152). These circumstances seem to justify us in under- standing what the contemporary poet Anacreon (fr. 8) says of the hundred and fifty years' reign of Arganthonius over Tartessus as really applying to the duration of the king- dom ; and as he died in 545 the kingdom will date from 695. In Sicily the Phoenicians began to be pushed back from the time of the founding of Gela (690) ; and Himera (648) and Sélinus (628) mark the limits of Greek advance towards the region on the north-west coast, which the Phcenicians continued to hold. In 654 the Carthaginians occupied the island Ebusus, on the sea-way to Spain (Diod., v. 16), a step obviously directed to save what could still be saved. Soon after this, when Psammetichus opened Egypt to foreigners (650), the Greeks, whose mental superiority made them vastly more dangerous rivals than the Assyrians, supplanted the Pheenicians in their lucrative Egyptian trade ; it is noteworthy that Egypt is passed over in silence in Ezekiel's full list of the trading connexions of Tyre.

In the last crisis of the dying power of Assyria the Egyptians for a short time laid their hand on Pheenicia, but atter the battle of Carchemish (605) the Chaldeans took their place. Apries made an attempt to displace the Chaldzans, took Sidon by storm, gained over the other cities, and defeated the king of Tyre, who com- manded the Phcenician and Cyprian fleet (Herod., ii. 161 ; Diod., 1. 68). The party hostile to Chaldea now took the rule all through Phcenicia. The new king of Tyre, Ithobal IT., was on the same side (589), and after the fall of Jerusalem Nebuchadnezzar laid siege to the great merchant-city, which was still rich and strong enough to hold out for thirteen years (587-574).4 Ezekiel says that Nebuchadnezzar and his host had no reward for their heavy service against Tyre, and the presumption is that the city capitulated on favourable terms, for Ithobal's reign ends with the close of the siege, and the royal family is subsequently found in Babylon, obviously as cards that might on occasion be played against the actual princes of Tyre. The king appointed by Nebuchadnezzar was Baal IT. (574-564), on whose death a republic was formed under a single suffet. This form of government lasted a year, and then after three months' interregnum under the high priest Abbar there were for six years

3 There was no Straton, king of Tyre, between 587 and 480; a war between Tyrians and Persians between 480 and 390 is nowhere heard of, and is highly improbable, and Straton, from what we learn of his descendants, cannot have reigned later than this.

4 See the Tyrian sources in Jos., Ap., i. 21, compared with Ezek. Ooi I Gh, sonbe, WY Ce

> See Winer's "Pfingstprogramm" : De Nebuc. exp. Tyr. ad Ez. xxvi.-xxviii. (Leipsic, 1848).

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two suffets—presumably one for the island and one for Old Tyre—after which an elected king, Balatorus, ruled for a year (557-556). The next two kings (556-532) were brought from Babylon. Under the second of these, Hiram III., Phoenicia passed in 538 from the Chaldeans to the Persians ; at the same time Amasis of Egypt occupied Cyprus (Herod., ii. 182). There seems to have been no struggle, the great siege and the subsequent civil disorders had exhausted Tyre completely, and the city now becomes second to Sidon. Accordingly about this time Carthage asserted her independence ; the political activity of Hanno the Great, the real founder of the Carthaginian state, falls in the years 538-5211 Of Hanno it is said that he made his townsmen Africans instead of Tyrians (Dio Chrys., Or., xxv. 7). The old dependence was changed for a mere relation of piety.

Constitution As Carthage was of old a republic, and its constitution underwent many changes, it is not safe to infer from the two Carthaginian suffets that Tyre also stood in the oldest time under two such magistrates. All Canaanite analogy speaks for kingship in the several cities as the oldest form of Phcenician government. The royal houses claimed descent from the gods, and the king could not be chosen outside their members (Curt., iv. 1, 17). The land belonged to the king, who was surrounded by much splendour (Ezek. xxviii. 13), but the highly-devel- oped independent activity of the citizens limited his actual power more than in ordinary Oriental realms ; it was pos- sible for war or peace to be decided at Tyre in the king's absence, and in Sidon against his will (Arrian, ii. 15, 16; Curt., iv. 1, 16). In Tyre the high priest of Hercules was the second man in the state (Just., xviii. 4, 5),

and so the office was by preference given to a kinsman of the king. The sovereign had a council of elders, who in Sidon were in number a hundred ; of these the most distinguished were the ten First whom we find at Marathus and Carthage (Diod., ii. 628; Just., xviii. 6, 1),—originally, it may be supposed, heads of the most noble houses. The third estate was the people; the freemen, however, were much outnumbered by the slaves, as we have seen in Tyre. Under the Persians there was a federal bond between the cities, which we may suppose to be due to that great organizer DariusI. The federation comprised Sidon, Tyre, and Aradus—Sidon being chief—and contributed 300 triremes to the Persian fleet (Herod., vii. 96-99); the contingents of the lesser towns were under the command of the great cities, which probably had the rule in other matters also. This holds for Marathus, Sigon, Mariamme, which belonged to Aradus (Arr., 11. 13), even for Byblus also, which had its own kings in the Persian period, and seems from the number of its coins and inscriptions to have been very flourishing. We know the names of sixteen kings of Sidon, ten of Byblus, eight of Aradus, but none of Berytus in historical times ; presumably it formed with Byblus a single kingdom, and in later times the capital was moved to the latter. Tripolis was a bond of three cities, Sidonian, Tyrian, and Aradian, a stadium distant from one another (Diod., xvi. 41). Here sat the federal council under the kings of the three leading states, who were accompanied to Tripolis by their senators (probably 300 in all). Among the chief concerns of this council were the relations to the Persian Government, which was represented at the meetings.

Under Persian Rule.—Pheenicia, Palestine, and Syria formed the fifth satrapy, paying a tribute of £99,296. The Phoenicians were favoured subjects for the sake of

1 This date is got from Justin, who in xix. 1, 1 says of his Mago the same thing that others say of Hanno ; for the defeat spoken of in xviii. 7, 1 is the battle against the Phoczans in 538, and the war with a Spartan prince in Sicily (xix. 1, 7) is the war with Dorieus (510). Taking into account the eleven years of Hasdrubal's dictator- ship we get Hanno's date as above.

their indispensable fleet; and having also common interests against Greece they were amongst the most loyal subjects of the empire. Sidon, as we have seen, was now the chief city ; its king at the time of the expedition of Xerxes was Tetramnestus. Among his descendants was the youthful Eshmun‘azar, whose inscription on the great sarcophagus in Egyptian style now in the Louvre, taken with other notices, enables us to make out the following fragment of a genealogical table with much probability.2

Eshmun‘azar I. I . Tabnit I. 7 ashtart (priestess of Astarte).

| Eshmum azar IT. Straton I. (Bod’ashtart; C..S., No. 4).

Tabnit II. (Tévyys).

Straton IT.

Reckoning back from Straton IL, and remembering that Eshmun‘azar IT. died as a minor under the regency of his mother, we may place the death of the latter c. 400 B.c.; the gift of Dor and Japho, which he received from the great king, may have been a reward for fidelity in the rebellion of the younger Cyrus. Certainly it was not Eshmun‘azar who led the eighty ships that joined Conon in 396 (Diod., xiv. 79), an event which may have been the beginning of the friendly relations between Sidon and Athens, indicated in a decree of “ proxenia” for Straton I. (C. I. Gr., No. 87). Tyre was then quite weak ; between 391 and 386 it was stormed by Evagoras of Salamis (Isocr., Paneg., 161, and Evag., 23, 62; Diod., xv. 2), who had already made the Greek element dominant over the Phee- nician in Cyprus. Straton was friendly with Evagoras’s son Nicocles; they rivalled one another in debauchery, and both found an unhappy end through their implication in the great revolt of the satraps (Ath., xii. 531). When Tachos entered Phcenicia Straton joined him, and on his failure (361) was about to fall into the hands of the foe when his wife slew him first and then herself (Jerome, ii. 1, 311 Vall.). A new revolt of Sidon against Persia took place under Tennes II. on account of insults offered to the Sidonians at the federal diet at Tripolis. Again they joined the Egyptian Nectanebus IT., carried the rest of Phoenicia with them, and with the aid of Greek mercenaries from Egypt drove the satraps of Syria and Cilicia out of Phee- nicia. Tennes, however, whose interests were not identical with those of the citizens at large,

betrayed his people and opened the city to Artaxerxes III. The Sidonians, to the number of 40,000, are said to have burned themselves and their families within their houses (345 B.c., Diod., xvi. 41-45). Tennes himself was executed after he had served the ends of the great king. The Perzplus ascribed to Scylax (§ 104) describes the respective possessions of Tyre and Sidon in the year before this catastrophe ; Sidon had the coast from Leontopolis to Ornithopolis, an Aradus near the later Sycaminon, and Dor; Tyre had Sarepta and Exope (2) in the district of the later Calamon, farther south a town seemingly called Cirtha, and, strangely enough, the important Ascalon. Tyre now again for a short time took the first place. When, however, Alexander entered Pheeni- cia after Issus and the kings were absent with the fleet, Aradus, Byblus, and Sidon joined him, the last-named showing special zeal against Persia. The Tyrians also offered submission, but refused to allow Alexander to enter the city and sacrifice in the temple of Hercules. Alexander was determined to make an example of the first sign of opposition that did not proceed from Persian officials, and

2 See for details Gutschmid, in Jahrbb. f. Phil. vu. Pédag., 1857, p. 613 sg.

at once began the siege. It lasted seven months, and, though the king, with enormous toil, drove a mole from the mainland to the island, he made little progress till the Persians were mad enough to dismiss the fleet and give him command of the sea through his Cyprian and Pheenician allies. The town was at length forced in July 332; 8000 Tyrians were slain, 30,000 inhabitants sold as slaves, and only a few notables, the king Azemilcus, and the Cartha- ginian festal envoys, who had all taken shelter in the fane of Hercules, were spared (Arr., ii. 13, 15 sg.). Tyre thus lost its political existence, and the foundation of Alexandria presently changed the lines of trade and gave a blow per- haps still more fatal to the Phcenician cities. The Pheeni- cians thenceforth ceased to be a great nation, though under the Greeks Tyre and Sidon were still wealthy towns, the seats of rich merchants.

Sources and Helps. —The only at all continuous records of ancicnt tradition are the account of Pheenician mythology by Philo of Byblus, the extracts of the Tyrian annals by Josephus from Menander of Ephesus, and what Justin

in the 18th book of his abridgment of Pompeius Trogus has taken from Timeus. Every- thing else has to be pieced together in mosaic fashion. The chief help is Movers's unfinished work, Die Phénizicr, i., ii. 1-3 (Bonn, 1841-56), which must be compared with his article " Phoenizien," in Ersch and Gruber (1848). Both works are learned and indis- pensable, but to be used with caution wherever the author's judg- ment on his material is involved, especially in the treatment of the mythology, which is mercly syncretistic, whereas it is essential to aright understanding of this subject to distinguish the peculiari- ties of the several Semitic nations. Selden, De diis Syris (London, 1617), is still a valuable mine. The best recent contributions are those of Baudissin, Studien zur semitischen Religionsgeschichte (Leipsic, 1876, 1878). For the colonial history Bochart's monu- mental Chanaan (Caen, 1646) is not superseded even by Movers, who, as has been wittily observed, has created with the help of etymo- logy Pheenician chambres de réunion ; and, though Olshausen (N. Rhein. Mus. , 1853, p. 321 sq.) does not go quite so far, both he and Miillenhoff (Deutsche Alterthumskunde, i., 1870) follow the steps of Movers much too closcly. A good corrective is given by Meltzer (Gesch. d. Karthager, i., 1879), though he, again, is sometimes too sceptical. Movers is best on the history proper; and the admirable sketch in Grote's History of Grecce should also be consulted. See also Duncker, Gesch. des Alterthums, and Maspero, Hist. anc. de U' Orient. (A. v. G.)

Art.—Of Pheenician buildings few remains now exist on Pheenician soil; the' coast has always been, and still is, densely peopled, and the builders of successive generations, like those of the present day, have regarded ancient edifices as their most convenient quarries. Phcenician architecture had its beginning in the widening and adaptation of caves in the rocks; the independent buildings of later times, constructed of great blocks of unhewn stone, are direct imitations of such cave-dwellings. As Syrian limestone (which is the material employed) does not admit of the chiselling of finer details, the Phoenician monuments are somewhat rough and irregular. Not a vestige remains of the principal sanctuary of this ancient people, the temple of Melkart in Tyre; but Renan dis- covered a few traces of the temple of Adonis near Byblus, and a peculiar mausoleum, Burj al-Bezzak, still remains near Amrit (Marathus). It may also be conjectured that the conduits of Ras al-Ain, south of Tyre, are of ancient date. Various notices

that have come down to us render it probable that the Phcenician temples, in the erection of which great magnificence was undoubtedly displayed, were in Many respects similar to the temple at Jerusalem ; and confirmatory evidence is afforded by the remarkable remains of a sanctuary near Amrit, in which there is a cella in the midst of a large court hewn out of the rock, and other buildings more of an Egyptian style. In the domain of art originality was as little a characteristic of the Pheenicians as of the Hebrews ; they followed foreign and especially Egyptian models. This influence is mainly evident in sculptured remains, in which Egyptian motifs such as the Ureeus frieze and the winged sun-disk not unfrequently

occur. It was in the time of the Persian monarchy that Phoenician art reached its highest development ; and to this period belong the oldest remains, numismatic as well as other, that have come down to us. The whole artistic movement may be divided into two great periods: in the first (from the earliest times to the 4th century B.C.) Egyptian influence is predominant, but the national Pheenician element is strongly marked; while in the second Greek influence has obtained the mastery, and the Pheenician element, though always making itself felt, is much less obtrusive. In the one period works of art, as statues of the gods and even sculptured sarcophagi, were sometimes imported direct from Egypt (such statues of the gods have been found even in the western colonies) ; in the other Greek works were procured mainly from Rhodes. The Pheenicians also adopted from the Egyptians the custom of depositing their dead in sarcophagi. The oldest examples of those anthropoid stone coffins are made after the pattern of Egyptian mummy-cases ; they were painted in divers colours, and at first were cut in low relief ; afterwards, however, towards and during the Greek period, the contours of the body began to be shown in stronger relief on the cover. Modern excavations show that, besides stone coffins (in marble or basalt), which indeed cannot be considered the oldest kind of receptacle, the Phoenicians employed coffins of wood, clay, and lead, to which were often attached metal plates or, at times it may be, decorations in carved wood. Embalming also seems to have been frequently practised as well as covering the body with stucco. Great care was bestowed by the Pheeni-clans on their burial-places, and their cemeteries are the most important

monuments left to us. The tombs are subterranean chambers of the most varied form: the walls and roof are not always straight ; sometimes there are two tiers of tombs one above the other, often several rows one behind the other. While in early times a mere perpendi- cular shaft led to the mouth of these excavations, at a later date regular stairs were constructed. The dead were deposited either on the floor of the chamber (often in a sarcophagus) or, according to the later custom, in niches. The mouths of the tombs were walled up and covered with slabs, and occasionally cippi were set up. The great sepul- chral monuments (popularly called maghdzil, "spindles 4 which have been found above the tombs near Amrit are very peculiar: some are adorned with lions at the base and at the top with pyramidal finials. Besides busts (which belong generally to the Greek period), the smaller objects usually discovered are numerous earthen pitchers and lamps, glass wares, such as tear-bottles, tesserze, and gems. Unrifled tombs are seldom met with.

Literature.—For topography and art, see Renan, Mission de Phénicic (Paris, 1846); for language, Schroder, Dic phénizische Sprache (Halle, 1869), and Stade in Morgenléndische Forschungen

(1875, p. 167); and for inscriptions, Corp. Inscr. Sem. (Paris, 1881, and following years). (A. SO.)

PHQENIX. Herodotus (ii. 73), speaking of the animals in Egypt, mentions a sacred bird called "phoenix," which he had only seen in a picture, but which the Heliopolitans said visited them once in five hundred years on the death of its father. The story was that the phcenix came from Arabia, bearing its father embalmed in a ball of myrrh, and buried him in the temple of the sun. Herodotus did not believe this story, but he tells us that the picture represented a bird with golden and red plumage, and closely resembling an eagle in size and shape. The story of the pheenix is repeated with variations by later writers, and was a favourite one with the Romans. There is only one pheenix at a time, says Pliny (W./, x. 2), who, at the close of his long life, builds himself a nest with twigs of cassia and frankincense, on which he dies ; from his corpse is generated a worm which grows into the young

phoenix. The young bird lays his father on the altar in the city of the sun, or burns him there, as Tacitus has it (Ann., vi. 28). The story of the birth and death of the pheenix has several other forms. According to Horapollo (ii. 57) he casts himself on the ground and receives a wound, from the ichor of which the new pheenix springs ; but the most familiar form of the legend is that in the Physvologus, where the phoenix is described as an Indian bird which subsists on air for 500 years, after which, lading his wings with spices, he flies to Heliopolis, enters the temple there, and is burned to ashes on the altar. Next day the young pheenix is already feathered; on the third day his pinions are full-grown, he salutes the priest and flies away. The period at which the phcenix re- appears is very variously stated, some authors giving as much as 1461 or even 7006 years, but 500 years is the period usually named; and Tacitus tells us that the bird was said to have appeared first under Sesostris, then under Amasis, again under Ptolemy III., and once more in 34 A.D., after an interval so short that the genuineness of the last phoenix was suspected. The phoenix that was shown at Rome in the year of the secular games, a.u.c. 800, was universally admitted to be an imposture.}

The form and variations of these stories characterize them as popular tales rather than official theology ; but they evidently must have had points of attachment in the mystic religion of Egypt, and indeed both Horapollo and Tacitus speak of the phoenix as a symbol of the sun. Now we know from the book of the Dead and other Egyptian texts that a bird called the "bennu" was one of the sacred symbols of the worship of Heliopolis, and Wiedemann (Ztsch. f. Aeg. Sprache, xvi. p. 89 sq.) has made it toler- ably clear that the bennu was a symbol of the rising sun, whence it is represented as "self-generating" and called "the soul of Ra (the sun)," "the heart of the renewed Sun." All the mystic symbolism of the morning sun, especially in connexion with the doctrine of the future life, could thus be transferred to the bennu, and the lan- guage of the hymns in which the Egyptians praised the luminary of dawn as he drew near from Arabia, delighting the gods with his fragrance and rising from the sinking flames of the morning glow, was enough to suggest most of the traits materialized in the classical pictures of the Phoenix. That the bennu is the prototype of the phenix is further confirmed by the fact that the former word in Egyptian means also "palm-tree," just as the latter does in Greek. How far the Egyptian priests

translated the symbolism of the bennu into a legend it would be vain to conjecture ; that the common people did so is only what we should expect ; and it is to be observed that the monu- ments have not yet shown any trace of the element in the classical legend which makes the phcenix a prodigy instead of a symbol—its actual appearance at long intervals. The very various periods named make it probable that the periodical return of the phoenix belongs only to vulgar legend, materializing what the priests knew to be symbolic. The hieroglyphic figure of the bennu is that of a heron

(bennu, or ne bah), and the gorgeous colours and plumed head spoken of by Pliny and others would be least inappropriate to the purple heron (Ardea purpurea),

1 Some other ancient accounts may be here referred to. That ascribed to Hecatzus is, in the judgment of Cobet (Jfnemosyne, 1883), stolen from Herodotus by a late forger. The poem of the Jew Ezechiel quoted by Eusebius (Prep. Ev., ix. 29, 30) appears to refer to the phoenix. Here the sweet song is first mentioned,—a song which, according to the poem on the phenix ascribed to Lactantins, accom- panies the rising sun. The bird is often spoken of in Latin poetry, and is the subject of an idyl by Claudian. See also Solinus, cap. xxxiii., with Salmasius's Exercitationes; Tertullian, De resur. carnis, c. 88; Clemens Rom., Hp. i. ch. xxv.

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with which, or with the allied Ardea cinerea, it has been identified by Lepsius and Peters (Aelteste Texte des Todten- buchs, 1867, p. 51). But it must be remembered that the bennu in the Egyptian texts is really a mere symbol, hav- ing the very vaguest connexion with any real bird, and the golden and purple hues described by Herodotus may be the colours of sunrise rather than the actual hues of the purple heron. How Herodotus came to think that the bird was like an eagle is quite unexplained ; perhaps this is merely a slip of memory.

Many commentators still understand the word bin, chél, in Job xxix. 18 (A.V. "sand"') of the phenix. This interpretation is per- haps as old as the (original) Septuagint, and is current with the later Jews, whose appetite for fable, however, is often greater than their exegetical sagacity. Compare

Eisenmenger's Entdecktes Juden- thum, vol. i. passim. Among the Arabs the story of the phcenix was confused with that of the salamander; and the samand or samandal (Damiri, ii. 36 sq.) is represented sometimes as a quad- ruped, sometimes as a bird. It was firmly believed in, for the incombustible cloths woven of flexible asbestos were popularly thought to be made of its hair or plumage, and were themselves called by the same name (comp. Yakut, i. 529, and Dozy, s.v.). The

'anka (Pers. simurgh), a stupendous bird like the roc (rukh) of

Marco Polo and the Arabian Nights, also borrows some features of the pheenix. According to Kazwini (i. 420) it lives 1700 years, and when a young bird is hatched the parent of opposite sex burns itself alive. In the book of Kalilah and Dimnah the simur or 'ank4 is the king of birds, the Indian garida on whom Vishnu rides.

PHGENIXVILUE, a borough in the United States, in Schuylkill township, Chester county, Pennsylvania, is situated 274 miles north-west of Philadelphia by the Philadelphia and Reading Railroad, on the right bank of the Schuylkill river, which is there joined by French Creek, crossed by eight fine bridges. Phoenixville is best known as the seat of the blast-furnaces and mills of the Phoenix Tron Company, which had its origin in a rolling and slitting mill erected in 1790 by Benjamin Longstreth, and long ranked as the largest in the States. The works cover 150 acres and employ sometimes 2500 men. Pheenixville also contains a pottery, a sash and planing mill, a shirt-factory, and needle works ; and iron, copper, and lead are all mined in the neighbourhood. The vicinity of the borough is noted for its large number of magnificent iron bridges. The population was 2670 in 1850, 4886 in 1860, 5292 in 1870, and 6682 in 1880.

PHONETICS (74 qdwvytixd, the matters pertaining to the voice, @wv7) is the science and art of the production of sounds, including cries, by means of the organs of speech in man and their analogues in other animals.

This very extensive subject may be divided into the following three parts. (1) Anatomical, the accurate descrip- tion of all the organs employed, emissive (lungs, with the muscles acting on them, trachea, larynx, pharynx, mouth and its parts, nose and its passages, with its closing valve the uvula)

and receptive (the ear, external and internal, and parts of the brain with which the auditory nerve com- municates). As all voice-sounds are produced by imita- tion, defects in the receptive organs entail defects in the action of the emissive. The congenitally deaf are conse- quently mute. (2) Physiological, the co-ordinated action of the parts just referred to in hearing and uttering sounds, and especially expiration and inspiration, with laryngeal, oral, and nasal actions, and the relation of these actions to the will (on these see Voicr). (3) Acoustical, with especial reference to the action of double membranous reeds, as in the glottis; the effects of resonance chambers, both fixed and variable in shape and size, open and closed, single and combined, and of the passage of air, more or less in a state of sonorous vibration, through tubes of variable lengths and widths, with walls of variable hardness, and with or without the interposition of semi-viscous fluids, as well as of flapping, smacking, or vibrating parts, and of other obstructions ; also investigations into the nature, pro-

duction, and appreciation of qualities of tone, and their gradual but rapid gliding one into another, as well as into the nature of sympathetic vibration, not only of the differ- ent cavities filled with air in the organs of speech but of the solid bony parts, and also the softer cartilages, sinews, and muscles connecting and supporting them. This part of the subject, which is far from having been fully investi- gated at present, has two main subdivisions—(a) musical, regarding the nature and properties of musical sound, and especially song, with their varieties due to force, pitch, and quality, as partly investigated in Helmholtz's Sensations of Tone ; (6) rhetorical, regarding the mechanism of speaking as distinct from singing, the blending and differentiation of qualities of tone, partly musical and partly unmusical, with constantly variable and ill-defined pitch and force, influenced by feeling; this subdivision embraces speech in particular, its special sounds for conveying thought and feeling, with their constantly-shifting characters, and also eries of joy and pain, as well as, properly speaking, the cries of the lower animals by which they communicate with those of the same kind; hence it comprehends also language, elocution, and philology in their fundamental constitution.

In a more restricted sense, applied solely to human be- ings and to articulate significant sounds (that is, exclusive of cries of pain and pleasure, or the inarticulate and often unconscious noises of snoring, snuffling, gargling, pant- ing, laughing, crying, sobbing, sneezing, and the like), the term "phonetics" is used to designate a work on the enu- meration, evaluation, relations, classification, analysis, and synthesis of SpEEcH-Sounps (q.v.),—that is, of the sounds actually used in speech for conveying and recording thought by different nations and tribes, together with a means of fixing them by visible signs. The alphabet has followed speech-sounds with very halting steps. It is only in quite recent times that sufficient knowledge of the nature of speech has been obtained to enable us in some measure to understand and unravel the mysteries of the old enigmatic forms, and thus to construct a securer basis for philology than the guesses on which it once rested.

In a still more restricted and popular sense the term "phonetics" has been recently used for attempts to construct a new practical alphabet for English or other individual languages, or for several such languages simultaneously, with a view either of superseding the alphabets at present in use, or of improving their employment, or, at any rate, of facilitating the generally very difficult tasks of teaching and learning to read and write. Attempts of this kind are by no means recent: witness Loys Meigret, Traité touchant le commun usage de Vescriture francoise (1545) ; Sir Thomas Smith, De recta et emendata lingux Anglice seriptione (1568) ; J. Hart, An orthographie, conteyning the due order and reason, howe to write or punte thimage of mannes voice, most like to the life or nature (1569) ; [William] Bullokars Booke at large for the Amendment of Orthographie for English speech (1580); Alexander Gill (master of St Paul's school, London, when Milton was there), Logonomia Anglica: qué gentis sermo facilins addis- ctur (1619 and 1621); Charles Butler, The English Grammar, or the Institution of Letters, Syllables, and Words m the English tongue (1633). All these works are more or less printed in the orthography proposed, and each orthography is different. They are described and illus- trated in A. J. Ellis's Karly English Pronunciation, parts 1, and ni. It is, however, not necessary in this place to go beyond attempts made by persons still living. In 1847, after three years of experiments, Isaac Pitman and Alexander John Ellis

brought out their phonotypy, consisting of twenty-three old types and seventeen new ones, with which, among much other matter, the Bible

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and the Phonetic News newspaper were printed in 1849, and extensive experiments were made, showing that read- ing in this alphabet could be rapidly taught, and that when children had learned to read phonotypy well they could easily learn to read in ordinary spelling. The new letters were subsequently much and frequently altered in meaning by Pitman, who in 1884 still produced a Phonetic Journal weekly in his present phonotypy. Very numerous forms of phonotypy, following either the old or the new edition, have also appeared in America. Many other systems have been tried by accenting, italicizing, supernumbering, or diacritically marking the letters to make the ordinary letters of English spelling convey their sounds. Almost every new "pronouncing dictionary" has its own method. This last plan has been, on the whole, successfully applied for teaching to read by many writers. In order to avoid new types, or even accented letters, and yet have a practical phonetic alphabet for English and its dialects, Ellis prefixed to part iii. of his Barly English Pronunciation (1871) an account of "Glossic, a new system of spelling intended to be used concurrently with the existing English orthography, in order to remedy some of its defects without detracting from its value." This has been extensively used by the English Dialect Society and in Ellis's works on Pro- nunciation for Singers (1877) and Speech in Song (1878), in which it is fully explained and used in complete: practical accounts of the phonology of English, German, French, Italian, and Spanish. Henry Sweet, in his Handbook of Phonetics (Oxford, 1878), proposed his " Broad Romic," admitting, however, a few inverted letters. Subsequently, the English Spelling Reform Association was started, and great numbers of new attempts at phonetic alphabets for English only were made, which will be found described and illustrated at full length in W. R. Evans's Spelling Experimenter and Phonetic Investigator (2 vols., September 1880 to April 1883). There is also an American spelling reform association. But neither association has as yet agreed upon a new alphabet. In 1881 the Philological Society of London approved of certain " partial

correc- tions of English spelling" submitted by Sweet, and these are more or less used in the Proceedings of that society, as edited by Sweet, and are generally approved by the American association, but they are not by any means an entirely phonetic scheme. In the books referred to, and particularly Evans's, the whole of this special branch of the subject of phonetics, so far as English is concerned, may be sufficiently examined. AT) PHORMIUM, or New Zeananp Fuax (also called "New Zealand hemp"), is a fibre obtained from the leaves of Phormium tenax (ord. Liliacee). The plant is a native of New Zealand, the Chatham Islands, and Norfolk Island ; it is now cultivated as an ornamental garden-plant in Europe, and for economic purposes it has been introduced into the Azores. The leaves grow from 3 to 6 and even 9 feet in height and from 2 to 3 inches in breadth, spring- ing from the extremity of a rhizome. After the tuft of leaves has continued growing for about three years a flower- ing stalk springs up to the height of about 16 feet, and when it comes to maturity the whole plant dies down. Meantime, however, lateral branches or fans have been given off from the main rhizome, and thus the life of the plant is continued by stem as wellas seed. Phormium has been treated as a cultivated plant in New Zealand, though only to a limited extent, and with no promising results ; for the supplies of the raw material dependence has been principally placed on the abundance of the wild stocks and on sets planted as hedges and boundaries by the Maoris. Among these people the fibre has always been an article of considerable importance, yielding cloaks, mats, cordage,

fishing-lines, &c., its valuable properties having attracted the attention of traders even before colonists settled in the islands. The leaves, for fibre-yielding purposes, come to maturity in about six months, and the habit of the Maoris is to cut them down twice a year, rejecting the outer and leaving the central immature leaves. Phormium is prepared with great care by native methods, only the mature fibres from the under-side of the leaves being taken. These are collected in water, scraped over the edge of a shell to free them from adhering cellular tissue and epidermis, and more than once washed in a running stream, followed by renewed scraping till the desired purity of fibre is attained. This native process is exceedingly wasteful, not more than one- fourth of the leaf-fibre being thereby utilized.

But up till 1860 it was only native-prepared phormium that was known in the market, and it was on the material so carefully, but wastefully, selected that the reputation of the fibre was built up. The troubles with the Maoris at that period led the colonists to engage in the industry, and the sudden demand for all available fibres caused soon afterwards by the Civil War in America greatly stimulated their endea- vours. Machinery was invented for disintegrating the leaves and freeing the fibre, and at the same time experiments were made with the view of obtaining it by water- retting and by means of alkaline solutions and other chemical agencies. But the fibre produced by these rapid and economical means was very inferior in quality to the product of Maori handiwork, mainly because weak and un- developed strands are, by machine preparation, unavoidably intermixed with the perfect fibres, which alone the Maoris select, and so the uniform quality and strength of the material are destroyed. No means have yet been devised for producing by mechanical or chemical means fibre in the perfect condition it shows when selected and prepared by Maoris. Phormium is a cream-coloured fibre with a fine silky gloss, capable of being spun and woven into many of the heavier textures for which flax is used, either alone or in combination with flax. It is, however, principally a cordage fibre, and in tensile strength it is second only to Manila hemp ; but it does not bear well the alternations of wet and dry to which ship-ropes are subject. It is largely used as an adulterant of Manila hemp in rope-making, and recently it has come into use as a suitable material for the bands of self-binding reaping-machines. Between 1864 and 1876 there were exported from New Zealand 26,434 tons of phormium, valued at £592,218; in 1881 the exports were 1307 tons, of the value of £26,285.

PHOSPHORESCENCE, a name given to a variety of phenomena due to different causes, but all consisting in the emission of a pale more or less ill-defined light, not obviously due to combustion. The word was first used by physicists to describe the property possessed by many substances of themselves becoming luminous after ex- posure to light. Such bodies were termed " phosphori," 'and the earliest known appears to have been barium sulphide, which was discovered by Vincenzo Cascariolo, a cobbler of Bologna, at the beginning of the 17th century. See PuospHorus. Subsequently, when certain animals were observed to be similarly endowed, the word " phos- phorescent" was applied to them also. It is clear, how-

ever, that the light derived from previous exposure to light, which thus becomes, as it were, stored up, is hardly comparable with that which is produced by living proto- plasm and evidently under the control of the nervous system. It has been suggested that. this' latter should have a special name appropriated to it, and here it will certainly be convenient to divide the subject into two heads in accordance with this distinction.

A. PHospHORESCENCE IN MinERALS.—In addition to the phosphorescence after insolation already alluded to

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(see Licur, vol. xiv. p. 603) many minerals exhibit this property under other circumstances : (2) on heating to a temperature much below what is known as "red heat" (fluorspar, lepidolite, quinine)—this being often attended with a change in molecular structure or in specific heat ; (0) on friction, as in the case of fused calcium chloride (Homberg's phosphorus) ; (c) on cleavage, a property mani- fested by mica, the two split portions becoming electrified— the one positive, the other negative ; (d) on crystallization, as boracic acid after fusion, or water on rapid freezing.!

A few meteorological phenomena may here be mentioned. Rain has been seen to sparkle on striking the ground, and waterspouts and meteoric dust have presented a luminous appearance. The cynis fatuus, or will-o'-the-wisp, seen in marshy districts, has given rise to much difference of opinion: Kirby and Spence suggest that it may be due to luminous insects; but this explanation will certainly not apply in all cases, and it is perhaps on the whole more reasonable to believe that the phenomenon is caused by the slow combustion of marsh gas (methyl hydride).

B, PHosPHORESCENCE IN Orcanisms.—The vegetable kingdom has furnished few instances of the property under consideration ; the earliest on record took place in the year 1762, when a daughter of Linnzeus saw luminous emana- tions from a species of 7"ropzolum, since which time a like appearance has been noticed in Helianthus annuus, Lilium bulbiferum, Calendula officinalis, Tagetes patula, and T. erecta, all of which are red or orange-coloured flowers. A few cryptogams have been seen to shine-in the dark, €.g., Schistostega osmundacea among the liverworts ; Rhizo- morpha

subterranea, Fungus igneus in Amboyna, and other fungi in Brazil and Italy ; and the mycelium (thread-like fibres) of other species growing in decayed wood is also occasionally luminous. There are also a number of small marine phosphorescent organisms? (Pyrocystis, Peridinium), concerning which it is impossible to say with certainty whether they should be referred to the animal or the vege- table kingdom. But the most brilliant as well as the most varied and interesting cases of phosphorescence belong to the animal world, and there is not one of the larger groups which does not furnish some instances of it.

Nature of the Light.—The light emitted by different animals varies very much in colour: green has been noticed in the glow-worm, fire-flies, some brittle-stars, centipedes, and annelids ; blue is seen in the Italian fire- fly (Luciola italica) ; and this and light green are the pre- dominant colours exhibited by marine animals, although the beautiful Girdle of Venus and some species of Salpa and Cleodora appear red, and Pavonaria and other gorgonoids

lilac. The curious lantern-fly (Pulgora pyrorhynchus) has a purple light. One very remarkable instance is mentioned

of an Appendicularia in which the same individual appeared first red, then blue, and finally green.? In comparatively few cases has the light been examined by the spectroscope. Panceri states that in every instance observed by him it was monochromatic, the spectrum consisting of a continu- ous band without any separate bright lines; in Pholas this band extended from the line E of the solar spectrum to a little beyond F; in Umbellula, examined on the voyage of the " Challenger," it was sharply included between the lines 6 and D.5*

Luminous Organs.—In the lowest forms of life and in

1 Phipson, Phosphorescence, London, 1862.

2 Ehrenberg, Das Leuchten des Meeres, 1835, and in Abhandl. k. Akad. Wiss., Berlin (1834), 1836.

3 Giglioli, “La Fosforescenza del Mare,” in Bollet. d. Soc. Geog.- Geol. Ital., 1870.

4 Numerous papers in Atti Accad. Sci. Fis. e Mat., Naples, 1870- 78, and abstr., Ann. Sci. Nat., ser. 5, vol. xvi., 1872.

® Thomson, Voyage of the Challenger: the Atlantic, London, 1877, WO th Jo, LED,

many jelly-fish there seem to be no organs specially set apart for the production of light, this being emitted from the whole surface of the body; but even in the latter group a degree of specialization is found, for in some it is only the marginal sense-organs, in others the radial canals and ovaries, that are luminous. In other groups of animals the localization of the photogenic property in certain organs or tissues is universal, and these present the utmost variety in structure and situation. In the sea-pens (Pennatula) every polyp has eight luminous bands on the outer surface of the stomach ; when the colony is touched the light com- mences at the point irritated and then spreads to other portions. Pyrosoma, a colonial free-swimming ascidian, has two small patches of cells at the base of each inhalent tube; the cells have no nucleus, but contain a material which appears from its chemical relations to be fatty ; as in Pennatula, the light spreads from the irritated point. In the transparent pelagic molluse (Phyllirrhoe) there are rounded cells connected with the nerve-twigs from which, as also from the ordinary cells of the nerve-ganglia, the light emanates. Several annelids (Chetopterus, Tomopteris) have luminous organs at the bases of lateral processes of the body. The rock-boring mollusc (Pholas), whose phos- phorescent properties were known as long ago as the time of Pliny, has three distinct luminous organs—(1) a curved band along the anterior border of the mantle, (2) two small triangular patches at the entrance of the anterior siphon, and (3) two long parallel cords situated within this latter ; these are all covered with ciliated epithelium, like that of other parts of the mantle, but having granular contents.1 The glow-worm (Lampyris splendidula) has been investi- gated by Max Schultze ;? he finds that the male has a pair of organs in each of the two segments preceding the last in the abdomen ; each organ consists of a

pale transparent superficial layer, which gives off the light, and a deep opaque layer, whose function is less obvious, but which may serve as a reflector. Quite recently Emery‘ has examined the Italian fire-fly, in which both male and female are luminous.*

of a very brilliant display of this phosphorescence during the “ Triton” expedition in the Faroe Channel.

Many deep-sea fish possess round shining bodies im- bedded in the skin, either in the vicinity of the eye or along the sides of the body ; some of these resemble modi- fied eyes, whilst the structure of others recalls a glandular organ without the usual duct,® and it is supposed that some or all of these are luminous organs, the lens in the former group acting as a bull’s eye (see IcHTHYOLOoGY, vol. xii. p. 684).

Dead and putrescent animals are not unfrequently phos- phorescent ; this fact has most commonly been observed in fish, though instances are not wanting in which the pro- perty has been manifested by molluscs and other animals, and even by the human body. Furthermore, a few startling but apparently well-authenticated instances are on record in which human beings have been luminous while yet alive owing to certain states of disease.”

Causes of Phosphorcscence.—On this head it is at present impos- sible to write with certainty ; it seems likely, however, from the variety of the effects produced by different chemical and physical agents, that the causes are manifold. In many instances light is only emitted after stimulation, either mechanically, chemically (by fresh water, milk, ammonia), or by electricity, though there are cases in which this last has no effect whatever. The fact that the nervous systein is so often closely connected with the luminous organs indicates that the exhibition of the light is either dependent on the volition of the animal or is the reflex result of the stimula- tion of sensory nerves (Panceri). In the glow-worm the distribu- tion of trachez (air-tubes) throughout the photogenic apparatus, and the fact that carbonic acid extinguishes the light while oxygen in- tensifies it, suggest that it is due to some form of slow combustion, while the fatty contents of the luminous cells

of this and many other animals point to the probability that a fat containing free phosphorus is the active agent in the process. Since a large num- ber of luminous organs retain their power after the death of the animal, and even after desiccation and subsequent moistening, there seems no necessity to adopt the theory that we have to deal with an instance of the direct transformation of vital into radiant energy.

The well-known phosphorescence of the sea is due to the animals which inhabit it, except in a few cases in which it has been ascribed to putrescent matter. This was known as long ago as 1749, when Vianelli® discovered in the waters of the Adriatic a luminous animal- cule which was named by him Nerevs noctiluca, and was probably the creature now known as Noctiluca miliaris. This minute animal swarms in countless myriads on the surface of the sea not very far from land, and is the commonest cause of its diffuse luminosity, although other low forms of life such as Peridiniwm (Ceratium) contribute in no small degree ; and in mid-ocean another organism, Pyrocystis, which has often been mistaken for Noctiluca, appears to replace it, and is very abundant. The brilliant sparkling phos- phorescence morc rarely seen is caused by the presence of copepods and other small surface crustaceans.

Uses of Phosphorescence.—The service rendered by this property to its possessors is in many cascs by no means obvious ; indeed it would seem certain that to crustacean larve and other surface- organisms surrounded by voracious enemies phosphorescence must be a "perilous gift." It is possessed by so many anthozoa and jelly-fish, which have also stinging organs, that fish have perhaps learned to shun instinctively all phosphorescent animals; fishermen state that fishes avoid nets in which phosphorescent AMfcduse# have become entangled ; if such be the case, it would be possible for animals otherwise defenceless to obtain protection by acquiring this property. A similar hypothesis has been propounded with respect to the Italian fire-fly,?° although, as regards the glow-worm, it has been generally believed that the light serves to attract the opposite sex, and the same has been stated with respect to the earth-worm. The fact that so many deep-sea animals are phosphor- escent, coupled with the discovery that many fish from those regions have large and normally-developed eyes whilst others have organs which appear to be adapted for the production of

light, has led to the belief that this source of light becomes of great importance in the depths of the ocean where no sunlight penetrates,—an hypothesis which is known as the "abyssal theory of light." | (W. E. HO.)

1 Panceri, op. cit.

2 "Zur Kenntn. d. Leuchtorgane v. Lampyris splendidula," in Archiv f. mikr. Anat., vol. i., 1865.

3 Heinemann, "Unters. ii. d. Leuchtorgane d. b. Vera Cruz vor- komm. Leuchtkafer," in Archiv J. mikr. Anat., vol. viii., 1872.

- *Zeitschr. f. wiss. Zool., vol. xl., 1884.*

5 Narrative of the " Challenger" Expedition, vol. i. 1885.

F Ussoff, Bull. Soc. Imp. Nat. Moscow, vol. liv. part i. p. 79,

1879.

? Phipson, op. cit.

8 Nuove Scoperte intorno alle Luci notturne dell' Acqua marina, Venice, 1749.

® Verrill, in Nature, vol. xxx. p. 281, 1884.

0 Zeitschr. f. wiss. Zool., xl., 1884.

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PHOSPHORUS anp PHOSPHATES. "Phosphorus " (pwspdpos, light-bringer) had currency in chemistry as a generic term for all substances which shine in the dark without burning, until the name came to be monopolized by a peculiar kind of ' phosphorus" which was discovered, some time previous to 1678, by the German alchemist Brand of Hamburg. Brand, hoping to obtain thereby an essence for the "ennobling" of silver into gold, sub- jected urine-solids to dry distillation. In lieu of the hoped-for essence he obtained as part of the distillate a wax-like, easily fusible solid

which, besides being phos- phorescent, readily caught fire, to burn with a dazzling light into a white solid acid. The new phosphorus natur- ally excited universal interest ; but it was, and remained, only a rather costly chemical curiosity until Scheele, in 1771, starting from the discovery of Gahn that bone-ash is the lime-salt of a peculiar non-volatile acid, proved that this acid is identical with the one formed in the com- bustion of phosphorus, and that the latter, being only "phlogisticated" bone-ash acid, can be obtained from it by distillation with charcoal at a high temperature. This method of Scheele's is used to the present day for the manufacture of phosphorus, and even the theoretical notion on which it rests is recognized as correct as far as it goes, anhydrous bone-ash acid being a compound of phosphorus with oxygen the formation of which involves the liberation of part of the energy (" phlogiston ") of each in the kinetic form of heat. That phosphorus is an elementary sub- stance was originally a surmise, which, however, has been confirmed by all subsequent experiences. In compara- tively recent times it was found that Brand's phosphorus is susceptible of passing (by mere loss of energy) into two allotropic modifications, known as "red" and " metallic" phosphorus respectively, so that the name " phosphorus" has again come to assume a generic meaning, being used for these three substances and the element as such conjointly.

Manufacture.—¥or the manufacture of ordinary phos- phorus any kind of phosphate of lime might be used, and in fact mineral phosphates are used occasionally, though as a rule the bones of domestic animals are employed as a raw material. Such bones (apart from a large percent- age of water and a small admixture of fats and other subsidiary organic components) consist essentially of two things, namely, (1) osseme—a nitrogenous organic com- pound, insoluble in water, but convertible by long treat- ment with hot water into a solution of '" glue"—and (2) an infusible and incombustible part,—the two being united together (perhaps chemically) into a cellular tissue. The following analysis of the humerus of an ox gives an idea of the constitution of the second part and its ratio to the whole.

Phesphate of lime, P,O;8C20…:.....0.20.: 61°4

Phosphate of magnesia, P,0,3Mg0O …..... 17

(Gar Morar OnOlplIMG ss, cote. tee cue e oqeteestaaeees SiG efile

(OSS 3B cosSpteeSonce ene a encR ne aera ncmeren Maeerrcnec one 28°3 100°0

The percentages, however, in bones generally are sub- ject to great variation. When bones are heated to red- ness in the absence of air the organic part is destroyed, and there remains ultimately a cellular tissue of bone- phosphate impregnated, so to speak, with finely-divided charcoal. This black residue, known as " bone-black," is used largely for the decoloration of sugar-syrup, and, after having been exhausted in this direction, forms a cheap niaterial for the manufacture of bone-ash and con- sequently of phosphorus ; but, as a rule, the phosphorus- manufacturer makes his bone-ash direct from bones, by burning them in a furnace (constructed and wrought pretty much like a limekiln) between alternate layers of coal.

The burned bones (which retain their original shape)

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are ground up into granules of about the size of lentils, and these are then placed in a wooden tank coated inside with lead, to be decomposed by means of about their own weight of chamber-acid, 7.¢., sulphuric acid containing about 60 per cent. of real H,SO,. To accelerate the action the bone-meal is mixed with boiling water previous to the addition of acid, and steam may be passed into the magma when its temperature threatens to fall too low. The acid readily decomposes the carbonate of the bone- ash, and then acts, more slowly, on the phosphate, the process being completed in about twenty-four hours; and the result, in regard to the latter, is that about two-thirds of the phosphate are decomposed into sulphate of lime (gypsum), which separates out as a precipitate, and phos- phoric acid, which unites with the residual one-third of the phosphate and the water into a solution of superphos- phate of lime—

2H,0

P30; CaO =F xAq.

To eliminate the gypsum the mass is diluted with water, allowed to settle, and the solution drawn off with lead syphons, then the residue is washed by decantation, and ultimately filtered off through a bed of straw contained in a cask with a perforated bottom. The spent heat of the distillation-furnace is utilized to concentrate the united liquors to about 1°45 specific gravity, when a remnant of gypsum separates out, which must be removed. The clari- fied liquor is then mixed with about one-tenth of its weight of granulated charcoal, and the whole evaporated in an iron basin until the mass is sufficiently dry to be passed through a copper sieve and granulated. The granules are heated cautiously over a fire, to be dehydrated as far as possible without loss of phosphorus (as phosphuretted hydrogen) ; and the dry mass is then transferred to fire- clay retorts—either pear-shaped with bent-down necks, or cylinders, about 18 inches long and 4 inches in diameter, with straight necks—arranged within a powerful furnace. The condensers are made of earthenware, and must be so arranged that loss of phosphorus by combustion is avoided as far as possible; its condensation takes care of itself. One construction is to give the condenser the form of a bell-jar resting in a saucer containing water ; lateral orifices in the bell serve to couple every two bells into one, to unite each with its retort-neck, and to send the vapour (of phosphuretted hydrogen, carbonic oxide, and other poisonous gases) into a chimney, where they take fire spontaneously, and the products are carried away by the draught. While the condensers are being adjusted the fire is kindled and raised very slowly, but ultimately forced up to the highest temperature which the retorts can stand, and maintained at this pitch until the appearance of the flames of the escaping vapours proves the absence from them of phosphorus, free or combined. This takes from thirty-six to forty-eight hours. The reduction- process, though in reality very complex, is in its principal features easily understood. Theacid-phosphate behaves as if it were a mere mixture of 2x P,O,+4 x P,0,3CaO (bone-phos- phate). The quasi-free acid (2P,0;) is reduced by the charcoal with formation of carbonic oxide and phosphorus- vapour, one-third of the phosphorus remaining in its original form of bone-phosphate.

The distillation of phosphorus is rather a dangerous operation, because the connecting pipes at the condensers are apt to get blocked up with frozen phosphorus, and consequently must be cleared from lime by copper or iron wires being pushed through them (at a certain risk to the operator). Another

difficulty is that, although a retort may be quite whole in the ordinary sense, it may, and asa rule does, admit of the perspiration of phosphorus-vapour. To render retorts as nearly as possible impermeable to the

vapour they are being provided with two or three coats of some kind of cement, such as a mixture of slaked lime and borax, or a magma of clay, horse-dung, and water. In the collecting and further manipulation of the phosphorus the dangerous inflammability of the substance demands that all operations be conducted under water.

As soon as the retorts have cooled down sufficiently the condensers are detached and their tubuli bunged up to prevent access of air to the inside. The necks of the retorts are knocked off and thrown into water to save the phosphorus which has condensed within them and to unite it with that of the condensers. From the analysis of the ox-bone quoted we calculate that its ash contains 17°6 per cent. of phosphorus, of which two-thirds (= 11°7 per cent.) should be recoverable as free phosphorus ; according to Fleck, the yield of phosphorus is 8 per cent., while Payen puts it down at 8 to 10 per cent. But this crude phos- phorus is largely contaminated with blown-over bone-ash and charcoal and with "red" phosphorus. Its purifica- tion used to be effected everywhere by melting it under water of about 60° C., and pressing it through chamois leather by means of a force-pump. In certain French works porous fireclay serves as a filtering medium, while superheated steam supplies at the same time the necessary heat and pressure. By the addition of coarsely-powdered charcoal to the phosphorus the clogging-up of the pores of the fireclay septum is precluded. A more effectual method of purification is to re-distil the crude (or perhaps the previously filtered) phosphorus from out of cast-iron retorts, the necks of which dip half an inch deep into water contained in a bucket. A chemical method of purification is that of Bottcher, who fuses the crude phos- phorus (100 parts) under water, with addition of 3°5 parts of oil of vitriol and 3°5 parts of bichromate of potash. The phosphorus passes, with a feeble gas-evolution, into an almost colourless liquid, with a loss of only 4 per cent. of its weight, as against the 10 to 15 per cent. unavoid- ably involved in the distillation process. To bring the purified phosphorus into the traditional

form of sticks it is fused under water and sucked up into slightly conical glass tubes about two-fifths of an inch wide and a foot long; the tubes are closed below with the finger and immersed in cold water to cause the contents to freeze. The solid stick is then pushed out by means of a rod, and cut into pieces with a pair of scissors. For emission into commerce the sticks are put into cylindrical wide-necked glass bottles, or into tin canisters, full of water, which latter had better be mixed with a sufficiency of alcohol or glycerin to prevent freezing (and bursting) in winter time.

Seubert, about 1844, invented an ingenious apparatus for the continuous casting of phosphorus-sticks, consisting of a funnel-shaped vessel of copper, terminating below in a long horizontal copper tube, the outer end of which lies within a tank full of cold water. The phosphorus is placed in the funnel, covered with water, and the whole up to the cold-water tank raised (by means of a water-bath and steam-pipes) to a suitable temperature, matters being ar- ranged so that the phosphorus freezes just on arriving at the exit end of the tube. The workman then catches the protruding button of phosphorus and pulls out an endless stick, which is cut up into pieces of the desired length. This ingenious apparatus, however, has not been found to work satisfactorily, and has been given up again in favour of some form of the old method. The loss of one-third of the phosphorus contained in the bone-ash, which is unavoid- ably involved in the ordinary method of phosphorus- making, can be avoided, according to Wéhler, by adding finely-powdered quartz to the mixture which goes into the retorts. The superphosphate is then completely decom- posed with formation of a residue of silicate, instead of

phosphate, of lime. An improvement by Fleck aims at the utilization of the organic part of the bones. He pro- poses to recover the fat from the bones by boiling them with water and then the gelatin by digesting them in

hydrochloric acid of 1:05 specific gravity. The gelatin

remains in a coherent form; the phosphate passes into solution as mono-calcic salt, which is recovered by evapora- tion in crystals and then reduced by distillation with charcoal. None of these (and other) proposals have been

much heeded ; the manufacture of phosphorus at present, in fact, is almost a monopoly, the bulk of what occurs in commerce being produced by two firms, viz., Albright and Wilson of Oldbury, near Birmingham, and Coignet and Son in Lyons. According to E. Kopp, the production. in 1874 amounted to 1200 tons.

Recently purified phosphorus is a slightly yellowish or colourless solid of about the consistence of beeswax. At low temperatures it is brittle ; specific gravity = 1°83 at 10°C. It fuses at 44°°3 C. into a strongly light-refracting liquid of 1-743 (Kopp) specific gravity. Neither in the solid nor in the liquid state does it conduct electricity. When heated further (in an inert atmosphere such as hydrogen or carbonic-acid gas) it boils at 290° C., and assumes the form of a colourless vapour which at 1040° C. is 4°5 times as heavy as air or 65:1 times as heavy as hydrogen, whence it follows that its molecular weight is 2 × 65°1 = 130°2 = very nearly four times the atomic weight of phosphorus (31:0). Phosphorus is insoluble in water, more or less sparingly soluble in alcohol, ether, fatty oils, and oil of turpentine, and very abundantly soluble in bisul- phide of carbon. When exposed to the air, and especially to moist air, it suffers gradual oxidation into phosphorous and phosphoric acids with evolution of a feeble light. Phos- phorus does not phosphoresce in the absence of oxygen. Singularly, it does not phosphoresce in pure oxygen either, unless the tension of the gas be reduced to some point considerably below one atmosphere (Graham). Phosphorus is a most dangerous poison; doses of as little as 0°1 gramme (=1°5 grains) are known to have been fatal to adults. The heads of a few lucifer matches may suffice to kill a child. Phosphorus is used chiefly for the manu- facture of lucifer matches (see MatcHEs, vol. xv. pp. 625, 626) and also in the manufacture of iodide of methyl and other organic preparations used as auxiliary agents in the tar-colour industry. Phosphorus-paste, made by working up a small proportion of phosphorus melted under water in a hot mortar with flour, is used as poison for vermin.

Red Phosphorus.—A red infusible solid which is always produced when ordinary phosphorus is made to burn in an insufficient supply of air, and also by the long-continued action of sunlight on phosphorus-sticks kept under water, used to be taken for a lower oxide of the element, until A. v. Schrotter of Vienna showed, in 1845, that it is nothing but an allotropic

modification of the elementary substance. A given mass of ordinary phosphorus can be converted alinost completely into the red modification by keeping it at 240° to 250° C. in the absence of air for a sufficient time. The addition of a trace of iodine to phosphorus at 200° C. brings about the conversion suddenly with large evolution of heat (Brodie). Red phosphorus is now an article of chemical manufacture. The phos- phorus is simply heated, and kept at the requisite temperature, within a large iron pot which communicates with the atmosphere by only a narrow pipe. At a very slight expense of the material the air within the apparatus is quickly deoxygenated and con- verted into (inert) nitrogen. The requisite steady temperature is maintained by means of a bath of molten solder. By the mere effect of the heat the phosphorus becomes more and more viscid and darker and darker in colour, and is at last completely con- verted into a dark-red opaque infusible solid. This, however, always includes a small proportion of the ordinary modification, which is most readily extracted by powdering the crude product and exhausting it with bisulphide of carbon, which does not affect the red kind. A less expensive method is to boil the powdered raw product with successive quantities of caustic-soda ley, when the ordinary phosphorus only is dissolved as hypophosphite with evolution of phosphuretted hydrogen. The residue is washed and

dried and then sent out in bottles or canisters like any ordinary chemical preparation. It is not at all affected by even moist air, nor by aerated water, hence it is neither phosphorescent nor poisonous. When heated in air to about 260° C. it begins to pass into the ordinary modification and consequently burns, readily enough, into the same phosphoric acid P.O, as ordinary phosphorus does. But its combustion-heat amounts to only 5070 Centigrade- units per unit-weight of fuel as against the 5953 units produced in the combustion of ordinary phosphorus. The balance of 883 units is the equivalent of the surplus of energy contained in the yellow as compared with the red modification. This accounts for the relative chemical inertness of the latter. The specific gravity of red phosphorus is 2-089 to 2-106 at 17°C. ; its electric conduct- ive power is about -000,000,1 of that of silver wire (Matthiesen). It is used in making safety-matches.

Metallic Phosphorus.—This, discovered by Hittorf, is obtained by heating ordinary phosphorus with lead in sealed-up tubes to redness for forty hours. After removal of the lead by nitric acid metallic phosphorus remains, partly in the shape of dark re- splendent plates, partly in the form of microscopic rhombohedra. It requires a temperature of 358° to be converted into ordinary phosphorus-vapour. The specific gravity is 2°24 at 15° C.

Detection of Phosphorus.—The detection of (ord.) phosphorus in medico-legal cases offers no difficulty as long as the phosphorus has not disappeared by oxidation. In the case of a mass of food or the contents of a stomach the first step is to spread out the inass on a plate and view it in the dark. A very small admixture of phosphorus becomes visible by its phosphorescence. Failing this, the mass is distilled with water from out of a glass flask connected with a glass Liebig's condenser in a dark room. The minutest trace of phosphorus suffices to impart phosphorescence to the vapours at some stage of the distillation. Should this second test fail we must search for phosphorous acid, which may be there as a product of the oxidation of phosphorus originally present as such. To test for phosphoric acid would be of no use, as salts of this acid are present in all animal and vegetable juices and tissues. Phosphorous acid, if present, can be detected by treating the mass, in a properly constructed gas-evolution appa- ratus, with pure hydrochloric acid and zinc. The hydrogen gas evolved must be purified by passing it over pieces of solid caustic potash, and inade to stream out of a narrow platinum nozzle. If the reagents are pure and phosphorous acid is absent the gas burns with a colourless flame, which remains so even when depressed by means of a porcelain plate; in the presence of phos- phorous acid the gas contains phosphuretted hydrogen, which causes the flame of the gas to exhibit a green core, at least when depressed by means of a porcelain plate. The test is very delicate, but in interpreting a positive result it must be remembered that it applies likewise to hypophosphorous acid, and that certain salts of this acid are recognized medicinal agents.

*Of all phosphorus compounds ortho-phosphates are the com- monest, and they can be detected by the tests given below under '*Phosphates." All other phosphorus compounds, when fused with carbonate of alkali and nitre, or heated in sealed-up tubes with strong nitric acid to a sufficient*

temperature, are changed so that the phosphorus assumes the form of ortho-phosphoric acid, which is easily detected. Either of the two operations named (by the mere action of the alkali or of the acid qua acid) converts what may be present of meta-phosphoric or pyro-phosphoric into ortho-phosphoric acid.

LPhosphor-Bronze.—This name has been given to a class of useful metallic substances produced by the chemical union of either pure copper or of copper alloys with phosphorus. Most commercial copper is contaminated with a small proportion of its own sub- oxide, which, in the casc of an otherwise pure metal, detracts from its tenacity and plasticity ; and all ordinary bronze is subject to a similar contamination, because, whatever kind of copper may have been used in making it, the tin is sure to suffer partial oxidation, and some of this oxide, as Montefiori- Levi and Kiinzel found, remains diffused throughout the casting, and diminishes its homo-geneity and solidity. Experience shows that both in the case of copper and bronze the oxygen prescnt as metallic oxide can be re- moved by introduction into the fused metal of a judiciously limited proportion of phosphorus, which takes out the oxygen (and itself) into the slag as phosphate, and thus produces a purcly metallic and consequently superior metal. A small excess of phosphorus in either case effects further improvement. A phosphor-copper con- taining 0°1 to 0°5 per cent. of the non-metallic element has all the plasticity of the pure metal coupled with higher degrees of hard-

ness and solidity. An alloy of from 0°5 to 2°0 per cent. gives good .

castings, because, unlike the pure metal, it does not form blisters on solidifying. In the case of phosphorized bronze the presence of somewhat more than 0°5 per cent. of phosphorus (in the finished alloy) produces a warmer tone of colour (more gold-like than that of the plain alloy), a finer grain (similar to that of steel), a higher degree of elasticity, and a higher breaking-strain. The latter may be more than double that of the corresponding plain bronze. By

increasing or diminishing the proportion of phosphorus the mechan- ical properties of a phosphor-bronze can be modified at will, within wide limits. it lends itself particularly well for the casting of artistic or orna- inental articles. is best effected by fusing it with the proper proportion of a rich phosphor-copper.

of phosphorus can phosphorus ("phosphorus mass") is made by mixing superphos- phate of lime with 20 per cent. of charcoal, and dehydrating the Inixture at a dull red heat. mixed with 975 of copper-turnings and 75 of charcoal, and kept at copper-fusion heat for sixteen hours within a graphite crucible. The phosphor-copper is obtained in the form of detached granules, which are picked out, re-fused, and cast out into cast-iron moulds, Phosphor-bronze has only come to be popularly known during the last decade or two; mingham took out a patent for phosphoriferous metallic alloys.

By its fine colour and its perfect fluidity when molten The introduction of phosphorus into the metal

A phosphor-copper containing about 9 per cent. be produced as follows. A kind of potential

Six hundred parts of this mass are

but as early as 1848 A. & H. Parkes of Bir-

Phosphuretted Hydrogens. —Of these threc are known, namely, (1)

phosphine,-a gas of the composition and specific gravity PH,, (2) a volatile liquid of the composition and vapour-density P,H,, and (3) a yellow solid of the liquid compound (No. 2) at once takes fire when it comes into contact with air, and a small admixture of its vapour to any inflam- mable gas, such as coal-gas, renders the latter self-inflammable. The most important and best known of the three hydrides is phosphine, PH. acid is heated—thus, 4PH,0,=3PH,0,+PH;; also when phos- phorus is being dissolved in hot solutions of caustic potash, soda, or baryta,

probable composition P,H,. The

This gas is formed when (syrupy) phosphorous

4P +3(KHO + H,0)=3PH,KO, +PH,; Hypophos- phite.

also by the action of water on the phosphides of highly basilous metals. The gas evolved by any of these processes is impure ; that obtained by the second or third invariably includes vapour of ile and consequently is self-inflammable. obtained only by decomposing solid iodide of phosphonium with

Pure phosphine can be

concentrated caustic potash-ley in a suitable gas-cvolution bottle

previously filled with hydrogen to avoid explosions. It is a colour- less gas, smelling intensely like putrid fish, and very poisonous. It is slightly soluble in water, and takes fire in air only beyond 100° C.

It may be mixed with pure oxygen without change ; but when the mixture is suddenly expanded it explodes violently. Notwith- standing its analogy to ammonia (NH;), phosphine is only very feebly basic. It unites with gaseous hydriodic or hydrobromic acid into solid phosphonium salts PH,(I or Br); but these are both decomposed by water into the respective acids and phosphine. Pure phosphine is little known ; chemists are more familiar with the (impure) gas which is evolved when "phosphide of calcium" is thrown into water, and which, containing vapour of P,H,, at once catches fire when it bubbles out of the water into the air, with formation of steam and a smoke of meta-phosphoric acid, which latter, in a still atmosphere, assumes the form of an exquisite vortcx-ring. During the last decade or so this reaction has come to be pretty extensively utilized in navigation for producing a light on the surface of the sea at night, in case of accidents, and for other purposes. A British patent for this useful application of phosphide of calcium was granted (as No. 1828) to the agent of Silas and Pegot Ogier of Paris on the 8th of August 1859, but allowed to lapse in 1863, to be subsequently wrought by others. The manufacture of the phosphide is now (1884) being chiefly carried on by one firm (in Warrington, England), and through the courtesy of their chemist, Mr W. G. Johnston, the writer is enabled to give the following details. The preparation of the phosphide is

effected within a crucible standing on a support within a furnace, and divided by a perforated false bottom into two compartments. The lower is charged with pieces of phos- phorus, the upper, up to the closcly-fitting lid, with fragments of quicklime. The firing is conducted so that the lime is red hot before the phosphorus, through the radiation and conduction of the heat applied above, begins to volatilize. A charge yielding 20 Tb of product is finished in from five to eight hours. The reaction is very complex, but it is easy to see through its general course ; part of the phosphorus deoxidizes lime with formation of P,O;, which unites with other lime into phosphate, and of calcium, which combines with other phosphorus into phosphides. Of the latter, PCa seems to predominate, and consequently the product, when thrown into water, should yield chiefly the hydride P,H,; but this latter very readily breaks up into phosphine and solid hydride P,H. The crude phosphide forms a brown stone- like mass, which must at once be secured in air-tight receptacles. But most of it is immediately worked up into "lights" of various kinds, of which the "life-buoy light" may be selected as an example. It consists of a cylindrical tinned-iron box, the upper half of which is taken up by an inverted hollow box, which serves as a float when the light is in the water. The lower half contains

me 16 oz. of fragments of phosphide of calcium. T Rails portions of Me top and bottom respectively consist of soft metal (lead). These are pierced with an appended pricker before the apparatus goes overboard along with the buoy, to which it is attached by means of a cord. The water penetrates through the lower hole and the gas comes out through the upper and burns with a brilliant flame, which is from 9 to 18 inches high and lasts for about half an hour. A larger similar contrivance, intended to be accommodated within a bucket full of water on deck, serves as an inextinguishable night-signal to ships in distress. By the British Merchant Shipping Act, 1876, Vict. 21, every sea- going passenger-steamer and every emigrant-ship must be provided with arrangements for inextinguishable distress- lights and life-buoy lights. In the British navy a peculiar form of the phosphide of caicium light is used in connexion with torpedo-practice. :

Phosphorus Bases.—This is a generic name for organic bases which are related to phosphine (PH,), as the "compound ammonias"' are to NH,. Sce CHEMISTRY, vol. V. Pp. 516 sg.; also METHYL, vol. xvi. p. 197. Tri-ethyl phosphine P(C,H,)3, a colourless sclf-inflammable liquid, readily unites with bisulphide of carbon into a red crystal- line compound, and consequently is available as a dclicate reagent for the detection of the vapour of this compound in coal-gas.

PHOSPHATES.

" Phosphates," in chemistry, is a generic term for the salts formed by the union of the acid-anhydride P,O, with bases or water or both. As explained in CHEMISTRY (vol. v. pp. 517, 518) there are three classes of phosphates customarily distinguished by the prefixes ortho, pyro, and meta, The last two nowhere occur in nature, and are hardly known to the arts ; hence in this article only the ortho- compounds will be noticed, and their specific prefix will be dropped except where it is needed for definiteness. Combined phosphoric acid is universally diffused throughout the three kingdoms of nature, and (it is perhaps as well to add) to the practical, if not absolute, exclusion of all other phosphorus compounds. All organic tissues and juices contain it: of animal matters boncs and blood- solids, of vegetable the sceds of cereals, may be referred to as being exceptionally rich in phosphates. Of mineral phosphates the follow- ing may be here referred to :—pyro-

morphite, 3(P,0;.3PbO) + PbCl., where the chlorine may be replaced partially by fluorine; wavellite, 2(Al,0,.P,0;) + Al,0;3H,0 + 9Aq (this is a crystalline mineral ; an amorphous or massive phosphate of alumina, known as "rotondo- mineral," occurs asa large deposit ona West Indianisland); vivianite, P,0;3Fe0 +8H,0. All these and any others that might be named are rare minerals compared with apatite and its derivatives.

Apatite. —This exists in a variety of forms, but, as long as unde- composed, always answers the formula 3(P,0;.3CaO)+(CaX,). In the fluor-apatites the X, is wholly F, (fluorine) ; in the chlo-apatites it stands for (Cl,, F)., 7.¢., chlorine and fluorine coming up conjointly to two equivalents. See vol. xvi. p. 407.

Phosphorites. —Phosphorite is the name given to many impure forms of amorphous or massive apatite, modified morc or less by disintegration. It occurs (a) in massive, irregular, corroded-looking nodules embedded in limestone or other kinds of soft rock near Amberg (Bavaria), in Baden, Wiirtemberg, the Weser hills, and in the Teutoburger Wald, and contains from 40 to 80 per cent. of phosphate and up to 3 per cent. of fluoride of calcium ; the phos- phorite nodules in the sandstone of Kursk and Voronezh, the "South Carolina phosphate," and the "Lot phosphate" belong to the same category. It is met with (6) in more or less extensive beds, as '"'kidneys," as stalactites, or as a connective ceinent in breccias ; such phosphorite, of which large quantities are found in the Lahn valley, generally contains only from 25 to 60 per cent. of phosphate of lime, and includes large percentages of clay or marl, and more or less of the phosphates of iron and alumina. Another variety is © black phosphorite slate. A deposit contain- ing 20 per cent. of P,O; occurs in the Coal-measures of Horde (Westphalia), also in Wales; an earthy deposit is found in the "braunkohle" of Pilgramsreuth in the Fichtelgebirge. Phosphorite is also found (d) in veins, as a stone of very varying structure, generally intermixcd with quartz,—for instance at Logrosan in Estremadura (65 to 80 per cent. of phosphate and up to 14 per cent. of fluoride of calcium), also in the Silurian slate of the Dniester.

Coprolites.—According to Buckland, coprolites are derived from the excrements of extinct animals. They consist of highly impure phosphate of lime. All native phosphate of calcium being fluor- iferous, we need not wonder at the constant occurrence of traces of phosphates in the bones of vertebrate animals; the wonder is that the fluorine in these amounts to only '005 per cent.}

Preparation. —For the preparation of phosphates the oxide P,O; affords a natural starting-point. This substance is produced when phosphorus burns in an abundant supply of oxygen or air. Appa- ratus for the convenient execution of the process on a preparative scale are described in the handbooks of chemistry. Phosphoric anhydride forms a snow-white, loose, inodorous powder, which,

1 Some books (Nicklés) quote as high : Pe wee a gh percentages as 1 or 1°5, but these are

Two small | when heated in a hard glass tube to redness, sublimes slowly. It

is extremely hygroscopic. When thrown into water it hisses like a red-hot iron and passes into the meta-acid, most of which, in spite of its abundant solubility, separates out as a sticky precipitate, which is rather slow in dissolving. It is the most energetic of all dehydrating agents; even sulphuric acid, when distilled with an excess of it, suffers dehydration, and passes into SOs. The pre- paration is liable to be contaminated with red phosphorus and phosphorous anhydride (P,0s), also with 'white arsenic," because most commercial phosphorus, being made by means of pyrites-vitriol, is arseniferous. A freshly-prepared solution of the anhydride in water, being one of the meta-acid, coagulates albumen (as HNO, does) and gives a white precipitate with nitrate of silver. But, when the solution is allowed to stand, the dissolved meta-acid gradually passes into pyro-acid (P,0,;2H,O), and this latter again gradually passes into ortho-acid (P,0;3H,0), the highest hydrate. At a boiling heat, especially if a little nitric acid be added, the whole of the dissolved P,O; is converted into ortho-acid in the course of one or two hours. The solution then does not coagulate albumen ; it gives no precipitate with nitrate of silver unless the mixture be

neutralized with an alkali, when a yellow precipitate of the salt P,0;.3Ag,0 comes down. The aqueous ortho-acid, when evaporated at temperatures not exceeding 160° C., and ultimately dried at this temperature, leaves its substance P,0,;.3H,0 as a thick syrup, which, when left to itself in a dry atmosphere, slowly freezes into crystals. At 215°C. the ortho-acid loses one-third of its water and becomes pyro-acid ; at a red-heat it is reduced to a "glass" of meta-acid, P,O;H,O, which retains its water even at the highest temperatures. The substance known in pharmacy as "acidum phosphoricum glaciale" is very impure meta-acid.

Ortho-Phosphoric Acid, H,PO,.—The synthetical method de- scribed in the last paragraph is not so easy in practice as it appears on paper ; hence it is generally preferred to prepare this substance by the oxidation of ordinary phosphorus with nitric acid. An acid of 1°2 specific gravity works best ; weaker acid acts too slowly ; if stronger it may act with dangerous violence. One part of phos- phorus is placed in a large tubulated, retort, connected with an ordinary globular receiver, and treated therein, at a carefully regu- lated heat, with ten or twelve parts of the acid. When about half the acid has distilled over, it is poured back and the opera- tion resumed and kept on until all the phosphorus is dissolved. The excess of nitric acid is then distilled over as far as conveniently possible and thus recovered. Towards the end of the distillation afresh gas-evolution sets in through the conversion of previously produced phosphorous acid (H3PO;) into phosphoric. The residual liquid in the retort is now poured out into a Berlin porcelain (or, what is bettcr, a platinuin) basin, and, if it still contains phosphor- ous acid, fully oxidized by evaporation with occasional addition of strong nitric acid. Phosphorous acid, if present, is easily detected by the following tests: (1) its solution, when mixed with nitrate of silver and excess of ammonia, gives a black precipitate of metallic silver ; (2) when heated with a solution of corrosive sublimate, HgCl, it produces a white precipitate of calomel, HgCl; (8) when heated to boiling with excess of aqueous sulphurous acid it gives a precipitate of sulphur, or, if arsenious acid is present, of sulphide of arsenic. When the final oxidation is accomplished the acid needs only be freed of the remnant of nitric acid by repeated evaporation with water to be ready for use if arsenic be absent. Asa rule, however, this impurity is present and must be renioved by diluting the acid, passing in sulphuretted hydrogen first at 70° C., and then in the cold, and

allowing to stand for twenty-four hours, when all the arsenic is converted into sulphide, which, after elimination of the excess of sulphuretted hydrogen by continued exposure to air at a gentle heat, is filtered off. In practice, as a rule, the filtrate is being concentrated to some predetermined specific gravity and preserved as aqueous phosphoric acid, which preparation is official, and used besides for the cleansing of metallic surfaces, in lithography, and for other purposes. The British pharmacopceia prescribes for the official acid a strength corresponding to 10 per cent. of P,O;.

Hager has published a complete table showing the dependence of the specific gravity, taken at 17°°5 C., on the strength of the

acid. From it the following is extracted.

Spec. Grav. Percentages of Spec. Grav. Percentages of POs. H3P04 P20s. H3P04

1809 68-0 93°7 1:271 30°0 41°3

1677 60°0 82°7 1°218 25°0 34°4

1521 50°0 68°9 1°169 20°0 276

1°448 45°0 62°0 ie.) 15°0 20°7

1383 40°0 55-1 1-079 10°0 13°8

1°325 35°0 48°2 1-037 50 6:9

Aqueous phosphoric acid has all the properties of a decided acid, but, for a mineral acid, the exceptional qualities of an agreeably sour taste and of non-poisonousness. Phosphoric is the only mineral acid which might be uscd as a condiment in place of vinegar

PH O—PH O

or citric acid ; but the writer is far from recommending the substi- tution. Professor Gamgee has made the very surprising discovery that meta-

phosphoric and pyro-phosphoric, although so closely allied to ortho-phosphoric acid, are poisons, as phosphorous acid is.

Phosphoric acid readily combines with and neutralizes alkalis, even when these are given as carbonates. The concentrated acid, when heated in porcclain or glass, strongly attacks either material ; hence its concentration ought always to be effected in platinum. In former times, when phosphorus was expensive, the acid, or rather an apology for the same, used to be prepared from bone-ash.

Alkaline Phosphates.—Of these the di-sodic salt is of the greatest practical importance. It is prepared by somewhat more than neutralizing the hot aqueous acid with carbonate of soda. A cheaper (manufacturing) process is to prepare a solution of "super-phos- phate" from bone-ash by the action of vitriol, and, after elimination of the gypsum, to supersaturate the liquid with carbonate of soda and filter off the phosphate of lime produced (see p. 815 swpra, where the process is explained indirectly). The salt, from sufficiently strong hot solutions, separates out in large transparent crystals of the composition PO,HNa,+12H,0, which lose their crystal-water on exposure to dry air, even at ordinary temperatures, and very quickly at 100°C. The residue, PO,HNa,=3(P,0,.2Na,0.H,0), when heated to redness, loses its remnant of water and becomes pyro-phosphate, which latter retains its specific character on being dissolved in water. A solution of the (original) salt in water has a mild taste (hence its preferential application as a pleasant purga- tive) ; it colours red litmus-paper intensely blue, and does not act upon alkaline carbonate. But, when evaporated with the calculated proportion of carbonate of soda (Na,CO; per P,O,) to dryness at, ultimately, a red heat, it yields a residue of tri-sodic salt (PO,Nag) as a white mass, infusible at the highest temperature producible within a platinum crucible over a glass blowpipe. The solution of this salt in water has all the properties of a mixed solution of PO,Na,H+Na0OH ; yet it is capable of depositing crystals of the composition PO,Nag+12H,O. The mono-sodic salt (PO,H,Na), producible by mixing together solutions containing the quantities H,PO, and Na,HPO,, is of no importance. Of the three potash salts, the mono-metallic salt (PO,KH,) is the most readily produced. It forms beautiful anhydrous quadratic crystals which at a red heat lose their H,O and become meta-phosphate, PO,K.

Ammonia Salts.—A strong solution of the acid, when super- saturated with ammonia, deposits on cooling crystals of the di- ammonic salt PO,NH,).H, liable to be contaminated with the mono-ainmonic salt. The tri-ammonic salt is very unstable, and hardly known.

The double salt PO,NH,)NaH+4H,O was known to the al- chemists as "sal microcosmicum urine," and is interesting his- torically as having served Brand as a raw material for the mak- ing of phosphorus. It is easily prepared, either by mixing the solution of the two quantities PO,Na,HPO, and PO,(NH,),HPO, together and allowing to crystallize, or by dissolving the former along with NH,Cl parts of sal-ammoniac in water, and removing the chloride of. sodium produced by crystallization in the heat. Microcosmic salt, when heated to redness, leaves a viscid glass of meta-phosphate of soda, which dissolves all basic metallic oxides pretty much as fused borax does, with formation of glasscs which often exhibit colours characteristic of the dissolved oxides. Hence its application in blowpipe analysis. ;

Phosphates of Lime.—The normal salt P,0;.8CaO or PO,cas, where ca=4Ca=one equivalent of calcium, or perhaps a compound of it and carbonate of lime, forms the predominating component of bone-ash. A hydrate of the salt is produced by precipitating chloride of calcium solution with excess of ordinary phosphate of soda, mixed with enough of ammonia to produce (virtually) tri- alkaline salt, as a gelatinous precipitate similar in appearance and behaviour on filtration to precipitated alumina. A suspension of this precipitate in water, when mixed with a carefully adjusted quantity of hydrochloric acid, gradually passes into a mass of mnicroscopic crystals of di-calcic salt, POca,H+axAq, which latter is used medicinally. A solution of the di-calcic or tri-calcic salt, in the proper proportion of hot aqueous hydrochloric acid, deposits on cooling crusts of crystals of the mono-calcic salt PO,H,ca, which is soluble in about 700 parts of cold water, but is decomposed, by hot water or by prolonged contact with a proportion of cold water insufficient to dissolve it, into free acid and a precipitate of di- calcic salt, 2PO,caH,=PO,H3+PO,ca,H. A very impure form of this salt, known as "superphosphate," enters into the composition of many artificial manures. Such superphosphate is made in- dustrially by treating broken-up bones, or powdered bone-ash, or powdered phosphorite, or coprolitc, or occasionally apatite with chamber-acid, meaning vitriol of

about 60 per cent., as it coimes out of the chamber. The phosphate is mixed with the acid ina lead-lined trough by means of machinery, when a rather lively reaction scts in, involving the evolution of vaponr of water mixed with hydrofluoric acid, and fluoride of silicon if mineral phosphate is used, possibly also with traces of fluoride or chloride of arsenic, and, in any case, with stinking volatile organic substances. The

vapour, therefore, must be removed by means of suitable draught arrangements. The mass passes from the trough intoa (ventilated) chamber, where the reaction gradually accomplishes itself with ulti- mate formation of a porous friable mass, dry to the touch. This is superphosphate as it goes out into commerce or is used asan ingredi- eut in making more complex manures. Its value is determined chiefly by its percentage of "soluble phosphoric acid," meaning the percent- age of P,O;, extractable as PO,H; or PO,caH, by a certain large proportion of cold water. This percentage is liable to decrease on long-continued storing, especially in the case of mineral superphos- phate, through a gradual formation of (or regeneration of origin- ally present) phosphate of iron and alumina, partly, perhaps, also through the spontaneous decomposition of some of the mono-calcic salt into insoluble di-calcic salt and free acid. The portion of the P,0O; which has thus become insoluble is designated "reduced " phosphoric acid. In regard to other phosphates than those named reference may be made to the handbooks of chemistry. Analysis.—Phosphoric acid, when given in any form, soluble in solution of ammonia, can be detected and determined by " magnesia mixture " (a solution of chloride of magnesium and sal-ammoniac, MgCl, . 2NH,Cl, strongly alkalinized by addition of aqueous am- monia). The phosphoric acid is very gradually, but at last completely, precipitated in microscopic crystals of the salt PO,MgNH,+6H,0, which, though slightly soluble in water, can be washed pure, with- out loss, with dilute ammonia. All other acids except arsenic acid (As,0O;)—which behaves like phosphoric, and, if present, must be removed by sulphuretted hydrogen—remain dissolved. The precipi- tate, when kept at a red heat, assumes the composition P,O;2Mg0, and from the weight of the ignited precipitate that of the phos- phoric acid present is easily calculated. Phosphates soluble in acids, and reprecipitated from their solutions as such

by ammonia—as phosphate of lime or aluimina, or ferric oxide—used to give great difficulties to the analysts until Sonnenschein founded an excellent quantitative method for their analysis upon a reaction discovered by Swanberg and Struve, which is explained under MotyspENUM (vol. xvi. p. 697). The phosphate is dissolved in nitric acid (hydrochloric is less to be recommended) and the solution mixed, and kept for some hours at 40° C., with a large excess ofa solution of molybdate of ammonia in excess of nitric acid. The phosphoric acid (along with any arsenic acid that may be present) comes down as yellow crystalline phospho-molybdate of ammonia, soluble in phos- phoric acid and slightly in water, but insoluble in diZute nitric acid in the presence of a sufficiency of nitrate of ammonia. The precipitate is soluble in aqueous ammonia, and from the solution its P,O, can be precipitated by magnesia mixture as above explained. Neither of the two methods applies directly to meta-phosphates or pyro- phosphates. Regarding these, see the last paragraph of the section "phosphorus " above. (OV Ds)

PHOTIUS, patriarch of Constantinople from 857 to 867 and again from 877 to 886, a.D., the most eminent literary and ecclesiastical character of his age, was probably born between 820 and 825. If we could credit the asser- tions of his adversaries, his father, an official of the im- perial court, named Sergius, was of heathen extraction, and his mother, Irene, a faithless nun. It is more certain that he displayed from an earlyage the most extraordinary talent and appetite for knowledge, and that, having mastered whatever Greek literature could give him (Latin and Hebrew he never acquired), he began to teach with dis- tinguished success grammar, rhetoric, divinity, and philo- sophy. The way to public life was probably opened for him by the brilliant marriage of his maternal uncle to the princess Irene, sister of the empress Theodora, who, upon the death of her husband Theophilus in 842, had assumed the regency of the empire. Photius became captain of the guard and subsequently first imperial secretary. Some- where about 850 he was entrusted with a mission to the " Assyrians," by whom the Saracens must be meant, pos- sibly to the court of the caliph of Baghdad. Just previous to his departure on this mission he compiled his Bibliotheca, or Myriobiblion, the noblest monument of his erudition, and, from the number of classical authors whose writings it has partially preserved, by much the most important of his works.*

Some time after his return from this embassy an un- expected path was opened to Photius's ambition by the dissensions between the patriarch Ignatius and Bardas, the uncle of the youthful emperor Michael ITI., who had suc- ceeded to the regency on the disgrace of Theodora. Ignatius,

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a man of austere morals and apparently not exempt from spiritual pride, had excommunicated Bardas on the ground of an alleged incestuous connexion with his daughter-in- law. Bardas retorted by an accusation of a conspiracy. Ignatius was arrested and imprisoned (November 857), and upon his refusing to resign was illegally deposed, when Photius, receiving all the necessary sacerdotal orders within six days, was installed as patriarch in his place. This sudden elevation of a layman to the highest ecclesi- astical office could not but provoke scandal, even though the laic, as was actually the case, might be the first theo- logian of his age. Ignatius, continuing to refuse the abdi- cation which could alone have given it a semblance of legality, was treated with extreme severity, and a violent persecution broke out against his adherents. Photius urged clemency in his epistles to Bardas, probably with sincerity, but shrank from taking the only step which could have effectually repressed the persecution and healed the schism,—the resignation of the patriarchate. In judging his conduct, however, two circumstances have to be borne in mind,—the fact that the party of Ignatius dwindled away so rapidly as to flatter Photius with the hope of its extinction, and the espousal of his competitor's cause by Nicholas, bishop of Rome, in a manner highly offensive to the independent feeling of the Eastern Church. Photius felt himself the champion of Eastern Christianity against Latin pretensions; and, when in 863 Nicholas finally anathematized and deposed him, he replied by a counter- excommunication. He also sought to ally himself with Western bishops who had been displaced or suspended by the arrogant Nicholas, and with the latter's secular adver- saries, while at the same time he was more honourably engaged in endeavours to reunite the Armenians to the Eastern Church, in combating the Paulicians, and in success- ful missions to the Russians and Bulgarians. While these transactions were proceeding the situation was suddenly

changed by the murder of Photius's patron, Czesar Bardas, by order of the emperor Michael, who was himself assassin- ated by his colleague Basil in the following year (867). The fall of Photius immediately ensued, but the attendant circumstances are exceedingly obscure. According to Georgius Hamartolus, or rather his continuator, the cause was Photius's stern reproof of the crime by which Basil had obtained the throne. As the only definite testimony of any kind, this statement cannot be wholly disregarded, but it is certainly difficult to reconcile it with the general suppleness of Photius in his relations with the Byzantine court. Whatever the cause, Photius was removed from his office and banished about the end of September 867, a few days after the accession of Basil, and the deposed Ignatius, brought back from his exile, was reinstated on 23d November. The convocation of a general council followed, to give the restoration of Ignatius a character of indisputable legality. This synod, regarded by the Latins as the eighth cecumenical council, but rejected as such by the Greeks, met in October 869. The attendance of Eastern bishops was relatively very small; Photius's friends and creatures generally remained faithful to him; and the ostentatious patronage of Pope Hadrian must have been irritating to the Orientals. Photius, when brought before the assembly, maintained a dignified silence, which per- plexed his accusers, but could not avert his condemna- tion. It seems, nevertheless, to have been generally felt that the proceedings of the council were entitled to little moral weight. The usurper, for such he unquestionably was, had successfully identified himself with the cause of his church and nation. In his captivity, which, notwith- standing his complaints, the extent of his correspondence Proves to have been mild, he maintained the same unbend- ing spirit, and rejected all overtures of compromise. About

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876 he was suddenly recalled to Constantinople and en- trusted with the education of Basil's children. A tale of his having regained favour by forging an illustrious gene- alogy for the upstart emperor may be dismissed without hesitation as an invention of his enemies. The cause was in all probability Basil's recognition of the fact that he had disgraced and banished the ablest man in his dominions, and the best qualified to fill the patriarchate upon the decease of the aged Ignatius. This event soon

occurred, probably in October 877, and after a decent show of reluct- ance Photius again filled the patriarchal throne. Accord- ing to his own account, which there seems no reason to discredit, he had become fully reconciled to his predecessor, and had shown him much kindness. Photius now proceeded to obtain the formal recognition of the Christian world. In November 879 a synod, considered by the Greeks as the eighth cecumenical council, and far more numerously attended than the one by which he had been deposed, was convened at Constantinople. The legates of Pope John VIII. attended, prepared to acknowledge Photius as legiti- mate patriarch, a concession for which John was so much censured by Latin opinion that Baronius rather fancifully explains the legend of Pope Joan by the contempt excited by his want of spirit. John, however, was firm on the other two points which had long been contested between the Eastern and Western Churches, the ecclesiastical juris- diction over Bulgaria and the introduction of the "filioque" clause into the creed. He disowned his legates, who had shown a tendency to yield, again excommunicated Photius, and thus kindled smouldering ill-will into the open hostility which has never been appeased to this day. Strong in the support of the council, Photius simply ignored him. He has been accused of interpolating John's letters, a charge not improbable in itself, but which can neither be proved nor disproved at this date. At the height of glory and success he was suddenly precipitated from his dignity by another palace revolution. Archbishop Theodore Santa-baren, his confidant and favourite, had accused Basil's son, Leo, of a conspiracy against his father. Leo owed his liberty and eyesight to Photius's entreaties ; nevertheless, on his accession in 886, he involved his benefactor in the ruin of his accuser. Arrested, degraded from the patri-archate, banished to the monastery of Bordi in Armenia, Photius, as if by magic, disappears from history. No letters of this period of his life are extant, which leads to the inference that his imprisonment was severe. The precise date of his death is not known, but it is said to have occurred on 6th February 891.

For long after Photius's death his memory was held in no special honour by his countrymen. His literary merits were obscured by the growing barbarism of the times, and the anarchy and apparent decrepitude of the Roman Church made his protest against its pre- tensions seem superfluous. But, when, in the crusading age, the Greek Church and state were alike in

danger from Latin encroach- ments, Photius became a national hero, and is at present regarded as little short of a saint. To this character he has not the least pretension. Few men, it is probable, have been more atrociously calumniated ; but, when every specific statement to his prejudice has been rejected, he still appears on a general review of his actions worldly, crafty, and unscrupulous. Yet, however short he may fall of the standard of an Athanasius or a Luther, he shows to no little advantage when regarded as an ecclesiastical statesman. His firmness was heroic, his sagacity profound and far-seeing ; he sup- ported good and evil fortune with equal dignity ; and his fall was on both occasions due to revolutions beyond his control. If his original elevation to the patriarchate was unquestionably irregular, his re-enthronement was no less certainly legal; he began as a usurper and ended asa patriot. His zeal for the promotion of learn- ing, education, and missions was most genuine, and fruitful in good. In erudition, literary power, and force and versatility of intellect he far surpassed every contemporary. The records of his actions are so imperfect or so prejudiced that in endeavouring to judge his personal character we have to rely principally upon the internal evidence of his own letters. With every allowance for their ex parte and rhetorical character and the writer's manifest desire to display

himself in the most favourable light, they nevertheless seem to afford sufficient testimony of a magnanimous spirit and a feeling heart.

The most important of the works of Photius is his renowned Myriobiblion, a collection of extracts from and abridgments of 280 volumes of classical authors, the originals of which are now to a great extent lost. Dictated in haste immediately before lis departure on his Eastern embassy, it is open to the charges of imper- fect recollection and hasty criticism, but these are as nothing in comparison with its merits. It is especially rich in extracts from historical writers. To Photius we are indebted for almost all we possess of Ctesias, Memnon, Conon, the lost books of Diodorus Siculus, and the lost writings of Arrian. Theology and ecclesi- astical history are also very fully represented. The best edition is Bekker's (Berlin, 1824-25), which, however, has neither notes nor a Latin version. The next of his works in importance is

the Amphilochia, a collection of 333 questions and answers on difficult points in Scripture, addressed to Amphilochius, archbishop of Cyzicus. This valuable work has exposed Photius to charges of plagiarism, which, as he does not claim entire originality, are wholly undeserved. The only complete edition is that published by Sophocles iconomus at Athens in 1858. Photius is further

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| author of a Lexicon (London, 1822), of a Nomocanon or harmony of the ecclesiastical canons with the imperial edicts relating to the discipline of the church, a work of great authority, but based on the labours of his predecessors, and of numerous theological writ- ings. The more important of these are his treatise Against the Paulicians, in four books, and his controversy with the Latins on the procession of the Holy Spirit. His Epistles are valuable from their contents, but the style is often affected or unsuitable to the subject. The most complete edition is Valetta's (London, 1864). Many of Photius's works yet remain in manuscript. The only complete edition is Bishop Malou's in Migne's Patrologia Greea, and this is very imperfect and unsatisfactory.

After the allusions in his own writings the chief contemporary authority for the life of Photius is his bitter enemy Nicetas the Paphlagonian, the biographer of his rival Ignatius. In modern times his life has been written with great prejudice and animosity by Baronius, and by Weguclin in the Memoirs of the Berlin Academy, and more fairly by Hankins (De Byzantinarum Rerum Scriptor- ibus, pt. 1). But all previous writers are superseded by the classical work of Cardinal Hergenroéther, Photius, Patriarch von Constantinopel (8 vols., Ratisbon, 1867-69). As a dignitary of the Roman Catholic Church Cardinal Hergenrother is Inevitably biassed against Photius as an ecclesiastic, but his natural candour and sympathy with intellectual eminence have made him just to the man, while

his investigation of all purely historical and literary questions is industrious and exhaustive in the highest degree.

Pa OT OG EM PRY

T would be somewhat difficult to fix a date when what we now know as "photographic action" was first re- corded. No doubt the tanning of the skin by the sun's rays was what was first noticed, and this is as truly the effect of solar radiation as is the darkening of the sensitive paper which is now in use in photographic printing opera- tions. We may take it that Scheele, the Swedish chemist, was the first to enter upon a scientific investigation of the darkening action of sunlight on silver chloride. He found by experiment that when silver chloride was exposed to the action of light beneath water there was dissolved in the fluid a substance which, on the addition of caustic (silver nitrate), caused the precipitation of new silver chloride, and that on applying liquor ammonia to the blackened chloride an insoluble residue of metallic silver was left behind. He also noticed that of the rays of the spectrum the violet most readily blackened the silver chloride. In Scheele, then, we have the first who applied combined chemical and spectrum analysis to the science of photo- graphy. found that in fifteen seconds the violet rays blackened silver chloride as much as the red rays did in twenty minutes.! About twenty years later than Scheele's experi- ments Count Rumford contributed a paper to the Philo- sophical Transactions of the Royal Society (1798) entitled 'An inquiry concerning the chemical properties that have been attributed to light," in which he tried to demonstrate that all effects produced on metallic solutions could be brought about by a temperature somewhat less than that of boiling water. Robert Harrup in 1802, however, con- clusively showed in Wicholson's Journal that, at all events, salts of mercury were reduced by visible radiation and not by change of temperature. In 1801 we come to the next decided step in the study of photographic action, when Ritter proved the existence of rays lying beyond the violet limit of the spectrum, and found that they had the power of blackening silver chloride. Such a discovery naturally gave a direction to the investigations of others, and See- beck (between 1802 and 1808) and Bérard turned their attention to this particular subject, eliciting information which at the time was of a valuable nature. We need only mention two or three other cases where the influence of light was noticed at the beginning of this century. Wollaston observed the conversion of yellow gum gualacum into a green tint by the violet rays, and the restoration of the colour by the red rays, —both of which, be it observed, aa Mi ae mee a? ee

1 It may here be remarked that had he used a pure spectrum he would have found that the red rays did not blacken the material in the slightest degree.

Senebier repeated Scheele's experiments, and |

are the effect of absorption of light, the original yellow colour of the gum absorbing the violet rays, whilst the green colour to which it is changed absorbs the red rays. Davy found that puce-coloured oxide of lead, when danip, became red in the red rays, whilst it blackened in the violet rays, and that the green oxide of mercury became red in the red rays,—again an example of the necessity of ab- sorption to effect a molecular or chemical change in a sub- stance. Desmortiens in 1801 observed the change effected in Prussian blue, and Béckman noted the action of the two ends of the spectrum on phosphorus, a research which, it may be mentioned, Draper extended further in America at a later date.

To England belongs the honour of first producing a Wedg- photograph by the utilization of Scheele's observations on wood.

chloride of silver. In June 1802 Wedgwood published in the Journal of the Royal Institution the paper—' An account of a method of copying paintings upon glass and of making profiles by the agency of light upon nitrate of silver, with observations by H. Davy." He remarks that white paper or white leather moistened with a solution of nitrate of silver undergoes no change when kept in a dark place, but on being exposed to the daylight it speedily changes colour, and, after passing through various shades of grey and brown, becomes at length nearly black. The alteration of colour takes place more speedily in proportion as the light is more intense.

"In the direct beam of the sun two or three minutes are sufficient to produce the full effect, in the shade several hours are required, and light transmitted through different-coloured glasses acts upon it with different degrees of intensity. Thus it is found that red rays, or the common sunbeams passed through red glass, have very little action upon it; yellow and green are more efficacious, but blue and violet light produce the most decided and powerful effects."

Wedgwood then goes on to describe the method of using this prepared paper by throwing shadows on it, and infer- entially by what we now call "contact printing." He states that he has been unable to fix his prints, no wash- ing being sufficient to eliminate the traces of the silver salt which occupied the unexposed or shaded portions. Davy in a note states that he has found that, though the images formed by an ordinary camera obscura were too faint to print out in the solar microscope, the images of small objects could easily be copied on such paper.

*'*In comparing the effects produced by light upon muriate of silver (silver chloride) with those upon the nitrate it seemed evident that the muriate was the most susceptible, and both were more readily acted upon when moist than when dry—a fact long ©*

| ago known. Even in the twilight the colour of the moist muriate of silver, spread upon paper, slowly changed from white to faint

Seebeck,

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violet ; though under similar circumstances no intermediate altera- tion was produced upon the nitrate. . .. Nothing but a method of pre- venting the unshaded parts of the delineations from being coloured by exposure to the day is wanting to render this process as useful as it is elegant."'

In this method of preparing the paper lies the germ of the silver-printing processes which are practised at the present time (1884), and it was only by the spread of chemical knowledge that the hiatus which was to render the "process as useful as it is elegant" was filled up— when hyposulphite of soda, discovered by Chaussier in 1799, or three years before Wedgwood published his paper, was used for making the print permanent. Here we must call attention to an important observation by Dr Seebeck of Jena in 1810. In the Parbenlehre of Goethe he says:

"When a spectrum produced by a properly constructed prism is thrown upon moist chloride of silver paper, if the printing be con- tinued for from fifteen to twenty minutes, whilst a constant position for the spectrum is

maintained by any means, I observe the follow- ing. In the violet the chloride is a reddish brown (sometimes more violet, sometimes more blue), and this coloration extends well be- yond the limit of the violet ; in the blue the chloride takes a clear blue tint, which fades away, becoming lighter in the green. In the yellow I usually found the chloride unaltered ; sometimes, how- ever, it had a light yellow tint ; in the red and beyond the red it took arose or lilac tint. This image of the spectrum shows beyond the red and the violet a region more or less light and uncoloured. This is how the decomposition of the silver chloride is seen in this region. Beyond the brown band, . . . which was produced in the violet, the silver chloride was coloured a grey-violet for a distance of several inches. In proportion as the distance from the violet increased, the tint became lighter. Beyond the red, on the contrary, the chloride took a feeble red tint for a considerable distance. When moist chloride of silver, having received the action of light for a time, is exposed to the spectrum, the blue and violet behave as above. In the yellow and red regions, on the other hand, it is found that the silver chloride becomes paler; . . . the parts acted upon by the red rays and by those beyond take a light coloration."

This has been brought prominently forward by Dr J. M. Eder as being undoubtedly the first record we have of photographic action lending itself to production of natural colours, a fact which, in describing the history of photo- graphic phenomena, has been more or less overlooked.

- We shall see later on that this observation of Seebeck was

N. de Niepce.

allowed to lie fallow for many years, until it was again taken up and published as a novelty. In photography perhaps, above all other technical applications of science, there has been a great flood of rediscovery, owing, no doubt, in the first instance to the fact that much published in one country has remained unknown in others, and also to the fact that it is difficult to boil down photographic literature and to ascertain what is really scientifically true and what is merely the result of unscientific use of the imagination. Photography has suffered greatly also from the fact that those who follow it are usually artists rather than scientific men, and fall into mistakes of theory which must of necessity lead to wrong conclusions.

_ The first to found a process of photography which gave pictures that were subsequently unaffected by light was Nicéphore de Nigpcx (g.v.). His process, which he called provisionally "héliographie, dessins, et gravures," consists in coating the surface of a metallic plate with a solution of asphaltum in oil of lavender and exposing it to a camera image. In his description he recommends that the asphaltum be powdered and the oil of lavender dropped upon it in a wine-glass, and that it be then gently heated. A polished plate is covered with this varnish, and, when dried, Js ready for employment in the camera. After requisite exposure, which is very long indeed, a very faint image, requiring development, is seen. Development is effected by diluting oil of lavender with ten parts by volume of white petroleum. After this mixture has been allowed to stand two or three days it becomes free from turbidity and is ready to be used. The plate is placed in a dish

and covered with the solvent. By degrees the parts un- affected by light dissolve away, and the picture, formed of modified asphaltum, is developed. The plate is then lifted from the dish, as much as possible of the solvent being allowed to drain away. It is next placed on an inclined support and carefully freed from all the remaining solvents by washing in water. Subsequently, instead of using oil of lavender as the asphaltum solvent, Niepce employed an animal oil, which gave a deeper colour and more tenacity to the surface-film than did his original agent.

Later still, Daguerre and Niepce used as a solvent the brittle residue obtained from evaporating the essential oil of lavender dissolved in ether or alcohol,—a transparent solution of a lemon-yellow colour being formed. This solution was used for covering glass or silver plates, which, whien dried, could be used in the camera. The time of exposure varied somewhat in length. Daguerre remarked that "the time required to procure a photographic copy of a landscape is from seven to eight hours, but single monuments, when strongly lighted by the sun, or which are themselves very bright, can be taken in about three hours." Perhaps there is no sentence which could be quoted that illustrates more forcibly the advance made in photography from the days when this process was described. The ratio of

three hours to z}5th of a second is a fair estimate of the progress made since Niepce. The develop- ment was conducted by means of petroleum-vapour, which dissolved the parts not acted upon by light. As a rule silver plates seem to have been used, and occasionally glass ; but it does not appear whether the latter material was chosen because an image would be projected through it or whether simply for the sake of effect. Viewed in the light of present knowledge, a more perfectly developable image in half-tone would be obtained by exposing the film through the back of the glass. The action of light on most organic matter is apparently one of oxidation. In the case of asphaltum or bitumen of Judea the oxidation causes a hardening of the material and an insolubility in the usual solvents. Hence that surface of the film is generally hardened first which first feels the influence of light. Where half-tones exist, as in a landscape picture, the film remote from the surface first receiving the image is not acted upon at all, and remains soluble in the solvent. It is thus readily seen that, in the case of half-tone pictures, or even in copying engravings, if the action were not con- tinued sufficiently long when the surface of the film farthest from the glass was first acted upon, the layer next the glass would in some places remain soluble, and on develop- ment would be dissolved away, carrying the top layer of hardened resinous matter with it, and thus give rise to imperfect pictures. In carbon-printing development from the back of the exposed film is absolutely essential, since it depends on the same principles as does heliography, and in this the same mode of procedure is advisable. It would appear that Niepce began his researches as early as 1814, but it does not appear that he was very successful in his first endeavours: it was not till 1827 that he had any success worth recounting. At that date he communi- cated a paper to Dr Bauer of Kew, the secretary of the Royal Society of London, with a view to its presentation to that society. Its publication, however, was prevented because the process, of which examples were shown, was a secret one. There lies before the present writer an authentic MS. copy of Niepce's "Mémoire," dated " Kew, le 8 Décembre 1827," in which he says it will be found that "in his framed drawings made on tin the tone is too feeble, but that by the use of chemical agents the tone may be darkened." This shows that Niepce was familiar with the idea of using some darkening medium even with his photographs taken on tin plates.

Paeroch & Phy

Daguerre Daguerreotype-—We have already noticed in the joint a process of Daguerre and Niepce that polished silver plates iepce.

Da- guerreo- type process.

were used, and we know from the latter that amongst the chemical agents tried iodine suggested itself. Iodine vapour or solution applied to a silvered plate would cause the formation of silver iodide on those parts not acted upon by light. The removal of the resinous picture would leave an image formed of metallic silver, whilst the black parts of the original would be represented by the darker silver iodide. This was probably the origin of the daguerreotype process. Such shrewd observers as Niepce and Daguerre, who had formed a partnership for prosecut- ing their researches, would not have thus formed iodide of silver without noticing that it changed in colour when exposed to the light. What parts respectively Daguerre and Niepce played in the development of the daguerreo- type, which we shall shortly describe, will probably never be known with absolute accuracy, but in a letter from Dr Bauer to Dr Bennett, F.R.S., dated 7th May 1839, the former says :

"T received a very interesting letter from Mons. Isidore Niepce, dated 12th March [about a month after the publication of the daguerreotype process], and that letter fully confirms what I sus- pected of Daguerre's manceuvres with poor Nicéphore, but Mr

Isidore observes that for the present that letter might be considered confidential."

Dr Bauer evidently knew more of 'poor Nicéphore's " work than most people, and at that early period he clearly thought that an injustice had been done to Niepce at the hands of Daguerre. It should be remarked that Nicéphore de Niepce died in 1833, and a new agreement was entered into between his son Isidore de Niepce and Daguerre to continue the prosecution of their researches. It appears further that Niepce communicated his process to Daguerre on 5th December 1829. At his death some letters from Daguerre and others were left by him in which the use of iodine, sulphur, phosphorus, &c., is mentioned as having been used on the metal plates, and their sensi- tiveness to light, when thus treated,

commented upon. We are thus led to believe that a great part of the success in producing the daguerreotype is due to the elder Niepce ; and indeed it must have been thought so at the time, since, on the publication of the process, life-pensions of 6000 francs and 4000 francs were given to Daguerre and to Isidore Niepce respectively. In point of chronology the publication of the discovery of the daguerreotype process was made subsequently to the Talbot-type process. It will, however, be convenient to continue the history of the daguerreotype, premising that it was published on 6th February 1839, whilst Talbot's process was given to the world on 25th January of the same year.

Daguerreotype pictures were originally taken on silver- plated copper, and even at the present day the silvered surface thus prepared serves better than electro-deposited silver of any thickness. An outline of the operations is as follows. A brightly-polished silver plate is cleaned bymeans, first of finely-powdered pumice and olive oil then of dilute nitric acid, and a soft buff is employed to give it a brilliant polish, the slightest trace of foreign matter or stain being fatal to the production of a perfect picture. The plate, thus prepared, is ready for the iodizing operation. Small fragments of iodine are scattered over a saucer, covered with gauze. Over this the plate is placed, face down- wards, resting on supports, and the vapour from the iodine is allowed to form upon it a surface of silver iodide, which is the sensitive compound. It is essential to note the colour of the surface-formed iodide at its several stages, the varying colours being due to interferences caused by the different thicknesses of the minutely thin film of iodide of silver. The stage of maximum sensitiveness 1s obtained when it is of a golden orange colour. In this

state the plate is withdrawn and removed to the dark slide of the camera, ready for exposure. A plan frequently adopted to give an even film of iodide was to saturate a card with iodine and hold the plate a short distance above the card. Long exposures were required, varying in Paris from three to thirty minutes. The length of the exposure was evidently a matter of judgment, more particularly as over-exposure introduced an evil which was called "solar- ization," but which was in reality due to the oxidation of the

iodide, itself altered by prolonged exposure to light. As a matter of history it may be interesting to remark that the development of the image by means of mercury- vapour is said to be due to a chance discovery of Daguerre. It appears that for some time previous to the publication of the daguerreotype method he had been experimenting with iodized silver plates, producing images by what would now be called the "printing out" process. This operation in- volved so long an exposure that he sought some means of reducing it by the application of different reagents. Having on one occasion exposed such a plate to a camera-image, he accidentally placed it in the dark in a cupboard containing various chemicals, and found after the lapse of a night that he had a perfect image developed. By the process of exhaustion he arrived at the fact that it was the mercury- vapour, which even at ordinary temperatures volatilizes, that had caused this intensification of the almost invisible camera-image. It was this discovery that enabled the exposures to be very considerably shortened from those which it was found necessary to give in mere camera- printing. The development of the image was effected by placing the exposed plate over a slightly heated (about 75° C.) cup of mercury. The vapour of mercury condensed on those places where the light had acted in an almost exact ratio to the intensity of its action. This produced a picture in an amalgam of mercury, the vapour of which attached itself to the altered iodide of silver. Proof that such was the case was subsequently afforded by the fact that the mercurial image could be removed by heat. The developing box was so constructed that it was possible to examine the picture through a yellow glass window whilst the image was being brought out. The next operation was to fix the picture by dipping it in a solution of hyposulphite of soda. The image produced by this method is so delicate that it will not bear the slightest handling, and has to be protected from accidental touching.

The first great improvement in the daguerreotype pro- cess was the resensitizing of the iodized film by bromine vapour. Mr Goddard published his account of the use of bromine in conjunction with iodine in 1840, and M. Claudet employed a combination of iodine and chlorine vapour in 1841. In 1844 Daguerre published his improved method of preparing the plates, which is in reality based on the use of bromine with iodine. That this addition points to additional sensitiveness will be readily understood when we remark that so-called instantaneous pictures of yachts in full sail, and of

large size, have been taken on plates so prepared,—a feat which is utterly impossible with the original process as described by Daguerre. The next improvement to be noticed in the process was toning or gilding the image by a solution of gold, a practice introduced by M. Fizeau, Gold chloride is mixed with hyposulphite of soda, and the levelled plate, bearing a sufficient quantity of the fluid, is warmed by a spirit-lamp until the required vigour is given to the image, as a consequence of which it is better seen in most lights. Nearly all the daguerreotypes extant have been treated in this manner, and no doubt their permanence is in a great measure due to this operation. Images of this class can be copied by taking electrotypes from them, as shown by Grove and others. These repro- ductions are admirable in every way, and furnish a posi-

Fox- Talbot process.

Calotype.

Albumen process on glass.

tive proof, if any were needed, that the daguerrean image is a relief,

Fou-Talbot Process. —In January 1839 Fox Talbot described the first of his processes, photogenic drawing, in a paper to the Royal Society. He states that he began experimenting in 1834, and that in the solar microscope he obtained an outline of the object to be depicted in full sunshine in half a second. We must turn, however, to the Philosophical Magazne for the account of the full details of his method, which consisted essentially in soak- ing paper in common salt, brushing one side only of it with about a 12 per cent. solution of silver nitrate in water, and drying at the fire. Fox Talbot stated that by repeating the alternate washes of the silver and salt—always ending, however, with the former—greater sensitive- ness was attained. This is the same in every respect as the method practised by Wedgwood in 1802; but, when we come to the next process, which he called " calotype" or "beautiful picture," we have a distinct advance. This process Talbot protected by a patent in 1841. It may be briefly described as the application of iodide of silver to a paper support. Carefully-selected

paper was brushed over with a solution of silver nitrate (100 grains to the ounce of distilled water), and dried by the fire. It was then dipped into a solution of potassium iodide (500 grains being dissolved in a pint of water), where it was allowed to stay two or three minutes until silver iodide was formed. In this state the iodide is scarcely sensitive to light, but is sensitized by brushing " gallo-nitrate of silver" over the surface to which the silver nitrate had been first applied. This "gallo-nitrate" is not a chemical compound, but merely a mixture, consisting of 100 grains of silver nitrate dissolved in 2 oz. of water, to which is added one-sixth of its volume of acetic acid, and immediately before applying to the paper an equal bulk of a saturated solution of gallic acid in water. The prepared surface is then ready for exposure in the camera, and, after a short insolation in the dark, develops itself, or the development may be hastened by a fresh application of the "gallo-nitrate of silver." The picture is then fixed by washing it in clean water and drying slightly in blotting paper, after which it is treated with a solution of potassium bromide, and again washed and dried. Here there is no mention made of hyposulphite of soda as a fixing agent, that having been first used by Sir J. Herschel in February 1840. In a strictly historical notice it ought to be mentioned that development by means of gallic acid and nitrate of silver was first known to Rev. J. B. Reade. When impressing images in the solar microscope he employed gallic acid and silver in order to render more sensitive the chloride of silver paper that he was using, and he accidentally found that the image could be developed without the aid of light. The priority of the discovery was claimed by Fox Talbot ; and his claim was sustained after a lawsuit, apparently on the ground that Reade's method had never been legally published. It would be beyond the scope of the present article to give the slight improvements which Talbot afterwards made in the process. In one of his patents he recognizes the value of the proper fixing of his photogenic drawings by the use of hyposulphite of soda, and also the production of positive prints from the calotype negatives, We pass over his application of albumen to porcelain and its subsequent treatment with iodine vapour, as also his application of albumen in which iodide of silver was held in suspension to a glass plate, since in this he was undoubtedly preceded by N iepce de St Victor in 1848. _ Albumen Process on Glass.—It was a most decided step in advance when Niepce de St Victor, a nephew of Nicé- phore de Niepce,

employed a glass plate and coated it with iodized albumen. The originator of this method did not

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meet with much success. In the hands of M. Blanquart Evrard it became more practicable ; but it was carried out in its greatest perfection by M. Le Gray. The outline of the operations is as follows. The whites of five fresh eggs are mixed with about one hundred grains of potassium iodide, about twenty grains of potassium bromide, and ten grains of common salt. The mixture is beaten up into a froth with an egg-whisk or fork, and allowed to settle for twenty-four hours, when the clear liquid is decanted off. A circular pool of albumen is poured on a glass plate, and a straight ruler (its ends being wrapped with waxed paper to prevent its edge from touching the plate anywhere except at the margins) is drawn over the plate, sweeping off the excess of albumen, and so leaving an even film. The plate is first allowed to dry spontaneously, a final heating being given to it in an oven or before the fire. The heat hardens the albumen, and it becomes insoluble and ready for the nitrate of silver bath. One of the difficulties is to prevent crystallization of the salts held in solution, and this can only be effected by keeping them in defect rather than in excess, The plate is sensitized for five minutes in a bath of nitrate of silver, acidified with acetic acid, and exposed whilst still wet, or it may*

_be slightly washed and again dried and exposed whilst in

its desiccated state. The image is developed by gallic acid in the usual way. After the application of albumen many modifications were introduced in the shape of starch, serum of milk, gelatin, all of which were intended to hold iodide om situ on the plate; and the development in every case seems to have been by gallic acid. At one time the waxed- paper process subsequently introduced by Le Gray was a great favourite. Paper that had been made translucent by white wax was immersed in a solution of potassium iodide until impregnated with it, after which it was sensi- tized in the usual way, development being by gallic acid. This procedure is still followed in some meteorological observatories for obtaining transparent magnetograms, barograms, &c, Reflexion will show that in images ob- tained by this process the high lights are represented by metallic silver,

whilst the shadows are translucent. Such a print is technically called a "negative." When chloride of silver paper is darkened by the passage of light through a negative, we get the highest lights represented by white paper and the shadows by darkened chloride. A print of this kind is called a " positive."

Collodion Process.—A great impetus was given to photo- Collo- graphy in 1850, rendering it easy of execution and putting dion.

it into the hands of the comparatively untrained. This was the introduction of collodion, a vehicle which up to the present day holds its own against the more rapid pro- cesses on account of the facility with which the plates are prepared, and also because it is a substance totally un- affected by silver nitrate, which is not the case when any organic substance is employed, and, it may be said, in- organic as well in many instances. Thus albumen forms a definite silver compound, as do gelatin, starch, and gum. The employment of collodion for use in photo- graphy was first suggested by Le Gray, who has been already mentioned in connexion with the albumen process. He does not appear to have gone beyond suggestion, and it remained for Archer of London, closely followed by Fry, to make a really practical use of the discovery. Collodion is a solution of cotton or cellulose in which some atoms of its hydrogen have been replaced by N O, by treatment with a more or less dilute mixture of sulphuric and nitric acids. The action of the sulphuric acid is to take up the molecules of water formed by elimination of the hydrogen from the cotton, which combines with oxygen from the nitric acid, the latter acid supplying the cotton with NO,. According to the temperature of the acids and

Collo- dion process.

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their dilution a tri-nitro or di-nitro cellulose is said to be

formed, one of which is the explosive gun-cotton, insoluble in ether and alcohol, whilst the other, though inflammable, is readily soluble in a mixture of these two solvents, When collodion is poured on a glass plate it leaves on drying a hard transparent film which under the microscope is slightly

reticulated. Before drying, the film is gelatinous and per- fectly adapted for holding 2n situ salts soluble in ether and alcohol. Where such salts are present they crystallize out when the film is dried, hence such a film is only suitable where the plates are ready to be immersed in the silver bath. As a rule, about five grains of the soluble cotton are dissolved in an ounce of a mixture of equal parts of ether and alcohol, both of which must be of low specific gravity, '725 and '805 respectively. If the alcohol or ether be much diluted with water the cotton (pyroxylin) precipitates, but, even if less diluted, it forms a film which is "'crapey" and uneven. Such was the material with which Le Gray proposed to work, and which Archer actu- ally brought into practical use. The opaque silver plate with its one impression was abandoned; and the paper support of Talbot, with its inequalities of grain and thick- ness, followed suit, though not immediately. When once a fine negative had been obtained with collodion ona glass plate—the image showing high lights by almost complete opacity and the shadows by transparency (as was the case, too, in the calotype process)—any number of impressions could be obtained by means of the silver-printing process introduced by Fox Talbot, and they were found to pos- sess a delicacy and refinement of detail that certainly eclipsed the finest print obtained from a calotype nega- tive. To any one who had practised the somewhat tedious calotype process, or the waxed-paper process of Le Gray with its still longer preparation and development, the advent of the collodion method must have been extremely welcome, since it effected a saving in time, money, and uncertainty. The rapidity of photographic action' was much increased, and the production of pictures became possible to hundreds who previously had been excluded from this art-science by force of circumstances. We can merely give an outline of the procedure, referring the reader for further information to the manuals of photography. A glass plate is carefully cleaned by the application of a detergent such as a cream of tripoli powder or spirits of wine (to which a little ammonia is often added), then wiped with a soft rag, and finally polished with a silk handkerchief or chamois leather previously freed from grease. A collodion containing soluble iodides and bro- mides is made to flow over the plate, all excess being drained off when it is covered. A good standard formula for the collodion may be taken to be as follows,—55 grains of pyroxylin, 5 oz. of alcohol, 5 oz. of ether ; and in this liquid are dissolved 2} grains of ammonium lodide, 2 grains of cadmium iodide, and 2 grains of cadmium

bromide. When the collodion is set, ¢.¢., when it is in a gelatinous condition, the plate is immersed in a bath of nitrate of silver—a vertical form being that mostly used in Britain, whilst a horizontal dish is used on the Continent—a good formula for which is 350 grains of silver nitrate with 10 oz. of water. The plate is steadily lowered into this solu- tion without pause, and moved in it until all the repellent action between the aqueous solution of the silver and the solvents of the collodion is removed, when it is allowed to rest for a couple of minutes, after which period it is taken out and placed in the dark slide ready for exposure in the camera. After undergoing proper exposure the plate is withdrawn, and in a room lighted with yellow light the developing solution is applied, which originally was a solu- tion of pyrogallic acid in water restrained in its action by the addition of acetic acid. One of the old formule

employed by Delamotte was 9 grains of pyrogallic acid, 2 drachnis of glacial acetic acid, and 3 oz. of water. The Image gradually appears after the application of this solu- tion, building itself up from the silver nitrate clinging to the film, which is reduced to the metallic state by degrees. Should the density be insufficient a few drops of nitrate of silver are added to the pyrogallic-acid solution and the developing action continued.

In 1844 Hunt introduced another reducing agent, which has continued to be the favourite down to the present time, viz., ferrous sulphate. By its use the time of neces- sary exposure of the plate is reduced, and the image de- velops with great rapidity. A sample of this developing solution is 20 grains of ferrous sulphate, 20 minims of acetic acid, with 1 oz. of water. This often leaves the image thinner than is requisite for the formation of a good print, and it is intensified with pyrogallic acid and silver. There are other intensifiers used to increase the deposit on a plate by means of mercury or uranium, followed by other solutions to still further darken the double salts formed on the film; but into these it is not necessary to enter here. Such intensifying agents have to be applied to the image after the plate is fixed, which is done by a concentrated solution of hyposulphite of soda or by cyanide of potassium, the latter salt having been first introduced by Martin and Gaudin in 1853 (La Lumiére, 23d April 1853). Twenty-five grains of

cyanide of potassium to one ounce of water is the strength of the solution usually em- ployed. The reaction of both these fixing agents is to form with the sensitive salts of silver double hyposulphites or cyanides, which are soluble in water, not, as is often considered to be the case, to merely dissolve the silver salt itself. It may be well to remark that the utility of bromides in the collodion process seems to have been recognized in its earliest days, Archer (1852) and Bingham (1850) both mentioning it. We notice this, since as late as the year 1866 a patent-right in its use was sought to be enforced in America, the patent being taken out by James Cutting in July 1854. .

Positive Pictures by the Collodion Process.—In the infancy Positive of the collodion process it was shown by Mr Horne that collodion a negative image could be made to assume the appearance P!0C¢ss- of a positive by whitening the metallic silver deposit. This he effected by using with the pyrogallic acid developer a small quantity of nitric acid. A better result was obtained by Mr Fry with ferrous sulphate and ferrous nitrate, whilst Dr Diamond gave effect to the matter in a practical way. Mr Archer used mercuric chloride to whiten the image. To Mr Hunt, however, must be awarded the credit of noticing the action of this salt on the image, in his paper in the Philosophical Transactions of 1843. The whitened picture may be made to stand out against black velvet, or black varnish may be poured over the film to give the necessary black background, or, as has been done more recently, the positive pictures may be produced on japanned iron plates (ferrotype plates) or on japanned leather. This process is still practised by some photographers, and from the number of ferrotype plates sold the number of portraits taken by it must be still very large.

Most Collodion Process.—From what has been stated Moist above it will be seen that for the successful working of the collodion collodion process it was necessary that the plate should PFocess- be exposed very shortly after its preparation; this was a drawback, inasmuch as it necessitated taking a heavy equipment into the field. In May 1854 Messrs Spiller and Crookes published in the Philosophical Magazine a process whereby they were enabled to keep a film moist (so as to prevent crystallization of the silver nitrate) several days, enabling plates to be prepared at home, exposed in the field, and then developed in the dark room. The plate

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dion dry with collodion dry plates were due to M. Gaudin.

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was prepared in the usual way and a solution of zinc nitrate and silver nitrate in water was made to flow over it. The hygroscopic nature of the zinc salt kept sufficient moisture on the plate to attain the desired end. Various modifications in procedure have been made since, but it is scarcely necessary to record them here; for details the reader may consult the volumes of the Photographic Journal, 1854-55.

Dry Plates.—It would appear that the first Spe n

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An image was obtained from the double film by means of the developer, which penetrated through the upper unexposed film, and the development was prolonged until an image appeared through the same film, when the plate was fixed, washed, and dried. A piece of gelatinous paper was cemented on the upper film, and a similar piece on the lower after both had been stripped off the glass. When quite dry the two papers were forcibly separated, a, film adhering to each. The upper film, although never exposed to light, showed an image in some cases more

plates. 74 Lumiere of 22d April and 27th May 1854 he describes | intense than the under film. The action of the alkaline his researches on the question; whilst in England Mr G. | developer was here manifest: the bromide of silver in R. Muirhead, on the 4th August 1854, stated that light | close contiguity to the exposed particles was reduced to acts almost as energetically on a dry surface as on a wet | the metallic state. Hence, from this and similar experi- after all the silver has been washed away from the former | ments Abney was able to announce that silver bromide could previous to desiccation. Dr Taupenot, however, seems to | not exist in the presence of freshly precipitated or reduced have been the first to use a dry-

plate process that was | metallic silver, and that a sub-bromide was immediately really workable. His original plan was to coat a plate | formed. Thus Ag,Bry+Ag.=2Ag,Br. From this it will with collodion, sensitize it in the ordinary manner, wash | be seen that the deposited silver 1s well within the sphere it, cause a solution of albumen to flow over the surface, | of molecular attraction, and that consequently a less ex- dry it, dip it in a bath of silver nitrate, acidified with acetic | posure (7.e., the reduction of fewer molecules of the sensi- acid, and wash and dry it again. The plate was then in a | tive salt) would give a developable image. condition to be exposed, and was to be developed with pyro- The alkalis used embraced the alkalis themselves and gallic acid and silver. In this method we have a double | the mono-carbonates. The sole reducing agent up till manipulation, which is long in execution, though perfectly | recent times was pyrogallic acid. In the year 1880 Abney effective, as we know from experience. found that hydrokinone was even more effective than Alkaline A great advance was made in all dry-plate processes | pyrogallic acid, its reducing power being stronger. Various devel- by the introduction of what is known as the "alkaline | other experimentalists tried other kindred substances, but oper developer," which is, however, inapplicable to all plates on | without adding to the list of really useful agents. In

which silver nitrate is present in the free state. It will be remembered that the developers previously described, either for collodion or paper processes, were dependent on

the reduction of metallic silver by some such agent as ferrous Another set of developers for dry plates dependent on Other sulphate, the reduction taking place gradually and the | the reduction of the silver bromide and the metallic state ary Pee reduced particles aggregating on those portions of the film | is founded on the fact that certain organic salts of iron i "etl

which had been acted upon by light. The action of light being to reduce the silver iodide, bromide, or chloride to the state of sub-salts (¢.g., sub-iodide of silver), these re- duced particles really acted as nuclei for the crystallized metal. It will be evident that in such a method of develop- ment the molecular attraction acts at distances relatively great compared with the diameters of the molecules them- selves. If it were possible to reduce the

altered particles it was plain that development would be more rapid, and also that the number of molecules reduced by light would be smaller if the metallic silver could be derived from silver compounds within shorter distances of the centres of mole- cular attraction. Alkaline development accomplished this to a very remarkable extent ; but the method is only really practicable when applied to films containing bromide and chloride of silver, as iodide is only slightly amenable to the alkaline body. We have not been able to trace the exact date of the introduction of this developer. It is be- lieved to be of American origin; and it is known that in the year 1862 Major Russell used it with the dry plates he introduced. An alkaline developer consists of an alkali, a

_teducing agent, and a restraining agent. These bodies,

when combined and applied to the solid bromide or chloride

1884, however, Herr Egli and Arnold Spiller brought out hydroxylamin as a reducing agent, which promises to be of great use if it can be prepared cheaply enough.

can be utilized. In 1877 Mr Carey Lea of Philadelphia and Mr William Willis announced almost simultaneously that a solution of ferrous oxalate in neutral potassium oxalate was effective as a developer, and from that time it has been universally acknowledged as a useful agent in that capacity; and it is a rare favourite, more especially amongst Continental photographers. In 1881 Abney showed that the addition of a small quantity of sodium hyposulphite very greatly increased its rapidity of action by reducing the time of exposure necessary to get a developable image. In 1882 Dr Eder demonstrated that gelatin chloride of silver plates could be developed with ferrous citrate, which could not be so readily accomplished with ferrous oxalate The exposure for chloride plates when developed by the latter was extremely prolonged. In the same year Abney showed that if ferrous oxalate were dissolved in potassium citrate a much more powerful agent was formed, which allowed not only gelatino-chloride plates to be readily developed but also collodio-chloride plates. These, it may be said, were undevelopable except by the precipitation method until the advent of the agents last-mentioned ; the chloride being as readily reduced as the sub-chloride rendered the development of an image impracticable.

of silver, after being acted upon by light, as when a plate was exposed to the camera image, were able to reduce the sub-bromide or sub-chloride, and to build up an image upon it, leaving the unaltered bromide intact, except so far as it

Aniongst the components of an alkaline developer we Re-_ mentioned a restrainer. This factor, generally a bromide ee or chloride of an alkali, serves probably to form a com-}? 23%

line de- pound with the silver salt which has not been acted upon velopel

was used in the building up. In 1877 Abney investigated this action and was able to demonstrate what actually occurred during the development. One of the experiments will show on what grounds this conclusion was arrived at. A dry plate was prepared by the bath process in the usual manner (to be described below), and exposed in the camera. The exposed film was covered with another film of collodio- bromide emulsion, which of course had not seen the light.

by light, and which is less easily reduced than is the silver salt alone,—the altered particles being left intact. The action of the restrainer is regarded by some as due to its combination with the alkali. But whichever theory is correct the fact remains that the restrainer does make the primitive salt less amenable to reduction. Such restrainers as the bromides of the alkalis act through chemical means ; but there are others which act through physical means, an

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example of which we have in the preparation of a gelatin plate. In this case the gelatin wraps up the particles of the silver compound in a colloidal sheath, as it were, and the developing solution only gets at them in a very gradual manner, for the natural tendency of all such reducing agents is to attack the particles on which least work has to be expended. In the case of bromide of silver the developer has only to remove one atom of bromine, whereas it has to remove two in the case of sub-bromide of silver. The sub-bromide formed by light and that sub- sequently produced in the act of development are therefore reduced. A large proportion of gelatin compared

with the silver salt in a film enables an alkaline developer to be used without any chemical restrainer; but when the gelatin bears a small proportion to the silver such a restrainer has to be used. With collodion films the particles of bromide are more or less unenveloped, and hence in this case some kind of chemical restrainer is absolutely necessary. We may say that the organic iron developers require less restraining in their action than do the alkaline developers.

Alkaline development was first used by Major Russell in a dry-plate process in which the collodion was merely bromized by means of bromides soluble in alcohol. The plate was prepared by immersion in a strong solution of silver nitrate and then washed and a preservative applied. The last-named agent executes two functions, one being to absorb the halogen liberated by the action of light and the other to preserve the film from atmospheric action.

exposed the image appears rapidly and gradually gains in intensity, and when all action from the developer ceases the plate is washed and further intensified with pyrogallic acid and silver as is a wet plate. The image is finally fixed in sodium hyposulphite.

In photographic processes not only has the chemical condition of the film to be taken into account but also the optical. When light falls on a semi-opaque or translucent film it is scattered by the particles in it and passes through the glass plate to the back. Here the rays ere partly transmitted and partly reflected, a very small quantity of them being absorbed by the material of the glass. Theory points out that the strongest reflexion from the back of the glass should take place at the vertical angle. In 1875 Abney investigated the subject and proved that practice agreed with theory in every respect, and that the image of a point of light in development on a plate was surrounded by a ring of reduced silver caused by the reflexion of the scattered light from the back surface of the glass, and that this ring was shaded inwards and outwards in such a manner that the shading varied with the intensity of the light reflected at different angles. To avoid "halation," as this phenomenon is called, it was usual for photographers to cover the back of their dry plates with some material which should be in

optical contact with it, and which at the same time should absorb all the photographically active rays, and only replace those which were incapable of reducing the silver salt. This was called “ backing a plate.”

Collodion Emulsion Processes—In 1864 Bolton and Collo-

Tannin, which Major Russell employed, if we mistake not, f Sayce published the germ of a process which revolutionized tion

is a good absorbent of the halogens, and acts as a varnish en

to the film. Other collodion dry-plate processes carried out by means of the silver-nitrate bath were very numerous at one time, many different organic bodies being also employed. In most cases ordinary iodized collodion was made use of, a small percentage of soluble bromide being as a rule added to it. When plates were developed by the alkaline method this extra bromide induced density, since it was the silver bromide alone which was amen- able to it, the iodide being almost entirely unaffected by the weak developer which was at that time in general use.

photographic manipulations, and by a subsequent substi- tution of gelatin for collodion gave an impetus to photo- graphy which has carried it to that state of perfection at which it has arrived at the present time (1884). In the ordinary collodion process it will be recollected that a sen- sitive film is procured by coating a glass plate with collodion containing the iodide and bromide of some soluble salt, and then, when set, immersing it in a solution of silver nitrate in order to form iodide and bromide of silver in the film. The question that presented itself to Bolton

Dry- One of the most successful bath dry-plate processes was | and Sayce was whether it might not be possible to get the plate introduced by Mr. R. Manners Gordon and was a really | sensitive salts of silver formed 7 the collodion whilst bath beautiful process. The plate was given an edging of | liquid, and a sensitive film given to a plate by merely let- proveS®- albumen and then coated with ordinary iodized collodion | ting this collodion, containing the salts in suspension, flow

to which one grain per ounce of cadmium bromide had been added. It was kept in the silver-nitrate bath for ten minutes, after which it was washed thoroughly. The following preservative was then applied :—

over the glass plate. Gaudin had attempted to do this with chloride of silver, and later G. W. Simpson had suc- ceeded in perfecting a printing process with collodion con- taining chloride of silver, citric acid, and nitrate of silver ; but the chloride until recently has been considered a slow

WePMUM NAC) Jo… .2siesunaonoarueneeesecee esos at 20 grs. a 1 Sug 1 fea ERE ci Sac sce a anacece i working salt, and nearly incapable of development. Up Water Be a mew ewe e eee er eee erases eetereseeeeetetsesses 6 dr. to the time of Bolton and Sayce's experiments 1odide of Z ee meme ee +S silver had been considered the staple of a sensitive film ; ALOT vcccceccccecccccetcccccsseevcccscsccssesceses .

These ingredients were mixed just before use and, after filtering, applied for one minute to the plate, which was allowed to drain and set up to dry naturally. Great latitude is admissible in the exposure ; it should rarely be less than four times or more than twenty times that which would be required for a wet plate under ordinary circum- stances. The image may be developed with ferrous sulphate restrained by a solution of gelatin and glacial acetic acid, to which a solution of silver nitrate is added just before application, or by the following alkaline developer :—

and, though bromide had been used by Major Russell and others, it had not met with so much favour as to lead to the omission of the iodide. At the date mentioned the suspension of iodide of silver in collodion was not thought practicable, and the inventors of the process turned their attention to bromide of silver, which they found could be secured in such a fine state of division that it remained suspended for a considerable time in collodion, and even when precipitated could be resuspended by simple agita- tion. The outline of the method was to dissolve a soluble bromide in plain collodion, and add to it drop by drop an

1 ayro Oa cuaet dy. o…2.2 ee one -waeterts sear 96 grs. alcoholic solution of silver nitrate, the latter being in : sl eae dont aS ae A ma excess or defect according to the will of the operator. To Ee a EE prepare a sensitive surface

the collodion containing the g, { Ammonium carbonate «0… 80 grs. emulsified sensitive salt was poured over a glass plate, NE eee carte vn ne eves n ~~*ooeteonsrnensnares 1 02. allowed to set, and washed till all the soluble salts result*~~

The development of the image requires 6 minims of No. 1, 4 drachm of No. 2, with 3 drachms of No. 3. If properly

ing from the double decomposition of the soluble bromide and the silver nitrate, together with the unaltered soluble

Modifi- cations in the process,

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bromide or silver nitrate, were removed, when the film was exposed wet, or allowed to dry and then exposed. The rapidity of these plates was not in any way remark- able, but the process had the great advantage of doing away with the sensitizing nitrate of silver bath, and thus avoiding a tiresome operation. The plates were developed by the alkaline method, and gave images which, if not primarily dense enough, could be intensified by the ap- plication of pyrogallic acid and silver nitrate as in the wet collodion process. Such was the crude germ of a method which was destined to effect a complete change in the aspect of photographic negative taking ;! but for some time it lay dormant. In fact there was at first much to discourage trial of it, since the plates often became veiled on development. Mr Carey Lea of Philadelphia, and Mr W. Cooper, jun., of Reading, may be said to have given the real impetus to the method. Mr Carey Lea, by introducing an acid into the emulsion, established a practicable collodion emulsion process, which was rapid and at the same time gave negative pictures free from veil. To secure the rapidity Carey Lea employed a fair excess of silver nitrate, and Colonel Wortley gained further rapidity by a still greater increase of it; the free use of acid was the only means by which this could be effected without hopelessly spoiling the emulsion. It may be well to mention that the effect of the addition of the mineral acids such as Carey Lea employed is to prevent the forma- tion of (or to destroy when formed) any sub-bromide or oxide of silver, either of which acts as a nucleus on which development can take place. Captain Abney first showed the theoretical effect of acids on the

sub-bromide, as also the effect of oxidizing agents on both the above compounds (see below). A more valuable modification was introduced in 1874 by Mr W. B. Bolton, one of the originators of the process, who allowed the ether and the alcohol of the collodion to evaporate, and then washed away all the soluble salts from the gelatinous mass formed of pyro- xylin and sensitive salt. After washing for a considerable time, the pellicle was dried naturally or washed with alcohol, and then the pyroxylin redissolved in ether and alcohol, leaving an emulsion of silver bromide, silver chloride, or silver iodide, or mixtures of all suspended in collodion, In this state the plate could be coated and dried at once for exposure. Sometimes, in fact generally, preservatives were used, as in the case of dry plates with the bath, in order to prevent the atmosphere from rendering the surface of the film spotty or insensitive on development. This modification had the great advantage of allowing a large quantity of sensitive salt to be prepared of precisely the same value as to rapidity of action and quality of film. A great advance in the use of the collodion bromide process was made by Colonel Stuart Wortley, who in June 1873 made known the powerful nature of a strongly alkaline developer as opposed to the weak one which up to that time had usually been employed. The brief exposure necessary for a collodion emulsion plate, or indeed any dry plate, had not been recognized till the introduction of this developer. This at once placed in the hands of photographers an instru- ment which by judicious use enabled them to shorten the tame of exposure of their plates and to render possible effects which had before been considered out of the question. As an example of the preparation of a collodion emulsion and the developer usually employed with it we give the following,— 24 oz. of alcohol, 5 oz. of ether, 75 grains of pyroxylin. In 1 oz. of alcohol are dissolved 200 grains of zinc bromide ;2 it is then acidulated with 4 or 5 drops

An account of Mr Sayce's process is to be found in the Photo- peal cae of October 1865, or the Photographic Journal of the same date.

oe advantages of this salt were pointed out by Mr. Warnerke in

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of nitric acid, and added to half the above collodion. In 2 drachms of water are dissolved 330 grains of silver nitrate, 1 oz. of alcohol being added. The

silvered alcohol is next poured into the other half of the collodion and the brominized collodion dropped in, care being taken to shake between the operations. An emulsion of bromide of silver is formed in suspension ; and it is in every case left for 10 to 20 hours to what is technically called "ripen," or, in other words, to become creamy when poured out upon a glass plate. When the emulsion has ripened it may be used at once or be poured out into a flat dish and the solvents allowed to evaporate till the pyroxylin becomes gelatinous. In this state it is washed in water till all the soluble salts are carried away. After this it may be either spread out on a cloth and dried or treated with two or three doses of alcohol, and then redissolved in equal parts of alcohol (specific gravity, 805) and ether (specific gravity, '720). In this condition it is a washed emulsion, and a glass plate can be coated with it and the film dried, or it may be washed and a preservative applied. An ex- cellent preservative introduced by Colonel Stuart Wortley is as follows :—

1. Salycin, a saturated solution in water.

CDRA aun couaus sree aneematee ie neecess eae 60 grs. "T Dstilled swear choccy er ccatye uses socee cases 1 02,

UGCA iis cua Teen akacs'scsookeee 48 ors, "NG WEEDING « sca carmcteaias, siete a a eas Oona eee ioz,

To make the preservative, take 2 oz. of No. 1, 1 oz. of No. 2, $ oz. of No. 3, 40 grains of sugar, and 7 oz. of water. The plates are immersed in this solution and dried. It is often necessary to give the plate a previous coating with very dilute albumen or gelatin in order to make the film of collodion adhere during development, which can be effected by the strong alkaline developer, or by the ferrous oxalate developer, previously noticed. ;

The type of a useful alkaline developer is as follows :—

Pyro gall imenewiec. 0, Seren… 96 grs. AIOE Bite eee ei esis Aca eee ulaat tsa 1 02. Potassiam bromide ….....0occsse.case803 12 grs,

- *(eWWaliow 'aitst ll lies 2.5 sacs ceeccanves ecatstees es il eye. 3 { ATMO My CarbOmate. 0-.00:s*

To develop the plate 6 minims of No. 1, $ drachm of No. 2, and 3 drachms of No. 3 are mixed together and made to flow over the plate after washing the preservative off under the tap. Sometimes the development is conducted in a flat dish, sometimes the solution is poured on the plate. The unreduced salts are eliminated by either cyanide of potassium or sodium hyposulphite. Intensity may be given to the image, if requisite, either before or after the "fixing" operation. Where resort is had to ferrous oxalate development, the developer is made in one of two ways—(1) by saturating a saturated solution of neutral potassium oxalate with ferrous oxalate, and adding an equal volume of a solution (10 grains to 1 oz. of water) of potassium bromide to restrain the action, or (2) by mixing, according to Eder's plan, 3 volumes by measure of a saturated solution of the potassium oxalate with 1 volume by measure of a saturated solution of ferrous sul- phate, and adding to the ferrous oxalate solution thus obtained an equal bulk of the above solution of potassium bromide. The development is conducted in precisely the same manner as indicated above, and the image is fixed by one of the same agents.

*Gelatin Emulsion Process.—The facility with which Gelatin collodion emulsion plates could be prepared had turned al] emulsion investigation into this channel, and collodion was not the P'°**

only vehicle that was tried for holding the sensitive salts in suspension, As early as September 1871 Dr R. L.

3 For further details the reader is referred to Instruction in Photo- graphy, p. 99.

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Maddox had tried emulsifying the silver salt in gelatin, and had produced negatives of rare excellence, as the present writer can testify from personal knowledge. In November 1873 Mr King described a similar process, getting rid of the soluble salts by washing. Efforts had also been made in this direction by Mr Burgess in July 1873. Mr R. Kennett in 1874 may be said to have been the first to put forward the gelatin emulsion process in a practical and workable form, as he then published a formula which gave good and quick results. It was not till 1878, however, that the great

capabilities of silver bromide when held in suspension by gelatin were fairly known ; in March of that year Mr C. Bennett showed that by keeping the gelatin solution liquid at a low temperature for as long as seven days extraordinary rapidity was conferred on the sensitive salt. The molecular condition of the silver bromide seemed to be altered, and to be amenable to a far more powerful developer than had hitherto been dreamt of. In 1874 the Belgian chemist Stas had shown

in 1879. Another improvement was effected by Mr W. B. Bolton by emulsifying the silver salt in a small quantity of gelatin and then raising the emulsion to boiling point, boiling it for from half an hour to an hour, when extreme rapidity was attained. It would be impossible to enumer- ate many minor improvements in this process that have from time to time been made; it is sufficient to have stated in historical sequence the different important stages through which it has passed. It may be useful to give an idea of the relative rapidities of the various processes we have described.

Daguerreotype, originally …..... half an hour's exposure.

Calotymelc cies: ecteesece ete aes 2or8minutes' ,, Colllodiion.
....c.ccteceren ee eee eee 10 seconds' – Collodionsemmullsion® 2..—.--5
—«.4- see 15 seconds' 55 Rapid gelatin emulsion …..... sth second 5

By this it will be seen what advances have been made in the art of photography during the forty-five years of its existence.

The following is an outline of two representative processes. All Gelatin operations should be conducted in light which can act but very emul- slightly on the sensitive salts employed, and this is more necessary sions.

that various modifications of silver bromide and chloride were possible, and it seemed that the green molecular

condition (one of those noted by Stas) of the bromide was attained by prolonged warming. It may in truth be said that the starting-paint of rapid plates was 1878, and that the full credit of this discovery should be allotted

to Mr C. Bennett. Both Kennett and Bennett got rid of the soluble salts from the emulsion by washing; and in order to attain success it was requisite that the bromide should be in excess of that necessary to combine with the silver nitrate used to form the emulsion. In June 1879 Abney showed that a good emulsion might be formed by precipitating a silver bromide by dropping a solution of a soluble bromide into a dilute solution of silver nitrate. The supernatant liquid was decanted, and after two or three washings with water the precipitate was mixed with the proper amount of gelatin. Dr van Monckhoven of Ghent, in experimenting with this process, hit upon the plan of obtaining the emulsion by splitting up silver car- bonate with hydrobromic acid, leaving no soluble salts to be extracted. He further, in August 1879, announced that he had obtained great rapidity by adding to the bromide emulsion a certain quantity of ammonia. This addition rapidly altered the bromide of silver from its ordinary state to the green molecular condition referred to above. At this point we have the branching off of the gelatin emulsion process into two great divisions, viz., that in which rapidity was gained by long-continued heating, and the other in which it was gained by the use of ammonia—a subdivision which is maintained to the present day. Photographers' opinions as to the respective merits of the two methods are much divided, some maintaining that the quality of the heated emulsion is better than that produced by alkalinity, and vice versa. We may mention that in 1881 Dr Herschell intro- duced a plan for making an alcoholic gelatin emulsion with the idea of inducing rapid drying of the plates, and in the same year Dr H. Vogel of Berlin brought forward his ideas for combining gelatin and pyroxylin together by means of a solvent which acted on the gelatin and allowed the addition of alcohol. in order to dissolve the pyroxylin. This micthod was called "collodio-gelatin emulsion," and apparently was only a shortlived process, which is not sur- prising, since its preparation involved the inhalation of the fumes of acetic acid.

The warming process introduced by Bennett was soon superseded. Colonel Stuart Wortley in 1879 announced that, by raising the temperature of the vessel in which the emulsion was stewed to 150° Fahr., instead of days being required to give the desired sensibility only a few hours were necessary. A further advance was made by boiling the emulsion, first practised, we believe, by Mr Mansfield

with this process than with others on account of the extreme ease with which the equilibrium of the molecules is upset in giving rise to the molecule which is developable. The light to work with, and which is safe, is gaslight or candlelight passing through a sheet of Chance's stained red glass backed by orange paper. Stained red glass allows but few chemically effective rays to pass through it, whilst the orange paper diffuses the light. If daylight be em- ployed, it is as well to have a double thickness of orange paper. The following should be weighed out :—

Pe ROLASSINIEOCICe meri er cte sete iee sere rte 5 grs. Oe SPotassiviiy Dram pase) 2 sisie islets EIS) 5

3. Nelson's No. 1 photographic gelatin …..... SOuess

Be USulversitraueuee eee sie eke ckeielstere saci ts ar We ry

5 { Autotype or other hard gelatin…..... OGRE. "eNelsoniSeNO. Wpekitine. .... smear nnieeel act OCI,

Nos. 8 and 5 are rapidly covered with water or washed for a few seconds under the tap to get rid of any adherent dust. No. 2 is dissolved in 14 oz. of water, and a little tincture of iodine added till it assumes a light sherry colour. No. 1 is dissolved in 60 minims, of water. No. 4 is dissolved in 4 oz. of water, and No. 3 is allowed to swell up in 1 oz. of water, and is then dissolved by heat. All the flasks containing these solutions are placed in water at 150° Fahr. and carried into the "dark room," as the orange-lighted chamber is ordinarily called ; Nos. 3 and 4 are then mixed together in a jar or flask, and No. 2 added drop by drop till half its bulk is gone, when No. 1 is added to the remainder, and the double solution is dropped in as before. When all is added there ought to be formed an emulsion which is very ruddy when examined by gaslight, or orange by daylight. The flask containing the emul- sion is next placed in boiling water, which is kept in a state of ebullition for about three-quarters of an hour. It is then ready, when the contents of the flask have cooled down to about 100° Fahr., for the addition of No. 5, which should in the interval be placed in 2 oz. of water to swell and finally be dissolved. The gelatin emulsion thus formed is placed in a cool place to set, after which it is turned into a piece of coarse canvas or mosquito-netting made into a bag. By squeezing, threads of gelatin

containing the sensitive salt can be made to fall into cold water; by this means the soluble salts are extracted. This is readily done in two or three hours by frequently changing the water, or by allowing running water to flow over the emulsion-threads. The gelatin is next drained by straining canvas over a jar and turning out the threads on to it, after which it is placed in a flask, and warmed till it dis- solves, half an ounce of alcohol being added. Finally, itis filtered through chamois leather or swansdown calico. In this state it is ready for the plates.

The other method of forming the emulsion is with ammonia. The same quantities as before are weighed out, but the solutions of Nos. 2and 8 are first mixed together and No. 4 is dissolved in 1 oz. of water, and strong ammonia of specific gravity '880 added to it till the oxide first precipitated is just redissolved. This ammoniacal solution is then dropped into Nos. 2 and 3 as previously described, and finally No. 1 is added. In this case no boiling 1s required ; but to secure rapidity it is as well that the emulsion should be kept an hour at a temperature of about 90° Fahr., after which half the total quantity of No. 5 is added. When set the emulsion is washed, drained, and redissolved as before ; but in order to give tenacity to the gelatin the remainder of No. 5 is added before the addition of the alcohol, and before filtering.

Coating the Plates.—Glass plates are best cleaned with nitric Coating acid, rinsed, and then treated with potash solution, rinsed again, theplate.

Expo- sure.

Develop- ment of plate.

Intensi- fying negative.

Varnish-

ing nega- tive.

Sensitiz- ing bath.

Toning and fix- ing print.

and dried with a clean cloth. They are then ready for receiving the emulsion, which, after being warmed to about 120° Fahr., is poured on them in sufficient quantity to cover well the surface. This being done, the plates are placed on a level shelf and allowed to stay there till the gelatin is thoroughly set ; they are then put in a drying cupboard, through which, by a simple contrivance, a current of warm air is made to pass. It should be remarked that the warmth is only necessary to enable the air to take up the moisture from the plates. They ought to be dry in about twelve hours, and they are ready for immediate use. '

Lxposure.—With a good emulsion and on a bright day the ex- posure of a plate to a landscape, with a lens whose aperture is one- sixteenth that of the focal distance, should not be more than one- half to one-fifth of a second. This time depends, of course, on the nature of the view ; if there be foliage in the immediate foreground it will be longer. In the portrait-studio, under the samc circum- stances, an exposure with a portrait-lens may be from half a second to four or five seconds.

Development of the Plate.—To develop the image either a ferrous oxalate solution or alkaline pyrogallic acid may be used. The former is conveniently prepared as described on p. 826. No chemical restrainer such as bromide of potassium is necessary, since the gelatin itself acts asa physical restrainer. If the alkaline developer be used, the following may be taken as a good standard :—

Pyrogallol 1. < Citric acid

\ ETC cos APe i tet ere Meng Ja) 1 oz 9 { Potassium bromide

IMEC. ener hehe aaa en eae

One drachm of each of these is taken and the mixture made up to 2 oz. with watcr. The plate is placed in a dish and the above poured over it without stoppage, whereupon the image gradually appears and, if the exposure has been properly timed, gains suff- cient density for printing purposes. It is fixed in a solution of hyposulphite of soda, as in the other processes already

described, and then thoroughly washed for two or three hours to eliminate all the soluble salt. This long washing is necessary on account of the nature of the gelatin.

Intensifying the Negative. —Sometimes it is necessary to intensify the negative, which can be done in a variety of ways with mercury salts. An excellent plan, introduced by the Platinotype Company, is to use a saturated solution of mercuric chloride in water, and a subsequent addition of 2 grains to the ounce of platinic chloride.

This is put in a dish and the metallic solution allowed to act till.

sufficient density is obtained. With most other methods with mercury the image is apt to become yellow and to fade ; with this apparently it is not.

Varnishing the Negative.—The negative is usually protected by receiving first a film of plain collodion and then a coat of shellac or other photographic varnish. This protects the gelatin from moisture and also from becoming stained with the silver nitrate owing to contact with the sensitive paper used in silver printing.

Printing Processes.

The first printing process may be said to be that of Fox Talbot (see above, p. 824), which has continucd to be generally employed to the present day (with the addition of albumen to give a surface to the print,—an addition first made, we believe, by Fox Talbot). Paper for printing is prepared by mixing 150 parts of ammonium chloride with 240 parts of spirits of wine and 2000 parts of water, though the proportions vary with different manufacturers. These Ingredients are dissolved, and the whites of fifteen fairly-sized eggs are added and the whole beaten up toafroth. In hot weather it 1s advisable to add a drop of carbolic acid to prevent decomposition. The albumen is allowed two or three days to settle, when it is filtered through a sponge placed in a funnel, or through two or three thicknesses of fine muslin, and transferred to a flat dish. The paper is cut of convenient size and allowed to float on the solution for about a minute, when it is taken off and dried in a warm room. For dead prints, on which colouring is to take place, plain salted paper is useful. It can be made of the

following pro- portions—80 parts of ammonium chloride, 100 parts of sodium citrate, 10 parts of gelatin, 5000 parts of distilled water. The gelatin is first dissolved in hot water and the remaining components are added. It is next filtered, and the paper allowed to float on it for three minutes, then withdrawn and dried.

Sensitizing Bath.—To sensitize the paper it is made to float on a 10 per cent. solution of silver nitrate for three minutes. It is then hung up and allowed to dry, after which it is ready for use. To print the image the paper is placed in a printing-frame over a negative and exposed to light. It is allowed to print till such time as the image appears rather darker than it should finally appear.

Toning and Fixing the Print.—The next operation is to tone and fix the print. In the earlier days this was accomplished by means of a bath of sel d'or,—a mixture of hyposulphite of soda and anric chloride. This gilded the darkened parts of the print which light

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had reduced to the semi-metallic state; and on removal of the chloride by means of hyposulphite an image composed of inetallic silver, an organic salt of silver, and gold was left behind. There was a suspicion, however, that part of the coloration was due to a combination of sulphur with the silver, not that pure sulphide of silver is in any degree fugitive, but the sulphuretted organic salt of silver seems to be liable to change. This gave place to a method of alkaline toning, or rather, we should say, of neutral toning, by employing auric chloride with a salt, such as the carbonate or acetate of soda, chloride of lime, borax, &. By this means there was no danger of sulphurization during the toning, to which the method by sel d'or was prone owing to the decomposition of the hyposulphite. The substances which can be employed in toning seem to be those in which an alkaline basc is combined with a weak acid, the latter being readily displaced by a stronger acid, such as nitric acid, which must exist in the paper after printing. This branch of photography owes much to the Rev. T. F. Hardwich, he having carried on extensive researches in connexion with it during 1854 and subsequent years. MM. Davanne and Girard, a little later, also

investigated the matter with fruitful results. The following may be taken as two typical toning-baths :—

AUTICCMIOMGE) ccc aateiee ete ee eee ee 1 part. Sodiumicarbenateyn. =: eer ere eee 10 parts. Winter, © cece rer oe are 5000 ,, BOTA oc o:.,0 sane cee a Cee 100); (a) { yore POA b AL LOR PROM ee 4000 ,, ») Aurie chloride 1 part. g WEED? 55s .c ete eee 4000 parts.

In the latter (a) and (8) are mixed in equal parts immediately

before use. Each of these is better used only once. A third bath is :— NUTIC CHIOMIGeIN eae eee eee meee 2 parts. Civleridevoislimes «. 26 eee enn 46 1 aarti ear en ae ices ee ER rescicur holo Beate nen 40 ,, IWRLET: & Sciicc saison yn eee eee ee 8000 ,,

These are mixed together, the water being warmed. When cool the solution is ready for use. In toning prints there isa distinct difference in the modus operandi according to the toning – bath employed. Thus in the first two baths the print must be thoroughly washed in water to enable all free silver nitrate to be carried away from the image, that salt forming no part in the chemical reactions. On the other hand, where free chlorine is used, the presence of free silver nitrate or some active chlorine absorbent is a necessity.

.In 1872 Abney showed that with such a toning-bath free silver

nitrate might be eliminated, and if the print were immersed in a solution of a salt such as lead nitrate the toning action proceeded rapidly and without causing any fading of the image whilst toning, which was not the case when the free silver nitrate was totally removed and no other chlorine absorbent substituted. This was an important factor in the matter, and one which had been overlooked. In the third bath the free silver nitrate should only be partially removed by washing. The print, having been partially washed or thoroughly washed, as the case may be, is immersed in the toning- bath till the image attains a purple or bluish tone, after which it is ready for fixing. The solution used for this purpose is a 20 per cent. solution of hyposulphite of soda, to which it is best to add a few drops of ainmmonia in order to render it alkalinc. About ten minutes suffice to cffect the conversion of the

chloride into hyposulphite of silver, which is soluble in hyposulphite of soda and can be removed by washing. The organic salts of silver seem, however, to form a different salt, which is partially insoluble, but which the ammonia just recommended helps to remove. If it is not removed, there is a sulphur compound left behind, according to Spiller, which by time and exposure becomes yellow.

The use of potassium cyanide for fixing prints is to be avoided, as this reagent attacks the organic coloured oxide which, if removed, would render the print a ghost. The washing of silver prints should be very complete, since it is said that the least trace of hyposulphite left behind renders the fading of the image a mere matter of time. Whether this be due to the hygroscopic nature of the hyposulphite and its reaction on the organic salt of silver, or to the destruction of the hyposulphite and sulphurizing of the black organic salt, seems at present to be an undetermined question. The stability of a print has been supposed to be increased by immersing it, after washing, in asolution of alum. The alum, like any other acid body, decomposes the hyposulphite into sulphur and sulphurous acid. If this be the case, it seems probable that the destruction of the hyposulphite by time is not the occasion of fading, but that its hygroscopic character is. This, however, as has already been said, is a moot point. It is usual to wash the prints some hours in running water. We have found that half a dozen changes of water, and between successive changes the application of a sponge to the back of each print sepa- rately, are equally or more efficacious. On drying, the print assumes a darker tone than what it has after leaving the fixing-bath.

Different tones can thus be given to a print by different toning- baths ; and the gold itself may be deposited in a ruddy form or in a blue form. The former molecular condition gives the red and' sepia tones, and the latter the blue and black tones. The degree

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of minute subdivision of the gold may be conceived when it is stated that, on a couple of sheets of albuminized paper fully printed, the gold necessary to

give a decided tone does not exceed half a grain. Collodio- Collodio-chloride Silver Printing Process.—In the history of the chloride emulsion processes we have already stated that Gaudin had attempted emul- _ to use silver chloride suspended in collodion, but it was not till the sion. year 1864 that any practical use was made of the suggestion so far as silver printing is concerned. In theautumn of that year Mr George Wharton Simpson worked out a method which has been more or less successfully employed, and is still one of the best with which we are acquainted. The formula appended is the original one which Mr Simpson published :—

60 parts.

60

br svetntavenatn ciatecens aso eee 64, ieee CONGIMM yr tras 5 oo) dase es seiee eens 100 op 3 {oie EIEIT less create Sveti oi ate eae ee mes 64, BPP AC ON ONG.) queer ce eeinaiaen hhc eoni ace 1000s,

To every 1000 parts of plain collodion 30 parts of No. 1, previ-

ously mixed with 60 parts of alcohol, are added ; 60 parts of No. 2

are next mixed with the collodion, and finally 30 parts of No. 3.

This forms an emulsion of silver chloride and also contains citric

acid and silver nitrate. The defect of this emulsion is that it con-

‘tains a large proportion of soluble salts, which are apt to crystallize

out on drying, more particularly if it be applied to glass plates.

The addition of the citric acid and the excess of silver nitrate is

the key to the whole process ; for, unless some body were present

which on exposure to light was capable of forming a highly-

coloured organic oxide of silver, no vigour would be obtained in

printing. If pure chloride be used, though an apparently strong image would be obtained, yet on fixing only a feeble trace of it

would be left, and the print would be worthless. The collodio-

chloride emulsion may be applied to glass, as before stated, or to

paper, and the printing carried on in the usual manncr. The

toning takes place by means of the chloride-of-lime bath or by

ammonium sulpho-cyanide and gold, which is practically a return

to the sel d'or bath. The organic salt formed in this procedure

does not seem so prone to be decomposed by keeping as docs that

formed by albumen, and the washing can be more completely

carried out. This is a beautiful process, and deserving of more attention than has hitherto been given to it.

Gelatino- Gelatino-citro-chloride Emulsion.—A modified emulsion printing

citro- _ process was introduced by Abney in 1881, which consisted in sus-

chloride pending silver chloride and silver citrate in gelatin, there being no

emul- excess of silver present. The formula of producing it is as follows :—

sion. {Peas chloride il.

*Potassium citrate…..... Water 2 ; BILVORAINIU TLL C rae ante vests eraser eee eee *(Water 3 {Wate Pie ROCHE ing tenes OT OIC OA OIIOS * (Water*

Nos. 2 and 3 are mixed together whilst warm, and No. 1 is then gently added, the gelatin solution being kept in brisk agitation. This produces the emulsion of citrate and chloride of silver. The gelatin containing the suspended salts is heated for five minutes at boiling point, when it is allowed to cool and subsequently slightly waslied, as in the gelatino-

bromide emulsion. It is then ready for application to paper or glass. The prints are of a beautiful colour, and seem to be fairly permanent. They may be readily toned by the borax or by the chloride of lime toning-bath, and are fixed with the hyposulphite solution of the strength before given. Printing Printing with Salts of Uraniuwm.—The sensitiveness of the salts with of uranium to light seems to have been discovered by Niepce, and uranium the fact was subsequently applied to photography by Burnett in salts. England. One of the original formule consisted of 20 parts of uranic nitrate with 600 parts of water. Paper, which is better if slightly sized previously with gelatin, is floated on this solution. When dry it is exposed beneath a negative, and a very faint image is produced ; but it can be developed into a strong one by 6 to 10 per cent. solution of silver nitrate to which a trace of acetic acid has been added, or by a 2 per cent. solution of auric chloride. In both these cases the silver and gold are deposited in the metallic state. Another developer ts a 2 per cent. solution of ferro-cyanide of potassium to which a trace of nitric acid has been added, sufficient to give a red coloration. The development takes place most readily by letting the paper float on thesc solutions. Wothly Type.—A variation was introduced in the uranium pro- cess by Herr Wothly in 1864, when he employed uranic nitrate with other salts in the collodion, and then coated starched paper with the product. The paper was printed until it assumed a bluish- black image, which was subsequently intensified by means of gold. The most generally uscd Wothly-type formula, however, consisted of a triple salt of silver nitrate, uranic nitrate, and ammonic nitrate, which were dissolved in collodion. This compound was applied to paper sized with arrowroot, and, after drying, the printing pro- ceeded in the usual manner, the image being subsequently fixed

Wothly type.

with hyposulphite of soda. The prints produced by this method were very beautiful, but for some reason they found no great favour with the public.

Printing with Chromates.—The first mention of the use of Printing purposes seems to have been with made by Mungo Ponton in May 1839, when he

stated that paper, chrom- if saturated with this salt and dried, and then exposed to the sun's ates,

potassium bichromate for printing

rays through a drawing, would produce a yellow picture on an orange ground, nothing more being required to fix it than wash- ing it in water, when a white picture on an orange ground was obtained. In 1840 M. E. Becquerel announced that paper sized with iodide of starch and soaked in bichromate of potash was, on drying, more sensitive than unsized paper. Joseplt Dixon of Massachusetts, in the following year, produced copies of bank-notes by using gum arabic with bichromate of potash spread upon a litho- graphic stone, and, after exposure of the sensitive surfacc through a bank-note, by washing away the unaltered gum and inking the stone as in ordinary lithography. The same process, with slight modifications, has been used quite recently by Simonet and Toovey of Brussels, and is capable of producing most excellent results, Dixon's method, however, was not published till 1854, when it appeared in the Scientific American, and consequently, as regards priority of publication, it ranks after Fox Talbot's photo-engraving process (see below), which was published in 1852. On 18th Decem- ber 1855 M. Alphonse Poitevin took out a patent in England, in which he vaguely described a method of taking a direct carbon- print by rendering gelatin insoluble through the action of light on bichromate of potash. This idea was taken up by Mr Pouncey of Dorchester, who perhaps was the first to produce veritable

carbon-prints, notwithstanding that Testud de Beauregard took Carbon-

out a somewhat similar patent to Poitevin's at the end of 1857. Mr Pouncey published his process on 1st January 1859; but, as described by him, it was by uo means in a perfect state, half- tones being wanting. The cause of this was first pointed out by Abbé Laborde in 1858, whilst describing a kindred process in a note to the French Photographic Society. He says, "In the sensi- tive film, however thin it may be, two distinct surfaces must be recognized—an outer, and an inner which is in contact with the paper. The action of light commences on the outer surface; in the washing, therefore, the half-tones lose their hold on the paper and are washed away." Mr J. C. Burnett in 1858 was the first to endeavour to get rid of this defect in

carbon-printing. In a paper to the Photographic Society of London he says, "There are two essential requisites . . . (2) that in printing the paper should have its wnprepared side (and not its prepared side, as in ordinary printing) placed in contact with the negative in the pressure- frame, as it is only by printing in this way that we can expect to be able afterwards to remove by washing the unacted-upon portions of the mixture. Ina positive of this sort printed from the front or prepared side the attainment of half-tones by washing away more or less depth of the mixture, according to the depth to whic it has been hardened, is prevented by the insoluble parts being on the surface and in consequence protecting the soluble part from the action of the water uscd in washing ; so that either nothing is removed, or by stecping very long till the inner soluble part is sufficiently softened the whole depth comes bodily away, leaving the paper white." This method of exposing through the back of the paper was crude and unsatisfactory, and in 1860 Fargier patented a proccss in which, after exposure to light of the gelatin film which contained pigment, the surface was coated with collodion, and the print placed in warm water, where it separated from the paper support and could be transferred to glass. Poitevin opposed this patent, and his opposition was successful, for he had used this means of detaching the films in his powder-carbon process, in which ferric chloride and tartaric acid were used. Fargier at any rate gave an impetus to carbon-printing, and J. W. Swan (to whom electric lighting owes so much) took up the matter, and in 1864 secured a patent. One of the great features in Swan's innovations was the

production of what is now known as "carbon-tissue," made by Carbon-coating paper with a mixture of gelatin, sugar, and colouring tissue.

matter, and rendered sensitive to light by means of bichromate of potash or ammonia. After exposure to light Swan placed the printed carbon-tissue on an india-rubber surface, to which it was made to adhere by pressure. The print was immersed in hot water, the paper backing stripped off, and the soluble gelatin containing colouring matter washed away. The picture could then be re- transferred to its final support of paper. In 1869 J. R. Johnson of London took out a patent in which he claimed that carbon-tissue which had been soaked in water for a short period, by its tendency to swell further, would adhere to any waterproof surface such as glass, metal, waxed paper,

&c., without any adhesive material being applied. Tlris was a most important and fruitful improvement. Johnson also added soap to the gelatin to prevent its excessive brittleness on drying, and made his final support of gelatinized paper, rendered insoluble by chrome alum. In 1874 J. R. Sawyer patented a flexible support for developing on; this was a sized paper coated with gelatin and treated with an ammoniacal solution of

shellac in borax, on which wax or resin wastubbed. The advantage of this flexible support is that the dark parts of the picture have no tendency to contract from the lighter parts, which they were apt to do when a metal plate was used, as was the case in Johnson's original process. With this patent, and minor improvements made since, carbon-printing has arrived at the state of perfection in whieh we find it to-day.

According to Liesegang, the carbon-tissue when prepared on a large scale consists of from 120 to 150 grains of gelatin (a soft kind), 15 grains of soap, 21 grains of sugar, and from 4 to 8 grains of dry colouring matter. The last-named may be of various kinds, from lamp-black pigment to soluble colonrs such as alizarin. The gelatin, sugar, and soap are put in water and allowed to stand for an hour, and then melted, the liquid afterwards receiving the colours, which have been ground with a mallet on a slab. The mixture is filtered through fine muslin. In making the tissue in large quantities the two ends of a piece of roll-paper are pasted together and the paper hung on two rollers; one of wood about 5 inches in diameter is fixed near the top of the room and the other over a trough contain- ing the gelatin solution, the paper being brought into contact with the surface of the gelatin by being made to revolve on the rollers. The thickness of the coating is proportional to the rate at which the paper is drawn over the gelatin: the slower the movement, the thicker the coating. The paper is taken off the rollers, cut through, and hung up to dry on wooden lathes. If it be required to make

is treated with potassium ferri-cyanide a blue compound is formed. If, therefore, a solution of a ferric salt be brushed over a paper, and the latter be dried, and then exposed behind a tracing, the parts of the ferric salt on

the papcr exposed beneath the white ground are converted into a ferrous salt, and if potassium ferri-cyanide be brushed over the paper, or the paper floated upon it, the tracing shows white lines on a blue ground. Another method is to mix ferri-cyanide of potassium with a ferric salt, and expose it behind a tracing or drawing. Where the light acts, the mixture is con- verted into a blue compound. The resulting print is the same as the foregoing. Another method of producing blue lines on a white ground is to expose paper coated with gum and a ferric salt to light, and then treat it with potassium ferro-cyanide. This body forms an insoluble blue compound with the ferric salt, whilst the ferrous salt is inactive, or only gives a soluble body. A further development of printing with salts of iron is the beautiful platinotype process. Sized paper is coated with a solution of ferric oxalate and a platinous salt, and exposed behind a negative. It is then floated on a hot solution of neutral potassium oxalate, when the image is formed of platinum black. This process was introduced by Mr W. Willis in 1874. The rationale of it is that a ferrous salt when in solution is capable of reducing a platinum salt to metallic platinum. In this case the ferrous salt is dissolved by the potassium oxalate, and at the moment of solution the platinum salt is reduced and forms the image. i

Photo-mechanical Printing Processes.— Allusion has already been Photo- made to the invention of Poitevin, who claimed to have discovered mechani- that a film of gelatin impregnated with bichromate of potash, eal print- after being acted upon by light and damping, would receive greasy ing.

the tissue sensitive at once, 120 grains of potassium dichromate should be mixed with the ingredients in the above formula. The carbon-tissue when prepared should be floated on a sensitizing bath consisting of one part of potassium dichromate in forty parts

Printing slowly dried. As the tissue is coloured, it is not possible to | metallic plates with gelatin impregnated with bichromate or tri- with ascertain by inspection of it whether the printing operation is | chromate of potash or ammonia and mercuric chloride, then treat- carbon- sufficiently carried out, and in order to ascertain this it is usual | ing with oleate of silver, exposing to light through a negative, tissue. _ to place a piece of ordinary silvered paper in an "actinometer," or | washing, inking with a

lithographic roller, and printing from "photometer," alongside the carbon-tissue to ascertain the amount | the plates as for an ordinary lithograph. The half-tints by this of light that has acted on it. There are several devices for ascer- | process were very good, and illustrations executed by it are to be taining this amount, the simplest being an arrangement of a | found in several existing works. The method of producing the varying number of thicknesses of gold-beater's skin. The value | plates, however, was most laborious, and it was not long before it of 1, 2, 3, &c., thicknesses of the skin as a screen to the light | was simplified by Albert of Munich. He had been experimenting is ascertained by experiment. Supposing it is judged that a | for many years, endeavouring to make the gelatin films more dur-sheet of tissue under some one negative ought to be exposed to | able than those of Tessie de Motay. He added guw-resins, alum, light corresponding to a given number of thicknesses, chloride of | tannin, and other such matters, which had the property of hardening silver paper is placed alongside the negative beneath the actinometer | gelatin ; but the difficulty of adding sufficient to the mass in its and allowed toremain there until it takes a visible tint beneath a | liquid state before the whole becaine coagulated rendered these un- number of thicknesses equivalent to the strength of the negative. | manageable. It at last occurred to him that if the hardening action After the tissue is removed from the printing-frame—supposing a | of light were utilized by exposing the surface next the plate to light double transfer is to be made—it is placed in a dish of cold water, | after or before exposing the front surface of the film and the image, face downwards, along with a piece of Sawyer's flexible support | the necessary hardness might be given to the gelatin without adding (already described). When the edges of the tissue begin to curl up, | auy chemical hardeners to it. In Tessie de Motay's process the its surface and that of the flexible support are brought together and | hardening was almost absent, and the plates were consequently not placed flat. The water is pressed out with an india-rubber squeezer | durable. It is evident that to effect this one of two things had to called a "squeegee"' and the two surfaces adhere. About a couple | be done: either the metallic plate used by Tessie de Motay must of minutes later they are placed in warm water of about 90° to 100° | be abandoned, or else the film must be stripped off the plate and Fahr., and the paper of the tissue, loosened by the gelatin solution exposed in that manner. Albert adopted the transparent plate, next it becoming soluble, can be

stripped off, leaving the image | and his success was assured, since instead of less than a hundred (reversed as regards right and left) on the flexible support. An | impressions being pulled from one plate he was able to take over a application of warm water removes the rest of the soluble gelatin | thousand. This occurred about 1867, but the formula was not and pigment. When dried, the image is transferred to its permanent | published for two or three years afterwards, when it was divulged support. This usually consists of white paper coated with gelatin by Ohm and Grossman, one of whom had been employed by Albert and made insoluble with chrome alum, though it may be mixed | of Munich, and had endeavonved to introduce a process which with barium sulphate or other similar pigments. This transfer- | resembled Albert's earlier efforts. The name of "Lichtdruck" was paper is made to receive the image by being soaked in hot water given about this time to these surface-printing processes, and Albert till it becomes slimy to the touch ; and the surface of the damped | may be considered, if not the inventor, at all events the perfecter print is brought in contact with the surface of the retransfer-paper | of the method. Another modification of "Lichtdruck" was patented in the same ntanner as was done with the flexible support and the | in England by Ernest Edwards under the name of " heliotype." Helio- carbon-tissue. When dry the retransfer-paper bearing the gelatin | This consisted in coating a glass plate, the surface of which was type. image can be stripped off the flexible support, which may be used | very finely ground, with bichromated gelatin to which a certain again as a temporary support for other pictures, amount of chrome alum had been added. 'The film itself was much Such isa brief outline of carbon-printing as practised at the pre- | thicker than that of the Albert type, since it had to be detached meee mea of course, to various modifications which need from the surface of the glass by stripping, which was rendered not be entere into here. We ought, however, to mention that if possible by the previous application of a waxing solution to the ie negative be used the image may be transferred at once plate. After the film was stripped off it was "exposed under a ae final support instead of to the temporary flexible support, | negative for the time necessary to give a good image with printing – = te a of practical value, since single-transfer are better | ink, after which the inner side was exposed to light for almost the eeee Ps : oS e Pa prints. ; _ | same length of time. The gelatin sheet was then transferred to a g rinting

with Salts of Iron.—Sir Johu Herschel and Mr Hunt in pewter plate, to which it was cemented by thick india-rubber cement

of water. This is effected by turning up about 1 inch from the end of the sheet of tissue (cut to the proper size), making a roll of it, and letting it unroll along the surface of the sensitizing solu- tion, where it is allowed to remain till the gelatin film feels soft. It is then taken off and hung up to dry in a dark room through wluch a current of dry warm air is passing. Tissue dried quickly, though not so sensitive, is more manageable to work than if more

with salts sundry papers and publications entered into various methods of

of iron,

printing with salts of iron. At the present time there are two or three which are practised, being used in draughtsmen's offices for copying tracings. When a ferric salt is exposed to light it be- comes reduced to the.ferrous state, and when this latter compound

ink on those parts which had been affected by light. But Paul Oreloth seems to have made the discovery previous to 1854, for in his patent of that year he states that his designs were inked with printing ink before being transferred to stone or zine. Tessie de Motay (in 1865) and Marechal of Metz, however, seem to have been the first to produce half-tones from gelatin films by means of greasy ink. Their general method of procedure consisted in coating

and soaked in water till all the soluble bichromate was extracted. After this it was placed in a type printing-press and inked with a lithographic or gelatin roller, and an impression pulled on paper in the same manner as in printing with type, save that a greater pressure was brought to bear on the surface. This pressure was necessary

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for two rcasons,—the relief of the image would be too great if only a moderate pressure were used, and the entire surface was so large that a

heavy pressure was requisite to make the paper bite on the ink. Between each pull the gelatin film was damped, the surface moisture taken off with a dry cloth, and the inking proceeded with. The drawback to this process is undoubtedly the great relief that is given from the film being so thick, but it is a miore manageable process in some respects than that of Albert, since the support is unbreakable. We should mention that Edwards also patented the use of two or more inks of different degrees of stiffness. The stiffest, which was generally black, adhered to the most deeply printed parts of the image, the next stiffest to the next most deeply printed parts, and so on. By this means the least deeply printed parts acquired a different tone from that of the deeper printed parts, which was an advantage as regards artistic effect. The same method of inking could be applicd to Albert's process with the same results. Since the time of the heliotype patent many im- provements have been made in the minor details of the operations, and various firms now produce prints in greasy ink very little if at all inferior to silver prints.

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basis in printer's ink. Being anxious to produce copies of such prints mechanically, he conceived the idea of trans- ferring the greasy ink impression to stone, and multiplying the impressions by mechanical lithography. Following very closely upon Asser, J. W. Osborne of Melbourne made a similar application ; his process is described by himself in the Photographic Journal for April 1860 as follows. "A negative is produced in the usual way, bear- ing to the original the desired ratio. . . . A positive is printed from this negative upon a sheet of (gelatinized) paper, so prepared that the image can be transferred to stone, it having been previously covered with greasy printer's ink. The impression is developed by washing away the soluble matter with hot water, which leaves the ink on the lines of print of the map or engraving." The process of transferring is accomplished in the ordinary

Wood- Woodbury Type.—This process was invented by Mr W. Wood- | way. arly in 1860 Colonel Sir H. James, R.E., F.R.S., bury bury about the year 1864, though we believe that Mr J. W. Swan brought forward the Southampton method of photo-litho- South- type. had been working independently in the same direction about the graphy, which had been

carefully worked out by Captain ampton same time. In October 1864 a description of the invention was dae : Scott WE. Wee dace ae ¢ method. given in the Photographic News. M. Gaudin claimed the principle | © VOUFCY Scott, tr.4, € give & detailed description o of the process, insisting that it was old, and basing his pretensions | 1# as practised at Southampton. on the fact that he had printed with translucent ink from intaglio Preparation of the Paper.—The mixture consists of 3 blocks engraved by hand ; bnt at the same time he remarked that oz. of Nelson's "fine art" gelatin and 2 oz. of potassium the application of the principle might lead to important results. : F . It was just these results which Mr Woodbury obtained, and for bichromate dissolved Me 10 oz. of water and added to the which he was entitled to the fullest credit. Woodbury type is a 40 oz. of water with which the gelatin, after Eas soak- combination of the principle upon which intaglio printing is base in as been previously mixed. ood and gralniess ban ination of the principle up hich intaglio printing is based g, has been p ly d. Good and grainless bank with that upon which a carbon-print is obtained. The general post-paper (chosen on account of its toughness) of medium features of the procedure will be understood from the foregoing de- phiclotess is) weaderto. Noak oa tea (after it has scription of the carbon-process. An image is obtained on bichro- : Rie" rich : matized gelatin from a negative of the usual kind by exposing a been strained) for three TMUEBUUES; when it is ung up mm thick layer of gelatin to hght and then washing away all its soluble | the dark to dry. It is again floated on the solution and it is necessary toobtain. At first Woodbury made electrotypes from which were previously uppermost, and then passed throu gh the mould, from which he could obtain prints mechanically. The 1 lith hi ee He th intaglio was placed on a specially devised printing-press, and the | copper-plate or lithographic press to obtain a smoo mould filled with gelatin containing colouring matter such as Indian | surface. The paper is next placed upon a negative and ink. A piece of papcr perfectly even in thickness was placed in con- printed in the ordinary manner, the negative being very iad eu eae Ba eee a Eee ee ee dense in those parts which should print white, and perfectly own upon this. e excess of p n é : : out, and, when slightly sct, it adhered to the paper and was brought | transparent where the black lines have to be impressed. away fromthe mould. After drying, a perfect picture was obtained |

From about two minutes’ exposure in sunshine to an in pigment, the image being reversed as regards right and left; | hour in dull light is requisite to give sufficient intensity to ian Soar eam lege eee ee by oe naira eee the prints, which are next covered with greasy printer’s and also by a modification of the process subsequcutly introduced | . : : me age: : : by Mr AW oftlsary. The gelatin rclief was made as before, and then ink, made from lithographic printing ink, pitch, varnish, by means of very heavy pressure in a hydraulic press the mould | palm oil, and wax. The inking is best done by covering a was squeezed into soft metal, from which the prints could be after- | lithographic stone with a fine layer by means of a roller, 1 ae ae : er vy ; : wards taken off. pa = ie ee are fa Pee ue hile and then passing the paper through the press as if pulling nature-printing is conducted, and at first sight it seems strange ° : wena : : that ie eh as gelatin should be able toimpress metal. Mr | lithographic print,—an operation ate my have to be Woodbury found that it made very little if any difference in the | repeated twice to ensure the whole suriace being covered, sharpness of the image if the relief was reversed and the back of | and yet not too thickly. The inked print is placed face the relief pressed into the out ae of Sige made ee print | uppermost on water of a temperature of about 90° Fahr., eorrect as regards right and left. e has not, however, been con- : tent with his original operations, but has further simplified them, and, when the soluble parts – the Soe tie a uP the outcome being what is known as the “stannotype process.” In their full quantity of water, the paper is laid onas oping 1880 he read a description of it before the French Photographic | glass plate, inked surface uppermost, and a gentle stream Society. The modification ae in eae : ake ee of warm water poured over it. This removes the soluble from a positive on glass. The mould, when hardened by ehemica : . . tle mew means a was indeed the casc with the original Woodbury-type gelatin and ie a) a nk y ieee ft aia a we process), was attached to a sheet of flat glass, and then covered by helped by th e application of a very solt sponge. en the foil and passed through a rolling press the cylinders of which | all the gelatin and ink except that forming the image have were covered with thick india-rubber. This forced the tinfoil into | heen removed, the paper is allowed to dry till ready to every crevice of the ite yielding a es ny aol a hae es transfer

to stone. The method admits of several variations to } tin impressions taken from it. rst Mr | . : . : ; Woolbacy ek acre from the relief, covered with tinfoil, | in detail, such as coating the gelatin with albumen and obtained from a negative, but he abandoned this for a simpler plan. | removing the soluble albumen by cold water, some of them a positive on glass in the ordinary manner adopted by | being excellent, especially where the relief of the developed He took a p c : ; oh; g é » especially Boe! photographers, from which he made a mould in gelatin. This he | }yin¢ is small, as relief isan enemy to the production of eovered with tinfoil and printed direct from it. fine work on a lithographic stone, since the ink, in passing Photo-Lithography. through the press, squeezes out and produces broad lines Photo- Reference has already been made to the effect of light | which should be otherwise fine. litho- —_ on gelatin impregnated with bichromate of potash, where- Another method of producing a transfer, called the Papyro-graphy. by the gelatin becomes insoluble, and also incapable of | "papyrotype process," was published by Abney in 1870, type

method.

absorbing water where the action of the light has had full play. It is this last phenomenon which occupies such an important place in photo-lithography. In the spring of 1859 Asser of Amsterdam produced photographs on a paper

in which the ink is put on to a surface of gelatin by means of a soft roller; and this has the great advantage that the ink can be removed at pleasure if any part is not satisfactorily inked, without the basis of the print being XVIII. — 105

Photo- engrav- ing.

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PHOTOGRAPHY

destroyed. In this process tough paper is coated with a | already quoted from the Marbenlehre of Goethe, where Photo-

fine layer of gelatin and subsequently treated with alum or chrome alum, afterwards receiving another coating, as in the Southampton method. The printing too is carried out as in the Southampton method, but not so deeply. After withdrawing the prints from the printing-frame they are soaked in cold water, and a roller is passed over them charged with an ink made of 4 parts of best lithographic chalk ink mixed with | part of palm oil. A roller coated with velvet is said to be better than the ordinary composi- tion rollers. The ink takes when the work is all clear ; the transfer is exposed to light, and is ready to be put down on stone or zinc.

Photo-Engraving and Photo-Reliefs.

This may be divided into two classes, one the production of an engraved plate for printing by the copper-plate press,

and the other for the production of clichés for printing'

with type. Niepce's process is still generally employed for the first when line engravings have to be reproduced. A copper plate is covered with asphaltum, a film negative placed in contact with it, and the necessary exposure given. After development with olive oil and turpentine the lines are shown as bare copper. The plate after being waxed at the back is next plunged into an acid bath and etched as are etched plates. When a half-tone negative has to be reproduced on copper Fox Talbot's method, described in his patents of 1852 and 1858, is still the simplest. A print on gelatin is transferred to a copper plate, and the surface etched by means of different strengths of ferric chloride, which renders the gelatin insoluble and imper- meable ; hence it will be seen that a weak solution of ferric chloride is able to reach the copper through the gelatin more readily than a strong one. In order to be successful it is necessary to give a grain to the plate; this is effected by sprinkling it with powdered resin, which is then warmed.

Relief plates for printing with type are usually made on zinc, If an ordinary photo-lithographic transfer be trans- ferred to zinc and then sprinkled with resin, the zinc may be immersed in weak acid and the uncovered parts eaten away. The regularity of the erosion is much increased by previously immersing the plate in a weak solution of copper sulphate. The particles of metallic copper deposited on the zinc form with it and with dilute acid

galvanic couples, which rapidly eat away the zinc. The etching bath should be kept in motion. The depth of the erosion is increased by littering the surface again with powdered resin, which adheres to the lines, and then heating the plate. The warmed resin runs down the eroded lines and protects them from under-cutting when again placed in acid, This process is applicable to line-engravings. Niepce's bitumen process is also applicable, but in that case a posi- tive must be applied to the plate to be etched, There exist several methods by which half-tone negatives may be reproduced for working off in the printing-press. They depend principally on breaking up the whole surface by means of lines. Thus, if, between the surface on which the printing is to take place (and which has been coated with some sensitive medium) and the positive, a film on which a network of lines has been photographed be inter- posed, it is evident that the resulting print will consist of the half-tone subject together with an image of the net- work of lines. This can be etched in the manner described above. Most of these processes are secret, but it is be- lieved that this is the one most generally practised.

Photographs in Natural Colours.

The first notice on record of coloured light impressing its own colours on a sensitive surface is in the passage

Seebeck of Jena (1810) describes the impression he ob- tained on paper impregnated with moist chloride of silver. In 1839 Sir J. Herschel (Athenzum, No. 621) gave a somewhat similar description. In 1848 Edmond Becquerel succeeded in reproducing upon a daguerreotype plate not only the colours of the spectrum but also, up to a certain point, the colours of drawings and objects. His method of proceeding was to give the silver plate a thin coating of silver chloride by immersing it in ferric or cupric chlor- ides. It may also be immersed in chlorine water till it takes a feeble rose tint. Becquerel preferred to chlorinize the plate by immersion in a solution of hydrochloric acid in water, attaching it to the positive pole of a voltaic couple, whilst the other pole he attached toa platinum plate also immersed in the acid solution. After a minute's subjection to the current the plate took successively a grey,

a yellow, a violet, and a blue tint, which order was again

repeated. When the violet tint appeared for the second time the plate was withdrawn and washed and dried over a spiritlamp. In this state it produced the spectrum colours, but it was found better to heat the plate till it assumed a rose tint. At a later date Niepce de St Victor chlorinized by means of chloride of lime, and made the surface more sensitive by applying a solution of lead chlor- ide in dextrin. G. W. Simpson also obtained coloured images on silver chloride emulsion in collodion, but they were less vivid and satisfactory than those obtained on daguerreotype plates. Poitevin obtained coloured images on ordinary chloride of silver paper by preparing it in the usual manner and washing it and exposing it to light. It was afterwards treated with a solution of bichromate of potash and cupric sulphate, and dried in darkness. Sheets So prepared gave coloured images from coloured pictures, which he stated could be fixed by sulphuric acid (Comptes fendus, 1868, vol. Ixi. p. 11). In the Bulletin de la Soctété Frangaise (1874) St Florent describes experiments which he made with the same object. He immerses ordi- nary or albuminized paper in silver nitrate and afterwards plunges it into a solution of uranium nitrate and zinc chloride acidulated with hydrochloric acid ; it is then ex- posed to light till it takes a violet, blue, or lavender tint. Before exposure the paper is floated on a solution of mer- curic nitrate, its surface dried, and exposed to a coloured image.

It is supposed—though it is very doubtful if it be so— that the nature of the chloride used to obtain the chloride of silver has a great effect on the colours impressed; and Niepce in 1857 made some observations on the relationship which seemed to exist between the coloured flames pro- duced by the metal and the colour impressed on a plate prepared with a chloride of such a metal. In 1880 (Proc. Roy. Soc.) Abney showed that the production of colour really resulted from the oxidation of the chloride that was coloured by light. Plates immersed in a solution of hydro- xyl took the colours of the spectrum much more rapidly than when not immersed, and the size of the molecules seemed to regulate the colour. He further stated that the whole of the spectrum colours might be derived from a mix- ture of two or at most three sizes of molecules. In 1841, during his researches on light, Robert Hunt published some results of colour-photography by means of fluoride of silver. A paper was washed with nitrate of silver and with sodium fluoride, and afterwards exposed to the spectrum. The action of the

spectrum commenced at the centre of the yellow ray and rapidly proceeded upwards, arriving at its maximum in the blue ray. As far as the indigo the action was uniform, whilst in the violet the paper took a brown tint. When it was previously exposed, however, a yellow space was occupied where the yellow

graphy

0

colours,

PHOTOGRAPHY

rays had acted, a green band where the green had acted, whilst in the blue and indigo it took an intense blue, and over the violet there was a ruddy brown. In reference to these coloured images on paper it must not be forgotten that pure salts of silver are not being dealt with as a rule. An organic salt of silver is usually mixed with chloride of silver paper, this salt being due to the sizing of the paper, which towards the red end of the spectrum is usually more sensitive than the chloride. If a piece of ordinary chloride of silver paper is exposed to the spectrum till an impression is made, it will usually be found that the blue colour of the darkened chloride is mixed with that due to the coloration of the darkened organic com- pound of silver in the violet region, whereas in the blue and green this organic compound is alone affected, and is of a different colour from that of the darkened mixed chloride and organic compound. This naturally gives an impression that the different rays yield different tints, whereas this result is simply owing to the different range of sensitiveness of the bodies. In the case of the silver chlorinized plate and of true collodio-chloride, in which no organic salt has been dissolved, we have a true coloration by the spectrum. At present there is no means of permanently fixing the coloured images which have been obtained, the effect of light being to destroy them. If protected from oxygen they last longer than if they have free access to it, as is the case when the surface is exposed to the air. That photography in colours may one day be

tilizes to a certain extent and fills the tube. When exposed to light chlorine is liberated from the chloride, and calomel forms on the sides of the tube. In this case the chloride darkens. Again, dried chloride sealed up in dry hydrogen discolours, owing to the combination of the chlorine with the hydrogen. Poitevin and H. W. Vogel first enunciated the law that for the reduction by light of the haloid salts of silver halogen absorbents were necessary, and it was by following out this law that the present rapidity in obtain- ing camera images has been rendered possible. To put it briefly, then, the action of light is a reducing action, which is aided by or entirely due to the fact that other bodies are present which will absorb the halogens. There is another action which seems to occur almost simultane- ously when exposure takes place in the absence of an active halogen absorbent, as is the case when the exposure is given in the air,—that is, an oxidizing action occurs. The molecules of the altered haloid salts take up oxygen and form oxides. An example of this has already been shown in the section on " photographs in natural colours." If a sensitive salt be exposed to light and then treated with an oxidizing substance, such as bichromate of potash, per- manganate of potash, hydroxyl, ozone, an image is not developed, but remains unaltered, showing that a change has been effected in the compound. If such an oxidized salt be treated very cautiously with nascent hydrogen the oxygen is withdrawn, and the image is again capable of development.!

Spectrum Effects on Silver Compounds.—The next in- Spec- quiry is as to the effect of the spectrum on the different trum silver compounds. We have already described Seebeck's ae =

(1810) experiments on the chloride of silver with the oom- spectrum whereby he obtained coloured photographs, but pounds.

accomplished is still possible, though the bright tints of nature can never be hoped for, since, as a rule, they are produced by sunshine, whereas on the plate they have to be viewed by diffused light.

Reducing Action of Light on Silver Salts—The action of light on

action of sensitive bodies has occupied the attention of many experi-

light.

mentalists from a very early period of photography. In 1777 Scheele, according to Hunt (Researches in Light), made the following experiments : —

"TI precipitated a solution of silver by sal-ammoniac ; then I edulcorated it and dricd the precipitate and exposed it to the beams of the sun for two weeks; after which I stirred the powder, and repeated the same several times. Hereupon I poured some caustic spirit of sal-ammoniac (strong ammonia) on this, in all appearance, black powder, and set it by for digestion. This men- struum dissolved a quantity of Zwna cornua (horn silver), though some black powder remained undissolved. The powder having been washcd was, for the greater part, dissolved by a pure acid of nitre (nitric acid), which, by the operation, acquired volatility. This solution I precipitated again by means of sal -ammoniac into horn silver. Hence it follows that the blackncss which the luna cornua acquires from the sun's light, and likewise the solution of silver poured on chalk, is silver by reduction. . . . mixed so much of distilled water with well-edulcorated horn silver as would just cover this powder. The half of this mixture I poured into a-white crystal phial, exposed it to the beams of the sun, and shook it scveral times each day ; the other half I set ina dark place. After having exposed the one mixture during the space of two weeks, I filtrated the water standing over the horn silver, grown already black ; I let some of this water fall by drops in a solution of silver, which was immediately precipitated into horn silver."

This, as far as we know, is the first intimation of the re- ducing action of light. From this it is evident that Scheele had found that the silver chloride was decomposed by the action of light liberating some form of chlorine. Others have repeated these experiments and found that chlorine is really liberated from the chloride ; but it 1s necessary that some body should be present which would absorb the chlorine, or, at all events, that the chlorine should be free to escape. A tube of dried silver chloride, sealed up am vacuo, will not discolour in the light, but keeps its ordinary white colour. A pretty experiment is to seal up in vacuo, at one end of a bent tube, perfectly dry chloride, and at the other a drop of mercury. The mercury vapour vola-

Scheele in 1777 allowed a spectrum to fall on the same material, and found that it blackened much more readily in the violet rays than in any other. Senebier's experi- ments have been already quoted at the beginning of this article. We merely mention these two for their historical interest, and pass on to the study of the action of the spectrum on different compounds by Sir J. Herschel which is to be found in the Philosophical Transactions for 1840. He there describes many interesting experiments, which became the foundations of nearly all subsequent researches of the same kind. The effects of the spectrum have been studied by various experimenters since that time, amongst whom we may mention Becquerel, Draper, Poitevin, H. W. Vogel, Schumann, and Abney. Fig. 1 (see pp. 836-38), which appeared in the Proceedings of the Royal Society for 1882, shows the most recent researches by the last-named. experimenter as regards the action of the spectrum on the three principal haloid salts of silver. We may mention that in two instances exception has been taken to these results—(1) by H. W. Vogel, who recognizes a difference of behaviour in the spectrum in chloride and bromide of silver when precipitated in alcoholic and aqueous solutions, and (2) by Schumann to the effect of the spectrum on the double iodide and bromide, and iodide and chloride. The latter experimenter finds that when the two salts are mixed after precipitation the results are correct, but that if the precipitations of the two salts take place together the most refrangible maximum of sensitiveness disappears. The dia- gram (see fig. 1), however, will give a very approximate approach to the truth. Nos. 33 and 34 show the effect of the spectrum on a peculiar modification of silver bromide made by Abney, in which the silver bromide is seen to be sensitive to the infra-red rays. This modification is, and will be, largely used in investigating this part of the spectrum.

1 See Abney, "Destruction of the Photographic Image," in Phil. Mag., vol. v., 1878; also Proc. Roy. Soc., vol. xxvii., 1878.

836 FROTO Gh A

[P.=print; D.= developed; le. =long exposure; s.e.= short exposure.]

Fie. 1.—Spectrum Effects on Salts of Silver.

- *AgI-t+AgNOs on paper…... P.*

F E DCBA Vy;

! . ee a n WLLL

a1 Sa TIA eet — eb coeeuei7® eH

AgNOs, soaked in NaCl, washed from excess, and exposed with KNO2

Paper floated on AgNO3 .. P.

AgI on paper washed from P,

excess of AgNO; – and

treated with KNO, AgI on paper washed from P. esa al ee ies! er ee |

AglI on paper washed from P. excess of AgNOs, ruddy tint

AgI on paper washed from P. excess of AgNOs, treated with KI and KNOj; or Agl in collodion

AgiI+AgNOg3 in albumen ., P.

AglI prepared in bath,treated D. with KI, washed, redipped (1.e.) in silver bath, developed

y with pyrogallic acid

ht 2 2

29 32

® AgI unpurified, treated, and D. developed as above…... Qe.) | it | f | AgI with trace of AgCl or D. AgBr, developed by acid (le.) or alkaline method

2? 2?

AgI+AgNOzin albuminized D. collodion, or on paper washed, acid development Agi+AgNOz in albuminized D. collodion, or on paper washed,

ferrous citrate developer Agl + AgNOs, prolonged ex- D. posure

TV

==

if

| im Cad SS Sey eH GET poser)

&

td Lr] 3 aR

&

A (o) w

on paper .. P.

33 os Pp;

{ 33 33 ee iP.

4

ee 7s Jez

Green AgBr in collodion, with P. || or without AgNO;

!

i Orange AgBr in collodion P. i| gelatin, with or without

|| Grey AgBr in gelatin …... P.

AgBr on paper washed from D. AgNOs, acid or ferrous (.e.) citro-oxalate developer

} h ”? ” |

IH

Grey AgBr in gelatin, de- D. veloped alkaline or ferrous (l.e.) oxalate

i 2 ”?

Pipe

wip

ey

Orange AgBr in collodion or D. gelatin, alkaline ferrous (l.e.) oxalate or acid developer

= a8 ices

PHY

Eifect of Dyes on Sensitive Films.—In 1874 Dyes and Dr Vogel of Berlin called attention to this sub- sensitive ject. He found that when films were stained #™s. with certain aniline and other dyes and exposed to the spectrum an increased action on develop- ment was shown in those parts of the spectrum which the dye absorbed. The dyes which pro- duced this action he called “ optical sensitizers,” whilst preservatives which absorbed the halogen liberated by light he called “chemical gensi- tizers.” A dye might, according to him, be an optical and a chemical sensitizer. He further claimed that, if a film were prepared in which the haloid soluble salt was in excess and then dyed, no action took place unless some “ chemi- cal sensitizer” were present. The term “optical sensitizer” seems a misnomer, since it is meant to imply that it renders the salts of silver sensi- tive to those regions of the spectrum to which they were previously insensitive, merely by the addition of the dye. The idea of the action of dyes was at first combated by many, but it was soon recognized that such an action did really exist. Abney showed in 1875 that certain dyes combined with silver and formed true coloured organic salts of silver which were sensi- tive to light; and Dr Amory went so far as to take a spectrum on a combination of silver with eosine, which was one of the dyes experimented upon by Major

Waterhouse, who had closely followed Dr Vogel, and proved that the spectrum acted simply on those parts which were absorbed by the compound. Abney further demonstrated that, in many cases at all events, the dyes were themselves reduced by light, thus acting as nuclei on which the silver could be deposited. He further showed that even when the haloid soluble salt was in excess the same character of spectrum was produced as when the silver nitrate was in excess, though the exposure had to be prolonged. This action he concluded was due to the action of the dye. The subject has been discussed again recently owing to the production of so-called iso-chromatic films, 2.¢., films which are supposed to be sensitive to all colours, and which are prepared on gelatin or collodion plates by dyeing them with eosine or some similar dye ; and the instructions given indicate that, if a coloured picture or landscape be photographed through yellow glass, the "yellows" will be denser in the negative than will the "blues." Experiment shows if a film after preparation be dipped in a solution of "eoside of silver," made by precipitating eosine with silver nitrate, wash- ing the precipitate, and then dissolving in water faintly alkaline, a negative taken in the usual way will give the "yellows" equally as dense as the "blues." The action of the yellow glass is to cut off the blue rays to which the normal salt is most sensitive, and to leave the yellow rays unaltered ; these then expend their energy upon the organic salt of silver. The advantage of rendering the yellows of a picture most in- tense in a negative is that the resulting print will be more nearly true to nature, since these are the most luminous rays. Further experi- ment ought surely to show how this can be done without the introduction of the tinted glass.

Action of the Spectrum on Chromic Salts — The salts most usually employed in photography

PHOTOGRA

z= > o a] ™ S o o >

Green AgBr in collodion, D. developed ferrous oxalate (L.e.)

/

aN

» oA Sicatax ARO

f ———

ia | a

AgCl+AgNOg on paper …. P.

wy Ry S

N

aa

AgCl+AgNO3 on paper, P. slight preliminary exposure

Mt

AgCl on paper washed from P. excess of AgNO3

| mie

&

J

AgCl on paper washed, P. treated with NaCl, washed again; also colladio-chloride of silver, and yel- low AgCl in gelatin

Grey AgCl in gelatin Pr

AgCl in collodion, excess of D. AgNOg3 or NaCl present, (1.e.) ferrous citrate or acid development

33 »

fo lh ee ee

Yellow AgClin gelatin, acid D. or ferrous citro-oxalate (1.e.) development —

> 3000 ee

Grey AgCl in gelatin, acid D. or ferrous citro-oxalate (1.e.) development

AMAA

ecole chee)

32 33

AgCl in collodion, short pre- D. liminary exposure, acid or ferrous citro-oxalate

| development

| Agi + AgBr + AgNO3 paper, moist

AgI+AgBr, AgNO3

i a ea el

on P.

N

NS

WY)

S Re h Rs Ss SS Ss

washed from P.

as 3 developed D. ferrous citro-oxalate

Dih)

i apiblui

Agi + AgBr+ AgNOz3, wet D. plate, acid or alkaline developer

AgI+AgBr in gelatin, devel- D. oped ferrous oxalate

**

||AgBr+AgI in collodion, D. acid or alkaline developer (Le.)

ce etes as (s.e.)

/8AgI+AgBr on paper…... PE

83AgI+ AgBr on paper, devel- D. oped gallic acid

A

», developed ferrous D. citrate

3AgI+AgBr+AgNOg3 collo- D. dion, wet plate, acid or(l.e.) alkaline developer :

*uh ee * iy*

3AgI+AgBr in gelatin, al- D. kaline or ferrous oxalate (1. & developer 8.e, shown.)

AgI+3AgBr on paper or in D. collodion, "ferrous citro- (1.e.) oxalate developer

t ill 24 | " "? AgI+3AgBr in gelatin, fer- D. rous oxalate developer le.) bs i

BON (4)

Ae a a8 ee = ie eae & Th C.F EO CEA BAgI + AgCl + AgNO on P. . aper, or paper washe 64 ee ral \ oe both dry : AgI+AgCl+AgNOz wet, or P. 3AgI+AgCl+KNOz2 wet

be

%.

ta

rae eek Yf of

(4

yo

8AgI + AgCl + AgNOs, or D. 8AgI + AgCl+KNOg on paper, developed with gal- lic acid or ferrous citro- oxalate

ri = 837

are the bichromates of the alkalis. The result Spec- of spectrum action in connexion with them is #™m™ confined to its own most refrangible end, com- eens mencing in the ultra-violet and reaching as far gaits,

as in the solar spectrum. The accompanying diagram (fig. 2) shows the relative action of the

H & G E 2 DiGB”A

No.!

No. 2 5 ae | B G Y OR

Fig. 2. The top letters have reference to the Fraunhofer lines; the bottom letters are the initials of the colours. The relative sensitiveness is shown by the height of the curve above the

_ base-line.

various parts of the spectrum on potassium

bichromate. If other bichromates are employed, the action will be found to be tolerably well represented by the figures. No. 1 is: the effect of a long exposure, No. 2 of a shorter one. It should be noticed that the solution of bichro- mate of potash absorbs those rays alone which

are effective in altering the bichromate. A

reference to pp. 831, 833 will show that the change is only possible in the presence of organic matter of some kind, such as gelatin or albumen.

Action of the Spectrum on Asphaltum.—This Spec- seems to be continued into and below the red ; trum ac- the blue rays, however, are the most effective. et The action of light on this body is to render it ‘ less soluble in its usual solvents. Compare this statement with that on p. 822.

Action of the Spectrum on Salts of LIron.— Spee- Many ferric salts have been used from time to trum- time in the production of prints, the most prays common at the present time being the ferric seaih oxalate, by which the beautiful platinotype prints are produced. We give this as a repre- sentation (fig. 3) of the spectra obtained on ferric

H 4.G FE DOBA

No.3

No.4 vi BG YOR

Fic. 3.—Same description as for fig. 2.

salts in general. Here, again, we have an ex- ample of the rigorous law that exists as to the correlation between absorption and chemical action. One of the most remarkable compounds of iron is that experimented upon by Sir J. Herschel and later by Lord Rayleigh, viz., ferro- cyanide of potassium and ferric chloride. If these two be brushed over paper and the paper be then exposed to a bright solar spectrum, action is exhibited into the infra-red region. This is one of the few instances in which these light- waves of low refrangibility are capable of pro- ducing any effect. The colour of this

solution is a muddy green, and analysis shows that it cuts off these rays as well as generally absorbs those of higher refrangibility.

Action of Light on Uranium.—tThe salts of Light uranium are affected by light in the presence of action on organic matter, and they too are only acted upon a by those rays which they absorb, Thus nitrate

nen. Uke % Bet and of uranium, which shows, too, absorption-bands in

ashe + Ag on D. :

paper, ferrous citro-oxal- the green blue, is affected more where these occur ate developer than in any other portion of the spectrum.

ieee at [me | 3AgI+AgCl in gelatin, de- D. It would be going beyond our province to do N\ aner arrer e more than enumerate the other metallic com- r AgI+AgCl in gelatin, de- D. | pounds which are amenable to chemical change SEARS SORE CAEN by the impact of radiation; suffice it to say AgI+3AgClon paper,washed P, | that some salts of mercury, gold, copper, lead, manganese, molybdenum, platinum, vanadium, Agl+SAg(l+AgNOs, wet .. P, | are all affected, but in a less degree than those which we have discussed. In the organic world AgI+3AgCl in gelatin, or D, | there are very few substances which do not

wale ey deed eae change by the continuous action of light, and it will be found that as a rule they are affected by

gCl+AgNOs, acid D. aera i i ae the blue end of the spectrum rather than by

AgBr, exposed to light, p, | the red end. For a more detailed account we treated with I, exposed to also} must refer the reader to The Chemical Lffects of spectrum. D. =

the Spectrum by Dr J. M. Eder (London).

The following table gives the names of the observers of the 3 : : : ; Sees ubstance. Observer. Date. action of light on different substances with the

date of publication of the several observations. It is nearly identical with one given Oxalate (mercuric) ..... ru 1776 by Dr Eder in his Geschichte der Photo-Chemic. Oxalate (MErGGNORS) oo a3 op ne cnmcia pf MMMM siecssins coe os cp oasis 1836 Sulphate and amnionia (mercurous) | Fourcroy …..... 1791 Acetate (mercurous) be dans ae SPOMOb Maori te 8 eta, os 1826 Substance. Observer. Date. Bromide (nerentic) 5.24 sciec.eg soee ohh Bi dlesokatel sae nilevsnsi 2 anaisyaye' 1828 ; a, Iodide (mercurous) ..... { OPGQE WICH Aetoei aga 2 3-7 1836 Silver. SATAG Beal cverc aes. s asic, cieaioviek 1836 Nitrate solution mixed with chalk, | J. H. Schulze …..... ieerg Lodid ¢ (HBKSUIRE) Sealine asjaca MEIN Ac meee ok ee 1836 gives in sunshine copies of writing Citrate Qmeremrig)) 5.2 eccacs oe wiesnicres BAO torent rece CATER S 1836 Nitrate solution on paper …..... EEeMOR® 55 Seh.eee § Setaneptse 1737 Tartrate and potassium (mercurous) | Carbonell and Bravo…... 1831 Nitrate photographically used…... Wedgwood and Davy …. 1802 Carbonate (merenme)) | ladeciacon «|| DRY once t o.cnescccenk. 1812 oF Weenie On BIE © oeecs ccc es cou, { ae auoiEkdiowatenets yates ae . eerrn : ene Fs Sea ce Bee a, DI ABOISNGe Osea cr = | Nitrate with white of egg …..... WB, MABCHORS «5 erste soe einec oF eA > ee ee ee ee eee ae Nitrate with lead salts ….. es Herschel 2. wecissacccussl | 1839 Iron. COIR eR ogi, th, eee ae | Jf, Bs BOGESRINS® oostevo oa 1757 Sulphate (ferrous) ..... CHITA Bs 25 cei Bap 1877 Chloride in the spectrum …..... ONCE ety. oe emia aces & 1777 Chloride (ferric) and alcohol…..... Bestuscheff 22.52.6652 << 1725 Chloride photographically used ….} Wedgwood …..... 1802 Cilloride and iher ...5..-escss0- SMCAROG satets teed sscink Scns & 1782 eee Dlaekened).. 7.5 saeecctatr es | eee Sie Aas cb toaeme 1839 Oxalate (enmay ise a5 sean. WOBEROMIOR ox ...e.c scoie ara oc 1831 OMIdO Fo ecg fearowo ces ccna ee: MEY Belo reste ous cheyere eee oe 1814 Ferro-cyanide of potassium ..... St, seen 1808 ~— My action of iodine(on metallic} Daguerre .....+... 1889 Sulpho-cyanide . a sit, usiokatetarseetviaya{all| ROME exaqeye 5 yosenear, syle 1818 silver Prussian biGe 5.2.65. bnecleacen coud BRS OOUE Fes e.g, Acieisiciem ernie Iodide photographically used ..... Bleached fois acyassieie s cadens 1840 Ferric Cineas with ammonium..... Herschel SRebO500 30-0900 i880 Iodide with gallic acid ..... PRION Ace dg, . € chsinioite 1841

Perrie tartrate: «ssc: secee denna ws UROL. oo cicsensceyserenaica ¢ 1840 Iodide with ferrous sulphate ..... PRG 2S 0 Peictars Se 5 ohisee, os <A 1844 CHrOMmBhe” ...ciasaias teen ee MSMR 2 yc F aietat isha tsre aie No.5. « 1844 Chloride and iodide by chlorine and | Claudet Meee sii, Ho.8 5 stopaicier- se 1840 iodine (on metallic silver Copper. Bromide ..... Aes std Tepercriee TSS NIOR 5 i103 ws eronchensray Hoe 1826 Chloride (cupric dissolved in ether) | Gehlen ....., 1804 Bromide by action of bromine (on| Goddard ..... 1840 Oxalate with sodium ..... BE WON Wetter rect pit 1813 metallic silver) CAROMREG 4. cece etiae cece Soe ersuids suoodeotbesuesosubEe has tye ON ha So asics Ba eu teen with ammonium ..... Hunt POD On tat te han ocr Ee eee Goo aan eecundasan. PED OWE «orig as seuss Se 8 13 Se Oxide with ammonia ..... MUTISOMEPNEH 5 2.606 c:0 ci. cc.0 1827 Iodide a ies eee ig RU RAG, 05 Mgr access er ceveraaet, BOVE AAN 5 Fe aic.no Pe wcities 1779 a re rrr ae Chromaie! Oe cats. iis tant Mitt GOMID .°.eaisevere ». ste 1798 Chloride (caproug) ai... .c.c5.c cece. cs iB WGC). escapee see ced 1859 CARDONGGBL Nas, K Sack earcincleis. Sachs Bee, says. « 3 x: avetsrs ave anee 1800 ane IPAROCMK 53 ois osczre< aco ean 1841 OR BIINE cocsia at eines Brot gis etE sc Bergman: socgeaseascal LTO Copper plates (iodized) ..... { AUG oy cigs fone teOea: 1841 BEB ROU Er 2 4s Satan jane IA PromansdOrl . eo ie:Ms s wcved 1793 Manganese. CCUG ae 8 At AR Bees One eae” ee WEOGQCNN cocscncosncuccsait ae Sul pHa, 22. sn mest ea ds ee tec eee Brandenburg ..... 1815 ae scratdeoencG eee nonne ae heeas i and Plisson.....] 1829 ORB 501.352 eryeeics ey OEE RIE CHOW, d- Ges cern cag 1832 tba se nore chaos pra ogi ORD. i oes e aseceeert) CARBO Potassium permanganate ..... PIPOMIMADELG) 55.0 7… USUI) ee aap ooanoe toot 1844 POPINIR e50010 841 ain tee | ME 1844 oo Sulphide by vapour of sulphur Cee Ge” axa ctereis roe Seer 1820 eo i ee DAVY casnne see sis une i – metallic silver) em Umrao g Schdnbein 1850 osphide by vapour of phos horus Ni ut 6 UDINE so. ose ai iain a Lecter ee AL en en ee eee (on metallic sliver) ss a aaa Bee Wee 1820 Benoni < 58 sts ok ee ee Gay -TUSBa@: onus ocd osc se 1811 mas = and cyanide of potassium ao. Feneageaocne coon oF 1844 old. CELMGE, ©

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1854).

Tue CAMERA.

Any article descriptive of photography would be incomplete without a brief notice of the development of the camera. The inventor of the camera obscura was Giambattista della PorTA (q.v), who was born at Naples about 1540. Except as a scientific toy, his apparatus was not of any practical use, though it is the parent of the apparatus which have grown up with photography. The principles which govern photographic lenses have been briefly given under Lieut (vol. xiv. p. 598 sg.) and Optics (vol. xvii. p. 802 sg.), and we need only state here that the finest camera which can_ be manufactured is useless unless the lens with which it has to be worked gives a flat field and an approximately achromatic image. Fic. 4.—Daguerre's Camera. M, stop of lens; J, lens; A, Dagucrre's camera ground glass plate, on which the image formed by the . . Jens is thrown, and for which the sensitive plate is sub- is shown in the stituted ; B, a mirror held at 45° by means of L, on which accompanyilg the operator viewed the image on the ground glass. The figure (fig. 4), ac- focus was obtained by sliding the inner box D towards cording to Hunt

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or from the lens

(Photography, 4th ed., p. 39), by which it will be seen that at first the idea existed of moving the plate away from the camera.

The first camera made in England, as far as is known, was that by Mr Palmer of Newgate Street, London, on the plan of Mr Fry and for him, in 1839. It was a very primitive apparatus, and was furnished with a lens made in the same year. 'he ordinary form of camera was simply a box, at one end of which was a lens, and at the other a ground glass for focusing, for which could be substituted a dark slide holding a sensitive plate. The adjustment of the focus was made by a rack and pinion motion attached to the lens. 'The arrangement, however, subsequently introduced for ob- taining a rough approximation to focns was to have a sliding inner box as in Daguerre's camera ; and finally to obtain the greatest sharp- ness the

rack and pinion motion attached to the lens was used. It is evident that this form of camera has an advantage over the single box, since it allows more than one lens to be used. Ottewill's folding camera was a great improvement, in that, for outdoor work, it enabled a cumbersome article to be folded up into a compact space. Figs. 5 and 6 show it set up for use, and folded. A still more portable form was made by Mr George Edwards of Carlton Colville (Suffolk) in 1853, and for it he obtained the medal of the Society of Arts. Its portability is shown by the fact that for a 7-inch by 53-inch plate its weight was only 2 fb 302. Broadly speaking its principle was that of a couple of frames attached by screws to a solid bar, one of

which carried the dark slide and the other the lens. The two were connected together and enclosed in a cloth bag, which in reality

Fig. 5.—Ottewill's Camera, set up for use. Fic. 6.—Ottewill's Camera, folded.

was the camera. This instrument is still used at the present day. It did not come into general use owing to its complicated arrangement of screws,—for the main point in any camera is that there should be as few loose screws as possible. The next improvement is that known as the bellows form, originally introduced, it is believed, by Captain Fowke, R.E., about 1854. Its introduction may be said to mark a new era in camera construction, and from that time to the present the bellows is to be found in nearly every improved form. After this invention the square instead of the tapering form of bellows was that most generally adopted. It is unnecessary to trace every improvement that has been introduced, but we give two typical

Fic. 7.—Hare's Camera.

ones (figs. 7 and 8), which are manufactured by Hare and Meagher

respectively. It will be noticed that in both these cameras there is an arrangement by which the focusing screens can be made to tilt at an angle

with the axis of the lens. This is called a swing-back ar- rangement, and is necessary when pho- tographing architec- tural subjects to pre- 9. vent vertical lines ~ converging in the picture. When the ground glass is in a Fic. 8.—Meagher's Camera.

vertical plane, no matter what tilt is given to the camera, vertical lines will always be shown as parallel in the picture. It will also be noticed that in these cameras there is an arrangement for focusing the lens by means of a rack and pinion motion in fig. 7, and by means of a screw in fig. 8. The gradual motion which can thus be given to the focusing screen is a great advantage, since lenses need not be constructed with rack and pinion mo- tion. Many suggestions have been put forward for adapting

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Fic. 9.—Marion & Co.'s' Camera,

the camera for a developing chamber, and we believe Archer's could be used for this purpose. Mr Newton in 1852 introduced a camera in which wet plates after exposure were developed by dipping in troughs of solutions ; and we might name many others who sub-

sequently worked at the same idea. It met, however, with no very | instruments is that they possess no striking advantage and many

great suecess. The introduction of dry plates was a great step for the landscape photographer, as it enabled him to carry a supply of plates in the field, and to develop them at home. To economize spaee and weight, what are known as "double baeks" were in- vented.

PHOTOMETRY, Crtestrau. The earliest records that have come down to us regarding the relative positions of the stars in the heavens have always been accompanied with estimations of their relative brightness. With this brightness was naturally associated the thought of the relative magnitudes

of the luminous bodies from whence the light was assumed to proceed. Hence in the grand catalogue of stars published by Ptolemy (c. 150 a.p.), but which had probably been formed three hundred years before his day by Hipparchus, the 1200 stars readily visible to the naked eye at Alexandria were divided into six classes according to their lustre, though instead of that term he uses the word péyeGos or "magnitude"; the brightest he designates as being of the first magnitude, and so down- wards till he comes to the minimum visibile, to which he assigns the sixth. These magnitudes he still further divides each into three. To those stars which, though ranged in any particular order of brightness, nevertheless exceed the average of that order in lustre he attaches the letter #, the initial letter in peifwv (greater), and to those in the same order which exhibit a lustre inferior to that of the average he affixes the letter «, the initial letter of éAdcowv. With this sort of subdivision he passes through all the six orders of magnitude. He does not, indeed, tell us the precise process by which these divisions were esti- mated, but the principle involved is obvious. The eye was here made the natural photometer, and it is certain that even in the instances where modern instrumental ap- pliances are called into requisition the ultimate appeal is made to perception by the eye. Moreover, it is one of the many remarkable instances of the acuteness and precision of the Greek mind that for upwards of 1590 years no real improvement was made in these estimations of lustre by any of Ptolemy's numerous successors in this field of re- search, Flamsteed was the first astronomer who extended the estimation of magnitude to stars visible only by the telescope, and he improved Ptolemy's notation by writing 4°3 instead of 6, »—indicating thereby an order of mag- nitude brighter than the average of a fourth, but inferior to that of a third— and 3-4 for 6, «¢, and so on. Later astronomers have sometimes adopted a more precise nomen- clature by subdividing the several orders decimally, but it does not appear that by any immediate and unaided effort the eye can estimate subdivisions of lustre exceeding the thirds adopted by the Greek philosopher.

It was not till the year 1796 that any real advance was made in stellar photometry. Sir W. Herschel, instead of assigning a particular magnitude to stars, arranged them in small groups of three or four or five, indicating the order in which they differed from each other in lustre at the time of observation. This method was admirably adapted to the discovery of any

variations in brightness which might occur in the lapse of time among the members of the group. Sir William observed in this way some 1400 stars, pub- lished in catalogues scattered through the Philosophical Transactions from 1796 to 1799 ; but he discontinued the work before its conclusion. It might be urged that such

disadvantages, unless for very special purposes. Hven for a minia- ture camera for taking instantaneous street views whilst holding the apparatus in the hand the use of double backs is to be preferred. An exeellent specimen is a camera made by Marion & Co. of London (see fig. 9): it is entirely of metal, and fitted with a finder and in- stantaneous shutter, —one which should stand any amount of rough usage. The whole apparatus, including a dozen plates, can easily be earried in the pocket. 'The dark slides are strongly made of metal. In the preeeding sketch, brief though it is, of the successive improvements in cameras, probably enough has been said to show the very remarkable development that has taken place since the days when a cigar-box and spectacle lens were used to obtain an image on a sensitive plate. (W. pE W. A.)

a work touches on no human interests, but it rightly seemed otherwise to the philosophic mind of the great astronomer. He remarked that the sun is, after all, only one among the stars, and that what befalls them in the way of varying light as time proceeds may also befall the sun. He puts the question, "Who would not wish to know what degree of permanency we ought to ascribe to the lustre of our sun?

Not only the stability of our climates, but the very exist-

ence of the whole animal and vegetable creation itself, is involved in the question. Where can we hope to receive information upon the subject butfrom astronomical observa- tions?" These researches of the elder Herschel were in due time followed by those of his son, Sir J ohn, about the year 1836 at the Cape of Good Hope. He both extended and improved the methods adopted by his father at Slough, and by a method of estimated sequences of magnitude he hoped to arrange all the stars visible to the naked eye at the Cape or in England in the order of their relative lustre, and then to reduce his results into the equivalent magni- tudes adopted by the universal consent of astronomers. Sir John, however, like his father, left this

important labour incomplete. Not only is the work one of great and con- tinuous effort, but the effects of ever-varying meteoro- logical conditions greatly impede it. Moreover, there is an unsatisfactory indefiniteness attending all estimations made by the unaided eye ; numerical or quantitative com- parisons are out of the question, and hence we find Sir John, in the very midst of establishing his "sequences," adopting also an instrumental method which might lead him to more definite results,

In the year when Sir John Herschel concluded his photometric work at the Cape (1838) Dr Argelander com- menced, and in 1843 completed, his Uranometria Nova, in which the magnitudes of all stars visible to the unaided eye in central Europe are catalogued with a precision and completeness previously unknown. It contains 3256 stars, and although it will probably be superseded by instru- niental photometry it must ever remain a monument of intelligent patience. Argelander's labours were confined to stars visible to the naked eye; by the aid of his assist- ants, Dr Schénfeld and Dr Kriiger, a catalogue of magni- tudes and celestial coordinates was ultimately published in their well-known Durchmusterung, extending to the enormous number of 324,000 stars.

Dr Gould also, in his Uranometria Argentina, has done similar work for stars visible only in the southern hemi- sphere, and with the aid of his colleagues has attained to an exactness and precision in his estimations of stellar lustre certainly not hitherto surpassed. There have been other worthy labourers in the same field, each of whom has rendered efficient service, such as Dr Heis and M. Houzeau ; but it is chiefly to the labours of Argelander and Gould that astronomers at present make their appeal,

It is to Sir John Herschel that we are indebted for the first successful attempt at stellar photometry by what may

1 Phil. Trans., 1796, p. 184.

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be termed "artificial" means. By the aid of appliances of the simplest kind he deflected the light of the moon (by means of the internal reflexion of a rectangular prism) through a small lens 0°12 inches in diameter and of very

short focus, 0°2253 inches, so as to form a sort of artificial star in its focus. By the instrumentality of strings and a wooden pole he could move this artificial star of compari- son so as to be in the same line of sight with any actual star whose light he proposed to measure. Other strings enabled him to remove this microscopic lunar image to such a distance from the eye that its light was adjudged to be sensibly the same as that of the star compared. The dis- tance of the short focused lens with the image contiguous to it was measured by a graduated tape, and the inverse squares of these distances afforded relative numerical mea- sures of the brightness of the several stars thus brought into ocular juxtaposition with the equalized light of the tiny lunar image. In this way he proceeded with the ob- servations of a considerable number of stars, and these, by appropriate methods, were reduced so as to afford the means of the comparison of their relative brightness when set side by side with results obtained by means of his '" sequences," and with the estimated magnitudes of preceding astro- nomers. Sir John, however, did not go on to the formation of a complete "uranometria." While he was thus busy at the Cape of Good Hope, Steinheil at Munich had com- pleted for Dr Seidel an instrument nearly the same in principle but more manageable in form. He divided the small object-glass of a telescope into two halves, one of which was movable in the direction of its axis. The images of two stars whose light he desired to compare were formed by the intervention of prismatic reflexion, nearly in the same line of sight, and one of the lenses was then moved until the light of the two stars near the respective foci of the semi-lenses seemed equal to the judgment of the observer's eye. The distance through which it was neces- sary to bring the movable lens furnished the data for com- paring the relative lustre of the two stars in question. A large amount of work was thus achieved by Seidel, which for a considerable time has been, with greater or less reason, regarded as worthy of confidence in regard to precision (Trans. Mun. Acad., vol. ii.). Br Zéllner substituted the deflected and reduced image of a lamp for one of Steinheil's stars, and the intensity of this light, or artificial star, he could by means of double refraction reduce in any measur- able proportion he pleased according to the well-known relations of polarized light. In this way he could equalize the light of the artificial lamp- star with that of the real star with which he compared it; and the division of the lens was thus dispensed with, but a new difficulty was intro- duced in the impossibility of maintaining the constancy of the flame. Dr Zéllner also

availed himself of the effects of double refraction in altering at will the colour of his artificial star of comparison. This ingenious form of photometer has enjoyed considerable reputation, but no astronomer has yet persevered in producing a complete '"'uranometria" by its aid. The most recent and probably the most successful device for a stellar photometer on the principle of equalizing lights is that invented by Professor Pickering of Harvard College. He deflects the light of Polaris, or of some other star such as A Ursa Minoris, by means of prismatic reflexion, and he contrives to form an image of it contiguous to the image of any other star selected on the meridian. The equalization of the lights is then effected by the intervention of a polarizing appa- ratus, such as that adopted by Zéllner. Thus the artificial and in many respects objectionable lamp-star of Zéllner is dispensed with. Professor Pickering, with singular invent- ive power, has devised many other forms of stellar photo- meters on virtually the same principle; for a detailed

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account of these labours the reader is referred to the Annals of the Harvard College Observatory (vol. xi.). Unlike his eminent predecessors, the American astronomer is persever- ing in the formation of a complete catalogue of star- magnitudes,

It has been already stated that mere estimations of relative brightness by the unaided eye are inadequate to the production of numerical quantitative results. In the instrumental devices explained, whether by means of the alteration of distances or by the known alteration of planes of polarization, no such defect exists. By their means it is possible to obtain a fairly exact numerical expression for the ratio of the intensities of the two lights measured. On applying a photometric measurement it is found that

- the ratio of the intensities of the lights in passing from one

magnitude to the next, even in the conventional magni- tudes of Argelander and Gould, is not by any means con- stant, and even hardly definite. At the suggestion of Mr Pogson it is now generally accepted by astronomers. that the adopted and conventional ratio of the intensity of light in passing from one magnitude to another shall be 27512, a convenient number because its

logarithm is ‘4, which is easily remembered, and still more so because on the whole it agrees better than any other number with the varying light-ratio existing among the hitherto received orders of magnitude obtained by eye-estimation alone.

There remains still another principle on which a stellar photometer may be successfully formed, and which has been recently largely applied to.the determination of star- magnitudes at the university observatory, Oxford. It is constructed on the principle that the absorption of light in passing through a uniform medium depends, ceteris paribus, upon the thickness. On this principle a thin wedge is constructed of homogeneous and nearly neutral-tinted glass, through which the images of stars formed in the focus of a telescope are viewed. Simple means are con- trived for measuring with great exactness the several thicknesses at which the light of these telescopic star- images is extinguished. In this way the light of any star can be readily compared with that of Polaris (or any other selected star) at the moment of observation, and tlius a catalogue of star-magnitudes can be formed. This method has been already applied by Professor Pritchard to all the brighter stars north of the equator; the results are published in the forty-seventh volume of the Memoirs of the Royal Astronomical Society, and are to be speedily followed by a complete catalogue, extending to all the stars in Argelander’s Uranometria Nova north of the equator, and to a few others beyond. For the details of the processes adopted the reader must here, as in all other cases, consult the original researches.

Even in a rapid sketch of so extensive a subject some notice must be taken of the application of photometry to the determination of the relative amount of light received on the earth from the sun, the moon, and the planets. The methods by which these ratios have been obtained are as simple as they are ingenious ; and for them we are mainly indebted to the labours of Bouguer and Bond. The former philosopher compared the light received from the sun with that from the moon in the following fashion in 1725. A hole one-twelfth of a Paris inch was made in the shutter of a darkened room; close to it was placed a concave lens, and in this way an image of the sun 9 inches in diameter was received on a screen. Bouguer found that this light was equal to that of a candle viewed at 16 nches from his eye. A similar experiment was repeated with the light of the full moon. The image now formed was

only two-thirds of an inch in diameter, and he found that the light of this image was comparable with that of the same candle viewed at a distance of 50 feet. From

these data and a very simple calculation it followed that the light of the sun was about 256,289 times that of the moon. Other experiments followed, and the average of all the results was that the light of the.sun was about 300,000 times the average light of a full moon, both being viewed in the heavens at the same altitudes. The details will be found in Bouguer's Z'raité @Optique. Wollaston in 1829 tried a series of experiments in which the ratio 801,072 was obtained ; but the omission of certain necessary pre-cautions vitiates the result (Phil. Trans., 1829). Bond (Mem. Amer. Acad., 1851, p. 295) adopted a different process. He formed the image of the sun on a silvered globe of some 10 inches diameter ; the light of this image was reflected on to a small mercurial thermometer bulb ; and then this second image was compared with a Bengal light so moved that the lights appeared to be equal. The same process was adopted with the full moon instead of with the sun. The result was that the sun's light was 470,980 times that of the moon. Seidel long before this date had compared the light of the mean full moon with that of Jupiter in mean opposition ; his result is 6430. So also this light of Jupiter was found to be °4864 times that of Venus at her brightest; and Jupiter was found to give 8-2 times the light of a Lyre. If, then, these numbers could be accepted with confidence, we should have the means of comparing the light received from the sun with that received from any of the stars. Adopting these pre- carious numbers on the authorities of Bond and Seidel we have the following results—

Sun's light= 470,980 that of the full moon. a = 622,600,000 ,, Venus at her brightest. – = 302,835,000 ,, Jupiter at mean opposition. 5, =5,970,500,000 ,, Sirius.

Lastly, Bouguer, by comparing the light of the full moon viewed at different altitudes with an artificial light, found that the atmosphere absorbs °1877 of the light incident on it at the zenith of any place. Professor Pritchard, from

photometric measures taken at Cairo, found this number to be °157. At Oxford it was ~~209. Thus Bouguer's determination indicates an absorptive capacity in the atmosphere of Brittany just midway between those of Oxford and Cairo. Seidel at Munich expresses "sur~~ prise" at finding his own results so nearly accordant with Bouguer's. These numbers, therefore, may be regarded as close approximations to fact. Oe)

PHOTOPHONE. See TELEPHONE.

PHRENOLOGY. This name was given by Forster in 1815 to the empirical system of psychology formulated by Gall and developed by his followers, especially by Spurz- heim and Combe. At first it was named "cranioscopy," "craniology," "'physiognomy," or "zoonomy," but Forster's naine was early adopted by Spurzheim, and became that whereby the system is now known. The principles upon which it is based are four: (1) the brain is the organ of the mind ; (2) the mental powers of man can be analysed into a definite number of independent faculties ; (3) these faculties are innate, and each has its seat in a definite region of the brain ; (4) the size of each of these regions is the measure of the power of manifesting the faculty associated with it. While phrenology is thus, on the one hand, a system of mental philosophy, it has a second and more popular aspect as a method whereby the disposition and character of the individual may be ascertained. These two sides of the subject are distinct from each other, for,

' Since this article was put in type, Professor Pickering at Harvard College has published his concluded results. Professor Pritchard at Oxford has also completed his photometric measures of some 2000 of the same stars. Taken as a whole, and as comprising the first com- plete and systematic efforts in a new and difficult line of research. the agreements of the two catalogues may fairly be regarded as very satis- factory, not to say surprising.

while it can only serve as a reliable guide for reading character on the assumption of its truth as a philosophic system, yet the possibility of its practical application does not necessarily follow from the establishment of the truth of its theoretic side. .

History.—That the phenomena of mind are in some measure connected with the action of the brain has been recognized from a very early age of philosophy. It is true that Aristotle? describes the brain as the coldest and most bloodless of bodily organs, of the nature of water and earth, whose chief purpose is to temper the excessive heat of the heart, as the cooler regions of the firmament condense the vapours rising from the earth. In his view, as in that of most of the earlier writers of other nations of antiquity, the heart is the seat of hfe; to it, not to the brain, the Hebrew writers refer thoughts and affections, while they considered judgment as seated sometimes in the head, sometimes in the kidneys. This was, likewise, the teach- ing of the ancient Egyptian philosophy ; and hence, while many rites were practised and many prayers offered for the preservation of the heart of the deceased, the brains were passed over with very little precaution for their pre- servation.4 The influence of the Aristotelian teaching is traceable in that of some of the earlier classic writings on philosophy, as is that of the Hebrews in our own collo- quial language ; but we learn from Diogenes Laertius° that much more accurate physiological views were held by Pythagoras, who believed the mind and the intellect to have their seat in the brain. The theory of Hippocrates was Pythagorean rather than Aristotelian, for, although in one passage in his work De Corde he expresses himself rather doubtfully, yet elsewhere he clearly states that he considers the brain to be the index and messenger of the intellect.6 The cerebral seat of sense-perception is also taught by Plato,' who puts into the mouth of Socrates the theory that the brain is the organ affected by the senses, whereby memory and opinion arise, and from whence know- ledge springs. The classic poets also notice this depend- ence of mind on brain; for example, in the Clouds (v. 1276) Strepsiades accuses Amynias of not being in his right mind, and, on being asked why, responds, '"' You seem to me as if you had had a concussion of the brain."

The two founders of anatomical science, Erasistratus and Herophilus, who lived in the days of Ptolemy Soter, taught not only that the brain was the seat of sensation and of intellect, but also that there was therein a certain degree of localization of function. Erasistratus believed that the sensory nerves arose from the brain-membranes, the motor from the cerebral substance. Herophilus was apparently the first who held that the vital forces resided in and circulated from the ventricles of the brain, at least so we

gather from Celsus and the other authors who have preserved his views. By the influence of the writings of Galen,® which directly teach that the brain is the seat of

2 De partibus animalium, ii. c. 7 (Paris, 1629, p. 986).

3 In the Chaldee portion of Daniel (ii. 28, iv. 5, vii. 1) visions and thoughts are referred to the head. For other particulars as to early views see Nasse on the psychical relations of the heart in Zeitschr. f. psychische Aerate, i.,1818. A few of the later medical writers express similar views ; see Santa Cruz, Opuscula medica, Madrid, 1624.

4 Book of the Dead, ch. xxvi.-xxx.

> viii. 30, ed. Cobet, Paris, 1850, p. 211,—“ @pévas 6¢ xai vodv, ra év TH eryKepary.”

§ “De morbo sacro,” in Opp., ed. Ktihn, i. 612 sq.; also Epist., iii. 824. Among later writers Licetus of Genoa taught the coextension of soul and body, upon which subject he wrote two books (Padua, 1616). In this connexion may be noted a curious work by Schegkius, Dia- logus de anime principatu, Aristotelis et Galeni rationes preferens quibus ille cordi, hic cerebro, principatum atirtbuit, Tiibingen, 1542.

7 Phedo, ch. xlv., Valpy’s ed., 1838, p. 128. See also Haller’s Bibl. anat., i. 30.

8 De usu partium, ed. Kiihn, iii. 700,—‘ ras pev ofv dodelées TOU THY AoyLoTIKhY Wuxi oikely év eyxépary, Kal mvedua WuxeKdy

soul and intellect, the Pythagorean doctrine became uni- versally received among philosophers. According to the Galenical theory of life, the animal spirits arising from the brain are conveyed thence by the arteries through the body. These animal spirits have their origin in the ven- tricles of the brain, and pass thence to the heart. It is true that in one place (viii. 159) he refers their origin to the cerebral substance, but the ventricular theory was

that adopted by his followers. This view is held by the Greek physicians,' some of whom even speculated on the relation of the intellect to the shape and size of the head. The Arabians adopted the same hypothesis, so we find Aver- rhoes? correcting Aristotle's notion of cerebral physiology in favour of Galen's view. Rhazes? also extended this by giving a sketch of a scheme of psychic localization ; and Avicenna added to the regions recognized by pre- vious authors by interpolating one of his own. Such of the early Christian authors as had occasion to refer in their writings to the relation of soul to body naturally adopted the teaching of Galen, and suited it to their theology, thereby conferring on it an importance which rendered correction difficult. Thomas Aquinas® thus ex- presses his acquiescence in the theory of localization, as also in a sense does Tertullian.®*

Early in the 13th century Albertus Magnus' gave a detailed description of the distribution of mental and psychical faculties in the head. The anterior region he assigned to judgment, the middle to imagination, and the posterior to memory. A somewhat similar allocation was made by Gordon, professor of medicine in Montpellier (1296), who assigned common sensation and the reception of impressions to the anterior cornua of the lateral ven- tricles, phantasia to the posterior, this power being two- fold (tmaginativa and cogitativa), judgment or xstimativa to the third ventricle, and memory to the fourth.® Figures of a similar division were given by Petrus Montagnana! and Lodovico Dolce," still later by Ghiradelli }? of Bologna and by Theodore Gall of Antwerp.!8 That the "vital spirits " resided in the ventricles was doubted by many, and refuted by a few of the anatomists of the 17th century. Bauhin in 162114 attacked the old view, and Hoffmann of Altorf

atr@ mepréxecOar waumodv." See also v. 288, viii. 159, xv. 360. In his Definitiones medice (467, xix. 459) he says that the brain has a puxixh Svvauts, but does not specify in what part the power inheres.

1 Sce Paulus Atgineta, Stephens's ed., 1567, cap. 62, col. 363, also Actuarius, De actionibus et affectibus spiritus animalis, Paris, 1556,

5 DOS Te 4 2 Comment. in Arist., Latin tr., Venice, 1550, vi. 73.

3 “Tmaginatio quidem in duobus ventriculis anterioribus perficitur. Cogitatio vero in medio expletur. Memoria autem posteriorem possidet ventriculam.” De re medica, Gérard’s tr., Basel, 1554, i. p. 9.

4 Lib. can., 1507, p. 19, and De naturalibus, c. 6.

5 Summa theologiw, ed. Migne, i. pp. 1094, 1106-7. – Prochaska and his translator Laycock (Jind and Brain, ii. 163) charge Duns Scotus with holding this view, which most probably he did; he does not express it, however, but simply specifies the cerebrum and its root, the spinal cord, as the source of the nerves along which sensory impulses travel. Comment. de anima, Leyden, 16387, i. 515.

6 De anima, exiv., ed. Franeker, 1597, p. 268.

7 Opera, Leyden, 1651, iii. 124, vi. 20.

& Lilium medicine, Venice, 1494, 101.

9 Avicenna’s fifth region is interposed between imaginativa and wstimativa (De naturalibus, c. vi.). Thomas Aquinas combines the last two, which he says are possessed by the same eminence (op. Cit. i. 1107). On the other hand, he says of ratio particulars, medici assionant determinatum organum, scilicet mediam partem capitis” (i. 1106). 10 Physiognomia, Padua, 1491.

11 Dialogo nel quale si ragione del modo di accrecere e conservar la memoria, Venice, 1562, 27. 12 Physiognomia, 1670.

13 Tabule element. scientiz, Rome, 1632.

14 Theatr. anat., Basel, 1621, iii. 314; Caspar Hoffmann, De usu cerebri, Leipsic, 1619. See also Spigelius, De corp. humant fabrica, Amsterdam, 1645, 296 ; Varolius, 1591, p. 6; Wepfer, Historiarum apoplecticarum potissimum anatonuz subjectorum aucta- rium, Amsterdam, 1681. See also many of the anatomical works of this age, such as those of Fernel, Cabrol, Argenterius, Rolfinck, &c.

showed that, as the ventricles were closed cavities, they could not transmit any material fluid. That these spirits existed at all was doubted by Alexander Benedictus,1® Plater,!® and a few others; but they were believed in by the great majority of 17th and even of 18th century medical writers, many of whom conceived that the ven- tricles were "semper pleni spiritibus animalibus flammulis similibus, quorum beneficiis intelligimus, sentimus,et move- mus,"!" and the opponents of this view were strongly assailed by Riolan and others as revolutionary. The grey matter of the surface of the cerebrum was first re- cognized as the true dynamic element by Malpighi 8 and Willis.19 The latter regarded the convoluted surface of the cerebrum as the seat of the memory and the will, the convolutions being intended to retain the animal spirits for the various acts of imagination and memory. Ima- gination he 'described as seated in the corpus callosum,

'Sense-perception in the corpus striatum, and impetus et

perturbatio in the basal parts of the cerebrum above the crura. The thalami he regarded as the centres of sight and the cerebellum of involuntary acts. Columbus"? ridi- culed the idea that the convoluted surface can have any- thing to do with intellect, as the ass, a proverbially stupid animal, has a convoluted cerebrum. According to his view, the convolutions are for the purpose of lightening the brain and facilitating its movements. Succeeding anatomists simply varied these localizations according to their respective fancies. Lancisi placed sensc- perception in the corpus callosum, Vieussens in the centrum ovale majus. Descartes supposed the soul to be seated in the pineal gland, Lotze in the pons Varolii.2!_ Meyer considered abstract ideas to arise in the cerebellum, and memory to have its seat at the roots of the nerves.22

Of later writers three deserve special notice as having largely prepared the way for the more modern school of phrenology. Unzer of Halle in his work on physiology ex- tended the pre-existing theories of localization. Metzger, twenty years before the publication of Prochaska's work, had proposed to make a series of observations on the anatomical characters of the brains of persons of marked intellectual peculiarity ; but it is not known to the present writer whether he ever carried this into effect. In a more special manner Prochaska of Vienna may be looked upon as the father of

*phrenology, as in his work on the nervous system, published in Vienna in 1784, are to be found the germs of the later views which were propounded in that city twelve years later.*4*

The system formulated by Gall is thus a modern ex- pansion of an old empirical philosophy, and its immediate parentage is easily traced, although, according to Gall's

15 Alexander Benedictus, Anatomica, vol. iii., Basel, 1527. Quer- cetanus is said by Laycock (following Prochaska) to have assailed this doctrine of spirits,—on what ground is not apparent, as he certainly expresses himself as a believer in the old view; see Tetras graviss. totius capitis affect., Marburg, 1606, x. 89. Possibly Prochaska may allude to an obscure passage in the work of the other Quercetanus (Eustachius), Acroamaton in librum Hippocratis, Basel, 1549, p. 14, not to the better-known Josephus Armeniacus, but he gives no reference.

16 Onera, Basel, 1625, col. 22, 89.

WW Joelis opera medica, Amsterdam; 1668, 22.

18 "Fpist. de cerebro et cort. cereb. ad Fracassatum,' Geneva, 1685, vol. ii.

19 De anima brutoruwm, Oxford, 1677, p. 71, "he particule sub- tilissime, spiritus animales dicte, partium istarum substantias corti- eales primo subeuntes, exinde in utriusque meditullia," &c., also p. 76 sq.

2 De re anatomica, Frankfort, 1598, p. 350.

21 Fechner, Psychophysica, ti. 382.

22 Some of the medieval views were very fanciful, thus Schabtai Donolo taught that the spirit of life has its seat in the brain-mem- brane, expanded over the brain and subarachnoid fiuid, as the Shekinah in the heavens arched over the earth and waters. See Der Mensch als Gottes Hbenbild, ed. Jellinek, Leipsic, 1854.

23 Vermischte medicinische Schriften, 1764, i. 58.

24 Sce Laycock's trans., in Sydenh. Soctety's Pub., 1851.

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account, it arose with him as the result of independent observations. These, he tells us, he began to make at an early age, by learning to correlate the outward appearances and mental qualities of his schoolfellows.1 Gall's first published paper was a letter in the Deutscher Merkur of December 1798, but his principal expositions were oral, and attracted much popular attention, which largely increased when, in 1802, he was commanded by the Austrian Govern- ment, at the instance of the ecclesiastical authorities, to discontinue his public lectures. In 1804 he obtained the co-operation of Spurzheim (1776-1832), a native of Long- wich near Treves, who became his pupil in 1800, and proved a powerful ally in promulgating the system. Master and pupil at first taught in harmony, but they found it advis- able to separate in 1813; and we find Spurzheim, several years after their parting, declaring that Gall had not introduced any new improvements into his system since their separation (notes to Chenevix, p. 99). " My philo- sophical views," he also says, "' widely differ from those of Gall."

In Paris, where he settled in 1807, Gall made many influential converts to his system. Broussais, Blainville, Cloquet, Andral, Geoffroy St-Hilaire, Vimont, and others warmly attached themselves to it, and countenanced its progress. Gall visited Great Britain, but the diffusion of phrenology there was chiefly due to Spurzheim, who lec- tured through the country and through America, and, with the aid of his pupil George Combe, soon attracted a large popular following. His most influential disciples were Elliotson, Andrew Combe, Mackenzie, Macnish, Laycock, and Archbishop Whately, and in America Caldwell and Godman. On the opposite side many influential men took up a strongly antagonistic position, prominent among whom were Barclay the anatomist, Roget, Sir Charles Bell, Sir W. Hamilton, Jeffrey, Brougham, T. Brown, and Sir B. Brodie. The nature of the system rendered it eminently fitted to catch public attention, and it rapidly attained to so great a degree of popularity that in 1832 there were twenty-

nine phrenological societies in Great Britain, and several journals devoted to phrenology in Britain and America ; of these the Phrenological Journal, a quarterly edited chiefly by George Combe with aid from others of the Edinburgh confraternity, notably Sir George Mackenzie and Macnish, "the modern Pythagorean," lived from 1823 to 1847, through twenty volumes. The. controversy in many places was heated and often personal, and this largely increased the popular interest. In the Hdinburgh Review the theory was severely criticized by Thomas Brown, and afterwards in a still more trenchant manner by J effrey. In Blackwood it was ridiculed by Professor Wilson. Being a subject which lent itself easily to burlesque, it was parodied cléverly in a long rhyme by two authors, "The Craniad," 87 pages long, published in 1817, while, on the other hand, verse was pressed into its service in the rhyme " Phrenology in Edinburgh" in 1824.2 The best defence of the system was that by Chenevix in the third number of the Foreign Quarterly, afterwards reprinted with notes by Spurzheim.

The popularity of phrenology has waned, and few of the phrenological societies now survive; the cultivation of the system is confined to a few enthusiasts such as will be found attached to any cause, and some professional teachers who follow phrenology as a vocation, Like many similar systems, it has a much larger following in

America than in Europe. Based, like many other artificial | philosophies, on an admixture of assumption and truth, |

' For a brief sketch of the life of Gall, see GALL, vol. x. p. 37.

? Other burlesque and satirical writings were published at this time, notably The Phrenologists, a farce by Wade, 1830 ; The Headpiece, or Phrenology opposed to Divine Revelation, by James the Less ; and A Helmet for the Headpicce, or Phrenology incompatible with Reason, by Daniel the Seer.

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certain parts will survive and become incorporated into scientific psychology, while the rest will in due course come to be relegated to the limbo of effete heresies.

The Faculties and their Localities.—The system of Gall was constructed by a method of pure empiricism, and his so-called organs were for the most part identified on slender grounds, Having selected the place of a faculty, he ex- amined the heads of his friends and casts of persons with that peculiarity in common, and in them he sought for the distinctive feature of their characteristic trait. Some of his earlier studies were made among low associates, in jails, and in lunatic asylums, and some of the qualities located by him were such as tend to become perverted to crime. These he named after their excessive manifestations, map- ping out organs of murder, theft, &c. ; but as this cast some discredit on the system the names were changed by Spurz- heim, who claimed as his the moral and religious consider- ations associated with it. Gall marked out on his model of the head the places of twenty-six organs as round en- closures with vacant interspaces. Spurzheim and Conibe divided the whole scalp into oblong and conterminous patches (see the accompanying figures). Other methods of division and other names have been suggested by succeed- ing authors, especially by Cox, Sidney Smith (not Sydney), Toulmin Smith, Carus of Dresden, Don Mariano Cubi i Solar, Powell of Kentucky, Buchanan of Cincinnati, Hittel of New York. Some, like the brothers Fowler, raise the number of organs to forty-three ; but the system of Spurz- heim and Combe is that which has always been most popular in Britain.

Spurzheim separated the component faculties of the human mind into two great groups and subdivided these' as follows.

I. Feelings, divided into— 1. Propensities, internal impulses inviting only to certain actions. 2. Sentiments, impulses which prompt to emotion as well as to action. A. Lower,—those common to man and the lower animals. B. Higher,—those proper to man. II. Intellectual faculties.

1. Pereeptive faculties. 2. Reflective faculties.

Im the following list the locality and the circumstances of the first recognition of the organ are appended to the names, which are mostly the inventions of Spurzheim. Gall's names are placed in brackets.?

Propensities.

(1) Amativeness (Instinct de la génération), median, below the inion ; first determined by Gall from its heat in an hysterical widow, supposed to be confirmed by many observations, and referred to the cerebellum.4

(2) Philoprogenitiveness (Amour de la progéniture), median, on the squama oeeipitis, and selected as the organ for the love of children because this part of the skull is usually more prominent in apes and in women, in whom the love of children is supposed to be stronger than in men.

(3) Concentrativeness, below the obelion and over the lambda. This is a region of uncertain function, unnoticed by Gall, but de- scribed as Inhabitiveness by Spurzheim, because he found it large in cats and ina clergyman fond of his home. It has since been con- sidered by Combe to be the seat of the power of concentration, whereof he belicved Inhabitiveness to be a special case.

(4) Adhesiveness (Amitié), over the lateral convoluted area of the lambdoidal suture. This region was prominent in a lady intro- duced to Gall as a model of friendship, and is said by him to be the region where persons who are closely attached put their heads together.

(5) Combativeness (Instinct de la défensc}, above the asterion ; it was found by Gall by examining the heads of the most quarrelsome

% For topographical purposes Broca's names are adopted as the most convenient for localities on the head.

4 Apollonius Rhodius speaking of the love of Medea for Jason (Argonautica, iii. 760-765) says, "ddxpu & dw' éb0aduGy péev &vdo0 3d aiel reip' ddtvn cutxovoa did xpods, dudl dpaias ivos cal Kepadfs, umd velarov iviov dypis, .. ."*

of his low companions whom he had beforehand stimulated by alcohol. It was verified by comparing this region with the same part of the head of a quarrelsome young lady.

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(6) Destructiveness (Instinet earnassier), above the ear meatus. This is the widest part of the skulls of carnivorous animals, and was found large in the head of a student so fond of torturing animals that he became a surgeon, also large in the head of an apothecary who became an executioner.

(6a) Alimentiveness, over the temporal muscle and above the ear. Hoppe describes it as being large in a gourmand aequaintance, and he therefore supposes it to be the organ of selecting food.

(7) Secretiveness (Ruse, Finesse), the posterior part of the squam- ous suture.

(8) Aequisitiveness (Sentiment de la propriété), on the upper edge of the front half of the squamous suture. This part of the head Gall noticed to be prominent in the pickpockets of his acquaintance.

(9) Constructiveness (Sens de méchanique), on the stephamnion ; deteeted by its prominence on the heads of persons of mechanical genius. It was found large on the head of a milliner of uncommon taste and on a skull reputed to be that of Raphael.

The organ of Vitativeness, or love of life, is supposed by Combe to be seated at the base of the skull. To this locality Herophilus referred most of the intellectual powers.

Lower Sentiments.

(10) Self-esteem (Orgueil, Fierté), at and immediately over the obelion ; found by Gall in a beggar who excused his poverty on account of his pride.

This was confirmed by the observation that proud persons held their heads backwards in the line of the organ.

(11) Love of Approbation (Vanité), outside the obelion; the region in which Gall saw a protuberance on the head of a lunatic who fancied herself queen of France. : ;

(12) Cautiousness (Cireonspection), on the parietal eminenec ; placed here because an ecclesiastic of hesitating disposition and a vacillating councillor of state had both large parietal eminences.

Superior Sentiments.

(13) Benevolence (Bonté), on the middle of the frontal bone in front of the coronal suture ; here Gall noticed a rising on the head of the highly-commended servant of a friend, as well as on a bene- volent schoolmate who nursed his brothers and_ sisters when they were ill. To this spot Xenocrates referred the intellectual powers. hie ‘

(14) Veneration (Sentiment réligieux), median at the bregma. Gall noted when visiting churches that those who prayed with the greatest fervour were prominent in this region, and it was also pro- minent in a pious brother.

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(15) Conscientiousness, unknown to Gall ; recognized by Spurz- heim usually from its deficiency, and placed between the last and the parietal eminence.

(16) Firmness (Fermeté), median, on the sagittal suture from behind the bregma to the front of the obelion. Lavater first pointed out that persons of determination had lofty heads.

(17) Hope, not regarded as primary by Gall, who believed hope to be akin to desire and a function of every faculty which desires, and left this territory unallocated.

(18) Wonder, said to be large in vision-seers and many psychic researchers. A second similar organ placed between this and the next is called Mysterizingness by Forster, and is said to preside over belief in ghosts and the supernatural.

(19) Ideality (Poésie), noted by Gall from its prominence in the busts of poets ; said to be the part touched by the hand when ecom- posing poetry.

(20) Wit (Esprit caustique), the frontal eminence, the organ of the sense of the ludicrous, prominent in Rabelais and Swift.

(21) Imitation (Faculté dimiter), disposition to mimicry, placed between Benevolence and Wonder.

Pereeptive Faculties.

(22) Individuality, over the frontal sinus in the middle line; the capacity of recognizing external objects and forming ideas therefrom ; said to have been large in Michelangelo, and small in the Seots.

(28) Form (Mémoire des personnes), capacity of recognizing faces ; gives a wide interval between the eyes ; found by Gall in a squinting girl with a good memory for faces.

(24) Size, over the trochlea at the orbital edge; described by Spurzheim and Vimont as the capacity of estimating space and distanee.

(25) Weight, outside the last on the orbital edge and, like it, over the frontal sinus. The prominence of ridge here is due to large sinus or a projecting bone. Certain old writers, such as Strato Physiecus, loeated the whole intellect in this ridge.

(26) Colour, also on the orbital edge external to the last.

(27) Loeality (Sens de loealité), placed above Individuality on each side, and corresponding to the upper part of the frontal sinus and to the region immediately above it.

(28) Number, on the external angular proccss of the frontal bone, large in a ealeulating boy in Vienna.

(29) Order, internal to the last, first noted by Spurzheim in an orderly idiot.

(30) Eventuality (Afémoire des choses), the median projection above the glabella, supposed to be the seat of the memory of events.

(31) Time, below the frontal eminence and a little in front of the temporal crest.

(32) Tune (Sens des rapports des tons), on the foremost part of the temporal muscle, where Gall noticed a bulge on the head of a musical prodigy of five.

(33) Language (Sens des mots), behind the eye. This was the first organ noticed by Gall, as a elever schoolfellow, quick at lan- guages, had prominent eyes. Old authors have noted the con- nexion between prominent eyeballs and mental development ; thus Gazzali and Syenensis Medicus Cyprius place the intellect and soul in and behind the eyeballs.

Reflective Faculties.

(34) Comparison (Sagaeité comparative), median, at the top of the bare region of the forehead, where a savant friend of Gall's, fond of analogies, had a prominent boss.

(35) Causality (Esprit métaphysique), the eminence on each side of Comparison, noticed on the head of Fichte and on a bust of Kant ; the seat of the faeulty of correlating causes and effects.

The first identification of each organ was made by an induction from very limited data, but the founders and exponents of the system have collected all available instances wherein enlargements of each of these regions coexisted with increased powers of the faculty supposed to reside therein, and in some cases they have discovered coineidenees of a surprising nature. When, however, such do not exist, a convenient excuse is found by reference to the indefinite article of temperament, or by a supposed explanation of the faeulty in question as not simple but produeed by the co-operation of other

influences. Thus, as Sheridan's bump of wit was small, he is said not to have been truly witty, but to have had eomparison and memory strongly developed. The girl Labrosse (described in Férussac's Bulletin for October 1831), who exhibited strong amative- ness but had a rudimentary cerebellum, is said to have obliterated it by over-use. Thurtell, a cold-blooded murderer whose organ of benevolence was large, is said to have been generous, as he once gave half a guinea to a friend, &c.

The method whereby the sizes of organs are estimated is arbitrary and the boundaries of the regions indefinite. The attempts of Nicol, Straton, and Wight to devise mechanical and accurate modes of measurement have not been very successful and have not found favour with the professional phrenologist.

Anatomical Aspect of Phrenology.—The phrenological |

controversy served the useful purpose of stimulating research into the anatomy of the brain; but we owe very little of solid progress to the advocates of the system. Gall is the only writer of his creed in whose works original observations of value are to be found. Although the study of the surface of the cerebrum is of the essence of phreno- logy, yet nowhere in the circle of phrenological literature are the convolutions of the brain accurately described ; our knowledge of their order and disposition comes from the morphologist, not from the phrenologist. The first real step towards their systematic description was made by Rolando,! who in 1830 described the fissure to which his name is attached, and very little advance was made until the publication in 1856 of Gratiolet's ? and Huschke's? memoirs. These works for the first time placed the de- scription of the surface of the brain, imperfectly attempted by Desmoulins in 1825, on a satisfactory basis. Most of the anatomical details contained in the works on phreno- logy relate to controversial matters of secondary importance, and presuppose the truth of the theory ; but even in con- nexion with these they give us no statistical details of any value. It would be important, for instance, to have tabulated a sufficiently large number of measurements of the relative thicknesses of scalp and skull in different regions, of the variations in development of the diploe, of the varying range of the frontal*

sinus; but of these we find no sufficient nor definite researches in the whole circle of books cited below. :

As under Anatomy (vol. i. p. 874) a careful descrip- tion of the brain has been given, we need only allude to such anatomical points involved in the examination of phrenology as are not included in that account.

i. Any psychological theory which correlates brain-action and mental phenomena requires a correspondence between brain-size and mental power; aud, speaking generally, we find that the brains of those whose capacities are above the average are larger

than those of the general run of their fellow-men. The details

of brain-weights will be found at pp. 879, 880 of the article

cited.

2. Direct measurements of the relative devclopments of different portions of brains are difficult and troublesome to make ; but their importance to phrenologists is so great that it is remarkable that no attempts to obtain any such were made by them. The series given by Wagner of the relative sizes of the cerebral lobes of four brains is almost the only record of importance in this direction, and is

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_ From this it appears that the woman exceeded Gauss in percep- tive and reflective organs, exceeded Fuchs in sentiment, and fell below the workman in propensities. It must be said, however, that the phrenological divisions do not accurately coincide with the anatomical. Other series constructed along these lines are very

*k Della Struttura degli Emisferi Cerebrali, Turin, 1830. * Mémoire sur les plis cérébrauz de Chomme et des primates, Paris, 1856.*

® Schddel, Hirn, und Seele, Jena, 1856. 4 Magendie and Desmoulins, Anat. du syst. nerveux, Paris, 1825.

much wanted, and it would furnish important physiological data if the brains of men distinguished for special qualities were examined in this or some comparable way.

3. It is important in relation to phrenology to ascertain the constancy of the convolutions. Many varieties in the detail of the surface-patterns have been recorded by Tenchini, Poggi, Gia- comini, Riidinger, and Sernow,? but the general plan is fairly uni- form. A still more important question has been recently raised by Langley, viz., how far identical spots on identical convolutions in different brains consist of nerve-cells with precisely the same connexions. The convoluted arrangement results from growth of brain-surface under constraint, hence as the different tracts of surface undergo proportional overgrowth they fold along different lines. The occurrence of small differences in the rate of overgrowth, testified to by the varieties of the resulting pattern, will cause con- siderable alteration in the place of definite territories of grey cells. Some method for the determination of the limits of these shiftings of place is much required.

4, The comparison of the rate of growth of brain with the development of mental faculties is important not only to the phrenologist but to the psychologist. No observations on this point were made by phrenological writers, and they simply refer to the first and rather crude observations of the earlier anatomists. We have, however, recently learned from the researches of Bischoff, Tuczec, and Exner® many particulars as to the rate and progress of brain-growth. At birth the brain weighs one-tenth of the weight of the body, and averages about 11 ounces. For the first year brain-

growth and consequently expansion of the skull proceed with great rapidity, the growth during a large part of this period averag- ing one cubic centimetre daily. This enormous increase is chiefly due to the rapid development of medullated nerve-fibres, which are deficient in the fcetal brain. During the second and third years growth takes place more slowly, the occipital and parietal lobes increasing more than the 'frontal or temporo-sphenoidal. During these and the four succeeding years the base elongates commensurately with the increasing depth of the face. In the sixth and seventh years the frontal lobes grow faster than the parietals, and at seven the average brain has attained the weight of 1340 grammes, being to the weight of the body as 1:20. In the period between seven years and puberty growth is slight, but at puberty the whole brain grows actively, especially the frontal lobes. This activity lasts until about eighteen years of age, then diminishes ; but the average brain does not reach its maximum size until about thirty, from a little after which period the brain tends to diminish towards senility.7 These measurements illustrate the relation between brain-growth and mental development, but are as casily explicable on any psychological theory of brain-action as on the phrenological. The relation supposed by Davaine to subsist between development of the brain and stature is not borne out by statistics.§

5. The estimation of the relative development of grey and white mattcr in the several lobes is important to any theory of cerebral dynamics which allocates functions specifically diverse to each separate part of the brain-surface; but no attempt has been made by the phrenologist to obtain precise results in this direction, nor even to determine the physical constants of the two forms of brain-matter. The recently-introduced method of Bourgoin and Danilewski, based upon the differing specific gravities of grey and white matter, promises to give definite information as to the relative amounts of these forms of brain-matter; but further cxperiments are needed to perfect the method.®

6. The relations, if any, between the alterations which take place in the shape and position of the head and alterations in brain-surface have been speculated on by the phrenologist. Broussais is reported to have said that his organ of causality had enlarged with increasing use, and a list of cases of similar alterations of head-shape is given by Deville (Phrén. Jour., xiv.

32), most of which are simply age- changes, of the kind described by Professor Cleland (Phil. Trans., 1870). There arc no exact measurements recorded which indicate the occurrence of topical increases of a normal brain in special directions coincident with the cultivation of definite faculties. All the so-called cases are given vaguely, with no measurements, and the careful measurements of George Combe in such cases as were available to him showed no appreciable alterations in adult heads even at long intervals of time (see also Andrew Combe, Phren. Journ. x. 414).

> Rivista Sperimentale di Freniatria, ii. 193 (1883) ; zbéd. iv. 408 ; Archiv fiir Anthropologie, 1879, xi. 289.

8 Neurologisches Centralblatt, 1888, p. 457.

7 Weisbach, Med. Jahrbuch der k. Gleselisch. der Aerzte, Vienna, 1869, xvii. 183 ; Merkel, Beitr. z. post-embryonale Lintwickelung des menschl. Schddel, Bonn, 1882; Calori, Afem. de l' Accad. di Bologna, WEVAL, x BYa,

8 Lebon, Revue d' Anthropologie, 1879, 15; Marshall, Proc. Roy. Soc., 1875, 564; Engel, Wiener med. Wochenschrift, 1863.

° Centralblatt, 1880, No. 14 ; Bettrage zur Biologie, Stuttgart, 1882.

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7. The phrenological want of knowledge of the topography of the brain-surface was necessarily correlated with ignorance of the exact relations of the convolutions to the interior of the cranial bones ; these have been carefully worked out by Huschke, Heffler, Turner, and Reid. Some latitude, however, must be allowed in

topography, as the exact relation of convolution to skull varies

with the shape of the skull. Giacomini showed that the fissure of Rolando is perceptibly farther back from the coronal suture in dolichocephalie than in

brachyccphalic skulls, and it is still farther back in the extreme boat-shaped form of long-headedness. Passet shows that there is a slight topographical difference in the two sexes (Arch. f. Anthrop., 1882, xiv. 89), and in the heads of those with unsymmetrically-shaped skulls there is often a want of lateral symmetry of convolution. Artificial deformations likewise alter the topographical relations of convolutions, and have served not a little to puzzle the phrenologist. Thus, the artificial dolichocephaly of the Caribs having bulged the squama occipitis, they decided that these people must be amiable lovers of children,! &c.

8. The existence of structural differences between different areas of cerebral surface is important to any theory of cerebral localiza- tion, but no phrenologist has given us any original information on this point. Since the investigation of Baillarger,? it has been shown that some local differentiations of structure do really exist. Thus in the convolutions around the fissure of Rolando the gan- glion-cells of the fourth layer are of large size (giant-cells of Betz), and in the convolutions of the temporo-sphenoidal lobe a layer of smal] angular cells (granule-cclls) is interposcd between the larger pyramidal and the ganglion-cells, so that, while in the parts of the brain above the fissure of Sylvius the grey cortex is for the most part five-layered, below and behind that fissure it is six-layered. There is no abrupt passage from the onc to the other, the only sudden transition of structure of the grey cortex being at the hippocampal sulcus ; and giant-cells, although of smaller size, and less like these of the anterior cornu of the spinal cord, are scattered over other parts of the cerebral grey matter. In fig. 71, vol. i. p. 874, the relations of the convolutions to the internal surface of the skull are represented, and their want of accurate correlation to the phreno- logical areas can be seen by comparing that figure with the fore- golng serics.

The teachings of anatomy with regard to phrenology may be summarized thus: (1) the rate of growth of brain is concurrent with the rate of development of mental faculty ; (2) there is some degree of structural differentiation as there are varying rates of development of different parts of the cerebral surface ; (3) there is no accordance between the regions of Gall and Spurzheim and definite areas of cerebral surface.

Physiological Aspect.—The theory of some of the older metaphysicians, that the mind, in feeling and reflexion, makes use of no material instrument is not now accepted by psychologists. It was advanced by Brougham and Jeffrey as against the theory of phrenology; but the doctrine that the brain is the organ of the mind is now universally received. While it is probable that certain molecular changes in the grey matter are antecedents or concomitants of mental phenomena, the precise nature of these processes, to what extent they take place, or how they vary among themselves have not as yet been deter- mined experimentally ; the occurrence of the change can only be demonstrated by some such coarse method as the altered pulsation of the carotid arteries, the increase of the temperature of the head,° the abstraction, during brain- action, of blood from other organs as shown by the plethys- mograph, or the formation of lecithin and other products of metabolism in brain-substance. As yet not a single step has been made towards the understanding of the con- nexion between the molecular changes in the nerve-cell and the phenomena of thought and feeling. While our*

1 Martius tells us that the Caribs castrate their own children, fatten and eat them, an abuse of the organ of philoprogenitiveness ; see also Garcilaso de la Vega, Hist. des Incas, i. 12.

2 Mém. del' Acad. de Médecine, 1840, vill. 149.

3 For further particulars of structure, in addition to the authors quoted at vol. i. p. 878, see Bevan-Lewis and Clark, P. R. S., 1878, and Phil. Trans., 1880 and 1882. a"

4 See Eugéne Gley, "Sur les Conditions Physiologiques de la Pensee,' in Archives de Physiologie, 1881, 742.

5 Lombard, N.Y. Med. Journal, June, 1867, and Experimental Researches on the Regional Temperature of the Head, London, 1872.

knowledge of the anatomy of the brain, especially of the grey nuclei and of the white bands uniting them, has within the last few years become much

more accurate, brain-function has not as yet been so definitely determined ; indeed, much of nerve-physiology, especially that part which relates to the division of labour in the nerve-centres, is largely hypothetical and based on anatomical structure. Certain masses of grey nerve-matter situated in the spinal cord and medulla oblongata are so linked by nerve-cords to organs outside the nervous system which are set apart for the discharge of separate functions that they obviously form parts of the mechanism for the fulfilment of such functions. In the cases where these can be subjected to experiment we learn that they are nervous centres presid- ing over the discharge of such functions; and it has been determined by experiment, or else deduced from anatomical structure, that in those lower parts of the nervous centres which are more directly connected with the segmental elements of the body there is a certain localization of function ; hence the centres of pelvic actions, of respira- tion, cardiac action, and inhibition of vaso-motor influence, deglutition, secretions, &c., can be mapped out in ascend- ing series. As certain of these centres are united by bands of fibres to the larger and higher-lying grey portions of the nervous centres there is an a priori presumption in favour of the extension of this principle of -localization. This has been premised on metaphysical as well as on anatomical grounds. Bonnet believed each portion of the brain to have a specifically separate function, and Herbert Spencer has said that "no physiologist can long resist the conviction that different parts of the cerebrum subserve different kinds of mental action.

Localization of function '

is the law of all organization whatever ; separateness of |

duty is universally accompanied with separateness of struc- ture, and it would be marvellous were an exception to exist in the cerebral heniispheres. Let it be granted that the cerebral hemispheres are the seats of the higher psychical

activities; let it be granted that among these higher !

psychical activities there are distinctions of kind which,

though not definite, are yet practically recognizable, and |

it cannot be denied, without going in direct opposition to established physiological principles, that these more or less distinct kinds of psychical activity must be carried on in more or less distinct parts of the cerebral hemisphere."

For the results of experiment on the brain, see Puysio- LOGY, section " Nervous System."

There is a large weight of evidence, which cannot be explained away, in favour of the existence of some form of localization of function. So little is known of the physical changes which underlie psychical phenomena, or indeed of the succession of the psychical processes them- selves, that we cannot as yet judge as to the nature of the mechanism of these centres. So much of the psychic work of the individual life consists in the interpretation of sen- sations and the translation of these into motions that there are strong a priort grounds for expecting to find much of the material of the nerve-centres occupied with this kind of work, but in the present conflict of experimental evi- dence it is safer to suspend judgment. That these local areas are not centres in the sense of being indispensable parts of their respective motor apparatuses is clear, as the function abolished by ablation of a part returns, though tardily, so that whatever superintendence the removed region exercised apparently becomes assumed by another part of the brain.® Experimental physiology and pathology, by suggesting other functions for much of the brain-surface, are thus directly subversive of much of the phrenology of Gall and Spurzheim.

Bianchi, Za Psichiatria, i. 97.

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§ For cases, see Rochefontaine, Archives de Physiologie, 1883, 28 ;

Psychological Aspect.—The fundamental hypothesis |

which underlies phrenology as a system of mental science is that mental phenomena are resolvable into the mani- festations of a group of separate

faculties. A faculty is defined as "a convenient expression for the particular states into which the mind enters when influenced by par- ticular organs; it is applied to the feelings as well as to the intellect, thus the faculty of benevolence means every mode of benevolence induced by the organ of benevolence " (Combe). In another work the same author says it 1s "used to denote a particular power of feeling, thinking, perceiving, connected with a particular part of the brain." The assumption is contained in the definition that the exercise of a faculty is the physical outcome of the activity of the organ, and in several of the standard works this is

illustrated by analogies between these and other organs ;

thus the organs of benevolence and of firmness are said to be as distinct as the liver and pancreas. The mind, according to another author, consists of the sum of all the faculties. In this view the unity of consciousness is some- what difficult to explain, and consequently there is assumed by others a single unifying substratum, and on this the organs are supposed to act; thus thoughts are defined as "relations of the simple substance, mind, to certain por- tions of the encephalon" (Welsh, Phren. Journ., i. 206). Gall himself believed that there was but a single principle which saw, felt, tasted, heard, touched, thought, and willed (Fonctions du Cerveau, i. 243); and the American exponent of phrenology, Caldwell, says "the mind is as single in its power as it is in its substance ; it is a quickening and operating principle, essential to all the mental faculties, but does not, by any means, possess them itself" (Hle- ments, p. 16). It is not easy to understand the supposed relation of this hypothetical substratum to the separate faculties acting on it. It must be both immaterial and unconnected with the brain, as the whole two thousand million cells supposed to exist in the cerebral hemispheres are all parcelled out among the faculties, and none are left for the unifying nous.

Each organ is considered as engaged, either independ- ently in bringing forth its own product, or collectively with others in elaborating compound mental states, and according to their several degrees of development and activity they are considered capable of perceiving, conceiving, recollect- ing, judging, or imagining each its own subject. This mechanical conception of the division of labour in the pro- duction of the phenomena of

mind has the charm of sim- plicity, but is attended with the difficulty that arises in discriminating the operations of the different organs one from the other. Phrenologists are apt to be vague respect- ing the limits of the several faculties, as about the bound- aries of the separate organs. It was pointed out by Jeffrey that the lines of demarcation between benevolence, ad- hesiveness, and philoprogenitiveness were indeterminate, although the organs are not very close, and the same applies to other organs.

It is unfortunate for the clearness of the definition that, although historically the faculties were the first pheno- mena noted, independent of and previous to their localiza- tion, yet in the definition the faculties are defined in terms of their localities.

The following arguments are adduced in favour of the fundamental separateness of the faculties : (1) analogy,— clsewhere in the animal economy division of labour is the rule; (2) the variety of mental endowment observed among children before they are influenced by education, and the inequalities in the mental endowments of indi- viduals; (3) the phenomena of insanity, especially of inonomania ; (4) the varying periods at which individual faculties attain their maximum development ; (5) the

phenomena of dreams, and the awakening of a limited number of faculties during them ; (6) pain being felt in an organ when it is overtaxed.1

Such faculties are supposed to be primary—(1) as exist in some animals and not in others, (2) as vary in their development in the sexes, (3) as are developed in varying proportions with regard to other faculties, (4) as may act separately from other faculties, (5) as are not necessarily simultaneous with other faculties in action, (6) as are hereditary, and (7) as may be singly diseased.

According to the development of their powers mankind may be divided into six classes: (1) those in whom the highest qualities are largely developed and the animal qualities feeble ; (2) those with the reversed conditions developed, with large animal and feeble intellectual and moral faculties ; (3) those in whom good and evil are in constant war, with active animal and

strong intellectual faculties and sentiments; (4) those partial geniuses in whom a few qualities are unusually developed, while the rest are at or below the mediocre standard ; (5) those men of moderate endowment in whom some faculties are nearly or quite deficient ; (6) those with an unvarying standard of undistinguished mediocrity in all their faculties.

It is perhaps unfortunate that the word "faculty" has been used in this sense of original power by phrenologists. It would have been better to employ, as Mr Lewes suggests, the term "function" for the native activity of an organ, and to leave "faculty" for the expression of an acquired activity. 'Faculty is properly limited to active power, and therefore is abusively applied to the mere passive affections of the mind" (Hamilton, Lectures, i. 177).

Practical Application.—" Die Schadellehre ist allerdings nicht so sehr Irrthum in der Idee als Charlatanerie in der Ausfithrung," says one of its most acute critics. Even though no fault could be found with the physiology and psychology of phrenology, it would not necessarily follow that the theory could be utilized as a practical method of reading character ; for, although the inncr surface of the skull is moulded on the brain, and the outer surface approximates to parallelism thereto, yet the correspondence is sufficiently variable to render conclusions therefrom un- certain. The spongy layer or diploe which separates the two compact tables may vary conspicuously in amount in different parts of the same skull, as in the cases described by Professor Humphry (Journ. of Anat., vol. viii. p. 137). The frontal sinus, that opprobrium phrenologicum, is a reality, not unfrequently of large size, and may wholly occupy the regions of five organs. The centres of ossifica- tion of the frontal and parietal bones, the muscular crests of these and of the occipital bones also, differ in their prominence in different skulls. Premature synostoses of sutures mould the brain without doing much injury to its parts. Artificial malformations alter the apparent skull- shape considerably and affect the relative development of the brain but little. All these and other cogent reasons of a like kind, whose force can be estimated by those accustomed to deal with the component soft parts of the head, should lead phrenologists to be careful in predicating relative brain-development from skull-shape. Psychology, physiology, and experience alike contribute to discredit

1 It is interesting in this connexion to note that in a case published by Professor Hamilton in Brain (April 1884), where a tumour existed on the occipital lobe, the pain was persistently referred to the fore- head. Many similar cases are to be noticed among the records of localized brain-lesions. Bearing on this point also it is worth noting, once for all, that in nothing is the purely hypothetical nature of phreno- logical description better realized than in the accounts of what these authors call the "natural language of the faculties,'—that poets are supposed to touch ideality when composing, musicians to press on tone and time, and painters on form and colour, when in the exercise of their arts! Yet we are gravely taught this in the standard works on the subject.

See plate II. vol. xv.

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the system and to show how worthless the so-called dia- gnoses of character really are. Its application by those who are its votaries is seldom worse than amusing, but it 1s capable of doing positive social harm, as in its proposed application to the discrimination or selection of servants and other subordinate officials. It has even been proposed to use it for the purposes of the guarantee society and for the selection of parliamentary representatives. The sar- castic suggestion which originated with Christopher North of moulding children's heads so as to suppress the evil and foster the good was actually repeated in good faith by a writer on phrenology, but experience of the effects of mal- formation leads one to be sceptical as to the feasibility of this mode of producing a social Utopia. The application of phrenology to the art of painting and sculpture has been suggested, but a careful examination of some of the best pictures of the best masters, who were close observers of nature, shows that no phrenological principles were accepted by them in their works. An application to ethnology has also been proposed ; but, although there are in most cases well-marked racial characters presented by the skull, yet all attempts at correlating national characteristics there- with have been groundless and worthless. For further particulars on allied subjects, see PaystocNomy. LiTERATURE.—Prochaska, Functions of the Nervous System (tr. by Laycock, in Sydenham Society's series, 1851); Gall, Recherches sur le

Systeme Nerveux, &c. (Paris, 1809), Anatomie et Phystologie du Systeme Nerveux, &c. (Paris, 1810-19), Traité des Dispositions tnnées de Ame et de U Esprit (Paris, 1811), and Sur les Fonctions du Cerveau (6 vols., 1825); Beryk, Bemerkungen w. Zweifel tiber die Schddellehre des Dr Gali's (Leipsic, 1803) ; Marton, ZLeicht- fassliche Darstellung der Gehirn- u. Schéddellehre (Leipsic, 1803) ; Metzger, Ueber den menschlichen Kopf (Konigsberg, 1803) ; Walther, Neue Untersuchungen der Gall'schen Gehirn~ und Schédellehre (Munich, 1804); Kessler, Priifung des Gall'schen Systems (Jena, 1805) ; Bischoff, Darstellung des Gallschen Gehirn- und Schddellehre, &c. (Berlin, 1805) ; Ackermann, Die Gallsche Gehirnlehre widerlegt (Heidelberg, 1806); Himly, Lrérterung der Gallschen Lehre (Hale, 1806) ; Forster, "Sketch of the New Anatomy and Physiology of the Brain," in Pamyphleteer (1815, No. ix., reprinted with additions 1817) ; Spurzheim, Zhe Physiognomical System of Gall and Spurz- heim (London, 1815), Phrenology, or the Doctrine of the Mind (1825), and The Anatomy of the Human Brain (1826); Gordon, Observations on the Structure of the Brain, comprising an estimate of the claims of Gall and Spurzheim, &c. (1817) ; G. Combe, Essays on Phrenology (Edinburgh, 1819), Elements of Phrenology (1824), System of Phrenology (1825), Constitution of Man (1827), Lectures on Phrenology by Boardman (1839), and Outlines of Phrenology (1847) ; Dewhurst, Guide to Human and Comparative Phrenology (London, 1831); Otto, Phrenologien eller Galls og Spurzheims Hjerne- og Organlzre (Copenhagen, 1825); Broussais, Cours de Phrénologie (Paris, 1836); Vimont, Traité de Phrénologie humaine et comparéc (1836); Noel, Grundztige der Phrenologie (Leipsic, 1836), and Die materielle Grundlage des Seelenlebens (Leipsic, 1874); Macnish, Introduction to Phrenology (Glasgow, 1836) ; Capen, Phrenological Library (Boston, 1836); Ferrarese, Aemorie risguardanti la Dottrina Frenologica (1836-38); Watson, Statistics of Phrenology (1836) ; Azais, Traité de la Phrénologie (Paris, 1839) ; Sidney Smith, Principles of Phrenology (Edinburgh, 1838) ; Joshua T. Smith, Synopsis of Phrenology ; Forichon, Le Matérialisme et la Phrénologie combattu (Paris, 1840); K. G. Carus, Grundziige einer newen und wissenschaftlich begriindeten Kranioskopte (Stutt- gart, 1841); Castle, Die Phrenologie (Stuttgart, 1845) ; Struve, Geschichte der Phrenologie (Heidelberg, 1843); Idjiez, Cours de Phrénologie (Paris, 1847); Flourens, Hxamen de la Phrénologie (Paris, 1842); Serrurier, Phrénologie Morale (Paris, 1840); Mariano Cubi i Solar,

Legons de Phrénologie (Paris, 1857) ; Morgan, Phreno- logy; Donovan, Phrenoiogy; Struve and Hirschfeld, Zeitschrift Siir Phrenologie (Heidelberg, 1843-45) ; Phrenological Journal (20 vols., 1823-47); Lelut, Qw'est ce que la Phrénologie? (1836), and

Rejet de (Organologie phrénologique (1843) ; Tupper, Lnguiry into

Dr Gall's System (1819); Wayte, Antiphrenology (1829); Stone, Observations on the Phrenological Development of Murderers (Edin- burgh, 1829); Epps, Hore Phrenologice (1829) ; Crock, Com- pendium of Phrenology (1878); Aken, Phrenological Bijou (1839) ; Hall, Phreno-Magnet (1843). (A. MA.) PHRYGIA was the name of a large country in Asia Minor, inhabited by a race which the Greeks called Ppvyes, Freemen.1_ Roughly speaking, Phrygia comprised the

. . . 2 ra ” 1 The meaning is given in Hesych., s.v. “ Bpiyes.

western part of the great central plateau of Anatolia, extending as far east as the river Halys ; but its bound- aries were vague,? and varied so much at different periods that a sketch of its history must precede any account of the geography. According to unvarying Greek tradition the Phrygians were most closely akin to certain tribes of Macedonia and Thrace ; and their near relationship to the Hellenic stock is proved by all that is known of their language and art, and is accepted by almost every modern authority. The country named Phrygia in the better known period of history lies inland, separated from the sea by Paphlagonia, Bithynia, Mysia, and Lydia. Yet we hear of a Phrygian “ thalassocracy ” at tite beginning of the 9th century B.c. The Troad and the district round Mount

Sipylus are frequently called Phrygian, as also is the sea-

port Sinope; and a district on the coast between Sestus and the river Cius was regularly named Little Phrygia. Again, Abel? has pointed to the wide currency of names like Mygdones, Doliones, and Phryges or Briges both in Asia Minor and in Europe, and many other examples might be added. The inference has been generally drawn that the Phrygians were a stock widespread in the countries which lie round the Augean Sea. There is, however, no decisive evidence, and no agreement among modern scholars, as to whether this stock came from the East over Armenia, or whether it was European in origin and crossed the Hellespont into Asia Minor.

According to Greek tradition there existed in early time a Phrygian kingdom in the Sangarius valley, ruled by kings among whom the names Gordius and Midas were common. It was known to the ancient Greeks of Ionia and the Troad as something great and half-divine. When the goddess appeared to her favourite Anchises she repre- sented herself as daughter of the king of Phrygia; the Phrygians were said to be the oldest people, and their language the original speech of mankind ; the Phrygian kings were familiar associates of the gods, and the heroes of the land tried their skill against the gods themselves ; we hear of the well-walled cities of Phrygia and of the riches of its kings. Tradition is completely corroborated by archeological evidence. In the mountainous region on the upper waters of*

the Sangarius, between Kutayah and Afium Kara Hissar, there exist numerous monuments of great antiquity, showing a style of marked individuality, and implying a high degree of artistic skill among the people who produced them. On two of these monuments are engraved the names of " Midas the King" and of the goddess "Kybile the Mother." Even the title "king" (évag)> appears to have been borrowed by Greek from Phrygian.

It is impossible to fix a date for the beginning of the Phrygian kingdom. It appears to have arisen on the ruins of an older civilization, whose existence is revealed to us only by the few monuments which it has left. These monuments, which are found in Lydia, Phrygia, Cappa- docia, and Lycaonia, point to the existence of a homogene- ous civilization over those countries; they show a singularly marked style of art, and are frequently inscribed with a peculiar kind of hieroglyphics, engraved bowstrophedon, which have not as yet been deciphered.6 There can be

2 The difficulty of specifying the limits gave rise toa proverb— xwpis Ta PpvyGy, Strabo.

3 Art. " Phryges," in Pauli's Real- Encykl.

4 Herod., ii. 2; Pausan., i. 14, 2; Claudian, In Hutrop., ii. 251 f Apul., Afet., xi. p. 762.

° Favaxres on the Midas tomb. It is expressly recorded that TUpavvos is a Lydian word. Bagid-'s resists all attempts to explain it as a purely Greek formation, and the termination assimilates it to ecrtain Phrygian words.

6 It is common to name these monuments " Hittite," but this name presupposes the truth of an historical hypothesis, namely, the conquest of Asia Minor by a race whose capital was in Syria, which has not as

| yet been supported by any convincing arguments.

traced in Asia Minor an ancient road-system, to which belongs the "royal road" from Sardis to the Persian capital, Susa (Herod., v. 55). The royal road followed a route so difficult and circuitous that it is quite unintelligible as the direct path from any centre in Persia, Assyria, or Syria to the west of Asia Minor. It can be understood only by reference to an imperial centre far in the north. The old trade-route from Cappadocia to Sinope, which had passed out-of use centuries before the time of Strabo (pp. 540, 546), fixes this centre with precision. It must be far enough west to explain why trade tended to the distant Sinope,! hardly accessible behind lofty and rugged mountains, and not to Amisus by the short and easy route which was used in the Graeco-Roman period. This road- system, then, points distinctly to a centre in northern Cappa- docia near the Halys. Here must have stood the capital of some great empire connected with its extremities, Sardis or Ephesus on the west, Sinope on the north, the Cilician Gates on the south, by roads so well made as to continue in use for a long time after the centre of power had changed to Assyria, and the old road-system had become circuitous and unsuitable.2 The precise spot on which the city stood is marked by the great ruins of Boghaz Keui, probably the ancient Pteria, of which the wide circuit, powerful walls, and wonderful rock-sculptures make the site indis- putably the most remarkable in Asia Minor.

The ancient road from Pteria to Sardis crossed the upper Sangarius valley, and its course may be traced by the monuments of this early period.? Close to its track, on a lofty plateau which overhangs the Phrygian monu- ment inscribed with the name of '" Midas the King," is a great city, inferior indeed to Pteria in extent, but sur- rounded by rock-sculptures quite as remarkable as those of the Cappadocian city. The plateau is between 2 and 3 miles in circumference, and presents on all sides a per- pendicular face of rock 50 to 200 feet in height. In part, at least, this natural defence was crowned by a wall built of large squared stones.4 This city was evidently the centre of the old Phrygian kingdom of the Sangarius valley, but at least one of the monuments in it seems to belong to the older period of Cappadocian supremacy, and to prove that the city already existed in that earlier time.® The Phrygian kingdom and art therefore took the place of an older civilization. It isas yet impossible to determine the relation in which the Phrygians stood to the ruling race of that older period, whether they came in from the north-west, or whether they were a primitive people taught, and

for a time ruled, by foreigners from Cappadocia, but at last expelling their teachers. It is probable that the tradition of battles between the Phrygians and the Amazons on the banks of the Sangarius preserves the memory of a struggle between the two races.®

Of the monuments that exist around this city two classes may be confidently referred to the period of Phrygian greatness. That which is inscribed with the name of "Midas the King" is the most remarkable example of one class, in which a large perpendicular surface of rock

5 Sinope was made a Greek colony in 751 B.¢., but it is said to have existed long before that time.

2 When the Persians conquered Lydia they retained, at least fora time, this route, which they found in existence, and the royal messengers went first across the Halys to Pteria, and then by the road across Cappadocia to the Cilician Gates.

3 See a paper on "The Karly Historical Relations between Phrygia and Cappadocia," in Journ. Roy. As. Soc., 1883.

; # The small fortress Pishmish Kalessi is a miniature of the great

city beside it; see Perrot, Explor. Archéol., p. 169 and pl. viii.

® A large tumulus exists in this district between Bei Keui and Ak Kuren, from which one large stone, with an inscription in the usual Cappadocian hieroglyphics, has already been dug.

a Abel (/.c.) identifies these two races, and makes the city at Boghaz Keui a Phrygian city.

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is covered with a geometrical pattern of squares, crosses, and meanders, surmounted by a pediment supported in the centre by a pilaster in low relief. In some cases a floral pattern occupies part of the surface, and in one case the two sides of the pediment are filled by two sphinxes of

extremely archaic type.' In some of these monuments a doorway is carved in the lower part ; the door is usually closed, but in one case, viz., the sphinx monument just alluded to, the valves of the door are thrown wide open and give access to a little chamber, on the back of which is sculptured in relief a rude image of the Mother-goddess Cybele, having on each side of her a lion which rests its forepaws on her shoulder and places its head against hers. Sometimes a grave has been found hidden behind the carved front; in other cases no grave can be detected, but it is probable that they are all sepulchral.° The imitation of wood-work is obvious on several monuments of this kind. The second class is marked by the heraldic type of two animals, usually lions rampant, facing one another, but divided by a pillar or some other device. This type is occasionally found conjoined with the preceding; and various details common to both classes show that there was no great difference in time between them. The heraldic type is used on the monuments which appear to be the older, and the geometrical pattern is often employed on the inscribed monuments, which are obviously later than the uninscribed. Monuments of this class are carved on the front of a sepulchral chamber, the entrance to which is a small doorway placed high and inaccessible in the rocks.

Early Phrygian art stands in close relationship with the art of Cappadocia, but has such individuality, such freedom from conventionality, such power of varying and combining types learned from other peoples, as to show that the Phrygians possessed high artistic faculty very similar in character to the Greek. The monuments of the type of the Midas tomb are obviously imitated from patterns employed in cloth and carpets. Such patterns were used in Cappadocia, and the priest in the rock- sculpture at Ibriz wears an embroidered robe strikingly similar in style to the pattern on the Midas tomb; but the idea of using the pattern as the Phrygians did seems peculiar to themselves. The heraldic type of the second class is found also in the art of Assyria, and was undoubt- edly adopted by the Phrygians from earlier art ; but it is used so frequently in Phrygia as to be specially character- istic of that country.? While Phrygian art is distinctly non-Oriental in spirit, its resemblance to archaic Greek art is a fact of the greatest importance. It is not merely that certain types are employed both in Phrygia and in Greece, but most of the favourite types in early Greek art can be traced in Phrygia, employed in similar spirit and for similar purposes. The heraldic type of the

two lions is the device over the principal gateway of Mycenz, and stamps this, the oldest great monument on Greek soil, with a distinctly Phrygian character. Mycenze was the city of the Pelo- pide, whom Greek tradition unhesitatingly declares to be Phrygian immigrants.

7 Published in Journ. Heil. Stud., 1884.

8 The monuments of Phrygia fall into two groups, which probably mark the sites of two cities about 16 miles distant from each other. One group lies round the villages of Kumbet, Yapuldak, and Bakshish ; the other beside Liyen, Bei Keui, Demirli, and Ayazin.

9 The heraldic type continues on gravestones down to the latest period of paganism. Carpets with geometrical patterns of the Midas- tomb style are occasionally found at the present time in the houses of the peasantry of the district.

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appears to be the city of Midas,! and the name is one more link in the chain that binds Mycene to Phrygia. This connexion, whatever may have been its character, belongs to the remote period when the Phrygians inhabited the ffigean coasts. In the 8th and probably in the 9th cen- tury B.c. communication with Phrygia seems to have been maintained especially by the Greeks of Cyme, Phocea, and Smyrna. About the end of the 8th century Midas king of Phrygia married Damodice, daughter of Agamemnon, the last king of Cyme. Gyges, the first Mermnad king of Lydia (687-653), had a Phrygian mother. The worship of Cybele spread over Phocza to the west as far as Massilia : rock monuments in the Phrygian style and votive reliefs of an Anatolian type are found near Phocea. Smyrna was devoted to the Phrygian Meter Sipylene. It is then natural that the lays of the Homeride refer to Phrygia in the terms above described, and make Priam's wife a Phrygian woman. After the foundation of the Greek colony at Sinope in 751 there can be no doubt that it formed the link of connexion between Greece and Phrygia. Phrygian and Cappadocian traders brought their goods, no doubt on camels, to Sinope, and the Greek sailors, the dewvatrat of Miletus, carried home the works of Oriental and Phrygian artisans. The Greek alphabet was carried back to Phrygia and Pteria, either from Sinope or

more probably from Cyme, in the latter part of the 8th century. The immense importance of Sinope in early times is abun- dantly attested, and we need not doubt that very intimate relations existed at this port between the Ionic colonists and the natives. The effects of this commerce on the development of Greece were very great. It affected Ionia in the first place, and the mainland of Greece indirectly ; the art of Ionia at this period is almost unknown, but it was probably most closely allied to that of Phrygia.? A striking fact in this connexion is the frequent use of a very simple kind of Ionic capital on the early Phrygian monuments, making it practically certain that the " proto- Ionic" column came to Greece over Phrygia. It is obvious that the revolution which took place in the relations between Phrygians and Greeks must be due to some great movement of races which disturbed the old paths of communication. Abel is probably correct in placing the inroads of the barbarous European tribes, Bithynians, Thyni, Mariandyni, &., into Asia Minor about the beginning of the 9th century B.c. The Phrygian element on the coast was weakened and in many places annihilated ; that in the interior was strengthened; and we may suppose that the kingdom of the Sangarius valley now sprang into greatness. The kingdom of Lydia appears to have become important about the end of the 8th century, and to have completely barred the path between Phrygia and Cyme or Smyrna. Ionian maritime enterprise opened a new way over Sinope.®

The downfall of the Phrygian monarchy can be dated with comparative accuracy. Between 680 and 670 the Cimmerians in their destructive progress over Asia Minor overran Phrygia; the king Midas in despair put an end to his own life ; and from henceforth the history of Phrygia is a story of slavery, degradation, and decay, which contrasts strangely with the earlier legends. The catastrophe seems to have deeply impressed the Greek mind, and the memory of it was preserved. 'The date of the Cimmerian invasion is fixed by the concurrent testimony of the contemporary

1 A city Midea occurs also in Beeotia, a village Midea on the Hellespont, and a city Mideum in the Sangarius valley.

2 See Furtwangler, Goldfund von Vettersfelde, Winckelm. Progr., 1884. The closest analogies of old Phrygian art are to be found in the earliest Greek

bronze work in Olympia, Italy, and the northern

lands. 3 Hipponax, fr. 36 [49], proves that a trade-route from Phrygia

down the Meander to Miletus was used in the 6th century.

S51 poets Archilochus and Callinus, of the late chronologers Kusebius, &c., and of the inscriptions of the Assyrian king Essar-haddon. The Cimmerians were finally expelled from Asia Minor by Alyattes before his war with the Medes under Cyaxares (590-585 3.c.). The Cimmerians, therefore, were ravaging Asia Minor, and presumably held possession of Phrygia, the only country where they achieved complete success, till some time between 610 and 590. Phrygia then fell under the Lydian power, and by the treaty of 585 the Halys was definitely fixed as the boundary between Lydia and Media. The period from 675 to 585 must there- fore be considered as one of great disturbance and probably of complete paralysis in Phrygia. After 585 the country was ruled again by its own princes, under subjection to Lydian supremacy. To judge from the monuments, it appears to have recovered some of its old prosperity, but the art of this later period has to a great extent lost the strongly-marked individuality of its earlier bloom. The later sepulchral monuments belong to a class which is widely spread over Asia Minor, from Lycia to Pontus. The graves are made inside a chamber excavated in the rock, and the front of the chamber imitates a house or temple. No attempt is made to conceal the entrance or render it inaccessible. The architectural details are in some cases unmistakably copied without ntentional modi- fication from the architecture of Greek temples, others point perhaps to Persian influence, while several—which are perhaps among the early works of this period—show the old freedom and power of employing in new and original ways details partly learned from abroad. This style continued in use under the Persians, under whose rule the Phrygians passed when Cyrus defeated Croesus in 546, and probably lasted till the 3d century B.c. One monument appears to presuppose a development of Greek plastic art later than the time of Alexander. It would, however, be quite wrong to suppose that the influence of truly Hellenic art on Phrygia began with the conquest of Alexander. Under the later Mermnad kings the Lydian enipire was penetrated with Greek influence, and Xanthus, the early Lydian historian, wrote his history*

in Greek. Under the Persian rule perhaps it was more difficult for Greek manners to spread far east ; but we need not think that European influence was absolutely unfelt even in Phrygia. The probability is that Alexander found in all the large cities a party favourable to Greek manners and trade. Very little is to be learned from the ancient writers with regard to the state of Phrygia from 585 to 300. The slave-trade flourished: Phrygian slaves were common in the Greek market, and the Phrygian names Midas and Manes were stock-names for slaves. Herodotus (i. 14) records that a king Midas of Phrygia dedicated his own chair at Delphi; the chair stood in the treasury of Cypselus, and cannot have been deposited there before 680 to 660 B.c. It is not improbable that the event belongs to the time of Alyattes or Croesus, when Greek influence was favoured throughout the Lydian empire ; and it is easy to understand how the offering of a king Midas should be considered, in the time of Herodotus, as the earliest made by a foreign prince to a Greek god. The Phrygian troops in the army of Xerxes were armed like the Armenians and led by the same commander.

It is to be presumed that the cities of the Sangarius valley gradually lost importance in the Persian period. Formerly the great line of communication across Anatolia traversed the Sangarius valley, but a better and shorter path south of the Salt Desert came into use in this period, from which these cities were far distant. The final cata- strophe was the invasion of the Gauls about 270 to 250 ; and, though the circumstances of this invasion are almost

4A gorgoneum, on a tomb engraved in Jowr. Hell. Stud., pl. xxvi.

unknown, yet we may safely reckon among them the com- plete devastation of northern Phrygia. At last Attalus Te settled the Gauls permanently in eastern Phrygia, and a large part of the country was henceforth known as Galatia. Strabo mentions that the great cities of ancient Phrygia were in his time either deserted or marked by mere villages. The great city over the tomb of Midas has remained un- inhabited down to the present day. About 5 miles west of it, near the modern Kumbet, stood Merus, a bishopric in the Byzantine time, but never mentioned under the Roman empire.

Alexander the Great placed Phrygia under the command of Antigonus, who retained it when the empire was broken up. When Antigonus was defeated and slain at the decisive battle of Ipsus, Phrygia came under the sway of Seleucus. As the Pergamenian kings grew powerful, and at last confined the Gauls in eastern Phrygia, the western half of the country was incorporated in the kingdom of Pergamum. Under the Roman empire Phrygia had no political existence under a separate government,' but formed part of the vast province of Asia. In autumn 85 B.c. the pacification of the province was completed by Sulla, and throughout the imperial time it was common for the Phrygians to date from this era. The imperial rule was highly favourable to the spread of Hellenistic civilization, which under the Greek kings had affected only a few of the great cities, leaving the mass of the country purely Phrygian. A good deal of local self-government was permitted : the cities struck their own bronze coins, in- scribed on them the names of their own magistrates,? and probably administered their own laws in matters purely local. The western part of the country was pervaded by Greco-Roman civilization very much sooner than the central, and in the country districts the Phrygian language® continued in common use at least as late as the 3d century after Christ.

When the Roman empire was reorganized by Diocletian at the end of the 3d century Phrygia was divided into two provinces, distinguished at first as Prima and Secunda, or Great and Little, for which the names Pacatiana and Salutaris soon came into general use. Pacatiana com- prised the western half, which had long been completely pervaded by Greco-Roman manners, and Salutaris the eastern, in which the native manners and language were still not extinct. Each province was governed by a " preses " or #yenov about 412 a.v., but shortly after this date an officer of consular rank was sent to each province (Hierocles, Synecd.). About 535 Justinian made some changes in the provincial administration: the governor of Pacatiana was henceforth a "comes," while Salutaris was still ruled by a "consularis." When the provinces of the Eastern empire were reorganized and divided into "themata" the two Phrygias were broken up between the Anatolic, Opsician, and Thracesian themes, and the name Phrygia finally dis- appeared. Almost the whole of the Byzantine Phrygias is now included in the vilayet of Broussa or Khodavendikya, with the exception of a small part of Parorius and the district about Themisonium (Karayuk Bazar) and*

Ceretapa (Kayadibi), which belong to the vilayet of Koniyeh, and the district of Laodicea and Hierapolis, which belongs

1 An imperial officer named Procurator Phrygiw is mentioned in a few inscriptions of the 2d century; but he belongs to a financial, not an administrative division.

2 This liberty was not granted to the cities of any other province in Anatolia.

3 A number of inscriptions in a language presumably Phrygian have been discovered in the centre and east of the country ; they belong generally to the end of the 2d and to the 8d century.

; 4 The name Salutaris is first found in Polemius Silvius about 385; in the Wotit. Dignit., about 412 a.p., the names Pacatiana and Salu- taris are used.

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to Aidin. The principal modern cities are Kutayah (Cotyzum), Eski Sheher (Doryleum), Afium Kara Hissar (near Prymnessus), and Ushak (near Trajanopolis).

It is impossible to say anything definite about the boundaries of Phrygia before the 5th century. Under the Persians Great Phrygia extended on the east to the Halys and the Salt Desert ; Xenophon (Anab., 1. 2, 19) includes Teonium on the south-east within the province, whereas Strabo makes Tyrizum the boundary in this direction. The southern frontier is unknown: the language of Livy (xxxviii. 15) implies that Metropolis (in the Tchul Ova) belonged to Pisidia; but Strabo (p. 629) includes it in Phrygia. Celzenze, beside the later city of Apamea (Dineir), and the entire valley of the Lycus were Phrygian. The Meander above its junction with the Lycus formed for a little way the boundary between Phrygia and Lydia. The great plateau now called the Banaz Ova was entirely or in great part Phrygian. Mount Dindymus (Murad Dagh) marked the frontier of Mysia, and the entire valley of the Tem- brogius or Tembris (Porsuk Su) was certainly included in Phrygia. The boundaries of the two Byzantine Phrygias were not always the

same. Taking Hierocles as authority, the extent of the 'two provinces at the beginning of the 6th century will be readily gathered from the accompanying list, in which those towns which coined money under the Roman empire are italicized and the nearest modern

village is appended.

I. PacaTIANA.—1. Laodieea(Eski Hissar); 2. Hierapolis (Pambuk Kalessi) ; 8. Mosyna (Geveze) ; [4. Metellopolis, only in Notitie Episeop. (Geuzlar)]; 5. Attudda (Assar, south-west from Serai Keui); 6. Trapezopolis (perhaps between Davas Ova and Karayuk Ova) ; 7. Colosse (near Chonas); 8. Ceretapa Dioewsarea (Kayadibi) ; 9. Thenrisontum (Karayuk Bazar) ; 10. Tacina (Yarishli) ; 11. Sanaus Sari Kavak, in Daz Kiri) ; 12. Dionysopolis (Orta Keui) ; 13. Ana- stasiopolis, originally a village of the Hyrgalis (Utch Kuyular) ; 14. Attanassus (Eski Aidan); 15. Lunda (Eski Seid); 16. Peltz Karayashlar) ; 17. Hwmenea (Ishekly) ; 18. Siblia, (Homa); 19. Pepuza (Yanuik Euren) ; 20. Bria (Garbasan or Suretly); 21. Sebaste Sivasly) ; 22. Eluza or Aludda (Hadjimlar); 23. ~~Aemonia (Ahat Keui); 24. Alia (Kirka); 25. Hieroeharax (Otourak); 26. Dioclea Dola); 27. Aristinm (Karaj Euren, in Sitchanly Ova) ; 28. Cidyessus (Cutch Eyuk); 29. Apia (Abia); 30. Cotyeum (Kutayah); 31. Afzani (Tchavdir Hissar); 32. Ttberiopolis (Altyntash) ; 38. Cadzx Gediz); 84. Ancyra (Kilisse Keui); 35. Synaus (Simav); 36. Llaviopolis Temenothyrx (ara Tash); 37. Trajanopolis Grimeno~~ thyre (Giaour Euren, near Orta Keui); 38. Blawndus (Suleimanly).®

II. SALUTARIs. —1. Ewearpia (near Mentesh); 2. Hteropolis(Kotch Hissar) ; 8. Otrows (Tchor Hissar) ; 4. Steetoriwm (Emir Assar) ; 5. Bruzus (Kara Sandykly)®; 6. Bewdus (Aghzi Kara); 7. Augustopolis, formerly Anabura (Surmeneh); 8. Szb¢dunda (perhaps Yeni Keui); 9. Lysias (perhaps Bazar Agatch) ; 10. Synnada (Tchifut Cassaba) ; 11. Prymnessus (Seulun) ; 12. Ipsus, formerly Julia (near Sakly) ; 13. Polybotus (Bolawadun) ; 14. Doetmiwm (Istcha Kara Hissar) ; 15. Metropolis, including Conni (B. Tchorgia) and Ambasus (Ambanaz) ; 16. Merus (Kumbet); 17. Nacolea (Seidi Ghazi); 18. Doryleum (Eski Sheher) ; 19. A/idawm (Kara Eyuk) ; 20. Lycaones (Kalejik) ; 21. Aulocra (in Dombai Ova); 22 and 23. Amadassus and Pre- penissus (unknown). In latcr times the important fortress (and

bishopric) of Acroenus was founded on the site of the present Aflum Kara Hissar,

Besides these, certain cities beyond the bounds of the Byzantine Phrygias belonged under the Roman empire to the province of Asia and are usually considered Phrygian—({1) in Byzantine Pisidia, Philomelium (Ak Sheher), Hadrianopolis (Arkut Khan); (2) in Byzantine Galatia, Amoriwm (Assar near Hamza Hadji), Orcistus (Alikel or Alckian), Tricomia or Trocmada or Trocnada (Kaimaz) ; (8) in Byzantine Lycia, Cibyra (Horzum).

Phrygia contains several well-marked geographical districts. (1) Parorivs, the narrow, flat, elevated valley stretching north-west to south-east between the Sultan Dagh and the Emir Dagh from Holmi (about Tchai) to Tyrizum (Hghin); its waters collect within the valley, in three lakes, which probably supply the great foun- tains in the Axylum, and through them the Sangarius. (2) AXYLUM, the vast treeless plains on the upper Sangarius; there burst forth at various points great perennial springs, the Sakaria fountains

> Ococlia, which is known only from coins, probably belongs to this province. Hierocles adds Theodosia, probably a name of Daldis (Demirji), which is usually included in Lydia. Mionnet gives coins of Mosyna, but they are falsely read and belong to the Mosteni.

§ Nos. 1-5 were called the Phrygian " Pentapolis."

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(Strabo, p. 548), Ilije Bashi, Bunar Bashi, Geuk Bunar, Uzuk Bashi, which feed the Sangarius. Great part of the Axylum was assigned to Galatia. (3) The rest of Phrygia is mountainous (except the great plateau, Banaz Ova), consisting of hill-country intersected by rivers, each of which flows through a fertile valley of varying breadth. The northern half is drained by rivers which run to the Black Sea; of these the eastern ones, Porsuk Su (Tembris or Tembrogius), Scidi Su (Parthenius), Bardakchi Tchai (Xerabates), and Bayat Tchai (Alandrus), join the Sangarius, while the western,! Taushanly Tchai (Rhyndacus) and Simay Tchai (Macestus), meet and. flow into the Propontis. The Hermus drains a small district included in the Byzantine Phrygia, but in earlier times assigned to Lydia and Mysia. Great part of

southern and western Phrygia is draincd by the Meander with its tributaries, Sandykly Tchai (Glaucus), Banaz Tchai, Kopli Su (Hippurius), and Tchuruk Su (Lycus) ; moreover, some upland plains on the south, especially the Dombai Ova (Aulocra), communicate by underground channels with the Meander. Finally, the Karayuk Ova in the extreme south-west drains through the Kazanes, a tributary of the Indus, to the Lycian Sea. Phrygia Parorius and all the river- valleys are exceedingly fertile, and agriculture was the chief occupation of the ancient inhabitants ; according to the myth, Gordius was called froin the plough to the throne. The high-lying plains and the vast Axylum furnish excellent pasturage, which formerly nourished countless flocks of sheep. The Romans also obtained fine horses from Phrygia. Grapes, which still grow abundantly in various parts, were much cultivated in ancient times. Other fruits are rare, except in a few small districts. Figs cannot be grown in the country, and the ancient references to Phrygian figs are either erroneous or due to a loose use of the term Phrygia.2 Trees are exceedingly scarce in the country; the pine-woods on the western tributaries of the Sangarius and the valonia oaks in parts of the Banaz Ova, and a few other districts, form exceptions. The underground wealth is not known to be great. Iron was worked in the district of Cibyra, and the marble of Synnada, or more correctly of Docimium, was largely used by the Romans. The scenery is generally monotonous ; even the mountainous districts rarely show striking features or boldness of character ; where the landscape has beauty, it is of a subdued melancholy character. The water-supply is rarely abundant, and agriculture is more or less dependent on an uncertain rainfall. The circumstances of the country are well calculated to impress the inhabitants with a sense of the overwhelming power of nature and of their complete depend- ence onit. Their mythology, so far as we know it, has a melan- choly and mystic tone, and their religion partakes of the same character. The two chief deities were Cybele, the Mother, the re- productive and nourishing power of Earth, and Sabazius, the Son, the life of nature, dying and reviving every year. The annual vicissitudes of the life of Sabazius, the Greek Dionysus, were accom- panied by the mimic rites of his worshippers, who mourned with his sufferings and rejoiced with his joy. They enacted the story of his birth and life and death ; the Earth, the Mother, is fertilized only by an act of violence by her own child ; the representative of the god was probably slain each year by a cruel death, just as the god himself died. The rites were characterized by a frenzy

of devotion, unrestrained enthusiasm, wild orgiastic dances, and wanderings in the forests, and were accompanied by the music of the flute, cymbal, and tambourine. At an early time this worship was affected by Oriental influence, coming over Syria from Baby- lonia. Sabazius was identified with Adonis or Atys, Cybele with the Syrian goddess ; and many of the coarsest rites of the Phrygian worship, the mutilation of the priests, the prostitution at the shrine,® came from the hot countries of the south-east. But one curious point of Semitic religion never penetrated west of the Halys: the pig was always unclean and abhorred among the Semites, whereas it was the animal regularly used in purification by the Phrygians, Lydians, Lycians, and Greeks.© The Phrygian religion exercised a very strong influence on Greece. In the archaic period the Dionysiac rites and orgies spread from Thrace into Grecce, in*

1 This district was according to the Greek view part of Mysia.

- *In Strabo, p. 577, éhardpurov must be wrong; dueddguror is true to fact, and is probably the right reading. Olives cannot grow on the uplands.*

3 Those cults of Greece which are most closely related to the Phry- gian were certainly accompanied originally by human sacrifices.

4 The influence which was exerted on Greck music and lyric poetry by the Phrygian music was great; see Marsyas, OLYMPUS.

5 There is no direct evidence that this was practised in the wor- ship of Cybele, but analogy and indirect arguments make it pretty certain. ; ‘

6 Cleon, the Phrygian, when high priest of the Cappadocian goddess at Comana, caused much scandal by using pigs in the sacred precincts (Strabo, p. 574); he only carried out the customs of his country. Pigs were used in all Greek purificatory rites, which were also practised in Lydia (Herod., i. 35). A pig is under the seat of the deified dead on

the harpy tomb.

spite of opposition which has left many traces in tradition, and the worship of Demeter at Eleusis was modified by Cretan influence ultimately traceable to Asia Minor. Pindar erected a shrine of the Mother of the gods beside his house, and the Athenians were directed by the Delphic oracle to atone for the execution of a priest of Cybele during the Peloponnesian War by building the Metroon. In these and other cases the Phrygian character was more or less Hellenized ; but wave after wave of religious influence from Asia Minor introduced into Greece the unmodified " barbarian " ritual of Phrygia. The rites spread first among the common pcople and those engaged in foreign trade. The comic poets satirized them, and Plato and Demosthenes inveighed against them; but they continued to spread, with all their fervid enthusiasm, their super- stition, and their obscene practices, wide among the people, whose religious cravings were not satisfied with the purely external reli- gions of Hellenism. The orgies or mysteries were open to all, free- men or slaves, who had duly performed the preliminary purifi- cations, and secured to the participants salvation and remission of sins. Under Mysrsrigs (g.v.) a distinction of character has been pointed out between the true Hellenic mysteries, such as the Eleusinian, 'and the Phrygian ; but there certainly existed much similarity between the two rituals. In the first centuries after Christ only the Phrygian and the Egyptian rites retained much real hold on the Graeco-Roman world. Phrygia itself, however, was very early converted to Christianity. Christian inscriptions in the country begin in the 2d and are abundant in the 3d century. There is every appearance that the great mass of the people were Christians before 300, and Eusebius (H. E., v. 16) is probably correct in his statement that in the time of Diocletian there was a Phrygian city in which every living soul was Christian. The great Phrygian saint of the 2d century was named Abercius ; the mass of legends and miracles in the late biography of him long brought his very existence into dispute, but a recently-discovered fragment of his gravestone has proved that he was a real person, and makes it probable that the wide-veaching conversion of the people attri- buted to him did actually take place. The strange enthusiastic character of the old Phrygian religion was not wholly lost when the country became Christian, but is clearly traced in the various heresies that arose in central Anatolia. Especially the wild ecstatic character and the prophecies of the Montanists recall the old type of religion. Montanus (see MonrTanism, vol. xvi. p. 775) was born on the borders of Phrygia and

Mysia (doubtless in the Murad Dagh), and was vehemently opposed by Abercius.

Of the old Phrygian language very little is known ; a few words are preserved in Hesychius and other writers. Plato mentions that the Phrygian words for "dog," "fire," &¢., were the same as the Greek ; and to these we may add from inscriptions the words for "mother" and "king." A few inscriptions of the ancient period are known, and a somewhat larger number of the Roman period have been found, but not yet published.

Owiug to the scantiness of published material about Phrygia frequent reference has been made in this article to unpublished monuments, and historical views are stated which have only quite recently been published by the writer. Besides the works already quoted of Abel and Perrot, see Ritter's " Kleinasien," in his Erdkunde von Asien ; Leake's Asia Minor ; Kiepert's appendix to Franz, Fiinf Inschr. u. fiinf Stidte Kleinasiens ; Haase, in Ersch and Giuber's Encyklop. ; Hamilton's Travels in Asia Minor; Hirschfeld's ' Reisebericht," in the Berl. Monatsber. (1879) ; Texier, Asie Mineure ; Steuart, Ancient Monuments ; besides the special chapters in the geographical treatises of Cramer, Vivien St Martin, Forbiger, &c.; Ramsay, in Mittheil. Instit. Athen. (1882), Bulletin de Corresp. Hellén. (1882-83), and Journal of Hellenic Studies (1882 sq.). CW. M. RA.)

PHRYNE, a celebrated Greek courtesan, flourished in the time of Alexander the Great (4th century B.c.). She was born at Thespiz in Boeotia, but seems to have lived at Athens. Originally so poor as to earn a living by gathering capers, she acquired so much wealth by her extraordinary beauty that she offered to rebuild the walls of Thebes, which had been destroyed by Alexander (335), on condition of inscribing on them, " Destroyed by Alexander, restored by Phryne the courtesan." On the occasion of a festival of Poseidon at Eleusis she laid aside her garinents, let down her hair, and stepped into the sea in the sight of the people, thus suggesting to the painter Apelles his great picture of Aphrodite rising from the Sea, for which Phryne sat as model. The sculptor Praxiteles was one of her lovers, and she is said to have been the model of his celebrated Cnidian Aphrodite, which Pliny declared to be the most beautiful statue in the world." There were statues of her by Praxiteles at Delphi and in

7 So Athenzus, 590, 591. But according to others (Clemens Alex- andrinus, Protrep., 53, and Arnobius, Adv. Gentes, vi. 13) Praxiteles's model for the Cnidian Aphrodite was Cratina; and Pliny (xxxv. 87) says that some declared that Apelles's model was Pancaspe.

her native town; the former was golden or plated with gold, the latter was of marble. It is said that at her request Praxiteles promised her the most beautiful of his works, but would not tell her which was it. Having dis- covered by a stratagem that of his works he prized most a statue of Love (Eros) and one of a Satyr, she asked of him the former and dedicated it in Thespiz. Being accused of impiety by Euthias, she was defended by the orator Hyperides, one of her lovers. When it seemed that the verdict was about to be against her, he rent her robe and displayed her lovely bosom, which so moved her judges that they acquitted her. According to others it was Phryne herself who thus displayed her charms. She is said to have made an attempt on the virtue of the philo- sopher Xenocrates, and to have signally failed.

PHRYNICHUS, the name of a number of distinguished Greeks, of whom the most prominent were the following.

1. Parynicuus, one of the earliest tragic poets of Athens, was the son of Polyphradmon, and a pupil or follower of Thespis, who is commonly regarded as the founder of tragedy. But such were the improvements introduced by Phrynichus that some of the ancients regarded him as its real founder. He flourished, according to Cyrillus and Eusebius, in 483 B.c., but he gained a, poetical victory (probably his first) as early as 9511. His famous play the Capture of Miletus was probably composed shortly after the conquest of that city by the Persians (494). It moved the Athenians to tears ; they fined the poet 1000 drachms for reminding them of the woes of their friends, and decreed that the play should never be used again. In 476 Phrynichus won another poetical victory, probably with his play the Phenisse, which celebrated the defeat of Xerxes at Salamis (480). The drama derived its name from the chorus of Phcenician women. On this occasion Themistocles acted as choragus, and it is probable that the play was written to revive his waning popularity by reminding the Athenians of

his great deeds. The Persians of Aischylus (exhibited in 472) was an imitation of the Phenisse of Phrynichus. Phry- nichus died in Sicily, perhaps at the court of Hiero, tyrant of Syracuse, who welcomed those other great contemporary poets AMschylus and Pindar. The titles of his plays mentioned by Suidas and others show that he treated mythological as well as contemporary subjects ; such are the titles Zhe Danaides, Acton, Alcestis, Tantalus. But in his plays, as in the early tragedies generally, the dramatic element was subordinate to the lyric element as represented by the chorus. Indeed in his earliest dramas there can only have been one actor, for the introduction of two actors was a novelty due to his younger contemporary fischylus, who first exhibited in 499. Phrynichus was especially famous for the sweetness of his songs, which were sung by old people down to the time of Aristophanes. Connected with the predominance of the chorus in early tragedies was the prominence in them of the dance. There is an epigram ascribed to Phrynichus in which he boasts that the figures of his dances were as various as the waves of the sea. According to Suidas it was Phrynichus who first introduced female characters on the stage (played by men in masks). The few remains of his works are collected by Wagner and Nauck in their editions of the fragments of the Greek tragedians.

2, PHRYNICHUS, a poet of the Old Attic Comedy and a contemporary of Aristophanes, is said by Suidas to have been an Athenian, but according to the scholiast on Aristo- phanes (Frogs, 13) he was satirized as a foreigner. His first comedy was exhibited in 429 B.c. (according to Suidas, as corrected by Clinton and Meineke). He composed ten plays, of which the Solitary (“‘Monotropos”) was exhibited in 414 along with the Birds of Aristophanes and gained

(London, 1881).

the third prize, and the JJuses carried off the second prize in 405, Aristophanes being first with the Frogs. This poet (Mrogs, 13) accuses Phrynichus of employing vulgar tricks to raise a laugh, and he was further charged with plagiarism and defective versification, but such accusations were too commonly bandied between rival poets to merit much attention.

He was not included by the Alexandrian critics in their canon of the best poets. The remains of his works, which have been edited with the other frag- ments of the Attic Comedy by Meineke and Bothe, are too scanty to allow us to judge of their merits.

3. PHRYNICHUS ARABIUS, a grammarian of Bithynia, lived in the reigns of the emperors Marcus Antoninus and Commodus (2d century a.p.). According to Suidas he was the author of the following works: (1) an Atticist, or On Attic Words, in two books; (2) TiWepevav cvvaywyy; (3) Zofiorrixy mwapackev}, or Sophistical Preparation, in forty-seven or (according to others) seventy-four books. We have an account of the last-mentioned work by Photius, who had read thirty-six books of it. The copy used by Photius contained only thirty-seven books, but he states that the author in a preface addressed to the emperor Commodus, to whom the work was dedicated, promised, if life lasted, to write as many more books. Separate parts of the work were dedicated to various friends, and Phrynichus excused its delays and imperfections on the ground of numerous illnesses. It consisted of a collection of Attic words and phrases, arranged in alpha- betical order, and distinguished according to the purposes they were meant to serve, whether oratorical, historical, conversational, jocular, or amatory. The models of Attic style, according to Phrynichus, were Plato, Demosthenes and the other nine Attic orators (viz., Antiphon, Ando- cides, Lysias, Isocrates, Iszeus, Mschines, Dinarchus, Lycurgus, Hyperides), Thucydides, Xenophon, schines the Socratic, Critias, Antisthenes, Aristophanes and the other poets of the Old Comedy, together with Aischylus, Sophocles, and Euripides. Of these, again, he assigned the highest place to Plato, Demosthenes, and Adschines the Socratic. The work was learned, but prolix and garrulous. A fragment of it, contained ina Paris MS., was published by Montfaucon, and again by Im. Bekker in the first volume of his Anecdota Graca (Berlin, 1814). We possess another work of Phrynichus which is not mentioned by Photius, but is, perhaps, identical with the Atticist mentioned by Suidas. This is the Selection (Heloge) of Attic Words and Phrases. It is dedicated to Cornelianus, a man of literary tastes, and one of the emperor's secretaries, who had invited the author to undertake the work. It is a collection of current words and forms which deviated from the Old Attic standard. Side by side with these incorrect words and forms are given the true Attic equiva- _ lents. The work is thus a

“lexicon antibarbarum,” and is interesting as illustrating the changes through which the Greek language had passed between the 4th century B.c. and the 2d century a.D. Phrynichus is especially severe upon Menander, and wonders what people can see in him to admire so much. The style is concise and pointed, and is occasionally relieved by touches of dry humour. The book is divided into two parts, of which the second appears in some editions as a separate work under the title of Epitome. Editions of it, with valuable notes, have been published by Chr. Aug. Lobeck (Leipsic, 1820) and W. G. Rutherford Lobeck devotes his attention chiefly to the later, Rutherford to the earlier usages noticed by Phrynichus.

There was also an Athenian general Phrynichus in the Pelopon- nesian War, who took a leading part in establishing the oligarchy of the Four Hundred at Athens in 411 B.c. He was assassinated in the same year.

PHT—PAHT

PHTHALIC ACID. This name was given by Laurent to a di-basic acid, C,H,O,, which he obtained by the oxida- tion of naphthalin or its tetra-chloride with nitric acid. Schunck subsequently obtained the same acid by boiling alizarin with nitric acid, but failed to recognize its iden- tity with Laurent’s.

One part of naphthalin is mixed with two parts of chlorate of potash, and the mixture added cautiously to ten parts of crude muriatic acid. The product, C,)H,.Cl,, is washed with water and then with “ligroin’” (the more volatile fraction of petroleum). The chloride thus purified is oxidized by boiling it with ten parts of (gradually added) nitric acid of 1-45 specific gravity, evaporated to dryness, and the residue distilled to obtain the anhydride C,H ,0,, or

rationally Gi =O. long colourless needles fusing at 128° C.,

—the boiling point being 276°. When boiled with water it becomes

phthalic acid, rat. formula Ge oes thombic crystals, fusing at

184° C. with transformation into anhydride, very slightly soluble in water (100 parts at 11° dissolve 0°77 parts), more soluble in alcohol (100 of absolute dissolve 10-1 parts at 15°). Phthalic acid, when heated to redness with lime, breaks up into CO, and benzol ; the lime salt when mixed with one equivalent caOH of lime, and kept at 330° to 350° C., yields carbonate and benzoate—

CoH sgn 4 + chOH = CaCO, + CgH,COOca (Ca=2ea = 40).

Hence phthalic acid should be obtainable by the oxidation of di-derivatives, CgH,R'R", of benzol (R= CH;, C.H;, &c.), and indeed two acids, CgH, (COOH),, can be thus produced, but neither is identical with phthalic.

Terephthalic acid is obtained by the oxidation of ordinary cymol,

pOgHy ath, or other similar "para" bodies with bichromate of

potash and sulphuric acid. It isa white powder, quite insoluble in water, sublimable without fusion or dehydration.

Isophthalic acid is obtained similarly from "mcta" derivatives, CgH4R., of benzol, hair-fine needles fusing above 300°, almost insoluble in water, but pretty easily soluble in alcohol.

Ortho-bi-derivatives of benzol ought to give " ortho," z.e., Laurent's phthalic acid; but this acid itself is oxidized by the bichrome mixture into CO, and H,0.

Phthaleins are a most interesting family of coloured derivatives of phthalic anhydride, which were discovered by Baeyer, and soon found their way into the colour industry. As an example we quote phenol-phthalein, obtained by the union of the anhydride with phenol, CgH;0H=H +O,H,.OH=H+"Phen." The phthalein is

CoHic(Phen), 2 Phthalic rest.

and, as will easily be understood, something widely different from the di-phenyl-phthalic ether. Phthalic anhydride and resorcin— one of the three

di-hydroxyl derivatives, C,H,(OH),, of benzol— unite into "fluorescin," distinguished by the strong fluorescence of its solutions. Tetra-brom-fluorescin, a beautiful red colour, is used industrially as eosin (from Greek és, the morning-red).

PHTHISIS (¢6éo1s) or Consumption. This term, al- though applicable to several forms of wasting disease, is commonly used to designate a malady having for its chief manifestations progressive emaciation of the body and loss of strength, occurring in connexion with morbid changes in the lungs and in other organs.

Few diseases possess such sad interest for humanity as consumption, both on account of its widespread prevalence and its destructive effects, particularly among the young ; and in every age of medicine the subject has formed a fertile field for inquiry as to its nature, its cause, and its treatment. On all these points medical opinion has under- gone numerous changes with the advance of science and the application of more accurate methods of investigation; yet, notwithstanding the many important facts which within recent years have been brought to light, it must be admitted that our knowledge of this disease is still far from complete. As regards the nature or pathology of consumption it is unnecessary in a notice like the present to refer at length to the doctrines which have from time to time been held upon the subject, further than merely to indicate in a general way the views which have been more or less widely accepted in recent times. In the early part of the present century the study of the diseases of the

be evolved out of this condition.

chest received a great impetus from the labours of Laennec, whose discovery of the stethoscope led to greater minute-

ness and accuracy in investigation (see AUSCULTATION).

This physician held that phthisis depended on the develop- ment of tubercles in the lungs, which, undergoing various

retrograde changes, led to the breaking down and excava-

tion of these organs,—in short, produced the whole pheno-

mena of consumption ; and, further, that this tuberculous formation affected various other parts and organs, and was the result of a morbid constitutional condition or diathesis.

This doctrine, which was generally taught during the first

half of the century, and even longer, was to some extent superseded by that to which the greatest prominence was given by Niemeyer and others, namely, that the majority of cases of phthisis had their origin in an inflammation of the lung (catarrhal pneumonia), but that tubercle—the

existence of which was freely admitted—might occasionally This view has had wide acceptance, but has been modified in a variety of ways, especially by its extension to inflammation in other parts besides the lungs, the unabsorbed products of which are

held to be capable of producing tubercle by infection from

within the system. Still more recently there has arisen another doctrine in connexion with the discovery by Koch of the micro-organism or bacillus of tubercle, which can be cultivated and which, when inoculated, appears capable of producing tubercular disease, namely, the doctrine of the infectiveness of phthisis by means of this " microbe " received into the system from without. This view, which is supported by many striking facts and arguments, has been extensively adopted as furnishing in all probability a rational basis of the pathology of tubercular consumption. Yet it has not been universally accepted, being held by many to be insufficient to account for the origin and course of the disease in numerous instances and in certain of its forms. It is impossible to deny an important place in the course of the disease to inflammatory processes. Even in. those cases where the lungs are infiltrated with tuber- cular deposit evidence of inflammation is abundantly pre- sent, while, on the other hand, it would seem that in not a few instances the process is inflammatory throughout. That phthisis, therefore, is not the same process in all cases, but that there are distinct

varieties of the disease, is made clear by the morbid anatomy of the lungs no less than by other considerations.

Whatever be the form, the common result of the presence of these disease-products is to produce consolidations in the affected portions of the lungs, which, undergoing retrograde changes (caseation), break down and form cavities, the result being the destruction in greater or less amount of lung-substance. These changes most commonly take place at the apex of one lung, but with the advance of the disease they tend to spread throughout its whole extent and to involve the other lung as well. When the disease is confined to a limited area of a lung it may undergo arrest—even although it has advanced so far as to destroy a portion of the pulmonary tissue, and a healing process may set in and the affected part cicatrize. This is, how-ever, exceptional, the far more common course being the progress of the destructive change either by the spread of the inflammatory process or by infection through the lymphatics, &c., from the existing foci of diseased lung- tissue. Various morbid changes affecting the lungs them- selves or other organs frequently arise in the course of phthisis, complicating its progress and reducing the chance of recovery. Of these the more common are affections of the pleura, stomach, liver, kidneys, and especially the in-testines, which in the later stage of the disease become ulcerated, giving rise to the diarrhoea which is so frequent and fatal a symptom at this period.

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The causes influential in producing phthisis are numer- ous and varied, but they may for general consideration be embraced under two groups, namely, those which are pre- disposing and operate through the constitution as a whole, and those which are exciting and act immediately upon the organs implicated. These two sets of causes may be more or less distinctly associated in an individual case ; but, on the other hand, one may appear to act in both ways—as predisposing and exciting. The following may serve to illustrate some of the conditions of a predisposing kind. A constitutional tendency to scrofula and its manifestations lends itself readily to the production of phthisis. This morbid constitution is characterized among other things by a liability to low chronic forms of inflammation affecting

gland-textures, mucous membranes, é&c., the products of which show little readiness to undergo absorption, but rather to degenerate. Inflammations of this character affecting the lungs, as is not uncommon, have a special tendency to lead to the breaking down of lung-texture and formation of phthisical cavities. Many high authorities hold that tubercle-formation may be evolved out of scrofu- lous inflammations of glands, such as those of the neck, by an infective process, like that already referred to. The mention of this constitutional state naturally suggests another powerful predisposing cause, namely, hereditary transmission. The extent to which this influence operates as a cause of consumption has been differently estimated by writers, owing probably to the various aspects in which the matter is capable of being viewed. It is impossible to deny that the children of parents one or both of whom are consumptive are liable to manifest the disease,— that is, they inherit a constitution favouring its development under suitable exciting causes. But a similar constitu- tional proclivity may be induced by other influences acting through the parents. Should either or both of them be enfeebled by previous disease or by any other weakening cause, they may beget children possessing a strong pre- disposition to consumption. Marriages of near relatives are held by some to induce a consumptive tendency,— probably, however, owing to the fact that any constitu- tional taint is likely to be intensified in this way. Phthisis is a disease of early life, the period between fifteen and thirty-five being that in which the great majority of the cases occur, and of these by far the larger proportion will be found to take place between the ages of twenty and thirty. The influence of sex is not marked. Occu- pations, habits, and conditions of life have a very im- portant bearing on the development of the disease apart altogether from inherited tendency. Thus occupations which necessitate the inhalation of irritating particles, as in the case of+stone- masons, needle-grinders,. workers in minerals, in cotton, flour, straw, &c., are specially hurtful, chiefly from the mechanical effects upon the delicate pul- monary tissue of the matter inhaled. No less prejudicial are occupations carried on in a heated and close atmosphere, as 1s often the case with compositors, gold-beaters, semp- stresses, &c. Again, habitual exposure to wet and cold or to sudden changes of temperature will act in a similar way In inducing pulmonary irritation which may lead to phthisis. _ Irregular and intemperate habits are known predisposing causes ; and over-work, over-anxiety, want of exercise, insufficient or unwholesome food, bad hygienic

surroundings such as overcrowding and defective ventila- tion, are all powerful agents in sowing the seeds of the disease. Consumption sometimes arises after fevers and other infectious maladies, or in connexion with any long- continued drain upon the system, as in over-lactation. The subject of climate and locality in connexion with the causation of phthisis has received considerable attention and some interesting facts have been ascertained on tis

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point. That phthisis is to be met with im all climes, and it would seem fully as frequently in tropical as in tem- perate regions, is evidence that climate alone exercises but little influence. It is very different, however, with locality, elevation appearing to affect to a considerable extent the liability to this disease. It may be stated as generally true that phthisis is less prevalent the higher we ascend. The investigations of Dr H. J. Bowditch in New England and of Dr George Buchanan of the Local Government Board in the counties of Surrey, Kent, and Sussex agree in proving that elevated regions with dry- ness of soil are hostile to the prevalence of consumption, while low-lying and damp districts seem greatly to favour its development ; and it has been found that the success- ful drainage of damp localities has occasionally had a marked effect in reducing their phthisis mortality. In all such observations, however, various modifying circum- stances connected with social, personal, and other condi- tions come into operation to affect the general result. As regards immediate or exciting causes, probably the most potent are inflammatory affections of the respiratory pass- ages produced as the result of exposure. The products of such attacks are liable under predisposing conditions, such as some of those already mentioned, to remain unabsorbed and undergo degenerative changes, issuing in the breaking down and excavation of the pulmonary texture. A neces- sary consequence of the modern doctrine of the contagious nature and inoculability of tubercle has been to bring to the front a view as to phthisis once widely prevalent and in some countries—e.g., Italy——never wholly abandoned, namely, its infectiousness. By some supporters of the recent theories of tubercle it is maintained that phthisis is communicated by

infection and in no other way, the infecting agent being the bacillus. Others, while holding the view of the specific nature of the disease, deny that it can be communicated by infection like a fever, and cite the experience of consumption hospitals (such as that described by Dr C. T. Williams with respect to the Brompton Hospital) as to the absence of any evidence of its spreading among the nurses and officials. Others, again, deny both its specific nature and its direct infectious character. There appears, however, to be a growing opinion that phthisis may occasionally be acquired by a previously healthy person from close association with one already suffering from it, and, if this view be well founded, it affords a strong presumption that some infecting agent (such as the tubercle bacillus) is the medium of communi- cation, The whole subject of the infectiousness of this disease is as yet unsettled; but there appears to be suffi- cient reason for special care on the part of those who of necessity are brought into close contact with patients suffering from it.

Cases of phthisis differ widely as regards their severity and their rate of progress. Sometimes the disease exhibits itself as an acute or galloping consumption, where from the first there is high fever, rapid emaciation, with cough and other chest symptoms, or with the comparative absence of these, and a speedily fatal termination. In such instances there would probably be found extensive tuberculization of the lungs and other organs. In other instances, and these constitute the majority, the progress of the disease is chronic, lasting for months or years, and along with periods of temporary improvement there is a gradual pro- gress to a fatal issue. In other cases, again, the disease is arrested and more or less complete restoration to health takes place.

It is unnecessary to describe the symptoms or course and progress of all the varieties of this malady. It will be sufficient to refer to those of the ordinary form of the disease as generally observed. The onset may be somewhat

sudden, as where it is ushered in by hemoptysis (spitting of blood), but more commonly it is slow and insidious and may escape notice for a considerable time. The patient is observed to be falling away in flesh and strength. His appetite fails, and dyspeptic symptoms trouble him. But the most marked

feature of the condition is the presence of a cough, which is either persistent or recurs at certain times, as in lying down in bed or rising in the morning. The cough is dry or is accompanied with slight clear ex- pectoration, and the breathing is somewhat short. Feverish symptoms are present from an early period, the tempera- ture of the body being elevated, especially in the evening. The patient often complains of flying pains in the chest, shoulders, and back. Such symptoms occurring, especially in one who may possess by inheritance or otherwise an evident tendency to chest' disease, should excite suspicion, and should be brought under the notice of the physician. They constitute what is commonly known as the first stage of phthisis and indicate the deposit of tubercle or else inflammatory consolidation in the lung. Not unfre- quently the disease is arrested in this stage by judicious treatment, but should it go on the symptoms characteriz- ing the second stage (that of softening and disintegration of lung) soon show themselves. The cough increases and is accompanied with expectoration of purulent matter in which lung-tissue and the bacillus of tubercle can be detected on microscopic examination.2 The symptoms present in the first stage become intensified: the fever continues and assumes a hectic character, being accom- panied with copious night-sweats, while the appetite and digestion become more and more impaired and the loss of strength and emaciation more marked. Even in this stage the disease may undergo abatement, and improve- ment or recovery take place, though this is rare; and by careful treatment the advance of the symptoms may be in a measure held in check. The final stage (or stage of excavation), in which the lung has become wasted to such an extent that cavities are produced in its substance, is characterized by an aggravation of all the symptoms of the previous stage. In addition, however, there appear others indicating the general break-up of the system. Diarrhcea, exhausting night-perspirations, and total failure of appetite combine with the cough and other pulmonary symptoms to wear out the patient's remaining strength and to reduce his body to a skeleton. Swelling of the feet and ankles and soreness of the mouth (aphthz) proclaim the approach of the end.? Death usually takes place from exhaustion, but sometimes the termination is sudden from hemorrhage, or from rupture of the pleura during a cough and the consequent occurrence of pneumothorax. A _ re- markable and often painful feature of the disease is the absence in many patients of all sense of the nature and

1 The examination of the chest by the usual methods of physical diagnosis reveals in this stage the following as among the chief points. On inspection the thorax is observed to be narrow and poorly developed, or it may be quite natural. At its upper region there may be noticed slight flattening under the clavicle of one side, along with imperfect expansion of that part on full inspiration. On percussion the note may be little if at all impaired, but frequently there is dulness more or less marked at the apex of the lung. On auscultation the breath- sounds are variously altered. Thus they may be scarcely audible, or again harsher than natural, and the expiration may be unduly pro- longed. Sometimes the breathing is of an interrupted or jerky char- acter, and is occasionally accompanied with fine crepitations or rales. Pleuritic friction-sounds may be audible over the affected area.

2 In this stage the physical signs are more distinctive of the disease. Thus the flattening of the chest-wall is still more marked, as is also the dulness to percussion, while on auscultation the breathing is accompanied with coarse moist sounds or rales, which become more audible on coughing. The voice-sound is broncho-phonic.

3 The physical signs now present are those of a cavity in the lung— viz., in general absolute dulness on percussion—cavernous breathing, gurgling rales, and pectoriloquy.

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gravity of the malady from which they suffer, and their singular buoyancy of spirits (the spes phthisica), rendering them hopeful of recovery up till even the very end.

This description is but a brief and imperfect outline of the course and progress of an ordinary case of phthisis. It is scarcely necessary to remark that the disease is greatly modified in its course and progress and in the presence or absence of particular symptoms in individuals. Thus in some the chest-symptoms (cough, é&c.) are pro- minent throughout, while in others these are compara- tively in abeyance, and diarrhcea or fever and exhausting perspirations or throat-troubles specially conspicuous. Nevertheless, essentially the same pathological conditions are present in each case. Further, as has been already mentioned, there are types of the

disease which obviously influence alike its main features and its duration; these have beer embraced under two classes, the acute and the chronic. In the former, which includes the acute tuber- culous and acute inflammatory or pneumonic phthisis, the progress of the disease is marked by its rapidity and the presence of fever even more than by local chest-symptoms. Such cases run to a fatal termination in from one to three or four months, and are to be regarded as the most severe and least hopeful form. The chronic cases, of which the description above given is an example (and which embrace various chronic changes, e.g., chronic interstitial pneumonia or cirrhosis of the lung), progress with variable rapidity. Their duration has been estimated by different authorities at from two to eight or more years. Much, however, necessarily depends on the effect the disease exercises upon the patient's strength and nutrition, on his circum-_ stances and surroundings, and on the presence or absence of weakening complications. Many cases of this class remain for long unchanged for the worse, perhaps under- going temporary improvement, while in a few rare in- stances, where the disease has become well marked or has even attained to an advanced stage, what is virtually a cure takes place.

The treatment of phthisis has received much attention from physicians as well as from empirics, by the latter of whom chiefly many so-called cures for consumption have from time to time been given forth. It need scarcely be stated that no "cure" for this disease exists; but, while this is true, it is no less true that by the adoption of certain principles of treatment under enlightened medical guidance a very great deal may now be done to ward off the disease in those who show a liability to it, and to mitigate and retard, or even arrest, its progress in those who have already become affected by it. The preventive measures include careful attention to hygienic conditions, both personal and surrounding. In the case of children who may inherit a consumptive tendency or show any liability to the disease mucli care should be taken in bringing them up to promote their general health and strengthen their frames. Plain wholesome food with fatty ingredients, if these can possibly be taken, milk, cream, &c., are to be recommended. Ex- ercise in the open air and moderate exercise of the chest by gymnastics and by reading aloud or singing are all advantageous. An ample supply of fresh air in sleeping apartments, schools, &c., is of great importance, while warin clothing and the use of flannel are essential, especially in a climate subject

to vicissitudes. The value of the bath and of attention to the function of the skin is very great. The like general hygienic principles are equally applicable in the case of adults. When the disease has begun to show any evidence of its presence its treatment becomes a matter of first importance, as it is in the early stages that most can be done to arrest or remove it. Special symptoms, such as cough, gastric disturbances, pain, &c., must be dealt with by the physician according to the indi-

vidual case; but it is in this stage of the disease that the question of a change of climate in the colder seasons of the year arises among those whose circumstances render such a step practicable. There can be no doubt that as regards Great Britain the removal of patients threatened by or already suffering from consumption to some mild locality, either in the country or abroad, proves in many instances most salutary. The object aimed at is to obtain a more equable climate, where the atmosphere may have a soothing influence on the respiratory organs, and where also open-air exercise may be taken with less risk than at home. Of British health-resorts Bournemouth, Hastings, Torquay, Ventnor, Penzance, &c., in the south of England, are the best known and most frequented, and although the climate is not so certain as in places farther south in Europe they possess the advantage of home residence, and may be resorted to by persons who are unable to undertake a farther journey. The climate of the Riviera (Maritime Alps) is of superior efficacy owing to its mild- ness and the dry bracing character of its air, and, despite the long journey, is as a rule to be recommended as one of the best for the greater proportion of the cases of phthisis. The same may be said for Algiers and Egypt. Of recent years the air of elevated dry regions, such as Davos in the Alps and the Rocky Mountains in America, has been strongly recommended, and in not a few cases appears to be productive of good in arresting the disease at its outset, and even advantageous in chronic cases where there is no great activity in its progress. Of like value, and in a similar class of cases, are long sea-voyages, such as those to Australia or New Zealand. Nevertheless, there is no doubt that consumptive patients are often sent abroad manifestly to die.

It may be stated generally (although doubtless there may be exceptions) that where the disease exhibits a decidedly acute form, even in its earlier stages, any distant change is rather to be discouraged ;

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while in the advanced stages, where there is great prostra- tion of strength, with colliquative symptoms, the removal of a patient is worse than useless, and frequently hastens the end.

Throughout the whole course of the malady the nutrition of the patient forms a main part of the treatment, and tonics which promote the function of the digestive organs are especially helpful. Codliver oil has long been held to be of eminent value, as it appears not merely to possess all the advantages of a food but to exert a retarding effect on the disease. Where it is well borne, not only will the weight of the body be found to increase, but the cough and other symptoms will markedly diminish. The oil is as a rule best administered at first in small quantity. The frequently employed substitutes, such as malt extract, tonic syrups, &c., although not without their uses, are all inferior to codliver oil. The occasional employment of counter- irritation to the chest in the form of iodine or small blisters is of service in allaying cough and relieving local pains. Respirators to cover the mouth and nose, and so con- structed as to contain antiseptic media through which the air is breathed, are sometimes found to lessen cough and other symptoms of chest-irritation.

Among the most serviceable drugs in the treatment of the symptoms of phthisis are the preparations of opium. Administered along with such agents as hydrocyanic acid and expectorants, they are eminently useful in soothing severe cough; along with astringents they are equally valuable in controlling diarrhcea; while with quinine, digit- alis, &c., they aid in allaying fever and restlessness and in procuring sleep. But besides these many other medi- cinal agents, too numerous to mention here, are employed with much advantage. Each case will present its own features and symptoms calling for special attention and treatment, and details upon these points must be left to the advice of the medical attendant. (JO? A.)

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ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XIX

EDINBURGH: ADAM AND CHARLES BLACK

MDCCCLXXXV

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ENCYCLOPAIDIA

BRITANNICA.

PHY-PAE

HYLACTERY (dvAaxrtyjpiov) is the name given in P the New Testament to the yon (tefillin) or ‘“ prayer- thongs” of the Jews. Every Jew wears at prayer two of these thongs—(1) the hand-tefilla, a leather thong wound round the left arm and supporting a small case containing a parchment strip with the passages Exod. xiii. 1-10, 11-16, Deut. vi. 4-9, xi. 13-21 written in four columns; (2) the head-tefilla, a similar thong with the four passages inscribed on four separate slips of parchment, and worn round the head so that the box with the texts rests on the forehead. The use of these phylacteries is justified by a literal inter- pretation of expressions in the passages above cited, and they form, together with the M¥¥ (zizith) or “fringe” (Numb. xv. 37 sg.) and the MnM) (meztiza) above the door, the

three sets of visible signs by which the Israelite is constantly reminded of his duty to God. The zizith is no longer placed on the outer garment as in New Testa- ment times (Matt. xxiii. 5), but on the woollen scarves called mdy (tallith), of which the Jewish man always wears one, while another is wound round the head and neck during prayer. The meztfiza is now a longish box fixed over the right doorpost of houses or rooms and containing a parchment with Deut. vi. 4-9, xi. 13-21.

In their origin there can be little doubt that the phylacteries are, according to the proper sense of the Greek word, a kind of amulet, not essentially different from the Aramaic kmt‘é, and in fact “the Hebrew” of the Hexapla uses the word “ phylacteries” for the amulets (EZ. V. pillows) of Ezek. xiii. 18. Phylactery and meziiza were supposed to keep off hurtful demons (Targ. on Cant. viii. 3). For further particulars, see Surenhusius, Aisha, i. 9 sq., and Bodenschatz, Kirch. Verf. d. heutigen Juden, iv. 9 sq.

PHYLLOXERA. See VINz.

PHYSICAL CONSTANTS. See WeicHtTs AND MEa- SURES.

PHYSICAL GEOGRAPHY. See vol. x. pp. 210-212.

PHYSICAL SCIENCES.! According to the original meaning of the word, physical science would be that knowledge which is conversant with the order of nature— that is, with the regular succession of events whether

1 The paper of the late Professor J. Clerk Maxwell which is pre- sented to the reader under this head was prepared at the time when the ninth edition of the Encyclopedia Britannica was being planned, and bore in his M8. the title ‘‘ Remarks on the Classification of the Physical Sciences.”

mechanical or vital—in so far as it has been reduced to a scientific form. The Greek word “physical” would thus be the exact equivalent of the Latin word “natural.” In the actual development, however, of modern science and its terminology these two words have come to be restricted each to one of the two great branches into which the knowledge of nature is divided according to its sub- ject-matter. Natural science is now understood to refer to the study of organized bodies and their development, while physical

science investigates those phenomena primarily which are observed in things without life, though it does not give up its claim to pursue this investi- gation when the same phenomena take place in the body of a living being. In forming a classification of sciences the aim must be to determine the best arrangement of them in the state in which they now exist. We there- fore make no attempt to map out a scheme for the science of future ages. We can no more lay down beforehand the plan according to which science will be developed by our successors than we can anticipate the particular dis- coveries which they will make. Still less can we found our classification on the order in time according to which different sciences have been developed. This would be no more scientific than the classification of the properties of matter according to the senses by which we have become acquainted with their existence.

It is manifest that there are some sciences, of which we may take arithmetic as the type, in which the subject- matter is abstract, capable of exact definition, and incap- able of any variation arising from causes unknown to us which would in the slightest degree alter its properties. Thus in arithmetic the properties of numbers depend entirely on the definitions of these numbers, and these definitions may be perfectly understood by any person who will attend to them. The same is true of theoretical geometry, though, as this science is associated in our minds with practical geometry, it is difficult to avoid thinking of the probability of error arising from unknown causes affecting the actual measurement of the quantities. There are other sciences, again, of which we may take biology as the type, in which the subject-matter is con- crete, not capable of exact definition, and subject to the influence of many causes quite unknown to us. Thus in

biology many abstract words such as “species,” “ genera- tion,” &c., may be employed, but the only thing which we can define is the concrete individual, and the ideas which the most accomplished biologist attaches to such words as “species” or ‘“ generation” have a very different degree of exactness from those which mathematicians associate, say, with the class or order of a surface, or with the umbilical generation of conicoids. Sciences

of this kind are rich in facts, and will be well occupied for ages to come In the co-ordination of these facts, though their cultivators may be cheered in the meantime by the hope of the discovery of laws like those of the more abstract sciences, and may indulge their fancy in the contemplation of a state of scientific knowledge when maxims cast in the same mould as those which apply to our present ideas of dead matter will regulate all our thoughts about living things.

What is commonly called “physical science” occupies a position intermediate between the abstract sciences of arithmetic, algebra, and geometry and the morphological and biological sciences. The principal physical sciences are as follows.

A. The Fundamental Science of Dynamics, or the doctrine of the motion of bodies as affected by force.—The divisions of dynamics are the following. (1) Kinematics, or the investigation of the kinds of motion of which a body or system of bodies is capable, without reference to the cause of these motions. This science differs from ordinary geometry only in introducing the idea of motion,—that is, change of position going on continuously in space and time, Kinematics includes, of course, geometry, but in every existing system of geometry the idea of motion is freely introduced to explain the tracing of lines, the sweeping out of surfaces, and the generation of solids. (2) Statics, or the investigation of the equilibrium of forces, —that is to say, the conditions under which a system of forces may exist without producing motion of the body to which they are applied. Statics includes the discussion of systems of forces which are equivalent to each other. (3) Kinetics, or the relations between the motions of material bodies and the forces which act on them. Here the idea of matter as something capable of being set in motion by force, and requiring a certain force to generate a given motion, is first introduced into physical science. (4) Energetics, or the investigation of the force which acts between two bodies or parts of a body, as dependent on the conditions under which action takes place between one body or part of a body and another so as to transfer energy from one to the other.

The science of dynamics may be divided in a different manner with respect to the nature of the body whose motion is studied. This formsa cross

division. (1) Dyna- mics of a particle ; including its kinematics or the theory of the tracing of curves, its statics or the doctrine of forces acting at a point, its kinetics or the elementary equations of motion of a particle, and its energetics, including, as examples, the theory of collision and that of central forces. (2) Dynamics of a connected system, including the same subdivisions. This is the most important section in the whole of physical science, as every dynamical theory of natural phenomena must be founded on it. The sub- divisions of this, again, are—a. dynamics of a rigid system, or a body of invariable form; 6. dynamics of a fluid, including the discussion (a) of its possible motion, (8) of the conditions of its equilibrium (hydrostatics), (y) of the action of force in producing motion (hydro-dynainics, not so unsatisfactory since Helmholtz, Stokes, and Thomson's investigations), and (6) of the forces called into play by change of volume; c. dynamics of an elastic body ; d. dynamics of a viscous body.

B. The Secondary Physical Sciences.—Each of these

SCIENCES

sciences consists of two divisions or stages. In the ele- mentary stage it is occupied in deducing from the observed phenomena certain general laws, and then employing these laws in the calculation of all varieties of the phenomena. In the dynamical stage the general laws already discovered are analysed and shown to be equivalent to certain forms of the dynamical relations of a connected system (A, 2), and the attempt is made to discover the nature of the dynamical system of which the observed plenomena are the motions. This dynamical stage includes, of course, several other stages rising one above the other; for we may successfully account for a certain phenomenon, say the turning of a weathercock towards the direction of the wind, by assuming the existence of a force having a parti- cular direction and tending to turn the tail of the cock in that direction. In this way we may account not only for the setting of the weathercock but for its oscillations about its final position. This, therefore, is entitled to rank as a dynamical theory. But we may go on and discover a new fact, that the air exerts a pressure and that there is a greater pressure on that side of the cock on which the wind blows. This is a further development of the theory, as it tends to account for the force already discovered. We may go on and

explain the dynamical connexion be- tween this inequality of pressure and the motion of the air regarded as a fluid. Finally, we may explain the pressure of the air on the hypothesis that the air consists of molecules in motion, which strike against each other and against the surface of any body exposed to the air.

The dynamical theories of the different physical sciences are in very different stages of development, and in almost all of them a sound knowledge of the subject is best acquired by adopting, at least at first, the method which we have called ‘elementary,’—that is to say, the study of the connexion of the phenomena peculiar to the science without reference to any dynamical explanations or hypo- theses. Thus we have—

(1) Theory of gravitation, with discussion of the weight and motion of bodies near the earth, of the whole of physical astronomy, and of the figure of the earth. There is a great deal of dynamics here, but we can hardly say that there is even a beginning of a dynamical theory of the method by which bodies gravitate towards each other.

(2) Theory of the action of pressure and heat in chang- ing the dimensions and state of bodies, This is a very large subject and might be divided into two parts, one treating of the action of pressure and the other of heat. But it is much more instructive to study the action of both causes together, because they produce effects of the same kind, and therefore mutually influence each other. Hence the term ‘“‘ thermodynamics” might be extended to the whole subject were it not that it is already restricted to a very important department relating to the transformation of energy from the thermal to the mechanical form and the reverse. The divisions of the subject are seven. (a) Physical states of a substance,—gaseous, liquid, and solid ; elasticity of volume in all three states ; elasticity of figure in the solid state; viscosity in all three states ; plasticity in the solid state ; surface-tension, or capillarity ; tenacity of solids ; cohesion of liquids ; adhesion of gases to liquids and solids. (6) Effects of heat in raising temperature, altering size and form, changing physical state. (c) Ther- mometry. (d) Calorimetry. (¢) Thermodynamics, or the mutual convertibility of heat and work. (/) Dissipation

-of energy by diffusion of matter by mixture, diffusion of

motion by internal friction of fluids, diffusion of heat by conduction. (g) Theory of propagation of sound, vibra- tions of strings, rods, and other bodies.

(3) Theory of radiance. (a) Geometrical optics ; theory of conjugate foci and of instruments. (b) Velocity

PHY—PHY 3

(c) Prismatic analysis of

of light in different media. visible radiance,

light, spectroscopy, radiant heat, ultra-violet rays, calorescence, &c., fluorescence, &c. (d) Colours of thin plates, diffraction, ke, (d’) Proof of the existence of wave-lengths and wave-periods (prepara- tion for dynamical theory). (¢) Polarized light, radiant heat, &c. (e’) The disturbance is transverse to the ray. (7) Quantity of energy in the total radiation from a hot body ; Prévost’s theory of exchanges, &c. (g) Theory of three primary colours.

(4) Electricity and magnetism. (a) Electrostatics, or distribution and effects of electricity in equilibrium. (6) Electrokinematics, or distribution of currents in conductors. (c) Magnetism and magnetic induction (diamagnetism, &e.). (d) Electromagnetism, or the effects of an electric current at a distance. Under (%) we may discuss electro- chemistry, or the theory of electrolysis ; under © terres- trial magnetism and ship’s magnetism; and after (d) comes electrokinetics, or electromagnetic phenomena considered with reference to the fundamental science of dynamics. There is also Faraday’s discovery of the effect of magnet- ism on light and the electromagnetic theory of light.

Chemistry is not included in this list, because, though dynamical science is continually reclaiming large tracts of good ground from the one side of chemistry, chemistry is extending with still greater rapidity on the other side into regions where the dynamics of the present day must put her hand upon her mouth. Chemistry, however, is a physical science, and a physical science which occupies a very high rank. (5. C. M.)

PHYSIOGNOMY. By the Act of Parliament 17 George II. c. 5 all persons pretending to have skill in physiognomy were deemed rogues and vagabonds, and were liable to be publicly whipped, or sent to the house of correction until next sessions.![1] The pursuit thus stigma- tized as unlawful is one of great antiquity, and one which in ancient and medieval times had an extensive though now almost forgotten literature. Physiognomy was re- garded by those who cultivated it as a twofold science— (1) a mode of discriminating character by the outward appearance and (2) a method of divination from form and feature. It was very early noticed that the good and evil passions by their continual exercise stamp their impress on the face, and that each particular passion has its own expression. Thus far physiognomy is a branch of physiology, and from a very early age of human thought it attracted philosophic attention. But in its second aspect it touched astrology, of which Galen[2] says that the physiognomical part is the greater, and this aspect of the subject bulked largely in the fanciful literature of the Middle Ages.

The name originated with the Greeks, who called it provoyvopia, prrvoyvwpovia, or Pvtwyvepoctvy. Accord- ing to Principal Blackwell[3] of Aberdeen, Homer wrote upon the lines of the hand; but this is not supported by classical authority. That Homer was a close observer of appearance as correlated with character is shown in his description of Thersites* and elsewhere. Hippocrates, writing about 450 B.c., refers to this subject, but not in

1 The Act 39 Elizabeth c. 4 declared “all persons fayning to have knowledge of Phisiognomie or like Fantasticall Ymaginacions ” liable to “be stripped naked from the middle upwards and openly whipped until his body be bloudye.” This was modified by 13 Anne c. 26, still further by 17 George II. c. 5, which was re-enacted by 5 George IV. c. 88. This last Act only specifies palmistry.

2 Galen, Iepi xaraxloews mpoyvworikd (ed. Kiihn, xix. 530).

3 Proofs of the Inquiry into the Life and Writings of Homer, London, 1747.

4 JL, ii. 214. See also Blackwell’s Inquiry, 2d ed., 1736, p. 330. A physiognomical study of the Homeric heroes is given by Malalas,

Chronogr., ed. Dindorf, v. p. 105.

detail.5 He believed in the influence of environment in determining disposition, and in the reaction of these upon feature,—a view in which he is supported later by Trogus. Galen speaks of it at more length in his work [epi rov THs Wuxis 79wv, in which, having discussed the nature and immortality of the soul, he proceeds in chapter vii. to a brief study of physiognomy (ed. Kiihn, iv. 795). How- ever, at the end of the chapter he passes over the current physiognomical speculations, saying that he might criticize them but feared to waste time, and become tedious over them. In the eighth chapter he quotes with approbation the Hippocratic doctrine referred to above; and in a later work, [epi xataxAioews tpoyvwotixd, he speaks of its relations to medicine thus: '" Hippocrates igitur, et vetustate admodum notus et scientia admirandus, in- quit, 'quocunque exercentes medicinam, physiognomonie sunt expertes, horum mens in tenebras devoluta torpida senescit,'" &c.6 We learn both from Iamblichus' and Porphyry § that Pythagoras was in the habit of diagnos- ing the characters of candidates for pupilage before ad- mitting them. However, he seems to have discredited the current physiognomy of the schools, as he rejected Cylo the Crotonian from his discipleship on account of his professing these doctrines, and thereby was brought into considerable trouble.® Plato also tells us that Socrates predicted the promotion of Alcibiades from his appearance ; and Apuleius !° speaks of Socrates recognizing the abilities of Plato at first view. On the other hand, it has been recorded by Cicero! that a certain physiognomist, Zopyrus, who professed to know the habits and manners of men from their bodies, eyes, face, and forehead, characterized Socrates as stupid, sensual, and dull (bardus), "in quo Alcibiades cachinnum dicitur sustulisse." Alexander Aphrodisiensis !* adds that, when his disciples laughed at the judgment, Socrates said it was true, for such had been his nature before the study of philosophy had modified it. Zopyrus is also referred to by Maximus Tyrius}° as making his recognitions " intuitu solo."

That one's occupation stamps its impress on the out- ward appearance was also noticed at an early period. In the curious poem in praise of literature found in the Sallier papyrus (II.) in the British Museum this is ex- patiated on, and the effects of divers handicrafts on the workmen are compared with

the elevating influences of a literary life by an Egyptian scribe of the XIIth Dynasty, perhaps 2000 years B.c.14 Josephus tells us that Casar detected the pretence of the spurious Alexander by his rough hands and surface.!°

The first systematic treatise which has come down to us is that attributed to Aristotle,!® in which he devotes six chapters to the consideration of the method of study, the general signs of character, the particular appearances characteristic of the dispositions, of strength and weakness,

5 Tlept dépwr, vddrwv, Torwy (ed. Kiihn, i. 547).

8 Op, cit., xix. p. 530.

7 Tlept Blov WvOayopixod débyos, i. 17, Amsterdam, 1707, p. 59.

8 De vita Pythagore, Amsterdam, 1707; p. 16. This author tells us that he applied the same rule to his friends. See also Aulus Gellius, i. ix. ® Tamblichus, p. 49.

10 Philosophi Platonic, i., ‘‘De dogmate,” Leyden, 1714, p. 34.

ll De fato, Geneva, 1684, iii. p. 303, 1. 25.

12 Tlepi ciuappévys, § 6, London, 1658.

13 Diss., xv., Cambridge, 1703, p. 157.

14 Select Papyri, pl. xv., xix., and (Anastasi) ibéd., cxxviii.-cxxxiii.

VA, xviie 12; 2.

16 Authors differ in their views as to its authenticity, but Diogenes Laertius (v. 22) and Stobeus (Serm., clxxxix.) both believe it to be genuine. The chief difficulty is the reference to a certain sophist, Dionysius, but this is probably an interpolation. There are physio- gnomic references in other writings of Aristotle (cf. Anal. pr., li. c. 30; Hist. anim., i. 8, &c.) sufficient to justify the attribution of the treatise to him. On this, see Franz, Preface, p. vi. sg., of his Scrip- tores physiognomie veteres, Leipsic, 1780.

of genius and stupidity, of timidity, impudence, anger, and their opposites, &c. Then he studies the physiognomy of the sexes, and the characters derived from the different features, and from colour, hair, body, limbs, gait, and voice. He compares the varieties of mankind to animals, the male to the lion, the female to the leopard. The general character of the work may be gathered from the following specimen. While discussing noses, he says that those with thick bulbous ends belong to persons who are insensitive, swinish; sharp-tipped belong to the irascible, those easily provoked, like dogs ; rounded, large, obtuse noses to the magnanimous, the lion-like ; slender hooked noses to the eagle-like, the noble but grasping ; round-tipped retroussé noses to the luxurious, like barn- door fowl; noses with a very slight notch at the root belong to the impudent, the crow-like ; while snub noses belong to persons of luxurious habits, whom he compares to deer ; open nostrils. are signs of passion, &c. Several good editions have been published,! and numerous voluminous commentaries written upon it ;? most subsequent authors have copied from it, with or without acknowledgment.

References exist to a work on physiognomy by Theo- |

phrastus, but it is not extant; and the next important author is Melampus, the Egyptian hierogrammateus, who lived at the court of Ptolemy Philadelphus, and wrote, about 270 B.c., the work Ilept wadpov pavtixy. This, while descriptive, like that of Aristotle, deals largely in omens, in divination from nevi and the twitchings of limbs. It was edited by Camillus Peruscus, and published at Rome (1545) along with those of Polemon and Adaman- tius.3 References to physiognomy are to be found in many of the Greek classics.4 Apion speaks of the metopo- scopists who judge by the appearance of the face, and Cleanthes the Stoic says it is possible to tell habits from the aspect (cf. Ecclus. xix. 29, 30). Polemon (c. 150 A.D.) is the next in order who has left a treatise on the subject, similar in character to that of Aristotle; but he excels in graphic descriptions of different dispositions and differs only from Aristotle in some of his animal com- parisons. The best modern edition of his work is contained in Franz’s Scriptores phystognomix veteres. It was trans- lated into Latin and published at Venice by Nicholas Petreius in 1534.

This book was referred to by Albertus Magnus, who attributes to its author a second work on the subject. A more important contribution to the literature of physiognomy was added by a converted Jew, Adaman- tius, about 415. This work is in two books, the first on the expression of the eye, the second on physiognomy in general, mostly Aristotelian in character. He professes to have learned much from the Egyptians, and tells us that nature speaks in the forehead and face and in the silence of the mouth. He follows Aristotle in holding rather a low opinion of the intellect of the female sex, whom he makes the subject of some rather depreciating com- parisons, His work was edited with the foregoing by Franz.> Artemidorus, Loxus, Philemon, Posidonius,® Con-

1 That of J. G. Franz (Leipsic, 1780) is the best ; Andreas Lacuna

published a Latin version, Paris, 1585; Willichius, another at Wittenberg, 1538,

? Fontain's Commentary (Paris, 1611), Camillus Baldus of Bologna (1621), Sanchez of Toulouse (1636).

; And later by Franz (op. cit., p. 470).

See an interesting paper on "Stretching and Yawning as Signs of Madness, by Professor Ridgeway (Trans. Camb. Philol. Soc., vol. i. p. 210), which refers to Aristoph., Wasps, 642, with which he compares Plautus, Menzchmi, 279. Other references exist to physiognomy in Cassiodorus, Isidorus, Meletius, and Nemesius, but none of any very great importance.

It was edited by Janus Cornaro at Marburg, 1543, by Bonum of Paris ten years later, by Camillus Peruscus, by Petreius, and by Sylburg in the sixth volume of his Aristotle,

c Tlept waduGv. See Justin Martyr's Quast. ad orthodox, xix., vol, ii., Paris, 1742, p, 461.

stantinus," are other early authors frequently quoted by 16th-century writers, while Phemonoe, Antiphon, Helenus of Syracuse, and Eumolpius

are mentioned as writers by Porta, Albertus Magnus, and others, but their works are not extant.

The Latin classics occasionally refer to physiognomy : Juvenal (vi. 383) speaks of the examination of forehead and face, but not with much respect; Suetonius (Vita Titz, 2) tells us, ‘Quo quidem tempore, aiunt, metoposcopum a Narcisso, Claudio liberto, adhibitum, ut Britannicus in-spiceret”; and Pliny also refers to it (47. WV., xxxv. 10). Refcrences also exist in the writings of Clement of Alexandria; and Origen,’ while speaking of the Jewish fable as to the birth of Christ, asks, Is it possible, if there be any truth in the science taught by Zopyrus, Loxus, and Polemon, that such a soul as Christ’s could have been provided with a suitable body in such a way? Sir George Wharton quotes the text Job xxxvii. 7, ‘He impresseth (DFM) the hand of every man, that all may know His work,” as an authority for chiromancy, and other chiro- mantists have followed him in so doing.? ;

Hitherto the physiognomy of the schools had been chiefly descriptive; in the succeeding period the astro- logical side, whose gradual development may be noted, becomes the most important part. Hence in the sub- sequent or second stage of history chiromancy is specially predictive in character, and attains an importance it had not originally possessed. The treatises also contain occa- sional digressions on onychomancy, alectoromancy, clido-mancy, coscinomancy, podoscopy, spasmatomancy, &e.

Along with the medical science of the period the Arabians took up the study of physiognomy: ‘Ali b. Ragel wrote a book on nevi; Rhazes (1040) devoted several chapters of his medical work to it ; and Averroes (1165) made many references to it in his De Sanztate (p. 82, Leyden, 1537). Avicenna also makes some acute physiognomical remarks in his De Animalibus, which was translated by Michael Scott about 1270, but printed subsequently (without date or place). Albertus Magnus (born 1205) devotes much of the second tract of his De Animalibus to the consideration of physiognomy. There is, however, nothing original in the treatise, which largely consists of extracts from Aristotle, Polemon, and Loxus. He does not enter so much into the animal comparisons of his predecessors, but occupies himself chiefly with simple descriptive physiognomy as indicative of character; and the same is true of the many scattered notes in the writ-

ings of Duns Scotus and Thomas Aquinas. The famous sage of Balwearie, Michael Scott, while court astrologer to the emperor Frederick I1., wrote his treatise De hominis phisionomia (c. 1272), much of which is physiological and of curious interest. It was not printed until 1477, and the edition was not illustrated. The physiognomical treatise forms the third part of his work De secretes nature, In 1335 Petrus de Abano of Padua delivered in Paris a course of lectures on this subject (afterwards edited by Blondus, 1544), a few years before he was burned for heresy. Shortly after the introduction of printing in the 15th century a large number of works on physiognomy were produced ; probably the oldest is the block book by Hartlieb, Die Kunst Ciromantia. This is an exceedingly rare folio, of which one fine copy is extant in Paris; each page bears a figure of a giant hand from 7 to 104 inches long, inscribed with characteristic words, and with a small amount of description below ; there are twenty-seven such

7 Constantinus Africanus, De humana natura et prinetpalibus membris corporis humant, Basel, 1541, folio.

8 Contra Celsum, i. 38.

® For other references to Scriptural allusions to physiognomy, see Vecchius, Observationes in div. script., Naples, 1641.

plates. A description of another perfect copy belonging to Earl Spencer occurs in Dibdin’s Bibliographical De- cameron (1817), vol. i. p. 148, and four imperfect copies are known to exist elsewhere. The date of Hartlieb’s work is probably 1470. This and Michael Scott’s books were the first printed works on the subject.

The 16th century was particularly rich in publications on physiognomy. Not only were the classical works printed, but additions were made to the literature by Cocles, Corvus, Johannes de Indagine, Cornaro, Blondus, Douxciel, Pompeius Ronnseus, Gratarolus, Niquetius, Pom- ponius Gauricus, Tricassus, Cardan, Tiberius, Thaddzeus ab Hayck, Taisnierus, Rizzacasa, Campanella, Hund, Picci- olus, Rothman, Johannes Padovanus, and, last and greatest of all, Giantbattista della Porta. Several works also ap-

peared in England, the earliest being the anonymous On the Art of foretelling Future Events by Inspection of the Hand (London, 1504). A second anonymous work, A pleasant Introduction to the Art of Chiromancie and Physiognomie, was published at the same place in 1558. Neither of these is of any merit. The first English work with the author's name is that of Dr Thomas Hill (1571), Zhe Contemplation of Mankynde, contayning a singular Discourse after the Art of Phisiognomie. Thisis rather quaintly written, but is simply an adaptation from the Italian writers of the day. Another anonymous author about this period, but whose work has no date, writes, under the name " Merlin Britannicus," upon moles and nevi after the model of 'Ali b. Ragel. The word '"physiognomy" had been introduced into England before this century, and, from analogy with the Greek, had been used in the sense of the outward appearance, or the face: thus in Udall's translation of the paraphrase of Erasmus on Mark iv. it occurs spelt " phisnomi"; the pugnacious bishop of Ossory, Bale, in his Hnglish Votaries, spells it " physnomie" (pt. i. ch. ii. p. 44).

The rise of the study of anatomy served largely to bring physiognomy into discredit by substituting real facts for fictions ; hence in the 17th century its literature, while not smaller in quantity, was less important in quality. The principal authors are Goclenius, Fuchs, Timpler, Tischbein, Gallimard, Moldenarius, Septalius, Hertod, Scarlatini, Saunders, Withers, Helvetius, Lebrun, Elsholtius, De la Belliére, Philipp May, Evelyn, Freius, Baldus, Torreblanca, Otto, Bulwer, Rhyne, Merbitzius, Fludd, Zanardus, Finella, Tamburini, Etzler, Vecchius, Pretorius, De la Chambre, and Giraldus.

The 18th century shows a still greater decline of interest in physiognomy. Historians of philosophy, like Meursius and Franz, re-edited some of the classical works, and Fiilleborn reviewed the relation of physiognomy to philo- sophy. Indeed the only name worthy of note is that of Lavater (q.v.). The other authors of this century are Peuschel, Spon, Lichtenberg, Schutz, Wegelin, Pernetty, Girtanner, Grohmann, and several anonymous writers, and from the anatomical side Lancisi, Parsons, and Peter Cam- per. The popular style, good illustrations, and pious spirit pervading the writings of Lavater have given to them a popularity they little deserved, as there is really no system in his work, which largely consists of rhapsodical comments upon the several portraits. Having a happy knack of estimating

character, especially when acquainted with the histories of the persons in question, the good pastor con- trived to write a graphic and readable book, but one much inferior to Porta's or Aristotle's as a systematic treatise. With him the descriptive school of physiognomists may be said to have ended, as the astrological physiognomy expired with De la Bellitre. The few straggling works which have since appeared are scarcely deserving of notice, the rising attraction of phrenology having given to pure phy- slognomy the coup de grdce by taking into itself whatever

was likely to live of the older science. The writers of this century are Horstig, Maas, Rainer, Cross, Stohr, Sehler, Diez, Carus, Piderit, Burgess, and Gratiolet.

The physiological school of physiognomy was fore- shadowed by Parsons and founded by Sir Charles Bell, as his Essay on the Anatomy of Expression, published in 1806, was the first really scientific study of expression. He was one of the first who accurately correlated the motions expressive of the passions with the muscles which produce them, and in the later editions of his work these descriptions are much enlarged and improved. Shortly after the appearance of the first edition of Bell's Hssay Moreau published his first edition of Lavater along some- what the same lines (1807). The experiments of Duchenne (Mécanisme de la Physionomie ITumaine, Paris, 1862) showed that by the use of electricity the action of the separate muscles could be studied and by the aid of photography accurately represented. These tested and confirmed by experimental demonstration the hypothetic conclusions of Bell. The machinery of expression having thus been clearly followed out, the correlation of the physical actions and the psychical states was made the subject of specula- tion by Spencer. (Psychology, 1855), and such speculations were first reduced to a system by Darwin (Expression of Emotions, 1872), who formulated and illustrated the fol- lowing as fundamental principles.

(1) Certain complex acts are of direct or indirect service under certain conditions of the mind in order to relieve or gratify certain sensations or desires; and whenever the same state of mind is induced the same set of actions tend to be performed, even when they have ceased to be of use. (2) When a directly opposite state of inind is induced to one with which a

definite action is correlated, there is a strong and involuntary tendency to perform a reverse action. (8) When the sensorium is strongly excited nerve - force

is generated in excess, and is transmitted in definite directions, depending on the connexions of nerve-cells and on habit.

It follows from these propositions that the expression of emotion is for the most part not under the control of the will, and that those striped muscles are the most expressive which are the least voluntary. The philosophy of phy- siognomy may be formulated upon this definite theoretic basis. (1) The actions we look upon as expressive of emotions are such as at some time were serviceable in relieving or gratifying the desires or sensations accom- panying the emotion. (2) Such actions become habitually associated with the mental condition and continue even where their utility is lost. (3) Certain muscles which pro- duce these actions become from habitual action strength- ened, and, when the skin diminishes in fulness and elasticity with advancing age, the action of the muscle produces furrows or wrinkles in the skin at right angles to the course of the fibres of the muscle. (4) As the mental disposition and proneness to action are inherited by children from parents, so the facility and proneness to expression are similarly developed under the law of heredity. (5) To some extent habitual muscular action and the habitual flow of nerve-force in certain directions may alter the contour of such bones and cartilages as are thereby acted upon by the muscles of expression. Illustrations of these theoretic propositions are to be found in the works of Bell, Duchenne, and Darwin, to which the student may be referred for further information.

For information on artistic anatomy as applied to physiognomy see the catalogue of sixty-two authors by Ludwig Choulant, Geschichte und Bibliographic der anatomischen Abbildwng, &c., Leipsic, 1852, and the works of the authors enumerated above, especially those of Aristotle, Franz, Porta, Cardan, Corvus, and Bulwer. An attempt has been made recently to rehabilitate palmistry by D’Arpentigny and Desbarrolles, for summaries of which see the works of Beamish and Craig. For physiognomy of disease, besides the usual medical handbooks, see Cabuchet, Essai sur I’ Expression de la Face dans les Maladies, Paris, 1801. For ethnological physiognomy,

see amongst older authors Gratarolus, and amongst moderns the writers cited in the various text-books on anthropology. (A. MA.)

6 PHYS@tonocwus

PHYSIOLOGUS, the most common title of a collection of some fifty Christian allegories much read in the Middle Ages, and still existing in several forms and in about a dozen Eastern and Western languages. As nearly all its imagery is taken from the animal world, it is also known as the Bestiary. There can be hardly a doubt about the time and general circumstances of its origin. Christian teachers, especially those who had a leaning towards gnostic speculations, took an interest in natural history, partly because of certain passages of Scripture that they wanted to explain, and partly on account of the divine revelation in the book of nature, of which also it was man's sacred duty to take proper advantage. Both lines of study were readily combined by applying to the interpretation of de- scriptions of natural objects the allegorical method adopted for the interpretation of Biblical texts. Now the early Christian centuries were anything but a period of scientific research. Rhetorical accomplishments were considered to be the chief object of a liberal education, and to this end every kind of learning was made subservient. Instead of reading Aristotle and other naturalists, people went for information to commonplace books like those of lian, in which scraps of folk-lore, travellers' tales, and fragments of misapprehended science were set forth in an elegant style for the enjoyment of the general reader. Theological writers with a merely literary training were not in the least prepared to question the worth of the marvellous descriptions of creatures that were current in the schools on the faith of authorities vaguely known as "the history of animals," 'the naturalists," and "the naturalist" in the singular number (dvawwAdyos).! So they took their notions of strange beasts and other marvels of the visible world on trust and did their best to make them available for religious instruction. In some measure we find this practice adopted by more than one of the fathers, but it was only natural that the Alexandrian school, with its pronounced taste for symbolism, should make the most of it. Clement himself had declared that natural lore, as taught in the course of higher Christian education accord- ing to the canon of truth, ought to proceed from '' cosmo- gony" to "the theological idea,"* and even in the little that is left

of the works of Origen we have two instances of the proceeding in question. And yet the fact that these reappear in the Phystologus would not suffice to stamp the work as a series of extracts from Alexandrian writings, as parallels of the same kind can be adduced from Epiphanius (doc. cit.) and Ephraem Syrus (Opp. Syr., il. pp. 17, 130). Father Cahier would even trace the book to Tatian, and it is true that that heresiarch mentions a writing of his own upon animals. Still the context in which the quotation occurs makes it evident that the subject-matter was not the nature of particular species nor the spiritual lessons to be drawn therefrom, but rather the place occupied by animal beings in the system of creation. On the other hand, the opinion of Cardinal Pitra, who referred the Physiologus to the more orthodox though somewhat peculiar teaching of the Alexandrians, is fully borne out by a close examination of the irregularities of doctrine pointed out in the Physiologus by Cahier, all of which are to be met with in Origen. The technical words by which the process of allegorizing is designated in the Physwologus, like épynveio, Oewpia, dvaywyh, &dAnyopia,

1 Origen, Sel. in Jerem., xvii. 11, “év 7H Pe oP Epiphan., Adv. Her. i. 3, » 24 oe Ce ate is nee ol

puovoroyo.” ; Origen, Hom. xvii., in Gen. xliv. 9, “nam physiologus de catulo leonis scribit.”

2 Strom., iv. p. 564 (ed. Potter),) yotv xara rév rfjs ddnGelas kavéva yrworikhs mapaddcews pvovoroyla, paddov 6é émromrela, €x

ToU mepl Koopoyovlas jptytat Adyou, évOévde dvaBalvovoa éml 7d BeodoytKdv eldos.

has, moreover, been remarked that almost all the animals mentioned were at home in the Egypt of those days, or at least, like the elephant, were to be seen there occasion- ally, whereas the structure of the hedgehog, for instance, is explained by a reference to the sea-porcupine, better known to fish-buyers on the Mediterranean. The fables of the phoenix and of the conduct of the wild ass and the ape at the time of the equinox owe their origin to astro- nomical symbols belonging to the Nile country.*? In both chapters an Egyptian month is named, and elsewhere the antelope bears its Coptic name of ‘“ antholops.”

That the substance of the Physiologus was borrowed from commentaries on Scripture * is confirmed by many of the sections opening with a text, followed up by some such formula as "‘ but the Physiologus says." When zoological records failed, Egypto-Hellenic ingenuity was never at a loss for a fanciful invention distilled from the text itself, but which, to succeeding copyists, appeared as part of the teaching of the original Physiologus. As a typical instance we may take the chapter on the ant-lion,—not the insect, but an imaginary creature suggested by Job iv. ll. The exceptional Hebrew for a lion (dayish) appeared to the Septuagint translators to call for a special rendering, and as there was said to exist on the Arabian coast a lion-like animal called "‘myrmex" (see Strabo, xvi. p. 774; Aélian, NV. A., vii. 47) they ventured to give the compound noun "myrmekoleon." After so many years the commentators had lost the key to this unusual term, and only knew that in common Greek ‘‘myrmex" meant an ant. So the text "the myrmekoleon hath perished for that he had no nourish- ment" set them pondering, and others reproduced their meditations, with the following result: "The Physiologus relates about the ant-lion: his father hath the shape of a lion, his mother that of an ant; the father liveth upon flesh, and the mother upon herbs. And these bring forth the ant-lion, a compound of both, and in part like to either, for his fore part is that of a lion, and his hind part like that of an ant. Being thus composed, he is neither able to eat flesh like his father, nor herbs like his mother; therefore he perisheth from inanition"; the moral follows.

At a later period, when the church had learnt to look with suspicion upon devotional books likely to provoke the scoffing of some and lead others into heresy, a work of this kind could hardly meet with her approval. A synod of Pope Gelasius, held in 496, passed censure, among others, on the "Liber Physiologus, qui ab hereticis conscriptus est et B. Ambrosii nomine signatus, apocryphus," and evidence has even been offered that a similar sentence was pro- nounced a century before. Still, in spite of such measures, the Physvologus, like the Church History of Eusebius or the Pastor of Hermas, continucd to be read with general interest, and even Gregory the Great did not disdain to allude to it on occasion. Yet the Oriental versions, which had certainly nothing to do with the Church of Rome, show that there was no systematic revision made according to the catholic standard of doctrine. The book remained essentially the same, albeit great liberties were

taken with its details and outward form. There must have been many imperfect copies in circulation, from which people tran- scribed such sections as they found or chose, and afterwards completed their MS. as occasion served. Some even re- arranged the contents according to the alphabet or to zoological affinity. So little was the collection considered as a literary work with a definite text that every one assumed a right to abridge or enlarge, to insert ideas of his

3 Cp. Leemans on Horapollo, i. 16, 34.

4 Including the Apocrypha. See the Icelandic account of the ele- phant, also a decidedly Alexandrian fragment upon the udpyos, founded upon 4 Maccab. i. 3, which has got into the scholia upon the Odyssey, xviii, 2 (ii. p. 583, ed. Dindorf, Oxford, 1855).

own, or fresh Scriptural quotations ; nor were the scribes and translators by any means scrupulous about the names of natural objects, and even the passages from Holy Writ. Physiologus had been abandoned by scholars, and left to take its chance among the tales and traditions of the un- educated mass. Nevertheless, or rather for this very reason, its symbols found their way into the rising literature of the vulgar tongues, and helped to quicken the fancy of the artists employed upon church buildings and furniture. The history of the Phystologus has become entwined from the beginning with that of the commentaries on the account of creation in Genesis. The principal production of this kind in our possession is the Heraemeron of Basil, which contains several passages very like those of the Physiologus. Yor instance, in the seventh homily the fable of the nuptials of the viper and the conger-eel, known already to A®lian and Oppian, and proceeding from a curious misreading of Aristotle (fist. An., v. 4, p. 540 b, Bekk.), serves to point more than one moral. Notwith- standing the difference in theology, passages of this kind could not but be welcome to the admirers of the Alexan- drian allegories. In fact a medley from both Basil and the Physiologus exists under the title of the Zexaemeron of Eustathius ; some copies of the first bear as a title Hepi pvovodAoyias, and ina Milan MS. the “morals” of the Physiologus are ascribed to Basil. The Leyden Syriac is

- supplemented with literal extracts from the latter, and

| the whole is presented as his work. Other copies give the

names of Gregory Theologus, Epiphanius, Chrysostom, and Isidore.

As far as can be judged, the emblems of the original Physiologus were the following: (1) the lion (footprints rubbed out with tail ; sleeps with eyes open ; cubs receive

| life only three days after birth by their father's breath) ;

(2) the sun-lizard (restores its sight by looking at the sun) ; (3) the charadrius (Deut. xiv. 16; presages recovery or death of patients); (4) the pelican (recalls its young to life by its own blood); (5) the owl (or nyktikorax ; loves darkness and solitude) ; (6) the eagle (renews its youth by sunlight and bathing in a fountain); (7) the phoenix (revives from fire); (8) the hoopoe (redeems its parents from the ills of old age) ; (9) the wild ass (suffers no male besides itself) ; (10) the viper (born at the cost of both its parents' death) ; (11) the serpent (sheds its skin; puts aside its venom before drinking; is afraid of man in a state of nudity; hides its head and abandons the rest of its body); (12) the ant (orderly and laborious ; prevents stored grain from germinating ; distinguishes wheat from barley on the stalk) ; (13) the sirens and onocentaurs (Isa. xiii, 21, 22; compound creatures); (14) the hedgehog (pricks grapes upon its quills) ; (15) the fox (catches birds by simulating death); (16) the panther (spotted skin ; enmity to the dragon; sleeps for three days after meals ; allures its prey by sweet odour) ; (17) the sea-tortoise (or aspidochelone ; mistaken by sailors for an island); (18

the partridge (hatches eggs of other birds); (19) the vul- ture (assisted in birth by a stone with loose kernel) ; (20) the ant-lion (able neither to take the one food nor to digest the other) ; (21) the weasel (conceives by the mouth and brings forth by the ear) ; (22) the unicorn (caught only by a virgin); (23) the beaver (gives up its testes when pur- sued) ; (24) the hyena (a hermaphrodite) ; (25) the otter (enhydris ; enters the crocodile's mouth to kill it); (26) the ichneumon (covers itself with mud to kill the dragon ; another version of No. 25); (27) the crow (takes but one consort in its life);

(28) the turtle-dove (same nature as No. 27); (29) the frog (either living on land and killed by rain, or in the water without ever seeing the sun) ; (30) the stag (destroys its enemy the serpent) ; (31) the salamander (quenches fire); (32) the diamond (powerful

against all danger); (33) the swallow (brings forth but once ; misreading of Aristotle, Hist. An., v. 13); (34) the tree called peridexion (protects pigeons from the serpent by its shadow); (35) the pigeons (of several colours; led by one of them, which is of a purple or golden colour) ; (36) the antelope (or hydrippus; caught by its horns in the thicket) ; (37) the fire-flints (of two sexes ; combine to produce fire); (38) the magnet (adheres to iron); (39) the saw-fish (sails in company with ships); (40) the ibis (fishes only along the shore) ; (41) the ibex (descries a hunter from afar); (42) the diamond again (read " car- buncle" ; found only by night); (43) the elephant (con- celves after partaking of mandrake ; brings forth in the water; the young protected from the serpent by the father; when fallen is lifted up only by a certain small individual of its own kind); (44) the agate (employed in pearl-fishing) ; (45) the wild ass and ape (mark the equinox) ; (46) the Indian stone (relieves patients of the dropsy) ; (47) the heron (touches no dead body, and keeps to one dwelling-place); (48) the sycamore (or wild fig; grubs living inside the fruit and coming out); (49) the ostrich (devours all sorts of things; forgetful of its own eggs). Besides these, or part of them, certain copies contain sections of unknown origin about the bee, the stork, the tiger, the woodpecker, the spider, and the wild boar.

The Greek text of the Physiologus cxists only in late MSS., and has to be corrected from the translations. In Syriac we have a full copy in a 12th-century Leyden MS., published in J. P. N. Land's Aneedota Syriaea ; thirty-two chapters with the "morals" left out in a very late Vatican copy, published by Tychsen ; and about the same number in a late MS. of the British Museum (Add. 25878). In Armenian Pitra gave some thirty-two chapters from a Paris MS. (13th century). The Athiopic exists both in London and Paris, and was printed at Leipsic by Dr Hommel in1877. In Arabic we have fragments at Paris, of which Renan translated a specimen for the Spieilegium Solesmense, and another version of thirty-seven chapters at Leyden, probably the work of a monk at Jerusalem, which Land translated and printed with the Syriac. The Latin MSS. of Bern are, after the

Vatican glossary of Ansileubus, the oldest of which we know; there are others in several libraries, and printed editions by Mai, Heider, and Cahier. Besides these a few fragments of an old abridgment occur in Vallarsi's edition of Jerome's works (vol. xi. col. 218). A metrical Physiologus of but twelve chapters is the work of Theobaldus, probably abbot of Monte Cassino (1022-1085 A.D.). From this was imitated the Old-English fragment printed by Th. Wright, and afterwards by Maetzner; also the Old-French Sensuyl le bestiaire d'amours. The prose Physiologus was done into Old High German before 1000, and afterwards into rhyme in the same idiom; since Von der Hagen (1824) its various forms have found careful editors among the leading Germanists. The Icelandic, in a Copenhagen MS. of the 18th century, was printed by Prof. Th. Mobius in his Analecta norroena (2d ed., 1877); at the same time he gave it in German in Dr Hommel's Aethiopic publication. Some Anglo-Saxon metrical fragments ~~are to be found in Grein's Bibliothek, vol. i. The Provencal (c. 1250), pub~~ lished in Bartsch's Chrestomathie provencale, omits the "morals," but is remarkable for its peculiarities of form. Before this there had been translations into French dialects, as by Philippe de Thaun (1121), by Guillaume, ''clere de Normandie," also, about tlie same period, by Pierre, a clergyman of Picardy. All the Old-French materials have not yet been thoroughly examined, and it is far from improbable that some versions of the book either remain to be detected or are now lost past recovery. A full account of the history of the Phystologus should also cmbrace the subjects taken from it in the productions of Christian art, the parodies suggested by the original work, ¢9., the Bestiaire d'Amour by Richard de Fournival, and finally, the traces left by it upon the encyclo- pedical and literary work of the later Middle Ages.

Nearly all the information now obtainable is to be found in the following works, and such as are there quoted : S. Epiphanius ad Physiologum, ed. Ponce de Leon, Rome, 1587 (with woodcuts); another edition, Antwerp, 1588 (with copper-plates); S. Hustathii in Hexahemeron Commentarius, ed. Leo Allatius, Lyons, 1629 (cp. H. van Herwerden, Kaercitt. Critt., Hague, 1862, pp. 180-182) ; Physiologus Syrus, ed. O. G. Tychsen, Rostock, 1795; Classici Auctores, ed. Mai, vol. vii., Rome, 1835, pp. 585-596; G. Heider, in Archiv fiir Kunde Osterretch. Geschichisquellen, Vienna, 1850, vol. ii. p. 545 sq. ; Cahier and Martin, Mélanges d' Archéologie, &c., vol. ii., Paris

(1851), p. 85 sq., vol. iii. (1853) p. 203 sq., vol. iv. (1856) p. 55 sq. ; Cahier, Nouveaux Mélanges (1874) p. 106 sq. ; J. B. Pitra, Spicilegiwm Solesmense, vol. iii., Paris, 1855, pp. xlvii. sq., 338 sq., 416, 535; Maetzner, Altengl. Sprachproben, vol. i. pt. i., Berlin, 1867, p. 55 sq.; J. Victor Carus, Gesch. der Zoologie, Munich, 1872, p. 109 sq.; J. P. N. Land, Anecdota Syriaca, vol. iv., Leyden, 1874, p. 31 sq., 115 sqg., and in Verslagen en Mededeel- ingen der kon. Akad. van Wetenschappen, 2d series, vol. iv., Amsterdam, 1874 ; Mobius and Hommel in their publications quoted above. (J. P. N. 1.)

Morpho- logy.

Physio- logy de- fined.

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PHYSIOL G XT

PART I.—GENERAL VIEW.

HE word “ physiology ” may be used either in a general or in a more restricted sense. In its more general meaning it was used largely of old, and is still occasion- ally used in popular writings, to denote all inquiry into the nature of living beings. A very slight acquaintance, however, with the phenomena of living beings shows that these can be studied from two, apparently very different, points of view.

The most obvious and striking character of a living being is that it appears to be an agent, performing ac- tions and producing effects on the world outside itself. Accordingly, the first efforts of inquirers were directed towards explaining how these actions are carried on, how the effects of a living being upon its surroundings are brought about. And the dissection or pulling to pieces of the material body of a living being was, under the name of Anatomy (g.v.), regarded as simply an analysis pre- paratory and necessary to the understanding of vital actions. But it soon became obvious that this anatomical analysis gave rise of itself to problems independent of, or having only distant relations to, the problems which had to do with the actions of living beings. Hence in course of time a distinct science has

grown up which deals exclusively with the laws regulating the form, external and internal, of living beings, a science which does not seek to explain the actions of living beings, and takes note of these actions only when they promise to throw light on the occurrence of this or that structural feature. Such a science, which is now known under the name of Morpnotocy (q.v.), might be carried on in a world in which all living things had, in the ordinary meaning of the word, become dead. Were the whole world suddenly petrified, or were a spell to come over it like that imagined by Tennyson in his “Day Dream,” but more intense, so that not only the gross visible movements but the inner invisible movements which are at the bottom of growth were all stayed, the morphologist would still find ample exercise for his mind in investigating the form and struc- ture of the things which had been alive, and which still differed from other things in their outward lineaments and internal build.

In its older sense physiology embraced these morpho- logical problems, and so corresponded to what is now called BIOLOGY (q.v.) ; in its more modern sense physiology leaves these matters on one side and deals only with the actions of living beings on their surroundings (the study of these necessarily involving the correlative study of the effect of the surroundings on the living being), and appeals to matters of form and structure only so far as they throw light on problems of action. Looking forward into the far future, we may perhaps dimly discern the day when morphology and physiology will again join hands, and all the phenomena of living beings, both those which relate to form and those which relate to action, will be seen to be the common outcome of the same molecular processes. But that day is as yet most distant; and, though occasion- ally even now the two sciences cross each other’s path, action explaining form and form in turn explaining action, the dominant ideas of the two are so distinct, the one from the other, that each must for a long time yet be developed along its own line. It is proposed to treat in the following pages of physiology in this narrower, more restricted sense.

If any one at the present day, making use of the know- ledge so far gathered in, were to attempt a rough prelimi-

nary analysis of the phenomena of action of a living being, —for instance of one of the more complex, so-called higher animals, such as man—he might proceed in some such way as the following.

One of the first, perhaps the first and most striking fact Moy about man is that he moves: his body moves of itself from ™ place to place, and one part of the body moves on another, ™™

Tf we examine any one of these movements, such as the bending of the forearm on the arm, we find that it is brought about by certain masses of flesh, called muscles, which from time to time contract, that is, shorten ; and these muscles are so disposed that, when they shorten, and so bring their ends nearer together, certain bones are pulled upon and the arm is bent. Upon further examina- tion it will be found that all the gross movements of the body, both the locomotion of the whole body and the movements of parts upon parts, are carried out by the contraction or shortening of muscles. The muscles, together with bones, tendons, and other structures, are arranged in various mechanical contrivances, many of them singularly complex ; hence the great diversity of movement of which an animal or man is capable; but in all cases the central fact, that which supplies the motive-power, is the contrac- tion of a muscle, a shortening of its constituent fibres whereby its two ends are brought for a while nearer together.

When, pushing the analysis farther, we attempt to solve the question, Why do muscles contract? we find that the muscles of the body are connected with what is called the

central nervous system by certain strands of living matter N called nerves ; and we further find that, with some few ex- 54

ceptions, which need not concern us now, the contractions of muscles are brought about by certain occult invisible changes called nervous impulses which travel along these nerves from the central nervous system to the muscles. Hence, when a nerve is severed, the muscle to which the nerve belonged, thus cut adrift from the central nervous system, no longer stirred by impulses reaching it from thence, ceases to contract, and remains motionless and as it were helpless. Pushing the problem still farther home,

and asking how these impulses originate in the central nervous system, we find that this central nervous mass is connected,

not only with the muscles by means of nerves which, carry- |

ing impulses outward from itself to the muscles and so serving as instruments of movement, are called motor or efferent nerves, but also with various surfaces and parts of the body by means of other nerves, along which changes or impulses travel inwards to itself in a centripetal fashion. Moreover, the beginnings or peripheral endings of these

other nerves appear to be so constituted that various changes |

in the surroundings of the body, or internal changes in the body itself, give rise to impulses, which, thus originated, travel inwards to the central nervous system ; hence these nerves are spoken of as sensory or afferent. Such sensory impulses reaching the central nervous system may forth- with issue as motor impulses leading to movement; but on many occasions they tarry within the central mass, sweeping backwards and forwards along particular areas of its substance, thus maintaining for a while a state of molecular agitation and leading to movement at some subsequent period only. Moreover, we have reason to think that molecular disturbances may arise within the central nervous system apart from the advent, either past or present, of any impulses along sensory nerves. Lastly, the presence of these molecular agitations in the central

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nervous system, whether the immediate result of some new afferent impulse, or the much delayed and complicated ‘outconie of some impulse which arrived long ago, or the product of internal changes apparently independent of all disturbance from without and so far spontaneous, may be indicated by corresponding phases of what we speak of as ~~consciousness. We are thus led to conceive of the central nervous system as, chiefly at least, the seat of a molecular turmoil maintained by multitudinous afferent impulses streaming in along the various afferent nerves, a turmoil which makes itself felt within as changes of conscious~~ ness, and produces effects without by movements wrought _ through motor nerves and muscles. And

one large part of physiology has for its task the unravelling of the laws which goyern this turmoil, which determine, in relation to the advent of afferent impulses and the occurrence of intrinsic changes, the issue of motor impulses, and thus the characters of the resulting movements. al The movements of man or of an animal are not, how- ever, the only salient facts of his existence. Equally _ characteristic of him are the facts, (1) that he from time to time eats, and must eat in order to live, and (2) that a supply of frésh air containing a certain quantity of oxygen is indispensable to his remaining alive. Viewed from a chemical point of view, an animal body, whether dead or alive, is a mass of complex unstable chemical substances, combustible in nature, 7.e., capable of being oxidized, and of being reduced by oxidation to simpler, more stable sub- stances, with a setting free of energy. Combustible in the ordinary sense of the word an animal body is not, by

composition ; but an animal body thoroughly dried will in the presence of oxygen burn like fuel, and, like fuel, give out energy as heat. The material products of that com- bustion are fairly simple, consisting of water, carbonic acid, some ammonia or nitrogen compounds, and a few salts. And these same substances appear also as the pro- ducts of that slower combustion which we call decay ; for, whether the body be burnt swiftly in a furnace or rot away slowly in earth, air, or water, the final result is the same, the union of the complex constituent substances

reason of the large excess of water which enters into its |

sciousness, and of the beating heart and writhing visceral muscles, is sooner or later, by friction or otherwise, con- verted into heat ; and it is as heat that the energy evolved in this labour leaves the body. Manifold as seems the body’s energy, it has but one source, the decay of living material, z.¢., the oxidation of complex substances diversely built up into various living matters, and but two ends, heat and muscular work. – The continued setting free of energy which thus marks the living body, entailing as it does the continued breaking up and decay of living substance, con- stitutes a drain upon the body which must be met by con- stantly-renewed supplies, or otherwise the body would waste away and its energy flicker out. Hence the necessity on the one hand for that which we call food, which, however

varied, is essentially a mixture of complex combustible energy-holding bodies, and on the other hand for that other kind of food which we call breath, and which supplies the oxygen whereby the complex oxidizable substances may be oxidized to simpler matters and their potential energy made to do work. Thus food supplies the energy of the body, but in. quantity only, not in quality. The food by itself, the dead food, can exhibit energy as heat only, with intervening phases of chemical action; before its energy can be turned into the peculiar grooves of nervous and muscular action it needs to be transmuted into living sub- stance, and in that transmutation there is a preliminary expenditure of part of the food's store of energy.

Here, then, we have a second view of physiological labour. To the conception of the body as an assemblage of* mole- cular thrills—some started by an agent outside the body, by light, heat, sound, touch, or the like ; others begun within the body, spontaneously as it were, without external cause: thrills which, travelling to and fro, mingling with and commuting each other, either end in muscular movements or die away within the body —to this conception we must add a chemical one, that of the dead food continually being changed and raised into the living substance, and of the living substance continually breaking down into the waste inatters of the body by processes of oxidation, and thus supplying the energy needed both for the unseen molecular thrills and the visible muscular movements.

Hence the problems of physiology may in a broad sense Prob- be spoken of as threefold. (1) On the one hand, we have lems of to search the laws according to which the complex unstable PhYsio- food is transmuted into the still more complex and still °°

with the oxygen furnished from the air, and their reduc- tion thereby to the above-named products, with a develop- ment of heat, which either as in the first case is rapid and appreciable, or as in the second is so slow and gradual as

to be with difficulty recognized. Moreover, during life also the same conversion, the same oxidation, the same reduc- tion of complex substances to simpler matters, the same setting free of the energy present in the former but absent in the'latter, may be noted. The animal body dies daily, in the

sense that at every moment some part of its sub- stance is suffering decay, is undergoing combustion; at every moment complex substances full of latent energy are by processes of oxidation reduced to simpler substances devoid of energy or containing but little.

of This breaking down of complex substances, this con- tinued partial decay, is indeed the source of the body's energy ; each act of life is the offspring of an act of death. Each strain of a muscle, every throb of the heart, all the inner work of that molecular turmoil of the nervous system of which we spoke above, as well as the chemical labour wrought in the many cellular laboratories of glands and membranes, every throw of the vital shuttle, means an escape of energy as some larger compacted molecule splits into smaller simpler pieces. Within the body the energy thus set free bears many shapes, but it leaves the body in two forms alone, as heat and as the work done by the muscles of the frame. both that of the chemical gland-cells, of the vibrating nherve-substance with its accompanying changes of con-

All the inner labour of the body,

more unstable living flesh, and the laws according to which this living substance breaks down into simple, stable waste products, void or nearly void of energy. (2) On the other hand, we have to determine the laws according to which the vibrations of the nervous substance originate from extrinsic and intrinsic causes, the laws according to which these vibrations pass to and fro in the body acting and reacting upon each other, and the laws according to which they finally break up and are lost, either in those larger swings of muscular contraction whereby the movements of the body are effected, or in some other way. (3) And lastly, we have to attack the abstruser problems of how these neural vibrations, often mysteriously attended with changes of consciousness, as well as the less subtle vibrations of the contracting niuscles, are wrought out of the explosive chemical decompositions of the nervous and muscular sub- stances, that is, of how the energy of chemical action is transmuted into and serves as the supply of that vital energy which appears as movement, feeling, and thought. Even a rough initial analysis, however, such as we have just attempted to sketch, simple as it seems with our present knowledge, is an expression of the

accumulated and corrected inquiries of many ages; the ideas which it embodies are the results of long-continued investigations, and the residue of many successive phases of opinion. XIX. — 2

Animal

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In the natural hierarchy of the sciences, physiology fol-

and vital lows after chemistry, which in turn follows physics, molar

spirits.

Organs and func tions.

and molecular; and ina natural development, as indeed is evident from what we have just seen, the study of the two latter should precede that of the former. At a very early age, however, the exigencies of life brought the study of man, and so of physiology, to the front before its time ; hence the history of physiology consists to a large extent, especially in its opening chapters, of premature vain attempts to solve physical and chemical problems before the advent of adequate physical or chemical knowledge. But no ignorance of these matters could hide from the observant mind, even in quite early times, two salient points which appear also in the analysis just given, namely, that, while some of the phenomena of living beings seem due to powers wholly unknown in things which are not living, other phenomena, though at first sight special to living beings, appear to be in reality the peculiar outcome of processes taking place as well in things not alive. It was further early seen that, while the former are much more conspicuous, and make up a greater part of the life of the individual in those living beings which are called animals, especially in man, and in animals more closely resembling man, than in those which are called plants, the latter are common to both divisions of living things. Both sets of phenomena, however, were at first regarded as the products of certain special agencies ; both were spoken of as the work of certain spirits; and the distinction between the two was formulated by speaking of the spirits as being in the former case animal and in the latter vital.

From the very outset even the casual observer could not fail to be struck with the fact that many of the pro- cesses of living beings appear to be the results of the various contrivances or machines of which a living body is largely built up. This indeed was evident even before the distinction between animal and vital spirits was recog- nized ; and, when that differentiation was accepted, it was seen that the part played by these machines and contriv- ances in deterntining the actions of living beings was much more conspicuous in the domain of vital than of animal spirits. As inquiry was pushed forward the prominence and importance of this machinery became greater and greater, more especially since the phenomena supposed to be due to the agency of vital spirits proved more open to direct observation and experiment than those attributed to the animal spirits. It was found that the most fruitful path of investigation lay in the direction of studying the structure and independent action of the several constituent machines of the body, and of unravelling their mutual relations.

These machines received the names of organs, the work or action of an organ being at a later: period spoken of as its function, And, when it became clear that many of the problems concerned with what was supposed to be the work of the vital spirits could be solved by the proper appreciation of the functions of certain organs, it was in ferred that the more difficult problems belonging to the animal spirits could be solved in the same way. Still later on it was found that the conception of organs and functions was not only quite separable from, but indeed antagonistic to, the hypothesis of the entities called spirits.

In this way the first great phase, as it may be called, of the science of physiology was evolved,—a phase which lasted till quite recent times. Under this conception every living being, plant or animal, was regarded as a complex of organs, each with its respective function, as an engine built up of a number of intricately contrived machines, each performing its specific work. The whole animal body was parcelled out into organs, each of which was supposed to have its appropriate function; and the

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efforts of investigators were directed, on the one hand, to a careful examination of the structural features of an organ with the view of

determining by deduction what its function must be, and, on the other hand, to confirniing or correcting by observation and experiment the conclusions thus reached by the anatomical method. And the fruit- fulness of this line of inquiry proved so great that the ideas directing it became absolutely dominant. In many cases the problem to be worked out was in reality a purely mechanical one. This was notably so in the great ques- tion of the circulation so brilliantly solved by Harvey. Putting aside for a while the inquiry as to the origin of the force with which the walls of the heart press on the blood contained in its cavities, accepting the fact that the blood is thus pressed at each beat of the heart, all the other truths of the circulation which Harvey demonstrated are siniply the outcome of certain mechanical conditions, such as the position and arrangement of the valves, the connexion of various patent tubes, and the like. And many other problems —as, for instance, those connected with respiration—proved to be similarly capable of solution by the application of ordinary mechanical principles to anatomical facts.

So fruitful, and consequently so adequate, seemed this conception of living beings as built up of contrivances or organs, in contrast with the lifeless world in whose mono- tonous masses no such structural disposition could be recognized, that the word “organic” came into use as a term distinctive of living things. The phrase was especi- ally adopted by the chemists, who for a long time classified their material into “organic” substances, 2.¢., substances found only in living beings, and into inorganic substances, that is, substances occurring in lifeless bodies as well. Indeed, this nomenclature has not even yet been wholly abandoned. Triumphant, however, as was this mode of inquiry in these and similar instances, there remained in every investigation an unsolvable residue, like the question of the origin of the force exerted by the heart referred to above in speaking of Harvey’s work; and in many other instances the questions which could not be solved on mechanical principles formed a great part of the whole problem. Thus in the case of the liver careful dissection showed that minute tubes starting from all parts of the liver joined into one large canal, which opened into the small intestine, and observation and experiment taught that these tubes during life conveyed from the liver to the intestine a peculiar fluid called bile, which appeared on the one hand to originate in the liver, and on the other to be used up for some purposes in the intestine. But here the mere mechanieal

flow of the bile along the gall- ducts, instead of being of primary, was merely of second- ary importance, and the problem of how the bile was generated and made its way into the small beginnings of the ducts was the greater part of the whole matter. This latter problem was left unsolved, and indeed for a while unattempted. Nevertheless the success in other directions attending the conception of organs and functions encour- aged physiologists to speak of the liver as an organ whose function was to secrete bile, and further, led them to ignore to a large extent the great unsolved portion of the problem, and to regard the mere enunciation of the function as the chief end of physiological inquiry.

Moreover, whenever attempts were made to unravel these obscurer problems, the efforts of investigators were mainly confined to a fuller and more complete elucidation of the supposed function of an organ, and the method of inquiry adopted was in most cases one which regarded the finer elements of the part studied as minute organs making up the whole gross organ, and which sought to explain the functions of these smaller organs on the same mechanical

principles which had proved so successful in the case of the whole organ. When the improvements in the micro- scope opened up a new world to the anatomist, and a wholly fresh mechanical analysis of the structure of living bodies became possible, great hopes were entertained that the old method applied to the new facts would soon solve the riddles of life by showing how the mysterious opera- tions of the living substances out of which the grosser organs were built were the outcome of structural arrange- ments which had hitherto remained invisible, were in fact the functions of minute component organs.

Long before, in the previous century, the genius of Caspar Wolff had led him to maintain that the bodies of living beings may be regarded as composed of minute constituent units, which, being in early life all alike and put together as an unformed mass, gradually differentiate and are ultimately arranged into the tissues and organs of the adult being. But, though Wolff was not unaware of the physiological bearing of his conception, his mind was chiefly bent towards morphological views, and

his cell- theory is essentially a morphological one. The cell-theory, however, which became famous in the third decade of the present century, and to which the twin names of Schwann and Schleiden will always be attached, was essentially a physiological one. The chief interest which these authors felt in the ideas that they put forth centred in the convic- tion that the properties of the cell as they described it were the mechanical outcome of its build; and for a time it seemed possible that all physiological phenomena could be deduced from the functions of cells, the anatomical characters of the various kinds of cells determining in turn their special functions. In the cell-theory the con- ception of organs and functions reached its zenith; but thenceforward its fall, which had been long prepared, was swift and great. Two movements especially hurried on its decline.

It had long been a reproach to physiologists that, while to most organs of the body an appropriate function had been assigned, in respect to certain even conspicuous organs no special use or definite work could be proved to exist. Of these apparently functionless organs the most notorious instance was that of the spleen, a large and important body, whose structure, though intricate, gave no sign of what its labours were, and whose apparent use- lessness was a stumbling-block to the theological specula- tions of Paley. While in the case of other organs a definite function could be readily enunciated in a few

left for inquiry as touching the liver seemed to be those which should show how the minute structure of the organ was adapted for carrying on this work. About the middle of this century, however, the genius of Claude Bernard led him to the discovery that the secretion of bile was by no means the chief labour of the liver. He showed that this great viscus had other work to do than that of secreting bile, had another “function” to perform, but a function which seemed to have no reference whatever to the mechanical arrangements of the organ, which could never have been deduced from any inspection however complete of its structure, even of its most hidden and minute features, and which therefore could not be called a function in the old and proper sense of that word. By a remark- able series of experiments, which might have been carried out by one knowing

absolutely nothing of the structural arrangements of the liver beyond the fact that blood flowed to it along the portal vein, and from it along the hepatic vein, he proved that the liver, in addition to the task of secreting bile, was during life engaged in carrying on a chemical transformation by means of which it was able to manufacture and store up in its substance a peculiar kind of starch, to which the name of glycogen was given. Bernard himself spoke of this as the glycogenic function of the liver, but he used the word “function” in a broad indefinite sense, simply as work done, and not in the older narrower meaning as work done by an organ structurally adapted to carry on a work which was the inevitable outcome of the form and internal build of the organ. In this glycogenic function organization, save only the arrangements by means of which the blood flows on from the portal to the hepatic channels in close proxi- mity to the minute units of the liver-substance, the so-called hepatic cells, appeared to play no part whatever ; it was not a function, and in reference to it the liver was not an organ, in the old senses of the words. This discovery of Bernard’s threw a great flash of light into the darkness hitherto hiding the many ties which bound together dis- tant and mechanically isolated parts of the animal body. Obviously the liver made this glycogen, not for itself, but for other parts of the body; it laboured to produce, but they made use of, the precious material, which thus became a bond of union between the two.

The glycogenic labours of the simple hepatic substance carried out independently of all intricate structural arrange- ments, and existing in addition to the hepatic function of secreting bile, being thus revealed, men began to ask theraselves the question, May not something like this be true of other organs to which we have allotted a function and thereupon rested content? And further, in the cases where we have striven in hope, and yet in vain, to com- plete the interpretation of the function of an organ, by finding in the minute microscopic details of its structure the mechanical arrangements which determine its work, may we not have followed throughout a false lead, and sought for organization where organization in our sense of the word does not exist? The answer to this question, and that an affirmative one, was hastened by tle collapse of the cell-theory on its physiological side, very soon after it had been distinctly formulated.

words, and their existence therefore easily accounted for, the spleen remained an opprobrium, existing, as it appeared to do, without purpose, and therefore without cause.

The progress of discovery during the present century, by a cruel blow, instead of pointing out the missing use of the spleen, rudely shook the confidence with which the

The “cell,” according to the views of those who first Cell- propounded the cell-theory, consisted essentially of an mem- envelope or “cell-membrane,” of a substance or substances >™®

¢ oe cell-con- contained within the cell-membrane, hence called cell- tents contents, and of a central body or kernel called theana “nucleus,” differing in nature from the rest of the cell- nucleus.

contents.

physiologists concluded that they had solved the riddle of an organ when they had allotted to it a special function. From very old times it had been settled that the function

of the liver was to secrete bile; and the only problems |

And, when facts were rapidly accumulated, all tending to prove that the several parts of the animal or vegetable body, diverse as they were in appearance and structure, were all built up of cells more or less modified,

Proto- plasm.

Proto- plasmic theory.

Tissues.

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the hope arose that the functions of the cell might be deduced from the mutual relations of cell-membrane, cell- contents, and nucleus, and that the functions of an organ might be deduced from the modified functions of the

con- stituent modified cells. Continued investigation, however, proved destructive of this physiological cell-theory. It soon became evident that the possession of an investing envelope or cell-membrane was no essential feature of a cell, and that even the central kernel or nucleus might at times be absent. It was seen in fact that the anatomical unit need have no visible parts at all, but might be simply a minute mass, limited in various ways, of the material spoken of as cell-contents. Under the cell-theory, the cell was supposed to be the first step in organization, the step by which a quantity of formless unorganized plasm became an organized unit ; this plasm was further supposed still to form the chief part of the cell-contents, and soon became recognized under the name of protoplasm. Hence the destructive anatomical researches which deprived the cell of its cell-membrane, and even of its nucleus, left nothing except a mass of protoplasm to constitute an anatomical unit. For such a unit the word “cell” was a misnomer, since all the ideas of organization denoted by the word had thus vanished ; nevertheless it was retained with the new meaning, and up to the present time the definition of a cell is that of a limited mass of proto- plasm, generally but not always containing a modified kernel or nucleus.

With this anatomical change of front the physiological cell-theory was utterly destroyed. The cell was no longer a unit of organization ; it was merely a limited mass of protoplasm, in which, beyond the presence of a nucleus, there was no visible distinction of parts. It was no longer possible to refer the physiological phenomena of the cell to its organization ; it became evident that the work done by a “cell” was the result not of its form and cellular structure but simply of the nature and properties of the apparently structureless protoplasm which formed its body. A new idea pressed itself on men’s minds, that organization was a concomitant and result of vital action, not its condition and cause; as Huxley in one of his earliest writings put it, “They [cells] are no more the producers of the vital phenomena than the shells scattered in orderly lines along the sea-beach are the instruments by which the gravitative force of the moon acts upon the ocean. Like these, the cells mark only where the vital tides have been, and how they have acted.”! Hence arose the second of the two movements mentioned above, that which may be called the “protoplasmic” movement, a movement which, throwing overboard altogether all conceptions of life as the outcome of organization, as the mechanical result of structural

conditions, attempts to put physiology on the same footing as physics and chemistry, and regards all vital phenomena as the com- plex products of certain fundamental properties exhibited by matter, which, either from its intrinsic nature or from its existing in peculiar conditions, is known as living matter, —mechanical contrivances in the form of organs serving only to modify in special ways the results of the exercise of these fundamental activities and in no sense determining their initial development. ;

Long before the cell-theory had reduced to an absurdity the “organic” conception of physiology, the insight of the brilliant Bichat, so early lost to science, had led him to prepare tlhe way for modern views by developing his doctrine of “tissues.” That doctrine regarded the body as made up of a number of different kinds of living material, each kind of material having certain innate qualities proper to itself

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as well as certain structural features, and the several kinds of material being variously arranged in the body. Each of these body-components was spoken of as a tissue, muscular tissue, nervous tissue, and the like; and the varied actions of the body were regarded as the result of the activities of the several tissues modified and directed by the circum- stance that the tissues were to a great extent arranged in mechanical contrivances or organs which largely deter- mined the character and scope of their actions.

The imperfection of microscopic methods in Bichat’s time, and, we may perhaps add, his early death, prevented him from carrying out an adequate analysis of the qualities or properties of the tissues themselves. During the nuddle portion of this century, however, histological investigation, i.¢., inquiry into the minute structure of the tissues, made enormous progress, and laid the basis for a physiological analysis of the properties of tissues. In a short time it became possible to lay down the generalization that all the several tissues arise, as far as structure is concerned, by a differentiation of a simple primitive living matter, and that the respective properties of each

tissue are nothing more than certain of the fundamental properties of the primordial substance thrown into prominence by a division of labour running to a certain extent parallel to the differ- entiation of structure. Developed in a fuller manner, this modern doctrine may be expounded somewhat as follows.

In its simplest form, a living being, as illustrated by Evo some of the forms often spoken of as amcebee, consists of tion a mass of substance in which there is no obvious distinc- ; In the body of such a creature even the of ; highest available powers of the microscope reveal nothing plas

tion of parts.

more than a fairly uniform network of material, a network sometimes compressed, with narrow meshes, sometimes more open, with wider meshes, the intervals of the mesh- work being filled, now with a fluid, now with a more solid substance or with a finer and more delicate network, and minute particles or granules of variable size being some- times lodged in the open meshes, sometimes deposited in the strands of the network. Sometimes, however, the net- work is so close, or the meshes filled up with material so identical in refractive power with the bars or films of the network, and at the same time so free from granules, that the whole substance appears absolutely homogeneous, glassy or hyaline. Analysis with various staining and other re- agents leads to the conclusion that the substance of the network is of a different character from the substance filling up the meshes. Similar analysis shows that at times the bars or films of the network are not homogeneous, but composed of different kinds of stuff; yet even in these cases it is difficult if not impossible to recognize any de- finite relation of the components to each other such as might deserve the name of structure; aud certainly in what may be taken as the more typical instance, where the network seems homogeneous, no microscopic search is able to reveal to us a distinct structural arrangement in its substance. In all probability optical analysis, with all its aids, has here nearly reached its limits; and, though not wholly justified, we may perhaps claim the right to con- clude that the network in such case is made up of a substance in which no distinction of parts will ever be visible, though it may vary in places or at times in what may be spoken of as molecular construction, and may

carry, lodged in its own substance, a variety of matters foreign to its real self. This remarkable network is often spoken of as consisting of protoplasm, and, though that word has come to be used in several different meanings, we may for the present retain the term. The body of an amceba, then, or of a similar organism consists of a network or framework which we may speak of as protoplasm, filled up with other matters. In most cases it is true that in

the midst of this protoplasmic body there is seen a peculiar body of a somewhat different and yet allied nature, the so-called nucleus; but this we have reason to think is specially concerned with processes of division or reproduction, and may be absent, for a time at all events, without any injury to the general properties of the proto- plasmic body.

Now such a body, such a mass of simple protoplasm, homogeneous save for the admixtures spoken of above, is a living body, and all the phenomena which we sketched out at the very beginning of this article as characteristic of the living being may be recognized in it. There is the same continued chemical transformation, the same rise and fall in chemical dignity, the same rise of the dead food into the more complex living substance, the same fall of the living substance into simpler waste-products. There is the same power of active movement, a move- ment of one part of the body upon another giving rise to a change of form, and a series of changes of form resulting eventually in a change of place. In what may be called the condition of rest the body assumes a more or less spherical shape. By the active transference of part of the mass in this or that direction the sphere flattens itself into a disk, or takes on the shape of a pear, or of a rounded triangle, or assumes a wholly irregular, often star-shaped or branched form. Each of these transformations is simply a rearrangement of the mass, without change of bulk. When a bulging of one part of the body takes place there is an equivalent retraction of some other part or parts ; and it not unfrequently happens that one part of the body is repeatedly thrust forward, bulging succeeding bulging, and each bulging accompanied by a corresponding retrac- tion of the opposite side, so that, by a series of movements, the whole body is shifted along the line of the protuber- ances.

The tiny mass of simple living matter moves on- ward, and that with some rapidity, by what appears to be a repeated flux of its semi-liquid substance.

The internal changes leading to these movements may begin, and the movements themselves be executed, by any part of the uniform body ; and they may take place with- out any obvious cause. So far from being always the mere passive results of the action of extrinsic forces, they may occur spontaneously, that is, without the coincidence

ourselves this total change which we denote by the term “metabolism” as consisting on the one hand of a down- ward series of changes (katabolic changes), a stair of many steps, in which more complex bodies are broken down with the setting free of energy into simpler and simpler waste bodies, and on the other hand of an upward series of changes (anabolic changes), also a stair of many steps, by which the dead food, of varying simplicity or complexity, is, with the further assumption of energy, built up into more and more complex bodies. The summit of this double stair we call “protoplasm.” Whether we have a right to speak of it as a single body, in the chemical sense of that word, or as a mixture in some way of several bodies, whether we should regard it as the very summit of the double stair, or as embracing as well the topmost steps on either side, we cannot at present tell. Even if there be a single substance forming the summit, its existence is abso- lutely temporary: at one instant it is made, at the next it is unmade. Matter which is passing through the phase of life rolls up the ascending steps to the top, and forthwith rolls down on the other side. But to this point we shall return later on. Further, the dead food, itself fairly but far from wholly stable in character, becomes more and more unstable as it rises into the more complex living material. It becomes more and more explosive, and when it reaclies the summit its equilibrium is overthrown and it actually explodes. The whole downward stair of events seems in fact to be a series of explosions, by means of which the energy latent in the dead food and augmented by the touches through which the dead food becomes living pro- toplasm, is set free. Some of this freed energy is used up again within the material itself, in order to carry on this same vivification of dead food; the rest leaves the body as heat or motion. Sometimes the explosions are, so to

speak, scattered, going off as it were irregularly throughout the material, like a quantity of gunpowder sprinkled over a surface, giving rise to innumerable minute puffs, but pro- ducing no massive visible effects. Sometimes they take place in unison, many occurring together, or in such rapid sequence that a summation of their effects is possible, as in gunpowder rammed into a charge, and we are then able to recognize their result as visible movement, or as appre- ciable rise of temperature.

of any recognizable disturbance whatever in the external

These various phenomena of protoplasm may be conven- Proper-
conditions to which the body is exposed. They appear to

ientlyspoken of under the designation of so many properties, renee proto-

be analogous to what in higher animals we speak of as acts of volition. They may, however, be provoked by changes in the external conditions. A quiescent amoeba may be excited to activity by the touch of some strange body, or by some other event,—by what in the ordinary language of physiology is spoken of as a stimulus. The protoplasmic mass is not only mobile but sensitive. When a stimulus is applied to one part of the surface a movement may com- mence in another and quite distant part of the body; that is to say, molecular disturbances appear to be propagated along its substance without visible change, after the fashion

or attributes, or powers of protoplasm, it being understood that these words are used in a general and not in any definite scholastic sense. Thus we may speak of proto- plasm as having the power of assimzlation, 1.e., of building up the dead food into its living self; of movement, or of contractility as it is called, 2.¢., of changing its form through internal explosive changes; and of irritability or sensitiveness, t.c., of responding to external changes, by less massive in- ternal explosions which, spreading through its mass, are not in themselves recognizable through visible changes, though they may initiate the larger visible changes of movement.

of the nervous impulses we spoke of in the beginning of this article. The uniform protoplasmic mass of the amoeba exhibits the rudiments of those

attributes or powers which in the initial sketch we described as being the fundamental

These and other fundamental characters, all associated Differ- with the double upward and downward series of chemical entia- changes, of constructive and destructive metabolism, are “0% a

é é to- present in protoplasm wherever found; but a very brief at

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characteristics of the muscular and nervous structures of the higher animals.

These facts, and other considerations which might be brought forward, lead to the tentative conception of proto-

je Plasm as being a substance (if we may use that word in

a somewhat loose sense) not only unstable in nature but subject to incessant change, existing indeed as the ex- pression of incessant molecular, that is, chemical and phy- sical change, very much as a fountain is the expression of an incessant replacement of water. We may picture to

survey soon teaches us that specimens of protoplasm existing in different beings or in different parts of the same being differ widely in the relative prominence of one or another of these fundamental characters. On the one hand, in one specimen of protoplasm the energy which is set free by the series of explosions constituting the down- ward changes of destructive metabolism may be so directed as to leave the mass almost wholly in the form of heat, thus producing very little visible massive change of form. Such a protoplasm consequently, however irritable and

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explosive, exhibits little power of contractility or move- ment. In another specimen, on the other hand, a very large portion of the energy similarly set free may be spent in producing visible changes of form, the protoplasm in

this instance being exquisitely mobile. Such differences must be due to different internal arrangements of the proto- plasm, though, since no vision, however well assisted, can detect these arrangements, they must be of a molecular nature rather than of that grosser kind which we generally speak of as structural. It is true that, as the differences in properties become more and more prominent, as the protoplasm becomes more and more specialized, features which we can recognize as structural intervene ; but even these appear to be subsidiary, to accompany and to be the result of the differences in property, or to be concerned in giving special directions to the activities developed, and not to be the real cause of the differences in action. We are thus led to the conception of protoplasm as existing in various differentiated conditions while still retaining its general protoplasmic nature, a difference of constitution making itself felt in the different character of the work done, in a variation of the results of the protoplasmic life. We have a division of physiological labour going hand in hand with a differentiation of material, accompanied ulti- mately by morphological results which may fairly be spoken of as constituting a differentiation of structure. Some of the simpler and earlier features of such a divi- sion and differentiation may be brought out by comparing with the life of such a being as the amoeba that of a more complex and yet simple organism as the hydra or fresh- water polyp. Leaving out certain details of structure, which necd not concern us now, we may say that the hydra consists of a large number of units or cells firmly attached to each other, each cell being composed of proto- plasm, and in its broad features resembling an amceba. The polyp is in fact a group or crowd of amceba-like cells so associated together that, not only may the material of each cell, within limits, be interchanged with that of neighbouring cells, but also the dynamic events taking place in one cell, and leading to exhibitions of energy, may be similarly communicated to neighbouring cells, also within limits. These cells are arranged in a particular way to form the walls of a tube, of which the body of the hydra practically consists. They form two layers in appo-

derm and sition, one an internal layer called the endoderm, lining the

ectoderm

cells.

tube, the other an external layer called the ectoderm, form- ing the outside of the tube. And, putting aside minor details, the differences in structure and function observ- able in the organism are confined to differences between the ectoderm on the one hand, all the constituent cells of which are practically alike, and the endoderm on the other, all the cells of which are in turn similarly alike. The protoplasm of the ectoderm cells is so constituted as to exhibit in a marked degree the phenomena of which we spoke above as irritability and contractility, whereas in the endoderm these phenomena are in abeyance, those of assimilation being prominent. The movements of the hydra are chiefly brought about by changes of form of the ectoderm cells, especially of tail-like processes of these cells, which, arranged as a longitudinal wrapping of the tubular body, draw it together when they shorten, and lengthen it out when they elongate, and it is by the alternate lengthening and shortening of its body, and of the several parts of its body, that the hydra changes its form and moves from place to place. Inaugurating these changes of form, the products of contractility, are the more hidden changes of irritability ; these also are especially developed in the ectoderm cells, and travel readily from cell to cell, so that a disturbance originating in one cell, either from some extrinsic cause, such as contact with a

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foreign body, or from intrinsic events, may sweep from cell to cell over the surface of the whole body. The animal feels as well as moves by means of its ectoderm cells. In the endoderm cells the above phenomena, though not wholly absent, are far less striking, for these cells are almost wholly taken up in the chemical work of digesting and assimilating the food received into the cavity, the lining of which they form.

Thus the total labour of the organisni is divided between these two membranes. The endoderm cells receive food, transmute it, and prepare it in such a way that it only needs a few final touches to becoine living material, these same cells getting rid at the same time of useless ingredi- ents and waste matter. Of the food thus prepared the endoderm cells, however, themselves use but little; the waste of substance involved in the explosions which carry out movement and feeling is reduced in them to a mini- mum ;

they are able to pass on the greater part of the elaborated nourishment to their brethren the ectoderm cells. And these, thus amply supplied with material which it needs but little expenditure of energy on their part to convert into their living selves, thus relieved of the greater part of nutritive labour, are able to devote nearly the whole of their energies to movement and to feeling.

Microscopic examination further shows that these two kinds of cells differ from each other to some extent in visible characters ; and, though, as we have seen, the differ- ences in activity appear to be dependent on differences in invisible molecular arrangement rather than on gross visible differences such as may be called structural, still the invisible differences involve or entail, or are accom- panied by, visible differences, and such differences as can be recognized between endoderm and ectoderm, even with our present knowledge, may be correlated to differences in their work; future inquiry will probably render the correlation still more distinct.

The ectoderm cells together constitute what we have spoken of above as a tissue, whose function in the modern sense of the word is movement and feeling, and the endo- derm cells constitute a second tissue, whose function is assiinilation; and the phenomena of the whole being result from the concurrent working of these two functions. Of organs, in the old sense of the word, of mechanical contrivances, there is hardly a trace.1 The performances of the being are, it is true, conditioned by its being moulded in the form of a long tubular sac with a crown of like tubular arms, but beyond this the explanation of every act of the hydra’s life is first to be sought in the characters of the endoderm and ectoderm. The physiology of the hydra is, for the most part, a series of problems, dealing on the one hand with the intimate nature of the ectodermic protoplasm and the changes in that protoplasm which give rise to movement and feeling, as well as with the laws whereby those changes are so regulated that movement and feeling come and go as the needs of the organism may require, and on the other hand with the intimate nature of the endodermic protoplasm and the changes in that protoplasm whereby the dead food is, also according to the needs of the economy, transformed into living substance. Whereas the older physiology dealt almost exclusively with mechanical problems, the physio-

logy of to-day is chiefly busied with what may be called molecular problems.

_ The physiology of the higher animals, including man, is merely a development of the simpler physiology of the hydra, which has been rendered more complex by a greater division of physiological labour, entailing greater differen-

iL : , : ; aaa The existence of certain minute mechanisms called urticating

organs lodged in the ectoderm cells does not affect the present argument,

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tiation of structure, and been varied by the intercalation of numerous mechanical contrivances.

In the hydra each ectoderm cell—for, broadly speaking, they are all alike—serves three chief purposes of the body. (1) It is sensitive, that is, it is thrown into peculiar mole- cular agitations, with expenditure of energy, when acted upon by external agents. In man and the higher animals certain cells of the original ectoderm of the embryo are differentiated from their fellows (which, losing to a large extent this sensitiveness, remain as a mechanical covering to the body) by a more exquisite development of this power of reaction, and moreover are differentiated from each other in their relative sensitiveness to different agents, so that one set of cells becomes peculiarly susceptible to light, another set to pressure, and the like. Thus the uniform ectoderm of the hydra, uniformly susceptible to all agencies, is replaced by a series of special groups of cells forming the basis of sensory organs, each group being specially sensitive to one agent, and having the nature of its con- stituent cells correspondingly modified. (2) In each ecto-derm cell of the hydra the agitations primarily induced by the exciting agent become so modified by changes taking place in the cell that the outcome is not always the same. According to processes taking place in the cell, movement of one kind or another, or no movement ~~at all, may result, and such movement as results may take 'place immediately or at some other time; it may be at a time so distant that the connexion between the exciting 'disturbance is lost, and the movement appears to be spon~~ taneous. In man

and the higher animals these more complex “neural” processes are carried on, not by the simple sensory cells which receive the primary impression, but by a group of cells set apart for the purpose. These

the like (tissues of mechanical virtues, manufactured by an active protoplasm, but themselves passive, no longer

active), into various mechanical contrivances. Similarly the

sensory cells, as notably those of the eye and the ear, set apart to be acted upon by special agents, are provided with special mechanisms in order that the agent may act with more complete precision. Thus the sensory cells consti- tuting the retina of the eye, in which alone sensory, visual impulses are generated, are provided with an intricate dioptric mechanism, formed partly of inert tissues such as the lens, partly of peculiarly arranged muscular and nervous elements.

In this way the simple ectoderm of the hydra is replaced by a complicated system composed of organs, some of them of extremest intricacy. But the whole system may be re- duced to two sets of factors. On the one hand there are organs in the old sense of the word, that is, mechanical arrangements, some connected with the muscles and others connected with the sensory cells, organs whose functions have for the most part to be interpreted on mechanical principles, since their most important factors, putting aside intervening muscular and nervous elements, are the inert products of protoplasm doing simple mechanical work. On the other hand there are organs in the later sense of the word, namely, sensory cells differentiated to be sensi- tive to special influences, central nervous cells differentiated to carry on the inner nervous work, muscles differentiated to contract, and nerves differentiated to bind together these three other factors. The work of these latter organs is dependent on the nature of their protoplasm ; mechanical arrangements play but little part in them; and the results of their activity can in no way be explained on simple mechanical principles,

Corresponding with this differentiation of the ectoderm Differ- cells runs a somewhat similar differentiation of the endo- entia- derm cells. In the hydra each endoderm cell appears to #0? of

cells constitute a central nervous system, in which a still further division of labour and differentiation of structure

takes place, the simple neurotic processes of the hydra, i

with its dim volition and limited scope of action, being de- veloped in a complex manner into processes which range from simple elaboration of the initial additional agitation of the sensory cell into what we speak of as intelligence and thought. (3) Each octoderm cell, by its tail-like prolonga- tion, or by its whole body, contributes to the movement of the animal while still carrying on the two other actions just ‘described. In man and the higher animals the material of the sensory cell and of the central nervous cells is too precious to be wasted in movements; these accordingly are carried out by groups of cells constituting the mus- cular tissue, in which both the sensitiveness and the higher neurotic processes of the primitive cell are held in abey- ance ; indeed, the latter have almost disappeared in order that the energy of the protoplasm may be more completely directed to producing those changes of form which deter- mine the movements of the animal.

Further, the separation in space of these three groups of cells or tissues necessitates the introduction of elements whereby the agitations set up in the sensory cell should be communicated to the central nervous cells, where these agitations are further elaborated, as well as of elements whereby the muscular tissue may receive vibrations from the central nervous cells, so that the movements of the body may be determined by these. Hence strands of irritable protoplasm whose energy is not spent in move- ment, but wholly given up to the rapid and easy trans- mission of molecular vibrations, unite, as sensory nerves, the sensory cells with the central nervous cells, and, as motor nerves, these with the muscles.

Lastly, for the adequate carrying out of complex move- ments, the contractile cells, elongated into specially con- structed fibres and constituting the muscles, are arranged, with mert tissues such as bones, cartilages, tendons, and

receive some of the food bodily into itself and there to elaborate it into what may be spoken of as prepared nutri- tive material. Some of this material the cell retains within itself in order to renew its own protoplasm ; the rest oozes out to the ectoderm cells, the replenishment of whose pro- toplasm is thereby effected with a saving of labour. In the higher animals the preparation of food is far more com- plicated. The endodermic sheet of the alimentary canal is folded and arranged into organs called glands, with the mechanical advantage that a large amount of surface is secured within a small bulk; and the constituent endo- dermic cells of their glands pour out, or secrete, as is said, divers fluids into the cavity of the canal, so that much pre- liminary preparation of digestion of the food takes place before the food really enters the body. Further, these secreting glandular cells are so differentiated as to pour out special juices acting on special constituents of a meal, and the food subjected in turn to the action of these several juices becomes thoroughly prepared for reception into the body. This reception is carried out by other endoderm cells, which in receiving the digested food probably act upon it so as still further to heighten its nutritive value ; and the absorbed food, before it is presented to the mus- cular and nervous tissues, for whose use it is largely, though of course not exclusively, intended, is subjected to the action of other cells, such as those forming the lymphatic glands and the liver, in order that it may be still further elaborated, still further prepared for the final conversion into living protoplasm.

As in the case of the tissues and organs of ectodermic origin, so also here, the wide separation in space of the masses of differentiated cells constituting tissues necessi- tates the introduction of mechanical contrivances for the carriage of material from place to place. In the simple

Vascular minute hydra the nutritive material can permeate the system. whole body by simply oozing from cell to cell. In the

higher animal a hydraulic system for the distribution of nutritive material is introduced. A fluid 1s distributed in a ceaseless flow all over the body by a mechanical arrangement, consisting of a pump with branching tubes, worked on mechanical principles, and capable of being imitated artificially,

save that the power which drives the machine is the energy set free by living muscle. As this circulating fluid or blood rushes past the endoderm cells which have gorged themselves from the rich contents of the alimentary canal, it receives from them some of the material which they have absorbed and elaborated, and carries this nutritive supply to muscles, nerves, and all parts of the body. Similarly it carries away from muscles, nerves, and other tissues the waste-products of their ac- tivity, those broken fragments of simpler stuffs into which, as we have seen, the complex protoplasm, wherever 1t exists, is for ever splitting up, and bears them back to differentiated endoderm and other cells, whose work has become, so to speak, inverted, since their activity is directed to casting things out of the body, instead of receiving things into the body. And lastly, by a special arrange- ment, by a peculiar property of those red corpuscles which inake blood red, this circulating material at one and the same time carries to each corner of the body, not only the nutritive material required for building up protoplasm, but also the oxygen by which the constructed protoplasm may suffer oxidation, and in being oxidized set free that energy the manifestation of which is the token of life. Blood is in fact the medium on which all the various parts of the body live. Just as an amceba finds in the water which is its home both the food with which it builds itself up and the oxygen with which it breaks itself down, and returns to the water the waste-products of its continued disintegra- tion, so each islet of the living substance of the higher animal, be it muscle or nerve or gland, draws its food and its oxygen from the red blood-stream sweeping past. it, finding therein all its needs, and sheds into the same stream the particles into which it is continually breaking up, and for which it has no longer any use. Hence the blood becomes, as it were, a chemical epitome of the body: from it each tissue takes something away ; to it each tissue gives something back. As it sweeps by each tissue, losing and gaining, it makes the whole body common, and when working aright brings it about that each tissue is never in lack of the things which it wants, never choked up with the things with which it has done.

This vascular system, consisting of a force-pump and branching tubes, constitutes, as we have said, a mechanical arrangement worked on mechanical principles. Neverthe- less occult protoplasmic processes intervene as factors in its total work. Not only is the force-pump itself a

living muscular organ, not only are the walls of the tubes muscular in nature, so that the mere mechanical working of the system is modified by changes not of mechanical origin taking place in them, but the living material which lines the tubing throughout, especially in the minuter channels, finds work to do, also not of a mechanical nature. The gross phenomena of the flow of blood through the capillary channels may (see VASCULAR SysTEM) be inter- preted on simple hydraulic principles ; but no appeal to the ordinary physical laws of dead material will explain the phenomena of the interchange between the blood on a oi Bawah bir the tissue-elements on the blood, so far iain re oe eae sea omnes aa iors _ being actually in contact with the

protoplasmic units of the tissue, is separated by the protoplasmic film of the capillary wall, and by a space or Spaces, greater or smaller, filled with the fluid called lymph

and lined to a greater or less extent with protoplasmic cells, which lining, often at least, parts the tissue-units from the lymph. Hence the tissue lives upon the lymph, while the lymph is replenished from the blood ; and the interchange between the tissue-unit and the blood is de- termined, not only by the direct action of the tissue-unit on the lymph, but also by the relations of the lymph to the blood, as regulated by the capillary wall and the cell- ular lining of the lymph-spaces. We may speak of the interchange as broadly one of diffusion or osmosis through filmy membranes; but diffusion is not the lord in the matter: it is rather a humble servant directed hither and thither by occult molecular processes in the protoplasmic structures concerned.

The foregoing rough analysis leads to a conception of the physiology of the animal body which may be expressed somewhat as follows. The body is composed of different kinds of matter; each kind of matter, arranged in units more or less discrete, constitutes a tissue ; and the several tissues, though having a common likeness in token of their origin from a common primordial protoplasm, have dissimi- lar molecular constitutions, entailing dissimilar modes of activity. Nor is each tissue homogeneous, for two parts of the body, though so far alike as to be both examples of the same general

tissue, may be different in molecular con- stitution, more or less distinctly expressed by microscopic differences of structure, and correspondingly different in action, Thus a liver-cell and a kidney-cell, though both examples of glandular tissue, are quite distinct; so also several varieties of muscular tissue exist ; and in the domi- nant nervous tissue we have not only a broad distinction between nerve-fibres and nerve-cells, but the several groups of nerve-cells which are built up into the brain and spinal cord, and indeed probably the single nerve-cells of these, though all possessing the general characters, both in struc- ture and function, of nervous protoplasm, differ most widely from each other. These several tissues of diverse consti- tution and activity, ranging as regards the rapidity of the molecular changes taking place in them from tlie irritable, unstable, swiftly-changing nerve-cell to the stable, slowly- changing, almost lifeless tendon or bone, are disposed in the body in various mechanical arrangenients constituting organs or machines, whereby the activities of the constitu- ent tissue-elements are brought to bear in special direc- tions. These organs range from those in which the mechan- ical provisions are dominant, the special activity of the tissue-elements themselves being in the background, and supplying only an obscure or even unimportant factor, as in the organs of respiration, to those in which the mechan- ical provisions are insignificant, as in the central nervous system, where the chief mechanical factor is supplied by the distribution in space of the nerve fibres or cells.

Hence it is obvious that almost every physiological in-N quiry of any large scope is, or sooner or later becomes, P of a mixed nature. On the one hand, investigation has‘ to be directed to the processes taking place in the actual tissue-elements, in the protoplasmic cells and modifications of cells. These are essentially of a molecular, often of a chemical or chemico-physical nature; in the problems thus raised matters of form and structure, other than that of molecular structure, which no microscope can ever reveal, are of secondary moment only, or have no concern in the matter at all. These may be spoken of as the purely physiological or as the molecular problems. On the other hand, the natural results of these tissue-activities are con- tinually being modified by circumstances whose effect can be traced to the mechanical arrangements under which the tissue in question is acting,

whence arise problems which have to be settled on simple mechanical principles.

We may take as an illustration the physiology of the

kidney. In the old language the function of the kidney is to secrete urine.

When we come to inquire into the matter, we find, in the first place, that the secretion of urine —that is, the quantity and quality of the urine escaping from the duct of the kidney in a given period—is partly determined by the quantity of blood passing through the kidney and the circumstances of its passage. Now the quantity of blood reaching the kidney at any one time is dependent partly on the width of the renal arteries, partly on the general pressure of the blood in the arterial sys- tem. The width of the renal arteries is in turn dependent on the condition of their muscular walls, whether con- tracted or relaxed ; and this condition is determined by the advent of nervous impulses, the so-called vaso-motor im- pulses, arising in the central nervous system and passing down to the renal arteries along certain nerves. The emis- sion of these vaso-motor impulses from the central nervous system is further determined, on the one hand by the con- dition of certain parts of the central nervous system, the so-called vaso-notor centres, and on the other by the passage of certain afferent sensory impulses to those vaso-motor centres from sensory surfaces such as the skin. Similarly the general blood-pressure is dependent on the condition, patent or narrowed, of the small arteries generally, this

‘ being likewise governed by the vaso-motor system and on ‘ the coincident work done by the heart in driving blood into _ the great blood-vessels, this work being also governed by the nervous system. Hence in attacking such a problem as to

how any particular event, such as the exposure of skin to the

cold, influences the flow of blood through the kidney and

thus the secretion of urine, the investigator, without staying to inquire into the nature of nervous impulses, or into the nature of changes taking place in vaso-motor centres, «c., directs his attention to determining what impulses are

- generated under the circumstances, what paths they take, to

what extent they are quantitatively modified, how far they and their effects react upon each other, and so on. His inquiry in fact takes on to a large extent the characters of an attempt to unravel an intricate game, in which the counters are nervous impulses, muscular contractions, and elastic reactions, but in which the moves are determined by topographical distribution and mechanical arrangements.

But there are other problems connected with the phy- siology of the kidney of quite a different nature. The kidney is, broadly speaking, constructed of living proto- plasmic cells so arranged that each cell is on one side bathed with blood and lymph, and on the other forms the boundary of a narrow canal, which, joining with other canals, ultimately opens into the urinary bladder. Here the question arises how it is that these protoplasmic cells, having nothing to draw upon but the common blood, which is distributed to other organs and tissues as well, are able to discharge on the other side of them into the canal the fluid urine, which is absolutely distinct from blood, which contains substances wholly unknown in blood, as well as substances which, though occurring in blood, are found there in minute quantities only, and, moreover, are not found to escape from the blood into any other tissues or organs. In attempting to answer this question we come upon an inquiry of quite a different nature from the pre- ceding, an inquiry for the solution of which mechanical suggestions are useless. We have to deal here with the molecular actions of the protoplasmic cell. We must seek for molecular explanations of the questions, why a current sets across the cells from blood-capillary and lymph-space to the hollow canal; why the substances which emerge on the far side are so wholly unlike those which enter in on the near side; why, moreover, the in- tensity of this current may wax and wane, now flooding the canal with urine, now nearly or quite drying up; why

not only the intensity of the current but also the absolute and relative amount of the chemical substances carried along it are determined by events taking place in the cell itself, being largely independent of both the quantity and quality of the blood which forms the cell's only source of supply. These and other like questions can only be solved by looking with the mind's eye, by penetrating through careful inferences, into those inner changes which we call molecular, and which no optical aid will ever reveal to the physical eye.

These two lines of inquiry, which we may call the mechanical and the molecular, obtain in all parts of physio- logy, sometimes the one and sometimes the other being dominant. A study of the special articles dealing with the several parts of physiology (see "Nervous System " below, Nurririon, REpropucTion, ResprraTIoN, VAscu- LAR System) will perhaps sufficiently show this; but it may be worth while to give a very brief survey of the whole field from this point of view.

The master tissues and organs of the body are the nervous and muscular systems, the latter being, however, merely the instrument to give effect and expression to the motions of the former. All-the rest of the body serves simply either in the way of mechanical aids and protection to the several parts of the muscular and nervous systems, or as a complicated machinery to supply these systems with food and oxygen, 7.¢., with blood, and to keep them cleansed from waste matters throughout all their varied changes. The physiology of the muscular system is fairly simple. The mechanical problems involved have been long ago for the most part worked out, and the molecular problems which touch on the nature of muscular contractions, their dependence on the blood-supply, and their relations to nervous impulses are being rapidly solved. The physiology of the nervous system, on the other hand, is in its infancy. The mechanical side of the inquiry is here represented, inasmuch as the various actions of the system are condi- tioned by the distribution and topographical arrangement of the constituent fibres and cells; and even these simple problems, as may be seen from the article ' Nervous Sys- tem" below, are as yet largely unworked. The deeper molecular problems, those which deal with the real nature of the processes taking place in cell and fibre, even the simpler of these, such as the one which asks why the neural protoplasm of one cell, or group of cells, seems

quiescent until stirred by some foreign impulse, its own vibrations being otherwise retained and lost within its own substance, while the neural protoplasm of another cell is continually, or from time to time, discharging vibrations, as rhythmic molecular pulses, along adjoining fibres,— these, at the present day, can hardly be said to be touched. The physiology of the nervous system is emphatically the physiology of the future.

The rest of the body may, from a broad point of view, be regarded as a complex machinery for supplying these master tissues with adequately-prepared food and oxygen, for cleansing them from the waste-products of their activity, and for keeping them at a temperature suitable for the development of their powers. As we have already said, the blood is the agent which not only supplies both food and oxygen but sweeps away all refuse, and, we may add, is the instrument for maintaining an adequate temperature. All the rest of the body may in fact be looked upon as busied in manufacturing food into blood, in keeping up the oxygen supply of the blood, in sifting out from the blood all waste material, and in maintaining the blood at a uniform heat. This work, of which blood is, so to speak, the centre, is, as we have already seen, carried out by protoplasmic cells, many of which are themselves of a mus- cular nature, often forming part of complicated mechanical

contrivances, built up partly of inert tissues, partly of active tissues, such as muscle and nerve. In tracing the food and oxygen into the blood and the waste matters out of the blood, in studying the distribution of the blood itself and the means adopted to maintain its even temperature, we come, as before, on problems partly mechanical or chemical and partly molecular. The changes which the food undergoes in the intestine can be, and have been, successfully studied as a series of purely chemical prob- lems conditioned by anatomical arrangements, such as the existence of an acid

fluid in the stomach, succeeded by alkaline fluids in the intestine, and the like ; but the ques- tions concerned in the discharge of the digestive juices into the alimentary canal, in the secretory activity of the digestive glands, raise up protoplasmic molecular inquiries. In the reception or absorption of the digested food we similarly find the purely physical processes of diffusion and the like overridden by the special protoplasmic activities of the constituent cells of the lining of the canal. In the further elaboration of the digested products the action of cells again intervenes, as it similarly does in the, so to speak, inverted action by which waste matters are cast out of the body, though in both cases the results are in part conditioned by mechanical contrivances. The circulation of the blood is carried on by means of an intricate mechanical contrivance, whose working is determined and whose effects are conditioned by molecular changes occur- ring in the constituent muscles and other protoplasmic cells; the work done by the heart, the varying width of the channels, the transit of material through the filmy capillary walls, all these are at once the results of proto- plasmic activity and factors in the mechanical problems of the flow of blood. The oxygen passes into and carbonic acid out of the blood, through simple diffusion, by means of the respiratory pump, which is merely a machine whose motive-power is supplied by muscular energy, and both oxygen and carbonic acid are carried along in the blood by simple chemical means ; but the passage of oxygen from the blood into the tissue and of carbonic acid from the tissue into the blood, though in themselves mere diffusion processes, are determined by the molecular activity of the constituent cells of the tissue, Lastly, the blood, however well prepared, however skilfully driven to the tissue by the well-timed activity of the vascular system, even when it has reached the inner network of the tissue-elements, is not as yet the tissue itself. To become the tissue it must undergo molecular changes of the profoundest kind: it must cross the boundary from dead material to living stuff. The ulti- mate problems of nutrition are of the molecular kind. All the machinery, however elaborate, is preparatory only, and it is the last step which costs the most,

Of the many problems concerned in these several depart- ments of physiology the one class which we have spoken of as being mechanical in nature is far too varied to be treated of as a whole. The problems falling under it have but few features in common ; each stands, as it were, on 1ts

own bottom, and has to be solved in its own way. The problems of the other class, however—those which we have spoken of as being molecular in nature—have a certain common likeness ; and it may be worth while to consider, in a brief and general Manner, some of their most striking characters, .

For this purpose we may first of all turn to the changes taking place in a secreting cell, for these have of late years been studied with signal success. They illustrate what may be called the chemical aspects of vital actions, Just as the changes in @ muscular fibre, on the other hand, po ie cei — a form, the kinetic aspects i ns. we examine a secreting gland,

pancreas or a salivary gland, we find that it is

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composed of a number of similar units, the unit being a

secreting cell of approximately spheroidal form, one part |

of the surface of which borders a canal continuous with the duct of the gland, while another part is bathed in lymph, The process of secretion consists in the cell discharging into the canal a fluid which is of a specific character, inso- much as, though it consists partly of water and other sub-stances common to it and other fluids of the body, these

are present in it in special proportions ; and it also contains |

substances or a substance found in itself and nowhere else, To enable it to carry on this work the cell receives supplies of material from the lymph in which it is bathed, the lymph in turn being replenished from neighbouring capillary blood-vessels. The secreting cell itself consists of a soft protoplasmic ‘‘ body,” of the nature previously described, in the midst of which lies a “‘ nucleus.” the actions carried out by the nucleus may, for simplicity’s sake, be left on one side for the present; and we may regard the cell as a mass of protoplasm consisting, as we have seen, of a network of a particular nature, and of other substances of different nature filling up the meshes or interstices of the network.

The consideration of |

Such a cell may exist under two different conditions, —

At one time it may be quiescent: although the blood

vessels surrounding it are bathing it with lymph, although —

this lyniph has free access to the protoplasm of the cell,

no secretion takes place, no fluid whatever passes from the —

cell into the canal which it borders. At another time, under, for instance, some influence reaching it along the nerve distributed to the gland, although there may be no change in the quantity or quality of the blood passing through the adjacent blood-vessels, a rapid stream of

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material flows froin the protoplasmic cell-body into the

canal. How is this secretion brought about?

If we examine certain cells, such, for instance, as those

of the pancreas, we find that during a period of rest sue

ceeding one of activity the cell increases in bulk, and further that the increase is not so much an enlargement of the protoplasmic network as an accumulation of material in the meshes of the network ; in fact, there appears to be a relative diminution of the actual protoplasm, indicating, as we shall see, a conversion of the substance of the net work into the material which is lodged in the interstices of the network. This material may, and frequently does, exist in the form of discrete granules, recognizable under the microscope ; and in the pancreas there is a tendency for these granules to be massed together on the side of the cell bordering the lumen of the canal. During activity, while the cell is discharging its secretion into the canal, these granules disappear, so that the protoplasmic network is after prolonged activity left with a very small burden of material in its meshes; at

the same time there also ap- pears to be an accompanying absolute increase of growth of the mass of the protoplasm itself. We have further evi- dence that the substance which is thus stored up in the meshes of the cell, forming the granules, for instance, just spoken of, is not, as it exists in the cells, the same sub- Stance as that which occurs in the secretion as its charac- teristic constituent. Thus the characteristic constituent of pancreatic juice is a peculiar ferment body called “ tryp- sin,” and we possess evidence that the granules in the pan- creatic cells are not trypsin. But we have also evidence that these granules consist of material which, upon a very slight change, becomes trypsin, of material which is an ante cedent of trypsin, and which has accordingly been called “‘trypsinogen.” Thus the cell during rest stores up tryp- Sinogen, and the change which characterizes activity is the conversion of trypsinogen into trypsin, and its consequent discharge from the cell. These ‘are facts ascertained by observation and experiment, viz., that trypsinogen appears

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in the protoplasm of the cell, and that in the act of secre- tion this trypsinogen is discharged from the cell in the form of the simpler trypsin. When, however; we come to consider the origin of the trypsinogen we pass to matters of inference and to a certain extent of speculation.

Two views seem open to us. On the one hand, we may _ adopt an old theory, once generally accepted, and suppose that the cell picks out from the lymph which bathes it part- icles of trypsinogen, or particles of some substance which is readily transformed into trypsinogen, and deposits them

stability. The substances or mesostates appearing in the former we may speak of as “anastates,” those of the latter we may call “katastates.” At each step of the former, by which a simpler anastate becomes, or by which simpler anastates become, a more complex one, energy is absorbed ; at each step of the latter energy is set free. And, since in the animal-cell the initial anastates seem always or at least generally more complex than the final

katastates, the total life of the animal-cell is virtually a giving forth of energy.

initssubstance. This may be called the “selective ” theory. On the other hand, we may suppose that the trypsinogen results from the breaking down, from the katabolic or de-

So far we have spoken of the secreting cell, but we have Mole- evidence that in the activity of a muscle a similar series cular

_ structive metabolism of the protoplasm, being thus wholly formed in the cell. This may be called the ‘metabolic ” theory. Our present knowledge does not permit us wholly to prove or wholly to disprove either of these theories ; but such evidence as we possess is in favour, and increasingly in favour, of the metabolic theory. All efforts to detect in the blood or in the lymph such substances as trypsinogen, or analogous substances in the case of other glands, have hitherto failed ; and, although such a negative argument has its weakness, still it is of avail as far as it goes. On

| the other hand, the diminution of the protoplasm in the

| pancreatic cell, part passu with the increase of trypsinogen, ‘ and its subsequent renewal previous to the formation of

‘| | new trypsinogen, strongly support the metabolic theory,

and a number of other facts drawn from the history of ‘ various animal and vegetable cells all tend strongly in the ‘ same direction. We have further a certain amount of evidence that trypsinogen arises from an antecedent more complex than itself, as it in turn is more complex than trypsin. So, although clear demonstration is not as yet _ within our reach, we may with considerable confidence conclude that trypsinogen and other like products of secreting cells arise from a breaking down of the cell- ‘ substance, are’‘manufactured by the protoplasm of the cell ‘ out of itself.

We are thus led to the conception that the specific material of a secretion, such as the trypsin of pancreatic juice, comes from the protoplasm of the cell, through a number of intermediate substances, or mesostates as they

|) are called; that is to say, the complex protoplasm breaks

| down into a whole series of substances of decreasing com- | plexity, the last term of which is the specific substance of the secretion. Now the protoplasm is undoubtedly formed at the expense of the material or pabulum brought to it from the blood through the medium of the lymph; the pabulum becomes protoplasm. Here also two views are open tous. On the one hand, we may suppose that the ‘ crude pabulum is at once by a magic stroke, as it were, _ built up into the living protoplasm. On the other hand, _ we may suppose that the pabulum reaches the stage of protoplasm through a series of substances of increasing _ complexity and instability, the last stage being that which _ we call protoplasm. And here, too, no absolute decision | between the two views is possible, but such evidence as ‘ we do -possess is in favour, and increasingly in favour, of the latter view.

| We may therefore with considerable confidence anti- eipate the future arrival of evidence which will demonstrate _ the as yet only probable view that in the secreting cell

of events takes place. Reduced to theoretical simplicity, a

the unit a number of which go to form a muscle is a proto- plasmic cell, undergoing, like the secreting cell, a con- tinual metabolism, with a change in the results of that metabolism at the moment of functional activity. Put in a bald way, the main difference between a secreting cell and a muscle-cell, or elementary muscle-fibre as it is often called, is that in the former the products of the metabolism constitute the main object of the cell’s activity, a change of form being of subordinate importance, whereas in the latter the change of forni, an increase of one axis at the expense of another, a shortening with corresponding thick- ening, is the important fact, the products of the metabol- ism which thus gives rise to the change of form being of secondary value.

Now we have evidence, which, as in the case of the secreting cell, though not demonstrative, is weighty and of daily increasing weight, that the change of form, the contraction of a muscle, is due to a sudden metabolism, to an explosive decomposition of what may be called “contractile substance,” a substance which appears to be used up in the act of

contraction, and the consumption of which leads with other events to the exhaustion of a muscle after prolonged exertion. We know as a matter of fact that when a muscle contracts there is an evolution of a considerable quantity of carbonic acid, and a chemical change of such a kind that the muscle becomes acid. This carbonic acid must have some antecedent, and the acidity must have some cause. It is of course possible that the protoplasm itself explodes, and is the immediate parent of the carbonic acid and the direct source of the energy set free in the contraction ; but evidence analogous to that brought forward in relation to the secreting cell leads to the conclusion that this is not so, but that the explosion takes place in, and that the energy is derived from, a specific contractile substance. And there is further evidence that this hypothetical substance, to which the name of "inogen" has been provisionally given, is, like its analogue in the secreting cell, a katastate. So that the contracting activity of a muscular fibre and the secreting activity of a gland-cell may be compared with each other, in so far as in each case the activity is essentially a decom- position or explosion, more or less rapid, of a katastate, the inogen in the one instance, the trypsinogen or some other body in the other instance, with the setting free of energy, which in the case of the secreting cell leaves the sub- stance wholly as heat, but in the case of the muscle partly as movement, the activity being followed in each case by the discharge from the fibre or cell of the products, or some of the products, of this decomposition. :

there are two series of events, two staircases, as it were, of chemical transformation,—one an ascending staircase of

Further, we may carry on the parallel to nervous sub- In ner-

stance. Asa nervous impulse travels along a nerve-fibre or bite sub- stance.

synthetic, anabolic processes through which the pabulum, consisting of several substances, some of them already com- plex and unstable, is built up into the still more complex _ and still more unstable protoplasm ; the other a descending _ staircase, consisting of a series of katabolic processes giving rise to substances of decreasing complexity and increasing

pursues its intricate course along the fibrillar tracts of a nerve-cell, the amount of chemical change is too slight to be satisfactorily appreciated by

the methods at present under our command. There is certainly no massive ex-

‘plosion like that of a muscular fibre, and the most striking

phenomena attending the passage of a nervous impulse are

Meta- bolic changes in cen- tral nervous system.

-of an electrical nature.

20

We cannot indeed distinctly prove that any chemical change does really accompany nervous activity ; but from many considerations it 1s extremely probable that a chemical change, an explosive decomposition of more complex into more simple substances, is the basis of a nervous impulse. The energy, however, which 1s set free by this decomposition is not discharged from the nervous substance to so great an extent as is the case In the muscle-fibre, but is largely consumed in conveying or con- ducting the decomposition from one particle of the nervous substance to succeeding ones,—that is to say, In carrying out that which is the essential work of the nervous sub- stance. Moreover, even ina muscle, while the explosion of inogen and the consequent shortening and thickening of the muscle-substance travel along the fibre from particle to particle in the form of a wave starting from the junction of the nerve-fibre with the muscular fibre, or from some other point of stimulation, this wave of visible con- traction is preceded by invisible molecular changes also travelling along the fibre in the form of a wave, changes which manifest themselves by no massive explosions, which are indicated by electrical phenomena chiefly, and which are exceedingly like the nervous impulses of proper nervous structures. In the very substance of the muscular fibre there appears to be a material which is not inogen, but which is capable of undergoing changes, probably of the nature of an explosive decomposition, and it is these which in turn induce the more massive decomposition of the inogen. It is possible, indeed probable, that the con- stituent particles of inogen are not able to communicate their explosions to each other, so that the presence in the muscular fibre of an impulse-carrying material is a neces- sity. Be this as it

may, a change antecedent to the explosion which is the cause of the actual contraction does occur in every particle of the muscle which contracts, and, as we have urged, the change is probably one taking place in a special substance. This substance may be the verit- able protoplasm itself of the fibre, but considerations analogous to those urged before would lead us to suppose that it too is a katastate, but a katastate different in qualities from inogen ; and we may furthur suppose that a very similar katastate is manufactured by nervous proto- plasm, and by its decomposition gives rise to nervous energy. This katastate is, as it were, the fuse or trigger whose action fires the massive charge of the muscular gun, and might receive the name of “apheter.”

If we accept this view as to the nature of the simple nervous impulses which sweep along nerve-fibres—and in this respect motor and sensory nerves would seem wholly alike—there is no great difficulty in extending the con- ception to the more complicated processes taking place in the central nervous system. An ordinary reflex act, so called, is perhaps one of the simplest labours of that system, and we have evidence that in a reflex act sensory impulses arriving along a sensory fibre at the protoplasm of a nerve- cell induce in that protoplasm changes which, though in certain respects differing from, are fundamentally analogous to, those changes in motor and sensory nerve-fibres which constitute their respective nervous impulses. The chief difference is that, whereas along sensory and motor fibres the impulses pursue an even course, possibly undergoing some augmentation, but one which is not sufficiently marked to be beyond doubt, in the nerve-cell, on the contrary, an unmistakable augmentation accompanied bya systematic dispersion takes place. So great is the augment- ation in some cases that a gentle short series of sensory im- pulses reaching one of a group of nerve-cells along a single sensory fibre may throw the whole group of nerve-cells into such profound agitation that repeated series of even violent impulses may be discharged along a multitude of

due to difference in the kind of impulses brought about

motor fibres. Allowing for this increase in the energy set free, the changes in the nerve-cells do not seem to differ fundamentally from those in the nerve-fibres (which indeed differ to a certain extent among themselves), and may, like them, be regarded as due essentially to the decomposi- tion of some katastate or katastates.

Further, just as the apheter of the muscular fibre, that which inaugurates the explosion of the contractile inogen, differs from the apheter of the nerve-fibre, so we may suppose that in the various nerve-cells of different parts of the central nervous system difference of function, while partly due to the mere arrangement and distribution of nervous impulses of the same kind, is also and more largely

by difference in the composition and mode of decomposition of the nervous material. For instance; certain changes in the nervous system are accompanied by distinct changes of consciousness, while others are not. And, while we may justly refuse.to attempt any explanation of consciousness, Om it is nevertheless within our right to suppose that, in that sam nervous substance which is the highest development of ™} protoplasm and to whose service the whole body minis- ters, amid the many substances of increasing complexity and dignity which enter into its composition there should be a substance or some substances the changes in which are, or may be, accompanied by consciousness. The doc- trine of evolution compels us to admit that consciousness must be potentially present in the simple protoplasm of the amoeba, and must be similarly present in all the tissues of the highly-developed animal, instead of being confined to some limited portion of the nervous system. Evolution refuses to admit a sharp line of demarcation between a “conscious” and a “non-conscious ” part, and this decision is increasingly supported as our knowledge of the nervous system advances. But a great deal of the earlier part of this article was directed to show that all the powers of the complex animal are the outcome of the differentiation of a primordial protoplasm, while the discussion concerning the molecular changes of tissues in which we are now engaged is simply an attempt to trace out how that differentiation has taken place. And, as far as we can see, there are no just reasons why the differentiation which sets apart the nervous tissue from other parts of the body should ‘ not obtain in the nervous tissue itself, and the obscure — rudiments of consciousness

present in all nervous material become by differentiation developed, in some particular ‘ kinds of nervous substance, into consciousness more strictly so called.

In the case, then, of secreting cells, of muscular tissue, and of the various forms of nervous tissue the tendency of inquiries into the molecular processes taking place in them is to lead us to regard the varied activities of these tissues as due to molecular disruptive changes in their several katastates, these being various stages of the down- ward metabolism or katabolism of protoplasm.

Similar considerations might be extended to other tissues of the body which are neither nervous nor muscular, and, though engaged in chemical work, are not distinctly secretory or excretory, such, for instance, as the hepatic cells engaged in the elaboration of glycogen. They might also be extended to those tissues in which the katastates are not exploded and discharged, but retained and massed up in the body for mechanical or other purposes, to car- tilage, for instance, the chondrigenous basis or ground- substance which many considerations show to be a product or katastate of protoplasm. We are thus led to the con- ception, brought forward in an earlier part of this article, that all over the body protoplasm is continually building itself up out of the pabulum supplied by food, and con- tinually breaking down, giving rise in different tissues and 1

different parts of the body to different katastates with

different composition and different properties, the various |

activities of the body being the outcome of the various properties of the various katastates. Tf this be admitted, it almost inevitably follows that what we have called proto-

plasm cannot be always the same thing, that there must’

be many varieties of protoplasm with different qualities and with correspondingly different molecular structure and composition. If this be so,

the question naturally arises, why use the word protoplasm at all, since, by the showing, it seems to have no exact meaning? But it has an exact meaning. All the evidence at our disposal goes to show

that a katastate of any given degree cannot form a fresh

katastate of the same degree; any one katastate can only arise from the decomposition of a preceding more.complex katastate, and that in turn from a katastate still more complex. Passing upwards, we come at last to something which, instead of proceeding from a more complex sub- stance, builds itself up out of a less complex, more simple substance, and it is this something, whatever its exact composition, into whatever katastates it is destined to fall asunder, to which the generic name “ protoplasm ” should be given. Possibly another new name were better, but there are advantages in retaining the old term. It is protoplasm in this sense which is alone living; it is its synthetic power which is its token of being alive. That synthetic power is, we must admit, exercised along the ascending series of anastates. But here our knowledge is a blank ; and it would be simply waste of time to speculate as to the details of the constructive processes. Using the word “protoplasm” in this sense, it is obvious that the varieties of protoplasm are numerous, indeed almost in- numerable. The muscular protoplasm which brings forth a contractile katastate must differ in nature, in com- position—that is, in construction—from glandular proto- plasm, whose katastate is a mother of ferment. Further, the protoplasm of the swiftly contracting striped muscular fibre must differ from that of the torpid smooth unstriated fibre ; the protoplasm of human muscle must differ from that of a sheep ora frog; the protoplasm of one muscle must differ from that of another muscle in the same kind of animal; and the protoplasm of Smith’s biceps must differ from that of Jones’s.

We may, for a moment, turn aside to point out that this innate difference of protoplasm serves to explain the con- clusions to which modern investigations into the physiology of nutrition seem to be leading. So long as we speak of muscle or flesh as one thing, the step from the flesh of mutton which we eat to the flesh of our body which the mutton, when eaten, becomes, or may become, does not seem very far; and the older physiologists very naturally assumed that the flesh of the meal was directly,

without great effort and without great change, as far as mere chemical composition is concerned, transformed into the muscle of the eater. The researches, however, of modern times go to show that the substances taken as food undergo many changes and suffer profound disruption before they actually become part and parcel of the living body, and conversely that the constructive powers of the animal body were grossly under-rated by earlier investigators. If one were to put forward the thesis that the proteid of a meal becomes reduced almost to its elements before it undergoes synthesis into the superficially similar proteid of muscle, the energy set free in the destruction being utilized in the subsequent work of construction, he might appeal with confidence to modern results as supporting him rather than opposing him in his views. It would almost seem as if the qualities of each particle of living protoplasm were of such an individual character that it had to be built up afresh from almost the very beginning ; hence the im-

mense construction which inquiry shows more and more clearly every day to be continually going on as well in the animal as in the vegetable body. .

Taking into consideration all the fine touches which make up the characters of an individual organism, and remembering that these are the outcome of the different properties or activities of the several constituent tissues of the body, working through-a delicately-balanced complicated machinery, bearing in mind the far-reaching phenomena of heredity by which the gross traits and often the minute tricks of the parents' body are reproduced in the offspring, if there be any truth at all in the views which we have urged, tracing the activities of the organism to the con- stitution of its protoplasm, this must be manifold indeed. The' problems of physiology in the future are largely con- cerned in arriving, by experiment and inference, by the inind's eye, and not by the body's eye alone, assisted as that may be by lenses yet to be introduced, at a knowledge of the molecular construction of this protean protoplasm, of the laws according to which it is built up, and the laws according to which it breaks down, for these laws when ascertained will clear up the mysteries of the protean work which the protoplasm does.

And here we may venture to introduce a word of caution. We have, in speaking of protoplasm, used the words "con- struction," "composition,"

“decomposition,” and the like, as if protoplasm were a chemical substance. And it is a chemical substance in the sense that it arises out of the union or coincidence of certain factors, which can be resolved into what the chemists call ‘ elements,” and can be at any time by appropriate means broken up into the same factors, and indeed into chemical elements. This is not the place to enter into a discussion upon the nature of so-called chemical substances, or, what is the same thing, a discus- sion concerning the nature of matter ; but we may venture to assert that the more these molecular problems of phy- siology, with which we are now dealing, are studied the stronger becomes the conviction that the consideration of what we call “structure ” and “ composition” must, in har- mony with the modern teachings of physics, be approached under the dominant conception of modes of motion. The physicists have been led to consider the qualities of things as expressions of internal movements ; even more impera- tive does it seem to us that the biologist should regard the qualities (including structure and composition) of proto- plasm as in like manner the expression of internal move- ments. He may speak of protoplasm as a complex sub- stance, but he must strive to realize that what he means by that is a complex whirl, an intricate dance, of which what he calls chemical composition, histological structure, and gross configuration are, so to speak, the figures; to him the renewal of protoplasm is but the continuance of the dance, its functions and actions the transferences of figures. In so obscure a subject it is difficult to. speak otherwise than by parables, and we may call to mind how easy it is to realize the comparison of the whole body of man to a fountain of water. As the figure of the fountain remains the same though fresh water is continually rising and falling, so the body seems the same though fresh food is always replacing the old man which in turn is always falling back to dust. And the conception which we are urging now is one which carries an analogous idea into the study of all the molecular phenomena of the body. We must not pursue the subject any further here, but we felt it necessary to introduce the caution concerning the word “ substance,” and we may repeat the assertion that it seems to us necessary for a satisfactory study of the problems on which we have been dwelling for the last few pages to keep clearly before the mind the conception that the phenomena in question are the result not of properties of kinds of

desirable to touch upon it since it illustrates a possible or probable new departure. What we have said of it and of the more manageable molecular problems of physiology will perhaps show that, vast and intricate as is the maze before the physiologist of to-day, he has in his hand a clue which promises, at least, to lead him far on through it.

Space forbids our entering upon a discussion concerning Maj} the methods of physiology; but, accepting the truth of of the preceding discussion as to the nature of physiological 4) problems, the means of solving these problems speak for themselves.

From the earliest times the methods of physiological inquiry have belonged to one of two categories : they have been anatomical or experimental. And the same distinc- tion holds good to-day, though both methods are often joined together in one inquiry, and indeed at times may be said to merge the one into the other. By the anatom- ical method the observer ascertains the gross outlines, the minute structure, and if necessary the physical characters and the chemical composition of an organism or part of an organisin ; and by comparison of these with those of differ- ent organisms, or of the same organism placed by nature —that is, not by himself—in different circumstances, he draws conclusions as to the actions taking place in it while it was alive. In early times the comparison of gross struc- tures gave important results, but they have now been to a great extent exhausted ; and the most valuable conclusions reached at the present day by the anatomical method are those arrived at by histological investigation of minute structures and by chemical analysis. The marks of this method are that on the one hand it deals for the most part with things which are no longer alive, and hence must necessarily fail to make touch with the inner workings of which we have spoken above, and on the other hand in its comparison of organisms under different conditions it has to wait till Providence brings about what it requires, and has to be satisfied with such differences as the chapter of accidents provides. In the experimental method the observer places the organism or part of the organism under conditions of his own choosing, and applies to the organism under those conditions the same analysis as in the former methods. He ascertains changes in the gross features, minute structure, physical characters, and chemical com- position, as before. So that in reality the two methods are in part identical, and differ

chiefly by the fact that in the latter the observer chooses the conditions in which to place the organism. But an important corollary follows, viz. that by choosing his own conditions the observer is able to bring his analysis to bear on an organism or part of an organism while still alive.

The history of physiology, especially in recent times, shows that this method is the one not only of the greatest fertility but one becoming more and more essential as inquiry 1s pushed deeper and deeper into the more abstruse parts of physiology. If there be any truth in the sketch given above of the modern tendencies of molecular physio- logy, it will be clear to every mind that the experimental method alone can in the future give adequate results. It might indeed be urged that when molecular physics has advanced far enough the molecular problems of physiology will be interpreted by its light without recourse to experi- ment. It will be a long waiting till that comes. Mean- while, all the power over not only the body but, what is more important, the mind of man which the physiology of

matter, in the vulgar sense of these words, but of kinds of motion. In the above brief sketch we have dealt chiefly with such well-known physiological actions as secretion, muscular contractions, and nervous impulses. But we must not hide from ourselves the fact that these grosser activities do not comprise the whole life of the tissues. Even in the simple tissues, and more especially in the highly-developed nervous tissues, there are finer actions which the conception out- lined above wholly fails to cover. Finer Two sets of vital phenomena have hitherto baffled in- activities quirers,—the phenomena of spontaneous activity, rhythmic of proto- y other, and the phenomena of “inhibition.” All attempts “to explain what actually takes place in the inner working of the tissues concerned when impulses passing down the pneumogastric nerve stop the heart from beating, or in the many other analogous instances of the arrest of activity through activity, have signally failed; the superficial re- semblance to the physical “interference of waves” breaks down upon examination, as indeed do all other hypotheses which have as yet been brought forward. And we are wholly in the dark as to why one piece of protoplasm or muscular fibre or nervous tissue remains quiescent till stirred by some stimulus, while another piece explodes into activity at rhythmic intervals. We may frame ana- logies and may liken the phenomena to those of a constant force

rhythmically overcoming a constant resistance, but such analogies bring us very little nearer to understanding what the molecules of the part are doing at and between the repeated moments of activity. Hering's Further, if the ingenious speculations of Hering, that ee specific colour-sensations are due to the relation of assimi- mp ation (anabolism) to dissimilation (katabolism) of proto- plasmic visual substances in the retina or in the brain, should finally pass from the condition of speculation to that of demonstrated truth, we should be brought face to face with the fact that the mere act of building up or the mere act of breaking down affects the condition of protoplasm in other ways than the one which we have hitherto considered, viz., that the building up provides energy to be set free and the breaking down lets the energy forth. In Hering's conception the mere condition of the protoplasm, whether it is largely built up or largely broken down, produces effects which result in a particular state of consciousness. Now, whatever views we may take of consciousness, we must suppose that an affection of con- sciousness is dependent on a change in some material, But in the case of colour-sensations that material cannot be the visual substance itself, but some other substance, That is to say, according to Hering's views, the mere con- dition of the visual substance as distinct from a change in that condition determines the changes in the other sub- Stance which is the basis of consciousness, So that, if Hering's conception be a true one (and the arguments in favour of it, if not wholly conclusive, are at least serious), we are led to entertain the idea that, in addition to the rough propagation of explosive decompositions, there are continually passing from protoplasm to protoplasm delicate touches compared with which the nervous impulses which with such difficulty the galvanometer makes known to us are gross and coarse shocks, And it is at least possible if not probable (indeed present investigations seem rapidly tending in this direction), that an extension of Hering's view, with such modifications as future inquiry may render necessary, to other processes than visual sensations, more especially to the inner working of the central nervous Sys- tem, may not only carry us a long way on towards under. standing inhibition and spontaneous activity but may lay the foundation of a new molecular physiology. This, how- ever, Is speculative and dangerous ground. But it seemed

“matter” which could not be discovered by the examina- tion of bodies which had never lived.

- Tt would not be a hard task to give chapter and verse for the assertion that the experimental method has, especi- ally in these later times, supplied the chief means of progress in physiology ; but it would be a long task, and we may content ourselves with calling attention to what is in many respects a typical case. We referred a short time back to the phenomena of “inhibition.” It is not too much to say that the discovery of the inhibitory function of certain nerves marks one of the most important steps in the pro- gress of physiology during the past half-century. The mere attainment of the fact that the stimulation of a nerve might stop action instead of inducing action con- stituted in itself almost a revolution ; and the value of that fact in helping us on the one hand to unravel the tangled puzzles of physiological action and ‘yeaction, and on the other hand to push our inquiries into the still more diffi- cult problems of molecular changes, has proved immense. One cannot at the present time take up a physiological memoir covering any large extent of ground without find- ing some use made of inhibitory processes for the purpose of explaining physiological phenomena.

Now, however skilfully we may read older statements between the lines, no scientific—that is, no exact—know- ledge of inhibition was possessed by any physiologist until Weber, by a direct experiment on a living animal, dis- covered the inhibitory influence of the pneumogastric nerve over the beating of the heart. It was of course previously known that under certain circumstances the beating of the heart might be stopped ; but all ideas as to how the stoppage was or might be brought about were vague and uncertain before Weber made his experiment. That experiment gave the clué to an exact knowledge, and it is difficult, if not impossible, to see how the clue could

have been gained otherwise than by experiment; other experiments have enabled us to follow up the clue, so that it may with justice be said that all that part of the recent progress of physiology which is due to the introduction of a knowledge of inhibitory processes is the direct result of

the experimental method. But the story of our know- ledge of inhibition is only one of the innumerable instances of the value of this method. In almost every department of physiology an experiment or a series of experiments has proved a turning-point at which vague nebulous fancies were exchanged for clear decided knowledge, or a starting- point for the introduction of wholly new and startling ideas. And we may venture to repeat that not only must the experimental method be continued, but the progress of physiology will chiefly depend on the increased application of that method. The more involved and abstruse the problems become, the more necessary does it also become that the inquirer should be able to choose his own con- ditions for the observations he desires to make. Happily, the experimental method itself brings with it in the course of its own development the power of removing the only valid objection to physiological experiments, viz., that in certain cases they involve pain and suffering. For in nearly all ex- periments pain and suffering are disturbing elements. These disturbing elements the present imperfect methods are often unable to overcome ; but their removal will become a more and more pressing necessity in the interests of the experi- ments themselves, as the science becomes more exact and exacting, and will also become a more and more easy task as the progress of the science makes the investigator more and more master of the organism. In the physiology of the future pain and suffering will be admissible in an ex- periment only when pain and suffering are themselves the object of inquiry. And such an inquiry will of necessity take a subjective rather than an objective form. (M. F.)

PART IL—NERVOUS SYSTEM

To supplement the foregoing general sketch some detailed account must be given of the physiology of the several functions. NUTRITION (q.v.) has received separate treatment ; a sketch of the ‘‘ Nervous System ” is now appended ; and RESPIRATION and REPRODUCTION will be dealt with in their places.

However complex may be the anatomical arrangements in man and the higher animals, the nervous system consists essentially of three portions: (1) central masses of nervous matter, or ganglia, constituting the brain and spinal cord, and containing invariably nerve-cells ; (2) peripheral or

terminal arrangements, existing in the organs of sense, in muscle, and in electric organs ; and (3) nerves, or internuncial cords connecting the central with the peripheral organs. The nerves may be regarded as conductors of a inode of energy which, for want of a better term, is termed “ nerve-force,” originating either in the nerves themselves on the application of a stimulus or in the terminal organs or in the central organs. Thus, if a nerve be irritated at any point of its course, a change is set up in the nerve-fibres at the point of irritation, and this change is propagated along the nerve-fibres toa central or terminal organ, thus producing a characteristic phenomenon, —it may be a sensation of pain or of pleasure, an involuntary movement, the contraction of a muscle, or a discharge of electricity. Again, the stimulus may act ona terminal organ, such as the retina, setting up a change which is then propagated or conveyed to the brain by the optic nerve, there giving rise to a sensation of light or colour. Finally, the nervous action may originate in a central organ, as is the case when a vol- untary movement is made. The voluntary impulse, in this instance, originates in the brain ; a change passes along nerve-fibres from the brain to the muscles, and as a result the muscles contract. We have therefore to discuss the general properties and modes of action of nerves, terminal organs, and central organs.

1.—NERVEs.

Structure of Nerves.—A general description of the structure of nerves and of nerve-fibres will be found in vol. i. p. 859 sq.; but there are a few points of physiological importance still to be noticed. Two kinds of nerve-fibres exist in the body, white or medullated fibres, so called because each fibre has a sheath indi- cated by a double contour (see fig. 1), and the pale or non-medul- lated. The medullated nerve-fibres form the white part of the

brain, spinal cord, and nerves. They vary in diameter from the xeooth to the ye}sath of an inch, and when of very small size often show varicosities or swellings. ach fibre consists of three parts: (1) an external sheath, or primitive sheath ; fpr

(2) within this the medullary sheath or white substance of Schwann; and (3)in the centre an axial fibre, the cylinder axis of Purkinje, or band of Remak. The axis-

cylinder in a fresh nerve seems to be homogeneous ; but with high powers and proper illumination, and more especially

Fig. 1. Fig. 2.

Fic. 1.—(1) Medullated nerve-fibres, showing double contour ; (2) a similar fibre in which A is primitive membrane, B medullary sheath, C axial cylinder protruding beyond the broken end of the fibre ; (3) transverse section through medullated fibres of a nerve showing axial eylinder in each fibre. Between the fibres is the interfibrous connective tissue.

Fic. 2.—Medullated nerve-fibres. A, medullated nerve-fibre, showing subdivision of medullary sheath into cylindrical sections imbrieated with their ends; a nerve-corpusele with an oval nucleus is seen between neurilemma and medullary sheath ; B, medullated nerve-fibre at a node or constriction of Ranvier; the axis-cylinder passes uninterruptedly from one segment into the other, but the medullary sheath is interrupted. (Key and Retzius.)

by the action of perosmic acid, it is scen to be formed of extremely fine fibrille. It is continuous from end to end of the nerve. The medullary sheath shows at certain intervals interruptions called the “nodes of Ranvier” (see fig. 2). In the middle of each internode an oval nucleus is found in the medullary sheath. The pale or non-medullated fibres, sometimes called the “fibres of

Chemi- eal con- stitution.

Exeita- bility,

Stimuli of nerves.

Remak,” are found chiefly in branches of the sympathetic nerve. They have no double contour, and they often give off branches which anastomose, a condition never found in the course of medul- lated nerves. If the axis-cylinder of a nerve-fibre be traced in-

wards to a nerve-centre it is found to end in the pole or process of a nerve-cell, whilst in the periphery it ends in a terminal organ, in

muscle, blood-vessel, gland, skin, or electric organ. It may there- fore be presumed that the axis-rod is the conducting and so far the essential constituent of the nerve-fibre. . Chemical Constitution.—Little is known of the chemical con- stitution of the nerve-fibre. The medullary matter contains fatty substances such as lecithin (Cy;Hgj)NPO,). The axis-rod appears to contain albuminous substances. Cholesterin (CygH,,O + H,O) and creatin (C,H,N,O,) have been obtained from nerves along with a small amount of gelatin and a horny matter, neurokeratin (Her- mann). Nerves contain about 30 per cent. of water. Their reaetion to test-paper is neutral. Nothing is known regarding the chentical

changes occurring in a nerve-fibre during a state of activity, nor of

the chemical products formed at that time. It has been stated that

a nerve becomes acid after death (Funke).

As to the miero-chemistry of the nervous elements, it may be stated that the axis-cylinder contains an albuininous substance different from myosin; it gives a red colour on boiling with Milton's reagent (an acid nitrate of mercury) ; it is dissolved in weak solutions of ammonia, caustic potash, and chloride of sodiuin; it is hardened by solutions of chromic acid, bichromate of potash, and corrosive sublimate; it reduces the chloride of gold; and it shows transverse markings on the action of nitrate of silver. The white substance of Schwann is blackened by perosmic acid and is soluble in alcohol, ether, and oil of turpentine, thus showing its fatty character. The primitive sheath is a substance of a collagenous nature,—that is, it yields gelatin on boiling. According to some, digestion in gastric or pancreatic juice leaves an insoluble matter like that found after the digestion of corneal or epidermie tissues, and hence called ''neurokeratin."

Exeitability.—The special property of a nerve-fibre is termed "excitability." Every kind of living protoplasmic matter is irrit- able, —that is, it responds in some way toa stimulus. Thus, if a morsel of protoplasm, such as an ameba or a cartilage-cell or a white blood-corpusele, be stimulated

mechanically or by shocks of electricity, it will contract or change its form. Again, if living muscular fibre be thus stimulated it also will contract. This pro- perty of responding to a stimulus is termed “irritability”; and in the structures mentioned the property is manifested by movement as the obvious phenomenon, but it is well known that more obscure phenomena follow the application of the stimulus. In the case of living nerve there is irritability also,—that is, the nerve responds to a stimulus; but in a portion of isolated nerve no change is visible. If, however, the nerve be connected at one end with its appropriate central or terminal organ we may have evidence of something having been transmitted along the nerve. Thus there may be sensation or movement, or both. Nerves are more irritable than contractile matter, and the term “excitability ” is applied to the special irritability of nerve. The same strength of stimulus will act more powerfully on a nerve than on a muscle (Rosenthal). The use of the term “property” in physiology does not imply the idea of any kind of inherent force or entity, but simply that, in the case of muscle and nerve, irritation is followed by certain phenomena seen only in living matter. :

(1.) The exeitability of nerves is affected by certain conditions. Injury to the nerve, the application of caustics, and drying quickly destroy it. When a nerve is divided the excitability is increased for a short time, then rapidly diminishes, and finally disappears near the point of section, The end of the nerve stil] connected with central organs undergoes these changes in excitability more quiekly than the portion eut off. As shown by Augustus Waller, when a nerve is separated from its central organ, such as the grey matter of the spinal cord for the motor roots, and the ganglia on the posterior roots for the sensory roots, the end of the nerve sepa- rated from the centre undergoes fatty degeneration. If, however the cut ends of the nerve be brought into accurate contact, union soon takes place. Surgeons have frequently observed a return of sensibility to a part within a few days after the sensory nerve had been divided and the cut ends again brought into contact. Con- tinued or excessive activity of a nerve soon lowers and may abolish excitability, thus produeing exhaustion. On the other hand, a lengthened period of absolute repose lowers excitability, and if the nerve be inactive beyond a certain time it wastes, becomes thinner and fatty degeneration occurs in its substance. Heat increases, whilst cold diminishes, excitability. In the case of frogs’ nerves temperatures above 45° QC,

destroy excitability the more rapidly as they approach 70°, at which point it is almost instantaneously destroyed. Below 45° a rise of temperature first increases and then diminishes excitability, and it has been observed that whilst Homann 1 pie oa it diminishes its duration (Afanasieff,

mann). Finally, a dimini i oar isin” shed supply of blood quickly causes

(2.) Nerves may be excited by various kinds of stimuli: mechanically, as by intermittent pressure, beating, ed ee ing, &c. ; (0) thermally, by variation of temperature ; (c) chemically by the application of’ such substances as acids, alkalis, or metallic

salts ; (d) electrically, by continuous or induced currents; and (ec) normally, by changes in the central or terminal organs, Mechanical irritation is applied during life when the trunk of a nerve is pressed upon. Radiant heat acts on the nerves of the skin, or heat may be applied by conduction from a hot body in contact with the surface. Little is known as to the specific effects of heat on the nerves of the human being. In the frog it hag been found that a temperature of from 34° to 45° C. stiniulates the motor nerves; about 40° C, sudden alterations of temperature may cause twitching of the connected muscles (Hermann). Many chemical substances in sufficient concentration will quickly destroy a nerve; but if they are in weak solutions the result may be stimu- lation. Thus, concentrated solutions of the mineral acids, alkalis, alkaline salts, concentrated lactic acid, and concentrated glycerin may act as strong stimulants (Kiihne). ;

(3.) The influence of electrical stimulation of nerves demands more elaborate description. The effects, as already indicated, can be observed only when the nerve is connected with a muscle or with a central organ. In the first case electrical stimulation is followed by contraction of the muscle, in the second by a sensation if the central organ is the brain. Consequently we have to consider the phenomena following electrical stimulation (a) of a motor nerve and (0) of a sensory nerve. .

(a.) Electrical Stimulation of a Motor Nerve.—A perfectly con- By stant current of elcctricity, of moderate quantity and intensity, tig) flowing through a portion of nerve produces no evident effect on stig). the muscle, but any variation in the intensity or density of the tig) current causes irritation, and the muscle gives a twitch. The mo effect is most apparent when the current is allowed to flow into nem! the nerve and when it is suddenly cut off, or, in other words, at the moment of opening and of closing the circuit. The rapidity with which the variation in the density of the current is effected also has an important influence. Thus the shocks of frictional electricity stimulate strongly, because, although the amount of electricity is small, the currents are extremely rapid in appearing and disappearing. In like manner the quick shocks from induction- coils produced by rapidly opening and closing the primary circuit are strongly stimulating. Again, a very powerful current may pass through a nerve without exciting it, if it pass gradually, Occasionally a very weak current sent through a portion of nerve will cause a contraction, whilst a very strong current may fail to do so. In fact, the phenomenon of contraction ofa muscle is influenced (a) by the direction and (f) by the strength of the |}, current sent through the nerve. When the current is transmitted | from the muscle in the direction of the spinal cord it is called an “upward” or “centripetal” current, when from the cord in the direction of the muscle it is called a “ downward” or “ centrifugal ” current, Its strength is graduated by employing small Grove’s cells, one cell giving a weak current, two or three giving a medium current, and four to six or seven a strong current. To graduate its amount more precisely resistance-coils may be introduced into the circuit, or we may employ a rheochord, by which a portion of the current is shunted back to the battery, whilst the remainder is allowed to pass to the nerve. In the circuit a key or interrupter is interposed, and so arranged that when the key is opened the current is broken or interrupted, and when the key is closed the circuit is completed and the current passes to the nerve. With these arrangements, and employing the sciatic nerve of a frog attached to the limb, the following results are readily obtained.

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Current Strength. Key. Upward Current. Downward Current. Weak. Close. Contraetion. Contraetion. Weak. Open. Rest. Rest. Mediuin. Close. Strong

eontraction, Strong contraction. Mediuin. Open. Strong contraction. Strong eontraction. Strong. Close. Rest. Rest. Strong. Open. Very strong eontraetion. Contraction.

That is to say, on beginning with a very feeble current neither opening nor elosing causes a contraction, but on strengthening it up to a certain point contraction appears first on closing, whilst opening produces no effect. By increasing the strength of the current a contraction is obtained both on opening and on closing the key, and by and by, when a certain strength of current is reached, the closing contraction becomes weaker and finally dis-appears, leaving only a contraction on opening the key. Thus the effects of a strong current are usually the reverse of those caused by a weak current. These facts, usually included under the term

Pfliiger’s Law of Contraction,” have been specially investigated by Pfliiger, and the following is the explanation offercd by him and generally accepted by physiologists.

Suppose that stretched over t

current coming from the Grove’s elements. the negative

SYSTEM. |

positive pole it is diminished,—that is to say, a stimulus from the induction-coil, not sufficient to excite the nerve so much as to cause a muscular contraction if applied near the positive pole, will at once do so if applied near the negative pole; or, a stimulus so strong as to cause tetanus in the muscle when applied near the negative pole may produce no effect when applied near the positive pole. In other words, the nerve near the negative pole is more excitable than in the normal state, whilst near the positive pole itis less so, indicating that at least one of the physiological properties of the nerve has been changed by the action of the continuous current. Buta nerve-fibre has also the property of conducting the effects ofan impression, or the nerve-force travels with a certain velocity along a nerve, as will be shown lower down. It has been ascer- tained that near the negative pole the rate of conductivity is increased, whilst near the positive pole it is diminished. Finally, a piece of living nerve, when connected with the terminals of a galvanometer, so that the one terminal touches the surface whilst the other touches the transverse section of the nerve, shows the existence of a current of electricity travelling from the surface of the nerve through the galvanometer to the transverse section,—that is, the surface is positive to the transverse section. This condition is also modified by the transmission through the nerve of a continuous current, so that the difference of potential is increased near the positive pole and diminished near the negative. These results are thus sumined up,

State of Nerve. Functions of Nerve.

Electromotive force. Conductivity. Excitability. Near positive pole
Increased Diminished Diminished Near negative pole Diminished Increased

Increased

EE EE EE The properties of the nerve, therefore, are altered by the passage through it of a continuous current, and the altered condition is termed the ‘‘electrotonic state,” the condition in the neighbourhood of the positive pole, or anode, being termed “‘anelectrotonic,” whilst that near the negative pole or katode is called “katelectrotouic.” A certain portion of nerve near each pole is thrown during the assage of a continuous current into these conditions of anelectrotonus and of Taasieetrotonns, whilst the amount of nerve thrown into the one condition or the other depends on the strength of the current, Further, there is always be- tween the two poles a point of indifference, in which the properties of the nerve seem to be unaltered, and the position of this point depends on the strength of the current. Thus, with a current of medium strength the point is midway between the poles; with a weak current the point is near the positive pole,— that is, a large portion of the nerve near the negative pole is in the katelectro- tonic state in which the excitability is increased ; and with a strong current the point is near the negative pole,—that is, a large portion of the nerve near the positive pole is in the anelectrotonic state in which the excitability is diminished, Now, according to Pfliiger, the stimulating effect of closing the current occurs at the katode only, whilst the stimulating effect of opening the current occurs at the anode only, or a nerve is stimulated by a current on the appearance or increase of katelectrotonus, on closing the circuit, or by the disappearance or diminution of anelectrotonus on opening the circuit. If we suppose that this depends on the modification of excitability near the negative pole, by the molecules of the nerve becoming more mobile, the matter is in- telligible. Thus the passage of the molecules from the normal stable con- dition to the katelectrotonic less stable condition acts as a stimulus, whilst the passage backwards has no effect. On the other hand, the passage from the more stable condition in anelectrotonus to the normal stable condition acts as a stimulus, whilst, again, the reverse action has no effect. This explains why it is that a weak current gives contraction on closing, because on closing a large portion of the nerve near the negative pole passes from the normal into the katelectrotonic state, and this acts as a stimulus. On the other hand, a strong current causes contraction on opening, because on opening a large por- tion of nerve near the positive pole passes back from the anelectrotonic state into the normal state, and this acts as a stimulus.

Again, with currents of medium strength, as both states are equally produced, there is contraction both on opening and on closing. Thus Pfliiger's theory accounts for most of the facts; but its weak point is that no reason can be given why a nerve is stimmlated only by the appearance of katelectrotonus and by the disappearance of anelectrotonus. It remains only to add that currents passing transversely through nerves produce no stimulating effect. In ascending currents the shorter the piece of nerve between the electrodes the greater the stimulating effect, whereas in descending currents the reverse holds good (Hermann). |

(b.) Electrical Stimulation of Sensory Nerves.—The effect of stim- ulating sensory nerves as distinguished from the direct stimulation of sensory or terminal organs has not been sufficiently studied, but, so far as is known, the laws seem to be the same as those relating to motor nerves. When a sensory nerve is stimulated the test must be the resulting sensation. As stimulation of the motor nerve in the condition of anclectrotonus or of katelectrotonus may or may not be followed by a contraction, so stimulation of the sensory nerve may or may not be followed by a sensation, or the character of the sensa- tion may vary just as the muscular contraction may be weak or strong. Further, Donders has shown that electrical stimulation of the vagi or pncumogastric nerves is attended by analogous pheno- mena, so far as-the movements of the heart are concerned. In this case, however, as will be shown lower down in discussing the pheno- mena of nervous inhibition, the result is not movement but arrest of movement.

(c.) Chauveau's Researches on Unipolar Excitation.—Chauveau has studied the comparative influence of the two poles of any arrange- ment supplying a continuous current,—that is, he has tried the stimulating effect, supposing either the positive or the negative pole be applied to the nerve whilst the other is in contact with another part of the body. He has found, amongst other more abstruse and less practical results, that there is in each case a certain intensity of current corresponding to the physiological con- dition of the nerve by which the influence of one pole is the same as that of the other. If the intensity of the current be below this medium strength the effect of the negative pole on motor nerves is greater than that of the positive ; but, if the intensity be above, the reverse is the case, —that is, the positive pole is the stronger excitant. In the case of sensory nerves Chauveau found that

application of the negative pole with a moderately strong current was more painful than application of the positive pole. Thus the inflnence of unipolar

excitation with a strong current on motor nerves is the reverse of that on sensory nerves,—that is, the positive pole is the more powerful on motor nerves, the negative pole on sensory nerves.

(d.) Production of Tetanus.—Tetanus or cramp of a muscle is Produc- produced when its nerve is stimulated by successive irritations tion of at intervals so short that the muscle has no time to relax between tetanus.

them, and consequently it passes into a state of more or less firm contraction. A single muscular contraction may be called a twitch of the muscle, but in tetanus or cramp the individual contractions are fused together so as to maintain a rigid state of the muscle for some time. A rapid series of induction shocks, each of short duration, always produces tetanus, even if they are sent to the muscle at the rate of 15 per second. A continuous current, on the other hand, usually causes contraction only at the moment of open- ing and closing the circuit, but occasionally tetanus may be seen during the passage of the current. Tetanus during the passage of a constant current has been attributed to electrolytic changes in the nerve. Pfliiger holds that this is a normal production of tetanus and may be seen even with feeble currents ; but certainly it is very difficult to demonstrate. Long ago Ritter showed that, if a constant current of sufficient intensity be sent up a nerve for a considerable time, say half an hour, and then be suddenly interrupted, tetanus lasting for eight or ten seconds may be seen, which disappears on again closing the current. Ritter’s tetanus, according to Pfliiger, is really due to the stimulation caused by the disappearance of an- electrotonus, which occurs, as we have seen, when the current is opened, and the proof he offers is that the tetanus disappears when the muscle is cut off from the anelectrotonic portion, Tetanus may also be caused by the mechanical irritation of the nerve, or by heat, or by chemical substances.

Nervous Conductivity. —When a nerve is irritated at any point in its course a change is produced which is propagated along the nerve,—that is, the nerve conducts, and the phenomenon is called the ‘‘nerve-current.” The velocity of transmission can be measured only by the use of delicate apparatus, as the time occupied is too short to directly affect consciousness. For example, when the tip of the finger is touched the mind apparently perceives the contact without any loss of time. But it can be shown that an appreciable interval of time clapses between the instant the finger is touched and the instant the mind perceives the impression. During this time a change passes along the nerve from the point touched to the brain. The method usually employed for determining the velocity of the nerve-current consists in preparing the gastrocnemius muscle of a frog with the sciatic nerve attached, and connecting it with a recording apparatus, so that if the muscle be caused to contract by irritating the nerve the record of the contraction may be made on a rapidly-moving surface. If, then, the nerve be irritated in two consecutive experiments, first close to the muscle, and secondly at a distance from it, and the muscle be caused to contract in each case, it will be found that it does not contract so soon when the nerve is irritated at a distance from the muscle as when it is irritated close to it; in other words, if the nerve be irritated at a distance from the muscle the transmission of the nervous impression from the point irritated to the muscle occupies an appreciable time. If, then, we know the length of nerve between the two points irritated, we can determine the length of time the nerve-current took in passing along that distance of nerve.

(1.) Measurement of Velocity in Motor Nerves.~~Many ingenious methods have been devised for this purpose, but the simplest is the use of the ‘‘spring myo~~ graphion ” of Du Bois-Reymond (see fig.3). The apparatus consists of a smoked-glass plate, which is driven in front of the re- cording stylet of the myograph by the recoil of a steel spring C. Underneath the frame carrying the glass plate are two binding screws 1 and 2, to one of which is attached a rectangular arm of brass 1, which can so move horizontally as to establish metallic connexion between the two binding screws (marked Break, F). By means of these binding screws the myograph is interposed in the circuit of a galvanic element and the primary coil I of an cs ae i mye ah is Lea ing screws, thus completing the circuit, 200VIB.PER

SEC.) stoked glass plate there deseonds a small fates Sein (aan: an iene plate, oy RAPIDITY OF NERVE CURRENT

Fia. 3.—Diagram showing arrange-

releasing a catch not seen in the figure, but close to C, is driven across by the ment of apparatus in measuring rapidity of nerve-current.

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spiral spring from left to right) pushes the brass arm aside and thus interrupts the circuit of the primary coil. When this occurs an opening shock is trans- mitted from the secondary coil II to a commutator E, an instrument by which electric currents may be transmitted to the nerve either at a point close to the muscle at A, or at a distance from it at B. Suppose the ap- paratus all arranged so as to send the shock to the nerve at a point close

XIX. — 4

Nervous conduct- ivity.

Measure- ment of velocity innerves.

Heat-

produc- tion by neryes,

_ exciting electrolytic decomposition.

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fl f he muscle A, the muscle stimulated contracts, and draws by means 0 te ae on the smoked surface of the glass, the curve seen in the lower part of it at A. This leaves the horizontal line (which would be drawn bs the stylet were the muscle at rest) at A. Arrangements are then — 4 another experiment, in which the nerve will be stimulated at a a gee — the muscle, at the point B in the upper part of the diagram. i is wie by again placing the smoked-glass plate in proper position, closing the ane y circuit by the brass arm at the binding screws, as already described, an hs yersing the

commutator so as to send the shock along the wires to iv “A muscle again contracts when the primary circuit is opened, and this ime / describes on the smoked surface the curve B, seen to the left of the curve A. It will be perceived that this curve leaves the horizontal line at B,—that is, a little later than when the nerve was stimulated close to the muscle. It follows, therefore, that the distance on the horizontal line from A to B represents the time occupied by the transmission of the nervous impulse from B to A of the nerve. With suitable arrangements, the rate of movement of the glass plate ~ be measured by bringing into contact with it a marker on one of the prongs 0 a vibrating tuning-fork. The waves thus recorded enable the experimenter to measure with accuracy the rate of movement of the glass plate, and ae quently the minute interval of time between A and B. In the diagram it ie be observed that there are 24 waves between A and B; each represents y4,th of a second; therefore the ,jth of a second is the time represented by the distance A, B; or, in other words, the ,,;th of a second was occupied by the nerve-current in passing along the portion of nerve from B to A.

(2.) Measurement of Velocity in Sensory Nerves.—Supposea sensory nerve to be excited in the hand ; the theory of nervous conduction is that a change is pro- pagated along the nerve to the brain, and that in the brain the molecular changes occur which result in a sensation. The individual having the sensa- tion nay feel it and make no sign by which any one else might be made aware that he has felt it, or the subject of the sensation might, by a muscular move- ment, such as the motion of an arm, let any one else see that he has felt the sensation. We have no means of knowing whether or not an individual has felt a sensation except by the individual making some kind of gesture or muscular movement. Now it is clear that, if we regard the brain as the seat of the changes resulting in sensation, the nearer any stimulated portion of skin is to the brain the sooner will the brain feel and respond to the stimulus. Thus, if the skin on the big toe of the right foot be stimulated, the effect of the stimulus passes to the brain and there calls forth a sensation, but if the stimulus be applied to the skin at the top of the thigh it is evident the effect has to pass along a shorter length of nerve and that the sensation in the brain will be aroused sooner. If we suppose that in each case the individual who is the subject of the experiment indicates the moment he feels the sensation, and that the instant the stimulus is applied

successively to the skin on the toe and on the thigh is also accurately recorded, it is clear that he will signal the sensation of stimulation of the toe a little later than when he signals stimu- lation of the skin on the thigh, and that the difference will indicate the time required by the change in the nerve to pass along the length of nerve from the toe to the thigh. In the observation it is assumed that the time required for the changes in the brain resulting in sensation and volition, for the trans- mission along the motor nerve, and for the muscular contraction required to signal is the same in each experiment. Thus, supposing the total time between the moment of stimulating to the moment when the signal that the sensation has been felt and responded to is a, it is clear that this time is composed of a, the time required for the passage of the nerve-current in the first experiment from the toe to the brain, of b, the time required for the changes in the brain involved in sensation and volition, and of ¢, the time required for the trans- mission along the motor nerves and for the muscular contraction to move the signal, —that is, z=a+b-+-c. But, if the time between the moment of stimu- lating the thigh to the moment of signalling be shorter, and supposing that b and c are constant, then a varies according to the length of the nerve. Suppose the difference of time between the registration of stimulating at the toe and at the thigh to be y, then in the second experiment =a—y+b+c,—that is, y=the time occupied by the passage of the nerve-current from the toe to the thigh. This method has also been used to measure the time required for signalling a nervous impression in various circumstances, or what is usually called the “reaction period.” The most convenient apparatus for the purpose is a chronograph ade by Konig of Paris, the instrument being fully described in M‘Kendrick’s Outlines of Physiology, pp. 588-542.

The general result of measurements made by these methods is that the nerve-current travels slowly compared with the velocity of electricity or of light. In the motor nerves of the frog the velocity is about 87 feet (26 to 27 metres) per second, and in man aud warm-blooded animals somewhat faster, 115 to 130 feet (35 to 40 metres) per second. The results as to velocity in sensory nerves vary from 50 to 100 metres per second. Cold retards, heat accel- erates, the velocity. As already stated, the velocity is also retarded In a herve 1n an anelectrotonic, and accelerated ina katelectrotonic state. The remarkable point is that the transmission of the

nerve- current is slow, and that events appearing to our consciousness instantaneous require a considerable time for their occurrence. It may be laid down asa general truth that all kinds of nervous actions, even those considered as purely psychical, require time.

Production of Heat by Nerves. —It is extremely doubtful whether the production of heat by a nerve in action has been detected, although theoretically one would expect heat to be so produced. Schiff observed an increase of temperature on tetanization in the nerves of warm-blooded animals that had been artificially cooled ; on the other hand, Helmholtz and Heidenhain's experiments yielded

from the galvanometer were I e removed from an anima] newly I I current would be obtained, and even if there were a current it might be due to contact of the metallic conductors with the ea tissue Hence it is necessary to have a uid in- terposed between the metal and the animal tissue, say, fox example, the tine wire or plate forming the terminals of the galvanometer is immersed in a rte lon se of sulphate of zinc. But as sulphate of zine solution 1 d have the living muscle it is necessary t inactive substance between the tissue and the sulphate of zinc qeiaiion: ae these conditions are fulfilled by the non- polarizable electrodes of Du Bois-

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f which there are various forms. Two zinc troughs, mounted on med es pinion of vuleanite, have the inner surfaces carefully amalgamated, These are filled with a saturated solution of sulphate of zinc, and in each trough is placed a small cushion of clean blotting or filter paper, which quickly becomes permeated with the solution. Finally, a small plate of sculptor's clay, or kaolin, moistened with a half per cent. solution of common salt, or,

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Fic. 4.—Diagrain of apparatus of Du Bois-Reymond for experiments on elec- a, zinc troughs, mounted on pieces

of vulcanite 6; c, paper pads; d, e, small pieces of moist clay ; f, f, binding screws for attaching terminals of galvanometer g. A small piece of paper connects d and e, and thus completes the galvanometer circuit. (Wundt.)

still better, with saliva, is laid on each paper pad. These clay pads are for guarding the tissue from the irritant action of the sulphate of zinc. Wires are carried from the troughs to the galvanometer, and a key is interposed in the circuit. The object of these careful arrangements is to secure that no current is formed by the apparatus itself. If now a small piece of nerve be so placed on the clay pads that the transverse scction touches one pad and the longitudinal surface the other, and the key is opened, a current passes through the galvano. meter, as indicated by the swing of the needle. Suppose that the needle is allowed to come to rest, the amount of deflexion of course indicating the strength of the current, and the nerve is now irritated so as to call forth its physiological activity, then the needle swings back towards zero. This back- ward swing is called the negative variation of the nerve-current. The electro- motive force of the current obtainable from a frog's sciatic nerve is about ~~022 of a volt, and somewhat more from the sciatic nerve of a rabbit. This is some~~ what less than the electromotive force of a frog's muscle, which varies from -035 to '075 of a volt. According to the views of Hermann, the negative variation. current is a true current indicating, and indeed preceding, the physiological activity of the nerve. He denies that the currents pre-exist in nerve or muscle, and states that the first current observed when the nerve is laid on the pads is simply due to the lower potential of the transverse section, caused by the rapid death of the nerve-substance. The nerve-current excited by a series of irrita- tions, say feeble induction-currents, may be regarded as composed of a wave- like series of momentary currents, each of which is preceded by a negative variation-current. Thus the electrical phenomena of nerve are similar in kind to those manifested by living muscle.

Nutrition of Nerves.— Probably nerves are nourished by the Nut plasma reaching the axis-cylinder at the nodes of Ranvier ; but it tion rom the researches of Waller that the nutrition of nen

would appear the uerve-fibre is influenced by the nerve-cell with which it is con- nected. The so-called ‘‘law of Waller” is well illustrated in the case of division of the roots of the spinal nerves. Fach of these nerves has two roots,—a posterior, sensory, on which there is a ganglion; and an anterior, motor. If the anterior root be divided, in the course of a few days the end of the nerve cut off from the spinal cord is found to be undergoing degeneration, whilst the end attached to the cord is still normal. Again, if the posterior root be divided between the ganglion and the cord, the end remaining in connexion with the ganglion remains unaffected, whilst the other end undergoes degeneration. This degeneration, in the case of a motor nerve, affects the nerve to its very terminations. The axis- cylinder ie ie ev into drops of fatty matter, and the medullated structure entirely disappears. It is well known that when a nerve 1s cut the ends may reunite so completely as to ensure a return of the normal function in from two to five weeks. According to Ranvier, the axis-cylinders in connexion with the central portion play an important part in this regeneration. They become larger, striated, and by and by form new axis-cylinders, which pass into the cicatricial tissue and come into contact with the other end of the divided nerve. This is a remarkable confirmation of the view of Waller that the nutritional activity of a nerve-fibre is in the direction of its physiological activity.

m a herve-fibre effected by a stimulus is quite unknown ; but it ise important to appreciate clearly the view that a nerve is both a Tecelver and a conductor of impressions. It can be stimulated in any part of its course, and from the stimulated point some kind of change is propagated along the nerve. This change is analogous to the passage of electricity along a conductor, or to the rapid decompositions, as when a properly prepared is scen to slowly to the quick transmission of isomeric but the analogy is not complete in any case. Whatever

Nature of Nerve-currents.—The intrinsic nature of the change ,

long thin band of gun-cotton burn from end to end, or to changes ;

the change may be, however, it does not appear to pass from one nerve-fibre to another running alongside of it. Each fibre con- ducts only its own impression, and there is nothing analogous to the inductive effect of one electrical conductor wpon an adjacent one. Another question much debated is whether scnsory and motor nerves act in the same way ; or, in other words, is there any essential difference between them? ‘There appears to be no difference in mode of action ; the difference in the effect produced depends on | the apparatus in which the nerve ends. Thus there may be con- ‘ traction of a muscle if the nerve terminates in a muscle, change of the calibre of a blood-vessel if the nerve ends in that structure, ‘ secretion from a gland if the nerve is in connexion either with the – vessel or the nerve-cells of a gland, an electrical discharge if the nerve ends in the electrical organ of a Torpedo or Gymnotus, and a feeling or sensation if the nerve-fibres go to a sentient brain. In all these instances the nature of the change in the nerve and the mode of its transmission are the same, and the results are differ- ent because the nerves terminate in different kinds of structure. It would appear from experimental evidence that, when a nerve- fibre is irritated, say about the middle of its length, a change is simultaneously propagated towards each end ; but, as only one end is in connexion with an apparatus capable of responding, the effect at this end is the only one observed. Thus, if a motor nerve be irritated, there is muscular contraction, in consequence of the stimulus rousing the muscular substance into activity, probably through the agency of the end-plates ; but there will be at the same time a backward wave along the nerve to the motor centres in the cord or brain. It is doubtful whether the nerve-energy be- comes weaker or gathers intensity as it passes along a nerve ; but the balance of evidence is in favour of the view that the so-called | ‘avalanche theory” of Pfliiger, according to which the energy | gathers intensity as it passes along, is incorrect. | Classifieation of Nerves.—Functionally, nerves may be classified into motor, sensory, vascular, secretory, and inhibitory. The original meaning attached to the term “motor” nerve was a nerve entirely composed of fibres by the excitation of which influences were conveyed to a muscle which caused the muscle to contract. As these influences passed outwards from a

nerve-centre towards _ the periphery of the body they were also termed “efferent” nerves. _ On the other hand, nerves were found which, when stimulated, _ gave rise to sensations of pleasure ar of pain, and these were called “sensory” nerves. Finally, it was shown that a third class of nerves were composed both of sensory and of motor fibres, and they were called “senso-motor” nerves. Sensory nerves were also sub- divided into those of general and those of special sensibility. This was an artificial classification based on the fact that when a nerve of so-called special sensibility, such as the optic, was stimulated in

SYSTEM. |

CENTRIFUGAL, or EFFER- ENT, or Motor, convey- ing influences outwards } 4 from a nerve-centre.

any way the same kind of sensation followed. Thus stimulation of the optic nerve by cutting, pricking, pressure, or electricity is always followed by a luminous sensation. But the progress of research showed that when certain nerve-fibres were stimulated the result was not necessarily a muscular contraction: it might be contraction of a blood-vessel, modified secretion of a gland, or a diminution or arrest of some kind of nervous action. ‘These facts demand another classification of nerves such as the following.

1. Motor, sometimes termed efferent, to muscles, exciting contraction. ;

2, Secretory, to the cells of glands, causing secre- tion, possibly a particular kind of secretion.

3. Vascular, or vaso-motor, to the walls of blood- vessels, so as to cause contraction (vaso-motor) or dilatation (vaso-dilators, or vaso-inhibitors).

. Inhibitory, so atfecting other centres of nervous activity as to moderate or neutralize their action. :

5, Electrical, so affecting a special organ as to call forth electrical discharges, as in electric fishes, Torpedo, Gymnotus, Malapterurus, &c.

a. General, conveying to nerve-

centres in brain influences

which cause sensations of a

vague character, scarcely perceptible to conscious-

1. Sensory, caus- ing i! Ste oe ness, and not permanent, to} CENTRIPETAL, or AFFER- less acute veges RAED NAAT, ae ENT, or SENSoRY, con- sensations. Sy Oe

bv. Special, conveying to nerve- centres in brain influences which cause visual, audit- ory, gustatory, olfactory,

W or tactile seusations.

. Afferent, or reflex, conveying to nerve-centres in- fluences which usually cause no sensation, and which may or may not be followed by inove- nents, secretions, changes in calibre of vessels,

No &e,

.In addition there are nerve-fibres connecting nerve-cells in the great centres,

to which no special functions cau be attributed.

veying influences in-< wards towards & nerve- centre.

to

‘ 2.—TERMINAL ORGANS.

ia Although, as has been shown, a nerve may be stimulated in any part of its course, the stimulus is usually applied to a special structure adapted physiologically for the reception of the particular kind of stimulus. Such a special structure may be termed a

“terminal organ.” For example, in the mechanism of vision (see Eye, vol. viii. p. 821 sg.) there are the retina or terminal organ, the optic nerve or conductor, and the brain or a portion of it, the recipient of the impression. The fibres of the optic nerve are not affected by light, but when they are mechanically or electrically irritated the result is a luminous sensation, because the action of the fibres of the optic nerve is to call forth in the brain the mechanism connected with luminous sensations. But light has a specific action on the retina, and in turn the activity of the retina stimulates the fibres of the optic nerve. The retina 1s therefore the terminal organ adapted for the reception of rays of light. In like manner, cach sense has its appropriate terminal apparatus, and these are described under the headings of the various senses, EAR, Evyg, Smet, Taste, Toucu. To understand the true nature of nervous action it is necessary to be clear as to the functions of the terminal organs. They are liberating mechanisms. transform the outer energy into the physiological energy, uervous action; but they call it into action. Thus light acting on the retina is not directly transformed into nervous energy, but it excites changes in the retina, which in turn produce activity of the optic nerve. The structure of each of these terminal organs need not be here described, but it may be stated that they all essentially consist of modified epithelium-cells, or what may be called ‘‘nerve-epithelium.” In tracing their development throughout the animal sins eerie it will be found that the simplest terminal organs are epithelium-cells on the surface of the body ; but during evolutionary progress from lower to higher forms these cells become more and inore modified and more and more protected by descending deeper into the structure of the animal, until we meet with the complicated organs of special sense in the higher animals. Another class of ter- minal organs is that comprehending the forms at the ends of motor nerves. Such are the end-plates found in muscle, and described in vol. i. pp. 861, 862. The different modes of nerve-termination may be here briefly classified.

Organ. Skin (see Toucn)

Terminal Organ.

Tactile cells of Merkel, in the epi->, dermis.

Tactile corpuscles of Wagner and Meissner, in papille of the skin.

End-bulbs of Krause, in conjunc- tiva, penis, and clitoris.

Effect.

Touch, pressure, or

Pacinian bodies, attached to temperature. nerves of hand or foot, or in the mesentery. Corpuscles of Grandry, found in bills of birds. Network of fibres, as in cornea. Ear (see vol. i. p, 894, Hair-cells, supported by arches Hearing. and vol, vii. p. 591). of Corti, and connected with the basilar membrane. Eye (see vol. i. pp. 886 Rods and cones of retina,..... .. Vision. and 888, and vol. viii. p. 816), Nose (see SMELL) .... Rods and olfactory cells…..... Smell. Tongue (see TasTE) .. Taste-buds and gustatory cells.. Taste. Muscles (vol. i. p. 862) Motorial end-plates of Doyere, Motion. Kithne, Krause, Ranvier, &c. (Cl chalol Salam qoleaiaao Ono a Nerve-endings in secreting cells Secretion.

—Pfliiger and Kupffer, Lamine with free cilia-like pro- cesses,

Electric organs (see vol.

c Electric discharge. xii. pp. 649, 650).

38.—CENTRAL ORGANS. A,—General Physiology of Central Organs.

General Structwre.—The central organs consist of a special kind of cells called ‘‘nerve-cells,” of nerve-fibres, both medullated and non-medullated, and of a variety of connective tissue, termed “neuroglia.”* On cutting into any central nervous organ, such as the spinal cord or brain, two kinds of nervous matter are seen, the white and the grey. The grey consists of nerve-cells, nerve – fibres, and neuroglia, whilst the white is com- posed chiefly of nerve-fibres with a small amount of neuroglia and no nerve-cells. Nerve cells vary much in Fig. 5.—Various forms of nerve-cells. form, as will be seen by referring to fig. 5. They may be spher- oidal, ovoidal, or ir-regularly triangular. The cells of the spinal ganglia are usually rounded ; those of the sympathetic more angular ; those of the spinal cord multipolar, — that is, having many processes or poles connected with them ; those of the cerebrum triangular or pyramidal; and those of the cere-

a, multipolar, from grey matter of spinal cord ; }, d, bipolar, from ganglia on posterior roots of spinal nerves; ¢, 9, uni- polar, from cerebellum; g shows indications of a process coming off at lower end; ¢, union of three multipolar cells in spinal cord; f, union of three tripolar cells in grey inatter of cerebral hemispheres.

They do not:

Shapes

of nerve-

cells.

Chemical

sub- stances in nerv- ous matter.

Excita- bility and blood-

supply.

Nervous centres.

28

llum flask-shaped, having processes at each end. A nerve-cell cee a large far nucleus Lat a small nucleolus, whilst the — substance is very granular. Some observers think they have trace into the substance of the cell a fibrillated structure from the axis- cylinder of the nerve-fibre ending in the pole or process ; but this is doubtful, and the appearance may be accounted for by the cto of the reagent employed and by the great difficulty of wong interpreting optical appearances under very high powers. the neuroglia is a delicate interstitial connective substance having small connective-tissue corpuscles imbedded in it. ie

Chemical Constitution of Grey and White Matter.—This is still imperfectly known, and throws almost no light on the functions of the central organs. By various chemical processes the following substances have been obtained

from nervous matter: cerebrin, lecithin, albumin, neurokeratin, cholesterin and fats, creatin, xanthin, hypoxanthin, inosite, lactic acid, volatile fatty acids, salts, and water. The grey matter of the brain is distinguished chemically from the white chiefly by containing more water, albumin, lecithin, and lactic acid, and less cholesterin, fat, and protagon (Hermann). Doubtless many of these substances are de- rived from the disintegration of a more complex chemical substance not yet isolated in a pure state from nervous matter. Petrowsky gives the composition of grey and white matter as follows.

Grey matter, | White matter.

ENC one kM EOP OT OTaCT. 4 OCD? OCR te 81°6 68°4 Solas SA. yor Meat A riciiais Silxaieg* iti ee couskes® 18°4 31°6 The solids consist of— on Albumins and gelatin 55-4 27 Bu SCOUT LIB iae autis oo: cbebauatte hater ans Uy2 9°9 Cholesterin and fats ……..... 18‘7 51°9 Gate I Weaysteteissnicraneth ateaeGtetr etnies) everers, ha 816) 3% 0°5 9 5 Substances soluble in ether……..... 6’°7 83 Ree texctefoseye tis ote ershe ne erat Pies csatalsia Goin mieulli a ous as 0°6

The salts found in nervous matter are similar to those in blood, and it would appear that phosphates, or rather combinations in which phosphorus exists, are the most prominent products of analysis. Thus about 40 per cent. of the salts consist of phos- phates of soda and of potash—that is, the ash, on analysis, gives this result ; but it must not be inferred that in nervous tissue phosphates of the alkalis exist to this amount, as there is every reason to think that phosphorous compounds, along with alkalis, exist in nervous matter, although not in the form usually called phosphates, The remarkably large amount of water, amounting to no less than from 70 to 80 per cent., indicates matter in a condition suitable for rapid molecular changes, on which, no doubt, the functions of the tissue depend.

Exeitability of Grey Matter.—As grey matter contains both nerve- fibres and nerve-cells, and as these cannot be separated in any experi- ment, it is clear that no precise results can be obtained from any effort to distinguish the excitability of grey matter from that of white. The excitability of the grey matter must depend on blood- supply and on the rapid removal of waste-products. If the first be deficient either in quantity or quality, or if the

second be not carried on so rapidly as to get rid of the waste-products as they are formed, the activity of the nerve-cells must suffer. The sudden deprivation of blood, as when the heart ceases to beat for even half a second, will cause unconsciousness; the mixture with the blood of a small quantity of bromide of potassium, or of alcohol, or of chloroform or other anesthetic, or of morphia, will affect the activity of the brain. And it is well known that, when disease of the kidney, or such a disease as an acute fever, affects the body, matters may accumulate in the blood which so contaminate it as to make it unfit to carry on the vital changes on which activity of brain depends, and the result is delirium or unconsciousness. There is every reason to believe that the activity of nerve-cells is delicately attuned to surrounding conditions. A small excess per cent. of carbonic acid, ora small amount of what we call a poison, is sufficient to modify or arrest their action. The rhythmic action of various centres, such as those controlling the movements of re- spiration, is in favour of the view that the activity of such centres depends on delicate equipoises. If during expiration there is for the moment a deficiency of oxygen in the blood, or an accumula- tion of carbonic acid, the result will be an attempt at inspiration. This gets rid of the carbonic acid and introduces oxygen, and an expiration ensues. It is not pretended here to state what exactly happens, as these phenomena of respiration are still obscure, but they are brought forward with the view of showing that the actions of the rhythmic centres of respiration depend on the delicate balance established between the external conditions and those centres. If this be the case there is little doubt that a similar effect is produced on other centres by the nature of the blood supplied, and that the quality and quantity of the supply are important factors in the production of all conscious conditions.

_ General Phenomena manifested by Nervous Centres.—Before enter- ing on a detailed description of the functions of the great centres such as spinal-cord and brain, it is well to take a survey of some of

the general phenomena manifested by such centres. These may be grouped under the heads of (1) reflex actions, (2) inhibitory actions, (3)-accelerating

actions, (4) vaso-motor actions, (5) secretory actions, (6) sensations, and (7) intellectual acts.

Reflex Aetions.—Impressions made on sensory nerves are con- veyed to nerve-centres, where they may or may not awaken COD ac sciousness. A sensation may be defined as the consciousness of an impression, and may or may not be followed by motion. Hither motion may be voluntary, or it may be caused by direct stimulation of the motor nerve distributed to the muscles. The latter kind of action in the living body is not common. Usually motor nerves are acted on by the will or by emotional states ; but it not unfrequently happens that physical stimuli occasion motion in an indirect manner, the impressions being carried along sensory nerves to a central organ, where changes are excited which result in a discharge of nervous energy along motor nerves to various muscles, Thus a frog in which the brain and medulla oblongata have been destroyed will draw up its limbs-if the foot be pinched. Such actions, taking place without consciousness, are called ‘* reflex actions,” and the mechanism required for their performance may be thus described: (1) excitation of a sensory or afferent nerve, (2) excitation of an intermediate neryous or reflex centre, and (3) excitation of a motor or efferent nerve, which causes a muscular contraction. The dia- gram in fig. 6 shows the sim- plest mechanism; but it is rare to find the arrangements so simple, and the mechanism may become more complex (see fig. 7) either by the existence of a number of cells or groups of cells in the nerve-centre, or by the existence of numerous afferent or efferent nerves. The essence of a reflex action is the transmutation by means of the

Fic. 6.—Simple reflex action; 1, sensory surface ; 2, muscle; a, sensory nerve; b, nerve-cell; c, motor nerve. The arrows indicate the direction in which the influence travels.

Fic. 7.—Double reflex action, or action in which two or more nerve-cells are involved ; 1, 2, as in fig. 6; a, motor nerve; b, c, nerve cells. irritable protoplasm of a nerve-cell of afferent into efferent impulses (Foster). The following is a brief summary of the leading facts

relating to reflex action.

(a) The initial excitation may occur both in nerves of general sensibility and in those of the special senses; but certain nerves more easily excite reflex actions than others. Thus when light falls on the retina there is contraction of the pupil, the afferent nerve in this case being the optic (see vol. viii. p. 821 sq.).

(b) A reflex movement may occur whether we excite a sensory nerve at its commenceinent or at some point in its course, but in the latter case the action is less intense than in the former.

(e) Grey matter containing nerve-cells constitutes the chief por- tion of reflex centres, and groups of such reflex centres are frequently associated by internuncial fibres. The excitability is increased when these centres are severed from communication with psychical centres which preside over voluntary movements. Thus, after decapitation, reflex movements occur with greater intensity than in the injured animal ; they are also more active during sleep. It is evident, therefore, that reflex actions may be restrained or hindered in their development by the action of higher centres. This is termed the “inhibition of reflex action.”

(2) Reflex movements may occur in one muscle, or in many muscles or groups of muscles. One or more groups of muscles may be involved according to the strength of the stimulus applied to the sensory sur- face and the degree of excitability of the reflex centre at the time (see fig. 8). The facts are thus summarized by Pfliiger. Unilateral action; if in a decapitated frog we excite th the hind foot p, the excitation is ¢ 4, ¢, nerve-cells; 1, 2,3, 4, 5, transmitted from the centre a to the 5» 5» 5: muscles. muscles 1 of the foot on the same side. the excitation be more intense, it is trans

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fac

e skin of Fic. 8,—p, sensory surface; a, 0,

Symmetrical action ; if mitted to a centre on the

opposite side 6, and contractions may occur in the muscles of the | and gullet; vomiting, ponies by ketal: in gional, or in cna, or follow- : : – eae aie 4 evn C ing nausea ; forced contractions of the sphincter muscles of the anus, Urinary j hind limbs Ke both sides 1, 2. Irradiation ; if the excitation be pladder, and yagina, under local irritation ; erection and emission under the still increased in intensity, 1t influence of irritation of the nerves of the penis and other parts in the vicinity ; affects higher centres ¢, 4, . area Nn age of lympaiie hearts in reptiiea : fap howe provenen @ ‘ ne heart by the action of cardiac ganglia ; peristaltic motions e stomac there etl be Pan atts =. 7 and alimentary canal, in digestion and in defecation, &c., under the influence of oe s “es . pape re ual impressions conveyed to the ganglia by the splanchnic and intestinal nerves ; if the excitation be still turther increased, it may pass to a still

action of the bladder in expelling urine; expulsive action of the uterus in par- turition ; contractions and dilatations of the blood-vessels under the influence

- 3 of the vaso-motor system of nerves ; many obscure and complex morbid actions higher reflex centre @, and the such as palpitations of the heart, cramps in the limbs caused by irritation in result is general convulsions. the stomach or intestinal canal, fainting from concussion or from peculiar

(e) Reflex centres may be so odours, dilatation of the pupil and grinding of the teeth from the irritation of arranged in the body as to con- worms, and the convulsive seizure sometimes occurring during teething. stitute a series in which those Inhibitory and Accelerating Actions. —As we have seen, stimula- Tnhi- of the cerebrum govern or con- ; 2> aA 2 tion of a nerve may cause a sensation, a reflex action, or the direct bitory trol others in the deeper gan- K ,) contraction of a muscle; but in some instances when the nerve and glia of the brain, while these, ; is stimulated movements may be arrested. This occurs where accel- in turn, have an influence over 16 ») 9 1 14) & of rhythmic and apparently spontaneous or automatic actions are erating still lower centres in the spinal y \ Y ¢ , ur restrained or inhibited by the activity of certain nerves. The most actions, cord. This arrangement is oy BY gy ‘| SS J S| En striking instance of inhibition 1s IE

termed the ‘‘superposition of mA offered by the heart. The subject MEDULLA, ,77---~-. reflexes” (see fig. 9). will be readily understood with the

surface may simultaneously pro- 1, 1, series of reflex centres on one side, innervation of the heart and blood- duce, by a reflex mechanism, under the control of 2, 2, which are | vessels and especially the inhibition movement, secretion, and con- “8! governed by 3. ‘There is a cor- | and action of the depressor nerve.

v

i : respondi series, 1’, 1’; 2’, 2’; 8 a : movement, soeretion, emiimmont evoing serew 1 1 2) 2; 8.00 | Tt is well known that the heart Hy in the mouth may cause in- over by 4. Thus a stimulus reaching of a warm- blooded animal ceases to = voluntary twitchings of the 4 might excite the activity of all the beat almost immediately after re- =! muscles, secretion of saliva and muscles m, m ; if it reached 8, only one | moval from the body, but the heart 2 ib ; ’ half of the muscles ; if it reached 2, to f 1d – blooded Seokal J ze

a sensation (see fig. 10). the left, only three of the muscles; | 1 @ cold- blooded animal, such as Hs (g) Certain substances, in and, finally, if it affected 1, to the left, | the frog, will beat for hours or even id particular strychnin, increase only one muscle m. days, especially if it be supplied with a)

refiex excitability, so that the slightest external stimulation of the defibrinated blood. The rhythmic sensory nerves of the skin is sufficient to cause severe convulsions. | beat depends to some extent on the On the other hand, existence in the heart of ganglia or bromide of potas- small nerve- centres (fig. 11, I, A, sium, hydrate of R). It is quite true, however, that chloral, and atro- rhythm may go on in a portion of pin diminish reflex the heart containing no ganglionic excitability. structure. Now the heart receives

(h) Individual nerves from two sources, from the stimuli only excite vagus or pneumogastric nerve and a reflex act when from fibres derived from the

spinal they are very pow- cord through the sympathetic. If erful, but stimuli wy the vagus be cut and the lower

i 1 nd sti ; i ~~._ Fic. 11.—The origins of pheumogas~~ Pinu es Noort end stimulated by feeble induction- *’.-‘s4 vaso-motor systems are in intervals act the

shocks, the heart beats more slowly, medulla, that of the sympathetic more quickly and and will probably be brought to a in upper portion of cord. The powerfully the

stand-still in a dilated condition, arrows indicate direction of nervé- more rapidly they Fic. 10.—Diagram illustrating a complex reflex mechan-

S-:----

Lo ak

- ◦ currents. In the heart R represents A strong stimulation of the vagus 4g yeflex centre, I an inhibitory

succeed each other. ism. The arrows indicate direction of currents. 1, will invariably arrest the action of centre, and A an accelerating

To produce the re- Sensory surface; 2, muscle; 8, gland; a, sensory | the heart, and the organ will be centre.

i nerve ; 0, reflex centre, connected with another reflex ; : sh

centre, therefore, a nerve; f, secretory nerve passing to gland 3. From | of the stimulus the heart will soon resume its beats. It is clear summation or ad- the other side of d is seen a fibre passing to the brain, that the vagus cannot be regarded as the motor nerve of the heart, die of conta * there exciting changes which result in asensation. | because, if so, stimulation would have arrested the action of the

petal excitations is required. When these reach a certain number | heart in a state of contraction or systole. The question, then, is the centre responds (Stirling). whether the fibres of the vagus possessing this remarkable power

(i) Reflex actions involve time. Thus the time between the of inhibiting or restraining the action of the heart terminate 1n the stimulation and the movement ean be measured, and, if we take muscular fibres, or In some intermediate structures, such as ganglia into consideration the time occupicd by the passage of the nerve- The influence of various polsons has shed light on this question. current along the nerves involved, and the latent period of muscular A minute dose of atropin injected into. the blood paralyses this contraction, and subtract this from the total time, the remainder | inhibitory action. After such a dose stimulation of the vagus 1s will represent the time occupied by the changes in the centre or | followed by no effect, and the heart beats as usual.

14 ‘ s ‘ “47 “ Again, in slight urari poisoning the inhibitory action of the vagus is still the — gs Fag eas been found to be from *0555 to 0471 of present ; in the profounder stages it disappears, but even then inhibition may asecond. It is lengt ened by cold and shortened by increasing | bc obtained by applying the electrodes to the sinus. Tn order to explain this the strength of the stimulus and by strychnia. result, it has been supposed that what we may call the inhibitory fibres of the

(k) In compound reflex acts the initial excitation may occur | Ya8”s terminate in an inhibitory mechanism (probably ganglionic in nature) in psychical centres, as when the rec aati f rl seated in the heart itself, and that the urari, while in large doses it may psy » a 2 recollection of an odour causes | paralyse the terminal fibres of the vagus, leaves this inhibitory mechanism nausea, or when a feeling of ennui is followed by a yawn. intact and capable of being thrown into activity. by a stimulus applied directly

(1) Some reflex movements are the result of inherited peculiar- | t° ge Fee ag hes been Bee ee cannot be arene aie : . . * about by stimulation either o e vacus fibres or of the sinus, or indced o ities of structure, as those made by a new-born child when it seizes any part of the heart. Hence it is inferred that atropin, unlike urari, paralyses

the breast. Other reflex movements are acquired during life. Such | thjs intrinsic inhibitory mechanism. After the application of muscarin or

are at first voluntary, but they become automatic by repetition. pilocarpin the heart stops beating, and remains in diastole in perfect stand- xin- The following are some of the more common examples of reflex movements. still. Its appearance is then exactly that of a heart inhibited by promt and \Cof Motions of the muscles in any part of the limbs or trunk under the influence | sting vagus stimulation. This effect is not hindered by ca the b gs of sensory impressions on the skin, such as tickling, pricking, &c.; shud- tion, however, of a small dose of atropin at once restores the tin m oe dering from cold, shuddering caused by grating noises, &c. ; contraction of facts are interpreted as meaning that muscarin (or Lagi Yes AC nm. the pupil under the influence of light on the retina ; winking, from irritation excites the inhibitory apparatus spoken of above, which atropin paralyses or of the sensory nerves of the conjunctiva; sneezing, from irritation of the | Places hors de combat” (Foster, Text-Book of Physiology, 4th ed., P- 186). Schneiderian membrane, or by a glaring light on the eye ; spasm of the glottis Thus physiologists are satisfied that, when the vagus 1s stimulated,

and coughing, from irritation of the larynx or trachea ; laughing, caused by 6 i f the intrinsic tickling the skin; the first respiration of the child at birth, from the im- currents of nerve-energy pass pe is Sieeses Sancta @ &

pression of cold upon the nerves of the skin, and especially those of the chest : ganglia of the heart and inhibit or restrain these, so that the heart respiratory movements in the adult, from the impression cansed by the afferent beats more slowly or is arrested altogether. But the centres in the nerves of the lungs (sympathetic or vagus), by the presence of carbonic acid | heart may also be stimulated. After division of both vagi in a

in the air cells and passages, or in those of the general system, —also, occasional 4G , j a modifications of tne respiratory movements from impressions of cold, &e., on mammal, =)? rabbit, the heart’s beat may be quiekened or acceler

the surface of the body ; sucking in infancy ; deglutition or swallowing, with ated by stimulation of the cervical spinal cord. Fibres having this all the complicated movements then occurring in the tongue, fauces, larynx, | power of accelerating the action of the heart have been traced from

Nerves and blood- vessels.

Nerves and glands.

the cervical spinal cord through the last cervical and first thoracic ganglia of the sympathetic. Stimulation of these aecelerator nerves causes a quickening of the heart's beat, in which, however, what is gained in rate is lost in force" (Foster). They are referred to here as showing another kind of nervous action, quite different from inhibition. Thus any nerve-centre concerned in reflex movements may have, by impulses reaching it from the periphery, its action inhibited or restrained or accelerated. :

Influence of Nerves on Blood-Vessels.—If the sympathetic nerve be divided in the neck, there is a dilatation of the vessels and an increase of temperature on the same side; but irritation by weak induction-currents of the cephalic end will cause the vessels to contract and the temperature to fall. In the sympathetic, there- fore, there are nerve-fibres which influence the contractile coats of the blood-vessels. These fibres, called "'vaso-motor," originate from a vaso-motor centre in the medulla oblongata between the point of the calamus scriptorius and the lower border of the corpora quadrigemina, in the floor of the fourth ventricle. From this chief vaso-motor centre nervous influences emanate which tend to keep the smaller vessels in a more or less contracted condition. if it be injured, paralysed, or destroyed there is at once great dilatation of the vessels, more especially those in the abdominal cavity, and the blood collects in these dilated vessels. This of course dimi- nishes the arterial pressure in the larger vessels, Consequently, by observations on blood-pressure, it has been found possible to study the conditions of vaso-motor action. By connecting a kymo- graph (a recording manometer) with a large vessel, say the carotid, observing for a time the mean blood-pressure, and afterwards injuring the supposed vaso-motor centre, Ludwig and his pupil Owsjannikoff at once observed an enormous fall of blood-pressure, to be explained by the paralysis of the smaller and a consequent oe of the larger vessels.

The vaso-motor centre may be influenced—that is, inhibited, or possibly strengthened—by impulses coming from the periphery. Such impulses may

be sent to the centre along any sensory nerve, but in 1866 Cyon and Ludwig discovered a nerve which apparently exercises this function to a remarkable extent. In the rabbit it originates by two roots from the superior laryn- geal and from the vagus. Stimulation of the distal end of this nerve pro- duces no effect, but stimulation of the cephalic end causes at once a great fall of blood-pressure in the arterial system and a diminution in the frequency of the pulse. As this nerve, therefore, inhibits, restrains, or depresses the activity of the vaso-motor ceutre it has received the name of the "' depressor nerve of Cyonand Ludwig." It appears to influence chiefly the vaso-motor arrangeinents of the abdomen and lower extremities. Thus, after section of the splanchnics, which control the vessels of the abdominal viscera, it is said that excitation of the depressor does not produce nearly the same diminution of pressure in the carotid vessels. By the influence of the depressor a balance is kept up between the central and the peripheric circulations. Imagine the heart to be pumping blood through the vessels. If from some cause the smaller vessels become constricted so as to offer greater resistance to the passage of the blood, the arterial pressure in the larger vessels is increased, and the heart has more work to do to overconie this resistance. When the resistance reached a certain amount the heart would be in danger of exhaustion in endeavouring to over- come it. But by the depressor this danger is removed, as an influence may pass from the heart along the fibres of the depressor to the vaso-motor centre, the effect of which is to inhibit the activity of this centre, and thus allow the smaller vessels to dilate. When this occurs, either locally, as in the abdominal region, or generally, the result is a depletion of the larger vessels, a consequent fall of pressure in them, and therefore less resistance to the efforts of the heart. Thus it would appear that in the heart itself there is an arrangement by which, to a certain extent, it governs its own work, and there is an adjust-

ment between the activity of the heart and distribution of blood throughout the body (see fig. 11).

he vaso-motor nerves causing contraction of vessels have been called '' vaso-constrictors" ; but there are other nerve-fibres possess- ing the property of causing a dilatation instead of a contraction. These have been called ''vaso-dilators." Excitation of the chorda- tympani nerve, for

example, causes the vessels of the sub-maxillary gland to dilate (see vol. xvii. p. 672). Erection, as it occurs in the penis, has long been known to depend on dilatation of vessels and consequent increased afflux of blood. Stimulation of the nerves of the sacral plexus may cause erection. But how do such nerve- fibres act? It cannot be that they directly cause relaxation of the muscular fibres in the walls of the vessels. These contain layers of involuntary muscular fibres in the transverse and longitudinal directions, and it is difficult to understand how any contraction of fibres in either of these directions could possibly cause dilatation of the vessel. Probably the effect is brought about by the action of some kind of inhibitory mechanism. Ganglia abound in the walls of the vessels. From these, fibres pass to and from the muscular elements of the vessel. Such ganglia or local reflex centres may be supposed to be under the influence of two sets of nerve-fibres: (1) accelerating or strengthening, corresponding to the accelerating fibres that influence the heart ; and (2) inhibitory like the fibres of the vagus distributed to the heart, having the power of restraining the action of the local ganglia, According to this view, the fibres in the chorda which cause dilatation of the vessels of the sub-maxillary gland on stimulation are vaso-inhibitory nerves.

Influence of Nerves on Glands.—This has already been described under N UTRITION (vol. xvii. p. 672), but the facts may be here briefly summarized.

the gland, whilst the third set directly affects the activity of the secreting cells. According to Heidenhain, in addition to the vascu- lar nerves supplying a gland there are secretory and trophic nerves, ‘Stimulation of secretory fibres leads to an increased flow of water, stiinulation of the trophic to an increased secretion of specific sub- stances and to an increased production of protoplasm” (Gamgee). The vaso-constrictor fibres of a gland are derived from the sympa- thetic, and the vaso-dilator and secretory from the cerebro-spinal system.

core of Nerve-Centres.— Although these are usually Ney, classified anatomically, according to the organ in which they are cent situated, they may also be arranged according to their functions, as clagy, follows :—(1) receptive centres, to which influences arrive which fied, may excite

sensations (in grey matter of brain), or some kind of activity not associated with consciousness (reflex centres of the cord and of the brain) ; (2) psychical centres, connected with sensa- tion in the sense of conscious perception, emotion, volition, and intellectual acts (in the grey matter of the brain) ; (3) discharging centres, whence emanate influences which, according to structures

at the other ends of the nerves connected with them, may cause movements, secretions, or changes in the calibre of vessels (in brain and spinal cord) ; (4) inAibitory centres, which inhibit, restrain, or arrest the actions of other centres.

B.— Special Physiology of Central Organs.

General Physiological Anatomy.—The central organs of the nervous system consist of ganglia or of what is called a “cerebro- spinal axis.” The anatomy of the latter is described under ANA- Tomy, and some account of the gangliated cords in invertebrates and of the rudimentary nervous systems of the lower forms of vertebrates will be found under the articles Crustacra, INsxcrts, AMpHIBIA, Brrps, IcHTHyouocy, &c. But, as one of the most effective ways of obtaining an intelligent conception of the com- plicated nervous system of man and of the higher animals is to trace its various forms in the scale of animal existence, and to observe the close correspondence between complexity of structure and complexity of function, a short introductory review of its comparative anatomy, from the physiological side, will here be given. In the first place, we find that the different forms of nervous systems may be divided into (a) those consisting of ganglia or chains of ganglia, as found throughout the invertebrates, and (6) those having a great axis of nervous matter forming a brain and spinal cord, the cerebro-spinal axis, as seen in vertebrates.

Comparative View of Nervous System of Invertebrates.—In the New simplest forms of animals the protoplasmic cell is the scat of syst sensation and of motion; but as the contractile or muscularofin) layers become more marked sensation is relegated to the cells of tebl the ectoderm, or outer layer of the body. As portions of this sensory layer become of higher value to the organism, their protec- tion is accomplished by some of the sensory cells sinking into the body of the organism so as to be covered by less

important structures. The portions, originally of the surface, thus differen- tiated and protected become ganglia, and processes pass from them on the one hand to cells in the periphery, so that they may still be influenced by external energies, and on the other to the contractile parts of the organism by which movements are accomplished. Still higher in the scale of life, the ganglia are connected by inter- nuncial fibres, and the plan of the primitive nervous system bears a relation to the general type of structure of the animal. Thus in radiate animals the gangliated cords show a radiated arrangement, and when the animal form is bilateral and symmetrical the nervous arrangements are on the same type. It is also to be noted that the ganglion specially connected with the rudimentary organs of sense attains a size and importance proportionate to the development of the sense-organs, The nerves of the sensc-organs are chicfly con- nected with the supra-cesophageal ganglion, which thus may be looked on as a rudimentary brain, When the body of the animal becomes more complicated by the development of similar segments (or metameres), we find that by a reduplication, as it were, of the subcesophageal ganglion a ventral chain of ganglia is formed, a pair of ganglia for each segment, the individual ganglia being connected by longitudinal commissures. Such an arrangement is seen in the ringed worms and in arthropods, The next step is a fusion of ganglia into masses, according to the size and importance of the part of the body to be innervated (see vol. vi. p. 636, figs. 7 and 9).

No trace of a nervous system can be detected in Protozoa. The Scyphomedu- soid forms of Hydrozoa show nerve-fibres and ganglion-cells (Schafer) in the sub-umbrella and around the tentaculo-cysts (see vol. xii. p. 552, fig. 15), and in the Iiydromedusoid forms the nerve-ganglion cells form a ring round the margin of the disk. In some of the Actinozoa (anemones, &c.) fusiforni gan- euOme cells united by nerve-fibres are said to exist (P. M. Duncan). In all

he worms (Vermes) the most important central organs of the nervous system are placed in the anterior part of the body near the beginning of the alimentary a Tf they have a distinct head the nervous organ is in it and supplies

Hee les to the Sense-organs. Froin thence nerve-trunks radiate to the peri-
phery of the body, often in the form of two longitudinal trunks on the
ventral surface. Frequently there is a nervous ring round the esophagus.
Nerve- ens have been found in all the Platyhelminthes, Rotatoria, and
Bryozoa. The emathelminthes show a further advance. The central organ is
placed on the esophagus, surrounding it as a ring, from which nerves radiate
forwards aud

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backwards. Often six strands of nerve run forwards, whilst a dorsal and a _
ventral trunk pass backwards. The size of these trunks depends on the
length _ of the body. The cephalic ganglion is bilateral and is largely
developed. In | the Hirudinia and Annelida the cerebral ganglia are
connected by commissures with a ventral cord, which, in turn, shows
individual ganglia connected by commissures. Each ganglion cousists of
two equal portions with a transverse commissure, and in the higher forms
they are so close as to form almost a single cord. It is also evident that the
cerebral ganglia are composed of several ganglia fused together, and
acquire functional importance as the sense-organs are more highly
developed. In the Echinodermata the nervous system consists of a number
of trunks placed ventrally and having a radial arrangement. Each of these
trunks corresponds to the ventral ganglionic chain of the Annulata. In
Asterida (star-fishes) each radial nerve consists of two bands thickened in
the middle, and at the end there isa swelling connected with an optical
appa- ratus placed there. In the Echinus (sea-urchin) the nervous ring lies
above the floor of the oral cavity, between the oesophagus and the lips of
the ossicles of the masticatory apparatus. From this ring lateral branches
issue which accom- pany the branches of the ambulacral vessels. In
Holothwroida (sea-cucumbers) the nervous ring lies in front and near the
mouth, and is thicker than the five nerves which it gives off, thus differing
from the Asteroida and Echinoida. The uervous system of the Arthropoda
resembles that of the Annelida, There is a large ganglion above the
cesophagus, the cerebral ganglion, united to a ventral ganglion by two
commissures so as to form a nervous ring. From the ventral ganglion a
series of ganglia united by commissures extends along the ventral surface of
the body. The increased size of the cerebrum is the most striking

characteristic, and no doubt bears a relation to the higher degree of development of the sense-organs, more especially those of sight. In some Crustacea the optic nerves arise from distinct lobes. As pointed out by Gegen- bauer, when the optic organs are reduced or lost the cerebrum becomes so small as to be represented by nothing but a commissure. In the individuals having a large portion of the body composed of similar metameres the ganglia are regular in size, appearing in pairs. On the other hand, in the Thoracostraca (crabs, &c.) the anterior ganglionic masses are fused into larger masses So as to correspond to the concrescence of the anterior metameres into a cephalo-thorax. In the abdominal portion of the body, where the metameres are smnall, distinct, and more or less regular, the ganglia are also distinct and in pairs. In the Protracheata (Peripatus) the nervous system is simpler, and consists of the cesophageal collar with a double ventral cord having no ganglia or swellings on it, although nerve-cells are distributed through it. In the Myriapoda there isa well-inarked ventral cord, with ganglia corresponding to the metameres. In the Arachnida the ventral ganglia are often reduced in number and fused, They are characterized by the close connexion between the cerebral ganglia and the ventral cord, owing to the extreme shortness of the commissures (Gegenbaucr). In the Scorpions the nervous system is richly segmented, and remarkable for the large size of the ganglion giving off the pedal nerves. The Spiders have a single large ganglion in the cephalo-thorax, no doubt consisting of several ganglia. Inthe Acarina(mites) the cerebral ganglion is extremely small, and the other ganglia are fused so as to form one single mass, giving off nerves all round, These minute animals show a remarkable degree of concentration of the nervous system. In Insecta (see fig. 12) the ventral cord traverses the whole length of the body, the ganglia being at equal distances, and all united by commissures. This condition is well seen in the larval condition, and is like the permanent state of the Myriapoda. When the insect passes into the adult condition changes occur, con- sisting essentially of tle fusion of * ganglia and a shortening of the com- inissures. The cerebral ganglion is : composed primitively of three pairs, Aaah and in most cases does not unite Fic, 12.—Typical forms of nervous system with the rest of the ventral cord. in invertebrates. A, in Serpwla,a marine It shows hemispheres and a com- annelid; a, cephalic ganglion. B, ina plicated structure. The first gan- crab; a, cephalic ganglion; 6, ganglia glion of the ventral cord supplies fused under cephalo-thorax. C, in a the organs of the

mouth ; the three white ant (Termes); a, cephalic ganglion. succeeding send nerves to the ap- (Gegenbauer.) pendages, feet, and wings; the re-

naining ganglia are small, except the last, which supplies the generative organs. There is great variety among the Insecta in the number of ganglia in the ventral cord, but coalescence always indicates a higher type of structure. The nervous system of the Brachiopoda is formed of masses of ganglia near the oesophagus. From these nerve-fibres pass to various parts of the body. There is an cesophageal ring, but the superior ganglion is very small, owing to the absence of higher sensory organs. In Mollusca (see vol. xvi. p. 635, fig. 1) the nervous system is divided into a superior ganglionic mass, which lics above the com- mencement of the esophagus—the supra-cesophageal or cerebral ganglia—and a ventral mass which is connected with the other by commissures, and forms the inferior or pedal ganglia. They are both paired. The cerebral ganglion is connected with the sense-organs. Both the cerebral and the pedal ganglionic masses really consist of ganglia fused together. This is well shown in some of the lower forms, in which the pedal ganglia are divided, and form an arrange- ment like the ventral cord of the Annulata. The remarkable feature in the nervous system of Mollusca is the great development of the visceral ganglia and nerves supplying the heart, branchial apparatus, and generative organs (see vol, xvi. p. 643, figs. 17,18; p. 644, figs. 20, 21, 22; p. 647, figs. 34, 35; p. 648, fig. 36), In the Lamellibranchia the cerebral ganglia are very small, owing to the absence of a head and its sensc-organs. In some forms they are placed so much to the side as to be united by a long commissure. There are also two pedal ganglia, of a size proportional to the degree of development of the foot. The visceral ganglionic mass is often the largest. It lies behind the posterior adductor muscle, and is united by long commissures to the cerebral ganglion (vol. xvi. p. 693, fig. 144). The nervous system of the Gastropoda is remark- able for the large size of the cerebral ganglia. In the Pteropoda the cerebral ganglia either retain their lateral position or approach the pedal ganglia, with which the visceral ganglia are also fused. The three ganglionic masses, cerebral, pedal, and visceral, are also represented in the Cephalopoda, but they are more approximated by the shortening of the commissures. The ganglionic masses consequently are of great size, and they are more differentiated than any other ganglia in invertebrates. 1t is possible to distinguish an outer grey layer. formed of ganglionic cells,

surrounding a white layer, composed of fibres (vol. xvi. p. 679, figs. 113, 114, 115). Lastly, in Tunicata the nervous system is dorsal, instead of ventral, as in other invertebrates. It is developed from the ectoderm, or outermost layer of the embryo, by an infolding so as to form at first a groove and afterwards a tube. In the Ascidian larve this nervous tube reaches throughout the length of the tail, and we have thus the remarkable condition of a dorsal-median nerve-cord, analogous to the cerebro-spinal system of vertebrates. Further, embryologists are of opinion that this rudimentary nervous system is the true central organ, although the greater portion of it

disappears by the atrophy of the tail in the passage from the larval to the adult state. (Gegenbauer.)

Comparative View of Nervous System of Vertebrates.—To under- Nervous stand the structure of the complicated eentra]l nervous system of system of vertebrates, and to appreciate the physiological importance of its verte- various parts, it is necessary to trace its development in the embryo brates.

and to note the various forms it presents from the lowest to the highest vertebrates. A consideration of the embryological and morphological aspects of the subject elears up many difficult problems which a study of the human nervous system, by far the most complicated physiological system in the body, fails to do, and in particular it gives an intelligent conception of its architecture, as scen both in simple and complex forms. The cerebro-spinal axis begins in the embryo as a tube of nervous matter produced by an infolding of the epiblast, or outermost embryonic layer. The tube widens at its anterior end, and, by constrictions in its wall, three primary cerebral vesicles are formed, which afterwards become the anterior, middle, and posterior parts of the brain. In the fully- developed condition the cavity of the tube remains as the central canal of the spinal cord and the ventricles of the brain, whilst the various parts of the brain and cord are

formed by thickenings in its walls. The three cerebral vesicles have been called the fore- brain, the mid-brain, and the hind-brain. A protrusion from the anterior cerebral vesicle, at first single, but afterwards divided by a median cleft, becomes the rudiment of the eerebral hemispheres (prosen- cephala), the eavity remain- ing in the adult condition as the lateral ventricle on each side. From each cerebral vesicle another hollow process protrudes which constitutes the olfactory lobe .(rhinen- cephalon). i remains of the cavity of the first vesicle ; : becomes “the third ventricle _ = wl ‘. tear 7 IG. »— Outhne om above of emoryo opetig rece Ie be chick in first half of the second day. ”

: : to 2, three primary encephalic vesicles proseneephala a thickening enclosed in front and at the sides by is formed which becomes

the cephalic fold; 8, hinder extremity of the corpora striata, two large medullary canal dilated into a rhomboid bodies in the floor of the

space in which is the primitive trace ; 4, : 4, seven proto-vertebral somites. (Quain’s lateral ventricles of the adult Anatomy.) brain, whilst the roof is modi- we kee athe ne —_ Ne or s tS] 5 fied into the substance of the medullary canal is now closed in; ¢, an- cerebral hemispheres. Im- terior encephalic vesicle; 0, primitive mediately behind the corpora

optic vesicle; au, primitive auditory striata, and in the floor of vesicle, opposite third encephalic vesicle; the thalamencephalon, two

am, cephalic fold of amnion ; ov, vitelline similar thickenings occur

veins entering heart posteriorly ; pv, proto-vertebral somites. (Quain’s Ana-

which become the optie tha- 1™v-) lami, a thin layer between the two constituting the tania semi- etreularis, and the Y-shaped canal passing from the eavity be- tween the thalami to the cavities in the cerebral hemispheres (lateral ventricles) is the foramen of Monro. The floor of the third ventricle is produced into a conical process, the infwndt- bulum, at the blind end of which is the pituitary body, or hypo- physis cerebri. The roof of this ventricle is very thin, and in con- nexion with it is developed the pineal gland, or epiphysis cerebri. Transverse fibres pass from the one corpus

striatum to the others, constituting the white commissure, whilst the two optic thalami are connected by two grey commissures. In mammals the two cerebral hemispheres are connected by a large and important set of commissural fibres, forming the corpus callosum. In addition there are certain sets of longitudinal eommissural fibres. Thus two scts of fibres arise from the floor of the third ventricle, areh upwards, and form the anterior pillars of the fornix. These are eontinued over the roof of the third ventricle and run backwards, constituting the body of the fornix. Behind this the bands diverge so as to form the posterior pillars of the fornix. In the higher vertebrates the upper lip of the foramen of Monro thickens, and becomes converted into a bundle of longitudinal fibres, which is continuous anteriorly with the anterior pillars of the fornix. These are eontinued back between the inner boundary of the cerebral hemisphere and the margin of the corpora striata and optic thalami, and project into the lateral ventricle, forming the hippocampus major. Asin highly- formed brains the corpus callosum passes across considerably above the level of the fornix, a portion of the inner wall of the hemisphere on each side and a space between are intercepted. The two inner walls constitute the septum lueidwm, and the space the cavity of

the fifth ventricle. By a thickening of the floor of the middle cerebral vesicle (mesencephalon) two large bundles of longitudinal fibres, the erura cerebri, are formed, whilst its roof is modified into the optic lobes, corpora bigemina or corpora quadrigemina. The cavity, reduced to a mere tube, is the der a tertio ad quartum ven- trieulum, or the aqueduet of Sylvius. The third cerebral vesicle, myleneephalon, undergoes less modification than the others. The upper wall is exceedingly thin before the cerebellum so as to form a lamina, the valve of Viewssens, whilst the part behind is covered only by membrane, and opens into the posterior subarachnoid space. The cerebellum makes its appearance as a thin’ medullary lamina, forming an arch behind the corpora quadrigemina across the wide primitive medullary tube. The portion forming cerebellum, pons Varolii, and the anterior part of the fourth ventricle is termed the epencephalon, whilst the remaining portion, forming the medulla oblongata and fourth ventricle, is the metencephalon. These facts are briefly summarized as follows (Quain, vol.

ii. p. 828). Cerebral hemispheres, corpora striata, corpus callosum, fornix, lateral ventricles, olfactory bulb

1, Anterior cerebral (rhinencephalon). in a vesicle, C Thalamenceph- ° { Optic thalami, pineal gland, pitui-

a. Prosencephalon —Fore-brain.

alon — Inter- tary body, third ventricle, optic brain. nerve (primarily).

5 Corpora quadrigemina, crura cere- 2. Middle cerebral c. Mesencephalon dl . 5 Haiein. { =_Mid-beain, bri, aqueduct of Sylvius, optic

nerve (secondarily). : d. Epencephalon { Cerebellum, pons Varolii, anterior —Hind-brain, part of the fourth ventricle. e. Metencephalon { Medulla oblongata, fourth ven- —After-brain. { tricle, auditory nerve.

8. Posterior primary vesicle.

The general architecture of the brain considered in this way will be understood by the diagram in fig. 15, whilst details as to the

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Fig. 15.—Diagrammatic longitudinal and vertical section of a vertebrate brain. The lamina terminalis is represented by the strong black line between 1M and 8. Mb, mid-brain, what lies in front of this being the fore-brain, and what lies behind the hind-brain ; Olf, the olfactory lobes; Hmp, the hemispheres ; ThE, the thalamencephalon ; Pn, the pineal gland; Py, the pituitary body ; FM, the foramen of Monro ; CS, the corpus striatum; Th, the optic thalamus ; CQ, the corpora quadrigemina; CC, the crura cerebri; Cb, the cerebellum; PV, the pons Varolii; MO, the medulla oblongata ; I, olfactorii; II, optici; III, point of exit from the brain of the motores oculorum; IV, of the pathetici; V, of the abducentes; VI-XII, origins of the other cerebral nerves; 1, olfactory ventricle; 2, lateral ventricle; 8, third ventricle; 4, fourth ven- tricle. (Huxley.)

exact anatomy of the human brain will be found under ANATOMY (vol. i. p. 869 sq.).

The complex structure of the brain in the higher animals arises to a large extent from the great development of the cerebral hemi- spheres. At a very early period these grow forward and project more and more beyond the region of the first primary vesicle, A which, as has been noticed, never ad-

vances farther forward than the pituitary fossa (lamina terminalis); in expanding upwards they take the place previously occupied by the mid-brain, and fill the most peeos part of the head ; and by a downward and lateral enlargement —

Fic. 16.—Surface of foetal brain at six months (from R. Wagner). This figure is intended to show the commencement of formation of the principal fissures

and convolutions. A, from above ; B, from left side, F, frontal lobe; P,

parietal; 0, occipital; 7, temporal ; a, a, a, slight appearance of several — Ca tetone | 5 Beivien fissure ; 3’, its ectlindae “aiiehon : within C entral lobe or convolutions of island of Reil; fiss : 9, parieto-occipital fissure. (Quain.) i aia cia

they form the temporal lobes. Thus frontal, parietal, and tem- poral lobes come to be distinguishable, and somewhat later, by a farther increase posteriorly, the hindmost lobes constitute the

occipital lobes, and the cerebrum at last covers completely all the lower parts of the brain. The hemispheres, therefore, which are small in the early embryo of all animals, and in adult fishes perma- nently, attain so large a size in man and in the higher animals as to conceal all the other parts. Whilst this general development is going on the layer of grey matter on the surface of the hemispheres increases to such an extent as to throw the

surface into folds or con- volutions. The upper surface of the hemispheres is at first smooth (see fig. 16). The first appearance of division into lobes is that of a blunt notch between the frontal and temporal parts below, in what afterwards becomes the Sylvian fissure. In the fourth and fifth months there appear the vertical fissure, separating the parietal and occipital lobes, and the transverse fissure, called the fissure of Rolando, which divides the frontal and parietal lobes superiorly, and which is peculiarly characteristic of the cerebral type of man and of the apes (Allen Thomson). Then the convolutions appear from the formation of secondary grooves or sulci, for even at birth they are not fully perfected; and by the deepening of the grooves and the formation of subordinate ones the process goes on during the first years of infancy. For the convolutions see vol. i. p. 873; also PHRENOLOGY, vol. xviii. p. 847.

The evolution of the brain throughout the animal kingdom shows Deve a graduated series of increasing complication proceeding out of the ment same fundamental type; so that the forms of brain found perma- bnini nently in fishes, amphibians, reptiles, birds, and in the lower mam- anim mals are repetitions of those shown in the stages of the embryonic seria,

development of the brain of one of the higher animals.

In the whole class of fishes the brain retains throughout life more or less of the elementary form,—that is, it consists of a series of enlargements, single or in pairs (see fig. 17, C). The simplest of all forms is in the lancclet (Branchio-

2

stoma), in which there is ,)| no distinction between l brain and cord, there being 5 4

no anterior enlargement to form an encephalon. In the Cyelostomata, as the lampreys, the form is nearer that of the embryo when the five fundamental parts of the brain can be distinguished. At this stage the cerebrum and cerebellum are extremely sinall, whilst the ganglia chiefly developed are those connected with the organs of sense, more especially those of vision. In the sharks aud skates (Selachit, or cartilaginous fishes) the cerebral

portion is consi- derably larger. In osseous fishes (Teleostei) the thalamencephalon is so fused with the mesencephalon as to make the homology of the parts difficult to trace, but both cerebellum and cerebrum are still small relatively to the rest of the brain. The most important part of the brain of a fish is the part behind the mesencephalon, as from it all the cerebral nerves originate. Thus not only are the optic lobes relatively important as being the centres of vision, but the medulla oblongata is usually very large. In many sharks it forms the largest part of the brain (Gegenbauer). The spinal lobes of the electric fishes are differentiations of this portion of the encephalon,

In the Amphibia the hemispheres are larger, and are divided into two parts (see fig. 17, B). In the Urodela (siren, proteus, triton, newt) the mesencephalon remains small, and consists of one lobe, but in the Anwra (frogs, toads, &c.) there is an advance in this part, it being divided into two. In reptiles there is still an advance in the size of the thalamencephalon and mesencephalon, and the pros: encephalon is so large as to pass backwards and overlap the thalam- encephalon, The cerebellum (metencephalon) is still small, especially so in Ophidit (serpents) and Saurii (lizards), but in the Chelonti (tortoises, &c.) and in Crocodilini (crocodiles, alligators) it is larger. In the crocodile there is a transverse grooving of the cerebellum, giving rise to foliation or laminar division, which is carried much farther in birds and mammals, indicating a greater power of co-ordination or regulation of movement.

In birds (fig. 18) the vesicles of the mid-brain are partially hidden by development of the cerebral hemispheres. These are connected by a fine anterior commissure, and they contain a large amount of ganglionic matter bulging into the primitive cavity or ventricles, which are of very small size. The middle portion of the cerebellum shows a distinctly laminated structure and a differentiation into white and grey matter. But there is no pons Varolii, nor corpus In the floor of the lateral

Fia. 17.—Typical forms of brains of lower vertebrates. A. Brain of tortoise (Testudo). 1, olfactory; 2, cerebral lobes; 8, corpora striata; 4, optic lobes; 5, medulla. Part of the surface of the cerebral lobes has been removed to show the cavities in the interior, termed ‘‘the ventricles.” Immediately be- hind 4,

the optic lobes, is the imperfectly- developed cerebellum. B. Brain of common frog (Rana). a, olfactory; b, cerebral lobes covering corpora striata; c, corpora quadri- gemina, or optic lobes; d, cerebellum (rudi- mentary); s, back of medulla, showing fossa. C. Brain of gurnard (T'rigla). 1, olfactory; 2, cerebral lobes; 8, optic lobes; 4, cerebellum.

callosum, nor fornix, nor hippocampus.

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ventricles may be seen a ganglionic mass corresponding to corpus striatum and optic thalanms. The optic lobes are relatively large and show considerable differen- tiation of structure.

Mammals, even the lower orders, not only show a general enlargement of the cerebral hemispheres, but we find a commissure, the corpus cal- losum, uniting them. This en oa Se oop EN

issure i i y. 18.—Typical brain of bird. A,

pe petal — yew Pan pre B, lateral view ofa bisected : : brain, A.—a, olfactory; 8, cerebral

part of the hemispheres in jopes; c, optic or bigeminal lobes; 4,

Monotremata(Ornithorhynchus, cerebellum i é, apelie-cepnnn ae

seuiess) ont. once be ¢, olfactory ¢ a, optic nerves ; e,

(kangaroos, &c.), and in some jy) eqntia;'f, spinal cord.

of the Zdentata (ant-eaters,

sloths, &e.), but it gradually extends farther and farther back as

we ascend to the higher orders. The chief changes thus occur 1n

the prosencephalon. In the lower orders of mammals the hemi-

(iL) Sm ul oll Capeey ATI) ag Hubs

spheres are comparatively small and simple, and do not present any division into convolutions, and very little distinction even of

lobes. ing mid- brain, the higher Primates (monkeys, apes, and man). — general enlargement of the brain and of the cranial cavity. The development of a posterior lobe only takes place in the higher orders, and in these also the enlargement of the frontal lobes brings the front of the cerebrum more and more over the nasal eavities, causing a development of forehead. This also explains how the olfactory bulbs in more highly-formed brains are thrown below the frontal part of the hemispheres, instead of originating at their anterior borders. But the internal arrangements of the brain also become more complicated. The fornix, already described, establishes, by its longitudinal commissural fibres, a connexion between the anterior and posterior lobes of the cerebrum. In the Monotremata and Marsupialia the mid-brain retains a bifid form, constituting the optic lobes, or corpora bigemina, but in all higher animals each is divided into two by a transverse groove, forming the corpora quadrigemina, of which the anterior pair is the largest. As we rend also, we find the surface of the brain becoming more and more convoluted (see figs. 19 and 20). This is the general fact ; but whilst the convolutions are most numerous and deepest in the highest orders there is no regular gradation, as in each group there are very great variations in the degree of convolution (Allen Thom- son), Thus in the AMonotremata the Echidna has a more convoluted eerebrum than the Ornithorhynchus, whilst in the Primates the brains of the marmosets show a compara- tively smooth non-convoluted sur- face, in striking contrast to the rich convolutions seen on the brains of the higher monkeys and of the apes. It is important to note that the cerebellum also becomes more and more complicated as we ascend from the lower to the higher groups. At first merely a lamina or band, as secn in fishes and amphibia, it is a centrally differentiated body in crocodiles. In birds there is an indication of a division into three portions, # ecntral and two lateral, whilst the central is by far the larger, the two lateral being feebly developed. In Monotremata the central portion is larger than the lateral, but, whilst it is larger in Marsupialia, Edentata, and Cheiroptera (bats, &c.), it is elear that the lateral as are increasing in size so as to make the disproportion ess. But in Carnivora

(felines, hyena, otter, bear, &c.) and in Ungulata (sheep, ox, camel, rhinoceros, horse) the lateral lobes, or hemispheres, of the cerebellum develop to a much greater size ; and in most of the Primates they are much larger than the median portion, which is now called the worm or ‘“‘vermiform pro- cess.” As regards the development of the spinal cord continuous with the medulla oblongata, it need only be said that it does not show any marked peculiarities of structure in different animals. The grey matter from which nerve-fibres originate and in which they end is found in the centre of the cord, and it is most abundant in the regions associated with the development of limbs. The white matter is external, and, in the cords of the higher animals, ean be differentiated by fissures into columns, the special functions of which will be hereafter considered. The size of the cord is influenced by the masses of nerves given off from it, so that it attains its greatest thickness and development in the four higher

The cerebral hemispheres gradually grow backwards, cover- cerebellum, and medulla oblongata, as we find in

Fig. 19. Fig. 20.

Fic. 19.—Rabbit’s brain. 1, olfac- tory; 2, surface of cerebral hemi- sphere; 8, lateral ventricle, on the floor of which is seen the corpus striatum ; 4, cerebellum.

Fic. 20.—Cat’s brain, showing con- voluted surface, Contrast the form of the cerebellum in the cat and the rabbit. In the cat the central lobe is small, whilst the lateral lobes are largely developed.

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There is also a

divisions of the vertebrates possessing limbs. Thus, too, are formed cervical, dorsal, and lumbar enlargements, contrasting with the more uniform and ribbon-like form of the cord in fishes, although even in these

there are special enlargements corresponding to the points of exit of important spinal nerves.

Size and Weight of Brain.—The gradual increase in the size of the brain, as Size and compared with that of the body, which is observed as we rise in the animal weight of scale, has some intimate proportional relation to a corresponding increase of, ae the nervous and mental endowments. Information as to the size of the brain Pee may be obtained by direct measurement of dimensions and weight; but as this is often difficult recourse may be had to the measurement of the capacity of the cranium, which contains, however, not only the brain but its accessories, such as membranes and blood-vessels. Details will be found in vol. i. p. 879. After considering the measurements of several thousand skulls made by differ- ent observers, the late Dr Allen Thomson arrived at the conclusion that the cranial capacity is on the whole greater among the highly-civilized than among the savage races, and that there is even a very manifest difference to be found between persons of higher mental cultivation and acknowledged ability and those of the uneducated class and of inferior intellectual powers ; and he states further that the amount of this difference may be from 5 to 7} per cent. in persons of the same race, and about double that range in those of different races. Thus, the average adult brain of men in Britain being taken at 3 Ib, or, more precisely, at 494 oz, avoir. (women, about 44 to 444 0z.), at an average specific gravity of 1040, would give a bulk of 82°5 cubic inches of brain-sub- stance; 10 per cent. being deducted for loss by membranes, fluid, &c., the cranial capacity will be about 90 inches. Conversely, the weight of the brain may be calculated from the known cranial capacity. If, therefore, the brain of the uneducated class falls 2°5 oz. below the average, whilst that of the more culti- vated persons rises to the same amount above it, or to 52} oz., we may regard these brain-sizes as corresponding with brain-bulks and cranial capacities of 78 and 87 cubic inches, and of 88 and 97 cubic inches respectively. The average brain-weight of an Australian aboriginal man is about 42 0z., corresponding to a brain-bulk of about 70 cubic inches, and a cranial capacity of about 78 cubic inches. There are, however, great variations in all races. Thus the prain of Cuvier, the great naturalist, weighed 65 0z. avoir., corresponding to a brain- bulk of 108 cubic inches and a cranial capacity of 118 cubic inches ; whilst, on the other hand, in Europeans the brain-weight has fallen as low

as 82 oz., or a brain-bulk of 53 cubic inches and a cranial capacity of 63 cubic inches. The brains of the anthropoid apes—gorilla, chimpanzee, and orang—are all inferior to man in their dimensions. In the gorilla the brain does not attain more than a third of the weight of the average human brain, and in the chimpanzee and orang it does not reach a fourth, so that the ratio of brain-weight to body- weight in these animals may be as 1 to 100, whilst in man it ranges from 1 to 40 to 1 to 50. It is remarkable that in general among the largest animals of any group the brain does not reach a size proportionate to the greater magni- tude of the other organs or of the whole body, so that in the smaller members of the same order a considerably greater proportional size of the brain is observed. Thus in the small marmosets the proportion of the brain-weight to

the body-weight may be 1 to 20, or more than double the proportion in man.

Similar facts are brought out in comparing the brains of cetaceans, pachyderms,

dogs, &¢., a8 shown in the following table.

Table of comparative sizes of Brain and Body.

Internal

Brain- ; Whole weight | Proportion | Examples. weight in oa of the body | of brain to

02, avOil.| Gub in. in Ib. body weight Average European inan | 48 (3 fb) | 85 to 88 140 1 to 46 Child at birth ….....| 12 22 7h 1 to 10 Chimpanzee …...5…] 10 19 50 1 to 80 MaviMOBOt 0.0 ceases } 4 6 oz. 1 to 18 Middle-sized dog …... 38 6 36 lto 164 BMAUAOR vo clnce coves 25 4 7 1to 45 PSP A Gioia. om oistsierererevss 144 (9 Ib) 300 6,720 (3 tons) | 1to 747 ee en ecaes 6 by) Ser 94 1to 250 Whplel! ccowsessees nes 96 (6 tb) 650 | 134,400 (60 tons)| 1 to 22,400 AL OROPRE [ere ,oktonelauskehons 16 30 60 1 to 60

Although the proportion of brain-weight to body-weight ina male child at birth is1to10, yet so rapidly does the brain continue to grow during the early

period of childhood that by the age of three years it has attained more than three- fourths of its full size, by the age of seven years it has reached the proportion of nine-tenths, and after this, only by slow and small gradations, it attains the full size between the ages of twenty and twenty-five years.2_ See PHRENOLOGY.

From this survey of the comparative development of the brain Com- the following general conclusions can be drawn. parative 1. The first and essential portion of the cerebro-spinal axis is develop- the portion forming the spinal cord and medulla oblongata, inas- ment of much as it is found throughout the whole range of vertebrate brain. existence, and is connected with the reflex or automatic movements on which locomotion, respiration, and the circulation more or less depend, and with the simple sense of contact, or touch, or press- ure. This portion is necessary to mere existence. 2. When higher senses are added, such as those of taste, smell, hearing, vision, portions of the anterior part of the cerebro-spinal axis are differentiated so as to form centres. The earliest and most important of these senses (next to touch) is vision, hence the high degree of development of the optie lobes even in the lowest forms ; to these are added the optic thalami, which may be regarded as the centres of tactile sensations involving appreciation of differences of touch as to softness, smoothness, hardness, &c., requiring in the periphery special terminal organs. Special centres for hearing, taste, and smell are not differentiated. It is remarkable that the organs relating to the sense of smell are most anterior and most closely related with the prosencephalon, indicating, apparently, that this sense is one of the earliest in appearance, and probably, along with vision and touch, one of the most necessary to existence. 1 The large cranial bulk in this instance is connected with the enormous size of the roots of the cranial nerves.

2 Many of the facts of this paragraph as to size and weight of brain are derived from an unpublished lecture by the late Dr Allen Thomson.

Spinal cord,

It is equally striking that the origin of the auditory nerves should be placed so far back as in the medulla oblongata and cerebellum, indicating the primitive nature of simple auditory impressions and their relation to co-ordination of movement. The sense of taste originates in nerves springing from the medulla, and in close con- nexion with those regulating the movements of the tongue and swallowing. q

3, When sensations of a simple character are elaborated into ideas and give rise to the physical changes in some way correlated to mental states, involving memory, emotions, volitions, and intel- lectual acts, a part of the cerebro-spinal axis is differentiated for these functions in proportion to the extent to which such mental phenomena are manifested by the animal. J udging from the facts obtained by comparing animal intelligences, so far as they can be appreciated by us, we have the right to infer that in proportion to the degree of development in size and complexity of structure so is the mental condition of the animal. Taking it broadly, there can be no question that the intelligence of a bird is higher than that of a reptile, amphibian, or fish, and that the intelligence of the higher mammals, such as one of the Primates, is superior to that of the lower, as one of the Insectivora (hedgehog), or of the Marsupialia (kangaroo); and along with the higher intelligence is the more complex brain. There are qualifications to this statement to be afterwards alluded to, but they arise from deficient knowledge and do not vitiate the main conclusion. In proportion, therefore, to the degree of development of the prosencephalon do we find the intelligence of the animal, and we may regard this portion as superadded to the cerebro-spinal axis as the organic mechanism for such mental operations.

4, There is also a correspondence between the degree of develop- ment of the cerebellum and the faculty of co-ordination of move-

ment. Movements of the members of the body may be of a very | cornua of grey simple character, or they may be very complex. They may be due | matter. Some of to the action only of flexor and extensor muscles, causing the limb | the fibres of the to move almost in the same plane, or they may be associated with | anterior roots

the action of adductor and abductor muscles, by which there may be many kinds of circular or rotatory movements. There isa great difference between the movements of a fish's fin, of a bird's wing, of a horse's fore-leg, and of the arm of a monkey ora man. In the first. three they are almost to-and-fro movements, unlike the deli- cate movements of flexion, extension, pronation, supination, and prehension seen in the latter. Delicacy of movement of the anterior limb reaches its highest condition in man. It may be put generally that simplicity of movement is associated with an imperfectly- developed cerebellum, whilst in animals having the power of com- plicated movements, involving especially the knowledge of how the limbs are acting at any moment, and of adjustiment of movement in special circumstances, the cerebellum is highly developed. From this point of view, the degree of development of the cerebellum is as characteristic of man as the degree of development of the cere- brum. That this is no accidental correspondence will be shown in treating of the functions of the cerebellum.

Having reviewed the physiological anatomy of the cerebro-spinal system, an account will now be given of the more special physio-

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found along the whole of the anterior part of the anterior cornua, many of the processes of the nerve-cells being continuous with the nerve-fibres of the anterior roots of the spinal nerves. This column of nerve-cells has been called the ‘‘ motor ganglionic column,” or the ‘‘vesicular column of the anterior cornua.” (2) A group or column of nerve-cells at the inner or mesial angle of the base of the posterior cornu, in the middle region of the cord from the third lumbar to the seventh cervical nerve. This is termed the ‘‘ posterior vesicular column,” or ‘‘ Clarke's column,” after the late Mr Lockhart Clarke, who did much to unravel the intricate anatomy of the nerve-centres. The nerve-cell processes are continuous chiefly with nerve-fibres coming from the lateral column. This vesicular column is best developed where the column of the anterior cornu is least so. (8) The third column of nerve-cells is in the outer- most portion of the grey matter, midway between the anterior and posterior cornua. Development has shown that at an early period the anterior horns are distinctly differentiated from the posterior, and that the grey matter between them is the last to be formed,

The nuclei in the latter may be regarded, therefore, as accesso nuclei. It has also been observed by Flechsig and others that the white substance of the cord also makes its appearance first in the neighbourhood of the anterior and posterior roots. The cord ata very early period consists almost entirely of grey matter, and_the columns are superadded in the anterior first, the posterior last. The posterior can also be traced to the cortex of the cerebellum (Flechsig).

The anterior and posterior roots of the spinal nerves are attached along the sides pmf of the cord, op- eS posite to the corresponding

end in nerve-cells in the anterior cornu, Others pass through the grey matter and cross to the other side of the cord through theante- rior commissure, a layer of white matter at the bottom of the anterior median fissure.

umn and to the Fic. 22.—Diagram to illustrate the course taken by the posterior cornu. fibres of the nerve-roots on entering the spinal cord ~

logy of the centres composing it,—namely, spinal cord, medulla | The course of eat ca rou tibes Oa oblongata, pons Varolii, basal ganglia (including corpora striata | these fibres is _ into lateral cells of anterior cornu; 1’, 1’, others passing

optic thalami, and corpora quadrigemina), cerebellum, and hemi- spheres of the cerebrum.

Spinal Cord.—The spinal cord is described at vol. i. p. 865 sq., but it is necessary here to allude to a few points of physiological importance. The cord consists externally of white and internally of grey matter. The white matter, com- posed of nerve-fibres,

into mesial cells of same cornu; 2, 2, fibres passing to lateral column of same side without joining nerve-cells ; 8, 3, fibres passing towards posterior cornu ; 4, 4, fibres passing across anterior commissure, to enter nerve-cells in anterior cornu of other side ; p, funiculus of posterior. root; pl, fibres of its external or lateral division coming through and around gelatinous

substance of Rolando}; some of these (5) are represented as becoming longi- tudinal in the latter, others (6, 6) as passing towards anterior cornu, either directly or after joining cells in

shown in fig. 22. A portion of the fibres of the pos- terior roots ends in the grey mat- ter on the same side, but many cross to the grey

forms a series of. tation ~~< th posterior cornu, and others (7) as curving inwards to~~ strands or columns in it ae id e wards grey commissure ; pm, fibres of mesial or inner aach balk af tha oud opposl @ side. division, entering into posterior column and then be:

: al There is thus qa Coming longitudinal; p’m’, fibres from a posterior root The grey matter in decussation of which had joined the cord lower down and entered pos

the central part of the cord is arranged in two crescentic masses, and shows under the microscope numerous multipolar cells con- nected with nerve-fibres and imbedded in neuroglia, or the special connective tissueofthe nerve-cen-

Fic. 21.—Transverse section through spinal cord. AF, antero-median, and PF, postero-median fis- sures ; PC, posterior, LC, lateral, and AC, anterior

tres. columns; AR, anterior, and PR, posterior nerve-

terior column, now passing into the grey matter at root of posterior cornu. Of these, 8 is represented as enter- ing Clarke’s column, 9 as curving round this and coursing to anterior commissure, and 10 as passing towards an- terior cornu,—the axis-cylinder processes of the cells of Clarke’s column are shown arching round and taking the direction of the lateral column; am, anterior median fissure; pm, posterior median fissure ; cc, central canal ; SR, substantia gelatinosa of Rolando.

fibres connected with both the anterior and the posterior roots. The arrangement of the white or fibrous columns of the cord is seen in the table under medulla oblongata below.

The spinal cord acts (1) as a transmitter of motor and sensory— or centrifugal and centripetal—impressions between the encephalon and the periphery, and (2) as a reflex centre.

The neuroglia

ig c ompose dof a kind roots ; C, central canal of cord, with its columnar

a — : of semi-fluid matrix, the grey mati is shown by the demos aknice fibrils, and peculiar Portion.

cells having numerous branches called ‘“ Deiter’s cells.” (See fig 21.) These nerve-cells are arranged in definite groups and occupy the same relative position in successive sections, forming the gan- glionic or vesicular columns of the grey matter, as follows. (1) Cells

1. Transmission of Motor and Sensory Impressions.—Each spinal Moto nerve, as already mentioned, is connected with the spinal cord by and two roots, an anterior and a posterior. Section of a number ofsen! anterior roots causes paralysis of motion of muscles on the same imp” side of the body, whilst irritation of the distal or peripheral end of sio™ the divided roots causes twitchings or tetanus of the muscles. Neither section nor irritation has any effect on sensation. Hence the anterior roots contain motor fibres, carrying impressions from

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is followed by loss of sensation of a part of the body on the same side, and, if the proximal ends of the divided roots—those next the cord—be irritated, painful sensations are excited. The posterior roots, therefore, contain sensory fibres, carrying impressions Into the cord from the periphery. As we have seen, these roots are connected with the grey and white matter of the cord, and it is practically impossible to trace all their ramifications. Recourse must there- fore be had to the evidence supplied by experiment

(cutting, or by the Wallerian method, p. 26) and by pathological observation. In tracing the path of fibres, what may be called the " developmental method" has been pursued. It has been shown by Flechsig that, "if the development of the cord be carefully observed, the medul- lary substance of the nerve-fibres is formed later along eertain traets of the white columns than in the rest of the white matter, so that in transverse sections of the cord these tracts are easily dis- tinguishable by their more transparent grey appearance " (Quain, vol. ii. p. 277). If the anterior columns be cut by an incision ex- tending into the grey matter, leaving the posterior columns intact, voluntary movements disappear in the parts below the section. Again, section of the posterior columns and grey matter, leaving the anterior uninjured, enfeebles but does not destroy the power of voluntary movement below the section. Finally, section of an antero-latcral column on one side paralyses voluntary motion on the same side. From these facts it is inferred (a) that the motor tracts passing from the brain to the periphery are in the antero- lateral columns, and (6) that the fibres forming these tracts are chiefly distributed to the same side of the body. These inferences are supported by pathological observation. In diseases where the anterior horns of grey matter are affected paralysis ensues, with complete flaceidity of the limbs ; and if, from hemorrhage, soften- ing, or the pressure of tumours, the anterior portion of the cord be irritated there are spasmodic twitchings of muscles. Complete transverse section of the posterior columns does not abolish sensi- bility in the parts below; but there is a loss of the power of making co-ordinated movements. Section of the posterior columns and of the antero-lateral columns, leaving only the grey matter in the centre of the cord intact, does not abolish sensibility. Again, section of the antero-lateral columns aud of the whole of the grey matter, leaving only the posterior columns uninjured, is followed by complete loss of sensibility in the parts bencath. The inference therefore is that sensory impressions pass through the grey matter. As already seen, many of the sensory fibres conncted with the posterior roots decussate in the grey matter. This explains some of the results obtained by Brown-Séquard, that hemi-section of the cord, involving the grey matter, enfeebled sensibility on the opposite side more and more as the section cut deeply into the grey matter; that a vertical section in the bottom of the posterior median fissure caused loss of sensibility on both sides; and that a lateral section, whilst it caused loss of sensibility (anesthesia) on the opposite side, was followed by increase of sensibility

(hyper- wsthesia) on the same side,—a curious fact, explained by Brown-Séquard as being due to irritation caused by paralysis of the vessels of the cord on the side of the section. It would appear also that tactile impressions travel, for a certain distance at all events, in the posterior columns. This has been inferred chiefly from the fact that in certain eases of paralysis involving the posterior columns, where the sensation of touch was absent, the patient could still feel a painful sensation, as when a needle was thrust into the skin ; whilst in other cases, in which these columns were not affected, the converse held good. In the disease known as locomotor ataxia (see Avaxy and PaTHotoey, vol. xviii. p. 392) the patient first passes through a period in which there are disorders of general sensibility, especially lancinating pains in the limbs and back. By and by there is unsteadiness of gait when the eyes are closed or in the dark, and to a large extent the patient loses the power of co-ordinating movement. Especially he is unable to judge of the position of the limbs without seeing them ; in other words, the so-called muscular sense is enfeebled. At last there is a stage before death in which there is almost complete paralysis, A study of this disease has thrown much light on the physiology of the cord. It is known to be caused by a slow disorganization or sclerosis of the posterior root-zones, the posterior columns,—slowly passing on to affect the columns of Goll, the lateral columns, and the anterior grey horns, and ultimately involving the cord. The disordered sensations at an early stage, the staggering gait at a later, show that the posterior part of the cord has to do with the transmission of sensory impres- sions. The man staggers, not because he is paralysed as regards the power of movement, but because, in consequence of the scnsory tracts being involved, he does not receive those peripheral impres- sions which exeite or indirectly regulate all well-ordered movements of locomotion.

2. As a Reflew Centre.—The grey matter of the lower cervical, dorsal, and lumbar regions of the cord may be regarded as composed of reflex eentres associated with the general movements of the body, whilst in the upper cervieal region there are more differentiated centres corresponding to special actions. The initial excitation

‘ the cord outwards. Again, section of a number of posterior roots

may commenee in any sensory nerve ; the effeet passes to the eord, and sets up changes in the nerve-cells of the grey matter, involving time, and resulting in the transmission outwards along motor fibres of impulses which excite particular groups of muscles. There is an exact co-ordination, with a given strength of stimulus, between eertain areas of skin and eertain groups of muscles, and thus movements may be so purpose-like as to simulate those of a con- scious or voluntary character. Thus irritation near the anus of a decapitated frog will invariably cause. movements of the limbs towards the irritated point. The activity of reflex centres may be inhibited, as already shown, by highcr centres, or possibly by certain kinds of scnsory impressions reaching them directly from the periphery. Hence removal of these higher centres is followed by apparently inercased reflex excitability. Strychnia and the alkaloids of opium increase it, whilst aconite, hydrocyanic acid, ether, chloral, and chloroform have an opposite effect. In certain pathological conditions also, as in tetanus, or in some slow progressive diseases of the cord, reflex excitability may be much inereased. In tetanus the slightcst touch, a movement of the bedclothes, the closing of a door, the vibration caused by a footstep, may throw the patient into severe and prolonged con- vulsions. The earlier formed ganglionic cells are those specially concerned in reflex acts.

Spectal reflex centres have been clearly made out in the cord. (1) A cilio-spinal centre, between the sixth cervical and third dorsal nerves, associated with the movements of the iris. The fibres controlling the radiating fibres of the iris, and found in the sympathetic, originate here (see Eyr). Hence irritation of this region causes dilatation of the pupil, an effect not produced if the sympathetic fibres have been divided. (2) Accelerating centres, supply- ing fibres to the sympathetic which ultimately reach the heart, and irritation of these centres quickens the movements of that organ. (3) Respiratory centres, The movements of respiration, of a reflex character, involve the action of many thoracic and abdominal muscles. Section of the cord above the eighth dorsal paralyses the abdominal muscles; above the first dorsal, the intercostals ; above the fifth cervical, the serratus magnus

and the pectorals ; and above the fourth cervical, by paralysing the phrenics, it arrests the action of the diaphragm. (4) Genito-spinal centre. This is in the lumbar region. Irritation causes erection, &c.; destruction or disease is followed by loss of virile power. (5) Ano-spinal and vesiculo-spinal centres. These, connected with the movements of the sphincter ani and of the bladder, exist in the lower portion of the dorsal and upper portion of the lumbar regions. Disease or injury involving these centres causes involuntary evacuation of the bowel and com- plete paralysis of the bladder, with non-retention of urine. The bladder may be full whilst the urine constantly escapes in small quantity.

3. As a Trophie Centre. —The ganglion-eclls in the anterior coruua undoubtedly have a trophic or nutritive influence upon muscles. This has been determined chicfly on pathological evidence. If these cells undergo atrophy or degenerative changcs, the muscles, even though they may be kept periodically in a state of activity by galvanism, become soft and fatty changes take place. There is thus a correlation between the nutritive condition of muscle and nerve-centre, and influences affecting the one affect the other also.

It has been supposed that the cells in Clarke’s vesicular column may form the centres in visceral innervation. They arc bipolar, like those in the sympathetie, and not multipolar as in the rest of the cord, and the columns are absent in the lumbar and cervical enlargements. The cells are found where nerves come off that influence the viscera, and similar cells are found at the roots of the vagus in the medulla,—a nerve also much concerned in the innerva- tion of viscera.

Inhibition of Reflex Actions.—The reflex actions of the spinal eord may be inhibited or restrained to a greater or less extent by the action of centres in the encephalon, so that pure reflex actions only occur after removal of the ecrebrum, or during profound sleep, when the cerebrum is inactive. Thus a strong effort of the will may restrain from scratching an irritated part of the skin, whilst the same amount of irritation would certainly cause reflex movements if the will were in abeyance. Such power of voluntary control, however, is limited with respect to most reflex actions, whilst some reficx acts cannot be so influenced. Any movement that may be orginated by the

will may be inhibited or restrained to a certain extent when the movement is of a reflex character; but, if the movement be invariably involuntary, it can never be inhibited. Thus the ejaculation of semen cannot be voluntarily induced, whilst the reflex act once provoked cannot be arrested (Hermann). That these inhibitions of reflex actions of the cord depend on mechanisins in the brain is proved by the fact that removal of the brain is fol- lowed by an increase in the reflex excitability of the cord, and that even section of the cord permits of increased reflex excitability below the plane of section (Setschenoff). Further, after section of the spinal cord in the ccrvical region, irritation of the lowcr end arrests reflex movements dependent on reflex centres in the lower eervieal, dorsal, and lumbar regions (M ‘Kendrick).

Medulla Oblongata.—This is the prolongation into the cranium of the spinal cord so as to unite it with the brain. Strictly speak-

Special reflex eentres.-

Cord as trophie eentre.

Inhibi- tion of reflex

actions.

Medulla oblon-

ing, the medulla spinalis and the medulla oblongata form one organ. gata.

The columns of white matter of the cord undergo changes in form, structure, and relative position when they pass into the medulla (see vol. i. p. 870). Without again detailing the minute anatomy, it is necessary to show, as in the following table, the connexions of the cord and of the medulla with the rest of the brain.

Columns of

‘ i in Medulla the Spinal | Divided into age eo Pass on to A. a. Lateral, or crossed, Decussate in anterior pyra-| Cerebrum. Pyramidal) fibres from the

pos- inids. tract. terior part of the lateral column as low as the third or fourth sacral 7 nerves. b. Anterior, or un-|Pass under crossed, fibres from | pyramid on ; the dorsal region| same side, | 1. Posterior} Cerebrum. of the cord-col-| and form | longitudi- uns of Tiirck, or} longitudinal nal bundle columns of Lock-} fibres of the (in pons. hart Clarke. reticularis al- { 2. Traet of} Corpora ‘ ba in dorsal] the fillet. quadri- a part of me- geimina. 3 sial area. 8 B. c. Cerebellar tract, | Restiform body. Cerebellum. | Cerebellar} between latera} g tract. pyramidal tract 8 and the outer sur- } face of the cord as 3 low as the second E or third lumbar. All the|. Principal tract of antero- | anterior column, lateral that is, the antero- columns! lateral eolumn less except the fibres in b. Not AandB,| continued up— probably comunis- sural from one side of cord to the other. e. From anterior col- | Pass below olivary body to | Cerebellum. umn, form part of restiform body. Sometimes called the ‘‘ band of Solly ’—not always present. a. Posterior white column, or Goll’s tract, from middle of dorsal region. b. Posterior lateral| Posterior median column, | Cerebrum. column, between] becoming the funiculus posterior median] gracilis, which, with the Posterior column and pos-] expansion called the clava, column. tero- lateralgroove.| becomes the posterior py- ramids. c. Funiculns of Ro-}Funigulus cuneatus, form-| Cerebellum.

lando, between the} ing, with cerebellar tract posterior lateral! fromantero- lateralcolumn, column b and pos-| the restiform body. tero-lateral groove

higher up.

It is important to note the fact that each column of the cord, through the medulla, is thus connected both with the cereorum and with the cerebellum. Development has shown that the fibres of the bundles which are first formed develop a medullary sheath at a time when the fibres of the later- formed bundles are non-medullated. ‘When the cord of a human embryo is examined at the end of the fifth month it will be found that the pyramidal fibres of the lateral columns, the fibres of the columns of Tiirck, and of the columns of Goll are non-medullated ; while the fibres of the anterior and pos- terior root-zones and the cerebellar fibres of the lateral columns are medullated” (Ross). It would appear, therefore, that the latter are the more priinitive structures, and that the former are super- added in the cords of the

higher animals. The grey matter of the inedulla is broken up by changes in the distribution of the white matter into nuclei or masses of nerve-cells, instead of having the crescentic form seen in the spinal cord. These nuclei are connected with the roots of important cranial nerves, and may be regarded as corresponding with the anterior horns of grey matter, with the posterior horns, and with the grey matter between these.

The following nuclei can be found :—(1) the hypoglossal nucleus for the hypoglossal nerve, the motor nerve of the tongue ; (2) a common nucleus, for a portion of the spinal accessory, vagus, and glosso-pharyngeal nerves; (3) the principal or lower auditory nucleus, for the auditory nerve; (4) nuclei for the sixth or abducent nerve, supplying the external rectus muscle of the eye ; (5) nucleus for the fourth nerve, supplying the superior oblique muscle of the eye; (6) the facial nerve, the motor nerve of the face; (7) the cor- pus dentatum of the olivary body, not directly connected with the roots of nerves, but containing nerve-cells. “Some fibres, both of the sensory and motor roots of the fifth nerve, originate also as far back as the medulla. The third, fourth, sixth, and hypoglossal nerves belong to the system of anterior motor nerves, related to the anterior cornua, whilst the spinal accessory, vagus, glosso- pharyngeal, and fifth belong to the ‘‘ mixed lateral system, that 1s, they are related to the posterior cornua and intermediate grey matter. –

Like the spinal cord, the medulla may be regarded as containing

tracts for sensory and motor transmission, and as constituting a series of reflex centres for special movements.

1. As a Conductor of Motor and Sensory Impressions. —Inasmuch Moti also, as such movements as those of the circulation, respiration, and and vaso-motor action are necessary to life, destruction of the Be medulla causes almost instant death. Motor fibres coming from t the brain above decussate in the anterior pyramids and then runsiony down the lateral columns of the cord, issuing to the muscles by mej! the anterior roots of the spinal nerves. Hence, whilst section of an antero-lateral column of the cord will cause paralysis of motion on the same side, section of an anterior pyramid above the decus- sation causes paralysis of motion on the opposite side. But fibres carrying sensory impressions also decussate in the grey

matter at the bottom of the posterior median fissure of the cord. It follows, therefore, that disease, such as rupture of a vessel causing a clot in the brain, say in the left corpus striatum and left optic thalamus, causes paralysis both of motion and of sensation on the opposite side,—that is, in the case supposed, there would be right hemiplegia. The path of sensory impressions is probably in the grey matter but the precise course of sensory fibres has not been traced.

2. Asa Reflex Centre.—Numerous special centres have been re- Meth ferred to the medulla oblongata. a8 rely

(1) Respiratory centres, two in number, expiratory and inspiratory, connected centr, with the roots of the pneumogastric nerves. Destruction at once causes cessa- tion of respiratory movements. (2) Vaso-motor centre, regulating the calibre of the smaller blood-vessels throughout the body (see p. 30). (3) Cardiac centres, probably two in number—one accelerating, associated with the sympathetie; the other inhibitory, connected with the pneumogastric (see p. 29). (4) Centres for deglutition, associated with the sensory and motor nerves involved in this process (see NuTRITION, vol. xvii. p. 670). (5) Centre for voice, regu- lating to some extent, through the sterno-cleido-mastoid muscle, the emission of air through the glottis in expiration and phonation. (6) Centre influencing glycogenesis, probably by the action of the vaso-motor centre on the blood- vessels of the liver (see NUTRITION, vol. xvii. p. 682), (7) Centre directly in- fluencing salivary secretion, from which originate those fibres of the facial, forming the chorda tympani and lesser superficial petrosal, distributed to the salivary glands (see NuTrition, vol. xvii. p. 672). (8) Centre for the moter fibres supplying the face and muscles of mastication. These exist in the facial for the muscles of the faccand in the motor portion of the fifth for the muscles of mastication. Further, the medulla receives nervous influences from the higher centres, by which all the centres above enumerated may be more or less influenced,

Pons Varolii.—The pons Varolii is above and in front of the Pos medulla oblongata, and between the hemispheres of the cerebellum, Vani It consists of fibres passing in two directions, viz., longitudinally, connecting the brain above with the medulla and cord below ; and transversely, connecting the

lateral hemispheres of the cerebellum, thus forming the middle peduncles of that organ. Its general position and appear- ance are seen in fig, 28. Mixed up with these fibres are various nuclei of grey matter connected with the roots of cranial nerves. The most important of these nuclei are—(1) the nucleus of the facial nerve ; (2) the motor nucleus of the fifth nerve; (3) the upper sensory nucleus of the fifth nerve ; (4) the inner or chief nucleus of the auditory nerve; (5) the outer or superior nucleus of the auditory nerve; (6) the accessory nucleus of the auditory nerve; (7) the nu- cleus of the sixth nerve. It will be observed that several of these nerves are also con- : nected with nuclei in the Fic. 23.—Section of medulla oblongata and medulla oblongata. Like pene to show the course of fibres. a, so

; : cial, and a’, deep transverse fibres of pons, the cord and medulla, the 4, b, anterior pyramids ascending at 0! pons is to be regarded as_ through pons; ¢, ¢, olivary bodies; ¢, ol a conductor of impressions vary fasciculus in pons; d,d, anterior

cal i : Le eoht and probabl : i columns of cord; e, inner part of righ I y also as a reflex column joining anterior pyrainid ; f, outer

centre. Motor transmission part going to olivary fascicnlus ; g, lateral occurs chiefly in the an- column of cord; h, the part which decus- terior part. As the fibres of sates at k, the decussation of the pyramids;

: , : l, the part whieh joins the restiform body; ~ facial nerve decussate in m, that which forms the fasciculus teres} the pons, and then Carry 1N- , arciform fibres. 1 and 2, sensory and fluences outwards, unilateral motor roots of the fifth nerve; 3, sixth

inj i nerve; 4, portio dura; 5, portio inter- i is wi Sanne ie pens media} 6, portio mollis of the seven hay cause paralysis of the nerve; 7, glosso- pharyngeal ; 8, pneumo

face on the same side as the gastric; 9, spinal accessory; 10, hypo disease, and paralysis of the glossal nerve.

limbs on the opposite side if the disease has affected the facial before its decussation in the pons. Usually in cases of paralysis of one side

(hemiplegia) from a clot or disorganization in one corpus striatum the paralysis of the face is on the same side as that of the limbs. In diseases of the pons loss of sensibility is a much more

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rare result than loss of motion, and is always on the opposite side.

According to Brown-Séquard, tactile, thermal, and painful impres- sions pass through the central part of the pons.

centres in the pons are associated in complex reflex movements.

Nothnagel has described it as a convulsive centre, because irritation but this was no doubt due to irritation of the

caused severe cramps, : motor strands passing through it. _ Cerebral Peduneles. —Thesc contain both sensory and motor fibres,

and they establish a connexion between the cerebellum and the

cerebrum, and also between the ganglia at the base,—corpora striata, optic thalami, and corpora quadrigemina on the one hand, and the pons and medulla on the other. except that they are conductors. the animal to move to the side opposite the lesion, circle somewhat in the manner of a horse in a circus. may cause pain or movements of various groups of muscles.

Basal of the cerebro-spinal system, the brain consists of a series of gan- glia, in pairs, more or less overlapped by the cerebral hemispheres.

These ganglia, termed the “basal ganglia,” are usually held to include, from behind forwards, the corpora quadrigemina, the optic thalami, and the

corpora striata ; but in addition.there are bodies they cannot be regarded as belonging to the cerebral hemispheres. These are

meriting an equal amount of attention, inasmuch as

the locus niger, the red nucleus of the tegmentum, and the corpora geniculata ; but we have no knowledge of their functions. No doubt all these ganglia act along with the cercbral hemispheres, so that practically the whole mass forms one organ.

Corpora Quadrigemina.—These are two pairs of rounded bodies found above the Sylvian aqueduct, which passes between the third and fourth ventricles. They are situated behind the optic thalami, and are intimately related to the crura, and through these to the pons, medulla, and cord. Homologous with the optic lobes seen in the brain of the fish, frog, and bird (see figs. 17 and 18), and in marsupials and monotremes, their relative size to the mass of the encephalon is much less in the brain of man and of the higher animals. These bodies contain grey matter, covered by a thin stratum of white matter. The two posterior bodies are probably connected with the cerebellum by the superior peduncles of that

organ; at all events these peduncles disappear under the base of

the corpora quadrigemina. ‘The two posterior bodies arc also related to the crura cerebri by the prominences on the sides of the crura known as the inner genicilate bodies. Both anterior and posterior bodies, more especially the anterior, are connected with the optic tracts, and finally, the two antcrior bodies unite with the optic thalami. (See fig. 24 below ; also, plate XVIII., vol. i., fig. 1, 9, 9.) As shown by their anatomical connexions, the corpora quadri- gemina are part of the mechanism of vision. Destruction causes immediate blindness. If, in a pigeon, the encephalon be removed with the exception of thesc bodies, the iris will still continuc to contract on the influence of light. On then destroying onc of these bodies, the iris is immobile, and the power of accommodation is lost. As the third cranial nerve (which is known to contain fibres controlling the circular fibres of the iris by which the pupil con- tracts, and the fibres governing the ciliary muscle by which the eye is accommodated or focused to varying distances) originates in the grey matter of the floor of the Sylvian aqueduct, close to

the corpora quadrigemina, it is held that these bodies are the centres of the reflex movements of the iris and of the ciliary muscle. The corpora quadrigemina are also the first recipients of visual impres- sions. When light falls on the retina changes are there induced which stimulate the optic nerve-fibres, and these fibres carry impres- sions through the optic tracts to the corpora quadrigemina. What then occurs is matter of conjecture. Whether sensation is there excited, or whether to produce sensation it is necessary that the impulses be sent onwards to the cerebrum, or whether the impres- sions directly received from tlie retina may excite, through the corpora quadrigemina and adjacent ganglia, reflex movements (like those of the somnambulist, who may sec so that his steps are taken rightly, but who may at the same time not see consciously), are all speculative questions. We know that these boilies are concerned in the movements of the iris and of the ciliary muscle, but their great proportionate size in lowly-formed brains indicates that this is probably a secondary function, and that they are largely con- cerned in the phenomena of consciousness of light and colour. Optic Thalami.—These are two ganglionic masses placed behind the corpora striata and in front of the corpora quadrigemina. The internal surfaces are seen chiefly in the third ventricle, the upper surfaces in the same ventricle and the lateral ventricles (see vol. i. pp. 875, 876, figs. 74 and 75), whilst the external and under surface of each thalamus is united with other parts of the brain. The under surface receives fibres from the crus cerebri, whilst the upper surface is covered by fibres which diverge and pass between the thalamus and a mass of grey matter in the extra-ventricular portion of the corpus striatum (called lenticular nucleus), to form a white layer called the ‘‘internal capsule.” From the internal capsule, which thus contains fibres from the optic thalamus, fibres

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Little is known of their functions Destruction of one peduncle causes describing a Irritation

Ganglia.—As already shown in tracing the development

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radiate outwards to the surface of the cerebral hemispheres. The under surface of the thalamus is connected with the tegmentum,— that is, with the layer of fibres forming the upper surface of the crus cerebri. They also receive fibres from the corpora quadrigemina, and according to some authorities from the superior peduncles of the cerebellum. The substance of the thalamus contains nerve- cells, scattered and also aggregated into two nuclear masses, but the relations of these to nerve-tracts have not been ascertained. It is important physiologically to notice that the thalami receive fibres from the back of the crura, and therefore are probably related to the posterior or sensory portion of the spinal cord.

There is still much uncertainty as to the functions of the optic thalami. The most commonly received opinion is that they are centres for the reception of peripheral impulses, which they may elaborate and transmit forwards to the corpora striata, or directly to the cerebral hemispheres. If the scnsory impulses received by the optic thalami are sent to the corpora striata, and by these trans- mitted downwards and outwards through the crura cerebri, then reflex actions may occur in which the basal ganglia are the centres ; but, if the impulses are sent up, in the first place, to the cerebral hemispheres, and by these transmitted down to the corpora striata, then the action must include the higher mechanism of the grey matter of the hemispheres. In the first case it is supposed by those who hold that consciousness is specially connected with the grey matter of the hemispheres .that the action would be purely reflex and unconscious. Experiment has not thrown much light on this problem, owing to the deep-seated situation of these bodies rendering the results of operative interference untrustworthy. The little that has been done shows that injury to them does not cause paralysis of motion. Nor can it be said that such injuries cause loss of sensation, the only phenomenon observed being that the animal places its limbs in anomalous positions, and does not seem to beaware of havingdoneso. Meynert is of opinion that the optic thalami fulfil the same functions as to tactile impressions—that is, impressions on the periphery of the body—that the corpora quadri- gemina do for visual impressions—that is, impressions on the retina. In cases of apoplexy in which these bodics are involved there are always sensory disturbances on the side opposite the lesion. This would lead to the inference that the optic thalaini are the sensory ganglia of the opposite sides of the body. They are not, however, the first ganglionic apparatus through

which scnsory impressions pass, but they probably co-ordinate in some way centripetal impulses before these are sent to the cerebral hemispheres, where they are correlated with feeling. Further, as the old name ‘‘ optic thalami” indicates, these ganglia are concerned in some way in vision, because, if seriously injured, blindness, or at all events disturbauce of vision, is one of the constant results. This favours the view that they are the “middlemen” between special sensory ccntres and the higher centres of the cerebrum,

Corpora Striata.—These ganglia, sometimes termed the “ ganglia Corpora of the cerebral hemispheres,” sitnated in front and on the outer striata. side of the optic thalami, are seen in the lateral ventricles. (See vol. i. pp. 875, 876, figs. 74 and 75.) The greater part of each is imbedded in the white substance of the hemisphere (extra-ventri- cular portion), whilst the part seen in the floor of the lateral ventricle is called the intra-veutricular portion. Each of these contains a nucleus of grey matter, the nucleus caudatus in the intra-ventri- cular and the nweleus lentiewlaris in the extra-ventricular. The latter is separated internally froin the intra-ventricular portion by a laycr of white matter called the “internal capsule,” whilst on the outer side there is another layer of white matter called the “external capsule,” beyond which, again, is a lamina or web of grey matter, called the “claustrum,” which scparates the external capsule from the island of Rcil. The internal capsule is of great importance inasmuch as it is continuous with the eruwsta, a portion of the erus cerebri, which, in turn, is a continuation of the pyramidal fibres of the medulla oblongata and the pons. Multipolar nerve- cells are found in the nucleus caudatus ; in the claustrum the cclls are small and spindle-shaped. Postcriorly, therefore, the corpus striatum is related by fibres with the optic thalamus ; inferiorly, through the internal capsule, with the pyramidal portion of the medulla and cord; and externally and superiorly with the grey matter of the cerebrum. The corpus striatum is a centre for the co-ordination of centrifugal or motor impulses. It may be roused into activity by impressions reaching it directly from the optic thalamus, but probably it usually acts in obedience to impulses coming from the cerebral hemispheres. When a clot of blood is formed in, say, the right corpus striatum there is motor paralysis of the opposite side of the body, and, according to the size of the clot, the paralysis may affect more or less completely the different groups of muscles. Destruction of the

two bodies destroys voluntary movement, but the animal may move forwards asinrunning. De- struction of the nucleus caudatus renders movements of progression impossible, and the animal performs movements of rotation. Noth- nagel by injecting a minute drop of a solution of chromic acid destroyed the nucleus lenticularis of a rabbit, with the result of throwing the animal into complete unconsciousness. He also states

; [NERVOUS ©

frritation causes movements of the eyeballs and other movements ~ indicative of vertigo. Section of the middle peduncle on one side causes the animal' to roll rapidly round its longitudinal axis, the rotation being towards the side operated en., '. 77 If the cerebelluin be removed gradually by successive slices—an operation easily done in a pigeon—there is a progressive effect on locomotive actions. Qn — taking away only the upper layer tliere is some weakness and a hesitation in gait. When the Sections have reached the iniddle of the organ the animal staggers much, and assists itself by its wings in walking. . The sections being continued further, it is no longer able to preserve its equilibrium withdut the. assistance of its wings and tail; its attempts to fly or walk resemble the fruit- less efforts ofa nestling, and the slightest touch knocks it over. At last, when the whole cerebel- lun is removed, it can- not support itself even with the aid of its wings and tail; it makes vio- lent efforts to rise, but only rolls upand down; then, fatigued with struggling, it remains for a few seconds at rest on its back or ab- domen, and then again commences its vain struggles to rise and walk, Yet all the while sight and hearing are ' perfect. See fig. 26. It attempts to escape, and appears to have all its sensa- tions perfect. The results contrast very strongly with those of removing the cerebral lobes, ''Take two pigeons," says Longet; ''from'one remove com- pletely the cerebral lobes, and from the other only half the cerebellum; the next day the first will be:firm on its feet, the second will exhibit the unsteady and uncertain gait of drunkenness," 2

There is thus a loss of the power of co-ordination, or of regula. | + tion of movement, without the loss of sensibility, and hence it has | . been assumed that in some way or other the cerebellum acts ag the co-ordinator of movements: , ;

Co-ordination of Movement.—The nervous mechanisms by which Oooh — movements are co-ordinated—that is, adapted to specific ends—are dinaliin not thoroughly understood, but a short description of what is of moe known may be here given. Muscular movements may be either ment . simple or complex. In winking, the movement of the eyelid is

that in the corpus striatum -of the same animal there is a point; the nodus cursorius, the excitation of which caused the rabbit to rush forwards. ‘This obServation’ agrees with the statement of Magendie that, when he injured the corpora striata, the animal seemed to have an irresistible propulsion forwards. Ferrier states that when the corpora striata were stimulated by an interrupted current convulsive movements of the opposite side of the body took

Fig, 26.—Pigeon

from which the cerebellum has been removed.

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Fic. 24.—Three pairs of cerebellar peduncles (from Sappey, after Hirschfeld and Leveillé. Quain). On the left the three cerebellar peduncles have been cut short; on the right side the hemisphere has been cut obliquely to show its connexion with the superior and inferior peduncles. 1, median groove of fourth ventricle ; 2, the same groove at the place where the auditory striz emerge from it to cross the floor of the ventricle; 8, inferior peduncle or restiform body; 4, funiculus gracilis; 5,5, superior peduncles,—on the right the dissection shows the superior and inferior peduncles crossing each other as they pass into the white substance of cerebellum; 6, 6, fillets at the side of crura cerebri ; 7, lateral grooves of crura cerebri; 8, corpora quadrigemina.

place ; and when the current was powerful the side of the body opposite to the side of the brain stimulated p.. was forcibly drawn into an arch.

effected by two muscles, one bringing the lid down, the other rais- ing it. But pieking up a pen from the table, taking a dip of ink,

Pedun- Cerebellum.—In connexion with the phy- and writing a few words involve a complicated set of movements cles of siology of this organ it is important to note of the muscles of the trunk, shoulder, arm, forearm, fingers, and cere- its conuexions with the rest of the cerebro- thumb. To perform the movements with precision ‘each muscle or bellum, spinal axis. It has three peduncles : (1) the group of muscles must act at the right time and to the proper superior peduncles (see fig. 24)—crura ad cere- amount. ‘It is also clear that all this is accomplished autotmatic- brum, or processes ad testes —together with |v ally. Weare not conscious of the requisite combinations ; but it the valve of Vieussens, connect the cerebellum “| must be noted that many of these complicated movements are first to the cerebrum ; (2) the inferior peduncles, |* acquired by conscious efforts, and that they become automatic only or crura ad medullam, are the superior ex- | by repetition. Again, in walking, equilibrium is maintained by a tremities of the restiform bodies; (8) the A delicate series of muscular adjustments. When we swing forward middle peduncles, or crura ad pontem, much one leg and balance the body on the other many muscular’ move- the largest, are the lateral extremities of the i) ments occur, and with every change in the position of the centre transverse fibres of the pons Varolii. They’ of gravity in the body there are corresponding adjustments. It act as commissural fibres for the hemispheres 7J || would appear that in all mechanisms of co-ordination the first part of the cerebellum. All these peduncles pass q | of the process is the transmission of sensory impressions from the into the interior of the cerebellum at its fore- | p4)\| \ periphery. These sensory impressions may be derived from the part. In the interior of the organ, where the] [/\j/ skin or muscles, and may be caused by variations of pressure arising peduncles enter, we find a nueleus of grey Puy in them. Thus, if we lift a heavy weight, as a large stone, by the matter, the corpus dentatum. The cortical £4 right hand and raise it to the bend of the elbow we throw the body substance consists of two layers,—an outer —] to the other side by the action of the muscles of that side, thus molecular layer, consisting of a delicate ma- 5% maintaining the equilibrium. We judge of the amount of force trix containing a few round cells and fibres, 4 necessary to overcome an obstruction by the feeling of resistance we and an inner or

granule layer, containing ¢ encounter. All the movements of the body, therefore, give rise to granules or nueleated eorpuseles closely feelings of varying pressures, and these feelings regulate the amount packed together. The corpuscles are from or degree of muscular action necessary to maintaih equilibrium, or zvyoth to zsyoth of an inch in diameter, to perform a requisite movement. This is at first a conscious ex- and are mixed with a network of delicate perience, and a child has to pass through an education, often involyv- nerve-fibres. At the junction of the granu- ing pain, before the nervous mechanisms become automatic and the lar layer with the molecular layer there are movement is done without effort. But the ordinary sensory nerves, peculiar large cells called “ Purkinje’s cells.” s8¢ coming from skin and muscle, are not the only channels by which They are flask-shaped and about {5th to 28 such guiding mechanisms are set in action. As one would expect, tooth of an inch in diameter, and the long sensory impressions, such as those associated with sight and hearing, process is directed towards the surface of the “== may be brought into play. oie (see fig. 25). The white centre of ee e 1. Peripheral Impressions from Semicircular Canals.—If the Tmpres = ny ra of delicate nerve-fibres, °==«=== —— membranous pager of the horizontal semicircular caval in the S100 eabstateva dead tata = =. = internal ear of a pigeon be cut, the bird moves its head from side to | inter cian 8 sitio Abaue il cd ey “ —— side, and if one of the vertical canals be divided it moves the head sem Teeny open ll ni cingetg e pat e an * o hinovany section | up and down. The effects may pass off in a few days if only one ” On ws heen ; urxinjes cells. Phrough cortex of cere- | canal has been cut. If the canals on both sides be divided them n comparing the section of cerebrum (fig, bellum (Sankey). «, pia | movements are e ted and th dition b t 28) with that of cerebellum (fig. 25) the con. Mater; > external layer; | 7. ay iy Se nd eee tae is atric Th 8 ¢, layer of cells of Pur- will then be observed that the animal has lost the power of co- { iking. e structure of eerebellum kinje; d, inner or gran- ordinating its movements It t with only a twitcliin is more like that of the retina (vol. i. p. 888, Ule layer; ¢ medullary | perhaps. of th head, b if j pint eee Boe : eo Experi- fig. 78) than of any other nerve-centre. centre. perhaps, of the head, but if it attempt to fly or walk its movements asia Ge, Reeuiing a Beene ae ata ae are indefinite and irregular, like those of a dizzy person, or like _ esults of Experiments. —The cerebellum is insensible to mechan- | those described as following in} P i] cine. teal exaltation. © ie Bees :

ollowing injury to the cerebellum. The irregular excitations uncture causes no indications of pain, but there | movements do not arise from deaf. ises in th tial bellum. may be twisting of the head to the side. 2 Dene deena oY hoes ee ee

Ferrier states that Faradaic

paralysis, or from an uncontrollable impulse. Any strong sensory

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. guided and controlled by the sense of vision. Simply blindfolding

impression, such as holding the bird, supporting its beak, or hold-

ing a brilliant light before its eyes, will steady it, and it has been noticed that ‘it can, even without assistance, clean its feathers and * seratch its head, its beak and foot being in these operations guided

by contact with its. own body.” It has been supposed that the semicircular canals are concerned in the mechanism of equibration,

—a view urged chiefly by Mach and Crum-Brown. Ifa blindfolded |

man ds seated on a horizontal rotating table, such as that used in a lighthouse for rotating or eclipsing the light, and the table is turned round, at first there is a sensation of movement in the same direction as that of the table; then this sensation fades away, until he has no sensation of movement, although the table may be rapidly rotating ; finally, if the table be stopped without a jerk there is first a very short period in which there is no definite sensation, which is succcedéd by a sense of rapid movement in the opposite direction, often accompanied by a feeling of nausea, Now it is evident that neither sight. nor touch nor muscular sensations can give a sense of rotation in these circumstances, and yet it is possible to form a fairly accurate judgment. of the angle through which the body has moved. It has been suggested that this is effected by the action of the semicircular canals. tions are surrounded by a fluid called the ‘‘ endolymph,”.and are free to move through a short distance. Hence it has been supposed that

rotations more or less rapid must cause variations of tension of the membranous portion. Thus, if the membranous part, especially the ampulla or dilated ends of the canals, lag behind when rotation in one direction takes place, the nerves ending in them will be subjected to a strain ; by and by both membranous portions and surrounding parts will be moving with the same velocity, when there will be no strain and no sense of movement ; and at last, when

_the rotatory movement.is arrested, there will be a tendency on the

art of the membranous portions, as they are floating in a fluid, to move on a little farther than the rest, and thus again produce a strain, causing a sensation of movement in the opposite direction. By similar reasoning it can be shown that if we take the peculiar position of the three canals into consideration any movement in space might be thus appreciated, and these appreciations enter into the judgment we form of the movements. According to this theory, the sense of equilibrium may be largely due to impressions derived from the position of the head, and, as muscular movements required for placing the body in definite positions are determined, as we have seen, by peripheral impressions, the irregular movements of the pigeon, ‘after injury to these canals, may be accounted for. It is not improbable that in the bird, which from the structure ‘of its extremities—feet and wings—can have no peripheral impressions so delicate as those derived from the papille of the skin on the extremities ofother animals, the sense of equilibrium is maintained chiefly by impressions from these canals, and this may account for thé comparatively large size of these organs in birds and fishes. This is in correspondence also with the requirements of birds in the balancings of flight and of fishes in swimming. It is well known that disease or injury of these canals in the human being produces symptoms of vertigo and a diminution of the power of co-ordinated action, as in Menibre’s disease, showing that the canals, even ir man, have similar functions to those in the bird. : 2. Peripheral Impressions from the Eye.—Many movements are

a bird usually makes it passive, and it will not attempt either to walk or to fly ; the same effects to a less degree may be seen in a mammal ; and a blindfolded man will stagger in his gait. The wonderfully accurate

movements of the blind in walking are ac- quired by long and laborious effort, and are guided by the sensa- tions of hearing, of touch, and of resistance. If the optic lobes of a frog be destroyed, its power of balancing itself is lost. There are thus at least three channels by which peripheral impressions pass to the centres-and seem to guide or co-ordinate movement: (1) from the periphery, by nerves of ordinary sensibility arising in the skin, muscles, and viscera ; (2) from the semicircular canals of the ear, by special nerve-fibres in the auditory nerve ; (3) from the eye, by fibres of the optic nerve. How and where these skeins of sensi- tive impressions are gathered up and so arranged as to call forth the requisite movements can only be conjectured ; but the cerebellum is the organ most likely to be concerned in such a mechanism. It is in organic connexion with many of the nerve-fibres conveying sensory impressions. By the restiform bodies it receives many of the sensory fibres of the spinal cord ; the auditory nerve has roots intimately related to the cerebellum ; and it is fair to assume that there are communications between the corpora quadrigemina and

the cerebellum. Stimulation of the cerebellum causes movements |

of the eyeballs, and disease of the cerebellum is sometimes attended by blindness. How the cerebellum co-ordinates movement is quite unknown, and the difficulty in explaining its functions is not lessened by the clinical fact that extensive disease of this organ may exist without any appreciable sensory or motor disturbance. There is no evidence to support the view of the founders of phrenology that the cerebellum has to do with the sexual functions.

Cerebral Hemispheres.—As these have been fully described in vol.

The membranous por- |

i: p. 873, it is only necessary here to point out the anatomical facts that assist in explaining the functions of the organ. It is import- ant to observe,

first, the gencral arrangements, of the fibres, and, secondly, the arrangement and structure of the grey matter. The white matter of the cerebrum consists of ascending or peduncular fibres, longitudinal or collateral fibres, and of transverse or com- missural fibres. x.

(1.) Peduneular Fibres.—The crusta of the cerebral peduncles consists of bundles of ‘ah longitudinal fibres de- si rived mainly from the anterior pyramid of the medulla. The crust is quadrilateral in form, but in ascending to the hemispheres it becomes flattened from above downwards, so that the fibres spread out like a fan. The fan formed by these fibres is bent into the form of an incom- plete hollow cone, the convex surface of which is directed upwards and inwards. ‘Thus the fibres)p pass between the optic thalamus and the lenti- cular nucleus, forming the internal capsule. Higher up the fibres pursue their course be- neath and to the outside of the thalamus and the caudate nucleus, and over the lenticular nu- cleus, ‘‘Still higher up the internal capsule has spread out from before backwards, while the anterior half forms an obtuse angle with the posterior, The angle where the halves meet is called the knee (fig. 27, K), while the divi- sions themselves are called the anterior’ (fig. 27, IK’) and_ posterior segments of the internal capsule ” (Ross). On emerging from the basal anglia the fibres of the internal capsule radiate in all directions to reach the cortex of the brain, giving rise to the appear- ance called the ‘corona radiata.” The following sets of fibres have been traced into connexion with the cerebrum.

(a) Sensory peduncular fibres, derived from the posterior root-zones and the

columns of Goll. These are in connexion with the cerebellum ; but, as shown by Meynert, Flechsig, and others, many pass up through the pons to reach the

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Fra. 27.—(After Flechsig.) Horizontal section of brain of child ‘nine months old, only a portion of the right side being shown. F, frontal, TS, temporo-sphenoidal, and 0, occipital lobes ; op, operculum ; Jn, island of Reil ; Cls, claustrum ; f”, third frontal convolution ; Th, optic thal- amus ;

NC, caudate nucleus; NC’, tail of caudate nucleus ; LN, lenticular nucleus ; IJ, III, second and third divisions of lenticular nucleus; EK, external capsule; IK, posterior division, 1K’, anterior division, and K, knee of internal cap- sule; ah, ph, anterior and posterior horns re- spectively of lateral ventricles; gcc, knee of corpus callosuin ; sp, splenium ; me, middle com- missure ; Jf, fornix ; sl, septum lucidum.

erus cerebri, occupying the posterior and external portion of the pyramidal

tract. They do not appear to be connected with the optic thalamus and the lenticular nucleus, but pass between them to the cortex. (6) Fibres from the roots of the optic nerves, reaching the brain by what have been called the ‘optic radiations of Gratiolet.”” This bundle of fibres issues from the posterior and external border of the optic thalamus, and is closely applied to the pedun- cular sensory tract in its passage through the internal capsule, and the fibres seem to be connected with the convolutions of the occipital lobe. It is im- portant to note that at least one of the roots of the optic nerve (the internal) passes into the external geniculate body and thence into the anterior bodies of the corpora quadrigemina. Thus there is a path for the passage of impressions from the retina to the cortex of the brain. (c) Fibres from the olfactory lobes have been traced to a junction with the optic radiations of Gratiolet, and pass with them to the convolutions of the cortex of the occipital or temporo-sphen- oidal lobe. (d) The pyramidal tract has already been traced through the spinal cord, medulla, and pons. It then goes on, as already seen, to form the internal capsule and the corona radiata, the fibres ending in the parietal lobule, the paracentral lobule, the superior extremities of the ascending frontal and parietal convolutions, probably the posterior extremity of the first frontal convolution, the posterior extremity of the third frontal, and the inferior extremities of the ascending frontal and parietal convolutions,—in short, in the convolutions forming the middle and parietal region of the surface of the cortex. (e) Fibres issuing from the external surface of the optic thalamus to join the internal capsule. These are distributed to the convolutions of the frontal and parietal lobes. (f) Fibres issuing from the external surface of the caudate nucleus, passing also into the corona radiata. (g) Fibres issuing from the superior and internal surface of the lenticular nucleus to join the ascending fibres of the internal capsule. (h) Fibres ascending from the superior peduncle ofthe cerebellum. Flechsig

says that some of the fibres of the superior peduncle of the cerebellum of the opposite side pass uninterruptedly through the red nucleus and along the internal surface of the fibres of the pyramidal tract to

Pedun- cular

fibres ot

cere- brum.

Longi- tudinal fibres of cere- brun.

Com- missural fibres of cere- brumn.

Arrange- ment and

structure A web or sheet of it is also thrown over the

of grey matter.

AO

be distributed to the central convolutions of the cerebrum. (i) Fibres issuing from the corpus callosum and descending into the internal capsule. (k) Fibres of the external capsule which ascend from the crusta and ultimately reach the cortex through the corona radiata.

In addition to the peduncular fibres above enumerated, all of

which belong to what may be termed the system of the internal capsule and corona radiata, fibres from the fornix, tenia seml- circularis, outer layer of septum lucidum, and the fillet of the crus also pass from below upwards to the cortex of the hemispheres (Ross).

(2.) Longitudinal mediately below the

or Collateral Fibres.—(a) Fibres running im- surface of the cortex, and connecting the grey matter of adjacent convolutions. (5) Fibres in the gyrus fornicatus, a convolution immediately above the corpus callosum. It is said

that bands of these fibres arise in the anterior perforated space and pass completely round the corpus callosum to end in the same per- forated space, and that offsets of these fibres pass upwards and backwards to reach the summits of the secondary convolutions derived from the gyrus fornicatus near the longitudinal fissure. (c) Longitudinal fibres of the corpus callosum (nerves of Lancisi), connecting the anterior and posterior ends of the callosal convolu- tion. (d) Longitudinal septal fibres, lying on the inner surface of the septum lucidum, and entering into the gyrus fornicatus. (¢) The fasciculus uncinatus, passing across the bottom of the Sylvian fissure and connecting the convolutions of the frontal and temporo- sphenoidal lobes. (f) The longitudinal inferior fasciculus, connect- ing the convolutions of the occipital with those of the temporal lobe. (3.) Transverse or Commissural Fibres.— Tr 7 FT (a) Many, if not all, of the fibres of the — corpus callosum pass transversely from ! YY 1 t one side to the other ye connect ecw sponding convolutions in the hemispheres. This is the generally accepted view; but At Hy VK f 4 Professor Hamilton of Aberdeen has recently (f A } (\ NN is gh! stated that his preparations show that there 9 it (h I} Al! \A is no such commissural system between con- t { A 4 \i volutions, and that the fibres decussating in the corpus callosum are not continued to convolutions on the other side, but pass downwards. (b) The fibres of the anterior commissure wind backwards through the lenticular nuclei to reach the convolutions round the Sylvian fissure. (c) The fibres of the posterior commissure run through the optic thalami.! , Arrangement and Structure of Grey Mat-

ter.—The grey matter in the medulla and basal ganglia has been already considered.

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surface of the cerebrum, and forms the outer portion of all the convolutions. The cor- tical substance consists of cells and fibres imbedded in a matrix similar to the neuroglia of the spinal cord. It may be divided into five layers, which merge into each other by almost insensible gradations, The most cx- ternal layer consists of delicate nerve-fibres, neuroglia, and a few small round cells desti- tute of processes (see fig. 28). Going deeper we find cells of a characteristic pyramidal , form, the largest being in the deepest

layer. ” Their bases are turned inwards, and their apices towards the surface of the convolu- tion. Cleland states that fibres passing from the apices are continuous with the delicate fibres found on the very surface of the cor- tex. In tne ascending frontal convolu- tions Betz and Mierzejewski have found : pyramidal cells two or three times larger = than those of other regions of the cortex, and these have been termed “ giant-cells.” All the pyramidal cells, no doubt, anasto- pyg, 98 mose by their processes, and give origin to Vertic the nerve-fibres of the white substance, but it is rarely possible to trace the fibres from cell to cell. A consideration of these ana- tomical facts, along with those mentioned in connexion with the comparative anatomy of the brain, shows that the cerebral hemi- spheres are in intimate connexion by fibres with all the other portions of the cerebro- spinal system. Further, they are not on’y intricate in structure themselves, but the the claustrum); m, me- commissural sets of fibres indicate that dulary lamina,” ”

there is harmony of function between one part and another. In

—(After Meynert.) Vertical section of a fur- row of third cerebral con- volution of man. 1, layer of scattered small corti- cal corpuscles; 2, layer of close-set sinall pyra-

mnidal corpuscles; 3, layer of large pyramidal cortical corpuscles; 4, layer of small close-set irregular-shaped corpus- cles ; 5, layer of fusiform corpuscles (like those in

1 In preparing the foregoing sketch of the fibres of tl ri Ti is much indebted to Ross, Diseases of the Nervous 8) on ng hain ia

determining the function of so complicated an apparatus recourse must be had to the evidence (1) of development, (2) of compara- tive anatomy, (3) of human anatomy, (4) of the observed effects of disease before and after death, and (5) of experiment. Facts have already been collected from the first three of these fields of inquiry, all tending to show that the grey matter of the hemi- sphere is associated with the manifestation of intelligence in it various forms. The phenomena of disease support the same con. clusion. Diseases producing slow changes in the layer of grey matter on the cortex are invariably associated with mental disturb. ance, such as melancholia, mania, or dementia. If the grey matter be suddenly injured or submitted to compression, as by a blow causing fracture and depression of a portion of the skull, or the effusion of fluid consequent on inflammation, unconsciousness is a certain result. So long as the pressure continues there is no con- sciousness ; if it be removed, consciousness may soon return. On the other hand, if the disease affect the white matter of the central portions or the ganglia at the base, there may be paralysis or con- vulsions without consciousness being affected. All the facts, therefore, of pathology relating to the brain indicate that the grey matter on the surface of the hemispheres is the organ of conscious ness and of all mental operations. This statement

is nowan axiom of medical science, and the basis of the rational treatment of the insane and of all maladies of the central nervous organs.

Two methods of experiment upon the cerebrum have usually been followed, and both have yielded important results.

(a.) Removal.—Flourens and the older observers were aware of Ren the fact that as successive slices of grey matter are removed fromofgy

the surface of the cere- brum an animal be- comes more dull and stupid, until at last all indications of percep- tion and volition dis- appear. A pigeon in this condition (see fig. 29), if carefully fed, may live for many months; to quote from —==Sa=e= . = Dalton – : = “The effect of this muti- F1a. 29.— Pigeon, in which the cerebrum has bee lation is simply to plunge injured or removed. the animal into a state of profound stupor, in which it is almost entirely inattentive to surrounding objects. The bird remains sitting motionless upon his perch or standing upon the ground, with the eyes closed and the head sunk between the shoulders, The plumage is smooth and glossy, but is uniformly expanded by a kind of erection of the feathers, so that the body appears somewhat puffed out, and larger than natural. Occasionally the bird opens its eyes with a vacant stare, stretches its neck, perhaps shakes its bill once or twice, or smooths down the

ey upon its shoulders, and then relapses into its former apathetic con- dition.”

Similar observations have also been made on reptiles and mammals, but the latter survive the operation for a comparatively short time. In watching such an animal it is difficult to divest one’s mind of the belicf that it still feels and sees and hears. It may be observed that it rarely makes movements unless stimulated from without, Thus it may remain motionless for many hours ; but if pushed, or gently touched, it moves. As remarked by Prof. M. Foster— ‘“No image, either pleasant or terrible, whether of food or of an enemy, pro duces any effect, on it, other than that of an object reflecting more or less light. And, though the plaintive character of the cry which it gives forth when pinched suggests to the observer the existence of passion, it is probable thatis. a wrong interpretation of a vocal action ; the cry appears plaintive, simply be- cause, in consequence of the completeness of

the reflex nervous machinery and the absence of the usual restraints, it is prolonged. The animal is able to execute all its ordinary bodily movements, but in its performance nothing 1s ever seen to indicate the retention of an educated intelligence.”

(b.) Electrical Stimulation of Surface of Brain.—It is remarkable Blecis that, although many of the early workers in cerebral physiology stint stimulated the surface of the brain by electric currents, they tion Mattencci, Longet, brill Weber, Budge, Schiff, and others taught that irritation of the surfie

observed no effect, and therefore Magendie,

surface of the hemispheres called forth no muscular movements; and it was generally accepted that the grey matter on the cortex of the brain was entirely concerned in the phenomena of sensation, volition, and intellectual action. During the Franco-German wat in 1870 Hitzig had occasion to apply galvanism to a portion of the exposed brain of a wounded soldier, and he observed contrac tions of the muscles of the eyeball. When peace was restored, experiments Were made on the lower animals by Hitzig and F ritsch, in which a portion of exposed brain was irritated by 4 continuous current, and it was observed that the phenomena took place on opening and closing the current. By these experiments the German observers discovered that, when certain areas of grey matter were stimulated, contractions of certain muscles occurred, and they were thus able to map out areas for grotips of muscles. Immediately afterwards the research was taken up by Professor David Ferrier of King’s College, London, who, using a Faradaic instead of a continuous current, greatly extended the field of Inquiry, and obtained many important results, which are not only

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of value in cerebral physiology but have been successfully applied to the diagnosis of various diseases of the nervous system. The motor areas as determined by Ferrier in the monkey are shown in fig. 30. Dr Ferrier has also indicated the corresponding motor areas in man by carefully comparing the convolutions with those of the monkey.! An inspection of the figures shows that the areas which, when stimu- lated, give rise to definite movements are distributed only over a part of the cortex. As stimulation gives rise to no movements over other regions of the brain, these have been assumed to be conneeted with psychi- cal states, such as sensation, volition, &c. Much controversy has arisen as to the real

Fia. 30.—A. Li ft hemisphere of monkey. B. Upper surface of hemisphere of monkey. The numbers in A and Bcorrespond. 1, advance of opposite leg as in walking; 2, complex movements of thigh, leg, and foot, with adapted movements of trunk; 3, movements of tail; 4, retraction and adduction of opposite fore-limb; 5, extension forward of opposite arm and hand, as if to reach or touch something in front; a, 0, ¢, d, individual and combined move- ments of fingers and wrists, ending in clenching of fist ; 6, supination and flexion of forearm, by which the hand is raised towards the mouth ; 7, action of zygomatics, by which the angle of the mouth is retracted and elevated ; 8, elevation of ala of nose and upper lip, with depression of lower lip, so as to expose the canine teeth on the opposite side ; 9, opening of mouth with protrusion of tongue ; 10, opening of mouth with retraction of tongue ; 11, retraction of angle of mouth ; 12, eyes opening widely, pupils dilating, head and eyes turning towards opposite side ; 13, 13’, eyeballs moving to opposite side,—pupils generally contracting ; 14; sudden retraction of opposite ear ; 15, subiculum cornu ammonis,— torsion of lip and nostril on same side. (Ferrier.)

nature of these so-called ‘‘ motor areas.” It has been clearly ascer-

tained that the effects are not due to diffusion of the electric currents influencing other parts of the brain. That there is to some extent such

diffusion between the electrodes there can be no doubt, but the exact correspondence between the area stimulated and the

movements produced, and the fact that shifting the electrodes a

very short distance to one side or another is followed by different

results, show that the effect is somehow owing to changes excited by the electric current in that particular area of grey matter.

Hitzig, Ferrier, and others have also found that removal of the

layer of grey matter of a ‘‘ motor centre” is followed by enfeeble-

ment of the movements assigned to the area, but in the course of

a few days the paralytic symptoms disappear. The latter effect

cannot be due to the corresponding centre on the opposite side

taking up the work ‘‘as subsequent destruction of the latter pro- duced the usual paralysis on the side opposite to the lesion, but

did not cause a repetition of the paralysis on the side opposed to

the first lesion” (Carville and Duret). It would appear, therefore,

that after destruction of a centre on one side some other part of the same hemisphere may take up the functions of the destroyed part. Goltz of Strasburg has removed large portions of the grey eortex (even to the extent of almost the whole of one hemisphere) by a jet of water so as to avoid hemorrhage, and still recovery of motor power took place after a time, although there remained

‘‘clumsiness in the execution of certain movements.” His opinion

is that the paralytic phenomena are caused by the injury exciting

an inhibitory aetion on lower centres. This view, substantially that advocated for many years by Brown-Séquard does not explain why it is that gentle irritation of the centre by a weak Faradaic current calls forth movements of a definite character. The evidence, therefore, is strongly in favour of the view that there are definite motor areas of grey matter on the cortex,—that is, in ordinary circumstances these areas are intimately related to specific muscles or groups of muscles. It is quite possible, however, that each group o muscles does not depend on one area alone, but on several, whilst it is more intimately related to one than to the others. This would account also for the fact that movements of a group of muscles re be excited by stimulation of other areas than those mapped out

y Ferrier and Hitzig. Recently areas associated with definite move- ments of the thorax, abdomen, and pelvis have been discovered by

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Ferrier has also attempted to differentiate sensory centres.

and associated movements of the head, and he regarded the pheno- mena as being "' merely reflex movements on the excitation of sub- jective visual sensation." He then found that, '' when the angular gyrus of the left hemisphere was destroyed, the animal was blind on the right eye soon after the operation, but recovered sight com- pletely on the following day." On destroying the angular gyri of both hemispheres, an animal became permanently blind in both eyes. In neither case was there motor paralysis. By similar processes of thought and experiment he placed the auditory centre in the superior temporo-sphenoidal convolution, the centres of taste and smell at the extremity of the temporo-sphenoidal lobe, and that of touch in the gyrus uncinatus and hippocampus major. On the other hand, Goltz asserts that even after removal of a con- siderable part of the cortex the animal is not actually blind, but suffers from an imperfection of sight; and he states that he "can no more obtain distinct evidence of localization in reference to vision or other sensations than in reference to movements." Ferrier's view is supported by the observations of Munk, who finds that destruction of a considerable portion of the occipital lobes causes blindness.

Munk has put forth the important distinction that there may be blindness in the sense of total deprivation of vision, and “psychical blindness,” or the ‘inability to form an intelligent comprehension of the visual impressions received”; and he supposes that the grey matter of the cortex over the occipital isten tint to do with the elaboration of simple visual impressions into perceptions. In like manner he concludes that other parts of the cortex may have to do with the elaboration of tactile, olfactory, gustatory, and auditory sensations. This is a likely hypothesis, and not very dissimilar to what has been held for many years, the only novelty being that there is localization in these actions. At present the question cannot be regarded as settled ; but it may be stated generally that the posterior portion of the brain has to do chiefly with the reception of sensory impressions, and the middle and lateral regions with the transmission outwards of motor impulses, But there still remains the anterior portion. Electrical irritation of the pre-frontal region of the cortex in the moukey causes no motor reaction. Complete destruction causes no paralysis of motion and no sensory disturbance. Dr Ferrier states :—

‘Removal or destruction by the cautery of the antero-frontal lobes is not followed by any definite physiological results. The animals retain their appetites and instincts; and are capable of exhibiting emotional feeling. The sensory faculties—sight, hearing, touch, taste, and smell—remain unimpaired. The powers of voluntary motion are retained in their integrity, and there is little to indicate the presence of such an extensive lesion or a removal of so large a part of the brain. And yet, notwithstanding this apparent absence of physiological symptoms, I could perceive a very decided alteration in the animal’s character and behaviour, though it is difficult to state in precise terms the nature of the change. The animals operated on were scleeted on account of their intelligent character. After the operation, though they might seem to one who had not eompared their present with the past fairly up to the average

of monkey intelligence, they had undergone a considerable psychological altera- tion. Instead of, as before, being actively interested in their surroundings, and curiously prying into all that came within the field of their observation, they remained apathetic or dull, or dozed off to sleep, responding only to sensations or impressions of the moment, or varying

their listlessness with restless and purposeless wanderings to and fro. While not actually deprived of intelli- gence, they had lost to all appearance the faculty of attentive and intelligent observation ” (Functions of the Brain, 1st ed., p. 231).

Thus the frontal lobes appear to have to do with cognition and intellectual action. If so, the grey matter on the surface of the brain may be mapped out into three great areas—an area concerned in cognitions, and volitions in front, a motor or ideo-motor area in the middle, and a sensory area behind. These distinctions are no doubt arbitrary to a considerable extent ; but, if they are retained as the expressions of a working hypothesis, they are of service. Long ago, and prior to the researches above alluded to, Dr Hughlings Jackson pointed out that disease of certain areas of grey matter on the cortex of the hemispheres may occasion epileptiform convulsions, localized to particular groups of museles. The theory of the localization of motor functions has been of great service in the diagnosis and prognosis of such diseases. As to the localization of the faculty of language in the third left frontal convolution, founded on pathological evidence, see APHASIA, vol. ii. p. 171.

The functions of the nervous system have now been described ; but they are so complicated and so closely related to each other as to make it no easy matter to form a conception of the system working as a whole. The progress of discovery naturally tends to differentiation, and probably to attach too much importance to one organ as compared with the others, so that we are in danger of losing sight of the solidarity of the whole nervous system. Probably every nervous action, however minute and evanescent, affects more or less the entire system, and thus there may be an under-current of nervous action streaming into and out of the nerve-centres, along with a perpetual series of interactions in the centres them- selves, contributing to and accounting for the apparent continuity

On Sensory stimulating the angular gyrus he obtained movements of the eye centres.

Horsley and Sehifer, and thus almost all the muscular mechanisms

; : of conscious experience. Certain relations of one nerve-centre to have been connected with some of the cerebral convolutions. P

the others are indicated in fig. 31. No one now déubts that con- Consciousness has an anatomical substratum, but the great problein scious- of the relation between the two is as far from solution as in the ness.

XIX. — 6

1 For figures of human brain showing motor areas, see Foster’s Physt stol 4th ed., figs. 86 and 87, pp. 627, 628. ; mt = Ge

Cireula- tion in brain.

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days when little or nothing was known of the physiology of the nervous system. Consciousness has been driven step by step upwards until now it takes refuge 5 in a few thousand nerve-cells in a portion of the grey matter of the cortex of the brain. The ancients believed that the body partici- pated in the feelings of the mind, and that, in a real sense, the heart : might be torn by contending Ag emotions. As science advanced, consciousness took refuge in the Maays brain, first in the medulla and lastly in the cortex. But even supposing we are ultimately able KIB to understand all the phenomena —chemical, physical, physiologi- cal—of this intricate ganglionic mechanism we shall be no neare1 a solution of the problem of the connexion between the objective and subjective aspects of the phenomena. It is no solution to resolve a statement of the phenomena into mental terms

or expressions aud to be content with pure idealism ; nor is it any better to resolve all the pheno- mena of mind into terms describ- ing physical conditions, as in pure materialism. A philosophy : “4 : eee nie Bae j . Fia. 81.—M., muscle; SK., skin ; CE ay

that Tecognizes ong i nm P = reflex centre A INH., inhibitory centre; ctl ee mutua Sousa ee MOT., motor centre; G.SE., centre of ever interacting, may be no ex- general sensation; S.SH., centre of planation ; but at all events it is ora ee ms — ra

4 y ° ibrium; ay ¥ re; vam oe pare atin: peel facts, emotional centre ; ID., ideational cen- and does not delude the mind by tre; EY., eye; EA., ear; TA., taste ; offering a solution which is no SM., smell; V., vessel; G., gland; solution at all. But apart from &V., heart and hy he pd the ultimate question there is the {7 Organs In Borne ese ee Ly fol. t q indicate direction of currents, by fol- important one of whether phy- lowing which the influence of one siologists are on the whole right centre over another may be studied. in relegating sensation or consciousness entirely to the grey matter of the brain. The facts of comparative physiology are against such an exclusive notion, because we cannot deny consciousness to many animals having rudimentary nervous systems. As already said, research in anatomy and physiology and the observation of disease have driven physiologists to adopt the view that the brain is the organ of sensation. This is no doubt true in the sense that it ultimately receives all those nervous impressions that result in consciousness ; but the parts transmitting the nervous impressions are in another sense as much concerned in the produc- tion of conscious states as the brain. This view of the matter, put forward by Professor John Cleland in 1870, has not received from psychologists the attention it deserves, His thesis is— “‘that the consciousness extends from its special seat so far as there is con- tinuity of the impressed condition ; that when an irritation is applied to a nerve-extremity in a finger or elsewhere the impression (or rather impressed condition) travels, as is generally understood, but exists for at least a moment along the whole length of the nerve, and that as soon as there is continuity of the impressed condition from finger to brain the consciousness is in connexion with the nerve and is directly aware of the irritation at the nerve-extremity ” (Evolution, Expression, and Sensation, Glasgow, 1881, p. 106). This view is quite consistent with all the facts of nervous physio- logy and presents fewer difficulties than the one generally held, which drives consciousness into the recesses of the nerve-cells in the cortex of the cerebral hemispheres. It appears to kcep clear of the prevailing error in the philosophy of modern physiology, —that of regarding the body and even the nervous system as a vast series of almost independent organs, losing sight of the community of function and interdependence of parts, characteristic of the body of one of the higher animals.

CIRCULATION IN THE BRAIN.

A due supply of healthy arterial blood and the removal of venous blood are essential to cerebral activity. The brain is contained in an osseous case of which the total capacity is variable. The cere- bral substance undergoes almost insignificant changes of volume even under a pressure of 180 mm. of mercury. The quantity of blood in the cranium may vary. In the rabbit not more than 1 per cent. of the total qnantity of blood of the body (equal to about 5 per cent. of the total weight of the organ) is present at any one time in the brain, whereas in the kidney, by weight, the blood may amount to nearly 12 per cent., and in the liver to as much as nearly 30 per cent. (Foster). If a small round window be made in the cranium and a suitable piece of glass fitted into it, the veins of the pia mater may be observed to dilate or contract if inter- mediate pressure be made on the veins of the neck. There is

evidently, then, within the cranium some arrangement by which such variations become possible. This is probably accomplished by the anatomical arrangements of the sub-arachnoid spaces. These spaces, containing fluid, communicate freely with each other and with the space surrounding the spinal cord, so that when the quan- tity of blood increases in the cranium a corresponding quantity of fluid escapes into the spinal space, the walls of which are not inextensible like those of the cranium. In young children, before the fontanelles are closed, the variations of circulation and blood- pressure cause pulsations, of which there are two kinds—those coinciding with the ventricular systole, produced by the pulsation of the arteries at the base of the brain, and those coinciding with expiration. Pressure on the brain-substance beyond a limit leads to paralysis, unconsciousness, and death. The large sinuses prob- ably assist in equalizing internal pressure, and, as inspiration favours the flow of blood from the sinuses, too great distension of these is also avoided. Vaso-motor nerves regulate the calibre of the arteri- oles of the brain, but we know nothing of the conditions affecting the nerves. Nor do we know how the waste-products of the brain are got rid of. There are no lymphatic vessels, but there are spaces around many of the vessels. These probably

communicate with the cavities in the membrane containing the cerebro-spinal fluid, the value of which, as suggested by Foster, ‘‘ depends in all prob- ability more on its physiological properties as lymph than on its

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Fig. 82.—Injected convolution of cerebrum (Duret). 1, 1, medullary arteries; l’, group of medullary arteries in fissure between two neighbouring con- volutions; 1”, arteries of system of arcuate fibres; 2, 2, 2, arteries of grey substance of cortex; a, large-meshed capillary network situated under pia niater; b, smaller-meshed capillary network situated in middle layers of cortex ; c, somewhat larger network in internal layers adjoining white sub- stance ; d, capillary network of white substance.

mechanical properties as a mere fluid.” The grey matter is much more richly supplied with capillaries than the white matter, as seen in fig. 32.

CRANIAL NERVES.

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The general anatomy of these nerves is described under ANATOMY, Crania vol. i. p. 880 sg., and it remains only to enumerate their functions. nervs

Their deep roots have also been alluded to in treating of the medulla oblongata and the pons Varolii above.

1. The olfactory nerve. The nerve of smell (see SMELL).

2. The optic nerve. The nerve of sight (see EYE).

8. The oculo-motor or third nerve,—motor, supplying all the muscles of the eyeball except the superior oblique and external rectus ; it also supplies the circular fibres of the iris and the ciliary muscle (see EY).

4, a pathetic or fourth nerve,—motor, supplying the superior oblique muscle.

_5. The trigeminal or fifth nerve. It has three branches: (A) The ophthalmic division of the fifth, or nerve of Willis, is sensory and supplies (a) the skin of the forehead, the eyebrow, the upper eyelid, the root and lobule of the nose; (b) the palpebral and ocular conjunctiva, the mucous membrane of the lacrymal passages, the frontal sinuses, the upper part of the nasal mucous membrane; (c) the cornea, the iris, the choroid, and the sclerotic; (d) the periosteum and bones of the frontal, orbital, and nasal regions ; and (e) muscular sensibility to the intra-orbital muscles. It also influences the secretion of the lacrymal gland. It contains the fibres from the sympathetic governing the radiating fibres of the iris (see Eyk), and also the vaso-motor fibres for the iris, choroid, and retina. It is associated with the otic ganglion. (B) The supertor maxillary division of the fifth furnishes sensory branches to (a) the skin of the lower eyelid, alee of the nose, upper lip, and skin covering the malar bone; (0) the mucous membrane of the nasal, pharyngeal, and palatine regions, the maxil- lary sinuses, the gums, the upper lip, and the Eustachian tube ; (c) the peri- osteum ofthe bones corresponding to its distribution ; and (d) the teeth of the upper jaw. It furnishes filaments to the nasal and palatine glands, and prob-

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ably to the glands of the velum palati. It contains vaso-motor fibres from the sympathetic for the vessels, and is associated with the spheno- palatine ganglion. (C) The inferior moaillary division of the fifth contains sensory branches to (a) the skin of the cheeks, temples, lower lip, chin, front part of

the ear, and external auditory canal ; (6) the mucous membrane of the cheeks, lips, gums, front part of the tongue, the mucous membrane of the tympanum, and the mastoid cells ; (c) the periosteum of the lower jaw and temporal bones ; (d) the teeth of the lower jaw ; (e) the temporo-maxillary articulation ; and (f) the muscles in the neighbourhood (muscular sensibility). It thus exercises an influence on taste, hearing, and secretion (see Nutrition). It contains vaso-motor fibres for the blood-vessels. Its motor branch is distributed to the muscles of mastication; and it is related to two ganglia, the otic and the sub-maxillary.

6. The sixth nerve is motor, and supplies the external rectus muscle of the eyeball only. .

7. The facial or seventh nerve is purely motor, and supplies all the muscles of expression. Italso contains secretory fibres influencing the action of the salivary glands (see NuTriTion). Some assert that the chorda tympani con- tains gustatory fibres, but the question has not been settled. Claude Bernard found that the facial contains vaso-motor fibres. ”

8. The auditory or eighth nerve is the nerve of hearing (see Ear). In addition to purely auditory filaments it contains fibres from the semicircular canals having to do with impressions of movement in space (see pp. 38, 39).

9. The glosso-pharyngeal nerve is sensory to (a) the mucous membrane of the posterior part of the tongue (nerve of taste), the pillars of the fauces, the anterior face of the epiglottis, and the tonsils; and (6) the mucous membrane of the tympanum, the fenestra ovalis and fenestra rotunda (see Bar), the mastoid cells, and the Eustachian tube along with the fifth. It probably supplies motor fibres to the muscles of the pharynx, but this is doubtful. Vulpian states that it contains vaso-dilator fibres for the vessels of the posterior third of the tongue.

10. The pnewmogastric or vagus nerve has any complicated actions. (A) Itis sensitive to (a) the mucous membrane of all the respiratory passages, includ- ing specially the larynx; (b) the heart; (c) a portion of the digestive tube, namely, the base of the tongue, the velum palati, the pharynx, cesophagus, stomach, and probably the duodenum ; (d) it confers muscular sensibility on the muscles to which it is distributed ; (e) the mucous

membrane of the biliary passages; (f)a part of the dura mater corresponding to the transverse and occipital sinuses; (g) the posterior part of the auditory canal. By the laryn- geal branches it specially stimulates expiratory movements. (B) It is motor to (a) many of tle muscles of the palate ; (b) the constrictors of the pharynx ; (c) the cesophagus ; (d) the larynx by (a) the superior laryngeal to the crico-

thyroid muscle and a portion of the arytenoid, and by (8) the inferior or recurrent laryngeal to the rest of the muscles of the larynx; and (e) to the muscular fibres of the bronchial tubes. (C) It contains vaso-inhibitory fibres for the heart. In connexion with this organ the vagus also contains sensory fibres and fibres belonging to the depressor system. (D) It influences secretion in the stomach (see Nurririon); but it is doubtful whether it has any action on the renal secretion. (E) It influences the production of glycogen in the liver (see NuTriT10N).

11. The spinal accessory is a motor nerve supplying the sterno-cleido-mastoid muscle and the trapezius. It gives an important branch to the vagus (tnternal braueh), which supplies all the motor fibres in that nerve distributed to the larynx, except those in the superior laryngeal supplying the crico- thyroid muscle, and also the motor fibres of the vagus sent to the pharynx. Accord- ing to Heidenhain, it also supplies the vagus with the inhibitory cardiac fibres.

12. The hypoglossal is exclusively a motor nerve supplying the muscles of the tongue and also the sub-hyoid muscles (see Anatomy). It also contains vaso-motor filaments.

SpinaAL NERVES.

The spinal cord gives origin in its course to thirty-one pairs of spinal nerves, each nerve having two roots, anterior and posterior, the latter being distinguished by its greater thickness and by the presence of an enlargement called a ganglion, in which are found numerous bi-polar cells. The anterior root is motor, the posterior sensory. The mixed nerve after junction of the roots contains (#) sensory fibres passing to the posterior roots ; (6) motor fibres com- ing from the anterior roots; (¢) sympathetic fibres, either vaso-motor or vaso-dilator.

SYMPATHETIC SYSTEM.

The fibres of the sympathetic system consist of two kinds—(1) of grey or gelatinous fibres, destitute of the white substance of Schwann ; and (2) of medullated fibres similar to those met with in the cerebro-spinal centres. The grey fibres originate in the ganglia so prevalent in the sympathetic system, whilst the medullated fibres arc believed to come from the cerebro - spinal system. The trunk of the great sympathetic nerve consists of a chain of swellings or ganglia, connected by intermediate cords of grey nerve-fibres, and extending nearly symmetrically on each side of the vertebral column, from the base of the cranium to the

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coceyx. On this part of the nerve twenty-four ganglia are placed on each side. This great trunk, as it passes along the spine, is connected with the spinal nerves, the connecting fibres being of the two kinds already described. The grey fibres dominate in the sympathetic nerves, and the medullated in the cerebro-spinal ; and these two elements are mixed in various proportions in both of the great divisions of the nervous system. At their lower extremities the main trunks of opposite sides generally unite in the middle line ; and at the upper ends each trunk, after being connected with the eighth and ninth cranial nerves, extends to the cranium, passes into that cavity along with the internal carotid artery, and there, as well as in other situations, comes into connexion with all the remaining cranial nerves, except the olfactory, auditory, and optic. This conjunction may be cffected directly, as with the fourth, sixth, and ninth nerves; or through a ganglion, as the ophthalmic, with the third and fifth ; the spheno-palatine, otic, and sub-maxillary, with the fifth and seventh, or facial; the geniculate, with the seventh or facial; the jugular, with the glosso- pharyngeal; and with the vagus, through one of its own ganglia. On the fibres of the sympathetic distributed to the viscera numerous ganglia, or plexuses in which ganglia exist, are met with, and frequently there is a plexus following the course of each vessel.

As to the functions of the sympathetic, experiment has led to the following conclusions. ;

(a.) The vaso-motor fibres of the head are supplied by the cervical portion of the sympathetic, and originate in the cervical region of the cord, proceeding from it by the anterior roots of the lower cervical and upper dorsal nerves. The fibres supplying the radiat- ing fibres of the iris also come from that region (see Eyr).

(b.) The vaso-motors of the upper limbs and of the thorax come (a) from the inferior cervical and superior thoracic ganglia, and (8) from the cord, by communicating branches between the third and seventh dorsal vertebre.

(e.) The vaso-motor fibres of the lower limbs come from the cord through the sciatic and crural nerves, whilst those of the pelvic organs are derived from the abdominal ganglia of the Stilt gay

(d.) The vaso-motors of the abdominal viscera exist chiefly in the splanchnic nerves; some fibres supplying the stomach appear to be derived from the pneumogastric.

(e.) The splanchnie nerves all arise in man from the thoracic ganglia of the sympathetic—the greater splanchnic from the fifth to the tenth ganglia, the lesser splanchnic from the tenth and eleventh, and the smallest splanchnic from the twelfth ganglion. The splanchnics supply the stomach, liver, spleen, pancreas, intestines, and kidneys. Division causes dilatation of vessels ; irritation causes contraction of vessels, and appears also to arrest or inhibit peristaltic motions of the stomach and intestines. Probably they also contain secretory filaments. The functions of vaso-motor nerves have been already described.

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(Berlin, 1881); Ross, Treutise on the Diseases of the Nervous System (2d ed., London, 1883). (J. G. M.)

PART IIL—PHYSIOLOGY OF PLANTS.

Tue body of a plant, like that of an animal, consists of one or more structural units which are termed ' cells," and in plants, as in animals, the cell consists essentially of an individualized mass of protoplasm.

The probable structure and chemical composition of protoplasm have been already considered. It need only be stated here that the protoplasmic cell-contents do not consist of pure protoplasm, but that the protoplasm con- tains imbedded in it particles of various substances which may be of the nature of food, or which may have been formed from food, or which are products of the metabolism of protoplasm ; it is to the presence of these particles that

the granular appearance of protoplasm is largely due. Moreover, there is present in the protoplasm of the cell, in the vast majority of cases at least, a well-defined, highly- refractive, usually somewhat spherical body, also proto- plasmic in nature, the nucleus.

The cell or cells constituting the body of a plant pre- sent, in most cases, the important peculiarity that the protoplasm is enclosed in a membrane termed the “cell- wall.” This membrane does not consist of protoplasm, but of a substance, cellulose, belonging to the group of the carbohydrates, and having the formula zC,H,,O,. All cell-walls do not, however, consist exclusively of this sub-

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stance, though this is probably always the case at their first formation ; but the cell-wall may undergo consider- able modification during the life of the cell. It may, for example, undergo lignification ; it then comes to consist largely of a substance termed “lignin,” which is much richer in carbon than is cellulose; this takes place typically in those cells which form woody or sclerenchymatous tissue. Or it may undergo cuticularization, when it comes to consist largely of a substance termed “‘suberin ” or “ cutin,” which, like lignin, is richer in carbon than cellulose. Or, again, it may become gummy or mucilaginous. These chemical differences are accompanied by differences in the physical properties of the cell-wall. A cellulose cell-wall is extensible, capable of swelling from taking up water into itself by imbibition, and is readily traversed by water. A lignified or cuticularized

cell-wall is more rigid and less capable of swelling by imbibition ; moreover, a cuticularized cell-wall is almost impermeable to water. A gummy or mucilaginous cell-wall is more extensible and more capable of swelling by imbibition.

The structure of the plant-cell is not the same at all periods of its life. When a cell is young the protoplasm occupies the whole of the cavity enclosed by the cell-wall. But in the course of growth the increase in bulk of the protoplasm is not nearly so great as the increase in sur- face of the cell-wall, so that in the mature cell the proto- plasmic contents form merely a rather thin layer known as the primordial utricle, which lies in close contact with the internal surface of the cell-wall at all points. There thus comes to be a relatively large cavity in the cell, the vacuole, which is filled with a liquid, the cedl-sap, consisting of water holding various substances, organic and inorganic, in solution. The structure of a mature living cell is then this: it consists of a cell-wall, lined with a layer of protoplasm, which encloses the vacuole, filled with cell-sap.

The protoplasm of plants is endowed with all those fundamental properties which are possessed by that of animals. When a plant is unicellular these properties are all exhibited, so far as they are necessary to the main- tenance of the organism, by its protoplasm; in other words, all the necessary vital functions are performed by the protoplasm of the single cell of which the plant con- sists. The performance of all the necessary vital functions by the protoplasm of one cell obtains also in the case of not a few multicellular plants,—in those, namely, in which all the cells are similar to each other in structure and contents. In the great majority of multicellular plants, however, the functions are distributed to a greater or a less extent; there is more or less complete physiological division of labour. In these plants the cells are not all similar in appearance, and their diversity is to be ascribed to their adaptation in different ways to the performance of parti- cular functions. Further, the cells which have undergone modification in some particular direction for the perform- ance of some particular function are grouped together in certain parts of the plant, and these parts are spoken of as “organs.” ‘Thus the roots of one of the higher plants are the organs for the absorption from the soil of water and substances in solution ; the leaves are the organs for the absorption of gases from the air, and, in virtue of the

green colouring-matter chlorophyll, which their cells contain, they are also the organs in which certain im- portant constructive processes are carried on. But the extent to which physiological division of labour is car- ried out in plants is not nearly so considerable as it is in animals, and accordingly the protoplasm of the dif- ferent cells of plants exhibits only in a very slight degree that specialization of structure which is so conspicuous in animals.

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Absorption.

1. Absorption of Water and Substances in Solution. —The bodies of plants, unlike those of the great majority of animals, do not contain any internal cavity into which the food may be taken as a preliminary to its being absorbed by the tissues. The materials of the food of plants are therefore taken up directly from without into the cells of

the absorbent organs. The cells which are especially con- Absor. cerned in absorption are, in the higher and subaerial plants, tion by the root-hairs,— thin-walled, unicellular, unbranched fila-1

ments which are developed from the epidermal cells some way behind the growing-point of the root; in the lower plants, and even in those of the higher plants which lie submerged, all the cells of the plant may take part in absorption. Since the food is directly absorbed by the cells, and since the cells all possess a cell-wall, the materials of the food must be taken up in solution. Salts and other substances are, as a natter of fact, taken up by the ab- sorbent cells in the form of watery solutions. Substances which are soluble in water are dissolved in the water which is present in a greater or smaller proportion in all soils, and of those which are not soluble in water many are brought into solution by the acid sap which saturates the walls of the root-hairs. The actual process of absorption is an in-

stanceof diffusion through a membrane,—that is, of osmosis, Osmotis

Only such substances can be absorbed by a root-hair, for instance, as are capable of diffusing not only through the cell-wall but also through the protoplasmic primordial utricle. Further, only such substances can be absorbed by the root-hair as are present in larger proportion in the water to be absorbed than they are in the cell-sap of the root-hair ; this inequality between the proportion of any substance in solution in the liquid on the one side and in that of a membrane on the other is a necessary condition of osmosis. Hence, in order that the absorption of any particular ‘substance by the root-hairs may be continuous, it is necessary that the substance in question should not accumulate in the cell-sap ; this accumulation is prevented either by the actual consumption (¢.¢., chemical decomposi- tion) of the substance in the cell or by the withdrawal of it to supply the needs of adjacent cells. In fact, so far as the process of absorption is concerned, the cell-sap of the internal cells of the root stands in the same relation to the cell-sap of the root-hairs as the cell-sap of the root- hairs does to the external liquid; and, as this relation exists between the successive internal layers of cells, there is set up a current of absorbed substances which travels from the surface towards the centre.

It appears from the foregoing considerations that the amount of any particular salt absorbed in a given time

depends upon (1) its diffusibility and (2) its consumption i

in the plant. Of these two conditions the second is the one which is of real physiological importance, and, if only the given time is sufficiently long, the first condition may be neglected. For instance, let us suppose that a plantis absorbing by its roots two salts—the one (A) being very diffusible, the other (B) much less diffusible—and that, whilst the former undergoes no change in the plant after absorption, the latter is at once decomposed. Now, if the time of observation is short, it may happen that the amount absorbed of the salt A will be found to be greater than that of the salt B; but, if the time be extended, the amount absorbed of the salt B will certainly be found to be greater than that of the salt A. The explanation is that the salt A would at first be absorbed very rapidly, on account of its high diffusibility ; but the absorption of it would gradually diminish, in consequence of the

accumu- lation of it in the cell-sap of the plant, until it ceased alto- gether. The absorption of the salt B, on the other hand,

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*¢ Jess active at first than that of A, would be continuous,

and thus, over a relatively long period of time, the amount of it absorbed would come to be much greater than that

of A.

As a matter of fact, it has been ascertained that when different salts or other substances are presented to the root of a plant they are absorbed in different quantities. And further, it has been ascertained that the different salts are

absorbed in different proportions by the roots of different

plants ; it is, in fact, upon this that the necessity for the “rotation of crops” depends. A striking illustration of this is afforded by a comparison of the amount of silica present in the ash of equal dry weights of gramineous and leguminous plants. According to Wolff—

100 parts meadow-hay contain 27°01 per cent. of silica.

r wheat-straw i, 50 os ne »» red clover m LL x 0 2 pea-straw ss 6°83 50 ”

The absorption of salts in certain proportions by a plant is the expression of what may be conveniently termed its “specific absorbent capacity.” It must

not be supposed that this term suggests that the roots possess any selective power by which they absorb this salt and reject that one, or by which this one is absorbed in larger proportion than that one, The question as to whether or not a particular sub- stance will be absorbed is a purely physical one, dependent'

' upon the relation between the molecules of the substance

and the cell-wall and primordial utricle which they have to traverse, and in no degree dependent upon the useful- ness or hurtfulness of the substance to the plant. The amount absorbed of any particular substance depends ulti- mately upon the activity with which the plant chemically alters the substance after absorption. To return to the illustration just given. The great difference between the amounts of silica present in the ash of gramineous and of leguminous plants respectively is the expression of the fact that the former are capable of withdrawing relatively large quantities of absorbed silica from the sphere of osmotic activity, and depositing it in the insoluble form in the tissues, whereas the latter can only do so to a comparatively small extent. The specific absorbent capa- city of a plant is simply a manifestation of its specific metabolic properties.

The amount of the various salts absorbed is not, how- ever, exclusively dependent upon the specific absorbent capacity of the plant, for it is materially affected by the composition of the soil. The larger the quantity of any substance presented to the roots, the greater, other things being equal, will be the amount of it absorbed. This does not mean that substances can be absorbed by the roots in solutions of any degree of concentration. It appears that the root-hairs can only absorb very dilute solutions ; but for the watery solution of any salt capable of being absorbed there is a certain degree of concentration at which the proportion of the amount of the salt absorbed to that of the water absorbed is the same as that of the solution. If the solution be more concentrated the propor- tion of water absorbed will be greater, if the solution be more dilute the proportion of salt absorbed will be greater. This is the general "law of absorption" determined by the experiments of De Saussure and of Wolff. It must, however, be borne in mind that, though the proportion of salt absorbed is larger in the case of a dilute than of a more concentrated solution, yet the absolute quantity of it

absorbed from a more concentrated solution in a given time is greater than that absorbed from a dilute solution.

2. Absorption of Gases,—An interchange of gases is con- stantly taking place between the plant and the medium in which it lives—in the case of terrestrial plants, between the plant and the air; in the case of aquatic plants, between

the plant and the water. When the plant is a simple one each of its cells is in direct relation with the external medium ; when it is of complex structure there is usually some means provided by which the more internal cells are brought into relation with it, namely, a coritinuous system of intercellular spaces which communicate with the exterior in terrestrial plants by certain apertures termed “stomata,” in the epidermis of the leaves and young stems, and by others termed “lenticels,” in the cortical tissue of older stems and of roots.

The gases principally absorbed by plants are oxygen and carbon dioxide. The former is absorbed by every living cell, and at all times; the latter is absorbed exclu- sively by cells which contain chlorophyll, and by them only when exposed to light. In the more highly – organized plants the cells which contain chlorophyll are confined almost entirely to the leaves, so that the leaves may be regarded as the organs by which these plants absorb carbon dioxide. It has been held that the stomata are of great importance in promoting the absorption of this gas by the leaves, but the experiments of Boussingault prove that this view is not well founded. He discovered, namely, that the upper surface of the leaves of various plants with which he experimented absorbed carbon dioxide more actively than the lower surface, although the upper surface had scarcely any stomata, whereas they were very numerous on the lower. The absorption of carbon dioxide by the leaves is directly effected by the superficial cells.

Gases, like solid substances, are only absorbed in solu- tion by the cells of plants. They may be brought to the surface of the cell-wall already

dissolved in water, as in the case of submerged plants, or they may be dissolved from the atmosphere by the sap which saturates the cell- wall, as in the case of land-plants; in either case they reach the interior of the cell in solution, When a gas has been taken up at the surface it diffuses throughout the cell- sap; and in the case of a gas like nitrogen, for instance, which is not chemically altered in the cell, the absorption of it will cease when the cell-sap has become saturated with it. If, however, the metabolism of the cell changes the chemical condition of a gas its absorption will be continuous. This accords with what has been said with regard to substances absorbed by the roots.

‘Another analogy exists between the absorption of gases and the absorption of substances in solution, namely, that, just as the root can only absorb a solution below a certain degree of concentration, so the leaf can only absorb a gas below a certain degree of pressure. Let us take in ‘llustration the case of carbon dioxide. The pressure of the carbon dioxide in the air is very slight (0°04 per cent. by volume). It was first observed by Percival that an increase in the quantity of carbon dioxide in the air is favourable to the nutrition of green plants; De Saussure found that a considerable increase is prejudicial; and subsequently Godlewski showed that the optimum proportion is from § to 10 per cent.,—that is, that carbon dioxide is most readily absorbed by the plant when its pressure is about 200 times greater than in ordinary air. Boussingault found that when leaves are exposed to sunlight in an atmosphere of pure carbon dioxide at the ordinary pressure they cannot decompose it, but if the gas is at a low pressure (in his experiment 0°17 mm. of mercury) they can do so.

Besides oxygen and carbon dioxide other gases are also absorbed by plants, but to a small extent only. Nitrogen ss absorbed in small quantities merely in virtue of its solubility and diffusibility ; as mentioned above, it is not in any way acted upon by the cells after its absorption. Tt appears that ammonia may be absorbed from the air in the form of gas by the leaves, and that, when thus absorbed, it contributes to the nutrition of the plant. Other gases,

Oxygen and carbon dioxide.

Absorp- tion of

gases in solution.

Other gases absorbed.

Osmotic circula- tion.

Root- pressure,

such as sulphur dioxide, sulphuretted hydrogen, and hydro- chloric acid, which are occasionally present in the air as impurities, are absorbed by the leaves, as is shown by the pernicious effects which they produce.

Circulation.

It is obviously necessary, in multicellular plants in which certain cells only are in a position to absorb food-materials from without, that these food-materials should be conveyed from the absorbent cells to the remainder of the plant. In no plant is there any organ comparable to the heart of animals by means of which a distribution throughout the tissues of absorbed food-materials is effected. The distribu- tion is accomplished by purely physical means, principally by osmosis. When the cell-sap of a cell becomes charged, by absorption from without or from neighbouring cells, with any substance, diffusion-currents are at once set up between this cell and any adjacent cells the cell-sap of which may contain the substance in question in smaller proportion, and these currents will persist until osmotic equilibrium, as far as this substance is concerned, is estab- lished. The diffusion-currents do not flow in any definite direction, but their course is determined simply by inequali- ties in the chemical composition of the cell-sap of the cells in different parts of the plant. Since in subaerial plants the roots are as a rule the only organs which absorb sub- stances from the soil, and since the cell-sap of their cells is therefore relatively rich in absorbed food-materials, the general direction of the diffusion-currents is from the roots upwards into the stem and leaves.

In cellular plants—that is, in plants which possess no vascular tissue—the distribution of absorbed food-materials is effected solely by osmosis. Many

of these plants are small, so that the distribution is effected from cell to cell with sufficient rapidity by this means. Those of them that are large have a very considerable absorbent surface, many of them being aquatic in habit, so that the absorbed substances have no great distance to travel. In vascular plants, more particularly in those which are subaerial in habit, the distribution of the water, holding substances in solution, which is absorbed by the roots is effected to a considerable extent by means of the vascular system. The forces by which the flow of liquid through the vascular tissue is maintained are the following. ‘The first is the root-pressure. It is a matter of common observation that, when the stems of vascular plants are cut across, particularly in the spring, an escape of water takes place

from the surface of that portion of the stem which still

remains connected with the root, an escape which may persist for some considerable time. It has been ascertained that this outflow of water takes place under considerable pressure ; for instance, Hales observed, in the case of a Vine, that the pressure was sufficiently great to support a column of mercury 324 inches in height. But the root- pressure not only manifests itself by causing a flow of water from the cut surfaces of stems, it also causes in many plants the exudation of drops of water at the free surface. Drops may commonly be seen on the surface of certain Fungi (Pilobolus crystallinus, Penicillium glaucum, Merulius lacrimans), which are exuded in consequence of the hydrostatic pressure set up in the plant by the active absorption effected by the organs (rhizoids) which here perform the functions of roots. Again, drops are frequently to be found on the margins and at the apices of the leaves, especially the younger ones, of many plants, such as Grasses, Aroids, Alchemillas, Saxifrages, &e. That the formation of these drops depends upon the forcing of water upwards through the vessels by the root-pressure is proved by the fact that, if the stem be cut off from the root and then placed with its cut end in water, no more drops will appear

on the leaves. The water thus forced into the vascular system is not pure water, but a watery solution of various substances, principally salts absorbed by the roots. It is therefore obvious that the root-pressure assists in the dis- tribution of these substances throughout the plant.

In order to understand how the root-pressure is set up Sti, it will be necessary to give a brief description of the oft general structure of the root. It consists of a central fibro-vascular cylinder which is surrounded by several layers of parenchymatous cells, the most external of these layers being in contact with the epidermal layer, certain cells of which are developed into root-hairs. Water is absorbed by the root-hairs and passes from them by osmosis into the subjacent parenchymatous cells. It is obvious, however, that osmosis cannot take place between the cells of the innermost layer and the vessels, for the conditions of osmosis are not fulfilled, inasmuch as the vessels at first contain no liquid. The passage of water from the cells into the vessels can only take place by filtration. For this a certain pressure is necessary, and this pressure is set up by the absorbent activity of the root-hairs and of the parenchymatous cells, The system of cells absorbs large quantities of water, more indeed than the cells can contain, so that at length the resistance of the cell-walls is overcome at what is presumably the weakest point, and water filters into the cavities of the vessels of the wood. There it collects, and it may, under certain circumstances, fill the whole vascular system ; then, since absorption is still going on at the surface of the roots, sufficient pressure is set up to cause that exudation of drops on the leaves to which allusion has been made, and, if the stem be cut across, to cause “bleeding” at the cut surface. From the foregoing account it is apparent that the root-pressure is the expres- sion of the absorbent activity of the root-hairs.

But the vessels of the wood do not always contain water, Tm Hales observed that, whereas a Vine will bleed freely if itsS!™” stem be cut across in the month of April, no bleeding is observed if it be cut in July. And yet it cannot be doubted that the plant is absorbing water by its roots more actively in July than in April. The explanation of these facts is that, although in July the plant is absorbing water ae- tively by its roots, yet it is losing so much in the form of vapour from its leaves that water does not accumulate in the cavities of the vessels. This loss of water in the form 4 of vapour from the general surface of the plant exposed to the air is termed “transpiration.” The parts of the plant which are more especially concerned in transpiration are the leaves. By their structure they are peculiarly adapted | for this purpose. The tissue of a leaf is penetrated in

all directions by intercellular spaces, which communicate : directly with the external air by means of the stomata in q the epidermis. In this way a very large surface of moist | and thin cell-wall is brought into contact with the air, a

condition most favourable to evaporation. Some idea of : the activity of transpiration in a plant is afforded by the following determinations made by Hales. In the case of | a Sunflower with a leaf-surface of 5616 square inches the amount of water transpired during twelve hours of daylight was 30 fluid oz. (a pint and a half); in the case of a Cabbage with 2736 square inches of leaf-surface the amount of water transpired in the same time was 25 fiuid oz. The activity of transpiration is very much affected by Light — external conditions,—the moister the air, the smaller willy sin' be the transpiration; and conversely, the drier the air and gion, the higher the temperature, the greater will be the amount

of water transpired. Light, too, has a remarkable influence:

it has been ascertained by a great number of observers that transpiration is more active in light than in darkness.

It seems probable that this is to be attributed largely to the influence of light upon the stomata. Each stoma is

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_ left between them; the stoma is then open.

-tribution of water through the plant is very great.

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usually bounded by two cells, termed "guard-cells," which are capable of so altering their form as to close or to open the aperture between them. The form of the guard-cells is dependent upon the amount of water which they

contain. When they hold comparatively little water, and are flaccid, their adjacent free surfaces are straight and in contact with each other; the stoma is then closed. When, how- ever, they contain so much water that their cell-walls are under considerable pressure from within—in a word, when the guard-cells are turgid—they curve so that their ad- jacent free surfaces are no longer in contact, but a space is It appears that the guard-cells become turgid under the influence of light; and it is probably to this open condition of the stomata that the greater transpiration of leaves when exposed to light is to be ascribed.

It is obvious that the effect of transpiration upon the dis- It sets up a rapid current, known as the “transpiration-current,” which travels from the roots upwards towards the leaves. Sachs has made some observations as to its rate by means of the lithium-method, which consists in supplying the root of a plant with a solution of a salt of lithium, and determining by means of the spectroscope the length of stem in which lithium could be detected after the lapse of a given time. He estimates the rate per hour to be in Nicotiana Tabacum 118 centimétres (46°458 inches), in Helianthus annuus 63 (24°793 inches), and in Vitis vint- fera 98 (38°583 inches). But the water of the transpira- tion-current holds salts and other substances in solution. It is clear, therefore, that transpiration promotes the dis- tribution not only of water but:also of the substances which the water holds in solution. Sachs’s experiments go to prove that salts travel in solution in the current ; hence it affords a ready means of transport of substances from the roots, where they are absorbed, to the leaves where (as will be shown below) the food undergoes certain changes which fit it for the nutrition of the plant. There is yet another important point to be noted with regard to the physiological significance of transpiration. It has been mentioned that the roots absorb from the soil only very dilute solutions of salts and other substances, so that for any given quantity of a salt absorbed an excessive quantity of water has to be absorbed likewise. It is obvious that the absorption of salts from the soil by the roots can only go on provided that the plant is able to get rid of the excess of absorbed water, and this is effected chiefly by transpiration, though, as mentioned above, an actual ex- cretion of water in the form of drops not unfrequently takes place.

It has been conclusively proved that the channel along which the transpiration-current travels is the fibro-vascular tissue, and that it is the xylem or woody portion of a fibro-vascular bundle which is the conducting tissue. In the case of plants like Conifers and Dicotyledons, in which there is a formation of secondary xylem or wood from a cambium-layer, it is the younger wood, the alburnum, along which the transpiration-current passes. The older wood, the duramen, it is true, usually contains water, but it does not serve as a conducting channel, only as a reservoir.

The question now arises as to the mode in which the

transpiration-current travels through the wood. Since the vessels contain no water in their cavities at the time when transpiration is most active, it is clear that it is not In the cavities of the vessels that the water of the current travels. Sachs is of opinion that it moves in the substance of the lignified cell-walls. Others, amongst whom Hartig may be especially named, consider that it travels from the cavity of one wood-cell to that of the next by filtration under pressure. The mechanism of conduction would, in

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the latter case, be this: the conducting cells contain air and water; when water is withdrawn from one ‘of them the contained air becomes rarefied, and the water in that cell is then subject to a lower pressure than that in neigh- bouring cells; as a consequence water is forced into the former cell through the thin membranes of the pits in its walls until equilibrium is re-established. Inasmuch, then, as the air in the conducting wood-cells in the leaves is constantly undergoing rarefaction in consequence of tran-spiration, a current is set up towards the leaves from the stem and the root.

There can be no doubt, however, that, as Hales first Negative pointed out, transpiration has the effect of diminishing the Pressure.

pressure of the gases contained in the cells and vessels. Von Hohnel has found that, if the stem of a transpir- ing plant be cut through under mercury, the mercury will at once rise to a height of several centimétres in the

vessels, the greatest height being reached in the younger vessels. This rise can only be accounted for by ascribing it to the difference between the atmospheric pressure and the pres- sure of the gases in the vessels, the lower pressure of the latter being due to the removal of water by transpiration, which necessarily involves an expansion, and therefore also a diminished pressure of the gases. The effect of this so- called “negative pressure” is to set up diffusion-currents of gases from the surrounding tissues into the cells and vessels of the fibro-vascular bundles. It must not be assumed, however, that the vessels are the principal channels in which gases circulate throughout the plant. They circulate principally in the intercellular spaces which communicate with the external air by means of the stomata.

Stating the foregoing facts in the most general terms, Recapit- it appears that in a plant the food-materials travel by ulation.

osmosis from the absorbent organs to the organs in which the processes of constructive metabolism are carried on— in one of the higher plants, for instance, from the roots to the leaves—and that the distribution of the food-materials is assisted and accelerated by root-pressure and by tran- spiration, the fullest expression of this being the transpira- tion-current in terrestrial vascular plants. And just as there is a current of food-materials tending towards the organs in which the processes of constructive metabolism are carried on, so also there is a current of the organic nutrient substances formed in these organs travelling from them to the other parts of the plant. The final cause of the current is the same in both cases. A given salt, for instance, which has been absorbed by the root travels towards the leaves because it is in some way undergoing chemical alteration in those organs; similarly, a given organic substance fornted in the leaves travels from them towards any part of the plant in which that substance is being chemically altered, or, to use a somewhat different expression, is being consumed. The cause of the diffusion in either case is the disturbance of osmotic equilibrium by the chemical alteration of the substance, and the result is a current of the substance from those parts which are relatively rich in it to those which are relatively poor.

Distribution of Organic Nutrient Substances.—In vas- Distribu- cular plants the distribution of the organic nutrient sub- ton of

stances is, like the conduction of substances absorbed by

the roots, assisted by the vascular tissue ; but, whereas it sap. is the wood which is the conducting tissue in the latter stances.

case, in the former it is the bast or phloem, and more especially the bast-vessels or sieve-tubes. These vessels consist of elongated cells placed end to end, the septa be- tween the adjacent cells being perforated so as to admit of a direct continuity between their protoplasmic contents. The importance of the wood and of the bast respectively as conducting tissues is well illustrated by the “ringing” experiments which have been repeatedly made on plants,

such as Dicotyledons and Conifers, which have the fibro- vascular bundles arranged in a ring in the stem. When a ring of tissue, extending inwards as far as the cambium- layer, is removed from the stem of a dicotyledonous plant the following facts are to be observed: (1) that the leaves which are borne on branches arising from the stem above the level at which the ring of tissue has been removed will not exhibit any signs of withering ; (2) that the part of the stem below the incision will not increase in thickness to nearly the same extent as the part above the incision. From these facts it is clear (1) that the operation in question has not materially affected the conduction of water and food- materials in solution upwards to the leaves, and, since the wood is the only unimpaired tissue, it is obviously in the wood that the upward current travels; and (2) that the operation has materially affected the conduction of organic nutrient substances to the parts below the incision, the diminished growth of these parts being the result of in- adequate nutrition; this effect of the operation is to be ascribed, principally at least, to the destruction of the con- tinuity of the bast-tissue.

though, so far as is known, they are not essential constitu. ents of the organized structure of the plant, are neverthe. less essential to the maintenance of its life; they may not, indeed, go to build up the plant-substance, but in some way or other they promote the metabolic processes,

The method which has afforded the most valuable results yx, bearing upon the relative physiological importance ofeulk various food-materials is that which is known as “ water. culture.” It consists in growing plants with their roots immersed in water holding certain salts in known quantities in solution. The mixture of salts can, of course, be varied at pleasure, and the effect upon the plant of the absence of certain elements, as of their presence in smaller or larger quantities, can be observed. Further, by an analysis of that portion of the solution which remains unabsorbed at the close of the experiment, the proportion in which the various salts have been absorbed can be ascertained.

The elements of the food of plants may be conveniently classified into two groups, the first consisting of those which enter into the composition of organized plant-sub- stance, the second consisting of those which, without ae-

tually entering into the structure of the plant, are essential to the proper performance of the metabolic processes. To the first group belong the elements C, H, O, N,8, P; to

Laticifer: In various families of vascular plants, and in some oustissue cellular plants also (certain Fungi), there are to be found ~ cells, forming what is known as “laticiferous tissue,” which

a probably assist in distributing both food-materials and organic nutrient substances throughout the plant. In some plants (Zuphorbiacex, Asclepiadacee, Morex, &c.) the cells are quite distinct from each other, and extend from one end of the plant to the other, growing with its growth, so that they attain a very considerable size, and are much branched ; these are spoken of as “ laticiferous cells.” In other plants (Cichoriacex, Papaveracee, &c.) the cells are comparatively small, and fuse together to form an intri-cate network; these are spoken of as “laticiferous vessels.” The cells of the laticiferous tissue contain a milky liquid, termed “latex,” which consists of

water holding inorganic salts, sugar, gum, extractives and proteids, in solution, and holding in suspension resinous and fatty bodies. The cells contain protoplasm in addition, and not uncommonly starch-granules.

Food of Plants.

A rough idea of the nature of its food can be obtained by analysing a plant. It is found that, in the process of incineration, a considerable weight of its dry solid is burned up and given off in the form of gas ; this represents the combustible or organic portion of the plant. The in- combustible residue, the ash, is found to be of a mineral or inorganic nature. The gases given off are carbon dioxide, watery vapour, and nitrogen, showing that the combustible portion of the plant contained the elements carbon, hydrogen, and nitrogen. In the ash occurs a num- ber of elements, of which the principal are sulphur, phos- phorus, potassium, calcium, magnesium, iron, sodium, chlorine, and silicon. But it does not necessarily follow that, because any given chemical element can be detected in a plant, that element is to be regarded as part of the food of the plant, for, as has been already pointed out, plants may absorb substances which in no way contribute to their nutrition, or are even injurious. When an element enters into the chemical composition of the substances of which the organized structure of the plant consists (as C, H, O in starch and cellulose, C, H, O, N, 8, P in pro- teids), then it is clear that this element must form part of the food; but, when, as in the case of the rest of the elements mentioned above, an element does not thus con- tribute to the building up of the organized substance of the plant, its admission to the rank of a food-material must be the subject of direct experiment. It has been ascertained that many of the elements enumerated above,

the second, K, Ca, Mg, Fe, Cl (?).

We will now briefly discuss the form in which the various chemical elements are absorbed, and their use in the economy of the plant, beginning with those which enter into the composition of organized plant-substanee. A few words will also be said about those elements, such as sodium and silicon, which, though always present in the ash of plants, appear to have no real physiological signifi- cance as far as nutrition is concerned.

Carbon. —This element constitutes a large percentage of the total fo dry weight of plants. It enters into the composition of all thee organic substances, such as starch, cellulose, and other carbohydrates, fats and other hydrocarbons, proteids, organic acids, alkaloids, &e., which may be present in plants. The form in which carbon is absorbed depends upon the nature of the plant. It may be broadly stated that all those which contain chlorophyll absorb their carbon in the form of carbon dioxide, whereas those which do not contain chlorophyll absorb their carbon in the form of more complex carbon compounds which contain C, H, and O, and in which the C is directly combined with H. Moreover, in green plants it is only those cells which contain chlorophyll that can absorb carbon dioxide, and this only under the influence of light. It must not be assumed, however, that plants containing chlorophyll are in- capable of absorbing complex carbon compounds. It is known from the researches of Darwin and others that the " insectivorous" plants absorb such compounds by their modified leaves, and it is known also that a number of green plants, such as the Mistletoe, the Rattle, and others, live parasitically on other plants. It has indeed been proved by direct experiment that green plants can ab- sorb substances such as urea, glycocoll, asparagin, leucin, tyrosin, ' which are all highly complex carbon compounds. The physio- logical distinction to be drawn between plants which do and those which do not contain chlorophyll is really that the former are capable of assimilating carbon in a simple compound, such as C0z, whilst the latter are incapable of doing this, and require, there-

fore, compounds of more complex constitution. Plants which do not contain chlorophyll are either parasites (that is, they live upon other living organisms) or saprophytes (that is, they live upon the products of the waste and decay of other living organisms). The plants which do not contain chlorophyll are the Fungi and a few Phanerogams,—Epipogium Gmelini, Cuscuta, Monotropa, Lathrea, Corallorhiza. Of these the Fungi include both parasites and sapro- phytes ; Epipogium Gmelini is a saprophyte, Cuscuta a parasite, and Monotropa may apparently be either the one or the other. The Orobanchex, which are parasitic, and Neottia, which is saprophyt¢, have not a green colour, but small quantities of chlorophyll have nevertheless been detected in them.

Hydrogen.—This element is absorbed by all plants in the form of water and of ammonia and its compounds; it may also be absorbed in the form of organic compounds.

: Oxygen.—Oxygen is taken up either in the free state, or in com- bination in the form of water or of salts; it may also be absorbe’ in the form of organic compounds. The free oxygen absorbed 1s especially concerned in the processes of destructive metabolism, the combined oxygen in those of constructive metabolism.

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Witrogen.—Nitrogen is absorbed in the form of ammonia and its compounds and of nitrates ; it may also be absorbed in the form of organic nitrogenous compounds. ‘The researches of Lawes, Gilbert, | and Pugh, as also those of Boussingault, have proved that plants “are incapable of assimilating free nitrogen. It appears that, on the

whole, nitrogen absorbed in the form of ammonia compounds is

more readily assimilated by plants than nitrogen absorbed in the form of nitrates. Pasteur has shown, for instance, that the Yeast plant cannot assimilate nitrates. Sulphur.—Sulphur is absorbed from the soil as sulphates, those of ammonium, potassium, magnesium, and calcium being the most | | advantageous. It may also be absorbed to some extent in the form of organic: compounds. neil “A Phosphorus.— Phosphorus is absorbed from the soil in the form of phosphates. Besides being a constituent of certain substances ! allied to the proteids, such as nuclein and plastin, phosphorus scems to bear an important relation to certain of the metabolic processes. Phosphates are to be found especially in those parts of plants which are rich in protoplasmic cell-contents. It appears that a supply of phosphates promotes considerably the assimilation of nitrogen by the plant. Potassium.—Potassium is absorbed in the form of a variety of salts,

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Silicon. —Silicon is absorbed in the form of soluble silicates, and possibly as soluble silicic acid. The silicates are brought into solution to some extent

by the carbon dioxide present in the soil, and also by the acid sap of the root-hairs. It is always present in the ash of plants, sometimes in large quantity ; in wheat-straw, for instance, it constitutes 67°50 per cent. of the ash (Wolff). It was thought that silicon must be essential to nutrition. Sachs found, however, that a Maize plant will grow well in a water-culture from which it can obtain no silicon. On the other hand, Wolff has ascer- tained that in the case of Oats the number of perfect seeds formed is greater when the plant is abundantly supplied with silicon.

Constructive Metabolism (Anabolism).

When a plant is adequately supplied with appropriate Meta- food-materials, the external conditions to which it is bolism. exposed being favourable, it increases in weight, owing to an accumulation of the substances which constitute its organized structure. But this gain in weight is only rela- tive ; for side by side with the constructive processes by

en; ts which the food is converted into the substance of the

bn – of which the chloride is the most advantageous form, according

to Nobbe. Like phosphorus, it is to be found in largest quantity in those parts of plants which are rich in protoplasmic cell-contents. It appears to have an important influence on the constructive meta- bolic processes of plants which contain chlorophyll. Nobbe found, in the case of a Buckwheat plant, that in the absence of a supply

of potassium its growth was diminutive, and that the amount of

starch in the plant was very small. On the addition of potassium chloride. to the water-culture the starch-grains became morc numerous in the chlorophyll-corpuscles, and made their appearance also in the tissues of the stem. The precise significance of potas- sium in relation to these processes is not known. Liebig was of opinion that it played an important part in the distribution of carbohydrates throughout the plant, but this view has not been confirmed. It appcars rather that the facts upon which this view was based point to an effect due not to the potassium itself but to the particular salt of it which was absorbed (see “ chlorine ” below). There can be no

doubt, however, that potassium bears some im- portant relation to the formation and storing up of carbohydrates, for it is always present in large quantity in organs, such as leaves, tubers, seeds, &c., in which these processes especially take place.

Caleiwm.—The compounds in which calcium is usually absorbed are the sulphate, phosphate, nitrate, and carbonate, the last-named salt undergoing decomposition in the process. It appears that the chloride is injurious to plants. The precise usc of calcium is un- known. It very commonly occurs in the cells of plants in the form of crystals of the carbonate or the oxalate, and possibly one of its important functions is to form insoluble salts with acids which are of no further use in the plant, and are even injurious to it.

_ Moagnesiwm.—Like calcium, this may be advantageously absorbed in the form of all its salts, execpt the chloride. Nothing definite is known as to its use.

Tron.—It appears that iron may be absorbed in the form of any of its salts. 1t is known to be essential only to those plants which contain chlorophyll. If a scedling he cultivated by the method of water-culture, with its roots in a solution which contains no iron, the leaves formed will be successively paler in colour until at length theyare nearly white; in this state the plant is said to be “chlorotic.” If a small quantity of a salt of iron be then added to the solution in which the roots are, or if the pale leaves be painted over with a dilute solution of iron, they will soon become green. Iron, there- fore, plays an important part in connexion with the formation of the green colouring-matter chlorophyll. It is still a debated question whether or not iron enters into the composition of the chlorophyll-molccule.

Chlorine.—Chlorine is absorbed from the soil in the form of chlorides. The evidence as to its significance in the nutrition of plants is conflicting. Nobbe, Leydhecker, Beyer, and morc recently Farsky have observed that water-cultures of Buckwheat, Barley, and Oats do not flourish when grown in solutions containing no chlorides, and since the chlorophyll-corpuscles of the plants become crowded with starch-grains it was thought that chlorine had some import- ance in connexion with the translocation of carbohydrates. Knop and Dworzak have observed, on the other hand, that Maize plants will grow well in solutions containing no chlorine, and further,

that the accumulation of starch in the chlorophyll-corpuscles may be induced by various abnormal external conditions.

Sodiwm.—This clement is never absent from the ash of plants, and in some cases, cspecially in maritime plants, it is present in considerable quantity. It might be inferred from its constant occurrence in the ash that sodium is of some importance as a food- material ; it was thought, in fact, that it might serve as a substitute for potassium, but this has not been found to be the case. Its con-

stant presence in the ash is due merely to its universal distribution in the soil.

plant—processes, that is, which have as their result the formation of relatively complex from relatively simple chemical compounds—there are going on destructive pro- cesses—processes, that is, which have as their result the formation of relatively simple from relatively complex chemical compounds—which are attended by a loss of weight. The gain in weight by the plant represents the difference between the activity of the constructive and of the destructive metabolic processes respectively. The end of constructive metabolism is the formation of protoplasm. Protoplasm is certainly a very complex substance, though its precise constitution is unknown, and the food-materials of plants are much simpler substances ; there must, there- fore, be a considerable number of processes to be gone through before protoplasm can be produced from the food- materials. We will now study these processes, and, in the first instance, confine our attention to those which have been ascertained to take place in plants which possess chlorophyll.

It has been already mentioned that a green plant absorbs Building Under these P of

carbon dioxide when it is exposed to light. circumstances it also increases in weight; it does not increase in weight when kept in the dark, nor when it is kept in an atmosphere from which all carbon dioxide has been removed. ‘The absorption of carbon dioxide is then an indication that the plant is performing certain con- structive processes,—that it is assimilating carbon. The absorption of carbon dioxide is accompanied by an evolu- tion of

oxygen gas, the volume of the latter exhaled being approximately equivalent to that of the carbon dioxide absorbed. ‘This is an indication that the absorbed carbon dioxide is undergoing chemical change. It seems probable that the change is of the nature expressed by the following equation— 2CO, +#H,0=«(CH,0) +20, —that is, that from carbon dioxide and water a substance allied to formic aldehyde, or a polymer of it, is formed, free oxygen being evolved. It may be stated generally, with some considerable probability, that the first step in the constructive metabolism of a plant contaming chloro- phyll is the formation of a non-nitrogenous organic compound. It is just this formation of non-nitrogenous organic substance from carbon dioxide and water that the plant which is destitute of chlorophyll is unable to per- form ; and it is on account of this inability that the carbon of its food must be supplied to it in the form of organic compounds, as pointed out above. The further processes of constructive metabolism appear to be much the same in all plants, whether they contain chlorophyll or not. The next step is probably the formation of some relatively simple nitrogenous organic substances from the nitrogen of the food and the non-nitrogenous organic substance pd Fi)

which has been either formed in the plant or absorbed as food from without. The nitrogenous substances thus formed are probably crystallizable bodies, such as asparagin and leucin, which all contain nitrogen in the form of the group NH,. The derivation of these substances from the nitrogenous food when it contains nitrogen in the form of ammonia (NH,) is sufficiently obvious. When, how- ever, it consists of nitrates it appears probable that the nitrogen of the nitric acid has to be transformed into the nitrogen of ammonia, —that is, to be combined directly with

Destructive Metabolism (Katabolism).

Just as all the processes by which increasingly complex organic substances are formed in the plant, and which intervene between the food-materials on

the one hand and the protoplasm on the other, are designated collectively “constructive metabolism,” so all the processes of decom. position by which relatively simple substances are produced from relative complex ones, and which intervene between the protoplasm on the one hand and the excreta and other waste-products on the other, are designated collectively ‘destructive metabolism.”

hydrogen ; it is probably owing to their inability to effect this transformation that some plants, as mentioned above, cannot be supplied with nitrogen in the form of nitrates. The first step in this transformation is probably, as

Of all the various processes Sj of destructive metabolism the most fundamental jis the dew. decomposition of the protoplasm. It appears that this pal decomposition is spontaneous—that it is, as Pfliiger terms y.”

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Emmerling has pointed out, the decomposition of the absorbed nitrates by the organic acids, especially the oxalic, of the plant ; the liberated nitric acid then under- goes chemical change, resulting in the formation of ammonia. It is impossible to say with precision how this is effected, but there can be little doubt that it does take place ; some direct evidence is afforded by Hosaeus’s

it, a “self-decomposition”; and it is, in fact, only so long as this self-decomposition is proceeding that protoplasm can be said to be living. The destructive metabolism of an organism is not, however, confined to the self-decom- position of its protoplasm; the various complex organic substances which the cells contain may undergo chemical change quite independently of their entering into the

observation that ammonia salts were to be found on ana- lysis in a number of plants which had been supplied with manure containing no ammonia. The next process is an

metabolism of the protoplasm. The most active agents Ui in producing chemical changes of this kind are certain gtuini bodies which are termed

“‘ferments,” and are distinguished ™™

tnerease in the size and complexity of the molecule, attended in certain cases by the introduction of new elements (S and P), the product being one of those sub- stances which are known as “‘proteids.” The last stage is the formation of living protoplasm from the proteid and other organic substances.

as “unorganized ” ferments from the so-called “ organized” ferments, such as Yeast and Bacteria. But little is known as to their chemical composition, and nothing as to the peculiarity of chemical constitution upon which their char-

acteristic properties depend. The unorganized ferments which have hitherto been detected in

Forma The formation of nitrogenous organic substance may | plants may be classified, according to the nature of the chemical fie, take. placolinvany living-cel, and, unlterthe fomeaaag (re tee cnet tari tarsi) on ce

- : . . ces 4 vert star iga ic fer genous non-nitrogenous organic substance, it goes on quite ind © | These have been found to be very widely. distributed in plants, organic pendently of the presence of chlorophyll and of the action | and in fact it seems probable that a ferment of this kind is preseut sub- of light. But there is evidence to show that in green | inall living plant-cells. Their mode of action is generally indicated stance. plants it is especially in the cells which contain the chloro- | by the following equation—

phyll that the process goes on. The experiments by which this evidence has been obtained were made on plants with distinctly differentiated leaves. Emmerling observed in the Bean that, whereas in the root a relatively large quantity of nitric acid could be detected, there was much less in the stem, and in the leaves none at all, and he inferred that as the nitrates are supplied to the leaves they are used up in the formation of organic nitrogenous substance. Further, from the researches of Kellner, Emmerling, Borodin, and others it appears that the leaves contain the above-mentioned crystallizable organic sub- stances, asparagin, leucin, &c., in considerable quantity ; and it is quite possible that these substances may be formed

synthetically in the leaves, though it is true that they may be formed in other ways as well. Finally, Pott has found that the proportion of proteid in the plant increases from the roots upwards towards the leaves, the proportion in the latter being about twice as great as that in the former of many of the plants which he analysed.

The formation of living protoplasm from the organic substances elaborated from the food necessarily goes on in every living cell. It has been already mentioned that de- structive metabolism—that is, processes of decomposition— is active in living cells, and it is especially the protoplasm which is the seat of these processes. The maintenance of the life of the cell is therefore an, indication of the fact that the activity of the destructive metabolism is at least equalled by the activity of the constructive metabolism. In a young cell the latter exceeds the former, so that the protoplasm is increased in quantity; then for a time the two are approximately equivalent, until at length the destructive gradually gains the upper hand, and eventually the death of the cell is the result.

Starch. Maltose. 2(CgH 1905) + HyO =C,.H»,0y.

2. Ferments which convert cane-sugar into glucose (inverting ferments). A ferment of this kind, termed ‘‘invertin,” has been obtained from Yeast ; it is probable that a similar ferment is present in succulent fruits, for they commonly contain a mixture of cane- sugar and glucose. The following equation will indicate the natme of the process—

Cane-sugar. Dextrose. Levulose. CypHo0 1 + HO = CgHy.0¢ + CoH 206.

3. Ferments which decompose glucosides. The most familiar members of this group are emulsin or synaptase, found in the Bitter Almond; myrosin, in the sccd of the Black Mustard ; eryth- rozym, in the root of the Madder. The following equation repre sents the decomposition of the glucoside amygdalin by emulsin—

2 Oil of Bitter Prussic Amygdalin. Witanaee wat! Glucose.

C.9Ha NO), + 2H,,0 = C,H,0 a HCN a 2(C,H,.05).

4, Ferments which convert proteids that are indiffusible and may be insoluble in water into others (peptones) which are both soluble and diffusible. These, which are only active in the presence of free acid, are termed ‘‘ peptic ” ferments. They have been found in quantity in the latex of certain plants (Carica Papaya and Ficus Carica) and in the liquid excretion of carnivorous plants, It is, of course, impossible to represent by an cquation the nature of the chemical change which these ferments induce. F

It is probable that other ferments than these may be present m plants, but they have not yet been actually obtained. There 1s probably one which decomposes fats (glycerides) into glycerin and the corresponding fatty acid, thus—

Olein. Oleic Acid. Glycerin. C57 9406 + 3H,O = 3C,,H3,0, a C,,H,05.

Miintz and Von Rechenberg have pointed out that the quantity of free fatty acids in oily seeds increases very much during germma- tion, and the only satisfactory explanation of this fact which can at present be offered is that it is the result of the decomposition of the fats, in the manner indicated above, by an unorganized ferment. Again, it was mentioned above that crystallizable nitrogenous organic substances, such as leucin, asparagin, and tyrosin, occur in plants, and it was pointed out that they may be formed synthe ally. But there can be no doubt that they may be, and frequently are, formed analytically,—that is, by the decomposition, of more

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complex substances. For instancc, when the seeds of leguminous plants, such as the Pea or the Bean, germinate, the quantity of proteid substance diminishes, and the quantity of amides, notably asparagin, increases ; there can be no doubt that the latter are derived from the former. It is well known that similar changes take place in the pancreatic digestion of animals, that leucin and tyrosin are formed from protcids, and that this is effected by an unorganized ferment termed ‘“‘trypsin”; it is quite possible that a ferment of this kind may be present in plants. Finally, there is probably, in cer- tain plants at least, a ferment which converts cellulose into sugar. For instance,

the Date seed contains a quantity of non-nitrogenous reserve material stored up as cellulose in its very thick cell-walls ; on germination this undergoes absorption and is conveyed to the embryo ; it is extremely probable that the conversion of the in- soluble cellulose into some soluble substance (doubtless sugar) is cffeeted by the action of aferment. The penetration of the absorb- ent organs of parasites into the tissnes of their hosts is probably effected by the action of a fermeut of this kind which is excreted by the parasite. : ;

But there are still other chemical changes to be accounted for as the result of which substances relatively rich in oxygen are produced from others which are relatively poor in that element. Some of these are, so far as is known, processes of simple oxidation, which go on as readily out- side the organism as within it; for instance, chlorophyll is oxidized quite as readily in alcoholic solution as when it exists in the chlorophyll-corpuscles of a plant; these processes of simple oxidation may then be regarded as going on independently of the vital activity of the organism. But there are other and more complex oxidations which may be termed “oxidative decompositions”; these involve something more than mere oxidation, and appear to de- pend upon the vital activity of the organism.

The following instances may be given to illustrate the nature of these changes. Ethyl-alcohol becomes oxidized, under the influence of a Fungus known as the Mycoderma Aceti, as follows—

Acetie acid. C,H,O aa O.<= C,H,0, AP H,0. Another similar Fungus, the Mycoderma Vint, induces a more com- plete oxidative decomposition of aleohol,—carbon dioxide and water being the products of its action. Again, a substance termed “‘pyrocatechin” and various organic acids occur in plants, and there seems reason, from the researches of Hoppe-Seyler and of Carl Kraus, to believe that they are derived from carbohydrates in some such way as the following— Glucose. Pyrocatechin. Succinic acid. 80,H,,0¢ ap 40, = C,H,0. fe 380,H 04 Te 3H,0,

it being understood that this suggests ouly one of the ways in which the vegetable acids are formed.

There are yet other processes of decomposition which, like the oxidative decompositious, are effected under the influence of living protoplasm, but which, unlike them, do not depend upon the presence of oxygen; on the contrary, these decompositions, which may be generally termed “ fermentations,” depend upon the absence of free oxygen, for their activity is the greater the more limited the supply of this element. A characteristic example of this kind is afforded by the decomposition of sugar into alcohol and carbon dioxide, which is effected by Yeast, and is known as the “alcoholic fermentation.” Its nature is indicated by the following equation —

; C,H, .0,=2C,H,0 +2C0,.

Again, various forms of Bacteria effect decompositions of this kind. Of these the putrefaction of organic matter, the lactic and butyric fermentations, are examples. It must not be supposed, however, that the property of exciting fermentation is confined to the protoplasm of lowly plants such as Yeast and Bacteria. It has been found that various fermentations are set up when living plant-organs of any kind—leaves, flowers, fruits, seeds—are kept in an atmo- sphere which contains no free oxygen.

The characteristic accompaniment of the destructive metabolism of plants, as of all living organisms, is, under normal conditions, that interchange of gases between the plant and the atmosphere which is known as ‘‘ respiration,” and which consists in the absorption of oxygen and the

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evolution of carbon dioxide. It may be stated generally that the continual absorption of free oxygen is essential to the existence of at least the more highly-organized plants, and that in the absence of a supply of free oxygen they die. Death under these circumstances is to be attributed to the arrest of those metabolic processes which are accompanied by an evolution of kinetic energy in the organism—that is, of the destructively metabolic processes ; and of these by far the most important is the self-decom-

position of the protoplasm. It would appear that the absorption of oxygen is essential to the self-decomposition of the protoplasm-molecule. It is impossible to say any- thing definite as to the mode in which oxygen affects this process. Pfltiger has, however, suggested that the absorbed oxygen enters into the protoplasm-molecule as “ intra- molecular ” oxygen, that the molecule is thereby rendered unstable, and that it then readily undergoes decomposition.

In contrast to the plants which continue to live only Anaero- Pasteur biotic

when supplied with free oxygen (the aerobia, as has termed them) stand the anaerobia—those, namely, which thrive best in the absence of free oxygen, and to which, in certain cases, the access of free oxygen is fatal ; of the latter, certain Schizomycetes and Saccharomycetes may be taken as examples. It is remarkable that it is just the anaerobiotic plants which are most highly endowed with the property of exciting fermentation ; and this, taken in conjunction with the fact that the activity of fermenta- tion stands in an inverse relation to the supply of free oxygen, indicates the existence of some sort of correlation between the normal respiratory and the fermentative pro- cesses. It appears that in aerobiotic plants the normal processes of destructive metabolism, of which the absorption of oxygen and the evolution of carbon dioxide are the out- ward expression, may be replaced for a longer or shorter time by those abnormal processes of which fermentation is the outward expression; in completely anaerobiotic plants the fermentative are the normal processes. It is difficult to explain the physiological significance of fermentation, and to determine the manner in which it contributes to the maintenance of the life of the organism. Pasteur has suggested that it is the expression of an effort of the organism to obtain oxygen from substances which contain it in combination. Another possible view is that the organism obtains, by the fermentative decomposition of the substances upon which it acts, the supply of energy which, in the case of an aerobiotic plant, is afforded by the normal decomposition of its own protoplasm-molecules.

The products of destructive metabolism are extremely numerous and of very different chemical nature. They may be roughly classified into two groups: (1) the waste-products, substances which cannot be used in the

constructive meta- bolism of the plant, and which may be excreted ; and (2) the plastic products, substances which can enter into the constructive metabolism.

1. Waste-Products.—Among the waste-products the Waste- most constant are carbon dioxide and water, which are products.

exhaled in respiration ; it may, in fact, be stated generally that all living plants and parts of plants exhale carbon dioxide and watery vapour at all times. There is, however, no constant relation between the volumes of carbon dioxide exhaled and of oxygen absorbed in respiration, and the processes of destructive metabolism, of which the respira- tory interchange of gases is the external expression, are so complex that the relation, whatever it may be, between the volumes of these gases in any particular case cannot be accounted for. The degree of independence between these processes is well illustrated by the fact that the absorption of oxygen is relatively greater at low temperatures, and that the exhalation of carbon dioxide is relatively greater at high temperatures. This seems to indicate that ata

Organic acids.

Aroma- tic sub- stances.

low temperature the storing-up of intramolecular oxygen is relatively more active than the decomposition of the protoplasm-imolecules, whereas at a high temperature the converse is the case. At medium temperatures these pro- cesses are about equally active, for it has been ascertained in various cases that the volumes of oxygen absorbed and of carbon dioxide exhaled are under these circumstances approximately equal. It must not, however, be concluded that the exhalation of carbon dioxide is entirely independ- ent of the absorption of oxygen, for the observations of Broughton, Wilson, and Wortmann all show that when plants are deprived of a supply of free oxygen the activity of the exhalation of carbon dioxide rapidly diminishes.

Among the other waste-products the following are those which are of most common occurrence, —organic acids, aromatic substances, colouring matters, bitter principles, certain fatty bodies, alkaloids.

(1.) Organte Acids.—The organic acids are very generally pre- sent in plants, either frec or in combination with organic or in- organic bases, and it is to the presence of these acids or of their acid-salts that the acid reaction of plant-tissues is due. Those most commonly occurring are the malic, tartaric, citric, oxalic, and fatty acids, the last-named being generally in combination with glycerin, forming fats (glycerides). There can be little doubt that they are to be regarded as products of destructive metabolic processes, though Liebig regarded some of the more highly-oxidized acids as the first products of constructive metabolism, and as being formed from carbon dioxide and water in the cells which contain chlorophyll. It is not so clear that they are all to be regarded as waste-products ; it appears possible that some of the less highly- oxidized may undergo reduction with the formation in carbo- hydrates, for it has been observed, especially by Beyer, that in ripening fruits the acids diminish and the sugar increases in quantity. Again, there can be no doubt that fats entcr into con- structive metabolism, and hence the fatty acids must be regarded as plastic products. The more highly-oxidized acids are almost certainly waste-products. Oxalic acid, for instance, is commonly found as crystals of calcium oxalate which, in most cases at any rate, undergo no alteration. It appears that the oxalic acid is withdrawn in this way from the sphere of metabolism, and, inas- much as these crystals are deposited especially in the deciduous parts of the plant, it is also ultimately got rid of. It is probable that the organic acids are largcly produced as the result of oxidative decompositions (see swpra). There can be no doubt that the self- decomposition of protoplasm is attended by a formation of acids, especially of nitrogenous acids, such as the aspartic and gluta- minic, and of fatty acids.

In addition to their significance in the constructive metabolism of plants the organic acids are of use in other ways. Their presence in the living cells contributes to the maintenance of the turgid con- dition ; the presence of acid-sap in the root-hairs renders possible the solution and absorption of mineral substances which are insoluble in water; oxalic acid, at least, decomposes the salts absorbed by the roots ; and finally it appears that the

organic acids are capable of inducing the conversion of one carbohydrate into another—cane- sugar into glucose, for instance—and they may in this way play an important, though hitherto undctermined, part in the general metabolisin of plants.

(2.) Aromatic Substances.—These occur generally in the form of glucosides, the most common of which is tannin. The glucosides are bodies, for the most part non-nitrogenous, which yield sugar on decomposition amongst other substances. In so far as they yield sugar they may be regarded as plastic products; but the aromatic substances to which they give rise on decomposition are waste-products, for it appears from the observations which have been made on this point that the higher plants, at least, cannot avail themselves of carbon when combined in an aromatic molecule for the purposes of their constructive metabolism. Probably the resins which are so commonly present in plants are derived from tannin. The first step is the formation of a terpene (C,,H,,) in the secreting cells; this is then excreted into the ducts and undergoes partial oxidation with the formation of resin. In connexion with the terpenes two hydrocarbons, caoutchouc and gutta-percha (C5H,)a, may be mentioned, which occur in the latex of certain plants.

It is not possible to make any definitive statement as to the mode of origin of the aromatic substances in the plant, but the fact that tannin is constantly present in the cells of parts in which destruc- tive metabolism is active—growing points, mobile organs of lcaves, galls, for example—tends to prove that this glucoside at least may be derived from protoplasm. It must not be overlooked, too, that substances like tyrosin, which contain an aromatic radical, occur in plants, and that they are derived more or less directly from protoplasin.

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(8.) Colouring Matters. — The principal colouring matters of Colom,' plants are—(q) those which occur in the walls of the bark-cells ofing trees and shrubs (phlobaphenes); (4) those of woods, such aS Matter logwood ; (c) those which occur in solution in the cell-sap, as in most flowers ; (d)

those which occur in connexion with protoplasmic corpuscles, as in the Algw and in the leaves and other green parts of the higher plants. With regard to the three first-named groups it appears probable that they are derived in various ways from tannin.

Of the colouring matters which occur in connexion with proto- plasmic corpuscles by far the most important is chlorophyll, the substance to which plants owe their green colour. The corpuscle has a spongy structure, the interstices of which are occupied by the chlorophyll in solution in some fatty substance. The other colour- ing matters which may be present in corpuscles are—etiolin, yellow, which is apparently present in all chlorophyll-corpuscles, conspicuously so in those in parts of normally green plants which have been growing in darkness, and is apparcntly an antecedent of chlorophyll ; xanthophyll, also yellow, and commonly present in chlorophyll- corpuscles, especially in those of fading leaves, prob- ably a derivative of chlorophyll ; anthoxanthin, also yellow, the colouring matter of yellow flowers, and a derivative of chlorophyll ; phycoxanthin, brownish, present in the chlorophyll-corpuscles of the brown Algz (Phxophycex or Melanophycex) ; phycoerythin, red, present in the chlorophyll-corpuscles of the red Alga (Rhodophycee, Floridex).

Chlorophyll is a substance of such great physiological Form importance that the conditions of its formation and its tion of properties must be treated of in some detail. The general ot conditions upon which its formation depends are (a) ex.P 7 § posure to light, (6) a sufficiently high temperature, (c) a supply of iron. Plants which are normally green are not green if they have been grown in the dark, or if the tem- perature has been too low, or if they have not been supplied with iron; they are usually yellow, and in the last case especially they may be quite colourless. Normally green plants which have been kept in the dark or at too lowa temperature are said to be “etiolated,” since they form etiolin; plants which have grown in absence of a supply of iron are said to be “chlorotic.” There are good grounds for regarding etiolin as an antecedent to chlorophyll. It is formed in the corpuscle in darkness and at a tempera- ture lower than that which is necessary for the formation of chlorophyll. It appears from the researches of Gris, Mikosch, and others that when the corpuscle is about to form etiolin it contains a starch-granule, and that as it assumes a yellow colour the

included starch-granule dimi- nishes in size and may disappear. It must not be inferred from this observation that the etiolin is directly formed from the starch. . It is more probable that it is derived from the protoplasm, and that, as the protoplasm is con- sumed in the formation of the etiolin, the starch is used in the construction of fresh protoplasm. Under the in- fluence of light and of a sufficiently high temperature the — yellow etiolin is converted into the green chlorophyll, but nothing is known as to the nature of the process by which the conversion is effected.

With regard to the physical properties of chlorophyll Pro | it has long been known that it is soluble in alcohol, ether, pete | benzol, chloroform, carbon disulphide, and various oils. ohyll | / Hansen has obtained, by a process of saponification, from? 7 the alcoholic extract of leaves a green crystalline substance, \f probably the purest form of chlorophyll yet obtained, |

which is readily soluble in water. All solutions of chloro- phyll in the above-mentioned media are fluorescent,—that | is, when they are viewed by reflected light they appear | opaque and of a deep lake-red colour, but when thin | layers are viewed by transmitted light they appear green.

If the light which has passed through a layer of a moder- } ately strong solution be examined with the spectroscope

a characteristic absorption-spectrum will be observed. Beginning at the red end of the spectrum, a well-marked dark band will be seen between Fraunhofer’s lines B and

C, extending rather beyond ©, a second dark band in the orange between C and D, a third very faint band at the

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junction of the yellow and the green, and a fourth more distinct band in the green near F. When an alcoholic extract of leaves is used, as is ordinarily the case, the whole of the blue end of the spectrum beyond F is absorbed, in consequence of the coalescence of three broad bands, which can be seen

separately when a very dilute solution is used, two of the bands being in the blue between F and G, and one at the end of the violet. The spectrum of the alcoholic extract presents then seven bands in all. According to Hansen, the spectrum of solutions of his erystallized chlorophyll possesses only the first four of the above-mentioned bands, and it is only when very thick layers are used that the blue end of the spectrum is absorbed ; this is true also of the spectrum of the green colouring matter obtained by Tschirch.

Little is as yet known as to the chemical composition of chlorophyll. Gautier and Hoppe-Seyler have both obtained a crystalline green substance from the alcoholic extracts of leaves, termed by the latter “ chlorophyllan,” which is not to be regarded as pure chlorophyll. The following are their analyses of this substance, to which is added for comparison Hansen’s analysis of the green crystalline substance which he obtained—

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Gautier. Hoppe-Seyler. Hansen. © nontnts Ob (OCB E Soe ce aE Eee 73°97 73°34 60°33 RMR case ccscccnte aa. 9°80 9°72 9°37 IN) cocconeoo sng esesgge nea 4°15 5°68 4°77 «) cogaenenh@segesspoEaaneEge 10°33 9°54 14°77

i P. 1°38 ae 175 Me. Rei 10°76

Hansen states that the ash found by him is due to the previous processes of preparation, and that the only normal ash-constituent is iron, which neither Gautier nor Hoppe- Seyler had discovered. Tschirch on reducing chlorophyllan by means of zinc-dust has obtained a green substance which does not crystallize, and is soluble in alcohol, ether, and oils, but not in water. This he believes to be pure chloro- phyll. From the percentage composition of the crystals of chlorophyllan Gautier deduces the formula C,yH».N.Os, and draws attention to the similarity between this and the formula of bilirubin (C,,H,,N,O3). Hoppe-Seyler concludes that chlorophyllan contains phosphorus in its molecule, and is either a lecithin or a lecithin compound. Schunck has found that the residue of an ethereal solution of chlorophyll when treated with sulphuric or hydrochloric acid yields glucose amongst other products ; he therefore regards chlorophyll as a glucoside.

(4.) Bitter Principles.—It has been ascertained that some of these are glucosides, and some alkaloids, but the chemical nature of many of them is still undetermined. Such are santonin (Cy3H,,03), aloin (C,;H,,0,), quasiin (CypH,.0,). It is impossible at present to say anything as to the possible mode of their origin or as to their physiological significance in the plant.

(5.) Certain Fatty Bodies.—The ordinary fats (glycerides) are to be regarded as plastic products, and they will be subsequently treated of under that head. But there are certain fatty bodies of which this statement caunot be made; these are cholesterin, lecithin, and wax. It is not known how these substances are formed, but probably they, like the ordinary fats, are derived from protoplasm. This view is especially probable with regard to lecithin, which is a nitrogenous and phosphorized fat. Wax occurs especi- ally in the external cell-walls or on the surface of those parts of plants which have a cuticularized epidermis; the “pbloom”’ on fruits, for example, is a layer of wax.

(6.) Alkaloids.—The alkaloids arc regarded as waste-products, because, as the observations of Knop and Wolff show, the demand for combined nitrogen cannot be met by suy plying the plant with it in the form of alkaloids, though the plant can avail itsclf of such organic nitrogenous substances as urea, uric acid, leucin, tyrosin, or glycocoll. The alkaloids are compound ammonias which are not volatile at ordinary temperatures. With regard to their mode of origin in the plant, there can be little doubt that they are derived more or less directly from protoplasm, or at least from proteid, as are urea and uric acid in the animal body. But, although these nitrogenous waste-products are formed in the destructive metabolism of plants, their formation is not accom-

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panied by a loss of nitrogen, for they are not excreted, as is the case in animals, but are deposited in the cells.

2. Excretion.—Of the waste-products, some, such as oxygen, water, and carbon dioxide, are excreted in the gaseous form—the oxygen and the carbon dioxide through the superficial cell-walls of the plant, the watery vapour through the stomata. Some of the carbon dioxide may combine with

earthy bases to form carbonates, which are either retained in the plant or excreted in solution. The resins and ethereal oils, as well as wax, are frequently

in different cases. excreted by means of special glandular organs. may be a hair on the surface, and it is then commonly the terminal cell at the free end which is secretory ; or it may be a group of epidermal cells between which large inter- cellular spaces are formed, which serve as receptacles for the excreted substance; or it may be formed by the absorp- tion of the adjoining walls of a group of cells belonging partly to the epidermis and partly to the underlying ground-tissue, a cavity being thus constructed, which con- tains the excreted substance ; or again, longitudinal strands of cells may become separated so as to enclose an elongated intercellular space into which they excrete (resin-ducts). In many cases the substance to be excreted may be detected in the glandular cells; not unfrequently, however, and always in the case of wax, no trace of it can be discovered in the cells themselves ; it is first to be found in the cell- walls between the cuticular and the deeper layers. The actual excretion is usually effected, in the case of super- ficial glands, by the rupture of the cuticle which is con- tinuous over the gland, and by the consequent escape of the contents ; in some cases the gland remains closed, and any volatile substances (ethereal oil) which may be present escape by evaporation.

The excretion of the earthy carbonates in solution is most commonly effected by means of a well-developed gland. Such a gland consists of a group of modified parenchymatous cells in connexion with the termination of a fibro-vascular bundle; and one or two openings, termed “water-pores,” and somewhat resembling stomata, are present in the epidermis immediately over it. Under the action of the root-pressure the gland excretes water which holds the carbonates in solution. Glands of this kind are present in the leaves of various Saxifragaceous and Crassulaceous plants. In other cases these salts appear to be excreted by ordinary epidermal cells. In certain Ferns (various species of Polypodiwm and Aspidium), for instance, scales of calcium carbonate are found on depres- sions in the surface of the leaves which are situated imme- diately over the terminations of the fibro-vascular bundles.

It not unfrequently happens that plants excrete sub- stances other than waste-products, but this has the effect of securing indirect advantages. In the great majority of flowers there are glandular organs which excrete a watery fluid holding principally sugar in solution ; these organs are termed "'nectaries," and the excretion "nectar." The nectary has essentially the same structure as the water-gland de- scribed above, the only important difference being that, whereas the gland is sunk in the tissue and is covered by the epidermis, the nectary has a large free surface, so that the nectar is at once poured out on to the exterior. But there is an important functional difference between them, namely, that, whereas excretion by the gland can only take place under the influence of the root-pressure, excretion by the nectary is independent of the root-pressure, for it will continue when the flower has been removed from the plant. Another instance of an excretion of this kind is afforded by the carnivorous plants. The glands of their leaves excrete a watery liquid which holds in solution a peptic

excreted, The mechanism of excretion is widely different Gland- The resins and ethereal oils are usually Ular ex- The glan d cretion.

Nectary excre- ion.

ferment and one or more organic acids. The use of the nectar is to attract insects, and thus to ensure cross- fertilization. The use of the excretions of the carnivorous plants is to dissolve the organic matter (usually insects) which has been deposited on the leaves, so as to bring it into a form in which it can be absorbed.

are also commonly to be found in plants. Glucose may be regarded as having been derived by the action of an unorganized ferment from one or other of the other carbo- hydrates, except in certain plants, the Onion for example, in which it appears to be formed in the chlorophyll-cor-

puscles in the first instance. Nothing is known at present Cane.

Waste- Many of the waste-products are not excreted, but remain | as to the mode of origin of cane-sugar, which exists in Suge. products in the plant. Thus the terpenes are indeed excreted by | such large quantities in certain plants, as the Beet and the not eX- the cells which line the resin-ducts, but these ducts have Sugar-cane. ae no aperture on the surface of the plant. Similarly the With regard to the fats, it is commonly assumed that Fats, | caoutchoue and gutta-percha which are contained in the | they are formed directly from the carbohydrates, because | laticiferous tissue of certain plants have no means of egress. | in oily seeds, for example, as the starch which they contain This is also true of the tannic acid, of the calcium carbonate | when young diminishes in quantity it is replaced by fats, (usually) and oxalate, of the alkaloids, and of silica. These | There is, however, sufficient evidence to prove that the substances are usually deposited in the cells. Calcium | fats are the products of the decomposition of protoplasm, carbonate and oxalate are deposited in the form of crystals | The disappearance of the starch in ripening oily seeds is either in the cell-wall or in the cell-cavity, and silica in | due to its being used up in the construction of protoplasm, the cell-wall. In some cases calcium carbonate is deposited | as the protoplasm undergoes decomposition in connexion on cellulose processes which extend into the cell from its | with the formation of fat. wall, the whole body being termed a “cystolith.” The nitrogenous plastic products are proteids and Proteid: 3. Plastic Products.—The principal non-nitrogenous | amides. There can be little doubt that the proteids may : plastic products are the carbohydrates and the fats (gly- | be derived from protoplasm. If the molecule of living cerides); to these, as suggested above, some of the organic | protoplasm be regarded as an extremely complex one, acids are perhaps to be added. there is no difficulty in inferring that proteid may be Starch. Of the carbohydrates the substance which most demands | one of the products of the decomposition of the proto- attention is starch. Starch makes its appearance in the | plasm-molecule. The amides may also be products of the Amide form of minute granules in chlorophyll-corpuscles in which | decomposition of protoplasm, or they may be formed from constructive metabolism is being actively carried on. It | proteids by the fermentative action of living protoplasm ; was thought that it was the immediate product of the | or by the action of some

as yet undiscovered unorganized decomposition and recombination of carbon dioxide and | ferment, as pointed out above. of water in the corpuscle under the influence of light, the It has been stated that the plastic products are so called process being represented by some such equation as the | because they are substances which can be used in the con- following— structive metabolism of plants. But it must not be inferred 6CO, + 5H,0=C,H,,0, + 60,. that they are so used immediately. The very fact that it Increased knowledge of the conditions under which | is possible to detect their presence in considerable quantity starch makes its appearance in plants has, however, made | isa proof that this is not the case. They are largely stored it evident that this is not the case. Starch may be regarded up either for the use of the plant itself at some future as the first wstble product of the constructive metabolism | time, or for the benefit of the progeny of the plant. In going on in a chlorophyll-corpuscle, but it is not the first | a perennial plant, for example, plastic products are stored non-nitrogenous substance formed. That, as has been | in the persistent parts for the use of the plant when it pointed out, is probably a body allied to formic aldehyde. | recommences its active growth ; they are also stored up in The starch is formed as one of the products of the decom- | seeds and spores to be used by the young plant during the position of the protoplasm of the corpuscle. That this is early stages of germination. Plastic products thus stored so is made evident when the formation of starch in parts up are termed “reserve materials,” and the organs in which of plants which are not green and which are not exposed | they are deposited are termed “depositories for reserve to light is considered. In the cells of these parts there | materials.” The non-nitrogenous reserve materials are Non are certain small colourless protoplasmic bodies which are | stored up in the form of carbohydrates or of fats. The nitro- termed “‘starch-forming corpuscles” or “leukoplasts,”and it | starch which is formed in the green parts of the plant is by these that the starch-granules are formed. It appears | (which is, be it observed, a temporary reserve material) mate. that the starch-granule is formed in the first instance by | is converted into a soluble substance, probably glucose, rials, the deconiposition of a portion of the protoplasm of the | and is conveyed in solution to the depository ; and from corpuscle, successive layers of starch being deposited upon | it, directly or indirectly, the non-nitrogenous reserve the primitive granule by the decomposition of successive | materials are formed. The reserve carbohydrates are layers of

protoplasm. It is in this way that the stratified | stored up either in the insoluble or the soluble form. In structure of these starch-granules is produced. There is | the former case they are deposited as starch-granules, or as no reason for assuming that the process of starch-formation | cellulose (as in the endosperm of the Date) in thick cell- in chlorophyll-corpuscles is essentially different from that | walls ; in the latter they exist as various forms of sugar in leukoplasts ; on the contrary, in view of the close re- | in solution in the cell-sap. The starch-granules are formed lationship of these bodies, the one being convertible into | in these depositories by the leukoplasts. From the soluble it the other, there is every reason for believing it to be the on-nitrogenous substance, probably glucose, together with Me same. There is, however, this functional difference between nitrogenous substances conveyed to the cells, the leuko- iH chlorophyll-corpuscle and leukoplast, that in the former plasts construct protoplasm ; and it is as the result of the | the synthetic processes, 7.¢., the construction of protoplasm, | decomposition of this protoplasm in a certain way that | begin with such simple substances as carbon dioxide, | starch is formed. This is true also of the reserve cellu- water, and mineral salts, whereas in the latter they begin | lose. From the plastic materials, both nitrogenous and (see below) with tolerably complex substances, such, for non-nitrogenous, which are supplied to the cells proto- example, as glucose and asparagin. Starch, then, is the | plasm is constructed, and the external layers of proto- immediate product, not of constructive, but of destructive plasm undergo decomposition in such a way that cellulose mi metabolism. is formed and deposited in successive layers upon the ucose.

Various kinds of sugar, notably glucose and cane-sugar,

internal surface of the cell-wall. The various kinds of

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sugar (cane-sugar in the Beet root, glucose in the Onion, inulin in the Dahlia root, mannite in the unripe fruits of the Olive and in some Agarics, trehalose in many Agarics) are probably formed more or less directly from the glucose conveyed from other parts to the depository in each case. The fats occur as reserve materials characteristically in seeds and sometimes in fruits; they are not stored up in any considerable quantity in any other kind

of depository. They too are formed by the decomposition of protoplasm which has been constructed from plastic materials, nitrogenous and non-nitrogenous, which have been conveyed to the cells, The nitrogenous reserve materials are stored either in solution or as solid granules. In the former case they are amides, such as aSparagin and glutamin, leucin and tyrosin, and are held in solution in the cell-sap ; they are present characteristically in roots and tubers, but they have also been found, though in small quantity, in seeds. In the latter case these materials are stored in the form of proteids, chiefly globulins and peptones, and the granules in which they are deposited are termed “aleurone grains.” The aleurone grain may consist simply of an amorphous mass of proteid, or a portion of the proteid may have crystallized out so as to form a crystalloid ; in most cases the grain contains a small mass of mineral matter which consists, according to Pfeffer, of double phosphate of lime and magnesia. Aleurone grains occur characteristically in seeds, and they are especially well developed in oily seeds. When once deposited, the reserve materials suffer no

\ xe of further change, or at most the proteids may slowly undergo rive some alteration (globulin being converted into albuminate), — so long as the organ in which they are deposited remains g vth, wan inactive condition. But when the external conditions

become favourable the quiescent organ resumes its active life—in a word, it germinates—and the reserve materials which it contains then undergo chemical changes of such a nature as to convert them into substances which can readily travel to the seat of growth and can be used as plastic material by the growing cells. In a germinating seed, for instance, as the embryo grows the reserve materials of the seed diminish in quantity ; they are evidently conveyed to the seedling, and are used by it in the construction of new protoplasm. Beginning with the non-nitrogenous reserve materials, the starch in starchy seeds and the cellulose in such seeds as the Date are converted into sugar; this is proved by the detection of sugar as well in the seed as in the seedling, and by the detection in the seed of an unorganized ferment which possesses the property of con- verting starch into sugar. In oily seeds the fats are replaced by starch, formed through the intermediation of protoplasm, and the starch so formed is converted into sugar. With regard to the reserve proteids, they are converted into amides, for it has been

ascertained that, as they diminish in quantity, the amides, and notably asparagin, increase.

The effect of the absorption of these plastic substances by the embryo is that the cell-sap of its cells becomes charged with them, for the supply is more rapid than the consumption in the formation of protoplasm. If the seed- ling is growing under favourable conditions these sub- stances gradually diminish in quantity. Some light has been thrown upon the nature of these conditions by the researches of Pfeffer. He found that Lupin seedlings grown in the dark contained a very large quantity of asparagin so long as they continued to live, but that if they were exposed to light the asparagin gradually diminished. But he ascertained further that mere exposure to light is not the cause of this, since the asparagin did not diminish in seedlings exposed to light in an atmosphere which con- tained no carbon dioxide. The disappearance of the asparagin depended, therefore, upon conditions which were

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essential to the formation of non-nitrogenous organic sub- stance by the seedlings. Now the Lupin seed is one which is particularly rich in nitrogenous reserve materials, the quantity of non-nitrogenous reserve materials being relatively small. The accumulation of the asparagin in the seedlings grown in the dark is then to be ascribed to the absence of an adequate supply of non-nitrogenous substance with which it could combine to form proteid. When the seedlings were exposed to light this supply was forthcoming, and then the asparagin disappeared.

Supply of Energy.

It is evident that the various chemical processes which make up Supply the metabolism of plants involve an expenditure of energy ; hence of the maintenance of the life of the plant is dependent upon a supply energy. of energy.

In the case of animals the food affords the principal supply of energy. It consists for the most part of complex organic substances which represent a considerable amount of potential energy, and when these substances are decomposed in the body the potential energy appears in the kinetic form. This holds good also witli reference to plants which are destitute of chlorophyll, for their food necessarily includes, like that of animals, complex organic substances. But with plants which possess chlorophyll the casc is entirely different. Their food consists of inorganic substances which do not represent any considerable amount of potential energy ; from these simple substances green plants build up complex orgauic substances which do represent a considerable amount of potential energy ; it is evident, therefore, that green plants must be largely supplied from without with kinetic energy in some form or other. It has been already mentioned that the metabolic processes of plants are materially affected by external conditions, especially by the pre- sence or absence of light, and by variations in the temperature of the surrounding medium. A somewhat elevated temperature is essential to the active life of all plants, but light is essential only to the life of those which contain chlorophyll. This naturally suggests that the energy requisite for the maintenance of the life of plants is obtained by them in the form either of light or of heat.

Light.—In discussing the constructive metabolism of green plants Light a it was pointed out that such can only assimilate their food—that source of is, can only construct protoplasm from it—when exposed to light, plant- whereas plants which do not possess chlorophyll can assimilate energy. their food in the absence of light. It is true that a green seedling ean live for a time in continuous darkness and increase in light, but it does so, not by assimilating its food, but at the expense of the organic reserve materials which may be present in it. The fact of the dependence of green plants upon exposure to light sug- gests that the energy necessary for the processes of their constructive metabolism is obtained in the form of light, and that their chloro- phyll enables them to avail themselves of this form of kinetic energy. The function of chlorophyll has been made clear by the researches of Timiriaseff and of Engelmann. They have shown that the evolution of oxygen by a plant coutaining chlorophyll, which is the expression of the first stages of constructive metabolism, is most active when the plant is exposed to those rays of the solar spectrum which correspond to the

absorption-bands of the chloro- phyll-spectrum ; the more conspicuous the absorption-band, the greater is the degree of activity, so that the evolution of oxygen is most considerable in the rays between the lines B and C of the solar spectrum, at the junction of the red and the orange, which correspond to the absorption-band I in the chlorophyll-spectrum. It is, then, in consequence of this absorption by the chlorophyll that the kinetic energy of the solar rays is made available for the work of constructive metabolism in the plant. The whole of the kinetic energy absorbed by the chlorophyll is not converted into potential energy; still the chlorophyll-corpuscle appears to be a very perfect machine in this respect, for, according to Timiriaseff's calculations, it converts into the potential form as mucli as 40 per cent. of the absorbed energy. Inasmuch as light exercises so great an influence upon the constructive metabolism of green plants, it may be inferred that it must indirectly affect the absorption of food-materials by the roots. Rudolph Weber has, in fact, ascer- tained that the greatest absorption of the essential ash-constituents takes place when the plant is kept exposed to those rays of light which are most efficacious in promoting its constructive metabolism.

The effect of light upon the destructive metabolism of plants appears to be unimportant. This subject has been investigated by means of observations upon the respiration of plants ; and such a method is calculated to afford the necessary information, inasmuch as the activity of respiration may be taken as a measure of the activity of destructive metabolism.

It has been generally stated that chlorophyll is not formed in the absence of light. There are, nevertheless, certain cases in which its formation in complete darkness has been observed, provided

Heat a

source of blooded animals.

energy.

Accumu- lation of energy.

Dissipa- tion of energy,

that the temperature has been sufficiently high, namely, in the cotyledons of some Conifers and in the leaves of Ferns. The colouring matter etiolin is formed in the corpuscles in darkness, but the conversion of this into chlorophyll can only take place, as a rule, under the influence of light. The formation of chlorophyll will take place in light of very low intensity, but, as Wiesner's experiments show, there is a lower limit of intensity below which light is inactive. With regard to the relative efficacy of the differ- ent rays of the spectrum in promoting the formation of chlorophyll, it appears from Wiesner's researches that all the rays between Fraunhofer's lines B and H promote it in different degrees, and further, in confirmation of older observations, that seedlings turn green more rapidly in the yellow than in any other part of the spectrum. This last statement is true only for light of moderate intensity; when the light is very intense the formation of chlorophyll takes place more rapidly in blue than in yellow light. The reason of this is that in intense light chlorophyll undergoes decomposition, or at least chemical alteration of the nature of oxidation, which gocs on most actively in yellow light.

Heat.—Plants behave in relation to temperature like the cold- When they are maintained at a low temperature they cease to exhibit any signs of life. The meaning of this is that at a low temperature the activity of the metabolic processes is so reduced that they appear to be altogether arrested. But the im- portance of a moderately high temperature for the maintenance of the active life of the plant is not, as might be supposed, that it affords a continuous supply of energy to be converted into work ; it is rather that it determines the initiation of chemical processes which are carried on by means of energy obtained from other sources. Hence the supply of energy in the form of heat is rela- tively small as compared, on the one hand, with the supply of potential energy afforded by their food to the plants which do not possess chlorophyll, and, on the other hand, with the supply ob- tained in the form of light by plants which do possess chlorophyll.

It is not possible within the limits of this article to enter fully into the relations existing between plant-life and temperature. The following statements will at least indicate their general nature. In the first place, the

tolerance of extreme temperatures is different for different plants, as determined in the case of any particular organ, such as the seeds for instance. Secondly, for each of the processes which can be studied separately, such as germination, growth, respiration, the formation of chlorophyll, the action of unorganized ferments, the evolution of oxygen by green plants in light, &c., there are threc cardinal points of temperature to be noted—the minimum or zero point, at which the performance of the process is just possible; the optimum point, at which it is carried on with the greatest activity; the maximwm point, at which it is arrested. But these different phenomena do not all stand in precisely the same relation to temperature,—that is, the cardinal points for the exhibition of any two or more of thesc phenomena by one and the saine plant do not necessarily coincide. Thirdly, the larger the proportion of water in an organ, the more liable it is to be injured by exposure to extreme temperatures.

Expenditure of Energy.

We have now to ascertain what becomes of energy supplied to the plant. The matter may be briefly stated thus: a portion of it is stored up in the plant in the form of potential energy ; the re- inainder is lost to the plant, being either spent in the performance of mechanical work in connexion with growth or movement, or given off, most generally in the form of heat, occasionally in the form of light, and possibly in the form of electricity. The storing- up of energy in the potential form may be termed the “accumula- tion of energy,” the loss as the “dissipation of energy.”

1. Accumulation of Energy.—The accumulation of energy is the necessary accompaniment of constructive metabolism ; the forma- tion of more and more complex organic substances involves the conversion of kinetic into potential energy. By taking into con- sideration the amount of organic substance formed by a plant from its first development to its death, it is possible to arrive at some ilea of the amount of kinetic energy which the plant has stored up in the potential form. For the heat which is given out by burning the organic substance is but the conversion into kinetic energy of the potential energy stored up in the substance; it is but the reappearance of the kinetic energy which was used in produc- ing the substance. The heat, for instance, which is given out by burning wood or coal represents the

kinetic encrgy, derived prin- cipally from the sun’s rays, by which were effected the processes of constructive metabolism of which the wood or the coal was the product. The amount of energy thus stored up by plants in the potential form is very large, because they produce relatively large quantitics of organic substance.

2. Dissipation of Energy.—The expenditure of energy in con- nexion with growth and movement, and with the evolution of heat, light, and electricity, is dependent upon destructive meta- bolism, for the conditions which are essential to destructive meta- bolism are also those which are essential to the exhibition of these

phenomena. Taking growth, for example—that is, continuous change of form accompanied usually by increase in bulk—it appears that in an aerobiotic plant it is dependent upon the following ex- ternal conditions, namely, a supply of free oxygen and an adequate temperature, conditions which are precisely those upon which the destructive metabolic proccsses of such a plant also depend. This is true in such plants of the other above- mentioned phenomena also, Anaerobiotic plants can grow when the conditions are such that they can induce active fermentation,—that is, when their destruc. tive metabolism is active. After what has been said in the section on the “ Nervous System” above (p. 38 sq.) about animal movement it is hardly necessary to prove that the movements of plants, which are of essentially the same nature as those of animals, depend upon destructive metabolism and involve a dissipation of energy.

An evolution of energy in the form of heat is the inseparable result of destructive metabolism. With regard to plants, it may be stated generally that the cvolution of heat ig not sufficiently active to raise the temperature of the plant-body above that of the surrounding medium, it being remembered that plants are constantly losing heat, principally by radiation and in connexion with tran- spiration. In organs, however, in which destructive metabolism is very active it is easy to detect a rise of temperature, especially when a large number of them are collected together. A good instance of this is afforded by germinating seeds; for example, a rise of temperature is a familiar fact in the process of the malting of Barley. It

can also be readily observed in the case of opening flowers in dense inflorescences ; Warming observed, for example, that, at the time of the opening of the flowers, the inflorescence of an Aroid (Philodendron bipinnatifidum) attained a temperature of 18°°5 C. above that of the air.

The evolution of light by plants is a phenomenon which has been known from the times of Aristotle and of Pliny, and is commonly spoken of as “phosphorescence.” All the well-authenticated in- stances of luminosity are confined to the Fungi, to various Agarics, and to Schizomycetes (Bacteria), The so-called “phosphorescence ” of decaying wood is due to the presence of the mycelium of A garicus melleus (Rhizomorpha), and that of putrefying meat and vegetables to micrococci. See PHOsPHORESCENCE. The evolution of light is essentially dependent upon the life of the organism, and further, it is dependent upon the destructive metabolism ; for it ceases when the organism is killed (as by dipping it into hot water), or deprived of its supply of free oxygen, which is essential to the metabolic processes,

In view of the changes, both chemical and physical, which are

oing on with greater or less activity in the various parts of a liv- ing plant it has not been unnaturally inferred that the electrical equilibrium is being constantly disturbed, and that differences of electrical potential energy may exist in different parts. Many experimenters have investigated this subject, and such differences have been apparently observed. It is impossible to enter here into a detailed consideration of the results obtained ; it may suffice to state that in the majority of cases the electrical currents detected do not indicate a dissipation of the energy of the plant, but are due to physical causes, and in some cases even to the effect upon the organism of the apparatus employed for the purpose of detecting them. It has been clearly made out in certain instances that the currents persist in organs whicli have been suddenly killed in such a way as not to destroy their gross organization.

There is, however, one instance in which an electrical current has been detected which seems to be connected with the destructive metabolism of the plant. Burdon-Sanderson and Munk have both observed that, when the two electrodes are placed upon a mobile leaf of Dionzxa muscipula

(Venus's Fly-trap) when at rest, a certain electrical current is indicated by the galvanometer. When the leaf is stimulated, whether the stimulation be or be not followed by a movement, the direction of the observed current is suddenly re- versed. This change in the direction of the current—or "negative variation," as it is termed—is, according to Burdon-Sanderson, the "visible sign of an unknown molecular process," which he considers to be "an explosive molecular change," of the same nature as the negative variation which follows upon the stimulation of the muscles and nerves of animals,

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In concluding this part of the subject it may be well, for the Income sake of clearness, to draw up an account of the income and expendi- and er

ture of a plant. In the case of a plant possessing chlorophyll the income of matter

consists of the food (salts, water, carbon dioxide, free oxygen), and plants.

the income of energy of kinetic energy in the form of light and heat, the former being the more important of the two items. The great bulk of the food absorbed is converted into organic matter, and is for the most part retained by the plant in the form of organ- ized structures, of reserve materials, and of waste-products which are not excreted ; but a certain proportion of it is lost in the form of the carbon dioxide and water exhaled in respiration, of oxygen exhaled by green parts in sunlight, and of excreted organic or inorganic matter. Besides these items of loss there are yet others. All plants lose a certain amount of matter in connexion with repro-

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duction, for all plants throw off in the course of their lives certain portions of their structure in the form of seeds, spores, antherozoids, &e. Again, plants whieh persist for more than one period of growth Jose matter by the falling off of eertain of their organs and of por- tions of their structure,—for example, by the falling of the leaves in autumn, and by the shedding of bark, fruits, Xe. With reference to the expenditure of energy, a large proportion of the income of energy remains stored up in the potential form in the organic matter which the plant accumulates. A dissipation of energy as heat.and in connexion with growth is common to all plants: in some there is dissipation of energy in the form of motion, in some in the form of light, in some, probably, in the form of electricity. A loss of energy—potential energy—occurs also when the plant loses organic matter in any of the ways mentioned above. These various items may be tabulated under the two heads of “ineome” and “ expendi- ture.” The water lost in transpiration is not considered, for it simply traverses the plant ; only that amount of water is considered which may be assumcd to enter into the processes of constructive metabolism or to be produced in the processes of destructive

metabolism. Plant possessing Chlorophyll. Income. Expenditure. Matter. Food— Inorganic salts. Carbon dioxide. Water. Free oxygen.

Matter. Organic substance formed. Carbon dioxide) evolved in respir-
Water ation. Free oxygen, evolved in light. Excreted substances, organic or inorganic. Reproduction (spores, seeds, &c.). Other losses (leaves, fruits, bark, &c.). Energy. Constructive metabolism. Growth. Movement (in some cases). Heat. Light. Electricity (in some cases). Potential energy (when organic matter is excreted or thrown off).

Balance in favour of Plant. Matter.—Organic substance (including tissues, reserve materials, and unex- ereted waste-products). Energy.—Potential energy, represented by the accumulated organic sub- stance.

Plant destitute of Chlorophyll. Expenditure.

Same as above, except that no free oxygen is given off.

Energy.

Rays of light absorbed by chloro- phyll.

Heat.

Income. Matter. Food— Inorganic salts. Organic substances. sh apt ree oxygen (in most cases). pormgen(oe) Balance in favour of Plant.

Same items as above.

Energy. Potential energy of organic food. Heat.

Movement of Plants.

It has been pointed out above that movement, ineluding in the conception the slow movement of growth, is an item in the ex- penditure of energy by the plant. The phcnomena connected with movement are of such physiological importance that it will be well to consider them rather fully.

In dealing with this large subject attention will be directed for the present simply to the external phenomena, leaving the internal causes and mechanisins till subsequently, and those presented by growing organs will be taken first.

1. Growth.—In commencing the study of growth it is important to have a perfectly elear idea of what the word means. It means the continual change in form of the body of the plant, or of any organ of it, the change being frequently accompanied. by increase in bulk, though this is not necessarily the case. For the purposes of this article it will be convenient to use “ growth” as meaning, unless expressly stated otherwise, growth in length, that is, the elongation of the organ along the linc joining its base aud its apex. The conditions upon which growth is dependent are—(1) a supply of plastic material for the formation of new protoplasm ; (2) favour- able external conditions, especially an adequate temperature ; (3) a supply of free oxygen in the case of aerobiotic plants, or, in the case of anaerobiotic plants, of fermentable substance ; (4) a supply of water to maintain the turgidity of the cells. Any variation in these essential conditions will lead to a variation in the rate of growth. The capacity for growth is limited, as a rule, to a certain period of the life of an organ and of its constituent cells ;

when this period is past growth ceases, however favourable the external con- ditions may eontinue to be.

The rate of growth of an organ is not uniform. At first the organ grows slowly, then more and more rapidly, until a maximum rapidity is reached, and then the rate diminishes until growth ceases altogether. This eycle of spontaneous variation in the rate of growth is known as the ‘‘grand period of growth.” It can be conveniently studied by marking on the growing point of an organ a series of transverse zones of known length, and observing their relative elongation in a given time. It will be found that the

youngest (nearest the apex) have elongated slightly, that the elon- gation is greater the farther each sueeessive zone is from the apex, until a zone of maximum elongation is reached ; the elongation of the zones lying behind this will be found to be less and less, until at last zones will be found which have not elongated at all. In addition to the variations in the rate of growth in length of an organ which make up its grand period it is found, if its growth be watehed from hour to hour, or at even shorter intervals, that it presents irregular variations, which are likewise to be regarded as spontaneous. Variations in the rate of growth may be induced by variations in the external conditions, especially by variations of temperature and of illumination. It will be of interest to inquire briefly into these relations between growth and temperature and growth and light.

Inasmueh as the decompositions which determine the evolution Growth of energy in the plant are dependent upon temperature, their and tem- activity being promoted by a rise of temperature within certain perature.

limits, it will be readily understood that growth, which is one ex- pression of the evolntion of energy, should likewise be affected by variations in temperature. It has been found, in faet, that the growth of any given plant will only take place within certain limits of temperature, a lowest or minimum temperature on the one hand and a highest or maximum temperature on the other; and further, that between these two points there is

one, the optimum temperature, at which the rate of growth is most rapid. Growth is more rapid-at each degree as the temperature rises from the minimum to the optimum point ; it is less rapid at each degree as the temperature continues to rise from the optimum to the maxi- mum point ; and conversely, growth is more rapid at each degree as the temperature falls from the maximum to the optimum, and less rapid at each degree as the temperature further falls from the optimum to the minimum. This dependence of growth on temper- ature, and this relation betwcen different degrecs of temperature and different rates of growth, may be convenicntly spoken of as the ‘‘tonie influence” of temperature. The mere variation in temperature as such does not appear, as a rule, to affeet the rate of growth. Roots exposed to rapid and considerable variations of temperature for some time are found by Pedersen to have grown to about the same extent as similar roots which had been growing for the same time at the mean temperature. The only case in which it appears that variation in temperature produces a distinct effect is afforded by Pfeffer’s observations upon the opening and closing of flowers. He found that a rise of temperature caused the flowers to open and a fall to close, the opening or closing being an expression of the accelerated growth in length of the organ as a whole. This effect of variation of temperature is distinguished as the ‘stimulating ” effect.

In considering the relation of light to growth we have prinei- Growth pally to consider its influenee as being an essential normal condition and of growth, its “ tonie ” influence, —that is, it is a question whether or light.

not light exereises any influence whieh ean be regarded as ‘‘ stiniu- lating” on the rate of growth. Speaking generally, it may be stated that plant-organs, with the exception of ordinary flattened horizontally expanded Icaves and other organs of similar organiza- tion, grow at least as well in darkuess as in light,—that exposure to light is not an essential condition of their growth. With leaves and Teaf-like organs the case is different. When plants are kept for some time in darkness one of the most striking features is the smallness of the lcaves of the shoots whieh have been developed during that time. This is not to be ascribed to an absenee of plastie material, for it is exhibited when plastie material is abun dantly present in the tissues; nor can it be attributed to the fact that in darkness the leaves are not able to

carry on the formation of organic substance, for it is not all leaves which remain small in darkness, but only those which have the organization described above. The long tubular lcaves of the Onion, for example, continue to grow in darkness, and so do the long flattened leaves of Irises. The arrest of the growth of flattened horizontally ex- panded leaves in darkness is due to some peculiar effect, which we must regard as of a “tonic” nature, exereised by light upon the growing cells. Intermittent exposure to light for brief periods suffices to enable the leaves to carry on their growth in darkness, and it is not necessary that the light should be intense. The in- » termittent exposure induces in the leaf a condition, though it can- not be precisely stated what, whieh permits of the continuanee of growth,—a condition which is termed “nhototonus.” Assuming that the organ is actually growing, we find that in all cases light retards the rate of growth, and this the more markedly the greater its intensity. Wiesner has, in fact, shown that growth may be altogether arrested by exposure of the growing organ to intense light. The effect of light in retarding growth has been ascertained by comparative measurements of similar organs growing, some in darkness others in light, and is proved negatively by the greater length usually attained by shoots which have grown in darkness for a given time as compared with that attained in an equal time by shoots growing in light. It appears that variations in the in- tensity of light, as such, affect the rate of growth. Pfeffer has

found that exposure to light causcd certain flowers to open, and to darkness to close. Probably this is accompanied, as in the parallel case of temperature, by an acceleration of the mean rate of growth.

The relation of the long axis of a growing organ to the line of action of gravity appears also to affect its rate of growth. Elfving has found that the sporangiferous hyphe of Phycomyces, which normally grow vertically upwards, grow somewhat less rapidly when they are maintained in the inverse position, that their growth in length is more rapid in opposition to the action of gravity than in the same direction, and this he thinks is true of all organs which normally grow vertically upwards. Gravity would appear, there- fore, to exercise a tonic influence on growth. The substitution for gravity of a considerable centrifugal force produced no apparent effect on the rate of growth. ’

The direction of growth of an organ is determined partly by in- herent and partly by external causes, Beginning with the inherent causes, we find that, when the action of external directive influences upon growing organs is as far as possible eliminated, the axis of growth—that is, the line joining the apex and the basc—is approxi- mately a straight line. Thus Véchting has shown that, when growing shoots are caused to grow in darkness and to rotate slowly about a horizontal axis by means of an instrument termed a “clino- stat,” their long axes become straight. This is the expression of an inherent tendency which he terms “ rectipetality.” But the line of growth is not at all times straight ; for instance, the apex of an organ growing vertically upwards does not travel upwards in a straight line, but oscillates from side to side of the vertical. This oscillation is termed ‘‘ nutation,” and is due to the fact that growth in length is not uniformly rapid on all sides of the growing organ, but that during any given period of time one side grows more rapidly than the others. This unequal growth, which we may term “heterauxesis,” is apparently spontaneous. The particular path which the apex of an organ describes in the course of its growth depends upon the propertics of the organ, a point which may now be conveniently dealt with.

Some information as to the properties of an organ may be ob- tained from observation of its anatomical structure. For instance, cylindrical organs, such as many shoots, are radially syinmetrical in structure, and they are in most cases found to be also physio- logically radial. Some organs, again, such as the leaves of some Irises, are bilaterally symmetrical in structure, and they are found to be physiologically bilateral. Other organs, finally, such as flattened expanded leaves, Liverworts, though, like the bilateral

organs, they present two opposed surfaces, are not bilaterally symmetrical in structure, inas- much as the tissues in relation with the two surfaces are differently constituted. Such organs are dorsiventral both anatomically and physiologically. The properties of an organ are not, however, always to be inferred from structure. In some cases radial sym- metry of structure is accompanied by dorsiventral properties. This is the case, as Sachs has shown, with the shoots of Tropxolwm majus under certain circumstances,

The question now naturally arises, How are the peculiar pro- perties induced? In some cases they can only be accounted for by regarding them as inherent; this is true of radial organs, of bi- lateral organs, and to a certain extent of dorsiventral organs. The lateral branches of dicotyledonous trees have, in many cases, been found to possess inherent dorsiventral properties. In other cases, however, dorsiventrality is induced. It has been found by Frank —and his observation has been corroborated by De Vries— that the dorsiventrality of the lateral shoots of Conifers is induced by their relation to gravity. When maintained in a horizontal position during their growth the side which is uppermost becomes the dorsal surface, the other the ventral surface. Again, Sachs has shown that the young shoot of 7’ropxolwm is radial, but that if it be exposed tostrong unilateral illumination it exhibits dorsiventral properties, the more strongly illuminated side becoming the dorsal surface, and further, that the plane of dorsiventrality may be altered by causing the light to fall on a fresh side of the shoot. A similar case of the induction of dorsiventrality is offered by the thalloid shoot of Marchantia. Tracing the development of the shoot from a gemma, we find the gemma to be bilaterally symmetrical in structure and in physiological properties. It falls to the earth with one surface undefmost, which becomes the ventral surface, whilst the upper surface becomes the dorsal. That the dorsiven- trality is in this case induced by light is proved by the fact that, if an experiment. be so arranged that the light falls on the under surface of the gemma, this becomes the dorsal surface, whilst the upper surface becomes the ventral.

The further question now arises, How can the nature of the pro- perties of an organ be determined, if, as has been shown, it cannot always be determined by an examination of the structure? The answer is, that it can be determined by observing the mode of growth of the organ, and especially its

response to the action of ex- ternal directive influences. Thus, the spontaneous heterauxesis of a radial organ is such that each side in turn is the one which is growing with the greatest rapidity, so that, seen from above, the

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apex will appear to describe a somewhat circular orbit, and its path upwards will be spiral.

prothallia of Ferns, thalloid shoots of

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This kind of nutation is termed “revolving nutation,” or ‘ circumnutation ” (Darwin). Similarly,

in bilateral organs each of the two sides grows alternately the more rapidly, so that, seen from above, the apex appears to oscillate from side to side of the vertical, and its path will be a zigzag line. Algo in dorsiventral, as in bilateral, organs alternately the more rapidly, but the period of alternation is much

each of the two sides grows

longer, and may occur only once during the whole period of growth, For instance, the young leaves of Ferns are rolled up upon their internal (dorsal) surfaces ; they present what is known as “ circinate vernation.” This is due to the fact that at first the lower (ventral) surface of the leaf grows more rapidly than the upper (dorsal) ; it is only towards the end of the period of growth that the upper surface grows the more rapidly, and then the leaf expands. Special terms have been applied to these phases of growth ; when the upper surface of the organ is growing the more rapidly the growth is said to be ‘‘epinastic,” when the lower “ hyponastic.””

The spontaneous variations in the direction of growth of an organ Extery thus afford some indication of the nature of its organization, but directiy this is more clearly shown by its response to the action of external influ. ences,

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radia that it tends to place its long axis parallel to the direction of the ius)

directive influences. These will now be taken in order.

Radiant Energy.—It will be convenient to consider separately the phenomena exhibited by organs of different physiological properties.

Beginning, then, with radial shoot-organs, it is usually found that Helio. an organ the organ curves tropism

when light falls upon one side of such soas to direct its apex towards the source of light,—in other words, in

incident rays. The effect of the unilateral illumination is to cause heterauxesis of the organ such that the side upon which the light dircctly falls is the one which grows the most slowly, and therefore becomes concave. Inasmuch as all curvatures induced by light are included under the term ‘“heliotropism,” organs which exhibit the kind of curvature above described may be said to be ‘* positively heliotropic.” As examples of positively heliotropic radial organs may be mentioned radial stems, the multicellular stipes of some Fungi (Coprinus, Claviceps), the sporangiferous hyphe of unicclular Fungi (Aucor, Pilobolus), radial leaves, such as those of the Onion, and, as exceptional cases, some roots (Onion, Ranuneulus aquattlis), In other cases the effect of unilateral illumination is the reverse of the above: the organ curves so as to direct its apex away from the source of light, though it still tends to place its long axis parallel to the direction of the incident rays. Organs curving in this manner are said to be ‘negatively heliotropic.” This condi- tion has been frequently observed in roots, and among shoots it is characteristic of the hypocotyl of the Mistletoe. Many cases of negative hcliotropism in shoots have been mentioned, particularly the tendrils of Vitis and Ampelopsis, in which its

existence was first detected by Knight ; but the apparent negative heliotropism in these cases is probably the expression of something altogether different, as will be subsequently pointed out. There appear to be some well-authenticated cases of a reversal of heliotropic properties in the course of development of certain organs. Hofmeister states that the floral peduncles of Linaria Cymbalaria are positively heliotropic, but that when the fruit has replaced the flower the peduncle is negatively heliotropic; and Wiesner states that the peduncle of Helianthemum vulgare is negatively heliotropic after fertilization has taken place. The nature of the heliotropic pro- perties appears thus to vary with the biological conditions of the organs.

Tien organs are exposed throughout the whole period of their growth to unilateral illumination they usually take up a certain position which is termed the “fixed-light position,” such that they curve towards the direction of incidence of the brightest light. In some cases this is not so. This may be explained by an absence of heliotropic sensitiveness, but in some cases it is due to the fact that the organs follow the daily course of the sun. Wiesner mentions Sonchus arvensis as a striking example of the latter condition. The activity of the curvature stands in a direct relation to the intensity of the incident light. The same botanist has found that for the organs of cach plant there is an optimum intensity of light which produces the maximum of heliotropic effect, and that any increase or diminution of this intensity is followed by a diminished heliotropic effect.

With regard to the relative heliotropic effect of rays of different wave-length, it has long been known that the rays of high refrangi- bility are much more powerful than those of low refrangibility. Wiesner finds the distribution of heliotropic effect in the spectrum to be more exactly this: the greatest curvature is produced by the rays at the junction of the ultra-violet and violet ; from this point the heliotropic effect diminishes until, in the yellow, it disappears; it begins to manifest itself again in the orange, and increases until it reaches a small secondary maximum in the ultra-red. Helio- tropic effect is by no means confined to the luminous rays of the spectrum. Wiesner, and more recently Wortmann and Barthé- lemy, have shown that the dark heat-rays possess it. The curva-

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tures produced by the dark rays are sometimes designated by the term ‘‘ thermotropism.”

The effect of unilateral illumination is not immediately ex- hibited, nor does it cease immediately upon the withdrawal of the organ from light. If an organ be exposed for only a short time to unilateral itlumination, it may not exhibit any curvature during the period of exposure, but will curve subsequently in darkness. The exposure had sufficed to induce heliotropic curvature. This Wiesner terms ‘‘ photo-mechanical induction,” but it is simply due to the slow response of the organ to the directive influence of the incident rays,—to a long “latent period.”

Turning now to the part played by the growing organ in helio- tropic curvature, it is clear that the curvature will largely depend upon the heliotropic sensitiveness of the organ, and it must be porne in mind that organs vary widely in this respect. The cur- yature is in all cases confined to the growing region of the organ, or, to put it more generally, to the region which is capable of growing. In connexion with this point, the further one naturally arises as to the seat of heliotropic sensitiveness. It is usually assumed that those zones which are growing most rapidly are those which are most sensitive, but Darwin found that in some cases (cotyledons of Phalaris and Avena, hypocotyls of Cabbage and Beet) illumination of the tip of the organ appeared to induce heliotropic curvature. Thiscanunot at present be regarded as fully established.

With regard to the heliotropic phenomena presented by simply pilateral organs, such as the leaves of Irises, it will suffice to say that they are positively heliotropic.

The heliotropic phenomena presented by dorsiventral organs are morecomplicated. It has been observed that dorsiventral branches (including the tendrils of Vitis and Amypelopsis mentioned above), when

exposed to vertical light, tend to assume a horizontal position, whereas in darkness they usually grow erect. Dorsiventral leaves usually remain horizontal in darkness. A full discussion of these facts cannot be entered upon here; a few remarks must suffice. It is argued by some, especially by De Vries, that the horizontal position of dorsiventral organs when exposed to light is due to negative heliotropism ; but there is no adequate proof that this is really the case. Bache says on the subject, ‘‘So far as I cau apprehend the facts, the negative heliotropism of the Marchantia-shoot, and that of many other shoots which behave in the same way, is the same phenomenon as the epinasty of foliage-leaves described by De Vries.” Detmer has in fact found that exposure to light, quite independently of the direction of the incident rays, induces the rapid growth of the dorsal surface of dorsiventral leaves—in a word, induces photo-epinasty. Continued photo-epinasty would clearly cause the organ to curve downwards below the horizontal plane, and this is occasionally actually the case. But more fre- quently the organ remains in the horizontal plane when the light falls vertically upon it, or, to put the case more generally, the organ takes up such a fixed-light position that its long axis is at right angles to the direction of the incident rays. Moreover, it has been ascertained that it is always the dorsal surface of leaves which is directed towards the brightest incident light. It is clear that, in addition to the induction of photo-epinasty, light exercises a directive influence upon the growth of these organs. The attempt has been made to explain this by ascribing to the dorsiventral organs merely the heliotropic properties which belong to radial organs, but this explanation is quite insufficient. They can only be accounted for by attributing to dorsiventral organs, as Frank has done, a peculiar heliotropic sensitiveness, which he terms ‘‘trans- verse heliotropism ” and Darwin ‘‘diaheliotropism,” which mani- fests itself in the assumption of such a position that the dorsal surface of the organ is placed at right angles to the direction of the incident rays.

Gravity.—The influence of gravity in determining the direction of growth of an organ manifests itself in phenomena which are designated by the term ‘‘ geotropism.” We will again consider sepa- rately the phenomena which are presented by organs of different physiological properties.

Beginning with radial organs, we find that a great number of them normally grow either upwards or downwards; thus, primary shoots grow upwards and primary roots grow downwards. If any attempt is made to alter the direction of growth of these organs they at once curve so as to regain their normal direction. That the direction of growth is actually the result of the action of gravity was first demonstrated by Knight. He caused seeds to germinate on a wheel revolving with sufficient rapidity to set up a considerable centrifugal force, and he found that the roots and stems of the seed- lings behaved with regard to the direction of the centrifugal force precisely as they do with regard to that of gravity: the roots grew radially outwards, and the stems radially inwards. He states his conclusion thus: “I conceive myself to have proved that the radi- cles of germinating seeds are made to descend, and their plumules to ascend, by some external canse, and not by any power inherent in vegetable life; and I see little reason to doubt that gravitation

is the principal, if not the only, agent employed in this case by Nature.”

In conformity with the terminology used with reference to helio- tropism, organs which grow towards the centre of the earth are said to be “positively geotropic’’ and those growing in the opposite direction ‘‘ negatively geotropic.” As examples of positively geo- tropic radial organs may be mentioned, in addition to primary roots, the hyphe of Moulds which penetrate into the substratum, the root-like filaments of Vawcheria, Caulerpa, and other Algz, the rhizoids of Muscincx, the rhizomes of some plants, such as Yucca and Cordyline. As examples of negatively geotropic radial organs may be mentioned, in addition to primary shoots, the stipes of Mushrooms, the sporangiferous hyphe of Moulds, the stalks of the receptacles of Liverworts, the sete of Muscinew, the peduncles of many flowers, the climbing roots of various epiphytes. Cases of the absence of geotropic irritability are afforded by the hypocotyl of the Mistletoe, and by the aerial roots of various epiphytes. A reverse of its geotropic properties may take place in the course of the development of an organ. Vochting has found, for instance, that the peduncle of the Poppy is negatively geotropic

whilst the flower is in the bud, but positively geotropic during flowering and fruiting.

In dealing with these phenomena we have first to consider the effect of gravity acting at different angles. Sachs concludes, and his conclusion is generally accepted, that the geotropic influence of gravity is greatest when the long axis of the organ is at right angles to the vertical, and that it is zero when the long axis of the organ coincides with the vertical, whether the apex point upwards or downwards, or whether the organ be positively or negatively geo- tropic,—that is, if the force of gravity acting at any point of an organ be decomposed into two forces, the one acting at right angles to the long axis of the organ and the other along it, it is only the former which produces a geotropic effect. Sachs bases this view upon the fact that geotropic curvature is more rapidly produced when an organ is horizontal than when it is in any other position. Elfving has made observations which suggest a different view, namely, that the geotropic action of gravity upon an organ is greatest when that organ is removed as far as possible from its normal relation to the vertical.

The degree of geotropic sensitiveness is different in different organs. This is shown by the different directions of growth taken by different organs when grown under conditions which prevent to a sufficient extent other directive influences from producing any effect. For instance, primary roots grow vertically downwards, but lateral roots grow more or less nearly horizontally. It has been ascertained, by means of centrifugal force, that lateral roots can be induced to behave like primary roots if only the force is sufficient: lateral roots grow – s outwards on the wheel when the centrifugal force is 4g (g=force of gravity). It may be inferred that their geotropic sensitiveness is one-fourth of that of primary roots. The response of an organ to the directive influence of gravity, as in the case of heliotropism, is not immediate, but is preceded by a long latent period. An organ placed horizontally will not begin to curve for some time, and if then placed vertically the curvature will proceed for some time. Geotropic curvature, like heliotropic curvature, isa phenomenon of induced heterauxesis, the result being the assumption by the organ of such a position that gravity ceases to exert any directive influence upon it. Primary shoots and roots, for instance, find the vertical to be their position of rest, whereas lateral

branches take up a more or less inclined position. It appears that, generally at least, the most rapidly growing zones of organs are those in which geotropic influ- ence is most active. It has been hitherto generally accepted that the seat of most active curvature was also the seat of geotropic sensitiveness. Darwin recently brought forward the view, based upon the behaviour of roots with their tips cut off, that, in the root at least, the tip is the seat of geotropic sensitiyeness. This suggestion has given rise to a number of researches, the results of which are so conflicting that it is impossible at present to come to any definite conclusion on the subject.

With regard to the geotropic properties of simply bilateral organs (leaves of Irises, &c.) it need only be said that they are negatively geotropic.

Coming, finally, to the geotropic phenomena presented by dorsi- Geotrop- ventral organs, we find that many organs which when growing ism of exposed to light have a more or less oblique direction of growth, dorsi- grow erect in darkness. This is obviously an effect of gravity, and ventral the organs arc clearly negatively geotropic (examples are afforded organs. by the runners of Polygonum aviculare, Atriplex latifolia, and others, by radical leaves, and by thalloid shoots of Marchantia). But some dorsiventral organs do not grow erect in darkness. Frank mentions the runners of Fragaria lucida, lateral branches of Conifers, and many dicotyledonous shrubs and trees as examples. He finds, further, that when these organs are placed otherwise than horizontally they curve until they come to lie in that plane, and, if they are placed in an inverse position so that their normally inferior surface (ventral) is uppermost, they twist on their own axes until the normal relation of their surfaces with respect to the vertical is attained ; many leaves also behave in this way. Frank

Hydro- tropism,

Galvano- tropism.

Sub- stratum.

Contact.

Twining of ten- drils.

accounts for these phenomena by ascribing to such dorsiventral organs a peculiar geotropie sensitiveness, which he terms "'trans- verse geotropism," and Darwin ''diageotropism." De Vries has severely criticized this assumption. He regards the curvatures of shoots and branches into the horizontal plane as being, to some extent, the expression of the negative geotropism of the stems inter- fered with by the weight of the leaves, and, to some extent, also the expression of those forms of spontaneous heterauxesis termed epinasty and hyponasty which were alluded to above. Similarly he aecounts for the torsions observed by Frank by ascribing them to the unequal twisting moment of the leaves on the two sides of the shoot when in the inverse position. In view of the existence of diaheliotropism, it may be regarded as probable that diageotropism exists also. But at present the case for the latter is not sufficiently made out. More experimental evidence must be forthcoming be- fore the assumption of diageotropism can be regarded as fully justified.

Moisture.—It has long been known that roots when brought into the neighbourhood of a moist surface curve towards it. For instance, when seeds are sown in a box of damp sawdust, the bottom of the box being perforated with sufficiently large holes, the roots of the seedlings grow downwards into the sawdust, and ultimately project through the holes. They then no longer grow vertically downwards, but curve so as to apply themselves to the moist surface offered by the bottom of the box. To these phenomena Darwin has applied the term ''hydrotropism." Organs which curve in this way are said to be '' positively hydrotropic"; but there are also ''negatively hydrotropic" organs. Wortmann has observed, for instance, that the sporangiferous hyphe of Phycomyces curve away from a moist surface. The phenomenaare precisely similar to those of heliotropism and of geotropism. The curvature is in this case also the expression of induced heterauxesis. It takes place in this case also with the greatest activity in the region of most rapid growth. Darwin came to the conclusion that the hydrotropic sensitiveness of roots at least is localized in their tips, a conclu- sion which, though opposed by Detlefsen and Wiesner, is so far confirmed by Molisch's results that it may be accepted as well founded.

Hlectricity.—Elfving found that when a root is placed vertically between two electrodes it curves towards the positive electrode,—that is, against the direction of the current. In one case (Cabbage) the curvature was towards the negative electrode. Miiller (Hettlingen), in repeating Elfving's experiments, found that the curvature was in all cases such as to tend to place the long axis of the root in the plane of the current, the curvature being towards the negative pole. These phenomena are spoken of as ‘‘galvanotropism.” Miiller found that the curvature was induced when the current traversed only the tip of the root, thus affording apparently another instance of localization of sensitiveness in the tip.

Lhe Substratum.—Dutrochet long ago observed that the hypo- cotyl of the Mistletoe, in whatever position the seed may have been placed, assumes such a direction of growth that its long axis is perpendicular to the surface ou which the seed has germinated. Sachs has shown, by means of rotation on the clinostat, that this position is assumed both by shoots and roots. It is clear that the substratum exercises a directive influence upon the organs growing either outwards from its surface or inwards into its surface, but the nature of this influence has not yet been investigated. It is certainly not to be ascribed, as Van Tieghem suggested, to the mcre mass of the substratum. The effect of a cube of turf or a pot of earth would vanish entirely in comparison with the attraction of the earth, —in other words, with the influence of gravity. The pheno- mena are designated generally by the term “ somatotropism.”

Contact.—The effeet of coutaet upon the direction of growth of an organ must be clearly distinguished from the effects of cousider- able pressure. The latter are of two kinds: in the one case the pressure arrests the growth of that side of the organ which is exposed to it; in the other it excites the organ to active growth, particularly in thickness. Examples of the former effect are so common that they need not be specified ; examples of the latter are afforded by the thickening of tendrils and of climbing stems when they have firmly grasped some support. The phenomena now to be considered are such as are induced by slight pressure. Striking instances of this are afforded by tendrils. A very slight touch suffices, in the case of the very sensitive, such as those of Passiflora gracilis and of Sicyos angulatus, to

induce very per- ceptible curvature, which can be detected, according to Darwin, in half a minute after the touch.

In order to illustrate the subject adequately a brief account will be given here of the more important phenomena connected with the twining of tendrils. Darwin has shown that tendrils are not sensitive during the whole of their existence ; speaking generally, they are not sensitive when they are either very young or full grown, and are most sensitive when they are about three-fourths grown. Darwin has also found that their sensitiveness is localized. In most the lower or basal part is either not at all sensitive or is sensitive only to prolonged contact. Most tendrils have their tips

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| Cissus discolor) they are sensitive on all sides; in Mutista the in-

it travels over a large area, and there is eonsiderable

just below the point of attachment to the support. The coiling of

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slightly but permanently hooked, and the sensitiveness is localized in the concavity of the hook. In some cases (Cobwa scandens,

ferior and lateral surfaces are sensitive. Asa rule, when in its most sensitive condition the tendril is actively circumnutating, so that probability that it will come into contact with some body around which it can twine. When contact takes place the tendril begins to eurve round the support. As it does so new points of the sensitive surface are stimulated, and the curvature increases and extends until the whole of the tendril lying between the original point of contact and the apex is wound in a spiral coil round the support. In some cases this is all that takes place. In the great majority of cases, how- ever, the coiling of the apical portion of the tendril round a support is followed by the spiral coiling of more or less of that portion of the tendril which lies between the original point of contact and the insertion of the tendril upon the stem, provided that this is mechanically possible. The spiral coiling of the basal part of the tendril involves, namely, a

considerable shortening, and, if both the stem and the support are immovably fixed, this shortening eannot take place. The turns of the coil are not all in the same direction ; they are grouped into two or more spires, separated by short straighter portions, the turns of any two successive spires being in opposite directions. This is a mechanical necessity asso- ciated with the spiral coiling of a filament attached at both ends, The spiral coiling of the basal part of the tendril usually begins

tendrils, like all the curvatures hitherto considered, is a pheno- menon of induced heterauxesis. Hence it is that the possibility of the twining of a tendril round a support depends upon the thickness of the support and upon that of the tendril. Most tendrils, inas- much as they are very thin, can twine round strings, but those which are relatively thick can only twine round a support of some thickness, for there is a mechanical limit to the excess of elonga- tion of the convex over the concave side. The spiral coiling of the untouched portion of the tendril has an especial interest, as it offers a striking sineemtion of the transmission of a stimulus. It is true that the tendrils of many plants, if they fail to come into contact with a support, likewise coil spirally ; but this is a much slower process, and only begins at the time when the tendrils are ceasing to grow aud to be sensitive.

Tendrils are not, however, the only organs which are sensitive to contact. Other instances are afforded by the petioles of most leaf-elimbers, by shoots, and apparently by roots.

In the case of sensitive shoots Dutrochet observed that the twin- ing stem of Cuscuta is sensitive like a tendril. Von Mohl suggested that all climbing stems are sensitive, but both Darwin and De Vries were unable to detect the sensitiveness. This view of Von Mohl has been recently revived by Kohl, who finds that the inter- nodes of climbing stems are sensitive to a long-continued pressure which is insufficient to produce any simply mechanical effect. Darwin found the young internodes of Lophospermum scandens, which is not a stem-climber, as also the peduncles of Mawrandia semperflorens, to be seusitive to touch, and Kerner states that this is also the case with the peduncles of many flowers (Poppy, Anemone, Ranunculus, Tulip).

With regard to roots, Darwin was led to suspect, by observing Dar- the behaviour of the radicles of seedlings in their attempts to pass winiat over obstacles in the soil, that the tip of the radicle is sensitive to eurva- contact, and that the stimulus is transmitted from this, the sen- ture. sory organ, to the growing zones behind it, in which the necessary — curvature is then effected. He made experiments by attaching small objects to one side of the tip of the radicle in various plants, by touching one side of the tip with caustic, and by cutting a thin slice off one side, and found in most cases that the radicle curved away from the touched or injured side, that the curvature is pre- cisely the opposite of that performed by tendrils when touched.

The peculiar curving of radicles has been termed the “ Darwinian curvature.” Darwin’s conclusions as to the sensitiveness of the radicle have given rise to considerable discussion, It is clear, in the first place, as he himself showed, that radicles are not perceptibly affected by brief contact or by friction ; the contact must be pro- longed. Those who dissent from Darwin’s view, such as Wiesner, Burgerstein, and Detlefsen, urge that the curvatures induced in his experiments are pathological. It seems probable that this objection is valid. It may be admitted at once in the case of the experiments made by means of slicing the root-tip or touching it with caustic. With regard to the effect of small objects, such as pieces of card, it appears that the curvature of the radicle is due mainly, if not entirely, to the substances used in attaching them. In some cases, for instance, they were attached by a drop of shellae. It has been shown that the mere presence of the drop of shellac is sufficient to induce thé Darwinian curvature, and microseopieal

examination has proved that ‘the part touched by the shellac had died away. Moreover, it is known that a radicle can grow down- wards against considerable resistance: it can penetrate into mer- cury ; it can perforate tinfoil without deflexion ; Darwin, in faet,

estimates the force of downward growth of the radicle at } Tb, and its lateral pressure, in particular cases, at 8 and 3 Ib respectively. The evidence leads to the conclusion that the Darwinian curvature of roots is not the

expression of sensitiveness to contact, but that it is the result of injury of one side of the root. ;

Combined Effects. Now that the influences which determine the direction of growth have been individually considered, it is possible to account for the characteristic positions taken up by organs in the course of their development. In dealing with this subject it is convenient, as Sachs suggests, to classify organs, according to their ultimate position, into two groups, —those which, under normal conditions, have their long axes vertical and those which have their long axes more or less inelined to the vertical ; the former Sachs terms ‘‘ orthotropic” organs, the latter ‘‘plagiotropic.” —

The direction of growth of plant-organs under normal conditions is the expression of the resultant effect of various external directive influences. To illustrate this in the case of orthotropic organs, let us consider the primary shoot and the primary root of a seedling growing under conditions which may be taken as normal. In the case of a shoot growing upwards into the air when light falls verti- cally upon it, its vertical upward growth is chiefly due to the action of gravity,—that is, it is the expression of the particular degree and quality of the geotropic sensitiveness of the shoot. Since the light is equally intense on all sides of the shoot, it exerts no direct- ive influence. Orthotropism is then mainly due to negative geo- tropism. That this is so can be readily proved in various ways. For instance, the hypocotyl of the Mistletoe, as mentioned above, is not geotropic at all; hence it cannot be included among either orthotropic or plagiotropic organs, for it may grow vertically or it may grow obliquely, its direction of growth being determined chiefly by its somatotropism. Again, when a normally orthotropic organ is grown in darkness on a clinostat its direction of growth is hori- zontal. Passing now to the case of aay roots growing in the earth, when the conditions are normal—that is, especially when the earth is uniformly moist around the root—their direction of growth is vertically downwards. This is chiefly due to their strong positive geotropism. Let us suppose, now, that the conditions of growth of these organs are somewhat different from those which we have regarded as normal ; let us suppose that the shoot or the root is exposed to lateral light, or that the soil about the root is not equally moist on all sides. In the former case, the action of light will

tend to induce heliotropic curvature, but it will depend upon the relative strength of heliotropic and of geotropic sensitiveness whether or not a curvature actually takes place. In the case of most ortho- tropic shoots a curvature (positive) would take place, thus showing the heliotropic sensitiveness of shoots to be greater than the geo- tropic, but in some instances it would not take place ; in the case of most orthotropic roots no curvature would take place, but in some instances (Sinapis alba and others) a curvature (negative) would take place, showing that in most cases the heliotropic sensitiveness of roots is less than their geotropic sensitiveness. The unequal moisture in the soil around the root would cause hydrotropic curva- ture, inasmuch as the sensitiveness of roots to the influence of moist surfaces is greater than their sensitiveness to gravity.

We will deal with plagiotropic organs in a similar way. The majority of such are lateral members, as branches, leaves, &c. The direction of growth of a lateral member, certainly of branches of stems and roots and probably also of leaves, is at first determined by its relation to the parent axis. It has been found—by Dutrochet, Sachs, and others—that at their first development the long axes of lateral organs make a definite angle—tcrmed the "‘ proper angle ”— with the long axis of the parent organ. Dutrochet thought that the proper angle was in all cases a right angle, that the relation of lateral organ to parent axis was of the nature of somatotropism ; but this is a too general statement. The original direction of growth of a lateral organ determined by its proper angle would be maintained, in the absence of internal directive influences, by its rectipetality, but in nature it is affected by light, by gravity, &c. Lateral shoot-branches, for example, are either inherently dorsi- ventral or they become dorsiventral under the influence of gravity or of unilateral illumination ; they are then diaheliotropic, though the manifestation of their diaheliotropism may be interfered with by photo-epinasty ; they are usually negatively geotropic. Their direction of growth—that is, the direction of their long axes when mature—is the resultant effect of diaheliotropism and of negative geotropism. In the case of lateral root-branches these are plagio- tropic but radial ; they grow outwards, slightly inclined downwards

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a few inches above the ground it appears to be growing almost vertically upwards, but as it elongates the last-formed internodes exhibit well-marked circumnutation. It continues to grow upwards mainly in virtue of its negative geotropism, the direction of its growth being little, if at all, affected by light in consequence of its low degree of heliotropic sensitiveness. If now one of the young growing apical internodes comes into contact with a vertical support it begins to twine around it in virtue of the sensitiveness to per- manent though slight pressure which, as mentioned above, these organs possess, the direction of the curvature round the support being also that of cireumnutation. The coils formed are nearly horizontal when the support is thick and become more nearly ver- tical as the support grows thinner ; in any case, the steepness of the spire always increases after it is first formed, its diameter is thus diminished, and the stem gains a firm grip of the support. As the stem twines round the support it undergoes torsion around its own axis, so that any one side maintains throughout the same position, whether it be directed inwards, towards the support, or outwards or laterally. The direction of torsion may be either the same as that of coiling or the reverse,—that is, either homodromous or antidromous. The direction of torsion appears to depend princi- pally on the relation between the thickness of the climbing stem and that of the support, and on the smoothness or roughness of the surface of the support ; when the support is relatively thin the torsion is homodromous, but when it is relatively thick the torsion is antidromous; with smooth supports, up to a certain limit of thickness, the torsion is homodromous, and with rough supports, down to a certain limit of thinness, the torsion is antidromous; in a word, the direction of torsion is determined by the degree of friction between the climbing stem and the support.

2. Movements.—We pass now to the consideration of movements Proto- other than those associated with growth, and we take first move- plasmic These may be classified into two move- categories, —(1) those which are performed by naked protoplasm, — ments.

ments exhibited by protoplasm.

by protoplasm, that is, which is not enclosed in a cell-wall ; (2) those exhibited by protoplasm enclosed in a cell-wall. The move- ments of naked protoplasm are effected in two ways,—either by the protrusion of portions of the protoplasm, termed ‘‘pseudopodia, ” or by permanent flagelliform protoplasmic filaments, termed ‘‘cilia”; the first kind of movement is known as ‘‘amceboid,” the second as ‘‘ciliary” movement. The ameeboid movement is exhibited, though rarely, by isolated cclls—for instance, by the zoospores of the Myxo- myeetes—and characteristically by those large axgregates of cells which constitute the plasmodia of this group of Fungi. The pseudo- podia are thrown out at first as protrusions of the denser hyaline outer layer of the mass of protoplasm, the ectoplasm, and into this the more watery eg internal protoplasmic substance, the endoplasm, gradually flows. The repeated formation of pseudopodia in any given direction will result in locomotion taking place in that direction. The ciliary movement is characteristic of zoospores and of antherozoids. In some cases the organism, asin the case of Volvox and Pandorina, passcs a large part of its existence in the mobile condition, and then the protoplasm is enclosed within a cell-wall which is perforated by the cilia. The number of cilia may be only one ; more commonly in zoospores it is two, and sometimes four ; occasionally the cilia are numerous, as in the zoospores of Vaueheria and Cdogoniwm ; in antherozoids they are usually numerous. The cilia are constantly performing a lashing movement, which causes the organism to move forward and at the same time to rotate on its own axis.

In considering the movements of protoplasm when enclosed within a cell-wall, the typical structure of a plant-cell, as described at the beginning of this section (p. 44), must be borne in mind. In many cells the vacuole is found to be traversed by protoplasmic filaments which extend between one part of the primordial utricle and another. These filaments are continually varying in number, in position, and in size ; they are formed and withdrawn in the same manner as the pseudopodia of naked masses of protoplasm. This kind of movement is, in fact, amcecboid movement exhibited by protoplasm enclosed within a cell-wall. In all actively living proto- plasm, whether naked or enclosed in a cell-wall, a streaming of the more fluid endoplasm can be observed, the direction and rapidity of the current being clearly shown by the granules which are carried along in it. This is very conspicuous in closed cells (as in leaf-cells of Vallisneria spiralis and root-

hairs of Hydrocharis Morsus Ranz) when the whole of the endoplasm rotates in a con- stant direction.

below the horizontal ; as they grow in the dark,—assuming that the moisture of the soil around them is uniform,—their direction of growth is affected to some extent by their slight positive geotropism. Though their geotropic sensitiveness is slight, their hydrotropic

Movements of Mobile Organs. —With regard now to the movements Move- exhibited by mobile organs, to the ‘‘movements of variation” as ments of they are sometimes termed, sometimes they are spontaneous, like varia- the protoplasmic movements just considered ; in other cases they tion.

Sensitiveness is great, so that their direction of growth is often ae a modified by their coming into relation with moist areas soil. A complicated case of the action of a number of directive in- fluences is afforded by climbing stems, and it may be worth while to specially consider it. When the stem is young and extends only

are only performed in consequence of stimulation : they are induced, Instances of spontaneous movements of variation are, for reasons to be given hereafter, comparatively rare. A case in point is afforded by the Telegraph Plant, Hedysarwm (Desmodium) gyrans. Under favourable conditions, particularly of temperature, the two lateral leaflets of the trifoliolate leaf move upwards and downwards, their

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It appears that anaerobiotic plants (Schizomycctcs) are mobile in the absence of oxygen.

Nature and Mechanism of Movements.—On comparing the state. Condi. ments which have been made above as to the movements of STOW- tions ing organs and of mature mobile organs, their general similarity essenti is at once apparent. The spontaneous movement of growth isto move comparable to the spontaneous movements of protoplasm and of ment,

apices describing nearly a circle, a revolution taking from two to five minutes. , A familiar example of an induced movement is afforded by the leaves of the Sensitive Plant (Mimosa pudica), Whena leaf is touched the lateral leaflets close in pairs, folding upwards and forwards, and, if the stimulus be strong enough, the main petiole sinks downwards. The movement of this plant.is of special interest, inasmuch as it affords an instance of the transmission of a stimulus.

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It suffices, namely, to touch the terminal leaflet to cause the closing of the successive pairs of lateral leaflets and the sinking down of the main petiole. Another example of induced movement is afforded by the so-called ‘‘sleep” of plants; the leaves of many plants, namely, take up during the night a position different from that which they take up during the day. Taking the Sensitive Plant as an example, during the day its leaflets are widely expanded, and its main petioles are directed obliquely upwards; at night its leaflets are folded together and its main petioles are directed obliquely downwards ; it takes up at night, in fact, a position similar to that which is induced by a touch. Excessive illumina- tion tends to induce closing. Other examples are afforded by the mobile stamens of the Cynarce# and of Berbcris and Mahonia.

The relation of these movements to external conditions is as follows :—

mobile organs, and the performance of the former is dependent upon the same external conditions as the lattcr. The reaction to the influence of external agents is the same in many instances ; for example, strong light arrests growth, and it arrests also the spontancous movements of the leaves of Afimosa and other plants, and contact stimulates tendrils as it stimulates the leaves of the Sensitive Plant. Again, light exercises a directive influence on the growth of growing organs ; it also exercises a directive influence on the movenients of zoospores and plasmodia. These considerations lead to the conclusion that the causes of the movements must in all cases be the same.

It has been already pointed out that growth and movement are expressions of the expenditure of energy on the part of the organism, that they are dependent upon the decomposition of some complex substance forming part of, or at least present in, the protoplasm.

External 1. Yemperatwre.—These movements, like the slow movement of | The conditions which are essential to movement of any kind are, condi- growth, only take place within certain limits of temperature, which, | then, these: that the decomposable substance in question is formed tions of however, vary in different cases. Movements of protoplasm, speak- | and decomposed in sufficient quantity, in other words, that the these ing generally, will only go on at temperatures between 0° and 50°C., protoplasm is irritable ; that the protoplasm is capable of mani- move- and between these limits there is an optimum temperature at which festing by a molecular change, which may be accompanied by a ments. they are most rapid. In the case of movements of variation the change in external form, the cvolution of energy attending the

lower limit lies considerably higher, from 15° to 20°C. The fore- going illustrates the tonic relation between temperature and move- ment. Sudden changes of temperature have a stimulating effect. For instance, Dutrochet observed that the protoplasm of the inter- nodal cells of a Chara exhibited rotation in water at 7° C., which

decomposition ; and, finally, in the case of protoplasm surrounded by a cell-wall, that the anatomical structure is such as to permit of a movement ensuing upon the change in the protoplasm. It is clear that, if the cell-wall is rigid, no change in the protoplasm can cause a change in form of the cell as a whole.

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soon ceased when the plant was placed in water at 32°C. ; after some time the movement returned, and was again arrested on replacing the plant in water at 7° C.

2. Light.—In most cases of protoplasmic movements light ap-

We may regard spontaneous movement as being due to the Spon. spontaneous decomposition of the decomposable substance whereby taneous _ the protoplasm undergoes a molecular change. The automatic move | decomposition not unfrequently takes place, as in the case of the ment

pears to exert no influcnce ; in other cases it exerts a tonic influ- ence. For instance, Engelmann has discovered a form of Bacterium, termed by him Bacterium photometricum, which is only mobile when exposed to light. Again, organs which exhibit spontaneous movements of variation, like the leaflets of Hedysarum, or induced movements, like the leaflets of Mimosa, lose their power of move- ment when kept in darkness for a day or two. Exposure to light, or, as it is termed, the state of ‘‘phototonus,” is an essential condi- tion of their movement. Bright light tends to arrest movement. For instance, the protrusion of pseudopodia by the plasmodium of Aithalium septicum is less active in light than in darkness. This is well shown in the sleep of plants, alluded to above. The ‘diurnal position” of the leaves is due to exposure to light, the “ nocturnal position” to its absence. This is perhaps most clearly exhibited by the Sensitive Plant. Under the normal alternation of day and night the leaves assume alternately the diurnal and nocturnal positions. Ifa plant be kept for some time in darkness, at a suit- able temperature, it will be found that the leaves exhibit periodic movements of opening and closing. They are, in fact, endowed, like those of the Telegraph Plant, with the power of spontaneous movement, which is arrested when the plant is exposed to light. Variations in the intensity of light act as stimuli. For instance, a sudden variation will cause the closing of the leaves of Mimosa, Light also exercises a directive influence on mobile protoplasm in some cases. For instance, when bright light falls obliquely on a plasmodium of 4thalium scpticum, it causes it to creep away from the light. Again, the chlorophyll-corpuscles in the cells of leaves exposed to bright light are found to accumulate on those surfaces of the cells which are least exposed, to assume what is termed the position of ‘‘apostrophe,” a change of position which is due to move- ments in the protoplasm in which the corpuscles are embedded. Finally, the direction of movement of ciliated zoospores swimming in water is affected by light. When light falls obliquely upon a vessel of water containing zoospores, they place themselves so that their long axes are more or less nearly parallel

to the direction of the incident rays, and it is along this line that they move. They may either move towards the incident light or away from it, the direction being apparently determined by the intensity of the light, by the age of the zoospores, and by the amount of oxygen in the water. Protoplasmic masses which respond to the directive action of light are said to be ‘‘ phototactic.”

3. Other Stimuli.—lt has been mentioned that movements may be induced in the Sensitive Plant by mechanical stimulation, by variations of temperature, and variations in the intensity of light. They may also be induced by electrical and chemical stimuli. The effect of an electrical stimulus on protoplasm exhibiting the ameeboid movement is to cause retraction of the pseudopodia. It arrests also the rotating movement of the protoplasm for a time.

4, Oxygen.—The presence of oxygen is an essential condition of movement of any kind, in the case at least of aerobiotic plants.

Telegraph Plant, at regular intervals, so that the movement is shyt or periodic. Spontaneous movement is most active when a certain favourable combination of external conditions is ensured ‘ any variation in the combination leads to a diminution in the activity, or even to complete arrest, of the movement. External conditions may affect the process either of formation or of decom- position of the decomposable substance. For instance, movements are arrested at a low temperature, most probably because either the formation of the decomposable substance or the necessary explosive decomposition does not take place under such circumstances with sufficient activity. Again, when movement is arrested at a high temperature, or by continuous darkness, it is probably for similar reasons. In this way the tonic effect of external conditions may be accounted for. The stimulating effect of external agents may be accounted for in a similar manner.

Movement, whether spontaneous or induced, is regarded as a phenomenon of contractility (see above, p. 13), but we have at present no knowledge of the exact nature of the molecular changes which constitute a contraction. It must be borne in mind not only that protoplasm contracts, but that, after contraction, it returns to its condition of rest. Spontaneous movement is the

expression of automatic contraction, External tonic conditions either promote

or retard movement, by either promoting or retarding contraction

and recovery. Stimuli induce contraction. 5

The mechanism of the movements of protoplasm-masses appears Meehan) to be as follows. Taking first the case of the ameboid movement, ism of the protrusion of pseudopodia is due to a molecular change, of the move | nature of a contraction of the protoplasm, which takes place in the ments. |

ectoplasm at the spot where the pseudopodium is to be formed, an elevation being gradually produced into which the more fluid endo- plasm is, as it were, sucked. The rotating movement of protoplasm appears to depend upon a kind of ameeboid movement taking place coustantly in one direction,—to be, that is, a creeping movement. Ciliary movement appears to depend on the alternate contraction of each longitudinal half of the cilium. It is not possible at present to attempt any explanation of the directive influence of light on moving protoplasm, but the fact itself is of great physiological importance.

The mechanism of the movements of organs, whether unicellular or multicellular, in which the cell-wall has to be considered is more complicated. The cells possess the structure described above: they consist of a cell-wall lined by the protoplasmic primordial utricle enclosing the cell-sap. They are, moreover, in a state of turgidity,—that is, they are tensely filled with water. The state of turgidity in a cell depends upon three conditions, —(1) upon a tendency to absorb more water in consequence of the presence of osmotically active substances dissolved in the cell-sap ; (2) upon the resistance offered by the primordial utricle to the escape of water from the cell; (3) upon the elasticity of the cell-wall. The elasticity of the primordial utricle is so small that it may be

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neglected. The growth in length of a filament of Vawcheria may be taken as a case illustrative of the importance of turgidity as a condition of growth in

unicellular organs. This growth cannot be attributed to a greater hydrostatic pressure at the apex of the cell, for the pressure is necessarily the same at all points, and clearly it cannot be referred to a diminished resistance on the part of the rimordial utricle to the passage outwards of water at that point. It must be referred to the cell-wall, and it can only be accounted for on the assumption that the elasticity of the eell-wall is less at the apex than at any other point of its surface. Growth is not, however, to be regarded as the result merely of the mechanical expansion of the cell which is rendered permanent.

same nature as that of unicellular organs. Applying the above explanation of the curvature of unicellular organs to multicellular organs, the conclusion to be drawn would be that the curvature of the latter is due to the induction of the same changes in the protoplasin in each of their growing cells.

The phenomenon of spontaneous heterauxesis, as exhibited in nutation, may be accounted for in precisely the same way, but it is possible to imagine that it may be due to some extent in the case of unicellular organs to local variations in the extensibility of the cell-wall, and in that of multicellular organs to variations in the extensibility of the cell-walls of groups of cells on different sides of the organ.

There is every reason to believe that the protoplasm takes an active part in producing this expansion, and in determining the direction in which expansion shall more particularly take place. The arrest of growth by strong light is a case in point. There is no reason to pelieve that this is to be ascribed to an increased rigidity of the

The phenomenon exhibited by mature mobile organs, such as the Function leaves of the Sensitive Plant, &c., remains finally to be considered. of pul- The movement of the leaf as a whole is effected by a group of cells, vinus. constituting a swelling, the pulvinus, at the insertion of the main

eell-wall, or to a diminution of the attraction of the cell-sap for water. It can only be ascribed to a molecular change in the proto- plasm, which causes it to offer considerable resistance to any change of form, either spontaneous or such as is induced by the hydro- static pressure. The arrest of growth which, as we have seen, usually occurs when leaves are kept in continuous darkness is another case in point. ‘The arrest of growth of the cells under these circumstances cannot be referred to a change in the physical pro- perties of either the cell-wall or the cell-sap, but must be attri- buted to a change in the molecular condition of the protoplasm. The phenomena of heterauxesis, spontaneous and induced, have now to be considered. It will be convenient to deal with induced heterauxesis first, and we will begin with the case of a unicellular organ. It has been mentioned that heterauxesis, in the form of curvature, is induced by the action of light, gravity, &c. In- asmuch as the hydrostatic pressure is necessarily the same at all points of the internal surface of the cell, the curvature must depend upon a local variation of the properties either of the cell- wall or of the protoplasm. In the case of the cell-wall either its rigidity is increased on one side, the concave, or its extensibility increased on the other, the convex. It is just conceivable, with regard to the action of light, that such a difference in properties might be induced by the more direct exposure of one side of a deli- eate filament to light, though the difference of intensity on the two sides would be very small. But it is not at all conceivable that such a difference could be induced by the action of gravity, and no explanation can be regarded as satisfactory which fails to meet all eases of curvature. The cause of the curvature is doubtless to be sought in the protoplasm. Unilateral illumination of the organ, or an abnormal relation to the line of action of gravity, acts as a stimulus on the organ and causes an alteration in the properties of its protoplasm, which is perhaps of such a nature that it becomes relatively rigid on the side which becomes concave. The induced heterauxesis of multicellular organs is certainly of essentially the

petiole, and of each leaflet by a similar organ at its attachment to the main petiole. The structure of the pulvinus is briefly a mass of parenchymatous cells having the same structure as that described above, traversed by a strand of flexible fibro-vascular tissue. When the leaf is fully expanded, its position is maintained by an equality between the downward pressure of the portion of the pulvinus above the fibro-vascular strand and the upward

pressure of the portion below it. The downward movement of the leaf as a whole is due to a sudden diminution of the upward pressure of the lower portion of the main pulvinus ; similarly, the upward movement of a leaflet is due to the sudden diminution of the downward pressure of the upper portion of its pulvinus. In both cases the diminution of pressure is due to a loss of turgidity of the portion of the pulvinus concerned: the cells become flaccid. This loss of turgidity has been shown to be due to an escape of water from the cells, which can only be accounted for by ascribing it to a change in the molecular condition of their protoplasm. In spontaneous movements this change is induced automatically, in induced movements by the action of astimulus. This molecular change is probably of such a kind that the protoplasm takes up water into itself, and at the same time allows it to pass through. The recovery of turgidity is slow. The arrest of movement which is induced by long-continued darkness or by exposure to light is probably due to the preveution of the occurrence of molecular change in the protoplasm. The con- duction of a stimulus, which undoubtedly takes place in the leaves of the Sensitive Plant, and probably in many other plant-organs (see above on heliotropism, geotropism, hydrotropism, tendrils), is effected by means of the delicate filaments of protoplasm which, as Gardiner has clearly shown in the pulvinus, are continuous between the protoplasm-bodies of adjacent cells.

For the reproduction of plants, see REPRODUCTION.

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PIACENZA (Fr., Plaisance; Lat., Placentia), a city of Italy, a bishop's see, and the chief town of a province, lies on the Lombard plain, 217 feet above sea-level, not far from the right bank of the Po, just below the confluence of the Trebbia. By rail it is 43 miles south-east of Milan and 354 north-west of Parma. Formerly a place of con- siderable strength, it is still surrounded by walls with bastions and fosse in a circuit of 4 miles. The cathedral was erected between 1122 and 1233, in the Lombardo- Gothic style, under the direction of Santo da Sambuceto, on the site of a church of the 9th century which had been destroyed by earthquake. The west front has three doors with curious pillared porches. The campanile is a massive square brick tower'223 feet high ; the iron cage attached to one of its windows was put up in 1495 by Ludovico il Moro for the confinement of persons guilty of treason or sacrilege. The crypt is a large church supported by one hundred columns. Sant' Antonino, which was the cathedral church till 877, and occupies the spot where it was reputed that St Barnabas preached to the people, was built by St Victor, the first bishop of Piacenza, in 324, restored in 903, rebuilt in 1104, and altered in 1857. It was within its walls that the deputies of the Lombard League swore to the conditions of peace ratified in 1183 at Constance. The brick vestibule (I] Paradiso) on the north side is one of the older parts of the building. San Francesco, a spacious edifice begun by the Franciscans in 1278, occu- pies the site of Ubertino Landi's palazzo, and is famous as the place where Agostino Landi harangued the people after the murder of Pierluigi, and where in 1848 the deputies of Piacenza proclaimed the annexation of their city to the Sardinian kingdom. San Sisto, which dates from 1499, and takes the place of the church founded in 874 by Angilberga (consort of the emperor Louis II.) for the Benedictines, lost its chief attraction when Raphael's Sistine Madonna (now in Dresden) was

sold by the monks in 1754 to Frederick Augustus ITI. San Sepolcro and Sta Maria della Campagna are both after Bramante's designs ; the latter is rich in works of Pordenone. Sant' Anna, dating from 1334, was the church of the barefooted Carmelites. Of the secular buildings in the city the most interesting is the Palazzo Communale, begun in 1281. In the main front the lower story, constructed of red and white marble, presents a series of five open pointed arcades ; the upper story, in brick, has six very rich round-arched windows, each of five lights; and above the cornice rise forked battlements. The square in front is known as the Piazza dei Cavalli, from the two bronze equestrian statues of Ranuccio (1620) and his father Alexander, prince of Parma, governor of the Netherlands (1625). Both were designed by Francesco Mocchi. The Farnese palace was begun after Vignola's designs by Margaret of Austria in 1558 ; but it was never completed, and since 1800 it has been used as barracks. Other buildings or institutions of

Sensory centres in brain-cortex, 41. Tetanus, 25. »» _herves, 8, 25 Thermotropism, 59. Somatotropism, 60. Tissues, 12.

» . constitution of, 16. Transpiration, 46.

a current of, 47, Unipolar excitation, 25. Vacuole, 44.

Vagi electrotonus, 25. Vascular system, 16.

Spinal cord, physical anatomy of, 34. as reflex centre, 35. as transmitter of nervous impressions, 34. + », as trophic centre, 35. » herves, 43. Starch in plants, 54. Stimuli, of nerves, 24 sq. » of plant-moveinent, Stomata, 45 sq. Velocity, measurement of in nerves, Sympathetic system, 43. 25,026. Temperature, influence of on growth of | Vital spirits, 10. plants, 57. Waller's law, 26. influence of on movement | Waste-products, 51, 54. of plants, 62. Water-culture, 48. Tendrils, twining of, 60. White matter of nerves, 28, 35.

" "? 3 bBy

Vaso-inhibitory nerves, 30. Vaso-motor fibres, 30.

note are the old and the new bishop's palace, the fine theatre designed by Lotario Tomba in 1803, the great hospital dating from 1471, the library presented to the commune in 1846 by the marquis Ferdinando Landi, and the Passerini library founded in 1685. About a mile to the east of the city is the Collegio Alberoni, instituted in 1751 for the education of priests and missionaries. Ata distance of about 2 miles in the opposite direction the Trebbia is crossed by a bridge of twenty-three arches, erected in 1825 at a cost of £47,000; the Austrians blew up two of the arches in 1859. Piacenza is an important point in the Italian railway system—the Lombardy, Piedmont, and Ligurian lines meeting there with those of Central Italy. Silk, cotton, and woollen goods, pottery, and hats are among the local manufactures. The popula- tion of the commune (which in this case is almost exactly identical with the city) was 34,985 in 1871 and 34,987 in 1881. .

Piacenza, originally, it is supposed, a Ligurian and afterwards a Gallic town, was made a Roman colony in 219 B.c. While its walls were yet unfinished it had to repulse an attack by the Gauls, whose hopes were excited by the news of Hannibal's approach, and in the latter part of 218 it afforded protection to the remains of the Roman army under Scipio which had been defeated by the Carthaginian general in the great battle on the Trebbia. In 207 it withstood a protracted siege by Hasdrubal, Hannibal's brother, and thus contributed largely to the ultimate success of the Romans. Seven years later the Gauls surprised and burned the city ; and the colony was so diminished in strength that in 190 it had to be recruited with three thousand families. In 187 it was connected with Rimini and the south by the construction of the AZmilian Way. During the later republic and the empire Placentia is named in connexion with a defeat of the forces of Marius in the neighbourhood (82 B.c.), a mutiny of Julius Cesar's garrison (49 B.c.), another mutiny under Augustus (41 B.c.), the defence of the city by Spurinna, Otho's general, against Cvcina, Vitellius's

general (69 A.D.), and the defeat of Aurelian by the Marcomanni —

outside the walls (271 A.D.). In 546 Totila reduced Piacenza by famine. Between 997 and 1035 the city was governed by its bishops, who had received the title of count from Otho III. In the latter part of the 12th

century it was one of the leading members of the Lombard League. For the most part it remained Guelph, though at times, as when it called in Galcazzo Visconti, it was glad to appeal to a powerful Ghibelline for aid against its domestic tyrants. In 1447 the city was captured and sacked by Francesco Sforza. Having placed itsclf directly under papal protection in 1512, it was in 1545 united with Parma (q.v.) to form an hereditary duchy for Pierluigi Farnese, son of Paul III. In 1746 a battle between the Franco-Spanish forces and the Austrians was fought under the city walls. In 1848 Piacenza was the first of the towns of Lombardy to join Piedmont; but it was re-occupied by the Austrians and had to wait for its emancipation till 1859. Lucius Calpurnius Piso (father-in-law of Julius Ceesar), Pope Gregory X., and Alexander Farnese, duke of Parma, were natives of the city. Among the local historians are Boselli, Rossi, Bonara, and Gemmi.

PIANOFORTE. The group of keyed stringed instru- ments, among which the pianoforte is latest in order of time, has been invented and step by step developed with the modern art of music, which is based upon the simul taneous employment of different musical sounds. In the

- 1323) teaches how true relations

‘invented. Perhaps one of the

PrAn OEP ORT E

10th century the “ organum ” arose, an elementary system of accompaniment to the voice, consisting of fourths and octaves below the melody and moving with it; and the organ, the earliest keyed instrument, was, in the first instance, the rude embodiment of this idea and convenient means for its expression. ‘here was as yet no keyboard of balanced key levers ; batons were drawn out like modern draw-stops, to admit the compressed air necessary to make the pipes sound. About the same time arose a large stringed instrument, the organistrum, the parent of the now vulgar hurdy-gurdy ; as the organ needed a blower as well as an organist, so the player of the organistrum required a handle-turner, by whose aid the three strings of

the instrument were made to sound simultaneously upon | a wheel, and, according to the well-known sculptured | relief of St George de Boscherville, one string was_ manipulated by means of a row of stoppers or tangents |

pressed inwards to produce the notes. The other strings were drones, analogous to the drones of the bagpipes, and

differing in effect from the changing “ organum” of the |

organ. In the 11th century, the epoch of Guido d’Arezzo, to whom the beginning of musical notation is attributed, the Pythagorean monochord, with its shifting bridge, was used in the singing schools to teach the intervals of the plain-song of the church. The practical necessity, not merely to demonstrate the proportionate relations of the intervals, but also to initiate pupils into the different grada- tions of the church tones, had soon after Guido’s time brought into use quadruplex-fashioned monochords, which were constructed with scales, analogous to the modern practice with thermometers which are made to show both Réeaumur and Centigrade, so that four lines indicated as many authentic and as many plagal tones. This arrange- ment found great acceptance, for Aribo, writing about fifty years after Guido, says that few monochords were to be found without it. Had the clavichord then been known, this make-shift contrivance would not have been used. Aribo strenuously endeavoured to im- prove it, and “by the grace of God” invented a monochord measure which, on account of the rapidity of the leaps he could make with it, he named a wild-goat (caprea). Jean de , Muris (Musica Speculativa,

may be found by a single- string monochord, but recom- mends a four-stringed one, pro- perly a tetrachord, to gain a knowledge of unfamiliar inter- vals. He describes the musical | imstruments known in his time, but does not mention the clavi- chord or monochord with keys,

which could not have been then Fie. 1.—Farliest existing represen- tation of a Keyed Stringed Instru- ment from St Mary’s, Shrewsbury (primitive Clavichord). Before 1460. Drawn by Miss Edith Lloyd.

earliest forms of such an instru- ment, in which stoppers or tan- gents had been adopted from the organistrum, is shown in fig. 1, from a wood carving of a vicar choral or organist, preserved in St Mary's Church, Shrewsbury. The latest date to which this interesting figure may be attributed is 1460, but the conventional representation shows that the mstrument was then already of a past fashion, although perhaps still retained in use and familiar to the carver.

A keyboard of balanced keys may have been first intro- duced in the little portable organ known as the regal so

often represented in old carvings, paintings, and stained windows. It derived its name regal from the rule (regula) or graduated scale of keys, and its use was to give the singers in religious processions the note or pitch. The only instrument of this kind known to exist in the United Kingdom is at Blair Athole, and it bears the very late date of 1630. The Brussels regal may be as modern. These are instances of how long a some-time admired musical instrument may remain in use after its first inten- tion is forgotten. We attribute the adaptation of the narrow regal keyboard to what was still called the mono- chord, but was now a complex of monochords over one resonance board, to the latter half of the 14th century; it was accomplished by the substitution of tangents fixed in the further ends of the balanced keys for the movable bridges of the monochord or such stoppers as are shown in the Shrewsbury carving. Thus the monochordium or "»ayre of monochordis" became the clavichordium or " payre of clavichordis "—pair being applied, in the old sense of a " pair of steps," to a series of degrees. This use of the word to imply gradation was common in England to all keyed instruments; thus we read, in the Tudor period and later, of a pair of regals, organs, or virginals.

The earliest known record of the clavichord occurs in some rules of the minnesingers, dated 1404, preserved at Vienna. The monochord. is named with it, showing a differentiation of these instruments, and of them from the clavicymbalum, the keyed cymbal, cembalo (Italian), or psaltery. From this we learn that a keyboard had been thus early adapted to that favourite medizval stringed instrument, the "cembalo" of Boccaccio, the " sautrie" of

Chaucer. There were two forms of the psaltery:—(1) the trapeze, one of the oldest representations of which is to be found in Orcagna's famous Trionfo della Morte in the Campo Santo at Pisa, and another by the same painter in the National Gallery, London ; and (2) the contemporary "testa di porco," the pig's head, which was of triangular shape as the name suggests. The trapeze psaltery was strung horizontally, the " istromento di porco" either hori- zontally or vertically,—the notes, as in the common dul- cimer, being in groups of three or four unisons. In these differences of form and stringing we see the cause of the ultimate differentiation of the spinet and harpsichord. The compass of the psalteries was nearly that of Guido's scale ; but, according to Mersenne, the lowest interval was a fourth, G to C, which is worthy of notice as anticipating the later "short measure" of the spinet and organ.

The simplicity of the clavichord inclines us to place it, in order of time, before the clavicymbalum or clavicembalo; but we do not know how the sounds of the latter were at first excited. There is an indication as to its early form to be seen in the church of the Certosa near Pavia, which compares in probable date with the Shrewsbury example. We quote the reference to it from Dr Ambros's History of Music. He says a carving represents King David as hold- ing an "istromento di porco" which has eight strings and as many keys lying parallel to them ; he touches the keys with the right hand and damps the strings with the left. The attribution of archaism applies with equal force to this carving as to the Shrewsbury one, for when the monastery of Certosa was built chromatic keyboards, which imply a considerable advance, were already in use. 'There is an authentic representation of a chromatic keyboard, painted not later than 1426, in the St Cecilia -panel (now at Berlin) of the famous Adoration of the Lamb by the Van Eycks. The instrument depicted is a positive organ, and it is interesting to notice in this realistic painting that the keys are evidently boxwood as in the Italian spinets of later date, and that the angel plays a common chord—A with the right hand, F and C with the left. But diatonic organs XIX. — 9

with eight steps or keys in the octave, which included the B flat and the B natural, as in Guido’s scale, were long preserved, for Pretorius speaks of them as still existing nearly two hundred years later. This diatonic keyboard, we learn from Sebastian Virdung (Musica getutscht und auszgezogen, Basel, 1511), was the keyboard of the early clavichord. We reproduce his diagram as the only autho- rity we have for the disposition of the one short key.

seieeeges ap

Fig. 2.—Diatonie Clavichord Keyboard (Guido’s Scale) fromVirdung. Before 1511.

The extent of this scale is exactly Guido’s. diagram of the chromatic is the same as our own familiar keyboard, and comprises three octaves and a note, from F below the bass stave to G above the treble. But Virdung tells us that even then clavichords were made longer than four octaves by repetition of the same order of keys. The introduction of the chromatic order he attributes to the study of Boetius, and the consequent endeavour to restore the three musical genera of the Greeks—the diatonic, chro- matic, and enharmonic. But the last-named had not been attained. Virdung gives woodcuts of the clavicordium,

the virginal, the clavicimbalum, and the claviciterium. We |

reproduce three of them (figs. 3, 6, and 12), omitting the virginal as obviously incorrect. All these drawings have been continually repeated by writers on musical instru- ments up to the present day, but without discerning that in the printing they are reversed, which puts the keyboards entirely wrong, and that in Luscinius’s Latin translation of Virdung (Musurgia, sive Praxis Musice, Strasburg, 1536), which has been hitherto chiefly followed, two of the engrav- ings, the clavicimbalum and the claviciterium, are trans- posed, another cause of error. Martin Agricola (Musica Instrumentalis, Wittenberg, 1529) has copied Virdung’s illustrations with some differences of perspective, and the addition, here and there, of errors of his own.

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WY YAU LEEPER j LZZZZZZTTZIT ZT i Y)

(ae ees et ey ae CLZIZTITLLE LODE,

Fia, 3.—Virdung’s Clavichordium, 1511; reversed Sacsimile,

Still vulgarly known as monochord, Virdung’s clavi- chord was really a box of monochords, all the strings being of the same length. He derives the clavichord from Guido’s monochord as he does the virginal from the psaltery, but, at the same time, confesses he does not know when, or by whom, either instrument was invented. We observe in this drawing the short sound-board, which always

remained a clavichord peculiarity, and the straight sound- |

board bridge—necessarily so when all the strings were of

one length. To gain an angle of striking place for the |

tangents against the strings the keys were made crooked, an expedient further rendered necessary by the “ fretting, ’— three tangents, according to Virdung, being directed to stop as many notes from each single group of three strings tuned in unison; each tangent thus made a different vibrating length of string. In the drawing the strings are

PIANOTOERT i

Virdung’s |

| merely indicated. The German for fret is Bund, and such a clavichord, in that language, is known as a “ gebunden” one, both fret (to rub) and Bund (from binden, to bind) having been taken over from the lute or viol. The French and Italians employ “touche” and “tasto,” touch. Pre. torius, who wrote a hundred years later than Virdung, says two, three, and four tangents were thus employed in stopping. The oldest clavichords extant have no more | than two tangents to a note formed by a pair of strings, no longer three. Thus seven pairs of strings suffice for an octave of twelve keys, the open notes being F, G, A, B flat, C, D, E flat, and by an unexplained

peculiarity, perhaps derived from some special estimation of the notes which was connected with the church modes, A and D are left throughout free from a second tangent. A corresponding

value of these notes is shown by their independence of

chromatic alteration in tuning the double Irish harp, as explained by Galilei in his treatise on music, published in 1581. Adlung, who died in 1762, speaks of another fretting, but we think it must have been an adaptation to the modern major scale, the “free” notes being E and B. Clavichords were made with double fretting up to about the year 1700,—that is to say, to the epoch of J.§. Bach, who, taking advantage of its abolition and the consequent use of independent pairs of strings for each note, was enabled to tune in all keys equally, which had been impossible so long as the fretting was maintained. The modern scales having become established, Bach was now able to produce, in 1722, Das wohkltemperirte Clavier, the first collection of preludes and fugues in all the twenty- four major and minor scales for a clavichord which was tuned, as to concordance and dissonance, fairly equal. The oldest clavichord, here called manicordo (as French, manicorde, from monochord), known to exist is that shown in fig. 4. It will be observed that the lowest octave is

sii dd Md Pee cea AMAR

Fig. 4.—Manicordo (Clavichord) d’Eleonora di Montalvo, 1659; Kraus Museum, Florence.

here already “ bundfrei ” or fret-free.

| longer of equal length, and there are three bridges, divi- sions of the one bridge, in different positions on the sound-board. Mersenne’s “manicorde” (Harmonie Umiverselle, 1636), shown 3 in an engraving in that work, has the strings still nearly of equal length, but divides the sound-board bridge into five. The fretted clavichords made in _ Germany in the last years of the 17th century have the curved sound-board bridge, like a spinet. In. ia

the clavichord the tangents = — always form the second | bridge, indispensable for the vibration, as well as act as | the sound exciters (fig. 5).

The common damper to all the strings is a list of cloth, interwoven behind the tangents. As the tangents quitted the strings the cloth immediately

The strings are no —

PIANOFORTE

stopped vibration. Too ‘much cloth would diminish the tone of this already feeble instrument, which gained the name of “dumb spinet” from its use. The cloth is accurately painted in the clavichord Rubens’s St Cecilia (Dresden Gallery) plays upon,—interesting as perhaps representing that painter’s own instrument. The number of keys there shown is three octaves and a third, F to A, __the same extent as in Handel’s clavichord now in the museum at Maidstone (an Italian instrument dated 1726, and not fretted), but with a combined chromatic and short octave peculiarity in the lowest notes we shall have to refer to when we arrive at the spinet; we pass it by as the only instance in the clavichord we have met with. The clavichord must have gone out of favour in Great Britain and the Netherlands early in the 16th century, before its expressive power, which is of the most tender and intimate quality, could have been, from the nature of the music played, observed,—the more brilliant and elegant spinet being preferred to it. Like the other key- board instruments it had no German name, and can hardly have been of German origin. Holbein, in his drawing of the family of Sir Thomas More, 1528, now at Basel, indi- cates the place for “ Klavikordi und ander Seytinspill.” But it remained longest in use in Germany—until even the beginning of the present century. It was the favourite “Klavier” of the Bachs. Besides that of Handel already noticed, there are in existence clavichords the former possession of which is attributed to Mozart and Beethoven. The clavichord was obedient to a peculiarity of touch possible on no other keyboard instrument. This is described by C. P. Emmanuel Bach in his famous essay on playing and accompaniment, entitled Versuch tber die

wahre Art das Klavier zu spielen (An Essay on the True |

Way to play Keyboard Instruments). It is the “ Bebung” (trembling), a vibration in a melody note of the same nature as that frequently employed by violin players to heighten the expressive effect ; it was gained by a

repeated move- ment of the fleshy end of the finger while the key was still held down. The “ Bebung” was indicated in the notation by dots over the note to be affected by it, perhaps

showing how many times the note should be repeated. | now refers to the illustration], so that there are five keys

According to the practice of the Bachs, as handed down

to us in the above mentioned essay, great smoothness of |

touch was required to play the clavichord in tune, As with the monochord, the means taken to produce the sound disturbed the accuracy of the string measurement _ by increasing tension, so that a key touched too firmly in the clavichord, by unduly raising the string, sharpened the pitch, an error in playing deprecated by C. P. Emmanuel Bach. This answers the assertion which has been made that J. S. Bach could not have been nice about tuning when he played from preference on an instrument of un- certain intonation.

The next instrument described by Virdung is the Virginal (virginalis, proper for a girl), a parallelogram in shape, with a projecting keyboard and compass of keys the same as the clavichordium. Here we can trace deriva- tion from the psaltery in the sound-board covering the entire inner surface of the instrument and in the triangular disposition of the strings. The latter in Virdung’s drawing has an impossible position with reference to the keyboard, which renders its reproduction as an illustration useless.

But in the next drawing, the clavicimbalum, this is rectified, | ‘ich ‘clavicimbalum, spinet, or virginal, derived from the

and the drawing, reversed on account of the key-board, can be accepted as roughly representing the instrument so called (fig, 6), .

_ There would be no difference between it and the virginal were it not for a peculiarity of keyboard compass, which emphatically refers itself to the Italian “spinetta,”

® name unnoticed by Virdung or by his countryman |

Arnold Schlick, who, in the same year 1511, published his Spiegel der Orgelmacher (“ Organ-builders’ Mirror”), and

Fic. 6.—Virdung’s Clavicimbalum (Spinet), 1511; reversed Sacsimtle.

named the clavichordium and clavicimbalum as familiar instruments. In the first place, the keyboard, beginning apparently with B natural, instead of F, makes the clavicimbalum smaller than the virginal, the strings in this arrangement being shorter ; in the next place it is almost certain that the Italian spinet compass, beginning appar- ently upon a semitone, is identical with a “short measure ” or “short octave” organ compass, a very old keyboard arrangement, by which the lowest note, representing B, really sounded G, and C sharp in like manner A. The origin of this may be deduced from the psaltery and many representations of the regal, and its object appears to have been to obtain dominant basses for cadences,—harmonious closes having early been sought for as giving pleasure to the ear. We have found a hitherto unnoticed authority for this practice in Mersenne, who, in 1636, expressly describes it as occurring in his own spinet (espinette). He says the keyboards of the spinet and organ are the same. Now, in his Latin edition of the same work he renders espinette by clavicimbalum. We read (Harmonie Uni- verselle, Paris, 1636, liv. 3, p. 107)—“ Its longest string [his spinet’s] is little more than a foot in length between the two bridges. It has only thirty-one steps [“ marches *| ia its keyboard, and as many strings over its sound-board [he

hidden on account of the perspective,—that is to say, three naturals and two sharps [“ feintes,” same as the Latin jicts], of which the first is cut into two (a divided sharp form- ing two keys); but these sharps serve to go down to the third and fourth below the first step, C so/ [tenor clef C], in order to go as far as the third octave, for the eighteen principal steps make but an eighteenth, that is to say, a fourth more than two octaves.” The note we call F he,

| on his engraving, letters as C, indicating the pitch of a

spinet of the second size, which the one described is not. The third and fourth, reached by his cut sharp, are conse- quently the lower E and D; or, to complete, as he says, the third octave, the lowest note might be I, but for that he would want the diatonic semitone B, which his spinet, according to his description, did not possess.1 Mersenne's statement sufficiently proves, first, the use in spinets as well as in organs of what we now call "short measure," and, secondly, the intention of cut sharps at the lower end of the keyboard to gain lower notes. He speaks of one string only to each note; unlike the double and triple strung clavichord, those instruments,

could only present one string to the mechanical plectrum which twanged it. As regards the kind of plectra earliest used we have no evidence. The little crow-auill points, Scaliger, who was born in 1484, ex-

TMr A. J. Ellis (History of Musical Pitch, p. 318) sees the B in Mersenne's outline diagram.

psaltery,

pressly says were introduced when he was a boy. They project from centred tongues in uprights of wood known as "jacks" (fig. 7), which also carry the d The quills, rising by the depression of the keys in front, set the strings vibrating as they pass them,—springs at first of steel, later of bristle, giving energy to the twang and governing their return. Scaliger remem- bered the "harpichordum" and " clavi- cimbalum" being without those quill- points (mucrones), and attributes the intro- duction of the name " spinetta" to them (from spina, a thorn). We will leave har- pichordum for the present, but the early identity of clavicimbalum and spinetta is certainly proved. Scaliger's etymology has remained unquestioned until quite re- cently ; it is due to Signor Ponsicchi of Florence to have discovered another de- rivation, He has found in a rare ~~book entitled Conclusione nel suono dell organo, di D. Adiano Banchieri (Bologna, 1608), the following passage, which translated reads: —"Spinetta was thus named from the inventor of that oblong form, who was one Maestro Gio~~ vanni Spinetti, a Venetian; and I have seen one of those instruments, in the possession of Francesco Stivori, organist of the magnificent community of Montagnana, within which was this inscription

—Joannes Spinetus Venetus fecit, A.D. 1503.” Scaliger’s and Banchieri’s state- ments may be combined, as there is no discrepancy of dates, or we may rely upon whichever seems to us to have the greater authority, always bearing in mind that neither invalidates the other. The intro- duction of crow-quill points, and adaptation to an oblong case of an instrument previously in a trapeze form, are synchronous ; but we must accept 1503 as a late date for one of Spinetti’s instruments, seeing that the altered form had already become common, as shown by Virdung, in another country as early as

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The apparent compass of the keyboard in Italy generally exceeded four octaves by a semitone, E to F; but we may regard the lowest natural key as usually C, and the lowest sharp key as usually D, in these instruments, according to “short measure.”

The rectangular spinet, Virdung’s “ virginal,” early gu Pp gs gs y

assumed in Italy the fashion of the large “casone” or wedding chests. The oldest we know of in this style, and dated, is the fine specimen belonging to M. Terme which figures in L’Art Decoratif (fig. 9). Virginal is not an Italian name ; the rectangular instrument in Italy is “ spinetta tavola.” In England, from Henry VII. to Charles Ig all quilled instruments (stromenti di penna), without distinction as to form, were known as virginals, It was a common name, equivalent to the contemporary Italian clavicordo and Flemish clavisingel. From the latter, by apocope, we arrive at the French clavecin,—the French claner, a keyboard, being in its turn adopted by the Germans to denote any keyboard stringed instrument. Mersenne gives three sizes for spinets,—one 2) feet wide, tuned to the octave of the “ton de chapelle” (in his day a whole tone above the present English medium pitch), one of 34 feet, tuned to the fourth below, and one of 5 feet, tuned to the octave below the first,—the last being therefore tuned in unison to the chapel pitch. He says his own spinet was one of the smallest it was custom-

1511. After this date there are frequent references to spinets in public records and other documents, and we have fortunately the instruments themselves to put in evidence, preserved in public museums and in private

collections, The oldest spinet we can point out is in the Conservatoire, Paris. It isa pentagonal instrument made by Francesco di Portalupis at Verona, 1523. The Milanese Rossi were famous spinet-makers, and have been accredited (La Nobilita di Milano, 1595) with an improve- ment in the form which we believe was the recessing of

the keyboard, a feature which had previously entirely pro- |

jected ; by the recessing a greater width was obtained for the sound-board. The spinets by Annibalo Rosso at South Kensington, dated respectively 1555 (fig. 8) and 1577,

_their use was to heighten the brilliant effect.

SSS : : SSS SSS TAS E Fic. 9.—Spinetta Tavola (Virginal), 1568; collection of M. Terme.

ary to make, but from the lettering of the keys in his drawing it would have been of the second size, or the spinet tuned to the fourth. The octave spinet, of trapeze form, was known in Italy as “ottavina” or “spinetta di serenata.” It hada less compass of keys than the larger instrument, being apparently three and two-third octaves, E to C,—which by the “short measure” would be four octaves, CtoC. We learn from Pretorius that these little spinets were placed upon the larger ones in performance; In the double rectangular clavisingel of the Netherlands, in which there was a movable octave instrument, we recognize a similar intention. There is a fine spinet of this kind at Nuremberg, Pretorius illustrates the Italian spinet by a form known as the “ spinetta traversa,” an approach towards the long clavicembalo or harpsichord,—the tuning pins

Fie. 8.—Milanese Spinetta, by Annibale Rosso, 1555; South Kensington Museum.

show this alteration, and may be compared with the older and purer form of one, dated 1568, by Marco Jadra (also

known as Marco “dalle spinette,” or “dai cembali”). Besides the pentagonal spinet, there was an heptagonal variety ; they had often withdrawn from

decorated cases when required for performance, In other instances, as in the 1577 Rosso spinet, the case of the instrument itself was richly adorned.

neither covers nor stands, and were |

being immediately over the keyboard. This trans- posed spinet, more powerful than the old trapeze one, became fashionable in England after the Restoration,—Haward, Keene, Slade, Player, Baudin, the Hitchcocks, Mahoon, Haxby, ‘the Harris family, and others having made such “ spinnets” during a period for which we have dates from 1668 to 1784. Pepys bought his “Espinette” from Charles Haward for £5,

| July 13, 1668,

The spinets of Keene and Player, made about 1700, have frequently two cut sharps at the bass end of the key-

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board, which Mersenne’s short measure, and the realization at that time of the independence of each key in the chromatic scale, may be taken when combined to explain.

Fic. 10.—English Spinet (Spinetta Traversa), by Carolus Haward. About 1668. Collection of Mr W. Dale, London.

Hitherto such cut sharps have been assumed to be quarter tones, but enharmonic intervals in the extreme bass can have no justification. From the tuning of Handel’s Italian clavichord already mentioned, which has this peculiarity, we are led to infer that the nearer halves of the two cut sharps were the chromatic semitones, and the farther halves the lower thirds or fourths below what they appeared to be. Thomas Hitchcock (for whom we have a date 1703 upon a spinet jack in an instrument of older model with two cut sharps by Edward Blunt) and his son John made a great advance in con- structing spinets, giving them the wide compass of five octaves, from G to G, with very fine keyboards in which the sharps were inlaid with a slip

of the ivory or ebony, as the case might be, of the naturals. Their instruments, always numbered, and not dated as has been sometimes supposed, became models for the contemporary and subsequent Eng- lish makers.

We have now to ask what was the difference between Scaliger's harpichor- dum and his clavicymbal. Galilei, the father of the astronomer of that name (Dialogo della Musica Antica e Moderna, Florence, 1581), says that the harpichord was so named from having resembled an "arpa giacente," a prostrate or

couched" harp,—proving that the clavicymbal was at first the trapeze-shaped spinet; and we should therefore differentiate harpi- chord and clavicymbal as, in form, suggested by or derived from the harp and psaltery, or froma "testa di porco" and an ordinary trapeze psaltery. We are inclined to prefer the latter. The Latin name "clavicymbalum," having early been replaced by spinet and virginal, was in Italy and France bestowed upon the long harpichord, and was con- tinued as clavicembalo (gravecembalo, or familiarly cembalo only) and clavecin. Much later, after the restoration of the Stuarts, the first name was accepted and naturalized in England as harpsichord, which we will define as the long quill instrument shaped like a modern grand piano,

instrument of this kind so old as the Roman cembalo at South Kensington (fig. 11). It was made by Geronimo of Bologna in 1521, two years before the Paris Portalupis spinet. The outer case is of finely tooled leather. It has a spinet compass of keyboard of nearly four octaves, E to D. The natural keys are of boxwood, gracefully arcaded in front. The keyboards of the Italian cembalo were after- wards carried out to the normal four octaves. There is an existing example dating as early as 1526, with the bass keys carried out in long measure. It is surprising to see with what steady persistence the Italians adhered in making the instrument to their original model. As late as the epoch of Cristofori, and in his 1722 cembalo at Florence, we still find the independent outer case, the single keyboard, the two unisons, neither of which could be dispensed with by using stops. The Italians have been. as conservative with their forms of spinet, and are to this day with their

organs. The startling “piano e forte” of 1598, brought to light from the records of the house of D’Este, by Count Valdrighi of Modena, after much consideration and a desire to find in it an anticipation of Cristofori’s subsequent invention of the pianoforte, we are disposed to regard as an ordinary cembalo with power to shift, by a stop, from two unisons (forte) to one string (piano), at that time a Flemish practice, and most likely brought to Italy by one of the Flemish musicians who founded the Italian school of composition. About the year 1600,~~when accom~~ paniment was invented for monody, large cembalos were made for the orchestras to bring out the bass part—the performer standing to play. Such an instrument was called “archicembalo,” a name also applied to a large cembalo, made by Vito Trasuntino, a Venetian, in 1606, intended by thirty-one keys in each of its four octaves—one hundred and twenty-five in all—to restore

Frc. 11.—Roman Clavicembalo, by Geronimo of Bologna, 1521; South Kensington Museum.

the three genera of the ancient Greeks. How many attempts have been made before and since Trasuntino to purify intonation in keyboard instruments by multiplying keys in the octave? Simultaneously with Father Smith’s well-known experiment in the Temple organ, London, there were divided keys in an Italian harpsichord to gain a sepa- rate G sharp and A flat, and a separate D sharp and E flat.

Double keyboards and stops in the long cembalo or harpsichord came into use in the Netherlands early in the 16th century. We find them imported into England. The following citations, quoted by Rimbault in his History of

; | the Pianoforte, but imperfectly understood by him, are and resembling a wing, from which it has gained the | German appellation “ Fliigel.” We can point out no long |

from the privy purse expenses of King Henry VIII, as extracted by Sir Harris Nicolas in 1827.

“1530 (April). Item the vj daye paied to William Lewes for ii payer of virginalls in one coffer with iiii stoppes brought to Grenewiche iii li. And for ii payer of virginalls in one coffer brought to the More other iii li.”

Now the second instrument may be explained, virginals meaning any quilled instrument, as a double spinet, like that at Nuremberg by Martin Van der Beest, the octave division being movable; but the first cannot be so explained ; the four stops can only belong to a harpsichord, and the two pair instrument to a double-keyed one, one keyboard being over, and not by the side of the other. Again from the inventory after the king’s death—

“Two fair pair of new long Virginalls made harp-fashion of Cipres, with keys of ivory, having the King’s Arms crowned and supported by his Grace’s beastes within a garter gilt, standing over the keys.”

Rimbault saw in this an upright instrument, and such a one was not then impossible, Virdung’s claviciterium (fig. 12) being no more than a horizontal —_ harpsichord turned up upon its broad end, which a slight modi- fication of the action rendered facile, but if upright, the two fair pair of new long virginalls would not have been “long ”—but high. We explain “ harp-fashion ” according to Galilei’s “arpa giacente,” and are disposed to believe that we have here another double keyboard harpsi- chord. We read in an inventory of the furniture of Warwick Castle, 1584, Fie. 12.—Virdung’s Claviciterium (upright “a faire paire of double Harpsichord), 1511.

virginalls,” and in the Hengrave inventory, 1603, “ one great payre of double virginalls.” Hans Ruckers, the great clavisingel maker of Antwerp, lived then too late to have invented the double keyboard and stops, evident adaptations from the organ, but we may not withhold from him the credit of introducing the octave string, so

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long attributed to him, which incorporated the octave |

spinet with the large instrument, to be henceforth play-

able without the co-operation of another performer. It |

had been attached to the bent or angle side of harpsi- chords, as shown in a modern instrument which forms part of the famous Plantin Museum at Antwerp, and also in one by Hans Ruckers himself, dated 1594, preserved in the Kunst und Gewerbe Museum, Berlin. The double harpsi- chord by that maker at the Conservatoire, Paris, dated

1590, which is four years earlier than the above, has the |

octave string. From that date until the last harpsichord was made by Joseph Kirkman in 1798, scarcely an instru- ment of the kind was made, except in Italy, without the octaves. Hans Ruckers had two sons, Hans the younger and Andries the elder, who followed and rivalled him in skill and reputation. the former, appears to have done but little, at least for him- self; but a nephew, Jan Couchet, a grandson of old Hans Ruckers, continued the prestige of this distinguished family, Huygens being a witness to the rare ability of Couchet. All these men, and, in fact, all the clavisingel makers of Antwerp, affiliation being recognized from the close alliance at that time of the arts, the painter having often as much to do with the musical instrument as the maker himself. The Ruckers harpsichords in the 18th century were fetching such prices as Bologna lutes did in the 17th or Cremona

Another Andries, the son of |

belonged to the artist’s guild of St Luke, the |

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violins do now. There are still many specimens existing

in Belgium, France, and England. Handel had a Ruckers _ harpsichord, which may be the one long sought for and _lately discovered by Mr Julian Marshall in Windsor

Castle ; it completes the number of sixty-three existing Ruckers instruments catalogued in Grove's Dictionary of Music and Musicians.

After the Antwerp make declined, London became pre- eminent for harpsichords,—the representative makers being Jacob Kirckmann and Burckhard Tschudi, pupils of a Flemish master, one Tabel, who had settled in London, and whose business Kirckmann continued through marriage with Tabel's widow. 'Tschudi was of a noble Swiss family belonging to the canton of Glarus. According to the custom with foreign names obtaining at that time, by which Haendel became Handel, and Schmidt Smith, Kirckmann dropped his final » and Tschudi became Shudi, but he resumed the full spelling in the facies of the splendid harpsichords he made in 1766 for Frederick the Great, which are still preserved in the New Palace, Potsdam, By these great makers the harpsichord became a larger, heavier-strung, and more powerful instrument, and fancy stops were added to vary the tone effects. To the three shifting registers of jacks of the octave and first and second unisons were added the "lute," the charm of which was due to the favouring of high harmonics by plucking the strings close to the bridge, and the "harp," a surding or muting effect produced by impeding the vibration of the strings by contact of small pieces of buff leather. Two pedals were also used, the left-hand one a combination of a unison and lute, rendered practicable by first moving the "machine," a sixth stop, with the left hand of the player; the right-hand pedal was to raise a hinged portion of the top or cover and thus gain some power of "swell" or creg- cendo, an invention of Roger Plenius, to whom also the harp stop may be rightly attributed. This ingenious harp- sichord maker had been stimulated to gain these effects by the nascent pianoforte which, as we shall find, he was the first to make in England. The first idea of pedals for the harpsichord to act as stops appears to have been John Hay- ward's (? Haward) as early as 1676, as we learn from Mace's Musick's Monument. The French makers preferred a kind of knee-pedal arrangement known as the " genouillére," and sometiines a more complete muting by one long strip of buff leather, the "sourdine." As an improvement upon Plenius's clumsy swell, Shudi in 1769 patented the Venetian swell,

a framing of louvres, like a Venetian blind, which opened _ by the movement of the pedal, and, becoming in England

a favourite addition to harpsichords, was early transferred to the organ, in which it replaced the rude “ nag’s-head” swell. A French harpsichord maker, Marius, whose name is remembered from a futile attempt to design a piano-

forte action, invented a folding harpsichord, the “clavecin, _ brisé,” by which the instrument could be disposed of in

a smaller space. One, which is preserved at Berlin, probably formed part of the camp baggage of Frederick the Great.

It was formerly a custom with kings, princes, and nobles who were well-disposed towards music to keep large collec-

tions of musical instruments,—not as now for beauty of

decoration, form, and colour, or historical associations, but for actual playing purposes in the domestic and festive music of their courts. There are records of their inventories, and it was to keep such a collection in playing order that Prince Ferdinand dei Medici engaged a Paduan harpsichord maker, Bartolommeo Cristofori, the man of genius who in-vented and produced the pianoforte. We fortunately pos- sess the record of this invention in a literary form from a well-known writer, the Marchese Scipione Maffei; his

| description appeared in the Giornale dei letterati d’Italia,

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a publication conducted by Apostolo Zeno. ‘The date of | ness, he adopted the bold expedient of inverting it, driving

Maffei’s paper was 1711. Rimbault reproduced it, with a technically imperfect translation, in his History of the Piano- forte. We learn from it that in 1709 Cristofori had completed four ‘“gravecembali col piano e forte”—keyed-psalteries with soft and loud—three of them being of the

long or usual harpsichord form. A synonym in Italian for the original cembalo (or psaltery) is “salterio,” and if it were struck with hammers it became a “salterio tedesco” (the German hackbrett, or chopping board), the latter being the common dulcimer. Now the first notion of a pianoforte is a dulcimer with keys, and we may perhaps not be wrong in supposing that there had been many attempts and failures to put a keyboard toa dulcimer or hammers to a harpsichord before Cristofori successfully solved the problem. The sketch of his action in Maffei’s essay shows an incomplete stage in the invention, although the kernel of it, the principle of escapement or the controlled rebound of the hammer, is already there. He obtains it by a centred lever (linguetta mobile) or hopper, working, when the key is depressed by the touch, in a small projection from the centred hammer butt. The return, governed by a spring, must have been un- certain and incapable of further regulating than could be obtained by modifying the strength of the spring. More- over, the hammer had each time to be raised the entire distance of its fall. Cristofori in Florence, dated respectively 1720 and 1726, which show a much improved, we may even say a perfected, construction, for the whole of an essential piano movement is there. The earlier instrument has undergone some re- storation, but the 1726 one, which is in the Kraus Museum, retains’ the original leather hammerheads. Both instru- ments possess alike a contrivance for determining the radius of the hopper, and both have been unexpectedly found to have the “check” (Ital. paramartello) which regulates the fall of the hammer according to the strength of the blow which has impelled it to the strings. After this discovery of the actual instruments of Cristofori, there can be no longer doubt as to the attribution of the invention to him, in its initiation and its practical completion with escapement and check. To Cristofori we are indebted not only for the power of playing piano and forte, but for the infinite variations of tone, or mwances, which render the in- strument so delightful.

But his problem was not solved by the devising of a working action ; there was much more to be done to instal the pianoforte as a new musical instrument. The reson-

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Fig. 13.—Cristofori’s Escapement Action, 1720. ance, that most subtle and yet all-embracing factor, had been experimentally developed to a certain perfection by Many generations of spinet and harpsichord makers, but the resistance structure had to be thought out again. Thicker stringing, rendered indispensable to withstand even Cristofori’s light hammers, demanded, in its turn, a stronger framing than the harpsichord had needed. To make his structure firm, he considerably increased the strength of the block which holds the tuning-pins, and, as he could not do so without materially adding to its thick-

There are, however, two pianofortes by |

‘ends of the strings,

his wrest-pins, harp-fashion, through it, so that tuning was effected at their upper, while the wires were attached to their lower ends. Then to guarantee the security of the case he ran an inde- pendent string-block round it of stouter wood than had been used in harpsichords, in which block the hitch-pins were driven to hold the farther

which were spaced at equal distances (unlike the harpsi- chord), the dampers lying between the pairs of unisons.

Cristofori died in 1731. Hehad pupils, but did not found a school of Italian pianoforte making, perhaps from the peculiar Italian con- servatism in musical instruments we have already remarked upon.

The essay of Scipione Maffei was translated into German in 1725, by Kénig, the court poet at Dresden, and friend of Gottfried Silbermann, the renowned organ builder and harpsichord and clavichord maker.! Incited by this publication, and perhaps by having seen in Dresden one of Cristofori’s pianofortes, Silbermann appears to have taken up the new instrument, and in 1726 to have manufactured two, which J. S. Bach, according to his pupil Agricola, pronounced failures. The trebles were too weak; the touch was too heavy. There has long been another version to this story, viz., that Silbermann borrowed the idea of his action from a very simple model contrived by a young musician named Schroeter, who had left it at the electoral court in 1721, and, quitting Saxony to travel, had not afterwards

claimed it. It may be so; but Schroeter's letter, printed in Mitzler's Bibliothek, dated 1738, is not supported by any other evidence than the recent discovery of an altered German harpsichord, the hammer action of which, in its simplicity, may have been taken from Schroeter's diagram, and would sufficiently account for the condemnation of Silbermann's earliest pianofortes if he had made use of it. In either case it is easy to distinguish between the lines of Schroeter's interest- ing communications (to Mitzler and later to Marpurg) the bitter disappointment he felt in being left out of the practi- cal development of so important an instrument.

But, whatever Silbermann's first experiments were based upon, it has been made certain by the personal investiga- tions of the present writer that he, when successful, adopted Cristofori's pianoforte without further alteration than the compass and colour of the keys, and the style of joinery of the case. In the Silbermann grand pianofortes, in the three palaces at Potsdam, known to have been Frederick the Great's, and to have been acquired by that monarch prior to J. 8. Bach's visit to him in 1747, we find the Cristofori framing, stringing, inverted wrest-plank, and action complete. Fig. 15 represents the instrument on which J. 8. Bach palyed in the Town Palace, Potsdam.

It has been repeatedly stated in Germany that Frederici of Gera in Saxony, an organ builder and musical instrument

Fic. 14.—Cristofori's Piano e Forte, 1726; Kraus Museum Florence.

1 This translation, reproduced in eatenso, may be read in Dr Oscar Paul's Geschichte des Claviers, Leipsic, 1868.

maker, invented the square or table-shaped piano, the "fort

bien" as he is said to have called it, about 1758-60. No square piano by this maker is forthcoming, but M. Victor

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do with the invention of it!) a square piano, which was to become the most popular domestic instrument, tells us all about Zumpe; and his instruments, stil]

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existing, fix the date of the first at about 1765. In his simple “old man’s head” action, we have the nearest approach to a realization of Schroeter’s simple idea, Tf will be observed that Schroeter’s damper would stop all vibration at once. This de. fect is overcome by Zumpe’s ““mopstick ” damper. Another piano action had, however, come into use about that time or even earlier in

Germany. The discovery of it in the simplest ,

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form is to be attributed to M. Mahillon, who has found it in a square piano belonging to M. Henri Gosselin, painter, of Brussels,

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Fra. 15.-—Silbermann Forte Piano; Stadtschloss, Potsdam, 1746. Engraved by permission of H.I.H.

the Crown Princess of Prussia,

Mahillon of Brussels has acquired a Frederici “upright | grand” piano, dated 1745, and contributes a diagram of | the simple action (fig. 16). In

Frederici’s upright grand action we have not to do with Ra

the ideas of either Cristofori or Schroeter ; the movement is practi- cally identical with the hammer action of a German clock, and has its counterpart in a piano at Nuremberg, a fact which needs further elucidation. We note here the earliest example of the leather hinge afterwards so com- mon in piano actions, and only how going out of use. Where are we to look for Schroeter’s copyist, if not found in Silber- mann, Frederici, or, as we shall

presently see, perhaps Wagner ? It might be in the harpsichord we have mentioned, which, made in 1712 by one Brock for the elector of Hanover (after- Wr

wards George I. of Fic, 16.—Frederici’s Upright Grand Piano Action, England), was by 1745. Instrument now transferred to the museum

- of the Brussels Conservatoire.

him presented to

the Protestant pastor of Schulenberg near Hanover, and has since been rudely altered into a pianoforte (fig. 17). There is an altered harpsichord in the museum at Basel which appears to have been no more successful. But an attempted combination of harpsichord and pianoforte appears as a very early intention. The English poet Mason, the friend of Gray, bought such an

Fie, 17.—Hammer and Lifter of altered Harpsichord by Brock. Instrument in the collection of Mr Kendrick Pyne, Manchester,

instrument at Hamburg in 1755, with “the cleverest mechanism imaginable.” ;

It was only under date of 1763 that Schroeter pub- lished for the first time a diagram of his proposed inven- tion, designed more than forty years before. It appeared in Marpurg’s Kritische Briefe (Berlin, 1764). Now, immediately after, Johann Zampe, a German in London who had been one of Shudi’s workmen, invented or introduced (for there is some tradition that Mason had to

———— The principle of this action is that which was later perfected by the addition of a good escapement by Stein of Augsburg, and was again later experimented upon. by Sebastian Erard. Its origin is perhaps due to the contrivance of a

piano action that should suit the shallow clavichord and

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Fig, 18.—Schroeter's Model for an Action, 1721,

| permit of its transformation into a square piano; a trans _ formation, Schroeter tells us, had been going on when he

Fig. 19.—Zumpe's Square Piano Action, 1766.

wrote his complaint. It will be observed that the hammer

1s, as compared with other actions, reversed, and the axis

Fie. 20.—Old Piano Action on the German principle of Escapement. Square Piano belonging to M. Gosselin, Brussels. rises with the key, necessitating a fixed means for raising the hammer, in this action effected by a rail against which the hammer is jerked up. It was Stein's merit to graft the hopper principle upon this simple action ; and Mozart's

2 Mason really invented the " celestina,'" as we know from the cor- respondence of Mary Granville. Under date of the 11th January 1775 she describes this invention or improvement of the poet as a short harpsichord in form, 2 feet long, but played with the right hand only. The left hand controlled a kind of violin-bow, which produced a charming sostinente, in character of tone between the violin tone and that of musical glasses. Mason played upon it with great ex- pression,

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approbation of the invention, when he met with it at Augs- burg in 1777, is expressed in a well-known letter addressed to his mother. No more

“blocking” of the hammer, destroying all vibration, was henceforth to vex his mind.

Fic, 21.—Stein’s Action (the earliest so-called Viennese), 1780. He had found the instrument that for the rest of his short

life replaced the harpsichord. M. Mahillon has secured for his museum the only Johann Andreas Stein piano which is known to remain. It is from Augsburg, dated 1780, and has Stein’s escapement action, two unisons, and the knee pedal, then and later common in Germany.

Mozart’s own grand piano, preserved at Salzburg, and the two grand pianos (the latest dated 1790) by Huhn of Berlin, preserved at Berlin and Charlottenburg, because they had belonged to the Prussian Queen Louise, follow Stein in all particulars. These instruments have three unisons upwards, and the muting movement known as celeste which no doubt Stein had also. The wrest-plank is not inverted; nor is there any imitation of Cristofori. We imay regard Stein, coming after the Seven Years’ War which had devastated Saxony, as the German reinventor of the grand piano. Stein’s instrument was accepted as a inodel, as we have seen, in Berlin as well as Vienna, to which city his business was transferred in 1794 by his daughter Nanette, known as an accomplished pianist and friend of Beethoven, who at that time used Stein’s pianos. She had her brother in the business with ~~her, and had already, in 1793, married J. A. Streicher, a pianist from Stuttgart, and distinguished as a personal friend of Schiller. In 1802, the brother and sister dissolving partnership, Streicher began himself to take his full share of the work, and on Stein’s lines improved the Viennese instrument, so popular for many years and famous for its lightness of touch, which contributed to the special character of the Viennese school of pianoforte playing. The firm of Streicher still exists in Vienna; but since 1862, when Steinway’s example caused a complete revolution in German and Austrian piano~~ making, the old wooden cheap grand piano has died out. We will quit the early German piano with an illustration (fig. 22) of an early square piano action in an instrument

Fic. 22.—German Square Action, 1783. Piano by Wagner, Dresden.

made by Johann Gottlob Wagner of Dresden in 1783. This interesting discovery of M. Mahillon's introduces us to a rude imitation (in the principle) of Cristofori, and it appears to have no relation whatever to the clock hammer notion seen in Frederici's.

Burney, who lived through the period of the displace- ment of the harpsichord by the pianoforte, is the only authority we can refer to as to the introduction of the latter Instrument into England. He tells us,! in his gossiping way, that the first hammer harpsichord that came to England was made by an English monk at Rome, a ee ee

1 Rees's New Cyclopedia, article " Harpsichord."

Father Wood, for an English gentleman, Samuel Crisp of Chesington ; the tone of this instrument was superior to that produced by quills, with the added power of the shades of piano and forte, so that, although the touch and mechanism were so imperfect that nothing quick could be executed upon it, yet in a slow movement like the Dead March in Saul it excited wonder and delight. Fulke Greville afterwards bought this instrument for 100 guineas, and it remained unique in England for several years, until Plenius, the inventor of the lyrichord, made a pianoforte in imitation of it. In this instrument the touch was better, but the tone was inferior. We have no date for Father Wood. Plenius produced his lyrichord, a sostinente harpsichord, in 1745. When Mason imported a pianoforte in 1755, Fulke Greville's could have been no longer unique. The Italian origin of Father Wood's piano points to a copy of Cristofori, but the description of its capabilities in no way supports this supposition, unless we adopt the very possible theory that the instrument had arrived out of order and there was no one in London who could put it right, or would perhaps divine that it was wrong. Burney further tells us that the arrival in London of J. C. Bach in 1759 was the motive for several of the second-rate harpsichord makers trying to make pianofortes, but with no particular success. Of these Americus Backers, said to be a Dutchman, appears to have gained the first place. He was afterwards the inventor of the so-called English action, and, as this action is based upon Cristo- fori's, we may suppose he at first followed Silbermann in copying the original inventor. There is an old play-

bill of Covent Garden in Messrs Broadwood’s possession, dated the 16th May 1767, which has the following announce- ment :—

“End of Act 1. Miss BrickLER will sing a favourite song from JUDITH, accompanied by Mr Dippin, on a new instrument call’d PIANO Forts.’

The mind at once reverts to Backers as the probable maker of this novelty. Be that as it may, between 1772 and 1776, the year of his death, he produced the action continued in the direct principle to this day by the firm of Broadwood, or with a reversed lever and hammer-butt introduced by the firm of Collard in 1839,

Fig, 23.—Grand Piano Action, 1776. The“ English” action of Americus Backers.

The escapement lever is suggested by Cristofori’s first action, to which Backers has added a contrivance for regulating it by means of a button and screw. The check is from Cristofori’s second action. No more durable action has been constructed, and it has always been found equal, whether made in England or abroad, to the demands of the most advanced virtuosi. John Broadwood and Robert Stodart were friends, Stodart having been Broadwood’s

pupil; and they were the assistants of Backers in the XIX. — 10

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installation of his invention. On his death-bed he com- mended it to Broadwood’s care, but Stodart appears to have been the first to advance it, —Broadwood being pro-

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Fria. 24.—Broadwood’s Grand Piano Action, 1884. English direet meehanism. bably held back by his partnership with his brother-in-law, the son of Shudi, in the harpsichord business. (The elder Shudi had died in 1773.) Stodart soon made a con. siderable reputation with his “grand” pianofortes, a

Fig. 25.—Collard’s Grand Piano Action, 1884. English action, with reversed hopper and eontrivanee for repetition added.

designation he was the first to give them. In Stodart’s

in framing and resonance entirely on the harpsichord prin- ciple, the sound-board bridge being still continued in one undivided length. The strings, which were of brass wire in the bass, descended in notes of three unisons to the lowest note of the scale. Tension was left to chance, and a reasonable striking line or place for the hammers was not thought of. Theory requires that the notes of octaves should be multiples in the ratio of 1 to 2, by which, taking the treble clef C at one foot, the lowest F of the five-octaye scale would require a vibrating length between the bridges of 12 feet. As only half this length could be conveniently afforded, we see at once a reason for the above-mentioned deficiencies. Only the three octaves of the treble, which had lengths practically ideal, could be tolerably adjusted. Then the striking-line, which should be at an eighth or not less than a ninth or tenth of the vibrating length, and had never been cared for in the harpsichord, was in the lowest two octaves out of all proportion, with corresponding dis-advantage to the tone. John Broadwood did not venture alone upon the path towards rectifying these faults. He called in the aid of professed men of science—Cavallo, who in 1788 published his calculations of the tension, and Dr Gray, of the British Museum. The problem was solved by dividing the sound-board bridge, the lower half of

which was advanced to carry the bass strings, which were

still of brass. The first attempts to equalize the tension and improve the striking-place were here set forth, to the great adyantage of the instrument, which in its wooden construc- tion might now be considered complete. pianists of that epoch, except Mozart and Beethoven,

were assembled in London,—Clementi, who first gave the.

pianoforte its own character, raising it from being a mere variety of the harpsichord, his pupils Cramer and for a time Hummel, later on John Field, and also the brilliant virtuosi Dussek and Steibelt. To please Dussek, Broad-wood in 1791 carried his five-octave, F to F, keyboard, by

grand piano we first find an adaptation from the lyrichord adding keys upwards, to five and a half octaves, F to C.

of Plenius, of steel arches between the wrest-plank and bellyrail, bridging the gap up which the hammers rise, in itself an important cause of weakness. in any contemporary German instruments, but may have been part of Backers's. Imitation of the harpsichord by "octaving" was at this time an object with piano makers. Zumpe's small square piano had met with great success ; he was soon enabled to retire, and his imitators, who were legion, continued his model with its hand stops for the dampers and sourdine, with little change but that which straightened the keys from the divergences inherited from the clavichord. John Broadwood took this domestic instru- ment first in hand to improve it, and in the year 1780 succeeded in entirely reconstructing it. He transferred the wrest-plank and pins from the right-hand side, as in the clavichord, to the back of the case, an linprovement uni- versally adopted after his patent, taken out in 1783, expired. In this patent we first find the damper and piano pedals, since universally accepted, but at first in the grand pianofortes only. Zumpe's action remaining with an altered damper, another inventor, John Geib, about this time patented the hopper with two separate escape- ments, one of which soon became adopted in the grass- hopper of the square piano, it is believed by Geib him- self; and Petzold, a Paris maker, appears to have taken later to the escapement effected upon the key. We may mention here that the square piano was developed and continued in England until about the year 1860, when it went out of fashion.

To return to John Broadwood,—having launched his reconstructed square piano, he next turned his attention to the grand piano to continue the improvement of it from the point where Backers had left it, The grand piano was

These are not found | to the piano.

In 1794 the additional bass half octave to C, which Shudi had first introduced in his double harpsichords, was given Steibelt, while in England, instituted the familiar signs for the employment of the pedals, which owes its charm to excitement of the imagination instigated by power over an acoustical phenomenon, the sympathetic vibration of the strings. In 1799 Clementi founded a pianoforte manufactory, to be subsequently developed and carried on by Messrs Collard.

The first square piano made in France is said to have been constructed in 1776 by Sebastian Erard, a young Alsatian. London manufactory of harps and pianofortes bearing his name. That eminent mechanician and inventor is said to

Fic, 26.—Erard's Double Eseapement Action, 1884. The double eseapement or repetition is effeeted by a spring in the balanee pressing the hinged lever upwards, to allow the hopper which delivers the blow to return to its position under the nose of the hammer, before the key has risen again.

have at first adopted for his pianos the English models However, in 1794 and 1801, as is shown by his patents,

The greatest

In 1786 he came to England, and founded the —

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he was certainly engaged upon the elementary action described as appertaining to M. Gosselin's piano, of probably German origin. In his long-continued labour of inventing and constructing a double escapement action, Erard appears to have sought to combine the English power of gradation of tone with the German lightness of touch. He took out his first patent for a " repetition" action in 1808, claiming for it "the power of giving repeated strokes without missing or failure, by very small angular motions of the key itself." He did not, however, succeed in producing his famous repetition, or double escapement action until 1821; it was then patented by his nephew Pierre Erard, who, when the patent expired in England in 1835,

proved a loss from the difficulties of carrying out the invention, which induced the House of Lords to grant an extension of the patent.

Although some great pianists have been opposed to double escapement, notably Kalkbrenner, Chopin, and Dr Hans von Biilow, Erard's action, in its complete or a shortened form as introduced by Herz, is now more extensively used than at any former period. Erard invented in

Fic. 27.Steinway's Grand Piano Action, 1884. The double escapement as in Erard's, but with shortened balance and usual check.

1808 an upward bearing to the wrest-plank bridge, by means of agraffes or studs of metal through holes in which the strings are made to pass, bearing against the upper side. The wooden bridge with down-bearing strings is clearly not in relation with upward-striking hammers, the tendency of which must be to raise the strings from the bridge, to the detriment of the tone. A long brass bridge on this principle was introduced by William Stodart in 1822. A pressure-bar bearing of later introduction is claimed for the French maker, M. Bord, and is very fre- quently employed, by German makers especially. The first to see the importance of iron sharing with wood (ultimately almost supplanting it) in pianoforte framing was a native of England and a civil engineer by profession, John Isaac Hawkins, who has been best known as the inventor of the ever-pointed pencil. He was living at Philadelphia, U.S., when he invented and first produced the familiar cottage pianoforte—" portable grand" as he then called it. He patented it in America, his father, Isaac Hawkins, taking out the patent for him in England in the same year,

1800. It will be observed that the illustration here given (fig. 28) represents a wreck; but a draughtsman's restora- tion might be open to question.

_There had been upright grand pianos as well as upright harpsichords, the horizontal instrument being turned up upon its wider end and a keyboard and action adapted to it, William Southwell, an Irish pianomaker, had, in 1798, tried a similar experiment with a square piano, to be repeated in later years by W. F. Collard of London ; but Hawkins was the first to make a piano, or planino, with the strings descending to the floor, the keyboard being raised, and this, although at the moment the chief, was not his only

merit. He anticipated nearly every discovery that has since been introduced as novel. His instrument is in a complete iron frame, independent

of the case; and in this frame, strengthened by a system of iron resistance rods combined with an iron upper bridge, his sound-board is entirely suspended. An apparatus for

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Fic, 28.—Hawkins's Portable Grand Piano, 1800. An upright instrument, the original of the modern cottage piano or pianino. In Messrs Broadwood's museum and unrestored.

tuning by mechanical screws regulates the tension of the strings, which are of equal length throughout. The action, in metal supports, anticipates Wornum's in the checking, and still later ideas in a contrivance for repetition. This remarkable bundle of inventions was brought to London and exhibited by Hawkins himself, but the instrument being poor in the tone failed to bring him pecuniary reward or the credit he deserved. Southwell appears to have been one of the first to profit by Hawkins's ideas by bringing out the high cabinet pianoforte, with hinged sticker action, in 1807. All that he could, how- ever, patent in it was the simple damper action, turning on a pivot to relieve the dampers from the strings, which is

still frequently used with such actions. The next steps for producing the lower or cot- tage upright piano were taken by Robert Wornum, who in 1811 produced a dia- gonally and in 1813 a vertically strung one. Wornum's perfected crank action was not complete until 1826, when it was patented for a cabinet piano; but it was not really introduced until three years later, when Wornum applied it to his little "piccolo." The principle of this centred lever check action was introduced into Paris by Pleyel! and Pape, and thence has gone to Germany and America. In Eng- land it has now nearly superseded the once favourite leather-hinged action.

It was not, however, from Hawkins's invention that iron be- came introduced as essential to the structure of a pianoforte. This was due to William Allen, a young Scotsman in the employ of the Stodarts. He devised a metal system of framing intended primarily for compensation, but soon to become, in other hands, a framing for resistance. His idea was to meet the divergence in tuning caused in brass and iron strings by

Fic, 29,—Wornum's Upright Action, 1826. The original of the now universal crank action in upright pianos.

1 Pleyel exhibited a small upright piano in Paris in 1827. Pierre

Erard did not turn his attention to upright pianos until 1831.

atmospheric changes by compensating tubes and plates of the same metals, guaranteeing their stability by a cross batoning of stout wooden bars and a metal bar across the wrest-plank. Allen, being simply a tuner, had not the full practical knowledge for carrying out the idea. He had to ally himself with Stodarts' foreman, Thom; and Allen and Thom patented the invention in January 1820. The firm of Stodart at once acquired the patent. We have now arrived at an important epoch in pianoforte construction,— the abolition, at least in England and France, of the wooden construction in favour of a combined construction of iron and wood, the former material gradually asserting pre- eminence. Allen's design is shown in fig. 30, The long

bars shown in the dia- ie N i

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attached being in the same correspondence. At once a great advance was made in the possibility of using heavier strings than could be stretched before, without danger to the durability of the case and frame. The next step was in 1821 to a fixed iron string-plate, the in- vention of one of Broad- woods' workmen, Samuel Hervé, which was in the first instance applied to one of the square pianos of that firm. The great advantage in the fixed plate was a more even '1890. 'The first complete sactal framing solid counterpoise to the 8ystem applied over the strings.

drawing or tension of the strings and the abolition of their undue length behind the bridge, a reduction which Isaac Carter! had tried some years before, but unsuccessfully, to accomplish with a plate of wood. So generally was attention now given to improved methods of resistance that it has not been found possible to determine who first practically introduced those long iron or steel resistance bars which are so familiar a feature in modern grand pianos. They were experimented on as substitutes for the wooden bracing by Joseph Smith in 1798; but to James Broadwood belongs the credit of trying them first above the sound-board in the treble part of the scale as long ago as 1808, and again in 1818; he did not succeed, however, in fixing them properly. The introduction of fixed resist- ance bars is really due to observation of Allen's compen- sating tubes, which were, at the same time, resisting. Sebastian and Pierre Erard seem to have been first in the field in 1823 with a complete system of nine resistance bars from treble to bass, with a simple mode of fastening them through the sound-board to the wooden beams beneath, but, although these bars appear in their patent of 1824, which chiefly concerned their repetition action, the Erards did not either in France or England claim them as of original invention, nor is there any string-plate combined eee

those of iron lie over the ETT TT,

iron or steel wire, while

those of brass lie over HH HE i a: =H dll lll cE) aa a

the brass wire, the metal plates to which they are ei | ececanentarnerta| tntanatTantaacs is i : “TO, |

Fie.30.—Allen’s Compensating Grand Piano,

a Sometime foreman to the pianoforte maker Mott, who attracted much attention by a piano with sostenente effect, produced by a roller and silk attachments in 1817, But a sostenente piano, how-

ever perfect, is no longer a true piano such as Beethoven and Chopin wrote for,

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with them in their patent. James Broadwood, by his patent of 1827, claimed the combination of string-plate and resistance bars, which was clearly the completion of the wood and metal instrument, differing from Allen’s jn the nature of the resistance being fixed. Broadwood, however, left the bass bars out, but added a fourth bar in the middle to the three in the treble he had previously used. It must be borne in mind that it was the trebles that gave way in the old wooden construction before the tenor and bass of the instrument. But the weight of the stringing was always increasing, and a heavy close overspinning of the bass strings had become general. The resistance bars were increased to five, six, seven, eight, and, as we have seen, even nine, according to the ideas of the different English and French makers who used them in their pursuit of stability.

The next important addition to the grand piano in order of time was the harmonic bar of Picire Erard, introduced in 1838. This was a gun-metal bar. of alter. nate pressing and drawing power by means of screws which were tapped into the wrest-plank immediately above the treble bearings; making that part of the instrument nearly immovable, this favoured the production of higher harmonics to the treble notes, recognized in what we com- monly call “ring.” A similar bar, subsequently extended by Broadwood across the entire wrest-plank, was to prevent any tendency in the wrest-plank to rise, from the combined upward drawing of the strings. A method of fastening the strings on the string-plate depending upon friction, and thus dispensing with “eyes,” was a contribution of the Collards, who had retained James

Stewart, who had been in America with Chickering, and was a man of considerable inventive power. This invention was intro- duced in 1827. Between 1847 and 1849 Mr Henry

Fowler Broadwood, son of James, and grandson of John

Broadwood, and also great grandson of Shudi (Tschudi), in- vented agrand piano- forte to depend prac- ||} tically upon iron, in which, to avoid the conspicuous inequali- ties caused by the breaking of the scale with resistance bars, there should be no bar parallel to the strings except a bass bar, while another flanged __ resistance bar, as an entirely novel feature, crossed p over the strings from the bass corner of the wrest-plank to a point upon the string-plate | where the greatest accumu- lation of tension strain was found. Mr Broadwood has Fre. 31.—Broadwood's Iron Grand Piano, 1884. not continued, with- —— iron frame with diagonal resistance out some compro- —

mise, this extreme renunciation of ordinary resistance means. Since the Great Exhibition of 1851 he has employed an ordinary straight bar in the middle of his concert grand scale, his smaller grands having frequently two such as well as the long bass bar. From 1862 he has covered his wrest-plank with a thick plate of iron into

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which the tuning pins screw as well as into the wood beneath, thus avoiding the crushing of the wood by the constant pressure of the pin across the pull of the string, an ultimate source of danger to durability.

The introduction of iron into pianoforte structure has been differently and independently effected in America, ' the fundamental idea there being a single casting for the _ metal plate and bars, instead _of forging or casting them in separate pieces. Alpheus Babcock was the pioneer to this kind of metal construction. He also was bitten with the compensation notion, and had cast an iron ring for a square piano in 1825, which is not said to have succeeded, but gave the clew to a single casting resistance framing, which was suc- cessfully accomplished by Conrad Meyer, in Philadelphia, in 1833, in a square piano which still exists, and was shown in the Paris

Exhibition of 1878. Meyer’s idea was taken up and improved upon by Jonas Chickering of Boston, who applied it to the grand piano as well as to the square, and brought the principle up to a high degree of perfection, —establish- ing by it the independent construc- tion of the American pianoforte.

We have now to do with over- or cross-stringing, by which the bass division of the strings is made to cross over the tenor part of the scale in a single, double, or treble disposi- “tion at diverging angles,—the object being in the first instance to get longer bass strings than are attainable in a parallel scale, and in the next to open out the scale and extend the area of bridge pressure on the sound- board. In the 18th century clavi- chords were sometimes overstrung in the lowest octave to get a clearer rye. 32.—Meyer’s Metal tone in that very indistinct part Frame for a Square Mano, of the instrument (strings tuned an =» ores octave higher being employed). ‘The first suggestion for the overstringing in the piano was made by the cele- brated flute-player and inventor Theobald Boehm, who carried it beyond theory in London, in 1831, by employing a small firm located in Cheapside, Gerock & Wolf, to make some overstrung pianos for him. Boehm expected to gain in tone; Pape, an ingenious mechanician in Paris, tried a like experiment to gain economy in dimensions, his notion being to supply the best piano possible with the least outlay of means. Tomkinson in London continued Pape’s model, but neither Boehm’s nor Pape’s took perma- nent root. The Great Exhibition of 1851 contained a grand plano, made by Lichtenthal of St Petersburg, overstrung in order to gain symmetry by two angle sides to the case. It was regarded as a curiosity only. A few years later, in 1855, Henry Engelhard Steinway (originally Steinweg), who had emigrated from Brunswick to New York in 1849, and had established the firm of Steinway & Sons in 1853 in that city, effected the combination of an overstrung scale with the American iron frame, which, exhibited in grand and square instruments shown in London in the International Exhibition of 1862, excited the attention of European pianoforte makers, leading ultimately to import- ant results. The Chickering firm claim to have antici- pated the Steinways in this invention. They assert that Jonas Chickering had begun a square piano on this com- bined system in 1853, but, he dying before it was completed, it was brought out later. It is often difficult to adjudicate

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upon the claims of inventors, so rarely is an invention the product of one man’s mind alone. However, the principle has been taken up and generally adopted in America and Germany, and has found followers elsewhere, not only in grand but in upright pianos, to the manufacture of which it has given, and particularly in Germany, a powerful impetus. But, in spite of this general recognition, the overstringing, as at present effected, is attended with grave disadvantages, in disturbing the balance of tone by in- troducing thick, heavy basses, which, like the modern pedal organs, bear no just relation to that part of the keyboard where the part-writing lies. The great increase also of tension which is held up as a gain, acts pre- judicially upon the durability of the instrument, as no artificial screw- ing up of the sound-board can always preserve the elasticity of the fibres of the fir tree (Abies excelsa in Europe, Adzes alba in America) of which it is made. The re- markableimprove- ments in the draw- ing of the cast steel wire pro- duced in Birming- ham, Vienna, and Nuremberg (this last initiated by Boehm) have ren- dered very high tensions practic- Fie. 33.—Steinway’s Grand Piano, 1884. Metal framing able. We believe in a single casting and overstrung.

they have been overstated in figures ; it is certain, however, that Broadwood’s seven-octave concert grands have a tension of not less than sixteen tons when at the English orchestral pitch,—the notes of the ideal lengths each draw- ing 450 tb. We have no such accurate statement to offer of the American and German concert grands, but we regard Steinway’s as of not less than twenty-two tons tension.

Whatever of importance has been introduced in the structure of the pianoforte we believe we have attributed to its legitimate inventor or to the manufacturer who has placed it in the light of day. It would be impossible within reasonable limits to chronicle the variations which have taken place

in the barrings of sound-boards on which their resonant structure depends, the disposition of wooden beams or metal bars, the adaptation of mechanical action, or any of those countless modifications upon which finally depends the individual character of an instrument worthy to be presented and upheld as a work of art. There are many names of first-rate pianoforte makers whose place has not been in this record, simply because they have not ranked with the initiators or perfecters of inventions that have been accepted as of paramount importance.

The earliest keyboard instrument makers were to be found in monasteries or collegiate foundations, and such lay help as may have been employed was at best of the roughest kind. In the next epoch the artists' guilds in cities absorbed lay musical instrument makers, notably on account of the then universal practice of making such instruments beautiful ; and, indeed, we are indebted

to this for the preservation of many spinets and harpsichords in museums and private collections. The full members of the craft-

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guilds were all masters who had terminated their apprenticeships by producing complete instruments as "master-pieces," made according to the rules and to the satisfaction of the wardens or deacons of the guilds. A trial of this kind lasted long in many crafts—for instance, in the case of Scottish cabinetmakers' inden- tures, an apprentice's freedom was only gained after the test produc- tion of an "essay " piece of work, duly authenticated aud admitted. Spinets and harpsichords were bound to bear the inscription of the maker's name, or to show his trade mark as a guarantee for honest workmanship. The master's sons and apprentices were, in the master's workshops, probationers of the guild and protected by it. Even in the 17th century we hear little about journeymen, who, as the name implies, would be paid by the day. But the extension of musical instrument workshops about the beginning of the 18th century was one of the signs of the

weakened power of the guilds—particularly in Great Britain. In France it needed the Revolution to entirely abolish them.

Throughout the 18th century journeywork and apprenticeship were general, Wages, compared with the cost of living, were meagre, and the day's work, not unfrequently extended by overtime, was a long one. The result was a slow production. The English cabinet- makers, however, owing to disputes which at last called for judicial interferenee, in the year 1788 brought out their book of prices which was the foundation of the present piece-work system. Piano- forte makers in course of time adopted this new departure with the result of quicker work and higher wages, benefiting alike the master and man. The next industrial revolution was inaugurated some-where about 1815, by the introduction of machinery to save manual labour, the division of which had already been instituted, and by the use of steam. Machinery has, as yet, been extended to its furthest limit in America, where labour-saving is relied upon as a powerful ally against strikes, which are more frequently victorious in the New thau in the Old World. Simultaneously a dislike has arisen to apprenticeships ; and even in Germany, the traditional land of the apprentice, this mode of acquirement has weakened.

Turning to the commercial importance of the pianoforte, we find that we have to face great difficulties in order to obtain anything like trustworthy information. It is true official blue-books give yearly statements of exports and imports, but as they do not separate the pianoforte from other musical instruments an analysis is impossible. Personal inquiry again among pianoforte makers brin gs but scattered information, partly from the natural inclination to enhance business returns, and partly from an equally natural disinclination to impart that which, if spoken of at all, should be confidential. From this dilethma we fall back upon gleanings of intelligence either of our own gathering or as afforded by the leading pianoforte trade organs in England and Germany—the London Music Trades Review and the Leipsic Zeitschrift fiir Instrumentenbau.

The chief centres of the pianoforte trade are London, Paris, Berlin, Leipsic, Dresden, Stuttgart, Hamburg, Vienna, St Petersburg, Brussels, New York, Boston, and Baltimore. The greatest cen- tralizations are found in London

and Paris, —very few pianofortes being made in the United Kingdom or France, excepting perhaps at Marseilles, out of those cities. But in Germany and the United States there are pianoforte makers in many towns besides those we have named. Pianofortes are made in Italy at Turin, Milan, Florence, Naples, and Palermo, and in Spain at Barcelona (principally), Madrid, and Saragossa. The large export trade belonged formerly to England and France, but it has been weakencd of late years by the comniercial activity of the Germans, who have besides copied successfully and with the advantage of much lower wages recent American models. German pianofortes are now much found in Great Britain, where free trade has favoured their introduction, and in the Australian colonies ; they have also outrivalled the French in Holland; but we believe France still keeps the trade of southern Europe, as the United States mainly supply Canada. English exports of good makers will be found all over the world ; but some important markets have been lost through the inferior instruments consigned or sold because they were cheap, and were supposed to be good enough.

The United States and Germany appear to employ the greatest number of workmen in the pianoforte handicraft, Germany pro- ducing the largest numbers of instruments. In adopting, how- ever, the statistics given, we must not forget to take into account that custom of advertising which leavens nearly every statement. There are said to be upwards of 8000 workmen employed in piano- making in America. The Messrs Steinway claim for America an annual production of about 25,000 pianofortes of all kinds. We hardly feel disposed to allow Germany 73,000, with a less number of workmen, viz., 7834 ; but such is the statement put forward, it is said, by a seml-official source, the Deutsche Consulats-Zeitung. It must be borne in mind that maehinery adds its power in- definitely to the number of men employed, but this occurs more in America than in Germany. A recent strike in Paris repre- sented the pianoforte trade society as consisting of 5000 members ; and we shall not be far out in crediting that city with a produc- tion of 20,000 instruments yearly. The number made in London aunually may be taken as reaching at least 35,000.

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PIARISTS, the popular name of the "clerici regulares scholarum piarum," the Pauline Congregation of the Mother of God, which was founded by Joseph Calasanza (Josephus a Matre Dei) at Rome in the beginning of the 17th century. Calasanza, a native of Calasanz in the province of Huesca in Aragon, was born on September 11, 1556, studied at Lerida and Alcala, and

after his ordina- tion to the priesthood removed to Rome. Here he became zealously interested in the education of poor and orphan children, and with this end he organized, in 1607, a brother- hood which ultimately, in 1617, became an independent – Congregation, numbering at that time fifteen priests, under Calasanza as their head. To the three usual vows they added a fourth, that of devotion to the gratuitous instruc- tion of youth. In 1622 the Congregation received a new constitution from Gregory XV., and had all the privileges of the mendicant orders conferred upon it, Calasanza being recognized as general. In this capacity he busied himself with the extension of the order, not only in Italy, but also in Germany, Poland, and other countries, until 1643, when the jealousy of the Jesuits led to conflicts which resulted in his removal from office; owing to the same cause the Congregation was deprived of its privileges by Innocent X. in 1646. Calasanza, who died on August 22, 1648, was beatified in 1748, and canonized in 1767. The privileges of the Congregation were successively restored in 1660, 1669, and 1698. ‘The Piarists, who are not a numerous body, are found chiefly in Italy, Spain, the West Indies, Germany, and especially in Austria-Hungary.

PIATRA, a town of Roumania (Moldavia) at the head of the department of Neamtsu, on the left bank of the | Bistritza, an affluent of the Sereth. It is about 45 miles

by road from Roman, a station on the railway from Galatz and Czernowitz. The population of the prefecture in 1878 was 25,383 (9887 Jews). It contained seven Orthodox churches,—-the most remarkable being St John’s, or the Prince’s Monastery, founded by Stephen the Great in 1497. There are five annual fairs, and a large trade is done in grain and timber—the latter being rafted down the Bistritza from the mountains to Galatz.

PIAZZA ARMERINA (Sicilian, Chiazza), a city of Italy, in the province of Caltanisetta, Sicily, on a hill 39 miles by road east-south-east of the city of that name, and 30 miles north of Terranova on the coast. It is a flourishing and populous place (17,038 inhabitants in the city and 19,591 in the commune in 1881), has an 18th-century cathedral, an episcopal palace, and

a communal library (1859). The church of Sant’ Andrea, less than a mile distant, has a fresco of date 1486, and other objects of interest.

Of the ancient city, which old local antiquaries held to have been built by a colony of refugees from Platea, little is known. The name sometimes occurs as Plutia. In 1095 Piazza was taken by Count Roger of Sicily, who bestowed onit a banner reputed to bear a likeness of the Virgin painted by St Luke. William I. destroyed the city in 1160, but it was rebuilt on a new site in 1163.

See Piazza antica, &c., by J. P. Chiaranda (a native), of which a Latin transla- tion by Mosheim is given in Grevius’s Thesaurus ant. et hist. Sic., vol, xii.

PIAZZI, Giuserps (1746-1826). See AsTRoNomy.

PICARDY (Za Picardie), one of the old feudal pro- vinces of France, was bounded N. by Hainault, Artois, and the English Channel, E. by Champagne, 8. by fle-de France, and W. by Normandy and the Channel. Northern Picardy (subdivided into Upper and Lower Picardy) was formed into one of the great military governorships of the kingdom, while Southern Picardy was included in the governorship of {le-de-France. Upper Picardy comprised the districts (pays) of Amienois, Santerre, Vermandois, and Thierache ; Lower Picardy Boulonnais, Ponthieu, Vimeu, and the Pays Reconquis (or Calais, Guines, Ardre, and Oye); and Southern Picardy Beauvaisis, Soissonais, and Laonnais. The territory is now divided among the depart- ments of Pas-de-Calais, Somme, Aisne, Oise, and Nord.

The name Picardy does not appear before the 13th century. Under the Romans the country formed part of Belgica Secunda, and was inhabited by various Belgian tribes—the Morini, Ambiani, Veromandui, Bellovaci, and Suessiones, whose names still appear in Amiens, Vermandois, Beauvais, and Soissons. After forming part of the kingdom of Soissons and of Neustria, Picardy (that is, the countship of Vermandois, &c.) passed to the counts of Flanders. It was finally united with the French crown by Louis XI.

See De Verité (1770-74), Dubelloy (1770), La Bourt (1840), Roger (1842-43), and Cocheris (1854), V. de Beanvillé has published a magnificent

Mecuetl de documents inédits concernant la Picardie, 1861, 1867, &c.

PICCINI, or Piccrnn1, Niccota (1728-1800), musical composer, was born at Bari in 1728, and educated, under Leo and Durante, at the Conservatorio di San Onofrio in Naples. His first opera, Le Donne dispettose, produced in 1754, won him a high reputation, which he maintained creditably until 1760, when he composed, at Rome, the chef Peewvre of his early life, La Cecchina, ossia la Buona Figliuola, an opera buffa which attained a European success, little less remarkable than that of Pergolesi's Serva Padrona. In a very short time this charming piece found its way not only to every theatre in Italy, but to Paris, to London, and to every great city on the Continent. It was even re- presented by marionettes ; and every new fashion was named alla Cecchina. Six years after this Piccini was invited to Paris. He knew nothing of French, but his librettist, Marmontel, assisted him to such good purpose that, after the production of his first French opera, Roland, he was carried home from the theatre in triumph. All his next works were successful; but, unhappily, the directors of the Grand Opéra conceived the mad idea of deliberately oppos- Ing him to Gluck, by persuading the two composers to treat the same subject—Iphigéme en Tawride—simultaneously. The Parisian public now divided itself into two rival parties,

which, under the names of Gluckists and Piccinists, carried on an unworthy and disgraceful war, equally ruinous to both artists, who would gladly have withdrawn from its violent excesses. That the final victory should be obtained by the Gluckists was inevitable ; for Piccini, though a brilliant ornament of the Italian school, was no match for his illustrious antagonist. Gluck's masterly [phigénie was first produced on May 18, 1779. Piccini's Iphagénie followed on January 23, 1781, and, though performed seventeen times, was afterwards consigned to oblivion. The fury of the rival parties continued unabated, even after Gluck's departure from Paris in 1780; and an attempt was after- wards made to inaugurate a new rivalry with Saccliini. Still, Piccini held a good position, and on the death of Gluck, in 1787, proposed that a public monument should be erected to his memory,—a suggestion which the Gluck- ists themselves declined to support. On the

breaking out of the Revolution in 1789, Piccini returned to Naples, where he was at first well received by King Ferdinand IV.; but the marriage of his daughter to a French demo- crat brought him into irretrievable disgrace. For nine years after this he maintained a precarious existence in Venice, Naples, and Rome; but, deriving new hope from the declaration of peace, he returned in 1798 to Paris, where the fickle public received him with enthusiasm, but left him to starve. He died at Passy, May 7, 1800.

Fétis gives a complete list of Piccini's works, including cighty

operas, and much choral music. It is certain that the list of operas is very far from complete.

PICENUM. See Iraty, vol. xiii. pp. 444, 447.

PICHEGRU, Cuartes (1761-1804), the conqueror of Holland, was born at Arbois in the Jura on February 16, 1761. His father was only a labourer, but the friars who managed the college of Arbois gave the boy a good educa- tion, and one of his masters, the Pére Patrault, took him to the military school of Brienne. In 1783 he entered the first regiment of artillery, where he rapidly rose to the rank of adjutant-sub-lieutenant. When the Revolution began he at once became leader of the extreme revolutionary party in Besangon, where he was stationed; and, when a regiment of volunteers of the department of the Gard marched through the city, the popular society recommended him for the rank of lieutenant-colonel, to which he was at once elected. 'Ihe fine condition of his regiment was soon remarked in the army of the Rhine, to which it was attached, and his organizing ability was made use of by an appointment on the staff, and finally by his promotion to the rank of general of brigade. In 1793, when Dumouriez had deserted, and all generals of noble birth had been super- seded, Carnot and Saint Just were sent to find roturier generals who could be successful ; Carnot discovered Jour- dan, and Saint Just discovered Hoche and Pichegru. In co-operation with Hoche and the army of the Moselle, Pichegru, now general of division and in command of the army of the Rhine, had to reconquer Alsace and reorganize the disheartened troops of the republic. They succeeded ; Pichegru, instead of fighting great battles, made use of the élan of his soldiers to win innumerable small engagements, and with Hoche forced the lines of Haguenau, and relieved Landau. In December 1793 he

superseded Hoche, became commander-in-chief of the united armies of the Rhine and Moselle, whence he was summoned to succeed Jourdan in the army of the North in February 1794. It was now that he fought his three great campaigns of one year. The English and Austrians held a strong position along the Sambre to the sea. After vainly attempting to break the Austrian centre, Pichegru suddenly turned their left, and defeated Clerfayt at Cassel, Menin, and Courtrai, while Moreau, his second in command, defeated Coburg at Turcoing in May 1794; then after a pause, during which

Pichegru feigned to besiege Ypres, he again dashed at Clerfayt and defeated him at Rousselaer and Hooglede, while Jourdan came up with the new army of the Sambre and Meuse, and utterly routed the Austrians at Fleurus on June 27, 1794. After a pause Pichegru began his second campaign by crossing the Meuse on October 18, and after taking Nimeguen drove the Austrians beyond the Rhine. Instead of going into winter-quarters, he prepared his army for a winter campaign. On December 28th he crossed the Meuse on the ice, and stormed the island of Bommel, then crossed the Waal in the same manner, and, driving the English before him, entered Utrecht on January 19, and Amsterdam on January 20, and soon occupied the whole of Holland. This grand feat of arms was marked by many points of interest, such as the capture of the Dutch ships which were frozen in the Helder by the French hussars, and the splendid discipline of the ragged battalions in Amster- dam, who, with the richest city of the Continent to sack, yet behaved with perfect self-restraint. This conquest aroused a storm of admiration in France. The former friend of Saint Just now offered his services to the Thermidorians, and after receiving from the Convention the title of Sauveur de la Patrie, subdued the sans-culottes of Paris, when they rose in insurrection against the Convention on 12 Germinal (1 April). Honoured by the republicans, and with the greatest military reputation in France, Pichegru then took command of the armies of the North, the Sambre and Meuse, and the Rhine, and crossing the Rhine in force took Mannheim in May 1795. When his fame was thus at its height he be- came a traitor, and for the promise of a marshal’s baton, the governorship of Alsace, the castle of Chambord, 1,000,000 francs in cash, and 200,000 francs a year, sold his army and his country. He allowed Jourdan to be

beaten before Mannheim, and betrayed all his plans to the enemy. His intrigues were suspected, and when he offered his resigna- tion to the Directory in October 1795 it was to his surprise promptly accepted. He retired in disgrace, but hoped to serve the royalist cause by securing his election to the Council of Five Hundred in May 1797. He was there the royalist leader, and planned a coup d'état, but on the 18th Fructidor he was arrested, and with fourteen others de- ported to Cayenne in 1797. Escaping, he reached London in 1798, and served in the archduke Charles's staff in the campaign of 1799. He went to Paris in August 1803 with Georges Cadoudal tohead a royalist rising against Napoleon; but, betrayed by a friend, he was arrested on February 28, 1804, and on April 15th was found strangled in prison. It has often been asserted, but without a shadow of proba- bility, as he was certain to have been condemned if brought to trial, that he was murdered by the orders of Napoleon.

Pichegru's campaigns of 1794 are marked by traits of an audacious genius which would not have disgraced Napoleon ; like him, he per- ceived the intrinsic fitness of the French soldiers for strokes of daring rather than for sustained battles. But a more thorough traitor never commanded anarmy. He flattered in turn Saint Just

and the Terrorists, the Thermidorians and the Directors, and seemed altogether unmoved by considerations of loyalty or patriotism.

There is no really good life of Pichegru; perhaps the best is Gassier's Vie du général Pichegru, Paris, 1814. For his treason, trial, and death consult Mont- gaillard's Mémotres concernant la trahison de Pichegru, 1804; Fauche-Borel's Mémoires , Savary, Mémoires sur la Mort de Pichegru, Paris, 1825; and G. Pierret, Pichegru, son Procés et son Mort, 1826,

PICKLES. The term pickie was originally applied to herrings preserved in salt brine, and by a pickle is still meant any preservative solution for either animal or vegetable food, that for flesh and fish being a brine of common salt, usually with saltpetre, sugar, and certain Spices added, while for vegetable substances vinegar is the principal pickling medium. Preparations of the latter description—vegetables saturated with vinegar—constitute the ordinary pickles of domestic use, Acid fruits and suc- culent fleshy vegetables are the proper materials for pickles.

The vegetable substances principally treated in this way are—beetroot, cabbage, cauliflower, gherkins (small cucum. bers), capers, French beans, onions, shallots, mushrooms, green peaches, mangoes, green walnuts, and several tropical fruits besides those mentioned. These are variously dealt with. Such as are soft and in themselves hot and spicy require simply to have vinegar of the proper strength poured over them, after the materials have been carefully selected, washed, and, if necessary, shred. Vegetable sub- stances of a harder and tougher character require first to be steeped in salt brine for some time, then washed, and the vinegar poured over them hot; and yet more leathery and fibrous vegetables must be softened with boiling brine, and then prepared with boiling vinegar. The vinegar employed may be either wood or strong malt vinegar; the former, being free from mucilage, has no tendency to fer- mentation, and can be obtained of greater strength than that prepared from malt. The vinegar is commonly flavoured with spices or aromatic herbs, flavours being chosen with special reference to the fruit or vegetable operated on. The flavouring materials, of which pepper, allspice, red pepper, cloves, horse-radish, garlic, and ginger are examples, are either added whole to the pickle or may be separately infused in the vinegar. For the preservation of pickles it is necessary that the jars in which they are stored should be secured with stoppers tied over with bladder and sealed, so as to render them as far as possible air-tight. It is of the utmost consequence that in the compounding and storing of these acid preparations no vessels or fittings of copper, brass, zinc, or lead, which yield, with acetic acid, poisonous products, should be used. Contamination with copper is especially to be avoided ; yet, as small quantities of acetate of copper give to pickled vegetables a fine, fresh green, natural colour, such an adulteration is not unfre- quently practised ; and some of the older cookery books actually recommend the use of copper vessels, and even the addition of small pieces of verdigris, to improve the colour of the pickles. As food adjuncts, pickles should be sparingly used, their chief merit being piquancy, though the acid they contain exercises a solvent influence on the more directly nutritious constituents of food, and, the added spices having a stimulating effect, they thus aid the process of digestion.

PICO, Giovanni, or Mrranpota (1463-1494), was the youngest son of Giovanni Francesco Pico, prince of Mirandola, a small territory about 30 Italian miles west of Ferrara, afterwards absorbed in the duchy of Modena.

‘The family was illustrious and wealthy, and claimed descent from Constantine. From his childhood Pico was remark- able for his quick and tenacious memory, and gave promise of his future distinction as a scholar. In his fourteenth year he went to Bologna, where he studied for two years, and was much occupied with the Decretals. The tradi- tional studies of the place, however, disgusted him 3 he was eager to know all the secrets of nature, and devoting him- self wholly to speculative learning he spent seven years wandering through all the schools of Italy and France and collecting a precious library. Like most men with brilliant faculties of acquisition and assimilation, Pico was constitu- tionally an eclectic ; and he owes his place in the history of learning and thought to the indefatigable spirit of inquiry which left him dissatisfied with current teaching and drove him to studies then new and strange. Besides Greek and Latin he knew Hebrew, Chaldee, and Arabic ; and his Hebrew teachers (Eliah del Medigo, Leo Abarbanel, and Jochanan Aleman—see L. Geiger, Johann Reuchlin [1871], p. 167) introduced him to the Kabbalah, which had great fascinations for one who loved all mystic and theosophic speculation. His learned wanderings ended at Rome, where he set forth for public disputation a list of nine hundred questions and conclusions in all branches of

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philosophy and theology. He remained a year in Rome, put the disputation he proposed was never held. He was an object of envy to many for the range of attainments, which earned him the title of the Phoenix of his age, and detractors found it easy to fix on his conclusions a suspicion of heresy. ‘The pope prohibited the little book in which they were contained, and Pico had to defend the impugned theses in an elaborate Apologia. His personal orthodoxy was, however, finally vindicated by a brief of Alexander VL, dated 18th June 1493. The suspected theses included such points as the following :—that Christ descended ad inferos not in his real presence but quoad effectum ; that no image or cross should receive Jatreca even in the sense allowed by Thomas; that it is more reasonable to regard Origen as saved than as damned ; that it is not in a man’s free will to believe or disbelieve an article of faith as he pleases. But perhaps the most startling

thesis was that no science gives surer conviction of the divinity of Christ than “magia” (2.c., the knowledge of the secrets of the heavenly bodies) and Kabbalah. Pico was the first to seek in the Kabbalah a proof of the Christian mysteries, and it was by him that Reuchlin was led into the same delusive ath.

: Pico had been up to this time a gay Italian nobleman ; le was tall, handsome, fair-complexioned, with keen grey eyes and yellow hair, anda great favourite with women. But his troubles led him to more serious thoughts ; he burned his amorous verses and gave himself wholly to sacred letters, publishing as the first fruits of his studies, in his twenty-eighth year, the Heptaplus, a mystical exposition of the creation. Next he planned a great sevenfold work against the enemies of the church, of which only the section directed against astrology was completed. After leaving Rome he again lived a wandering life, often visiting Florence, to which he was drawn by his friends Politian and Marsilius Ficinus, and where also he came under the influence of Savonarola. It was at Florence that he died in 1494. Three years before his death he parted with his share of the ancestral principality, and gave much of his wealth to the poor. He was now increasingly absorbed in ascetic exercises and religious meditation, and designed, when certain literary plans were completed, to give away all he had and wander barefoot through the world preach- ing Christ, or perhaps to join the preaching friars. But these plans were cut short by a fever which carried him off just at the time when Charles VIII. was at Florence. Pico’s attainments and the beauty of his character and piety produced a profound impression on his contemporaries, but his works, published by his nephew Giov. Fran. Pico, with a biography, at Bologna in 1496, and more than once reprinted, cannot now be read with much interest. The man himself, however, is still interesting, partly from his influence on Reuchlin and partly from the spectacle of a truly devout mind in the brilliant circle of half-pagan scholars of the Florentine renaissance.

PICTON, Str Tuomas (1758-1815), general under Wellington in the Peninsular War, was the younger son of Thomas Picton, of Poyston, Pembrokeshire, where he was bornin August 1758. In 1771 he obtained an ensign’s commission in the 12th regiment of foot, but he did not join until two years afterwards. The regiment was then stationed at Gibraltar, where

he remained until he was made captain in the 75th in January 1778, when he returned to England. The regiment was shortly after- wards disbanded, and in 1794 he embarked for the West Indies without an appointment, on the strength of a slight acquaintance with Sir John Vaughan, who made him his aide-de-camp and gave him a captaincy in the 17th foot. Shortly afterwards he was promoted major. Under Sir Ralph Abercromby he took part in the capture of St Lucia

and St Vincent. After the reduction of Trinidad he was made governor of the island, and in October 1801 he was gazetted brigadier-general. Resigning the governorship of Trinidad in 1803, he took part in an expedition against St Lucia and Tobago, and he held the governorship of the latter island until forced to resign it by public clamour in England. In 1807 he was put upon his trial for applying torture to a female slave in Trinidad to extort confession respecting a robbery, and a general verdict of guilty was returned. A new trial was, however, granted, and after protracted litigation the court, on 10th February 1810, ordered “the defendant’s recognizance to be respited until they should further order.” Previous to this he had taken part in the capture of Flushing, of which in 1809 he was made governor. At the special solicitation of Wellington he was named to the command of a division of the army in Spain, and during the Peninsular campaign he was placed in the post of honour, and so distinguished himself that he seven times received the thanks of the House of Commons. The capture of Badajoz was effected chiefly through his daring self-reliance and penetration in convert- ing what was intended to be only a feint attack into a real one. At the battle of Quatre Bras.on the 16th June 1815 he was dangerously wounded, and at Waterloo on the 18th, while repulsing with impetuous valour what Wellington denominated “ one of the most serious attacks made by the enemy on our position,” he was struck dead by a ball on the temple. A public monument was erected to his memory in St Paul’s Cathedral.

See Robinson, Life of Sir Thomas Picton, 2d ed., London, 1836.

PICTOR, Fasrus. See Fazius Prcror; also Livy, vol. xiv. p. 728-29.

PICTS. See ScoTLaNnp.

PIEDMONT (Italian, Piemonte ; Low Latin, Pedemons and Pedemontium), a region of northern Italy, bounded N. by Switzerland, W. by France, S. by Liguria, and E. by Lombardy. Physically it may be briefly described as the upper gathering-ground and valley of the river Po, enclosed on all sides except towards the Lombard plain by the vast semicircle of the Pennine, Graian, Cottian, Maritime, and Ligurian Alps. In 1859 it was divided into the four pro- vinces of Alessandria, Cuneo, Novara, and Torino (Turin), which still remain as provinces of the kingdom of Italy. In 1858 its population was 2,738,814.

The name of Lombardy was used as inclusive of the upper valley of the Po as late as 1091, when the house of Savoy lost most of its Italian possessions by the death of Adelaide; but in the time of Thomas I. (1177-1233), duke of Savoy, while the name Savoy was applied more especially to the ducal territory on the French side of the Alps, that of Piedmont came into use as a collective term for the territory on the Italian side. Thomas II. of Savoy, count (not Thomas II., count of Savoy, as he is often wrongly called), son of Thomas I., obtained (1255) part of Piedmont as an apanage from his brother Amadeus IV., and was appointed imperial vicar in Piedmont by Frederick II.; and, though he was afterwards obliged to renounce all the concessions he had received alike from pope and emperor, his son Thomas III. became the founder of the line which bore the title “Princes of Achaia and Morea, and lords of Pied- mont.” Louis, the last of these lords, dying in 1418, left his possessions to Amadeus VIII.

PIERCE, FRANKLIN (1804-1869), fourteenth president of the United States, was descended from an old yeoman family of New England, and was born at Hillsborough, New Hampshire, 23d November 1804. His father, Ben- jamin Pierce, served through the revolutionary war, after- wards attaining the rank of major-general, and became governor of his State. The son entered Bowdoin College, Brunswick, Maine, in 1820. Nathaniel Hawthorne, who was in the class below him, and was his intimate friend, mentions as his most notable characteristic at this time his “ fascination of manner, which has proved so magical in winning him an

unbounded popularity.” The same charac- teristic remained with him through life, and was the chief

cause of his success. his classmates, and, although he took at length a good position, he was not distinguished for scholarship. After leaving college in 1824 he studied law with Judge Wood- bury at Portsmouth, and afterwards in the law school at Northampton, Mass., and with Judge Parker at Amherst, and came to the bar in 1827. His first appearance as a pleader was a failure, but this only incited him to redoubled perseverance and determination. From the first he was a zealous supporter of the Democratic party, and he took an active part in promoting the election of Andrew Jackson tothe presidency. In 1829 he was elected by his native town to the State legislature, of which he was speaker in 1832-33. In the latter year he was chosen a member of Congress, and in 1837 he was elected to the senate of the United States. He displayed no striking oratorical gifts, but as a member of the judiciary and other committees gained general respect. In 1842 he resigned his seat in the senate, and returned to the practice of the law. His reputation at the bar was very high, his success being largely due to his power of identifying himself with his client’s cause, and his strong personal influence over a jury. In 1846 he was offered the position of attorney-general of the United States, but declined it. On the outbreak of the Mexican War he joined as a volunteer one of the companies raised in Concord. He was soon after appointed colonel of the 9th regiment, and in March 1847 brigadier-general. At the battle of Contreras on the 19th of August he was severely injured by the fall of his horse. At the close of the war in December 1847 he resigned his commission. In 1850 he was president of the convention for revising the constitution of New Hampshire. In 1852, as candi- date of the Democratic party, he was elected president of the United States by 254 electoral votes against 42 given to General Scott. The special feature of his inaugural address was the support of slavery in the United States, and the announcement of his determination that the Fugi- tive Slave Act should be strictly enforced. This was the keynote of his administration, and pregnant with vital consequences to the country. From it

came during his term the Ostend conference and “ manifesto,” the repeal of the Missouri compromise, and the troubles in Kansas and Nebraska, which crystallized the opposing forces into the Republican party, and led later to the great rebellion. President Pierce, surrounded by an able cabinet, among them Jefferson Davis as Secretary of War, firmly adhered throughout his administration to the pro-slavery party. He failed, notwithstanding, to obtain re-nonination, but was succeeded by James Buchanan, March 4, 1857, and retired to his home in Concord, N. H., after spending some years in Europe. During the war of 1861-65 his sympa- thies were wholly with the South, but, with the exception of delivering a strong speech at Concord in 1863, he took no very active part in politics. He died 8th October 1869.

Among several lives of General Pieree, published during his

eandidature for the presideney, special mention may be made of that by his friend Nathaniel Hawthorne.

PIERO (or PIETRO) DE’ FRANCESCHI (1415- 1492), a leading painter of the Umbrian school. This master is generally named Piero della Francesca (Peter, son of Frances), the tradition being that his father, a woollen- draper named Benedetto, had died before his birth, This is not correct, for the mother’s name was Romana, and the father continued living during many years of Piero’s career. The painter is also named Piero Borghese, from his birthplace, Borgo San Sepolcro, in Umbria. The true family name was, as above stated, Franceschi, and the family still exists under the name of Martini-F ranceschi.

Piero first received a scientific education, and became an adept in mathematics and geometry. This early bent

Tis abilities did not greatly impress |

of mind and course of study influenced to a large extent his development as a painter. He had more science than either Paolo Uccello or Mantegna, both of them his con- temporaries, the former older and the latter younger, Skilful in linear perspective, he fixed rectangular planes in perfect order and

measured them, and thus got his figures in true proportional height. He preceded and excelled Domenico Ghirlandajo in projecting shadows, and rendered with considerable truth atmosphere, the harmony of colours, and the relief of objects. He was naturally therefore excellent in architectural painting, and, in point of technique, he advanced the practice of oil-colouring in Italy.

The earliest trace that we find of Piero as a painter is in 1439, when he was an apprentice of Domenico Veneziano, and assisted him in painting the chapel of S. Egidio, in S. Maria Novella of Florence. Towards 1450 he is said to have been with the same artist in Loreto; nothing of his, however, can now be identified in that locality. In 1451 he was by himself, painting in Rimini, where a fresco still remains. Prior to this he had executed some exten- sive frescos in the Vatican; but these were destroyed when Raphael undertook on the same walls the Liberation of St Peter and other paintings. His most extensive ex- tant series of frescos is in the choir of S. Francesco in Arezzo,—the History of the Cross, beginning with legendary subjects of the death and burial of Adam, and going on to the entry of Heraclius into Jerusalem after the overthrow of Chosroes. This series is, in relation to its period, remarkable for effect, movement, and mastery of the nude, The subject of the Vision of Constantine is particularly vigorous in chiaroscuro; and a preparatory design of the same composition was so highly effective that it used to be ascribed to Giorgione, and might even (according to one authority) have passed for the handiwork of Correggio or of Rembrandt. A noted fresco in Borgo San Sepolcro, the Resurrection, may be later than this series ; it is preserved in the Palazzo de’ Conservatori. An important painting of the Flagellation of Christ, in the cathedral of Urbino, is later still, probably towards 1470. Piero appears to have been much in his native town of Borgo San Sepolcro from about 1445, and more especially after 1454, when he finished the series in Arezzo. He grew rich there, and there he died, and in October 1492 was buried.

Two statements made by Vasari regarding “ Piero della Franeesca” are open to much controversy. He says that Piero beeame blind at the age of sixty, which cannot be true, as he continued paint- ing some years later ; but scepticism need perhaps hardly go to the extent of inferring that he was never blind at all. Vasari also says that Fra Luea Pacioli, a diseiple of Piero

in scientific matters, defrauded his memory by appropriating his researches without acknowledgment. This is hard upon the friar, who constantly shows a great reverence for his master in the sciences. One of Pacioli's books was published in 1509, and speaks of Piero as still living. Henee it has been propounded that Piero lived to the patriarehal age of ninety-four or upwards ; but, as it is now stated that he was buried in 1492, we must infer that there is some mistake in relation to Pacioli's remark—perhaps the date of writing was several years earlier than that of publication. Piero was known to have left a manuscript of his own on perspeetive ; this remained undiseovered till a reeent date, when it was found by E. Harzen in the Ambrosian Library of Milan, ascribed to some supposititious " Pietro, Pittore di Bruges." The treatise shows a knowledge of perspective as dependent on the point of distanee.

In the London National Gallery are four paintings attributed to Piero de' Franceschi. One of them, a profile of Isotta da Rimini, may safely be rejeeted. The Baptism of Christ, which used to be the altarpiece of the Priory of the Baptist in Borgo San Sapolero, is an important example; and still more so the N ativity, with the Virgin kneeling, and five angels singing to musieal instruments. This is a very interesting and- charactcristie speeimen, and_ has

indeed been praised somewhat beyond its deservings on eesthetie grounds.

Piero's earlier style was energetic but unrefined, and to the last he laeked seleetness of form and feature. The types of his visages are peculiar, and the costumes (as especially in the Arezzo series)

singular. He used to work assiduously from clay models swathed in real drapery. Luca Signorelli was his pupil, and probably to some extent Perugino ; and his own influence, furthered by that of Signorelli, was potent over all Italy. Belonging as he does to the Umbrian school, he united with that style something of the Sienese and more of the Florentine mode.

PIETISM. Pietism is the name of an exceedingly influential, instructive, and interesting movement in the Lutheran Church which arose towards the

end of the 17th and continued during the first half of the following century. The name of Pietists was given to the ad- herents of the movement by its enemies, as a term of ridicule, like that of ‘‘ Methodists” somewhat later in England. The origin and nature of the movement itself inay be both traced to defects in the Lutheran Church of the time and to isolated efforts to correct them. That church had in the 17th century become a creed-bound theological and sacramentarian institution, which orthodox theologians ruled with almost the absolutism of the papacy. Correctness of creed had taken the place of deep religious feeling and purity of life. Christian faith had been dismissed from its seat in the heart, where Luther had placed it, to the cold regions of the intellect. The dogmatic formularies of the Lutheran Church had usurped the position which Luther himself had assigned to the Bible alone, and as a consequence they only were studied and preached, while the Bible was neglected in the family, the study, the pulpit, and the university. Instead of advocating the priesthood of all believers, so powerfully proclaimed by Luther, the Lutheran pastors had made themselves a despotic hierarchy, while they neglected the practical pastoral work of caring for the moral and spiritual welfare of their flocks. One of the consequences, as the Pietists believed, of all this was that immorality, irreligion, and heathenish ignorance of Christianity abounded in the land, and cried to heaven against an unfaithful church. As forerunners of the Pietists in the strict sense, not a few earnest and powerful voices had been heard bewailing the shortcomings of the church and advocating a revival of practical and devout Christianity. Amongst them were Jacob Boehme (Bemen), the theosophic mystic; Johann Arndt, whose principal devotional work on Z’rue Christiamty is universally known and appreciated ; Heinrich Miiller, who described the font, the pulpit, the confessional, and the altar as the four dumb idols of the Lutheran Church; the theologian Johann Valentin Andrea, the court chaplain of the landgrave of Hesse ; Schuppius, who sought to restore to the Bible its place in the pulpit ; and Theophilus Grossgebauer of Rostock, who from his pulpit and by his writings raised “the alarm cry of a watchman in Sion.” The direct originator of the movement was Philip Jacob Spener. Born in Alsace January 13, 1635, as a child trained in piety under the influence of a devout godmother and books of devotion recommended by her, particularly Arndt’s Zrue Christianity, accustomed to hear the sermons of a pastor who preached the Bible more than the Lutheran creeds, he was early convinced of the necessity of a

moral and religious reformation of the German church. He studied theology, with a view to the Christian ministry, at Strasburg, where the professors at the time were more inclined to practical Christianity than to theological disputation. He afterwards spent a year in Geneva, and was powerfully influenced by the strict moral life and rigid ecclesiastical discipline prevalent there, and also by the preaching and the piety of the Waldensian professor Antoine Leger and the converted Jesuit preacher Jean de Labadie. During a: stay in Tiibingen he read Grossgebauer's Alarm Cry, and in 1666 he entered upon his first pastoral charge at Frankfort-on-the-Main, profoundly impressed with a sense of the danger of the Christian life being sacrificed to zeal for rigid orthodoxy. Pietism, as a

distinct movement in the German church, was then origin- ated by Spener by religious meetings at his house (collegia pretatis), at which he repeated his sermons, expounded passages of the New Testament, and induced those present to join in conversation on religious questions that arose. These meetings were largely attended, produced a great sensation, and were soon imitated elsewhere. They gave rise to the name '" Pietists." In 1675 Spener published his Pia Desideria, or Harnest Desires for a Reform of the True Evangelical Church, the public literary exposition and defence of his position and aims. In this publication Spener made six proposals as the best means of restoring the life of the church :—(1) the earnest cultivation of a more general and thorough familiarity with the Holy Scriptures by means of private meetings, ecclesiole in ecclesia; (2) a practical carrying out of the principle of the universality of the Christian priesthood by a participation of the laity in the spiritual government of the church and by the holding of family worship; (3) a serious laying to heart of the fact that a knowledge of Christianity must be attended by the practice of it as its indispensable sign and supplement ; (4) the conversion of the habit of making merely didactic, and often bitter, attacks on the heterodox and unbelievers into a treatment of them instigated by genuine affection and animated by the simple desire of doing them good; (5) a reorganization of the theological training of the universities, in such a way that young divines should be urged not only to diligence in their studies but above all to lead devout lives; and (6) a different style of preaching, namely, in the place of pleasing rhetoric, the

implanting of Christianity in the inner or new man, the soul of which is faith, and its effects the fruits of life. This work produced a great impression throughout Germany. Although large num- bers of the orthodox Lutheran theologians and pastors were deeply offended by it, its complaint and its demands were both too well justified to admit of their being point- blank denied. A large number of pastors at once practi- cally adopted Spener's proposals. In 1686 Spener accepted an appointment to the court-chaplaincy at Dresden, which opened to him a wider though more difficult sphere of labour. He succeeded in reviving the catechetical instruc- tion of the young in religious truth in Saxony. In Leipsic, where Scriptural exegesis had almost wholly disappeared, a society of young theologians was formed under his influence, for the learned study and devout application of the Bible. Three magistri belonging to that society, one of whom was August Hermann Francke, subsequently the founder of one of the noblest works of Pietism—the orphanage at Halle—commenced courses of expository lectures on the Scriptures of a practical and devotional character and in the German language, which were zealously frequented by both students and townsmen. The lectures aroused, however, the ill-will of the other theologians and pastors of Leipsic, and their promoters, charged with having slighted the established worship of the land as well as true learning, were ordered to discon- tinue them. Francke and his friends left the city, and with the aid of Christian Thomasius and Spener founded the new university of Halle, which became the chief home of the Pietists, and the object of the jealousy and unspar- ing attacks of the older universities of Wittenberg and Leipsic. The theological chairs in the new university were filled in complete conformity with Spener's proposals. The main difference between the new Pietistic school and the orthodox Lutherans was not one affecting doctrine directly, inasmuch as Spener adhered in every point to the Lutheran faith. The difference arose from his conception of Christianity as chiefly consisting in a change of heart and consequent holiness of life, while the orthodox Lutherans

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of the time made it to consist mainly in correctness of doctrine. At the same time, the greater importance which he attached to the religious life and to practical godliness than to correctness of belief, and his restoration of the

Bible to its place of superiority over the creeds, involved numerous possible departures from and advances beyond the Luther- anism of the 17th century. Again, the earnestness with which he had insisted on the necessity of a new birth, and on a separation of Christians from the world, led to exaggera- tion and fanaticism among followers less distinguished than himself for wisdom and moderation. Many Pietists soon maintained that the new birth must always be preceded by agonies of repentance, and that only a regenerated theo- logian could teach theology, while the whole school shunned allcommon worldly amusements, such as dancing, the theatre, and public games, and affected a severe austerity with re- gard to dress, meals, and conversation. Through these extravagances a reactionary movement arose at the begin- ning of the 18th century, one of the most distinguished leaders of which was Loescher, superintendent at Dresden. But it was only as the opponents of Pietism gradually ceased their attacks that the movement lost its strength and by degrees handed over its vital truths and truest work to various representatives of a new and better age of the church. As a distinct movement it had run its course before the middle of the 18th century. The spirit of the school of Spener long made itself felt amongst the Pro- testants of north and south Germany, and particularly at Halle. Pietism could claim to have contributed largely to the revival of Biblical studies in Germany, and to have given a Biblical basis once more to theology. It also made religion once more an affair of the heart and the life, and not merely of the intellect, to which theologians had reduced it. It likewise vindicated afresh the rights of the Christian laity in regard to their own beliefs and the work of the church, against the assumptions and despotism of an arrogant clergy. It thus revived eternal elements of Christianity that had been long neglected, and was a distinct agent in preparing the way for modern advance in religion and theology. But it sprang from a temporary necessity, and, like similar phases of Christian life, lacked the philosophical and scholarly depth, the human and secular breadth, and the progressive impetus of a per- manent and world-subduing religious movement.

Spener’s Pietism in Westphalia, on the Rhine, in Wiirtemberg, and at Halle and Berlin, and whieh at the commencement worked to

Amongst older works on Pictism are Walch’s [Historische und theologische Ein- lettung ™m die Religionstreitigkeiten der Evangelisch-Lutherischen

Kirche, 17380 ; Tholuck ‘8 Geschichte des Pietismus und des ersten Stadiums der Aufkldrung, 1865; TRE Schmid, Die Geschichte des Pietismus, 1863; Goebel’s Geschichte des christlichen

(J. FS.)

PIETRO. See Prero.

PIG. See Switz.

PIGALLE, Jean Bapriste (1714-1785), French sculp- tor, was born at Paris on 26th January 1714. Although he failed to obtain the Great Prize, after a severe struggle he entered the Academy and became one of the most popular sculptors of his day. His earlier work, such ag Child with Cage (model at Sévres) and Mercury Fastening his Sandals (Berlin, and lead cast in Louvre), is less com- monplace in character than that of his maturer years, but his statue of Voltaire (Institut) and his tombs of Comte d’Harcourt (Notre Dame) and of Marshal Saxe (Lutheran church, Strasburg) are good specimens of French sculpture in the 18th century. He died on 21st August 1785.

See Tarbé, Vie et cuv. de Pigalle; Suard, Eloge de Pigalle; Mélanges de littérature ; Dussieux, Les artistes francais a létranger; Barbet de Jouy, Sculptures mod. Louvre.

PIGAULT-LEBRUN, Cuartes ANTOINE GUILLAUME, sometimes called PicauLT DE 1’Eprnoy (1753-1835), the chief fiction writer of the first empire, and the most popular light novelist of France before Paul de Kock, was born at Calais (he is said to have traced his pedigree on the mother’s side to Eustache de St Pierre) on April 8, 1753. His youth was decidedly stormy. He twice carried off young ladies of some position, and was in con- sequence twice imprisoned by lettre de cachet. His first love, a Miss Crawford, the daughter of an English merchant whose office Pigault had entered, died almost immediately after her elopement ; the second, Mademoiselle de Salens, he married. Besides his commercial and criminal experiences, he was a soldier in the queen’s guards. an actor, and a teacher of French. At the breaking out of the great war he re-enlisted and fought at

Valmy. It should be said, however, that the romantic incidents of his life are differ-

ently related by different authorities, and are open to not

a little suspicion, Although he had tried dramatic writing, he does not seem to have attempted prose fiction till he was forty, but from that time he was a fertile writer of novels for nearly thirty years. In his old age he took to graver work, and executed an abridgment of French history in eight volumes, besides some other work. His Guores Completes were published in twenty volumes between 1822 and 1824. He died on July 24, 1835. Pigault's numer- ous novels, though still occasionally reprinted, are not much read; and none of them is much better or worse than any other. Their style is insignificant, and their morality very far from severe. But Pigault deserves the credit, such as it is, of being almost the first writer of numerous light novels calculated to hit, and which suc- ceeded in hitting, the taste of his day. Nor was he by any means without wit. As almost the father of a kind of literature which has since developed itself enormously, and which, whatever may be its intrinsic merits, has main- tained and increased its popularity for a century, Pigault- Lebrun deserves a certain place in literary history. PIGEON,} French Pigeon, Italian Piccione and Pipione, Latin Pipio, literally a nestling-bird that pipes or cries out, a "Piper"—the very name now in use among Pigeon-fanciers, The word Pigeon, doubtless of Norman introduction as a polite term, seems to bear much the same relation to Dove, the word of Anglo-Saxon origin, that mutton has to sheep, beef to ox, veal to calf, and pork to bacon ; but, as before stated (Dove, vol. vii. p. 379), no sharp distinction can be drawn between the two, and the collective members of the group Columbe are by ornitho- logists ordinarily called Pigeons. Perhaps the best known species to which the latter name is exclusively given in common speech? is the Wild Pigeon or Passenger-Pigeon

' See furthcr under the heading Pourrtry. * It may be observed that the " Rock-Pigeons " of Anglo-Indians are SAND-GROUSE (¢.v.), and the "Cape Pigeon" of sailors isa PETREL (9.2).

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of North America, Mctopistes migratortus, which is still |

plentiful in many parts of Canada and the United States, though no longer appearing in the countless numbers that it did of old, when a flock seen by Wilson was estimated to consist of more than 2230 millions. The often-quoted descriptions given by him and Audubon of Pigeon-haunts in the then “ back woods ” of Kentucky, Ohio, and Indiana need not here be reproduced. That of the latter was declared by Waterton to be a gross exaggeration if not an entire fabrication; but the critic would certainly have changed his tone had he known that, some hundred and fifty years earlier, Passenger-Pigeons so swarmed and ravaged the colonists’ crops near Montreal that a bishop of his own church was constrained to exorcise them with holy water, as if they had been demons. The rapid and sustained flight of these Pigeons is also as well-established as their former overwhelming abundance—birds having been killed in the State of New York whose crops con- tained undigested grains of rice that must have been not long before plucked and swallowed in South Carolina or Georgia. The Passenger-Pigeon is about the size of a common Turtle-Dove, but with a long, wedge-shaped tail. The male is of a dark slate-colour above, and purplish-bay beneath, the sides of the neck being enlivened by gleaming violet, green, and gold. The female is drab-coloured above and dull white beneath, with only a slight trace of the brilliant neck-markings.?

Among the multitudinous forms of Pigeons very few can here be noticed. A species which seems worthy of attention as being one that might possibly repay the trouble of domestication, if any enterprising person would give it the chance, is the Wonga-wonga or White-fleshed Pigeon of Australia, Leucosarcia picata, a bird larger than the Ring-Dove, of a slaty-blue colour above and white beneath, streaked on the flanks with black. It is known to breed, though not very freely, in captivity, and is said to be excellent for the table. As regards flavour, however, those who have been so fortunate as to eat them declare that the Fruit-Pigeons of the genus Z’reron (or Vinago of some authors) and its allies surpass all birds. These inhabit tropical Africa, India, and especially the Malay Archipelago; but the probability of domesticating any of them is very remote. Hardly less esteemed are the

Pigeons of the genus Ptilopus and its kindred forms, which have their headquarters in the Pacific Islands, though some occur far to the westward, and also in Australia. Among them are found the most exquisitely-coloured of the whole Family. There may be mentioned the strange Nicobar Pigeon, Calenas, an inhabitant of the Indian Archipelago, not less remarkable for the long lustrous hackles with which its neck is clothed than for the structure of its gizzard, which has been described by Prof. Flower (Proc. Zool. Society, 1860, p. 330), though this peculiarity is matched or even surpassed by that of the same organ in the Phenorrhina goliath of New Caledonia (Rev. de Zoologie, 1862, p. 138) andin the Carpophaga latrans of Fiji. In this last the surface of the epithelial lining is beset by horny conical processes, adapted, it is believed, for crushing the very hard fruits of Onocarpus vitiensis on which the bird feeds (Proc. Zool. Society, 1878, p. 102), The modern giants of the group, consisting of about half a dozen species of the genus Goura and known as

1 Voyages du Baron de la Hontan dans l Amerique septentrionale, ed. 2, Amsterdam, 1705, vol. i. pp. 93, 94. In the first edition, pub- lished at The Hague in 1703, the passage, less explicit in details but to the same effect, is at p. 80. Theauthor’s letter, describing the cir- eumstance, is dated May 1687.

% There are several records of the occurrence in Britain of this Pigeon, but in most cases the birds noticed cannot be supposed to have found their own way hither. One, which was shot in Fife in 1825, may, however, have crossed the Atlantic unassisted by man.

Crowned-Pigeons, belong to New Guinea and the neighbour- ing islands, but want of space forbids further notice of their characteristics, of which the most conspicuous are their large size and the reticulated instead of scutellated cover- ing of their “ tarsi.”

A very distinct type of Pigeon is that represented by Didunculus strigirostris, the “ Manu-mea” of Samoa, still believed by some to be the next of kin to the Dopo (vol. vii. p. 321), but really presenting only a superficial resemblance in the shape of its bill to that effete form, from

which it differs osteologically quite as much as do other Pigeons (Phil. Transactions, 1869, p. 349). It re- mains to be seen whether the Papuan genus Otediphaps, of which several species are now known, may not belong rather to the Didunculide than to the true Columbidx (see OrniTHoLoey, vol. xviii. p. 46).

At least 500 species of Pigeons have been described, and many methods of arranging them suggested. That by Garrod (Proc. Zool. Society, 1874, pp. 249-259) is one of the most recent ; but, for reasons before assigned (vol. xviii. p. 40), it is not satisfactory. Temminck's great work on the group with its continuation by M. Florent-Provost, already mentioned (vol. xviii. p. 11), is of course wholly out of date, as also Selby's more modest Natural History of the Columbide (forming vol. ix. of Jardine's Vaturalist's Library). Schlegel's catalogue of the specimens contained in the museum at Leyden (Muséum des Pays-Bas, livr. 10, 1873) contains much useful information, but a new monograph of the Pigeons, containing all the recent discoveries, is much wanted. A. N.)

PIGMENTS are coloured powders which, when mixed with oil, water, or other fluids, in which they are in- soluble, form paints. They are distinguished from dyes and washes by their entire insolubility in the media in which they are mixed, whereas dye-stuffs are tinctorial sub- stances applied in solution. Insoluble colours, when used in printing textile fabrics, are distinguished as pigment colours. The sources of materials available as pigments are numerous; many are native coloured earths, others are separated from native metallic compounds and other mineral substances; a large number are artificially pre- pared from inorganic—principally metallic—sources ; an important class consist of animal and vegetable colouring principles, forming with earthy bodies insoluble powders called lakes; and the dye-stuffs artificially obtained from organic sources are also similarly utilized. In fact all substances coloured or neutral, capable of being presented in the form of impalpable powder, which at the same time are insoluble and unalterable under ordinary atmospheric influences, may be regarded as possible pigments. But there are many qualities practically essential in a pigment which limit the range of available substances. A con- sideration of the first importance is the "body" or cover- ing power of a pigment,—that is, the property of fully covering and concealing with an

opaque coating the surface over which it is spread. It is also important that the material should work well in, and be unaffected in appear- ance and constitution by the medium with which it is made into a paint, and that it should spread in an even uniform coat, which should dry well and quickly in the air and adhere firmly to the surface to which it is applied. When dry it should possess durability and resist change under the action of weather and other influences to which paint is exposed, These are the principal qualities re- quisite in paints in their important function of preserva- tive coatings for the surfaces to which they are applied. On their artistic side, as decorative and pictorial materials, pigments should possess purity and brightness of colour with intensity of tinting power, capacity for mixing or coming into contact with other colours without injuriously

affecting these or being themselves deteriorated, and per- manence and unalterability of tone after long exposure. Pigments being so numerous and so diverse in their origin, the industries connected with their production and preparation are of necessity varied in character. Many of the substances employed being used in large quantities in other important industrial relations, as well as for paints, are manufactured on a large scale and constitute the basis of considerable chemical industries, as, for example, the manufacture of white lead, Prussian blue, ultramarine, the chrome materials, &c. In other cases the materials require no preparation other than that given to them by the paint-grinder or the artists' colourman, according to the purpose for which the substances are to be prepared.

The colour trade embraces two distinct departments :—

that of the paint-grinder, who manufactures and com- pounds the pigments used by artisans, house-painters, and

paper-stainers ; and that of the artists' colourman, who |

prepares and supplies the finer, more brilliant, and exten- sive assortment of pigments used for artistic purposes.

The pigments employed for pottery painting and glass and |

enamel work are a special class of preparations to suit the requirements of these trades. Leaving out of account the chemical reactions involved in preparing raw materials, the ordinary manufacturing operations connected with the preparation of painters' colours are simple, and consist essentially of a careful system of grinding. Formerly, when painters ground their own colours, a stone slab and muller formed the entire apparatus ; but now, when paint- grinding has become a separate industry, efficient machinery has been devised for grinding and its collateral operations, Bulky and rough colours such as whiting and common ochres are dry-ground under heavy edge stones which revolve in a strong iron bed. Ordinary dry colours requiring to be pulverized with more care are mixed to a thin cream with water, which is fed into and ground principally between a pair of millstones dressed and mounted like the ordinary horizontal stones of a flour mill, but smaller in diameter. For fine colours the pig- ment so ground is levigated, or floated into a vat in which the heavier particles sink, and the lighter, more finely divided portion is run into another vessel at a lower level, where it is deposited as a fine sediment. The sediment is dried in a uniformly heated stove, and when thoroughly dry is again pulverized under a pair of edge stones, and sifted or winnowed ; so- treated it is ready for use as dry colour. The greater proportion of the white lead and the other common oil paints are ground in oil. For this purpose the raw material is mixed in a machine with ojl (sometimes boiled) to the consistence of a stiffish paste, and in this state it is ground in horizontal paint millstones, after which it requires no further preparation than the necessary thinning with oil when to be used for painting. There are many varieties of apparatus used for grinding both dry and oil colours.

The artists' colourman grinds his pigments with much greater labour, and selects his materials in a more care- ful manner, than is necessary in the case of the ordinary paint-grinder. Pigments for artistic painting in oil are ground in that medium to a definite consistency, and are put up for use in convenient compressible tubes of tin. For water colours the pigments are prepared principally in the form of small indurated cakes or as " moist colours " contained in small porcelain dishes. Water colours may also be obtained thin in tin tubes like oil colours, or as "pastilles," which are thin round cakes intermediate in condition between cake and moist colours,

In enumerating the principal commercial pigments it is usual and convenient to classify them according to their

tints. They are not, as a rule, definite chemical com- |

Pic Westy ts

pounds: many indeed are mixed substances prepared by processes and according to recipes known only to theip inakers; and, while the same commercial name is fre. quently given to substances quite dissimilar in character, the confusion is further increased by applying many different titles to substances which are practically identi, cal. Thus white lead is known by at least a dozen names,

and distinct and even conflicting qualities are by autho.

rities attributed to this one substance under its various aliases.

It would be impossible to catalogue all the paints met with in commercial lists, and it would serve no good purpose to enumerate the whole of the pigments which might be and are occasionally used. Premising that details regarding many of the substances will be found under the heading of the metals, &c., whence they are derived, we shall here simply classify, according to their colour, the principal well-recognized pigments of commerce, adding brief remarks regarding each class.

WHITE PicmMENTs.—The whites are the most important pigments used by painters, forming as they do the basis or body of nearly all paints, excepting only certain dark hues. Good available whites are limited in number, and all of real importance are included in the following list :—white lead, a carbonate of lead (chiefly); zine white, oxide of zinc, called also Chinese white; antimony white, oxide of antimony; fixed white, sulphate of baryta; “ silicate” white, sulphate of baryta, or strontia and sulphide of zinc; mineral white, powdered gypsum (with alumina it forms satin white); chalk or whiting carbonate of lime: and china clay, silicate of alumina.

White Lead (see Lean, vol. xiv. p. 878) is the most important of all pigments, and forms the basis of nearly all ordinary oil paints, which, when coloured, consist of white lead tinted with the necessary coloured pigments, It possesses the greatest amount of body or covering power, and works beautifully in oil, with which it partially combines, drying as a hard homogeneous adherent plaster. On the other hand it is a most poisonous body, very injurious to the persons connected with many of the processes by which it is prepared. As an oil colour it darkens gradually in an atmosphere containing traces of sulphur; it cannot be used at all as a water or distemper colour; and it acts injuriously on the colour of several important pigments. Notwithstanding these drawbacks no white has yet been made that can compete with white lead, although paint manufacturers go far to provide a substitute by adulterating it to such an extent that the white lead frequently bears only a small ratio to the adulterant. Baryta white is the ordinary adulterant, and among respectable manufacturcrs the intermixture is a well-understood fact, and the relative proportions of white lead and baryta are regulated by a series of grades passing from “genuine ” to No. 5 or No. 6 white lead. Many efforts have been made to substitute for ordinary white lead lead carbonates made by other processes, and other lead salts such as the oxychloride (Pattinson’s), sulphate, tungstate, antimoniate, &c.; but none of these has proved permanently successful.

Zinc White.—Next in importance to white lead, is an oxide of zinc prepared by the sublimation and combustion of metallic zine. The pigment is deficient in covering power and it dries but slowly when mixed with oil. On the other hand it is not injurious to health, its purity of tone is not affected by sulphurous air, it does

| not affect tints added to it or with which it comes in contact, and

it can be used in water as well asin oil. Like white lead it is very much adulterated, and generally with the same ageut—baryta white.

Baryta White plays an important independent part as well as acting so extensively as a sophisticator of other pigments. It is prepared by grinding to a fine powder the pure white native sulphate of baryta (heavy spar), and the same substance artificially prepared is known as permanent white or blanc fizé. The artificial preparation is much superior, as a pigment, to the

powdered spar ; but both are deficient in body, notwithstanding which they are of great value to paper-stainers and for distemper painting.

Under the uame of Charlton White or silicate paints, Mr J. B. Orr prepares a range of white paints which have come into exten- sive use. The pigment as originally prepared under Mr Orr's patent of 1874 consisted of an intimate mixture of artificial sul- phate of baryta and sulphide of zinc in certain proportions, made by the double decomposition of solutions of barium sulphide and sulphate of zinc. In 1881 a patent was secured by Mr Orr fora combination in which strontia takes the place of baryta. It 1s claimed for these pigments that they possess body greater than white lead, that they are non-poisonous, and that with certain modifications in the manufacture they can be made quite as valuable for distemper painting as for oil colours.

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The oxides of autimony, tin, bismuth, &c., form white pigments ; but these possess no peculiarities which render them valuable for painters' use. The carbonate of lime, more or less pure and in various degrces of pulverulence under sevcval names, such as Chalk White, Paris White, Whiting, &c., is very extensively used in distemper work for walls, roofs, &c., and in paper-staining, occupy- ing in these relations the important place held by white lead in oil painting. Mineral white or satin white consists of powdcred

psum and alumina, a preparation very largely used by paper- stainers for their glossy satin bodies. There are several other white earths of relatively little importance as pigments.

Buiuze Prements.—The list of blue colours of real iinportance is not extensive, comprising, as principal items, ultramarine, Prussian blue, the cobalt blues, andindigo. The following list embraces the names and varieties ordinarily recognized in commerce :—ultra- marine (native), powdered lapis lazuli; ultramarine (artificial), silicates of alumina and soda with sulphide of sodium ; Prussian blue, cyanide of iron; Paris blue, modified Prussian blue; Antwerp blue, fine Prussian blue; smalts, a cobalt glass; azure blue, a preparation of smalts ; cobalt or Thenard's blue, sub-phosphate of cobalt; cxruleum, stannate of cobalt and sulphate of lime ; mountain blue, native carbonate of copper; lime blue, earbonate of copper

and lime; Verditer or Bremen blue, hydrated oxide of copper; indigo from species of Indigofera ; indigo carmine, prepara- tion of indigo.

Apart from the important colours ULTRAMARINE, Prussian Buvz, and Inp1eo, separately noticed, these blues, which are not of much value for painters, owe their colour principally to cobalt and copper. ‘The principal cobalt colour is Smaits, called also strewing smalts, cobalt glass, zaffre, Saxony blue, &c. It is prepared by smelting together the mineral arsenide of cobalt, pure sand, and carbonate of potash into a glass. The molten glass is cast into cold water, then ground fine and levigated. Shalis is chiefly available for distemper and fresco painting, and is not much used as anoil colour. Azure Blue is generally recognized as a preparation of smalts, but the name is given to several compounds. Cxrulewm is a light blue colour of durable quality with a greenish tinge, consisting of a combination of cobalt oxide with stannic acid; and Cobalt Blue, the subphosphate of cobalt, a colour discovered by Thenard, possesses a purple tinge. Carbonate of copper, either in the form of the mincral azuritc or artificially prepared, is a principal source of the copper blues, which, however, possess little value as pigments owing to their tendency to blacken under exposure. Blue Verditer, a greenish blue which passes into green verditcr, is a hydrated oxide of copper.

Yettow PicmuntTs.—The following list includes the ordinary yellow colours of commerce :—ochres and sienna earth, native earths tinted with iron; Mars yellow, hydrated ferric oxide ; chromes, chromates of lead and other metals; massicot, protoxide of lead; Naples yellow, antimoniate of lead; mineral yellow, basic chloride of lead; aureolin, nitrate of potassium and cobalt ; cadmium yellow, sulphide of cadmium ; orpimcnt, trisulphide of arsenic ; Indian yellow, urio-phosphate of calcium; gamboge, resin of Garcinia ; Dutch pink, a vegetable lake ; yellow lakes.

Of these colours the more important are the ochres and the various combinations containing chromium. The Yellow Ochres are native earths coloured with hydrated ferric oxide, the brownish ycllow substance that colours, and is deposited from, highly ferruginous water. These ochres are of two kinds—one having an argillaceous basis, while the other is a calcareous earth, the argillaccous variety being in general the richer and

more pure in colour of thetwo. Both kinds are widely distributed, fine qualitics being found in Oxford- shirc, the Isle of Wight, near Jena and Nuremberg in Germany, and in France in the departments of Yonne, Cher, and Nievre. The original colour of these ochres can be modified and varied into browns and reds of more or less intensity by calcination. The high heat expels the water of hydration from the iron oxide, changing it into red ferric oxide. The nature of the associated earth also influences the colour assumed by an ochre under calcina- tion, aluminous ochres developing red and violet tints, while the calcarcous varieties take brownish red and dark brown hues. The well-known ochre Terra da Sienna which in its raw state is a dull-coloured ochre, becomes when burnt a fine warm mahogany brown hue highly valued for artistic purposes. Yellow ochres are also artificially prepared—Mars Yellow being either pure hydrated ferric oxide or an intimate mixture of that substance with an argillaceous or caleareous earth, and such compounds by careful calcination can be transformed into Mars Orange, Violet, or Red, all highly important, stable, and reliable tints. The metal chromium owes its name to the intense coloration produced by the combination of its oxide, chromic acid, with various metals and alkaline earths. Several of thesc salts are soluble, but those which form pigments are insoluble compounds. The principal chrome pigments—the various shades of lemon and yellow chrome deepen- Ing to orange tints—are composed of the ncutral chromate of lead, the difference of hue depending on the greater or smaller proportion of Icad used in the preparation. The basic chromate of lead has a

dcep orange colour passing into the minium-red-like hue of chrome red. Strontia Chrome, the chromate of strontium, is a pale lemon pigment of fine quality and permanence. With zinc, chromic acid forms two combinations, neutral and basic, both possessed of an intense yellow colour; and chromate of barium also furnishes a useful yellow colour. Lead itself, without chromium, is the basis of several valuable yellows. Massicot, the protoxide of lead, isa clear yellow pigment deficient in body. Naples Yellow, a colour highly esteemed by early artists, is an antinioniate of lead which in early times was obtained from native sources; and Mineral Yellow is an oxychloride of lead. The sulphide of cadmium forms the fine durable

Cadmium Ycllow, a eolour now much appreciated for artistic use. The arsenical yellow, Orpiment, is now little used as a pigment, although formerly, under such names as King's Yellow, Imperial Yellow, and Chinese Yellow, it was held in high esteem by artists. Aureolin, a nitrate of potassium and cobalt, is a eolour of recent origin which has come into high favour among artists. Indian Yellow is a colour of animal origin of no perma- nencc, and Gamboge is a gum resin yiclded by trees of the genus Garcinia, principally employed as a water colour. The yellow lakes are comparatively unimportant, but some, known, rather absurdly,as Dutch, English, or Italian Pink, are largely used in paper-staining.

RED PIGMENTs embrace two distinct series of substances—the reds of inorganic origin, and red lakes obtained from animal and vegetable colours. The principal commercial vavictics are as follows :—rouge, Turkey red, and Indian red, red ferric oxide ; Venetian red, ochreous ferric oxide; ochres, earths coloured by ferric oxide; vermilion and cinnabar, sulphide of mercury ; antimony vermilion, red sulphide of antimony; Derby red, a form of chrome red ; red lead or minium, red oxide of lead ; chrome red, basic chromate of lead ; realgar, bisulphide of arsenic ; madder lake, alizarin and alumina; madder carmine, preparation of aliza- rim; carmine lake, cochineal red and aluinina; carmine, prepara- tion of cochineal ; wood lakes, from various red dyewoods.

The principal mincral reds owe their colour to oxides of iron and to compounds of mercury. The reds due to iron are closely allied to the yellow ochres and other ferruginous pigments. As already explained in connexion with these yellows, tints passing through orange to deep purple reds are obtained by calcination of yellow hydrated ferric oxide, and in this way a great variety of ruddy and red tints are prepared. The proportion of ferric oxide in these compounds ranges from pure oxide to combinations in natural ochres eontaining not more than 2 or 3 per cent. of iron. touge or Mars Red, Crocus, Indian Red, and Turkey Red are all pure ferric oxide, varying in depth of tint from having undergone different degrees of calcination, or from being made from different artificial or natural sources. The other iron reds are all of the nature of ochres—some of them, such as Venetian Ted, being artificial compounds. These reds form exceedingly useful durable colours which do not injuri- ously affect the tints with which

they are associated. Of red colours from mercury, Cinnabar and Vermilion are the most import- ant, the former being the native and the latter an artificial sul- phide of mercury (see MERcuRY, vol. xvi. p. 34). Vermilion is one of the most pure, brilliant, solid, and durable of all colours. Its beauty is largely affected by the smoothness of the powder to which it is reduced, and in this respect that obtained from China is of the highest excellence. Being a costly pigment, vermilion is freely adulterated with other reds, a fraud easily detected by the perfect volatility of the genuine substance. From mercury com- bined with iodine is prepared a pigment of unequalled vivacity and brilliance, Jodine Scarlet, but unfortunatcly as fugitive as it is bright, and consequently not available for work requiring perma- nence. The principal red colour from lead is Miniwm or Led Lead, a pigment of great antiquity obtained as a product of the oxidation of massicot, or by the calcination and oxidation of white lead. It is orange red in colour, of good opacity and body, but it has the fault of white lead and lead colours generally, blackening in con- taminated air and injuring colours with which it comes in contact. By itself it is a valuable paint for first coating exposed iron surfaces to prevent their oxidation, and it is an excellent dryer, on which account it is much used in preparing boiled oil for painters. Chrome Red, a basic chromate of lead known also as Persian or Derby Red, is a brilliant pigment ranging in tone from orange to a deep vermilion hue. It is obtaincd by precipitating a solution of acetate of lead with bichromate of potash, with the addition of morc or less of caustic potash or soda,—the proportion of the latter addition determining the depth of resultant toue. Antimony Vermilion is the red variety of the sulphide of antimony which, as found in nature (stibnite), is a dark grey body with metallic lustre. This, when fused and kept some time at a high heat and suddenly cooled, by allotropic modification becomes a fine vermilion red. The colour is artificially prepared by acting on solutions of the butter of antimony (antimony chloride) with hyposulphite of soda or lime. lt is a colour of excellent purity and body as a water colour, but unfortunately it becomes brown by exposure. The lakes form a numerous and important class of red pigments. A lake is a com- bination of a colour of organic origin with a metallic oxide or salt,

commonly with alumina. Originally all lakes were red colours, the name being derived from the lac insect Coceus laeca, the colouring matter of which forms the lake now known as Lae Lake. But lakes of any colour or tint are now made. The most important – lake pigment is Dfadder Lake, a compound of alumina and the tinetorial principle of madder root, Rubia officinalis, but now made with artificial alizarin. Scarlet or Carmine Lake has cochineal for its colour basis, and there are corresponding lakes from lac, kermes, &c. Wood Lakes coloured-with several of the red dyewoods have little durability, but they are nevertheless largely used by paper-stainers. Cuwrmine, a colouring matter from coehineal, and Madder Carmine or Field's Carmine, from madder, are exceedingly brilliant colours ; but the first of them is of a fugitive character.

GREEN PIGMENTS form an extensive group embracing two sections :— (1).simple greens, in which green is a primary inherent or natural colour ; and (2) compound greens, made up of intimate mixtures of blue and yellow pigments, The latter class it is obvious are capable of indefinite modification by simply varying the proportions of the compound ingredients. The following list embraces the principal commercial greens : —Brunswick green, oxychloride of copper ; malachite green or mountain green, hydrated carbonate of copper; verdigris, sub-acetate of copper ; verditer or Bremen grecn, hydrated oxide of copper; Scheele's green, arsenite of copper ; Schweinfurt green, mixed acetate and arsenite of copper; emerald green, a variety of Schweinfurt green; mineral green, nixed copper oxide and arsenite ; chrome green, oxide of chromium ; Guignet green or veridian, hydrated oxide of chromium; Cassel green, manganate of baryta; cobalt green, oxides of cobalt and zinc ; ultramarine grecn, modified artificial ultramarine ; Veronese earth or terra verde, a form of ochre ; green lakes.

The greater proportion of these greens are copper compounds— the most brilliant of them containing also arsenic. They are all poisonous colours, the latter especially being dangerous poison; and there can be no doubt that their free use in wall papers, the colour- ing of toys, artificial flowers, &c., is frequently the source of dangerous disease and even death. Brunswick Green, the most important non-arsenical green, is an oxychloride of copper, but factitious Brunswick greens are not uncommon. Scheele's Green, the

arsenite of copper, and Schweinfurt Green, mixed arsenite and acetate of copper, are very powerful and brilliant colours. These copper greens all blacken in foul gases and when mixed with oil, and thus, although they possess great body, they are much mire useful to the paper-stainer than the painter. The sesquioxide of chromium both water-free and hydrated, prepared in various ways, forms important stable green colours which resist atmospheric influences ; and chromium is further the basis of several other green colours, which, however, are not of importance. Cobalt Green, a mixed oxide of cobalt and zinc, discovered by the Swedish chemist Rinman, isa valuable and durable but expensive colour. Cassel Green, called also Rosenstiehl's Green, isa fine innocuous pigment made by melting together sulphate of baryta and oxide of manganese, and carefully washing the resulting mass in water. Verona Green or Terra Verde, a natural celadon green highly valued by artists for permanence, is a mixed earthy body coloured by ferrous oxide, and Ultramarine Green, also a stable body, is an intermediate pro- duct of the manufacture of ultramarine blue.'

Brown PicMents.—Many of the painters' browns are simply tints obtained by mixture. In the case of simple pigments the shades pass by fine gradations into yellows and reds, so that the limits of classification are not well defined. The following are generally classed as pure browns :—umber, silicate of iron and man- ganese ; brown ochres, called Mars brown, iron brown, &c., native and artificial earths ; Vandyke brown and Cologne or Cassel brown, peaty ochres ; purple brown, ferric oxide ; Spanish brown or tiver, a brown iron ochre; bistre, washed beechwood soot ; sepia, secre- beg cuttle-fish ; brown lake; asphaltum, natural and artificial pitch.

Iron and manganese, separately or combined, earthy or pure, are the sources of the principal brown pigments. Some of them are intermediate products between yellow ochres and red ochres by calcination of the yellow, and, as they are ochreous in their nature, their colours may be heightened or otherwise modified by calcining. Thus Umber, which properly is a hydrated silicate of manganese and iron, is brightened in colour by calcination into Burnt Umber. The finest umber comes from the island of Cyprus, and is known as Turkey umber. Large quantities also of "'English" umber are inined in Devonshire and Cornwall. Real Vandyke Brown, a very celebrated pigment, ought to be a kind of bituminous peaty earth of a fine rich semi-

transparent colour, allied to which are Cologne and Cassel Karth. But under the name Vandyke brown pure ferric oxide and ferruginous earths of a clear brown hue are also sold. Cappagh Brown is a peaty earth coloured by manganese, found at Cappagh near Cork, Ireland, and is a valuable artists' colour, as is also Bisire, a brown washed from the soot of beechwood. Sepia, a much valued warm brown, is a substanee seereted by the cuttle-fish, Sepia officinalis, which emits it to cloud the water for conceal- ing its whereabouts when alarmed. ;

PIK—PIK

Buiack PieMENtTs form a numerous class of bodies, though those in common use are easily enumerated. They appear in commerce principally under these names :—vegetable black, carbonized vegetable matter ; lamp black, soot of oils and fats ; Indian ink, preparation of lamp blaek ; ivory black, carbonized ivory and bone ; bone black, carbonized bone; blue black, washed wood chareoal ; charcoal black, carbonized wood ; black wad, a native oxide of manganese ; black lead, a form of carbon ; tar, from distillation of organic substances.

Most of these blacks owe their colour to carbon. From the charring of vegetable substances are prepared Charcoal Black, Blue Black, and Vegetable Black, but these take many names aceording as they are prepared from carbonized wood, twigs of the grape vine, peach and other fruit stones, cork, the lecs of wine, &c. Bone and Lvory Blacks again are carbonized animal substanees, principally bones, which when skilfully burned yield dense durable blacks, Lamp Black of the best quality is the soot deposited from the imperfect combustion of oils and fats, and the soots of resin and tar are also collected and used under this name. Indian Ink (see vol. xiii. p. 80) is a form under which lamp black of the finest quality occupies an important position among pigments. Of the other blacks Zar is the most important owing to its extensive use as a preservative and antiseptic coating.

Several pigments are prepared on account of special properties apart from the protective and decorative purposes for which ordinary paints are applied. Among such may be mentioned: Balmain's luminous paint, a preparation in oil or water of certain of the phosphorescent sulphides.

Objects coated with this material have the property of continuing to emit light in dark situation$ for some time after they have been exposed in daylight or to high artificial light. The luminous paint has been proposed for eoating buoys, signals, public notice boards, clock and watch dials, playing balls, match boxes, &c., but it has not come into extensive use. Powdered asbestos has been introduced as a fire-proof paint for wood ; but all common paints applied as distemper colour are equally fire-proof in the scuse that they themselves are incombus- tible, and when they coat wood thickly they offer great resistance to an incipient fire, and even retard combustion under very high heat. Numerous anti-fouling compositions for the painting of ships' sides and bottoms and anti-corrosive, inoxidizable, damp-proof, and water-proof paints have been patented, some of whieh are in extensive use, (J. PA.)

PIKE, freshwater fishes generally distributed over the rivers and lakes of Europe, northern Asia, and North America, and forming a small family (Zsocide) of Soft-rayed Fishes. They are readily recognized by their elongate compressed body covered with small scales, a long head, long and spatulate snout, and very large mouth armed with strong and long teeth in the jaws and broad bands of smaller teeth on the palate and tongue. The teeth point backwards or can be depressed so as to offer no obstruction to any object entering the gape, but prevent its withdrawal in the opposite direc- tion. The dorsal and anal fins are placed far back on the

European Pike (soz luetus).

tail, thus greatly increasing the propelling power of the fish, and, although pike are bad swimmers and lead rather a sedentary than a roving life, they are excelled by no other freshwater fish in rapidity of motion when, by a single stroke of the tail, they dash upon their prey or dart out of reach of danger. In the Old World one species only is known (Zsow lucius), which prefers lakes and sluggish reaches of rivers to strong currents or agitated waters. Its eastward range in northern Asia is not known; it extends into Lapland in the north and into central Italy

and the vicinity of Constantinople in the south, but is absent in the Iberian Peninsula. The European species occurs also in North America, and is common in the eastern United States southwards to northern Ohio. But North America is tenanted by other species of pike besides, of which the largest is the Muskelunge or Maskinonge of the Great Lakes (Esow nobilior) ; it commonly attains to the large size which is exceptionally recorded of sox lucius. The other American pike are of smaller size, and generally named “Pickerel”; but opinions as to the distinction of the species differ widely among American ichthyologists. The European pike, like its brethren, is the most voracious of freshwater fishes; it probably exceeds the shark, to which it has been compared by many writers, in the rela- tive quantity of food it consumes. Ponds would soon be depopulated but for its cannibal propensities, no pike being safe from another of its own kind large enough to swallow it. To the young of water-fowl pike are most destructive, and large specimens will seize rats or rabbits when they take to the water, and are said to attack even foxes and small dogs. Individuals of from forty to fifty pounds are not scarce, but captures of much larger ones are on record. Pike are wholesome food, and much esteemed in inland countries,—the smaller (of 20 to 24 inches in length) being preferred to the larger individuals. They are prolific, and not easily exterminated in a water in which they have been once allowed to spawn. Accord- ing to season and climate they spawn in April or May, and sometimes as early as February.

PIKE-PERCH (Lucioperca), freshwater fishes closely allied to the perch, but with strong canine teeth standing between the smaller teeth of the jaws and palate. As indicated by the name, these fishés show some slight resemblance to the pike in their elongate body and head, and like that fish they are most dangerous enemies to other freshwater fishes. Their acclimatization therefore in waters intended for the culture of valuable food fishes is not advisable, though they compensate in some measure for their destructiveness by the excellent flavour of their flesh. In Europe two species occur, the more celebrated being the “Zander” of North Germany or “ Schiel” of the Danube (Lucioperca sandra); strange to say, it is absent in the system of the Rhine. It prefers the quiet waters of large rivers and clear deep lakes, in which it reaches a weight of twenty-five or thirty pounds; it does not thrive in small and confined waters. The second European species (Lucioperca wolgensis) is limited to rivers in southern Russia and Hungary.

In North America several pike-perches have been described, but in the most recent works only two are distinguished, viz., Lucwoperca americana, which grows to a weight of twenty pounds, and the much smaller Lucioperca canadensis ; both are abund- ant in the Canadian lakes and upper Mississippi, and the latter also in the Ohio.

. PILATE,: Pontius, the fifth Roman procurator or

governor" (émizporos, wyenav) of Judea, Samaria, and Idumza, succeeded Valerius Gratus in 26 a.v. By rank he was a Roman eques, possibly of Samnite extraction ; his official appointment he owed to the influence of Sejanus. His ordinary residence as procurator was at Ceesarea, the capital, but from time to time he visited Jerusalem, especially at the greater feasts, and on these occasions he had his Bema in the magnificent palace of Herod the Great, hence called the pratorium. Apart from the supreme (to him, likely enough, most trivial) incident in

a T.e., Pilatus, either derived from pilum, and thus analogous with the surname Torquatus, or a contraction of pileatus. The pileus was the badge of manumitted slaves, and if this etymology be accepted, the naine probably indicates that Pilate was a libertus, or the descendant of a libertus, of a member of the Sammnite gens of the Pontii.

Oo

his life ("suffered under Pontius Pilate") the few facts that are known of him' indicate a somewhat exceptional recklessness about awakening Jewish fanaticism, and unscrupulousness as to the' means used in quelling its manifestations. Not long after his appointment he allowed his soldiers to carry their eagles and other insignia to Jerusalem, and did not give way until an excited mob had stormed for five whole days and_ nights around his palace at Cesarea. At a later date, in order to provide for the completion of his aqueduct for bringing water to the city from the " Pools of Solomon," he appropriated funds from the Corban or sacred treasury; but, profiting by his former experience, when this conduct was resented by the popu- lace he caused some of his soldiers, disguised as Jewish citizens but armed with staves and daggers, to mingle in the crowd, when many casual spectators as well as rioters were trampled to death. For having hung up in Herod's

palace certain gilt shields dedicated to Tiberius he was in vain remonstrated with by the Jews, but Tiberius, on being appealed to, ordered their transference to the temple of Augustus at Czsarea. Of the circumstances under which he " mingled the blood " of certain Galilseans "with their sacrifices" nothing is known; but his cruelty in causing a number of Samaritans to be attacked and massacred when assembled on Mount Gerizim led to a complaint being lodged with Vitellius the legate of Syria, and ultimately to his being deprived of his office early in 36 A.p. According to Eusebius (H. Z., ii. 7) he was banished to Vienne in Gaul, where various misfortunes caused him at last to commit suicide ; the Chronicle of Malalas alleges, with less probability, that he was beheaded under Nero. Later legend (see, for example, the apocryphal Mors Pilati mentioned below) has a good deal more to say : his suicide was anticipatory of Caligula's sentence ; the body was thrown into the Tiber and there caused disastrous tempests and floods; it afterwards produced similar effects in the Rhine at Vienne, and finally had to be consigned to a deep pool among the Alps. Local tradition points to a little tarn on Mount Pilatus near Lucerne ; if anything is thrown into it the water is forthwith strangely agitated. The devil takes the body from the water on Good Fridays and sets it on a throne where it goes through the gesture of washing its hands. The fact that Pilate allowed Jesus to be crucified is by no means out of keeping with what we know of his indifference to the claims alike of justice and of mercy; that he obviously wished to spare hin if this could be done without too much inconvenience to himself has, however, gained him in sone quarters very generous recognition ; thus Tertullian speaks of him as "jam pro sua conscientia Christianum," the Copts regard him as a martyr, and the Abyssinian Church has given him a place in its calendar (June 25). This view is reflected in the spurious Paradosis Pilate. Pilate's wife, known to tradition as Procla or Claudia Procula, is repre- sented as having been a proselyte of the gate and a secret disciple of Jesus. She is commemorated as a saint in the Greek Church (Oct. 27).

There is a considerable body of apoE, literature connected with the name of Pilate. The Acta Pr ati, which forms part of the Evangelium Nicodemi, gives a copious account of the trial of Jesus, intermingled with legendary details of uncertain and very unequal value. It exists in a variety of texts, but in substance 1s supposed with most probability to date from about the

middle of the 2nd century, and to be the work of a Jewish Christian, written for Jews. The Epistola Pilati, of which there are two differing forms,

contains what purports to be Pilate's account to Tiberius of the resurrection of Jesus. The Paradosis Pilati relates his trial, con- demnation, and execution at the emperor's command; Pilate appeals in prayer to Jesus, and, along with Procla his wife, is received as a true penitent into the number of the faithful. The Mors Pilati relates the circumstances of his suicide, the casting of his body into the Tiber, its removal to Vienne (explained as '' Via Gehennz "), and the final disposal of it at 'Losania." For all

these apocryphal writings see Tischendorf's Evangelia Apocrypha

(1863).

PILCHARD (Clupea pilchardus), a fish of the herring family (Clupecde), abundant in the Mediterranean and on the Atlantic coasts of Europe, northwards to the British Channel. Sardine is another name for the same fish, which on the coast of Britanny and Normandy is also called Célan or Céléren.. It is readily distinguished from the other European species of Clupea or herrings. The oper- culum is sculptured with ridges radiating and descending towards the suboperculum ; the scales are large, about thirty along the lateral line, deciduous ; the ventral fins are inserted below, or nearly below, the middle of the base of the dorsal fin; the dorsal fin has seventeen or eighteen, the anal from nineteen to twenty-one rays. A small blackish spot in the scapulary region is very constant, and sometimes succeeded by other similar marks. There are no teeth on the palate; pyloric appendages exist in great numbers; the vertebree number fifty-three. The pilchard is one of the most important fishes of the English Channel (see article FisHEeRixs, vol. ix. p. 253 sq.). It spawns at a distance from the shore, and, ac- cording to Couch, the spawn has been seen to extend several miles in length, and a mile or more in breadth floating on the surface of the sea, of the thickness of brown paper, and so tough as not to be readily torn in pieces. 'The spawning takes place at two periods of the year, viz., in

April or May, and again in the early part of autumn ; but it is not probable that the same individuals or shoals spawn twice in the same year. When commenc- ing their migrations towards the land, the shoals consist of countless numbers, but they break up into smaller com- panies in close vicinity to the shore. Pilchards feed on minute crustaceans and other animalcules, and require two or three years before they attain their full size, which is about 10 inches in length. On the Pacific coasts of America, in New Zealand, and in Japan a pilchard occurs (Clupea sagax) which in its characters and habits is so similar to the European pilchard that its general utiliza- tion is deserving of attention, and there is every reason to believe that New Zealand could produce its own sardines and fumadoes. Immense shoals are reported to visit the east coast of Otago every year in February and March.

PILES. See Hamorruorps.

PILGRIMAGE. The word Pilgrimage (derived from the Latin pereger, i.e, per-ager, “one who traverses a region,” through the intermediate forms peregrinus, pellegrino, pelegrin) denotes the act of journeying to some place esteemed sacred, for the purpose of discharging a religious obligation, or to obtain some supernatural assist- ance or benefit. The practice is common to many re- ligions, and mounts back to prehistoric ages. It is ulti- mately traceable to the nature of tribal religion, in its early form of worship of a deity regarded as purely local in the sphere of his special influence. As community in religious acts was one of the principal ties between members of the same tribe, to the exclusion of outsiders, it would naturally become the rule, and then the duty, of the tribesmen to pre- sent themselves at recurrent intervals at the sanctuary of their tribal god. As they scattered away from their own settlement, and became travellers or sojourners amongst aliens, the belief that they were in some sense cut off from the protection of their tribal deity, and subjected to the influence of others in whose worship they had no share, would induce visits from a distance to the seat of their own religion, not merely for the purpose of keeping up their tribal relations, but to propitiate a power which perhaps could not hear supplications addressed from a distance, and would in any case be more ready to hear and answer prayers made in his own special shrine, attended with the appro-

priate rites performed by his own body of ministers. This

latter consideration would operate even in the case of eultg directed to the Sun-God, the Moon-Goddess, and the planet- ary bodies, which could hardly be regarded as localized within earthly boundaries, but might well be supposed more placable in shrines of exceptional splendour and sanctity, officered by a trained and numerous priesthood. And wherever it was believed that the deity not merely responded to prayer, but gave direct answers by omen or by oracle to inquirers, the frequentation of the prophetic seat would naturally increase. Further, as the political strength of any tribe grew, that would be attributed in a multitude of cases to the superior power of its tutelary god, or, where they worshipped the same deity as their neighbours, to some more acceptable mode of paying that worship, whence the custom would grow of making the principal temple of the most powerful tribe the meeting-place of the confederacy, as well for political deliberation as for the more directly religious purpose of reaffirming the common pact with sacrificial ceremonies. And if the strongest tribe passed from the stage of hegemony to that of sovereignty, whether by cession or by conquest, so becoming the nucleus of a nation or kingdom, the same feelings would operate yet more powerfully,—the subject tribes being either compelled to accept the gods of their conquerors, or voluntarily adopting them from a conviction of their superior might. Certain temples would in this wise become national from having been tribal, and in large empires, such as Egypt

and Assyria, would collect worshippers from all the various

peoples ruled under a common sceptre. The second stage in the genesis of special sanctuaries is peculiar to religions with a real or supposed historical basis, and takes the form of devotion towards localities which have been the scenes of important events in the lives of personages reverenced in the creeds of those religions. And the third stage, be- longing to a much later period than either of the former, when self-consciousness had become more developed, is that where the aim of the pilgrims is primarily subjective, to stir up certain emotions in their own minds, through the means of the associations connected with special localities. But in each and all of these the fundamental underlying thought is the same, the localization of deity,

the almost insuperable difficulty which the ideas of omniscience and omnipresence offer to undeveloped intellects.

It will be convenient, in tracing the history of pilgrim- ages, to begin with those which belong to the various forms of heathenism, ancient and modern, as pertaining, whatever be their actual date, to an earlier stage of mental evolution than the Jewish, Christian, and Mohammedan ones.

The first pilgrimages, then, of which we have any trust- Beyplitm

worthy knowledge, are those of ancient Egypt. The mythology of the Egyptians is even yet but imperfectly understood, but it is at any rate clear that, just as the votaries of Vishnu and of Siva keep apart in modern Hindustan, so the chief deities of the Egyptian pantheon had cults which were as often rival as complementary, and that the emulation of the competing temples took the form of bidding against each other for popular favour by the splendour of their chief yearly festivals. We are obliged to have recourse to Herodotus and Plutarch for informa- tion as to the general cycle of feasts nationally observed; for, although local calendars and rubrics of festivals have been discovered in several places, nothing cognate with Ovid's Wasti has yet been found inEgypt. Herodotus notices that, instead of having but one yearly national festival (waviyvpis), the Egyptians had six, the principal of which was that of Artemis (i.e. Bast or Sekhet) at Bubastis, to which the pilgrims went in boats crowded with both sexes, playing on castanets and flutes, and singing to this accompaniment. They landed at every town along the

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river to perform orgic dances, and at Bubastis itself offered

great sacrifices, besides feasting copiously, in particular consuming vast quantities of grape-wine. He states the numbers assembling on this occasion, exclusive of children, to average 700,000. Next to this ranked the

festival of Isis at Busiris, attended with ceremonies of mourning, most probably in memory of the sufferings of Osiris. Third in order was the feast of Athene (Neith) at Sais, celebrated at night, with illuminations. Fourth was the festival of the Sun (Ra) at On or Heliopolis; fifth that at Buto in honour of Latona (Buto or Uat). These two were attended with. simply sacrificial rites, and there were no symbolical ceremonies in addition. Last came the festival of Ares (Har-tash, the Hertosi of Cedrenus) at Papremis, at which there was a rough tussle, symbolizing war, between the temple-attendants and the pilgrims, in which lives were sometimes lost. There was another high festival, that of Apis at Memphis, not included by Herodotus in his list, perhaps because not of yearly recur- rence, besides the much frequented oracle of Ammon at Thebes, whither it had been transferred from Meroe, its first seat in Egypt. And it is noticeable that there was no pilgrimage at all to the most sacred spot in Egypt, the island of Philz, the burial-place of Osiris, because its very sanctity made it “tabu” to lay folk. The mysteries, in like manner, being rigidly confined toa few, did not form an occasion of pilgrimage. .

As regards the great Mesopotamian empires, our know- ledge does not yet enable us to say that pilgrimages entered into their religious system, though we may not unreasonably infer so from the size and wealth of several temples, notably those of Ishtar, from the Assyrian custom of imposing their own deities upon conquered nations, and from the example of one great religious assembly from all the provinces of the Babylonian empire, recorded in Daniel iii. There may, perhaps, be indirect proof of Babylonian pilgrimages in what Cyrus states in his cylinder-inscription, namely, that Nabonidus had offended the gods by trans- porting their images to Babylon, and thus, as it were, making them perform pilgrimage.

The ancient Zend creed of the Medes and Persians, having no temples for worship, had no pilgrimages ; but in its later Mithraic form, the initiation of neophytes by the Magians into the mysteries, through a painful course of purgation (curiously resembling one prevalent in Ireland far within the present century), in a cavern or grotto at Babylon, necessitated a pilgrimage thither on the part of those who desired to become experts ; and Lucian has left some account of its rules in his Afenippus.}

Amongst the Phcenicians there are clear traces of at least two great pilgrimages in honour of Ashtoreth, one to Aphaca (probably the Aphek of Scripture), celebrated for a yearly iniracle of a ball of fire appearing on the mountain summit, and thence falling into the sea. The obscene rites for which this temple was infamous led to its destruc- tion by Constantine the Great (Euseb., Vit. Const., iii. 56). The other great Ashtoreth pilgrimage was to Hierapolis in Syria, frequented by votaries from all the Semitic races except the Jews. Antioch was also a great centre of this cult, as also of that of Thammuz, but, strictly speaking, there is no proof of a Thammuz pilgrimage, nor of one in honour of Melkarth, though his worship was carried from Tyre, its chief seat, into all the Phoenician colonies, and the famous oracle of his temple at Gades drew crowds of Inquirers annually. In Palestine proper, though the cults of Baal, Ashtoreth, Moloch, Dagon, and Beelzebub were widespread and persistent, and though the name Jericho

‘ This is probably the source of the Moslem legend of Hartt and Marfit, the fallen angels chained in a cavern at Babylon, who will teach magic to such as consult them in a prescribed manner.

probably, and Ashtaroth-Karnaim certainly, point to a seat of moon-worship, as Bethshemesh does to one of sun- worship, there is no direct evidence of organized pilgrim- ages to these places.

In ancient Hellas there were four classes of religious Greek.

observance more or less cognate with pilgrimage, though not in any case identical therewith. First may be placed the consultation of oracles,—those of Apollo at Delphi, of Zeus at Dodona, of Trophonius at Lebadeia, and of Asclepius at Epidaurus (the last of which was resorted to also for the cure of disease) being the most famous and most frequented, while, outside Greece and its colonies, the oracle of the Libyan Ammon in the desert south of Cyrene was also in much esteem. Next come the four great national festivals and games, the Olympic, Pythian, Nemean, and Isthmian, attended by crowds from all Greek states, not only as attractive shows, but as religious ceremonies.? Thirdly may be named the more local or tribal festivals, such as the Panathenza, the feast of the Charites at Orchomenus,

that of Hera at Samos, of Aphrodite at Paphos, and of Artemis at Ephesus, which drew together many worshippers besides those who were specially bound to visit the shrines in question. But the closest parallel to the Christian theory of pilgrimage is found in the celebration of the Eleusinian mysteries (see Mysrtertzs), the special likeness of which to pilgrimages of a later day lies in the notion of merit and spiritual benefit attached to initiation, to the belief that happiness in a future state of existence would be promoted, nay, insured, by admission to the ranks of the myste.

The Latin customs bear a certain superficial likeness to the Greek, in that local oracles, such as those of Faunus, of Albunea, of Fortuna, and of the Sibyls, were much frequented ; there are traces of great tribal sanctuaries and gatherings, such as the worship of Jupiter Latiaris on the Alban Mount, of more narrowly restricted tribal cults, such as the Julian worship of Vejovis at Boville and the Fabian sacrifice to Hercules on the Quirinal, and of at least two temples to which regular pilgrimages seem to have been made—those of Juno Sospita at Lanuvium, and of Vesta (perhaps of all the Penates also) at Lavinium. But, apart from racial and theosophic differences of belief, there was one factor at work in Italy which tended to bring about a wholly different character of popular religion from that which was evolved in Hellas—the overmastering centralization of Rome, and the practical identification of all solemn worship (apart from the rustic ceremonies in honour of niinor and little-known deities) with the apothe- osis of the Republic. Hence, after the chief seat of Roman worship was transferred from the Regia to the Capitol, pilgrimage proper disappeared, for the local gods of each newly absorbed city or state were added to the original triad of Roman gods, and to the other Sabine triad, moved from the Quirinal to the new sanctuary, and it becomes impossible to distinguish clearly between the purely poli- tical ceremonies performed in honour of gods viewed primarily as the tutelars of Rome and voluntary resort to the great temple for the personal cult of any particular deity enshrined there. One relic of the older custom seems to have survived till later times, namely, the pilgrimage of Roman women barefoot to the temple of Vesta in the Forum on June 9 every year.

No pilgrimages seem to have been usual in the Teutonic and Slavonic religions, though both had special temples regarded as more sacred than the

remainder, and in the case of the latter we know with tolerable accuracy that Kieff, Novgorod, Rethra in Mecklenburg, Karenz, Winneta

2 ‘he Panhellenic festival at Augina is omitted, as a mere factitious device of the emperor Hadrian, when classical paganism was dying, and not a real Greek custom.

Roman.

Teutonic and Slavonic.

Mexican.

Peruvian.

Indian.

and Julin (isle of Wollin), Stettin, and lastly Arkona in the isle of Riigen, succeeded one another as the chief seat of the worship of Perun, Lada, Bielbog, and other principal Slavic deities, and were necessarily attended by much larger bodies of worshippers than temples of less account, more thinly officered, and inferior in repute for the learning and prophetic powers of their priests. ;

Directing our attention to an entirely different region of the world, we learn that in 1519, when Cortes entered Cholula in Mexico, he found it a great resort of pilgrims to the huge temple of Quetzalcoatl, then of unknown antiquity, as founded by a race earlier than the Aztecs, and built upon a colossal mound, vying in dimensions with the largest pyramids of Egypt. And what is yet more curious, besides this principal shrine, there were subsidiary tribal temples in the city, restricted to the uses of the several allied or kindred nations, who desired to have their own sanctuary in the holy city, precisely as churches of different nationalities are found in Jerusalem and in Rome to-day. And similarly in Peru, the great Temple of the Sun at Cuzco, with its encircling girdle of chapels dedicated to minor

deities, was visited by pilgrims from all parts of the empire; nay, it was even regarded as a misfortune to fail in accomplishing the journey.

India, however, is above all others the land of pilgrim- ages, for it has observed them during a longer unbroken period than any other country of which we possess sufficient records, and for frequency and multitude it would be difficult to find any parallel. The most celebrated of them are those to the temple of Jagan-nath at Puri in Orissa, Benares, Hurdwar, Ganga-Sagara, Gangotri, Jumnotri, Prayaga (Allahabad), RAméswara, Gaya in Behar, and Ayodhya or Oudh. Apart from the motives, common to all pilgrims, of acquiring religious merit or expiating sins, these Indian shrines are frequented for the performance of sraddha ceremonies in honour of deceased ancestors or as votive acts for the recovery of the Sick, or, again, to carry the ashes of deceased kindred to be scattered in the waters of some sacred or purifying river. Every great river in India, with some lakes, tanks, and springs, is regarded as permeated with the divine essence, and as capable of cleansing from all sin. Hence the favourite resorts are river sources and confluences, while Benares, as situated on the Ganges itself, is the holiest spot in Hindustan. The other most frequented shrines are usually associated with the cults of Krishna, Siva, and Rama. All these are exclusively connected with Brahman rites, for the entire extirpation of Buddhism from the Hindu peninsula has prevented any special sacredness from continuing to attach to the scenes of Gautama Buddha's life (though the Buddhists allege that the sanctity of Benares is due to its having been the residence of Buddha himself and the scene of his earliest preachings); and it is in Ceylon only that two Indo-Buddhist pilgrimages survive,—that of

'Adam's Peak, and the yet more popular one to the temple

of Kandy, where the Dalada Malagawa, or tooth of Buddha, is an object of special veneration. For northern Buddhism the chief shrines are Lhassa in Tibet, the seat of the Dalai Lama, and Urga in northern Mongolia, the seat of the Tesho-Lama or Bogdo-Lama. Before the Brahman revolution, which drove Buddhism out of India, pilgrimages to the chief scenes of Gautama Buddha's life were common; and notably Kapilavastu, his birthplace, Benares, where he began his mission, and Kasinagara, where he died, were

much frequented, especially by Chinese converts. The narratives of some of these, Fa Hian, Hwai-Seng, and Sung-yun, and Hwen-T'sang, the most noteworthy of them all (see vol. xii. p. 418), who came to visit the holy places and to collect the sacred books, are still extant.

PILGRIMAGE

In China pilgrimages are made to several of the MOTE Chinese

sacred spots both by Buddhists and Confucianists, Wutai- shan in Shan-si is the chief resort of Buddhist pilgrims, and Tai-shan, the mountain sacred to Confucius, that of Confucianists (Williamson, Journeys in North China). In

Japan both the older Shinté nature-worship and the newer Japanes

Buddhist creed have their several sanctuaries and pilgrim- ages. The principal Shinté pilgrimages are those to Isé in the department of Watarai, and to the sacred mountain Fuji. There are two temples at Isé, ranking in sanctity first of all Shinté shrines, and the special seat of the worship of Ten-shéké-daigin, the Sun-Goddess, from whom the Mikado is held to descend. Two great festivals are held yearly at Isé, in the sixth and twelfth months, and are known as O-barai no matsuri, " great purification feast," being held to effect the purifying of the whole nation from the sins of the previous half year. Tickets inscribed with the names of the gods of Isé, and especially that of the Sun-Goddess, are issued at the temples and their agencies (being formerly sold by hawkers correspond- ing to the pardoners of medieval Europe), and are care- fully preserved in the domestic shrine of J apanese houses, being supposed to avert all peril for six months, but requiring renewal at the end of that period. The pilgrims to Isé number many thousands yearly, and are known as they return by bundles of charms wrapped in oiled paper, and hanging from the neck by a string. The pilgrimage to Fuji takes place in summer, and the pilgrims go clad in white, and carrying bells. They ascend the mountain so as to reach the summit before sunrise, when they turn to the east, clap their hands, and chant a hymn to the Sun-Goddess. There are also many local Shinté pilgrimages of less note. Buddhism in J apan is broken up into several sects, having each of them their own pil- grimages ; but the most frequented are those of the god Fudo at Narita and the sacred mountain of Oyama, each some 30 miles

distant from Tokio. These both belong to the Shingou sect, the earliest introduced into J apan. The Hokke or Nichiren sect make pilgrimages to the monastery of Ikegami near Tokio, and to that at Mount Minobu, about 100 miles to the west, between which two shrines the relics of the founder are divided. Ninety miles north of Tokio are the shrines of Mount Nikko, also a great Buddhist pil- grimage, where the shoguns are buried, and where the founder of the Tokugawa dynasty is worshipped under the name of Gongen.

So much will suffice to have said concerning the various heathen pilgrimages, and we may now consider those of the Hebrew religion and its two derivatives, Islam and Christianity.

The legislation of the Pentateuch is precise in making Jewish ;

resort to one central shrine a positive and fundamental pre- cept, binding on the whole nation, obviously with the double object of cementing national unity and of guarding against the erection of local sanctuaries, which were liable to be diverted to idolatrous cults (see Punrareucn). Under the judges and the kings we find many traces of pilgrim- age, not only to the sanctuary of the ark at Shiloh, and afterwards to Jerusalem, but to local high places, such as Ophrah, Mizpeh, Dan, Bethel, and Beersheba. In truth, it is not till the post-exilic period that the supremacy of one national sanctuary is assured (though a pilgrimage even after the destruction of the temple is recorded in Jeremiah xli. 5, showing that the mere site was held sacred), for the local devotion of the high places resisted all the efforts of the reforming party under Hezekiah and Josiah even in the kingdom of Judah itself. Since the final overthrow of the Jewish polity by Titus and Hadrian, no effort has been made either to establish a centre of sacrificial worship anywhere outside Palestine (as in thie

curious episode of the temple of Heliopolis in Egypt), or to revive it in Jerusalem itself, where, even now, the syna- gogues and colleges of the Sephardim and Ashkenazim are entirely separate and independent organizations, and show no tendency to coalesce into the nucleus of a national system. Hence, as the political and religious motives for the pilgrimage to Jerusalem have both dropped into abey- ance, the custom

itself is no longer regarded as binding, and, though it is not obsolete, inasmuch as a visit to the Holy City is considered a meritorious act, yet it has now, like the pilgrimage to Hebron, more of an emotional and historical character than a ceremonial one, so that it is not in the strict sense a pilgrimage any longer.

Although the Mohammedan pilgrimages are much later . in chronological order than the Christian ones, it will be more convenient to consider them briefly first. They con- sist, then, of two main classes, which may be distinguished conveniently by Latin theological terms, as those of "obligation" and those of "devotion." There is properly only one Moslem pilgrimage of obligation, that to Mecca, which still often draws an annual contingent of from 70,000 to 80,000 pilgrims (see Mecca). It is in truth a pagan survival which proved too powerful for extirpation by Mohammed. The Kaaba had been constituted the national sanctuary of Arabia about 100 B.c., and contained, besides the famous Black Stone, some three hundred and

sixty idols of various Bedouin tribes, united in one pan- |

theon, exactly as with the Capitol of Rome ; and, though it was possible to sweep the idols out of the Kaaba, it was not so easy to deconsecrate the spot, but far more convenient to give it a new sanction.

The Mohammedan pilgrimages of devotion are very numerous, and are chiefly connected with the saint-worship which has overlaid and obscured the original strict mono- theism of Islam. Chief amongst the sacred shrines of this second class stands the tomb of Mohammed at Meprina (q. v.), but, holy as it is considered, and meri- torious as a visit to it is accounted, it is in no sense bind- ing on a Moslem's conscience, and only about one-third of the Meccan pilgrims proceed thither. Other sanctuaries abound in all Mohammedan countries, of which a few, like Abraham's tomb at Hebron, are honoured by all Mohammedan sects, while others are peculiar to the Sun- nites and Shiites respectively, and others again, such as Kairwan in Tunis, and Wazan in Morocco, and still more the tombs and oratories of merely local saints or welts, found in almost every Moslem town or village, are restricted to a comparatively small body of votaries. The most famous, after the Pan-Islamic pilgrimages, are the great Shiite sanctuaries, of which

there are three :—Meshed in Khorasan, with the tomb and mosque of Imam Riza, said to attract almost as many yearly pilgrims as Mecca itself; Khoum in Irak Ajemi, where Fatima, wife of Imam Riza, is buried ; and, yet more sacred than either, Kerbela in Mesopotamia, in the Turkish dominions, about 28 miles north-west of the ruins of Babylon, where is the tomb and mosque of Imam Hosein, grandson of Mohammed (see KerseLA and MoHAMMEDANISM). ‘There is a passion-play performed there at the yearly commemoration, which draws enormous crowds from all parts of Persia and other Shiite regions, and the title hAjj attaches to all who make the journey. Some idea of the multiplicity of minor pilgrimages amongst Moslems may be gathered from the fact that in the city of Damascus alone there are one hundred and ninety-four places of resort by pilgrims, and fourteen more in the environs. A great reaction against the whole system, inclusive of the invocation of saints, took place under the Wahhabis in the last century, in the course of which countless welis or tombs of Moslem saints were destroyed, including even those of Hosein and

Mohammed himself ; but, on the overthrow of the fanatics by Mohammed Ali, the customary practices were restored, and have continued in full vigour ever since.

Christian pilgrimages were at first limited to Jerusalem Christian.

and its immediate neighbourhood, including Bethlehem. It is probable enough that the local church of Jerusalem regarded the various scenes of the gospel history, and notably of the Passion and Resurrection, with special reverence, and would guide the steps of visitors to the most sacred localities while the city yet stood, and point out the sites, as nearly as possible, after the work of Titus had been completed by Hadrian, and a vast mound of earth, on whose summit rose a temple of Venus, had been raised over the Holy Sepulchre. But this is matter of conjecture rather than of knowledge. There is no actual proof of very early Christian pilgrimage to the holy places, though the belief was already current at the close of the 4th century that the custom had prevailed unbroken from apostolic times, as is distinctly asserted by Paula and Eustochium in their letter to Marcella (Epist. Hieronym., xvii.), written in 386, wherein they state also that of which they

are more trustworthy witnesses, that pilgrims then flocked from Armenia, Persia, India, Ethiopia, and even Gaul and Britain, to visit the cradle of Christianity. But in point of fact the earliest pilgrim of whose visit as a religious act we have definite proof is Alexander, a Cappadocian bishop, who came to Jerusalem in consequence of a dream (212), and was elected coadjutor to Narcissus, then bishop of the diocese (Euseb., #. H., vi. 11). Origen, who was a friend of Alexander, is another early example, but his own words (Comm. in Evang. Joann., vi. § 24) imply that he came rather in the modern spirit of devout scholarly inquiry than as a pilgrim in the strict sense. He paid a short visit in 216, and returned in 231, to settle down for a time at Czesarea, where he opened a school of theology in 238. It is not till after the pilgrimage of the empress Helena (the first quite unquestionable event of the kind) about 326 or 328, that the fashion set in, accompanied with the desire to bring back some relic, either inherently sacred or at least hallowed by contact with certain venerated spots. That the temper of the time was not a very critical one is sufficiently proved by the casual mention by St Chrysostom of a pilgrimage as commonly practised to Arabia in order to see the dunghill on which Job sat, and that by visitors from the very ends of the earth (Hom. v. de Status).

But another kind of pilgrimage, destined to be more powerful than that to Jerusalem, began to be popular nearly at the same time, that to the tombs of distinguished martyrs or confessors. In the present day, the passionate admiration of the Christians of the 3d, 4th, and 5th centuries for the martyrs as a class seems somewhat dis- proportioned to the part they actually played in the history of Christianity, which was more effectually propagated and maintained by the eminent teachers and divines of the ancient church. But the truth is that they supplied just the element of enthusiasm which was needed to sus- tain the courage and endurance of the humbler Christian laity under the stress of recurrent persecutions ; and, when peace was finally secured under Constantine the Great, there were so many families which counted one or more martyrs amongst their kindred, and viewed such kinship as a patent of nobility, that everything favoured the rapid development of pilgrimages to places in which so many had a direct personal, as well as a corporate religious, interest. So much did the notion begin to prevail that pilgrimage was almost a necessity of religion, and that

prayer could be heard more assuredly in particular places, that warnings against error of the kind were uttered by

teachers whose own acts had helped to propagate the opinion in question. Thus, only a few years after the letter above cited, urging Marcella to migrate to Bethlehem, St Jerome writes to Paulinus (393) pointing out that many of the most celebrated saints and ascetics had never visited the holy places, that heaven is just as open from Britain as from Jerusalem, and that the circumstances of life in Jerusalem itself were far from helpful to devotion. But his own abode at Bethlehem, the celebrity of the religious houses he founded and directed there, and the unlike tenor of other letters he wrote, entirely counteracted this advice. St Chrysostom at one time speaks of the need- lessness of pilgrimage (/Zom. i. in Philem. ; Lom. iii. and iv. ad pop. Antioch.), and at another expresses his own wish to see the relics of St Paul at Rome (Hom. xxxii. in Rom. il, ul; Lom. viii. in Hph. ii.). So, too, St Augustine con- tributed powerfully to promote pilgrimages to the shrines of saints, by sending in 404 two clerical disputants to the shrine of St Felix of Nola, in the hope that some miracle would be worked there to decide the matter, though no such signs had been granted at the grave of any African saint (Zp. Ixxviii.). And in another place he attests the working of many miracles by the relics of the protomartyr St Stephen in various African towns where portions of them had been shrined (De Civ. Det, xxii. 8). Nevertheless, in yet a third place he appears to con- demn this very temper as mere superstition, stating that, while he knows many professing Christians who are worshippers of tombs and pictures, “the church condemns them, and daily strives to correct them as evil children” (De Mor. Eccl. Cath., xxxiv. 75, 76).

Here, too, example proved stronger than precept, and the only unqualified opposition to the popular tendency which issued from any quite unimpeachable source (for Vigilantius and Jovinian cannot be fairly cited) is the remarkable letter of St Gregory of Nyssa to a friend, on the subject of pilgrimages to Jerusalem, the heads of which are as under:—there is no divine precept for the usage ; the moral dangers of the journey, from bad companions and from the quality of the inns, are great, especially to

women, and above all to nuns; the immorality and irreligion of Jerusalem itself are gross and notorious. True, he had gone thither himself, but it was on public ecclesiastical business, connected with the Arabian Church, and he had travelled in a public vehicle with a company of monks. He did not find his faith stimulated or improved in any way by a sight of the scenes of the gospel history, and he recommends others to stay at home, assuring them that no spiritual benefit is lost by so doing, and no spiritual gain acquired by visiting the most sacred places without inward amendment (Epist. ii.). The authenticity of this epistle has been challenged, but on no sufficient grounds.

What makes the devotion to the tombs of saints such a powerful factor in ecclesiastical history is that, after the Holy Sepulchre itself, no grave had such a hold on Christian imagination as that where the bodies of the two chief apostles, St Peter and St Paul, were held to rest in Rome. And consequently, as the division of the empire lessened the intercourse between East and West, as the decay of the old lines of communication made travelling more difficult, and as the advance of Mohammedanism in Syria and Palestine made it more dangerous also in that direction, Rome gradually supplanted Jerusalem toa great degree in the West as the goal of pilgrimage, and the enthusiasm of the visitors did much to consolidate the papal monarchy over Latin Christendom. So markedly did this new influence prevail that it has left its trace in more than one European language. The Low Latin romeruus, romapeta for a pilgrim anywhither, romerta, romi-

petagium for the actual pilgrimage, the obsolete French

| licence of transit from the king of France.

romieu, romipete, romvage, the still current Spanish romero, romeria, and Portuguese romeiro, romaria, the Italian forename Homeo, and the English romare (Piers Plowman) attest the celebrity and popularity of this pilgrimage, into which soon entered such further ideas as the desirability of confessing sins to the pope personally and obtaining absolution from him, the reference of private cases to papal arbitration on the part of bishops and

other ecclesiastical judges, and the injunction of the journey as in itself a penance, a notion prevalent in the Gallic churches as early as the close of the 5th century (Cesar. Arelat., Hom. ili.). Nowhere was the pilgrimage to Rome more popular than in Saxon England, and amongst the crowds of penitents who made the journey were four kings, Ceadwalla, Ine, Coinred, and Offa, all of whom died in Rome, two of them as monks (Beda, H.L,, v. 7, 19). There were not wanting efforts to check the movement. Apart from the theological objections raised by Claudius of Turin, there is a letter extant from Boniface of Mainz, an Englishman born, to Cuthbert, archbishop of Canterbury, written about 743, begging him to get a canon enacted to forbid the pilgrimage to Rome, especially to nuns, on the ground of the moral perils of the road, stating that no city of France, Lombardy, or Italy was without Englishwomen leading depraved lives, whose virtue had fallen during pilgrimage. And the council of Chalons, in 813, enacted a canon to check pilgrimages both to Rome and to the shrine of St Martin at Tours (then the most famous sanctuary in France), on the ground of serious abuses on the part of both clergy and laity; and the council of Seligenstadt made a like effort in 1022. But even the robber barons who looked on pilgrims as their natural prey could not arrest the movement (which was specially stimulated, as we learn from Radulphus Glaber, in 999 and 1000 by the belief that the end of the world was at hand), and the Roman pilgrimage reached its height in the Middle Ages through the institution of the Jubilee, or plenary indulgence to pilgrims, by Boniface VIII. in 1300, when 200,000 are said to have availed themselves of it, and smaller but still considerable numbers on its various repetitions at irregular intervals since. The pilgrimage to Jerusalem received fresh stimulus in the 9th century by the first occurrence of the alleged miracle of the heavenly fire on Easter Eve at the Holy Sepulchre, and continued to be frequented till checked by the fanaticism of the caliph Hakem-Biamrillah about 1018, and more severely and permanently by the Seljukian Turks on their conquest of Syria, which occasioned those armed pilgrimages, the crusades, to whose history this branch of the subject thenceforward belongs. Meanwhile, a third class of sanctu- aries had been steadily coming into notice and popularity, consisting neither of the seats of great historical events nor of the ascertained resting-places of eminent saints. These were the purely legendary shrines, the sites of some alleged vision, of the supernatural discovery of hidden relics, or of the presence of a wonder-working image or picture. Oneof the earliest and

most famous of these was that of Compostella, where the relics of St James the Great were said to be discovered in 816, and, after being again hidden for many centuries, to have been discovered afresh in 1884. This was one of those most frequented by Eng- lish pilgrims, no fewer than 2460 licences being granted for the journey in the one year 1434 (Rymer, Med., xi.).!

1 This concourse of English pilgrims was soon looked on in France as politically dangerous, so that in the 14th century, when Pedro the Cruel was dethroned by Henry of Trastamara, the latter was compelled by his allies to refuse entrance into Spain to all pilgrims who had not This kind of jealousy

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Another, which became the Bethlehem of the West, as_

Rome had become its Jerusalem, was Loreto, where, ever since 1295, the Santa Casa, declared to be the home of the Holy Family, miraculously transported from Nazareth, has been frequented by pilgrims till very recent times, when its popularity has waned. Other famous shrines, some few of which even still attract yearly crowds of pilgrims, are Einsiedeln in Switzerland; Assisi, Oropa, Varese and Vicovaro in Italy; Monserrat and Guadalupe in Spain; Mariazell in Austria; Oetting and Eberhards- clausen in Germany; Walsingham; Becket’s shrine at Canterbury, Peterborough, St Davids, and Holywell in England and Wales; St Andrews in Scotland ; Chartres, ‘Notre Dame de Liesse, Notre Dame de Rocamadour, and Notre Dame des Victoires, with Ste Anne d’Auray in Britanny, in France; and Hal in Belgium. Devotion to these shrines was encouraged and developed by copious in- dulgences annexed to them; but this system in the long run became adverse to pilgrimages, because exactly the same privileges were annexed at a later time to acts much more easy of performance. Thus, the

wearers of the cord of St Francis, every time of reciting certain brief prayers, acquire all the indulgences attached to the holy places of Palestine, Rome, Assisi, and so forth, and have naturally little induce- ment to perform toilsome and costly journeys thither.

There is a further small class of pilgrimages, differing from all others in being neither permanent nor yearly, but periodical at various long intervals. They are usually connected with the exposition of the principal relic or relics in some important church, an event which rarely occurs. Such are the pilgrimages of Cologne, to the shrine of the Three Kings, and: that of Treves, where the alleged seam- less coat of Christ has been displayed for popular devotion, and has been visited by vast crowds of pilgrims.

Pilgrims in the Middle Ages were known by a peculiar garb and various badges, the hood and cape, the staff and scrip and water-bottle, and the low-crowned hat, turned up in front, and fastened with strings, being common to all, while the palm specially marked a pilgrim from the Holy Land ; a shell, one from Compostella; a bottle or bell, one from Canterbury, and so forth. They had many privileges and advantages. They were exempt from toll, their persons were inviolable, and any injury done to them incurred the penalty of excommunication ; they were entitled to shelter, fire, and water in all convents on their road, and the needier ones to food in addition ; and there were resting-stations erected for them on all the great lines of travel, sustained cometimes by voluntary offerings, and sometimes by public mmposts ; while in Rome, above all, institutions for their reception and relief were established early, and are still in active operation.! Nevertheless they declined in repute, not only by reason of the feigned devotees who joined them for purposes of vagrancy and mendicancy, and even from worse motives, but because many notorious criminals were customarily sent on pilgrimage as a punishment, with no care to isolate them from their innocent companions. The general charge of moral deterioration as a result of pil- grimage, which recurs from the fourth century onwards, eciaally brought by Langland in respect of truthful-

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“Pilgrims and palmeres plighten hem togidere, For to seken seint Jame and seintes at Rome. They wenten forth in hire wey, with many wise tales, And

hadden leve to lyen all hire lif after.”

—(Vision of Piers Plowman, pass. i. line 82). po very long, for there are edicts of Louis XIV. and XV. forbid- Ss pilgrimage to French subjects without the written per- — of their bishop, and the counter-signature of a state official,

der pain of the galleys for life.. They bear date 1671, 1686, and 1738. co for more details see Mr Scudamore’s articles, “ Holy Places” and Pilgrimages,” in Smith’s Dictionary of Christian Antiquities.

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Hence pilgrimages were attacked with the weapons of ridicule, and the most celebrated satires upon them are the chapter in Reineke Fuchs, describing Reynard’s adventures as a pilgrim, and the yet wittier squib of Erasmus, Pere- grinatio religionis ergo, in which he gives a sarcastic account of the pilgrimage to Walsingham, which had much to do with destroying the prestige of not only that particular one, but most others also. The French Revolution all but completed the work of the Reformation in causing pil- grimages to decline seriously, where they were not entirely: abolished, in the West, though they were still able to main- tain their ground in retired and unchanging places such as Britanny, various places in central Italy, and in Ireland, where the severely penitential pilgrimages of Lough Finn, Lough Dearg, and Croagh Patrick are not yet obsolete. There was a remarkable recrudescence of the spirit of pil- grimage under the pontificate of Pius IX., notably to the new sanctuaries of La Salette and Lourdes in France, which reached its height about 1872-73, but has shown signs of subsiding again since.

In the Eastern Church, pilgrimages have not for many centuries formed so important a part of popular religion as in Latin Christendom, and the number of frequented shrines is very small. In the Greek Church properly so called, Mount Athos, with its numerous monasteries, where the great yearly gathering is on the feast of the Trans- figuration, ranks next to the visit to the Jordan (Tozer, Highlands of Turkey, i. 103). After Mount Athos comes a shrine in the island of Tenos, where, in the cathedral church of the Panagia Evangelistria, is preserved an icon of the Madonna, alleged to be

wonder-working, and said to have been discovered by means of a dream in 1824; the annual concourse of pilgrims twice a year, on the feasts of the Annunciation and the Assumption, is very great. Three alleged pictures of the Blessed Virgin by St Luke—at Megas- pelion, at Sumelas in the mountains behind Trebizond, and

‘at Stiri in Mount Helicon—are also much visited. Etch-

miadzin is the chief Armenian pilgrimage, besides which are those of Kaisariyeh and Mush (Tozer, 7’urkish Armenia, pp. 161, 271). And finally, the chief Russian pilgrimages are to the Petcherskoilavra at Kieff (said to be visited by 200,000 pilgrims yearly), the Solovetsk monastery near Archangel, and the Troitsa, close to Moscow, besides many more locally popular shrines. (R. F. L.)

PILLORY. This was a mode of punishment by public exposure of the offender on a platform or scaffold long used in most countries of Europe, originating prob- ably with the Anglo-Saxons, one of whose methods of punishment as described by Strutt is nearly identical with the instrument which eventually became known as the pillory. The etymology is not quite clearly made out. It is most probably connected with pillar, Fr. pilier, M. H. German Pfilaere, but there are forms with an initial s (Prov. espitlori, Low Lat. spiloriwm) which this derivation does not explain. The more usual French term is not pilori but le carcan. The Germans have Preller. Leals-fang or halsfang (Anglo-Saxon for a catching of the neck) was the old English name. The word was also sometimes applied to the pecuniary mulct paid in commutation of the punishment. No punishment has been inflicted in so many different ways as that of the pillory. Sometimes the machine was constructed so that several criminals might be pilloried at the same time, but it was commonly capable of holding only one. Douce (Zilustrations of Shakespeare) gives six representations of distinct varieties of this instrument. In Griffiths (Chron. of Newgate) and in a learned and exhaustive account of the pillory by Jewitt (Reliquary, April 1861), examples will also be found, and notably of the pillory for women, which differed in form from that in use for male offenders. It would

appear that it had not always been customary to sub- ject women to this form of punishment; for them the thew or the tumbrel, which latter was

probably the same as the ducking or cucking stool often spoken of in the early English laws in conjunction with the pillory, was reserved. ‘These varieties are all reducible, however, to the simplest form of the pillory as ordinarily known, which consisted of a wooden post and frame fixed on a platform raised several feet from the ground, behind which the culprit stood, his head and his hands being thrust through holes in the frame so as to be exposed in front of it. This frame in the more complicated forms of the instrument consisted of a perforated iron circle or carcan (hence the French name), which secured the heads and hands of several persons at the same time.

In the statutes of Edward I. it is enacted that every pillory or stretch-neck should be made of convenient strength so that execution might be done on offenders without peril of their bodies. It was customary to shave the heads wholly or partially and the beards of men, and to cut off the hair and even in extreme cases to shave the heads of female culprits. Some of the offences punished in England by the pillory will be found enumerated in the statute 51 Hen. III. c. 6 (1266), comprehending chiefly indictable offences not amounting to felony (commonly called misdemeanours), such as forestalling and regrating, using deceitful weights and measures, perjury or suborna- tion of perjury, libel, seditious writings, &c. ‘Later on, the punishment of the pillory was ordained for courtesans, common scolds, and brawlers and other like delinquents both male and female, and in the later years of its exist- ence, notably during the 17th and 18th centuries, it was much resorted to as a punishment for political offenders, who on some occasions experienced the roughest treatment at the hands of the mob, ill-usage resulting in some instances on record even in death. The intention of setting a criminal in the pillory was that he should become infamous and known as such afterwards by the spectators. Examples have not been wanting, however, in which much sympathy has been both felt and expressed by the populace for the individual subjected to this punishment. The duration of the punishment was usually assigned at the discretion of the judge who passed the sentence, though sometimes it was fixed by law. The form of the judgment was that the defendant should “be set zm and upon the pillory”; he was consequently said to stand in the pillory, not at it.

The pillory was abolished in Britain, so far as related to all offences save perjury and subornation, in 1816 (56 Geo. ITI. c. 138), and finally altogether by statute 7 Will. IV. and 1 Vict. c. 23 in 1837. In the former Act power had been reserved to the court to pass sentence of fine or imprisonment or both in lieu of the pillory. The punish- ment was done away with in France in 1832 upon the revision of the penal code, and has now indeed been with- drawn from most of the modern systems of penal law.

PILOT. The English Merchant Shipping Act of 1854 (17 & 18 Vict. c. 104) defines a pilot as being a person duly licensed by any pilotage authority to conduct ships to which he does not belong as one of the crew. Pilots are in fact taken on board to superintend the steering of the vessel, where the navigation is difficult and dangerous, in consequence of their special knowledge of particular waters; and it is to this class alone that the term now applies, whereas in early times the pilot was the steersman, or the individual who conducted the navigation of a ship across the ocean and out of sight of land. The word seems to be of Dutch origin, and to mean primarily a person who conducts a ship by the sounding line (perllood). Cowell (Law Dict.), describing lodemanage, speaks of it as

the hire of a pilot for conducting a vessel from one place to another,—a lodesman (Ang. Sax. ldéd-man, a leader being a pilot for ~~harbour and river duty. During the period of his charge the whole responsibility of the safe conduct of the vessel devolves upon the pilot. Most systems of maritime law have made the employment of pilots compulsory, though this does not usually apply to ships of war. One effect of neglect or refusal on the part of the master of a ship to take a pilot is to discharge the insurers from their liability.1 Excepting under extraordin~~ ary circumstances (such as where it is evident that he is acting rashly or is intoxicated, or is palpably incompetent) a master would not be justified in interfering with the pilot in his proper vocation. In England, societies or corporations have long been established for the appoint ment and control of pilots in particular localities ; and of these the Trinity House, London, owing to the number of the pilots under its control, and the large extent of its jurisdiction, may be deemed the

principal. The laws re lating to pilotage were consolidated by 48 Geo. III. «. 104 (1808), which was amended by 6 Geo. IV. c. 125 (1825) ; further regulations were made by 16 & 17 Vict. c. 129 (1853), which incorporated the Cinque Ports with the Trinity House pilots; and all existing regulations on the subject were embodied in the Merchant Shipping Act

17 & 18 Vict. c. 104 (1854), already referred to, from ~

which pilotage authorities within the United Kingdom derive their jurisdiction, and which regulates their powers, the licensing of pilots and their rights, privileges, liabili- ties, and remuneration (Maude and Pollock, Law of Mer. chant Shipping, 1861).

The laws of pilotage in the United States are regulated by the individual States according to the Acts of Congress.

PILOT-FISH (Naucrates ductor), a pelagic fish of the family of Horse-Mackerels, well known to sailors from its peculiar habit of keeping company with ships and large fishes, especially sharks. It occurs in all tropical and sub-tropical seas, and is common in the Mediterranean, but becomes scarcer in higher latitudes. In summer pilots will follow ships as far north as the south coast of Eng land into port, where they are generally speedily caught. This habit was known to the ancients, who describe the

Pilot fish,

Pompilus as a fish which points out the way to dubious or embarrassed sailors, and by its sudden disappearance indi- cates to them the vicinity of land; the ancient seamen of the Mediterranean regarded it therefore as a sacred fish. That the pilot follows sharks is an observation of much later date, which first appears in works of travel of the 17th century, the writers asserting that the shark never seizes the pilot-fish, and that the latter is of great use to its big companion in conducting it and showing it the way to its food. It is, however, extremely doubtful whether the pilot’s connexion with a shark serves a more special purpose than its temporary attachment to a ship. It accompanies both on account of the supply of food which it derives from them, picking up the crustaceans, cirripeds,

? In a measure before parliament in 1884, but not passed, it was contemplated to wholly abolish compulsory pilotage, releasing owners

or masters of ships not employing pilots from all pilotage dues or rates and from any penalty for not employing a pilot.

PItIL—

or other marine animals swarming about the ship's bottom | or parasitic on the shark, offal thrown overboard, or smaller pieces of flesh which are left unnoticed by the shark when it tears its prey. The pilot, therefore, stands _ to both in the relation of a so-called "commensal," like the Echeneis or sucking-fish, whose habits are in some respects identical with those of the pilot, and which is frequently found associated with it. All observers, however, agree that neither the pilot nor the sucker is ever attacked by the shark. The pilot attains to a length of about 12 inches. In the shape of its body it resembles a mackerel, but is rather shorter, especially in the head, and covered with small scales. A sharp keel runs along the middle of each side of the tail. The first dorsal fin consists of a few short spines not connected by a membrane; the second | dorsal and the anal are composed of numerous rays. The — teeth, which occupy the jaws, vomer, and palatine bones, | are all small, in villiform bands. The coloration of the pilot renders it conspicuous at a distance; on a bluish ground- | colour from five to seven dark-blue or violet cross-bands traverse the body from the back to the belly. The pilot-fish spawns in the open sea, and its fry is constantly caught in the tow-net. But young pilot-fish differ con- siderably from the adult, having the spines of the first dorsal connected by a membrane, and some bones of the head armed with projecting spines. These little fishes were therefore long considered to be a distinct genus, Nauclerus.

PILPAY. See Brprat, vol. iii. p. 666.

PILSEN, the second town of Bohemia, lies at the con- fluence of the Radbusa and the Mies, 50 miles to the south-west of Prague. It consists of the town proper, which is regularly built and surrounded with promeuades on the site of the old ramparts, and of three suburbs. The most prominent buildings are the Gothic church of St Bartholomew, said to date from 1292; the Renaissance town-house, containing au interesting armoury; the new

real school; and the German and Bohemian theatres. The staple article of manufacture and commerce is beer, of which about 6,000,000 gallons are brewed here annu- ally. Other industrial products are machinery, enamelled tinware, leather, alum, paper, earthenware, stoves, and spirits, while a tolerably brisk trade is carried on in wool, feathers, cattle, and horses. In the neighbourhood are several coal-pits, iron-works, and glass-works, as well as large deposits of kaolin. The four annual fairs have lost much of their former importance. The population in 1280 was 38,883, consisting of Germans and Czechs in nearly equal proportions.

Pilsen first appears in history in 976, as the scene of a battle between Otho I. and Henry V., duke of Bavaria, and it became a. | town in 1272. During the Hussite wars it resisted several sieges, | but it was taken by Mansfeld in 1618, Wallenstein fixed his headquarters at Pilsen in 1633-34; and it was the principal scene of the alleged conspiracy which cost him his life. The first printing press in Bohemia was sct up at Pilsen in 1468,

PIMENTO, also called ALLsPice (from a supposed com- bination of various flavours) and Jamaica Prppsr, is the dried immature fruit of Hugenia Pimenta or Pimenta offi- cmalis, an evergreen tree about 30 feet high belonging to the natural order Myrtacex. It is indigenous in the West — India Islands, growing on limestone hills near the sea. | The spice derives its name from prmeenta, the Spanish word for pepper, which was given to it by the early explorers of the New World from its resemblance to Peppercorns. The allspice of commerce is furnished wholly i — of Jamaica ; and all attempts to cultivate hae ie . it is not found growing spontaneously . “ i failed. The so-called Pimento walks or | . ees ations from which the pimento is collected

y cutting down other growth upon land where

the tree grows naturally, and thus allowing it to multiply freely. The berries are gathered in July and August,

when of full size, but still unripe,—the small branches

bearing fruit being broken off and dried in the sun and

air for some days, when the stalks arc removed and the

berrics are ready for packing. These owe their aromatic properties to an essential oil, of which they yield on dis- tillation from 3 to 43 per cent. This oil has a specific gravity of 1:037, deflects the ray of polarized light 2° to the left when examined in a column of 50 millimetres, and has substantially the same composition as oil of cloves, although differing in flavour. The berries also contain a tannin (giving a black colour with ferric salts), starch, and a minute quantity of an alkaloid which, according to Dragendorff, has somewhat the odour of conia. The chief use of pimento is as a spice. The oil and distilled water are used to a limited extent in medicine

to disguise the taste of nauseous drugs, and the oil is

also used in perfuming soaps. The yield of some trees is said to reach as much as 150 tb of fresh or 112 lb of dried berries. The highest export reached of late years was 6,857,830 Ib in 1870-71, valued at £28,574: In 1877-78 it was 6,195,109 tb. About two-thirds of the produce goes to England, and one-third to the United States. The value in the London market is about 4d. to 6d. per ib.

The fruit of an allied specics, Pimenta acris, Wight, distinguished by the calyx being crowned with tecth, is sometimes met with in commerce. The bay rum so much used asa toilet article in the United States is a tincture flavoured with the oil of the fruit and leaves of P. acris, which is commonly known as the bayberry tree.

PIN. A pin isa small spike, usually of metal, with a bulbed head, or some other arrangement for preventing the spike passing entirely through the cloth or other material it is used for fastening together. In one form or another pins are of the highest antiquity, and it may be assumed that their use is coeval with human dress of any kind, the earliest form doubtless being a natural thorn, such as is still often seen fastening the dresses of peasant women in upper Egypt. Pins of bronze, and bronze brooches in which the pin is the essential feature, are of common occurrence among the remains of the bronze age. Brooches and pins on which considerable artistic

ingenuity was lavished were universally used among the civilized nations of antiquity (see Broocn, vol. iv. p. 369). The ordinary domestic pin had become in the 15th century an

article of sufficient importance in England to warrant | legislative noticc, as in 1483 the importation of pins was

prohibited by statute. In 1540 Queen Catherine received pins from France, and again in 1543 an Act was passed providing that “no person shall put to sale any pinnes but only such as shall be double headed, and have the heads soldered fast to the shank of the pinnes, well smoothed, the shank well shapen, the points well and round filed, canted, and sharpened.” At that time pins of good quality were made of brass; but a large proportion of those against which the legislative enactment was directed were made of iron wire blanched and passed as brass pins. To a large extent the supply of pins in England was received from France till about 1626, in which year the manufacture was introduced into Glou- eestershire by John Tilsby. His business flourished so well that he soon gave employment to 1500 persons, and Stroud pins attained a high reputation. In 1636 the

_pinmakers of London formed a corporation, and the

manufacture was subsequently established at Bristol and

Birmingham, the latter town ultimately becoming tlre

principal centre of the industry. So early as 1775 the

attention of the enterprising colonists in Carolina was

drawn to the manufacture by the offer of prizes for the

first native-made pins and needles. At a later date several XIX. — 13

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pin-makinug machines were invented in the United States. During the war of 1812, when the price of pins rose enormously, the manufacture was actually started, but the industry was not fairly successful till about the year

1836. Previous to this an American, Mr Lemuel W. Wright of Massachusetts, had in 1824 secured in England a patent for a pin-making machine, which established the industry

on its present basis.

The old form of pin, which has become obsolete only within the memory of middle-aged persons, consisted of a shank with a separate head of fine wire twisted round and secured to it. The formation and attachment of this head were the principal points to which inven- tive ingenuity was dirccted. The old method of heading involved numerous operations, which had to be expeditiously accomplished, and, notwithstanding the cxpertness of the workers, the result was frequently unsatisfactory. ine wire for heads was first wound on a lathe round a spit the exact circumference of the pin shanks to be headed. 1u this way a long elastic spiral was produced which had next to be cut into heads, each consisting of two complete turns of the spiral. These heads were softened by annealing and made into a heap for the heading boy, whose duty was to thrust a number of shanks into the heap and Ict as many as might be fit themselves with heads, Such shanks as came out thus headed were passed to the header, who with a falling block and die arrangement compressed together shank and head of such a number as his die-block was fitted for. All the other operations of straightening the wire, cutting, pointing, &c., were separately performed, and these numer- ous details connected with the production of a common pin were seized on by Adam Smith as one of the most remarkable illustrations of the advantages of the division of labour.

The beautiful automatic machinery by which pins are now made of single pieces of wire is au inveution of the present century. In 1817 a communication was made at the Patent Office by Seth Hunt, describing a machine for making pins with “head, shaft, and point in one entire piece.” By this machine a suitable length of wire was cut off and held in a die till a globular head was formed on one end by compression, and the other end was pointed by the re- volution around it of a roughened steel wheel. This machine does not appear to have come into use; but in 1824 Wright patented the pin-making apparatus above referred to as the parent form of the machinery now employed. An extension for five years, from 1888, of

Wright’s patent, with certain additions and improvements, was secured by Henry Shuttleworth and Daniel Foote Tayler, and in the hands of Tayler’s firm in Birmingham the development of the inachine has principally take place. In a pin-making machine as now used wire of suitable gauge running off a reel is drawn in and straightened by passing between straightening pins or studs set in a table. When a pin length has entcred it is caught by lateral jaws, beyond which enough of the end projects to form a pin-head. ‘Against this end a steel punch advances and compresses the metal by a die arrangement into the form of ahead. The pin length is immediately cut off and the headed piece drops into a slit sulfi- ciently wide to pass the wire through but retain the head. The pins are consequently suspended by the head while their projecting points are held against a revolving file-cut steel roller, along the face of which they are carried by gravitation till they fall out at the extremity well-pointed pins. The pins are next purified by boiling in weak beer ; and, so cleaned, they are arranged in a copper pan in layers alternating with layers of grained tin, The contents of the pan are covered with water over which a quantity of argol ‘bitartrate of potash) is sprinkled, and after boiling for several hours the brass pins are coated with a thin deposit of tin, which gives them their silvery appearance. They are then washed in clean water and dried by revolving in a barrel, mixed with dry bran or fine sawdust, from which they are winnowed finished pins.

A large proportion of the pins sold are stuck into paper by an automatic machine uot less ingenious than the pin-making machine itself, Mourning pins are made of iron wire, finished by immers- ing in black japan and drying in a stove. A considerable variety of pins, including the ingeniously coiled, bent, and twisted nursery safety pin, ladies’ hair pins, &c., are also made by automatic machin- ery. The sizes of ordinary pins range from the 34-inch stout blanket pin down to the finest slender gilt pins used by entomolo- gists, 4500 of which weigh about an ounce. A few years ago it was estimated that in the United Kingdom there were made daily 50,000,000 pins, of which 37,000,000 were produced in Birmingham, and the weight of brass and iron wire then annually consumed was stated at 12754 tons, of which one-eighth part was iron wire. The annual value of the whole British trade was stated at £222,000. At the same time the consumption of wire in pin-making in the United States was estimated to be

from 350 to 500 tons per annum the value of the trade being £112,000. (J. PA.) :

PINDAR, the greatest lyric poet of ancient Greece whose work is represented by large remains, was born

about 522 B.c., being thus some thirty-four years younger than Simonides of Ceos. phantus ; his birthplace the village of Cynoscephale near Thebes in Bocotia. The traditions of his family, which claimed a proud descent, have left their impress on his poetry, and are not without importance for a correct estimate of: his relation to his contemporaries. The clan of the Aigeidee—tracing their line from the hero Aigeus —hbelonged to the “ Cadmean ” element of Thebes, 7.¢., to the elder nobility whose supposed date went back to the days of the founder Cadmus. A branch of the Theban Aaigeide had been settled in Achzean times at Amycle in the valley of the Eurotas (Pind. Isthm. vi. 14), and after

the Dorian conquest of the Peloponnesus had apparently

been adopted by the Spartans into one of the three Dorian tribes. The Spartan Aigeidee helped to colonize the island of Thera (Pyth. v. 68). Another branch of the race was settled at Cyrene in Africa; and Pindar tells how his /Egid clansmen at Thebes “ showed honour” to Cyrene as often as they kept the festival of the Carneia (Pyth. v. 75). Pindar is to be conceived, then, as standing within the circle of those families for whom the heroic myths were domestic records. He had a personal link with the memories which everywhere were most cherished by Dorians, no less than with those which appealed to men of “Cadmean” or of Achean stock. And the wide ramifications of the Aigeide throughout Hellas rendered it peculiarly fitting that a member of that illustrious clan should celebrate the glories of many cities in verse which was truly Panhellenic.

His father’s name was Dai-p

Pindar is said to have received his first lessons in flute- Life

playing from one Scopelinus at Thebes, and afterwards to have studied at Athens under the musicians Apollodorus (or Agathocles) and Lasus of Hermione. In his youth, as the story went, he was defeated in a poetical contest by the Theban Corinna—who, in reference to lis use of Theban mythology, is said to have advised him " to sow with the hand, not with the sack." There is an extant fragment in which Corinna reproves another Theban poetess, Myrto, "for that she, a woman, contended with Pindar" (drt Bava dodo" éBa Iuwddéporo mor @pw)—a senti- ment, it may be remarked, which does not well accord with the story of Corinna's own victory. The facts that stand out from these meagre traditions are that Pindar was precocious and laborious. Preparatory labour of a somewhat severe aud complex kind was, indeed, indispens able for the Greek lyric poet of that age. Lyric compost- tion demanded studies not only in metre but in musi¢, and in the adaptation of both to the intricate movenients of the choral dance (dpxnori«y). Several passages inl Pindar's extant odes glance at the long technical develop-

ment of Greek lyric poetry before his time, and at the –

various elements of art which the lyrist was required to temper into a harmonious whole (see, ¢.g., Ol. iii. 8, vi 91, ix. 1, xiv. 15, xiii. 18; Pyth. xii. 28, &c.). The earliest ode which can be dated (Pyth. x.) belongs to the twentieth year of Pindar's age (502 B.c.); the latest (Olymp. v.) to the seventieth (452 8.c.). He visited the court of Hiero at Syracuse ; Theron, the despot of Acragas, also entertained him ; and his travels perhaps included Cyrene. Tradition

notices the special closeness of his relations with Delphi: °

"He was greatly honoured by all the Greeks, because he was so beloved of Apollo that he even received a share of the offerings ; and at the sacrifices the priest would cry aloud that Pindar come in to the feast of the god."! He is said to have died at Argos, at the age of seventy-nine, in 443 B.C.

1 Thvddpou yévos, in ed, Ald.: ériphOn d€ opddpa bwd ardyrov TOV 'EAAhvwr 814 Td brdT0d'ArdédAAwvos obrw pirctoOat ws kad peptoa

Tv mpoodepopévov TE OG AauBdverv, kal Tov lepéa Boty ey Tals Ovotas Mivdapoy emt 1d Setmvov Tod Oeod.

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Among the Greeks of his own and later times, Pindar was pre-eminently distinguished for his piety towards the gods (cbaeBéoraros, auct. vit.). He tells us that, “near to the vestibule” of his honse (rap éudv rpdbupov, Pyth. iii. 77), choruses of maidens used to dance and sing by night in praise of the Mother of the Gods (Cybele) and Pan—deities peculiarly associated with the Phrygian music of the flute, in which other members of Pindar’s family besides the poet himself are said to have excelled. A statue and shrine of Cybele, which he dedicated at Thebes, were the work of the Theban artists, Aristomedes aud Socrates. He also dedicated at Thebes a statue to Hermes Agoraios, aud another, by Calamis, to Zeus Ammon. The latter god claimed his especial veneration because Cyrene, one of the homes of his Aigid ancestry, stood “where Zeus Ammon hath his seat,” 7.e., near the oasis and temple (Aids év “Appwvos GepebAois, Pyth. iv. 16). The author of one of the Greek lives of Pindar says that, “when Pausanias the king of the Lacedemonians was burning Thebes, some one wrote on Pindar’s house, ‘ Burn not the house of Pindar the poet; and thus it alone escaped destruction.” This incident, of which the occasion is not further defined, has been regarded as a later inven- tion! Better attested, at least, is the similar clemency of Alexander the Great, when he sacked Thebes one hundred

and eight years after the traditional date of Pindar’s death

(335 B.c.). He spared only (1) the Cadmeia, or citadel, of Thebes (thenceforth to be occupied by a Macedonian garrison); (2) the temples and holy places; and (3) Pindar’s house. While the inhabitants were sold into slavery, exception was made only of (1) priests and priestesses ; (2) persons who had been connected by private gevia with Philip or Alexander, or by public &evia with the Macedonians ; (3) Pindar’s descendants. It is probable enough, as Dio Chrysostom suggests (ii. 33, 25), that Alexander was partly moved by personal gratitude to a poet who had celebrated his ancestor Alexander I. of Macedon. But he must have been also, or chiefly, influ- enced by the sacredness which in the eyes of all Hellenes surrounded Pindar’s memory, not only as that of a great national poet, but also as that of

a man who had stood in a specially close relation to the gods, and, above all, to the Delphian Apollo.2 Upwards of six hundred years after Pindar's death, the traveller Pausanias saw an iron chair which was preserved among the most precious treasures of the temple in the sanctuary at Delphi. It was the chair, he was told, "in which Pindar used to sit, whenever he came to Delphi, and to chant those of his songs which pertain to Apollo."

_ During the second half of Pindar's life, Athens was rising to that supremacy in literature and art which was ' to prove more lasting than her political primacy. Pindar did not live to see the Parthenon, or to witness the mature triumphs of Sophocles; but he knew the sculpture of Calamis, and he may have known the masterpieces of Aschylus. It is interesting to note the feeling of this great Theban poet, who stands midway between Homeric epos and Athenian drama, towards the Athens of which Thebes was so often the bitterest foe, but with which he himself had so large a measure of spiritual kinship. A few words remain from a dithyramb in which he paid a glowing tribute to those "sons of Athens" who "laid the shining foundations of freedom" (mratdes "APavaiwv €Badovro

' Schaefer, Demosthenes und seine Zeit, iii. 119. It will be remarked that history requires us to modify the state- ment in Milton's famous lines:—

"The great Emathian conqueror bade spare The house of Pindarus, when temple and tower Went to the ground,"

Indeed, the point of the incident

depends much on the fact that the temples and Pindar's house were e :

lassed together for exemption.

gaevvav xpn7id édevbepias, fr. 77, Bergk, 4th ed.), while Athens itself is thus invoked :—@ rat Aurapat cat toorédavor Kat Gotdyuor, "EAAddos eperopa, KAewat "APGva, Sandviov mrodebpov. Isocrates, writing in 353 B.c., statcs that the phrase 'EdAados gpeccpa, "stay of Hellas," so greatly gratified the Athenians that they conferred on Pindar the high distinction of

zpogevia (t.e., appointed him honorary consul, as it were, for Athens at Thebes), besides present- ing him with a large sum of money (Antid. § 166). One of the letters of the pseudo-Aischines (Zp. iv.) gives an improbable turn to the story by saying that the Thebans had fined Pindar for his praise of Athens, and that the Athenians repaid him twice the sum,? The notice pre- served by Isocrates—less than one hundred years after Pindar's death—is good warrant for the belief that Pindar had received some exceptional honours from Athens. Pausanias saw a statue of Pindar at Athens, near the. temple of Ares (i. 8, 4). Besides the fragment just mentioned, several passages in Pindar's extant odes bespeak his love for Athens. Its name is almost always joined by him with some epithet of praise or reverence. In alluding to the great battles of the Persian wars, while he gives the glory of Plata to the Spartans, he assigns that of Salamis to the Athenians (Pyth. i. 75). In cele- brating the Pythian victory of the Athenian Megacles, he begins thus :—" Fairest of preludes is the renown of Athens for the mighty race of the Alemzonide. What home, or what house, could I call mine by a name that should sound more glorious for Hellas to hear?" Refer- ring to the fact that an A'ginetan victor in the games had been trained by an Athenian, he says— xpy 0 am 'Adavav réxtov' aOAntatcw eupev (Vem. v. 49); "meet it is that a shaper of athletes should come from Athens "—where, recollecting how often Pindar compares the poet's efforts to the athlete's, we may well believe that he was thinking of his own early training at Athens under Lasus of Hermione.

Pindar's versatility as a lyric poet is one of the characteristics remarked by Horace (Carm. iv. 2), and is proved by the fragments, though the poems which have come down entire represent only one class of compositions — the Lpinicia, or odes of victory, commemorating suc- cesses in the great games. The lyric types to which the fragments belong, though it cannot be assumed that the list is complete, are at least numerous and varied.

1. "Yuvo1, Hymns to deities—as to Zeus Ammon, to Persephone, to Fortune. The fragmentary tuvos entitled yBalors seems to have eclebrated the deities of Thebes. 2. Madéves, Pxans, expres- sing prayer or praise for the help of a protecting god, especially Apollo, Artemis, or Zeus. 8. A:ddpauBo:, Dithyrambs, odes of a latty and impassioned strain, sung by choruses in

honour of Dionysus (ep. Pind., Ol. xiii. 18, tal Aiwvicov wdbev etépavev atv Bonddta Xdpires 5:OvpduBw,—where Pindar alludes to the choral form given to the dithyramb, circ. 600 B.c., by Arion,— Bonddrns, “ox-driving,” perhaps meaning “winning an ox as prize”). 4. Wpocdd:a, Processional Songs, choral ehants for worshippers approaching a shrine. One was written by Pindar for the Delians, another for the Mginctans. 5. Map0éva, Choral Songs for Maidens. The referenee in Pind. Pyth, i. 77 to maidens worshipping Cybele and Pan near the poet’s house is illustrated by the faet that one of these Mapéma invoked “ Pan, lord of Areadia, attendant of the Great Mother, watcher of her awful shrine” (fr. 95, Bergk). 6. ‘Yropxjpara, Choral Dance- Songs, adapted to a lively movement, used from an early date in the eult of Apollo, and afterwards in that of other gods, especially Dionysus. ‘To this elass belongs one of the finest fragments (107), written for the Thebans in connexion with propitiatory rites after

_an eclipse of the sun, probably that of April 30, 463 B.c. 7.

Eyxduia, Songs of Praise (for men, while Suvo: were for gods), to be sung by a xa@uos, or festal eompany. In strictness éyedmuiov was the genus of whieh émvtxioy was a speeies ; but the latter is more conveniently treated as a distinet kind. Pindar wrote eneomia for Theron, despot of Acragas, and for Alexander J. (son

of Amyntas), king of Maeedon. 8. ZxddAra, Festal Songs. The

3 Compare Jebb, Attic Orators, vol. ii. p. 148.

Works.

Frag- ments.

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usual sense of oxddcoy is a drinking-song, taken up by one guest after another at a’ banquet. But Pindar’s oxéAca were choral and antistrophic. One was to be sung at Corinth by a chorus of the fepdSovAor attached to

the temple of Aphrodite Ourania, when a certain Xenophon offered sacrifice before going to compete at Olympia. Another brilliant fragment, for Theoxenus of j Tenedos, has an erotic character. 9. pfjvos, Dirges, to be sung with choral dance and the music of the flute, either at the burial of the dead or in commemorative rituals. Some of the most beautiful fragments belong to this class (129-133). One of the smaller fragments (187) —in memory of an Athenian who had been initiated into the Eleusinian mysteries (i3» xetva)—has been conjecturally referred to the pfvos which Pindar is said to have written (schol. Pyth. vii. 18) for Hippocrates, the grandfather of Pericles. A number of small fragments, which cannot be certainly classified, are usually given as éf ad#awy eidav, “of uncertain class.” On comparing the above list with Horace, Carm.iv. 2, it will be seen that he alludes to No. 3 (dithyrambos) ; to Nos. 1, 2, and 7 (sew deos regesve canit);

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mixing wine in a bowl, and many morc. (¢) Homely images, from common life, are not rare; as from account keeping, usury, sending merchandise over sea, the oKutahy or secret despatch, &c. And we have such homely pro- verbs as, “he hath his foot in this shoe,” @e., stands in this case (Ol. vi. 8). (jf) The natural order of words ina sentence is often boldly deranged, while, on the other hand, the syntax is seldom difficult. (g) Words not found except in Pindar are numerous, many of these being com- pounds which (like évapiuPporos, xarapvAdopoeww, ke.) suited the dactylic metres in their Pindaric combina- tions. Horace was right in speaking of Pindar’s “ nova verba,” though they were not confined to the “bold dithyrambs.”

2. The actual victory which gave occasion for the ode Treat.

. Lt pUv aptum Plorat),—as well as | . : : ; 3 he ae Ta eieies oe “Title ae aie ie Palma | 18 seldom treated at length or in detail,—which, indeed, meutot ceolestes). only exceptional incidents could justify. Pindar’s method”

The The Epinicia.—The émuixia (sc. pédy), or émwvixcot (sc. | is to take some heroic myth, or group of myths, i extaut Juvor), “Odes of Victory,”

form a collection of forty- connected with the victor’s city or family, and, after | odes. four odes, traditionally divided into four books, answering | a brief prelude, to enter on this, returning at the } to the four great festivals:— (1) “OAvpmuovixat (sc. tuvor): | close, as a rule, to the subject of the victor’s merit or good , fourteen odes for winners of the wild olive-wreath in the | fortune, and interspersing the whole with moral comment. , Olympian games, held at Olympia in honour of Zeus | Thus the fourth Pythian is for Arcesilas, king of Cyrene, , once in four years; (2) v@sovicar: twelve odes for win- | which was said to have been founded by men of Thera, | ners of the laurel-wreath in the Pythian games held at | descendants of one of Jason’s comrades. Using this link, ; Delphi in honour of Apollo, once in four years, the third | Pindar introduces his splendid narrative of the Argonauts. of each Olympiad; (3) Neweovixac: seven odes for winners | Many odes, again, contain shorter mythical episodes,—(as : of the pine-wreath in the Nemean games, held at Nemea, | the birth of Jamus (OV. vi), or the vision of Bellerophon , in honour of Zeus, once in two years, the second and | (Ol. xiii),—which form small pictures of masterly finish | fourth of each Olympiad; and (4) “IcOpuovixar: eleven | and beauty. Particular notice is due to the skill with | odes for winners of the parsley wreath in the Isthmian | which Pindar often manages the return from a mythical } games, held at the Isthmus of Corinth, in honour of | digression to his immediate theme. It is bold and swift, yet | Poseidon, once in two years, the first and third of each | is not felt as harshly abrupt—justifying his own phrase at i Olympiad. The Greck way of citing an ode is by the | one such turn, kai twa olpov toape Bpaxdv (Pyth. iv. 247). nomin. plur. followed by the numeral, eg., “the ninth | It has been thought that, in the parenthesis about the Olympian” is ’Odvpriovica 6’. The chronological range | Amazons’ shields (quibus Mos wnde deductus . . . quarere | of the collection (so far as ascertainable) is from 502 z.c. | déstulé, Carm. iv. 4, 17), Horace was imitating a Pindaric | (Pyth. x.) to 452 B.c. (Ol. v.). With respect to the native | transition ; if so, he has illustrated his own observation as places of the victors, the geographical distribution is as | to the peril of imitating the Theban poet. follows :—for the mainland of Greece proper, 13 odes ; for 3. (a) The religious feeling of Pindar is strongly marked Senti- Aigina, 11; for Sicily, 15; for the Epizephyrian Locrians | in the odes. “From the gods are all means of human a (southern Italy), 2; for Cyrene (Africa), 3. excellence.” He will not believe that the gods, when

they om The gencral characteristics of the odes may be briefly | dined with Tantalus, ate his son Pelops ; rather Poseidon tigious; considered under the following heads :—(1) language ; (2) | carried off the youth to Olympus. That is, his reason for f treatment of theme ; (3) sentiment—religious, moral, and | rejecting a scandalous story about the gods is purely political ; (4) relation to contemporary art. religious, as distinct from moral; it shocks his conception aoe 1. The diction of Pindar is distinct in character from | of the divine dignity. With regard to oracles, he guase that of every other Greek poet, being almost everywhere | inculcates precisely such a view as would have been most marked by the greatest imaginative boldness. ‘hus (a) | acceptable to the Delphic priesthood, viz. that the gods metaphor is used even for the expression of common ideas, | do illumine their prophets, but that human wit can or the translation of familiar phrases, as when a cloak is | foresee nothing which the gods do not choose to reveal. called eidcavov pap paKov aipav (Ol. ix. 104), “a warm | A mystical doctrine of the soul’s destiny after death ‘ remedy for winds.” (6) Images for the highest excellence | appears in some passages (as Ol. i. 66 sg.). Pindar ! are drawn from the furthest limits of travel or navigation, | was familiar with the idea of metempsychosis (cp. . or from the fairest of natural objects; as when the | #. 83), but the attempt to trace Pythagoreanism in superlative hospitality of a man who kept open house | some phrases (Pyth. ii. 34, iii. 74) appears unsafe. | 5 the a ae is described by saying, * far as to The belief in a fully conscious existence for the soul | a a = ins in summer days, and in winter | in a future state, determined by the character of the ae eres 4 ile” (Isthm. ii. 42) ; or when Olympia, | earthly life, entered into the teaching of the Elcusimian the “crown” (xopudd) or flower (dwros) of festivals, is

said to be excclent as water, bright as gold, brilliant as the noonday sun (O/. i. ad init.). This trait might be called the Pindarie imagery of the superlative. (e) Poetical inversion of ordinary phrase is frequent; as instead of, “he struck fear into the beasts,” “lhe gave the beasts to fear” (Pyth. v. 56). (d) The efforts of the poet’s genius are represented under an extraordinary number eee borrowed from javelin-throwing, chariot riving, leaping, rowing, sailin loughing, buildin shooting with the bow, slieapeatite a Sait ou ee an

and othcr mysteries. Comparing the fragment of the @pfvos (no. 137, Bergk), we may probably regard the mystic or esoteric element in Pindar's theology as due to such a source.

(6) The moral sentiment pervading Pindar's odes rest on a constant recognition of the limits imposed by the divine will on human effort, combined with strenuots exhortation that each man should strive to reach the limit allowed in his own casc. Native temperament ($vy) is the grand source of all human excellence (aper#), while such excellences as can be acquired by

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O° he was an exquisite artist.

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study (SSaxrat dperai, Ol. ix. 100) are of relatively small scope—the sentiment, we may remark, of one whose thoughts were habitually conversant with the native quali- ' ties of a poet on the one hand and of an athlete on the other. The elements of ty/es dABo0s—" sane happiness," such as has least reason to dread the jealousy of the gods,

are substance sufficing for daily wants and good repute

(edroyia). He who has these should not "seek to be a god." " Wealth set with virtues" (aAotdros dperats

SeSaSadpévos), as gold with precious gems, is the most fortunate lot, because it affords the amplest opportunities for honourable activity. Pindar does not rise above the ethical standard of an age which said, “ love thy friend and hate thy foe” (cp. Pyth. ii, 83; Isthm, iii, 65). But in one sense he has a moral elevation which is distinctively his own; he is the glowing prophet of generous emulation and of reverent self-control. |. (c) The political sentiments of the Theban poet are suggested by Pyth. xi. 53; “In polities I find the middle state crowned with more enduring good; there-fore praise I not the despot’s portion; those virtues move my zeal which serve the folk.” If in Pyth. ii. 86 a democracy is described as 6 AdBpos orpards, “ the raging crowd,” it is to be noted that the ode is for Hicro of Syracuse, and that the phrase clearly refers to the violence of those democratic revolutions which, in the early part of the 5th century B.c., more than once convulsed Sicilian cities. At Thebes, after the Persian wars, a “ constitu- tional oligarchy” (dAtyapxia icdvopos, Thue. iii. 62) had replaced the narrower and less temperate oligarchy of former days (Svwvacreia ov pera vouwv); and in this we may probably recognize the phase of Greek political life most congenial to Pindar. He speaks of a king’s lot as unique in its opportunities (Ol, i. 113); he sketches the character of an ideal king (Pyth. iii. 71) ; but nothing in his poetry implies liking for the ruparvis as a form of government. Towards the Greek princes of Sicily and Cyrene his tone is ever one of manly independence ; he speaks as a Greek citizen whose lineage places him on a level with the proudest of the Dorian race; and whose office invests him with an almost sacred dignity. In regard to the politics of Hellas at large, Pindar makes us feel the new sense of leisure for quiet pursuits and civilizing arts which came after the Persian wars. He honours “Tranquillity, the friend of cities” (“Acvxia pirdrohis, Ol. iv. 16). The epic poet sang of wars ; Pindar celebrates the “ rivalries of peace.” 4, Pindar’s genius was boldly original ; at the same time \ “Mine be it to invent new strains, mine the skill to hold my course in the chariot of the Muses; and may courage go with me, and power of ample grasp” (réApa dé Kat éupradis Svvapus €oroito, Ol. ix. 80). Here we see the exulting sense of inborn strength ; in many other places we perceive the feeling of conscious art—as in the phrase duddAdeuv, so apt for his method of in- laying an ode with mythical subjects, or when he compares the opening of a song to the front of a stately building (Ol. vi. 3). Pindar’s sympathy with external nature was deeper and keener than is often discernible in the poetry of his

age. It appears, for example, in his welcome of the season when “the chamber of the Hours is opened, and delicate plants perceive the fragrant spring” (fr. 75); in the passage where Jason invokes “ the rushing strength of waves and winds, and the nights, and the paths of the deep” (Pyth. iv. 194); in the lines on the eclipse of the sun (fr. 107); and in the picture of the eruption, when Etna, “ pillar of the sky, nurse of keen snow all the year,” sends forth “pure springs of fire unapproachable ” (Pyth. 1, 20). The poet’s feeling for colour is often noticeable,

~—as in the beautiful story of the birth of Jamus—when

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Evadne lays aside her silver pitcher and her girdle of scarlet web; the babe is found, “ its delicate body steeped in the golden and deep purple rays of pansies ” (Ol. vi. 55).

The spirit of art, in every form, is represented for Pindar by xdprs—“ the source of all delights to mortals” (Ol. i. 30)—or by the personified Charites (Graces). The Charites were often represented as young maidens, decking themselves with early flowers—the rose, in particular, being sacred to them as well as to Aphrodite. In Pindar’s mind, as in the old Greek conception from which the worship of the Charites sprang, the instinct of beautiful art was inseparable from the sense of natural beauty. The Sculp- period from 500 to 460 B.c., to which most of Pindar’s ture. extant odes belong, marked a stage in the development of Greek sculpture. The schools of Argos, Sicyon, and Aigina were effecting a transition from archaic types to the art which was afterwards matured in the age of Phidias. Olympia forms the central link between Pindar’s poetry and Greek sculpture. From about 560 B.c. onwards, sculpture had been applied to the commemoration of athletes, chiefly at Olympia. In a striking passage (Vem. v. ad init.) Pindar recognizes sculpture and poctry as sister arts employed in the commemoration of the athlete, and contrasts the merely local effect of the statue with the wide diffusion of the poem. “No sculptor I, to fashion images that shall stand idly on one pedestal for aye ; no, go thou forth from /Zgina, sweet song of mine, on every freighted ship, on each light bark.” Many particular subjects were common to Pindar and contemporary sculp- ture. Thus (1) the sculptures on the east pediment of the temple at Aigina

represented Heracles coming to seek the aid of Telamon against Troy—a theme brilliantly treated by Pindar in the fifth Isthmian ; (2) Hiero's victory in the chariot-race was commemorated at Olympia by the joint work of the sculptors Onatas and Calamis ; (3) the Gigan- tomachia, (4) the wedding of Heracles and Hebe, (5) the war of the Centaurs with the Lapithz, and (6) a contest between Heracles and Apollo are instances of mythical material treated alike by the poet and by sculptors of his day. The contemporary improvements in town architecture, introducing spacious and well-paved streets, such as the oxupwry dds at Cyrene (Pyth. v. 87), suggest his frequent comparison of the paths of song to broad and stately causeways (7Aaretat mpoa0dor— Exar o7redou xéerevdor, Vem. vi. 47, v. 22). A song is likened to cunning work which blends gold, ivory, and coral (Vem. vii. 78). Pindar's feel- ing that poetry, though essentially a divine gift, has a technical side (codéa), and that on this side it has had an historical development like that of other arts, is forcibly illustrated by his reference to the inventions (codiopara.) for which Corinth had early been famous. He instances (1) the development of the dithyramb, (2) certain im- provements in the harnessing and driving of horses, and (3) the addition of the pediment to temples (Ol. xiil.).

In the development of Greek lyric poetry two periods are Pindar' broadly distinguished. During the first, from about 600 place in to 500 B.c., lyric poetry is local or tribal—as Alcaus and ties Sappho write for Lesbians, Aleman and Stesichorus for ture, Dorians. During the second period, which takes its rise in the sense of Hellenic unity created by the Persian wars, the lyric poet addresses all Greece. Pindar and Simonides are the great representatives of this second period, to which Bacchylides, the nephew of Simonides, also belongs. These, with a few minor poets, are classed by German writers as die universalen Meliker. The Greeks usually spoke, not of "lyric," but of "melic" poetry (1.¢., meant to be sung, and not, like the epic, recited) ; and " uni- versal melic" is lyric poetry addressed to all Greece. But Pindar is more than the chief extant lyrist. Epic, lyric, and dramatic poetry succeeded each other in Greek litera-

Manu- scripts and editions,

ture by a natural development. Each of them was the spontaneous utterance of the age which brought it forth. In Pindar we can see that phase of the Greek mind which produced Homeric epos passing over into the phase which produced Athenian drama. His spirit is often thoroughly dramatic—witness such scenes as the interview between Jason and Pelias (Pyth. iv.), the meeting of Apollo and Chiron (Pyth. ix.), the episode of Castor and Polydeuces (Nem. x.), the entertainment of Heracles by Telamon (Isthm. v.). Epic narrative alone was no longer enough for the men who had known that great trilogy of national life, the Persian invasions ; they longed to see the heroes moving and to hear them speaking. The poet of Olympia, accustomed to see beautiful forms in vivid action or vivid art, was well fitted to be the lyric interpreter of the new dramatic impulse. Pindar has more of the Homeric spirit than any Greek lyric poet known tous. On the other side, he has a genuine, if less evident, kinship with Eschylus and Sophocles. Pindar's work, like Olympia itself, illustrates the spiritual unity of Greek art.

The fact that eertain glosses and lacunz are common to all our MSS. of Pindar make it probable that these MSS. are derived from a common

archetype. ‘Now the older scholia on Pindar, which appear to have been compiled mainly from the commentaries of Didymus (cire. 15 B.c.), sometimes presuppose a purer text than ours. But the compiler of these older scholia lived after Herodian (160 A.p.). The arehetype of our MSS., then, cannot have been older than the end of the 2d century. Our MSS. fall into two general classes :—(1) the older, representing a text which, though often corrupt, is comparatively free from interpolations; (2) the later, which exhibit the traces of a Byzantine recension, in other words, of lawless conjecture, down to the i4th or 15th century. To the first class belong Parisinus 7, breaking off in Pyth. v.; Ambrosianus 1, which has only Ol. i. —xii.; Mediceus 2; and Vati- canus 2,—the two last-named being of the highest value. The editio princeps is the Aldine, Venice, 1518. A modern study of Pindar may be almost said to have begun with Heyne’s edition (1773). Hermann did much to advance Pindaric criticism. But Augustus Boeckh (1811-22), who was assisted in the commentary by L. Dissen, is justly regarded as the founder of a seientific treat- ment of the poet. The edition of Theodor Bergk (Poet. Lyr.) is marked by considerable boldness of conjecture, as that of Tycho Mommisen (1864) by a sometimes excessive adherence to MSS. A recension by W. Christ has been published in Teubner’s series (1879). The edition of J. W. Donaldson (Cambridge, 1841) has many merits; but that of C. A. M. Fennell (Cambridge, 1879-83) is better adapted to the needs of English students. The transla- tion into English prose by Ernest Myers (2d ed., 1883) is excellent. Pindar’s metres have been analysed by J. H. Schmidt in Die Kunstformen der Griechischen Poesie (Leipsie, 1868-72). For esti- mates of Pindar see the histories of Greek literature by G. Bern- hardy, K. O. Miiller, Nicolai, and E. Burnout. (R. C. J.)

PINE (Pinus, Gr. mirvs), a name given by the ancients to some of the resinous cone-bearing trees to which it is now applied, and, as limited by modern botanists, the designation of a large genus of true conifers (Abietinz), differing from the firs in their hard woody cone-scales being thickened at the apex, and in their slender needle-shaped leaves growing from a membranous sheath, either in pairs or from three to five together, — each tuft representing an abortive branch, springing from the axil of a partially deciduous scale-leaf, the base of which remains closely adherent to the stem. The numer. ous male catkins are generally arranged in dense

whorls around the bases of the young shoots; the anther-scales, surmounted by a crest-like appendage, shed their abund- ant pollen by longitudinal slits; the two ovules at the base of the inner side of each fertile cone-scale develop into a pair of winged seeds, which drop from the opening scales when mature—as in the allied genera.

The pines are widely distributed over the north temperate zone, in the southern portions chiefly confined to the mountains, along which, in Central America, a few are found within the tropic ;, In more northern regions they frequently form extensive forests, sometimes hardly mingled with other trees. Their soft, straight-grained,

resinous, and often durable wood gives to many kinds q

high economic value, and some are among the most esteemed of timber trees. | Of the two-leaved species, P. sylvestris, the pine of northern Europe, may~be taken as a type. in perfection it is one of the finest of the group, and perhaps the most picturesque of forest trees ; attaining a height of from 70 to 120 feet, it is of conical growth

when young, but in maturity acquires a spreading’ cedar _

or mushroom-like top, with a straight trunk of from 2 to 4 feet in diameter at the base, and gnarled twisted boughs, densely clothed at the extremities with glaucous green foliage, which contrasts strongly with the fiery red-brown bark. The leaves are rather short, curved, and often

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Fic. 1.—Seotch Fir (Pinus sylvestris). a, male flower and young eones ; 0, male eatkin ; ¢, d, outer and inner side of anther-seale.

twisted ; the male catkins, in dense cylindrical whorls, fill the air of the forest with their sulphur-like pollen in May or June, and fecundate the purple female flowers, which, at first sessile and erect, then become recurved on a lengthening stalk ; the ovate cones, about the length of the

leaves, do not reach maturity until the autumn of the following year, and the seeds are seldom scattered until the third spring; the cone scales terminate in a pyramidal recurved point, well-marked in the green state and im some varieties in the mature cone, but in others scarcely projecting. P. sylvestris is found, in greater or less abund- ance, from the hills of Finmark and the plains of Bothnia to the mountains of Spain and even the higher forest-slopes of Etna, while in longitude its range extends from the shores of the North Sea to Kamchatka. Nowhere more abundant than in the Scandinavian peninsula, this tree 18 the true fir (fur, fura) of the old Norsemen, and still re-

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tains the name among their descendants in Britain, though botanically now classed as a pine. It grows vigorously in Lapland on the lower ground, and is found even at an elevation of 700 feet, while in south Norway it occurs up to 3000 feet, though the great forests from which “Norway pine ” timber is chiefly derived are on the com- paratively lower slopes of the south-eastern dales ; in the highest situations it dwindles to a mere bush. In Germany, both on the mountains and the sandy plains, woods of “Kiefer” are frequent and widely spread, while vast forests in Russia and Poland are chiefly composed of this species; in many northern habitats it is associated with the spruce and birch.. In Asia it abounds in Siberia and on the mountains of Dahuria ; on the European Alps it occurs at a height of 5600 feet, and on the Pyrenees it is found at still higher elevations ; on the northern side of Etna it is

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Fic. 2.—Scotch Fir (Pinus sylvestris). a, fertile flower of mature cone; b, winged seed; c, fertile catkin (or cone); d, scale and bract ; ¢, inner side of scale.

said to grow at above 7000 feet. In Britain natural

forests of Scotch fir of any extent are only now found in

the Highlands, chiefly on the declivities of the Grampians, and most of the great woods have been much curtailed

m recent times, while the larger trees are generally felled

as soon as they attain a timber size. In former ages the

tree covered a large portion of the more northern part of the island, as well as of Ireland; the numerous trunks found everywhere in the mosses and peat-bogs of the northern counties of England attest its abundance there ™m prehistoric times; and in the remoter post-Glacial epoch its range was probably vastly more extended. The tree is not at present indigenous in southern Britain, but when planted in suitable ground multiplies rapidly by the wind-sown seeds ; on many of the sandy moors and

Peni natural pine woods of large extent have been thus

ormed during the last fifty years. The Scotch fir is a very

variable tree, and certain varieties have acquired a higher reputation for the qualities of their timber than others ; among those most prized by foresters is the one called the Braemar pine, the remaining fragments of the great. wood in the Braemar district being chiefly composed of this kind; it is mainly distinguished by its shorter and more glaucous leaves and ovoid cones with blunt recurved spines, and especially by the early horizontal growth of its ultimately drooping boughs ; of all varieties this is the most pictur- esque. On the Continent the Hagenau pine of Westphalia is esteemed for the straightness and good quality of its timber. The heart-wood of the finer kinds of Scotch fir is of a deep brownish-red colour, abounding in the resin to which its durability is probably due. For all indoor and most outdoor purposes it is as lasting as oak, and for ship planking is perhaps little inferior; from its lightness and elasticity it is well adapted for the construction of yachts and other small fast-sailing craft, and is said to be the best of all wood for masts and large spars; its weight varies from 30 to 40 tb

the cubic foot. The sap-wood is more perishable, but is useful for fences, easks, and a variety of other purposes; soaking in lime-water renders it more lasting; great numbers of young pines are annually cut for railway sleepers, mining timber, and numerous agricultural applications; large quantities are consumed in forming the wood-pavement which in the great towns is rapidly superseding stone. The quality of the timber depends greatly on the soil and position in which the trees are grown: the dry slopes of granitic or gneissic mountains, or the deep well-drained sandy gravels of the lower country seem to answer equally well; but on clay or wet peat the tree rarely flourishes, and the timber is always indifferent; it is usually said that the wood is best in the cold climate of its more northern habitats, but the writer has seen a trunk (4 feet in diameter) grown on the sands of Surrey with heart-wood quite equal to any produced in Glenmore or Rothiemurchus. The rapidity of growth is still more variable: in Britain full maturity is attained in from seventy to one hundred and twenty years, but in Norway the trunk Increases much more slowly ; Schiibeler states that a tree felled in the Alten district (about 70° lat.), measuring 2 feet 10 inches in diameter without the bark, showed four hundred circles of annual growth. In Norway the tree, growing in dense forests, is generally of but moderate girth, and prob- ably this pine nowhere reaches a greater size than in the Scottish woods ; a plank from Glenmore forest measured nearly 54 feet across, and from 3 to 44 feet is not an unusual diameter for a British pine tree.

Vast numbers of Scotch firs are raised in nurseries for artificial planting ; the seed is sown in the spring, being just covered with earth, and the seedlings transplanted in the second year into rows for further culture, or taken direct from the seed-bed for final planting ; sometimes the seed is sown where the trees are intended to grow. A plantation of Scotch fir requires frequent and careful thinning as the young trees increase in size; but pruning should be avoided as much as possible, excepting for the removal of dead wood. Plantations in England are generally ready for final cutting in from sixty to seventy years, and many are cleared at a much earlier stage of growth. P. sylvestris in Britain is liable to many insect depredations: the pine-chafer, Hy/urgus piniperda, is de- structive in some places, the larva of this beetle feeding on the young succulent shoots, especially in young planta- tions ; Hylobius abietis, the fir-weevil, eats

away the bark, and numerous lepidopterous larva devour the leaves ; the pine-sawfly is also injurious in some seasons; the removal of all dead branches from the trees and from the ground beneath them is recommended as most of these

insects lay their eggs among the decaying bark and dead leaves. “nurse” for oak trees, its conical growth when young admirably adapting it for this purpose ; its dense foliage renders it valuable as a shelter tree for protecting land from the wind; it stands the sea gales better than most conifers, but will not flourish on the shore like some other species. As fuel the wood of the Scotch fir is of value, but it makes too much black smoke to form an agreeable open fire; the small trunks and cuttings of plantations are employed by the lime-burner.

The pine is an important tree in the economy of the northern nations of Europe. In Scandinavia and Russia houses are chiefly constructed of its timber; and log-huts are made of the smaller trunks, and lined and roofed with the bark. ‘The inner bark is twisted into ropes, and, like that of the spruce, is kiln dried, ground up, and mixed with meal in times of scarcity; in Kamchatka it is macerated in water, then pounded, and made into a kind of substitute for bread without any admixture of flour. In recent days the fibre of the leaves has been extracted in some quantity and applied to textile purposes under the name of waldwolle, both in Germany and Sweden. It is prepared by boiling the ueedles in a solution of soda to remove tle resin, which process loosens the fibre and renders its separation easy; it has some resemblance to coarse wool, and is spun and woven into blankets and garments that are said to be warm and durable ; it is also used for stuffing cushions; an essential oil, obtained by a previous distillation of the leaves, has medicinal virtues attributed to it by some German practitioners.

Large quantities of turpentine are extracted from this pine in Sweden and Russia by removing a strip of bark, terminating below in a deep notch cut in the wood, into which the turpentine runs, and from which it is scooped as it accumulates ; but the product is not equal to that of the silver fir and other species. Tar is prepared largely from P. sylvestris; it is chiefly obtained from the roots, which, mingled with a few logs, are arranged in a conical or

funnel-shaped hollow made on the steep side of a hill or bank; after filling up, the whole is covered with turf and fired at the top, when the tar exudes slowly and runs into an iron vessel placed below, from the spout of which it is conveyed into barrels. Most of the so-called Stockholin tar is thus prepared, chiefly in the province of Bothnia.

Closely allied to the Scotch pine, and perhaps to be regarded as a mere alpine form of that species, is the dwarf P. Pumilio, the “krummholz” or “knicholz” of the Germans,—a recumbent bush, generally only a few feet high, but with long zigzag stems, that root occasionally at the knce-like bends where they rest upon the ground. The foliage much resembles that of the Scotch fir, but is shorter, denser, and more rigid; the cones are smaller but similar in form. Abounding on the higher slopes of the Bavarian aul] Tyrolese Alps, it is a favourite shelter for the chamois; the hunters call it the “latschen,” from its recumbent straggling habit. Krummbolz oil, valued in Germany as an outward applica- tion in rlicumatism and for bruises and sprains, is distilled from the young branches, and a fragrant white resin that exudes in some quantity from the buds is used for similar purposes and as a perfume ; under the name of Hungarian balsam it is sold in the towns of Germany, being probably obtained from the Carpathians.

The Red Pine of Canada and New England (so called from the colour of its bark), P. resinosa, is a tree of considerable size, some- times attaining the dimensions of P. sylvestris. The somewhat glaucous leaves form dense tufts at the ends of the branches, and are 4 or 5 inches long; the ovate blunt cones are about half that vlength. The tree is of quick growth and the wood strong and resinous, but it is less durable than Scotch fir, though much employed in shipbuilding ; according to Emerson, trunks exist in Maine 4 fect in diameter. A sandy soil seems to suit it best, and the quality of the wood probably much depends on its place of growth, Red pines abound in Nova Scotia and Newfoundland and the tree is rather widely distributed over the northern parts of the continent ; it rarely forms extensive woods, but grows chiefly in clumps among other trees, at least in its more southern habitats. Nearly allied is P. Banksiana, the Grey or Labrador Pine, some-

In England the pine is largely employed as a |

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times called the Scrub Pine from its dwarfish habit; it is the most northerly representative of the genus in America, and is chief remarkable for its much recurved and twisted cones, about 2 inches long. ‘he trunks are too small to be of great economic value, but the light wood is used by the natives for their canoes.

P. Larieio, the Corsican Pine, is one of the noblest trees of this group, growiug to a height of 100 or even 150 feet, with a straight trunk and branches in regular whorls, forming in large trees pyramidal head ; the slender leaves, of a dark green tint, are from 4 to 7 inches long; the cones, either in pairs or several together, project horizontally, and are of a light brown colour. This pine abounds in Corsica, and is found in more or less abundance ip Spain, southern France, Greece, and many Mediterranean countries; it occurs on the higher mountains of Cyprus. The trec is of very rapid growth, but produces good timber, much used in southern dockyards and very durable, though less strong than that of P. sylvestris ; the heart-wood is of a brownish tint. In southern France it has been planted with success on the drift-sands of the Bay of Biscay, though it does not bear the full force of the sea. blast as well as the pinaster. In England it grows well in sheltered sitnations and well-drained soils.

The Black Pine, P. austriaea, derives its name from the extreme

| depth of its foliage tints,—the sharp, rigid, rather long leaves lp

dark green hue giving a sombre aspect to the tree. The ligl

coloured, glossy, horizontal cones are generally in pairs, but some- times three or four together. The tree is conical when young, but when old forms a spreading head ; it often attains a large size,

| Southern Austria and the adjacent countries are the natural

habitats of this pine; it seems to flourish best on rocky mountain sides, but in England grows well on sandy soils. ‘The timber is valued in its native country, and is said to be durable and to stand exposure to the weather well; various resinous products are extracted fromit. P. pyrenaica isa handsome species of pyramidal form, attaining a large size on the mountains of

northern Spain. The lcaves are long and of a light bright green ; the cones are soli- tary, oblong, conical, and ofa yellow tint. The timber is used in Spanish dockyards, but opinions vary as to its quality. In planta- tions its bright foliage, with the orange cones and young shoots, render it an oraamental tree, hardy in southern Britain. Near to

| the above are P. Pallasiana or maritima, and P, halepensis, Medi-

terranean forms chiefly valued for their resinous products; the former, planted on the loose sands of France, supplies much turpentine and resin.

P. Pinaster, the Cluster Pine or Pinastcr, is an important species from its vigorous growth in the sand-drifts of the coast, for the purpose of binding which it has been grown more extensively and successfully than any other tree, especially on the dunes of the Bay of Biscay. Growing to a height of from 40 to 70 feet, the deeply-furrowed trunk occasionally reaches a diameter of 3 feet or more at the base, where, like most sand trees, it usually curves upward gradually, a form that enables the long tap-roots to with- stand better the strain of the sea gale; when once established, the tree is rarely overthrown even on the loosest sand. The branches

| curve upwards like the stem, with their thick covering of long dark | green leaves, giving a massive rounded outline to the tree; the

ovate cones are from 4 to 6 inches long, of a light shining brown hue, with thick scales terminating in a pyramidal apex; they are arranged around the branches in the radiating clusters that give name to the tree. The pinaster grows naturally on sandy soils around the Mediterranean from Spain to the Levant. On the drift-sands of France, especially in the Gironde, forests have been formed mainly of this pine; the seeds, sown at first under proper shelter and protected by a thick growth of broom sown simultaneously, vegetate rapidly in the sca-sand, and tho trees thus raised have, by their wind-drifted seed, covered much of the former desert of the Landes with an evergreen wood. These forests of pinaster, apart from the production of timber in a once treeless district, have a great economic value as a source of turpen- tine, which is largely obtained from the trees by a process analogous to that employed in its collection from P. sylvestris; the resm 1s yielded from May to the end of September, the cuts being renewed as the supply

fails, until the tree is exhausted; the trunks are then felled and used in the manufacture of charcoal and lamp black; much tar and pitch is also obtained from these pinaster forests. In England the cluster-pine has been largely planted on sandy districts near the sea, and has become naturalized in Purbeek and other wild tracts in the southern countics, but the summer heat 1s too small to permit of its resinous products acquiring any value; the soft coarse wood, though perishable in the natural state, has been used for railway sleepers after saturation with creosote oF preservative solutions. P. bruttia, the Calabrian Pine, a kindred form, is remarkable for its numerous densely clustered radiating cones; its wood is considered good in southern Italy.

P. Pinea is the Stone-Pine of Italy; its spreading rounded canopy of light green foliage, supported on a tall and often braneh- less trunk, forms a striking feature of the landscape in that country, as well as in some other Mediterrancan lands. The beautiful

food or dessert. 1 ; y ‘kept in the cone until required, as their abundant oil soon turns

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PINE

reddish-brown shining-cones, roundly ovate in shape, with pyrami- dal scale apices, have been prized from the ancient days of Rome for their edible nut-like seeds, which are still used as an article of They do not ripen until the fourth year, and are

rancid. The tree has been naturalized in many warm countries, even in China; in England it seldom attains any large size, as the deficient summer heat preveuts the wood from maturing; but trees occur occasionally in plantations 20 or 30 feet in height ; the wood, though soft and deficient in the resin that gives durability to the timber of some species, is valued by the southern carpenter and cabinetmaker for its lightness, its fineness of grain, and the ease with which it is worked. ‘

P. mitis, the Yellow Pine ofthe northern and middle States of America, is rather allied to the three-leaved section, but the leaves are mostly in pairs. It is a tree of large size, often attaining a height of 70 feet and upwards, though rarely more than 2 feet in diameter at the root; the lower branches spread horizontally, the upper, converging towards the trunk, give the tree somewhat the aspect of a spruce, hence it is called in some districts the " spruce- pine." The leaves are long, slender, and of a bluish-green hue ; the pendant cones are about 14 inches long, with a slender point to each scale. The yellow pine is one of the most important timber trees of the genus; the heart-wood being very durable is largely employed in shipbuilding and for house timber, being nearly equal to that of P. sylvestris; large quantities are exported to Britain under the name of "New York yellow pine"; the sapwood is perishable.

The three-leaved group includes several of the most valuable trees of America; among them is P. rigida, the Pitch-Pine of the northern States, a tree of from 40 to 50 feet in height with rugged trunk, occasionally 3 feet in diameter; the short dark-green leaves are in thick tufts, contrasting with the pale yellowish, usually clustered cones, the scales of which are furnished with small curved spines. The wood is very hard and abounds with resin, but on swampy land is of inferior quality and of little value except for fuel, for which the pitch-pine is highly prized; on drier ground the grain is fine from the numerous knots. Large quantities of tar and pitch are obtained from this species. The tree is one of the few that will flourish in salt-marshes,

P. australis is the "Georgia Pitch-Pine," or Yellow Pine of the southern States; it abounds on the sandy soils that cover so much of Georgia, the Carolinas, and Florida, and on those dry lands attains its highest perfection, though occasionally abundant on moist ground, whence it is sometimes called P. palustris. The most marked feature of the tree is its long tufted foliage,—the leaves, of a bright green tint, springing from long white sheaths, being often a foot in length. The tall columnar trunk furnishes the most valued pine timber of the States; close-grained and resinous, it is very durable and polishes well ; it is largely employed in American shipyards, and immense quantities are exported, especially to Britain and the West India Islands. This tree yields an abundant supply of tar and turpentine of

good quality, which products are collected and manufactured in the “ pine-barrens” on a large scale.

P. Tzda, the “ Loblolly Pine” of the backwoodsman, a tall tree with straight trunk and spreading top, covers great tracts of the

pine-barrens ” of the aehesn States, but also frequently spreads over deserted arable lands that have been impoverished by long and

ad farming ; hence the woodsmen call it the “old-field ” pine, while, — the fragrance of its abundant resin, it is also known as the rankincense pine. It is a fine species 80 or 90 feet high, having Sometimes a girth of 6 or 8 feet, with a broad spreading head ; the leaves are rather long and of a light green tint, the cones generally ‘a patrs, the scales terminating in a sharp incurved prickle. The imber of this pine is indifferent, but the forests of it are of import- Pre from the quantity of turpentine they yield ; the trees also urnish much firewood of good quality. e 3 , ad a pine of western America belonging to this section, of ge “4 er tree deserving of notice from the extreme density : Wood, which barely floats in water ; it abounds in some parts ; the western range of the Rocky Mountains. The leaves are very eee twisted, the small oval cones armed with recurved aloes the tree is said to be of rapid growth. In Oregon and oa la several large pines of this group are found. P. Coultert, by oe is remarkable for its enormous cones (sometimes ry ie 6 inches in diameter, and weighing more than 4 Ib); “a = es end in long hooked points curving upwards; the leaves Ps 8, Tigid, and glaucous in hue. Nearly related to this is

j abiniana, the Nut-Pine of California, the cones of which are of pre eon size, also with hooked scales ; the large nut-like seeds occas en by the Indians; the tree is one of the largest of the hi % Sometimes attaining a height of 120 feet and upwards > pa on have been found, it is said, 10 or 12 fect in diameter. of its = Ake Species, is remarkable for the great length points of ‘ong + leaves, of a grass-green tint; the cones have the

Cates recurved, It is known in India as the “ Cheer-

Pine”; the wood is good, resinous, and moderately durable ; the tree iscommon on the foot-hills of the Himalayas. P. Gerardiana, another Nepal species, is a large tree with a conical head, growing on the more elevated parts of the mountain range ; it furnishes edible seeds. The leaves, short and glaucous, like those of the Scotch fir, have deciduous sheaths; the cones have recurved scale-points like those of the cheer-pine. P. eanariensis, which forms forests on the mountains of Grand Canary and Teneriffe, growing at an elevation of 6000 feet, also belongs to this group. ‘The leaves are long, lax, and of a bright green tint; the cone-scales are without spines; the trunk attains a large size, and yields good and durable timber. The beautiful Monterey-Pine, P. insignis, dis- tinguished by the brilliant colour of its foliage, has the leaves in tufts of three or four ; the lower cone-scales have recurved points. This fine pine has been planted in the south-western parts of England, but is scarcely hardy.

The pines with five leaves in each tuft have generally deciduous sheaths. The most important economic species is the well-known White Pinc, P. Strobus, from its large growth and abundance, as well as the soft even grain of its white wood, one of the most valuable of American trees. The tree abounds from Canada to Georgia, and is also found in British Columbia, but in the eastern States has been so long sought for by the lumberer that most of the old trees have long disappeared, and large white pine timber is now only found in quantity in the Canadian Dominion. Formerly Maine and Vermont were celebrated for the size of their pines, but few of these great trees now exist in New England; one that stood near the banks of the Merrimack in New Hampshire is said to have had a trunk nearly 8 feet in diameter, and Michaux measured a stump 6 feet across. On a deep rich soil P. Strobus attains a height of 150 or even 200 feet, and trunks without a branch are sometimes found 80 or 90 feet long; in the earlier stages of growth it has a pyramidal form, in open glades the lower boughs often touching the ground, but in old age it acquires a wide almost cedar-like top. The light bluish-green foliage is somewhat lax, very dense in young trees ; the cones are long and rather curved, with thin smooth scales a little thickened at the apex, and gener- ally more or less covered with exuding white resin ; they are about 5 or 6 inches in length and 14 to 2 inches broad; the male catkins are of a bluish tint ; the cones ripen in the autumn of the second year. The wood of the white pine is durable for indoor use,

especially when protected by paint, but when exposed to moist air it rapidly decays, and it is very liable to dry rot; it is said to be best when grown on sandy soils. Immense quantities are still exported, especially from Canada, its smooth casily-worked grain rendering it a favourite wood for the house-carpenter and joiner; it weighs about 28 fb per cubic foot. In England, where it is generally known as the “ Weymouth Pine,” it succeeds well on deep light soils when well-drained ; trees have attained occasionally a height of 100 feet and upwards in British plantations; but it is apt to be infested with American blight (Zriosoma). In northern Germany it also grows well ; a tree at Berlin measured upwards of 3 metres in circumference, the age being one hundred and fifty years. The climate of Scotland appears less suitable for it, probably from the want of summer heat, and it can hardly be recommended for British planting otherwise than for ornamental purposes.

Nearly approaching this is P. exeelsa, the Bhotan Pine, which differs chiefly in its longer cones and drooping glaucous foliage. It is found in Kumaon and Bhotan and on some of the Nepal ranges, but does not grow in the moist climate of the Sikkim Himalayas; it is found at a height of 6000 to 7000 feet, and attains large dimen- sions; the wood is highly resinous, and is said to be durable; great quantities of a white clear turpentine exude from the brauches when injured. The Bhotan pine is quite hardy in southern England, and has been largely planted of late as an ornamental tree.

P. Lambertiana, the Giant Pine or Sugar- Pine of California, is the largest of the genus, rising to the height of 200 feet, with a trunk 20 to 30 feet in girth, and, it is said, occasionally attaining much larger dimensions. The head is of a pyramidal form, the lower branches drooping like those of a Norway spruce; its foliage is of a light bright green colour. The pendent cones are very large, sometimes 18 inches long and 4 inches in diameter, with large nut- like seeds, which, pounded and baked, are eaten by the Indians. The tree abounds in some sandy districts, but more generally oceurs singly or in small groups dispersed through the woods, attaining its greatest dimensions in light soils. The wood is soft and nearly white, but contains much resin, which when fire has run through the forest exudes, and, having in this half-burnt condition a sweetish taste, has given the common name to the tree; the wood seems to be formed slowly; from its smooth grain it is valued for

indoor carpentry; the saccharine burnt resin is used as a laxative in California.

P. Cembra is the Stone-Pine of Siberia and central Europe. It abounds on the Alps, the Carpathians, and the Siberian ranges, in Switzerland being found at an altitude of 6800 feet in some localities. It is a straight-growing tree, with grey bark and whorls of horizontal branches, growing often from the ground, giving a

cylindro-conical outline ; the leaves are short, rigid, and glaucous; the cones, oblong and rather pointing upwards, grow only near the top of the tree, and ripen in the second autumn; the seeds are oily like those of P. Pinea, and are eaten both on the Alps and by the

inhabitants of Siberia ; a fine oil is expressed from them which is used both for food and in lamps, but, like that of the Italian pine, ‘¢ soon turns rancid. The growth of P. Cembra is slow, but the wood is of remarkably cven grain, and is employed by the Swiss wood-carvers in preference to any other. The Cembra is the “zirbel” or “zirbel-kiefer” of the Germans, and is known locally in Switzer- land as the “aroile,” “aloies,” and “ arve.”

P. occidentalis, a five-leaved pine with pale green foliage and small ovate cones, is found on the high mountains of St Domingo. Many members of the group occur on the Mexican isthmus, one of which, P. cembroides, produces edible seeds. P. Ayacahuite, a large tree growing on the mountains of Guatemala, with glaucous foliage like P. Strobus, yields a valuable resin. P. filifolia and P. macrophylla, likewisc natives of Central America, are remark- able for the extreme length of their leaves ; the former is said to attain a large size. ae)

PINE-APPLE. The pine-apple so-called consists in reality of the inflorescence of the plant, the originally separate flowers of which, together with the bracts sup- porting them, become fleshy and consolidated into one mass. The swelling and fusion of the tissues take place after the process of

fertilization, and it may be that the richly perfumed succulent mass is an aid in the distribu- tion of seed by affording food to certain animals. In the highly developed cultivated pines, however, it frequently happens that the seeds do not ripen properly. The pine, Ananassa sativa, is a member of the Bromeliad family, supposed to be of tropical American origin, and has been found wild in Mexico, Central America, Guiana, and Brazil, but is now widely dispersed in all tropical and semitropical countries.

Evelyn in his Diary mentions tasting a pine-apple from Barbados at the table of Charles II., and this is we believe the first mention of the fruit in English literature. A picture, of which a copy may be seen at the rooms ‘of the Royal Horticultural Society of London, represents the royal gardener, Mr Rose, presenting on bended knee the first pineapple grown in Britain, and it is surmised that this may have been grown from the “suckers” of the fruit above alluded to by Evelyn, though it is generally considered that the pine was not cultivated in England till 1712. In spite of the great improvements in the quality of pines, and the great progress that has been brought about in the rapidity and facility of production, pine- crowing is still attended with considerable expense, and much expenditure of time and labour. At the same time great attention has been given to pine culture in the West India Islands, the Azores, &c., and very large quantities of fruit of fine quality are imported into Britain at relatively low prices. But for pines of the highest flavour in the winter and spring seasons Englishmen must still look to their own gardens. See HorTicuLTURE.

PINEL, PutupreE (1745-1826), a distinguished French physician, was born at the chateau of Rascas, Saint-André in the department of Tarn, France, on April 20, 17 4D. He studied at Lavaur and afterwards at the university of Toulouse, where he took his doctor’s degree in 1773. From Montpellier, where he taught mathematics and at the same time carried on his medical studies, he removed in 1778 to Paris, engaging there chiefly in literary work connected with his profession. His first publication was a French translation of Cullen’s Wosology (1785) ; it was ae os an ae of the works of Baglivi (1788), and aeaneianh a ms ed a Praité medico-philosophique de _—ae i tat seh In 1792 he became head physician i eek a an two years afterwards he received fe peti ie ee rt aan at the Salpétritre, where ae ae oo of clinical lectures ; these 6th ed. 1818), whicl is Nosographie phalosophique CLAS

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| clinique (1802). Pinel was made a member of the Insti. tute in 1803, and soon afterwards was appointed professor of pathology in the Ecole de Médecine. Neither as a lecturer nor as an author, however, did he achieve great success, and his enduring fame rests entirely upon the fact that by his courageous action he was among the first to introduce the humane treatment of the insane, removing with his own hands the bonds of patients who had been chained to the wall for years. See vol. xiii. p. 110. He died at Paris on October 26, 1826.

PINEROLO, a city of Italy, in the province of Turin (Piedmont), is built in a straggling manner on a hill-side just above the junction of the valleys of the Chisone and the Lemina, at a height of 1237 feet above the sea, 234 miles by rail south-west of Turin. It is the terminus of the branch railway from Turin by Sangone or Nichellino, and has steam tramways running up to Perosa (12 miles) and south to Saluzzo. ‘Till 1696 it was strongly fortified with a citadel on Santa Brigida, a castle on St Maunizio, and city walls constructed by Thomas I. of Savoy. It has a cathedral (St Donatus), a bishop’s palace, a large semi- nary, a theatre (1842), a hospital (1546), a public hbrary, a cavalry college, a school of music, and a Waldensian chapel and schools. Cotton, silk, wool, and hemp are among the local manufactures. The population of the city was 11,362 in 1871 and 12,003 in 1881 (commune 16,730 and 17,492).

Pinerolo was bestowed on the bishops of Turin by Otho III. in 996; but in 1078 the countess Adelaide made it over to the Bene- dictine abbey of Santa Maria, in whose possession it remained till 1159. Thomas J. of Savoy captured the castle in 1188, and in 1246-the commune formally recognized the supremacy of Savoy. Passing in 1295 into the hands of Philip, son of Thomas III., Pinerolo became his residence and capital, a distinction which it retained under Amadeus VIII. of Savoy, even after the extinction of the separate house of Piedmont in 1418. Francis I. of France obtained possession of the town in his descent into Italy, and tried to secure the allegiance of the people by relieving the woollen trade from taxation; but Emmanuel Philibert received it back from Henry III. in 1574. A second occupation by the French occurred under Cardinal Richelien: the French

language Was imposed on the people, great fortifications were constructed, and the fortress was used as a state prison for such men as Fouquet, De Caumont, and the Man with the Iron Mask. Victor Amadeus bombarded the place in 1693, and ultimately compelled Louis XIV. to relinquish his hold on it; but before the withdrawal of the French troops the defences were demolished and the military importance of Pinerolo brought to a close. In 1748 the town was made a bishop's see. Michele Buniva, pensioned by Victor Emmanuel J. as the introducer of vaccination into Piedmont, was a native of Pinerolo and has a statue in the Piazza del Palazzo. De Grossi and Massi are among the local historians.

PINK. As usually applied this word corresponds 10 a genus of Caryophyllacee, the Dianthus of botanists. It 1s characterized by the presence of opposite simple leaves proceeding from thickened nodes, a cymose inflorescence, a tubular calyx surrounded by a number of overlappmg bracts, a showy corolla of five free long-stalked petals, ten stamens proceeding, together with the petals, from a short stalk supporting the ovary, which latter has two styles and ripens into an oblong pod which splits by two valves. The species are herbaceous or perennial, of low stature, often with very showy flowers. They are natives chiefly of southern Europe and the Mediterranean region, @ few being found in temperate Asia and South Africa. One species only is native to America, and that only in thenorth- west. Four species are wild in Britain, with two others which are more or less naturalized. These two are more interesting as being the originals of the pinks an of the carnations and picotees of English gardens. Garaen Pinks are derivatives from Dianthus plumarius, a native of

central Europe, with leaves rough at the edges, and "a rose-coloured or purplish flowers. The use 0 "pink" to denote a colour is derived from the name of the plant.

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The Carnation and Picotee are modifications of Dianthus Caryophyllus, the Clove Pink, a species with smooth edges to the leaf. This is a native of Europe, growing on rocks

in the south, but in the north usually found on old walls.

Its occurrence in England on some of the old Norman castles, as at Rochester, is supposed by Canon Ellacombe to indicate its introduction by the Normans; in any case

the plant grows in similar situations in Normandy. The

original species has “ self ”-coloured flowers, that is, flowers of one hue, generally some shade of pink, but the varia- tions in gardens are infinite. The carnation includes those flowers which are streaked or striped lengthwise—the picotees are those in which the petals have a narrow band of colour along the edge, the remainder of the petal being free from stripes or blotches. These by the old writers were called “ gillyflowers” (see vol. x. p. 601). The Sweet William of gardens is a product from Dianthus barbatus ; the Indian Pink comes from D. sinensis, of which D. Heddewigii is a variety; the Alpine Pink, D. alpinus, isa very lovely plant for the rockery; and there are many hybrid and other varieties met with in gardens, for an account of which reference must be made to treatises on horticulture.

PINKERTON, Joun (1758-1826), archeologist, numis- matist, historian, geographer, and miscellaneous writer in prose and verse, was born at Edinburgh, February 17, 1758. After a brief education at Lanark he was articled as a law clerk in Edinburgh, his earliest work, printed during his clerkship, being an Slegy on Craigmillar Castle (1776). In 1780 he removed to London to devote himself to literary work, publishing in 1781 a volume of Fumes of no great merit, and a professed collection of Scottish T’ragic Ballads. These were followed in 1782 by Two Dithyrambic Odes on Enthusiasm and Laughter, and by a series of Zales in Verse. Under the title of Select Scottish Ballads he reissued in 1783 his tragic ballads, with a supplement comprising Ballads of the Comic Kind,— a collection which obtained for him the not wholly appro- priate title of “the second Chatterton.” An Essay on Medals in 1784 won him a considerable reputation, which was in some respects unpleasantly maintained by his bold but eccentric Letters on Literature published in 1785 under the pseudonym of Robert Heron—a temporary adoption of his mother’s surname. In the following year he edited the Ancient Scottish Poems from the MS. Collec- tons of Sir Richard Maitland of Lethington,—a genuine reproduction, though his confession in the preface of forgery in the previous collections

published by him brought groundless suspicion upon it. It was succeeded in 1787 by a compilation, under the new pseudonym of Bennet, entitled the Treasury of Wit, and by his first important historical work, the Dissertation on the Origin and Progress of the Scythians or Goths, to which Gibbon professed himself indebted. Turning his attention to hagiology, Pinkerton next collected and printed in 1789 certain Vite Sanctorum Scotiz, and, a little later, published his Enquiry imto the History of Scotland preceding the Reign of Malcolm III., in which he hoped to settle the ancient history of his country on the solid footing of facts and authorities and “leave nothing in the ink horn.” In Many quarters his attitude towards the Highlanders excited “violent disgust,” but the Enquiry was twice — in 1794 and 1814, and is still of value for the — embodied in it. His edition of Barbour’s

ruce and a Medallic History of England to the Revolution appeared in 1790 3 2 collection of Scottish Poems reprinted J ore ated Editions in 1792 ; and a series of biographical a ee Lconographia Scotica, in the years 1795-97. Scotl es -mentioned year he published a History of

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of Mary, containing valuable material, but almost entirely devoid of literary finish, A new biographical collection, the Gallery of Eminent Persons of Scotland (1799), was succeeded after a short interval by a Modern Geography digested on a New Plan (1802; enlarged, 1807). About this time he left London for Paris, where he chiefly resided until his death on May 10, 1826. His remaining publica- tions were the Recollections of Paris in the years 1802—3- 4-5 (1806); a very useful General Collection of Voyages and Travels (1808-1813); a New Modern Atlas (1809-15); and his Petralogy (1811). An unsuccessful tragedy by him was performed at Edinburgh in 1813.

Pinkerton possessed an exceedingly vigorous and acute mind, but very lacking in high constructive power; and, as he was less patient in the formation of opinion than in research, his best work is marred by imperfect judgments crudely and obstinately asserted. At the same time his writings take no mean rank in the advance towards a scientific treatment of history.

Walpole, notes of whose conversations were published at his death by Pinkerton under the title of Walpoliana, regarded his understanding as “one of the strongest, most manly, and clearest he ever knew;” and Gibbon not only praised his faculty of persistent application as herculean and heroic, but wished to secure his co-operation in a scheme for organizing the materials of early English history. The final verdict upon his work must be that of the Earl of Buchan, who endorsed Pinkerton’s statement that he was “a homo umbratilis, of a hypochondriac unsocial disposition,” with the comment “ se ipse dixtt: it is his best apology; yet undoubtedly he has been a benefactor to literature.”

PINSK, a district town of the government of Minsk, Russia, is situated in a marshy region at the confluence of the Strumefi and Pina rivers, 172 miles to the south-west of Minsk. It has a lyceum, several primary schools, and a great number of Jewish schools. The town is almost entirely built of wood, and has a poor appearance. The population (13,000 in 1865) was in 1884 22,950, more than four-fifths of whom are Jews, who live almost exclusively on trade. This development of trade in a town situated at a distance from all railways (the nearest, that from Moscow to Warsaw, being 60 miles off) is due to the navigable river Pina, which connects it with the fertile regions on the Dnieper, and, by means of the Dnieper-and- Bug Canal, with Poland and Prussia, while the canal of Oginsky connects it with the basin of the Niemen. The merchandise brought from the Dnieper is unshipped at Pinsk, and sent west or north-west on smaller vessels.

Pinsk (Pinesk) is first mentioned in Russian annals in 1097 as a town belonging to Sviatopolk, prince of Kieff. In 1132 it formed part of the Minsk principality, and it often changed its rulers subsequently. After the Mongol invasion it became the chief town of a separate principality, and continued to be so until the end of the 13th century. In 1320 it was annexed to Lithuania ; and in 1569, after the union of Lithuania with Poland, it was recognized as chief town of the province of Brest, During the rebellion of Bogdan Khmelnitzky (1640), as it had fallen into the hands of the Cossacks, the Poles took it by assault, destroying 14,000 persons and burning 5000 houses. Eight years later the town was burned again by the Russians. Charles XII, took it in 1706, and when compelled to quit, burned the palace

of Prince Wisznewecki, and the town with its suburbs. Pinsk was annexed to Russia in 1795.

PINTO, Fernio MeEnpEs (1509(?)-1583), a noted Portuguese adventurer, was born in 1509 or 1510 at Montemor-o-Velho, near Coimbra, and died near Lisbon, July 18, 1583. After spending some years in Lisbon and Setubal, and experiencing various adventures, he left his native country in 1537, in a fleet of five ships, committing himself to a career of adventure at sea, which lasted twenty-one years, in the course of which he was five times shipwrecked, thirteen times taken captive, and seventeen times sold asa slave. If Pinto's own nar- rative is coloured in many passages by a wandering and fervid imagination, its substantial honesty is now generally admitted, in spite of Congreve's opprobrium in Love for Love,—" F. M. Pinto was but a type of thee, thou liar of the first magnitude." The fleet with which Pinto left

Portugal anchored, after various adventures, at Socotra, and he himself was taken captive near the Straits of Babelmandeb, carried to Mocha, sold as a slave, and ran- somed by the Portuguese governor of Ormuz. Returning to the Indies, he was again engaged in several expedi- tions, again enslaved, again ransomed, and again captured by pirates. In 1542 he was engaged in an expedition to Calempin, near Peking, to rifle the tombs of seventeen Chinese kings. Shipwrecked and captured on the Chinese coast, he was set to work in repairing the Great Wall, whence an inroad of Tartars transported him to the siege of Peking and next to Tartary. Hence we follow him to Cochin-China, Macao, and Japan. At Ningpo his report of Japan and its wealth caused the equipment of nine ships, eight of which foundered, Pinto's ship being driven to the Lew-chew Islands. After a variety of other adven- tures, Pinto returned a third time to Japan with Francis Xavier in 1548. In 1553, while at Goa on his return to Portugal with his rich fortune, he was induced to devote nearly all his wealth to the foundation of a seminary for propagating the faith in Japan. Returning to Lisbon in 1558, he spent a few years at court, but found the life very stale after his stirring adventures in the Hast.

The first extant account of his adventures is to be found ina collection of Jesuits' letters published in Italian at Venice in 1565. The full narrative, however, of his life is his own Peregrinagdo, which was first published in quarto at Lisbon in 1614 by Francisco de Herrera. In 1620 appeared a Spanish translation, and in 1628 at Paris a French translation by L. Figuier, followed by two other editions (1645 and 1830). There is also an English translation by H. Cogan (London, 1663 and 1692). See also Barbosa Machado, Bibl. Lusitana ; Fr. da Sylva, Dicionario bibliographico Portugucz ; Castclho, Litcraria Classica Portugueza.

PINTURICCHIO (1454-1513), whose full name was BERNARDINO DI Betti, the son of a citizen of Perugia, Benedetto or Betto di Biagio, was one of a very important group of painters who inherited the artistic traditions and developed the style of the older Perugian painters such as Bonfigli and Fiorenzo di Lorenzo. According to Vasari he was a pupil of Perugino ; and so in one sense no doubt he was, but rather as a paid assistant than as an apprentice. The strong similarity both in design and methods of execution which runs through the works of this later Perugian school, of which Perugino was the oldest member, is very striking ; paintings by Perugino, Pinturicchio, Lo Spagna, and Raphael (in his first manner) may often be mistaken one for the other. In most cases, especially in the execution of large frescos, pupils and assistants had a large share in the work, either in enlarging the master's sketch to the full-sized cartoon, in transferring the cartoon to the wall, or in painting backgrounds, drapery, and other accessories. In this way the spirit and individuality of one man could impress itself indelibly on a numerous school of younger artists.

_ After assisting Perugino in the execution of his frescos in the Sistine Chapel, Pinturicchio was employed by various members of the Della Rovere family and others to decorate a whole series of chapels in the church of S. Maria del Popolo in Rome, where he appears to have worked from 1484, or earlier, to 1492 with little interrup- tion. The earliest of these is an altarpiece of the Adora- tion of the Shepherds, in the first chapel (from the west) on the south, built by Cardinal Domenico della Rovere ; a portrait of the cardinal is introduced as the foremost of the kneeling shepherds. In the lunettes under the vault Pinturicchio painted small scenes from the life of St Jerome. The frescos which he painted in the next chapel, that built by Card.

Innocenzo Cibo, were destroyed in 1700, when the chapel was rebuilt by Card. Alderano Cibo. The third chapel on the south is that of Giov. della Rovere, duke of Sora, nephew of Sixtus IV., and brother of Giuliano, who was afterwards Pope Julius IT.

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| This contains a fine altarpiece of the Madonna enthroned between Four Saints, and on the east side a very nobly composed fresco of the Assumption of the Virgin. The vault and its lunettes are richly decorated with small pictures of the life of the Virgin, surrounded by graceful arabesques ; and the dado is covered with monochrome paintings of scenes from the lives of saints, medallions with prophets, and very graceful and powerfully drawn female figures in full length, in which the influence of Signorelli may be traced. In the fourth chapel Pinturic- chio painted the Four Latin Doctors in the lunettes of the vault. Most of these frescos are considerably injured by damp, but happily have suffered little from restoration ; the heads are painted with much minuteness of finish, and the whole of the pictures depend very largely for their effect on the final touchings a secco. The last paint- ings completed by Pinturicchio in this church were the frescos on the vault over the retro-choir, a very rich and well-designed piece of decorative work, with main lines arranged to suit their surroundings in a very skilful way. In the centre is an octagonal panel of the Coronation of the Virgin, and round it medallions of the Four Evangelists —the spaces between them being filled up by reclining figures of the Four Sibyls. On each pendentive is a figure of one of the Four Doctors enthroned under a niched canopy. The bands which separate these pictures have elaborate arabesques on a gold ground, and the whole is painted with broad and effective touches, very telling when seen (as is necessarily the case) from a considerable distance below. No finer specimen of the decoration of a simple quadripartite vault can anywhere be seen.

In 1492 Pinturicchio was sumnioned to Orvieto, where he painted two Prophets and two of the Doctors in the duomo. In the following year he returned to Rome, and was employed by Pope Alexander VI. (Borgia) to decorate a suite of six rooms in the Vatican, which Alexander had just built.

These rooms, called after their founder the Appartamenti Borgia, now form part of the Vatican library, and five of them still retain the fine series of frescos with which they were so skilfully decorated by Pin- turicchio. The upper part of the walls and vaults, not only covered with painting, but further enriched with delicate stucco work in relief, are a masterpiece of decorative design applied according to the truest principles of mural ornament,—a much better model for imitation in that respect than the more celebrated Stanze of Raphael immediately over the Borgia rooms. The main subjects are—(1) the Annunciation, the Nativity, the Magi, and the: Resurrection ; (2) Scenes from the lives of St Catherine, St Antony, and other saints; (3) allegorical figures of Music, Arithmetic, and the like ; (4) four figures in half length, with rich arabesques ; (5) figures of the planets, the occupations of the various months, and other subjects. The sixth room was repainted by Perino del Vaga.' _

Though not without interruption, Pinturicchio, assisted by his pupils, worked in these rooms from 1492 till 1498, when they were completed. His other chief frescos m Rome, still existing in a very genuine state, are those m the Cappella Bufalini at the south-west of St Maria in Ara Ceeli, probably executed from 1497 to 1500. These are well-designed compositions, noble in conception, and finished with much care and refinement. On the altar wall 1s@ grand painting of St Bernardino of Siena between two other saints, crowned by angels; in the upper part 18? figure of Christ in a vesica-glory, surrounded by angel musicians ; on the left wall is a large fresco of the miracles done by the corpse of St Bernardino, very rich in colour, and full of very carefully painted heads, some being

1 See Guattani, Quadri nell' Appart. Borgia, Rome, 1820.

portraits of members of the Bufalini family, for whom these frescos were executed. One group of three females, the central figure with a child at her breast, is of especial beauty, recalling the grace of Raphael's second manner. The composition of the main group round the saint's corpse appears to have been suggested by Giotto's painting of St Francis on his

bier in §. Croce at Florence. On the vault are four noble figures of the Evangelists, usually attributed to Luca Signorelli, but certainly, like the rest of the frescos in this chapel, by the hand of Pinturicchio. On the vault of the sacristy of S. Cecilia in Trastevere, Pinturicchio painted the Almighty surrounded by the Evangelists, a work which still exists in a fair state of preservation and unrestored. During a visit to Orvieto in 1496 Pinturicchio painted two more figures of the Latin Doctors in the choir of the duomo—now, like the rest of his work at Orvieto, almost destroyed. For these he received fifty gold ducats.

Among his panel pictures the following are the most important. An altarpiece for St Maria de' Fossi at Perugia, painted in 1496-98, now moved to the picture gallery, is a Madonna enthroned among Saints, graceful and sweet in expression, and very minutely painted ; the wings of the retable have standing figures of St Augustine and St Jerome ; and the predelia has paintings in miniature of the Annunciation and the Evangelists. Another fine altar- piece, similar in delicacy of detail, and probably painted about the same time, is that in the cathedral of San Severino—the Madonna enthroned looks down towards the kneeling donor. The angels at the sides in beauty of face and expression recall the.manner of Lorenzo di Credi or Da Vinci. The Vatican picture gallery has the largest of Pinturicchio's panels—the Coronation of the Virgin, with the apostles and other saints below. Several well- executed portraits occur among the kneeling saints. The Virgin, who kneels at Christ's feet to receive her crown, is a figure of great tenderness and beauty, and the lower group is composed with great skill and grace in arrange- ment. Other important panel paintings by Pinturicchio exist in the cathedral of Spello, in the Siena gallery, at Florence, at Perugia, and in other collections.

In 1501 Pinturicchio painted several fine frescos in S. Maria Maggiore at Spello,—all very decorative, and full of elaborate architectural accessories. One of them, the Annunciation, is signed "Bernardinvs Pintvrichivs Pervsinvs." They are much injured by damp and clumsy restoration. The most striking of all Pinturicchio's frescos, both for brilliance of colour and their wonderful State of preservation, are those in the cathedral library at Siena, a large room built in 1495 by Cardinal Francesco Piccolomini, afterwards Pius III. In 1502 the cardinal contracted with Pinturicchio to

decorate the whole room with arabesques on the vault, and on the walls ten scenes from the life of Alneas Sylvius Piccolomini, Pius II., the uncle of Cardinal Francesco.

The contract, given in full by Milanesi (Vasari, iii. p. 519), is a very interesting one; it specially provides that the cartoons, their transference on to the walls, and all the heads, were to be by Pinturieehio's own hand, thus contradieting Vasari's assertion that the cartoons were the work of Raphael. In fact when closely ex- amined the evidenee which would give Raphael an important share 7 the execution of these fine paintings amounts to very little. The

oeument provides for the price of these frescos, namely one thousand ie dueats, to be paid in various instalments. The work was

ae early in 1503, but was interrupted for a while by the death

ee a His will, however, provided for the completion of the The s th 1s executors, and the whole series were finished in 1507. Fe ne jects are (1) the journey of the young Sylvius Piceolomini a poe of Basel, in the suite of Cardinal Capraniea ; (2) his Basi ae y James I. of Seotland as envoy from the council of Tire m) his being crowned with the poet's laurel by Frederick -; (4) his reeeption by Pope Eugenius IV. as ambassador from

Vrederick 111; (5) outside the wall of Siena he presents to

Frederiek III. his bride Leonora, infanta of Portugal; (6) he receives the eardinal's hat from Pope Calixtus IIl.; (7) he is borne in procession after his election as Pope Pius Il.; (8) he presides at a council at Mantua ; (9) he eanonizes St Catherine of Siena ; (10) he arrives in Ancona to promote the crusade against the Turks. In addition to these there is, outside the library, over the door, the Coronation of Pius ITI.

Though this splendid series of paintings are laid in with true fresco-eolours, there is but little fresco buono visible ; almost the whole is painted over a secco with eolours much more brilliant in tone than could be used on the

wet stueeo, This retouching, which was employed by all freseo painters, was used by Pinturiechio more than by most artists. In the lower part of the seene of St Cather- ine's eanonization hc has introduced his own portrait, and standing by him is a youth who bears some resemblance to Raphacl. The paintings are all finished with much care, but Pinturicchio has not kept to the flat and simply decorative treatment of his earlier man- ner; there is much more of aerial perspective and distance destroy- ing the apparent solidity of the wall surface.

In 1508 Pinturicchio painted another panel of the Madonna enthroned among Saints for the church of the Minori Conventuali at Spello. It is now over the altar in the sacristy. On his return to Siena he painted a whole series of frescos on the walls of the Palazzo Petrucci, now all destroyed except one scene of the return of Ulysses to Penelope (or possibly Collatinus and Lucretia), which is now in the National Gallery of London, trans- ferred to canvas. One of his last works, painted in 1513, the year of his death, is a very beautiful and highly finished panel with Christ bearing His Cross, now in the Palazzo Borromeo in Milan. Pinturicchio married Grania di Niccold, and had by her two sons and four daughters ; there is probably no truth in the story of his being starved by his wife during his last illness.

The freseos in the Cappella Bufalini were engraved in ten plates by Fran. Giangiacomo, and published by the Calcografia Camerale of Rome. The Siena library series were engraved by Faucci in the the last century, and more recently by Lasinio. Neither set is remarkable for fidelity or spirit. The Siena frescos and those at Spello have been published in ehromo-lithograph by the Arundel Soeiety of London.

Pinturicchio's worth as a painter has been for the most part undervalued, partly owing to the very strong prejudice and dislike which tinges Vasari's biography of him. Even reeent writers, such as Crowe and Cavalcaselle, have hardly done him justice.

PINZON, a family of wealthy Spanish navigators, of Palos de Moguer, in Andalusia, three members of which —aAlonzo, Francesco, and Vicente, brothers—were associ- ated with Columbus in his great discovery.

Martin ALoNzo Pinzon, born about the middle of the 15th century, gave material assistance to Columbus in carrying out his project. In the expedition of 1492 Alonzo commanded the “Pinta,” on board of which his brother Francesco was pilot; another brother, Vicente Yaiiez, had command of the “Nina.” It was at Alonzo’s pursuasion that on October 7th the course of the expedi- tion was changed to the south-west; the island of Guana- hani or San Salvador, four days after, was sighted. On November 21, off the coast of Cuba, Alonzo separated himself from the expedition, and crowded sail to the west- ward, hoping to be the first to arrive at the land of gold of which they had heard the natives speak. After an absence of six weeks he rejoined Columbus, who accepted the excuses he gave for his absence. On the return journey Alonzo again separated from his leader, probably by design, and when Columbus arrived at Palos on March 15, 1493, he learned that Alonzo had already landed at Bayona in Galicia. If his object was to forestall Columbus and obtain the credit of being the discoverer of the New World, his intentions were foiled; he was refused the

audience which he craved of the sovereigns, and very shortly after died, it is supposed of chagrin. Even although it could be proved that Alonzo’s intentions were dishonourable, we should remember that it was largely through his liberality that Columbus was enabled to carry out his immortal voyage.

Vicente YANgEZ Pinzon, who commanded the “ Nina,” also gave Columbus material help, and remained loyal to his leader throughout. In after years he made important discoveries on his own account. In 1499 he sailed with four caravels across the Atlantic to the south-west, and on January 20, 1500, he struck the South-American continent at Cape 8. Agostinho, its most easterly projection, three months before the Portuguese navigator Cabral reached Brazil, the discovery of which is generally attributed to him. Proceeding southwards a short distance, he then turned north, followed the coast to the north-west, and went as far at least as what is now Costa Rica. After touching at Hayti, and losing two of his vessels among the Bahamas, Vicente returned to Palos in the end of Septem- ber 1500. Although concessions were made to him, and he was created

governor of the newly discovered lands by Ferdinand and Isabella, he does not seem to have ever taken possession. In 1508 we find Vicente sailing with Juan Diaz de Salis along the east coast of South America, in their attempt to find an opening towards the west that would conduct them to the Spice Islands. He did not get beyond the 40th degree of S. lat., about the mouth of the Rio Negro, having passed the mouth of the La Plata without recognizing it. After 1523 all traces of Vicente are lost.

Navarrete, Coleccion de Viajes; Humboldt, Geography of the New World ; Washington Irving's Columbus and Companions of Columbus ; bibliography in Joaquin Caetano da Silva's L' Oyapoc et V Amazone ; Peschel, Geschichte des Zeitalters der Entdeckungen.

PIOMBO, SEBASTIANO DEL. See SEBASTIANO.

PIOTRKOW, the chief town of a government of the same name in Russian Poland, and formerly the seat of the high court of Poland, is situated on the railway from Warsaw to Vienna, 90 miles by rail to the south-west of the capital, 5 miles to the west of the river Pilica. Ten years ago it was a poor town of 17,000 inhabitants, but it has grown during the last few years, partly as the seat of the provincial administration, and partly in consequence of the development of trade. In April 1882 it had 23,050 inhabitants, including 3000 military. Its manufactures are still insignificant; it has a few flour- mills, saw-mills, soap-works, and breweries.

PIOZZI, Hester Lynow (1741-1821), the daughter of John Salisbury of Bodville, Carnarvonshire, was born there, as it would appear from a protracted dispute between Croker and Macaulay, 27th January 1741. After an education which extended considerably beyond that given to most ladies of her period—for she was acquainted with the learned languages as well as with French, Italian, and Spanish—she was married in 1763 to Henry Thrale, a brewer of Southwark, whose house was at Streatham on the south-east corner of Tooting Beck Common. In this retreat she drew around her many of the most distin- guished men of letters of the age. She was introduced to Johnson by Arthur Murphy in the year after her marriage, and for nearly twenty years the sage remained on the closest intimacy with her. He travelled with them in Wales in 1774, and visited France in their company in 1775. Boswell's first visit to Streatham took place in October

1769. Madame D'Arblay was first received there in August 17 78. In spite of this intercourse with the princi- pal writers of the day troubles grew upon her in her married life. Her talents were not appreciated by her husband ; he was always ill and frequently in pecuniary

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anxiety ; and when children were born to her they often succumbed to sickness. After some years' illness Mr Thrale died on April 4, 1781, and, as the brewery in the borough sold for £135,000, the widow found herself amply provided for. At the time of Mr Thrale's death Dr Johnson was in declining health, and he soon began to think himself slighted, nor was his indignation abated at the announcement in the spring of 1783 of her engage- ment to Piozzi, an Italian musician. For a time the engagement was broken off, but it was quickly resumed, and on the 25th of July 1784 they were married. The union provoked the resentment of her children, and the undying denunciations of Dr Johnson; but, when her husband was found to be a man of quiet and inoffensive manners and a careful guardian of his wife's resources, her children acquiesced in the marriage and most of her friends returned to her. Baretti, always her enemy, abused her, and Boswell ridiculed her, but her character has survived the insinuations of the one and the open malevolence of the other, as well as the satiric attacks of Peter Pindar. Piozzi died of gout at Brynbella, March 1809, and from that time his widow's life was chiefly spent in the social circles of Bath and Clifton or in the retire- ment of Penzance. When long past seventy she took a fancy to William Augustus Conway the actor, and the "love letters" which she. wrote to him have been published with a catchpenny title. She died at Clifton, 2d May

1821.

Mrs Piozzi was bright and witty, and possessed of manners which, if not refined, never failed to attract. Several of her literary publications have long since perished from want of vitality, but her little poem of "The Three Warnings" forms a part of most selections of English poetry. Her Anecdotes of Dr Johnson, now 4 scarce book, are contained, "as she herself gave them

to the world," in the concluding volume of Napier's Johnson (1884), and her notes to Wraxall's Historical Memoirs are reprinted in the 1884 edition of that work. The Anecdotes and the Letters to and from Dr Johnson are inferior in interest only to the work of Boswell. Two editions of the Autobiography of Mrs Piozzi, under the editorship of Abraham Hayward, have been issued, and the Rev. Edward Mangin published in 1883, under the disguise of "by a friend," a thin volume of Piozziana. Her features are reproduced in the lady's countenance in Hogarth's picture of the Lady's Last Stake.

PIPE (see Music, vol. xvii. p. 77; and Orcan, 2, P- 829), Strutt, in his Sports and Pastimes of the People of England, gives representations of the pipe and tabor as used in England in the 14th century to accompany @ dancing-dog, a cock on stilts, a horse rearing, &c. From the drawings we cannot ascertain the nature of the pipe represented. We may, however, suppose it to have been similar to the galoubet used in France, along with the tabor, from a very remote period. This galoubet is a small instrument of the flageolet kind. Its use for more than the last two centuries has been confined to Provence. It has only three finger-holes, and is played with the left hand, whilst the right beats the tabor, which is attached to the performer. The compass of the galoubet is two octaves and a tone from D on the third line of the treble clef up to E in altissimo. Great skill is required to bring out all the sounds of its compass. Some of the players on this small and imperfect instrument are said to be 0 dexterous as to be able to perform upon it very difficult pieces of music composed for other instruments, such as the violin, &. It is always accompanied by the tabor, which is a small drum of a cylindrical form, and rather longer and narrower in its relative proportions than the common drum. In the last century several books of instruction were published at Paris by distinguished per formers on the galoubet. ;

PIPE, Topacco. The smoking of tobacco in pipes 8 a custom which prevailed in America for a period of unknown duration previous to the discovery of that con-

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tinent by Columbus. The most ancient pipes of which remains exist have been found in mounds or tumuli called pipe mounds, principally in the

States of Ohio, Indiana, Tllinois, and Iowa. These mound pipes, which are carved in porphyry and other hard stones, are very uniform in type. ‘The pipe, cut out of a single piece of stone, consists of a slightly convex platform or base, generally from 3 to 4 inches in length, and about an inch broad, with the bowl on the centre. A fine hole is pierced from one end of the platform to the bottom of the bowl, the opposite end being obviously for holding in the hand while the pipe is being smoked. Inthe ~ commonest forms the bowl is a simple cylinder or urn (fig. 1), but in many cases remarkable artistic skill has been g displayed in carving the ~ bowls into miniature figures of birds, mammals, reptiles, and human heads, often grotesque and fantastic, but always vigorously expressed (fig. 2). These mound

or platform pipes with carved human and ani- mal forms are objects of the highest ethno- graphic interest and im- portance, being among the most characteristic remains of the ancient inhabitants of the Mis- ; sissippi valley. The wide area over which they, as well as remains of baked clay pipes, are found throughout the American continent testifies to the universal prevalence of smoking in the pre-Columbian era. Many of the ancient clay pipes found in Mexico, &c., are elaborately moulded and ornamented, while others show considerable similarity to the early clay pipes of Europe. Among the North-American Indian tribes the tobacco pipe occupies a position of peculiar symbolic significance in connexion with the superstitious rites and usages of the race. The

Fia. 1.—“Monitor”’ Pipe.

Fig. 2.—Heron Pipe.

calumet, peace pipe, or medicine pipe is an object of the:

most profound veneration, entrusted to the care of a highly honoured official, and produced and smoked with much ceremony only on occasions of great importance and solemnity. It is remarkable that, whilst the most ancient American pipes had no separate stem, it is the stem only of the medicine pipe which is the object of veneration among the Indians, the bowl used being a matter of indifference. The favourite material for Indian pipe bowls is the famous red pipe stone (catlinite), a fine- grained easily-

worked stone of a rich red colour of the Coteau des Prairies, west of the Big Stone Lake in Dakota. The quarries were formerly neutral ground among the warring Indian tribes, many sacred traditions being associated with the locality and its product (see Longfellow's Hiawatha, i.). The Babeen Indians of the British-Columbian coast carve from a soft blue clay slate very elaborate and massive pipes with intricate pierced Work and fantastic animal forms, the pipe tube being pierced from some protruding part of the sculpture.

There is considerable dispute as to whether pipes for smoking were at all known in Europe previous to the dis- covery of America. That tobacco-smoking was unknown 18 certain ; but pipes of iron, bronze, and clay have been so frequently found associated with Roman remains and other antiquities as to lead many authorities to maintain that such pipes must have been anciently used for burning incense or for smoking aromatic herbs orhemp. Through- out Great Britain and Ireland small clay pipes are fre-

quently dug up, in some instances associated with Roman relics. These are known amongst the people as elfin, fairy, or Celtic' pipes, and in some districts supernatural agencies have been called in to account for their existence. The elfin pipes have commonly flat broad heels in place of the sharp spur now found on clay pipes, and on that flat space the mark or initials of the maker is occasionally found. 'There is no reason to believe that these pipes are older than the 17th century, The introduction of the tobacco pipe into Europe is generally ascribed to Ralph Lane, first governor of Virginia, who in 1586 brought an Indian pipe to Sir Walter Raleigh, and taught that courtier how to use the implement. The pipe makers of London became an incorporated body in 1619, and from England the other nations of Europe learned the art of making clay pipes. Baillard, in his Discowrs du Tabac (1668) says of the English—'"Ces derniers ont inventé les pipes de terre cuite, qui ont cours aujourd'huy par tout le monde."

The habit of smoking with pipes spread with incredible rapidity ; and among the various peoples the pipe assumed special characteristics, and its modifications became the medium of conveying social, political, and personal allu- sions, in many cases with no little artistic skill and humour.

The pipe also became the object of much inven- tive ingenuity, and it varied as greatly in material as in form—wood, horn, bone, ivory, stone, precious and other metals, amber, glass, porcelain, and above all clay being the materials employed in various forms. By degrees pipes of special form and material came to be associated with particular people, so that now we have the elongated painted porcelain bowls and pendulous stem of the German peasantry, the red clay bowl and long cherry wood stem of the Turk, and the very small metallic bowl and cane stem of the Japanese, &c. The most luxurious and elabo- rate form of pipe is the Persian kalydén, hookah, or water tobacco pipe. This consists of three pieces, the head or bowl, the water bottle or base, and the snake or long flexible tube ending in the mouthpiece. The tobacco, which must be previously prepared by steeping in water, is placed in the head and lighted with live charcoal, a wooden stem passes from its bottom down into the water which fills the base, and the tube is fitted to a stem which ends in the bottle above the water. Thus the smoke is cooled and washed before it reaches the smoker by passing through the water in the bottle, and by being drawn through the coil of tube frequently some yards in length. The bottles are in many cases made of carved and other- wise ornamented cocoa-nut shells, whence the apparatus is called nérgila, from nérgil, a cocoa-nut. Silver, gold, damascened steel, and precious stones are freely used in the making and decoration of these pipes for wealthy smokers.

Pipe Manufacture.—The regular pipe-making industrics divide into many branches, of which the more important are the clay pipe, meerschaum (real and artificial), and wooden bowl trades. Clay pipes are made in prodigious numbers by hand labour with an iron mould and a steel wire for forming the tube of the stem. Pipe moulding is a very simple operation iu pottery, and the work is performed with astonishing celerity. A number of machines have been devised for automatic pipe-moulding ; but the manual opera- tions are so rapid and inexpensive that there is little margin for saving by the substitution of machinery. The pipes are very lightly fired so as to keep them soft and porous; and so cheaply made are they that the commoner kinds can be retailed at a profit for a farthing each. The principal centre of the clay pipe industry is at Broseley in Staffordshire, where the trade has been established since the early part of the 17th century. Meerschaum pipes

(see MEERscHAUM, vol. xv. p. 825) are the expensive luxury of the European smoker, and large sums of money are occasionally

expended on the artistic treatment of the meerschaum bow! or ou the adornment of its adjuncts. The common meerschaum is gene-

rally provided with a mouth-piece of amber, but modern ingenuity

has succeeded in providing a femarkably clever imitation of both substances, so that a large proportion of the so-called meerschaum pipes are factitious, The headquarters of the meerschaum pipe

industry is at Ruhla in Thuringia, and in connexion with an official inquiry into the German tobacco trade in 1879 the average production of pipes and pipe adjuncts in that district for several years was ascertained. Of pipe bowls there were made yearly 540,000 genuine meerschaums; 5,400,000 artificial meerschaums; 4,800,000 wooden heads ; 9,600,000 common porcelain bowls (the favourite of the German peasant); and 2,700,000 fine clay or lava bowls. Further the trade included 15,000,000 pipe stems or tubes of various materials; 19,200,000 adjuncts, such as flexible tubes, chains, tops, &c.; 144,000 pipe cases ; 9,600,000 mouth-pieces and cigar-holders of amber, horn, meerschaum, wood, &c.; and finally 15,000,000 complete pipes of various materials. The whole annual value of the industry is estimated at £1,000,000 sterling. The favourite wooden pipe generally known as a briar-wood or briar-root pipe is really made from the roots of the tree heath, Erica arborea (French, bruyére), principally obtained on the hills of the Maremma and taken thence to Leghorn. There the roots are shaped into blocks each suitable for a pipe, the cutting of the wood so as to avoid waste requiring considerable skill. These blocks are simmered in a vat for twelve hours, which gives them the much appreciated yellowish-brown hue of a good “briar-root.” So pre- pared the blocks are exported for boring and finishing to St Claude (Jura) in France and to Nuremberg, the two rival centres of the wooden pipe trade. (J. PA.)

PIPE-FISHES, small marine fishes, which with the Sea- horses form a distinct family, Syngnathidx, of the order of Lophobranchiate Fishes (see

IcurHyoLoey, vol. xii. p. 694). The name is derived from the peculiar form of their

Fie. 1.—Syngnathus acus, male, with sub-caudal pouch.

snout, which is produced into a more or less long tube, ending in a narrow and small mouth which opens upwards and is toothless, The body and tail are long and thin, snake-like, encased in hard integuments which are divided into regu- larly arranged segments. This dermal skeleton shows several longitudinal ridges, so that a vertical section through the body | represents an angular figure, not round or j/Z oval as in the majority of other fishes. A dorsal fin is always present, and the |jj principal (in some species, the only) organ [| of locomotion. The ventral fins are as JAR constantly absent, and the other fins may UR J): or may not be developed. The gill-open- [4a ings are extremely small, and placed near |i the upper posterior angle of the gill-cover. |) ‘s Pipe-fishes are abundant on such coasts of te Su the tropical and temperate zones as offer [\ by their vegetation shelter to these de- || fenceless creatures. They are very bad }!) swimmers, slowly moving through the |) water by means of the rapid undulatory i movement of the dorsal fin. Their tail, | even when provided with a caudal fin, ig |” i!.:\ Ay of no use in swimming, and not prehensile aS in sea-horses. Specimens, therefore, Fic. 2.—Sub-candal sda pba at a great distance PONY A 6 oe

, g been resistlessly carried ready to leave the by currents into the open OCeAN 5 lth «Ins hooumrene of inn species, Syngnathus pelagicus, has an extra-

the membrane of the c é z . aside to admit of a ordinarily wide range over the tropical view of its interior. habiting the vegetation of the Sargasso Sea. In pipe- fishes the male is provided with a pouch—in some species

pouch is pushed seas, and is one of the common fishes in- (N#turalsize.) on the abdomen, in others on the lower side of the tail—

PIP—PIP

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in which the ova are lodged during their development,

This marsupial pouch is formed by a fold of the skin —

developed from each side of the trunk or tail, the free margins of the fold being firmly united in the median line throughout the period during which the eggs are being hatched. When the young are hatched the folds separate, leaving a wide slit, by which the young gradually escape when quite able to take care of themselves. Nearly a hundred different species of pipe-fishes are known, of which Siphonostoma typhle, Syngnathus acus (the Great Pipe-fish, up to 18 inches in length), WVerophis xquoreus (Ocean Pipe-fish), Verophis ophidion (Straightnosed Pipe fish), and Merophis lumbriciformis (Little Pipe-fish) are British species. The last three are destitute of a caudal fin. ‘

PIPIT, French Pipit, cognate with the Latin Pipio (see PIGEON, supra p. 84), the name applied by ornithologists to a group of birds having a great resemblance both in habits and appearance to the Larxs (vol. xiv. p. 317), with which they were formerly confounded by systematists as they are at the present day in popular speech, but differing from them in several important characters, and, having been first separated to form the genus Anthus, which has since been much broken up, are now generally associated with the WaeTalLs (q.v.) in the Family Mota- cillide.| Pipits, of which over fifty species have been de- scribed, occur in almost all parts of the world, but in North America are represented by only two species— Jeocorys spraguti, the Prairie-Lark of the north-western plains, and Anthus ludovicianus, the American Titlark, which last is

every nearly allied to the so-called Water-Pipit of Europe,

A. spipoletta. To most English readers the best known species of Pipit is the Titlark or Meadow-Pipit, A. pratensis, a bird too common to need description, and abundant on pastures, moors, and uncultivated districts generally ; but in some localities the Tree-Pipit, A. trivialis, or A. arboreus of some authors, takes its place, and where it does so it usually attracts attention by its loud song, which is not unlike that of a Canary-bird, but delivered (as appears to be the habit of all the Pipits) on the wing and duringa short circuitous flight. Another species, the Rock-Lark, A.

obscurus, scarcely ever leaves the sea-coast and is found almost all round the British Islands. The South-African genus Macronyz, remarkable for the extreme length of its hind claw, is generally placed among the Pipits, but differs from all the rest in its brighter coloration, which has a curious resemblance to the American genus Stwrnella (see Icrerus, vol. xii. p. 697), though the bird is certainly not allied thereto. (A. N.)

PIPPI, Grutto (c. 1492-1546), the head of the Roman school of painting in succession to Raphael. This prolific painter, modeller, architect, and engineer is currently named GiuLi0 (or Jutio) Romano, from the place of his birth—Rome, in the Macello de' Corbi. His name in full was Giulio di Pietro di Filippo de' Giannuzzi,—Guiannuzal being the true family name, and Pippi (which has prac- tically superseded Giannuzzi) being an abbreviation from the name of his grandfather Filippo.

The date of Giulio's birth is a little uncertain. Vasarl (who knew him personally) speaks of him as fifty-four years old at the date of his death, 1st November 1546; thus he would have been born in 1492. Other accounts assign 1498 as the date of birth. This would make Giulio young indeed in the early and in such case most precocious stages of his artistic career, and would show him as dying, after an infinity of hard work, at the comparatively early age of forty-eight.

Giulio must at all events have been quite youthful

1 Pipits can always be distinguished from Larks by having the hind part of the " tarsus" undivided, while the Larks have it scutellated.

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when he first became the pupil of Raphael, and at

} Raphael's death in 1520 he was at the utmost twenty-

eight years of age. Raphael had loved him as a son, and had employed him in some leading works, especially in the Loggie of the Vatican ; the series

there popularly termed “Raphael’s Bible” is done in large measure by Giulio,— as for instance the subjects of the Creation of Adam and Eve, Noah’s Ark, and Moses in the Bulrushes. In the saloon of the “Incendio del Borgo,” also, the figures of Benefactors of the Church (Charlemagne, &c.) are Giulio’s handiwork. It would appear that in subjects of this kind Raphael simply furnished the design, and committed the execution of it to some assistant, such as Giulio,—taking heed, however, to bring it up, by final retonching, to his own standard of style and type. Giulio at a later date followed out exactly the same plan; so that in both instances inferiorities of method, in the general blocking- out and even in the details of the work, are not to be pre- cisely charged upon the caposcuola. Amid the multitude of Raphael’s pupils, Giulio was eminent in pursuing his style, and showed universal aptitude ; he did, among other things, a large amount of architectural planning for his chief. Raphael bequeathed to Giulio, and to his fellow- pupil Gianfrancesco Penni (“Il Fattore ”), his implements and works of art; and upon them it devolved to bring to completion the vast fresco-work of the “ Hall of Constan- tine” in the Vatican—consisting, along with much minor matter, of the four large subjects, the Battle of Constan- tine, the Apparition of the Cross, the Baptism of Constan- tine, and the Donation of Rome to the Pope. The two former compositions were executed by Pippi, the two latter by Penni. The whole of this onerous undertaking was completed within a period of only three years,—which is the more remarkable as, during some part of the in- terval since Raphael’s decease, the Fleming, Adrian VL., had been pope, and his anti-esthetic pontificate had left art and artists almost in a state of inanition. Clement VI. had now, however, succeeded to the popedom. By this time Giulio was regarded as the first painter in Rome ; but his Roman career was fated to have no further sequel. Towards the end of 1524 his friend the celebrated writer Baldassar Castiglione seconded with success the urgent request of the duke of Mantua, Federigo Gonzaga, that Giulio should migrate to that city, and enter the duke’s service for the purpose of carrying out his projects In architecture and pictorial decoration. These projects were already considerable, and under Giulio’s management they became far more extensive still. The duke treated his painter munificently as to house, table, horses, and whatever was in request; and soon a very cordial attachment sprang up between them. In Pippi’s multi- farious work in Mantua three principal undertakings should be noted. (1) In the Castello he painted the

History of Troy, along with other subjects. (2) In the suburban ducal residence named the Palazzo del T (this designation being apparently derived from the form of the roads which led towards the edifice) he rapidly carried out a rebuilding on a vastly enlarged scale,—the materials being brick and terra-cotta, as there is no local stone,— and decorated the rooms with his most celebrated works a . fresco painting—the story of Psyche, Icarus, i all of the Titans, and the portraits of the ducal a, a papndss The foreground figures of Titans se 4 4 to 14 feet high; the room, even in its ‘tructural details, is made to subserve the general artistic pe and many of its architectural features are dis- ae Greatly admired though these pre- ae a 8 have always been, and at most times even ea Aan now be fully ratified, they have suffered y at the hands of restorers, and modern eyes see

them only through a dull and deadening fog of renovation. The whole of the work on the Palazzo del T, which is of the Doric order of architecture, occupied about five years. (3) Pippi recast and almost rebuilt the cathedral of Mantua ; erected his own mansion, replete with numerous antiques and other articles of vertu; reconstructed the street architecture to a very large extent, and made the city, sapped as it is by the shallows of the Mincio, com- paratively healthy ; and at Marmiruolo, some five miles distant from Mantua, he worked out other important buildings and paintings. He was in fact, for nearly a quarter of a century, a sort of Demiurgus of the arts of design in the Mantuan territory.

Giulio’s activity was interrupted but not terminated by the death of Duke Federigo. The duke’s brother, a cardinal who became regent, retained him in full employ- ment. For a while he went to Bologna, and constructed the fagade of the church of S. Petronio in that city. He was afterwards invited to succeed Antonio Sangallo as architect of St Peter’s in Rome,—a splendid appointment, which, notwithstanding the strenuous opposition of his wife and of the cardinal regent, he had almost resolved to accept, when a fever overtook him, and, acting upon a constitution somewhat cnfeebled by worry and _ labour, carried him off on lst November 1546. He lies buried in the church of S. Barnaba in Mantua. At the time of his death Giulio enjoyed an annual income of more than 1000 ducats, accruing from the liberalities of

his patrons. He left a widow, and a son and daughter. The son, named Raffaello, studied painting, but died before he could pro- duce any work of importance; the daughter, Virginia, married Ercole Malatesta.

Wide and solid knowledge of design, combined with a prompti- tude of composition that was never at fault, formed the chief motive power aud merit of Giulio Romano's art. Whatever was wanted, he 'produced it at once, throwing off, as Vasari says, a large design in an hour ; and he may in that sense, though not equally so when an imaginative or ideal test is applied, be called a great inventor. It would be difficult to name any other artist who, working as an architect, and as the plastic and pictorial embellisher of his architecture, produced a total of work so fully and homo- geneously his own; hence he has been named "the prince of decorators." He had great knowledge of the human frame, and represented it with force and truth, though sometimes with an excess of movement; he was also learned in other matters, especially in medals, and in the plans of ancient buildings. In design he was more strong and emphatic than graceful, and worked a great deal from his accumulated stores of knowledge, without consulting nature direct. As a general rule, his designs are finer and freer than his paintings, whether in fresco or in oil—his easel pictures being comparatively few, and some of them the reverse of decent; his colouring is marked by an excess of blackish and heavy tints.

Giulio Romano introduced the style of Raphael into Mantua, and established there a considerable school of art, which surpassed in development that of his predecessor Mantegna, and almost rivalled that of Rome. Very many engravings—morce than three hundred are mentioned—were made contemporaneously from his works ; and this not only in Italy, but in France and Flanders as well. His plan of entrusting principally to assistants the pictorial execution of his cartoons has already been referred to ; Primaticcio was one of the leading coadjutors. Rinaldo Mantovano, a man of great ability who died young, was the chief executant of the Fall of the Giants ; he also co-operated with Benedetto Pagni da Pescia in painting the remarkable series of horses and hounds, and the story of Psyche. Another pupil was Fermo Guisoni, who remained settled in-Mantua. The oil pictures of Giulio Romano are not generally of high importance; two leading ones are the Martyrdom of Stephen, in the church of that saint in Genoa, and a

Holy Family in the Dresden Gallery. Among his architectural works not already mentioned is the Villa Madama in Rome, with a fresco of Polyphemus, and boys and satyrs; the Ionic facade of this building may have been sketched out by Raphael.

Vasari gives a pleasing impression of the character of Giulio. He was very loving to his friends, genial, affable, well-bred, temperate in the pleasures of the table, but liking fine apparel and a handsome scale of living. He was good-looking, of middle height, with black curly hair and dark eyes, and an ample beard ; his portrait, painted by himsclf, isin the Louvre. (W. M. R.)

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PIPPIN, or Perry, a name borne by several members of the Carlovingian family. (1) Pippin of Landen, or Pippin the Old, mayor of the palace, died 639. (2) His grand- son, Pippin of Heristal, the father of Charles Martel, died 714. (3) Martel's son, Pippin the Short, king of the Franks, died 768. See, for these three, FRANCE, vol. ix. p.

530 sq. (4) Pippin, son of Charles the Great (776-810),.

was his father's deputy in Italy, and as such was anointed "king for Italy" by Pope Adrian I. in 781. (5) Pippin, second son of Louis the Pious, appointed king of Aquitaine by his father in 817, died in 838 after a reign spent in the family conflicts of the period. (6) The son of the last- named Pippin was called to the throne by the Aquitanians on his father's death, and maintained himself with varying fortunes against Charles the Bald, to whom Louis had given the vacant throne, till in 864 he was taken by treachery and soon died in confinement.

PIQUA, a city of Miami county, Ohio, U.S., is situated in a rich agricultural district on the Miami river, on the Miami and Erie Canal, and on the Pittsburgh, Cincinnati, and St Louis and the Cincinnati and Michigan railways, about 90 miles N. by E. of Cincinnati. Besides a large agricultural trade the city has woollen manufactures, iron foundries, and agricultural

machine works. The popula- tion, 3277 in 1850, was 5967 in 1870 and 6131 in 1880.

PIQUET, a game at cards. The name, of uncertain etymology, is probably from pique (the spade suit). The Germans had formerly a Schwerter game, the packs used being like piquet packs. The pquwe of French cards corre- sponds to the spade (sword) of Italian and to the espadas of Spanish cards. Hence piquet may be the sword game.

It seems likely that piquet is a development of ronfa, a game mentioned by Berni in 1526 ; la ronjfle (included in Rabelais's list, circa 1530) may be regarded as the same game. The point at piquet was anciently called ronjle.

The Spanish name of the game was cientos (centum, a hundred). Piquet was played in England under the name of cent, or sant, probably as early as 1550 (contemporane- ously with the marriage of Mary to Philip of Spain). About the middle of the 17th century (shortly after the marriage of Charles I. to Maria Henrietta of France) the name cent was dropped in England, and the French equt- valent, piquet, adopted.

Piquet is played by two persons, with a pack of thirty- two cards, —the sixes, fives, fours, threes, and twos being thrown out from a complete pack. Until recently the partie was the best of five games of a hundred up (a player not obtaining fifty losing a double game). But now the partie is generally determined in six hands, the player making the largest aggregate score being the winner. The number of points won is the difference between the two scores, with a hundred added for the game. If, how- ever, the loser fails to make a hundred in six hands, the number of points won is the two scores added together, with a hundred for the game. Piquet played in this way is called Rubicon Piquet.

The dealer (see ‘‘ Laws”) deals twelve cards to his adversary and twelve to himself, by two at a time or by three at a time to each alternately. He then places the undealt cards, called the stock, face downwards on the table.

The players now look at their hands and discard, ¢.e., put out, such cards as they deem advisable, and take in an equivalent number from the stoek. The elder hand (non-dealer) may exehange five or any less number. He

separates his diseard from his hand, places it face downwards on the table, and takes from the top of the stock the number discarded. If he discards less than five he must state how many he leaves. He is entitled to look at cards he leaves, replacing them face downwards on the top of the stock.

The younger hand may exchange three eards or any less number. If the elder hand leaves any cards, the younger may exehange as many as remain in the stock, discarding an equal number. He takes his cards from the top of the stock, including any left by the elder hand. Ifthe younger hand leaves any cards, he announces

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the number left. He has the option of looking at eards he leaves, If he looks at them, he must show them to the elder hand, after the elder has named the suit he will first lead, or has led a ecard, If the younger hand elects not to look at the eards left the elder cannot see them. The younger hand must makc his cleetion before he plays to the card first led, or, if so required, after the dealer hag named the suit he will first lead.

Each player may examine his own discard at any time during the hand ; but he must keep it separate from his other cards,

The elder hand next calls his point, sequences, and quatorzes or trios, and, if good, scores for them.

The point must be called first or the right to call a point is lost. It is scored by the player who announces the suit of greatest strength, valued thus: ace, 11; court cards, 10 caeh ; other eards, the number of pips on each. Thus, if the elder hand’s best suit is ace, king, knave, nine, eight, he calls “five cards.” If the younger hand has uo suit of five cards, he says “good.” The elder hand then says ‘‘in spades,” or whatever the suit may be, or shows his point face upwards. If the younger hand has a suit of more than five eards, he says “not good.” If the younger hand has also five cards, he says “equal” or ‘‘ what do they make?” when the elder calls ‘‘forty eight” (or “making eight,” short for forty-eight), The younger must not inquire what the point makes unless he has an equal nuniber of cards. If the younger hand’s five

cards make less than forty-eight he says “good”; if exactly forty-eight, he says “equal”; if more than forty-eight, he says ‘‘ not good.”

The player whose point is good reekons one for each card of it; if the points are equal neither player scores for point.

Sequences are usually called next, the elder hand stating what his best sequence is, and the younger saying, “ good,” ‘‘equal,” or ‘not good,” as in the case of the point. Any three or more con- secutive cards of the same suit held in hand constitute a sequence. The order of the cards is as follows :— ace (highest), king, queen, knave, ten, nine, eight, seven (lowest). A sequence of three eards is called a tierce; of four, a quart; of five, a guint; of six, a siatéme ; of seven, a septiemc; of eight, a huitieme. A tievee of ace, king, queen is called a tierce major ; a tierce of king, queen, knave is called tierce to a king (and so on for other intermediate sequences according to the card which heads them); a tierce of nine, eight, seven is called a ticrec minor. Sequences of four or more cards follow the same nomenclature, ¢.g., ace, king, queen, knave is a quart major ; knave, ten, nine, eight is a quart toa knave ; and so on.

A sequence of a greater number of cards is good against a sequence of a smaller number ; thus, a quart minor is good against a tierce major. As between sequences eontaining the same number of cards, the one headed by the highest eard is good; thus, a quart to a queen is good against a quart to a knave. Only iden- tical sequences can be equal.

The clder hand announces, say, a quint major. If the younger has a sixiéme he says ‘not good”; if he has a quint major he says ‘‘equal” ; if he has a lower sequence, or no sequence, he says ‘‘good.” The player whose sequence is good reckons one for each card of it, and ten in addition for quints or higher sequences. Thus a tierce counts three ; a quart, four; a quint, fifteen (5 +10); a sixieme, sixteen; and so on. If the elder hand’s sequence 8 good, he names the suit, or shows it face upwards.

If the highest sequence (or the sequence first called) is good, all lower sequences can be reckoned, notwithstanding that the ad ver- sary has a sequence of intermediate value. For example, A has a quart to a queen

(good), and a tierce minor. He calls and reckons seven, notwithstanding that B has a quart to a kmave B’s quart counts nothing. h

If the highest sequence is equal, neither player scores anything for sequence, even though one player may hold a second sequence of equal or inferior value.

Quatorzes are composed of four aces, four kings, four queens, four knaves, or four tens; érios of three of any of these. They are called and reckoned as before, except that here there can be no equality. A quatorze, if good, reckons fourteen ; a tro, if guod, reckons three. Any quatorze is good against a trio ; if each player has a quatorze the highest is good; the same if each has @ Wo. As in the case of sequences, anything that is good enables the player to reckon all smaller quatorzes or trios in his hand. 4 quatorze or trio is called thus :—the elder hand says “ four aces, “three queens,” or as the case may be; the younger replies ‘“cood” or ‘‘not good,” as before. When a player calls a trio of a denomination of which he might hold a quatorze, the adversary is entitled to be informed which card is not reckoned. Thus, A, who might hold four kings, calls “three kings”; B Svs “good”; A says ‘‘I do not reckon the king of diamonds, whiehever king it may be that he has put out or suppresses.

When the elder hand has done calling he leads a card. Before playing to this card, the younger hand reekons all that he xd good, stating of what cards his claims are composed, or showing the cards claimed for.

The next step is playing the hands. The elder hand leads and

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| card he pleases ; the younger plays to it. The younger hand must follow suit if able ; otherwise he may play any card he thinks fit.

The two cards thus played constitute a trick. The trick is won _ by the higher card of the suit led. It is not eompulsory to win

the trick if able to follow suit without. The winner of the trick

Jeads to the next, and so on until the twelve cards in hand are

layed out.

‘ Ties the play of the hands the leader counts one for each

eard led, whether it wins the trick or not. If the leader wins the

trick, his adversary reckons nothing that trick ; but if the second layer wins the trick he also counts one; and so on. The winner of the last trick counts two instead of one.

The tricks are left face upwards on the table, in front of the player who wins them. They may be examined by either player at any time.

If ech player wins six tricks the cards are divided, and there is no further score. If one player wins more than six tricks he wins the cards, and adds ten to his score. If one player wins every trick, he wins a capot, and scores forty for the cards, instead of ten.

During the play of the hand, a player is entitled to be informed as to any cards his adversary holds which he has reckoned as good, or has declared to be equal. A player may require his adversary to exhibit any such cards ; but the usual practice is to reply to all necessary questions with regard to them, such as “how many of your point?” meaning how many in hand, ‘‘ how many of your tierce?” and so on.

During the progress of the hand each player repeats aloud the amount of his score for the time being (see example). At the end of the hand the number scored is recorded on a ruled card. Eaeh

_ player has a card and writes down the scores of both himself and hisopponent. At the end of the sixth hand, the totals are recorded, and the neeessary subtraction or addition made. The scores are then compared. If there is any difference in the written scores, a player’s score of his own hand is deemed to be the correct one.

Exampic.—A (elder hand) has dealt him acc, king, knave of spades ; ace, queen, knave, eight of hearts ; knave, eight, seven of clubs ; and nine, eight of diamonds. He discards king of spades ; eight, seven of clubs ; and nine, eight of diamonds. He takes in re ett of spades ; king of hearts ; nine of clubs; and king of

iamonds.

B (younger hand) has ten, seven of spades; ten, nine, seven of hearts ; king, queen, ten of clubs; and ace, queen, knave, ten of diamonds. He discards seven of spades ; and nine, seven of hearts. He takes in queen of spades ; ace of clubs; and seven of diamonds.

The hand then proceeds thus. A (calls his point) “ five cards.” B (says) “equal,” or ‘‘ what do they make?”

A “forty-nine,” or ‘‘ making nine.” B “ good.”

_ A (eounting his point) “ five” and (counting his sequence, which 1s good) ‘fa quart major, nine. Three knaves?” B “not good.”

A (leads ace of hearts and says) ‘“‘ten.” B ‘‘ four tens, fourteen, and three queens, seventeen ” (plays the ten of hearts).

A (leads the remaining hearts and says) ‘‘eleven, twelve, thirteen, fourteen.” B (plays seven, ten, knave, queen of diamonds, and repeating his score, says) ‘ seventeen.”

A has now five tricks, and in order to win the eards should lead any card but ahighspade. He leads king of diamonds, and says “fifteen.” B (wins with ace and says) “ eighteen,” (and then leads the winning clubs, saying) “ nineteen, twenty, twenty-one, twenty-two.”

a. (keeps ace, knave of clubs, and repeating his seore says) fitteen, B (leads queen of “spades and says) ‘‘ twenty-three.”

; A (wins with ace and says) “sixteen” (and leads knave, saying) eighteen ” (and adding ten for the eards) ‘‘ twenty-eight.”

§ A then writes on his scoring card 28 ; 23. B writes on his 23 ;

28. The pack is collected, and the next hand commences.

Three scores (omitted in order to simplify the description of the game) have yet to be mentioned.

: Carte Blanche.—If either player has neither king, queen, nor pee in the hand dealt him, he holds carte blanche, for which he I ten. As soon as a player discovers he has a carte blanche,

¢ must tell his adversary ; this he usually does by saying “ dis- ont for carte blanche.” The adverse discard is then made (as ieee discarding), after which the carte blanche is shown onatmeeec e cards quickly one on top of the other, face upwards

Pique.—If the elder hand scores, in hand and play, thirty or more, before the younger counts anything, he oii i ee for a he adds thirty to his score. “For example, A has a quint

po ie ad ae sequence, and three aces, also good. quiné major (t nts twenty-three in hand. He next leads the

Wenty-eight), one of the aces and another card,

making hi i 2 5 his “aes He then adds thirty for the pique and calls

Repique.—If a

“ player scores, in hand alone, thirty or more pe me hissed versary reckons anything, he gains ios! for which goal Oe insist am ous, point, quint, and quatorze, all > Satay -10Ur, ayer holdi j

tepique, and calls his score – athide s ae these adds sixty for the

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The order in which the scores accrue is of importance. For the sake of convenience, the elder hand finishes his reckoning before the younger

begins. ‘The scores, however, whether made by the elder or younger hand are recordable in the following order :—(1) carte blanche ; (2) point; (8) sequences ; (4) quatorzes and trios ; (5) points made in play; (6) the cards. This will often affeet a pique or repique. ‘Thus, a pique can only be made by the elder hand, asthe one he reckons in play when he leads his first card counts before points subsequently made in play by the younger hand. The younger, therefore, cannot make thirty in hand and play before the elder scores one. But the one reckoned by the elder hand when he leads his first card does not prevent his being repiqued, because scores made in hand have precedence of points made in play. ‘The elder leads his first card and counts for it before the younger reckons, simply as a convenient way of stating that he has nothing iz hand which is good. Again, say A has a quint (good), a tierce, and a quatorze (good). He scores thirty-two in hand alone; but, if his point is not good, he does not gain a repique, because the younger hand’s point is recordable in order before the sequences and quatorze. And again, say A has a hatieme (good for twenty-six), and a tierce, and leads a card thus reaehing thirty in hand and play. B has three tens. The trio reekoning in order before the point made in play by A saves a pique.

Carte blanche, taking precedence of all other scores, saves piques and repiques. It also counts towards piques and repiques. Thus, a player showing carte blanche, and having point and quint, both good, would repique his adversary.

A capot does not count towards a pique, as the capot is not made in play. It is added after the play of the hand is over.

A player who reckons nothing that hand as a penalty (see ‘*Laws”) is not piqued or repiqued if he holds any cards which, but for the penalty, would have reckoned before his adversary reached thirty.

Equalities do not prevent piqnes or repiques. A player who has an equal point or sequence scores nothing for it. Therefore if, notwithstanding the equality, a player makes thirty, in hand and play, or in hand, by scores which reckon in order before anything. his adversary can count, he gains a pique or a repique.

Hints to Players. —On taking up your hand look for carte blanche.

Before disearding, ascertain what there is against you. Thus: if you have knave or ten of asuit, there is no quint against you in that suit.

When discarding, elder hand, your main object is to plan an attack. Younger hand, on the contrary, should guard his weak places and then see if he has a chance of attacking anywhere. Thus, the elder hand may freely ungnard kings and queens, or discard whole suits of which he has indifferent cards only. The younger should do just the reverse, keeping guards to kings and queens, and should not leave himself blank of a weak suit, as his small eards may guard high ones taken in.

In most hands, and especially younger hand, it is essential to keep the whole of your best suit for point. Gaining the point makes an average difference of at least ten to the score ; and, what is of more eonsequence, it saves piques and repiques-

The cards are next in importance to the point. In discarding you should, when in doubt, take the best chance of dividing or winning the cards. Winning the cards instead of losing them makes a difference of about twenty-three points. Hence, especially elder hand, you should not necessarily keep the longest suit for point, if that suit is composed of low cards, and keeping it involves the discard of high cards from other suits.

Asa rule, it is not advisable to leave any cards. The younger hand is at less disadvantage in leaving a card than the elder ; for a card left by the elder can be taken by the younger ; but a card left by the younger is only excluded from his hand. A card may generally be left when there is a chance of a great score if the cards in hand are not parted with, there being at the sanie time no pique or repique against you.

It is generally right to keep unbroken suits. Having made up your mind to discard from a given suit, you should throw the whole of it, except (a) winning cards ; (0) guards to kings or queens, especially younger hand ; or © cards which make up a quatorze or trio. It is better to keep ecards in sequence than cards not in sequence. Trios should be kept if they can be retained without injury to the hand in other respects; but it is seldom advisable to put out a high card for the sake of keeping a trio of knaves or tens, especially if there is a quatorze against you.

The discard is further affected in the last hand of a partie by the state of the score. Thus, if you area long way behind, and your only chance is a desperate discard, in order to kecp cards which may possibly give you a pique or a repique, you may run consider- able risk with that object. On the other hand, if you are well ahead, make a safe discard, 7.¢., one which is likely to win the eards or to keep your adversary back.

When taking in after discarding, count that you leave the full number of eards for the younger hand, the penalty for taking in one of your adversary's cards being that you can reckon nothing

that deal. The younger hand should also count that the proper number of cards are in the stock, before he takes in, as, if he mixes one of the elder's cards with his hand, he can reckon nothing that deal. '

After taking in and before calling your hand, look through it and your discard to ascertain what remains against you. If there is anything against you which is not called, you will probably be able to judge from this some portion of the discard, and will so be assisted in playing the cards. But implicit reliance must not be placed on this. For experienced players not unfrequently omit to call some small score, such as a tierce, in order intentionally to mislead you. This manceuvre (called sinking a score) is especially resorted to when a player has a high card unguarded. In order to induce you to believe that it is guarded, he will put up with the loss of several points in calling, on the chance of recouping himself by afterwards saving or winning the cards in consequence of your misconceiving his discard.

If your adversary calls a point which is not good, you should at once note in which suit it is (or may be), in order to count the hand. If the younger hand admits a point to be good (as regards the number of cards that compose it), the elder should observe whether the younger could possibly have had equal or better in any suit. If so he has probably put out that suit. But it may be that the younger hand, if a good judge of the game, will admit the number of cards of a point to be good when he has an equal number. Thus:—A calls five cards, and B knows, from examining his hand and discard, that there is

only one suit in which A can have five cards, and that they make fifty. B has five cards making forty-nine. B should promptly reply “good,” although he has five cards himself; because he ought to know that A’s five cards are better than his. By saying “equal,” he unnecessarily exposes his hand.

In playing the cards, you must be guided a good deal by what your adversary has called, and, to some extent, by what he has not called. You will generally know several cards in the adverse hand, or will be able to mark some that have been put out. Sometimes you will know all the cards. ‘hus, if the younger hand fails to follow suit to your first lead in which you could only have five cards, it is evident he has put out three cards of that suit, and you know every card in his hand.

Failing direct indications, lead the point, unless you have a small point and there is a tenace in that suit against you.

When playing to the opponent’s lead, keep guards to kings and queens. Having the choice between throwing a card you have declared and one you have not, prefer the former.

If you can make a pique, lead your winning cards one after the other, without considering how many of the reinaining tricks you will lose. There is one exception to this :—in the sixth hand, if your losing the cards will enable the younger hand to save his rubicon, and your score is such that you can win the partie without the pique, you should fcrego the pique, when by not leading out your winning cards immediately you can divide or win the cards.

_When you have five or six tricks and a winning card, lead the winning card, unless certain that your opponent has cards of that suit. By playing otherwise, you risk eleven points for the chance of gaining one for the last trick. This, of course, is liable toa similar exception as the previous case, viz., in the sixth hand with five tricks up, if you must win the cards or the last trick to win the partie or to save the rubicon.

In the sixth hand, if a player has scored less than a hundred, he should consider, before calling or playing, whether he can make his aggregate score up to a hundred or more. If he cannot, his object should be to reckon

as little as he can, and to prevent his adversary from scoring, by making his point or sequence equal (if possible), and by endeavouring to divide the cards. If he is satis- fied he cannot divide the cards, and there is no capot against him he is at liberty to score two (one for a trick he wins, and one for a card he plays), and to throw his cards down, allowing the adversary to reckon thirteen in play.

On the other hand, a player who is ahead, and who sees his adversary cannot reach a hundred, should endeavour to prevent the declaration of equalities, and, if he cannot win the cards himself. should play to lose them. :

During the calling and play of the hand, always keep in mind your adversary's score and satisfy yourself that he does not reckon too many. Mistakes occur, even among the most honourable

players. If your adversary reckons too few, you are not bound to correct him.

Laws of Piquet.—1. A player may shuffle either pack, above the table The dealer has the right to shuffle last. 2. A cut rane, consist of at least two cards. 3. Highest has choice of deal and cards. (Ace highest, seven lowest.) 4. If a card is exposed in cutting or before dealing, there must be a fresh rai The mode of distributing the cards (by twos or by threes) must not oo nee during the partie. 6. The stock must be placed, in one packet

ace downwards, between the players. 7. If the cards are dealt wrongly. the error may be rectified before either player has taken up his hand ~ or the adversary may demand a fresh deal. 8. If a card belonging to the elder hand or the stock is exposcd when dealing, the adversary has the option of a fresh deal. If there is a faced card in the pack, there must be a fresh deal.

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9. If, after the deal is completed, more than one card is found to have been dealt wrongly, or nine cards are found in the stock, there must be a fresh

deal. The same if the wrong pack is dealt with, and the error is discovered before either player has taken up his cards; otherwise the packs remain changed. 10. If only one card has been dealt wrongly, the elder hand, after looking at his cards and before taking in a card, has the option of a fresh deal, and if there are only seven cards in the stock, he may alter his discard (see Laws 12 sq.). 11. The players deal alternately. If a player deals out of tum, and the error is discovered by either player before he takes up his cards, the deal is void, and the right dealer deals. If the error is discovered later, the elder hand must deal twice running with his own pack, unless that or the next deal is the last of the partie, 12. Each player is bound to discard at least one card (but see Laws 21, 22, and 23). 18, When taking in, the cards must be taken in order from the top of the stock. 14. After taking a card, a player cannot alter his discard ; and if he then takes back any of his discard, he must play with more than twelve cards (see Law 80); if after taking a card he mixes any of his hand with his discard, he must play with less than twelve cards (see Law 29). 15. If either player, when taking in, exposes a card of the stock belonging to his adversary, he can reckon nothing that deal. 16. If either player mixes with his hand a card of the stock which belongs to his adversary, he can reckon nothing that deal; or the adversary may have a fresh deal. If he stands the deal he can only take in such of his cards as have not been mixed. 17. Ifaplayer discards more cards than he takes in, he must play with less than twelve cards (see Law 29). 18. If a player discards fewer cards than he takes in, he can reckon nothing that deal. 19. The adversary has the option of not enforcing the penalty of reckoning nothing that deal. 20. If the younger hand leaves any cardsand mixes them with his discard, without showing them to the elder hand, the elder, after leading a card, is eutitled to see the younger’s discard. 21, If the elder hand elects to stand the deal when one card has been dealt wrongly, and he has thirteen cards, he must discard one card more than he takes in, and must discard at least two cards. If there are eight cards in the stock, the younger hand discards one less than he takes in, and if he only takes one card he need not discard any; if there are seven cards in the stock, and the elder hand discards six cards and takes five, the younger hand can only take two cards. 22. If the elder hand elects to stand the deal when he has eleven cards, and there are eight in the stock, he must discard one less than he takes in; if he only takes one card he need not discard any. The younger hand must discard one more than he takes in, and must discard at least two

cards. 23. If the elder hand elects to stand the deal when he has twelve cards, and there are seve in the stock, he discards the same number as he takes in; the younger discards one more than he takes in, and must discard at least two cards. 24. When the elder hand's call is good against the cards, it is sufli- cient if he states the number of cards that compose it; if not he must say what it makes or to what card it is, or the value of the cards of which it con- sists. 25. The elder hand calling too little may correct his miscall before it has been replied to by the younger hand ; and the younger hand, allowing a correct call to be good or equal, when he holds better, may correct his reply before the elder hand has made another call, or, if there is no further call, before the elder hand hasledacard. 26. If a player calls what he does not hold, he may correct his call before the younger hand has played to the first trick; and, if the younger hand has miscalled, the elder hand may take up his card and play differently. In the absence of correction, the offender can reckon nothing that deal, and the adversary, on discovery of the error, can reckon anything he has good, which is not barred by a correct call made in addition to the miscall. But there is no penalty for calling anything which a player could not possibly hold in his hand and discard taken together, nor for misnaming a suit, nor for misnaming the rank of a sequence, when one of the counting value named is held, provided the claim could not have been held in the hand and discard taken together; and, if a player voluntaril shows what he claims for, he is liable to no penalty for miscalling it. 27. player who calls anything which is allowed to be good or equal must show the cards called at any time they are asked for during the play of the hand. 28. When the younger hand has played to the first trick, neither player can reckon anything omitted (but see Law 26). 29. A player is liable to no penalty for playing with less than twelve cards. His adversary counts as tricks all cards that cannot be played to. 30. If a player plays with more than twelve cards, he can reckon nothing that deal; but his cards, though not good to score, are good to bar his adversary. 31. A card led or played cannot be taken up (but see Law 26), but cards accidentally dropped may be retaken. Also, if the leader leads several cards consecutively without waiting for them to be played to, and the adversary plays too many cards, he may retake the extra ones; and cards subsequently played in error must be taken up and played over again. Or, if a player leads out of turn, he may take up his card unless it has been played to. Or, if a player does not follow suit when able, the card played in error and all cards

subsequently played must be taken up and played over again. Or, if a player misinforms his adversary when asked what cards he holds that have been allowed to be good or equal, the adversary may retake all the cards he has subsequently played, and may play differently. 32. Errors in counting the hand, if proved, may be rectified before the player in error has seen his next hand. 383. If both players score the same number in six dcals, each deals once more, when the partie is concluded, even if there should be a second tie. 34. If the loser fails to score a hundred, he is rubi- coned, whether the winner's score reaches a hundred or not. 38. The deal in which the discovery of an incorrect pack is made is void. All preceding deals stand good, 34. A bystander calling attention to any error or oversight, and thereby affecting the score, may be called upon to pay all stakes and bets of the player whose interest he has prejudicially affected.

See Edmond Hoyle, A Short Treatise on the Game of Piquet (1744); **Cavendish," The Laws of Piquet and of Rubicon Piquet, adopted by the Portland Club, with a Treatise on the Game (1882). (H. J.)

PIRACY. Sir Edward Coke (Jnstit. ili. 113) describes a pirate (Latin pirata, from Greek zeiparys) as hosts humani generis, and as a rover and robber upon the sea. Piracy may be defined in law as an offence which consists in the commission of those acts of pillage and violence upon the high seas which on land would amount to felony. By the ancient common law of England piracy, if com- mitted by a subject, was deemed to be a species of treason, being contrary to his natural allegiance, and by an alien to be felony; but since the Statute of Treasons, 25 Edw. III. c. 2 (1851-52), piracy has been held to be felony only. Formerly this offence was only cognizable by the Admiralty courts, whose proceedings were based upon the

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civil law, but by the statute 28 Hen. VIIE. ¢. 15 (1536) | a new jurisdiction proceeding according to the common law was set up which, modified and regulated by subse- quent enactments, such as 39 Geo. III. c. 37 (1798-99),

4 & 5 Will. IV. c. 36 (1834), and 7 & 8 Vict. c. 2 (1844), | continues to be the tribunal by which offenders of this description are tried.

Piracy, being a crime not against any particular state put against all mankind, may be punished in the compet- ent court of any country where the offender may be found or into which he may be carried. But, whilst, the law of nations gives to every one the right to pursue and exter- minate pirates without any previous declaration of war (pirates holding no commission or delegated authority from any sovereign or state), it is not allowed to kill them without trial except in battle. Those who surrender or are taken prisoners must be brought before the proper tribunal and dealt with according to law.

The earliest of all sea-rovers were perhaps the Phceni- cians. During the heroic age of Greece piracy was univer- sally practised. In the Homeric poems frequent mention is made of piracy, which indeed was held in honourable estimation,—the vocation of a pirate being recognized, so that a host, when he asked his guest what was the purpose of his voyage, would enumerate enrichment by indis- criminate maritime plunder as among those projects which night naturally enter into his contemplation. So late as the time of Solon the Phoceans, on account of the sterility of their soil, were forced to roam the seas as pirates. That legislator tolerated whilst he regulated the association of sea-rovers which he found established by inveterate usage. The prevalence of the piratical spirit in Greece in the early ages may perhaps be explained by the number of small independent states into which the country was divided, and the violent animosity subsisting among them. In this way predatory habits were diffused and kept alive. Asa more regular system of government grew up, and a few states such as Athens and Corinth had become naval powers, piracy was made a capital offence. It was, how- ever, never entirely put down. Cilicia was at all times the great stronghold of the pirates of antiquity, and in consequence of the decline of the maritime forces which had kept them in check they increased so much in numbers and audacity as to insult the majesty of Rome itself, so that it became necessary to send Pompey against them with a large fleet and army and more extensive powers than had ever previously been conferred on any Roman general. The Etruscans were notorious sea-rovers who infested the Mediterranean ; and Polybius relates that the Romans imposed

upon the Carthaginians as a condition of peace the stipulation that they should not sail beyond Cape Faro, either for the purposes of trade or piracy.

Hallam (Middle Ages, iii. 336) says that in the 13th and 14th centuries a rich vessel was never secure from attack, and neither restitution nor punishment of the criminals was to be obtained from Governments. Hugh Despenser seized a Genoese vessel valued at 14,300 marks, for which no restitution was ever made. The famous Hanseatic League was formed in the middle of the 13th century in northern Germany chiefly for the purpose of protecting the ships of the confederated cities from the attacks of the pirates by which the Baltic was then infested.

A graphic account of piracy as it existed at the end of the 16th century in European waters, especially on the English, French, and Dutch coasts, will be found in Motley, Hist. United Netherlands (vols. iii. and iv.). The oe was not abated in Europe until the feudal system

ad been subverted and the ascendency of the law finally a In more modern times some of the smaller West

ndia Islands became a great resort of pirates, from which,

however, they have for many years been driven ; for con- tinued acts of piracy the city of Algiers was successfully bombarded by the British fleet under Lord Exmouth as lately as August 1816; and pirates are still not unfre- quently met with in the Indian and Chinese seas, but piracy in its original form is no longer in vogue. The BUCCANEERS (q.v.) were cruel piratical adventurers of a later date who commenced their depredations on the Spaniards soon after they had taken possession of the American continent and the West Indies, although there was a time when the spirit of buccaneering approached in

some degree to the spirit of chivalry in point of adventure.

Scaliger observes in a strain of doubtful compliment, ‘“Nulli melius piraticam exercent quam Angli.” The first levy of ship money in England in

1635 was to defray the expense of chastising these pirates. The buccaneering confederacy was broken up through the peace of Ryswick ine! GO.

At a very early period of English history the law pro- vided for the restitution of property taken by pirates, if found within the realm, whether belonging to strangers or Englishmen; but any foreigner suing for the recovery of his goods was required to prove that at the time of the capture his own sovereign and the sovereign of the captor were in mutual amity, for it was held that piracy could not be committed by the subjects of states at war with each other, In England the crown is, generally speaking, entitled to all bona piratorum; but if any person can estab- lish a title to the goods the claim of the crown thereto ceases. By 13 & 14 Vict. c. 26 (1850), ships and effects captured from pirates are to be restored on the payment of one-eighth of their value (by way of salvage), which is to be distributed among the recaptors.

Cowel (Law Dict., 1727) states that in former times the word pirate was used in a better sense than that of a sea-robber, being attributed to persons to whose care the mole or pier of a haven was entrusted, and, quoting the learned Spelman, he adds, sometimes to a sea soldier: “Robertus vero Comes (Normaniz) attemptavit venire in Angliam cum magno exercitu, sed a piratis Regis qui curam maris a Rege (Willielmo) susceperant repulsus est” (Glos- sariwm, 1687, p. 460). (J. C. W.)

PIRANUS. See ATHENS.

PIRANESI, Giovanni Battista, an eminent Italian engraver of ancient architectural subjects, was born in the former half of the 18th century, and studied his art at Rome. The great remains of that city kindled his enthusiasm and demanded portrayal. His hand faith- fully imitated the actual remains of a fabric ; his inven- tion, catching the design of the original architect, supplied the parts that were wanting ; his skill introduced groups of vases, altars, tombs ; and his broad and scientific dis- tribution of light and shade completed the picture, and threw a striking effect over the whole. One engraving after another was executed with much brilliancy ; and, as the work went on, the zeal of the artist only waxed stronger. In course of time it was found necessary to call in the aid of all his children

and of several pupils. He did not, in fact, slacken in his exertions till his death in 1778. The plates of Piranesi, in which the severity of burin work is largely supplemented by the freer lines of the etching-needle, were collected and preserved by his son and coadjutor Francesco. They were published, to the number of about 2000, in 29 vols. fol., Paris, 1835-37.

PIRMASENS, a small manufacturing town of the Bava- rian palatinate, lies in a hilly district, nearly 40 miles west by south of Spires. The staple industry is the production of boots and shoes, which are exported to Austria, Russia, and even America; but musical instruments, stoneware, and other articles are also manufactured. The only noteworthy buildings are the town-house and the principal church, the latter containing a fine monument to Louis IX., landgrave

of Hesse-Darmstadt. In 1880 the town contained 12,039 inhabitants, three-fourths of whom were Protestants.

Pirmasens owes its name to a St Pirmin, who is said to have preached Christianity here in the 8th century. It originally belonged to the count of Hanau-Lichtenberg, but passed to Hesse- Darmstadt in 1736. In 1793 the Prussians gained a victory here over a body of French troops.

PIRNA, an ancient town of Saxony, lies on the left bank of the Elbe, on the margin of the “Saxon Switzer- land,” 11 miles above Dresden. It is on the whole a regularly built town, with promenades on the site of the former ramparts, but contains no notable edifices except the fine Gothic Hauptkirche (1502-46) and the town- house. The chief source of its prosperity is formed by the excellent sandstone found on both banks of the Elbe above the town; but manufactures of cigars, chemicals, enamelled tinware, pottery, and leather are also carried on. Besides the export of the sandstone, it transacts a trade in grain, fruit, and timber, mainly by river. The population in 1880 was 11,680, almost all Protestants.

Pirna, originally a Slavonic settlement, long oscillated between Bohemia and Meissen (Saxony), but became permanently united with the latter in 1404. Having at a very early period received the privilege of holding fairs,

it was at one time among the most flourishing of Saxon towns, but afterwards lost its import- anee through pestilence and the disasters of the Thirty Years' and Seven Years' Wars. On a rock above the town rises the fortress of Sonnenstein, now a lunatic asylum, erected in the 16th century on the site of an older castle, and once considered the most important fortress on the Elbe. It successfully withstood the Swedes in the Thirty Years' War, though the town was stormed, but was cap- tured and dismantled by the Prussians in 1758. In 18138 it was oceupied by the French, and held for several months.

PIRON, Atexis (1689-1773), the foremost epigramma- tist of France, was born at Dijon on the 9th July 1689. His father, Aimé Piron, was an apothecary, but was also a frequent writer of verse in Burgundian patois. Alexis began life as clerk and secretary to a banker, and then studied law without any success or much seriousness. As a young man he made himself notorious by the composi- tion of a piece of licentious verse which might have brought him into serious difficulties but for the good nature of a high legal official, the president Bouhier. His sarcastic tongue made him unpopular in his neighbour- hood, and at last in 1719, when nearly thirty years old, he went to seek his fortune at Paris. His first experiences were not very encouraging, and he had to put up with tho unpleasant and not very honourable position of literary adviser and corrector to the Chevalier de Belle Isle. An accident, however, brought him money and notoriety. Tho jealousy of the regular actors produced an edict restricting the Thédtre de la Foire, or licensed booths at fair times, to a single character on the stage. None of the ordinary writers for this theatre, not even Lesage, would attempt a monologue-drama for the purpose, and Piron obtained a footing as a dramatic author, much applause, and three hundred crowns, with a piece called Arlequin Deucalion. Thenceforward he was constantly employed for this theatre, and not seldom for the more dignified Comédie Frangaise, but with the exception of the excellent verse comedy of La Métromanie no one of his comedies and none of his tragedies at all deserve mention. His real vocation was that of an epigram maker, and this, though it made him not a few enemies, recommended him to not a few patrons who supplied his necessities, His most intimate associates, however, during the middle period of his life were two ladies of talent though not of position Mademoiselle Quinault, the actress, and her friend Made- moiselle

Quenaudon or De Bar, companion to a lady of rank. She was slightly older than Piron and not beauti- ful, but after twenty years acquaintance he married her in 1741, lived happily enough with her for four years, and nursed her tenderly during an attack of madness which

in other two years proved fatal. He long outlived her, dying on the 21st January 1773 in his eighty-fourth year, The discredit of his early literary misdeed, and perhaps his indiscriminate habits of lampooning, prevented his clection to the Academy, certain persons having induced the king to interpose his veto. But Piron was pensioned, and during the last half century of his life was never in any want. He was a complete literary free-lance, and lam- pooned Fréron and Desfontaines as sharply as he lam- pooned Voltaire and the philosophe coterie. Socially he was a rather loose liver, though probably, except on paper, not worse than most of his contemporaries. He was a member of the somewhat famous convivial society of the Caveau. But his true title to remembrance lies in his epigrams, one of which, the burlesque epitaph on himself but reflecting on the Academy (see vol. viii. p. 496), is known to almost everybody, while many others equal or surpass it in brilliancy. Grimm called him a “ machine & saillies,” and probably no man who ever lived possessed

more of the peculiarly French faculty of sharply pointed

verbal wit than he. It is noteworthy too that he was as ready with conversational retort as with his pen.

Piron published his own theatrical works in 1758, and after his death his friend and literary executor Rigollot de Juvigny pub- lished his @uvres Completes. During the last thirty years a good deal of unpublished work has been added by MM. Bonhomme, Lalanne, and others. But the epigrams, which take up but little

room and have been frequently reissued in various selections, are

alone of great importance.

PISA, which has always been one of the most import-

ant cities of central Italy, is situated on the banks of the Arno at a short distance from the sea, in the midst of a

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1. Cavalieri di S. Stefano,

2. Academy of Fine Arts,

3. Royal Theatre.

4. University. fertile plain backed by marble mountains wooded with pines and other forest trees. In the days of Strabo it was only two geographical miles from the sea-shore, but the continual increase of the delta at the mouth of the river has now trebled that distance. In the Middle Ages the Arno was still navigable for all ships of war then in use, and formed the safest of harbours.

The origin of Pisa is very ancient, and is involved in obscurity. The Romans believed it to date from the days of Troy, and also gave a legendary account of its foundation by colonists from Greece. Strabo mentions it as one of the bravest of the Etruscan cities. From Polybius we learn that in 225 B.c. it was already the friend of the Romans;

5. Palazzo Lanfreducci or Alla Giornata, 6. Post Office,

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and later it became their ally and was defended by them | from the ferocious onslaughts of the Ligurian and Apuan tribes. Thus the Romans acquired great power over the city, and finally subjected it to their rule. In Caesar’s time according to some writers, in that of Augustus according to others, they established a military colony there. Nevertheless, excepting some inscriptions, sarco- phagi, statues, and columns, very few remains of Roman buildings have been discovered in Pisa. Little is known of the history of Pisa during the barbarian invasions, but it is an ascertained fact that it was one of the first towns to regain its independence. Under the Byzantine dominion Pisa, like many other of the maritime cities of Italy, pro- fited by the weakness of the Government at Constan- tinople to reassert its strength. And even during the first years of the harsh Lombard rule the need recognized by these oppressors of defending the Italian coast from the attacks of the Greeks was favourable to the development of the Pisan navy. Few particulars are extant concerning the real condition of the town; but we occasionally find Pisa mentioned, almost as though it were an independent city, at moments when Italy was overwhelmed by the greatest calamities. According to Amari’s happy expression, “it was already independent by sea, while still enslaved on land.” Its prosperity notably declined after the re-estab- lishment of the Lombard rule and under the Franks. It again began to flourish under the marquises of Tuscany, who governed it in the naine of the emperor.

In 1003 we find records of a war between Pisa and Lucca, which, according to Muratori, was the first waged between Italian cities in the Middle Ages. But the military development and real importance of Pisa in the 11th century must be attributed to the continuous and desperate struggle it maintained against the tide of Saracenic invasion from Sicily. And, although the numer- ous legends and fables of the old chroniclers disguise the true history of this struggle, they serve to attest the importance of Pisa in those days. In 1004 the Saracens forced the gates and sacked a quarter of the town ; and in 1011 they renewed the attack. But the Pisans repulsed them and assumed the offensive in Calabria, Sicily, and even in Africa. Still

more memorable was the expedition afterwards undertaken by the united forces of Pisa and Genoa against Mogdhid, better known in the Italian chronicles as Mugeto. This Moslem chief had made him- self master of Sardinia, and was driven thence by the allied fleets in 1015. Again invading the island, he was again attacked and defeated by the same adversaries, leaving a brother and son, or, as some authorities aver, a wife and son, prisoners in their hands. Sardinia con- tinued to be governed by native magistrates, who were like petty sovereigns, but were now subject to the sway of Pisa. This was the' primary cause of the jealousy of the Genoese, and of the wars afterwards made by them upon Pisa and carried on until its power was crushed. Mean- while the Pisans flourished more and more, and continued hostilities against the Saracens. In 1062 their ships returned from Palermo laden with spoil. Thus it is not surprising that Pisa should already have had its own code of laws (Consuetudint di Mare), which in 1075 were approved by Gregory VIL, and in 1081 confirmed by a pent from the emperor Henry IV., that supplies the

rst authentic notice of the existence of consuls in medieval Italy.1 The oldest of Pisan statutes still extant Is the Breve dei Consoli di Mare of 1162.

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a remembered that the Pisans and Florentines dated the

the nee e year ab incarnatione, t.e., from the 25th March. But

iu, a dated it from the 25th following and the Pisans from the

Rn. ch preceding the commencement of the common year. The r common style was adopted throughout Tuscany in the year 1750.

| and Sardinia.

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In 1099 the Pisans joined in the second crusade, proved their valour at the capture of Jerusalem, and derived many commercial advantages from it ; for within a short time they had banks, consuls, warehouses, and privileges

of all kinds in every Eastern port. Thus, while the com- mune of Pisa was still under the rule of the marquises of Tuscany, all negotiations with it were carried on as with an independent state officially represented by the archbishop and consuls. The aristocrats were the domin- ant party, and filled the highest offices of the republic, which, in the 12th century, rose to great power, both on sea and land, by its wars with the Lucchese, Genoese, and Moslems. In 1110 Pisa made peace with Lucca after six years of continuous hostilities. And between 1114 and 1116 it achieved a still greater en- terprise. The Pisan fleet of three hundred sail, com- manded by the archbishop Pietro Moriconi, attacked the Balearic Isles, where as many as 20,000 Christians were said to be held captive by the Moslems, and returned loaded with spoil and with a multitude of Christian and Moslem prisoners. The former were set at liberty or ransomed, and among the latter was the last descendant of the reigning dynasty. The chief eunuch who had governed Majorca perished in the siege. Immediately afterwards the fourteen years' war with Genoa broke out. The two republics contested the dominion of the sea, and both claimed supreme power over the islands of Corsica A papal edict awarding the supremacy of Corsica to the Pisan church proved sufficient cause for the war, which went on from 1118 to 1182. Then Innocent II. transferred the supremacy over part of Corsica to the Genoese church, and compensated Pisa by grants in Sardinia and elsewhere. Accordingly, to gratify the pope and the emperor Lothair II., the Pisans entered the Neapolitan territory to combat the Normans. They aided in the vigorous defence of the city of Naples, and twice attacked and pillaged Amalfi, in 1135 and 1137, with such effect that the town never regained its pro- sperity. It has been said that the copy of the Pandects then taken by the Pisans from Amalfi was the first known to them, but in fact they were already acquainted with those laws. 'The war with Genoa never came to a real end. Even after the retaking of Jerusalem by the Moslems (1187) the Pisans and Genoese again met in conflict in the East, and performed many deeds of valour. They were always ready to come to blows, and gave still more signal proofs of their enmity during the Sicilian war in behalf of the emperor Henry VI. From that moment it was plain that there could be no lasting peace between these rival powers until the one or the other should be crushed. The greatness and wealth of the Pisans at this period of their history is proved by the erection of the noble buildings by which their city is adorned, The foundations of the cathedral were laid in

1063, and its consecration took place in 1118; the bap- tistery was begun in 1152, and the campanile (the famous leaning tower) in 1174. And all three magnificent struc- tures were mainly the work of Pisan artists, who gave new life to Italian architecture, as they afterwards renewed the art of sculpture.

It is asserted by some writers, especially by Tronci, that in the 12th century Pisa adopted a more democratic form of government. But in fact the chief authority was still vested in the nobles, who, both in Pisa and in Sardinia, exercised almost sovereign power. They formed the real strength of the republic, and kept it faithful to the em- pire and the Ghibelline party. The Guelf and popular element which constituted the force and prosperity of Florence was hostile to Pisa, and led to its downfall. The independence of the former city was of much later origin,

only dating from the death of Countess Matilda (1115), but it rapidly rose to an ever-increasing power, and to inevitable rivalry with Pisa. Owing to the political and commercial interests binding Florence to the Roman court, the Guelf element naturally prevailed there, while the growth of its trade and commerce necessarily compelled that state to encroach on waters subject to Pisan rule. And, although Pisa had hitherto been able to oppose a glorious resistance to Genoa and Lucca, it was not so easy to continue the struggle when its enemies were backed by the arms and political wisdom of the Florentines, who were skilled in obtaining powerful allies. The chroniclers ascribe the first war with Florence, which broke out in 1222, to a most ridiculous motive. The ambassadors of the rival states in Rome are said to have quarrelled about a lapdog. This merely shows that there

were already so many general and permanent reasons |

for war that no special cause was needed to provoke it.

In 1228 the Pisans met and defeated the united forces of |

Florence and Lucca near Barga in the Garfagnana, and at the same time they despatched fifty-two galleys to assist Frederick II. in his expedition to

the East. Shortly after this they renewed hostilities with the Genoese on account of Sardinia. The judges who governed the island were always at strife, and, as some of them applied to Pisa and some to Genoa for assistance against one another, the Italian seas were once more stained with blood, and the war burst out again and again, down to 1259, when it ter- minated in the decisive victory of the Pisans and the con- solidation of their supremacy in Sardinia. But meanwhile Florence had made alliance with Genoa, Lucca, and all the Guelf cities of Tuscany against its Ghibelline rival. pope had excommunicated Frederick II. and all his adher- ents. And, asa crowning disaster, the death of Frederick in 1250 proved a mortal blow to the Italian Ghibelline cause.

Nevertheless the Pisans were undaunted. Summoning | Siena, Pistoia, and the Florentine exiles to their aid, they |

boldly faced their foe, but were defeated in 1254. Soon

after this date we find the old aristocratic government of |

Pisa replaced by a more popular form. Instead of the consuls there were now twelve elders (anziani); besides the

podesta, there was a captain of the people; and there was |

a general council as well asa senate of forty members. The rout of the Tuscan Guelfs on the field of Montaperto (1260) restored the fortunes of Pisa. (1266), where Manfred fell, and the rout of Tagliacozzo (1268), sealing the ruin of the house of Hohenstauffen in Italy and the triumph of that of Anjou, were fatal to Pisa.

For the republic had always sided with the empire and |

favoured Conradin, whose cruel end struck terror into the Ghibelline faction. The pope hurled an edict against the Pisans and tried to deprive them of Sardinia, while their merchants were driven from Sicily by the Angevins. The internal condition of the city was affected by these events. Owing to the increasing influence of the Guelf and popular side, to which the more anibitious nobles began to adhere

for the furtherance of personal aims, the aristocratic |

Ghibelline party was rapidly losing ground. The first man

to step to the front at this moment was Count Ugolino |

della Gherardesca of the powerful house of that name. He had become the virtual head of the republic, and, in order to preserve its independence and his own sway, inclined to the Guelfs and the popular party, in spite of the Ghibelline traditions of his race. He was supported by his kinsman Giovanni Visconti, judge of Gallura; but almost all the other great families against him, and proclaimed him a traitor to his party. his country, and his kin. were driven into exile. Both then joined the Florentines took part in the war against their native city, and laid

The |

But the battle of Benevento |

vowed eternal hatred |

So in 1274 he and Visconti |

Pais A

| waste its surrounding territories. In 1276 the Pisans were compelled to agree to very grievous terms,—to exempt Florentine merchandise from all harbour dues, to yield certain strongholds to Lucca, and to permit the return of Count Ugolino, whose houses they had burnt, and whose lands they had confiscated. Thus the count again became a powerful leader in Pisa. Visconti, however, was dead,

This was the moment chosen by Genoa fora desperate and decisive struggle with her perpetual rival. For some years the hostile fleets continued to harass each other and engage in petty skirmishes, as if to measure their strength and prepare for a final effort. On the 6th August 1284 the great battle of Meloria took place. Here seventy-two Pisan galleys engaged eighty-eight Genoese, and half the Pisan fleet was destroyed. The

chroniclers speak of 5000 killed and 11,000 prisoners ; and, although these figures must be exaggerated, so great was the number of captives | taken by the Genoese as to give rise to the saying-—“To see Pisa, you must now go to Genoa.” This defeat crushed the power of Pisa. She had lost her dominion over the sea, and the Tuscan Guelfs again joined in attacking her by land. Count Ugolino had taken part in the battle of Meloria and was accused of treachery. At the height of his country’s disasters, he sought to confirm his own power by making terms with the Florentines, by yielding certain castles to Lucca, and by neglecting to conclude negotiations with the Genoese for the release of the prisoners, lest these should all prove more or less hostile to himself. This excited a storm of opposition against him, The archbishop Ruggieri, having put himself at the head of the nobles, was elected podesti by the Lanfranchi, Sismondi, and Gualandi, and a section of the popular party. The city was plunged into civil war. The great bell of the commune called together the adherents of the archbishop; the bell of the people summoned the partisans of the count. Aftera day’s fighting (1st July 1288) the count, his two sons, and his two nephews were captured in the Palazzo | del Popolo (or town hall), and cast into a tower belonging to the Gualandi and known as the “Tower of the Seven Streets.” Here they were all left to die of hunger. Their tragic end was afterwards immortalized in the Divina Commedia. The sympathies of Dante Alighieri, the Florentine patriot and foe of Rome, were naturally in favour of the victims of an aristocratic prelate, opposed to all reconciliation with Florence.

The Florentines were now allied with Lucca and Genoa, and a few of their vessels succeeded in forcing an entry into the Pisan port, blocked it with sunken boats, and seized its towers. Their own internal dissensions of 1293 | put a stop to the campaign, but not before they had con- cluded an advantageous peace. They and all the members of the Guelf league were freed from all imposts in Pisa and its port. In addition to these privileges the Genoese also held Corsica and part of Sardinia ; and throughout the island of Elba they were exempted from every tax. They likewise received a ransom of 160,000 lire for their Pisan prisoners. These were no longer numerous, many having succumbed to the hardships and sufferings of all kinds to which they had been exposed.

In 1312 the arrival of the emperor Henry VII. gladdened the hearts of the Pisans, but his sudden death in 1313 again overthrew their hopes. He was interred at Pisa, and Uguccione della Faggiuola remained as imperial lieutenant, was elected podesta and captain of the people, and thus became virtual lord of the city. As a Ghibelline chief of valour and renown, he was able to restore the | military prestige of the Pisans, who under his command captured Lucca and defeated the Florentines at Monteca- tini on the 29th August 1315. So tyrannical, however, was his rule that in 1316 he was expelled by the popular

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fury. But Pisa's freedom was for ever lost. He was succeeded by other lords or tyrants, of whom the most renowned was Castruccio Castracane, a political and mili- tary adventurer of much the same stamp as Uguccione himself. With the help of Louis the Bavarian, Cas- truccio became lord of Lucca and Pisa, and was victorious over the Florentines; but his premature death in 1328 again left the city a prey to the conflicts of opposing factions. New lords, or petty tyrants, rose to power in turn during this period of civil discord, but the military yalour of the Pisans was not yet extinguished.- By sea they were almost impotent—Corsica and Sardinia were lost to them for ever ; but they were still formidable by land. In 1341 they besieged Lucca in order to prevent the entry of the Florentines, to whom the city had been sold for 250,000 florins by the powerful Mastino della Scala. Aided by their Milanese, Mantuan, and Paduan allies, they gave battle to their rivals, put them to rout at Altopascio (2nd October), and then again excluded them from their port. Thereupon the Florentines obtained Porto Talamone from Siena and established a navy of their own. By this means they were enabled to capture the island of Giglio, and, attacking the Pisan harbour, carried off its chains, bore them in triumph to Florence, and suspended them in front of the baptistery, where they remained until 1848. Then, in pledge of the

brotherhood of all Italian cities, they were given back to Pisa, and placed in the Campo Santo.

The war was now carried on by the free companies with varying fortune, but always more or less to the hurt of the Pisans. In 1369 Lucca was taken from them by the emperor Charles IV.; and afterwards Giovan Galeazzo Visconti, known as the count of Virtt, determined to forward his ambitious designs upon the whole of Italy by wresting Pisa from the Gambacorti. For at this time the conflicts of the Raspanti faction, headed by the Gherar-desea, with the Bergolini led by the Gambacorti, had left the latter family masters of the city. At Visconti's instigation Piero Gambacorti, the ruler of the moment, was treacherously assassinated by Jacopo d'Appiano, who succeeded him as tyrant of Pisa, and bequeathed the state to his son Gherardo. The latter, a man of inferior ability and daring, sold Pisa to the count of Virtt, receiving in exchange 200,000 florins, Piombino, and the islands of Elba, Pianosa, and Monte Cristo. Thus in 1399 Visconti took possession of Pisa, and left it to his natural son Gabriele Maria Visconti, who was afterwards expelled from its gates. But even during this century of disaster the Pisans continued to cherish the fine arts. In the year 1278 they had entrusted the erection of their fine Campo Santo to Niccola and Giovanni Pisano, by whom the architectural part of it was completed towards the end of the century. In the following year the first artists of Italy were engaged in its decoration, and Orcagna painted his celebrated frescos on its walls. Others were after- wards supplied by Benozzo Gozzoli and men of lesser note, oe — labour of ornamentation was only discontinued in

Meanwhile, in 1406, the Florentines made another attack upon Pisa, besieging it simultaneously by sea and land. Owing to the starving condition of its defenders, and aided by the treachery of Giovanni Gambacorti, they entered the city in triumph on the 9th October, and sought to "crush every germ of rebellion and drive out its a by measures of the utmost harshness and cruelty." : hid the orders sent by the Ten of War to the repre- ata 'ann a the Florentine Government in Pisa, and such essa feed policy of every Ttalian state. of _ : ntly for a long time there was a continual stream

gration from Pisa, The Medici pursued a humaner

course. In 1472 Lorenzo the Magnificent tried to restore the ancient renown of the Pisan university. To that end he filled it with celebrated scholars, and, leaving only a few chairs of letters and philosophy in Florence, compelled the Florentines to resort to Pisa for the prosecution of their studies. But nothing could now allay the inextinguish- able hatred of the conquered people. When Charles VIII. made his descent into Italy in 1494, and came to Sarzana on his way to Tuscany, he was welcomed by the Pisans with the greatest demonstrations of joy. And, although that monarch was ostensibly the friend of Florence, they did not hesitate, even in his presence, to assert their own independence, and, casting the Florentine ensign, the Marzocco, into the Arno, made instant preparations for war. Between 1499 and 1505 they heroically withstood three sieges and repulsed three attacking armies. But their adversaries always returned to the assault, and, what was worse, yearly laid waste their territories and destroyed all their crops. Soderini, who was perpetual gonfalonier of Florence, and Machiavelli, the secretary of the Ten, urged on the war. In 1509 the latter encamped his forces on three sides of the distressed city, which at last, reduced to extremity by famine, was forced to surrender on the 8th June 1509. Thenceforth the Florentines remained lords of Pisa. But now, mainly owing to the efforts of Soderini and Machiavelli, the conquerors showed great mnagnanimity. They brought with them large stores of provisions, which were freely distributed to all; they tried to succour the suffering populace in every way, and gave other assistance to the wealthier classes. Nevertheless, emigration continued even on a larger scale than in 1406, and the real history of Pisa may be said to have ended. In Naples, in Palermo, in all parts of Italy, Switzerland, and the south of France, we still find the names of Pisan fainilies who quitted their beloved home at that time. The Florentines immediately built a new citadel, and this was a great bitterness to the Pisans. The Medici, how- ever, remained well-disposed towards the city. Leo X. was an active patron of the university, but it again declined after his death. The grand-duke Cosmo I., a genuine statesman, not only restored the university, but instituted the “Uffizio dei Fossi,” or drainage office for the reclania- tion of marsh lands, and founded the knighthood of St Stephen. This order played a noble part in the protection of Tuscan commerce, by fighting the Barbary pirates and establishing the prestige of the grand-ducal navy (see Mepic1). Under the

succeeding Medici, Pisa's fortunes steadily declined. Ferdinand I. initiated a few public works there, and above all restored the cathedral, which had been partly destroyed by fire in 1595. These dreary times, however, are brightened by one glorious name— that of Galileo Galilei. A native of Pisa, he taught in its university ; he made his first experiments in gravity from its bell tower, discovered, by observing the swing of the cathedral lamp, the law of the oscillation of the pendulum, and began there his stupendous reform of natural philosophy. But the sufferings inflicted on him by the Inquisition prove the depth of ignorance to which Tuscany and all Italy had then sunk.

As to Pisa, it is enough to mention that its population within the walls had been reduced in 1551 to 8574 souls, and that by 1745 it had only risen to the number of 12,406. Under the house of Lorraine, or more correctly during the reign of that enlightened reformer Pietro Leopoldo (1765-1790), Pisa shared in the general pro- sperity of Tuscany, and its population constantly increased. By 1840 it contained 21,670 souls, exclusive of the suburbs and outlying districts. At the present day Pisa is again one of the most flourishing cities of Tuscany. It counts 26,863 inhabitants within the walls, and in-

cluding the suburbs a total of 44,518. Its university is one of the best in Italy; it isan important railway centre; its commerce and manufactures are continually on the increase; its agriculture is rich and flourishing ; and it is the chief city of a province numbering 283,563 inhabitants.

Sce P. Tronci, Annali Pisani, 2 vols., Pisa, 1868-1871 ; Roncioni, "Istorie Pisane," in the Archivio Storico- Italiano, vol. vi. pt. 1; "Cronache Pisane," in the same Archivio, vol. vi. pt. 2; Repetti, Dizionario Geografico Storico della Toscana, sv. "Pisa." (Eo V2)

A few details regarding the principal buildings may be given by way of supplement to the foregoing article. The architects of the cathedral were Boschetto and Rinaldo, both Italians, probably Pisans. It is in plan a Latiu

cross, with an internal length of 3114 feet and a breadth of 252 feet. The nave, 109 feet high, has double vaulted aisles and the transepts single aisles; and at the inter- section of nave and transepts there is a cupola. The basilica is still the predominant type, but the influence of the domed churches of Constantinople and the mosques of Palermo is also apparent. The pillars which support the nave are of marble from Elba and Giglio ; those of the side aisles are the spoils of ancient Greek and Roman buildings brought by the Pisan galleys. Externally the finest part of the building is the west front, in which the note struck by the range of arches running round the base is repeated by four open arcades. Of the four doors three are by John of Bologna, who was greatly helped by Francavilla, Tacca, aud others ; that of the south side, of much older date, is generally supposed to be the work of Bonanno. Of the interior decorations it is enough to mention the altars of the nave, said to be after designs by Michelangelo, and the mosaics in the dome and the apse, which were among the latest designs of CIMABUE (q.v.). The baptistery was completed only in 1278, and marred in the 14th century by the introduction of Gothic details. The building is a circle 100 feet in diameter, and is covered with a cone-surmounted dome 190 feet high, ou which stands a statue of St Raniero. The lowest range of semicircular arches consists of twenty columns and the second of sixty ; and above this is a row of eighteen windows in the same style separated by as many pilasters. In the interior, which is supported by four pilasters and eight columns, the most striking features are the octagonal font and the hexagonal pulpit, erected in 1260 by Niccola PIsANO (g.v.). The campanile or “leaning tower of Pisa” is a round tower, the noblest, according to Freeman, of the southern Romanesque. Though the walls at the base are 13 feet thick, and at the top about half as inuch, they are constructed throughout of marble. The basement is surrounded by a range of semicircular arches supported by fifteen columns, and above this rise six arcades with thirty columns each. The cighth story, which contains the bells, is of much smaller diameter than the rest of the tower, and has only twelve columns. It is less to the beauty of its archi- tecture, great though that is, than to the fact that, being 11 feet 2 inches (or if the cornice be included 18 feet 8 inches) out of the perpendicular, it strikes the imagination in a way peculiarly its own. The eutire height is 183 feet, but the ascent is easy by a stair in the wall, and the visitor hardly perceives the inclination till he reaches the top and from the lower edge of the gallery looks “down”

along the shaft receding to its base. There is no reason to suppose that the architects, Bonanno and William of Innsbriick, intended that the campanile should be built in this oblique position ; it would appear to have assumed it while the work was still in pro- gress. The Campo Santo, lying to the north of the cathedral, owes its origin to Archbishop Ubalde (1188-1200), who made the spot peculiarly sacred by bringing fifty-three shiploads of earth from Mount Calvary. The building, erected in the Italian Gothic style between 1273 and 1283, by Giovanni Pisano, is of special interest

chiefly for its famous frescos noticed above (see also ORCAGNA, vol. xvii. p. 815).

PISA, LEonarpo oF. See PIsanus.

PISANELLO. See Pisano, Virrors.

PISANO, Anprea. Andrea da Pontadera (c. 1270- 1348), generally known as Andrea Pisano, the chief pupil of Giovanni Pisano (¢.v.), was born about 1270, and first learned the trade of a goldsmith, as did many other after- wards celebrated artists. This early training was of the greatest value to him in his works in bronze, to which the manipulation of the precious metals gave precision of design and refinement of execution. He becamea pupil of Giovanni Pisano about 1300, and worked with him on the sculpture for S. Maria della Spina at Pisa and elsewhere. But it is at Florence that his chief works were executed, and the formation of his mature style was due rather to Giotto

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than to his-earlier master. Of the three world-famed bronze doors of the Florentine baptistery, the earliest one —that on the south side—was the work of Andrea; he spent many years on it; and it was finally set up in 1336.1 This marvellous piece of bronze work, in many respects perhaps the finest the world has ever seen, has all

the breadth of a sculptor’s modelling, with the finish of a

piece of gold jewellery. It consists of a number of small quatrefoil panels—the lower eight containing single figures of the Virtues (see the figure), and the rest scenes from the

Part of the first bronze door of the Baptistery at Flerence, by Andrea Pisano,

life of the Baptist. In design the panels owe much to Giotto: the composition of each is simple and harmonious, kept strictly within the due limits of the plastic art, no attemptat pictorial effects and varied planes being made,— in this very unlike the perhaps more magnificent but less truly artistic reliefs on the third door, that last executed by Ghiberti. Andrea Pisano, while living in Florence, also produced many important works of marble sculpture, all of which show strongly Giotto's influence. In some cases probably they were actually designed by that artist, as, for instance, the double band of beautiful panel-reliefs which Andrea executed for the great campanile. The sub- jects of these are the-Four Great Prophets, the Seven Virtues, the Seven Sacraments, the Seven Works of Mercy, and the Seven Planets) The duomo contains the chief of Andrea's other Florentine works in marble. In 1347 he was appointed architect to the duomo of Orvieto, which had already been designed and begun by Lorenzo Maitani. The exact date of his death is not known, but it must have been shortly before the year 1349.

Andrea Pisano had two sons, Nino aud Tommaso,—both, especi- ally the former, sculptors of considerable ability. Nino was very successful in his statues of the Madonna and Child, which are full of human feeling and soft loveliness, —a perfect embodiment of the Catholic ideal of the Divine Mother. Andrea's chief pupil was Andrea di Cione, better known as OrncAGNA (q.v.). Balduccio di Pisa, another, and in one branch (that of sculpture) equally gifted pupil, executed the wonderful shrine of S. Eustorgio at Milan—a most magnificent mass of sculptured figures and reliefs.

PISANO, Giovanni (c. 1250-1330), son of NiccoLa

PIsan 0 (see below), born about 1250, was but little inferior to his father either as an architect or a sculptor. Together

1 The date on the door, 1330, refers to the completion of the wax model, not of the casting, which was at first unsuccessful, and had to be done over again by Andrea himself.

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with Arnolfo del Cambio and other pupils, he developed and extended into other parts of [taly the renaissance of sculpture which in the main was due to the extraordinary talent of that distinguished artist. After he had spent the first part of his life at home as a pupil and fellow-worker of Niccola, the younger Pisano was summoned between 1270 and 1274 to Naples, where he worked for Charles of Anjou on the Castel Nuovo. One of his earliest independent performances was the Campo Santo at Pisa, finished about 1283 ; along with this he executed various pieces of sculp- ture over the main door and inside the cloister. The richest in design of all his works (finished about 1286) is in the, cathedral of Arezzo,—a magnificent marble high altar and reredos, adorned both in front and at the back with countless figures and reliefs—mostly illustrative of the lives of St Gregory and St Donato, whose bones are enshrined there. The actual execution of this was pro- pably wholly the work of his pupils. In 1290 Giovanni was appointed architect or “capo maestro” of the new cathedral at Siena, in which office he succeeded Lorenzo Maitani, who went to Orvieto to build the less ambitious but equally magnificent duomo which had just been founded there. The design of the gorgeous facade of that duomo has been attributed to him, but it is more probable that he only carried out Maitani’s design. According to Vasari, Giovanni and other pupils of Niccola also executed the bas-reliefs on the west front of Orvieto, but this assertion is unsupported by any documentary evidence. At Perugia, Giovanni built the church of S. Domenico in 1304, but little of the original structure remains. The

north transept, however, still contains his beautiful tomb of Benedict XI., with a sleeping figure of the pope, guarded by angels who draw aside the curtain (see woodcut).

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Part of the tomb of Benedict XI., by Giovanni Pisano.

Above is a sculptured plinth supporting canopied figures of the Madonna and other saints. The whole composition 18 framed by a high cusped and gabled arch, on twisted columns, enriched with glass mosaic in the style of

the Cosmati. The general design is like the earlier tomb of Cardinal de Braye at Orvieto, the work of Giovanni's fellow-pupil, Arnolfo del Cambio. Z Ang of Giovanni's most beautiful architectural works is ~ _ chapel of S. Maria della Spina, on the banks of i mo in Pisa; the actual execution of this gem-like chapel, and the sculpture with which it is adorned, was – Inostly the work of his pupils! This exquisite little build- ing has recently been pulled down and rebuilt, under the pretext of "restoration."

The influence of his father N iccola is seen strongly in all

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. Schultz, Denkmaler der Kunst in Unter-Italien. vol. vii.

Giovanni's works, but especially in the pulpit of S. Andrea at Pistoia, executed about 1300. In design it resembles that in the Pisan baptistery; but the reliefs are less severely classical, and more full of vivid dramatic power and complicated motives. Another pulpit, designed on the same lines, was made by him for the nave of Pisa cathedral between 1310 and 1311. Only fragments of this now exist, but it is in course of restoration. The last part

of Giovanni's life was spent at Prato, near Florence, where with many pupils he worked at the cathedral till his death about 1330.

PISANO, Niccona (c. 1206-1278), one of the chief sculptors and architects of medizval Italy, was born about 1206. Though he called himself Pisanus, from Pisa, where most of his life was spent, he was not a Pisan by birth. There are two distinct accounts of his parentage, both derived mainly from existing documents. According to one of these he is said to have been the son of " Petrus, a notary of Siena;" but this statement is very doubtful, especially as the word "Siena" or 'de Senis" appears to be a conjectural addition. Another document among the archives of the Sienese cathedral calls him son of " Petrus de Apulia." Crowe and Cavalcaselle, as well as the majority of modern writers, accept the latter statement, and believe that he not only was a native of the province of Apulia in southern Italy, but also that he gained there his early instruction in the arts of sculpture and

architec- ture. Those on the other hand who, with most of the older writers, prefer to accept the theory of Niccola's origin being Tuscan suppose that he was a native of a small town called Apulia near Lucca, As is the case with the biographies of so many of those artists who lived long before Vasari's own time, that author's account of Niccola is quite untrustworthy. There is no doubt that in the century preceding Niccola Pisano's birth Apulia, and the southern provinces generally, were more advanced in the plastic art than any part of northern Italy—witness especially the magnificent architecture and sculpture in the cathedrals of Salerno, Bari, Amalfi, Ravello, and many others, in which still exist bronze doors, marble pulpits, and other works of art of great merit, dating from the

| 11th and 12th centuries,—-a period when northern Italy

produced very little art-work of any real beauty. That the young Niccola Pisano saw and was influenced by: these things cannot be denied, but Crowe and Cavalcaselle, in their eagerness to contradict the old traditions, go very | much too far when they deny the story, told by Vasari, of Niccola's admiration for and keen study of the remains of

In Niccola Pisano's works it

| ancient Roman sculpture which were then beginning to be

sought for and appreciated.

| is somewhat difficult to trace the direct influence of Apulian

art, while in many of them, especially the panel-reliefs of his Pisan pulpit (see figure), classical feeling is apparent in every fold of the drapery, in the modelling of the nude, and in the dignified reserve of the main lines of the com- position.

For all that, Niccola was no dull copyist ; though he emancipated himself from the stiffness and unreality of earlier sculpture, yet his admiration and knowledge of the physical beauty of the human form in no way detracted from the purity and religious spirit of his subjects. Though pagan in their beauty of modelling and grace of attitude, his Madonnas are as worshipful,

and his saints as saintly, as those of any sculptor the world has ever seen. With true genius he opened out to the church a new field in which all the gifts of God, even purely physical ones,

| were made use of and adopted as types and symbols of

inward purity and love—not repudiated and suppressed as ‘snares of the evil one. Except through his works, but

little is known of the history of Niccola’s life. As early

as 1221 he is said to have been summoned to Naples by Frederick IL, to do work in the new Castel dell’ Uovo. This fact supports the theory of his southern origin, though not perhaps very strongly, as, some years before, the Pisan Bonannus had been chosen by the Norman king as the sculptor to cast one of the bronze doors for Monreale cathedral, where it still exists. The carliest existing plece of sculpture which can be attributed to Niccola is a beautiful relief of the Deposition from the Cross in the tympanum of the arch of a side door at San Martino at Lucca ; it is remarkable for its graceful composition and delicate finish of execution. The date is about 1237.

In 1260, as an incised inscription records, he finished the marble pulpit for the Pisan baptistery ; this is on the whole the finest of his works.

The of the panels in the pulpit af the Pisan Baptistery, by Niccola Pisano.

seated on a throne, recalls the Roman Juno ; the head of Joseph behind her might be that of Vulcan ; while the youthful beauty of an Apollo and the mature dignity of a Jupiter are suggested by the standing and kneeling figures of the Magi. Certain figures in others of the panels are no less deeply imbued with classical feeling.

_The next important work of Niccola in date is the Arca di San Domenico, in the church at Bologna consecrated to that saint, who died in 1221. Only the main part, the actual sarcophagus covered with sculptured reliefs of St Dominic’s life, is the work of Niccola and his pupils. The sculptured base

and curved roof with its fanciful orna- ments are later additions. This “Arca” was made when St Dominic was canonized, and his bones translated ; it was finished in 1267, not by Niccola himself, but by his pupils. The most magnificent, though not the most beautiful, of Niccola’s works is the great pulpit in Siena cathedral (1268). ‘It is much larger than that at Pisa, though somewhat similar in general design, being an octa-

gon on cusped arches and columns. Its stairs, and a large landing at the top, with carved balusters and panels, rich with semi-classical foliage, are an addition of about 1500. The pulpit itself is much overloaded with sculp- ture, and each relief is far too crowded with figures. An attempt to gain magnificence of effect has destroyed the dignified simplicity for which the earlier pulpit is 80 re- markable.

Niccola’s last great work of sculpture was the fountain in the piazza opposite the west end of the cathedral at Perugia. This is a series of basins rising one above another, each with sculptured bas-reliefs; it was begun in 1274, and completed, except the topmost basin, which is of bronze, by. Niccola’s son and pupil Giovanni.

Niccola Pisano was not only pre-eminent as a sculptor, but was also the greatest Italian architect of his cen- tury; he designed a number of very important buildings, though not all which are attributed to him by Vasari. Among those now existing, the chief are the main part of the cathedral at Pistoia, the church and convent of Sta Margherita at Cortona, and Sta Trinita at Florence. The church of Sant’ Antonio at Padua has also been attributed to him, but without reason. Unfortunately his architec- tural works have in most cases been much altered and modernized. Niccola was also a skilled engineer, and was conipelled by the Florentines to destroy the great tower, called the Gwarda-morto, which overshadowed the baptistery at Florence, and had for long been the scene of violent conflicts between the Guelfs and Ghibellines, He managed skilfully so that it should fall without injuring the baptistery. Niccola Pisano died at Pisa in the year 1278, leaving his son, Giovanni a worthy successor to his great talents both as an architect and sculptor.

Though his importance as a reviver of the old traditions of beauty in art has been to some extent exaggerated by Vasari, yet it is probable that he, more than any other one man, was the

| means of starting that “new birth” of the plastic arts which, in the years following his death, was so fertile in countless works of

the most unrivalled beauty. Both Niccola and his son had many | pupils of great artistic power, and these earried the influence of the

| Pisani throughout Tuscany and northern Italy, so that the whole

art of the succeeding generations may be said to have owed the

| greater part of its rapid development to this one family.

| On the three preceding Pisani see Perkins, Tuscan Sculptors, vol, 1., 1864; | Cicognara, Storia della Scultura, 1823-24; Gaye, Kunstblatt, 1839; Riimohr, Italienische Forschungen, 1827-31; Milanesi, Documenti dell Arte and Vita di Niccola Pisano; Vasari, Milanesi’s ed., i p. 293 and 481, 1882; Crowe and Cavale iselle, Painting in Italy, 1864-66; Gruner, Marmor-Bildwerke der Schule der Pisaner, 1858; Leader Scott, Early Jtalian Sculptors, 1882; Symonds, Renaissance tn Italy: Fine Arts, p. 100 sg., 1877; Dohme, Kunst und Kunstler Jtaliens, Leipsic, 1878 ; Le tre porte del Battistero di Firenze, 1821. (J. 1M.)

PISANO, Virrore (c. 1380-1456), commonly called PIsANELLO, the greatest of Italian medallists, was a native of San Vigilio sul Lago in the territory of Verona. Speci- mens of his work as a painter are still extant in Rome, Venice, Verona, and Pistoia, and entitle him to a place of some distinction in the history of that art. The National Gallery in London possesses a very fine specimen of Pisa- nello’s work—a panel painted with miniature-like delicacy. For his pre-eminent position as a medallist, see NUMIS- MATICS, vol, xvii. p. 657. During the latter portion of his life he lived in Rome, where he enjoyed great repute.

PISANUS, Leonarpus-(Leonardo of Pisa), an Italian mathematician of the 13th century who has left the stamp of his name on a whole period in the

history of the science. Of Leonardo's personal history few particulars are known. His father was called Bonaccio, most probably a nickname with the ironical meaning of "a good stupid fellow," while to Leonardo himself another nickname Bigollone (dunce, blockhead) seems to have been given. The father was secretary in one of the numerous factories erected on the southern and eastern coasts of the Mediterranean by the warlike and enterprising merchants of Pisa. Where Euro- pean and Arab merchants met was at that time the right

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place for learning arithmetic, and it was certainly with a view to this that the father had Leonardo sent to Bugia to continue his education. But Leonardo aimed at some- thing higher than to make himself an accomplished clerk, and during his travels round the Mediterranean he obtained such erudition as would have gained him the name of a great scholar in much later times. In 1202 Leonardo Fibonacci (7c, son of Bonaccio) was again in Italy and published his great work Laber Abaci, which probably pro- cured him access to the learned and refined court of the emperor Frederick II. Leonardo certainly was in relation with some persons belonging to that circle, when he published in 1220 another more extensive work De Prac- tiea Geometrixe, which he dedicated to the imperial astro- nomer Dominicus Hispanus. Some years afterwards (perhaps in 1228, as is related by an author on the authority of a manuscript only once seen by him) Leonardo dedicated to another courtier, the well known astrologer Michael Scott, the second edition of his Liber Abact, which has come down to our times, and has been printed as well as Leonardo's other works by Prince Bald. Boncompagni (Rome, 1857-62, 2 vols.). The other works consist of the Practica Geometrix and some most striking papers of the greatest scientific importance, amongst which the Inber Quadratorum may be specially signalized. It bears the notice that the author wrote it in 1225, and in the intro- duction Leonardo himself tells us the occasion of its being written. Dominicus had presented Leonardo to Frederick I! The presentation was accompanied by a kind of mathematical performance, in which Leonardo solved several hard problems proposed to him by John of Palermo, an imperial notary, whose name is met with in several documents dated between 1221 and 1240. The methods which Leonardo made use of in

solving those problems fill the Liber Quadratorum, the I’los, and a Letter to Magister Theodore. All these treatises seem to have been written nearly at the same period, and certainly before the publication of the second edition of the Zuber Abaci, in which the Liber Quadratorum is expressly mentioned. We know nothing of Leonardo’s fate after he issued that second edition, and we might compare him to a meteor flashing up suddenly on the black back- ground of the midnight sky, and vanishing as suddenly, were it not that his influence was too deep and lasting to allow of his being likened to a phenomenon passing quickly by.

To explain this influence and the whole importance of Leonardo’s scientific work, we must rapidly sketch the state of mathcmatics about the year 1200. The Greeks, the most geometrical nation on the earth, had attained a high degree of scientific perfection, when they were obliged to yield to the political supremacy of Rome. From this time mathematics in Europe sunk lower and lower, till only some sorry fragments of the science were still preserved in the eell of the studious monk and behind the counting-board of the eager merchant. Geometry was nearly forgotten ; arithmetic made use of the abacus with counters, or with the nine characters the ongin of which is still a matter of controversy (see NUMERALS); the zero was still unknown. Among the Arabs it was quite other- Wise. Greek mathematics found amongst them a second home, ee the science was not only preserved but came to new i ee from India, whence in particular came

i its use, which alone renders possible numerical calculation in the modern sense of the word. Ancient aa as well as ancient mathematics reappeared in Europe,

e beginning of the 12th century onwards, in an Arabian

A, Two men especially recognized the worth of these sciences made it the task of their life to propagate them amongst their

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Ps oe pote “eum Magister Dominieus pedibus eelsitudinis vestre i. . ueeret presentandum” have always been taken to mean es eee was presented to the emperor at Pisa, but the date of aa sae this interpretation, as Frederick II.

eertainly never was « os a ore July 1226. The translation, therefore, ought to be— = agister Dominicns brought me from Pisa, &e.,” the plaee

ere Leonardo met the emperor remaining unknown.

eontemporaries,—the German monk Jordanus Nemorarius and the Italian merchant Leonardus Pisanus. Leonardo, as we have said, travelled all round the Mediterranean gathering knowledge of every kind. He studied the geometry of Euclid, the algebra of Moham- med ibn Musa Alcharizmi; he made himself acquainted with Indian methods; he found out by himself new theories. So runs his own account ; and an exact comparison of Leonardo’s works with older sources not only confirms the truth of his narrative, but shows also that he must have studied some other authors, —for instance, Alkarchi. In his Practica Geomctriz plain traces of the use of the Roman “agrimensores” are met with; in his Liber Abaci old Egyptian problems occur revealing their origin by the reappearance of the very numbers in which the problem is given, though one cannot guess through what channel they came to Leonardo’s knowledge. Leonardo cannot now be regarded (as Cossali regarded him about 1800) as the inventor of that very great variety of truths for which he mentions no earlier source. But even were the pre- decessors to whom he is indebted more numerous than we are inclined to beheve, were he the Columbus only of a territory the existence of which was unknown to his century, the historical importance of the mau would be nearly the same. We must remember the general ignorance of his age, and then fancy the sudden appearance of a work like the Liber Abaci, which fills 459 printed pages. These pages set forth the most perfect methods of calculating with whole numbers and with fractions, practice, extraction of the square and cube roots, proportion, chain rule, finding of proportional parts, averages, progressions, even compound interest, just as in the completest mercantile anthmetics of our days. They teach further the solution of problems leading to equations of the first and second degree, to determinate and inde- terminate equations, not by single and double position only, but by real algebra, proved by means of geometric constructions, and including the use of letters as symbols for known numbers, the unknown quantity being called res and its square census. We

may well wonder, not that the impression caused by a work of such overwhelming character was so deep, but that it made any impres- sion at all, and that the unprepared soil could receive the seed. The second work of Leonardo, his Practica Gcomctriz (1220), is still more remarkable, since it requires readers already acquainted with Euclid's planimetry, who are able to follow rigorous demon- strations and feel the necessity for them. Among the contents of this book we simply mention a trigonometrical chapter, in which the words sinus versus arcus occur, the approximate extraction of cube roots shown more at large than in the Liber Abaci, and a very curious problem; which nobody would search for in a geome- trical work, viz., to find a square number which remains a square number when 5 is added to it. This problem evidently suggested the first question put to our mathematician in presence of the emperor by John of Palermo, who, perhaps, was quite enough Leonardo's friend to set him such problems only as he had himself asked for. The problem was :—To find a square number remain- ing so after the addition as well as the subtraction of 5. Leonardo gave as solution the numbers 117%, 16;°f, and 6;2,,,—the squares of 345, 47s, and 27%; and the Liber Quadratorum gives the inethod of finding them, which we cannot discuss here. We observe, how- ever, that the kind of problem was not new. Arabian authors already had found three square numbers of equal difference, but the difference itself had not been assigned in proposing the qnestion. Leonardo's method, therefore, when the difference was a fixed condition of the problem, was necessarily very different from the Arabian, and, in all probability, was his own discovery. The Flos of Leonardo turns on the second question set by Jolin of Palermo, which required the solution of the cubic equation a + Qa? + 10x =20. Leonardo, making use of fractions of the sexagesimal scale, gives a=1° 22! 71i gait g3iv 4v 40vl, after having demonstrated, by a discussion founded on the 10th book of Euclid, that a solution by square roots is impossible. It is much to be deplored that Leonardo does not give the least intimation how he found his approximative value, outrunning by this result more than three centuries. Genocchi believes Leonardo to have been in _posses- sion of a certain method called regula awrea by Cardan in the 16th century, but this is a mere hypothesis without solid foundation. In the Flos equations with negative values of the unknown quantity are also to be met with, and Leonardo perfectly under- stands the meaning of these negative solutions. In the Letter to Magister Theodore indeterminate problems are chiefly

worked, and Leonardo hints at his being able to solve by a general method any problem of this kind not exceeding the first degree. We have enumerated the main substance of what appear to be Leonardo's own discoveries, and the experienced reader will not hesitate to conclude that they prove him to have been one of the greatest algebraists of any time. As for the influence he exercised on posterity, it is enough to say that Luca Pacioli, about 1500, in his celebrated Summa, leans so exclusively to Leonardo's works (at that time known in manuscript only) that he frankly acknowledges his dependence on them, and states that wherever no other author is quoted all belongs to Leonardus Pisanus. (M. CA.)

PISCICULTURE. This art as at present pursued is not limited to those animals which are grouped by zoologists in the class of Pisces. " Fishery" is now under- stood to signify the exploitation of all products of the sea, lake, and river, the capture of whales, turtles, pearls, corals, and sponges, as well as of fish proper. The pur- pose of fish-culture (or aqutculture, as it is in France more appropriately named) is to counteract by reparative and also by preventive measures the destructive effects of fishery. : : a.

The possibility of exterminating aquatic animals within the restricted limits of a lake or a river cannot be doubted ; authorities are decidedly at variance, however, as to the extent of the influence of man upon the abundance of life in the open seas. Distinction must be made between the extermination of a species, even in a restricted locality, and the destruction of a fishery; the former is very unusual, and is seemingly impossible in the case of oceanic species, but the latter, especially for limited regions, is of almost yearly occurrence. Aquatic mammals, such as seals, may be en- tirely exterminated, especially when, like the fur seal, they forsake the water for a season and resort to the land for breeding purposes. The fur seals of the Pacific and Ant- arctic are now nearly gone, except in two groups of islands, the Pribylovs in Alaska and the Commander Islands in Siberia, where they enjoy Government protection, the islands being leased to the Alaska Commercial Company by whom only a stated number, all non-breeding males, may be killed each year, the permanence of the fishery being thus perfectly secured. Aquatic mammals also which never leave the

water, like whales and sirenians, being conspicuous by reason of their size, and incapable of rapid multiplication, may, especially when they breed near the shore, suffer extermination. As examples may be cited the Arctic sea cow (Rhytina steller') and the Pacific grey whale (Rhachianectes glaucus), the former extinct, the latter having practically become so within the present century. The sperm whale is also rapidly dis- appearing. In the case of fixed animals like the oyster, the corals, and the sponges, again, the colonies or beds may be swept out of existence exactly as forests are hewn down. The native oyster beds of Europe are for the most

part gone, and still more rapid has been the recent destruc-

tion of the oyster reefs in Pocomoke Sound, Maryland, a large estuary, formerly very productive—the result being due more directly to the choking up of the beds by the rubbish dragged over them by dredges, and the demolition of ledges suitable for the reception of young spat, than to the removal of all the adult oysters, which could, of course, never have been effected. The preservation of oyster-beds is a matter of vital importance to the United States, for oyster-fishing, unsupported by oyster-culture, will soon destroy the employment of tens of thousands and a cheap and favourite food of tens of millions of the people. Some- thing may undoubtedly be effected by laws which shall allow each bed to rest for a period of years after each season of fishing upon it. It is, however, the general belief that shell-fish beds must be cultivated as carefully as are garden beds, and that this can be done only by giving to indivi- duals rights in submerged lands, similar to those which may be acquired upon shore. It is probable that the present unregulated methods will prevail until the dredging of the natural beds shall cease to be remunerative, and that the oyster industry will then pass froin the improvi- dent fishermen to the painstaking oyster-grower, with a corresponding increase in price and decrease in consump- tion. Such a change has already taken place in France and Holland, and to a large extent in England, but there appear to be almost unsurmountable difficulties in the way of protecting the property of oyster-culturists from depre-

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dations—difficulties apparently as formidable in England as in America.

Fishes in ponds, lakes, or streams are quickly exter- minated unless the young be protected, the spawning season undisturbed, and wholesale methods of capture prohibited. Salmon and trout streams are preserved in all countries of northern Europe; and in Canada also a large service of fishery wardens is maintained. In the United States there are in many of the older common- wealths excellent codes of laws for the preservation of fish and game, which are enforced by anglers' clubs, A river may quickly be emptied of its anadromous visitors, salmon, shad, and alewives, by over-fishing in the spawning season, aS well as by dams which cut off the fish from their spawning-grounds. Numerous rivers in Europe and America might be named in which this has occurred. In the same way, sea fishes approaching the coasts to spawn in the bays or upon the shoals may be embarrassed, and the numbers of each school decimated,—particularly if, as in the case of the herring, the eggs are adhesive and become entangled in nets. Sea fishes spawning in estuaries are affected much in the same manner as the salmon in rivers, though in a less degree, by wholesale capture in stationary nets The shad and alewife fisheries of the United States are protected by an extensive code of laws, varying in the several States and in the different rivers of each State. The most satisfactory laws appear to be those which regulate the dates when fishery must commence and end, and prescribe at least one day in each week, usually Sunday, during which the ascent of the fish may not be interrupted. Migratory, semi-migratory, or wandering fishes, ranging singly or in schools over broad stretches of ocean, the mackerels, the tunnies, the sardines or pilchards, the menhaden, the bluefish, the bonitoes, and the sque- teague, stand apparently beyond the influence of human agency, especially since, so far as is known, they spawn at a distance from the coast, or since the adults, when about to spawn, cannot be reached by any kind of fishery apparatus. Their fecundity is almost beyond comprehension, and in many instances their eggs float free near the surface, and are quickly disseminated over broad areas. The conclu- sions gained by Prof. Baird, U.S. commissioner of fisheries, agree exactly with those of Prof. Huxley, that the number of any given kind of oceanic fish killed by man is perfectly insignificant when compared with the destruction effected by their natural enemies. Almost any body of water, be it a bay or sound, or be it the covering of a ledge or shoal

at sea, may be over-fished to such a degree that fishing

becomes unprofitable, especially if fishing be carried on in the spawning season. In this manner, no doubt, have the coasts of England been robbed of the formerly abundant supplies of turbot and sole.

The character of the various destructive influences which man brings to bear upon the inhabitants of the water and their effects having thus been briefly noticed, the student of fish culture is confronted by the question, What can be done to neutralize these destructive tendencies? There are evidently three things to do:—(1) to preserve fish waters, especially those inland, as nearly as it may be possible in their normal condition ; (2) to prohibit waste- ful or immoderate fishing; and (3) to put into practice the art of fish breeding—(a) to aid in maintaining a natural supply, (6) to repair the effects of past improvi- dences, and © to increase the supply beyond its natural limits rapidly enough to meet the necessities of a con stantly increasing population.

; The preservation of normal conditions in inland waters 1s comparatively simple. A reasonable system of forestry and water-purification is all that is required; and this is needed not only by the fish in the streams but by the

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people living on the banks. It has been shown that a river which is too foul for fish to live in is not fit to flow near the habitations of man. Obstructions, such as dams, may, in most instances, be overcome by fish ladders. The salmon has profited much by those devices in Europe, and the immense dams in American rivers will doubtless be passable even for shad and alewives if the new system of fishway construction devised by Col. M‘Donald, and now being applied on the Savannah, James, and Potomac, and other large rivers, fulfils its present promises of success.! . ;

The protection of fish by law is what legislators have been trying to effect for many centuries, aud the success of their efforts must be admitted to have been very slight indeed. Great Britain has at present two schools of fishery-economists,—the one headed by Prof. Huxley, opposed to legislation, save for the preservation of fish in inland waters; the other, of which Dr Francis Day is the chief leader, advocating a strenuous legal regulation of sea fisheries also. Continental Europe is by tradition and belief committed to the last-named policy. In the United States, on the contrary, public opinion is generally anta- gonistic to fishery legislation ; and Prof. Baird, the com-missioner of fisheries, after carrying on for fourteen years, with the aid of a large staff of scientific specialists, inves- tigations upon this very question, has not yet become satisfied that laws are necessary for the perpetuation of the sea fisheries, nor has he ever recommended to Congress the enactment of any kind of fishery laws.

Just here we meet the test problem in fish culture. Many of the most important commercial fisheries of the world, the cod fishery, the herring fishery, the sardine fishery, the shad and alewife fishery, the mullet fishery, the salmon fishery, the whitefish fishery, the smelt fishery, and many others, owe their existence to the fact that once a year these fishes gather together in closely swimming schools, to spawn in shallow water, on shoals, or in estua- ries and rivers. There is a large school of guas¢ econo- mists who clamour for the complete prohibition of fishing during spawning time. Their demand demonstrates their ignorance. Deer, game, birds, and other land animals may easily be protected in the breeding season, and so may trout and other fishes of strictly local habits. Not so the anadromous and pelagic fishes. If they are not caught i the spawning season, they cannot be caught at all.

The writer recently heard a prominent fish-culturist advocating before a committee of the United States Senate the view that shad should not be caught in the rivers because they come into the rivers to spawn. When asked what would become of the immense shad-fisheries if this Were done, he ventured the remark that doubtless some Ingenious person would, invent a means of catching them at sea. The fallacy in the argument of these economists lies, in part, in supposing that it is more destructive to the progeny of a given fish to kill it when its eggs are nearly ripe than to kill the

same fish eight or ten months earlier. We must not, however, ignore the counter-argu- ment. Such is the mortality among fish that only an infinitesimal percentage attains to maturity. Professor Mobius has shown that for every grown oyster upon the beds of Schleswig-Holstein 1,045,000 have died. Only a very small percentage, perhaps not greater than this, of the shad or the smelt ever comes upon the breeding grounds. Some consideration, then, ought to be shown to those individuals which have escaped from their enemies and have come up to deposit the precious burden of eggs. ad much must they be protected? Here the fish-cul-

1st comes in with the proposition that “it is cheaper to le lean oaths

1 Report of United States Fish Commission for 1883.

make fish so plentiful by artificial means that every fisher- man may take all he can catch than to enforce a code of protection laws.”

The salmon rivers of the Pacific slope of the United States, the shad rivers of the east, and the whitefish fisheries of the lakes are now so thoroughly under control by the fish-culturist that it is doubtful if any one will venture to contradict his assertion. The question is whether he can extend his domain to other species.

Fish-culture in a restricted sense must sooner or later be resorted to in all densely populated countries, for, with the utmost protection, nature unaided can do but little to meet the natural demand for fish to eat. Pond-culture (Teichwirthschaft), has been practised for many centuries, and the carp and the gold-fish have become domesticated like poultry and cattle. The culture of carp is an import- ant industry in China and in Germany, though perhaps not more so than it was in England three and four

| centuries ago; the remains of ancient fish-stews may be

scen upon almost every large estate in England, and particularly in the vicinity of old monasteries. Strangely enough, not a single well-conducted carp-pond exists in England to-day to perpetuate the memory of the tens of

thousands which were fornierly sustained, and the carp, escaping from cultivation, have reverted to a feral state and are of little value. Until inrproved varieties of carp are introduced from Germany, carp-culture can never be made to succeed in England. Carp-culture is rapidly coming into favour in the United States ; a number of young scale carp and leather carp were imported in 1877 for breeding purposes, and the fish commission has since distributed them to at least 30,000 ponds. Two railway cars especi- ally built for the purpose are employed during the autuinn months delivering cargoes of carp, often making journeys of over three thousand miles, and special ship- ments have been made to Mexico and Brazil. The carp is not recommended as a substitute for the salmon, but is especially suited to regions remote from the sea where better-flavoured fish cannot be had in a fresh condition.

A kind of pond-culture appears to have been practised by the ancient Egyptians, though in that country as in ancient Greece and Rome, the practice seems to have been similar to that now employed in the lagoons of the Adriatic and of Greece, and to have consisted in driving the young fish of the sea into artificial enclosures or vivaria, when they were kept until they were large enough to be used.

The discovery of the art of artificially fecundating the ova of fish must apparently be accredited to Stephen Ludwig Jacobi of Hohenhausen in Westphalia, who, as early as 1748, carried on successful experinients in breed- ing salmon and trout. The importance of this discovery was thoroughly appreciated at the time, and from 1763 to 1800 was a fruitful subject of discussion in England, France, and Germany. George III. of England in 1771 granted to Jacobi a life pension. It has been claimed by many French writers that the process of artificial fecunda- tion was discovered as early as 1420 by Dom Pinchon, a monk in the abbey of Reome, but this claim is but a feeble one, not having been advanced until 1854, and it is believed by many that the practice of the French monk was simply to collect and transplant the eggs which he had already found naturally fertilized. However interest- ing to the antiquarian, the proceedings of Dom Pinchon had no influence upon the progress of fish-culture. To Germany, beyond question, belongs the honour of discover- ing and carrying into practical usefulness the art of fish- culture. Upon the

estate of Jacobi, by the discoverer and his sons, it was carried on as a branch of agriculture for fully eighty years—from 1741 to 1825—though it was nearly a hundred years before public opinion was |

ripe for a general acceptance of its usefulness, a period during which its practice was never abandoned by the Germans.

Fish-culture in Britain was inaugurated in 1837 by Mr John Shaw, gamekeeper to the duke of Buccleuch at Drumlanrig, who, in the course of ichthyological investiga- tions, had occasion to fecundate the eggs of salmon and rear the young; and, as regards France, an illiterate fisher- man, Joseph Remy, living in the mountains of the Vosges, rediscovered, as it is claimed, or at any rate successfully practised, in association with Antoine Gehin, the culture of trout in 1842. The originality and practical influence of Remy and Gehin's work appear to have been exaggerated by French writers. On the other hand the establishment in 1850 at Huningue (Hiininger) in Alsace by the French Government of the first fish-breeding station, or " pisci- factory," as it was named by Professor Coste, is of great significance, since it marks the beginning of public fish- culture. The art discovered in Germany was practised in Italy as early as 1791 by Baufalini, in France in 1820, in Bohemia in 1824, in Great Britain in 1837, in Switzerland in 1842, in Norway under Government patronage in 1850, in Finland in 1852, in the United States in 1853, in Belgium, Holland, and Russia in 1854, in Canada about 1863, in Austria in 1865, in Australasia, by the intro- duction of English salmon, in 1862, and in Japan in ISG.

Artificial Propayation.—Sponges have been successfully multi- plicd by cuttings, like plants, in Austria and in Florida. Oysters have long been raised in artificial enclosures from spat naturally deposited upon artificial stools. The eggs of the American and Portuguese oysters have been artificially fecundated and the young hatched, and in July 1883 Mr John A. Ryder, embryologist of the U.S. Fish Commission, solved the most difficult problem in American oyster-culture by completing a mechanical device for pre- veuting the escape of the newly hatched oysters while swimming about prior to fixation.1 The English oyster, being hermaphrodite, or moneecious,

cannot be artificially propagated from the egg like the dicecious Amcrican species.

The fertilization of the fish egg is the simplest of processes, con- sisting, as every one knows, in simply pressing the ripe ova from the female fish into a shallow receptacle and then squeezing out the milt of the male upon them. Formerly a great deal of water was placed in the pan; now the ‘‘ dry method,” with only a little, discovered by the Russian Vrasski in 1854, is preferred. The eggs having been fertilized, the most difficult part of the task remains, namely, the care of the eggs until they are hatched, and the care of the young until they are able to care for themselves.

The apparatus employed is various in principle, to correspond to the physical peculiarities of the eggs. Fish-culturists divide eggs into four classes, viz. :—(1) heavy eggs, non-adhesive, whose specitic gravity is so great that they will not float, such as the eggs of the salmon and trout ; (2) heavy adhesive eggs, such as those of the herring, smelt, and perch ; (3) semi-buoyant eggs, like those of the shad and whitefish (Coregonus) ; and (4) buoyant eggs, like those of the cod and mackerel. (1) Heavy non-adhesive eggs are placed in thin layers either upon gravel, grilles of glass, or sheets of wire cloth, in receptacles through which a current of water is constantly passing. There are numerous forms of apparatus for eggs of this class, but the most effective are those in which a number of trays of wire cloth, sufficiently deep to carry single layers of eggs, are placed one upon the other in a box or jar into which the water enters from below, passing out at the top. (2) Heavy adhesive eggs are received upon bunches of twigs or frames of glass plates to which they adhere, and which are placed in receptacles through which water is passing. (3) Semi-buoyant eggs, or those whose specifie gravity is but slightly greater than that of the water, require altogether different treatment. Thcy are necessarily placed together in large numbers, and to prevent their settling upon the bottom of the receptacle it is necessary to introduce a gentle current from below, For many years these eggs could be hatched only in ane receptacles with wire-cloth bottoms, placed at an angle to the current of the stream in which they were fixed, the motion of which was utilized to kcep the eggs in suspension. Later an arrangement of plunging-buckets was invented, cylindrical recep- tacles

with tops and bottoms of wire cloth, which were suspended in rows from beams worked up and down at the surface of the

1 Bulletin, United States Fish Commission, 1883.

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constantly in motion. Finally the device uow most in favour was perfected ; thisis a receptacle, conical, or at least witha constricted termination, placed with its apex downward, through which passes from below a strong current, keeping the eggs constantly suspended and in motion. This form of apparatus, of which the M‘Donald and Clark hatching-jars are the most perfect development, may he worked in connexion with any common hydrant.* (4) Floating eggs have been hatched only by means of rude contrivances for sustaining a lateral circular eddy of water in the receptacle.

The use of refrigerators, to retard the development of the egas until such time as it is most convenient to take care of the fry, has been extensively introduced in the United States, and has been experimented upon in Germany.

The distinction between private and public fish-culture must be carefully observed. The maintenance of ponds for carp, trout, and other domesticated species is an industry to be classed with poultry- raising and bee-keeping, and its interest to the political economist is but slight. The proper function of public fish-culture is the stocking of the public waters with fish in which no individual can claim the right of property. This is being donc in the rivers of the United States, with salmon, shad, and alewives, and in the lakes with whitefish. The use of steamships and steam machinery, the construction of refrigerating transportation cars, two of which, with a corps of traincd experts, are constantly employed by the United States Fish Commission, moving fish and eggs from Maine to Texas, and from Maryland to California, and the maintenance of permanent hatching stations, seventeen in number, in different parts of the continent, are forms of activity only attainable by Government aid. Equally unattainable by private effort would be the enormous experimeuts in transplanting and acclimatizing fish in new waters,—such as the planting of Californian salinon in the rivers of the east, land-locked salmon and smelt in the lakes

and rivers of the interior, and shad in California and the Mississippi valley, and the extensive acclimatization of German carp ; the two last-named experiments carricd out within a period of three years have met with successes beyond doubt, and are of the greatest importance to the country; the others have been more or less successful, though their results are not yet fully realized. It has been demonstrated, however, that the great river fisheries of the United States, which produced in 1880 48,000,000 tb of alewives, 18,000,000 tb of shad, 52,000,000 fb of salmon, besides bass, stur-

eon, and smelt, and worth ‘‘at first hand” between 4,000,000 and 6,000,000 dollars, are entirely under the control of the fish-culturist to sustain or to destroy, and are capable of immense extension.

Having now attcmpted to define the field of modern fish-culture, and to show what it has already accomplished, it remains to be stated what appear to be its legitimate aims and limitations.

The aims of modern fish-culture, as understood by the present writer, are—(1) to arrive at a thorough knowledge of the life history from beginning to end of every species of economic value, the histories of the animals and plants upon which they feed or upon which their food is nourished, the histories of their enemies and friends, and the friends and foes of their cnemies and friends, as well as the currents, temperatures, and other physical phenomena of the waters in relation to migration, reproduction, and growth; and (2) to apply this knowledge in such a practical manner that every form of fish shall be at least as thoroughly under control as are now the salmon, the shad, the alewife, the carp, and the whitefish. Its limitations are precisely those of scientific agriculture and animal rearing, since, although certain physical conditions may constantly intervene to thwart man’s efforts in any given direction, it is quite within the bounds of reasonable expecta- tion to be able to understand what these are, and how their effects are produced. An important consideration concerning the limita- tions of fish-cultnre must always be kept in mind in weighing the arguments for and against its success, viz., that effort towards the acclimatization of fishes in new waters is not fish-culture, but 1s simply one of the necessary experiments upon which fish-culture may be based. The

introduction of carp from Germany to the United States was not fish-culture; it was an experiment ; the experiment has succeeded, and fish-culture is now one of its results. The intro- duction of California salmon to the Atlantic slope was an experl- ment; it has not succeeded; its failure has nothing to do with the success of fish-culture. 1f any one wants to see successful fish- culture in connexion with this fish let him go to the Sacramento river. The introduction of shad to the Pacific coast was an experiment ; it succeeded ; shad culture can now be carried on without fear of failure by the Fish Commission of the Pacific States. An equally established success is whitefish culture in the Great Lakes. The experiments with cod and Spanish mackcrel were not fish-culture, though it is hoped that they may yet lead up to it. And there is every reason to believe, from experiments in part completed, that the dominion of fish-culture may be extended m like manner to certain of the great sea fisheries, such as the cod, haddock, herring, mackerel, and Spanish mackerel fisheries.

2 Transactions, American Fish Cultural Association, 1883.

Public fish-culture exists only in the United States and Canada. European fish-culturists have always operated | with only small numbers of eggs. The hatchery of Sir James Maitland at Howicton near Stirling, Scotland, may be specially mentioned in this con- nexion, since it is undoubtedly the finest private fish-cultural establishinent in the world. It is described in one of the Confcr- ence papers of the International Fishery Exhibition.

The recent organization of the Scottish Fishery Board, and the establishment of a society for the biological investigation of the coasts of Great Britain, are indications that England, having at last recoonized the importance of protecting its extensive fishery

industries, will at no distant time become a leader in matters of

fishery economy.

Holland, Germany, and Norway have hitherto been the only European nations manifesting intelligent enterprise in the con- sideration of fishery

questions in general, although fair work has been done by Sweden and other countries in the treatment of limited special branches of this industry. In Germany the functions of the German Fishery Union (Deutscher Fischerct-Verein) and of the commission for the investigation of the German seas (Ministerial-Kommission zur wisscnschaftlichen Untersuchung der deutschen Mecrc zw Kiel), taken together, represent practically the two divisions of the work of the United States Fish Commission,

a commission of scientific men, whose head is appointed by the

Government; it is carried on with Government funds, but is not in | any way subjected to Government control, the central headquarters _

being at Kiel instead of Berlin. The Fischerei-Vercin is also a private body, under the patronage of the emperor, and with funds partly furnished by the Governinent and having also the general direction of the National Fish Cultural Society at Hiiningen. This, also, is not a bureau of any Government department, but managed entirely by its own officers. It is the ouly European fish- eries institution that has so far constituted a thoroughly successful experiment. The Netherlands Commission of Sea Fisheries (Collegie voor de Lecvisscherijen) is a body of fifteen men, chiefly workers in science, occupying a responsible position in the national economy, their function being ‘‘to advise Government in all subjects con- nected with the interest of the fisheries.” During the twenty-five years of its existence, says its historian, ‘‘the commission has con- stantly been consulted by Government on the different measures that might be beneficial, or on the abolition of others that were detrimental, to the fisheries.” The Society for the Development of Norwegian Fisheries (Selskabet for de Norske Fiskericrs Fremme) is an organization independent of the Government, and electing its own officers, but receiving large grants from Government to carry on work precisely similar to that of the United States Commission. In 1882-83 these grants amounted to 49,000 kroner.

Asan illustration of the interest manifested in fish-culture in the United States, it may be stated that from 1871 to 1883 $1,190,955 has been appropriated by Congress for the nse of the United States Fish Commission, and that thirty-five of the State Governments have made special grants for fish-culture, in the aggregate equal to $1,101,000. To show the wholesale

methods employed in this, a letter by Mr Livingston Stone, superintendent of one of the seventeen hatcheries supported by the United States Fish Commis- sion, that on the M‘Cloud river in California, may be quoted : —

“Tn the eleven years since the salmon-breeding station has been in operation 67,000,000 eggs have been taken, most of which have been distributed in the various States of the Union. Several millions, however, have been sent to foreign countries, including Germany, France, Great Britain, Denmark, Russia, Belgium, Molland, Canada, New Zealand, Australia, and the Sandwich Islands. About 15,000,000 have been hatched at the station, and the young fish placed in the M‘Cloud and other tributaries of the Sacramento river. So great have been the benefits of this restocking of the Sacramento that the statistics of the salmon

fisheries show that the annual galmon catch of the river has increased 5,000,000 pounds cach year during the last few years.”

_ Fifteen canneries now are fully supplied, whereas in 1872 the Single establishment then on the river was obliged to close for lack of fish, In the two Government hatcheries at Alpena and North- ville, Michigan, there have been produced in the winter of 1883-84 over 100,000,000 eggs of the whitefish, Coregonus clupeiformis, and bs total number of young fish to be placed in the Great Lakes ae year by these and the various State hatcheries will exceed ‘ ,000,000. The fishermen of the Great Lakes admit that but fees fish-culture half of them would be obliged to abandon eir calling. Instances of great improvement might be cited in ee with nearly every shad river in the United States. In e Potomac alone the annual yield has been brought up by the Operations of fish-culture from 668,000 ib in 1877 to an average of te than 1,600,000 tb in recent years. In 1882 carp bred in the one eee ponds in Washington were distributed in lots a. ty a apphcants throughout every State and Territory, at ae oe istance of more than 900 miles, the total inileage of the ee about 9,000,000 miles, and the actual distance ae SC a y the transportation car 34,000 miles. There still . ; — “a urope some scepticism as to the beneficial results of fish- re. Such doubts do not cxist on the other side of the Atlantie,

if the continuance from year to year of liberal grants of public money may be considered to be a test of public confidence.

Perhaps the best gencral treatises upon the methods of artificial propagation practised by pisciculturists are Herr Max Von Dem Borne's Fischzuchi, Berlin, 1880, and from the philosophical standpoint, Dr Francis Day's Fish Culture, one of the handbooks of the International Fisheries Exhibition of 1883. The reports and bulletins of the Unitcd States Fish Commission, in twelve volumes, from 1873 to 1884, contain full descriptions of Amcrican methods, and discussions of all foreign discoveries and movements. Two prominent London journals, the Field and Land and Water, contain authoritative articles upon the subject, and the museum of fisheries and fish-culture at South Kensington, enriched as it has been by the contributions of exhibitors at the Fisheries Exhibition of 1883, is an excellent exponent of the methods and implements in use in the past and at present. For a history of the subject see ''Epochs in the History of Fish Culture," by G. Brown Goode, in Transactions of the Amcrican Fish Cultural Association (10th meeting, 1881, pp. 34-58), and '' The Status of the United States

| Fish Commission in 1884," by the same author, in part xii. of the Report of

that commission; and for a discussion of modern methods and apparatus, as shown at the late Fisherics Exhibition, the essays by Mr R. Edward Earll in the report of the United States commissioner to the exhibition and in Vature (Oct. 4, 1883), (G. B. G.)

PISEK, a small town of Bohemia, 55 miles to the south of Prague, lies on the right bank of the Wottawa, which is here crossed by an interesting stone bridge of great antiquity. The town generally has a medizval air,

t sh Ce | heightened by the preservation of part of the old walls — propagation and investigation. The latter body is composed of |

and bastions, The most prominent buildings are the church of the Nativity, the town-house, and the venerable chateau. The name of Pisek, which is the Czech for sand, is said to be derived from the gold-washing formerly carried on in the bed of the Wottawa. This source of profit, however, has

been long extinct, and the inhabitants now support themselves by iron and brass founding, brewing, and the manufacture of shoes and Turkish fezes. The population in 1880 was 10,545,

Pisek was one of the chicf centres of the Hussites, and it suffered very. severely in the Thirty Years' War, when Maximilian of Bavaria put almost all the inhabitants to the sword. It was also occupied by the French in 1741. In spite of these reverses Pisek is now a very wealthy community, possessing large aud valuable tracts of woodland.

PISIDIA, in ancient geography, was the name given to a country in the south of Asia Minor, immediately north of Pamphylia, by which it was separated from the Mediterranean, while it was bounded on the north by Phrygia, on the east by Isauria, Lycaonia, and Cilicia, and on the west and south-west by Lycia and a part of Phrygia (see vol. xv. Pl. II). It was a rugged and mountainous district, comprising some of the loftiest portions of the great range of Mount Taurus, together with the offshoots of the same chain towards the central tableland of Phrygia. Such a region was naturally occupied from a very early period by wild and lawless races of mountaineers, who were very imperfectly reduced to subjection by the powers that successively established their dominion in Asia Minor. The Pisidians are not mentioned by Herodotus, either among the nations that were subdued by Croesus, or among those that furnished contingents to the army of Xerxes, and the first mention of them in history occurs in the Ana- basis of Xenophon, when they furnished a pretext to the younger Cyrus for levying the army with which he designed to subvert his brother's throne, while he pretended only to put down the Pisidians who were continually harassing the neighbouring nations by their lawless forays (Azad. i. 1, 115 ii. 1, 4, &c.). They are afterwards mentioned by Ephorus among the inland nations of Asia Minor, and assume a more prominent part in the history of Alexander the Great, to whose march through their country they opposed a deter- mined resistance. In Strabo's time they had passed tran- quilly under the Roman dominion, though still governed by their own petty chiefs and retaining to a considerable extent their predatory habits.

The boundaries of Pisidia, like those of most of the inland provinces or regions of Asia Minor, were not clearly defined, and appear to have

fluctuated at different times. This was especially the case on the side of Lycia, where the upland district of Milyas was sometimes included in Pisidia, at other times assigned to Lycia. Some

writers, indeed, considered the Pisidians as the same people with the Milyans, while others regarded them as descendants of the Solymi, but Strabo speaks of the language of the Pisidians as distinct from that of the Solymi, as well as from that of the Lydians. The whole of Pisidia is an elevated region of tablelands or upland valleys in the midst of the ranges of Mount Taurus which descends abruptly on the side of Pamphylia. It contains several small lakes, but the only one of any importance 1s that now called the Egerdin Gol, of which the ancient name has not been preserved. It is a fresh-water lake of about 30 miles in length, situated in the north of Pisidia on the frontier of Phrygia, at an elevation of 2800 feet above the sea. The only rivers of any importance are the Cestrus and the Eurymedon, both of which take their rise in the highest ranges of Mount Taurus, and flow down through deep and narrow valleys to the plain of Pamphylia, which they traverse on their way to the sea.

Notwithstanding its rugged and mountainous character, Pisidia contained in ancient times several considerable towns, the ruins of which have been brought to light by the researches of recent travellers (Arundell, Hamilton, Daniell), and show them to have attained under the Roman empire to a degree of opulence and prosperity far beyond what we should have looked for in a country of predatory mountaineers. The most important of them are Termessus, near the frontier of Lycia, a strong fortress in a position of great natural strength and commanding one of the principal passes into Pamphylia; Cremna, another mountain fortress, north of the preceding, impending over the valley of the Cestrus; Sagalassus, a little farther north, a large town in a strong position, the ruins of which are among the most remarkable in Asia Minor; Selge, on the right bank of the Eurymedon, surrounded by rugged mountains, notwithstanding which it was in Strabo’s time a large and opulent city; and Antioch, known for dis- tinction’s sake as Antioch in Pisidia, and celebrated for the visit of St Paul. This was situated

in the extreme north-east of the district immediately on the frontier of Phrygia, between Lake Egerdin and the range of the Sultan Dagh.” Besides these there were situated in the rugged mountain tract west of the Cestrus Cretopolis, Olba or Olbasa, Pogla, Isinda, Etenna, and Conana. Pednelissus was in the upper valley of the Eurymedon above Selge. The only place in the district at the present day deserving to be called a town is Isbarta, the residence of a pasha; it stands at the northern foot of Mount Taurus, looking over the great plain which extends from thence into Phrygia. North of this and immediately on the borders of Phrygia stood Apollonia, called also Mor- dizum. Several other towns are assigned to Pisidia by Strabo, Pliny, and Ptolemy, of which the sites have not yet been determined.

We have no clue to the ethnic character and relations of the Pisidians, except that we learn from Strabo that they were distinct from the neighbouring Solymi, who were probably a Semitic race, but we find mention at an early period in these mountain districts of various other tribes, as the Cabali, Milyans, &c., of all which, as well as the neighbouring Isaurians and Lycaonians, the origin is wholly unknown, and in the absence of monuments of their language must, in all probability, ever remain so.

PISISTRATUS, citizen and afterwards tyrant of Athens, was the son of Hippocrates, through whom he traced his pedigree to Neleus and Nestor, princes of Messene in the Heroic Age. A branch of the family had reigned at Athens in the persons of Codrus and his aa ean was second cousin to Solon, 7 ee een cousins, and the early friendship

men was not entirely broken off even by

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the wide political differences which separated them in later life. Pisistratus, who was much junior to Solon, was born about 605 B.c. In his youth there was a keen rivalry between Athens and Megara, and Pisistratus as general of Athens contrived by stratagem to defeat the Megarians and capture their port Nisea (perhaps 570 or a little later).1_ But Pisistratus was ambitious of more than military triumphs, and in the internal condition of Attica he

discerned the road to power. The constitution which Solon had given to Athens a few years before (594 B.C.) was too moderate to satisfy either of the extreme parties. The wealthy nobles chafed at the political rights granted to the lower classes, while the poor were dissatis- fied with what they regarded as merely a half measure of relief. The nobles themselves were divided into the parties known as the Plain (Pedieis) and the Coast (Paralot), the former inhabiting the western lowlands of Attica, the latter the level districts on the southern and eastern coasts.2 The former were led by the noble Lycurgus, the latter by Megacles, of the proud house of the Alemonide. Pisistratus took advantage of their dissensions to form a third political party out of the men of the Mountain (Diacreis or Diacriot), the poor cottars and shepherds of the eastern and northern hills, among whom his own estates lay. He easily won the affection of these simple highlanders. His manners were captivat- ing, his good humour imperturbable ; his purse was ever at the service of the needy ; his fields and gardens stood open for their enjoyment. Equality and fraternity, together with the maintenance of the constitution, were the watch-

‘words of this eloquent and handsome aristocrat, the

people’s friend. But his easy and affable deportment hid a boundless ambition. Solon detected his schemes, and warned the people against him, but in vain. One day, not long after a violent dispute with Megacles in the public assembly, Pisistratus drove into the market-place, himself and his mules bleeding from wounds which he had inflicted with his own hand, but which he pretended to have received from his political enemies. The indignant people decreed a guard for the protection of their cham- pion. Of this guard the champion soon availed himself in order to seize the Acropolis and make himself master of Athens (560). Megacles and the Alemzonide fled, but Solon remained and continued to lift his voice against the usurper, who, however, treated the old man with the utmost deference, as a valued friend and counsellor. Solon did not long survive his country’s freedom ; he died in the next year (559). The government of Pisistratus was marked by great moderation; he maintained the existing laws, to which he exacted obedience from all, and set the example of it himself. Being once accused of

1 Herod., i. 59; Justin, ii. 8; Frontinus, iv. 7, 44. Other writers (Polyznus, i. 20; Allian, Var, Hist., vii. 19) erroneonsly attribute the stratagem to Solon, and refer it to the expedition in which Solon recovered Salamis. Plutarch (Solon, 8) falls into this mistake, and adds to it the blunder of representing Pisistratus as having taken part in the expedition, which happened about 600 B.c. The two events (Solon's conquest of Salamis and Pisistratus's capture of Salamis) ate distinguished by Justin (ii, 7, 8), and after him by Dunckcr (@esch. des Alterthums, vi. pp. 145, 244) and others, but they are confused by Thirlwall and Grote. From Plutarch (Solon, 8, 9) we may infer that the confusion arose in popular tradition. The account of the stratagem itself in the Greek writers Plutarch and Polyenus differs somewhat from that in the Latin writers Justin and Frontinus. fflian follows (with some variations) the latter account.

2 The difference between the Pedieis and the Paraloi seems to have been of the nature of a local feud between two ancient districts of Attica (Schol. on Aristoph., Lys., 58 ; Strabo, ix. p. 392; Steph. Byz., s.vv. Atdkpia, Tidpados, wedloy ; Suidas, s.v. Tdpador) rather than 2 disagreement between two political parties. It is true that Plutarch (Solon, 18) represents the Paraloi as a moderate political party, inter- mediate between the Pedieis (oligarchs) and the Diacrioi (democrats), but this has the appearance of being a mere conjecture of his own. His view is, however, accepted by Curtius and Duncker.

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murder, he appeared in court like a private citizen to answer the charge, which, however, the accuser did not venture to press. But before he had time to establish himself firmly on the throne, he was expelled by a coalition of the Plain and Coast parties (perhaps in 555). His property was confiscated and sold by auction. But after five or six years Megacles, unable to make head against the party of the Plain, proposed to Pisistratus to secure his recall on condition that Pisistratus should marry his daughter Ccesyra. Pisistratus agreed, and his return was effected by a stratagem. A tall and beautiful woman,. Phya by name, was dressed as the goddess Athene, and drove into Athens on a chariot with Pisistratus at her side, while heralds proclaimed that Athene herself was bringing back Pisistratus.

Thus restored, Pisistratus fulfilled his part of the bargain by marrying Coesyra; but by his former marriage he had already sons approaching manhood (Hippias and Hipparchus), and he treated his young wife so slightingly that Megacles, feeling himself affronted, made peace with his adversaries, and the united parties once more compelled Pisistratus to quit Athens (perhaps in 549). But he did not renounce his designs on the tyranny. The contributions which he received from various cities, especially Thebes, enabled him to hire a body of Argive mercenaries, with which he landed at Marathon in the eleventh year after his expulsion (perhaps in 538). His partisans flocked to him, and he defeated the Athenians at Pallene, and repossessed himself of the tyranny, which he thenceforward held till his death. He now placed his power on a securer basis by keeping a body of mercenaries in his pay, and levying a tax of a tenth or a twentieth on the produce of the soil. A further revenue accrued to him from the Thracian mines, and probably from the silver mines of Laurium, and the harbour and market dues. He now developed his plans for the exten- sion of the naval empire of Athens in the Augean. The island of Naxos was conquered by him, and handed over to Lygdamis, a native of the island, who had zealously supported the restoration of Pisistratus with men and money. In Naxos Pisistratus deposited the hostages he exacted from those of his enemies who chose to re- main at Athens. In Sigeum on the Hellespont, which he conquered from the Mytilenians, he established as tyrant Hegesistratus, his son by an Argive wife, whom he had married in his second exile. The European side of the Hellespont was already in Athenian hands, Miltiades having established an Athenian colony on the Thracian Chersonese during the first tyranny, and with the consent of Pisistratus. Athens thus commanded the straits through which passed the corn trade of the Black Sea. Pisistratus further raised the reputation of Athens by purifying the sacred island of Delos; all the graves within sight of the temple of Apollo were opened and the dead removed to another part of the island. His rule was as Wise and beneficent at home as it was glorious abroad. He encouraged agriculture by lending the poorer peasants cattle and seed, and he paid special attention to the culti- vation of the olive. He enacted or enforced a law against idleness, and he required that the state should maintain its disabled soldiers. Under his rule and that of his sons Attica, was intersected by high roads, which, converging to the capital, helped to unite the country and thus to abolish

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‘ Out of the thirty-three years which elapsed between Pisistratus’s oa usurpation and his death in 527 B.c., we know (from Aristotle,

ov.) V. p. 1315 b) that he reigned during seventeen. He was twice de- Peed and banished, and his second exile lasted between ten and eleven — iepa. pime2)) hence his first must have lasted between five and ae ut we cannot fix with certainty the dates of these two exiles. e ee La whom Clinton, Yasti Hellenici, ii. p. 254, and Stein oe ec i. 64, uearly agree) places the first in 555-550, and the

Ont in 549-538 (see his Gesch. d. Alterthums, vi. p. 454 sq.).

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local feuds and factions. To the tyrants Athens further owed those subterranean channels in the rock which still supply it with drinking water from the hills _ Pisistratus also adorned Athens with splendid public buildings. The temple of the Pythian Apollo was his work; and he began, but did not finish, the great temple of Zeus, the remaining columns of which still astonish the beholder. Modern authorities? further ascribe to him the old Parthenon on the Acropolis, which was afterwards burned by the Persians and replaced by the Parthenon of Pericles. The Lyceum was attributed to him by Theopompus, but to Pericles by the better authority of Philochorus. He caused the Panathenaic festival to be celebrated every fourth year with unusual magnificence.

The well-known story that Pisistratus was the first to collect and publish the poems of Homer in their present form rests on the authority of late writers (Cicero being the earliest), and seems to be sufficiently disproved by the silence of all earlier authorities (see Homer). The state- ment of Aulus Gellius that Pisistratus was the first to establish a public library at Athens is perhaps equally void of foundation. The tyrant seems to have been merciful and amiable to the last. It is not recorded of him that he ever put an enemy to death, and the easy good humour with which he submitted to affronts offered to himself and his family reminds us of Czesar. Solon’s description of him appears to have been justified—that apart from his ambi- tion there

was not a better-disposed man at Athens than Pisistratus. He died at an advanced age in 527, and was succeeded by his sons Hippias and Hipparchus (the Pisistratide), who continued to rule Athens in the same moderate and beneficent spirit. (3. G. FR.)

PISTACHIO NUT, see Not, vol. xvii. p. 665. The pistachio nut is the species named in Gen, xlii. 11 (Heb. Dba, Ar. bofm) as forming part of the present which Joseph's brethren took with them from Canaan, and in Egypt it is still often placed along with sweetmeats and the like in presents of courtesy. The nut is used in various ways ; but the simplest plan is to boil it with salt.

PISTOIA, or Pistosa, a well-walled ancient city, 21 miles north-west of Florence, on a slight eminence near the Ombrone, one of the tributaries of the Arno; it now contains about 12,500 inhabitants. The chief manufac- ture of the place is iron-working, especially fire-arms.® It is on the site of the Roman Pistorza, of which little trace remains. During the Middle Ages Pistoia was at times a dangerous enemy to Florence, and the scene of constant conflicts between the Guelfs and the Ghibellines : it was there that, in the year 1300, the great party struggle took place which resulted in the creation of the Bianchi and Neri factions (see Dante, Infer., xxiv., 1. 121 to end). In the early development of architec- ture and sculpture Pistoia played a very important part ; these arts, as they existed in Tuscany before the time of Niccola Pisano, can perhaps be better studied in Pistoia than anywhere else; nor is the city less rich in the later works produced by the school of sculptors founded by Niccola. In the 14th century Pistoia possessed a number of the most skilful artists in silver work, a wonderful specimen of whose powers exists now in the cathedral,— the great silver altar and frontal of St James, originally made for the high altar, but now placed in a chapel on the south side (see Mera Work, vol. xvi. p. 65, fig. 4). The cathedral is partly of the 12th century, but rebuilt by one of the Pisani, and inside sadly modernized in the worst

2 Curtius and Duncker in their histories of Grecce; see also Wachsmuth, Die Stadt Athen im Alterthum, vol. i. p. 502.

3 The word "pistol" is derived (apparently through pistolese, a dagger, — dagger and pistol being both small arms) from Pistoia, where that weapon

was largely manufactured in the Middle Ages.

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taste. Besides the silver altar it contains many fine works | blood, and grateful for the services rendered them from time

of sculpture; the chief are the monument of Cino da Pistoia, lawyer and poet, Dante's contemporary (1337), and Verrocchio's finest work in marble, the monument to Cardinal Forteguerra (1474), with a large figure of Christ, surrounded by angels, in high relief. Unhappily two of the principal figures were destroyed not many years ago, and replaced by worthless modern ones.1_ Among the very early churches the principal is Sant' Andrea, enriched with sculpture, and probably designed, by Gruamons and his brother Adeodatus, in 1186; in the nave is Giovanni Pisano's magnificent pulpit, imitated from his father's pulpit at Pisa. Other churches of almost equal interest are S. Giovanni Evangelista, also with sculpture by Gruamons, about 1160, and S. Bartolomeo in Pantano by the architect Rudolfinus, 1167. S. Piero Maggiore and San Paolo are also churches begun in the 12th century. San Francesco al Prato is a fine church of the school of Niccola Pisano, end of the 13th century. San Domenico, a noble church built about 1380, contains the beautiful tomb of Filippo Lazari by Bernardo di Matteo, 1464. In addition to its fine churches, of which the above is a very incomplete list, Pistoia contains many noble palaces and public buildings. The Palazzo del Commune and the Palazzo Pretorio, once the residence of the podesta, are both fine specimens of 14th-century domestic architecture, in very good preservation. The Ospedale del Ceppo, built originally in the 13th century, but remodelled in the 15th, is very remarkable for the reliefs in enamelled and coloured terra-cotta with which its exterior is richly decorated, Besides various medallions, there is a frieze of figures in high relief extending along the whole front, over its open arcade. The reliefs consist of a series of groups representing the Seven Works of Mercy and other figures; these were executed by the younger members of the Della Robbia family between 1525 and 1535, and, though

not equal to the best work of Luca and Andrea, are yet very fine in conception and modelling, and extremely rich in their general decorative effect.

PITCAIRN, or Pircarrn's IsLanp, an island of the eastern Pacific, in 25°4' N. lat. and 130° 8' W. long., may be considered as a member or appendage of the Paumotu, Tuamotu, Low, or Dangerous Archipelago, but is nearly 100 miles south of Oeno. It is not more than 3 miles long from east to west and about 2 miles broad. the other islands of this region it has no coral reef, but rises abruptly from the depths with steep and rugged cliffs of dark basaltic lava. There is no anchorage except on a bank at the west end; and even the best of its three landing places—Bounty Bay on the north coast—is danger- ous from the violence of the surf and the existence of a strong undertow. The longer axis of the island is formed by a range of steep hills, attaining in Outlook Ridge a maximum height of 1008 feet. On a plateau about 400 feet above the sea lies the village of Adamstown, with its fields and gardens. The climate is variable and rainy, and snow sometimes falls on the mountains ; but, as there are no springs or streamlets, drinking water is apt to grow scarce in a dry season. Vegetation is luxuriant. Neither the bread fruit nor the cocoa nut, introduced by the settlers, are fully successful ; but the sweet potato, which forms their staple food, banana, yam, taro, pine-apple, &c., produce abundantly. Cor cannot be grown because of rats. The Pitcairn Islanders (not more than ninety in 1878), descended mainly from the mutineers of the " Bounty " and their Tahitian wives, are a healthy, virtu- ous, cheerful, and hospitable people, proud of their English

1 One of the chief treasures of the 9, Kensington Museum is the

original sketch in clay for this monument, about 18 inches high, rt ; —low the only record of the original design of the two chief Piiten

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to time by the English Government and private liberality,

Stone axes, remains of sculptured stone pillars similar to those of Rapanui (Easter Island), and skeletons with a pearl-mussel beneath their head, have been found in the island, and show that, though it was uninhabited when

discovered by Carteret in 1767, it had previously been occupied. Pitcairn was the name of the midshipman who first descried it from the mast-head. On 28th April 1789 a mutiny broke out on board the “ Bounty,” then employed by the English Government in conveying young bread- fruit trees from Tahiti to the West Indies. The commander, Lieutenant BuLicH (qg.v.), was set adrift in the launch with a number of his officers and crew, but managed to make his way to Kupang in Timor (Dutch Indies). The mutineers, twenty-five in number, at first all returned to Tahiti. Of those who chose to be landed on that island, six were condemned to death by court-martial in England, and three of these were ultimately executed (1792). Two years earlier (1790) the other party (consisting of Fletcher Christian, the leader of the mutiny, eight other Englishmen, six Polynesian men, and twelve Polynesian women) had taken pos- session of Pitcairn and burned the “ Bounty.” The beautiful island, which might have been a paradise, was soon turned into a little hell. Treachery, drunkenness, madness, and murder fill the first years of its annals. By 1800 all the men were dead except Alexander Smith (afterwards known as John Adams), whose endeavours to train up the youthful generation thus left in his sole charge were crowned with success. An American vessel, the “ Topaze,” under Mayhew Folger, discovered the strange colony in 1808, and again, by accident, it was visited by the “ Briton,” Captain Sir F. Staines, and the “Tagus,” Captain Pipon, in 1817. On the death of John Adams, 29th March 1829, George Hunn Nobbs, who, after an adventurous life had settled at Pitcairn in 1828, was appointed pastor and chief magistrate of the settlement. Through fear of drought the islanders, now numbering 87 persons, removed in 1830 to Tahiti, but neither the climate nor the morals of the place were such as they approved, and in 1831 they returned to their lonely island. Hardly had they settled into their old ways when Joshua Hill, a strange adventurer, rather crazy than criminal, appeared among them; claiming to be under Government authority, he tyrannized over them till his removal by an English man-of-war in 1838. th 1856 the whole population of Pitcairn—60 married per- sons and 134 young men, women, and children —were landed on NorFo.k IsLanp (¢.v.); and the little island was again left to the occupancy of goats and cattle. In 1858, however, two men, William and Moses Young, chose to return with their families to their old homes, and their example was afterwards followed by a few others.

See Shillibeer, The “ Briton’s” Voyage to Pitcairn’s Island, 1818; Beechey, Voyage to the Pacific, 1831; Sir John Barrow, History of the Mutiny of the “ Bounty,” 1831; W. Brodie, Pitcairn’s Island, 1850; T, B. Murray, Piteatrn, 1854; Meinicke, Die Insel Pitcairn, 1858, and Die Inseln des Stillen Oceans, vol. ii., 1876 ; and Lady Belcher, The Mutineers of the “* Bounty,” 1870.

PITCAIRNE, ArcurBatp (1652-1713), a distinguished Scottish physician, born at Edinburgh in 1652, and de- scended of an ancient Fifeshire family which barely escaped extinction at the battle of Flodden,—the proprietor of the estate and his seven sons having fallen in the battle, and the succession being only preserved by the birth of a posthumous child. After obtaining some classical education at the school of Dalkeith, Pitcairne entered Edinburgh university in 1668, and took his degree of M.A. in 1671. Like some men of great general ability, he seems to have remained long undetermined as to his future profession, and before taking to medicine he had made some progress first in divinity and then in law. But, having been sent to France for the benefit of his health, he was induced at Paris to begin the study of medicine. On his return to Scotland he applied himself for a time and with great success to the study of mathematics. Having at last taken vigorously to medicine, first at Edinburgh and after- wards for the second time at Paris, he obtained in 1680 his degree of M.D. from the faculty at Rheims. On returning to Scotland he at once began practice at Edin- burgh, and in a short time acquired a great and wide reputation—so much so that in 1692 he was invited to fill a professor’s chair at Leyden, and is said to have lectured there with great applause. Among his pupils were at least two men who afterwards rose to great eminence in their profession, Mcad and Boerhaave, and both of them are understood to have attributed much of their skill to what they had learned from Pitcairne. In the followimg year

Pitcairne returned to Scotland to fulfil a matrimonial engagement with a daughter of Sir Archibald Stevenson, an eminent physician in Edinburgh ; and, the family of the young lady having objected to their daughter going abroad, Pitcairne did not return to Leyden, but settled once more in Edinburgh, speedily acquired a most extensive practice, rose indeed to be

the first physician of his time in Scotland, and was frequently called in as consulting physician not only in England but even in Holland.

Soon after his return to Edinburgh, feeling the great want of the means of anatomical study, he importuned the town council to permit himself and certain of his medical friends to dissect the bodies of paupers in " Paul's Work" unclaimed by their relations, and who therefore had hitherto been buried at the town's expense. They offered to attend them gratis when ill, and after dissection to bury them at their own charges. Strangely enough this pro- posal was strongly opposed by the chief surgeons of the place, but ultimately the town council had the good sense to comply with Pitcairne's request, and in this way he may be said to have the credit of laying the foundation of the great Edinburgh school of medicine.

Though, according to Boerhaave, Pitcairne had not com- pletely emancipated himself from some of the fanciful theories prevalent in his age in the science of medicine, yet the main characteristic of his superiority appears to have been that, like Sydenham and the higher class of physicians in England at that time, he insisted on strict adherence to the Baconian method of attending chiefly to facts of experience and observation. " Nothing," he remarks, "more hinders physic from being improved than the curiosity of searching into the natural causes of the effects of medicines. 'The business of men is to know the virtues of medicines, but to inquire whence they have that power is a superfluous amusement, since nature lies concealed. A physician ought therefore to apply himself to discover by experience the effects of medicines and diseases, and reduce his observations into maxims, and not needlessly fatigue himself by inquiring into their causes, which are neither possible nor necessary to be known. If all physicians would act thus we should not see physic divided into so many sects."

Pitcairne's medical opinions are chiefly contained in a volume of Dissertations which he published in 1701 (second and improved edition, 1713). In these he dis- cusses the application of geometry to physic, the circula- tion of the blood in the smaller vessels, the difference in the quantity of the blood contained in the lungs of animals in the womb and of the same animals after birth, the motions by which food becomes fit to

supply the blood, the question as to inventors in medicine (in which he repels the idea of certain medical discoveries of modern umes having been known to the ancients, especially vindicating for Harvey the discovery of the circulation of the blood, and refuting the opinion of Dacier and others that it was known to Hippocrates), the cure of fevers by evacuating medicines, and the effects of acids and alkalis m medicine,

In addition to his great knowledge and skill as a physician, Pitcairne is understood to have been also an accomplished mathematician. He was intimate with the two Gregorys, and is said to have made some improvement on the method of infinite series invented by David Gregory. ee addiction to mathematics seems to have misled ae. 4 ong with some other eminent men of his time, into ; idea of applying its methods of reasoning to subjects

or which they are quite unfitted: in Pitcairne's case the

attempt is made in one of his papers to adapt them to medicine.

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Latin verses, occasionally with something more than mere imitative cleverness and skill. Some verses of his on the death of Lord Dundee were translated by Dryden, and, as one of the latest editors of Dryden's poetry with perfect justice remarks, "the translation will not be thought so happy as the original."

According to the representations which are left by his contemporaries of his personal bearing and character, he seems to have carried his great faculties very lightly. A strong man all round, with great animal spirits and jovial habits, somewhat contemptuous of the gravities and feeblosities around him, a loudly avowed Jacobite and Episcopalian, rather reckless in his jests and sarcasms, and spending a good deal of his time in clubs, public houses, and drinking jollities, he was evidently regarded with little favour and some suspicion by the sober and decent Presbyterian circles of Edinburgh. " Drunk twice a day," according to the worthy, credulous, gossiping Wodrow (in one of his note books) ; "an unbeliever," 'much given to profane jests," an "atheist," according to otliers. These reports may be taken for what they

are worth, which perhaps is not very much. What is certain is that he was repeatedly involved in violent quarrels with his medical brethren and others, and once or twice got into scrapes with the Government on account of his indiscreet political utterances. Among his friends, however, he was evidently well liked, and he is known to have acted with great kindness and generosity to deserving men who needed his help. Ruddiman, the great Scottish scholar, for example, was rescued from a life of obscurity by his encouragement and assistance, and by no one was his memory more gratefully cherished.

"__Vale, lux Scotigenum, princepsque Mcdentum, Musarum columen delicieeque, vale!"

are the concluding lines of a Latin epitaph by him on his venerated patron and friend, which still remains on Pitcairne's monument in the Greyfriars churchyard. Mead too, appears never to have forgotten what he owed to his old teacher at Leyden. A son of Pitcairne's had gone out in the rebellion of 1715, and, having been con- demned to death was saved by the earnest interposition of Mead with Sir Robert Walpole. He pleaded, very art- fully, that if Walpole's health had been bettered by his skill, or if members of the royal family were preserved by his care, it was owing to the instruction he had received from Dr Pitcairne. Pitcairne died in October 1713. Among his other scholarly tastes he had been a great collector of books, and his library, which is under- stood to have been of considerable value, was, through the influence of Ruddiman, disposed of to Peter the Great of Russia.

PITCH. See Tar.

PITCHER PLANTS. vol. xiii. pp. 138, 139.

PITHOM, a city of Egypt, mentioned in Exod. i. 11, along with RAMESES (q.v.).

PITHOU, Pierre (1539-1596), lawyer and scholar, was born at Troyes on November 1, 1539. His taste for litera- ture was early seen, and his father, an advocate, cultivated it tothe utmost. He first studied at Troyes, and afterwards went to Paris, where he completed his classical studies under Adrien Turnébe and Pierre Galand. He next attended the lectures in law of

Cujas at Bourges and Valence, and was called to the Paris bar in 1560. Here he achieved but little success as a pleader, but soon acquired a considerable practice as a consulting lawyer. On the out- break of the second war of religion in 1567, Pithou, who was a Calvinist, withdrew to Sedan and afterwards to Basel, whence he returned to France on the publication of the

See Insectrvorous~ PLants,

He was also a very thorough classical scholar, and wrote | edict of pacification. Soon afterwards he accompanied the

Duc de Montmorency on his embassy to England, return- ing shortly before the massacre of St Bartholomew, in which he narrowly escaped with his life. Next year he followed the example of Henry of Navarre, to whose cause he was ardently attached, by abjuring the Protestant faith. Henry, shortly after his own accession to the throne of France, recognized Pithou's talents and services by bestow- ing upon him various legal appointments. It was con- siderably after this date that Pithou achieved what was probably the most important work of his life, whether political or literary, by co-operating in the production of the powerful Satere Menippée (1593), which did so much to damage the cause of the League ; the harangue of Daubray is usually attributed to his pen. He died at Nogent-sur- Seine on November 1, 1596. His valuable library, specially rich in MSS., was for the most part transferred to what is now the Bibliothéque Nationale in Paris.

Pithou wrote a great number of legal and historical books, besides preparing editions of several ancient authors. His earliest publication was Adversariorum Subsecivorum Lib, II, (1565), which was highly praised by Turnébe, Lipsius, and others. Perhaps his edition of the Leges Visigothorum (1579) was his most valuable contribution to historical science; in the same line he edited the Capitula of Charlemagne, Louis the Pious, and Charles the Bald in 1588, and he also assisted his brother Frangois in preparing an edition of the Corpus Juris Canonici (1687). His essay On the Gal- lican Liberties (1594) is reprinted in his Opera sacra juridica historica miscellanea collecta (1609). In classical literature he was the first who

made the world acquainted with the Fables of Phedrus (1596) ; he also edited the Pervigilium Veneris (1587), aud Juvenal and Persius (1585).

PITT, Witit1am, First Eart or Cuaruam. See CHATHAM.

PITT, Wriuxram (1759-1806), the second son of William Pitt, earl of Chatham, and of Lady Hester Grenville, daughter of Hester, Countess Temple, was born on the 28th of May 1759. The child inherited a name which, at the time of his birth, was the most illustrious in the civilized world, and was pronounced by every Englishman with pride, and by every enemy of England with mingled admiration and terror. During the first year of his life every month had its illumina- tions and bonfires, and every wind brought some mes- senger charged with joyful tidings and hostile standards. In Westphalia the English infantry won a great battle which arrested the armies of Louis XV. in the midst of a career of conquest ; Boscawen defeated one French fleet on the coast of Portugal; Hawke put to flight another in the Bay of Biscay; Johnson took Niagara; Amherst took Ticonderoga ; Wolfe died by the most enviable of deaths under the walls of Quebec ; Clive destroyed a Dutch arma- ment in the Hooghly, and established the English supre- macy in Bengal ; Coote routed Lally at Wandewash, and established the English supremacy in the Carnatic. The nation, while loudly applauding the successful warriors, considered them all, on sea and on land, in Europe, in America, and in Asia, merely as instruments which received their direction from one superior mind. It was the great William Pitt, the great commoner, who had vanquished the French marshals in Germany and French admirals on the Atlantic,—who had conquered for his country one great empire on the frozen shores of Ontario and another under the tropical sun near the mouths of the Ganges. It was not in the nature of things that popularity such as he at this time enjoyed should be permanent. That popularity had lost its gloss before his children were old enough to understand that their father was a great man. He was at length placed in situations in which neither his talents for administration nor his talents for debate appeared to the best advantage. The energy and decision which had eminently fitted him for the direction of war were not needed in time of peace. The lofty and spirit-stirring

eloquence which had made him supreme in the House

of Commons often fell dead on the House of Lords. A cruel malady racked his joints, and left his joints only to

fall on his nerves and on his brain. During the closing years of his life he was odious to the court, and yet was not on cordial terms with the great body of the Opposition. Chatham was only the ruin of Pitt, but an awful and majestic ruin, not to be contemplated by any man of sense and feeling without emotions resembling those which are excited by the remains of the Parthenon and of the Colos- seum. In one respect the old statesman was eminently | happy. Whatever might be the vicissitudes of his public life, he never failed to find peace and love by his own hearth. He loved all his children, and was loved by them; and of all his children the one of whom he was fondest and proudest was his second son.

The child's genius and ambition displayed themselves yj. with a rare and almost unnatural precocity. At seven the hood interest which he took in grave subjects, the ardour with which he pursued his studies, and the sense and vivacity of his remarks on books and on events amazed his parents and instructors. One of his sayings of this date was reported to his mother by his tutor. In August 1766, when the world was agitated by the news that Mr Pitt had become earl of Chatham, little William exclaimed, "I am glad that I am not the eldest son. I want to speak in the House of Commons like papa." A letter is extant in which Lady Chatham, a woman of considerable abilities, remarked to her lord that their younger son at twelve had left far behind him his elder brother, who was fifteen. 'The fine- ness," she wrote, "of William's mind makes him enjoy with the greatest pleasure what would be above the reach of any other creature of his small age." At fourteen the lad was in intellect a man. Hayley, who met him at Lyme in the summer of 1773, was astonished, delighted, and somewhat overawed, by hearing wit and wisdom from so younga mouth. The poet, indeed, was afterwards sorry that his shyness had prevented him from submitting the plan ofan extensive literary work, which he was then meditating, fo the judgment of this extraordinary boy. The boy, indeed, had already written a tragedy, bad, of course, but not worse than the tragedies of his friend. This piece is still pre- served at Chevening, and is in some respects highly curi- ous. There is no love. The whole plot is political ; and it is remarkable that the interest, such as it is, turns on a contest about a regency. On one side is a faithful servant

of the crown, on the other an ambitious and unprincipled conspirator. At length the king, who had been missing, reappears, resumes his power, and rewards the faithful defender of his rights. A reader who should judge only by internal evidence would have no hesitation in pronoun- cing that the play was written by some Pittite poetaster at the time of the rejoicings for the recovery of George IIL in 1789. |

The pleasure with which William’s parents observed the Edu rapid development of his intellectual powers was alloyed by 4″ apprehensions about his health. He shot up alarmingly fast ; he was often ill, and always weak ; and it was feared that it would be impossible to rear a stripling so tall, so slender, and so feeble. Port wine was prescribed by his medical advisers ; and it is said that he was, at fourteen, accustomed to take this agreeable physic in quantities which would, in our abstemious age, be thought much more than sufficient for any full-grown man. This regimen, though it would probably have killed ninety-nine boys out of a hundred, seems to have been well suited to the peculi- arities of William’s constitution ; for at fifteen he ceased to be molested by disease, and, though never a strong man, continued, during many years of labour and anxiety, of nights passed in debate and of summers passed in London,

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to be a tolerably healthy one. It was probably on account of the delicacy of his frame that he was not educated like other boys of the same rank. Almost all the eminent English statesmen and orators to whom he was afterwards opposed or allied—North, Fox, Shelburne, Windham, Grey, Wellesley, Grenville, Sheridan, Canning—went through the training of great public schools. Lord Chatham had him- self been a distinguished Etonian ; and it is seldom that a distinguished Etonian forgets his obligations to Eton. But William's infirmities required a vigilance and tenderness such as could be found only at home. He was therefore bred under the paternal roof. His studies were superin- tended by a clergyman named Wilson ; and those studies, though often interrupted by illness, were prosecuted with extraordinary success. Before the lad had completed his fifteenth year his knowledge both of the ancient languages and of mathematics was such as very few men of eighteen then carried up to college. He was therefore sent, towards the close of the year 1773, to Pembroke Hall, in the uni- versity of Cambridge. So younga student required much more than the ordinary care which a college tutor bestows on undergraduates. The governor to whom the direction of William's academical life was confided was a bachelor of arts named Pretyman,! who had been senior wrangler in the preceding year, and who, though not a man of prepos- sessing appearance or brilliant parts, was eminently acute and laborious, a sound scholar, and an excellent geometri- cian. At Cambridge Pretyman was, during more than two years, the inseparable companion, and indeed almost the only companion, of his pupil. A close and lasting friendship sprang up between the pair. The disciple was able, before he completed his twenty-eighth year, to make his preceptor bishop of Lincoln and dean of St Paul's; and the preceptor showed his gratitude by writing a life of the disciple, which enjoys the distinction of being the worst biographical work of its size in the world.

Pitt, till he graduated, had scarcely one acquaintance, attended chapel regularly morning and evening, dined every day in hall, and never went to a single evening party. At seventeen he was admitted, after the bad fashion of those times, by right of birth, without any examination, to the degree of

master of arts. But he continued during some years to reside at college, and to apply himself vigorously, under Pretyman’s direction, to the studies of the place, while mixing freely in the best academic society.

The stock of learning which Pitt laid in during this part of his life was certainly very extraordinary. In fact, it was all that he ever possessed ; for he very early became too busy to have any spare time for books. The work in which he took the greatest delight was Newton’s Principia. His liking for mathematics, indeed, amounted to a passion, which, in the opinion of his instructors, themselves distin- guished mathematicians, required to be checked rather than encouraged, The acuteness and readiness with which he solved problems was pronounced by one of the ablest of the moderators, who in those days presided over the dis- putations in the schools and conducted the examinations of the senate-house, to be unrivalled in the university. Nor was the youth’s proficiency in classical learning less remark- able. In one respect, indeed, he appeared to disadvantage when compared with even second-rate and third-rate men from public schools. He had never, while under Wilson’s care, been in the habit of composing in the ancient lan- guages ; and he therefore never acquired that knack of

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ion pe Pretyman (1750-1827) was senior wrangler in 1772.

‘Porat on falling heir ‘to a large estate, he assumed the name of

7 oa From Lincoln, to which see he had been elevated in 1787,

a translated to Winchester in 1820. Tomline, to whom Pitt

Life hae had bequeathed his papers, published his Memoirs of the of William Pitt (down to the close of 1792) in 1821 (8 vols. 8vo).]

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versification which is sometimes possessed by clever boys whose knowledge of the language and literature of Greece and Rome is very superficial. It would have been utterly out of his power to produce such charming elegiac lines as those in which Wellesley bade farewell to Eton, or such Virgilian hexameters as those in which Canning described the pilgrimage to Mecca. But it may be doubted whether any scholar has ever, at twenty, had a more solid and pro- found knowledge of the two great tongues of the old civilized world. The facility with which he penetrated the meaning of the most intricate sentences in the Attic writers astonished veteran critics. He had set his heart on being intimately acquainted with all the extant poetry of Greece, and was not satisfied till he had mastered Lycophron's Cassandra, the most obscure work in the whole range of ancient literature. This strange rhapsody, the difficulties of which have perplexed and repelled many excellent scholars, "he read," says his preceptor, '"' with an ease at first sight which, if I had not witnessed it, I should have thought beyond the compass of human intellect."

To modern literature Pitt paid comparatively little atten- tion. He knew no living language except French; and French he knew very imperfectly. With a few of the best English writers he was intimate, particularly with Shakspeare and Milton, The debate in Pandemonium was, as it well deserved to be, one of his favourite passages ; and his early friends used to talk, long after his death, of the just emphasis and the melodious cadence with which they had heard him recite the incomparable speech of Belial. He had indeed been carefully trained from infancy in the art of managing his voice, a voice naturally clear and deep- toned. His father, whose oratory owed no small part of its effect to that art, had been a most skilful and judicious instructor. At a later period the wits of Brookes's, irri- tated by observing, night after night, how powerfully Pitt's sonorous elocution fascinated the rows of country gentle- men, reproached him with having been " taught by his dad on a stool."

His education, indeed, was well adapted to form a great parliamentary speaker. One argument often urged against those classical studies which occupy so large a part of the early life of every gentleman bred in the south of our island is, that they prevent him from acquiring a command of his mother tongue, and that it is not unusual to meet with a youth of excellent

parts, who writes Ciceronian Latin prose and Horatian Latin alcaics, but who would find it impos- sible to express his thoughts in pure, perspicuous, and forcible English. There may perhaps be some truth in this observation. But the classical studies of Pitt were carried on in a peculiar manner, and had the effect of enriching his English vocabulary, and of making him wonderfully expert in the art of constructing correct Eng- lish sentences. His practice was to look over a page or two of a Greek or Latin author, to make himself master of the meaning, and then to read the passage straight forward into hisown language. This practice, begun under his first teacher Wilson, was continued under Pretyman. It is not strange that a young man of great abilities, who had been exercised daily in this way during ten years, should have acquired an almost unrivalled power of putting his thoughts, without premeditation, into words well selected and well arranged.

Of all the remains of antiquity, the orations were those on which he bestowed the most minute examination. His favourite employment was to compare harangues on opposite sides of the same question, to analyse them, and to observe which of the arguments of the first speaker were refuted by the second, which were evaded, and which were left untouched. Nor was it only in books that he at this time studied the art of parliamentary fencing. When he

Called to the bar,

1780.

M.P. for Appleby,

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was at home, he had frequent opportunities of hearing important debates at Westminster ; and he heard them, not only with interest and enjoyment, but with a close scien- tific attention resembling that with which a diligent pupil at Guy's Hospital watches every turn of the hand of a great surgeon through a difficult operation. On one of these occa- sions Pitt, a youth whose abilities were as yet known only to his own family and to a small knot of college friends, was introduced on the steps of the throne in the House of Lords to Fox, who was his senior by eleven years, and who was already the greatest debater, and one of the greatest orators, that had appeared in England. Fox used afterwards to relate that, as the discussion proceeded, Pitt repeatedly turned to him, and said, ‘‘ But surely, Mr Fox, that might be met thus ;” or “ Yes; but he lays himself open to this retort.” What the particular criticisms were Fox had for- gotten ; but he said that he was much struck at the time by the precocity of a lad who, through the whole sitting, seemed to be thinking only how all the speeches on both sides could be answered.

One of the young man's visits to the House of Lords was a sad and memorable era in his life. He had not quite completed his nineteenth year when, on the 7th of April 1778, he attended his father to Westminster. A great debate was expected. It was known that France had recognized the independence of the United States. The duke of Richmond was about to declare his opinion that all thought of subjugating those states ought to be relin- quished. Chatham had always maintained that the resistance of the colonies to the mother country was justifiable. But he conceived, very erroneously, that on the day on which their independence should be acknow- ledged the greatness of England would be at an end. Though sinking under the weight of years and infirmities, he determined, in spite of the entreaties of his family, to be in his place, His son supported him toa seat. The excitement and exertion were too much for the old man. In the very act of addressing the peers, he fell back in convulsions. A few weeks later his corpse was borne, with gloomy pomp, from the Painted Chamber to the Abbey. The favourite child and namesake of the deceased statesman followed the coffin as chief mourner, and saw it eae in the transept where his own was destined to lie.

_ His elder brother, now earl of Chatham, had means sufficient, and barely sufficient, to support the dignity of the peerage. The other members of the family were poorly provided for. William had little more than three hundred a year. It was necessary for him to follow a profession, He had already begun to eat his terms. In the spring of 1780 he came of age. He then quitted Cambridge, was called to the bar, took chambers in Lincoln's Inn, and joined the western circuit. In the autumn of that year a general election took place; and he offered himself as a candidate for the university ; but he was at the bottom of the poll. It is said that the grave doctors who then sat, robed in scarlet, on the benches of Golgotha thought it great presumption in so young a man to solicit so high a distinction, He was, however, at the request of a hereditary friend, the duke of Rutland, brought into parliament by Sir James Lowther for the borough of Appleby.

'The dangers of the country were at that time such as might well have disturbed even a constant mind. Arm after army had been sent in vain against the rebellious le of North America. On pitched fields of battle i ae eee with the disciplined troops of the ee ee a wi not on pitched fields of battle

;) ontest could be decided. An armed nation, with hunger and the Atlantic for auxiliaries,

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was not to be subjugated. Meanwhile the house of Bour- bon, humbled to the dust a few years before by the genius and vigour of Chatham, had seized the opportunity of revenge. France and Spain had united against us, and had recently been joined by Holland. The command of the Mediterranean had been for a time lost. The British flag had been scarcely able to maintain itself in the British Channel. The northern powers professed neutrality ; but their neutrality had a menacing aspect. In the East, Hyder had descended on the Carnatic, had destroyed the little arniy of Baillie, and had spread terror even to the ramparts of Fort St George. The discontents of Ireland threatened nothing less than civil war. In England the authority of the Government had sunk to the lowest point. The king and the House of Commons were alike unpopular. The cry for parliamentary reform was scarcely less loud and vehement than in the autumn of 1830. Formidable

associations, headed, not by ordi- nary demagogues, but by men of high rank, stainless character, and distinguished ability, demanded a revision of the representative system. The populace, emboldened by the impotence and irresolution of the Government, had recently broken loose from all restraint, besieged the chambers of the legislature, hustled peers, hunted bishops, attacked the residences of ambassadors, opened prisons, burned and pulled down houses. London had presented during some days the aspect of a city taken by storm; and it had been necessary to form a camp among the trees of St James's Park.

In spite of dangers and difficulties abroad and at home, George III, with a firmness which had little affinity with virtue or with wisdom, persisted in his determination to put down the American rebels by force of arms; and his ministers submitted their judgment to his. Some of them were probably actuated merely by selfish cupidity ; but their chief, Lord North, a man of high honour, amiable temper, winning manners, lively wit, and excellent talents both for business and for debate, must be acquitted of all sordid motives. He remained at a post from which he had long wished and had repeatedly tried to escape, only because he had not sufficient fortitude to resist the entreaties and reproaches of the king, who silenced all arguments by passionately asking whether any gentleman, any man of spirit, could have the heart to desert a kind master in the hour of extremity.

The Opposition consisted of two parties which had once been hostile to each other, and which had been very slowly and, as it soon appeared, very imperfectly reconciled, but which at this conjuncture seemed to act together with cordiality. The larger of these parties consisted of the great body of the Whig aristocracy. Its head was Charles, marquis of Rockingham, a man of sense and virtue, and in wealth and parliamentary interest equalled by very few of the English nobles, but afflicted with a nervous timidity which prevented him from taking a prominent part In debate. In the House of Commons the adherents of Rockingham were led by Fox, whose dissipated habits and ruined fortunes were the talk of the whole town, but whose commanding genius, and whose sweet, generous, and affectionate disposition, extorted the admiration and love of those who most lamented the errors of his private life. Burke, superior to Fox in largeness of comprehen- sion, in extent of knowledge, and in splendour of imagina- tion,

but less skilled in that kind of logic and in that kind of rhetoric which convince and persuade great assemblies, was willing to be the lieutenant of a young chief who might have been his son.

A smaller section of the Opposition was composed of the old followers of Chatham. At their head was William, | earl of Shelburne, distinguished both as a statesman and

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as a lover of science and letters. With him were leagued Lord Camden, who had formerly held the great seal, and whose integrity, ability, and constitutional knowledge commanded the public respect; Barré, an eloquent and acrimonious declaimer ; and Dunning, who had long held the first place at the English bar. It was to this party that Pitt was naturally attracted.

On the 26th of February 1781 he made his first speech

. in favour of Burke’s plan of economicalreform. Fox stood

up at the same monient, but instantly gave way. The lofty yet animated deportment of the young member, his perfect self-possession, the readiness with which he replied to the orators who had preceded him, the silver tones of his voice, the perfect structure of his unpremeditated sentences, astonished and delighted his hearers. Burke, moved even to tears, exclaimed, “It is not a chip of the old block ; it is the old block itself.” ‘‘ Pitt will be one of the first men in parliament,” said a member of the opposition to Fox. ‘He is so already,” answered Fox, in whose nature envy had no place. It is a curious fact, well remembered by some who were very recently living,! that soon after this debate Pitt’s name was put up by Fox at Brookes’s.

On two subsequent occasions during that session Pitt addressed the House, and on both fully sustained the reputation which he had acquired on his first appearance. In the summer, after the prorogation, he again went the western circuit, held several briefs, and acquitted himself insuch a manner that he

was highly complimented by Buller from the bench, and by Dunning at the bar.

On the 27th of November the parliament reassembled. Only forty-eight hours before had arrived tidings of the surrender of Cornwallis and his army; and it had conse- quently been necessary to rewrite the royal speech. Every man in the kingdom, except the king, was now convinced that it was mere madness to think of conquering the United States. In the debate on the report of the address, Pitt spoke with even more energy and brilliancy than on any former occasion. He was warmly applauded by his allies; but it was remarked that no person on his own side of the

ingham as first minister. Fox and Shelburne became secretaries of state. Lord John Cavendish, one of the most upright and honourable of men, was made chancellor of the exchequer. Thurlow, whose abilities and force of character had made him the dictator of the House of Lords, continued to hold the great seal.

To Pitt was offered, through Shelburne, the vice- Declines treasurership of Ireland, one of the easiest and most office in highly paid places in the gift of the crown; but the offer Rock-

was without hesitation declined. The young statesman had resolved to accept no post which did not entitle him to

a seat in the cabinet ; and a few days later he announced 1782. _that resolution in the House of Commons.

It must be remembered that the cabinet was then a much smaller and more select body than at present. We have seen cabinets of sixteen. In the time of our grandfathers a cabinet of ten or eleven was thought inconveniently large. Seven was a usual number. Even Burke, who had taken the lucrative office of paymaster, was not in the cabinet. Many therefore thought Pitt’s declaration indecent. He himself was sorry that he had made it. The words, he said in private, had escaped him in the heat of speaking ; and he had no sooner uttered them than he would have given the world to recall them.

They, however, did him no harm with the public. The second William Pitt, it was said, had shown that he had inherited the spirit as well as the genius of the first. In the son, as in the father, there might perhaps be too much pride; but there was nothing low or sordid. It might be called arrogance in a young barrister, living in chambers on three hundred a year, to refuse a salary of five thousand a year, merely because he did not choose to bind himself to speak or vote for plans which he had no share in framing; but surely such arrogance was not very far removed from virtue. Pitt gave a general support to the administration of Rockingham, but omitted, in the meantime, no opportunity of courting that ultra-Whig party which the persecution of Wilkes and the Middlesex election had called into existence, and which the disastrous events of the war, and the triumph of republican principles in America, had made

house was so loud in eulogy as Henry Dundas, the lord advocate of Scotland, who spoke from the ministerial ranks, That able and versatile politician distinctly fore- saw the approaching downfall of the Government with which he was connected, and was preparing to make his own escape from the ruin. From that night dates his connexion with Pitt, a connexion which soon became a

ee and which lasted till it was dissolved by eath.

formidable both in numbers and in temper. He supported

a motion for shortening the duration of parliaments. He

made a motion for a committee to examine into the state Intro-

of the representation, and, in the speech by which that duces notion was introduced, avowed himself the enemy of the Be alte: close boroughs, the strongholds of that corruption to which mentary he attributed all the calamities of the nation, and which, as reform, he phrased it in one of those exact and sonorous sentences May 7, of which he had a boundless command, had grown with the ee

About a fortnight later Pitt spoke in the committee of supply on the army estimates. Symptoms of dissen- sion had begun to appear on the treasury

bench. Lord George Germaine, the secretary of state who was especi- ally charged with the direction of the war in America, had held language not easily to be reconciled with declarations made by the first lord of the treasury. Pitt noticed the discrepancy with much force and keenness. Lord George and Lord North began to whisper together ; and Welbore Ellis, an ancient placeman who had been drawing salary almost every quarter since the days of Henry Pelliam, bent down between them to put ina word. Such interruptions Sometimes discompose veteran speakers. Pitt stopped, and, looking at the group, said, with admirable readiness,

I shall wait till Nestor has composed tlie dispute between

gamemnon and Achilles.”

Aiter several defeats, or victories hardly to be distin- guished from defeats, the ministry resigned. The king, reluctantly and ungraciously, consented to accept Rock-

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; it 1s to be noted that this and some other allusions in the pre- ent article refer to the date of its original appearance, 1859.]

growth of England and strengthened with her strength, but had not diminished with her diminution or decayed with her decay. On this occasion he was supported by Fox. The motion was lost by only twenty votes in a house of more than three hundred members. The reformers never again had so good a division till the year

1831.

The new administration was strong in abilities, and was more popular than any administration_which had held office since the first year of George IIL, but was hated by the king, hesitatingly supported by the Parlia- ment, and torn by internal dissensions. The chancellor was disliked and distrusted by almost all his colleagues. The two secretaries of state regarded each other with no friendly feeling. The line between their departments had not been traced with precision; and there were conse- quently jealousies,

encroachments, and complaints. It was all that Rockingham could do to keep the peace in his cabinet; and before the cabinet had existed three months Rockingham died.

In an instant all was confusion. The adherents of the

XIX. — 18

Shel- burne ministry.

Pitt chan- cellor of the ex- chequer, July

1782,

deceased statesman looked on the duke of Portland as their chief. The king placed Shelburne at the head of the treasury. Fox, Lord John Cavendish, and Burke immediatcly resigned their offices ; and the new prime minister was left to constitute a Government out of very defective materials. His own parliamentary talents were great ; but he could not be in the place where parliamen- tary talents were most needed. It was necessary to find some member of the House of Commons who could confront the great orators of the Opposition ; and Pitt alone had the eloquence and the courage which were required. He was offered the great place of chancellor of the exchequer, and he accepted it. He had scarcely completed his twenty-third year. ;

The parliament was speedily prorogued. During the recess a negotiation for peace which had been commenced under Rockingham was brought toa successful termination. England acknowledged the independence of her revolted colonies; and she ceded to her European enemies some places in the Mediterranean and in the Gulf of Mexico. But the terms which she obtained were quite as advanta- geous and honourable as the events of the war entitled her to expect, or as she was likely to obtain by persevering in a contest against immense odds. All her vital parts, all the real sources of her power, remained uninjured. She preserved even her dignity ; for she ceded to the house of Bourbon only part of what she had won from that house in

previous wars. She retained her Indian empire un- diminished ; and, in spite of the mightiest efforts of two great monarchies, her flag still waved on the rock of Gibraltar. There is not the slightest reason to believe that Fox, if he had remained in office, would have hesitated one moment about concluding a treaty on such conditions. Unhappily that great and most amiable man was, at this crisis, hurried by his passions into an error which made his genius and his virtues, during a long course of years, almost useless to his country.

He saw that the great body of the House of Commons was divided into three parties—his own, that of North, and that of Shelburne; that none of those three parties was large enough to stand alone ; that, therefore, unless two of them united there must be a miserably feeble administra- tion, or, more probably, a rapid succession of miserably feeble administrations, and this at a time when a strong Government was essential to the prosperity and respecta- bility of the nation. It was then necessary and right that there should be a coalition. To every possible coalition there were objections. But of all possible coalitions that to which there were the fewest objections was undoubt- edly a coalition between Shelburne and Fox. It would have been generally applauded by the followers of both. It might have been made without any sacrifice of public principle on the part of either. Unhappily, recent bicker- ings had left in the mind of Fox a profound dislike and distrust of Shelburne. Pitt attempted to mediate, and was authorized to invite Fox to return to the service of the crown. “Ts Lord Shelburne,” said Fox, “ to remain prime minister?” Pitt answered in the affirmative. “It is im- possible that I can act under him,” said Fox. “Then negotiation is at an end,” said Pitt; “for I cannot betray him.” Thus the two statesmen parted. They were never again in a private room together.

As Fox and his friends would not treat with Shelburne, nothing remained to them but to treat with North. That fatal coalition which is emphatically called “The Coali- — was formed. Not three quarters of a year had elapsed since }I’ox and Burke had threatened North with impeachment, and had described him night after night as the most arbitrary, the most corrupt, and the most incap- able of ministers. They now allied themselves with him

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for the purpose of driving from office 4 statesman with whom they cannot he said to have differed as to any important question. Nor had they even the prudence and the patience to wait for some occasion on which they might, without inconsistency, have combined with their old enemies in opposition to the Government. That nothing might be wanting to the scandal the great orators who had, during seven years, thundered against the war determined to join with the authors of that war in passing a vote of censure on the peace.

The parliament met before Christmas 1782. But it | was not till January 1783 that the preliminary treaties 1733 were signed. On the 17th of February they were taken into consideration by the House of Commons. There had been, during some days, floating rumours that Fox and — North had coalesced ; and the debate indicated but too | clearly that those rumours were not unfounded. Pitt was suffering from indisposition; he did not rise till hisown | strength and that of his hearers were exhausted ; and he was consequently less successful than on any former occa- sion. His admirers owned that his speech was feeble and petulant. He so far forgot himself as to advise Sheridan to confine himself to amusing theatrical audiences. This ignoble sarcasm gave Sheridan an opportunity of retorting with great felicity. “After what I have seen and heard to-night,” he said, “I really feel strongly tempted to venture on a competition with so great an artist as Ben — Jonson, and to bring on the stage a second Angry Boy.” | On a division, the address proposed by the supporters of the Government was rejected by a majority of sixteen.

But Pitt was not a man to be disheartened by a single failure, or to be put down by the most lively repartee. When, a few days later, the Opposition proposed a resolu- tion directly censuring the treaties, he spoke with an eloquence, energy, and dignity which raised his fame and — popularity higher than ever. To the coalition of Fox and North he alluded in language which drew forth tumultu- ous applause from his followers. ‘“‘If,” he said, “ this ill- omened and unnatural marriage be not yet consummated,

I know of a just and lawful impediment; and, in the name of the public weal, I forbid the banns.”

The ministers were again left in a minority, Shelburne consequently tendered his resignation. It was ae accepted ; but the king struggled long and hard before he ide submitted to the terms dictated by Fox, whose faults he yj 3! detested, and whose high spirit and powerful intellect he 17! detested still more. The first place at the board of treasury was repeatedly offered to Pitt; but the offer, though tempting, was steadfastly declined. The young man, whose judgment was as precocious as his eloquence, — saw that his time was coming, but was not come, and was — deaf to royal importunities and reproaches. His Majesty, bitterly complaining of Pitt's faintheartedness, tried to — break the coalition. Every art of seduction was practised — on North, but in vain. During several weeks the county — remained without a Government. It was not till all devices had failed, and till the aspect of the House of Commons became threatening, that the king gave way. | The duke of Portland was declared first lord of the Pa treasury. Thurlow was

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dismissed. Fox and North nt became secretaries of state, with power ostensibly equal. — But Fox was the real prime minister. The year was far advanced before the new arrangements PP | were completed; and nothing very important was done at during the remainder of the session. Pitt, now seated OD ¢, ari the Opposition bench, brought the question of parliament mY ary reform a second time under the consideration of the re" Commons. He proposed to add to the House at once ri hundred county members and several members for metro- politan districts, and to enact that every borough of which

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an election committee should report that the majority of yoters appeared to be corrupt should lose the franchise. The motion was rejected by 293 votes to 149.

After the prorogation, Pitt visited the Continent for the first and last time. His travelling companion was one of his most intimate friends, a young

man of his own age who had already distinguished himself in parliament by an engaging natural eloquence, set off by the sweetest and most exquisitely modulated of human voices, and whose affectionate heart, caressing manners, and brilliant wit made him the most delightful of companions, William Wilberforce. That was the time of Anglomania in France; and at Paris the son of the great Chatham was absolutely hunted by men of letters and women of fashion, and forced, much against his will, into political disputa- tion. One remarkable saying which dropped from him during this tour has been preserved. A French gentleman expressed some surprise at the immense influence which Fox, a man of pleasure, ruined by the dice-box and the turf, exercised over the English nation, “ You have not,” said Pitt, “ been under the wand of the magician.”

In November 1783 the parliament met again. The Government had irresistible strength in the House of Commons, and seemed to be scarcely less strong in the House of Lords, but was, in truth, surrounded on every side by dangers. The king was impatiently waiting for the moment at which he could emancipate himself from a yoke which galled him so severely that he had more than once seriously thought of retiring to Hanover; and the king was scarcely more eager for a change than the nation. Vox and North had committed a fatal error. They ought to have known that coalitions between parties which have long been hostile can succeed only when the wish for coalition pervades the lower ranks of both. If the leaders unite before there is any disposition to union among the followers, the probability is that there will be a mutiny in both camps, and that the two revolted armies will make a truce with each other in order to be revenged on those by whom they think that they have been betrayed. Thus it was in 1783. At the beginning of that eventful year North had been the recognized head of the old Tory party, which, though for a moment prostrated by the disastrous issue of the American war, was still a great power in the state. To him the clergy, the universities, and that large body of country gentlemen whose rallying cry was “ Church and King” had long looked up with respect and confid- ence, Fox had, on the other hand, been the idol of the Whigs, and of the whole body of Protestant dissenters. The coalition at once alienated the most zealous Tories from North and the most zealous Whigs from Fox. The university of Oxford, which had marked its approbation of North’s orthodoxy by electing him chancellor, the city of London, which had been

during two and twenty years at war with the court, were equally disgusted. Squires and rectors who had inherited the principles of the cava- liers of the preceding century could not forgive their old leader for combining with disloyal subjects in order to put a force on the sovereign. The members of the Bill of Rights Society and of the reform associations were enraged by learning that their favourite orator now called the great champion of tyranny and corruption his noble friend. Two great multitudes were at once left without any head, and both at once turned their eyes on Pitt. One party Saw in him the only man who could rescue the king ; the other saw in him the only man who could purify the parliament. He was supported on one side by Archbishop Markham, the preacher of divine right, and by Jenkinson, the captain of the pretorian band of the king's friends ; on the other side by Jebb and Priestley, Sawbridge and Cartwright, Jack Wilkes and Horne Tooke. On the

benches of the House of Commons, however, the ranks of the ministerial majority were unbroken; and that any statesman would venture to brave such a majority was thought impossible. No prince of the Hanoverian line had ever, under any provocation, ventured to appeal from the representative body to the constituent body. The ministers, therefore, notwithstanding the sullen looks and muttered words of displeasure with which their sugges- tions were received in the closet, notwithstanding the roar of obloquy which was rising louder and louder every day from every corner of the island, thought themselves secure.

Such was their confidence in their strength that, as Fox's

soon as the parliament had met, they brought forward a!

singularly bold and original plan for the government of B

the British territories in India. What was proposed was that the whole authority which till that time had been exercised over those territories by the East India Com- pany should be transferred to seven commissioners, who were to be named by parliament, and were not to be removable at the pleasure of the crown. Earl Fitzwilliam, the most intimate personal friend of

Fox, was to be chair- man of this board, and the eldest son of North was to be one of the members.

As soon as the outlines of the scheme were known all the hatred which the coalition had excited burst forth with an astounding explosion. The question which ought undoubtedly to have been considered as paramount to every other was whether the proposed change was likely to be beneficial or injurious to the thirty millions of people who were subject to the company. But that question cannot be said to have been even seriously discussed. Burke, who, whether right or wrong in the conclusions to which he came, had at least the merit of looking at the subject in the right point of view, vainly reminded his hearers of that mighty population whose daily rice might depend on a vote of the British parliament. He spoke with even more than his wonted power of thought and language, about the desolation of Rohilcund, about the spoliation of Benares, about the evil policy which had suffered the tanks of the Carnatic to go to ruin; but he could scarcely obtain a hearing. The contending parties, to their shame it must be said, would listen to none but English topics. Out of doors the cry against the ministry was almost universal. Town and country were united. Corporations exclaimed against the violation of the charter of the greatest corporation in the realm. Tories and democrats joined in pronouncing the proposed board an unconstitutional body. It was to consist of Fox's nomi- nees. The effect of his bill was to give, not to the crown, but to him personally, whether in office or in opposition, an enormous power, a patronage sufficient to counter- balance the patronage of the treasury and of the admiralty, and to decide the elections for fifty boroughs. He knew, it was said, that he was hateful alike to king and people ; and he had devised a plan which would make him inde- pendent of both. Some nicknamed him Cromwell, and some Carlo Khan. Wilberforce, with his usual felicity of expression, and with very unusual bitterness of feeling, described the scheme as the genuine offspring of the coali- tion, as marked with the features of both its parents, the corruption of one and the violence of the other. In spite of all opposition, however, the bill was supported in every stage by great majorities, was rapidly passed, and was sent up to the Lords. To the general astonishment, when the second reading was moved in the Upper House, the Opposition proposed an adjournment, and carried it by eighty-seven votes

to seventy-nine. The cause of this strange turn of fortune was soon known. Pitt’s cousin, Earl Temple, had been in the royal closet, and had there

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of the treasury and chan- cellor of the ex- chequer, Dec.

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been authorized to let it be known that His Majesty would consider all who voted for the bill as his enemies. The ignominious commission was performed, and instantly a troop of lords of the bedchamber, of bishops who wished to be translated, and of Scotch peers who wished to be re- elected made haste to change sides. On a later day the Lords rejected the bill. Fox and North were immediately directed to send their seals to the palace by their under secretaries; and Pitt was appointed first lord of the treasury and chancellor of the exchequer. ;

The general opinion was that there would be an 1m- mediate dissolution. But Pitt wisely determined to give the public feeling time to gather strength. On this point he differed from his kinsman Temple. The consequence was that Temple, who had been appointed one of thie secre- taries of state, resigned his office forty-eight hours after he had accepted it, and thus relieved the new Government from a great load of unpopularity ; for all men of sense and honour, however strong might be their dislike of the India Bill, disapproved of the manner in which that bill had been thrown out. Temple carried away with him the scandal which the best friends of the new Government could not but lament. The fame of the young prime minister pre- served its whiteness. He could declare with perfect truth that, if unconstitutional machinations had been employed, he had been no party to them.

He was, however, surrounded by difficulties and dangers. In the House of Lords, indeed, he had a majority ; nor could any orator of the opposition in that assembly be con- sidered as a match for Thurlow, who was now again chan- ecllor, or for Camden, who cordially supported the son of his old friend Chatham. But in the other House there was not a single eminent speaker among the official men who sat round Pitt. His most useful assistant was Dundas, who, though he had not eloquence, lad sense, knowledge, readiness, and boldness. On the opposite benches was a powerful majority, led by Fox, who was supported by Burke, North, and Sheridan, The heart of the young minister, stout as it was, almost died within him. He could not once close his eyes on the night which followed Temple's resignation. But, whatever his internal emotions might be, his language and deportment indicated nothing but unconquerable firmness and haughty confidence in his own powers. His contest against the House of Commons lasted from the 17th of December 1783 to the 8th of March 1784. In sixteen divisions the Opposition tri- umphed, Again and again the king was requested to dismiss his ministers; but he was determined to go to Germany rather than yield. Pitt's resolution never wavered. The cry of the nation in his favour became veliement and almost furious. Addresses assuring him of public support came up daily from every part of the king- dom. 'The freedom of the city of London was presented to him in a gold box. He went in state to receive this mark of distinction, He was sumptuously feasted in Grocers' Hall; and the shopkeepers of the Strand and Fleet Street illuminated their houses in his honour. These things could not but produce an effect within the walls of parliament. The ranks of the majority began to waver ; a few passed over fo the enemy; some skulked away ; many were for capitulating while it was still possible to capitulate with the honours of war. Negotiations were opened with the view of forming an administration on a wide basis, but they had scarcely been opened when they were closed. The Opposition demanded, as a preliminary article of the treaty, that Pitt should resign the treasury ; and with this demand Pitt steadfastly refused to comply. ss eg 3 ve raging, the clerkship of the Pells, a ae Ag A – ile, worth three thousand a year, and

eat in the House of Commons, became

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vacant. The appointment was with the chancellor of the exchequer ; nobody doubted that he would appoint him- self, and nobody could have blamed him if he had done so; for such sinecure offices had always been defended on the ground that they enabled a few men of eminent abili- ties and small incomes to live without any profession, and to devote themselves to the service of the state. Pitt, in spite of the remonstrances of his friends, gave the Pells to his father's old adherent, Colonel Barré, a man distin. guished by talent and eloquence, but poor and afilicted with blindness. By this arrangement a pension which the Rockingham administration had granted to Barré was saved to the public. Never was there a happier stroke of policy. About treaties, wars, expeditions, tariffs, budgets, there will always be room for dispute. The policy which is applauded by half the nation may be condemned by the other half. But pecuniary disinterestedness everybody comprehends, It is a great thing for a man who has only three hundred a year to be able to show that he considers three thousand a year as mere dirt beneath his feet, when compared with the public interest and the public esteem. Pitt had his reward. No minister was ever more rancorously libelled ; but even when he was known to be overwhelmed with debt, when millions were passing through his hands, when the wealthiest magnates of the realm were soliciting him for marquisates and garters, his bitterest enemies did not dare to accuse him of touching unlawful gain.

At length the hard-fought fight ended. A final remon- Dissol strance, drawn up by Burke with admirable skill, was pati carried on the 8th of March by a single vote in a full i house. Had the experiment been repeated, the sup- 794 porters of the coalition would probably have been in a minority. But the supplies had been voted ; the Mutiny Bill had been passed ; and the parliament was dissolved.

The popular constituent bodies all over the country were in general enthusiastic on the side of the new Government. A hundred and sixty of the supporters of the coalition lost their seats. The first lord of the treasury Retu himself came in at the head of the poll for the university Di of Cambridge. His young friend, Wilberforce, was elected a | knight of the great shire of York, in opposition to the versit) whole influence of the Fitzwilliams, Cavendishes, Dun- qa dases, and Saviles. In the midst of such triumphs Pitt completed his twenty-fifth year. He was now the greatest | subject that

England had seen during many generations. | He domineered absolutely over the cabinet, and was the favourite at once of the sovereign, of the parliament, and of the nation. His father had never been so powerful, nor Walpole, nor Marlborough.

This narrative has now reached a point beyond which a full history of the life of Pitt would be a history of England, or rather of the whole civilized world; and for such a history this is not the proper place. Here a very slight sketch must suffice; and in that sketch prominence will be given to such points as may enable a reader who is already acquainted with the general course of events to form a just notion of the character of the man on whom so much depended.

If we wish to arrive at a correct judgment of Pitt's merits and defects, we must never forgct that he belonged to a peculiar class of statesmen, and that he must be tried by a peculiar standard. It is not easy to compare him fairly with such men as Ximenes an Sully, Richelieu and Oxenstiern, John de Witt and Warretl Hastings. The means by which those politicians governed great communities were of quite a different kind from those which Pitt was under the necessity of employing. Some talents, which they never had any opportunity of showing that they possessed, were developed in him to an extraordinary degree. In some qualities, on the other hand, to which they owe a large part of their fame, he was decidedly their inferior. They transacted business in their closets, or at boards where a few confidential councillors sat. It

was his lot to be born in an age and ina country in which parlia- mentary government was completely established ; his whole training from infancy was such as fitted him to bear a part in parliamentary government; and, froin the prime of his manhood to his death, al

the powers of his vigorous mind were almost constantly exerted !

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He accordingly became | the greatest master of the whole art of parliamentary government

ery that has ever existed, a greater than Montague or Walpole, a

greater than his father Chatham or his rival Fox, a greater than either of his illustrious suecessors Canning and Peel.

Parliamentary government, like every other contrivance of man, has its advantages and its disadvantages. On the advantages there ig no need to dilate. The history of England during the hundred and seventy years which have elapsed since the House of Commons beeame the most powerful body in the state, her immense and still growing prosperity, her freedom, her tranquillity, her greatness in arts, in sciences, and in arms, her maritime ascendency, the marvels of her public credit, her American, her African, her ‘Australian, her Asiatic empires, sufficiently prove the excellence of her institutions. But those institutions, though excellent, are assuredly not perfect. Parliamentary government is government by speaking. In such a government, the power of speaking is the most highly prized of all the qualities which a politician can possess; and that power may exist, in the highest degree, without judgment, without fortitude, without skill in reading the eharacters of nen or the signs of the times, without any knowledge of the prineiples of legislation or of political economy, and without any skill in diplomacy or in the administration of war. Nay, it may well happen that those very intellectual qualities which give a peculiar charm to the specches of a public man may be incompatible with the qualities which would fit him to meet a pressing emer- geney with promptitude and firmness. It was thus with Charles Townshend. It was thus with Windham. It was a privilege to listen to those accomplished and ingenious orators. But in a perilous erisis they would have been found far inferior in all the qualities of rulers to such a man as Oliver Cromwell, who talked nonsense, or as William the Silent, who did not talk at all. When parliamentary government is established, a Charles Townshend or a Windham will almost always exercise much greatcr influence than such men as the great Protector of Eugland, or as the founder of the Batavian commonwealth. In such a government, parliamentary talent, though quite distinct from the talents of a good executive or

judicial officer, will be a chief qualification for executive and judicial office. From the Book of Dignities a curious list night be made out of chancellors ignorant of the principles of equity, and first lords of the admiralty ignorant of the principles of navigation, of colonial ministers who could not repeat the names of the colonies, of lords of the treasury who did not know the differ- enee between funded and unfunded debt, and of secretaries of the India board who did not know whether the Mahrattas were Moham- medans or Hindus. On these grounds, some persons, incapable of seeing more than one side of a question, have pronouneed parlia- mentary government a positive evil, and have maintained that the administration would be greatly improved if the power, now exer- eised by a large asseinbly, were transferred to a single person. Men of sense will probably think the remedy very much worse than the disease, and will be of opinion that there would be small gain in exchanging Charles Townshend and Windham for the Prince of the Peace, or the poor slave and dog Steenie.

Pitt was emphatically the man of parliamentary government, the type of his elass, the minion, the child, the spoiled child, of the House of Commons. For the House of Commons he had a heredi- tary, an infantine love. Through his whole boyhood the House of Commons was never out of his thoughts, or out of the thoughts of his instruetors. Reciting at his father's knee, reading Thucydides and Cieero into English, analysing the great Attic speeches on the Embassy and on the Crown, he was constantly in training for the eonfliets of the House of Commons. He was a distinguished member of the House of Commons at twenty-one. The ability which he had displayed in the House of Commons made him the most powerful subject in Europe before he was twenty-five. It would have been happy for himself and for his country if his elevation had been deferred. Eight or ten years, during whiel: he Would have had leisure and opportunity for reading and reflexion, for foreign travel, for social intercourse and free exchange of thought on equal terms with a great variety of companions, would have supplied what, without any fault on his part, was wanting to his Powerful intellect. He had all the knowledge that he could be expeeted to have—that is to say, all the knowledge that a man acquire while he is a student at Cambridge, and all the know- rs e ee a man can acquire when he is first lord of the treasury te a of the exchequer. But the stock of general informa- At . leh he brought from college, extraordinary for a boy, was a gl to what Fox

possessed, and beggarly when compared tor e massy, the splendid, the various treasures laid up in the | el mind of Burke. After Pitt became minister, he had no ae to learn more than was necessary for the purposes of the ar a ih passing over him. What was necessary for those | oats – sueh a man could learn with little difficulty. He was a ounded by experienced and able public servants. He could at | a a command their best assistance. From the stores

eh they produced his vigorous mind rapidly collected the |

materials for a good parliamentary case; and that was enongh. Legislation and administration were with him secondary matters. To the work of framing statutes, of negotiating treaties, of organiz- ing fleets and armies, of sending forth expeditions, he gave only the leavings of his time and the dregs of his fine intellect. The strength and sap of his mind were all drawn in a different direction. It was when the House of Commons was to be convinced and per- suaded that he put forth all his powers.

Of those powers we must form our estimate chiefly from tradition ; His for, of all the eminent speakers of the last age, Pitt has suffered oratory.

most from the reporters. Even while he was still living, critics remarked that his eloquence could not be preserved, that he must be heard to be appreciated. They more than once applied to him the sentence in which Tacitus describes the fate of a senator whose rhetoric was admired in the Augustan age: “ Haterii canorum illud et profluens cum ipso simul exstinctum est.” There is, however, abundant evidence that nature had bestowed on Pitt the talents or a great orator; and those talents had been developed in a very peculiar manner, first by his education, and secondly by the high official position to which he rose early, and in which he passed the greater part of his public life.

At his first appearance in parliament he showed himself sliperior to all his contemporaries in command of language. He conld pour forth a long succession of round and stately periods, without pre- meditation, without ever pausing for a word, without ever repeating a word, ina voice of silver

clearness, and with a pronunciation so articulate that not a letter was slurred over. He had less amplitude of nind and less richness of imagination than Burke, less ingenuity than Windham, less wit than Sheridan, less perfect mastery of dialectical fence and less of that highest sort of eloquence which consists of reason-and passion fused together than Fox. Yet the almost unanimous judgment of those who were in the habit of listening to that remarkable race of men placed Pitt, as a speaker, above Burke, above Windham, above Sheridan, and not below Fox. His declamation was copious, polished, and splendid. In power of sarcasm he was probably uot surpassed by any speaker, ancient or modern; and of this formidable weapon he made merciless use. In two parts of the oratorical art which are of the highest value to a minister of state he was singularly expert. No man knew better how to be luminous or how to be obscure. When he wished to be understood, he never failed to make himself understood. He eould with ease present to his audience, not perhaps an exact or profound, but a clear, popular, and plausible view of the most extensive and complicated subject. Nothing was out of place; nothing was forgotten ; minute details, dates, sums of money, were all faithfully preserved in his memory. Even intricate questions of finance, when explained by him, secmed clear to the plainest man among his hearers. On the other hand, when he did not wish to be explicit, — and no man who is at the head of affairs always wishes to be explicit, —he had a marvellous power of saying nothing in language which left on his audience the impression that he had said a great deal. He was at once the only man who could open a budget with- out notes, and the only man who, as Windham said, could speak that most elaborately evasive and unmeaning of human eomposi- tions, a king’s speech, without premeditation.

The effect of oratory will always to a great extent depend on the Personal There perhaps never were two speakers charaec- whose eloquence had more of what may be called the race, more of ter.

character of the orator.

the flavour imparted by moral qualities, than Fox and Pitt. The speeches of Fox owe a great part of their charm to that warmth and softness of heart, that sympathy with human suffering, that admira- tion for everything great

and beautiful, and that hatred of cruelty and injustice, which interest and delight us even in the most defec- tive reports. No person, on the other hand, could hear Pitt without perceiving him to be a man of high, intrepid, and commanding spirit, proudly conscious of his own rectitude and of his own intellectual superiority, incapable of the low vices of fear and envy, but too prone to feel and to show disdain. Pride, indeed, pervaded the whole man, was written in the harsh, rigid lines of his face, was marked by the way in which he walked, in which he sat, in which he stood, and, above all, in which he bowed. Sueh pride, of course, inflicted many wounds. It may confidently be affirmed that there cannot be found, in all the ten thousand inveetives written against Fox, a word indicating that his demeanour had ever made a single personal enemy. On the other hand, several men of note who had been partial to Pitt, and who to the last continued to approve his public conduct and to support his admini- stration—Cumberland, for example, Boswell, and Matthias—were so much irritated by the contempt with which he treated them, that they complained in print of their wrongs. But his pride, though it made him bitterly disliked by individuals, inspired the great body of his followers in parliament and throughout the country with respect and confidenec. They took him at his own valuation. They saw that his self-esteem was not that of an upstart who was drunk with good luck and with applause, and who, if fortune turned, would sink from arroganec into abject humility. It was that of the magnanimous man so fincly described by Aristotle in

Private life,

Patron- age of letters and art.

the Ethics, of the man who thinks himself worthy of great things, being in truth worthy. It sprang from a consciousness of great powers and great virtucs, and was never so conspicuously displayed as in the midst of difficulties and dangers which would have unnerved and bowed down any ordinary mind. It was closely connected, too, with an ainbition which had no mixture of low cupidity. There was something noble in the cynical disdain with which the mighty minister scattered riches and titles to right and left among those who valued them, while he spurned them out of his

way. Poor himself, he was surrounded by friends on whom he had bestowed three thousand, six thousand, ten thousand a year. Plain Mister himself, he had made more lords than any three ministers that had preceded him. The garter, for which the first dukes in the kingdom were contending, was repeatedly offered to him, and offered in vain. a

The correctness of his private life added much to the dignity of his public character. In the relations of son, brother, uncle, master, friend, his conduct was exemplary. In the small circle of his intimate associates he was amiable, affectionate, even playful. They loved him sincerely; they regretted him long ; and they would hardly admit that he who was so kind and gentle with them could be stern and haughty with others. He indulged, indeed, somewhat too freely in wine, which he had early been directed to take as a medicine, and which use had made a necessary of life to him. But it was very seldom that any indication of undue excess could be detected in his tones or gestures; and, in truth, two bottles of port were little more to him than two dishes of tea. He had, when he was first introduced into the clubs of St James's Street, shown a strong taste for play; but he had the prudence and the resolution to stop before this taste had acquired the strength of habit. From the passion which generally exercises the most tyrannical dominion over the young he possessed an immunity, which is probably to be ascribed partly to his temperament and partly to his situation. His constitution was feeble; he was very shy ; and he was very busy. The strictness of his morals furnished such buffoons as Peter Pindar and Captain Morris with an inexhaust- ible theme for merriment of no very delicate kind. But the great body of the middle class of Englishmen could not see the joke. They warmly praised the young statesman for commanding his passions, and for covering his frailties, if he had frailties, with decorous obscurity, and would have been very far indeed from thinking better of him if he had vindicated himself from the taunts of his enemies by taking under his protection a Nancy Parsons or a Marianne Clark.

No part of the immense popularity which Pitt long enjoyed is to be attributed to the eulogies of wits and poets. It might have been naturally expected that a man of genius, of learning, of taste, an orator whose diction was often compared to that of Tully, the repre- sentative, too, of a great university, would have taken a peculiar pleasure in befriending eminent

writers to whatever political party they might have belongec. The love of literature had induced Augustus to heap benefits on Pompeians, Somers to be the pro- tector of nonjurors, Harley to make the fortunes of Whigs. But it could not move Pitt to show any favour even to Pittites. He was doubtless right in thinking that, in general, poetry, history, and philosophy ought to be suffered, like calico and cutlery, to find their proper price in the market, and that to teach men of letters to look habitually to the state for their recompense is bad for the state and bad for letters. Assuredly nothing can be more absurd or mischievous than to waste the public money in bounties for the purpose of inducing people who ought to be weighing out grocery or measuring out drapery to write bad or middling books. But, though the sound rule is that authors should be left to be remuner- ated by their readers, there will, in every generation, be a few ex- ceptions to this rule. To distinguish these special cases from the inass is an employment well worthy of the faculties of a great and accomplished ruler; and Pitt would assuredly have had little difficulty in finding such cases. While he was in power, the greatest philologist of the age, his own contemporary at Cambridge, was reduced to earn a livelihood by the lowest literary drudgery, and to spend in writing squibs for the Morning Chroniele years to which we might have owed an all but perfect text of the whole tragic and comic draina of Athens. The greatest historian of the age, forced by poverty to leave his country, completed his immortal work on the shores of Lake Leman. The political heterodoxy of Porson and the religious heterodoxy of Gibbon may perhaps be pleaded in defence of the minister by whom those eminent men were neglected. But there were other cases in which no such excuse could be sct up. Scarcely had Pitt obtained posses- sion of unbounded power when an aged writer of the highest eminence, who had made very little by his writings, and who was sinking into the grave under a load of infirmities and SOrToWsS, wanted five or six hundred pounds to enable him, during the winter or two which might still remain to him, to draw his breath more easily in the soft climate of Italy. Nota farthing was to be obtaincd; and before Christmas the author of the English Dietionary and of the Lives of the Poets had gasped his last in the

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river fog and coal smoke of Fleet Strect. A few months after the death of Johnson appeared the Z'ask, incomparably the best poem that any Englishman then living had produced—a poem, too, which could hardly fail to excite in a well-constituted mind a feeling of esteem and compassion for the poet, a man of genius and virtue, whose means were scanty, and whom the most cruel of all the calamities incident to huinanity had made incapable of support- ing himself by vigorous and sustained exertion. Nowhere had Chatham been praised with more enthusiasm, or in verse more worthy of the subject, than in the Task. The son of Chatham, however, contented himself with reading and admiring the book, and left the author to starve. The pension which long after enabled poor Cowper to close his melancholy life unmolested by duns and bailiffs was obtained for him by the strenuous kindness of Lord Spencer. What a contrast between the way in which Pitt acted towards Johnson and the way in which Lord Grey acted towards his political enemy Scott, when Scott, worn out by misfortune and disease, was advised to try the effect of the Italian air! What a centrast between the way in which Pitt acted towards Cowper and the way in which Burke, a poor man and out of place, acted towards Crabbe! Even Dundas, who made no pretensious to literary taste, and was content to be considered as a hard-headed and somewhat coarse man of business, was, when compared with his eloquent and classically educated friend, a Meecenas or a Leo. Dundas made Burns an exciseman, with seventy pounds a year; and this was more than Pitt, during his long tenure of power, did for the encouragement of letters. Even those who may think that it is, in general, no part of the duty of a Government to reward literary merit, will hardly deny that a Government which has much Incrative church preferment in its gift is bound, in distributing that preferment, not to overlook divines whose writings have rendered great service to the cause of religion. But it seems never to have occurred to Pitt that he lay under any such obligation. All the theological works of all the numerous bishops whom he made and translated are not, when put together, worth fifty pages of the Horw Pauling, of the Natural Theology, or of the View of the Evidenees of Christianity. But on Paley the all-powerful minister never bestowed the smallest benefice. Artists Pitt treated as contemptuously as writcrs. For painting he did simply nothing. Sculptors who had been selected to cxecute monuments voted by parliament had to haunt the ante-chambers of the treasury during many years before they could obtain a farthing from him. One of them, after

vainly soliciting the minister for payment during fourteen years, had the courage to present a memorial to the king, and thus obtained tardy and ungracious justice. Architects it was ; absolutely necessary to employ ; and the worst that could be found |

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seem to have been employed. Nota single fine public building of any kind or in any style was erected during his long administra- tion. It may be confidently affirmed that no ruler whose abilities and attainments would bear any comparison with his has ever shown such cold disdain for what is excellent in arts and letters, His first administration lasted seventeen years. That long First period is divided by a strongly marked line into two almost exactly minist equal parts. The first part ended and the second began in the tion, autumn of 1792. Throughout both parts Pitt displayed in the 178t- | highest degree the talents of a parliamentary leader. During the 1801. | first part he was a fortunate and in many respects a skilful administrator. With the difficulties which he had to encounter during the second part he was altogether incapable of contending; but his eloquence and his perfect mastery of the tactics of the House — of Commons concealed his incapacity from the multitude. ; The eight years which followed the general election of 1784 were First as tranquil and prosperous as any eight years in the whole history period, of England. Neighbouring nations which had lately been in arms 1/84 against her, and which had flattered themsclves that, in losing her 1792. American colonies, she had lost a chief source of her wealth and of her power, saw, with wonder and vexation, that she was more wealthy and more powerful than ever. Her trade increased. Her manufactures flourished. Her exchequer was full to overflowing. Very idle apprehensions were generally entertained that the public debt, though much less than a third of the debt which we now bear with ease, would be found too heavy for the strength of the nation. Those apprehensions might not perhaps have been easily quieted by reason. But Pitt quieted them by a juggle. He suc ceeded in pursuading first himself and then the whole nation, his opponents included, that a new sinking fund, which, so far as It differed from former sinking funds, differed for the worse, would, by virtue of some

mysterious power of propagation belonging to money, put into the pocket of the public creditor great suns not taken out of the pocket of the tax-payer. The country, terrified by a danger which was no danger, hailed with delight and bound- less confidence a remedy which was no remedy. The minister was almost universally extolled as the greatest of financiers. Mean- while both the branches of the house of Bourbon found that England was as formidable an antagonist as she had ever been. France had formed a plan for reducing Holland to vassalage. But England interposed, aud France receded. Spain interrupted by

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violence the trade of our merchauts with the regions near the Oregon. But England armed, and Spain receded. Within the island there was profound tranquillity. The king was, for the first time, popular. During the twenty-three years which had followed his accession he had not been loved by his subjects. His domestic virtues were acknowledged. But it was gencrally thought that the good qualities by which he was distinguished in private life were wanting to his political character. As a sovereign he was resentful, unforgiving, stubborn, cunning. Under his rule the country had snstained crnel disgraces and disasters ; and every one of those disgraces and disasters was imputed to his strong anti- pathies, and to his perverse obstinacy in the wrong. One states- man after another complained that he had been induced by royal caresses, entreaties, and promiscs to undertake the direction of affairs at a difficult conjuncture, and that as soon as he had, not without sullying his fame and alienating his best friends, served the turn for which he was wanted, his ungrateful master began to intrigue against him and to canvass against him. Grenville, Rockingham, Chatham—men of widely different characters, but all three upright and high-spirited—agreed in thinking that the prince under whom they had successively held the highest place in the Government was one of the most insincere of mankind. His con- fidence was reposed, they said, not in those known and responsible

counsellors to whom he had delivered the seals of office, but in secret advisers who stole up the back stairs into his closet. In parliament his ministers, while defending themselves against the attacks of the opposition in front, were perpetually, at his instiga- tion, assailed on the flank or in the rear by a vile band of mercen- aries who called themselves his friends. These men constantly, while in possession of lucrative places in his service, spoke and voted against bills which he had authorized the first lord of the treasury or the secretary of state to bringin. But from the day on which Pitt was placed at the head of affairs there was an end of secret influence. His haughty and aspiring spirit was not to be satisfied with the mere show of power. Any attempt to undcrmine him at court, any mutinous movement among his followers in the House of Commons, was certain to be at once put down. He had only to tender his resignation and he could dictate his own terms. For he, and he alone, stood between the king and the coalition. He was therefore little less than mayor of the palace. The nation loudly applauded the king for having the wisdom to repose entire confidence in so excellent a minister. His Majesty's private virtues now began to produce their full cffect. He was generally regarded as the model of a respectable country gentleman, honest, good- natured, sober, religious. Hc rose early, he dined tempcrately, he was strictly faithful to his wife, he never missed church, and at church he never missed a response. His people heartily prayed that he might long reign over them; and they prayed the more heartily because his virtues were set off to the best advantage by the vices and follies of the prince of Wales, who lived in close intimacy with the chiefs of the Opposition.

How strong this feeling was in the public mind appeared signally on one great occasion. In the autumn of 1788 the king became Insane. The Opposition, eager for office, committed the great indiscretion of asserting that the heir apparent had, by the funda- mental laws of England, a right to be regent with the full powers of royalty. Pitt, on the other hand, maintained it to be the con- stitutional doctrine that when a sovereign is, by reason of infancy, disease, or absence, incapable of exercising the regal functions, it belongs to the estates of the realm to determine who shall be the vicegerent, and with what portion of the executive authority such vicegerent shall be entrusted. A long and violent contest followed, in which Pitt was supported by the great body of the people with as much enthusiasm as during the first

months of his administra- tion. Tories with one voice applauded him for defending the sick- bed of a virtuous and unhappy sovereign against a disloyal faction and an undutiful son. Not a few Whigs applauded him for assert- Ing the authority of parliaments, and the principles of the Revolu- tion, In opposition to a doctrine which seemed to have too much affinity with the servile theory of indefeasible hereditary right. The middle class, always zealons on the side of decency and the domestic virtues, looked forward with dismay to a reign resem- bling that of Charles IT. The palace, which had now been, during thirty years, the pattern of an English home, would be a public nulsance, a school of profligacy. To the good king's repast of mutton and lemonade, despatched at three o'clock, would succeed midnight banquets, from which the guests would be carried home speechless. To the backgammon board at which the good king played fora little silver with his equerries wonld succeed faro tables trom which young patricians who had sat down rich would rise up beggars.

he drawing-room, from which the frown of the queen had repelled ake generation of frail beauties, would now be again what it ad been in the days of Barbara Palmer and Louisa de Querouaille. i severely as the public reprobated the prince's many illicit % tachments, his one virtuons attachmeut was reprobatcd more Severely still, Even in grave and pious circles his Protestant iuistresscs gave less scandal than his Popish wife. That he must

be regent nobody ventured to deny. But he and his friends were so unpopular that Pitt could, with gencral approbation, proposc to limit the powers of the regent by restrictions to which it would have been impossible to subject a prince beloved and trusted by the country. Some interested men, fully expecting a change of administration, went over to the Opposition. But the majority, purified by these desertions, closed its ranks, and presented a more firm array than ever to the enemy. In every division Pitt was victorious. When at length, after a stormy interregnum of threc months, it was announced, on the very eve of the inauguration of the regeut, that the king was himself again, the nation was wild with delight. On the evening of the day on which His Majesty resumed his functions a spontaneous

illumination, the most general that had ever been seen in England, brightened the whole vast space from Highgate to Tooting, and from Hammersmith to Greenwich. On tlie day on which he returned thanks in the cathedral of his capital all the horses and carriages within a hundred miles of London were too few for the multitudes which flocked to see him pass through the streets. A second illumination followed, which was cven superior to the first in magnificence. Pitt with difficulty escaped from the tumultuous kindness of an innumerable multitude which insisted on drawing his coach from St Paul's Churchyard to Downing Street. This was the moment at which his fame and fortune may be said to have reached tlic zenith. His influence in the closet was as great as that of Carr or Villiers had been. His dominion over the parliament was morc absolute than that of Walpole or Pelham had been. He was at the same time as high in the favour of the populace as ever Wilkes or Sacheverell had been. Nothing did more to raise his charactcr than his noble poverty. It was well known that, if he had been dismissed from office after more than five years of boundless power, he would hardly have carried out with him a sum sufficient to furnish the set of chambers in which, as he cheerfully declared, he meant to resume the practice of the law. His admirers, how- ever, were by no means disposed to suffer him to depend on daily toil for his daily bread. The voluntary contributions which were awaiting his acceptance in the city of London alone would have sufficed to make him arich man. But it may be doubted whether his haughty spirit would have stooped to accept a provision so honourably earned and so honourably bestowed.

To such a height of power and glory had this extraordinary man risen at twenty-nine years of age. And now the tide was on the turn. Only ten days after the triumphant procession to St Paul's, the states-general of France, after an interval of a hundred and seventy-four years, met at Versailles.

The nature of the great Revolution which followed was long very French imperfectly understood in this conntry. Burke saw much further Revoln- than any of his contemporaries ; but whatever his sagacity descried tion,

was refracted and discoloured by his passions and his imagination. More than three years elapsed before the principles of the English administration underwent any material change. Nothing could as yet be milder or more

strictly constitutional than the minister’s domestic policy. Not a single act indicating an arbitrary temper or a jealousy of the people could be imputed to him. He had never applied to parliament for any extraordinary powers. He had never used with harshness the ordinary powers cntrusted by the constitution to the executive Government. Nota single state prosecution whicli would cven now be called oppressive had been instituted by him. Indced, the only oppressive state prosecution instituted during the first eight years of his administration was that of Stockdale, whicli is to be attributed, not to the Government, but to the chiefs of the Opposition. In office, Pitt had redeemed the pledges which he had, at his entrance into public life, given to tlic supporters of parliamentary reform. He had, in 1785, bronght forward a judicious plan for the improvement of the representative system, and had prevailed on the king, not only to refrain from talking against that plan, but to recommend it to the Houses in a speech from the throne.!_ This attempt failed; but there can be little doubt that, if the French Revolution had not produced a violent reaction of public feeling, Pitt would have performed, with little difficulty and no danger, that great work which, at a later period, Lord Grey could accomplish only by means which for a time loosened the very foundations of the commonwealth. When the atrocitics of the slave trade were first brought under the con- sideration of parliament, no abolitionist was more zealous than Pitt. When sickness prevented Wilberforce from appearing in public, his place was most efficiently supplied by his friend the minister. A humane bill, which mitigated the horrors of the middle passage, was, in 1788, carried by the eloquence and determined spirit of Pitt, in spite of the opposition of some of his own colleagues ; and it ought always to be remembcred to his honour that, in order to carry that bill, he kept the Houses sitting, in spite of many murmurs, long after the business of the Government had becn done

1 The speech with which the king opened the session of 1785 concluded with an assurance that His Majesty would heartily concur in every measure which could tend to sccure the truce principles ef the constitution. These words were at the time understood to refer to Pitt’s Reform Bill.

Its in- fluence in Eng- lish poli- tics.

and the Appropriation Act passed. In 1791 he cordially con- eurred with Fox in maintaining the sound constitutional doctrine that an impeachment is not terminated by a dissolution. In the course of the same year the two grcat rivals contended side by side in a far more important cause. Thcy are fairly entitled to divide the high honour of haviug added to our statute-book the inestimable law which places the liberty of the press under the protection of juries. On one occasion, and one alone, Pitt, during the first half of his long administration, acted in a manner unworthy of an en- lightened Whig. In the debate on the Test Act, he stooped to gratify the master whom he served, the university which he repre- sented, and the great body of clergymen and country gentlemen on whose support he rested, by talking, with little heartiness indeed, and with no asperity, the language of a Tory. With this single exception, his eonduct from the end of 1783 to the middle of 1792 was that of an honest friend of civil and religious liberty.

Nor did anything, during that period, indicate that he loved war, or harboured any malevolent feeling against any neighbouring nation. Those French writers who have represented him as a Hannibal sworn in childhood by his father to bear eternal hatred to France, as having, by mysterious intrigues and lavish bribes, instigated the leading Jacobins to commit those excesses which dishonoured the Revolution, as having been the rcal author of the first eoalition, know nothing of his character or of his history. So far was he from being a deadly enemy to France that his laudable attempts to bring about a closer connexion with that country by means of a wise and liberal treaty of commerce brought on him the severe censure of the Opposition. He was told in the House of Commons that he was a degenerate son, and that his partiality for the hereditary foes of our island was enough to make his great father’s bones stir under the pavement of the Abbey.

And this man, whose name, if he had been so fortunate as to die in 1792, would now have been associated with peace, with freedom, with philanthropy, with temperate reform, with mild and constitu- tional administration, lived to associate his name with arbitrary government, with harsh laws harshly executed, with alien bills, with gagging bills, with suspensions of the Habeas Corpus Act, with cruel punishments inflicted on some political agitators, with un- justifiable prosecutions instituted against others, and with the most costly and most sanguinary wars of modern times.

He lived to be held up to obloquy as the stern oppressor of England, and the indefatigable disturber of Europe. Pocts, contrasting his earlier with his later years, likened him sometimes to the apostle who kissed in order to betray, and sometiines to the evil angels who kept not their first estate. A satirist of great genius introduced the fiends of famine, slaughter, and fire, proclaiming that they had received their commission from one whose name was formed of four letters, and promising to give their employer ample proofs of grati- tude. Famine would gnaw the multitude till they should rise up against him in maduess. The demon of slaughter would impel them to tear him from limb tolimb. But fire boasted that she alone

could reward him as he deserved, and that she would cling round'

lim to all eternity. By the French press and the French tribune every crime that disgraced and every calamity that afflicted France was ascribed to the monstcr Pitt and his guineas. While the Jacobins were dominant it was he who had corrupted the Gironde, who had raised Lyons and Bordeaux against the Convention, who had suborned Paris to assassinate Lepelletier, and Cecilia Regnault to assassinate Robespierre. When the Thermidorian reaction came, all the atrocities of the Reign of Terror were imputed to him. Collot D'Herbois and Fouquier Tinville had been his pensiouers. It was he who had hired the murderers of September, who had dictated the pamphlets of Marat and the carmagnoles of Barére, who had paid Lebon to deluge Arras with blood aud Carrier to ehoke the Loire with corpses.

The truth is that he liked neither war uor arbitrary government. He was a lover of peace and freedom, driven, by a stress against which it was hardly possible for any will or any intellect to struggle, out of the course to which his inclinations pointed, and for which his abilities and acquirements fitted him, and forced into a policy repugnant to his feelings and unsuitcd to his talents.

The charge of 'apostasy is grossly unjust. A man ought no more to be called an apostate because his opinions alter with the opinions of the great body of his contemporaries than he ought to be called an Oriental traveller because he is always going round from west to east with the globe and everything that is upon it. Between the spring of 1789 and the close of 1792 the public mind of England underwent a great change. If the change of Pitt's

sentiments attracted peculiar notice, it was not because he changed more than his neighbours, for in fact he changed less than most of them, but poeatise his position was far more conspicuous than theirs, because

e was, till Bonaparte appeared, the individual who filled the greatest space in the eyes of the inhabitants of the eivilized world. During a short time the nation, and Pitt as one of the nation looked with interest and approbation on the French Revolution. But soon vast coufiscations, the violent sweeping away of ancient institutions, the domination of clubs, the barbarities of mobs

maddened by famine and hatred, produced a reaction here. The court, the nobility, the gentry, the clergy, the manufacturers, the merchants, in short nineteen-twentieths of those who had good roofs over their heads aud good coats on their backs, became eager intolerant Autijacobins. This feeling was at least as strong among the minister's adversaries as amoug his supporters. Fox in vain attempted to restrain his followers. All his genins, all his vast personal influence, could not prevent them froin rising up against him in general mutiny. Burke set the example of revolt; and Burke was in no long time joined by Portland, Spencer, Fitzwilliam, Loughborough, Carlisle, Malmesbury, W indham, Elliot. In the House of Commons the followers of the great Whig statesman and orator diniinished from about a hundred and sixty to fifty. In the House of Lords he had but ten or twelve adherents Icft. There can be uo doubt that there would have been a similar mutiny on the ministerial benches, if Pitt had obstinately resisted the general wish. Pressed at once by his master and by his colleagues, by old friends and by old opponents, he abandoned, slowly and reluctantly, the policy which was dear to his heart. He laboured hard to avert the European war. When the European war broke out, he still flattered himself that it would not be necessary for this country to take either side. In the spring of 1792 he congratu- lated the parliament on the prospect of long and profound peace, and proved his sincerity by proposing large remissions of taxation. Down to the end of that year he continued to cherish the hope that England might be able to preserve neutrality. But the passions which raged on both sides of the Channel were not to be restrained. The republicans who ruled France were inflamed by a fanaticism resembling that of the Mussulmans, who, with the Koran in one hand and the sword in the other, went forth

conquering and converting, eastward to the Bay of Bengal, and westward to the Pillars of Hercules. The higher and middle elasses of England were animated by zeal not less fiery than that of the crusaders who raised the ery of Deus vult at Clermont. The impulse which drove the two nations toa collision was not to be arrested by the abilities or by the authority of any single man. As Pitt was in frout of his fellows, and towered high above them, he seemed to lead them. But in fact he was violently pushed on by them, and, had he held back but a little more than he did, would have been thrust out of their way or trampled under their feet.

He yielded to the current; aud from that day his misfortunes Secon began. The truth is that there were only two consistent courses period before him. Since he did not choose to oppose himself, side by of first} side with Fox, to the public feeling, he should have taken the admini. advice of Burke, and should have availed himself of that feeling to tration the full extent. If it was impossible to preserve peace, he should 1792- have adopted the only policy which conld lead to victory. He 1801. should have proclaimed a holy war for religion, morality, property, order, public law, and should have thus opposed to the Jacobins an energy equal to their own. Unhappily he tried to find a middle path ; and he found one which united all that was worst in both : extremes. He went to war; but he would not understand the War peculiar character of that war. He was obstinately blind to the policy. plain fact that he was contending against a state which was also a | sect, and that the new quarrel between England and France was of | quite a different kind from the old quarrels about colonies i America and fortresses in the Netherlands. He had to combat frantic enthusiasm, boundless ambition, restless activity, the wildest and most audacious spirit of innovation ; and he acted as if he had had to deal with the harlots and fops of the old court of Versailles, with Madame de Pompadour and the Abbé de Bernis.

It was pitiable to hear him, year after year, proving to an ad- miring audience that the wicked republic was cxhausted, that she could not hold out, that her credit was gone, that her assignats

were not worth mote than the paper of which they were made,—as

if eredit was necessary to a government of which the principle was : rapine, as if Alboin could not turn Italy into a desert till he had i negotiated a loan

at five per cent., as if the exchequer bills of Attila

had been at par. It was impossible that a man who so completely mistook the nature of a contest could carry on that contest suc cessfully. Great as Pitt's abilities were, his military administra: tion was that of a driveller. He was at the head of a nation Milit engaged in a struggle for life and death, of a nation eminently dis- adyil tinguished by all the physical and all the moral qualities which tratio make excellent soldiers. The resources at his command were unlimited. The parliament was even more ready to graut hun

men and money than he was to ask for them. In such am } emergency, and with such means, such a statesman as Richelieu, |

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as Louvois, as Chatham, as Wellesley, would have created in a few months one of the finest armies in the world, and would soon have H discovered and brought forward generals worthy to command such anarmy. Germany might have been saved by another Blenheim ; Flanders recovered by another Ramillics ; another Poitiers might have delivered the Royalist and Catholic provinces of France from a yoke which they abhorred, and might have spread terror even to the barriers of Paris. But the fact is that, after eight years of war, after a vast destruction of lifc, after an expenditure of wealth

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far exceeding the expenditure of the American War, of the Seven Years' War, of the War of the Austrian Succession, and of the War of the Spanish Succession united, the English army under Pitt was the laughing-stock of all Europe. It could not boast of one single brilliant exploit. It had never shown itself on the Continent but to be beaten, chased, forced to re-embark, or forced to capitu- late. To take some sugar island in the West Indies, to scatter sone mob of half-naked Irish peasants—such were the most splendid yictories won by the British troops under Pitt's auspices. : The English navy no mismanagement could ruin. But during nw s- a long period whatever mismanagement could do was done. The . earl of Chatham, without a single

qualification for high publie trust, was made, by fraternal partiality, first lord of the admiralty, and was kept in that great post during two years of a war in which the very existence of the state depended on the efficiency of the fleet. He continued to doze away and trifle away the time which ought to have been devoted to the public service, till the whole mercantile body, though generally disposed to support the Government, com- plained bitterly that our flag gave no protection to our trade. Fortunately he was succeeded by George, Earl Spencer, one of those chiefs of the Whig party who, in the great schism caused by the French Revolution, had followed Burke. Lord Spencer, though inferior to many of his colleagues as an orator, was decidedly the best administrator among them. To him it was owing that a long and gloomy succession of days of fasting, and most emphatically of humiliation, was interrupted, twice in the short space of eleven months, by days of thanksgiving for great victories. It may seem paradoxical to say that the incapacity which Pitt | showed in all that related to the conduct of the war is, in some sense, the most decisive proof that he was a man of very extra- _ ordinary abilities. Yet this is the simple truth. For assuredly one-tenth part of his errors and disasters would have been fatal to the power and influence of any minister who had not possessed, in the highest degree, the talents of a parliamentary leader. While his schemes were eonfounded, while his predictions were falsified, while the coalitions which he had laboured to form were falling to pieces, while the expeditions which he had sent forth at enormous vost were ending in rout and disgrace, while the enemy against whom he was feebly contending was subjugating Flanders and Brabant, the electorate of Mainz and the electorate of Treves, Tfolland, Piedmont, Liguria, Lombardy, his authority over the House of Commons was constantly becoming more and more absolute. There was his empire. There were his victories—his Lodi and his Arcola, his Rivoli and his Marengo. If some great misfortune, a pitched battle lost by the allies, the annexation of a new department to the French republic, a sanguinary insurrection in Ireland, a mutiny in the fleet, a panic in the city, a run on the bank, had spread dismay through the ranks of his majority, that dismay lasted only till he rose from the treasury bench, drew up his haughty head, stretched his arm with commanding gesture, and poured forth, in deep and sonorous tones, the lofty language of inextinguishable hope and inflexible resolution. Thus, through

government by physical force, were indicted for high treason, and were saved from the gallows only by the righteous verdicts of juries. This severity was at the time loudly applauded by alarmists whom fear had made cruel, but will be seen in a very different light by posterity. The truth is that the Englishmen who wished for a revolution were, even in numbcr, not formidable, and in every- thing but number a faction utterly contemptible, without arins, or funds, or plans, or organization, or leader. ‘There can be no doubt that Pitt, strong as he was in the support of the great body of the nation, might easily have repressed the turbulence of the discon- tented minority by firmly yet temperately enforcing the ordinary law. Whatever vigour he showed during this unfortunate part of his life was vigour out of place and season. He was all feebleness and languor in his conflict with the foreign enemy who was really to be dreaded, and reserved all his energy and resolution for the domestic enemy who might safely have been despised.

One part only of Pitt’s conduct during the last eight years of Irish He was the first English policy,

the 18th eentury deserves high praise. minister who formed great designs for the beuefit of Ireland. The manner in which the Roman Catholic population of that unfortunate country had been kept down during many generations seemed to him unjust and crucl; and it was scarcely possible for a man of his abilities not to perceive that, in a contest against the Jacobins, the Roman Catholies were his natural allies. Had he been able to do all that he wished, it is probable that a wise and liberal policy would have averted the rebellion of 1798. But the difficulties which he encountered were great, perhaps insurmountable ; and the Roman Catholics were, rather by his misfortune than by his fault, thrown into the hands of Jacobins. There was a third great rising of the lrishry against the Englishry, a rising not less formid- able than the risings of 1641 and 1689. The Euglishry remained victorious ; and it was necessary for Pitt, as it had been necessary for Oliver Cromwell and William of Orange before him, to consider how the victory should be used. It is only just to his memory to say that he formed a scheme of policy so grand and so simple, so righteous and so humane, that it would

alone entitle him to a high place among statesmen. He determined to make Irelaud one kingdom with England, and, at the same time, to relieve the Roman Catholic laity from civil disabilities, and to grant a public maintenance to the Roman Catholie clergy. Had he been able to carry these noble designs into effect, the Union would have been a union indeed. It would have been inseparably associated in the minds of the great majority of Irishmen with civil and religious freedom ; and the old parliament in College Green would have been regretted only by a sniall knot of discarded jobbers and oppressors, and would have been remembered by the body of the nation with the loathing aud contempt due to the most tyrannical and the most corrupt assembly that had ever sat in Europe. But Pitt could execute only onc half of what he had projected. He succeeded in obtaining the conseut of the parliaments of both kingdoms to the Uniou ; but that reconciliation of races and sects without which the Union could exist only in name was not accom- plished. He was well aware that he was likely to find difficulties in the closet. But he flattered himself that, by cautious and dex- terous management, those difficulties might be overcome. Un- happily, there were traitors and sycophants in high place who did not suffer him to take his own time and his own way, but pre- maturely disclosed his scheme to the king, and disclosed it in the manner most likely to irritate and alarm a weak and diseased mind. His Majesty absurdly imagined that his coronation oath bound him to refuse his assent to any bill ~~for relieving Roman Catholics from civil disabilities. To argue with him was impossible. Dundas tried to explain the matter, but was told to keep his Scotch meta~~

physics to himself. Pitt and Pitt’s ablest colleagues resigned their Resigns offices. It was necessary that the king should make a new ar- office, rangement. But by this time his anger and distress had brought March 14, back the malady which had, many years before, incapacitated him 1801

a long and calamitous period, every disaster that happened with- out the walls of parliament was regularly followed by a triumph within then, At length he had no longer an Opposition to en- . counter. Of the great party which had contended against him dur- ing the first eight years of his administration more than one-half now marched under his standard, with his old competitor the duke | of Portland at their head; and the rest had, after many vain | struggles, quitted the field in despair. Fox had retired to the

shades of St Anne’s Hill, and had there found, in the society of friends whom no vicissitude could estrange from him, of a woman whom he tenderly loved, and of the illustrious dead of Athens, of Rome, and of Florence, ample compensation for all the misfortunes . of his public life. Session followed session with scarcely a single division. In the eventful year 1799 the largest iminority that

0 atte “3 be mustered against the Government was twenty-five. – n Pitt’s domestic policy there was at this time assuredly no _¥ ~want of vigour. While he offered to French Jacobinism a resist- anee so feeble that it only encouraged the evil which he wished to Suppress, he put down English Jacobinism with a strong hand. The Habeas Corpus Act was repeatedly suspended. Public meet- f Ings were placed under severe restraints. The Government obtained from parliament power to send out of the country aliens who were as of evil designs ; and that power was not suffered to be 4 1 Ne. Writers who propounded doetrines adverse to monarchy and : rey were proscribed and punished without mercy. It was aM safe for a republican to avow his political creed over his an steak and his bottle of port at a chop-house. The old laws of Seotland against sedition, laws which were eonsidercd by English- men as barbarous, and which a succession of Governments had aes to rust, were now furbished up and sharpened anew. Men ee ted minds and polished manners were, for offences ee at Westminster would have been treated as mere misde- a Sent to herd with felons at Botany Bay. Some a mers, whose opinions were extravagant, and whose language S Intemperate, but who had never dreamed of subverting the

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for the discharge of his functions. He actually assembled his family, read the coronation oath to them, and told thein that, if he broke it, the crown would immediately pass to the house of Savoy. It was not until after an interregnum of several weeks that he re- gained the full use of his small faculties, and that a ministry after his own heart was at length formed.

The materials out of which he had to construct a Government were neither solid nor splendid. To that party, weak in numbers, but strong in every kind of talent, which was hostile to the domestic and foreign policy of his late

advisers, he could not have recourse. For that party, while it differed from his late advisers on every point on which they had been honoured with his approbation, eordially agreed with them as to the single matter which had brought on them his displeasure. All that was left to hiin was to call up the rear ranks of the old ministry to form the front rank of anew ministry. In an age pre-eminently fruitful of parliamentary talents, a cabinet was formed containing hardly a single man who' in parliamentary talents eould be considered as even of the second rate. The most important offices in the state were bestowed on dcecorous and laborious mediocrity. Henry Addington was at the

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head of the treasury. He had been an early, 2 \ friend of Pitt, and had by Pitt's influence been placed, while still a young man, in the chair of the House of Commons. He was universally admitted to have been the best Speaker that had sat in that chair since the retirement of Onslow. But nature had not be- stowed on him very vigorous faculties; and the highly respectable situation which he long oceupied with honour had rather unfitted than fitted him for the discharge of his new duties. His business had been to bear himself evenly between eontending factions. He had taken no part in the war of words; and he had always been addressed with marked deference by the great orators who thundered against each other from his right and from his left. It was not strange that when, for the first time, he had to encounter keen and vigorous antagonists, who dealt hard blows without the

smallest ceremony, he should have been awkward and unready, or.

that the air of dignity and authority which he had acquired in his former post, and of which he had not divested himself, should have made his helplessness laughable and pitiable. Nevertheless, during many months, lis power seemed to stand firm. He was a favourite with the king, whom he resembled in narrowness of mind, and to whom he was more obsequious than Pitt had ever beeu. The nation was put into high good humour by a peace with France. The enthusiasm with which the upper and middle elasses had rushed into the war had spent itself. Jacobinism was no longer formidable. Everywhere there was a strong reaction against what was called the atheistical and anarehical philosophy of the 18th eentury. Bonaparte, now first consul, was busied in constructing out of the ruins of old institutions a new eeclesiastical establish- ment and a new order of knighthood. That nothing less than the dominion of the whole eivilized world would satisfy his selfish ambition was not yet suspected ; nor did even wise men see any reason to doubt that he might be as safe a neighbour as any prince of the house of Bourbon had been. ‘The treaty of Amiens was therefore hailed by the great body of the English people with ex- travagant joy. The popularity of the minister was for the moment immense, His want of parliamentary ability was, as yet, of little consequence ; for he had seareely any adversary to encounter. The old Opposition, delighted by the peace, regarded him with favour. A new Opposition had indeed been formed by some of the late ministers, and was led by Grenville in the House of Lords and by Windham in the House of Commons. But the new Opposition could scarcely muster ten votes, and was regarded with no favour by the country. On Pitt the ministers relied as on their firmest support. He had not, like some of his colleagues, retired in anger. Iie had expressed the greatest respect for the conscientious scruple whieh had taken possession of the royal mind ; and he had promised his suecessors all the help in his power. In private his advice was at their service. In parliament he took his seat on the bench be- hind them, and in more than one debate defended them with powers far superior to theirown. The king perfeetly understood the value of such assistance. On one oceasion, at the palace, he took the old minister and the new minister aside. “If we three,” he said, “keep together, all will go well.”

But it was hardly possible, human nature being what it is, and more especially Pitt and Addington being what they were, that this union should be durable. Pitt, conscious of superior powers, imagined that the place which he had quitted was now occupied by a mere puppet which he liad set up, which he was to govern while he suffered it to remain, and which he was to fling aside as soon as he wished to resume his old position. Nor was it long before he began to pine for the power which he had relinquished. He had been so early raised to supreme authority in the state, and had enjoyed that authority so long, that it had beeome necessary to him. In retirement his days passed heavily. He could not, like Fox, forget the pleasures and cares of ambition in the company of Euripides or Herodotus. Pride restrained him from intimating, even to his dearest friends, that he wished to be again minister. But he thonght it strange, almost ungrateful, that his wish had not been divined, that it had not been anticipated by one whom he regarded as his deputy.

Addington, on the other hand, was by no means inclined to descend from his high position. He was, indeed, under a delusion mueh resembling that of Abou Hassan in the Arabian tale. His brain was turned by his short and unreal caliphate. He took his elevation quite seriously, attributed it to his own merit, and con- sidered himself as one of the great triumvirate of English statesmen as worthy to make a third with Pitt and Fox. ,

Such being the feelings of the late minister and of the present minister, a rupture was inevitable; and there was no want of persons bent on making that rupture speedy and violent. Some of these persons wounded Addington’s pride by representing him as a poaiey, ace to keep a place on the treasury beneh till his master s ae l fin Ae convenient to come. Others took every opportunity of praising him at Pitt’s expense. Pitt had waged a long, a bloody, a costly, an unsuceessful war. Addington had made peace. Pitt had suspended the constitutional liberties of Englishmen. Under Addington those liberties were again enjoyed. Pitt had wasted

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indeed a hereditary, –

the public resources. Addington was earefully nursing them, It was sometimes but too evident that these compliments were not unpleasing to Addington. Pitt became cold and reserved. During many months he remained at a distanee from London. Meanwhile his most intimate friends, in spite of his declarations that he made no complaint, and that he had no wish for office, exerted themselves to effect a change of ministry. His favourite disciple, George Canning, young, ardent, ambitious, with great powers and great virtues, but with a temper too restless and a wit too satirical for his own happiness, was indefatigable. He spoke; he wrote; he intrigued ; he tried to induce a large number of the supporters of the Government to sign a round robin desiring a change ; he made game of Addington and of Addington's relations in a suecession of lively pasquinades. The minister's partisans retorted with equal aerimony, if not with equal vivacity. Pitt could keep out of the aflray only by keeping out of politics altogether; and this it soon became impossible for him to do. Had Napoleon, content with the first place among the sovereigns of the Continent, and with a inilitary reputation surpassing that of Marlborough or of Turenne, devoted himself to the noble task of making France happy by mild administration and wise legislation, our eountry might have long continued to tolerate a Government of fair intentions and feeble abilities. Unhappily, the treaty of Amiens had scarcely been signed when the restless ambition and the insupportable insolenee of the first eonsul convineed the great body of the English people that the peace so eagerly welcomed was only a precarious armi- stice. As it beeame elearcr and eleaier that a war for the dignity, the independence, the very existence of the nation was at hand, men looked with increasing uneasiness on the weak and languid eabinet which would have to contend against an encmy who united more than the power of Louis the Great to more than the genius of Frederick the Great. It is true that Addington might easily have made a better war minister than Pitt, and could not possibly have been a worse. But Pitt had cast a spell on the public mind. The eloquence, the judgment, the calm and disdainful firmness which he had during many years displayed in parliament deluded the world into the belief that he must be eminently qualified to superin- tend every department of politics; and they imagined, even after the miserable failures of Dunkirk, of Quiberon, and of the Helder, that he was the only statesman who eould cope with Bonaparte, This feeling was nowhere stronger than among Addington's own eolleagues. The pressure put on him

was so strong that he could not help yielding to it; yet, even in yielding, he showed how far he was from knowing his own place.

such a scheme, and talked of it with bitter mirth. “Whieh secretaryship was offered to you?” his friend Wilberforce asked. “ Really,” said Pitt, “I had not the euriosity to inquire.” Adding- ton was frightened into bidding higher. He offered to resign the treasury to Pitt, on condition that there should be no extensive change in the Government. But Pitt would listen to no sueh terms. Then came a dispute such as often arises after negotiations orally conducted, even when the negotiators are men of strict honour. Pitt gave one aecount of what had passed; Addington gave another; and, though the discrepancies were not such a3 necessarily implied any intentional violation of truth on either side, both were greatly exasperated.

Meanwhile the quarrel with the first eonsul had eome to @ crisis. On the 16th of May 1808 the king sent a message calling ou the House of Commons to support him in withstanding the ambitious and encroaching policy of France; and on the 22d the House took the message into consideration.

Pitt had now been living many months in retirement. There had been a gencral election since he had spoken in parliament, and there were two hundred members who had never heard him. It was known that on this occasion he would be in his place, and euriosity was wound up to the highest point. Unfortunately, the shorthand writers were, in eonsequence of some mistake, shut out on that day from the gallery, so that the newspapers contained only a very meagre report of the proccedings. But several accounts of what passed are extant ; and of those accounts the most inter-esting is contained in an unpublished letter written by a very young meniber, John William Ward, afterwards carl of Dudley. When Pitt rose, he was received with loud eheering. At every pause in his speech there was a burst of applause. The peroration is said to have been one of the most animated and magnificent ever heard in parliament. “Pitt’s speech,” Fox wrote a few days later, “was admired very much, and very justly. I think it was the best he ever made in that style.” The debate was adjourned ; and on the second night Fox replied to it in an oration which, as the most zealous Pittites were forced to acknowledge, left the palm of eloquence doubtful.

Addington made a pitiable appearance between the two great rivals; and it was observed that Pitt, while exhort- ing the Commons to stand resolutely by the executive Government

His first proposition was that Pitt some insignificant nobleman should be first lord of the treasury and clines nominal head of the administration, and that the real power should stbo be divided between Pitt and himself, who were to be secretaries of nate state. Pitt, as might have been expected, refused even to diseuss oflice.

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. against France, said not a word indicating esteem or friendship for +he prime minister.

War was speedily declared. The first consul threatened to in- yade England at the head of the conquerors of Belgium and Italy, and formed a great camp near the Straits of Dover. On the other side of those straits the whole population of our island was ready to rise up as one man in defence of the soil. At this conjunc- ture, as at some other great conjunctures in our history —the con-

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tional principle was at stake, and that they would not take office while a man eminently qualified to render service to the conimon- wealth was placed under a ban merely because he was disliked at court. All that was left to Pitt was to construct a Government out of the wreck of Addingtou's feeble administration. The small eircle of his personal retainers furnished him with a very few useful assistants, particularly Dundas (who had been created Viscount Melville), Lord Harrowby, and Canning.

juncture of 1660, for cxample, and the conjuucture of 1688—there was a general disposition among honest and patriotic men to forget old quarrels, and to regard as a friend every person who was ready, in the existing emergency, to do his part towards the saving of the state. A coalition ofall the first men in the country would, at that

Such was the inauspicious manner in which Pitt entered on his Second second adininistration. The whole history of that administration Pitt was of a piece with the commencement. Almost every month adminis- brought some new disaster or disgrace. To the war with France tration, was soon added a war with Spain. The opponents of the ministry May 12

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moment, have been as popular as the coalition of 1783 had been un- popular. Alone in the kingdom the king looked with perfect com- placency ona cabinet in which no man superior to himself in genius was to be found,

and was so far from being willing to admit all his blest subjects to office that he was bent on excluding them all.

A few months passed before the different parties which agreed in regarding the Government with dislike and contempt came to an understanding with each other. But in the spring of 1804 it be- eame evident that the weakest of ministries would have to defend itself against the strongest of Oppositions, an Opposition made up of three Oppositions, each of which wonld, separately, have beeu formidable from ability, and which, when united, were also for- midable from number. The party whieh had opposed the peace, headed by Grenville and Windham, and the party which had op- posed the renewal of the war, headed by Fox, eoneurred in thinking that the men now in power were incapable of either aking a good peace or waging a vigorous war. Pitt had in 1802 spoken for peace against the party of Grenville, and had in 1803 spoken for war against the party of Fox. But of the capacity of the cabinet, and especially of its chief, for the couduct of great affairs, he thought as meanly as either Fox or Grenville. Questions were easily found on which all the cnemies of the Government could act cordially together. The unfortunate first lord of the treasury, who had, during the earlier months of his administration, been supported by Pitt on oue side and by Fox on the other, now had to answer Pitt and to be answered i Fox. Two sharp debates,

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| followed by close divisions, made him weary of his post. It was known, too, that the Upper House was ever more hostile to him than the Lower, that the Scoteh representative peers wavered, that there were signs of mutiny among the bishops. In the cabinet itself there was discord, and, worse than diseord, treachery. It

ding- was necessary to give way; the ministry was dissolved, and the

i task of forming a Government was entrusted to Pitt.

istry Pitt was of opinion that there was now an opportunity, such as

igns. had never before offercd itself, and such as might never offer itself again, of uniting in the public service, on honourable terms, all the eminent talents of the kingdom, The passions to which the French Revolution had given birth were extinct. The madness of the innovator and the maduess of the alarmist had alike had their day. Jacobinism and Antijacobinism had gone out of fashion together. The most liberal statesman did not think that*season propitious for schemes of parliamentary reform; and the most

conservative statesman could not pretend that there was any

i occasion for gagging bills and suspensions of the Habeas Corpus

| Act. The great struggle for independence and national honour occupied all minds ; and those who were agreed as to the duty of maintaining that struggle with vigour might well postpone to a more convenient time all disputes about matters eomparatively unimportant. Strongly impressed by these considerations, Pitt wished to form a ministry including all the first men in the country.

The treasury he reserved for himself; and to Fox he proposed to

assign a share of power little inferior to his own.

The plan was excellent; but the king would not hear of it. Dull, obstinate, unforgiving, and at that time half mad, he positively refused to admit Fox into his service. Anybody else, even men who had gone as far as Fox, or further than Fox, in what His Majesty considered as Jacobinism—Sheridan, Grey, Erskine— should be graciously received, but Fox never. During several hours Pitt laboured in vain to reason down this senseless antipathy. That he was perfectly sincere there can be no doubt; but it was not enough to be sincere—he shonld have been resolute. Had he declared imself determined not to take office without Fox, the toyal obstinacy would have given way, as it gave way, a few ; months later, when opposed to the immutable resolution of Lord

Grenville. In an evil hour Pitt yielded. He flattered himself

with the hope that, though he consented to forego the aid of his pions rival, there would still remain ample materials for the 7 oo of an efficient ministry. That hope was cruelly

sappointed. Fox entreated his friends to leave personal considera- tions out of the question, aud declared that he would support, With the utmost cordiality, an efficient and patriotie ministry from which he should be himself excluded. Not only his friends, how- ao but Grenville and Grenville's adherents answered with one Voice that the question was not personal, that a great constitu-

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were nunierous, able, and active. His most useful eoadjutors he 1804. soon lost. Sickness deprived him of the help of Lord Harrowby. It was discovered that Lord Melville had been guilty of highly culpable laxity in transactions relating to public money. He was eensured by the House of Commons, driven from office, ejected from the Privy Council, and impeached of high erimes and mis- demeanours. The blow fell heavy on Pitt. It gave him, he said in parliament, a deep pang; and, as he uttered the word pang his lip quivered, his voice shook, he paused, and his hearers thought that he was about to burst into tears. Such tears shed by Eldon would have moved nothing but laughter. Shed by the warm- hearted and open-hearted Fox, they would have moved sympathy, but would have caused no surprise. But a tear from Pitt would have been something portentous. He suppressed his emotion, how- ever, and proceeded with his usual majestic self-possession.

His difficulties eompelled him to resort to various expedients. At one time Addington was persnaded to accept office with a peerage ; but he brought uo additional strength to the Goveru- ment. Though he went through the form of reconciliation, it was impossible for him to forget the past. While he remained in place he was jealous and punctilious; and he soon retired again. At another time Pitt renewed his efforts to overeome his master's aversion to Fox; and it was rumoured that the king's obstinacy was gradually giving way. But, meauwhile, it was impossible for the minister to conceal from the public eye the decay of his health and the constant anxicty which gnawed at his heart. His sleep was broken. His food eeased to

nourish him. All who passed him in the park, all who had interviews with him in Downing Street, saw misery written in his face. The peculiar look which he wore during the last months of his life was often pathetically described by Wilberforce, who used to call it the Austerlitz look.

Still the vigour of Pitt's intellectual faculties and the intrepid haughitiness of his spirit remained unaltered. He had staked everything on a great venture. He had succeeded in forming another mighty coa'ition against the French ascendency. The united forces of Austria, Russia, and England might, he hoped, oppose an insurmountable barrier to the ambition of the eommon enemy. But the genius and energy of Napoleou prevailed. While the English troops were preparing to embark for Germany, while the Russian troops were slowly coming up from Poland, he, with rapidity unprecedented in modern war, moved a hundred thousand men from the shores of the ocean to the Black Forest, and compelled a great Austrian army to surrender at Ulm. To the first faint rumours of this calamity Pitt would give no credit. He was irritated by the alarms of those around him. "Do not believe a word of it," he said ; "it is alla fiction." The next day lic received a Dutch newspaper containing the capitulation. He knewno Dutch. It was Sunday, and the public offiees were shut. He carried the paper to Lord Malmesbury, who had been minister in Holland; and Lord Malmesbury translated it. Pitt tried to bear up, but the shock was too great; and he went away with death in his face.

The news of the battle of Trafalgar arrived four days later, and seemed for a moment to revive him, Forty-eight hours after that most glorious and most mournful of victories had been announeed to the country came the Lord Mayor's Day; and Pitt dined at Guildhall. His popularity had declined. But on this occasion the multitude, greatly excited by the recent tidings, welcomed him enthusiastically, took off his horses in Cheapside, and drew his carriage up King Street. When his health was drunk, he returned thanks in two or three of those stately sentenees of which he had a boundless command. Several of those who heard him laid up his words in their hearts; for they were the last words that he ever uttered in public: 'Let us hope that England, having saved herself by her energy, may save Europe by her example."

This was but a momentary rally. Austerlitz soon completed what Ulm had begun. Early in December Pitt had retired to Bath, in the hope that he might there gather strength for the approaching session. While he was languishing there on his sofa arrived the news that a decisive battle had been fought and lost in Moravia, that the coalition was dissolved, that the Continent was at the feet of France. He sank down under the blow. Ten days later he was so emaciated that his most intimate friends hardly knew him. He came up from Bath by slow journeys, and on the 11th of January 1806 reached his villa at Putney. Pavlia-

Death, January 23, 18U6.

Public funeral.

ment was to meet on the 21st. On the 20th was to be the parlia- mentary dinner at the house of the first lord of the treasury in Downing Street; and the cards were already issued. But the days of the great minister were numbered. he only chance for his life, and that a very slight chance, was that he should resign his office, and pass some months in profound repose. His colleagues paid him very short visits, and carefully avoided political conver- sation. But his spirit, long accustomed to dominion, conld not, even in that extremity, relinquish hopes which everybody but him- self perceived to be vain. On the day on which he was carried into his bedroom at Putney the Marquis Wellesley, whom he had long loved, whom he had sent to govern India, and whose adminis- tration had been eminently able, energetic, and successful, arrived in London after an absence of eight years. The friends saw each other once more. There was an affectionate meeting and a last part- ing. That it was a last parting Pitt did not seem to beaware. He fancied himself to be recovering, talked on various subjects cheer- fully and with an unclouded mind, and pronounced a warm and discerning eulogium on the marquis’s brother Arthur. ‘‘ I never,’ he said, ‘‘met with any military man with whom it was so satisfac- tory to converse.” The excitement and exertion of this interview were too much for the sick man. He fainted away; and Lord Wel- lesley left the house convinced that the close was fast approaching.

And now members of parliament were fast coming up to London. The chiefs of the Opposition met for the purpose of considering the course to be taken on the first day of the session. It was easy to guess what would be the language of the king's speech, and of the address which would be moved in answer to that speech. An amendment condemning the policy of the Government had been prepared, and was to have been proposed in the House of Commons by Lord Henry Petty, a young nobleman who had already won for himself that place in the esteem of his country which, after the lapse of more than half a century, he still retains.! He was unwill- ing, however, to come forward as the accuscr of one who was incap- able of defending himself. Lord Grenville, who had been informed of Pitt's state by Lord Wellesley, and had been deeply affected by it, earnestly recommended forbearance ; and Fox, with charactcristic gencrosity and good nature, gave his voice against attacking his now helpless rival. 'Sunt lacryme rerum," he said, "et mentem nortalia tangunt.'" On the first day, therefore, there was no debate. It was rumoured that evening that Pitt was better. But on the following morning his physicians pronounced that there were no hopes. The commanding faculties of which he had been too proud were beginning to fail. His old tutor and friend, the bishop of Lincoln, informed him of his danger, and gave such religious advice and consolation as a confused and obscured mind could receive. Stories were told of devout sentiments fervently uttered by the dying man. But these stories found no eredit with anybody who knew him. Wilberforce pronounced it impossible that they could be true; '' Pitt," he added, 'was a man who always said less than he thought on such topics." It was asserted in many after-diuner speeches, Grub Strect elegies, and academic prize poems and prize declamations that the great minister died exclaiming, ''Oh my country!" This is a fable, but it is true that the last words which he uttered, while he knew what he said, were broken exclamations about the alarming state of public affairs. He ceased to breathe on the morning of the 28rd of January 1806, the twenty-fifth anniversary of the day on which he first took his seat in parliament. He was in his forty-seventh year, and had been during near nineteen years first lord of the treasury, and un- disputed chief of the administration. Since parliamentary govern- ment was established in England, no English statesman has held Supreme power so long. Walpole, it is true, was first lord of the treasury during more than twenty years, but it was not till

Walpole had been some time first lord of the treasury that he could be properly called prime minister.

It was moved in the House of Commons that Pitt should be honoured with a public funeral and a monument. The motion was opposed by Fox in a speech which deserves to be studied as a model of good taste and good feeling. The task was the most invidious that ever an orator undertook; but it was performed with a humanity and delicacy which were warmly acknowledged by the mourning friends of him who was gone. The motion was carried by 288 votes to 89.

The 22d of February was fixed for the funeral. The corpse having lain in state during two days in the Painted Chamber, was borne with great pomp to the northern transept of the Abbey. A splendid train of princes, nobles, bishops, and privy councillors followed. The grave of Pitt had been made near to the spot where his great father lay, near also to the spot where his great rival was soon to he. The sadness of the assistants was beyond that of ordinary mourners. For he whom they were committing to the

1 (Henry Petty Fitzmauri in ‘quis of | Suny 2 Vr an id a ged aa aS 1801, and succeeded to the peerage in 1809.” Seeretary of state for the home department, a

foreign affairs. From 1831 to 1841, and from of the council,]

sdowne, was born in London, . He entered parliament in For a brief period in 1828 he was nd again, in 1828-29, seeretary for 1846 to 1852, he was lord president

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dust had died of sorrows and anxieties of which none of the survivors could be altogether without a share. Wilberforce, who carried the banner before the hearse, described the awful ceremony with deep feeling. As the coffin descended into the earth, he sald, the eagle face of Chatham from above

seemed to look down with consternation into the dark house which was receiving all that remained of so much power and glory.

All parties in the House of Commons readily concurred in voting forty thousand pounds to satisfy the demands of Pitt's creditors, Some of his admirers scemed to consider the magnitude of his embarrassments as a circumstance highly honourable to him ; but men of sense will probably be of a different opinion. It is far better, no doubt, that a great minister should carry his contempt of money to excess than that he should contaminate his hands with unlawful gain. But it is neitherright nor becoming in a man to whom the public has given an ineome morc than sufficient for his comfort and dignity to bequeath to that public a great debt, the effect of mere negligence and profusion. As first lord of the treasury and chancellor of the exchequer Pitt never had less than six thousand a year, besides an excellent house. In 1792 he was forced by his royal master's friendly importunity to accept for life the office of warden of the Cinque Ports, with near four thousand a year more. He had neither wife nor child ; he had no needy relations; he had no expensive tastes; he had no long election bills. Had he given but a quarter of an hour a week to the regulation of his household, he would have kept his expendi- ture within bounds. Or, if he could not spare even a quarter of an hour a week for that purpose, he had numerous friends, excellent men of business, who would have becn proud to act as his stewards. One of those friends, the chief of a great commer- cial house in the city, made an attempt to put the establishment in Downing Street to rights, but in vain. He found that the waste of the servants' hall was almost fabulous. The quantity of butcher's meat charged in the bills was nine hundredweight a week, The consumption of poultry, of fish, of tea, was in propor- tion. The character of Pitt wonld have stood higher if with the disinterestedness of Pericles and of De Witt he had united their dignified frugality.

The memory of Pitt has been assailed, times innumerable, often Estim: justly, often unjustly ; but it has suffered much less from his of Pitt

assailants than from his eulogists. For, during inany years, his name was the rallying cry of a class of men with whom, at one of those terrible conjunctures which confound all ordinary distine- tions, he was accidentally

and temporarily connected, but to whom, on almost all great questions of principle, he was diametrically opposed. The haters of parliamentary reform called themselves Pittites, not choosing to remember that Pitt made three motions for parliamentary reform, and that, thongh he thought that such a reform could not safely be made while the passions excited by the French. Revolution were raging, he never uttered a word indicating that he should not be prepared at a more convenient season to bring the question forward a fourth time. The toast of Protestant ascendency was drunk on Pitt's birthday by a set of Pittites who could not but be aware that Pitt had resigned his office because he could not carry Catholic emancipation. The defenders of the Test Act called themselves Pittites, though they could not be ignorant that Pitt had laid before George ILI. un- answerable reasons for abolishing the Test Act. The enemies of free trade called themselves Pittites, though Pitt was far more deeply imbued with the doctrines of Adam Smith than either Fox or Grey. The very negro-drivers invoked the name of Pitt, whose eloquence was never more conspicuously displayed than when he spoke of the wrongs of the negro. This mythical Pitt, who resembles the genuine Pitt as little as the Charlemagne of Ariosto resembles the Charlemagne of Eginhard, has had his day. History will vindicate the real man from calumny disguised under the semblance of adulation, and will exhibit him as what he was—a minister of great talents, honest intentions, and liberal opinions, pre-eminently qualified, intellectually and morally, for the part of a parliamentary leader, and capable of administering with prudence and moderation the government of a prosperous and tranquil country, but unequal to surprising and terrible emergencies, and liable in snch emergencies to err grievously, both on the side of weakness and on the side of violence. (M.)

PITTA, in Ornithology, from the Telegu Pitta, meaning a small Bird, Latinized by Vieillot in 1816 (Analyse, p. 42) asthe name of a genus, and since adopted by English ornithologists as the general name for a group of Birds, called by the French Bréves, and remarkable for their great beauty.? Fora long while the Pittas were commonly supposed to be allied to the 7'urdidzx, and some English

2 In Ornithology the word is first found as part of the native name, * Pon-nunky pitta," of a Bird, given in 1713 by Petiver, in the ''Mantissa " to

Ray’s Synopsis (p, 195), on the authority of Buekley (see ORNITHOLOGY, Vol. xviii. p. 4, note 1). This bird is the Pitta bengalensis of modern ornithologists, and is said by Jerdon (Birds of India, i. p. 503) now to bear the Telegu name of Pona-inki.

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writers applied to them the name of “ Water-Thrushes ” and “Ant-Thrushes,” though there was no evidence of their having aquatic habits or predilections, or of their preying especially upon ants; but the fact that they formed a separate Family was gradually admitted. Their position

was at last determined by Garrod, who, having obtained |

examples for dissection, in a communication to the Zoo- logical Society of London, printed in its Proceedings for 1876, proved (pp. 512, 513) that the Putedx belonged to that section of Passerine Birds which he named Mesomyodi (OrnirHOLOGY, vol. xviii. p. 41), since their syrinx, like that of the Tyrannide (KiNG-BIRD, vol. xiv. p. 80), has its muscles attached to the middle of its half-rings, instead of to their extremities as in the higher Passerines or Acromyodi. This in itself was an unexpected determina- tion, for such a structure had been thought to be confined

to Birds of the New World, to which none of the Pittas |

belong. But it is borne out by, and may even serve to explain, the sporadic distribution of the latter, which seems to point them out as survivors of a somewhat ancient and lower type of Passeres. Indeed except on some theory of this kind the distribution of the Pittas is almost unaccountable. They form a very homogeneous

Pitta elegans, male and female.

Family, not to say genus, which it is not easy to split-up justifiably, for all its members bear an unmistakable and close resemblance to each other—though the species inhabit countries so far apart as Angola and China, India and Australia; and, to judge from the little that has been recorded, they are all of terrestrial habit, while their power of flight, owing to their short wings, is feeble. Nearly fifty species have now been described, most of them found mn the Malay Archipelago, between the eastern and western divisions of which they are pretty equally divided ; and, in Mr Wallace's opinion,! they attain their maximum of beauty and variety in Borneo and Sumatra, from the latter of which islands comes the species, Petta elegans, represented in the accompanying woodcut. Few Birds can vie with the Pittas in brightly-contrasted coloration.

eep velvety black, pure white, and intensely vivid Scarlet, turquoise-blue and beryl-green—mostly occupying a considerable extent of surface —are found in a great many of the species,—to say nothing of other composite or inter- mediate hues ; and, though in some a modification of these tints is observable, there is scarcely a trace of any blend- Ing of shade, each patch of colour standing out distinctly.

ae Owing to recent discoveries in Papuasia it is possible that this Pinion may require some modification.

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This is perhaps the more remarkable as the feathers have hardly any lustre to heighten the effect produced, and in some species the brightest colours are exhibited by the plumage of the lower parts of the body. Pittas vary in size from that of a Jay to that of a Lark, and generally have a strong bill, a thickset form, which is mounted on rather high legs with scutellated "tarsi," and a very short tail. In many of the forms there is little or no external difference between the sexes. All the species then known were figured in Mr Elliot's Monograph of the Pittide, com- pleted in 1863; but so many have since been described that this work but imperfectly represents the existing know- ledge of the Family, and even Schlegel's revised catalogue of the specimens contained in the Leyden Museum (Mus. des Pays Bas, livr. 11), published in 1874, is now out of date, so that a new synopsis is very

desirable. Many of the lately-discovered species have been figured in Gould's Birds of Asia and Birds of New Guinea.

Placed by some authorities among the Pittide is the genus Philepitta, consisting of two species peculiar to Madagascar, while other systematists would consider it to form a distinct Family. This last is the conclusion arrived at by W. A. Forbes (Proc. Zool Society, 1880, pp. 387- 391) from its syringeal characters, which, though shewing it to be allied to the Pittas, are yet sufficiently different to justify its separation as the type of a Family Philepittide, The two species which compose it have little outward resemblance to the Pittas, not having the same style of coloration and being apparently of more arboreal habits. The sexes differ greatly in plumage, and the males have the skin round the eyes bare of feathers and carunculated.

It may be advisable to remark that nomenclatorial purists, objecting to the names Pitta and Philepitta as "barbarous," call the former Coloburis and the latter Paictes. Brachyurus also has frequently been used for Pitta, but, having been previously applied in another sense, it is inadmissible. (A. N.)

PITTACUS of Mytilene in Lesbos, one of the seven sages of Greece, was born in 651 B.c. His father Hyrradius (or Caicus) was a Thracian, his mother was a Lesbian. About 611 B.c. Pittacus, along with the brothers of the poet Alczeus, overthrew Melanchrus, tyrant of Lesbos. In a war between the Mytilenians and Athenians for the possession of the town of Sigeum on the- Helle- spont, Pittacus, as general of the Mytilenians, slew the Athenian commander Phrynon in single combat, having entangled him in a net (606 B.c.). In 589 his fellow- citizens entrusted Pittacus with despotic power for the purpose of protecting them against the exiled nobles, at the head of whom were Alczeus and Antimenides. Pittacus effected this object, and, without introducing a new con- stitution, contrived by legislation to restore the existing constitution to regular working order. One of his laws enacted that offences committed during intoxication should be punished with double severity. For the historian of the law of inheritance some interest attaches to the enact- ment of Pittacus that father and mother should succeed, in equal shares, to the property of a deceased child. He resigned the government after holding it for ten years, and died ten years later (569 B.c.).

The stories which bring Pittacus and Creesus into connexion are probably mere legend, since Croesus was only twenty-five years of age at the date of Pittacus's death. Pittacus was regarded as a pattern of all the virtues, and this high character is borne out by what we know of him. When Alceus, who had bitterly assailed him in his poems, fell into his hands, he let him go, saying that forgiveness was better than revenge. Of the lands which his grateful countrymen would have bestowed on him he aecepted only a small part. Amongst the sayings attributed to him are these :— it is hard to be good ; rule reveals the man; the best rule is that of law; speak ill neither of friend nor foe. Pittacus was also a poet ; Diogenes Lacrtius states that he eomposed six hundred elegiae verses.

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PITTSBURGH, the second largest city of Pennsylvania, and the leading iron, steel, and glass manufacturing centre of the United States, lies at the confluence of the Alle- gheny and the Monongahela, which unite here to form the Ohio, 250 miles west by north of Philadelphia. The business quarter of the city is built on a nearly level

triangular plain, between the two rivers, measuring about | tur | their fires by night, are of a unique and picturesque char-

three quarters of a mile on each side back to the hills which rise to the east.

The manufacturing establishments stretch for a distance of 7 miles up the Allegheny, 7 up the Monongahela, and 2 down the Ohio, and occupy the strip of low ground usually a few hundred feet broad between the river banks

and the hills which generally face them. The slope of | of engineering in iron.

the hills to the east of the business quarter is closely built with residences and retail stores for the distance of a mile and a half, but the summits, 400 or 500 feet high, are partially unoccupied. Beyond the hills extends a rolling country which, for a space of about 5 miles long by 2 wide is occupied by the villas of the citizens. The hills facing the rivers are generally

precipitous, and vary in height from 300 to 600 feet, but at different points they recede from the river banks and afford sites for the

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suburbs of Lawrenceville (on the Allegheny), Hazlewood, and Birmingham (on the north and south banks respec- tively of the Monongahela), which are within the muni- cipality of Pittsburgh, and (on the north bank of the Allegheny and Ohio) for the city of Allegheny, which, with its separate municipal government and population of 78,000 inhabitants, is commercially and socially a part of Pittsburgh. The two cities together cover an irregular space of 9 miles between the extreme eastern and western points, with a breadth varying from 2 to 4 miles.

From the character of its site Pittsburgh would natur- ally be very attractive, but the free use of the bituminous coal which has been the principal agent in its development has so spoiled its beauty as to give it the name of the Smoky City. Not only do the manufacturing quarters show long lines of smoke-stained buildings, but the busi- ness quarter, which is composed of rather narrow streets laid out early in the century, is mainly constructed of brick and iron, and in spite of the presence of some fine public buildings in granite and brown stone—the municipal hall, the petroleum exchange, the new United States post office and court-house (1884), the new county court-house (1884), &.—has a generally grimy and unattractive appearance.

PITTSBURGH

the city is obtained from a view of the suburban quarters of the East End and the parks and residence quarters of Allegheny. And, all disfigurement and dirtiness notwith- standing, it is full of interesting and striking sights. The interiors of its rolling-mills and glass-houses, and the views of the city from the surrounding hills, with the manufac- turing quarters marked out by their smoke by day and

acter. Along the rivers are fleets of steamers towing barges laden with coal for consumption at this point and for shipment to the cities lower down. Joining the various quarters of the city are ten bridges for ordinary traffic and four railway viaducts, among which the Point Bridge and the Smithfield Street Bridge are fine examples Six inclined-plane railways afford access to the summits of the high hills.

Pittsburgh is of historical interest from the struggle (1755-1758) for its possession between England and France in the Seven Years' War, and the fact that the public and military career of George Washington was commenced with those campaigns (see WASHING- Ton). With the termination of that struggle in the capture of the ruins of Fort Duquesne by the British, the history of the place

, becomes that of an ordinary frontier town, A new fort was erected

and named Fort Pitt in honour of the prime minister whose energy had urged the war forward to its capture, WSFA] and wrested the Ohio valley and Canada from \{ French control. After one or two Indian 7 wars, in which the post was threatened, and <4 on one occasion nearly taken, Fort Pitt lost yx) its military character and became a trading "aq town. 'The first streets were laid out near 4 the fort in 1764, and in 1769 the first survey of the unsettled lands in the vicinity was made for the proprietors, the heirs of William 4 Penn, under the name of the manor of Pitts- burgh. After the termination of the revolu- { | tion, the legislature of Pennsylvania ineor- Q porated Pittsburgh as a village on April 22, 4] 1794, and on March 18, 1816, its charter asa A city was granted. During the colonial period Z| a dispute arose between Virginia and Penn- sylvania as to the possession of the territory surrounding the town, and in the first few years of its history

under the United States it attracted attention from its proximity to the famous “ Whisky Insurrection ” of Western Pennsylvania. After it had attained a popu- lation of 30,000 it was visited on the 10th of _| April 1845 by a disastrous conflagration im which the buildings in the business centre, covering a space of 56 acres, and valued at $5,000,000 dollars, were consumed.

In the Pittsburgh of to-day there is little besides names of streets, hills, and suburbs to recall the struggle which decided the Anglo-Saxon character of the country. The locality known as the Point, where Fort Duquesne stood, is covered with thickly built factories and dingy tenements. Ina squalid and obscure court a portion of the wall of a blockhouse ereeted in 1763 by Colonel Boquet, one of the British commandants of Fort Pitt, still forms a part of a building, and on the wall of the staircase of Municipal Hall is a stone bearing the inscription with which that officer commemorated its erection. Immediately across the Monon- gahelaa range of precipitous hills some 500 feet high bears the names of Mount Washington and Duquesne Heights. On the first hill rising to the east of the level part of the city, a red granite court- house, to cost $2,000,000, is in process of construction near to the spot where Major Grant was defeated and slain, and the new build- ing will replace the brown stone structure which for many years fronted on the street bearing that unfortunate officer’s name. Twelve miles away, the suburb long known as Braddock’s Field and now as Braddock’s, attracts attention chiefly by the roar and glare of its great steel manufacturing establishment. ,

Deriving its early importance in commerce from its position at the head of the Ohio, which was until 1855 the principal route between the middle States and the west and south-west, Pittsburgh has since obtained its greatest growth from the coal which under- lies nearly all Western Pennsylvania. This has made the city and its immediate suburbs the most important manufacturing distriet in America, in both pig and bar iron, steel, glass, and copper. | 4 1883 Allegheny county produced 114 per cent. of the pig 1roD produced in the United States, and 21 per cent. of the rolled iron and steel. The iron industry consists of 16 blast furnaces, pro- ducing, in 1883, 592,475 tons; 32 rolling mills, producing 472,351

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tons of finished iron ; and 91 other establishments, turning outa large variety of other manufactures of iron, from boilers to safes and steam pumps. The stcel industry comprises 20 large mills with an output for 1883 of 405,530 tons.

rolling-mills

The blast furnaces and | of Pittsburgh employ a capital of $23,910,000 and |

21,190 workmen, the steel industry $10,170,000 and 7060 work- |

men, Next in importance is the glass manufacture, in which 75 establishments are engaged, 24 making table ware, 24 window glass, 10 green glass bottles, and 9 lamp ehimneys. The capital ‘nvested in them is $5,985,000. They employ 6442 hands, and the value of their last reported annual production is $6,832,683. The coal and coke industry of the district, which is controlled mainly by Pittsburgh, comprises a capital of $26,406,500, employs 23,621 miners and other labourers, and makes an annual output of 7,720,090 tons of eoal and 2,760,000 tons of coke, valued at $16,600,000. The total of all the manufacturing industries of the city is 1380 establishments, with $105,401,481 of capital, employing 85,936 workmen of all kinds, and producing to the value of $149,721,619. trade]

important than its manufacturing industries, exceptions is confined to the immediate vicinity. firms with an aggregate capital of $11,206,000 and total sales of $125,390,472. Within the last year a new and unique industry has been developed. By drilling in the earth to a depth of 1200 to 2000 feet, what is practically the fire-damp of the coal mine is tapped in such quantity that it comes to the surface in great foree. It has been found to be useful as a fuel for all the purposes of coal except the smelting of ores in blast furnaces; and, as it is cheaper both for making steam and for the heating of the iron and glass furnaces, its adoption has been general among the manufacturers.

As the railway system has developed, the important boating interest of Pittsburgh has become confined to the transportation of coal from the Monongahela river mines to the down-river cities. The coal is only taken out when freshets have raised the river, and at that time fleets of steamers, each towing from eight to fifteen barges, covering acres in extent and carrying thousands of tons of coal, start down stream. The total steam tonnage of Pittsburgh is 36,845 tons with 163 vessels, but the addition of the barges brings the tonnage up to 1,359,972 and the number of vessels to 3208.

Pittsburgh is stated to be the origin of more railway freight than any other poiut in the country. There are a large number of lines, under the control of three great companies. The most important is the Pennsylvania Railroad, whose trunk lines pass through the eity, and number amoung their feeders the West Pennsylvania ; the Allegheny Valley ; the Pittsburgh, Virginia, and Charleston ; the Pittsburgh, Cincinnati, and St Louis; the Pittsburgh, Fort Wayne, and Chicago ; and the Cleveland and Pittsburgh Railroads. The Pittsburgh division of the Baltimore and Ohio Railroad gives a connexion with that trunk line, and by the Pittsburgh and Western, and the Pittsburgh, Cleveland, and Toledo, reaches the Chieago branch of the same system to the west. The Pittsburgh and Lake Erie affords the New-York Central and the New York, Pennsylvania, and Ohio lines an access to Pittsburgh, while its extension under the name of the Pittsburgh, MacKeesport, and gee iegheny penctrates the coal and coke district to the south- east.

and with a few

In 1796, by the first accurate census on record, the population of Pittsburgh was 1395. By 1810 it had increased to 4968; by 1820 to 7248 ; by 1830 to 12,452; by 1840 to 21,115 ; by 1850 to 36,601; by 1860 to 49,221 ; by 1870 to 86,076. In 1874 the con- solidation of outlying boroughs made the population, according to the ceusus of 1870, 121,799 ; and in 1880 this had increased to 156,389. These figures do not comprise the population of Allegheny, which was 28,702 in 1860, 58,180 in 1870, and 78,682 in 1880. Including the manufacturing and residential suburbs, the total population by the census of 1880 was 274,160 ; and, with the arge extension of

manufacturing and building that has gone on since then, it was estimated in 1884 at 325,000.

The municipal governments of Pittsburgh and Allegheny are each composed of a mayor, controller, and treasurer, with city councils in two branches styled respectively select and cominon. These are elected by the people, and appoint other administrative officials to take charge of the police and fire departments, assessments, and ae works. The total assessed valuation of the city of Pitts- purgh for purposcs of taxation is $101,508,603, on which a revenue 8 collected tor all purposes of $2,777,405. Allegheny has an -— valuation of $40,707,858, and spends $650,000 annually.

ne total indebtedness of Pittsburgh is $14,497,800, of which nearly $10,000,000 was expended for water-works and _ street on. The debt of Allegheny is but $1,400,000.

a he school system of each city is governed by a central board of ae and ward boards, both elected by popular vote. The the sburgh system comprises a fine stone high sehool overlooking 93 ae and 52 ward schools, in which are 469 teachers and $550.0 Scholars, the approximate annual expenditure being

000. In the Allegheny system there are the high school

The wholesale trade of the city is much less |

It includes 90 |

| from 158 to 167 a.D.

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and 18 ward seliools, with 207 teachers, 9392 scholars, and an annual expenditure of about $200,000. The principal institutions established by public taxation are the Riverside State Peniten- tiary, completed in 1884 in the lower part of Allegheny; the Morganza Reform Sehool; the workhouse

at Claremont, on the Allegheny river; and the Pittsburgh, Allegheny, and County poorhouses.

The churches and chapels in Pittsburgh and Allegheny number 237: 57 are Roman Catholic, including 18 monastic and conventual establishments ; 58 represent the various branches of Presbyterian- ism; 89 are Methodist Episcopal, and 16 Protestant Episcopal. Among the leading examples of church architecture are St Paul's

| Cathedral (Roman Catholic), Trinity and St Peter's (Protestant

Episcopal), the First and Third Presbyterian and the German Lutheran churches in 'Pittsburgh, and the North Presbyterian in Allegheny. Private charity has established the West Penn. Hospital with a large branch for the treatment of the insane at Dixmont, the Homeopathic Hospital, the Mercy Hospital, the Pittsburgh Infirmary, the Free Dispensary, the North Side Hospi- tal, and St Francis Hospital ; and 18 asylums for orphans and the aged and infirm are maintained throughout the two cities. The collegiate institutions comprise the Western University, the Western Theological Seminary (Presbyterian), the United Presby- terian Seminary, the Catholic College, the Pennsylvania Female College, and the Pittsburgh Female College. (J. Hp)

PITTSFIELD, a borough and township of the United States, the shire town of Berkshire county, Massachusetts, lies at a height of from 1000 to 1200 feet above the sea on a plain between the Hoosacs on the east and the Taconics on the west. It is traversed by the headwaters of the Housatonic and Hoosac rivers, and derives its supply of drinking water from Lake Ashley, a romantic loch on the top of the Washington Hills, 7 miles to the south-east. As the northern terminus of the Housatonic Railroad, and a junction on the Boston and Albany and the Pittsfield and North Adams Railroads, it is an important centre of traffic. Most of the dwelling houses are built of wood. Among the public edifices are a court-house, in white marble ; the Berkshire Athenzeum, with a free library and reading-room ; the Roman Catholic church of St Joseph, in marble ; the Methodist church, a spacious edifice of brick ; the First Congregational church (rebuilt in 1853), for thirty years under the charge of Rev. John Todd, author of the Student's Manual ; and the Maplewood Institute for young ladies. The

Berkshire Medical Institute (1822 ceased to exist in 1869. There isa small park with a fine soldiers' monument (1872) in the heart of the town, as well as a larger park with a race-course in the eastern suburb. Cotton and woollen goods, silk, knit goods, shoes, and tacks are among the local manufactures. The population in 1860 was 8045; in 1870, 11,132; in 1880, 13,364. Pittsfield, which once formed part of the Indian domain of Pontoosuc, and for a time was known as Boston Plantation, was incorporated in 1761, and received its present name in honour of the earl of Chatham. Oliver W. Holmes long resided on a small farm two miles south of Pittsfield.

PITTSTON, a borough of the United States, in Luzerne county, Pennsylvania, on the east bank of the

| Susquehanna, just below the confluence of the Lackawanna,

105 miles north by west of Philadelphia. It is the centre of the Wyoming anthracite region and the seat of the Pennsylvania Coal Company's operations, contains knit- ting mills, planing mills, terra cotta works, a stove factory, lumber yards, &c., and commands four distinct railway lines. The population was 6760 in 1870 and 7472 in 1880. If West Pittston (a borough on the other side of the Susquehanna, with which Pittston communi- cates by two bridges) were included, the total would be

10,016.

PIUS I. Hardly anything is known with certainty respecting Pius IL, except that he was bishop of Rome He is said to have been born at Aquileia and to have been thie son of a certain Rufinus ; it is added that he suffered martyrdom, but, although

he is celebrated as a martyr in the breviary, there seems no other evidence for this assertion. PIUS II. (Enea Silvio Piccolomini, commonly known in literature as Adneas Sylvius), pope from 1458 to 1464, " whose character reflects almost every tendency of the age in which he lived," was born at Corsignano in the Sienese territory, October 18, 1405, of a noble but

decayed family. After studying at the universities of Siena and Florence, he settled in the former city asa teacher, but in 1431 accepted the post of secretary to Domenico Capranica, bishop of Fermo, then on his way to Basel to protest against the in- justice of the new pope Eugenius IV. in refusing him the cardinalate for which he had bcen designated by Martin V. Arriving at Basel after numerous adventures, he successively served Capranica and several other masters. In 1435 lie was sent by Cardinal Albergata, Eugenius's legate at the council, on a secret mission to Scotland, the object of which is variously related, even by himself. He visited England as well as Scotland, underwent many perils and vicissitudes in both countries, and has left a valuable account of each. Upon his return he sided actively with the council in its conflict with the pope, and, although still a layman, obtained a leading share in the direction of its affairs. But when in 1442 the council elected Amadeus, duke of Savoy, as an antipope under the name of Felix V., /Eneas, perceiving that the step was generally disapproved, found a pretext for withdrawing to the emperor Frederick III.'s court at Vienna. He was there crowned imperial poet laureate, and obtained the patronage of the emperor's chancellor, Kaspar Schlick, a love adventure of whose at Siena he celebrated in his romance, Lurialus and Lucretia. His character had hitherto been that of an easy man of the world, with no pretence to strictness in morals or consistency in politics. He now began to be more regular in the former respect, and in the latter adopted a decided line by making his peace with Rome. Being sent ona mission to Rome in 1445, with the ostensible object of inducing Eugenius to convoke a new council, he was absolved from ecclesiastical censures, and returned to Germany under an engagement to assist the pope. This he did most effectually by the diplomatic dexterity with which he smoothed away differences between the court of Rome and the German electors; and he had a leading part in the compromise by which, in 1447, the dying Eugenius accepted the reconciliation tendered by the German princes, and the council and the antipope were left without support. He had already taken orders, and one of the first acts of Eugenius's successor Nicholas V. was to make him bishop of Trieste. In 1450 he was sent ambassador by the emperor Frederick to negotiate his marriage with the Princess Leonora of Naples, which object he successfully achieved ; in 1451 he undertook a mission to Bohemia, and concluded a satisfactory arrange- ment with the Hussite chief George Podiebrad; in 1452 he accompanied Frederick to Rome, where the

emperor wedded Leonora and was crowned king of the Romans. In August 1455 Aineas again arrived in Rome on an embassy to proffer the obedience of Germany to the new pope, Calixtus III. He brought strong recommendations from the emperor and King Ladislaus of Hungary for his nomination to the cardinalate, but delays arose from the pope's resolution to promote his own nephews first, and he did not attain the object of his ambition until December in the following year. ere ae hee on August 6, 1458. On August 10 Hig ie ere into conclave. The wealthy cardinal » though a Frenchman and of exceptionable character, seemed certain to be elected. Auneas has told us In a passage of his own history of his times, long

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retrenched from that work but printed clandcstinely in the Conclavi dé Pontifici Romani, by what art, energy, and eloquence he frustrated this false step. It seemed but meet that the election should fall upon himself: no other candidate appears to have been seriously thought of ; nor, although the sacred college probably included a few men of higher moral standard, had it any on the whole g0 worthy of the tiara. It was the peculiar faculty of Atneas to accommodate limself perfectly to whatever position he might be called upon to occupy; it was his peculiar good fortune that every step in life had placed him in circum. stances appealing more and more to the better part of his nature, an appeal to which he had never failed to respond, The party pamphleteer had been more respectable than the private secretary, the diplomatist than the pamphleteer, the cardinal than the diplomatist ; now the unscrupulous adventurer and licentious novelist of a few short years ago seated himself quite naturally in the chair of St Peter, and from the resources of his versatile character produced without apparent effort all the virtues and endowments becoming his exalted station. After allying himself with Ferdinand, the Aragonese claimant of the throne of Naples, his next important act was to convene a congress of the representatives of Christian princes at Mantua for joint action against the Turks. His long progress to the place of assembly resembled a triumphal procession; and the congress, a complete failure as regarded its ostensible object, at least showed that the impotence of Christendom was not owing to the pope. On his return from the con- gress Pius spent a considerable time in his native district of Siena,

and has described his delight and the charms of a country life in very pleasing language. He was recalled to Rome by the disturbances occasioned by Tiburzio de Maso, who was ultimately seized and executed. The papal states were at this time greatly troubled by rebellious barons and marauding condottieri, but these evils gradu- ally abated. The Neapolitan war was also terminated by the success of the pope's ally Ferdinand. In July 1461 Pius canonized St Catherine of Siena, and in October of the same year he gained what at first appeared to bea most brilliant success by inducing the new king of France, Louis XI., to abolish the pragmatic sanction, by which the pope's authority in France had been grievously impaired. But Louis had expected that Pius would in return espouse the French cause in Naples, and when he found himself disappointed he virtually re-established the pragmatic sane- tion by royal ordinances. Pius was also engaged in a serics of disputes with the Bohemian king and the count of Tyrol, and the crusade for which the congress of Mantua had been convoked made no progress. The pope did his best : he addressed an eloquent letter to the sultan urging him to become a Christian; he succeeded in reconciling the emperor and the king of Hungary, and derived great encouragement as well as pecuniary advantage from the discovery of mines of alum in the papal territory. But France was estranged ; the duke of Burgundy broke his positive promise ; Milan was engrossed with the attempt to seize Genoa ; Florence cynically advised the pope to let the Turks and the Venetians wear each other out. Pius was unawares nearing his end, and his malady probably prompted the feverish impatience with which on June 15, 1464, he assumed the cross and departed for Ancona to conduct the crusade in person. It secmed certain that the issue of such an enterprise could only be ridiculous ot disastrous. Pius II.'s good genius again stepped in, and rendered it pathetic. He was suffering from fever when he left Rome. The crusading army meltcd away at Ancona for want of transport, and when at last the Venetian fleet arrived the dying pope could only view it from a window. He expired two days afterwards, August

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14, 1464, in his death as in his life a figure picturesque and significant far beyond the wont of Roman pontiffs. He was succeeded by Paul II.

Pius, indeed, regarded as a man and not merely as an historical personage, is the most interesting of all the successors of St Peter. It is easy to take his character to pieces, but the aroma of something exquisite lingers around every fragment. He had a healthy, sincere, loving nature, frank and naive even in his aberrations and defects, which seem after all sufficiently venial. The failings of other popes have most frequently been those of the priest, and therefore in the true sense of the term inhuman. It is a refreshing transition to the faults of the adventurer, the diplomatist, the man of letters and pleasure. The leading trait of Pius's character was his extreme impressionable- ness. Chameleon-like he took colour from surrounding cir- cumstances, and could always depend on being what these circumstances required him to be. As, therefore, his prospects widened and his responsibilities deepened, his character widened and deepened too; and he who had entered upon life a shifty adventurer quitted it a model chief shepherd. His virtues were not only great, but the most conspicuous were those especially characteristic of the finer natures. While he vied with any man in indus- try, prudence, wisdom, and courage, he excelled most men in simplicity of tastes, constancy of attachments, kindly playfulness, magnanimity, and mercy. As chief of the church he was able and sagacious, and showed that he comprehended the conditions on which its monopoly of spiritual power could for a season be maintained; his views were far-seeing and liberal ; and he was but slightly swayed by personal ends. He is especially interesting as the type of the scholar and publicist who wins his way by intellectual strength, foreshadowing the age to come when the pen should be mightier than the sword ; and no less as the figure in whom the medizval and the modern spirit are most distinctly seen to meetand blend, ere the latter definitively gains the mastery.

Pius was a versatile and voluminous author, one of the best and most industrious of his period. His most important work is his Commentaries of his own Times, published in 1584 under the name of Gobelinus, to whom it has been ascribed, but who was in fact only the copyist. It appears to have been altered to some slight extent by his secretary Campanus. Numerous passages suppressed at the time of publication have been recently published

in the 7rans- actions of the Accademia de’ Lincei by Signor Cugnone, together with other inedited works. Pius’s Commentarics are delightful reading, and their historical value is very great. “ Pius II.,” says Creighton, “ is the first writer who attempted to represent the present as it would look to posterity, who consciously applicd a Scientific conception of history to the explanation and arrange- ment of passing events.” His Zpistles, which were collected by himself, are also an important source of historical information. The most valuable of his minor historical writings are his histories of Bohemia and of the emperor Frederick III., the latter partly autobiographical. He sketched: geographical treatises on Europe and Asia, and in early and middle life produced numerous tracts

on the political and theological controversies of his day, as well as |

on ethical subjects. Pius was greatly admired as a poet by his eontemporaries, but his reputation in belles lettres rests princi- pally upon his Zurialus and Lucretia, which continues to be read to this day, partly from its truth to nature, and partly from the Singularity of an erotic novel being written by a pope. He also composed some comedies, one of which alone is extant, and as yet only in MS. All these works are in Latin. Pius was not an eminent scholar: his Latin is frequently incorrect, and he knew little Greek ; but his writings have high literary qualities, and will always be prized as vivid and accurate reproductions of the

_ Spirit of a very remarkable age.

Pe ea chief authorities for Pius’s life are sifted and condensed in the admir- ea by Voigt (3 vols., Berlin, 1856-63). Professor Creighton, in his We ry History of the Papacy during the Reformation (vol. ii., London, 1882), i ao the English reader the substance of Voigt’s narrative, while preserving lindependence of judgment. (R. G.

PIUS III. (Francesco Todeschini), pope from September

- to October 18, 1503, was born at Siena, May 9, 1439. $ the nephew of Pius IT. by his sister Laodamia, he was

received into favour by that pontiff, who permitted him to assume the name and arms of the Piccolomini, and raised him, when only twenty-two years of age, to the see of Siena and the cardinalate. He was employed by subsequent popes in several important legations, as by Paul IT. at the diet of Ratisbon, and by Sixtus IV. to secure the restoration of ecclesiastical authority in Umbria. Amid the disturbances consequent upon the death of Alexander VI. he was, by the not wholly disinterested influence of Cardinal Rovera, elected pope on September 22, 1503, his installation taking place on the 8th October following.

| He at once took in hand the reform of the papal court and

arrested Cesar Borgia; but after a brief pontificate of twenty-six days he died (October 18, 1503) of an ulcer in the leg, or, as some have alleged, of poison administered at the instigation of Pandolfo Petrucci, governor of Siena. He was succeeded by Julius II.

PIUS IV. (Giovanni Angelo Medici), pope from 1559 to 1565, was born of humble parentage at Milan, March 31, 1499. His early career connects itself in some

| measure with the romantic rise of his elder brother from

the position of bravo to that of Marchese di Marignano. After studying at Bologna and acquiring reputation as a

| jurist, he went in 1527 to Rome, and as the favourite of

Paul III. was rapidly promoted to the governorship of several towns, the archbishopric of Ragusa, the vice- legateship of Bologna, and in April 1549 to the cardinal- ate. On the death of Paul IV. he was elected pope on December 28, 1559, and installed on the 6th January 1560. His first public acts of importance were to grant a general pardon to the participators in the riot which had closed the previous pontificate, and to bring to trial the nephews of his predecessor, of whom Cardinal Carlo Caraffa was strangled, and the duke Paliano, with his nearest connexions, beheaded. On the 18th January 1562 the council of Trent, which had been suspended by Julius III., was opened for the third time. Great skill and caution were necessary to

effect a settlement of the ques- tions before it, inasmuch as the three principal nations taking part in it, though at issue with regard to their own special demands, were prepared to unite their forces against the demands of Rome. Pius, however, aided by Morone and Borromeo, proved himself equal to the emer- gency, and by judicious management and concession brought the council to a termination satisfactory to the disputants and favourable to the pontifical authority. Its definitions and decrees were confirmed by a bull dated January 26, 1564; and, though they were received with certain limitations by France and Spain, the famous Creed of Pius IV., or Tridentine Creed, remained the authorita- tive expression of the Catholic faith. The more marked manifestations of stringency during his pontificate appear to have been prompted rather than spontaneous, his personal character inclining him to moderation and ease. Thus a monitory, issued in 1564, summoning the queen of Navarre before the Inquisition on a charge of Calvinism, was withdrawn by him in deference to the indignant pro- test of Charles IX. ; and in the same year he published a bull granting the use of the cup to the laity of Austria and Bohemia. One of his strongest passions appears to have been that of building, which somewhat strained his resources in contributing to the adornment of Rome, and in carrying on the work of restoration, erection, and forti- fication in various parts of the ecclesiastical states. A conspiracy against him, headed by the Catholic fanatic Benedetto Accolti, was discovered and crushed in 1565. He died shortly afterwards, on December 9th of that year, and was succeeded by Pius V.

PIUS V. (Michele Ghislieri), pope from 1566. to 1572,

| was born at Bosco in the duchy of Milan, January 17,

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1504. At the age of fourteen he entered the Dominican order, passing from the monastery of Voghera to that of Vigevano, and thence to Bologna. Having been ordained priest at Genoa in 1528, he settled at Pavia, where he

lectured for sixteen years. He soon gave evidence of the opinions which found a more practical expression in his pontificate, by advancing at Parma thirty propositions In support of the papal chair and against the heresies of the time. As president of more than one Dominican monast- ery he proved himself a rigid disciplinarian, and, in accordance with his own wish to discharge the office of inquisitor, received an appointment to that post at Como. His zeal provoking resentment, he was compelled in 1550 to return to Rome, where, after having been employed in several inquisitorial missions, he was elected to the com- missariat of the Holy Office. Paul IV., who while still Cardinal Caraffa had shown him special favour, conferred upon him the bishopric of Sutri and Nepi, the cardinalate with the title of Alessandrino, and the honour—unique in one not of pontifical rank—of the supreme inquisitorship. Under Pius IV. he became bishop of Mondovi in Pied- mont, but his opposition to that pontiff procured his dismissal from the palace and the abridgment of his authority as inquisitor.

Before Ghislieri could return to his episcopate, Pius IV. died, and on January 7, 1566, he was elected to the papal chair with duly attendant prodigies, his coronation taking place on his birthday, ten days later. Fully alive to the necessity of restoring discipline and morality at Rome to ensure success without, he at once proceeded to reduce the cost of the papal court, compel residence, regulate inns, expel prostitutes, and assert the importance of ceremonial. In his wider policy, which was characterized throughout by a stringency which tended to defeat its own ends, the maintenance and increase of the efficacy of the Inquisition and the enforcement of the canons and decrees of the Tridentine council had precedence over all other considera- tions. The prudence of Commendone alone saved him at the commencement of his pontificate from trouble with Germany, as in the general diet of the empire at Augsburg (March 26, 1566) Pius saw a threatened invasion of his own supremacy and was desirous of limiting its discussions. In France, where his influence was stronger, he directed the dismissal of Cardinal Odet ~de Coligny and seven bishops, nullified the royal edict tolerating the extra-mtral services of the Reformers, introduced the Roman catechism, restored papal discipline, and strenuously opposed all com- promise with the heretics—his exertions leading up in no small degree to the massacre of St Bartholomew. In the list of more important bulls issued by him the famous bull “In Coena Domini” (1568) takes a leading

place; but amongst others throwing light on his character and policy there may be mentioned his prohibition of questuary (February 1567 and January 1570); the condemnation of Michael Baius, the heretical professor of Louvain (1567); the reform of the breviary (July 1568) ; the denunciation of the dirwm nefas (August 1568) ; the banishment of the Jews from the ecclesiastical dominions except Rome and Ancona (1569) ; the injunction of the use of the reformed missal (July 1570); the confirmation of the privileges of the Society of Crusaders for the protection of the Inquisi- tion (October 1570); the prohibition of discussions con- cerning the miraculous conception (November 1570) ; the suppression of the Fratres Humiliati for alleged profligacy (February l 57 1); the approbation of the new office of the Blessed Virgin (March 1571); the enforcement of the daily recitation of the canonical hours (September 1571) ; and the purchase of assistance against the Turks by offers ee pardon (March 1572). His antagonism to

eth was shown, not only in the countenance lent by

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him to Mary Stuart and those who sought in her name to

deliver England “ex turpissima muliebris libidinis seryi-

tute,” but in the publication of a bull, dated April 27, 1570, excommunicating Elizabeth and releasing her sub- jects from their allegiance. His energy was in no respect more favourably exhibited than in his persistent and suc- cessful endeavours to form a general league against the Turks, as the result of which the battle of Lepanto (Oct. 7, 1571) was won by the combined fleet under Colonna, Three national synods were held during his pontificate— at Naples under Cardinal Alfonso Caraffa (whose family had, after inquiry, been reinstated by Pius V.), at Milan under Carlo Borromeo, and at Mechlin. His death took place on May 1, 1572, and he was canonized by Clement XI. on May 24th 1712. He was succeeded by Gregory XEIL

PIUS VI. (Giovanni Angelo Braschi), pope from 1775 to 1799, was born at Cesena, December 27, 1717. After taking the degree of doctor of laws in 1735, he went to Ferrara and became the private secretary of Cardinal

Ruffo, in whose bishopric of Ostia and Velletri he held the post of udetore until 1753. His skill in the conduct ofa mission to the court of Naples won him the esteem of Benedict XIV. who appointed him one of his secretaries and canon of St Peter's. In 1758 he was raised to the prelature and then to the treasurership of the apostolic chamber by Clement XIII., whose successor, Clement XIV. created him cardinal on the 26th April 1773. On the death of Clement XIV. and after protracted debate, Braschi was elected to the vacant see on the 15th February 1775. His assumption of the title Pius VI. even then recalled to the populace the verse current in the pontificate of Alexander VI. "Semper sub Sextis perdita Roma fuit," though his earlier acts gave fair promise of liberal rule and reform in the defective administration of the papal states. He showed discrimination in his benevolences, reprimanded Potenziani, the governor of Rome, for unsuppressed dis- orders, appointed a council of cardinals to remedy the state of the finances and relieve the pressure of imposts, called to account Nicolo Bischi for the expenditure of moneys intended for the purchase of grain, reduced the annual disbursements by the suppression of several pen- sions, and adopted a system of bounties for the encourage- ment of agriculture. The circumstances of his election, however, involved him in difficulties from the outset of his pontificate. He had received the support of the ministers of the crowns and the anti-Jesuit party upon a

tacit understanding that he would continue the action of

Clement, by whose brief Dominus ac Redemptor (1773) the dissolution of the Society of Jesus had been pronounced. On the other hand the zelanti, who believed him secretly inclined towards Jesuitism, expected from him some reparation for the alleged wrongs of the previous reign. As the result of these complications, Pius was betrayed into a series of half measures which gave little satisfaction to either party. The case of Ricci and the other Jesuits imprisoned in the castle of St Angelo had scarcely been settled, by formal discountenance but informal relaxations and final release, before the question became an inter- national one. Driven from devout Catholic countries, the members of the condemned society found an asylum under the rule of the heretic Frederick II. and the schismatic Catherine IL, who welcomed them upon educational grounds. A long correspondence ensued in which both monarchs maintained their right, Catherine carrying the

matter still further and wresting from Pius a series of important concessions. Even in countries acknowledging the papal authority practical protests arose which tended to its limitation. In Austria the social and ecclesiast cal reforms undertaken by Joseph II. and his minister

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Kaunitz touched the supremacy of Rome so nearly that in the hope of staying them Pius adopted the exceptional course of visiting Vienna in person. He left Rome on the 27th February 1782, and was magnificently received by the emperor, but his mission was unattended by any marked success. In Naples difficulties necessitating cer- tain concessions in respect of feudal homage were raised by the minister Tannucci, and more serious disagreements arose with Leopold I. and Ricci, bishop of Pistoia and Prato, upon questions of reform in Tuscany. The outbreak of the French Revolution followed, and Pius in vain endeavoured to preserve the ecclesiastical discipline and property. The old Gallican Church was suppressed ; the pontifical and ecclesiastical possessions in France were confiscated ; and an effigy of himself was burnt by the populace at the Palais Royal. ‘The murder of the Re- publican agent, Hugo Basseville, in the streets of Rome (January 1793) gave new ground of offence ; the papal court was charged with complicity by the French Conven- tion; and Pius threw in his lot with the league against France. In 1796 Napoleon invaded Italy, defeated the papal troops, and occupied Ancona and Loreto. Pius sued for peace, which was granted at Tolentino on the 19th February 1797 ; but on the 28th December of that year, in ariot created by some Italian and French revolution- ists, General Duphot of the French embassy was killed and anew pretext furnished for invasion. General Berthier marched to Rome, entered it unopposed on February 10, 1798, and, proclaiming it a republic, demanded of the pope the renunciation of his temporal authority. Upon his refusal he was taken prisoner, and on February 20th was escorted from the Vatican to Siena, and thence from place to place—in succession to Florence, Parma, Piacenza, Turin, Grenoble, and Valence, where he died six weeks later, on the night of the 28th August 1799. Pius VIL. succeeded him,

The name of Pius VI. is associated with many and often un- popular attempts to revive the splendour of Leo X. in the promo- tion of art and public works,—the words “Munificentia Pii VI. P.M.,” graven in all parts of the city, giving rise amongst his impoverished subjects to such satire as the insertion of a minute loaf in the hands of Pasquin with that inscription beneath it. He is best remembered in connexion with the establishment of the museum of the Vatican, commenced at his suggestion by his predecessor, and with the attempt to drain the Pontine Marshes. In the latter undertaking large sums were expended to such small purpose that the phrase “Sono andate alle paludi Pontine ” passed into a proverb applied to funds employed in extravagant projects. The chief result was the restoration of the Appian Way by the removal of the additions of Trajan and Theodoric with later

PIUS VII. (Gregorio Luigi Barnaba Chiaramonti), pope from 1800 to 1823, was born at Cesena on August 14, 1742. After studying at Ravenna, he entered the Benedictine Inonastery of St Mary in his native town, but was almost immediately sent by his superiors to Padua and to Rome for a further course of studies in theology. He then held various teaching appointments in the colleges of his order at Parma and at Rome. He was created an abbot of his order by Pius VI., who appointed him bishop of Tivoli on the 16th December 1782, and on February 14, 1785, raised him to the cardinalate and the see of Imola. At the death of Pius VI. the conclave met at Venice on the Ist December 1799, with the result that Chiaramonti was declared his successor on March 14, 1800, and crowned on the 21st of that month. In the following July he entered Rome, appointed Cardinal Consalvi secretary of State, and busied himself with administrative reforms. His attention was at once directed to the ecclesiastical anarchy of France, where, apart from the broad schism on the question of submission to the republican constitu- hon, discipline had been so far neglected that a large pro-

portion of the churches were closed, dioceses existed with- out bishops or with more than one, Jansenism and marriage had crept into the ranks of the clergy, and indifference or hostility widely prevailed amongst the people. Encouraged by the intimation through Cardinal Martiniana of Napoleon’s

desire for the re-establishment of the Catholic religion in France, Pius appointed Caselli and Archbishop Spina to arrange a concordat with three nomi- nees of Napoleon—Joseph Bonaparte, Cretet, and the Vendean priest Bernier. Difficulties having arisen, the aid of Consalvi was called in, and the concordat, signed at Paris on July 15th, was ratified by Pius on the 14th August 1801. Its value, however, from the pontifical point of view was considerably lessened by the “Articles Organiques” appended to it by the French Government on the 8th April 1802. In 1804 Napoleon opened negotiations to secure at the pope’s hands his formal con- secration as emperor. After some hesitation Pius was induced to perform the ceremony at Notre Dame and to extend his visit to Paris for four months. He returned to Rome on the 16th May 1805 with many expressions of good will; butin the October following the French troops, in evacuating the kingdom of Naples, suddenly occupied Ancona upon the alleged necessity of protecting the Holy See. Resistance by force was out of the question, but to a requisition from the emperor that all Sardinians, English, Russians, and Swedes should be expelled from the ponti- fical states, and that vessels of all nations at war with France should be excluded from his ports, Pius replied by asserting the independence and neutrality of his realm. After negotiations had dragged on for two years, in the course of which the French occupied the chief Adriatic ports, Civita) Vecchia was seized and the papal troops placed under French officers. On the 2d February 1808 Rome itself was occupied by General Miollis; a month later the provinces of Ancona, Macerata, Fermo, and Urbino were united to the kingdom of Italy, and diploma- tic relations between Napoleon and Rome were broken off ; finally, by a decree issued from Vienna on May 17, 1809, the emperor declared the papal states reunited to France by resumption of the grant of Charlemagne. Pius retali- ated by a bull, drawn up by Fontana and dated June 10, 1809, excommunicating the invaders; and, to prevent insurrection, Miollis—ejther on his own responsibility, as Napoleon afterwards asserted, or by order of the latter— employed General Radet to take possession of the pope’s person, The palace on the Quirinal was broken open during the night of July 5th, and, on the persistent refusal of Pius to renounce his temporal authority, he was carried off, first to Grenoble, thence after an interval to Savona, and in June 1812 to Fontainebleau. There he was induced, on the 25th January 1813, to sign a new concordat, which was published as an imperial decree on the 13th February. On conference with the cardinals,

however, Pius withdrew his concessions and proposed a concordat upon a new basis. At first no attention was paid to this, and, when after the French armies were driven from Germany Napoleon endeavoured to purchase a new concordat by offering to restore the papal possessions south of the Apennines, Pius refused to treat with him from any place other than Rome. The order for his departure thither reached him on the 22d January 1814, and after a brief delay at Cesena he entered Rome on the 24th May 1814. With his states restored to him by the congress of Vienna and freed from the Napoleonic terror, he devoted the remainder of his life to social and ecclesiastic reform in accordance with the modern spirit, suppressing many of the feudal survivals, abolishing torture, reconstituting civil and judicial procedure, and giving effect to many beneficial changes introduced by the French. His long and in many

respects admirable pontificate of more than twenty-three |

years' duration was brought to a close by an accident. His thigh having been broken by a fall in July 1823, acute inflammation supervened, and he died on the 20th August in that year. His successor was Leo XII.

PIUS VILL (Francesco Xaviero Castiglioni), pope, was born at Cingoli near Ancona on November 20, TAGE. After having been appointed bishop of Montalto in 1800, cardinal and bishop of Cesena in 1816, and bishop of Frascati in 1821, he was in 1829 declared successor of Leo XII. His unimportant pontificate was of little more than sufficient duration to enable him to give expression to convictions largely characterized by narrowness and intolerance in his choice of Cardinal Albani as head of affairs, and in his encyclical letter against the liberty of the press, civil marriage, and similar impious institutions. His death took place at Rome on the 30th November 1830. He was succeeded by Gregory XVI.

PIUS IX. (Giovanni Maria Mastai Ferretti), pope from 1846 to 1878, was born 13th May 1792 at Sinigaglia, near Ancona, the fourth son of Count Jerome and the Countess Catherine Vollazi of the same place. The family of Mastai is of ancient descent, and its representatives have frequently filled the office of mayor in Sinigaglia. The title of count was first given to its

head by Prince Farnese, duke of Parma, towards the close of the 17th century. Somewhat later the elder branch, having become allied by marriage with the last representative of the family of Ferretti, assumed its second name. From the age of eleven to sixteen Giovanni received his education at the college of Piarists at Volterra, in Tuscany ; a liability to epileptic fits precluded, however, much application to study. On one occasion, when thus attacked, he fell into a lake and was only saved from drowning by the intervention of a herdsman who observed the occurrence. A handsome lad, with a certain charm of expression and demeanour which characterized him throughout his life, he frequently attracted the attention of visitors to the college. On leaving Volterra, he conceived an attachment for a lady (afterwards a duchess), and the non-requital of his passion is said to have been a main cause of his resolu- tion toenter the church. In 1818 he was invited to accom- pany Monsignor Odescalchi, a prelate attached to the ponti- fical court, ona visitation tour in his native province. On returning to Rome, he was encouraged by Pius VII. to persevere in his design of entering the church, was admit- ted (18th December 1818) to deacon's orders, and cele- brated his first mass at the church of S. Maria del Falignani on Easter Sunday 1819. His benevolent dis- position had led him about this time to interest himself in an orphanage, familiarly known by the name of " Tata Giovanni," and he was now appointed by Pius to preside over the establishment, and continued to fill the post for five years. In 1823 he accompanied the apostolic delegate, Monsignor Muzi, to the republic of Chili, and remained at Santiago for two years, actively engaged in missionary labours. In 1825 he returned to Rome, was made a canon of 8. Maria in the Via Lata, and appointed to preside over the hospice of San Michele,—a vast charitable insti- tution for destitute children. Here he remained somewhat less than two years, being promoted 21st May 1827, by Leo XIL, to the archbishopric of Spoleto. His residence in that city was marked by many acts of benevolence, and especially by the foundation of a large orphanage where poor children were maintained and educated and also taught some mechanical art. Here, as at Rome, his genuine kindliness and conciliatory disposition made him deservedly popular, but his defects were also not less apparent. He had allowed the hospice to become financi- ally embarrassed, and after succeeding to the episcopal

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office showed himself incapable of duly regulating his own expenditure.

During the insurrectionary movements which followed upon the election of Gregory XVI. to the papal chair, headed by Menotti and the two Napoleons —Charles Louis (afterwards emperor of the French) and his brother— Archbishop Mastai did his best to protect the insurgents, He disapproved of the reactionary policy of the new pope, and strongly resented the oppressive rule of the Austrians, When Napoleon (against whom sentence of death had been pronounced) fled to Spoleto, the archbishop, to whom he applied for help, obtained for him the services of an officer who conducted him beyond the frontier to a place of safety. In the following year (1832) he was translated to the bishopric of Imola, and a few years later was elected a cardinal, being reserved im petto in the consistory of 23d December 1839, and proclaimed cardinal 14th December 1840. It was not until overcome by the persuasion of others that Gregory XVI. consented to bestow this dignity on his future successor. He is said to have expressed his conviction that Mastai's liberal tendencies and impulsive disposition unfitted him for power, and that if he should ever become pope he would be the ruin of the church, During the tenure of his bishopric at Imola, Mastai gained additional reputation by the foundation of various philan- thropic institutions and marked simplicity of life.

On the death of Gregory XVI., he repaired to Rome, and on the evening of 16th June 1846 was elected to the papal chair as Pius IX., having chosen this name out of respect for his predecessor in the see of Imola, Pius VIL His election, at the final scrutiny, proved to be unanimous, the cardinals Patrizzi and De Angelis throwing all their influence in his favour. On the following morning, when it was too late, the Austrian ambassador received instruc- tions from his Government to veto the new pope's elec- tion.

Pius's first act in his new capacity was to proclaim a general amnesty for political offences, whereby thousands of unhappy beings who had dragged out weary years in prison or in exile, ignorant, many of them, even of the offences with which they were charged, were restored to society. With genuine catholicity of feeling he visited and relieved even the poor Jewish population in the city. He authorized the construction of railways, organized a civil guard, and considerably modified the restrictions on the press. In

order to develop further reforms he instituted a commission largely composed of laymen; and in 1847 he brought forward his scheme of a Consulta, or council of state, designed to assist him in the general temporal government. But, notwithstanding these concessions, the supreme power remained in the hands of ecclesiastics, and no measure passed by the council could acquire validity until it had been examined and approved in a conclave of cardinals) Hence, although both Mazzinr (g.v.) and Garibaldi were among his avowed supporters, the liberal party were still far from satisfied. His policy was regarded, on the one hand, with extreme dissatisfaction by Austria, and on the 17th July 1847 that power sent a force of 1500 men into Ferrara, where she was entitled by the treaty of 1815 to maintain a garrison. To this direct nienace Pius replied by counter demonstrations and an indignant protest, but hostilities were ultimately averted. His policy was viewed with not less dislike at the court of Naples, but by the rest of Italy and throughout Europe he was at this time regarded as the champion of the national rights of his countrymen. Such was the posture of affairs when the revolution in Paris (February 1848) fanned into flames the already smouldering elements of insurrection throughout Europe. The Austrians were driven out of Milan; a republic was proclaimed in Venice

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(see Irany, vol. xili. pp. 488-89); and a “free Italy” became the general cry. At first Pius, who felt but little sympathy with the views represented by the son of Philippe Egalité, seemed disposed to head the movement. He dismissed his state-secretary, Gizzi, an irresolute and timorous politician, and appointed Cardinal Ferretti in his place. On 14th March 1848 appeared the Statuto Londa- mentale, 2 more complete scheme for the reorganization of the temporal government of the papal states. By this two deliberative assemblies were created,—the first, the high council, the members of which were to be nominated by the pope himself for life ; the second, the council of depu- ties, to be elected by the people, and to be entrusted with the chief voice in all questions relating to taxation. Over both these bodies, hovrever, the college of cardinals retained the supreme authority ; without its consent no measure could acquire legal validity. Liberty of the press was promised, but the ecclesiastical censorship was to be retained. A new ministry was

formed, which, with two exceptions (Antonelli and Morichini), was composed of laymen. But at this juncture Pius began to waver. Although he had hitherto shown no sympathy with the Jesuits, he endeavoured to protect them against the measures now brought forward with a view to their expul- sion, and when his general, Durando, crossed the Po with- out his orders, and denounced the Austrians as " the enemies of the cross of Christ," he disowned, in an allocu- tion (29th April), all intention of participating in an offen- sive war for the purpose of rectifying the boundaries of Italy, and at the same time disavowed all complicity in the schemes then in agitation for creating an Italian federal republic, with himself as the nominal head. This apparent desertion of the national cause, at a time when the public mind had been roused to the highest pitch of excitement by the course of events at other centres, created an irreparable breach between Pius and the people. His new chief minister, Mamiani, who wished to see him a constitutional monarch, advocated further concessions— the handing over of the political government to the new assemblies and a responsible ministry. But after the Austrian successes in the north and Radetsky's entry into Milan (5th August), Mamiani was dismissed, and his place was filled by Count Rossi, the French ambassador, a states- man of signal ability and intrepid character, but of conser- vative views. On the 15th November 1848, as Rossi was alighting at the steps of the house of assembly, he was assassinated in broad daylight. It was an ominous symptom of the prevailing temper of the capital that this atrocious act elicited no expression of disapproval in the assembly, and drew forth no marks of sympathy with the victim's family. Two days later a numerous mob, largely composed of disbanded soldiers, assembled in the square of the Quirinal, and' proffered fresh demands, at the same time intimating their intention, if these were not conceded, of commencing a general massacre of the inmates, excepting only the pope himself. After his secretary, Palma, had been shot by a bullet, Pius, in order to avert further bloodshed, made the requisite concessions, and assented to the formation of a new ministry, while he him- self was made a virtual prisoner. On the 24th November he effected his escape, with the connivance of the French Government, to Gaeta, disguised as a dependant of Count Spaur, the Bavarian minister. Thus terminated what has been described as "the first and only attempt of a pope to govern in a liberal spirit."

_ From Gaeta he published a formal protest against the to which he had been subjected, and whereby his atest enactments had been extorted from him, at the a time declaring all measures decreed in Rome during

S$ absence null and void. Gioberti, the Sardinian

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minister, endeavoured without success to gain his concur- rence in a new scheme for the formation of an Italian federation of princes. In the following February it was resolved in a consistory of cardinals to appeal to the chief Catholic powers (France, Austria, Spain, and Naples) for their aid in bringing about the re-establishment of the temporal sovereignty. About the same time (3d February 1849), as if to mark his undisturbed sense of his spiritual supremacy, Pius himself addressed an encyclic to the superior Catholic clergy throughout the world, enjoining that on appointed days of the year the doctrine of the Immaculate Conception B: V.M. should be preached through- out their dioceses. The decisive defeat of the Sardinian forces at Novara by Radetsky (23d March 1849) encouraged the papal party now to demand that Pius should be rein- stated at Rome without any conditions being attached to his restoration. This demand created a divergence of opinion among the above-named powers; eventually General Oudinot landed at Civita Vecchia with 10,000 French soldiers, and De Tocqueville, the French minister for foreign affairs, sought to induce Pius to resume his sovereignty on the basis of the Statuto Fondamentale. This he resolutely refused to do, and after the occupation of Rome by Oudinot’s forces he was permitted to return (12th April 1850) unfettered by any condition whatever. Pius returned an altered man in relation to his state policy, in which, in fact, he was from this time guided almost entirely by Antonelli. A certain profession of a design to reform abuses was indeed made, but the former ecclesiastical ascendency in the government was re-estab- lished, while the pope entered into the closest relations with the Jesuit party. Notwithstanding his specious dis- claimers of any desire to take revenge for the past, the Documenti Oficiali, published in 1860, prove that little mercy was shown to those who were suspected of disaffec- tion. As, however, the continuance of the French occupa- tion relieved him from any anxiety with respect to the maintenance of order, Pius was enabled to

devote his attention chiefly to the objects which undoubtedly lay nearest to his heart,—the more complete definition of Roman dogma and the enhancement of the prerogatives of his office. In this direction his views had never been characterized by any liberality, as is sufficiently shown by his encyclic of 9th November 1846, his letter to the arch- bishop of Cologne (3d July 1847), and his allocution of 17th December 1847, in which all the modern tendencies to a more philosophic interpretation of doctrine are visited with unqualified condemnation. He now proceeded skilfully to avail himself of the reaction that began to set in, especially in Germany and in England, after the repression of the revolutionary movements, by taking, as the burden of his allocutions, the essential connexion between political innovation and freedom of scientific or religious thought. The activity of the Jesuits was studiously encouraged ; the " beatification " of several eminent deceased members of their order was proclaimed ; and lives of the saints, full of marvellous and legendary incidents, were widely circulated among the poorer laity. A combination of circumstances, at this period, largely contributed to the success of these efforts both in Europe and in America. By the bull "Tneffabilis Deus" (8th December 1854) the doctrine of the immaculate conception was formally "defined," as a dogma binding on the acceptance of all the faithful, and in pamphlets favourable to the assumptions of the curia it was pointed out that the supreme pontiff had . thus defined the doctrine without recourse to any council. In 1862 the canonization of six hundred and twenty mission- aries, who had met with martyrdom in Japan some two centuries and a half before, was made the occasion of an imposing ceremonial. Ina letter (11th December 1862) to

the archbishop of Munich, the teaching of Frohschammer, a distinguished professor of philosophy in the university in that city, was singled out for severe reprobation. — The famous encylic Quanta cura, and the Syllabus, or list of prevalent errors calling for especial reprobation, appeared in December 1864.

The war between France and Austria and the treaty of Villafranca (8th July 1859; see Iraty, vol. xii. p. 490) seemed at one time likely to result in placing the temporal power on a basis somewhat resembling that indicated

in Gioberti's pamphlet of 1843, and the ultramontane party waited with lively expectation the assembling of the congress. Among the inhabitants of the Romagna them- selves, however, discontent with the political administra- tion was intense. The papal rule had become almost as oppressive as that at Naples; and the prisons of Rome were filled with inmates against whom no more definite charge could be brought than that of suspected disaffection towards the Government. The manner in which the currency had been tampered with was alone sufficient to produce the gravest discontent, and the lira papalina was eventually accepted at the money-changers' only at a heavy loss to the holder. When, in the spring of 1857, Pius visited central Italy, it was observed that, while in other provinces he was greeted with enthusiasm as the pope, in his own dominions he was received with sullen coldness. A pamphlet published at Paris in December 1859 (ascribed to imperial inspiration), after describing the condition of the Romagna, openly raised the question of the continuance of the temporal power, and suggested that it would at least be desirable that it should be restricted to the capital itself. Pius replied in an encylic issued on the 19th of the ensuing January—a document since widely known as his Von Possumus. His obstinacy proved of no avail. The Romagna was occupied by Sardinia, and the Central-Italian states shortly afterwards formed themselves into a league to prevent its reoccupa- tion by the pontifical forces. Antonelli rejoined by raising a motley force, composed of French, Belgians, Bavarians, and Irish, who were placed under the command of Lamori- ciére, an able French odficer who had seen active service in Algiers. There can be no doubt that, in making this apparently hopeless effort, the curia was deluded by the belief that, if matters proceeded to extremities, France would intervene in its behalf. After a stubborn resistance at Ancona, the superior forces of Sardinia prevailed, and in September 1860 the whole of the States of the Church, with the exception of the patrimonium Petri(see PopEDoM), were annexed to the kingdom of Victor Emmanuel.

From the reduction of Ancona to the year 1870 Pius was maintained in Rome only by a French garrison. The emperor of the French was reluctant to appear altogether to desert the papal cause, while Cavour was unwilling, in like manner, to proceed to extremities. After the capture of Garibaldi at Aspromonte, however, Victor Emmanuel felt himself strong enough to put

in a formal claim for Rome; and it was eventually arranged, by the convention of 15th September 1864, that the French should withdraw from the city before the end of 1866. This stipulation was duly observed, and on the 11th December 1866 the last of the French forces quitted the capital. The engagement was, however, virtually violated by the entry, in the following year, of the Antibes legion, and for some time longer the French soldiery continued to ward off both the daring assaults of Garibaldi and the more insidious approaches of Ratazzi, In this manner, at the outbreak of the war of 1870, France had come again to be looked upon as the ally of the papacy; and the overweening claims put forward by Pius in convening a general council to proclaim the dogma of Papal Infallibility were generally

interpreted as in a certain sense correlative with the aggressive designs of France on Protestant Germany. The dogma was decreed in the Vatican on the 18th July, but not without strenuous opposition on the part of some of the most distinguished members of the Catholic episcopal order, who, at the same time, were staunch supporters of the temporal power (see OLD CaTuotics). At nearly the same time the occupation by the French came definitively to an end. ‘Their forces were withdrawn from Civita Vecchia at the outbreak of the war, when the Duc de Gramont announced that his Government relied on the convention of 1864, whereby Italy was bound not to attack the papal territory. That territory being now, however, again exposed to the dangers of revolution, Victor Emmanuel, on receiving the tidings of the battle of Gravelotte, notified to Pius that “the responsibility of maintaining order in the peninsula and the security of the Holy See” had devolved upon himself, and that his army must enter the pontifical dominions. This intimation was received by Pius with demonstrations of the liveliest indignation, but the appearance of the Sardinian troops was hailed by his own subjects with enthusiasm. On arriving outside Rome, General Cadorna summoned the garrison to sur render, and after a short bombardment the white flag was hoisted. On the following day (21st September 1870) the Zouaves, some nine thousand in number, after

receiving, as they stood massed in the square of St Peter's, the pontifical blessing, marched out of Rome, and the temporal power of the pope had ceased to exist.

For the rest of his days Pius IX. remained unmolested at the Vatican, while the king resided at the Quirinal. The pontiff was virtually a prisoner; and his position, although viewed with comparative indifference in Rome, was regarded with nota little sympathy by the Catholic world at large. The tribute of Peter's Pence was revived in order to supply, in some measure, the loss of his alien- ated revenues ; and numerous pilgrimages, in which dis- tinguished and wealthy individuals took part, were made to St Peter's from all parts of Catholic Christendom, and especially from England. His advanced years, fine pre- sence, dignified demeanour, and elasticity of spirits (unbroken by his adverse fortunes) combined to invest both the person and the office of the pope with a kind of fascination for devout minds, which those about him well understood how to turn to the best advantage. Occasion- ally, however, his naturally impetuous temper still mani- fested itself. The complicity of the Roman Catholic

clergy with the Polish insurrection of 1863 had been.

punished by Russia with excessive rigour, and, on receiving the Russian deputies who came to offer the customary felicitations on New Year's Day 1866, Pius so far forgot the proprieties of the occasion as to himself address them in terms of reproach. A suspension of diplomatic relations ensued; and Russia now eagerly availed herself of the pretext afforded by the promulgation of the new dogmas to aim a severe blow at Roman Catholic influence within her dominions, by annexing to the Russian Church the bishopric of Chelm, with a population of over 300,000 souls. Pius showed his resentment by espousing the side of Turkey in the struggle of that country with the Russian power. On the 3d June 1877 he celebrated the fiftieth anniversary of his consecration to the archbishopric of Spoleto, and the event was made singularly memorable by the spectacle of numerous deputations, bearing costly offerings, from all parts of the world. Pius died on the Sth of the following February, and was succeeded by Cardinal Pecchi as Leo XIII.

The life of Pius has been written by the late J. F. Maguire

(2d ed., 1878), and by Leopold Wappmannsperger, Leben wnd Wirken des Papstes Pius des Newnten (Ratisbon, 1878). Both

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authors write from the ultramontane point of view, but the latter much more in detail, giving original documents and information respecting events subsequent to 1870 not to be found in English sources. Nippold's Handbuch der newesten Kirchengeschichte, vol. ii., supplies an outline of the papal policy in connexion with other contemporaneous religious movements ; and a concise but more impartial skctch will be found in Ranke, Die rémischen Pépste (7th ed.), ii. 162-208. The literature connected with the Vatican Council is given under OLD CATHOLICS. (J. B. M.)

PIZARRO, Francisco (c. 1471-1541), discoverer of Peru, and the principal hero of its conquest, born at Truxillo in Estremadura, Spain, about the year 1471, was an illegitimate son of Gonzalo Pizarro, who as colonél of infantry afterwards served in Italy under Gonsalvo de Cor- dova, and in Navarre, with some distinction. Of Pizarro's early years hardly anything is known ; but he appears to have been only poorly cared for, and his education was cer- tainly neglected. Shortly after the news of the discovery of the New World had reached Spain he was in Seville, and thence found his way across the Atlantic ; there he is first heard of in 1510 as having taken part in an expedi- tion from Hispaniola to Urabé under Alonzo de Ojeda, by whom, in his absence, he was entrusted with the charge of the unfortunate settlement at San Sebastian. Afterwards he accompanied Balboa to Darien; and under Balboa's suc- cessor, Pedrarias, he received a "'repartimento," and be- came a cattle farmer at Panama, where in 1522 he entered into a partnership with a priest named Hernando de Luque and a soldier named Diego de Almagro for purposes of ex- ploration and conquest towards the south. An expedition along the coast of New Granada (November 1524) was unfortunate, but supplied various confirmations of

rumours previously heard as to the existence of a great and opulent empire farther to the south. On March 10, 1526, Pizarro, Almagro, and Luque renewed their compact, but in a much more solemn and explicit manner, to conquer and divide equally among themselves this empire still undis- covered, and Pizarro and Almagro, with a force of about one hundred and sixty men, again sailed from Panama. The force was too small to effect much at the time, and was at length recalled by the governor, but Pizarro was not to be shaken, and, though he was left for months with but thirteen followers on a small island without ship or Stores, persisted in his enterprise till at length he had coasted as far as to about 9° S. lat., and obtained distinct accounts of the Peruvian empire. The governor still show- ing little disposition to encourage the adventurers, Pizarro resolved to apply to the sovereign in person for help, and with this object sailed from Panama for Spain in the spring of 1528, reaching Seville in early summer. After long and tedious delays, the queen, in Charles's absence, executed at Toledo on 26th July 1529 the famous capitu- lacion by which Pizarro was upon certain conditions made governor and captain-general of the province of " New Castile" for the distance of 200 leagues along the newly discovered coast, and invested with all the authority and prerogatives of a viceroy. One of the conditions of the grant was that within six months he should raise a sufii- ciently equipped force of two hundred and fifty men, of Whom one hundred might be drawn from the colonies ; but this he had some difficulty in fulfilling. Sailing from San Lucar clandestinely (for his due complement was not yet made up) in January 1530, Pizarro was afterwards Jomed by his brother Hernando with the remaining vessels, and When the expedition left Panama in January of the following year it numbered three ships, one hundred and eighty men, and twenty-seven horses. A footing was established on the mainland at Tumbez, whence Pizarro Set out for the interior in May 1532. San Miguel de Piura was founded a few wecks afterwards, and Caxamarca entered on November 15th. The subsequent movements

of Pizarro belong to the history of Prrv (see vol. xviii. p. 677; and, for authorities, comp. p. 679).

PLAGUE (Aounds, Pestes, Pestilentia). This name has been given to any epidemic disease causing a great mortality, and in this sense was used by Galen and the ancient medical writers, but is now confined to a special disease, otherwise called Oriental, Levantine, or Bubonic Plague, which may be shortly defined as a specific febrile disease, transmissible from the sick to healthy persons, accompanied usually by buboes and sometimes by car- buncles. This definition excludes many of the celebrated pestilences recorded in history,—such as the plague of Athens, described by Thucydides ; that not less celebrated one which occurred in the reign of Marcus Aurelius and spread over nearly the whole of the Roman world (164— 180 a.p.),! which is referred to, though not fully described, by the contemporary pen of Galen; and that of the 3d century (about 253), the symptoms of which are known from the allusions of St Cyprian (Sermo de Mortalitate). There is a certain resemblance between all these, but they were very different from Oriental plague.

Symptoms.—There are two chief forms :—(1) mild plague, pestis minor, larval plague (Radcliffe), peste fruste, in which the special symptoms are accompanied by little fever or general disturbance ; and (2) ordinary epidemic or severe plague, pestis major, in which the general disturb- ance is very severe. Cases which are rapidly fatal from the general disturbance without marked local symp- toms have been distinguished as fulniinant plague (pestis siderans, peste foudroyante).

1. In the minor form of the disease spontaneous swellings of the glands occur, chiefly in groins and arm- pits, but also in neck or other parts, which either undergo resolution or suppurate. There is a certain amount of fever ; the temperature is rarely high, but has been known to be 104° Fahr. The duration of the disease is ten to twenty days usually, but may be eight weeks, for most of which time the general health is little impaired and the patient able to go about as usual. It rarely, if ever, causes death, the only fatal case at Astrakhan in 1877 having been so through a complication. The disease is not obviously contagious; whether it is propagated by infection or not is unknown. It is possibly rather of a miasmatic character. This form of disease has sometimes preceded or followed severe epidemics, as in Mesopotamia (Irak) on several occasions, 1873-78, and in Astrakhan, 1877;

its importance in relation to the origin of plague has only lately been appreciated.”

It might be expected that gradations would be found connecting this form with the severe epidemic form ; but this appears to be not usually the case, the latter form appearing somewhat suddenly and abruptly. Hence the minor form has probably often been regarded as a distinct disease, even when observed in plague countries.

2. As regards pestis major, or severe plague, the symp- toms appear to have been nearly the same in all great epidemics for several centuries, if not for two thousand years, but will be best given from modern observations, such as those of Surgeon-Major Colvill, Dr Cabiadis, and others in Irak, and recent observers in India. The early symptoms are sometimes like those of ague (shivers, often long continued, and pains in the limbs), but combined with nervous symptoms. The patient becomes distracted, tosses about in constant fear of something he cannot describe,

1 Amm. Marcell., xxiii. 7; see Hecker, De Peste Antoniana, Berlin, 1835.

2 Payne, Trans. Epidem. Soc. of Lond., iv. 862; Tholozan, La Peste en Turquie, Paris, 1880; J. N. Radcliffe, Report of Local Government Board, 1879-80 (Supplement, pp. 24, 49), and article “Plague,” in Quain’s Dictionary of Medicine, London, 1882.

has a difficulty in understanding the questions put to him, |

and is slow in answering. He is often described as staggering like a drunken man. There is severe head- ache, intense thirst, and severe pain in the epigastrium. The eyes are red and turbid; the tongue swollen, dry, and fissured, sometimes black, sometimes remarkably white (Colvill). This condition may pass into coma even before fever sets in. In other cases bilious vomiting is the earliest symptom. The fever which sets in may last twenty-four to thirty hours, or more. The temperature may be 100° to 107° Fahr., or even higher; but in the most rapidly fatal cases there may be little or no fever. Generally there is obstinate constipation, but sometimes

diarrhoea. Besides these symptoms there are certain special ones especially characteristic of plague.

(a) Buboes or glandular swellings are observed in all except very rapidly fatal cases. They occur in 45 or 50 per cent. of the cases in the groin, in 35 per cent. in the axilla, also less frequently in the neck or other parts. These swellings may occur before the fever, simultaneously with it, or some hours after it has set in. A sudden pain like that of a stab is felt in some region of the body, which has given rise to the superstition that the unfor- tunate victim was wounded by the arrow of an invisible demon,—a belief recorded in Constantinople in the 6th century, and said still to survive in Mohammedan coun- tries. ‘The buboes may suppurate, and free discharge of matter from them has in all times been held to be a favourable sign and conducive to recovery.

(6) Carbuncles were observed in about 24 or 3 per cent. of the cases in recent epidemics in Irak. They are always an unfavourable sign.

(c) Petechiee or hemorrhagic spots on the skin have always been regarded as signs of the worst omen. Under the name of “tokens” they were considered in the English epidemics of the 16th century as the infallible signs of approaching death. “They appear generally only a few hours before death” (Colvill). Hodges (1665) noticed hard- ness which showed the existence of hemorrhage under the skin. The skin is sometimes so covered with petechiz as to become of a dark livid hue after death, recalling the name Black Death (Cabiadis).

The occurrence of the above symptoms, especially the first, in an idiopathic fever attacking many persons at one time is sufficient to make the diagnosis of plague.

A very notable and fatal form of the disease is that in which hemorrhages from the lungs, stomach, bowels, nose, &., occur. These are of the worst omen, and are seen in some cases where there are no buboes, and which are rapidly fatal. This was observed in Irak in recent epidemics, in the outbreak on the Volga in 1878-79, and in the plague of India. It was a noticeable symptom in the black death, and was observed even in the plague of the 6th century. The bleeding is mostly from the lungs, and is sometimes associated

with other symptoms of -lung affection. This form of the disease appears, however, to have no distinct historical or geographical limit. A similar hemorrhagic form has been observed in small-pox and scarlet fever, and is always extremely fatal.

In all plague epidemics cases occur in which death takes place very rapidly, even within twenty-four hours, without the development of the special symptoms of the disease. Such cases are reported by Diemerbroek, Hodges, and others in the 17th century, and have been observed in recent epidemics in Irak, as well as in the recent plague on the Volga. Some are more like cases of poisoning than ea or eee which are met with f fi eae” oe poisoning) ae ¢ rom time to time. It is these which

given rise to the expression fulminant plague.

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Duration.— The duration of an attack of plague may be from some hours to a month. Three-fifths of the cases observed by Mr Colvill were fatal on the third day, and the majority of cases in India had the same termination (Francis). Five-sixths of fatal cases end by the fifth day, Most of those who survive the fifth day get well; after the seventh day a patient in Baghdad was considered by his friends safe; and in Mr Colvill’s cases only 4 per cent. of fatal cases died after the tenth day. In non-fatal cases with suppurating buboes the disease may be protracted to two or three weeks or a month.)

Mortality.—Plague is the most fatal of all known diseases which affect large numbers of people. The mortality, according to official registers in Baghdad, was 55-7 per cent. of those attacked. Dr Cabiadis thinks this too high, owing to many cases of recovery not being re- ported. But in some epidemics the proportion of fatal cases is much higher. In Vetlanka it was about 90 per cent., and in some other villages on the Volga every person who took the disease died. The older accounts do not give the proportion of deaths and attacks.

Morbid Anatomy.—Examinations after death have not done much to elucidate the nature of plague, except nega- tively. The appearances are those of death from an acute infective disease, and resemble those of typhus, except for the special affection of the lymphatic glands. The brain and the lungs are found to contain excess of blood; the right side of the heart distended, the blood dark- coloured and undergoing rapid decomposition! The spleen is found enlarged, and in a less degree the liver. The stomach and intestinal canal often show signs of inflam- mation and hemorrhage, sometimes ulceration, The characteristic swelling of the lymphatic glands, both ex- ternal and internal, is often accompanied by inflammation of the cellular tissue around. Petechial patches are some- times found on the internal organs.?

Pathology of Plague.—All that is known of plague goes to show that it isa specific febrile disease depending on the reception into the body of a specific organic contagion, which becomes multiplied in the body of the patient. Analogy makes it very probable that this contagion isa living organism of the class Bacteria, but the suspected organism has not yet been discovered. The nearest ally of plague is typhus fever, so that some authorities have spoken of it as the typhus of hot climates, modified by temperature, &c., but this opinion does not appear to have ever been held by any competent physician who has examined the disease at first hand. It appears to be as distinct from typhus as this is from enteric fever, or other so-called typhoid diseases. It has also been thought that plague is related to intermittent or remittent malarious fevers ; but the most recent observations show that there is no real connexion between these diseases. In India, says Dr Francis, neither intermission nor remission has ever been observed in plague. It is quite distinct from and in no way modified by the types of fever that are caused by malaria. Dr Cabiadis speaks to the same effect of: plague in Irak, and insists that the physical conditions which favour the production of marsh poison are not necessarily favourable to plague.

External Conditions of Plague.—The nature of the soil OI EBS = LL

1 This post-mortem decomposition of the blood is doubtless the cause of some appearances described with great particularity in the older accounts.

2 Onr knowledge of the morbid anatomy of plague is derived almost entirely from the observation of the French physicians in Egypt dumng the epidemic in 1835-36. Earlier observations are of no value, and in later epidemics of Irak and Russia none have been made. In India Drs Pearson and Francis made a few autopsies. Clot-Bey, De la Peste en Egypte, Paris, 1840; Bulard, De la Peste Orientale, Paris, 1889; Francis, Indian Annals of Medical Science, vol. i., 1854.

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has little influence on plague. It may flourish in alluvial deltas, on calcareous ridges or granitic mountains. Moisture in the soil has generally been thought to be an important factor in its production, but, though often found in marsh situations, such as the banks of the Nile, the Euphrates, or even the Volga, it also occurs in India at elevations approaching 7000 feet, and in Kurdistan at 5000 to 6000 feet above the sea.

The temperature most favourable to plague is a moder- ately high one. ‘The disease is unknown in the tropics. When prevalent in Egypt it was said never to penetrate farther south than Assouan. It has not crossed the plains of India within historic times. Where the disease does occur, a temperature of 80° to 85° or more, combined with absence of moisture, usually stops the epidemic. In Egypt it was observed to cease as an epidemic almost suddenly about the 22d to 24th of June, and not to begin again till September. In Irak it dies out suddenly during the summer. When the temperature rises above 86° it begins to diminish; and it ceases abruptly at a temperature of 113°. In India it has been observed by Dr Francis when the temperature of his tent was 83° to 95°, or ina grass hut to 105°, while the air was moist ; but he thinks a lower temperature with dryness renders the poison inert.

On the other hand, in northern countries, the disease is usually checked by the cold of winter, starts up in the spring, and is most active in August and September. To this rule there have been some remarkable exceptions, such as the epidemic on the Volga in 1878-79, which raged during severe winter weather, and the great plague of Moscow in 1770.

Samtary Conditions.—Of all the co-operating causes of the plague, wncleanliness is the most powerful,—meaning by this the accumulation of

decaying animal matter around human bodies or dwellings. The saturation of the soil with filth is perhaps the most important point. A plague seat in Mesopotamia is thus described by Colvill :—“ The ground is so saturated with moisture that the refuse of the village is neither absorbed nor evaporated, but acquires the form of a bluish-black oily fluid, which sur- rounds the huts and covers the paths, and stains the walls 2 feet from the ground ; and in fact the village is in such a state of filth that it requires to be seen to be believed.” Of the people among whom the Pali plague of India taged it is said “they were filthy beyond conception ” (Francis), There can be little doubt that European cities in the Middle Ages, and down to the 17th century, presented very similar conditions. These conditions may be con- sidered to act by supplying a suitable environment for the life and growth of the organized poison (or bacterium) outside the human body. Where these are wanting one of the main factors in the spread and permanence of the disease will be absent, a fact which makes it probable that Increased cleanliness is the chief cause of the disappearance of plague from Europe.

_ Overcrowded dwellings, especially with deficient ventila- tion, greatly favour the spread of the disease ; but this is not necessarily correlative with density of population, and plague may flourish in thinly-peopled countries.

Of social conditions poverty has by far the most power- y influence on the spread and development of plague. Many plague epidemics have followed on years of famine, 7 been connected with destruction of crops and cattle. = among which the disease is endemic are almost an a exception under- nourished, if not destitute. In 1879 aa oa the Volga there appeared to the writer, in ane 0 be little destitution, though the diet of the people i. a In all city epidemics the poor are the Ba – almost the only sufferers. This is as true of

ghdad in the 19th century as it was of London in the

| 17th. Those of the upper classes who have been attacked have been chiefly doctors, clergy, officials, and others whose occupations take them among the sick.

Origin and Spread of Plague.—Although the above- mentioned conditions are those in which plague originates, and may be considered in a general way essential to its continued existence, it is plain that they do not account for its origin. Poverty, overcrowding, filth, and marsh soil, with a temperature suited to plague, occur in many parts of the world where this disease has never been heard of or has ceased to exist. The geographical distribution of diseases cannot, any more than the distribution of plants or animals, be explained by climatic causes alone. With regard to plague it is quite clear that there are some parts of the world where it is at home, or, as the phrase is, “endemic.” In other parts it is probable (or, as some think, certain) that its existence, and even its periodical recur- rence, depend on importation from an endemic centre. Although it is not always easy to distinguish between these cases, they must be considered separately.

In the case of an endemic disease we suppose that the poison is either kept in existence by continued transmission from one case to another, or that it can subsist outside the human body in soil, water, or otherwise. The first mode of existence is that of a pure contagious disease, such as small-pox; and it is plain that this mode of continued existence obtains in the case of plague also. It is not,

however, clear that the second may not also be one of the modes of existence of plague, which would then be a so- called “miasmatic” disease like ague, as well as a conta- gious one. In India, for instance, the disease appears as if it depended on a poison in the soil, since it returns years after to the same spot, appearing in many villages simul- taneously ; and some morbid influence causes the death of animals (rats) which live under ground. Similar facts have been observed in China; and, if further inquiry should confirm the hypothesis, it would show that plague is (like anthrax or the “steppe murrain” of cattle) both miasmatic and contagious. If so, there is no difficulty in supposing the disease to be carried by contagion to a distant part, and there to be established in the soil, for a longer or shorter period, as the conditions are more or less favourable. The adoption of this hypothesis would remove many of the difficulties attending the explanation of plague epidemics, and to some extent reconcile the contro- versies of the last three centuries between the “ contagi- onist” and “non-contagionist” schools. It has been maintained by the former that European epidemics have

always been caused by the importation of the disease from its home in the East, by the latter that it arose on European soil in the sanie way as in Egypt or Syria.

In the case of an imported non-endemic disease, the only question which arises is how the importation is effected,—whether the disease may be brought by the air alone, whether by infected persons only, or whether also by objects which have been in close relation to infected persons, Transmission of the disease by the air cannot be pronounced impossible ; and there are facts to show that it is even probable with distances measured by yards, or possibly even hundreds of yards; but there is no evidence whatever that the disease has ever been carried by the air over distances measured by miles. Transmission of the disease by infected persons over longer or shorter distances, and from one country to another, is an established fact. Transmission by infected objects over great distances and from one country to another seems less clearly established. The last two cases must be separately considered.

1. It is clear that the first necessary condition to such transmission is contagion, or transference of the disease from the sick to the healthy. The existence of contagion

is shown by such facts as these -—when a case of plague breaks out in a house the other inmates are extremely likely to take the disease ; and even in severe forms the plague does not cease till it has affected all or nearly all the household. This is indisputably an almost universal law. In the plague of London in 1603 it was said the disease entered hardly any house but it seized all that lived in it. And in 1879, on the Volga, in one village, as was ascertained by Mr Oolvill and the present writer, the plague attacked five houses containing thirty-three persons, all of whom except two took the disease and died. In this respect plague resembles typhus. In the next place the disease will spread from an infected house to persons who have close relations with it. Thus in the villages on the Volga it was noticed that after one family was affected cousins and relations by marriage were the next to

be attacked. Doctors and those visiting the house are also exposed to the risk, though in a less degree. | In Vetlanka on the Volga three physicians and six surgical assistants died. On the other hand, doctors in some instances have singularly escaped from being attacked by the disease. In Egypt, in 1835, out of ten French physicians engaged one only died, nor was this immunity secured by any precautions. These experiences do not prove that the disease is not contagious, but they modify the ex- aggerated notions which have been held on the subject. The facts appear to be expressed by saying that it may undoubtedly be communicated from one person to another, but chiefly by breathing the air of the sick room, and this generally from prolonged not from momentary exposure,— so that the possibility of communication by chance meet- ings and similar contingencies may be disregarded. This view is that of Dr Cabiadis and others who have studied plague in Irak where no doctor or assistant, with one exception, suffered from the disease. It is not inconsist- ent with the experience recorded in Egypt. But it is clear that the intensity of contagion varies greatly in different epidemics. Modern experience contradicts the belief formerly entertained that contact with plague patients was the only or even the chief means of acquiring the disease. Everything tends to show that the atmo- sphere immediately surrounding the patient is the most effectual conveyer of contagion, and more effectual in pro- portion as the poison is concentrated. Precisely the same relations are observed with regard to typhus.

It has been disputed whether dead bodies convey infec- tion of plague. Formerly the contagion from this source was greatly dreaded, and the task of burying thought to be specially dangerous. But the French in Egypt made more than a hundred post-mortem examinations without precautions and without harm. In Mesopotamia and in Russia no autopsies were made, but in the latter country some striking instances were noted of those engaged in burying the dead themselves dying of the plague. On the whole both facts and analogy lead to the belief that the disease may be derived from touching or being near a dead body, but not that there is any special danger of infection from this source.

2. It is a very momentous question whether the con- tagion is capable of being conveyed by clothes and other objects which have been in contact

with the sick. The very general belief that this is so has been controverted only by the French physicians in Egypt, one of whom, Bulard, himself wore a shirt, taken direct from the body of a plague patient, for two days. They also state that in Egypt it was customary, when a plague epidemic was over, to sell the clothes and effects of those who had died of plague, without, as is affirmed, communicating the dis- ease. In Constantinople they were customarily sold at once ; and it is alleged that the dealers in old clothes did

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not specially suffer. In 1835 the hospital at Cairo, where 3000 plague patients had been treated, was used, without even changing the bed coverings, immediately after the epidemic for other patients, without harm. Negative instances of this kind might be multiplied, but their im- portance is diminished by the consideration that the communicability of plague, by whatever means, is always found to become spontaneously weak at the decline of the epidemic, till it is extinct altogether. While the epidemic influence lasts there is abundant evidence that infected clothes, &c., are among the means by which the disease spreads. In Egypt, in 1835, two criminals con- demned to death were for the sake of experiment placed in the clothes and beds of those who had died of plague, and both took the disease, one dying. Instances are given by White (Zreatise on the Plague, p. 161, London, 1847) of the disease spreading "'like wildfire" through the dis- tribution of infected garments, and of those engaged in disinfecting clothes and other objects being suddenly seized with the complaint, ¢.g., on opening a box containing infected garments. While the reality of this mode of com- munication cannot reasonably be doubted, it admits of some question whether the plague has ever been thus con- veyed over great distances, or from one country to another. The best known instance in England is the alleged trans- mission of plague from London to the village of Eyam in Derbyshire in 1665 by an infected parcel of clothes,—a story which cannot be criticized at this distance of time, but which presents some weak points.!_ Dr Cabiadis states that he has seen plague thus conveyed in Irak to places outside the existing focus of infection, but gives no details. On the whole we must consider the exportation of plague by clothes over great distances, and into countries not subject to the same epidemic conditions as the infected country, '" not proven."

The communication of plague by merchandise or objects not personal, coming from an infected country, rests upon still more defective evidence, though at one time generally believed. In virtue of this belief all goods, especially those regarded as susceptible (as wool, furs, raw cotton, &e.), were, when coming from an infected or suspected country, subjected to disinfection under special regula- tions. But there is really no evidence that plague was ever thus transmitted or that these regulations kept it out. On the contrary there are numberless instances of this supposed cause having failed to operate when it might have been most expected to do so.

During the plague at Alexandria in 1835, which destroyed 9000 persons in that city, the exportation of cotton from the Government warehouses was never inter- rupted, though the plague was most destructive in those very buildings. It was loaded on English and other ships without any precautions whatever. Twenty-five ships, eight of which were infected with plague, conveyed cotton amounting to 31,000 bales to England. Nevertheless n0 case of plague is known to have occurred among the quarantine officers or others engaged in unloading these ships or disinfecting their cargoes in quarantine. Equally large quantities were exported to Marseilles and Trieste, and smaller quantities to other ports, with the same result. Further, no case of infection has occurred among quaran- tine officers or persons employed to disinfect goods, from this cause alone, either at Marseilles since 1720, or at any European lazaretto.2 The conclusion is that the fear 0 importation of plague by merchandise coming from an infected country rests on no solid foundation. :

By whatever means, there is no doubt that plague 6 en —

1 See W. Wood, History of Eyam, London, 1848. 2 Laidlaw, quoted in Prus, Rapport, p. 479.

diffused or “spreads” from one place to another, and that its spread is connected mediately or immediately, in most cases at least, with human intercourse. But this diffusion appears to take place as a rule slowly, and to

be effected by the formation of new foci of contaminated atmosphere. Such foci on land will be inhabited houses, and the disease will creep in a gradual though irregular manner from house to house and street to street. It was so in London in 1665; and in Russia in 1878, as has been said, the disease was confined to one village for two months, though for great part of the time communication was perfectly open. In 1834 plague existed eight months at Alexandria before passing to Damietta and Mansoorah, though traffic was quite uninterrupted. These new foci of disease are doubt-

less mostly produced by persons infected with the disease, | actually or in incubation, who form a contaminated atmo- |

sphere around them in a place previously healthy. Transmission of the disease by sea may take place in the same manner,—a ship forming a focus of disease as easily as a house, and being obviously specially liable to concen- trate the poison. It is by a floating atmosphere of plague,

and not by casual contaminated objects, that the disease | has been conveyed, when it has been, from one port to The reality of the mode of

another of the Mediterranean. transmission is shown by the fact that between 1720 and 1846 twenty-five ships arrived at French and Italian ports with the plague among their crews; and in the case of those arriving at Marseilles (ten in number), which: were carefully observed, there were several instances of plague being communicated in the lazaretto to surgeons and others, or to those placed in charge of the ships. Of these persons several died,—without, however, any exten: sion of the disease to the town. From this it is clear that plague may be transmitted by ships, and may spread at the point to which it is conveyed, if the surrounding cir- cumstances are favourable. In all these cases the ships had left the infected ports at a time when an epidemic of plague, and not merely sporadic cases, prevailed there. No similar facts are on record as to the importation of plague by ships to England,—the probable cause of this difference being the greater length of the voyage from the Levantine ports, and the precautions taken at those ports

to prevent the shipment of infected persons or goods. Plague —

has never been brought to an English quarantine station.1

In such cases it must remain undetermined whether the disease would have spread, had it not been interrupted by the quarantine. As we have seen, plague will often die

out in the cases which convey it without spreading ; and | hence some have supposed (with Sydenham) that an |

“epidemic constitution” is necessary at any particular time and place in order that the disease should become general, but the practical value of this law is diminished by the fact that there is nd means of recognizing the epidemic constitution except by the actual production of an epidemic.

Plague, like all similar diseases, and in a specially high degree, is subject to the law of periodicity. Even when it

is most strictly endemic it seldoms prevails continuously, |

but appears in definite outbreaks, or epidemics, with inter- vals in which there are either no cases of plague or only so-called sporadic cases. This may be partly due to the general law that the susceptibility of the population to a special disease is exhausted by an epidemic, partly to the immensely increased transmissibility of the disease caused by the increased number of cages, so that when once a

certain stage of severity has been reached the disease pro- |

a in a far more rapid ratio. In most epidemics of plague there is at one time a sudden and alarming increase

- Prus, Rapport sur la Peste, Pari ‘ p L , Paris, 1846, p. 183; Report of Com- mittee of House of Commons, 1819, p. 101. z :

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in mortality; but, by a law not yet understood, each epidemic is liable to a spontaneous decline, which is some- times sudden. This may be connected with rise or fall in the temperature of the air, but is not always so. The

disease may be dormant during the cold or hot weather (as the case may be) and reappear when the temperature is favourable again, but not necessarily. It is generally agreed that plague is transmissible to another country only when it is epidemic, and not from sporadic cases.

Incubation.—It is a very important question what time may elapse between a person receiving the poison and showing symptoms of the disease. The usual time of incubation appears to be from three to five days. In certain very malignant epidemics this period may be shortened, and, it is thought, reduced to even less than a day. In rare cases incubation may be prolonged to eight days. There are doubtful accounts of ten days' incubation. Generally a week's observation? would show whether a suspected person was really affected or no. It has been thought that articles contaminated by contact with plague patients may retain the power of communicating the disease for weeks, months, or even years; but of this there is no adequate proof.

Treatment.—No special line of treatment has proved efficacious in checking the disease once established. Special symptoms are treated in accordance with the ordinary rules of practice, and need not here be considered. Free ventilation appears to be of the greatest service in preventing the spread of the disease, and pro- bably in promoting recovery.

Prevention.—There can be no doubt whatever of the efficacy of hygienic measures in rendering a locality unsuitable for the spread of plague. Such measures include, not only personal cleanliness, but especially the removal of all foul organic matters, good drainage, and prevention of overcrowding ; all such measures might be looked upon by our readers generally as matters of course, but are quite unknown in most of the homes of plague. Since there is no doubt that plague may be carried from places where it prevails epidemically, measures to prevent such importation cannot be neglected. The best known of such measures is the system of quarantine first produced about 1480. See QuARANTINE. The efficiency of quaran- tine has been much discussed, and very strong opinions have been expressed for and against it. The subject is too large for discussion here ; but it would appear that, while the system as originally applied in the Mediterranean, when traffic was comparatively slow and infrequent, and when European cities

presented an extremely favourable soil for plague if introduced, was a real protection, the regulations have long ceased to correspond to the actual state of medical knowledge; and, in addition, it would be impossible to apply them to our crowded traffic. The alternative is a system of medical inspection of all arrivals in our ports, and strict isolation of ships in which plague has occurred or is suspected. Such a ship should then be treated as an infected house.

Prevention of the Spread of Plagwe.—When cases of plague have once occurred in a town or on board a ship in port, the house or ship should be emptied of its inhabit- ants, the sick removed to a hospital, the sound placed in an isolated building and subjected to observation for at least a week, or, better, ten days. The clothes of sick persons had better be burnt, their bedding and furniture completely disinfected. The house should in the mean- time be rigidly closed until it has been disinfected. If these measures are taken in time, there can be no objection to allowing free emigration of the population. Isolation of the place by a “sanitary cordon” would only be possible

2 Prus, Itapport, p. 196.

in very exceptional positions, and as a rule would aggravate, by overcrowding, the intensity of the disease within.

History of the Plaguc.—The first historical notice of the plague is eontained in a fragment of the physieian Rufus of Ephesus, who lived in the time of Trajan, preserved in the Collections of Oribasius.1 Rufus speaks of the buboes called pestilential as being specially fatal, and as being found chiefly in Libya, Egypt, and Syria. “He refers to the testimony of a physician Dionysius, who lived probably in the 3d century B.c. or earlier, and to Dioscorides and Posidonius, who fully described these buboes in a work on the plague which prevailed in Libya in their time. Whatever the preeise date of these physicians may have been, this passage shows the antiqnity of the plague in northern Africa, which for centuries was considered as its home. The great plague referred to by Livy (1x., Epitome) an dmore fully by Orosius:(Histor., iv. 11) was pro- bably the samc, though

the symptoms arc not recorded. It is reported to have destroyed a million of persons in Africa, but is not stated to have passed into Europe. : =

It is not till the 6th century of our era, in the reign of Justinian, that we find bubonic plague in Europe, as a part of the great cycle of pestilence, accompanied by extraordinary natural phenomena, which lasted fifty years, and is described with a singular misunder- standing of medical terms by Gibbon in his forty-third chapter. The descriptions of the contemporary writers Procopius, Evagrius,

‘and Gregory of Tours are quite unmistakable? The plague of Justinian began at Pelusium in Egypt in 542 a.p.; it spread over Egypt, and in the same or the next year passed to Constantinople, where it carried off 10,000 persons in one day, with all the symptoms of bubonic plague. It appeared in Gaul in 546, where it is described by Gregory of Tours with the same symptoms as lwes inguinaria (from the frequent seat of buboes in the groin). In Italy there was a great mortality in 543, but the most notable epidemic was in 565, whieh so depopulated the country as to lcave it an easy prey to the Lombards. In 571 it is again recorded in Liguria, and in 590 a great epidemic at Rome is conneeted with the pontificate of Gregory the Great. But it spread in faet over the whole Roman world, beginning in maritime towns and radiating in- land. In another direction itextended from Egypt along the north coast of Africa. Whether the numerous pestilences recorded in the 7th century were the plague cannot now be said; but it is possible the pestilenees in England chronicled by Bede in the years 664, 672, 679, and 683 may have been of this disease, especially as in 690 pestis inguinaria is again recorded in Rome. For the epidemics of the succeeding centuries we must refer to more detailed works.

It is impossible, however, to pass over the great eycle of epi- demies in the 14th century known as the Black Death. Whcther in all the pestilences known by this name the disease was really the same may admit of doubt, but it is clear that in some at least it was the bubonic plague. Contemporary observers agree that the disease was introduced from the East; and one eye-witness, Gabriel de Mussis, an Italian lawyer, traced, or indeed accom- panied, the march of the plague from the Crimea (whither it was said to have been introduced from Tartary) to Genoa, where with ‘a handful of

survivors of a Genoese expedition he landed pyro- bably at the end of the year 1347. He narrates how the few that had themselves escaped the pest transmitted the contagion to all they met.4 Other accounts, especially old Russian chronicles, place the origin of the disease still further to the east in Cathay (or China), where, as is eonfirmed to some extent by Chinese records, pestilenee and destructive inundations are said to have destroyed the enormous number of thirteen millions. It appears to have passed by way of Armenia into Asia Minor and thenee to Egypt and northern Africa. Nearly the whole of Europe was gradually overrun by the pestilence. It reached Sicily in 1346, Constantinople, Greece, and parts of Italy early in 1347, and towards the end of that year Marseilles. “ In 1348 it attacked Spain, northern Italy and Rome, eastern Germany, many parts of France including Paris, and England; from England it is said to have been conveyed to the Scandinavian countries. In England the western counties were first invaded early in the year, and London in November. In 1349 we hear of it in the midlands 5 and in subsequent years, at least till 1357, it prevailed in parts of the eountry, or generally, especially in the towns. In 1352 Oxford

1 Lib, xliv. cap. 17,—Guvres de Oribase, ed. Buss k E i 186i, va ne , ed. Bussemaker and Daremberg, Paris, ; Evagrius, Hist. Eccles., iv. 29; Procopius, De Bello Persico, ii. 22, 23. See Noah Webster’s History of Epidemic Diseases, 8vo, 2 vols., London, 1800 & work which makes no pretension to medical learning, but exhibits the history g i? im connexion with physical disasters, as carthquakes, famines, &c.); ab: 5 Kleine Pest-Chronik, 8vo, 1880 (a convenient short compendium, but not q wee accurate); ‘* Athanasii Kircheri Chronologia Pestium ” (to 1656 a.D.), in 4 tie see (Rome, 1658), Leipsic, 1671, 4to; Bascome, History of Epidemic es “ eS ne ae + wis bs — complete medical history of epidemics is S epidemischen Krankheiien (3d editi = ing on ae volume of his History of edits. eMail cick ox ee the original account reprinted with other documents in Haeser, Op. cit.; olag Hecker, Epidemics of the Middle Ages, trans. by Babington, Syaeriben, ‘Soe., i on, 1844; Volkskrankheiten des Mittelalters, ed. Hirseh., Berlin, 1865; R. oeniger, Der Schwarze Tod in Deutschland, Berlin, 1882, : ,

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lost two-thirds of her academical population. The outbreaks of 1361 and 1368, known as the second and third plagues of the reign of Edward III., were doubtless of the same disease, though by some historians not called the black death. Scotland and Treland, though later affected, did not escape.

The nature of this pestilence has been a matter of much contro- versy, and some have doubted its being truly the plague. But when the symptoms are fully described they seem to justify this conclusion, one character only being thought to make a distinction between this and Oriental plague, viz., the special implication of the lungs as shown by spitting of blood and other symptoms. Guy de Chauliac notes this feature in the earlier epidemic at Avignon, not in the later. Moreover, as this complication was a marked feature in certain epidemics of plague in India, the hypothesis has been framed by Hirsch that a special variety of plague, pestis Indiea, still found in India, is that which overran the world in the 14th century. But the same symptoms (hemoptysis) have been scen, though less notably, in many plague epidemics, even in the latest, that in Russia in 1878-79, and, moreover, according to the latest accounts, are not a special feature of Indian plague. Accord- ing to Surgeon-General Francis (7’rans. Epidem. Soc., vol. v. p. 898) “hemorrhage is not an ordinary accompaniment” of Indian plague, though when seen it is in the form of hemoptysis. It seems, therefore, impossible to make a special variety of Indian plague, or to refer the black death to any such special form, Gabriel de Mussis describes it even in the East, before its arrival in Europe, as a bubonic disease.

The mortality of the black death was, as is well known, enor- mous. It is estimated in various parts of Europe at two-thirds or three-fourths of the population in the first pestilence, in England even higher, but some countries were much less severely affected, Hecker calculates that one-fourth of the population of Europe, or 25 millions of persons, died in the whole of the epidemics. Itis hardly neccessary to dwell upon the social results of this terrible mortality. In England great part of the country remained untilled, and the deficiency of labourers was such as to cause a sudden rise of wages, which, in spite of attempts to check it by legislation, is thought to have effected the final emancipation of the labouring elass. On the other hand a great transfer of property to the ehurch took place, with what results is well known.

In the 15th century the plague recurred frequently in nearly all parts of Europe. In the first quarter it was very destructive in Italy, in Spain (especially Barcelona and Seville) , in Germany, and in England, where London was severely visited in 1400 and 1406, and again in 1428. In 1427 80,000 persons died in Dantzic and the neighbourhood. In 1438-89 the plague was in Germany, and its occurrence at Basel was described by Aineas Sylvius, afterwards Pope Pius II. In 1448-50 Italy (Kircher), Germany (Lersch, from old chronicles), France, and Spain were ravaged by a plague supposed to have arisen in Asia, scarcely less destructive than the black death. England was probably seldom quite free from plague, but the next great outbreak is recorded in 1472 and following years. In 1466 40,000 persons died of plague in Paris; in 1477-85 the cities of northern Italy were devastated, and in 1485 Brussels. In the fifteenth year of Henry VII. (1499-1500) a severe plague In London caused the king to retire to Calais.

The 16th century was not more free from plague than the 15th. Simultaneously with a terrible pestilence which is reported to have nearly depopulated China, plague prevailed over Germany, Holland,

Italy, and Spain in the first decade of the eentury, and revived at:

various times in the first half. In 1529 there was plague in Edin- burgh; in London in 1537-89, and again 1547-48 ; and also in the north of England, though probably not absent before. Some of the epidemics of this period in Italy and Germany are known by the accounts of eminent physicians, as Vochs, Fracastor, Mercurt- alis, Borgarucci, Ingrassia, Massaria, Amici, &v.,> whose writings are important because the question of contagion first began to be raised, and also plague had to be distinguished from typhus fever, which began in this century to appear in Europe.

The epidemic of 1563-64 in London and England was very severe, a thousand dying weekly in London. In Paris about this time plague was an everyday occurrence, of which some were less afraid than of a headache (Borgarucci). In 1570 200,000 persons died in Moscow and the neighbourhood, in 1572 50,000 at Lyons; m 1568 and 1574 plague was at Edinburgh, and in 1570 at Newcastle. When, however, in 1575 a new wave of plague passed over Europe, its origin was referred to Constantinople, whence it was said to have spread by sea to Malta, Sicily, and Italy, and by

land through the Austrian territories to Germany. Others contended that the ee eee NS ae se

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5 Vochs, Opusculum de Pestilentia, 1537; Fracastorius, ‘‘De Contagione, — Opera, Ven., 1555; Hieron. Mercurialis, De Peste, presertim de Veneta et Pata- vina, Basel, 1577; Prosper Borgarntius, De Peste, Ven., 1565, 8vo; in Ingrassia, Informatione del pestifero morbo … Palermo e . . . Regno ¥ Sicilia, 1575-76, 4to, Palermo, 1576-77; A. Massaria, De Peste, Ven., 1597; Diomedes Amicus, Tres tractatus, Ven., 1599, 4to; Victor de Bonagentibus, Decem Problemata de Peste, Ven., 1556, 8vo; Georgius Agricola, De Pesté hed tres, Basel, 1554, 8vo. The works of English physicians of this period are of little medical value; but Lodge’s Treatise of the Plague (London, 1608) deserves mention.

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disease originated locally; and, indeed, considering previous history, no importation of plague would seem neeessary to explain its pres- enee in Europe. Italy suffered severely (Venice, in1576, lost 70,000); the north of Europe not less, though later ; London in 1580-82. In 1585 Breslau witnessed the most destructive plague known in its history. The great plague of 1592 in London seems to have been a part of the same epidemic, which was hardly extinguished by the end of the century, and is noted in London again in 1599. On the whole, this eentury shows a decrease of plague in Europe.

In the first half of the 17th century plague was still prevalent in Europe, though considerably less so than in the Middle Ages. In the second half a

still greater decline is observable, and by the third quarter the disease had disappeared or was disappearing from a great part of western Europe. The epidemics in England will be most conveniently considered in one series. From this time onwards we have the guidanee of the “Bills of Mortality” issued in London, which, though drawn up on the evidence of ignorant persons, are doubtless roughly true. The accession of James I. in 1603 was marked by a very destructive plague which killed 38,000 in Loudon. In this and subsequent years the disease was widely diffused in England—for instance, Oxford, Derbyshire, Newcastle. It prevailed at the same time in Holland, and had done so some years previously in northern Germany. In the same year (1603) one million persons are said to have died of plague in Egypt. This plague is said to have lasted eight years in London. At all events in 1609 we have the seeond great plague year, with a mortality of 11,785. After this there is a remission till about 1620, when plague again began to spread in northern Europe, especially Germany and Holland, which was at that time ravaged by war. In 1625 (the year of the siege of Breda in Holland) is the third great London plague with 35,417 deaths,—though the year 1624 was remarkably exempt, and 1626 nearly so. In 1630 was the great plague of Milan, deseribed by Ripamonti.’ In 1632 severe epidemic, apparently plague, was in Derbyshire. 1636 is the fourth great plague year in London with a mortality of 10,400, and even in the next year 3082 persons died of the same disease. The same year 7000 out of 20,000 inhabitants of Newcastle died of plague; in 1635 it was at Hull. About the same time, 1635-37, plague was patent in Holland, aud the epidemic of Nimeguen is eelebrated as having been described by Diemerbroeck, whose work (Tractatus de Peste, 4to, 1641-65) is one of the most important on the subject. The English epidemic was widely spread and lasted till 1647, in which year, the mortality amount- ing to 3597, we have the fifth epidemic in London. The army diseases of the Civil Wars were chiefly typhus and malarial fevers, but plague was not unknown among them, as at Wallingford Castle (Willis, “ Of Feavers,” Works, ed. 1681, p. 181) and Dunstar Castle. From this time till 1664 little was heard of plague in England, though it did not cease on the Continent. In Ireland it is said to have been seen for the last time in 1650.?

_ In 1656 one of the most destructive of all recorded epidemics in Europe raged in Naples ; it is said to have earried off 300,000 persons in the space

of five months. It passed to Rome, but there was much less fatal, making 14,000 victims only—a result attri- buted by some to the preeautions and sanitary measures introduced by Cardinal Gastaldi, whose work, a splendid folio, written on this oceasion (Tractatus de avertenda et profliganda peste politico- legalis, Bologna, 1684) is historically one of the most important on the subjeet of quarantine, &c. Genoa lost 60,000 inhabitants from the same disease, but Tuscany remained untouched. The comparatively limited spread of this frightful epidemic in Italy at this time is a most noteworthy fact. Minorca is said to have been depopulated. Nevertheless the epidemic spread in the next few years over Spain and Germany, and a little later to Holland, where Amsterdam in 1663-64 was again ravaged with a mortality given as 50,000, also Rotterdam and Haarlem: Hamburg suffered in 1664.

The Great Plague of London.—The preceding enumeration will have prepared the reader to view the great plague of 1664-65 in its true relation to others, and not as an isolated phenomenon. The Preeeding years had been unusually free from plague, and it was hot mentioned in the bills of mortality till in the autumn of 1664 ember 2d) a few isolated cases were observed in the parishes ‘ St Giles and St Martin’s, Westminster, and a few occurred in th e following winter, which was very severe. About May 1665 the a again beeame noticeable, and spread, but somewhat slowly. cal a contemporary doctor, notices that it crept down Hol- an and took six months to travel from the western suburbs (St a a to the eastern (Stepney) through the city. The mortality ee ie from 43 in May to 590 in June, 6137 in July, 17,036 in F ae , 31,159 in September, after which it began to decline. The bill humber of deaths from plague in that year, according to the

lls of mortality was 68,596, in a population estimated at 460,000,

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. A oom Ripamontius, De Peste anni 1630, Milan, 1641, 4to. 1579-166 ee see Index to Remembrancia in Archives of City of London, Miinacti2 oe? 1878; Richardson, Plague and Pestilence in North of England

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Graunt, Observations on the Bills of Mortality, 34 ed., London, 1665.

out of whom two-thirds are supposed to have fled to escape the contagion. This number is likely to be rather too low than too high, since of the 6432 deaths from spotted fever many were pro- bably really from plague, though not declared so to avoid painful restrictions. In December there wasa sudden fall in tle mortality which continued through the winter; but in 1666 nearly 2000 deaths from plague are recorded.

According to some authorities, especially Hodges, the plague was imported into London by bales of merehandise from Holland, which came originally from the Levant ; aecording to others it was intro- duced by Dutch prisoners of war; but Boghurst regarded it as of local origin. It is in favour of the theory that it spread by some means from Holland that plague had been all but extinct in London for some seventeen years, and prevailed in Holland in 1663-64. But from its past history and local conditions, London might well be deemed capable of produeing such an epidemic. In the bills of mortality since 1603 there are only three years when no deaths from plague are recorded. The uncleanliness of the eity was comparable to that of Oriental cities at the present day, and, aeeording to contemporary testimony (Garenciéres, Angliw Flagel- lum, London 1647, p. 85), little improved since Erasmus wrote his well-known description. The spread of the disease only partially supported the doctrine of contagion, as Boghurst says :— ‘‘The disease spread not altogether by contagion at first, nor began only at one place and spread further and further as an eating sore doth all over the body, but fell upon several places of eity and suburbs like rain.” In fact dissemination seems to have taken place, as usual, by the conversion of onc house after another into a focus of disease, a process favoured by the fatal custom of shutting up infected houses with all their inmates, which was not only almost equivalent to a sentence of death on all therein, but caused a dangcrous con- centration of the poison. The well-known custom of marking sueh houses with a red cross and the legend ‘‘ God have mercy upon us !” was no new thing: it is found in a proclamation in the possession of the present writer dated 1641; and it was probably older still. Hodges testifies to the futility and injurious effects of these regu- lations. The lord mayor and magistrates not only carried out the appointed administrative measures, but looked to the cleanliness of the eity and the relief of the poor,

so that there was little or no actual want ; and the burial arrangements appear to have been well attended to. The college of physicians, by royal command, put forth such advice and prescriptions as were thought best for the emergency. But it is clear that neither these measures nor medical treatment had any effect in checking the disease. Early in November with colder weather it began to deeline; and in December there was so little fear of contagion that those who had left the city ‘crowded baek as thick as they fled.” As has often been observed in other plague epidemics, sound people could enter infected houses and even sleep in the beds of those who had died of the plague ‘before they were even cold or cleansed from the steneh of the diseased ” (Hodges). The symptoms of the disease being sueh as have been generally observed need not be here considered. The discase was, as always, niost destructive in squalid, dirty neighbour- hoods and among the poor, so as to be called the ‘‘ poor’s plague.” Those who lived in the town in barges or ships did not take the disease ; and the houses on London Bridge were but little affeeted. Of those doctors who remained in the city some eight or nine died, nota large proportion. Some had the rare courage to investi- gate the mysterious disease by dissecting the bodies of the dead. Hodges implies that he did so, though he left no full account of his observations. Dr George Thomson, a chemist anda disciple of Van Helmont, followed the example, and nearly lost his life by an attack whieh immediately followed.

The plague of 1665 was widely spread over England, and was generally regarded as having been transmitted from London, as it appeared mostly later than in the metropolis, and in many cases the importation by a particular person could be traced. Places near London were earliest affected, as Brentford, Greenwich, Deptford ; but in July or August 1665 it was already in Southampton, Sunder- land, Newcastle, &c. A wider distribution oecurred in the next year. Oxford entirely escaped, though the residence of the court and in constant communication with London. The exemption was attributed to cleanliness and good drainage.

After 1666 there was no epidemic of plague in London or any part of England, though sporadic cases appear in bills of mortality up to 1679; and a column filled up with “0” was left till 1703, SE GS ele eae ea EA ARPT

4 On the plague of 1665 sce Nath. Hodges, Loimologia sive Pestis nupere apud

pulum Londinensem narratio, London, 1672, 8vo,—in English by Quiney, London, 1720 (the chief authority); Aotmoypadia, or an Experimental Relation of the last Plague in the City of London, by William Boghurst, apothecary in St Giles's-in- the-Fields, London, 1666,—a MS. in British Museum (Sloane 349), containing important details; George Thomson, AOIMOTOMIA, or the Pest Anatomized, 8vo, London, 1666; Sydenham, '¢ Fepris pestilentialis et pestis annorum 1665-66," Opera, ed. Greenhill, p. 96, London, 1844; Collection of Scarce Pieces on the Plague in 1665, London, 1721, 8vo; Defoe's fascinating Journal of a Citizen, which should be read and admired as a fiction, but accepted with caution as history; T. Vincent (minister of the gospel), God's Terrible Voice in the City, 8vo, London, 1667; Calendar of State Papers, 1665-6 (Domestic Series), by M. E. Grecn,

when it finally disappeared. The disappearance of plague in London was attributed to the Great Fire, but no such cause existed in other cities. It has also been ascribed to quarantine, but no effective quarantine was established till 1720, so that the cessation of plague in England must be regarded as spontaneous. :

But this was no isolated fact. A similar cessation of plague was noted soon after in the greater part of western Europe. In 1666 a severe plague raged in Cologne and on the Rhine, which was pro- longed till 1670 in the district. In the Netherlands there was plague in 1667-69, but there are no definite notices of it after 1672. France saw the last plague epidemic in 1668, till it reappeared in 1720. In the years 1675-84 a new plague epidemic appeared in North Africa, Turkey, Poland, Hungary, Austria, and Germany, pro- gressing generally northward. Malta lost 11,000 persons in 1675. 'The plague of Vienna in 1679 was very severe, causing 76,000 or probably more deaths. Praguc in 1681 lost 83,000 by plague. Dresden was affected in 1680, Magdeburg and Halle in 1682,—in the latter town with a mortality of 4897 out of a population of about 10,000. Many North German cities suffered about the same time; but in 1683 the plague disappeared from

Germany till the epidemic of 1707. In Spain it ceased about 1681; in Italy cer- tain cities were attacked till the end of the century, but not later (Hirsch). 5 , ,

Plague in the 18th Century.—At the beginning of this period plague was very prevalent in Constantinople and along the Danube. In 1703 it caused great destruction in the Ukraine. In 1704 it began to spread through Poland, and later to Silesia, Lithuania, Prussia, and a great part of Germany and Scandinavia. In Prus- sia and Lithuania 283,000 persons perished ; Dantzic, Hamburg, and other northern cities suffered severely. rae was attacked in 1710. In Stockholm there was a mortality of 40,000. Certain places near Brunswick (10° E. long.) marked the western limit of the epidemic ; and cholera was arrested at the same spot in later years (Haeser).

At the same time the plague spread westward from the Danube to Transylvania and Styria, and (1718) appeared in Austria and Bohemia, causing great mortality in Vienna. Thence it passed to Prague and Ratisbon —to the former, possibly to the latter, almost certainly conveyed by human intercourse. This city (12° E. long.) was the western limit reached in this year. Haeser states that the plague disappeared everywhere in Europe after the great hurricane of February 27, 1714.

In 1717 plague raged severely in Constantinople ; and in 1719 it made a fresh progress westwards into Transylvania, Hungary, Galicia, and Poland, but not farther (about 20° E. long.). It thus appears that each successive invasion had a more eastcrly western limit, and that the gradual narrowing of the range of plague, which began in the 17th century, was still going on.

This process suffered a temporary interruption by the outbreak of plague of southern France in 1720-22. In 1720 Marseilles became affected with an cpidemic plague, the origin of which was attributed by some to contagion through the ship of a Captain Chataud which arrived, May 20, 1720, from Syria, where plague at that time pre- vailed, though not epidemically when he sailed. Six of the crew had diced on the voyage to Leghorn, but the discase was declared not to be plague. Cases of plaguc occurred, however, on the ship, and on June 22 among porters unloading the cargo. Hence, according to believers in contagion, the discase passed to familics in the ‘‘old town,” the poorest and unhcalthiest quarter. In the meantime other

ships had arrived from Syria, which were put in quarantine. According to others the plague arose in Marseilles from local causes; and recently discovered data show that suspicious cascs of contagious disease occurred in the town before the arrival of Chataud's ship. Opinions were divided, and the evidence appears even now nearly balanced, though the believers in contagion and importation gained the victory in public opinion. The pestilence was fearfully severe. Thousands of unburied corpses filled the streets, and in all 40,000 to 60,000 persons were carried off. In December 1721 the plague passed away, though isolated cases oceurred in 1722. It passed to, or at least broke out in, Arles and Aix in 1720, causing great mortality, but in Toulon not till 1721, when it destroyed two-thirds of the population. The epidemic spread generally over Provence, but not to other parts of France, notwithstanding that, as confessed by D'Antrechaus, consul of Toulon, a believer in the exclusive power of contagion, there were abundant opportunities. The disease was in fact, as in other cases, self-limited. In all 87,659 persons are said to have died out of a population of nearly 250,000.2 _ This great epidemic caused a panic in England, which led to the introduction (under Mead's advicc) of quarantine regulations, never previously enforced, and also led to the publication of many

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1 Relation historique de la Peste de Marseille, Cologn i

: e, 1721, Paris, 1722, &e.; Se eee We ee et Reflexions é " 3 dé la 'Peste, Marscilles,

al; (ll, Lratte de la Peste, Paris, 1744; ti Ie cai Dictionnaire de Medicine, vol. xxiv., Paris, 1841, ee ee

2 D'Antrechaus, Relation de la Peste de Toulon en 1721, Paris, 1756; G. Lam-

bert, Wistotre de la Peste de Toul E pe eae eitiom, Krankh. on en 1721, Toulon, 1861, quoted by Haeser,

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pamphlets, &c., beside Mead's well-known Discourse on Pestilential Contagion (London, 1720).

Plague in Sicily in 1748.—An outbreak of plague at Messina in 1743 is important, not only for its fatality, but as one of the strongest cases in favour of the theory of imported contagion, Messina had been free from plague since 1624, and the Sicilians prided themselves on the rigour of the quarantine laws which were thought to have preserved them. In May 1743 a vessel arrived from Corfu, on board of which had occurred some suspicious deaths, The ship and cargo were burnt, but soon after cases of a suspicious form of disease were observed in the hospital and in the poorest parts of the town ; and in the summer a fearful epidemic of plague developed itself which destroyed 40,000 or 50,000 persons, and then became extinct without spreading to other parts of Sicily.

Spread of Plague from the Hast.—Independent of the episodes of Marscilles and Messina, the spread of plague from the Hast coutinued to exhibit the above-mentioned law of limitation. In 1738-44 the discase was in the Ukraine, Hungary, the borders of Carniola, Moravia, and Austria, extending along the Carpathians as far as Poland (20° E. long.), and also in Bukowina (25° E. long.) It lasted till 1745, and then disappeared from those parts for fifteen years. In 1755-57 plague prevailed in parts of European Turkey, whence it on one occasion extended into Transylvania, in the nei bourhood of Cronstadt, where it was checked (25°'5 E. long,).?

In 1770 a destructive plague arose in Moldavia during the Russo- Turkish War, and shortly afterwards in Wallachia, apparently endemic in the former country at least. It affected also Transyl- vania and part of Hungary, and still more severely Poland, but was confined to Podolia, Volhynia, the Ukraine, and the eastern part of Galicia (25° E. long.), not even penetrating as far as Warsaw. After destroying, it is said, 300,000 persons, and without being checked by any quarantine regulations, the plague died out finally in March 1771, being remarkable for its short duration and spontaneous limitation (Haeser).

In another direction the plague spread over Little Russia in 1770, |

and desolated Kieff, while in the next year it broke out in Moscow aud produced one of the most destructive epidemics of modern times. More than 50,000 persons, nearly one-fourth of the popula- tion, were carried off.*

The remaining European plague-epidemics of the 18th century were inconsiderable, but on that very account noteworthy, Tran- sylvania was again affected in 1785, Slavonia and Livonia (a dis- trict of eastern Galicia) in 1795-96 (25° E. long.), Volhynia in 1798. The disease, while reappearing in the seats of the terrible earlier epidemics, was more limited in its range and of shorter duration.' An epidemic in Dalmatia in 1783-84 is noteworthy in connexion with es outbreaks in the same region. In the last years of the century (1799-1800) there was a new epidemic in Syria and Egypt, where it affected the French and afterwards the English army.

Plague in the 19th Centwry.—This history divides itself naturally into two periods—1800-1845, and 1858 to the present time.

1800-1845.—Plague appeared at Constantinople in 1802-3, about the same time in Armenia (Kars), and in 1801 in Baghdad. Ithad prevailed since 1798 in Georgia and the Caucasus, and in 1803-6 began to spread from the north of the Caucasus into Russia, till in 1806 it was established at or near Astrakhan, and in 1807 reached Zareff, 200 miles higher np the Volga. These localities are inter- esting as being near those where plague appeared in 1877-78. tis also said to have entered the government of Saratoff, but probably no great distance. The plague remained in the Caucasus and Georgia till 1819 at least. In 1828-31 it was in Armenia, and again il 1840-43, since which time it has not been heard of in that country.

In 1808 plague was at Constantinople, in 1809 at Smyrna. In 1812 was a more general epidemic affecting these places and also Egypt. An outbreak at Odessa is supposed to have been brought from Constantinople and thence to have passed to Transylvania. In 1818 a severe plague at Bucharest is supposed to have been brought from Constantinople. About the same time plague prevailed m Bosnia, and is supposed to have passed thence to Dalmatia in 1816. In 1814-15 it again appeared in Egypt, and once more invaded the continent of Europe in Albania and Bosnia. Two insular outbreaks, Malta in 1813 and Corfu in 1815, attracted much attention as

being both thought to be cases of importation by sea-traffic,” and there seems good reason for this opinion.

A panic spread through Europe in 1815 in consequence of an outbreak in Noja on the eastern coast of Italy, its last appearance ieee Abc icine caine Sa

3 Adam Chenot, Abhandlung von der Pest, Dresden, 1776; De Pesté, Vicnna,

766

4 Samoilowitz, Afémoire sur la Peste en Russie, 1771, Paris, 1783; Mertens, De la Peste en 1771, Paris, 1784. F .

5 Lorinser, Pest des” Orients, Berlin, 1837, p. 103; Schraud, Pest in Syrmten, 1795, 2 vols., Pesth, 1801.

6 From the annals of the Moravian community of Sarepta on the Volga, Geschichte der Brtider-Gemeinde Sarepta, by A. Glitsch, Sarepta and Berlin, 18695 also Tholozan, Epidémies de Peste du Caucase, Paris, 1879. 4

7 Faulkner, On the Plague in Malta, London, 1820, 8vo; J. D. Tully, History of the Plague in Malta, Gozo, Corfu, and Cephalonia, London, 1821, 8vo; White, Treatise on the Plague (at Corfu), London, 1847; Calvert, ‘‘On the Plague ™ Malta, 1813,” dfed.-Chi. Transactions, vi. 1.

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in that country. According to one view it was imported from the opposite coast of Dalmatia, though no definite history of contagion was established ; according to others, it originated endemically in that place. It remained, however, strictly confincd to a small district, perhaps in consequence of the extraordinarily rigorous measures of isolation adopted by the Italian Government. In 1828 an isolated epidemic appeared in Greece in the Morea, supposed to have been brought by troops from Egypt.! In 1824-25

an outbreak took place at Tutehkoffin Bessarabia; the town was strictly isolated by a military cordon and the disease did not spread. Cronstadt in Transylvania was the scene of a small outbreak in 1828, which was said to be isolated by similar measures (Lorinser). A far more serious epidemic was connected with the eampaign of the Russian army against Turkey in 1828-29. Moldavia, Wallachia, and Bes- sarabia were widely affected ; the disease broke out also in Odessa and the Crimea, and isolated cases occurred in Transylvania. The most northerly points reached by the plague were near Ozernowitz on the frontier of Bessarabia, and Bukowina, and its limitation was as before attributed to the Russian and Austrian military cordons.

In 1831 another epidemic occurred in Constantinople and Roumelia ; in 1837 again in Roumelia, and in Odessa,—its last appearance in those regions, and the last on the European continent except an isolated outbreak in Dalmatia in 1840, and one in Con- stantinople in 1841.8 |

The plague-epidcmics in Egypt between 1833 and 1845, when it was last observed in that country, are very important in the history of plague, since the disease was alinost for the first time scientifically studied in its home by skilled European physicians, chiefly French. The disease was found to be less contagious than reported to be by popular tradition, and most of the French school went so far as to deny the contagiousness of the disease altogether. The epidemic of 1834-35 was not less destructive than inany of those notorious in history ; but in 1844-45 the disease disappeared, and it has never been seen since in the country which was for centuries regarded as its native home. This result can hardly be attributed to quaran- tine, though it is probable that increased attention to sanitary measures under the influence of educated medical officials may have had much to do with it. But on the large scale it is a part of the great eastward recession of the plague, which is an undoubted fact, however it is to be cxplained. In 1840 Dalmatia (17° E. long.), in 1841 Constantinople (29° E. long.), in 1848-44 the eastern parts of Kgypt (81° E. long.), were the western boundaries of plague. The same law has, with one notable cxception, been observed since.

1853-84.—Since the apparent extinction of plague in Egypt in 1845, it has appeared in several points of Asia and Africa, and once in Europe.

In 1853 plague appeared in a district of western Arabia, the Asir country in North Yemen, and it is known to have occurred in the same district in 1815, as it did afterwards in 1874 and 1879. In 1874 the disease extended within four days' march of Mecca. From the scantiness of population the mortality has not been great, but it is clear that this is one of the endemic seats of plague.*

In June 1858 intelligence was received in Constantinople of an outbreak of disease at the small town Benghazi, in the district of Barca, province of Tripoli, North Africa, which though at first misunderstood was clearly bubonic plague. From later researches there is reason to believe that it commenced in 1856 or in 1855. The disease did not spread, and ceased in the autumn, to return with less violence in 1859, when it died out. In the autumn of 1873 it returned, but apparently came again to a spontaneous termi- nation. At all events it has not been heard of since.®

After the epidemic of Benghazi in 1856-59, plague was next heard of in the district of Maku, in the extreme north-west of Persia in November 1863. It occurred in a scattered population, and the inortality was not absolutely large.®

In 1867 an outbreak of plague was reported in Mesopotamia (Irak), among the marshes of Hindieh bordering on the lower Euphrates ; and, as it has prevailed at intervals up to the present time in the same country, great importance attaches to its history. The epi- demic began in December 1866 (or probably earlier) and ceased in June 1867. But numerous cases of non-fatal mild bubonic disease (mild plague or pestis minor) occurred both before and after the epidemic, and accordin g to Tholozan similar cases had been observed nearly every year from 1856 to 1865.7

he next severe epidemic of plague in Irak began in December 1878. _ But facts collected by Tholozan show that pestis minor, or Sporadic cases of true plague, had appeared in 1868 and subsequent years. 'The outbreak of 1873-74 began about 60 miles from the origin of that of 1867. It caused a much greater mortality and extended over a much wider area than that of 1867, including the

; L A. Gosse, Relation de la Peste en Gréce, 1827-28, Paris, 1838. 3 poinser, Pest des Ortents, p. 319, : For the authorities, see Haeser, Op. cit. = Le Radcliffe, Report of Local Government Board 1879-80, suppl., p. 42. + a ozan, La Peste en Turquie dans les Temps Modernes, Paris, 1880. – Netten Radcliffe, Report of the Medical Officer of the Privy Council, &e.,

1875; also in Papers on Levantine Plague, presented to parliament, 1879, p. 7.

7 Tholozan, La Peste en Turquie, p. 86.

towns of Kerbela and Hilleh. After a short interval it reappeared at Divanieh in December 1874, and spread over a much wider area than in the previous epidemics. This epidemic was carcfully studied by Surgeon-Major Colvill.8 He estimated the mortality at 4000. The epidemic ceased in July, but broke ont again early in 1876, and in this year extended northwards to Baghdad and beyond. The whole area now affected extended 250 miles from north-west to south-east, and the total number of deaths was believed to be 20,000. In 1877 plague also occurred at Shuster in south-west Persia, probably eonveyed by pilgrims returning from Irak, and caused great mortality.

After its customary cessation in the autumn (a pause attributed as before to the efficiency of quarantine regulations), the epidemic began again in October 1876, though sporadic cases occurred all the stunmer. The disease appeared in 1877 in other parts of Mesopo- tamia also with less severity than in 1876, but over a wider area, being now announced at Samara, a town 70 miles above Baghdad on the Tigris. Since then the existence of plague in Baghdad or Mesopotamia has not bcen announced till the year 1884, when ac- counts again appeared in the newspapers, and in July the usnal official statement occurs that the plague has been stamped out. ‘The above account of plague in Irak is the most complete history of a succession of epidemics in one country which we have had of late years.

To complete the history of plague in Persia it should be stated that in 1870-71 it appeared in a district of Mukri in Persian Kurdistan to the south of

Lake Urumiah (far removed from the out- break of 1863). The epidemic appears, however, to have died out in 1871, and no further accounts of plague there have been received. The district had suffered in the great epidemic of plague in Persia in 1829-35. In the winter 1876-77 a disease which appears to have been plague appeared in two villages in the extreme north of the province of Khorasan, about 25 leagues from the south-east angle of the Caspian Sea. In March 1877 plague broke out in Resht, a town of 20,000 inhabitants, in the provinee of Ghilan, near the Caspian Sea at its south-west angle, from which there is a certain amount of trade with Astrakhan. In 1832 a very destruc- tive plague had carried off half the inhabitants. In 1877 the plague was very fatal. From March to September 4000 persons were calculated to havedied. The disease continued till the spring of 1878. In 1877 there was a doubtful report of the same disease at Astrabad, and also in some parts near the Perso-Afghan frontier. In 1878 plague again occurred in Kurdistan in the district of So-nj- Bulak, said by Dr Tholozan to be the same as in the district of Mukri where it occurred in 1870-71. These scattered outbreaks of plague in Persian territory are the more remarkable because that country has been generally noted for its freedom from plague (as compared with Asiatic Turkey and the Levant).

It has since been known that a few cases of plague occurred in January 1877 at Baku on the west shore of the Caspian, in Russian territory.®

The last outbreak of plague on European soil was that of 1878-79 on the banks of the Volga, which caused a panic throughout Europe.!° It is now known that in the summer of 1877 a disease prevailed in several villages in the neighbourhood of Astrakhan and in the city itself, which was clearly a mild form of plague (pestis minor). It caused no deaths (or only one due to a complica- tion) and died out apparently spontaneously. An official physician, Dr Kastorsky, who investigated the matter for the Government, declared the disease to be identical with that prevailing in the same year at Resht in Persia ; another physician, br Janizky, even gave it the name of pestis nostras. In October 1878 some cases appeared in the stanitza or Cossack military settlement of Vetlanka, 130 miles from Astrakhan on the right bank of the Volga, which seem to have puzzled the physicians who first observed them, but on Nov- ember 30th were recognized as being but the same mild plague as had been observed the year before near Astrakhan

by Dr Doppner, chief medical officer of the Cossacks of Astrakhan. His report on the epidemic is the only original one we have. At the end of November! the disease became suddenly more severe, and most of those attacked died; and from the 21st December it became still more malignant, death occurring in some cases in a few hours, and without any buboes being formed. No case of recovery was known in this period. At the end of the year it rapidly declined, and in the first weeks of January still more so. The last dcath was on January 24. In the second half of December, when the disease had already lasted two months, cases of plague occurred in several neighbouring villages, all of an extremely malignant type, so that in some places all who were attacked died. In most of these cases the disease began with persons who had been at Vetlanka, though this was not nniversally established. The inhabitants of these

8 See his report cited by Radcliffe, Papers on Levantine Plague, 1879.

9 J. Netten Radcliffe, Reports; Tholozan Histoire de la Peste Bubontque en Perse. Paris, 1874.

10 See Radcliffe, Reports, 1879-80 ; Hirsch and Sommerbrodt, Pest-Hpidemie, 1878-9, in Astrachan, Berlin, 1880; Zuber, La Peste d'Astrakhan en 1878 9,

| Paris, 1880; Colvill and Payne, Report to the Lord President of the Council, 1879.

11 The dates are all reduced to new style.

villages, terrified at the accounts from Vetlanka, strictly isolated the |

sick, and thus probably checked the spread of the discase. But it evidently suffered a spontancous decline. By the end of January there were no cases left in the district except at one village (Selitren- noye), where the last occurred ou the 9th February. The total number of cases in Vetlanka, out of a population of about 1700, was 417, of whom 362 died. In the other villages there were about 62 deaths from plague, and not more than two or

three cases of recovery. In consequence of the alarm excited by this last appearance of plague upon European soil, most European Govern- ments sent special commissions to the spot. The British commis- sioners were Surgeon-Major Colvill and the present writer, who, like all the foreign commissioners, reached the spot when the epidemic was over. With respect to the origin of this epidemic, the possi- bility of its having originated on the spot, as in Resht and on the Euphrates in very similar situations, is not to be denied. An attempt was made to show that the contagion was brought home by Cossacks returning from the Turkish War, but on absolutely no evidence. In the opinion of the writer the real beginning of the disease was in the year 1877, in the vicinity of Astrakhan, and the sudden develop- ment of the malignant out of a mild form of the disease is no more than has been observed in other places. ° The Astrakhan disease may have been imported from Resht or Baku, or may have becn caused concurrently with the epidemics of these places by some cause affecting the basin of the Caspian geuerally. But the condi- tions under which these mild or miasmatic forms of plague are spread are as yet unknown. ;

Plague in India.—It used to be held as a maxim that plague never appeared east of the Indus; nevertheless it has been observed during this century in more than one distinct centre in India. So long ago as 1815 the disease appeared in Guzerat, Kattywar, and Cutch, “after three years of severe famine.” It reappeared early next year, in the same locality, when it extended to Sind as far as Hyderabad, and in another direction south-east as far as Ahmeda- bad and Dhollerah. But it disappeared from these parts in 1820 or early in 1821, and was not heard of again till July 1836, when a disease broke out into violence at the town of Pali in Marwar in Rajputaua. It spread from Pali to the province of Meywar, but died out spontaneously in the hot season of 1837, and has never been heard of again in that part of India. The origin of these two epidemics was obscure. No importation from other countries could be traced.

In 1823 (though not officially known till later) an epidemic broke out at Kedarnath in Gurwhal, a sub-district of Kumaon on the south-west of the Himalayas, on a high situation. In 1834 and 1836 other epidemics occurred, which at last attracted the attention of Government. In 1849-50, and again in 1852, the disease raged very severely and spread southward. In 1853 Dr

Francis and Dr Pearson were appointed a commission to inquire ‘into the malady. In 1876-77 another outbreak occurred, since which time no accounts of the epidemic have been received. The symptoms of this disease, called maha murree by the natives, are precisely those of Oriental plague. The feature of blood-spitting, to which much importance has been attached, appears to be nota common one. A very remark- able circumstance is the death of animals (rats, and more rarely snakes), which occurs at the outbreak of an epidemic. The rats bring up blood, and the body of one examined after death by Dr Francis showed an affection of the lungs. Maha murree is intensely communicable, but does not show much tendency to spread, since pilgrims who visit the mountain shrines are not affected and do not convey the disease. It is doubtless connected with uncleanliness and poverty, but Dr Francis believes that the poison cxists in the soil, which becomes more and more coutaminated with it. The disease is pretty clearly endemic, not imported.}

It is remarkable that of late years reports have come of the occurrence of Oriental plague in China. It has been observed in the province of Yunnan since 1871, and also at Pakhoi, a port in the Tong-king Gulf, as lately as 1882,—but said to have prevailed there at least fifteen years. In Yunnan it appears to be endemic, though there are rumours of its having been brought from Burmah, and become more noticeable after the suppression of a rebellion in that province. The climate is temperate and the country partly mountainous. Some regard the disease as being conveyed from Pakhoi to Yunnan. In both places the symptoms were the same, of undoubted bubonic plague. It has always been noticed, as in India, that rats leave their holes and die at the beginning of an epidemic ; and the same mortality has been observed among cats, dogs, cattle, ponies, deer, &. At Pakhoi it recurs nearly every

year. Uncleanly habits have much to do with fostering the disease.

1 On Indian plague, see Francis, Trans. Epidi i 3 Dl: i . Epidem. Soc, Lond., vol. iv. pp. 407-8

i aie tbid,, vol. iv. part 2; J. N. Radcliffe, Reports of Local ae eee

oard, 1875, 1876, 1877, and for 1879-80 ; Parliamentary Papers, 1879; Frederick Forbes, On Plague in North-West Provinces of India, Edinburgh, 1840 (Disserta- tion); Hirsch, Handbuch der historischen-geogr. Pathologie, vol. i. p. 209, 1860 ens. trans, by Creighton, London, 1883); Hecker's Volkskrankhetiten des Mittel- alters, Berlin, 1865, p. 101; Webb, Pathologia Indica, 24 ed., Calcutta, 1848,

2 See J. N. Radcliffe's Report for 1879-80, p. 45; Manson in Reports of Imperial

It thus appears that at the present time plague exists, or hag existed within ten years, in the following parts of the world :—(1) Benghazi, Africa ; (2) Persian Kurdistan ; (3) Irak, on the Tigris and Euphrates; (4) the Asir country, western Arabia; (5) on the lower Volga, Russia; (6) northern Persia and the shores of the Caspian ; (7) Kumaon and Gurhwal, India; (8) Yunnan and Pak- hoi, China, Except Benghazi all these places show an eastward recession as compared with the old seats of plague known to us,

Literature.—See the following works, besides those already quoted 3 :—Kamin- tus, Regim en contra epidimiam sive pestem, 4to, circa 1494 (many editions); Jacobus Soldus, Opus insigne de Peste, 4to, Bologna, 1478; Alex. Benedictus, De Observatione in Pestilentia, 4to, Ven., 1493; Nicolaus Massa, De Febre Pestilentia, 4to, Ven., 1556, &c.; [Fioravanti, Regimento della Peste, 8yo, Ven., 1565]; John Woodall, The Surgeon's Mate, folio, London, 1639; Van Helmont, Tumulus Pestis, 8vo, Cologne, 1644, &c.; [Muratori, Trattato del Governo della Peste, Modena, 1714]; John Howard, An Account of Lazaretioes in Europe, &ei, 4to, London, 1789; Patrick Russell, A Treatise of the Plague, 4to, London, 1791 i' Thomas Hancock, Researches into the Laws of Pestilence, 8vo, London, 1821; [Foderé, Legons sur les Epidémies, &c., 4 vols. 8v0, Paris, 1822-24]; [Ségur Dupcyron, Recherches Historiques, &c., sur la Peste, 1837]; Bulard, La Peste Orientale, 8vo, Paris, 1839; Griesinger, Die Infectionskrankheiten, 2d ed., Byo, Erlangen, 1864, (I. FPS

PLAICE (Pleuronectes platessa), a species of Flat-fish, common on the coasts of northern Europe from Iceland to the Bay of Biscay. It is readily

recognized by the yellow or orange-coloured spots which are placed in a row along the dorsal and anal fins, and scattered over the body, The eyes are on the right side, and the teeth in the jaws compressed and truncate. The scales are minute and smooth. In the dorsal fin from sixty-seven to seventy-seven rays may be counted, in the anal from fifty’to fifty- seven. Plaice, like other flat-fishes, prefer a. sandy flat bottom to a rocky ground, and occur in suitable localities in great abundance; and, as they belong to the better class of fishes for the table, immense quantities are brought to the market. They spawn early in spring, and are in finest condition in the month of May. Individuals of seven or eight pounds weight are considered fish of large size, but specimens of double that weight have been caught. Plaice grow quickly and are tenacious of life; and, as they thrive in brackish water, their culture in littoral back-waters would seem to be deserving of every attention.

PLAINFIELD, a city of the United States, in Union county, New Jersey, lies at the foot of Mount Orange, and on the left side of the Green Brook, a tributary of the Raritan. It may to some extent be regarded as a residen- tial suburb of New York, from which it is distant 24 miles by the Central Railroad. The local manufactures—hats and clothing—are comparatively trifling. Laid out in 1735 and made a city in 1869, Plainfield had 5095 inhabitants in 1870 and 8125 in 1880. A railroad consisting of narrow iron bands nailed down to wooden logs was con- structed between Plainfield and Elizabeth as early as 1838. Two miles to the south-west is Washington’s Rock, a

coign of vantage from which the general used to watch:

the British movements.

PLAIN SONG, or Puain Cuant (Gregorian Music; Lat. Cantus planus ; Ital. Canto Gregoriano; Fr. Plain Chant), a style of music, easily recognizable by certain strongly-marked characteristics, some very ancient frag- ments of which are believed to have been in use under the Jewish dispensation from a remote period, and to have been thence transferred to the ritual of the Christian church.

The theories advanced as to the origin of this solemn form of ecclesiastical music are innumerable. The most widely-spread opinion is that the older portion of it originated with the Psalms themselves, or at least sprang from the later synagogue music. Another theory traces the origin of plain song to the early Greeks; and the supporters of this view lay much stress on the fact that the scales in which its melodies are composed are named after the old Greek “modes.” But, beyond the name,

Chinese Customs, special series No. 2, for half-year ended 31st March 1878, 15th

issue, Shanghai; Lowry, “Notes on Epidemic Disease at Pakhoi,” 1882, ¢#d., 24th issue, p. 31.

3 Those in square brackets [ ] have not been seen by the writcr.

no connexion whatever exists between the two tonalities, which bear not the reniotest resemblance to each other. Less reasonable hypotheses attribute the origin of plain song to the Pheenicians, to the Egyptians, to the early Christian converts, and to the musicians of the Middle Ages. These divergent views, however, though entirely

hypothetical, are defended by arguments so voluminous |

that for the elucidation of the subject we must con- tent ourselves with referring the rcader to the works of Gerbert, P. Martini, P. Kircher, Mersennus, P, Lambil- lotte, the Abbé Raillard, Coussemaker, Kiesewetter, Jakob, Ambros, and other authors, who have treated it at great length.

The earlicst important fact upon which we can rest with absolute confidence is that towards the close of the 4th century Ambrose of Milan, fearing the loss or corruption of the venerable melodies which up to that time had been preserved to the church by means of oral tradition only, endeavoured to restore them as nearly as possible to their primitive purity, and at the same

time to teach the clergy to sing them with greater precision than had previously been attempted. A still more extensive work of the same nature was undertaken, two centuries later, by Pope Gregory the Great. And thus arose two schools of ecclesiastical music, still known as the “ Ambrosian” and the “ Gregorian chant,”—the first of which is now practised only in the diocese of Milan, while the latter is universally accepted as the authorized “Roman use.” In order to explain the essential differences existing between these two schools, we must here describe in detail some of the peculiar characteristics of plain song to which allusion has been made.

The melodies which collectively form the repertoire of plain chant are not written in modern major and minor scales, but in certain tonalities bearing names analogous to those of the early Greek “‘ modes,” though constructed on very different principles. Of these “modes,” fourteen exist in theory, though twelve only are in practical use. The intervals of each ‘“‘mode” are derived from a funda- mental sound, called its “final.” The compass of each

mode comprises eight sounds,—that of the first, third, | fifth, seventh, ninth, eleventh, and thirteenth ‘‘ modes,” |

extending to the octave above the “final,” and that of the second, fourth, sixth, eighth, tenth, twelfth, and fourteenth, extending from the fourth note below the final to the fifth note above it. Consequently, the “finals” of the first series, called the “authentic modes,” occupy the lowest place in each system of sounds, and those of the second series, called the ‘“‘plagal modes,” the middle place,—the same “final” being common to one “authentic” and one “Pplagal mode.” The following table exhibits the entire system, expressed in the alphabetical notation peculiar to modern English music,—the “final” being indicated in each case by an asterisk, and the position of the semitones, from which each mode derives its distinctive character, by brackets,

Authentic Modes.

”

1. Dorian,*D, E, F, G, A, B, G, D.

. tay 3, Phrygian, *E, F, G, A, B, 6, D, E.

J

Plagal Modes. oa -_— 2. Hypodorian, A, B, C, *D, E, F, G, A. sen, -_— 4. Hypophrygian, B,C, D, *£, F,G, A, B.

ja i me = Be 5. Lydian, *F, G, A, B, G, D, £, F. 6. Hypolydian, C, D, E,*F, G, A, B, C. —_— “a <<

— Wiens, <> a 8. Hypomixolydian,D,E, A eu lb ia – Holian, “A, B,C, D, E, F, G, A. 10. Hypoeolian, E, F, G, *A, B, C, D, E. lL. Lorian, *B, 6, D, BE ; “KODE » 8,0,), &, FSG, ALB. 12. Hypolocrian, F, G, A, *B, C, D, E, F. : —., em, 13. Tonian, *C, D, E, F, G, A, B,C. 14. Hypoionian, G, A, B,*C, D, E, F, G. i c a . oa _ and 12 in this series are rejected, for technical reasons into which we not space to enter; they are practically useless 2

hay Of these modes Ambrose used four only—the first four

7. Mixolydian, *G, A, B, C, D, E, F, G.

1

: pe ots to the tonic or key-note of the modern scale.

a es fuller information on the subject see the article “ Modes, ¢ Ecclesiastical,” in Sir G. Grove’s Dictionary of Music.

“authentic modes,” now numbered 1, 3, 5, and 7. Gregory acknowledged, and is said by some historians of credit to have invented, the first four “plagal modes,”—Nos 2, 4, 6, and 8. The use of the remaining “modes,” except per- haps the ninth, was not formally authorized until the reign of Charlemagne, who published an official decision upon the subject. In one or

other of the twelve “modes” recognized by this decision, every plain-chant melody is composed. ‘The number of such melodies preserved to us the genuineness of which is undoubted is immensely large ; and the collection is divided into several distinct classes, the most important of which are the melodies proper to the Psalm-Tones and Antiphons ; the Ordinarium Missex ; the Introits, Graduals, and Offertoria; the Prefationes, Versiculi, and Responsoria; the Hymns and Sequences ; and the Lamentationes, Exultet, and other music used in Holy Week.

Of these classes the most interesting by far is that which includes the psalm-tones, or psalm-tunes, called by niodern English historians, the ‘Gregorian tones.” The oldest of these are tones 1, 3, 5, and 7, as sung by Ambrose. The antiquity of tones 2, 4, 6, and 8 is less firmly established, though there is no doubt that Gregory the Great sanctioned their use on strong traditional evidence. In addition to these, a peculiarly beauti- ful melody in mode 9, known as the Yonus peregrinus, has been sung from time immemorial only to the psalm In exitu Israel. The oldest version of this melody now extant is undoubtedly to a certain extent impure; but tradition imputes to it a very high antiquity, and cven our doubts as to the authenticity of the now generally accepted reading extend only’to one single note. A widely-accepted tradition points out this melody as the tune sung to Jn exttu Israel, as part of the Great Hallel (see Psaums), which is genetally (but hardly rightly) identified with the hymn sung by our Lord and His apostles immediately after the institution of the Last Supper.

One very powerful argument in favour of the Jewish origin of the psalm-tones lies in the peculiarity of their construction. We are not aware that this argument has ever been previously brought forward; but it is im- possible to subject the venerable melodies to minute examination without observing their perfect adaptation to the laws of Hebrew poetry, as opposed to those which governed Greek and Latin verse. The division of the tune in every case, without exception, into two distinct strains, exactly balancing each other, points assuredly to the intention of singing it to the two contrasted phrases which, inseparable from the constitution of a Hebrew verse, find no place in any later form of poetry. And it is very remarkable that this constructional peculiarity was never imitated, eithe: in the earliest hymns or antiphons we possess or in those of the Middle Ages,—evidently

| because it was found impossible to adapt it to any medi-

eeval form of verse—even to the Z’e Deum, which, though a manifest reproduction of the Hebrew psalm, was adapted by Ambrose to a melody of very different formation, and naturally so since so many of its phrases consist of a single clause only, balanced in the following verse. ‘ This peculi- arity now passes for the most part unnoticed ; and the Ze Deum is constantly sung to a psalm-tone, very much to the detriment of both. But in the Middle Ages this abuse was unknown; and so it came to pass that, until the “School of the Restoration” gave birth, in England, to the single chant, avowedly built upon the lines of its Gregorian predecessor, and a somewhat later period to the double one, so constructed as to weld two verses of the psalm into one, often with utter disregard to the sense of the words, the venerable psalm-tones stood quite alone— the only melodies in existence to which the psalms could ax. -= 22

be chanted. And so intimate is the adaptation of these plain-chant melodies to the rhythm as well as to the sense of the sacred text, even after its translation into more modern languages, so strongly do they swing with the one and emphasize the other, that it is difficult to believe that the composition of the music was not coeval with that of the poetry. . f

Next in antiquity to the psalm-tones are the melodies adapted to the antiphons, the offertoria, the graduals, and the introits, sung at high mass. Those proper to the Ordinarium Misse are probably of later date. Those belonging to hymns and sequences are of allages. Among the latest we possess—perhaps the very latest of any great importance—is that of Lauda Ston,—a very fine one, in modes 7 and 8, adapted to the celebrated sequence written by Thomas Aquinas about 1261. ,

To the melodies adapted to the Lamentationes and the Fxulte, as sung in the Church of Rome during Holy Week, it is absolutely impossible to assign any date at all. All we know is that they are of extreme antiquity, and beautiful beyond all description. The melody of Hxultet is, indeed, very frequently cited as the finest example of plain song in existence.

To assert that melodies so old as these have been handed down to us in their original purity would be absurd. But the presence of corruption rarely passes undetected by the initiated; and vigorous efforts have been made from time to time to purify the received text by reference to the oldest and most trustworthy MSS. attainable. Such an effort was made on a very extensive scale by the ‘Congregation of Rites,” at the instigation of Pope Pius IX., in the year 1868; and the labours of that learned body, still in active progress, are doing all that can now be done towards the restoration of plain chant to the highest state of purity possible in the present stage of its existence. (Ww. S. RB.)

PLANARIANS. The name Planaria was first applied by O. F. Miiller in his Prodromus Zoologize Danicx (1776) to a group of worms, inhabitants of fresh and salt water, characterized, so far as was then known, by a flattened ,eaf-like forn. Ehrenberg in 1831 changed this name to Turbellaria on account of the cilia with which the body is furnished, by means of which the worms create a whirl- pool in the surrounding water. The extent of this group was subsequently more restricted, and at present the name Turbellaria is applied to all those (mainly free-swimming) Platyhelminths whose body is clothed externally with a ciliated epidermis (fig. 9), and which possess a mouth and (with the exception of one division) an alimentary canal, but are without ananus. The Turbellarians, exclud- ing the NEMERTINES (¢.v.), which until recently were classed with them, form an order of the class Platyhelminthes, and the old name Planaria is now confined to a group of the fresh-water representatives of this order.

Size and External Characters. — Many forms of the Turbellarians are so minute as to be hardly visible with the naked eye, while others attain to a length of several inches, and a land Planarian of no less than 9 inches in length has been described by Moseley. The freshwater forms are generally small, the largest representatives of the order being marine or terrestrial. The smaller Species are mostly cylindrical, or convex dorsally and flat ventrally ; the anterior extremity is commonly trun- cated and the posterior extremity pointed (fig. 1, a, 6). The larger aquatic forms are thinner in proportion to the increasing surface of the body, so that they come to resemble thin leaf-like lamelle (d), while the large land Planarians instead

of increasing in superficies grow in length (¢ and J), so that they may be best compared to leeches. The larger aquatic forms are frequently provided

with tentacles in the shape of paired finger-like processes or ear-like folds of the anterior part of the body (d and g); sometimes the tentacles are papillary outgrowths of the dorsal surface; the land Planarians are often to be distinguished by a crescent-shaped area at the fore end of the body, which is separated off from the rest (f). In many cases the whole dor sal surface is beset with papillae (d). The aper- ture of the mouth varies greatly in its position ; sometimes it is situated at the anterior extremity, sometimes in the middle of the ventral surface of the body, occasionally quite close to the posterior ex- tremity; the single com- mon or distinct male and female generative aper- tures are also situated upon the ventral surface of the body, and the former in rare cases open in com- mon with the mouth ; the genital apertures always lie behind the mouth. Many Turbellarians have a sucker which serves to attach the animal to sur- rounding objects, or to another individual during copulation.

Integument.—The integument is composed of a single layer of ciliated epithelium ; between the cilia there are often long flagella and stiff tactile hairs and even (ina single instance) chitinous spines; these latter must be regarded as local thickenings of the firm cuticle which covers the epidermic cells. The epidermic cells are flat or columnar, and are united to each other by smooth opposed margins or by denticulate processes which fit into similar processes in the adjacent cells (fig. 2). Sometimes the epidermic cells are separated by an interstitial nucleated tissue. The structure and functions of the cells of the epidermis differ, and four varieties are to be found :—(a) indifferent ciliated cells; (b) cells containing certain definite structures (rhabdites, nematocysts); (c) gland cells; and (d) glutinous cells (Klebzellen). The rhabdites are refracting homogeneous rod-like bodies, of a firm consistency, which are met with in most Turbellaria, and often fill all the cells of the epidermis ; they are not always found entirely within the cells, but the extremity often projects freely on to the exterior of the body. They are readily extruded from the cells by pressure, and are often found in great abundance in the mucus secreted by the glandular cells (many

Turbellarians, like snails, deposit threads of mucus along their track); in this case the epidermic cells become perforated like asieve. In many Turbellarians the rhabdites are chiefly massed in the anterior part of the body ; fre- quently there are several varieties of rhabdites in one and the same species,—some' being pointed at both ends, others cylindrical with truncated extremities. These structures are either formed directly in the ordinary epidermis cells as a kind of secreted product of the cell, or in special formative cells which lie beneath the integument and are connected with the epidermis cells by protoplasmic fila- ments, by means of which the rhabdites reach the surface

Fig. 1.—a, Convoluta paradoxa, Oe.; b, Vor- tex viridis, M. Seh.; ¢, Monotus fuseus, Gff.; d@, Thysanozoon brochit, Gr., with elevated anterior extremity (after Joh. Schmidt); e, Rhynchodemus terrestris, 0. F, Miiller (after Kennel); 7, Bipaltum ceres, Mos, (after Moseley); g, Polycelis cornuta, O. Seh., attached by the pharynx (ph) to a dead worm (after Johnson), All the figures of natural size, and viewed from the dorsal surface,

of the body. These cells must be regarded as epidermic

cells which have become disconnected with the epidermis itself, and wandered into the subjacent parenchyma, 'The function of the rhabdites seems to be to support the tactile sense. In rare instances nematocysts are present which in structure and development entirely resemble those of the Celentera (see vol. xii. p. 550). Very com- monly structures known as pseudo-rhabdites are present ; these have a rod-like form, but instead of being homo- geneous are finely granular; they are an intermediate step between the rhabdites proper and a granulated secretion occasionally thrown off by the gland cells. The unicellu- lar glands are either situated among the epidermic cells or in the parenchyma, in which case they are connected with the exterior only by the excretory duct. A peculiar modi- fication of the epidermic cells are the so-called " glutinous cells," which occur on the ventral surface or at the hinder end of the body of many Turbellarians, and compensate for the suckers; the surface of these cells is furnished with numerous minute processes by means of which and a sticky

secretion the animals can attach themselves to sur- rounding objects. Sometimes the epidermic cells contain caleareous concretions, and very commonly pigment is found either in the cells themselves or within the inter- stitial tissue. The colours of Turbellarians are, however, not always due to the pigment of the epidermis but to pigment contained in the parenchyma. Beneath the epidermis is a basement membrane (fig. 2, bm) which is in

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Fic. 2.—Integument of Mesostoma lingua, O. Sch. On the right hand is the epidermis (z) with perforations (7) through which the rhabdites (s¢) projeet. Beneath this the basement membrane (6m), and beneath this again the muscular layers consisting of cireular (rm), diagonal (sm), and longitudinal (7m) fibres,

some cases very delicate and structureless, and in other

cases much thicker and enclosing branched cells; this membrane is attached more firmly to the subjacent tissue than to theepidermis. Since this tissue is the strongest in the body, and serves as a surface of attachment for the

Inuscles, it has been termed by Langa skeletal membrane.

The third section of the integument is formed by the muscular layers. These form a continuous covering to the rest of the body, but their arrangement and thickness are very different in different forms. In the smaller species

(Rhabdoceelidi) there are two layers, an outer circular and

an inner longitudinal, only in a few cases the circular layer

is external to the longitudinal ; sometimes there are three distinct layers, as in fig 2, where a diagonal layer is inter- posed. The larger forms (Dendrocelida) have a much more complicated muscular system: in the

most differen- uated forms there are six separate layers (two circular, two diagonal, and two longitudinal), which are, however, always less developed upon the dorsal than upon the ventral surface in that the thickest layer of the ventral

Surface (the innermost longitudinal) is absent or very

feebly developed upon the dorsal side. Besides the

integumentary muscular system, there are also found dorso- ventral muscular bands which ‘traverse the whole body from the dorsal to the ventral basement membrane, being branched at both extremities, and the special muscles of the pharynx, genital organs, and suckers.

The perivisceral cavity, bounded by the integument and traversed by the dorso-ventral muscles, contains the organs’ of the body—alimentary canal, excretory system, nervous system, and genital glands. The space left between these organs is filled with parenchyma; the latter varies much in appearance and is very difficult to study. Generally it consists of a network.of fibres and trabeculae, which contain nuclei, and between which is a system of cavities filled during life with the perivisceral fluid. These cavities are generally but few in number and vary with the stronger or feebler development of the reticulum ; they occasionally contain free cells.

Alimentary Canal.—All Turbellarians are furnished with a mouth, which, as there is no anus, serves both to take in nutriment and expel the undigested remains of food. The alimentary canal consists of a muscular pharynx andan intestine. The pharynx (figs 3, 5 to 8, ph) is cylindrical in form, rather complicated in structure, and surrounded by a muscular sheath, which opens on to the exterior by the mouth (m). Often the pharynx consists merely of a circular fold lying within the pharyngeal pouch (fig. 8); it can be protruded through the mouth and acts like a sucker, so that the animal can fasten itself upon its prey and draw it into the intestine by suction. At the junction of the pharynx with the intestine open the salivary glands, which are frequently large and well- developed (fig. 5, 8). The intestine (7) has a very characteristic form in the different sections, and has long served to divide the Zwurbellaria into two groups :—(1) Rhabdocelida, with a straight unbranched intestine (figs. 5, 6), and (2) Dendroceelida, with

a branched intestine (figs. 7, 8). In the latter group Lang has recently called attention to further differences that exist in the form of the intestine : in the Z'ricladida (fig. 7) there is no central "stomach," but three equally-sized intestinal branches (which have secondary ramifications) unite together to open into the pharynx ; in the second group, the Polycladida (fig. 8), there is a median stomach (st), from which numerous intestinal branches arise; this stomach communicates directly with the pharynx; the branches of the intestine are much ramified and often form an anastomosing net- work. The epithclium of the intestine is a single layer of cells generally not ciliated, capable of protruding amceboid processes by which the food is absorbed ; the digestion of these animals is intracellular. Sometimes a muscular coat surrounds the intestine, the lumen of which is thus capable of being totally or partially contracted. To the above-mentioned divisions of the group, distinguished from each other by the varying form of the alimentary tract, another has been added, viz., the Acala (Ulianin), which are characterized by the entire absence of any intestine. In these forms (fig. 4) the mouth leads directly into the parenchyma of the body by a short tube which is merely an invagination of the integument; the paren- chyma is a syncytium, consisting of a soft protoplasmic mass with scattered nuclei, which represents the elements of the intestine and the body parenchyma (ento- and mesoderm) completely fused and without any traces of differentiation. This fact, as well as the disappearance of a nervous and excretory system, reduces the Acela to the lowest position not only among the 7'urbellaria, but among the whole group of the Vermes.

Excretory System.—The excretory system of the Turbel- larians is quite similar to that of the Trematodes and Cestoids; it consists of (1) the main trunks with their

external aperture, (2) the secondary branches of these, and (3) the excretory cells with the fine tubules leading from them. Rarely is there but a single main excretory trunk present opening at the hinder end of the body (Steno- stoma); generally there are a pair of such trunks which open in common at the hinder end of the body, or separately (most Rhabdocela), or by the mouth (fig. 3). In the Tricladida there are two or four lateral trunks present

which open by a number of pores arranged in pairs upon the dorsal surface of the body ; the same appears to be the case in the Polycladida. The main trunks of the excretory sys- tem are generally much twisted in their course, and anastomose with each other; they receive the fine tubules either directly or, as in the Rhabdocela, there is a network of secondary tubules interposed. The excretory cells are pear-shaped ; they are branched and furnished with a nucleus and a large vacuole which is directly continuous with the lumen of the tubule; from the boundary wall of the vacuole springs a single flagellum, which depends into the lumen of the tubule and is capable of active movement. Lang discovered in a marine form of the Tricladida (Gunda) similar vacuo- F's. 3.—Main trunks Of the ox: lated cells with a single flagellum chrenberga, O. Sch. – Open among the epithelial cells of the {f, ea 'intestine, and came to the conclu- sion that the excretory cells were on that account derived from the epithelium of the intestine. The movements of the excretory fluid towards the external pore are directed by this flagellum as well as by cilia developed upon the walls of the fine tubules; the motion of all these cilia is such as to drive the contents of the tubules towards the excretory pore. The main trunks of the excretory system are either sparsely (Z'ricladida according to Jijima) or com- pletely (Polycladida according to Lang) lined with cilia. Nervous System.—The central organ of the nervous system, the brain (cn), is a double ganglion at the anterior end of the body, and has been noticed in all the known forms with the exception of the Acela. It is situated in front of or above the pharynx ; in those species in which a process of the intestine extends beyond the region of the brain (cf. figs. 7 and 8 viewed from the ventral surface) it is placed below this. In such cases there is sometimes.a com- missure encircling the prolongations of the intestine. Each of the two ganglia gives off a strong longitudinal nerve cord (figs. 5-8, 7m) from which arise branches going to the various organs of the body. The structure of the nervous system is somewhat different in the Lhabdocela, Tricla- dida, and Polycladida. In the first group (figs. 5, 6) the two longitudinal cords and their branches are the most feebly developed, and there is but rarely (Mesostoma, Monotus) a transverse commissure uniting the longitudinal _ cords. These cords are very large in the Z'ricladida,

where the brain is to be regarded as a simple thickening of them ; in this group there are numerous transverse com- missures between the longitudinal nerve cords (fig. 7), and the nerves arising from them and passing to the periphery form a subcutaneous nerve plexus within the muscular coat. Lang has observed a similar nerve plexus in the Polycladida, the central nervous system of which differs from that of the Tricladida in that a number of stout nerve cords radiate outwards from the brain as well as the

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two longitudinal cords; they are all united together by m

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Fig. 5. e, eye; m, mouth; of, otolith; ov, ovary ; p, digesting parenchyma; ¢, testicular follicles ; vs, vesicula seminalis %, male organ of copulation; ¢ 9, common sexual aperture.

Fig. 4. Fic. 4.—Plan of an Aecelous Turbellarian,

Fic. 5.—Plan of a Rhabdoceelous Turbellarian. bc, bursa copulatrix ; cn, brain; e, eye; g, germarium; ¢, intestine ; In, longitudinal nerve trunk ; m, mouth; ph, pharynx ; rs, reeeptaculum seminis; s, salivary gland; ¢, testis; u, uterus (containing an egg); v, yelk gland; vs, yesicula scminalis; , chitinous copulatory organ; Q, common sexual aperture; bc, bursa copulatrix.

numerous commissures, and a network is thus formed which extends throughout the body.

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Fig. 7. Fig. 6.—Plan of an Alloioecelous Turbellarian. Lettering as in fig. 5.

Fig. 6.

4,, auterior, and Zt, 43, paired posterior branches of

Fie. 7.—Plan of a Tricladid. d Q, female

intestine; od, oviduct; te, tentacle; vd, vas deferens; 3, male, an copulatory organ. Other letters as in fig. 5.

- Sense Organs.—These are represented by tactile organs,

auditory organs (otoliths), andeyes. The whole surface of the body is very sensitive and (¢.g., in the Polycladida). con- tains cells which end in tufts of fine hairs, so that certain regions thus become specially sensitive and serve as tactile organs. The anterior pointed extremity of the body in the Rhabdocela is characterized by an abundant develop- ment of rhabdites and tactile hairs, and thus becomes a special tactile organ ; in other cases this region of the body is transformed into a conical tactile proboscis which can be retracted into a sheath (Proboscida). In the freshwater Tricladida the anterior margin of the head is richly inner- vated, and is beset with a special row of tactile cells which contain no rhabdites ; in the terrestrial forms of the same family (Bipaliwm) Moseley has described a row of papille along the crescent-shaped anterior extremity which can be

Fig, 8.—Plan of a Polycladid. cn, brain; @, intestinal branches; 4), anterior Unpaired intestinal branch; Im, longitudinal nerve cord; m, mouth; od, oviduct ; ov, ovarian follicle ; ph, pharynx ; p2;, pharyngeal pouch ; st, stomach; t, testicular follicle; u, uterus; vd, vas deferens; ¢, male copulatory organ, with the male aperture behind; Q, female copulatory organ, with the female aperture before it, The cyes are omitted.

extended and form tactile organs ; between the papill are peculiar ciliated grooves connected with nerves. Polycladida there are tactile cells with stiff hair-like pro-

cesses on the summit of the dorsal papillz and the various | tentacular structures; the tentacles in this family also |

Serve to support the eyes.

The majority of the Turbellarians possess eyes; the Khabdocelida commonly have two or four, as also have the Pricladida ; the latter, however, are in some instances furnished with a greater number arranged in a continuous row round the anterior end of the body ; in the Poly- cladida there are from fourteen to several hundred eyes arranged in two symmetrical groups round the brain or

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scattered over the whole of the anterior margin of the body and upon the tentacles. The eyes are always situ- ated beneath the integument within the parenchyma, sometimes directly upon the brain or connected with it by special optic nerves. In its simplest form the eye is a pigmented spot with or without a refractory lens-like body ; the more complicated eyes consist of a pigmented sheath containing a number of refracting rods which are connected at their outer extremity with a series of retinal cells, one to each rod; the retinal cells are prolonged into a nerve thread running to the brain; the arrangement of the visual elements is therefore precisely the same as in the vertebrate eye. Of great interest is the fact that in the Polycladida the number of eyes increases with the growth of the animal, and Lang has shown that the eyes increase in number by actual division. On the other hand Carriére has discovered by experimenting with certain freshwater Tricladida that the compound eyes (those containing a number of rods) are formed by the coalescence of several simple eyes. Only a single eye is found in the Monotida, which has the form of a simple pigment spot in front of the otolith.

Auditory organs are found in the shape of vesicles filled with fluid and containing circular lenticular or spindle: shaped otoliths formed ‘of carbonate of lime. Otolithic vesicles of this kind are found in many Lhabdoceelida (Acela, Monotida, fig. 4, ot) embedded in a depression ou the anterior surface of the brain. In the Dendrocelida these organs are but rarely present.

As a sensory organ of unknown function must be men- tioned the paired lateral ciliated grooves which are met with on either side of the brain in many Rhabdoceela (fig.

| 9, ¢); they are also found commonly in NEMERTINES (¢. v.),

but are here more complicated in structure.

Reproductive Organs.—With a few exceptions all the Turbellarians are hermaphrodite, and reproduce themselves sexually. Only among the Microstomida is there an asexual as well as a sexual reproduction. The male and female organs open to the exterior, either through a common cloaca (atriwim genitale) on the ventral sur- face (most Rhabdocelida and all Tricladida, figs. 4-7), or there are separate male and female apertures. In this case the male aperture is generally placed in front of the female aperture (some Lhabdo- celida and all Polycladida, fig. 8), but occasionally the positions are reversed (certain Rhabdocelida). The genital glands display a primitive condition in being paired, though frequently the ger- marium (fig. 5, g) of the Rhubdocela, and occasionally also the testis, is developed only upon one side of the body.

The structure of the female organs varies. In some cases there are simple ovaries (ov in figs. 4, 8) in which the ova originate and become fully mature without being furnished with the secretion of a second gland; in other cases there is a division into ger- marium (fig. 5-7, g) and yelk gland (v); the primordial ova or germs originate in the former, and absorb the products of the yelk gland in the atrium, where they become ready for fertilization. An intermediate condition is seen in those forms where there is but a simple gland present which produces germs in its upper portion and yelk in the lower portion. The ovarics are generally compact round or tubular glands (fig. 4); sometimes they are formed of a number of pear-shaped follicles (fig. 8); there is usually a simple or paired uterus (w) which retains the ova for some time before they are deposited ; sometimes, however, the ova undergo their develop- ment within the utcrus and are completely developed before expul- sion; in some cases the egg-shell is detached within the uterus so that the young are produced alive.

In Turbellarians without a yelk gland the uterus is a simple widening of the oviduct (fig. 8); in those forms which possess addi- tional yelk glands the uterus is a simple or paired diverticulum of the atrium genitale (figs. 5, 7). ‘The ova are either surrounded by a more or less hard chitinous shell, or one shell contains a number of ova (“cocoon” of Tricladida and many Polycladida). The Polycladida deposit an egg-string which like that of the Gastropoda consists of a number of eggs bound together by a transparent albumen-like mass. Many Rhabdoccel Turbellarians (¢.g., Afesostoma

ehrenbergii) produce two sorts of ova, thin-shelled summer ova and thick-shelled winter ova; the latter are capable of withstanding a considerable amount of desiccation, and are deposited in the autumn. The accessory female organs of reproduction are represented by burs seminales, which receive the semen during copulation and retain it

until fertilization is accomplished. A further division of labour is brought about by the presence of two diverticula of the atrium genitale, one of which serves as a bursa copulatrix (fig. 5, bc) and the other as a receptaculum seminis (7s) in the same sense as the equivalent organs of insects. In the place of a special receptaculum seminis the efferent duct of the ovary is often (Mesostomida) metamorphosed into a chamber to contain the semen. In the Tricladida and Polycladida the female efferent duct is often differentiated into a muscular vagina which closely resembles the penis (figs. 7, 8, 2). } ‘ f

Finally, the female generative apparatus is furnished with a number of glands which have been termed cement glands, albumini- parous glands, and shell glands. hn gt

The male sexual glands (figs. 4-8, ¢) resemble the ovaries in being either compact tubular (fig. 5) or follicular (figs. 4, 6, 7, 8) strnc- tures. ‘The vasa deferentia (vd) are often widened out into vesicule semninales (figs. 4, 6, vs) ; or there are special vesicule seminales present, formed by a portion of the penis (fig. 5, vs). In the male organ of copulation there is frequently found in addition to the sperinatozoa an accessory granulated secretion produced by special glands, but of unknown function.

The muscular penis, especially in the Rhabdocela, has a number of cliitinous spines and hooks which serve to assist the animal in maintaining a firm hold during copulation, but also in capturing and retaining its prey. In Jacrorhynchus helgolandicus, Giff, there is a peculiar poison dart counected with the male copulatory organ which only serves the latter purpose. Very remarkable is the opening of the penis into the mouth cavity in Stylostomum (Polycladida) and Prorhynehus (Rhabdocela), and also the

existence of several (2-15) pairs of male copulatory organs and genital apertures in certain Polycladida.

The spermatozoa vary much in form, especially in the Rhabdo- –

celida, where frequently the species of one and the same genus are distinguished by the different form of the spermatozoa. Copulation in the Turbellarians is generally reciprocal; only in those cases where both summer and winter ova (see above) arc formed do the former arise from self-fertilization; the latter are the result of the copulation of two individuals. The fertilization of the ova always takes place in the atrium genitale. Many Turbellarians, especially the

Asexual generation is met with only in the Microstomida ; it takes the form of transverse division accompanied by budding. The posterior third of the body becomes separated off by a septum ruuning from the gut to the integument and an external furrow corresponding to this; this part of the body grows in length until it equals the anterior portion. By further repetition of this double procedure of separation and equalization there, chains of 4, then 8, 16, and 32 buds are formed, which remain attached (fig. 9), and, although fresh mouth apertures (m’, am”, m’”) have been formed, are still in communication by the intestinal lumen ; this becomes closed before or after the several buds break off from their connexion with each other. Throughout the whole summer chains of zooids are met with ; in antumn this asexual division probably ceases to occur; the several individuals become sexually mature, separate from each other, and lay eggs which remain quiescent during the winter and in the spring develop into fresh individuals reproducing asexually.

Development.—The study of the development of the Turbellarians is unfortunately not very far advanced, particularly among the small Rhabdoewlida, whieh are extremely difficult to investigate, and about whieh hardly any developmental facts are known. The larger freshwater T’ricladida and the Polycladida on the contrary have been recently very fully investigated. The Rhabdocela and the Yricladida appear to develop directly without any metamor- phosis, while a great part of the Polycladida undergo a metamor- phosis and pass through a larval condition, during which thicy are furnished with provisional ciliated processes (fig. 10); the

Acela have also a free larval form; pelagic larvee with a coat of long cilia apparently belonging to this group have becn observed by Ulianin. The segmentation of the ovum is total, but unequal; an epibolic gastrula is formed and the aperture of invagination becomes the permanent mouth of the adult.

Systematic Arrangement and Mode of Life.—Order Turbellaria.—Platyhelminths with a ciliated integument, a mouth and pharynx, but no anus ; with paired cerebral ganglia and two lateral nerve cords ; sexual organs hermaphrodite ; chiefly free-swimming.

Sub-order A. Khabdocelida.—Of small size; body cylindrical or depressed ; without an intestine, or with a simple unbranched intestine; the female genital glands always compact, not follicular ; genital apertures single or distinct.

Tribe I. Aecla (fig. 1, a).— With a digestive parenchyma not differentiated into intestine and parenchyma proper; with no nervous system or excretory organs ; sexual organs hermaphrodite, with follicular testes and paired ovaries : generally without a

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pharynx, but having otoliths ; all the forms marine. Many quite flat, with the lateral margins bent down towards the ventral surface (Convoluta), frequently with brown or green parasitic alge in the parenchyma.

Tribe II. Rhabdocela (fig. 1, 6).—Intestinal tract and paren. chyma separate; nervous system and excretory organs present; with compact testes and female generative glands (ovaries or separated germarium and yelk glands); with a complicated pharynx, but generally without otoliths. Numerous forms, freshwater and marine; the genus Prorhynchus (two species) also in damp earth. The Microstomida (he. 9) propagate asexually,

Fig. 10,

Fic. 9.—Microstoma lineare, Oc., undergoing division. There are 16 individuals, 8 with mouth apertures, showlng the buds of the first (m),

second (mm/), third (m”), and fourth (m’”) generation. The fifth generation has not yet acquired

Fig, 9.

a mouth aperture. , ciliated grooves; e, eye spots; 7, intestine. z Fic, 10.—Larva of Yungia aurantica, L. (Polycladida), with provisional ciliated processes (after A. Lang).

Freshwater forms mostly belong to the families Mesostomida and Vorticida, some of which contain green parasitic alge. Marine forms include representatives of these two families and of the Proboscida (with a tactile proboscis). Of the family Vorticida, the genera Grafilla and Anoplodiwm are parasitic, the former in Gastropods the latter in Echinoderms (Holothurians).

Tribe III. Alloiocela (fig. 1, c).—Intestinal tract and parenchyma separate ; nervous system and excretory organs present ; with folli- cular testes and compact female glands (as in the Rhabdocela) ; pharynx similarly developed as a shorter or longer sac. One family (Monotida), with otoliths. Al the species marine, with one excep- tion, Plagiostoma lemani, which lives in the deep water of the Alpine lakes.

Sub-order B. Dendrocelida,—Large forms, with a flattened body, branched intestine, follicular testes and follicular yelk glands or ovaries ; without otoliths. .

Tribe I. Tricladida.— Body elongate; intestine with three mam branches uniting to open into a cylindrical retractile pharynx 3 with follicular testes, two round germariums, and numerous yelk follicles, with a single sexual aperture. Planaria, Dendrocelum, Polycelis (fig. 1, g) are inhabitants of fresh water (with great power of reproduction). Terrestrial forms (fig. 1, ¢, /) of leech-like shape, especially met with in the tropics (only two European species Rhyn- ehodenvus terrestris and Geodesmus bilincatus) ; marine forms Gunda (characterized by a metameric structure), Bdcllowra (external para- site of Limulus).

Tribe II. Polycladida (fig. 1, d).—Body leaf-like, thin, and broad, with numerous branched or retiform intestinal cceca which unite to form a central tube (stomach) ; with follicular testes and follicular ovaries, with two separated genital apertures, the male in front of the female ; without (Acotylea) or with (Cotylea) a sucker situated behind the female generative opening. All marine.

Literature,—The most recent works, which also contain a full account of what has gone before, are the following :—Rhabdocela.—L. v. Graff, Monographte der Turbellarien: 1. Rhabdocelida, Leipsic, 1882, with 20 plates. Marine and Freshwater Tricladida.—A. Lang, " Der Bau von Gunda segmentata und die Verwandtschaft der Platyhelminthen mit Ccelenteraten und Hirudineen, 1 Mitth. Zool. Stat. Neapel, vol. iii., 1881; El. Metschnikoff, '* Dic Embryologie von Planaria polychroa," in Zeitschr. f, wiss. Zool., vol. xxxviii., 1883 ; Isao Jijima, 'Untersuchungen itber den Bau und die Entwickelungsgeschichte der Stiss- wasser-Dendrocoelen," in Zetischr f.wiss.Zool., vol. x1., 1884, Land Planartans.—

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fi. N. Moseley, "On the Anatomy and Histology of the Land Planarians of Ceylon, with some Account of their Habits, and with a Description of Two New Specics, and with Notes on the Anatomy of some European Aquatic Species," in Phil. Trans. (London, 1874), and "Notes on the Structure of several Forms of Land Planarians, with a Description of Two New Genera and Scyeral New Spccics, and a List of all Species at present known," in Quart. Jour, Micr. Sci., vol. xlvii., 1877; J.v. Kennel, " Dic in Deutschland gefundenen Landplanarien Rhynchode- mus terrestris und Geodesmus bilineatus." in Arbeit, Zool.~~Zootom. Instit. Wiirz~~ burg, v., 1879. Polycladida,—A. Lang, '' Die Polycladen," in Fauna und Flora des Golfes von Neapel, No. 11, 39 plates, Leipsic, 18S4-85. (L. v. G.)

PLANCK, Gorruirs Jaxop (1751-1833), theologian and church historian, was born at Niirtingen in Wiirtem- berg, where his father was a notary, on November 15, 1751. He was educated for the Protestant ministry at Blaubeuren, Bebenhausen, and Tiibingen, and from 1774 to 1784 held successive appointments as repetent, preacher, and professor in Tiibingen and Stuttgart. In 1781 he published anonymously the first volume of his

Geschechte des Protestantischen Lehrbegrif's; the second, also anonymous, appeared in 1783; and in 1784 he was chosen to succeed Walch at Gottingen. Here in the course of a long and useful professional career he enjoyed a large number of academical and ecclesiastical honours. His death took place on August 31, 1833.

The Geschichte des Protestantischen Lehrbegriffs was completed in 6 vols. in 1800. It was followed by an extensive Geschichte der Kirchenverfassung, in 5 vols. (1803-1809). Both are works of considerable importance, and are characterized by abundant learn- ing and acuteness, the most conspicuous fault in the eyes of his least favourable critics being a tendency, which cannot be wholly denied, to ‘‘subjective pragmatisin.”

PLANTAGENET. This surname, distinctive of a line of kings who ruled in England for more than three hundred years, was first adopted by Geoffrey, count of Anjou, in reference to a sprig of broom (planta genistx) which he is said to have worn in his bonnet. He is described by early writers as a very handsome man, but there was certainly nothing very striking in his character. He was the son of Fulk, count of Anjou, king of Jerusalem, who, before his departure for the Holy Land, placed him in possession of the counties of Anjou and Maine. This made him in the eyes of Henry J. of England, who was anxious to protect Normandy, an eligible husband for his widowed daughter, the empress Maud, whom he proposed to make his heiress, both in England and beyond sea. It was a purely political marriage, and the couple immediately afterwards had violent quarrels. Nor was either of them popular in England, where a female sovereign would at that time have been an innovation, and Geoffrey was dis- liked as a foreigner—although the same objection might have Seemed to apply to Stephen of Blois, whose superior activity gained possession of the throne before Maud could make good her pretensions. In a long war with the usurper, though recognized as “lady of England” and virtual sovereign by one part of the country, she was only able in the end to secure the succession for her son. Stephen ended his days in peace, and the house of Plantagenet succeeded to the throne in the person of Henry II. by virtue of a compact.

Henry, the son of Geoffrey of Anjou and the empress Maud, was born at Le Mans in the year 1133, and was Just twenty-one years of age when he

attained the crown. But his youth had been well spent in preparation for it. When eight years old he was brought to England to be trained in arms. At sixteen he was knighted by his great-uncle David of Scotland. In 1151 his father put him in possession of N ormandy, and, dying soon after, left him also the succession to Anjou. These advantages he improved next year by his marriage with Eleanor of Aquitaine, which, by adding Poitou and Guienne to his : tions, gave him the lordship over the whole western

© of France from north to south, with the exception of

Eas which also some time afterwards came under his er,

Having thus, even before he was twenty, become master of so many fair provinces, he then sailed to England, and, though he did not dethrone Stephen, compelled him to acknowledge him as his successor. Next year he was king. It is a new era in the history of England as well as in the fortunes of his house. The country, which was lately so impatient of the rule of a foreigner—fearing, doubtless, that English interests would be sacrificed to those of Anjou —now yields an easy submission to the ruler of all western France from Picardy to the Pyrenees. And, though Henry is in fact one of the greatest of Continental potentates, greater really than his feudal superior. the king of France, there is no great cause for anxiety. Henry devotes him- self to the interests of his island kingdom, takes steps to secure the succession there to his issue, causing his eldest son even to be crowned king during his own lifetime, and is much more intent on the subjugation of Wales and Ireland and the recognition of his feudal superiority over Scotland than upon any extension of his responsibilities abroad. Personally a man of fiery temperament and strong passions, his patience as a politician is remarkable. Bit by bit he is building up a strong empire, and even keeping the pretensions of the church within definite and reasonable bounds. But a single angry word undoes the work of years. He is responsible for Becket’s murder. He must do penance and make his peace with the church. He must humiliate himself before Becket’s grave.

His dynastic policy seemed almost an equal failure, but was productive of wide and far-reaching conseqnences. His ungrateful sons rebelled against

him, and when he heard that even John had joined the confederacy he felt that he had nothing more to live for. The eldest, Henry, whom he had been so anxious to make a king during his own life, sickened and died in France after flagrant acts of ingratitude and impiety. Geoffrey, to whom he had secured the duchy of Britanny, soon followed his brother ; and there remained but Richard and John, besides three daughters, who were all disposed of in marriage to Continental princes. As Richard, though he came to the crown, also died without legitimate issue, the male line was continued in the two sons of John, Henry III. and Richard, king of the Romans, and the issue of the latter became extinct in the next generation.

It is remarkable how the prosperity of England seemed to keep pace with the stability of the succession. The short reigns of Richard I. and John were times of peculiar misery, which was only brought to a climax by the war of the Great Charter and by the dauphin being called in to enforce it. Matters improved under Henry III, even during the minority ; but he, too, had a war with his barons in the latter part of his reign. He, too, like his father, had but two sons who grew up to manhood ; and, while the elder, Edward I., succeeded him on the throne and was the ancestor of all the following kings, the younger, Edmund Crouchback, became progenitor of the house of Lancaster by the niarriage of his great granddaughter Blanche to John of Gaunt, fourth son of Edward III. Edward I. had three sons who came to man’s estate; Edward II. only two, or more properly only one, for the second, John of Eltham, died in Scotland at the age of nineteen. Finally the time of Edward III. with his great family was the climax in the fortunes of the house of Plantagenet. Nor need we pursue the family history further, as the story of its descent after the days of Edward III. will be found sufficiently treated elsewhere (see LancasTeR, Hovsk or, and York, House oF).

Of the alliances of this great dynasty the most import- ant after the days of Henry II. were those of the house of Lancaster. Henry III. married his daughter Margaret to Alexander III. of Scotland, and another daughter to the

duke of Britanny. Edward I. had for his sons-in-law Gilbert de Clare, earl of Gloucester, the duke of Brabant, and the earl of Holland. A daughter of Edward II. married a duke of Gueldres. But “the aspiring blood of Lancaster” spread itself over Europe by alliances with Castile and Portugal, Navarre and Denmark, Bavaria and other foreign states. It has reigned in Portugal to the present day, and it continued to reign in Spain till the end of the 17th century. (3. GA.) PLANTAIN (Lat. plantago), a name given to plants with broad palm-like leaves. This is the case with certain species of Plantago, Alisma, and Musa, to all of which the term is popularly applied. Of the Plantago little need be said here, the species being for the most part mere weeds, though one species, P. lanceolata, is eaten by cattle, and the seeds of another, P. major, are collected for the food of birds. Of far greater general importance is the genus Musa, to which belong the Plantain, and the BANANA (q.v.). These are gigantic herbs, now diffused by cultiva- tion throughout the tropics of both hemispheres, and sending up from a short . thick underground stem WV shoots with a number of very large leaves whose long, thick leaf-stalks are wrapped one round another. The blades are usually oblong-obtuse, like the blade of an oar, with a very thick midrib from which diverge on each side numerous pa- rallel densely arranged secondary ribs. The flowers are borne in huge pendulous spikes _pro- vided with large boat- shaped, often coloured, bracts, in whose axils the whorls of flowers are pro- duced; the lower ones are usually female or hermaphrodite, those at the apex of the spike are male only. These flowers consist of a perianth of six divisions partly united below, slightly two-lipped above, and enclosing five perfect and one imperfect stamen. The ovary is inferior and three-celled—ripening into a long ob- long fruit filled with spongy pulp, in which the numerous seeds are embedded. The accumulation of starch and sugar in this pulp renders the fruit of vast importance as an article of diet in the tropics. Corenwinder, cited by Pavy, says that, while starchy matter forms more than 19 per cent. of the ripe fruit—there is also nearly 5 per cent. of nitrogen- ous matter, about double that of the potato. The plant requires but little attention, and the produce from a rela- tively small area is enormous ; hence it is one of the most valuable of all food-plants. After fruiting, the stem dies down, but provision for new growth is made by the pro- duction from the underground stock of numerous offsets. The number of varieties is very great, a circumstance which in itself testifies to the long period during which the plant has been cultivated. It is also the -more

remarkable in that perfect seeds are comparatively rarely produced, the inference being that the different forms have arisen from bud-variations or “sports.” In spite of the vast number of varieties grown in the tropics of both hemispheres—varieties mostly dependent on diversities in the size, form, and flavour of the fruit—the general opinion among botanists is that they have all sprung from one species, the Musa saprentum of Brown. Were it otherwise, it is presumed that the varieties found in

AMM Silly

Musa sapientum.

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America would be different from the Asiatic ones, and these again from those found in the South Sea Islands, &c.; but, as a matter of fact, there are no geographic limitations, the same varieties being found in different quarters of the globe. The varieties are arranged under two heads by Desvaux according to the size of their fruit —the bananas, with fruit 7-15 inches in length, and the fig bananas, with fruit from 1-6 inches long; but these variations are not constant, and Schomburgk has recorded a case in which a spike of the fig banana bore numerous fruits proper to that variety, and: in addition a large number of fruits like those of the Chinese dwarf-plantain, Musa chinensis, the Cavendish banana of gardens—a cage analogous to, but even more remarkable than, the not infrequent occurrence of peaches and‘ nectarines on the same branch. ‘The plantain and the banana are sometimes spoken of as distinct. The former has a green stem and yellow angular fruit not fit for eating till cooked. The banana (M. sapientum) has the stem marked with purple spots, and a shorter more cylindric fruit which may be eaten without cooking, but the two run one into the other so that no absolute distinction can be drawn between them. The species have been found ina wild state in Chittagong and Khasia, in the Philippine Islands, in Siam, and in Ceylon, but nowhere truly wild on the American continent.

Throughout tropical and subtropical Asia the plant has numerous and diverse native names; and it was mentioned by old Greek and Latin authors. On the other hand, there are no native names for the plant in Mexico, Peru, or Brazil. From such considerations as these Alphonse de Candolle, in his Origine des Plantes Cultivées, sums up the evidence by asserting the Asiatic origin of the plantain and its early introduction into America by the Spaniards or Portuguese. If it should turn out that the banana or the plantain existed in America before the discovery of that continent, then M. de Candolle would attribute that

circumstance to some fortuitous introduction at no very

remote date rather than to the simultaneous existence of the banana as an indigenous plant in both hemispheres.

It is not only for their fruit that these plants are valuable. The leaves are used for thatching, and the abundant fibre they contain forms a good substitute for hemp. Musa textilis is of special value from this point of view. The Abyssinian banana, J. Ensete, has dry capsular fruit, and very handsome foliage.

PLANTAIN-EATER. See Touraxkoo.

PLANTIN, CuristopHe (1514-1589), born in a vil lage near Tours (probably Saint-Avertin) in 1514, learned book-binding and book-selling at Caen, and, having mar- ried in that town, settled in 1549 as bookbinder in Antwerp, then the principal commercial town of the Netherlands, where he was soon known as the first in his profession. A bad wound in the arm, which unfitted him for this occupation, seems to have been the cause that first led him (about 1555) to apply himself to typography. The first known book printed in his office was La Instiw- tione di una fanciulla nata nobilmente, by J. M. Bruto, with a French translation, and this was soon followed by many other works in French and Latin, which in point of execution rivalled the best printing of his time, while the masters in the art of engraving then flourishing in the Netherlands illustrated many of his editions. In 1562, Plantin himself being absent in Paris, his workmen printed an heretical pamphlet, which caused his movables to be seized and sold. It seems, however, that he recovered a great deal of the money, and in 1563 he

associated him- self with some friends to carry on his business on a larger scale. Among them were two grand-nephews of Dan. Bomberg, who furnished him with the fine Hebrew types

He was now in a | pleasantly situated on the right bank of the Xerte or

of that renowned Venetian printer. position to spare no expense in printing his books with all the care he deemed necessary; and his editions of the Bible in Hebrew, Latin, and Dutch, his Corpus Juris, Latin and Greek classics, and many other works produced at this period are renowned for their beautiful execution and accuracy. A much greater enterprise was planned by him in those years-—the publication of a Biblia Polyglotta, which should fix the original text of Old and New Testaments on a scientific basis. In spite of clerical opposition he was supported by Philip II. king of Spain, who sent him the learned Benedictus Arias Montanus to take the leading part in the work of editorship. With his zealous help the work was finished in five years (1569-73, 8 vols. fol.). Plantin earned much renown by it, but little profit, or rather less than none ; but in conzpensation he received the privilege of printing all liturgical books for the states of King Philip, and the office of "‘ prototypo- graphus regius," which carried with it the oversight over all printers in the Netherlands, a cliarge of which Plantin seems to have acquitted himself indifferently. This need not surprise us, when we know that Plantin, though out- wardly a faithful son of the church, was till his death the partisan of a mystical sect of heretics; and it is now proved that many of their books published without the name of a printer came from his presses together with the missals, breviaries, &c., for the Roman Catholic Church.

Besides the polyglott Bible, Plantin published in those years many other works of note, such as editions of St Augustine and St Jerome, the botanical works of Dodonzus, Clusius, and Lobelius, the description of the Netherlands by Guicciardini, &ce. In 1575 his printing- office reckoned more than twenty presses and seventy-three workmen, besides a similar number that worked for the office at home. But soon there came bad times for Antwerp. In November 1576 the town was plundered and in part burnt by the Spaniards, and Plantin had to pay an exorbitant ransom. A great

many inhabitants of the once flourishing city emigrated, and Plantin also thought of settling elsewhere. He established a branch of his office in Paris; and when in 1583 the states of Holland sought a typographer for the newly erected university at Leyden, and invited him to occupy this place, he left his much reduced business in Antwerp to his sons- inlaw John Moerentorf (Moretus) and Francis van Ravel- inghen (Raphelengius), and settled at Leyden. But he could not thrive, it seems, in Holland. When in 1585 Antwerp was taken by the prince of Parma and affairs became there more settled, he left the office in Leyden to Raphelengius and returned to Antwerp, excusing himself for having served the states of the revolted provinces by the difficulties of his situation. Im Antwerp he laboured till his death on the Ist July 1589. His son-in- law, John Moretus, and his descendants continued to print many works of note “in officina Plantiniana,” but from the second half of the 17th century the house began to decline. Jt continued, however, in the possession of the Moretus family, which religiously left all the old things In the office untouched, and when in 1876 the town of Antwerp acquired the old buildings with all their contents, for 1,200,000 francs, the authorities were able with little trouble to create one of the most remarkable museums in existence (Musée Plantin, opened 19th August 1877). be Max Rooses, Christophe Plantin imprimeur Anversois,

ntwerp, 1882; Aug. de Backer and Ch. Ruelens, Annales de

pyprimerie Plantinienne, Brussels, 1865; Degeorge, La maison antin, 2d ed., Brussels, 1878. (P. A. T.)

PLANTING. Sce ARBORICULTURE. a PLASENCIA, a city of Spain and an episcopal see, in € north of the province of Caceres (Estremadura), is

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Jerte, a sub-tributary of the Tagus, and at the foot of the sierras of Bejar and Vera, continuations of the Guadarrama range. Industrially and commercially insignificant, the place has some interest for the artist and ecclesiologist on account of its fine walls, built in 1197 by Alphonso VIII. of Castile, and of its cathedral, begun in 1498, which is a favourable specimen of the ornate Gothic of its period, and also shows good examples of the workmanship of

Berruguete, Aleman, and other artists. The population of the ayuntamiento was 7090 in 1877. The Hieronymite convent of Yuste, the scene of the last years of the emperor Charles V., lies about 24 miles to the westward, and is most conveniently reached from Plasencia.

PLASTER OF PARIS. See Gypsum.

PLATA, LA. See ARGENTINE REPUBLIC.

PLATA, RIO DE LA. See Prats River, p. 187.

PLATA, or PLatza#, a celebrated city of ancient Greece, lay at the foot of the northern slope of Mount Citheron in Beeotia, about 64 miles by road south of Thebes, or a little over 5 geographical miles in a direct line. Its territory was separated from that of Thebes by the river Asopus. The Thebans claimed to have founded Platzea, but, however this may have been, Platzea was always at feud with its more powerful neighbour. In 519 B.C. the Platzans, being hard pressed by Thebes, applied for help to the Spartan king Cleomenes, who advised them to place themselves under the protection of Athens, They did so, and Athens and Platea were thenceforward fast friends. It was perhaps on this occasion that the Plateeans were granted that restricted citizenship of Athens which we know that they enjoyed at a later time. When Athens faced the Persians alone at Marathon, the Plateeans to a man marched out to their help and shared in the victory (490 B.c.). From that day the names of Athens and Platzea were always associated in solemn prayers at Athens. Though dwellers in an inland town, and therefore ignorant of seamanship, the Platzeans helped to man the Athenian ships at the sea fight with the Persians off Artemisium (480). In revenge the Persians burned Platza. The great battle of Platsea, which finally secured the freedom of Greece against the Persians, was fought on the uneven and broken ground to the east and north of the town (September 479). After the battle the Greeks declared the city and territory of Platzea to be independent and inviolable. The Platzeans undertook to bring annual offerings of food and raiment to the graves of those who had fallen in the battle; and a festival of liberation (Eleutheria) was celebrated every fifth year. These offer- ings continued to be brought, and the festival to be held, as late as the 2d century of ourera. With the spoils of the Persian wars the Platzans raised a temple of Athene the Warlike.! The

Peloponnesian War began with an attempt of the Thebans to seize Plata (431 B.c.). The attempt failed, but in 427, after a siege of about two years, the city was taken by the Peloponnesians and the garrison put to the sword. The bulk of the population had previously taken refuge in Athens. A year afterwards the Thebans razed the city to the ground, and built a large hospice close to the old temple of Hera, to whom they erected a new temple 100 feet long. In 421 the surviving Platzans received from the Athenians the town of Scione in Macedonia as a residence, but they had no doubt to quit it at the end of the war (404). When the peace of Antalcidas was concluded between Greece and Persia (387) Platzea was restored, but a few years afterwards it was surprised and destroyed, except the temples, by the Thebans (about 373). The Platzeans were again received

1 It was built, according to Plutarch (Arist. 20), after the battle of Platea; according to Pausanias (ix. 4, 1), after the battle of Marathon.

at Athens, where they were now admitted to full citizen- ship, except that they were not eligible for the priesthood and the archonship. After the battle of Chzronea (338)

Philip of Macedon brought back the Plataeans as a counter- |

poise to the power of Thebes, but the walls were not fully restored till some years later. Alexander the Great, then monarch of Asia, contributed to rebuild them, in recog- nition, he declared, of the services which the Platzans had rendered against the Persians of old. With the loss of Greek freedom Platea sank into insignificance. The inhabitants lived on the glories of the past, and were regarded as braggarts by the rest of the Beeotians. In the 6th century the walls were once more restored by Justinian.

The fullest deseription of ancient Platea is that of Pausanias, who visited it in the 2d century. The great temple of Hera, he tells us, contained a statue of Rhea by Praxiteles; the temple of Athene the Warlike was adorned with an image of the goddess by Phidias and paintings by Polygnotus. Close to the

city gates were the tombs of the Greeks who had fallen in the battle of Platea, and an altar and image of Zeus the Liberator in white marble. The ruins of the ancient town lie about 500 yards east of the modern village of Kokhla. They oceupy a slightly elevated plateau forming a rude triangle about two and a half miles in eircumferenee, of which the apex to the south almost touches the great rocky slope of Citheron, and the base to the north has a steep though short descent to the plain. The outer walls follow the edge of the plateau, but an inner cross-wall divides it into two uncqual parts. The southern and higher part is probably as old as the Persian wars; the masonry of the northern part is more recent, and probably belongs to the age of Philip and Alexander. It is likely that these two parts were never included at the same time within the city walls, but that the southern was the ancient city, and that at one of the restorations (perhaps that of 387 B.c.) the northern and more spacious part of the plateau was preferred as the ‘site. Within this northern half, and elose to the northern wall, is a terrace on which may have stood the temple of Hera. The north-western corner of the northern town is portioned off by a wall, and is conjectured to have been the acropolis of the newer city.

See Dodwell’s Tour through Greece, i. p, 274 sq.; Leake’s Travels in Northern Ste vol. ii. chap. 16; and Bursian’s Geographie von Griechenland, vol. i. p.

PLATE. The word plate (connected with the Greek wAarvs, flat, the late Latin plata = lamina, and the Spanish plata, silver) is usually employed to denote works in silver or gold which belong to any class other than those of per- sonal ornaments or coins.!

On account of the ease with which it can be worked and the pure state in which it is generally found, it is pro- bable that gold was the first metal used by man; and it is certain that, in some countries at least, he attained to the most marvellous skill in its manipulation at a time when the other arts were in a very elementary condition. As an instance of this we may mention a sword of the bronze age, found in a barrow near Stonehenge, and now in the museum at Devizes? The hilt of this sword is covered with the most microscopically minute gold mosaic. A simple design is formed by fixing tesserae, or rather pins, of red and yellow gold into the wooden core of the

handle. Incredible as it may appear, there are more than two thousand of these gold tesseree to the square inch. The use of silver appears to belong to a rather later period, probably because, though a widely spread metal in almost all parts of the world, it is usually found in a less pure state than gold, and requires some skill to smelt and refine it. Though both these precious metals were largely and skilfully used by prehistoric races, they were generally employed as personal ornaments or decorations for weapons. Except in Scandinavian countries but little that can be called “plate” has been discovered in the early barrows of the prehistoric period in western Europe.

_ + In medieval English the term “a plate” was oeeasionally used in the sense of a silver vessel. A curious survival of this nse of the word still exists at Queen’s College, Oxford, where the servants ma’

yet be heard asking at the buttery for any “ ‘ ie a egg y for so many “ plates of beer,” that

- Hoare, Ancient Wiltshire, 1840.

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It will be convenient to consider the no less prehistoric gold and silver work recently found at Troy, Tiryns, and Mycenz as forming a stage in the history of Greek art.

Ancient Egypt.—An enormous amount of the precious metals was annually brought as tribute to the Egyptian kings ; according to Diodorus, who quotes the authority of Hecatzeus, the yearly produce of the royal gold and silver mines amounted to thirty-two millions of minze—that is, about 133 millions sterling of modern money. Though this estimate is probably an exaggeration, the amount must have been very great. The gold chiefly came from the mines in the Bishari desert, about eighteen days’ journey south-east of Kum Ombos. These mines were constantly worked down to the time of the Arab caliphs, but now appear to be exhausted. It is not known where the silver came from. Gold appears to have been relatively more abundant

than silver, and the difference in value between them was very much less than itisnow. Tribute was paid to the Egyptian kings, not in coined money, which was then unknown, but in rings or ingots. Owing to the Egyptian practice of burying with their dead pérsonal ornaments and jewellery, rather than other possessions less intimately connected with the person of the deceased, but few speci- mens of either gold or silver plate have survived to our times, whereas the amount of gold jewellery that has been discovered is very large, and shows the utmost amount of skill in working the precious metals. We can, however, form some notion of what the larger works, such as plates and vases in gold and silver, were like from the frequent representations of them in mural sculpture and paintings. In many cases they were extremely elaborate and fanciful in shape, formed with the bodies or heads of griffins, horses, and other animals real or imaginary. Others are simple and graceful in outline, enriched with delicate surface ornament of leaves, wave and guilloche patterns, hieroglyphs, or sacred animals, Fig. 1 shows a gold vase of the time of Thothmes III. (Dynasty XVIIL, about 1500 B.C.), taken from a wall-painting in one of the tombs at Thebes. The figure on its side is the hieroglyph for “gold.” Others appear to have been very largeand massive, with human figures in silver or gold supporting a great bowl or crater of the same metal. 5,4 1 Gola Vase, from wall-

In the language of the hiero- paintings at Thebes. glyphs silver is called “ white gold,” and gold is the generic name for money,—unlike most languages, in which silver usually has this special meaning,—a fact which points strongly to the priority of the use of gold. On the walls of one of the tombs at Beni Hassan there is an interesting representation of a gold- and silver-smith’s workshop, show- ing the various processes employed—weighing, melting or soldering with the blow-pipe, refining the metal, and polish- ing the almost finished bowl or vase. In the time of Rameses IIT., about 1300 3.c., a clearly defined Assyrian influence appears in the decoration of some of the gold plate. A gold basket, represented in the tomb of this king at Thebes, has on its side a relief of the sacred tree between two beasts, the oldest of purely Aryan or Indo- European subjects, and quite foreign to Egypt.

The chief existing specimens of Egyptian plate are five silver phiale or bowls, found at the ancient Thumuis 1 the Delta, and now in the Bulak

Museum (Nos. 482 to 486 in the catalogue). These are modelled in the form of & lotus blossom, most graceful in design, but are apparently not earlier than the 5th century B.c. The Louvre possesses a fine gold patera, 6} inches across, with figures of fishes

PLATE 179

within a lotus border in repoussé work ; an inscription on the rim shows it to have belonged to an officer of Thothmes IIL. (Afém. Soc. Ant. de France, xxiv. 1858).

Assyrian and Pheencian Plate-—Among the many treasures of early art found by General Cesnola in the tombs of Cyprus none are of more interest than a large number of Pheenician silver phiale or saucer-like dishes, enriched with delicate repoussé and tooled reliefs, which in their design present many characteristics of Assyrian art mingled with a more or less strong Egyptian influence. A considerable number of bowls and phiale found in Assyria itself are so exactly similar to these Cyprian ones, both in shape and ornamentation, that they cannot but be classed together as the production of the same people and the same age. The British Museum possesses a fine collection of these bowls, mostly found in the palace at Nimrid. Though they are made of bronze, and only occasionally ornamented with a few silver studs, they are evidently the production of artists who were accustomed to work in the precious metals, some of them in fact being almost identical in form and design with the silver phialze found at Curium and elsewhere in Cyprus. They are ornamented in a very delicate and minute manner, partly by incised lines, and partly by the repoussé process, finally completed by chasing. ‘Their designs consist of a central geometrical pattern, with one or more concentric bands round it of figures of gods and men, with various animals and plants. In these bands there is a strange admixture of Assyrian and Egyptian style. The main motives belong to the former class, the principal groups being purely Assyrian—such as the sacred tree between the two attendant beasts, or the king engaged in combat and van- quishing a lion single-handed ; while mingled with these

are figures aud groups purely Egyptian in style, such as

the hawk-headed deity, or a king slaying a whole crowd of captives at one blow. Fig. 2 gives a silver dish from

Fig. 2.—Silver Bow], about 7 inches in diameter, found in a tomb in Cyprus, with repoussé reliefs of Egyptian and Assyrian style Curium containing examples of all the above mentioned subjects. Some of the designs are exceedingly beautiful, and are arranged with great decorative skill: a favourite omposition is that of antelopes walking in a forest of tall Papyrus plants, arranged in radiating lines, so as to suit the circular phiale, and yet treated with perfect grace and freedom. In addition to the numerous silver phiale some were found, with similar decoration, made of pure gold.

The Curium find alone is said to have included more than a thousand objects in gold and silver.

Etruscan Plate.—The Etruscan races of Italy were specially renowned for their skill in working all the metals, and above all in their gold work. Large quanti- ties of the most exquisite gold jewellery have been found in Etruscan tombs, including, in addition to smaller objects, sceptres, wreaths of olive, and massive head-pieces. The Museo Kircheriano in Rome possesses a magnificent speci- men of the last form of ornament; it is covered with nearly a hundred little statuettes of lions arranged in parallel rows.!_ Little, however, that can be classed under the head of plate has yet been found. A number of silver bowls found in Etruscan tombs have ornaments in the Egypto-Assyrian style, and were probably imported into Italy by the Phcenicians; some almost exactly resemble those found in Cyprus.

The British Museum (gold ornament room) possesses a fine specimen of early plate found at Agrigentum in

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Fie. 3.—Archaic Gold Phiale, found at Agrigentum, now in the British Museum. It is shown in section below. It is 5 inches in diameter.

across, with central boss or omphalos (didAn peodudados) which seems once to have contained a large jewel. Round the inside of the bowl are six

figures of oxen, repoussé in relief, and at one side a crescent, formed by punched dots. A delicate twisted moulding surrounds the edge; the workmanship of the whole is very skilful (see fig. 3). Hellenic Plate.—Discoveries made of late years on the plains of Troy, at Mycene, and at Camirus in Rhodes have brought to light a large quantity of gold and silver plate of very remote antiquity. These early specimens of plate are all very similar in character, graceful in shape, hammered, cast, and soldered with great skill, but, with the exception of weapons and ornaments, mostly devoid of surface decoration. The most remarkable find was that which Dr Schliemann calls " Priam's treasure," including a large number of silver vases and bowls, with fine massive double-handled cups in gold, and a very curious spherical gold bottle. Fig. 4 shows a silver cup, with gold mounts, found in a tomb at Camirus in Rhodes, apparently a work of the same early date and class. Homer's poems are full of descriptions of rich works in both the precious metals (Iliad xxiii. 741), showing that the taste for valuable pieces of plate was developed among the Greeks at a very early time—much more so probably than it was during

1 Another, very similar, exists in the Vatican Mus, Gregor.

the most flourishing period of Hellenic art, when the pro- duction of beautifully painted fictile vases seems to some extent to have superseded the more barbaric magnificence

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Fra. 4.—Silver Cantharus from Rhodes, with gold mounts. Possibly the form of the Homerie déras audixvmeddov.

of gold and silver. During the 6th century B.c. the demand for works of this class, valuable not only for their material but for their workmanship, seems to have been very great under the last dynasty of Lydian kings, whose

wealth in gold‘and silver has become proverbial. Croesus especially encouraged the art, and paid enormous sums for silver vases and cups to the most renowned artists of his time, such as Glaucus and Theodorus the Samian.

Pliny (V. H., xxxiii.) gives a valuable account of the sources whence the Greeks and Romans derived their precious metals, their methods of refining, and the sculptors who were most celebrated for their skill in making articles of plate. Among the Greeks and Romans the greatest artists of the day did not disdain to practise this branch of art. The same sculptor who produced noble and colossal statues for the temples of the gods would at another time put forth his utmost skill and artistic talent in chasing and embossing some small silver cup or vase. In this way ancient pieces of plate ranked among the most perfect productions of art—very different from the custom of the 19th century, which leaves its plate to be executed by some dull mechanical craftsman, after the pompous designs supplied by a tradesman whose only standard of merit appears to be the pretentiousness of the design and the number of ounces of silver it contains.

In the best times of Greek art, the chief works in gold and silver seem to have been dedicated to religious pur- poses, and to have been seldom used for the ostentatious pomp of private individuals. Vessels for the use of the temples, tripods in gold or silver of the richest work, and statues of the gods were the chief objects on which the precious metals were lavished.!

The gold used by the Greeks probably came from Asia Minor or Egypt, while the mines of Laurium, in the mountains which form the promontory of Sunium in Attica, supplied an abundant amount of silver for many centuries.2 According to Pliny, Phidias was the first sculptor who produced works of great merit in the precious metals ; he mentions a number of other Greek artists who were celebrated for this class of work, but unluckily does not give their dates. The chief of these were Mentor and Mys (both of the 5th century B.c.), Acragas, Boethus, the sculptors Myron and Stratonicus, as well as the well-known Praxiteles and Scopas. In Pliny’s time many works in gold and silver by these artists still existed in Rhodes and elsewhere. Among later workers he specially mentions Zopyrus, who made two silver cups, embossed with the scene of the judgment of Orestes by the

Areopagite court, and Pytheas, who made a bowl with reliefs of Ulysses and Dio- medes carrying off the Palladium. Enormous prices were

given by wealthy Romans for ancient silver plate made by |

distinguished Greek artists; according to Pliny, more than £300 an ounce was paid for the last-mentioned cup.

1 The gold eagles on the sacred omphalos at Delphi were notable examples of this ; see Pindar, Pyth. iv. 4. 2 Boeckh, Silver Mines of Laurium, 1842.

| find of Greek silver plate,

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Though a large quantity of later Greeco-Roman plate still exists in various museums, the specimens of Greek silver-work of the best period are extrentely rare, and mostly unimportant in point of size. In 1812 Dr Lee dis- covered at Ithaca a very beautiful vase or cyathus 33 inches high (see fig. 5) and a phiale or patera, 94 inches

Fie hos ion avin found in shan, 33 inches high. across, both of silver, repoussé and chased, with very rich and graceful patterns of leaves and flowers—suggesting a slight tinge of Assyrian style. These are probably not later than the 5th century B.c. A good many silver

mirror-cases, with repoussé figure-subjects in high relief, places ; as, for instance, one

have been found at various with a beautiful seated figure of Aphrodite found at Taren- tum and now in the British Museum.* The South Ken- \ sington Museum contains a most exquisite little silver vase found in the baths of B Apollo at Vicarello in Italy § (fig. 6), enriched with a band in low relief of storks devour- ing serpents, executed with gem-like minuteness and finish — probably not later than the 3rd century B.C. The British Museum has a little vase of similar form and almost equal beauty, though perhaps later in date ; it is decorated with bands of vine branches in a graceful flowing pattern, and is partly gilt. The most important

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Fic. 6.—Greek Silver Vase, 5 inches high, c. 4th century B.c, The ornd mental band is shown below in plano.

mingled with pieces of (South Kensington Museum.)

Roman or Greco-Roman work, was that discovered in the crypt of the temple of Mercury Augustus, at Villeret, neat Bernay, in France (the ancient Canetum), in 1830.° It

4 Jb,, xxxiv. 265-72. d:c., de la Bibliotheque

3 See Archxologia, xxxiii, 36-54.

5 See Chabouillet, Catalogue des Cameés, Imperiale, Paris, 1858, pp. 418-57; also Raoul Rochette, ad’ Antiquité, p. 272, and Lenormant, Bull. dell’ Inst. Arch., Rome,

1830.

Monuments –

Roman production of the 2nd or 3rd century A.D. shapes of the vessels composing this treasure are very

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consists of silver vessels and two silver statuettes, sixty-nine pieces in all, the gift of various donors to the temple. It is in itself a small museum of specimens of ancient plate, containing objects of great variety of date and

workmanship, from fine Greek work of about 300 B.c. down to the coarser The

numerous—ewers, bowls, paterz, large ladle-shaped cups, and drinking cups with and without handles. Those of Greek workmanship are in slight relief, while some of the Roman wine-cups and bowls have heads and figures almost detached from the ground. Some of these latter much resemble some silver canthari found in Pompeii! The dedicatory Roman inscriptions, in some cases, appear to be later additions, made by the various donors who presented these treasures to the temple.? It is interesting to note that two vases among the Bernay treasure have reliefs of the theft of the Palladium, like the celebrated cup by Pytheas mentioned by Pliny; another subject described by him as decorating silver plate by Zopyrus, the judgment of Orestes, is represented on a fine cup found at Antium, apparently of Greek design, which is preserved in the Cor- sini Palace in Rome. These may possibly be copies from originals by those much-renowned artists.

Greco-Roman and Roman Plate——Of what may be called Greco-Roman plate a much larger number of specimens still exist. ven during the Ist century the growing pomp and ostentation of the wealthy Romans led to an enormous demand for large and elaborate pieces of plate, while their good taste induced them to prefer the works of Greek cclatores,—a branch of art which even at that time showed but little signs of decay. It was no doubt the desire for objects which should combine intrinsic value with artistic merit, and also be of a more durable sort, that by slow degrees gave the death-blow to the art of vase painting. It is not always easy to distinguish

the best works in silver of this Roman period from the

more purely Greek works of an earlier time. They are often of the highest merit both in design and execution. The finest collection of these was found in 1869 at Hildes- heim in Hanover, and is now in the Berlin Museum. They consist of a large number of cups, bowls, vases, dishes, and tripods, all of silver, some decorated with gilding and enriched in the most elaborate way with figure and scroll-work reliefs of the greatest beauty and finish ; these, except one or two of very rude work, can hardly be later in date than the first century after Christ. The most remarkable is a cylix, inside which a

geometrical Greek border in slight relief forms a frame for a seated figure of Athene—an “emblema” soldered on, in very high relief. The attitude of this figure, the folds of the drapery, and other details are arranged with extreme grace. Almost the only point which recalls the fact that this exquisite piece does not belong to the best period of Greek art is the very salient relief of the figure, whereas in earlier times the silver-worker was content with a more moderate amount of relief, and thus

decorated the surface of his vessel without injuring its |

main contour.

surface of the vessel, with very slight projection from the |

main surface,—a perfect model in every way for the treat- Ment of silver. Pliny specially mentions the custom of Roman generals and other officers travelling on military

: Quaranta, Quattordici Vasi d’ Argento. . . Pompei, Naples, 1837. ee a valuable paper on this subject in the Journal of Hellenic v€8, Vol. iii. No, 1, by Dr Waldstein, who attributes part of this : asure to the Ephesian school of artists, and traces in some of the

sighs miniature reproductions of large works of Greek sculpture.

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| silver statues in Rome was very great. | Augustus records that he melted down no less than 80 silver statues

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expeditions with magnificent services of plate; and it appears probable that this had been the case with the

Fre. 7.—Silver Crater, 154 inches high, from the Hildesheim find. (Berlin Museum.)

Hildesheim treasure; defeat or some other disaster may have forced the Roman owner to hide and relinquish the whole set.®

The museum at Naples contains a very large number of silver cups found in Pompeii, encrusted with figure-subjects or branches of ivy and vine in relief. In cases of this sort the cup is made double, with a smooth inner skin to hide the sinkings produced by the repoussé work in relief on the outside. Silver vessels ornamented in relief were called by the Romans celata or aspera, to distinguish them from plain ones, which were called lewa.*

Among later specimens of Roman plate the most remarkable is the gold patera, nearly 10 inches in dia- meter, found at Rennes in 1777, and now in the Paris Bibliothéque—a work of the most marvellous delicacy and high finish—almost gem-like in its minuteness of detail. Though not earlier than about 210 a.p., a slight clumsi- ness in the proportion of its embossed figures is the only visible sign of decadence. The outer rim is set with sixteen fine gold coins—awrei of various members of the Antonine family from Hadrian to Geta. The central emblema or nedallion represents the drinking contest be- tween Bacchus and Hercules, and round this medallion is a band of repoussé figures showing the triumphal proces- sion of Bacchus after winning the contest. He sits triumphant in his leopard-drawn car, while Hercules is led along, helplessly intoxicated, supported by bacchanals. A long line of nymphs, fauns, and satyrs complete the circular band.

The so-called “shield of Scipio,” also in the Paris Bibliothéque, which was found in the Rhone near Avignon, is the finest example of Roman plate of the 4th century. It is not a shield, but a large silver patera, about 26 inches in diameter, with a repoussé relief representing the restora- tion of Briseis to Achilles. The composition and general design are good, but the execution is feeble and rather coarse.

3 Darcel, Trésor de Hildesheim, 1870. The number of gold and In the inscription of Ancyra,

of himself, and with the money thus obtained presented “ golden gifts” to the temple of Apollo Palatinus. See Mon. Ancyr., ed, Mommsen, 1883.

4 For the various classical methods of working in silver and gold see METAL- WORK.

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The British Museum possesses good specimens of Roman silver work in its last stage of decline. These are two large caskets or toilet boxes, with silver unguent vases, oblong lances, pateree, ewers, spoons, and other objects, all found in Rome in 1793. ‘The caskets are decorated in low relief with somewhat blunt repoussé figures and orna- ments. The rim of one casket is incised with the follow- ing words—SECUNDE ET PROIECTA VIVATIS IN CHRISTO. One of the silver vases has the words PELEGRINA VTERE reLIx. The legend on the casket, and the # which appears among the ornaments, show that it was made for a Roman lady, named Projecta, who was a Christian ; her portrait, together with that of her husband Secundus, is on the centre of the lid ina medallion supported by two cupids. With the exception of a pair of small silver two- handled vases, undecorated, but of the purest Greek-like form, these various pieces of silver work probably date from the 5th century.!

Plate from the Crimea.—The finest collection of early gold and silver plate is that in the Musée de l’Ermitage at St Petersburg, the result of many years’ excavation in the tombs of the Cimmerian Bosphorus.? Most of these magnificent pieces of plate, both in style of workmanship and the character of their decoration, resemble the work of Greek artists; in some cases nothing but the costume of the figures embossed upon them shows that they were not produced in Athens.

The earliest in style is a massive gold phiale (fiady pecdupados) covered with the richest and most minute surface ornament. The motive of the design is taken from an open lotus flower ; the petals form radiating lobes, and these petals are entirely covered with delicate scroll-work, surrounding Greek-like gorgons’ heads, and other smaller heads, savage-looking and bearded. Though perhaps rather overloaded with ornament, this beautiful phiale, which shows strong traces of Phcenician or Assyrian influence, is a real masterpiece of decorative design. Of later date, probably 4th century B.c., is a small gold bottle, Hellenic in form, but ornamented with a band of non- Hellenic figures in relief—Scythian bowmen, as their dress clearly

shows. The grandest piece of all is a large silver amphora, of about the same date, shaped like the Greek fictile amphore, and ornamented with a beautiful flowing pattern, of pure Hellenic honeysuckle form, mingled with birds and very highly projecting animals' heads. On the shoulder of the vase there is a band of Scythians and horses, executed with great spirit and refinement. It is difficult to believe that this splendid vase, so graceful in outline, and so pure in its decoration, was not produced by some famous Athenian toreutes.

Oriental Plate.—Some very curious pieces of plate both in gold and silver have been found in northern India; these appear to be of native workmanship, but the subjects with which they are embossed, and the modelling of the figures, show that they were produced under late Roman influence, or in some cases possibly even Greek influence in a highly degraded state, handed down from the time of Alexander's Indian conquests, ;

Under the Sasanian kings of Persia (from the 3rd to 6th centuries) very massive and richly decorated gold vases, bowls, and bottles were made (fig. 8). Those which still exist show a curious mingling of ancient Assyrian art with that of Rome in its decline. Reliefs representing winged lions, or the sacred tree between its attendant beasts, alternate with subjects from Roman mythology,

; Visconti, Una Supellettile d' Argento, Rome, 1825. See Stephani, Antiguités du Bosphore Cimmérien, 1854, and

Compte-rendu de la Commission Imperiale, St Petersburg, 1859, and still in progress.

3 Gaz. des B. Arts, xxv. 19-39, 1882,

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such as the rape of Ganymede ; but all are treated alike with much originality, and in a highly decorative manner, The Paris Bibliotheque and the Vienna Museum contain some fine specimens.

The gold and silver work of Russia resembles in style that of Byzantium at an early period. Shrines and other magnificent pieces of plate in the treasury of the cathedral at Moscow (see Weltmann, Le trésor de Moscou, 1861), though executed at the end of the 15th century, are exactly similar in design to Byzantine work of the 11th or 12th century, and even since then but little change or development of style has taken place.

The caliphs of Baghdad, the sultans of Egypt, and other Moslem rulers were once famed for their rich stores of plate, which was probably of extreme beauty both in design and workmanship. Little or nothing of this Moslem plate now remains, and it is only possible to judge of its style and magnificence from the fine works in brass and other less valuable metals which have survived to our time.

Early Medixval Plate-—The Gothic, Gaulish, and other senti-barbarian peoples, who in the 6th century were

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Fig. 9. Fie. 8.—Sasanian Gold Bottle, about 10 inches high. Inthe Vienna Museum. Fig. 9.—Gold Ewer, 15 inches high, from the Petrossa treasure.

Fig. 8.

masters of Spain, France, and parts of central Europe, produced great quantities of work in the precious metals, especially gold, often of great magnificence of design and not without some skill in workmanship. In 1837 a large number of pieces of very massive gold plate were found at Petrossa in Roumania; much of this find was unfortun- ately broken up and melted, but a considerable portion was saved, and is now in the museum at Bucharest. These magnificent objects are all of solid gold, and consist of large dishes, vases, ewers, baskets of open work, and personal ornaments (fig. 9). Some of them show a strong Roman influence in their design, others are more purely barbaric in style. very fine phiale or patera, 10 inches in diameter. In the centre is a seated statuette of a goddess, holding a cup, while all round, in high relief, are standing figures of various male and female deities, purely Roman in style. Though the execution is somewhat clumsy, there is much reminiscence of classical grace in the attitudes and

drapery of these figures. A large basket and other pieces, made of square bars of gold arranged so as to form an open pattern of stiff geometrical design, have nothing i common with the vessels in which Roman influence 18

To the first of these classes belongs 4 —

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apparent, and can hardly be the work of the same school of goldsmiths.1 The date of this Petrossa treasure is supposed to be the 6th century. The celebrated Gourdon gold cup aud tray now preserved in Paris belong to about the same date. ‘They are very rich and magnificent, quite free from any survival of classic influence, and in style resemble the Merovingian gold work which was found in the tomb of Childeric I. The cup is three inches high, shaped like a miniature two-handled chalice ; its com- panion oblong tray or plate has a large cross in high relief in the centre. They are elaborately ornamented with inlaid work of turquoises and garnets, and delicate filigree patterns in gold, soldered on.

In the 6th century Byzantium was the chief centre for the production of large and magnificent works in the precious metals. The religious fervour and the great wealth of Justinian and his successors filled the churches of Byzantium, not only with enormous quantities of gold and silver chalices, shrines, and other smaller pieces of ecclesiastical plate, but even large altars, with tall pillared baldacchini over them, fonts, massive candelabra, statues, and high screens, all made of the precious metals. The wealth and artistic splendour with which St Peter’s in Rome and St Sophia in Constantinople were enriched is now almost inconceivable. ‘To read the mere inventories of these treasures dazzles the imagination,—such as that given in the Liber Pontijicalis of Anastasius Bibliothe- carius, which includes the long list of treasures given by Constantine to St Peter’s before he transferred his seat of empire to Byzantium (330), and the scarcely less wonder- ful list of gold and silver plate presented to the same basilica by Pope Symmachus (498-—514).?

During the 7th century France and other Western countries were but little behind Italy and Byzantium in their production of massive works, both

secular and religious, in the precious metals. St Eloy, the French gold- smith bishop, made a number of most splendid shrines and other sacred furniture in beaten gold—among them large shrines for the relics of St Denis, St Genevieve, and St Martin, as well as gold thrones, plate, and jewellery for the French kings Clothaire II. and Dagobert I. At this time every cathedral or abbey church in Germany, France, and even England began to accumulate rich treasures of every kind in gold and silver, enriched with jewels and enamel ; but few specimens, however, still exist of the work of this early period. The most notable are Charlemagne's regalia * and other treasures at Aix-la-Chapelle, a few preserved at St Peter's in Rome, and the remarkable set of ecclesiastical utensils which 'still exist in the cathedral of Monza near Milan—the gift of Queen Theodelinda in the early part of the 7th century.4

The existing examples of magnificent early work in the precious metals mostly belong to a somewhat later period. The chief are the gold and silver altar in Sant' Ambrogio at Milan, of the 9th century; the "Pala d'Oro," or gold retable, in St Mark's at Venice, begun in the 10th century (see Mrrat-Worxk); and the gold altar frontal given by the emperor Henry II. and his wife Cunigunde, at the beginning of the 11th century, to the cathedral at Basel. The last is about 4 feet high by 6 feet long, repoussé in high relief, with figures of Christ, the three archangels, and St Benedict, standing under an arcade of round arches ; It is now in the Cluny Museum in Paris.® A similar gold frontal, of equal splendour, was that made for the arch- bishop of Sens in 999. This was melted down by Louis

: Soden Smith, Treasure of Petrossa, 1869. : See D'Agincourt, Mistoire de ? Art, 1823. ; Bock, Die Kleinodien des heil. rimischen Reiches, 1864. : Arch, Jour., xiv. 8. Archzologia, xxx. 144-48.

XV. in 1760, but fortunately a drawing of it was preserved, and is published by Du Sommerard (Album, 9th series, pk xiiis). .

A most valuable description of the various methods of work practised by gold- and silver-smiths in the 11th and 12th centuries is given by the monk Theophilus in his Diversarum Artium Schedula (Hendrie's ed., 1847). He

minutely describes every possible process that could be employed in making and ornamenting elaborate pieces of ecclesiastical plate—such as smelting, refining, hammering, chasing and repoussé work, soldering, casting (by the “cire perdue” ae wire-drawing, gilding with mercury amalgam, and the application of niello, enamel, and gems.

The silversmith of those days, as in classical times, was not only a thorough artist with a complete sense of beauty and fitness in his work, but he was also a craftsman of the most varied fertility of resource, and made himself thoroughly responsible for every part of his work and every stage through which it passed,—a most striking contrast to the modern subdivision of labour, and eager- ness to produce a show of neatness without regard to real excellence of work, which is the curse of all 19th-century handicrafts, and one of the main reasons why our modern productions are in the main neither works of true art nor objects of real lasting utility.

Italian Plate-—Before the latter part of the 15th century, large pieces of silver work were made more for ecclesiastical use than for the gratification of private luxury. The great silver shrine in Orvieto cathedral, made to contain thd blood-stained corporal of the famous Bolsena miracle, is one of the chief of these. It is a very large and elaborate work in solid silver, nade to imitate the west front of a cathedral, and decorated in the most sumptuous way with figures cast and chased in relief, and a wonderful series of niiniature-like pictures embossed in low relief and covered with translucent enamels of various brilliant colours. This splendid piece of silver work was executed about 1338 by Ugolino da Siena and his pupils. The other most important pieces of silver work in Italy are the frontal and retable of St James in the cathedral at Pistoia, and the altar of San Giovanni at Florence (see Merat-Work). On these two works were employed a whole series of the chief Tuscan artists of the 14th and 15th centuries, many of whom, though of great reputation in other branches of art, such as painting, sculpture on a large scale, and architecture, did not disdain to devote their utmost skill, and years of labour, to work which we now as a rule consign to craftsmen of the very smallest capacity.

Among the distinguished names of Florentines who during the space of one century only, the 15th, worked in gold and silver, the following may be

given to suggest the high rank which this class of work took among the arts :— Brunelleschi, Ghiberti, Donatello, Luca della Robbia, the two Pollaiuoli, Verrocchio, Michelozzo, Ghirlandaio, Botti- celli, Lorenzo di Credi, Baccio Baldini, and Francia. The cities of Italy which chiefly excelled in this religious and beautiful class of silver-work during the 14th and 15th centuries were Florence, Siena, Arezzo, Pisa, and Pistoia.

Owing to the demoralization and increase of luxury which grew in Italy with such startling rapidity during the early years of the 16th century, the wealth and artistic skill which in the previous centuries had been mainly devoted to religious objects were diverted into a different channel, and became for the most part absorbed in the production of magnificent pieces of plate—vases, ewers, dishes, and the like—of large size, and decorated in the most lavish way with the fanciful and over-luxuriant forms of ornament introduced by the already declining taste of the Renaissance. This demand created a new school of metal-workers, among whom Benvenuto Cellini

(1500-1571) was perhaps the ablest, and certainly the most prominent. His graphic and often shameless auto- biography makes him one of the foremost and most vivid figures of this wonderful 16th century, in which the most bestial self-indulgence was mingled with the keenest enthusiasm for art. Cellini’s work is always perfect in execution, but very unequal in merit of design; some of his silver pieces, such as the large salt-cellar made for Francis I., are much marred by an attempt to produce a massive grandeur of effect, on a scale and in a material quite unsuited to such ambitious and sculpturesque effects. Cellini’s influence on the design of silver plate was very great, not only in Italy and France, where his life was spent, but also on the great silversmiths of Augsburg and Nuremberg, many of whose finest pieces are often attri- buted to Cellini! During the 17th and even the 18th centuries fine pieces of plate were produced in Italy, many of them still retaining some of the grace and refine- ment of the earlier Renaissance.

Germany.—From very early times Germany was speci- ally famed for its works in the precious metals, mostly, as in other countries, for ecclesiastical use. In the 15th century a large quantity of secular plate was pro- duced, of

very beauti- ful design and the most skilful work- manship. Tall cov- ered cups or hanaps on slender stems, modelled with a series of bosses something like a pineapple and surmounted by a cleverly wrought flower, or beakers, cylindrical tankards with lids, enriched with delicate Gothic cresting or applied foliage, are the most beautiful in form and decoration. On the lids of these cups are frequently placed heraldic figures, hold- ing shields with the owner's arms, modelled and cast with great spirit and finish. One celebrated silver beaker, of about 1400, now in the South Kensington Museum (fig. 10), is ornamented with Gothic traceried windows filled in with translucent enamels.* Another,® rather later in date, preserved in the print room of the British Museum, is covered with figures and foliage in minute niello work, a most elaborate and splendid piece of plate.

During the first half of the 16th century Augsburg and Nuremberg, long celebrated for their silver work, developed a school of artists in plate whose productions are of the most unrivalled beauty, at once graceful in general form and decorated in slight relief with arabesques, strap-work, wreaths, and figure subjects arranged with the utmost good taste, and modelled and chased with the most perfect precision of touch. Though influenced by the contempo- rary silver-work of Italy, the works of Paul Flint, Wenzel a Seana ig Re ie | Wenisc inl ap «Sid 2 ip ie

Fria. 10.—Silver Beaker, decorated with open work, filled in with translucent enamels. German or Flemish, of the 15th century. (S. K. M.)

1 See the valuable work by Eugé int } : y Eugene Plon, Ben. Cellini, sa vie, &c. eas, 1883; also Cellini's own work, Dell' 'Oreficeria, 1568. ; : Shaw, Decorative Arts of the Middle A ges, 1851. Shaw, Dresses and Decorations of the Middle Ages, 1858.

FLATT

Jamnitzer (1508-1585), and Theodor de Bry of Liége (1528-98) are free from the extravagance of outline and over-elaboration of detail which often disfigure the grand In Germany

silver pieces of men like Cellini (see fig. 11). the traditions of earlier Gothic art were less rapidly broken with ; and many purely Gothic forms survived there till quite the end of the 16th century. In the first half of the 17th century the technical skill of the German _ silversmiths reached its highest point of perfection, but there was some falling off in their designs, which rapidly lost their purity of outline. Switzerland produced several _ silversmiths whose work is similar to that of this German school, especially their large plateaux and ewers, most richly and gracefully covered with ornament, all finished with almost gem-like minuteness. The prin- cipal among these art- ists was Francois Briot, all of whose productions are of extreme beauty. The majority of his existing works are not in silver, but in pewter,

and thus by their absence of intrinsic value have escaped the melting pot (fig. 12). Gaspar Enderlein was an- other workman of this school, whose productions cannot always be distin- guished from those of Briot. Though born in Switzerland, these artists really belong to the great Augsburg and Nuremberg school.

Many of the famous 15th and 16th century painters, such as Martin Schon, Israel von Mecken, and Holbein, used to supply the silver- workers with elaborate de- signs for plate. Virgil Solis of Nuremberg (1514-1562) was especially fertile in this sort of invention, and exe- cutedalarge series of etchings of designs for vases, cups, ewers, tazze, and all sorts of plate.4

Spain.—Throughout the Middle Ages Spain was : remarkable for its large and magnificent works in the precious metals. The cathedral of Gerona still possesses 4 most massive silver retable, made by a Valencian silver- smith called Peter Bernec. The gold and silver altar-

4 See twenty-one facsimiles of these rare etchings published by J. Rimell, London, 1862.

attributed to Jamnitzer, but more probably by Paul Flint. Made at Nuremberg about the middle of the 16th century. (S. K. M.)

Fic. 12.—Ewer by Frangois Briot, about 10 inches high, middle of 16th ccn- tury.

a

PLATE

frontal, a work of the 11th century, was carried off froin |

this cathedral by the French in the present century. Another very large and beautiful piece of silver work is

the throne, Northern Gothic in style, made for King |

Martin of Aragon, about 1400, and now preserved in Bar- celona cathedral. ‘Tillafter 1500 little that is distinctively Spanish appears in the style of their silver work. At first Moorish influence, and then that of France and Germany, appear to have been paramount. It is not till the 16th century that a really Spanish school of art was developed; and the discovery of America with its rich stores of gold and silver gave an enormous impetus to this class of work.! The “custodia,” or tabernacle for the host, in many of the Spanish cathedrals, is a large and massive object, decorated in a very gorgeous though somewhat debased style. In spite of the plundering of the French, even now no country is so rich in ecclesiastical plate as Spain. England.—The Celtic races of both England and Ireland appear to have possessed great wealth in gold and silver, but especially the former. It seems, however, to have been mostly used in the manufacture of personal orna- ments, such as torques, fibule, and the like. A magni- ficent suit of gold armour, repoussé with simple patterns of lines and dots, was found some years ago at Mold in Flintshire, and is now in the British Museum.2 The amount of gold jewellery found in Ireland during the past century has been enormous ; but, owing to the unfortunate law of “treasure-trove,” by far the greater part was immediately melted down by the finders. Little of this period that can be called plate has been discovered in the British Isles,;—unlike Denmark and other Scandinavian countries, where the excavation of tombs has in many eases yielded rich results in the way of massive cups, bowls, ladles, and horns of solid gold, mostly decorated with simple designs of spirals, concentric circles, or inter- laced grotesques. Others are of silver, parcel-gilt, and some have figure subjects in low relief (fig. 13). In like manner, during the Saxon period, though gold and silver jewellery was com- mon, yet little plate appears to have been made, with the exception of shrines,

altar-frontals, and vessels for ecclesiastical use, of which every important church in England must have possessed a magnifi- cent stock. With regard to English secular plate, though but few early ex- amples still exist, we know from various records, such

owo

Fig. 13,—Silver Cup, 43 inches high, with embossed gold band; found in & grave

as wills and inventories, ‘ . :

that the 14th century was roy Rvp chery oy pita ne one in which every rich lord 1°” A8e-

or burgher prided himself on his fine and massive collection of silver vessels ; on festive occasions this was displayed, not only on the dinner-table, but also on sideboards, arranged with tiers of steps, one above the other, so as to show off to advantage the weighty silver vases, flagons, and dishes with Which it was loaded. The central object on every rich man’s table was the “nef ”—a large silver casket, usually (as the name suggests) in the form of a ship, and arranged to contain the host’s napkin, goblet, spoon, and knife, with an assortment of spices and salt. Great sums were often spent on this large and elaborate piece of plate, eg., one made for the duke of Anjou in the 14th century weighed

1 “ag : L See Riaho, Industrial Arts in Spain, 1879; and Davillier, orfevrerie en Espagne, 1879. 2 Archeol., xxvi. 422.

‘and corporation of King’s Lynn.

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348 marks of gold. The English silversmiths of this period were highly skilled in their art, and produced objects of great beauty both in design and workmanship. One of the finest specimens of late 14th century plate which still exists is a silver cup belonging to the mayor It is graceful and chalice-

like in form, skilfully chased, and decorated in a very rich and elaborate way with coloured translucent

_ enamels (fig. 14) of ladies and youths, several with hawks

on their wrists.? Silver salt- cellars were among the most ela- borate pieces of plate produced

Fig. 14.

Fic. 14.—Silver Cup, with translucent enamels, 14th eentury.

Fic. 15.—Silver-gilt Salt-eellar, 14} inches high. Given to New College, Oxford, in 1493,

Fig. 15. Probably Freneh work of the

during the 15th century. Several colleges at Oxford and Cambridge still possess fine specimens of these (fig. 15) ; the favourite shape was a kind of hour-glass form richly ornamented with spiral fluting or bosses.

But few existing specimens of English plate are older than the beginning of the 15th century. Among the few that remain the principal are two or three chalices—such as the two large gold ones found in the coffin of an archbishop of York, now used for holy communion in the cathedral, and a fine silver chalice from the church of Berwick St James, Wilts, now in the British Museum. Both this and the York chalices are devoid of ornament, but, judging from their shape, appear to be of the 12th or 13th century.*

It is interesting to note the various changes of form through which the ecclesiastical chalice passed from early Christian tines till the 16th century. It was at first an ordinary secular cup (fig. 16, A), with two handles classical in form, and of large capacity, because the laity as well as the clergy received the wine. The double handles were of practical use in passing the cup round like a modern “loving cup.” The first alteration was the omission of the handles, so that it took the form B, with large hemi- * spherical bowl, a round foot, and a knop for security in holding it. For some centuries it appears to have been the custom for the priest to hold the

chalice, while the eommunicant sucked the wine through a silver tube or “ fistula.” Some of the most magnificent

3 See Carter, Specimens of Ancient Sculpiure, d&c., 1838.

4 Among the most important existing specimens are the solid gold chalice and paten preserved at Corpus Christi College, Oxford, the gift of the founder, Bishop Fox. These have the year-mark K for 1507-8. See Quart. Rev., cxl. p. 353.

early examples of this form of chalice have the bowl mounted in bands, set with jewels, and enriched with minute filigree work,—a design which appears to have been taken from those cups, such as the four magnificent examples in the treasury of St Mark’s at Venice, which have their bowl cut out of crystal, onyx, or some other precious stone.! The finest examples of this elass are the Ardagh chalice, now in the Dublin Museum, and the chalice of St Remigius, in Rheims cathedral; both are most magnificent specimens of the taste and skill of 11th-century goldsmiths. C shows the next form (12th and 18th centuries). The design is simpler; there is a distinct shaft, extending above and below the knop; and on the foot is marked a eross, not found in the earlier ones, to show which side the pricst is to hold towards himself at celebration. The next alteration in the form of chalice,

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Fic. 16.—Various shapes of Chalices, showing development from the earliest forin,

‘which occurred in the 14th century, was to make the foot not circular in plan but polygonal or lobed, so that the cup might not roll when laid on its side to drain, after it had been rinsed out. It thus took the shape D, and this form lasted in most countries till about 1500, and in England till the Reformation. In countries which did not adopt the Reformed faith the shape

was altered, by the general growth of the Renaissance, into a form frequently like KE, But in England the change was more complete; the bowl, which in the previous two or three centuries had been slowly reduced in size, owing to the gradually introduced practice of re- fusing the wine to the laity, was suddenly made more capacious, and the form was altered to the shape F, in order that the Pro- testant “communion cup” might bear no resemblance to the old Catholic “ massing chalice.” This was ordered to be done in 1562, (see Areh, Jow’. xxv. 44-53). The last form, G, shows the usual shape of sepulchral chalices, which, before the Reformation, were enclosed in the coffins of all ecclesiastics who had received priest’s orders. These are without the knop, and were frequently made of pewter, tin, or even wax, as they were not meant for use. In some few eases a real chalice was buried with some ecclesiastic of rank, but this was exceptional.

Secular plate during the 15th and 16th centuries was very similar in style to that made in Germany, though the English silversmiths of the latter century never quite equalled the skill or artistic talent of the great Nurem- berg and Augsburg silver-workers. In the 17th century, during the reigns of James I. and Charles I., many fine pieces of plate, especially tall hanaps and tankards, were made of very graceful form and decoration. The greater part of this, and all earlier plate, especially the fine collections belonging to the universities, were melted down during the Civil War. In Charles IT.’s reign returning prosperity and the increase of luxury in England caused the production of many magnificent pieces of plate, often

1 See De Fleury, La Messe, Paris, 1882, in progress,

on a large scale, such as toilet services, wine-coolers, and even fire-dogs and tables. These are very florid in their ornament, and mostly have lost the beautiful forms of the century before (fig. 17). In the early part of the

FiG. 17,—Covered Cup of solid gold, 6 inches high, eirea 1660-70. Given to Exeter College, Oxford, by George Hall, Bishop of Chester,

18th century the designs are mostly poor, and the decora- tion rather coarse, till the time of the classical revival which was brought about mainly by the

discovery of the buried cities of Pompeii and Herculaneum. A quite different style of plate then came into vogue—semi- classical both in form and decoration, and often worked with great delicacy of treatment. A good deal of plate in this style was made under the influence of the brothers Adam (fig. 18), distinguished architects in the second half of the 18th century. Of modern plate from the art point of view there is nothing to say; it is nearly always poor in design and feeble in execution.

The Assay of Gold and Silver Plate.—The primitive method of testing the purity of the metal was by marking a streak with it on the touch-stone, and comparing the colour of the mark with that made by various pieces of gold or silver of known degrees of purity. Assay by cupellation is now employed for silver: a piece of the silver to be tested is melted with some lead in a cupel or bone-ash crucible ; the lead is oxidized, and rapidly sinks into the bone-ash, carrying with it any other im- purities which are present. The residue of pure silver is then weighed, and by its loss Fre, 18.—Silver Vase, 11 shows how much alloy it contained. Gold is inehes high, dated fe = now tested by an elaborate chemical process Dedgoe a a by which the trial bit is dissolved in acid, and ~~ then thrown down in the form of precipitate, which can be ex- amined by a careful quantitative analysis. See Assayinc, GOLD, and SILVER.

The standard of purity required in the time of Edward I. was, for gold, that it should be of the “Paris touch,” ¢.¢., 193 carats out of 24. Before then 22 carats was the standard. Silver was to be “ of the sterling alloy,” viz., 11 oz. 2 dwts. to the pound. Except for a time during the 16th century, this standard of silver has been kept up, and is still required by law. : .

Hall-marks on Silver.—In the 18th century the English Guild of Gold- and Silver-smiths had grown into great importance, and had acquired monopolies and many pipe privileges. In order to keep the standard up to the required purity the system of requit- ing each article to be stamped with certain marks was introduced by royal command. The first of these was the King’s mark-—a leopard’s or lion’s head crowned. This was introduced in 1300 by Edward I. (29 Edw. I. stat. 8, c. 30). The second, the Maker s mark, was added in 1363 (37 Edw. III. c. 7). This might be any badge or initial chosen by the master silversmith himself. The third was the Year letter or

Assayer’s mark ; this was an alphabet, one letter being used for a year, counting from the day of the annual election of the warden of the Goldsmiths’ Company. When one alphabet was exhausted, another with differently shaped letters was begun. The first of these series of year-lettcrs cominences 1n 1438, The earliest existing piece of plate which has the three marks

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complete is a spoon which was given by Henry VI. to Sir Ralph Pudsey ; this has the year mark for 1445. Other marks, subse-

quently introduced, were the lion passant, first nsed in 1545; the

Hion’s head erased, and a full-length figure of Britannia, used only between 1697 and 1720; and lastly the portrait of the reigning sovereign, Which has been in use since 1784. In addition to these general hall marks, the plate made in various towns had from the vear 1423 certain special provincial marks. The best work on hall-marked plate and the marks themselves, with the history of the Silversmiths’ Company, is Cripps, Old English Plate, 1881. See also Cripps, Old French Plate, 1880.

The South Kensington Museum has a very fine illustrative collection of plate, from early medieval times downwards. It also possesses a very valuable and large assortment of electrotype copies, including the Hildesheim and a part of the Petrossa treasures, as well as a number of the best specimens of college and corporation plate. The museum handbooks on this subject by J. H. Pollen and W. Cripps are extremcly useful to the student.

The same department has also published a most valuable List of

Works on Gold- and Silver-smiths’ Works in the National Art Library, 1882.

Modern Plate in the Hast.—Though little plate of real artistic merit is now made in Europe, in the East, among the Moslem and Hindu races, there still survive some real taste in design and skill in execution. Delhi, Benares,

Lueknow, Cutch, and other places in India and Kashmir still produce a quantity of beautiful silver and gold work,— chiefly ewers, basins, rose-water sprinklers, salvers, coffee- pots, and the like. These are of graceful form, covered with rich repoussé work, or more often with very delicate chased patterns. Their style in the main is Moslem, but some combine an Arab form with native Indian surface decoration. This class of work is not a revival, but has been practised and handed down by unbroken tradition, and with little or no change in style from the 16th century or even earlier! The silversmiths of Persia, Damascus, and other Eastern places are still skilful, and retain sonie good tradition in their designs. They are, however, more occupied in the production of personal ornaments than in making larger works of silver or gold.

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PLATE, Tue River, or Rio DE La Prata (“River of Silver”), in South America (see vol. ii, Plate xxv., and vol. iv. Plate xvii.), was at first known as Rio de Solis, after Juan Diaz de Solis, who discovered it in 1515, and lost his life on its banks. The present name, a double misnomer, was bestowed by Sebastian Cabot, who, ignorant that he was on the wrong side of the continent, thouglit he had reached a country of mineral wealth—a mistake (perpetuated also in the designation Argentine Republic) which may be said to have received a kind of poetic justification in the fact that the distant mines of Potosi lie within the drainage area of the La Plata system. Like Rio Grande do Sul and Rio de Janeiro on the Brazilian coast, this Rio is not a river but a vast estuary into which rivers discharge. At its narrowest it is 23 miles across, opposite Buenos Ayres 34 miles, and opposite Montevideo 63 miles. By some writers the conventional limit between estuary and ocean is drawn from Montevideo, where the water is still fresh enough to be drunk; but others go farther out and take the line 150 iniles across from Maldonado to Cabo San Antonio. In the former case the length of the estuary is 125

miles. At one time it must evidently have extended 200 miles farther inland to Diamante, at the bend of the Parana; and nature is steadily and rapidly at work prolonging the rivers proper at the expense of the estuary. At low water the average depth may be taken at 18 feet, and shoals and sandbanks are abundant, especially in the upper end. Nearly the whole expanse between Buenos Ayres and Martin Garcia Island is between 3 and 6 feet deep, and a great portion is even shallower. In the shallower portions the bottom consists of a very fine hard-grained sand, in the deeper portions of a sticky ooze. The tidal movement is so disguised by the more obvious effects of wind that Mr Révy found people who had lived all their lives on the banks ready to deny its existence. But at Buenos Ayres the normal neap-tide is 5 feet 3 inches above ordinary low water, and the spring tides vary from 6 to more than 10 feet. The region being one of “storms and extraordinary electrie disturbance,” with the pampero at one time blow-

ing hard from the land and at another a sea wind driving the ocean before it, the ordinary levels and currents are often violently disturbed. The general slope of the sur- face may even be reversed, and the main current of estuary and river run up stream for a hundred miles or more. It has been estimated that the volume of water poured into the Rio de la Plata exceeds the aggregate discharge of all the rivers of Europe put together. Nor need this be matter of surprise when the enormous extent and the character of the drainage area are taken into account. The headwaters of the Rio Blanco (a feeder of the Pilecomayo sub-system) rise only 125 miles from the coast of the Pacific, in 68° 10’ W. long., and those of the Rio Grande are not more than 70 miles from the coast of the Atlantic, in 44° W. long.; the basin thus extends east and west over twenty-four degrees of longitude, or 1500 miles, and the direct distance from the northmost source to the mouth of the Parana is about as great. A considerable proportion of this vast area lies within the tropics, and receives an abundant rainfall, which, owing to the character of the strata, is largely carried off by the surface drainage. As an instance of the effect of this rainfall on even the secondary tributaries, Mr Bigg-Wither’s experience may be cited: at Jataly on the Tibagy he was detained from the 2d to the 25th of July by the river, after nine days of incessant downpour, rising 33 feet at a place where it was 200 yards wide,

and pouring along a volume of 90,000 cubic feet per second, or twenty-five times its low-water volume (see Journ. Roy. Geogr. Soc., 1876).

The three great rivers of the La Plata system are the Parana, its equal affluent the Paraguay, and the Uruguay—the second being the most important as a water- way, and the first the most interesting from its physical features! As the general course of the Parana and the Paraguay, both of which rise in Brazil, has already been sketched in the article on that country (vol. iv. p. 222), it simply remains to direct attention to afew points of interest. In regard to the great “Seven Falls” of the Parana, we have still no better account than that of Azara in the 18th century; but the Hundred Cataracts or Victoria Falls of the Curityba or Y-guazu have been described in detail by the members of the first Germano- Argentine colonial land-surveying expedition to Misiones in 1883 (see Verhandl. d. Ges. f. Erdkunde zu Berlin, vol. x. pp. 357-364). For combined beauty and grandeur of scenery they claim to rank among the foremost cataracts in the world. About 6 or 7 miles higher up the river is 3 miles broad; it gradually narrows until, after passing through a perfect labyrinth of islands (King Albert Archipelago), it pours, not in a single mass, but in numer- ous streams, over a horse-shoe edge of rock into a gorge 120 to 150 feet deep. Niederlein divides the falls into three groups—a northern or Brazilian, a central or insular, and a southern or Argentine, to which he has attached respectively the names of the Emperor Don Pedro, the Emperor William, and General Roca. The river continues for some distance shut in by overhanging cliffs; and a large number of secondary cataracts (Bosetti Falls, Prince Bismarck Falls, &c.) are formed by tributary streams, and add to the bewildering beauty of the scene.

The watersheds between the north-eastern headwaters of the Paraguay system and the southern affluents of the Amazons are so low and narrow that in some instances canoes have been conveyed overland from the one to the other. Interest has recently been concentrated on the exploration of the Pilcomayo, a right-hand tributary which joins the Paraguay proper in 25° 20’ S. lat.

Though its sources have long been known, all attempts to trace it downward from Bolivia or upward from the Argentine Republic

1 The word Parana, meaning simply river, appears, it is to be re- membered, alone or in composition again and again throughout South America. See Lallemant, in Zeitschr. fiir Erdk., Berlin, 1863, p. 156.

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had been foiled by the hostility of the Indians. At length, on April 27, 1882, Dr Crevaux, the great French explorer of South- American rivers, was slain with all his party by the Tobas at a place called Ipanticapu. General interest was thus aroused ; and the task in which Dr Crevaux perished has since been practi- cally accomplished by Dr Thouar, his fellow-countryman, who, leaving the San Francisco mission-station on 10th September 1883, reached the mouth of the river on 10th November, though he had not been able to keep close to its course in the lower section of the journey. The Pilcomayo rises in Vileapujia (a mountain 13,500 feet high to the E. of Lago Poopo), and passes between the Cordillera of Livichueo and the Cordillera de los Frailes, a few miles to the north of Potosi. It cuts through the last range of the Andes in 21° 16’ 50″ S. lat. and 63° 25’ W. long., and enters the plains of the Gran Chaco at a height of 1456 feet above sea-level (J. B. Minchin?), It is soon after joined by the Pilaga, which brings down the waters of the Rio Blanco and other streams from the mountains. Till in its south-eastern course it reaches 22° S. lat., the river has a very regular course, flowing at the rate of 6500 feet per hour over a sandy bed 600 to 700 feet wide, unimpeded by rocks or trees, and enclosed by steep banks 15 to 20 feet high, above which the country stretches out in pasture-covered plains. Farther down tlre banks increase in height to from 20 to 45 feet, and embrace a channel or valley 5500 feet or more in breadth, though the actual river does not exceed 150 or 200 feet. At the point called Cabello Muerto, 24° 20’ S. lat., commence the marshy plains of the lower course, in which the bauks hardly rise above the level of the water, and a whole series of lagoons lie at a distance of a mile or two on the left hand. So flat is the country, and so tortuous the river that when Mr Robinson, in 1873, ascended for 150 miles, he never lost sight of the white houses of Asuncion.

About 150 miles below the mouth of the Pilcomayo the Paraguay is joined by another Andean river the Rio Vermejo or Y-pyta, whose red waters, pouring into the dark clear water of the main stream, are sufficient to tinge the whole current downwards to the conflu- ence of the Parana. “From the junction of its headstreams down to the Paraguay, the Vermejo does not receive a single afflucnt ; its breadth varies from 70 to 250 yards, its depth from 5 to 16 feet; and the current appears to average 14 miles an hour” (Keith Johnston). Its navigability was shown about 1780 by the Fran- cisean nussionaries Murillo and Lapa descending the whole way im a canoe, but it was not till 1874 that, under Don Natalio Roldan, the regular navigation was undertaken.

At their confluence the Paraguay has a width of half a mile, the Parana of 3 miles. The united river continues for 686 miles, first in a south-south-west, then in a south, and finally in a south-east direction before it reaches the head of the La Plataestuary. Down to Diamante, or for 433 miles, its left bank is at intervals formed by lines of bold bluffs from 100 to 200 feet high, on which several of the more important towns are built; but the channel often breaks up so as to euclose extensive islands. The worst reach in this respect is the 45 milcs below Goya, a little town in 29°7’S. lat. At Diamante begins the enormous delta (some 5000 or 6000 square miles) which is traversed by countless and changing chan- nels, and presents nothing else, even if viewed from the masthead of the steamer, but a boundless labyrinth of islands clothed with exuberant vegetation. The two chief lines of navigation through this deltaic region are the Parana de las Palmas (so ealled by Cabot,

_in 1526, but now showing comparatively few palms among its

ceibos, willows, and poplars) and the Parana Guazu. The former has its mouth about 24 miles north of Buenos Ayres, the latter joining the estuary of the Uruguay 22 miles farther north, in 34° N. lat. and 58° 24’ 30” W. long. :

The third great confluent of the La Plata system, the Uruguay, 18 quite unlike the other two. Instead of having a fairly steady and eontinuous flow, it appears sometimes as an insignificant torrent and at other times as a magnificent river. It has its headwaters in the Serra Geral, and for several

hundred miles continues to flow west through Brazil (forming the northern boundary of Rio Grande do Sul province), as if it meant, like the Curityba, to carry 1ts waters to the Parana; but about 54° W. long. it is turned aside by the mountain range of Misiones, and flows south-west and south almost parallel with the Parana. It has a total length of 950 miles, and a drainage area of 200,000 square milcs.

In the matter of annual rise and fall the three rivers differ con- siderably. The Paraguay is regular, reaching its lowest stage m the end of February, and its highest about the end of June, and showing an average difference of level not exceeding 15 feet. The ordinary flow at Asuncion is between 97,400 and 99,950 cubic feet per second. Above the junction of the Paraguay the Parana appeals to have numerous and rapid risings at irregular intervals, but to reach its maximum in December. Below the junetion it has much the same movement as the Paraguay, having high water in sum- ee eee

2 “astern Bolivia, &c.,” in Proc. Roy. Geo. Soc., 1881. ee See Thouar’s aeeount in L’ Faploration, 1884; and map of the Pileomayo, in Bol. Inst. Geogr. Argentino, 1882.

mer, gradually shrinking through September, October, and Decem- | glycerin, or masses of oil suspended in a mixture of alcohol

ber, flooding in January, and continuing high and steady till June. The Uruguay rises about the middle of Jannary (at Salto sometimes 92 feet above low water); again in April, to continne in flood for two months (30 feet at Salto); and for the third time, and with great regularity, in September or October, to last a whole month, and reach 40 to 50 feet above low water. Occasionally the flood

two years in succession ; and at intervals, asin 1858 and 1868, the water rises so high that the whole delta is snbinerged. The highest

floods on record stood 24 feet above ordinary low-water mark at _

Rosario, or 12 feet above ordinary high water.

As a system of | and more frequently a cheap and inferior body by a super-

waterways the La Plata rivers are but partiallydcveloped. Stcamers, | mainly Brazilian, ascend from Buenos Ayres by the Parana, Para- | guay, and Cuyaba, a total distance of 2146 miles, to the town of | Cuyaba in Brazil; and the Pilcomayo and the Vermejo, the Apa,

the Jejuy, and the Tebiquary are all more or less navigable. The

Parana affords a free passage for 280 miles above the confluence to |

the Seven Falls, except during low water, when the rapids of Apipe

‘interfere; and, according to Bigg-Wither, the upper Parana and

its tributaries the Tibagy, Paranapanéma, Tiete, Ibahy, &c., fur- nish 1290 miles of navigable stream, of which 510 could be at once utilized by steamers of light dranght, while the remainder would require a certain outlay in the way of improvements. Vessels drawing 44 feet of water can always ascend the Uruguay to Salto (200 miles), and during six months they can cross the Salto Chico, or Lesser Fall, a mile higher np; but the Salto Grande, 8 miles farther, stops all progress except during six weeks in October and September. Tlie whole system may be estimated to give upwards of 5000 miles of waterway, of which 3500 are accessible from the sea, without counting the secondary deltaic channels.

See T.S. Page, U.S.N., Za Plata, 1859 (the surveys of the ‘‘ Waterwitch “); Burton, Battle ~fields of Paraguay, 1870; Bigg-Wither, Pioneering in South Brazil, 1878; J. J. Révy, Hydraulics of Great Rivers: the Parana, the Uruguay, and the La Plata Estuary, 1874 (a series of elaborate investigations and measurements of great value) ; and other works mentioned under PARAGUAY. (H. A. W.)

PLATEAU, JosepH ANTOINE FERDINAND, was born at Brussels in 1801, and died in 1883 at Ghent, where he had been professor of physics from 1835. He was a pupil and friend of Quetelet, who had much influence on the early part of his career. The more original investigations of Plateau refer chiefly to portions of one or other of two branches of science—physiological optics and molecular forces. His doctoral thesis (Liége, 1829) had for its subject "Impressions produced by Light on the Organs of Vision"; and it was succeeded by numerous memoirs, some of much value, on the persistence of visual impressions, subjective impressions of colour, irradiation, &c. Among other results

of his studies was the invention of the philosophical toy |

known as the " thauinatrope." We owe to him also some- thing much more important, the process of studying the motion of a vibrating body by looking at it through equidistant radial slits ina revolving disk. In 1829 he Imprudently gazed at the midday sun for 20 seconds, with the view of studying the after effects. The result was blindness for some days, succeeded by a temporary recovery; but for the next fourteen years his sight gradually deteriorated, and in 1843 he became perma- nently blind. This calamity did not interrupt his scientific activity. Aided by his wife and son, and afterwards by his son-in-law Van der Mensbrugghe, he continued to the end of his life his researches on vision,—directing the course of the experiments which they made for him, and inter- preting the bearing of the results. He also published a valuable analytical catalogue of all the more important memoirs which had been written, from the earliest times to the end of the 18th century, on his favourite theme of Subjective visual phenomena. But even more extraordi-

hary were this blind man's investigations about molecular |

forees, embracing hundreds of novel experiments whose results he saw only with others' eyes. These form the subject of his great work Statique expérimentale et théorique des Liquides soumis aux seules Forces moleculaires (2 vols.,

1873

of the far as pl

phenomena usually called capillary. To avoid, as possible, complications due to gravity, Plateau em-

ee See | working. level of the Parana is maintained throughout a whole year, or even | g

| 1796, and died at Syracuse on December 5, 1835.

eS 8 | Pinto” (the little silver from the river Pinto).), Which is a valuable contribution to our knowledge |

and water of the same density as the oil. See CAPILLARY ACTION.

PLATED WARE. The plating or coating of one metal or alloy with another is extensively practised in metal In some cases the coating metal is a valuable protector from oxidation, &c., of the underlying metal ; in other cases the properties and advantages of two metals— such as strength and lustre—are combined in one object ;

ficial coating gets the appearance of a more valuable and important metal. The art of plating was originally applied to the production’ of imitation silver plate, whence the term “ plating.” The original method of silver plating consisted in attaching, by a kind of autogenous soldering, thin plates of silver to the opposite surfaces of a prepared ingot of copper alloy or of German silver. The silver plates were firmly wired to the ingot and submitted to a soldering temperature in a plating furnace, in which the surfaces became firmly united. Subsequently the ingot was rolled down to a sheet in which the relative thickness of the metals was maintained, and from such sheets ‘silver

| plated” articles were fashioned. This method of plating

may be regarded as now extinct, being superseded by electro-plating (see ELEcTro-MrTaLLuRGy, vol. vill. p. 114). Recently, however, cooking vessels, c&c., of iron plated in an analogous manner with nickel have come into use (see NicKEL, vol. xvii. p. 488). The plating or casing of iron with

brass is extensively practised in the manufac- ture of stair-rods, curtain and picture rods, and “ cased” tubing for upholstery purposes generally; and in the manufacture of pipes for conveying water the body of lead is frequently lined with a coating of pure tin. The gilding of metals is a process analogous to plating, as are also the galvanizing of iron and the manufacture of tin and terne plates. For these see [Ron, vol. xiii. p. 357.

PLATEN-HALLERMUND, Aveust, GraF von (1796- 1835), German poet, was born at Ansbach on October 24, His principal publications were Lyrische Blatter (1821), Sonette aus Venedig (1825), an historical fragment entitled Greschich- ten des Konigreichs Neapel 1414-43 (1833), and a poem in nine cantos, Die Abbasiden (1835). He wrote also a number of dramas, of which may be mentioned Der gldserne Pantofel and Die Liga von Cambrai. See vol. x. p. 546.

PLATINUM anp tHE PLATINUM METALS. The metals platinum (Pt), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), and osmium (Os) are united into a family by a striking similarity in chemical characters and by their association in natural occurrence. A rather rare ore, called platinum ore or polyxene, is almost the only native material which is available for their extrac- tion; it contains them all in the reguline form. Traces of platinuin are found in almost all native gold.

As early as the first half of the 16th century it appears to have been noticed that the gold ore in the Spanish mines of Darien includes grains of a white metal, endowed with the qualities of a noble metal and yet distinctly different from silver; but the fact remained unknown in Europe because the Spanish Government, having found out that the new metal lent itself most admirably for the adulteration of gold, prohibited its exportation. Only from about the middle of last century did the metal begin to find its way to Europe and to become known there, at first as a curiosity, under its Spanish name of “ platina del Its chemi- cal individuality and qualities were established by the successive labours of Scheffer (1752), Marggraft (1757), Bergmann (1777), and others. An amateur, Count von

oyed either films formed of a solution of soap with | Sickingen, it appears, was the first who succeeded in work-

ing the metal (1772); the first platinum crucible was pro- duced by Achard (1784). Achard's mode of rendering the native metal amenable to mechanical working was founded upon the fact that it forms a readily fusible alloy with arsenic, from which the latter can be driven off again by intense heating. This method was worked industrially for a time, but subsequently superseded by another superior process, which is usually credited to Wollaston, because 1t was he who, after having wrought it asa rich source of revenue for years, published it in 1828. But as early as 1800 Knight of London had published all that is essential in the process; and Messrs Johnson, Matthey, & Co. in- form the writer that Wollaston obtained the secrets of both the refining and the compressing of the spongy into compact metal from a relative of theirs, Thomas Cock, who, they are convinced, is the true inventor. Undisputed merits of Wollaston's are his discoveries of palladium (1803) and rhodium (1804). About the same time iridium and osmium were discovered by Smithson Tennant.

Platinum ore well deserves its cognomen of " polyxene," because it is a most complex mixture of mineralogical species, including (1) a number of heavy reguline species designated as platinum, osmiridium, iron-platinum, platin- iridium, iridium, palladium (also gold), and (2) a number of non-metallic species, notably chrome-iron ore, magnetic oxide of iron, zircone, corundum, and occasionally also diamond. The reguline components always form detached granules, which are generally small, but occasionally assume considerable dimensions. The Dentidoff niuseum contains a native platinum lump weighing 21 pounds troy. The ore, as already stated, was discovered first in South

America ; it is found there chiefly in the provinces of Choco | It occurs |

and Barbacos, New Granada, and also in Brazil. besides in San Domingo, in California, at the Rogue river in Oregon, in Canada, and in the island of Borneo. But the richest deposits are those of the Ural Mountains ; these were discovered about 1823, and have been wrought by the Russian Government since about 1828. Part at least of the Ural ore, as Daubré showed, was embedded origin- ally with chrome-iron in a serpentine derived from olivine. The very variable percentages of the several

components range approximately as follows :—platinum, 60 to 87; other polyxene metals 3 to 7; gold up to 2 and more; iron 4 to 12; copper 0 to 4; non-metallic gangue 1 to 3.

Platinum, though a noble metal chemically, has too modest an appearance to lend itself much to the jeweller's purposes. The Russian Government used, for a while, to strike platinum coins, but soon came to give up the prac- tice on account of the immense fluctuations in the commer- cial value of the metal. Almost all the platinum produced now-a-days is made into chemical utensils. Platinum, in fact, is the metal of the chemist. "Without platinum crucibles, which share the infusibility of porcelain with the chemical inertness of gold ones the composition of most minerals could not have been ascertained" (Liebig), and chemistry generally could not have come up to its present level. In industrial chemistry platinum is used chiefly for the construction of those stills for the concentration of oil of vitriol which, although a single one costs a fortune, are cheaper in the long run than glass retorts.

The technical extraction of platinum from its ore is to the present day effected everywhere by some modification or other of the so-called '* Wollaston" process. Heraeus of Hanau operates as follows. The ore is digested within glass retorts in aqua regia diluted with three times its weight of water, an over-pressure of some 12 inches of water being established within the retorts to aecelerate the proeess, which always takes several days. The Whole of the osmiridium, along with more or less of other polyxene metals, and the 'sand " (corundum, chrome-iron, &c.) remain undissolved, as a heavy black deposit; the platinum palladium, part of the rhodium, and more or less of the other three

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polyxene metals pass into solution, the platinum, iridium, aud pal- ladium as tetrachlorides. From the clarified solution the whole (almost) of the platinum can_ be precipitated as PtCl,(NH,), by addition of a large excess of sal-ammoniac ; and this simple process used to be adopted formerly. But the precipitate then includes much chloro-iridiate of ammonium IrCl,(NH,), and other impuri- ties. Heraeus, thereforc, first evaporates to dryuess and heats the residue to 125° C. for a sufficient time, to reduce the palladic and

iridie chlorides to the lower stages of PdCl, and It,Cl,, which form soluble double salts with sal-ammoniac. The heated residue is dissolved in water acidulated with hydrochloric acid, the solution filtered, and mixed with hot concentrated solution of sal-ammoniae, when a (relatively) pure chloroplatinate comes down as a yellow precipitate (the iridium compound is dark-red), whieh is washed, first with saturated sal-ammoniac solution, then with dilute hydro- chloric acid. The precipitate needs only be exposed to a dull red heat to be converted into “spongy platinum,” 7.e., metallic platinum in the form of a grey porous mass. As platinum is infusible even at the highest temperature producible in a wind- furnace, the spongy metal cannot be fused together into a regulus like an ordinary metal ; but it shares with wrought irou the rare quality of assuming a high degree of softness and viseosity at a strong red heat ; and consequently the sponge, after a preliminary compression by purely mechanical means, needs only be exposed to a strong heat to “frit” into a coherent mass ; and this mass, by repeated forging at a white heat is readily made into a perfectly homogeneous compact bar, which, as the metal is very ductile, is easily rolled out into sheet or drawn into wire. In the former form more especially it goes into the workshop to be made into utensils.

This process of welding at the time of Achard (who used it first) and of Knight was a necessary make-shift ; but it is singular that it was retained long after the invention of the oxyhydrogen blast (see vol. xviii. p. 105), by means of which platinum can be fused as easily as ise canin an ordinary fire. With the oxyhydrogen-

blowpipe Hare, as early as 1847, fused 970 grammes (upwards of

two pounds) of platinum into ote regulus. Yet platinum manu- facturers did not utilize this obvious protess until Deville and Debray, in 1859, again demonstrated its practicability. Their furnace is of the simplest description. Two flat pieces of quick- lime, scooped out so as to represent two cupels, are placed one upon tle other so that they enclose a flat space similar in form to two superimposed soup-plates. The lower cupel has a notch cut out of its side to servé as a spout for pouring out the liquefied metal, the upper and shallower one is pierced with a central slightly conical round hole through which the (platinum) nozzle of the blowpipe enters, so that the

flame flattens itself out on the intro- hice metal. By means of this simple contrivance Deville and Debray had no difficulty in fusing as much as twelve kilogrammes of platinum into one regulus ; and Messrs Jolinson, Matthey, & Co. of London riow think nothing of fusing up as much as 1000 ounces of metal in one operation. A regulus made under Mr Geo. Matthey's superintendence for the metric Commission in Paris in 1874 weighed one quarter of a ton.

The shaping of compact platinum is effected pretty much in the same way as Tek of gold or silver; only the difficulties are less because platinum, unlike the two ordinary noble metals, is sus- ceptible of "welding"; é.¢., two pieces of the metal, at a white heat, can be united into one by a stroke of the hammer. Soldering is rarely necessary; it used to be effected (and still is occasionally) by means of gold as a connecting medium and an ordinary blow- pipe. But platinum workers, following the lead of Messrs Johnson, Matthey, & Co., have long learned to unite two platinum seams by the ''autogenic" process—the local fusing of the two contiguous parts in the oxyhydrogen flame. . .

For the preparation of chemically pure platinum Schneider's process is the one most easily executed and explained. The commercial metal is dissolved in aqua regia and the excess of nitric acid removed by evaporation to a syrup in a water-bath. The residue is redissolved in water and boiled for a long time with a large excess of potash-free caustic soda. If care be taken to main- tain a strong alkaline reaction, all the foreign polyxene chlorides are reduced to lower forms than that of tetrachloride ; while only the platinum itself retains this state of combination. The hypo- chlorite formed is then reduced (to NaCl) by addition of a little alcohol to the boiling alkaline liquid, which is now allowed to cool and acidified strongly with hydrochloric acid so as to redissolve any hydrated platinic oxide which may have been precipitated by the first instalments of acid. The liquid at last is filtered, and precipitated by sal-ammoniac to obtain a pure chloroplatinate (PtCl,(NH,).), which, on ignition, of course, yields an equally pure spongy metal.

Pure compact platinum is a tin-white metal about as soft as pure copper and nearly (but not quite) equal in plasticity to gold. The specific gravity of the

fused metal is 21:48 to 21°50 at 17°°6 ©. (Deville and Debray). The breaking strain is 34°1 kilos for hard- drawn and 23°5 kilos for annealed wires ; the modulus of elasticity 15,518 (kilogramme and millimetre as units; by Werthum's cx-

| RL = cee

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periments on annealed welded wire). Unit length of the (fused) metal expands by 0:000907 from 0° to 100° C. (Fizean). The specific conductivity for heat at 12° C. is 8°4, for electricity at 0° C. 16°4(silver=100). The statement regarding electricity refers to the annealed metal. The fusing point, according to recent determina- tion by Violle, is 1779 C.; the same experimenter finds for the true specific heat 8Q/8¢=0°0317 +0°000012¢ (centigrade scale). When platinum is heated beyond its fusing point, it soon begins to vola- tilize. The fused metal, like silver, absorbs oxygen, and consequently "spits" on freezing. Atared heat the then viscid metal, as Graham has shown, '' occludes" hydrogen gas; 7.¢., it dissolves the gas (just as, for instance, liquid water would), which explains the fact pre- viously discovered by Deville that a platinum tube, although it may be perfectly gas-tight in the cold, at a red heat allows hydrogen (but not, for instance, oxygen, nitrogen, or carbonic acid) to pass through its walls. According to Graham the quantity of gas occluded is independent of the surface of the metal operated on, but proportional to its weight. No gas is taken up in the cold; but the gas occluded at a red heat, though extractable at that temperature by means of an absolute vacuum as producible by a Sprengel pump (see MERcuRTAL Arr Pump, vol. xvi. p. 30), is retained on cooling and cannot be thus liberated at the ordinary temperature. The volume of hydrogen absorbed by unit-volume of metal at a red heat under one atmosphere's pressure was found, in the case of fused metal, to vary from 0°13 to 0°21 volume measured cold ; in the case of merely welded metal, from 2°34 to 88 volumes (compare Palladium below). Oxygen gas, though absorbed by the liquid, is not occluded by the solid metal at any temperature, but when brought in contact with it at moderate tem- peratures suffers considerable condensation at its surface. The thin condensed film of oxygen exhibits a high degree of chemical aetivity : a perfectly clean piece

of platinum foil, when immersed in a mixture of hydrogen or ammonia or other combustible gas and air, begins to glow and starts a process of slow combustion or there may bean explosion. The spongy metal of course exhibits a very high degree of activity: a jet of hydrogen gas when made to strike against a layer of spongy platinum causes it to glow and takes fire. This is the principle of the (now defunct) Débereiner lamp. But the most striking effects are produced by a peculiar kind of very finely divided platinum, which was ieectek by Liebig and called by him platinum black on account of its resemblance to lamp-black. A ely active “black” is produced by dropping platinum chloride solution into a boiling mixture of three volumes of glycerin and two of caustic potash of 1°08 specific gravity. Platinum black, aecording to Liebig, absorbs 800 times its volume of oxygen from the air, and in virtue thereof is a most active oxidizing agent, which, in general, acts “catalytically ” because the black, after having given up its oxygen to the oxidizable substance present, at once takes up a fresh supply from the atinosphere. For examples see FERMENTATION, vol. ix. pp. 94-98.

Platinum Alloys.

Platinum alloys of almost any kind are easily produced syntheti- cally ; and, as a rule, a temperature little if at all above the fusing point of the imore fusible component suffices to start the union. We will begin with the cases in which the metal combines with another member of its own family. Jridiwm.—In the heat of an oxyhydrogen flame the two metals unite permanently in all pro-

ortions. The alloy has pretty much the appearance of platinum,

ut it is less fusible, harder, more elastic, specifically heavier, and less readily attacked by aqua regia, —all these qualities increasing as the percentage of iridium increases. The 19 per cent. alloy was produced for the first time by G. Matthey. It has the hardness and elasticity of soft steel (modulus of elasticity = 22,000 for milli- metre and kilogramme), and is hardly attacked by aqua regia. Alloys richer in iridium are difficult to work. The 10 per cent. alloy on the other hand still retains enough of the virtues referred to to be far superior to platinum itself—perhaps we might say, to any other solid—as a material for standard measures of length or weight. In

1870 Messrs Johnson, Matthey, & Co. exhibited a standard metre made of this alloy, and it gave such unqualified satisfaction that the international metric committee which sat in Paris some years ago adopted it for the construction of their ae kthodium.—An alloy of 30 per cent. of this metal and

0 of platinum is absolutely proof against aqua regia, but is very pemthel Deville and Debray once elaborated an igneous process ane producing, directly from the ore, a triple alloy of platinum, iri- oe and rhodium, which is quite workable and, besides being more Genly infusible than platinum, is almost proof against aqua regia.

tucibles made Of this alloy used to be sold in Paris and elsewhere at moderate prices ; but they are now no longer to be had. Gold. —This metal unites with platinnm in all proportions, forming eryish-yellow or greyish-white alloys. A graduated series of these

i was recommended by Schertel and Ehrhard as a means for

eining certain ranges of high temperatures. According to their

experiments, whil ine-poi a item 17 while the fusing-point for gold was 1075° C., and for

5°, it was 1130° for 10 per cent. of platinum, 1190° | metal.

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for 20, 1255° for 80, 1320° for 40, 1385° for 50, 1460° for 60, 1535° for 70, 1610° for 80, and 1690° for 90 per cent. Silver and platinum unite readily in any proportion, but the alloys are in general liable to ‘‘liquation” (see METALS, vol. xvi. p. 67). Now platinum is as proof against nitric acid as gold; and yet these alloys cannot, like gold-silver, be parted by means of nitric acid ; because, if the alloy is rich enough in silver to be at all attacked by the acid, part at least of the platinum passes into solution along with the silver. But concentrated oil of vitriol effects a sharp separation; the platinum remains. A considerable variety of alloys of platinum with other noble metals are used in mechanical dentistry. The following examples may be

quoted :—66‘7 per cent. of gold and 38 of platinum; platinum 50, silver 25, palladium 25 ; platinum 41°7, gold 25, palladium 33°3.

Of the great varicty of alloys of platinum with base metals which have been recommended as substitutes for noble metals or other- wise we select the following :—

Platinum.| Silver.

Copper. | Tin. Brass. Nickel. 1 19 0 1 Q 0 0

2 1 0 26 0 0 0

3 2 1 D 0 2 1

4 1 0 0 10 0 100 5 1 2 0 20 0 100

6 0°5 0 0 15 0 100

7 20 0 0 20 0 100

8 5 to 10 0 0 0 120 60

(1) Known to jewellers and dentists as hard platinum ; (2) a rose-coloured fine- grained ductile alloy; (3) introduced by Bolzani in Paris as an imitation gold; (4 to 7) platinum bronzes, recommended—(4) for knife and fork handles, (5) for bells, (6) for articles de luxe, (7) for telescopes ; (8) not subject to oxidation.

Platinum Compounds.

Platinum is not changed by air, water, or steam at any tempera- ture. It is proof against the action of all ordinary single acids, including hydrofluoric, in the heat or cold. Aqua regia (a mixture of hydrochloric and nitric acids) dissolves it slowly as chloro- platinic acid PtCl,H,. The metal is not attacked by even very strong boiling caustic potash or soda ley, nor is it changed by fusion with carbonate of.soda or potash. Carbonate of lithia, and the hydrates of potash, soda, and baryta, however, when fused in platinum vessels, attack them strongly, with formation of com- pounds of

PtO, with the respective bases, According to recent experiments by the writer, none of these reactions go on in the absence of air ; hence, for instance, a fusion with caustic baryta or potash can safely be carried out in a platinum crucible if the latter is protected by an atmosphere of hydrogen or nitrogen. Fused hepar (alkaline sulphide) dissolves platinum at a red heat ; so does fused cyanide of potassium, especially if mixed with caustic potash.

Chloroplatinie Acid.—The solution of the metal in aqua regia is evaporated down repeatedly in a water bath with hydrochloric acid to destroy the excess of nitric acid and the very concentrated solution allowed to stand, when the acid gradually separates out in brown-red deliquescent crystals of the composition PtCl,H,+6H,0, which are abundantly soluble in water and also easily in even strong alcohol. The aqueous solution, if free of iridium and platinous chlorides, is of a rich but clear yellow colour free of any tinge of brown. The ‘‘chloride of platinum”’ solution of the analyst is an aqueous solution of this acid. When the solution is mixed with those of certain chlorides, the 2HCl are displaced by their equivalent of metallic chloride, and metallic ‘‘chloroplatin- ates” are produced. Of these the potassium (rubidium and cesium) and the ammonium salts are most easily prepared,—by addition of the respective chlorides to a moderately strong solution of chloroplatinic acid ; they come down almost completely as pale yellow crystalline precipitates, little soluble in cold water and very nearly insoluble in alcohol. The sodium salt PtCl,Na,+6H,O and the lithium salt PtCl,Li.+6H,O are readily soluble in water and in aqueous alcohol (the Li,~~compound dissolves even in ab~~ solute alcohol); hence ‘‘chloride of platinum” is used for the separation of K, NH,, Rb, Cs from Na and Li. On the other hand chloride of potassium or ammonium may serve as a precipitant for platinum, but in this case a large excess of a concentrated solution of the precipitant must be used to bring the solubility of the chloroplatinate precipitate to its minimum. Gold, copper, iron, and many other metals not belonging to the polyxene group, if present, remain dissolved. Real platinic chloride, PtCl,, can be produced from the acid PtCl,H, only by precipitating from its solution the chlorine of the 2HCl by the exact equivalent of nitrate of silver. The filtrate when evaporated (cold) over vitriol deposits red crystals of the composition PtCl,+5H,O. When chloropla- tinic acid is heated to 300° C. it loses its 2HC] and half the chlorine of its PtCl, and platinous chloride, PtCl,, remains as a dull green

powder, insoluble in water but soluble in aqueous hydrochloric acid. ither chloride when heated to redness leaves spongy The hydrochloric solution of platinous chloride, when

evaporated with one of chloride of potassium to a sufficiently small volume, deposits rose-coloured crystals of a double salt PtCl,+2KCl=PtCl,K,, From a solution of this double salt platinous hydrate, Pt(OH),, is obtained, by boiling it with the calculated quantity of caustic soda, as a black precipitate, which, when gently heated, becomesanhydrous. Platinic hydrate, Pt(OH),, is obtained by boiling chloroplatinic acid solution with excess of caustic soda and then acidifying with acetic acid, as an almost white precipitate, Pt(OH),+2H,0, which loses its 2H,0 at 100° C. and becomes brown; at a certain higher temperature it loses all

its water and assumes the form of the black anhydride PtO.. Both |

oxides are bases in so far as their hydrates combine with a limited number of acids; towards strong bases they behave as feeble acids. Only a few of the salts of the acid PtO, have been investigated. Either oxide when heated to redness breaks up into oxygen and metal. ;

Platin- Ammonium Compounds. —In this very numerous family of bodies a compound radieal containing platinum and some ammonia residue plays the part of a basilous metal. The first member was discovered by Magnus in 1828. By adding ammonia to a hydrochloric solution of platinous chloride, he obtained a green precipitate of the composition PtCl,.NgH,g, which soon became known as ‘‘Magnus’s green salt,” and served asa starting point for subsequent investigations.

Platinoeyanides.—These were discovered by L. Gmelin, who obtained the potassinm salt Pt(NC),K, by fusing the metal with prussiate of potash. Martius’s method is more convenient: chloroplatinate of ammonia is heated in a strong mixed solution of caustic potash and cyanide of potassium as long as ammonia is going off. The solution on cooling deposits crystals contain- ing 8H,O of water, which appear yellow in transmitted and blue in reflected light. From the potash salt numerous other platinocyanides can be made by double decompositions ; anda very interesting series is derived from these by the addition of chlorine or bromine. All these bodies are distinguished by their magnificent fluorescence,

The Polyxene Metals Generally.

The metals all exist in the three forms of “black,” ‘‘sponge,” and compact regulus. The colours of the compact metals are shades of white, except in the case of osmium, which forms blue crystals. Platinum, palladium, and rhodinm are ductile ; the rest break under the hammer.! In regard to specific gravity they arrange themselves into two groups as shown by the following table, which at the same time gives the atomic weights (those of Pt and Ir according to Seubert) and the formule of the most stable chlorides :—

Name. Ateneo pe Chlorides. Plat W <.se1s2—0 Pt =194°8 21°50 PtCl, ; PtCl,. Nasiclivinnweess eee ee Ir =193°0 22°38 Tr,Cl,. (QEMOIET Goa Sooueee: Os =195 22°48 q Lei EXC GUITID organo: Pd =106°6 11:4 PdCl.,. Rhodium……..... Rh=104°3 121 Bh,Cly. Ruthenium…..... Ru =103°8 E26 Ru,Cl, + RCI.

The order of fusibility is as follows :—Pd, Pt, Ir, Rh, Ru, Os. Palladium almost fuses in the strongest heat of a wind furnace, but like the four metals following requires an oxyhydrogen flame for its real fusion ; osmium has never been fused at all; but it volatilizes abundantly at the highest tempcrature producible by the oxyhydrogen blast. 7

Aetion of Air.—Platinuin and palladium do not oxidize at any temperature ; rhodium also does not oxidize by itself, but when cupelled with lead it remains as monoxide RhO. Compact iridium does not oxidize appreciably even in the heat; but the finely-divided metal, at some temperature below 800° C., suffers gradual conversion into Ir,03, which when heated more strongly begins to dissociate at 800°, and is completely reduced at 1000° C. Ruthenium draws a film of oxide in even cold air ; at a red heat it passes into Ru,O3, which retains its oxygen at a white heat. Osmium (the finely-divided metal), when heated in air to about 400°C., takes fire and burns into vapour of tetroxide, OsO, This and the analogous ruthenium compound are the only volatile oxides of the group.

Water.—None of our metals seem to decompose water or steam at any temperature.

Hydrochloric Acid acts slowly on palladium in the presence of air; otherwise there is no action in any case.

Hot Nitric Acid dissolves palladium as nitrate Pd(NOs3)., and converts finely divided osmium into tetroxide vapour. Compact

osmium, and platinum, iridium, and rhodiuin j attacked by the acid. ’ A m in any form, are uot

1 It still remains to be seen how far this latter

; er statement holds for the absolutely pure metals. Mr George Matthey has succeeded i ing iridi ir ; COTE EME To a Téep Withon ween ed in producing iridium wire, whieh

| driving off the ‘‘solvent” in a wind-furnace.

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Aqua Regia, in the heat, dissolves palladium (very readily) and platinum (somewhat more slowly) as MeCl,H, ; only the palladium compound is very unstable, being completely reduced to dichloride, PdCl,, by mere cvaporation over a watcr-bath. Iridium black, or iridium alloyed with much platinum, dissolves slowly as IrCl,H., readily reducible (by, for instance, addition of alcohol, or evaporation to dryness and heating of the residue to about 150° ©.) to lr,Cl,. Compact iridium, like ruthenium or rhodium, is hardly attacked even by the hot acid; rhodium exhibits the highest degree of stability. Native osmiridiumn is not touched by aqua regia. Osmium, in the heat at least, becomes tctroxide.

Free Chlorine combines directly with all polyxene metals at suitable temperatures. As a disintegrator it is useful chiefly for the manipulation of osrairidium and other such platinum-ore components as refuse to dissolve in aqua regia. ‘The action of the gas is greatly facilitated by the presence of fixed alkaline chloride,

Polyxene Oxides and Salts.

Monoxides have been produced from platinum, palladium, ruthenium, and osmium. PtO and PdO are decided, the other two are very feeble bases. .

Sesquioxides, Me,Q3, have been got from rhodium, iridium, ruthe- nium, and osmium. All are basic.

Binoxides, MeOg, exist from all the metals except rhodium. PdQ,, like PtO, (see above), is basic or feebly acid ; IrO, is a feeble base; RuO, and OsO, are neutral.

Tetroxides, MeO, are formed by osmium and ruthenium only. Both OsO, and RuOy, are easily fnsible and very volatile solids. Their vapours have a most powerful smell and are most dangerously poisonous.

Trivatdes and Heptoxides do not exist as snbstances; but the groups RuO;, OsO;, and R,O, unite with alkalies into soluble salts analogous to chromates and permanganates in their constitution respectively, The oxides MeO, Me,O,, MeO, are as a rule pre- parable by evaporating a solution of the respective chloride or potassio- &c. chloride to dryness with excess of carbonate of soda, heating the residue to dull redness, and removing the alkaline chloride and excess of carbonate by lixiviation with water. The oxides remain as very dark-coloured powders insoluble in acids, The corresponding hydrates are precipitated from the solutions of the chlorides or potassio- &c. chlorides, on addition of excess of caustic potash or soda and heating. These hydrates of the oxides are soluble in certain aqueous acids with formation of salts, and in this limited sense only the “ oxides” can be said to be “ bases.”

Salts. —Of these the most characteristic and the best known are compounds of certain of their chlorides with alkaline chlorides.

1. The compounds MeCl,R, (chloroplatinates and analognes), formed by all polyxene metals, except rhodium, are all crystalline salts, more or less soluble in water but asa rule insoluble or nearly so inalcohol. The acids MeCl,Hy, in which Me is not platinum, exist only as unstable solution, which by the action of excess of caustic soda in the heat, if not by the action

of a gentle heat alone, are all reduced to lower chlorides ; only the platinum compound possesses

| a higher degree of stability.

2. Chlorides, MeCl,, and potassio- &c. chlorides, McC1,R,, exist only in the platinum and palladium series.

3. Hexachlorides, Me,Clg, and compounds thereof with other chlorides are formed only by rhodium, iridium, and ruthenium.

Preparation of the Rarer Polyxene Metals.

For this the residues obtained in the industrial extraction of platinum from the ore form the natural raw material. These residues are two in number,—(1) that part of the ore which resisted the action of aqua regia (we will call it the osmiridinm residue), and (2) the filtrate from the chloroplatinate of ammonia.

1. Part of the osmiridium in the first residue consists of scales or grains so hard that they cannot be powdered even in a steel mortar. They must be reduced to a fine powder, which is best done by fusing them up with cight to ten parts of zinc and then The osmiridium remains as a dark friable mass, which is easily powdered and in- corporated with the originally sifted-off part. The disintegration of the residue may then be effected, according to Wohler, by mixing it with its own weight of common salt and exposing the mixture to a current of chlorine at a dull red heat within a com- bustion tube. If the chlorine is moist much of the osmium goes 0 as vapour of tetroxide, which must be collected in solution of caustic potash. After complete chlorination the contents of the tube are treated with water, when asa rule some undisintegrated osmiridium remains which is filtered off. The solution is mixed with nitric acid and distilled as long as any osmic tetroxide vapours are going off, which are readily recognized by their powerful pungent smcll, and of course must be carefully collected in caustic potash ley. The residual liquor (which contains the iridium as TrCl,Na,) 1s supersaturated with carbonate of soda, and evaporated to dryness,

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the residue kept at a dull red heat and then lixiviated with water. Alkaliferous oxideof iridium, Ir,O3, remains as a blue-black powder, which needs only be heated in hydrogen to be reduced to metal, from which the alkali is now easily removed by washing with water. Such iridium is always contaminated with more or less osmium, ruthenium, rhodium, and platinum, to remove which the crude metal is fused up with ten parts of lead, and the alloy treated with dilute nitric acid to dissolve the bulk of the lead, when the polyxene metals remain in the shape of a black powder. From this the platinum is extracted by prolonged treatment with dilute aqua regia, and from the residue the rhodium by fusion with bisulphate of potash and subsequent treatment with water, which dissolves away the sulphate of rhodium formed. The residue now left is fused in a gold crucible with ten parts of caustic and three of nitrate of potash, when the ruthenium and osmium assume the form of soluble MeO,K,0 salts, which are extracted with water and thus removed. What remains is an alkaliferous (blue) sesquioxide of iridium, which as a rule still retains some iron, ruthenium, and traces of gold and silica (G. Matthey). For the final purification of the metal and the recovering of the ruthenium and rhodium see G. Matthey's memoir (Chem. Soc. Journ., 1879, Abstr., p. 772) and chemical handbooks.

The osmium, as already stated, is obtained at an early stage of the process in the shape of a solution of its volatile tetroxide in causti¢ potash. This solution is mixed with a little alcohol to bring the osmium into the state of osmite, K,0 aOsO,, which is insoluble in alcohol. This precipitate is digested in sal-ammoniac, to convert it into a yellow compound of the composition 2NH,C1 OsO,(NH3)., which latter needs only be heated in hydro- gen to be converted into finely divided metallic osmium.

2. The second residue consists of a solution of a variety of polyxene chlorides in sal-ammoniac. This liquor is kept in contact with metallic iron, when the dissolved polyxene metals, and any gold or copper present, come down as a black heavy precipitate. This precipitate includes all the palladium and part of the rhodium as principal components. Bunsen has worked out an exhaustive method for the extracting of all its polyxene metals in pure forms; but it is too complicated to be reproduced here.1 The customary method for extracting the palladium is to treat the metallic precipitate with aqua regia, which dissolves the palladium and platinuin along

with some of the iridium and rhodium, to filter, evaporate the residue to a syrup (for bringing the palladium into the form of PdCl,), redissolve and precipitate the palladium by addition of the exact quantity of mercuric cyanide as cyanide Pd(NC),. This cyanide necds only be ignited strongly to leave a residue of metal. But this metal includes at least part of the copper of the original material, To remove it and other impnrities, the crude metal is dissolved in hydrochloric acid with the help of free chlorine, and the solution next evaporated to dryness to reduce the PdCl,H, to PdCl,, The chloride is redissolved, the solution mixed with enough of ammonia to redissolve the precipitate first produced, and hydrochloric acid gas is now passed into the solution. Yellow palladiochloride of ammonium, PdCl, (NH,)o, is precipitated, while copper and iron remain dissolved. After removal of the mother liquor the double salt is ignited and thus converted into palladium- Sponge, which is easily fused up in the oxyhydrogen flame and thus brought into the form of regulus.

Notes on Palladiwm, Osmium, and Osmtridium.

Palladium, a silver-white metal of great ductility, is much used, notwithstanding its high price, in mechanical dentistry and occasionally also for the graduated limbs of theodolites and other imstruments, because, unlike silver, it remains bright in sulphur- etted hydrogen.

Of all the properties of this metal the most remarkable is its extra- ordinary power of “occluding” hydrogen. According to Graham (to whom we owe almost all our knowledge on the subject) the compact metal when immersed in cold hydrogen gas takes up none or at most very little of it; but at higher temperatures very con- siderable occlusions take place. A certain specimen of foil was found to occlude 526 volumes of the gas at 245° C., and 643 at 90° to 97° C., measured at 17°°5 to 18° and one atmosphere’s pressure, per unit-volume of metal. The hydrogen, as in the case of platinum, is retained on cooling, and from the cold compound cannot be extracted by means of an absolute vacuum, which re- extracts the gas at a red heat.

Far more striking results can be obtained by using palladium aS a negative pole in the electrolysis of (acidulated) water. The Coefficient of occlusion then assumes very high values ; in Graham’s = i attained its maximum when the palladium was produced i. Gee from a 1°6 per cent. solution of its

chloride, and ai : Togenized while itself in the nascent state. The galvani- a Y deposited sheet was found to contain 982 volumes of hydrogen

measured cold) per unit-volume of original inetal, corresponding

1 Jahresb. d, Chemie, 1868, p. 280; Ann. d. Chemie, vol. cxlvi. 265.

approximately to the formula Pd,H, for the compound. When palladium unites with (nascent or free) hydrogen it suffers a very appreciable expansion which on the removal of the hydrogen is followed by a contraction beyond the original volume of the plain metal. This can be most beautifully illustrated by electrolysing water in an apparatus in which the negative electrode consists of a long strip of palladium-foil of which one side is covered over with varnish or electrolytically deposited platinum. The hydrogen goes in at the bare side of the electrode ; this side consequently expands more strongly than the other and the originally straight strip of metal becomes curved. When the current is reversed, hydrogen bubbles at once rise from what is now the negative pole, but the oxygen due at the palladium plate is for a time taken up by the hydrogen occluded there; this hydrogen is gradually consumed, and as it diminishes the plate unbends more and more completely and at last gets bent over in the opposite sense. Palladium by being hydrogenized does not lose any of its metallic properties, but (in the case of complete saturation) its density sinks from 12°38 to 11°79, its tenacity to 82 per cent. of its original value, its electric conductivity in the ratio of 8°1 to 5:9.

Graham views hydrogenized palladium as a true alloy, containing its hydrogen in the form of a metal ‘‘hydrogenium.” He found that certain palladium alloys take up hydrogen as readily (though less abundantly) as the pure metal does with corresponding expan- sion, but when dehydrogenized shrink back into exactly their ori- ginal volume. He calculated that the density of hydrogenium lies somewhere about the value 0°733 (water=1),—which of course means only that the weight of the occluded hydrogen, measured by the weight of a volume of water equal to the expansion observed, is =0°733. Dewar arrived at 0°620 as being

probably nearer the truth, and for the specific heat of hydrogenium found values from 3°79 to 5°88.

Osmium.—According to Deville and Debray, powdery osmium is most readily obtained by mixing the vapour of the tetroxide with that gas (CO+CO,) which is prepared by the decomposition of oxalic acid with oil of vitriol, and passing the mixture through a red-hot porcelain tube. The powdery metal readily fuses up with 3 or 4 parts of tin into a homogeneous alloy. When this alloy is treated with hydrochloric acid most of the tin dissolves, and the rest of it can be driven off by heating the residue in HCl gas. There remains ultimately pure osmium in the form of blue crystals endowed with a grey to violet reflex, which are hard enough to scratch glass. Their specific gravity is 22°48, so that osmium, besides being the most infusible of metals, is the heaviest of all known bodies.

Osmiridiwm.—Native osmiridium forms crystalline plate-shaped grains, distinguished by an extraordinary degree of hardness, which certainly exceeds that of hard-tempered steel. Most of the grains are very minute; the larger ones are utilized for making the so-called “diamond points” of gold pens. Osmiridium would lend itself for endless other applications if it were possible to unite the native dust into large compact masses. From a series of articles in the Chemical News (Jan. 2, 9, and 16, 1885), by Nelson W. Perry, it would appear that this problem has been solved, in a sense. John Holland, an American pen-maker, starting from the long- known fact that platinum metals readily unite with phosphorus into relatively easily fusible alloys, succeeded in producing a phos- phorized osmiridium which can be cast (and pressed while liquid) into thin continuous slabs even harder than the native substance, and susceptible of being wrought into drills, knife-edges, &c.

Statistics.

The production of platinum-ore in Russia was 2327 kilogrammies in 1862, 492 in 1863, 397 in 1864, 2273 in 1865, 1768 in 1867, and 2050 in 1871,—a total in those six years of 9307. The average production of platinum metal, from 1828 to 1845, amounted to 2623°8 kilogrammes per annum. In 1870 it was only 2005°8 kilos, of which about 80 per cent. came from the Ural Mountains.”

The manufacture of platinum utensils is in the hands of a very few firms, of which that of Messrs Johnson, Matthcy, & Co. of London is generally understood to be the most important. Even the total amount of inetal which passes through these works in the aggregate is difficult of ascertainment, the more so as some of them at least are discounting large reserves of old metal, including more or less of the obsolete coins. According to an approximate estimate which a very competent authority has kindly furnished, the consumption during the last five years fell little short of 100,000 tb troy,? of which from 75 to 80 per cent. are believed to have passed through the hands of London manufacturers.

The price of the metal during the last ten or twelve years has ranged from four to eight times that of silver. It is very high at present (1885) in consequence of the constantly increasing demand for platinum utensils. (W. D.)

2 From Kamarsch and Heeren's Technisches Wérterbuch. em 3 Equal to 7464 kilogrammes per annum, which is 3°7 times the amount given

above for 1870. XIX. — 25

Antece- dent ten- dencies.

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PLATO

LATO, the Athenian philosopher and father of ideal- Pp ism, was born 427 B.c., and lived to the age of eighty. His literary activity may be roughly said to have extended over the first half of the 4th century B.c. His father's name was Ariston, and his mother's family, which claimed descent from Solon, included Critias, one of the thirty tyrants, and other Athenian notables. That throughout his early manhood he was the devoted friend of Socrates, that in middle life he taught those who resorted to him in the grove named of Academus, near the Cephisus, and there founded the first great philosophical school, that (with alleged interruptions) he continued to preside over the Academy until his death, are matters of established fact. It is said by Aristotle that he was at one time intimate with Cratylus the

Heraclitean. Beyond this we have no authentic record of his outward life. That his name was at first Aristocles, and was changed to Plato because of the breadth of his shoulders or of his style or of his forehead, that he wrestled well,! that he wrote poetry?

which he burnt on hearing Socrates, that he fought in | three great battles,? that he had a thin voice, that (as is |

told of other Greek philosophers) he travelled to Cyrene and conversed with priests in Egypt, are statements of Diogenes Laertius, which rest on more or less uncertain tradition. The express assertion—which this author attri- butes to Hermodorus—that after the death of Socrates Plato and other Socratics took refuge with Euclides in Megara, has a somewhat stronger claim to authenticity. But the fact cannot be regarded as certain, still less the elaborate inferences which have been drawn from it. The romantic legend of Plato's journeys to Sicily, and of his re- lations there with the younger Dionysius and the princely but unfortunate Dion, had attained some degree of con- sistency before the age of Cicero, and at an unknown but probably early time were worked up into the so-called Epistles of Plato, now all but universally discredited. Nor is there sufficient ground for supposing, as some have done, that an authentic tradition is perceptible behind the myth. For the details of the story the reader is referred to Grote,* who believed in the genuineness of the Kpistles.

It is more important than any further balancing of uncertainties to observe the intellectual tendencies of the preceding generation (c. 430-400 B.c.).

The later years of the Peloponnesian War witnessed much mental disturbance and restlessness at Athens. Thoughtful minds looked forward with apprehension and backwards with regret, while even the most thoughtless were stirred into superficial activity. More than at any time since the age of Clisthenes, the city was divided, and a man's foes were often men of his own tribe or deme. Athenian politics were more factious and less significant than ever. Contention in the law-courts and rivalries in the assembly had for many men a more absorbing interest than questions of peace and war. Hereditary traditions had relaxed their hold, and political principles were not yet formulated. Yet there was not less scope on this account for personal ambition, while the progress of democracy, the

necessity of conciliating the people, and the apportionment of public offices by lot had a distract- ing and, to reflecting persons, often a discouraging effect.

1 See Laws, vii. 814 c. 2 Some epigrams in the Anthology are attributed to him.

3 This is told on the authority of Aristoxenus. But Plato cannot have been at Delium.

‘oe 5 Pe History of Greece, c. \xxxiv. ; Plato, vol. i. ¢. iii.

For those amongst whom Plato was brought up this effect was aggravated by the sequel of the oligarchical revolution, while, on the other hand, for some years after the restora- tion of the democracy, a new stimulus had been imparted, which, though of short duration, was universally felt. The events and circumstances thus briefly summarized appear in two ways to have encouraged the diffusion of ideas. The ambitious seem to have welcomed them as a meéans of influence, while those who turned from public life were the more stimulated to speculative disputation. However this may have been, it is manifest that before the beginning of the 4th century B.c. the intellectual atmo- sphere was already charged with a new force, which although essentially one may be differently described, according to the mode of its development, as (1) rhetorical and (2) theoretical and “sophistical.” This last word indicates the channel through which the current influences were mostly derived. A new want, in the shape both of interested and of disinterested curiosity, had insensibly created a new profession. Men of various fatherlands, some native Athenians, but more from other parts of Hellas, had set themselves to supplement the deficiencies of ordinary education, and to train men for the require- ments of civic life. More or less consciously they based their teachings on the philosophical dogmas of an earlier time, when the speculations of Xenophanes, Heraclitus, or Parmenides had interested only a few “wise men.” Those great thoughts were now to be expounded, so that “even cobblers might understand.” ® The self-appointed teachers found a rich field and abundant harvest among the wealthier youth, to the chagrin of the old-fashioned Athenian, who sighed with Aristophanes for the good old days when men knew less and listened to their elders and obeyed the

customs of their fathers. And such distrust was not wholly unfounded. For, amidst much that was graceful and improving, these novel questionings had an influence that, besides being unsettling, was aimless and unreal. A later criticism may discern in them the two great tendencies of naturalism and humanism. But it may be doubted if the sophist was himself aware of the direction of his own thoughts. For, although Prodicus or Hippias could debate a thesis and moralize with effect,

they do not appear to have been capable of speculative

reasoning. What passed for such was often either verbal quibbling or the pushing to an extreme of some isolated abstract notion. That prudens questio which is dimidium scientie had not yet been put. And yet the hour for putting it concerning human life was fully come. For the sea on which men were drifting was profoundly troubled, and would not sink back into its former calm. Conserva tive reaction was not less hopeless than the dreams of theorists were mischievously wild. In random talk, with gay, irresponsible energy, the youth were debating problems which have exercised great minds in Europe through all after time.

Men’s thoughts had begun to be thus disturbed and Sor

eager when Socrates arose. To understand him is the most necessary preliminary to the study of Plato, In our first authentic knowledge of him he is a man in mature life, attracting the attention of his fellow-citizens no less by his courage as a soldier than by his strange-familiat presence in the Athenian agora. Like the cicada of the trees by the Ilissus, his voice was never silent—except when checked by his divine monitor, or when wrapt, as he some-

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5 Theet., 180 D.

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times was for hours, in a catalepsy of reverie (see SocRATES). When he appeared in the market-place about midday, ready to single out his man for questioning, he had already spent some hours in the wrestling-schools, conversing with the youth. This was not, as it appeared to his contemporaries, mere idleness or mental dissipation (édoAecxéa), but the exercise of his self-chosen profession. There is no reason to doubt the general truth of the assertion which Plato attributes to him in the Apologia. He felt a divine vocation to examine himself by questioning other men. Gifted with an iron frame, and having trained himself to have fewer wants than a soldier or a slave, he could devote all his time to this one object, without engaging in remunerative business, or setting hours apart for recrea- tion, since he was indefatigable alike in body and mind. He was really doing for the Athenians, whether they would or no, what the sophist professed to do for his adherents, and what such men as Protagoras and Prodicus had actually done in part. One obvious difference was that he would take no fee. But there was another and more deep-lying difference, which distinguished him not only from the contemporary sophists but from the thinkers of the previous age. This was the Socratic attitude of inquiry.

The sceptical movement had confused men's notions as to the value of ethical ideas! "If 'right' is one thing in Athens and another at Sparta, why strive to follow right rather than expediency? The laws put restraint on Nature, which is prior to them. Then why submit to law?" And the ingenuities of rhetoric had stirred much unmean- ing disputation. Every case seemed capable of being argued in opposite ways. Even on the great question of the ultimate constitution of things, the conflicting theories of absolute immutability and eternal change appeared to be equally irrefragable and equally untenable.

Now Socrates first of all maintained imperturbably the simple habits of an ordinary Athenian citizen, observing scrupulously even minute religious customs, entering also unreservedly into the lightest pastimes of his associates, while the plain and strenuous tenor of his own peculiar life remained unaffected. But intoall he carried the same irre- pressible,

insatiable spirit of search, to which nothing human was alien or uninteresting. Taking men and women as he found them, and conversing casually, as it appeared, on the topic which chanced to interest his hearer, he had not gone far before he had unmasked some vain pretence, cut folly to the quick, or raised some doubt of wide significance. And, though he often ended with negation, his negative achievements had a positive aim. For there underlay the process even when most ironical the conviction, not less profound because implicit, that in spite of false appearances, In spite of error, there are realities not undiscoverable, and whatsoever is real is good. His hearers had been confused by contradictory voices,—one erying “All is motion,” another “ All is rest”; one “ The absolute is unattainable,” another “The relative alone is real”; some upholding a vague sentiment of traditional right, while some declared for arbitrary convention and some for the “law of nature.” Some held that virtue was spontaneous, some that it was due to training, and some paradoxically denied that either vice or falsehood had any meaning. The faith of Socrates, whether instinctive or inspired, remained untroubled by these jarring tones. He did not ask—“Is virtue a reality?” or “Is goodness a delusion?” But, with perfect confidence that there was an answer, he asked himself and others “What is it?” (ri éori); or, more particularly, as Xenophon testifies, “What is a state? What is a statesman? What is just? What is unjust?

1 See Caird, Hegel, p. 168.

What is government? What is it to be a ruler of men?” In this form of question, however simple, the originality of Socrates is typified; and by means of it he laid the first stone, not only of the fabric of ethical philosophy, but of scientific method. The secret of his success lay in the combination of a deep sense of human ignorance with a confidence not less deep in the power of reason.

The first result, and, as the Platonic Socrates declares, the only result he had obtained, was the consciousness of knowing nothing. But he who knows that he knows nothing is disposed to seek, and only those who seek will find. And the seeking mind attains, if not to knowledge, yet to a new standard*of knowing. So long as results are contradictory, so long as

negative instances are success- fully applied, the searcher may make progress but is still to seek. For the aim of inquiry is the universal.

Human life and experience the sphere of search; truth and good, regarded as identical, the end of it ; universality the test of reality, conversation the method, rational thought the means,—these are the chief notes of the dialectic of Socrates. Applying the native strength of his intelligence directly to the facts of life, he revealed their significance in countless ways, by unthought-of generaliza- tions, by strange analogies, combining what men had not combined, distinguishing what they had not distinguished, — but always with the single aim of rousing them to the search after eternal truth and good.

The spirit which led on towards this unseen goal was not less practical than speculative. Socrates desired not only that men might know, but that they might know and do. Utility is the watchword no less of the Socratic than of the Baconian induction. But Socrates never doubted that if men once know they will alsodo. His own conscious conviction of the unity of truth and good he believed to be unconsciously the basis of all men's actions. They erred, he thought, from not seeing the good, and not because they would not follow it if seen. This is expressed in the Socratic dicta, "Vice is ignorance," "Virtue is knowledge." Men therefore must be brought to see the good and true, and that they may see it they must first be made aware that they do not see.

This lifelong work of Socrates, in which the germs of ethics, psychology, and logic were contained,—after it had been sealed by the death in which he characteristically at once obeyed his countrymen and convinced them of error,— was idealized, developed, dramatized—first embodied and then extended beyond its original scope—in the writings of Plato, which may be described as the literary outcome of the profound impression made by Socrates upon his greatest follower.

These writings (in pursuance of the importance given by Socrates to conversation) are all cast in the form of imaginary dialogue. But in those which are presumably the latest in order of composition this imaginative form interferes but little with the direct expression of the philosopher's own

thoughts. The many-coloured veil at first inseparable from the features is gradually worn thinner, and at last becomes almost imperceptible.

Little more will be attempted in the following pages than to give a general outline of these immortal works in the order which is on the whole most probable, omitting those whose claim to authenticity is weakest, and passing lightly over some which, although genuine, are less import- ant than the rest, or have less to do with the main current of Plato's thought.

The Platonic dialogues are not merely the embodiment The of the mind of Socrates and of the reflexions of Plato. dialogues.

They are the portraiture of the highest intellectual life of Hellas in the time of Plato,—a life but distantly related to

military and political events, and scarcely interrupted by them. Athens appears as the centre of the excitable Hellenic mind, profoundly stirred by the arrival of great sophists,! and keenly alive to the questions of Socrates, although in the pages of Plato, even more than in reality, he only "whispers with a few striplings in a corner. For, in the Platonic grouping, the agora, which was the chief scene of action for the real Socrates, retires into the background, and he is principally seen consorting with his chosen companions, who are also friends of Plato, and with the acquaintances whom he makes through them, The scene is narrowed (for the Academy was remote from the bustle of resort, and Plato judged the Hellenic world securely from the vantage-ground of partial retirement) — but the figures are distinct and full of life. In reading the dialogues, we not only breathe the most refined intellectual atmosphere, but are also present witnesses of the urbanity, the freedom, the playfulness, the generous warmth of the "best society" in Athens. For Plato has a numerous repertory of dramatis persone, who stand in various relations to his chief character—the impetuous Cherephon, Apollodorus the inseparable weak brother, old Crito the true-hearted, Phedo the beloved disciple, Simmias and Cebes, who have been with Philolaus, the graceful and ingenuous Pheedrus, the petulant Philebus, Thesetetus of the philosophic nature, who is cut off in his prime, and the incorrigible Alcibiades ; then Plato's own kinsmen—Glaucon the

irrepressible in politics, in quarrel, and in love, Adimantus, solid and grave, Critias in his phase of amateur philosopher, and not as what he after- wards became, Charmides, not in fiery manhood, but in his first bloom of diffident youth; and many others who appear as mere acquaintances, but have an interest of their own-—the accomplished Agathon, the gay Aristophanes, Eryximachus the all-worthy physician, Meno, light of spirit, Callias, entertainer of sophists, Callicles the wilful man of the world, Cephalus the aged father of Lysias, and Nicias the honoured soldier. All these appear, not as some of them do on the page of history, in sanguinary contention or fierce rivalry, but as peaceful Athenians, in momentary contact with Socrates, whose electric touch now benumbs and now exhilarates, and sometimes goads to frenzy of love or anger. Still more distantly related to him, as it were standing in an outer circle, are the imposing forms of Gorgias and Protagoras, surrounded with the lesser lights of Hippias, Prodicus, and Polus. Thrasymachus, Euthydemus, Dionysodorus hang round like comic masks, adding piquancy to the design. The adversaries Anytus and Meletus are allowed to appear for a moment, but soon vanish. The older philosophers, though Socrates turned away from them, also make their entrance on the Platonic stage. Parmenides with his magnificent depth is made to converse with the imaginary Socrates, who is still quite young. A stranger from Elea plays an important part in some later dialogues, and Timzeus the Pythagorean is introduced discoursing of the creation of the world. In these dialogues Socrates is mostly silent; in the Philebus he has lost himself in Plato; and in the twelve books of the Zaws, where an unnamed Athenian is the chief speaker, even the Platonic Socrates finally disappears.

Now, in evolving his philosophy from the Socratic basis, Plato works along three main lines,—the ethical and political, the metaphysical or scientific, and the mystical. All three are often intimately blended, as in the close of Rep., bk. vi., and even where one element is uppermost the others are not wholly suppressed. But this distinction, like that sometimes made in modern philo-

1 Tt had been part of the foreigners to Athens,

policy of Pericles to draw distinguished

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sophy between the good, the true, and the beautiful, is one which, if not unduly pressed, may be usefully borne in mind. Having noted this once for all, we pass to the more detailed consideration of the several dialogues,

I. Laches, Charmides, Lysis.—-In this first -group Socrates is dealing tentatively with single ethical notions, The result in each case is a confession of ignorance, but the subject has been so handled as to point the way to more fruitful discussions in the future. And suggestions are casually thrown out which anticipate some of the most far-reaching of Plato's subsequent conteniplations.

The Laches is a vigorous sketch, in which the characters Laches

of the soldier, the aged citizen, and the prudent general are well preserved; and Socrates is seen conversing with his elders, although with reference to the treatment of the young. The question raised is the definition of courage ; and the humour of the piece consists in showing that three men, all of whom are unquestionably brave, are unable to give an account of bravery, or to decide whether courage is an animal instinct or a mental accomplishment.

Similarly, in the dialogue which bears his name, the Char.

temperate Charmides, of whom all testify that (as Aristo mides.

phanes has it?) he "fills up the gracious mould of modesty," is hopelessly embarrassed when challenged by the Socratic method to put in words his conception of the modesty or temperance which he possesses, and which, as Socrates assures him, is a priceless gift. The Charmides contains some hints of Platonic notions, such as that of knowledge as self-consciousness, and of virtue as "doing one's own business."

The graceful little dialogue which bears the name of Lysis.

Lysis ends, like the two former, with a confession of failure. Socrates, Lysis, and Menexenus are all friends, and think highly of friendship, yet

after many efforts they are unable to tell “what friendship is.” Yet some of the suggestions which are here laid aside are afterwards allowed to reappear. The notion that ‘what is neither good nor evil loves the good because of the presence of evil” isexpanded and emphasized in the Symposiwm. And the conception of an ideal object of friendship, an avro fidrov (though rejected as in the criticism of Aristotle by the characteristic reductio ad infinitum), is destined to have a wider scope in the history of Platonism.

Il. Protagoras, Io, Meno.—The previous dialogues have marked the distinction between unconscious and conscious morality, and have also brought out the Socratic tendency to identify virtue with the knowledge of good. Now, the more strongly it is felt that knowledge is inseparable from virtue the more strange and doubtful appears such unconscious excellence as that of Laches, Charmides, or Lysis. Hence arises the further paradox of Socrates,—“Virtue is not taught, and that which is com- monly regarded as virtue springs up spontaneously or 1s received unconsciously by a kind of inspiration.”

Protagoras, in the dialogue named after him, 1s the Fre professor of popular, unscientific, self-complacent excel- °°”

lence ; while Socrates appears in his life-long search after the ideal knowledge of the best. The two men are naturally at cross purposes. Protagoras contends that virtue is taught by himself and others more or less success- fully, and is not one but many. Socrates disputes the possibility of teaching virtue (since all men equally pro fess it, and even statesmen fail to give it to their sons), but affirms that, if it can be taught, virtue is not many, but one. The discussion, as in the former dialogues, ends inconclusively. But in the course of it Plato vividly sets forth the natural opposition between the empiric and scientific points of view, between a conventional and an

2 Nub., 995, rijs aidods wérrers Tayarp’ dvaTAjoat.

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intellectual standard. He does full justice to the thesis of Protagoras, and it is not to be supposed that he was con- tented to remain in the attitude which he has here attri- buted to Socrates. In his ideal state, where the earlier training of the best citizens is a refinement on the actual Hellenic education, he has to some extent reconciled the conceptions which are here dramatically opposed.

The preparations for the encounter and the description of it include many life-like touches,—such as the eagerness of the young Athenian gentleman to hear the sophist, though he would be ashamed to be thought a sophist himself; the confusion into which the house of Callias has been thrown by the crowd of strangers and by the selfimportance of rival professors; the graceful dignity of the man who has been forty years a teacher, the graphic description of the whole scene, the characteristic speeches of Prodicus and Hippias (from which some critics have elicited a theory of their doctrines), and the continued irony with which Socrates bears them all in hand and soothes the great man after disconcerting him.

In the argument there are two points which chiefly deserve notice. (1) Protagoras, in accordance with his relative view of things (which Plato afterwards criticized in the Theetetus), claims not to give men principles but to improve them in those virtues which Providence has given in some measure to all civilized men. (2) Socrates in postulating a scientific principle, which he expressly reserves for future consideration, would have it tested by the power of calculating the amount of pleasure. Grote dwells with some complacency ou the “utilitarianism ” of Socrates in the

Protagoras. And it is true that a principle of utility is here opposed to conventional sentiment. But this opposition is intended to prepare the way for the wider and deeper contrast between an arbitrary and a scientific standard, or between impres- sions and conceptions or ideas. And when Plato (in the Gorgias and Philebus) endeavours to define the art of measurement, which is here anticipated, it is not wonderful that differences here unthought of should come into view, or that the pleasant should be again contra-distinguished from the good. In all three dialogues he is equally asserting the supremacy of reason.

On the first vision of that transcendental knowledge! which is to be the key at once to truth and good, philosophy Is apt to lose her balance, and to look with scorn upon “the trivial round, the common task,” and the respectable common-places of “ordinary thinking.” Yet, as Socrates is reminded by Protagoras, this unconscious wisdom also has a value. And Plato, who, when most ideal, ever Strives to keep touch with experience, is fully convinced of the reality of this lower truth, of this unphilosophic virtue. But he is long puzzled how to conceive of it. For, if knowledge is all in all, what are we to make of wisdom and goodness in those who do not know? Protagoras had boldly spoken of honour and right as a direct gift from Zeus, and Socrates, in the Zo and Meno, is represented as adopting an hypothesis of inspiration in order to account for these unaccredited graces of the soul.

Socrates has observed that rhapsodists and even poets have no definite knowledge of the things which they so powerfully represent (comp. Apol., 22; Phed., 245 A; Rep., iii. 398 A), He brings the rhapsode Io to admit this, and to conclude that he is the inspired medium of a mag- netic influence. The Muse is the chief magnet, and the poet 1s the first of a series of magnetic rings. Then follow the thapsode and the actor, who are rings of inferior power, and the last ring is the hearer or spectator.

The Meno raises again the more serious question, Can

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1 Phed., 82B; Rep., x. 619 C.

virtue be taught? Socrates here states explicitly the paradox with which the Protagoras ended. “ Virtue is knowledge; therefore virtue can be taught. But virtue is not taught. Therefore (in the highest sense) there can be no virtue.” And he repeats several of his former reasons, —that Athenian statesmen failed to teach their sons, and that the education given by sophists is unsatisfying. (The sophists are here denounced by Anytus, who is angered by Socrates’s ironical praise of them.) But the paradox is softened in two ways:—(1) the absence of knowledge does not preclude inquiry, and (2), though virtue cannot be taught, yet there is a sense in which virtue exists.

1. Meno begins in gaiety of heart to define virtue, but is soon “ benumbed ” by the “ torpedo” shock of Socrates, and asks “ How can one inquire about that which he does not know?” Socrates meets this “ eristic ” difficulty with the doctrine of reminiscence (avéprvyors). All knowledge is latent in the mind from birth and through kindred (or association) of ideas much may be recovered, if only a beginning is made. Pindar and other poets have said that the soul is immortal and that she has passed through many previous states.2 And Socrates now gives a practical illustration of the truth that knowledge is evolved from ignorance. He elicits, from a Greek slave of Meno’s, the demonstration of a geometrical theorem.? About the middle of the process he turns to Meno and observes that the slave (who has made a false start) is now becom- ing conscious of ignorance. He then gradually draws from the man, by leading questions, the positive proof.

2. Though virtue is not yet defined, it may be affirmed “hypothetically ” that, if virtue is knowledge, virtue can be taught. And experience leads us to admit two phases of virtue—the one a mode of life based on scientific principle, which hitherto is an ideal only; the other sporadic, springing of itself, yet of divine origin, relying upon true opinion, which it is, however, unable to make fast through demonstration of the cause or reason. But, if there were a virtuous man who could teach virtue, he would stand amongst his fellows like Tiresias amongst the shades:*

This mystical account of ordinary morality is in keeping with the semi-mythical defence of the process of inquiry— that all knowledge is implicit in the mind from birth.

Ill. Euthyphro, Apologia, Crito, Phedo.—There is no ground for supposing that these four dialogues were written consecutively, or that they belong strictly to the same period of Plato's industry. But they are linked together for the reader by their common reference to the trial and death of Socrates; no one of them has been proved to be in the author's earliest or latest manner ; and they may therefore fitly end the series of dialogues in which the personal traits of the historic Socrates are most apparent, and Plato's own peculiar doctrines are as yet but partially disclosed.

The little dialogue known by the name of Huthyphro Euthy- might have been classed with the Laches, Charmides, and phro.

Lysis, as dealing inconclusively with a single notion. But, although slight and tentative in form, it has an under- tone of deeper significance, in keeping with the gravity of the occasion. Plato implies that Socrates had thought more deeply on the nature of piety than his accusers had, and also that his piety was of a higher mood than that of ordinary religious men.

Euthyphro is a soothsayer, well-disposed to Socrates, but not one of his particular friends. They meet at the

2 The origin of this traditional belief is very obscure. The Greeks themselves were apt to associate it with Pythagoras and with the '¢Orphic " mysteries.

3 Eucl., i. 47 (the case where the triangle is isosceles).

4 Hom., Odyss., x. 495, Om memvic@at, ral SE oKial dlacovoew.

Apology.

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door of the king archon, whither Socrates has been summoned for the " precognition " (dvdxpuors) preliminary to his trial. Both men are interested in cases of alleged impiety. For Euthyphro's business is to impeach his father, who has inadvertently caused the death of a criminal labourer. The prophet feels the duty of purging the stain of blood to be more imperative

the nearer home. Socrates is struck by the strong opinion thus evinced respecting the nature of piety, and detains Euthyphro at the entrance of the court, that he may Icarn from so clear an authority “what piety is,” and so be fortified against Meletus. He leads his respondent from point to point, until the doubt is raised whether God loves holiness because it is holy, or it is holy because loved by God. Does God will what is righteous, or is that righteous which is willed by God? Here they find themselves wandering round and round. Socrates proves himself an involuntary Dedalus who makes opinions move, while he seeks for one which he can “bind fast with reason.”

“The holy is a portion of the just.” But what portion ? “Due service of the gods by prayer and sacrifice.” But how does this affect the gods? “It pleases them.” Again we are found to be reasoning in a circle.

“Thus far has Socrates proceeded in placing religion on a moral foundation. Hc is seeking to realize the harmony of religion and morality, which the great poets Aschylus, Sophocles, and Pindar had unconsciously anticipated, and which is the universal want of all men. To this the soothsayer adds the ceremonial clement, ‘attending upon the gods.’ When further interrogated by Socrates as to the nature of this ‘attention to the gods,’ he replies that piety is an affair of business, a science of giving and asking and the like. Socrates points out the anthropomorphism of these notions. But when we expect him to go on and show that the true service of the gods is the service of the spirit and co-operation with them in all things true and good, he stops short; this was a lesson which the soothsayer could not have been made to under- stand, and which every one must learn for himself.”?

In Plato’s Apology the fate of Socrates is no longer the subject of mere allusions, such as the rage of Anytus at the end of the Afeno, and the scene and occasion of the Euthyphro. He is now seen face to face with his accusers, and with his countrymen who are condemning him to death.

What most aggravated his danger (after life-long impunity) is thus stated by Mr James Riddell, in the intro- duction to his edition of the dialogue :—“ The éme(keta ” (clemency) “of the restored people did not last long, and was naturally succeeded by a sensitive and fanatical zeal for their revived political institutions. Inquiry into the founda- tions of civil society was

obviously rather perilous for the inquirer at such a time. Socrates knew the full extent of his danger. But, according to Xenophon (Mem., iv. c. 8, § 14), he prepared no defence, alleging that his whole life had been a preparation for that hour.”

The tone of the Platonic Apology is in full accordance with that saying; but it is too elaborate a work of art to be taken literally as a report of what was actually said. Professor Jowett well compares it to “ those speeches of Thucydides in which he has embodied his conception of the lofty character and policy of the great Pericles.” Yet “it is significant that Plato is said to have been present at the defence, as he is also said to have been absent at the last scene of the Phedo. Some of the topics may have been actually used by Socrates, and the recollection of his very words may have rung in the ears of his disciple.”

The Platonie Apology is in three parts :—(1) before conviction, (2) after conviction and before sentence, (3) after the sentence.

1. Socrates cares not for acquittal. But he does care to explain his life. And he selects those aspects of it which there is hope of making his audience understand. That he partly

succeeded in this is shown by the large number of those (220 out of 500) who voted for his adil cs oe

1 Jowett.

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a. His answer to Meletus, as least important, is reserved for the middle of his speech. He addresses himself first to “other accusers,”—comic poets and the rest, who have prejudiced his reputation by falsely identifying him with the physical philosophers and the sophists. ~ But what then is the strange pursuit which has given to Socrates the name of wise? Itis the practice of cross- examining, to which he was first impelled by the oracle at Delphi, and which he has followed ever since.asa religious niission. The god said “Socrates is wise,” when he was conscious of no wisdom great or small. So he went in search of some one wiser than himself, bunt could find

none, though he found many who had conceit of wisdom. And he inferred that the god must mean “ He is wisest who, like Socrates, is most aware of his own ignorance.” This unceasing quest has left him in great poverty, and has made him enemies, who are represented by Anytus, Meletus, and Lycon, And their enmity is further embittered by the pleasure which young men take in seeing pretence unmasked, and in imitating the process of refutation. Hence has arisen the false charge that Socrates is a corrupter of youth. :

b. Here he turns to Meletus. “IfI corrupt the youth, who does them good?” Mel: “The laws, the judges, the audience, the Athenians generally” (comp. Protagoras and Meno). “Strange, that here only should be one to corrupt and many to improve; or that any one should be so infatuated as to wish to have bad neighbours.” Jfel. “Socrates is an atheist. He believes the sun to be astone.” ‘“ You are accusing Anaxagoras. I have said that I know nothing of such theories. And you accuse ine of introduc- ing novel notions about divine things. How can I believe in divine things (Sajudéyia) and not in divine beings (Safuoves) ? and how in divine beings, if not in gods who are their authors ?”

c. That is a sufficient answer for his present accuser. He returns to the general long-standing defamation, which may well be his death, .as slander has often been and again will be the death of many a man.

Yet if spared he will continue the same course of life, in spite of the danger. As at Potideea and Delinm he faced death where the Athenians posted him, so now he will remain at the post where he is stationed by the god. For to fear death is to assume pretended knowledge.

One thing is certain. A worse man cannot harm a better. But if the Athenians kill Socrates, they will harm themselves. For they will lose the stimulus of his exhortations ;—and his poverty is a sufficient witness that he was sincere. Not that he would engage in politics. If he had done that he would have perished long before,? as he nearly did for his independent vote after the battle of Arginuse, and for disobeying the murderous command of the thirty tyrants.

But have not Socrates's disciples, Alcibiades, Critias, Charmides, proved bad citizens? He has uo disciples. Any one, bad or good, may come and hear him, and the talk which is his life-work is not unamusing. But why are no witnesses brought to substantiate this charge? There are elder friends of his companions, who would be angry if he had used his influence for harm. But these men's confidence in Socrates is unshaken.

He will not appeal ad miscricordiam. That would be a disgrace for one who (rightly or not) has been reputed wisc, and to admit such an appeal in any case is a violation of the juror's oath.

Socrates has told the Athenians the whole truth, so far as a mixed audience of them could receive it. Elaboration and subtlety could have no place in addressing the Heliastic court, nor could that universal truth towards which he was leading men be made intelligible to a new audience while the clepsydra was running. But his tone and attitude must have made a strong appeal to the better nature of his hearers. With Meletus he "played rather than fought," but he has shown clearly that he has no fear of death, that he ehooses to obey God rather than man,

and that for very love of the Athenians he will not be swayed by

their desires. :

2. One convicted on a capital charge had the right of pleading before sentence in mitigation of the penalty proposed by his accuser. Socrates was convicted by fewer votes than he lumself anticipated. The indictment of Meletus was ineffectual, and if it had not been for the speeches of Anytus and Lycon the defendant would have been triumphantly acquitted. Could he but have conversed with his judges more than once, he might have removed their prejudices. In no spirit of bravado, therefore, but in simple justice to himself, he meets the claim of Meletus that he shall be punished with death by the counter claim that he shall be maintained in the prytaneum as a public benefactor. He cannot ask that death, which may be a good, shall be commuted for imprisonment or exile, which are certainly evils. A fine would be no evil: but he has no money ;—he can offer a mina. Here Plato and others interpose, and with their friendly help he offers thirty mine.

3. He is sentenced to death, and the public business of the court

2 Comp. Gorg., 521; Rep., vi. 496.

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is ended. But, while the record is being entered and the magis- trates are thus occupied, Socrates is imagined as addressing (a) the majority, and (4) the minority in the court. ; :

qa. To those who have condemned him he speaks in a prophetic tone. “For the sake of depriving an old man of the last dregs of life, they have given Athensa bad name. He would not run away, and so death has overtaken him. But his accusers are overtaken by unrighteousness, and must reap the fruits of it.

“Nor will the Athenians find the desired relief. Other reprovers, whom Socrates has hitherto restrained, will now arise, not in a friendly but in a hostile spirit. The only way for the citizens to escape reproof is to reform their lives.”

b. To the minority, who would have acquitted him, he speaks with gentle solemnity. “Let them know to their comfort that the divine voice has not once checked him throughout that day. This indicates that death is not an evil. And reason shows that death is either a long untroubled sleep, or removal to a better world, where are no unjust judges.

“No evil can happen to a good man either in life or after death. Wherefore Socrates will not be angry with his condemners, who

‘have done him no harm, although they meant him anything but

good. He will only ask of them to do to the sons of Socrates as Socrates has done to them.”

Is the love of truth consistent with civic duties? Is the philosopher a good citizen? are questions which are sure to arise where the truth involves practical improve- ment. In the Apology Socrates appears as an intrepid

reformer ; the Crito gives an impressive picture of him as a loyal and law-abiding Athenian.

Execution had been delayed during the annual mission to Delos (during which no one could be put to death). But the returning vessel had just been reported as descried from Sunium., At early dawn Crito, the oldest friend of Socrates, obtained access to his cell, and found him sleeping peacefully. Presently he awoke, and Crito told him of the approach of the fatal ship. Socrates replies by telling his dream. A fair form stood over him and said,

“The third day hence to Phthia shalt thou come.” And it would seem that the day after to-morrow will really be the day for going home.

Crito then reveals his |e for an escape. the question in the old familiar way. “Crito’s zeal is excellent, and most men would think his object right. But the few who think soundly say that it is wrong to return evil for evil. The laws of Athens (through the fault of men) are doing Socrates harm. But ought he therefore to infringe the law? Might not the laws of his country plead with him and say :—‘ You owe to us your birth and breeding ; and when grown up you voluntarily submitted to us. For you might have gone elsewhere. But you preferred us to all other laws, and have been the most constant resident in Athens. Even at the last you accepted death rather than exile. Ifyou now break your covenant, you will ruin your friends and will be rejected by all well-ordered cities. You might be received in Thessaly, but could only live there by cringing to foreigners for food. Where in that case will be your talk about virtue? You would not take your sons thither. And your friends would be equally kind to them if you were dead.

“Think not of life and children first and of justice afterwards, but think of justice first, that you may be justified in the world below.” Crito admits these arguments to be unanswerable.

The Meno referred to the immortality and pre-existence of the soul as a traditional doctrine, and it was there associated with the possibility of inquiry. In the Phedo Plato undertakes to substantiate this belief and base it anew, by narrating the last hours of Socrates, who is fepresented as calmly discussing the question with his friends when his own death was immediately at hand. The argument turns chiefly on the eternity of

knowledge, and is far from satisfying. For, granting that eternity of knowledge involves eternity of mind, does the eternity of mind assure continued being to the individual?! Yet no unprejudiced reader of the Phxdo can doubt that Plato, at the time of writing it, sincerely believed in a conscious personal existence after death. The words of Socrates, when he declares his hope of going to be with other friends, are absolutely unambiguous, and his reply to Crito's question, " How shall we bury you?" has a convincing

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And Socrates argues

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; In the Timeeus immortality is made to rest on the goodwill of God, ecause "ouly an evil being would wish to dissolve that which is har- monious and happy" (Tim., 41 A).

force beyond all dialectic :—" I cannot persuade Crito that I here am Socrates—I who am now reasoning and order- ing discourse. He imagines Socrates to be that other, whom he will see by and by, a corpse." This and similar touches not only stamp the Phedo as a marvel of art, but are indisputable evidences of the writer's profound belief. They may be inventions, but they have nothing " mythi- cal" about them, any more than the charge of Socrates to his friends, that they would best fulfil his wishes by attending to their own lives.

The narrative, to be appreciated, must be read in full. Buta short abstract of the argument may be given here.

1. Death is merely the separation of soul and body. And this is the very consummation at which philosophy aims. The body hinders thought. The mind attains to truth by retiring into her- self. Through no bodily sense does she perceive justice, beauty, goodness, and other ideas. The philosopher has a life-long quarrel with bodily desires, and he should welcome the release

of luis soul. Thus he alone can have true courage, even as temperance and all the virtues are real in lrim alone.

But does the soul exist after death ?

a. An old tradition tells of many successive births, the soul departing to Hades and returning again, so that the living are born from the dead. And if the dead had no existence, this could not be, since from nothing nothing can arise. Moreover, experi- ence shows that opposite states come from their opposites, and that such a process is always reciprocal. Death certainly succeeds to life. Then life must succeed to death. And that which undergoes these changes must exist through all. If the dead came from the living, and not the living from the dead, the universe would ultimately be consumed in death.

This presumption is confirmed by the doctrine (here attributed to Socrates, comp. Jeno) that knowledge comes through recollection. What is recollected must be previously kuown. Now we have never since birth had intuition of the absolute equality of which (through association) we are reminded by the sight of things approximately equal. And we cannot have seen it at the moment of birth, for at what other moment can we have forgotten it? Therefore, if ideals be not vain, our souls must have existed before birth, and, according to the doctrine of opposites above stated, will have continued existence after death.

b. To charm away the fears of the “child within,” Socrates adds, as further considerations :—

(1) The soul is uncompounded, incorporeal, invisible, and there- fore indissoluble and immutable.

(2) The soul commands, the body serves ; therefore the soul is akin to the divine.

(3) Yet even the body holds together long after death, and tho boues are all but indestructible.

The soul, if pure, departs to the invisible world, but, if tainted by communion with the body, she lingers hovering near the earth, and is afterwards born into the likeness of some lowerform. That which true philosophy has purified alone rises ultimately to the gods. This lesson is impressively applied.

2. A pause ensues ; and Simmias and Cebes are invited to express their doubts. For, as the swan dics singing, Socrates would die discoursing.

a. Simmias desires not to rest short of demonstration, though he is willing to make the highest attainable probability the guide of life.

If the soul is the harmony of the body, what becomes of her ‘¢when the lute is broken ” ?

b. Cebes compares the body to a garnicnt which the soul keeps weaving at. The garment in which the weaver dies outlasts him. So the soul may have woven and worn many bodies in one lifetime, yet may perish and leave a body behind. Or even supposing her to have many lives, does even this hypothesis exempt her from ultimate decay ?

Socrates warns his friends against losing faith in inquiry. Theories, like men, are disappointing ; yet we should be neither misanthropists nor misologists. Then he answers his two friends.

(a) (1) The soul is acknowledged to be prior to the body. But no harmony is prior to the elements which are harmonized.

(2) The soul has virtue and vice, z.c., harmony and discord. Is there harniony of harmony? Comp. Rep., x. 609.

(3) All soul is equally soul, but all harmony is not equally harmonious.

(4) If the soul were the harmony of the body, they would be agreed ; but, as has been already shown, they are perpetually quarrelling.

(5) The soul is not conditioned by the bodily elements, but has the power of controlling them.

(b.) Cebes has raised the wide question whether the soul is inde- pendent of generation and corruption. Socratcs owns that he him-

self (7.¢., Plato?) had once been fascinated by natural philosophy, and had sought. to give a physical account of everything. Then, hearing out of Anaxagoras that mind was the disposer of all, he had hoped to learn not only how things were, but also why. But he found Anaxagoras forsaking his own first principle and jumbling causes with conditions. (‘‘The cause why Socrates sits here is not a certain disposition of joints and sinews, but that he has thought best to undergo his sentence,—else the joints and sinews would have been ere this, by Crito’s advice, on the way to Thessaly.”) Physical science never thinks of a power which orders everything for good, but expects to find another Atlas to sustain the world more strong and lasting than the reason of the best. ;

Socrates had turned from such philosophers and found for him- self a way, not to gaze directly on the universal reason, but to scek an image of it in the world of mind, wherein are reflected the ideas, as, for example, the idea of beauty, through partaking of which beautiful things are beautiful. Assuming the existence of the ideas, he felt his way from hypothesis to hypothesis.

Now the participation of objects in ideas is in some cases essential and inseparable. Snow is essentially cold, fire hot, three odd, two even. And things thus essentially opposite are exclusive of each other’s attributes. (When it was said above that opposites come from opposites, not opposite things were meant, but opposite states or conditions of one thing.) Snow cannot admit heat, nor fire cold; for they are inseparable vehicles of heat and cold respectively. The soul is the inseparable vehicle of life, and therefore, by parity of reasoning, the soul cannot admit of death, but is immortal and imperishable.

3. What follows is in the true sense mythological, and is admitted by Socrates to be uncertain.—‘‘ Howbeit, since the soul is proved to be immortal, men ought to charm their spirits with such tales.””—

The earth, a globe self-balanced in the midst of space, has many mansions for the soul,! some higher and brighter, some lower and darker than our present habitation. We who dwell about the Mediterranean Sea are like frogs at the bottom of a pool. In some higher place, under the true heaven, our souls may dwell hereafter, and see not only colours and forms in their ideal purity but truth and justice as they are.

In the Phedo, more than elsewhere, Plato preaches withdrawal from the world. The Delian solemnity is to Socrates and his friends a period of "retreat," in which their eyes are turned from earthly things to dwell on the eternal. The theory of ideas here assumes its most transcendental aspect, and it is from portions of this dialogue and of the Phedrus and Timeus that the popular conception of Platonism has been principally derived. But to understand Plato rightly it is not enough to study isolated passages which happen to charm the imagina- tion; nor should single expressions be interpreted without regard to the manner in which he presents the truth else- where.

It has already been shown (1) that Socratic inquiry implied a standard of truth and good, undiscovered but end- lessly discoverable, and to be approached inductively; and (2) that in Plato this implicit assumption becomes explicit, in the identification of virtue with knowledge (Lach., Charm.) as an art of measurement (Protag.), and in the vision (towards the end of the Lysis) of an absolute object of desire. The Socratic " self-knowledge" has been de- veloped (Charm.) into a science of mind or consciousness, apart from which no physical studies can be fruitful. (3) Co-ordinate with these theoretical tendencies there has appeared in Plato the determination not to break with experience.—The bearing of these remarks on the further | progress of Plato's thoughts will appear in the sequel. Meanwhile, in the Phedo, a long step is made in the | direction of pure idealism. The ordinary virtue, which in the Protagoras and Meno was questioned but not con- demned, is here rejected as unreal, and the task proposed to the philosopher is less to understand the world than to escape fromit. The universal has assumed the form of the ideal, which is supposed, as elsewhere in Plato, to include

1 Comp. Milton, ZZ Penseroso, 88-92—

: “ To unsphere H The spirit of Plato, to unfold What worlds or what vast regions hold The immortal mind that hath forsook

ller mansion in this fleshly nook.” i

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mathematical as wellas moral notions. The only function of perception is to awaken in us some reminiscence of this ideal. By following the clue thus given, and by searching for clearer images of truth in the world of mind, we may hope to be emancipated from sensation, and to lay hold upon the sole object of pure reason.

It is obvious that when he wrote the Phxdo Plato conceived of universals as objective entities rather than as forms of thought. The notien of “ideal colours” (though occurring in the myth) is an indication of his ontological mood.

Yet even here the eidy are not consistently hypostatized. The notion of “what is best” has a distinctly practical side, and the “ knowledge through reminiscence ” is in one aspect a process of reflexion on experience, turning on the laws of association? It is also said that objects “partake” of the ideas, and some concrete natures are regarded as embodiments or vehicles of some of them. Still, if taken as a whole, notwithstanding the scientific attitude of Socrates, the Phexdo is rather a meditation than an inquiry,—a study of the soul as self-existent, and of the mind and truth as co-eternal.

IV. Symposium, Phedrus, Cratylus.—Socrates is again imagined as in the fulness of life. But the real Socrates is becoming more and more inextricably blended with Platonic thought and fancy. In the Apology there is a distinct echo of the voice of Socrates; the Phedo gives many personal traits of him; but the dialogues which are now to follow are replete with original invention, based in part, no doubt, on personal recollections,

The Symposium admits both of comparison and of con- Sympc

trast with the Phedo, are spiritual, but the spirituality in either is of a different order. That is here immanent which was there transcend- ent; the beautiful takes the place of the good. The world is not now to be annihilated, but rather transfigured, until particular objects are lost in universal light. Instead of flying from the region of growth and decay, the mind, through intercourse with beauty, is now the active cause of production. Yet the life of contemplation is still the highest life, and philosophy the truest povorky,

The leading conception of the Symposiwm has been anticipated in the Lysis, where it was said that “the indifferent loves the

good, because of the presence of evil.”

The banqueters (including Socrates), who are met to celcbrate the tragic victory of Agathon, happen not to be disposed for hard drinking. They send away the flute-girl and entertain each other with the praise of Love.

Phedrus tells how Love inspires to honourable deeds, and how Alcestis and Achilles died for Love.

Pausanias rhetorically distinguishes the earthly from the heavenly Love.

The physician Eryximachus, admitting the distinction, yct holds that Love pervades all nature, and that art consists in followm the higher Love in each particular sphere. So Empedocles ha spoken of Love as overcoming previous discord. For opposites cannot, as Heraclitus fancied, coexist.

Aristophanes, in a comic myth, describes the origin of Love as an imperfect creature’s longing for completion. The original double human beings were growing impious, and Zeus split them in twain,

| ever since which act the bereaved halves wander in search of one

another, . Agathon speaks, or rather sings, of Love and his works. He 1s the youngest, not the eldest of gods, living and moving delicately wherever bloom is and in the hearts of men,—the author of all virtue and of all good works, obeyed by gods, fair and causing all things fair, making men to be of

one mind at feasts—pilot, defender, saviour, in whose footsteps all should follow, chanting strains of love. f Socrates will not attempt to rival the poet, and begins by stipt- lating that he may tell the truth. He accepts the distinchon between Love and his works, but points out that, since desire implics want, and the desire of Love is toward beauty, Love, as wanting beauty, is not beautiful. So much being established 1m

2 Comp. Thewt., 184-186.

Both dialogues are mystical, both sium.

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the Socratic manuer, he proceeds to unfold the mystery once revealed to him by Diotima, the Mantinean wise woman.

Love is neither beautiful nor ngly, neither wise nor foolish, neither god nor mortal. Between gods and mortals is the world of mediating spirits (7d daiudviov). And Love isa great spirit, child of Resource (the son of Prudenee) and Poverty the beggar maid, who conceived him at the birthday feast of Aphrodite. living “ delicately,” but is ragged and shoeless, always in difficul- ties, yet always brimming with invention, a mighty hunter after wisdom and all things fair ; sometimes “all full with feasting ” on them, the next moment “ clean starved ” for lack ; never absolutely knowing nor quiteignorant. That is to say, he is a “philosoplier.” For knowledge is the most beautiful thing, and love is of the beautiful.

But what does love desire of the beautiful? The possession is enough. “But there is one kind of love—called “being in love ”— which desires beauty

for a peeuliar end. The lover is seeking, not his “other half,” but possession of the beautiful and birth in beauty.

For there is a scason of puberty both in body and mind, when human nature longs to create, and it cannot save in presence of beauty. This yearning is the earnest of immortality. Even in the bird’s devotion to its mate and to its young there is a craving after continued being. In individual lives there is a flux, not only of the body, but in the mind. Nay, the sciences themselves also come and.go (here the contrast to the Phedo is at its height). But in mortal things the shadow of continuity is succession.

The love of fame is a somewhat brighter image of immortality than the love of offspring. Creative souls would bring into being not children of their body, but good deeds. And such a one is readiest to fall in love with a fair mind in a fair body, and then is filled with euthusiasm and begets noble thoughts. Homer, Hesiod, Lycurgus, Solon, were such genial minds. But they stopped at the threshold (comp. Prot., Mfeno), and saw not the higher mysteries, which are reserved for those who rise from noble actions, institutions, laws, to universal beauty. The true order is to advance from one to all fair forms, then to fair practices, fair thoughts, and lastly to the single thought of absolute beauty. In that com- munion only, beholding beauty with the eye of the mind, one shall bring forth realities and become the friend of God and be immortal, if mortal man may.

Alcibiades here breaks in and is vociferously welcomed. He is crowning Agathon, when, on percciving Socrates, he deelares that he will crown him too. Then he announces himself king of the feast, and insists upon hard drinking (though this will make no difference to Socrates).

Eryximachus demands from the newcomer a speech in praise of love. But Alcibiades will praise no one else when Socrates is near, And with the freedom of one who is deep in wine he proceeds with his strange encomium of “ this Marsyas.”

“Tn face and outward bearing he is like a Satyr or Silenus, and by his voice he charms more powerfully than they do by their Pipings. The eloquence of Pericles has no effect in comparison with lis. His words alone move Alcibiades to shame, and fascinate him until he stops his ears and runs from

him.”—“ | often wish him dead. Yetthat would break my heart. He brings me to my wit’s end.”—“ And, as carved Sileni are made to encasc Images of gods, so this Silenus-mask entreasures things divine. He affects ignorance and susceptibility to beauty. Thus he mocks mankind. But he cares nothing for outward shows, and his tem- perance (ewdpoctyn) is wonderful.”

Toprove this Alcibiades reveals his own heart-secret. (He is not ashamed to speak it amongst others who have felt the pang which Socrates inflicts.) And he makes it abundantly manifest that in their widely-rumoured intercourse (comp. Protag. init.) Socrates had hever cared for anything but whiat was best for his younger friend. Alcibiades then relates as an eyewitness the endurance shown by Socrates at Potidea, his strange persistence in solitary meditation, —standing absorbed in thought for a day and a night together, —and his intrepid conduct in the retreat from Delium (comp. Laches).

The talk of Socrates is of pack-asses and cobblers, and he is ever saying the same things in the same words; but one who lifts the mask and looks within will find that no other words have mean- ing. Alcibiades ends by warning his companions against the wiles of Socrates.

Some raillery follows, and they are invaded by another band of revel ers, who compel them to drink still more deeply. The soberly inclined (led by Eryximachus) slink off, and Aristodemus, the reporter of the seene, only remembers further that when he awoke at cock-crow Socrates was still conversing with Agathon and Aristophanes, and showing them that tragedy and comedy were essentially one. He talked them both asleep, and at daybreak went about his usual business.

The philosopher of the Symposiwm is in the world and yet not of it, apparently yielding but really overcoming. In the Phedo the soul was exhorted to “live upon her

+ . epiece servant’s loss,” as in Shakspeare’s most religious sonnet ;

He is far from .

this dialogue tells of a ‘‘soul within sense ” in the spirit cf some more recent poetry. By force of imagination rather than of reason, the reconciliation of becoming (yéveots) with being (oto/a), of the temporal with the eternal, is anticipated. But through the bright haze of fancy and behind the mask of irony, Socrates still appears the same strong, pure, upright, and beneficent human being as in the Apology, Crito, and Phedo.

The impassioned contemplation of the beautiful is again Phedrus.

imagined as the beginning of philosophy. But the “limitless ocean of beauty” is replaced by a world of supramundane forms, beheld by unembodied souls, and remembered here on earth through enthusiasm, proceeding by dialectic from multiform impressions to one rational con- ception, and distinguishing the “lines and veins” of truth. The Phedrus records Plato’s highest ‘hour of insight,” when he willed the various tasks hereafter to be fulfilled. In it he soars to a pitch of contemplation from whence he takes a comprehensive and keen-eyed survey of the country to be explored, marking off the blind alleys and paths that lead astray, laying down the main lines and chief branches, and taking note of the erroneous wanderings of others. Reversing the vulgar adage, he flies that he may creep.

The transcendent aspiration of the Phxdo and the mystic glow of the Symposium are here combined with the notion of a scientific process. No longer asking, as in the Prota- goras, Is virtue one or many? Plato rises to the conception of a scientific one and many, to be contemplated through dialectic,—no barren abstraction, but a method of classifi- cation according to nature.

This method is to be applied especially to psychology, not merely with a speculative, but also with a practical aim. For the “birth in beauty” of the Symposium is here developed into an art of education, of which the true rhetoric is but the means, and true statesmanship an accidental outcome.

Like all imaginative critics, Plato falls to some extent under the influence of that which he criticizes. The art of rhetoric which he so often travestied had

a lasting effect upon his style. Readers of his latest works are often reminded of the mock grandiloquence of the Phedrus. But in this dialogue the poetical side of his genius is at the height. Not only can he express or imitate anything, and produce any effect at will, but he is standing behind his creation and disposing it with the most perfect mastery, preserving unity amidst profuse variety, and giving har- mony to a wildness bordering on the grotesque.

The person of Socrates is here deliberately modified. He no longer (as in the Symposium) teaches positive wisdom under the pretence of repeating what he has heard, but is himself caught by an exceptional inspiration, which is accounted for by the unusual circumstance of his finding himself in the country and alone with Phdrus. He has been hitherto a stranger to the woods and fields, which would tempt him away from studying himself through intercourse with men. But by the promise of discourse —especially of talk with Phadrus—he may be drawn anywhither.

Pheedrus has been charmed by a discourse of Lysias, which after some coy excuses he consents to read. ;

It is a frigid erotic diatribe, in which one not in love pleads for preference over the lover. Socrates hints at criticism, and is chal- lenged to produce something better on the same theme.

1. Distinguishing desire from true opinion, he defines love as desire prevailing against truth, and then expatiates on the harmful tendencies of love as so defined. But he becomes alarmed at his own unwonted eloquence, and isabout to remove, when the “divine token” warns him that he must first recite a “ palinode” in praise of love. For no divine power can be the canse of evil.

2. Love is madness ; but there is a noble madness, as is shown by soothsayers (called pdvrets from palyouat). And of the higher madness there are four kinds.

To explain this it is necessary to understand psychology. The soul is self-existent and self-moving, and therefore eternal. her form is like a pair-of winged steeds with their charioteer. In divine souls both steeds are good, but in human souls one of them is

“ine the body the soul lost her wings, which in | _ dialogu a areal Ae At ate 4 | ception of classification is somewhat altered through contact

in which they |

her unembodied state were nourished by beauty, wisdom, goodness, and all that is divine. For at the festival of souls, visit the heaven that is above the heavens, the unruly steed caused the charioteer to see imperfectly. So the soul cast her feathers and fell down and passed into the human form. And, according to the comparative clearness or dimness of that first

vision, her earthly lot is varicd from that of a philosopher or

artist down through nine grades (including womail) to that of a |

tyrant. On her conduct in this state of probation depends her condition when again born into the world. And only in ten thousand years ean she return to her pristine state, except through a life of philosophy (comp. Phedo) or of pure and noble love (conip. Symposium). ;

The mind of the philosopher alone has wings. He is ever being initiated into perfect mysteries, and his soul alone becomes complete. But the vulgar deem him mad and rebuke him ; they do not see that he is inspired.

This divine madness (the fourth kind of those above mentioned) is kindled through the renewed vision of beauty. For wisdom is not seen; her loveliness would have been transporting if she had a visible form. The struggle of the higher passion with the lower is then described with extraordinary vividness, under the image of the two steeds. When the higher impulse triumphs, the issue is a philosophic friendship, at once passionate and absolutely pure.

3. From his “palinode” Socrates returns to Lysias, who is advised to leave speech-writing for philosophy.

a. Phedrus remarks that the speech-writer is despised by the politician. Socrates replies that speech-writing and politics are one concern. ‘The real difference is between those who base their teaching on philosophy and those who are content with rules of art. For example, if the first spcech of Socrates is compared with that of Lysias, the one is found to distinguish and define, the other not ; the one observes order in discourse, the other “ begins where he should end,” aud his utterance is like a disordered chain. A speech should be an organic whole, a “ creature having hands and feet.” So in the “palinode ” there was a classification of the kinds of madness, which led the way to “a possibly true though partly erring myth.”

This approximation to truth in the midst of much that was playful was due to the observance of two principles, generalization and division (cuvaywyh, Stalpeccs). Whoever sees the one and many in nature, him Socrates follows and walks in his footsteps, as if he were a god.

In comparison of dialectic, as thus conceived, the frigid rules of Lysias, Thrasymachus, Theodorus, Evenus, Tisias, Gorgias, Polus, and Protagoras are futile and absurd.

b. Another condition of teaching (or true rhetoric) is the scienee of mind. Whether the soul be one or many, complex or multiform, and if multiform what are its parts and kinds, are questions which the teacher must have already solved. And he must likewise have classified all arguments and know them in their various applica- bility to divers souls. An art of speaking that should fulfil this condition is non-existent. Yet how can even verisimilitude be attained without knowledge of truth ?

c. The art of writing is kindred to the art of speech. But Socrates maintains that oral teaching through the living contact of mind with mind has many advantages over written composition, which is, comparatively speaking, a dead thing. Men may write for ainusement or to record the intercourse that has been. But the serious occupation of the true thinkcr and teacher is the com- munication of truth through vital converse with others like- minded,—the creation of “thoughts that breathe” in spirits conscious of their value.

In conclusion, a friendly hint is given to Isocrates that he may do better than Lysiasif he will but turn his attention to philosophy.

The Phedrus anticipates much that Plato afterwards slowly elaborated, and retains some things which he at last eliminated. (1) The presence of movement or impulse in the highest region is an aspect of truth which reappears in the Sophistes and other later dialogues. It has been thought strange that it should be found so early as in the Phedrus, But does not this remark imply an unwarrant- able assumption, viz., that Plato's idealisn took its depar- ture from the being of Parmenides? Is it not rather the fact that his own theory was formulated before the Megarian ascendency led him to examine the Eleatic doctrine, and that it was by a tendency from the first inherent in Platonism that that doctrine was modified

And |

| much light on them.

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in his final teaching? (2) The outlines of method which are thrown out at white heat in the Phadrus area preparation for the more sober treatment of the ideas in the dialectical dialogues. In these, however, the con-

with Eleaticism. (3) The Phedrus aims, not merely at realizing universals, but at grasping them in and through particulars. This is an ideal of knowledge which was 'lost as soon as seen," but one which in some of his latest dialogues, such as the Politicus and Philebus, Plato again endeavours to work out. (4) The Phadrus contains the elements of that true psychology into which the ontologi- cal theory of the ideas is gradually transmuted in Plato's more advanced writings, when the difficulties of his ideal doctrine in its cruder forms have been clearly felt and understood. (5) Plato here appears as a professor of education, preferring oral intercourse to authorship. In this paradox he at once exalts the work of Socrates and avows his own vocation as a teacher. The passage throws an interesting light upon the form of dialogue in which his works are cast. But it is not to be supposed that he remained long unconscious of the influence he was destined to wield by writing. In undertaking a great task like the Republic,

he practically receded from the untenable view asserted here ; and in the Laws he recommends his longest and most prosaic work as a suitable basis for the education of the future. (6) It must always appear strange, even to

| those most familiar with the conditions of Hellenic life, that

in portraying the idealizing power of passionate love Plato should have taken his departure from unnatural feeling. On this subject he has sung his own “ palinode” in the Laws, which he intended as his final legacy to mankind.? Not that he ceased to exalt genius and originality above mere talent, or to demand for philosophy the service of the heart as well as the head, nor yet that friendship was less valued by him in later years. All this remained unchanged. And in the Republic the passion of love is still distantly referred to as the symbol of ideal aspiration. But a time came when he had learned to frown on the aberration of feeling which in the Symposium and Phadrus he appears to regard as the legitimate stimulus of intellectual enthu- siasm. And already in the Thewtetus not love but

| wonder is described as the only beginning of philosophy.

While calling attention to this change of sentiment, it is right to add that Platonic love in the “ erotic ” dialogues of Plato is very different from what has often been so named, and that nothing even in the noble passage of the Laws above referred to casts the slightest shadow of blame on the Socrates of the Symposium.

Such changes are, amongst other things, a ground for caution in comparing the two steeds of the Phedrus with the spirit (Ouzds) and desire (émOupta) of the Republic and Timexus. The Phedrus, in common with these dialogues,

_ asserts the existence of higher and lower impulses in

human nature, but there is no sufficient ground for suppoS ing that when Plato wrote the Phedrus he would have defined them precisely as they are defined in the Republic.

The Cratylus is full of curious interest as marking the Crat

highest point reached by the “science of language ” in antiquity ; but, as this dialogue “ hardly derives any light from Plato’s other writings,”? so neither does it reflect It deals slightly with the contrast between Heracliteanism and Eleaticism, the importance of dialectic, the difficulty about the existence of falsehood, and ends with a brief allusion to the doctrine of ideas,— but these topics are all more fully discussed elsewhere.

1 Laws, viii. 836. ; 2 Professor Jowett, —who has, notwithstanding, thrown much light on the Cratylus in his brilliant introduetion.

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Three persons maintain different views respecting the nature and origin of language.

Hermogenes affirms that language is conventional, Cratylus (the Heraclitean) that it is natural. Socrates, mediating between these sophistical extremes, declares that language, like other institutions, is national, and therefore (1) is based on nature, but (2) modified by convention.

In his dialectical treatment of the subject, Socrates displays a tissue of wild etymologies in reliance on the “inspiration” of Euthyphro. Presently a distinction appears between primary and secondary words. Many primary words convey the notion of move- mentand change. It follows that the legislator or word-maker held Heraclitean views. Socrates thus far presses on Hermogenes the view of Cratylus. Then turning to Cratylus he asks if there are no false names. “False language,” Cratylus argues, “is

impossible.” Socrates shows that a true image may be inadequate, so that we have aright to criticize the work of the word-maker. And the facts indicate an element of meaningless convention. Nor was the original word-maker consistently Heraclitean. For some important words point not to motion but to rest.

But the question returns—Are we sure that the theory of nature which the word-maker held was true? This difficulty cannot be touched by verbal arguments. In seeking to resolve it we must consider, not words, but things. If there is a true beauty and a true good, which are immutable, and if these are accessible to knowledge, that world of truth can have nothing to do with flux and change.

V. Gorgias, Republic.—In the Symposium and Phxedrus Plato largely redeems the promise implied in the Phedo, where Socrates tells his friends to look among themselves fora charmer who may soothe away the fear of death. But he was pledged also to a sterner duty by the warning of Socrates to the Athenians, in the Apology, that after he was gone there would arise others for their reproof, more harsh than he had been. To this graver task, which he had but partially fulfilled with the light satire upon Lysias or the gentle message to Isocrates, the philosopher now directs his powers, by holding up the mirror of what ought to be against what is, the principles of truth and right against the practice of men, For the good has more than one aspect. The beautiful or noble when realized in action becomes the just. And to the question, What is just? are closely allied those other questions of Socrates— What isa state? What is it to be a statesman 4

In the Gorgias Plato asserts the absolute supremacy of

justice through the dramatic portraiture of Socrates in his opposition to the world; in the Republic he strives at greater length to define the nature of justice through the imaginary creation of an ideal community. _ In the former dialogue the Platonic Socrates appears in direct antagonism with the Athenian world. The shadow of his fate is hanging over him. Charephon (who is still alive) understands him, but to the other inter- locutors, Gorgias, Polus, Callicles, he appears perversely paradoxical. Yet he effectively dominates them all. And to the reader of the dialogue this image of

“Socrates contra mundum ” is hardly less impressive than that former image of Socrates confronting death.

1. Gorgias asserts that rhetoric is an art concerned with justice, and that persuasion is the secret of power.

a. Socrates, after suggesting some ironical doubts, declares his opinion that rhetoric is no art, but a knack of pleasing, or in other words “the counterfeit of a subsection of statesmanship.”

This oracular definition rouses the interest of Gorgias, and Socrates proceeds with the following “ generalization and division ”:—

Management of I

| Soul.

| Body. | x! | | | eal, Pretended. Real. Pretended. oo al oe} ee ———____ p P a , 7 | | Sophistic. Rhetoric. Gymnastic. Medicine. Cosmetic. Confec- Legis- Juris- =

lation, prudence. — ia

| | Flattery.

| Athenians practises.

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Flattery influences men through pleasure without knowledge. And the rhetor is a kind of confectioner, who can with difficulty be distinguished from the sophist.

b. Rhetoric, then, is not an art. secret of power. paradoxes ;—

The tyrant does what he chooses but not what he wishes ;

It is less evil to suffer wrong than to do wrong ;

It is better for the wrongdoer to be punished than to escape punishment.

The only use of rhetoric, therefore, is for self-accusation, and (if it is ever permissible to do harm) to prevent the punishment of one's enemy.

2. Callicles here loses patience and breaks in. He propounds his theory, which is based on the opposition of nature and custom.

"There is no natural right, but the right of the stronger. And natural nobility is to have strong passions and power to gratify them. The lawful

is a word that cowards use,

Devised at first to keep the strong in awe."

Socrates entangles him in an argument in which it is proved that pleasure is different from good, and that there are good and bad pleasures.

Now the question is whether the life of philosophy, or the life which Callicles defends, is conducive to good. And it has been shown that rhetoric is one of a class of pursuits which minister to pleasure without discriminating what is good.

Callicles again becomes impatient. Did not Themistocles, Cimon, Pericles labour for their country's good? Socrates then renews his demonstration, proving that if the just man is wronged the evil lies with the wrongdoer, not with him, and that it is worst for the wrongdoer if he escape. And for avoidance of this greatest evil not Hassani avails anything, nor any of the arts which save life (seeing that life may be used well or ill), nor even such an art of politics as Themistocles, Cimon, or Pericles knew, but another science of politics which Socrates alone of the The pursuit of it may well endanger him ;

And persuasion is not the Here Socrates maintains against Polus the three

but his strength lies in having done no wrong. For in the world to come he can present his soul faultless before her judge. Not the show of justice but the reality will avail him there.

This truth is enforced by an impressive myth. And Callicles is invited to leave the life which relies on rhetoric and to follow Socrates in practising the life of philosophic virtue,

The value of justice has been shown. But what is justice? Is the life upheld by Socrates sufficiently defi- nite for practical guidance? The views of Callicles have been overborne ; but have they been thoroughly examined ? Socrates claims to be the only politician. But how can that deserve the name of policy which results in doing nothing? These and cognate questions may well have

haunted Plato when he planned the greatest of his works. republic.

For that which lay deepest in him was not mere specula-

| tive interest or poetic fervour, but the practical enthusiasm

of a reformer, The example of Socrates had fired him

| with an ideal of wisdom, courage, temperance, and

righteousness, which under various guises, both abstract and concrete, has appeared and reappeared in the preceding dialogues. But the more vividly he conceived of this ideal life, the more keenly he felt its isolation in the present world—that of the restored Athenian democracy. For to a Greek mind above all others life was nothing with- out the social environment, and justice, of all virtues, could least be realized apart from a community. Hence it became necessary to imagine a form of society in which the ideal man might find himself at home, a state to which the philosopher might stand in harmonious relationship, no longer as an alien sojourner, but as a native citizen, not standing aloof in lonely contemplation, but acting with the full consent of other men and ruling in the right of wisdom. Plato did not regard his own republic asa barren dream. He believed that sooner or later in the course of time a state essentially resembling his ideal commonwealth would come into being. Still more firmly was he con- vinced that until then mankind would not attain their highest possible development. To ignore this real aspect of his most serious work is to lose much of the author’s

meaning. Yet it is hardly less erroneous to interpret a great imaginative creation au pied de la lettre, as if exam-

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ining a piece of actual legislation.

Even in his Laws, a |

far more prosaic writing, Plato himself repeatedly protests

against such criticism. In his most aspiring flights he is well aware of the difference between the imaginary and actual embodiment of an ideal,! although as a literary

artist he gives to his creations, whether in anticipation or | fae

retrospect, an air of sober reality and matter-of-fact. is more in earnest about principles than about details, and if questioned would probably be found more confident with regard to moral than to political truth, He may have been wholly unconscious of the inconsistencies of his

scheme, but it would not have greatly disconcerted him to |

have discovered them, or to have been told that this or that arrangement would not “work.” He would have trusted the correction of his own rough draft to the philo- sopher-kings of the future.

The Republic falls naturally into five portions. (1) Bk. i. is preliminary, raising the main question about justice. (2) Bks. ii., lii., iv. contain the outlines of the perfect state, including the education of the “guardians,” and leading up to the definition of justice (a) in the state, and (4)-in the individual. (8) Bks. v., vi., vii. (which to some critics present the appearance of an after- thought or excrescence on the original design) contain the cardinal provisions (1) of communism (for the guardians only), (2) that philosophers shall be kings, (3) of higher education for the rulers (viz., the philosopher-kings). This third provision occupies bks. vi. and vil. (which have again, as some think, the appearance of an. outgrowth from bk. v.). (4)

Bks. viii. and ix., resuming the general subject from bk. iv., present the “ obverse side,” by showing the declension of the state and individual through four stages, until in the life of tyranny is found the image of ideal injustice, as that of justice was found in the life of the perfect state. (5) Bk. x. forms a concluding chapter, in which several of the foregoing enactments are reviewed, and the work ends, like the Gorgias, with a vision of judgment.

Thus the main outlines of the scheme are containcd in bks. ii., iii, iv., viii, ix. And yet bks. v., vi, vii. form the central portion, a sort of inner kernel, and are of the highest significance.

In speculating about the composition of the Republic (as is the fashion of some interpreters), it is important to bear in mind the general character of Plato’s writings.

““‘The conception of unity,” says Professor Jowett,2 ‘really applics in very different degrees to different kinds of art,—to a statue, for example, far more than to any kind of literary com- position, and to some species of literature far more than to others. Nor does the dialogue appear to be a style of composition in which the requirement of unity is most stringent ; nor should the idea of unity derived from one sort of art be hastily transferred to another. . . . Plato subjects himself to no rule of thissort. Like every great artist he gives nnity of form to the different and apparently distracting topics which he brings together, freely, and is not to be supposed to have arranged every part of the dialogue before he begins to write. He fastens or weaves to- gether the frame of his discourse loosely and imperfectly, and which is the warp and which the woof cannot always be determined.”

It should be added, that as Dialectic was still a “world

. ” . . ° not realized,” and he was continually conscious of using imperfect methods, he was not solicitous to bind himself to any one method, or to watch carefully over the logical coherence wot his work. “Sailing with the wind of his argument,” he often tacks and veers, changing his method with his subject-matter, much as a poet might adopt a change of rhythm. Absorbed as he is in each new phase of his subject, all that precedes is cancelled for the time. And much of what is to come is deliberately kept out

of view, because ideas of high importance are reserved for the place where their introduction will have most effect. Another cause of apparent inconsequence in Plato is what he himself would call the use of hypothesis. He works less deductively and more from masses of generalized experience than Platonists have been ready to admit, zt in the Republic he is as much engaged with the cri a of an sola as with the projection of an ideal condition of society.3 If we knew more of the working of

1 See especially Me Wer p., V. p. 472; Legg., v. p. 746. , Jowett, Introd. to the Phexdrus. eae Krohn, Der Platonische Staat, Halle, 1876.

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Attic institutions as he observed them, we should often understand him better.

These general considerations should be weighed against the inequalities which have led some critics to suppose

_ that the " first sketcli of the state" in bks. ii.—iv. is much

He works |

earlier than the more exalted views of bks. v.~~vii. If in these later books new conditions for choosing the future rulers are allowed to emerge, if in discussing the higher intellectual virtues the simple psychology of bk. iv. is lost sight of (it reappears in the Z%mezus), if the "knowledge of the expedient" at first required falls far short of the conception of knowledge afterwards attained, all this is quite in keeping with Plato's manner elsewhere, and may be sufficiently accounted for by artistic and dialectical reserve. It can hardly be an altogether fortuitous circum~~ stance that the culminating crisis, the third and highest wave of difficulty,—the declaration that philosophers must be kings and kings philosophers,~-comes in precisely at the central point of the whole long work.

The great principle of the political supremacy of mind, though thus held back through half the dialogue, really dominates the whole. It may be read between the lines all through, even in the institution of gymnastic and the

appraisement of the cardinal virtues. It is a genuine development of Socratic thought. And it is this more than any other single feature which gives the Republic a prophetic significance as “an attempt towards anticipating the work of future generations.” ¢.

Other aspects of the great dialogue, the Dorian frame- work, so inevitable in the reaction from Ionian life, the traces of Pythagorean influence, the estimate of oligarchy and democracy, the characters of the interlocutors in their bearing on the exposition, have been fully treated by recent writers, and for brevity’s sake are here passed over.

There are other points, however, which must not be omitted, because they are more intimately related to the general development of Plato’s thoughts.

1. The question debated by Proclus has been raised before and since, whether the proper subject of the Republic is justice or the state. The doubt would be more suggestive if put in a somewhat different form: Is Plato more interested in the state or the individual? That he is in earnest about both, and that in his view of them they are inseparable, is an obvious answer. And it is almost a truism to say that political relations were prior to ethical in the mind of a Greek. Yet if in some passages the political analogy reacts on moral notions (as in the defini- tion of temperance), in others the state is spoken of in language borrowed from individual life. And it remains questionable whether the ethics or the politics of the fepublic are less complete. On the whole Plato himself seems to be conscious that the ideal derived from the life- work of Socrates could be more readily stamped on individual lives than on communities of men (see especi- ally Rep., vii. 528 A, ix. 592).

2. The analogy of the individual is often used to enforce the requirement of political unity and simplicity (see especially v. 462 C). This is also to be referred, however, to Plato’s general tendency to strain after abstractions. He had not yet reached a point of view from which he could look steadily on particulars in the light of universal principles. He recurs often to experience, but is soon carried off again into the abstract region which to him seemed higher and purer.’ “It has been said that Plato flies as well as walks, but this hardly expresses the whole truth, for he flies and walks at

the same time, and is m the air and on firm ground in successive instants ” (Jowett).

4 Grote. # ° See, for example, the admission of luxury and the after-purification through “ music,” bks, ii., iii.

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Plato’s scheme of communism had been suggested to him partly by Dorian institutions and partly by the Pythagorean rule. But it was further commended by the general con- sideration that the state is a higher and more abstract unity than the family. The lower obligation must give way to the higher; the universal must overrule the particular bond.

3, Similarly it may be argued that, while the subordina- tion of music to state discipline, and the importance attached to rhythm and harmony in education, had like- wise a connexion with Sparta and the Pythagoreans severally, Plato’s deliberate attitude towards poetry and art could hardly be other than it is. Philosophy, while still engaged in generalization, could not assign to the imagination its proper function. “ Aisthetik” could not enter into her purview. For a moment, in the Symposium, the ancient quarrel of poetry and philosophy had seemed to be melted in a dominant tone, but this was only a fond anticipation. Plato, if man ever did so, had felt the siren charm, but he is now embarked on a more severe endeavour, and, until the supreme unity of truth and good is grasped, vagrant fancy must be subdued and silent.

4, In the early education of the guardians a place is found for the unconscious virtue acquired through habit which the Protagoras and Meno stumbled over and the Phedo treated with disdain. In the ideal state, however, this lower excellence is no longer a wild plant, springing of itself through some uncovenanted grace of inspiration, but cultivated through an education which has been purified by philosophy so as to be in harmony with reason. But if Plato were cross-questioned as to the intrinsic value of habits so induced as a preservative for his pupils against temptation, he would have replied, “I do not pretend to have removed all difficulties from their path. Enough of evil still surrounds them to test their moral strength. I have but cleared the well-springs of the noxious weeds that have been fatal

to so many, in order that they may have little to unlearn, and be exposed only to such dangers as are inevitable.”

5. It is a singular fact, and worth the attention of those who look for system in Plato, that the definition of justice here so laboriously wrought out, viz., the right division of labour between the three classes in the state and between the three corresponding faculties in the individual soul, is nowhere else repeated or applied, although the tripartite division of the soul recurs in the Zimexus, and the notion of justice is of great importance to the arguments of the Politicus and the Laws.

6. Before leaving the Republic, it is important to mark the stage which has now been reached by Plato’s doctrine of ideas. The statements of the Republic on this subject are by no means everywhere consistent.

a. Towards the end of bk. v. philosophers are defined as lovers of the whole, who recognize the unity of justice, goodness, beauty, each in itself, as distinguished from the many just or good or beautiful things. The former are said to be objects of knowledge, the latter of opinion, which is intermediate between knowledge and ignorance. Knowledge is of being, ignorance of the non-existent, Opinion of that which is and is not. =~. qn bk. vi. there is a more elaborate statement, implying a more advanced point of view. The “con- templation of all time and all existence” is a riper concep- tion than “the love of each thing as a whole.” Ignorance and nonentity have now disappeared, and the scale is graduated from the most evanescent impression of sense to the highest reach of absolute knowledge. And in the highest region there is again a gradation, rising to the form of good, and descending from it to the true forms of all things. In the application of this scheme to the theory

of education in bk. vii. there are still further refinements, The psychological analysis becomes more subtle, and more stress is laid on the connexion of ideas.

c. The doctrine reverts to a cruder aspect in bk. x, where we are told of an ideal bed, which is one only and the pattern of all the many actual beds.

d, A yet different phase of idealism presents itself in bk. ix. (sub fin.), in the mention of a “pattern” of the perfect state laid up in heaven which the philosopher is to make his rule of life.

What is said above concerning Plato’s mode of composi- tion has some bearing on these inconsistencies of expres- sion. And that bks. vi., vii., as being the most important, were finished last isa not untenable hypothesis. But that Plato, in preparing the way for what he had in contempla- tion, should content himself with provisional expressions which he had himself outgrown, or that in a casual illus- tration (as in bk. x.) he should go back toa crude or even childish form of his own theory, is equally conceivable and in accordance with his manner elsewhere. Socrates in the Parmenides confessedly wavers on this very point. And there are “ ideas” of the four elements in the Zimzxus.

VL. Euthydemus, Parmenides, Theextetus, Sophist, States- man, Philebus (the dialectical dialogues).—Even in the most advanced metaphysics of the Republic there is a hyperbolical, transcendental tendency, from which Plato ultimately to some extent worked himself free. But it was not in conversation with “ dear Glaucon,” or “ between the lines” of an ethico-political writing, that this partial emancipation could be effectually attained. We have now to consider a series of dialogues, probably intended for a narrower circle of readers, in which Plato” grapples directly with the central difficulties of his own theory of knowing. and being. It is not necessary to assume that all of these are later than the Republic. The position of the Euthydemus and Parmenides in the order of com- position is very uncertain. The Theextetus has points of affinity with the Republic. The Sophist, Polrticus, and Philebus are in a later style. But, on account of their cognate subject-matter, these six dialogues may be con- veniently classed together in a group by themselves. And the right place for such a group is intermediate between the Republic and the Laws.

The unity of the object of definition, the identity of virtue and knowledge, the existence of an absolute good, which would be universally followed if universally known, and of a standard of truth which is implied in the confession of ignorance, were postulates underlying the Socratic process, which in so far made no claim to bea “philosophy without assumptions.”

These postulates, when once apprehended, drew Plato on to speculate concerning the nature, the object, and the method of knowledge. Now, so far as we have hitherto followed him, his speculation has either been associated with ethical inquiry, or has been projected in a poetical and senll-mythical form. In the Phedrus, however, the vision of ideas was expressly conjoined with an outline of psychology and a foreshadowing of scientific method. And, while the opposition of ideas to phenomena and of knowledge to opinion has been repeatedly assumed, it has also been implied that there is a way between them,’and that the truth can only be approached by man through interrogation of experience. For it is nowhere supposed that the human inquirer is from the first in a position to deduce facts from ideas. Much rather, the light of the ideas is one which fitfully breaks in upon experience as men struggle towards the universal.

But it is not less true that the metaphysical aspirations from which Socrates had seemed to recall men’s thoughts had been reawakened in consequence of the impulse which

The dia- lectical dialogues.

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Plato appears in the same act to have become aware of Parme. his affinity with Parmenides, and to have been led to recon- nites.

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Socrates himself had given. From asking, Is virtue one? | Can virtue be taught? Plato passes on to ask, What is

Euthy- The Huthydemus is a treatise “ De Sophisticis Elenchis” | along two lincs, according as either term of the proposition is demus. in the form of a farce, and may serve to introduce the five emphasized, and this not only as regards the hypothesis of unity, i

unity? What are knowledge and being? From criticiz- ing imperfect modes of teaching virtue, he has begun to speculate about the right and wrong uses of the intellect, and from dramatic portraits of the individual Protagoras or

Gorgias goes on to the ideal delineation of the sophist. He has entered upon the “longer way,” and is no longer con- tented with mere “hypotheses.” With this demand for scientific precision his conception of the ideas themselves is modified, and he strives anew to conceive of them in relation to one another, to the mind, and to the world. As the balance of ethical truth was restored by admitting an uncon- scious (or inspired) conformity to reason, so now a fresh attempt is made on the intellectual side to bridge the gulf between sense and knowledge.

This endeavour involves, not only an expansion of the method of Socrates, but an examination of the earlier philosophies from which Socrates had turned away. Their influence on Plato has been traceable in the preceding dialogues, though, except in the case of Pythagoreanism (Phed., Rep.), ithas been mostly indirect and casual. But in these dialectical dialogues he manifests his serious con- viction that the contemporary fallacies which formed the chief hindrance to inquiry were deeply rooted in forms of thought created by earlier thinkers, above all by Heraclitus and Parmenides. To the exclusiveness of their first principles as held by their followers Plato attributed the barrenness and impracticable unreality of many discussions, which put shadow-fighting and controversy in the place of real investigation, and led men to think that truth was unattainable. He therefore enters into conver- sation, as it were, with the great minds of former times, and in the spirit of Socrates compels each of them to yield up his secret, and to acknowledge a supplemental truth. To this effort he may very probably have been stimulated by the dialectical activity of his Socratic friends at Megara, whose logical tastes had drawn them towards Eleaticism. But, unlike them, while strengthening his metaphysical theory, he was also led to give to his political speculations a more practical turn.

other dialogues, as the encounter with Thrasymachus intro- duces the serious part of the Republic. Under the veil of mockery there is more of concentrated thought, and also more of bitterness, in this dialogue than in the Protagoras or the Gorgias.

A sample of educational dialectic—in which Socrates draws out of young Clinias the admissions (1) that a philosophy is needed, (2) that the highest philosophy is a science of king-craft, which remains for the present

undefined,—is contrasted with a series of ridiculous sophisms, propounded by Dionysodorus and his brother Euthydemus, in which absolute and relative notions, whether affirmative or negative, object and subject, universal and particular, substance and attribute, action and modality, are capriciously confused. Crito, to whom Socrates narrates the scene, is moved to contempt. But Socrates warns him not on this account to despair of philosophy. In conclusion, Isocrates, or some one else, who prematurely mixes up philosophy with practical politics, is cautioned against spoiling two good things.

Such puzzles as—How can I learn either what I know or what I do not know?! How can things become what they are not? How is falsehood or denial possible ?— although treated jocularly here, will be found returning afterwards to “ trouble the mind’s eye.”

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1 Comp. Afeno.

sider the foundations of his own doctrine. The one being of Parmenides was a more abstract notion than justice, beauty, or the good. And the Zenonian method had more pretension to exactness than the Socratic. But it remained barren, because contented to repeat its own first essays in the destructive analysis of experience, without rising to the examination of its own first principles. For this higher criticism, of which he himself also stood in need, Plato looks up from the disciples to the master, Parmenides. The appeal to him is put into the mouth of Socrates, as a very young man, who has framed for hini- self a theory of ideas, and would gladly see the Zenonian process applied to the notions of sameness, difference, like- ness, unlikeness, unity, and being.

Parmenides, whom Plato treats with tender reverence not unmixed with irony, proposes to the youth a series of questions which reveal the crudity of the doctrine of «dy. (1) Are there ideas of trivial things?? (2) How do things “partake” of them? (3) Must not idealism proceed am infiuntum’? (4) If ideas are thoughts, do they and their participants think? (5) If they are patterns, and things resemble them, must there not be a pattern of the

resem- blance, and so on in infinitum? (6) If absolute, are they thinkable by man ?

These difficulties are real, and yet to deny ideas is to destroy philosophy. (As the. paradoxical doubts in the Protagoras do not shake the faith of Socrates in the existence of good, so neither does Plato here intend fora moment to derogate from the belief in the existence of the One and the True.)

Parmenides advises Socrates to arm himself for the further pur- suit of truth (1) by the higher application and (2) by the extension or completion of the Zenonian mcthod. (1) The method is to be applied to abstractions. (2) It isnot enough to show the inferences which may be drawn from the admission of an ite but account must also be taken of the inferences which follow from its rejection.

Parmenides exemplifies his suggestion by examining his own first principle in conversation with a youth who, while a contemporary

of Socrates, is a namesake of Plato's pupil Aristotle.? Not content with the affirmative and negative hypotheses, he pursues either

but also as applied to the alternative hypothesis of plurality. The result, as in the Protagoras, is purely destructive, and the dialogue ends abruptly without a word of reply from Socrates.

The second part of the Parmenides may be regarded as an experiment in which Plato "assays to go" in Eleatic armour. Yet the strange web is "shot" with colours of original thought. The mode of conceiving time and becoming, and the vision of nothingness towards the end, may be noted as especially Platonic. These passages may be regarded in the same light as the wise words of Pro- tagoras or the sober truths which occur amidst the wild fancies of the Cratylus. They should not mislead the interpreter into a search for recondite meanings.

The Zenonian method has been carried out to the utmost in application to the highest subject, and has led the mind into a maze of contradiction. It remains to call in question the method itself, and the notion of absolute

identity and difference on which it hinges, and so to lay anew the foundation-stone of thought.

Before this can be attempted, however, another set of difficulties have to be met, and another set of philosophers examined. For the current scepticism had undermined the conception of knowledge as well as that of being, and the fame of Heraclitus was hardly second to that of Parmenides. Protagoras appeared in a former dialogue as

2 Comp. Rep., x, 597. 3 Comp. the younger Socrates of the Politicus. carious to draw any inference from this minute fact,

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the champion of ordinary morality ; he is now made the exponent of ordinary thinking. His saying “Man the measure” is shown to rest on the unstable basis of the Heraclitean flux. By an elaborate criticism of both theories knowledge is at last separated from the relativity of sense; but the subsequent attempt to distinguish on abstract grounds between true and false opinion, and to define knowledge as true opinion with a reason (comp. Meno), proves ineffectual. Plato still shows traces of Megarian influence. But the disjunctive method of the Parmenides is not resumed. The indirect proofs are so arranged as to exhibit the skill of Socrates in “ bringing to the birth” the germs of thought in a richly-endowed and “pregnant” young mind. Theztetus is the embodiment of the philosophic nature described in Rep., bk. vi., and has already been trained by Theodorus of Cyrene in geometry and the other preparatory sciences of Rep., bk. vil. It is in conversation with Theodorus that Socrates impressively contrasts the lives of the lawyer and the philosopher. The Theetetus marks a great advance in clearness of meta- physical and psychological expression. See for example the passage (184-186) in which the independent function of the mind is asserted, and ideas are shown to be the truth of experience. There is also a distinct approach towards a critical and historical method in philosophy,

while the per- fection of style continues unimpaired, and the person of Socrates is as vividly represented as in any dialogue.

Notwithstanding the persistence of an indirect and negative method, the spirit of this dialogue also is the reverse of sceptical. “Socrates must assume the reality of knowledge or deny himself” (197 A). Perhaps in no metaphysical writing is the balance more firmly held between experience, imagination, and reflexion. Plato would seem to have made a compact with himself to abstain rigidly from snatching at the golden fruit that had so often eluded his grasp, and to content himself with laboriously “ cutting steps ” towards the summit that was still unsealed. ’

With Plato, as with other inventive writers, a time seems to have arrived when he desired to connect succes- sive works ina series. Thus in planning the Sophistes he linked it to the Theetetus (which had been written with- out any such intention), and projected a whole tetralogy of dialectical dialogues, Theextetus, Sophistes, Poltticus, Philosophus, of which the last piece seems never to have been written.

After an interval, of which our only measure is a change of style, the philosopher returns to the great central question of knowledge and being. The obstacle in his path, on which he has often played with light satire, dramatic portraiture, and indirect allusion, is now to be made the object of a seriously planned attack. He has made his approaches, and the enemy’s fortress is to be forthwith sapped and overthrown. This hostile position 18 not merely the “ Sophistik ” which, as some tell us, is an Invention of the Germans, and as Plato himself declares 1s only the reflexion or embodiment of the average mind! but the fallacy of fallacies, the prime falsehood (mpdrov Wetdos) of all contemporary thought. This is nothing else than the crude absoluteness of affirmation and negation which was ridiculed in the Huthydemus, and has been elsewhere mentioned as the first principle of the art of controversy.? For dramatic purposes this general error is personified. And the word “sophist,” which had somehow become the béte noire of the Platonic school, thus for the first time fixedly acquires the significance which has since clung to the name.—That Plato himself would not adhere pedantically to the connotation here implied is shown by | (iri nS

1 Rep., vi. 493.

2 ayTiAoyiKh.

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the admission, at the opening of the dialogue, that amongst other disguises under which the philosopher walks the earth, the sophist is one.—In this dialogue, as in the Parmenides, a new method is introduced, and again by an Eleatic teacher. This method is repeated with improvements in the Poltticus, and once more referred to in the Philebus. It bears a strong resemblance to the "'synagoge" and " dieresis" of the Phedrus, but is applied by the "friend from Elea" with a degree of pedantry which Socrates nowhere betrays. And the two methods, although kindred, have probably come through different channels,— the classifications of the Phedrus being Plato's own generalization of the Socratie process, while the dichotomies of the Sophistes and Politicus are a caricature of Socrates cast in the Megarian mould. Plato seems to have regarded this method as an implement which might be used with advantage only when the cardinal principles on which it turned had been fully criticized.

1. After various attempts to "catch the sophist," he is defined as the maker of an unreal likeness of truth. Here the difficulty begins—for the definition implies the existence of the unreal, z.¢., of not-being. In our extremity it is necessary to "lay hands on our father Parmenides."

2. The contradictions attendant on the notion of " being," whether as held by Parmenides or his opponents or by the " less exact" thinkers who came after them, are then examined, and in an extremely subtle and suggestive passage (246-249) an attempt is, made to mediate between idealism and materialism. The result is that while consummate being is exempt from change it cannot be devoid of life and motion. " Like children, 'Give us both,' say we,

3. This leads up to the main question :—(qa) are different notions incommunicable, or (0) are all ideas indiscriminately communicable, or © is there communion of some kinds and not of others? The last view is alone tenable, and is confirmed by experience. And of Le true combination and separation of kinds the philosopher is udge.

; 4. Then it is asked (in order to “bind the sophist”) whether being is predicable of not-being.

Five chief kinds (or categories) are now examined, viz., being, rest, motion, sameness, difference. Rest and motion are mutually incommunicable, but difference is no less universal than being itself. For everything is “other” than the rest, %e, is not. ‘Thus positive and negative not only coexist but are coextensive.

5. And, in spite of Parmenides, we have discovered the existence, and also the nature, of not-being. It follows that the mere pur- suit of contradictions is childish and uscless and wholly incompa- tible with a philosophic spirit.

Negation, falsity, contradiction, are three notions which Plato from his height of abstraction does not hold apart. His position is the converse of the Spinozistic saying, “Omnis determinatio est negatio.” According to him, every negative implies an affirmative. And his main point is that true negation is correlative to true affirmation, much as he has said in the Phedrus that the dialectician separates kinds according to the “lines and veins of nature.” The Sophistes is a standing protest against the error of marring the finely-graduated lineaments of truth, and so destroying the vitality of thought.

The idealists whom the Eleatic stranger treats so gently have been identified with the Megarians. But may not Plato be reflecting on a Megarian influence operating within the Academy ?

Here, as partly already in the Parmenides and Theetetus, the ideas assume the nature of categories, and being is the sum of positive attributes, while negation, as the shadow of affirmation, is likewise finally comprehended in the totality of being.

The remark made incidentally, but with intense em- phasis, that the universe lives and moves “according to God,” is an indication of the religious tone which reappears increasingly in the Politicus, Philebus, Timexus, and Laws.

In passing on to consider the statesman, true and false, the Eleatic stranger does not forget the lesson which has just been learned. While continuing his

method of dicho-

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Politicus (States-

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tomies, he is careful to look on both sides of each alterna- | own peculiar function is an art of weaving strength (the warp) with

tive, and he no longer insists on dividing between this and not-this when another mode of classification is more natural. A rule not hitherto applied is now brought forward, the rule of proportion or right measure (76 pézpuov), as distin- guished from arbitrary limitations. Nor is formal logical treatment any longer felt to be adequate to the subject in hand, but an elaborate myth is introduced. On the ethico-political side also a change has come over Plato. As he has stripped his ideas of transcendental imagery, so in reconsidering his philosopher-king he turns away from the smiling optimism of the Republic and looks for a scientific statesmanship that shall lay a strong grasp upon the actual world. He also feels more bitterly towards the demagogues and other rulers of Hellas. The author of the Politecus must have had some great quarrel with mankind. But so far as they will receive it he is still intent on doing them good,

1. The king is first defined as a herdsman of men, who as “slow bipeds” are distinguished from the pig and the ape. But the king is not all in all to his charges, as the herdsinan is. The above definition confuses human with divine rule.

2. Now the universe is like a top, which God first winds in one direction and then leaves to spin the other way. In the former or divine cycle all was spontaneous, and mankind, who had all things in common, were under the immediate care of gods. They were happy, if they used their leisure in

interrogating nature. But in this reign of Zeus it is far otherwise. Men have to order their own ways and try to imitate in some far-off manner the all-but forgotten divine rule.

3. Therefore in our present definition the term “superintendent ” must be substituted for “ herdsman.”

What special kind of superintendence is true statesmanship ?

4, By way of an example, the art of weaving is defined. The example shows that kingcraft has first to be separated from other kindred arts, both causal and co-operative. Nine categories are adduced which exhaust social functions. Eightare eliminated, and the ninth, the class of ministers, remains, Of thesc (a) slaves, (2) hirelings, (c) traders, (d) officials, (¢) priests are again parted off, although the last are only with difficulty ere from the king, when (/) a strange medley of monstrous creatures come into view. Some are fierce like lions, some crafty like the fox, and some have mixed natures like centaurs and satyrs. These are the actual rulers of mankind, more sophistical and juggling than the sophist him- self, And they too must be separated from the true king.

5. The familiar tripartite distinction of monarchy, oligarchy, democracy, is doubled by introducing into each the distinction involved in the presence or absence of wealth, and in the observance or non-observance of law. But no one of the six carries in itself a scientific principle.

The true government is the rule, not of many, but of one or of a few. “And they may govern, whether poor or rich, by freewill or compulsion, and either with or without law, so long as they govern scientifically.”

6. The respondent, a youthful namesake of Socrates, is shocked at the remark that the true ruler may govern without law.

This leads to a discussion of the nature of law, which is com- pared to the prescription left by a physician. If present, he might dispense with his own rule. So the presence of a competent ruler is better than the sovereignty of law, which makes no allowance for nature or circumstance, but tyrannically forces its own way. Imagine medicine, navigation, &c., similarly conducted

by time- honoured prescription, with penalties for innovation ;—what would become of civilization? Yet if law is disregarded by rulers who are unscientific and warped by self-interest, this leads to far worse evils. For the laws are based on some experience and wisdom. Hence, in the continued absence of the truc ruler, the best course, though only second best, is the strict observance of law. And he who so rules in humble imitation of the scientific governor may be truly called a king, although if the divine lawgiver were to appear his living will would supersede the law.

7. As it is, though cities survive many evils, yet many are ship- wrecked because of the ignorance of those at the helm. The order of badness in the actual states is—

1, Constitutional monarchy.

| —2. Constitutional oligarchy,

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be 3. Law-abiding democracy. |

— 4. Law-breaking democracy. ——5. Law-defying oligarchy. 6. Tyranny.

8. It remains to separate from the true ruler those who co-operate with him as subordinates, the general, the Judge, the orator. His

gentleness (the woof), when education has prepared them, —and this (1) by administration, (2) by marriage.

The four preceding dialogues have shown (1) the gradual transformation of the Platonic ideas (while still objective) into forms of thought, (2) the tendency to group them into series of categories, (3) a corresponding advance in psychological classification, (4) an increasing importance given to method, (5) the inclination to inquire into pro- cesses (yevéoeis) aS well as into the nature of being.

Meanwhile Plato’s approach to the Eleatics, though in the way of criticism, has brought into prominence the notions of unity, being, sameness, difference, and has left some-

all studies ” Plato now returns, equipped with his improved instruments, and ready to forge new ones in the same laboratory, or in some other, should occasion serve. His converse with Parmenides ended in his assertion of an element of difference pervading all things, in other words, of an indeterminate element underlying all determinations, This brings him again into relation with the Pythagoreans, who had similarly asserted the combination of finite and infinite in the universe.

Taking advantage of their help, he gains a more advanced (but still ideal) conception of the concrete har- mony of things, and approaches the definition of that which in the Republic he but shadowed forth.

With this most serious inquiry there is combined (as in the Sophistes and Politicus) an ironical and controversial use of dialectic, by which the juggler and false pretender (who is in this case the goddess of pleasure), after claiming the highest place, is thrust down to the lowest.

It must be admitted that the style of the Philebus is far from brilliant, or even clear. In the effort of connecting abstractions Plato's movement is more laboured than in his first glad realization of them.

Instead of attempting here to follow the windings of the dialogue, it must suffice to state the main result. Neither pleasure nor knowledge is the highest good, and the good eludes definition; but the shrine, or habitation, of the good is a complex life of which the elements are, in order of merit—(1) measure, the cause of all right mixture; (2) (a) beauty, the effect, and (6) reality, the inseparable condition; (3) intellect; (4) science, art, and right opinion; (5) pure pleasure unaccompanied with pain. "Not all the animal kingdom shall induce us to put pleasure first."

The Philebus introduces us to the interior of the Academy in the lifetime of the master. More than any other of the dialogues it recalls Aristotle's description of Plato's teaching. But, while his followers seem early to have fallen under the dominance of the latest phase of his doctrine, Plato himself, even in the Philebus, is still detached from any servitude to the creations of his own mind. He manipulates them as the medium for expressing his fresh thoughts, but they are not yet crystallized into a system.

"T will remind you," Socrates, "of what has been omitted," says Protarchus at the conclusion of this dialogue. The last (presumably) of Plato's metaphysical writings thus fitly ends with a confession of incomplete- ness. But if, as M. Renan says, "the most fatal error is to believe that one serves one's country by calumniating those who founded it," neither is it for the interest of science to ignore these imperfect anticipations. By methods elaborated in the course of centuries, and far more sure than any which Plato had at his command, mankind have gained an extent of knowledge which he dreamt not of! But the Greek metaphysician is none the

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1 See, however, Polit., 272 C, D.

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less a pioneer of knowledge,! while the special sciences of ethics and psychology had been carried from infancy to adolescence in a single lifetime.

VIL Timezus, Critias, [Hermocrates].—As the Sophistes and Politicus were written in continuation of the Theextetus, so, at some uncertain time, Plato conceived the design of writing a great trilogy, for which the ideal state depicted in the Republic should be the point of departure. The

rand outline there sketched by Socrates was now to be filled up by Critias and Hermocrates, The form set up by reasoning should be made alive, the “airy burghers” should be seen “ making history.” Asa prelude to this magnificent celebration, Timeus, the Pythagorean philo- sopher, who is present at the Panathenza, is invited to discourse of the origin of all things, and to bring down the glorious theme to the creation of man. What should have followed this, but is only commenced in the fragment of the Critias, would have been the story, not of a fall, but of the triumph of reason in humanity.

In the Philebus (59 A, comp. 62 D) Plato speaks with a touch of contempt of the life-long investigation of nature, as being concerned only with this visible universe, and immersed in the study of phenomena, whether past, present, or to come, which admit of no stability and there- fore of no

certainty. “ These things have no absolute first principle, and can never be the objects of reason and true science.”

Yet even this lower knowledge is there admitted as an element of that life which is the habitation of the good. And there are not wanting signs in his later dialogues that Plato’s imagination had again been strongly drawn towards those physical studies which, as the Phedo shows, had fascinated him in youth. That nature and the world proceed “according to God and not according to chance ” is the belief of the Eleatic stranger, to which he perceives that Thestetus will be irresistibly drawn as he grows older. In the midst of dialectical abstractions, the pro- cesses of actual production (yevéoes) have been increas- ingly borne in mind. And the myth in the Politicus turns on cosmological conceptions which, although differing from those in the Zimxus, and more accordant with Plato’s bitterest mood, yet throw a new light on the deeper current of his thoughts. In the same passage (272 C) there occurs the first clear anticipation of an interrogatio nature.

The impulse in this new direction, if not originated, was manifestly reinforced, through closer intercourse with the Pythagorean school. And the choice of Timeus the Pythagorean as chief speaker is an acknowledgment of this obvious tendency. If in the course of the dialogue there occur ideas apparently borrowed from the Atomists, whom Plato persistently ignored, this fact ought probably to be referred to some early reaction of Atomic on Pytha- gorean doctrine. It is important to observe, however, that not only the Zimzus, but the unfinished whole of which 1t forms the introduction, is professedly an imaginative creation. For the legend of prehistoric Athens and of Atlantis, whereof Critias was to relate what belonged to Internal policy and Hermocrates the conduct of the war, would have been no other than a prose poem, a “ mytho- logical lie,” conceived in the spirit of the Republic, and in the form of a fictitious narrative. And, therefore, when Timezus professes to give only a probable account of shadowy truths, he must be taken at his word, and not criticized in too exacting a spirit. His descriptions have much the same relation to the natural philosophy of Plato’s time that Milton’s cosmology has to the serious investiga- tions of Galileo or Copernicus,—except that all physical

speculation hitherto partook in some measure of this half- mythological character, and that Plato's mind, although working in an unfamiliar region, is still that of a specu- lative philosopher.

As Parmenides, after demonstrating the nonentity of Timaus,

growth and decay, was yet impelled to give some account of this non-existent and unintelligible phenomenal world, so Plato, although warned off by Socrates, must needs attempt to give a probable and comprehensive description of the visible universe and its creation. In doing so he acknowledges an imperfect truth in theories which his dialectic had previously set aside. In examining the earlier philosophers he has already transgressed the limits prescribed by Socrates, and the effort to connect ideas has made him more and more cdnscious of the gap between the ideal and the actual. He cannot rest until he has done his utmost to fill up the chasm—calling in the help of imagination where reason fails him.

His dominant thought is still that of a deduction from the " reason of the best," as in the Phedo, or " the idea of good," as in the Republic. But both his abstract idealism and his absolute optimism were by this time considerably modified, and, although not confounding " causes with con- ditions," as he once accused Anaxagoras of doing, he yet assigns more scope to "second causes " than he would then have been willing to attribute to them. This partly comes of ripening experience and a deepening sense of the per- sistency of evil, and partly from the feeling—which seems to have grown upon him in later life—of the distance between God and man.

Timeus begins by assuming (1) that the universe being corporeal is caused and had a beginning, and (2) that its mysterious author made it after an everlasting pattern. Yet, being bodily and visible, it can only be made the subject, humanly speaking, of probable discourse.

Thus much being premised, he proceeds to unfold—(A) the work of mind in creation, (B) the effects of necessity, including the general and specific attributes of bodies, (C) the principles of physiology, and (D) an outline of pathology and medicine.

To give a full account of such a comprehensive treatise is beyond the scope of this article, and the Timwus, however great and interesting, has been well described as an out-building of the great fabric of original Platonism. A very few scattered observations are all that there is space for here.

(A) 1. In the mythology of the Timzus some of the conceptions which attained logical clearness in the Sophist and Philebus resumé an ontological form. Thus, in compounding the soul-stuff of the universe, the father of all takes of the continuous and discrete and fuses them into an essence (the composite being of the Philebus). Again he takes of the same and other (comp. the Sophist), over- coming their inherent repugnance by his sovereign act.

2. The notion of an economy or reservation in Plato has been often exaggerated and misapphed. But it is difficult to acquit him of intentional obscurity in speaking of the creation of the Earth. It is clear, though Plato does not say so, that she is meant to have been created together with the Heaven and together with Time, and so before the other ‘‘ gods within the heaven,” ¢.¢., the sun and moon and five planets, and it is a plausible supposition that she is the “artificcr of day and night” by interposing her bulk to the sun’s rays. If the word efAAouévy in p. 40 implies motion (as Aristotle thought *), it cannot be, as Grote supposed, a motion consentaneous with that of the outer sphere, but either some far slower motion, perhaps assumed in order to account for the shifting of the seasons, or an equal retrograde motion which is supposed to neutralize in her case the “ motion of the same.” She clings to the centre, as her natural abode. And the diurnal motion of the heavens is due not to any mechanical force but to the soul of the world extending from the centre to the poles and comprehending all.

3. Immortality is in the Timgus dependent on the will of the Eternal. And the sublime idea of eternity is here first formulated.

4. The phenomena of vision and hearing are included among the works of reason, because the final cause of these higher senses is to give men perception of number, through contemplation of the measures of time.

(B) 1. It has been commonly said that the four elements of the Timzxus are geometrical figures, without content. This is not true. For what purpose does Plato introduce, “besides the archetype and

1 See Jowett, Introd. to the Timzus.

2 Aristotle, however, uses efAoupévy, a different word. ALX., — 27

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the created form, a third kind, dim and hard to conceive, a sort of | limbec or matrix of creation,” if not to fill up the triangles which are elements of elements, and to be the vehicle of the forms com- pounded of them? It has been supposed that this “nurse of generation” is identical with “space,” and it cannot be said that they are clearly kept apart by Plato. But he had a distinct nomenclature for either, and, although gravity is explained away (so that his molecules, unlike Clerk Maxwell’s, may be called imponderable), yet extension, or the property of filling space, 1s sufficiently implied. .

2. The diffcrence of size in the triangles and varying sharpness of their outlines are ingenious though inadequate expedients, | adopted in order to account for qualitative difference and physical ehange. ;

3. In criticizing the illusory notion of up and down Plato broaches the conception of antipodes. ; ;

4. More distinctly than in the Philebus, bodily pleasure is explained by “a sudden and sensible return tonature” (comp. Ar., genet, 1. 11, § 13. £., vil. 10),

5. Natural philosophers are warned against experimenting on the mixture of colours, which isa divine process and forbidden to man.

(C) 1. Plato tends more and more in his later writings to account for moral evil by physical conditions, thus arriving at the Socratic principle of the involuntariness of vice by a different road. ‘

Hence in the 7¢mzus not the body only is made by the inferior gods; but they also create the lower and mortal parts of the huinan soul :—the principle of anger which is planted in the breast, within hearing of reason, and that of appetite which is lodged below the diaphragm like an animal tied in a stall, with the stomach fora crib and the liver for a “soothsaying” looking-glass to soothe or terrify it when tempted to break loose.

2. The brain-pan was left bare of protecting flesh “ because the sons of God who framed us deliberately chose for us a precarious life with capability of reason, in preference to a long secure existence with obstruction of thought.”

3. The nails are a rudimentary provision for the lower animals, into which degencrate souls were afterwards to be transformed.

4. Vegetables have sensation but not motion.

5. By way of illustrating the very curious account here given of respiration, it is asserted that what is commonly thought to be

the attraction of the magnet is really due to rotatory motion and displacement.

6. When the original particles wear out, and the bonds of soul and body in the marrow give way, the soul escapes delightedly and flies away. This is the painless death of natural decay.

(D) 1. The dependence of mental disease on bodily conditions is more fully recognized in the Z’imeus than elsewhere in Plato (con- trast the Charmides, for example).

2. He has also changed his mind about the treatment of disease, and shows more respect for regimen and diet than in the Republic. ei are a kind of second nature, and should be treated accord- ingly.

3. It is also a remark in contrast with the Republic, that over- study leads to head complications, which physicians ascribe to chill and find intractable.

Lastly, it is one of the strange irregularities in the composition of the 7imeus that the creation of woman and the relation of the sexes ‘ to each other are subjects reserved to the end, because this is the place given to the lower animals, and woman (compare the Phedrus) is the first transmigration from the form of man. This order is probably not to be attributed to Plato’s own thought, but to some peculiarity of Pythagorcan or Orphic tradition.

VIII. The Laws.—The two series of dialogues, the dialectical and the imaginative,—Sophistes, Politicus, Philosophus,—Timeus, Critias, Hermocrates,—were left incomplete. For Plato had concentrated his declining powers, in the evening of his life? upon a different task. He was resolved to leave behind him, if he could so far overcome the infirmities of age,? a code of laws, conceived In a Spirit of concession, and such as he still hoped that some Hellenic state might sanction. The motive for this great work may be gathered from the Politicus. The physician in departing is to give a written prescription, adapted as far as possible to the condition of those from whom he goes away. This is the second-best course, in the absence of the philosopher-king. And, as the Hellenic world will not listen to Plato’s heroic remedy, he accom-

; u There is an anticipation of microscopic observation in the words adpara ord ouixpdétntos Kal &didwrAacTa (ga = spermatozoa. 5 mets a &y Svopais Tod Blov, Legg., vi. 770 A. bv… yhpws emicpaTduév ye rocodtov, Legg., vi. 752 A.

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modates his counsel to their preconceptions. once more from abstract discussions to study the applica- tion of ideas to life, and though, by the conditions of the problem, his course is “nearer earth and less in light,” this long writing, which is said to have been posthumous,‘ has a peculiar interest. The ripeness of accumulated experience and the mellowness of wise contemplation make up for the loss of prophetic insight and poetic charm.

The form of dialogue is still retained, and an aged Athenian is imagined as discoursing of legislation with the Lacedemonian Megillus and the Cretan

Clinias, who has in view the foundation of a new colony, and is on his way with his two companions from Cnossus to the temple and oracle of Zeus.

Plato now aims at moderating between Dorian and Ionian law, freely criticizing both, and refining on them from a higher point of view. “The praise of obedience, the authority assigned to elders, the prohibition of dowries, the enforcement of marriage, the common meals, the distribution and inalienability of land, the institution of the Crypteia, the freedom of bequest to a favourite son, the dislike of city walls—all reflect the custom of Sparta.” . . + “The use of the lot, the scrutiny of magistrates, the monthly courses of the council, the pardon of the forgiven homicide, most of the regulations about testaments and the guardianship of orphans, the degrees of consanguinity recognized by law, correspond to Athenian laws and customs” (Jowett). _

The philosopher’s own thoughts come out most strongly in the ‘‘preludes” to the laws,> and in the regulations concerning education, marriage, and the punishment of impiety (ze. Ist, atheism, 2d, denial of providence, 3d and worst, immoral superstition), The difficulty which is met in the Politicus by the abandonment of the world for a time, and in the Z’imeus by the lieutenancy of lower gods, here leads to the hypothesis of an evil soul. The priority of mind (often before asserted) and the increased importance attached to numbers are the chief indications of Plato’s latest thoughts about the intelligible world. But it must be remembered that the higher cducation (answering to Fep., vi., vii.) is expressly reserved.6 Had Plato written his own Lpmomis, the proportions of the whole work (not then “acephalous”) might have been vastly changed.

The severity of the penalties attached to the three forms of heresy, especially to the third and worst of them, has led to the remark that Plato, after asserting “ liberty of pro- phesying,” had become intolerant and bigoted in his old age. But the idea of toleration in the modern sense was never distinctly present to the mind of any ancient philo- sopher. And, if in the Laws the lines of thought have in one way hardened, there are other ways in which experience has softened them. Plato’s “second-best” constitution contains a provision, which was not admissible in the “perfect state,” for possible changes and readaptations in the future. The power of

self-reformation is hedged round indeed with extreme precautions ; and no young or middle- aged citizen is ever to hear a word said in depreciation of any jot or tittle of the existing law. But that it should be provided, however guardedly, that select com- missioners, after travelling far and wide, should bring back of the fruit of their observations for the consideration of the nocturnal council, and that a power of constitutionally Me ee ee, eee

- Published by Philippus the Opuntian.

> See especially iv. 716 sg. ; v. 727 sq., 735 sq. 3 vi. 766; vii. 778

sy., 777, 794, 808 sq., 811, 817; viii. 835 SHAR) Ube YhiG 2S BIC! Ses 897 sq., 904 sq. f 6 Legg., xii. 968 E. (Ath.) ‘¢I am willing to share with yon the

danger of stating to you my views about education and nurture, which is the question coming to the surface again.”

He returns Laws.

Doubtful and spu- yious works,

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amending the laws should thus be admitted into the state, is sufficiently remarkable, when the would-be finality of ancient legislation is considered. Plato even comes near to the reflexion that “constitutions are not made, but grow” (iv. 709 A).

Plato in the Laws desists finally from impersonating Socrates. But he is in some ways nearer to his master in spirit than when he composed the Phedrus. The sympathy with common life, the acceptance of Greek religion, the deepening humanity, are no less essentially Socratic than the love of truth which breathes in every page. And some particular aspects of Socratism reappear, such as the question about courage} and that concerning the unity of virtue.”

Of the dialogues forming part of the “ Platonic canon,” and not included in the preceding survey, the Lesser Hippias, First Alcibiades, and Menexenus are the most Platonic, though probably not Plato’s. The Greater Hippias and the Clitophon are also admitted to have some plausibility. The Second Alcibiades (on Prayer), the Hipparchus (touching on Pisistratus and Homer), Adinos (“de lege”), Hpinomis, Hrastx, T’heages, are generally con- demned, though most of them are very early forgeries or Academic exercises.2 And the Asiochus (though some- times prized for its subject, “the contempt of death ”), the De Justo, De Virtute, Demodocus, Sisyphus, Eryxvas (a not-uninteresting treatise on the use of money), together with the so-called Definitions, were rejected in ancient times, and are marked as spurious in the MSS.

Two great forces are persistent in Plato, the love of truth and zeal for human improvement. In the period culminating with the Mepublic, these two motives, the speculative and the practical, are fused in one harmonious working. In the «succeeding period, without excluding one another, they operate with alternate intensity. In the varied outcome of his long literary career, the metaphysical “doctrine of ideas” which has been associated with Plato’s name underwent many important changes. But pervading all of these there is the same constant belief in the supremacy of reason and the identity of truth and good. From that abiding root spring forth a multitude of thoughts concerning the mind and human things, —turning chiefly on the principles of psychology, education, and political reform, —thoughts which, although unverified, and often needing correction from experience, still constitute Plato the most fruitful of philosophical writers. While general ideas are powerful for good or ill, while abstractions are necessary to science, while mankind are apt to crave after perfection, and ideals, either in art or life, have an acknowledged value, so long the renown of Plato will continue. “ All philosophic truth is Plato rightly divined ; all philosophic error is Plato misunderstood ”—is the verdict of one of the keenest of modern metaphysicians.*

Plato’s followers, however, have seldom kept the propor- tions of his teaching. The diverse elements of his doctrine have survived the spirit that informed them. The Pythagorizing mysticism of the Z%meus has been more prized than the subtle and clear thinking of the 7’heetetus. Logical

inquiries have been hardened into a barren ontology. Semi-mythical statements have been construed literally, and mystic fancies perpetuated without the genuine thought which underlay them. A part (and not | the essential part) of his philosophy has been treated as_ the whole. But the influence of Plato has extended far _ beyond the limits of the Platonic schools. The debt of |

1 Comp. Laches. 2 Comp. Protagoras. 3 According to Schaarschmidt, only nine dialogues are genuine, — Protag., Phedr., Symp., Apol., Crito, Phedo, Rep., Tim., Leges.

| the dialogues in the order of composition.

- Ferrier, Zustitutes of Metaphysics, p. 169 (sect. i., prop. vi. § 12).

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Aristotle to his master has never yet been fully estimated. Zeno, Chrysippus, Epicurus borrowed from Plato more than they: knew. The moral ideal of Plutarch and that of the Roman Stoics, which have both so deeply affected the modern world, could not have existed without him. Neopythagoreanism was really a crude Neoplatonism. And the Sceptics availed themselves of weapons either forged by Plato or borrowed by him from the Sophists. A wholly distinct line of infiltration is suggested by the mention of Philo and the Alexandrian schools, and of Clement and Origen, while Gnostic heresies and even Talmudic mysticism betray perversions of the same influence. . The effect of Hellenic thought on Christian theology and on the life of Christendom is a subject for a volume, and has been pointed out in part by Professor E. Zeller and others (comp. NEoPLATONISM). Yet when Plotinus in the 3d century (after hearing Ammonius), amidst the revival of religious paganism, founded a new spiritualistic philosophy upon the study of Plato and Aristotle combined, this return to the fountain-head had all the effect of novelty. And for more than two centuries, from Plotinus to Proclus, the great effort to base life anew on the Platonic wisdom was continued. But it was rather the ghost than the spirit of Plato that was so “unsphered.” Instead of striving to reform the world, the Neoplatonist sought after a retired and cloistered virtue. Instead of vitalizing science with fresh thought, he lost hold of all

reality in the contemplation of infinite unity. He had some skill in dealing with abstractions, but laid a feeble hold upon the actual world.

“Hermes Trismegistus ” and “Dionysius Areopagita ” are names that mark the continuation of this influence into the Middle Ages. The pseudo-Dionysius was translated by Erigena in the 9th century.

Two more “ Platonic” revivals have to be recorded,—- at Florence in the 15th and at Cambridge in the 17th century. Both were enthusiastic and both uncritical. The translation of the dialogues into Latin by Marsiglio Ficino was the most lasting effect of the former movement, which was tinged with the unscientific ardour of the Renaissance. The preference still accorded to the 7imzxus is a fair indication of the tendency to bring fumum ex fulgore which probably marred the discussions of the Florentine Academy concerning the “chief good.” The new humanism had also a sentimental cast, which was alien from Plato. Yet the effect of this spirit on art and literature was very great, and may be clearly traced not only in Italian but in English poetry.

“The Cambridge Platonists” have been described by Principal Tulloch in his important work on Jeational Theo- logy in England in the 17th Century. Their views were mainly due to a reaction from the philosophy of Hobbes, and were at first suggested as much by Plotinus as by Plato. It is curious to find that, just as Socrates and Ammonius (the teacher of Plotinus) left no writings, so Whichcote, the founder of this school, worked chiefly through conversation andpreaching. His pupils exercised a considerable influence for good, especially on English theology ; and in aspiration if not in thought they derived something from Plato, but they seem to have been incapable of separating his mean- ing from that of his interpreters, and Cudworth, their most consistent writer, was at once more systematic and less scientific than the Athenian philosopher. The trans- lations of Sydenham and Taylor in the 18th century and the beginning of the 19th are proofs of the continued influence of Platonism in England.

The critical study of Plato begins from Schleiermacher, who did good work as an interpreter, and tried to arrange His attempt, which, like many efforts of constructive criticism, went far

beyond possibility, was vitiated by the ground-fallacy of | supposing that Plato had from the first a complete system | in his mind which he partially and gradually revealed in | “writing. At a considerably later time Karl Friedrich | Hermann, to whom all students of Plato are indebted, renewed the same endeavour on the far more plausible assumption that the dialogues faithfully reflect the growth of Plato’s mind. But he also was too sanguine, and exaggerated the possibility of tracing a connexion between the outward events of Plato’s life and the progress of lis thoughts. This great question of the order of the dialogues, which has been debated by numberless writers, is one which only admits of an approximate solution. Much confusion, however, has been obviated by the hypothesis (first hinted at by Ueberweg, and since supported by the present writer and others) that the Sophistes and Politicus, whose genuineness had been called in question | by Socher, are really intermediate between the Republic and the Laws. The allocation of these dialogues, and consequently of the Philebus, not only on grounds of inetaphysical criticism, but also on philological and other evidence of a more tangible kind, supplies a point of view from which it becomes possible to trace with confidence the general outlines of Plato’s literary and philosophical development. Reflecting at first in various aspects the impressions received from Socrates, he is gradually touched with an inspiration which becomes his own, and which seeks utterance in half-poetical forms. Then first the ethical and by and by the metaphysical interest becomes predominant, And fora while this last is all absorbing, as he confronts the central problems which his own thoughts have raised. But, again, the hard-won acquisitions of this dialectical movement must be fused anew with imagination and applied to life. And in a final effort to use his intellectual wealth for the subvention of human need the great spirit passed away.

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Baiter-Orelli-Winkelmann (Zurieh, [1839] 1881); Engelmann (with Germ, trans. and comm., [1841] 1877); K. F. Hermann (Leips., 1851-53 and 1868-74); Wohlrab (see Stallbaum, 1877); Martin Schanz (1875-81, not yet completed) ; 1, F. Heindorf (Zys,, Charm., Hipp, Maj., Phiedr., Gorg., Thext., Crat,, Parm., Euthyd., Phed., Prot., Soph., 1802-10); F. Ast (Protag., Phedr., Gorg., Phxd., with eomm., 1819-22), Separate Dialogues,—Sympostum, by F. A. Wolf ([1782] 1828) and Otto Jalin ([1864] 1875); Republic, by Ast (1801) and Selineider ([1830] 1833); Phedo, by Wyttenbach (1810); Legg. et Epinomis, by Ast (Leips., 1814); Parmenides, by Stallbaum (1839); Phi/ebus, by Stallbaum (1840); Critias, by Sehneider (Wratislaw, 1855); 7imezus (Chaleidius, 1569; repr. by Wrobel, Leips. 1876); and Gorg., by Krohn. English.—Timzus (Gr. and Lat., Camb., 1670) : De rebus divinis dialogi delecti(Camb., 1673); Euthyd., Gorg. (eum notis), by Routh (Camb., 1784), Protag., by Wayte ([1854] 1871); Philebus, by Badham (Lond., [1855] 1878) and Poste (1860); Thewt., by L. Campbell (Oxford, [1861] 1882) and Kennedy (Camb., 1881); Phxdo, by Geddes (1863) and Archer Hind (Camb., 1883); Luthyd., Symp., by Badham (1866); Soph., Polit., by L. Campbell (1867); Phedvus, by W. H. Thompson (1868); Apol., by W. Wagner (Camb., 1869), and James

PLATON, Luvsuin (1737-1812), a celebrated Russian | archbishop, was born at the village of Tchashnikovo, near Moscow, in 1737, and was educated in the academy of that city. On completing his studies there in 1758 he was appointed teacher of rhetoric in the school connected with the monastery of St Sergius, and about this time entered the priesthood. In 1763 Catherine invited him to instruct her son Paul in theology, and he became one of the court chaplains. Three years afterwards Platon was appointed | archimandrite of the monastery of the Trinity (Troitzkaia Lavra) near Moscow ; in 1770 he was made archbishop of | Tver, and finally in 1787 archbishop of Moscow and metro- politan. He died in 1812. Platon was a brilliant and

| le Timée (Paris, 1841).

ae man, not only in the opinion of his countrymen, | ut in the estimation of all foreigners who made his | acquaintance. We get a graphic and interesting

picture |

| get bua

Riddell (Oxford, 1877); Gorg., by W. 11. Thompson (1871); and Parm., by Maguire (Dublin, 1882). French. —Hirschig and Schneider (in Didot's Aibliotheca Script Greec., Paris, [1856] 1873). Separate Dialogues.—Apologie de Socrates, by Ii. David (Paris, 1866), Phedo, by Belin (Paris, 1878), Jéalian.—Protag., by G Oliva (Florence, 1877).

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| is the basis of Latin.translations aeeompanying later editions, sueh as that | of Bekker, 1816-23, said to have been revised by F. A. Wolf, and that of

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| by Cope (1864); Sophistes, and Meno to 69, by Mackay (1858); Thewtetus, by F. A.

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of him at the beginning of the present century in the travels of Edward Clarke of Cambridge, who was much struck with his wit and wide range of

reading. As a preacher he enjoyed great celebrity, one of the most remarkable specimens of his eloquence being the sermon preached at the coronation of Alexander I. He was also the author of several works which enjoyed considerable reputation in their time, such as A Short Course of Diwinity, compiled for the use of the emperor Paul when grand-

| duke, several Catechisms, A Short History of the Russian

Church, which has been translated into English, and other works. Platon is altogether a striking and important

| figure in a very eventful period of his country's history.

PLATTNER, Cart Frrepricu (1800-1858), a famous scientific metallurgist, was born in Kleinwaltersdorf, near

Freiberg in Saxony, on the 2d January 1800, and died

in the latter town on the 22d January 1858. Plattner's father, though only a poor working miner, found the means for having his son educated first at the " Berg- schule" and then at the "Bergakademie " of Freiberg. After having completed his curriculum there in 1820, he obtained a position in connexion with the royal mines and metal works, and was employed chiefly as an assayer, in which capacity he soon became conspicuous by his rare exactness and circumspection, and his constant striving after scientific advancement.

The mouth-blowpipe, after doing service for centuries to metal-workers as a soldering tool (hence the German name Lithrohr), in the hands of Gahn and subsequently of Berzelius became the most useful of instruments for the qualitative testing of mineral substances. Through the efforts of the latter, in fact, blowpipe analysis had developed into almost an independent branch of analysis. But nobody dreamt of quantitative mouth-blowpipe assaying until Harkort in 1827 (while a student in the Freiberg academy) succeeded in working out a blowpipe-assay for silver. Harkort stopped there; but the idea of blowpipe-assaying was taken up subsequently by Plattner, who, by

bringing his characteristic thoroughness, indefatigability, and unex- ampled dexterity to bear on the subject, succeeded in working out reliable methods for all the ordinary useful metals. His modes of assaying for cobalt and nickel more especially quickly found favour with metallurgists, because they were more exact than the then known corresponding methods of ‘‘ wet-way” analysis, and required a less number of hours than the latter required of days for their execu- tion. Our analytical methods for the determination of cobalt have since become far more perfect but no less troublesome, and to the present day Plattner’s nickel-assay is the most precise method for the estimation of this metal in complex mixtures.

Plattner, while working at this specialty of his own, at the same time overhauled the entire field of qualitative blowpipe assaying, and ultimately summed up the whole of his vast experience in his Probirkunst mit dem Lithrohr, which soon became, and to the present day ranks as, the standard book on the subject. Since its first publication in 1835 the work has gone through four editions, apart from two independent English translations.

With all his high and recognized distinction in his own specialty, Plattner most keenly felt that his scientific education in Freiberg had been somewhat one-sided ; and in 1839 he left his post and family to work for a year in Heinrich Rose’s laboratory in Berlin, and supplement his knowledge of modern methods of chemical analysis. While there as a student he at the same time acted as a teacher in his branch, and won the lasting friendship of a number of distinguished scientific men. On his return home in 1840 he was raised to the rank of assessor at the Government board of mining and metallurgy, and made chief of the royal department of assaying. In 1842 he was deputed to complete a course of lectures on metallurgy in the Bergakademie which had been commenced by Lampadius ; and he subsequently became Lampadius’s suc- cessor as professor of that branch, and for the then newly instituted course of blowpipe-assaying. In addition to these functions he instituted, in 1851, a special course on the metallurgy of iron. He continued lecturing in the academy as long as he was able,—until the session of 1856-57. It was during this period of professorial activity that he made the extensive studies and experi- mental researches which form the basis of his work Die metallurgischen Réstprocesse theoretisch betrachtet (Freiberg, 1856). His well-known Vorlesungen tiber

allgememe Hiittenkunde (vol. i. and ii., Freiberg, 1860) is a posthumous publication edited by Prof. Thomas Richter.

| In addition to these great works (and the Probirkunst) Plattner published (in Zrdmann's Journal and in Schweig- | ger's Journal and elsewhere) numerous memoirs on metal- lurgical or mineralogical subjects, regarding which we must confine ourselves to saying that they mark him as an investigator of rare diligence and power. How he found time for all his original work is difficult to say ; it certainly did not cause him to neglect his students. He attended to them in the most conscientious and effi- cient manner, as hundreds of his pupils all over the world can testify. His marked success as a teacher was no doubt owing greatly to his high personal qualities,—his cheerful, untiring, unselfish devotion to duty, his kind- liness of heart and manner, his freedom from all cant and morbid ambition. The latter years of his life were embittered by intense suffering. After a long period of lingering illness he succumbed to a disease of the brain.
PLATTSBURGH, a village and township of the United States, the shire-town of Clinton county, New York, and the port of entry of Champlain customs district, Jies on the west side of Lake Champlain at the mouth of the Saranac. By rail it is 168 miles north of Albany and 73 south-south-east of Montreal (Canada). A branch line runs 20 miles south-west to Au Sable and forms a favourite route to the Adirondacks, and the Chateaugay Railroad runs 34 miles west by north to Lyon Mountain, where there are extensive iron mines. Plattsburgh contains county build- ings and court-house, a custom-house, a high school, and a small public library. It has nail and waggon factories, flour-mills, saw-mills, an iron furnace, machine shops, and a large sewing-machine manufactory. It is a garrison town of the United States army, with extensive barracks about a mile south of the village. The value of the imports and exports of the district for the year ending June 30th 1884 was $3,169,780 and $1,319,422 ; and 1279 vessels entered from Canada, while 1179 cleared. The aggregate burthen of the vessels belonging to the district was 57,477 tons. In 1870 the township had 8414 inhabitants, the village 5139; in 1880 the figures were 8283 and 5245. Plattsburgh dates from 1785. It has twice been destroyed by fire (1849 and 1867). In 1812 it became the headquarters of the U.S. army on the northern frontier; and in September 1814 it was rendered famous through the capture of the British flotilla under Commodore Downie by the United States

flotilla under Commodore Macdonough, and the consequent retreat across the Saranac of Sir George Prevost, who had been attacking the village with a powerful

army. Downie and fifteen other officers of the contending forces are buried in Plattsburgh cemetery.

PLATYHELMINTHES. See PLANARIANS and TAPE- WORMS.

PLATYPUS. The Duck-billed Platypus (Platypus anatinus) was the name assigned to one of the most remarkable of known animals by Shaw, who had the good fortune to introduce it to the notice of the scientific world in the Waturalist's Miscellany (vol. x., 1799). In the fol- lowing year it was independently described by Blumenbach (Voigts Magazin, ii. p. 205) under the name of Ornitho- rhynchus paradorus. Shaw's generic name, although having priority to that of Blumenbach, could not be retained, as it had been used at a still earlier time (1793) by Herbst for a genus of Coleoptera. Ornithorhynchus is therefore now universally adopted as the scientific designa- tion, although Duck-billed Platypus may be conveniently retained as a vernacular appellation. By the colonists it is called ""'Water-Mole," but its affinities with the true moles are of the slightest and most superficial description.

The anatomical differences by which the platypus, and its only ally the echidna, are separated from all other mammals, so as to form a distinct subclass with relation- ship to the inferior vertebrated classes, have been described in the article MAMMALIA (vol. xv. pp. 371 and 377), where

also will be found the main distinctive characters of the | two on each side of each jaw,—those in the front narrow,

two existing representatives of the group. It is there stated that the early stages of the development of the young are not yet fully known; in fact this was till very recently one of the most interesting problems in zoology to be

solved. It has been repeatedly affirmed, in some cases by persons who have had actual opportunities of observa- tion, that the platypus lays eggs; but these statements have been generally received with scepticism and even denial. This much-vexed question has, however, been settled by the researches of Mr W. H. Caldwell (1884), who has found that these animals, although undoubtedly mammals throughout the greater part of their structure, are ovipar- ous, laying eggs, which in the manner of their development bear a close resemblance to the development of those of the Lteptilia, Two eggs are produced ata time, each measuring about three-fourths of an inch in its long and half an inch in its short axis, and enclosed in a strong, flexible, white shell.

The platypus is pretty generally distributed in situa- tions suitable to its aquatic habits throughout the island of Tasmania and the southern and eastern portions of Australia, Slight variations in the colouring and size of different individuals have given rise to the idea that more

From Gould’s Mammals of Australia.

than one species may exist ; but all naturalists who have had the opportunity of investigating this question by the aid of a good series of specimens have come to the con- clusion that there is but one; and no traces of any extinct allied forms have yet been discovered.

The length of the animal when full grown is from 18 to 20 inches from the extremity of the beak to the end of the tail, the male being slightly larger than the female. The fur is short, dense, and rather soft to the touch, and composed of an extremely fine and close under-fur, and of longer hairs which project beyond this, each of which is very slender at the base, and expanded, flattened, and glossy towards the free end. The general colour is deep brown, but paler on the under parts. The tail is short, broad, and depressed, and covered with coarse hairs, which in old animals generally become worn off from the under surface. _ The eyes are small and brown. There is no pro- jecting pinna or ear-conch. The mouth, as is well known, bears a striking resemblance to the bill of a duck. It is covered with a naked skin, a strong fold of which projects outwards around its base. The nostrils are situated near the extremity of the upper surface. There are no true teeth, but their purposes are served by horny prominences,

longitudinal, sharp-edged ridges, and those behind broad, flattened, and molariform. The upper surface of the lateral edges of the mandible has also a number of parallel fine transverse ridges, like those on the bill of a duck. In the cheeks are tolerably capacious pouches, which appear to be used as receptacles for food.

The limbs are strong and very short, each with five well- developed toes provided with strong claws. In the fore feet the web not only fills the interspaces between the toes, but extends considerably beyond the ends of the long, broad, and somewhat flattened nails, giving great expanse to the foot when used for swimming, though capable of being folded back on the palm when the animal is burrowing or walking on the land. On the hind foot the nails are long, curved, and pointed, and the web extends only to their base. On the heel of the male is a strong, curved, sharply pointed, movable horny spur, directed upwards and backwards, attached by its expanded base to the accessory bone of the tarsus. This spur, which attains the length of nearly an inch, is traversed by a minute canal, terminating in a fine longitudinal slit near the point, and connected at its base with the duct of a large gland situated at the back part of the thigh. The whole apparatus is so exactly analogous in structure to the poison gland and tooth of a venomous snake as to suggest a similar function, but evidence that the platypus ever employs its spur as an offensive weapon has, at all events until lately, been wanting. A case is, however, related by Mr Spicer in the Proceedings of the Royal Society of Tasmania for 1876 (p. 162) of a captured platypus inflicting a severe wound by a powerful lateral and inward movement of the hind legs, which wound was followed by symptoms of active local poisoning. It is not improbable that both the inclination to use the weapon and the activity of the secretion of the gland may be limited to the breeding season, and that their purpose may be, like that of the antlers of deer and many similar organs, for combat among the males. In the young of both sexes the spur is present in a rudimentary condition, but it disappears in the adult females.

The platypus is aquatic in its habits, passing most of its time in the water or close to the margin of lakes and streams, swimming and diving with the

greatest ease, and forming for the purpose of sleeping and breeding deep burrows in the banks, which generally have two orifices, one just above the water level, concealed among long grasses and leaves, and the other below the surface. The passage at first rans obliquely upwards in the bank, sometimes to a distance of as much as 50 feet, and expands at its termination into a cavity, the floor of which is lined with dried grass and leaves, and in which the eggs are laid and the young brought up. Their food consists of aquatic insects, small crustaceans, and worms, which are caught under water, the sand and small stones at the bottom being turned over with their bills to find them. They appear at first to deposit what they have thus collected in their cheek pouches, and when these are filled they rise to the surface and quietly triturate their meal with the horny teeth before swallowing it. Swimming is effected chiefly by the action of the broad forepaws, the hind feet and tail taking little share in locomotion in the water. When asleep they roll themselves into a ball, as shown in the figure. In their native haunts they are extremely timid and wary, and very difficult to approach, being rarely seen out of their burrows in the daytime. Mr A. B. Crowther, who has supplemented the often quoted observations of Dr George Bennett upon the habits of these animals in confinement, says, ‘‘ They soon become very tame in captivity ; ina few days the young

ones appeared to recognize a call, swimming rapidly to the hand paddling the water ; and it is curious to see their attempts to procure a worm enclosed in the hand, which they greedily take when offered to them. I have noticed that they appear to be able to smell whether or not a worm is contained in the closed hand to which they swim, for they desisted from their efforts if an empty fist was offered.” When irritated they utter a soft low growl, resembling that of a puppy. (w. H. F.) PLAUEN, a busy manufacturing town of Saxony, in the

‘government district of Zwickau, is situated on the Elster,

60 miles to the south of Leipsic. It was formerly the

capital of the Voigtland, a territory governed directly by

the imperial voigts or bailiffs, and this name still clings in popular speech to the hilly manufacturing district in which it lies. The most prominent buildings are the fine Gothic church of St John, the town-house (about 1550), the new post-office, and the loftily-situated old castle of Hradschin, now occupied by a law court. Plauen is now the chief place in Germany for the manufacture of em- broidered white goods of all kinds, and for the finishing of woven cotton fabrics. Dyeing, tanning, bleaching, and the making of paper and machinery are also prosecuted ; and an active trade is carried on in these various industrial products. In 1880 the town contained 35,078 inhabitants and in 1884 above 40,000, almost all Protestants.

As indicated by the name of the castle, Plauen was probably founded by the Slavs, after whose expulsion it was governed directly by the imperial bailiffs. In 1327 it became a Bohemian fief, but passed into the possession of Saxony in 1466 and remained per-

manently united to it from 1569 onwards. The manufacture of white goods was introduced by Swabian or Swiss immigrants about

1570, and since then the prosperity of the town has been great,

in spite of the storms of the Thirty Years' and Seven Years' Wars. The advance of Plauen has been especially rapid since its incor- poration in the Zollverein.

PLAUTUS, T. Maccrus, was the greatest comic and dramatic genius of Rome, and still ranks among the great comic dramatists of the world. While the other creators of Roman literature, Nevius, Ennius, Lucilius, &c., are known to us only in fragments, we still possess twenty plays of Plautus. A few of them are incomplete, and in some cases they show traces of later interpolations, but they have reached us in the main as they were written by him in the end of the 3d and the beginning of the 2d cen- tury B.c. Atthe date of his birth Roman literature may be said to have been non-existent. When he died the Latin language had developed its full capacities as an organ of social intercourse and familiar speech, and the litera- ture of the world had been enriched by a large number of adaptations from the New

Comedy of Athens, animated by the new life of ancient Italy and vivified by the genius and robust human nature of their author; and these have been the chief means of transmitting the traditions of the ancient drama to modern times. The maturity which comedy attained in a single generation affords a remarkable contrast to the slow processes by which the higher forms of Roman poetical and prose literature were brought to perfection. It may be explained partly by the existence, for some generations before the formal begin- ning of literature at Rome, of the dramatic and musical medleys (“‘saturee impletee modis”) which in their allu- Sions to current events and their spirit of banter must have had a considerable affinity with the dialogue of Plautus, and partly to the diffusion of the Latin language, as the organ of practical business among the urban com- munities of Italy. But much also was due to the indivi- dual genius and the command over their native idiom possessed by the two oldest of the genuine creators of Roman literature, Nevius and Plautus.

A question might be raised as to whether Plautus or

his younger contemporary Ennius was the most character- istic representative of the national literature of their time. Ennius certainly exercised a much more important influ- ence on its subsequent development. He arrested the tendency imparted to that development by Nevius and Plautus. He made literature the organ of the serious spirit and imperial ambition of the Roman aristocracy, while the genius of Plautus appealed to the taste and temperament of the mass of the people, at a time when they were animated by the spirit of enjoyment and com- paratively indifferent to political questions. The ascend- ency of the aristocracy in public affairs for two generations after the end of the Second Punic War determined the ascendency of Ennius in Roman literature ; and it may be admitted that, if the genius of Plautus and of Ennius could not work harmoniously together, it was best that that of the younger poet, as representative of the truer genius of Rome, should prevail. The popularity of Plautus was greatest in his own time and in the generation succeeding him, but his plays still continued to be acted with applause till the age of Cicero, and he was greatly admired both by Cicero and by the man among

his contemporaries who, both from his learning and taste, retained most of the antique spirit, Varro. The literary taste of the Augustan age and of the first century of the empire was adverse to him ; but the archaic revival in the latter part of the 2d century of our era brought him again into favour, with the result of securing the preservation of his works through medieval times and their revival with great acceptance at the Renaissance. That his original popularity was due to genuine gifts of humour and genuine power in represent- ing human life is clear from their reception by a world so much altered from that in which he himself had played his part. And if his influence was not felt like that of Ennius in determining the form and spirit of the litera- ture of his country, it was not without effect on the two greatest dramatists of modern times, Shakespeare and Moliére.

The few facts known of his life rest on the authority of Cicero, of Aulus Gellius, and of Jerome in his continuation of the Eusebian Chronicle. He was born in the earlier half of the 3d century B.c., and died at an advanced age in the year 184 B.c. Hewas a native of Sarsina in Umbria. His first employment was in some way connected with the stage “in operis artificum scenicorum.” He saved money in this employment, engaged in foreign trade, and return- ing to Rome in absolute poverty was reduced to work as a hired servant in a null; and then for the first time he began to write comedies. The earliest allusion to any contemporary event which we find in any of his plays is that in the Miles Gloriosus (1. 212-3) to the imprisonment of Neevius, which happened about the year 207 B.c. The Cistellaria and Stichus were apparently written immedi- ately after the end of the Second Punic War. The last ten years of his life were the most productive, and the greater number of his extant comedies belong to that period. They do not seem to have been published as literary works during his lifetime, but to have been left in possession of the players, to whom the interpolations and some other unimportant changes are to be ascribed. The prologues to the plays, with three or four exceptions, belong to the generation after his death. In a later age the plays of many contemporary playwrights were attri- buted to him. Twenty-one were accepted by Varro as undoubtedly genuine, and of these we possess twenty nearly complete, and fragments of another, the Vidularia. Other nineteen Varro regarded as probably genuine, and the titles of some of them, ¢.g., Saturio, Addictus, Com- morventes, are also known to us.

We get the impression from his works and from ancient

criticisms on them that he was, in his latter years, a rapid and productive writer, niore concerned with the immediate success of his works than with their literary perfection.1 Yet he shows that he took pride and pleasure in his art (Bacch., 214), and Cicero testifies especially to the gratification which he derived from two works of his old age, the Psewdolus and T'ruculentus (De Senec., 14). We get further the impression of a man of strong animal spirits and of large intercourse with the world, especially with the trading and middle classes. We find no indication of familiarity with the manners, tastes, or ideas of the governing aristocracy. The story told of his unsuccessful mercantile speculations might seem to derive confirmation from the "flavour of the sea" and the spirit of adventure present in many of his plays, from his frequent colloquial use of Greek phrases, and from indications of familiarity with the sights, manners, and pleasures of the Greek cities on the Mediterranean. He has many allusions to works of art, to the stories of Greek mythology, and to the sub- jects of Greek tragedies ; and he tried to enrich the native vocabulary with a considerable number of Greek words which did not maintain their place in the language. The knowledge of these subjects which he betrays, and his copious use of Greek words and phrases, seem to be the result rather of active and varied intercourse with contem- porary Greeks than of the study of books.

Like all the old Roman dramatists, he borrows his plots, incidents, scenes, characters, and probably the outlines of his dialogue from the authors of the new comedy of Athens,—Diphilus, Philemon, Menander, and others. But he treated his borrowed materials with much more freedom and originality than the only other dramatist of whom we possess complete pieces—Terence. A note of this dif- ference appears in the fact that the titles of all the plays of Terence are Greek, while those of Plautus are nearly all Latin. We find a much greater range and variety in the scenes and incidents introduced by Plautus, and inuch greater divergence from a conventional type in his characters. But it is especially on his dialogue and his metrical soliloquies that his originality is stamped. Though all the personages of his plays are supposed to be Greeks, living in Greek towns, they constantly

speak as if they were Romans living in the heart of Rome. Frequent mention is made of towns in Italy, of streets, gates, and markets in Rome itself, of Roman magistrates and of their duties, of the business of the law-courts, the comitia, and the senate, &. We constantly meet with Roman formule, expressions of courtesy, proverbs, and the like. While avoiding all direct reference to politics, he fre- quently alludes to recent events in Roman history, and to laws of recent enactment. Although he maintains and seems to inculcate an attitude of political indifference, he is not altogether indifferent to social conditions, and in more than one of his plays comments on the growing estrangement between the rich and poor, as an element of danger to the state. Still he writes neither as a political nor as a social satirist, but simply with the wish to represent the humours of human life and to amuse the people in their holiday mood.

His independence of his originals, in regard to expres- sion, is further shown by the puns and plays on words, the alliterations, assonances, &c., which do not admit of being reproduced in translation from one language to another; in the metaphors taken from Roman military operations, business transactions, and the trade of various artisans ; and in his profuse use of terms of endearment and vituperation, characteristic of the vivacity of the Italian temperament in modern as in ancient times. But in nothing is his difference from Terence, and presum-

1 “Securus cadat an recto stet fabula talo.”—Hor. Lipeiionloe li6s

P4a> A UW was

ably from the originals which they both followed, more decided than in his large use of lyrical monologue, or “cantica,” alternating with the ordinary dialogue in much the same way as the choral odes do in the old Greek comedy. These one may conjecture to have been a partial survival of passages in the old dramatic satwrx, which were repeated to a musical accompaniment. In the naiveté of the reflexions which they contain, and the pro- lixity with which the thought is worked out, we recognize the earliest effort of the Roman mind applied to reflexion on life, and no reproduction of any phase of the Greek mind to which the expression of such reflexion had been familiar for generations.

In the diction of Plautus accordingly we may consider that we have a thorough reflexton of his own mind, and an important witness of Roman life and thought in his time. The characters in his plays are the stock characters of the New Comedy of Athens, the “ fallax servus,” the “Jeno insidiosus,” the “ meretrix blanda,” the “ parasitus edax,” the “amans ephebus,” the “pater attentus,” &. We may miss the finer insight into human nature and the delicate touch in drawing character which Terence pre- sents to us in his copies from Menander, but there is wonderful life and vigour, and considerable variety in the embodiment of these different types by Plautus. The characters of Ballio and Pseudolus, of Euclio in the Aulularia, of the two Menechmi, and of many others have a real individuality, which shows that in reproducing Greek originals Plautus thoroughly realized them and animated them with the strong human nature of which he himself possessed so large a share. For his plots and incidents he has been much more indebted to his originals. There is a considerable sameness in many of them. A large number turn upon what are called “ frustrationes ” —tricks by which the slave who plays the principal part in the comedy succeeds in extracting either from the father of his young master or from some other victim a sum of money to aid his master in his love affairs. But Plautus, if not more original, is more varied than Terence in his choice of plots. In some of them the passion of’ love plays either no part or a subordinate one. He also varies his scenes much more than Terence. Thus in some of his plays we find ourselves at Epidamnus, at Ephesus, at Cyrene, and not always in Athens.

The following is a list of the comedies according to their usual arrangement, which is nearly, but not strictly alphabetical :— Amphitruo, Asinaria, Aulularia, Captivi, Curculio, Casina, Cistellaria, Epidicus, Bacchides, Mostellaria, Menechmi, Miles Gloriosus, Mercator, Pseudolus, Penulus, Persa, Rudens, Stichus, Trinummus, Truculentus. Of these the most generally read, and on the whole the most interesting, are the Aulularia, Captivi, Menzchmi, Miles Gloriosus, Mostellaria, Pseudolus, Rudens, and Trinummus. Besides these the Amphitruo, Bacchides, and Stichus (although the last two are incomplete) are of special interest. The Amphitruo is altogether exceptional, aud gives, perhaps, as high an idea both of the comic and of the imaginative power of the author as any of the others. The interest attaching to it is enhauced by the fact that it has been imitated both by

Moliére and Dryden, that attaching to the Aulularia by its having suggested the subject of L' Avare of the French dramatist, and to the Menewchmi by the reappearance of its principal motive in the Comedy of Errors of Shakespeare. The Captivi was characterized by Lessing as the best constructed drama in existence. It may be classed with the Rudens as appealing to a higher and purer class of feelings, and as coming nearer to the province of serious poetry, than any other extant specimens of Latin comedy. The Aulularia and Trinum- mus may be mentioned along with these as bringing us into contact with characters more estimable and attractive than those in the great majority of the other pieces.

While there are abundant good sense and good humour in the comedies of Plautus, and occasional touches of pathos and elevated feeling in one or two of them, there is no trace of any serious purpose behind his humorous scenes and represcntations of character, He presents a remarkable exception to the didactic and moralizing spirit which appears in most of the leading repre- sentatives of Roman literature. He is to be judged on the claim

which is put forward in the epitaph which in ancient times was attributed to himself :— " Postquam est mortem aptus Plautus, comeedia luget, Sczena est deserta, dein risus, ludu' jocusque, Et numeri innumeri simul omnes conlacrumarunt." 1 He has not the more subtle and penetrating irony which we recognize in Terence, in Horace, and in Petronius; still less can we attribute to him the " rigidi ccnsura cachinni" which accompanied and inspired the humorous fancies of Lucilius and Juvenal. But among all the ancient humorists, with the exception of Aristo- phanes, he must have had the power of immediately provoking the heartiest and broadest mirth and laughter. He was too careless in the construction of his plots to be a finished dramatic artist. He was apparently more popular among the mass of his countrymen

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than any Roman author of any age; but to be thoroughly popular | | establishment of a European peace, he made a journey

he had to satisfy the tastes of an audience accustomed to the indigenous farces of Italy. This is the defect, according to the judgment of cducated eritics in the Augustau age, which Horace indicates in the line “ Quantus sit Dossennus edacibus in parasitis.” But he had the most wonderful power of drainatic expression of feeling, fancy, and ‘eharactcr by means of action, rhythm, and language. In the line in which Horace expresses the more favour- able eriticism of his time,— “Plautus ad exemplar Siculi properare Epicharmi,””—

the term properare expresses the vivacity of gesture, dialogue, declamation, and recitative in which the plays of Plautus never fail, and which must have made them admirable velhieles for the art of the actor. The lyrical recitative occupies a much larger place in his comedies than in those of Terence, and in them he

shows the true poetical gift of adapting and varying his metres in |

accordance with the moods and fancies of his characters. But the gift for which he is pre-eminent above almost every other Roman author is the vigour and exuberant flow of his language. No other writer enables us to feel the life and force of the Latin idiom, un- disguised by the mannerisms of a literary style, in the same degree. Among the masters of expression in which the prose and poetical literature of Rome abounds, none was more prodigally gifted than Plautus, and this gift of expression was the accompaniment of the exuberant creativeness of his fancy and of the strong vitality and lively social nature which was the endowment of the race to which he belonged.

In the beginning of the 15th century only the first eight plays(from Amphitruo |

to Epidicus) were in circulation, The other twelve were recovered in the course of that century, and two new manuscripts, one of them containing the whole twenty, were discovered in the following century. The Ambrosian palimpscst,

discovered in 1815, has been recognized as the most trustworthy text for those |

plays which it preserves, and it is on this that the critical labours of Ritschl have been based. His great critical edition is being continued by his pupils G. Loewe, G, Gotz, Fr. Schoell, An edition of the plays with a commentary by Professor Ussing of Copenhagen is now nearly complete. The most useful editions of separate plays are those of Lorenz and Brix. @Yo eis”)

PLAYFAIR, Jonn (1748-1819), mathematician and | physicist, was born at Benvie, Forfarshire, where his father |

was parish minister, on March 10, 1748. He was entered the university of St Andrews. Ability for scien- tific studies must have appeared very early with him, for while yet a student he was selected to teach natural philosophy during the occasional absence of the professor.

In 1766, when only eighteen, he was candidate for the

chair of mathematics in Marischal College, Aberdeen, and, |

although he was unsuccessful, his claims were admitted to be high. Six years later he made application for the chair of natural philosophy in his own university, but again without success, and in 1773 he was offered and accepted the living of the united parishes of Liff and Benvie, vacant by the death of his father. He continued, however, to carry on his mathematical and physical studies, and in 1782 he resigned his charge in order to become the tutor of Ferguson of Raith. By this arrangement he was able to be frequently in Edinburgh, and to cultivate the literary and scientific society for which it was at that time specially distinguished; and through Maskelyne, whose acquaintance he had first made in the course of the cele- brated Schiehallion experiments in 1774, he also gained access to the scientific circles of London. In 1785 when Dugald Stewart succeeded Ferguson in the Edinburgh chair

1 “ After Plautus died, comedy mourns, the stage is deserted, then

laughter, mirth, and jest, and his numberless numbers all wept in concert,

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of moral philosophy, Playfair succeeded the former in that of mathematics. In 1802 he published a volume entitled filustrations of the Huttonian Theory of the Earth, and in 1805 he exchanged the chair of mathematics for that of natural philosophy in succession to Robison, whom also he succeeded as general secretary to the Royal Society of Edinburgh. He took a prominent part, on the liberal side, in the ecclesiastical controversy which arose in con- nexion with Leslie's appointment to the post he had vacated, and published a satirical Letter (1806) which was greatly adinired by his friends. His election as a fellow of the Royal Society took place in 1807. In 1815, after the

through France and Switzerland to Italy, and remained abroad for nearly eighteen months, interesting himself chiefly in the geology and mineralogy of the districts he visited. After a few years of gradually failing health he

| died on July 19, 1819.

A collected edition of Playfair's works, with a memoir by James G. Playfair, appeared at Edinburgh in 4 vols. 8vo. His writings include a number of essays contributed to the Edinburgh Review from 1804 onwards, various papers in the Phil. Trans. (including his earliest publication ‘‘ On the Arithmetic of linpossible Quantities,”

| 1779, and an ‘‘ Account of the Lithological Survey of Schehallion ”

1811) and in the Transactions of the Royal Society of Edinburgh (‘On the Causes which affect the Accuracy of Barometrical Measurement,” &c.), also the articles ‘‘ Mpinus” and ‘‘ Physical Astronomy,” and a ‘‘ Dissertation on the Progress of Mathematical and Physical Science since the Revival of Learning in Europe,” in the Encyclopedia Britannica (Supplement to fourth, fifth, and sixth editions). His Elements of Geometry first appeared in 1795 and have passed through many editions; his Outlines of Natural Philosophy (2 vols., 1812-16) consist of the propositions and formule which were the basis of his class lectures. Playfair's con- tributions to pure mathematics were not considerable, his paper ‘*On the Arithmetic of Impossible Quantities,” that ‘‘ On the Causes which affect the Accuracy

of Barometrical Mcasurements," and his Elements of Geometry, all already referred to, being the most im- portant. As a mathematician simply he was far inferior to the first two Gregorys, to Colin Maclaurin, and even to Matthew Stewart. He was, however, a man of great general ability and was conspicuous for a calm intellect. His scientific style was a model of clearness, and his Illustrations of the Huttonian Theory of the Earth attained great popularity through its litcrary merits. His lives of Matthew Stewart, Hutton, Robison, many of his reviews, and above all his ''Dissertation" are of the utmost value. The English mathematicians of his day professed unlinited admiration of Newton, but few of them were found able to wield his weapons, and the majority had come simply to rest under the shadow of

i | that t man; to Playfair belongs the ercdit of having been one educated at home until the age of fourteen, when he woe y g g

of the first to diffuse among his conntrymen a knowledge of the substantial progress which the infinitesimal caleulus had been making in the hands of the Continental analysts.

PLEADING, in law, denotes in civil procedure the statement in legal form of the grounds on which a party to an action claims the decision of the court in his favour, in criminal procedure the accusation of the prosecutor or the answer of the accused. The term " pleadings" is used for the collected whole of the statements of both parties, the term " pleading" for each separate part of the plead- ings. A pleading may be the statement of either party; a "plea" is (except in Scots and ecclesiastical law) confined to the defence made by an accused person. To "plead" is to frame a pleading or plea.

All systems of law agree in making it necessary to bring the grounds of a claim or defence before the court ina more or less technical form. In Roman law the action passed through three stages (see Acrion), and the manner of pleading changed with the action. In the earliest historical period, that of the legis actiones, the pleadings were verbal, and made in court by the parties themselves, the proceedings imitating as far as possible the natural conduct of persons who had been disputing, but who suffered their quarrel to be appeased (Maine, Ancient Law, ch. x.). Though pleadings were probably not couched in technical language originally, this soon became a necessity,

and was regarded as so important that, as Gaius tells us, the party who made even the most trifling mistake would lose his suit. This excessive reverence for formality is a universal characteristic of archaic law. Its probable explanation is to be found in the weakness of the execu- tive. In the second period, that of the procedure by formule, the issue which the judex decided was made up by the pretor in writing from the statements of the partics before him. ‘The formula was a short summary of the facts in dispute in technical language, with instructions to the judex. The part of the formula which contained the plaintiff’s claim was called the imtentio. Any equitable defence in the formula was set up by means of an exceptio, which was either peremptory, denying the right of the plaintiff to recover at all, or dilatory, denying only that the action could be brought at the time or by the parti- cular plaintiff. The plaintiff might meet the exceptco with a replicatio, the defendant on his side might set up a duplicatio, and the plaintiff might traverse the duplicatio by a triplicatio. The parties might proceed even further, but beyond this point the pleadings had no special names. Actions bone jfidei implied every exceptio that could be set up; in other actions the exceptio must be specially pleaded. From the formula the judex derived his whole authority, and he was liable to an action for exceeding it. He could not amend the formula; that could only be done by the pretor. In the third period the formula did not exist, the plaintiff’s claim appeared in the summons (libellus conventionis), and the defendant might take any defence that he pleased, all actions being placed on the footing of actions bone fidei. The issue to be tried was determined by the judge from the oral statements of the parties. In criminal procedure the indictment (inscriptio or libellus accusationis) was usually in writing, and con- tained a formal statement of the offence. In some cases oral accusations were allowed. The pleading of the accused seems to have been informal.

The development of the system of pleading in Roman and English law proceeded upon very similar lines. It is possible that the English system was directly based upon the Roman. Bracton (temp. Henry III.) uses many of the Roman technical terms. Pleading was oral as late as the reign of Henry VIII,

but in the reign of Edward III. pleadings began to be drawn up in writing, perhaps at first more for the purpose of entry on the court records than of the instruction of the court (see 2 Reeves, History of Linglish Law, 398). The French language was used up to 36 Edw. IIT. st. 1, ¢ 15, after which English was used for oral pleading, but Latin for enrolinent. Latin was the language of written pleadings at common law until 4 Geo. II. c. 26.1 Such terms as declaration, answer, replication are survivals of the oral period. It is no doubt from the circumstance of pleading having been originally oral that the word in the popular though not in the legal sense is used for the oral conduct of the case by an advocate? The period of the Roman formula has its analogue in the period of the original writ in England.? The writ was at first a formal commission from the crown to a judicial officer to do justice between the parties, the claim being made by means of a count. The issue of the writ was part of the prerogative of the crown, unlimited until the Provisions of Oxford (1258) forbade the issue of fresh writs (except writs de cursu) without the consent of

; * In Chancery the “English Bill,” so called from its being in the English language, had existed long before this time,—-according to Mr Spence, as early as the reign of Henry V. (Lquitable Jurisdiction, vol. i. p. 348).

; In France plaider and plaidoyer still bear this meaning.

: The original writ was so called to distinguish it from the judicial writ, which was a part of the process of the court. The judicial writs still exist, ¢.9., writs of certiorari or Jeri facias,

the council. Gradually the writ came to absorb the count and included the plaintifi’s claim and sometimes the nature of hisevidence. The defendant pleaded to the writ. The writ became the universal form of instituting proceedings in the king’s court, irrespective of the method of trial which followed, and probably grew fixed in form about the reign of Henry II. (see Bigelow, History of Procedure, ch. iv.). Ata later date the writ again tended to approach its earlier form and to split into two parts, the writ of summons and the declaration or plaintiff’s claim. The writ of summons was addressed to the defendant, and not, as the original writ, to a judicial officer. The

pleadings became the act of the party, differing in this from Roman law, in which they were a judicial act. The writs became precedents for the forms of action, which, like the writs, were limited in number. stantial repetition of the writ. Modern legislation, in the case of the specially indorsed writ of summons (see below), practically returns to this ancient stage of law. In the writ, as in the formula, the slightest failure in form was as arule fatal. “The assigning of a writ of a particular frame and scope to each particular cause of action, the appropriating process of one kind to one action and of a different kind to another, these and the like distinctions rendered proceedings very nice and complex, and made the conduct of an action a matter of considerable difficulty” (1 Reeves, Hist. of English Law, 147). Fines were levied for mistakes in pleading, non-liability to which was some- times granted by charter as a special privilege to favoured towns. In both Roman and English law fictions, equity, and legislation came to mitigate the rigour of the law. In England this result was largely attained by the framing of the action of trespass on the case under the powers of the Statute of Westminster the Second (13 Edw. I. stat. 1, c. 24), and by the extension of the action of assumpsit to non-feasance. To a less extent the same difficulties were found in the period of special pleading + which followed the writ period, owing to the particularity with which the claim had to be set out and the narrow powers of amendment possessed by the courts. practical questions at issue were thrown into the shade by questions of the proper way of stating them. Substantive law could only be arrived at through the medium of adjec- tive law. Special pleading became an art of the utmost niccty, depending on numerous rules, some of them highly technical (see Coke upon Littleton, 303). Those who made it their business to frame pleadings were called special pleaders. They were not necessarily members of the bar, but might be licensed to practise under the bar. Pleaders under the bar still exist, but recent legislation has much diminished their numbers and importance. Changes were gradually introduced by a long series of statutes of which the most important have been the Statutes of Jeofails, beginning as early as 14 Edw. IIL, c. 6, the Statutes of Set-off, the Common Law Procedure Acts, and the Judica- ture Acts. The advance has always been, as in Roman law, in the direction of less formality. Up to 1875 the system of pleading varied in the different courts which now compose the High Court of Justice. In the Common Law Courts the action was commenced by a declaration (containing either special or common counts,

or both com- bined), to which the defendant put in a plea or pleas. The plea was either of the general issue, 7.¢., a bare denial (as “Never Indebted” to an action of debt), or special, setting out the facts with greater particularity. Pleas were also peremptory or dilatory, names taken from the Roman law.

4 The ingenuity of the pleader chiefly showing itself in framing special as opposed to general pleas, the term special pleading grew to be used for the whole proceedings of which it was the most important

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By the Common Law Procedure Act, 1854, equitable pleas might be pleaded. To the defendant’s plea the plaintiff pleaded a replication ; the defendant might follow with a rejoinder, the plaintiff with a surrejomder, the defendant with a rebutter, the plaintiff with a surrebutter. Beyond that point, which was scldom reached, the pleadings had no special names. The pleadings concluded with a joinder of issue. A copy of the pleadings constituted the record. Since the Judicature Acts there has been no record, properly so called, in civil cases, though it has not been expressly abolished. Its place is supplied by copies of the pleadings delivered for the use of the judge and of the officer enter- ing the judgment under the Rules of the Supreme Court, 1883 (Ord. xxxvi. r. 30; Ord. xli. r. 1). Either party might demur at any stage of the pleadings (see DemuR- RER). In certain cases the replication of the plaintiff pro- ceeded by way of new assignment; e.g., in an action of trespass to which justification was pleaded, the plaintiff might complain of acts in excess of those covered by the justification. the defendant pleaded to the new assignment. In the Court of Chancery the plaintiff’s claim was contained in a bill (in certain matters of a public nature an information), to which the defendant filed an answer on oath or a

demurrer or, more rarely, pleas, and the plaintiff a replica- tion. Beyond the replication equity pleadings did not

extend, the place of further pleadings being supplied by | Exceptions (note again a Roman law term) |

amendment. inight be taken to the bill or answer on various grounds. Equity pleadings, unlike common law pleadings, were signed by counsel.1 In the High Court of Admiralty the pleadings were called petition, answer, reply, and conclusion. In the Court of Probate they were called declaration, plea, and replication, but the procedure was not the same as that in use in the Common Law Courts. In all the courts a special case without pleadings could by leave of the court be stated for the opinion of the court.

The Judicature Act, 1873, introduced a uniform system of pleading in the High Court of Justice. The practice is now regulated by the Rules of the Supreme Court, 1883. By Ord. xix. r. 4, “every pleading shall contain, and con- tain only, a statement in a summary form of the material facts on which the party pleading relies for his claim or defence, as the case may be, but not the evidence by which they are to be proved, and shall, when necessary, be divided into paragraphs, numbered consecutively. Dates, sums, and numbers shall be expressed in figures and not in words. Signature of counsel shall not be necessary ; but where pleadings have been settled by counsel or a special pleader they shall be signed by him, and if not so settled they shall be signed by the solicitor or by the party if he sues or defends in person.” The term “ pleading” in the Judicature Acts includes a petition or summons, 36 & 37 Vict. c. 66, § 100. From 1875 to 1883 the plaintiff had in almost every case to deliver a statement of claim. But now no statement of claim is delivered where the action iscommenced by a specially indorsed writ, or where the writ is not specially indorsed unless the defendant gives notice in writing that he requires a statement of claim to be delivered.2 The defendant presents his case in a statement of defence, and may also set of or set up by way of cownter-claim any right or claim against the plaintiff whether sounding in damages or not. A counter-claim

1 For the pleading before 1875 see Stephen on Pleading for the Common Law Courts, Story on Equity Pleading for the Court of Chancery, and the articles BILL and DECLARATION.

; 2 A specially indorsed writ may be used in an action for a debt or liquidated demand, The advantage of using it is that the defendant

must obtain leave to defend the action by showing to the satisfaction of a judge that he has reasonable grounds of defence.

In this case he was said to new assign, and |

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may be made against the plaintiff and a third party. To

,a statement of defence or counter-claim the plaintiff or

third party delivers a reply. No pleading other than a joinder of issue can be pleaded after reply except by leave of the court or a judge. Both the parties and the court or a Judge have large powers of amending the pleadings. Issues are in certain cases settled by the court or a judge. Demurrers are abolished, and a party is now entitled to raise by his pleading any point of law. Forms of plead- ings are given in Appendices C, D, and E to the Rules of 1883. In actions for damages by collision between ships, a document called a preliminary act (before the Judica- ture Act peculiar to the Court of Admiralty) must be filed, containing details as to the time and place of collision, the speed, tide, lights, &c. The case may be tried on the preliminary act without pleadings. In all actions such ground of defence or reply as if not raised would be likely to take the opposite party by surprise, or would raise issues of fact not arising out of the preceding pleadings, must be specially pleaded. Such are compulsory pilotage, fraud, the Statute of Limitations, the Statute of Frauds. The pleadings in replevin and petition of right are governed by special rules. To courts other than the High Court of Justice the Judicature Acts do not apply. In some courts, however, such as the Chancery of the County Pala- tine of Lancaster and the Court of Passage of the City of Liverpool, the rules of pleading used in the High Court have been adopted with the necessary modifications. In the Mayor’s Court of London the common law pleading, as it existed before the Judicature Acts, is still in use. In the ecclesiastical courts the statements of the parties are ealled generally pleas. The statement of the plaintiff in civil suits is called a libel, of the promoter in criminal suits articles. Every subsequent plea is

called an allega- tion. To the responsive allegation of the defendant the promoter may plead a counter-allegation. The cause is concluded when the parties renounce any further allega- tion. In the Divorce Court the pleadings are named petition, answer, replication. In that court and in the ecclesiastical courts there exists in addition a more short and summary mode of pleading called an act on petition. In the county courts proceedings are commenced by a plaint, followed by an ordinary or default summons. No further pleadings are necessary, but the defendant cannot set up certain special defences, such as set-off or infancy, without the consent of the plaintiff, unless after notice in writing of his intention to set up the special defence.

The pleading in English criminal law has been less affected by legislation than the pleading in actions. The pleading is more formal, and oral pleading is still retained. Cases in which the crown was a party early became known as pleas of the crown (placita coronx), as distinguished from common pleas (communia placita), or pleas betwecn subject and subject, that is to say, ordinary civil actions. Pleas of the crown originally included all matters in which the crown was concerned, such as exchequer cases, franchises, and liberties, but gradually became confined to criminal matters, strictly to the greater crimes triable only in the king's courts. In criminal pleading the crown states the case in an indictment or mformation. The answer of the accused is a plea, which must in almost all cases be pleaded by the accused in person. The plea, according to Blackstone, is either to the jurisdiction, a demurrer, in abatement, special in bar, or the general issue. The latter is the only plea that often occurs in practice ; it consists in the oral answer of "Guilty" or "Not Guilty" to the charge. A demurrer is strictly not a plea at all, but an objection on legal grounds. Pleas to the jurisdiction or in abatement do not go to the merits of the case, but allege that the court has no jurisdiction to

try the particular offence, or that there is a misnomer or some other technical ground for stay of proceedings. The power of amendment and the procedure by motion in arrest of judgment have rendered these pleas of little practical importance. The special pleas in bar are autre- fois convict or

autrefors acquit (alleging a previous convic- tion or acquittal for the same crime), autrefors attaint (practically obsolete since the Felony Act, 1870, has abolished attainder for treason or felony), and pardon (see Parpon). There are also special pleas in indictments for libel under the provisions of Lord Campbell's Act, 6 & 7 Vict. c. 96 (see LiBEL), and to indictments for non-repair

of highways and bridges, where the accused may plead |

that the liability to repair falls upon another person. These special pleas are usually, and in some cases must be, in writing. Where there is a special plea in writing, the crown puts in a replication in writing. (For the history of criminal pleading see Stephen, History of the Criminal Law, vol. i. ch. ix.)

In Scotland an action in the Court of Session begins by a swm-

dence, containing the allegations in fact on which the action is founded. The pleas in law, or statement of the legal rule or rules relied upon (introduced by 6 Geo. IV. e. 120, § 9), are subjoined to the condescendence. The term /ivel is also used (as in Roman law) as a general term to express the claim of the pursuer or the accusation of the prosecutor. The statement of the defender, including his pleas in law, is called his defences. y é dilatory or peremptory. There is no formal joinder of issue, as in England, but the same end is attained by adjustment of the plead- ings and the closing of the record. Large powers of amendment and revisal are given by the Court of Session Act, 1868. In the

Sheriff Court pleadings are very similar to those in the Court of |

Session. They are commenced by a petition, which includes a con- descendence and a note of the pursuer's pleas'in law. The defender may upon notice lodge defences. The procedure is now governed by 39 & 40 Vict. c. 70. The term 'pleas of the crown" is confined in Scotland to four offences—murder, rape, robbery, and fire-raising. A prosecntion is commenced either by indictment or criminal letters, the former being the privilege of the lord advocate. In the Supreme Court the indictment or criminal letters ran in the name of the lord advocate ; in the Sheriff Court the criminal letters (indictinents not being used in that court) run in the

name of the judge. The Scotch indictment differs from the English, and is in the form of a syllogism, the major proposition stating the nature of the crime, the minor the actual offence committed and that it constitutes the crime named in the major, the conclusion that on conviction of the panel he onght to snffer punishment. The panel nsually pleads “Guilty” or ‘Not Guilty” as in England, but he may plead in bar want of jurisdiction or res judicata, or make special defences (such as alibi or insanity), which must be lodged with the clerk of the court in writing signed by him or his counsel. The

special defence is read to the jury immediately after they have been |

sworn. (See Macdonald, Criminal Law of Scotland.)

In the United States two systems of pleading in civil procedure exist side by side. Up to 1848 the pleading did not materially differ from that in use in England at the same date. But in 1848 the New York legislature made a radical change in the system, and the example of New York has been followed by more than twenty States. The New York Civil Code of 1848 established a uniforni procedure called the civil action, applicable indifferently to common law and equity. The pleadings are called complaint, answer (which includes counterclaim), and reply. The demurrer also is still used. In some States which follow the new procedure the complaint bears the name of petition. In the inferior courts, such as eourts of justices of the peace, the pleadings are more simple, and in many cases oral. In States which do not adopt the amended procedure, the pleading is much the same as it was in the days of Blackstone, and the old double jurisdiction of com- mon law and eqnity still remains. Criminal pleading differs little from that in use in England. (See Bishop, Law of Criminal Pro- cedure.) (J. WT.)

PLEBEIANS. See Nozrnrry and Rome.

PLEDGE, or Pawn, in law, is “a bailment of personal

property as a security for some debt on engagement” | established by Conybeare in 1821, and including numerous

1 3 : | Species, some of which may have attained a length of as denote the property which constitutes the security. Pledge |

(Story on Bailments, The term is also used to

§ 286). is the pignus of Roman law, from which most of the modern law on the subject is derived. It differs from hypothec and from the more usual kind of mortgage in

eae | him, or a pledge of property with which he was intrusted

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that the pledge is in the possession of the pledgee ; it also differs fron1 mortgage in being confined to personal pro- perty. A mortgage of personal property in most cases takes the name and form of a bill of sale (see Brit, the giving of bills of ‘sale being now regulated by the Bills of Sale Acts, 1878 and 1882). The chief difference between Roman and English law is that certain things, e.g., wearing apparel, furniture, and instruments of tillage, could not be pledged in Roinan law, while there is no such restriction in English law. In the case of a pledge, a special property passes to the pledgee, sufficient to enable him to maintain

an action against a wrongdoer, but the general property,

that is the property subject to the pledge, remains in the pledgor. As the pledge is for the benefit of both parties,

_ the pledgee is bound to exercise only ordinary care over

delivery, such as money or negotiable securities. mons on the part of the pursuer to which is annexed a condescen- |

the pledge. The pledgee has the right of selling the pledge if the pledgor make default in payment at the stipulated time. No right is acquired by the wrongful sale of a pledge except in the case of property passing by In the case of a wrongful sale by a pledgee, the pledgor cannot recover the value of the pledge without a tender of the amount due. For pledges by factors see

Facror. A pledge by a banker, merchant, broker, attorney, or other agent, in violation of good faith, and contrary to the purpose for which the property pledged was intrusted to

for safe custody, renders the offender guilty of a mis-

demeanor, punishable with a maximum term of seven years' penal servitude, 24 & 25 Vict. c. 96, §§ 75, 76. Pledges with pawnbrokers are regulated by the Pawn- brokers' Act, 1872, 35 & 36 Vict. c. 93 (which applies to Great Britain). By the provisions of the Act (which does not affect loans above £10), a pledge is redeemable within one year and seven days of grace added to the year. Pledges pawned for 10s. or under not redeemed in time become the property of the pawnbroker, pledges above 10s. are redeemable until sale. The sale must be by public auction. The pawnbroker is entitled to charge as interest one halfpenny per month on every two shillings' lent where the loan is under 40s., on every two shillings and sixpence where the loan is above 40s. Special con- tracts may be made where the loan is above 40s. Unlaw-

| ful pawning of goods not the property of the pawner, and

taking in pawn any article from a person apparently

under the age of sixteen or intoxicated, or any linen or

apparel or unfinished goods or materials intrusted to wash, make up, &c., are (inter alia) made offences punishable by summary conviction. An annual licence, costing £7, 10s., must be taken out for every pawnbroker's shop.

The law of Scotland as to pledge generally agrces with that of England, as does also that of the United States. The main differ- ence is that in Scotland and Louisiana a pledge cannot be sold unless with judicial authority. In some of the States the common law as it existed apart from the Factors' Acts is still followed; in others the factor has more or less restricted power to give a title by pledge. In some States pawnbroking is regulated by the local authorities, and not, as in most, by the general law of the State.

PLESIOSAURIANS. The remarkable extinct marine reptiles included in the group of the Plesiosauria (or Sauropterygia, as they are sometimes called) existed during the whole of the Mesozoic period, that is, from Triassic

| into Cretaceous times, when they appear to have died

out. The best known of these reptiles, and that which

| gives its name to the group is the Plesiosaurus, a genus

much as 20 feet. The nearly allied Zlasmosaurus of North America, however, reached a much greater size, its

Temains indicating an animal about 45 fect in length.

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Several almost perfect skeletons of Plesiosawrus having at

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different times been found, the general proportions of the body are well known. Although the different species vary in regard to proportions, the small size of the head and extreme length of the neck are always striking points in the skeleton of a Plesiosawrus, while the tail is propor- tionately short. The limbs, both fore and hind, are well developed and modified for swimming, the forms of the various bones making it clear that the digits of each limb were not separate, but enclosed in one covering of integu- ment, as in the flippers of a whale or a turtle. The exterior of the body, there is every reason to believe, was smooth as it is in Cetacea, and not provided with either

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Fia. 1.—Plesiosawrus (after Owen),

rostrum. On the base of the skull four fossz are to be |

seen; the front pair of these are bounded behind by the

palatine bones, and are regarded as the true posterior |

nares. The teeth are slender, sharp, curved, and striated ; they have single fangs, and are placed loosely in separate alveolar sockets.

The spinal column is composed of a large number of |

vertebrae, some species having ninety or more in the entire series. The centrum of each vertebra has the fore and hind surfaces slightly concave; the neural arch is con- nected with the centrum by a suture, which seems never to have been entirely obliterated. The cervical vertebrze vary in number from twenty-four to upwards of forty in different species. Each is provided with a pair of ribs, closely resembling those found in the cervical region in the crocodile, but with a single articular head only. Towards the hinder part of the neck the ribs become more elongated, and take on the form of dorsal ribs; but, as none of the ribs join the sternum, the usual means of dis- tinguishing the dorsal and cervical regions is wanting. There may be from twenty to thirty dorsal vertebre. True sternal ribs have never been detected ; but abdominal

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Fig. 2. Fig. 3.

Fig, 2,-—Pectoral arch of Plestosaurus, seen from below (after Hulke). coracoid; sc, scapula; pe, precoracoid; ost, omosternum. j

Fig. 3.—Pelvic arch of Plestosaurus, from above (after Huxley). is, ischium; pb, pubis ; él, ilium.

bones, or ribs, are well developed. The sacrum consists of two vertebra, with stout broad ribs for attachment to the iliac bones. The caudal vertebra, between thirty and forty in number, have distinct chevron bones, which are attached between the successive vertebrae. The pectoral arch (fig. 2) consists of a large coracoid on each side, in

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bony or horny scutes or scales as in the living crocodiles and turtles. The internal skeleton therefore is the only part available for study.

The skull of Plestosawrus has a tapering and depressed snout, and in consequence of the large size of the pre- maxillary bones the nasal apertures are placed far back, just in front of the orbit, as in birds. There is a distinct parietal foramen, as in lizards. The orbit is completely surrounded by bone, and there are supra- and infra- temporal fossz. The single occipital condyle is formed almost entirely by the basi-occipital bone. The basi- sphenoid is well developed, and is produced into a long

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front and outside of which is a peculiarly shaped scapula with a plate extending dor- sally from the glenoid cavity, and a second process directed inwards and downwards. The latter process is now regarded as the precoracoid by Mr J. W. Hulke, who also considers the plate of bone—originally of two pieces—found in the middle and in front of the coracoids to be the homologue _ of the omosternum of Batrachia. If this interpretation be correct, Plesiosaurus has neither clavicles nor interclavicles. .In the fore limb all the characteristic bones are present. The humerus is an elongated bone with the anterior border nearly straight and the hinder border concave ; it is rounded at the upper end, and flat- tened below, where it is articulated to two much shorter bones, the radius and ulna. Next to these is a row of three carpal bones—the radiale (scaphoid), the ulnare (cuneiform), and the intermedium (lunar) ; a second row of four bones succeeds these, three of which are carpals, but the outer one may be a metacarpal; next comes a row of five metacarpals. The digits are five in number, and with the exception of the first are made up of numerous separate ossicles, or phalanges.

The pelvic arch (fig. 3) is large, and ventrally consists of a pair of flattened more or less quadrate pubes, and a pair of somewhat triangular ischia. The iliac bones are elongated, narrower where they form part of the acetabular articula- tion and becoming broader above where they join the sacral ribs. The hind limb very closely resembles the fore limb. The front and back margins of the femur are straighter than they are in the humerus; but the other parts almost exactly repeat the corresponding bones of the fore limb.

With regard to the probable habits of the Plesiosaurus we are not without some indications. The paddle-like form of the limbs leaves no doubt as to its aquatic mode of life, and judging from the fossils with which it is usually asso- ciated it must have been an inhabitant of the sea; it is highly probable, however, that some species at least ascended rivers, for remains of Plesiosauria are found in the Wealden freshwater deposits. The comparatively small tail and large paddles render it probable that the limbs were the chief means of propulsion. The long neck would tend to impede its progress through the water, and it would be better adapted, therefore, for swimming on or near the surface. It is unlikely that the Plestosaurus could move as rapidly through the water as the Ichthyosaurus; but this slower movement would be compensated for by the rapidity with which its long and flexible neck could be darted at its prey. Seeing that the marine turtles and seals of the | present day make their way on shore, it is quite possible _ that the Plesiosawrus may also have occasionally visited the

land. The sharp and slender teetli would be admirably | adapted for catching and holding a slippery prey, and there is no doubt that fishes formed in part, if not altogether, its natural food. Indeed the scales and teeth of fishes have been found, in one case at least, just below the vertebre, in the region which must have been occupied by the creature’s stomach.

It is of interest to note the differences whieh exist between the Plesiosaurus and the IcHTHYOSAURUS (q.v.), the latter being the type of another group, the Ichthyosauria, which is by some palzontolo- gists included with the Plestosauria in a larger group ealled Hnalio- sauria. In outward form the Ichthyosaurus must have resembled some of the reeent Cetacea, inasmueh as the head is proportionately large, and without any appearance of a neck

joins direetly on to the trunk. The hind limbs are smaller than the front ones, and the bones of both limbs are mueh more shortened and flattened than in Plestosawrus ; in addition to this there are supernumerary rows of bones, besides the five typieal digital series. The pectoral areh differs in having distinet elavieles and interelavieles. The vertebre are short from baek to front, deeply bieoncave, and their neural arehes never have a bony connexion with the eentra. There is no saerum. The teeth are placed in a groove, and not in separate sockets. The eye-ball was protected by a series of bony selerotic plates, whieh are not found in Plesiosaurus.

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The group Plestosauria ineludes several other genera besides the Plesiosaurus ; but most of these are only represented by such imperfeet speeimens that the distinetions between them, as at present known, are far from satisfactory. The characters whieh have been relied upon for their separation are to be found chiefly in the strueture of the peetoral areh, limbs, and vertebre. Plesiosawrus is only certainly known to have existed from the time of the Lower Lias to the Chalk ; and it is especially characteristic of the Lias. More than fifty species, sometimes placed in several subgenera, have been deseribed from different localities in Britain, some of which are represented by remarkably perfect specimens, and others by fragments only. This genus has a wide geographical distribu- tion, species having been named from Seeondary strata, on the con- tinent of Europe, in India, Australia, South Ameriea, and North America, The closely allied and gigantic form Pliosaurus is ehiefly charaeteristie of the English Oolites.

In European Triassie beds, Plesiosauria are represented by such genera as Nothosaurus, Simosaurus, and Pistosaurus, in all of whieh the neural arches seem to have been less elosely united to the vertebral eentra than in Plestosaurus. Neusticosaurus is another Triassie form, remarkable, not only on aeeount of its small size, being less than 12 inches in length, but also beeause its limbs seem to show a transitional eondition ; for, while the structure of the hind limb resembles that of a land reptile, the fore limb seems to have had more the structure of a paddle.

A number of forms closely related to the Plesiosaurus have been described from roeks of Cretaceous age in North America under the following generie names —- Cimoltiasaurus, Elasmosaurus, Oligo- simus, Piratosaurus, and Polycotylus. Of these the Elasmosaurus is better known than any of the others. It was an extremely elon- gated form, as may be gathered from the faet that the snake-like neek alone consisted of more than sixty vertebre,— the entire body, as we have notieed above, being more than 45 feet in length.

Sce Conybeare, Trans. Geol. Soc., ser. 1, vol. v. p, 559, 1821, and ser. 2, vol. i, p. 103, 1824; Owen, Brit. Assoc. Rep.,' 1839, Hi 43: Hawkins, Great Sea Dragons, 1840; Phillips, Valley of the Thames, 1871; Huxley, Anat. of Vert. Anim., 1871, p. 208; Nicholson, Palxontology, vol. fi. p. 218, 1879; Sollas, Quart. Journ. Geol. Soc., vol. xxxviii. p. 440, 1881; Hulke, Presidential Address, Geol. Soc., 1883 ; Leidy, ' Fossil Vertebrates," in Report U.S. Geol. Surv. Terri. tories, vol, i., 1873; and Cope, ibid., vol. ii,, 1875.

PLETHO. See Gemisrvs.

PLEURISY, or Prevriris, inflammation of the pleura or serous membrane investing the lungs and lining the interior of the thoracic cavity. It isa common form of chest complaint, and may be either acute or chronic, more frequently the former. _ The morbid changes which the pleura undergoes when inflamed are similar to those which take place in other Serous membranes, such as the peritoneum (see PERITONI- Tis), and consist of three chief conditions or stages of pro- gress. (1) Inflammatory congestion and infiltration of the pleura, which may spread to the tissues of the lung on the one hand, and to those of the chest wall on the other. (2) Exudation of lymph on the pleural surfaces. This lymph is of variable consistence, sometimes composed of thin and easily Separated pellicles, or of extensive thick masses or strata, or again showing itself in the form of a tough membrane. It is of greyish-yellow colour, and

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microscopically consists mainly of coagulated fibrinc along

| with epithelial cells and red and white blood corpuscles.

Its presence causes roughening of the two pleural surfaces, which, slightly separated in health, may now be brought into contact by bands of lymph extending between them. These bands may break up or may become organized by the development of new blood-vessels, and adhering permanently may obliterate throughout a greater or less space the pleural sac, and interfere to some extent with the free play of the lungs. (8) Effusion of fluid into the pleural cavity. This fluid may vary in its characters. Most commonly it is clear or slightly turbid, of yellowish-green colour, sero-fibrinous, and containing flocculi of lymph. In bad constitutions or in cases where the pleurisy complicates some severe form of .disease, ¢.g., the acute infectious maladies, it is deeply-coloured, bile-stained, sero-purulent, purulent, or bloody, occasionally containing bubbles of air from decomposition. The amount may vary from an almost inappreciable quantity to a gallon or more. When large‘in quantity it may fill to distension the pleural sac, bulge out the thoracic wall externally, and compress more or less completely the lung, which may in such cases have all its air displaced and be reduced to a mere fraction of its natural bulk lying squeezed up upon its own root. Other organs, such as the heart and liver, may in conse- quence of the presence of the fluid be shifted away from their normal position. In favourable cases the fluid is absorbed more or less completely and the pleural surfaces again may unite by adhesions; or, all traces of inflammatory products having disappeared, the pleura may be restored to its normal condition. When the fluid is not speedily absorbed it may remain,long in the cavity and compress the lung to such a degree as to render it incapable of re-expansion as the effusion passes slowly away. The consequence is that the chest wall falls in, the ribs become approximated, the shoulder is lowered, the spine becomes curved and internal organs permanently displaced, while the affected side scarcely moves in respiration. Some- times the unabsorbed fluid becomes purulent, and an empyzma is the result. In such a case the matter secks vent in some direction, and it may point as an abscess upon the chest or abdominal wall, or on the other hand burst into the lung and be discharged by the mouth. It must be observed that many cases of pleurisy do not reach the stage of

effusion, the inflammation terminating with the exudation of lymph. To this form the term dry pleurisy is applied. Further pleurisy may be limited to a very small area, or, on the contrary, may affect throughout a greater or less extent the pleural surfaces of both lungs.

Pleurisy frequently arises from exposure to cold ; hence it is more common in the colder weather ; but besides this various other causes are connected with its occurrence. Thus it is often associated with other forms of disease within the chest, more particularly pneumonia, bronchitis, and phthisis, and also occasionally accompanies pericarditis. Again it is apt to occur as a secondary disease in certain morbid constitutional states, ¢g., the infectious fevers, rheumatism, gout, Bright's disease, diabetes, &c. Further, wounds or injuries of the thoracic walls are apt to set up pleurisy, and the rupture of a phthisical cavity in the lungs causing the escape of air and matter into the pleura has usually a similar effect.

The symptoms of pleurisy vary, being generally well- marked, but sometimes obscure. In the case of dry pleurisy, which is on the whole the milder form, the chief symptom is a sharp pain in the side, felt especially in breathing. Fever may or may not be present. here is slight dry cough; the breathing is quicker than natural, and is shallow and of catching character. If much pain is present the body leans somewhat to the affected side, to

relax the tension on the intercostal muscles and their covering, which are even tender to touch. On listening to the chest by the stethoscope the physician recognizes sooner or later "friction," a superficial rough rubbing sound, occurring only with the respiratory acts and ceasing when the breath is held. It is due to the coming together during respiration of the two pleural surfaces which are roughened by the exuded lymph. The patient may himself be aware of this rubbing sensation, and its vibration or fremitus may be felt by the hand laid upon the thoracic wall during breathing. This form of pleurisy may be limited or may extend over the greater part of one or both sides. It is a not unfrequent complication of phthisis in all its stages. In general it disappears in a short time, and complete recovery takes place ; or on the other hand extensive adhesions may form between the costal and pulmonary surfaces of the pleura, preventing uniform -expansion of the

lung in respiration, and leading to emphysema. Although not of itself attended with danger, dry pleurisy is sometimes preliminary to more serious lung disease, and is always therefore to be regarded while it lasts with some degree of anxiety.

Pleurisy with effusion is usually more severe than dry pleurisy, and, although it may in some cases develop insidi- ously, it is in general ushered in sharply by rigors and fever, like other acute inflammatory diseases. Pain is felt in the side or breast, of a severe cutting character, referred usually to the neighbourhood of the nipple, but it may be also at some distance from the affected part, such as through the middle of the body or in the abdominal or iliac regions. This transference of the pain occasionally misleads the medical examiner. The pain is greatest at the outset, and tends to abate as the effusion takes place. A dry cough is almost always present, which is particularly distressing owing to the increased pain the effort excites. The breathing is painful and difficult, tending to become shorter and shallower as the disease advances and the lung on the affected side becomes compressed. The patient at first lies most easily on the sound side, but as the effusion increases he finds his most comfortable position on his back or on the affected side. When there is very copious effusion and, as is apt to happen, great congestion of the other lung, or disease affecting it, the patient’s breathing may be so embarrassed that he cannot lie down.

On physical examination of the chest the following are among the chief points observed. (1) On inspection there is more or less bulging of the side affected, obliteration of the intercostal spaces, and sometimes elevation of the shoulder. (2) On palpation with the hand applied to the side there is diminished expansion of one-half of the thorax, and the normal vocal fremitus is abolished. Should the effusion be on the right side and copious, the liver may be felt to have been pushed downwards, and the heart somewhat displaced to the left ; while if the effusion be on the left side the heart is displaced to the right. (3) On percussion there is absolute dulness over the seat of the effusion. If the fluid does not fill the pleural sac the floating Iung may yield a hyper-resonant note. (4) On auscultation the natural breath sound is in- audible over the effusion. Should the latter be only partial the breathing is clear and somewhat harsh, with or without friction, and the voice sound is zegophonic. Posteriorly there may be heard

tubular breathing with wegophony. These various physical signs render it im- possible to mistake the disease for other maladies the Symptoms of which may bear a resemblance to it, such as pleurodynia.

_ The absorption or removal of the fluid is marked by the disappearance or diminution of the above-mentioned physical signs, except that of percussion dulness, which |

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may last a long time, and is probably due in part to the thickened pleura. Friction may again be heard as the fluid passes away and the two pleural surfaces come together. The displaced organs are restored to their position, and the compressed lung re-expanded. Fre- quently this expansion is only partial, and consequently, as already indicated, the chest falls in, the respiration on one side is imperfectly performed, and the patient remains permanently short in breathing to a greater or less degree.

In most instances the termination is favourable, the acute symptoms subsiding and the fluid (if not drawn off) gradually or rapidly becoming absorbed, sometimes after re-accumulation. On the other hand it may remain long without undergoing much change, and thus a condition of chronic pleurisy becomes established. Such cases are to be viewed with suspicion, particularly in those who are predis- posed to phthisis, of which it is sometimes the precursor.

Pleurisy may exist in a latent form, the patient going about for weeks with a large accumulation of fluid in his thorax, the ordinary acute symptoms never having been present in any marked degree. Cases of this sort are often protracted, and their results unsatisfactory as regards complete recovery.

The chief dangers in pleurisy are the occurrence of a large and rapid effusion, particularly if both sides be affected, causing much embarrassment to the breathing and tendency to collapse; the formation of an empyxma (often marked by recurring rigors and hectic symptoms) ; severe collateral congestion of the other lung; imperfect recovery ; and the supervention of phthisis. Further the consequences are apt to be more serious where pleurisy exists as a complication of some pre-existing disease.

The treatment of pleurisy need only be alluded to in general terms. It will necessarily depend as regards details upon the form and severity of the attack. One of the first symptoms calling for treatment is the pain. Opiates in the form of morphia or Dover's powder are useful along with the application to the chest of hot poultices or fomentations sprinkled with turpentine. In severe cases much relief to the pain and difficulty of breathing may be afforded by the application of a few leeches to the side. Cases of simple dry pleurisy usually soon yield to such treatment, aided if need be by the application of a fly-blister or of iodine to the chest. The fixing as far as possible of the one side of the thorax by means of cross straps of adhesive plaster according to the plan recom- mended by Dr Roberts seems of use in many instances. In the case of pleurisy with effusion, in addition to these measures, including blistering, the internal use of saline cathartics and diuretics appears to be often of service in diminishing the amount of the fluid in the pleural cavity, as are also powerful diaphoretics such as pilocarpin. When these measures fail to reduce the effusion the question of the artificial removal of the fluid comes to be considered. The operation (thoracentcsis) was practised by the ancient physicians, but was revived in modern times by Trousseau in France and Bowditch in America, by the latter of whom an excellent instrument was devised for emptying the chest, which, however, has been displaced in practice by the still more convenient aspirator. The propriety of this proceeding in pleurisy with eflu- sion has been much discussed, but there now appears to be a gencral consent that in cases of extensive accumulation, when other means such as those briefly referred to fail to reduce or remove the fluid in a short time, the only hope of preventing snch compression of the lung as will impair its function lies in the performance of thoracentesis. All the more will the operation be justifiable if the accumulated fluid is interfering with the function of other organs, such as the heart, or is attended with marked embarrassment of the breathing. The chest is punctured in the lateral or posterior regions, and in most cases the greater portion or all of the fluid may be safely drawn off. In genera] the operation is unattended with danger, although not entirely exempt from such risks as sudden syncope, and therefore not to be undertaken without due vigilance as well asa careful consideration of the individual case and its associa- tions. In many instances not only is the removal of distressing symptoms speedy and complete, but the lung is relieved from pressure in

time to enable it to resume its normal function. When there is any evidence that the fluid is purulent the operation should be performed early. In such cascs it is sometimes necessary to establish for a time a drainage of the pleural cavity by surgical measures.

The convalescence from pleurisy requires careful tending, and the state of the chest should be inquired into from time to time, in view of the risks of more serious forms of lung discase super- vening. (J. O. A.)

PLEURO-PNEUMONIA. See Murratn, ». 60. PLEVNA, or PLeven, the chief town of one of the pro- vinces in the principality of Bulgaria, lies in the midst of a series of hills (whose crests rise above it for 200 to 600 feet) and about 6000 yards to the east of the river Vid (a tributary of the Danube), into which the streamlets by which it is traversed discharge. Its position at the meet- ing place of roads from Widdin, Sofia, Shipka, Biela, Zimnitza, and Nikopoli gives it a certain military import- ance, and in the Russian campaign of 1877 it became one of the great centres of operation. The Russians, who had been defeated in two minor attacks on the 20th and 30th of July, were again repulsed with a loss of 18,000 men in an assault (September 7-13) in which they em- ployed 75,000 infantry and 60,000 cavalry. They formally invested the town on October 24th and obliged Osman Pasha to surrender on December 10th. In 142 days the assailants had lost 40,000 men and the defenders 30,000. Plevna, which contains two old Christian churches as well as a number of mosques, had 11,129 inhabitants in 1881, the province at the same date containing 100,870.

See F. V. Greene, The Russian Army and its Campaigns in Turkey in 1877-78, London, 1879.

PLEYEL, Ienaz JosepH (1757-1831), though now almost forgotten, was once one of the most popular com- posers in Europe. He was born at Ruppersthal, near Vienna, June 1, 1757, studied the pianoforte under Van Hal (known in England as Vanhall), and learned com- position from Haydn, who became his dearest friend. He was appointed maitre de chapelle at Strasburg in 1783 ; and in 1791 he was invited to London, where, though Haydn was also there, he achieved an immense success. On his return to

Strasburg he narrowly escaped the guillo- tine; but, after proving that he was not an aristocrat, he was permitted to remain until 1795, when he migrated to Paris. Here he opened a large music shop, published the first complete edition of Haydn's quartetts, and founded, in 1807, the pianoforte manufactory which still bears his name. He died at Paris, November 14, 1831.

Pleyel's compositions are very numerous, but it is only in the earlier ones that the fire of true genius is discernible. His daughter-in-law, Maria Pleyel, —née Moke (1811-1875), and wife

of his cldest son, Camille,—was one of the most accomplished pianistes of the age.

PLINY, tHe Naruratist (23-79 a.p.). Caius Plinius Secundus, commonly distinguished as the elder Pliny, the author of the Vatural History, is believed to have been born (23 a.p.) at Novum Comum (Como). In the first sentence of his preface he calls Catullus, born at Verona, "'conterraneum meum," meaning, perhaps, a native of Gallia Cisalpina, though it may be that Verona was the actual birthplace of both. At Comum, however, was the family estate which the younger Pliny inherited from his uncle. Like his nephew, the elder Pliny had seen military service, having joined the campaign in Germany under L. Pomponius Secundus ;? like him also, he had been a pleader in the law-courts, and a diligent student of Greek and Roman literature. Much of his literary work was done, he tells us himself, in the hours stolen from sleep. Of his many works the Naturalis Historia in thirty-seven books has alone been preserved, and in a nearly complete state. This voluminous treatise professes to be an encyclo- peedia of Roman knowledge, mainly based on the researches and speculations of the Greeks. What A. von Humboldt

- But, as has been shrewdly remarked by Mr Long, "this some- what barbarous word is much better adapted to intimate that Catullus was oe ae of Pliny than that he was a fellow-townsman."

e Vita Pomponi Secundi duo (libri)" are enumerated among

his uncle's works by the younger Pliny, Zp. iii. 5, § 8, who adds, "a

quo ee amatus hoc memorie amici quasi debitum munus eXsolvit.

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accomplished in our own times, in his great work Cosmos, Pliny had essayed to carry out on similar principles,—but, of course, without the scientific knowledge, and also with- out the comprehensive view of the universe which is the inheritance of the present age. Pliny, we must admit, was an industrious compiler, but he was not, like Aristotle, a man of original research.?

In his first book, which contains a summary of the whole work, he names the authors, both Greek and Latin, from which the matter of each book was derived. The list indeed is a surprising one, and of comparatively few have we any remains. Among Roman authors he most frequently cites Cato the censor, M. Varro, Celsus, Cor-

nelius Nepos, Pomponius Mela, Columella; among tlie

Greeks, Aristotle, Theophrastus, Democritus, more than oneApollodorus, Apollonius of Pergamum, and Hippocrates. The Latin writers he calls simply “auctores ;” the Greeks, of whom the list is considerably longer, are ‘‘ externi.”

The preface, written in a rather inflated and by no means clear style, very inferior to the Latinity of the younger Pliny, is a dedication of the work in a strain of extravagant adulation to Titus, who was then, as Cesar, joint emperor with his father Vespasian. Pliny apologizes for dedicating to such a man a work of such commonplace and hackneyed subject-matter, but he pleads the novelty of the undertaking, and boasts of being the first who had attempted so comprehensive a theme.

The work itself commences with a pantheistic definition of the universe, J/undus, 2.e., world and sky, and the sun and stars in space, This, he says, is

reasonably regarded as a divinity—eternal, boundless, uncreated, and indestructible. Nature, he adds, and Nature's work are one, and to suppose there is more than one universe is to believe there can be more than one Nature, —which he calls "furor." His theology is "agnostic," or Epicurean ; if there is any God, he says, it is vain to inquire His form and shape; He is entirely a Being of feeling and sentiment and intelligence, not of tangible existence. He believes in the "religion of humanity," according to a rather recent definition of the idea. God is what Nature is; God cannot do what Nature cannot do ; He cannot kill Himself, nor make mortals immortal, nor raise the dead to life, nor cause one who has lived never to have lived at all, or make twice ten anything else than twenty. The last sentence of his work is remarkable, and is characteristic of a pagan piety which takes Nature alone for its God :— "Salve, parens rerum omnium Natura, teque nobis Quiritium solis celebratum esse numeris omnibus tuis fave" (xxxvii. 205).

But, although he regarded nature as one whole, of the great doctrine of the unity of nature and the tendency of all its operations to one definite end Pliny had no correct He had a great store of ill-digested knowledge, not only imperfect in itself, but put together on no consistent plan. His style too is forced and somewhat pedantic, so that to read through and understand even a single book 1s by no means a light task.

To give an outline sketch of the Natural History, it may be said that book ii. treats of carth, stars, meteorics, and terrestrial phcno-

mena, such as earthquakes, elevation of islands, &c. Books iti. to vi. inclusive are devoted toa geographical account of the known

3 He claims for himself " ingenium perquam mediocre," Pref. § 12. His nephew (iii. 5, § 8) calls it "acre ingenium," which may mean active and energetic.

4 Hence he reckons the number of books at 36, the subject begin- ning with Book ii. The matter of these, he says, comprising 20,000 points worthy of attention, he has collected from the perusal of about 2000 books, and from 100 Roman authors of special note (ex exquisitis auctoribus centum), Pref. §17. The first book the author regards as an appendix to the dedicatory

letter or preface, “ Quia occupationi- bus tuis publico bono parcendum erat, quid singulis contineretur libris huic epistule subjunxi,” Pref. § 33.

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world, in giving which the author makcs no mention of Strabo. Book vii. contains a physical treatise on man, his form, the laws of his birth, age, mental qnalities, &e. Book viii. treats of the larger beasts, as elephants, lions, tigers, camcls, descending to snakes, crocodiles, and the smaller and domesticated animals. Book ix. includes marine animals of all kinds, fishes, shells, crustaceans, sponges, &c. Book x. is on birds, xi. on insects,—thc latter half being devoted to an anatomical description of animals generally. Book xii. is on trees; xiii. on tlfcir products, fruit, gums, perfumes, &c. ; xiv. on the grape and the making of wine; xv. on the olive, fig, apple, and other luscious fruits ; xvi. on forest trees, canes, and reeds, kinds of timber, and different ages of trees. Book xvii. treats chiefly of the culture of trees, their diseases, and the arts of pruning, manuring, training, &c. Book xviii. is on farming and cereal crops ; xix.’on other kinds of produce, including horticulture ; xx. on the medicinal properties of plants ; xxi. on flowers, bees, honey, and on botanical distinctions as to leaves, thorns, and times offlowering. Book xxii. treats of all kinds of herbs used in medicine and in cookery ; xxiii. the medicinal properties of cultivated trees ; xxiv. the same of forest trees, and their useful products generally. (These two books are chiefly derived from Greek anthorities, and include the names and properties of a vast number of species.) Books xxv. to xxvii. inclusive treat of the properties of plants, and these books also are chiefly from Greek sources,—Cornelius Celsus being the principal Roman authority. Books xxviii. to xxx. discuss the medicinal properties residing in animals; xxxi. and xxxii. those in fishes. These books are full of the most extraordinary and nonsensical superstitions, including discnssions on magic in book xxx. Book xxxiii. is on the nature and use of the precious metals ; xxxiv. on the different kinds of bronze, on lead, iron, and the oxides generally. Book xxxv. is on the origin and practice of painting ; xxxvi. on the different kinds of stone and marble, includ- ing lime, sand, and gypsum; xxxvii. on precions stones.

It will be observed tliat, though there is no scientific classifica- tion in this long work, a kind of sequencc, not altogether unphilo- sophical, is observed. The amount of matter and the number of subjects treated of in each book are always recorded at the end of the epitome (book i.), just before the list of authors, in the formula, “Summa: res et histori et observationes MDCVI.” &c.; but in the medical books, in place of res, “subjects,” medicine, “prescriptions,” is used. By historiw# he means “ inquiries,” or “the results of inquiries,” as distinguished from observationes, “remarks, ”

With all its faults, inevitable to the infant state of science, Pliny’s work is an astounding monument of in- dustry. It is believed to have been published about two years before his death. He wrote, besides several other treatises,1 a history of the wars from the first in Germany,” in twenty books, and a continuation of the history of Aufidius Bassus down to his own times, in thirty-one books —all now lost.

He is said to have been a great student, an early riser, abstemious and temperate in his meals.? In his later days he appears to have grown somewhat unwieldy and asth- matic, for Pliny the younger, in describing his uncle’s death by suffocation from the fumes in the eruption of Vesuvius, 79 a.D., says that his breathing “ propter ampli- tudinem corporis gravior et sonantior erat.”4 Pliny’s intimate friendship with Vespasian may be inferred from his custom of attending the morning levée; he seems to have first known him in the German wars in the time of Claudius.

Besides his published works, the elder Pliny left, as his nephew tells us, one hundred and sixty note-books of extracts (electorum commentarios clx.), written in a very small hand on both sides of the page. So valuable were these volumes considered that Pliny assured his nephew he could have sold them in Spain for £3500, even before the full number had been made up. He acted as procu-

‘ Three books, in six volumes, were entitled “ Studiosus,” and eight books bore the title “Dubius Sermo.” To this last he probably refers, Pray. § 28, “audio—Epieureos quoque parturire adversus libellos quos de grammatiea edidi.”

2 Bellorum Germanie viginti (libri), quibus omnia que eum Germanis gessimus bella eollegit (Pliny, Zp. iii. 5,§ 4). A treatise on throwing the lance from horseback, “De jaculatione equestri, ” 1s mentioned here as his first work, written when he was in command of a squadron of eavalry (prefectus ale).

3 Pliny, Ep. iii. 5, § 163 see ibid. §§ 8-10. * Epist. vi. 16, § 18,

rator in Spain in 71, and was recalled to Rome by the death of his brother-in-law Caius Czxcilius, who by will appointed him guardian of the younger Pliny. At the tune of his death, the elder Pliny had the command of the Roman fleet at Misenum. He fell a victim to his imprudent curiosity in advancing within the range of the thickly- falling ashes during the eruption of Vesuvius in 79 A.D.

Pliny’s influence on the nomenclature and the popular ideas about common objects long continued to be very extensive, and survived till the dawn of the age of more exact science. The knowledge he gives us of the writings and opinions of so large a number of lost authors opens a view of the whole cycle of the science of the period.

The best editions of the Natural History are those by Julius Sillig (Leipsic, 1831-36, in 5 vols. 12mo), and by Louis Janus (Teubner, Leipsic, 1854-59, in 6 vols.), which is virtually a revised reprint of it, the whole of the last volume being occupied with copious and accurate indices of authors and subjects. These may be called eritical editions ; two French editions with scientific com- mentaries had preceded,—by Hardouin (1685 and 1723), and by Panckoucke (1829-33), in twenty volumes with a French transla- tion. (Gig ANS 12)

PLINY tHe Youncer (61-c.115 a.p.). Caius Cecilius Secundus, commonly called Pliny the Younger, was the nephew and heir of the elder Pliny, the naturalist. He was born 61 A.D. at Comum (Como) on the southern shore of Lake Larius in northern Italy, near to which, on the east side, stood the spacious and beautiful family villa.5 He took the name of Cvcilius from his father, who had inarried Plinia, the elder Pliny’s sister. Atten years of age he

was left to the care of Virginius Rufus, a distinguished man and thrice consul.®

Pliny was a man of refined taste, highly accomplished, devoted to literature, kind and indulgent to his freedmen and his slaves, gentle and considerate in all his family relations, just in his dealings, munificent in the use of his wealth, humane and forgiving to all who had offended him.' By profession an advocate, and a pupil of the famous Quintilian (ii. 14), he was a frequent and very popular pleader at the courts of the centumviri held in the Julian basilica, as well as occasionally in the senate and in public prosecutions (vi. 29).

His fame in centumviral trials, which were chiefly con- cerned with will cases, is attested by Martial (x. 19, 17), whose epigram he quotes in lamenting the poet's death (ili, 21). But, though himself somewhat. ambitious of praise as a pleader (for he séems to have regarded Cicero as his model in everything), he sternly reproved the arts of bribery and flattery which were commonly adopted by patrons to secure the applause of their clients. " For half-a-crown a head," he complains, "you may fill the benches with any number of shouters and bawlers of your praises." Fond as he was of eloquence, he seems to have given up legal practice from some feeling of disgust at these abuses, and to have devoted himself to the duties of the state-offices. He was appointed augur and prefect of the treasury in the temple of Saturn, and rose in due course through the offices of queestor, praetor, and tribune of the people, finally attaining to the consulship, 100 a.p. His inaugural address to the emperor Trajan, a long and finished but rather pedantic oration in Ciceronian

5 "Quid agit Comum, tue meeque delicie ?" he writes to Caninius Rufus, Hp. i. 38. He had several eountry honses on this estate (plures ville, Hp. ix. 7). Two of these, his espeeial favourites, he playfully ealled "Tragedy and Comedy," eomparing the low and the lofty site to the soccus and the cothurnus of the aetors.

6 Pliny speaks of him with great regard in ii. 1, § 8 :-—" Ile mihi tutor relictus adfeetum parentis exhibuit."

7 His motto was “to pardon others as if one daily needed pardon oneself, and to abstain from sins as if one viewed sin as unpardonable,” viii. 22. In Ep, 2 of the same book he finely says, “ Mihi egregium in primis videtur, ut foris ita domi, ut in magnis ita in parvis ut in alienis ita in suis, agitare justitiam.”

Latinity, entitled Panegyricus, old custom,” he says in his opening sentence, “of com- mencing all public business with prayers to the gods is especially to be observed by a consul, and on an occasion of offering public thanks to the best of princes by the command of the senate and the state.” The piece teaches

is extant.1 “The good

us a good deal about the imperial policy and the military ©

career of Trajan ($§ 13-16).

Between Pliny and Trajan the sincerest regard and even affection seem to have subsisted. In the last book of the Epistles, which contains a hundred and twenty-one letters and replies on matters of business connected with the pro- vince between Pliny and the emperor, the latter is always addressed as “ Domine ” (sire), the former as “ Secunde (or mi Secunde) carissime.” Most of these were written by Pliny as proprator (103-5) of Bithynia and Pontica, and they show the careful interest taken in the welfare and pro- sperity of the cities under his charge. The replies of the emperor are characteristically brief; they are written in good and literary Latin, and show Trajan to have been a man of letters as well as a man of business. Pliny’s celebrated inquiry what should be done with recusant Christians, in which he says? that “not only cities but

country towns and rural districts have been touched by |

the contagion of this superstition," is briefly replied to ; "conquirendi non sunt," writes the emperor, "si defer- antur et arguantur, puniendi sunt, ita tamen ut qui negaverit se Christianum esse, idque re ipsa manifestum fecerit, id est supplicando dis nostris, quamvis suspectus in preteritum, veniam ex pcenitentia impetret." Pliny had said :—" Those who obstinately persisted that they were Christians, after being warned of the consequence, I ordered to be led off to punishment, not doubting that, whatever it was that they professed, their inflexible obstinacy deserved it." Doubts have even been raised as to the genuineness of a passage which appears so inconsist- ent with the established Roman policy of tolerating every superstitio. But it is clear that what Pliny doubted was the fidelity to the emperor of those who refused to make the customary religious offerings to his statue. It was zeal for loyalty that led him into a course which his humane nature condemned.?

Pliny was twice married, but had no children. The emperor bestowed on him the jus trium liberorum, which conferred certain state privileges upon those who brought up that number of legitimate children to become Roman citizens. Three affectionate letters, none of them long, are addressed to his second wife Calpurnia Hispulla.

In health Pliny seems to have been far from robust. He speaks of his slight and thin figure, " gracilitas mea," 4 though in his youth he had seen military service in the East.° He was fond too of hunting, but used to boast that he combined the worship of Diana with that of Minerva.®

Pliny's great wealth was most liberally bestowed, both privately and publicly. He undertakes to rebuild a temple of Ceres on his estate, entirely at his own cost, with a

1 He alludes to it in iii. 18, and in iii. 18 he explains how the address in the senate was afterwards expanded into a book, and recited for three consecutive days to his friends. The title Panegyricus appears then to have been given to it.

2 x. 96, § 9.

3 The context shows that he had some suspicion that the Christians were forming secret and illegal societies (hcterie, § 8). This is his only excuse for having put two deaconesses (ministre) to the torture to find out what they really held.

; ii. 11, § 15. Pip lilem sao:

ix. 10. Ini. 6 he gives a droll account of his hunting wild boars and reading books while the beaters were at work: “ad retia sede- bam ; erat in proximo non venabulum aut lancea, sed stilus et pugil-

lares; meditabar aliquid enotabamqne, ut si manus vacuas plenas tamen ceras reportarem.”

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‘ new statue and the addition of a portico, with walls and floor decorated with marbles.?7 To his friend Romatius Firmus, a fellow-townsman, he writes® that in order to have the pleasure of seeing him an eques he offers £2500 to make up the equestrian census. To Calvina, in addi-. tion to nearly £1000 which he had given her as a marriage portion, he offers to remit the whole of the mortgage debt on an encumbered estate which she had inherited from her father. He founded and endowed with landed property _an almshouse for people of free birth of both sexes.? He presented his nurse with a farm worth nearly £1000 ; }° he gave fifty sestertia 1! as a marriage present to the daughter _ of his tutor Quintilian; he gave up to the township of Comum a sum of about £3500, which, having been illeg- ally left to it by Saturninus, Pliny, as his heir, could have claimed for himself,—and this in addition to over £10,000 which he had already given to the same township. He generously returned a large percentage of the sum he had sold his vintage for, when the produce had been found to disappoint the purchasers.!? In a beautiful letter to Sabinianus !’ he kindly intercedes for a libertus with whom his friend was offended. In a word, the letters are full of acts of Pliny’s goodness and generosity, and these are not boastfully expressed, but rather with the view of inciting others by his example.

There are few, if indeed any, remains of Roman prose literature which are as elegant, as intcresting, and as varied as Pliny’s Letters. They were

evidently written and published! on the model and precedent of Cicero's Letters. They are all carefully composed, and couched in the most graceful and polished Latinity. The first letter is a reply to a friend, Septicius, who had often requested Pliny to collect and publish his more carefully written correspond- ence, —"si quas paullo curatius scripsisset." An admirer of nature, and with the faculty for observation perhaps learnt from his uncle, he sometimes describes, and in the most beautiful language, the scencs or wonders he had visited. Of his spacious and beautiful villas in Tuscany and at Laurentum he has given fulland detailed accounts, which are of especial value as alinost the sole authority on the difficult subject of Roman houses.? ® The Tuscan estate appears to have been his favourite residence. In reply to his friend Fuscus (ix. 36) he gives a pleasing account of the daily life and studies of a refined and temperate man, and a considerate country gentleman, neighbour, and landlord. Of the eruption of Vesuvius in 79 A.p., and the death of his uncle, he gives a minute and evidently faithful account as an eye-witness. This is contained in two long lettcrs " to his friend Tacitus the historian. Two excellent ghost-stories are given,!§ and a letter to Tacitus on the omens of dreams ® shows that both the friends had considerable credulity on this subject.

Like Cicero, but not so frequently, Pliny occasionally ° ' venti- lates" his Greek, and he tells us that at the age of fourteen he wrote a Greek tragedy, adding jocosely, " qualem ? inquis: nescio ; tragcedia vocabatur" (vii. 4, § 2). Like Cicero too, he was fond of art ; he describes with enthusiasm 2! a Corinthian bronze statuctte which he had just purchased out of a legacy received.

As a writer Pliny the younger is as graceful, fluent, and polished as the style of the elder Pliny is crabbed and obscure. Indeed, the Latinity of the epistles cannot fairly be called inferior to that of Cicero himself. There are few indications of the " deterioration "

7 ix. 89. A similar offer is made to Trajan, including the dedica- tion of his statue, Hp. Pl. et Tr., 8.

Sy, ily), a viteeliss Mh GB:

N About £480, vi. 32. Lyi. 2

13 ix. 21. “Tune precipua mansuetudinis laus,” he‘well says, “ cum iree causa justissima est.”

M4 Keil (Pref. to ed. Teubner, 1865, p. 1) quotes Sidonius Apolli- naris, Hpist. ix. 1, to show that nine books of his Letters were edited by Pliny himself.

iS E.g., the sources of the Clitumnus, viii. 8, and the floating islands on a lake at Ameria, viii. 20.

16 See ii. 17 and v. 6. The former describes in glowing terms the Laurentian villa, though he says of it in iv. 6, “nihil ibi possideo preter tectum et hortum, statimque harenas”; but he is comparing the extent of other landed properties.

VW vi. 16 and 20. ea ite

19 i, 18. It is clear from Ann. vi. 28 that Tacitus had some belief in astrology. Pliny the elder wrote his history of the German wars “soninio monitus,” Ep. iii. 5, § 4.

20 #.g. ini. 18 and 20; ii. 8; iv. 7; ix. 26.

*1 iii. 6. He says, however (§ 1), that in bronzes he was not much | of a critic: “in hac re certe perquam exiguum sapio.”

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(if progress and development in a language ought so to be called) of the “Silver Age.” That he imitated Ciccro both in his style and his eloquence is avowed by himself.1 As a friend of Tacitus, whom he often mentions, he predicts the ‘‘immortality ” of the books of his history, and he even proffered his services in reading .Tacitus’s MSS.**. He writes also to Suctonins and to Cornelius Nepos, the lattcr of whom he spcaks of as “vir gravissimus, doctissimus, disertisstmus;” the former he praises to Trajan,? in asking for him the jus triwm liberorum, as ‘** probissimum honestis- simum eruditissimum virum.”

Pliny's Zpistles were first printed in 1471, but incomplete, as was the Aldine edition of 1508. A full account of the MSS. and editions is given by H. Keil in his preface; among the best editions of later times are that of Cortius, published in 1734; after his death that of G. H. Schaefer (who reprinted with corrections, in 1805, the text of Gesner and Gierig, 1800), and that of Maurice Doering, 1843. The latest and best is the Teubner text of II. Keil (Leipsic, 1865, 12mo), with full indices and brief introductory notice of the most important different readings. (PE. APP)

PLOCK (Puorsk), a government of Russian Poland, on the right bank of the Vistula, having the provinces of Western and Eastern Prussia on the north, and the Polish provinces of Lomza on the east and Warsaw on the south ; its area is 4200 square miles. Its flat surface, 350 to 500 feet above the sea-level, gently rises towards the north, where it merges in the Baltic coast-ridge of the Prussian lake district. Only a few hills reach 600 feet above the sea, while the broad valley of the Vistula has an elevation of but 130 to 150 feet. In the west—district of Lipno— broad terraces covered with forests, small lakes, and ponds, aud very poor in vegetation, descend from the Baltic lake- district towards the plains of Ptock ; and in the central district of Mtawa extensive marshes cover the upper basin of the Wkra. The Vistula borders the province on the south, almost from Warsaw to Thorn, receiving the Skrwa and Wkra, which last rises on the Prussian frontier, and, flowing south-east, joins the Narew close to its confluence with the Vistula, in the south-eastern corner of Ptock. The Drweca, or Drewenz, flows along the north-west boundary of Ptock, while several small tributaries of the Narew water the north-eastern district of Ciechanow. Petty lakes and ponds dot the plains in the west, and the whole country bears traces of a very wide extension of lakes during the post-Glacial period. Peat-bogs, used of late for fuel, and marshes containing bog-iron, fill many depressions in the north, while the more elevated parts of the plains are covered with fertile clays, or a kind of "black-earth." Lacustrine post-Glacial deposits cover all depressions in the thick sheet of boulder clay, with Scandinavian erratic boulders, which extends everywhere over the Tertiary sands and marls,—these last containing masses of silicated wood and lignite. Layers of gypsum are found in the hills on the Vistula. The soil is very fertile in several parts of the province, especially in the district of Lipno and closer to the Vistula, and agriculture is the chief occupation of the inhabitants even in the towns.

The chief crops are, however, rye, oats, and barley ; but wheat gives good crops in some parts of the province ; beet-root is also cultivated for sugar, especi- ally on the great estates of the west, where machinery finds application to agriculture on.a large scale; in the north the property is much divided, and the szlachta- landholders, very numerous in Ciechanow, are far from prosperous. The average crops of late years may be valued at 1,700,000 quarters of corn and 1,575,000 quarters of potatoes. The forests, which formerly covered very extensive tracts, are much destroyed now, but still Ptock is one of the best wooded provinces of Poland.

The population of the province of Ptock, which was but 490,950 in 1873, reached 538,150 in 1881, and must be now about 557,000. It is Polish throughout, but contains a large admixture of Jews

(more than 11 per cent.) and of Germans, the number of whom is yearly increasing. Besides agriculture, the inhabitants find a per-

1 Of, i. 5, $12; iv. 8, 84. pcee wi, 205 viii, 7 5 vil, 93),8 1 wix) 14. 3 Ho. Pl. et Traj. 94,

Fi 22%

manent source of occupation in shipping on the Vistula, some mining, and various domestic trades, such as the fabrication of wooden cars, sledges, and wheels, and textile industry. The whole value of manufactures in 1879 was £211,000 (flour mills £68,900, saw-mills £17,500, sugar works £45,700, and iron works £32,200), and 1750 hands were employed. There is some export trade, especially in the Lipno district ; but its development is limited by the lack of facilities of communication, the best being those offered by the Vistula. The railway from Warsaw to Dantzic, via Ciechanow and Mtawa, will now help the eastern part of the province.

Since the Prussian occupation, and perhaps under the influence of Prussian neighbourhood, the province of Ptock is somewhat better supplied with primary schools, cspecially in its northern districts, than other provinces of Poland ; still there are only 272 primary schools (exclusive of the Jewish heders), with 15,000 scholars. There are two colleges for boys and girls, and one seimi- nary for teachers at Wymysty.

The province is divided into eight districts, the chief towns of which are Ptock (22,140 inhabitants), Ciechanow (5800), Lipno (5650), Mtawa (10,050), Plonsk (6350), Przasnysz (7200), Rypin (3350), and Sierpce (6850). Novogcorgievsk, or Modlin, on the Vistula, 12 miles below its confluence with the Narew, is a fortress of the first rank ; Wyszgorod (4400) has considerable trade in corn.

History.—After the sccond dismemberment of Poland in 1793, what is now the government of Ptock became part of Prussia. It fell under Russian dominion after the treaty of Vienna, and, in the division of that time into five provinces, extended over the western part of the present province of Lomza, which was created in 1864 from the Ostrolenka and Pultusk districts of Ptock together with parts of the province of Augustowo.

PEOCK, capital of the. above province, is situated on the right bank of the Vistula, 60 miles to the west-north- west of Warsaw. It is well built of stone ona high hill facing the river, and has an ancient cathedral. It is now of importance only as the seat of the provincial adminis- tration; and its population, which is partly agricultural, increases very slowly. In May 1883 it had 19,640 inhabit- ants, of whom 7135 were Jews and about 450 Germans. The Russian garrison numbered 2500. Ptock has two colleges for boys and girls, with 864 male and 496 female scholars, and twelve primary schools (exclusive of the Jewish heders), with 890 scholars. Its manufactures are insignificant (not above 100,000 roubles yearly), and there is some trade in agricultural produce.

PLOTINUS. See NEopiatonism, vol. xvii. p. 335 sq.

PLOUGH. See Acricutrurgy, vol. i. p. 311.

PLOVER, French Pluvier, Old French Plower, which doubtless has its origin in the Latin pluwvia, rain (as witness the German equivalent Regenpfeifer, Rain-fifer) ; but the connexion of ideas between the words therein involved, so that the former should have become a bird’s name, is doubtful. Belon (1555) says that the name Plumer is bestowed “pour ce qu’on le prend mieux en temps pluvieux qu’ en nulle autre saison,” which is not in accordance with modern observation, for in rainy weather Plovers are wilder and harder to approach than in fine. Others have thought it is from

the spotted (as though with rain-drops) upper plumage of two of the commonest species of Plovers, to which the name especially belongs—the Charadrius pluvialis of Linneus, or Golden Plover, and the Squatarola helvetica of recent ornithologists, or Grey Plover. Both these birds are very similar in general appearance, but the latter is the larger and has an aborted hind-toe on each foot. Its axillary feathers are also black, while in the Golden Plover they are pure white, and this difference often affords a ready means of distinguishing the two species when on the wing, even at a considerable distance. The Grey Plover is a bird of almost circum- polar range, breeding in the far north of America, Asia, and eastern Europe, frequenting in spring and autumn the coasts of the more temperate parts of each continent, and generally retiring further southward in winter—examples

4 But for this really unimportant distinction both birds could doubtless have been kept by ornithologists in the same genus, for they agree in most other structural characters. As it is they have long been sundered.

not unfrequently reaching the Cape Colony, Ceylon, Australia, and even Tasmania. Charadrius pluvialis has a much narrower distribution, though where it occurs it 1s much more numerous as a species. Its breeding quarters do not extend further than from Iceland to western Siberia,

but include the more elevated tracts in the British Islands,

whence in autumn it spreads itself, often in immense flocks, over the cultivated districts if the fields be sufficiently open. Here some will remain so long as the absence of frost or snow permits, but the majority make for the Mediter- ranean basin, or the countries beyond, in which to winter , and, as with the Grey Plover, stragglers find their way to the southern extremity of Africa. The same may be said, mutatis mutandis, of what are usually deemed to be two other cognate forms, C. virginicus and C. fulvus, which respectively represent C. pluvialis in America and eastern Asia, where they are also known by the same English name. The discrimination of these two birds from one another requires a very acute eye, and room is here wanting in which to specify the minute points in which they differ ;1 but both are

easily distinguished from their European ally by their smaller size, their greyish-brown axillary feathers, and their proportionally longer and more slender legs. All, however,—and the same is the case with the Grey Plover, —undergo precisely the same seasonal change of colour, greatly altering their appearance and equally affecting both sexes. In the course of spring or early summer nearly the whole of the lower plumage from the chin to the vent, which during winter has been nearly pure white, becomes deep black. ‘This is partly due to the growth of new feathers, but partly to some of the old feathers actually changing their colour, though the way in which the alteration is brought about is still uncertain.? A corresponding alteration is at the same season observable in the upper plumage ; but this seems chiefly due (as in many other birds) to the shed- ding of the lighter-coloured margins of the feathers, and does not produce so complete a transformation of appear- ance, though the beauty of the wearer is thereby greatly increased.

Though the birds just spoken of are those most emphati- cally entitled to be called Plovers, the group of Ringed Plovers before mentioned (KiLLDEER, vol. xiv. p. 76) and the Lapwine (vol. xiv. p. 308), with its allies, have, according to usage, hardly less claim to the name, which is also extended to some other more distant forms that cau here have only the briefest notice. Among them one of the most remarkable is the “ Zickzack ” (so called from its cry)—the zpoxtAos of Herodotus (see Hummine-Birp, vol. xi. p. 358, n. 3), the Pluvianus or Hyas xgyptius of ornithologists, celebrated for the services it is said to render to the crocodile—a small bird whose plumage of delicate lavender and cream-colour is relieved by markings of black and white. This probably belongs to the small section generally known as Coursers, Cursorius, of which some eight or ten species inhabit the deserts of Africa and India, while one, C. gallicus, occasionally strays to Europe and even to England. Allied to them are the curious PRATINCOLES (q.v.), also peculiar to the Old World, while

3 Schlegel (Mus. _Pays-Bas, Cursores, p. 58) states that in sortie examples it seems impossible to determine the form to which they

belong; but ordinarily American Speciinens are rather larger and |

ee, and have shorter toes than those from Asia. _ * Itis much to be regretted that ornithologists favourably situated i regard to zoological gardens have not more extensively used oppor-

lee which might thus be accorded to them of conducting useful

would be hardl under the best

unremitting attention. The results of some i i : ! partial observations superintended by Yarrell in the gardens of the Zoological Society of

London are given in its Transactions (i 13- i done there since of this nature, Re le

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the genera Thinocoris aud Attagis form an outlying group peculiar to South America, that is by some systematists regarded as a separate Family 7’henocorvdx, near which are often placed the singular SHEATHBILLS (q.v.). By most authorities the Stone-Curlews (CURLEW, vol. vi. p. 712), the OYSTER-CATCHERS (vol. xviii. p. 111), and TuRNSTONES (g.v.) are also regarded as belonging to the Family Char- adriidx, and some would add the Avocets (Recurvirostra) and Stivrs (q.v.), among which the Cavalier, Dromas ardeola—a form that has been bandied about from one Family and even Order to another—should possibly find its resting-place. It frequents the sandy shores of the Indian Ocean and Bay of Bengal from Natal to Aden, and thence to Ceylon, the Malabar coast, and the Andaman and Nicobar Islands,—a white and black bird, mounted on long legs, witll webbed feet, and a bill so shaped as to have made some of the best ornithologists lodge it among the TERNS (¢.v.).

Though the various forms here spoken of as Plovers are almost certainly closely allied, they must be regarded as constituting a very indefinite group, for hardly any strong line of demarcation can be drawn between them and the SANDPIPERS aiid SNipEs (q.v.). Uuited, however, with both of the latter, under the name of Limicolex, after the method approved by the most

recent systematists, the whole form an assemblage the compactness of which no observant ornithologist can hesitate to adinit, even if he be not inclined to treat as its nearest relations the Bustards on the one hand and the Gave on the other, as before suggested (ORNITHOLOGY, vol. xviii. p. 45). (A. N.)

PLUCKER, Junius (1801-1868), mathematician and physicist, was born at Elberfeld on the 16th June 1801. After being educated at the gymnasium at Diisseldorf and studying at the universities of Bonn, Heidelberg, and Berlin, he went in 1823 for a short time to Paris, where he came under the influénce of the great school of French geometers, whose founder, Monge, was only recently dead ; and there can be no doubt that his intercourse with the mathematicians of that school, more particularly with Poncelet and Gergonne, greatly helped to determine the earlicr part at least of his career. In 1825 he was received as “ privat-docent ” at Bonn, and after three years he was made professor extraordinary. The title of his “habilitationsschrift,” Generalem analyseos applicationem ad ea qux geometrie altioris et mechanice basis et funda- menta sunt e serie Tayloria deducit Julius Pliicker (Bonn, 1824), indicated the course of his future researches. The mathematical influence of Monge had two sides represented respectively by his two great works, the Géométrie Descrup- tive and the Application de l Analyse a la Géométrie. Although fully master of those general ideas of modern geometry whose development began with the publication of the former of these works, Pliicker’s actual labours lay more in the direction of the latter. It was his aim to furnish modern geometry with suitable analytical methods and thus to give it an independent analytical development. In this effort he was as successful as were his great con- teinporaries Poncelet and Steiner in cultivating geometry in its purely synthetical form. From his lectures and researches at Bonn sprang his first great work Analytisch-Geometrische Entwickelungen (vol. i. 1828, vol. ii. 1831).

In the first volume of this treatise Pliicker introduced for the first time? the method of abridged notation which has become one of the characteristic features of modern analytical geometry. The

: : : eculiarity of this method consists in this, that the Ictters uscd in ervations on this subject and others of similar kind. Elsewhere it | ; s :

y possible to carry on such an investigation, and even | circumstances it would not be easy and would require |

the equations of curves and surfaces represent, not coordinates of a point with respect to arbitrary chosen axes, but straight lines, or it may be curves or surfaces, intrinsically related to the figure

3 The independent development of a similar idea by the brilliant

| young French geometer Bobillier (1797-1882) was cut short by his premature death.

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under discussion. For example, if it be wished to investigate the properties of a conic section with respect to a pair of tangents and their chord of eontact, we write its equation wv+w°?=0, where w=0, v=0, w=0 represent the two tangents and the chord of contact respectively. This procedure has two great advantages. It enables us to greatly abridge the necessary analytical equations, to arrive at them more easily, and thus to lighten or altogether avoid the cumbersome algebraieal ealculations which had broken the back of the old-fashioned Cartesian geometry and arrested its progress altogether; and it greatly facilitates the geometrical interpretation of analytical results whether intermediate or final. In the first volume of the Hniwickelungen, Pliicker applied the method of abridged notation to the straight line, circle, and conic sections, and he subscquently used it with great effect in many of his researches, notably in his theory of eubic eurves.

In the sccond volume of the Entwickelungen, Pliicker clearly established on a firm and independent basis the great principle of duality. This principle had originally been established by Poncelet as a corollary on the theory of the pole and polar of a conic section. Gergonne maintained the independent and fundamental nature of the principle, and henee arose a violent discussion between him and Poncelet into which Pliicker was drawn. He settled the matter in Gergonne’s favour by introducing the notion of the coordinates of a line and of a plane, and showing that in plane geometry, for example, we could with equal readiness represent a point either by means of coordinates or by means of an equation, and that the same was true of a

line. Hence it appeared that the point or the line in plane geometry, and the point or the plane in solid geometry, could with equal readiness and with equal reason be taken as elements. It was thus made evident that any system of equations proving a theorem regarding points and lines or regarding points and planes could at once be read as proving another in which the words point and dine or the words point and plane were everywhere interchanged.

Another subject of importance which Pliicker took up in the Znt-wickelungen was the curious paradox noticed by Euler and Cramer, that, when a certain number of the intersections of two algebraical curves are given, the rest are thereby determined. Gergonne had shown that when a number of the intersections of two curves of the (p+q)th degree lie on a eurve of the pth degree the rest lie on a curve of the gth degree. Pliicker finally (Gergonne Ann., 1828-29) showed how inany points must be taken ou a curve of any degree so that eurves of the same degrec (infinite in number) may be drawn through them, and proved that all the points, beyond the given ones, in which these curves intersect the given one are fixed by the original choice. Later, simultaneously with Jacobi, he extended these results to curves and surfaces of unequal order. Allied to the matter just mentioned was Pliicker's discovery of the six equations counecting the numbers of singularities in algebraical curves. It will be best described in the words of Clebsch :—" Cramer was the first to give a more exact discussion of the singularities of alge- braical eurves. The considcration of singularities in the modern geometrical sense originated with Poncelet. He showed that the elass & of a eurve of the nth order, which Gergonne by an extra- ordinary mistake had considered to be identical with its order, is in general n(7-1); and hence arose a paradox whose explanation became possible only through the theory of the simple singularities, By the principle of duality the order 7 of a curve should be derived in the same way from the class as k is from. But if we derive n in this way from & we return not to n but to a much greater number. Hence there must be causes which effect a reduction during this operation. Poncelet had already recognized that a double point reduces the class by 2, a cusp at least by 3, and a multiple point of the pth order, all of whose tangents are distinct, by 4p(p—1). Here it was that Pliicker took up the question. By first directly determining the number of the points of inflexion, eonsidering the influence of double

points and cusps, and finally applying the principle of duality to the result obtained, he was led to the famous formule for the singularities of curves which bear his name, and which completely resolve the paradox of Poncelet-—formule which already in the year 1854 Steiner could cite as the ‘well known,’ without, however, in any way mentioning Pliicker’s name in con- uexion with them. Pliicker communicated his formule in the first place to Crelle’s Journal, vol xii. (1834), and gave a further exten- sion and complete aecount of his theory in his Theorte der Alge- braischen Curven, 1839.”

In 1833 Pliicker left Bonn for Berlin, where he occupied for a short time a post in the Friedrich Wilhelm’s Gymnasium. He was then called in 1834 as ordinary professor of mathe- matics to Halle. While there he published his System der Analytischen Geometrie, auf neue Betrachtungsweisen gegriin- det, und insbesondere eine Ausfiihrliche Theorie der Curven dritter Ordnung enthaltend, Berlin, 1835. In this work he mtroduced the use of linear functions in place of the ordinary coordinates, and thereby increased the generality

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| and elegance of his equations; he also made the fullest use of the principles of collineation and reciprocity. In fact he develops and applies to plane curves, mainly of the third degree, the methods which he had indicated in the Entwickelungen and in various memoirs published in the interim. His discussion of curves of the third order turned mainly on the nature of their asymptotes, and depended on the fact that the equation to every such curve can be put into the form pgr+ps =0. He gives a com- plete enumeration of them, including two hundred and nineteen species. In 1836 Pliicker returned to Bonn as ordinary professor of mathematics. Here he published his Theorie der Algebraischen Curven which formed a con- tinuation of the System der Analytischen Geometrie. The work falls into two parts, which treat of the asymptotes and singularities of algebraical curves respectively ; and extensive use is made of the method of counting constants which plays so large a part in modern geometrical researches. Among the results given we may mention the enumeration of curves of the fourth order according to the nature of their asymptotes, and according to the nature of their

singularities, and the determination for the first time of the number of double tangents of a curve of the fourth order devoid of singular points.

Froni this time Pliicker's geometrical researches practi- cally ceased, only to be resumed towards the end of his life. It is true that he published in 1846 his System der Geometrie des Raumes in neuer Analytischer Behandlungs-weise, but this contains merely a more systematic and polished rendering of his earlier results. It has been said that this cessation from pure mathematical work was due to the inappreciative reception accorded by his country- men to his labours, and to their jealousy of his fame in other lands; it seems likely, however, that it was due in some degree to the fact that he was called upon to under- take the work of the physical chair at Bonn in addition to his proper duties. In 1847 he was made actual professor of physics, and from that time his wondrous

scientific activity took a new and astonishing turn.

Pliicker now devoted himself to experimental physics in the strictest sense as exclusively:as he had formerly done to pure mathematics, and with equally brilliant results. His first physical memoir, published in Poggendorff's Annalen, vol. \xxii., 1847, contains his great discovery of magnecrystallic action. Then followed a long series of researches, mostly published in the same journal, on the properties of magnetic and diamagnetic bodies, establishing results which are now part and parcel of our magnetic knowledge. It is unnecessary here to analyse these re-searches, of which an account has been given in the article MAGNETISM (vol. xv. p. 262 sg.); it will be sufficient to say that in this work Pliicker was the worthy collaborateur, and, had it not been that their fast friendship and mutual admiration renders the word inappropriate, we might have said rival, of Faraday.

In 1858 (Pogg. Ann., vol. ciii.) he published the first of his classical researches on the action of the magnet on the electric discharge in rarefied gases (see ELECTRICITY, vol. vill. p. 74). It is needless now to dilate upon the great beauty and importance of these researches, which remain the leading lights in one of the darkest channels of magnetic science. All the best work that has recently been done on this important subject is simply development of what Pliicker did, and in some instances (notably in many

of the researches of Crookes) merely reproduction on a larger scale of his results.

Pliicker, first by himself and afterwards in conjunction with Hittorf, made many important discoveries in the spectroscopy of gases. He was the first to use the vacuum tube with the capillary part now called a Geissler's tube,

by means of which the luminous intensity of feeble electric discharges was raised sufficiently to allow of spectroscopic investigation. He anticipated Bunsen and Kirchhoff in announcing that the lines of the spectrum were character- istic of the chemical substance which emitted them, and in indicating the value of this discovery in chemical analysis. According to Hittorf he was the first who saw the three lincs-of the hydrogen spectrum, which a few months after ~~his death were recognized in the spectrum of the'solar protuberances, and thus solved one of the mysteries of modernastronomy. Fora fuller account of the important discoveries regarding the influence of tempera~~ ture and pressure on the nature of gaseous spectra made in Gonjunction with Hittorf see SpEcrRUM ANALYSIS. Hittorf, who had good means of knowing, tells us that Pliicker never. attained great manual dexterity as an experimenter. He had always, however, very clear con- ceptions as to what was wanted, and possessed in a high degree the power of putting others in possession of his ideas and rendering them enthusiastic in carrying them into practice. Thus he was able to procure from the Sayner Hiitte in 1846 the great electromagnet which he turned to such noble use in his magnetic researches ; thus he attached to his service his former pupil the skilful mechanic Jessel ; and thus he discovered and fully availed himself of the ability of the great glass-blower Geissler, in conjunction with whom he devised many of those physical instruments whose use all over the civilized world has rendered the name of the artificer of Bonn immortal. It was thus also that, when he felt his own want of chemical knowledge and manipulative skill, he sought and obtained the assistance of Hittorf, one of the ablest of German experimenters. Induced by the encouragement of his mathematical friends in England, Pliicker in 1865 returned once more to the field in which he first became known to fame, and adorned it by one more great achievement

—the invention of what is now called Line Geometry. A remark containing the fundamentally new idea of this new geometry had, as Clebsch remarks, already been embodied in the System der Geometrie des Raumes :—“ A straight line depends on four linear constants. The four magnitudes which we consider as variables receive for any given line constant values, which may be easily constructed and are the four coordin- ates of the straight line. A single equation between these four coordinates does not determine a locus for the straight line, but merely a law according to which infinite space is made up of straight lines.” Here we have the new idea of the straight line considered as an element of space, and of the “complex,” as Pliicker afterwards called it, made up of a threefold infinity of straight lines subject to a onefold relation. Space thus becomes as it were four-dimensioned, and we have, instead of the three degrees of freedom of space considered as an aggregate of points, four degrees of freedom according as the linear element is (1) absolutely unconditioned, (2) subject to a onefold, (3) subject to a twofold, or (4) subject to a threefold relation. In the first case we have the complex of straight lines, in the second the congruency of lines, in the third the regulus or ruled surface. The last of these geometrical figures had been considered long before, and even the congruency had been discussed before or independently of Pliicker, notably by Hamilton and Kummer. The general conception of the linear complex seems to be entirely due to Pliicker. At all events he developed the notion to such an extent that he is entitled to be called the founder of Line Geometry, in which the theory of the complex holds a fundamental position. His first memoir on the subject was published in the Philosophical Transactions of the Royal Society of London. It attracted much attention,

and almost at once became the source of a large literature in which the new science was developed. Pliicker himself worked out the theory of complexes of the first and second order, introducing in his investigation of the latter the fanious complex surfaces of which he caused those models to be constructed which are now so well known to the student of the higher mathematics. He was engaged in bringing out a large work embodying the results. of his researches in Line Geometry when he died on the 22d May 1868. The work was so far advanced that his pupil and assistant Klein was able to complete and publish it, there- by erecting the worthiest monument to the genius of his master, whose wonderful scientific activity endured to the very last. Of the very numerous honours bestowed on Pliicker by the various scientific societies of Europe it may suffice to mention here the Copley medal, awarded to him by the Royal Society two years before his death.

Most of the facts in the above notice have been taken from Clebsch's obituary notice of Pliicker (4bh. d. Kén. Ges. d. Wiss. z. Gottingen, xvi., 1871), to which is appended an appreciation of Pliicker's physical researches by Hittorf, and a list of Pliicker's works by F. Klein. See also Gerhardt, Geschichte der Mathe- matik in Deutschland, p. 282; and Pliicker's life by Dronke (Bonn, 1871). (G. CH.)

PLUM (Prunus). Our cultivated plums are supposed to have originated from one or other of the species P. domestica or P. insititia. The young shoots of P. domestica are glabrous, and the fruit oblong; in P. ¢nsititia the young shoots are pubescent, and the fruit more or less globose. A third species, the common sloe or blackthorn, P. spinosa, has stout spines; its flowers expand before the leaves ; and its fruit is very rough to the taste, in which particulars it differs from the two preceding. These dis- tinctions, however, are not maintained with much con- stancy. P. domestica is a native of Anatolia and the Caucasus, and is considered to be only naturalized in Europe. J. insititid, on the other hand, is wild in southern Europe, in Armenia, and along the shores of the Caspian. In the Swiss lake-dwellings stones of the P. cnsititia as well as of P. spinosa have been found, but not those of P. domestica. Nevertheless, the Romans cultivated large numbers of plums. The cultivated forms are now ex- tremely numerous, some of the

groups, such as the green gages, the damsons, and the egg plums being very distinct, and even reproducing themselves from seed. This, how- ever, cannot be depended on, and hence the choice varie- ties are propagated by budding or by layers. The colour of the fruit varies from green, pale yellow, red, up to deep purple, the size from that of a small cherry to that of a walnut; the form is oblong acute or obtuse.at both. ends or globular ; the stones or kernels vary in like manner; and the flavour, season of ripening, and duration are-all subject to variation. From its hardihood the plum is one of the most valuable fruit trees for the farmer, as it is not parti- cular as to soil, and the crop is less likely to be destroyed by spring frosts. Prunes and French plums are merely plums dried in the sun. Their preparation is carried on on a large scale in Bosnia and Servia, as well as in Spain, Portugal, and southern France. The cherry plum, Prunus myrobalana, is employed chiefly as a stock for grafting upon, and for the sake of its ornamental flowers. See also HorvTicururg, vol. xii. p. 275.

PLUMBAGO, a name frequently applied to graphite in allusion to its remote resemblance to lead, whence it is popularly called “black lead.” When Scheele, in 1779, examined this mineral he regarded it as a compound of carbon and iron, and consequently termed it a “carburet of iron”; but Vanuxem in 1825 showed that the iron existed in the form of an oxide, and was not essential to the constitution of the mineral—a conclusion also reached about this time by Karsten. It thus became fully estab-

lished that plumbago is simply an impure form of native | a considerable practice in equity; and, after an apprentice-

carbon. Plumbago is principally used in the manufacture of “black-lead” pencils, for which purpose it was at one time very extensively worked at Borrowdale in Cumber- land. It was known locally as “ wad,” and a grant of the manor of Borrowdale, as far back as the reign of James L.,

cawke.” The Cumberland plumbago is found in pipes, strings, and irregular masses known as “sops,” which

occur in a dyke of diorite, associated with a compact blue |

diabase, penetrating some of the altered ash-beds of the volcanic series. Important mines of plunbago, yielding fine pencil lead, were opened some years ago by M. Alibert in the government of Irkutsk in eastern Siberia. A good deal of plumbago is also worked near Passau in Bavaria. The graphite so largely used, when mixed with fire-clay, in the manufacture of “ black-lead ” crucibles, is obtained chiefly from Ceylon; and it is notable that, notwithstand- ing the purity of the Ceylon plumbago, it is not applicable to the manufacture of lead pencils. Large quantities of plumbago occur in the Laurentian limestones of Canada ; while in the United States the mineral is worked at Sturbridge, Mass.; at Ticonderoga and Fishkill, N.Y. ; at Brandon, Vt.; and at Wake, N.C. yielded by the mines of Ashford in Connecticut. Among the minor applications of plumbago may be mentioned its use as a lubricating agent for machinery and for polishing cast iron. In the preamble to an Act for protecting the black-lead mines of Cumberland, 25 Geo. II. ¢. 10, it is stated that plumbago is necessary “for divers useful pur- poses, and more particularly in the casting of bomb-shells, round shot, and cannon balls.” It was formerly held in repute in medicine, and a writer on the Cumberland plumbago in 1709 asserts—“ It’s a present remedy for the cholick ; it easeth the pain of gravel stone and strangury ; and for these and the like uses it’s much bought up by apothecaries and physicians.” It is notable that plumbago is occasionally found in masses of meteoric iron, and that a substance of similar physical and chemical characters is produced in the blast-furnace during the preparation of cast iron, and is known to the workmen as dish. Plum- bago bears a strong resemblance to the mineral termed molybdenite, while it resembles to a less extent certain varieties of micaceous iron-ore ; the molybdenite, however, is easily distinguished by giving a slightly greenish streak, while the iron-ore yields a red streak.

For the mineralogical characteristics of plumbago or graphite, see vol. xvi. p. 381; for its chemical relations, vol. v. p. 86; and for its use in crucible-making, vol. ix. p. 843.

PLUNKET, Witiram Conynenam PLUNKET, Baron (1765-1854), an eminent lawyer, orator, and statesman, was born in the county of Fermanagh in July 1765. He was educated in boyhood by his father, a man of considerable ability and reputation ; and in 1779 he became a student of Trinity College, Dublin. Though well versed in regular

academic studies, he was most conspicuous in his university |

career as the acknowledged leader of the Historical Society, the debating club of Trinity College, then full of young men of remarkable promise.

Having entered Lincoln's Inn in 1784, Plunket was called to the Irish bar in 1787. His intellect was exactly that of a jurist or a great master of equity—not too refin- ing or overprone to speculation, and yet capable of the highest legal generalizations, and of applying them to masses of fact, however tedious and complicated. His power of close and rapid argument was very remarkable, his memory equally capacious and exact, and he had enriched an ample store of professional learning with the fruits of assiduous general study. Although at first his Progress at the bar was not rapid, he gradually obtained

It was formerly |

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ship of eleven years as a junior, he was raised to the rank of king's counsel in 1798. :

In 1798 he entered the Irish parliament as member for Charlemont. His political faith was already settled, and

_ was only slightly modified in after life, at. least as regards refers to "the wad-holes and wad, commonly called black

its cardinal tenets. He was an anti-Jacobin Whig of the

' school of Burke, not ungracefully filled: with a fervent

Irish patriotism. He disliked the principles’of the French Revolution, and its excesses made such an impression upon him that he always showed the greatest antipathy to merely democratic movements. But he was a sincere admirer of the constitutional government of England as established in 1688 ; he even justified the ascendency it had given to the Established Church, although he thought that the time had arrived for extending toleration to Roman Catholics and dissenters. To transfer it to Ireland as thus modified, and under an independent legislature, was even in his youth the only reform he sought for his country; and, although he opposed the Union with all his power, this was only because he thought it incompatible with this object.

When Plunket became a member of parliament, the Irish Whig party was almost extinct, and Pitt was feeling his way to accomplish the Union. In this he was seconded ably by Lord Castlereagh, by the panic caused by a wild insurrection, and by the secession of Grattan froin politics. When, however, the measure was actually brought forward, it encountered a vehement opposition; and among the ablest and fiercest of its adversaries was Plunket, whose powers as a great orator were now universally recognized. His speeches in these debates show all the force of reagon- ing, the admirable arrangement, and the grasp of facts which. characterize his later efforts; but they are some- what disfigured by personal invective, and here and there betray an indecent acrimony. They raised him, however, immediately to the front rank of his party; and, when Grattan re-entered the moribund senate, he took his seat next to Plunket, thus significantly recognizing the place the latter had attained.

After the union of Great Britain and Ireland Plunket returned to the practice of his profession, and became at once a leader of the equity bar. In 1803, after the out- break of Emmet’s rebellion, he was selected as one of the crown lawyers to prosecute the unfortunate enthusiast, and at the trial, in summing up the evidence, delivered a speech of remarkable power, which shows his characteristic dislike of revolutionary outbursts. For this speech he was exposed to much unmerited obloquy, and more espe- cially to the abuse of Cobbett, against whom he brought a successful action for damages. In 1804, in Pitt’s second administration, he became solicitor-general and then attor- ney-general for Ireland; and he continued in office when Lord Grenville caine into power at the head of the ministry of All the

Talents. Plunket held a seat in the imperial parliament during this period, and there made several able speeches in favour of Catholic emancipation, and of continuing the war with France; but, when the Grenville cabinet was dissolved, he returned once more to professional life, and for some years devoted himself exclusively to it.

In 1812, having amassed a considerable fortune, he re- entered parliament as member for Trinity College, and identified himself thoroughly with the Grenville or anti- Gallican Whigs. He was now in the full maturity of his powers, and very soon was acknowledged one of the first orators, if not the first, of the House of Commons. His reverence for the English constitution in church and state, his strong dislike of l'rench principles, his steady advocacy of the war with Napoleon, and his antipathy to anything like democracy made him popular with the Tory party. On the other hand, he was the zealous and most able sup-

porter of Catholic emancipation; he was not averse to some measure of parliamentary reform; and, as generally he was on the side of constitutional progress, he was reckoned a principal ornament of one of the sections of the Whigs.

In 1822 Plunket was once more attorney-general for Ireland, with Lord Wellesley as lord-lieutenant. One of his first official acts was to prosecute for the " bottle riot," an attempt on his part to put down the Orange faction in Ireland. But, though always the advocate of the Catholic claims, he strenuously opposed the Catholic Association, which about this time, under the guidance of O'Connell, began its extraordinary and successful agitation. He struggled vehemently to extinguish it, and in 1825 made a powerful speech against it; and thus the curious spectacle was seen of the ablest champion of an oppressed sect doing all in his power to check its efforts to emancipate itself.

In 1827 Plunket was made master of the rolls in Eng- land; but, owing to the professional jealousy of the bar, who not unnaturally thought him an intruder, he was obliged to abandon this office. Soon afterwards he became chief justice of the common pleas in Ireland, and was then created a peer of

the United Kingdom. In 1830 he was appointed lord chancellor of Ireland, and held the office, with an interval of a few months only, until 1841, when he finally retired from public life. During this period he made some able speeches in favour of parliamentary reform ; but they were scarcely equal to his earlier efforts ; and his reputation as a judge, though far from low, was not so eminent as might have been expected. He died in 1854, in his ninetieth year. W. 0. M.)

PLUSH (French Peluche), a textile fabric having a cut nap or pile the same as fustian or velvet. Originally the pile of plush consisted of mohair or worsted yarn, but now silk by itself or with a cotton backing is used for plush, the distinction from velvet being found in the longer and less dense pile of plush. The material is largely used for upholstery and furniture purposes, and is also much employed in dress and millinery. The most distinctive form of plush is that which has taken- the place of the napped beaver felt in the dress hats of gentlemen, which are now consequently known as “silk” hats. That plush, a considerable manufacture, is principally made in Lyons.

PLUTARCH (II\ovrapyos Xatpwvevs), a Greek prose writer, born at Cheeronea in Beeotia, and a contemporary of Tacitus and the Plinys. The precise dates of his birth and death are unknown ; but it is certain that he flourished under the Roman emperors from Nero to Trajan inclusive, so that from 50 to 100 a.p. will probably include the best years of his life. ‘here is some probability that he out- lived Trajan,! who died in 117. In the Consolation to his Wrfe on the loss of his young daughter, he tells us (f 2) that they had brought up four sons besides, one of whom was called by the name of Plutarch’s brother, Lamprias. We learn incidentally from this treatise (§ 10) that the writer had been initiated in the secret mysteries of Dionysus, which held that the soul was imperishable, He seems to have been an independent thinker rather than an adherent to any particular school of philosophy. His forte, so to say, was learning, and the application of it to the casualties of human existence. His vast acquaintance with the litera- ture of his time is everywhere apparent ; and with history especially he was thoroughly conversant, and hardly less so with physics.

The celebrity of Plutarch, or at least his popularity, is st founded on his forty-six Parallel Lives. He is

ought to have written this work in his later years after

1 The scanty evidences of date c iti , (ollected from Plutarch's writings are well discussed by Long in Smith's Dict, of Biog., iii. p. 429. '

his return to his native town Cheronea. Huis knowledge of Latin and of Roman history he must have partly derived from some years' residence in Rome and other parts of Italy,? though he says he was too much engaged in lecturing (doubtless in Greek, on philosophy) to turn his attention much to Roman literature during that period. Long observes that "we must expect to find him imperfectly informed on Roman institutions, and we can detect in him some errors. Yet, on the whole, his Roman lives do not often convey erroneous notions; if the detail is incorrect, the general impression is true."

Plutarch's design in writing the Parallel Lives—for this is the title which he gives them in dedicating Theseus and Romulus to Sosius Senecio—appears to have been the publication, in successive books, of authentic biographies in pairs, a Greek and a Roman (generally with some approxiniation to synchronism as well as some well-marked resemblances in political career) being selected as the subject of each. In the introduction to the Theseus he speaks of having already issued his Lycurgus and Numa, viewing them, no doubt, as bearing a resemblance to each other in their legislative character; and so Theseus and Romulus are compared as the legendary founders of states.

In the opening sentence of the life of Alexander he says that ''en thes book he has written the lives of Alexander and Cesar" (Julius), and in his Demosthenes, where he again (§ 1) mentions his friend Sosius, Séecvos, he calls the life of this orator and Cicero the fifth book. It may there- fore fairly be inferred that Plutarch's original idea was simply to set (rapaBddrev, Nic., § 1) a Greek warrior, statesman, orator, or legislator side by side with some noted Roman celebrated for the same qualities. In his age, when Rome held the supremacy, but Greece was still looked up to as

the centre and source of wisdom and art, such a comparison of the greatest men of both nations had a special propriety and significance, and was more than a mere literary exercise. It was a patriotic theme, to show the superiority of this or that race; and Plutarch, in a sense, belonged to both. Now Alexander and C. Ceesar, Demosthenes and Cicero, Solon and Valerius Publicola, have some fairly obvious resemblances, which are not so conspicuous in some other pairs. But the sequel which follows most (not all) of the Leaves, entitled cvyxpucts, viz., a comparison in detail, is by modern critics rejected as spurious. It was manifestly added as an appendix from a misapprehension of Plutarch's real motive; the effort to bring out exact points of resemblances which are either forced or fanciful far exceeded the design contemplated by him. Moreover, the marked difference in style between the Bio. and the cvyxpices is quite decisive of the question.

Nearly all the lives are in pairs; but the series con- cludes with single biographies of Artaxerxes, Aratus (of Sicyon), Galba, and Otho. In the life of Aratus, not Sosius Senecio, but one Polycrates, is addressed.

It is not to be supposed that Plutarch was content to write merely amusing or popular biographies. On the contrary, the Zwes are works of great learning and research, and they must for this very reason, as well as from their considerable length, have taken many years in their compilation. For example, in the life of Theseus the following long list of authorities appears :—the Megarian historians, Hellanicus, Simonides, Philochorus, Pherecydes, Demo, Peon of Amathus, Dicsearchus, Hero-

2 Demosth., § 2. Plutarch's orthography of Roman words and names is important as bearing on the question of pronunciation. A curious example (De Fortun. Rom., § 5) is Virtutis et Honoris, written Otsprotris re nal 'Ovapis. The Volsci are OdorodcKa:, ibid.

3 It is quite evident that the original order of the books has been

altered in the series of Zives as we now have them. * Of Meyapdbey cvyypadeis, referred to in § 10.

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dorus, Bio, Menecrates, Clidemus, Hereas, Ister,! Dio- | part of a good education; (7) philosophy should form the principal

dorus. For the life of Romulus he refers to “one Promathio who composed a history of Italy” (§ 2 fin.), Diocles of Peparethus, Fabius Pictor, Herodorus, Varro, Valerius, Juba (IoBas), Zenodotus of Treezen, Simulus the poet (from whom he quotes eight elegiac verses), Antigonus, “one Butas,”? and Caius Acilius, and (as a viva voce informant) Sextius Sulla of Carthage. In the life of Lycurgus he cites Aristotle, Eratosthenes, Apollodorus, Timzeus, Xenophon, Simonides, Aristocrates the Spartan, Spherus, Critias, Theophrastus, Dioscorides, Hippias the sophist, Philostephanus, Demetrius Phalereus, Hermippus, Sosibius, Thucydides, Apollothemis, Aristox- enus, Aristocrates. In the life of Alexander, which is a long and elaborate essay, mention is made of Onesicritus, Aristobulus, Duris, Chares, Callisthenes, Eratosthenes, Clitarchus, Polyclitus, Antigenes, Ister, Ptolemzeus, Anti- clides, Philo of Thebes, Philippus of Theangele, Philippus of Eretria, Hecatzeus, Hermippus, Sotion.

It is true that many of the lives, especially of Romans, do not show such an extent of research or such a wealth of authorities. But Plutarch must have possessed or had access to a great store of books, and his diligence as an historian cannot be questioned, if his accuracy is in some points impeached.

His sympathy with Doric characters and institutions is very evident; he delights to record the exploits, the maxims, and the virtues of Spartan kings and generals. This feeling is the key to his apparently unfair and virulent attack on Herodotus, who, as an Ionian, seemed to him to have exaggerated the prowess and the foresight of the Athenian leaders.

The voluminous and varied writings of Plutarch exclu- sive of the Lives are known under the common term Opera Moralia. These consist of above sixty essays, some of them long and many of them rather difficult, some too of very doubtful genuineness. Their literary value is greatly enhanced by the large number of citations from lost Greek poems, especially verses of the dramatists, among whom Euripides holds by far the first place. They evince a mind of vast and varied resources, historical as well as philosophical—the

mind of an inquirer and a seeker after knowledge, rather than that of an exponent or an opponent of any particular philosophical system.

But Plutarch's Greek is not, like Lucian's, fluent and easy, nor even clear. He uses many words not in the ordinary Greek vocabulary, and he too often constructs long sentences, the thread of which separately, as well as the connexion, cannot be traced without close attention. Hence he is unattractive as a writer, so far as style is con- cerned, and he is often diffuse and carries his discussions to an unnecessary length.

It is certain that to most persons in Britain, even to those who call themselves scholars, the Opera Moralia of Plutarch are practically almost unknown. No English translation of them, we believe, has been printed since the bulky folio of Philemon Holland, published at the end of the 17th century, with the exception of a single volume in Bohn's Classical Library, lately added to that series by Mr C. W. King, M.A. It is therefore the more desirable to devote the remainder of this article to a brief notice of the principal treatises.

On the Education of Children recommends (1) good birth, and sobriety in the father; (2) good disposition and good training are alike necessary for virtue ; (3) a mother ought to nurse her own off- Spring, on the analogy of all animals; (4) the pedagogus must be honest and trustworthy ; (5) all the advantages of life and fortune must be held secondary to education; (6) mere mob-oratory is no

l'oy a a a : O lorpos év Th Tpicxadexdtn Tov Artixay, § 34. ef na nn Bovras tis airlas uvOmders ev ercyelois wept Tay 'PwpaiKar

dvaypapwy, § 21.

study, but not to the exclusion of the other sciences; (8) gymnas- tics are to be practised; (9) kindness and advice are better than blows; (10) over-pressure in learning is to be avoided, and plenty of relaxation is to be allowed; (11) self-control, and not least over the tongue, is to be learned; (12) the grown-up youth should be under the eye and advice of his father, and all bad company avoided, flatterers included; (18) fathers should not be too harsh and exacting, but remember that they were themselves once

young; (14) marriage is recommended, and without disparity of rank; (15) above all, a father should be an example of virtue to a son.

How a Young Man ought to Hear Poetry is largely made up of quotations from Homer and the tragic poets. The points of the essay are the moral effects of poetry as combining the true with the false, the praises of virtue and heroism with a mythology depraved and unworthy of gods, ei @col 7: Spor PadAov, odk é1olv Geol (§ 21). “So long as the young man,” says Plutarch, “admires what is rightly said and done in the poets, but feels annoyed at the contrary, no harm is done; but if he learns to admire every-thing which is presented to him undcr the name of a hero, he will unconsciously become morally deteriorated ” (§ 26).

On the Right Way of Hearing (wept tod a&xodverv) advocates the listening in silence to what is being said, and not giving a precipi- tate reply to statements which may yct receive some addition or modification from the speaker (§ 4). The hearer is warned not to give too much weight to the style, manner, or tone of the speaker (§ 7), not to be either too apathetic or too prone to praise, not to be impatient if he finds his faults reproved by the lecturer (§ 16). He concludes with the maxim, “to hear rightly is the beginning of living rightly,” and perhaps he has in view throughout his own profession as a lecturer.

How a Flatterer may be Distinguished from a Friend is a rather long and uninteresting treatise. The aucicnt writers are full of warnings against Hatterers, who do not seem to exercise much influence in modern society. The really dangerous flatterer (§ 4) is not the parasite, but the pretender to a disinterested friendship, —one who affects similar tastes, aud so insinnates himself into your confidence. Your accomplished flatterer does not always praise, but flatters by act, as when he occupies a good scat at a public meeting for the express purpose of resigning it to his patron (§ 15). A true friend, on the contrary, speaks freely on proper occasions. A good part of the essay turns on wappyota, the honest expression of opinion. The citations, which are fairly numerous, are mostly from Homer.

How one may be Conscious of Progress i Goodness is addressed to Sosius Senecio, who was consul in the last years of Nerva, and more than once (99, 102, 107) under Trajan. If, says Plutarch, a man could become suddenly

wise instcad of foolish, he could not be ignorant of the change; but it is otherwise with moral or mental processes. Gradual advance in virtue is like steady sailing over a wide sea, and can only be measured by the time taken and the forces applied ($ 3). Zcno tested advance by dreams (§ 12); if no excess or immorality presented itself to the imagination of the sleeper, his mind had been purged by reason and philosophy. When we love the truly good, and adapt our- selves to their looks and manners, and this even with the loss of worldly prosperity, then we are really getting on in goodness ourselves (§ 15). Lastly, the avoidance of little sins is an evidence of a scrupulous conscience (§ 17).

How to get Benefit out of Enemies argues that, as primitive man had savage animals to fight against, but learnt to make use of their skins for clothing and their flesh for food, so we are bound to turn cven our enemics to some good purpose. One service they do to us is to make us live warily against plots; another is, they induce us to live honestly, so as to vex our rivals not by scolding them but by making them secretly jealous of us (§ 4). Again, finding fault leads us to consider if we are ourselves faultless, and to be found fault with by a foe is likely to be plain truth speaking, dxovoréov éot) mapa tTav exOpav Thy ddAfGeav (§ 6). Jealousies and strifes, so natural to man, are diverted from our friends by being legiti- mately expended on our enemies (§ 10).

On Having Many Friends, On Chance, On Virtue and Vice, are three short essays, the first advocating the concentration of one's affections on a few who are worthy (robs d&lous PiAlas Sider, § 4), rather than diluting them, as it were, on the many; the second pleads that intelligence, ¢pévnois, not mere luck, is the ruling principle of all success; the third shows that virtue and vice are but other names for happiness and misery. All these are interspersed with citations from the poets, several of them unknown from other sources.

A longer treatise, well and clearly written, and not less valuable for its many quotations, is the Consolation addressed to Apollonius, on the early death of his "generally beloved and religions and dutiful son." Equality of mind both in prosperity and in adversity is recommended (§ 4), since there are "ups and downs" (8Wos «ab tameivérns) in life, as there are storms and

calms on the sea, and good and bad seasons on the earth. That man is born to reverscs

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he illustrates by citing fifteen fine verses from Menander (§ 5). The uselessness of indulging in grief is pointed out, death being a debt to all and not to be regarded as an evil ($§ 10-12). Plato’s doctrine is cited (§ 13) that the body is a burden and an impediment to the soul. Death may be annihilation, and therefore the dead are in the same category as the unborn (§ 15). The lamenting a death because it is untimely or premature has something of selfish- ness in it (§ 19), besides that it only means that one has arrived sooner than another at the end of a common journey. Ifa death is more grievous because it is untimely, a new born infant’s death would be the most grievous of all (§ 28). One who has died early may have been spared many woes rather than have been deprived of many blessings ; and, after all, to die is but to pay a debt due to the gods when they ask for it (§ 28). Examples are given of fortitude and resignation under such affliction ($ 33). _ If, says the author in conclusion, there is a heaven for the good hereafter, be sure that such a son will have a place in it.

Precepts about Health commences as a dialogue, and extends to some length as a lecture. It is technical and difficult throughout, and contains but little that falls in with modern ideas. Milk, he says, should be taken for food rather than for drink, and wine should not be indulged in after hard work or mental effort, for it docs but tend to increase the bodily disturbance ($17). Better than purges or emetics is a temperate dict, which induces the bodily functions to act of themselves (§ 20). Another wise saying is that idleness docs not conduce to health (ob8 aAndés eort Td parroy dytatvew rovs hovxlay &yovTas, § 21), and yet another that a man should learn by experience his bodily capabilities without always consulting a physician (§ 26).

‘Advice to the Married is addressed to his newly wedded friends Pollianus and Eurydice. It is simply and plainly written, and con- sists chiefly of short maxims and anecdotes, with but few citations from the poets.

The Banquet of the Seven Wise Men is a longer treatise, one of the several "Symposia" or imaginary conversations that have come down to us. It is supposed to be given by Pcriander in the public banqueting-room (éor:arépioy) near the harbour of Corinth (Lecheum) on the occasion of a sacrifice to Aphrodite. The whole party consisted of "more than twice seven," the friends of the principal guests being also present. Like Plato's Symposium this treatise takes the form of a narrative of what was said and done, the narrator being one Diocles, a friend of Periander's, who professes to give Nicarchus a correct account as having been present. The dinner was simple, and in contrast with the usual splendour of "tyrants" (§ 4). The conversation turns on various topics; Solon is credited with the remarkable opinion that "a king or tyrant is most likely to become celebrated if he makes a democracy out of a monarchy" (§ 7). There is much playful banter throughout, but neither the wit nor the wisdom seems of a very high standard. Solon delivers a speech on food being a necessity rather than a pleasure of life (§ 16), and one Gorgus, a brother of the host, comes in to relate how he has just shaken hands with Arion brought across the sea on the back of a dolphin (§ 18), which brings on a discussion about the habits of that creature. Among the speakers are sop, Anacharsis, Thales, Chilo, Cleobulus, and one Chersias, a poet.

'A short essay On Superstition contains a good many quotations from the poets. It opens with the wise remark that ignorance about the gods, which makes the obstinate man an atheist, also begets credulity in weak and pliant ninds. The atheist fears nothing because he believes nothing ; the superstitious man believes there are gods, but that they are unfriendly to him (§ 2). A man who fears the gods is never free from fear, whatever he may do or whatever may befall him. He extends his fears beyond his death, and believes in the "gates of hell," and its fires, in the darkness, the ghosts, the infernal judges, and what not (§ 4). The atheist does not believe in the gods; the superstitious man wishes he did not, but fears to disbelieve ($ 11). Onthe whole, this is a most interesting treatise. Mr King has given a translation of it, and of the next five essays. ; _ On Isis and Osiris is a rather long treatise on Egyptian symbolism, interesting chiefly to students of Egyptology. It gives an exposi- tion of the strange myths and superstitions of this ancient solar cult, including a full account of the great antagonist of Osiris, Typhon, or the Egyptian Satan. Plutarch thus lays down the

Zoroastrian theory of good and bad agencies (§ 45): “if nothing can happen without cause, and good cannot furnish cause for evil, it follows that the nature of evil, as of good, must have an origin and principle of its own.”

On the Cessation of Oracles is a dialogue, discussing the reasons why divine inspiration seemed to be withdrawn from the old seats of prophetic lore. The rcal reason of their decline in popularity is probably very simple; when the Greek cities became Roman provinces the fashion of consulting oracles fell off, as unsuited to nat more practical infiuences of Roman thought and Roman politics. The question is discussed whether there are sueh inter- mediate beings as demons, who according to Plato communicate

planets being elements, fire, ether, treatise is metaphysical, but it concludes with remarks on the exhalations at Delphi having different effects on different people and at different tinies. vapour was the breath of some mysterious being sent up from the under-world.

written on or in the Delphic temple. the number five, others that it introduced the ae of oracle-

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the will of the gods to men, and the prayers and vows of men to the gods.

The possibility of a plurality of worlds is entertained, and of the more or less composed of the essence of the five earth, air, and water (§ 37). The whole

The ancient notion doubtless was that the

On the Pythian Responses, why no longer given in Versc, is also a

dialogue, the first part of which is occupied mainly with conver- sation and anecdotes about the statues and other offerings at Delphi. kind of appendix to the last. that verse was the older vehicle of philosophy, history, and religion, but that plain prosc has become the later fashion, and therefore that oracles are now generally delivered “in the same form as laws speak to citizens, kings reply to their subjects, and scholars hear their teachers

speak.” by the facility with which it was employed by impostors (§ 25). Moreover, verse is better suited to ambiguity, and oracles now-a-days have less need to be ambiguous (§ 28).

It is rather an amusing essay, and may be regarded as a The theory propounded (§ 24) is

Discredit too was brought on the verse-oracle

On the E at Delphi is an inquiry why that letter or symbol was Some thought it represented

seekers, Jf so-and-so was to be done ; while one of the speakers, Ammonius, decides that it means EZ, “‘thou art,” an address to Apollo containing the predication of existence ($ 17).

On the Face on the Moon’s Disk is a long and curious if somewhat trifling speculation, yet not without interest from its calculations of the sizes and the distance from earth ofthe sun and moon (§ 10), and from the contrast between ancient lunar theories and modern mathematics. The cause of the moon’s light, its peculiar colour, the possibility of its being inhabited, and many kindred questions are discussed in this dialogue, the beginning and end of which are alike abrupt. Some of the ‘‘ guesses at truth” are very near the mark, as when it is suggested ($$ 21-2) that the moon, like the carth, contains decp recesses into which the sun’s light docs not descend, and the appearance of the ‘‘face” is nothing but the shadows of streams or of deep ravines.

On the Late Vengeance of the Deity is a dialogue consequent on a pal ae lecture by Epicurus. An objection is raised to the ordinary dealings of providence, that long delayed punishment encourages the sinuer and disappoints the injured, the reply to which is (§ 5) that the god sets man an example to avoid hasty and precipitate resentment, and that he is willing to give time for repentance (§ 6). Moreover, he inay wish to await the birth of good progeny from erring parents (§ 7). Another fine reflexion is that sin has its own punishment in causing misery to the sinner, and thus the longer the life the greater is the share of misery (§ 9). The essay concludes with a

long story about one Thespesius, and the treatment which he saw, during a trance, of the souls in the other world.

On Fate discusses the law of chance as against the overruling of providence. This treatise cnds abruptly ; the point of the argument is that both fate and providence have their due influence in mundane affairs (§ 9), and that all things are constituted for the best.

On the Genius of Socrates is a long essay, and, like so many of the rest, in the form of a dialogue. The experiences of one Timarchus, and his supernatural visions in the cave of Trophonius, are related at length in the Platonic style ($ 22), and the true nature of the BSatuoves is revealed to him. They are the souls of the just, who still retain regard for human affairs and assist the good in their efforts after virtue (§ 28). The dialogue ends with an interesting narrative of the concealment of Pelopidas and some of the Theban conspirators against the Spartans in the house of Charon.

On Exile is a fine essay, reudered the morc interesting from its numerous quotations from the poets, including several from the Phoenisse. Man is nota plant that grows only in one soil ; he belongs to heaven rather than to earth, and wherever he goes there are the same sun, the same seasons, the same providence, the same laws of virtue and justice (§ 5). There is no discredit in being driven from one's country ; Apollo himself was banished from heaven and condemned to live for a time on earth (§ 18).

The Consolation to his Wife, on the early death of their only daughter Timoxena (§ 7), is a feeling and sensible exhortation to moderate her gricf.

Nine books of Symposiaea extend to a great length, discussing inquiries (arpoBAhwara) on a vast number of subjects. The general treatment of these, in which great literary knowledge is displayed, is not unlike the style of Atheneus. It is, of course, impossible here to give any summary of the questions propounded.

The Amorous Man is a dialogue of some length, describing conversation on the nature of love held at Helicon, pending quinquennial feast of the Thespians, who specially worshipped

that deity along with the Muses. It is amply illustrated by poetical quotations. In § 24 mention is made of the emperor Vespasian. It is followed by a short treatise entitled Love Stories, giving a few narratives of sensational adventures of lovers.

Short Sayings (arop0éypara), dedicated to Trajan, extend to a great length, and are divided into three parts :—(1) of kings and conimanders (including many Roman); (2) of Spartans; (3) of Spartan women (a short treatise on Spartan institutions being interposed between the last two). The names of the authors are added, and to some of them a large number of maxims are attributed. Many are terse, shrewd, wise, or pointed with strong common-sense; but a good many seein to us now somewhat commonplace.

A rather long treatise On the Virtues of Women contains a series of narratives of noble deeds done by the sex in times of danger and trouble, cspeeially from “tyrants.” Many of the stories are interesting, and the style is easy and good.

Another long and learned work bears the rather obscure title Kedadalwy xaraypaph. It is generally known as Quezstiones Romanz and Grexex, in two parts. In the former, which contains one hundred and thirteen headings, the inquiry (on some matter political, religious, or antiquarian) always commences with 8:4 ri, usually followed by rérepoy, with alternative explanations. In the Greek Questions the form of inquiry is more often rls or tlyes, not followed by rérepoy. This treatise is of great interest and import- anee to classical archeology, though the inquiries seem occasionally trifling, and sometimes the answers are clearly wrong.

Parallels are a series of similar incidents which occurred respec- tively to Greeks and Romans, the Greek standing first and the Roman counterpart following. Many of the characters are mytho- logieal, though Plutarch regards them as historical.

On the Fortune of the Romans discusses whether, on the whole, good luck or valour had more influence in giving the Romans the supremacy. This is followed by two diseourses (Adyo:) on the same question as applicable to

the career of Alexander the Great, Whether the Athenians were more renoumed for War or for Wisdom? The conclusion is (§ 7) that it was not so much by the fame of their poets as by the deeds of their heroes that Athens became renowned.

Gryllus is a most amusing dialogue, in which Circe, Ulysses, and a talking pig take part. Ulysses wishes that all the human beings that have been changed by the sorceress into bestial forms should be restored ; but “piggy” is quite opposed to the return, arguing that in moral virtues, such as true bravery, chastity, temperance, and general simplicity of life and contentment, animals are very far superior to man.

Whether Land Animals or Water Animals are the Cleverer is a rather long dialogue on the intelligence of ants, bees, elephants, spiders, dogs, &c., on the one hand, and the crocodile, the dolphin, the tunny, and many kinds of fish, on the other. This isa good essay, much in the style of Aristotle’s History of Animals.

On Flesh-Eating, in two orations, discusses the origin of the practice, viz., necessity, and makes a touching appeal to man not to destroy life for mere gluttony (§ 4). This is a short but, very sensible and interesting argument. Questions on Plato are ten in number, each heading subdivided into several speculative replics. The subjects are for the most part metaphysical ; the essay is not long, but it concerns Platonists only. Whether Water or Fire ts more Useful is also short; after discussing the uses of both elements it deeides in favour of the latter, since nothing can exceed in importanec the warmth of life and the light of the sun. On Primary Cold is a physical speculation on the true nature and origin of the quality antithetical to heat. Physical Reasons (Quexstiones Naturales) are replies to inquiries as to why certain facts or phenomena occur ; ¢.g., “ Why is salt the only flavour not in fruits?” “Why do fishing-nets rot in winter more than in summer?” “Why does pouring oil on the sea produce a calm?” On the Opinions accepted by the Philosophers, in five books, is a valuable compendium of the views of the Ionic school and the Stoies on the phenomena of the universe and of life. On the IIl- nature of Herodotus is a well-known critique of the historian for his unfairness, not only to the Beeotians and Lacedemoniaus, but to the Corinthians and other Greck states. It is easy to say that this essay

“ neither requires nor merits refutation”; but Plutarch knew history, and he writes like one who thoroughly understands the charges whieh he brings against the historian. The Lives of the Ten Orators, from Antipho to Dinarchus, are biographies of various length, compiled, doubtless, from materials now lost.

_ Two rather long essays, Should a Man engage in Politics when he 1s no longer Yi oung, and Precepts for Governing (modrrinda maparyyér- Mara), are interspersed with valuable quotations. In favour of the former view the administrations of Pericles, of Agesilaus, of Augustus, are eited (§ 2), and the preference of older men for the pleasures of doing good over the pleasures of the senses (§ 5). In the latter, the true use of eloquence is diseusscd, and a con- trast drawn between the brilliant and risky and the slow and safe

poliey (§ 10). The choice of friends, and the caution against enmi- |

ties, the dangers of love, of gain, and of ambition, with many

topics of the like kind, are sensibly advanced and illustrated by

exaniples.

‘Besides the numerous works that have come down to us, Plutarch speaks of a work called Atria, the same title with the lost poem of Callimachus (Romulus, § 15).

The Lives have often been translated; the most popular version into English is that by. John and William Langhorne ; more reeently many of the Roman lives have been translated, with notes, by the late Mr George Long. An exeellent and convenient edition of the Greek text, in 5 vols. 12mo, has been published in the Teubner series by Carl Sintenis. It seems strange that no modern edition of the Opera Moralia exists, and that the student has to fall baek on the old-fashioned volumes of Wyttenbach (6 vols. 4to, Oxford, also printed in 8vo), Reiske (in 12 vols. 8vo), and Hutten (14 vols. 8vo). Whether there is any hope of Rudolph Hereher’s single volume (1872) in

the Teubner series being followed by others, we have no information. (F. A. P.)

PLUTO, the god of the dead in Greek mythology. His oldest name was Hades (‘At8ys, “AuSys, “ASns), “the Unseen”; the name Pluto (II\ovrwv) was given him as the bestower of the riches (zAodros) of the mine, and in ordinary language it ousted the dread name of Hades, which was, however, retained in poetry. He was the son of Cronus and Rhea, and brother of Zeus and Poseidon. Having deposed Cronus, the brothers cast lots for the king- doms of the heaven, the sea, and the infernal regions, and Pluto obtained the infernal regions, which from their ruler were afterwards known as Hades. The “house of Hades” was a dark and dreadful abode deep down in the earth. How literally the god was supposed to dwell underground is shown by the method of invoking him, which was by rapping on the ground to attract his attention. According to another view the realm of Hades was in a land beyond the ocean in the far west, which to the Greek was always the region of darkness and death, as the east of light and life. This is the view of Hades presented in the Odyssey. Ulysses sails all day with a north wind, and at sunsct reaches a land at the limits of ocean. Here, wrapped in mist and cloud, dwell the Cimmerians, who never see the sun. He lands, and moving along the shore he calls the ghosts of the departed to meet him. In the description of the Cimmerians we have perhaps a traveller’s tale of the long dark winters of the north. Besides this gloomy region, we find in another passage of the Odyssey (iv. 561 sq.) a picture of Elysium, a happy land at the ends of the carth, where rain and snow fall not, but the cool west wind blows and men live at ease. After Homer this happy land, the abode of the good after death, was known as the Islands of the Blest, and these in later times were identified with Madeira and the Canary Islands.!_ But in the oldest Greek mythology the “‘house of Hades” was a place neither of reward nor punishment; it was simply the home of the dead, good and bad alike, who led a dim and shadowy reflexion of life onearth. The differentiation of this “home of Hades” into a heaven and a hell was the result of pro- gressive thought and morality. Pluto was himself simply the ruler of the dead; in no sense was he a tempter and seducer of mankind like the devil of Christian theology. Indeed the very conception of a devil, as a principle of evil in continual conflict with God or the principle of good, is

totally foreign to Greek mythology, as it was also to Indian and Teutonic mythology. Pluto was certainly depicted as

1 The conception of the land of the dead, whether in the far west or beneath the earth, might be paralleled from the beliefs of many savage tribes. The Samoan Islanders unite the two conceptions : the entrance to their spirit-land is at the westernmost point of the westernmost island, where the ghosts descend by two holes into the under-world. Long ago the inhabitants of the French eoast of the English Channel believed that the souls of the dead were ferried across to Britain, and there are still traces of this belief in the folk-lore of Brittany (Tylor, Primitive Culture, ii. p. 64; Grimm, Deutsehe Mythologie, ii, p. 694). In classical mythology the underground Hades prevailed over the western. It was an Etrusean custom at the foundation of a city to dig a deep hole in the earth, and close it with a stone; on three days in the year this stone was removed, and the ghosts were then supposed to ascend from the lower world. In Asia Minor caves filled with mephitic vapours or containing hot springs were known as Plutonia or Charonia. The most famous entrances to the under-world were at Tenarum in Laconia, and at the Lake Avernus in Italy.

stern and pitiless, but he was so only in discharge of his | duty as custodian of the dead. But even Pluto once melted at the music of Orpheus when he came to fetch from the dead his wife Eurydice. The cap of Hades, like the Vebelkappe of German mythology, rendered its wearer invisible; as a sort of thick cloud it was the reverse of the nimbus or halo of the heavenly gods. While the victims sacrificed to the latter were white, those offered to Pluto were black. His wife was Proserpine (Persephone), daughter of Demeter (Ceres), whom he carried off as she was gathering flowers at Enna in Sicily. Like the Greeks, the ancient Italians believed that the souls of the dead dwelt underground; in Latin the names for the god of the dead are Orcus and Father Dis, but the Greek name Pluto also frequently occurs. But, while Orcus was rather the actual slayer, the angel of death, Father Dis was the ruler of the dead, and thus corresponded to Pluto. Their names also correspond, Dis being a contraction for Dives, “wealthy.” The Etruscan god of death was represented asa savage old man with wings and a hammer; at

the gladiatorial games of Rome a man masked after this fashion used to remove the corpses from the arena. In Romanesque folklore Orcus has passed into a forest-elf, a black, hairy, man-eating monster, upon whose house children lost in the woods are apt to stumble, and who sometimes shows himself kindly and helpful. He is the Italian orco, the Spanish ogro, the English ogre.

PLUTUS (zAotros, “ wealth”), the Greek god of riches, whom Demeter bore to Iasion “in the fat land of Crete.” He enriched every one whom he fell in with. According to Aristophanes, he was blinded by Zeus in order that he might not enrich the good and wise alone. At Thebes there was a statue of Fortune holding the child Plutus in her arms; at Athens he was similarly represented in the arms of Peace; at Thespize he was represented standing

beside Athene the Worker. Elsewhere he was represented as a boy with a cornucopia. He is the subject of one of the extant comedies of Aristophanes.

PLYMOUTH, a municipal and parliamentary borough and seaport town of Devonshire, England, is picturesquely situated on Plymouth Sound in the south-west corner of the county, at the confluence of the Tamar and Plym, 44 miles south-west of Exeter. With = the borough of Devonport and the township of East [—~ Stonehouse it forms the ag- |”) = gregate town known as the | ‘Three Towns.” There is 4k; railway communication by |: means of the Great Western |: and South-Western lines, and by several branch lines / connected with these sys- tems. The defences of the town, in addition to the citadel, an obsolete fortifica- Environs of Plymouth. tion built by Charles IT., on the site of an older fort, con- sist of a most elaborate chain of forts of great strength mounted with guns of the heaviest calibre, and forming a complete line of defence round the whole circumference both landwards and seawards. The streets are for the most part narrow and crooked, and the houses very irregular both in style of architecture and in height. Great improvements have, however, recently taken place. The more ancient part of the town near the water-side has been much altered; and a number of model dwellings have also lately been erected. In the principal thoroughfares there are numerous hand- some shops and other imposing

business establishments. Among the most important of the public buildings is the Guildhall, completed in 1874 at a cost of £56,000, a fine

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group in the Gothic style of the 13th century, with a lofty tower, and containing the town-hall with a fine organ and a series of historical windows, a police court and offices, a sessions and other court rooms, and the council chamber and municipal offices. The new post office in Westwell Street was erected at a cost of £12,000. The market, dating from 1804, and occupying about three acres in the centre of the town, is in course of reconstruction. A fine clock-tower, erected by the corporation, stands at the junction of George Street and Union Street. The parish church of St Andrews, some portions of which date from about 1430, has undergone alterations and improvements at different periods, and in 1874-75 was completely restored under the direction of the late Sir G. G. Scott. The tower, built in 1460, contains a fine peal of bells. The church of Charles the Martyr was begun in 1640, when the parish was divided, but owing to the Civil War was not completed till 1657. Of the other more modern parish churches there are none of special interest. The town is the seat ofa Roman Catholic bishopric, the cathedral of which, a good building in the Early English style, was opened in 1858 at a cost of £10,000. Attached to it is the convent of Notre Dame, and several other religious houses and chapels. The Athenzeum (1812) is the home of the Plymouth Institution and the Devon and Corn- wall Natural History Society. In connexion with it there are a lecture hall, a museum, art gallery, and a small but select scientific library. The Plymouth Proprietary Library (1812) has a good selection of books in general literature, and the building also contains the library of the Plymouth Incorporated Law Society and the Cottonian collection, which includes many relics of Sir Joshua Reynolds and a number of his pictures. The Free Public Library, estab- lished in 1876, at present occupies the old Guildhall. The principal educational establishments are the Western

| College for the training of students for the ministry of the | Independent denomination ; the Plymouth College, a high

school for boys; the High School for Girls ; the Corpora- tion Grammar School, founded in 1572; the Public School,

_ established in 1809 (one of the largest public schools in

England) ; the Grey Coat School; the Blue Coat School ; the Orphan's Aid; Lady Rogers's School; the Orphan Asylum; and the Household of Faith founded by the well known Dr Hawker, The Plymouth school board has nine schools in full operation ; and each of the prin- cipal parishes has also its parochial day school. The charitable institutions embrace the South Devon and East Cornwall Hospital, for which a fine range of buildings has lately been erected; the Devon and Cornwall Female Orphan Asylum (1834); the Penitentiary and Female Home (1833) ; the Royal Eye Infirmary (1821); the South Devon and Cornwall Institution for the Blind (1860, new building erected 1876), and various other philanthropic societies. The only public recreation ground of any extent is the Hoe Park, 18 acres, a fine promenade sloping gradually to the sea, attached to which is a handsome promenade pier. On the Hoe a statue in bronze, by Boehm, of Sir Francis Drake was unveiled in 1884. Smeaton's lighthouse has been removed from the reef on which it stood for one hundred and twenty years, and is now a prominent object on the Hoe. Theview from the Hoe includes Mount Edgcumbe with its beautifully wooded slopes, the Cornwall hills, the Dartmoor hills on the north-eastern horizon, and Eddy- stone lighthouse far away over the waters of the Channel.

Plymouth not only holds a leading position in the country as a naval station, but is the centre of the growing trade of Devonshire and Cornwall, and is also becoming @ holiday centre and health resort. To the south of the town is the Sound, protected by the magnificent break- water, within the limits of which and the harbours con-

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nected with it the whole British navy might find a safe anchorage. The western harbour, known as the Hamoaze, at the mouth of the river Tamar, is devoted almost exclu- sively to the requirements of the royal navy, as along

its banks are the dockyard, the Keyham factory, the arsenal, and other Government establishments (See Devonport, vol. vii, 138; and Dockyarps, vol. vii, 315). The eastern harbour, Cattewater with Sutton Pool, now pro-

‘tected by a new breakwater at Mount Batten, is the

anchorage ground for merchant shipping. Commodious dock accommodation is provided at the Great Western Docks, Millbay, between Plymouth and Stonehouse, opened in 1857, and comprehending a floating basin over 13 acres in extent with a depth of 22 feet at spring tides, a tidal

harbour of 35 acres, anda graving dock. The port has an

extensive trade with America, the West Indies, Mauritius,

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Africa, and the Baltic ports, as well as an extensive coast- ing trade. It is the starting point for many of the emigrant ships for Australia, New Zealand, and British America. The chief exports are minerals, including copper, lead, tin, granite, and marble. There is also some trade in pilchards and other fish. The imports are chiefly agricultural produce and timber. The total number of vessels that entered the port in cargo and in ballast in 1883 was 3852, of 843,227 tons, the number that cleared 3443, of 754,318 tons. Plymouth has few manufactures, the principal being biscuits, black-lead, candles, manures, soap, starch, sugar, lead, and the celebrated Plymouth gin. The principal industries are connected with shipbuilding and the fisheries. According to the Act of 1835, the

borough is divided into six wards, and is governed by a mayor, twelve aldermen, and thirty-six councillors. The

Plan of Plymouth.

water-works are under the control of the corporation, but the gas works are in the hands of acompany. The popula- tion of the municipal borough (area

1468 acres) in 1871 was 68,758, and in 1881 it was 73,794. The population of the parliamentary borough (area 2061 acres) in the same years was 70,091 and 76,080. It returns two members to parliament.

The Hoe at Plymonth is claimed to be the high rock from which, according to Geoffrey of Monmouth, Corineus the Trojan hurled the giant Goemagot into the sea, and at an early period there was cut out in the ground at the Hoe the likeness of two figures with clubs in their hands, which for many years was renewed by the corporation, and was in existence till the erection of the citadel about 1671. Both British and Roman remains have been found in the neighbour- hood, the most important being those of a Romano-British cemetery discovered in 1864 during the construction of Fort Stamford. In Domesday it occurs as Sutone, and afterwards it was divided into the town of Sutton Prior, the hamlet of Sutton Valletort, and the tithing of Sutton Ralph, a part of it having been granted to the Norman family of Valletort, while the greater part belonged to the

priory of Plympton. About 1253 a market was established, and in 1292 the town first returned members to parliament. In the 14th century it was frequently the port of embarkation and of disem- barkation in connexion with expeditions to France. It suffered considerably at the hands of the French in 1338, 13850, 1377, 1400,. and 1402, the Bretons on the last oecasion destroying six hundred houses. In 1412 the inhabitants petitioned for a charter, but for a long time their application was opposed by the prior and convent of Plympton. In 1439 a charter was, however, at last granted by Henry VI., defining the limits of the town, permitting the erection of walls and defences, allowing the levying of dues on shipping for the purpose of such buildings and their maintenance, and directing the institution of a corporate body under the title of the “ mayor and commonalty of the borough of Plymouth.” Leland speaks (1540-47) of Plymouth harbour as being chained across in times of necessity, and of an ‘‘old ‘castel quadrate’ between the town and the sea.” A small fragment of one of the outer works of this castle still stands at the foot of Lambhay Street. During the rebellion of 1548-49 the town suffered severely at the hands of the insurgents, and according to Westcote the ‘“‘evidences” of the borough were burnt. Under Elizabeth it rose to be the foremost port of England, and Camden, who visited the town about 1588,

states that “though not very large its name and reputation is very great among all nations.” In the discovery of the New World it played a part of prime importance. Martin Cockeram, a native of the town, sailed with Sebastian Cabot when he touched_the coast of America in 1497. Sir John Hawkins and his father Wil- liam were natives of the town, and in 1571 Sir John was returned member of parliament for the borough. In 1572 Sir Francis Drake left the port for the West Indies, and in 1577 he set out from it on his voyage ‘about the earth.” He was elected mayor of the town in 1581, and in 1592-93 represented it in parliament. Sir Humphrey Gilbert, who was M.P. for Plymouth in 1571, had in 1578 received from Queen Elizabeth letters patent for a colony in America; but, after setting out in 1579, he was compelled to return with the loss of his principal ship. In 1583 he sailed again from Plymouth (see GiupeRt). In 1585 Drake again sailed from Plymouth for the West Indies, bringing back on his return the remnant of Raleigh’s Virginian colony. The port supplied seven ships against the Spanish Armada, and it was in the Sound that the English fleet of 120 sail awaited the sighting of the Spaniards. In 1590 Drake was successful in the oft attempted task of bringing in a stream of fresh water for the use of the town, from the river Meavy near Sheepstor, Dartmoor. He and Sir John Hawkins sailed from Plymouth on their last voyage in 1595, both dying at sea in the following year. Many other expeditions from Drake’s time to the present have been despatched from this port, which was the last at which the Pilgrim Fathers touched when they set sail for America. Plymouth was throughout nearly the whole Civil War closely invested by the Royalists, and was the only town in the west of England which never fell into their hands. The town was one of the first to declare for William of Orange. It was in 1691, during his reign, that the dockyard was commenced. The “Jocal literature ” of Plymouth is singularly rich and comprehensive. It has also a connexion with many men of great eminence. Sir Joshua Reynolds, born at Plympton, first practised his art in the town, and its native artists are represented by Sir Charles Lock Eastlake, James Northcote, Benjamin Robert Haydou, aud Samuel Prout. Besides Sir John Hawkins and other celebrated seamen, it has also given birth to Sir Willian Snow Harris, Dr James Yonge, Dr John Kitto, Dr S. P. Tregelles, Dr Robert Hawker, N. pee the Dartmoor poet, Mortimer Collins, and Sir R. P. Collier.

See Histories by Worth, 1871, and by Jewitt, 1873; Rowe, Hcclestastical History of Old Plymouth; The Western Antiquary ; Worth, The Three Towns Bibliotheca.

PLYMOUTH, a township and village of the United States, the shire-town of Plymouth county, Massachusetts, and a port of entry on Cape Cod Bay,—the village lying at the terminus of a branch of the Old Colony Railroad, 37 iniles south-south-east of Boston. The main interest of Plymouth is historical, and centres in the fact that it was the first settlement of the Pilgrim Fathers of New England, who landed December 21 (n. 8.), 1620, on the rock now covered by a handsome granite canopy in Walter Street. Leyden Street, so called in memory of the Dutch town where the exiles had stopped for a season, is the oldest street in New England. The houses and general appear- ance of Plymouth are, however, thoroughly modern. Pilgrim Hall (which is built of granite and measures 70 feet long by 40 feet wide) was erected in 1824-25 by the Pilgrim Society constituted in 1820; it contains a public library and many relics of the fathers—including Miles Standish's sword and Governor Carver's chair. The corner stone of a national monument to the Pilgrims was laid August 1, 1859, on a high hill near the railroad station ; 1500 tons of granite were used for the foundation ; and a pedestal 45 feet high is surrounded by statues 20 feet high of Morality, Law, Education, and Freedom, and bears a colossal statue of Faith, 36 feet high, holding a Bible in her right hand (the largest granite statue in the world). Burying Hill was the site of the embattled church erected in 1622, and contains many ancient tombstones and the foundations of the watchtower (1643) now covered with sod. Cole's Hill is the spot where half of the " Mayflower" Pilgrims found their rest during the first winter. Five of their graves were discovered in 1855 while pipes for the town water-works were being laid, and two more (now marked with a granite slab) in 1883. The bones of the first five are deposited in a compartment of the canopy over the

Forefathers' Rock." A town hall (1749), the county

court-house, and the house of correction are the main public buildings of Plymouth. The population of the township was 4758 in 1830, 6024 in 1850,

6238 in 1870, 7093 in 1880, and 7500 in 1884. Manufactures of sail- duck, cotton-cloth, tacks, nails, plate-iron, rolled zinc and copper rivets, hammers, &e., are carried on; the cordage factories are among the largest and most complete works of the kind in the world.

PLYMOUTH, a borough of the United States, in Luzerne county, Pennsylvania, on the Bloomsburg division of the Delaware, Lackawanna, and Western Railroad, 8 miles from Wyoming, is a flourishing coal-mining town, which increased its population from 2648 in 1870 to 6065 in 1880. At Plymouth junction, 2 miles to the north- east, a branch line to Wilkesbarre connects with the Central Railroad.

PLYMOUTH BRETHREN (Breturen, or CuRIsTIAN BRETHREN) are a sect of Christians who received the name in 1830 when the Rev. J. N. Darby induced many of the inhabitants of Plymouth to associate themselves with him for the promulgation of opinions which they held in common. Although small Christian communities existed in Ireland and elsewhere calling themselves Brethren and holding similar views, the accession to the ranks of Mr Darby so increased their numbers and influence that he is usually reckoned the founder of Plymouthism. Darby (born in Nov. 1800, in London ; graduated at Trinity College, Dublin, in 1819; died April 29, 1882 at Bournemouth) was a curate in the Episcopalian Church of Ireland until 1827, when he felt himself constrained to leave the Established Church ; betaking ~~himself to Dublin, he be~~ came associated with several devout people who refused all ecclesiastical fellowship, met statedly for public worship, and called themselves the Brethren. In 1830 Darby at Plymouth won over a large number of people to his way of thinking, among whoin were the Rev. Benjamin Wills Newton, who had been a clergyman of the Established Church of England; the Rev. James L. Harris, a Plymouth clergyman; and the well known Biblical scholar Dr Samuel Prideaux Tregelles. The Brethren started a newspaper, Zhe Christian Witness, continued under the names Zhe Present Testimony (1849) and The Bible Trea- sury (1856), with Harris as editor and Darby as the most important contributor. During the next eight years the progress of the sect was rapid, and communities of the brethren were to be found in many of the principal towns in England.

In 1838 Darby, after a short stay in Paris, went to reside in French Switzerland, and found many disciples. Congregations were formed in Geneva, at Lausanne, where most of the Methodist and other dissenters joined the Brethren, at Vevey, and elsewhere in Vaud. His opinions also found their way into Germany, German Switzerland, Italy, and France; but French Switzerland has always remained the stronghold of Plymouthism on the Continent, and for his followers there Mr Darby wrote two of his most important tracts, Le Ministére considéré dans sa Nature and De la Presence et de VAction du S. Esprit dans UVEglise. The revolution in the canton Vaud, instigated by the Jesuits in 1845, brought persecu- tion to the Brethren in the canton and in other parts of French Switzerland, and Darby felt his own life insecure there.

He returned to England, and his reappearance was accompanied by divisions among the Brethren at home. These divisions began at Plymouth. Mr B. Wills Newton, at the head of the community there, was accused of departing from the testimony of the Brethren against an official ministry, and of reintroducing the spirit of cleri- calism. Unable to detach the congregation from the

preacher, Darby began a rival and separate assembly. The majority of the Brethren out of Plymouth supported Darby, but a minority kept by Newton. The separation became wider in 1847 on the discovery of supposed heretical teaching by Newton. In 1848 another divi- sion took place. The Bethesda congregation at Bristol, where Mr George Miiller was the most influential member, received into communion several of Newton’s followers and justified their action. A large number of communi- ties approved of their conduct; others were strongly opposed to it. Out of this came the separation into Neutral Brethren led by Miiller, and Exclusive Brethren or Darbyites, who refused to hold communion with the followers of Newton or Miiller. The exclusives, who were the more numerous, suffered further divisions. An Irish clergyman named Cluff had adopted the views of Mr Pearsall Smith, and when these were repudiated seceded with his followers. The most important division among the exclusives came to a crisis in 1881, when Mr William Kelly and Mr Darby became the

recognized leaders of two sections who separated on some point of discipline. There are therefore at least five official divisions or sects of Plymouthists :—(1) the followers of Mr B. Wills Newton ; (2) the Neutrals, who incline to the Congregationalist idea that each assembly should judge for itself in matters of discipline, headed by Mr George Miiller ; (3) the Darbyite Exclusives ; (4) the Exclusives who follow Mr Kelly ; and (5) the followers of Mr Cluff. The fundamental principle of the Exclusives, " Separation from evil God's principle of unity," has led to many unimportant excommunications and separations besides those mentioned.

The theological views of the Brethren do not differ greatly from those held by evangelical Protestants (for a list of divergences, see Reid, Plymouth Brethrenism Unveiled and fefuted); they make the baptism of infants an open question and celebrate the Lord's Supper weekly. Their distinctive doctrines are ecclesiastical, They hold that all official ininistry, anything like a clergy, whether on Episcopalian, Presbyterian, or Congregationalist theories, is a denial of the spiritual priesthood of all believers, and a striving against the Holy Spirit. Hence it is a point of conscience to have no communion with any church which possesses a regular ministry. The gradual growth of this opinion, and per- haps the reasons for holding it, may be traced in Mr Darby's earlier writings. While a curate in the Church of Ireland he was indignant with Archbishop Magee for stopping the progress of mission work among Roman Catholics by imposing on all who joined the church the oath of supremacy. This led Darby to the idea that established churches are as foreign to the spirit of Christi- anity as the papacy is (''Considerations addressed to the Archbishop of Dublin, &.," Coll. Works, vol. i. 1). The parochial system, when enforced to the extent of prohibit- ing the preaching of the gospel within a parish where the incumbent was opposed to it, led him to consider the whole system a hindrance to the proper work of the church and therefore anti-Christian ("Thoughts on the present position of the Home Mission," Coll. Works, i. 78). And the waste of power implied in the refusal to sanction lay-preaching seemed to him to lead to the con- clusion that an official ministry was a refusal of the gifts of the Spirit to the church ("On Lay Preaching," Coll. Works, p. 200). These three ideas seem to have led in the end to Plymouthism ; and the movement, if it has had small results in the formation of a sect, has at least set churches to consider how they might

make their machinery more elastic. Perhaps one of the reasons of the comparatively small number of Brethren may be found in their idea that their mission is not to the heathen but to “the awakened in the churches,”

Authorities. —Darby, Collected Works, 82 vols., edited by Kelly ; Reid, Plymouth Brethrenism Unveiled and Refuted, 3a ed., 1880, and History and Literature of the so-called Plymouth Brethren, 2d ed., 1876; Miller, Zhe Brethren, their Rise, Progress, and Testimony, 1879 ; Teulon, History and Doctrines of the Plymouth brethren, 1883. (T. M. L.)

PNEUMATIC DESPATCH. The transport of written despatches through long narrow tubes by the agency of air-pressure was introduced in 1853, by Mr Latimer Clark, between the Central and Stock Exchange stations of the Electric and International Telegraph Company in London. The stations were connected by a tube 14 inches in diameter and 220 yards long. Carriers containing batches of telegrams, and fitting piston-wise in the tube, were sucked through it (in one direction only) by the production of a partial vacuum at one end. In 1858 MrC. F. Varley improved the system by using compressed air to force the carriers in one direction, a partial vacuum being still used to draw them in the other direction. This improvement enables single radiating lines of pipe to be used both for sending and for receiving telegrams between a central station supplied with pumping machinery and outlying stations not so supplied. In the hands of Messrs Culley and Sabine this radial system of pneumatic despatch has been brought to great perfection in connexion with the telegraphic department of the British post office. Another method of working, extensively used in Paris and other Continental cities, is the circuit system, in which stations are grouped on circular or loop lines, round which carriers travel in one directiononly. In one form of circuit system —that of Messrs Siemens—a continuous current of air is kept up in the tube, and rocking switches are provided by which carriers can be quickly introduced or removed at any one of the stations on the line without interfering with the movement of other carriers in other parts of the circuit. More usually, however, the circuit system is worked by despatching carriers, or trains of carriers, at relatively long intervals, the pressure or vacuuin which gives motive power being applied only while such trains are on the line. On long circuits means are provided at several

stations for putting on pressure or vacuum, so that the action may be limited to that section of the line on which the carriers are travelling at any time.

The following partieulars refer to the radial system of pneumatic despatch as used in the British post office. In London most of the lines connect the central office with district offices for the purpose of collecting and distributing telegrams. Iron tubes were used in some of the earliest lines, but now the tubes are always made of lead, with soldered joints, and are enclosed in outcr pipes of iron for the sake of mechanical protection. Thc bore, which is very smooth and uniform, is normally 2} inches, though in a few cases it is as much as 8 inches, and in somconly Ildinches. The greatest single length of any of the existing London lines is 3873 yards, but a more usual length is from 1000 to 2000 yards. In most cases a single tube serves both to send and to receive, but where the traffic is heavy a pair of tubes arc used, one to send by pressure and the other to receive by vacuum. The pumps, which supply pressure and vacuum to two mains, are situated in the ccntral office. At the outlying stations the tubcs terminate in a glass box, open to the atmosphere. At the central station the end of each tube is a short vertical length, facing downwards, and pro- vided with a double valve, consisting of two sluices, one at the end and the other a little way above the end, the distance between the sluices being somewhat longer than the length of a carricr. The sluices are geared together in such a manner that a single movement of a handle closes one and opens the other, or vice versa. To send a earrier from the central station, the carricr is introduced into the tube, the lower sluice being open; a single movement of the handle then successively (1) closes the lower sluice, (2) opens the upper sluice, and (3) opens a valve which admits air behind the carrier from the compressed-air main. As soon as the arrival of the carrier is signalled (electrically) from the out-station, the handle is pushed back, thus (1) cutting off the compressed air, (2) closing the upper sluice, and (8) opening the lower sluice. The tube is then ready for the sending of another carrier. When an electric signal arrives from an out-station that a carrier is inserted there for transmission to the central station the handle is pulled for-

ward far enough to close the lower and open the upper sluice, but not far enough to put on the air-pressure. ‘The vacuum main is then put in connexion with the tube by a separate stop-cock. When the carrier arrives the vacuum is shut off and the lower sluice opened to allow it to drop out. This arrangement of double sluices admits of the insertion or removal of a carrier while other carriers are travelling in the same tube, and without sensible dis- turbance of their motion. But great caution requires to be exercised in allowing two or more carriers to follow one another on a single section of line, especially on lines worked by pressure, since no two carriers travel at precisely the same speed. When the same tube is used alternately for sending and receiving the upper sluice is dispensed with. On some lines there are intermediate stations, and the sections are then worked by a block system like that used on railways. The earriers are cylindrical cases of gutta-percha covered with felt, which is allowed to project loosely at the back, so that the pressure makes it expand and fit the pipe closely. In front the carrier is closed by a buffer or piston composed of disks of felt of the diameter of the pipe. The despatches are held in by an elastic baud at the back. An ordinary carrier weighs 2% 0z., and holds about a dozen despatches. During business hours earriers are passing through the London tubes almost incessantly. With a pressure of 10 tb per square inch, ora vacuum of 7 tb, the time of transit, if through a 2} inch tube, is 1 minute for a length of nearly 1000 yards, and 54 minutes for a length of 3000 yards. —

The following statistics show the growth of the pncumatic despatch in the post office during ten years (the figures for 1875 are taken from a paper by Messrs Culley and Sabine, cited below, and those for 1885 have been furnished by Mr W. H. Preece) :—

January 1875. January 1885. No. of Tubes. | Total Length. | No. of Tubes. | Total Length. er Miles. Yards, Miles. vas 4 ondonie.. c+. 25 1160 gee 383 685 Liverpool…... 4 1 1237 5 2 389 | Glasgow …..... il 242 5 1 1142 | JD UDI oaconcor 3 940 5 1 954 Manchester … 5 1 266 6 1 294 Birmingham.. 3 Oy 4 1235 | Neweastle….. 0 0 1 460 Total …... 41 21 1242 | 108 40 1239 |

1 Including 29 short “house” tubes.

In Paris large areas of the city have been covered by pneumatic circuits made up of iron pipes round which omnibus trains of earriers are sent at

intervals of fifteen minutes. The trains consist of several carriers much heavier than the English type, linked to one another and to a leading piston. The trains are stopped at the suc- cessive stations to take up and deposit despatches. ‘The pneumatic despatch took root in Paris in 1866, and has been developed there in a way which differs greatly in mechanical details from the English system. An arrangement like that used in Paris has been followed in Vienna and in Berlin, where the Siemens system has also been used. In New York the English system is adopted, but with brass instead of lead tubes.

Interruptions occurring in the pipes can be localized by firing a pistol at one end and registering by a chronograph the interval of time between the explosion and the arrival of the air-wave reflected from tle obstacle.

In addition to its use for postal and telegraphic purposes the pneumatic despatch is occasionally employed for internal com- munication in offices, hotels, &c., and also in shops for the transport of money and bills between the cashier’s desk aud the counters.

_ References.—The system as now used in the United Kingdom is fully deseribed in a paper by Messrs Culley and Sabine (Min. Proc. Inst. Civ. £ng., vol. xiiii.) The same volume eontains a description of the pneumatie telegraphs of Paris and of experiments on them by M. Bontemps, and also a discussion of the theory of pneumatie transmission by Prof. W. C. Unwin. Reference should also be made to a paper by C. Siemens (Min. Proc. Inst. Civ. Eng., vol. Xxxiii.) de-

scribing the Siemens eireuit system ; and to Les Télégraphes, b l (Paris 4881) H graphes, by M. A. os pe

PNEUMATICS is that department of hydrodynamics which treats of the properties of gases as distinct from liquids. Under Hypromecuanics will be found a general discussion of the subject as a branch of mathematical physics ; here we shall limit our attention mainly to the experimental aspect.

The gaseous fluid with which we have chiefly to do is our atmosphere. Though practically invisible, it appeals in its properties to other of our senses, so that the evidences of its presence are manifold. Thus we feel it in

its motion as wind, and observe the dynamical effects of this motion in the quiver of the leaf or the momentum of

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the frigate under weigh. It offers resistance to the passage of bodies through it, destroying their motion and trans- forming their energy—as is betrayed to our hearing in the whiz of the rifle bullet, to our sight in the flash of the meteor. In its general physical properties air has much in common with other gases. It is advisable therefore first to establish these general properties, and then consider the

| characteristic features of the several gases.

| of a fluid is of the nature of a pressure.

Matter is conveniently studied under the two great divisions of solids and fluids. The practically obvious distinction between these may be stated in dynamical language thus :—solids can sustain a longitudinal pressure without being supported by a lateral pressure; fluids can- not. Hence any region of space enclosed by a rigid boundary can be easily filled with a fluid, which then takes the form of the bounding surface at every point of it. But here we distinguish between fluids according as they are gases or liquids. The gas will always completely fill the region, however small the quantity put in. Remove any portion and the remainder will expand so as to fill the whole space again. On the other hand it requires a de- finite quantity of liquid to fill the region. Remove any portion and a part of the space will be left unoccupied by liquid. Part of the liquid surface is then otherwise conditioned than by the form of the wall or bounding surface of the region ; and if the portion of the wall not in contact with the liquid is removed the form and quantity of the liquid are in no way affected. Hence a liquid can be kept in an open yessel ; a gas cannot so be.

The mutual action between any two portions of matter is called the stress between them. This stress has two aspects, according as its effect or tendency is considered with reference to the one or the other body. Thus

between the earth and moon there is a stress which is an attraction, The one aspect is the force which attracts the

moon to the earth; the other is the foree which attracts

the earth to the moon. According to Newton’s third law of motion these are equal and opposite. Similarly the repulsive stress between the like poles of two magnets has its two aspects, which are equal but oppositely directed forces. In the case of a mass hanging by a cord, the stress is a tension at every point of the cord. At any given point this tension has two equal and opposite aspects, one of which is the weight of the mass and the portion of the cord below the given point. Finally, the stress between any body and the horizontal table on which it rests is a two-faced pressure, being downwards as regards the table, upwards as regards the body. The total pressure upon the table over the whole surface of contact is clearly the weight of the body. If the total pressure is supposed to be uniformly distributed, the measure of the pressure on unit surface is the quotient of this weight by the area of the surface. When we speak of pressure at a point, it is this pressure on unit surface that is meant. When the pressure varies from point to point over a surface, the pressure at any point is defined to be the limit of the ratio of the total pressure over any small element of surface around that point to the area of the element as the element is diminished indefinitely.

The stress which exists between the contiguous portions The ideal or perfect fluid is a substance in which this stress between contiguous portions is always perpendicular to the common interface. In other words there is no stress tangential to the interface at any point. Hence if the contiguous portions are at relative rest, or have a relative motion parallel to the interface, neither state can be affected by the mutual stress. This condition is perfectly fulfilled in the case of any known fluid in equilibrium ; but for a fluid in motion it is not even approximately fulfilled. For, any

Solid and fluid distin- guished,

Stress.

| Ideal per fect fluid

defined. —

|

Level surfaces.

Equipo- tential surfaces,

Broa PT iCs

visible relative motion set up among the parts of a fluid rapidly decays in virtue of viscosity, which even for the subtlest gases is quite appreciable in its effects.

In a fluid at rest, then, the pressure over any surface which we may imagine to be drawn is perpendicular (or normal) to the surface at every point of it; and from this it follows at once, as has been proved in HYDROMECHANICS, vol. xii. p. 439, that the pressure at any point of a fluid at rest has the same value in all possible directions.

The pressures at two contiguous points in a fluid may either differ or not. If they differ, the change of pressure must be balanced by some extraneous force acting on the fluid in the direction in which the pressure increases. Any direction in which no such force acts must be a direction in which there is no change of pressure; otherwise, equi- librium will be destroyed. Suppose now the resultant force at every point in a fluid at rest to be given. In directions at right angles to the force at any given point the pressure will not vary. Hence we can pass to an infinite number of contiguous points at which the pressure is the same as at the given point. By making each of these in turn the starting-point, we can pass on to another set of points, and so gradually trace out within the fluid a surface at every point of which the pressure is the same. Such a surfaceis called a surface of equal pressure, or briefly a level surface ; and we see from the mode of its construc- tion that it is at every point of it perpendicular to the resultant force at that point.

Imagine any two contiguous level surfaces to be drawn, at every point of the one of which the pressure is », at every point of the other p+ 6p. Consider the equilibrium of a small column of average density p, bounded

at its ends by these surfaces. Let A be the area of each end, and 8r the length of the column or perpendicular distance between the level surfaces. If R is the average resultant force per unit mass acting on the column, then we have, for equilibrium of the column,

Adp=Abr. pR,

or dp—=Rpdr.

or the rate of increase of the pressure at any point per umt of length at right angles to the level surface is equal to the resultant force per unit of volume at that point.

If the applied forces belong to a conservative system, for which V is the potential (see MECHANICS), we may write the equation in the form

dp= — pdV.

Hence over any equipotential surface, for which 8V =0, p is constant, and is therefore a function of V. Consequently p also is a function of V. For a fluid in equilibrium, therefore, and under the influence of a conservative system of forces, the pressure and density are constant over every equipotential surface, that is, over every surface cutting the lines of force at right angles.

Now in the case of gases, to which our attention is at present confined, the density (temperature remaining con- stant) varies with every change of pressure; in mathemat- ical language p is a function of p. Thus, before we can solve the equation of equilibrium for a gas, we must be able to express this function mathematically ; in other words, we must know the exact relation between the

potential surfaces and consequently the surfaces of equal pressure and of equal density will be approximately spheres concentric with the earth. At any point there will. be a definite atmospheric pressure, which is equal numerically to the weight of the superincumbent vertical column of air of unit cross-section. The effect of this pressure, as exemplified in the action

of the common suction-pump, seems to have been first truly recognized by Galileo, who showed that the maximum depth from which water can be pumped is equal to the height of the water column which would exert at its base a pressure equal to the atmospheric pressure. As an experimental verification, he suggested filling with water a long pipe closed at the upper end, and immersing it with its lower and open end in a reservoir of the same liquid. The liquid surface in the pipe would, if the pipe wére long enough, stand at a definite height, which would be the same for all longer lengths of pipe. The practical difficulty of constructing a long enough tube (33 feet at least) prevented the experi- ment being really made till many years later.

Torricelli, however, in 1642, by substituting mercury for Torri- water, produced the experiment ona manageable scale. As elli's ex-

mercury is denser than water in the ratio of about 13.6:1, the mercury column necessary to balance by its weight the atmospheric pressure will be less than the water columu in the inverse ratio, or a little under 30 inches. Torricelli's experiment is exhibited in every mercurial barometer (see BAROMETER and Mergorotocy). By this experiment he not only gave the complete experimental verification of Galileo's views relating to atmospheric pressure, but pro- vided a ready means of measuring that pressure.

The most obvious applications of the barometer are these :—(1) to measure the variation in time of atmo- spheric pressure at any one locality on the earth's sur- face (the existence of this variation was discovered soon after the date of Torricelli's experiment by Pascal, Descartes, Boyle, and others); (2) to measure the varia- tion of atmospheric pressure with change of height above the earth's surface (Descartes mentions this application in the Principia Philosophiz, 1644; but to Pascal is the honour due of having first carried the experiment into execution, 1647) ; and (3) to compare pressures at different localities which are on the same level (if the pressures are equal, the air is in equilibrium ; if they are not, there must be flow of air from the place of higher pressure to that of lower—in other words, there must be wind, whose direction of motion depends on the relative position of the places, and whose intensity depends on the distance between the places and the difference of pressures). The first and last of these measurements are of

the greatest importance in meteorology. The second is a valuable method for measur- ing attainable heights, and is intimately connected with the problem as to the relation between the pressure and density of the air. Thus it would be possible, by barometric observations at a series of points in the same vertical line, to obtain a knowledge of this relation—more and more truly approximate the closer and more numerous the points of observation taken. At best, however, such a method could give the law connecting density with pressure for those pressures only which are less than the normal atmo- spheric pressure. The problem is better solved otherwise.

density of a gas and the pressure to which it is subject. Assuming Boyle's law that the density of air is directly as the Relation

This problem, which can only be settled by experiment, | pressure, we can now integrate the equation of equilibrium between was solved for the case of air within a certain range of ap= – pov, aa pressures by Robert Boyle (1662). Before discussing sa paiinan tron > presstire his results and the later results of other investigators, we p=me-VK, in our at- shall first consider the general properties of our atmo- mosphere,

where y, is the pressure at zero potential and K is the constant ratio of the pressure to the density.

For all attainable heights in our atmosphere we may assume the force of gravity to be the same. Hence we may write V=gh,

MIK. — 91

| sphere as recognized before Boyle's day. _ It is evident that, for a fluid situated as our atmosphere is, the pressure must diminish as we ascend. The equl-

Boyle's experl- ment.

Mariotte's experi- ments,

where g is the force acting on unit mass at height 4. K=gH, the equation becomes pape, ‘i

where H is obviously the height of a fluid of uniform density pol K which would give at its base the pressure py—in other words, the height of the homogeneous atmosphere, as it 1s called. Its value is readily found, since it bears to the height of the mercurial baro- metric column the same ratio which the density of mercury bears to the density of the atmosphere at the sea-level. For dry air at 0° C. and with g taken as equal to 981 dynes (=32°2 poundals nearly), the value of H is 79887 × 10° centimetres, or 26,210 feet. Hence the formula giving the hcight above the sea-level in terms of the pressure may be written

h=7°9887 × 10° x Nap. log. (p/p). In practice this formula must be modified to suit regions where g is other than 981, and where the temperature is other than 0°. The effect of the water-vapour present must also be taken into account, and the constants involved earefully tested by observation. The subject is treated in detail under BAROMETER.

In an appendix to the Mew Experiments, Physico- Mechanical, dc., touching the Spring of Air (1660), Robert Boyle states that the density of air is directly as the pressure. His apparatus and method of experiment are as follows. A U-shaped tube is taken, one of whose limbs is considerably longer than the other. The shorter limb is closed at the end; and the whole apparatus is set vertically with the open end pointing upwards. A small quantity of mercury fills the bend, so that at the beginning of the experiment the two mercury surfaces are at the same level. Hence the air confined in the shorter limb is subjected to a pressure along its lower surface equal to the atmospheric pressure, or one atmosphere as it 1s com- monly called. As the height of the air column in the closed tube is small, the pressure and density are practic- ally the same throughout. Now let mercury be poured into the longer limb. The free mercury surface will be observed to rise in the shorter limb, so that the air con- fined there becomes compressed into smaller bulk. Since the mass of air has not altered, the density is obviously inversely as the bulk, and can therefore be easily measured. Again, the pressure to which the confined air is now sub- jected is equal to the pressure over that surface in the mercury in the open limb

which is at the same level as the free mercury surface in the closed limb. But this pres- sure is clearly the sum of the atmospheric pressure and the pressure due to the superincumbent column of mercury, which latter can be readily expressed in atmospheres if the height of the barometer is known. In other words, divide the vertical distance between the two mercury sur- faces by the height of the barometer column. The quotient added to unity gives the required pressure in atmospheres.

Fourteen years after the date of the publication of Boyle's results, Mariotte,! working independently, dis- covered the same law, which is still widely known on the Continent as Mariotte's law. He supplemented Boyle's experiments by investigating the effect of pressures less than that of the atmosphere, and proved that the same law held at these diminished pressures. His method was essentially as follows. A barometer tube is filled in the ordinary way with mercury and fixed up as in the Tor- ricellian experiment. A little air is then introduced at the lower end of the tube which is dipping in the reservoir of mercury. This air travels up the tube and fills the Torricellian vacuum at the top, thereby depressing to a slight extent the barometer column. The amount of depression divided by the true height of the barometer gives the pressure in atmospheres which acts upon the air in the tube. The tube, always kept truly vertical, dips in @ reservoir of mercury sufficiently deep to admit of its complete immersion. For a certain position of the tube the free surfaces of mercury in the tube and reservoir are

1 Traité de la Nature de U Air, 1676.

If we put ‘ at the same level.

For that position the confined air is at the atmospheric pressure ; and for any higher position of the tube the pressure in the confined mass of air is less than the atmospheric pressure by the pressure due to the column of mercury between the free surfaces. Recent experiments by Kraevitch and Petersen (Journal of the Russian Chemical Society, vol. xvi.) seem to show that very rarefied air is very far from obeying Boyle's law. At such low

pressure, the condensation of the gas upon solid surfaces is an important factor.

For most ordinary purposes Boyle's law—that, at con- stant temperature, the density of a gas varies directly as the pressure—may be assumed to be true, at least for moderate ranges of pressure ; but the careful investigations of later experimenters, such as Oersted, Despretz, Dulong, Regnault, Andrews, Cailletet, and Amagat, have proved that the law is only approximate for every known gas, and that the deviation from correspondence with the law is different for each gas. The most recent investigations are those of Cailletet and Amagat, who have carried the results to much higher pressures than former experimenters employed. Both adopted in the first place a form of apparatus essentially the same as Boyle's, only inuch longer. The gas was subjected to the pressure of a mercury column enclosed in a strong narrow steel tube ; and, as oxygen acts vigorously upon inercury at high pressures, nitrogen was used. In this way Cailletet? attained to a pressure of 182 metres of mercury, and Amagat* to a pressure of nearly 330. |

Boyle's law only approxi- mate,

Having thus determined accurately the corresponding Amagat'i

pressures and densities of nitrogen, Amagat proceeded to determine the relation for other gases by Pouillet's differential method. That is, the pressure to which the new gas was subjected was. made to act simultaneously upon a given mass of nitrogen, whose volume could be readily measured and pressure estimated. Oxygen, hydro- gen, carbonic oxide, dry air, olefiant gas, and marsh gas were investigated in this way. The general results obtained by Amagat are exhibited in the subjoined chart taken from his paper. For all gases except hydrogen the product py (pressure into volume), instead of being con- stant, as Boyle's law would require, diminishes at first as the pressure is increased. At a certain pressure, however, different for each gas, the diminution ceases, and if the pressure is still further increased the product pv begins to increase also, and continues so to do to the greatest pressure used. In the case of hydrogen the product increases from the very beginning.

On the diagram, abscisse represent pressures in metres of mercury, and the ordinates represent the deviations from the Boylean law. It will be observed that all the curves pass through the point on the pressure axis which represents a pressure of 24 metres of mercury. If represents the product pv for any gas at this pressure, and 7’ the corresponding product for any other pres- sure, then we may write

ar/n’ =1+5, where 6 represents the deviation from Boyle’s law. All the curves exeept that for hydrogen show a well-marked minimuni, at and near the pressure corresponding to which the particular gas obeys

Boyle’s law. For the several gases these positions occur at the pressures as given in the following table :—

NGO MON Ts… .2c2c seca o0’m, | Catbonielacid’.....0. 50 in ORG EN oo. sacs eoscenees TOOsmn, | Marslitpasy….....00 120 m NG ie ov dus iene aneeencsent 65 th. | Ole@anit Gas. .....0..5 65 m

For olefiant gas 5 is so great, and varics so rapidly, that only portions of the curve are represented. The value of 8 for its miniinum point is —1°3, while the corresponding value for oxygen is —0°05. In these experiments the temperature of the gases varied between 18° and 22° C,

Amagat * has extended his researches to higher temperatures up

2 Journal de Physique, vol. viii., 1879. 3 Annales de Chimie et de Physique, vol. xix., 1880. 4 Annales de Chimie et de Physique, vol. xxii., 1881.

ments.

experi- |

_ Charles’s

law,

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to 100° ©. The gencral characters of the curves obtained for hydrogen, nitrogen, olefiant gas, and marsh gas remain the same as at the ordinary temperature ; that is, with the exception of hydrogen, the product pu decreases to a minimum and then increases indefinitely.

The position of the minimum changes with the temperature. Thus for olefiant gas and carbonic acid gas (whose properties were also studied at these higher temperatures), the pressure at which the minimum occurs increases with the temperature, while in the case of nitrogen and marsh gas this critical pressure decreases as the temperature rises. Probably at some temperature higher than 100° olefiant gas and carbonic acid gas would begin to behave like nitrogen, and all would appear to tend more and more, as the tem- perature rises, to the condition of which hydrogen is the type. That is, the deviation from the Boylean law up to the minimum point would steadily decrease until finally the curve would cease to

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have a marked minimum. For any one gas, the higher the tem- perature the less the curvature at the minimum point; and the comparison of different gases seems to indicate that the curvature 1s greater for the more easily liquefiable gas. At sufficiently high temperatures the law of compressibility for all gases approximates to the relation

P(V – a) =constant,

where P is the pressure, V the volume, and aaconstant. Hydrogen follows this law very closely at the ordinary temperature of the air, as the straightness of its representative curve shows at a glance.

Amagat has further discussed by means of his results the law of dilatation of gases. This law is named Charles’s law, after the discoverer of it. Stated simply, it is that at constant pressure every gas expands by the same fraction of itself for a given rise from a given temperature. Charles did not publish

his results; and it was not till fifteen years later, when Dalton and Gay-Lussac, working independently, rediscovered it, that the law became generally known.

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Their results were published in 18011 and 18022 respec- tively; and it is upon the authority of the latter, who accidentally became acquainted with the fact, that the law is now named after Charles. The careful measurements of Magnus,'? Regnault,* Jolly, and others have established that there is an appreciable difference in the coefficients of expansion for the different gases. The difference is slight for the so-called permanent gases—air, nitrogen, oxygen, hydrogen, and marsh gas; but for the more easily lique- fiable gases it is quite marked. The mean coefficient of expansion for air between 0° C. and 100° C. and at the ordinary atmospheric pressure is '(003665 per degree, and the value for any one of the gases just mentioned does not certainly differ from this by one-half per cent.5 This may be expressed by the formula v=KT,

where K is a constant and T the tempera- ture measured from absolute zero, which is 274° C. below the freezing point of water (see Heat). When T is constant, we have by Boyle's law the product pv also constant. Hence we may combine the two laws in the form

pu=RT,

where R is a constant. We thus see that, Boyle's law being assumed to be true at all temperatures, Charles's law, if true for any given pressure, is true for every other pressure. Further, if v is kept constant the rate of increase of log p with temperature will be expressed by © the same number as the rate of increase of log v when p is kept constant. Ex- periment has fully verified this conclusion to as close an approximation as Boyle's and Charles's laws themselves are fulfilled. The rate of increase of log v with tempera- ture, or, what is the same thing, the ratio of the rate of increase of the volume to the original volume, is given by the formula

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vat T’ and this is the measure of the coefficient of expansion at temperature T. Hence the coefficient of expansion diminishes as the temperature rises, a conclusion also in accordance with experiment so long as we are dealing with gases which nearly obey Boyle’s and Charles’s laws.

We have seen, however, that even in the case of Amagat’s hydrogen the departure from Boyle’s law is very marked results.

at the higher pressures ; and therefore we cannot expect a closely numerical agreement between the results of experi- ment and the results of calculation from the above formula. Thus, it is not surprising that practically the coefficient of expansion should be affected by the pressure, as Amagat’s experiments clearly show,—although in the equation deduced above the pressure does not enter. In the following table given by Amagat, the second column contains the mean coefficients of expansion of hydrogen between 17° and 60° C. at the pressures given in the first

1 Memoirs of the Philosophical Society of Manchester, vol. v.

2 Annales de Chimie, xliii., An X.

3 Pogg. Ann., lv., 1841. 4 Mém. del Acad., xxi.

5 The first who really gave accurate values of these quantities was

‘ Rudberg.

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column ; and the third column contains the corresponding mean coeflicients between 60° and 100° C.

Pressure in Metres of Mercury.

60°-100°.

40 0033 0029 100 0033 0028 180 0031 0027 260 0030 0025 820 0028 0024

The temperature effect upon the coefficient of expan- sion, as shown by these numbers, is approximately that indicated above, viz., that at constant pressure the co- efficient of expansion is inversely as the absolute tempera- ture. A glance down each column shows at once the marked effect of pressure. In this steady decrease of the coefficient of expansion .with increase of pressure, hydrogen stands alone amongst the substances discussed by Amagat. His conclusions are given in these words :—

1. The coefficient of expansion of gases increases with the pres- sure to a maximum, after which it decreases indefinitely.

2. This maximum occurs at the pressure for which at constant temperature the product pv is a minimum, that is, the pressure at which the gas follows for the instant Boyle's law.

8. With increasing temperature this maximum becomes less and less sensible, finally disappearing with the minimum characteristic of the compressibility curve.

Thus, as hydrogen does not show this minimum characteristic, its coefficient of expansion has no maximum value. Possibly at lower temperatures hydrogen may, however, possess these characteristics.

It thus appears that the simple gaseous laws established by Boyle and Charles are most nearly fulfilled by those gases which are difficult to liquefy, and are better fulfilled by all the higher the temperature is. When a gas is near its point of liquefaction the density increases more rapidly than the pressure, or in other words the volume diminishes more quickly than Boyle's law requires. When the point of liquefaction is actually reached, the

slightest increase of pressure condenses the whole of the gas into a liquid; and in this state the alteration of volume is very small even for a large increase of pressure.

The transition from the gaseous to the liquid state is conveniently studied by the help of isothermal lines, which may be generally defined as curves showing the relation between two mutually dependent variables for given con- stant temperatures. Such variables are the pressure and volume of a mass of gas. Let the numbers representing the volumes be measured from a chosen origin along a horizontal axis, and the numbers representing the pressures similarly along a vertical axis passing through the same origin. If we consider a mass of gas at a given tempera- ture, for any volume that can be named there will be a definite pressure corresponding, and vice versa. Hence the point whose coordinates are the corresponding volume and pressure is completely determined if either coordinate is given, The temperature always being kept constant, let now the volume change continuously. The pressure will also alter according to a definite law; and the point whose coordinates are at any instant the corresponding volume and pressure will trace out a curve. This curve is an isothermal curve, or simply an isotherm. If Boyle's law were fulfilled, the equation to the isotherm for any given temperature would be of the form

pv=constant. The isotherm would be a rectangular hyperbola, whose asymptotes are the coordinate axes, For any gas not

near its point of liquefaction the isotherm will not deviate greatly from the hyperbolic form.

Let now the pressure be kept constant, and the gas raised

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somewhat in temperature. The volume of course increases, and the corresponding point on the diagram moves off the original isotherm. Through this point in its new position

we can draw a second isotherm corresponding to the new

temperature. And thus the whole field may be mapped out by a series of isotherms, each one of which corresponds to a definite temperature. The higher the temperature the farther does the isotherm lie from the origin. Such a mapped out diagram or chart shows at a glance the rela- tions between the volume, pressure, and temperature of a given mass of gas, so that if any two of these are given the third can be found at once.

So long as the substance is in the gaseous form, the Iso-

isotherm remains approximately hyperbolic; but at the therms for water

pressure at which liquefaction takes place a marked change occurs in the form of the curve. consider the case of a gramme of steam at 100° C. and at a pressure somewhat below one atmosphere. As the pres- sure is increased, the volume diminishes appreciably faster than Boyle's law requires, but still in such a way as to give an approximately hyperbolic form to the isotherm. When the pressure reaches one atmosphere, however, any further increase is accompanied by the liquefaction of the whole; that is, the volume suddenly diminishes from 1647°5 cubic centimetres to 1 cubic centimetre. Between these extremes of volume, the isotherm is a straight line parallel to the horizontal axis. The pressure remains constant until the whole of the gas is liquefied. In other words, the pressure of a gas in presence of its liquid does not alter provided the temperature is kept constant. This isa partial statement of the more general law that the tempera- ture of the liquid surface alone determines the maximum pressure which its vapour or gas in contact therewith can exert (see Heat). After the whole has been liquefied, any increase of pressure is accompanied by a very minute diminution of volume. Hence the isotherm rises abruptly from the point whose coordinates are 1 cubic centimetre and 1 atmosphere, becoming nearly but not quite vertical. Thus, the isotherm for water-substance at 100° consists of three parts:—an approximately hyperbolic portion for pressures less than one atmosphere, the substance being then wholly gaseous ; a horizontal portion, corresponding to the state in which the substance is partly liquid partly gaseous ; and a nearly vertical portion for pressures higher than one atmosphere, the substance being then wholly liquid. If we trace out the isotherm for some higher temperature, say 150° C., we obtain the same general characteristics. The straight line portion, however, is not so long, for

two reasons :—the steam must be reduced to a smaller volume before liquefaction begins ; and the volume of the liquid when condensed is greater. The pressure corresponding to the transition state is in this case 4:7 atmospheres, and the range of volumes is from 384°4 cubic centimetres in the gaseous state to 1-038 cubic centimetres in the liquid state. It thus appears that the positions of the two points of abrupt change on an isotherm draw nearer the higher the temperature, coming together finally when the temperature has reached a certain critical value. In other words, at and above a certain temperature a liquid and its vapour cannot co-exist. This temperature for water-substance is very high, somewhere about the point of fusion of zinc, and is therefore difficult to measure.

For greater definiteness stance,

|

. . . th || Dr Andrews, however, in his classical researches on car- Andrew”

bonic acid gas,! to which we owe most of what is said he : above, has discussed the whole subject in a very complete y onic aci! This substance, at a temperature of 13°11 C., gas.

manner. begins to liquefy at a pressure of 47 atmospheres. | During the process of liquefaction there is a perfectly visible

1 Phil. Trans., 1869.

Cagniard- Latour’s

| experi- – ments,

The lique-

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liquid surface separating the two coexisting states of the substance ; and the isotherm has a corresponding straight line portion. At a temperature of 21° °5 C. liquefaction occurs at a pressure of 60 atmospheres. ‘The horizontal portion of the isotherm, which marks the co-existence of the gaseous and

liquid states, is considerably shorter than at the former temperature. The isotherm for 31°11 C, however, has no such rectilinear characteristic ; and at this and higher temperatures the substance is never during the whole compression in two distinct conditions at once. It is impossible to say when the dense gaseous condition passes into the light liquid condition. The two states are absolutely continuous. The critical temperature—that is, the temperature below which there is a distinct separation between the liquid and the gas—is fixed by Dr Andrews at 30°92 C. for carbonic acid gas. Above this tempera- ture it is impossible to obtain a free liquid surface in a closed vessel. ‘This conclusion had already been arrived at by Faraday in 1826, when he considered himself entitled to state that above a certain temperature no amount of pressure will produce the phenomenon known as condensa- tion.

Andrews’s results also give the true explanation of the observations made by Cagniard-Latour! in 1822 upon the effect of high temperature on liquids enclosed in glass tubes which they nearly filled. He found that at a certain temperature the free liquid surface disappeared, and the tube became filled with a substance of perfectly uniform appearance throughout. He concluded that the whole had become gaseous. In reality he had reached the critical temperature at which the liquid and gaseous con- ditions pass continuously the one into the other. The following are Cagniard-Latour’s estimated values for the temperature and pressure of various substances at the eritical point

| Temperature. Pressure.

Gy y6scevc.cerne cons sneee 17p° C. 38 atmospheres. PM COON ERG sicsecacascss esa esease PHN 119 . Bisulphide of carbon.. ..... Oot i a

Avenarius? and Drion® have studied the critical tem- peratures of other substances, such as sulphuric acid, ace- ton, and carbon tetrachloride. The substances, however, which can be so studied are comparatively few, since the greater number of those which are liquid under ordinary conditions have their critical temperatures very high, while A majority of those which are gaseous have theirs very ow.

The necessity for a very low temperature long prevented

faction of the obtaining in a liquid form of the standard gases—

gases,

hydrogen, oxygen, nitrogen, &c.—which were accordingly distinguished by the name permanent gases. Faraday 4 proved that these could not be liquefied at a temperature of —110° C., even when subjected to a pressure of 27 atmospheres. Natterer® likewise failed to reduce these gases to the liquid state, even at a pressure of 3000 atmo- spheres. His means for reducing the temperature were not satisfactory. In 1877 Cailletet and Pictet, working inde- pendently, first successfully effected their approximate liquefaction. The former compressed each of the gases oxygen, nitrogen, and carbonic oxide to 300 atmospheres in a glass tube, which was cooled to — 29° C.6 When the gas was allowed to escape, it did so in the form of a cloud,

Annales de Chimie, 2d ser., xxi., xxii.

Poggendorf’’s Annalen, cli., 1874.

Ann. de Chimie et de Physique, 3d series, lvi.

Phil. Trans., 1845.

ele Berichte, 1850, 1851, 1854; and Pogg. Ann., xciv.,

5 Ann. de Chimie et de Physique, 1878 ; Comptes Rendus, 1882.

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condensing for the moment to the liquid state under the influence of the extreme cold produced by the rapid expansion of the gas. Pictet in a similar way obtained an issuing stream of liquid oxygen. Von Wroblewski and

Olzewski’ have more recently obtained oxygen, nitrogen, and carbonic oxide in a more evident liquid state. They used Cailletet’s form of apparatus, and cooled the gas by means of the evaporation of liquid ethylene. Under this extreme cold they observed these substances forming a well-defined liquid in the bottom of the tube. The follow- ing table gives the results of five different observations at shightly different temperatures.

Temperature, C… — 134°°8 | — 135°°8

—129°°6 | -131°°6 | —133°°4 8 27°02 25°85 24 °4

Pressure,in atmos. 23°18 222

At slightly higher temperatures, the pressure necessary for the liquefaction increased very rapidly. Nitrogen and carbonic oxide were not so easily reduced, remaining still gaseous at — 136° C., and under a pressure of 150 atmo- spheres. By a sudden diminution of the pressure to 50 atmospheres there was obtained under the influence of the reduced temperature a rapidly evaporating liquid. The critical point of oxygen has been experimentally fixed by Von Wroblewski® at — 113° C. and 50 atmospheres pres- sure. With the data given by Amagat’s researches, Sarrau® has calculated from a formula of Clausius’s the following values of the critical temperature and pressure for oxygen, nitrogen, hydrogen.

Critical Temperature. | Critical Pressure.

ERR OI 65.50. cin noses ses —105°°4 C, 48°7 atmospheres. INGERO SEN)... cscs. o-0e0e — 123°°8 42:1 Ae iy dmOSenl:. 2. s-csc-<.e —174°°2 98°9 ms

It will be observed that Von Wroblewski’s observed values for oxygen are in remarkably close agreement with the calculated values given here. Apparently oxygen is just at the limit fixed by Faraday.

The behaviour of a gas under varying pressure is a Mano- phenomenon of great practical importance, and gives a valu- meter.

able method for measuring pressures (see MANOMETER).

A modification of the ordinary mercury manometer is used for measuring volumes, and is especially valuable in estimating the densities of substances which cannot be put into water, such for example as liquids or powders. The closed end of the manometer tube, which by means of a stop-cock may be opened to the air at will, is fitted to a flask with which it may be put into connexion when required. ‘Two fiducial marks are then made upon it— one at the position where the mercury surfaces in the two limbs of the tube are co-level, and the other somewhat higher at a convenient spot. Between the two marks the tube expands into a bulb, thereby increasing the interven- ing volume and minimizing the effect of any slight error in bringing the mercury surface to the higher mark. Let the volume of the flask and tube down to the higher mark be v, and the volume of the rest of the tube down to the lower mark V. At first the volume of air in the flask and tube is V + v, at the atmospheric pressure P. Now pour mercury into the open end till the liquid surface in the closed end reaches the higher mark. The air has been compressed to volume v; and the corresponding pressure, as measured by the balanced mercury column, is p+ P. Hence

(p+P)v=P(V +0). Let now a volume z be placed in the flask, and let the

7 Comptes Rendus, 1882-83; Wiedemann’s Annalen, 1883 ; and Annales de Chimie et de Physique, 1884. ; 8 Comptes Rendus, 1884. 9 Comptes Rendus, 1882.

same succession of operations be made. ‘Then, if p’ be the

increase of pressure necessary to bring the mercury surface

from the lower to the higher fiducial mark, we have (p’+P)\(v-x)=P(V+0-2).

As V can be readily determined by gauging the tube,

and as P, p, p’ are all known, the quantities v and x can

be at once found from these equations. —

In many experiments on the properties of gases it is necessary to have an efficient and rapid means for altering the density. – Instruments for this purpose are called air- pumps, and their function may be either to rarefy or con- dense the air—usually the former.

Otto Von Guericke of Magdeburg constructed the first air-pump about the year 1652. It was simply a spherical glass vessel opening below by means of a stop-cock and narrow nozzle into the cylinder of an “ exhausting syringe,” which inclined upwards from the extremity of the nozzle. The cylinder, in which a well-fitting piston worked, was provided at its lower end with two valves. One of these opened from the nozzle into the cylinder, the other from the cylinder into the outside air. During the down-stroke of the piston the former was pressed home, so that no air entered the nozzle and vessel, while the latter was forced open by the air which so escaped from the cylinder. During the return-stroke the latter was kept closed in virtue of the partial vacuum formed within the cylinder, while at the same time the former was forced open by the pressure of the denser air in the vessel and nozzle. Thus, at every complete stroke of the piston, the air in the vessel or receiver was diminished by that fraction of itself which is expressed by the ratio of the volume of the available cylindrical space above the outward ‘opening valve to the whole volume of receiver, nozzle, and cylinder.

Boyle, on hearing of Von Guericke’s success in applying the expansive properties of air as a means to its rarefaction, Hooke, Constructed a machine essentially the same as Von Papin, Guericke’s, of which no description had then been pub- &e. lished, Boyle, however, made the exhausting cylinder a

continuation of the nozzle, which was thus considerably reduced in size, and worked the piston by means of a wheel and racket work. He also employed a transparent glass receiver with removable cover, so that the operator could observe what was going on inside, and more easily alter the contents. Other modifications and improvements followed rapidly ; and in the carrying out of these Boyle was greatly aided by Hooke, who conceived the happy idea of using two syringes opening into the same duct from the receiver. This improvement has recently been credited to Papin.! In this

form the pistons are worked by the same toothed wheel, and are so adjusted that the one rises as the other falls. This arrangement not only doubles the rate of exhaustion per stroke, but vastly increases the ease of working. In the single-barrelled form the piston is drawn back against a pressure of air which is greater the more complete the exhaustion is within ; but in the double-barrelled form the downward pressures upon the two pistons to a certain extent counteract each other, producing opposite rotational effects on the toothed wheel and driving handle. Boyle also early adopted the flat plate, on which could be set receivers of various shapes and sizes. The junction of the plate and receiver he made tolerably air-tight by covering the plate with wet leather and having the receiver rim ground flat. According to Gerland, the invention of the plate is due to Huygens, who constructed the first alr-pump so provided in 1661, shortly after a visit to London, where his interest in the subject was awakened by Boyle. To Huygens, prob- ably in conjunction with Papin, is also due the applica-

Air- pumps.

Invented by Von Guericke.

Improve- ments by Boyle,

? See Gerland, in Wiedemann’s Annalen, 1877, 1883.

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tion of the mercury manometer to measure the pressure in the receiver—an indispensable equipment in all serviceable airpumps. The form of the piston plugs and valves received the special attention of Papin, who by his refined and detailed improvements did much to increase the efficiency of the apparatus.

The important characteristics of an efficient air-pump are as follows. The piston must work smoothly and easily. The valves must act precisely, and be when closed absolutely air-tight. The plate on which the receivers rest must be smooth and plane, so that the ground edges of the receivers may be in close contact all round. This perfect fitting is beyond the powers of the best workmanship, so that it is necessary to press between the receiver and plate

a thin layer of lard, which renders the junction air-tight. Some- where in the duct leading from the receiver to the piston cylinders, a stop-cock must be fixed, so that it may be possible to shut off the receiver completely from these. Then a second stop-cock is required as a ready means for admitting air to the receiver, whenever the need should arise. A combination three-way stop-cock is a very usual form. And, finally, the apparatus should be provided with a pressure gauge—a mercury manometer communicating by means of a duct with the main duct and receiver.

The double-barrelled form of reciprocating air-pump, as Bianchi') finally employed by Boyle, is still much in use; but it is ait-pum gradually being superseded by Bianchi's, which has but | one cylinder and piston. The piston is, however, double- acting, as the cylinder communicates both above and below by suitable valves with the main duct which leads to the receiver. Hence, during both the up and down strokes of the piston, exhaustion is being effected, the gas which is in the diminishing chamber being driven out through a suitable valve to the open air. The chief merit of Bianchi's machine, however, as compared with the older form, lies in the mechanism by which the piston is driven. The end of the piston rod is attached by a crank to a rotating horizontal axle, which is in gearing with the axle of a fly- wheel. The piston cylinder is capable of a reciprocating oscillatory motion about its lower end, which pivots on a horizontal axis. Thus, as the crank rotates, the piston rises and falls in the cylinder, and oscillates along with it from side to side. The driving power is applied to a handle fixed to the fly-wheel. This substitution of a con- tinuous rotatory motion for a reciprocating motion greatly facilitates rapid exhaustion.

At every complete stroke of the piston the pressure of Complet) air in the receiver is reduced by a definite fraction of itself, exhavs- which depends upon the relative volumes of the receiver os. and piston cylinder. Hence the absolute change of pres- 3 sure per stroke is smaller as the pressure is smaller; and the rate of exhaustion at very low pressures becomes prac- tically inappreciable. There is, in fact, a practical limit to exhaustion, the particular value of which depends upon the special characteristics of the instrument. The best air-pumps of the type described above cannot reduce the pressure to less than what would balance one or two millimetres of mercury—that is, to what is technically called a pressure of one or two

millimetres. To obtain a lower pressure or a higher vacuum, as it is commonly termed, requires the use of a different principle. a

In a well-constructed barometer the region above the Mercuri) mercury contains no air. It is not an absolute vacuum, ~_ | but is filled with vapour of mercury ata very low pressure —according to Regnault, ‘0372 mm. at 20° C., and ‘02 mm, at 0° C. The way in which the Torricellian vacuum has been applied to give a practical air-pump has been described in MercurraL Arr-Pump. So long as mercury vapour is permitted to pass freely through the exhausting tubes, it is impossible to obtain by the mercurial air-pump

pressures lower than the fortieth of a millimetre. If, however, there is placed somewhere in the duct leading from the mercury pump to the receiver a non-volatile sub- stance which absorbs mercury vapour, the mercury vapour will be arrested. With similar precautions for the absorp- tion of water vapour or other vapour which may be present, it is possible to obtain very low pressures indeed. Thus Crookes! in his radiometer experiments obtained pressures as low as ‘00015 mm. or the ‘2 millionth of an atmosphere. The form of pump used was of Geissler’s type. The water vapour was absorbed by phosphoric anhydride. Sulphur was used to absorb the mercury vapour; and on the further side metallic copper was placed to absorb any sulphur vapour which might tend to pass.

Test ofa The best test of a good vacuum is the electrical test. Disruptive gool discharge through a long tube filled with gas is possible only when vacuum, the gas is very rare, but there is a point in the rarefaction of a gas at which the discharge passes most easily. In other words, the dielectric strength of a gas reaches a minimum as its pressure is diminished, and it is possible to obtain such a high vacuum that

electric discharge will not take place through any considerable length of the exhausted space (see ELEcTRICITY). In this con- nexion we may notice a simple but instructive experiment of Dewar’s. He carefully exhausted a vacuum tube, in which he had previously inserted a piece ot carbon. In the last stages of the exhaustion the carbon was strongly heated so as to drive off most of the gas which is always condensed ou its surface. After the

completion of the exhaustion, the tube was sealed up and the earbon allowed to cool. As it cooled, it condensed over its surface , the greater portion of the small quantity of gas left in the vacuuin tube. The vacuum was thus vastly improved, so that it was im- possible to pass an electric spark between two platinum electrodes which had been previously fused into the glass. A gentle heat applied to the carbon, however, was sufficient to drive off from its surface enough of the occluded gas to raise the pressure to the point necessary for the passage of the electricity. As the carbon cooled again, the high vacuum was restored and the discharge ceased. Condens- It is hardly necessary to do more than mention the other mg “= class of air-pumps. Let the essential valves in an exhaust- per: ing pump have their actions reversed, and the apparatus will become a condensing pump. The condensing syringe is the usual form of such a pump; but, compared to the exhausting instrument, it has very limited applications. For the mere obtaining of high pressures hydraulic means are preferable, being at once more manageable and less dangerous. Besides, even moderately slow compression of a gas is accompanied by considerable rise of tempera- ture, just as rarefaction of a gas is accompanied by appreciable lowering of temperature. In the former case work is done in compressing the gas against its own pres-

sure, and this energy appears as heat which raises the temperature of the gas. In the latter case the gas in expanding draws upon its own energy and so cools. | Thermal ‘The thermal properties of gases are treated as a branch of mathematical physics under Heat and TuERmo- DYNAMICS, where also will be found discussed such experi- mental details as bear intimately upon the theory. The C, article ATom contains a concise statement of the modern kinetic theory of gases; and in Constrrution or Bop1Es and Dirruston certain more special aspects of the same theory are regarded. For the mathematical theory see

Mouecute. The principles embodied in these articles have been assumed throughout the present article.

The cooling of a gas by its own expansion may be observed in one of its effects during exhaustion in an ordinary receiver. Frequently a cloud of minute drops of water—a veritable fog—forms in the exhausted air. The

reason simply is that the air has become cooled below its dew-point, or the temperature corresponding to the pres- sure of water vapour present. If the receiver is first filled With dry air and then exhausted, no cloud forms. Also if |

‘ Aitken’s experi- ments,

the air is carefully filtered through cotton wool, no cloud — ree altered through cotton wool, no cloud

‘ See his Bakerian Leeture, Phil. Trans., 1878, clxix. 300.

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forms, even though the air be thoroughly saturated with water vapour. This latter fact was established by Mr Aitken in his beautiful series of experiments on dust, fogs, and clouds? It thus appears that the formation of fog and cloud depends not only upon the humidity of the air but also upon the amount of dust in the air. The little

| particles of dust are necessary as nuclei upon which the

vapour can begin to condense. The more numerous the dust particles the finer are the drops which form on them. As these coalesce into larger drops and fall, they bring down the dust nuclei with them ; and hence the tendency of rain is to clear the atmosphere, and make conditions less favourable for the formation of more cloud and rain. Thus rain, fog, and dew all require for their formation a free solid surface, colder than the temperature of saturation, on which to condense. In a dustless atmosphere no cloud can ever form.

It has been already pointed out that when a fluid is in motion it Finid cau no longer be regardcd as even approximately possessing the pro- friction. perties of the ideal perfect fluid. ‘The postulate that the stress he- tween contiguous portions is perpendicular to the common interface cannot be fora moment admitted. A few examples will inake this clear. Thus, if a vessel filled with a liquid be set in rotation, the liquid will soon be found to be rotating with the vessel; and if the motion of the vessel be stopped, the

motion of the liquid inside will gradually subside. These phenoniena show the existence of a stress tangential to the fluid elements, whereby the relative motion of the different parts of the system is gradually destroyed, until the vessel and its contents behave as one solid body. Again, a fluid stream flowing along a tube or canal moves fastest in the middle, slowest at the bounding walls, and with all possible intermediate speeds at intermediate places. ‘his retardation, due in the first instance to the action of the walls upon the fluid in direct contact therewith, aud then to the friction between the successive contiguous sheets of fluid, plainly implies the existence of tangential stress. The action of the wind in causing waves on thie smooth surface of a sheet of water is a further illustration.

In the discussion of fluid motion, however, it is customary to consider first the properties of the ideal fluid in this respect.

Under Hypromecuanics, and especially under Atom, will be found the mathematical theory treated in full so far as the motion of a non-viscous fluid is concerned.

The possibility of setting up vortex-motion in a fluid depends General upon its imperfection, upon the property of viscosity or fluid effects of friction which is possessed by all known fluids. Some of the more viscosity. obvious effects of this property have been already noticed. Its effects indeed are conspicuous wherever there is relative motion of the contiguous parts of a fluid. A current of air moving through a mass of air at rest soon loses its momentum; a solid body moving through still air likewise has its motion retarded. The loss of energy which a meteoric stone so suffers as it speeds through the atmosphere appears in the form of heat, which is sufli- cient to make the stone glow to incandescence or to the temperature of rapid combustion. The waves of rarefaction and condensation, which constitute sound physically, gradually decay in virtue of viscosity. It appears that the rate of this decay is quickest for the shortest waves ; so that a sound after travelling through a long distance may lose its shriller constituents and so be niodified and mellowed. It is viscosity also which supports the minute dust particles and cloud-forming drops of water in our atmo- sphere. These are bulk for bulk heavier than the atmosphere, and in tranquil air are slowly

sinking. The slowness of their down- ward motion is directly due to the effect of fluid-friction.

The term fluid-friction is applied because of the similarity of Fluid its effects to the effects of friction between solid masses, Other- friction wise there necd be uo further resemblance. The true nature of depends friction between solid surfaces is not known; possibly, as suggested on diffu- by Sir W. Thomson, it may be in great measure electrical. In the sion. case of gases, however, the origin of friction is more apparent. Its laws cau be deduced froin the kinetic theory, and depend directly upon the principle of diffusion. According to the kinetic theory of gases, the molecules of a gas are in constant motion amongst themselves. Compared to their own dimensions, they are by no means closely packed, so that any individual molecule travels a comparatively large space between its encounters with other molecules. Any two contiguous regions are continually inter-changing molecules. This diffusion of a gas into itself we have no means of measuring experimentally, as we cannot deal with the individual molecules. Suppose, however, that we have two con- tiguous layers of a gas flowing in pavallel directions with diferent speeds. The general drift of molecules in the one layer is faster

2 Trans. Roy. Soc. Edin., 1880-81.

than in the other. But this difference will vot prevent the individual molecules diffusing across the interface between the layers. Diffusion will go on freely. The result will be that the slower moving layer will on the whole gain momentum in the direction of its motion and the faster moving layer lose moineutum. Thus, diffusion tends to the equalization of momentum between

two contiguous regions, and the rate at which this takes place |

across unit area is the measure of the viscosity. Maxwell has proved! that the viscosity so measured is independent of the

density of the gas when the temperature is constant ; whereas the |

relation between the viscosity and temperature depends upon the particular mode of action between the molecules when they approach each other. ;

The above definition of viscosity is not one which can be used in experimental determinations, since we cannot take account of the individual molecules of a gas. The coefficient of viscosity must be defined in terms of directly measurable quantities.

Viscosity Maxwell has defined viscosity in these words :—the viscosity of

defined physi- cally.

Experi- ments on viscosity.

a substance is measured by the tangential force on unit of area of either of two horizontal planes at the unit of distance apart, one of which is fixed, while the other moves with unit of velocity, the space between being filled with the viscous substance. This is the dynamical definition. When the effects of viscosity on the internal motions of a fluid itself are being considered it is often more convenient to use the kinematical definition. It is given in terins of pw, the coefficient of viscosity, by the equation R= pv,

where p is the density of the substance, and y the kinematic viscosity.

The viscosity of fluids has been determined experimentally i three distinct ways—by flow of the fluid through tubes, by motion in the fluid of pendulums or vibrating disks, and by the oscilla- tions of spheres filled with the fluid. The last was employed by Helmholtz and Von Piotrowski in their investigation of liquids," but it is not applicable to the case of gases. Experiments on the flow through capillary tubes have been carried out by Poiseuille * for liquids, and by Graham, 4 Meyer,® Springmiih],® andPuluj ® for gases. This, the transpiration method, is the most effective for comparing viscosities, which are directly proportional to the times of trans- piration of the respective gases. There is, however, a little uncertainty as to the effect of the capillary tube,—so that, for measuring absolutely the viscosity for any one gas, the method is not so trustworthy as the second method. Here we may use cither pendulums swinging through small ares or disks oscillating in their own plane under the action of torsion. In both the

measurement depends upon the rate at which the amplitude of oscillation diminishes.

Stokes, who first satisfactorily discussed the true nature of viscosity, tested the theory by a discussion' of the pendulum experiments of Dubuat (1786), Bessel (1826), and Baily (1832). From Baily's results he calculated '000104 (in metric units) as the coefficient of viscosity of air. Meyer® similarly deduced from Bessel's and Girault's® experiments the values '000275 and 000384. It is not in the least surprising that these are all pretty

wide of the true value, seeing that the experimenters had not the |

special problem of finding the viscosity hefore them.

Meyer, to whom we owe a very complete serics of valuable memoirs on the subject, has more recently experimented !° with three different-sized pendulums. The values deduced for the viscosity were '000232, '000233, and 000184. The last number, given by the shortest pendulum, Meyer considers to be the best.

Maxwell," Meyer,'? and Kundt and Warburg'? have experimented with oscillating disks. The methods of Maxwell and Meyer were so far similar that each used an arrangement of three horizontal circular disks, fixed centrally to the same vertical axis, and sus- pended by a torsion wire inside a receiver. The pressure and tem- perature of the air or gas inside could be adjusted to any desired values within certain limits. In Maxwell's apparatus, which Meyer adopted in his later researches, the moving disks vibrated between parallel fixed disks, which were perforated in the centre so as to allow the vertical suspended axis to pass freely through them. Each disk thus oscillated in its own plane between two parallel fixed surfaces. After the disks were set in position, and the air in the receiver brought to the desired temperature and pressure, the suspended disks were set in oscillation. This was effected magneti- cally, a small magnet fixed to the end of the suspended axis being acted upon by an external magnet suitably adjusted. Each disk, in its oscillations, dragged after it the layer of air in immediate con- tact with it; and in virtue of viscosity this oscillation was trans-

1 Phil, Mag., 1860, and Phil. Trans., 1867.

2 Sitzungsber. der Wiener Akad., 1860.

3 Afém. des Savants Etrangers, 1846.

5 Poggendorf’s adnn., cxlviii., 1873.

6 Sitzungsber. d. Wiener Akad., 1xix.

7 Cam. Phil. Trans., ix., 1850, ;

t. ike Care etc., de Caen, 1860. oggendorff’s Ann., cxlii., 1871. N Phil, i

12 Poggendorf’s Ann., exciii., 1871, and cxlviii. 1873, ia

13 Poggendor ffs Ann., cly. clyi., 1875, ,

4 Phil. Trans., 1846, 1849.

1878.

8 Poggendorf’’s Ann., cxxv., 1865.

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| nearly the same as in millionths of an atmosphere.

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mitted with diminishing amplitude from layer to layer until the fixed disks were reached. In thus setting and sustaining in motion a mass of gas, the disk was doing work ; and, if left to itself and to the action of the torsion suspension, it oscillated with gradually diminishing range until it came to rest. The viscosity of the air was not the only retarding influence. The torsion wire had also a coeflicient of viscosity ; and then there was a possible resistance due to the slipping of the fluid at the surfaces of the disks. These vari- ous effects were discriminated by suitable modifications.

Thus by placing the oscillating disks in contact with each other, and setting two of the fixed disks at measured distances above and below,

| Maxwell reduced the number of surfaces in contact with the fiuid,

and so increased the relative importance of the cffect due to the wire's viscosity. Again, by diminishing the distances between the fixed and oscillating disks, he made the conditions more favourable to the effect (if any) due to the slipping. This latter effect was found to be so small as to be almost within the errors of observation ; consequently Maxwell felt himself warranted in calculating the coefficient of viscosity on the assumption that there was no slipping.

Maxwell's final result in metric (C. G. 8.) units for the coefficient

of viscosity of dry air is w= 0001878(1 + 003658) , where @ is the temperature in degrees Centigrade. Meyer's result is

= 000190(1 + * 00258).

Maxwell found the effect of pressure to be inappreciable down toa pressure of 12 mm., and thus verified the deduction from theory.

Kundt and Warburg, in their experiments, used only one disk, which oscillated under the influence of a bifilar suspension between two fixed disks, They carried the pressure down to as low as 0°6 mm. At 20 mm. pressure the viscosity was the same as at the atmospheric pressure; but at lower pressures a sliglit diminution began to show itself. According to Crookes's later researches, this diminution becomes more and more marked at the higher exhaustions. The manner in which the viscosity then diminishes coincides remarkably with the manner in which the free path increases. It could not be expected that in such modified circumstances Maxwell's law would continue to apply. When the gas becomes so far rarefied that the mean frec path of a mole- cule is not small compared to the space in which the gas is confined, the motion of the molecules cannot be treated statistically. Hence the deductions from a theory based upon the statistic method will no longer hold good.

Maxwell, Kundt and Warburg, and Crookes investigated by the disk method the viscosities of other gases, the values for which are compared below with the transpiration times of the same gases through capillary tubes. Maxwell also found that damp air, at 100 mm. pressure, and over water at about 20° C., was one-sixtieth less viscous than dry air at the same temperature. Kundt and Warburg found for water vapour, at 21° C. and 16 mm, pressure, the value

p= 0000975,

a little more than half that of air.

The results obtained by Meyer and Springmiihl and by Pulyj from their transpiration experiments agree well with those already given. In such experiments, however, the slipping of the gas over the solid surface has in certain circumstances a measurable effect. This slipping is measured by a certain coefficient, called the Gleitungs-Coefficient by Hehnholtz and Von Piotrowski. When this coefficient becomes appreciable, the gas in contact with the solid surface, instead of being at rest relatively to that surface, will be gliding over it with a finite velocity v. The circumstances of the notion will be very nearly the same if we remove a layer of the solid surface and replace it by fluid, the new surface of fluid in contact with the new solid surface being at rest. The thickness which must be so removed is the measure of the cocfficient of slipping. Kundt and Warburg,‘ in their experiments with glass tubes, found this cocfficient for dry air at about 20° C. to be

8/p centimetres, where p is the pressure in dynes per square centimetre, which is The value for hydrogen on glass is 15/p. Hence at ordinary pressures and moderate exhaustions this coefficient is very small, becoming appreciable only at low pressures.

The relation between viscosity and temperature is indicated at once by Maxwell’s and Meyer’s formule given above. According to Maxwell, the viscosity is proportional to the absolute tempera- ture. Ifin the kinetic theory the forces between the molecules are disregarded, that is, if the molecules are assumed to rebound after collision like elastic spheres, the relation deduced is that the vis- cosity varies as the square root of the

absolute temperature. Hence the mutual molecular forces must be taken into account. Maxwell’s experimental iaw would require any two molecules to repel each other with a force varying inversely as the fifth power of the distance. According to Meyer, however, the viscosity varies

14 Poggendorff’s Ann., 1876.

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aceording to a power of the absolute temperature less than unity, but greater than one-half. His results in this respeet are corro- borated by those of Kundt and Warburg, Puluj, and other later experimenters. The ‘77 power is probably not far from the truth. Henee we may give as the final value for the viscosity of dry air the expression

p= 000185(1 + °00288) .

The following table gives the values for the different gases, as determined by the different investigators, the viseosity of air being taken as unity.

Graham.| Maxwell.) Meyer. ae Crookes. JE. 000 RHERR eee 1:000 | 1:000 | 1:000} 1°:000 | 1°000 (SST op naueoeenaepagobeee 1112 1:095 1119 PNTUTO GEM 2.2… 112005 eens ‘971 972 Carbonie oxide 968 ee aa at ‘972 Carbonie aeid …..... 840 “859 851 806 920 BV ULOGEN.. .....00..00000 488 516 | *601} +488 “444

We do not here enter into the question of the thermodynamies of gases; enough to say that the relations between viscosity, diffusion, and thermal eonduetivity deduced by Maxwell from the kimetie theory have reeeived remarkable eorroboration from the experiments of Losehmieht, Stefan, Kundt and Warburg, and others. A discussion of the dynamieal properties of gases would not, however, appear complete without mention of Crookes’s so- called radiometer, even though these phenomena of high vaeua are ultimately thermodynamic.

The typieal form of the radiometer is a glass bulb, in which is hung a delieately poised arrangement of vanes. These, usually four in number, are fixed at the extremities of two light horizontal cross-rods, which are supported so as to be capable of easy rotation about a central vertical axis. The vanes or disks are set in vertical planes passing through the axis ; and eaeh has its one side bright, and the other blackened. For any rotation the motion of each vane is exaetly alike; that is, either the bright faces all move first, or the dark faees do so. If the pressure of the gas inside the bulb is redueed to a very low exhaustion, the vanes under the action of light or heat will begin to rotate. The mere bringing the radio- meter out of a dark region into daylight is enough to set up this rotation. In ordinary eircumstanees the dark faces are apparently repelled, and the vanes move round with their bright faeces in advanee.

The phenomenon is really a thermal one, as was demonstrated experimentally by Tait and Dewar.! Further, although it is most evident in high vacua (provided they are not too high), it ean be produeed in very moderate exhaustions by a suitable arrangement, as was long ago pointed out by Fresnel. Thus, if under the receiver of an ordinary air-pumip a light disk be delieately poised near a parallel fixed surfaee, it will be apparently strongly repelled by this surface if the opposing surfaces are brought to different ten1- peratures. This may be effeetively done by means of a ray of sunlight. In this experiment, the essential eondition is (as shown by Tait and Dewar) that the surfaces be at a distanee comparable to the mean free path of the gaseous moleeules. In Crookes’s radiometer the free path is very long, and hence there is apparent repulsion between the blaekened surfaces and the walls of the bulb. The reason simply is that, under the action of the radiant energy direeted in upon the vanes, the dark faees, absorbing more energy, become warmer than the bright faces. _Henee an inequality of temperature is produeed in. the highly rarefied gas, and this brings into existence a stress whieh displaces the vanes.

Liquid in the spheroidal state illustrates the same principle. That a drop of water may be supported over a hot surfaee without touching it requires an upward pressure. In other words, the vertieal stress in the vapour and gas which separate the drop from the surface must be greater than the ordinary gaseous pressure all round the drop. This stress exists because of the

difference of temperature between the drop and the surface, so that the pressure m the thin layer of vapour and gas is slightly greater in the vertieal than in any horizontal direetion.

A general notion of the manner in whieh this stress is sustained may be obtained from the following eonsideration. According to the kinetie theory of gases, the mean speed of the moleeules is a function of the temperature —the higher the temperature the greater the speed. Henee molecules, impinging upon a surface at a higher temperature, and in a direetion more nearly perpen- dieular to it, will rebound from that surfaee with ‘increased momentum. The simultaneous motion of the surface, as if repelled, is then somewhat analogous to the reeoil of a eannon When fired. The whole investigation of the question is, however, by no means simple. Maxwell has diseussed it with charaeteristic lucidity in his latest eontribution? to the dynamieal theory of

- Proc. Roy. Soc. Edin., and Nature, 1875. ? Phil. Trans., 1879.

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gases. He finds that, when inequalities of temperature exist at a given point in a gas, the pressure is not the same in all direetions. its value in any given direetion, in so far as it depends upon the temperature inequality, is proportional to the space-rate of change of the space-variation of the temperature in that direetion—that is, to the second differential coefficient of the temperature with respeet to the given direetion. Hence the pressure will be greatest along the line tor which this differential eoeffieient is a maximum. It appears that the pressure so called into existence by a possible temperature inequality is very minute at ordinary hydrostatic pressures, but beeomes considerable when the pressure of the gas is inade very small. If the inequality of temperature throughout the gas is due to the presenee of small bodies, whose temperatures differ from the temperatnre of the gas at a distanee from them, then the small bodies will be aeted upon by the stresses set up, provided they are of the same order of smallness as the mean free path of the molecules. In the case of two sueh small bodies, there will be apparent repulsion between them if the bodies are warmer than the air at a

distanee from them, and attraction if they are colder. Ifone is warmer and the other eolder, the action may be either attraetive or repulsive, aecording to the relative sizes of the bodies and their exaet temperatures. These results are obtained by eonsidering only the stresses normal to the solid surfaees. When the tangential stresses are taken into aecount, then it appears that inequality of temperature, when the flow of heat becoines steady, cannot produce other than equilibrium in the material system immersed in the gas. Henee Maxwell believes that the explana- tion of Crookes's phenomenon must depend ultimately upon the slipping of the gas over tlie solid surface. If such slipping be permitted, its effeet will be to diminish the tangential stresses acting on the solid surfaee without affecting the normal stresses ; and henee the equilibrium will be destroyed. Inattempting to express the eonditions to be satisfied by the gas at the solid surface, Maxwell is led to the consideration of the phenomenon discovered by Osborne Reynolds? and named thermal transpiration. This phenomenon consists of a sliding of the gas over the surface of an unequally heated solid from the eolder to the hotter parts. Maxwell eonsiders the partieular ease of the slow steady flow of gas along a eapillary tube of circular section, the temperature of which varies steadily from point to point. The amount of gas whieh passes through any seetion depends both upon the rate of ehange of pressure and the rate of ehange of temperature in passing along the axis of the tube. If the pressure is uniform there will be a flow of gas from the colder to the hotter end. If there is no flow of gas, the pressure will inerease from the colder to the hotter end. The case of uniform temperature is the ordinary case of transpiration through capillary tubes, as discussed experimentally by Graham, Meyer, Puluj, and Kundt and Warburg. The experi- mental investigation of the first two cases seems at present hopeless, on aeeount of the minuteness of the quantities to be measured. Reynolds experimented, not on eapillary tubes, but on the passage of the gas throngh a porous plate, the temperatures being diflerent on the two sides. e (Ch (Ch IS,)

PNEUMONIA, or inflammation of the substance of the lungs, manifests itself in several forms which differ from each other in their nature, causes, and results,—viz., (1) Acute Croupous or Lobar Pneumonia, the most common form of the disease, in which the inflammation affects a limited area, usually a lobe or lobes of the lung, and runs a rapid course; (2) Catarrhal Pneumonia, Broncho-Pneu- monia, or Lobular Pneumonia, which

occurs as a result of antecedent bronchitis, and is more diffuse in its distribu- tion than the former; (3) Interstitial Pneumonia or Cir- rhosis of the lung, a more chronic form of inflammation, which affects chiefly the framework or fibrous stroma of the lung and is closely allied to phthisis.

Acute Croupous or Lobar Pneumonia.—This is the disease commonly known as inflammation of the lungs. It derives its name from its pathological characters, which are well marked. The changes which take place in the lung are chiefly three. (1) Congestion, or engorgement, the blood-vessels being distended and the lung more voluminous and heavier than normal, and of dark red colour. Its air cells still contain air. (2) Red Hepatiza- tion, so called from its resemblance to liver tissue. In this stage there is poured into the air cells of the affected part an exudation consisting of amorphous fibrin together with epithelial cells and red and white blood corpuscles, the whole forming a viscid mass which occupies not only

the cells but also the finer bronchi, and which speedily coagulates, causing the lung to become firmly consolidated. In this condition the cells are entirely emptied of air, their blood-vessels are pressed upon by the exudation, and the lung substance, rendered brittle, sinks in water. The appear- ance of a section of the lung in this stage has been likened to that of red granite. It is to the character of the exudation, consisting largely of coagulable fibrin, that the term croupous is due. (3) Grey Hepatization. In this stage the lung still retains its liver-like consistence, but its colour is now grey, not unlike the appearance of grey granite. This is due to the change taking place in the exudation, which undergoes resolution by a process of fatty degeneration, pus formation, liquefaction, and ultimately absorption, —so that in a comparatively short period the air vesicles get rid of their morbid contents and resume their normal function. This is happily the termination of the majority of cases of croupous pneumonia, yet it occa- sionally happens that this favourable result is not attained, and that further changes of a retrograde kind take place in the inflamed lung in the form of suppuration and abscess or of gangrene. exists some serious constitutional cause which contributes to give this unfavourable direction to the course of

the disease. Further, pneumonia become chronic, the lung never entirely clearing up, and it may terminate in phthisis. Pneumonia may be confined to a portion or the whole of one lung, or it may be double, affecting both lungs, which is a serious and often fatal form. The bases or middle of the lungs are the parts most commonly inflamed, but the apex is sometimes the only part affected. The right lung is considerably more fre- quently the seat of pneumonia than the left lung.

Many points in the pathology of this form of pneumonia remain still to be cleared up. Thus there is a growing opinion that it is not a simple lung inflammation, as was formerly supposed, but that, as regards its origin, progress, aud termination, it possesses many of the characters of a fever or of a constitutional affection. An interesting and important fact in this connexion is the recent discovery by Friedlander and others of a micro-organism or bacillus in the blood, lungs, and other tissues in cases of pneumonia, which, when inoculated into eertain lower animals, is followed by the symptoms and appearances characteristic of that disease. While it must be confessed that such inoculation experiments carried on in rabbits, guinea pigs, or mice are scarcely sufficient by themselves to settle the question of the specific and infectious nature of pneumonia as it affects the human subject, yet they are of distinct value as evidence pointing in that direction. Further, there are numerous iInstaces on record in which this disease has appeared to spread as an epideinic in localities or in families in such a way as strongly to suggest the idea of infectiveness. Cases of this kind, however, are open to the question as to whether there may not coexist some other disease, such as a fever, of which the pneumonia present is but acomplication. The whole subject of the pathology of pneumonia is still under investigation, and all that can in the meantime be affirmed is that it presents many features which render its phenomena unlike those of an ordinary inflammation, while on the other hand it has strong analogies to some of the specific fevers. As regards known causes, in the vast majority of instances an attack of pneumonia comes on as the result of exposure to cold as the exciting agent, while such conditions as fatigue and physical or mental depression are often traceable as powerful predisposing influences,

The symptoms of acute pneumonia are generally well marked from the beginning. The attack is usually ushered in by a rigor (or in ehildren a

convulsion), together with vomiting and the speedy development of the febrile condition, the temperature rising to a considerable degree—101° to 104° or more. The pulse is quickened, and there isa marked disturbance in the respiration, which is rapid, shallow, and difficult, the rate being usually accelerated to some ee or three times its normal amount. The lips are livid, and the

ace has a dusky flush. Pain in the side is felt, especially should any amount of pleurisy be present, as is often the case. Cough is an early symptom. It is at first frequent and hacking, and is accompanied with a little tough colourless expectoration, which em however, becomes more copious and of a rusty brown colour, either tenacious or frothy and liquid. Microscopically this con- sists mainly of epithelium, casts of the air eclls, and fine bronchi together with granular matter and blood and pus corpuscles. ,

In such instances there usually |

may in some instances |

PNEOCMONTA

The following are the chief physical signs in the various stages of the disease. In the stage of congestion fine crackling or crepi- tation is heard over the affected area; sometimes there is very little change from the natural breathing. In the stage of red hepatization the affected side of the chest is seeu to expand less freely than the opposite side ; there is dulncss on percussion, and increase of the vocal fremitus ; while on auscultation the breath sounds are tubular or bronchial in character, with, it may be, some amount of fine crepitation in certain parts. In the stage of grey hepatization the percussion note is still dull and the breathing tubular, but crepitations of coarser quality than before are also audible. These various physical signs disappear more or less rapidly during convalescence. With the progress of tle inflammation the febrile symptoms aud rapid breathing continue. The patient during the greater part of the disease lies on the back or on the affected side. The pulse, which at first was full, becomes small and soft owing to the interruption to the pulmonary circulation. Occasionally slight jaundice is present, due probably to’ a similar cause. The urine is scanty, sometimes albuminous, and its chlorides are diminished. In favourable

cases, however severe, there generally occurs after six or eight days a distinct crisis, marked by a rapid fall of the temperature accompanied with perspiration and with a copious discharge of lithates in the urine. Although no material change is as yet noticed in the physical signs, the patient breathes more easily, sleep returns, and conval- escence advances rapidly in the majority of instances. In unfavour- able cases death may take place either from the extent of the inflammatory action, especially if the pneumonia is. double, from excessive fever, from failure of the heart's action or general strength at about the period of the crisis, or again from the disease assuming from the first a low adynamic form with delirium and with scanty expectoration of greenish or '"'prune juice" appearance. Such cases are seen in persons worn out in strength, in the aged, and especially in the intemperate. Death may also take place later from abscess or gangrene of the lung; or again recovery may be imperfect and the disease pass into a chronic pneumonia.

The treatment of acute pneumonia, which at one time was con- ducted on the autiphlogistic or lowering principle, has of late years undergone a marked change ; and it is now generally held that in ordinary cases very little active intcrference is called for, the disease tending to run its course very much as a specific fever. The employment of blood-letting once so general is now only in rare instances resorted to; but, just as in pleurisy, pain and difficulty of breathing may sometimes be relieved by the applica- tion of a few leeches to the affected side. In severe cases the cautious employment of aconite or antimony at the outset appears useful in diminishing the force of the inflammatory action. Warm applications ip the form of poultices to the chest give com- fort in many cases. Cough is relieved by expectorants, of which those containing carbonate of ammonia are specially useful. Any tendency to excessive fever may. often be held in eheck by quinine. The patient should be fed with milk, soups, and other light forms of nourishment. In the later period of the disease stimulants may be called for, but most reliance is to be placed on nutritious aliment. After the acute symptoms disappear counter-irritation by iodine or a blister will often prove of service in promoting the absorption ef the inflammatory products. After recovery is complete the health

| should for some time be watched with care.

When pneumonia is complicated with any other ailment or itself complicates some pre-existing malady, it must be dealt with

‘ on priuciples applicable to these conditions as they may affect the

individual case.

Catarrhal or Lobular Pneumonia (Broncho-Pneumonia) differs from the last in several important pathological and clinical points. Here the inflammation is more diffuse and tends to affect lobules of lung tissue here and there, rather than one or more lobes as in croupous pneumonia. At first the affected patches are dense, non-crepitant, with a bluish red appearance tending to become grey or yellow. Under the microscope the air vesicles and finer bronchi are crowded with cells, the result of the inflammatory process, but there is no fibrinous exudation such as is present in croupous pneumona. In favourable cases resolution takes place by fatty degeneration, liquefaction, and absorp- tion of the cells, but on the other hand they may undergo caseous degenerative changes, abscesses may form, or a condition of chronic interstitial pneumonia be developed in both of which eases the condition passes into one of phthisis, Evidence of previous bronchitis is usually present in the lungs affected with catarrhal pneumonia. In the great majority of instances catarrhal pneumonia

occurs as an accompaniment or sequel of bronchitis either | from the inflammation passing from the finer bronchi to the pulmonary air vesicles, or from its affecting portions of lung which have undergone collapse. It occurs most frequently in children, and is often connected with some pre-existing acute ailment in which the bronchi are implicated, such as measles or hooping cough. It likewise affects adults and aged people in a more chronic form as the result of bronchitis. Sometimes a condition of catarrhal pneumonia may be set up by the plugging of one or more branches of the pulmonary artery, as may occur in heart disease, pyzemia, cc.

The symptoms characterizing the onset of catarrhal pneumonia in its more acute form are tlie occurrence during an attack of bronchitis of a sudden and marked elevation of temperature, to- gether with a quickened pulse and

increased difficulty in breathing. The cough becomes short and painful, and there is little or no ex- peetoration. The physical signs are not distinct, being mixed up with those of the antecedent bronchitis; but, should the pneumonia be extensive, there may be an impaired percussion note with tubular breathing and some bronchophony.

Acute catarrhal pneumonia must he regarded as a condition of serious import. It is apt torun rapidly to a fatal termination, but on the other hand a favourable result is not unfrequent if it is re- cognized in time to admit of efficient treatment. In the more chronic form it tends to assume the characters of chronic phthisis (see PHTHIsIs). The treatment is essentially that for the more severe forms of bronchitis (see BRONCHITIS), where, in addition to expectorants, together with ammoniacal, cthereal, and alcoholic stimulants, the maintenance of the strength by good nourishment and tonics is clearly indicated. The breathing may often be re- lieved by light warm applications to the chest and back. Con- valescence is often prolonged, and special care willalways he required in view of tle tendency of the disease to develop into phthisis.

Chronic Interstitial Pneumonia or Cirrhosis of the Lung is a slow inflammatory change affecting chiefly one portion of the lung texture, viz., its fibrous stroma.

The changes produced in the lung by this disease are marked chiefly by the growth of nucleated fibroid tissue around the walls of the bronchi and vessels, and in the intervesicular septa, which proceeds to such an extent as to invade and obliterate the air cells. The lung, which is at first enlarged, becomes shrunken, dense in texture, and solid, any unaffected portions being emphysematous; the bronchi are dilated, the pleura thickened, and the lung substance often deeply pigmented, especially in the case of miners, who are apt to suffer from this disease. In its later stages the lung breaks down, and cavities form in its substance as in ordinary phthisis.

This condition is usually present to a greater or less degree in almost all chronic diseases of the lungs and bronchi, but it is specially apt to arise in an extensive form from pre-existing catarrhal pneumonia, and not unfrequently occurs in connexion with occupations which necessitate the habitual inhalation of particles of dust, such as those of colliers, flax-dressers, stonemasons, millers, é&c.

The symptoms are very similar to those of chronic phthisis (see PurHisis), especially increasing difficulty of breathing, particularly on exertion, cough either dry or with expectoration, sometimes Copious and fetid. In the case of coal-miners the sputum is black from containing carbonaceous matter.

The physical signs are deficient expansion of the affected side— the disease being mostly confined to one lung—increasing dulness ol percussion, tubular breathing, and moist sounds. As the disease PTogresses retraction of the side becomes manifest, and the heart and liver may be displaced. Ultimately the condition both as regards physical signs and symptoms takes the characters of the later stages of phthisis with colliquative symptoms, increasing emaciation, and death. Occasionally dropsy is present from the heart becoming affected in the course of the disease. The malady

1s usually of long duration, many cases remaining for years in a Stationary condition and even undergoing temporary improvement in mild weather,

but the tendency is on the whole downward.

The treatment is conducted on similar principles to those applicable in the case of plithisis. Should the malady be con- nected with a particular occupation, the disease might be averted or at least greatly modificd by early withdrawal from such source of irritation, (Jo1Ope:.)

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PNOM-PENH, the capital of Campopta (see vol. iv. p. 725).

PO, the largest river of Italy, traverses the whole length of the great plain between the Alps and the Apennines, which was in the Miocene period an arm of the sea con- necting the Adriatic with the Mediterranean by what is now the Col d'Altare or Col di Cadibona and has gradually been filled by detritus from the surrounding highlands, That its course lies much nearer the Apennines than the Alps is evidently due to the fact that the tributaries from the loftier range on the north, whether in the form of glacier or stream, have all along been much more powerful than the tributaries from the south. The total length of the river from its conventional source to the mouth of the principal channel is 4174 miles, and the area of its basin, which includes portions of Switzerland and Austria, is estimated at 26,798 square miles. The general course of the river has been already described in Iraty (vol. xiii. p. 435).

The Po forms a very extensive delta, and is probably one of the most active of all rivers in the work of denuda- tion. Prony has calculated that between 1200 and 1600 the delta advanced at the rate of 80 feet per annum; and between 1600 and 1804 the rate is said to have been as much as 230 feet. This. advance has naturally been attended by great changes in the course and size of the several channels. Ravenna, for example, once a great port, now stands on dry land 4 miles from the sea. The modern lagoons of Comacchio, which stretch southwards from the delta, are being artificially reclaimed by the help of the alluvial deposits.

In its ordinary condition the Po has a depth between Pancalieri and the mouth of the Ticino of from 6 to 10 feet, and between the mouth of the Lambro and that of the Adda of about 14 or 15 feet. Lower down the depth

occasionally exceeds 40 feet. Permanent fords exist only in the upper Po, and between the mouths of the Ticino and the Lambro. In times of great drought the bed is quite dry at Rovello, and fords appear below Casalmaggiore and at Borgoforte, where the Freneh and Germans crossed in 1796, 1807, 1813, and 1814; but in general the river forms a complete barrier both to foot and horse. The principal points where crossing is effected by ferries or bridges are *Moncalieri, Turin, *Casale Monferrato, Frassinato, *Valenza, *Mezzana Corti, *DPiacenza, Cremona, Casalmaggiore, Brescello, *Borgoforte, San Benedetto, Ostiglia, *Occhiobello, Pontelagoscuro, Francolino. Railway bridges exist at the places distinguished by an asterisk.

The river in general is at its fullest in May and June, and at its lowest in January (see details in Lombardini's elaborate study on the lower Po in Memorie del Reale Istituto Lombardo, Milan, 1870). The ordinary floods on the Po are attended with little danger; but at intervals sometimes of a few sometimes of many years they become events of the gravest national concern. Those of 1651 and 1705 are among the most destructive recorded in history, and in the present century the more memorable are those of 1839, 1846, 1855, 1857, 1868, 1872, and 1879. In 1872 1150 square miles of country between the Reno and the Adige were submerged, the district about Modena was turned into a lake, the people of Revere saved the rest of their town only by sacri- ficing the front row of houses to form a temporary embankment, and it was only by the wisely conducted energy of its inhabit- ants that Ostiglia was kept from destruction. During April and May 1879 the rainfall was exceptionally heavy, the quan- tity for May alone being equal to more than a third of the an- uual total. The result was a rise in all the tributaries of the Po, and on May 80 the flood in the main river was 21 feet above low water at Mezzana Corta. A breach 720 feet long in the embank- ment between Bonizzo and Borgofranco caused the submergence of 155 square miles in the provinces of Mantua, Modena, and Ferrara, and involved in its repair a national expenditure of £53,460.

Of the £5,902,981 devoted by the Government to the regulation of the rivers of Italy in the twenty years 1861-1880, £2,257,872 had to be appropriated to the Po and its tributaries. Nowhere in Europe except in Holland has the system of embankment been carried to such perfection on

so extensive a scale. A wide bed for the river at its height is enclosed for long distances by a massive master-dyke or froldo, and in the space between this and the ordi- nary channels suitable areas are often enclosed by secondary dykes or golene. The following figures show the extent of the system in

1880 :—

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| | ey | es aL ed Froldo. | Golena. | Miles. Miles. Miles. | B09°97 71-93 | 438-03 Adige ……cceereresee reeererceeeeeees | 156712 109°81 46°30 Tartaro and Po di Levaute…... | 148-30 35°62 | 112°68 Me Sl crumnoacsesseterseeners | 146*72 33°68 | 113°04 Re cc asoinasoeotroeaeeee ee 48:26 52°07 Soren Ai eeiciceie satciers See hea aera 89°75 28°21 61°54 Bia RT el

Recent researches (see Helbig, Dic Jtaliker in der Po-Kbence, Leipsic, 1879) show that the lower valley of the Po was at an early period occupied by people of the Paleolithic and Neolithic stages of civilization, who built houses on piles along the swampy borders of the streams. It is possible that even they may have begun by crude dykes the great system by which the waters are now con- trolled; at least it is certain that these works date their origin from pre-Roman antiquity. Pliny refers them to the Etruscans, who occupied the country before the arrival of the Gauls. The reclaim- ing and protecting of the riparian lands went on rapidly under the Romans, and in several places the rectangular divisions of the ground, still remarkably distinct, show the imilitary character of some of the agricultural colonies. During the time of the bar’ba- rian invasions much of the protective system was allowed to fall into decay ; but the later part of the Middle Ages saw the works resumed and carried out with great energy, so that the main features of the present arrangement were in existence by the close of the 15th century.

The usual name for the Po among Greek and Latin authors was Padus (Id80s); but the Greek writers of the empire began to apply to it the poetic naine of Eridanus, familiar in the Phaethon myth.

POCHARD, Pockarp, or Poxer,! names properly belonging to the male of a species of Duck (the female of which is known as the Dunbird), the Anas feria of Linneus, and Fuligula or dithyia ferina of later ornitho- logists—but names very often applied by writers in a general way to most of the group or Subfamily Puliguline, commonly called Diving or Sea-Ducks (of. Duck, vii. p. 505). The Pochard in full plumage is a very handsome bird, with a coppery-red head, on the sides of which sparkle the ruby irides of his eyes, relieved by the greyish- blue of the basal half of his broad bill, and the deep black of his gorget, while his back and flanks appear of a light grey, being really of a dull white closely barred by fine undulating black lines. The tail-coverts both above and below are black, the quill feathers brownish-black, and the lower surface of a dull white. The Dunbird has the head and neck reddish-brown, with ill-defined whitish patches on the cheeks and chin, the back and upper tail-coverts dull brown, and the rest of the plumage, except the lower tail-coverts, which are brownish-grey, much as in the Pochard. This species is very abundant in many parts of Europe, northern Asia, and North America, generally fre- quenting in winter the larger open waters, and extending its migrations to Barbary and Egypt, but in summer retiring northward and inland to breed, and is one that certainly seems to have profited by the legislative protec- tion lately afforded to it in Britain, for, whereas during many years it had but a single habitual breeding-place left in England, it is now known to have several, to some of which it resorts in no inconsiderable numbers. American examples seem to be slightly larger and somewhat darker in colour, and hence by some writers have been regarded as specifically distinct under the name of Puligula americana ; but America has a perfectly distinct though allied species in the celebrated Canvas-back Duck, 1’. vallisneriana, a much larger bird, with a longer, higher,

1 The derivation of these words, in the first of which the ch is pro- nounced hard, and the o in all of them generally long, is very uncer- tain. Cotgrave has Pocheculier, which he renders “ Shoueler,” now- a-days the name of a kind of Duck, but in his time meaning the bird we commonly call SPooNBILL (q¢.v.). Littré gives Pochard as a popular French word signifying drunkard. That this word would in the ordinary way become the English Pochard or Poker may be re-

garded as certain ; but then it is not known to be used in French as a bird's name.

POC—POC

and narrower Dill, which has no blue at the base, and, though the plumage of both, especially in the females, is very similar, the male Canvas-back has a darker head, and the black lines on the back and flanks are much broken up and further asunder, so that the effect is to give these parts a much lighter colour, and from this has arisen the bird's common though fanciful name. Its scientific epithet is derived from the freshwater plant, a species of Vadles- neria, usually known as "wild celery," from feeding on which its flesh is believed to acquire the delicate flavour that is held in so great a repute. The Pochard and Dunbird, however, in Europe are in much request for the table (as the German name of the species, T'afelente, testi- fies), though their quality in this respect depends almost wholly on the food they have been eating, for birds killed on the sea-coast are so rank as to be almost worthless, while those that have been frequenting fresh water are generally well-tasted.?

Among other species nearly allied to the Pochard that frequent the northern hemisphere may be mentioned the Scaup-Duck, F. marila, with its Amcrican representative F. affinis, in both of which the male has the head black, glossed with blue or green ; but these are nearly always uneatable from the nature of their food, which is mostly gathered at low tide on the "scaups * or "scalps; = —as the banks on which mussels and other marine molluscs grow are in many places termed. Then there are the Tufted Duck, F. cristata—black with a crest and white flanks—and its Amcrican equivalent /. collaris, and the White-eyed or Castaneous Duck, / nyroca, and the Red-crested Duck, F. rufina—both peculiar to the Old World, and the last, conspicuous for its red bill and legs, well known in India. In the southern hemisphere the genus is represented by three species, F. capensis, F. australis, and F. nove-zealandice, whose respective names indicate the country each inhabits, and in South America exists a somewhat divergent form which has been placed in a distinct genus as Metopiana pcposaca.

Generally classed with the Fuliguline is the small group known as the Eiders,* which differ from them in several respects: the bulb at the base of

the trachea in the male, so largely developed in the members of the genus Puligula, and of conformation so similar in all of them, is here much smaller and wholly of bone; the males take a much longer time, two or even three years, to attain their full plumage, and some of the feathers on the head, when that plumage is completed, are always stiff, glistening, and of a peculiar pale-green colour. – This little group of hardly more than half-a dozen species may be fairly considered to form a separate genus under the name of Somateria. Many authors indeed have—un- justifiably, as it seems to the present writer—broken it up into three or four genera. The well-known Eider, S. mollissima, is the largest of this group, and, beautiful as it is, is excelled in beauty by the King-Duck, 8. spectabilis, and the little S. stedleri. Space fails here to treat of the rest, but the sad fate which has overtaken one of them, S. labradoria, has been before mentioned (Birps, vol. iii. p. 735); and only the briefest notice can be taken of a most interesting form generally, but obviously in error, placed among them. This is the Logger-head, Racehorse, or Steamer-Duck, Microptcrus (or more properly Tachycres) cinereus of the Falkland Islands and Straits of Magellan—nearly as large as a tame Goose, and subject to the, so far as known, unique peculiarity of losing its power of flight after reaching maturity. _ Its habits have been well described by Darwin in his Jowrnal of Rescarches, and its anatomy is the subject of an excellent paper in the Zoological Society's Transactions (vii., pp. 4938-501, pls. lviii.—lxii.) by Prof. R. O. Cunningham. (ACIS

POCOCK, Epwarp (1604-1691), one of the most eminent of English Oriental and Biblical scholars, was born in 1604, the son of a Berkshire clergyman, and re- ceived his education up to his fourteenth year at the free school of Tame in Oxfordshire and then at Oxford, where he became scholar of Corpus Christi College in 1620 and fellow in 1628. The foundation of his Eastern learning was laid at Oxford under Matthias Pasor, son of the better

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2 The plant known in some parts of England as " willow-weed tel not to be confounded, as is done by some writers, with the willow- wort (Epilobiwm) —one of the many species of Polygonum, is especially a favourite food

with most kinds of Ducks, and to its effects is attri- buted much of the fine flavour which distinguishes the birds that have had access to it.

3 Cognate with scallop, and the Dutch schelp, a shell.

1. Icelandic, dur.

known George Pasor, who had been driven to England by the troubles in the Palatinate, and he subsequently received instruction from the learned W. Bedwell. The first fruit of his studies was an edition from a Bodleian MS. of the four New Testament epistles which were not in the old Syriac canon, and were not contained in European editions of the Peshito. This was published at Leyden at the instigation of G. Vossius in 1630, and in the same year Pocock sailed for Aleppo as chaplain to the English factory. At Aleppo he made himself a profound Arabic scholar and collected many valuable MSS. At this time Laud was busy with the learned collections with which he afterwards enriched his university, and Pocock became known to him as one who could help his schemes. A correspondence ensued, and ultimately Laud resolved to set up an Arabic chair at Oxford and to invite Pocock home to fill it. The invita- tion was accepted, and the lecturer entered on his duties on August 10, 1636, but next summer sailed again for Constantinople with the archbishop’s consent to prosecute further studies and collect more books, and remained there for about three years. When he returned to England Laud was in the Tower; and, though he had taken the precaution to place the Arabic chair on a permanent foot- ing, a time soon followed in which to have been a protegé of the archbishop was a dangerous distinction. Pocock does not seem to have been an extreme churchman or to have meddled actively in politics, but his views were decided enough to make him objectionable to the Parlia- mentary party, and to bring on him many troubles not only at Oxford but in his parish of Childrey, where he accepted a college living in 1643. On the other hand his rare scholarship and personal qualities raised him up influential friends even among men of the opposite party in church and state, foremost among these being Selden. Through the offices of these friends he was even advanced in 1648 to the chair of Hebrew, though as he could not take the engagement of 1649 he lost the emoluments of the place very soon after,

and did not recover them till the Restoration. All these cares seriously hampered Pocock in his studies, as he complains in the preface to his Lutychius ; he seems to have felt most deeply the attempts to remove him from Childrey, where he attended to his parochial work with the same modest and diligent zeal that marks him asa scholar. But he continued to work hard ; in 1649 he published the Specimen Historix Arabum, that is, a short account of the origin and manners of the Arabs, taken from Barlebreeus (Abulfaraj), with a mass of learned notes from a vast number of MS. sources which are still highly valuable to the student of Oriental history. This was followed in 1655 by the Porta Mosis, extracts from the Arabic commentary of Maimonides on the Mishna, with translation and very learned notes ;} and in 1656 by the annals of Hutychius in Arabic and Latin, a work of great value which has not found an editor since. He also gave active assistance to Walton's polyglott, and the preface to the various readings of the Arabic Penta- teuch is from his hand. After the Restoration Pocock's political and pecuniary troubles were removed, but the reception of his complete edition of the Arabic history of Barhebreus (Greg. Abulfaragii Historia Dynastiarum), which he dedicated to the king in 1663, showed that the new order of things was not very favourable to profound Scholarship. After this his most important works were his English commentaries on Micah (1677), Malachi (1677), Hosea (1685), Joel (1691), —admirable in every way, and still thoroughly worth reading. An Arabic translation of Grotius De Veritate which appeared in 1660 may also be mentioned as a proof of Pocock's interest in

: Pocock was justly impressed with the fact that the best parts of Rabbinic literature belong to the Jews who wrote in Arabic.

the propagation of Christianity in the East. This was an old plan which he had talked over with Grotius at Paris on his way back from Constantinople.

Pocock married in 1646 and died in 1691. One of his sons, Edward, published several contributions to Arabic literature—a fragment of Abdullatif's description of Egypt and the Philosophus Autodidactus of Ibn Tofail.

_ The theological works of Pocock were collected in 2 vols. folio, in 1740, with a tedious but curious account of his life and writings by L. Twells. ;

POCOCKE, Ricuarp (1704-1765), distantly related to the preceding, was the son of Richard Pococke, head master of the free school at Southampton, where he was born in the year 1704. He received his school learn- ing under his father, and his academical education at Corpus Christi College, Oxford, where he took his various degrees. He commenced his travels in the East in 1737, and returned in 1742. In 1743 he published his Odserva- tions on Egypt, under the general title of A Description of the East and some other Countries. In 1744 he was made precentor of Waterford; and in 1745 he printed the second volume of his travels, under the title of Observa- tions on Palestine, or the Holy Land, Syria, Mesopotamia, Cyprus, and Candia. In 1756 Pococke was promoted to the bishopric of Ossory; in July 1765 he was translated to the see of Meath, and in September following he died suddenly of apoplexy, whilst engaged in visiting his diocese.

PODIEBRAD, Gerorce or (1420-1471), king of Bohemia, was the son of Herant of Podiebrad, a Bohemian nobleman, and was born 6th April 1420. After the death of the emperor Sigismund he took up arms against Albert of Austria, who was finally compelled to raise the siege of Tabor and retreat to Prague. On the death of Patzek in 1444 George of Podiebrad became the recognized head of the Calixtines or Utraquists, and was chosen to represent them as one of the two governors of Bohemia during thie minority of Ladislaus the son of Albert. After some years of conflict with the Catholic party he was in 1451 recog- nized as sole governor. Following a policy of conciliation, he made no opposition to the accession of Ladislaus in 1453, who repeated to the Bohemians the promises made by Sigismund. The Catholic predilections of Ladislaus rendered him ina great measure blind to the obligations into which he had entered, but the result was silently to strengthen the influence of George of Podiebrad, who on the death of Ladislaus in 1457 was chosen king of Bohemia (March 1458), and on May 7, 1459, was crowned by Catholic bishops, promising on his part due obedience to the church. This effort at a reconciliation was, however, soon seen to be futile. In 1462 Pope Pius II. refused the ratification of the compactata, agreed upon in 1433, and still no basis of a settlement had been found when Pius died in November 1464. The new pope, Paul II, at once

brought matters to a crisis by issuing against George of Bohemia the ban of excommunication, and a summons for a crusade to crush his authority. To this George replied by a letter of grievances to kings and princes, and an appeal to a general council. The summons of Paul IL. did not awaken any general response, and, although Matthias of Hungary was proclaimed king of Bohemia, George successfully resisted all attempts to wrest from him his dominion, and in July 1470 Matthias agreed to an armistice. George died March 22, 1471, and was suc- ceeded by Ladislaus, eldest son of Casimir IV.

See Markeraf, Ueberd as Verhiiltniss des Konigs Georg von Béhmen zu Papst Pius I1., 1867; Richter, Georg von Podiebrad's Bestrebungen, 1863; Jordan, Das Kénigthum Georgs von Podiebrad, 1867; Bachmann, Lin Jahr bohmischer Gesehiehte, 1876.

PODOLIA, a government of south-western Russia, having Volhynia on the N., Kieff and Kherson on the E,

the W., from which last it is separated by the Zbrutch, or Rodvotcha, a tributary of the Dniester. It has an area of 16,223 square miles, extending for 200 miles from north- west to south-east on the left bank of the Dniester. In the same direction two ranges of hills, nearly parallel, and separated by the Bug, traverse the government; they are ramifications of the so-called " Avratynsk heights." One of these ranges runs parallel to the Dniester at a distance of some 40 miles, and reaches a maximum elevation of 1185 feet in the northern districts, sending a lateral branch to the Dniester at Kamenets. The other range, entering also fron the north-west, follows the boundaries of the government of Kieff on the left bank of the Bug; its highest eminences do not exceed 1050 feet. The geological structure of Podolia is in accordance with the above-mentioned orographical features ; a strip of land to the east of the Bug belongs to the Huronian granitic region of the Dnieper, granites and aplites (granulites) appearing also in the bed of the Bug, and being covered with Quaternary deposits only, while the remainder of the province, towards the west, is covered with Tertiary (Miocene). In the deep valleys of tlie rivers, older formations—the Cretaceous and Silurian, as also sometimes the granites—appear from

beneath the Tertiary. The whole is covered with a boulder-clay, mostly contain- ing débris of the local rocks, and with loess, the origin of both still being a subject of controversy among Russian geologists. Two large rivers, with numerous tributaries, water the government,—the Dniester, which forms its boundary with Bessarabia and is navigable throughout its length, and the Bug, which flows almost parallel to the former in a higher, sometimes swampy valley, and is broken at several places by strong rapids. The Dniester is an important channel for trade, no less than 30,000 tons of corn, spirits, and timber being exported every year from its eighteen ports, the chief of which are Moghileff, Kalus, Zhvanets, and Porog. The rapid smaller tributaries of the Dniester supply numerous flour-mills with motive power. The soil is almost throughout “ black-earth,” and Podolia is one of the most fertile provinces of Russia. Forests cover about 245,000 acres. Marshes occur only on the Bug. The climate is moderate, the average temperature of the year at Kamenets being 48°°3 (24°°5 in January, 69° in July).

The population, which was 2,242,650 in 1881, and is now estimated at 2,335,000, consists chiefly of Little Russians, Poles (about 12 per cent.), and Jews (about 13 per cent.), of whom some 9000 are agriculturists. There are besides about 300 Armenians, some 2500 Germans, and nearly 45,000 Moldavians. There are many Nonconformists among the Russians, Tultchin being the seat of their bishops and a centre of propaganda. The chief occupation is agriculture, 56 per cent. of the surface being under crops, and the average harvests of recent years reaching 3,382,000 qrs. of corn and 453,000 qrs. of potatoes. The chief crops are wheat, Indian corn, oats, rye, potatoes, and beetroot. No less than 2,500,000 qrs. of corn are exported every year to Austria or to Odessa. Gardening is in a flourishing condition, and fruit is largely exported to the interior; the vine is cultivated mostly for grapes, but partly also for wine; the culture of tobacco is a considerable source of income. Cattle-breeding is less de- veloped, owing to a want of grazing grounds and meadows. Horned cattle—a mixture of the Hungarian and Bessarabian breeds—are however, exported to Moscow and to Austria. Finer breeds of sheep are raised in the proportion of two-fifths of the whole number. In 1881 Podolia had 169,000 horses, 432,000 horned cattle, 513,000 sheep, and 307,000 swine. Bees are kept throughout the territory, and honey is exported. Sericulture has developed considerably of late years,

and will probably take an important position, owing to the climate. Agriculture and cattle-breeding are on the whole oe. Lately manufactures have grown rapidly. In 1865 a a af eae ene hands, but produced only to the value Shae ano fas ange any teste empased nor 29,411,000 roubles. The first place ig taken by beetroot suger

place is taken by beetroot sugar works (15,800 hands; £1,038,000), after which come distillertes (£1,372,000), sugar refineries (£287,100), flour-mills (£134,500),

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and §., Bessarabia on the 8.W., and Galicia (Austria) on |

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tobacco manufacture (£32,200), the woollen cloth industry, and several smaller manufactures (spirits, leather, soap, candles, ma- chinery, and agricultural implements), An active trade is carricd on with Austria, especially through the Isakovets and Gusyatin custom-houses,—corn, cattle, horses, skins, wool, linseed, and hemp seed being exported, in exchange for wooden wares, linen, woollen stuffs, cotton, glass, and agricultural implements. The trade with the intcrior is also carried on very briskly, especially at the twenty-six fairs, the aggregate returns of which exceed 3,000,000 roubles; the chicf are at Balta and Yarmolintsy. Podolia is traverscd by a railway which runs parallel to the Dniester, from Lemberg to Odessa, and has two branch lines to Kieff (from Zhmerinka) and to Poltava (from Balta). Primary schools are better than in many central provinces of Russia, and Kamenets-Podolsk has of late years begun to show some develop- ment of intellectual life. The publications of the provincial assembly and the memoirs of the historical and statistical com- mittee of the government are especially worthy of notice. Podolia is divided into twelve districts, the chief towns of which arc— Kamenets-Podolsk, capital of the government (22,650), Balta (22,450), Bratslaff (5550), Gaysin (9450), Letitcheff (4800), Litin (7100), Moghileff-on-Dniester (18,150), Novaya Ushitsa (4500), Olgopol (6950), Proskuroff (11,750), Vinnitsa (18,800), and Yampol (4800). The following towns have municipal institutions:—Bar (7800), Khmelnik (7800), Nemiroff (5450, has a lyceum), Salnitsa (3300),

Staraya Ushitsa (3700), Verbovets (2150), and Tultchin (11,220), besides many myestetchki, having Polish municipal insti- tutions.

History.—The country has been inhabited since the beginning of the Neolithic period. In the 5th century B.c. it was already known to geographers, and Herodotus mentions it as the seat of the Alazoncs and Neuri, who were followed by.the Dacians and Get. The Romans left traces of their rule in the Wall of Trajan, which stretches through the modern districts of Kamenets, Ushitsa, and Proskuroff. Many nationalities passed through this territory, or settled within it for some time, during the great migrations, leaving traces in numerous archeological remains. The annals of Nestor mention that the Slavonians, Bnjanes, and Dulebes occu- pied the Bug, while the Tivertsi and Uglitches were settled on the Dniester. They were conquered by the Avars in the 7th cen- tury. Oleg extended his rule over this territory—the Ponizie, or lowland, which became later a part of the principalities of Volhynia, Kieff, and Galicia. In the 13th century the Ponizie was plundered by the Mongols; a hundred years afterwards Olgerd freed it from this rule, aunexing it to Lithuania under the name of Podolia, a word which has the same meaning as Ponizie. After the death of Witowt Podolia was annexed to Poland, with the exception of its eastern part—the province of. Bratslaff—which remained under Lithuania until its union with Poland. The Poles retained Podolia until the third division of Poland in 1793, when it was taken by Russia, which instituted the present government of Podolia in 1796.

PODOLSK, a district-town of Russia, in the govern- ment of Moscow, is situated 23 miles to the south of the capital, at the junction of the two main roads going from Moscow to the Crimea and to Warsaw, and within a mile from the Podolsk railway station. It is picturesquely built on the hilly banks of the Pakhra, here crossed by an elegant suspension bridge for carriages as well as by the railway bridge. Down to 1781, when it became a district town, the wealthy village of Podol was a dependency of the Daniloff monastery of Moscow, and it still maintains many of the features of a suburb of that city. The numberless caravans of cars and sledges which before the opening of the southern railway carried on the entire transport of merchandise to and from Moscow (as they still to some extent continue to do) had their chief halting place at Podolsk before setting out on a long

journey, or before entering the capital; the principal occupation of the inhabitants was accordingly to keep inns and taverns, and to supply the caravans with provisions and other neces- saries of travel. The merchants of Podolsk prefer to carry on their trade at Moscow, and in itself the town has no commercial importance. Still, notwithstanding the recent modifications in traffic produced by the railway system, the population of Podolsk (11,000 in 1881) is increasing. The limestone quarries in the neighbourhood, at the con-

| fluence of the Desna and Pakhra, supply the capital with

a good building material, while a steam factory of cement,

lime, and bricks employs 900 hands and has an annual

production of about £20,000. A paper-mill close to Podolsk has an annual production of about £15,000. PODOPHYLLIN, a popular remedy which is much used by those who are averse to the employment of calomel and other mercurial preparations, and hence has been called vegetable mercury. The drug, as used in medicine, is obtained from the rhizome of the American mandrake or May apple, Podophyllum peltatum, L., an herbaceous perennial belonging to the natural order Ber- beridacex, indigenous in woods in Canada and the United States. The plant is about a foot high, bearing two pel- tate, deeply-divided leaves, which are about 5 inches in diameter, and bear in the axil a solitary, stalked, white flower about the size and shape of the garden anemone, with six or more petals and twice as many hypogynous stamens. The fruit is ripe in May, and is an oval, yellow- ish, fleshy berry containing twelve or more arillate seeds. The rhizome, as met with in commerce, occurs’ in cylin- drical pieces two or three inches long and about } inch in diameter, of a chocolate or purplish brown colour, smooth and slightly enlarged where the juncture of the leafy stem is indicated by a circular scar on the upper and a few broken rootlets on the under side. The odour is heavy and disagreeable, and the taste acrid and bitter.

Podophyllin is a resinous powder obtained by precipitating an alcoholic tincture of the rhizome by meaus of water acidulated with hydrochloric acid, It varies in colour from greyish to briglit yel- low or grcenish brown, the first-named being the purest, The drug has been the subject of numerous chemical investigations, the most recent of which (Podwyssotzki, in Zischr. f. Russland, xx. 777 indicates that its activity is due to a definite resinous compound which has been named by its discoverer podophyllotoxin ; another constituent uamed podophylloquercetin has neither emetic nor purgative properties, but appears to be the cause of the griping pains which sometimes accompany the action of podophyllin; a third substance, podophyllic acid, has no medicinal action. Podophyl- lotoxin is a bitter amorphous principle soluble in weak alcohol and in hot water, ether, and chloroform, but insoluble in petroleum spirit. It is split up by the action of alkalies into a resin-acid named picropodophyllic acid, which is inert, and a very active substance, picropodophyllin, which crystallizes in delicate silky needles. Picropodophyllin is insoluble in water, and almost in- soluble in spirit of less than 80 per cent., but is rendered soluble when united to the picropodophyllic acid. _Podophylloquercetin crys- tallizes in short needles of a yellow colour and metallic lustre. It is soluble in ether and alcohol, and forms a compound with acetate of lead which is soluble in acetie acid and can be sublimed in shining yellow crystals, and which on exposure to the air gradu- ally becomes green. Podophyllic acid is insoluble in water and in ether, but soluble in alcohol. In medicine podophyllin is employed for torpor of the liver and obstinate constipation, arising from sedentary employment, imprudence in dict, and irregularity of habits. In small doses it acts as a slow and gentle laxative, especially if combined with henbane and belladonna, but in large doses it is an irritant hydragogue cathartic, the action of which persists for some time. The usual dose as a laxative and mild hepatic stimulant is about 4 of a grain, but the samples met with In commerce vary considerably in strength, and act with varying effect upon different individuals. Specimens having a greenish tint should be avoided, since they probably coutain podophyllo- quercctin and tend to cause severe griping. In large doses it appears to lose its stimulant action on the liver. Podophyllin is official in the pharmacopmias of Great Britain, India, France, Russia, and the United States.

POE, Epcar ALLAN (1809-1849), is the most interest-

ing figure in American literature, and his life furnishes | _in Richmond, New York, and Philadelphia, and there is | unanimous testimony that, so far from being an irregular greater part of his short working life was passed in intense —

the most extraordinary instance on record of systematic misrepresentation on the part of a biographer. The

and unremitting literary toil, and no poems or romances were ever produced at greater expense of brain and spirit than his. Yet, till lately, when Mr J. H. Ingram, the careful editor of Poe's works, undertook to collect the plain facts of the poet's life, the current statement and belief were that his strange tales and poems were flung off from a distempered imagination in the intervals of degraded debauchery. This myth was studiously floated by his first

‘ ness, and took a pride in these homely virtues. _ connexion was not in any one case "severed by his irregu-

biographer, Griswold, and found readier acceptance- with the public owing to the weird and horrible character of much of his imaginative work. Griswold's story of a life wayward and irregular from hapless beginning to disgrace- ful close was just what people were prepared to believe about a genius so eccentric and with such a turn for dark mysteries, horrible crimes, inhuman doings and sufferings. That the author of such works should have been expelled from the university and from the army, and from situation after situation when he tried to make a living by litera- ture, all owing to the gross irregularity of his habits, and should finally have died in a hospital in a fit of intoxi- cation, seemed credible enough when affirmed by a self-constituted biographer. Many of Griswold's allegations were denied at the time, but the denials were local and isolated, and the truth had no chance against the system- atic libel, repeated as it was in many editions, till Mr Ingram prepared a regular and authoritative memoir.}

There was a sufficient mixture of truth with falsehood to make Griswold's story plausible. It. was not quite correct to describe Poe as the son of

strolling players, but his father, a man of good family, had married an actress and taken to the stage as a profession. Their son was born in Baltimore, February 19, 1809; and father and mother died in 1811 when he was a child. The orphan was adopted by his godfather, Mr Allan, a wealthy mer- chant, and from his eighth till his thirteenth year (1816- 1821) was placed at school in England. Thence he was transferred to an academy at Richmond, Virginia, and thence at the age of seventeen to the university of Virginia at Charlottesville. Mr Allan was childless, and apparently treated his adopted son as his own child. Why Poe left the university after one session is not clearly explained, but it has been ascertained that he was not expelled, but on the contrary was honourably distinguished as a student, although it is admitted that he had contracted debts and had “an ungovernable passion for card-playing.” These debts may have been sufficient cause for a quarrel with Mr Allan. Poe disappeared for two years, setting out for Europe to join the Greeks in their fight for independence. Reappearing at Richmond in 1829, he stayed at home for a year, and then was entered as a military cadet at West Point. But all his ambitions by this time were towards literature ; he neglected his duties, disobeyed orders, and was dismissed from the service of the United States. What he did for two years after is not ascertained, but in 1833 he reappeared as the successful competitor for a prize offered by a Baltimore newspaper for a prose story. From that time he subsisted by literature. Mr Allan had married again, and died soon afterwards, leaving an heir by his second wife, and “not a mill,” as Griswold puts it. to Poe.

It is chiefly in his account of Poe’s literary career that Griswold has been guilty of slandering the subject of his biography, representing him as rendered incapable of permanent employment by his intemperate habits. There would seem to be not the slightest foundation for this coarse slander. During the fifteen years of his literary life Poe was connected with various newspapers and magazines

contributor, he was a model of punctuality and thorough-

His

larities.” He wrote first for the Southern Literary Mes- senger in Richmond, and edited it for some time; then, in 1837, he removed to New York, and

wrote criticisms and did editorial work for the Wew York Quarterly Review ;

1 See his Works of Edgar Allan Pce, 4 vols., 1874-75.

then, after a year, with a prospect of more lucrative |

employment, he removed to Philadelphia, and for four years was the mainstay of Graham's Magazine. His literary work was poorly paid for, though some of his most powerful tales—Hans Pfaal, Arthur Gordon Pym, Ingetia, The House of Usher, The Murders in the Rue Morgue, Marie Roget, The Descent into the Maelstrom —were among Poe's contributions to these periodicals. Not unnaturally he conceived the idea of starting a magazine of his own as the most hopeful way of living by his work, but he had no capital, and was obliged to abandon the project, and return to New York and miscellaneous journalism. To add to his troubles his wife, a cousin of his own, whom he had married in 1836, and to whom he was passionately attached, was in very delicate health, and during a linger- ing illness of eight years gave him constant anxiety. We have only to look at the character of Poe's work, and the condition of such literature commercially, to see why it was that the most popular writer of his generation in America had to struggle so hard for a bare subsistence. His short stories were an easy prey for the newspaper pirate, and when thousands were reading them the author received nothing but the few dollars paid him by the pub- lication in which they first appeared, The Aaven was published first in 1845, and in a few months was being read and recited and parodied wherever the English language was spoken; but the half-starved poet, who had to live by his genius, received only two pounds for the production. And, fertile and active as his imagination was, these short works of his, which served for the pass- ing sensation of the newspaper reader, were far from being extempore effusions. His Philosophy of Composition is sometimes, indeed generally, regarded as half-serious half a jest in the author's peculiar way of

mystification. But to any one who examines Poe’s work closely by the light of this essay it is obvious that the disclosure of his method is only too seriously true. It would have been well for his own powers of endurance if he had composed on a less exacting and exhausting system. The most fantastic of Poe’s creations are not the product of the imagina- tion abandoned to the impulses of a dominant mood; the effects are deliberately calculated, as he says they were, step by step and point by point to a prearranged culmina- tion. A man writing on such a system, with the wolf at the door and affections daily on the rack, could hardly have endured the strain if he had had a constitution of iron, It was no wonder that Poe’s health became dis- tempered, or that, during the last years of his wife’s illness and the two remaining years through which he survived her, he had recourse to the dangerous help of stimulants. Not only did he subject his imagination to exhausting con- ditions, but he wasted his force in doing with superfluous thoroughness what a ready journalist would have dismissed with a few easy sentences of commonplace. When we read his criticisms, which are full of insight and sugges- tion, we see that in reviewing a book or a poem he was never satisfied till he had thought out what could be done

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‘fe modern criticism the word poetry is used sometimes to _ denote any expression (artistic or other) of imaginative feeling, sometimes to designate one of the fine arts.

As an expression of imaginative feeling, as the move- ment of an energy, as one of those great primal human forces which go to the development of the race, poetry in the wide sense has played as important a part as science. In some literatures (such as that of England) poetic energy and in others (such as that of Rome) poetic art is

POE—POE

with the subject. His famous feat in anticipating the plot of Barnaby Rudge from the opening chapters was only a sample of the thoroughness with which he threw himself into whatever he undertook. Poe failed to make a living by literature, not because he was an irregular profligate in the vulgar sense, but because he did ten times as much work as he was paid to do—a

species of profligacy, perhaps, but not quite the same in kind as that with which he was charged by his malignant biographer.

The current story about his breaking off his engagement with Mrs Whitman by presenting himself at her house in a state of violent drunkenness has been proved to bea fabrication, and many other stories about him have been. exploded by Mr Ingram. His wife died in 1847, and he followed her in 1849, dying under painful circumstances at Baltimore. For a critical estimate of Poe's writings the reader may be referred to Professor Nichol's American Literature. There are few English writers of this century whose fame is likely to be more enduring. The feelings to which he appeals are simple but universal, and he appeals to them with a force that has never been sur- passed. (w. M.)

POERIO, Carto (1803-1867), Italian statesman, born in 1803, was descended from an old Calabrian family and was the son of Giuseppe Poerio, a distinguished lawyer of Naples. In 1815 he accompanied his father into political exile, but, a pardon having been obtained in 1818, he returned to Naples where he afterwards adopted the pro- fession of advocate. From 1837 to 1848 he was frequently arrested and imprisoned, but, when Ferdinand, moved by the demonstration of 27th January of the latter year, promulgated a constitution, he was at once raised to honour, being made prefect of police and shortly after- wards minister of public instruction. Discovering, how- ever, that the king was only temporizing, he resigned office in April of the same year and was returned for Naples to parliament, where he led the constitutional opposition. On 19th July 1849 he was arrested, and after trial on the charge of belonging to the sect deno- minated the "Italian Unity," was condemned to irons. Chained in pairs, he and other fifteen political prisoners were confined in one small room in the bagno of Nisida near the lazaretto. The eloquent exposure of the horrors of the Neapolitan dungeons by Mr Gladstone in 1851, who emphasized especially the case of Poerio, awakened the universal indignation of Europe, but he did not obtain his liberty till 1858. He and other exiles were then placed on board a ship bound for the United States, but they compelled the crew to land them at Cork, whence Poerio made his way to London. In the following year he returned to Italy, and in 1860 he was elected deputy to the

parliament of Turin, of which he was chosen vice-pre- sident in 1861. He died at Florence, 28th April 1867.

See Baldachinni, Della Vita e de Tempi di Carlo Poerio, 1867; W. E. Gladstone, Zwo Letters to the Harl of Aberdeen, 1851; Carlo Poerio and the Neapolitan Police, London, 1858; Colletta. History of Naples.

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the dominant quality. It is the same with individual writers. In classical literature Pindar may perhaps be taken as a type of the poets of energy ; Virgil of the poets of art. With all his wealth of poetic art Pindar's mastery over symmetrical methods never taught him to " sow with the hand," as Corinna declared, while his poetic energy always impelled him to "sow with the whole sack." In English poetical literature Elizabeth Barrett Browning

| typifies, perhaps, the poets of energy; while Keats (not-

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withstanding all his unquestionable inspiration) is mostly | must be here attempted ; and, using the phrase "absolute taken as a type of the poets of art. In French literature | poetry" as the musical critics use the phrase "absolute Hugo, notwithstanding all his mastery over poetic methods, | music," we may, perhaps, without too great presumption represents the poets of energy. submit the following :—

In some writers, and these the very greatest-_in Homer, Absolute poetry is the concrete and artistic expression of Absolute /éschylus, Sophocles, Dante, Shakespeare, Milton, and | the human mind in emotional and rhythmical language. poetry perhaps Goethe—poetic energy and poetic art are seen in This at least will be granted, that no literary expression 'fined. something like equipoise. Itis of poetry as an art, how- | can properly speaking be called poetry that is not in a ever, that we have mainly to speak here ; and all we have | certain deep sense emotional, whatever may be its subject to say upon poetry as an energy is that the critic who, like | matter, concrete in its method and its diction, rhythmical Aristotle, takes this wide

view of poetry—the critic who, | in movement, and artistic in form. like him, recognizes the importance of poetry in its rela- That the expression of all real poetry must be concrete It is con- tions to man's other expressions of spiritual force, claims | in method and diction is obvious, and yet this dictum crete in a place in point of true critical sagacity above that of a | would exclude from the definition much of what is called ™°t24-

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Divisions of the , subject.

What is

poetry ?

critic who, like Plato, fails to recognize that importance. And assuredly no philosophy of history can be other than inadequate should it ignore the fact that poetry has had as uch effect upon human destiny as that other great human energy by aid of which, from the discovery of the use of fire to that of the electric light, the useful arts have been developed.

With regard to poetry as an art, in the present work most of the great poems of the world have been or will be examined either in connexion with the names of the writers or with the various literatures to which thcy belong ; consequently these remarks must be confined to general principles. To treat historically so vast a subject as poetry would be obviously impossible here.

All that can be attempted is to inquire briefly—(1) What is poetry? (2) What is the position it takes up in relation to the other arts? (3) What is its value and degree of expressional power in relation to these? and, finally, (4) What varieties of poetic art are the outcome of the two great kinds of poetic impulse, dramatic imagination and lyric or egoistic imagination ?

1. What is Poetry?—Definitions are for the most part alike unsatisfactory and treacherous; but definitions of poetry are proverbially so. Is it possible to lay down invariable principles of poetry, such as those famous "invariable principles" of the Rev. Mr Bowles, which in the earlier part of the century awoke the admiration of Southey and the wrath of Byron? Is it

possible for a critic to say of any metrical phrase, stanza, or verse, “This is poetry,” or “This is not poetry”? Can he, with anything like the authority with which the man of science pronounces upon the natural objects brought before him, pronounce upon the qualities of a poem? These are questions that have engaged the attention of critics ever since the time of Aristotle.

_ Byron, in his rough and ready way, has answered them in one of those letters to the late John Murray, which, rich as they are in nonsense, are almost as rich in sense.

So far are principles of poetry from being invariable,” says he, “that they never were nor ever will be settled. These principles mean nothing more than the predilec- tions of a particular age, and every age has its own and a different from its predecessor. It is now Homer and now Virgil; once Dryden and since Sir Walter Scott; now Corneille and now Racine; now Crébillon and now Voltaire.” This is putting the case very strongly—perhaps too strongly. But if we remember that Sophocles lost the first prize for the Gdipus T’yrannus ; if we remember what m Dante’s time (owing partly, no doubt, to the universal ignorance of Greek) were the relative positions of Homer and Virgil, what in the time of Milton were the relative positions of Milton himself, of Shakespeare, and of Beau- mont and Fletcher; again, if we remember Jeffrey’s famous classification of the poets of his day, we shall be driven to pause over Byron’s words before dismissing them. Yet some definition, for the purpose of this essay,

didactic poetry. With abstractions the poct has nothing to do, save to take them and turn them into concretions ; for, as artist, he is simply the man who by instinct embodies in concrete forms that “universal idea” which Gravina speaks of —that which is essential and elemental in nature and in man; as poetic artist he is simply the man who by instinct chooses for his concrete forms metrical language. And the questions to be asked con- cerning any work of art are simply these—

Is that which is here embodied really permanent, uni- versal, and elemental? and Is the concrete form em- bodying it really beautiful—acknowledgcd as beautiful by the soul of man in its highest moods? Any other qucs- tion is an impertinence.

Examples are always useful in discussions such as this.

As an example of the absence of concrete form in verse take the following lines from George Eliot's Spanish Gypsy -—

"Speech is but broken light upon the depth

Of the unspoken ; even your loved words

Float in the larger meaning of your voice

As something dimmer." Without discussing the question of blank verse cadence and the weakness of a line where the main accent falls upon a positive hiatus, "of the unspoken," we would point out that this powerful passage shows the spirit of poetry without its concrete form. The abstract method is substituted for the concrete. Such an abstract phrase as "the un-spoken " belongs entirely to prose.

As to what is called ratiocinative poetry, it might per- haps be shown that it does not exist at all. Not by syllogism, but per saltum, must the poet reach in every case his conclusions. We listen to the poet—we allow him to address us in rhythm or in rhyme—we allow him to sing to us while other men are only allowed to talk, not because he argues more logically than they, but because he feels more deeply and perhaps more truly. It is for his listeners to be knowing and ratiocinative ; it is for him to be gnoniic and divinely wise.

That poetry must be metrical or even rhythmical in movement, however, is what some have denied. Here we touch at once the very root of the subject. The difference between all literature and mere " word-knead- ing" is that, while literature is alive, word-kneading is without life. This literary life, while it is only bipartite in prose, seems to be tripartite in poetry; that is to say, while prose requires intellectual life and emotional life, poetry seems to require not only intellectual life and emotional life but rhythmic life, this last being the most important of all according to many critics, though Aristotle is not among these. Here indeed is the "fork" between the old critics and the new. Unless the rhythm of any metrical passage is so vigorous, so natural, and so free that it seems as though it could live, if need

were, by its rhythm alone, has that passage any right to exist? and should it not, if the substance is good, be forthwith

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It is

rhythmic in move-

ment.

Import- ance of metrical ques- tions. –

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demetricized and turned into prose? Thoreau has affirmed

that prose, at its best, has high qualities of its own beyond |

the ken of poetry; to compensate for the sacrifice of thesc, should not the metrical gains of any passage

all cavil ?

But this argument might be pressed further still, ~ Tt |

might seem bold to assert that, in many cases, the mental value of poetry may actually depend upon form and colour, but would it not be true? The mental value of

poetry must be judged by a standard not applicable to | | fect fusion of all poetic elements of which he was such a

prose; but, even with regard to the different kinds of poetry, we must not compare poetry whose mental value consists in a distinct and logical enunciation of ideas, such as that of Lucretius and Wordsworth, and poetry whose mental value consists partly in the suggestive richness of passion or synrbol latent in rhythm (such as that of Sappho sometimes, Pindar often, Shelley always), or latent in colour, such as that of some of the Persian

poets. To discuss the question, Which of these two kinds of poetry is the more precious? would be idle, but are we not driven to admit that certain poems whose strength is rhythm, and certain other poems whose strength is colour, while

devoid of any logical statement of thought, may be as |

fruitful of thoughts and emotions too deep for words as a shaken prism is fruitful of tinted lights? The mental forces at work in the production of a poem like the Excursion are of a very different kind from the mental

forces at work in the production of a poem like Shelley's —

"Ode to the West Wind." In the one case the poet's artistic methods, like those of the Greek architect, show, and are intended to show, the solid strength of the struc- ture. In the other, the poet's artistic methods, like those of the Arabian architect, contradict the idea of solid strength—make the structure appear to hang over our heads like the cloud pageantry of heaven. But, in both cases, the solid strength is, and must be, there, at the base. Before the poet begins to write he should ask himself which of these artistic methods is natural to him; he should ask himself whether his natural impulse is towards the weighty iambic movement whose primary function is to state, or towards those lighter movements which we still call, for want of more convenient words, anapeestic and dactylic, whose primary function is to suggest. Whenever Wordsworth and Keats pass from the former to the latter they pass at once into doggerel. Nor is it difficult to see why English anapzestic and dactylic verse must suggest and not state, as even so comparatively successful a tour de force as Shelley's ''Sensitive Plant" shows. Concise- ness is a primary virtue of all statement. The moment the English poet tries to " pack" his anapzestic or dactylic line, as he can pack his iambic line, his versification becomes rugged, harsh, pebbly—becomes so of necessity. Nor is this all: anapzestic and dactylic verse must in English be obtrusively alliterative, or the same pebbly effect begins to be felt. The anapzestic line is so full of syllables that in a language where the consonants dominate the vowels (as in English), these syllables grate against each other, unless their corners are artfully bevelled by one of the only two smoothing processes at the command of an English versifier—obtrusive alliteration, or an ob- trusive use of liquids. Now these demands

of form may be turned by the perfect artist to good account if his appeal to the listener's soul is primarily that of suggestion by sound or symbol, but if his appeal is that of direct

and logical statement the diffuseness inseparable from

good anapestic and dactylic verse is a source of weakness such as the true artist should find intolerable.

But enough has been said to show that in discussing poetry questions of versification touch, as we have said, the very root of the subject.

be beyond | ; _ vised by an Italian peasant girl, whether it be an ode by

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POrTRY

Using the word "form" in a wider sense still, a sense that includes " composition," it can be shown that poetry to be entitled to the name must be artistic in form. Whether a poem be a Welsh triban or a stornello impro-

Keats or a tragedy by Sophocles, it is equally a work of art. The artist's command over form may be shown in the peasant girl's power of spontaneously rendering in simple verse, in her stornello or rispetto, her emotions through nature's symbols ; it may be shown by Keats in that per-

master, in the manipulation of language so beautiful both for form and colour that thought and words seem but one blended loveliness ; or it may be shown by Sophocles in a mastery over what in painting is called composition, in the exercise of that wise vision of the artist which, looking before and after, sees the thing of beauty as a whole, and enables him to grasp the eternal laws of cause and effect in art and bend them to his own wizard will. In every case, indeed, form is an essential part of poetry ; and, although

George Sand's saying that " L'art est une forme" applies

perhaps more strictly to the plastic arts (where the soul is reached partly through mechanical means), its application to poetry can hardly be exaggerated.

Owing, however, to the fact that the word rouris (first used to designate the poetic artist by Herodotus) means maker, Aristotle seems to have assumed that the indis- pensable basis of poetry is invention. He appears to have thought that a poet is a poet more on account of the com- position of the action than on account of the composition of his verses. Indeed he said as much as this. Of epic poetry he declared emphatically that it produces its imita- tions either by mere articulate words or by metre super- added. ‘This is to widen the definition of poetry so as to include all imaginative literature, and Plato seems to have given an equally wide meaning to the word wouyous. Only, while Aristotle considered zrotjovs to be an imitation of the facts of nature, Plato considered it to be an imitation of the dreams of man. Aristotle ignored, and Plato slighted, the importance of versification (though Plato on one occasion admitted that he who did not know rhythm could be called neither musician nor poet). It is impossible to discuss here the question whether an imaginative work in which the method is entirely concrete and the expression entirely emotional, while the form is unmetrical, is or is not entitled to be called a poem. That there may bea kind of un- metrical narrative so poetic in motive, so concrete in dic- tion, so emotional in treatment, as to escape altogether from those critical canons usually applied to prose, we shall see when, in discussing the epic, we come to touch upon the Northern sagas.

Perhaps the first critic who tacitly revolted against the dictum that substance, and not form, is the indispensable basis of poetry was Dionysius of Halicarnassus, whose treatise upon the arrangement of words is really a very fine piece of literary criticism. In his acute remarks upon the arrangement of the words in the sixteenth book of the Odyssey, as compared with that in the story of Gyges by Herodotus, was perhaps first enunciated clearly the doctrine that poetry is fundamentally a matter of style. The Aristo- telian theory as to invention, however, dominated all criti- cism after as well as before Dionysius. When Bacon came to discuss the subject (and afterwards) the only division between the poetical critics was perhaps between the fol- lowers of Aristotle and those of Plato as to what

poetry should, and what it should not, imitate. It is curious to speculate as to what would have been the result had the poets followed the critics in this matter. instinct of the poet been too strong for the schools, would poetry as an art have been lost and merged in such imagina-

Had not the —

It is artistic in form

poetic atmo- sphere,

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tive prose as Plato's? Or is not the instinct for form too strong to be stifled? By the poets themselves metre was always considered to be the one indispensable requisite of a poem, though, as regards criticism, so recently as the time of the appearance of the Waverley Novels, the Quarterly Review would sometimes speak of them as " poems"; and perhaps even now there are critics of a very high rank who would do the same with regard to romances so concrete in method and diction, and so full of poetic energy, as Wuthering Heights and Jane Eyre, where we get absolutely all that Aristotle requires for a poem. On the whole, however, the theory that versification is not an indispens- able requisite of a poem seems to have become nearly obsolete in our time. Perhaps, indeed, many critics would now go so far in the contrary direction as to say with Hegel (Aesthetih, ili. p. 289) that "metre is the first and only condition absolutely demanded by poetry, yea even more necessary than a figurative picturesque diction." At all events this at least may be said that in our own time the division between poetical critics is not between Aristo- telians and Baconians ; it is now of a different kind alto- gether. While one group of critics may still perhaps say with Dryden that "a poet is a maker, as the name signi- fies," and that "he who cannot make, that is, invent, has his name for nothing," another group contends that it is not the invention but the artistic treatment, the form, which determines whether an imaginative writer is a poet or a writer of prose,—contends, in short, that emotion is the basis of all true poetic expression, whatever be the subject matter, that thoughts must be expressed in an emotional manner before they can be brought into poetry, and that this emotive expression demands even yet some- thing else, viz., style and form.

But, although many critics are now agreed that ‘ L’art est une forme,” that without metre and without form there can be no poetry, there are few who would contend that poetry can exist by virtue of any one of these alone, or even by virtue of all these combined. Quite inde- pendent of verbal melody, though mostly accompanying it, and quite independent of “composition,” there is an atmosphere floating around the poet through which he sees everything, an atmosphere which stamps his utterances as poetry ; for instance, among all the versifiers contem- porary with Donne there was none so rugged as he occa- sionally was, and yet such songs as “Sweetest love, I do not go for weariness of thee” prove how true a poet he was whenever he could master those technicalities which far inferior poets find comparatively easy. While rhythm

and perhaps the greatest soul, that in our time has ex- pressed itself in English verse is Elizabeth Barrett Brown- ing ; at least it is certain that, with the single exception of Hood in the ‘Song of the Shirt,” no writer of the century has really touched our hearts with a hand so powerful as hers,—and this notwithstanding violations of poetic form, notwithstanding defective rhymes, such as would appal some of the contemporary versifiers of England and France “ who lisp in numbers for the numbers {and nothing else] come.” ‘he truth is that in order to produce poetry the soul must for the time being have reached that state of exaltation, that state of freedom from self-consciousness, depicted in the lines— “T started once, or seemed to start, in pain, Resolved on noble things, and strove to speak, As when a great thought strikes along the brain,

And flushes all the cheek.”

Whatsoever may be the poet’s “knowledge of his art,” into this mood he must always pass before he can write a truly poetic line. For, notwithstanding all that we have said and are going to say upon poetry as a fine art, it is in the deepest sense of the word an “inspiration” indeed. No man can write a line of genuine poetry without having been ‘‘born again” (or, as the true rendering of the text says, “born from above”); and then the mastery over those highest reaches of form which are beyond the ken of the mere versifier comes to him as a result of the change. Hence, with all Mrs

Browning’s metrical blemishes, the splendour of her metrical triumphs at her best.

For what is the deep distinction between poet and prose- man? A writer may be many things besides a poet; he may be a warrior like Ai%schylus, a man of business like Shakespeare, a courtier like Chaucer, or a cosmopolitan philosopher like Goethe; but the moment the poetic inood is upon him all the trappings of the world with which for years he may perhaps have been clothing his soul—the world’s knowingness, its cynicism, its self-seek- ing, its ambition—fall away, and the man becomes an inspired child again, with ears attuned to nothing but the whispers of those spirits from the Golden Age, who, according to Hesiod, haunt and bless the degenerate earth. What such a man produces may greatly delight and astonish his readers, yet not so greatly as it delights and astonishes himself. His passages of pathos draw no tears so deep or so sweet as those that fall from his own eyes while he writes ; his sublime passages overawe no soul so imperi- ously as his own; his humour draws no laughter so rich or so deep as that stirred within his own breast.

It might almost be said, indeed, that Sincerity and Con- Sincerity science, the two angels that bring to the poet the wonders 2”4 6on- of the poetic dream, bring him also the deepest, truest °°” delight of form. It might almost be said that by aid of

may to a very considerable degree be acquired (though, of course, the highest rhythmical effects never can), the power of looking at the world through the atmosphere

that floats before the poet’s eyes is not to be learned and not to be taught. This atmosphere is what we call poetic wmagination, a subject which will have to be fully discussed further on. But first it seems necessary to say a word or two upon that high temper of the soul which in truly great poetry gives birth to this poetic imagination.

sincerity and conscience the poet is enabled to see more clearly than other men the eternal limits of his own art— to see with Sophocles that nothing, not even poetry itself, is of any worth to man, invested as he is by the whole army of evil, unless it is in the deepest and highest sense

hee The “message” of poetry must be more unequivocal, | good, unless it comes linking us all together by closer ee more thoroughly accentuated, than that of any of the | bonds of sympathy and pity, strengthening us to fight the

other fine arts. With regard to modern poetry, indeed, it may almost be said that if any writer’s verse embodies a message, true, direct, and pathetic, we in modern Europe cannot stay to inquire too curiously about the degree of artistic perfection with which it is delivered, for Words- worth’s saying “That which comes from the heart goes to the heart” applies very closely indeed to modern poetry. The most truly passionate poet in Greece was no doubt in a deep sense the most artistic poet ; but in her case art and passion were one, and that is why she has becn so cruelly misunderstood. The most truly passionate nature,

foes with whom fate and even nature, the mother who bore us, sometimes seem in league—to see with Milton that the high quality of man’s soul which in English is expressed by the word virtue is greater than even the great poem he prized, greater than all the rhythms of all the tongues that have been spoken since Babel—and to see with Shakespeare and with Shelley that the high passion which in English is called love is lovelier than all art, lovelier than all the marble Mercuries that “await the chisel of the sculptor” in all the marble hills. So much for our first inquiry—‘‘ What is poetry ?”

The posi- tion of poetry in relation to the other arts.

Relation of poetry to music.

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9. What Position does Poetry take up in Relation to the other Arts ?—Notwithstanding the labours of Lessing and his followers, the position accorded by criticism to poetry in relation to the other arts was never so uncertain and anomalous as at the present moment. On the one hand there is a class of critics who, judging from their perpetual comparison of poems to pictures, claim her as a sort of handmaid of painting and sculpture. On the other hand the disciples of Wagner, while professing to do homage to

poetry, claim her as the handmaid of music. To find her proper place is therefore the most important task the critic can undertake at this time, though it is one far beyond the scope of a paper so brief as this. With regard to the relations of poetry to painting and sculpture, however, it seems necessary to glance for a moment at the saying of Simonides, as recorded by Plutarch, that poetry is a speaking picture and that painting is a mute poetry. It appears to have had upon modern criticism as much in- fluence since the publication of Lessing's Laocoon as it had before. Perhaps it is in some measure answerable for the modern vice of excessive word-painting. Beyond 'this one saying, there is little or nothing in Greek literature to show that the Greeks recognized between poetry and the plastic and pictorial arts an affinity closer than that which exists between poetry and music and dancing. . Understanding artistic methods more profoundly than the moderns, and far too profoundly to suppose that there is any special and peculiar affinity between an art whose medium of expres- sion is marble and an art whose medium of expression is a growth of oral symbols, the Greeks seem to have studied poetry not so much in its relation to painting and sculp- ture as in its relation to music and dancing. It is matter of familiar knowledge, for instance, that at the Dionysian festival it was to the poet as "teacher of the chorus" (xopodiSdéoKaAos) that the prize was awarded, even though the "teacher of the chorus" were Aéschylus himself or Sophocles. And this recognition of the relation of poetry to music is perhaps one of the many causes of the superi- ority of Greek to all other poetry in adapting artistic means to artistic ends. In Greek poetry, even in Homer's description of the shield of Achilles, even in the famous description by Sophocles of his native woods in the Zdipus Coloneus, such word-painting as occurs seems, if not inevit- able and unconscious, so alive with imaginative feeling as to become part and parcel of the dramatic or lyric move- ment itself. And whenever description is so introduced the reader of Greek poetry need not be told that the scenery itself rises before the listener's imagination with a clearness of outline and a vigour of colour such as no amount of detailed word-painting in the modern fashion can achieve. 'The picture even in the glorious verses at the end of the eighth book of the Ziad rises before our eyes—seems actually to act upon our bodily senses— simply because the poet's eagerness to use the picture for merely illustrating the solemnity and importance of his story lends to the

picture that very authenticity which the work of the modern word-painter lacks.

That the true place of poetry lies between music on the one hand and prose, or loosened speech, on the other, was, we say, taken for granted by the one people in whom the artistic instinct was fully developed.

No doubt they used the word music in a very wide sense, In a sense that might include several arts. But it Is a suggestive fact that, in the Greek language, long peor poctic art was called “making” it was called

singing.” The poet was not zoyrijs but dodds. And as regards the Romans it is curious to see how every now and then the old idea that poetry is singing rather than making will disclose itself. It will be remembered for instance how Terence, in the prologue of Phormio, alludes

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to poets as musicians. That the ancients were right in this we should be able to show did our scheme permit an historical treatment of poetry: we should be able to show that music and the lyrical function of the poet began together, but that here, as in other things, the progress of art from the implicit to the explicit has separated the two. Every art has its special function, has a certain work which it can do better than any one of its sister arts. Hence its right of existence. For instance, before the “sea of emotion” within the soul has become “curdled into thoughts,” it can be expressed in inarticulate tone. Hence, among the fine arts, music is specially adapted for rendering it. It was perhaps a perception of this fact which made the Syrian Gnosties define life to be “moving music.” When this sea of emotion has “curdled into thoughts,” articulate language rhythmically arranged— words steeped in music and colour, but at the same time embodying ideas—can do what no mere wordless music is able to achieve in giving it expression, just as unrhyth- mical language, language mortised in a foundation of logic, that is to say prose, can best express these ideas as soon as they have cooled and settled and cleared themselves of emotion altogether. Yet every art can in some degree invade the domain of her sisters, and the nearer these sisters stand to each other the more easily and completely can this invasion be accomplished. Prose, for instance, can sometimes, as in the case of Plato, do

some of the work of poetry (however imperfectly, and however tram- melled by heavy conditions) ; and sometimes poetry, as in Pindar's odes and the waves of the Greek chorus, can do, though in the same imperfect way, the work of music. The poems of Sappho, however, are perhaps the best case in point. Here the poet's passion is expressed so com- pletely by the mere sound of her verses that a good recita- tion of them to a person ignorant of Greek would convey something of that passion to the listener; and similar examples almost as felicitous might be culled from Homer, from /Eschylus, and from Sophocles. Nor is this power confined to the Greek poets. The students of Virgil have often and with justice commented on such lines as in. v. 481 (where the sudden sinking of a stricken ox is rendered by means of rhythm), and such lines as Georg. il. 441, where, by means of verbal sounds, the gusts of wind about a tree are rendered as conipletely as though the voice were that of the wind itself. In the case of Sappho the effect is produced by the intensity of her passion, in the case of Homer by the intensity of the dramatic vision, in the case of Virgil by a supreme poetic art. But it can also be pro- duced by the mere ingenuity of the artist, as in Edgar Poe's " Ulalume." The poet's object in that remarkable tour de force was to express dull and hopeless gloom in the same way that the mere musician would have expressed it,—that is to say, by monotonous reiterations, by hollow and dreadful reverberations of gloomy sounds—though as an artist whose vehicle was articulate speech he was obliged to add gloomy ideas, in order to give to his work the intellectual coherence necessary for its existence as a poem. He evidently set out to do this, and he did it, and "Ulalume " properly intoned would produce something

like the same effect upon a listener knowing no word of

English that it produces upon us,

On the other hand, music can trench very far upon the domain of articulate speech, as we perceive in the wonder- ful instrumentation of Wagner. Yet, while it can be shown that the place of poetry is scarcely so close to sculpture and painting as to music on the one side and loosened speech on the other, the affinity of poetry to music must not be exaggerated. We must

be cautious how we follow the canons of Wagner and the more enthust- astic of his disciples, who almost seem to think that

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| Relation _ of poetry _ to prose,

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inarticulate tone can not only suggest ideas but express them—can give voice to the Verstand, in short, as well as to the Vernunft of man. Even the Greeks drew a funda- mental distinction between melic poetry (poetry written to be sung) and poetry that was written to be recited. It isa pity that, while modern critics of poetry have understood or at least have given attention to painting and sculpture, so few have possessed any knowledge of music—a fact which makes Dante's treatise De Vulgari Eloquio so important. Dante was a musician, and seems to have had a con- siderable knowledge of the relations between musical and metrical laws. But he did not, we think, assume that these laws are identical.

If it is indeed possible to establish the identity of musical and metrical laws, it can only be done by a purely scientific investigation; it can only be done by a most searching inquiry into the subtle relations that we know must exist throughout the universe between all the laws of undulation. And it is curious to remember that some of the greatest masters of verbal melody have had no knowledge of music, while some have not even shown any love of it. All Greek boys were taught music, but whether Pindar's unusual musical skill was born of natural instinct and inevitable passion, or came from the accidental circumstance that his father was, as has been alleged, a musician, and that he was as a boy elaborately taught musical science by Lasus of Hermione, we have no means of knowing. Nor can we now learn how much of Milton's musical knowledge resulted from a like exceptional ' en- vironment," or from the fact that his father was a musician. But when we find that Shelley seems to have been with- out the real passion for music, that Rossetti disliked it, and that Coleridge's apprehension of musical effects was of the ordinary nebulous kind, we must hesitate before accepting the theory of Wagner.

The question cannot be pursued here; but if it should

on inquiry be found that, although poetry is more closely

related to music than to any of the other arts, yet the power over verbal melody at its very highest is so all- sufficing to its possessor as in the case of Shelley and Coleridge that absolute music becomes a superfluity, this would only be another illustration of that intense egoism and concentration of force—the impulse of all high artistic energy—which is required in order to achieve the rarest miracles of art. ;

With regard to the relation of poetry to prose, Coleridge once asserted in conversation that the real antithesis of poetry was not prose but science. And if he was right the difference in kind lies, not between the poet and the prose writer, but between the literary artist (the man whose instinct is to manipulate language) and the man of facts and of action whose instinct impels him to act, or, if not to act, to inquire.

One thing is at least certain, that prose, however fervid and emotional it may become, must always be directed, or seem to be directed, by the reins of logic. Or, to vary the netaphor, like a captive balloon it can never really leave the earth.

Indeed, with the literature of knowledge as opposed to the literature of power poetry has nothing todo. Facts have no place in poetry until they are brought into relation with the human soul. But a mere catalogue of ships may become poetical if it tends to show the strength and pride and glory of the warriors who invested Troy ; a detailed description of the designs upon a shield, however beautiful and poetical in itself, becomes still more so if it tends to show the skill of the divine artificer and the invincible splendour of a hero like Achilles. But mere dry exacti- tude of imitation is not for poetry but for loosened speech. Hence, most of the so-called poetry of Hesiod is not poetry

at all. The Muses who spoke to him about “truth” on Mount Helicon made the common mistake of confounding fact with truth. And here we touch

upon a very import- ant matter. The reason why in prose speech is loosened is that, untrammelled by the laws of metre, language is able with more exactitude to imitate nature, though of course speech, even when “ loosened,” cannot, when actual sensible objects are to be depicted, compete in any real degree with the plastic arts in accuracy of imitation, for the simple reason that its media are not colours nor solids but symbols—arbitrary symbols which can be made to indicate, but never to reproduce, colours and _ solids. Accuracy of imitation is the first requisite of prose. But the moment language has to be governed by the laws of metre—the moment the conflict begins between the claims of verbal music and the claims of colour and form—then prosaic accuracy has to yield; sharpness of outline, mere fidelity of imitation, such as is within the compass of prose, have in some degree to be sacrificed. But, just as with regard to the relations between poetry and music the greatest master is he who borrows the most that can be borrowed from music, and loses the least that can be lost from metre, so with regard to the relations between poetry and prose the greatest master is he who borrows the most that.can be borrowed from prose and loses the least that can be lost from verse. No doubt this is what every poet tries to do by instinct ; but some sacrifice on cither side there must be, and, with regard to poetry and prose, modern poets at least might be divided into those who make picturesqueness yield to verbal melody, and those who make verbal melody yield to picturesqueness.

With one class of poets, fine as is perhaps the melody, it is made subservient to outline or to colour; with the other class colour and outline both yield to metre. The chief aim of the first class is to paint a picture ; the chief aim of the second is to sing a song. Weber, in driving through a beautiful country, could only enjoy its beauty by translating it into music. The same may be said of some poets with regard to verbal melody. The supreme artist, however, is he whose pictorial and musical power are so interfused that each seems born of the other, as is the case with Sappho, Homer, Auschylus, Sophocles, and indeed most of the great Greek poets. Among our own poets (leaving the two supreme masters undiscussed) Keats and Coleridge have certainly done this. The colour seems born of the music and the music born of the colour. In French poetry the same triumph has been achieved in Victor Hugo’s magnificent poem “ En Marchant la Nuit dans un Bois,” which, as a rendering through verbal music of the

witchery of nature, stands alone in the poetry of France. For there the poet conquers that crowning diffi- culty we have been alluding to, the difficulty of stealing from prose as much distinctness of colour and clearness of outline as can be imported into verse with as little sacrifice as possible of melody.

But to return to the general relations of poetry to prose. If poetry can in some degree invade the domain of prose, so on the other hand prose can at times invade the domain of poetry, and no doubt the prose of Plato— what is called poetical prose—is a legitimate form of art. Poetry, the earliest form of literature, is also the final and ideal form of all pure literature ; and, when Landor insists that poetry and poetical prose are antagonistic, we must remember that Landor's judgments are mostly based on feeling, and that his hatred of Plato would be quite sufficient basis with him for an entire system of criticism upon poetical prose. As with Carlyle, there was a time in his life when Plato (who of course is the great figure standing between the two arts of metre and loosened speech) had serious thoughts of becoming a poet. And

perhaps, like Carlyle, having the good sense to see his true

function, he himself desisted from writing, and strictly

Import- ance of poetry in rela- tion to other arts.

Where poetry is inferior and. where superior to music;

to prose;

forbade other men to write, in verse. If we consider this, and if we consider that certain of the great English masters of poetic prose in the 17th century were as incapable of writing in metre as their followers Richter and Carlyle, we shall hardly escape the conclusion on the one hand that the faculty of writing poetry is quite another faculty than that of producing work in the arts most closely allied to it, music and prose, but that on the other hand

there 1s nothing antagonistic between these faculties. So much for poetry's mere place among the other arts.

Importance of Poetry in Relation to other Arts.—As to the comparative importance and value of poetry among the other arts, this isa sabject upon which much discussion, of a more or less idle kind, has been wasted. We do not feel called to dwell at any length upon it here. Yet a word or two upon the question is necessary in order that we may understand what is the scope and what are the iimits of poetry with regard to the other arts, especially with regard to music and to prose. ;

There is one great point of superiority that musical art exhibits over metrical art. This consists, not in the

capacity for melody, but in the capacity for harmony in

the musician's sense. The finest music of A%schylus, of Pindar, of Shakespeare, of Milton, is after all only a succes- sion of melodious notes, and, in endeavouring to catch the harmonic intent of strophe, antistrophe, and epode in the Greek chorus and in the true ode (that of Pindar), we can only succeed by pressing memory into our service. We have to recall by memory the waves that have gone before, and then to imagine their harmonic power in relation to the waves at present occupying the ear. Counterpoint, therefore, is not to be achieved by the metricist, even though he be Pindar himself; but in music this perfect ideal harmony was foreshadowed perhaps in the earliest writing. We know at least that as early as the 12th century counterpoint began to show a vigorous life, and the study of it is now a familiar branch of musical science. Now, inasmuch as " Nature's own hymn" is and must be the harmonic blending of apparently independent and apparently discordant notes, among the arts whose appeal is through the ear that which can achieve counter- point must perhaps rank as a pure art above one which cannot achieve it. We are of course speaking here of metre only. We have not time to inquire whether the counterpoint of absolute poetry is the harmony underlying apparently discordant emotions —the emotion produced by a word being more persistent than the emotion produced by an inarticulate sound.

But if poetry falls behind music in rhythmic scope, it is capable of rendering emotion after emotion has become disintegrated into thoughts, and here, as we have seen, it enters into direct competition with the art of prose. It can use the emphasis of sound, not for its own sake merely, but to strengthen the emphasis of sense, and can thus give a fuller and more adequate expression to the soul of man than music at its highest can give. With regard to prose, no doubt such writing as Plato's descrip- tion of the chariot of the soul, his description of the island of Atlantis, or of Er's visit to the place of departed souls, comes but a short way behind poetry in imaginative and even in rhythmic appeal. It is impossible, however, here to do more than touch upon the subject of the rhythm of prose In its relation to the rhythm of poetry ;.for in this matter the genius of each individual language has to be taken into account. _

Perhaps it may be said that deeper than all the rhythms of art is that rhythm which art would fain catch, the rhythm of nature ; for the rhythm of nature is the rhythm

of life itself. This rhythm can be caught by prose as well as by poetry, such prose, for instance, as that of the English Bible. Certainly the rhythm of verse at its highest, such, for instance, as that of Shakespeare's greatest writings, is nothing more and nothing less than the metre of that energy of the spirit which surges within the bosom of him who speaks, whether he speak in verse or in impassioned prose. Being rhythm, it is of course governed by law, but it is a law which transcends in subtlety the conscious art of the metricist, and is only caught by the poet in his most inspired moods, a law which, being part of nature's own sanctions, can of course never be formulated but only expressed, as it is expressed in the melody of the bird, in the inscrutable harmony of the entire bird-chorus of a thicket, in the whisper of the leaves of the tree, and in the song or wail of wind and sea. Now is not this rhythm of nature represented by that "sense rhythm" which prose can catch as well as poetry, that sense rhythm whose finest expressions are to be found

in the Bible, Hebrew and English, and in the Biblical

movements of the English Prayer Book, and in the dramatic prose of Shakespeare at its best? Whether it is caught by prose or by verse, one of the virtues of the rhythm of nature is that it is translatable. Hamlet's peroration about man and Raleigh's apostrophe to death are as translatable into other languages as are the Hebrew psalms, or as is Manu's magnificent passage about the singleness of man (we quote from memory) :—

"Single is each man born into the world.; single he dies ; single he receives the reward of his good deeds, and single the punishment of his evil deeds. When he dies his body lies like a fallen tree upon the earth, but his virtue accompanies his soul. Wherefore let man harvest and garner virtue, so that he may have an inseparable com-

panion in traversing that gloom which is so hard to be traversed." ©

Here the rhythm, being the inevitable movement of emotion and "sense," can be caught and translated by every literature under the sun. While, however, the great goal before the poet is to compel the listener to expect his ceesuric effects, the great goal before the writer of poetic prose is in the very opposite direction ; it is to make use of the concrete figures and impassioned diction of the poet, but at the same time to avoid the recognized and expected metrical bars upon which the poet depends. The moment the prose poet passes from the rhythm of prose to the rhythm of metre the apparent sincerity of his writing is destroyed.

And now how stands poetry with regard to the plastic to plastic | This is in truth a vast subject, and has given birth art.

arts ? to an infinitude of eloquent criticism in the present century. It cannot be expected that we should be able to discuss it adequately here. Yet this, too, must be glanced at. On the one side poetry is inferior to the plastic arts; on another side it is superior to them.

As compared with sculpture and painting the great infirmity of poetry, as an "imitation " of nature, is of course that the medium is always and of necessity words—even when no words could, in the dramatic situation,

have been spoken. It is not only Homer who is obliged sometimes to forget that passion when at white heat is never voluble, is scarcely even articulate; the dramatists also are obliged to forget that in love and in hate, at their tensest, words seem weak and foolish when compared with the silent and satisfying triumph and glory of deeds, such as the plastic arts can render. This becomes manifest enough when we compare the Niobe group or the Laocoon group, or the great dramatic paintings of the modern world, with even the finest efforts of dramatic poetry, such as the speech of Andromache to Hector, or the speech of Priam to Achilles, nay such as even the cries of Cassandra in the Agamemnon, or the wailings of Lear over the dead Cordelia. Even when writing the words uttered by Gidipns, as the terrible truth

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breaks in upon his soul, Sophocles must have felt that, in the holiest chambers of sorrow and in the highest agonies of suffering reigns that awful silence which not poetry, but painting sometimes, and sculpture always, can render. What human sounds could render the agony of Niobe, or the agony of Laocoon, as we see them in the sculptor's rendering? Not articulate speech at all; not words but wails. It is the same with hate ; it is the same with love. We are not speaking merely of the unpacking of the heart in which the angry warriors of the Ziad indulge. Even such subtle writing as that of Aischylus and Sophocles falls below the work of the painter. Hate, though voluble perhaps, as Clytzemnestra's when hate is at that red-heat glow which the poet can render, changes in a moment

whenever that redness has been fanned to hatred's own |

last complexion—whiteness as of iron at the melting- point,—when the heart has grown far too big to be "unpacked " at all, and even the bitter epigrams of hate's own rhetoric, though brief as the terrier's snap before he

fleshes his teeth, or as the short snarl of the tigress as she springs before her cubs in danger, are all too slow and sluggish for a soul to which language at its tensest has become idle play. But this is just what cannot be ren- dered by an art whose medium consists solely of words.

It is in giving voice, not to emotion at its tensest, but to the variations of emotion, it is in expressing the count- less shifting movements of the soul from passion to passion, that poetry shows in spite of all her infirmities her superiority to the plastic arts.

adequate to the entire breadth and depth of man's soul.

Poetic Imagination.—We have now reached our last |

general inquiry—What varieties of poetic art are the outcome of the two kinds of poetic impulse, dramatic

imagination and lyric or egoistic imagination? It would | of course be impossible within the space at our command to |

examine fully the subject of poetic imagination. For in order to do so we should have to enter upon the vast question of the effect of artistic environment upon the development of man's poetic imagination; we should have to inquire how the instinctive methods of each poet and of each group of poets have been modified. and often governed by the methods characteristic of their own time and country. We should have to inquire, for instance, how far such landscape as that of Sophocles in the @dipus Coloneus and such landscape as that of Wordsworth depends upon difference of individual tenrperament, and how far upon difference of artistic environment. That, in any thorough and exhaustive discussion of poetic imagina-

Hamlet and the | Agamemnon, the Iliad and the @dipus Tyrannus, are |

however, is, as we say, quite beyond the scope of any essay like this, and we can only point to the familiar instance of the troubadours and the trouvéres

and then pass on.

With the trouvére (the poet of the langue oil), the story or situation is always the end of which the musical language is the means; with the troubadour (the poet of the langue doc), the form is so beloved, the musical language so enthralling, that, however beautiful may be the story or situation, it is felt to be no more than the means to a more beloved and beautiful end. But then nature makes her own troubadours and her own trouvéres irrespective of fashion and of time—irrespective of langue doc and langue d'oil. And, in comparing the trouba- dours with the trouvéres, this is what strikes us at once— there are certain troubadours who by temperament, by original endowment of nature, ought to have been trou- véres, and there are certain trouvéres who by temperament ought to have been troubadours. Surrounding conditions alone have made them what they are. There are those whose impulse (though writing in obedience to contem- porary fashions lyrics in the langue d'oc) is manifestly to narrate, and there are those whose impulse (though writing in obedience to contemporary fashions fabliaux in the langue oil) is simply to sing. In other words, there are those who, though writing after the fashion of their brother-troubadours, are more impressed with the romance and wonderfulness of the human life outside them than with the romance and wonderfulness of their own passions, and who delight in depicting the external world in any form that may be the popular form of their time; and there are those who, though writing after the fashion of their brother-trouveéres, are far more occupied with the life within them than with that outer life which the taste of their time and country calls upon them to paint—born rhythmists who inust sing, who translate everything external as well as internal into verbal melody. Of the former class Pierre Vidal, of the latter class the author of " Le Lay de l'Oiselet,"» may be taken as the respective types.

That the same forces are seen at work in all literatures few students of poetry will deny,—though in some poetical groups these forces are no doubt more potent than in others, as, for instance, with the great parable poets of Persia, in some of whom there is perpetually apparent a conflict

between the dominance of the Oriental taste for allegory and subtle suggestion, as expressed in the Zoro- astrian definition of poetry,—“ apparent pictures of un- apparent realities,” —and the opposite yearning to represent human life with the freshness and natural freedom charac- teristic of Western poetry.

Allowing, however, for all the potency of external Ani poetry influences, we shall not be wrong in saying that of poetic the out- imagination there are two distinct kinds—(1) the kind of 0°™¢ of

3g ae. ° : : absolute poetic imagination seen at its highest in Aschylus, vision or Sophocles, Shakespeare, and Homer, and (2) the kind of of relative

poetic imagination seen at its highest in Pindar, Dante, vision.

tion, the question of artistic environment must be taken into account, the case of the Jliad is alone sufficient to show—a case that will at once occur to the reader. Ages before Phrynichus, ages before an acted drama was dreamed of, a dramatic poet of the first order arose, and, though he was obliged to express his splendid dramatic

imagination through epic forms, he expressed it almost as fully as if he had inherited the method and the stage of Sophocles. And if Homer never lived at all, then an entire group of dramatic poets arose in remote times Whose method was epic instead of dramatic simply be- cause there was then no stage.

This, contrasted with the fact that in a single half- century the tragic art of Greece arose with Zuschylus, culminated with Sophocles, and decayed with Euripides, and contrasted also with the fact that in England at one time, and in Spain at one time, almost the entire poetic ™magination of the country found expression in the acted drama alone, is sufficient to show that a poet’s artistic methods are very largely influenced by the artistic environ- ments of his country and time.

and Milton, or else in Sappho, Heine, and Shelley. The former, being in its highest dramatic exercise uncondi- tioned by the personal or lyrical impulse

of the poet, might perhaps be called absolute dramatic vision; the latter, being more or less conditioned by the personal or lyrical impulse of the poet, might be called relative dramatic vision. It seems impossible to classify poets, or to classify the different varieties of poetry, without drawing some such distinction as this, whatever words of definition we may choose to adopt.

For the achievement of all pure lyric poetry, such as the ode, the song, the elegy, the idyl, the sonnet, the stornello, it is evident that the imaginative force we have called relative vision will suffice. And if we consider the matter

So vast a subject as this, | thoroughly, in many other forms of poetic art—forms

which at first sight might seem to require absolute vision _—we shall find nothing but relative vision at work.

Even in Dante, and even in Milton and Virgil, it might be difficult to trace the working of any other than relative vision. Andas to the entire body of Asiatic poets it might perhaps be found (even in view of the Indian drama) that relative vision suffices to do all their work. Indeed the temper which produces true drama is, it might almost be said, a growth of the Western mind. For, unless it be Semitic as seen in the dramatic narratives of the Bible, or Chinese as seen in that remarkable prose story, Lhe Two Fair Cousins, translated by Rémusat, absolute vision seems to have but small place in the literatures of Asia. ‘The wonderfulness of the world and the romantic possibilities of fate, or circumstance, or chance—not the wonderfulness of the character to whom these possibilities befall—are ever present to the mind of the Asiatic poet. Even in so late a writer as the poet of the Shah Namek, the hero Irij, the hero Zal, and the hero Zobreb are in character the same person, the virtuous young man who combines the courage of youth with the wisdom and forbearance of age. And, as regards the earlier poets of Asia, it was not till the shadowy demigods and heroes of the Asiatic races crossed the Caucasus, and breathed a more bracing air, that they became really indi- vidual characters. But among the many qualities of

man’s mind that were invigorated and rejuvenated by that great exodus from the dreamy plains of Asia is to be counted, above all others, his poetic imagination. The mere sense of wonder, which had formerly becn an all-sufficing source of pleasure to him, was all-sufficing no longer. The wonderful adventure must now be connected with a real and interesting individual character. It was left for the poets of Europe to show that, given the interesting character, given the Achilles, the Odysseus, the Helen, the Priam, any adventure happening to such a character becomes interesting.

What then is this absolute vision, this true dramatic imagination which can hardly be found in Asia—which even in Europe cannot be found except in rare cases? Between relative and absolute vision the difference seems to be this, that the former only enables the poct, even in its very highest exercise, to make his own individuality, or else humanity as represented by his own individuality, live in the imagined situation; the latter enables him in its highest exercise to make special individual characters other than the poet’s own live in the imagined situation.

“That which exists in nature,” says Hegel, ‘‘is a some- thing purely individual and particular. Art on the contrary is essentially destined to manifest the general.” And no doubt this is true as regards the plastic arts, and true also as regards literary art, save in the very highest reaches of pure drama and pure lyric, when it seems to become art no longer—when it seems to become the very voice of Nature herself. The cry of Priam when he puts to his lips the hand that slew his son is not merely the cry of a bereaved and aged parent; it is the cry of the individual king of Troy, and expresses above everything else that most naif, pathetic, and winsome character. Put the words into the mouth of the irascible and passionate Lear and they would be entirely out of keeping.

_It may be said then that, while the poet of relative vision, even in its very highest exercise, can only, when depicting the external world, deal with the general, the poet of absolute vision can compete with Nature herself and deal with both general and particular. Now if thisis really so we may perhaps find a basis for a classification of poetry and of poets. That all poets must be singers has already been maintained. But singers seem to be divisible into three classes:—first the pure lyrists, each

of whom can with his one voice sing only one tune; secondly the epic poets, save Homer, the bulk of the narrative poets, and the quasi-dramatists, each of whom can with his one voice sing several tunes; and thirdly the true dramatists, who, having, like the nightingale of Gongora, many tongues, can sing all tunes.

It is to the first-named of these classes that most poets belong. With regard to the second class, there are not of course many poets left for it: the first absorbs so many. But, when we come to consider that among those who, with each his one voice, can sing many tunes, are Pindar, Firdausi, Jami, Virgil, Dante, Milton, Spenser, Goethe, Byron, Coleridge, Shelley, Keats, Schiller, Victor Hugo, the second class is so various that no generalization save such a broad one as ours could embrace its members. And now we come to class three, and must pause. The third class is necessarily very small. In it can ouly be placed such names as Shakespeare, Aischylus, Sophocles, Homer, and (hardly) Chaucer.

These three kinds of poets represent three totally different kinds of poetic activity.

With regard to the first, the pure lyrists, the iunpulse is pure egoism. Many of them have less of even relative vision at its highest than the mass of mankind. They are often too much engaged with the emotions within to have any deep sympathy with the life around them. Of every poet of this class it may be said that his mind to him “a kingdom is,” and that the smaller the poet the bigger to him is that kingdom. To make use of a homely image—like the chaffinch whose eyes have been pricked by the bird-fancier, the pure lyrist is sometimes a warbler because he is blind. Still he feels that the Muse loves him exceedingly. She takes away his eyesight, but she gives him sweet song. And his song is very sweet, very sad, and very beautiful; but it is all about the world within his own soul—its sorrows, joys, fears, and aspirations.

With regard to the second class the impulse here is no doubt a kind of egoisi too ; yet the poets of this class are all of a different temper from the pure lyrists. They have a wide imagination ; but it is still relative, still egoistic.

They have splendid eyes, but eyes that never get beyond seeing general, universal humanity (typified by them- selves) in the imagined situation. Not even to these is it given to break through that law of centrality by which every “me” feels itself to be the central “me ”—the only “me” of the universe, round which all other spurious “mes” revolve. This “me” of theirs they can transmute into many shapes, but they cannot create other “mes,”—nay, for egoism, some of them scarcely would perhaps if they could.

The third class, the true dramatists, whose impulse is the simple yearning to create akin to that which made “the great Vishnu yearn to create a world,” are ‘Col imagination all compact,”—so much so that when at work “the divinity” which Iamblichus speaks of “seizes for the time the soul and guides it as he will.”

The distinction between the pure lyrists and the other two classes of poets is obvious enough. But the distinc tion between the quasi-dramatists and the pure dramatists requires a word of explanation before we proceed to touch upon the various kinds of poetry that spring from the exer- cise of relative and absolute vision. Sometimes, to be sure, the vision of the true dramatists —the greatest dramatists —will suddenly become narrowed and obscured, as in that part of the CZdipus Tyrannus where Sophocles makes Qidipus ignorant of what every one in Thebes must have known, the murder of Laius. And again, finely as So- phocles has conceived the character of Electra, he makes her, in her dispute with Chrysothemis, give expression to sentiments that, in another play of his own, come far more

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appropriately from the lofty character of Antigone in a parallel dispute with Ismene. And, on the other hand, examples of relative vision, in its furthest reaches, can be found in abundance everywhere, especially in Virgil, Dante,

Calderon, and Milton; but in our limited space we can Some of the most remarkable

‘elative examples of that high kind of relative vision which may

ton,

easily be mistaken for absolute vision may be found in those great prose epics of the North which Aristotle would have called poems. Here is one from the Voélsunga Saga. While the brothers of Gudrun are about their treacherous business of murdering Sigurd, her husband, as he lies asleep in her arms, Brynhild, Sigurd’s former love, who in the frenzy of ‘“‘love turned to hate” has instigated the mur- derers to the deed, hovers outside the chamber with Gunnar, her husband, and listens to the wail of her rival who is weltering in Sigurd’s blood. At the sound of that wail Brynhild laughs

“Then said Gunnar to her, Thou laughest not because thy heart roots are gladded, or else why doth thy visage wax so wan?”

This is of course very fine; but, as any two characters in that dramatic situation might have done that dramatic business, fine as it is,—as the sagaman gives us the general and not the particular,—the vision at work is not absolute but relative at its very highest exercise. But our examples will be more interesting if taken from English poets. In Coleridge’s “‘ Ancient Mariner” we find an immense amount of relative vision of so high a kind that at first it seems absolute vision. When the ancient mariner, in his narra- tive to the wedding guest, reaches the slaying of the albatross, he stops, he can proceed no further, and the wedding guest exclaims — “God save thee, Ancient Mariner, From the fiends that plague thee thus ! Why look’st thou so?” “ With my cross-bow

I shot the albatross,”

But there are instances of relative vision—especially in the great master of absolute vision, Shakespeare—which are higher still,—so high indeed that not to relegate them to absolute vision seems at first sight pedantic. Such an example is the famous speech of Lady Macbeth in the second act, where she says—

“ Had he not resembled My father as lie slept, I had done ’t.”

Marvellously subtle as is this speech, it will be found, if analysed, that it expresses the general human soul rather than any one special human soul. Indeed Leigh Hunt records the case of a bargeman who, charged with robbing a sleeping traveller in his barge, used in his confession almost identical words—“Had he not looked like my father as he slept, I should have killed as well as robbed him.” Again, the thousand and one cases (to be found in every literature) where a character, overwhelmed by some sudden surprise or terror, asks whether the action going on is that of a dream or of real life, must all, on severe analysis, be classed under relative rather than under absolute vision, —even such a fine speech, for instance, as that where Pericles, on discovering Marina, exclaims—

“ This is the rarest dream that e’er dull sleep

Did mock sad fools withal ;”

or as that in the third act of Z%tus Andronicus, where — beholding his mutilated and ruined daughter, asks—

“When will this fearful slumber have an end?” even here, we say, the humanity rendered is general and not particular, the vision at work is relative and not absolute. The poet, as representing the whole human

race, throwing himself into the imagined situation, gives |

us what general humanity would have thought, felt, said,

1 Translation of Morris and Magnusson.

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or done in that situation, not what one particular indi- vidual and he alone would have thought, felt, said, or done.

Now what we have called absolute vision operates in a very different way. So vividly is the poet’s mere creative instinct at work that the ego sinks into

passivity—becomes insensitive to all impressions other than those dictated by the vision—by the “divinity” which has “seized the soul,’

We have left ourselves little room for examples; but Shakespeare is full of them.

Take the scene in the first act of /Jamlet where Hamlet hears for the first time, from Horatio, that his father’s ghost haunts the castle. Having by short sharp questions elicited the salient facts attending the apparition, Hamlet says, “I would I had been there.” To this Horatio makes the very commonplace reply, ‘It would have much amazed you.” Note the marvellously dramatic reply of Hamlet—“ Very like, very like! Stayed it long?” Sup- pose that this dialogue had been attempted by any other poet than a true dramatist, or by a true dramatist in any other mood than his very highest, Hamlet, on hearing Horatio’s commonplace remarks upon phenomena which to Hamlet were more subversive of the very order of the universe than if a dozen stars had fallen from their courses, would have burst out with—“ Amazed me!” and then would have followed an eloquent declamation about the “amazing ” nature of the phenomena and their effect upon him. But so entirely has the poet become Hamlet, so completely has ‘“‘the divinity seized his soul,” that all language seems equally weak for expressing the turbulence within the soul of the character, and Hamlet exclaims in a sort of meditative irony, ‘‘ Very like, very lke!” It is exactly this one man Hamlet, and no other man, who in this situation would have so expressed himself. Charles Knight has some pertinent remarks upon this speech of Hamlet; yet he misses its true value, and treats it from the general rather than from the particular side. Instances of absolute vision in Shakspeare crowd upon us; but we can find room for only one other. In the pathetic speech of Othello, just before he kills hiinself, he declares himself to be—

“One not easily jealous, but, being wrought, Perplexed in the extreme.”

Consider the marvellous timbre of the word “ wrought,” as coming from a character like Othello. When writing this passage, especially when writing this word, the poet had become entirely the simple English soldier-hero, as the Moor really is—he had become Othello, looking upon himself “as not

easily jealous," whereas he was " wrought" and ""'perplexed in the extreme" by tricks which Hamlet would have seen through in a moment.

in which absolute vision is demanded, viz., the drama, and in a lesser degree the Greek epic, especially the //iad. This will be seen more plainly perhaps if we now vary our definitions and call relative vision egoistic imagina- tion, absolute vision dramatic imagination.

Drama has been already fully treated in the present work (see Drama). But it follows from what has been here said that very much of the dramatist's work can be,. and in fact is, effected by egoistic imagination, while true dramatic imagination is only called into play on compara- tively rare occasions. Not only fine but sublime dramatic poems have been written, however, where the vitalizing power. has been entirely that of lyrical imagination. We need only instance the Prometheus Bound of Aisclhylus, the most sublime poem in the world. The dramas of Shelley too, like those of Victor Hugo and Calderon, are | informed entirely by egoistic imagination. In all these XIX. — 34

While all other forms of poetic art can be vitalized by Where relative vision, there are two forms (and these the greatest) absolute

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splendid poems the dramatist places himself in the imagined situation, or at most he places there some typical concep- tion of universal humanity. There is not in all Calderon any such display of dramatic imagination as we get in that wonderful speech of Priam's in the last book of the Iliad. to which we have before alluded. There is not in the Cenci such a display of dramatic imagination as we get in the sudden burst of anger from the spoilt child of gods and men, Achilles (anger which alarnis the hero him- self ag much as it alarms Priam), when the prattle of the old man has carried him too far. It may seem bold to say that the drama of Goethe is informed by egoistic imagination only,—assuredly the prison-scene in [aust 1s unsurpassed in

the literatures of the world. Yet, perhaps, it could be shown of the passion and the pathos of Gretchen throughout the entire play that it betrays a {female character general and typical rather than individual and particular.

The nature of this absolute vision or true dramatic imagination is easily seen if we compare the dramatic work of writers without absolute vision, such as Cal- deron, Goethe, Ben Jonson, Fletcher, and others, with the dramatic work of Aischylus and of Shakespeare. While of the former group it may be said that each poet skilfully works his imagination, of @schylus and Shake- speare it must be said that each in his highest dramatic mood does not work, but is worked by his imagination. Note, for instance, how the character of Clytzmnestra grows and glows under the hand of fischylus. The poet of the Odyssey had distinctly said that /igisthus, her paramour, had struck the blow, but the dramatist, having imagined the greatest tragic female in all poetry, finds it impossible to let a man like Aigisthus assist such a woman in a homicide so daring and so momentous. And when in that terrible speech of hers she justifies her crime (ostensibly to the outer world, but really to her own conscience), the way in which, by the sheer magnetism of irresistible personality, she draws our sympathy to her- self and her crime is unrivalled out of Shakespeare and not surpassed even there. In the Great Drama, in the Agamemnon, in Othello, in Hamlet, in Macbeth, there is an imagination at work whose laws are inexorable, are inevitable, as the laws by the operation of which the planets move around the sun. But in this essay our business with drama is confined entirely to its relations to epic.

Considering how large and on the whole how good is the body of modern criticism upon drama, it is surprising how poor is the modern criticism upon epic. Aristotle, comparing tragedy with epic, gives the palm to tragedy as being the more perfect art, and nothing can be more ingenious than the way in which he has marshalled his reasons. He tells us that tragedy as well as epic is capable of producing its effect even without action ; we can judge of it perfectly, says he, by reading. He goes so far as to say that, even in reading as well as in representation, tragedy has an advantage over the epic, the advantage of greater clearness and distinctness of impression. And in some measure this was perhaps true of Greek tragedy, for as Miiller in his Déssertations on the Eumenides has well said, the ancients always remained

and wished to remain conscious that the whole was a Dionysian entertainment ; the quest of a common-place érdry came afterwards. And even of Romantic Drama it may be said that in the time of Shakespeare, and indeed down through the 18th century, it never lost entirely its character of a recitation as well asadrama. It was not till melodrama began to be recognized asa legitimate form of drainatic art that the dialogue had to be struck from the dramatic action “at full speed” —struck like sparks from the roadster’s shoes. The

| by abandoning the chorus.

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truth is, however, that it was idle for Aristotle to inquire which is the more important branch of poetry, epic or tragedy.

Equally idle would it be for the modern critic to inquire how much romantic drama gained and how much it lost Much has been said as to the scope and the limits of epic and dramatic poetry. If in epic the poet has the power to take the imagination of his audience away from the dramatic centre and show what is going on at the other end of the great web of the world, he can do the same thing in drama by the chorus, and also by the introduction into the dramatic circle of messengers and others from the outside world.

But, as regards epic poetry, is it right that we should hear, as we sometimes do hear, the voice of the poet him- self as chorus bidding us contrast the present picture with other pictures afar off, in order to enforce its teaching and illustrate its pathos? This is a favourite method with modern poets and a still more favourite one with prose

narrators. Does it not give an air of self-consciousness to poetry? Does it not disturb the intensity of the poetic vision? Yet it has the sanction of Homer; and who shall

dare to challenge the methods of the great father of epic? An instance occurs in Iliad v. 158, where, in the midst of all the stress of fight, the poet leaves the dramatic action to tell us what became of the inheritance of Phzenops, after his two sons had been slain by Diomedes. Another instance

occurs in ili, 243-4, where the poet, after Helen's pathetic mention of her brothers, comments on the causes of their absence, "criticizes life" in the approved modern way, generalizes upon the impotence of human intelligence— the impotence even of human love—to pierce the darkness in which the web of human fate is woven. Thus she spoke (the poet tells us); but the life-giving earth already possessed them, there in Lacedeemon, in their dear native land :— bs pdro robs 8 Hdn xdtexev puoiCoos ala ey Aakedaluonr ad01, olan ev marpid: yaly.

This of course is "beautiful exceedingly," but, inasmuch as the imagination at work is egoistic or lyrical, not dra- matic, inasmuch as the vision is relative not absolute, it does not represent that epic strength at its very highest which we call specially "Homeric," unless indeed we remember that with Homer the Muses are omniscient: this certainly may give the passage a deep dramatic value it otherwise seems to lack.

The deepest of all the distinctions between dramatic and epic methods has relation, however, to the nature of the dialogue. Aristotle failed to point it out, and this is remarkable until we remember that his work is but a frag- ment of a great system of-criticism. In epic poetry, and in all poetry that narrates, whether the poet be Homer, Chaucer, Thomas the Rhymer, Gottfried von Strasburg, or Turoldus, the action, of course, moves by aid partly of narrative and partly by aid of dialogue, but in drama the dialogue has a quality of suggestiveness and subtle inference which we do not expect to find in any other poetic form save perhaps that of the purely dramatic ballad. In ancient drama this quality of suggestiveness and subtle inference is seen not only in the dialogue, but in the choral odes. The third ode of the Agamemnon is an extreme case in point, where, by a kind of double entendre, the relations of Clytemnestra and Aigisthus are darkly alluded to under cover of allusions to Paris and Helen. Of this dramatic subtlety Sophocles is perhaps the greatest master ; and certain critics have been led to speak as though irony were heart-thought of Sophoclean drama. But the suggestive- ness of Sophocles is pathetic (as Prof. Lewis Campbell has well pointed out) not ironical. This is one reason why drama more than epic seems to satisfy the mere intel-

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lect of the reader, though this may be counterbalanced by the hardness of mechanical structure which sometimes dis- turbs the reader's imagination in tragedy.

When, for instance, a dramatist pays so much attention to the evolution of the plot as Sophocles does, it is inevit- able that his characters should be more or less plot-ridden ; they have to say and do now and then certain things which they would not say and do but for the exigencies of the plot. Indeed one of the advantages which epic certainly has over drama is that the story can be made to move as rapidly as the poet may desire without these mechanical modifications of character.

The only kind of epic for Aristotle to consider was Greek epic, between which and all other epic the difference is one of kind, if the /éad alone is taken to represent Greek epic. In speaking of the effect that surrounding conditions seem to have upon the form in which the poetic energy of any time or country should express itself, we

But where in this classification are we to find a place for the Ziad? The heart-thought of the greatest epic in all literature is simply that Achilles was vexed and that the fortunes of the world depended upon the whim of a sulky hero. Yet, notwithstanding all the acute criticisms of Wolff, it remains difficult for us to find a place for the Iliad among the epics of growth. And wliy? Because throughout the Ziad the dramatic imagination shown is of the first order ; and, if we are to suppose a multiplicity of authors for the poem, we must also suppose that ages before the time of Pericles there existed a group of dramatists more nearly akin to the masters of the great drama, Aischylus, Sophocles, and Shakespeare than any group that has ever existed since. Yet it is equally difficult to find a place for it amongst the epics of art. In the matter of artistic motive the Odyssey stands alone among the epics of art of the world, as we are going to see,

instanced the //iad as a typical case. The imagination vivifying it is mainly dramatic. The characters represent much more than the mere variety of

mood of the delineator. Notwithstanding all the splendid works of Calderon, Mar- lowe, Webster, and Goethe, it is doubtful whether as a born dramatist the poet of the /éiad does not come nearer : to Aischylus and Shakespeare than does any other poet. His passion for making the heroes speak for themselves is

It is manifest that, as the pleasure derived from the epic A con. of art is that of recognizing a conscious scheme, if the epic scious of art fails through confusion of scheme it fails altogether, Scheme What is demanded of the epic of art (as some kind of com- ees abe pensation for that natural freedom of evolution which it quired for can never achieve, that sweet abandon which belongs to the true nature and to the epic of growth alike) is unity of im- epic of pression, harmonious and symmetrical development of a”

almost a fault in the //cad considered as pure epic, and the unconscious way in which each actor is made to depict his own character is in the highest spirit of drama. It is owing to this speciality of the Z/iad that it stands apart from all other epic save that of the Odyssey, where, how- ever, the dramatic vision is less vivid. It is owing to the dramatic imagination displayed in the Jiad that it is impossible to say, from internal evidence, whether the poem is to be classified with the epics of growth or with the epics of art. All epics are clearly divisible into two classes, first those which are a mere accretion of poems or traditionary ballads, and second, those which, though based indeed on tradition or history, have become so fused in the mind of one great poet, so stained, therefore, with the colour and temper of that mind, as to become new crystallizations —inventions, in short, as we understand that word. Each kind of epic has excellencies peculiar to itself, accompanied by peculiar and indeed necessary defects. In the one we get the freedom— apparently schemeless and motiveless— of nature, but, as a consequence, miss that “ hard acorn of thought” (to use the picturesque definition in the Vélsunga Saga of the heart of a man) which the mind asks for as the core of every work of art. In the other this great requisite of an adequate central thought is found, but accompanied by a constriction, a lack of freedom, a cold artificiality, the obtrusion of a pedantic scheme, which would be intolerable to the natural mind unsophisticated by literary study. The flow of the one isas that of a river, the flow of the other as that of a canal. Yet, as has been already hinted, though the great charm of Nature herself 18 that

she never teases us with any obtrusive exhibitions of scheme, she doubtless has a scheme somewhere, she does somewhere hide a “hard acorn of thought ” of which the poem of the universe is the expanded expression. And, this being so, art should have a scheme too; but in such a dilemma is she placed in this matter that the epic poet, unless he is evidently telling the story for its own sake, scornful of purposes ethic or esthetic, must sacrifice illusion.

Among the former class of epics are to be placed the great epics of growth, such as the Mahdbhirata, the Niblung story, &e.; among the latter the Odyssey, the

Aineid, Paradise Lost, the Gerusalemme Liberata, the Lusiadus,

conscious heart-thought, or motive. This being so, where are we to place the #neid, and where are we to place the Shih Nameh? Starting with the intention, as it seems, of fusing into one harmonious whole the myths and legends upon which the Roman story is based, Virgil, by the time he reaches the middle of his epic, forgets all about this primary intent, and gives us his own thoughts and re- flexions on things in general. Tine as is the speech of Anchises to Aineas in Elysium (dn. vi. 724-755), its incongruity with the general scheme of the poem as developed in the previous books shows how entirely Virgil lacked that artistic power shown in the Odyssey of making a story become the natural and inevitable outcome of an artistic idea.

In the Shah Nadmeh there is the artistic redaction of Virgil, but with even less attention to a central thought than Virgil exhibits. Firdausi relies for his effects upon the very qualities which characterize not the epic of art but the epic of growth—a natural and not an artificial flow of the story; so much so indeed that, if the Shih Ndmeh were studied in connexion with the //iad on the one hand and with the Kalevala on the other, it might throw a light upon the way in which an epic may be at one and the same time an aggregation of the national ballad poems and the work of a single artificer. That Firdausi was capable of working from a centre not only artistic but philosophic his Yaésuf and Zuleikha shows; and if we consider what was the artistic temper of the Persians in Firdausi’s time, what indeed has been that temper during the whole of the Mohammedan period, the subtle temper of the parable

poet,—the Skah Ndameh, with its direct appeal to popular sympathies, is a standing wonder in poetic literature. ‘

With regard, however, to Virgil’s defective power of working from an artistic motive, as compared with the poet of the Odyssey, this is an infirmity he shares with all the poets of the Western world. Certainly he shares it with the writer of Puradise Lost, who, setting out to “justify the ways of God to man,” forgets occasionally the original worker of the evil, as where, for instance, he substitutes chance as soon as he comes (at the end of the second book) to the point upon which the entire epic movement turns, the escape of Satan from hell and his | journey to earth for the ruin of man :—

“ At last his sail-broad vans

He spreads for flight, and, in the surging smoke

Uplifted, spurns the ground; thence many a league,

As in a cloudy chair, aseending rides

Audacious; but, that seat soon failing, meets

A vast vacuity ; all unawares,

Fluttering his pinions vain, plumb down he drops

Ten thousand fathoms deep, and to this hour

Down had been falling, had not, by ILL CHANCE,

The strong rebuff of some tumultuous cloud,

Instinct with fire and nitre, hurried hin

As many miles aloft.” | Tn Milton’s case, however, the truth is that he made the mistake of trying to disturb the motive of a story for artistic purposes,—

a fatal mistake as we shall see when we come to speak of the Nibelungenlied in relation to the old Norse epic cycle.

Though Vondel's mystery play of Lucifer is, in its execution, rhetorical more than poetical, it did, beyond all question, influence Milton when he came to write Paradise Zost. The famous line which is generally quoted as the key-note of Satan's character— " Better to reign in hell than serve in heaven io

seems to have been taken bodily from Vondel's play, and Milton's entire epic shows a study of it. While Marlowe's majestic movements alone are traceable in Satan's speech (written some years before the rest of Paradise Lost, when the dramatic and not the epic form had been selected), Milton's Satan became afterwards a splendid amalgam not of the Mephistopheles but of the /austus of Marlowe and the Lucifer of Vondel. Vondel's play must have possessed a peculiar attraction for a poet of Milton's views of human progress. Defective as the play is in execution, it is far otherwise in motive. This motive, if we consider it aright, is nothing less than an explanation of man's anomalous con- dition on the earth—spirit incarnate in matter, created by God, a little lower than the angels—in order that he may advance by means of these very manacles which imprison him, in order that le may ascend by the staircase

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faculty of developing a poetical narrative from a philosophic thought is Oriental, and on the whole foreign to the genius of the Western mind. Neither in Western drama nor in western epic do we find, save in such rare cases as that of Vondel, anything like that power of developing a story from an idea which not only Jami but all the parable poets of Persia show.

In recent English poetry, the motive of Shelley's dramatic poem Prometheus Unbound is a notable illustra- tion of what is here contended. Starting with the full intent of developing a drama from a motive—starting with a universalism, a belief that good shall be the final goal of ill—Shelley cannot finish his first three hundred lines without shifting (in the curse of Prometheus) into a Manichzism as pure as that of Manes himself :—

“ Heap on thy soul, by virtue of this eurse, Ill deeds, then be thou damned, beholding good ; Both infinite as is the universe.”

According to the central thought of the poem human nature, through the heroic protest and struggle of the human mind typified by Prometheus, can at last dethrone that supernatural terror and tyranny (J upiter) which the human mind had itself installed. But, after its dethrone- ment (when human nature becomes infinitely perfectible), how can the supernatural tyranny exist apart from the human mind that imagined it? How can it be as “ infinite as the universe” #

The motive of Paradise Lost is assailed with much vigour by Victor Hugo in his poem: Religions et Religion. But when M. Hugo, in the after parts of the poem, having destroyed Milton’s “God,” sets up an entirely French “Dieu” of his own and tries “to justify” him, we perceive how pardonable was Milton’s failure after all, Compare such defect of mental grip and such nebulosity of thought as is displayed by Milton, Shelley, and M. Hugo with the strength of hand shown in the “Sal4man” and ‘ Absal ”

of Jami, and indeed by the Sufi poets generally. There is, however, one exception to this rule that The Gres! | Western poetry is nebulous as to motive. There is, besides Northern

of the world, the ladder of fleshly conditions, above those cherubim and seraphim who, lacking the education of

sense, have not the knowledge wide and deep which brings man close to God.

Here Milton found his own favourite doctrine of human development and self-education in a concrete and vividly artistic form. Much, however, as such a motive must have struck a man of Milton’s instincts, his intellect was too much chained by Calvinism to permit of his treating the subject with Vondel’s philosophic breadth. The cause of Lucifer’s wrath had to be changed from jealousy of human progress to jealousy of the Son’s proclaimed superiority. And the history of poetry shows that once begin to tamper with the central thought around which any group of incidents has crystallized and the entire story becomes thereby re-written, as we have

seen in the case of the Agamemnon of Aischylus. Of the motive of his own epic, after he had abandoned the motive of Vondel, Milton had as little permanent grasp as Virgil had of his. As regards the Odyssey, however, we need scarcely say that its motive is merely artistic, not philosophic. And now we come to philosophic motive.

The artist' power of thought is properly shown not in the direct enuviation of ideas but in mastery over motive. Here ASschylus is by far the greatest figure in Western poetry,—a proof perhaps among many proofs of the Oriental strain of his genius. (As regards pure drama, however, important as is motive, freedom, organic vitality in every part, is of more importance than even motive, and in this freedom and easy abandonment the concluding part of the Oresteia is deficient as compared with such a play as Othello or Lear.) Notwithstanding the splendid exception of Alschylus, the truth seems to be that the

the Iliad, one epic that refuses to be classified, though °P™

for entirely different reasons. This is the Niblung story, where we find unity of purpose and also entire freedom of movement. We find combined here beauties which are nowhere else combined—which are, in fact, at war with each other everywhere else. We find a scheme, a real "acorn of thought," in an epic which is not the self- conscious work of a single poetic artificer, but is as much the slow growth of various times and various minds as is the Mahdbhdrata, in which the heart-thought is merely that the Kauravas defeated their relatives at dice and refused to disgorge their winnings.

This Northern epic-tree, as we find it in the Tcelandic sagas, the Norns themselves must have watered ; for it combines the virtues of the epic of growth with those of the epic of art.. Though not written in metre, it may usefully be compared with the epics of Greece and of India and Persia. Free in movement as the wind, which "bloweth where it listeth," it listeth to move by law. Its action is that of free-will, but free-will at play within a ring of necessity. Within this ring there throbs all the warm and passionate life of the world outside, and all the freedom apparently. Yet from that world it is enisled by a cordon of curses—by a zone of defiant flames more impregnable than that which girdled the beautiful Brynhild at Hindfell. Natural laws, familiar emotions, are at work everywhere in the story; yet

the “Ring of Andvari,” whose circumference is but that of a woman’s finger, encircles the whole mimic world of the sagaman as the Midgard snake encircles the earth. For this artistic perfection in an epic of growth there are,

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of course, many causes, some of them traceable and some of them beyond all discovery,—causes no doubt akin to those which gave birth to many of the beauties of other epics of growth. Originally Sinfiotli and Sigurd were the same person, and note how vast has been the artistic effect of the separation of the two! Again, there were several different versions of the story of Brynhild. The sagamen, finding all these versions too interesting and too much beloved to be discarded, adopted them all—worked them up into one legend, so that, in the Vélsunga Saga we have a heroine possessing all the charms of goddess, demi- goddess, earthly princess, and amazon—a heroine surpass- ing perhaps in fascination all other heroines that have ever figured in poetry.

It is when we come to consider such imaginative work as this that we are compelled to pause before challenging the Aristotelian doctrine that metrical structure is but an accidental quality of epic ; and it will now be seen why, in the early part of this essay, this doctrine was examined so carefully.

In speaking of the Niblung story we do not, of course, speak of the German version, the Wibelungenlied, a fine epic still, though a degradation of the elder form. Between the two the differences are fundamental in the artistic sense, and form an excellent illustration of what has just been said upon the disturbance of motive in epic, and indeed in all poetic art. It is not merely that the endings of the three principal characters Sigurd (Siegfried), Gudrun (Kriemhilt), and Brynhild are entirely different ; it is not merely that the Icelandic version, by missing the blood-

bath at Fafnir’s lair, loses the pathetic situation of Gudrun’s |

becoming afterwards an unwilling instrument of her hus- band's death; it is not merely that, on the other hand,

the German version, by omitting the early love passages |

between Brynhild and Sigurd at Hindfell, misses entirely the tragic meaning of her story and the terrible hate that is love resulting from the breaking of the troth; but the conclusion of each version is so exactly the opposite of that of the other that, while the German story is called (and very properly) "Kriemhilt's Revenge" the story of the Volsunga Saga might, with equal propriety, be called Gudrun's Forgiveness.

If it he said that, in both cases, the motive shows the same Titanic temper, that is because the Titanic temper is the special characteristic of the North-Western mind. The temper of revolt against authority seems indeed to belong to that energy which succeeds in the modern development of the great racial struggle for life. Although no epic, astern or Western, can exist without a struggle between

good and evil—and a struggle upon apparently equal terms |

—it must not be supposed that the warring of conflicting forces which is the motive of Eastern epic has much real relation to the warring of conflicting forces which is the motive of Western epic.

And, as regards the machinery of epic, there is, we Suspect, a deeper significance than is commonly appre- hended in the fact that the Satan or Shaitan of the Eastern world becomes in Vondel and Milton a sublime Titan who attracts to himself the admiration which in Eastern poetry belongs entirely to the authority of heaven. In Asia, save perhaps among the pure Arabs of the desert, underlying all religious forms, there is apparent a temper

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he became their equal and struggled alongside them, shoulder to shoulder, in the defence of heaven against the assaults of hell. Therefore, as we say, the student of epic poetry must not suppose that there is any real parallel between the attitude of Vishnu (as Rama) towards Ravana and the attitude of Prometheus towards Zeus, or the attitude of the human heroes towards Odin in Scandi- navian poetry. Had Ravana been clothed with a properly constituted authority, had he been a legitimate god instead of a demon, the Eastern doctrine of recognition of authority would most likely have come in and the world would have been spared one at least of its enormous epics. Indeed, the Ravana of the Rdmdyana answers somewhat to the Fafnir of the Volsunga Saga ; and to plot against demons is not to rebel against authority. The vast field of Indian epic, however, is quite beyond us here.

Nor can we do more than glance at the Kalevala. From one point of view that group of ballads might be taken, no doubt, as a simple record of how the men of Kalevala were skilful in capturing the sisters of the Pojohla men. But from another point of view the universal struggle of the male for the female seems typified in this so-called epic of the Finns by the picture of the “Lady of the Rainbow” sitting upon her glowing arc and weaving her golden threads, while the hero is doing battle with the malevolent forces of nature.

But it is in the Niblung story that the temper of Western epic is at its best—the temper of the simple fighter whose business it is to fight. The ideal Western fighter was not known in Greece till ages after Homer, when in the pass of Thermopyle the companions of Leonidas combed their long hair in the sun. The business of the fighter in Scandinavian epic is to yield to no power whatsoever, whether of earth or heaven or hell—to take a buffet from the Allfather himself, and to return it ; to look Destiny herself in the face, crying out for quarter neither. to gods nor demons nor Norns. This is the true temper of pure “heroic poetry” as it has hitherto flourished on this side the Caucasus—the temper of the fighter who is invincible because he feels that Fate herself falters when the hero of the true strain defies—the fighter who feels that the very Norns themselves must cringe at last before the simple courage of man standing naked and bare of hope against all assaults whether of heaven or hell or doom. The proud heroes of the Volsunga Saga utter no moans and shed no Homeric tears, knowing as they know that the

day prophesied is sure when, shoulder to shoulder, gods and men shall stand up to fight the entire brood of night and evil, storming the very gates of Asgard.

That this temper is not the highest from the ethical point of view is no doubt true. Against the beautiful resignation of Buddhism it may seem barbaric, and if moral suasion could supplant physical force in epic—if Siddartha could take the place of Achilles or Sigurd—it might be better for the human race.

But it would be difficult even to glance at the countless points of interest that suggest themselves in connexion with epic poetry. Returning now to the general subject of egoistic or lyrical and dramatic imagination,—as might

| be expected, we occasionally meet imagination of a purely

dramatic kind in narrative poetry, such for instance as

| that of Gottfried von Strasburg, of Chaucer, and of the

author of the Chanson de Roland.

of resignation to the irresistible authority of heaven. And as regards the Aryans it is probable that the Titanic temper—the temper of revolt against authority—did not begin to show itself till they had moved across the Caucasus. But what concerns us here is the fact that the farther they moved to the north-west the more vigorously this temper asserted itself, the prouder grew man in his attitude towards the gods, till at last in the Scandinavian cycle

But we must now give undivided attention to pure ie of

egoistic or lyric imagination. This, as has been said, is poetic art sufficient to vitalize all forms of poetic art save drama and are the the Greek epic. Many of these forms have been or will] natural be treated in this work under separate heads. sae It would be impossible to discuss adequately here the jmagina- Hebrew poets, who have produced a lyric so different in tion.

The great

lyric of the He- brews stands alone.

kind from all other lyrics as to stand in a class by itself. As it is equal in importance to the Great Drama of Shake- speare, /Eschylus, and Sophocles, we may perhaps be allowed to call it the “Great Lyric.” The Great Lyric must be religious—it must, it would seem, be an out- pouring of the soul, not towards man but towards God, like that of the God-intoxicated prophets and psalmists of Scripture. Even the lyric fire of Pindar owes much to the fact that he had a child-like belief in the myths to which so many of his contemporaries had begun to give a languid assent. But there is nothing in Pindar, or indeed else- where in Greek poetry, like the rapturous song, combining unconscious power with unconscious grace, which we have called the Great Lyric. It might perhaps be said indeed that the Great Lyric is purely Hebrew.

But, although we could hardly expect to find it among those whose language, complex of syntax and alive with self-conscious inflexions, bespeaks the scientific knowing- ness of the Western inind, to call the temper of the Great Lyric broadly “ Asiatic” would be rash. Itseems to belong as a birthright to those descendants of Shem who, yearning always to look straight into the face of God and live, could (when the Great Lyric was sung) see not much else.

~ Though two of the artistic elements of the Great Lyric,

unconsciousness and power, are no doubt plentiful enough in India, the element of grace is lacking for the most part. The Vedic hymns are both nebulous and unemo- tional, as compared with Semitic hymns. And as to the Persians, they, it would seem, have the grace always, the power often, but’ the unconsciousness almost never. This is inevitable if we consider fora moment the chief charac- teristic of the Persian imagination—an imagination whose wings are not so much “bright with beauty” as heavy with it—heavy as the wings of a golden pheasant—steeped in beauty like

the “tiger-moth’s deep damasked wings.” Now beauty of this kind does not go to the making of the Great Lyric.

Then there comes that poetry which, being ethnologic- ally Semitic, might be supposed to exhibit something at least of the Hebrew temper—the Arabian. But, whatever may be said of the oldest Arabic poetry, with its deep sense of fate and pain, it would seem that nothing can be more unlike than the Hebrew temper and the Arabian temper as seen in later poets. It is not with Hebrew but with Persian poetry that Arabian poetry can be usefully compared. If the wings of the Persian imagination are heavy with beauty, those of the later Arabian imagination are bright with beauty—brilliant as an Eastern butterfly, quick and agile as a dragon-fly or a humming-bird. To the eye of the Persian poet the hues of earth are (as Firdausi says of the garden of Afrasiab) ‘like the tapestry of the kings of Ormuz, the air is perfumed with musk, and the waters of the brooks are the essence of roses.” And to the later Arabian no less than to the Persian the earth is beautiful; but it is the clear and sparkling beauty of the earth as she “wakes up to life, greeting the Sabean morning”: we feel the light more than the colour.

But it is neither the Persian’s instinct for beauty nor the Arabian’s quenchless wit and exhaustless animal spirits that go to the making of the Great Lyric; far from it. In a word, the Great Lyric, as we have said, cannot be assigned to the Asiatic temper generally any more than it can be assigned to the European temper.

In the poetry of Europe, if we cannot say of Pindar, devout as he is, that he produced the Great Lyric, what can we say of any other European poet? The truth is that, like the Great Drama, so straight and so warm does it seem to come from the heart of man in its highest moods that we scarcely feel it to be literature at all.

| that all odes should be written on the same model.

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however, from this supreme expression of lyrical | imagination, we come to the artistic ode, upon which The arti subject the present writer can only

reiterate here what tie ode ot he has more fully said upon a former occasion, What- “™™ ever may have been said to the contrary, enthusiasm is, in the nature of things, the very basis of the ode; for the ode is a mono-drama, the actor in which is the poct himself ; and, as Marmontel has well pointed out, if the actor in the mono-drama is not affected by the sentiments he expresses, the ode must be cold and lifeless. But, although the ode is a natural poetic method of the poet considered as prophet—although it is the voice of poetry as a fine frenzy—it must not be supposed that there is anything lawless in its structure. “Pindar,” says the Ttalian critic Gravina, “launches his verses upon the bosom

of the sea; he spreads out all his sails; he confronts the tempest and the rocks; the waves arise and are ready to engulf him; already he has disappeared from the spec- tator’s view ; when suddenly he springs up in the midst of the waters, and reaches happily the shore.” Now it is this Pindaric discursiveness, this Pindaric unrestraint as to the matter, which has led poets to attempt to imitate him by adopting an unrestraint as to form. Although no two odes of Pindar exhibit the same metrical structure (the olian and Lydian rhythms being mingled with the Doric

in different proportions), yet each ode is in itself obedient, severely obedient, to structural law. This we feel ; but what the law is no metricist has perhaps ever yet been able to explain.

It was a strange misconception that led people for centuries to use the word “Pindaric” and irregular as synonymous terms; whereas the very essence of the odes of Pindar (of the few, alas! which survive to us) is their regularity. There is no more difficult form of poetry than this, and for this reason: when in any poetical composi- tion the metres are varied, there must, as the present writer has before pointed out, be a reason for such free- dom, and that reason is properly subjective—the varying form must embody and express the varying emotions of the singer. But when these metrical variations are governed by no subjective law at all, but by arbitrary rules sup- posed to be evolved from the practice of Pindar, then that very variety which should aid the poet in expressing his emotion crystallizes it and makes the ode the most frigid of all compositions. Great as Pindar undoubtedly is, it is deeply to be regretted that no other poet survives to

repre- sent the triumphal ode of Greece,—the digressions of his subject-matter are so wide, and his volubility is so great.

In modern literature the ode has been ruined by theories The and experiments. A poet like La Mothe, for instance, modern writes execrable odes, and then writes a treatise to prove 0%

Passing,

There is much confusion of mind prevalent among poets as to what is and what is not an ode.- All odes are, no doubt, divisible into two great classes :—those which, following an arrangement in stanzas, are commonly called regular, and those which, following no such arrangement, are commonly called irregular. |

We do not agree with those who assert that irregular The irr: | metres are of necessity inimical to poetic art. On the gular o” | contrary, we believe that in modern prosody the arrange ae ment of the rhymes and the length of the lines in any oqo, rhymed metrical passage may be determined either by a fixed stanzaic law or by a law infinitely deeper—by the law which impels the soul, in a state of poetic exaltation, to seize hold of every kind of metrical aid, such as rhyme, cesura, &c., for the purpose of accentuating and marking off each shade of emotion as it arises, regardless of any demands of stanza. But between the irregularity of make shift, such as we find it in Cowley and his imitators, and

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POE the irregularity of the “fine frenzy” of such a poem, for instance, as Coleridge’s Kubla Khan, there is a difference in kind. Strange that it is not in an ode at all but in this unique lyric Aubla Khan, descriptive of imaginative landscape, that an English poet has at last conquered the crowning difficulty of writing in irregular metres. Having broken away from all restraints of couplet and stanza,—having caused his rhymes and pauses to fall just where and just when the emotion demands that they should fall, scorning the exigencies of makeshift no less than the exigencies of stanza, —he has found what every writer of irregular English odes has sought in vain, a music as entrancing, as natural, and at the same time as inscrutable, as the music of the winds or of the sea.

The prearranged effects of sharp contrasts and anti- phonal movements, such as some poets have been able to compass, do not of course come under the present defi- nition of irregular metres at all. If a metrical passage does not gain immensely by being written independently of stanzaic law, it loses immensely ; and for this reason, perhaps, that the great charm of the music of all verse, as distinguished from the music of prose, is inevitableness of cadence. In regular metres we enjoy the pleasure of feel- ing that the rhymes will inevitably fall under a recognized law of couplet or stanza. But if the passage flows independently of these, it must still flow inevitably—it must, in short, show that it is governed by another and a yet deeper force, the inevitableness of emotional expres- sion. The lines must be long or short, the rhymes must be arranged after this or after that interval, not because it is convenient so to arrange them, but because the emotion of the poet inexorably demands these and no other arrangements. When, however, Coleridge came to try his hand at irregular odes, such as the odes “To the Departing Year” and “To the Duchess of Devonshire,” he certainly did not succeed.

As to Wordsworth’s magnificent “Ode on Intimations of Immortality,” the sole impeachment of it, but it is a grave one, is that the length of the lines and the arrange- ment of the rhymes are not always inevitable; they are, except on rare occasions, governed neither by stanzaic nor by emotional law. For instance, what emotional necessity was there for the following rhyme-arrangement ?

“My heart is at your festival, My head hath its coronal, The fulness of your bliss I feel—I feel it all.

Oh, evil day! if I were sullen

While earth herself is adorning,

This sweet May morning ;

And the children are culling,

On every side,

In a thousand valleys far and wide, Fresh flowers.” –

Beautiful as is the substance of this entire passage, so far from gaining, it loses by rhyme—loses, not in perspicuity, for Wordsworth like all his contemporaries (except Shelley) is mostly perspicuous, but in that metrical emphasis the quest of which is one of the unpulses that leads a poet to write in rhyme. In spite, however, of its metrical defects, this famous ode of Wordsworth’s is the finest irregular ode in the language ; for, although Coleridge’s “Ode to the Departing Year” excels it in Pindaric fire, it is below Wordsworth’s masterpiece in almost every other quality save rhythm. Among the Writers of English irregular odes, next to Wordsworth, stands Dryden. The second stanza of the “Ode for St Cecilia’s Day” is a great triumph.

Leaving the irregular and turning to the regular ode, it natural to divide these into two classes :—-(1) those

strophes, antistrophes, and epodes, variously arranged and

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contrasted ; and (2) those which consist of a regular succession of regular stanzas. Perhaps all Pindaric odes tend to show that this form of art is in English a mistake. It is easy enough to write one stanza and call it a strophe, another in a different movement and call it an antistrophe, a third in a different movement still and call it an epode. But in modern prosody,

disconnected as it is from musical and from terpsichorean science, what are these? No poet and no critic can say.

What is requisite is that the ear of the reader should catch a great metrical scheme, of which these three varieties of movement are necessary parts,—should catch, in short, that inevitableness of structure upon which we have already touched. In order to justify a poet in writ- ing a poem in three different kinds of movement, governed by no musical and no terpsichorean necessity, a necessity of another kind should make itself apparent ; that is, the metrical wave moving in the strophe should be metrically answered by the counter-wave moving in the antistrophe, while the epode—which, as originally conceived by Stesi- chorus, was merely a standing still after the balanced movements of the strophe and antistrophe—should clearly, in a language like ours, be a blended echo of these two. A mere metrical contrast such as some poets labour to effect is not a metrical answer. And if the reply to this criticism be that in Pindar himself no such metrical scheme is apparent, that is the strongest possible argument in support of our position. If indeed the metrical scheme of Pindar is not apparent, that is because, having been written for chanting, it was subordinate to the lost musical scheme of the musician. It has been contended, and is likely enough, that this musical scheme was simple—as simple, perhaps, as the scheme of a cathedral chant; but to it, whatever it was, the metrical scheme of the poet was subordinated. It need scarcely be said that the phrase “metrical scheme” is used here not in the narrow sense as indicating the position and movement of strophe and antistrophe by way of simple contrast, but in the deep metrical sense as indicating the value of each of these component parts of the ode, as a counter-wave balancing and explaining the other waves in the harmony of the entire composition. We touch upon this matter in order to show that the moment odes ceased to be chanted, the words strophe, antistrophe, and epode lost the musical value they had among the Greeks, and pretended to a complex metrical value which their actual metrical struc- ture does not appear to justify. It does not follow from this that odes should not be so arranged, but it does follow that the poet’s arrangement should justify itself by dis- closing an entire metrical scheme in place of the musical scheme to which the Greek choral lyric was evidently sub- ordinated. But even if the poet were a sufficiently skilled metricist to compass a scheme embracing a wave, an answering wave, and

an echo gathering up the tones of each, 2.e., the strophe, the antistrophe, and the epode, the ear of the reader, unaided by the musical emphasis which supported the rhythms of the old choral lyric, is, it should seem, incapable of gathering up and remembering the sounds further than the strophe and the antistrophe, after which it demands not an epode but a return to the strophe. That is to say, an epode, as alternating in the body of the modern ode, is a mistake; a single epode at the end of a group of strophes and antistrophes (as in some of the Greek odes) has, of course, a different function altogether.

The great difficulty of the English ode is that of pre- venting the apparent spontaneity of the impulse from being marred by the apparent artifice of the form; for, assuredly, no writer subsequent to Coleridge and to Keats would dream of writing an ode on the cold Horatian principles

Ts it

suited to modern — poetry ?

The simple ode of regular stanzas.

The French ode,

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adopted by Warton, and even by Collins, in his beautiful “Ode to Evening.” –

Of the second kind of regular odes, those consisting of a regular succession of regular stanzas, the so-called odes of Sappho are, of course, so transcendent that no other amatory lyrics can be compared with them. Never before these songs were sung and never since did the human soul, in the grip of a fiery passion, utter a cry like hers ; and, from the executive point of view, in directness, 1n lucidity, in that high imperious verbal economy which only Nature herself can teach the artist, she has no equal, and none worthy to take the place of second—not even in Heine, not even in Burns. Turning, however, to modern poetry, there are some magnificent examples of this simple form of ode in English poetry—Spenser’s immortal

‘ Epithal- amion” leading the way in point of time, and probably also in point of excellence.

Fervour being absolutely essential, we think, to a great English ode, fluidity of metrical movement can never be dispensed with. ‘The more billowy the metrical waves the better suited are they to render the emotions expressed by the ode, as the reader will see by referring to Coleridge’s “Ode to France” (the finest ode in the English language, according to Shelley), and giving special atten- tion to the first stanza—to the way in which the first metrical wave, after it had gently fallen at the end of the first quatrain, leaps up again on the double rhymes (which are expressly introduced for this effect), and goes bound- ing on, billow after billow, to the end of the stanza. Not that this fine ode is quite free from the great vice of the English ode, rhetoric. If we except Spenser and, in one instance, Collins, it can hardly be said that any English writer before Shelley and Keats produced odes independent of rhetoric and supported by pure poetry alone. But fervid as are Shelley’s ““Ode to the West Wind,” and Keats’s Odes “To a Nightingale” and “Ona Grecian Urn,” they are entirely free from rhetorical flavour. Notwithstanding that in the “Ode on a Grecian Urn” the first stanza does not match in rhyme arrangement with the others, while the second stanza of the “Ode to a Nightingale” varies from the rest by running on four rhyme-sounds instead of five, vexing the ear at first by disappointed expectation, these two odes are, after Coleridge’s “ France,” the finest regular odes perhaps in the English language.

With regard to the French ode, Malherbe was the first writer who brought it to perfection. Malherbe showed also more variety of mood than it is the fashion just now to credit him with. This may be especially noted in his ‘Ode to Louis XIII.” His disciple Racan is not of much account. There is certainly much vigour in the odes of Rousseau, but it is not till we reach Victor Hugo that we realize what French poetry can achieve in this line; and contemporary poetry can hardly be examined here. We may say, however, that some of Hugo’s odes are truly magnificent. Asa pure lyrist his place among the greatest poets of the world is very high. Here, though writing in an inferior language, he ranks with the greatest masters of Greece, of England, andof Germany. Had he attempted no other kind of poetry than lyrical, his would still have been the first name in French poetry. Whatever

is defective in his work arises, as in the case of Euripides, from the importation of lyrical force where dramatic force is mainly needed.

As most of the other varieties of lyrical poetry, such as the idyl, the satire, the ballad, the sonnet, &c., have been or will be treated under different heads, or under the names of the various masters of poetic art, it would be superfluous to discuss them here.

A word or two, however, must be said about the song aud the elegy. To write a good song requires that simpli-

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city of grammatical structure which is foreign to many natures—that mastery over direct and simple speech which only true passion and feeling can give, and which “coming from the heart goes to the heart.” Without going so far as to say that no man is a poet who cannot write a good song, it may certainly be said that no man can write a good song who is not a good poet. |

In modern times we have, of course, nothing in any The way representing those choral dance-songs of the Greeks, Italian — which, originating in the primitive Cretan war-dances, inpeaat became, in Pindar’s time, a splendid blending of song ae | and ballet. Nor have we anything exactly representing poetry, 1 the Greek scolia, those short drinking songs of which Ter- pander is said to have been the inventor. That these scolia were written, not only by poets like Alczeus, Anacreon, Praxilla, Simonides, but also by Sappho and by Pindar, shows in what high esteem they were held by the Greeks. These songs seem to have been as brief as the stornelli of the Italian peasant. They were accompanied by the lyre, which was handed from singer to singer as the time for each scolion came round.

With regard to the stornello, many critics seem to con- found it with the rispetto, a very different kind of song. The Italian rispetio consists of a stanza of inter-rhyming lines ranging from six to ten in number, but often not exceeding eight. The Tuscan and Umbrian stornello is much shorter, consisting, indeed, of a hemistich naming some natural object which suggests the motive of the little poem.

The nearest approach to the Italian stornello appears to be, not the rispetto, but the Welsh triban.

Perhaps the mere difficulty of rhyming in English and the facility of rhyming in Italian must be taken into account when we inquire why there is nothing in Scot- land—of course there could be nothing in England—answering to the nature-poetry of the Italian peasant. Most of the Italian rispetti and stornelli seem to be impro- visations ; and to improvise in English is as difficult as to improvise is easy in Italian. Nothing indeed is more interesting than the improvisatorial poetry of the Italian peasants, such as the canzone. If the peasantry discover who is the composer of a canzone, they will not sing it. The speciality of Italian peasant poetry is that the symbol which is mostly erotic is of the purest and most tender kind. A peasant girl will improvise a song as impassioned as “Come into the Garden, Maud,” and as free from un- wholesome taint. :

With regard to English songs, the critic cannot but English ask—Wherein lies the lost ring and charm of the Eliza- 86 bethan song-writers? Since the Jacobean period at least, few have succeeded in the art of writing real songs as distinguished from mere book lyrics. Between songs to be sung and songs to be read there is in our time a differ- ence as wide as that which exists between plays for the closet and plays for the boards.

Heartiness and melody—the two requisites of a song which can never be dispensed with—can rarely be com- passed, it seems, by one and the same individual. In both these qualities the Elizabethan poets stand pre- eminent, though even with them the melody is not so singable as it might be made. Since their time heartiness has, perhaps, been a Scottish rather than an English endow- ment of the song-writer. It is difficult to imagine an Englishman writing a song like “Tullochgorum ” or a song like “Maggie Lauder,” where the heartiness and impulse of the poet’s mood conquer all impediments of close vowels and rugged consonantal combinations. Of Scottish song: writers Burns is, of course, the head ; for the songs of John Skinner, the heartiest song-writer that has appeared in Great Britain (not excluding Herrick), are too few im

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number to entitle him to be placed beside a poet so prolific | “writers as Tyrtzous, Theognis, Catullus, Tibullus, and our in heartiness and melody as Burns. With regard to| own Gray. It may almost be said that perfection of forin Campbell’s heartiness, this is quite a different quality from | is more necessary here and in the sonnet than in the song,

the heartiness of Burns and Skinner, and is in quality English rather than Scottish, though, no doubt, it is of a fine and rare strain, especially in ‘The Battle of the

inasmuch as the artistic pretensions are more pronounced. Hence even such apparent minutize as those we have hinted at above must not be neglected here.

Baltic.” His songs illustrate an infirmity which even the Scottish song-writers share with the English—a defective sense of that true song-warble which we get in the stornelli and rispetti of the Italian peasants. A poet may have heartiness in plenty, but if he has that love of conso- nantal effects which Donne displays he will never write a first-rate song. Here, indeed, is the crowning difficulty

We have quoted Dionysius of Halicarnassus in relation Perfection to the arrangement of words in poetry. His remarks on of detail sibilants are equally deserving of attention. He goes so ea ae far as to say that o is entirely disagreeable, and, when it a often recurs, insupportable. more appropriate to the beast than to man.

The hiss seems to him to be sential Hence certain forms of writers, he says, often avoid it, and employ it with regret, PoCttY-

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elegy,

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of song-writing. An extreme simplicity of structure and of diction must be accompanied by an instinctive appre- hension of the melodic capabilities of verbal sounds, and of what Samuel Lover, the Irish song-writer, called “ sing- ing” words, which is rare in this country, and seems to belong to the Celtic rather than to the Saxon ear. “The song-writer,” says Lover, “must frame his song of open vowels with as few guttural or hissing sounds as possible, and he must be content sometimes to sacrifice grandeur and vigour to the necessity of selecting singing words and not reading words.” And he exemplifies the distinction between singing words and reading words by a line from one of Shelley’s songs—

“¢The fresh earth in new leaves drest,’

“where nearly every word shuts up the mouth instead of opening it.” But closeness of vowel sounds is by no means the only thing to be avoided in song-writing. A phrase may be absolutely unsingable, though the vowels be open cnough, if it is loaded with consonants. The truth is that in song-writing it is quite as important, in a consonantal language like ours, to attend to the consonants as to the vowels; and perhaps the first thing to avoid in writing English songs is the frequent recurrence of the sibilant. But this applies to all the brief and quintessential forms of poetry, such as the sonnet, the elegy, dc.

As to the elegy—a form of poetic art which has more relation to the objects of the external world than the song, but less relation to these than the stornello—its scope Seems to be wide indeed, as practised by such various

POGGENDORFF, Joann Curistian (1796-1877), physicist, and editor for more than half a century of the well-known scientific journal called after him Poggendorf’’s Annalen, was born in Hamburg on the 29th December 1796, His father, a wealthy manufacturer of that town, was all but ruined by the French siege. His son Christian, after receiving his education at Hamburg and Schiffbeck, had therefore, when only sixteen, to apprentice himself to an apothecary in Hamburg, and when twenty-two began to earn his living as an apothecary’s assistant at Itzehoe. Ambition and a strong inclination towards a scientific career led him to throw up his business and remove to Berlin, where he entered the university in 1820. Here his abilities were speedily recognized, and in 1823 he was appointed meteorological

observer to the Academy of Sciences with a small salary, which was important to him, mmasmuch as the expenses of his university career had nearly exhausted his slender patrimony. Even at this early period he had conceived the idea of founding a physical and chemical scientific journal. The realization of this plan was hastened by the sudden death of Gilbert, the editor of Gilbert's Annalen der Physik, in 1824. Poggendorff immediately put himself in communication

Some, he tells us, have composed entire odes without it. But if sibilation is a defect in Greek odes, where the softening effect of the vowel sounds is so poteut, it is much more so in English poetry, where the consonants dominate, though it will be only specially noticeable in the brief and quintessential forms such as the song, the sonnet, the elegy. Many poets only attend to their sibilants when these clog the rhythm. To write even the briefest song without a sibilant would be a tour de force; to write a good one would no doubt be next to impossible. It is singular that the only metricist who ever attempted it was John Thelwall, the famous "Citizen John," friend of Lamb and Coleridge, and editor of the famous Champion news- paper where many of Lamb's epigrams appeared. Thelwall gave much attention to metrical questions, and tried his hand at various metres. Though "Citizen John's" sap- phics might certainly have been better, he had a very remarkable critical insight into the rationale of metrical effects, and his "Song without a Sibilant" is extremely neat and ingenious. Of course, however, it would be mere pedantry to exaggerate this objection to sibilants even in these brief forms of poetry.

As a fine art English poetry is receiving much attention in our time. Defective rhymes once allowable, and make- shift work in general, are no longer tolerated. And we believe the time is not far distant when even such a sub- ject as vowel composition (the arrangement of one vowel sound with regard to another) will have to be studied with the care which the Greeks evidently bestowed upon it. (T. Ww.)

he was installed as editor of a scientific journal which was to be a continuation of Gilbert's Annalen on a somewhat extended plan, indicated by its title Annalen der Physik und Chemie. Poggendorff was admirably qualified for the post which he thus attained. He had an extraordinary

memory, well-stored with scientific knowledge, both modern and historical, which served him in good stead in the critical part of his editorial duty. He had a cool and impartial judgment, with a strong preference for facts as against theory of the speculative kind at least, and was able to throw himself into the spirit of modern experi- mental science, represented in the early part of his edi- torial career by such great names as Berzelius, Faraday, Brewster, Fresnel, Regnault. He also possessed in more than German measure the German virtue of orderliness in the arrangement of knowledge and in the conduct of busi- ness. To this he added an engaging geniality of manner and much tact in dealing with men; so marked in fact

|was this part of his character that, notwithstanding his | somewhat trying position, he never during his long life

was involved in anything that could be fairly called a literary quarrel. These qualities of its editor soon made Poggendorf's Annalen the foremost scientific journal in

with the publisher, Barth of Leipsic, with the result that | Europe. He collected around him all the eminent scien-

tific men of his own country, and he managed, either through original contributions or by translations of memoirs of approved value already printed,. to secure for many years an adequate representation of the scientific work of other lands. So true is this that, for years after the beginning of Poggendorff's editorship, the tables of con- tents of his annual volumes read like an index of the history of physical science.

In the course of his fifty-two years' editorship of the Annalen Poggendorff could not fail to acquire an unusual acquaintance with the labours of modern men of science. This knowledge, joined to what he had gathered by historical reading of equally unusual extent, he carefully digested and gave to the world in his Biographisch- literarisches Handbuch zur Geschichte der

Exacten Wissen- schaften, containing notices of the lives and labours of mathematicians, astronomers, physicists, chemists, minera-

logists, geologists, &c., of all peoples and all ages. ‘Thes two volumes of this work contain an astounding collection |

of facts invaluable to the scientific biographer and _his- torian; they form in fact the basis of the yet unwritten history of physical science. of such a history in the form of lectures delivered by Poggendorff himself at Berlin ; and probably he had con- templated at one time writing a continuous narrative ; but

even his long life was too short for the double task of |

collecting and using the material.

Poggendorff was a physicist of high although not of the very highest rank. He was wanting in mathematical ability, and never displayed in any remarkable degree the still more important power of scientific generalization, which, whether accompanied by mathematical skill or not, never fails to mark the highest genius in physical science. He was, however, an able amd conscientious experimenter. He was very fertile and ingenious in devising physical apparatus, and contributed greatly in the earlier part of his life to enrich the resources of experimental science. Contemporaneously with Schweigger, he succeeded in greatly increasing the sensitiveness of the galvanometer by introducing the multiplying coil, and he made important improvements on that particular type of this instru- ment which is usually called the sine galvanometer. To him (according to Wiedemann) we owe the use of binding screws in most of their various forms. He invented the “Inversor” for rapidly alternating the direction of a voltaic current, and the “ Wippe” for throwing a number of voltaic or electrolytic cells suddenly into “ series” or into “ multiple arc”; and to him is due the suggestion of the telescope and mirror method for reading galvanometers and other physical instruments, a device which has proved very valuable in all branches of physical science.

Poggendorff’s contributions to physics were published for the most part in his own journal. They form an important part of the scientific work of the 19th century ; but it would be difficult in a few words to characterize them inasmuch as they do not constitute a single coherent group or even a few

cohcrent groups of connected researches. By far the greater and more important part of his work related to electricity and magnetism. As specimens we may mention his investigations into the working of Holtz's machines, and his variations on their construction ; his researches on the resistance and electro- motive force of electrolytic cells, along with which ought to be noticed his admirable method of comparing electro- motive forces by "compensation"; and finally his researches on magnetism and diamagnetism.

Poggendorfi's literary and scientific reputation speedily brought him h iti :

g onourable recognition. In 1830 he was made royal professor and in 1834 Hon. Ph.D. and extra- ordinary professor in the university of Berlin, and in

We possess a small fragment |

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| Nothing marks the secular attitude of the Italians at an

| to the resuscitation of classical studies amid conflicts of

1839 member of the Berlin Academy of Sciences. He ultimately became a member of many foreign societies, and received more than the usual share of the orders bestowed by Continental nations for scientific merit. Dur- ing his lifetime many offers of ordinary professorships were made to him, but he declined them all, devoting himself to his duties as editor of the Anialen, and to the pursuit of his scientific researches. He died at Berlin on January 24, 1877.

POGGIO (1380-1459). Gian Francesco Poggio Brac- ciolini, eminent in the annals of the revival of learning, was born in 1380 at Terranova, a village in the territory of Florence. He studied Latin under John of Ravenna, and Greek under Manuel Chrysoloras. His distinguished abilities and his dexterity as a copyist of MSS. brought him into early notice with the chief scholars of Florence. Coluccio Salutati and Niccolo de' Niccoli befriended him, and in the year 1402 or 1403 he was received into the service of the Roman curia. His functions were those of a secretary ; and, though he

profited by benefices conferred on him in lieu of salary, he remained a layman to the end of his life. It is noticeable that, while he held his office in the curia through that momentous period of fifty years which witnessed the councils of Constance and of Basel, and the final restoration of the papacy under Nicholas V., his sympathies were never attracted to ecclesiastical affairs.

epoch which decided the future course of both Renaissance and Reformation more strongly than the mundane pro- clivities of this apostolic secretary, heart and soul devoted

popes and antipopes, cardinals and councils, in all of which he bore an official part. Thus, when his duties called him to Constance in 1414, he employed his leisure in exploring the libraries of Swiss and Swabian convents. The treasures he brought to light at Reichenau, Wein- garten, and above all at St Gall, restored many lost master- pieces of Latin literature, and supplied students with the texts of authors whose works had hitherto been accessible only in mutilated copies. In one of his epistles he describes how he recovered Quintilian, part of Valerius Flaccus, and the commentaries of Asconius Pedianus at St Gall. MSS. of Lucretius, Columella, Silius Italicus, Manilius, and Vitruvius were unearthed, copied by his hand, and communicated to the learned. Wherever Poggio went he carried on the same industry of research. At Langres he discovered Cicero's Oration for Cacina, at Monte Cassino a MS. of Frontinus. He also could boast of having recovered Ammianus Marcellinus, Nonius Mar- cellus, Probus, Flavius Caper, and Eutyches. If a codex could not be obtained by fair means, he was ready to use fraud, as when he bribed a monk to abstract a Livy and an Ammianus from the convent library of Hersfeld. Resolute in recognizing erudition as the chief concern of man, he sighed over the folly of popes and princes, who spent their time in wars and ecclesiastical disputes when they might have been more profitably employed in reviving the lost learning of antiquity. This point of view is eminently characteristic of the earlier Italian Renaissance. The men of that nation and of that epoch were bent on creating a new intellectual atmosphere for Europe by means of vital contact with antiquity. Poggio, like a still more eminent humanist of his age, Aineas Sylvius Piccolomini, was a great traveller, and wherever he went he brought, like Aneas Sylvius, enlightened powers of observation

trained in liberal studies to bear upon the manners of the countries he visited. We owe to his pei curious remarks on English and Swiss customs, valuable notes on the remains of antique art in Rome, and @ singularly striking portrait of Jerome of Prague as he

POG—P OI

appeared before the judges who condemned him to the |

stake. It is necessary to dwell at length upon Poggio's

devotion to the task of recovering the classics, and upon |

his disengagement from all but humanistic interests, |

because these were the most marked feature of his character and career. In literature he embraced the whole sphere of contemporary studies, and distinguished – himself as an orator, a writer of rhetorical treatises, a panegyrist of the dead, a violent impugner of the living, a transiator from the Greek, an epistolographer and grave historian, and a facetious compiler of fabliaux in Latin. Of his moral essays it may suffice to notice the disserta-

Misery of Human Lrfe, On the Infelicity of Princes, and On Marriage in Old Age. These compositions belonged to a species which, since Petrarch set the fashion, were very popular among Italian scholars. They have lost their value, except for the few matters of fact em- bedded in a mass of commonplace meditation, and for some occasionally brilliant illustrations. Poggio's History of Florence, written in avowed imitation of Livy's manner, requires separate mention, since it exemplifies by its defects the weakness of that merely stylistic treatment which deprived so much of Bruni's, Carlo Aretino's, and Bembo's work of historical weight. A somewhat different criticism must be passed on the Jacetix, a collection of humorous and indecent tales expressed in such Latinity as Poggio could command. This book is chiefly remarkable

for its unsparing satires on the monastic orders and the >

secular clergy. It is also noticeable as illustrating the Latinizing tendency of an age which gave classic form to the lightest essays of the fancy. Poggio, it may be observed, was a fluent and copious writer in the Latin tongue, but not an elegant scholar. His knowledge of the ancient authors was wide, but his taste was not select, and his erudition was superficial. His translation of Xenophon's Cyropedia into Latin cannot be praised for accuracy. Among contemporaries he passed for one of the most formidable polemical or gladiatorial rhetoricians; and a considerable section of his extant works are invectives. One of these, the Dialogue against Hypocrites, was aimed

another, written at the request of Nicholas V., covered the anti-pope Felix with scurrilous abuse. But his most famous compositions in this kind are the personal invec-

tives which he discharged against Filelfo and Valla. All |

the resources of a copious and unclean Latin vocabulary were employed to degrade the objects of his satire; and every crime of which humanity is capable was ascribed to them without discrimination. In Filelfo and Valla Poggio found his match ; and Italy was amused for years with the spectacle of their indecent combats. To dwell upon such literary infamies would be below the dignity of the historian, were it not that these habits of the early Italian humanists imposed a fashion upon Europe which extended to the later age of Scaliger's contentions with Scioppius and Milton's with Salmasius. The greater part of Poggio's long life was spent in attendance to his duties in the papal curia at Rome and elsewhere. But about the year 1452 he finally retired to Florence, where he was admitted to the burghership, and on the death of Carlo Aretino in 1453 was appointed chancellor and historiographer to the republic. He had already built himself a villa in Valdarno, which he adorned with a collection of antique sculpture, coins, and inscriptions. In 1435 he had married a girl of eighteen named Vaggia, of the famous Buondel- monte blood. His declining days were spent in the dis- charge of his honourable Florentine office and in the com-

in the church of Santa Croce. A statue by Donatello and

; | born at Paris January 3, 1777. tions On Nobility, On Vicissitudes of Fortune, On the |

| of public instruction.

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a picture by Antonio del Pollajuolo remained to com-

_memorate a citizen who chiefly for his services to human-

istic literature deserved the notice of posterity.

Poggio's works were printed at Basel in 1538, "ex exdibus Henrici Petri." Dr Shepherd's Life of Poggio Braceiolini is a good authority on his biography. For his position in the history of the revival, students may consult Voigt's Wiederbelebung des classichen Alterthums, and Symonds's Renaissance in Italy. (J. A. 8.)

POGY, a popular name for the fish Clupea menhaden, almost universally in use in the States of Maine and Massachusetts (see MENHADEN, vol. xvi. p. 10).

POINSOT, Louis (1777-1859), mathematician, was In 1794 he became a scholar at the Polytechnic School, which he left in 1796 to act asa civil engineer. In 1804 he was appointed pro- fessor of mathematics at the Lyceum, in 1809 professor

of applied mathematics and in 1816 examiner at the

Polytechnic School. On the death of Lagrange in 1813, Poinsot was elected to his place in the French Academy ;

_and in 1840 he became a member of the superior council

In 1846 he was made an officer of

_ the legion of honour ; and on the formation of the senate _in 1852 he was chosen a member of that body. He died

at Paris, December 5, 1859. Poinsot's earliest work was

his Llémens de Statique, in which he introduces the idea of

statical couples and investigates their properties. In the Théorie Nouvelle de la Rotation des Corps he treats the motion of a rigid body geometrically, and shows that the most general motion of such a body can be represented at any instant by a rotation about an axis combined with a translation parallel to this axis, and that any motion of a body of which one point is fixed may be produced by the rolling of a cone fixed in the body on a cone fixed in space. The previous treatment of the motion of a rigid

_ body had in every case been purely analytical, and so gave | no aid to the formation of a mental picture of the body's

motion ; and the great value of this work lies in the fact that, as Poinsot himself says in the introduction, it enables us to represent to ourselves the motion of a rigid body as clearly as that of a moving point. Poinsot also con- tributed a number of papers on pure and applied mathe-

"Inatics to Liowville's Journal and to the Journal of the In a spirit of vindictive hatred at the vices of ecclesiastics ; |

Polytechnic School. POINT DE GALLE. See Gatte, vol. x. p. 40. POINTE A PITRE, the principal port of the island of GUADELOUPE (¢.v.). POISONS. An exact definition of the word "poison"

| is by no means easy. There is no legal definition of what

constitutes a poison, and the definitions usually proposed are apt to include either too much or too little. Gene- rally, a poison may be defined to be a substance having an inherent deleterious property, rendering it capable of destroying life by whatever avenue it is taken into the system; or it isa substance which when introduced into the system, or applied externally, injures health or destroys life

_ irrespective of mechanical means or direct thermal changes.

In popular language, a poison is a substance capable of

| destroying life when taken in small quantity; but a sub-

_ branches of MepicaL JURISPRUDENCE (¢.v.).

2 on _ remote. position of his history. He died in 1459, and was buried |

| stance which destroys life by mechanical means as, ¢..,

powdered glass, is not, strictly speaking, a poison.

The subject of toxicology forms one of the most important The medical jurist should be familiar with the nature and actions of poisons, the symptoms which they produce, the circum-

| stances which modify their working, the pathological results of their action, and the methods of combating these.

Action of Poisons.—Poisons may exert a twofold action. This may be either local, or remote, or both local and The local action of a poison is usually one of corrosion, inflammation, or a direct effect upon the sensory or motor nerves. The remote actious of poisons are

usually of a specific character, though some writers group the remote effects of poisons under two heads, and speak of the common and the specific remote effects of a poison. The local action of a poison of the corrosive class is usually so well marked and obvious that the fact of the adminis- tration of a poison of this class is generally unmistakable. The same may be said, in a less degree, of the irritant poisons, especially the mineral irritants; but here the symptoms sometimes so closely simulate those of natural disease as to render the recognition of the administration of poison a matter of difficulty. Hence an accurate acquaint- ance with the remote specific effects of the various poisons is indispensable to the medical jurist. The class of poisons which has been administered or taken will thus be sug- gested to his mind by the observation of the symptoms ; and not unfrequently the specific poison taken will be suspected. It is almost universally admitted that absorp- tion of a poison is necessary for

the production of its specific remote effects, and the old notion that a poison may kill, by its action through the nervous system, without absorption, is abandoned.

— Modifying Circumstances.—The ordinary action of a poison may be greatly modified by the largeness of the dose, by the state of aggregation, admixture, or of chemi- cal combination of the poison, by the part or membrane to which it is applied, and by the condition of the patient. Thus, for example, opium may be a medicine or a poison according to the dose in which it is given; and a dose of the drug which may be beneficial to an adult in certain states of the system may be fatal to a child, or to an adult when suffering from some forms of disease. All barium salts, again, are poisonous, except the quite in- soluble sulphate. The simple cyanides, and many double cyanides, are highly poisonous; but yellow prussiate of potash, which is a double cyanide of iron and potassium, is almost without action upon the system. The part or tissue to which a poison is applied greatly affects the activity of a poison, owing to the varying rapidity with . which absorption takes place through the cutaneous, mucous, and serous surfaces, and by the other tissues of the body. Curare, an arrow poison, may be swallowed in considerable quantity without appreciable result, whilst a minute quantity of the same substance introduced into a wound is speedily fatal. Idiosyncracy has an important bearing in toxicology. Pork, mutton, certain kinds of fish, more especially shell fish so-called, and mushrooms have each produced all the symptoms of violent irritant poisoning, whilst other persons who have partaken of the same food at the same time have experienced no ill effects. Some persons are stated, on good authority, to be capable of taking with impunity such poisons as opium, corrosive sublimate, or arsenic, in enormous doses,—and this irrespective of habit, which is known to have such an influence in modifying the effects of some poisons, notably the narcotics. A tolerance of poisons is sometimes en- gendered by disease, so that a poison may fail to pro- duce its customary effect. Thus, opium is tolerated in large quantities in tetanus, and in delirium tremens; and mercurial compounds may in some febrile affections fail to produce the usual constitutional effects of the metal. On the other hand, diseases which impede the elimination of a poison may intensify its effects.

The evidence that a poison has been administered is based. upon the symptoms produced, on the appearances met with in the body after death, on the analysis of articles of food and drink, of excreta and ejecta, and of the organs of the body after death, and on physiological experiments made with substances extracted from the same articles. These physiological experiments are usually made upon animals, but in some cases, as for instance when aconite

has to be searched for, the physiological experiments must be made also upon the human subject. The evidence obtained from one or more of these sources, as compared with the properties or effects of various known poisons, will enable the medical jurist to form an opinion as to the administration or non-administration of a poison.

The symptoms exhibited by the patient during life rarely fail to afford some clue to the poison taken. Persons may, however, be found dead of whose history nothing can be learned. Here post-mortem appearances, chemical analysis, and, it may be, physiological expert- ments are all-important for the elucidation of the nature of the case.

Poisoning may be acute or chronic. The general condi- tions which should arouse a suspicion of acute poisoning are the sudden onset of serious and increasingly alarming symptoms in a person previously in good health, especially if there be pain in the region of the stomach, or, where there is complete prostration of the vital powers, a cada- veric aspect, and speedy death. In all such cases the aid of the analytical chemist must be called in either to con- firm well-founded or to rebut ill-founded suspicions.

The mode of treatment to be adopted in the case of poisoned persons varies greatly according to the nature of the poison. The first indication, when the poison has been swallowed, is to evacuate the stomach ; and this may usually be done by means of the stomach-pump when the poison is not of the corrosive class; or the stomach may be gently washed out by means of a funnel and flexible siphon-tube. In many cases.emetics are valuable. Anti- dotes and counter-poisons may then be given. ‘The former are such substances as chalk to neutralize the mineral acids and oxalic acid; the latter

have a physiological counter- action, and are such as atropine, which is a counter-poison to morphia. These may usually be administered most effectively by hypodermic injection. The stomach may to a certain degree be protected from the injurious effects of irritants by the administration of mucilaginous drinks; alkaloids may be rendered sparingly soluble by means of astringent substances containing tannin ; and pain may be relieved by means of opium, unless contra-indicated by the nature of the poison. The effects of the convulsant poisons, such as strychnine, may be combated by means of the inhalation of chloroform.

The classification of poisons is a matter of difficulty. Various attempts have been made to classify them scienti- fically, but with no signal success ; and perhaps the best system is that which groups the various poisons according to the more obvious symptoms which they produce. Our knowledge of the more intimate action of poisons is still too imperfect to admit of any useful classification according to the manner in which they specifically affect the vital organs. Poisons may in the manner indicated be classified as (1) Corrosives, (2) Irritants, (3) Neurotics, and (4) Gaseous Poisons. The subject of poisonous food has already been treated under the heading Meprcau JuRIS- PRUDENCE (vol. xv. pp. 781-2).

1. Corrosives.

The typical member of this class is corrosive sublimate, the soluble chloride of mercury. In it are included also the concentrated mineral acids (sulphuric, nitric, and hydrochloric) ; oxalic acid ; the alkalies (potash, soda, and ammonia) and their carbonates; acid, alkaline, and cor rosive salts of the metals (such as bisulphate of potash, alum, butter of antimony, and nitrate of silver); also carbolic acid.

The symptoms produced by the mineral acids and the alkalies are almost altogether referrible to local action; but some corrosive poisons, such as carbolic acid, produce,

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besides a local action, remote and specific constitutional effects. The symptoms of corrosive poisoning are marked and unmistakable, except in

infants. Immediately on swallowing the corrosive substance, an acid, caustic, or metallic burning sensation is experienced in the mouth, fauces, gullet, and region of the stomach, and this speedily extends over the whole belly ; asa rule vomiting speedily follows. In the case of the mineral acids, and in oxalic acid poisoning, the vomit is so acid that if it falls upon a marble or concrete floor effervescence ensues. No relief follows the evacuation of thestomach. The ejected matters contain blood, and even fragments of the corroded walls of the alimentary canal. The belly becomes distended with gas, and horribly tender. High fever prevails. The mouth is found to be corroded. Death usually ensues within a few hours ; or, if the patient survives, he or she may perish miserably, months after the poison was taken, through starvation consequent upon the gradual contraction of the gullet, brought about by its corrosion and subsequent healing.

The treatment of corrosive poisoning consists in very gently emptying and washing out the stomach by means of a soft siphon-tube. The stomach-pump cannot be used with safety in consequence of the weakening of the walls of the stomach by corrosion. Demulcents and opiates may be subsequently administered. After death from corrosive poisoning the walls of the stomach are found corroded, and even perforated.

1. Corrosive Sublimate.—Here all the signs and symptoms of corrosive poisoning are produced in their severest form. A grain or two of this poison may prove fatal. Fortunately there is an efficient antidote in whitc of egg, the albumen of which, if administered at once, renders the salt insoluble. The eggs should be divested of their yolks, beaten up with water, and given promptly, repeatedly, and abundantly, followed by emetics. Poisoning by corrosive sublimate may be followed by the specific toxic effects of mercury, such as salivation and tremor.

Workers in mercury, such as water-gilders, looking-glass makers, and the makers of barometers and thermometers, are apt to suffer from a peenliar form of shaking palsy, known as ‘‘the trembles,” or mercurial tremor. This disease affects most frequently those who are exposed to mercurial fumes. The victim is affected with tremors when an endeavour is made to exert the muscles, so that he is unable, for instance, to convey a glass of water to the lips steadily, and when he walks he breaks into a dancing trot. The

treatment consists in removal from the mercurial atmosphere, baths, fresh air, and the administration of iron and other tonics.

2. Mineral Acids.—These are oil of vitriol or sulphuric acid, aqua fortis or nitric acid, and spirit of salt or hydrochloric (muri- atic) acid. These when taken in a concentrated form produce well- marked symptoms of corrosion. When they are diluted, the symp- toms are those of an irritant poison. Nitric acid stains the mouth and skin of a yellowcolour. The treatment consists in the admin- istration of alkalies or their carbonates, chalk, whiting, or even uncoloured plaster scraped off the walls or ceiling, with the view of neutralizing the acid.

3. Oxalic acid is a vegetable acid. When taken in the state of concentrated solution it acts as a corrosive, but when diluted as an uritant. But it also exerts a specific effect, killing the patient by cardiac syncope not unfrequently within a few minutes. When a person after taking a crystalline substance, tasting strongly acid, dies within 15 or 30 minutes, after the manifestation of great weak- ness, small pulse, and failure of the heart's power, poisoning by oxalic acid is almost certain. The treatment consists in promptly administering an emctic, followed by chalk, whiting, or any sub- stance containing carbonate of calcium. The alkaline carbonates are valucless, for the alkaline oxalates are almost as poisonous as oxalic acid itself.

4. The Alkalies.—Potash, soda, and their carbonates and sul- phides produce symptoms resembling those of the mincral acids, execpt that purging is a usnal accompaniment.

5. Carbolic acid when taken in the form of a concentrated liquid acts as a corrosive, causing whitening and shrinking of all the animal membranes with which it comes in contact. Thc patient, however, becomes speedily comatose, the poison acting profoundly upon the great nervous centres. A curious phenomenon—black or dark green urine—is commonly observed after the administration of this poison. Saccharated lime-water, diluted and drunk freely,

and a solution of sulphate of soda are perhaps the most useful remedics,

2. Irritant Poisons.

Irritant poisons are of two classes—metallic irritants, and vegetable and animal irritants, these latter being for convenience grouped together. Perhaps none of the irritants act purely as such, the irritant symptoms being usually accompanied by well-marked effects upon the nervous system. An irritant is a substance which causes inflammation of the part to which it is applied,—usually the alimentary canal. Arsenic is by far the most im- portant of the metallic irritants. Other irritants are the inoderately diluted acids, many metallic salts, such as those of antimony, lead, copper, zinc, and chromium. Elaterium, gamboge, aloes, colocynth, and croton oil are good examples of vegetable irritants; and cantharides of animal irritants. Animal and vegetable food when decom- posed, or infested with certain organisms known as bacteria, may produce violent irritant symptoms. The symptoms produced by irritant poisons are usually more slow in their development than where a corrosive has been administered. Usually, after an interval, greater or less according to tlie specific nature of the irritant swallowed, a burning pain is felt in the mouth, throat, and gullet, with a sense of con- striction of the parts, and followed by burning pain in the region of the stomach. This is increased, and not allevi- ated, by pressure, a mark which serves to distinguish the attack from one of ordinary colic. Nausea, vomiting, and thirst ensue, speedily followed by distension of the whole. abdomen, which is exceedingly tender to the touch. Ordinarily the vomiting is followed by profuse diarrhcea.

Should the poison not be speedily eliminated in the

vomited and feecal matters, inflammatory fever sets in, followed by collapse; and death may ensue in a few hours.

There is danger of confounding irritant poisoning with some forms of natural disease, such as gastritis and gastric ulcer, colic, peritonitis, cholera, and rupture of the intes- tines,

1. Arsenicisaspecificirritant poison. Almostall the compounds of this metal are poisonous. The term ‘“‘arsenic’”’ is, however, most commonly applied, not to the metal itself, but to its lower oxide, arsenious oxide, which is also known as white arsenic. By whatever channel arscnic is introduced into the

system, it invari- ably affects specifically the stomach and intestines, cansing conges- tion or inflammation. The.common sources of arsenical poisoning are the taking of white arsenic, which causes acute poisoning, and the inhalation of dust from arsenical wall-papers and textile fabrics, whereby a chronic form of poisoning is induced.

The symptoms of acute arsenical poisoning do not come on, as in the case of corrosive poisoning, immediately after the poison is swallowed. There is usually an interval of half an honr or so before prominent symptoms supervene. Generally, after a feeling of faint- ness and depression, an intense burning pain is felt in the region of the stomach, with tenderness on pressure. Nausea and vomit- ing generally follow, increased by every act of swallowing. Unlike what occurs in ordinary vomiting, the pain and sickness are not relieved by the evacuation of the stomach. Vomiting is followed by purging, blood being frequently distinguishable in the evacua- tions. There is thirst, a feeble irregular pulse, and a perspiring clammy skin. The victim usually succumbs within cighteen to seventy-two hours ; if he survives the latter period, good hopes may be entertained of his recovery. The treatment consists in the use of the stomach-pump, emetics, such as mustard and warm water, demulcents, and the free administration of magnesia emulsion and either freshly precipitated ferric hydrate or dialysed iron. Ferric hydrate, and the solution known as dialysed iron, have the property of rendering arscnious anhydride insoluble. ;

Chronic arsenical poisoning is usually accidental. The inhala- tion of arscnical vapours in factories, or of arsenical dust from green wall-papers and in the manufacture of artificial flowers, are common sources of this form of poisoning. Arsenic when thus slowly absorbed into the system produces congestion and inflammation of the mucous membranes, redness and irritation of the conjunctive, sore throat, a peculiar eruption of the skin, and diarrhea. The treatment consists in removal from the poisoned atmosphere, and the administration of tonics.

Arsenic-eating, or the ability of some persons to take relatively large doses of arsenic habitually, is a well-established fact. The

cause of this singular immunity from the ordinary results of arsenic is quite unknown. ;

2. Lead.—The salts of lead, more especially the acetate (sugar of lead), are irritant poisons of no very great activity ; and, though ovcasionally death ensues, recovery is the rule. Chrome yellow, or lead chromate, is a powerful irritant poison. All chromates are, indeed, irritant poisons. ;

Chronic lead poisoning is a much more common affection than acute irritant poisoning by lead. When lead. in any form is slowly absorbed into the system, a peculiar affection results, known as satur- nine poisoning, and characterized by two prominent symptoms— colic and paralysis. Workers in lead and its compounds, such as plumbers and painters, are frequently affected by this form of disease. Water, especially soft water or such as is contaminated with sewage, on being passed throngh leaden pipes or stored in leaden cisterns may become contaminated with lead to a dangerous extent. Acid liquids, such as cider, vinegar, &c., may also contain lead as an impurity. Potmen, who drink beer which has rested for some time in pewter vessels, are also the occasional victims of saturnine poisoning. Water which contains lcad in asoluble form to the extent of more than one-tenth of a grain per gallon should not be used for drinking purposes. If more than this quantity be present, the water when placed in a white porcelain dish will become more or less dark in colour on the addition of a few drops of a solution of sulphuretted hydrogen.

The commonest manifestation of chronic lead poisoning is lead colic,—a peculiar twisting and agonizing sensation around the navel, attended with obstinate constipation. This, like all forms of chronic lead poisoning, is almost invariably attended with a peculiar blue line on the margin of the gums, and when this is present the nature of the affection can scarcely be doubtful. The treatment consists in the free usc of purgatives, opiates, and the internal use of potassium iodide, which favours the elimination of the metal through the urine. ‘‘Wrist-drop” or lead paralysis is also a common result of the ingestion of lead. It consists in a paralysis of the extensor muscles of the forearm, accompanied by a wasting of that structure. A dropping of the wrist is the result of this degeneration. Baths, the use of galvanism, and the administration of potassium iodide and tonics usually

afford relief. Should, how- ever, the patient in any form of lead poisoning be exposed for a lengthened period to the effects of the metal, degenerations of the liver, kidneys, and brain supervene, with fatal results.

In all cases of lead poisoning removal of the exciting cause is indispensable ; the worker in Icad must suspend his occupation for a time; the use of contaminated articles of food or drink must cease. ;

3. Copper.—The soluble salts of copper, such as blue vitriol (the sulphate) and verdigris (subcarbonate and subacetate), are emetic and irritant salts. Their emetic effects usually, but not invariably, secure their prompt rejection by the stomach. Occasionally fatal effects have resulted from their administration. Copper becomes accidentally mixed with articles of dietary in a variety of modes. It is also used for improving the colour of preserved fruits and vegetables. Its deleterious properties when thus used in minute quantities have been both asserted and denied. There is, however, a large body of evidence in favour of the at all events occasional poisonous effects of minute quantities of copper.

4, Zinc salts and barium salts, except the quite insoluble barium sulphate, are irritant poisons; and barium compounds act also upon the central nervous system.

5. Chromates, ¢.g., bichromate of potash, are violent irritants. Chrome yellow, or lead chromate, has already been mentioned.

6. Phosphorus.—Of the two chief forms of the clements—the yellow or ordinary and the red or amorphous—the former only is poisonous. Rarely there is met with a chronic form of poison- ing among workers in the material, arising from the inhalation of phosphorus vapours. Its special characteristic is a peculiar necrosis or death of the bony structure of the lower jaw. Acute phosphorus poisoning is more common. Thosphorus is used for tipping matches, and is also the basis of several vermin destroyers. When swallowed, phosphorus produces a variable amount of irri- tation and disturbance of the alimentary canal. There may be a burning sensation felt in the mouth, throat, and stomach, followed by vomiting. The vomited matters, and also the excreta, may be observed to be luminous in the dark. These symptoms usually subside, and for three or four days the person

appears to have recovered his or her usual health. ‘The liver then enlarges, and this and other structures undergo fatty degeneration ; jaundice supervenes; and the patient dies in a few days in a semi-typhoid condition. Rarely there is recovery. Oil of turpentine is thought to be the best remedy. Most of the organs undergo fatty degeneration. . 7. Vegetable Trritants.—These produce drastic purgative effects.

requently the nature of the illness may be ascertained by the dis- covery of portions of the vegetable substance—recognizable by the microscope—in the matters ejected by the patient. ‘

8. Cantharides.—The administration of CANTHARIDES (¢.v.) is

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followed by vomiting, purgiug, strangury, or even entire inability to pass the urine. wing-cases of the fly may often be recognized. There is often great excitement of the scxual proclivities. fly, cantharidin, may be extracted from suspected matters by means of chloroform, and the residue left after the evaporation of this blisters the lip or any tender mucous surface to which it is applied.

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Demulcent remedies, with opiate enemata and injections, afford the best relief by way of treatment.

3. Neurotics.

It is premature, for the present, to attempt a systematic division of this most important class, which embraces poisons so widely different in their actions as opium and strychnine, We at once proceed to details.

1. Prussic or Hydrocyanic Acid.—Hydrocyanic acid is one of the best-known poisons, and a very deadly one. In the pure state it is said to kill with lightning-like rapidity. It ismet with in commerce only in a dilute state. In

Great Britain two kinds of acid are com- monly sold—the pharmacopeeial acid, containing 2 per cent. of anhydrous prussic acid, and Scheele's acid, containing 4 or 5 per cent. Less than a teaspoonful of the 2 per cent. acid has caused death. Given in fatal doses, the symptoms of prussic-acid poisoning set in with great rapidity ; and, in consequence of the readiness with which the poison is absorbed from the stomach and diffused through the circulation,the onset of symptonis is reckoued by seconds rather than by minutes. Occasionally the victim may be able to perform a few voluntary actions before alarming symptoms are developed. There is first a very brief stage of difficult breathing, and slow action of the heart, with a tendency for the organ to stop in the state of dilatation. With widely-dilated pupils of the cye, the patient is then seized with violent irregular convulsive movements. The rhythm of the respiratory movements is disturbed, and the coun- tenance becomes of a bluish cast. The patient now sinks to the ground with complete loss of muscular power; and. the third or asphyxial stage is reached, in which there are slow gasping respira- tions, loss of pulse, and paralysis of motion. Death is frequently pre- ceded by muscular spasms. The fowdroyant character af tine illness, and the speedy death of the patient, coupled with the peculiar odour: of the acid in the breath and atmosphere around the body, seldom leave any doubt as to the nature of the case. The treatment con- sists in inhalation of the fumes of strong ammonia, drinks of warm and cold water alternatcly, friction of the limbs, and artificial respiration. The subcutancous injection of atropine, which acts as a cardiac stimulant, may prove serviceable.

Other soluble cyanides, mare especially cyanide of potassium, a salt largely used in photography and_in the arts, are cqually poisonous with hydrocyanic acid. See Prussic AcrD.

2. Opiwm.—In consequence of the extent to which OrtuM (q.1.), its preparations, and its active alkaloid morphia are used for the relief of pain, poisoning by opium is of frequent occurrence. It is largely used by suicides; and children, being very susceptible to its influ- ence, frequently die from misadventure after administration of anu overdose of the drug. The ordinary preparations of opium are the drug itself, which is the inspissated juice of the Oriental poppy, and the tincture, commonly known as landanum. Opium contaims a variety of more or less active principles, the chief of which is the

alkaloid morphia, which is present in good opium to the extent of about 10 per cent. in combination with meconic acid, which is phy- siologically inactive. Opium is largely used by Eastern nations for smoking, and there is great discrepancy of opinion as to the extent to which opium smoking is deleterious. The preponderance of opinion is in favour of the view that opium smoking is a demoralizing, degrading, and pernicious habit, and that its victims are sufferers both in body and mind from its use.

The first symptom of the administration of a poisonous dose of opium is a state of exaltation—which may not, however, be well- marked—soon passing into a second stage, in which the symp- toms are those of congestion of the brain. The countenance Is suffused and of a bluish cast, known as cyanosis, due to imperfect aeration of the blood; the pupils of the eyes are minutely con- traeted, the skin dry and warm, and the breathing slow, laboured, and becoming stertorous. The patient is apparently unconscious, but may be roused by shaking, or by shouting into the ear. When this has taken place, the breathing becomes more natural, and the skin less cyanosed. If he be left alone there is a specdy relapse into a state of insensibility. If effective treatment be not adopted, a third stage of prostration supervencs, in which there is profound coma, and it may be impossible to aronse the patient. The pupils of the eyes are now contracted to the size of pin-points. Breathimg is slow, shallow, and intermittent. The countenance is at once pallid and cyanosed, the skin bathed in perspiration. The pulse becomes more rapid with increased feebleness, and at length all signs of it are lost, until death supervenes.

The treatment consists in the use of the stomach-pump. Emeties

are nsually inoperative. After this the patient must be kept awake by walking him about, applying cold and warm douches alternately to the chest, shouting into the cars, flicking the hands and feet with damp towels, and the application of the galvanic current. Circulation should be promoted by friction of the limbs and trunk. Strong infusion of coffee, ammonia, and alcoholic stimulants may be freely administered. As a last resort when the

breathing inter- mits, artificial respiration may be performed. The hypodermic injection of full doses of atropine has proved of marked benefit,— atropine and morphia being to a certain extent counter-poisons.

Opium is a drug to which its victims may become habituated by the use of gradually increasing doses; and the practice of opium- cating, as it is termed, is a pernicious one. An atrophied condition of the body usually results. The only remedy is abstinence from the drug.

3. Strychnine and Strychnine-yielding Plants.—The alkaloids strychnine and brucine, as well as all the plants in which they arc found, all act in the same manner, being highly poisonous, and causing death after spasms of a severe character. Strychnine was first extracted from the secds of Strychnos Nua-Vomica in 1819, by Pelletier and Caventou. It exists in larger quantity in other species of the genus Strychnos, and notably in Strychnos Jgnatii. From the bark of Strychnos Nux-Vomica, known as false Angostura bark, another alkaloid, brweine, is also extracted. This bark was at onc time wrongly supposed to be the bark of Brucea anti- dysenterica ; hence the name brucia or brucine. Its effects are similar to those of strychnine, but its physiological activity is uot so great. Many vermin-killers contain strychnine as their active ingredient.

Strychnine, and all] substances containing that alkaloid, produce their effects within a very few minutes—usually within ten or fifteen minutes. ‘The patient complains of stiffuess about the neck, and his aspect exhibits terror. There is an impression of impending calamity or death. Very speedily the head is jerked back, the limbs ex- tended, the back arched (opisthotonos), so that the body may rest on the head and heels only. The mouth is drawn; and the condition

is one known as tetanus. Ina few moments these symptoms pass off, and there is complete relaxation of the spasm. The spasmodic condition speedily returns, and is brought about by the slightest touch or moveinent of the patient. Acccssions and remissions of the tetanic state ensue rapidly till the patient succumbs, usually within half an hour of the administration of the poison. The best treatment is to put, and keep, the patient under the influence of chloroform till time is given for the excretion of the alkaloid, having pre- viously given a full dose of chloral hydrate.

4, Aconite Poisoning.—The ordinary blue rocket, wolfsbane, or monkshood, Aconitum Napellus, and an alkaloid extracted from rh, aconitine, are perhaps the most deadly of known poisons. One- sixteenth of a grain of aconitine has proved fatal toa man. All the preparations of aconite produce a peculiar burning, tingling, and numbness of the parts to which they are applied. When given in large doses they produce violent vomiting, as a rule, more or less paralysis of motion and sensation, and great depression of the heart, usually ending in death from syncope. Intelligence remains unaffected till almost the last. The treatment consists in the hypodermic injection of tincture of foxglove (Digitalis) or its active principle digitalin, which is a counter-poison in its action upon the heart. The root of aconite has been eaten in mistake for that of horse-radish.

5, Belladonna.—The belladonna or deadly nightshade, Atropa Belladonna, contains an alkaloid, atropine, which is largely used by oculists to procure dilatation of the pupils of the eye. The bright scarlet berries of the plant have been eaten by children, who are attracted by their tempting appearance. elladonna produces dilatation of the pupils, rapid pulse, hot dry flushed skin, with an eruption not unlike that of scarlatina, soreness of the throat, with difficulty of swallowing, intense thirst, and gay mirthful delirium. The treatment consists in cvacuation of the poison by means of the

stomach-pump, and the hypodermic injection of morphia as a counter-poison.

4. Gaseous Poisons.

_ The effects of these are varied,—some of them acting as uritants, while others have a specific effect, apparently in consequence of their forming chemical compounds with the | red pigment of the blood, and thus destroying its capa- | bility of acting as a carrier of oxygen.

1. Chlorine and bromine act as powerful irritants. They provoke oon of the glottis when inhaled, and subsequently induce in- |

f ammation of the respiratory mucous membrane, which may prove pily fatal. Inhalation of diluted ammonia vapour is the best remecy,

2. Hydrochloric or muriatic acid gas and hydrofluoric or fluoric acid gas are irritating and destructive to life. The former is more | destructive to vegetable life than even chlorine. They are emitted |

in many processes of manufacture, and especially in the manufac- ture of carbonate of soda from common salt by Le Blane's process, in the salt-glazing of earthenware, and in the manufacture of arti- ficial manures.

3. Sulphurous Acid Gas.—The gas given off by burning sulphur is most suffocating and irritating. Its inhalation, even in a highly oe state, may cause speedy death from spasmodic closure of tlic glottis.

4. Nitrous vapours,.or gaseous oxides of nitrogen (except nitrous oxide), are given off from galvanic batteries excited by nitric acid ; also in the process of etching on copper. They produce, when diluted, little immediate irritation, but are exceedingly dangerous, setting up extensive and fatal inflammation of the lungs.

' a Ammonia gas is highly irritant, but does not often prove atal.

6. Carbonic acid gas is heavier than atmospheric air, is totally irrespirable when pure, and is fatal when present in large quantities in respired air. It is given off from burning fuel, accumulates in pits and wells as choke-damp, and constitutes the deadly after- damp of coal-mines. It is also formed during alcoholic fermen- tation, and hence accumulates in partially filled vats in which fer- mented liquors are stored. When it is breathed in a concentrated state, death isalmost instantaneous. Persons descending into wells foul with this gas sink down powerless, and are usually dead before they can be removed from the vitiated atmosphere. In these cases there is true asphyxia ; but carbonic acid is also a narcotic gas. Persons exposed to an atmosphere partially composed of this gas, but not long enough to produce fatal results, are affected with ster- torous breathings, oppression, flushed face, prominent eyes, swollen tongue, and feeble pulse. The proper treatment is removal from the fon] atmosphere, alternate cold and tepid douches to the chest, friction of the limbs and trunk, and artificial

respiration. When animation is restored the patient should be put to bed and kept quiet, but should be carefully watched in case of relapse.

7. Carbonte oxide gas is given off by burning charcoal and other forms of fuel, mixed with carbonic acid. The poisonous effects of charcoal fumes are perhaps due rather to the more poisonous car- bonic oxide than to the less poisonous carbonic acid. An atmo- sphere containing less than 1 per cent. of carbonic oxide would doubtless be fatal if breathed for many minutes. Carbonic oxide forms with hemoglobin, the red pigment of the blood, a bright scarlet compound. The compound is very stable, and the oxide cannot be displaced by atmospheric oxygen. Hencethe blood after death from the inhalation of carbonic oxide is of a bright arterial hue, which it retains on exposure to air.

8. Coal-gas acts as an asphyxiant and narcotic. The appear- ances met with after death—more especially the fluid state of the blood—are similar to those observed after death from carbonic oxide gas, which is a constituent of coal-gas, and to which the chicf effect of coal-gas may be due.

9. Sulphuretted hydrogen gas is highly poisonous by whatever channel it gains access to the body. In a concentrated form it produces almost instant death from asphyxia. Even in a diluted state it produces colic, nausea, vomiting, and drowsiness. This may pass into insensibility with lividity and feeble respiration. The skin is cold and clammy, or bathed in perspiration. ‘The red blood corpuscles are disintegrated. The treatment consists in re- moval from the contaminated atmosphere, friction to the surface of the body, warmth, and the administration of stimulants. The inha- lation of chlorine gas has been recommended on chemical grounds ; but it must be remembered that chlorine is itself poisonous.

10. Anzsthetics.—Nitrous oxide, or laughing gas, and the gases or vapours of other anzesthctie substances, such as chloroform, pro- duce death by asphyxia, and perhaps otherwise. Obviously, as a rule, medical assistance is at hand. The treatment consists in artificial respiration, and the use of galvanic current.

ll. Vapours of Hydrocarbons.—The volatile vapours of the natural hydrocarbons known as benzoline, petroleum, &c., are poisonous when

inhaled for lengthened periods. (is;*)

POISSON, Srmton Denis (1781-1840) a celebrated French mathematician, was born at Pithiviers in the department of Loiret, on the 21st June 1781. His father, Siméon Poisson, served as a common soldier in the Hanoverian wars; but, disgusted by the ill treatment he received from his patrician officers, he deserted. About the time of the birth of his son Siméon Denis he occupied a small administrative post at Pithiviers, and seems to have been at the head of the local government of the place during the revolutionary period. The infant Poisson was put out to nurse, and concerning his nursing Arago relates the following story, which he had from its hero himself. One day the anxious father went to visit his son, but found that the nurse had gone to the fields. Impatient,

he broke into the cottage, and there saw, with painful astonishment, the object of all his hopes suspended by a small cord to a nail fixed in the wall. This was a precau- tion on the part of the peasant nurse to prevent her charge from perishing under the teeth of the carnivorous and unclean animals that circulated in the house. Poisson, 1n telling the story, added—“ A gymnastic effort carried me incessantly from one side of the vertical to the other; and it was thus, in my tenderest infancy, that I made my pre- lude to those studies on the pendulum that were to occupy so much of my maturer age.” ;

Having survived the perils of infancy, and received the elements of his education (reading and writing) from his father, the question arose what calling he was to follow. It was at first suggested that he should be made a notary ; but the family council, with amusing irony, decided that this profession made too great demands upon the intellect, and surgery was preferred. He was sent to an uncle who exercised this art at Fontainebleau, and forthwith began to take lessons in bleeding and blistering, then the leading branches of a surgeon’s practice. To train him in the former, he was set to prick the veins of cabbage leaves with a lancet, but made little progress; how he sped in the latter he himself relates as follows :—“ Once my uncle sent me, with one of my comrades, M. Vanneau, now established in the colonies, to put a blister on the arm of a child; the next day, when I

presented myself to remove the apparatus, I found the child dead; this event, very common they say, made the most profound impression upon me; and I declared at once that I would never be either physician or surgeon. Nothing could shake my reso- lution, and they sent me back to Pithiviers.” Here accident and the bent of nature solved the problem that had passed the wisdom of the family council. The elder Poisson, being a Government official, received a copy of the Journal de Ul’ Hcole Polytechnique; the son read it, and soon began unaided to solve the problems propounded there from time to time ; and thus his mathematical talent was discovered. He was sent to the Ecole Centrale of Fontainebleau, and was fortunate in having a kind and sympathetic teacher, M. Billy, who, when he speedily found that his pupil was becoming his master, devoted himself to the study of higher mathematics in order to follow and appreciate him, and predicted his future fame by the punning quotation from Lafontaine !—

- Petit Poisson deviendra grand Pourvu que Dieu lui préte vie.”

At the age of seventeen the young provincial, less remarkable for the elegance of his attire than for the pro- fundity of his scientific knowledge, came up to Paris to undergo the entrance examination for the Polytechnic School. He passed first in his year, and immediately began to attract the notice of the professors of the school, who, seeing his obvious genius, excused him from the ordinary drudgery of the curriculum, and left him free to fallow the studies of his predilection. The wisdom of this course was soon proved; for, in 1800, less than two years after his entry, he published two memoirs, one on Bezout’s method of elimination, the other on the number of integrals of an equation of finite differences. The latter of these memoirs was examined by Lacroix and Legendre, who recommended that it should be published in the Recueil des Savants Etrangers, an unparalleled honour for a youth of eighteen. This success at once pro- cured for Poisson an entry into the Parisian scientific society of the day, the like of which for brilliancy has never elsewhere been seen. Its two kings both patronized him. Lagrange, whose lectures on the theory of functions

1 This prediction is sometimes attributed to Laplace.

he attended at the Polytechnic School, early recognized his talent, and became his friend; while Laplace, in whose footsteps Poisson followed, regarded him almost as his son. The rest of his career, till his death on the 25th of April 1840, was almost entirely occupied in the composition and publication of his many works, and in discharging the duties of the numerous educational offices to which he was successively appointed. Immediately after finishing his course at the Polytechnic School he was appointed

‘repetiteur there, an office which he had discharged as au

amateur while still a pupil in the school; for it had been — the custom of his comrades often to resort to his room after an unusually difficult lecture to hear him repeat and explain it. He was made professeur suppléant in 1802, and full professor in succession to Fourier in 1806. In 1808 he became astronomer to the Bureau des Longitudes ; and, when the Faculté des Sciences was instituted in 1809, he was appointed Professeur de la Mécanique Rationelle. He further became member of the Institute in 1812, exa- miner at the military school at St Cyr in 1815, leaving examiner at the Polytechnic in 1816, councillor of the university in 1820, and geometer to the Board of Longitude in succession to Laplace in 1827.

In 1817 he married Mademoiselle Nancy de Bardi, daughter of a French family which had emigrated to Eng- land, and by her he had two sons and two daughters.

Poisson was a simple-minded affectionate man. This is seen in the close relations which he kept up with his old teacher M. Billy, who ardently loved and admired his former pupil, and whose presence at the Institute was a well-known sign that Poisson was to read a paper there. Although he never returned to Pithiviers after his entry into the Polytechnic School, he corresponded constantly with his parents, more especially with his mother ; and he regularly sent copies of his memoirs to his father, who read and re-read with unwearied patience the parts of them within his comprehension. His tastes seem to have been of the simplest description ; he took little exercise, and he had more than a Frenchman’s horror of travelling. Arago

-says that he only travelled once, and that by medical

prescription, disguised under the form of some mission connected with the Polytechnic School, and that, after devoting his savings to the purchase of a beautiful farm im the department of Seine-et-Marne, he never so much as visited it.

It is probable that his simplicity of character had much to do with his passing apparently quite undisturbed through the stormy time in which he lived, a period in which many men of mark lost their heads, and few such escaped without loss of office and fortune. His father, whose early experiences led him to hate aristocrats, bred him in the stern creed of the first republic. Throughout the empire Poisson faithfully adhered to the family prin- ciples, and refused to worship Napoleon. Napoleon, how- ever, never interfered with Poisson's promotion. He said once himself that he never did anything uselessly, cer- tainly never committed a-useless crime; and he was wise enough to see that nothing was to be gained by persecut- ing the harmless academician, whose fame he doubtless regarded like that of the other savants of France as all apanage of his own glory. When the Bourbons were restored, his hatred against Napoleon led him to become 4 Legitimist—a conclusion which says more for the simplicity of his character than for the strength or logic of his political creed.

He was faithful to the Bourbons during the Hundred Days, in fact was with difficulty dissuaded from volunteer- ing to fight in their cause. After the second restoration his fidelity was recognized by his elevation to the dignity

| of baron in 1825; but he never either took out his

diploma or used the title. The revolution of July 1830 threatened him with the loss of all his honours; but this disgrace to the Government of Louis Philippe was adroitly averted by Arago, who, while his " revocation " was being plotted by the council of ministers, procured him an invita- tion to dine at the Palais Royale, where he was openly and effusively received by the citizen king, who " remembered " him. After this, of course, his degradation was impossible; he was left in undisturbed possession of all his well-earned appointments ; and seven years later he was made a peer of France, not for political reasons, but as a representative of French science.

As a teacher of mathematics Poisson is said to have been more than ordinarily successful, as might have been expected from his early promise as a repetiteur at the Polytechnic School. As a scientific worker his activity has rarely if ever been equalled. Notwithstanding his many official duties, he found time to publish more than three hundred works, several of them extensive treatises, and many of them memoirs dealing with the most abstruse branches of pure and applied mathematics. There are.two remarks of his, or perhaps two versious of the same remark, that explain how he accomplished so much: one, “ La vie mest bonne qu’ a deux choses—a faire des mathématiques et a les professer ;” the other, “ La vie c’est le travail.”

A list of Poisson’s works, drawn up by himself, is given at the end of Arago’s biography. A lengthened analysis of them would he out of place here, and all that is possible is a brief mention of the more important. There are few branches of mathematics to which he did not contribute something, but it was in the applica- tion of mathematics to physical subjects that his greatest services to science were performed. Perhaps the most original, and certainly the most permanent in their influence, were his memoirs on the theory of electricity and magnetism, which virtually created a new branch of mathematical physics. They have been already repeatedly referred to in the articles ELecTriciry and MAGNETISM (g.v.). Next (perhaps in the opinion of some first) in importance stand the memoirs on celestial mechanics, in which he proved him- self a worthy successor to Laplace. The most important of these are his memoirs ‘‘ Sur les in¢égalités séculaires des moyens mouve- ments des planetes,’’ “Sur la variation des constantes arbitraircs dans les questions de mécanique,” both published in the Jowrnal of the Polytechnic School, 1809; ‘Sur la libration de la lune,” in Connaiss. d. Temps, 1821, &c.; and ‘‘Sur la mouvement de la terre autour de son centre de gravitd,” in Ifém. d. V Acad., 1827, &e. In the first of these memoirs Poisson discusses the famous question of the stability of the planctary orbits, which had already been settled by Lagrange to the first degree of approximation for the disturbing forces. Poisson showed that the result could be extended to a second approximation, and thus made an important advance in the planetary theory. The memoir is remarkable inasmuch as it roused Lagrange, after an interval of inactivity, to compose in his old age one of the greatest of his memoirs, viz., that ‘‘Sur la théorie

des variations des éléments des planétes, et en particulier des variations des grands axes de leurs orbites.” So highly did he think of Poisson’s memoir that he made a copy of it with his own hand, which was found among his papers after his death. Poisson made important contributions to the theory of attraction. His well-known correction of Laplace’s partial differential equation

or the potential was first published in the Bulletin de la Société Philomatique, 1818. His two most important memoirs on the subject are ‘“Sur l’attraction des sphéroides ” (Connaiss. d. Temps, 1829), and ‘Sur V’attraction d’un cllipsoide homogene (A/ém. d. D Acad., 1835). In coneluding our selection from his physical memou’s we may mention his memoir on the theory of waves (Mém. d. [Acad. , 1825).

In pure mathematics, his most important works were his series of memoirs on definite integrals, and his discussion of Fourier’s Series, which paved the way for the classical researches of Dirichlet and Riemann on the same subject; these are to be found in the Journal of the Polytechnic School from 1813 to 1828, and in the Memoirs of the Academy for 1828. In addition we may also mention his essay on the calculus of variations (Afem. d. I’ Acad., 1833), and his memoirs on the probability of the mcan results of observations (Connaiss. d. Temps, 1827, &c.).

esides his many memoirs Poisson pnblished a number of treatises, most of which were intended to form part of a great work a mathematica] physics, which he did not live to complete. ‘ Bone these may be mentioned his Traité de Mécanique, 2 vols. ee 1811 and 1838, which was long a standard work; Théorie

ouvelle del’ Action Capillaire, 4to, 1881; Théorie Mathématique de

la Chaleur, 4to, 1835; Supplément to the same, 40, 1887; Recherches sur la probabilité des jugements en matiercs criminelles, &c. 4to, 1837, all published at Paris.

Enough has been said to establish Poisson's fertility as a writer on mathematical subjects, and the question naturally suggests itself, What is his rank among the mathematicians of allages? Since his own age was more productive of great mathematicians than any other the world has yet seen, it is natural to compare him with his contemporaries, chief among whom were Lagrange and Laplace. In so doing we see at once that, although we cannot seat him alongside of these mighty sovereigns, yet it is impossible to deny him the nearest rank to them in the temple of mathematical fame. In confirmation of this judgment, we cannot do better than quote one of them —"TI am old," said Lagrange to Poisson one day ; "during my long intervals of sleeplessness I divert myself by making numerical approximations. Keep this one; it may interest you. Huygens was thirteen years older than Newton, I am thirteen years older than Laplace ; D'Alembert was thirty-two years older than Laplace, Laplace is thirty-two years older than you." Arago, who gives this story, justly remarks that no more delicate way could be conceived of intimating to Poisson his admission into the inner circle of the fraternity of mathematical

enlus. (G. cH.)

POITIERS, a town of France, formerly the capital of Poitou, and now the chief town of the department of Vienne, lies 206 miles south-west of Paris on the railway to Bordeaux, at the junction of the Boivre with the Clain (a tributary of the Loire by the Vienne), and occupies the slopes and summit of a plateau which rises 130 feet above the level of the streams by which it is surrounded on three sides. The town is picturesque ; and its narrow, ill-paved, irregular, and deserted streets with their ill- built houses are interesting for certain remains of ancient architecture and the memories of great historical events. Blossac park, named after the intendant of the " gene- rality" of Poitiers (1751-1786), and situated on the south side of the town, and the botanic garden on the north-east, are the two principal promenades. Besides being the see of a bishopric, which comprises the depart- ments of Vienne and Deux-Sevres, Poitiers possesses a court of appeal, national faculties of law, literature, and science, a free faculty of Catholic theology, a school of artiliery, and numerous learned societies, of which the most celebrated is that of the " Antiquaires de l'Ouest" dating from 1834. Though not strictly a commercial or industrial town, it is the

centre from which railways branch out to Tours, Angers, Niort, Angouléme, Limoges, and prospectively to Chateauroux and Nantes. Up till 1857 it contained the ruins of a Roman amphitheatre more extensive than that of Nimes; remains of Roman baths, constructed in the Ist and demolished in the 3d century, were laid bare in 1877 ; and in 1879 a pagan burial place and the tombs of a number of Christian martyrs were discovered on the heights to the south-east—the names of some of the Christians being preserved in paintings and inscriptions. Not far from these tombs is a huge dolmen (the 'Pierre Levée"), 22 feet long, 16 feet broad, and 6 or 7 feet high, around which used to be held the great fair of St Luke.

The cathedral of St Peter, begun in 1162 by Eleanor of Guienne on the ruins of a Roman basilica, and well advanced at the time of her death in 1204, is a building after the Plantagenet or Angevin style. Its length is 308 feet, its width 128, and the keystone of the central vaulted roof is 89 feet above the pavement. There is no apse, and the exterior generally has a heavy appearance. The principal front has unfinished side-towers 105 and 110

feet in height, begun in the 13th century. windows of the choir and the transepts preserve their stained glass of the 12th and 13th centuries; the end window, which is certainly the first in the order of time, contains the figures of Henry II. of England and Eleanor. The choir stalls, carved between 1235 and 1257, are the oldest in France. The church of St Jean (originally a baptistery) near the cathedral is the most ancient Christian monument in the country. The church of St Hilaire was erected at the close of the 4th century over the tomb of the celebrated bishop. At first an unpretending oratory, it was rebuilt on a larger scale by Clovis, and afterwards became, in the 10th, 11th, and 12th centuries, a sumptuous collegiate church, of which the nave was flanked by triple aisles and surmounted by six cupolas. Great damage was done to it in the wars of religion and the French Revolu- tion. The confessional or oratory under the choir contains the relics of St Hilary and a Christian sarcophagus of the 4th century. The church of St Radegonde, a great resort of pilgrims, commemorates the consort of Hlothar I. (¢ 550), and preserves in its crypt, not only the tomb of Radegonde, who founded at

Poitiers the abbey of the Holy Cross, but those of St Agnes and St Disciola. The church is in the Angevin style; the choir is of the 11th, and the nave of the 13th century. Notre Dame la Grande, which dates from the close of the 11th century, and re- presents a collegiate church one or two hundred years older, has a richly sculptured Romanesque facade. The first stone of the church of Moutierneuf (Monasteriwn Novum) was laid in 1077 by William, duke of Aquitaine and count of Poitiers, who is buried within its walls ; and the choir (afterwards in the 13th century modified by the erection of a "lantern") was solemnly consecrated by Urban II. in 1096. Mutilated about 1640 and during the Revolution, the building was partly restored between

1850 and 1860. The tower of St Porchaire, a precious

remnant of 1lth-century architecture, has been restored in the present generation under the auspices of the Anti- quaires de Ouest and the French archeological society. Other churches of interest are the Chapel of the Lycée, that of the Sisters of the St Croix, and the old church of the Jesuits.

Among the secular buildings the first place belongs to the law courts, formerly the palace of the dukes of Aquitaine and counts of Poitiers, and rebuilt between the 12th and the 15th century. The Salle des Pas Perdus forms a fine nave 160 feet long by 56 feet wide, with a vaulted wooden roof. The southern wall is the work of Duke Jean de Berri, brother of Charles V.; above its three vast fireplaces are mullioned windows filled with stained glass. The Maubergeon tower attached to the palace represented the feudal centre of all the lordships of the countship of Poitiers. The prévété or provost's mansion, now occupied by a communal school, has a fine facade of the 15th century. In the new hétel de ville, erected between 1869 and 1876, are museums of archeology, natural history, and painting. The museum of the Anti- quaires de POQuest occupies the chapel and the great hall of the old university, now located in the old hétel de ville; It 1s a valuable collection comprising Roman antiquities, Merovingian sculptures, medals, a fine Renaissance fire. place, &e, The building devoted to the faculties of law, science, and literature (of which the first dates from 1431) also contains the library (35,000 printed volumes and 300 MSS.). The municipal records are very rich in charters of Eleanor of Aquitaine, Philip Augustus, Alphonse of Poitiers, &e. Convents and religious educational

estab- lishments are numerous in the town. The population of Poitiers in 1881 was 34,355.

Poitiers, ealled Limonum at the time of the Roman eonquest,

Most of the | then took the name of its Gallic founders the Pictones or Pictavi.

Christianity was introduced in the 3d century, and the first bishop of Poitiers, from 350 to 367, was St Hinarius (g.v.). Fifty years later the eity had fallen into the hands of the Arian Visigoths, and become one of the principal residenees of their kings. Alarie, one of their number, was defeated by Clovis at Vouillé not far from Poitiers in 507. This was the first oeeasion on whieh the peoples of northern and southern Gaul met in eonflict in the neighbour- hood of the town which was destined to see them so frequently join battle. By his victory in 732 over the Mohammedans at Moussais-la-Bataille in this region, Charles Martel proved the saviour of Christendom. Under the Carlovingians, Poitiers was dependent on the erown and afterwards on the duchy of Aquitaine. Eleanor of Guicune, after her divoree from Louis VII., earried it to her new husband Henry Plantagenet. She frequently re- sided in the city, which she embellished and fortified, and in 1199 entrusted with eommunal rights. Philip Augustus, having counfis- cated the Continental territories of John of England, united Poitou to the Freneh crown ; Louis VIII. made it an apanage for his son Alphonse of Poitiers, who afterwards beeame count of Toulouse. At a plenary court held in 1241 in the great hall of the palais de justicc, Alphonse received the homage of his numerous vassals. After his death in 1271 Poitou reverted to the erown. But, King John having been defcated and made prisoner in the disastrous – battle of Poitiers (fought 4 miles E. of the town on the hillside of Nouaille, 19th September 1356), Poitou was reeognized as an English possession by the treaty of Brétigny (1360). Nine years later it was recovered by Duguesclin ; and it beeame in succession the apanage of Jean de Berri, brother of king Charles VI., and of the dauphin, afterwards Charles VII. It was at Poitiers that the latter was proclaimed king (1428); and he removed thither the parlement and university of Paris, which remained in exile till the English with- drew from the eapital in 1436.

During this interval (1429) Joan of Are was subjected to a forma] inquest by the doctors of the uni- versity. Calvin had numerous converts at Poitiers. Of the violent proceedings which attended the wars of religion the city had its share. In 1569 it was defended by Count du Lude against Coligny, who after an unsuccessful bombardment retired from the siege at the end of seven weeks.

POITOU, one of the old provinces of France, which also formed one of the great military governments of the kingdom, was bounded N. by Brittany, Anjou, and Touraine ; 8. by Angoumois and Aunis; E. by Touraine, Berri, and Marche; and W. by the ocean. It was divided into Lower Poitou, which corresponded to the modern department of La Vendée, and Upper Poitou, now split into the departments of Deux-Sevres and Vienne. The principal towns in Upper Poitou were Poitiers the capital, Mirebeau, ChAtellerault, Richelieu, Loudun, Thouars, Mauléon, Parthenay, Niort, &c.; and in Lower Poitou Fontenai-le-Comté, Maillezais, Lugon, and Roche-sur-Yon. fle d'Yeu or fle-Dieu and Noirmoutier belonged to the province. LEcclesiastically Poitou was distributed among the dioceses of Poitiers, Lugon, and La Rochelle; for the administration of justice, it was attached to the parlement of Paris.

Poitou (Poictou, Pictavia) takes its name from the Pictones or Pictavi, a Gallic nation mentioned by Cesar, Strabo, and Ptolemy, and deseribed by Strabo as separated from the Namnetes on the

north by the Loire. It formed part of the territory known as AQUITANIA (g.v.). For the history see PorTiERs.

POKER, a game at cards,—probably a development of a frusso (played in Italy in the 15th century) A similar but less simple game, called primiera, was also played in Italy in the 16th century, whence under the name of primero it travelled to Spain. La prime is mentioned by Rabelais (16th century); and later the game of prime elaborated was played in France under the name of Vambigu or le meslé. Prime was also played in Eng- land in the 16th century; and later a bastard kind of prime, called post and pair, was much played in the west of England. Gleek had some points of resemblance to these games. The more modern game of brag is only post and pair with variations. Poker (originally played in America) may be

described as developed brag, though in some respects it “throws back” to the parent games post and pair, ’ambigu, and primero.

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FOK®#R

Any number of persons may play. If a pack of fifty-two cards is played with, from five to seven players makes the best game. Sometimes an écarté pack of thirty-two cards is used, when three or four makes the best game. There are numerous varieties of poker. Draw poker, with fifty- two cards, is the most common.

The dealer being determined (see Laws), he puts up a sum, previously agreed on (called the ante), gene- rally one chip or counter, and deals five cards to each player. Then each in rotation from the dealer’s left looks at his cards, and either throws up his hand (called going out of the game), when he stakes nothing, or chips, 7.e., puts up twice the amount of the ante (say two counters), The dealer finally looks at his hand and either goes out of the game or makes good his ante by putting up another counter.

The dealer then asks those in rotation who have chipped whether they will jill their hands (z.e., whether they will exchange any cards for an equivalent number from the top of the pack) or play the hand dealt.

When the hands are filled, the players to the left of the dealer have the say in rotation. Each player says whether he will (1) go owt of the game (forfeiting what he has already staked); or (2) raise, ve, put up a sum in addition to that already staked. As soon as any one raises, the next in rotation to say must either (1) go out of the game; or (2) see the raise, 2.e., put up an equal amount; or (3) go better, v.e., increase the raise. This continues round and round, each succeeding player being obliged either to see the stake made by the previous one, or to go better, or go out of the game.

Eventually the raising comes to an end, because either every player but one goes out of the game (when all the stakes are taken by the player who remains in, without showing his cards), or the players left in all see the last

raise, no one going better. When all the stakes are thus equal, it becomes a call. The last to stake, who makes his raise equal to that of each of the others, sees them, 7.e., the player to his left has to show his hand, or rather such part of it as he claims to compete with. The next to the left, then similarly shows his hand, if it can beat the one first shown ; if not, he throws up ; and so on all round ; the holder of the best hand takes the pool, and the next dealer deals.

Hands thrown up, either on a refusal to chip to fill, or ou being beaten, and cards discarded when filling, are placed face down in the middle of the table, and no one is allowed to look at them.

It is usual to limit the raise to prevent very high chip- ping. The modern usage is to play table stakes; 7.¢., each player puts up such an amount as he pleases at the com- mencement of each deal, and he cannot be raised more than he has on the table ; but he has the option of making good from his pocket a previous raise which exceeds his table stake.

Value of the Hands.—1, A straight flush (sequence of five cards of the same suit). 2. Fours (four cards of the Same rank, with one other ecard). 3. A full (three cards of the same rank, with a pair). 4. A flush (five cards of the same suit, not in sequence). 5. A straight (sequence of five cards, not all of the same suit). 6. Triplets (three cards of the same rank, with two other cards not a pair). (. Two pairs (with one other card not of the same rank with either pair). 8. One pair (with three other cards of different ranks). 9. Highest card.

_An ace may either begin or end a straight, e.g., ace, king, queen, knave, ten; or, five, four, three, two, ace. By agreement an ace may be made not to rank in se- quence with the two. In no case can ace occupy an inter- mediate position in a straight, and when an écarté pack is

used, ace is not in a straight with the seven. A higher straight flush, or straight, wins of a lower one; the cards rank as at whist, except that ace may be highest or lowest. In combinations other than straights ace is highest. High fours win of low ones; of two fulls the one that contains the highest

triplet wins; of two flushes the one that contains the highest card wins, if equal the next highest, and so on; a straight beats triplets (this is sometimes disputed, but calculation shows a straight is the less frequent hand); of two triplets, the highest wins ; of two two-pair hands, the highest pair wins, if both pairs are equal, the highest card ; of two hands each containing a pair the highest pair wins, if equal the highest remain- ing card wins ; of hands containing none of the above the highest card wins, if equal the next highest, and so on. In case of an absolute tie between the best hands they divide the pool.

Variations in the Mode of Playing.—Sometimes the ante may be raised by any one who chips to fill his hand, when succeeding players must make good the raise, or go better, or go out of the game. This isa mere excuse for higher play.

The player to the dealer's left (the age) is generally allowed to pass the first round after the hands are filled, and to come in again. If he passes he says "my age." Also, sometimes the age puts up the ante instead of the dealer. These useless complications, which only have the effect of making the first player the last player, are better omitted.

The age is sometimes allowed to go blind, 2.¢., to raise the ante before he sees his cards. The next player may double the blind, 2.¢., raise to double what the age staked ; the next may straddle the blind, 2.e., double again ; the next may double the straddle, and so on. Only the age can start a blind, and any one who refuses to double or straddle prevents a further raise ; but he must make good the pre- vious stake or go out. The player to the left of the last straddler has the first say; 2.¢, on looking at his hand and before filling, he declares whether he will make good or go out. Going blind, like raising the ante, is a mere pretext for higher play.

Some players do not consider straights in the game, and omit them. This makes four aces, or four kings and an ace, invincible; and it is open to the objection that if those cards are held the player is backing a certainty.

Hints to Players.—1. The dealer should generally go in, as half his stake is already up. 2. When drawing to fill a hand, it should be done off-hand and without hesita- tion. If in doubt, it is better to go out of the game at once. A

player may loose by going in, but can never loose by going out. 3. In filling to a pair it is generally right to draw three cards, unless drawing to a low pair, with a king or ace in hand. 4. In filling to two pairs, to a four, or to a straight or flush which wants one card, exchange one. It is not advisable to chip to fill to a straight or flush wanting more than one card; a draw to a straight or flush is usually a dear purchase. With a four the hand cannot be improved by drawing; but one card should be taken that the value of the hand may be concealed. 5. In filling to triplets one card only should be drawn, or triplets are at once declared; but, 6. Players should vary their mode of discarding to mystify the opponents, and should be sometimes cautious, some- times bold. 7. A good poker face is essential ; the coun- tenance should not betray the nature of the hand. Talk- ing without regard to facts (poker talk) is allowed, and is considered fair; but the best players put their cards face downwards on the table and leave them there, and neither move nor speak until it is their turn to say. 8. Blufjing (i.e. raising high on poor cards), in hopes of inducing the

other players to go out of the game, may be resorted to occasionally with success; but, as a rule, the player who goes in best will come out best. When about to bluff draw only one card or no cards. 9. A straight or higher hand may be backed freely, but the other players are more likely to go on staking if the raise is by small sums at atime. ‘The only general rule that can be given 1s to change the raising tactics pretty frequently.

Laws of Poker.—These vary considerably. The following are based on “the American Hoyle.” Determination of Deal.—1. One card is given to each player. Lowest has the deal. Ace is lowest. Ties of lowest card have one card each given again. The deal goes in rotation to the left of the last dealer. Shuffling, Cutting, and Dealing.—2. Any one may shufile, the dealer last. 3. The player to the dealer’s right cuts at least four cards. The dealer reunites the packets. If before the deal a card is exposed, there must be a fresh cut. A blank card is usually placed under the pack to prevent exposure of the bottom card. 4. The dealer must deal from the top of the pack, one card to each player in rotation, beginning to his left. 5. If the dealer deals without having the pack cut, or shuffles after it is cut, or misses a hand, or gives too

many or too few cards to any player (but see Law 6), or exposes a card in dealing, he forfeits an ante to the pool and deals again. The forfeit does not raise the other players, and the dealer must still make his first ante good when it comes to his turn, or go out of the game. (Some players merely require a fresh deal without any forfeit, and some require a player to take the card dealt him if only one card is exposed.) Filling the Hands.—6. If a player, after lifting any of his cards, is found to have too many or too few cards, he must go out of the game. (Some players give a hand with only four cards the option of going in.) 7. If, when drawing to fill, the dealer gives a player too many or too few cards, and the player lifts any of them, he must go out of the game. If the error is discovered before lifting, it can be rectified, —in the case of too many cards by withdrawing the superfluous ones, in the case of too few cards by filling from the top of the pack. 8. If, when drawing to fill, a card is exposed, it must be placed at the bottom of the pack, and the top card given instead (sometimes the top card after all the other players are served). 9. Cards thrown out must be placed face downwards in the middle of the table before any are drawn; otherwise the player is liable to the penalty for holding too many cards (Law 6). 10. Any player before taking up his filled hand may ask how many cards the dealer drew. Chipping.— 11. Ifall the players pass without chipping to fill, the dealer takes back his ante, and the deal passes. If, after filling, no one before the dealer raises, the dealer takes the pool. 12. If a player chips with more or less than five cards (but see note to Law 6), he must go out of the game. But, if all the other players have gone out of the game before the discovery is made, there is no penalty. 13. A player who passes or throws up cannot come in again. 14. Players are bound to put up distinctly the amount they chip, separate from their other chips. Aftercomers.—15. The place of an after- comer is determined by dealing a card between every two players. The aftercomer sits where the lowest card was dealt. Incorrect Packs.—16. The deal in which an imperfection of the pack is dis- covered is void. All preceding deals stand good. (H. J.)

POKROVSKAYA SLOBODA, or Poxkrovsk, also KASAKSTADT, a village of the district of Novo-uzen, in the government of Samara, Russia, on the left bank of the Volga, almost opposite Saratoff. In the 18th century it was a small cluster of clay huts occupied by a number of runaway serfs who had gathered round the storehouses erected by the crown for salt brought

from Lake Elton ; but, a body of free settlers having been enticed to the spot in 1747 by large grants of grazing ground, the village rapidly increased, its inhabitants, who numbered 12,776 in 1859, now exceeding 20,000. They support themselves by cattle breeding and agriculture ; and the Pokrovskaya landing place is one of the most important on the Volga, Taaee exports, mostly of wheat, reaching 99,850 ewts. in

POLA, the principal naval harbour and arsenal of the Austrian-Hungarian monarchy, is picturesquely situated at the south extremity of the peninsula of Istria, 55 miles to the south of Trieste. Its safe and commodious harbour is almost completely landlocked, and there is also a good roadstead between its mouth and the Brionian Islands. The harbour is divided into two basins by a chain of three small islands, and the inner basin is subdivided into the

naval and the commercial harbour by the Scoglio Olivi, a larger island connected with the mainland by an aqueduct. The hills enclosing the harbour are defended by forts and batteries. The town proper lies opposite the Scoglio Olivi, round the base of a hill formerly crowned by the Roman capitol and now by a castle of the 17th century. Besides the castle the chief medieval and modern buildings are the cathedral (15th century), the Franciscan convent (13th century), the Government and municipal offices, the huge infantry barracks, and the theatre. To the south- west, along the coast, extends the marine arsenal, a vast and well-planned establishment employing about 2000 workmen and possessing all the requisites for the equip- ment of a large fleet. It contains an interesting naval museum, and is supplemented by the docks and wharfs of the Scoglio Olivi. The artillery laboratory and the powder magazine are on the north bank of the harbour. Behind the arsenal lies the suburb of San Policarpo, almost exclu- sively occupied by the naval population and containing large naval barracks and hospitals. In the middle of it is a pleasant park, with a handsome monument to the emperor Maximilian of Mexico, who had been a rear-

‘ admiral in the Austrian navy. To the north, between

San Policarpo and the town proper, rises the Monte Zarro, surmounted by an observatory and a statue of Admiral Tegetthoff. Pola has no

manufactures outside of its naval stores, but its shipping trade is now considerable, the exports consisting of fish, timber, and quartz sand used in making Venetian glass, and the imports of manufactured and colonial wares. The population has increased from 600 at the close of last century and 5000 in 1857 to 25,175 in 1880, including a garrison of 5000 men. To many people, however, the chief interest of Pola centres in its fine Roman remains. The most extensive of these is the amphitheatre, which is 400 feet long and 320 feet wide, and could accommodate 20,000 spectators. It is remarkable as the only Roman amphitheatre of which the outer walls have been preserved intact; the inte- rior, however, is now completely bare, — though the arrangements for the naumachie, or naval contests, can still be traced. The oldest Roman relic is the fine triumphal arch of the Sergii, erected soon after the battle of Actium ; and of not much later date is the elegant and well-preserved temple of Augustus and Roma. Among the other antiquities are three of the old town-gates and a fragment of a temple of Diana.

The foundation of Pola is usually carried back to the mythic period, and ascribed to the Colchian pursuers of Jason and the Argonauts. In all probability it was a Thracian colony, but its verifiable history begins with its capture by the Romans in 178 B.c. It was destroyed by Augustus on account of its espousal of the cause of Pom- pey, but was rebuilt on the intercession of his daughter Julia, aud received (according to Pliny) the name of Pietas Julia. It seems to have attained its greatest prosperity about the time of the emperor Septimius Severus (193- 211 a.p.), when it was an important war harbour and con- tained 35,000 to 50,000 inhabitants. At a later period Pola became the capital of the margraves of Istria, and was more than once captured and plundered by the Vene- tians, who finally made themselves masters of the penin- sula. In 1379 the Genoese, after defeating the Venetians in a great naval battle off the coast, took and destroyed Pola, which disappears from history for the next four hundred and fifty years. It remained under Venetian supremacy down to 1797, and has been permanently united with Austria since 1815. In 1848 a new era began for Pola in its being selected as the principal naval harbour of Austria, and since then its progress has been constant.

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POLAND

OLAND (the Polish Polska, German Polen, French Pologne) was till towards the end of the 18th century a large and powerful kingdom, extending, with Lithuania, which was incorporated with it, over the basins of the Warta, Vistula, Dwina, Dnieper, and upper Dniester, and having under its dominion, besides the Poles proper and the Baltic Slavs, the Lithuanians, the White Russians, and the Little Russians or Ruthenians.

If Schafarik is correct in seeing the name of the Poles in the Lulanes of the geographer Ptolemy, we should have this Slavonic people mentioned as early as the 2d century after Christ.1 There can be no doubt about the derivation of the name ; the country is one vast plain, and thus the Poles come to mean dwellers of the plain or field (polé). Jordanes has no distinct name for them, although he speaks of Slavs inhabiting the banks of the Vistula. About the 6th or 7th century we find a people called Lekhs settled near that river, and this appears to be the oldest name which we can positively assign to the Poles. These Lekhs are considered by Szajnocha and some of the modern school of historians to have been a Norse tribe who in the 6th cen- tury ruled over the Slavonic peoples from the Baltic to the Carpathians. And, if this were the case, the origin of the Polish kingdom would be traced to the same source as the Russian empire. No satisfactory etymology has been given as yet of the word Lekh or Lech ; we cannot accept Schafarik's attempt to connect it with szlachta, nobility,

as that word is in all probability derived from the German °

geschlecht. Irom the form of the word Lech, Russian Inakh, we can see that the vowel represents a suppressed nasal, and this is further proved by the change which it undergoes in the neighbouring languages ; thus in Lithu- anian we get Lenkas and in Magyar Lengyel. The chronicle of Thomas, archdeacon of Spalato, calls them Lnngones (Bielowski, Mon. Hist. Pol.), the Polish chronicles of Mierzwa and of Vincent Kadlubek Lenchitx, Linchite. The loss of the nasal in the modern Polish form is curious, and contrary to the analogy of the language ; it is Supposed to have disappeared under the influence of Russian pronunciation. In the 13th century Kadlubek

invented the imaginary heros eponymus Lekh, supposed to have been the father of the Poles, and two brothers were found for him, Czech and Rus.? A great similarity has been noticed between these early heroes and others among the Czechs. Thus we may compare Cracus and Krok, Piast and Piemysl. Many of the legendary tales greatly resemble Scandinavian sagas, as indeed much of the early Russian history does which is contained in the chronicle of Nestor. Gradually the name Lekh was superseded by Poliani or Polaki. N estor, the old Russian chronicler, or at least the work which goes under his name, knows both appellations and distinguishes between Poliane Liakhove On the Vistula and Poliane Rousove on the Dnieper. When we first become acquainted with the Poles we find them like the other Slavonic peoples living in a kind of democratic communism, to which we need not assign the patriarchal simplicity and happiness in which some of their chroniclers, ¢.g., Dlugosz, would make us believe. All the early period of Polish history is mixed up with fables. Their first writers Gallus, Kadlubek, Dlugosz, Kromer, and others, who were ecclesiastics and used the Latin 1 There is another reading, Suéanes or Sulones; but the former is Preferred by the best editors. , For a further discussion of this subject, see the indexes to M. egers Nestor (p. 828), and especially the Archiv fiir Slawische

oe (vol. iii. Ueber die Namen fiir Polen und Lechen, by Prof. ehring, and vol. iv, » Polen, Ljachen, Wenden, by Prof. Perwolf).

language as their literary medium and handled it with considerable dexterity, have treated these stories ag genuine history,—just as Holinshed, Milton, Sir Richard Baker, and others did the Arthurian legends. The careful criticism, however, of modern times has relegated them to their proper place, and Lelewel has classified all the period of Polish history from the earliest times to the reign of Mieczystaw I. as belonging to the era of myths. We are hardly likely to believe in the existence of a Duke Lech or a beautiful Princess Wanda, who flourished in the 8th cen- tury, or in Cracus, said to have been the founder of Cracow. All these are obviously only generic and national names individualized. Many of the quaint and striking stories of these princes have done duty in all the legendary history of Europe. It cannot be doubted that poems corresponding to the Russian biéni are imbedded in the writings of these early chroniclers. The good peasant Piast, from whom was derived the celebrated line of kings, reminds

us of the Mikoula Selianinovich of the Russians and the Premysl of the Czechs. Kromer has tricked out the legend of his call to the throne in all the graces of his elegant Latinity. Bielowski, the editor

("Critical Introduction to Polish History") endeavoured to prove that the original Poles dwelt on the banks of the Danube, from which they were driven by the Romans. He also attempts to trace them in the 2d and 3d centuries after Christ. According to the whimsical theory of this author—a man to whom Slavonic history in other respects owes so much—the original habitation of the Poles was by the Lake of Ochrida. The Lechites (Lyncestwz) in the 3d century before Christ were driven by the Celts beyond the Danube, and there the kingdom of Dacia was founded. King Boirebista is Leszek II., Decebalus is Semowit, cc. Lelewel and Bielowski seem to have identified all the Thracian peoples with the Slavs.

All that we are told of the early Slavs shows them to The early We find them at Slavs.

have been a quiet agricultural people. first living in village communities with a tribal govern- ment. Nestor says, "The Poliani lived in separate groups, and each governed his family." Gradually a class of serfs sprung up, whose origin cannot be clearly traced. Répell in his history supposes that they were the descendants of rival tribes who had been conquered. At all events we soon find the following divisions of society among the Poles :—(1) the nobility, selachta, who throughout Polish history constitute the nation properly so-called ; (2) a superior class of peasants who were per- sonally free, but bound to perform certain services (these are always called in the old Polish documents cmetones, or kmetones, Polish kmiecz); and (3) the peasants strictly so called, who were the property of their masters and had no rights. We shall see how there was gradually formed in Poland a proud military aristocracy, which circumscribed the power of the king by the pacta conventa, so that he became a mere puppet in their hands. The nobles had ab- solute power over their serfs, as each separate palatinate had its tribunals. In course of time the kmiect became mere bondsmen. 'The miserable condition of the latter is seen in such books as Connor's Letters on Poland, published at the conclusion of the 17th century. Connor, who was physician to John Sobieski, had good opportunities for

3 The following directions for pronunciation may be useful :— c=ts; cz=ch; sz=sh; z=zh (the French j, as in jour); # has a thick sound which can only be acquired by ear, In nearly every word the accent is on the penult.

of the Monumenta Polonie Views of Historica, in his Wstep Krytyceny do Dziejéw Polski ® Bielowski.

Mieczys- Taw

Bolestaw theGreat.

forming an opinion. Thus the trade of the country fell wholly into the hands of foreigners and Jews. With the reign of Mieczystaw I. (962-992) we begin to have something firmer in our grasp. He became a suitor for the hand of Dabréwka, the daughter of the king of Bohemia. Being a Christian she refused to give her hand to a pagan, and Mieczystaw consented to be baptized in

965. He had been previously conquered by the Germans, who seem to have enforced conversion from all whom they brought into subjection. After this he proceeded to extirpate the worship of idols in as autocratic a manner as Vladimir had employed, when at Kieff Peroun, the god of war, was thrown from his pedestal and ignominiously cast into the Dnieper. In 980 an edict was issued that every Pole who had not already submitted to baptism should immediately undergo it. No opposition was offered to this strange decree, which from its easy adoption would seem to have left but little impression upon the neo- phytes, and probably the chroniclers have some reason for their assertion that Mieczystaw himself subsequently relapsed into gross sins. This complete conversion of the nation appears to have been aided by the labours of St Adalbert, bishop of Prague. Such traces as remained of the early Orthodox creed which had been introduced from Moravia were effaced, although they remained for some time in the sister kingdom of Bohemia, and we find a monastery established by the emperor Charles IV. for Greek monks at Prague. Mieczystaw acknowledged himself to be the feudatory of Otho of Germany ; he also resisted the encroachments of Vladimir of Russia, for already the feud between the two nations was

commencing. He died in 992 universally regretted, as we are told, and was succeeded by his son Bolestaw, surnamed the Great. During his reign Otho III. of Germany paid him a visit, and the Polish prince received him with such magnificence that the emperor elevated his duchy into a kingdom, probably intending that it should always remain a fief of the empire. Dlugosz and Kromer vie with each other in describing the splendour of this meeting; they are, how- ever, far outdone by their predecessor Gallus, who speaks of magnificent military manceuvres prepared by Bolestaw to delight his guest, and of the gorgeous array of the lords and court ladies; “for gold,” he adds, “was at this time held as common as silver and silver as cheap as straw.” Finally, Otho hailed Bolestaw as king, and him- self put the diadem upon his head. At his departure he presented the Polish king with the lance of St Maurice, still to be seen, as Kromer tells us, in the cathedral of Cracow ; and Bolestaw in turn offered as a gift the arm of St Adalbert, the patron saint of Poland. Lelewel treats the whole story of this coronation as a myth, because, as he observes, at that time kings were always crowned by bishops. Bolestaw afterwards defeated the Russian prince, and spent the latter part of his reign in administering justice throughout his kingdom. By the commencement of the 11th century he had absorbed nearly all the western Slavonic states, including Bohemia. He enjoyed among his subjects the epithet of Chrobry, or brave. The Germans, however, in derision of his corpulence, which he endea- voured to lessen by hunting, called him 7rinkbier. To him is due the foundation of the archbishopric of Gniezno (Gnesen), the chief see in Poland.

_Towards the end of his life he sought to aggrandize himself at the expense of Russia. He had previously, in 1013 according to Thietmar, given his daughter in marriage to Sviatopolk, the nephéw of Vladimir. His expedition against Kieff is alluded to by Nestor, but narrated more in detail by Thietmar and Martin Gallus. According to the latter he entered Kieff with the Polovtzi as his auxiliaries, and struck the golden gate with his

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sword. He was succeeded by Mieczystaw his son, who abandoned himself to pleasure and left the kingdom in a disordered state. He is said to have first divided Poland into palatinates, a term which will be explained shortly.

On his death an interregnum ensued and his queen Ryxa, niece of Otho of Germany, held the regency. Owing, however, to the continual feuds between the Slavs and Germans, she was driven out of the kingdom and betook herself to Saxony, whither her son soon followed her, During their absence Poland presented a spectacle of anarchy, the commencement of the long series of miseries

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of this unhappy country. The serfs are said to have risen —

everywhere and massacred their lords, and even the priests were not spared. Moreover, two foreign wars, with Bohemia on the one hand and Russia on the other, increased their miseries. The pious Kromer chiefly laments- the sacred relics carried off by the ferocious Bohemians which were never restored. ‘To heal the universal wounds it was resolved to send for Kazimiérz (Casimir), the son of Mieczystaw and Ryxa. But it required some time to find him, for he was hidden in Germany, although the story of his having become a monk in the abbey of Cluny in Burgundy has been shown by Répell to be groundless. We shall see afterwards that a Polish king did actually seek in a cloister rest from the turbulence of his subjects. Kazimiérz married Maria the sister of Yaroslav, the prince of Kieff, who was willing to abjure the Greek faith, and embrac- ing the Iatin took the name of Dobrogniewa. By this marriage he became the brother-in-law of Henry I. of France, who had married another sister. This king induced several monks to come from Cluny, and founded two monasteries for them, one near Cracow and the other in Silesia, at this time forming part of the kingdom of Poland. From the earliest period we find the country inundated with foreign ecclesiastics ; and to this cause we may probably trace the long use among the Poles of the Latin language.

told. In an expedition against Iziaslav, the prince of Kieff, he took that city and remained in it some time with his troops. The stay of Bolestaw and his soldiers at Kieff is said to have been attended with the same deleterious effects as befell Hannibal and the Carthaginians at Capua; and the conduct of the Polish ladies during the absence of their lords, unless the chroniclers belie them, cannot be held up as an example to wives. The whole story, how- ever, has a very mythical air.

The most remarkable event, however, of the reign of Bolestaw was the murder of St Stanistaw. In this respect he emulated Henry II. of England; he dared to come into collision with the ecclesiastical power, but he did not sug- gest the assassination of so prominent a person to others; he accomplished the deed with his own hand. His excesses had long drawn upon him the censure of Stanis- taw, who concluded by putting all the churches of Cracow under an interdict. Upon this the king vowed vengeance on his denunciator. The Polish chroniclers tell us that, on hearing that the saint was to celebrate mass in a chapel, he took with him a few determined followers and hurried to the place. He, however, forbore to break in upon the scene till the service was concluded. This being over, he ordered some of his attendants to enter and slay the pre- late. They were restrained, however, by a miracle, for, endeavouring to strike Stanistaw to the earth, they all suddenly fell backward. Again and again Bolestaw urged them on, and the miracle was repeated a third time, until the king rushed in and with one blow clove the skull of the ecclesiastic. Kromer tells us that immediately after the murder the king and his impious satellites slashed the body, separated it into many pieces, and cast

Kazimiérz was succeeded by a second Boles Bolestaw (1058-1101), of whom many curious stories are Hl.

it to be devoured by dogs and birds of prey. It was, however, guarded by eagles who kept off the assailants ; and, some monks collecting the remains, they all became mysteriously reunited and were afterwards honourably interred at Cracow. Such a crime was not likely to go unpunished in those days. Gregory VII. (Hildebrand) placed the whole kingdom under an interdict. regarded with hatred by all his subjects, fled into Hungary, but of his end we have no certain inforniation. After the disappearance of Bolestaw, who had taken his son with him, the state remained nearly a year without a sovereign. Finally, being afraid of a Russian or Hungarian invasion, the Poles called to the throne Wtadystaw (Ladislaus), the brother of Bolestaw. Anxious to remove the interdict, he at once despatched ambassadors to the pope ; but, although the-churches were allowed to be reopened, so great was the authority of the occupant of the chair of St Peter,

who refused again to ratify the title of king, that for two hundred yearsfrom this time no Polish ruler could legitimately assume such a dignity, but was obliged to consent to the humbler appellation of duke. Wtadystaw, who was engaged in constant wars with the Russians and the heathen inhabitants of Prussia, died in 1202 at Piock,—as was suspected, of poison. The power of Poland was diminished in his reign, as many provinces were occupied by the Russians. He was succeeded by his son, Bolestaw III., to whom the Poles have affixed the surname of Krzywousty, or the Wry-mouthed. Kromer tells us, “uit autem Boleslaus hic, habitudine corporis satis firma, vegeta, et laborum patiente, colore fusco, statura mediocri, os ei carbunculus morbus ab ineunte adolescentia distorserat, atque inde Criuousti cognomentum habuit.” He married Sbislava, the daughter of Sviatopolk, the prince of Kieff, and was successful in many wars, till, hav- ing eventually been defeated by the Hungarians on the banks of the Dniester, he is said to have died of grief. He seems to have been a redoubtable warrior, and to have distinguished himself in some very hard fighting. His expeditions against the Pomeranians were characterized by much cruelty, for we are told that Gniewomir, one of their chiefs, was beaten to death in the presence of the Polish army. Besides his attack upon the ~~Pomeranians we learn from Gallus that he also marched against the Prussians, whom he utterly defeated, returning with a large spoil of cattle and other booty. His most import~~ ant war, however, was with the German emperor Henry V., the husband of Matilda, the daughter of our Henry I. He had probably become jealous of the rising power of Bolestaw, for the Germans at that time affected to regard Poland as a fief of the empire. The only event of much interest in this war is the gallant defence of Glogau, where the imperialists were driven off, in spite of their furious Onslaught, and were ultimately routed near Breslau. The emperor fied precipitately, and the Poles gave little or no quarter. The field, says Kromer, where the battle took place was full of corpses, and exhibited a sorry and lament- able spectacle. The bodies of the Poles were carefully sought out and interred, but the Germans were unburied and lay as food for dogs and birds. In consequence of this the number of dogs who frequented the spot was so great that the road was rendered difficult to travellers. The place was called the Field of the Dog both by the Poles and Germans, a name which has obtained till the present day. Kromer, however, tells us that some of the German historians claimed the victory for their nation. Whatever the result

may have been, peace was soon after- wards made between the emperor and the duke, a peace which was further consolidated by the marriage of Bolestaw and his son Wtadystaw to members of the imperial family. Before his death the Polish duke, following the same fatal

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course which in Russia paved the way for its subjugation by the Mongols, parcelled out his territories to his sons Wiadystaw, Bolestaw, Mieczystaw, and Henry. There remained a fifth and youngest son, at that time of tender age, Kazimierz. The duke being asked why he had left him portionless is said to have declared that the four- wheeled chariot must have a driver, thus, as it were, prophesying the future pre-eminence of this child. The prediction, which looks very much like a prophecy after the event, reminds us of William the Conqueror distribut- ing his kingdom to his sons. The quarrels of these princes are very tedious. Wtadystaw was ultimately driven out and Bolestaw became supreme. His subjects gave him the nickname of Kedzierzawy, or the curly. He was drawn into a contest with the German emperor Frederick Barbarossa, who invaded Poland in the year 1158. It would have been impossible for Bolestaw to meet so formidable a foe in the field; he, however, succeeded in forcing him to make peace by continually harassing his army, and laying waste the territory before it. Frederick again attempted to convert Poland into a fief of the German empire, but failed. Bolestaw signed a peace by which he consented to give Silesia to his brother Wladystaw, and the Poles were to furnish three hundred spearmen to assist the emperor Frederick against Milan. An expedition which he undertook against the Prussians in 1167 was unsuccessful ; in consequence, as Kromer assures us, of treachery, the Poles became entangled in the marshes of the country and were cut to pieces.

unpopular that he was expelled from the country in 1177. The crown, therefore, according to the prophecy, devolved upon Kazimierz, the youngest son of Bolestaw Krzywousty. During his reign many judicious laws were passed in Poland ; among other improvements he abolished the

evil custom of purveyance. His reign was tranquil, and by summoning a council of the bishops and nobles at Leczyca he may be said to have instituted the Polish senate, at all events to have laid the foundations of it. At this time the third crusade was preached in Poland, and the order of the Cistercians was introduced into the country. We shall pass rapidly over the reigns of Leszek V. (the White), Wiadystaw III, and another Bolestaw. Conrad, duke of Masovia and brother of Leszek, introduced the order of Teutonic knights into the Polish territories on the Baltic, from whom the Prussian monarchy, one of the great enemies of the republic, was afterwards to develop itself.

In the reign of Bolestaw V. (1227-1279) the Mongols Bolestaw made an incursion into Poland, but were subsequently V.

diverted into Hungary, having gained a victory at Lig- nica (Liegnitz) in Silesia in 1241. They carried off great quantities of booty. It is said that on this occasion nine sacks were filled with the ears of the slain. During their stay Bolestaw, like Ivan the Terrible at a later period, remained cloistered in a monastery Lelewel dwells pathetically upon the many evils suffered by Poland during the long reign of this prince, and says he was an unjust judge, a soldier who had aversion to fighting, and a sovereign who neglected the government. At this time also commenced the introduction of Germans into the country in such numbers as to threaten to denationalize it. The trade was almost entirely in their hands, and instead of being governed by Polish laws they enjoyed the benefit of the Jus Magdeburgicum. The wide influence of these foreigners is shown by the many words of German origin to be found in the Polish language.

An unfortunate and uninteresting prince, Leszek the Black, succeeded, but the dignity of the house of Piast was fully restored when Przemystaw, without condescending to solicit the title of sovereign from the hands of the pope,

On his death Bolestaw Mieczystaw was succeeded by his brother Mieczystaw, who was so III.

Casimir III.

received the crown from his nobles and clergy at Gniezno |

(Gnesen). Thus did Poland again become a kingdom. This unfortunate prince, however, was afterwards murdered by the margrave of Brandenburg at Rogozno (1295). The reign of Wactaw (Wenceslaus) (1 300-5) was not of great importance. He united the crowns of Poland and Bohemia, but soon became unpopular on account of his preference of his Bohemian subjects. Shortly after his election he left the country, and, confiding the control of Poland to the Bohemian garrisons, retreated with his wife to Prague, having been invited to take the crown of Hungary, which he soon abandoned to his son. His death in the year 1305 was accompanied by suspicious circumstances which rendered it probable that it had been brought about by poison. With him expired the race of the holy peasant Pfemysl, which had ruled Bohemia accord- ing to the ancient chronicles for nearly six hundred years. The relations of the latter country to the German empire were now to become much closer. Wtadystaw Loketiek, who succeeded Wactaw, was constantly engaged in wars with the Teutonic knights. In three expeditions against them he allowed his troops to commit great excesses. A full account of them may be found in Kromer, who has given us a florid speech said to have been uttered by Wtadystaw before one of the battles. Several heretics at this time made their appearance in Poland, advocating among other things communistic doctrines. They were severely repressed, and from this time dates the establish- ment of the Inquisition in the country which lasted till the days of Sigismund I. About 1312 Cracow appears to have been made the capital of the kingdom, and continued so till the reign of Sigismund ITI.

Wtadystaw was succeeded by his son Kazimiérz (Casimir) IIL, justly surnamed the Great, whose reign was a golden period for Poland. The material prosperity of the country increased very much at this time. Commerce was active ; the Russians supplied the inhabitants with furs ; the south- ern parts of Europe sent wines, carpets, silks, cotton, ce. The principal towns of Poland, Dantzic and Cracow, to assist the development of their commerce, joined the Hanseatic league. The towns on the Vistula now began to increase in number and importance, and we first hear of Warsaw, which, however, was not made the capital of the kingdom till the

reign of Sigismund III. In 1364 Kazimiérz laid the foundation of the university of Cracow, but it was reserved for Queen Jadwiga to carry out his plans. One of the most important events of his reign was the pass- ing of the statute of Wislica (1347). In this legal docu- ment the palatines and castellans are mentioned, and the authority possessed by them is carefully defined. It may be well to enumerate here some of the chief functionaries of the republic. The duty of a palatine was to lead the troops of his palatinate on any military expedition, and to preside in the little diets or assemblies of the nobility of his province. Immediately after the palatines came the castellans, who, like the former, were all senators. They were lieutenants of the palatines in time of war, leading the nobility of their jurisdiction into the field, under the command of the palatines. Both the palatines and castellans held judicial tribunals in their respective provinces. The nuntii (posty) were the deputies returned by the various districts of the palatinates. There were sixteen ecclesiastical senators, including the primate (the archbishop of Gniezno) and the archbishop of Lemberg. They all sat in one house. The starostas, employed in collecting the revenue and other functions, had no seat in the house. There are many things in the statute of Wislica favourable to the peasant ; thus the power of life and death over him, which his master had previously enjoyed, was abolished. The peasant was not glebe ascriptus, and if ill-

treated by one lord could move to the estate of another. The inhabitants of the towns, foreign and chiefly German artisans were governed by the Jus Magdeburgicum ;, but appeals to Magdeburg itself were prohibited ; for this purpose a Teutonic tribunal was established at Cracow, consisting of a judge properly acquainted with foreign law, and of seven citizens nominated by the starosta, Kromer, in his Polonia, says, “ Legum scriptarum nullus fuit usus apud Polonos vetustioribus temporibus; nec ulle extant antiquiores iis quas Cazimirus magnus rex condidit.” A national dict was now being formed. It consisted of the upper clergy and the nobles, but the in- ferior clergy and the citizens-seem sometimes to have been admitted. Gradually questions of peace and war were introduced and even the election of kings,

the principle of departing from the hereditary line being admitted—a con- cession afterwards attended with great evils to Poland. The improvements of Kazimiérz were not confined to law- making ; he fortified the chief towns of his kingdom, and built many of their most handsome edifices. He also intro- duced many artisans from Germany. By his marriage with his first wife Anna Aldona of Lithuania, he had only a daughter. He therefore convoked a diet at Cracow on the 8th May 1339, in which he proposed as his successor his nephew Louis of Hungary, the son of his sister. This was to concede to the diet a very important privilege, as the throne became virtually elective. The nobles were not slow in availing themselves of the concession which had been made to them. Before they allowed Louis to succeed they exacted some very important terms from him which became the foundation of the celebrated pacta conventa. The year after the appointment of a successor his wife dicd. Accord- ing to Kromer she was passionately fond of music, and took musicians with her wherever she travelled. The wars of Kazimiérz against the hereditary cnemies of the country, the Russians, Lithuanians, and Mongols, were successful. His private life was stained with licentious- ness, but his reign marks a distinct epoch in the political and. legislative development of the country. With him the glory of Poland begins, and he is well worthy of the glowing eulogy of the national historian Dlugosz. We cannot wonder also that the Poles dwell with pleasure upon the splendour of the court of Kazimiérz, but he certainly squandered the royal treasures too freely. We are told that at one time he entertained at Cracow the emperor of Ger- many and the kings of Denmark, Hungary, and Cyprus. His death was occasioned by a fall from his horse while hunting near Cracow on the 5th November 1370, and with

him expired the line of the Piasts. Casimir was succceded, Louis.

as had been arranged, by Louis of Hungary, who held the crown for twelve years only, and of that period spent but a short time in the country. Louis showed too great a fondness for his own subjects ; he had also the misfortune to be unacquainted with the Polish language. After his

death his second daughter Jadwiga was elected queen, but Jadwigt

she was to accept as husband any prince whom the diet might propose to her. Her election is declared by Kromer to have been due to the eloquence

of one Jan Tenczyn (a member of a celebrated Polish family), whose speech, or an imaginary reproduction of it, is given at great length in very classical Latinity. Jadwiga is said to have been a woman of great beauty and worth. As a matter of state policy she was induced to marry Jagielto, the prince of Lithuania, a man of savage manners; but Lithuania was thus annexed to Poland, with which it remained joined ever afterwards,—a more complete federation having taken place at Lublin in the year 1569. Jagielto was a pagan, but he offered to renounce his creed and to introduce the Christian faith into his dominions ; although not educated in that religion he was born of a Christian mother, and its

doctrines were not entirely strange to him. The prin- eipality of Lithuania at that time stretched from the Baltic to the Black Sea, and eastwards to within a short distance of Moscow. Its religion was Greek Church, and – its official language White Russian. The Lithuanian tongue, so interesting to the philologist, seems never to have been anything more than a peasants' language, and no official documents whatever have come down to us in it. This was not the first marriage between the sovereigns of the two countries, as the first wife of Casimir the Great, Anna Aldona, had been a daughter of Gedymin, a Lithu- anian prince. Originally Jadwiga felt a repugnance to the marriage with Jagielto on account of the coarse and repul- sive manners of the barbarian, and also because she had previously plighted herself to the archduke William of Austria. The matter was referred to her mother Elizabeth of Hungary, who expressed herself favourable to the marriage. The archduke, however, did not abandon his hopes without a struggle ; he made his appearance with a splendid retinue at Cracow, but eventually retired on finding that the prosecution of his suit would lead to no favourable result, The new candidate arrived at the metropolis after him, and Jadwiga accepted his proposals. In 1386 they were married, and from that year we may date the com- mencement of the dynasty of the Jagieltos in Poland, which lasted for nearly two centuries, terminating in 1572,—indeed, we may say nearly a century longer, omit- ting the short and brilliant period of Batory (1576-1586), for Sigismund ITI. was the son of Catherine daughter of Sigismund IT., and Wtadystaw IV. and John Casimir were his sons; after the death of the latter the throne became entirely

elective. The new sovereign. was baptized by the name of Wtadystaw. Having been converted himself, he forced his subjects to be converted by the simple process which seems to have prevailed over all Slavonic countries. Wiadystaw is said to have assisted in these pious labours with persuasion as well as command, and by these means Lithuania, which had remained heathen longer than any other part of Europe, was finally Christianized. We are told, however, by travellers of heathen customs remaining long afterwards. Although owing so much to his consort, the king seems to have treated her with jealousy and suspicion. On his impugning her chastity, she insisted on being confronted with her calumniators. The investigation resulted in Jadwiga's triumphant acquittal ; and we are told by Dlugosz that her accuser was compelled in the singular fashion of the country to prostrate himself under a table and declare that he had lied like a dog, and at the same time to imitate the barking of that animal. We are further informed that this punishment for defamation continued in force in Poland until the close of the 18th century. 'The nobles wrested several important privileges from Wtadystaw ; and from this time we can trace step by step the rise of that fierce oligarchy which brought So much trouble upon the unfortunate kingdom. They secured for themselves exemption from all contributions when called to serve beyond the frontiers, and an allow- ance of five marks for every horseman ; they also procured the exclusion of members of the royal family from all the higher offices of the state, reserving these for themselves. In the reign of Wtadystaw many expeditions were under- taken against those inhabitants of Lithuania who preferred to remain pagans. In 1410 also occurred the great battle of Griinwald near Tanneberg in Prussia, in which the Teutonic knights were completely defeated and Ulrich von Jungingen, the grand master, killed. Wiadystaw died in 1434, and was succeeded by his son of the same name. His queen Jadwiga had died in 1399; she appears to lave been greatly beloved by the Poles, and was canonized

after death,—miracles, it is said, being wrought at her |

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_ senate.

intercession. The consolidation of Lithuania with Poland was destined to be a much more tedious and protracted matter than its somewhat violent union. Great as may have been the grief of Wtadystaw at the death of Jad- wiga, it did not prevent him from contracting three subse- quent marriages,—the third wife being Sophia, a princess of Kieff.

The younger Wtadystaw was able soon after his acces- sion to add (by election) both Bohemia and Hungary to his dominions. He then conimenced an expedition against the Turks, who under their sultan Amurath IT. were pressing the siege of Belgrade, having already annihilated the ill- starred Lazar and his army at the battle of Kossovo in 1389. At first Wtadystaw was everywhere successful, and had instilled such terror into the Turks that Amurath proposed a truce for ten years and offered to cede all his conquests except Bulgaria. The conditions, having been accepted, were ratified by mutual pledges; unfortunately Wtadystaw was induced by Cardinal Cesarini to recommence the war and violate his oaths. The sultan on' hearing of this perjury at once prepared for battle at. the head of a for-

midable army. The encounter took place at Varna, in Battle of After performing Varna. prodigies of valour, Wtadystaw was defeated and slain, 1444.

the present principality of Bulgaria.

Hardly a fifth part of the Polish army escaped from the battle, and of these many perished in the swamps of the Dobrudja. This melancholy engagement, which formed, as the Polish chroniclers tell us, the subject of so many lays—whereof it is a great pity that none have come down to us—is fully described by Kromer (p. 327-8), who adds many omens and pious reflexions. He dwells with delight upon the conspiracy of twelve noble captives, who would have murdered Amurath if their plot had not been re- vealed by a Bulgarian, whereupon they committed suicide: "Tn necem ejus conjurarunt, peregissentque facinus prie- clarum et omnibus seculis memorabile nisi in ipso articulo a Bulgaro, quem unum consilii socium adhibuerant, proditi essent." There is also another curious account in the Memoirs of a Janissary, an early Polish work which will be further described in the section devoted to literature. The memory of the unhappy young prince, who was only in his twenty-first year, was long cherished

amongst his countrymen, although, as Kromer tells us, during his short reign he almost drained the treasury and was so busied with the Turkish war that he had but little time to attend to the wants of his Polish subjects. The votaries of Mohammed were now beginning to make themselves a great name in Europe, and were already marching trium- phant over the ruins of the effete Eastern empire. The imperial city itself was soon to fall, and the crescent to be placed upon the domes of Saint Sophia.

After a brief interregnum Kazimiérz, brother of the deceased king, was chosen to succeed him; he had previously been grand-duke of Lithuania. In this reign the Poles carried on successful wars with the Teutonic knights, which resulted in a peace, by which western Prussia, including Pomerania and the cities Dantzic, Thorn, and others, were to belong to Kazimiérz, while eastern Prussia was left to the knights, who were, however, to hold it as a fief of the crown, and each subsequent grand master was to be the vassal (hotdowmk) of the Polish king and Permanent encroachments were made, however, upon the dominions of the “ Republic” (Jzeczpospolita) by Ivan ‘IIT., who reannexed to the Russian crown Novy- gorod, which had been incorporated by the Lithuanians ; he also appropriated a considerable portion of White Russia. The great Muscovite empire was now just becom- ing welded into a compact whole ; with Ivan III. was to commence the era of consolidation, with Ivan IV. that of absolutism. In this reign the nobles first elected nuntii

or deputies (posty) to attend at the diet, when they them- selves were unable to be present in person. They also passed some mischievous laws, aggravating the bondage of the miserable serfs. Previously it was possible for a peasant who had been ill-treated to fly from his lord; now it was enacted that he must be surrendered upon demand, and whoever harboured him incurred severe penalties. The researches of recent Polish historiogra-

phers have shown the importance of the reign of this monarch, who may be said to have consolidated the Polish kingdom ; from his time the influence of the diet began. The statute of Nieszawa in 1454 has been called as important in Polish law as Magna Charta in English ; it is the great charter of the rights and privileges of the Polish nobility.

Kazimiérz was succeeded by his son John I., surnamed Albert (in Polish, Jan Olbracht), a feeble prince, most of whose wars were unsuccessful. He led an expedition against Stephen the hospodar of Wallachia, which resulted in acomplete defeat. In this reign, at one of the diets (at Piotrkow in 1496,—for, as was the case with the parlia- ments anciently in England, they were held at various places), the nobles decreed that henceforth no burgher or

peasant should aspire to any of the higher offices in the

church ; all such appointments they reserved to themselves. Thus they constituted their clergy a mere aristocratic caste, and imitated the prince-bishops and other spiritual potentates of the Germans. The peasantry were now ob- liged to bring all their cases before tribunals presided over by their own masters, where they were likely at best to get but a scant measure of justice. Finally, this memorable diet still further limited the power of the king by enacting that none of their sovereigns should in future declare war without their permission. Short as was the reign of John Albert, it saw him involved in many disputes with his nobility. An Italian refugee, Buonacorsi, who had been his tutor, gave him many suggestions with a view to limit the power of the nobility. About the same time, in 1497, some nobles were killed in an unfortunate expedition in Bukowina, and a report was spread that this disaster had been caused by the king himself through the bad counsels of Buonacorsi. In this reign also laws were passed in the diets further limiting the power of the burghers and the peasantry, who were now forbidden to possess any landed property. John Albert was succeeded by his brother Alexander, an utterly insignificant king; in his reign, however, we trace the first germ of the detestable liberum veto, which ruined Poland. In a diet held at Radom it was settled that the decision of the deputies was not to depend upon the majority, but must imply unanimity of suffrages. Ata diet in 1652, as we shall afterwards see, it occurred for the first time that a single nuntius annulled by his /eberwm veto the decisions of the whole

body present and broke up the assembly. By this absurd custom an element of confusion and disintegration was introduced into all the meetings ; it was possible to hire a venal nuntius, for the majority of the Polish nobles seem to have had their price ; and as soon as such a man appeared, however important the subjects to be debated might be, he could put an end to all further discussion. The lord high treasurer had the complete control of public finance; he was appointed by the king, but could not be removed. According to the strict letter of the constitution, he must give in his accounts to the diet, but he might easily evade doing so. As the diets only lasted six weeks he might bring them in too late, or if the scrutiny became somewhat tiresome he would probably be able to find a convenient nuntius who would veto the whole proceedings! The story told by Connor of a certain Count Morsztyn, whom we shall find afterwards

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mentioned among Polish authors, is certainly a very pain- ful one. He says —‘I may here give an account of a passage that happened when Count Morsztyn was great treasurer of Poland, who, having more regard to his own private interest than the public benefit, sent all the riches of the treasury into France, when, fearing that the diet would soon think fit to call him to account, he retired privately with all his effects out of the kingdom and went to settle in France, where he purchased the whole county of Chateau-Villain, which is worth above one hundred thousand livres a year.” Such was the corrupt character of the Polish parliament. Other details are given of an equally painful description? We are told that these meetings rarely happened without bloodshed. A serious fracas occurred among the turbulent nobles—who them- selves, while dictating laws, embodied every principle ‘of anarchy—when Sigismund III. was elected. Blood flowed in torrents, and the booths erected for the accommodation of the senators were burnt. At the election of King Michael balls from pistols flew about the tents of the senators, and nuntii were actually killed. Even worse scenes occurred at the election of Augustus II, as will be shown subsequently. In the reign of Alexander we find an instance where a few deputies from the towns were admitted, but their presence was only invited on rare occasions, reminding us how Ivan IV. now and then summoned the Russian citizens to his despotic dowma. “He was of a middle stature,” says Connor, “ had a

long visage and black hair, was very strong built but exceeding dull-witted, and consequently but a little talker. He exceeded all his brothers in generosity, and was wont to delight much in musicians and such trifling artists. Nevertheless, this his liberality was generally esteemed but prodigality, insomuch that some were so bold as to say that he died in time, or else both Poland and Lithuania might have been lavished away. To prevent the like pernicious generosity for the future, the diet made a law, calling it Statutwm Alecandrinum, by which they revoked all this king's profuse gifts." In the reign of this sovereign the former statutes of Wislica, Warta, Nieszawa, and many others were confirmed and published in a single

volume under the superintendence of the chancellor Sigis

Laski. The feeble Alexander was succeeded by his 2

prother Sigismund (in Polish, Zygmunt), another son of Kazimierz. Sigismund was engaged in constant wars with Basil, the czar of Russia; his court was also filled with factions fomented by his wife Bona Sforza, the daughter of the duke of Milan, a woman thoroughly hated in her adopted country, on whom the Poles made the following epigram—

Si parcunt Parce, si luci lumine lucent,

Si bellum bellum, tum bona Bona fuit. When she left the country in the reign of her son Sigismund II., she carried large sums of money with her to Italy.

In this reign the order of Teutonic Knights embraced the doctrines of Luther; their dominions were already a fief of the Polish kingdom. Gradually this small prin- cipality was to absorb the Slavonic elements which sur- rounded it, and to rise triumphant over the ruins of Poland. The doctrines of the Reformation were now becoming widely spread over Europe, and the element of religious animosity was largely infused into this land of perpetual anarchy and tumults. Sigismund, however, was a man of remarkable ability, and under his rule the country flourished. He survived to

the age of eighty-two, and his memory is still cherished with affection by the Poles. His broad heavy physiognomy may be seen accurately represented in the old editions of Kromer, who dwells

1 See Letters concerning the Present State of Poland, 1778, p. 87.

2 Ibid., p. 27.

much upon his merits. In 1538 occurred the first rokosz, as it is termed in Polish, or rebellion of the nobility against the king. The affairs of Wallachia caused Sigis- mund to undertake a military expedition. Accordingly he

Polish republic was called. One hundred and fifty thousand nobles assembled at Lemberg, but instead of marching to the war they laid their complaints before the king and refused to serve, and the old man was obliged to put them off with promises. The Lithuanians had not yet become reconciled to their union with Poland, even

taking advantage of this feeling, attempted to restore its former independence to the country. Sigismund, however, succeeded in defeating Glinski, who fled to Russia. He then persuaded the grand-duke to invade Lithuania, and assisted him in getting possession of Smolensk-in 1514. Sigismund made a treaty with the grand-duke, but he did not succeed in getting back Smolensk. In 1526, by the

height of their power. This peace guaranteed to Poland

the free navigation of the Black Sea, with the sovereignty of | Moldavia, and prevented the irruption of the Mongols into | Podolia, where they were in the habit of committing great | excesses, as the Little-Russian national ballads pathetically |

tell us. The reign of Sigismund was a period of great this time culminated. It seems a rule that the great men of a country are produced at periods of national pro- Sperity, so we now find Copernicus flourishing, the one man of genius produced by Poland whose glory has re- sounded throughout the

world. In 1529 Sigismund pub- lished his code of laws for Lithuania, which was issued in the White-Russian language, and forms one of the most important monuments of Polish law.

He was succeeded by his son Sigismund II. (1548-72), otherwise called Sigismund Augustus, but this prince was not elected till a very stormy debate had ensued as to whether he should repudiate his wife or not. He had married, as a widower (his first wife having been Elizabeth, daughter of Ferdinand of Austria), a fair widow of the house of Radziwitt one of the most illustrious of the families of Lithuania. The nobles, however, who already treated their sovereign as a chief magistrate and nothing more, and had begun to control all his movements, required at the diet of Piotrkow that the marriage should be annulled, merely on the grounds that the country would gain more by his alliance with the daughter of a foreign potentate. But Sigismund, by sowing discord in the tanks of his opponents —proposing among other things to destroy pluralities in church and state— contrived to carry his point. His wife was crowned in 1550, but died

within Six months after, not without suspicions of having | been poisoned by her mother-in-law. She is said to have |

made herself universally beloved during the short period in which the Poles had beheld her as queen. In three years' time Sigismund married a third wife, the sister of the first, and widow of Francis Gonzaga, duke of Mantua. During this reign the quarrels between Protestants and Romanists raged fiercely in Poland, and the latter were very severe in their persecutions. A priest was burnt to death for administering the sacrament in both kinds, and a lady suffered the same terrible fate for denying the real presence. Many of the nobles were infected with the new teaching, but Sigismund was disingenuous and _ inconsist- ent in his conduct. He is himself supposed to have been inclined to the doctrines of the Reformation ; he certainly permitted Calvin to dedicate to him a commentary on

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| then used there was to be universal toleration. after so long a tiie, and one of their chief men, Glinski, |

| one of the epistles of Paul, and Luther an edition of his

German Bible. Finally, realizing that the majority of his subjects were Catholics, he abandoned a faith to which

he had perhaps given but a half-hearted adherence, and appealed to the rzeczpospolita, or commonwealth, as the |

allowed the bishops to suppress with severity all promulga- tion of the new doctrines.

The religious question was keenly debated in a diet held at Wola near Warsaw the year after the death of Sigis- mund. It was resolved not to allow the sword to settle any religious differences. According to the language We shall soon see how little this was carried out. We find from it that the Polish peers were supposed to be masters of the spiritual as well as the material condition of their serfs, for it was expressly stated that their power over them was to be unlimited, “tam in szcularibus quam in spiritualibus.”

In his wars with Ivan the Terrible, in which the subject of quarrel was the Baltic provinces, Sigismund was not very

fortunate ; he was not able to prevent the Russians from death of the last of the dukes of Masowsze (Masovia), this —

duchy was reunited to the crown of Poland. In 1533. Sigismund concluded a treaty with the Turks, then at the |

acquiring the palatinate of Polotsk, nor could he sub- sequently hinder the Swedes from making themselves masters of Livonia. He died in 1572, leaving no issue by his three wives ; and with him became extinct the race of the Jagieltos, the second great family which had ruled over Poland. His reign was very favourable to the develop- ment of Polish literature. Then, too, the laws were first authoritatively promulgated in the native language, which

_ was spoken at court, although Latin continued to be ex- peace for Poland, and we may truly say that its glory at.

tensively employed. During the reign of Sigismund Augustus, Poland reached the height of outward prosperity. It included Lithuania and western Prussia, and by the ad- dition of Masovia and Livonia extended its limits from the Baltic to the Black Sea, and almost from the Oder to the Don. The seeds of disintegration, however, had long been sown; since the marriage of Jadwiga with Wtadystaw Jagielto the crown of Poland had been more or less elective, although it continued in the same family. One important

event which marked this reign must not be forgotten ; in Diet of By this a Lublin.

1569 took place the celebrated diet of Lublin. close union was effected between Poland and Lithuania, which up to this time had been ill united, and indeed there were continual jealousies breaking out during the exist- ence of Poland as a nation—two great points being the difference of religion and language. Even the union of Lublin was not effected without considerable resistance. The following were its conditions :—Lithuania gives Pod-

_lasie to Poland ; Livonia, under the title of duchy, belongs

equally to the two states; Volhynia and the duchy of Kieff—that is to say, the Ukraine—are incorporated with Poland ; the kingdom of Poland and the grand-duchy of Lithuania are to form a single indivisible republic, and are to have a single head, elected by their common votes; the senate is to be composed of nobles of both nationali- ties. Warsaw was fixed upon as the seat of the diet, since, being part of Masovia (Masowsze), it was, strictly speaking, neither Polish nor Lithuanian. It afterwards became the regular capital of the country in the reign of Sigismund III. ; as we have seen, the first two capitals of Poland were Gniezno (Gnesen) and Cracow. Warsaw is of comparatively late origin. It is said to have been founded by Conrad, the duke of Masovia, in 1269. The old dukes of Masovia resided at Czersk near Warsaw, of which some of the ruins might be seen one hundred and fifty years ago (C. H. Erndtel, Warsavia physice illustrata, Dresden, 1730). The city is most advantageously situated, and with a better railway system and

fewer fiscal restric- tions would be one of the greatest emporiums in Europe. An interregnum now occurred on the failure of the line of the Jagieltos, and the throne was publicly offered for competition. Four candidates appeared :—Ernest, arch-

Henry.

Pacta conventa,

duke of Austria; Henry of Valois, duke of Anjou, brother of the French king ; a Swedish prince ; and finally Ivan the Terrible of Russia. ; between the first two; the Swedish alliance was despised as likely to bring with it no solid advantage ; the czar was hated both as coming from a race which had ever been hostile to Poland, and also on account of his detestable cruelties, which were well known throughout Europe. The political importance of France and the astute diplomacy of Montluc, the ambassador from that country, caused the decision to be given in favour of the French candidate. But, just as his name was brought forward as their prob- able king, the Poles, many of whom, we must remember, had embraced the Reformed doctrines, were startled by the news of the massacre of St Bartholomew (August 24, 1572). From the awkward dilemma in which he was placed by his complicity in this act, Henry endeavoured to escape by a falschood,—impudently denying at first that anything of the sort had happened. Finding, however, but little credence given to his assertions, he attempted to explain away the affair and to lower the number of its victims, which he reduced to fifty, alleging that they liad been really executed for a conspiracy. The Polish ambassadors duly made their appearance in Paris, show- ing their gay equipages, quaint and semi-Asiatic ; their bows and arrows and shaven crowns with a single tuft of hair greatly amused the inquisitive French. Loose flowing robes, high boots, and a sword resembling a scimitar completed the tout ensemble of a Polish noble- man.

Readers of French history must be well acquainted with the character of this duke of Anjou, one of the most de- testable of the house of Valois, who afterwards became king of France onder the title of Henry II. The articles, some of which the Polish nobles required Henry to sign, called the pacta

conventa so well illustrate the extraordi- nary influence of the aristocracy, and the shadow to which they had reduced the regal authority, that they are worth quoting im extenso. From this time every Polish king was compelled to accept them, together with the additions sub- sequently made.

(1) The king was to have no voice in the election of his suc- cessor ; the appointment was to depend entirely upon the nobles.” (2) He was to keep rigidly the terms of the treaty made with the Dissidents, as the Polish Protestants were called. (3) No war was to be declared nor military expedition undertaken without the consent of the diet. (4) No taxes were to be imposed without the consent of the diet. (5) The king was not to appoint ambassadors to foreign courts. members of the dict, the king was to adopt only such as were in accordance with the laws or advantageous to the nation. (7) The sovereign inust have a permanent council, consisting of five bishops, four palatines, and eight castellans, who were to be changed every year and elected by the diet. (8) A general diet was to be convoked every two years, or oftener, if there were any need. The assembling of these diets secms to have depended upon the will of the king. (9) The duration of each diet was not to exceed six weeks. (10) None but a native could hold any dignity or benefice. (11) The

king must neither marry nor divorce a wife without the consent of the diet.

Thus the regal shadow who was to sit upon the throne of Poland was able to interfere but little in questions either

’ The Poles regarded the national dress with peculiar fondness, and Coxe tells us that they were somewhat indignant with their last king Stanislaus (Stanistaw August Poniatowski, 1764-95), because he always appeared with flowing hair and adopted a French style of dress. They even meditated introducing a new clause into the pacta conventa, requiring that every king of Poland must wear the Polish dress.

2 We shall find, however, this rule sometimes infringed, and instances occur in which the opinion of a sovereign affected the next nominee. Thus the malicious wife of Sobieski was able to exclude her son James in the succession, to which the national voice had almost called him.

“ We shall afterwards see that this mischievous law was fruitful of evil consequences to the country, as frequently debates upon the most iniportant questions would ke brought to an end by the interference of one of the nuntii declaring that the legitimate six weeks had elapsed.

re Lyn ©

The contest, however, really lay |

(6) If different opinions prevailed among the |

of peace or war. The latter, we have seen, he could not declare; and, as each of the palatines held nearly supreme power in his own territories, the king could interfere in little relating to the former. A vexatious control was ex- ercised even over his private relations; his wife could not be of his own choosing, and, however odious she might become to him, she must remain attached as a state ap- pendage till his nobles consented to release him. Not that Henry was likely to trouble himself with any scruples on the score of marriage. He arranged all those matters very easily. What was left for the Polish king was chiefly to eat and drink at the expense of his subjects, and to form a glittering addition to their costly and semi-barbar- ous pageants. Still his revenue was ample, and when he comnianded the army in the field his power was unchecked ; he had also the nomination to the highest ecclesiastical and inilitary appointments.

Even before the severe terms of the pacta conventa had been presented to Henry, Montluc had agreed to all, but probably felt convinced that his sovereign would carry out no more of them than he could possibly help. He even promised that France should send a fleet into the Baltic, so that its dominion might be secured to the Poles, and that in the event of a war with Russia she should supply four thousand of her best troops, and herself pay their expenses ; in all cases of war she was to aid Poland with money. Henry was to spend a large portion of the rents which he drew from his estates in France for the benefit of his adopted country; he was also to pay the crown debts, and to educate one hundred young Polish nobles either at Paris or Cracow. Probably no sovereign in the world ever signed such

galling stipulations. Henry, how- ever, had no intention of observing them, and had so little relish for his new kingdom that he did not set out- till he had almost been driven from France by his brother, and the Polish nobles already talked of a new election. He proceeded on his way slowly, with all the dignity of a royal progress, but did not escape the gibes of the German princes through whose dominions he passed, for his con- nexion with the massacre of St Bartholomew. He was feasted at Heidelberg opposite a large picture which delineated the tragedy in all its horrors, and attendants were allotted him selected from French Huguenot refugees. He was crowned at Cracow in February 1574, but soon began to repent of his choice. The effeminate king re- lished but little the throne he had chosen among a war-like and turbulent people, where he seemed to enjoy but the shadow of sovereignty—a people also in every way inferior in civilization to the agreeable Parisians he had left behind. He felt himself a mere- puppet in their hands, and, burying himself in the recesses of his palace, led a life of dissipation. But release was at hand in an unexpected way ; he was destined to be king of Poland for five months

only. By the death of his brother Charles IX. he became

heir to the French crown. ‘This delightful piece of news he attempted at first to conceal, and to escape before it could get noised abroad in Poland, principally to avoid the ambitious designs of his brother, the duke of Alengon ; but unfortunately the report oozed out. He refused to follow the counsel of his advisers that he should convoke general diet to see what measures should be taken. On the evening of the 18th July he gave a grand entertain- ment in honour of the sister of the late king Sigismund. The conviviality was great; and never had Henry assumed a more pleasing manner or seemed more genially to identify himself with his new subjects. At the usual hour, to all appearance, he retired to his apartment and the lights were extinguished ; but already the king had flown. He was led by an attendant through secret passages to chapel in the suburbs of the city, as some say—but accord-

1573-1586.]

ing to a more probable account to the royal stables, where a rendezvous had been appointed. Here horses had been prepared ; and with a few chosen attendants he rode pre- cipitately from his kingdom, reaching the frontiers of Silesia early on the following day. Great was the consternation in Cracow when it was known that he had fled, and hot the pursuit of the authorities. The probability of the king's flight, gathered perhaps from his ill-concealed uneasiness, had caused it to be suspected before it was known as an actual fact. The grand chamberlain, anxious to calm the universal excitement, returned to the palace to which by virtue of his office he had general access. At first he knocked at the king's door, 'but no answer was forthcom- ing; he then tried the chambers of the gentlemen-in- waiting; there equally he found a dead silence. Again, he returned to the king's bedroom, and, not being able to force the door, entered by the window—for even in matters of etiquette they seem in Poland to have treated their kings somewhat roughly. The candles were burning as usual in the room ; the two pages were near the bed; the

curtains of the bed were drawn, but there was no Henry.

to be found. The grand chamberlain, amazed, rushed in pursuit, attended by five hundred cavaliers. Probably such a ludicrous sight had never been seen before as a monarch flying from his kingdom and subjects without being driven out by them. Owing to his ignorance of the route the horsemen were soon on his track, and many of his com- panions, to save themselves, deserted him. One of them named Pibrac hid himself in a bog, and was even obliged to make several dives to escape the infuriated peasants, who pelted him with stones, unconscious of what he had done, but satisfied, from his efforts at concealment, that he inust be flying from justice. In vain did Henry cause the bridges to be broken down behind him; the Slavs on his track forded the rivers on horseback, and the king was at last overtaken on the very boundaries of the German em- pire. There Tenczyn, the grand chamberlain, and five horsemen came up with the fugitives and shouted after the king, "Serenissima Majestas, cur fugis?" Finding that he was quite safe, Henry admitted Tenczyn to an audience, who remonstrated with him on account of the manner in which he was leaving the kingdom, and recommended him to return and convoke a diet so that with the consent of his subjects he might take possession of his new kingdom. But he refused to

be influenced by their entreaties, and merely promised in a vague manner that he would return as soon as he had placed France in a state of tranquillity— & promise which, it need hardly be said, he had no inten- tion whatever of carrying out. Nor did the king show any special alacrity in repairing to France, for before reaching that country he lingered a considerable time at Vienna and Venice, trifling with the highest interests of his country, and devoted only to frivolous amusement. The Poles, how- _ €ver, were well rid of one of the most corrupt sovereigns of acorrupt house. In 1589 the knife of the Dominican friar terminated his life, and with it the line of the Valois.

The Poles, piqued at the contempt with which their crown had been treated, assembled at Stezyca and resolved to declare the throne vacant if the king did not return by the 12th May 1575. During the interregnum the Mon- gols made incursions into Podolia and Volhynia, and griev- ously devastated those countries. The appointed period having elapsed, Stephen Batory, prince of Transylvania, was elected, having previously stipulated to marry the princess Anne, sister of Sigismund Augustus. There were some difficulties, however, before he succeeded in obtaining the royal authority. The primate Ucharski nominated the emperor Maximilian king. This caused considerable Opposition, and the city of Dantzic did not recognize the hew sovereign till compelled. To conciliate the nobility

Batory was obliged to consent to some serious diminutions of the royal prerogative. This king was a great soldier, successful against both Prussians and Russians, the latter of whom he compelled, in 1582, to evacuate Livonia, which was thus again annexed to Poland. He also did much to encourage letters, having founded the university of Vilna, which has, however, been suppressed in more recent times. His great fondness for the Latin language is said by Schafarik to have had a bad effect upon Polish ; for from this time may be dated the classical words and idioms which have been thrust upon the language, and have disfigured Polish more than her Slavonic sisters. It was Stephen Batory who first organized the regiments of Cossacks who play such an important part in Polish history. Before his

death, foreseeing the constant anarchy which the system of elective sovereignty would cause, he in vain urged the nobility to make the crown hereditary. Sarnicki, the Polish historian, says of him— “Fuit vir tam in pace quam in bello excelso et forti animo, judicii magni, presertim ubi ab affectibus liber erat; in victu et amictu parcus, et omni jactantia et ostentatione alienus, eruditione insigniter tinctus, sermonis Latini valde studiosus et prorsus Terentianus.” It would naturally be concluded that before the election of Batory the royal power had been sufficiently curtailed, but it was to undergo further mutilations. Sixteen senators were now chosen at each diet to attend the king and give their opinion in important matters, and no decree could be issued without their consent. Besides this, in 1578 the right of final appeal to the king, which had always been a royal prerogative, was taken away. The king could now only give the ultimate decision in a small district within a certain radius of his residence. The courts exercising judgments within these narrow limits were called Assessoria Regni, and even these judicial powers, slight as they were, were gradually abandoned after the time of Augustus II., and were exercised by the high chancellor of the realm. The king was supposed to have some control of the courts which were governed by the Jus Magdeburgicum ; but, Batory being busy with foreign wars, these were generally managed by the chancellor also. The palatines had the right of electing their own judges in their dietines or petty diets, who formed supreme courts of justice called Tribunalia Regni; here the causes of the nobles, for the peasants had no voice in the matter, were decided finally and without option of any appeal.

On the death of Batory in 1586, after many quarrels among the leading families, the throne was again brought into the market. The candidates were, among others, the archduke Maximilian of Austria; Feodore Ivanovich, the feeble Russian czar; and Sigismund, a Swedish prince, son of Catherine, sister of Sigismund Augustus. The last of the three was finally elected, although not without con- siderable opposition from Maximilian, who was only driven from his candidature by main force. The Zborowskis, a very powerful family always in opposition to Zamoiski, thé chancellor of the kingdom, invited him. But Zamoiski defeated him at Byczyna in Silesia, and he was there made prisoner, and was only released on the promise of desisting from being a candidate. The Austrians, how- ever, were always interfering in the affairs of Poland, and, if they could not procure the

admission of any of their family to the headship of the republic, we shall observe that during four generations the house of Hapsburg furnished queens to Poland. A very serious riot occurred at the election on this occasion, as Lengnich tells us in his Jus Publicum Regni Poloni; the booths erected for the senators were burnt to the ground. Such proceedings were only to be expected in a country where each noble might keep as many armed retainers as he pleased.

Sigis- mund WOE

(1587- 1632).

The new king signed the pacta conventa, and an alliance | offensive and defensive between Poland and Sweden ; the navigation of the Baltic was secured, and the debts of the nation were to be discharged. Sigismund, however, soon became unpopular among his new subjects, and among other causes of offence he violated the pacta conventa by marrying an Austrian princess, Anne, daughter of the archduke Charles, without their consent. In 1595, at Brzeéé in Lithuania, took place the so-called union of the Greek and Latin Churches, but this union was not brought about without considerable violence. The disputes between the king and the diet were destined to be renewed when (his wife being dead) he married her sister Constantia in 1603. This union was also entered into without the con- sent of his subjects, and caused the cup of their wrath, already full, to overflow. On this occasion Jan Zamoiski, the chancellor already mentioned, addressed a vehement oration to the king, which is quoted at full length by Lelewel, in which he brought his marriage against him among many other charges. When Zamoiski had finished, Sigismund rose from his throne in a moment of anger and seized his sword. At this gesture a murmur of indignation ran through the diet, and Zamoiski cried in the midst of the crowd, “ Rex, ne move gladium; ne te Caium Cesarem, nos Brutos sera posteritas loquatur. Sumus electores regum, destructores tyrannorum ; regna, sed ne impera.” A great rokosz or secession, as the phrase was in Polish, was the result of this. But the rebels wanted able leaders, and the king defeated them at Guzow, near Radom, on the 6th July 1607, and thus his throne, already tottering, seemed to become a little stronger. He pardoned the insurgents ; and the

country, on the verge of civil war, seemed pacified ; but the rebellion was a fatal precedent.

The most important events in this reign were the transac- tions which took place between Poland and Russia. The renegade monk Otrepieff personated the young Dmitri of Russia, who had been assassinated, probably by the orders of Boris Godounoff, and aspired to seat himself upon the throne of the czars. This wonderful plot was concocted at Cracow, and seems to have been a plan of the Jesuits to bring over the Russians to the Latin Church! In 1606 the pretender was killed in a tumult, and many of the Poles who had accompanied him to Moscow were murdered. In 1617 Sigismund sent his son Wtadystaw to Moscow, which had been taken by the Polish general Zolkiewski. Wtadystaw was elected czar by a certain faction ; but the Russians, disliking to have a heretic for their emperor, rose against the newly appointed sovereign; and the patriotism which was lacking to the boyars was found in the unselfish devotion of a provincial butcher. Russia was freed, and a new dynasty was established in the person of Michael Romanoff. Sigismund had many wars with the Turks, which led to no very important results ; the great victory, however, of Chodkiewicz at Khotin (September 28, 1622) has become ever memorable in Polish annals, and has formed the subject of several poems. Lengnich, in his Jus Publicum Regn Polona, tells us that in 1632 the Cossacks petitioned to be allowed to take part in the diets. Their request was refused in an insulting manner ; and the Poles had soon to pay dear for their insolence. Sigismund died in 1632; his statue still ornaments the city of Warsaw, which he made the capital in the place of Cracow. He was unceasing in his efforts to extirpate Protestantism from his dominions.

The luxury of the nobles at this period has been’ described at great length by Lelewel. He has also much to tell us about the small armies of retainers kept up by

the Polcs, which it is a pity there was no statute of

1 See, however, Rome et Demetrius, by A ierli : al te 5 s 1878), for the contrary view. va ge ae

AND

maintenance, as in England, to check. These private troops, however much bravery they may have occasionally shown, prevented all unity of action. The reign of Sigismund III. was on many grounds a disastrous one for Poland, and it was a very long one. There were constant military revolts and religions tumults. The king and his Austrian wife were so foolish as to be partly drawn into the Thirty Years' War. They thought that, supported by the emperor and the king of Spain, they might be able to regain the crown of Sweden. They therefore permitted the emperor to enrol troops in Poland, and even sent him some regiments of Cossacks ; they also got ready a fleet in the Baltic—strange as it may seem to hear of Poland as a naval power. All these plans, however, ended miserably. By the treaty of Malborg (Marienburg), in 1623, Sweden gained Livonia, Elbing, and part of Prussia.

He was succeeded by his son Wtadystaw IV., who was elected by the diet. During his reign the usual wars took place with the ancient enemies of the republic,— the Swedes, Russians, and Turks. Before its close the revolt of Bogdan Chmielnicki had broken out, which cost Poland her Cossack subjects, who had been so happily gained over by the more vigorous policy of Batory. The Zapor- ogians, or Cossacks of the Dnieper, now transferred their allegiance to Alexis of Russia. They had long felt uncomfortable under the Polish government owing to the proselytizing tendencies of the bigoted Sigismund III. Fresh alarms were caused by the erection of the fortress of Kudak on the Dnieper, and they broke out into open rebellion. In 1638 they were deprived of the right of having a hetman ; and Pawluk, their chief, was decapitated in spite of an express promise that his life should be spared. Wtadystaw was in constant collision with his nobles. He fretted under the restrictions placed upon his power, and attempted to carry on wars without the con- sent of the diet. But the nobles compelled him to break all his engagements. He died at Merecz in Lithuania, between Grodno and Vilna, May 20, 1648, and was suc- ceeded by his brother John Casimir (Jan Kaziniiérz), the other candidates being the czar Alexis, father of Peter the Great, and Ragotzi, prince of Transylvania, One of the first acts of the new king was to endeavour to negotiate with Bogdan, but the negotiations were brought to an abrupt termination by the treachery of Wisniowiecki, the Polish general, who fell upon the unsuspecting Cossacks while they were deliberating about the terms of the con- vention. After this massacre Bogdan raised another army, but was completely defeated by John Casimir

at Beresteczko in 1651. The kingdom, however, was thrown into the greatest confusion by the disputes of the nobles, and all vigorous action was paralysed. The blood-stained annals of these wars are full of horrors: the population in many districts was entirely extirpated ; every where murder and plunder were rampant; and tortures too hor- rible to mention were inflicted upon the unhappy prisoners.

Ata diet held in 1652 a single nuntius for the first time annulled by his iberum veto the united resolutions of the whole assembly,—Sicinski, from Upita in Lithuania, stop- ping the diet with the simple word “niepozwalam” (I forbid). As soon as he had uttered this ominous protest he quitted the assembly. Those who were present were puzzled as to what construction they ought to put upon such a proceeding, but Siciriski had not acted without con- federates on whom he could rely. An angry debate ensued, but the principle was finally carried by a majority and firmly established. Ruptures of this kind became more frequent, as Lelewel tells us, and the queen Louise Marie, who had great influence over the king, frequently made use of them. Lengnich, in his Jus Publicum Regni Polont (1742), enu- merates thirteen occasions on which this baleful practice

[MISTORY.

Wtadlys- taw IV,

(1682- 48),

John

Casimir

(1648- 68).

Liberum |

velo.

raty of Podolia.

drus- vO.

had broken up the diet. It was not finally abolished till. 1791. The reasons why it was popular have already been spoken of. Among other causes may be mentioned the anxiety of the great officers of the realm—the commander- in-chief, treasurer, marshal, and others—to be free from the control of the diet. These important functionaries held their appointments for life, and were under no super- vision during the intervals between the sessions of the diet. Again, it was only before the diet that a noble accused of capital crimes could be brought to trial, for the nobility exercised, as has already been said, supreme judicial powers in their own palatinates. If, therefore, as was frequently the case, a criminal of this rank happened to be brought forward, it was very convenient for him to be able to pro- cure a dissolution of the only tribunal by which he could be convicted. Again, it was an admirable way to oppose the levying of taxes, which could only be raised, by the consent of the diet ; and taxes, owing to the constant wars in which she. was engaged, were very heavy in Poland. There were emissaries of foreign powers, too, who fomented these internal discords and profited by fomenting them.

The ill effects of the literum veto soon began to be felt.

In 1670 the members of the diet bound themselves by an oath not to make use of the privilege. In spite, however, of this resolution that very diet was brought to an end by the appeal of Zabokrzycki, the nuntius from Braclaw in In 1667, by the treaty of Andruszowo, Poland lost to Russia Smolensk, Vitebsk, Polotsk, and other towns, the Dnieper now becoming the boundary ; Kieff, the inter- esting old historical city, was to go two years later. In the midst of all these misfortunes the exhausted country was attacked by a new enemy, Sweden, in consequence of the Polish monarch asserting a right to the Swedish crown, as the heir of the house of Vasa—a claim which he had no possibility of enforcing. Hampered as he was by a war with Russia, John could effect nothing against his new enemies, who took both Warsaw and Cracow, and ended by entirely subjugating the country, while the wretched king fled to Silesia. Although these new enemies were afterwards expelled, yet the war was pro- tracted for some years, and ended disastrously for Poland. Charles Gustavus, the Swedish king, is said to have pro- posed the

partition of the country; he offered Great Poland to the elector of Brandenburg, Little Poland to the duke of Transylvania, and a part of Lithuania to a Polish nobleman named Radziwitt. But Poland's hour had not yet come. The elector of Brandenburg procured the release of East Prussia from all seignorial rights in 1657. Livonia was also another loss, having been ceded to Sweden in 1660. An army of Cossacks and Mongols, which had invaded Podolia, was defeated by the celebrated John Sobieski, who now first appears in history and was made commander-in-chief of the Polish troops. Worn out with age, and disgusted with his repeated failures, the king abdicated in 1668. Ata previous diet he had warned his turbulent subjects that the partition of the kingdom must be the inevitable consequence of their dissensions. John Casimir had already been an ecclesiastic ; he had been absolved from his vows by the pope when he became a candidate for the throne. He now resolved to betaké him- self again to the cloister,—his wife, Louise Marie, daughter of the duke of N evers, a woman of beauty and spirit, being dead. _ He took his leave of the Poles in an affectionate and dignified address, which is still preserved, and has been pronounced by Coxe to be "the finest piece of pathetic eloquence that history has ever recorded." There was something very touching in the fact that Jan Kazimiérz nebresented the last of the Jagieltos and Vasas, the former of whom had so long ruled over Poland. He was son, as Previously mentioned, of Sigismund IIT., and great-grand-

son of Sigismund I., whose daughter Catherine had married John, king of Sweden. Connor says, "'While 1 was at Warsaw I spoke with several old gentlemen, who told me

that Casimir, the day after his resignation, observing the ~

people hardly paid him the respect due to a gentleman, much less to a king, seemed to have repented heartily of the folly he had committed " (i. 135). He now returned to France, a country in which some years previously he had suffered a strange captivity, having been detained in the reign of Louis XIII. while passing its coasts; but the story is too long to be narrated in these pages. Here he became abbé of St Germain and St Martin, and drew his means of subsistence from these ecclesiastical foundations : for the

Poles, although to all appearance abundantly moved by his melancholy rhetoric, refused to continue his pension. Nor does he appear to have spent the short remainder of his life entirely in the cloister, as we are told that he contracted a secret marriage with an amiable widow who had formerly been a laundregs. He, however, sur- vived only four years, dying in 1672, forgotten by the world but not forgetting it,—his disease, according to some accounts, being greatly aggravated by his receiving the intelligence that Kamenets in Podolia had been ceded to the Turks. His body was afterwards brought to Cracow and buried in the cathedral. The diet, which met on his abdication, passed a decree that for the future no Polish king should be allowed to abdicate. During this reign, in the year 1658, the Socinians were banished from Poland, in consequence of which Pope Alexander II. gave to the king and his successors on the Polish throne the title Lex Orthodoxus. In due time three candidates for the vacant throne made their appearance—the prince of Condé, the prince of Neuburg, supported by Louis Deliv… and 'Charles of Lorraine, who was put forward by Austria. The first of these could rely upon the cooperation of tlie great Sobieski, but eventually none of the three was chosen. The election fell upon a native Pole—Prince

Michael Korybut Wisniowiecki, of a noble family indeed, Michael but so impoverished that he may be said to have had regal Wisnio-

honours thrust upén him against his will, and we are even told that he was offered the crown half in derision. A graphic picture of this extraordinary scene is given in Pasek's contemporary memoirs. Michael soon became a mere puppet in the hands of his turbulent subjects. His reign, however, was rendered illustrious by the great suc- cesses of Sobieski against the Turks, although the Poles suffered the loss of the important town of Kamenets, and Michael, powerless to make head against them, concluded the treaty of Buczacz, by which he even stipulated to pay them tribute. By the great victory of Khotiu in 167 3, Sobieski did much to repair these losses, and was about to follow up his glorious campaign when he heard of the death of Wisniowiecki at Lemberg in Galicia ; so sudden was the end of Michael that some have even supposed that he was poisoned,—" by a Frenchman," says Connor. The dict met at Warsaw; there were several candidates; and among others Charles of Lorraine and Philip of Neuburg again put forward their claims. While the nobles were still in session, Sobieski, fresh from his

glorious victory, entered and proposed the prince of Condé. A stormy discussion ensued, and in the midst of it one of the nobles, Jablonowski, was heard to say, “Let a Pole rule over Poland.” The cry found a magic echo among those who were present, and the gallant Sobieski, the greatest of Polish generals, and one of the first soldiers of his time, was appointed king

under the title of John JIL, although not without con- John III. siderable opposition from Michael Pac, the general-in-chief (1674- of Lithuania, who was, however, ultimately induced to 2)

withdraw his protest. This king signed the same pacta conventa as the preceding monarchs; there was, however,

Siege of Vienna

(1688).

a trifling addition made to them, but that a very absurd one. To the article declaring that offices should only be conferred on native nobles it was added, “and on such only as have had their honours during three generations.” The leading idea of Sobieski was to drive the Turks out of Europe, and if possible to resuscitate the Byzantine empire. He was soon roused to action by a new Invasion of the Turks and Mongols, whose united armies are said to have amounted to 210,000 men,! commanded by the Seraskier Ibrahim, whose ferocious character was suffi- ciently indicated by his soubriquet, Shaitan or Devil. We are told that Sobieski had only 10,000 men to oppose to this vast host; he, however, set out from Lemberg, and was soon hemmed in by his adversaries at Zurawno, in Galicia, but by consummate bravery and adroitness suc- ceeded in rescuing himself and his soldiers, even conclud- ing a treaty with the Porte on favourable terms, by which Poland received back a part of the Ukraine and Podolia. Some years of peace followed, during which the king in vain endeavoured to raise supplies for an army to recon- quer the provinces which Russia had appropriated. All his plans were neutralized by the absurd practice of the liberum veto. In 1683 the Turks made their grand inva- sion which they had

long been preparing. After scouring the plains of Hungary, they advanced to the very walls of Vienna. The emperor Leopold at once fled with his court, but had great difficulty to avoid falling into the hands of the Mongols. The imperial party made no stay till it reached the Bavarian fortress of Passau. Quick in its track followed also the wealthier portion of the inhabitants ; their selfish desertion aroused murmurs of disapprobation, and also considerably thinned the number of the popula- tion capable of bearing arms; many of these fugitives fell into the hands of the invaders, who were capable of any cruelty. The command of the city was taken by Count Stahremberg ; he had already approved himself a brave soldier, and had been nominated to the post by the emperor. All classes at once—including even priests and women—laboured diligently at the fortifications, the bur- gomaster Von Liebenberg himself setting an excellent example. The imperial archives had already been removed ; nothing now remained for the devoted city but to await the approach of the enemy. The inhabitants could see the desolated villages, and the fire and smoke of the burn- ing cottages were conspicuous for miles around. At sun- rise on July 14 the vast hordes of the invaders, a pro- miscuous crowd of soldiers, camp-followers, camels, and baggage-waggons made their appearance. The camp was arranged in the form of a crescent; splendid above all other things was the tent of the vizier, Kara Mustapha, made of green silk, worked with gold and silver, set with precious stones, and containing inside the holy standard of the prophet. Marvellous stories are told of the foun- tains, baths, gardens, and all the appliances of Oriental luxury which it contained. Many painful incidents char- acterized the siege before the arrival of Sobieski ; a fire at one time broke out in the city, which was only suppressed with difficulty. Diseases raged among the townspeople owing to their being compelled to spend their days in such close quarters and to live chiefly upon salt meat. Relief, however, was rapidly approaching. The elector of Saxony, John George, marched out of Dresden on the 22d July with twelve thousand men and eighteen guns, and reached Krems on the 28th August. The Polish king, who had been solicited by the emperor himself, and to whom all Europe looked now as its saviour, left Cracow accompanied by, his son, and succeeded in reaching the quarters of Prince Charles of Lorraine. He was to act in concert

_’ 89,000 Turks and 130,000 Mongols, as we are told by the Polish historians, .

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with a man who had been competitor with him for the Polish crown; their meeting passed off amicably, and no subsequent jealousies seem to have marred their opera- tions. The Polish and German troops effected their junction at Krems on the Danube, near Vienna; there were about seventy-seven thousand men ready for active operations in the field. On the 12th September, after mass, Sobieski descended from the city to encounter the dense masses of the Moslems in the plains below. He appeared with his hair partly shaven in the Polish fashion, and, although plainly attired himself, was accompanied by a brilliant retinue. In front went an attendant bearing the king’s arms emblazoned, and with him another who carried a plume on the point of his lance. On his left rode his son James, unfortunate in afterwards incurring the hatred

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of his mother, who perhaps prevented him from being °

elected to the throne of Poland; on his right was his old rival, Charles of Lorraine. Before the battle the king knighted his son and made a patriotic address to his troops, in which he told them that on that occasion they did not defend Vienna alone, but rather all Christendom, and that they were not fighting for an earthly sovereign but for the King of kings. The shouts of the soldiers bore to the enemy the dreaded name of Sobieski, familiar to them on many a well-fought field. He is said to have been provoked to give the order for battle by seeing Kara Mustapha, the Turkish commander, tranquilly taking coffee with his two sons in his splendid tent.

The assault was made simultaneously on the wings and centre of the enemy. The king himself dashed forward to the pasha’s tent, bearing down all opposition and repeating with a loud voice, “Non nobis, non nobis, Domine exercituum, sed nomini Tuo da gloriam.” “Allah!” said the Mongol khan, “ the king is surely among them.” Tn spite of the bravery of the Turks they were overpowered by the éan of the Poles. Six pashas were slain, and the

vizier fled with the remnant of hisarmy. The booty taken was immense. The details of the battle may be gathered from the interesting letters which Sobieski wrote to his wife in the Polish language. She was a Frenchwoman, daughter of Henri de la Grange, captain of the guard to Philip, duke of Orleans, and had been originally maid of honour to Louisa, queen of Wtadysiaw IV., was then married to Count Zamoiski, and after his death became the wife of Sobieski. It is said that chiefly on her account the Polish king was induced to assist Austria. The selfish policy of Louis XIV. would have allowed this outpost of Christian Europe to be taken by the Turks, and he used all the secret springs of his diplomacy to divert Sobieski from his purpose. to this ambitious woman in refusing the title of duke to her father. After the complete rout of the Moslem, Sobieski and his troops entered Vienna, and divine service was performed in the cathedral; a priest read aloud the text, “ There was a man sent from God, whose name was John.” In spite of his success, the brave Pole was doomed to meet with ingratitude at the hands of the emperor Leopold, and through the selfishness of his own troops and the Lithuanian contingent, who seem to have been always at cross purposes with the Poles, he was not able to follow up his victory to its legitimate end.

The king, after this brilliant achievement, showed some inclination to be reconciled to Louis XIV., but the emperor succeeded in diverting him by holding out hopes of securing the government of Moldavia and Wallachia for his son. By the treaty of Moscow, which Sobieski con- cluded in 1686 with Sophia, the regent of Russia, Smolensk, Severia, Tchernigoff, and Kieff were definitely annexed to the latter country. The private life of Sobieski was embittered by family dissensions ; he was very much

He had, however, given mortal offence

under the influence of his wife, a woman of great beauty, but avaricious, fond of power, and revengeful. Thus the illustrious soldier had not peace in his own house, nor was he likely to meet with it in the stormy debates of the

diet, several of which were broken off by the exercise of the dcberum veto ; and so wearisome had his position become

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to pleasure. One of his favourite amusements was shooting dogs from the windows of his palace at Warsaw, in conse- quence of which dogs became very scarce in the city. He was too idle to learn a word of Polish, and left everything to the management of his minister Briihl. Frederick died on October 3, 1763, at Dresden, where he was buried.

that he several times thought of abdicating, and the Austrian party (such was the gratitude he met with) sought to effect this. He finally sank under an accumula- tion of disorders, and expired on the 17th June 1696, at

In 1764 Stanistaw August Poniatowski was elected king, Stanis- chiefly through the machinations of the Russian empress Jus Catherine. The new monarch was a man of refined ae manners and elegant mind, but weak, and a mere puppet 95).

his favourite castle of Willanow. Many incidents of his death-bed have been recorded by Zatuski, the bishop of Ptock, which show that the king died ‘ill at ease, being filled with the gravest apprehensions concerning the future of his country. The family is now extinct. With him sank the glory of Poland, which was rapidly hastening to its fall. ;

After a time the diet met as usual to elect the new sovereign. The three chief candidates were James Sobi- eski, the son of the late king; the prince of Condé, a nephew of Louis XIV.; and the elector of Saxony. The elector was appointed, and, in order to qualify for the throne, abjured Protestantism. In 1699, by the peace of Carlowitz, the Turks renounced all claim over the Ukraine and Podolia, but the king was foolish enough to allow himself to be drawn into a war with the Swedes, in conse- quence of which Cracow was taken in 1702. Charles XII. of Sweden became master of the country, and de-

in Muscovite hands. He caused the liberum veto to be abolished, but it was soon restored (in 1766), in conse- quence, it is said, of Russian influence, as the ruin of Poland had been resolved upon. In 1768 a few patriots met at the little town of Bar in Podolia, and formed what was called the Confederation of Bar, their object being to free the country from foreign influence. Among the members of this confederation were the Pulawskis (Casi- mir and Joseph), Joachim Potocki, and Adam Krasiziski, bishop of Kamenets. Their military operations extended over all Poland and Lithuania, but the Russian troops stationed round the capital prevented the junction of the confederates with the national army. Moreover the con- federates, whose number amounted to about eight thousand fighting men, were badly organized. In spite of a few trifling successes they saw their efforts gradually growing weaker. Nor did a bold attempt to carry off the king result in success. Their party speedily broke up, and

Augus- posed the newly elected Frederick Augustus, in whose | Casimir Pulawski, one of the leading spirits, left the tus II. place was chosen Stanistaw Leszezytiski, palatine of Posen, | country and joined the Americans in their War of In- os a man of benevolence and learning. All the courts of | dependence, in which he soon afterwards perished. In

Europe recognized this new king except the czar Peter, and when the latter defeated Charles at the battle of Poltava in 1709 Leszezyriski was compelled to leave the country, and Augustus II., as he was styled, was restored. Stanistaw at the approach of the Russian troops retired to Lorraine, which he governed till his death at an advanced age. In this reign Poland lost Courland, which had long been one of its fiefs, but was now seized by the Russians and given by the empress Anne to her favourite Biren. The Dissi- dents, as the Protestants were called, were slowly decreas- ing in number, and in an émeute which occurred at Thorn in 1724 many were cruelly put to death. A little later, in 1733, a law was passed by which they were declared incapable of holding any office or enjoying any dignity. Augustus II. died at Warsaw in the last-mentioned year. He was a contemptible king, notorious for his private vices. At the instigation of many of the Poles, Stanistaw Leszezyriski, who was now residing in Lorraine, and had become the father-in-law of Louis XV., was induced to return to Poland, and was elected king at Warsaw by a large majority. This

election, however, was displeasing to Austria and Russia, who resolved to resist his preten-

accordingly swore to the pacta conventa, and was crowned king at Cracow in 1734. Meanwhile the unfortunate Stanistaw fled to Dantzic, where he hoped to hold out till assistance should arrive from France. ‘The city, however, was obliged to capitulate after a siege of five months ; and Stanistaw, after many adventures and narrow escapes, reached the Prussian dominions. In 1736 a diet of pacifi- cation was held at Warsaw, which was followed by a general amnesty. The condition of the country during this reign was deplorable, although Poland was engaged in no wars. Factions rent the government, and the peasantry, crushed

and suffering, betook themselves to robbery and pillage. |

The king was a man of low tastes, and abandoned himself

consequence of the efforts of these patriots the pernicious liberum veto was put a stop to, though afterwards for a short time restored ; but the partition of the country had already been secretly agreed upon by Russia, Prussia, and Austria. The idea appears to have been first suggested by Frederick the Great. M., Rambaud, in his /istoire de la Russie, gives the following as the chief causes which led to the destruction of Poland, which, in addition, had always suffered from the want of natural frontiers :—

1. The national movement in Russia, which fostered the idea of recovering the provinces in the west which had formerly been Russian territory, and spoke a language but little differing froin Russian. To this was to be added the fact that the majority of the inhabitants were members of the Greek Church. This feeling had already led to the conquest of some of the western provinces in the time of Alexis Mikhailovich as previously mentioned. Moreover, the members of the Greek Church were being constantly persecuted by the Jesuits, who had done so much mischief to the country.

2. The great desire of Prussia to become possessed of the lower part of the Vistula, with the towns of Thorn and Dantzic. A reason for Prussian interference was afforded by the Polish persecution of the ‘‘ Dissidents,” as a sample of which the cruelties committed at Thorn may be cited. ;

3. The general political condition of Poland—an anaehronism among the nations of Europe. They had become strong by centralized

_ Frede- sions and to secure the election of Frederick Augustus, | power and by harmonizing their governments with the spirit of the tick Au- the son of the late king. A Russian army arrived in the | age. In Poland there was no middle class ; for the trade in the ; a neighbourhood of Warsaw, and a party of the nobles towns was in the hands of foreigners, and especially Jews. 34 — : ; : “78 a opposed to the French influence proclaimed the Saxon. He There were to be seen a proud nobility, the members

of which were engaged in constant feuds among them- selves, and far below them miserable serfs deprived of all political rights. There was no national spirit in the country, no sympathy between the nobility and peasantry. It was the Jews who chiefly busied themselves with com- merce ; they distributed the products, selling at the same time to the serfs and their masters, and preventing the two classes of the natives of the country to a great extent from coming into contact with each other. By their efforts the economic functions of every-day life were carried on, and yet they could not be considered a real part of the nation. In the moment of danger they were not at hand to bring together distinct classes and to establish a common bond XIX. — 38

Partition of the country.

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of interest; the nation, thus consisting of men who did not understand each other, remained perplexed and divided. The peasants, who had at one time communal possession of the land, according to the old Slavonic custom, had long ago lost all their rights. Those Poles who struggled for liberty themselves were not willing to extend it to their unhappy serfs. Kosciuszko desired to see serfdom abolished; but the peasants who followed him only enjoyed their liberty daring the war, and his decree of emancipation was so vaguely expressed that it was ineffec- tual. It is strange to think that the real liberators of the peasant were the Russians, who in the revolt of 1863 gave him a portion of the land which he cultivated.

In 1772 Prussia took the palatinates of Malborg, Pomeria, and Warmia, Culm, except Dantzic and Thorn, and a part of Great Poland; Austria took Red Russia or Galicia, with a part of Podolia, Sandomir, and Cracow ; and Russia took White Russia, with all the part beyond the Dnieper. The Poles were obliged to sanction this plundering of their country in a diet held in L773: The only real benefit conferred on the nation by this diet was the introduction of a better system of education; the

Jesuits were also suppressed, and their immense estates |

became national property. Although the country had

that he cried out on that occasion, “ Finis Polonie”; this he always denied till the day of his death. After storming the suburb Praga, Suwaroff took Warsaw, and the city was sacked with great cruelty. The kingdom of Poland was now at an end, and the third division took place. Austria had Cracow, with the country between the Pilica, the Vistula, and the Bug; Prussia had the capital, with the territory as far as the Niemen; and the rest went to Russia. Stanislaus resigned the crown at Grodno on April 25, 1795; he was summoned to St Petersburg, where he is said to have endured many indignities from the emperor Paul, who never allowed him to remain seated in his presence. There he died in 1798.

Many of the Poles now entered foreign services, as, for instance, the legion which followed the fortunes of France ; but the fate of these exiled patriots was often a sad one. Many perished on the burning sands of St Domingo. Many were killed in the famous expedition to Moscow. The Poles looked anxiously to the success of Napoleon. But all that the conqueror did for them was to form the duchy of Warsaw, consisting of six departments—Posen,

| Kalisz, Ptock, Warsaw, Lomza, and Bydgoszez—with a

population of more than two millions, which he united with Saxony.

A resettlement of Poland took place by the treaty of Resettle- Vienna (1814). (1) Austria was to have Galicia and the ment by | salt-mines of Wieliczka. treaty

heen mutilated in this fashion, it yet enjoyed tranquillity for a short time, and even made some material progress. Thus some useful manufactures were introduced. In

1788 a remarkable diet was opened which lasted four years,—the longest on record, for the others had only endured a few days or a few weeks at most. At this many important changes were .introduced, such as the amelioration of the condition of the burghers and peasants ; but it was now too late. On this occasion the liberum veto was decisively suppressed and the throne declared hereditary. The elector of Saxony, grandson of the wretched and incapable Augustus III., was declared the successor of Stanislaus. The Roman Catholic was to be the dominant religion, but the Dissidents were to be toler- ated. The burghers were to send deputies to the diet on the same footing as the nobles. The peasants were not yet emancipated, but their condition was improved. The new constitution was finally promulgated on the 3d May 1791. The king and the two chambers took the oaths to preserve it. The country now seemed to breathe afresh, and to be established upon a new basis. But the selfish- ness of the Polish nobles, who had always been the evil genius of the country, overturned all the arrangements. Among the most prominent non-contents was Felix Potocki, who was anxious to restore to the nobility the privileges they had lost by the new constitution. In concert with him were Francis Xavier Branicki and Severin Rzewuski, who sought the assistance of foreign powers, and especially Russia. These enemies of their country formed, in 1792, the Confederation of Targovica, and soon afterwards at their instigation Russian troops invaded Poland and Lithuania. The feeble king, Stanis- laus Augustus, made no resistance ; he signed the conven- tion of Targovica, and the Russians occupied Warsaw. In 1793 another treaty of partition was signed, by which Prussia acquired the remainder of Great and a portion of Little Poland, and the Russian boundary was advanced to the centre of Lithuania and Volhynia. An insurrection now broke out under the leadership of Thaddeus Kosci- uszko, which at first made head against the Prussians and Russians, who had invaded the country from all quarters ; but

the successes of the insurgents were stained by the murders committed by the popular party at Warsaw. Suwaroff now entered the country, and Kosciuszko was finally defeated and made prisoner at the battle of Macie-Jowice in 1794; there is no truth, however, in the assertion

(2) Posen was to belong to Prussia. This power was also confirmed in what it had gained at the first partition. (3) The city and district of Cracow were to form an independent republic under the guarantee of the three powers. This historical town was annexed by Austria in 1846 in defiance of all international law. (4) The remainder of ancient Poland, comprising the chief parts of the recent grand-duchy of Warsaw (embracing a tract bounded by a line drawn from Thorn to near Cracow on the west, to the Bug and Niemen in the east), reverted to Russia, and was to form a constitutional kingdom subject to the czar. This constitution, consider- ing the circumstances, was a very liberal one. Poland was to be governed by responsible ministers, a senate, and a legislative chamber. There were to be a national army under the national flag and a separate budget. Polish was to be the official language; personal liberty and the freedom of the press were also guaranteed. It was obvious from the first that it would be difficult to unite a country with such a liberal constitution to another still governed by a patriarchal despotism. Zajacek was named viceroy, and the grand-duke Constantine, brother of the emperor Alexander, took the command of the army.

The rebellions of the Poles in 1830 and 1863 more properly belong to Russian history ; perhaps, however, a few facts connected with them may be appropriately intro- duced here.

Considering the delicate position of affairs in Russian Poland, things had worked fairly well. The impulse to the Polish revolution was undoubtedly given by the French. It was begun by some students, who hoped to seize the grand-duke Constantine at his residence, Belvedere, in the vicinity of Warsaw. In the evening of November 29, 1830, they accordingly proceeded to the palace, but did not succeed in capturing the grand-duke. The city, however, rose, the troops fraternized with the people, and the chief command was entrusted to General Chlopicki, a veteran of the wars of Napoleon. Early in 1831 a large Russian army, commanded by Diebitsch,

advanced to reduce them to submission. Chlopicki laid down his dictatorship, but the Poles pursued the insurrection with vigour under the command of Prince Adam Czartoryski. They were disappointed in their hopes of assistance from foreign powers. On the 8th September Warsaw surrendered to

Vienna.

Rebellio of 1830.

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Paskewitch, who had taken the command, Diebitsch having | the closest affinities with the Czech or Bohemian and

died of cholera (June 10th), and a few weeks afterwards the grand-duke Constantine died at Vitebsk. On February 26, 1832, Poland was declared a Russian province,

Rebellion – No other outbreak occurred till 1863, but for some of 1363. time previously the country had been disturbed. On the

29th November 1860, on the occasion of the thirtieth anniversary of the revolution of 1830, many political manifestations took place both in the churches and streets, and portraits of Kosciuszko and Kilinski, a patriot of the time of the last partition, were distributed. Some riots took place, and unfortunately several persons were killed. These proceedings were followed’ by concessions from the emperor Alexander, who established municipal

institutions in Warsaw and the chief cities of the king-

dom. The Russian czar was acting under the advice of Wielopolski, a Pole, who was appointed director of public instruction and worship. Riots, however, still continued, and in 1862 the – grand-duke Constantine was

named viceroy. On the night of January 15, 1863, a secret conscription was held, and the persons sus- pected of being most hostile to the Government were dragged from their beds and enlisted as soldiers. Immedi- ately after this the insurrection broke out, which was directed by a secret committee (Rzad), the proceedings of which were as mysterious as those of the Fehmgerichte. Soon after bands of rebels began to make their appearance in the Polish forests. There were, however, no regular battles between the Russian troops and the Poles,—only guerilla fighting, in which the Poles, under the greatest disadvantages, showed splendid heroism. The secret emissaries of the revolutionary Government, armed with daggers, succeeded in putting to death many Russian spies—not the least memorable case being that of the Jew Hermani, stabbed while on the staircase of the Hotel de l'Europe at Warsaw. On the other hand the chiefs of the insurgents captured were shot or hanged. Langiewicz held out for some time, but was defeated by the Russians, and succeeded in making his escape into Galicia. A reign of terror was inaugurated by General

Lusatian Wendish (see Stavonic Laneuacss). Unlike the people of other Slavonic countries, the Poles are com- paratively poor in popular and legendary poetry, but such compositions undoubtedly existed in early times, as may be seen by the writings of their chroniclers ; thus Gallus translated into Latin a poem written on Bolestaw the Brave, and a few old Polish songs are included in Wojcicki's Inbrary of Ancient Writers. A great deal of the early literature written in Poland is in Latin. The earliest specimen of the Polish language is the so-called Psalter of Queen Margaret, discovered in 1826 at the convent of St Florian. The date of the MS. appears to be the middle of the 14th century, and probably in its present form it is only a copy of a much older text; there is also a trans- lation of the fiftieth psalm belonging to thé 13th cen- tury.!_ The ancient Polish hymn or war song, '"'Piesn Boga Rodzica," was an address to the Virgin, sung by the Poles when about to fight. The oldest manuscript of this pro- duction is dated 1408, and is preserved at Cracow. By a legend which subsequently grew up the composition of it was assigned to St Adalbert. John Lodzia, bishop of Posen from 1335 to 1346, composed several religious songs in Latin.

The next monument of Polish literature to which we come is the Bible of Queen Sophia or Bible of Szarosz- patak. It is imperfect, and only contains

the early books, viz., the Pentateuch, Joshua, Ruth, and Kings; there are, however, fragments of three others. It is said to have been written for Sophia, the fourth wife of Jagielto, about the year 1455. It has been edited with great care by Matecki. Five religious songs in Polish dating from the 15th century have been preserved; they are ascribed to Andrew Slopuchowski, prior of the monastery of the Holy Cross on Lysa Gora. There is also the fragment of a hymn in praise of Wickliffe. To these fragments may be added the prayer book of a certain Wactaw, a sermon on marriage, and some Polish glosses. These are all the exist- ing memorials of the Polish language before the 16th century. ———

Perhaps a few words should be said concerning the The writers in Latin. Martin Gallus lived in Poland between Latin 1110 and 1135. From his name he has been supposed by 270″

Mouravieff, and all attempts at reconciliation made by the great powers of Europe were useless. By May 1864 the

rebellion was quite suppressed, and it will be seen by the ome

results that it cost Poland dear. The kingdom of Poland now ceased to exist; it has been parcelled out into six governments. The Russian language was ordered to be used in all public documents instead of Polish, and the university of Warsaw has been Russified, all lectures now being delivered in that language.

We have not dwelt upon the terrible massacres of the Polish nobles by the peasants in Galicia in 1846, said to have been instigated by the Austrian Government. This province has been tolerably quiet since, but the Poles have to struggle with the large Ruthenian or Red-Russian popu- lation, speaking a different language, and adherents of the Greek Church or Uniates.

In Prussian Poland, though it is but fair to add that we hear no stories of massacres, the Germanization of the pro- vince has been more complete. Posen will soon be lost as a Polish town, and many historical places have had their uames obliterated for such substitutes as Bismarcksdorf and Sedan.

PowuisH LITERATURE.

The Polish Language, according to the latest statistics, is still spoken by nearly ten millions of people, distributed, according to the Revue Slave (Warsaw, 1878, vol. i. p. 78), as follows :—in Russia, 4,640,000; in Austria, 2,444,200; in Prussia, 2,405,800; in Turkey, 10,000. It belongs to the western branch of the Slavonic tongues, and exhibits

some to have been a Frenchman, and we must remember that Poland swarmed at that time with foreign ecclesias- tics. Lelewel, the Polish historian, considers that it is merely a translation into Latin of some such name as Kura, signifying “a fowl.” Others suppose him to have been an Italian, or a monk from the convent of St Gall in Switzerland. He has plenty of legends to tell us, and writes altogether in a poetical style, so that his prose seems to fall into rhythm unconsciously. His quotations from the classics, Sallust, Lucan, and others, show the extent of his reading. Gallus was followed by Matthew Cholewa and Vincent Kadlubek, two bishops of Cracow, and Bogufal or Boguchwal (Gottlob), bishop of Posen, who all used Latin. The work of Kadlubek is more ornate in dictton than that of Bogufal and for a long time enjoyed great popularity. He was born in 1160, educated at the university of Paris, and died in Poland in 1223,as aCistercian monk. His Latin, like that of Gallus, is far from classical, but he writes with spirit and throws a good deal of light upon the events of his time.

| The education of the country was wholly in the hands of

the ecclesiastics, many of whom were foreigners. In this way we must explain the great prevalence of the Latin language. Such a system would be sure to stifle all national outgrowth, and accordingly we have among the

1 The Psalter is called after Margaret, the first wife of King Louis, who died in 1349, bya mere conjecture. Caro thinks it more probable that the book belonged to Mary, his daughter.

Dlugosz.

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Poles none of those early monuments of the language which | Poles who have made themselves known beyond the limits

other countries boast. For instance, there are no béliné or legendary poems, such as are found among the Russians, although many passages in the ancient chroniclers from

their poetical colouring seem to be borrowed from old | songs or legends, and the first verses of some of these |

compositions have been preserved. Mention may here be made of other chroniclers such as Martin the Pole (Polonus), who died in 1279 or 1280, and Jan of Czarnkow, who died in 1389; the latter was the historian and panegyrist of Kazimiérz the Great. With the reign of Kazimiérz III. (1333-1370) must be associated the statutes of Wislhica. Jadwiga, the wife of Jagielto, was mainly instrumental in creating the university of Cracow, which was not founded, however, till 1400. In this institution for many years all the great men of Poland were trained—among others Gregory of Sanok, Dlugosz, and Copernicus. Kazimiérz the Great may be said to have laid the foundation of this

university. Having obtained the consent of Pope Urban |

V., he established at Cracow a studiwm generale on the model of the university of Bologna. It consisted of three faculties—Roman law, medicine, and philosophy. But the aristocratic youth still preferred frequenting the universities of Prague, Padua, and Paris, and accordingly the newly- founded studium languished. Jadwiga, however, obtained from Boniface IX. permission to create a new chair, that of theology ; and the university of Cracow was remodelled, having been reorganized on the same basis as that of Paris. Another university was founded later at Vilna by Batory, and one at Zamosé by the chancellor Zamoiski. were also good schools in various places, such as the Collegium Lubrafiskiego of Posen and the school of St Mary at Cracow.

The first press from which books in the Polish language

appeared was that of Hieronymus Wietor, a Silesian, who | A few fragments printed |

commenced publishing in 1515. in Polish had appeared before this, as the Lord's Prayer in

the statutes of the bishops of Breslau in 1475, the story of |

Pope Urban in Latin, German, and Polish in 1505, &c.;

but the first complete work in the Polish language appeared | from the press of this printer at Cracow in 1521, under the |

title Speeches of the Wise King Solomon. The translation was executed by Jan Koszycki, as the printer informs us in the preface, and the work is dedicated to Anna Wojnicka, the wife of a castellan. In 1522, a Polish translation of Ecclesiastes appeared from that press, and before the conclusion of that year Zhe Life of Christ, with woodcuts, translated into Polish by Balthasar Opec. presses were soon established. Printers of repute at Cracow, during the 16th and beginning of the 17th century, were Sybeneicher and Piotrkowezyk.

Little as yet had been produced in Polish, as the chroniclers still adhered to Latin; and here mention must be made of Jan Dlugosz, who called himself Longinus. He was bishop of Lemberg, the capital of Galicia, and has left usa very valuable history which has merits of style and shows considerable research. So anxious was Dlugosz to make his work as perfect as he could that he learned Russian so as to be able to read the Chronicle of Nestor. The best part of his book is that which treats of the period between 1386 and 1480. About 1500 was written an interesting little work entitled " Memoirs of a Polish Janissary" (Pamietniki Ianczara Polaka). written in the Polish language, it was probably the pro- duction of a Serb, Michael Konstantinovich of Ostro- vitza. He was taken prisoner by the Turks in 1455 and served ten years among the Janissaries, after which he

escaped into Hungary. About this time also flourished

Nicholas Copernicus, a native of Thorn, one of the few

There |

In the year 1474 a press was set up in | the latter city, where Giinther Zainer printed the first book. |

Many other |

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of their country.

The Poles call the period between 1548 and 1606 their’ golden age. Poland was the great land of eastern Europe, and owing to the universal toleration encouraged by the Government Protestantism was widely spread. Many of the chief nobility were Calvinists, and the Socini came to reside in the country. All this, however, was to pass away under the great Jesuit reaction. At Rakow in Poland was published the catechism of the Socinian doctrines in 1605. The Jesuits made their appearance in Poland in 1564, and soon succeeded in getting the schools of the country into their hands. Besides extirpating the various sects of Pro- testants, they also busied themselves with destroying the Greek Church in Lithuania. Latin poetry was cultivated with great success by Clement Janicki (1516-1543), but the earliest poet of repute who wrote in Polish is Rej of Nagtowice (1505-69). After a somewhat idle youth he betook himself to poetry. He was a Protestant, and among other religious works translated the Psalms. His best work was Zwierciadto albo zywot Poczciwego Caowieka (“The Mirror or Life of an Honourable Man”),—a some- what tedious didactic piece. He was also the author of a kind of play—a mystery we may term it, and productions of this sort seem to have been common in Poland from a very early time—entitled Life of Joseph in Egypt. This piece is interesting merely from an anti- quarian point of view; there is but little poetry in it. It teems with anachronisms; thus we have mention of the mass and organs, and also of a German servant.

Jan Kochanowski (1530-1584), called the prince of Polish poets, came of a poetical family, having a brother, a cousin, and a nephew who all enriched the literature of their country with some productions. Kochanowski studied for some time at the university of Padua, and also resided in Paris, where he

made the acquaintance of Ronsard, then one of the most celebrated poets. He exercised his talents in various ways; thus he has left Zhe Game of Chess, an imitation of Vida, and Proporzec albo Hold Pruski ("The Standard or Investiture of Prussia"), where he describes the fealty done by Albert of Brandenburg to Sigismund Augustus. He also wrote the first regular play, and executed a translation of the Psalms. The title of his play —a piece of one act, with twelve scenes—is The Despatch of the Greek Ambassadors. It is written in rhymeless five-foot iambics, and is altogether a product of the Renaissance, reminding us of some of the productions of George Buchanan. Rhyme is employed in the choruses only. It was acted on the marriage of the chancellor Jan Zamoiski with Christine Radziwitt, in the presence of King

| Stephen and his wife, at Ujazdowo near Warsaw, in 1578.

The poet's most popular work, however, is his Treny or " Lamentations," written on the death of his daughter Ursula. These beautiful elegies have been justly praised by Mickiewicz ; they are enough to raise Kochanowski far above the level of a merely artificial poet. Besides poems in Polish, he also wrote some in Latin. It will be observed that we get this double-sided authorship in many Polish writers. They composed for an exclusive and learned circle, certainly not for the Jew, the German trader of the town, or the utterly illiterate peasant. It may be said with truth of Kochanowski that, although the form of his poetry is classical and imitated from classical writers, the matter is Polish, and there is much national feeling in what he has left us. Mention must also be made of his epigrams, which he styled " Trifles " (Fraszkz) ; they are full of spirit and geniality. Stanislaus Grochowski (1554-1612) was a priest ; but his poetry is of little merit, although he was celebrated in his time as a writer of panegyrics. His satire Babie Kolo ("The Women's Circle "') gave offence on account

Kochan-

Szymono- wicz.

LITERATURE. |

of its personalities. A great partisan of the Catholics in the time of Sigismund III. was Caspar Miaskowski, whose Waleta Wtoszczonowska (“Farewell to his Native Country”) deserves mention. Szarzytiski, who died young in 1581, deserves notice as having introduced the sonnet to the Poles. This species of poetry was afterward to be carried to great perfection by Mickiewicz and Gaszynski. Szymonowicz (1554-1624) was a writer of good pas- torals. Although they are imitated from classical writers, he has introduced many scenes of national life, which he describes with much vigour. Among the best are “The Lovers,” “The Reapers,” and “The Cake” (Kotacz). Mickiewicz is very loud in his praise, and considers him one of the best followers of Theocritus. The condition, however, of the Polish peasants was too miserable to admit of their being easily made subjects for bucolic

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Sigismund ITI. Besides the Latin histories of Wapowski and Gwagnin (Guagnini, of Italian origin), we have the first historical work in Polish by Martin Bielski, a Pro- testant, viz., Kronika Polska, which was afterwards con- tinued by his son. The author was born in 1495 on his father’s estate, Biata, and was educated, like so many other

| of his illustrious contemporaries, at the university of Cra-

cow. He lived to the age of eighty; but, however great were the merits of his Chronicle, it was long considered a suspicious book on account of the leanings of the author to Calvinism. After his death his work was continued by his son Joachim (1540-1599). There is also a Chronicle by Bartholomew Paprocki. In 1582 was also published the Chronicle of Stryjkowski, full of curious learning, and still of great use to the student of history. Five years later appeared the Annales Polonie of Sarnicki. The

poetry. There is an artificial air about the, idyls of | last three works are in Latin.

Szymonowicz which makes one feel too keenly that they A few words may be said here about the spread of Spread are productions of the Renaissance; one of their best | Protestantism in Poland, which is so intimately mixed up of Pro- features is the humane spirit towards the miserable | with the development of the national language. The eal

peasantry which they everywhere display. Another ex- cellent writer of pastorals was Zimorowicz, a native of Lemberg, who died at the early age of twenty-five. Some of his short lyrics are very elegant, and remind us of Herrick and Carew,—e.g., that beginning " Ukochana Lancelloto ! Ciebie nie prosze o ztoto." Another writer of pastorals, but not of equal merit, was Jan Gawinski, a native of Cracow. Some good Latin poetry was written by Casimir Sarbiewski, better known in the west of Europe as Sarbievius (d. 1640). He was considered to have approached Horace more nearly than any other modern poet, and a gold medal was given him by Pope Urban VIII. Martin Kromer (1512-1589) wrote a history of Poland in thirty books, and another volume, giving a description of the country and its institutions,—both in Latin. The history is written in an easy style and is a work of great merit. A poet of some importance was Klonowicz (1545-1602), who Latinized his name into Acernus, Alon being the Polish for maple, and wrote in both Latin and Polish. Sometimes he is descriptive, as in his Polish poem entitled (lis ("The Boatman"), in which he gives a detailed account of the scenery on the banks of the Vistula. There is some poetry in this composition, but it alternates with very prosaic details. In another piece, Rhoxolania, in Latin, he describes the beauties of Galicia. Occasionally he is didactic, as in Worek Judaszow ("The Bag of Judas") and Victoria Deorum, where, under the allegory of the gods of Olympus, he represents the struggles of parties in Poland, not without severely satirizing the nobility and ecclesiastics. A curious work called Quincunz, written by Orzechowski, is concerned with religious pol- emics. Andrew Modrzewski, a Protestant, in his work De Republica Emendanda (1551), recommended the establishment of a national church which -should be independent of Rome, something upon the model of the Anglican.

A florid Jesuitical style of oratory became very popular in the time of Sigismund IIL, not without rhetorical power, but frequently becoming tawdry. _The chief repre- sentative of this school was Peter Skarga, one of

the main agents in extirpating Calvinism in Poland and the Greek Church in Lithuania. Among his numerous writings may be mentioned Lives of the Saints, Discourses on the Seven Sacraments, and especially his sermons preached before the diet, in which he lashed the Poles for their want of patriotism and prophesied the downfall of the country. Mecherzynski, in his “History of Eloquence in Poland” (Historya Wymowy w Polsce), especially praises his two funeral sermons on the burial of Anna Jagieltonka, widow of Stephen Batory, and Anna of Austria, first wife of

doctrines of Huss had entered the country in very early times, and we find Polish recensions of Bohemian hymns ; even the hymn to the Virgin previously mentioned is sup- posed to have a Czech basis. The bishops were soon active against those who refused to conform to the doctrines of the Roman Church. Thus we find that Bishop Andrew of Bnin seized five Hussite priests and caused them to be burnt in the market of Posen in 1439. A hundred years afterwards a certain Katharina Malcher, on account of her Utraquist opinions, was condemned by Gamrat, the bishop of Cracow, to be burnt, which sentence was accordingly carried out in the ragmarket at Cracow. As early as 1530 Lutheran hymns were sung in the Polish language at Thorn. In Konigsberg John Seklucyan, a personal friend of Luther, published a collection of Christian Songs. He was born in Great Poland, and was at first a Roman Catholic priest in Posen, but afterwards embraced the Protestant faith and was invited by Duke Albert as a preacher to Konigsberg, where he died in 1578. He exe- cuted the first translation of the New Testament in 1551. Four years afterwards appeared a complete Polish Bible published by Scharffenberg at Cracow. In 1553 appeared at Brzes¢é the Protestant translation of the whole Bible made by a committee of learned men and divines, and published at the expense of Nicholas Radziwilt, a very rich Polish magnate who had embraced the Protestant doctrines. This book is now of great rarity because his son Christopher, having been induced to become a Roman Catholic by the Jesuit Skarga, caused all copies of his father’s Bible which he could find to be burnt. One, how- ever, is to be seen in the Bodleian Library, and another in the library of Christ Church, at Oxford. A Socinian Bible was issued by Simon Budny in 1570 at Nieswiez, as he professed to find many faults in the version issued under the patronage of Radziwill; in 1597 ap- peared the Roman Catholic version of the Jesuit Wujek ; and in 1632 the so-called Dantzic

Bible, which is in use among Protestants and is still the most frequently reprinted.

Up to this time Polish literature, although frequently Macaronic rhetorical and too much tinctured with classical influences, period.

had still exhibited signs of genius. But now, owing to the frivolous studies introduced by the Jesuits, the so-called macaronic period supervened, which lasted from 1606 to 1764, and was a time of great degradation for the language and literature. The former was now mixed with Latin and classical expressions; much of the literature consists of fulsome panegyric, verses written on the marriages and funerals of nobles, with conceits and fantastic ideas, devoid of all taste, drawn from their

coats of arms. The poets of this period are, as may | nobleman underwent is furnished by the instructions

be imagined, in most cases mere rhymsters; there are, however, a few whose names are worth recapitulating, such as Wactaw Potocki (c. 1622-c. 1696), now known to have been the author of the Wojna Chocimska, or “ War of Khotin,” the same campaign which afterwards formed the subject of the epic of Krasicki. At first the author was supposed to have been Andrew Lipski, but the real poet was traced by the historian Szajnocha. The epic, which remained in manuscript till 1850, is a genuine representation of Polish life; no picture so faithful ap- peared till the Pan V’adeusz of Mickiewicz. Moreover Potocki had the good taste to avoid the macaronic style so much in vogue; his language is pure and vigorous. He does not hesitate to introduce occasionally satirical remarks on the luxury of the times, which he compares, to its disadvantage, with the simplicity of the old Polish life. There is also another poem attributed to Potocki called the Vew Mercury. In one passage he censures King Michael for ceding Podolia to the Turks. Samuel Twar- dowski (1600-1660) was the most prolific poet of

the period of the Vasas. His most important poem is Wtadystaw EV., King of Poland, in which he sings in a very bombastic strain the various expeditions of the Polish monarch. III. and Wtadystaw IV., and Rudawski, who describes events from the acces- sion of John Casimir to the peace of Oliwa (1648-1660) ; and as valuable materials for history may be mentioned the five huge volumes of Andrew Chrysostom Zatuski (1711), bishop of Warmia. This work is entitled Hpistole Historico-Familiares. It would be impossible to recapitu- late here the great quantity of material in the shape of memoirs which has come down, but mention must be made of those of John Chrysostom Pasek, a nobleman of Masovia, who has left us very graphic accounts of life and society in Poland; after a variety of adventures and many a well-fought battle, he returned to the neighbour- hood of Cracow, where he died between 1699 and 1701. Some of the most characteristic stories illustrating Polish history are drawn from this book. A later period, that of the miserable epoch of Augustus IIL. is described very graphically in the memoirs of Matuszewicz, first edited by Pawinski at Warsaw in 1876. Relating to the same period are also the memoirs of Bartholomew Michalowski (Pamietniki Lartlomigja Michalowskiego). A curious in- sight into the course of education which a young Polish

which James Sobieski, the father of the celebrated John, gave to Orchowski the tutor of his sons. This has been twice printed in comparatively recent times (Jnstrukcya Jakoba Sobieskiego kasztelana Krakowskiego dana panu Orchowskiemu ze strony synéw, Vilna, 1840). The old gentleman in his aristocratic imperiousness frequently reminds us of the amusing directions given by Sir John Wynne to his chaplain, quoted in Pennant’s Jour in Wales.

A History of the Inthuanians in Latin was published by the Jesuit Koiatowicz; the first volume appeared at Dantzic in 1650.

A notable man was Joseph Andrew Zatuski, bishop of Zatuski.

Kieff, a Pole who had become thoroughly Frenchified,—so much so that he preached in French to the fashionable congregations of Warsaw. He collected a splendid library of about 300,000 volumes and 15,000 manuscripts, which he bequeathed to the Polish nation ; but it was afterwards carried off to St Petersburg, where it formed the founda- tion of the imperial public library. According to Nitsch- mann in his Geschichte der

Polnischen Litteratur—a work which has been of service in the preparation of this article—the books were transported to Russia very care- lessly, and many of them injured by the way. It was especially rich in works relating to Polish history. Kon- arski edited in six volumes a valuable work entitled Volumina Legum, containing a complete collection of Polish laws from the time of the statute of Wislica. He did much good also in founding throughout the country schools for the education of the sons of the upper classes, but as yet nothing had been done for popular education properly so-called. About the close of this period we have some valuable writers on Polish history, which now began to be studied critically, such as Hartknoch in his Alt- und Neues Preussen (1684), a work in which are pre- served interesting specimens of the old Prussian language, and Lengnich (1689-1774), author of the valuable Jus Publicum Regni Polonizx, which appeared in 1742.

We now come to the reign of the last Polish king, Stan- istaw Poniatowski, and the few quiet years before the final division of the country, during which the French taste was all-powerful. This is the second great period of the development of Polish literature, which has known nothing of medieval romanticism. The literature of the first or Renaissance period gives us some good poets, who although occasionally imitators are not without national feeling, and a goodly array of chroniclers, most of whom made use of Latin. In the second or French period we get verse- makers rather than poets, who long to be Frenchmen, and sigh over the barbarism of their country ; but the study of history in a critical spirit is beginning under the influence of Naruszewicz, Albertrandi, and others. In the third period, that of modern romanticism, we get true national- ism, but it is too often the literature of exile and despair. Here may be mentioned, although living a little time before the reign of Stanistaw, a Polish poetess, Elizabeth Druzbacka (1695-1760), whose writings show a feeling for nature at a time when verse-making of the most artificial type was prevalent throughout the country. The portrait prefixed to the Leipsic edition of her works is a striking one, representing a handsome, intel- lectual-looking woman, dressed in the garb of some religious order. Her Life of David in verse appears tedious, but many of the descriptions in the Seasons

_Krasicki.

of the Dalmatian Gundulié.

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are elegant. Unfortunately she introduces Latinisms, so that her Polish is by no means pure. A national theatre was founded at Warsaw in 1765 under the influence of the court, but it was not till long after- wards that anything really national connected with the drama appeared in Poland. Thomas Kajetan Wegierski, who was chamberlain to the king, enjoyed a considerable reputation among his countrymen for his satirical writing. He was a kind of Polish Churchill, and like his English parallel died young (1755-1787). His life also appears to have been as irregular as Churchill's. In consequence of an attack on the empress of Russia, he was compelled to leave Poland, and accordingly made a tour in Italy, France, America, and England, dying at Marseilles at the early age of thirty-three. His poetry shows the influence of the French taste, then prevalent throughout Europe. In times of great national disasters he deserves to be remem- bered as a true patriot; but the spirit of his poetry is altogether unwholesome. It is the wailing cry of a mori- bund nation. was Trembecki (1722-1812), whose sympathies were too much with the Russian invaders of his country. He was little more than a fluent poetaster, and is now almost for- gotten. One of his most celebrated pieces was Zofjowka, written on the country seat of Felix Potocki, a Polish magnate, for this was the age of descriptive as well as didactic poetry. Perhaps the English gave the hint in such productions as ‘“‘Cooper's Hill.” The old age of Trembecki appears to have been ignoble and neglected ; he had indeed “fallen upon evil days and evil tongues”; and when he died at an advanced age all the gay courtiers of whom he had been the parasite were either dead or had submitted to the Muscovite yoke. He comes before us as a belated epicurean, whose airy trifles cannot be warbled in an atmosphere surcharged with tempests and gunpowder. The end of the 18th century was not the period for a court poet in Poland.

The most conspicuous poet, however, of the time was Igfiatius Krasicki, bishop of Warmia (1735-1801). He was the friend of Frederick the Great and a prominent member of the king's literary club at Sans Souci. Krasicki wrote an epic on the war of Khotin,—the same as had furnished the subject of the poem of Potocki, of which Krasicki in all probability had never

heard, and also that Krasicki's poem is at best but a dull affair, in fact a pale copy of a poor original, the Henriade of Voltaire. His mock heroics are, to say the least, amusing, and among these may be mentioned Myszeis, where he describes how King Popiel, according to the legend, was eaten up by rats. His Jlonachomachia is in six cantos, and is a satire upon the monks. The bishop was also the writer of some pretty good comedies. In fact most styles of composition were attempted by him,—of course satires and fables among the number. He presents himself to us much more like a transplanted French abbé than a Pole. In the year 1801 he travelled to Berlin, and died there after a short illness. Among his other works the bishop published in 1781-82 in two volumes a kind of encyclopedia of belles lettres entitled Zbibr Wradomoscr. His estimates of various great poets are not very accurate. Of course he finds Shakespeare a very "incorrect" author, although he is willing to allow him considerable praise for his vigour. Another bishop-poet was Adam Naruszewicz. The existence of so many ecclesi- astical writers was a natural feature in Polish literature; they formed the only really cultured class in the community, which consisted besides of a haughty ignorant nobility living among their serfs, and (at a vast distance) those serfs themselves, in a brutalized condition, Burghers there were, properly speaking, none, for most of the citizens in

the large towns were foreigners governed by the Jus Magdeburgicum. Naruszewicz has not the happy vivacity of Krasicki; he attempts all kinds of poetry, especially satire and fable. He is at best but a mediocre poet ; but he has succeeded better as a historian, and especially to be praised is his " History of the Polish Nation" (Historya Narodu Polskiego), which, however, he was not able to carry further than the year 1386. He also wrote an account of the Polish general Chodkiewicz and translated Tacitus and Horace. Interesting memoirs have been pub- lished by Kilinski, a Warsaw shoemaker, and Kosmian, state referendary, who lived about this time and saw much of the War of Independence and other political affairs. Among the smaller poets of this period may be mentioned Karpitski (1741-1828), a

writer of sentimental elegies in the style then so very much in fashion, and Kniaznin, who nourished his muse on classical themes and wrote some odes ; but his poetry is not of a high order. He was the court poet of Prince Adam Czartoryski at Pulawy, and furnished odes in commemoration of all the important events which occurred in the household. He lost his reason on the downfall of Poland, and died after eleven years' insanity in 1807. Julian Ursin Niemcewicz (1757— 1841) was one of the most popular of Polish poets at the commencement of the present century (see NIEMCEWICZ). His most popular work is the "Collection of Historical Songs" (Spiewy Listorycene), where he treats of the chief heroes of Polish history. Besides these he wrote one or two good plays, and a novel in letters, on the story of two Jewish lovers. John Paul Woronicz (1757-1829) born in Volhynia, and at the close of his life bishop of Warsaw and primate of Poland, was a very eloquent divine, and has been called the modern Skarga. A valuable worker in the field of Slavonic philology was Linde, the author of an excellent Polish dictionary in six volumes. For a long time the cultivation of Polish philology was in a low state, owing to the prevalence of Latin in the 17th century and French in the 18th. No Polish grammar worthy of the name appeared till that of Kopczynski at the close of the 18th century, but the reproach has been taken away in modern times by the excellent works of Matecki and Malinowski. Rakowiecki, who edited the Rousskaia Pravda, and Macieiowski (who died in 1883, aged ninety), author of a valuable work on Slavonic law, may here be mentioned. Here we have a complete survey of all the leading codes of Slavonic jurisprudence. At a later period (in 1856) appeared the work of Helcel, Starodawne prawa polskiégo pomniki (" Ancient Memorials of Polish Law"). Aloysius Feliriski (1771-1820) produced an historical tragedy, Barbara Radzwitt?, and some good comedies were written by Count Alexander Fredro (1793-

1876).

He introduced genuine comedy among his countrymen. The influence of Moliére can be very clearly seen in his pieces ; his youth was spent chiefly in France, where he formed one of the soldiers of the Polish legion of Napoleon and joined in the expedition to Russia. His first produc- tion was Pan Geldhab, written in 1819 and produced at Warsaw in 1821. From 1819 to 1835 he wrote about seventeen pieces and then abandoned publishing,

having taken offence at some severe criticisms. At his death he left several comedies, which were issued in a posthumous edition. There is a good deal of local colouring in the pieces of Fredro; although the style is French, the characters are taken from Polish life. From him may be said to date the formation of anything like a national Polish theatre, so that his name marks an epoch. The Poles, like many of the other nations of Europe, had religious plays at an early period. They were originally

In fact Fredro may be considered the most enter- Polish taining writer for the stage which Poland has produced, drama.

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performed in churches; but, Pope Innocent III. finding |

fault with this arrangement, the acting was transferred to churchyards. Mention has already been made of plays written by Rej and Kochanowski; they are mere fruits of the Renaissance, and cannot in any way be considered national. The wife of John Casimir, a Frenchwoman, Marie Louise, hired a troop of French actors and first familiarized the Poles with something which resembled the modern stage. The Princess Franciszka Radziwitt com- posed plays which were acted at her private residence, but they are spoken of as inartistic and long and tedious. The national theatre was really founded in the reign of Stanislaus Augustus; and good plays were produced by Bohomolec, Kamizski, Kropiriski, Boguslawski, Zablocki, and others. Perhaps, however, with the exception of the works of Fredro, the Poles have not produced anything of much merit in this line. A great statesman and writer of the later days of Polish nationality was Koltataj, born at Sandomir in 1750. He was a man of liberal sentiments, and, had his plans been carried out, Poland might have been saved. He wished to abolish serfdom and throw open state employments to all. The nobility, liowever, were too infatuated to be willing to adopt these wise measures. Like the French aristocrats with the reforms of Necker, they would not listen till ruin had overtaken them. During the last war of Poland as an independent country Koltataj betook himself to the camp of Kosciuszko, but when he saw that there was no longer hope he went to

Galicia, but was captured by the Austrians and imprisoned at Olmiitz till 1803. He died in 1812. An active co-operator with Koltataj was Salesius Jezierski, who founded clubs for the discussion of political questions, and Stanislaus Staszic, who did much for education and improved the condition of the university of Warsaw.

The reputation of all preceding poets in Poland was now destined to be thrown into the shade by the appear- ance of Mickiewicz (1798-1855), the great introducer of romanticism into the country (see Mickiewicz). Poland, as has been said before, is not rich in national songs and legendary poetry, in which respect it cannot compare with its sister Slavonic countries Russia and Servia. Collec- tions have appeared, however, by Wactaw Zaleski, who writes under the pseudonyms of Wactaw z Oleska, Wojcicki, Roger, Zegota Pauli, and especially Oskar Kolberg. Poland and Lithuania, however, abounded with supersti- tions and legends which only awaited the coming poet to put them into verse. In the year 1851 Romuald Ziefkie- wicz published Songs of the People of Pinsk, and collections have even appeared of those of the Kashoubes, a remnant of the Poles living near Dantzic. Mickiewicz had had a predecessor, but of far less talent, Casimir Brodzinski (1791-1835). He served under Napoleon in the Polish legion, and has left a sinall collection of poems, the most important being the idyl Wiestaw, in which the manners of the peasants of the district of Cracow are faithfully portrayed. The second great poet of the romantic school who appeared in Poland after Mickiewicz was Julius Stowacki (1809-1849), born at Krzemieniec. In 1831 he left his native country and chose Paris as his residence, where he died. His writings are full of the fire of youth, and show great beauty and elegance of expression. We can trace in them the influence of Byron and Victor Hugo. He is justly considered one of the greatest of the modern poets of Poland. His most celebrated pieces are Hugo ; Mnich (“The Monk”); Lambro, a Greek corsair, quite in the style of Byron; Anhelli, a very Dantesque poem express- ing under the form of an allegory the sufferings of Poland; Krol Duch (“The Spirit King”), another mysterious and allegorical poem; Wactaw, on the same subject as the Marya of Malezewski, to be afterwards noticed ; Beniowski, a long

poem in ottava rima on this strange adventurer, something in the style of Byron's humorous poems; Aordyan, of the same school as the English poet's Manfred; Lilla Weneda, a poem dealing with the early period of Slavonic history. The life of Stowacki has been published by Professor Anton Matecki in two volumes.

Mickiewicz and Stowacki were both more or less mystics, but even more we may assign this characteristic to Sigis- mund Krasiriski, who was born in 1812 at Paris, and died there in 1859. It would be impossible to analyse here his extraordinary poem WVieboska Komedja ("The Undivine Comedy"), Jrydion, and others. In them Poland, veiled under different allegories, is always the central figure. They are powerful poems written with great vigour of language, but enveloped in clouds of mysticism. 'The life of Krasisiski was embittered by the fact that he was the son of General Vincent Krasitiski who had become unpopular among the Poles by his ad- herence to the Russian Government ; the son wrote anony- mously in consequence, and was therefore called 'The Unknown Poet." Among his latest productions are his "Psalms of the Future" (Psalmy Przysztosci), which were attacked by the democratic party as a defence of aristo-

cratic views which had already ruined Poland. His friend.

Slowacki answered them in some taunting verses, and this led to a quarrel between the poets. One of the most striking pieces of Krasiriski has the title " Resurrecturis." The sorrows of his country and his own physical sufferings have communicated a melancholy tone to the writings of Krasitiski, which read like a dirge, or as if the poet stood always by an open grave—and the grave is that of Poland. He must be considered as, next to Mickiewicz, the greatest poet of the country. Other poets of the romantic school of considerable merit were Gorecki, Witwicki, Odyniec, and Gaszynski; the last-named wrote many exquisite sonnets, which ought alone to embalm his name. Wit- wicki (1800-1847) was son of a professor at Krzemieniec. He was a writer of ballads and poems dealing with rural life, which enjoyed great popularity among his country- men and had the good fortune to be set to music by Chopin. The historical works of Lelewel have already had separate mention (see LELEWEL); but here may be

specified the labours of Narbutt, Daeje Starozytne Narodu Litewskiego (“Early History of the Lithuanian People”), published at Vilna in nine volumes, and the valuable Monumenta Poloniex Historica, edited at Lemberg by Bielowski, of which four volumes have appeared, con- taining reprints of most of the early chroniclers. Bie- lowski died in 1876.

A further development of romanticism was the so-called Ukraine school of poets, such as Malezewski, Goszcezynski, and Zaleski. Anton Malezewski (1793-1826), who died at the early age of thirty-three, wrote one poem, Marya, which passed unnoticed at the time of its publication, but after its author’s death became very popular. Malczewski led a wandering life and became intimate with Byron at Venice ; he is said to have suggested to the latter the story of Mazeppa. Marya is a narrative in verse, written with much feeling and elegance, and ina most harmonious metre. The chief poem of Goszczynski is Zamek Kaniowski (“The Tower of Kanioff”). The most interesting poem of Bogdan Zaleski is his “Spirit of the Steppe” (Duch od Stepu). Other poets of the so-called Ukraine school, which has been so well inspired by the romantic legends of that part of Russia, are Thomas or Timko Padoura (who also wrote in the Malo-Russian, or Little-Russian, language), Alexander Groza, and Thomas Olizarowski. For many of the original songs and legends we must turn to the work of Messrs Antonovich and Dragomanoff. Bogdan Joseph Zaleski was born in 1802 in the Ukraine village, Boha-

Ukraine school.

Recent authors.

terka. in 1820 he was sent to the university of Warsaw, where he had Goszczynski as a fellow-student. Since 1830 he has resided in Paris. Besides the longer poem previously mentioned, he is the author of many charming lyrics in the style of the Little-Russian poems, such as Shevchenko has written in that language. Michael Grabowski (1805- 1863) belongs also to this school by his fine Melodies of the Ukraine. A poet of great vigour was Stephen Garezynski (1806-1833), the friend of

Mickiewicz, celebrated for his War Sonnets and his poem entitled The Deeds of Wactaw.

Among later authors, some of whom still survive, may be men- tioned Wincenty Pol, born in 1807 at Lublin. He wrote a fine descriptive work, Obrazy z Zycia t Podrézy (‘‘ Pictures of Life and Travel”), and also a poem, Piesn 0 Ziemi Naszej (‘Song of our Land”). For about three ycars from 1849 he was professor of geography in the university of Cracow. In 1855 he published Mohort, a poem relating to the times of Stanistaus Poniatowski. Ludwik Wtadystaw Kondratowicz (who wrote chiefly under the name of Syrokomila) was born in 1823 in the government of Minsk. His parents were poor, and he received a meagre education, but made up for it by careful self-culture. One of his most remarkable poems is his Jan Deborog, in which, like Mickiewicz, he has well described the scenery of his native Lithuania. He everywhere appears as the advocate of the sufiering peasants, and has consc- crated to them many beautiful lyrics. In Kaczkowski the Poles have a novelist who has treated many periods of their history with great success. His sympathics, however, are mostly aristocratic, though modified by the desire of progress. An important writer of history is Karl Szajnocha, born in Galicia of Czech parents in 1818. He began his labours with The Age of Casimir the Great (1848), and Bolestaw the Brave (1849), following these with Jadwiga and Jagielto, in three volumes (1855-1856),—a work which Spasovich, in his Russian History of Slavonic Literature, compares in vigour of style and fulness of colour with Macaulay’s History of England and Thierry’s Norman Conquest. Our author was still further to resemble tlie latter writer in a great misfortune ; from overwork he lost his sight in 1857. Szajnocha, however, like Thierry and the American Prescott, did not abandon his studies. His excellent memory helped him in his affliction. In 1858 he

ublished a work in which he traced the origin of Poland from the

arangians (Lechickt poczatek Polski), thus making them identical iu origin with, the Russians. He began to write the history of John Sobieski, but did not live to finish it, dying in 1868, soon after completing a history of the Cossack wars, Dwa lata dziejéw naszych (‘Two Years of Our History”). A writer of romauces of considerable power was Joseph Korzeniowski, tutor

in early youth to the poet Krasinski, and afterwards director of a school at Kharkoff. Besides some plays now forgotten, he was author of some popular novels, such as Wedréwki oryginata (‘‘ Tours of an Original”), 1848; Garbaty (‘The Hunchback”), 1852, &c. He died at Dresden in 1863. But the most fertile of Polish authors beyond all question is Kraszewski (born in 1812). His works con- stitute a library in themselves; they are chiefly historical novels, some of which treat of early times in Poland and some of its condi- tion under the Saxon kings. Up to 1879, when he cclebrated the fiftieth anniversary of his commencing authorship, he had written two hundred and fifty separate works in four hundred and forty volumes. One of the most popular of his novels is Jermota the Potter, a pathetic and noble story, which much resembles George Eliot’s Silas Marner, but appeared in 1857, some time before the publication of that work. A charge of trcason was recently brought against Kraszewski by the German Government, and he is now (1885) undergoing a sentence of imprisonment at Madgeburg. Among the various works of Kraszewski may be mentioned an interesting one on Lithuania (Zitwa), which contains many valuable accounts of Lithuanian customs ; perhaps, however, the historical and philo- logical parts of the work are not always very critically treated. * He is the author of two volumes of poetry. As lyrical poets may also be mentioned Jachowicz, JaSkowski, author of a fine poem The Beginning of Winter, Wasilewski, and Holowinski, archbishop of Moghileff (1807-1855), author of religious poems. The style of poetry in vogue in the Polish parts of Europe at the present time is chiefly lyrical. Other writers deserving mention are Cornelius Ujejski (born in 1828), the poet of the last revolt of 1863; Theophilus Lenartowicz (born 1822), who has written some very graceful poetry ; Sigismund Milkowski (born in 1820), author of romances drawn from Polish history, for the novel of the school of Sir Walter Scott still flourishes vigorously among the Poles. Among the very numerous writers of romanees may be mentioned Henry Rzewuski (1791-1866); Joseph Dzierzkowski wrote novels on aristocratic life, and Michael Czajkowski tales of adventure ; Valerius Wielogtowski (1865) gave pictures of country life. Of course at the head of all writers in this department must be con- sidered the unfortunate Kraszewski.

POLAND

In 1882 the Poles lost, in the prime of life, a very promising historian Szujski (born in 1835), and also Schmitt, who died in his sixty-sixth year. Szujski commenced his literary career in 1859 with poems and dramas; in 1860 appeared his first historical production, Rzat oka na Historye Polski (‘‘A Glance at Polish History”), which attracted universal attention; and in 1862 he commenced the publication in parts of his work Dzieje Polski (‘The History of Poland’’) the printing of which ceased in 1866. The value of this book is great both on account of the research it dis- plays and its philosophical and uuprejudiced style. One of the last works of Szujski, written in German, Die Polen und Ruthenen in Galizien, attracted a great deal of attention at the time of its appearance. Schmitt got mixed up with some of the political questions of the day—he was a native of Galicia and therefore a subject of the Austrian emperor—and was sentenced to death in 1846, but the penalty was commuted into imprisonment in Spielberg, whence he was released by the revolution of 1848. In 1863 he took part in the Polish rebellion, and was compelled to fly to Paris, whence he only returned in 1871. His chief works are fistory of the Polish People from the Earliest Times to the year 1763 (1854), History of Poland in the 18th and 19th Centuries (1866), and History of Poland from the time of the Partition (1868), which he carried down to the year 1832. In opposition to the opinion of many historians, his contemporaries, that Poland fell through the nobility and the diets, Schmitt held (as did Lelewel) that the country was brought to ruin by the kings, who always preferred dynastic interests to those of the country, and by the pernicious influence to the Jesuits. Adalbert Ketrzynski, who succeeded Bielowski in 1877 in his post of director of the Ossolinski Institute at Lemberg, is the author of some valuable monographs on the history of Poland. He was born in 1838. Kasimir Stadnicki has treated of the period of the Jagieltons ; and Szaraniewicz, professor at the university of Lemberg, has written on the carly history of Galicia. Thaddeus Wojciechowski has published a clever work on Slavonic antiquities. Xavier Liske, born in 1838, and now pro- fessor of universal history at Lemberg, has published many historical essays of considerable value, and must be a linguist of great attainments, as separate works by him have appeared in the German, Polish, Swedish, Danish, and Spanish languages. The ‘Sketch of the History of Poland” (Dzteje Polskie w Zarysie) by Michael Bobrzynski,

born in 1849 in Cracow (where he is professor of Polish and German law), is a very spirited work, and has given rise to a great deal of controversy on account of the opposition of inany of its views to those of the school of Lelewel. Vincent Zakrzewski, now professor of history at Cracow, has written some works which have attracted considerable attention, such as On the Origin and Growth of the Reformation in Poland, and After the Flight of King Henry, in which he describes the condition of the country during the period between that king's departure from Poland and the election of Stephen Batory. Smotka has published a history entitled Mieszko the Elder and his Age. Wtadystaw Wistocki has prepared a catalogue of manuscripts in the Jagielfon library at Cracow. Dr Joseph Casimir Plebafiski is now editor of the Biblioteka Warszawska, a very valuable literary journal which stands at the head of all works of the kindin Poland. He has also written a dissertation (in Latin) on the liberwim veto, which puts that institution in anew light. Felix Jezierski, the previous editor of the above-mentioned journal, published in it translations of parts of Homer, and is also the author of an excellent version of Faust.

The history of Polish literature has not been neglected. We first have the early history of Felix Bentkowski (1781-1852), followed by that of Michael Wiszniewski (1794-1865), which, how- ever, only extends to the 17th century, and is at best but a quarry of materials for subsequent writers, the style being very hcavy. A " History of Eloquence" (Historya Wymov:y w Polsce) was pub- lished by Karl Mecherzyiski. An elaborate history of Polish literature is now in course of preparation by Anton Matecki, who is the author of the best Polish grammar (Gramatyka Historyczno-Poréwnaweza Jezyka Polskiego, 2 vols., Lemberg, 1879). The Polish bibliography of Karl Estreicher, now director of the Jagielton library at Cracow, is a work of the highest importance. One of the most active writers on Polish philology and literature is Wladystaw Nehring, whose numerous contributions to the Archiv fiir Slavische Philologie of Professor Jagic entitle him to the gratitude of all who have devoted themselves to Slavonic studies. Wtadimir Spasowicz, a lawyer of St Petersburg, has assisted Pipin in his valuable work on Slavonic literature. The lectures of Professor Cybulski (0b. 1867) on Polish literature in the first half of the 19th century are written with much spirit and appreciation. The larger poetical works which appear during that time are carefully analysed.

In recent times many interesting geological and anthropo- logical investigations have been carried on in Poland. In 1868 Count Constantine Tyszkiewicz published a valuable monograph on the Tombs of Lithuania and Western Ruthenia. A diligent searcher for antiquitics is Prof. Joseph Lepkowski of Cracow, who has greatly enriched the archeological museum of his native

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In philosophy the Poles (as the Slavs generally) have produced .

but few remarkable names. Goluchowski, the brothers Andrew and John Sniadecki, the latter of whom has gained a reputation almost European, Bronistaw Trentowski, Karol Liebelt, and Joseph Kremer deserve mention. August Cieszkowski has written on philosophical and economic subjects. i present professor of philosophy at the university of Cracow, has also published some remarkable works. . :

Mention has already been made of the poetess Elizabeth Druzbacka. Female writers are not very common among Slavo- nic nations. Perhaps the most celebrated Polish authoress was Klementina Hoffmann, whose maiden name was Tanska, born at Warsaw in 1798. She married Karl Boroméus Hoffmann, and accompanied her husband, in 1831, to Passy near Paris, where she died in 1845. Her novels still enjoy great popularity in Poland. Of the poetesses of later times Gabriele Narzyssa Zmichowska (1825-1878), Maria Ilnicka, translator of Scott’s Lord of the Isles, and Jadwiga Luszczewska may be mentioned. ,

A poet of considerable merit is Adam Asnyk, born in 1838. In his poetry we seem to trace the steps between romanticism and the mniodern realistic school, such as we sce in the Russian poet Nekrasoff. In some of the flights of his Muse he reminds us of Stowacki, in the melody of his verse of Zaleski. Besides showing talent as a poet, he has also written some good plays, as ‘‘ The Jew” (Zid), Cola di Rienzi, aud Kiejstut. Other living poets

worthy of mention are Zagorski, Czerwienski, and Maria Konop- nicka, who has published two volumes of poems that have been very favourably noticed, Mention must also be made of Batucki,

Moritz Straszewski, the | WW, : ; : | years ago a cheap edition of the leading Polish classics, well

| Warszawska. (Ww.

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born at Cracow in 1887, and Narzymski (1839-1872), who was educated in France, but spent part of his short life in Cracow, author of some very popular tales.

The four centres of Polish literature, which, in spite of the attempts which have been made to denationalize the country, is fairly active, are Cracow, Posen, Lemberg, and Warsaw.

[RUSSIAN.

adapted for dissemination among the people, was published, under the title of Biblioteka Polska, at Cracow, which shows a great deal of vitality and is an interesting city. Not only are the pro- fessors of its university some of the most eminent living Poles, but it has been chosen as a place of residence by many Polish literary men. The academy of sciences, founded in 1872, celebrated the bicentenary of the raising of the siege of Vienna by Sobieski by publishing the valuable Acta Joannis III. Regis Poloniz. Some good Polish works have been issued at Posen, but it is becoming extremely Germanized, and no part of the original kingdom of Poland has undergone so much change as this. At Lemberg, the capital of Austrian Galicia, there is an active Polish press, Here appeared the Monumenta Polonizx Historica of Bielowski, previously mentioned ; but Polish in this province has to struggle with the Red-Russian or Ruthenian, a language or dialect which for all practical purposes is the same as the Southern or Little Russian. At Warsaw, since the last insurrection, the university has become entirely Russianized, and its Transactions are published in Russian ; but Polish

works of merit still issue from the press, —among others the leading Polish literary journal, ach he R. M.

POLAND, Russian. After the three dismemberments of the old kingdom, the name of Poland was chiefly re- tained by the part of the divided territory annexed to Russia. Since the insurrection of 1863, however, the name "'kingdom of Poland" has disappeared. Thencefor- ward this portion of the Russian empire is referred to in official documents only as the "territory of the Vistula," and later on as the '' Vistula governments." Nevertheless the geographical position of Russian Poland, its ethno- graphical features, its religion, and its traditions differ- entiate it so widely from the remainder of the Russian empire that the name of Poland still survives in current use. The area of this territory is 49,157 square miles, and the population exceeds 7,300,000. See Russra, and map accompanying that article.

Projecting to the west of Russia in a wide semicircle between Prussia and Austria, it is bounded on the N. by the provinces of western and eastern Prussia, on the W. by Posen and Prussian Silesia, on the S. by Galicia, and on the E. by the Russian governments of Volhynia, Vilna, Grodno, and Kovno. It consists for the most part of an undulating plain, 300 to 450 feet above the sea, which joins the lowlands of Brandenburg in the west, and the great plain of central Russia in the east. A low swelling separates it from the Baltic Sea; while in the south it gradually rises to a range of plateaus which imperceptibly blend with the spurs of the Carpathians. These plateaus, with an average height of from 800 to 1000 feet, occupy all the southern part of Poland. They are mostly covered with beautiful forests of oak, beech, and lime, and are deeply cut by the valleys of rivers and numerous streams, some being narrow and craggy, and others broad, with gentle slopes and marshy bottoms. Narrow ravines inter- sect them in all directions, and their surface often takes, especially in the east, the puszcza character,—in other words, that of wild, unpassable, woody, and marshy tracts. In these tracts, which occupy the south-eastern corner of Poland, and are called Podlasie, the neighbourhood of the Polyesie of the Pripet is felt. The Vistula, which borders these plateaus on the south-west, at a height of 700 to 750 feet, has to penetrate them before finding its way to the great plain of Poland, and thence to the Baltic. Its valley divides the hilly tracts of Poland into two parts,—the Lublin heights in the east, and the Sedomierz

(Sandomir), or central, heights in the west. These last are diversified by several ridges which run east-south-east, parallel to the Beskides, the highest of them being those of the “ Bald” or “ Holy Cross Mountains” (ysogérski, or Swietokrzyski), two summits of which respectively reach 1813 and 1961 feet above the sea. Another short ridge, the Checinski hills, follows the same direction along the Nida river, reaching 1135 feet at Zamkowa Gora. South of the Nida, the Olkusz Hills, already blended with spurs of the Beskides, fill up the south-west corner of Poland, reaching 1473 feet at Podzaincze, and containing the chief mineral wealth of the country ; while a fourth range, from 1000 to 1300 feet high, runs north-west past Czestochowo, separating the Oder from the Warta. In the north, the plain of Poland is bordered by a flat and broad swelling, 600 to 700 feet above the sea, dotted with lakes, and recalling the lake regions of north-western Russia. Its gentle southern slopes occupy the northern parts of Poland, while the province of Suwatki, projecting as a spur

| towards the north-east, extends over the flat surface of

this swelling. Wide tracts covered with sands, marshes, peat-bogs, ponds, and small lakes, among which the streams lazily flow from one marsh to another, the whole being covered with poor pine-forests and a scanty vegeta- tion, with occasional patches of fertile soil—such are the general characters of the northern border-region of the great plains of central Poland.

These plains extend in a broad belt, 150 miles wide, from the Oder to the upper Niemen and the marshes of Pinsk, gently sloping towards the west, and slowly rising towards “the woods” of Volhynia and Grodno. Few hills raise their flat tops above the surface, the irregularities of which for the most part escape the eye, and can be detected only by levellings. As far as the eye can see, it perceives a plain ; and each hill, though but a few hundred feet above its surface, is called a “gdéra” (mountain). The rivers flow in broad, level valleys, only a few hundred or even only a few dozen feet lower than the watersheds; they separate into many branches, enclosing islands, forming creeks, and covering wide tracts of land during inunda- tions. Their basins, especially in the west, are mixed up with one another in the most intricate way, the whole bearing unmistakable traces of having

been in recent gco- logical and partly in historical times the bottom of exten-

Rivers.

RUSSIAN. |

sive lakes, whose alluvial deposits now yield rich crops. The fertility of the soil and the facility of communication by land and by water have made this plain the very cradle of the Polish nationality, and every furlong of it to the Pole is rich in historical memories. The very name of Poland is derived from it,—Wielkopolska and Wielkopolane being the Slavonian for the great plain and its inhabitants.

Russian Poland belongs mostly, though not entirely, to the basin of the Vistula,—its western parts extending into the upper basin of the Warta, a tributary of the Oder, and its north-east spur (Snwatki) penetrating into the basin of the Niemen, of whieh it oecupies the left bank. For many centuries, however, the Poles have been driven back from the mouths of their rivers by the German race, maintaining only the middle parts of their basins.

The chief river of Poland, and the very cradle of the Polish nationality, is the Vistula (Pol., Wista), the Vandalus, Visula, and Istula of antiquity. It has a length of 620 miles, and a drainage area of 72,000 square miles. It rises in Galicia, in the Beskides, 3675 feet above the sea, where the Blaek and White Vistulas unite. Flowing first north-east, in an elevated valley between the Beskides and the Sandomir heights, it separates Russian Poland from Galicia, and already at Cracow has a breadth of 90 yards. It enters Russian Poland at Zawichwost, 473 feet above the sea. After having re- ceived the San, it turns north, traversing for some 35 miles a broad valley deeply cut through the plateaus of southern Poland. This valley reaches at several places a width of 10 miles between the

limestone crags which border it on both sides, the space between’

being oceupied by two alluvial terraces, where the river winds freely, divides into several branches, and frequently changes its bed. Here it has a speed of 8 feet per second, with a gradient of 1°3 to 1°5 feet per inile, and a

depth ranging from 4 to 20 feet. About Jusefow (51° N. lat.) it enters the great central plain, where it flows north and west-north-west between low banks, with a breadth of 1000 yards. Its inundations, dangerous even at Cracow, beeome still more so in the plain, where the accumulations of ice in its lower course obstruct the outflow, or the heavy rains in the Carpathians raise its level. Dams, 20 to 24 feet high, are maintained at great expense by the inhabitants for 60 miles, but they do not always prevent the river from inundating the plains of Opolic and Kozienic, the waters sometimes spreading as far as 150 niles to the east. Below Warsaw (267 feet) it frequently ehanges its bed, so that, for example, Ptock (180 feet), which formerly was on its left bank, is now on the right. About Thorn it enters Prussia, and a few miles below this town it finds its way through the Baltic ridge, flowing in a north-east direction and entering the Baltic Sea in the Frische- Haff at Dantzic. On the whole, it is what the physical geographer would call a "'voung" river, which is still excavating its bed, and probably on this account few towns of importance are situated on the Vistula in Russian Poland, the principal being Sedomierz, Warsaw, and Ptock, and the fortresses of Ivangorod and Novogeorgievsk (Modlin), while very many small towns have sprung up within short distances fromits eourse. It is navigable almost from Cracow for small boats and rafts, whieh deseend it at high water. Real navigation begins, however, only below its confluenee with the Wieprz, the middle and lower Vistula being the chief artery for the traffic of Poland. Thousands of rafts and boats of all deseriptions descend every year, with cargoes of corn, wool, timber, and wooden wares, giving occupa- tion toa large number of men. Steamers ply as far as to Sedomierz. The Vistula receives many tributaries, the most important being the San, the Wieprz, and the Bug on the right, and the Nida and the Pilica on the left. The San (220 miles) rises in Galicia, in the same part of the Carpathians as the Dneister, and flows north-west, close to the southern frontier of Poland; it is navi- gable downwards from Dynow, and is aseended by boats as far as Yarostaw in Galicia. The Wieprz (180 miles) is the chief' artery of the Lublin government; it flows north-west past Lublin and Lubartow, joining the Vistula at Ivangorod. It is navigable for small boats and rafts for 105 miles from Krasnostaw. The Bug, which deseribes a wide eurve eoncentric with those of the middle Vistula and Narew, rises to the east of Lwow (Lemberg) and flows north and west, past Hrubieszow, Chetm, and Brest-Litowski, separating the Polish provinces of

Lublin and Siedlce from Volhynia and Grodno, It joins the Vistula a few miles below its confluence with the Narew, some 20 miles below Warsaw, after a course of more than 675 miles. Only light boats (galary) are floated down this broad bunt shallow stream, whose flat and open valle is often inundated. Its great tributary, the Narew (150 mile, brings the forest-lands of Byelowezha into communication with Poland, timber being floated down from Surazh and light boats from Tykocin. The mountain-stream Nida waters the hilly tracts of Kielee, and, rapidly deseending south-east, joins the Vistula close by the Opatowiee custom-house. The Pilica rises in the south- western corner of Poland, and flows for 135 miles north and east in a broad, flat, sandy, or marshy vallcy, of evil repute for its unhealthi- ness ; it joins the Vistula at Mniszew, 30 miles above Warsaw.

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The Warta (450 miles) rises in the Chestochowo hills, 900 feet above the sea, and flows north and west past Sieradz (448 feet) and Koto. Below Czestochowo it waters a flat lowland, whose surface rises only from 2 to 5 feet above the level of the river, and the inhabitants have a constant struggle to keep it to its bed; the country is, however, so low that every spring an immense lake is formed by the river at the mouth of the Ner ; as regards its right hand tributaries, it is almost impossible to define them from those of the Bzura, tributary of the Vistula, amidst the marshy grounds where both take their origin. The Warta turns west at Koto and leaves Poland at Pyzdry in the government of Kalisz; it serves to eonvey timber to Prussia.

The Niemen, whieh has a total length of 500 miles and a basin of 40,000 square miles, flows along the north-east frontier of Poland, from Grodno to Yurburg, separating it from Lithuania. Already 70 yards wide at Grodno, it advanees northwards in great windings, between limestone hills covered with sand, or amidst forests, past numerous ruins of castles, or koorgans, which witness thc battles that have been fought for its possession. The yellowish sandy plains on its left allow only the cultivation of oats, buekwheat, and some rye. The river flows so slowly below Kovno as toseem almost stationary ; it often changes its bed, and, notwithstanding repeated attempts to regulate it, offers great diffieulties to navigation. Still,

large amounts of corn, wool, and timber are floated down, especially after its junction with the Black Hancza, giving occupation to about 90,000 men. A little above Kovno the Niemen turns west, and after having received the Wilja from the right, it attains a width of nearly 500 yards, At Yurburg it enters eastern Prussia, and reaches the Baltic Sea at the Kurisehe-Haff. Of its tributaries in Poland, only the Hancza Czarna and the Szeszupa, whieh winds through the province of Suwatki, are worthy of inention.

Lakes are numerous in the provinee of Suwatki, amounting Lakes.

there to over five hundred ; but the largest of them, Wigry, tra- versed by the Haneza, covers only. 11,000 aeres. They are mostly concealed amid thiek coniferous or birch forests, and their waters stretch with undefined banks amidst marshes, sands, or layers of boulders thickly covered with moss. Another group of some one hundred and twenty small lakes is situated in the basin of the Warta (north part of Kalisz), the largest being Gopto, 18 miles long and 100 feet deep, surrounded by many smaller lakes, and receiving the Noted river. It was mueh larger even within historical times, and was well known from being situated on the highway ace ‘ay Adriatic, via Koto on the Oder, to the basin of the Vistula,

Though navigable for a few months only, the rivers of Poland Canals.

have always been of considerable importance for the traffic of the country, and this importance is further increased by several canals connecting them with Russian and German rivers. The Niemen is connected with the Dnieper by the Oginski Canal, situated in the Russian government of Minsk. The Dnieper-and- Bug (Horodecki, Brzeski, also Krélewski) Canal in Grodno eonnects the Mukhavets, tributary of the Bug, with the Pina of the basin of the Pripet, that is, the Dnieper with the Vistula. The Vistnla is connected also with the Oder by the Bydgoski or Bromberg Canal in Prussia, which conneets the Brda, of the basin of the Vistula, with the Noted, or Netze, tributary of the Warta. All these eanals are, however, beyond Russian Poland. In Poland proper, the Augustowski Canal connects the Vistula with the Niemen, by means of the Hancza, Netta, Biebrz, and Narew. Another canal, to the west of Leczyca, connects the Bzura, a tributary of the Vistula, with the Ner and Warta ; and the bed of the former

has recently been altered so as to obtain regular irrigation of the rich meadows extending along its banks.

With the exception of its southern parts, Poland is built up Geology.

almost exclusively of Secondary and Tertiary formations, covered with a thick sheet of Quaternary deposits. The non-schistous rocks are represented only by a small patch of porphyries near Checin, and another of basalts at the castle of Teezyrski. Small deposits of quartzites in the Dyminski Hills, characterized by the Orthis kieleensis, Rom., which formerly were eonsidered as Devonian, belong to the Silurian as also a few dolomites appearing from beneath the Devon.an Old Red Sandstone and limestones. The last two cover wide traets in the province of Kielee, and in the district of Bedzin, on the Silesian frontier. The Devonian lime- stones of Kielee, which contain the Orthis striatula, Spirifer inflatus, Atrypa reticularis, A. desquamata, Leptwna interstrialis, Bronteus flabellifer, Spirifer verneuili, and Rhynchonella cuboides, thus exhibit a fauna closely akin to that of the Devonian of Germany aud Belgium, or the lowest part of the Upper Devonian—the so- called “ Cuboides-Schichten.” The hard sandstone of Dombrowa, Brzezina, &c., with Chonetes sarcinulata, Spirifer paradoxus, S. eultrijugatus, and Pterinea pailletei, is eertainly Lower Devonian. This formation eontains the ehief mineral resources of Poland.

The Carboniferous formation appears in the Olkusz and Bedzin districts. It consists of sandstones and clays, with layers of coal 30 feet thick. The Permian is represented by porphyric tnffs in the Olkusz district, “ Zeehstein” characterized by Produectus hor-

Minerals.

Climate.

ridus, Sow., at Kiclee, and a breccia consisting of Devonian boulders. The Trias is widely spread. It consists of variegated sandstones, characterized by Ayophoria eostata, occurring exten- sively in the governments of Kielce and Radom, yielding a fine building stone. The red sandstones north and west of

Kielce, con- sidered as Permian on Pusch's map, probably belong to the same formation, like the red sandstones in the most northern parts of the Kielce mountains. The " Muschelkalk " appears in the districts of Olkusz and Bedzin, as also in the Kielce mountains, and has great importance, containing as it does zinc, tin, and iron ores. The "Keuper" in the governments of Kielce, Piotrkow, and 2adom consists of sandstones, dolomites, and limestones, and con- tains brown coal and iron ores.

The Jurassic formation is widely spread; in south-west Poland it occupies the space from Olkusz to Wielun, and consists of brown and white "Jura," the whitish crags of which give pleasing land- scapes at Ojcowo and on the Pilica. The Oolite crags of Ojcowo contain numerous caverns, renowned for their bone deposits, worked out for manure, and for their numerous and remarkable Quaternary fossils. That of Jerzmanowice, close by Ojcowo, the largest of the series, has a length of 750 feet. The Cretaceous formation, which covers very large tracts throughout Poland, con- sists of lower series of sandstones, and of an upper series containing chalk and limestone, and yielding very fertile marls. They are covered with Tertiary limestones and gypsums, which, together with Cretaceous deposits, cover nearly the whole of the central plain and the northern provinces. The layers of sulphur at Kielce, 7 to 70 feet thick, belong to the Tertiary.

The whole is covered with Quaternary deposits, reaching at several places a very great thickness. They are chiefly made up of boulder clay containing Scandinavian erratics of all sizes up to 5 and 7 feet in diameter. The Baltic ridge is quite covered with them, their southern limit extending to 51° N. lat., or perhaps even to 50°, as the longitudinal valleys of the Kielce hills also con- tain layers of Scandinavian boulders. Diluvial and alluvial sands and clays cover the glacial deposits ; and everywhere in Poland one meets with remains of extensive lakes that filled up all depressions of the country during the post-Glacial period. Thick peat-bogs are being formed in the moister depressions, and cover an aggregate surface of no less than 2,800,000 acres.

In these lacustrine deposits numerous traces of prehistoric man have been found, but the old lake beds still await a more thorough exploration. The bone-caves at Ojcowo have yielded rich finds of extinct mammals, thirty-

two species of which are familiar to explorers of British caverns; the cave-bear alone has yielded fully four thousand canine teeth, while the mammoth, the woolly rhinoceros, the cave hyzena, and especially the reindeer, are repre- sented by numervus remains. The bones of extinct mammals have been found in assoviation with very numerous relics of man, some of which are most probably Paleolithic, while the great number belong to the Neolithic period,—those cave-inhabitants being in some instances dolichocephalic, like those of the shores of post- Glacial lakes, and in others mesocephalic.

Southern Poland is rich in minerals, especially in the Kielee moun- tains and the region adjacent to Prussian Silesia. The Devonian sandstones contain malachite ores at Medziana Géra, near Kielce, and copper has been worked there since the 15th century. In the years 1816-1826 65,000 cwts. of copper ore were extracted, but the mines are now neglected. The brown iron ores, also Devonian, of Kielce, and especially those of Daleszyc, contain no less than 40 per cent. of iron. The Triassic zinc ores of the Olkusz district, more than 50 feet thick at Bolestaw, contain 8 to 14 per cent., sometimes 25 per cent., of zinc ; and in 1879 2,866,000 ewts. of ore were extracted from nine pits, yielding about 100,000 ewts. of zine. The tin ores of Olkusz, also Triassic, are still more import- ant, and were extensively wrought as early as the 16th century, notwithstanding the difficulties arising from the presence of water ; they are reported to have then yielded more than 35,000 ewts. per annum. In 1878 the very fluctuating yield reached only 8960 ewts. Brown iron ores appearing in the neighbourhood of Bedzin as lenses 55 feet thick, and containing 25 to 33 per cent. of iron, accompany the Triassic zine ores. Spherosiderites and brown iron ores are also widely spread in the “ Keuper.” Sulphur is wrought at Czarkowa, in the district of Piriczow ; the deposits, which con- tain 25 per cent. of sulphur, reach a thickness of 7 to 70 feet, and the amount of sulphur is estimated at 1,300,000 ewts.

Carboniferous coal is spread in south-west Poland over a surface of about 200 square miles in the districts of Bedzin and Olkusz, which are estimated to contain 732,000,000 eubic yards of coal. The Triassic brown coal,»which appears in the Olkusz district in layers 3 to 7 feet thick, has lately been worked out, the single pit of St John yielding in 1879 204,200 cwts. of coal. Of other mineral produce, chalk exported from Lublin, a few quarries of

marble, and many of building stones are worthy of notice. Mineral waters are used medicinally at Cieclhocin and Natechow.

With the exception of the Lysa Géra hilly tracts (Kielce and South

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Radom), which lic within the isotherms of 41° aud 42°, Poland is |

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situated between the isotherms of 42° and 46°. The isotheres and isocheims (7.¢., lines of equal mean summer and winter temperature) crossing one another at right angles, and the former running east-north-east, Poland is included between the isothercs of 64° and 61° and the isocheims of 35°°7 and 39°°2. The prevailing winds are westerly, with north-north-east and south winds in autumn and winter, and east winds in spring. The number of rainy and snowy days varies from 152 to 158, increasing towards the Baltic, with an average of 21°7 to 23°6 inches of rainfall in central Poland, which figures slowly increase also towards the south on account of the proximity of the Carpathians, where they reach 80°3 inches. Of the above amounts, about 17 per cent. fell in spring, 29 per cent. in summer, 21 per cent. in autumn, and 33 per cent. in winter. Owing to this distribution the snow-covcr- ing in Poland is not very thick, and the spring sets in early. Still, frosts lowering the thermometer to ~ 4° and — 22° Fahr. are not uncommon, and the rivers are covered with ice for two and a half to three months,—the Warta being under ice for 70 to 80 days, the Vistula at Warsaw for 80 days and (exceptionally) even tor 116, and the Niemen for 100 (exceptionally for 140).

The following averages may help to give a more adequate idea of the climate of Poland :—

| Warsaw. | Vilna, Ham llestatrOsitiaed meccncuesessceereneccoser | Oct. 18 Oct. 17 WateStearOstta..cce- sec see tetraaccetens | Mar. 15 Mar. 25 Average maximum temperature…... | 85°°7 85°°1 Average minimum Wer wis.ces:| ag. ~9°°6 Absolute maximum do. ..... 95°5 89°‘3 Absolute minimum io}, a sacnone 37°°6 — 39°°0 PSIG UME iisica ys

~~cies’cedipegeeeckeware es 40 23 CLOT 10 2) 154 Le Annual rainfall (total) .....6~~ 22°8 in. 7°6 in, Rainfall—_ November to March…..... | 6°7 in. 4°7 in. Prevailing winds in January …..... | 8. E. S. Bs jy MUMIA oc Ase chan W. W. 9 », during the year… | S.E. W.

The flora of Poland is more akin to that of Germany than to that of Russia, several middle European species finding their north-east limits in the basin of the Niemen or in the marshes of Lithuania. Coniferous forests, consisting mostly of pine (Pinus sylvestris) and ~~birch, cover large tracts in Mazovia, extending over the Baltic lake~~ ridge, reaching southwards as far as the junction of the Bug with the Narew, and joining in the south-east the ‘‘Polyesie” of the Pripet. The pine covers also the Lysa Géra hills and those on the San. The larch (Larix ewropea), which three centuries ago covered large tracts, has almost entirely disappeared ; it is now met with only in the Samsonowski forests of Sandomeria. The Pinus Cembra is only remembered, as also the Zaxus baeeata, which has but a few representatives in Sandomerian forests, on the Pilica, on the puszezas of Ostroteka, and in the Preny forests on the Niemen. The Picea obovata is cultivated.

Of leaf-bearing trees, the common beech (Fagus sylvatica) is the most typical of the Polish flora ; it extends from the Carpathians to 52° N. lat., and three degrees farther north in small groups or isolated specimens ; the confluence of the Bug and Narew may still be regarded as its eastern limit. The white beech (Carpinws Betulas), the aspen (Populus tremula), and two elms (Ulmus campestris, U. effusa) are found nearly everywhere, mingled with other trees in forests. The same is true with regard to the lime-tree (Tilia parvi- folia), which appears in groves only in the cast (Niemen, Pripet, Lublin). It is the most popular tree with the Poles, as the birch with the Russians; judgment of old was pronounced under its shade, and all the folk-lore songs repeat its name. The oak—a highly venerated tree in Poland, though not so much as in Lithuania—grows in forests only on the most fertile patches of land, but it is of common occurrence in conjunction with the beech, elm, &c. The maples (Acer platanoides and A. pseudopla- tanus) are somewhat rare; the black alder (Alnus glutinosa) covers the banks of the rivers and canals, and the Alnus ineana is common. The willow, and the orchard trces—apple, pear, plum, and cherry—are cultivated everywhiere.

The flora of Poland contains 12 per cent. of Compositx, 6 per cent. of Leguminosx, 2 per cent. of Labiatz, 4 per cent. of Umbellt- Jerez, 5 per cent. of Crucifere, and 2 per cent. of Conifere.

The wheat frontier coincides very nearly with that of the leaf- bearing forests. It yields good crops on the fertile tracts of Sando- meria and Lublin, and on the plains of the Vistula and Wartha, but does not thrive very well beyond 52° N. lat. Rye, oats, barley, buckwheat, and hemp are cultivated everywhere, and flax in the east ; hops are very common, and tobacco-culture has been begun in the south. Some attempts in sericulture have been made with success.

Flora.

The fauna of Poland belongs to the middle European zoological Fauna.

group; within the historical period it has lost such species as formerly gave it a subarctic character. The reindeer now occurs

Popula- tion.

RUSSIAN. |

eastwards; the wild horse, also, described by the annals as intermediate between the horse and the ass—probably like the recently discovered Equus przewalskii—is said to have becn met with in the 13th century in the basin of the Warta, and two cen- turies later in the forests of Lithuania. The wild goat, bison, and elk have migrated to the Lithuanian forests. The lynx and beaver have also disappeared. The brown bear continues to haunt the forests of the south, but is becoming rarer in Poland ; the wolf, the wild boar, and the fox are most common throughout the great plain, as also the hare and several species of Arvicola. The mammals in Poland, however, do not exceed fifty species. The avi-fauna, which does not differ from that of central Europe, is repre- sented by some one hundred and twenty species, among which the singing birds (Dentirostre and Conirostre) are the most numerous. On the whole, Poland lies to the westward of the great line of passage of the migratory birds, and is less frequented by them than the

steppes of south-west Russia. Still, numerous aquatic birds breed on the waters of the Baltic lake-region.

The population of Poland, 6,193,710 in 1871, reached 7,319,980 in 1881, showing an increase of 1°8 per cent. per annum during the ten years, and an average of 15 persons per square mile. Of these 17 per cent. lived in towns. They were distributed as follows :—

. f 1 la- rba e GaneenaaeNee Square hites, ee 1881. eae Le, am KialS2nc cease 4,391 765,408 96,848 17°4 Kielce……..... 3,897 622,842 38,493 16:0 TiOQUIZA, .sor.sens 4,667 538,588 51,554 15 Jui ha)linoWaapanopne 6,499 860,382 78,867 13°2 Piotrkéw …... 4,730 837,928 144,246 Wee TtOCK evecse se 4,200 538,141 78,797 12°8 PRaAMOM:, «0.002: 4,769 638,715 69,058 13°3 | Siedlce……. c 5,585 616,649 lily, {onal LP Suwatki…..... 4,846 603,174 61,827 12°4 Warsaw: ..»-.. 5,623 1,303,158 485,852 23 °2

The bulk of the population are Poles. During prehistoric times the basin of the Vistula seems to have been inhabited by a dolicho- cephalic race, different from the brachycephalic Poles of the present day; but from the dawn of history the Slavonians (Poles), mixed to some extent with Lithuanians, are found on the plains of the Vistula and Warta. The purest Polish type is found in the basin of the middle Vistula and in Posen; in the north-east there is a Lithuanian admixture, and in the south-east a Little Russian. The geographical domain of the Poles corresponds approximately with the limits of Russian Poland. Some 250,000 Lithuanians (277,000 or 284,000, according to other enumerations) occupy the north part of Suwatki, their southern limit being the Hancza river and the towns Seino and Snwatki; while the Ruthenians (about 506,000 in 1878) appear in compact masses in the east and south- east, occupying the whole space between the Bug and the Wieprz as far as Siedlce, as also the region between the upper Wieprz and the San. The White Russians numbered 27,000 in the north-east and east, and the Great Russians 12,000. The Poles extend but little beyond the limits of Russian Poland. In east Prussia they occupy the southern slope of the Baltic ridge (the Mazurs) ; and on the left bank of the lower Vistula they spread to its mouth (the Kaszubes). Westward they occupy a strip of land of an average breadth of 50 miles in

Brandenburg, Posen, and Silesia, stretching down the Warta as far as to Birnbaum (100 miles east of Berlin) ; and in the south they extend along the right bank of the Vistula in western Galicia to the San. In Russia they constitute, with Jews, Lithuanians, Ruthenians, and White Russians, the town popu- lation, as also the landed nobility and sz/achéa, in several provinces west of the Dwina and the Dnieper. Their numbers in these pro- vinces may be seen from the following figures :—

T 1 v) .

Governments. | Peery” | poles,” (of Poles. | of Poles in 1881. AVAUITTE ese ee: 973,570 143,290 | 14°7 175,000 Kodolia…..... 1,946,760 233,650 12°0 269,000 Volhynia….. 1,648,270 1725405 | 10°5 215,000 MINSK ..... 1,135, 590 117,750 10°4 160,500 (Grodno,..... 958,850 89,850 9°3 112,700 Vitebsk. ..... 838,050 40,725 4°9 54,950 iS) ee 2,144,280 71,640 3°3 87,650 Moghileff….. 908,860 26,115 2.9 32,700 Kovno…....| 1, 131250 30,875 eet 38,950 Courland….. 597,290 13,155 2°2 14,000 Smolensk ….) 1,168,590 1,450 071 1,600 Total… 18,441,360 940,905 7:00 1,162,050

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only as a fossil; the sable, mentioned in the annals, has migrated |

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According to the localities which they inhabit, the Poles take different names. They are called Wielkopolanie on the plains of middle Poland, while the name of Matopolanie is reserved for those on the Warta. The name of Leczycanie is given to the inhabitants of the marshes of the Ner, that of Kurpic to those of the Podlasie; Kujawiacy, Szlacy in Silesia, and Gérale in the Carpathians.

The Kaszubes, and especially the Mazurs, may be considered as separate stocks of the Polish family. The Mazurs (whose northern limits may be thus described—Przerosl in Suwatki, Goldap, Rastenburg, and Bischofsburg in

Prussia, and Mtawa in Ptock) are distinguished from the Poles by their lower stature, broad shoulders, and massive structure, and still more by their national dress, which has nothing of the smartness of that of the southern Poles, and by their ancient customs ; they have also a dialect of their own, containing many words now obsolete in Poland, and several grammatical forms bearing witness to the Lithuanian influ- ence. They submit without difficulty to German influence, and already are Lutherans in Prussia. The language of the Kaszubes can also be considered as a separate dialect. ‘The Poles proper are on the whole of medium stature (5 feet 4°6 inches), finely built, dark in the south and fair in the north, richly endowed by nature, inclined to deeds of heroism, but perhaps deticient in that energy which characterizes the northern races of Europe, and in eet sense of unity which has been the strength of their present rulers.

The German element is annually increasing both in number and in influence, especially during the last twenty years. The Lodz manufacturing district, the Polish Birmingham, is becoming more German than Polish ; and throughout the provinces west of the Vistula German immigration is going on at a steadily increas- ing rate, especially in the governments of Ptock, Kalisz, Piotrkow, and Warsaw. It is estimated that a strip of land 35 iniles wide along the Prussian frontier is already in the hands of Germans, whose advance is further favoured by the rapid transference of landed property into German hands in Posen. In Russian Poland associations of four to six men, supported by German banks, purchase large numbers of properties belonging to members of the Polish nobility who have been ruined since the last insurrection. No fewer than 30,786 German landholders, owning 5433 estates, were enumerated last year in the provinces west of the Vistula; while 13,714 foreign proprietors, farmers, and labourers (11,497 Prussians and 1914 Austrians) were at the same time owners of 1,857,900 acres, valued at 135,000,000 roubles. According to other statistics, the foreigners in Poland, mostly Germans, who remained foreign subjects, numbered 170,000 in 1881 (5°15 per ccnt. of the population). Of these, 91,440 (families included) hold landed property to the amount of 2,605,500 acres, or 8°3 per cent. of the area of the kingdom. The aggregate number of Germans in Russian Poland, estimated at 370,000 in 1878, must now exceed 450,000, thus constituting about one-fifteenth of the population.

The Jews, who are found everywhere throughout Poland, are still more numerous, and must now exceed a million. They are nowhere agricultural ; in the larger towns many of them are artisans, but in the villages they are almost exclusively engaged as shopkeepers, second-hand traders, dealers on commission, innkeepers, and usurers. In the country, both commerce and agriculture are in the hands of their intimately connected trading associations. Their relations with Poles and Ruthenians are anything but cordial, and “Jew-baiting” is of frequent occurrence. They are increasing much more rapidly than the Slavs.

The relative numbers of the various inhabitants of Poland may be seen from the following figures :—

According to According to Per

Galkin (1868). | Rittich (1873). | cent.

Les Pevevaescarecaaucls senckes ee ae 3,900, 580 4,375,840 68°4

MEMS aden sete css asatrinneciene 764,950 860,330 13°4 Heithle USSIANS op ccs csseciesiiees 428,380 505,960

Wihites Russians, ...+0>-. 33,520 26,865 8°5

11,065 12,155

(Clown, copra caoemqgnsnpsonsocds 234,150 370,360 5°8

AIUD TMA Ss ccc-escscr sae sen- 277,050 241,150 3°8

The prevalent religion is the Roman Catholic, to which, in 1870, Religion.

4,596,956 out of a population of 6,034,430 belonged; at the same date 246,485 were adherents of the United Church, 327,845 were Lutherans, 34,135 were of the Greek Church, and 4926 Noncon- formists. The Jews at the same date were reckoned (certainly an under-estimate) at 815,448, and the Mohammedans at 426. The number of followers of the United Church has much diminished since 1873, when they were compelled to join the Greek Church. Since the last insurrection a series of measures have been

taken to reduce the numbers of the Roman Catholic clergy in Poland; in 1883 there remained 1318 churches ont of 1401, 1544 priests out of 2322, 10 monasteries out of 29, and 8 convents out of 30. One diocese (Podlasie) having been abolished, and a new one established

Agri- culture.

-nobility do not pass into the hands of

at Kielce, while several bishops had been sent out of the country, the whole situation remained unsettled until 1888, when the pope recognized the new diocesan subdivisions introduced by the Russian Government. Poland is now divided into four dioceses (Warsaw, Sedomierz, Lublin, and Ptock).

From remote antiquity Poland has been celebrated for the produc- tion and export of grain. Both, however, greatly declined in the 18th century ; and towards the beginning of this century the peasants, ruined by their proprietors, or abandoned to the Jews, were in a more wretched state than even their Russian neighbours. Serfdom was abolished in 1807 ; but the liberated peasants received no allotments of land, and a subsequent law (1808) rendered even their transference from one landlord to another almost impossible ; the old patrimonial jurisdictions were also retained. Compelled to aecept the conditions imposed by the landlords, they had to pay rack-rents and to give compulsory labour in various forms for the use of land. Only a limited number were considered as permanent farmers, while ncarly one-half of the peasants became mere prolétatres ; in 1864 1,338,830 former peasants had ceased to have Jand rights at all. Pursuing a policy intended to reconcile the peasantry to Russian rule and to break the power of the Polish nobility, the Russian Government promulgated, during the outbreak in 1864, a law by which those peasants who were holders of land on estates belonging to private persons, institutions (such as monasterics and the like), or the crown were recognized as proprietors of the soil,—the state paying compensation to the landlords in bonds, and the peasants having to pay a yearly annuity to the state until the debt thus contracted had been cleared. The valuation of these allotments was made at a rate much morc advantageous than in Russia, and the average size of holding reached

15 acres per family. Of those who held no land a number received it out of the confiscated estates of the nobility and monas- teries, At the same time the self-government of the peasant was organized on democratic principles. The so-called *servi- tudes," however, that is, the right to pasture on and take wood from the landlord's estates, were maintained for political reasons, becoming a source of great inconvenience both to landlords and peasants.

Whatever be the opinion held as to the intention of these reforms, there can be no doubt that they resulted in a temporary increase of prosperity, or at any rate an alleviation of the previous misery of the peasants. In 1864 there were 342,500 peasant families, holding an aggregate of 8,300,000 acres of land; but only 22,000

peasants, that is, less than one-half per cent. of the agricultural.

population, were proprietors, the remainder (218,500) being nobles, while 2,000,000 peasants were czinszewikt, that is, tenants at will, and 1,388,000 had no land at all. In 1872 there were already 572,100 free peasant estates, occupying 18,000,000 acres. In ten years (1864-73) the area of cultivated soil had increased by 1,350,000 acres, while during the fourteen years 1845-59 its increase was only 540,000 acres. The crops, which stood in 1846-60 at an average of 9,360,000 quarters of corn and 6,500,000 quarters of potatoes, reached respectively 15,120,000 and 14,400,000 quarters. The yearly increase, which was only 2:2 per cent. for corn and 1°3 per cent. for potatoes during the years 1846-60, became respectively 4°7 and 8°3 per cent. during the years 1864-75, and the average crop per head rose from 1°93 quarters in 1850 to 2°52 in 1872. The annual increase of horses, which formerly was 1 per cent., reached 2°7 per cent. in 1864-70, while the yearly increase of cattle remained almost stationary (1'2 per cent., against 11 per cent.). In fact, Poland had' in 1870 only 37 head of cattle for each 100 persons, against 41 head in 1860. Another consequence of these measures was a notable decrease of crime, and a rapid increase of village primary schools, maintained by the peasants themselves.

It must be acknowledged, however, that the maintenance of the "servitudes " has become a serious evil. Morcover, the want of pasture-land, the want of money for improvements, quite insuffi- ciently supplied by the joint-stock

banks in the villages, and the very rapid increase in the price of land, from 50 roubles per morgen (1°3835 acre) to 120 and 250 roubles, have all helped to lessen the benefits of the agrarian measures of 1864. The peasants arc unable to purchase land proportionately with the increase of population ; and, while a few of them buy, many others are compelled to sell to the Jews (notwithstanding the law which prohibits the purchase of land by Jews) or to German immigrants. The estates of the the Polish peasants as they

are sold, and still less to Russians, but largely into those of German

immigrants.

Agriculture in Poland is carried on with more perfect methods on the whole than in Russia. The extensive cultivation of beet- Toot, of potatoes for distilleries, and of grasses has led to the

introduction of a rotation of several years instead of the former

“ three-fields ” system; and agricultural machinery is in more gencral ‘use, especially

l on the larger estates of the west. Winter wheat is extensively cultivated, especially in the south, the Sando- mir wheat having a wide repute, In 1873 50 per cent. (15,728,000

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acres) of the surface of Poland was under crops, 9 per cent. (2,929,000 acres) under meadows, and 26 per cent. (8,242,000 acres) under forests. The first of these figures exceeds now 54 per cent. In 1881 the crops reached 19,050,000 quarters of corn, 21,151,000 quarters of potatoes, and 14,368,900 ewts. of beetroot (14,365,950 ewts. in 1882). The corn crops were distributed as follows :—wheat, 11 per cent.; rye, 38; oats, 29; barley, 12 ; buck- wheat, 4; various, 6 per cent.,—3 per cent. being used for manu-factures, 22 per cent. for secd, 60 per cent. for home consumption, and 15 per cent. for export. The potatoes were used almost entirely for distilleries.

The culture of tobacco is successfully carried on (about 3500 acres), especially in Warsaw, Ptock, and Lublin.

Cattle rearing is an important source of income. In 1881 there were approximatcly 3,300,000 cattle, 4,500,000 sheep (including 2,500,000 of the finer breeds), and 1,000,000 horses. J ine breeds of horses and cattle occur ou the larger estates of the nobility, and cattle are exported to Austria. Bee-keeping is widely spread, especially in the south-east. Fishing is carried on remuneratively, especially on the Vistula and its tributaries.

Manufactures have shown a rapid increase during the last twenty years. While in 1864 the annual production was only 50,000,000 roubles, it now exceeds 150,000,000,—the manufactures of Poland yielding one-eighth of the total production of the Russian empire.

Mining has shown a still more rapid development within the same period. While in 1862 only 154,100 cwts. of pig-iron and 100,900 cwts. of iron and steel were made, these figures respectively reached 947,800 and 1,742,500 cwts. in 1881; and, whereas the highest figure in the annual returns of the coal-mining industry from 1867 to 1878 was only 2,494,000 ewts., the average for 1876-80 was 17,157,000, and the amount reached 27,659,000 cwts. in 1881. The zine mines yiclded in 1881 89,640 cwts., and the extraction of tin reached 7580 cwts. in 1878. Sulphur was obtained to the amount of 6450 ewts. in 1879.

The development of the leading manufactures may be scen from the following figures :—

1866. 1879.

Prod i Prod i Roubles, | Ha”és | “Roubies. | Hands. Woollen stuffs……..... 7,134,483 | 7,579 | 26,838,000 | 12,716 Linen and hemp stuffs 1,151,882} 6,669 2,294,000 | 6,900 COTLOTISE...ssceractun | 6,099,474 | 9,578 | 22,492,000 | 16,949 Silks . vee eeeeeeeees Peer 61,785 100 538,000 850 Cs dealeaiiay dyeing, 606,656} 165] 4,818,000] 906 Paper Wares…..... 587,552 | 1,083} 1,348,000] 1,289 Produce from wood….| 311,126 379 | 2,665,000 | 2,497 Animal produce…..... | 4,150,756 | 5,579| 8,572,000] 3,182 Mineral produce…..... 1,591,833 | 5,583] 4,469,000] 7,096 Metallic

wares……... 5,654,496 | 7,149 | 9,426,000} 7,899 Chemical produce…... 443,980 368 900,000 443 MOT ers cesses 27,798,523 44,232 | 83,845,000 60,227 Average production | ” fer Wands……... sail en

Thus, while the number of hands occupied in these industries has increased by 40 per cent., the production has nearly trebled, showing a corresponding improvement in the machinery employed. The chief manufacturing centres are the Lddz region in the govern- ment of Piotrkdéw (woollen stuffs, cottons, sugar, corn-flour, wine- spirit, coal-mines) and Warsaw (linen stuffs, leather, machinery, sugar, wine-spirit, tobacco, and all kinds of grocery and mercery wares). Mining is chiefly concentrated in the south-west. The anual production for. separate governments (exclusive of mining, flour-mills, and breweries, and the number of hands employed by distilleries remaining unknown) was given in 1879 as follows :—

Roubles. Hands. EAOGRKOW.S …:....08 eee ee 60,900,000 36,550 NYRR is60s0c.cssnanvecn 2 42,110, 000 37,605 IESUIT SMA sis dss ose chess Sore eee 14,670,000 9,159″ Lo, | ne enn > 10, 495,000 DROW, MENON sce seasccen Mecsas epee 4,543,000 581 SVE CC wages Sssc sous eee eee 2,919,000 DL 3if OMOWE lin eisscccccurs cee 2,121,000 1,708 LETS © Tage ct oer Re 2,109,000 1,747 Bae fansieccnscisaneaensusoeene 1,862,000 1,815 SU i ena 0) 684,000 403 ee ee 142, 413,000 97,482 Russia in Europe ……..... 1,102, 949,000 711,097

ee |

Communi- cation,

Com- merce.

Adminis- » tration,

RUSSIAN. |

These figures, however, have already increased considerably, especially with regard to distilleries, which yielded, in 1882-83, 6,269,500 gallons of pure alcohol; while the sugar-works, which occupied in 1882-83 9774 men, 2636 women, and 2408 children, produced 315,460 cwts. of rough sugar

and 425,800 cwts. of refined sugar. In 1882 the production reached 66,291,700 roubles in Piotrkow, 3,948,200 in SiedIce, and 1,240,230 in Suwatki.

The railways of Poland have an aggregate length of 888 miles. A line of great importance, connecting Vienna with St Petersburg, crosses the country from south-west to north-east, passing through the mining district and Warsaw, and sending a short branch to £ddz. Another important line, connecting Dantzic with Odessa, crosses Poland from north-west to south-east. A branch line, parallel to this last, connects Skiernewice with Thorn and Lromberg ; while a military railway connects the fortresses of Warsaw and Ivangorod with Brest-Litowsky, via-Siedlce and hukow, and a side line will soon connect Siedlce with Matkin on the lower Bug. The great line from Berlin to St Petersburg crosses North Suwatki for 54 miles, between Eydtkunen and Kovno. The aggregate length of the macadamized roads, increased by 2110 miles since 1864, is now about 6700 miles.

The traffic on the Polish railways is very brisk. In 1880 the agere- gate amount of merchandise brought toand sent from Warsaw reached respectively 36,055,000 and 18,248,000 ewts.; and the whole amount of merchandise conveyed on Polish railways within Poland (exclusive of the Eydtkunen aud Kovno line) amounted to 81,469,000 ewts.

The chief custom-houses of the Russian empire—Wierzbotowo, ‘

Sosnowice, Granica, Warsaw—and many minor ones are situated on the frontiers of Poland. Their aggregate imports and exports reached respectively 127,414,054 and 146,320,921 roubles in 1882. The “ primary cell” of the administrative organization of Poland is the gmina,—formerly a village commune for the common posses sion and partly also for the common cultivation of land, which lost its characters with the introduction of serfdom, but has been taken by the law of 1864 as the basis of the organization of the peasantry in Poland. Each district is subdivided into twelve to

~~twenty gminas, including several villages and all farms on its terri~~

tory, and having a population of from 2000 to 10,000 inhabitants. All landholders of the gmina who are in possession of at least 4 acres constitute the communal assembly of the gymina. Only the clergy- men aud the police officials are excluded from it. Each member has but one vote, however extensive his property. The gmina differs thus from the Russian volost in its including, not only pea- sants, but also all landed proprietors of the territory. The assembly elects the wott, or elder (the executive of the gmina), a clerk, a sottys in each village, and a tribunal consisting of Zawniki, who judge all matters of minor importance, according to local customs. It also allocates the taxation among the members of the gmina, administers the common property (pasturage, grazing lands, forests), has charge of the poor, and generally deals with all questions educa- tional, hygienic, and economic which concern the gmina. The cost of administration of each gmina varies from 1000 to 3000 roubles, In reality, the powers of the gymina are, however, very much limited in all but purely economical questions by a numerous bureaucracy, and especially by the “chief of the district” nominated by the crown; there is also a general tendency towards transforming it into a mere auxiliary to the Russian administration, the clerk or secretary becoming its chief organ.

The provincial administration is regulated by the law of December 31, 1866. Each government being subdivided into ten to twelve districts, the district administration consists of an ouyezdnyi natchalnik, or “chief of the district,” with a numbcr of secretaries ani “chancelleries” (military, for recruiting; philanthropic ; for mutual assurance against fire ; for finance; and for gendarmerie). The provincial administration, under a military governor, consists in each of the ten governments of the following institutions :—(1) “chancellery”” of the governor; (2) a provincial “college,” with councillors corresponding to the following departments—admini- stration, military and police, finance, state domains, law, medicine, and insurance ; (3) a philanthropic committee ; (4) a postal depart- ment; (5) a “college” for finance ; (6-10) departments of excise, customs, forests, control, and education. There is also in each government a special institution for the affairs of peasants.

The entire administration of Poland is under the governor-general, residing at Warsaw, whose power is limited only by “collegiate” institutions

corresponding to the different branches of administra- tion. Heisat the same time the commander of the entire military force of the “ Warsaw military district.” Justice is represented by the gmina tribunals; the justices of the peace (nominated by government) ; the syezd, or “court” of the justices of the peace ; the district tribunals (assizes) in each government ; and the Warsaw courts of appeal and cassation. The prisons of Poland, with exception of a reformatory for boys at Studzieniec, are in a very bad state. With an aggregate capacity for only 4050 prisoners, they had in 1883 7210 ininates. Poland constitutes also a separate educational district, a district of roads and communications, an administration of justice district, and two mining districts.

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Poland has had no separate budget since 1867; its income and expenditure are included in those of the empire, and since 1881 they have ceased to appear under scparate heads. The peasants’ arrears, which reached 663,685 in 1878, have notably increased since then, ranging from 200,000 to 600,000 roubles in each government.

Perhaps no other country in Europe had so many towns (453), for the most part enjoying municipal rights according to the Magdeburg and Lithuanian law, as Poland. A large number of them (228) remained, however, private property, or property of the crown. In some of them the proprietors only levied rents on the holders of land that had been built upon; while in others the dominium supremum was maintained, and the proprietor exacted, not only rents, but also taxes from the inhabitants and visitors, claiming also the monopoly of selling spirits, &c.

After the last insurrection, all towns with less than 2000 inhab- itants were deprived of their municipal rights, and were included, under the designation of posads, in the gminas. The seignorial rights were abolished or redeemed, and those inhabitants who lived on agriculture received allotments of land redcemed by the state. But the spirit-selling monopoly was maintained, as also the “servitudes.” Viewed with suspicion by the Russian Government, the Polish towns received no self-government like the villages. Instead of

the former elective municipal councils (which enjoyed de jure very large rights, including that of keeping their own police, while in reality they were under the rule of the nobility), Russian officials were nominated and entrusted with all the rights of the former municipal councils. These last were, however, maintained to carry out the orders of tlic military chiefs. The new municipal law of 1870, first introduced at Warsaw and then applied to other towns, reduced the functions of the municipal council almost to nothing, depriving it even of the right of discussing the general budget, which is established by a special administrative committee aided by three to four citizens nominated by the governor. ‘The burgomaster, chosen by Government out of three candidates, and the members of the municipality (tawnik7) elected by one section of the citizens, mostly from the poorest classes, have no authority. The burgomaster, who often is a retired private soldier, very badly paid (£18 to £45 per ycar), is entirely dependent upon the police and the chief of the district, and has to discharge all sorts of functions (bailiff, policeman, &c.) which have nothing to do with municipal affairs.

Poland naturally contains the first line of the fortifications of the Russian empire on its western frontier. These fortifications, however, are intended only to protect the conntry to the east of the Vistula, the region to the west of it, which contains the chief mining and manufacturing districts of Poland, remaining quite open to invasion. The marshy lowlands, covered with forests on the western bank of the Vistula, arc a natural defence against an army advancing from the west, and they are supported by the fortresses on the Vistula connected by the Vistula railway. Thcir centre is at Warsaw, with Novogeorgievsk, formerly Modlin, in the north, at the mouth of the Bug, and Ivangorod, formerly Demblin, in the south, at the mouth of the Wieprz. Novogeorgievsk is a strongly fortified camp, which requires a garrison of 12,000 men, and may shelter an army of 50,000 men. The town Sierock, at the junc- tion of the Bug and Narew, is now fortified to protect the rear of Novogeorgievsk. ;

The citadel of Warsaw protects the railway bridge over the Vistula, and six forts—rather out of date, however—protcct the capital. The fortress of Ivangorod, on the right bank of the Vistula, is now supported by six forts, four of which arc situated on the right bank and two on the left. The Vistula

line of fortresses has, however, the great disadvantage of being easily taken from the rear by armies advancing from East Prussia or Galicia. Brest-Litowsky, at the western issue from the marshes of the Pripet, the towns. of Dubno and Lutsk, now about to be fortified, and Bobruisk constitute the second line of defence.

Finances,

Municipal institu- tions,

For- tresses.

The educational institutions of Poland are represented by a Educa- university with 1000 students in 1881 ; 18 gymnasiums and 8 pro- tion.

gymnasiums for boys, with 8269 scholars in 1878 ; 3 “ real-schulen,” with 914 scholars ; and 3279 primary schools, with 113,084 boys and 57,260 girls. There are also excellent technical schools, an insti- tute of agriculture and forestry at Nowa-Alexandrya, and several seminaries for teachers. In 1881 the number of scholars was 1 to 35 of the aggregate population, only 19 per cent. of the children of school age receiving instruction in school. The Jewish children mostly are taught in the heders, where they receive almost no in- struction at all.

The school is the great means used by the Russian Government ‘

- Russi-

for the so-called ‘‘ Russification” of Poland. The teaching in the fication.”

former Szkota Giéwna, now the university of Warsaw (even that of Polish literature), has been carried on in Russian since 1873, botli by a few Polish professors and by the new Russian ones. Polish is taught in primary and secondary schools only twice a week, in the lower classes ; and the scholars are prohibited from speaking Polish within the walls of the lyceums. In all official communications Russian is obligatory, and a gradual elimination of Poles from the

limited in number (to a fourth, for instance, for the examining magistrates), or else totally excluded from certain administrations (such as that of certain railways). ‘The vexatious measures of Russian rule keep up a continuous feeling of discontent ; and, though it was allowed in 1864 that the agrarian measures would conciliate the mass of the peasantry with the Russian Government, it now appears that the peasants, while gaining in those feelings of self-respect and independence which were formerly impossible to them, are not accommodating themselves to Russian rule ; the national feeling is rising into activity with them as formerly with the szlachta, and it grows every day. ; :

There are 27 towus the population of which exceeded 10,000 in- habitants in 1880-82, and 66 towns having a population of more than 5000. The list of the former is as follows :—Warsaw (1882), 406,260 ; Augustow, 11,100 ; Biata, 19,450 ; Czestochowa, 15,520 ; Garwolin, 14,620; Kalisz, 16,400; Kalwarya, 10,610; Kielce, 10,050 ; Konska Wola, 14,300; Kutno, 18,210; ask, 10,810; £404, 49,590 ; Lomza, 15,000; Lublin, 34,980 ; Eukow, 11,030 ; Mtawa, 10,010; Piotrkéw, 23,050; Ptock (1883), 19,640 ; Radom (1883), 19,870; Sedomierz, 14,080; Siedlee, 12,820; Sieradz, 15,040; Suwatki, 18,640; Turek, 11,500; Wtoctawek, 20,660 ; Wtodawa, 17,980 ; Zgerz, 13,360. (BEAK)

POLARITY anp ENANTIOMORPHISM. Any figure, such as a solid of revolution, which has one line in it in reference to which the figure is symmetrical may be said to have an axis, and the points at which the axis cuts the surface of the figure are poles. But the term polarity when applied to material figures or substances is usually confined to cases where there are not only a definite axis and poles, but where the two poles have distinct characters which enable us to recognize them and say which is which. It is in this sense that the word is used here.

Two figures or two portions of matter are said to be enantiomorph to each other when these forms are not superposable, z.¢., the one will not fit into a

mould which fits the other, but the one is identical in form with the mirror image of the other.

Polarity. —As examples of polarity we may take an awn of barley or a cat's tail, in which we recognize the distitic- tion between the two poles or ends, which we may call A and B by finding that it is easy to stroke from say A to B but not in the opposite direction. As an example of enantiomorphism we may take our two hands, which will not fit the same mould or glove, but the one of which resembles in figure the mirror image of the other.

It will be seen by and by that there is a close relation between polarity and enantiomorphism.

In the examples of polarity just given the condition occurs because the parts of the body are arranged in the direction of the axis in a particular order which is different when read backwards. The simplest expression for such a state of matters will be found in the case of a substance composed of equal numbers of three different kinds of particles, these particles being arranged along the axis in the order

A abcabe abe | B,

where A and B are poles and a, 8, ¢ particles of three different kinds. Of course the same may occur with a more complicated constitution, the condition being that the cyclical order read from A to B is different from that read from B to A. Even with particles all of the same kind we can imagine this sort of polarity produced by such an arrangement as

Oe ee ee es ee ee, ee OO 8

Alaaa a a aaa a data a ane

where the density varies periodically as we pass along the axis, but so that the order of variation is different in passing from A to B and from Bto A. There is another sort of polarity produced also by an arrangement such as that described above, but here not along the axis but about it. As we took a cat's tailas an example of the one, so we may take a sable muff as an

example of the other. As we stroke the tail in one direction along the axis, so

administration is steadily going on, Polish employés being either | we stroke the muff in one sense about the axis.

This arrangement also produces polarity, for there is a real difference between the two ends of the muff. The one is that into which we put our right hand, the other that into which we put our left hand if the fur is to lie downwards in front. If we reverse the ends we find the fur sticking up in front, and we have thus as little difficulty in distin- guishing the two poles from one another in this as in the former sort of polarity.

We can easily imagine the particles of a compound sub- stance to be arranged so as to produce this polarity. To take a simple case,—the molecules of the substance may

be formed of three atoms a, 6, and ¢, arranged a ? with

the planes of the molecules all at right angles to the axis, so that on turning the substance about the axis in one sense the atoms in every molecule follow each other in the order abc, and of course in the opposite order when the rotation is reversed.

In these examples the polarity is due to an arrangement of the matter at rest, but both kinds of polarity may be produced by motion. Thus a rotating body has polarity of the second kind; the axis is the axis of rotation, and the two poles differ from each other as the two ends of a muff do. A wire along which a current of electricity is passing has polarity of the first kind; and a magnet, in which currents of electricity may be supposed to circulate about the axis, has polarity of the second kind.

There is an important difference between these two kinds of polarity. We have seen that they depend on two different. conditions—the one on an arrangement of matter or motion along the axis, the other on a similar

arrange- ment about the axis. This gives rise to a difference in their relation to their mirror image.

If we hang up a cat's tail by one end, say the A end, in front of a mirror, we see in the mirror the image of a cat's tail hanging by its Aend. But if we hang up a muff by one end, say the right-hand end, before a mirror, we see in the mirror the image of a muff hanging by its left-hand end, If we put our hands into the muff in the usual way and stand before the mirror we see a person with his hands in a muff in the usual way. But his right and left hands correspond to our left and right hands respectively, and the right and left ends of the muff in the mirror are the images of the left and right ends respectively of the real muff. Thus the mirror image of a body having polarity of the second kind has its polarity reversed.

But the muff and its image are not truly enantiomorph. They differ in position but in nothing else. 'T'urn the one round and it will fit the other.

Magnetic and electric polarity having been already dis- cussed under Execrriciry and MaGNetisM, we shall here consider soine cases of crystalline polarity.

Both kinds of polarity occur in crystals.

We have no direct means of ascertaining how the ultimate particles of a crystal are arranged, but it seems reasonable to suppose that there is a relation between the form of the crystal and the structure of its smallest parts ; and, when we find the crystals of particular substances always showing polarity of the one or the other kind, we naturally suspect that this is the external indication of such an arrangement of the particles as has been shown above to be capable of producing structural polarity. Of crystalline polarity of the first kind the most striking instances are tourmaline and electric calamine (hydrated silicate of zinc), forms of which are shown in figs. 1 and 2, in which it will be seen that the crystals are not similarly terminated at the two ends. It is this kind of crystalline polarity (often called "hemimorphism") which (as was first observed by Haiiy and more fully investigated by

Gustav Rose and by Hankel) is associated with pyroelec- | Marbach observed that different tricity (see MINERALOGY, vol. xvi. p. 376). It is worthy of pyrites

Fic. 2.—Electrice Calamine,

Fie. 1.—Tourmaline.

note that the crystalline polarity and the physical (electric) polarity occurring in the same substances are both of the kind not inverted by reflexion in a mirror.

As an instance of the same kind of crystalline polarity of a somewhat more complicated character, also associated with pyroelectricity, we may take boracite. The crystals of this mineral exhibit combinations of the cube, the rhombic dodecahedron, and the tetrahedron, as shown in fig. 3. If four lines are drawn corresponding to the four dia- gonals of the cube, it will be observed that at the two ends of each of these axes the crystal is differently developed. (In the figure one of these axes is in- (WO dicated by the dotted line.) These \W axes, therefore, resemble the single —¥16. 8.—Boractte. axis in tourmaline and electric calamine, and are also axes of pyroelectricity, the end at which the tetrahedral face is situated being the antilogous pole.!

Scheelite, apatite, ilmenite, and fergusonite are examples

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Fria. 4.—IImenite.,

Fic. 5.—Apatite.

of crystalline polarity of the second kind. Figs. 4, 5, and 6 are representations of forms of ilmenite, apatite, and fergusonite.

Crystalline polarity of both kinds no doubt depends on the arrangement of the molecules and on their structure; it manifests itself by the occurrence of hemihedral or hemimorphic forms. A crystal may have a polar structure

although these external marks of pol- arity are absent, just as the faces parallel to planes of cleavage do not appear on every crystal.

Another kind of contrast between the two complementary hemihedral forms of the same substance may be mentioned here.

Fie, 6,—Fergusonite.

- Upon some crystals of boracite the faces of both tetrahedra oceur. They ean, however, be easily distinguished from one another. The faces of the tetrahedron represented in the figure are smooth and shin- ing, while those of the opposite tetrahedron are rough and usually much smaller. It has been suggested that boracite is only apparently regular, and that each crystal is really a group of eight pyramids with their apices in the centre of the group. For a full discussion of the relation between pyroelectrieity and crystalline form the reader is referred to a series of papers by Professor Hankel in Trans. R. Saxon Soc. of Sciences, 1857-79.

specimens of iron (and also of cobalt glance) have very different thermoelectric characters, differing indeed from one another more than bismuth and antimony. Gustav Rose showed that these thermoelectrically opposite kinds are also crystallographically opposite. There is indeed no geometrical difference between two opposite hemihedral forms in the regular system, but Rose detected a differ- ence in the lustre and striation of the faces of the two kinds, and by examining the rare cases in which the two opposite pentagonal dodecahedra or tetragonal icositetrahedra occur on the same crystal proved that the one surface character belongs to the one, the other surface character to the other of the two complementary hemihedra.

Enantiomorphism.—A figure having polarity of the first kind gives a mirror image resembling itself in form and in position; a figure having polarity of the second kind gives a mirror image resembling itself in form but not in position—the poles being inverted. A figure the axis of which has both kinds of polarity will therefore give a mirror image not superposable to the figure itself, because the polarity of the second kind is reversed while that

of the first kind remains unchanged. The figure and its mirror image are enantiomorph, as well as polar. We can construct a figure which is enantiomorph ‘to its mirror image but not polar. Imagine a. muff so made that in one half the fur lies the one way, and the opposite way in the other half (fig. 7, where the arrow-heads indicate the lie of the fur). In which-ever way we put our hands into this muff one end will be wrong; the muff in the figure has, in fact, two right- hand ends. It has therefore no polarity; the two ends are exactly alike. But there are two ways in which such a non-polar muff could be made—with two right-hand ends as in the figure, or with two left-hand ends, and these two forms are enantiomorph. A helix or screw has similar properties (compare fig. 8 with fig. 7); if uniform it is non-polar, but is either right- or left-handed. Hence the property which each of two enantiomorph bodies pos- sesses has been called by Sir William Thomson “helicoidal asymmetry.”

As we have crystals exhibiting polarity of both kinds, so we have also enantiomorph crystals, indeed the word enantiomorph was first used by Naumann to express the relation between such crystals. The crystallographic theory of enantiomorph crystals has been very fully worked out. We may divide them into two groups— (1) those in which the helicoidal asymmetry depends on the presence of tetartohedral forms of the regular or of the hexagonal system, and (2) those in which it depends on the presence of hemihedral forms of the rhombic system or hemimorphic forms of the monoclinic systen1.

In the first group the asymmetry seems to be produced by the manner in which the molecules, themselves sym- metrical, are arranged in the crystal. In the second group the molecules themselves appear to have helicoidal asym- metry. This is shown by the action of these substances on polarized light. We shall take examples from each group. If we allow a solution of sodium chlorate to crystallize we find that the crystals, which belong to the regular system, are of two kinds enantiomorph to each other. These are represented in fig. 9. The enantio: morphism depends on the combination of the tetrahedron XIX. — 4o

Fig. 8.

and the pentagonal dodecahedron.! Now when a ray of plane polarized light is passed through one of these crystals the plane of polarization is rotated, the amount of rotation being proportional to the length of the path in

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Fre. 9.—Sodium Chlorate.

a, right-handed ; 8, left-handed.

the crystal. The crystals having the form a rotate to the right, those having the form 6 to the left. They are therefore optically as well as crystallographically enantio- morph. But a solution of sodium chlorate is without action on the plane of polarization, even if the solution be made by dissolving only right-handed or only left-handed crystals, and if a crystal be fused the fused mass is optically inactive, so that it would seem that the optical activity depends on the arrangement of the molecules in the crystal and not on any enantiomorphism in the mole- cules. The enantiomorphism of quartz crystals is indi- cated by the presence of faces of a tetartohedral form (vol. xvi. p. 389). The two kinds of crystals rotate the plane of polarization equally, but in opposite senses, when a plane polarized ray is passed through a section cut at right angles to the axis of the crystal. Here also the optical activity ceases when crystalline structure is de- stroyed by fusion or solution.

Right-handed and left-handed tartaric acids crystallize in enantiomorph forms (fig. 10). Their solutions are optic-

a, right-handed; 6, left-handed.

Fic. 10.—Tartaric Acid.

ally active, the amount of the rotation for the same strength of solution and the same length of path in it being the same in both acids, but the sense of the rotation is right-handed in the one and left-handed in the other. It is clear that here we have to do with enantiomorph molecules. In ordinary physical properties such as den- sity, solubility, refracting power—in short, in everything not involving right- or left-handedness—the acids are iden- tical.

When mixed in equal proportions they unite and form racemic acid which is optically inactive, and from racemic acid we can by various means recover unchanged the right and left-handed tartaric acids) We now know a considerable number of cases where, as in that of the two tartaric acids, both enantiomorphs have been discovered, and many where only one has as yet been found.

It is natural that we should ask what peculiarity of constitution can give a molecule this helicoidal asymmetry? A very ingenious answer to this question was given simul- taneously and independently by the French chemist Le Bel and the Dutch chemist Van’t Hoff. We shall

1 This combination is regarded as tetartohedral because the tetra-

hedron and the pentagonal dodecah iffer fo g ecahedron belong to two different classes

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give a short statement of the essential points of this in- teresting theory.

All the known substances which are optically active. in solution are compounds of carbon, and may be regarded as derived from marsh gas, a compound of one atom of carbon and four of hydrogen, by the replacement of hydro- gen by other elements or compound radicals. Now we do not know how the atoms of hydrogen are actually arranged relatively to each other and to the atom of carbon in the molecule of marsh gas, but, if we may make a sup- position on the subject, the most simple is to imagine the four hydrogen atoms at the apices of a regular tetrahedron in the centre of which is the carbon atom as in the diagrams (fig. 11), where C 3 B represents the posi- , ae tion of the carbon * atom and a, B, y, 6 that of the four atoms of hydrogen.

If these hydrogen atoms are replaced by atoms of other elements or by compound radicals we should expect a change of form of the tetrahedron. If two or more of the atoms or radicals united to the carbon atom are similar there is only one way of arranging them, but if they are all different there are two ways in which they may be arranged, as indicated in the figures. It

will be seen that these two arrangements are enantiomorph. In the figures the tetrahedron is represented as regular, but if the dis- tance from C depends on the nature of the atom, the tetrahedron, when a, B, y, and 6 are all different, will not be symmetrical, but its two forms will be enantiomorph. A carbon atom combined with four different atoms or com- pound radicals may therefore be called an asymmetric carbon atom.

Now all substances of ascertained constitution, the solutions of which are optically active, contain an asym- metric carbon atom, and their molecules should therefore, on the above hypothesis, have helicoidal asymmetry.

The converse is not generally true. Many substances contain an asymmetric carbon atom but are optically inactive. It is easy to reconcile this with the theory; indeed, a little consideration will show that it is a necessary consequence of it.

Let us suppose that we have the symmetrical combina- tion of C with a, a, 8, y and that we treat the substance in such a way that one a is replaced by 6. The new arrangement is asymmetrical, and will be right or left as the one or the other a is replaced. But the chances for the two are equal, and therefore, as the number of mole- cules in any quantity we can deal with is very great, the ratio of the number of right-handed molecules in the new substance to the number of left-handed ones will be sensibly that of unity. It is therefore evident that by ordinary chemical processes we cannot expect to produce optically active from optically inactive substances ; all that we can get is an inactive mixture of equal quantities of the two oppositely active substances.

As these two substances have identical properties in every respect where right- or left-handedness is not in- volved, the problem of separating them is a difficult one. We may note three distinct ways in which the separation can be effected.

(1) By crystallization. For example, the right and left double tartrates of soda and ammonia crystallize in enan- tiomorph forms (fig. 12) and are less soluble in water than the double racemate formed by their union. If therefore racemic acid (the optically inactive compound of equal quantities of right and left tartaric acids) is half neutral-

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Fig. 11.

Plate II.

Extent.

Ap- proaches.

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ized with soda and half with ammonia, we obtain an optically inactive solution containing a mixture of the two double salts. If this solution is allowed to crystallize each salt crystallizes independently, and the crystals can be separated by picking them out. Further, a super- saturated solution of the one double salt is not made to crystallize by contact with a crystal of the other, so that

Fic. 12.—Double Tartrate of Soda and Ammonia. 6, left-handed.

if we make a supersaturated solution of the inactive mix- ture and drop into the vessel, at different places, two crystals one of the right the other of the left salt, crystal- lization occurs at each place, at the one of the one kind and at the other of the other. |

(2) By the action of another optically active substance. While the salts of the two opposite tartaric acids with an inactive base are precisely alike in solubility, density, and other physical characters, and, if they crystallize, crystal- lize in the same form (or in enantiomorph forms), it is not at all so when the base is optically active; thus right tartaric acid forms a crystalline salt with left asparagine, while with the same base left tartaric acid gives an

a, right-handed ;

-uncrystallizable compound.

(3) By the action of living ferments. which act as ferments do not show any right- or left-hand- edness as far as their obvious anatomical structure is

con- cerned, but Pasteur has shown that some of them are, if we may use the expression, physiologically asymmetrical. As an example we may give the very interesting case of mandelic acid. This acid, which stands to benzoic alde- hyde (bitter almond oil) in the same relation as lactic acid does to common aldehyde, contains one asymmetric carbon atom in its molecule. It is optically inactive, and there- fore, if Le Bel and Van ’t Hoff’s theory is true, it must be a mixture of two oppositely active acids. Now Lewko- witsch found that when Peniciliwm glaucum is cultivated in

The minute fungi |

Em) 4, 315

| a solution of mandelic acid fermentation takes place. This goes on until exactly half of the acid is decomposed, and what remains has all the properties of mandelic acid, but is optically active ; it is the right-handed component of the mixture, the growing fungus having consumed the other.

There is an interesting peculiarity of tartaric acid dis- covered by Pasteur (to whom we owe nearly all our know- ledge of the relations between optical activity and crystalline form in tartaric acid) which is of importance in connexion with the theory we have just been explaining.

We have not only right and left tartaric acid and racemic acid, the inactive compound of the two, but also a kind of tartaric acid which is inactive but incapable of being separated into the two oppositely active acids.

Now the chemical formula of tartaric acid is

OE. HH © Lh dt bh | ae a:

Tt will be observed that the carbon atoms marked * are asymmetric, and that they occupy precisely similar posi- | tions in the molecule. Each of them is combined with |H, OH, COOH and CH(OH)COOH. If in both of them these four things are arranged in the same order there is helicoidal asymmetry—the one order giving the one, the other the other enantiomorph form. But if the one has one order and the other the opposite, then there is in the whole molecule no helicoidal asymmetry, as the | two halves exactly

balance one another. There is not, as | in racemic acid, a compound of one molecule of each of the _ two opposite active acids, but rather a compound of half _a molecule of each; and we should not expect such a com- | pound to be easily separable. Jungfleisch has shown that if any one of the four tartaric acids (right, left, racemic, _and inactive) is mixed with a little water and kept for some _ time at a temperature of about 200° C., it is converted into _a mixture of racemic and inactive tartaric acids, so that, as racemic acid can be divided into right and left tartaric | acids, it is possible to prepare any one of the four from any other. (A. ©. B.)

POLARIZATION OF LIGHT. See Licut and Wave

| THEORY.

POLAR REGIONS

T and Antarctic Circles, in 66° 32’ N. and S., to the north and south poles, the circles being 1408 geographical miles from the poles. The intense cold and the difficulties of ice navigation have made the discovery and examination of these regions a slow and hazardous task. Millions of square miles are still entirely unknown. In the present article the history of the progress of discovery within the

north polar region will be traced, and some account of its |

physical geography will follow. A similar review of work in the south polar region will conclude the article.

Nortu Potar REGion.

The Arctic Circle is a ring running a little south of the northern shores of America, Asia, and Europe, so that those shores form a fringe within the polar region, and are its boundary to the south, except at three openings,—those of the North Atlantic, of Davis Strait, and of Behring’s (more properly Bering’s) Strait.

The width of the approach to this region by the Atlantic

Ocean, in its narrowest part, is 660 miles, from the |

Norwegian Islands of Lofoten to Cape Hodgson on the

HE polar regions extend respectively from the Arctic |

east coast of Greenland. The width of the approach by Davis Strait in the narrowest part, which is nearly on the Arctic Circle, is 165 miles; and the width of Behring Strait is 45 miles. Thus out of the whole ring of 8640 miles along which the Arctic Circle passes about 900 miles is over water. This great environment of land is an important feature in the physical condition of the north polar region. It influences the currents and the movements of ice, which are still further affected by the archipelagos lying to the northward of the fringing coast-lines. The larger opening into the north polar region by way of the Atlantic is divided from Davis Strait by the vast mass of Greenland, which, extending for an unknown distance to the north, crosses the Arctic Circle and ends in a point at Cape Farewell in 59° 48’ N. lat. It was inevitable that the routes across the Arctic Circle by the Atlantic and Davis Strait should first become known, because these openings to the polar regions are nearest to the temperate regions inhabited by the exploring nations of Europe.

| Circle, first brought by PyTueas (q.v.), and afterwards | doubted, was the extent of the knowledge of the north

A rumour respecting Thule, an island on the Arctic Thule.

Other.

Norse- men.

Wil- loughby.

Chan- cellor.

Burrough.,

polar regions with which the ancients can be credited. But in the 9th century some Irish monks really appear to have visited Iceland. The monk Dicuil, writing about 825, says that he had information from brethren who had been at Thule during several months, and they reported that there was no darkness at the summer solstice.

King Alfred told the story of the first polar voyages undertaken for discovery and the acquisition of knowledge, in his very free translation of Orosius. In the first book he inserted the narrative of the voyages of Other and Wulfstan, related to him by the former explorer himself. The localities mentioned in the story cannot now be identified, but it seems probable that Other rounded the North Cape, and visited the coast of Lapland.

The Norsemen of the Scandinavian peninsula, after colonizing Iceland, were the first to make permanent settle- ments on the shores of Greenland, and to extend their voyages beyond the Arctic circle along the western coast of that vast glacier-covered land. See GREENLAND. The Norse colonies in Greenland at Brattelid and Einarsfjord did not extend farther north than 65°, but in the summer time the settlers carried on their seal hunting far beyond the Arctic circle. One of their runic stones was found in a cairn in latitude 73° N., the inscription showing that the date of its being left there was 1235. Another expe- dition is believed, on good grounds, to have reached a latitude of 75° 46’ N. in Barrow Strait, about the year 1266. Their ordinary hunting grounds were in 73° N., to the north of the modern Danish settlement of Upernivik. For the visits of the Greenlanders to the American coasts see AMERICA, vol. i. p. 706.

The last trace of communication between Greenland and Norway was in 1347. The black death broke out in Norway and the far off colony was forgotten; while the settlers were attacked by Skrellings or Eskimo, who over- ran the West Bygd in 1349. Ivar Bardsen, the steward to the bishopric of Gardar in the East Bygd, and a native of Greenland, was sent to convey help to the sister colony.: A document, of which Ivar Bardsen was the author, has been preserved. It consists of sailing directions for reach- ing the colony from Iceland, and a chorography of the colony itself. It is the oldest work on arctic geography, and is still valuable in the study of all questions relating to the early settlements in Greenland. From 1400 to 1448 there was

some communication, at long intervals, with the Greenland settlers, but during the latter half of that century it entirely ceased. Here then the ancient portion of polar history comes to anend. The next period, comprised in the 16th and 17th centuries, was that in which expeditions were despatched across the Arctic Circle to discover a shorter route to India.

Sebastian Cabot, whose own northern voyages have been spoken of in the article Casot, was the chief pro- moter of the expedition which sailed under Sir Hugh Willoughby and Richard Chancellor on the 20th May 1553, “for the search and discovery of the northern parts of the world, to open a way and passage to our men, for travel to new and unknown kingdoms.” Willoughby, after dis- covering Nova Zembla (Novaya Zemlya) by sighting the cqast of Goose Land, resolved to winter in a harbour of Lapland, where he and all his men perished of starvation and cold. Chancellor reached the Bay of St Nicholas, and landed near Archangel, which was then only a castle. He undertook a journey to Moscow, made arrangements for commercial intercourse with Russia, and returned safely. His success proved the practical utility of polar voyages. It led to a charter being granted to the Associa- tion of Merchant Adventurers, of which Cabot was named governor for life, and gave fresh impulse to arctic discovery.

In the spring of 1556 Stephen Burrough, who had

Wt Gro Ns

served with Chancellor, sailed in a small pinnace called the “Searchthrift,” and kept a careful journal of his voyage. He went to Archangel, and discovered the strait leading into the Kara Sea, between Nova Zembla and the island of Waigat. In May 1580 the company fitted out two vessels under Arthur Pet and Charles Jackman, with orders to pass through the strait discovered by Burrough, and thence to sail eastward beyond the mouth of the river Obi. Pet discovered the strait into the Kara Sea, between Waigat and the mainland, and made a persevering effort to push eastward, returning to England in safety. Jack-

Pet

man, after wintering in a Norwegian port, sailed home- –

ward but was never heard of again.

In 1558 a narrative and map were published at Venice The Zeni.

which profoundly affected the system of polar cartography for many years afterwards. The publication was the handiwork of a Venetian nobleman named Niccold Zeno. Towards the close of the 14th century his ancestor, also named Niccold, made a voyage into the northern seas, and entered the service of a chief named Zichnmi as pilot. He was eventually joined by his brother Antonio, and four years afterwards died in the country he called Frislanda. Antonio remained ten years longer in the service of Zichnmi, and then returned to Venice. The younger Niccolé found the mutilated letters of these brothers in the Zeni palace, with a map; and out of these materials he prepared the narrative and map which he published, adding what he considered improvements to the map. It was accepted at the time as a work of high authority, and the names on it continued to appear on subsequent maps for at least a century, puzzling both geographers at home and explorers in the field. After a very exhaustive study of the subject, Mr Major has identified the names on the Zeni map, as follows :—Engronelant, Greenland ; Islanda, Iceland; Estland, Shetlands ; Frisland, Faroe Isles ;1 Mark- land, Nova Scotia; Estotiland, Newfoundland ; Drogeo, coast of North America ; Icaria, coast of Kerry in Ireland.

We now come to the voyages of Frobisher, undertaken Frobisher,

to obtain the means for equipping an expedition for the discovery of a shorter route to India by the north-west. Aided by Michael Lok, an influential merchant and diligent student of geography, Frobisher sailed, in the spring of 1576, with two small vessels of 20 to 25 tons, called the “Gabriel” and “ Michael.” But the “ Michael” parted company in the Atlantic, the voyage being continued in the “Gabriel” alone. On 20th July Frobisher sighted high land, which he called Queen Elizabeth’s Foreland ; and the next day he entered the strait to which he gave his own name, calling the land “ Meta Incognita.” On his return in the autumn, with various specimens of plants and stones, the “ goldfinders ” in London took it into their heads that a glittering piece of mica-schist contained gold ore. This caused great excitement, and much larger ex- peditions were fitted out, in the two following years, to collect these precious ores. As many as

fifteen vessels formed the third expedition of 1578, and one of them, a busse (small ship) of Bridgwater, called the “ Emma,” reported that on her voyage home she had sighted land in the Atlantic and sailed along it for three days. It was never seen again, and may have been only a large ice-field ; but it soon found its place on maps and charts under the name of Busse Island, and afterwards as “sunken land of Busse.” For a long time Frobisher Strait was supposed to pass through Greenland, and, the map of the Zeni adding to the confusion, the land to the south was called Frislanda. It is now clear that Frobisher never saw Greenland, and that his strait and ‘Meta Incognita ” are on the American side of Davis Strait. What Frobisher

1 Admiral Irminger of Copenhagen holds the opinion that Frisland is not the Faroe Isles, but Iceland.

Davis.

Barents,

POLAR “REGIONS

really did was to establish the fact that there were two or :

more wide openings leading to the westward, between latitudes 60° and 63°, on the American coast.

John Davis, who made the next attempt to discover a north-west passage, was one of the most scientific seamen of that age. He made three voyages in three successive years, aided and fitted out by William Sanderson and other merchants. Sailing from Dartmouth on the 7th June 1585, he was the first to visit the west coast of Greenland subsequent to the abandonment of the Norse colonies. He called it “The Land of Desolation.” He discovered Gilbert’s Sound in 64° 10’ (where now stands the Danish settlement of Godthaab) and then, crossing the strait which bears his name, he traced a portion of its western shore. In the second voyage Davis noted what

he calls ‘‘a furious overfall,” which was the tide flowing |

into Hudson Strait ; and in his third voyage, in 1587, he advanced far up his own strait, and reached a lofty granite island in 72° 41’ N. which he named Sanderson’s Hope. He considered that there was good hope of advancing farther, and reported “no ice towards the north, but a great sea, free, large, very salt and blue, and of an unsearchable depth.” The results of his discoveries are shown on the Molyneux globe which is now in the library of the Middle Temple; but he found it impossible to reconcile his work with that of Frobisher, and with the Zeni map. In 1595 Davis published a tract entitled The World’s Hydvrographical Description, in which he ably states the arguments in favour of the discovery of a north- west passage.

The Dutch also saw the importance of a northern route to China and India, especially as the routes by the Cape of Good Hope and Magellan’s Strait were jealously guarded by Spaniards and Portuguese. Their plan was to proceed by the north-east along the coast of Asia. As early as 1578 Dutch merchants had opened a trade with Kola and Archangel, but it was Peter Plancius, the learned cosmo- grapher of Amsterdam, who conceived the idea of dis- covering a north-east passage. In 1594 the Amsterdam merchants fitted out a vessel of 100 tons, under the com- mand of Willem Barents. The coast of Nova Zembla was sighted on the 4th July, and from that date until the 3rd of August Barents continued perseveringly to seek a way through the ice-floes, and discovered the whole western coast as far as Cape Nassau and the Orange Islands at the north-west extremity. The second voyage in which Barents was engaged merely made an unsuccessful attempt to enter the Kara Sea. The third was more important. Two vessels sailed from Amsterdam on May 13, 1596, under the command of Jacob van Heemskerck and Corneliszoon Rijp. Barents accompanied Heemskerck as pilot, and Gerrit de Veer, the historian of the voyage, was on board as mate. ‘The masses of ice in the straits leading to the Sea of Kara, and the impenetrable nature of the pack ‘near Nova Zembla, had suggested the advisability of avoiding the land and, by keeping a northerly course, of seeking a passage in the open sea. They sailed northwards and on 9th June discovered Bear Island. Continuing on the same course they sighted the north-western extreme of Spitz- bergen, soon afterwards being stopped by the polar pack ice. This important discovery was named “ Nieue Land,” and was believed to be a part of Greenland. Arriving at Bear Island again on 1st July, Rijp parted company, while Heemskerck and Barents proceeded

eastward, intending to pass round the northern extreme of Nova Zembla. On the 26th August they reached Ice Haven, after rounding the northern extremity of the land. Here they wintered in a house built out of driftwood and planks from the wrecked vessel. In the spring they made their way in

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voyage. This was the first time that an arctic winter was successfully faced. The voyages of Barents stand in the first rank among the polar enterprises of the 16th century. They led directly to the flourishing whale and seal fisheries which long enriched the Netherlands.

The English enterprises were continued by the Muscovy Company, and by associations of patriotic merchants of London; and even the East India Company sent an

expedition under Captain Waymouth in 1602 to seek for a Way. passage by the opening seen by Davis, but it had no success, mouth.

The best servant of the Muscovy Company in the work of polar discovery was Henry Hudson. was undertaken in 1607, when he discovered the most northern known point of the east coast of Greenland in 73° N. named “ Hold with Hope,” and examined the edge of the ice between Greenland and Spitzbergen, reaching a latitude of 80° 23’ N. On his way home he discovered the island now called Jan Mayen, which he named “ Hudson’s Tutches.” In his second expedition, during the season of 1608, Hudson examined the edge of the ice be- tween Spitzbergen and Nova Zembla. In his third voyage he was employed by the Dutch East India Company, and he explored the coasts of North America, discovering the Hudson river. In 1610 he discovered Hudson’s Strait, and the great bay which bears and immortalizes his name (see Hupson, vol. xii. p. 332).

His first voyage Hudson.

The voyages of Hudson led immediately to the Spitz- Spitz- bergen whale fishery. From 1609 to 1612 Jonas Poole bergen

made four voyages for the prosecution of this lucrative business, and he was followed by Fotherby, Baffin, Joseph, and Edge. These bold seamen, while in the pursuit of whales, added considerably to the knowledge of the archi- pelago of islands known under the name of Spitzbergen, and in 1617 Captain Edge discovered a large island to the eastward, which he named Wyche's Land.

whale fishery.

At about the same period the kings of Denmark began Danish

to send expeditions for the rediscovery of the lost Green- land colony. In 1605 Christian IV. sent out three ships, under the Englishmen Cunningham and Hall, and a Dane named Lindenoy, which reached the western coast of Greenland and had much intercourse with the Eskimo. Other expeditions followed in 1606-7.

Meanwhile the merchant adventurers of London con- tinued to push forward the western discovery. Sir Thomas Button, in command of two ships, the " Resolution" and "Discovery," sailed from England in May 1612. He entered Hudson's Bay, crossed to its western shore, and wintered at the mouth of a river in 57° 10' N. which was named Nelson's river after the master of the ship, who died and was buried there. Next year Button explored the shore of Southampton Island as far as 65° N., and returned home in the autumn of 1613. An expedition under Captain Gibbons, despatched in 1614, was a miser- able failure; but in 1615 Robert Bylot as master and William Baffin as pilot and navigator in the ' Discovery" examined the coasts of Hudson's Strait, and Baffin, who was the equal of Davis as a scientific seaman, made many valuable observations. In 1616 Bylot and Baffin again set out in the "Discovery." Sailing up Davis Strait they passed that navigator's farthest point at Sanderson's Hope, and sailed round the great channel with smaller channels leading from it which has been known ever since as Baffin's Bay. Baffin nanied the most northern opening Smith Sound, after the first governor of the East India Company, and the munificent promoter of the voyage, Sir Thomas Smith. Wolstenholme Sound, Cape Dudley Digges, Hakluyt Island, Lancaster Sound, Jones Sound, and the Cary Islands were named after other promoters and friends of the voyage. The fame of Baffin mainly

boats to the Lapland coast; but Barents died during the | rests upon the discovery of the great channel extending

voyages.

Button.

Baffin.

Luke the London ship “‘ Charles” Luke Fox explored the western Rep went far to the eastward along the northern shores of Fox. _ gide of Hudson’s Bay as far as the place called ‘Sir Thomas | Greenland, and saw very high land in 80° N, which has James. Roe’s Welcome.” In August he encountered Captain James | since been known as Gilies Land. The Dutch geographi- and the Bristol ship “Maria” in the middle of Hudson’s | cal knowledge of Spitzbergen was embodied in the famous Bay, and went north until he reached “North-west Fox | chart of the Van Keulens (father and son), 1700-1728. his furthest,” in 66° 47’ N. He then returned home and | The Dutch whale fishery continued to flourish until the wrote the most entertaining of all the polar narratives. | French Revolution, and formed a splendid nursery for Captain James was obliged to winter off Charlton Island, training the seamen of the Netherlands. From 1700 to in the southern extreme of Baffin’s Bay, and did not return | 1775 the fleet numbered 100 ships and upwards. In until October 1632. Another English voyager, Captain | 1719 the Dutch opened a whale fishery in Davis Strait, Wood, attempted, without success, to discover a north-east | and continued to frequent the west coast of Greenland for passage in 1676. upwards of sixty years from that time. In the course of The 16th and 17th centuries were periods of discovery | 6372 Dutch whaling voyages to Davis Strait between 1719 and daring enterprise, and the results gained by the gallant | and 1775 only 38 ships were wrecked. seamen of those times are marvellous when we consider The most flourishing period of the English fishery in English their insignificant resources and the small size of their | the Spitzbergen seas was from 1752 to 1820. Bounties whale vessels. Hudson’s Strait and Bay, Davis Strait, and | of 40s. per ton were granted by Act of Parliament; and fishery Baffin’s Bay, the icy seas from Greenland to Spitzbergen | in 1778 as many as 255 sail of whalers were employed.

‘and from Spitzbergen to Nova Zembla, had all been dis- | In order to encourage discovery £5000 were offered in covered, The following century was rather a period of | 1776 to the first ship that should sail beyond the 89th reaping the results of former efforts than of discovery. It | parallel (16 Geo. III. c. 6). Among the numerous daring saw the settlement of the Hudson’s Bay Territory and of | and able whaling captains, Captain Scoresby takes the Scoreshy. Greenland, and the development of the whale and seal | first rank, alike as a successful fisher and a scientific fisheries. observer. His admirable Account of the Arctic Regions is

The Hudson’s Bay Company was incorporated in 1670, | still a text book for all students of the subject. In 1806 and Prince Rupert sent out Zachariah Gillan, who wintered | he succeeded in advancing his ship “ Resolution” as far at Rupert’s river. At first very slow progress was made. | north as 81° 12’ 42”. In 1822 he forced his way through A voyage undertaken by Mr Knight, who had been | the ice which encumbers the approach to land on the east appointed governor of the factory at Nelson river, was | coast of Greenland, and surveyed that coast from 75° down unfortunate, as his two ships were lost and the crews | to 69° N., a distance of 400 miles. Scoresby combined Scroggs. perished. ‘This was in 1719. In 1722 John Scroggs was | the closest attention to his business with much valuable sent from Churchill river in search of the missing ships, | scientific work and no insignificant amount of exploration. but merely entered Sir Thomas Roe’s Welcome and The Russians, after the acquisition of Siberia, succeeded Russians. returned. His reports were believed to offer decisive | in gradually exploring the whole of the northern shores of proofs of the existence of a passage into the Pacific; and | that vast region. As long ago as 1648 a Cossack named a naval expedition was despatched under the command of | Simon Deshneff equipped a boat expedition in the river Middle- Captain Christopher Middleton, consisting of the ‘“ Dis- | Kolyma, passed through the strait afterwards named after ton. covery” pink and the “Furnace” bomb. Wintering in | Bering, and reached the Gulf of Anadyr. In 1738 a Churchill river, Middleton started in July 1742 and dis- | voyage was made by two Russian officers from Archangel covered Wager river and Repulse Bay. In 1746 Captain | to the mouths of the Obi and the Yenisei. Efforts were Moor. W. Moor made another voyage in the same direction, and | then made to effect a passage from the Yenisei to the Coats. explored the Wager Inlet.

Captain Coats, who was in the | Lena. In 1735 Lieutenant T. Tchelyuskin got as far as Tchel- service of the company 1727-51, wrote a useful account | 77° 25’ N. near the cape which bears his name; and in yuskin. of the geography of Hudson’s Bay. Later in the century | 1743 he reached that most northern point of Siberia in the Hudson’s Bay Company’s servants made some important | sledges, in 77° 41’ N. Captain Vitus Bering, a Dane, Bering. land journeys to discover the shores of the American polar | was appointed by Peter the Great to command an expedi- Hearne. ocean. From 1769 to 1772 Samuel Hearne descended | tion in 1725. ‘Two vessels were built at Okhotsk, and in the Coppermine river to the polar sea; and in 1789 | July 1728 Bering ascertained the existence of a strait ne Alexander Mackenzie discovered the mouth of the Mac- | between Asia and America. In 1740 Bering was again enziekenzie river. employed. He sailed from Okhotsk in a vessel called the The establishment of the modern Danish settlements in | “St Paul,” with G. W. Steller on board as naturalist. Greenland has already been spoken of under the heading | Their object was to discover the American side of the GREENLAND (q.v.). strait, and they sighted that magnificent peak named by Dutch The countrymen of Barents vied with the countrymen | Bering Mount St Elias. The Aleutian Islands were also ae, of Hudson in the perilous calling which annually brought | explored, but the ship was wrecked on an island named

‘ fleets of ships to the Spitzbergen seas during the 18th | after the ill-fated discoverer, and scurvy broke out amongst

ee The Dutch had their large summer station for hiscrew. Bering himself died there on December 8, 1741. q ouimg down blubber at Smeerenberg, near the northern Thirty years after the death of Bering a Russian Liakhof. extreme of the west coast of Spitzbergen. Captain | merchant named Liakhoff discovered the New Siberia or Vlamingh, in 1664, advanced as far round the northern | Liakhoff Islands, and in 1771 he obtained the exclusive

north from Davis Strait; but it was unjustly dimmed for many years, owing to the omission of Purchas to publish the skilful navigator’s tabulated journal and map in his great collection of voyages. It may be mentioned, as an illustration of the value of these early voyages to modern science, that

Professor Hansteen of Christiania made use of Baffin's magnetic observations in the compilation of his series of magnetic maps.

In 1631 two expeditions were despatched, one by the merchants of London, the others by those of Bristol. In

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end of Nova Zembla as the winter quarters of Barents. In 1700 Captain Cornelis Roule is said by Witsen to have sailed north in the longitude of Nova Zembla, and to have seen an extent of 40 miles of broken land. But Theunis Ys, one of the most experienced Dutch navigators, was of opinion that no vessel had ever been north of the 82d parallel. bergen group, and wrote the best account of its physical features and natural history that existed previous to the time of Scoresby. In 1707 Captains Gilies and Outsger

In 1671 Frederick Martens visited the Spitz- Martens.

Heden- strom.

Phipps.

Cook.

Barrow.

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right from the empress Catherine to dig there for fossil ivory. These islands were more fully explored by an officer named Hedenstrém in 1809, and seekers for fossil ivory annually resorted to them. A Russian expedi- tion under Captain Tchitschakoff, sent to Spitzbergen in 1764, was only able to attain a latitude of 80° 30' N.

Since the year 1773 the objects of polar exploration, at least so far as England is concerned, have been mainly the acquisition of knowledge in various branches of science. It was on these grounds that the Honourable Daines Bar- rington and the Royal Society induced the Government to

undertake arctic exploration once more. The result was that two vessels, the "' Racehorse" and ' Carcass" bombs, were commissioned, under the command of Captain Phipps. The expedition sailed from the Nore on the 2d June 1773, and was stopped by the ice to the north of Hakluyt Head- land, the north-western point of Spitzbergen. They reached the Seven Islands and discovered Walden Island ; but beyond this point progress was impossible. When they attained their highest latitude in 80° 48' N., north of the central part of the Spitzbergen group, the ice at the edge of the pack was 24 feet thick. Captain Phipps returned to England in September 1773. Five years afterwards Captain Cook received instructions to proceed northward from Kamchatka and search for a north-east or north-west passage from the Pacific to the Atlantic. In accordance with these orders Captain Cook, during his third voyage, reached Cape Prince of Wales, the western extremity of America, on August 9,1778. His ships, the ' Resolution " aud "Discovery," arrived at the edge of the ice, after passing Behring Strait, in 70° 41'N. On August 17th the farthest point seen on the American side was named Icy Cape. On the Asiatic side Cook's survey extended to Cape North. In the following year Captain Clerke, who had succeeded to the command, made another attempt, but his ship was beset in the ice, and so much damaged that further attempts were abandoned.

The wars following the French Revolution put an end to voyages of discovery till, after the peace of 1815, north polar research found a powerful and indefatigable advocate in Sir John Barrow (q.v.). Through his influence a measure for promoting polar discovery became law in 1818 (58 Geo. III. c. 20), by which a reward of £20,000 was offered for making the north-west passage, and of £5000 for reaching 89° N., while the commissioners of longitude were empowered to award proportionate sums to those who might achieve certain portions of svch discoveries. In 1817 the icy seas were reported by Captain Scoresby and others to be remarkably open, and this circumstance enabled Barrow to obtain sanction for the despatch of two expe- ditions, each consisting of two whalers—one to attempt discoveries by way of Spitzbergen and the other by Baffin's Bay. The vessels for the Spitzbergen route, the '' Doro- thea" and "Trent," were commanded by Captain David Buchan and Lieutenant John Franklin, and sailed in April 1818. Driven into the pack by a heavy swell from the south, both vessels were severely nipped, and had to return to England. 'The other

expedition, consisting of the ‘ Isa- bella” and ‘ Alexander,” commanded by Captain John Ross and Lieutenant Edward Parry, followed in the wake of Baffin’s voyage of 1616. Ross sailed from England in April 1818. The chief merit of his voyage was that it vindicated Baflin’s accuracy as a discoverer. Its practical result was that the way was shown to a very lucrative fishery in the ‘‘North Water” of Baffin’s Bay, which continued to be frequented by a fleet of whalers every year. Captain Ross thought that the inlets reported by Baffin were merely bays, while the opinion of his second in command was that a wide opening to the westward existed through Lancaster Sound of Baffin.

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Parry was consequently selected to command a new Parry’s expedition in the following year. His two vessels, the fitst and “Hecla” and “Griper,” passed through Lancaster Sound, °°°°“4 the continuation of which he named Barrow Strait, and TORE advanced westward, with an archipelago on his starboard hand, since known as the Parry Islands. He observed a wide opening to the north, which he named Wellington Channel, and sailed onwards for 300 miles to Melville Island. He was stopped by that impenetrable polar pack of vast thickness which appears to surround the archipelago to the north of the American continent, and was obliged to winter in a harbour on the south coast of Melville Island. Parry’s sanitary arrangements during the winter were very judicious, and the scientific results of his expedition were most valuable. The vessels returned in October 1820; and a fresh expedition in the “Fury” and “Hecla,” again under the command of Captain Parry, sailed from the Nore on May 8, 1821, and passed their first winter on the coast of the newly discovered Melville Peninsula in 66° 11’ N.

Still persevering, Parry passed his second winter among

the Eskimo at Igloolik in 69° 20’ N., and discovered a channel leading westward from the head of Hudson’s Bay, which he named Fury and Hecla Strait. The expedition returned in the autumn of 1823. Meantime Parry’s friend Frank- Franklin had been employed in attempts to reach by land lin’s

first the northern shores of America, hitherto only touched at JOU™*Y-two points by Hearne and Mackenzie. Franklin went out

in 1819, accompanied by Dr Richardson, George Back, and Hood. They landed at York factory, and proceeded to

the Great Slave Lake. In August of the following year

they started for the Coppermine river, and, embarking on

it, reached its mouth on July 18, 1821. From that point

550 miles of coast-line were explored, the extreme point being called Cape Turnagain. Most frightful sufferings,

from starvation and cold, had to be endured during the return journey ; but eventually Franklin, Richardson, and

Back arrived safely at Fort Chippewyan. It was now thought desirable that an attempt should be made to con-

nect the Cape Turnagain of Franklin with the discoveries made by Parry during his second voyage; but the first effort, under Captain Lyon in the ‘‘Griper,” was unsuc- cessful.

In 1824 three combined attempts were organized. Parry’s While Parry again entered by Lancaster Sound and pushed third down a great opening he had seen to the south named Y°Y*8° Prince Regent’s Inlet, Captain Beechey was to enter Behring’s Strait, and Franklin was to make a second journey to the shores of Arctic America. Parry was unfortunate, but Beechey entered Behring Strait in the “ Blossom ” in Beechey. August 1826, and extended our knowledge as far as Point Barrow in 71° 23’ 30” H. lat. Franklin, in 1825-26, Frank- descended the Mackenzie river to its mouth, and ex-lin’s plored the coast for 374 miles to the westward; while Se Dr Richardson discovered the shore between the mouths ; of the Mackenzie and Coppermine, and sighted land to the northward, named by him Wollaston Land, the dividing channel being called Union and Dolphin Strait. They returned in the autumn of 1826.

Work was also being done in the Spitzbergen and Barents Seas. From 1821 to 1824 the Russian Captain Lutke. Lutke was surveying the west coast of Nova Zembla as far as Cape Nassau, and examining the ice of the adjacent sea. In May 1823 the “Griper” sailed, under the com- mand of Captain Clavering, to convey Captain Sabine to Claver- the polar regions in order to make pendulum observations. “8: Clavering pushed through the ice in 75° 30’ N., and succeeded in reaching the east coast of Greenland, where observations were taken on Pendulum Island. He laid down the land from 76° to 72° N.

Parry’s attempt in 1827 to reach the pole from the

Parry’s

attempt to reach the pole.

Graah.

The Rosses.

a land named by him Boothia Felix.

Back.

Simpson and Dease.

Rae.

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northern coast of Spitzbergen, by means has been described under the heading Parry. The highest latitude reached was 82° 45’ N.; and the attempt showed that it is useless to leave the land and trust to the drifting pack in polar exploration. ; ;

In 1829 the Danes undertook an interesting piece of exploration on the east coast of Greenland. Captain Graah of the Danish navy rounded Cape Farewell in boats, with four Europeans and twelve Eskimo. He advanced as far as 65° 18’ N. on the east coast, where he was stopped by an

insurmountable barrier of ice. He wintered at Nugarlik in 63° 22’ N., and returned to the settlements on the west side of Greenland in 1830.

In the year 1829 Captain John Ross, with his nephew James, having been furnished with sufficient funds by a wealthy distiller named Felix Booth, undertook a private expedition of discovery in a small vessel called the “Victory.” Ross proceeded down Prince Regent’s Inlet to the Gulf of Boothia, and wintered on the eastern side of In the course of exploring excursions during the summer months James Ross crossed the land and discovered the position of the north magnetic pole on the western side of it, on June 1, 1831. He also discovered a land to the westward of Boothia which he named King William Land, and the northern shore of which he examined. The most northern point, opposite the magnetic pole, was called Cape Felix, and thence the coast trended south-west to Victory Point. James Ross was at Cape Felix on May 29, 1830. The tosses never could get their little vessel out of its winter quarters. They passed three winters there, and then fell back on the stores at Fury Beach, where they passed their fourth winter of 1832-33. Jventually they were picked up by a whaler in Barrow Strait, and brought home. Great anxiety was naturally felt at their prolonged absence, and in 1833 Sir George Back, with Dr Richard King as a companion, set out by land in search of the missing explorers. Wintering at the Great Slave Lake, he left Fort Reliance on June 7, 1834, and descended the Great Fish River, which is obstructed by many falls in the course of a rapid and tortuous course of 530 miles. The mouth was reached in 67° 11’ N., when the want of supplies obliged them to return. In 1836 Sir George Back was sent, at the suggestion of the Royal Geographical Society, to proceed to Repulse Bay in his ship, the “Terror,” and then to cross an assumed isthmus and examine the coast-line thence to the mouth of the Great Fish River; but the ship was obliged to winter in the drifting pack, and was brought back across the Atlantic in a sinking condition.

The tracing of the polar shores of America was completed by the Hudson’s Bay Company’s servants. In June 1837 Messrs Simpson and Dease left Chippewyan, reached the mouth of the Mackenzie, and connected that position with Point Barrow, which had been discovered by the “‘Blossom” in 1826. In 1839 Simpson passed Cape Turnagain of Franklin, tracing the coast eastward so as to connect with Back’s work at the mouth of the Great

Fish River. He landed at Montreal Island in the mouth of that river, and then advanced eastward as far as Castor and Pollux river, his farthest eastern point. On his return he travelled along the north side of the channel, which is in fact the south shore of the King William Island discovered by James Ross. The south-western point of this island was named Cape Herschel, and there Simpson built a cairn on August 26, 1839. Very little more remained to be done in order to complete the delineation of the northern shores of the American continent. This was entrusted to Dr John Rae, a Hudson's Bay factor, in 1846. He went in

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of sledge-boats, | nearly on the Arctic Circle ; and he and his six Orkney

men maintained themselves on the deer they shot. During the spring of 1847 Dr Rae explored on foot the shores of a great gulf having 700 miles of coast-line. He thus con- nected the work of Parry, at the mouth of Fury and Hecla Strait, with the work of Ross on the coast of Boothia, proving that Boothia was part of the American continent.

While the English were thus working hard to solve some of the geographical problems relating to Arctic America, the Russians were similarly engaged in Siberia.

In 1821 Lieutenant Anjou made a complete survey of the Anjou.

New Siberia Islands, and came to the conclusion that it was not possible to advance far from them in a northerly direction, owing to the thinness of the ice and to open water within 20 or 30 miles. similar investigations from the mouth of the Kolyma between 1820 and 1823. He made four journeys with dog sledges, exploring the coast between Cape Tchelagskoi and the Kolyma, and making attempts to extend his journeys to some distance from the land. He was always stopped by thin ice, and he received tidings from a native chief of the existence of land at a distance of several leagues to the northward. to explore the region which terminates in Cape Tchel- yuskin. He reached the cape in the height of the short sumnier, whence he saw open water and no ice blink in any direction. The whole arctic shore of Siberia had now been explored and delineated, but no vessel had yet rounded the

extreme northern point, by sailing from the mouth of the Yenisei to that of the Lena. When that feat was achieved the problem of the north-east passage would be solved. .

The success of Sir James Ross’s Antarctic expedition Franklin

Baron Wrangell prosecuted Wrangell. –

In 1843 Middendorf was sent — One

and the completion of the northern coast-line of America ¢xpedi-

by the Hudson's Bay Company's servants gave rise in 1845 to a fresh attempt to make the passage from Lancas- ter Sound to Behring Strait. The story of this unhappy expedition of Sir John Franklin, in the "Erebus" and "Terror," has already been told under FRANKLIN (q.v.); but some geographical details may be given here.

To understand clearly the nature of the obstacle which finally stopped Sir John Franklin, and which also stopped Sir Edward Parry in his first voyage, it is necessary to refer to the map. Westward of Melville and Baring Islands, northward of the western part of the American coast, and nortliward of the channel leading from Smith Sound, there is a vast unknown space, the ice which encumbers it never having been traversed by any ship. All navigators who have skirted along its edge describe the stupendous thickness and massive proportions of the vast floes with which it is packed. This accumulation of ice of enormous thickness, to which Sir George Nares has given the name of a " Paleocrystic Sea," arises from the absence of direct communication between this portion of the north polar region and the warm waters of the Atlantic and Pacific. Behring Strait is the only vent in a south-westerly direction, and that channel is so shallow that the heavy ice grounds outside it. In other directions the channels leading to Baffin's Bay are narrow and tortuous. In-one place only is there a wide and straight lead. The heavy polar ice flows south-east between Melville and Baring Islands, down what is now called M'Clintock Channel, and impinges on the north-west coast of the King William Land discovered by James Ross. It was this branch from the paleocrystic sea which finally stopped the progress of Franklin's expedition. On leaving the winter-quarters at Beechey Island in 1846, Franklin found a channel leading south, along the western shore of the land of North Somerset discovered by Parry in 1819. If he could reach the channel

boats to Repulse Bay, where he wintered in a stone hut | on the American coast, he knew that he would be able

tion.

_ Search expedi- tions. Ross.

Austin.

Kennedy.

Bellot.

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to make his way along it to Beliring Strait. This channel leading south, now called Peel Sound, pointed directly to thesouth. He sailed down it towards King William Island, with land on both sides. But directly they passed the southern point of the western land, and were no longer shielded by it, the great paleeocrystic stream from Melville Island was fallen in with, pressing on King William Island. It was impassable. The only possibility of progress would have been by rounding the eastern side of King William Island, but its insularity was then unknown.

It was not until 1848 that anxiety began to be felt about the Franklin expedition. In the spring of that year Sir James Ross was sent with two ships, the “Enter- prise” and “Investigator,” by way of Lancaster Sound.

point of North Devon. In the spring he made a long sledge journey with Lieutenant M‘Clintock along the northern and western coasts of North Somerset.

On the return of the Ross expedition without any tidings, the country became thoroughly alarmed. An extensive plan of search was organized,—the “ Enterprise ” and “Investigator” under Collinson and MClure proceeding by Behring Strait, while the “ Assistance” and “Resolute” with two steam tenders, the “Pioneer” and “Intrepid,” sailed May 3, 1850, to renew the search by Barrow Strait, under Captain Austin. Two brigs, the “Lady Franklin” and “Sophia,” under Captain Penny, a very energetic and able whaling captain, were sent b the same route. He had with him Dr Sutherland, a naturalist, who did much valuable scientific work. Austin aud

Penny entered Barrow Strait, and Franklin's winter- quarters of 1845-46 were discovered at Beechey Island ; but there was no record of any kind indicating the direc- tion taken by the ships. Stopped by the ice, Austin's expedition wintered (1850-51) in the pack off Griffith Island, and Penny found refuge in a harbour on the south coast of Cornwallis Island. Austin, who had been with Parry during his third voyage, was an admirable organizer, His arrangements for passing the winter were carefully thought out and answered perfectly. In concert with Penny he planned a thorough and extensive system of search by means of sledge travelling in the spring ; and Lieutenant

M'Clintock superintended every minute detail of this part |

of the work with unfailing forethought and consummate skill. Penny undertook the search by Wellington Channel. M'Clintock advanced to Melville Island, marching over 770 miles in eighty-one days; Captain Ommanney and Sherard Osborn pressed southward and discovered Prince

of Wales Island. Lieutenant Brown examined the western |

shore of Peel Sound. The search was exhaustive; but, except the winter-quarters at Beechey Island, no record, no sign was discovered. The absence of any record made Captain Austin doubt whether Franklin had ever

gone beyond Beechey Island. So he also examined the |

entrance of Jones Sound, the next inlet from Baffin's Bay north of Lancaster Sound, on his way home, and returned to England in the autumn of 1851. This was a thoroughly

well-conducted expedition, —especially as regards the sledge |

travelling, which M'Clintock brought to great perfection, So far as the search for Franklin was concerned, nothing remained to be done west or north of Barrow Strait.

In 1851 the "Prince Albert" schooner was sent out by

| Move again,

Lady Franklin, under Captain Kennedy, with Lieutenant | Bellot of the French navy as second. They wintered on | the east coast of North Somerset, and in the spring of 1852 |

the gallant Frenchman, in the course of a long sledging journey, discovered Bellot Strait separating North Somerset from Boothia,—this proving that the Boothia coast facing the strait was the northern extremity of the continent of America.

| reaching Melville Island. He wintered at Leopold Harbour, near the north-east |

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The “Enterprise” and “Investigator” sailed from Collinson.

England in January 1850, but accidentally parted com- pany before they reached Behring Strait. On May 6, 1851, the “Enterprise” passed the strait, and rounded Point Barrow on the 25th. Collinson then made his way up the narrow Prince of Wales Strait, between Baring and Prince Albert Island, and reached Princess Royal Islands, where M‘Clure had been the previous year. Returning south- wards, the “Enterprise” wintered in a sound in Prince Albert Island in 71° 35’ N and 117° 35’ W. Three travelling parties were despatched in the spring of 1852,— one to trace Prince Albert Land in a southerly direction, while the others explored Prince of Wales Strait, one of them In September 1852 the ship was free, and Collinson pressed eastward along the coast of North

| America, reaching Cambridge Bay (September 26), where

the second winter was passed. In the spring he examined the shores of Victoria Land as far as 70° 26’ N. and 100° 45’ W. He was within a few miles of Point Victory, where the fate of Franklin would have been ascertained. The “Enterprise” again put to sea on August 5, 1853, and returned westward along the American coast, until she was stopped by ice and obliged to pass a third winter

| at Camden Bay, in 70° 8’ N. and 145° 29’ W. In 1854

this most remarkable voyage was completed, and Captain Collinson brought the ‘ Enterprise” back to England.

Meanwhile M‘Clure in the “Investigator” had passed M‘Clure,

the winter-of 1850-51 at the Princess Royal Islands, only 30 miles from Barrow Strait. In October M‘Clure ascended a hill whence he could see the frozen surface of Barrow Strait which was navigated by Parry in 1819-20.

| Thus, like the survivors of Franklin’s crews when they

reached Cape Herschel, M‘Clnre discovered a north-west passage. It was impossible to reach it, for the branch of the palzocrystic ice which stopped Franklin off King William Land was athwart their northward course. So, as soon as he was free in 1851, M‘Clure turned south- wards, round the sonthern extreme of Baring Island, and commenced to force a passage to the northward between the western shore of that land and the enormous fields of ice which pressed upon it. The cliffs rose up like walls on one side, while on the other the stupendous ice of the palzeocrystic sea rose from the water to a level with the ““Investigator’s” lower yards. After many hair-breadth

| escapes M‘Clure took refuge in a bay on the northern

shore of Bank’s Land, which he named “The Bay of God’s Mercy.” Here the “Investigator” remained, never to After the winter of 1851-52 M‘Clure made a journey across the ice to Melville Island, and left a record at Parry’s winter harbour. Abundant supplies of

/ musk ox were fortunately obtained, but a third winter | had to be faced. In the spring of 1853 M‘Clure was pre-

paring to abandon the ship with all hands, and attempt, like Franklin’s crews, to reach the American coast. But succour providentially arrived in time.

The Hudson’s Bay Company assisted in the search for Rae’s In 1848 Sir John Richardson and Dr Rae journeys.

Franklin. examined the American coast from the mouth of the Mackenzie to that of the Coppermine. In 1849 and 1850 Rae continued the search; and by a long sledge journey in the spring of 1851, and a boat voyage in the summer, he examined the shores of Wollaston and Victoria Lands, which were afterwards explored by Captain Collinson in the ‘‘ Enterprise.”

In 1852 the British Government resolved to despatch

| another expedition by Lancaster Sound. Austin’s four : vessels were recommissioned, and the “North Star” was

sent out asa depét ship at Beechey Island. Sir Edward

Belcher commanded the “ Assistance,” with the “ Pioneer” Belcher.

under Sherard Osborn as steam tender. He went up Welling- XIX — 41

322 POLAR’TR FG 108% ton Channel to Northumberland Bay, where he wintered, | Land. He went up Chesterfield Inlet and the river ru passing a second winter lower down in Wellington Channel, Quoich for a considerable distance, wintering with eight a and then abandoning his ships and coming home in 1854, | men at Repulse Bay in a snow house. Venison and fish expel But Sherard Osborn and Commander Richards did good | were abundant. In 1854 he set out on a journey which tion. work. They made sledge journeys to Melville Island, and | occupied fifty-six days in April and May. He succeeded thus discovered the northern side of the Parry group. | in connecting the discoveries of Simpson with those of Kellett. Captain Kellett received command of the “Resolute,” | James Ross, and thus established the fact that King with M‘Clintock in the steam tender “Intrepid.” Among | William Land was an island. Rae also brought home Kellett’s officers were the best of Austin’s sledge travellers, | tidings and relics of Franklin’s expedition gathered from M‘Clintock, Mecham, and Vesey Hamilton, so that good | the Eskimo; and this led to the expedition of M‘Clintock work was sure to be done. George Nares, the future | in the “ Fox,” already described in the article FRANKLIN leader of the expedition

of 1874~75, was also on board the (vol. ix. p. 721-22). While M‘Clintock was prosecuting “Resolute.” Kellett passed onwards to the westward and | his exhaustive search over part of the west coast of passed the winter of 1852-53 at Melville Island. During | Boothia, the whole of the shores of King William Island, the autumn Mecham discovered M‘Clure’s record, and the | the mouth of the Great Fish River, and Montreal Island, position of the “ Investigator” was thus ascertained. The | Allen Young completed the discovery of the southern side safety of her crew was consequently assured, for it was | of Prince of Wales Island. The “Fox” returned to only necessary to send a message across the strait between England in the autumn of 1859. two fixed positions. This service was performed by The catastrophe of Sir John Franklin’s expedition led Work of Lieutenant Pim early in the following spring. The | to 7000 miles of coast-line being discovered, and to a vast officers and crew of the “Investigator,” led by M‘Clure, | extent of unknown country being explored, securing very tions, arrived safely on board the “Resolute” on June 17, 1853, | considerable additions to geographical knowledge. Much and they reached England in the following year. They attention was also given to the collection of information, not only discovered but traversed a north-west passage, | and the scientific results of the various search expeditions though not in the same ship, and partly by travelling over | were considerable. The catastrophe also afforded a warn- ice. For this great feat M‘Clure received the honour of | ing which would render any similar disaster quite inexcus- knighthood,—a reward of £10,000 being granted to him- | able. If arrangements are always carefully made for a self, the other officers, and the crew, by a vote of the | retreat beforehand, if a depot ship is always left within House of Conimons. | reach of the advancing expedition as well as of the outer Sledge The travelling parties of Kellett’s expedition, led by | world, and if there is annual communication, with positive travelling. M‘Clintock, Mecham, and Vesey Hamilton, completed the | rules for depositing records, no such catastrophe can ever discovery of the northern and western sides of Melville | happen again. Island, and the whole outline of the large Island of Prince The American nation was first led to take an interest in Grinnell Patrick, still further to the westward. M‘Clintock was | polar research through a very noble and generous feeling away from the ship with his sledge party for one hundred | of sympathy for Franklin and his brave companions. Mr and five days and travelled over 1328 miles. Mecham | Grinnell of New York gave

practical expression to this was away ninety-four days and travelled over 1163 miles. | feeling. In 1850 he equipped two vessels, the ‘ Advance” Sherard Osborn, in 1853, was away ninety-seven days and | and “Rescue,” to aid in the search, commanded by travelled over 935 miles. The “Resolute” was obliged | Lieutenants De Haven and Griffith, and accompanied by to winter in the pack in 1853-54, and in the spring of | Dr Kane. They reached Beechey Island on August 27, 1854 Mecham made a most remarkable journey in the | 1850, and assisted in the examination of Franklin’s winter- hope of obtaining news of Captain Collinson at the Princess | quarters, but returned without wintering. In 1853 Dr Royal Islands. Leaving the ship on 3d April he was | Kane, in the little brig “ Advance” of 120 tons, undertook Kane. absent seventy days, out of which there were sixty-one and | to lead an American expedition up Smith Sound, the most a half days of travelling. The distance gone over was | northern outlet from Baffin’s Bay. The “ Advance ” 1336 statute miles. The average rate of the homeward reached Smith Sound on the 7th August 1853, but was journey was 234 miles a day, the average time of travelling stopped by ice in 78° 45’ N. only 17 miles from the each day nine hours twenty-five minutes. This journey is entrance. He described the coast as consisting of pre- without a parallel in arctic records. cipitous cliffs 800 to 1200 feet high, and at their base Fearing detention for another winter, Sir Edward | there was a belt of ice about 18 feet thick, resting on the Belcher ordered all the ships to be abandoned in the ice, | beach. Dr Kane adopted the Danish name of “ice-foot ” the officers and crews being taken home in the “North | (zs fod) for this permanent frozen ridge. He named the Star,” and in the “Phoenix” and “Talbot” which had | place of his winter-quarters Van Rensselaer Harbour. In come out from England to communicate. They reached | the spring some interesting work was done. A great Inglefield. home in October 1854. In 1852 Captain Inglefield, R.N., | glacier was discovered and named the Humboldt glacier, had made a voyage up Baffin’s Bay in the “Isabel” as far | witha sea face 45 miles long. Dr Kane’s steward, Morton, as the entrance of Smith Sound. In 1853 and 1854 he | crossed the foot of this glacier with a team of dogs, and A Te out in the “Phoenix” to communicate with the | reached a point of land beyond named Cape Constitution. ae, A orth Star at Beechey Island. The drift of the | But sickness and want of means prevented much from being “Reco Hesolute” was a remarkable proof of the direction of the | done by travelling parties.

Scurvy attacked the whole party lute.” Current out of Barrow Strait. She was abandoned in 74° | during the second winter, although the Eskimo supplied 41’ N. and 101° 11″ W. on May 14,1854. OnSeptember | them with fresh meat and were true friends in need. On a 1855, an American whaler sighted the “ Resolute” in May 17 , 1855, Dr Kane abandoned the brig, and reached : N. lat. about twenty miles from Cape Mercy, in Davis the Danish settlement of Upernivik on 6th August. Lieu- i Serle Hee into an American port, and | tenant Hartstene, who was sent out to search for Kane, drifted y presented to the British Government. She had | reached Van Rensselaer Harbour after he had gone, but ae oe a thousand miles. took the retreating crew on board on his return voyage. ae ee mee was employed to connect a few points On July 10, 1860, Dr Hayes, who had served with Hayes. Fs quite complete the examination of the coast | Kane, sailed from Boston for Smith Sound, in the schooner oi America, and establish the insularity of King William

“United States” of 130 tons and a-crew of fifteen men.

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His object was to follow up the line of research opened by Dr Kane. He wintered at Port Foulke, in 78° 17’ N., and about ten miles fron. Cape Alexander, which forms the eastern portal of Smith Sound. Dr Hayes crossed Smith Sound in the spring with dog-sledges, but his observations are not to be depended on, and it is very uncertain how far he advanced northwards on the other side. He returned to Boston on October 23, 1861.

The story of Charles Hall of Cincinnati, who was led to become an arctic explorer through his deep interest in the search for Franklin, has been told in the article devoted to him (vol. xi. p. 388). In his first journey (1860-62) he discovered the interesting remains Of a stone house which Sir Martin Frobisher built on the Countess of Warwick Island in 1578. In his second expedition (1864-69) Hall by dint of the most unwearied persever- ance at length reached the line of the retreat of the Franklin survivors, at Todd’s Island and Peffer river, on the south coast of King William Island. He heard the story of the retreat and of the wreck of one of the ships from the Eskimo; he was told that seven bodies were buried at Todd Island ; and he brought home some bones which are believed to be those of Lieutenant Le

Vescomte of the ‘“‘ Erebus.” Finally, in 1871, he took the “ Polaris” for 250 miles up the channel which leads northwards from Smith Sound. The various parts of this long channel are called Smith Sound, Kane Basin, Kennedy Channel, and Robeson Channel. The ‘ Polaris” was beset in 82° 16’ N. on 30th August; and her winter-quarters were in 81° 38’ N., called Thank God Bay. The death of Hall and the subse- quent fortunes of the expedition have been described in the article above cited.

The Spitzbergen seas have been explored, in recent years, by Norwegian fishermen as well as by Swedish and German expeditions and by English yachtsmen. The Norwegian Spitzbergen fishery dates from 1820, but it is only in recent years that Professor Mohn of Christiania has watched over the voyages and carefully collected information from the captains. In 1863 Captain Carlsen circumnavigated the Spitzbergen group for the first time in a brig called the “Jan Mayen.” In 1864 Captain Tobiesen sailed round North-East Land. In 1872 Captains Altmann and Nils Johnsen visited Wiche’s Land, which was discovered by Captain Edge in 1617. In that year there were twenty-three sailing vessels from Tromso, twenty-four from Hammerfest, and one from Vardo engaged in the arctic sealing trade. They average from 35 to 40 tons, and carry a dozen men. ‘There were also eight vessels from Tromsé shark-fishing for cod-liver oil, and fifty from Hammerfest and Vardé. Since 1869 the Norwegians have extended their voyages to Nova Zembla. In that year Carlsen crossed the Sea of Kara and reached the mouth of the Obi. In 1870 there were about sixty Norwegian vessels in the Barents Sea, and Captain Johannesen circumnavigated Nova Zembla. In 1873 Captain Tobiesen was unfortunately obliged to winter on the Nova Zembla coast, owing to the loss of his schooner, and both he and his young son died of scurvy in the spring. Two years previously Captain Carlsen had suc- ceeded in reaching the winter-quarters of Barents, the first visitor since 1597, an interval of two hundred and seventy-four years. He landed on September 9, 1871, and found the house still standing and full of interesting relics, which are now in the naval museum at the Hague.

Between 1858 and 1872 the Swedes sent seven expeditions to Spitzbergen and two to Greenland. All returned with valuable scientific results. That of 1864 under Norden- skiéld and Duner made observations at eighty different

places on the Spitzbergen shores, and fixed the heights of numerous mountains. In 1868, in an iron steamer, the

“Sophia,” the Swedes attained a latitude of 81° 42’ N. on the meridian of 18° E., during the month of September. In 1872 an expedition consisting of the ‘‘ Polhem ” steamer and brig ‘‘ Gladen,” commanded by Professor N ordenskiéld and Lieutenant Palander, wintered in Mussel Bay, on the northern shore of Spitzbergen. In the spring an import- ant sledging journey of sixty days’ duration was made over North-East Land. The expedition was in some distress as regards provisions owing to two vessels, which were to have returned, having been forced to winter. But in the summer of 1873 they were visited by Mr Leigh Smith, in his yacht ‘“‘Diana,” who supplied them with fresh provisions.

Dr Petermann of Gotha urged his countrymen to take Koldewey,

their share in the noble work of polar discovery, and at his own risk he fitted out a small vessel called the “Germania,” which sailed from Bergen in May 1868, under the command of Captain Koldewey. His cruise extended to Hinlopen Strait in Spitzbergen, but was merely tentative ; and in 1870 Baron von Heuglin with Count Zeil explored the Stor Fjord in a Norwegian schooner, and also examined Walter Thymen’s Strait. After the return of the ‘‘Germania” in 1868 a regular expedition was organized under the command of Captain Koldewey, pro- visioned for two years. It consisted of the ‘‘ Germania,” a screw steamer of 140 tons, and the brig ‘‘ Hansa” com- manded by Captain Hegemann. Lieutenant Payer, the future discoverer of Franz Josef Land, gained his first arctic experience on board the “Germania.” The expedi- tion sailed from Bremen on the 15th June 1869, its destination being the east coast of Greenland. But in latitude 70° 46’ N. the “Hansa” got separated from her consort and crushed in the ice. The crew built a house of patent fuel on the floe, and in this strange abode they passed their Christmas. In two montlis the current had carried them south for 400 miles By May they had drifted 1100 miles on their ice-raft, and finally, on June 14, 1870, they arrived safely at the Moravian mission

station of Friedriksthal, to the west of Cape Farewell. Fairer fortune attended the “Germania.” She sailed up the east coast of Greenland as high as 75° 30’ N., and eventually wintered at the Pendulum Islands of Clavering in 74° 30’ N. In March 1870 a travelling party set out, under Koldewey and Payer, and reached a distance of 100 miles from the ship to the northward, when want of provisions compelled them to return. A grim cape, named after Prince Bismarck, marked the northern limit of their discoveries. As soon as the vessel was free, a deep branching fjord was dis- covered in 73° 15’ N. stretching for a long distance into the interior of Greenland. Along its shore are peaks 7000 and 14,000 feet high. The expedition returned to Bremen on September 11, 1870.

Lieutenant Payer was resolved to continue in the path Payer and of polar discovery. He and a naval officer named Wye

Weyprecht freighted a Norwegian schooner called the “Tsbjérn,” and examined the edge of the ice between Spitzbergen and Nova Zembla, in the summer of 1871. Their observations led them to select the route by the north end of Nova Zembla with a view to making the north-east passage. It was to be an Austria-Hungarian expedition, and the idea was seized with enthusiasm by the whole empire. Weyprecht was to command the ship, while Julius Payer conducted the sledge parties. The steamer “Tegethoff,” of 300 tons, was fitted out in the Elbe, and left Tromsé on July 14, 1872. The season was exceptionally severe, and the vessel was closely beset near Cape Nassau, at the northern end of Nova Zembla, in the end of August. The summer of 1873 found her still a close prisoner drifting, not with a current, but in the direction of the prevailing wind. At length, on the 31st August, a

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The gallant enterprises of other countries rekindled the English zeal of England for arctic discovery; and in October 1874 expedi-”

mountainous country was sighted about 14 miles to the

north. In October the vessel was drifted within 3 miles of an island lying off the main mass of land. Payer landed on it, and found the latitude to be 79° 54’ N. It was named after Count Wilczek, one of the warmest friends of the expedition. Here the second winter was passed. Bears were very numerous and as inany as sixty- seven were killed, their meat proving to be a most efficient remedy against scurvy. In March 1874 Payer made a preliminary sledge journey in intense cold (thermometer at — 58° F.). On 24th March he started for a more pro- longed journey of thirty days. Payer found that the newly discovered country equalled Spitzbergen in extent, and consisted of two or more large masses—Wilezek Land to the east, Zichy Land to the west, intersected by numer- ous fjords and skirted by a, large number of island. A wide channel, named Austria Sound, separates the two iain masses of land, and extends to 82° N., where Rawlin- son Sound forks off to the north-east. The mountains attain a height of 2000 to 3000 feet, the depressions between them being covered with glaciers; and all the islands even are covered with a glacial cap. The whole country was named Franz-Josef Land. Payer returned to the “Tegethoff” on 24th April; and a third journey was undertaken to explore a large island named after M‘Clin- tock. It then became necessary to abandon the ship and attempt a retreat in boats. This perilous voyage was com- menced on 20th May. Three boats stored with provisions were placed on sledges. It was not until 14th August that they reached the edge of the pack in 77° 40’ N.,and launched the boats. Eventually they were picked up by a Russian schooner and arrived at Vardé on September 3, 1874. This great achievement is one of the most important con- nected with the north polar region that has been made in the present century, and will probably lead in due time to still further discoveries in the same direction.

One of the most interesting problems connected with the physical geography of the polar regions is the history and actual condition of the vast interior of Greenland, which is generally believed to be one enormous glacier. In 1867 Mr Edward Whymper carefully planned an expedition to solve the question, and went to Greenland,

the prime minister announced that an expedition would be despatched in the following year. The route by Smith Sound was selected because it gave the certainty of ex- ploring a previously unknown area of considerable extent,

because it yielded the best prospect of valuable scientific results, and because it offered, with proper precautions, reasonable security for a safe retreat in case of disaster. Two powerful screw steamers, the “Alert” and “ Dis- covery,” were selected for the service, and Captain Nares was selected as leader. Commander Markham, who had made a cruise up Baftin’s Bay and Barrow Strait in a whaler during the previous year, Lieutenant Aldrich, an accomplished surveyor, and Captain Feilden, R.A., as naturalist, were also in the “ Alert.” The “ Discovery ” was commanded by Captain Stephenson, with Lieutenant Beaumont as first lieutenant. The expedition left Ports- mouth on the 29th May 1875, and entered Smith Sound in the last days of July. After much difficulty with the drifting ice Lady Franklin Bay was reached in 81° 44’ N., where the “ Discovery ” was established in winter-quarters. The “Alert” pressed onwards, and reached the edge of the palzocrystic sea, the ice-floes being from 80 to 100 feet in thickness. Leaving Robeson Channel, the vessel made progress between the land and the grounded floe pieces, and passed the winter off the open coast and facing the great polar pack, in 82° 27’ N. Autumn travelling parties were despatched in September and October to lay

| out depots; and during the winter a complete scheme

was matured for the examination of as much of the unknown area as possible, by the combined efforts of sledging parties from the two ships, in the ensuing spring. The parties started on April 3, 1876. Captain Markham with Lieutenant Parr advanced, in the face of almost insurmountable difficulties, over the polar pack to the high latitude of 83° 20’ 26” N. Lieutenant Aldrich ex- plored the coast-line to the westward, facing the frozen polar ocean, for a distance of 220 miles. Lieutenant Beaumont made discoveries of great interest along the northern coast of Greenland. The parties were attacked by scurvy, which, while increasing the difficulty and

Robert accompanied by Dr Robert Brown; but the season was | hardships of the work a hundredfold, also enhanced the Brown. too late, and progress was stopped, after going a short | devoted heroism of these gallant explorers. Captain distance, by the breaking down of the dog-sledges. But | Feilden was indefatigable in making collections, and was Dr Brown made most valuable geological and natural | zealously assisted by all the officers.

The expedition history collections, chiefly in the neighbourhood of Disco, | returned to England in October 1876. The ‘Alert 3 and still more valuable observations, the publication of | reached the highest northern latitude ever attained by which has added considerably to our knowledge. Dr | any ship, and wintered further north than any ship had Rink, for many years royal inspector of South Greenland | ever wintered before. The results of the expedition and the most distinguished authority on all Greenlandic | were the discovery of 300 miles of new coast-line, the questions, has also visited the inland ice, and has given | examination of this part of the frozen polar ocean, a his stores of information to the world. The most import- | series of meteorological, magnetic, and tidal observations Norden- ant inland journey was undertaken by Professor Norden- | at two points farther north than any such observations ie in skidld in 1870, accompanied by Dr Berggren, the professor | had ever been taken before, and large geological and land, OL botany at Lund. The difficulty of traversing the | natural history collections.

inland ice of Greenland is caused by the vast glacier being in constant motion, advancing slowly towards the sea. This moveinent gives rise to huge chasms and clefts, which

In the same year 1875 Sir Allen Young undertook a Voyages

voyage in his steam yacht the “Pandora” to attempt to of the force his way down Peel Sound to the magnetic pole, and qo.»

from their almost bottomless depth close the traveller’s way. The chasms occur chiefly where the movement of the glacier is most rapid, near the ice streams which reach the sea and discharge glaciers. Nordenskiold, therefore, chose for a starting point the northern arm of a deep inlet called Auleitsivikfjord, which is 60 miles south of the discharging glacier at Jakobshavn and 240 north of that at Godthaab. He commenced his inland journey on 19th July. The party consisted of himself, Dr Berggren, and two Green- landers ; and they advanced 30 miles over the glaciers to a height of 2200 feet above the sea.

if possible to make the north-west passage by rounding the eastern shore of King William Island. The “Pandora” entered Peel Sound on August 29,

1875, and proceeded down it much farther than any vessel had gone before since it was passed by Franklin's two ships in 1846. Sir Allen reached a latitude of 72° 14' N., and sighted Cape Bird, at the northern side of the western entrance of Bellot Strait. But here an ice-barrier right across the channel barred his progress, and he was obliged to retrace his steps, returning to England on October 16, 1875. In the following year Sir Allen Young made

Dutch expedl- tions.

Gore- Booth and Mark- ham.

Leigh Smith,

Norden- skiold and the N.E. Passage,

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another voyage in the " Pandora" to the entrance of Smith Sound.

Lieutenant Koolemans Beynen, a young Dutch officer, who had shared Young's two polar voyages, on his return successfully endeavoured to interest his countrymen in polar discovery. It was wisely determined that the first expeditions of Holland should be summer reconnaissances on a small scale. A sailing schooner of 79 tons was built at Amsterdam, and named the "Willem Barents." In her first cruise she was commanded by Lieutenant A. de Bruyne, with Koolemans Beynen as second, and she sailed from Holland on the 6th May 1878. Her instructions were to examine the ice in the Barents and Spitzbergen Seas, take deep-sea soundings, and make natural history collections. She was also to erect memorials to early Dutch polar worthies at certain designated points. These instructions were ably and zealously carried out. Beyner died in the following year, but the work he initiated has been continued. Every year from 1878 to 1884 the 'Willem Barents" has made a polar voyage, and has brought back useful scientific results. In 1879 the Dutch succeeded in sighting the coast of Franz-Josef Land.

In 1879 Sir Henry Gore-Booth, Bart., and Captain A. H. Markham, R.N., undertook a polar cruise in the Norwegian schooner “Isbjérn.” They sailed along the west coast of Nova Zembla to its most northern point, passed through the Matotchkin Shar to the east coast, and examined the ice in the direction of Franz-Josef Land as far as 78° 24’ N. Captain Markham brought home collections in various branches of natural history, and made useful observations on the drift and nature of the ice in the Barents and Kara Seas.

In 1880 Mr Leigh Smith, who had previously made three voyages to Spitzbergen, reached Franz-Josef Land in the screw steamer “Kira.” It was observed that, while the Greenland icebergs are generally angular and peaked, those of Franz-Josef Land are vast masses quite flat on the top, like the Antarctic bergs, and from 150 to 200 feet high. The “ Kira” sailed along the land to the westward, and discovered 110 miles of new coast line as far as the western extreme of the south side of Franz-Josef Land, whence the land trended north-west. A landing was

effected at several points, and valuable collections were |

made in natural history. In the following year the same explorer left Peterhead on July 14; Franz-Joseph Land was once more sighted on the 23d July, and the “Eira” reached a point farther west than had been possible in her previous voyage. But in August the ship was caught in the ice, was nipped, and sank. A hut was built on shore in which Mr Leigh Smith and his crew passed the winter of 1881-82; and on June 21, 1882, they started in four boats, to reach some vessels on the Nova Zembla coast. It was a most laborious and perilous voyage. They were first seen and welcomed by the “ Willem Barents” on 2d August, and soon afterwards were taken on board the “Hope,” a whaler which had come out for their rescue under the command of Sir Allen Young.

Professor Nordenskidld, when he projected the achieve- ment of the north-east passage, was a veterau polar explorer, for he had been in six previous expeditions to Greenland and Spitzbergen. In 1875 he turned his atten- tion to the possibility of. navigating the seas along the northern coast of Siberia. Captain Wiggins of Sunderland was a pioneer of this route, and his voyages in 1874, 1875, and 1876 led the way toa trade between the ports of Europe

and the mouth of the Yenisei river. In June 1875 Professor Nordenskiéld sailed from Tromsé in the “Proven,” reached the Yenisei by way of the Kara Sea, and discovered:an excellent harbour on the eastern side of its mouth, which was named Port Dickson, in honour of

Mr Oscar Dickson of Gothenburg, the munificent supporter of the Swedish expeditions. It having been suggested that the success of this voyage was due to the unusual state of the ice in 1875, Nordenskidld undertook a voyage in the following year in the “Ymer” which was equally successful. By a minute study of the history of former attempts, and a careful consideration of all the circum- stances, Professor Nordenskidld convinced himself that the achievement of the north-east passage was feasible. The king of Sweden, Mr Oscar Dickson, and M. Sibiriakoff, a wealthy Siberian proprietor, supplied the funds, and the steamer “ Vega” was purchased. Nordenskiéld was leader of the expedition, Lieutenant Palander was appointed commander of the ship, and there was an efficient staff of officers and naturalists, including Lieutenant Hovgaard of the Dutch and Lieutenant Bove of the Italian navy. A small steamer called the “Lena” was to keep company with the “Vega” as far as the mouth of the Lena, and they sailed from Gothenburg on the 4th July 1878. On the morning of 10th August they left Port Dickson, and on the 19th they reached the most northern point of Siberia and of the Old World, Cape Severo or Tchelyuskin, in 77° 41’ N. On leaving the extreme northern point of Asia a south-easterly course was steered, the sea being free from ice and very shallow. This absence of ice is due to the mass of warm water discharged by the great Siberian rivers during the summer. On 27th August the mouth of the river Lena was passed, and the “Vega” parted company with the little “Lena,” continuing her course eastward. Professor Nordenskiéld very nearly made the north-east passage in one season. Towards the end of September the ‘‘ Vega” was frozen-in off the shore of a low plain in 67° 7’ N. and 173° 20’ W. near the settlements of the Tchuktches. During the voyage very large and important natural history collections were made, and the interesting aboriginal tribe among whom the Winter was passed was studied with great care. The interior was also explored for some distance. On July 18, 1879, after having been imprisoned by the ice for two hundred and ninety-four days, the

“Vega” again pro- ceeded on her voyage and passed Behring Strait on the 20th. Sir Hugh Willoughby made the first attempt in 1553. After a lapse of three hundred and twenty-six years, the north-east passage had at length been accom- plished without the loss of a single life and without damage to the vessel. The “Vega” arrived at Yokohama on September 2, 1879.

In 1879 an enterprise was undertaken in the United Schwatka.

States, with the object of throwing further light on the sad history of the retreat of the officers and men of Sir John Franklin’s expedition, by examining the west coast of King William Island in the summer, when the snow is off the ground. The party consisted of Lieutenant Schwatka of the United States army and three others. Wintering near the entrance of Chesterfield Inlet in Hudson’s Bay, they set out overland for the estuary of the Great Fish River, assisted by Eskimo and dogs, on April 1, 1879. They only took one month’s provisions, their main reliance being upon the game afforded by the region to be traversed. The party obtained, during the journeys out and home, no less than five hundred and twenty-two reindeer. After collecting various stories from the Eskimo at Montreal Island and at an inlet west of Cape Richardson, Schwatka crossed over to Cape Herschel on King William Island in June. He examined the western shore of the island with the greatest care for relics of Sir John Franklin’s parties, as far as Cape Felix, the northern extremity. The return journey was com- menced in November by ascending the Great Fish River for some distance and then marching over the intervening

De Long.

Work of Danes in Green- land.

region to Hudson’s Bay. The cold of the winter months in this country is intense, the thermometer falling as low as — 70°,—so that the return journey was most remarkable, and reflects the highest credit on Lieutenant Schwatka and his companions. As regards the search little was left to be done after M‘Clintock, but some graves were found, as well as a medal

belonging to Lieutenant Irving of ELMS. “Terror,” and some bones believed to be his, which were brought home and interred at Edinburgh.

Mr Gordon Bennett, the proprietor of the Mew York Herald, having resolved to despatch an expedition of dis- covery at his own expense by way of Behring Strait, the “Pandora” was purchased from Sir Allen Young, and re- christened the “Jeannette.” Lieutenant De Long of the United States navy was appointed to command, and it was made a national undertaking by special Act of Con- gress, the vessel being placed under martial law and officered from the navy. The “Jeannette” sailed from San Francisco on July 8, 1879, and was last seen steaming towards Wrangell Land on the 3d September. This land had been seen by Captain Kellett, in H.M.S. “ Herald” on August 17, 1879, but no one had landed on it, and it was shown on the charts by a long dotted line. The “Jeannette” was provisioned for three years, but as no tidings had been received of her up to 1881, two steamers were sent up Behring Strait in search. One of these, the “Rodgers,” under Lieutenant Berry, anchored in a good harbour on the south coast of Wrangell Land, in 70° 57’ N. on the 26th August 1881. The land was explored by the officers of the “Rodgers” and found to be an island about 70 miles long by 28, with a ridge of hills traversing it east and west, the 71st parallel running along its southern shore. Lieutenant Berry then proceeded to examine the ice to the northward, and attained a higher latitude by 21 miles than had ever been reached before on the Behring Strait meridian, namely 73° 44’N. Sir R. Collinson, in 1850, had reached 73° 23’ N. No news was obtained of the “Jeannette,” but soon afterwards melancholy tidings arrived from Siberia. After having been beset in heavy pack ice for twenty-two months, the ‘‘Jeannette” was crushed and sunk on the 12th June 1881, in 77° 15’ N. lat. and 155° E. long. The officers and men dragged their boats over the ice to an island which was named Bennett Island, where they landed on the 29th July. They reached one of the New Siberia Islands on the 10th September, and on the 12th they set out for the mouth of the Lena. But in the same evening the three boats were separated in a gale of wind. A boat’s crew with Mr Melville, the engineer, reached Irkutsk, and Mr Melville set out in search of Lieutenant De Long and his party, who had also landed. The other boat was lost. Eventually Melville discovered the dead bodies of De Long and two of his crew on March 23, 1883. They had perished from ex- haustion and want of food. The

“Rodgers” was burnt in its winter quarters, and one of the officers, Mr Gilder, made a hazardous journey homewards through north-east Siberia.

The Danes have been very active in prosecuting dis- coveries and scientific investigations in Greenland, since the journey of Nordenskidld in 1870. Lieutenant Jensen made a gallant attempt to penetrate the inland ice in 1878, and Professor Steenstrup, with Lieutenant Hammer, closely investigated the formation of ice masses at Omenak and Jacobshavn. In 1883 an expedition under Lieu- tenants Holm and Garde began to explore the east coast of Greenland, the discovery of the outline of which was completed in 1879. In the summer of that year Captain Mourier, of the Danish man of war “ Ingulf,” sighted the coast from the 6th to the 10th of July, and was enabled to observe and delineate it from 68° 10’ N. to 65° 55’ N., being exactly the gap left between the discoveries of

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Scoresby in 1822 and those of Graah in 1829. Lieu- tenant Hovgaard of the Danish navy, who accompanied Nordenskiéld in his discovery of the north-east passage, planned an expedition to ascertain if land existed to the north of Cape Tchelyuskin. He fitted out a small steamer called the “Dymphna” and sailed from Copenhagen in July 1882, but was unfortunately beset and obliged to winter in the Kara Sea. In 1883 Baron Nordenskiéld undertook another journey over the inland ice of Green- land. Starting from

On September 18, 1875, Lieutenant Weyprecht, one of the discovers of Franz-Josef Land, read a thoughtful and carefully prepared paper before a large meeting of German naturalists at Gratz on the scientific results to be obtained from polar research and the best means of securing them. He urged the importance of establishing a number of stations within or near the Arctic Circle, in order to record complete series of synchronous meteorological and magnetic observations. Lieutenant Weyprecht did not live to see his suggestions carried into execution, but they bore fruit in due time. The various nations of Europe were repre- sented at an international polar conference at Hamburg in 1879, and at another at St Petersburg in 1882; and it was decided that each nation should establish one or more

stations where synchronous observations should be taken from August 1882. This useful project was matured and executed. The stations were at the following localities round the Arctic Circle :—

Norwegians…... Bosekop, Alten Fjord, Norway, M. Aksel S. Steen. Swedes …....0+00- Ice Fjord, Spitzbergen, Mr Ekholm. ; ADOT Greeosnencost Dickson Harbour, mouth of Yenisei, Siberia,Dr Smaller.

Lieut. Jiirgers. Lieut. Andreief. Lieut. Ray, U.S.A. Lieut. Greely, U.S.A.

Americans….. { Lieut. Dawson.

Gelnanss.c..+.see Cumberland Bay, west side of Davis Strait, Dr Giese. AMES oes.

The whole scheme was successfully accomplished with the exception of the part assigned to the Dutch at Dickson Harbour. They started in the “Varna” but were beset in the Kara Sea and obliged to winter there. The “Varna” was lost, and the crew took refuge on board Lieutenant Hovgaard’s vessel, which was also forced to winter in the pack during 1882-83.

The American stations commenced work in 1882. Lieutenant Greely’s party consisted of. two other lieu- tenants, of twenty sergeants and privates of the United States army, and of Dr Pavy, an enthusiastic explorer who had been educated in France, and had passed the previous winter among the Eskimo of Greenland. On August 11, 1881, the steamer “Proteus ” conveyed Lieutenant Greely and his party to Lady Franklin Bay during an exception- ally favourable season; a house was built at the “ Dis- covery’s” winter-quarters, and they were left with two years’ provisions. he regular series of observations was at once commenced, and two winters were passed without accident. ‘T’ravelling parties were also sent out in the summer, dogs having been obtained at Disco. Lieutenant Lockwood made a journey along the north coast of Green- land, and reached a small island in 83° 24’ N. and 44° 5’ W. Dr Pavy and another went a short distance beyond the winter-quarters of the “Alert,” and a trip was made into the interior of Grinnell Land. But all this region had already been explored and exhaustively examined by the English expedition in 1875-76. The real value of

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the work of Lieutenant Greely’s party will consist in the synchronous observations taken during 1882. Asnosuccour arrived in the summer of 1883—though relieving vessels were despatched both in 1882 and in 1883—Lieutenant Greely started from Lady Franklin Bay with his men on the 9th August, expecting to find a vessel in Smith Sound. On the 21st October they were obliged to encamp at Cape Sabine, on the western shore of Smith Sound, and build a hut for wintering. A few depdts were found, which had been left by Sir George Nares and Lieutenant Beebe, but all was exhausted before the spring. Then came a time of indescribable misery and acute suffering. The poor fellows began to die of actual starvation ; and, when the relieving steamers “Thetis” and “Bear” reached Cape Sabine, Lieutenant Greely and six suffering companions were found just alive. If the simple and necessary precaution had been taken of stationing a depét ship

in a good harbour at the entrance of Smith ‘Sound, in’

annual communication with Greely on one side and with America on the other, there would have been no disaster. If precautions proved to be necessary by experience are taken, there is no undue risk or danger in polar enterprise.

There is now no question as to the value and importance of polar discovery, and as to the principles on which expeditions should be sent out. Their objects are explora- tion for scientific purposes and the encouragement of maritime enterprise. The main principles have been briefly and clearly stated by Lieutenant Weyprecht :—(1) arctic research is of the highest

importance for a know- ledge of nature's laws; (2) geographical research is valu- able in proportion as it opens the field to scientific research generally ; (3) the north pole has, for science, no greater significance than any other point in the higher latitudes, Lieutenant Weyprecht thus contends, as the council of the Royal Geographical Society has contended for years, that the attainment of the highest possible latitude or of the pole itself is not the object to be sought, but the explora- tion of the unknown area with a view to scientific results.

In planning a new polar expedition on an adequate scale it will be necessary to profit by the lessons of experi- ence. This experience may be summed up in a few words. Any advanced ship or party must have a depdt ship to fall back upon which is within reach, and also in com- munication with the outer world. This makes disaster on a large scale, humanly speaking, impossible. Every precaution that medical science can suggest must be taken against scurvy. An advancing expedition must always follow a coast line, because an entry into the drift- ing pack entails failure and probably loss of the ship. The coast-line should trend north with a westerly aspect, because a general motion of the sea towards the west causes the ice to set in that direction, unless deflected from purely local causes. Hence there are usually open lanes of water along the west sides of polar lands at some time of the navigable season, while the eastern sides are usually closed with ice. These well-established canons point to the western side of Franz-Josef Land as the next region to be explored. –

Physical Geography of the North Polar Region.—Onr ignorance of about 3,000,000 square miles within the north polar circle, out of a total area of of 8,201,883, debars us from the possibility of considering the physical geography of the polar region as a whole. We can merely take stock of the isolated facts which our limited knowledge enables us to register.

As the physical condition of the whole area is mainly affected by the movements and positions of the ice masses, the temperature, and the circumstances which affect it, become the first and most fundamental elements for consideration. An examination of Dove's isothermal charts shows that the isotherms about the pole form ellipses tending to arrange themselves between two poles of cold, one in North America and the other

in eastern Siberia. The mildest winters appear to be in the meridians of Behring Strait

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influenced by the extent of frozen land or fixed ice on the one hand and the neighbourhood of open water and moving ice on the other. The following table shows the mean temperatures for the summer months, winter months, and whoie year, at various stations in the archipelago north of the American continent :—

Three | Three Summer] Winter | Year.

Latitude and

Expedition. Loeality. : . Longitude. Months.|Months M‘Clure…... Banks Island …..... .....| 74 ON, 118 W. +35 — 57) +41°8 PeaneVecnecesss Melville Island….....) 74 25N. 111 W. | +37 —10°6 | 41-4 | Sutherland..| Cornwallis Island…..... 7445N. 94W.| +36 — 86} 49°5 Belcher…... Northumberland Sound| 77 ON. 97W.! +39°8 | —11°8] —11 Parry… Port Boweh…...ssse-+0.| 7325N. 89 W. 436-9 | — 67] +43

At the Great Slave Lake in North America, Sir John Richardson found the mean of the three summer months to be +49°, of the three winter months — 0°°8, and of the year +9°. On the west coast of Greenland the climate of the southernmost part resembles that of Iceland or the northern shores of Norway. It exhibits

| a gradually decreasing temperature throughout the whole of its

extent to the north. The annual mean temperature at the south- ernmost station of Julianshaab is + 38°, and at the northernmost of Upernivik +13°. The mean temperature of the three summer months for Julianshaab is + 48° and for Upernivik + 48°; for the three winter months respectively +20° and -7°. The lowest temperature ever known at the Danish Greenland stations occurred at Upernivik and was – 47°. Farther north on the west coast the “North Star,” in 1851-52, observed the temperature for the year in Wolstenholme Sound (lat. 76° 30’ N.). os the three summer months the

mean was +387°:8, for the winter months —6°°8, and for the year +4°°5. The most northern observations ever taken for a complete year were those of H.M.S. “ Alert,” at Floeberg Beach in 82° 27’ N. Synchronous observations were taken by H.M.S. “ Discovery,” in Lady Franklin Bay, lat. 81° 44’ N. The results were as follows :—

Summer.

Ship. Latitude, Winter. | Year. MBE et O ss caeSanidct 82 27 N. +34 — 36 ~~3 |S aIBeOVERY ”....2vsc.5~~: 81 44.N. +33 -37 | -4

The minimum temperatures were — 78°, registered at Floeberg Beach in March, and ~~70°, at Lady Franklin Bay in the same mouth. These temperatures can be compared with the observations taken at Mossel Bay, on the north coast of Spitzbergen, by Nor~~ denskiold (lat. 79° 54’ N.), and on the south coast of Franz-Josef Land by Weyprecht and Leigh Smith. At these stations the winters are less severe on account of the closer proximity of open water. In Franz-Josef Land the minimum in the winter months was — 43°, and the mean was —- 26°; in May the mean was + 22°. The climate on the coast of Siberia was registered at the winter quarters of the “ Vega” in 67° 7’ N., the mean tempcrature of the three winter months being — 10°, miuimnm —51°, and the mean of the three summer months +36°; bunt the Siberian cold is far more intense inlaud.

The direction of the winds affects the temperatures and the movements of ice, but no general remarks upon them can be usefully made until onr knowledge of the polar area is more complete. One of the most interesting features in polar winds is the instability of the temperature caused by them over certain areas during the winter months. At Jacobshavn, in Greenland, the mean temperature in February was +16° in one ycar (1872), and — 25° in another (1863), a difference of 41°. It was remarked that great rises in the winter temperatures occurred at a time when the wind was blowing from the interior glacier. This wind often turns into a sudden gale. Greenland is surrounded by regions which have extremely different winter temperatures. While on one side there is the intense cold of Arctic America and the Parry Islands, on the other, to the east-south-east, there is the warm temperature caused by the Gulf Stream; so that the Greenland climate is at all times dependent on the direction of the winds. All winds from south through west

to north-west bring cold weather, but the east and south-east winds raise the temperature. The hot south-east winds of Greenland are caused in the same way as the “fohn” of the Alps. The interior glacier of Greenland rises toa height of at least 7000 feet. A warm wind from the Atlantic saturated with moisture could afford to lose considerably by cooling on its journey of 400 miles over the lofty ice deserts of Greenland, and yet arrive on the west coast with a comparatively high temperature. The influence of the Greenland fohns extends over a wide area. In 1875 there was a great rise of temperature at the Danish stations of Greenland; and Sir George Nares observed the same phenomenon, at nearly the same time, at his winter quarters in 82°17’ N. In Franz-Josef Land there are also great rises of

and the Spitzbergen seas. These temperatures appear to be mainly | temperature during the winter, with southerly winds accompanied

Winds,

Ice.

Icebergs.

Currents.

Paleo- erystic sea,

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by heavy falls of snow, as these winds come direct from cxpanses of open water caused by the current from the Atlantic. 4

Sea water, in the process of congelation, expels the salt, and its freezing point is about 28°. The ice first forms in thin, irregular flakes called “sludge,” and.when this is compact enough to hold snow it is known as “brash.” Gathered into rounded masses it becomes “ naneake ice,” and soon it becomes thicker. The first thin covering is called by the whalers “bay ice.” A “floe” isa sheet of ice the limits of whieh are visible. An “ice-field” differs from a floe in being so extensive that its limits cannot be seen. “ Pack ice” consists of broken floes foreed together by the wind or cnrrents.

When the paek is loosened and scattered by a wind from an opposite direction the pieees are called “sailing iee.” The greatest thickness attainable by iee in one season is about 7 feet. The results of observations made by Sir George Nares in 82° 17’ N. on the west side of Green- land and by Captain Koldewey on the east side in 74° 30 N. were identical, namely 6 feet 7 inches. Old ice is believed to become thicker in a second winter, and even to attain a thickness of 10 fect. In the palwocrystic sea there are floes from 80 to 100 feet thick, but these must be considered rather as sea-glaciers, formed by accumulations of snow on the ice year after year; and the smaller pieccs broken from them have been very appropriately named floebergs. These mighty floes are sea-borne glaciers, perpetually wasted beneath and restored from above. ; ;

Ieebergs are only met with where there are great discharging glaciers on the land, or in currents leading from them. Greenland is the principal mother of ieebergs. This immense mass covers an area of about 512,000 square miles, and has 3400 miles of coast- line. It is indented by deep channels or fjords, often extending moré than 60 miles, with many islands and rocks along the coast. The whole of the interior is believed to be capped by an enormous glacier always moving towards the coast, and at certain points reaching the sea where masses break off in the shape of icebergs. These icebergs rise to a height of from 60 to 800 fect above the sea, with a circumference from several hundred to several thousand yards; and from seven to eight times the bulk seen above water is submerged, so that the weight of a large berg is millions of ‘tons. When pieces break off from a parent iceberg the process is called “calving,” and the pieces are “calf ice.” Recent observation of one of the principal discharging glaciers of Grecnland shows it to be 920 feet thick, and 18,400 feet wide, and that it advances at a rate of 47 feet a day during the summer season. In Spitzbergen and Nova Zembla there are much sinaller glaciers discharging smaller berg pieces. The Franz-Josef Land glaciers produce large flat-topped icebergs, which do not, however, float southwards.

The movements of the polar seas are influenced by the currents of seas and rivers which are constantly flowing northwards, and by ice-laden counter-currents which press through every strait and channel in the opposite direction. On the fringe of land forming the northern shores of Asia and

America are the mouths of several great rivers, Of the Siberian rivers the Obi, with its affluent the Irtish, has a basin covering 60,000 square miles, the Yenisei 50,000, and the Lena 40,000; but these areas are almost entirely within the temperate zone. In America the rivers Mackenzie, Coppermine, and Great Fish (or Back) also pour their waters into the polar sea. The enormous volume of warm water which these rivers send into the ocean drives the heavy ice from the coast and, owing to the influence which the rotatory motion of the earth exercises, reccives an easterly direction along the coast. Behring Strait is too narrow and too shallow to admit of any large flow from the Pacific, still there is a warm current which keeps the heavy ice at some distance and also flows easterly, its influence being felt beyond Point Barrow. The Norwegian current, usually considered to be a continuation of the Gulf Stream, conveys a large volume of water northwards along the coasts of Norway and Lapland, and keeps the ice at a distance from that shore throughout the winter. The polar currents fow southwards in the direction of the two great openings by Davis Strait and the sea on the east coast of Greenland, but the whole body appears eventually to find its way southwards by the former outlet. The current flowing south along the east coast of Greenland brings with it immense quantities of heavy ice, and when it reaches the south point of the land it turns westward and northward round Cape Farewell, until about 64° N., when it unites with the current coming from Baffin's Bay, aud the united current, with its enormons quantity of ice and icebergs, flows south along the Labrador eoast to Newfoundland. The other polar current flows southwards through all the channels and straits among the Parry Archipelago, and through Fury and Hecla Strait, down Baffin's Bay and Davis Strait.

The observations of various explorers lead to the conclusion that these outlets are insufficient to carry off the great harvests of ice, and that, in one part of the polar region, it continues to accumulate and form sea-borne glaciers. Collinson observed this formation off the coast of North America. M'Clure found it along the west coast of Banks Island, while M'Clintock and Mecham traced it along the western side of Prince Patrick Island. " The surface of the floes resembles rolling hills, some of them a hundred feet from

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at Fort Foulke.

POLAR REG O MS

base to summit, —aged sea ice which may be centuries old, and from want of an outlet likcly to increase yet in thickness to an unlimited degree. The accumulated aetion of repeated thaws and falls of svow on the upper surface gives it a peeuliar hill and dale appear- anee.” The same ice was found by Nares’s expedition along the northern coast of Grant Land and Greenland 80 to 100 feet thick. A branch from it flows down M‘Clure Strait and M‘Clintock Channel until it impinges upon the north-west coast of King William Island. This is what Professor Haughton calls “ the ice barrier placed in this position by the still waters caused by the meeting of the Atlantic and Pacific tides.”

The physical aspects of polar lands are much influenced by their Geology.

geological formation. The Greenland coast: consists mainly of gneiss, mica schist, hornblende schist, and syenite pierced by granite veins. In this forination are found the steatite used by the natives to make lamps, the cryolite of Ivigtut in the south, and the plumbago at Upernivik. North of 69° N. a flow of basalt extends across the Noursoak peninsula and Disco Island, covering an area of about 7000 square miles, and rising to a height of 6000 feet. With these trap rocks are associated the Miocene and Cretaceous beds. The Cretaceous rocks have only been found in the Omenak-fjord in 70° N.; while the Miocene formation is confined to the shores of the Waigat Strait, between Disco and the main- land, underlying the trap. Coal beds appear in several places along the shore, and very interesting remains of fossil plants have been discovered. At the termination of Igalliko-fjord in 61° N. a compact red sandstone is found. Pendulum Islands on the east coast are Oolitic. But with these exceptions the whole mass of Greenland is granitic or gueissose. The opposite side of Baftin’s Bay is of the same character, as well as both sides of Peel Sound. The Parry Islands are partly Silurian and partly of the Carboniferous period. The eastern part, including North Somerset and Prince of Wales Land (except the shores of Peel Sound) and Cornwallis Island are of Silurian formation, with fossils, equivalents to the

Wenlock and Dudley groups. This formation extends westward from Boothia Felix and King William Island over Prince Albert Land and the southern half of Banks Island. The southern halves of Bathurst, Melville, and Prince Patrick Islands, and the northern half of Banks Island consist of Lower Carboniferous sand- stones with beds of coal, while Grinnell Land and the northern halves of Bathurst, Melville, and Prince Patriek Islands are Carboniferous limestone. lLias fossils (ammonites) were found at one place on the east side of Prince Patrick Island in 76° 20’ N. Sherard Osborn also found the vertebre of a hnge saurian (Teleo- sawrus) at the north-west extreme of Bathurst Island, probably of the Lower and Middle Oolitic period.

Ellesmere Land, on the western side of Smith Sound, consists of gneiss rising to heights of 2000 feet which underlie Miocene rocks Farther north the gneiss continues with stratified black slates having a very high and often vertical dip. In 82° 33’ N. these slates give place to a series of quartzites and grits rising to elevations of 2000 and 3000 feet. Silurian limestones are found on the shores of Kennedy Channel up to Cape Tyron on the Green- land side. Carboniferous limestone occurs on the north coast of Grant Land, as far west as Clements Markham Inlet, rising to a height of 2000 feet. Near Lady Franklin Bay in 81° 45’ N. a deposit of coal of the Miocene period was discovered, with a fossil flora including thirty species of plants—pines, birch, poplar, elm, and hazel. The whole of this land to the north of Baffin’s Bay is slowly rising.

Spitzbergen and Nova Zembla are also composed mainly of primitive rocks. In northeru Spitzbergen there are also Miocene beds with a fossil flora closely allied to that of Lady Franklin Bay, and some fossils of the Lias period. ‘The geological characters of Franz-Josef Land and Spitzbergen are closely allied. . The predomi- nant rock is dolerite, a kind of greenstone.

The ‘‘tundra” of Siberia is a wide belt of Jand intervening between the line of forest and the polar shores, and intersected by the great rivers. It is frozen for immense deptlis below the surface, and here tle remains of mammoths, generally in great landslips along the river banks, have been found. But their fossil ivory occurs in greatest quantity in the New Siberia group. On

these islands also occur the “ wood-hills ” consisting of horizontal sand-stone beds alternating with strata of bituminous trce stems, heaped

on each other to the top of the hill. Ammonites of the Lias period are also found there.

In the polar regions the line of forest seldom reaches to the Flora,

Arctic Circle; low birches and willows and shrubs bearing berries oecur in the south of Greenland, but farther uorth the creeping willow alone forms wood. There are 762 flowering plants, and 925 cryptogams within the Arctic Circle, making a total of 1687 plants. Lapland coultains by far the richest arctic flora, amounting to three- fourths of the whole, while three-fifths of the species found in Arctic Asia and America also belong to Lapland. In the European arctic distriet 616 flowering plants have been collected, in Arctic Asia 233, in Arctic America eastward of the Mackenzie 379, and westward of that river 364, and in Greenland 207. The most arctic plants of

Fauna.

Inhabit- ants.

POL RE GION 8

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general distribution, which are found far north in all the aretic | was one of a fleet which sailed from Rotterdam under the

areas, are three species of Ranunculus, a poppy (Papaver nudicaule), the Draba alpina aud five other speeies, the Braya alpina, lady’s- smoek (Cardamine pratensis), eight species of saxifrage, two of

‘command of Jacob Mahu as admiral in June 1598. was called the “Good News,” a yacht of 150 tons, with

Potentilla, two of Arenaria, the moss eampion (Silene acaulis), the |

dandelion, a Stellaria, the Dryas octopetala, Cerastiwm alpinum, Epilobium latifolium, erowberry, dwarf willow, and rushes and

grasses of the genera Juncus, Carex, and Poa. The most ubiquitous |

of all is the Saxifraga oppositifolia, whieh is considered the eom- monest and most aretie of the flowering plants. All the aretie seas team with the lower forms of animal life.

in full detail by the naturalists to whom the eolleetions of the various expeditions have been entrusted. The fishes, birds, and mammals of the north polar region have also been studied and earefully deseribed within the diseovered areas, though the subjeet is far from having been exhausted. :

The human raee is found to exist along the whole fringe of

and to have spread up the shores of Boothia, and up both sides of Davis Strait and Baffin's Bay. Living mainly on sea animals, the inhabitants of the polar regions rarely wander from the eoast. Spitzbergen, Franz-Josef Land, and Nova Zembla are uninhabited, except that oecasional summer visits are made to the sonthern shores of the latter group of islands. The Laps are the denizens of

the European polar regions, and the Samoyeds sueeeed them along |

the shores of the Kara Sea and on the Yalmal peninsula. These Laps aud Samoyeds possess herds of reindeer, and during the winter they withdraw from the coast. In Siberia there was onee a coast population, but it has retired into the interior or died out, and

inhabitants are not met with until the encampments of the |

Tchuktehes are reached, from the Kolyma to Behring Strait. A very complete account of this interesting people has been given by Baron Nordenskidld in his narrative of the voyage of the " Vega." The Eskimo race extends over the whole of Aretic Ameriea and along the Greenland eoasts, the warlike Indian tribes preventing them from retreating inland, and foreing them to find a precarious living or starve on the shores of the polar

sea. Differing in size and physical development, the individuals of the different tribes all have flat broad faees, black coarse hair, high eheek bones, low foreheads, short flat noses, and narrow eyes sloping upwards from the nose. Their hands and feet are small. Vast tracts of country, including the archipelago to the north of America, are not inhabited, yet there are traces of Eskimo eneampments along the whole line of eoast from Banks Island to Baffin's Bay. This may have been the route by which Greenland was first peopled, and it suggests a continuation of land along the same parallel, from Banks Island to the Siberian eoast. Yet it may be that the wanderers found their way northwards from Ameriea by Prinee of Wales Strait. The most remarkable tribe is that named Aretic Highlanders by Sir John Ross in 1818, and they are the most northern people in the world. 'heir stations range along the Greenland eoast from 76° to 79° N., a deeply indented eoast-line of gigantic cliffs broken by deep bays, with numerous rocks and islands. They have no canoes, but dogs and good sledges, and they attack the walrus at the edge of the ice with spears. They are separated from the Eskimo of Greenland farther south by the glaciers of Melville Bay. In Danish Greenland the original Eskimo were probably intermixed in blood with the old Norse settlers, and since the time of Hans Egede the number of half-breeds has inereased. In 1855 the half-breeds were caleulated at 30 per eent. of the inhabitants of Greenland, and the two elasses have sinee blended almost imperceptibly, so that there are now no full-blooded Eskimo. The population of Danish Greenland in 1870 was 9588, distributed among 176 winter stations. There are a few scattered families on the east coast of Greenland.

SoutH PoLaR ReEcIon.

The south polar region, unlike the northern region, is almost covered by the,ocean, the only extensive land being far to the south. It was of course entirely unknown to the ancients and to the early navigators of modern Europe, although a theory prevailed among geographers that a great continent existed round the south pole, the 'Terra Australis Incognita." Lope Garcia de Castro, the governor of Peru, sent his nephew Alvaro Mendajia in search of it, who sailed from Callao in 1567. Another expedition under Pedro Fernandez de Quiros left Callao in 1605, and discovered land in April 1606, which he called Australia del Espiritu Santo, now known to be one of

the New Hebrides group. These were the first regular expedi- tions in search of the supposed southern continent.

The first ship that ever approached the Antarctic Circle

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European, Asiatie, and American coast-line within the Aretie Cirele, ee oken of as south polar.

| Island in 48° 41’§., as it is at least a good base whence

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Dirk Gerritz as her captain. She was separated from the rest of the fleet in Magellan’s Strait in 1599, and was carried by tempestuous weather far to the south, discover- ing high land in 64° S. This appears to have been the land afterwards named the South Shetlands. Glerritz and

| his crew were eventually captured by the Spaniards at The invertebrate animals have been enumerated and reported upon | oot :

Valparaiso. In 1671 La Roche discovered South Georgia, a solitary island in the South Atlantic, but north even of the latitude of Cape Horn. Where so little is known, and where there is so little land, the discoveries within a few hundred miles of the Antarctic Circle come to be In this category is Kerguelen

south polar discovery may start, though its latitude in the southern is almost the same as England in the northern

_ hemisphere, on a meridian nearly half way between the

Cape and Australia. Its discovery is due to the gallant but unfortunate Frenchman whose name it bears, Yves J. Kerguelen. He sighted it on January 17, 1772, on the same day that his countryman Marion discovered the island named after himself, on a meridian nearer the Cape. Captain Cook, in his third voyege, visited Kerguelen Island, and Robert Rhodes in

1799 mapped a considerable portion of its coast. The Sandwich group, south-east of South Georgia, was discovered in 1762.

Captain Cook in January 1773 sailed southwards from the Cape of Good Hope in the “Resolution” with the “ Adventure” in company, and, after passing much ice, crossed the Antarctic Circle on the 17th, in longitude 39° 35′ E. In the same afternoon they sighted thirty-eight icebergs to the southward besides much loose ice; and in 67° 15’ their progress was stopped. Cook did not think it prudent to persevere in getting farther south, and bore up for New Zealand. In December 1773 another attempt was made to discover the supposed southern continent, by steering southwards from New Zealand. On the 20th Cook again crossed the Antarctic Circle in 147° 46 W., and came amongst a cluster of very large icebergs with loose ice in 67° 5’ 8. He got clear of them and after standing farther east he reached a latitude of 69° 45’S. in 108° 5’ W., and still shaping a southerly course he reached 70° 23’S. on January 29, 1774. Next day he came to icebergs forming an impenetrable barrier. He counted ninety-seven, which looked like a range of moun- tains, with closely packed ice round them. Cook’s farthest point was in 71° 15’ 8. on the meridian of 106° 54’ W. Captain Cook discovered islands in 53° to 54° 30’ S. in January 1775, which he named Sandwich, Willis, Pickersgill, and Georgia Isles, in about 32° W. In 27° 45’ W. he reached land which he named the Southern Thule, because it was the most southern land that had ever yet been discovered. It is in 59° 13’ 8. In the South Atlantic ice was met with as far north as 51°. In this second voyage Captain Cook made the circuit of the southern ocean in a high latitude, twice crossing the Antarctic Circle. He established the fact that, if there was any extensive south polar land, it must be south of the parallels along which he sailed. The Russian expedi-

| tion under Bellingshausen in 1820 also sailed over a great

many degrees of longitude in a high latitude, but only discovered two islets, Petra and Alexander. These islands were farther south than any land then known.

Auckland Island was discovered by Captain Bristow in 1806, and Campbell Island by Hazleburgh in 1810, both south of New Zealand, but far to the north of the Antarc- tic Circle. In 1818 Mr William Smith of Blyth redis-

‘ covered the land known as South Shetland. His work

was confirmed by Mr Bransfield, the master of H.M.S. “Andromache,” flag-ship on the west coast of South America, who further discovered another portion named Bransfield Land. Further coast-line was sighted by the

French expedition under Dumont d’Urville in 1838, who |

named it Prince de Joinville and Louis Philippe Land.

The South Orkneys were discovered by Captain George |

Powell, in the sloop “‘ Dove,” on October 6, 1821. Mr

Weddell, R.N., with the sailing vessels “Jane” and |

“‘‘Beaufoy,” penetrated as far south as 74° 15’ S. on the 20th February 1823.

In the early part of this century Messrs Enderby began to send vessels to the Antarctic regions for the whale fishery, which made several discoveries. The brig “Tula” of 148 tons and cutter “Lively” left London in July 1830 under the conunand of Mr John Biscoe, R.N., on a sealing voyage, but with special instruc- tions to endeavour to make discoveries in high southern latitudes. In February 1831 land was discovered in longitude 47° 20’ E. and latitude 65° 57’ S., which Biseoe named Enderby Land, in honour of his employers. He did not, however, get nearer to it than 20 or 30 miles. In February 1831 Biscoe again discovered land in 67° 1’ S. lat. and 71° W. long., to whicli he gave the name of Adelaide Island. It proved to be the westernmost of a chain of islands fronting a high continuous coast, since called Graham’s Land. A few days afterwards Captain Biscoe succeeded in landing on Adelaide Island. In 1833 Captain Kemp, in the sealing schooner

“ Magpie,” discovered another point of the land to the eastward, which doubtless forms part of Enderby Land.

Messrs Enderby sent out another expedition of discovery in 1838, consisting of the “ Eliza Scott” of 154 tons, commanded by Mr John Balleny, and the “Sabrina” cutter of 54 tons, under Mr Freeman. In February 1839, when on about the 163d E. meridian, they sighted high land in 66° 30’S. On the 12th, Captain Free- man managed to get on shore, but the cliffs were perpendicular, and the valleys were filled with ice. The discovery proved to be a group of volcanic islands, one of them rising to a beautiful peak estimated at 12,000 feet above the sea, named Freeman Peak. Sabrina Island was discovered in March 1839. The other group reccived the name of the Balleny Islands. The Auckland Islands were ceded to Messrs Enderby in 1849, and a whaling establish- ment was formed there under good auspices. a

In 1839 the French expedition under Dumont d’Urville pro- ceeded south from Tasmania and discovered two small islands on the Antarctic Circle named “Terre Adélie” and “ Céte Clarice.” At the same time Commander Wilkes of the United States expedi- tion made a cruise to the southward and mapped a large tract of land in the latitude of the Antarctic Circle for which he claimed the discovery. But as a portion of it had already been seen by Balleny, and the rest has since been proved not to exist, the claim has not been admitted.

The English Antarctic Expedition of 1839-48 was undertaken mainly with a view to magnetic observations, and the determination of the position of the south magnetic pole. Two old bomb vessels, the “ Krebus ” and “Terror,” were fitted out under the command of Captain (afterwards Sir James) Ross, with Captain Crozier in the “Terror.” Dr Joseph D. Hooker accompanied the expedition as naturalist. Leaving Chatham in September 1839, the two vessels first_ proceeded to the Cape, and went thence southwards to Kerguelen Island, which was reached in May 1840, and carefully surveyed. In August Sir James Ross established a magnetic observatory at Hobart Town. The cruise for the second season was comienced from Tasmania in November 1840. The Auckland Islands and Campbell Island were first visited and surveyed, and on New Year’s Day 1841 the Antarctic Circle was

crossed in about 172° KE. A few days afterwards the two vesscls were beset in the pack and began perscveringly boring through it. By January 10th they succeeded and were clear of ice in 70° 23’ S., and next day land was sighted, rising in lofty peaks and covered with perennial snow. ‘That day Ross passed the highest latitude reached by Cook (71° 15’S.). On a nearer approach to the land, there was a clear view of the chain of mountains with peaks rising to 10,000 feet, and glaciers filling the intervening valleys and projecting into the sea. The south magnetic pole was calculated to be in 76° S. and 145° 20’ E., or about 500 miles south-west from the ship’s position. The land interposed an insuperable obstacle to any nearer approach

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to it. Captain Ross landed with great difficulty, owing to the strong tide and drifting ice, on a small island near the shore, named Possession Island, in 71° 56’ S. and 171° 7’ E. Inconceivable myriads of penguins covered the surface, but no vegetation was seen. Next morning there was a southerly gale which moderated, and on 18th January they were again sailing south in an unexplored sea, On the 23d they were in 74° 20’S., and thus passed the most southern latitude previously reached (by Captain Weddell in 1828). Sailing along the newly discovered coast, Captain Ross landed alter much difficulty on an island named after Sir John Franklin in 76° 8’ 8. On the 27th they came in sight of a mountain 12,400 feet above the sea, which proved to be an active volcano emitting flame and smoke in great profusion. It was named Mount Erebus, and an extinct volcano to the eastward 10,900 feet high was named Mount Terror. Along the coast as far as the eye could reach to the eastward there was a perpendicular cliff of ice from 150 to 200 feet high, perfectly level at the top, and without any fissures or promontories on its smooth seaward face. Nothing could be seen above it except the summits of a lofty range of mountains extend- ing to the southward as far as 79° S. To this range the name of Parry was given. The most conspicuous headlands under Mount Erebus were named Capes Crozier and Bird. Captain Ross then sailed eastward along the marvellous wall of ice, in 77° 47’S. to 78° S. This ice barrier was calculated to be 1000

feet thick, and it was followed for a distance of 450 miles without a break. The winter was now approaching, young ice was beginning to form, but luckily a strong breeze enabled them to force their way through it. The whole of the great southeru land discovered by Sir James Ross was named Victoria Land.

In returning to Hobart Towu the expedition visited the Balleny Islands, and searched in vain for the land which Captain Wilkes had laid down on his chart.

In November 1841 the “ Erebus ” and “Terror” again shaped a southerly course, entered the pack ice on December 18th, and once more crossed the Antarctic Circle on New Year’s Day. The naviga- tion through a belt of ice 800 miles broad was extremely perilous. At length on Ist February 1842 a clear sea was in sight, and they proceeded to the southward in 174° 31’W. On the 22d they were surrounded by numerous lofty icebergs aground, and at midnight the Great Icy Barrier was sighted and its examination recommenced in 77° 49’S. Next day the expedition attained a latitude of 78°11’S., by far the highest ever reached before or since. After escaping imminent dangers in navigating through chains of huge icebergs, Captain Ross took his ships northward, and wintered at the Falk- land Islands.

In December 1842 the expedition sailed from Port Louis on the third visit to the south polar region, seeing the first iceberg in 61°S. On the 28th the ships sighted the land nanied after the Prince de Joinville by Dumont d’Urville, and the southern side of the South Shetlands was discovercd and surveyed. During February about 160 miles of the edge of the pack were examined, on March llth the Antarctic Circle was recrossed for the last time, and the expedition returned to England in September 1843. Thus after four years of most diligent work, this ably conducted and quite unparalleled voyage to the south polar regions came to an end.

In 1845 a merchant barque, the “Pagoda,” was hired at the Cape, in order that magnetic observations might be completed south of the 60th parallel, between the meridians of the Cape and Australia. The ship’s progress was stopped by an impenetrable. pack in 68°S. The magnetic work was, however, completed.

H.M.S. “ Challenger,” the exploring ship commanded by Captain Nares, arrived at Kerguelen Island on the 6th January 1874, where surveys were made, and the island was thoroughly examined by the naturalists of the expedition. Two islands, named Heard and M‘Donald, were also visited, which had been discovered in November 1853 by Captain Heard of the American ship “Oriental,” owing to the practical application of the problem of great circle sailing. There is in fact a group of islands about 240 miles from Kerguelen. In February the “ Challenger” ran south before a gale of wind and the first iceberg was sighted on the 11th in 60° 52’S. It was 200 feet high and about 700 long. On the 19th the ship was at the edge of a dense pack in 65° 42’ S.; and on the 4th March they bore up for Australia. Several deep-sea soundings were taken, the greatest depth being 1975 fathoms. The route of the “Challenger” was much the same as that of the “Pagoda” in 1845, but more to the north. With it ends the somewhat meagre record of voyages across aud towards the Antarctic Circle. (C. R. M.)

POLE, Recrnatp (1500-1558), generally known as Cardinal Pole, was born at Stourton Castle, Staffordshire, March 3, 1500. He was the son of Sir Richard Pole and Margaret, countess of Salisbury. Designed from early

youth for the church, he was educated in the Carthusian monastery at Sheen, and at Magdalen College, Oxford. He was admitted to deacon’s orders at the age of sixteen, and at once received high preferment, holding, among other

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benefices, the deanery of Exeter. He continued his studies at the university of Padua, where he made acquaintance with Erasmus and other prominent men, and, after a visit to Rome in 1525, returned to England. Henry VIII. was eager to keep him at court, but Pole appears to have held aloof from politics until the question of the king’s divorce drew him from his retirement. He was probably from the first opposed to Henry’s policy, but we find him, nevertheless, in 1530, at Paris, charged with the duty of obtaining the decision of the Sorbonne on the question at issue. That decision given, he returned to England, but refused to approve the king’s divorce, or the other.measures connected with it. The king, anxious to gain his adhesion, offered him the archbishopric of York, vacant by the death of

Wolsey in 1531. After some hesitation, he refused the offer and left the country.

This was the turning-point in his career, and concludes the first of the three periods into which his life may be divided. During the second period, for upwards of twenty years, he lived abroad, the declared and active enemy of the Protestant movement in his own country. After passing a year at Avignon, he took up his residence a second time at Padua. As he had not yet declared him- self publicly against Henry, the latter continued favour- ably disposed towards him, allowing him the revenues of his deanery, and exempting him from the oath of allegi- ance to ‘Queen Anne’s children. In 1535, however, there came a change. The king sent to ask his formal opinion on the divorce and the ecclesiastical supremacy. Pole’s answer, afterwards published, with considerable additions, under the title Pro Umitate Ecclesix, was sent to England early in the next year. It contained a vigorous attack upon Henry’s policy and menaced the king with condign punishment at the hands of the emperor and the king of France if he did not return to his allegiance to Rome. Summoned to England to explain himself, he refused to come. Late in 1536 he was made cardinal, and early next year he was sent as papal legate with the object of uniting Charles V. and Francis I. in an attack upon Eng- land, which was to coincide with a rising of the Romanists in that country. The terms of peace between England and France making it impossible for him to remain in the latte: country (for he was now attainted of high treason), he passed into Flanders, and soon afterwards (August 1537) returned to Rome. A year later (November 1538) he published his book, together with an apology for his own conduct, addressed to Charles V. In 1539, after the bull of excommunication had been issued against Henry VIIL, Pole went to Spain in order to urge Charles to attack England. An invasion was threatened but given up, and Pole retired to Carpentras. From 1539 to 1542 he acted as papal legate at Viterbo. In 1543 he was con- templating an expedition to Scotland with an armed force to aid the anti-English party, and in 1545 he was corre- sponding with the same party and with Charles V. for a joint attack on England. In the same he went to Trent in disguise, to avoid the danger of seizure on the way, and presided at some of the preliminary meetings of the council. On the death of Henry VIII. he made an attempt to reconcile himself with the English Govern- ment, but in vain. In 1549 he was a

candidate for the papacy on the death of Paul III., and at one moment was on the point of being elected, but in the end was unsuc- cessful, and retired to Maguzzano, on the Lake of Garda. When Edward VI. died Polo was engaged in editing his book Pro Umitate Ecclesiz, with an intended dedication to that king.

The accession of Mary opens the third period of his life. The pope at once appointed him legate, and entered into negotiations with the queen. A marriage between her

and Pole was at one moment contemplated, but the state of public feeling in England rendered his return impossible, and he was kept waiting for a year in Flanders and Germany. The reaction at length produced a parliament favourable to Rome, and enabled him to return (November 1554). As legate he received the national submission, and pronounced the absolution, accepting at the same time, on behalf of the pope, the demands of parliament with respect to ecclesiastical lands, &c. Next year he was on two occasions a candidate for the papacy, but was twice disappointed. After Philip's departure, and the death of Gardiner (October 1555), Pole became Mary's chief adviser, and, with her, must bear the blame of the perse- cution which followed on the reunion with Rome. On Cranmer's death (March 1556) he became archbishop of Canterbury, but soon afterwards (May 1557) fell into dis- grace with the pope, Paul IV., who was his personal enemy, On the outbreak of war with France, Paul, the political ally of that country, cancelled Pole's legatine powers and even charged him with heresy. No remon- strances on the part of Mary and Pole himself could induce the pope to retract this sentence, and Pole died (November 18, 1558) at enmity with the power in whose support he had spent his life.

His chief works are Pro Unitate Ecclesiw, ad Henricum VIIT. (ed. princ., Rome, n. d.); Reformatio Angliw (Rome, 1556); De Concilio (Rome, 1562); De summi Pontificis officio et putestate (Louvain, 1569); De Justificatione (Louvain, 1569); Letters, &c. (ed. Quirini, Brescia, 1744). ;

See Beccadelli, Vita Poli Cardinalis, Venice, 1553, London, 1690; Quirini, "Vita Ricardi Poli," prefixed to the Letters; Phillipps, History of the Life of

R. Pole, Oxford, 1764; also Strype’s Memorials; Froude’s History of England; Hook’s Archbishops of Canterbury; &c. (Ga, W. P.)

POLECAT. This name is applied to one of the English members of the large Family Mustelidx, which contains be- sides the Martens, Weasels, Otters, and Badgers (see Mam- MALIA, vol, xv. p. 439, and the separate articles under these names). :

In this family the Polecats, while belonging, with the stoats, weasels, and many others, to the nearly cosmo- politan genus Pwtorius, form by themselves a small group

Common Polecat.

confined to the northern hemisphere, and consisting of four species, of which the best known and most widely distributed is the common polecat of Europe (Putorius fetidus). This animal, at least so far as its disposition, size, and proportions are concerned, is well known in its domesticated condition as the ferret, which is but a tamed albino variety of the true polecat. The colour of the latter, however, instead of the familiar yellowish white of the ferret is of a dark brown tint above, and black below, the face being variegated with dark brown and white

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markings. gether of a far more powerful type than those of the stoats, weasels, or martens ; the skull of the female is very much smaller and lighter than that of the male. Its fur is long, coarse, and of comparatively small value, and changes its colour very little, if at all, at the different seasons of the year.

The distribution and habits of the common polecat have been well described by Blasius in his Stéugethiere Deutsch- lands, and the following is an abstract of his account. The polecat ranges over the greater part of Europe, reach- ing northwards into southern Sweden, and in Russia to the region of the White Sea. It does not occur in the extreme south, but is common everywhere throughout central Europe. In the Alps it ranges far above the tree- line during the summer, but retreats in winter to lower ground. In fine

weather it lives either in the open air, in holes, fox-earths, rabbit-warrens, under rocks, or in wood- stacks ; while in winter it seeks the protection of deserted buildings, barns, or stables. During the day it sleeps in its hiding place, sallying forth at night to plunder dovecots and hen-houses. It climbs but little, and shows far less activity than the marten. It feeds ordinarily on small mammals, such as rabbits, hamsters, rats, and mice, on such birds as it can catch, especially poultry and pigeons, and algo on snakes, lizards, frogs, fish, and eggs. Its prey is devoured only in its lair, but, even though it can carry away but a single victim, it commonly kills everything that comes in its way, often destroying all the inhabitants of a hen-house in order to gratify its passion for slaughter. The pairing time is towards the end of the winter, and the young, from three to eight in number, are born in April or May, after a period of gestation of about two months. The young, if taken early, may be easily trained, like ferrets, for rabbit-catching. The polecat is very tena- cious of life and will bear many severe wounds before succumbing ; it is also said to receive with impunity the bite of the adder. Its fetid smell has become pro- verbial. To this it is indebted for its generic name Puto- rius (derived, as are also the low Latin putacius, the French putois, and the Italian puzzola, from puteo), as well as the designation foumaré (2.c. foul marten), and its other Eng- lish names /fitchet, fitchew. Attempts to account for the first syllable of the word polecat rest entirely on conjec- ture.

_ The other species of the polecat group are the follow- VU aS é

The Siberian Polecat (Putorius eversmanni), very like the Kuropean in size, colour, and proportions, but with head and back both nearly or quite white, and skull more heavily built and sharply constricted behind the orbits, at least in fully adult indi- viduals. It inhabits the greater part of south-westcru Siberia,

aaons from Tibet into the steppes of south-eastern European Nussia.

The Black-footed or American Polecat (Putorius nigripes), a native of the central plateau of the United States, and extending southwards into Texas. It is very closely allied to the last spccies, but has nevertheless been made the type of a special sub-genus namel Cynomyonax, or ‘‘ King of the Prairie Marmots,”’ a name which expresses its habit of living in the burrows of,

and feeding upon, the curious prairie marmots (Cynomys) of the United States. An excellent account of this species may be found in Dr Elliott Coues's Fur-bearing Animals of North America.

Lastly, the Mottled Polecat (Putorius sarmaticus), a rare and peculiar species occurring in southern Russia and south-western Asia, extending from eastern Poland to Afghanistan. It differs from the other polecats both by its smaller size and its remarkable coloration, the whole of its upper parts being marbled with large irregular reddish spots on a white ground, and its underside, limbs, and tail being deep shining black. Its habits, which scem to be very much those of the common polecat, have been studied in Kandahar by Captain Thomas Hutton, who has given a vivid po ae of them in the Journal of the Asiatic Society of Bengal

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POLEVOY. See Russtan LrreRaTURE.

Its skull is rough, strongly ridged, and alto- |

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POLICE. The branch of criminal justice which com- prises a methodical system for the prevention and detection of crime is commonly known by the name of "Police." With the system having these objects is combined the execution of many duties not strictly involved in the popular defini- tion of crime, but materially affecting the security and convenience of the public. Bentham, more comprehen- sively, says that police is in general a system of precaution either for the prevention of crime or of calamities. It is destined to prevent evils and provide benefits. The system for the attainment of these objects and the introduction and establishment of that system in the United Kingdom form the main subject of this article ; some account will afterwards be given of the police in other states.

In this view the definition and use of the word ' police," as meaning the regulation and government of the city and country in relation to the inhabitants, are not sufficiently close. When Blackstone says that by the public police and economy he means ''the due regulation and domes- tic

order of the kingdom, whereby the individuals of the state, like members of a well governed family, are bound to conform their general behaviour to the rules of pro- priety, good neighbourhood, and good manners, and to be decent, industrious, and inoffensive in their respective stations," the definition is capable of an interpretation at once too wide and too narrow for the present purpose. It is vain to look for an accurate.description of police, as a system, in writers of a period when the thing sought for had no existence. The system is of recent growth, and it is necessarily more associated with personal instruments for the attainment of objects than with the objects to be attained. An observation of Gibbon, referring to the eediles and queestors of the Roman empire, that officers of the police or revenue easily adapt themselves to any form of government, correctly presents the idea of distinctive personal elements. A system of police administration includes neither the making of the law nor the law itself. Officers of police are neither legislators nor (in the usual sense) magistrates. They are the instruments by which conformity to the rules of the commonwealth is attained..

Apart from the repression of crime as generally under- stood, it is plain that, at least in crowded cities, a power ought to exist for the suppression of noise and disorder, the regulation of locomotion and traffic, the correction of indecency, and the prevention of a numerous class of annoyances and impositions which can only be restrained by cognizance being taken of them at the instant. To these may be added a number of petty disputes the immediate settlement of which tends materially to the public peace. Over such subjects as these it is obviously for the general advantage the police should have a summary control. Any apprehension of danger to liberty can only be founded on its abuse and not upon its proper exercise.

The employment of persons in these various duties, as well as in the prevention and detection of graver matters of crime, constitutes a division of state labour. 'Therefore, while it is perfectly correct to speak of the various legisla- tive and other measures for good order as "matters of police," the organization and management of the police forces constitute a distinct subject.

The essential features of the established police system, alike in Great Britain and in foreign states, in cities and towns as in countries and village communities, comprise the following matters :—

I. A body of persons in relation to the state enforcing obedience to the criminal law, the prevention and detec- tion of crime, and the preservation of order, over a defined area, generally divided and subdivided for the purpose of distribution and immediate government of the force, but having one jurisdiction throughout.

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Il. The division of that force into classes of various rank, comprising, in general, in ascending order, constables, sergeants, inspectors, alld superintendents (or their equi- valents),—the constables being the most numerous and themselves divided into classes.

III. General control of the entire body by heads, whether styled commissioners or chiefs, having power to make regulations for the government of the force, subject in turn to the control of state authorities.

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of the expression ; and, on the English statesman explain-

ing that he intended to refer to what every Government exercised in virtue of its sovereignty or under treaties with

other powers, Talleyrand would not admit the existence

of any maritime police, except that of each power over its

own vessels.

The supervision of the police by the Government stands Govern-

thus. The commissioner of police of the metropolis of ™ent

London is appointed by and acts under the immediate (il”’

Relation to the state.

IV. Patrol day and night of the streets, roads, and public places,—the “ beats” and “tours of duty” of con- stables being prescribed by regulations, and actual per- formance and compliance being secured by the sergeants and inspectors. ,

V. The payment of the force, including establishment charges, out of public funds provided for the purpose.

In dealing with these subjects as nearly as may be in.

the order indicated, the relationship of the police force to the state is of primary importance. A general control by the executive Government of a state of the police forces, for the legitimate objects for which they are established, seems essential. In Great Britain every member of the force, from an ordinary constable upwards, stands in the direct position of a servant of the crown. On admission he makes a promissory declaration (recently substituted for an oath) that he will serve the sovereign ; and it is upon the fact that a police constable has the powers, duties, and privileges of a peace officer of and for the crown that many of the incidents of his service depend, although the im- mediate power of dismissal is vested in heads of a force, whose orders he is bound to obey.

The state employs the police forces for the public wel- fare only. ‘There is not in England,” remarked the late Chief-Justice Cockburn, “any more than in America, any system of espionage or secret police to pry into men’s secret actions or to obtain information for the Government by underhand and unworthy means.” The truth of this is exemplified in the present position of police administra- tion in the metropolitan police district of England acting under the immediate control of the secretary of state. The fear expressed, and no doubt felt, on the first establish- ment of a regularly organized system of police, that the freedom of holding meetings and the utterance of opinion at them would be suppressed, has been dispelled. The police are expressly enjoined not to interfere with persons attending political meetings unless specially ordered, and such orders are not given unless disorder or a breach of the peace is imminent. Public addresses, even in some of the royal parks, are permitted, provided they do not cause any

obstruction, and are not of an unlawful character. There are no Government police to watch the delivery of mere political opinion or the tenor of its reception by the auditory. The press is also free from Government interference, through the police, in matters short of crime or not directly incentive to crime.

The sphere of action of the police force in relation to the state has been extended' by legislative enactments pro- viding that criminals who have escaped to or from colonies may be followed and removed by process of law, and tried where the crime originated. The practical execution of the law as to these fugitive offenders rests with the police. The same observation applies to the province of police under extradition treaties. But the general action of the police force of a country is bounded by its shores. As the open seais not the territory of any one nation, it is not

direction of the secretary of state for the home department. The commissioner of police of the city of London is in communication with the corporation, who appoint him. There is, however, a power of approval of regulations in the secretary of state. In the counties of England the appointment of the chief constable is by the county magistrates subject to the approval of the secretary of state. In municipal corporations the police, including the chief or head constable, are appointed by the watch committee. In all these cases except in the metropolis the secretary of state leaves the immediate control to local authorities and disclaims responsibility. In Scotland the secretary of state has a voice in the rules for the govern- ment, pay, and necessaries of the force. The appointment of the chief constable is subject to his approval, but practically there is no interference called for in this respect. In Ireland great authority is vested in the lord lieutenant both with respect to the police of Dublin and the royal Trish constabulary. The immediate government is vested in the heads of the forces, and the parliamentary responsi- bility isin the chief secretary for Ireland. Reports and returns as to the police forces of Great Britain and Ireland are laid before parliament. The immediate control and responsibility of a cabinet minister for the police of the metropolis of London makes a very important distinction between the position of that force and of the other police forces of the empire. There is, however, a general relation- ship of the police forces of the country to the state, arising from the contribution

(not now limited to a particular pro- portion) made by parliament to the expenditure for a pelice force. Under an Act of 1856 the crown appoints three persons as paid inspectors to visit and inquire into the state and efficiency of the police appointed for every county and borough in England and Wales, and to see whether the provisions of the Acts under which they are appointed are duly observed and carried into effect; and upon the secretary of state's certificate of efficiency, laid before parliament, the contribution is made. In the same way an inspector for Scotland reports annually.

It is to be observed that the contribution cannot be made toa borough police not consolidated with the county police where the population is less than 5000. In Eng- land the state, except in the city of London, contributes about half the pay of forces which submit to certain regu- lations, to inspection, and to a definite amount of imperial control. In Scotland the state also contributes. About two-thirds of the cost of the Dublin metropolitan police is met by the treasury. The balance in all the above cases comes from the locality. The royal Insh consta- bulary is the only force whose ordinary strength is entirely supported by imperial taxation, subject, however, to pay- ment by districts where special services are necessary.

'To prevent political influence being brought to bear upon the police, they cannot vote at elections of members of parliament within their district ; and the chief officers are disqualified from sitting in parliament.

competent to any one nation to preserve order or remove The relationship of the police forces of the country to Con-

all delinquents on its surface, as it is in the ports, rivers, | the army as a state force is satisfactory. The police isa an and lakes of a state. When Lord Castlereagh at the con- | civil force. Although constables constantly speak of the Bi

public as "civilians," the police are in turn styled civilians

gress of Vienna spoke of the " police" to be exercised over by soldiers. It is now only on rare occasions that soldiers

_ ships carrying slaves, Talleyrand asked the precise meaning

General duties.

Relation to crime.

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are required to intervene in the case of riot or tumult, as fortunately the police force is generally sufficient for the preservation of the peace of the country. If disturbance is apprehended in any district, special constables are called upon to aid. It is no less due to the improved temper and habits of the people than to the existence of the police force that military display is rarely needed to suppress riots. In state processions and on some other occasions the police and household troops together maintain the line of route, and where troops assemble for inspection the police sometimes aid in keeping the ground. The police, as constables, are required to carry out the law as to billet- ing and the impressment of carriages,—at one time a very heavy incident of duty, but considerably lightened by the practice of conveying troops by railway. The police appre- liend deserters on reasonable suspicion. Police in charge of a station niust receive prisoners, including deserters and absentees subject to military law, if duly sent there by military authority; and, as a person subject to military law is usually left to be dealt with by the ordinary civil tribunal for offences, he is taken by the police before a inagistrate. On the other hand no person subject to mili- tary law, whether an officer or a private, can neglect or refuse to deliver over to the civil magistrate any officer or soldier accused of au offence punishable in the ordinary mode, or to assist the police in his lawful apprehension; an adjustment of military and civil law is therefore effected.

The duties devolving on a police force require a fuller notice than the general remarks already made.

A constable on ordinary patrol duty has to attend to every circumstance that a keen eye and ready ear bring under his notice. In a carefully drawn statute, although not now in general use, the general sphere of observation and duty by constables is thus summarized :—

‘During the time they shall be on duty, use their utmost en- deavours to prevent any mischief by fire, and also to prevent all robberies, burglaries, and other felonies and misdemeanors, and other outrages, disorders, and breaches of the peace 5 and to appre- hend and secure all felons, rogues, vagabonds, and disorderly persons who shall disturb the public peace, or any party or persons wander- ing, secreting, or misbehaving himself, herself, or themselves, or whom they shall have reasonable cause to suspect of any evil designs ; and to secure and keep in safe custody any such person, in order that he or she may be conveyed as soon as conveniently may be before a justice of the peace, to be examined and dealt with according to law ; and it shall and may be lawful to and for the said watchmen, serjeants of the watch, patrols, and other person or persons to call and require any person or persons to aid and assist them in taking such felons, rogues, vagabonds, and all disorderly or sus- pected persons as aforesaid” (3 & 4 Will. IV. ¢. 90, § 41).

Police action in relation to the serious matters constitut- ing crime is familiar knowledge. It is essential to bear in mind that the powers of the police in arresting and other- wise dealing with criminals in a variety of ways is derived from and depends on police constables having been ex- pressly invested with the powers and duties of the old parish constables. Every police force has been given these powers and duties of constables, and the possession of them is so essential that, however they may be supplemented by modern legislation, without them no police force could exist for a day.

A statistical or other inquiry into crime is necessarily beyond the limits of this article. A few facts, however, bear on the efficiency of the police forces.

The returns indicate that the apprehensions in 1881-82 were (omitting fractions) in the proportion of 41 per cent. to the number of crimes committed in England and Wales, against a like propor- tion in 1880-81, 42 per cent. in 1879-80, 45 in 1878-79, 44 in 1877-78, 46 for 1876-77, and 47 per cent. for 1875-76.

The director of criminal investigations reported for the year 1882 that a comparison of the statistics—which are prepared by an independent service

with a scrupulous regard to accuracy—with those of foreign cities shows that the metropolis of London (metro- politan police district), with a territory nearly 700 square miles in extent, covered by more than 700,000 separate houses, and inhabited

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by a population barely less than 5,000,000, is the safest capital for life and property in the world. a

Although criminal procedure does not admit of being fully treated here as part of the police system, yet as the police by duty as well as practice are in fact prosecutors – in the majority of criminal cases, the important part taken by the police force requires notice.

The efficiency of the police, as well as the exigencies of cases, has led to the arrest of offenders or suspected persons in the great majority of fclonies and other crimes, where the powcrexists, with- out applying to magistrates for warrants in the first instance. Although there are some advantages attendant upon a practice under which magistrates do not hear of the matter until the accused is actually before them, it is undoubtedly better, as recently declared by the commissioners reporting on the criminal code, for the police officer to obtain a warrant where circumstances adinit of his doing so. When he arrests, whether with or without a warrant, it is his duty to take the prisoner before a magistrate.

Without attempting to enter fully into the rights and duties of the police in relation to arrest, it may be mentioned that, while the important action of the police is derived from and wholly depend- . cut (except in some cases where recent legislation has found a place) on the older powers, scicnce has been made subservient in facilitating the application of those powers to police duties. As in old times the reasonable suspicion giving the right to arrest may still be founded on ecaal” observation and information in the ordinary mode ; but the electric telegraph and the photograph now lend their aid as recognized agents in favour of justice and truth far more than in aid of fraud and deception.

If an arrest is without a warrant, it is the officer's duty to show that he acted rightly by establishing at least that he proceeded on reasonable information. His task is generally much more. He or some police officer, whether acting under a warrant or not, has to adduce all the evidence to justify a conmittal for trial, or, if the case is one in which the court of summary jurisdiction has the power, for a conviction. In carrying ont this duty even in simple cases a multitude of matters have to be attended to in which a number of police officers take a part. Whether the arrest is made by a constable on his beat or under other circumstances, the ordinary duty involves taking the prisoner to the police station, where the charge is entered. He is then taken before the magistrate, or, in some cases, bailed. If the charge be one of felony it generally involves a remand, not only for the attendance of witnesses, but to ascertain the prisoner's antecedents ; and these remands are often multiplied in complicated cases. Every remand involves the.con- veyance of the prisoner to and from the prison or 'lock-up,'-— generally the former. Detective police attend at the prison to ascertain whether the accused has been previously convicted or charged. Witnesses must be seen and their attendance secured. If the prisoner is eventually committed for trial it is the duty of the inspector or other officer having charge of the case to aid the magistrate's clerk in making out the certificate of costs, so that the proper aniounts for the allowance of witnesses are inserted. Although in ordinary cases there is a nominal '' prosecutor" (the person who has been wounded or lost his property), if he enters . into a recognizance before the magistrate, he leaves everything to the police, who have to inform him even when and where he must

-attend for the trial, and the police are required in many cases to

give the necessary instructions for the indictment; and, when the proper time arrives for the trial at the sessions or assizes (of which public notice is given), the police must inforin the witnesses and arrange for their conveyance and prompt attendance in the precincts of the court, first before the grand jury, afterwards on the trial. A police officer must attend the taxing officer, give the necessary particulars as to the witnesses, and see that they receive their allowauccs.

The responsibilities and duties of the police may be varied, but on the whole are scarcely diminished, if there is a solicitor for a private or for the public prosecutor; the Act of 1884 relating to the public prosecutor regards the police as essential parties, and it is certain that no general system of prosccution can be carried on with diminished police intervention.

The duties of police to accused persons are too important to be passed over in complete silence. ‘To say that they involve perfect fairness ought to be a sufficient guide, but it is right to add that the indirect as well as the direct extortion of statements, either by threat or promise, is forbidden. On the other hand to caution accused persons is not the province of the police; as on the one hand a police officer onght not in gencral to put questions, so on the other hand he ought not to prevent voluntary statements. – His general duty is to listen, and to remember accurately what the accused says. It is often the duty of an officer to give informa- tion to the accused, as for instance of the nature of the charge on which he is arrested or to read the warrant; but information of this kind should not be given interrogatively. It sometimes happens,

Relation to refor- matories.

Execution of process.

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however, that in the course of inquiries a person makes a criminatory statement to a police officer, in consequence of which it is the duty of the officer to arrest him. ‘This is distinct from questioning a person whom the officer has not merely suspected but predetermined to arrest. :

Some other duties, the growth of modcrn times and unknown until recently, devolve on the police in relation to criminals. They arise from the release of offenders sentenced to penal servitude before the expiration of the period, on certain conditions, or of offenders sentenced, after the expiration of their scntence of imprisonment, to’ be under police supervision for a given period. Both classes of convicts involve the performance by the- police of very responsible duties in reference to reporting and giving notice of changes of residence, so as to make the watch and supervision a real thing,

and at the same time to give the convicts the oppor- tunity, as intended, of gaining an honest livelihood at some labour or calling. It is a frequent source of complaint by. the convicts that they are so watched that they cannot obtain employment, and are driven into the repetition of crime,—the police retorting that the allegations are untrue, and that the fresh offencc is the result of the habitual offender's incurable love for crime. Any constable in

any police district may, if authorized so to do (in writing) by the'

chief officer of police of that district, without warrant take into custody any:convict who is the holder of a licence if it appears to such constable that such convict is getting his livelihood by dis- honest means, and may bring him before a court of summary juris- dictions The systein of ''reporting" is itself a branch of police administration of great importance, and requiring considerable knowledge. Its headquarters may be said to be in the metropolis and under the supcrintendence of the police of that district, but it involves constant communication with otlier districts and observa- tion throughout the kingdom.

The extent of police duty in respect of such offenders is shown by the fact that, according to the last published return, there were in England and Wales 1268 convicts on licence and persons under sentence of supervision.

The police are in general the instruments for carrying out thie statutory provisions respecting certified industrial schools and reformatories. Not only is the process for the most part directed to the police, but magistrates and others interested look to the force for suggestions and assistauce. In some respects it would be desir- able if industrial schools, as distinguished from reformatories, could he worked without the intervention of police agency, but that seems impracticable.

An important police function relates to the execution of process, aud is not confined to subjects or cases in which the force is collec- tively or individually concerned in the performance of their duty. Whether the process is a warrant or a summons, its execution or service is in the hands of the police. Magisterial warrauts of appre- hension and search are by law, in other than exccptional cases, necessarily directed to the police as peace

officers, whether their purport be to bring the person before the tribunal or to convey him from it or from one place to another ; and in other warrauts of exccution, although parochial officers are often joined, police are also included to prevent abuses of the law to which the poor are so much exposed. Police officers are now expressly required to have the direction of warrants of distress. The service of a magisterial summons, although not in general prescribed to be effected by a police officer, in practice properly devolves on the force. In the inctropolitan police district all police service must be by its officers. In a great variety of matters whicre notice has to be given to per- sons, the duty of communicating it either verbally or in writing or in print is thrown on the police. So convenient a medium for the orderly administration of purely civil matters are the police found that, at the request of the local government board, the police are allowed to deliver and collect voting papers in the election of parochial officers. 5

The increased area over which a police constable as compared with the old parish constable has jurisdiction facilitates both arrests and service of process. Although stationed within a defined area of limited jurisdiction, the duties of the force often involve the opera- tion of functions without geographical limits, requiring the actual presence of its members outside as well as the performance within the district of much that relates to the exterior.

The service of proccss calls for constant communication between different police forces. The law provides for the backing of warrants, by which a constable can act beyond his ordinary jurisdiction or by which the warrants can be transmitted. A magisterial summons for appearance does not require formal transmission. It is addressed not to the police but to the defendant, and can be served by an officer of any district ; but, as until recently the proof of service could only be given by the personal attendance of the serving officer at the magistrate’s court, great expense was incurred in travelling to effect service, and inconvenience in attend- ing to prove it. This has been remedied in most cases by allowing service to be proved by a declaration before a magistrate.

The transmission of process, declarations of service, payment of

30D fecs, and many other incidents arising in apparently the most simple cases now involve constant communication between police forces by whatever distance they may be separated.

A few lines must suffice on the general duties of the police force in relation to a variety of other matters. Some of these are closcly

Miscel- laneous

connected witli crime, others with municipal regulations only. The duties.

police, as having all the duties of constables, act as coroner’s officers; they niake minute inquiries as to suicides, accidents of every kind, insane persons and their apprehension, and deal with destitute persons and persons seized with sudden illness in the streets, and with vagrants.

In populous districts the adjustment of street traffic, of securing Street

the comfort as well as safety of persons in passing to. and fro, whether on foot or otherwise, forms a very important.brancli of the constable’s duty. This may be and often is effected by the mere presence of the constable passing on his round without greater exercise of his authority than a request to persons to move or to wait at crossings. Unless in crowded parts, this highway branch of duty may consist in preventing riding and driving furiously, or cn footpaths. The general or local laws of each district give ample scope for the exercise of the police constable’s authority and the performance of his duties in such matters, including obstructions of all kinds.

In the metropolitan police district the commissioner has large powers, including the power to prescribe special limits in the metropolis within which some acts affecting the general easc and freedom of the public are forbidden which are innocent elsewhere.

traffic.

On the police almost invariably devolve the licensing of public Public carriages and the enforcement of the great variety of regulations carriages.

respecting them. Inthe metropolitan police district the licensing of public carriages is vested in the secrctary of state, who makes numerous regulations respecting the carriages and their drivers and proprictors, and gives (under power vested in him by the legislature for that purpose) the administration of this important branch of the law to the commissioner of police. Elsewhere in England and Wales the administration of the law in relation to hackney carriages is in the hands of local authorities. The police have charge of the maintenance of good order in houses and places licensed for the sale of intoxicating liquors, including inquiries and notice as to all kinds of licences, renewals, aud transfers, and of course in- volving the conduct of numerous persons, not only of the licensed persons and those in their service, but of persons frequenting their houses, not excepting the members of the police force.

Licensed preinises.

The laws and regulations for common lodging-houses in the Regulated

metropolis are under the police. : constant vigilance, including pawnbrokers, marine-store dealers, pedlars, and chimney-sweepers. :

Among almost an infinity of offences may be enumerated those involving cruelty to animals, prize tights so called, and all descrip- tions of unlawful brawls (including brawling in places of public worship), gaming, gambling, and betting, lotteries, disorderly houses, dangerous performances, the infraction of fence months and seasons for Hine and fish, the fraudulent removal of goods, violations of cattle plague orders (which the police are expressly required to observe and enforce, involving of late years most arduous duties), and the sale of unwholesome food and of poisons. The police have also to deal with the care and keeping of explosive substances, animals straying, and dogs reasonably suspected to be mad or not under proper care. ;

Some public offences, such as the use of inaccurate weiglits, adul- teration of articles of food, &c., are generally dealt with by in- spectors aud other spccial officers, although it is undoubtedly the duty of the police to aid in enforcing the law, and to report to the proper quarter offences coming to

their knowledge. In the inetro- polis, smoke nuisances are dealt with as police offences.

The police aid the inland revenue in a variety of ways, and, although it is generally undesirable for the police to take part in the collection or enforcement of taxation, they are required in the metropolitan district, by order of the secretary of state, to enforce as far as lies in their power the payment of the dog tax, their other duties giving them greater knowledge on the subject. :

In visiting places of amusement the police are often performing duties of a multifarious character. In general the one object is the maintenance of good order, but sometimes the observation extends to the character of the amusement and the infringement of licences.

Apart from the special duties as to the restoration of property left or lost in public carriages, or with reference to prisoners pro- perty, for which there are special provisions, the police exercise a reasonable rather than a specially assigned duty in facilitating the recovery of lost and stray property by the rightful owners. —

A very few words niust suffice for notice of a subject which has been a vexed question before as well as since the establishment of a police force in the country, and down to the present moment— the action of police powers as to street prostitutes. Practically this action has nearly the same limits throughout England and Wales. In the metropolitan police district and in the City of London it is an offence for a common prostitute or night-walker to

Other traders exercise their trades.

Offences.

Dog-tax.

Places of amuse- ment.

Lost pro- perty.

Prosti- tutes,

Area of action,

Strength of police foree.

loiter or to be in a public place for the purpose of prostitution or solicitation to the annoyance of the inhabitants or passengers. Elsewhere the offence is in much the same terms included in the Police of Towns' Clauses' Act, 1847, and is so applied to all urban authorities under the Public Health Act, 1875. In the practical application of the law it is generally considered that there must be some evidence of a personal annoyance by and to one or more persous to justify a conviction.

The preceding survey of some of the multifarious func- tions of a police force affords an illustration of Bentham's classification of the business of police into distinct branches :—police for the prevention of offences; police for the prevention of calamities ; police for the prevention of endemic diseases; police of charity; police of interior communications ; police of public amusements ; police for recent intelligence and information. No attempt, how- ever, is made in the present article to follow such classifica- tion. It would lead the reader astray, where the object is to treat principally of the police force.

As to the defined area of police action, for general purposes the legal rights and powers of a police force (subject to the observations already made) are coextensive with the police district. In the metropolitan police dis- trict the members of the force have the powers of con- stables in the adjoining counties (10 Geo. IV. c. 44, § 4; 2 & 3 Vict. c. 47, § 5).

The determination of the geographical area of a police district is necessarily governed by a variety of circum- stances. Physical features have sometimes to be taken into account as affecting the demarcations of intercourse, nore frequently the occupations of the people and the amount of the population. A district may be too confined or too large for police purposes. The limited ideas of simple-minded rustics of a former generation whose views of

complete independence consisted in inhabiting two adjacent rooms in different parishes, so as to effectually baffle the visits of parochial officers, is probably a notion of the past; but obstructions of a like kind may arise from too narrow boundaries. On the other hand dense popula- tions or long-accustomed limits may outweigh convenience arising from a wide area.

In any case the making of altogether new boundaries merely for police purposes is very undesirable. The county, or divisions of a county or city, or the combination of parishes, ought to be and are sufficient for determining the boundaries of a police district. A boundary, more- over, that does not admit of ready application for rating is impracticable.

In England, Wales, and Scotland, with the exception of the metropolitan police district and the area of the City of London (geographically included within but distinct from it in police government), the police districts are for the most part identical in area with the counties. Large towns have police forces distinct from the county force surrounding them. There are 290 police forces in the island,—a number liable to frequent variation, as separate forces are created or existing forces are combined, for which powers exist.

By far the largest and most important force, as regards the char- acter of both area and numbers, is that of the metropolitan police district, comprising 20 divisions. The total number of the police (including of course the county constabulary) for England and Wales for the year ending 29th September 1883 was 34,488, an Increasc on the previous year of 1315. During the last decade the increase in the total number of the police, allowing for the aug- mented population, is trifling.

The following are the numbers composing the different forces in

“1882-83 :—

In boroughs under the Municipal Corporation Act and under local Acts

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Metropolitan police constables, including royal dockyards.. 12,663 Ory Ol Longo . 2….0..000 oe 885

i: 2: CBO OPRPR ret coy 34,488

The total gives one constable for every 774 of the population, according to the census of 1881. In boroughs, &c., there is 1 for

POLICE

every 758; in counties 1 for 1231; in the metropolitan police district (deducting 807, the number employed in royal dockyards, and 446 paid for by public companies and private individuals) 1 for every 413; and in the City of London 1 for every 57 of the City population, as enumerated on the night of the census of 1881. The total number, exclusive of the commissioner and assistant commissioners, belonging to the metropolitan police force on the lst January 1884 was 12,404,—comprising 10,741 constables, 1028 sergeants, 608 inspectors, 24 divisional superintendents, 1 chief superintendent (of the criminal investigation department), and 2 district superintendents.

The strength of the police force in proportion to population varies cousiderably in each county of Scotland, ranging for the year ended 15th March 1884 from 1 in 731 in Selkirk to 1 in 2438 in Bantf. In burghs it varies from 1 in 582 in Edinburgh and 1 in 535 in Glasgow to only 1 in upwards of 1500 of the population in the smallest burghs.

The strength of the royal Irish constabulary on the 1st July 1882, the geographical area of which comprises all Ireland, con- sisted of 258 officers and 13,750 men, and it was subsequently increased to 14,601 of all ranks.

The equal distribution of the force throughout a district— not a uniform distribution either as to area or population, but equal in accordance with wants—is one of the greatest difficulties in the administration of a police force. It is not merely that recruits must be sought for to keep pace with increase or variations of population, but daily and hourly events necessitate daily and hourly changes of dis- tribution. The duty is not merely to draw off men from adjacent divisions to the spot for a few hours, where they can

be best spared, but to fill places where required. It must be remembered that extra work by day incapacitates men for the night watch, and it takes days to restore the equilibrium. It is needless to say that, although the services of the police force may not be required to aid in the extinction of a fire, their presence is required in great numbers to preserve order; and thus men are necessarily kept on duty beyond their prescribed hours. Nor, in many of these cases, whether foreseen or unforeseen, is the distribution of the force self-adjusting. Let all do what they may in aid through all ranks of the force, in- equalities must occur ; and before the gaps are made up a fresh displacement occurs. Much may be done and is done by a system of reserves, and by averaging the yearly extra calls on the time of a force; but after all there is no perfect equality. The peacefully slumbering citizen may be startled by the announcement that, although the force of the metropolitan police district has been under anxious management for upwards of half a century, on no two nights since its formation have the beats been patrolled to precisely the same extent.

The police system of necessity involves the existence in a district of police stations or lock-ups, for the temporary detention of prisoncrs; and magistrates have generally the power to remand prisoners to these for short periods. Power to make police stations occasional courts of sum- mary jurisdiction has been recently conferred on county magistrates. A police power of admitting arrested persons to bail in petty cases, with a corresponding duty to exercise the power, is vested in the police in authority at stations. This power has existed throughout the metropolitan police district from the first establishment of the police on its present footing, and also in the City of London and in many populous places under local Acts; and the principle has been recently extended to the country.

The selection of persons for the force is a matter subject to general as well as special regulations, varying in each district according to circumstances of place and time. Testimonials as to character and antecedents should be and are in practice always required. For health a medical examination is enforced; as to general education, reading and writing are usually required; special education for police duties is necessarily unattainable before entry, but in the metropolitan police force of England approved

Distribu- | tion.

Stations.

Quali-

fications for ser-

vice.

Disci- pline.

Detec- tives.

roe hy CF

candidates are admitted on probation, and drilled. When finally approved of, on admission to the force they make a declaration, as already stated, to duly serve.

Discipline is enforced by dismissal, reprimand, fines, removal to another division, or degradation in rank. Violation or neglect of duty may be punished by summary conviction.

For the detection of crime and offences it is obviously necessary that some members of the force should perform their duties out of uniform. Some are constantly employed as detectives, others doff their official dress on emergencies. In the English metropolis the detective officers form a distinct branch of the police service, called the criminal investigation department. One of the assistant commis- sioners of the metropolitan police attends specially to this

- department, to which a chief superintendent and a separate

Chief Officers,

) Orders.

Main- | tenance,

staff of inspectors and sergeants are attached, having an office in Scotland Yard, with officers of the department placed in the divisions of the district. The qualifications of the principal officers are special, and they are selected for their aptitude, knowledge of foreign languages, and a variety of circumstances rendering the application of the ordinary routine of training undesirable and imprac- ticable. Constables and sergeants of the department are selected from the general body of the force. Officers of the detective department of the metropolis in the per- formance of their various duties travel all over the globe, to foreign states as well as to the colonies. The number of detective officers in England and Wales for 1882-83 was 551.

The chiefs of the metropolitan police force are the com- missioner and three assistant commissioners, one acting in place of a director of criminal investigations, who has recently retired. A legal adviser to the commissioners is appointed by the secretary of state. Besides the divisional superintendents, there are now two district superintendents, who visit the whole of the divisions. All promotions in the service up to the rank of superintend- ent are made from the next rank below. When vacancies occur the rule is to recommend to the commissioner those best qualified in all respects, seniority of service being duly considered ; but an educational examination by the civil service commissioners is requisite. A different standard and subject of examination is provided for each rank :— (1) constables for sergeants ; (2) sergeants for inspectors ; (3) inspectors for superintendents.

Orders having the approval of the secretary of state tor the government of the police of the metropolis in a variety of matters are printed and issued daily throughout the district. The majority of these orders relate to incidents and contingencies of the passing hour, and affect particular divisions ; others are of a permanent character and require attention throughout the district. Such orders form the practice of the police in almost all matters of detail either not specifically regulated by Act of Parliament or requiring explanation and elucidation ; and, if they are carefully considered and prepared, their issue must produce a uniform code of police procedure for the force.

The cost of a police system is defrayed from a fund formed by local rates or by imperial funds, or both, and in part by the appropriation of fines and the fees payable by law in respect of the performance of individual duties, but not permitted to be retained by the performer. This fund is collected and expended through the medium of a receiver, treasurer, or other officer, and a staff of clerks, with the aid of the superintendents, inspectors, and police officers. The regulation and amount of the salaries (which are generally paid weekly or monthly according to the class), depend of course on local and other circumstances, but do not vary frequently. Where agriculture is the

oo7 general occupation the pay of members of the force is low. Where mining and manufactures compete with agri- culture it is higher; where they are the principal business they create a demand for labour which raises the salary of the constable as well as those of other workers. The pay of the constables of the metropolitan district varies from £62, 11s. 6d. to £83, 8s. 7d. per annum, that of the sergeants from £88, 12s. 11d. to £146, of the inspectors from £88, 12s. 11d. to £351, 19s. 4d. The metropolitan police constable is subject to deductions for pension, and

he contributes on the average about 2d. a week to gratul-

ties for the widows or orphans of comrades who have recently died, and is under a rent of about 3s. 6d. if single and living out of the section house, and about 6s. 6d. a week if married. Analogous conditions exist in all the great city forces. The Liverpool constable begins with 26s. 8d. a week ; 8d. a week is deducted at first, and 10d. after a short period, towards pension fund ; an average of 4s. a week is spent on the lodgings of a single, and from 5s. 6d. to 7s. 6d. on those of a married man. Model scales of pay which were suggested by the secretary of state in 1879 have been adopted by several county forces in Scotland, but not in burghs.

In addition to fixed salaries, the police system generally Rewards.

provides for rewards for extraordinary diligence and gratuities out of the police fund. Gifts or payments to individual officers by private persons ought to be con- trolled in a well-regulated system, where good conduct and vigilance ought to be closely watched to ensure pro- motion in due time.

Specially meritorious acts, however, are sometimes admitted for pecuniary recognition by magistrates, or representative bodies. In England the police are not now permitted to participate in Government or other rewards for the discovery of crime. Provision is almost invariably made for pensions by a fund formed by a scale of deductions from pay, as already stated, and to some extent by fines. The general subject of super- annuation is, however, too large to be entered upon here. For the ordinary services of the police within their local jurisdiction no charge should fall on particular persons who happen to derive special advantage from such police duty. It is a general benefit for which in one form or

_ another the inhabitants are taxed. Other incidental expenditure in the performance of Incidental The heavy cost connected expenses.

duties is met in various ways. with the conveyance of prisoners to and from prison on committal and remand is in England, except in Middlesex, borne by the state, being paid by the prison commissioners. The preliminary cost attending the arrest in the first instance is generally borne by the police fund. In some exceptional cases where the police perform special duties beyond their district, the cost is thrown on individuals putting the lawin motion. ‘Thus the costs incurred under extradition treaties and under the Fugitive Offenders’ Act in following criminals and bringing them back within the jurisdiction for trial where the offence was committed or arose are not expressly provided for by statute ; but the regulations laid down by the secretary of state require all costs to be paid by applicants in the case of fugitive offenders.

The police have special powers in furtherance of their Special duties ; even the exemption from toll (not now of general powers.

value) has that aspect. ‘They are not only exempted but disqualified from various local offices as interfering with the time and attention required for the full performance of their duties. Rules of the service generally forbid con- stables following any trade or occupation of profit even when not on actual duty, and in the metropolitan police district of London this disqualification extends in practice to their wives. The police are protected in the discharge of XIX — 43

Uniform.

Arms.

Yearly cost.

338

their duties in a variety of ways. Assaulting, resisting, or wilfully obstructing a peace officer in the due execu- tion of his duty or any person acting in aid of such officer, and assaults with intent to resist or prevent lawful apprehension or detainer, are punishable summarily as well as upon indictment. Refusing to assist a constable in the execution of his duty in order to preserve the peace is an indictable misdemeanour at common law. The law specially provides for offences by the police in stealing or embezzling property entrusted to them in virtue of their employment (24 & 25 Vict. c. 96, §§ 69,

70).

Nearing a distinctive dress or uniform in the general performance of duty isa matter of the highest import- ance. Itcommands and has a very great effect in produc- ing obedience and conformity to law and order, and in preventing violence, without the use of even a word or threat ; and it has a scarcely less important effect in pro- tecting the public from the illegal or irregular action of the police when on duty, when the dress involves, as it ordinarily does, the exhibition on its exterior of a letter and number.

The extent to which the individual members of a police force are allowed or required to be armed when on duty for the enforcement of the law or for their own protection from violence is a matter of important discretion ; for, although the principles of law, entailing or withholding the right of peace officers or private persons to employ weapons of offence, are comparatively well-defined, the emergency depends on a variety of circumstances on which it is extremely difficult for heads of forces to make regula- tions for the guidance of the men. In general the only weapon carried about the person of a police constable is the familiar wooden staff of office of the

peace officer, and that not in the hands openly, but in a sheath at his side and only drawn when required.

The cost of the police in England and Wales for the year ending 29th September 1883, including salaries and pay, allowances, clothing and accoutrements, horses, harness, forage, buildings, station-house charges, printing, station- ery, and other miscellaneous charges was £3,367,678, a net increase of £107,598 as compared with the previous year. The cost of the separate forces for the year and amounts contributed from the public revenue stand thus :—

Total Changes: | ‘Diptic evento: POU INMOHCO occ ssesrescowenevcees £857,863 £379,210 wun ae ee eee eee eee 1,101,621 435,133 Metropolitan police (including naval dockyards and military 1,317,303 508,183 SBATIGMS) Os ss ieres ccs eneeeeee ssn ss City Gt LORAOM Ee 5.0.0.0 nansesecieeses 90,891 Melsbalsiaaioeietnseeeencles £3,367,678 £1, 322,526

Deducting the City of London police, towards which no contribution is paid from the public revenue, the propor- tion of the amount so contributed was 39°5. But if the total charge for the metropolitan police is reduced by £131,560 received from public departments for special services rendered by the police, the proportion contributed from the public revenue, computed upon £1,185,743, was 42°8 percent. All moneys received for the service of the metropolitan police between 1st April 1883 and the 31st

total the sum of £639,751, 7s. 4d. was derived from the from moneys voted by parliament of 4d. per £1 upon

£30,663,903, the assessed rental of property in the metro- politan police district. The pay, clothing, and equip-

PO Lt oO”!

ments of the force from constables to superintendents was £1,024,587, 13s. 9d.

In concluding this general account of the existing police system, it is well to mention that the old system of parish constables no longer exists as a general institution. As an auxiliary force, although not forming part of the establishment of a police system, special constables form an important resource in the preservation of the peace (see CONSTABLE).

History of the Introduction of the British Police System. History of British.

—It is a self-evident proposition that the duties of watch and ward, whether under the Statute of Winchester or otherwise (see CoNsTABLE), demanded greater attention in populous places than in scattered hamlets. Nevertheless the inefficiency of the arrangements was notorious from an early period, and is well illustrated by the “charge” of a Dogberry and the graver complaints of Lord Burleigh of the dulness of constables. In relation to London alone its state down to 1828 forms a subject not without general interest (see Lonpon). Here it must suffice to say that committees of the House of Commons in 1772, 1793, 1812, 1817, 1818, and 1822 produced facts tending to the formation, but with hesitation, of a police establishment. To Dr Colquhoun, a magistrate, the chief merit is due of having, before the close of the 18th century, in a treatise On the Police of the Metropolis, drawn attention to the subject. He pointed out that police in England may be considered as a new science, the properties of

police

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which consist, not in the judicial powers which lead to-

punishment, and which belong to magistrates alone, but in the prevention and detection of crimes, and in those other functions which relate to internal regulations for the well-ordering and comfort of civil society. His work went through several editions in a very brief period. It was not, however, until 1828 that a committee of the House of Commons, appointed at the instance of Mr (afterwards Sir Robert) Peel, the home secretary, to inquire into the cause of the increase in the number of commitments and convictions in London and Middlesex, and into the state of the police of the metropolis and of the districts adjoining, re- ported that a decisivechange

should be made, and an efficient system of police instituted for the adequate protection of property, and for the prevention and detection of crime in the metropolis. In the following year the famous Act for improving the police in and near the metropolis was passed (10 Geo. IV. c. 44).

The Act constituted a police district, excluding the City of London, with a radius of 12 miles. Two persons were constituted justices of the peace (afterwards called com- missioners of police) to administer the Act under the immediate direction of a secretary of state, and having a police office in Westminster. This office, established in a room with a table and two chairs, in an outlet from Whitehall, is the origin (as regards police associations) of the far-famed “ Scotland Yard,” with its now enlarged staff, but still inadequate structural arrangements.

‘and sections, and ranks established on the same general

March 1884 amounted to £1,469,930, 4s. 5d. Of this system as at present exists.

: _pally by rates on the district for the maintenance of the metropolitan police rate, and £510,933 as the contribution —

A fund was created princi-

force, with rewards for extraordinary diligence and com- pensation for injuries.

As might have been anticipated, the introduction of the new system of police attracted great public attention. At

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this distance of time, with the experience of an intervening half century, it is difficult to believe that the change by which the police system became in a few years as much a necessity of towns as their public lighting (and lighting and watching were of much the same age and character, and were

frequently coupled in legislation) was regarded otherwise than with the approval of well-regulated minds. It substituted the vigorous action of a really responsible and well-regulated body, acting in an enlarged area, and independently of parochial authorities, for the partial and lax action of a variety of ill-governed and inadequate bodies. Legitimate but passing regrets might be natural as the introduction of vicarious action superseded the necessity for self help and responsibility. No poet could thereafter compose, as a sally of fancy, the adventures of a London citizen between Cheapside and Edmonton mounted on a runaway horse with associated gentlemen galloping after a presumed horsestealer. To arrest the horse, whether a runaway or stolen, only a blue-coated policeman would thenceforward be seen on the track. The objections raised to the new police were of a more serious although scarcely of a more substantial kind. The assumption that a good police could only be attained at the expense of liberty, and that it necessarily involved some arbitrary principle opposed to the free constitution of the country, had been countenanced even by the report of the committee of 1822, in which it was remarked that it was difficult to reconcile an effective system of police with that perfect freedom of action and exemption from interference which are the great privileges and blessings of society in the country. With such sedate misgivings, it is not to be wondered at, when the system was actually introduced a few years later, that cries arose in the streets of “down with the new police,” and that the constables were fre- quently followed by hooting crowds calling them obnoxious names. By associating them with the statesman who introduced the measure, and calling them “ Peelers” and ‘“‘Bobbies,” names perpetuated to the present day and apparently likely to last, a compliment was really paid to the minister and to the force. But at that time Peel was attacked in parliament and suspicion thrown on the Act because the same minister had introduced Roman Catholic emancipation.

Within four years of the establishment of the police force the hostility seems to have culminated. It was evinced by the result of a collision between the police and a meeting of Chartists in Coldbath Fields in May 1853, in which three police officers were stabbed and one killed with a dagger. At the inquest the coroner’s jury returned a verdict of “justifiable homicide,” in the teeth of the evidence. ‘The crown thereupon adopted the strong but justifiable course of applying to the Court of King’s Bench, and

the inquisition was quashed. Committees were appointed by the House of Commons to inquire into the circumstances of the meeting, and also regarding an allegation of inhabitants of the Surrey side that policemen were employed as spies, and a third conmmittee was appointed to inquire into the state of the police and crime in the district. The police system and the force as a whole came out with credit, notwithstanding individual instances of undue exercise of power calling for greater control.

There was no hesitation as to the duty of maintaining the principle of the new system, and the popular hostility gradually died away. After intermediate parliamentary reports and legislation by way of extension, an important Act was passed in 1839, reciting that the system of police established had been found very efficient and might be yet further improved (2 & 3 Vict. c. 47). The metropolitan police district was extended to 15 miles from Charing Cross. The whole of the River Thames (which had been

in its course through London, so far as related to police matters, managed under distinct Acts) was brought within it, and the collateral but not exclusive powers of the metropolitan police were extended to the royal palaces and 10 miles around, and to the counties adjacent to the dis- trict. Various summary powers for dealing with street and other offences were conferred.

At the same time that the police were put on a more complete footing and the area enlarged, provision was made for the more effectual administration of justice by the magistrates of the metropolis (2 & 3 Vict. c.71). The changes that occurred in magisterial functions are scarcely less remarkable than the transition from the parish con- stable to the organized police. The misdirected activity of the civil magistrate in the 17th century is illustrated by the familiar literature of Butler, Bunyan, and others. The zeal of that age was succeeded by apathetic reaction, and it became necessary in the metropolis to secure the services of paid justices. The malpractices of the so-called “ trad- ing justices” of the 18th century are described and exposed for all time by Fielding, who honourably per- formed the duties of justice of the peace for Middlesex and Westminster. At the beginning of the 19th century outside of the City of London (where magisterial duties were, as now, performed by the lord mayor and aldermen) there were various public

offices besides the Bow Street and the Thames police offices, where magistrates attended. To the Bow Street office was subsequently attached the “horse patrol,” and each of the police offices had a fixed number of constables attached to it, and the Thames police had an establishment of constables and surveyors. The horse patrol was in 1836, as previously intended, placed under the new police. It became desirable that the horse patrol and constables allotted to the several police offices not interfered with by the Act of 1828 should be incor- porated with the metropolitan police force. This was effected, and thus magisterial functions were completely separated from the duties of the executive police; for, although the jurisdiction of the two justices, afterwards called commissioners, as magistrates extended to ordinary duties (except at courts of general or quarter sessions), from the first they did not take any part in the examination or committal for trial of persons charged with offences. No persons were brought before them. Their functions were in practice confined to the discipline of the force and the prevention and detection of offences, by having persons arrested or summoned to be dealt with by the ordinary magistrates whose courts were not interfered with.

Important alterations have been made since 1839 in the arrangements affecting the metropolitan police. In 1856 one commissioner and two assistant commissioners were sub- stituted for two commissioners, and a third assistant com- missioner has now (1884) been added. In 1866 jurisdic- tion was given to the metropolitan police in the royal naval dock yards and principal military stations of the war department in England and Wales, and within 15 miles, with the restriction that the powers and privileges of the constables of the metropolitan police when without the yards, naval and marine hospitals and infirmaries, and marine barracks or stations, and not on board or in any ship, vessel, or boat belonging to the queen or in her service, shall only be used in respect of the property of the crown or of persons subject to naval or marine or military discipline (23 & 24 Vict. c. 135).

Under this Act the metropolitan police exercise jurisdic- tion and perform duties extending from Chatham on the east and Dover and Portsmouth on the south to Devonport, Portsmouth, and Pembroke on the west, and of

course including Aldershot. The expenses incurred are defrayed by parliament.

Connected with the last-mentioned Act, and in conse- quence of it, has been the exercise for eighteen years by the metropolitan police of the powers of the Contagious Diseases Act, 1866, and the medical examination of women under it,—a much debated and warmly contested power. The réfusal in 1883 by the House of Commons to provide money for the expenses of the Act led to the discontinu- ance of action by the metropolitan police under it.

The Metropolitan Streets Act, 1867, for regulating the traffic in the metropolis, and for making provision for the greater security of persons passing through the streets and for other purposes, gives great discretionary power to the commissioner of police whether of the metropolis or of the City of London, in relation to prescribing special limits, with the approval of a secretary of state, within which regulations to prevent obstructions in the streets (without interfering with other powers) may be made and enforced. Apart from the special limits, general regulations are pre- scribed as to hackney carriages, stray dogs, and various other matters.

As already observed, the Acts noticed as to the metro- politan police district did not apply to the City of London, which was and is left as an island surrounded by the metropolis. The nightly watch and “ bedels” within the City were regulated, and rates imposed for the purpose, in the reign of George II. In 1839, on the same day that the Act of Parliament passed with respect to the metro- politan police, a corresponding Act was passed for the City of London and a salaried commissioner of the police for the City and its liberties appointed by the common council. The power to make regulations relative to the general government of the police is vested in the commissioner, subject to the approbation of the mayor and aldermen and a secretary of state. In case of emergency the secretary of state may, at the request of the lord mayor, authorize the metropolitan police to act within the City of London under the command of their own officers, and on the other hand the lord mayor inay, at the request of the secretary of state, in the like emergency, authorize the City police to act under their own officers within the metropolitan police district. The Act gives various special powers as to

offences cor- responding with the Metropolitan Police Act of 1839. It provides for a police rate, and the corporation is required to pay out of its revenues a fourth part of the expenses of the police force. No rated person is liable to any watch or ward by virtue of the Statute of Winchester (13 Edw. L.), and the ancient custom of electing ward constables is sus- pended.

In the article Lonpon (vol. xiii. p. 834) some statistics are given as to the police courts of the metropolis, and the state of crime and the proportion of police to the popula- tion under the last census.

In considering the introduction of the police system into the rest of England, it is to be borne in mind that in many towns and places an organized system of watching by paid officers, whether constables, watchmen, or police, was established by local Acts of Parliament, at various dates, but especially in the early part of the present century.

An attempt at a paid county force was made in 1829 (in the same year with the Metropolitan Police Act), but not on corresponding lines, by a local Act to enable the magistrates of the county palatine of Chester to appoint special high constables and assistant petty constables (10 Geo. IV. ¢. 97). In 1830, and again three years later, provision was made to facilitate voluntary lighting and watching parishes throughout England and Wales. In 1835 the regulation of municipal corporations included power (since renewed) to appoint, by a watch committee, constables called “ watchmen” paid by a watch rate. |

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Great facilities having been given by the legislature for the appointment of special constables (an auxiliary else- where noticed), provision was made in 1839 for the appointment of county paid constables where the ordinary officers for preserving the peace were insufficient for that purpose and for the protection of the inhabitants and for the security of property within the county. The number recommended (not exceeding one man for every thousand of the inhabitants, after deducting corporate boroughs already provided for, a restriction in after years removed from the statute book) and the rates of payment were required to be reported to the secretary of state, who made and laid before parliament rules for the government, pay,

clothing, accoutrements, aud necessaries of such constables ; and thereupon the justices appointed, subject to the approval of the secretary of state, a chief constable, who had the appointment, control, and disposition (subject to the approval of the justices) of the other constables, and a deputy and superintendent to be at the head of the con- stakles in each division of the county. On these constables were conferred all the powers and duties of constables by the common law or statute.

At first the salaries and allowances and expenses of the Act were paid out of the county rate (2 & 3 Vict. c. 93), but in the following year (1840) the Act was amended and extended, and a separate policé rate levied in the county. Provision was at the same time made for a superannuation fund and for “station houses and strong rooms,” and for consolidating the police of a borough with the county ; and on the other hand, as the number of con- stables needed may be different in different parts of the same county, it might be divided into police districts, each district paying for its own constables. Power is given to the- chief constable to appoint (with the approval of the justices) additional constables at the cost of individuals, but subject to the orders of the chief constable.

In 1842 an important statute was passed enacting that for the future no appointment of a petty constable, head- borough, borsholder, tithing man, or peace officer of the like description should be made for any parish at any court leet, except for purposes unconnected with the pre- servation of the peace, and providing, as a means of increasing the security of persons and property, for the appoiutment by justices of the peace in divisional petty sessions of fit persons or their substitutes to act as con- stables in the several parishes of England, and giving vestries an optional power of providing paid constables. The justices in quarter sessions were empowered to provide lock-up houses for the confinement of persons .taken into custody by any constable and not yet committed for trial, or in execution of any sentence, or instead to appropriate for that purpose existing lock-up houses, strong rooms, or cages belonging to any parish (5 & 6 Vict. c. 109). Con- stables appointed under this Act were made subject to the authority of the chief constable or superintendent, if any, appointed under the Act of 1839.

Under the Acts of 1839 and 1840 the establishment of a paid county police force was optional with the justices. After a further interval of fifteen years it was found expedient, for the more effectual prevention and detection of crime, suppression of vagrancy, and maintenance of good order, that further provision should be made for securing an efficient police force throughout England and Wales, and the previous optional power became compulsory (the Police Act, 1856). In every county in which a con- stabulary had not been already established under the previous Acts for the whole of the county, the justices in quarter sessions were required to proceed to establish a sufficient police force for the whole of the county and to consolidate divisions so as to form one general county

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police establishment,—subject, however, to the power by the queen in council to require the justices to form separate police districts, as provided for in the earlier Acts, The privy council might arrange terms of consolidation of a borough police with the county,

In 1869 provision was made for the abolition of the old office of high constable (the High Constables Act, 1869); and, the establishment of an efficient police having also rendered the general appointment of parish constables unnecessary, the appointment ceased, subject to the appointment by vestries of paid constables who are subject to the chief constable of the county (the Parish Constables Act, 1872). Thus under combined provisions the police system was established and has since continued through- out England.

In Scotland legislation for a system of police began early in the century by local Acts for Edinburgh and Glasgow, some con-, taining provisions of great importance. The police of towns and populous places is now regulated chiefly by the General Police and Improvement (Scotland) Act, 1862, and the county police by an Act of 1857 (20 & 21 Vict. c. 72), under which

counties are formed into police districts. Some details of the government, numbers, and cost have been already given.

The police in Ireland comprises two forces, —the Dublin metro- politan police and the royal Irish constabulary. Dublin was in 1808 formed into a district called “the police district of Dublin metropolis ” (48 Geo, ITI. c. 140). After intermediate amendments in 1836, concurrently with the consolidation of police law for Ireland generally, the Dublin system was placed on the lines of Sir Robert Peel’s Act of 1829 for the metropolis of London,—the

chief secretary of the lord lieutenant standing in the place of the | secretary of state for the home department (6 & 7 Will. IV. c. 29); |

and six years later the systems were further assimilated (5 & 6 Vict. c. 22), Several alterations were made subsequently, and police courts regulated. The Dublin police is under the imme- diate direction of one commissioner and an assistant commis- sioner and the offices of receiver and secretary are consolidated. The royal lrish constabulary dates from 1836, when the laws re- lating to the constabulary force in Ireland were consolidated and a number of older Acts repealed (6 & 7 Will. IV. c. 13). This Act, although often amended, is the foundation of the existing police system in counties, towns, and baronies throughout Ireland except

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sanction for doing what by practice they do in England: they take evidence for their own information and guidance in the investigation of cases, and are clothed with the power to compel the attendance of

| witnesses and question them. The smallness of the number of the

European magistrates and other circumstances make the police more important and relatively far more powerful in India than in England (Stephen). The difficulties in the way of ascertaihing the truth, and investigating false statements and suppressed cases, are very great,

As regards the rural police of India cvery village headman, and the village watchman as well as the village police officer, are required by the code to communicate to the nearest magistrate or the officer in charge of the nearest police station, whichever is nearest, any information respecting offenders.

Reports indicating an increase in the number of dacoities and crimes of violence since 1880, especially in Rajputana, Central India, and Hyderabad, are cited as proving the necessity for a system of detective police embracing the whole of India. A scheme for that purpose has been matured and will probably be carried out.

Taking Lower Bengal as an illustration of the existing system throughout India, the superior ranks of the police comprise an inspector general, deputies, district superintendents of different grades, assistant superintendents, and probationers. The subor- dinate officers consist of inspectors of four grades, sub-inspectors (who are in charge of police stations), head constables, and con- stables. The total budget grant for the year 1881-82 (the last examined) for the police department was 3,695,572 rupees, on a sanctioned strength of 78 superior officers, 3081 subordinate officers, and 14,588 constables, excluding the municipal police but including the civil police and frontier police of the Chittagong hill tracts and the railway police. The strength of the municipal police was 371 officers and 5702 constables. The cost of the force employed on purely police work was 2,154,600 rupees,—the cost per head of the total population being 6°2 pice. The proportion of police to popu- lation was in Bengal proper 1 to 3933. The number of offences reported during the year was 104,153. The percentage of reported cases not inquired into is under four.

In India generally, including Assam and British Burmah, the total regular police of all kinds in 1881 was 147,200. The cost was £2,324,786, of which £2,075,525 was payable from imperial or provincial revenues, and the remainder from other sources. The rural police are not paid by the state, but by village cesses.

In Bengal and the Punjab there are 14 policemen to cvery 100 square miles, and in the North-Western Provinces and Oudh 27. The ratio of these figures is explained partly by the greater density of population and partly by the frequency of crime.

The police force of the British empire, metropolitan, municipal, Total and rural together, is about 210,000. Of this total, 51,000 are in force of the United Kingdom and 147,000 in India, the remainder being British

in the Dublin metropolitan district. An inspector general, resident in Dublin and having an office there, and appointed by the lord lieutenant, has the general direction of the coustabulary, and with

the approbation of the lord lieutenant frames rules for their general government, classification, and distribution. In this way a uniform administration of police law prevails throughout Ireland without interfering with the Dublin metropolitan police. Under the inspector general there are a deputy inspector general and assistant inspectors general. The Irish constabulary is regarded asa semi-military force. Every man lives in barracks. It does not interfere with the Dublin metropolitan police, but a reserve force is established at a depét in Dublin. The strength and pay

in the colonies and dependencies. : number of village police in India who are legally recognized, whose number is not less than 350,000, the grand total of the police for the empire is 560,000. Thus we have for the whole empire an average of one policeman to every 571 of the people and to every 16 square miles (Sir Richard Temple).

The United States of America have a system of police closely United reseinbling that of England, and founded similarly on Acts of the States.

legislature combined with the common law applicable to peace

of the force have been already noticed. officers. Congress as well as the Statcs separately may establish British Police forces have been formed in all the British colonies, includ- | police regulations, and it is to be observed that the criminal law colonies. ing the Dominion of Canada, mainly on the lines

established in the | of England has been reproduced in various shapes in nearly all the mother country, having for their basis of action the common law | States. The source of revenue for the maintenance of the police is existing there. taxation of real and personal property. Every State and every city The early legislation for Sydney followed very closely the | in a State has its separate special administration. For the pur- metropolitan police Acts, and some of the existing Acts of the | poses of this article New York must suffice. The regulations of Australian colonies exhibit great skill, Colonial forces generally | the police of Brooklyn, Philadelphia, and other cities present the are swor to serve the qucen, and an Act of the colonial legis- | same general features. ; ; lature of New South Wales in 1853 made provision for the engage- The police department of the city of New York consists of a ment in Great Britain of persons to serve in the police force | ‘‘board of police” composed of four “comunissioncrs ” (appointed of New South Wales. The general features of the Australian | by the mayor with the consent of the board of aldermen) and the police comprisc a chief commissioner or other head for each colony | ‘‘ police force” and officers appointed by the board. The board, or district, appointed by the governor in council, with various grades | consisting of the commissioners, is the head of the police ed of officers as at home, some appointed by the governor and the rest | meut, and governs and controls its business; it 1s invested wit by the head of the police. The expense of the police establish- | and exercises all the powers conferred by law upon the police ments is borne by the colonial revenue (5 & 6 Vict. c. 76, § 46; | department, makes appointments, and by rules and regulations 13 & 14 Vict. c. 59, § 28). through a superintendent prescribes the general discipline of the British Nearly the whole of British India is divided into police districts, department. The orders cannot, however, conflict with the consti- India. the general arrangeinents of the system of the regular police re- | tution of the United States nor with the constitution or laws of the

sembling in most respects those of the English police, but differing in details in the different presidencies. All are in uniform, trained to the use of firearms, and drilled, and may be called upon to perform military duties. The superior officers are nearly all Europeans, and many of them are military officers. The rest are natives, in Bombay chiefly Mohammedans. The organization of the police was not dealt with by the criminal code

whicl: came into force in 1883, but the code is full of provisions tending to make the force efficient. By that code as well as by the former code the police have a legal

State of New York. ;

The police force of the city compriscs officers ranking as follows :— superintendent of the whole force, four inspectors (the whole area of the city being divided into four inspection districts, subdivided into precincts, with an inspector to each), sergeants, and roundsmen, who are visiting officers, —the body of the force being termed ‘‘patrol men,” with ‘‘overmen” at stations and prisons,

The force (clothed in uniform) is divided into as many companies as there are precincts, and such other companies and ‘‘squads” as

If to this total be added the empire.

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the board may order. The superintendent is the chief executive officer of the force, subject to the orders, rules, and regulations of the board, and it is his duty to enforce in the city all the laws of the State and ordinances of the city, and the rules and regulations of the police board. ‘The superintendent promulgates written or printed orders to the officers and members of the police force not inconsistent with law or the rules and regulations of the board. It is the duty of the police force at all times of the day and night within the city and county of New York, and they are accordingly empowered, to especially preserve the public peace ; prevent crime; detect and arrest offenders ; snppress riots and insurrections ; protect the rights of persons and of property ; guard the public health; preserve order at every primary and pub- lic election ; remove nuisances existing in public streets, roads, places, and highways ; repress and restrain disorderly houses and houses of ill-fame ; arrest all street beggars and mendicants ; pro- vide a proper police attendance at every fire in order that the fire- men, fire-engines, and property exposed may be suitably assisted or protected ; assist, advise, and protect immigrants, strangers, and travellers in public streets, or at steamboat and ship landings or railroad stations; enforce any law relating

to the suppression and punishment of crime, or to the observance of Sunday, or regarding pawnbrokers, or mock auctions, or emigration, or elections, or gambling, or intemperance, or lotteries, or lottery policies, or vagrants, or disorderly persons, or the public health, or auy ordi- nance or resolution of common councils, within the said district, applicable to police, health, or criminal procedure.

Special regulations are made on these and other kindred subjects, such as the regulation of traffic, preventing obstructions, the visita- tion of places of amusement, public houses and drinking places, observation of servants in charge of houses, and of suspicious persons, lost children, ‘ree balls and partics, elections, &c., and the attendance of an adequate number of police at every assembly of citizens.

The arrest of persons with or without process does not call for special notice as distinguished from the common law and statute law in England, and the practice as to the entry of charges and taking bail by the police is akin to the practice in the English metropolis, but the rules are somewhat stricter. A squad is organized for the sole purpose and duty of serving criminal process. Persons making complaint of a felony or misdemeanour may be required to make affirmation or oath which the police officers have power to administcr. Charges against police, whether by members of the force or citizens, are made and dealt with under strict rules, and are tried upon written charges by one or more of the commis- sioners in power, a committee dismissing charges or directing their trial. Evidence is taken upon oath, and if the case is heard by less than three commissioners no judgment can be acted on uutil the wit- ness is brought before and examined by all the commissioners. The board draws, by its president, on the treasurer of the city for the cost of arrest and conviction of criminals and others endangering the safety of the community and procuring information the use of which may prevent crime and enable the department to perform its import- ant duties more successfully and with greater satisfaction to the public. The sum so drawn is charged as a ‘‘secret service fund.” A place is provided in accordance with statute law for the detention of such witnesses as are unable to furnish security for their appear- ance in criminal proceedings.

The detective force, called the ‘‘ detective squad,” consists of a captain and other members assigned by the board to detective duty. This portion of the force has an office, as other portions of the police force, and is under the direct orders of the superintendent, to whom reports are made, and who in turn reports to the board. There is also a ‘‘special service squad” under the officer command- ing the detective force,

There is a sanitary code, and a ‘‘sanitary police company” is set apart from the police force by the board of police, performing duties assigned by the board. The captain of the sanitary company assigns policemen to act as school officers. There are harbour police, a police steamboat and steam-boiler inspection squad to enforce the statute law on the subject, an ‘‘ordinance police squad” to enforce ordinances of the corporation, and a “ property office.”

Members of the force are subject to rules; at the discretion of the board, on written application, they are permitted to receive rewards or presents for services rendered by them in the discharge of duties which are both ‘‘ meritorious and extraordinary,” but for such only.

_Admission to the force, examination, instruction, drill, and dis- cipline are provided for by special regulations. The right of every member of the police force to entertain political or partisan opinions, and to express the same freely when such expression shall not concern the immediate discharge of luis official duties, as well as the right of the elective franchise, is deemed sacred and inviol- able ; but no member of the force is permitted to be a delegate or representative to, or member of, or to take part in any political or partisan convention, whose purpose is the nomination of a candidate or candidates to any political office. Upon the days of election for public offices held under the laws of the State, he must do all

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within his power to eit 3: the peace, protect the integrity of the ballot box, enforce the rights of lawful voters, and prevent illegal and fraudulent voting.

The estiniated salaries for the police of New York for 1884, com- prising upwards of 2816 members of the force of all ranks, amounted to $3,328,333, besides the salaries of the clerical force. The ap- propriations for the maintenance of the city government (including the police) are made by the board of estimate and apportionment, composed of the mayor, comptroller, president of the board of aldermen, and president of the departinent of taxes and assessments. Some police statistics are given in the article New York (q.v.).

Looked at from a general point of view, the police in France France.

may be regarded as divided into two great branches—administrative police (la police administrative) and judicial police (la police judi- ciaire),—the former having for its object the maintenance of order, and the latter charged with tracing out offenders, collecting the proofs, and delivering the presumed offenders to the tribunals charged by law with their trial and punishment.

Police duties are exercised under the minister of the interior, in the departinents and municipalities by the prefects and sub-prefects, appointed by the president of the republic, and mayors, having as auxiliarics the commissaries of police and other officers (appointed by the president, but under the orders of the prefects). One of the chief prerogatives of the administrative police is to make rules to ensure public order. Of these rules some embrace general interests of the statc, these being regulations of high or grand police ; others have no other object than the ruling of the particular district and its inhabitants, and are simply ternied police regulations. Accord- ing as it deals with the general interests of the state or only with those of a municipality, the administrative police is said to be general or municipal ; and each of these branches admits of other divisions according to the subject. The police généralc, besides more obvious matters, includes all matters relating to public health, the regulation of prostitution, the inspection of food, the carrying on of trades and manufactures; and in relation to thé welfare of the state it embraces public ineetings, banquets, societies and clubs, cafés aud public places, and the enforcement of laws relating to the pub- lication and distribution of printed or written matter, the sale of journals, the surveillance of strangers or fugitives, the system of

passports, the sale of gunpowder and firearms, designs against the state, aud a variety of such matters. In this way the police who look after the safety of the state is closely allied with political matters (la police politique). Under a government really represent- ing the popular will the duties of the police politique are trifling, or at least innocuous, but under a despotic government they become of the highest importance. It is matter of history which cannot be treated of here that under Louis XIV. and in succeeding times the most unpopular and unjustifiable use was made of police as a secret instrument for thepurposces of despoticgovernment. Napoleon availed himself largely of police instruments, especially through his minister Fouché. On the restoration of constitutional government under Louis Philippe police action was less dangerous, but the danger revived under the second empire.

The ministry of police created by the act of the Directory in 1796 was in 1818 suppressed as an independeut office, and in 1852it was united with the ministry of the interior.

The detection and punishment of crime is theoretically as well as practically regarded by the French as essentially a matter of public concern, and to be provided for by public officials appointed for that purpose, and on the other hand in every French criminal proceeding, from the most trifling to the most important, every person injured by the offence may make himself partie civile. It follows that in many features the French police is organized in a different manner from the British, and has some very different duties (Stephen). An observation has been already cited, that neither in England nor in America is there a system of espionage by which private matters can be made the subject of police investigation or interference. On the other hand the English system is open to the observation that the police, in practice at least, are powerless to pro- tect from annoyance in many matters essential to perfect rule. Short of absolute indecency or obscenity, printed matter of a scurri- lous and offensive kind is openly sold in the streets withont police interference ; and, owing apparently to the much-abused maxim that an Englishman’s house is his castle, the quiet and freedom from annoyance in the performance and fulfilling of the daily duties and engagements of life are not sceured. The annoyance to which Carlyle was subject is only an illustration of the almost daily com- plaints that arise in the English metropolis. Although the noise of a bell may be the subject of

indictment or injunction, the officers of police do not complain of or even remonstrate with an inconsiderate or selfish neighbour in such a matter, or even in still greater annoy- ances, stich as those arising from animals kept in a state of confine- ment (not affecting public health), because the source of annoyance is within private territory, or because there is no summary mode of dealing with it. It is nnreasonable that complainants should be told, as they are every day, and correctly, by magistrates, that the annoyances which render the enjoyment of life impracticable

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may be subject of indictment or injunction, but not of summary police intervention. The fear of drawing down ridicule akin to Verges's dircction to the watch, ''If you hear a child cry in the night, you must call to the nurse to bid her still it," probably stands unduly in the way of police interference with real nuisances.

It is not, however, in the minute details of regulation and inspection of the incidents of every-day life that the distinctions between the police systems of the two countries chiefly consist. Such distinctions have of late years greatly diminished ; the inter- vention in all matters of health, for example, places the English system more akin to the French, and on the other hand all travellers of mature years can testify to the mitigation and even total cessation in France, and on the Continent generally, of the minute investigation of a stranger who is nota "suspect." "To the word espionage a stigma is attached," says Bentham. "Let us sub- stitute the word inspection, which is unconnected with the same pre- judices. Ifthis inspection consists in the maintenance of an oppres- sive system of police, which subjects innocent actions to punishment, which condemns secretly and arbitrarily, it is natural that such a system and its agents should become odious. But if the inspection consists in the maintenance of a system of police for the preserva- tion of the public tranquillity and the execution of good laws, all its inspectors and all its guardians act a useful and salutary part; it is only the vicious who will have reason to complain, and it will be formidable to them alone." It is with reference to criminal matters and the police judiciaire that important distinctions exist between the French and English systems. In every arrondissement there is a juge W@instruction who makes

the first formal inquiry in criminal cases ; and in every tribunal of first instance, or tribunal correctionnel, there is a procureur de la république who with deputies forms the ministére public of that court. In the court of the juges de paix (who may be compared to police magis- trates) the commissary of the police is the ministére public. The juges de paix, the maire, the commissaries of police, the gendar- merie, and in rural districts the gardes champétres aud the gardes Sorestiers, are officers of the judicial police; and by the Code ad' Instruction Oriminelle all these officers, even the juges d'instruc- tion, are under the orders of the procureur-général. The vocations of these officers as well as the courts are briefly explained in the article FRANCE (vol. ix. p. 511).

Sergents de ville, in Paris now called gardiens de la paix (the name having been changed thus in September 1870), are the nearest equivalents of English police constables and are not officers of the police judiciatre. Their powers in preserving the public peace closely resemble the common law powers and duties and protection of the English constable. Their reports of cases have not the authority of a procés verbal.

In Paris, as elsewhere, the préfet de police is at the head of the force, with commissaires de policc, appointed by the president of the republic on the nomination of the minister of the interior, but acting under the orders of the prefect, and having both administra- tive and judicial duties. The commissaries see that the laws relating to good order and public safety are observed, and that the

police orders are executed, and take special action in serious.

matters. As officers of the judicial police they are the auxiliaries of the procureur of the republic in correctional and criminal police action, and in the ordinary police tribunal (Je tribunal de simple police) they exercise the functions of magistrates.

The organization of the central administration (administration centrale) comprises three classes or functions which together consti- tute /a police. First there is the office or cabinet of the prefect for the general police (Ja police générale), with three bureaus having for their special object the safety of the president of the republic, matters con- nected with the use of

arms, various societies, the regulation and order of public ceremonies, theatres, amusements and entertain- nents, movements of troops, the military police (Ja police militaire), and various other inatters ; secondly, the judicial police (Ja police Jjudiciaire) already spoken of, with five bureaus, in constant com- munication with the courts of judicature, and including the service of the prisons of the Seine, matters relating to aliens, and the pro- tection of children ; thirdly, the administrative police (la police administrative), with four bureaus, including everything relating to supplies, navigation, public carriages, animals, firemen, public health, and the enforcement of the law respecting the employment of young persons. Some minor matters are under the supervision of the prefect of the Seine. Concurrently with these divisions there is the municipal police, which comprises all the agents in enforcing police regulations in the streets or public thoroughfares, acting under the orders of a chief (chef de la police municipale) with a central burean. The municipal police is divided into two principal branches—the service in uniform of the gardiens de la paix, and the service out of uniform of inspectewrs de police, the latter a compara- tively small number.

For purposes of municipal police, Paris is divided into twenty a1tondissements (corresponding in a great measure with the divisions of the metropolitan police of England), which the uniform police patrol.

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The total police strength of the Paris arrondissements, according to the latest return, showed 5932 gardiens de la: paix, each arrondissement officered by an officier de paix (an office peculiar to Paris), with 3 or 4 brigadiers and from 24 to 27 sous-brigadiers under his command. ‘There are two divisional inspectors.

Besides these divisional gardicns de la paix police, there is a cen- tral administration consisting of 6 central brigades of 100 each, 4 of the brigades carrying out the orders of the prefecture at theatres, assemblies, races, and in the Bois de Boulogne, and elsewhere in the capital where their presence is required, while the 5th brigade regulates traffic generally, and the 6th prevents obstructions in the markets.

The service de sireté, or detective department (out of uniform), with which is now amalgamated the brigade des meurs (which deals with public morals, houses of ill fame, prostitutes, and so forth), comprises a commissary, principal inspectors, brigadiers, aud 211 inspectors, There are a number of other branches of service including a fire brigade.

The proportion of police to inhabitants as last estimated is 1 in

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The pay of the gardiens de la paix is from 1400 to 1700 francs ; brigadiers, 2000 francs ; sous-brigadiers, 1800 francs ; officiers de paix, 3000 to 6000 frances. The estimate of expenditure of the

| whole Paris police for 1884 was 28,952,631 francs,—of which the state contributed 7,693,825 francs.

Whether the police of Paris are more effective than those of the English metropolis is doubted. Persons who are best entitled to express an opinion, having practical experience, think that, while a multitude of offices and officers for a multitude of subjects and stages of investigation—a system, in short, of bureaucracy—exists, which creates an impression, the actual detection of grave offences is not commensurate with the display of attention.

It is impossible in the narrow limits of this article to go through Germany.

all the police forecs of Europe. It must suffice to allude to a few principal states, noting the police forces of their capitals as illustrat- ing the systems. Taking the Berlin force as ‘linetiaries of the police system in the German empire, police duties are as various as in France; the system includes a political police controlling all matters relating to the press, societies, clubs, and public and social amusements. Police duties are carried out under the direction of the royal police presidency, the executive police force comprising a police colonel, with, besides commissaries of criminal investiga- tions, captains, lieutenants, acting lieutenants, sergeant-inajors, and a large body of constables (Schutemdnner). The total in 1883-84 amounted to 3441 executive officers, including criminal investigation

officers, the political police, and the department for the supervision of prostitution. Taking the population of Berlin from the statistical bureau of 27th July 1884 at 1,242,820, this gives 361 to each officer. The pay of the police is principally pro- vided from fiscal sources, and varies in an ascending scale from 1125 marks and lodging allowance for the lowest class of constable.

Taking Vienna in the same way as illustrative of the Austrian Austria.

police, it is to be observed that there are three branches, —(1) admini- stration ; (2) public safety and judicial police; and (8) the Govern- ment police. At the head of the policc service in Vienna there is a president of police, and at the head of each of the three branches there is an Oberpolizcirath or chief commissary. The head of the Government branch sometimes fills the office of president. Each of the branches is subdivided into departments at the head of which are Polizetrdthe. Passing over the subdivisions of the administrative branch, the public safety and judicial branch includes the following departments :—the office for public safety, the central inquiry office, and the record office or Hvidenzburcau. The Government police branch comprises three departments :—the Government police office, the press office, and the Vcreinsbwreau or office for the registra- tion of societies.

The Sicherheitswache or executive police of Vienna consists of a central inspector and chief, district, divisional, and other inspectors, with about 2500 constables, Sicherheitswachmdénner. The detective department comprises a chief and other inspectors, and 130 agents. In July 1884 the proportion of police constables to the inhabitants was 1 to 486. In the latest return, the entire police service com- prises 2816 persons, at a cost of 2,355,710 florins,—of which the state contributes 1,730,740 florins, and the communes the greater part of the remainder. The pay of the constable ascends from 360 florins with allowances of 90 florins.

It is obvious that there is a general resemblance between the organization and scope of the police forces of Germany and Austria and of France.

In Belgian municipalities the burgomasters are the heads of the Belgium.

force, which is under their control. The administrator of public safety is, however, specially instructed by the minister of justice to see that the laws and regulations affecting the police are properly earried out, and he can call on all public functionaries to act in furtherance of that object. The administrator of public safety is specially charged with the administration of the law in regard to aliens, and this law is applied, as in the case of Victor Hugo, to

Switzer- land.

Italy.

Nether- lands.

Russia.

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persons stirring up sedition. The duty of the gendarmerie, who constitute the horse and foot police, is generally to maintain internal order and peace. In Brussels as elsewhere the burgo- master is the head, but for executive purposes there is a chief commissary (subject, however, to the orders of the burgomaster), with assistant commissaries and commissaries of divisions and other officers, and central and other bureaus, with a body of agents (police constables) mm each. ‘

There are two main classes of police functions recognized by law, the administrative and the judicial police, the former engaged in the daily maintenance of peace and order and so preventing offences, the latter in the investigation of crime and tracing offenders ; but the duties are necessarily performed to a great extent by the same agents. The two other functions of the judicial police are, however, limited to the same classes of officers, and they perform the same duties as in Paris,—the law in practice there being expressly adopted in Brussels.

In Brussels the police force numbers, according to the latest re- port, 485 of all ranks. For the population (162,489), this gives 1 to every 335 persons. Strictly speaking therc is no detective branch so called, but the special and

judicial officers are employed in de- tection as the necessity arises. The pay and establishment charges are defrayed by local taxation. The annual pay of a constable is 1500 francs.

While this article is going through the press the idea is put for- ward, in consequence of political disturbances, to place the police of the larger Belgian towns under the control of Government instead of that of the respective municipalities as at present, and establish a sort of prefecture of police in Brussels. The attempt, if made, will probably meet with opposition from local authorities.

In Switzerland, which is sometiines classed with Belgium as among the least policed states of Europe, the laws of the cantons vary. In some respects they are stricter than in Belgium or even in France. Thus a permis de séjour is sometimes required where none is in practice necessary in Paris or Brussels.

In Italy there is in every province a prefect at the head of the police. See ITALY.

The police in the Netherlands, as regards the sources from which its powers are derived, is divided into the state police and the com- munal police, the former forming part of the general executive government, and the latter, althongh regulated by the executive, enforcing general and local police legislation. Regulatious for the state police are framed by the minister of justice. For the purposes of the state police the country is divided into five districts, with a director of police at the head of each district responsible for the control and government of the state police within it, and to see that the laws and ordinances for the safety and quietness of the state, the security of persons and property, and the equality of all before the law are carried out. The duty specially includes the supervision of strangers and their admission into and departure from the country, and extends even to the enforcement of shooting and fishing licences. In each district there.is an officer of justice who directs the prosecu- tion of criminal offences.

At the head of the communal police stand the burgomasters, and under them police commissaries entrusted with the observance of police regulations, whose appointment and removal rest with the crown, but they are paid by

the commune. The whole of the com- munal police are bound to assist the state police ; and, on the other hand, the latter assist the police, especially in the country districts. The duties of the officer of justice may be carried out by the com- missary of police, who for the time being is an assistant officer of justice. In large communes the police force is divided into several grades. Besides commissaries, of whom one is chief, there are a chief Sag classes of inspectors, and brigadiers ; but the arrangements differ in almost every municipality.

The total strength of the police is 6000; at The Hague there is supposed to be one constable to 1000 inhabitants. Only in Amsterdam, Rotterdam, and The Hague are there special depart- ments of detective police. Police salaries vary in different com- munes. The highest are at The Hague, and range from 600 florins for a third-class constable to 1800 florins for a chief inspector. The cost of the state police and the expenses incurred in prosecu- tions for crime are defrayed by the state. The expenses of the communal police are paid out of local rates on houses and land.

An official Russian document specially obtained for this article affords the following scanty particulars regarding the police in European Russia.

At the head of a police district there is a police master, who has subordinate officers on his staff. A number of constables are appointed, depending on the-population. Large towns are sub- divided into districts with inspectors and assistants, smaller towns with an assistant inspector. In villages police duties are executed by the inhabitants elected for that purpose, constituting “hundreds” or “ tenths” according to the number of inhabitants. There is a control over the villages by the police of the district, and the governor general has a controlling power over all, including the police master. Besides the ordinary police there are police brigades

in large towns with duties of a special kind, as attending parades and fétes. Each member of the brigade has five hundred inhabit- ants to look after or control. In the capitals there is a secret police having a staff in St Petersburg of a chief and his assistant, four clerks, and twenty inspectors, and in Moscow of a chief, two clerks, and twelve inspectors.

The principal active duties of the Russian police comprise the enforcement of police laws and the suppression of nuisances, disturbances, and crime. The details of these duties are laid down in a special Act, which is subdivided into different,statutes, taken from the criminal code. The provincial towns are- governed by a special law, passed in 1876, as supplementary to the already existing law. The towns provide the funds for the maintenance of the police. Laws of 1853 regulated the lodgings and necessaries for the whole police staff according to their rank; but a change has been introduced since 1873, and many officers receive payment in the place of lodg- ings. Police pay varies from 200 roubles upwards.

In closing this article, it is well to observe that the dis- tinction between the exercise of judicial power and police functions should be always borne in mind. “The func- tions of justice and those of the police must be apt in many points to run into one another, especially as the business would be very badly managed if the same persons whose more particular duty it is to act as officers of the police were not upon occasion to act in the capacity of officers of justice. The idea, however, of the two func- tions may still be kept distinct ” (Bentham). The employ- ment of police powers in the ante-judiciary part of criminal process, which previously to the establishment of a police force in England was thought to require an apology as founded on convenience and utility rather than on prin- ciple, has become a necessity.

The necessity for a police force as part of any system of orderly government is exemplified by its recent introduc- tion into Egypt. Amid differences of opinion on every subject, and even on the administration of the force and its duties, the abstract propriety of a police force is apparently beyond dispute.

In every country the difficult question, apart from any as to the extent of interference with the freedom of individual action, arises in actual police administration— Quts custodiet ipsos custodes ?

By whatever name the head of a police force is known, whether as commissioner, chief constable, superintendent, or otherwise, the efficient performance of his duty involves inquiry, and judgment upon that inquiry. The character and efficiency of his force must largely depend upon the insight as well as vigour brought to bear upon the indi- vidual members of that force.

In relation to the public generally a perfect police code must be full of restraints, with coextensive powers of inquiry, even in matters that do not involve punishment. The extent to which these restraints and powers are applied greatly depends on time and place, Precautions which

‘are necessary, Bentham observes, at certain periods of

danger and trouble, ought not to be continued in a period of quietness, and care should be taken not to shock the national spirit. One nation would not endure what is borne by another. (J. E. D.) POLIGNAG, an ancient French family, which had its seat in the Cevennes near Puy-en-Velay (Haute-Loire). Cardinal Mxtcutor DE Poricnac (1661-1742) was a younger son of Armand XVL., marquis de Polignac, and at an early age achieved distinction as a diplomatist. In 1695 he was sent as ambassador to Poland, where he con- trived to bring about the election of the prince of Conti as successorto John Sobieski(1697). The subsequent failure of this intrigue led to his temporary disgrace, but in 1702 he was restored to favour, and in 1712 he was sent as the plenipotentiary of Louis XIV. to the congress of Utrecht. During the regency he became involved in the Cellamare plot, and was relegated to Flanders for three years. From 1725 to 1732 he acted for France at the Vatican. In

1726 he received the archbishopric of Auch, and he died at Paris in 1742. He left unfinished a metrical refutation of Lucretius which was published after his death by the Abbé de Rothelin (Anti-Lucretius, 1745), and had consider- able vogue in its day. Count JuLes DE PotiaNnac (ob. 1817), grand-nephew of the preceding, was created duke by Louis XVI. in 1780, and in 1782 was made postmaster- general. His position and influence at court were largely due to his wife, the bosom friend of Marie Antoinette ; the duke and duchess alike shared the unpopularity of the court, and were among the first who were compelled to “emigrate” in‘ 1789. The duchess died shortly after the queen, but her husband, who had received an estate from Catherine II. in the Ukraine, survived till 1817. Of their three sons the second, Prince JULES DE Potianac (1780- 1847), held various offices after the restoration of the Bourbons, received from the pope his title of “ prince” in 1820, and in 1823 was made ambassador to the court of St James’s. In

August 8, 1829, he was called by Charles X. to the ministry of foreign affairs, and in the following November he becaine president of the council. On the revolution of July 1830 he fied for his life, but after wandering for some time among the wilds of Normandy was arrested at Granville. His trial before the chamber of peers resulted in his condemnation to perpetual imprisonment (at Ham), but he benefited by the amnesty of 1836, when the sentence was com- muted to one of exile. During his captivity he wrote Considérations politiques (1832). He afterwards spent some years in England, but finally was permitted to re- enter France on condition that he did not take up his abode in Paris. He died at St Germain on March 29,

1847,

POLILLO. See Purtippine IsLanps.

POLITIAN (1454-1494). Angelo Ambrogini, known in literary annals as ANGELO PoLIzIANo or PoLITIANUS from his birth-place, was born at Montepulciano in Tuscany in the year 1454. His father, Benedetto, a jurist of good family and distinguished ability, was murdered by political antagonists for adopting the cause of Piero de' Medici in Montepulciano ; and this circumstance gave his eldest son, Angelo, a claim on the family of Medici. At

the age of ten the boy came to prosecute his studies at

Florence, where he learned Latin under Cristoforo Landino, and Greek under Argyropulos and Andronicos Kallistos. From Marsilio Ficino he imbibed the rudiments of philo- sophy. The precocity of his genius for scholarship and poetry was early manifested. At thirteen years of age he began to circulate Latin letters ; at seventeen he sent forth essays in Greek versification ; at eighteen he published an edition of Catullus. In 1470 he won for himself the title of Homericus juvenis by translating four books of the Lliad into Latin hexameters. Lorenzo de' Medici, who was then the autocrat of Florence and the chief patron of learning in Italy, took Poliziano into his household, made him the tutor of his children, and secured him a distin- guished post in the university of Florence. Before he reached the age of thirty, Poliziano expounded the humani- ties with almost unexampled lustre even for that epoch of brilliant professors. Among his pupils could be

numbered the chief students of Europe, the men who were destined to carry to their homes the spolia opima of Italian culture. Not to mention Italians, it will suffice to record the names of the German Reuchlin, the English Grocyn and Linacre, and the Portuguese Tessiras. Poliziano had few advantages of person to recommend him. He was ungainly in form, with eyes that squinted, and a nose of disproportionate length. Yet his voice was rich and capable of fine modu- lation ; his eloquence, ease of utterance, and copious stream of erudition were incomparable. It was the method of

professors at that period to read the Greek and Latin authors with their class, dictating philological and critical notes, emending corrupt passages in the received texts, offer- ing elucidations of the matter, and pouring forth stores of acquired knowledge regarding the laws, manners, reli- gious and philosophical opinions of the ancients. Poliziano covered nearly the whole ground of classical literature during the years of his professorship, and published the notes of his courses upon Ovid, Suetonius, Statius, the younger Pliny, Quintilian, and the writers of Augustan histories. He also undertook a recension of the text of the Pandects of Justinian, which formed the subject of one of his courses; and this recension, though it does not rank high in the scale of juristic erudition, gave an impulse to the scholarly criti- cism of the Roman code. At the same time he was busy as a translator from the Greek. His versions of Epictetus,

.Herodian, Hippocrates, Galen, Plutarch’s Lroticus, and

Plato’s Charmides delighted contemporaries by a certain limpid fluency of Latin style and grace of manner which dis- tinguished him also as an original writer. Of these learned labours the most universally acceptable to the public of that time were a series of discursive essays on philology and criti- cism, first published in 1489 under the title of Afiscellanea. They had an immediate, a lasting, and a wide renown, encouraging the scholars of the next century and a half to throw their occasional discoveries in the field of scholarship into a form at once so attractive and so instructive. Poli- ziano was not, however, contented with these simply pro- fessorial and scholastic compositions. Nature had endowed him with literary and poetic gifts of the highest order. These he devoted to the composition of Latin and Greek

verses, which count among the best of those produced by men of modern times in rivalry with ancient authors. The Manto, in which he pronounced a panegyric of Virgil ; the Ambra, which contains a beautiful idyllic sketch of Tuscan landscape, and a studied eulogy of Homer; the Rusticus, which celebrated the pleasures of country life in no frigid or scholastic spirit ; and the Vutricoa, which was intended to serve asa general introduction to the study of ancient and modern poetry,—these are the masterpieces of Poliziano in Latin verse, displaying an authenticity of inspiration, a sincerity of feeling, and a command of metrical resources which mark them out as original productions of poetic genius rather than as merely professorial lucubrations. Exception may be taken to their style, when compared with the best work of the Augustan or even of the Silver age. But what renders them always noteworthy to the student of modern humanistic literature is that they are in no sense imitative or conventional, but that they convey the. genuine thoughts and emotions of a born poet in Latin diction and in metre moulded to suit the character- istics of the singer's temperament.

Poliziano was great as a scholar, as a professor, as a critic, and as a Latin poet at an age when the classics were still studied with the passion of assimilative curiosity, and not with the scientific industry of a later period. He was the representative hero of that age of scholarship in which students drew their ideal of life from antiquity and fondly dreamed that they might so restore the past as to compete with the classics in production and bequeath a golden age of resuscitated paganism to the modern world. Yet he was even greater as an Italian poet. Between Boccaccio and Ariosto, no single poet in the mother tongue of Italy deserves so high a place as Poliziano. What he might have achieved in this department of literature had he lived at a period less preoccupied with humanistic studies, and had he found a congenial sphere for his activity, can only be guessed. As it is, we must reckon him as decidedly the foremost and indubitably the most highly gifted among the Italian poets who obeyed Lorenzo

de’ Medici’s demand for a resuscitation of the vulgar | literature. Lorenzo led the way himself, and Poliziano was more a follower in his path than an initiator. Yet what Poliziano produced, impelled by a courtly wish to satisfy his patron’s whim, proves his own immeasurable superiority as an artist. His principal Italian works are the stanzas called La Giostra, written upon Giuliano de’ Medici’s victory in a tournament; the Orfeo, a lyrical drama performed at Mantua with musical accompaniment ; and a collection of fugitive pieces, reproducing various forms of Tuscan popular poetry. La Giostra had no plan, and remained imperfect ; but it demonstrated the capaci- ties of the octave stanza for rich, harmonious, and sonorous metrical effect. The Orfeo is a slight piece of work, thrown off at a heat, yet abounding in unpremeditated lyrical beauties, and containing in itself the germ both of the pastoral play and of the opera. The Tuscan songs are distinguished by a “‘roseate fluency,” an exquisite charm of half romantic half humorous abandonment to fancy, which mark them out as improvisations of genius. It may be added that in all these departments of Italian composi- tion Poliziano showed how the taste and learning of a classical scholar could be engrafted on the stock of the vernacular, and how the highest perfection of artistic form might be attained in Italian without a sacrifice of native spontaneity and natural flow of language.

It is difficult to combine in one view the several aspects presented to us by this many-sided man of literary genius. At a period when humanism took the lead in forming Italian character and giving tone to European culture, he climbed with facility to the height of achievement in all the branches of scholarship which were then most seriously prized—in varied knowledge of ancient authors, in critical capacity, in rhetorical and poetical exuberance. This was enough at that epoch to direct the attention of all the learned men of Europe on Poliziano. At the same time, almost against his own inclination, certainly with very little enthusiasm on his part, he lent himself so success- fully to Lorenzo de’ Medici’s scheme for resuscitating the

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decayed literature of Tuscany that his slightest Italian

POLITECAL

Sige present condition of the study of political economy

seenis to prescribe, as most suitable for these pages, a | treatment of the subject different from that adopted in relation to other departments of knowledge. There pre-. vails wide-spread dissatisfaction with the existing state of | economic science, and much difference of opinion both as to its method and as to its doctrines. There is, in fact, reason to believe that it has now entered on a transition | stage, and is destined ere long to undergo a considerable transformation. Hence it has appeared to be unseasonable, — and therefore inexpedient, to attempt in this place a new dogmatic treatise on political economy. What is known as the “orthodox ” or “classical” system, though in our time

very generally called in question, is to be found set out in numerous text-books accessible to every one. Again, some of the most important special branches of economics are so fully explained and discussed in other parts of the present work (see BANKING, Excuancr, Frnancr, Money, &ke.) as to dispense with any further treatment of them here. It | has been thought that the mode of handling the subject most appropriate to the circumstances of the case, and likely to be most profitable, would be that of tracing historically from a general point of view the course of speculation regarding economic phenomena, and contemplating the suc- cessive forms of opinion concerning them as products of the periods at which they were respectively evolved.

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effusions exercised a potent influence on the immediate He appears before us as the dictator of Italian culture in a double capacity—as the man who most per- fectly expressed the Italian conception of humanism, and brought erudition into accord with the pursuit of noble and harmonious form, and also as the man whose verna- cular compositions were more significant than

any others of the great revolution in favour of Italian poetry which culminated in Ariosto. Beyond the sphere of pure scholar- ship and pure literature Poliziano did not venture. He was present, indeed, at the attack made by the Pazzi conspirators on the persons of Lorenzo and Giuliano de' Medici, and wrote an interesting account of its partial success. He also contributed a curious document on tle death of Lorenzo de' Medici to the students of Florentine ° history. But he was not, like many other humanists of his age, concerned in public affairs of state or diplomacy, and he held no office except that of professor at Florence. His private life was also uneventful. He passed it as a house-friend and dependant of the Medici, as the idol of the learned world, and as a simple man of letters for whom (with truly Tuscan devotion to the Saturnian country) rural pleasures were always acceptable. He was never married ; and his morals incurred suspicion, to which his own Greek verses lend a certain amount of plausible colouring. In character Poliziano was decidedly inferior to the intellectual and literary eminence which he dis- played. He died half broken-hearted by the loss of his friend and patron Lorenzo de' Medici, in 1494, at the age of forty, just before the wave of foreign invasion which was gathering in France swept over Italy.

For the life and works of Politian, consult F. O. Mencken (Leipsic, 1736), a vast repertory of accumulated erudition ; Jac. Mahly, Angelus Politianus (Leipsic, 1864); Carducci's edition of the Italian poems (Florence, Barbera, 1863); Del Lungo's edition of the Italian prose works and Latin and Greek poenis (Florence, Barbera, 1867); the Opera Omnia (Basel, 1554); Greswell's English

| Life of Politian ; Roscoe's Lorenzo de' Medici ; Von Reumont's Life

of Lorenzo de' Medici ; Symonds's Renaissance in Italy, and transla- tions from Poliziano's Italian poems in his Sketches and Studies in Italy, which include the Orfeo. (J. A. S.)

ECONOMY

Such a study is in harmony with the best intellectual tendencies of our age, which is, more than anything else,

characterized by the universal supremacy of the historical

spirit. To such a degree has this spirit permeated all our modes of thinking that with respect to every branch of

‘ knowledge, no less than with respect to every institution ‘and every form of human activity, we almost instinctively

ask, not merely what is its existing condition, but what were its earliest discoverable germs, and what has been the course of its development? The assertion of J. B. Say that the history of political economy is of little value, being for the most part a record of absurd and justly exploded opinions, belongs to a system of ideas already obsolete, and requires at the present time no formal refuta- It deserves notice only as reminding us that we must discriminate between history and antiquarianism : what from the first had no significance it is mere pedantry We need concern ourselves only with those modes of thinking which have prevailed largely and seriously influenced practice in the past, or in which we can discover the roots of the present and the future. When we thus place ourselves at the point of view of history, it becomes unnecessary to discuss the definition of political economy, or to enlarge on its method, at the out- set. It will suffice to conceive it as the theory of social wealth, or to accept provisionally Say’s definition which

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makes it the science of the production, distribution, and consumption of wealth. Any supplementary ideas which require to be taken into account will be suggested in the progress of our survey, and the determination of the proper method of economic research will be treated as one of the principal results of the historical evolution of the science.

The history of political economy must of course be dis- tinguished from the economic history of mankind, or of any separate portion of our race. The study of the suc- cession of economic facts themselves is one thing; the study of the succession of theoretic ideas concerning the facts is another. And it is with the latter alone that we _are here directly concerned. But these two branches of

research, though distinct, yet stand in the closest relation

to each other. The rise and the form of economic doctrines have been largely conditioned by the practical situation, needs, and tendencies of the corresponding epochs. With each important social change new economic questions have presented themselves; and the theories prevailing in each period have owed much of their influ- ence to the fact that they seemed to offer solutions of the urgent problems of the age. Again, every thinker, however in some respects he may stand above or before lis contemporaries, is yet a child of his time, and cannot be isolated from the social medium in which he lives and moves. He will necessarily be affected by the circum- stances which surround him, and in particular by the practical exigencies of which his fellows feel the strain. This connexion of theory with practice has its advantages and its dangers. It tends to give a real and positive character to theoretic inquiry; but it may also be expected to produce exaggerations in doctrine, to lend undue pro- minence to particular sides of the truth, and to make transitory situations or temporary expedients be regarded as universally normal conditions.

There are other relations which we must not overlook in tracing the progress of economic opinion. The several branches of the science of society are so closely connected that the history of no one of them can with perfect rationality be treated apart, though such a treatment is recommended —indeed necessitated—by practical utility.

The movenient of economic thought is constantly and.

powerfully affected by the prevalent mode of thinking, and even the habitual tone of sentiment, on social subjects generally. All the intellectual manifestations of a period in relation to human questions have a kindred character, and bear a certain stamp of homogeneity, which is vaguely present to our minds when we speak of the spirit of the age. Social speculation again, and economic research as one branch of it, is both through its philosophic method and through its doctrine under the influence of those simpler sciences which in the order of development precede the social, especially of the science of organic nature.

It is of the highest importance to bear in mind these several relations of economic research both to external cir- cumstance and to other spheres of contemporary thought, because by keeping them in view we shall be led to form less absolute and therefore juster estimates of the succes- sive phases of opinion. Instead of merely praising or blaming these according to the degrees of their accordance with a predetermined standard of doctrine, we shall view them as elements in an ordered series, to be studied mainly with respect to their filiation, their opportuneness, and their influences. We shall not regard each new step in this theoretic development as implying an unconditional negation of earlier views, which often had a relative justi- fication, resting, as they did, on a real, though narrower, basis of experience, or assuming the existence of a different social order. Nor shall we consider all the theoretic posi-

| undergo it.

O47 tions now occupied as definitive ; for the practical system of life which they tacitly assume is itself susceptible of change, and destined, without doubt, more or less to Within the limits of a sketch like the present these considerations cannot be fully worked out; but an effort will be made to keep them in view, and to mark the relations here indicated, wherever their influence is speci- ally important or interesting.

The particular situation and tendencies of the several thinkers whose names are associated with economic doctrines have, of course, modified in a greater or less degree the spirit or form of those doctrines. Their rela- tion to special predecessors, their native temperament, their early training, their religious prepossessions and political partialities, have all had their effects. To these we shall in some remarkable instances direct attention ; } but, in the main, they are, for our present purpose, secondary and subordinate. The ensemble must prepon- derate over the individual; and the constructors of theories must be regarded as organs of a common intel- lectual and social movement.

The history of economic inquiry is most naturally divided into the three great periods of (1) the ancient, (2) the medizval, and (3) the modern worlds. In the two former, this branch of study could exist only in a rudi- mentary state. It-is evident that for any considerable development of social

theory two conditions must be ful- filled. First, the phenomena must have exhibited them- selves on a sufficiently extended scale to supply adequate matter for observation, and afford a satisfactory basis for scientific generalizations; and secondly, whilst the spectacle is thus provided, the spectator must have been trained for his task, and armed with the appropriate aids and instru- ments of research, that is to say, there must have been such a previous cultivation of the less complex sciences as will have both furnished the necessary data of doctrine and prepared the proper methods of investigation. Socio- logy requires to use for its purposes theorems which belong to the domains of physics and biology, and which it must borrow from their professors ; and, on the logical side, the methods which it has to employ—deductive, observational, comparative—must have been previously shaped in the cultivation of mathematics and the study of the inorganic world or of organisms less complex than the social. Hence it is plain that, though some laws or tendencies of society must have been forced on men's attention in every age by practical exigencies which could not be postponed, and though the questions thus raised inust have received some empirical solution, a really scien- tific sociology must be the product of a very advanced stage of intellectual development. And this is true of the economic, as of other branches of social theory. We shall therefore content ourselves with a general outline of the character of economic thought in antiquity and the Middle Ages, and of the conditions which determined that character.

ANCIENT TIMES,

The Oriental Theocracies.—The earliest surviving expres- sions of thought on economic subjects have come down to us from the Oriental theocracies. The general spirit of the corresponding type of social life consisted in taking imitation for the fundamental principle of education, and consolidating nascent civilization by heredity of the differ- ent functions and professions, or even by a system of castes, hierarchically subordinated to each other according to the nature of their respective offices, under the common supreme direction of the sacerdotal caste. This last was charged with the traditional stock of conceptions, and their applica- tion for purposes of discipline. It sought to realize a com-

plete regulation of human life in all its departments on the basis of this transmitted body of practical ideas. Conserva- tion is the principal task of this social order, and its most remarkable quality is stability, which tends to degenerate into stagnation. But there can be no doubt that the useful arts were long, though slowly, progressive under this regime, from which they were inherited by the later civilizations,— the system of classes or castes maintaining the degree of division of labour which had been reached in those early periods. The eminent members of the corporations which presided over the theocracies without doubt gave much earnest thought to the conduct of industry, which, unlike war, did not imperil their political pre-eminence by deve- loping a rival class, But, conceiving life as a whole, and making its regulation their primary aim, they naturally considered most the social reactions which industry is fitted to exercise. The moral side of economics is the one they habitually contemplate, or (what is not the same) the economic side of morals. They abound in those warnings against greed and the haste to be rich which religion and philosophy have in all ages seen to be necessary. They insist on honesty in mutual dealings, on just weights and measures, on the faithful observance of contracts. They admonish against the pride and arrogance apt to be gene- rated by riches, against undue prodigality and self-indulg- ence, and enforce the duties of justice and beneficence towards servants and inferiors. Whilst, in accordance with the theological spirit, the personal acquisition of wealth is in general thesis represented as determined by divine wills, its dependence on individual diligence and thrift is emphatically taught. There is indeed in the fully developed theocratic systems a tendency to carry precept, which there differs little from command, to an excessive degree of minuteness,—to prescribe in detail the time, the mode, and the accompaniments of almost every act of every member of the community. This system of exaggerated surveillance is connected with the union, or rather confusion, of the spiritual and temporal powers, whence it results that many parts of the government of society are conducted by direct injunction or restraint, which at a later stage are intrusted to general intellectual and moral influences.

Greck and Roman Antiquity.—The practical economic

enterprises of Greek and Roman antiquity could not, even |

independently of any special adverse influences, have com- peted in magnitude of scale or variety of resource with those of modern times. The unadvanced condition of physical science prevented a large application of the less obvious natural powers to production, or the extensive use of machinery, which has acquired such an immense development as a factor in modern industry. The imper-

fection of geographical knowledge and of the means of

communication and transport were impediments to the growth of foreign commerce. These obstacles arose neces- sarily out of the mere immaturity of the industrial life of the periods in question. But more deeply rooted impedi- ments to a vigorous and expansive economic practical system existed in the characteristic principles of. the civi- lization of antiquity. Some writers have attempted to set aside the distinction between the ancient and modern worlds as imaginary or unimportant, and, whilst admitting the broad separation between ourselves and the theocratic peoples of the East, to represent the Greeks and Romans as standing on a substantially similar ground of thought, feeling, and action with the Western populations of our own time. But this is a serious error, arising from the same too exclusive preoccupation with the cultivated classes and with the mere speculative intellect which has often led to an undue disparagement of the Middle Ages. There is this essential difference between the spirit and

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FPOLIEVTICAs SB Ccoro ry,

life of ancient and of modern communities, that the former were organized for war, the latter during their whole history have increasingly tended to be organized for industry, as their practical end and aim. The profound' influence of these differing conditions on every form of human activity must never be overlooked or forgotten. With the military constitution of ancient societies the institution of slavery was essentially connected. Far from being an excrescence on the contemporary system of life, as it was in the modern West Indies or the United States of America, it was so entirely

in harmony with that life that the most eminent thinkers regarded it as no less indispensable than inevitable. It does, indeed, seem to have been a temporary necessity, and on the whole, regard being had to what might have taken its place, a relative good. But it was attended with manifold evils. It led to the prevalence amongst the citizen class of a contempt for industrial occupations ; every form of production, with a partial exception in favour of agriculture, was branded as unworthy of a free man,—the only noble forms of activity being those directly connected with public life, whether military or administrative. Labour was degraded by the relegation of most departments of it to the servile class, above whom the free artisans were but little elevated in general esteem. The agents of production, being for the most part destitute of intellectual cultivation and excluded from any share in civic idcas, interests, or efforts, were unfitted in character as well as by position for the habits of skilful combination and vigorous initiation which the progress of industry demands. To this must be added that the comparative insecurity of life and pro- perty arising out of military habits, and the consequent risks which attended accumulation, were grave obstructions to the formation of large capitals, and to the establishment of an effective system of credit. These causes conspired with the undeveloped state of knowledge and of social relations in giving to the economic life of the ancients the limitation and monotony which contrast so strongly with the inexhaustible resource, the ceaseless expansion, and the thousandfold variety of the same activities in the inodern world. It is, of course, absurd to expect incom- patible qualities in any social system; each system must be estimated according to the work it has to do. Now the historical vocation of the ancient civilization was to be

_accomplished, not through industry, but through war,

which was in the end to create a condition of things admitting of its own elimination and of the foundation of a regime based on pacific activity.

The Greeks.—This office was, however, reserved for Rome, as the final result of her system of conquest; the military activity of Greece, though continuous, was inco- herent and sterile, except in the defence against Persia, and did not issue in the accomplishment of any such social mission. It was, doubtless, the inadequacy of the warrior life, under these conditions,

to absorb the faculties of the race, that threw the energies of its most eminent members into the channel of intellectual activity, and produced a singularly rapid evolution of the esthetic, philosophic, and scientific germs transmitted by the theocratic societies.

In the Works and Days of Hesiod, we find an order of thinking in the economic sphere very similar to that of the theocracies. With a recognition of the divine disposing power, and traditional rules of sacerdotal origin, is com- bined practical sagacity embodied in precept or proverbial saying. But the development of abstract thought, begin- ning from the time of Thales, soon gives to Greek culture its characteristic form, and marks a new epoch in the intel- lectual history of mankind.

The movement was now begun, destined to mould the whole future of humanity, which, gradually sapping the

old hereditary structure of theological convictions, tended | to the substitution of rational theories in every department

of speculation. ‘The eminent Greek thinkers, while taking | a deep interest in the rise of positive science, and most of

them studying the only science—that of geometry—then | assuming its definitive character, were led by the social

exigencies which always powerfully affect great minds to | study with special care the nature of man and the con-

ditions of his existence in society. These studies were

indeed essentially premature ; a long development of the

inorganic and vital sciences was necessary before sociology

or morals could attain their normal constitution. But by

their prosecution amongst the Greeks a noble intellectual

activity was kept alive, and many of those partial lights

obtained for which mankind cannot afford to wait.

Economic inquiries, along with others, tended towards | rationality; Plutus was dethroned, and terrestrial sub-

stituted for supernatural agencies. But such inquiries,

resting on no sufficiently large basis of practical life, could | not attain any considerable results. The military consti-

tution of society, and the existence of slavery, which was

related to it, leading, as has been shown, to a low estimate | of productive industry, turned away the habitual attention

of thinkers from that domain. On the other hand, the

absorption of citizens in the life of the state, and their

preoccupation with party struggles, brought questions

relating to politics, properly so called, into special promin-

ence. The principal writers on social subjects are there-

fore almost exclusively occupied with the examination and

comparison of political constitutions, and with the search

after the education best adapted to train the citizen for | public functions. And we find, accordingly, in them no systematic or adequate handling of economic questions,— only some happy ideas and striking partial anticipations of later research.

In their thinking on such questions, as on all sociological | subjects, the following general features are observable.

1. The individual is conceived as subordinated to the state, through which alone his nature can be developed and completed, and to the maintenance and service of which all lis efforts must be directed. The great aim of all poli- tical thought is the formation of good citizens ; every social | question is studied primarily from the ethical and educa- tional point of view. The citizen is not regarded as a producer, but only as a possessor, of material wealth; and this wealth is not esteemed for its own sake or for the enjoyments it procures, but for the higher moral and public aims to which it may be made subservient.

2. The state, therefore, claims and exercises a control- ling and regulating authority over every sphere of social life, including the economic, in order to bring individual action into harmony with the good of the whole.

3. With these fundamental notions is combined a tend- ency to attribute to institutions and to legislation an | unlimited efficacy, as if society had no spontaneous tenden- cies, but would obey any external impulse, if impressed upon it with sufficient force and continuity.

Every eminent social speculator had his ideal state, which approximated to or diverged from the actual or possible, according to the degree in which a sense of reality and a positive habit of thinking characterized the author.

The most celebrated of these ideal systems is that of Plato. In it the Greek idea of the subordination of the individual to the state appears in its mostextreme form. In that class of the citizens of his republie who represent the highest type of life, community | of property and of wives is established, as the most effective means of suppressing the sense of private interest, and consecrating the | individual entirely to the publie service. It cannot perhaps be truly said that his scheme was incapable of realization in an ancient community favourably situated for the purpose. But it would

soon be broken to pieces by the forces which would be developed | in an industrial society. It has however, been the fruitful parent |

sorganization or to deteriorate the national character.

thropy and tender piety which breathes through it.

of modern Utopias, specially attractive as it is to minds in which the literary instinct is stronger than the scientific judgment, in consequence of the freshness and brilliancy of Plato's exposition and the unrivalled charm of his style. Mixed with what we should eall the chimerical ideas in his work, there are many striking and elevated moral conceptions, and, what is more to our present' purpose, some just economic analyses. In particular, he gives a correct account of the division and combination of employments, as they naturally arise in society. The foundation of the social organization he traces, perlaps, too exclusively to economie grounds, not giving sufficient weight to the disinterested social impulses in men which tend to draw and bind them together. But he explains clearly how the different wants and capacities of individuals demand and give rise to mutual services, aud how, by the restriction of each to the sort of oceupation to which, by his position, abilities, and training, he is best adapted, everything needful for the whole is more easily and better produced or effected. In the spirit of all the ancient legislators he desires a sclf-sufficing state, protected from unnecessary contacts with foreign populations, which might tend to break down its internal Hence he discountenances foreign trade, and with this view removes his ideal eity to some distance from the sea. The limits of its territory are rigidly fixed, and the population is restricted by the prolibition of early marriages, by the exposure of infants, and by the maintenance of a determinate number of individual lots of land in the hands of the citizens who cultivate the soil. These precautions are inspired more by political and moral motives than by the Malthusian fear of failure of subsistence. Plato aims, as far as possible, at equality of property amongst the families of the com- munity which are engaged in the immediate prosecution of industry. This last class, as distinguished from the governing and military classes, he holds, according to the spirit of his age, in but little esteem ; he regards their habitual occupations as tending to the degradation of the mind and the enfeeblement of the body, and rendering those who follow them unfit for the higher duties of men and citizens. The lowest forms of labour he would commit to foreigners and slaves. Again in the spirit of ancient theory, he wishes (Legg., v. 12) to banish the precious metals, as far as practi- cable, from use in internal commerce, and forbids the lending of mouey on interest, leaving indeed to the free will of the

debtor even the repayment of the capital of the loan. All cconomie dealings he subjects to active control on the part of the Govern- ment, not merely to prevent violence and fraud, but to check the growth of luxurious habits, and secure to the population of the state a due supply of the necessaries and comforts of life. Contrasted with the exaggerated idealism of Plato is the some- what limited but eminently practical genius of Xenophon. In him the man of action predominates, but he has also a large element of the speculative tendency and talent of the Greek. His treatise entitled Geonomicus is well worth reading for the interesting and animated picture it presents of some aspects of eontemporary life, and is justly praised by Sismondi for the spirit of mild ee ok WE 1 scareely passes beyond the bounds of domestic economy, though within that limit its author exhibits much sound sense and sagacity. His precepts for the judicious conduct of private pro- perty do not concern us here, nor his wise suggestions for the government of the family and its dependants. Yet it is in this narrower sphere and in general in the concrete domain that his chief excellence lies ; to economics in their wider aspects he docs not contribute much. He shares the ordinary preference of his fellow countrymen for agriculture over other employments, and is, indeed, enthusiastic in his praises of it as developing patriotic and religious feeling and a respect for property, as the best preparation for military life, and as leaving sufficient time and thought dis- posable to admit of considerable intellectual and political activity. Yet lis practical sense leads him to attribute greater importanco than most other Greek writcrs to manufactures, and still more to trade, to enter more largely on questions relating to their eon- ditions and development, and to bespeak for them the countenance and protection of the state. Though his vicws on the nature of money are vague and in some respects erroneous, he sees that its export in exchange for commodities will not impoverish the com- munity. He also insists on the necessity, with a view to a flourishing commerce with other countrics, of peace, of a courteous and respectful treatment of foreign traders, and of a prompt and equitable decision of their legal suits. The institution of slavery he of course recognizes aud does not disapprove ; he even recom- mends, for the increase of the Attic revenues, the hiring out of slaves by the state for labour in the mines, after branding them to prevent their escape, the number of slaves being constantly increased by fresh purchases out of the gains of the enterprise. Almost the whole system of Greek idcas up to the time of Aristotle is represented in his

encyclopedic eonstruction. Mathe- matical and astronomical science was largely developed at a later stage, but in the field of social studies no higher point was ever

attained by the Greeks than is reached in the writings of this great ‘thinker. “Both his gifts and his situation eminently favoured him in the treatment of these subjects. He combined in rare measure a eapacity for keen observation with generalizing power, and sobriety of judgment with ardour for the public good. Al} that was original or significant in the political life of Hellas had run its course before his time or under his own eyes, and he had thus a large basis of varied experience on which to ground his conclu- sions. Standing outside the actual movement of contemporary publie life, he occupied the position of thonghtful spectator and impartial judge. He could not indeed, for reasons already stated, any more than other Greek speculators, attain a fully normal attitude in these researches. Nor could he pass beyond the sphere of what is now called statical sociology ; the idea of laws of the historical development of social phenomena he scarcely apprehended, except in some sinall degree in relation to the succession of political forms. But there is to be found in his writings a remarkable body of sound and valuable thoughts on the constitution and working of the social organism. The special notices of economic subjects are neither so nnmerons nor so detailed as we should desire. Like all the Greek thinkers, he recognizes but one doctrine of the state, under which ethics, politics proper, and economies take their place as departments, bearing to each other a very close relation, and having indecd their lines of demarcation from each other not very distinctly marked. When wealth comes under consideration, it is studied not as an end in itself, but with a view to the higher elements and ultimate aims of the collective life.

The origin of society he traces, not to economic necessities, but to natural social impulses in the human constitution. ‘The nature of the social union, when thus established, being determined by the partly spontaneous partly systematic combination of diverse activities, he respects the independence of the latter whilst seeking to effect their convergence. He therefore opposes himself to the suppression of personal freedom and initiative, and the

excessive sub- ordination of the individual to the state, and rejects the community of property and wives proposed by Plato for his governing class. The principle of private property he regards as deeply rooted in man, and the evils which are alleged to result from the correspond- ing social ordinance he thinks ought really to be attributed either to the imperfections of our nature or to the vices of other public insti- tutions. Community of goods must, in his view, tend to neglect of the common interest and to the disturbance of social harmony.

Of the several classes which provide for the different wants of the society, those who are occupied directly with its material needs —the immediate cultivators of the soil, the mechanics and artificers —are excluded from any share in the government of the state, as being without the necessary leisure and cultivation, and apt to be debased by the nature of their occupations.. Ina celebrated passage he propounds a theory of slavery, in which it is based on the uni- versality of the relation between command and obedience, and on the natural division by which the ruling is marked off from the subject race. He regards the slave as having no independent will, but as an ‘‘animated tool” in the hands of his master; and in his subjection to such control, if only it be intelligent, Aristotle holds that the true wellbeing of the inferior as well as of the superior is to be fonnd. This view, so shocking to our modern sentiment, is of course not personal to Aristotle; it is simply the theoretic pre- sentation of the facts of Greek life, in which the maintenance of a hody of citizens pursuing the higher culture and devoted to the tasks of war and government was founded on the systematic degra- dation of a wronged and despised class, excluded from all the higher offices of human beings and sacrificed to the maintenance of a special type of society.

The methods of economic acquisition are divided by Aristotle into two, one of which has for its aim the appropriation of natural products and their application to the material uses of the household ; under this head come hunting, fishing, cattle-rearing, and agricul- ture. With this ‘‘natural economy,” as it may be called, is, in some sense, coutrasted the other method to which Aristotle gives the name of ‘‘chrematistic,” in which an active exchange of pro- ducts goes on, and money comes into operation as its medium and regulator. A certain measure of this “ money econoiny,” as it may be termed in opposition to the preceding and simpler form of

industrial life, is accepted by Aristotle as a necessary extension of the latter, arising out of increased activity of intercourse, and satisfying real wants. But its development on the great scale, founded on the thirst for enjoyment and the unlimited desire of gain, he condemns as unworthy and corrupting. Though his views on this subject appear to be principally based on moral grounds, there are some indications of his having entertained the erroneous opinion held by the physiocrats of the 18th century, that agricul- ture alone (with the other branches of natural economy) is truly produetive, whilst the other kinds of industry, which either modify the products of nature or distribute them by way of exchange, however convenient and useful they may be, make no addition to the wealth of the community.

He rightly regards money as altogether different from wealth,

illustrating the difference by the story of Midas. And he seems to have seen that money, though its use rests on a social conven- tion, must be composed of a material possessing an independent value of its own. ‘That his views on capital were indistinct appears from his fanions argument against interest on loans, which is based on the idea that money is barren and cannot prodnce money.

Like the other Greek social philosophers, Aristotle recommends to the care of Governments the preservation of a due proportion between the extent of the civic territory and its population, and relies on pre-nuptial continence, late marriages, and the preven- tion or destruction of births for the due limitation of the number of citizens, the insufficiency of the latter being dangerous to the independence and its superabundance to the tranquillity and good order of the state.

The Romans.—Notwithstanding the eminently practical, realistic, and utilitarian character of the Romans, there was no energetic exercise of their powers in the economic field ; they developed no large and many-sided system of pro- duction and exchange. Their historic mission was military and political, and the national energies were mainly devoted to the public service dt home and in the field. To agriculture, indeed, much attention was given from the earliest times, and on it was founded the existence of the

hardy population which won the first steps in the march to universal dominion. But in the course of their history the cultivation of the soil by a native yeomanry gave place to the introduction on a great scale of slave labourers, acquired by their' foreign conquests; and for the small properties of the earlier period were substituted the vast estates—the lat¢fundia—which, in the judgment of Pliny, were the ruin of Italy. The industrial arts and commerce (the latter, at least when not conducted on a great scale) they regarded as ignoble pursuits, unworthy of free citi- zens ; and this feeling of contempt was not merely a pre- judice of narrow or uninstructed minds, but was shared by Cicero (De Of. i. 42) and others among the most liberal spirits of the nation. As might be expected from the want of speculative originality among the Romans, there is little evidence of serious theoretic inquiry on economic subjects. Their ideas on theseas on other social questions were for the most part borrowed from the Greek thinkers. Such traces of economic thought as do occur are to be found in (1) the philosophers, (2) the writers de re rustica, and (3) the jurists. It must, however, be admitted that many of the passages in these authors referred to by those who assert the claim of the Romans to a more pro- minent place in the history of the science often contain only obvious truths or vague generalities.

In the philosophers, whom Cicero, Seneca, and the elder Pliny sufficiently represent (the last indeed being rather a learned encyclopedist or polyhistor than a philosopher), we find a general conscionsness of the decay of industry, the relaxation of morals, and the growing spirit of self-indulgence amongst their contempo- raries, who are represented as deeply tainted with the imported vices of the conquered nations. This sentiment, both in these writers and in the poetry and miscellaneous literature of their times, is accompanied by a half-factitious enthusiasm for agricul- ture and an exaggerated estimate of country life and of early Roman habits, which are principally, no doubt, to be regarded as a form of protest against the evils of the present, and, from this point of view, reinind us of the declamations of Rousseau in a not dissimilar age. But there is little of large or just thinking on the economic evils of the time and their proper remedies. Pliny, still further in the spirit of Rousseau, is of opinion that the introduction of gold as a inedium of exchange was a thing to be deplored, and that the age of barter was preferable to that of money. He expresses views on the necessity

of preventing the efflux of money similar to those of the modern mercantile school—views which Cicero also, though not so clearly, appears to have entertained. Cato, Varro, and Columella concern themselves more with the teclinical precepts of husbandry than with the general conditions of industrial suc- cess and social wellbeing. But the two last namcd have the great merit of having seen and proclaimed the superior value of free to slave labour, and Columella is convinced tliat to the use of the latter the decline of the agricultural economy of the Romans was In a great measnre to be attributed. These three writers agree in the belief that it was chiefly by the revival and reform of agricnl- ture that the threatening inroads of moral corruption could be

stayed, the old Roman virtues fostered, and the foundations of the commonwealth strengthened. ‘Their attitude is thus similar to that of the French physiocrats invoking the improvement and zealous pursuit of agriculture alike against the material evils and the social degeneracy of their time. The question of the comparative merits of the large and small systems of cultivation appears to have bcen much discussed in the old Roman, as in the modern European world ; Columella is a decided advocate of the petite culture. The jurists were led by the coincidence which sometimes takes place between their point of view and that of economic science to make certain classifications and establish some more or less refined dis- tinctions which the modern economists have either adopted from them or used independently. They appear also (though this has been disputed, Neri and Carli maintaining the affirmative, Pagnini the negative) to-have had correct notions of the nature of money as having necessarily a value of its own, determined by economic conditions, and therefore incapable of being impressed upon it by convention or arbitrarily altered by public authority. But in general we find in these writers, as might be expected, not so much the results of independent thought as documents illustrating the facts of Roman economic life, and the historical policy of the nation with respect to economic subjects. From the latter point of view they are of much interest ; and by the information they supply as to the course of legislation relating to property generally, to sump- tuary control, to the restrictions imposed on spendthrifts, to slavery, to the encouragement of population, and the like,

they give us much clearer insight than we should otherwise possess into influences long potent in the history of Rome and of the Western world at large. But, as it is with the more limited field of system- atic thought on political economy that we are here occupied, we can- not enter into these subjects. One matter, however, ought to be adverted to, because it was not only repeatedly dealt with by legisla- tion, but is treated more or less fully by all Roman writers of note, namely, the interest on money loans. The rate was fixed by the laws of the Twelve Tables ; but lending on interest was afterwards (B.c. 341) entirely prohibited by the Genucian Law. In the legis- lation of Justinian, rates were sanctioned varying from four to eight per cent. according to the nature of the case, the latter being fixed as the ordinary mercantile rate, whilst compound interest was forbidden. The Roman theorists almost without exception dis- approve of lending on interest altogether. Cato, as Cicero tells us, thought it as bad as murder ("Quid fenerari? Quid hominem occidere ?" De Off. ii. 15); and Cicéro, Seneca, Pliny, Columella all join in condemning it. It is not difficult to see how in early states of society the trade of money-lending becomes, and not unjustly, the object of popular odium; but that these writers, at a period when commercial enterprise had made such considerable progress, should continue to reprobate it argues very imperfect or confused ideas on the nature and functions of capital. It is probable that oa took little heed cither of these speculative ideas or of egislation on the subject, which experience shows can always be easily evaded. The traffic in money seems to have gone on all through Roman history, and the rate to have fluctuated according to the condition of the market.

Looking back on the history of ancient economic specu- lation, we see that, as might be anticipated a priori, the results attained in that field by the Greek and Roman writers were very scanty. As Diihring has well remarked, the questions with which the science has to do were regarded by the ancient thinkers rather from their political than their properly economic side. This we have already pointed out with respect to their treatment of the subject of population, and the same may be seen in the case of the doctrine of the division of labour, with which Plato and Aristotle are in some degree occupied. They regard that principle as a basis of social classification, or use it in showing that society is founded on a spontaneous co-opera- tion of diverse activities. From the strictly economic point of view, there are three

important propositions which can be enunciated respecting that division :— (1) that its extension within any branch of production makes the products cheaper ; (2) that it is limited by the extent of the market ; and (3) that it can be carried farther in manufactures than in agriculture. But we shall look in vain for these propositions in the ancient writers; the first alone might be inferred from their discussions of the subject. It has been the tendency especially of German scholars to magnify unduly the extent and value of the contributions of antiquity to economic knowledge. The Greek and Roman authors ought certainly not to be omitted

| in any account of the evolution of this branch of study. But it must be kept steadily in view that we find in them only first hints or rudiments of general economic truths, and that the science is essentially a modern one. We shall indeed see hereafter that it could not have attained its definitive constitution before our own time.

MIDDLE AGEs.

The Middle Ages (400-1300 a.p.) form a period of great significance in the economic, as in the general, his- tory of Europe. They represent a vast transition, in which the germs of a new world were deposited, but in which little was fully elaborated. There is scarcely any- thing in the later movement of European society which we do not find there, though as yet, for the most part, crude and undeveloped. The mediaeval period was the object of contemptuous depreciation on the part of the liberal schools of the last century, principally because it contributed so little to literature. But there are things more important to mankind than literature ; and the great men of the Middle Ages had enough to do in other fields to occupy their utmost energies. The development of the Catholic institutions and the gradual establishment and maintenance of a settled order after the dissolution of the Western empire absorbed the powers of the thinkers and practical men of several centuries. The first medizeval phase, from the commencement of the 5th century to the end of the 7th, was occupied with the painful and stormy struggle towards the foundation of the new ecclesiastical and civil system; three more centuries were filled with the work of its consolidation and defence against the assaults of nomad

populations; only in the final phase, during the 11th, 12th, and 13th centuries, when the unity of the West was founded by the collective action against impending Moslem invasion, did it enjoy a sufficiently secure and stable existence to exhibit its essential character, and produce its noblest personal types. The elaboration of feudalism was, indeed, in progress during the whole period, showing itself in the decomposition of power and the hierarchical subordination of its several grades, the movement being only temporarily suspended during the second phase by the necessary defensive concentration under Charlemagne. But not before the first century of the last phase was the feudal system fully constituted. In like manner, only in the final phase could the effort of Catholicism after a universal discipline be carried out on the great scale—an effort for ever admirable, though necessarily on the whole unsuccessful.

No large or varied economic activity was possible under the ascendency of feudalism. That organization, as has been abundantly shown by philosophical historians, was indispensable for the preservation of order and for public defence, and contributed important elements to general civilization. But, whilst recognizing it as opportune and relatively beneficent, we must not expect from it advan- tages Inconsistent with its essential nature and historical office. The class which predominated in it was not sympathetic with industry, and held the handicrafts in contempt, except those subservient to war or rural sports. The whole practical life of the society was founded on territorial property ; the wealth of the lord consisted in the produce of his lands and the dues paid to him in kind ; this wealth was spent in supporting a body of retainers whose services were repaid by their maintenance There could be little room for manufactures, and less for commerce ; and agriculture was carried on with a view to the wants of the family, or at most of the immediate neighbourhood, not .to those of a wider market. The economy of the period was therefore simple, and, in the absence of special motors from without, unprogressive.

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In the latter portion of the Middle Ages several circum- stances came into action which greatly modified these con- ditions. The crusades undoubtedly produced a powerful economic effect by transferring in many cases the

posses- sions of the feudal chiefs to the industrious classes, whilst by bringing different nations and races into contact, by enlarging the horizon and widening the conceptions of the populations, as well as by affording a special stimulus to navigation, they tended to give a new activity to interna- tional trade. ‘The independence of the towns and the rising importance of the burgher class supplied a counter- poise to the power of the land aristocracy ; and the strength of these new social elements was increased by the corporate constitution given to the urban industries, the police of the towns being also founded on the trade guilds, as that of the country districts was on the feudal relations. The increasing demand of the towns for the products of agriculture gave to the prosecution of that art a more extended and speculative character ; and this again led to improved methods of transport and communication. But the range of commercial enterprise continued everywhere narrow, except in some favoured centres, such as the Italian republics, in which, however, the growth of the normal habits of industrial life was impeded or perverted by military ambition, which was not, in the case of those communities, checked as it was elsewhere by the pressure of an aristocratic class.

Every great change of opinion on the destinies of man and the guiding principles of conduct must react on the sphere of material interests ; and the Catholic religion had a powerful influence on the economic life of the Middle Ages. Christianity inculcates, perhaps, no more effectively than the older religions the special economic virtues of industry, thrift, fidelity to engagements, obedience to law- ful authority; but it brought out more forcibly and presented more persistently the higher aims of life, and so produced a more elevated way of viewing the difierent social relations. It purified domestic life, a reform which has the most important economic results. It taught the doctrine of fundamental human equality, heightened the dignity of labour, and preached with quite a new emphasis the obligations of love, compassion, and forgiveness, and the claims of the poor. The constant presentation to the general mind and conscience of these ideas, the dogmatic bases of which were scarcely as yet assailed by scepticism, must have had a powerful effect in moralizing life. But to the influence of Christianity as a moral doctrine was added that of the church as an organization, charged with the application of that doctrine to men’s daily transactions. Besides the teachings of the sacred books, there was a niass of

ecclesiastical legislation providing specific prescriptions for the conduct of the faithful. And this legislation dealt with the economic as with other provinces of social activity. In the Corpus Juris Canonici, which condenses the result of centuries of study and effort, along with much else is set out what we may call the Catholic economic theory, if we understand by theory, not a reasoned explanation of phenomena, but a body of ideas leading to prescriptions for the guidance of conduct. Life is here looked at from the point of view of spiritual interests; the aim is to establish and maintain amongst men a true kingdom of God.

The canonists are friendly to the notion of a community of goods from the side of sentiment ("Dulcissima rerum possessio communis est"), though they regard the distinc- tion of meum and tuum as an institution necessitated by the fallen state of man. In cases of need the public authority is justified in re-establishing pro hac vice the primitive community. The care of the poor is not a matter of free choice; the relief of their necessities is

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debitum legale. Avaritia is idolatry; cupiditas, even when it does not grasp at what is another's, is the root of all evil, and ought to be not merely regulated but eradicated. Agriculture and handiwork are viewed as legitimate modes of earning food and clothing; but trade is regarded with disfavour, because it»was held almost certainly to lead to fraud : of agriculture it was said, ' Deo non displicet"; but of the merchant, '' Deo placere non potest." The seller was bound to fix the price of his wares, not according to the market rate, as determined by supply and demand, but according to their intrinsic value (justwm pretium). He must not conceal the faults of his merchandise, nor take advantage of the need or ignorance of the buyer to obtain from him more' than the fair price. Interest on money is forbidden ; the prohibition of usury is, indeed, as Roscher says, the centre of the whole canonistic system of economy, as well as the foundation of a great part of the ecclesias- tical jurisdiction. The question whether a transaction was or was not usurious turning mainly on the intentions of the parties ; the innocence or blameworthiness of deal- ings in which money

was lent became rightfully a subject of determination for the church, either by her casuists or in her courts.

The foregoing principles point towards a noble ideal, but by their ascetic exaggeration they worked in some directions as an impediment to industrial progress. Thus, whilst, with the increase of production, a greater division of labour and a larger employment of borrowed capital naturally followed, the laws on usury tended to hinder this expansion. Hence they were undermined by various exceptions, or evaded by fictitious transactions. These laws were in fact dictated by, and adapted to, early condi- tions—to a state of society in which money loans were commonly sought either with a view to wasteful pleasures or for the relief of such urgent distress as ought rather to have been the object of Christian beneficence. But they were quite unsuited to a period in which capital was borrowed for ends useful to the public, for the extension of enter- prise and the employment of labour. The absolute theo- logical spirit in this, as in other instances, could not admit the modification in rules of conduct demanded by a new social situation ; aud vulgar good sense better understood what were the fundamental conditions of industrial life.

When the intellectual activity previously repressed by the more urgent claims of social preoccupations tended to revive towards the close of the medizval period, the want of a rational appreciation of the whole of human affairs was felt, and was temporarily met by the adoption of the results of the best Greek speculation. Hence we find in the writings of St Thomas Aquinas the political and economic doctrines of Aristotle reproduced with a partial infusion of Christian elements. His adherence to his master’s point of view is strikingly shown by the fact that he accepts (at least if he is the author of the De Regimine Principum) his theory of slavery, though by the action of the forces of his own time the last relics of that institution were being eliminated from European society.

This great change—the enfranchisement of the working classes—was the most important practical outcome of the Middle Ages. The first step in this movement was the transformation of slavery, properly so called, into serfdom. The latter is, by its nature, a transitory condition. The serf was bound to the soil, had fixed domestic relations, and participated in the

religious life of the society; and the tendency of all his circumstances, as well as of the opinions and sentiments of the time, was in the direction of liberation. This issue was, indeed, not so speedily reached by the rural as by the urban workman. Already in the second phase serfdom is abolished in the cities and towns, whilst agricultural serfdom does not disappear

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before the third. The latter revolution is attributed by Adam Smith to the operation of selfish interests, that of the proprietor on the one hand, who discovered the superior productiveness of cultivation by free tenants, and that of the sovereign on the other, who, jealous of the great lords, encouraged the encroachments of*the villeins on their authority. But that the church deserves a share of the merit seems beyond doubt—moral impulses, as often happens, conspiring with political and economic motives. The serfs were treated best on the ecclesiastical estates, and the members of the priesthood, both by their doctrine and by their situation since the Northern conquests, were constituted patrons and guardians of the oppressed or subject classes. –

Out of the liberation of the serfs rose the first linea- ments of the hierarchical constitution of modern industry in the separation between the entrepreneurs and the workers. The personal enfranchisement of the latter, stimulating activity and developing initiative, led to accumulations, which were further promoted by the estab- lishment of order and good government by the civic cor- porations which grew out of the enfranchisement. Thus an active capitalist class came into existence. It appeared first in commerce, the inhabitants of the trading cities importing expensive luxuries from foreign countries, or the improved manufactures of richer communities, for which the great proprietors gladly exchanged the raw produce of their lands. In performing the office of carriers, too, between different countries, these cities had an increasing field for commercial enterprise. At a later period, as Adam Smith has shown, commerce promoted the growth of manufactures, which were either produced for foreign sale, or made from foreign materials, or imitated from the work of foreign artificers. But the first import- ant development of handicrafts in modern Europe belongs to the 14th and 15th centuries, and the rise of manufac- turing entrepreneurs is

not conspicuous within the Middle Ages properly so called. Agriculture, of course, lags behind ; though the feudal lords tend to transform them- selves into directors of agricultural enterprise, their habits and prejudices retard such a movement, and the advance of rural industry proceeds slowly. It does, however, pro- ceed, partly by the stimulation arising from the desire to procure the finer objects of manufacture imported from abroad or produced by increased skill at home, partly by the expenditure on the land of capital amassed in the pro- secution of urban industries.

Some of the trade corporations in the cities appear to have been of great antiquity ; but it was in the 13th century that they rose to importance by being legally recognized and regulated. These corporations have been much too absolutely condemned by most of the economists, who insist on applying to the Middle Ages the ideas of the 18th and 19th centuries. They were, it is true, unfitted for modern times, and it was necessary that they should disappear ; their existence indeed was quite unduly prolonged. But they were at first in several respects highly beneficial. They were a valuable rallying point for the new industrial forces, which were strengthened by the rise of the esprit de corps which they fostered. They improved technical skill by the precautions which were taken for the solidity and finished execution of the wares produced in each locality, and it was with a view to the advancement of the industrial arts that St Louis undertook the better organization of the trades of Paris. The cor- porations also encouraged good moral habits through the sort of spontaneous surveillance which they exercised, and they tended to develop the social sentiment within the limits of each profession, in times when a larger public spirit could scarcely yet be looked for.

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The close of the Middle Ages, as Comte has shown, must be placed at the end, not of the 15th, but of the 13th cen- tury. The modern period, which then began, is filled by a development exhibiting three successive phases, and issuing in the state of things which characterizes our own epoch. During the 14th and 15th centuries the Catholico-feudal system was breaking down by the mutual conflicts of its own official members, whilst

the constituent elements of a new order were rising beneath it. On the practical side the ant- agonists matched against each other were the crown and the feudal chiefs ; and these rival powers sought to strengthen themselves by forming alliances with the towns and the industrial forces they represented. The movements of this phase can scarcely be said to find an echo in any contem- porary economic literature. In the second phase of the modern period, which opens with the beginning of the 16th century, the spontaneous collapse of the medieval structure is followed by a series of systematic assaults which still further disorganize it. During this phase the central temporal power, which has made a great advance in stabi- lity and resources, lays hold of the rising elements of manufactures and commerce, and seeks, whilst satisfying the popular enthusiasm for their promotion, to use them for political ends, and make them subserve its own strength and splendour by furnishing the treasure necessary for military success. With this practical effort and the social tendencies on which it rests the mercantile school of poli- tical.economy, which then obtains a spontaneous ascend- ency, is in close relation. Whilst partially succeeding in the policy we have indicated, the European Governments yet on the whole necessarily fail, their origin and nature disqualifying them for the task of guiding the industrial movement ; and the discredit of the spiritual power, with which most of them are confederate, further weakens and undermines them. In the last phase, which coincides approximately with the 18th century, the tendency to a completely new system, both temporal and _ spiritual, becomes decisively pronounced, first in the philosophy and general literature of the period, and then in the great French explosion. The universal critical doctrine, which had been announced by the Protestantism of the previous phase, and systematized in England towards the close of that phase, is propagated and popularized, especially by French writers. The spirit of individualism inherent in the doctrine was eminently adapted to the wants of the time, and the general favour with which the dogmas of the social contract and laissez faire were received indicated a just sentiment of the conditions proper to the contempor- ary situation of European societies. So long as a new coherent system of thought and life could not be intro- duced, what was to be desired was a large and active development of personal energy under no further control of the old social powers than would suffice to prevent anarchy. Governments were therefore rightly called on to abandon any effective direction of the social movement, and, as

far as possible, to restrict their intervention to the maintenance of material order. This policy was, from its nature, of temporary application only; but the negative school, according to its ordinary spirit, erected what was merely a transitory and exceptional necessity into a per- manent and normal law. The unanimous European move- ment towards the liberation of effort, which sometimes rose to the height of a public passion, had various sides, corresponding to the different aspects of thought and hfe; and of the economic side the French physiocrats were the first theoretic representatives on the large scale, though the office they undertook was, both in its destructive and organic provinces, more thoroughly and effectively done

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by Adam Smith, who must be regarded as continuing and completing their work. .

It must be admitted that with the whole modern move- ment serious moral evils were almost necessarily con- nected. he general discipline which the Middle Ages had sought to institute and had partially succeeded in establishing, though on precarious bases, having broken down, the sentiment of duty was weakened along with the spirit of ensemble which is its natural ally, and individual- ism in doctrine tended to encourage egoism in action, In the economic field this result is specially conspicuous. National selfishness and private cupidity increasingly dominate; and the higher and lower industrial classes tend to separation and even to mutual hostility. The new elements—science and industry—which were gradually acquiring ascendency bore indeed in their bosom an ulti- mate discipline more efficacious and stable than that which had been dissolved ; but the final synthesis was long too remote, and too indeterminate in its nature, to be seen through the dispersive and seemingly incoherent growth of those elements. Now, however, that synthesis is becoming appreciable ; and it is the effort towards it, and towards the practical system to be founded on it, that gives its peculiar character to the period in which we live. And to this spontaneous nisus of society corresponds, as we shall see, a new form of

economic doctrine, in which it tends to be absorbed into general sociology and subordinated to morals.

It will be the object of the following pages to verify and illustrate in detail the scheme here broadly indicated, and to point out the manner in which the respective features of the several successive modern phases find their counterpart and reflexion in the historical development of economic speculation.

FIRST MODERN PHASE.

The first phase was marked, on the one hand, by the spontaneous decomposition of the medizval system, and, on the other, by the rise of several important elements of the new order. The spiritual power became less apt as well as less able to fulfil its moral office, and the social movement was more and more left to the irregular impulses of individual energy, often enlisted in the service of am- bition and cupidity. Strong Governments were formed, which served to maintain material order amidst the growing intellectual and moral disorder. The universal admission of the commons as an element in the political system showed the growing strength of the industrial forces, as did also in another way the insurrections of the working classes. The decisive prevalence of peaceful activity was indicated by the rise of the institution of paid armies—at first temporary, afterwards permanent—which prevented the interruption or distraction of labour by devoting a determinate minority of the population to martial opera- tions and exercises. Manufactures became increasingly important ; and in this branch of industry the distinction between the entrepreneur and the workers was first firmly established, whilst fixed relations between these were made possible by the restriction of military training and service to a special profession. Navigation was facilitated by the use of the mariner’s compass. The art of printing showed how the intellectual movement and the industrial develop- ment were destined to be brought into relation with each other and to work towards common ends. Public credit rose in Florence, Venice, and Genoa long before Holland and England attained any great financial importance. Just at the close of the phase, the discovery of America and of the new route to the East, whilst revolutionizing the course of trade,

prepared the way for the establishment of colonies, Which contributed powerfully to the growing preponderance

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of industrial life, and pointed to its ultimate universality, It is doubtless due to the equivocal nature of the stage, standing between the medizval and the fully characterized modern period, that on the theoretic side we find nothing corresponding to this marvellous practical ferment and ex- pansion. The general political doctrine of Aquinas was retained, with merely subordinate modifications. The only special economic question which seems to have received particular attention was that of the nature and functions of money, the importance of which began to be felt as payments in service or in kind were discontinued, and regular systems of taxation began to be introduced. Roscher, and after him Wolowski, have called attcntion to Nicole Orcsine, who died bishop of Lisienx in 1882. Roscher pronounces him a great economist. His 7'ractatus de Origine, Natura, Jure, et Mutationibus Monetarwm (reprinted by Wolowski, 1864) contains a theory of money which is almost entirely correct according to the views of the 19th century, and is stated with such brevity, clear-

ness, and simplicity of language as, more than anything else, show the work to be from the hand of a master.

SECOND MODERN PHASE: MERCANTILE SYSTEM.

Throughout the first modern phase the rise of the new social forces had been essentially spontaneous ; in the second they became the object of systematic encouragement on the part of Governments, which, now that the financial methods of the Middle Ages no longer sufficed, could not further their military and political ends by any other means than increased taxation, implying augmented wealth of the com- munity. Industry thus became a permanent interest of European Governments, and even tended to become the principal object of their policy. In natural harmony with this state of facts, the mercantile system arose and grew, attaining its highest development about the middle of the 17th century.

The mercantile doctrine, stated in its most extreme form, makes wealth and money identical, and regards it therefore as the great object of a community so to conduct

‘its dealings with other nations as to attract to itself the

largest possible share of the precious metals. Each country must seek to export the utmost possible quantity of its own manufactures, and to import as little as possible of those of other countries, receiving the difference of the two values in gold and silver. This difference is called the balance of trade, and the balance is favourable when more money is received than is paid. Governments must resort to all available expedients—prohibition of, or high duties on, the importation of foreign wares, bounties on the export of home manufactures, restrictions on the export of the precious metals—for the purpose of securing such a balance.

But this statement of the doctrine, though current in the text books, does not represent correctly the views of all who must be classed as belonging to the mercantile school. Many of the members of that school were much too clear-sighted to entertain the belief, which the modern student feels difficulty in supposing any class of thinkers to have professed, that wealth consists exclusively of gold and silver. The mercantilists may be best described, as Roscher has remarked, not by any definite economic theorem which they held in common, but by a set of theoretic tendencies, commonly found in combination, though severally prevailing in different degrees in different minds. These tendencies may be enumerated as follows : —(1) towards overestimating the importance of possessing a large amount of the precious metals; (2) towards an undue exaltation (a) of foreign trade over domestic, and (6) of the industry which works up materials over that which provides them; (3) towards attaching too high a value to adense population as an element of national strength ; and (4) towards invoking the action of the state

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in furthering artificially the attainment of the several ends thus proposed as desirable.

If we consider the contemporary position of affairs in western Europe, we shall have no difficulty in understand- ing how these tendencies would inevitably arise. The discoveries in the New World had led to a large de- velopment of the European currencies. The old feudal economy, founded principally on dealings in kind, had given way before the new “money economy,” and the dimensions of the latter were everywhere expanding. Circulation was becoming more rapid, distant communica- tions more frequent, city life and movable property more important. The mercantilists were impressed by the fact that money is wealth swe generis, that it is at all- times in universal demand, and that it puts into the hands of its possessor the power of acquiring all other commodities. The period, again, was marked by the formation of great states, with powerful Governments at their head. These Governments required men and money for the maintenance of permanent armies, which, especially for the religious and Italian wars, were kept up on a great scale. Court expenses, too, were more lavish than ever before, and a larger number of civil officials was employed. The royal domains and dues were insufficient to meet these require- ments, and taxation grew with the demands of the monarchies. Statesmen saw that for their own political ends industry must flourish. But manufactures make possible a denser population and a higher total value of exports than agriculture; they open a less limited and more promptly extensible field to enterprise. Hence they became the object of special Governmental favour and patronage, whilst agriculture fell comparatively into the background. The growth of manufactures reacted on commerce, to which a new and mighty arena had been opened by the establishment of colonies. These were viewed simply as estates to be worked for the advantage of the mother countries, and the aim of statesmen was to make the colonial trade a new source of public revenue. Each nation, as a whole, working for its own power, and the greater ones for predominance, they entered into a com- petitive struggle in the economic no less than in the politi- cal field, success in the former being indeed, by the rulers, regarded as instrumental to pre- eminence in the latter. A national economic interest came to exist, of which the Government made itself the representative head. States became a sort of artificial hothouses for the rearing of urban industries. Production was subjected to systematic regulation with the object of securing the goodness and cheapness of the exported articles, and so maintaining the place of the nation in foreign markets. The industrial control was exercised, in part

directly by the state, but largely also through privileged corporations and trading companies. High duties on imports were resorted to, at first perhaps mainly for revenue, but afterwards in the interest of national production. Commercial treaties were a principal object of diplomacy, the end in view being to exclude the competition of other nations in foreign markets, whilst in the home market as little room as pos- sible was given for the introduction of anything but raw materials from abroad. The colonies were prohibited from trading with other European nations than the parent country, to which they supplied either the precious metals or raw produce purchased with home manufactures. It is evident that what is known as the mercantile doctrine was essentially the theoretic counterpart of the practical activities of the time, and that nations and Governments were led to it, not by any form of scientific thought, but by the force of outward circumstance, and the observation of facts which lay on the surface.

And yet, if we regard the question from the highest

point of view of philosophic history, we must pronounce the universal enthusiasm of this second modern phase for manufactures and commerce to have been essentially just, as leading the nations into the main avenues of general social development. If the thought of the period, instead of being impelled by contemporary circumstances, could have been guided by sociological prevision, it must have entered with zeal upon the same path which it empirically selected. The organization of agricultural industry could not at that period make any marked progress, for the direction of its operations was still in the hands of the feudal class, which could not in general really learn the habits of industrial life, or place itself in sufficient har- mony with the workers on its domains. The industry of the towns had to precede that of the country, and the latter had to be developed mainly through the indirect action of the former. And it is plain that it was in the life of the manufacturing proletariat, whose labours are necessarily the most continuous and the most social, that a systematic discipline could at a later period be first applied, to be afterwards extended to the rural populations.

That the efforts of Governments for the furtherance of manufactures and commerce were really effective towards that end is admitted by Adam

Smith, and cannot reason- ably be doubted, though free trade doctrinaires have often denied it. Technical skill must have been promoted by their encouragements ; whilst new forms of national pro- duction were fostered by attracting workmen from other countries, and by lightening the burden of taxation on struggling industries. Communication and transport by land and sea were more rapidly improved with a view to facilitate traffic; and, not the least important effect, the social dignity of the industrial professions was enhanced relatively to that of the classes before exclusively dominant.

It has often been asked to whom the foundation of the mercantile system, in the region whether of thought or of practice, is to be attributed. But the question admits of no absolute answer. That mode of conceiving economic facts arises spontaneously in unscientific minds, and ideas suggested by it are to be found in the Greek and Latin writers. The policy which it dictates was, as we have shown, inspired by the situation of the European nations at the opening of the modern period. Such a policy had

‘been already in some degree practised in the 14th and

15th centuries, thus preceding any formal exposition or defence of its speculative basis. At the commencement of the 16th century it began to exercise a widely ex- tended influence. Charles V. adopted it, and his example contributed much to its predominance. Henry VIII. and Elizabeth conformed their measures to it. The lead- ing states soon entered on a universal competition, in which each power brought into play all its political and financial resources for the purpose of securing to itself manufacturing and commercial preponderance. Through almost the whole of the 17th century the prize, so far as commerce was concerned, remained in the possession of Holland, Italy having lost her former ascendency by the opening of the new maritime routes, and Spain and Germany being depressed by protracted wars and internal dissensions. The admiring envy of Holland felt by English politicians and economists appears in such writers as Raleigh, Mun, Child, and Temple ; and how strongly the same spectacle acted on French policy is shown by a well-known letter of Colbert to M. de Pomponne, ambas- sador to the Dutch States. Cromwell, by his Navigation Act, which destroyed the carrying trade of Holland and founded the English empire of the sea, and Colbert, by his whole economic policy,

domestic and international, were the chief practical representatives of the mercantile system. From the latter great statesman the Italian

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publicist Mengotti gave to that system the name of | Colbertismo; but it would be an error to consider the French minister as having absolutely accepted its dogmas. He regarded his measures as temporary only, and spoke of protective duties as crutches by the help of which manu- facturers might learn to walk and then throw them away. The policy of exclusions had been previously pursued by Sully, partly with a view to the accumulation of a royal treasure, but chiefly from his special enthusiasm for agriculture, and his dislike of the introduction of foreign luxuries as detrimental to the national character. Colbert's | tariff of 1664 not merely simplified but considerably | reduced the existing duties; the tariff of 1667 indeed increased them, but that was really a political measure | directed against the Dutch. It seems certain that France | owed in a large measure to his policy the vast development of trade and manufactures which so much impressed the imagination of coutemporary Europe, and of which we hear so much from English writers of the time of Petty. But this policy had also undeniably its dark side. Industry was forced by such systematic regulation to | follow invariable courses, instead of adapting itself to changing tastes and popular demand. Nor was it free to simplify the processes of production, or to introduce increased division of labour and improved appliances. Spontaneity, initiation, and invention were repressed or discouraged, and thus ulterior sacrificed in a great measure to immediate results. The more enlightened statesmen, and Colbert in particular, endeavoured, it is true, to mini- mize these disadvantages by procuring, often at great expense, and communicating to the trades through inspec- tors nominated by the Government, information respecting improved processes employed elsewhere in the several arts ; but this, though in some degree a real, was certainly on the whole, and in the long run, an insufficient com- pensation.

We nust not expect from the writers of this stage any exposition of political economy as a whole; the publica- tions which appeared were for the most

part evoked by special exigencies, and related to particular questions, usually of a practical kind, which arose out of the great movements of the time. They were in fact of the nature of counsels to the Governments of states, pointing out how best they might develop the productive powers at their disposal and increase the resources of their respective countries. They are conceived (as List claims for them) strictly in the spirit of national economy, and cosmopoli- tanism is essentially foreign to them. On these mono- graphs the mercantile theory sometimes had little influ- ence, the problems discussed not involving its tenets. But it must in most cases be taken to be the scheme of funda- mental doctrine (so far as it was ever entitled to such a |

description) which in the last resort underlies the writer's | conclusions.

The rise of prices following on the discovery of the American mines was one of the subjects which first attracted the attention of theorists. This rise brought about a great and gradually increasing disturbance of existing economic relations, and so produced mnch perplexity and anxiety, which were all the more felt because the cause of the change was not understood. To this was added the loss and inconvenience arising from the debasement of the currency often resorted to by sovereigns as well as by republican states. Italy suffered most from this latter abuse, which was multiplied by | her political divisions. It was this evil which called forth the | work of Count Gasparo Scaruffi (Discorso sopra le monete e della vera proporzione fra l'oro e largento, 1582). In this he put forward the bold idea of a universal money, everywhere identical in size, shape, composition, and designation. The project was, of course, premature, and was not adopted even by the Italian princes to whom the author specially appealed ; but the reform is one which, doubtless, the future will sce realized. Gian Donato Turbolo, master of the Neapolitan mint, in his Diseorsi e Relazioni, 1629, protested against any tampering with the currency. Another treatise relating to the subject of moncy was that of the Florentine

| stability of states.

POLITIC k# L UO N Ors

Bernardo Davanzati, otherwise known as the able translator of Tacitus, Leztont delle Monete, 1588. It is a slight and somewhat superficial production, only remarkable as written with conciseness and elegance of style.

A French writer who dealt with the question of money, but from Bodin.

a different point of view, was Jean Bodin. In his Képonse aux paradoxes de M. Malestroit touehant Venehérissement de toutes les ehoses et des monnates, 1568, and in his Diseours sur le rehaussement et diminution des monnaies, 1578, he showed a more rational appreciation than many of his contemporaries of the causes of the revolution in prices, and the relation of the variations in money to the market values of -wares in general as well as to the wages of labour. He saw that the amount of money in circulation did not

| constitute the wealth of the community, and that the prohibition

of the export of the precious metals was useless, because rendered inoperative by the necessities of trade. Bodin is no inconsiderable figure in the literary history of the epoch, and did not confine his attention to economic problems ; in his Six livres de la République, about 1576, he studies the general conditions of the prosperity and In harmony with the conditions of his age, he approves of absolute Governments as the most competent to cnsnre the security and wellbeing of their subjects. He enters into an elaborate defence of individual property against Plato and More,

_ rather perhaps because the scheme of his work required the treat-

ment of that theme than because it was practically urgent in his day, when the excesses of the Anabaptists had produced a strong feeling against communistic doctrines. He is under the general influence of the mercantilist views, and approves of energetic Governmental interference in industrial matters, of high taxes ou foreign manufactures and low duties on raw matcrials and articles of food, and attaches great importance to a dense population. But he is not a blind follower of the system ; he wishes for un-limited freedom of trade in many cases ; and he isin advance of his more eminent contemporary Montaigne in perceiving that the gain of one nation

is not necessarily the loss of another. To the public finances, which he calls the sinews of the state, he devotes much attention, and insists on the duties of the Government in respect to the right adjustment of taxation. In gencral he deserves the praise of stcadily kceping in view the higher aims and interests of society in connexion with the regulation and development of its material life.

Correct views as to the cause of the general rise of prices are also put forward by the English writer, W. S. (William Stafford), in his Briefe Conceipte of English Poliey, published in 1581, and dedicated to Queen Elizabeth. It is in the form of a dialogue, and is written with liveliness and spirit. The author seems to have been acquainted with the writings of Bodin. He has just ideas as

Stafford.

to the nature of money, and fully understands the evils arising –

from a debased coinage. He describes in detail the way in which the several interests in the country had been affected by such dcbase- ment in previous reigns, as well as by the change in the value of the precious metals. The great popular grievance of his day, the conversion of arable land into pasture, he attribntes chiefly to the restrictions on the export of corn, which he desires to see abolished. But in regard to manufactures he is at the same point of view with the later mercantilists, and proposes the exclusion of all foreign wares which might as well be provided at home, and the prohibition of the export of raw materials intended to be worked up abroad.

Out of the question of money, too, arose the first remarkable Albertine German production on political economy which had an origina] pamph- national character and addressed the public in the native tongue. Jets.

Duke George of the Ernestine Saxon line was inclined (15380) to introduce a debasement of the currency. A pamphlet, Gemetne

| Stymmen von der Mintze, was published in opposition to this pro-

ceeding, under the auspices of the Albertine branch, whose policy was sounder in the economic sphere no less than in that of ecclesiastical affairs. A reply appeared justifying the Ernestine project. This was followed by a rejoinder from the Albertine side. The Ernestine pamphlet is described by Roscher as ill-written, obscure, inflated, and, as might be expected from the thesis it maintained, sophistical. But it is interesting as containing a statement of the fundamental principles of the mercantile system more than one hundred years before the publication of Mun's book, and forty-six before that of Bodin's Siz livres de la République. The Albertine tracts, accord- ing to Roscher, exhibit such sound views of the conditions and evidences of national wealth, of the nature of money and trade, and of the rights and duties of Governments in relation to economic action, that he regards the unknown author as entitled to a place beside Raleigh and the other English ''colonial-theorists" of the end of the 16th and beginning of the 17th century.

In connexion with the same subject of money we meet the great Coper-

name of Copernicus. His treatise De monetxw eudendzx ratione, 1526 (first printed in 1816), was written by order of King Sigis- mund I., and is an exposition of the principles on which it was pro- posed to reform the currency of the Prussian provinces of Poland. It advocates unity of the monctary system throughout the cntire

nicus.

Serra.

Watte- ville.

Mun.

Child.

Por rrea Tt F-CO NOM Y

state, with strict integrity in the quality of the coin, and the charge of a seigniorage sufficient to cover the expenses of mintage.

Autonio Serra is regarded by some as the creator of modern political economy. He was a native of Cosenza in Calabria. Breve Trattato delle cause ehe possono fare abbondare li reqni doro e @Margento dove non sono miniere, 1613, was written during his imprisonment, which is believed to have been due to his having taken part in the conspiracy of Campanella for the liberation of Naples from the Spanish yoke and the establishment of a republican government. This work, long overlooked, was brought into notice in the following century by Galiani and others. Its title alone would sufficiently indicate that the author had adopted the principles of the nercantile system, and in fact in this treatise the essential doctrines of that system are expounded in a tolerably formal and consecutive manner. He strongly insists on the superiority of manufactures over agriculture as a source of national wealth, and uses in support of this view the prosperity of Genoa, Florence, and Venice, as contrasted with the depressed condition of Naples. With larger insight than many of the mercantilists exhibit, he points out the importance, towards the acquisition of wealth, not alone of favourable external conditions, but of energetic character and industrious habits in a population, as well as of a stable government and a good administration of the laws,

The first systematic treatise on our science which proceeded from a French author was the Traité de Economie Politique, published by Montchretien de Watteville in 1615. The use of the title, says Roscher, now for the first time given to the science, was in itself an important service, since even Bacon understood by “Economia” only the theory of domestic management. The general tendencies and aims of the period are seen in tle fact that this treatise, notwithstanding the comprehensive name it bears, does not deal with agriculture at all, but only with the mechanical arts, navigation, comnierce, and public finance. The author is filled with the then dominant enthusiasm for foreign trade and colonies. He advocates the control by princes of the industry of their subjects, and eondemns the too great freedom, which, in his opinion to their own detriment, the Governments of Spain, Portugal, and Holland had given to trade. His book may be regarded as a formal exposition of the principles of the mercantile system for the use of Frenchmen.

A similar office was performed in England by Thomas Mun. In his two works 4 Discourse of Trade from England unto the East Indies, 2d ed., 1621, and especially in Lngland's T'reasure by Foreign Trade,:1664 (posthumous), we have for the first time a clear and systematic statement of the theory of the balance of trade, as well as of the means by which, according to tle author's view, a favour- able balance could be secured for England. The great object of the economic policy of a state, according to him, should be so to manage its export of manufactures, its direct and carrying trade, and its customs duties as to attract to itself money from abroad. He was, however, opposed to the prohibition of the export of the precious metals in exchange for foreign wares, but on the ground, fully according with his general principles, that those wares might afterwards be re-exported and might then bring back more treasure than liad been originally expended in their purchase; the first export of money might be, as he said, the seed-time, of which the ultimate receipt of a larger amount would be the harvest. He saw, too, that it is inexpedient to have too much money circulating in a country, as this enhances the prices of commodities, and so makes them less saleable to foreigners, but he is favourable to the forma- tion and maintenance of a state treasure.

One of the most remarkable of the moderate mercantilists was Sir Josiah Child (Brief Observations eoncerning Trade and the Interest of Money, 1668, and A New Discourse of Trade, 1668 and 1690). He was one of those who held up Holland as a model for the imitation of his fellow-countrymen. He is strongly impressed with the importance for national wealth and wellbeing of a low rate of interest, which he says is to commerce and agriculture what the soul is to the body, and which he held to be the " cawsa causans of all the other causes of the riches of the Dutch people." Instead of regarding such low rate as dependent on detérminate eonditions, which should be allowed to evolve themselves spontaneously, he thinks it should be created and maintained by public authority. Child, whilst adhering to the doctrine of the balance of trade, observes that a people cannot always sell to foreigners without ever buying from them, and denies that the export of the precious metals is necessarily detrimental. He has the ordinary mercantilist partiality for a numerous population. He advocates the reservation by the mother country of the sole right of trade with her colonies, and, under

certain limitations, the formation of privileged trading companies. As to the Navigation Act, he takes up a position not

1 Writers of less importance who followed the same direetion were Sir Thomas Culpeper (4 Tract against the High Rate of Usury, 1623, and Useful Remark on Iligh Interest, 1641); Sir Dudley Digges (Defence of Trade, 1615); G. Malynes (Consuetudo vel Lex Mercatoria, 1622); E. Misselden (Cirele of Commerce, 1623); Samuel Fortrey (England's Interest and Improvement, 1663 and 1673); and John Pollexfen (England and India inconsistent in their Manufactures, 1697).

His |

unlike that afterwards occupied by Adam Smith, regarding that measure much more favourably from the political than from the economic point of view. It will be seen that he is somewhat eclectic in his opinions ; but he cannot properly be regarded, though some have attributed to him that character, as a precursor of the free- trade school of the 18th century.

Two other eclectics may be here mentioned, in whom just

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Temple and Charles Davenant. upon the United Provinces of the Netherlands, 1672, and his Essay on the Trade of Ireland, 1673, has many excellent remarks on fundamental econoinic principles, as ou the functions of labour and of saving in the production of national wealth; but he is infected with the errors of the theory of the balance of trade. He follows the lead of Raleigh and Child in urging his fellow-countrynien to imitate the example of the Dutch in their economic policy—advice which in his case was founded on his observations during a lengthened residence in Holland as ambassador to the States.

,of Trade, 1699, &c., also takes up an eclectic position, combining some correct views on wealth and money with mercantilist notions on trade, and recommending Governmental restrictions on colonial

commerce as strongly as he advocates freedom of exchange at home.

Whilst the mercantile system represented the prevalent form of economic thought in the 17th century, and was alone dominant in the region of practical statesmanship, there was growing up, side by side with it, a body of opinion, different and indeed hostile in character, which was destined ultimately to drive it from the field. The new ideas were first developed in England, though it was in France that in the following century they took hold of the public mind, and became a power in politics. That they-should first show themselves here, and afterwards be extended, applied, and propagated throughout Europe by French writers, belongs to the order of things according to which the general negative doctrine in morals and politics, undoubtedly of English origin, found its chief home in France, and was thence diffused in widening circles through the civilized world. In England this movement of economic thought took the shape mainly of individual criticism of the prevalent doctrines, founded on a truer analysis of facts and conceptions; in France it was pene- trated with a powerful social sentiment, furnished the creed of a party, and inspired a protest against institutions and an urgent demand for practical reform.

Regarded from the theoretic side, the characteristic features of the new direction were the following. The view of at least the extreme mercantilists that national wealth depends on the accumulation of the precious metals is proved to be false, and the gifts of nature and the labour of man are shown to be its real sources. The exaggerated estimate of the importance of foreign com- merce is reduced, and attention is once more turned to agriculture and the conditions of its successful prosecu- tion. On the side of practical policy, a so-called favour- able balance of trade is seen not to be the true object of a nation’s or a statesman’s efforts, but the procuring for the whole population in the fullest measure the enjoyment of the necessaries and conveniences of life. And—what more than anything else contrasts the new system with the old —the elaborate apparatus of prohibitions, protective duties, bounties, monopolies, and privileged corporations, which the European Governments had created in the sup- posed interests of manufactures and trade, is denounced or deprecated as more an impediment than a furtherance, and the freedom of industry is insisted on as the one thing needful. This circle of ideas, of course, emerges only gradually, and

its earliest representatives in economic literature in general apprehend it imperfectly and advocate it with reserve ; but it rises steadily in importance, being more and more favoured by the highest minds, and finding _an increasing body of supporters amongst the intelligent | public.

views are mingled with mercantilist prejudices—Sir William Sir w. The former in his Observations ‘Temple.

Davenant, in his Essay on the East-India Trade, 1696-97, Essay Daven- on the Probable Ways of making the People Gainers in the Balance ant.

Hobbes.

Sir William Petty.

Sir Dudley North,

Locke,

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Some occasional traits of an economic scheme in harmony with these new tendencies are to be found in the De Cive and Leviathan of Hobbes. But the efficacy of that great thinker lay rather in the general philosophic field; and by systematizing, for the first time, the whole negative doctrine, he gave a powerful impulse towards the demolition of the existing social order, which was destined, as we shall see, to have momentous consequences in the economic no less than in the strietly political department of things. .

A writer of no such extended range, but of much sagacity and good sense, was Sir WitL1AM Perry (qg.v.), author of a number of pieces containing germs of a sound economic doctrine. A leading thought in his writings is that “labour is the father and active prineiple of wealth, lands are the mother.” He divides a population into two classes, the productive and the unproductive, according as they are or are not occupied in producing useful material things. The value of any commodity depends, he says, anticipating Ricardo, on the amount of labour necessary for its produetion. He is desirous of obtaining a universal measure of value, and ehooses as his unit

the average food of the cheapest kind required for a man's daily sustenance. He understands the uature of the rent of land as the excess of price over the cost of production. He disapproves of the attempt to fix by authority a inaximum rate of interest, and is generally opposed to Governmental interference with the course of industry. He sees that a country requires for its exchanges a definite quautity of money and may have too much of it, and eondemns the prohibition of its exporta- tion. He holds that one only of the precious metals must be the foundation of the currency, the other circulating as an ordinary article of merehandise. Petty's name is specially associated with the progress of statistics, with which he was much occupied, and which he called by the name of political arithmetic. Relying on the results of such inquiries, he set himself strongly against the opinion which had been advanced by the author of Britannia Lan- guens (1680), Fortrey, Roger Coke, and other writers, that the prosperity of England was on the decline.

The inost thorough-going and emphatic assertion of the free- trade doctrine against the system of prohibitions which had gained strength by the Revolution was contained in Sir Dudley North's Discourses upon Trade, 1691. He shows that wealth may exist independently of gold or silver, its source being human industry, applied either to the cultivation of the soil or to manu- factures. 'The precious metals, however, are one element of national wealth, and perform highly important offices. Money may exist in excess, as well asin defect, in a eountry; and the quantity of it required for the purposes of trade will vary with cireum- stances ; its ebb and flow will regulatc themselves spontaneously. It is a mistake to suppose that stagnation of trade arises from want of money ; it must arise either from a glut of the home market, or from a disturbance of foreign eommerce, or from diminished con- sumption caused by poverty. The export of money in the eourse of traffic, instead of diminishing, increases the national wealth, trade being only an exchange of superfluities. Nations are related to the world just in the same way as cities to the state or as families to the city. North emphasizes more than his predecessors the value of the home trade. With respect to the interest of capital, he maintains that it depends, like the price of any commodity, on the proportion of demand and supply, and that a low rate is a result of the relative increase of capital, aud cannot be bronght about by arbitrary regulations, as had been proposed by Child and others. In

arguing the question of free trade, he urges that individuals often take their private interest as the measure of good and evil, and would for its sake debar others from their equal right of buy- ing and selling, but that every advantage given to one interest or branch of trade over another is injurious to the public. No trade is unprofitable to the public; if it were, it would be given up; when trades thrive, so does the public, of which they form a part. Prices must detcrmine themselves, and cannot be fixed by law; and all forcible interference with them docs harm instead of good. No people can become rich by state regulations,—only by peace, industry, freedom, and unimpeded economic activity. It will be seen how closely North's view of things approaches to that embodied some eighty years later in Adam Smith's great work.

Locke is represented by Roscher as, along with Petty and North, | making up the "triumvirate" of eminent British economists of |

this period who laid the foundations of a new and more rational doctrme than that of the mercantilists. But this view of his claims seems eapable of being accepted only with considerable de- ductions. His specially economic writings are Considerations of the lowering of Interest and raising the value of Money, 1691, and Further Considerations, 1698. Though Leibnitz declared with respect to these treatises that nothing more solid or intelligent eould be said on their subject, it is diffieult absolutely to adopt that verdict. Locke's spirit of sober observation and patient analysis led him indeed to some just conclusions ; and he is entitled

to the eredit of having energetically resisted the debasement of the currency,

held to be eminent practical authorities. But he falls into errors

whieh was then recommended by some who were |

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which show that he had not by any means completely emancipated himself from the ideas of the mercantile system. He attaches far too much importance to money as such. He says expressly that riches consist in a plenty of gold and silver, that is, as he explains, in having nore in

proportion of those metals than the rest of the world or than our neighbours. ‘In a country not furnished with nines, there are but two ways of growing rieh, either conquest or eommerce.” Hence he accepts the doctrine of the balance of trade. He shows that the rate of interest can no more be fixed by law than the rent of houses or the hire of ships, and opposes Child’s demand for legislative intcrference with it: But he erroneously attributed the fall of the rate which had taken place generally in Europe to the increase of the quantity of gold and silver by the discovery of the American mines. He sets too absolute a value on a numerous population, in this point agreeing with Petty. On wages he observes that the rate must be such as to cover the indispensable wants of the labourer; when the price of subsistence rises, wages must rise in a like ratio, or the working population must come on the poor-rates. The fall of the rent of land he regards as a snre sign of the decline of national wealth. ‘‘Taxes, however contrived, and out of whose hands soever immediately taken, do, in a country where their great fund is in land, for the most part terminate upon land.” In this last proposition we see a foreshadowing of the impét unique of the physiocrats. Whatever may have been Locke’s direct economic services, his principal importance, like that of Hobbes, lies in his general philosophic and political principles, which power- fully affected French and indeed European thought, exciting a spirit of opposition to arbitrary power, and laying the foundation of the doctrine developed in the Contrat Social.}

THIRD MODERN PHASE: SYSTEM OF NATURAL LIBERTY.

Both in England and France the ruling powers had already begun to be alarmed by the subversive tendencies which a)jpeared inherent in the modern movement, and took up in consequence an attitude of resistance. Reaction became triumphant in France during the latter half of the reign of Louis XIV. under the disastrous influence of Madame de Maintenon. In England, after the transaction of 1688, by which the government was consolidated on the double basis of aristocratic power and official orthodoxy, the state policy became not so much retrograde as stationary, industrial conquest being put forward to satisfy the middle class and wean it from tlie pursuit of a social renovation. In both countries there was for some time a noticeable check in the intellectual development, and Roscher and others have observed that, in economic studies particularly, the first three

decades of the 18th century were a period of general stagnation, eclecticism for the most part taking the place of originality. The movement was, however, soon to be resumed, but with an altered and more formid- able character. The negative doctrine, which had risen and taken a definite form in England, was diffused and popularized in France, where it became evident, even before the decisive explosion, that the only possible issue lay in a radical social transformation. The partial schools of Voltaire and Rousseau in different ways led up to a violent crisis, whilst taking little thought of the conditions of a system which could replace the old; but the more complete and organic school, of which Diderot is the best representative, looked through freedom to reorganization. Its constructive aim is shown by the design of the Hncy- clopédie,—a project, however, which could have only a temporary success, because no real synthesis was forth- coming, and this joint production of minds often divergent could possess no more than an external unity. It was with this great school that the physiocrats were specially connected; and, in common with its other members, whilst

1 Minor English writers who followed the new economic direction wcre Lewis Roberts, Treasure of Trafick, 1641; Rice Vaughan, Discourse of Coin and Coinage, 1675; Nicholas Barbon, Discourse concerning Coining the new money lighier, 1696, inwhichsome of Locke’s crrors were pointed out; and the author of an anonymous | book entitled Considerations on the East India Trade, 1701. Practical questions much debated at this period were those connected with banking, on which a | lengthened controversy took place, S. Lamb, W. Potter, F. Cradocke, M. Lewis, | M. Godfrey, R. Murray, H. Chamberlen, and W. Paterson, founder of the Bank of England (1694), producing many pamplicts on the subject; and the manage- , Ment of the poor, which was treated by Locke, Sir Matthew Hale, R, Haines, ; 2. Firmin, and others..

Bois- guille- bert.

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| and furtherance ; that the often despised and wronged lower class

pushing towards an entire change of the existing system, they yet would gladly have avoided political demolition through the exercise of a royal dictatorship, or contemplated it only as the necessary condition of a new and better order of things. But, though marked off by such tendencies from the purely revolutionary sects, their method and funda- mental ideas were negative, resting, as they did, essenti- ally on the basis of the jus nature. We shall follow in detail these French developments in their special relation to economic science, and afterwards notice the correspond- ing movements in other European countries which showed themselves before the appearance of Adam Smith, or were at least unaffected by his influence.

1. Before Adam Smith.

france.—The more liberal, as well as more rational, principles put forward by the English thinkers of the new type began, early in the 18th century, to find an echo in France, where the clearer and more vigorous intellects were prepared for their reception by a sense of the great evils which exaggerated mercantilism, serving as instru- ment of political ambition, had produced in that country. The impoverished condition of the agricultural population, the oppressive weight and unequal imposition of taxation, and the unsound state of the public finances had produced a general feeling of disquiet, and led several distinguished writers to protest strongly against the policy of Colbert and to demand a complete reform.

The most important amongst them was Pierre Boisguillebert, whose whole life was devoted to these controversies. In his statistical writings (Détail de la France sous le régne présent, 1697 ; Faetum de la Franee, 1707) he brings out in gloomy colours the dark side of the age of Louis XIV., and in his theoretic works (Traité de la nature et du ecommerce des grains ; Dissertations sur la nature des richesses de Vargent et des tributs ; and Essai sur la rareté de V’argent) he appears as an earnest, even passionate, antagonist of the mercantile school. He insists again and again on the fact that national wealth does not consist in gold and silver, but in useful things, foremost among which are the products of agriculture. He

even goes so far as to speak of “argent criminel,” which from’ >

being the slave of trade, as it ought to be, had become its tyrant. He sets the " genuinely French Sully" far above the " Italianizing Colbert," and condemns all arbitrary regulations affecting either foreign or internal commerce, especially as regards the corn trade. National wealth does not depend on Governments, whose inter- ference does more harni than good; the natural laws of the economic order of things eannot be violated or neglected with impunity ; the interests of the several classes of society in a system of freedom are identical, and those of individuals coincide with that of the state. A similar solidarity exists between different nations; in their eco- nomic dealings they are related to the world as individual towns to a nation, and not merely plenty, but peace and harmony, will result from their unfettered intercourse. Men he divides into two classes —those who do nothing and enjoy everything, and those who labour from morning to night often without earning a bare subsistence;

- the latter he would favour in every way. Here wecatch the breath

Vauban.

of popular sympathy which fills the social atmosphere of the 18th century. He dwells with special emphasis on the claims of agriculture, which had in France fallen into unmerited neglect, and with a view to its improvement calls for a reform in taxation. He would replace indirect taxes by taxes on income, and would restore the payment of taxes in kind, with the object of securing equality of burden and eliminating every element of the arbitrary. He has some interesting views of a general character: thus he approximates to a correct conception of agricultural rent; and he points to the order in which human wants follow each other, —those of necessity, convenience, comfort, superfluity, and ostentation suc- ceeding in the order named,-and ceasing in the inverse order to be felt as wealth decreases. The depreciating tone in which Voltaire speaks of Boisguillebert (Siecle de Lowis XIV., chap. 30) is certainly not justified; he had a great economic talent, and his writings contain important germs of truth. But he appears to have exerted little influence, theoretical or practical, in his own time.

The same general line of thought was followed by the illustrious Vauban in his economic tracts, especially that bearing the title of Projet d'une dixme Royale, 1707. He is deeply impressed with the deplorable condition of the

working classes of France in his day. He urges that the aim of the Government should be the welfare of all orders of the community; that all are entitled to like favour

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is the basis of the social organization ; that labour is the foundation of all wealth, and agriculture the most important species of labour; that the most essential condition of successful industry is freedom ; and that all unnecessary or excessive restrictions on manufactures and commerce should be swept away. He protests in particular against the inequalities of taxation, and the exemptions and privileges enjoyed by the higher ranks. With the exception of some duties on consumption he would abolish all the existing taxes, and substitute for them a single tax on income and land, imparti- ally applied to all classes, which he describes under the name of " Dixme Royale," that is to say, a tenth in kind of all agricultural produce, and a tenth of money income chargeable on manufacturers and traders.

The liberal and humane spirit of Fénelon led hin: to aspire after freedom of commerce with foreign nations, and to preach the doc- trine that the true superiority of one state over another lies in the number indeed, but also in the morality, intelligence, and indus- trious habits of its population. The Z'élémaque, in which these views were presented in an attractive form, was welcomed and read amougst all ranks and classes, and was thus an effective organ for the propagation of opinion.

After these writers there is a marked blank in the field of French economic thought, broken only by the Réflexions Politiques sur les Finanees et le Commerce (1738) of Dutot, a pupil of Law, and the semi-mercantilist Essais Politiques sur le Commeree (1781) of Mélon, till we come to the great name of Montesquieu. The Esprit des Lois, so far as it deals with economic subjects, is written upon the whole from a point of view adverse to the mercantile system, especially in his treatment of money, though in his observations on colonies and elsewhere he falls in witli the ideas of that system. His immortal service, howéver, was not rendered by any special research, but by his enforcement of the doctrine of natural laws regulating social no less than physical phenomena. There is no other thinker of

importance on economic subjects in France till the appearance of the physiocrats, which marks an epoch in the history of the science.

The heads of the physiocratic school were Francois Quesnay (1694-1774) and Jean Claude Marie Vincent, sieur de Gournay (1712-1759). The principles of the school had been put forward in 1755 by Cantillon, a French merchant of Irish extraction (Hssai sur la nature du Commerce en général), whose biography Jevons has elucidated, and whom he regards as the true founder of political economy; but it was in the hands of Quesnay and Gournay that they acquired a systematic form, and became the creed of a united group of thinkers and practical men, bent on carrying them into action. The members of the group called themselves “les économistes,” but it is more convenient, because unambiguous, to designate them by the name “ physiocrates,” invented by Dupont de Nemours, who was one of their number. In this name, intended to express the fundamental idea of the school, much more is implied than the subjection of the phenomena of the social, and in particular the economic, world to fixed rela- tions of co-existence and succession. This is the positive doctrine which lies at the bottom of all true science. But the law of nature referred to in the title of the sect was something quite different. The theological dogma which represented all the movements of the universe as directed by divine wisdom and benevolence to the production of the greatest possible sum of happiness had been trans- formed in the hands of the metaphysicians into the con- ception of a jus nature, a harmonious and beneficial code established by the favourite entity of these thinkers, Nature, antecedent to human institutions, and furnishing the model to which they should be made to conform. This idea, which Buckle apparently supposes to have been an invention of Hutcheson’s, had come down through Roman juridical theory from the speculations of Greece. It was taken in hand by the modern negative school from Hobbes to Rousseau, and used as a powerful weapon of assault upon the existing order of society, with which the “natural ” order was perpetually contrasted as offering the perfect type from which fact had deplorably diverged. The theory received different applications according to the diversity of minds or circumstances. By some it was

Fénelon.

Montes- quien.

Physio- crats.

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directed against the artificial manners of the times," by others against contemporary political institutions ; it was specially employed by the physiocrats in criticizing the economic practice of European Governments. >

The general political doctrine is as follows. Society is composed of a number of individuals all having the same natural rights. If all do not possess (as some members of the negative school maintained) equal capacities, each can at least best understand his own interest, and is led by nature to follow it. The social union is really a contract between these individuals, the object of which is the limitation of the natural freedom of each, just so far as it is inconsistent with the rights of the others. Government, though necessary, is a necessary evil; and the governing power appointed by consent should be limited to the amount of interference absolutely required to secure the fulfilment of the contract. In the economic sphere, this implies the right of the individual to such natural enjoyments as he can acquire by his labour. That labour, therefore, should be undisturbed aud unfettered; and its fruits should be guaranteed to the possessor; in other words, property should be sacred. Each citizen must be allowed to make the most of his labour; and therefore freedom of exchange should be ensured, and competition in the market should be unrestricted, no monopolies or privileges being permitted to exist.

The physiocrats then proceed with the econoniic analysis | Only those labours are truly '" productive"

as follows. which add to the quantity of raw materials available for the purposes of man; and the real annual addition to the wealth of the community consists of the excess of the inass of agricultural products (including, of course, metals) over their cost of production. On the amount of this "produit net" depends the wellbeing of the community, and the possibility of its advance in civilization. The manufacturer merely gives a

new form to the materials extracted from the earth; the higher value of the object, after it has passed through his hands, only represents the quantity of provisions and other materials used and con- sumed in its elaboration. Commerce does nothing more than transfer the wealth already existing from one hand to another; what the trading classes gain thereby is acquired at the cost of the nation, and it is desirable that its amount should be as small as possible. The occupa- tions of the manufacturer and merchant, as well as the

"useful" indeed, but they are "sterile," drawing their income, not from any fund which they themselves create, but from the superfluous earnings of the agriculturist. Perfect freedom of trade not only rests, as we have already seen, on the foundation of natural right, but is also recom- mended by the consideration that it makes the " produit net," on which all wealth and general progress depend, as large as possible. " Laissez faire, laissez passer" should therefore be the motto of Governments. The revenue of the state, which must be derived altogether from this net product, ought to be raised in the most direct and simplest way,—namely, by a single impost of the nature of a land tax.

The special doctrine relating to the exclusive produc- tiveness of agriculture arose out of a confusion between "value" on the one hand and " matter and energy " on the other. Smith and others have shown that the attempt to fix the character of "sterility" on manufactures and commerce was founded in error. And the proposal of a single ¢mpét territorial falls to the ground with the doctrine on which it was based. But such influence as the school exerted depended little, if at all, on these peculiar tenets, which indeed some of its members did not hold, The effective result of its teaching was mainly destructive. It

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continued in a more systematic form the efforts in favour of the freedom of industry already begun in England and France. The essential historical office of the physiocrats was to discredit radically the methods followed by the European Governments in their dealings with industry. For such criticism as theirs there was, indeed, ample room: the policy of Colbert, which could be only tempor- arily useful, had been abusively extended and

intensified ; Governmental action had intruded itself into the minutest details of business, and every process of manufacture and transaction of trade was hampered by legislative restric- tions. It was to be expected that the reformers should, in the spirit of the negative philosophy, exaggerate the vices of established systems; and there can be no doubt that they condenined too absolutely the economic action of the state, both in principle and in its historic manifesta- tions, and pushed the “laissez faire” doctrine beyond its just mits. But this was a necessary incident of their connexion with the revolutionary movement, of which they really formed one wing. In the course of that movement, the primitive social contract, the sovereignty of the people, and other dogmas now seen to be untenable were habitually invoked in the region of politics proper, and had a transitory utility as ready and effective instru- ments of warfare. And so also in the economic sphere the doctrines of natural rights of buying and selling, of the sufficiency of enlightened selfishness as a guide in mutual dealings, of the certainty that each member of the society will understand and follow his true interests, and of the coincidence of those interests with the public welfare, though they will not bear a dispassionate examination, were temporarily useful as convenient and serviceable weapons for the overthrow of the established order. The tendency of the school was undoubtedly to consecrate the spirit of individualism, and the state of non-government. But this tendency, which may with justice be severely condemned in economists of the present time, was then excusable because inevitable. And, whilst it now impedes the work of reconstruction which is for us the order of the day, it then aided the process of social demolition, which was the necessary, though deplorable, condition of a new organization.

These conclusions as to the revolutionary tendencies of the school are not at all affected by the fact that the form

| of government preferred by Quesnay and some of his chief liberal professions, and every kind of personal service, are |

followers was what they called a legal despotism, which should embrace within itself both the legislative and the executive function. The reason for this preference was that an enlightened central power could more promptly and efficaciously introduce the policy they advocated than an assembly

representing divergent opinions, and fettered by constitutional checks and limitations. Turgot, as we know, used the absolute power of the crown to carry into effect some of his measures for the liberation of industry, though he ultimately failed because unsustained by the requisite force of character in Louis XVI. But what the physiocratic idea with respect to the normal method of government was appears from Quesnay's advice to the dauphin, that when he became king he should "do nothing, but let the laws rule," the laws having been of course first brought into conformity with the jus nature. The partiality of the school for agriculture was in harmony with the sentiment in favour of "nature" and primitive simplicity which then showed itself in so many forms in France, especially in combination with the revolutionary spirit, and of which Rousseau was the most eloquent exponent. It was also associated in these writers with a just indignation at the wretched state in which the rural labourers of France had been left by the scandalous neglect of the superior orders of society—a state of which the

Quesnay.

Gournay.

V. Mira- beau.

Dupont de

Nemours.

rower frre: HeC oO N Ow Y

terrible picture drawn by La Bruyére is an indestructible record. The members of the physiocratic group were undoubtedly men of thorough uprightness, and inspired with a sincere desire for the public good, especially for the material and moral elevation of the working classes. Quesnay was physician to Louis XV., and resided in the palace at Versailles; but in the midst of that corrupt court he maintained his integrity, and spoke with manly frankness what he believed to be the truth. And never did any statesman devote himself with greater singleness of purpose or more earnest

endeavour to the service of his country than Turgot, who was the principal practical representative of the school.

The publications in which Quesnay expounded his system were the following :—two articles, on “ Fermiers” and on “Grains,” in the Encyclopédie of Diderot and D’Alembert (1756, 1757) ; a discourse on the law of nature in the Physiocratie of Dupont de Nemours (1768); Afaximes générales de gouvernement économique dun royaume agricole (1758), and the simultaneously published Tableau Economique avec son explication, ow Extrait des Economies Royales de Sully (with the celebrated motto “pauvres paysans, pauvre royaume; pauvreroyaume, pauvreroi”); Dialogue sur le commerce et les travaux des artisans ; and other minor pieces. The Tableau Economique, though on account of its dryucss and abstract form it met with little general favour, may be considered the principal manifesto of the school. It was regarded by the followers of Quesnay as entitled to a place amongst the foremost products of human wisdom, and is nained by the elder Mirabeau, in a passage quoted by Adam Smith, as one of the three great inventions which have contributed most to the stability of political societies, the other two being those of writing and of money. Its object was to exhibit by means of certain formulas the way in which the products of agriculture, which is the only source of wealth, wonld in a state of perfect liberty be distributed among the several classes of the community (namely, the productive classes of the proprietors and cultivators of land, and the unproductive class composed of manu- facturers and merchants), and to represeut by other formulas the modes of distribution which take place under systems of Govern- mental restraint and regulation, with the evil results arising to the whole society from different degrees of such violations of the natural order. It follows from Quesnay’s theoretic views that the one thing deserving the solicitude of the practical economist and the statesman is the increase of the net product; and he infers also what Smith afterwards affirmed ou not quite the same ground, that the interest of the landowner is “‘strictly and indissolubly connected with the general interest of the society.”

Jean V. Gournay, as we have seen, was regarded as one of the founders of the school, and appears to have exercised some influence even upon the formation of Quesnay’s own opinions. With the exception of a translation of

Sir Josiah Child, Gournay wrote nothing but memoirs addressed to ministers, which have not seen the light; but we have a full statement of his views in the Lloge dedicated to his memory by his illustrious friend Turgot. Whilst Quesnay had spent his youth amidst rural scenes, and had been carly familiar with the labours of the field, Gournay had been bred as a merchant, and had passed from the counting- house to the office of intendant of commerce. They thus approached the study of political economy from different sides, and this diversity of their antecedents may in part explain the amount of divergence which cxisted between their views. Gournay softened the rigour of Quesnay's system, and brought it nearer to the truth, by rejecting what Smith calls its "capital crror" —the doctrine, namely, of the unproductiveness of manufactures and commerce. He directed his efforts to the assertion and vindication of the principle of industrial liberty, and it was by him that this principle was formulated in the phrase, since so often heard for good and for evil, "Laissez faire, laissez passer." One of the earliest and most com- plete adherents of the physiocratic school, as well as an ardent and unwearied propagator of its doctrines, was Victor Mirabeau, whose sincere and independent, though somewhat perverse and whimsical, character is familiar to English readers through Carlyle's essay on his more celebrated son. He had expressed some physiocratic views earlier than Quesnay, but owned the latter for his spiritual father, and adopted most of his opinions, the principal difference being that he was favourable to the petite as opposed to the grande culture, which latter was preferred by his chief as giving, not indeed the largest gross, but the largest net product. Mirabeau's principal writing's were Ami des Hommes, ow traité sur la population (1756, 1760), Théorie de Vimpét (1760), Les Economiques (1769), and Philosophie rurale, ou Economie générale et politique de? Agriculture (1763). The last of these was the earliest complete exposition of the physiocratic system. Another earnest and persevering apostle of the system was Dupont de Nemours (1739-1817), known by his

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treatises "De Pexportation et de UVimportation des grains (1764), De Vorigine et des progres d'une science nouvelle (1767), Du eommerce de la Compagnie des Indes (1767), and especially by his nore com- prehensive work Phystocratie, ou Constitution naturelle du gouverne- ment le plus

avantageux au genre humain (1768). The title of this work gave, as has been already mentioned, a name to the school.

Another formal exposition of the system, to which Adam Smith Lariviére.

refers as ‘‘the most distinct and best connected account” of it, was produced by Mercier-Lariviére, under the title L’Ordre naturel et essentiel des sociétés politiques (1767), a title which is interesting as embodying the idea of the gus nature. Both he and Dupont de Nemours professed to study human communities, not only in rela- tion to their economic, but also to their political and general social aspects ; but, notwithstanding these larger pretensions, their views were commonly restricted in the main to the economic sphere ; at least material considcrations decidedly preponderated in their inquiries, as was naively indicated by Lariviére when he said, “Property, security, liberty—these comprise the whole social order ; the right of property is a tree of which all the institutions of society arc branches.”

» The most eminent member of the group was without doubt Anne Turgot.

Robert Jacques Turgot (1727-1781). This is not the place to speak of his noble practical activity, first as intendant of Limoges, and afterwards for a bricf period as finance minister, or of the circum- stances which led to his removal from office, and the consequent failure of his efforts for the salvation of France. His economic views are explained in the introductions to his edicts and ordi- nances, in letters and occasional papers, but especially in his Réflexions sur la formation et la distribution des richesses (1766). This is a condensed but eminently clear and attractive exposition of the fundamental principles of political economy, as they were conceived by the physiocrats. It embodies, indeed, the erroneous no Jess than the sound doctrines of that school ; but several sub- jects, especially the various forms of land-economy, the different cinployments of capital, and the legitimacy of interest, are handled in a generally just as well as striking manner ; and the mode of presentation of the ideas, and the luminous arrangement of the whole, are Turgot’s own. The treatise, which contains a surprising amouut of matter in proportion to its length, must always retain a place among the classics of the science.

The physiocratic school never obtained much direct popular influence, even in its native country, though it strongly attracted many of the more gifted and earnest minds. Its members, writing on dry subjects in an austere and often heavy style, did not find acceptance with a public which demanded before all things charm of manner in those who addressed it. When Morellet, one of their number, entered the lists with Galiani, it was seen how esprit and eloquence could triumph over science, solid indeed, but clumsy in its movements. The physio- cratic tenets, which were in fact partially erroneous, were regarded by many as chimerical, and were ridiculed in the contemporary literature, as, for example, the apédt unique by Voltaire in his L'homme aux quarante écus, which was directed in particular against Mercier-Larivicre. It was justly objected to the group that they were too absolute in their view of things; they supposed, as Smith remarks in speaking of Quesnay, that the body politic could thrive only under one precise régime,—that, namely, which they recommended,—and thought their doctrines universally and immediately applicable in practice. They did not, as theorists, sufficiently take into account national diversities, or different stages in social development ; nor did they, as politicians, adequately estimate the impedi- ments which ignorance, prejudice, and interested opposi- tion present to enlightened statesmanship. It is possible that Turgot himself, as Grimm suggests, owed his failure in part to the too unbending rigour of his policy and the absence of any attempt at conciliation. Be this as it may, his defeat helped to impair the credit of his principles, which were represented as having been tried and found wanting. wee.

The physiocratic system, after guiding in some degree the policy of the Constituent Assembly, and awakening a few echoes here and there in foreign countries, soon ceased to exist as a living power; but the good elements it com- prised were not lost to mankind, being incorporated into

Bandini.

Genovesi.

Galiani,

the sounder and more complete construction of Adam Smith.

Italy.—In Italy, as in the other European nations, there was little activity in the economic field during the first half of the 18th century. It was then, however, that a really remarkable man appeared, the archdeacon Salustio Antonio Bandini (1677-1760), author of the Discorso sulla Maremma Sienese, written in 1737, but not published till 1775. The object of the work was to raise the Maremma from the wretched condition into which it had fallen through the decay of agriculture. This decay he showed to be, at least in part, the result of the wretched fiscal system which was in force ; and his book led to important reforms in Tuscany, where his name is held in high honour. Not only by Pecchio and other Italian writers, but by Roscher also, he is alleged to have anticipated some leading doc-

trines of the physiocrats, but this claim is disputed. There |

was a remarkable renascence of economic studies in Italy during the latter half of the century, partly due to French influence, and partly, it would appear, to improved govern- ment in the northern states.

The movement at first followed the lines of the mercantile school. Thus, in Antonio Broggia's Z'rattati dei tributi e delle monete c del governo politico della societa (1743), and Girolamo Belloni's Dis- sertazione sopra il commercto (1750), which seems to have had a success and reputation much above its merits, mercantilist tendencies decidedly preponderatc. But the most distinguished writer who re- presented that economic doctrine in Italy in the last century was Antonio Genovesi, a Neapolitan (1712-1769). He felt deeply the depressed intellectual and moral state of his fellow-countrymen, and aspired after a revival of philosophy and reform of education as the first condition of progress and wellbeing. With the object of protect- ing him from the theological persecutions which threatened him on account of his advanced opinions, Bartolomeo Intieri, of whom we shall hear again in relation to Galiani, founded in 1755, ex- pressly for Genovesi, a chair of commerce and mechanics, one of the conditions of foundation

being that it should never be filled by a monk. This was the first professorship of economics established in Europe ; the second was founded at Stoekholm in 1758, and the third in Lombardy ten years later, for Beccaria. he fruit of the labours of Genovesi in this chair was his Leztoni di commercio, ossia di cconomia civile (1769), which contained the first systematic treatment of the whole subject which had appeared in Italy. As the model for Italian imitation he held up England, a country for which, says Pecchio, he had a predilection almost amounting to fanaticism. He docs not rise above the false economic system which England then pursued ; but he rejects some of the grosser errors of the school to which he belonged ; he advocates the freedom of the corn trade, and deprecates regulation of the interest on loans. In the spirit of his age, he denounces the relics of medieval lustitutions, such as entails and tenures in mortmain, as impedi-

ments to the national prosperity. Ferdinando Galiani was another |

distinguished disciple of the mercantile school. Before he had comn- pleted his twenty-first year he published a work on moncy (Della moncta libri cinque, 1750), the principles of which are supposed to have been dictated by two experienced practical men, the marquis Rinuccini and Bartolomco Iutieri, whose name we have already met, But his reputation was made by a book written in French and published in Paris, where he was secretary of embassy, in 1770, namely, his Dialogues sur le commerce des blés. This work, by its light and pleasing style, and the vivacious wit with which it abounded, delighted Voltaire, who spoke of it as a book in the pro- duction of which Plato and Molitre might have been combined ! The author, says Pecchio, treated his arid subject as Fontenelle did the vortices of Descartes, or Algarotti the Newtonian systcm of the world. The question at issue was that of the freedom of the corn trade, then much agitated, and, in particular, the policy of the royal edict of 1764, which permitted the exportation of grain so long as the price had not arrived at a certain height. The general principle he maintains is that the best system in regard to this trade is to have no system, —countries differently circumstanced requiring, ac- cording to him, different modes of treatment. This seems a lame and impotent conelusion from the side of science; yet doubtless the physiocrats, with whom his controversy lay, prescribed on this, as on other snbjects,

rules too rigid for the safe guidance of statesmen, and Galiani may have rendered a real service by protesting against their absolute solutions of practical problems. He fell, however, into some of the most serious errors of the mercantilists, —holding, as indeed did also Voltaire and even Verri, that one country cannot gain without another losing, and in his earlier treatise going so far as to defend the action of Governments in debasing the currency.

Amongst the Italian cconoinists who were most under the influ-

ence of the modern spirit, and in closest harmony with the general movement which was impelling the Western nations towards a new social order, Cesare Beccaria (1738-1794) holds a foremost place. He is best known by his celcbrated treatise Dei dclitti e delle pene, by which Voltaire said he had made himsclf a benefactor of all Europe, and which, we are told, has been translated into twenty-two languages. The empress Catherine having invited him to fix his residence at St Petersburg, the Austrian Govcrument of Lombardy, in order to keep him at home, established expressly for him a chair of political economy; and in his Lilementi di economia pubblica (1769-1771 ; not published, however, till 1804) are embodied his teachings as professor. The work is unfinished: he had divided the whole subject under the heads of agriculture, manufactures, commerce, taxation, government; but he has treated adequately only the first two heads, and the last two not at all, having been called to take part in the councils of the state. He was in some degree uuder the influence of physiocratic ideas, and holds that agriculture is the only strictly productive form of industry, whilst manufacturers and artisans arc a sterile class. He was strongly opposed to monopolics and privileges, and to corporations in arts and trades ; in general he warmly advocated interna] industrial frecdom, though in regard to foreign commerce a protectionist. In the special case of the corn trade he was not, any more than Galiani, a partisan of absolute liberty. His exposition of economic principles is concise and sententious, and he often states correctly the most important considerations relating to his subject without adding the devclopments which would be desirable to assist comprehension and strengthen conviction. Thus on

“production capital” (capitali fondatori), as distinct from ‘‘revenue capital,” in its application to agriculture, he presents in a condeused form essentially the same explanations as Turgot about the same time gave; and on the division of labour and the circumstances which cause different rates of wages iu different employments, he in substance comes near to Smith, but without the flee of illustration which is so attrac- tive a feature of the Wealth of Nations. Pictro Verri (1728-1797), an intimate and life-long friend of Beccaria, was for twenty-five years one of the principal directors of the administration of Lom- bardy, in which capacity he originated many economic and other reforms. In his Riflessioni sulle leggi vincolanti, principalmente nel commercio de’ grant (written in 1769, printed in 1796), he con- siders the question of the regulation of the corn trade both histori- cally and in the light of theoretic principles, and arrives at the conclusion that liberty is the best remedy against famine and against excessive fluctuations of price. He is generally opposed to Governmental interference with internal cominerce, as well as to trade corporations, and the attempts to limit prices or fix the rate of intcrest, but is in favour of the protection of national industry by a judiciously framed tariff. These views are explained in his Meditazioni sul? economia politica (1771), an elementary treatise on the-science, which was received with favour, and translated into several forcign languages. A primary principle with him is what he calls the augmentation of reproduction—that is, in Smith’s language, of “ the annual produce of the land and labour” of a nation ; and by its tendency to promote or to restrict this augmentation he tests every enactment and institution. Accordingly, unlike Beccaria, he prefers the petite to the grande cultwre, as giving a larger total pro- duce. In dealing with taxation, he rejects the physiocratic pro-

| posal of a single impét territorial. Giovanni R. Carli (1720-1795),

also an official promoter of the reforms in the government of Austrian Lombardy, besides learned and sound treatises on money, was author of Ragionamenti sopra % bilanci economic delle naziont, in which he shows the falsity of the notion that a state gains or loses in foreign commerce according to the so-called balance of trade. Iu his letter to Pompeo Neri Sul libero commercio de’ grani (1771), he takes up a position similar to that of Galiani, regarding the question of the freedom of the corn trade as not so

much a scientific as an administrative one, to be dealt with differently under different local or other conditions. Rejecting the physiocratic doctrine of the exclusive productiveness of agriculture, he illustrates in an interest- ing way the necessity of various economic classes in a society, and the reflex agency of manufactures in stimulating the cultivation of the soil. several questions proposed by academies and sovereigns. In these he condemns trade corporations and the attempts by Governments to fix the price of bread and to limit the interest on loans. In advocating the system of a peasant proprietary, he suggests that the law should determine the minimum and maximum portions of land which a citizen should be permitted to possess. He also, with a view to prevent the undue accumulation of property, proposes the abolition of the right of bequest, and the equal division of the inheritance amongst the children of the deccased. Filangieri (1752-1788), one of the Italian writers of the last century whose names are most widely known throughout Europe, devoted to economic questions the second book of his Scienza della Icgis- lazione (5 vols., 1780-1785). Filled with reforming ardour and a passionate patriotism, he employed his vehement eloquence in denouncing all the abuses of his time. Apparently without any

Verri.

Carli.

Giambattista Vasco (1733-1796) wrote discourses on Vasco.

Gaetano Filan-

gieri.

Ricci. of national and universal progress. Ludovico Ricci (1742-1799) | that the real sources of the wealth and power of his country must was author of an able report Sulla riforma degli istituti pii della | be sought, not in America, but im her own industry. citta di Modena (1787). He treated the subject of poor relief and ; ; charitable institutions in so general a way that the work possesses In both Italy and Spain, as is well observed by Comte,

a universal and permanent interest. He dwells on the evils of | the impulse towards social change took principally the

indiscriminate relief as tending to increase the misery it seeks to | direction of economic reform, because the pressure exercised

remove, and as lowering the moral character of a population. He eer ” d 1

exposes especially the abuses connected with lying-in and foundling | PY “Overnments prevented so large a measure of free

hospitals. There is much in him which is akin to the views | Speculation in the fields of philosophy and general politics

of Malthus; like him he is opposed to any state provision for the | as was possible in France. In Italy, it may be added, the _ destitute, who ought, he thinks, to be left to voluntary private | traditions of the great industrial past of the northern

Paoletti. beneficence. Ferdinando Paoletti (1717-1801) was an excclllent oe f dhat ‘ 4eRaed 6 : hiefl and public-spirited priest, who did much for the diffusion of | CUES Ot that country also tended to fix attention chiefly intelligence amougst the agricultural population of Tuscany, and | On the economic side of public policy and legislation. for the lightening of the taxes which pressed upon them. He corre- Germany.—We have seen that in Italy and England abeopted the physiocratic doctrines, at least in theik’general sub, | POlitical economy had its beginnings in the study of Deuce. He Laeger of Pensieri sopra Pagricoltura (1769), and practical questions relating chiefly to money or to foreign of I veri mezzi di render felice le socicta (1772); in the latter he | commerce. In Germany it arose (as Roscher has shown)

, advocates the freedom of the corn trade. The tract Z/ Colbertismo | out of the so-called cameralistic sciences. From the end prengotti. hea Coun F a ee, a pee poe sect of the Middle Ages there existed in most German countries e extreme policy of prohibition and protection, which may sti . ? be read walt eee. Mengotti also ot (1791) a oct pai | © council, known as the Kammer (Lat. camera), which wer commercio de’ Romant, directed mainly against the exaggerations | Occupied with the management of the public domain and of Huet in his Histoire du commerce ct de la navigation des anciens | the guardianship of regal rights. The emperor Maximilian (1716),

wee ech as es the broad difference between the | found this institution existing in Burgundy, and estab- ancient and modern civilizations. g ae Seer Ls : * :

Ortes. Here lastly. may be mentioned another Italian thinker who, lished, ne tat a it, aulic councils 7 Innsbruck and eminently oviginal and even eccentric, cannot easily be classed | Vienna in 1498 and 1501. N ot only finance and taxation, among his contemporaries, though some Continental writers of our | but questions also of economic police, came to be intrusted own century have exhibited similar modes of thought. This was | to these bodies. A special preparation became necessary Cuapiname (Orie (le), Home opneved to theslibemiet | iritier members and chairs of camoralistic science were tendencies of his time, but does not espouse the doctrines of the ¢ é aa fie ait hi ¢ th ; mercantile system, rejecting the theory of the balance of trade and | founded in universities lor the teaching of the appropriate demanding commercial freedom. 1t is in the Middle Ages that he | body of doctrine. One side of the instruction thus given gees eee) and economic Bie. He adnoceiee ie maintenance | borrowed its materials from the sciences of external nature, of church property, is averse to the ascendency of the money power, : ae : eee and has re medioeel dislike for interest on lod, He puatidine aeons in. a ae ba ee ee cine = be ae the singular idea that the wealth of communities is always and | 42d the like; the other related to the conditions of nationa everywhere in a fixed ratio to their population, the latter being | prosperity as depending on human relations and institu- determined by the former. Poverty, therefore, necessarily waits | tions; and out of the latter German political economy was on wealth, and the rich, in beconzing so, only gain what the poor | at first developed. lose. Those who are interested in the improvement of the condi- ; tion of the people labour in vain, so long as they direct their efforts In no country had mercantilist views a stronger hold than in to the increase of the sum of the national wealth, which it is | Germany, though in none, in the period we are now considering, beyond their power to alter, instead of to the distribution of that | did the system of the balance of trade receive a less extensive pare- wealth, which it is possible to modify. The true remedy for | tical application. All the leading German economists of the 17th poverty lies in mitigating the gain-pursuing propensities in the | century—Bovnitz, Besold, Klock, Becher, Horneck, Seckendorf, and rich and in men of business.

Ortes studied in a separate work the | Schréder—stand on the common basis of the mercantile doctrine. subject of population ; he formulates its increase as ‘‘ geometrical,” | And the same may be said of the writers of the first half of the 18th but recognizes that, as a limit is set to such increase amongst the | century in general, and notably of Justi(d. 1771), who was the Justi. lower animals by mutual destruction, so is it in the human species | author of the first systematic German treatise on political economy, by ‘‘reason ’—the “‘ prudential restraint” of which Malthus after- | a work which, from its currency as a text book, had much effect on wards made so much. He regards the institution of celibacy as | the formation of opinion. Only in Zincke (1692-1769) do we find Zincke. no less necessary and advantageous than that of marriage. He | occasional expressions of a circle of ideas at variance with the enunciates what has since been known as the ‘‘ law of diminishing | dominant system, and pointing in the direction of industrial returns to agricultural industry.” He was carcless as to the diffu- | freedom. But these writers, except from the national point of sion of his writings ; and hence they remained*almost unknown | view, are unimportant, not having exercised any influence on the till they were included in the Custodi collection of Italian eco- | general: movement of European thought. : nnciaitant nomists, when they attracted much attention by the combined The principles of the physiocratic system met with i — San ~ sagacity and waywardness which marked their author’s intellectual | amount of favour inGermany. Karl Friedrich, margrave of Baden, Friedric character. wrote for the use of his sons an Abrégé des principes d’Economie of Baden.

; : * Politique, 1772, which is in harmony with the doctrines of that Sp aim. —The same breath of a new era which eee in the system. It possesses, however, little scientific value. Schlettwein air elsewhere in Europe made itself felt also in Spain. (1731-1802) and Mauvillon (1743-1794) were followers of the same

Ustariz. In the earlier part of the 18th century Geronimo Ustariz had | school. Theodor Schmalz (1764-1831), who is commonly named Schmalz. written his Teorica y Practica del Comercio y Marina (1724; pub- | as ‘‘the last of the physiocrats, may be here mentioned, though lished, 1740; Eng. transl. by John Kippax, 1751; French by | somewhat out of the historic order. He compares Colbertism with Forbonnais, 1753), in which he carries

mercantile principles to | the Ptolemaic system, physiocratism with the Copernican. Adam their utmost extreme. Smith he represents as the Tycho Brahe of political economy ,—a

Campo- The reforming spirit of the latter half of the century was best | man of eminent powers, who could not resist the force of truth in

manes. represented in that country by Pedro Rodriguez, count of Cam- | the physiocrats, but partly could not divest himself of rooted pre-

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kuowledge of Adam Smith, he insists on unlimited freedom of trade, calls for the abolition of the medieval institutions which impeded production and national wellbeing, and condemns the colonial system then followed by England, Spain, and Holland. He pro- phesies, as Raynal and Genovesi had done before him, that all America would one day be independent, a prediction which probably helped to elicit Benjamin Franklin's tribute of admiration for his work. Rather a propagator than a discoverer, he sometimes adopted from others erroneous opinions, as, for example, when he approves the impét unique of the physiocrats. ever, he represents the most advanced political and social tenden- cies of his age ; whilst strongly contrasted with Beccaria in tem- perament and style, he was a worthy labourer in the same cause

pomanes (1723-1802). He pursued with ardour the same studies and in some degree the same policy as his illustrious contemporary

On the whole, how- |

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Turgot, without, however, having arrived at so advanced a point of view. He was author of Respuesta fiscal sobre abolir la tasa y establecer el comereio de granos (1764), Discurso sobre el jomento de industria popolar (1774), and Discurso sobre la educacion de los artesanos y su fomento (1775). By means of these writings, justly eulogized by Robertson, as well as by his

personal efforts as minister, he sought to establish the freedom of the corn trade, to

‘remove the hindrances to industry arising from medieval survivals,

to give a large development to manufactures, and to liberate agri- culture from the odious burdens to which it was subject. He saw that, notwithstanding the enlightened administration of Charles III., Spain still suffered from the evil results of the blind confidence reposed by her people in her gold nines, and enforced the lesson

judices, and partly was ambitious of the fame of a discoverer and a reconciler of divergent systems. Though Smith was now ‘‘the

Sonnen- fels.

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Hume.

fashion,” Schmalz could not doubt that Quesnay’s doctrine was alone true, and would ere long be triumphant everywhere.

Just before the appearance of Smith, as in England Steuart, and in Italy Genovesi, so in Austria Sonnenfels (1733-1817), the first distinguished economist of that country, sought to present the mercantile system in a modified and more enlightened form ; and his work (Grundsdtze der Polizei, Handlung, und Finanz, 1765; 8th ed., 1822) exercised even during a considerable part of the present century much influence on opinion and on policy in Austria. ;

But the greatest German economist of the 18th century was, In Roscher’s opinion, Justus Méser (1720-1794), the author of Patrio- tische Phantasteen (1774), a series of fragments, which, Goethe nevertheless declares, form ‘‘ein wahrhaftes Ganzes.” The poet was much influenced by Méser in his youth, and has eulogized in

Whilst others occupied themselves with larger and more prominent public affairs and transactions, Méser observed and reproduced the common daily life of his nation, and the thousand “little things ” which compose the texture of popular existence. He has been com- pared to Franklin for the homeliness, verve, and freshness of his writings. In opinions he is akin to the Italian Ortes. He is opposed to the whole spirit of the ‘‘Aufklarung,” and to the liberal and rationalistic direction of which Smith’s work became after- wards the expression. He is not merely conservative but reaction- ary, manifesting a preference for medieval institutions sueh as the trade guilds, and, like Carlyle in our own time, seeing advantages even in serfdom, when compared with the sort of freedom enjoyed by the modern drudge. He has a marked antipathy for the growth of the money power and of manufactures on the large scale, and for the highly developed division of labour. He is opposed to absolute private property in land, and would gladly see revived such a system of restrictions as in the interest of the state, the commune, and the family were imposed on medieval ownership. In his wayward and caustic style, he often criticizes effectively the doctrinaire narrowness of his contemporaries, throws out many striking ideas, and in particular sheds real light on the economic phenomena and geueral social conditions of the Middle Ages.

2. Adam Smith, with his Immediate Predecessors and his Followers.

England.—The stagnation in economic inquiry which showed itself in England in the early part of the 18th century was not broken by any notable manifestation before 1735, when Bishop Berkeley put forward in his Querist, with much force and point, views opposed to those of the mercantile school on the nature of national wealth and the functions of money, though not without an admixture of grave error. But soon a more decisive advance was made. Whilst in France the physiocrats were working after their own fashion towards the con- struction of a definitive system of political economy, a Scottish thinker of the first order was elucidating, in a series of short but pregnant essays, some of the funda- mental conceptions of the science. What had been written on these questions in the English language before his time had remained almost altogether within the limits of the directly practical sphere. With Locke, indeed, the general system of the modern critical philosophy had come into relation with economic

inquiry, but only in a partial and indeterminate way. But in Hume the most advanced form of this philosophy was represented, and his appear- ance in the field of economics decisively marks the tendency of the latter order of speculation to place itself in con- nexion with the largest and deepest thought on human nature and general human history. Most of the essays here referred to first appeared in 1752, in a volume entitled Political Discourses, and the number was completed in the collection of Hssays and Treatises on Several Subjects, pub- lished in the following year. The most important of them are those on Commerce, on Money, on Interest, and on the Balance of Trade. Yet these should not be separated from the rest, for, notwithstanding the unconnected form of these little treatises, there runs through them a pro- found unity of thought, so that they indeed compose in a certain sense an economic system. They exhibit in full measure Hume's wonderful acuteness and subtlety, which

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| indeed sometimes dispose him to paradox, in combination

| with the breadth, the absence of prejudice, and the social

sympathies which so eminently distinguish him ; and they offer, besides, the charm of his easy and natural style and his rare power of lucid exposition.

In the essay on money he refutes the mercantilist error, which tended to confound it with wealth. ‘‘ Men and commodities,” he says, ‘‘are the real strength of any community.” ‘‘In the national stock of labour consists all real power and riches.” Money is only the oil which makes the movements of the mechanism of commerce more smooth and easy. He shows that, from the domestic as distinguished from the international point of view, the absolute

; ree | quantity of money, supposed as of fixed amount, in a country is of the Dichtung und Wahrheit his spirit, intellect, and character, and | his thorough insight into all that goes on in the social world. |

no consequence, whilst an excessive quantity, larger, that is, than is required for the interchange of commodities, may be injurious as raising prices and

driving foreigners from the home inarkets. He goes so far, in one or two places, as to assert that the value of nioney is chiefly fictitious or conventional, a position which cannot be defended ; but it must not be pressed against him, as he builds nothing on it. He has some very ingenious observations (since, however, questioned by J. S. Mill) on the effects of the increase of money in a country in stimulating industry during the interval which takes place before the additional amount is sufficiently diffused to alter the whole scale of prices. He shows that the fear of the money of an industrious community being lost to it by passing into foreign countries is groundless, and that, under a system of freedom, the distribution of the precious metals which is adapted to the requirements of trade will spontaneously establish itself. “In short, a Government has great reason to preserve with care its people and its manufactures ; its money it may safely trust to the course of human affairs without fear or jealousy.”

A very important service was rendered by his treatment of the rate of interest. He exposes the erroneous idea often entertained that it depends on the quantity of money in a country, and shows that the reduction of it must in general be the result of ‘‘the increase of industry and frugality, of arts and commerce,” so that it may serve as a barometer, its lowness being an almost infallible sign of the flourishing condition of a people. It may be observed in pass- ing that in the essay devoted to this subjeet he brings out a prin- ciple of human nature which economists too often overlook, ‘‘ the constant and insatiable desire of the mind for exercise and employ- ment,” and the consequent action of ennui in prompting to exer- tion.

With respect to commerce, he points to its natural foundation in what has since been called ‘‘ the territorial division of labour,” and proves that the prosperity of one nation, instead of being a hin- drance, is a help to that of its neighbours. ‘‘ Not only as a man, but as a British subject,” he says, ‘‘1 pray for the flourishing com- merce of Germany, Spain, Italy, and even France itself.” He con- demns the ‘‘ numberless bars, obstruetions, and imposts whieh all nations of Europe, and none more than England, have put upon trade.” Yet on the question of protection to national industry he is not quite at the free-trade point of view, for he approves of a tax on German linen as encouraging home manufactures, and of a tax on brandy as increasing the sale of rum and supporting our southern colonies. Indeed it

has been justly observed that there are in him several traces of a refined mercantilism, and that he represents a state of opinion in which the transition from the old to the new views is not yet completely effected.

We cannot do more than refer to the essay on taxes, in which, amongst other things, he repudiates the ¢mpét wnique of the physio- crats, and to that on public credit, in which he criticizes the “new paradox that public incumbrances are of themselves advan- tageous, independent of the necessity of contracting them,” and objects, perhaps too absolutely, to the modern expedient of raising the money required for national enterprises by way of loan, and so shifting our burdens upon the shoulders of posterity.

The characteristics of Hume which are most important in the history of economic investigation are (1) his practice of bringing economic facts into connexion with all the weighty interests of social and political life, and (2) his tendency to introduce the historical spirit into the study of those facts. He admirably illustrates the mutual action of the several branches of industry, and the influ- ences of progress in the arts of production and in com- merce on general civilization, exhibits the striking con- trasts of the ancient and modern system of life (see espe- cially the essay On the Populousness of Ancient Nations), and considers almost every phenomenon which comes under discussion in its relations to the contemporary stage of social development. It cannot be doubted that Hume

exercised a most important influence on Adam Smith, who

Tucker.

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in the Wealth of Nations calls him “ by far the most illus- trious philosopher and historian of the present age,” and who esteemed his character so highly that, after a friend- ship of many years had been terminated by Hume’s decease, he declared him to have “approached as nearly to the idea of a

perfectly wise and virtuous man as perhaps the nature of human frailty will permit.”

Josiah Tucker, dean of Gloucester (d. 1799), holds a distinguished place among the immediate predecessors of Smith. Most of lis numerous productions had direct reference to contemporary ques- tions, and, though marked by much sagacity and penetration are deficient in permanent interest. In some of these he urged the impolicy of restrictions on the trade of lreland, advocated a union of that country with England, and recommended the recognition of the independence of the United States of America. ‘he most important of his general economic views are those relating to in- ternational commerce. He is an ardent supporter of free-trade doctrines, which he bases on the principles that there is betwcen nations no necessary antagonism, but rather a harmony, of interests, and that their several natural advantages and different aptitudes naturally prompt them to exchange. He had not, however, got quite clear of mercantilism, and favoured bounties on exported manufactures and the encouragement of population by a tax on celibacy. Dupont, and after him Blanqui, represent Tucker as a follower of the physiocrats, but there seems to be no ground for this opinion except his agreement with them on the subject of the freedom of trade. Turgot translated into French his Important Questions on Commerce (1755).

In 1767 was published Sir James Steuart’s Inquiry into the Prin- ciples of Political Economy. This was onc of the most unfortunate of books. It was the most complete and systematic survey of the science from the point of view of moderate mercantilism which had appeared in England. Stenart was a man of uo ordinary abilities, and had prepared himself for his task by long and serious study. But the time for the mercantile doctrines was past, and the system of natural liberty was in possession of an intellectual ascendency which foreshadowed its political triumph. Nine years later the Wealth of Nations was given to the world, a work as superior to Steuart’s in attractiveness of style as in scientific sound- ness. Thus the latter was predestined to fail, and in fact never exercised any considerable theoretic or practical influence. Smith never quotes or mentions it ; being acquainted with Steuart, whose conversation he said was better than his book, he probably wished to keep clear of controversy with him. The German

economists have examined Steuart's treatise more carcfully than English writers have commonly done ; and they recognize its high merits, especially in relation to the thcory of value and the subject of population, They have also pointed out that, in the spirit of the best recent research, he has dwelt on the special characters which distinguish the economies proper to different nations and different grades in social progress.

Coming now to the great name of Adam Smith (1723- 1790), it is of the highest importance that we should rightly understand his position and justly estimate his claims. It is plainly contrary to fact to represent him, as some have done, as the creator of political economy. The subject of social wealth had always in some degree, and increasingly in recent times, engaged the attention of philosophic minds. The study had even indisputably assuined a systematic character, and, from being an assem- blage of fragmentary disquisitions on particular questions of national interest, had taken the form, notably in Turgot's Aéflextons, of an organized body of doctrine. The truth is that Smith took up the science when it was already considerably advanced ; and it was this very cir- cumstance which enabled him, by the production of a classical treatise, to render most of his predecessors obso- lete. But, whilst all the economic labours of the preceding centuries prepared the way for him, they did not anticipate his work. His appearance at an earlier stage, or without those previous labours, would be inconceivable; but he built, on the foundation which had been laid by others, much of his own that was precious and enduring.

Even those who do not fall into the error of making Smith the creator of the science, often separate him too broadly from Quesnay and his followers, and represent the history of modern economics as consisting of the successive

the same grounds.

physiocratic, and the Smithian. The last two are, it is true, at variance in some even important respects. But it is evident, and Smith himself felt, that their agreements were much more fundamental than their differences 5 and, if we regard them as historical forces, they must be con- sidered as working

towards identical ends. They both urged society towards the abolition of the previously pre- vailing industrial policy of European Governments; and their arguments against that policy rested essentially on Whilst Smith's criticism was more searching and complete, he also analysed more correctly than the physiocrats some classes of economic phenomena,— in particular dispelling the illusions into which they had fallen with respect to the unproductive nature of manu- factures and commerce. 'Their school disappeared from the scientific field, not merely because it met with a political check in the person of Turgot, but because, as we have already said, the Wealth of Nations absorbed into itself all that was valuable in their teaching, whilst it continued more effectually the impulse they had given to the necessary work of demolition.

The history of economic opinion in modern times, down to the third decade of our own century, is, in fact, strictly bipartite. The first stage is filled with the mercantile system, which, as we have shown, was rather a practical policy than a speculative doctrine, and which came into existence as the spontaneous growth of social conditions acting on minds not trained to scientific habits. The second stage is occupied with the gradual rise and ultimate ascendency of another system founded on the idea of the right of the individual to an unimpeded sphere for the exercise of his economic activity. With the latter, which is best designated as the "system of natural liberty," we ought to associate the memory of the physiocrats as well as that of Smith, without, however, maintaining their services to have been equal to his. .

The teaching of political economy was in the Scottish universities associated with that of moral philosophy. Smith, as we are told, conceived the entire subject he had to treat in his public lectures as divisible into four heads, the first of which was natural theology, the second ethics, the third jurisprudence ; whilst in the fourth "he examined those political regulations which are founded upon expediency, and which are calculated to increase the riches, the power, and the prosperity of a state." The last two branches of inquiry are regarded as forming but a single body of doctrine in the well-known passage of the Theory of Moral Sentiments in which the author promises to give in another discourse "an account of the general principles of law and government, and of the different revolutions they have

undergone in the different ages and periods of society, not only in what concerns justice, but in what concerns police, revenue, and arms, and whatever else is the subject of law." This shows how little it was Smith's habit to separate (except provisionally), in his conceptions or his researches, the economic phenomena of society from all the rest. The words above quoted have, indeed, been not unjustly described as containing "an anticipation, wonderful for his period, of general sociology, both statical and dynamical, an anticipation which becomes still more remarkable when we learn from his literary executors that he had formed the plan of a con- nected history of the liberal sciences and elegant arts, which must have added to the branches of social study already enumerated a view of the intellectual progress of society." Though these large designs were never carried out in their integrity, as indeed at that period they could not have been adequately realized, it has resulted from them that, though economic phenomena form the special

rise and reign of three doctrines—the mercantile, the | subject of the Wealth of Nations, Smith yet incorporated

into that work much that relates to the other social aspects, incurring thereby the censure of some of his fol- lowers, who insist with pedantic narrowness on the strict isolation of the economic domain.

There has been much discussion on the question— What is the scientific method followed by Smith in his great work? By some it is considered to have been purely deductive, a view which Buckle has perhaps carried to the greatest extreme. He asserts that in Scotland the induc- tive method was unknown, that the inductive philosophy exercised no influence on Scottish thinkers; and, though Smith spent some of the most important years of his youth in England, where the inductive method was supreme, and though he was widely read in general philo- sophical literature, he yet thinks he adopted the deductive method because it was habitually followed in Scotland,— and this though Buckle maintains that it is the only appropriate, or even possible, method in political economy, which surely would have been a sufficient reason for choos- ing it. That the inductive spirit exercised no influence on Scottish philosophers is certainly not true; as will be

presently shown, Montesquieu, whose method is essentially inductive, was in Smith's time studied with quite peculiar care and regarded with special veneration by Smith's fellow- countrymen. As to Smith himself, what may justly be said of him is that the deductive bent was certainly not the predominant character of his mind, nor did his great excellence lie in the " dialectic skill" which Buckle ascribes to him, What strikes us most in his book is his wide and keen observation of social facts, and his perpetual tendency to dwell on these and elicit their significance, instead of drawing conclusions from abstract principles by elaborate chains of reasoning. It is this habit of his mind which gives us, in reading him, so strong and abiding a sense of being in contact with the realities of life.

That Smith does, however, largely employ the deductive method is certain; and that method is quite legitimate when the premises from which the deduction sets out are known universal facts of human nature and properties of external objects. Whether this mode of proceeding will carry us far may indeed well be doubted; but its soundness cannot be disputed. But there is another vicious species of deduction which, as Cliffe Leslie has shown, seriously tainted the philosophy of Smith,—in which the premises are not facts ascertained by observa- tion, but the same a priori assumptions, half theological half metaphysical, respecting a supposed harmonious and beneficent natural order of things which we found in the physiocrats, and which, as we saw, were embodied in the name of that sect. In his view, Nature has made provi- sion for social wellbeing by the principle of the human constitution which prompts every man to better his condi- tion: the individual aims only at his private gain, but in doing so is "led by an invisible hand" to promote the public good, which was no part of his intention; human institutions, by interfering with the action of this principle in the name of the public interest, defeat their own end; but, when all systems of preference or restraint are taken away, "the obvious and simple system of natural liberty establishes itself of its own accord." This theory is, of course, not explicitly presented by Smith as a foundation of his economic doctrines, but it is really the secret sub- stratum on which they rest. Yet, whilst such latent postulates warped his view of things, they did not entirely determine his method. His native bent towards the study of things as they are preserved him from extrava- gances into which many of his followers have fallen. But besides this, as Leslie has pointed out, the influence of

Montesquieu tended to counterbalance the theoretic pre- possessions produced by the doctrine of the jus nature.

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That great thinker, though he could not, at his period, understand the historical method which is truly appropri ate to sociological inquiry, yet founded his conclusions on induction. It is true, as Comte has remarked, that his accumulation of facts, borrowed from the most different states of civilization, and not subjected to philosophic criticism, necessarily remained on the whole sterile, or at least could not essentially advance the study of society much beyond the point at which he found it. His merit, as we have before mentioned, lay in the recognition of the subjection of all social phenomena to natural laws, not in the discovery of those laws. But this limitation was over- looked by the philosophers of the time of Smith, who were much attracted by the system he followed of tracing social facts to the special circumstances, physical or moral, of the communities in which they were observed. Leslie has shown that Lord Kaimes, Dalrymple, and Millar —contemporaries of Smith, and the last his pupil—were influenced by Montesquieu ; and he might have added the more eminent name of Ferguson, whose respect and admiration for the great Frenchman are expressed in striking terms in his History of Civil Society. We are even informed that Smith himself in his later years was occupied in preparing a commentary on the sprit des Lois, He was thus affected by two different and incon- gruous systems of thought,—one setting out from an imaginary code of nature intended for the benefit of man, and leading to an optimistic view of the economic consti- tution founded on enlightened self-interest; the other following inductive processes, and seeking to explain the several states in which human societies are found existing, as results of circumstances or institutions which have been in actual operation. And we find accordingly in his great work a combination of these two modes of treatment— inductive inquiry on the one hand, and, on the other, a priori speculation founded on the “ Nature” hypothesis. The latter vicious proceeding has in some of his followers been greatly aggravated, while the countervailing spirit of inductive investigation has fallen into the background, and indeed the necessity or utility of any such investigation in the economic field has been sometimes altogether denied.

Some have represented Smith’s work as of so loose a texture and so defective in arrangement that it may be justly described as consisting of a series of monograplis. But this is certainly an exaggeration. The book, it is true, is not framed on a rigid mould, nor is there any parade of systematic divisions and subdivisions ; and this doubtless recommended it to men of the world and of business, for whose instruction it was, at least primarily, intended. But, as a body of exposition, it has the real and pervading unity which results from a mode of thinking homogeneous throughout and the general absence of such contradictions as would arise from an imperfect digestion of the subject.

Smith sets out from the thought that the annual labourof a nation is the souree from whieh it derives its supply of the neeessarics and eonveniences of life. He does not of eourse eontemplate labour as the only faetor in production; but it has been supposed that by empha- sizilig it at the outset he at once strikes the note of difference between himself on the one hand and both the mereantilists and the physioerats on the other. The improvement in the productiveness of labour depends largely on its division ; and he proceeds aecord- ingly to give his unrivalled exposition of that principle, of the grounds on whieh it rests, and of its greater applicability to manufaetures than to agriculture, in consequence of which the latter relatively lags beliind in the eourse of economic development. The origin of the division of labour he finds in the propensity of human nature “to truck, barter, or exehange one thing for another.” He shows that a certain accumulation of capital is a condition preeedeut of this division, and that the degree to which it can be earried is dependent on the extent of the market. When the division of labour has been established, each member of the society must have reeourse to the others for the supply of most of

his wants ; a medium of exchange is thus found to be necessary, and money comes into use. The exchange of goods against each other or against money gives rise to the notion of value. This word has two meanings—that of utility, and that of purchasing power ; the one may be called value in use, the other value in exchange. Merely mentioning the former, Smith goes on to study the latter. What, he asks, is the measure of value? what regu- lates

the amount of one thing which will be given for another ? “Labour,” Smith answers, ‘‘is the real measure of the exchange- able value of all commodities.” ‘‘ Equal quantities of labour, at all times and places, are of equal value to the labourer.” ‘Labour alone, therefore, never varying in its own value, is alone the ultimate and real standard by which the value of all commodities can at all times and places be estimated and compared. It is their real price; money is their nominal price only.” Money, however, is in men’s actual transactions the measure of value, as well as the vehicle of exchange ; and the precious metals are best suited for this function, as varying little in their own value for periods of moderate length ; for distant times, corn is a better standard of comparison. In relation to the earliest social stage, we need consider nothing but the amount of labour employed in the production of an article as determining its exchange value; but in more advanced periods price is complex, and consists in the most general case of three elements—wages, profit, and rent. Wages are the reward of labour. Profit arises as soon as stock, heing accumulated in the hands of one person, is employed by him in setting others to work, and supplying them with materials and subsistence, in order to make a gain by what they produce. Rent arises as soon as the land of a country has all become private property ; ‘‘the landlords, like all other men, love to reap where they never sowed, and demand a rent even for its natural produce.” In every improved society, then, these three elements enter more or less into the price of the far greater part of commodities. There is in every society or neigh- bourhood an ordinary or average rate of wages and profit in every different employment of labour and stock, regulated by principles to be explained hereafter, as also an ordinary or average rate of rent. These may be called the natural rates at the time when and the place where they prevail; and the natural price of a commodity is what is sufficient to pay for the rent of the land, the wages of the labour, and the profit of the stock necessary for bringing the commodity to market. The market price may rise above or fall below the amount so fixed, being determined by the proportion between the quantity brought to market and the demand of those who are willing to pay the natural price. Towards the natural price as a centre the market-price, regulated by competition, constautly gravitates. Some commodities, however, are subject to a monopoly of production, whether from the peculiarities of a locality or from legal privilege: their price is always the highest that can be got; the natural price of other commodities is the

lowest which can be taken for any length of time together. The .

three component parts or factors of price vary with the circum- stances of the society. The rate of wages is determined by a ‘‘dispute” or struggle of opposite interests between the employer and the workman. A minimum rate is fixed by the condition that they must be at least sufficient to enable a man and his wife to maintain themselves and, in general, bring up a family. The excess above this will depend on the circumstances of the country, and the consequent demand for labour,—wages being high when national wealth is increasing, low when it is declining. The same circumstances determine the variation of profits, but in an opposite direction ; the increase of stock, which raises wages, tending to lower profit through the mutual competition of capitalists. ‘The whole of the advantages and disadvantages of the different em- ployments of labour and stock must, in the same ncighbourhood, be either perfectly equal or continually tending to equality ;” if one had greatly the advantage over the others, people would crowd into it, and the level would soon be restored. Yet pecuniary wages and profits are very different in different employments, — either from certain circumstances affecting the employments, which recommend or disparage them in men’s notions, or from national policy, “‘ which nowhere leaves things at perfect’ liberty.” Here follows Smith’s adinirable exposition of the causes which produce the inequalities in wages and profits just referred to, a passage affording ample evidence of his habits of nice observation of the less obvious traits in human nature, and also of the operation both of these and of social institutions on economie facts. The rent of land comes next to be considered, as the last of the three elements of price. Rent is a monopoly price, equal, not to what the landlord could afford to take, but to what the farmer can afford to give. ‘Such parts only of the produce of land can commonly be brought to market, of which the ordinary price is sufficient to replace the stock which must be employed in bringing them thither, together with the ordinary profits. If the ordinary price is more than this, the surplus part will naturally go to the rent of the land. If it is not more, though the commodity may be brought to market, it can afford no rent to the landlord. Whether the price is or is not more depends on the demand.” ‘Rent,

therefore, enters into the price of commodities in a different way from wages and profits. High or low wages and profit are the causes of high or low price ; high or low reut is the effect of ry

Rent, wages, and profits, as they are the elements of price, are also the constituents of income; and the three great orders of every civilized society, from whose revenues that of every other order is ultimately derived, are the landlords, the labourers, and the capitalists. The relation of the interests of these three classes to those of society at large is different. The interest of the landlord always coincides with the general interest: whatever promotes or obstructs the one has the same effect on the other. So also does that of the labourer: when the wealth of the nation is progressive, his wages are high ; they are low when it is stationary or retrogressive. ‘The interest of the third order has not the same connexion with the general interest of the society as that of the other two; .. . it is always in some respects different from and opposite to that of the public.”

The subject of the second book is “the nature, accumulation, and improvement of stock.” A man’s whole stock consists of two portions—that which is reserved for his immediate consumption, and that which is employed so as to yield a revenue to its owner.

his latter, which is his “ capital,” is divisible into the two classes of ‘‘fixed” and “ circulating.” ‘The first is such as yields a profit without passing into other hands. The second consists of such goods, raised, manufactured, or purchased, as are scld for a profit and replaced by other goods ; this sort of capital is therefore cou- stantly going from and returning to the hands of its owner, The whole capital of a society falls under the same two heads. Its fixed capital consists chiefly of (1) machines, (2) buildings which are the means of procuring a revenue, (8) agricultural improve- ments, and (4) the acquired and useful abilities of all members of the society (since sometimes known as “ personal capital”), Its circulating capital is also composed of four parts—(1) money, (2) provisions in the hands of the dealers, (8) materials, and (4) com- pleted work in the hands of the manufacturer or merchant. |Next coines the distinction of the gross national revenue from the net,— the first being the whole produce of the land and labour of a country, the second what remains after deducting the expense of

maintaining the fixed capital of the country and that part of its circulating capital which consists of money. Money, “the great wheel of circulation,” is altogether different from the goods which are circulated by means of it; it is a costly instrument by means of which all that each individual receives is distributed to him ; and the expenditure required, first to provide it, and afterwards to maintain it, is a deduction from the net revenue of the society. In development of this consideration, Smith goes on to explain the gain to the community arising from the substitution of paper money for that composed of the precious metals; and ‘here occurs the remarkable illustration in which the use of gold and silver money is compared to a highway on the ground, that of paper money to a waggon way through the air. In proceeding to consider the accumulation of capital, he is led to the distinction between productive and unproductive labour,—the former being that which is fixed or realized in a particular object or vendible article, the latter that which is not so realized. The former is exemplified in the labour of the manufacturing workman, the latter in that of the menial servant. A broad line of demarcation is thus drawn between the labour which results in commodities or increased value of com- modities, and that which does no more than render services: the former is productive, the latter unproductive. ‘‘ Productive” is by ho means equivalent to ‘““useful”: the labours of the magistrate, the soldier, the churchman, lawyer, and physician, are, in Smith’s sense, unproductive. Productive labourers alone are employed out of capital ; unproductive labourers, as well as those who do not labour at all, are all maintained by revenue. In advancing industrial communities, the portion of annual produce set apart as capital, bears an increasing proportion to that which is immediately destined to constitute are venue, either as rent or as profit. Par- simony is the source of the increase of capital ; by augmenting the fund devoted to the maintenance of productive hands, it puts in motion an additional quantity of industry, which adds to the value of the annual produce. What is annually saved is as regularly consumed as what is spent, but by a different set of persons, by productive labourers instead of idlers or unproductive labourers ; and the former reproduce with a profit the value of their consump- tion. The prodigal, encroaching on his capital, diminishes, as far as in him lies, the amount of productive labour, and so the wealth of the country ; nor is this result affected by his expenditure being on home-made, as distinct from foreign, commodities. Every prodigal, therefore, isa public enemy ; every frugal man a public

benefactor. The only mode of increasing the annual produce of the land and labour is to increase either the number of productive labourers or the productive powers of those labourers, Either process will in general require additional capital, the former to maintain the new labourers, the latter to provide improved machinery or to enable the employer to introduce a more complete division of labour. In what are commouly called loans of money,

it is not really the money, but the money's worth, that the borrower wants ; and the lender really assigns to him the right to a certain portion of the annual produce of the land and labour of the country. As the general capital of a country inereascs, so also does the par- ticular portion of it from which the possessors wish to derive a revenue without being at the trouble of employing it themselves ; and, as the quantity of stock thus available for loans is augmented, the interest diminishes, not merely ''from the general causes which make the market price of things commonly diminish as_their quantity increases," but because, with the increase of capital, 'it becomes gradually more and more difficult to find within the country a profitable method of employing any new capital," —whence arises 2 competition between different capitals, and a lowering of profits, which must diminish the price which can be paid for the use of capital, or in other words the rate of interest. It was formerly wrongly supposed, and even Locke and Montesquieu did not eseape this error, that the fall in the value of the precious metals consequent on the discovery of the Aimerican mines was the real cause of the general lowering of the rate of interest in Europe. But this view, already refuted by Hume, is easily seen to be erroneous. ''In some countries the interest of money has becn prohibited by law. But, as something can everywhere be made by the use of money, something ought everywhere to be paid for the use of it," and will in faet be paid for it; and the prohibition will only heighten the evil of usury by inereasing the risk to the lender. The legal rate should be a very little above the lowest market rate ; sober people will then be preferred as borrowers to prodigals and projectors, who at a higher legal rate would have an advantage over them, being alone willing to offer that higher rate.

As to the different employments of capital, the quantity of pro- ductive labour put in motion by an equal amount varies extremely according as that amount is employed—(1) in the improvement of lands, mines or fisheries, (2) in manufactures, (3) in wholesale or (4) retail trade. In agriculture ‘‘ Nature labours along with man,” and not only the capital of the farmer is reproduced with his pro- fits, but also the rent of the landlord. It is therefore the employ- ment of a given capital which is most advantageous to society. Next in order come manufactures ; then wholesale trade—first the home trade, secondly the foreign trade of consumption, last the carrying trade. All these employments of capital, however, are not only advantageous, but neeessary, and will introduce them- selves in the due degree, if they are left to the spontaneous action of individual enterprise.

These first two books contain Smith’s general economic scheme ; and we have stated it as fully as was consistent with the brevity here necessary, because from this formu- lation of doctrine the English classical school set out, aud round it the discussions of more recent times in different countries have in a great measure revolved. Some of the criticisms of his successors and their modifications of his doctrines will come under our notice as we proceed.

The critical philosophers of the 18th century were often destitute of the historical spirit, which was no part of the endowment needed for their principal social office. But some of the most eminent of them, especially in Scotland, showed a marked capacity and predilection for historical studies. Smith was amongst the latter; Knies and others justly remark on the masterly sketches of this kind which occur in the Wealth of Nations. The longest and most elaborate of these occupies the third book ; it isan account of the course followed by the nations of modern Europe in the successive development of the several forms of industry. It affords a curious exainple of the effect of doctrinal prepossessions in obscuring the results of histori- cal inquiry. Whilst he correctly describes the European movement of industry, and explains it as arising out of adequate social causes, he yet, in accordance with the absolute principles which tainted his philosophy, protests against it as involving an entire inversion of the “natural order of things.” First agriculture, then manufactures, lastly foreign commerce; any other order than this he considers ‘unnatural and retrograde.” Hume, a more

purely positive thinker, simply sees the facts, accepts them, and classes them under a general law. “It is a violent method,” he says, ‘“‘and in most cases impractic- able, to oblige the labourer to toil in order to raise from the land more than what subsists himself and family. Furnish him with manufactures and commodities, and he

will do it of himself.” ‘If we consult history, we shall find that, in most nations, foreign trade has preceded any refinement in home manufactures, and given birth to domestic luxury.”

The fourth book is principally devoted to the elaborate and exhaustive polemic against the mercantile system which finally drove it from the field of science, and has exercised a powerful influence on economic legislation. When protection is now advocated, it is commonly on different grounds from those which were in current use before the time of Smith. He believed that to look for the restoration of freedom of foreign trade in Great Britain would have been “as absurd as to expect that an Oceana or Utopia should be established in it ;” yet, mainly in consequence of his labours, that object has been com- pletely attained; and it has lately been said with justice that free trade might have been nore generally accepted by other nations if the patient reasoning of Smith had not been replaced by dogmatism. His teaching on the subject is not altogether unqualified ; but, on the whole, with respect to exchanges of every kind, where economic motives alone enter, his voice is in favour of freedom. He has regard, however, to political as well as economic inter- ests, and on the ground that “defence is of much more importance than opulence” pronounces the Navigation Act to have been “perhaps the wisest of all the commercial regulations of England.” Whilst objecting to the preven- tion of the export of wool, he proposes a tax on that export as somewhat less injurious to the interest of growers than the prohibition, whilst it would “afford a sufficient advantage” to the domestic over the foreign manufacturer. This is, perhaps, his most marked devia- tion from the rigour of principle ; it was doubtless a con- cession to popular opinion with a view to an attainable practical improvement. The wisdom of retaliation in order to procure the repeal of high duties or prohibitions imposed by foreign Governments depends, he says, alto- gether on the

likelihood of its success in effecting the object aimed at, but he does not conceal his contempt for the practice of such expedients. The restoration of freedom in any manufacture, when it has grown to considerable dimensions by means of high duties, should, he thinks, from motives of humanity, be brought about only by degrees and with circumspection,—though the amount of evil which would be caused by the immediate abolition of the duties is, in his opinion, commonly exaggerated. The case in which J. 8. Mill justified protection—that, namely, in which an industry well-adapted to a country is kept down by the acquired ascendency of foreign producers —is referred to by Smith; but he is opposed to the admission of this exception for reasons which do not appear to be conclusive. He is perhaps scarcely consistent in approving the concession of temporary monopolies to joint-stock com- panies undertaking risky enterprises "of which the public is afterwards to reap the benefit." 1

He is less absolute in his doctrine of Governmental non- interference when he comes to consider in his fifth book the "expenses of the sovereign or the commonwealth." He recognizes as coming within the functions of the state the erection and maintenance of those public institutions and public works which, though advantageous to the society, could not repay, and therefore must not be thrown upon, individuals or small groups of individuals. He remarks in a just historical spirit that the performance of these functions requires very different degrees of ex- pense in the different periods of society. Besides the

1 Professor Bastable calls our attention to the interesting fact that the proposal of an export duty on wool and the justification of a tem- porary monopoly to joint-stock companies both appear for the first time in the edition of 1784.

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institutions and works intended for public defence and the administration of justice, and those required for facilitating the commerce of the society, he considers those necessary for promoting the instruction of the people. He thinks the public at large may with propriety – not only facilitate and encourage, but even impose upon almost the whole body of the people, the acquisition in youth of the most essential elements of education. He

suggests as the mode of enforcing this obligation the requirement of submission to a test examination “ before any one could obtain the freedom in any corporation, or be allowed to set up a trade in any village or town corpor- ate.” Similarly, he is of opinion that some probation, even in the higher and more difficult sciences, might be enforced as a condition of exercising any liberal profession, or becoming a candidate for any honourable office. The expense of the institutions for religious instruction as well as for general education, he holds, may without injustice be defrayed out of the funds of the whole society, though he would apparently prefer that it should be met by the voluntary contributions of those who think they have occasion for such education or instruction. There is much that is sound, as well as interesting and suggestive, in this fifth book, in which he shows a political instinct and a breadth of view by which he is favourably contrasted with the Manchester school. But, if we may say so without disrespect to so great a man, there are traces in it of what is now called Philistinism—a low view of the ends of art and poetry—which arose perhaps in part from personal defect, though it was common enough in even the higher minds in his century. There are also indications of a certain deadness to the lofty aims and perennial im- portance of religion, which was no doubt chiefly due to the influences of an age when the critical spirit was doing an indispensable work, in the performance of which the transitory was apt to be confounded with the permanent. For the sake of considering as a whole Smith’s view of the functions of government, we have postponed noticing his treatment of the physiocratic system, which occupies a part of his fourth book. He had formed the acquaintance of Quesnay, Turgot, and other members of their group during his sojourn in France in 1765, and would, as he told Dugald Stewart, had the patriarch of the school lived long enough, have dedicated to him the Wealth of Nations. He declares that, with all its imperfections, the system of Quesnay is ‘perhaps the nearest approximation to the truth that had yet appeared on the subject of political economy.” Yet he seems not to be adequately conscious of the degree of coincidence between his own doctrines and those of the physiocrats. Dupont de Nemours complained that he did not do Quesnay the justice of recognizing him as his spiritual father. It is, however, alleged, on the other side, that already in 1753 Smith had been teaching as professor a body of economic doctrine the same in its broad features with that contained in his great work. This is indeed said by Stewart ; and, though he

gives no evidence of it, it is possibly quite true ; if so, Smith's doc- trinal descent must be traced rather from Hume than from the French school. The principal error of this school, that, namely, of representing agricultural labour as alone produc- tive, he refutes in the fourth book, though in a manner which has not always been considered effective. Traces of the influence of their mistaken view appear to remain in his own work, as, for example, his assertion that in agriculture nature labours along with man, whilst in manufactures nature does nothing, man does all; and his distinction between productive and unproductive labour, which was doubtless suggested by their use of those epithets, and which seems to be inconsistent with his recognition of what is now called "personal capital."

To | out his principles to their extreme consequences.

the same source M'Culloch and others refer the origin of Smith's view, which they represent as an obvious error, that "individual advantage is not always a true test of the public advantageousness of different employments." But that view is really quite correct, as Prof. Nicholson has recently made plain. That the form taken by the use of capital, profits being given, is not indifferent to the working class as a whole even Ricardo admitted; and Cairnes, as we shall see, built on this consideration some of the most far-reaching conclusions in his Leading Prin- ciples.

On Smith's theory of taxation in his fifth book it is not necessary for us to dwell (see Taxation). The well-known canons which he lays down as prescribing the essentials of a good system have been generally accepted. They have lately been severely criticized by Prof. Walker—of whose objec- tions, however, there is only one which appears to be well- founded. Smith seems to favour the view that the con- tribution of the individual to public expenses may be regarded as payment for the services rendered to him by the state, and ought to be proportional to the extent of those services. If he held this opinion, which some of his expressions imply, he was certainly so far wrong in principle.

We shall not be held to anticipate unduly if we remark here on the way in which opinion, revolted by the aberra- tions of some of Smith's successors,

has tended to turn from the disciples to the master. A strong sense of his comparative freedom from the vicious tendencies of Ricardo and his followers has recently prompted the suggestion that we ought now to recur to Smith, and take up once more from him the line of the economical succession. But notwithstanding his indisputable superiority, and. whilst fully recognizing the great services rendered by his immortal work, we must not forget that, as has been already said, that work was, on the whole, a product, though an exceptionally eminent one, of the negative philosophy of the last century, resting largely in its ulti- mate foundation on metaphysical bases. The mind of Smith was mainly occupied with the work of criticism so urgent in his time ; his principal task was to discredit and overthrow the economic systeni then prevalent, and to demonstrate the radical unfitness of the existing European Governments to direct the industrial movement. ‘This office of his fell in with, and formed a part of, the general work of demolition carried on by the thinkers who gave to the 18th century its characteristic tone. It is to his honour that, besides this destructive operation, he contri- buted valuable elements to the preparation of an organic system of thought and of life. In his special domain he has not merely extinguished many errors and prejudices, and cleared the ground for truth, but has left us a per- manent possession in the judicious analyses of economic facts and ideas, the wise practical suggestions, and the luminous indications of all kinds, with which his work abounds. Belonging to the best philosophical school of his period, that with which the names of Hume and Diderot are associated, he tended strongly towards the positive point of view. But it was not possible for him to attain it; and the final and fully normal treatment of the economic life of societies must be constituted on other and more lasting foundations than those which underlie his imposing construction.

It has been well said that of philosophic doctrines the saying “by their fruit ye shall know them” is eminently true. And it cannot be doubted that the germs of the vicious methods and false or exaggerated theories of Smith’s successors are to be found in his own work, though his good sense and practical bent prevented his following The XIX. — 47

objections of Hildebrand and others to the entire historical development of doctrine which the Germans designate as "'Smithianismus" are regarded by those critics as applic- able, not merely to his school as a whole, but, though in a less degree, to himself. The following are the most important of these objections. It is said—(1) Smith's con- ception of the social economy is essentially individualistic. In this he falls in with the general character of the nega- tive philosophy of his age. That philosophy, in its most typical forms, even denied the natural existence of the disinterested affections, and explained the altruistic feel- ings as secondary results of self-love. Smith, however, like Hume, rejected these extreme views; and hence it has been held that in the Wealth of Nations he consciously, though tacitly, abstracted from the benevolent principles in human nature, and as a logical artifice supposed an "gconomic man" actuated by purely selfish motives. However this may be, he certainly places himself habitu- ally at the point of view of the individual, whom he treats as a purely egoistic force, working uniformly in the direc- tion of private gain, without regard to the good of others or of the community at large. (2) He justifies this per- sonal attitude by its consequences, presenting the optimis- tic view that the good of the community is best attained through the free play of individual cupidities, provided only the law prevents the interference of one member of the society with the self-seeking action of another. He assumes with the negative school generally—though he has passages which are not in harmony with these proposi- tions—that every one knows his true interest and will pursue it, and that the economic advantage of the indi-

vidual coincides with that of the society. To this last |

conclusion he is secretly led, as we have seen, by a priori theological ideas, and also by metaphysical conceptions of a supposed system of nature, natural right, and natural liberty. (3) By this reduction of every question to one of individual gain, he is led to a too exclusive consideration of exchange value as distinct from wealth in the proper sense. 'This, whilst lending a mechanical facility in arriv- ing at conclusions, gives a superficial character to economic investigation, divorcing it from the physical and biological sciences, excluding the question of real social utility, leaving no room for a criticism of production, and leading to a denial, like J. §. Mill's, of any economic doctrine dealing with consumption—in other words, with

the use of wealth. (4) In condemning the existing industrial policy, he tends too much towards a glorification of non-govern- ment, and a repudiation of all social intervention for the regulation of economic life. (5) He does not keep in view the moral destination of our race, nor regard wealth as a means to the higher ends of life, and thns incurs, not altogether unjustly, the charge of materialism, in the wider sense of that word. Lastly, (6) his whole system is too absolute in its character ; it does not sufficiently recognize the fact that, in the language of Hildebrand, man, as a member of society, is a child of civilization and a product of history, and that account ought to be taken of the

different stages of social development as implying altered |

economic conditions and calling for altered economic action, or even involving a modification of the actor.

Perhaps in all the respects here enumerated, certainly in |

some of them and notably in the last, Smith is less open to criticism than most of the later English economists ; but it must, we think, be admitted that to the general principles which lie at the basis of his scheme the ultimate growth of these several vicious tendencies is traceable.

Great expectations had been entertained respecting Smith's work by competent judges before its publication, as.is shown by the language of Ferguson on the subject in his History of Civil Society. That its merits received

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prompt recognition is proved by the fact of six editions having been called for within the fifteen years after its appearance.! From the year 1783 it was more and more quoted in parliament. Pitt was greatly impressed by its reasonings ; Smith is reported to have said that that minister understood the book as well as himself. Pulteney said in 1797 that Smith would convince the then living generation and would rule the next.

Smith’s earliest critics were Bentham and Lauderdale, who, though in general agreement with him, differed on special points. Jeremy Bentham was author of a short treatise entitled A Manual of Political Economy (1843), and various economic monographs, the most celebrated of which was his Defence of Usury (1787). This contained (Letter xiii.) an elaborate criticism of a passage in the Wealth of Nations, already cited, in which Smith had approved of a legal maximum rate of interest fixed but a very little above the lowest market rate, as tending to throw the capital of the country into the hands of sober persons, as opposed to “ prodigals and projectors.” Smith is said to have admitted that Bentham had made out his case. He certainly argues it with great ability; and the true doctrine no doubt is that, in a developed industrial society, it is expedient to let the rate be fixed by contract between the lender and the borrower, the law interfering only in case of fraud.

Bentham’s main significance does not belong to the economic field. But, on the one hand, what is known as Benthamism was undoubtedly, as Comte has said, a derivative from political economy, and in particular from the system of natural liberty; and, on the other, it pro- moted the temporary ascendency of that system by extend- ing to the whole of social and moral theory the use of the

| principle of individual interest and the method of deduc-

tion from that interest. This alliance between political economy and the scheme of Bentham is seen in the personal group of thinkers which formed itself round him, -—thinkers most inaptly characterized by J. S. Mill as “»rofound,” but certainly possessed of much acuteness and logical power, and tending, though vaguely, towards a positive sociology, which, froni their want of genuinely scientific culture and their absolute and unhistorical modes of thought, they were incapable of founding.

Lord Lauderdale, in his Inquiry into the Nature and Origin of Public Wealth (1804), a book still worth read- ing, pointed out certain real weaknesses in Smith’s account of value and the measure of value, and of the productivity of labour, and threw additional light on several subjects, such as the true mode of estimating the national income, and the reaction of the distribution of wealth on its pro- duction,

Smith stood just at the beginning of a great industrial revolution. The world of production and commerce in which he lived was still, as Cliffe Leslie has said, a ‘‘ very

1 Five editions of the Wealth of Nations appeared during the life of the author:—the second in 1779, the third in 1784, the fourth in 1786, and the fifth in 1789. After the third edition Smith made no change in the text of his work. The principal editions containing matter added by other economists are those by David Buchanan, with notes and an additional volume, 1814; by J. R. M‘Culloch, with life of the author, introductory discourse, notes, and supplemental disser- tations, 1828 (also, with numerous additions, 1839; since reprinted several times with further additions); by the anthor of England and America Edward Gibbon Wakefield), with a commentary, which, how- ever, is not continued beyond the second book, 1835-9 ; by James E. Thorold Rogers, now professor of political economy at Oxford, with biographical preface and a careful verification of all Smith’s quota- tions and references, 1869 (2d ed., 1880); and by J. 8. Nicholson, professor at Edinburgh, with notes referring to sources of further information on the various topics handled in the text, 1884. There is a careful Abridgment by W. P. Emerton (2d ed., 1881), founded on the earlier Analysis of Jeremiah Joyce (3d ed., 1821).

Malthus.

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early” and comparatively narrow one; “the only steam- engine he refers to is Newcomen’s,” and the cotton trade is mentioned by him only once, and that incidentally. “Between the years 1760 and 1770,” says Mr Marshall, “Roebuck began to smelt iron by coal, Brindley connected the rising seats of manufactures with the sea by canals, Wedgwood discovered the art of making earthenware cheaply and well, Hargreaves invented the spinning jenny, Arkwright utilized Wyatt’s and High’s inventions for spinning by rollers and applied water power to move them, and Watt invented the condensing steam-engine.

after.” Out of this rapid evolution followed a vast expansion of industry, but also many deplorable results, which, had Smith been able to foresee them,

might have made him a less enthusiastic believer in the benefits to be wrought by the mere liberation of effort, and a less vehement denouncer of old institutions which in their day had given a partial protection to labour. these evils of the new industrial system, socialism appeared as the alike inevitable and indispensable expression of the protest of the working classes and the aspiration after a better order of things; and what we now call “the social question,” that inexorable problem of modern life, rose into the place which it has ever since maintained. This question was first effectually brought before the English mind by Thomas Robert Malthus (1766-1834), not, how- ever, under the impulse of revolutionary sympathies, but in the interests of a conservative policy.

The first edition of the work which achieved this result appeared anonymously in 1798 under the title—An Essay on the Principle of Population, as tt affects the future improvement of Society, with remarks on the speculations of Mr Godwin, M. Condorcet, and other writers. This book arose out of certain private controversies of its author with his father Daniel Malthus, who had been a friend of Rousseau, and was an ardent believer in the doctrine of human progress as preached by Condorcet and other French thinkers and by their English disciples. The most distinguished of the latter was William Godwin, whose Enquiry concerning Political Justice had been pub- lished in 1793. The views put forward in that work had been restated by its author in the Hnquirer (1797), and it was on the essay in this volume entitled “ Avarice and Profusion ” that the discussion between the father and the son arose, “the general question of the future improve- inent of society” being thus raised between them—the elder Malthus defending the doctrines of Godwin, and the younger assailing them. The latter “sat down with an

intention of merely stating his thoughts on paper in a | oe | was such a change in the nature and composition of the

clearer manner than he thought he could do in conversa- tion,” and the Hssay on population was the result.

The social scheme of Godwin was founded on the idea that the evils of society arise from the vices of human institutions. There is more than enough of wealth avail- able for all, but it is not equally shared: one has too much, another has little or nothing. Let *this wealth, as well as the labour of

producing it, be equally divided ; then everyone will by moderate exertion obtain sufficient for plain living; there will be abundant leisure, which will be spent in intellectual and moral self-improvement; reason will determine human actions; government and every kind of force will be unnecessary ; and, in time, by the peaceful influence of truth, perfection and happiness will be established on earth. To these glowing anticipa- tions Malthus opposes the facts of the necessity of food, and the tendency of mankind to increase up to the limit of the available supply of it. In a state of universal physical wellbeing, this tendency, which in real life is held in check by the difficulty of procuring a subsistence, would

Cromp- | ton's mule and Cartwright's powerloom came shortly |

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operate without restraint. Scarcity would follow the increase of numbers; the leisure would soon cease to exist; the old struggle for life would recommence ; and inequality would reign once more. If Godwin's ideal system, therefore, could be established, the single force of the principle of population, Malthus maintained, would suffice to break it down.

It will be seen that the essay was written with a pole- mical object; it was an occasional pamphlet directed against the utopias of the day, not at all a systematic treatise on population suggested by a purely scientific interest. As a polemic, it was decidedly successful ; it was no difficult task to dispose of the scheme of equality propounded by Godwin. Already, in 1761, Dr Robert Wallace had published a work (which was used by Malthus in the composition of his essay) entitled Various Prospects of Mankind, Nature, and Providence, in which, after speak- ing of a community of goods as a remedy for the ills of society, he confessed that he saw one fatal objection to such a social organization, namely, "the excessive popula- tion that would ensue." With Condorcet's extravagances, too, Malthus easily dealt. That eminent man, amidst the tempest of the French Revolution, had written, whilst in hiding from his enemies, his Hsquisse d'un tableau histort- que de Vesprit humain. The general conception of this book makes its appearance an epoch in the history of the rise of sociology. In it, if we

except some partial sketches by Turgot, is for the first time explained the idea of a theory of social dynamics founded on history; and its author is on this ground recognized by Comte as his prin- cipal immediate predecessor. But in the execution of his great project Condorcet failed. His negative metaphysics prevent his justly appreciating the past, and he indulgcs, at the close of his work, in vague hypotheses respecting the perfectibility of our race, and in irrational expectations of an indefinite extension of the duration of human life. Malthus seems to have little sense of tle nobleness of Condorcet's attitude, and no appreciation of the grandeur of his leading idea. But of his chimerical hopes he is able to make short work; his good sense, if somewhat limited and prosaic, is at least effectual in detecting and exposing utopias.

_ The project of a formal and detailed treatise on popula- tion was an afterthought of Malthus. The essay in which he had studied a hypothetic future led him to examine the effects of the principle he had put forward on the past and present state of society; and he undertook an historical examination of these effects, and sought to draw such inferences in relation to the actual state of things as experience seemed to warrant. The consequence of this

essay as made it, in his own language, "a new work." The book, so altered, appeared in 1803 under the title— An Essay on the Principle of Population, or a wew of us Past and Present Effects on Human Happiness ; with an Enquiry into our prospects respecting the future removal or mitigation of the evils which wt occasrons.

In the original form of the essay he had spoken of no checks to population but those which came under the head either of vice or of misery. He now introduces the new element of the preventive check supplied by what he calls "moral restraint," and is thus enabled to "soften some of the harshest conclusions" at which he had before arrived. The treatise passed through six editions in his lifetime, and in all of them he introduced various additions and corrections. That of 1816 is the last he revised, and supplies the final text from which it has since been reprinted.

'Notwithstanding the great development which he gave to his work and the almost unprecedented amount of

discussion to which it gave rise, it remains a matter of some difficulty to discover what solid contribution he has made to our knowledge, nor is it easy to ascertain precisely what practical precepts, not already familiar, he founded on his theoretic principles. This twofold vagueness 1s well brought out in his celebrated correspondence with Senior, in the course of which it seems to be made appar- ent that his doctrine is new not so much in its essence as

in the phraseology in which it is couched. He himself tells us that when, after the publication of the original essay, the main argument of which he had deduced from Hume, Wallace, Smith, and Price, he began to inquire more closely into the subject, he found that " much more had been done" upon it "than he had been aware of." It had "been treated in such a manner by some of the French economists, occasionally by Montesquieu, and, among our own writers, by Dr Franklin, Sir James Steuart, Mr Arthur Young, and Mr Townsend, as to create a natural surprise that it had not excited more of the public attention." " Much, however," he thought, " re- mained yet to be done. The comparison between the increase of population and food had not, perhaps, been stated with sufficient force and precision," and "few inquiries had been made into the various modes by which the level" between population and the means of subsist- ence "is effected." The first desideratum here mentioned —the want, namely, of an accurate statement of the rela- tion between the increase of population and food— Malthus doubtless supposed to have been supplied by the celebrated proposition that "population increases in a geometrical, food in an arithmetical ratio." This proposition, however, has been conclusively shown to be erroneous, there being no such difference of law between the increase of man and that of the organic beings which form his food. J.S. Mill is indignant with those who criticize Malthus's formula, which he groundlessly describes as a mere "passing remark," because, as he thinks, though erroneous, it sufficiently suggests what is true; but it is surely important to detect unreal science, and to test strictly the foundations of beliefs. When the formula which we have cited is not used, other somewhat nebulous expressions are sometimes employed, as, for example, that " population has a tend- ency to increase faster than food," a sentence in

which both are treated as if they were spontaneous growths, and which, on account of the ambiguity of the word “ tend- ency,” is admittedly consistent with the fact asserted by Senior, that food tends to increase faster than population. It must always have been perfectly well known that population will probably (though not necessarily) increase with every augmentation of the supply of subsistence, and may, In some instances, inconveniently press upon, or even for a certain time exceed, the number properly. corre- sponding to that supply. Nor could it ever have been doubted that war, disease, poverty—the last two often the consequences of vice—are causes which keep popula- tion down. In fact, the way in which abundance, increase of numbers, want, increase of deaths, succeed each other in the natural economy, when reason does not intervene, had been fully explained by the Rev. Joseph Townsend in his Dissertation on the Poor Laws (1786), which was known to Malthus. Again, it is surely plain enough that the apprehension by individuals of the evils of poverty, or a sense of duty to their possible offspring, may retard the increase of population, and has in all civilized com- munities operated to a certain extent in that way. It is only when such obvious truths are clothed in the techni- cal terminology of “ positive” and “ preventive checks ” that they appear novel and profound; and yet they appear to contain the whole message of Malthus to mankind.

The laborious apparatus of historical and statistical facts |

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respecting the several countries of the globe, adduced in the altered form of the essay, though it contains a good deal that is curious and interesting, establishes no general result which was not previously well known, and is accord- ingly ignored by James Mill and others, who rest the theory on facts patent to universal observation. Indeed, as we have seen, the entire historical inquiry was an after- thought of Malthus, who, before entering on it, had already announced his fundamental principle.

It would seem, then, that what has been ambitiously called Malthus’s theory of population, instead of being a

great discovery, as some have represented it, or a poisonous ©

novelty, as others have considered it, is no more than a formal enunciation of obvious, though sometimes neglected, facts. The pretentious language often applied to it by economists is objectionable, as being apt to make us forget that the whole subject with which it deals is as yet very imperfectly understood—the causes which modify the force of the sexual instinct, and those which lead to variations in fecundity, still awaiting a complete investiga- tion.

It is the law of diminishing returns from land (of which we shall hear more hereafter), involving as it does—though only hypothetically—the prospect of a continuously in- creasing difficulty in obtaining the necessary sustenance for all the members of a society, that gives the principal importance to population as an economic factor. It is, in fact, the confluence of the Malthusian ideas with the theories of Ricardo, especially with the corollaries which the latter, as we shall see, deduced from the doctrine of rent (though these were not accepted by Malthus), that has led to the introduction of population as an element in the discussion of so many economic questions in recent times.

Malthus had undoubtedly the great merit of having called public attention in a striking and impressive way to a subject which had neither theoretically nor practically been sufficiently considered. But he and his followers appear to have greatly exaggerated both the magnitude and the urgency of the dangers to which they pointed.!_ In their conceptions a single social imperfection assumed such portentous dimensions that it seemed to overcloud the whole heaven and threaten the world with ruin. This doubtless arose from his having at first omitted altogether from his view of the question the great counteracting agency of moral restraint. Because a force exists, capable, if unchecked, of producing certain results, it does not follow that those results are imminent or even possible in the sphere of experience. A body thrown from the hand would, under the single impulse of projection, move for ever in a straight line; but it would not be reasonable to take special action for the prevention of this result, ignor- ing the fact that it will be sufficiently counteracted by the other forces which will come into play. And such other forces exist in the case we are considering. If the inherent energy of the principle of population (supposed everywhere the same) is measured by the rate at which numbers increase

under the most favourable circumstances, surely the force of less favourable circumstances, acting through prudential or altruistic motives, is measured by the great difference between this maximum rate and those whicli are observed to prevail in most European countries. Under a rational system of institutions, the adaptation of numbers to the means available for their support is effected by the felt or anticipated pressure of circumstances and the fear of social degradation, within a tolerable degree of approximation to what is desirable. To bring the result nearer to the just standard, a higher measure of

1 Malthus himself said, ‘‘It is probable that, having found the bow

| bent too much one way, I was induced to bend it too much the other | 4n order to make it straight.”

popular enlightenment and more serious habits of moral | themselves to blame, and not either the negligence of their reflexion ought indeed to be encouraged. But it is the | superiors or the institutions of the country. The applica- duty of the individual to his possible offspring, and not | tion of his doctrines, too, made by some of his successors

any vague notions as to the pressure of the national popu- lation on subsistence, that will be adequate to influence conduct.

The only obligation on which Malthus insists is that of abstinence from marriage so long as the necessary provision for a family has not been acquired or cannot be reasonably anticipated. The idea of post-nuptial continence, which has since been put forward by J. S. Mill and others, is foreign to his view. He even suggests that an allowance might be made from the public funds for every child in a family beyond the number of six, on the ground that, when a man marries, he cannot tell how many children he shall have, and that the relief from an unlooked-for distress afforded by such a grant would not operate as an encouragement to marriage. The duty of economic prudence in entering on the married state is plain; but in the

case of working men the idea of a secured pro- vision must not be unduly pressed, and it must also be remembered that the proper age for marriage in any class depends on the dura- tion of life in that class. Too early marriages, however, are certainly not unfrequent, and they are attended with other than material evils, so that possibly even legal measures might with advantage be resorted to for preventing them in all ranks by some- what postponing the age of full civil competence. On the other hand, however, the Malthusians often speak too lightly of involun- tary celibacy, not recognizing sufficiently that it is a deplorable necessity. They do not adequately estimate the value of domestic life as a school of the civic virtues, and the social importance (even apart from personal happiness) of the mutual affective education arising from the relations of the sexes in a well-constituted union.

Malthus further infers from his principles that states should not artificially stimulate population, and in particular that poor-laws should not be established, and, where they exist, should be abolished. The first part of this proposition cannot be accepted as applying to every social phase, for it isevident that in a case like that of ancient Rome, where continuous conquest was the chief occupation of the national activity, or in other periods when protracted wars threatened the independence or security of nations, statesmen might wisely take special action of the kind deprecated by Malthus. In relation to modern industrial communities he is doubtless in general right, though the promotion of immigration in new states is similar in principle to the encouragement of population. The question of poor-laws involves other considerations. ‘The English system of his day was certainly a vicious one, though acting in some degree as a corrective of other evils in our social institutions; and efforts for its amendment tended to the public good. But the pro- posal of abolition is one from which statesmen have recoiled, and which general opinion has never adopted. It is difficult to believe that the present system will be permanent; it is too mechanical and undiscriminating; on some sides too lax, it is often unduly rigorous in the treatment of the worthy poor who are the victims of misfortune; and, in its ordinary modes of dealing with the young, it is open to graveobjection. But it would certainly be rash to abolish it; it is one of several institutions which will more wisely be retained until the whole subject of the life of the working classes has been more thoroughly, and also more sympathetically,

studied. The position of Malthus with respect to the relief of destitution is subject to this general eriticism that, first proving too much, he then shrinks from the consequences of his own logic. It follows from his arguments, and is indeed explicitly stated in a celebrated passage of his original essay, that he who has brought children into the world without adequate provision for them should be left to the punishment of Nature, that “it is a miserable ambition to wish to snatch the rod from her hand,” and to defeat the action of her laws, which are the laws of God, and which “ have doomed him and his family to suffer.” Though his theory leads him to this conclusion, he could not, as a Christian clergyman, maintain the doctrine that, seeing our brother in need, we ought to shut.up our bowels of compassion from him; and thus he is involved in the radical incon- sequence of admitting the lawfulness, if not the duty, of relieving distress, whilst he yet must regard the act as doing mischief to society. Buckle, who was imposed on by more than one of the exaggerations of the economists, accepts the logical inference which Malthus evaded. He alleges that the only ground on which we are justified in relieving destitution is the essentially self-regarding one, that by remaining deaf to the appeal of the sufferer we should probably blunt the edge of our own finer sensibilities. ;

It can scarcely be doubted that the favour which was at once accorded to the views of Malthus in certain circles was due in part to an impression, very welcome to the higher ranks of society, that they tended to relieve the

rich and powerful of responsibility for the condition of the

had the effect of discouraging all active effort for social improvement. Thus Chalmers “reviews seriatim and gravely sets aside all the schemes usually proposed for the amelioration of the economic condition of the people” on the ground that an increase of comfort will lead to an increase of numbers, and so the last state of things will be worse than the first.

Malthus has in more recent times derived a certain degree of reflected lustre from the rise and wide acceptance of the Darwinian hypothesis. Its author himself, in tracing its filiation, points to the phrase “ struggle for existence ” used by Malthus in relation to the social com- petition. Darwin believes that man has advanced to his present high condition through such a struggle, consequent on his rapid multiplication. He regards, it is true, the agency of

this cause for the improvement of our race as largely superseded by moral influences in the more advanced social stages. Yet he considers it, even in these stages, of so much importance towards that end that, not-withstanding the individual suffering arising from the struggle for life, he deprecates any great reduction in the natural, by which he seems to mean the ordinary, rate of increase.

There has been of late exhibited in some quarters a tendency to apply the doctrine of the “survival of the fittest ” to humau society in such a way as to intensify the harsher features of Malthus’s exposition by encouraging the idea that whatever cannot sustain itself is fated, and must be allowed, to disappear. But what is repellent in this conception is removed by a wider view of the influence of Humanity, as the presiding race, alike on vital and on social conditions. As in the general animal domain the supremacy of man introduces a new force consciously con- trolling and ultimately determining the destinies of the subordinate species, so human providence in the social sphere can intervene for the protection of the weak, modi-fying by its deliberate action what would otherwise be a mere contest of comparative strengths inspired by selfisl instincts.

David Ricardo (1772-1823) is essentially of the school Ricardo.

of Smith, whose doctrines he in the main accepts, whilst he seeks to develop them, and to correct them in certain particulars. But his mode of treatment is very different from Smith’s. The latter aims at keeping close to the realities of life as he finds them,—at representing the con- ditions and relations of men and things as they are ; and, as Hume remarked on first reading his great work, his principles are everywhere exemplified and illustrated with curious facts. Quite unlike this is the way in which Ricardo proceeds. He moves in a world of abstractions. He sets out from more or less arbitrary assumptions, reasons deductively from these, and announces his conclu- sions as true, without allowing for the partial unreality of the conditions assumed or confronting his results with experience. When he seeks to illustrate his doctrines, it is from hypothetical cases,—his favourite device being that of imagining two contracting savages, and considering how they would be likely to act. He does not explain—prob- ably he had not systematically examined, perhaps was not competent to examine—the

appropriate method of political economy; and the theoretic defence of his mode of proceeding was left to be elaborated by J. S. Mill and Cairnes. But his example had a great effect in determin- ing the practice of his successors. There was something highly attractive to the ambitious theorist in the sweeping march of logic which seemed in Ricardo's hands to emulate

working classes, by showing that the latter had chiefly | the certainty and comprehensiveness of mathematical

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proof, and in the portable and pregnant formule which were so convenient in argument, and gave a prompt, if often a more apparent than real, solution of difficult problems. Whatever there was of false or narrow in the fundamental positions of Smith had been in a great degree corrected by his practical sense and strong instinct for reality, but was brought out in its full dimensions and even exaggerated in the abstract theorems of Ricardo and his followers.

The dangers inherent in his method were aggravated by the extreme looseness of his phraseology. Senior pro- nounces him " the most incorrect writer who ever attained philosophical eminence." His most ardent admirers find him fluctuating and uncertain in the use of words, and generally trace his errors to a confusion between the ordinary employment of a term and some special applica- tion of it which he has himself devised.

The most complete exposition of his system is to be found in his Principles of Political Economy and Taxation (1817). This work is not a complete treatise on the science, but a rather loosely connected series of disquisi- tions on value and price, rent, wages and profits, taxes, trade, money and banking. Yet, though the connexion of the parts-is loose, the same fundamental ideas recur con- tinually, and determine the character of the entire scheme.

The principal problem to which he addresses himself in this work is that of distribution,—that is to say, the pro- portions of the whole produce of the country which will be allotted to the proprietor of land, to the capitalist, and to the labourer. And it is important to observe that it is especially the

variations in their respective portions which take place in the progress of society that he professes to study,—one of the most unhistorical of writers thus in- dicating a sense of the necessity of a doctrine of econoinic dynamics—a doctrine which, from his point of view, it was impossible to supply.

The principle which he puts first in order, and which is indeed the key to the whole, is this—that the exchange value of any commodity the supply of which can be increased at will is regulated, under a régime of free competition, by the labour necessary for its production. Similar propositions are to be found in the Wealth of Nations, not to speak of earlier English writings. Smith had said that, “in the early and rude state of society which precedes both the accumula- tion of stock and the appropriation of land, the proportion between the quantities of labour necessary for acquiring different objects seems to be the only circumstance which can afford any rule for exchanging them with one another.” But he wavers in his con- ception, and presents as the mcasure of value sometimes the quantity of labour necessary for the production of the object, some- times the quantity of labour which the object would command in the market, which are identical only for a given time and place. The theorem requires correction for a developed social system by the introduction of the consideration of capital, and takes the form in which it is elsewhere quoted from Malthus by Ricardo, that the real price of a commodity ‘‘depends on the greater or less quantity of capital and labour which must be employed to produce it.” (The expression ‘quantity of capital” is lax, the element of time being omitted, but the meaning is obvious). Ricardo, however, constantly takes no notice of capital, mentioning labour alone in his statement of this principle, and seeks to justify his practice by treating capitalas “‘accumulated labour”; but this artificial way of viewing the facts obscures the nature of the co- operation of capital in produc- tion, and by keeping the necessity of this co- operation out of sight has encouraged some socialistic errors. Ricardo does not sufficiently distinguish between the cause or determinant and the measure of value; nor does he carry back the principle of cost of production as regulator of value to its foundation in the effect of that cost on the limitation of supply. It is the ‘‘ natural price” of a commodity that is fixed by the theorem we have stated ; the market price will be subject to accidental and temporary variations from this standard, depending on

changes in demand and supply; but the price will, permanently and in the long run, depend on cost of production de- fined as above. On this basis Ricardo goes on to explain the laws according to which the produce of the land and the labour of the country is distributed amongst the several classes which take part in production.

The theory of rent, with which be begins, though commonly associated with his name, and though it certainly forms the most

vital part of his gencral economic scheme, was not really his, nor did he lay claim to it. He distinctly states in the preface to the Principles, that ‘‘in 1815 Mr Malthus, in his Znquiry into the Nature and Progress of Rent, and a fellow of University College, Oxford, in his Lssay on the Application of Capital toLand, presented to the world, nearly at the same moment, the true doctrine of rent.” The second writer here referred to was Sir Edward West, afterwards a judge of the supreme court of Bombay. Still earlier than the time of Malthus and West, as M‘Culloch has pointed out, this doctrine had been clearly conceived and fully stated by Dr James Anderson in his Enquiry into the Nature of Corn-Laws,

| published at Edinburgh in 1777. That this tract was unknown to

Malthus and West we have every reason to believe; but the theory

‘is certainly as distinctly enunciated and as satisfactorily supported

in it asin their treatises; and the whole way in which it is put forward by Anderson strikingly resembles the form in which it is presented by Ricardo.

The essence of the theory is that rent, being the price paid by the cultivator to the owner of land for the use of its productive powers, is equal to the excess of the price of the produce of the land over the cost of production on that land. With the increase of popula- tion, and therefore of demand for food, infcrior soils will be taken into cultivation ; and the price of the entire supply necessary for the community will be regulated by the cost of production of that portion of the supply which is produced at the greatest expense. But for the land which will barely repay the cost of cultivation no rent will be paid. Hence the rent of any quality of land will be equal to the

dificrence between the cost of production on that land and the cost of production of that produce which is raised at the greatest expense.

The doctrine is perhaps most easily apprehended by means of the supposition here made of the coexistence in a country of a series of soils of different degrees of fertility which are successively taken into cultivation as population increases. But it would be an error to believe, though Ricardo sometimes seems to imply it, that such difference is a necessary condition of the existence of rent. If all the land of a country were of equal fertility, still if it were appro- priated, and if the price of the produce were more than an equiva- lent for the labour and capital applicd to its production, rent would be paid. This imaginary case, however, after using it to clear our conceptions, we may for the future leave out of account.

The price of. produce being, as we have said, regulated by the cost of production of that which pays no rent, it is evident that ‘‘eorn is not high because a rent is paid, but a rent is paid because corn is high,” and that ‘‘no reduction would take place in the price of corn although landlords should forego the whole of their rent.” Rent is, in fact, no determining element of pricc ; it is paid, indeed, out of the price, but the price would be the same if no rent were paid, and the whole price were retained by the cultivator.

It has often been doubted whether or not Adam Smith held this theory of rent. Sometimes he uses language which secms to imply it, and states propositions which, if developed, would infallibly lead to it. Thus he says, in a passage already quoted, ‘‘ such parts only of the produce of land can commonly be brought to market of which the ordinary price is sufficient to replace the stock which must be employed in bringing them thither, together with its ordinary profits. If the ordinary price is more than this, the surplus part of it will naturally go to the rent of land. If it, is not more, though the commodity can be brought to market, it can afford no rent to the landlord. Whether the price is or is not more depeuds on the demand.” Again, in Smith’s application of these considerations to mines, ‘‘ the whole principle of rent,” Ricardo tells us, ‘‘is admirably and perspicuously explained.” But he had formed the opinion that there is in fact no land which does not afford a rent to the landlord ; and, strangely, he seems not to have seen that this appearance might arise from the aggregation into an economic whole of

parcels of land which can and others which cannot pay rent. The truth, indeed, is that the fact, if it were a fact, that all the land in a country pays rent would be irrelevant as an argument against the Andersonian theory, for it is the same thing in substance if there be any capital employed on land already cultivated which yields a return no more than equal to ordinary profits. Such last-employed capital cannot afford rent at the exist- ing rate of profit, unless the price of produce should rise.

The belief which some have entertained that Smith, notwith- standing some vague or inaccurate expressions, really held the Andersonian doctrine, can scarcely be maintaincd when we remember that Hume, writing to him after having read for the first time the Wealth of Nations, whilst expressing general agreement with his opinions, said (apparently with reference to bk. I. chap. vii.), “TI cannot think that the rent of farms makes any part of the price of the produce, but that the price is determined altogether by the quantity and the demand.” It is further noteworthy that a state- inent of the theory of rent is given in the same volume, published in 1777, which contains Anderson’s polemic against Smith’s objec- tions to a bounty on the exportation of corn; this volume can hardly have escaped Smith’s notice, yet neither by its contents nor

by Hume’s letter was he led to modify what he had said in his first edition on the subject of rent.

It must be remembered that not merely the unequal fertilities of different soils will determine differences of rent ; the more or less advantageous situation of a farm in relation to markets, and there- fore to roads and railways, will have a similar effect. Every diminution of the cost of transit will enable the produce to be brought to market at a smaller expense, and will thus incrcase the surplus which constitutes rent. This considcration is indicated by Ricardo, though he docs not give it prominence, but dwells mainly on the comparative productiveness of soils.

Rent is defined by Ricardo as the price paid for thic use of “ the original and indestructible powers of the soil.” Hethus differentiates rent, as he uses the term, from what is popularly designated by the word ; and, when it is to

be taken in his sense, it is often qualificd as the “truce” or “economic” rent. Part of what is paid to the land- lord is often really profit on his expenditure in preparing the farm for cultivation by the tenant. But it is to be borne in mind that wherever such improvements are “ amalgamated with the land,” and “add permanently to its productive powers,” the return for them follows the laws, not of profit, but of rent. Hence it becomes difficult, if not impossible, in practice to discrinrinate with any degree of accuracy the amount received by the landlord “for the use of the original powers of the soil” from the amount received by him as remuneration for his improvements or those made by his predecessors. These have raised the farm, as an instrument for producing food, from one class of productiveness to a higher, and the case is the same as if nature had originally placed the land in question in that higher class.

Smith had treated it as the peculiar privilege of agriculture, as comparcd with other forms of production, that in it ‘‘ nature labours along with man,” and therefore, whilst the workmen in manu- factures occasion the reproduction merely of the capital which employs them with its owner’s profits, the agricultural labourer occasions the reproduction, not only of the employer’s capital with profits, but also of the rent of the landlord. This last he viewed as the free gift of nature which remained ‘‘after deducting or com- pensating everything which can be regarded as the work of map.” Ricardo justly observes in reply that ‘‘there is not a manufacture which can be mentioned in which nature does not give her assist- ance to man.” He then goes on to quote from Buchanan the re- mark that ‘‘ the notion of agriculture yielding a produce and a rent in consequence, because nature concurs with industry in the process of cultivation, is a mere fancy. It is not from the produce, but from the price at which the produce is sold, that the rent is derived ; and this price is got, not because nature assists in the production, but because it is the price which suits the consumption to the supply.”! There is no gain to the society at large from the rise of rent ; it is advantageous to the landlords alone, and their interests are thus permanently in opposition to those of all other classes. The rise of rent may be retarded, or prevented, or even temporarily changed to a fall, by agricultural improvements, such as the intro- duction of new manures or of machines or of a better organization of labour (though there is not so much room for this last as in other branches of production), or the opening of new

sources of supply in forcign countries ; but the tendency to a rise is constant so long as the population increases.

The great importance of the theory of rent in Ricardo's system arises from the fact that he makes the general cconomie condition of the society to depend altogether on the position in which agri- cultural exploitation stands. This will be seen from the following statement of his theory of wages and profits. The produce of every expenditure of labour and capital being divided between the labourer and the capitalist, in proportion as one obtains morc the other will necessarily obtain less. The productiveness of labour being given, nothing can diminish profit but a rise of wages, or increase it but a fall of wages. Now the price of labour, being the same as its cost of production, is determined by the price of the commodities necessary for the support of the labourer. The price of such manufactured articles as he requires has a constant tendeney to fall, principally by reason of the progressive application of the division of labour to their production. But the cost of his main- tenance essentially depends, not on the price of those articles, but on that of his food; and, as the production of food will in the progress of society and of population require the sacrifice of more and more labour, its price will rise; moncy wages will consequently rise, and with the rise of wages profits will fall. Thus it is to the necessary gradual descent to infcrior soils, or less productive expenditure on the same soil, that the decrease in the rate of profit which has historically taken place is to be attributed (Smith ascribed this decrease to the competition of capitalists, though in

1 Senior, however, has pointed out that Smith is partly right; whilst it is true that rent is demanded because the productive powers of nature are limited, and increased population requires a less remunerative expenditure in order to obtain the necessary supply, on the other hand, it is the power whieh most land possesses of producing the subsistenee of more persons than are required for its cultivation that supplies the fund out of which rent ean be paid.

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oue place, book I. chap. ix., he had a glimpse of the Ricardian view). This gravitation of profits towards a minimum is happily checked at times by improvements of the machinery employed in the produc- tion of necessaries, and especially by such discoveries in agriculture and other causes as reduce the cost of the prime necessary of the labourer ; but, here again, the tendency is constant. Whilst the capitalist thus loses, the labourer does not gain; his increased money wages only enable him to pay the increased price of his necessaries, of which he will have no greater and probably a less share than he had before. In fact, the labourer can never for any considerable time earn morc than what is required to enable the class to subsist in such a degree of comfort as custom has made in- dispensable to them, and to perpetuate their race without either increase or diminution. That is the ‘‘natural” price of labour; and if the market rate temporarily rises above it population will be stimulated, and the rate of wages will again fall. Thus, whilst rent has a constant tendency to rise and profit to fall, the rise or fall of wages will depend on the rate of increase of the working classes. For the improvement of their condition Ricardo thus has to fall back on the Malthusian remedy, of the effective application of which he does not, however, seem to have much expectation. The securities against a superabundant population to which he points are the gradual abolition of the poor laws—for their amend- ment would not content him—and the development aniongst the working classes of a taste for greater comforts and enjoyments.

1t will be seen that the socialists have somewhat exaggerated in announcing, as Ricardo’s “‘ iron law” of wages, their absolute iden- tity with the amount necessary to sustain the existence of the labourer and enable him to continue the race. He recognizes the influence of a “standard of living” as limiting the increase of the numbers of the working classes, and so kceping thcir wages above the lowest point. But he also holds that, in long-settled countries, in the ordinary course of human affairs, and in the absence of special efforts restricting the growth of population, the condition of the labourer will decline as surely, and from the same causes, as that . of the landlord will be improved.

If we are asked whether this doctrine of rent, and the conse- quences which Ricardo deduced from it, are true, we must answer that they are

hypothetically true in the most advanced industrial communities, and there only (though they have been rashly applied to the cases of India and Ireland), but that even in those communitics neither safe inference nor sound action can be built upon them. As we shall see hereafter, the value of most of the theorems of the classical economics is a good deal attenuated by the habitual as- suniptions that we are dealing with ‘‘ economic men,” actuated by one principle only; that custom, as against competition, has no existence ; that there is no such thing as combination ; that there is equality of contract between the parties to each transaction, and that there is a definite universal rate of profit and wages in a com- munity, which implies that the capital embarked in any undertak- ing will pass at once toanother in which larger profits are for the time to be made ; that a labourer, whatever his local ties of feeling, family, habit, or other engagements, will transfer himself imme- diately to any place where, or employment in which, for the time, larger wages are to be earned than those he had previously obtained ; and that both capitalists and labourers havea perfect knowledge of the condition and prospects of industry throughout the country, both in their own and other occupations. But in Ricardo’s specu- lations on rent and its conscquences there is still more of abstrac- tion. The influence of emigration, which has assumed vast dimen- sions since his time, is left out of account, and the amount of land at the disposal of a community is supposed limited to its own ter- ritory, whilst contemporary Europe is in fact largely fed by the western States of America. He did not adequately appreciate the degree in which the augmented productiveness of labour, whether from increased intelligence, improved organization, introduction of machinery, or more rapid and cheaper communication, steadily kecps down the cost of production. To these influences must be added those of legal reforms in tenure, and fairer conditions in con- tracts, which operate in the same direction. As a result of all tlese causes, the pressure anticipated by Ricardo is not felt, and the cry is rather of the landlords over falling rents than of the consumer over rising prices. The entire conditions are in fact so altered that Prof. Nicholson, no enemy to the ‘‘orthodox” econo- mics, when recently conducting an inquiry into the present state of the agricultural question, pronounced the so-called Ricardian theory of rent ‘‘ too abstract to be of practical utility.”

A particular economic subject on which Ricardo has thrown a useful light is the nature of the advantages derived from foreign commerce, and the conditions under which such commerce can go on. Whilst preceding writers had represented those benefits as consisting in affording a vent for surplus produce, or enabling a portion of the national capital to replace itself with a profit, he pointed out that they consist ‘‘simply and solely in this, that it enables each nation to obtain, with a given amount of labour and capital, a greater quantity of all commodities taken together.” This is no doubt the point of view at which we should habitually

place ourselves ; but the other forms of expression employed by his predecessors are sometimes useful as representing real considerations affecting national production, and nced not be absolutely disused. Ricardo proceeds to show that what determines the purchase of any commodity fromm a foreign country is not the circumstance that it can be produced there with less labour and capital than at homie. If we have a greater positive advantage in the production of some other article than in that of the commodity in question, even though we have an advantage in producing the latter, it may be our interest to devote ourselves to the production of that in which we have the greatest advantage, and to import that iu producing which we should have a less, though a real, advantage. It is, in short, not absolute cost of production, but comparative cost, which determines the interchange. This remark is just and interesting, though an undue importance seems to be attributed to it by J. S. Mill and Cairnes, the latter of whom magniloquently describes it as ‘sounding the depths” of the problem of international dealings, — though, as we shall see hereafter, he modifies it by the introduction of certain eonsiderations respecting the conditions of domestic pro- duction.

For the nation as a whole, according to Ricardo, it is not the gross produce of the land and labour, as Smith seems to assert, that is of importance, but the net income—the excess, that is, of this produce over the cost of production, or, in other words, the amount of its rent and its profits ; for the wages of labour, not essen- tially exceeding the maintenance of the labourers, are by him con- sidered only as a part of the “necessary expenses

of production.” Hence it follows, as he himself in a characteristic and often quoted passage says, that, ‘‘ provided the net real income of the nation be the same, it is of no importance whether it consists of ten or twelve millions of inhabitants. If five millions of men could produce as much food and clothing as was necessary for ten millions, food and clothing for five millions would be the net revenue. Would it be of any advantage to the country that to produce this same uet revenue seven millions of men should be required,—that is to say, that seven millions should be employed to produce food and clothing sufficient for twelve millions? The food and clothing of five millions would be still the net revenue. The employing a greater number of men would enable us neither to add a man to our army and navy nor to contribute one guinea more in taxes.” Industry is here viewed, just as by the mercautilists, in relation to the military and political power of the state, not to the maintenance and improvement of human beings, as its end and aim. The labourer, as Held has remarked, is regarded not as a member of society, but as a means to the ends of society, on whose sustenance a part of the gross incoine must be expended, as another part must be spent on the sustenance of horses. We may well ask, as Sismondi did in a personal interview with Ricardo, ‘“ What! is wealth then everything ? are men absolutely nothing?”

On the whole what seems to us true of Ricardo is this, that, whilst he had remarkable powers, they were not the powers best fitted for sociological research. Nature intended him rather for a mathematician of the second order than for a social philosopher. Nor had he the due previous preparation for social studies; for we must decline to accept Bagehot’s idea that, though “in no high sense an educated man,” he had a specially apt training for such studies in his practice as an eminently successful stockjobber. The same writer justly notices the “anxious penetration with which he follows out rarefied minutiz.” But he wanted breadth of survey, a comprehensive view of human nature and human life, and the strong social sympathies which, as the greatest.minds have recognized, are a most valuable aid in this department of study. On a subject like that of money, where a few elementary pro- positions—into which no moral ingredient enters—have alone to be kept in view, he was well adapted to succeed ; but in the larger social field he is at fault. He had great deductive readiness and skill (though his logical accuracy, as Mr Sidgwick remarks, has been greatly

exaggerated). But in human affairs phenomena are so complex, and prin- ciples so constantly limit or even compensate one another, that rapidity and daring in deduction may be the greatest of dangers, if they are divorced from a wide and balanced appreciation of facts. Dialectic ability is, no doubt, a valuable gift, but the first condition for success in social investigation is to see things as they are.

A sort of Ricardo-mythus for some time existed in econo- mic circles. It cannot be doubted that the exaggerated

estimate of his merits arose in part from a sense of the support his system gave to the manufacturers and other capitalists in their growing antagonism to the old aristo- cracy of landowners. The same tendency, as well as his affinity to their too abstract and unhistorical modes of thought, and their eudzmonistic doctrines, recommended him to the Benthamite group, and to the so-called Philo- sophical Radicals generally. Brougham said he seemed to have dropped from heaven—a singular avatar, it must be owned. His real services in connexion with questions of currency and banking naturally created a prepossession in favour of his more general views. But, apart from those special subjects, it does not appear that, either in the form of solid theoretic teaching or of valuable practical guidance, he has really done much for the world, whilst. he admittedly misled opinion on several important questions. De Quincey's presentation of him as a great revealer of truth is now seen to be an ex- travagance. J.S. Mill and others speak of his " superior lights" as compared with those of Adam Smith; but his work, as a contribution to our knowledge of human society, will not bear a moment's comparison with the Wealth of Nations.

It is interesting to observe that Malthus, though the combination of his doctrine of population with the prin- ciples of Ricardo composed the creed for some time pro- fessed by all the " orthodox" economists, did not himself accept the Ricardian scheme. He prophesied that "the main part of the structure would not stand." "The theory," he says, " takes a partial view of the subject, like the system of the French economists; and, like that system, after having drawn into its vortex a great number of very clever men, it will be unable to support itself against the testimony of obvious facts, and the

weight of those theories which, though less simple and captivating, are more just, on account of their embracing more of the causes which are in actual operation in all economical results. ”

We saw that the foundations of Smith’s doctrine in general philosophy were unsound, and the ethical character of his scheme in consequence injuriously affected; but his method, consisting in a judicious combination of induction and deduction, we found (so far as the statical study of eco- nomic laws is concerned) little open to objection. Mainly through the influence of Ricardo, economic method was perverted. The science was led into the mistaken course of turning its back on observation, and seeking to evolve the laws of phenomena out of a few hasty generalizations by a play of logic. The principal vices which have been in recent times not unjustly attributed to the members of the “orthodox” school were all encouraged by his example, namely,—(1) the viciously abstract character of the conceptions with which they deal, (2) the abusive preponderance of deduction in their processes of research, and (3) the too absolute way in which their conclusions are conceived and enunciated.

The two works of Malthus already named are by far the most important in the history of the science. He was also author of Principles of Political Economy (1820), Definitions in Political Economy, and some minor pieces. The works of Ricardo have been collected in one volume, with a biographical notice, by J. R. M‘Culloch (1846).

After Malthus and Ricardo, the first of whom had fixed The

public attention irresistibly on certain aspects of society, and the second had led economic research into new, if questionable, paths, came a number of minor writers who were mainly their expositors and commentators, and whom, accordingly, the Germans, with allusion to Greek mythical history, designate as the Epigoni. By them the doctrines of Smith and his earliest successors were thrown into more systematic shape, limited and guarded so as to

James Mill.

M’‘Cul- loch.

Senior.

Torrens.

Harriet Mar- tineau.

Perrricant PCONOM Y

be less opeu to criticism, couched in a more accurate ter- minology, modified in subordinate particulars, or applied to the solution of the practical questions of their day. James Mill's Elements (1821) deserves special notice, as exhibiting the system of Ricardo with a thorough-going rigour, a compactness of presentation, and a skill in the disposition of materials, which give toit in some degree the character of a work of art. Thea priori political economy is here reduced to its simplest expression. J. R. M'Culloch (1779-1864), author of a number of laborious statis- tical and other compilations, criticized current econoniic legislation in the Edinburgh Review from the point of view of the Ricardian doctrine, taking up substantially the same theoretic position as was occupied at a somewhat later period by the Manchester school. He is altogether without originality, and never exhibits any philo- sophic elevation or breadth. His confident dogmatism is oftcn repellent; he admitted in his later years that he had been too fond of novel opinions, and defended them with more heat and perti- nacity than they deserved. It is noticeable that, though often spoken of in his own time both by those who agreed with his views, and those, like Sismondi, who differed from them, as one of the lights of the reigning school, his name is now tacitly dropped in the writings of the members of that school. Whatever may have been his partial usefulness in vindicating the policy of free trade, it is at least plain that for the needs of our social future he has nothing to offer. Nassau William Senior (1790-1864), who was professor of political economy in the university of Oxford, published, besides a number of separate lectures, a treatise on the science, which first appeared as an article in the Encyclopedia Metropolitana. He is a writer of a high order of merit. He made considerable contributions to the elucidation of economic principles, specially studying exactness in nomeuclature and strict accuracy in deduction. His explanations on cost of production and the way in which it affects price, on rent, on the difference between rate of wages and price of labour, on the relation between profit and wages (with

special reference to Ricardo’s theorem on this subject, which he corrects by the substi- tution of proportional for absolute amount), aud on the dis- tribution of the precious metals between different countries are particularly valuable. His new term ‘‘abstinence,” invented to express the conduct for which interest is the reniuneration, was useful, though not quite appropriate, because. negative in meaning. It is on the question of wages that Senior is least satisfactory. He makes the average rate in a country (which, we must maintain, is not areal quantity, though the rate in a given employment and neighbourhood is) to be expressed by the fraction of which the numcrator is the amount of the wages fund (an unascertainable and indeed, except as actual total of wages paid, imaginary sum) aud the denominator the number of the working population ; and from this le proceeds to draw the most important and far-reaching consequences, though the equation on which he founds his inferences conveys at most only an arithmetical fact, which would be true of evcry case of a division amongst individuals, and contains no economic element whatever. The phrase “‘ wages fund” originated

in some expressions of Adam Smith used only for the purpose of |

illustration, and never intended to be rigorously interpreted ; and we shall see that the doctrine has been repudiated by several members of what is regarded as the orthodox school of political economy. As regards method, Senior makes the science a purely deductive one, in which there is no room for any other “‘faets” than the four fundamental propositions from which he undertakes to deduce all economic truth. And he does not regard himself as arriving at hypothetic conclusions; his postulates and his inferences are alike conceived as corresponding to actual phenomena. Colouel Robert Torrens (1780-1864) was a prolific writer, partly on economic theory, but principally on its applications to financial and com- mercial policy. Almost the whole of the programme which was carried out in legislation by Sir Robert Peel had been laid down in principle in the writings of Torrens. He gave substantially the samc theory of foreign trade whieh was afterwards stated by J. 8. Mill in one of his Essays on Unscttled Questions. He was an early and carnest advocate of the repeal of the corn laws, but was not in favour of a general system of absolute free trade, maintain- ing that it is expedient to impose retaliatory duties to countervail similar duties imposed by foreign countries, and that a lowering of import duties on the

productions of countries retaining their hostile tarifis would occasion an abstraetion of the precious metals, and a decline in prices, profits, and wages. His principal writings of a general eharacter were—Zhe Economist [i.e., Physiocrat] refuted, 1808; Essay on the Production of Wealth, 1821; Essay on the External Corn-trade (eulogized by Ricardo), 1827; The Budget, a Series of Letters on Financial, Commercial, and Colonial Policy, 1841-3. Harriet Martineau (1802-1876) popularized the doctrines of Malthus and Ricardo in her Illustrations of Political Economy (1882-84), a series of tales, in which there is much excellent description, but the effect of the narrative is often marred by the somewhat ponderous disquisitions here and there thrown in, usually in the form of dialogue.

€ ot7 Other writers who ought to be named in any history of the science are Charles Babbage, On the Economy of Machincs and Manufactures (1832), chiefly descriptive, but also in part theoretic; William Thomas Thornton, Overpopulation and its Remedy (1846), A Plea for Peasant Proprietors (1848), On Labour (1869; 2d ed., 1870); Herman Merivale, Lectures on Colonization and Colonies, (1841-2; new ed., 1861); T. C. Banfield, Zhe Organization of Industry cuplained (1844; 2d ed., 1848); and Edward Gibbon Wakefield, A View of the Art of Colonization, 1849. Thomas Chalmers, well known in other fields of thought, was author of The Christian and Civic Economy of Large Towns (1821-86), and On Political Economy in Connexion with the Moral State and Moral Prospects of Socicty (1832); he strongly opposed any system of legal charity, and, whilst justly insisting on the primary importance of morality, industry, and thrift as conditions of popular wellbeing, carried the Malthusian doctrines to excess. Nor was Ireland without a share in the economic movement of the period. Whately, having been second Drummond professor of political economy at Oxford (in succession to Senior), founded (1832), when he went to Ireland as archbishop of Dublin, a similar professorship in Trinity College, Dublin. Itwas first held by Monntifort Longfield, after-

. wards judge of the Landed Estates Court, Ireland (d. 1884). He pub-

lished lectures on the science generally (1834), on Poor Laws (1834), and on Commerce and Absenteeism (1835), which were marked by independence of thought and sagacious observation. He was laudably free

from many of the exaggerations of his contemporaries ; he said, in 1835, "' in political economy we must not abstract too much," and protested against the assumption too often made that ''men are guided in all their conduct by a prudent regard to their own interest." James A. Lawson (now Mr Justice Lawson) also published some lectures (1844) delivered from the same chair, which may still be read with interest and profit ; his discussion of the question of population is especially good ; he also asserted against Senior that the science is avide de faits, and that it must reason about the world and mankind as they really are.

The most systematic and thorough-going contemporary Richard critic of the Ricardian system was Richard Jones (1790- Jones.

1855), professor at Haileybury. Jones has received scant justice at the hands of his successors. J. S. Mill, whilst using his work, gave his merits but faint recognition. Even Roscher says that he did not thoroughly understand Ricardo, without giving any proof of that assertion, whilst he is silent as to the fact that much of what has been preached by the German historical school is found dis- tinctly indicated in Jones's writings. He has been some- times represented as having rejected the Andersonian doctrine of rent; but such a statement is incorrect. Attributing the doctrine to Malthus, he says that that economist " showed satisfactorily that, when land is culti- vated by capitalists living on the profits of their stock, and able to move it at pleasure to other employments, the expense of tilling the worst quality of land cultivated determines the average price of raw produce, while the difference of quality on the superior lands measures the rents yielded by them." What he really denied was the application of the doctrine to all cases where rent is paid ; he pointed out in his Zssay on the Distribution of Wealth and on the Sources of Taxation, 1831, that, besides "farmers' rents," which, under the supposed conditions, conform to the above law, there are " peasant rents," paid everywhere through the most extended periods of history, and still paid over by far the largest part of the earth's surface, which are not so regulated. Peasant rents he divided under the heads of (1) serf, (2) métayer, (3) ryot, and (4) cottier rents, a classification afterwards adopted in substance by J. S. Mill; and he showed that the contracts fixing their amount were, at least in the first three classes, determined rather by custom than by competition. Passing to the superstructure of theory erected by Ricardo on the doctrine of

rent which he had so unduly extended, Jones denied most of the conclusions he had deduced, especially the following:—that the increase of farmers' rents is always contemporary with a decrease in the productive powers of agriculture, and comes with loss and distress in its train ; that the interests of landlords are always and necessarily opposed to the interests of the state and of every other XIX. — 48

class of society ; that the diminution of the rate of profits is exclusively dependent on the returns to the capital last employed on the land; and that wages can rise only at

the expense of profits.

The method followed by Jones is inductive ; his conclusions are founded on a wide observation of contemporary facts, aided by the study of history. "If," he said, "we wish to make ourselves acquainted with the economy and arrangements by which the different nations of the earth produee and distribute their revenues, I really know but of one way to attain our object, aud that is, to look and sce. We must get. comprehensive views of facts, that we may arrive at principles that are truly comprehensive. If we take a different method, if we snatch at general principles, and content ourselves with confined observations, two things will happen to us. First, what we call general principles will often be found to have no generality—we shall set out with declaring propositions to be nniversally true which, at every step of our further progress, we shall be obliged to confess are frequently false ; and, secondly, we

shall miss a great mass of useful knowledge which those who |

advance to principles by a comprehensive cxamination of facts necessarily meet with on their road." The world he professed to study was not an imaginary world, inhabited by abstract " economic men," but the real world with the different forms which the owner-

ship and cultivation of land, and, in general, the conditions of |

production and distribution, assume at different times and places. His recognition of such different systems of life in communities occupying different stages in the progress of civilization led to his proposal of what he called a ‘‘political economy of nations.” This was a protest against the practice of taking the exceptional state of facts which exists, and is indeed only partially realized, in a small corner of our planet as representing the uniform type of human societies, and ignoring the effects of the early history and special devclopment of each community as influencing its economic rio nteats

It is sometimes attempted to elude the necessity for a wider range of study by alleging a universal tendency in the social world to assume this now exceptional shape as its normal and ultimate constitution. Even if this tendency were real (which is only partially true, for the existing order amongst ourselves cannot be regarded as entirely definitive), it could not be admitted that the facts witnessed in our civilization and those exhibited in lIcss advanced communities are so approximate as to be capable of being represented by the same formule. As Whewell, in editing Jones’s Remains, 1859, well observed, it is true in the physical world that ‘all things tend to assume a form determined by the force of gravity ; the hills tend to become plains, the waterfalls to eat away their beds and disappear, the rivers to form lakes in the valleys, the glaciers to pour down in cataracts.” But are we to treat these results as achieved, because forces are in operation which may ultimately bring them about? As Comte has said, all human questions are largely questious of time ; and the economic pheno- inena which really belong to the several stages of the human movement must be studicd as they are, unless we are content to fall into grievous error both in our theoretic treatment of them and in the solution of the practical problems they present.

Jones is remarkable for his freedom from exaggeration and one- sided statement ; thus, whilst holding Malthus in, perhaps, undue esteem, he declines to accept the proposition that an increase of the means of subsistence is necessarily followed by an increase of population ; and he maintains what is undoubtedly true, that with the growth of population, in all well-governed and prosperous states, the command over food, instead of diminishing, increases.

Much of what he has left us—a large part of which is unfortu- nately fragmentary—is akin to the later labours of Cliffe Leslie. The latter, however, had the advantage of acquaintance with the sociology of Comte, which gave him a firmer grasp.of method, as well as a wider view of the general movement of society ; and, whilst the voice of Jones was but little heard amidst the general applause accorded to Ricardo in the economic world of his time, Leslie wrote when disillusion had set in, and the current was beginning to turn in England against the a priori economics.

Comte somewhere speaks of the " transient predilec- tion" for political economy which had shown itself gene- rally in western Europe. This phase of feeling was speci- ally noticeable in England from the third to the fifth decade of the present century. "Up to the year 1818," said a writer in the Westminster Review, "the science was scarcely known or talked of beyond a small circle of philo- sophers ; and legislation, so far from being in conformity with its principles, was daily receding from them more and more." Mill has told us what a change took place within a few years. " Political economy," he says, " had asserted itself with great vigour in public affairs by the

petition of the merchants of London for free trade, drawn up in 1820 by Mr Tooke and presented by Mr Alexander Baring, and by the noble exertions of Ricardo during the few years of his parliamentary life. His writings, follow- ing up the impulse given by the bullion controversy, and followed up in their turn by the expositions and com- ments of my father and M'Culloch (whose writings in the Edinburgh Review during those years were most valuable), had drawn general attention to the subject, making at least partial converts in the cabinet itself; and Huskisson, supported by Canning, had commenced that gradual demolition of the protective system which one of their colleagues virtually completed in 1846, though the last vestiges were only swept away by Mr Gladstone in 1860." Whilst the science was thus attracting and fixing the attention of active minds, its unsettled condition was freely admitted. The differences of opinion among its professors were a frequent subject of complaint. But it

was confidently expected that these discrepancies would

soon disappear, and Colonel Torrens predicted that in twenty years there would scarcely “exist a doubt respect- ing any of its more fundamental principles.” “The pro- sperity,” says Mr Sidgwick, “that followed on the aboli- tion of the corn laws gave practical men a most impressive and satisfying proof of the soundness of the abstract reasoning by which the expediency of free trade had been

inferred,” and when, in 1848, “a masterly expositor of J. 5. Mill

thought had published a skilful statement of the chief results of the controversies of the preceding generation,” with the due “explanations and qualifications” of the reigning doctrines, it was for some years generally believed that political economy had “emerged from the state of polemical discussion,” at least on its leading doctrines,

and that at length a sound construction had been erected

on permanent bases.

This expositor was John Stuart Mill (1806-73). He exercised, without doubt, a greater influence in the field of English economics than any other writer since Ricardo. His systematic treatise has been, either directly or through manuals founded on it, especially that of Fawcett, the source from which most of our contemporaries in these countries have derived their knowledge of the science. But there are other and deeper reasons, as we shall see, which make him, in this as in other departinents of know- ledge, a specially interesting and significant figure.

In 1844 he published five Lssays on some Unsettled Questions of Political Economy, which had been written as early as 1829 and 1830, but had, with the exception of the fifth, remained in manuscript. In these essays is contained any dogmatic contribution which he can be regarded as having made to the science. The subject of the first is the laws of interchange between nations. He shows that, when two countries trade together in two commodities, the prices of the commodities exchanged on both sides (which, as Ricardo had proved, are not deter- mined by cost of production) will adjust themselves in such a way that the quantities required by each country of the article which it imports from its neighbour shall be exactly

sufficient to pay for one another. This is the law which appears, with some added developments, in his systematic treatise under the name of the “equation of international demand.” The most important practical conclusion (not, however, by any means an undisputed one) at which he arrives in this essay is, that the relaxation of duties on foreign commodities, not operating as protection but maintained solely for revenue, should be made contingent on the adoption of some corresponding degree of freedom of trade with England by the nation from which the commodities are imported. In the second essy, on the influence of con-

sumption on production, the most interesting results | arrived at are the propositions—(1) that absenteeism is a local, not a national, evil, and (2) that, whilst there cannot be permanent excess of production, there may be a temporary excess, not only of any one article, but of commodities gencrally, —this last, however, not arising from over-production, but from a want of commercial con- fidence. ‘The third essay relates to the use of the words “ productive” and “ unproductive” as applied to labour, to consumption, and to expenditure. The fourth deals with profits and interest, especially explaining and so justifying Ricardo’s theorem that “profits depend on wages, rising as wages fall and falling as wages rise.” What Ricardo meant was that profits depend on the cost of wages estimated in labour. Hence improvements in the production of articles habitually consumed by the labourer may increase profits without diminishing the real remuneration of the labourer. The last essay is on the definition and method of political economy, a subject afterwards more maturely treated in the author’s System of Logie.

In 1848 Mill published his Principles of Political Economy, with some of their Applications to Social Philo- sophy. ‘This title, though, as we shall see, open to criti- cism, indicated on the part of the author a less narrow and formal conception of the field of the science than had been common amongst his predecessors. He aimed, in fact, at producing a work which might replace in ordinary use the Wealth of Nations, which in his opinion was “ in many parts obsolete and in all imperfect.” Adam Smith had invariably associated the general principles of the subject with their

applications, and in treating those applications had perpetually appealed to other and often far larger considerations than pure political economy affords. And in the same spirit Mill desired, whilst incor- porating all the results arrived at in the special science by Smith's successors, to exhibit purely economic phenomena in relation to the most advanced conceptions of his own time in the general philosophy of society, as Smith had done in reference to the philosophy of his century.

This design he certainly failed to realize. His book is very far indeed from being a "modern Adam Smith." It is an admirably lucid and even elegant exposition of the Ricardian economics, the Malthusian theory being of course incorporated with these, but, notwithstanding the introduction of many minor novelties, it is, in_ its scientific substance, little or nothing more. When Cliffe Leslie says that Mill so qualified and amended the doctrines of Ricardo that the latter could scarcely have recognized them, he certainly goes a great deal too far; Senior really did more in that direction. Mill's effort is usually to vindicate his master where others have censured him, and to palliate his admitted laxities of expression. Already his profound esteem for Ricardo's services to economics had been manifest in his Essays, where he says of | him, with some injustice to Smith, that, " having a science to create," he could not "occupy himself with more than the leading principles," and adds that "no one who has thoroughly entered into his discoveries" will find any difficulty in working out "even the minutiz of the science." James Mill, too, had been essentially an ex- pounder of Ricardo ; and the son, whilst greatly superior to his father in the attractiveness of his expository style, is, in regard to his economic doctrine, substantially at the same point of view. It is in their general philosophical conceptions and their views of social aims and ideals that | the elder and younger Mill occupy quite different positions in the line of progress. The latter could not, for example, |

"ein historischer Kopf war er nicht."

in his adult period have put forward as a theory of | government tlic shallow sophistries which the plain good |

sense of Macaulay sufficed to expose in the writings of the former; and he had a nobleness of feeling which, in – relation to the higher social

questions, raised him far above the ordinary coarse utilitarianism of the Benthamites.

The larger and more philosophic spirit in which Mill dealt with social subjects was undoubtedly in great measure due to the influence of Comte, to whom, as Mr Bain justly says, he was under greater obligations than he himself was disposed to admit. Had he more completely undergone that influence, we are sometimes tempted to think he might have wrought the reform in economics whicli still remains to be achieved, emancipating the science from the a priori system, and founding a genuine theory of industrial life on observation in the broadest sense. But probably the time was not ripe for such a construction, and it is possible that Mill's native intellectual defects might have made him unfit for the task, for, as Roscher has said, However this might have been, the effects of his early training, in which positive were largely alloyed with metaphysical elements, sufficed in fact to prevent his attaining a perfectly normal mental attitude. He never altogether overcame the vicious direction which he had received from the teaching of his father, and the influence of the Benthamite group in which he was brought up. Hence it was that, according to the striking expression of Roscher, his whole view of life was "zu wenig aus Einem Gusse." The incongruous mixture of the narrow dogmas of his youthful period with the larger ideas of a later stage gave a waver- ing and indeterminate character to his entire philosophy. He is, on every side, eminently "un-final"; he represents tendencies to new forms of opinion, and opens new vistas in various directions, but founds scarcely anything, and remains indeed, so far as his own position is concerned, not merely incomplete but incoherent. It is, however, precisely this dubious position which seems to us to give a special interest to his career, by fitting him in a peculiar degree to prepare and facilitate transitions.

What he himself thought to be "the chief merit of his treatise" was the marked distinction drawn between the theory of production and that of distribution, the laws of the former being based on unalterable natural facts, whilst the course of distribution is modified from time to time by the changing ordinances of socicty. This distinction, we may remark, must not be too absolutely stated, for the organization of production changes with social growth, and, as Lauderdale long ago showed, the nature of the

| distribution in a community reacts on production. But

there is a substantial truth in the distinction, and the recognition of it tends to concentrate attention on the question—How can we improve the existing distribution of wealth? he study of this problem led Mill, as he advanced in years, further and further in the direction of socialism ; and, whilst to the end of his life his book con- tinued to deduce the Ricardian doctrines from the principle of enlightened selfishness, he was looking forward to an order of things in which synergy should be founded on

| sympathy.

The gradual modification of his views in relation to the economic constitution of society is set forth in his Awto- biography. In his earlier days, he tells us, he “had seen little further than the old school” (note this significant title) “of political economy into the possibilities of funda- mental improvement in social arrangements. Private pro- perty, as now understood, and inheritance appeared the dernier mot of legislation.” The notion of proceeding to any radical redress of the injustice “involved in the fact that some are born to riches and the vast majority to poverty ” he had then reckoned chimerical. But now his views were such as would “class him decidedly under the

general designation of socialist”; he had come to believe that the whole contemporary framework of economic hfe was merely temporary and provisional, and that a time would come when “the division of the produce of labour, instead of depending, as in so great a degree it now does, on the accident of birth, would be made by concert on an acknowledged principle of justice.” “The social problem of the future” he considered to be ‘‘how to unite the greatest individual liberty of action,” which was often compromised in socialistic schemes, “with a common ownership in the raw material of the globe, and an equal participation in all the benefits of combined labour.” ‘These ideas were scarcely indicated in the first edition of | the Political Economy, rather more clearly and fully in | the second, and quite unequivocally in the third,—the | French Revolution of 1848 having,

as he says, made the | public more open to the reception of novelties in opinion.

Whilst thus looking forward to a new economic order, he | yet thinks its advent very remote, and believes that the inducements of private interest will in the meantime be indispensable. On the spiritual side he maintains a similar attitude of expectancy. He anticipates the ulti- mate disappearance of theism, and the substitution of a_ purely human religion, but believes that the existing doctrine will long be necessary as a stimulus and a control. He thus saps existing foundations without providing any- thing to take their place, and maintains the necessity of conserving for indefinite periods what he has radically discredited. Nay, even whilst sowing the seeds of change in the direction of a socialistic organization of society, he favours present or proximate arrangements which would» urge the industrial world towards other issues. The system of peasant proprietorship of land is distinctly indi- vidualistic in its whole tendency; yet he extravagantly praises it in the earlier part of his book, only receding from that laudation when he comes to the chapter on the future of the labouring classes. And the system of so- called cooperation in production which he so warmly com- mended in the later editions of his work, and led some of | his followers to preach as the one thing needful, would inevitably strengthen the principle of personal property, and, whilst professing at most to substitute the competition of associations for that of individuals, would by no means exclude the latter.

The elevation of the working classes he bound up too exclusively with the Malthusian ethics, on which he laid quite an extravagant stress, though, as Mr Bain has observed, it is not easy to make out his exact views, any more than his father's, on this subject. We have no reason to think that he ever changed his opinion as to the necessity of a restriction on population ; yet that element seems foreign to the socialistic idea to which he increas- ingly leaned. It is at least difficult to see how, apart from individual responsibility for the support of a family, what Malthus called moral restraint could be enforced. This difficulty is indeed the fatal flaw which, in Malthus's own opinion, vitiated the scheme of Godwin.

Mill's openness to new ideas and his enthusiasm for improvement cannot be too much admired. But there | appears to have been combined with these

fine traits in» his mental constitution a certain want of practical sense, a failure to recognize and acquiesce in the necessary con- ditions of human life, and a craving for “better bread

than can be made of wheat.” He entertained strangely exaggerated, or rather perverted, notions of the “sub- jection,” the capacities, and the rights of women. He encourages a spirit of revolt on the part of working men against their perpetual condemnation, as a class, to the lot of living by wages, without giving satisfactory proof that this state of things is capable of change, and without ,

| mentary evidence.”

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showing that such a lot, duly regulated by law and morality, is inconsistent with their real happiness. He also insists on the “‘independence” of the working class— which according to him fara da se—in such a way as to

| obscure, if not to controvert, the truths that superior rank

and wealth are naturally invested with social power, and are bound in duty to exercise it for the benefit of the community at large, and especially of its less favoured members. And he attaches a quite undue importance to mechanical and, indeed, illusory expedients, such as the limitation of the power of bequest and the confiscation of: the “unearned increment” of rent.

With respect to economic method also, he shifted his position ; yet to the end occupied uncertain ground. In the fifth of his early essays he asserted that the method a priort is the only mode of investigation in the social

| sciences, and that the method a posterion “is altogether

inefficacious in those sciences, as a means of arriving at any considerable body of valuable truth.” When he wrote his Logic, he had learned from Comte that the a posterior method—in the form which he chose to call “inverse deduction ”—was the only mode of arriving at truth in general sociology; and his admission of this at once renders the essay obsolete. But,

unwilling to relinquish the a priort method of his youth, he tries to establish a distinction of two sorts of economic inquiry, one of which, though not the other, can be handled by that method. Sometimes he speaks of political economy as a department ‘carved out of the general body of the science of society ”; whilst on the other hand the title of his systematic work implies a doubt whether political economy is a part of “social philosophy” at all, and not rather a study pre- paratory and auxiliary to it. Thus, on the logical as well as the dogmatic side, he halts between two opinions. Notwithstanding his misgivings and even disclaimers, he yet remained, as to method, a member of the old school, and never passed into the new or “historical” school, to which the future belongs.

The question of cconomic method was also taken up by Cairnes.

the ablest of his disciples, John Elliott Cairnes (1824— 75), who devoted a volume to the subject (Logical Method of Political Economy, 1857 ; 2d ed., 1875). Prof. Walker has lately spoken of the method advocated by Cairnes as different from that put forward by Mill, and has even represented the former as similar to, if not identical with, that of the German historical school. But this is certainly an error. Cairnes, notwithstanding some apparent vacillation of view and certain conces- sions more formal than real, maintains the utmost rigour of the deductive method; he distinctly affirms that in political economy there is no room for induction at all, “the economist starting with a knowledge of ultimate causes,” and being thus, “at the outset of his enterprise, at the position which the physicist only attains after ages of laborious research.” He does not, indeed, seem to be advanced beyond the point of view of Senior, who professed to deduce all economic truth from four elementary pro- positions. Whilst Mill in his Logic represents verification as an essential part of the process of demonstration of economic laws, Cairnes holds that, as they “ are not asser- tions respecting the character or sequence of phenomena ” (though what else can a scientific law be’), “they can neither be established nor refuted by statistical or docu- A proposition which affirms nothing respecting phenomena cannot be controlled by being con- fronted with phenomena, Notwithstanding the unques-

_tionable ability of his book, it appears to mark, in some

respects, a retrogression in methodology, and can for the future possess only an historical interest.

Regarded in that light, the labours of Mill and

Cairnes on the method of the science, though intrinsically | and mutually dependent phenomena—identical, indeed, under a

unsound, had an important negative effect. They let down the old political economy from its traditional posi- tion, and reduced its extravagant pretensions by two modifications of commonly accepted views. First, whilst Ricardo had never doubted that in all his reasonings he was dealing with human beings as they actually exist, they showed that the science must be regarded as a purely hypothetic one. Its deductions are based on unreal, or at least one-sided, assumptions, the most essential of which is that of the existence of the so-called ‘economic man,” a being who is influenced by two motives only, that of acquiring wealth and that of avoiding exertion ; and only so far as the premises framed on this conception correspond with fact can the conclusions be depended on in practice. Senior in vain protested against such a view of the science, which, as he saw, compromised its social efficacy ;

whilst Torrens, who had previously combated the doctrines’

of Ricardo, hailed Mill’s new presentation of political economy as enabling him, whilst in one sense rejecting those doctrines, in another sense to accept them. Secondly, beside economic science, it had often been said, stands an economic art,—the former ascertaining truths respecting

the laws of economic phenomena, the latter prescribing |

the right kind of economic action ; and many had assumed that, the former being given, the latter is also in our possession—that; in fact, we have only to convert theorems into precepts, and the work is done. But Mill and Cairnes made it plain that this statement could not be accepted, that action can no more in the economic world than in any other province of life be

regulated by considerations borrowed from that department of things ouly, that economics can suggest ideas which are to be kept in view, but that, standing alone, it cannot direct conduct—an office for which a wider prospect of human affairs is required. This matter is best elucidated by a reference to Comte's classification, or rather hierarchical arrangement, of the sciences. Beginning with the least complex, mathematics, we rise successively to astronomy, physics, chemistry, thence to biology, and from it again to socio- logy. In the course of this ascent we come upon all the great laws which regulate the phenomena of the inorganic world, of organized beings, and of society. A further step, however, remains to be taken—namely, to morals ; and at this point theory and practice tend to coincide, because every element of conduct has to be considered in relation to the general good. In the final synthesis all the previous analyses have to be used as instrumental, in order to determine how every real quality of things or men may be made to converge to the welfare of humanity.

Cairnes's most important economic publication was his last, entitled Some Leading Principles of Political Economy newly Expownded, 1874. In this work, which does not pro- fess to be a complete treatise on the science, he criticizes and emends the statements which preceding writers had given of some of its principal doctrines, and treats elaborately of the limitations with which they are to be understood, and the exceptions to them which may be produced by special circumstances. Whilst marked by great ability, it affords evidence of what has been justly observed as a weakness in Cairnes's mental constitution—his "deficiency in in- tellectual sympathy," and consequent frequent inability to see mare than one side of a truth.

The three divisions of the book relate respectively to (1) value, (2) labour and eapital, aud (3) international trade. In the first he begins by elucidating the meaning of the word "value," and under this head controverts the view of Jevons that the exchange value of anything depends entirely on its utility, without, perhaps, distinctly apprehending what Jevons meant by this proposition, On supply and demand he shows, as Say had done before, that these, regarded as aggregates, are not independent, but strictly connected

system of barter, but, under a money system, conceivable as distinct. Supply and demand with respect to partieular commo- cities must be

understood to mean supply and demand ata given

| price ; and thus we are introduced to the ideas of market price and | normal price (as, following Cherbuliez, he terms what Smith less

happily called natural price). Normal price again leads to the consideration of cost of produetion, and here, against Mill and others, he denies that profit and wages enter into cost of produc- tion ; in otherwords, he asserts what Senior (whom he does not name) had said before him, though he had not consistently carried out the nomenclature, that cost of produetion is the snin of labour and abstinence necessary to production, wages and profits being the remuneration of sacrifice and not elements of it. But, it may well be asked, How can au amouut of labour be added to an ainount of abstinence? Mnst not wages and profits be taken as ‘‘ measures of cost?” By adhering to the conception of ‘‘saerifiee,” he exposes the emptiness of the assertion that ‘‘dear labour is the great obstacle to the extension of British trade”—a sentence in which ‘British trade” means capitalists’ profits. At this point we are introduced to a doctrine now first elaborated, though there are indications of it in Mill, of whose theory of inter- national values it is in fact an extension. In foreign trade cost of production, in Cairnes’s sense, does not regulate values, because it cannot perform that function except under a régime of effective competition, and between different countries effec- tive competition does not exist. But, Cairnes asks, to what ex- tent does it exist in domestic industries? So far as capital is concerned, he thinks the condition is sufficiently fulfilled over the whole field—a position, let it be said in passing, which he does not scem to make out, if we consider the practical iminobility of most invested, as distinct from disposable, eapital. But in the ease of labour the requisite competition takes place only within certain social, or rather industrial, strata. The world of industry may be divided into a series of superposed groups, and these gronps are practically ‘‘non-competing,” the disposable labour in any one of them being rarely eapable of choosing its field ina higher. The law that cost of production determines price cannot, therefore, be absolutely stated respecting domestic any more than respecting international exchange ; as it fails for the lattcr universally, so it fails for the former as between non-competing groups. The law that holds between these is similar to that governing international values, which may be called the equation of reeiprocal demand. Such a state

of relative prices will establish itself amongst the products of these groups as shall enable that portion of the products of each group which is applied to the purchase of the products of all other groups to discharge its liabilities towards those other groups. The reciprocal demand of the groups determines the “average relative level” of prices within each group; whilst cost of produetion regulates the distribution of price among the indivi- dual products of each group. This theorem is perhaps of no great practical value; but the tendency of the whole investigation is to attenuate the importance of cost of production as a regulator of normal price, and so to show that yet another of the accepted doctrines of the science had been propounded in too rigid and absolute a form. As to market price, the formula by which Mill had defined it as the price which equalizes demand and supply Cairncs shows to be an identical proposition, aud he defines it as the price which most advantageously adjusts the existing supply: to the existing demand pending the coming forward of fresh supplies from the sources of production.

His second part is chiefly remarkable for his defence of what is known as the wages fund doctrine, to which we adverted when speaking of Senior. Mill had given up this doctrine, having been convinced by Thornton that it was erroneous ; but Cairnes refused to follow his leader, who, as he believes, ought not to have been convinced. After having given what is eertainly a fallacious reply to Longe’s critieism of the expression “average rate of wages,” he proceeds to vindieate the doctrine in question by the consideration that the amount of a nation’s wealth devoted at any time to the payment of wages—if the character of the national industries and the methods of prodnetion cmployed remain the same—is in a definite relation to the amount of its general capital ; the latter being given, the former is also given. In illustrating his view of the subject, he insists on the principle (trne in the main, but too absolutely formulated by Mill) that “ demand for commodities is not demand for labour.” It is not necessary here to follow his in- vestigation, for his reasoning has not satisfied his successors, with the exception of Fawcett, and the question of wages is now commonly treated without reference to a supposed determinate wages fund. Cairnes next studies trades-unionism in relation to wages, and arrives in substance at the conclusion that the only way in which it can affect their rate is by accelerating an advance which must ultimately have taken place

independently of its action. He also takes occasion to refute Mr (now Sir Thomas) Brassey's supposed law of a uniform cost of labour in every part of the world. Turning

| to consider the material prospects of the working classes, he examines

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the question of the changes which may be expected in the amount and partition of the fund out of which abstinence and labour are remunerated. He here enunciates the principle (which had been, however, stated before him by Ricardo and Senior) that the increased

productiveness of industry will not affect cither profit or wages , . = He ef es. | other hand,—if we omit the socialists, who do not here come

unless it cheapen the commodities which the labourer consumes. These latter being mostly commodities of which raw produce is the only or principal element, their cost of production, notwithstanding

numbers of the labouring class be steadily kept in check ; and hence the possibility of elevating the condition of the labourer 1s confined within very narrow limits, if he continues to be a labourer only. The condition of any substantial and permanent improvement in his lot is that he should cease to be a mere labourer—that profits should be brought to reinforce the wages fund, which has a tendency to decline relatively to the general capital of a country. And hence Cairnes—abandoning the purely theoretic attitude which he else-

where represents as the only proper one for the cconomist—recoin- | who have contributed important truths, introduced improve-

mends the system of so-called co-operation (that is, in fact, the aboli- tion of the large capitalist) as offering to the working classes ‘‘ the sole means of escape from a harsh and hopeless destiny,” and puts aside rather contemptuously the opposition of the positivists to this solution, which yet many besides the positivists, as, for example, Leslie and F. A. Walker, regard as chimerical.

The third part is devoted mainly to an exposition of Ricardo's doctrine of the conditions of international trade and Mill's theory of international values. The former Cairnes modifies by introducing his idea of the paftial influence of reciprocal demand, as distinguished

from cost of production, on the regulation of domestic prices, and | founds on this rectification an interesting account of the connexion |

between the wages prevailing in a country and the cliaracter and course of its external trade. He emends Mill's statement, which represented the produce of a country as exchanging for that of other countries at such values ''as are required in order that the whole of her exports may exactly pay for the whole of her imports" by sub- stituting for the latter phrase the condition that each country should by means of her exports discharge all her foreign liabilities—in other words, by introducing tlie consideration of the balance of debts. This idea was not new; it lad been indicated by J. L. Foster as early as 1804, and was touched on by Mill himself; but he expounds it well; and it is important as clearing away common misconceptions, and sometimes removing groundless alarms. Pass- ing to the question of free trade, he disposes of some often-repeated protectionist arguments, and in particular refutes the American allegation of the inability of the highly-paid labour of that country to compete with the '' pauper labour" of Europe. He is not so successful in meeting the "political argument," founded on the admitted importance for civilization of developing diversified na- tional industries ; aid he meets only by one of the highly ques- tionable commonplaces of the doctrinaire economists Mill's pro- position that protection may foster nascent industries really adapted to a country till they have struck root and are able to endure the stress of foreign competition.

We have dwelt at some length on this work of Cairnes, not only of Quesnay and nephew of Turgot, he replied that he had

becanse it presents the latest forms of several accepted economic | : aye : : me | learned to read in the writings of the mercantile school,

doctrines, but also because it is, and, we believe, will remain, the last important product of the old English school. The author at the outset

expresses the hope that it will strengthen, and add consistence to, the scientific fabric “bnilt up by the labours of Adam Smith, Malthus, Ricardo, and Mill.” Whilst recognizing with him the gveat merits of Smith, and the real abilities and services of his three successors here uamed, we cannot entertain the same opinion as Cairnes respecting the permanence of the fabric they constructed. We hold that a new edifice is required, incorporating indeed many of the materials of the old, but planned on different ideas and in some respects with a view to different ends—above all, resting on different philosophic foundations, and having relation in its whole design to the more comprehensive structure of which it will form but one department, namely, the general science of society.

We have already had occasion to refer to Cairnes’s Essays in Polt- tical Economy, 1878. His Slave Powcr (1862) was the most valuable work which appeared on the subject of the great American conflict.

Lrance,—All the later European schools presuppose—in

part adopting, in part criticizing—the work of the English economists from Smith! to Ricardo and the Epigoni. ‘The

? The first French translation of the Wealth of Nations, by Blavet, appeared in the Journal de T Agriculture, du Commerce, des Finances, et des Arts, 1779-80 ; new editions of it were published in 1781, 1788, and 1800 ; it was also printed at Amsterdam in1784. Smith himself recommended it in his third edition of the original as excellent. ine (90 appeared the translation by Roucher, with notes by Condorcet, and in 1802 that by Count Gerinain Garnier, executed during his ne in ee ie ci now considered the standard version, and 1s been reproduced, with notes b is i i, &c., 1 the Collection des Principaux Pe alas or

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German school has had in a greater degree than any other a movement of its own,—following, at least in its more recent period, an original method, and tending to special and characteristic conclusions. The French school, on the

under consideration,—has in the main reproduced the

: A q Rede Salathease Tautoes He | doctrines of the leading English thinkers,—stopping short, Be ee re ee | however, in general of the extremes of Ricardo and his dis-

ciples. In the field of exposition the French are unrivalled ; and in political economy they have produced a series of more

_ or less remarkable systematic treatises, text books, and com-

pendiums, at the head of which stands the celebrated work of J. B. Say. But the number of seminal minds which have appeared in French economic literature-—of writers

ments of method, or presented the phenomena under new lights—has not been large. Sismondi, Dunoyer, and Bastiat will deserve our attention, as being the most important of those who occupy independent positions (whether permanently tenable or not), if we pass over for the present the great philosophical renovation of Auguste Comte, which comprehended actually or potentially all the branches of sociological inquiry. Before estimating the labours of Bastiat, we shall find it desirable to examine the views of Carey, the most renowned of American economists, with which the latest teachings of the ingeni- ous and eloquent Frenchman are, up to a certain point, in remarkable agreement. Cournot, too, must find a place among the French writers of this period, as the chief

| representative of the conception of a mathematical method

in political economy.

Of Jean Baptiste Say (1767-1832) Ricardo says—“ He Say.

was the first, or among the first, of Continental writers who justly appreciated and applied the principles of Smith, and has done more than all other Continental writers taken together to recommend that enlightened and_ beneficial system to the nations of Europe.” The Wealth of Nations in the original language was placed in Say’s hands by Claviére, afterwards minister, then director of the assurance society of which Say was a clerk; and the book made a powerful impression on him. Long after, when Dupont de Nemours complained of his injustice to the physiocrats, and claimed him as, through Smith, a spiritual grandson

had learned to think in those of Quesnay and his followers, but that it was in Smith that he had learned to seek the causes and the effects of social phenomena in the nature of things, and to arrive at this last by a scrupulous analysis. His Traité d’Economie Politique (1803) was essentially founded on Smith’s work, but he aimed at arranging the materials in a more logical and instructive order. He has the French art of easy and lucid exposition, though his facility sometimes degenerates into superficiality ; and hence his book became popular, both directly and through translations obtained a wide circulation, and diffused rapidly through the civilized world the doctrines of the master. Say’s knowledge of common life, says Roscher, was equal to Smith’s ; but he falls far below him in living

_ insight into larger political phenomena, and he carefully

eschews historical and philosophical explanations. He is sometimes strangely shallow, as when he says that ‘the best tax is that smallest in amount.” He appears not to have much claim to the position of an original thinker in political economy. Ricardo, indeed, speaks of him as having “enriched the science by several discussions, original, accurate, and profound.” What he had specially in view in using these words was what is, perhaps rather pretentiously, called Say’s théorie des débouchés, with his connected disproof of the possibility of a universal glut.

The theory amounts simply to this, that buying is also

selling, and that it is by producing that we are enabled to |

purchase the products of others. Several distinguished economists, especially Malthus and Sismondi, in conse- quence chiefly of a misinterpretation of the phenomena of commercial crises, maintained that there might be general over-supply or excess of all commodities above the demand.

tion may, it must indeed be admitted, exceed the existing capabilities of the market; but, if we remember that supply is demand, that commodities are purchasing power, we cannot accept the doctrine of the possibility of a uni- versal glut without holding that we can have too much of everything—that ‘all men can be so fully provided with the precise articles they desire as to afford no market for each other’s superfluities.” But, whatever services he may have rendered by original ideas on those or other subjects, his great merit is certainly that of a propagandist and popularizer.

The imperial police would not permit a second edition of his work to be issued without the introduction of changes which, with noble independence, he refused to make ; and that edition did not therefore appear till 1814.

Three other editions were published during the life of the

Sismondi.

author—in 1817, 1819, and 1826. In 1828 Say published a second treatise, Cours complet d’Economie Politique Pratique, which contained the substance of his lectures at the Conservatoire des Arts et Métiers and at the Collége de France. Whilst in his earlier treatise he had kept within the narrow limits of strict economics, in his later work he enlarged the sphere of discussion, introducing in particular many considerations respecting the economic influence of social institutions. oy a

Jean Charles L. Simonde de Sismondi (1773-1842), author of the Histoire des Républiques Italiennes du moyen dge, represents in the economic field a protest, founded mainly on humanitarian sentiment, against the dominant doctrines. He wrote first a treatise De la Richesse Com- merciale (1803), in which he followed strictly the principles of Adam Smith. But he afterwards came to regard these principles as insufficient and requiring modification. He contributed an article on political economy to the Hdin- burgh

Encyclopedia, in which his new views were partially indicated. They were fully developed in his principal economic work, Vouveaux Principes d' Economie Politique, ou de la Richesse dans ses rapports avec la Population (1819; 2d ed., 1827). This work, as he tells us, was not received with favour by economists, a fact which he explains by the consideration that he had "attacked an orthodoxy—an enterprise dangerous in philosophy as in religion." According to his view, the science, as commonly understood, was too much of a mere chrematistic: it studied too exclusively the means of increasing wealth, and not sufficiently the use of this wealth for producing general happiness. The practical system founded on it tended, as he believed, not only to make the rich richer, but to make the poor poorer and more dependent ; and he desired to fix attention on the question of distribution as by far the most important, especially in the social circum- stances of recent times.

The personal union in Sismondi of three nationalities, the Italian, the French, and the Swiss, and his comprehen- sive historical studies, gave him a special largeness of view ; and he was filled with a noble sympathy for the suffering members of society. He stands nearer to social- ism than any other French economist proper, but it is only in sentiment, not in opinion, that he approximates to it; he does not recommend any socialistic scheme. On the contrary, he declares in a memorable passage that,

whilst he sees where justice lies, he must confess himself |

_de Vobservation et de Vexpérience."

unable to suggest the means of realizing it in practice ; the division of the fruits of industry between those who are united in their production appears to him vicious; but it is, in his judgment, almost beyond human power to conceive any system of property absolutely different from that which is known to us by experience. He goes no

: further than protesting, in view of the great evils which This Say rightly denied. A particular branch of produc- |

he saw around him, against the doctrine of laissez faire, and invoking, somewhat vaguely, the intervention of Governments to "regulate the

progress of wealth” and to protect the weaker members of the community.

His frank confession of impotence, far wiser and more honour- able than the suggestion of precipitate and dangerous remedies, or of a recurrence to outworn medieval institutions, has not affected the reputation of the work. A prejudice was indeed early created against it in consequence of its partial harmony of tone, thougli, as we have seen, not of policy, with socialism, which was then beginning to show its strength, as well as by the rude way in

*which his descriptions of the modem industrial system, especially

as it existed in England, disturbed the complacent optimism of some members of the so-called orthodox school. ‘These treated the book with ill-disguised contempt, and Bastiat spoke of it as preaching au éconoimde politique a rebours. But it has held its place in the literature of the science, and is now even more inter- esting than when it first appearcd, because in our tine there is a more general disposition, instead of denying or glossing over the serious evils of industrial society, to face and remove or at least mitigate them. The Jaissez faire doctrine, too, has been dis- credited in theory and abandoned in practice ; and we are ready to admit Sismondi’s view of the state as a power not merely intrusted with the maintenance of peace, but charged also with the mission of extending the benefits of the social union and of modern progress as widely as possible through all classes of the community. Yet the impression which his treatise leaves beliind it is a dis- couraging one ; and this because he regards as essentially evil many things which seem to be the necessary results of the development of industry. The growth of a wealthy capitalist class and of manufacture on the great scale, the rise of a vast body of workers who live by their labour alone, the extended application of machines, large landed properties cultivated with the aid of thie most advanced appliances—all these he dislikes and deprecates; but they appear to be inevitable. The problem is, how to regulate and moralize the system they imply ; but we must surely accept it in principle, unless we aim at a thorough social revolution. Sismondi may be regarded as the precursor of the Gcrman economists known under the inexact designation of ‘‘ Socialists of the Chair”; but thcir writings are much more hopeful and inspiring.

To the subject of population he devotes special care, as of great importance for the welfare of the working classes. So far as agriculturists are concerned, he thinks the system of what he calls patriarchal exploitation, where the cultivator is also proprietor, and is aided by his family in tilling the land—a law of equal division among the natural heirs being apparently presupposed— the one which is most efficacious in preventing au undue increase of the population. The father is, in such a case, able distinctly to estimate the resources available for his children, and to determine the stage of subdivision which would necessitate the descent of the family from the material and social position it had previously occupied. When children beyond tlis limit are born, they do uot marry, or they choose amongst their number one to continue the race. This is the view which, adopted by J. S. Mill, makes so great a figure in the too favourable presentation by that writer of the system of peasant proprietors.

In no French economic writer is greater force or general Dunoyer.

solidity of thought to be found than in Charles Dunoyer (1786-1862), author of La Liberté du Travail (1845; the substance of the first volume had appeared under a differ- ent title in 1825), honourably known for his integrity and independence under the régime of the Restoration. What makes him of special importance in the history of the science is his view of its philosophical constitution and wnethod. With respect to method, he strikes the keynote at the very outset in the words “rechercher expéri- mentalement,” and in professing to build on “les données He shows a marked tendency to widen economics into a general science of society, expressly describing political economy as having for its province the whole order of things which results from the exercise and development of the social forces.

This larger study is indeed better named sociology ; and economic studies are better regarded as forming one department of it. But the essential circumstance is that, in Dunoyer’s treatment of his great subject, the widest intellectual, moral, and political considerations are insepar- ably combined with purely economic ideas. It must not be supposed that by liberty, in the title of his work, is meant merely freedom from legal restraint or

administra- tive interference ; he uses it to express all that tends to give increased efficiency to labour. He is thus led to discuss all the causes of human progress, and to exhibit them in their historical working.

Treating, in the first part, of the influence of external conditions, of race, and of culture on liberty in this wider sense, he proceeds to divide all productive effort into two great classes, according as the action is exercised on things or on men, and eensures the economists for having restrieted their attention to the former. He studies in his second aud third parts respectively the conditions of the elficieney of these two forms of humanexertion. In treating of economic life, strictly so called, he introduees his fourfold division of material industry, in part adopted by J. S. Mill, as "(1) extractive, (2) voituriére, (8) manufacturiére, (4) agricole," a division which is useful for physical economics, but will always, when the larger soeial aspect of things is considered, be inferior to the more commonly accepted one into agrieultural, manufactur- ing, and commereial industry, banking being supposed as common president and regulator. Dunoyer, having in view only action on material objects, relegates banking, as well as commerce proper, to the separate head of exchange, which, along with association and gratuitous transmission (whether inter vivos or mortis causa),

he classes apart as being, not industries, in the same sense with | 5 A l Be é he seeks to show that there exists, independently of

the occupations named, but yet functions essential to the social economy. The industries which act on man he divides according as they occupy themselves with (1) the amelioration of our physical nature, (2) the eulture of our imagination and sentiments, (3) the education of our intelligence, and (4) the improvement of our moral habits; and he proceeds accordingly to study the social offices of the physician, the artist, the educator, and the priest. We meet in Dunoyer the ideas afterwards emphasized by Bastiat that the real subjects of human exehange are services; that all value is due to human activity ; that the powers of nature always render a gratuitous assistance to the labour of man; and that the rent of land is really a form of interest on invested eapital. Though he had disclaimed the task of a practical adviser in the often-quoted sentence—"Je n'impose rien; je ne

propose méme rien ; j’expose,” he finds himself, like all economists, unable to abstain from offering counsel. And his policy is opposed to any state interference with industry. Indeed he preaches in its extreme rigour the laissez faire doctrine, which he maintains principally on the ground that the spontaneous efforts of the individual for the improvement of his condition, by developing foresight, energy, and perseverance, are the most efficient means of social culture. But he certainly goes too far when he represents the action of Governments as normally always repressive and never directive. He was doubtless led into this exaggeration by his opposition to the artificial organizations of labour proposed by so many of his eontemporaries, against which he had to vindicate the principle of competition ; but his eriticism of these schemes took, as Cointe remarks, too absolute a character, tending to the per- petual interdietion of a true systematization of industry.

Digres- At this point it will be convenient to turn aside and ey on notice the doctrines of the American economist Carey. mene Not much had been done before him in the sci b ” m in the science by mists. Citizens of the United States. Benjamin Franklin, other- Franklin, Wise of world-wide renown, was author of a number of tracts, in most of which he merely enforces practical lessons of industry and thrift, but in some throws out interesting theoretic ideas. Thus, fifty years before Smith,

he suggested (as Petty, however, had already done) human

labour as the true measure of value (Modest Inquiry into

the Nature and Necessity of a Paper Currency, 1721), and

in his Observations concerning the Increase of Mankind

(1751) he expresses views akin to those of Malthus. petal Alexander Hamilton, secretary of the treasury, in 1791 = presented in his official capacity to the House of Represen- tatives of the United States a report on the measures by

which home manufactures could be promoted. In this document he gives a critical account of the theory of the subject, represents Sinith’s system of

free trade as possible

in practice only if adopted by all nations simultaneously, ascribes to manufactures a greater productiveness than to agriculture, and seeks to refute the objections against the development of the former in America founded on the want of capital, the high rate of wages, and the low price of land. The conclusion at which he arrives is that for the creation of American manufactures a system of moderate protective duties was necessary, and he proceeds to describe the particular features of such a system. There is some reason to believe that the German economist List, of whom we shall speak hereafter, was influenced by Hamilton's work, having, during his exile from his native country. resided in the same State, Pennsylvania, of which Hamilton was a citizen.

Henry Charles Carey (1793-1879), son of an American Carey. citizen who had emigrated from Ireland, represents a reaction against the dispiriting character which the Smithian doctrines had assumed in the hands of Malthus and Ricardo. His aim was, whilst adhering to the in- dividualistic economy, to place it on a higher and surer basis, and fortify it against the assaults of socialism, to which some of the Ricardian tenets had exposed it. The most comprehensive as well as mature exposition of his views is contained in his Principles of Social Scrence (1859). Inspired with the optimistic sentiment natural to a young and rising nation with abundant undeveloped resources and an unbounded outlook towards the future,

human wills, a natural system of economic laws, which is essentially beneficent, and of which the increasing pro- sperity of the whole community, and especially of the working classes, is the spontaneous result, —capable of being defeated only by the ignorance or perversity of man resisting or impeding its action. He rejects the Malthusian doctrine of population, maintaining that numbers regulate themselves sufficiently in every well governed society, and that their pressure on subsistence characterizes the lower, not the more advanced, stages of civilization. He rightly denies the universal truth, for all stages of cultivation, of the law of diminishing returns from land. His fundamental theoretic position relates to the antithesis of wealth and value.

Wealth had bcen by most economists confounded with the sum of exchange values; even Smith, though at first distinguishing them, afterwards allowed himself to fall into this error. Ricardo had, indeed, pointed out the differenee, but only near the end of his treatise, in the body of which value alone is considered. ‘The later English economists had tended to regard their studies as conversant only with exchange; so far had this proeeeded that Whately had proposed for the science the name of Catallaetics. When wealth is considered as what it really is, the sum of useful products, we see that it has its origin in external nature as supplying both materials and physical forces, and in human labour as appropriating and adapting those natural materials and forees. Nature gives her assistanee gratuitously ; labour is the sole foundation of value. The less we ean appropriate and employ natural forces in any pro- duction the higher the value of the product, but the less the addition to our wealth in proportion to the labour expended. Wealth, in its true sense of the sum of useful things, is the measure of the power we have acquired over nature, whilst the value of an object expresses the resistance of nature whieh labour has to overcome in order to produce the object. Wealth steadily increases in the course of soeial progress ; the exchange value of objects, on the other hand, decreases. Human intellect and faeulty of social combination seeure increased command over natural powers, and use them more largely in production, whilst less labour is spent in achieving each result, and the value of the pro- duct accordingly falls. The value of the article is not fixed by its cost of production in the past; what really determines it is the cost whieh is necessary for its reproduction nnder the present eon- ditions of knowledge and skill. The dependence of value on cost, so interpreted, Carey holds to be universally true ; whilst Ricardo maintained it only with respect to objeets capable of indefinite multiplication, and in particular did not regard it as applicable to the case of land. Ricardo saw in the productive powers of land a free gift of nature which had been monopolized by a certain number

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of persons, and which became, with the increased demand for food, a larger and larger value in the hands of its possessors. To this value, however, as

not being the result of labour, the owncr had no rightful claim ; he could not justly demand a payment for what was done by the ‘original and indestructible powers of the soil.” But Carey held that land, as we are concerned with it in industrial life, is really an instrument of production which has been formed as such by man, and that its value is due to the labour expended on it in the past, though measured, not by the sum of that labour, but by the labour necessary under existing conditions to bring new land to the same stage of productiveness. He studies the occupa- tion and reclamation of land with peculiar advantage as an American, for whom the traditions of first settlement are living and fresh, and before whose eyes the process is indeed still going on. The difficulties of adapting a primitive soil to the work of yielding organic products for man’s use can be lightly estimated only by an inhabitant of a country long under cultivation. It is, in Carey’s view, the overcoming of these difficultics by arduous and continued effort that entitles the first occupier of land to his property in the soil. Its present value forms a very small propor- tion of the cost expended on it, because it represents only what would be required, with the science and appliances of our time, to bring the land from its primitive into its present state. Property in land is therefore only a form of invested capital—a quantity of labour or the fruits of labour permanently incorporated with the soil; for which, like any other capitalist, the owner is compensated hy a share of the produce. He is not rewarded for what is done Ly the powers of nature, and society is in no sense defrauded by his sole possession. ‘he so-called Ricardian theory of rent is a speculative fancy, contradicted by all experience. Cultivation does not in fact, as that theory supposes, begin with the best, and move downwards to the poorer soils in the order of their inferiority.} The light and dry higher lands are first cultivated ; and only when population has become dense and capital has accumulated, are the low-lying lands, with their greater fertility, but also with their morasses, inundations, and miasmas, attacked and brought into occupation. Rent, regarded as a proportion of the produce, sinks, like all interest on capital, in process of time, but, as an absolute amount, increases. ‘he share of the labourer incrcases, both as a proportion and an absolute amount. And thus the interests of these different social classes are in harmony.

But, Carey proceeds to say, in order that this harmonious progress may be realized, what is taken from the land must be given back to it. All the

articles derived from it are really separ- ited parts of it, which must be restored ou pain of its exhaustion. Hence the producer and the consumer must be close to each other; the products must not be exported to a foreign country in exchange for its manufactures, and thus go to enrich as manure a foreign soil. In immediate exchange value the landowner may gain by such exportation, but the productive powers of the land will suffer. And thus Carey, who had set out as an earnest advocate of free trade, arrives at the doctrine of protection: the ‘‘ co-ordinating power” in society must intervene to prevent private advantage from working public mischief. He attributcs his conversion on this question to his observation of the effects of liberal and protec- tive tariffs respectively on American prosperity. This observation, he says, threw him back on theory, and led him to see that the intervention referred to might be necessary to remove (as he phrases it) the obstacles to the progress of younger communities created by the action of older and wealthicr nations. But it seems probable that the influence of List’s writings, added to his own deep-rooted and hereditary jealousy and dislike of English predominance, had something to do with his change of attitude.

The practical conclusion at which he thus arrived, though it is by no meaus in contradiction to the doctrine of the existence of natural econoinic laws, accords but ill with his optimistic scheme; and another economist, accepting his fundamental ideas, applied himself to remove the foreign accretion, as he regarded it, and to preach the theory of spontaneous social harmonies in relation with the practice of free trade as its legitimate outcome.

Frédéric Bastiat (1801-1850), though not a profound thinker, was a brilliant and popular writer on economic questions. Though he always had an inclination for such studies, he was first impelled to the active propagation of his views by his earnest sympathy with the English

1 It is, however, a mistake to suppose that the assumption of this historical order of descent is essential to the theory in question.

? This argument seems scarcely met by Prof. F. A. Walker, Political Economy, 50-52. But perhaps he is right in thinking that Carey exag- gerates the importance of the considerations on which it is founded. Mill and Leslie remark that the transportation of agricultural pro- ducts from the

western to the Atlantic States has the same effect as their export to Europe, so far as this so-called ‘‘ land-butchery ” is concerned ; besides, some manures are obtainable from abroad.

anti-corn-law agitation. Naturally of an ardent tempera- ment, he threw himself with zeal into the free-trade con- troversy, through which he hoped to influence French economic policy, and published in 1845 a history of the struggle under the title of Cobden et la Ligue. In 1845-48 appeared his Sophismes Economiques (Eng. trans. by P. J. Stirling, 1873), in which he exhibited his best qualities of mind. Though Cairnes goes too far in compar- ing this work with the Lettres Provinciales, it is certainly marked by much liveliness, point, and vigour. But to expose the absurdities of the ordinary protectionism was no difficult task ; it is only in such a form as the doctrine assumed in the hands of List, as a purely provisional and preparatory scheme, that it deserves and demands con- sideration. After the revolution of 1848, which for a time put an end to the free-trade movement in France, the efforts of Bastiat were directed against the socialists. Besides several minor pieces possessing the same sort of merit as the Sophismes, he produced, with a view to this con- troversy, his most ambitious as well as characteristic work, the Harmonies Economiques (Eng. trans. by P. J. Stirling, 1860). Only the first volume was published ; it appeared in 1850, and its author died in the same year. Since then the notes and sketches which he had prepared as materials towards the production of the second volume have been given to the public in the collected edition of his writings (by Paillottet, with Life by Fontenay, 7 vols.), and we can thus gather what would have been the spirit and substance of the later portions of the book.

It will always be historically interesting as the last incarnation of thorough- going economic optimism. This optimism, recurring to its first origin, sets out from theo- logical considerations, and Bastiat is commended by his English translator for treating political economy “in con- nexion with final causes.” The spirit of the work is to represent “all principles, all motives, all springs of action, all interests, as co-operating towards a grand final result which humanity will never reach, but to which it will always increasingly tend, namely, the indefinite approxima- tion of all classes towards a level,

which steadily rises, —in other words, the equalization of individuals in the general amelioration.”

What claimed to be novel and peculiar in his scheme was principally his theory of value. Insisting on the idea that value does not denote anything inherent in the objects to which it is attributed, he endeavoured to show that it never signifies anything but the ratio of two “services.” This view he develops with great variety and felicity of illustration. Only the mutual services of human beings, according to him, possess value and can claim a retribution ; the assistance given by nature to the work of production is always purely gratuitous, and never en- ters into price. Economic progress, as, for example, the improvement and larger use of machinery, tends perpetu- ally to transfer more and more of the elements of utility from the domain of property, and therefore of value, into that of community, or of universal and unpurchased enjoyment. It will be observed that this theory is sub- stantially identical with Carey’s, which had been earlier propounded ; and the latter author in so many words alleges it to have been taken from him without acknow- ledgment. It has not perhaps been sufficiently attended to that very similar views are found in Dunoyer, of whose work Bastiat spoke as exercising a powerful influence on “the restoration of the science,” and whom Fontenay, the biographer of Bastiat, tells us he recognized as one of his masters, Charles Comte being the other.

_ The mode which has just been explained of conceiving industrial action and industrial progress is interesting and instructive so far as it is really applicable, but it was unduly generalized. Cairnes has

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well pointed out that Bastiat’s theoretic soundness was injuriously affected by his habit of studying doctrines with a direct view to contemporary social and political eontro versies. He was thus predis- posed to accept views which appeared to lend a sanction to legitimate and valuable institutions, and to reject those which seemed to him to lead to dangerous consequences. His constant aim is, as he him- self expressed it, to ‘‘ break the weapons” of antisocial reasoners ‘in their hands,” and this preoccupation interferes with

the singlc- minded effort towards the attainment of seientific truth. The creation or adoption of his theory of value was inspired by the wish to meet the socialistic criticism of property in land ; for the exigencies of this controversy it was desirable to be able to show that nothing is ever paid for exeept personal effort. His view of rent was, therefore, so to speak, foreordained, though it may have been suggested, as indeed the editor of his posthumous fragments admits, by the writings of Carey. He held, with the American writer, that rent is purely the reward of the pains and expenditure of the landlord or his predecessors in the process of converting the natural soil into a farm by clearing, draining, fencing, and the other species of permanent improvements. 1 He thus gets rid of the (so- called) Ricardian doctrine, which was accepted by the socialists, and by them used for the purpose of assailing the institution of landed property, or, at least, of supporting a claim of compensation to the community for the appropriation of the land by the concession of the ‘right to labour.” As Cairnes has said, ‘‘what Bastiat did was this: having been at infinite pains to exclude gratuitous gifts of nature from the possible elements of value, and pointedly identified [rather, associated] the phenomenon with ‘ human effort’ as its exclusive source, he designates human effort by the term ‘service,’ and then employs this term to admit as sources of value those very gratuitous natural gifts the exclusion of which in this capacity constituted the essence of his doctrine.” The justice of this criticism will be apparent to any one who considers the way in which Bastiat treats the question of the value of adiamond. That what is paid for in most cases of human dealings is effort no one can dispute. But it is surely a reductio ad absurdum of his theory of value, regarded as a doctrine of universal application, to repre- sent the price of a diamond which has been accidentally found as remuneration for the effort of the finder in appropriating and transmitting it. And, with respect to land, whilst a large part of rent, in the popular sense, must be explained as interest on capital, it is plain that the native powers of the soil are capable of appro- priation, and that then a price can be demanded and will be paid for their use.

Bastiat is weak on the philosophical side; he is filled with the ideas of theological teleology, and is led by these ideas to form a priori opinions of what existing facts and laws must necessarily be. And the jus nature, which, like metaphysical ideas generally, has its root in theology, is as much a

postulate with him as with the physiocrats. Thus, in his essay on J'ree T'rade, he says :—" Exchange isa natural right like property. Every citizen who has created or acquired a product ought to have the option of either applying it immediately to his own use or ceding it to whosoever on the surface of the globe consents to give him in exchange the object of his desires." Something of the same sort had been said by Turgot ; and in his time this way of regarding things was excusable, and even pro- visionally useful ; but in the middle of the 19th century it was time that it should be seen through and abandoned.

Bastiat had a real enthusiasm for a science which he thought destined to render great services to mankind, and

gave a special colour to his teaching. If his optimistic

exaggerations favoured the propertied classes, they certainly |

were not prompted by self-interest or servility. But they are exaggerations; and, amidst the modern conflicts of capital and labour, his perpetual assertion of social har- monies is the cry of peace, peace, where there is no peace. The freedom of industry, which he treated as a sort of panacea, has undoubtedly brought with it great benefits ; but a sufficient experience has shown that it is inadequate to solve the social problem. How can the advocates of economic revolution be met by assuring them that every-

; Satie Leroy-Beaulieu has reeently maintained (Hssai sur la Réparti- tion des Richesses, 2d ed., 1882) that this, though not strietly, is

ey true, —that economie forms a very sinall part of aetual rent,

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thing in the natural economy is harmonious—that, in fact, all they seek for already exists? A certain degree of spontaneous harmony does indeed exist, for society could not continue without it, but it isimperfect and precarious ; the question is, How can we give to it the maximum of completeness and stability

Augustin Cournot (1801-1877) appears to have been Cournot.

the first (the German, H. H. Gossen, praised by Jevons, wrote in 1854) who, with a competent knowledge of both subjects, endeavoured to apply mathematics to the treat- ment of economic questions. His treatise entitled Recherches sur les Principes Mathématiques de la Théorie des Richesses was published in 1838. He mentions in it only one previous enterprise of the same kind (though there had in fact been others)—that, namely, of Nicolas F rangols Canard, whose book, published in 1802, was crowned by the Institute, though “its principles were radically false as well as erroneously applied.” Notwithstanding Cournot’s just reputation as a writer on mathematics, the Recherches made little impression. The truth seems to be that his results are in some cases of little importance, in others of questionable correctness, and that, in the abstractions to which he has recourse in order to facilitate his calculations, an essential part of the real conditions of the problem is sometimes omitted. His pages abound in symbols repre- senting unknown functions, the form of the function being left to be ascertained by observation of facts, which he does not regard as a part of his task, or only some known properties of the undetermined function being used as bases for deduction. Jevons includes in his list of works in which a mathematical treatment of economics is adopted a second treatise which Cournot published in 1863, with the title Principes de la Théorie des Richesses. But in reality, in the work so named, which is written with great ability, and contains much forcible reasoning in opposition to the exaggerations of economic optimists, the mathe- matical method is abandoned, and there is not an algebrai- cal formula in the book. The author admits that the public has always shown a repugnance to the use of mathematical symbols in economic discussion, and, though he thinks they might be of service in facilitating exposi- tion, fixing the ideas, and suggesting further developments, he acknowledges that a grave danger attends their use. The danger, according to him, consists in the probability that an undue value may be attached to the abstract hypotheses from which the investigator sets out, and. which enable him to construct his formule. And his practical conclusion is that mathematical processes should be employed only with great precaution, or even not employed at all if the public judgment is against them, for

| “this judgment,” he says, “has its secret reasons, almost

always more sure than those which determine the opinions of individuals.” It is an obvious consideration that the

: L nd acceptance of unsound or one-sided abstract principles as he seems to have believed intensely the doctrines which |

the premises of argument does not depend on the use of mathematical forms, though it is possible that the employ- ment of the latter may by association produce an illusion in favour of the certainty of those premises. But the great objection to the use of mathematics in economic reasoning is that it is necessarily sterile. If we examine the attempts which have been made to employ it, we shall find that the fundamental conceptions on which the deduc- tions are made to rest are vague, indeed metaphysical, in their character. Units of animal or moral satisfaction, of utility, and the like are as foreign to positive science as a unit of dormitive faculty would be; and a unit of value, unless we understand by value the quantity of one com- modity exchangeable under given conditions for another, is an equally indefinite idea. Mathematics can indeed formulate ratios of exchange when they have once been

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observed ; but it cannot by any process of its own de- termine those ratios, for quantitative conclusions imply quantitative premises, and these are wanting. There is then no future for this kind of study, and it is only waste of intellectual power to pursue it. But the importance of mathematics as an educational introduction to all the higher orders of research is not affected by this conclusion. The study of the physical medium, or environment, in which economic phenomena take place, and by which they are affected, requires mathematics as an instrument; and nothing can ever dispense with the didactic efficacy of that science, as supplying the primordial type of rational investigation, giving the lively sentiment of decisive proof, and disinclining the mind to illusory conceptions and sophistical combinations. And a knowledge of at least the fundamental principles of mathematics is

necessary to econo- nists to keep them right in their statements of doctrine, and prevent their enunciating propositions which have no definite meaning. Even distinguished writers some- times betray a serious deficiency in this respect ; thus they assert that one quantity “varies inversely as” another, when what is meant is that the sum (not the product) of the two is constant ; and they treat as capable of numerical estimation the amount of an aggregate of elements which, differing in kind, cannot be reduced to a common standard. As an example of the latter error, it may be mentioned that “ quantity of labour,” so often spoken of by Ricardo, and in fact made the basis of his system, includes such various species of exertion as will not admit of summa- tion or comparison.

Italy.—The first Italian translation of the Wealth of Nations appeared in 1780. The most distinguished Italian economist of the period here dealt with was, however, no disciple of Smith. This was Melchiorre Gioja, author, besides statistical and other writings, of a voluminous work entitled Nuovo Prospetto delle Scienze Economiche (6 vols., 1815-17; the work was never completed), intended to be an encyclopedia of all that had been taught by theorists, enacted by Governments, or effected by popula- tions in the field of public and private economy. It isa learned and able treatise, but so overladen with quotations and tables as to repel rather than attract readers. Gioja admired the practical economic system of England, and enlarges on the advantages of territorial properties, manu- factures, and mercantile enterprises on the large as opposed to the small scale. He defends a restrictive policy, and insists on the necessity of the action of the state as a guiding, supervising, and regulating power in the indus- trial world. But he is in full sympathy with the sentiment of his age against ecclesiastical domination and other medi- zeval survivals. We can but very briefly notice Romagnosi (d. 1835), who, by his contributions to periodical literature, and by his personal teaching, greatly influenced the course of economic thought in Italy; Antonio Scialoja (Principti d’Economia Sociale, 1840; and Carestia ¢ Governo, 1853), an able advocate of free trade (d. 1877) ; Luigi Cibrario, well known as the author of Zconomia Politica del medio evo (1839 ; 5th ed. 1861; French trans. by Barneaud, 1859), which is in fact a view of the whole social system of that period ; Girolamo Boccardo (b. 1829; T’rattato Teorico-pratico di Economia politica, 18538) ; the brilliant controversialist Francesco Ferrara, professor at Turin from 1849 to 1858 (in whose school

most of the present Italian teachers of the science were, directly or indirectly, educated), a partisan of the lazssez faire doc- trine in its most extreme form, and an advocate of the peculiar opinions of Carey and Bastiat on the subject of rent ; and, lastly, the Neapolitan minister Ludovico Bian- chini (Principii della Scienza del Ben Vivere Sociale, 1845

and 1855), who is remarkable as having followed in some | 1810).

‘derived its knowledge of the science.

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degree an historical direction, and asserted the principle of relativity, and who also dwelt on the relations of economics with morals, by a due attention to which the

Italian economists have, indeed, in general been honourably distinguished.

Spain.—The Wealth of Nations was translated into Jovel- It may perhaps have influenced lanos.

Spanish by Ortiz in 1794. Gaspar de Jovellanos, who in 1795 presented to the council of Castile and printed in the same year his celebrated Informe de la Sociedad Economica de Madrid en expediente de Ley Agraria, which was a powerful plea for reform, especially in taxation and the laws affecting agriculture, including those relating to the systems of entail and mort- main. An English version of this memoir is given in the translation (1809) of Laborde’s Spain, vol. iv. Germany.—Roscher observes that Smith did not at first produce much impression in Germany.1 He does not appear

‘to have been known to Frederick the Great ; he certainly

exercised no influence on him. Nor did Joseph IT. take notice of his work. And of the minor German princes, Karl Friedrich of Baden, as a physiocrat, would not be accessible to his doctrines. It was otherwise in the generation whose principal activity belongs to the first decade of the 19th century. The Prussian statesmen who were grouped round Stein had been formed as

economists by Smith, as had also Gentz, intellectually the most important man of the Metternich régime in Austria.

The first German expositors of Smith who did more than mercly reproduce his opinions were Christian Jacob Kraus (1753-1807), Georg Sartorius (1766-1828), and August Ferdinand Liider (1760- 1819). They contributed independent views from different stand- points,—the first from that of the effect of Smith's doctrine on practical government, the second from that of its bearing on history, the third from that of its relation to statistics. Some-what latter came Gottlieb Hufeland (1760-1817), Johann Fricdrich Euscbius Lotz (1771-1838), and Ludwig Heinrich von Jakob (1759-1827), who, whilst essentially of the school of Smith, apply themselvcs to a revision of the fundamental conceptions of the science. These authors did not cxert anything like the wide influence of Say, partly on account of the less attractive form of their writings, but chictly because Germany had not then, like France, a European audience. Julius von Soden (1754-1831) is largely founded on Smith, whom, however, he criticizes with undue severity, cspecially in regard to his form and arrangement ; the Wealth of Nations he describes asa series of precious fragments, and censnres Smith for the absence of a comprehensive view of his whole subject, and also as one-sidedly English in his tendencies.

The highest form of the Smithian doctrine in Germany is represented by four distinguished names :—Karl Heinrich Rau (1792-1870), Friedrich Nebenius (1784-1857),

| Friedrich Benedict Wilhelm Hermann (1795-1868), and

Johann Heinrich von Thiinen (1783-18 50).

Rau's characteristic is ''erudite thoroughness." (1826-82) is an encyclopedia of all that up to his time had appeared in Gcrmany under the several heads of Volkswirthschaftslchre, Volkswirthschaftspolitik, and Finanzwissenschaft. His book is rich in statistical observations, and is particularly instructive on the cconomic effects of different geographical conditions. It is well adapted for the teaching of publie servants whose duties are con- nected with economics, and it has in fact been the souree from which the Gcrman official world down to the present time has

In his earlier period Rau had insisted on the necessity of a rcform of economic doctrine (Ansichten der Volkswirthschaft, 1821), and had tended towards relativity and the historical method ; but he afterwards conceived the mistakcn notion that that method “only looked into the past without studying the means of improving the present,” and became himself purely practical in the narrower sense of that word. He has the merit of having given a separate treatment of Unternehmer- gewinn, or wages of management. — I nius, who was largely instrumental in the foundation of the Zoll- verein, was author of a highly esteemed monograph on public credit (1820). The Staatswirthschaftliche Untersuchungen (1832;

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1 ‘The first German version of the Wealth of Nations was that by Johann Friedrich Schiller, published 1776-78. The second, which is the first good one, was by Christian Garve (1794, and again 1799 and A recent one by C. W. Asher (1861) is highly commended,

His Lehrbuch Ran.

The Prussian minister Nebe- Nebenius.

Hermann.

Von Thiinen.

Storch.

2d ed., 1870) of Hermann do not form a regular system, but treat a series of important special subjects. His rare technological know- ledge gave him a great advantage in dealing with some economic questions. He reviewed the principal fundamental ideas of the science with greatthoronghness and acuteness. “ His strength,

says Roscher, ‘‘lies in his clear, sharp, exhaustive distinction be- tween the several elements of a complex conception, or the several steps

comprehended in a complex act.” For keen analytical power his German brethren compare him with Ricardo. But he avoids several one-sided views of the English economist. Thus he places public spirit beside egoism as an economic motor, regards price as not measured by labour only but as a product of several factors, and habitually contemplates the consumption of the labourer, not as a part of the cost of production to the capitalist, but as the main practical end of economics. Von Thiinen is known principally by his remarkable work entitled Der Isolirte Staat in Bezichung auf Landwirthschaft und Nationalikonomie (1826 ; 2d ed., 1842). In this treatise, which is a classic in the political economy of agricul- ture, there is a rare union of exact observation with creative imagination. With a view to exhibit the natural development of agriculture, he imagines a state, isolated from the rest of the world, circular in form and of uniform fertility, without navigable rivers or canals, with a single large city at its centre, which supplies it with manufactures and receives in exchange for them its food-products, and proceeds to study the effect of distance from this central market on the agricultural economy of the several concentric spaces which compose the territory. The method, it will be seen, is highly abstract, but, though it may not be fruitful, it is quite legitimate. The author is under no illusion blinding him to the unreality of the hypothetic case. The supposition is necessary, in his view, in order to separate and consider apart one essential condition—that, namely, of situation with respect to the market. It was his intention (imperfectly realized, however) to institute afterwards several different hypotheses in relation to his isolated state, for the purpose of similarly studying other conditions which in real life are found in combination or conflict. The objection to this method lies in the difficulty of the return froin the abstract study to the actual facts ; and this is probably an insuperable one in regard to most of its applications. The investigation, however, leads to trustworthy conclusions as to the conditions of the succes- sion of different systems of land economy. The book abounds in calculations relating to agricultural expenditure and income, which diminish its interest to the general reader, thongli they are con- sidered valuable to the specialist. They embody the results of the practical experience of the author on his estate of Tellow in Mecklenburg-Sechwerin. Von Thiinen was strongly impressed with the danger of a violent conflict between the middle class and the proletariate, and studied earnestly the question of wages, which he was onc of the first to regard, not merely as the

price of the commodity labour, but as the means of subsistence of the mass of thecommunity. He arrived by mathematical reasonings of some complexity at a formula which expresses the amount of ‘‘ natural

wages” as=/ap, where a is the necessary expenditure of the labourer for subsistence, and p is the product of his labour. To this formula he attributed so much importance that he directed it to be engraved on his tomb. It implies that wages ought to rise with the amount of the product; and this conclusion led him to establish on his estate a system of participation by the labourers in the profits of farming, of which some account will be fonnd in Mr Sedley Taylor’s Profit-sharing between Capital and Labour (1884). Von Thiinen deserves more attention than he has reccived in England ; both as a man and as a writer he was eminently interesting and original; and there is much in Der Isolirte Staat and his other works that is awakening and suggestive.

Roscher recognizes what he calls a Germano-Russian (deutsch-russische) school of political economy, represented principally by Heinrich Storch (1766-1825). Mercantilist principles had been preached by a native (“‘autochthonen ”) economist, Ivan Possoschkoff, in the time of Peter the Great. The new ideas of the Smithian system were intro- duced into Russia by Christian von Schlozer (1774-1831) in his professorial lectures and in his Anfangsgriinde der Staatswirthschaft, oder die Lehre von National-reichthume (1805-1807). Storch was instructor in economic science of the future emperor Nicholas and his brother the grand- duke Michael, and the substance of his lessons to them is contained in his Cours d’ Economie Politique (1815). The translation of this treatise into Russian was prevented by the censorship ; Rau published a German version of it, with annotations, in 1819. It is a work of a very high order of merit. The epithet ‘“deutsch-russisch” seems little applicable to Storch; as Roscher himself says, he

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follows mainly English and French writers—Say, Sismondi, Turgot, Bentham, Steuart, and Hume, but, above all, Adam Smith. His personal position (and the same is true of Schlézer) led him to consider economic doctrines in con- nexion with a stage of culture different from that of the Western populations amongst which they had been formu- lated ; this

change of the point of view opened the door to relativity, and helped to prepare the historical method. Storch's study of the economic and moral effects of serfdom is regarded as especially valuable. The general subjects with which he has particularly connected his name are (1) the doctrine of immaterial commodities (or elements of national prosperity), such as health, talent, morality, and the like; (2) the question of " productive" and "unproductive," as characters of labour and of consumption, on which he disagreed with Smith and may have furnished indications to Dunoyer; and (3) the differences between the revenue of nations and that of individuals, on which he follows Lauderdale and is opposed to Say. The latter economist having published at Paris (1823) a new edition of Storch's Cours, with criticisms sometimes offensive in tone, he published by way of reply to some of Say's strictures what is considered his ripest and scientifically most important work, Considérations sur la nature du Revenu National (1824; translated into German by the author himself, 1825).

A distinct note of opposition to the Smithian economics was sounded in Germany by two writers, who, setting out from somewhat different points of view, animated by different sentiments, and favouring different practical sys- tems, yet, so far as their criticisms are concerned, arrive at similar conclusions ; we mean Adam Miiller and Friedrich List.

Adam Miiller (1779-1829) was undoubtedly a man of Miiller.

real genius. In his principal work Hlemente der Staatskunst (1809), and his other writings, he represents a movement of economic thought which was in relation with the (so-called) Romantic literature of the period. The reaction against Smithianism of which he was the coryphseus was founded on an attachment to the principles and social system of the Middle Ages. It is possible that the political and historical ideas which inspire him, his repugnance to contemporary liberalism, and his notions of regular organic development, especially in relation to England, were in some degree imbibed from Edmund Burke, whose Reflections on the Revolution in France had been translated into German by Friedrich Gentz, the friend and teacher of Miiller. The association of his criticisms with medieval prepossessions ought not to prevent our recognizing the elements of truth which they contain.

He protests against the doctrine of Smith and against modern political economy in general on the ground that it presents a mechanical, atomistic, and purely material conception of socicty, that it reduces to nullity all moral forecs and ignores the necessity of a moral order, that it is at bottom no more than a theory of private property and private interests, and takes no account of the life of the people as a whole in its national solidarity and historical continuity. Exclusive attention, he complains, is devoted to the immediate production of objects possessing exchange valuc and to the transitory existence of individuals ; whilst to the maintenance of the collective production for future generations, to intellectual pro- ducts, powers, possessions, and enjoyments, and to the state with its higher tasks and aims, scarcely a thought is given. The truth is that nations are specialized organisms with distinct principles of life, having definite individnalities which determine the course of their historical development. Each is through all time one whole, and, as the present is the heir of the past, it onght to keep before it constantly the permancnt good of the community in the future. The economic existence of a people is only one side or province of its entire activity, requiring to be kept in harmony with the higher ends of society; and the proper organ to effect this reconciliation is the state, which, instead of being merely an apparatus for the administration of justice, represents the totality of the national life. The division of labour, Miiller holds, is imperfectly developed

by Smith, who makes it to arise out of a native bent for truck or barter; whilst its dependence on capital—on the labours and accumulations of past generations—is not duly emphasized, nor is the nccessary counterpoise and completion of the division of labour, in the principle of the national combination of labour, properly brought out. Smith recognizes only material, not spiritual, capital ; yet the latter, represented in every nation by language, as the former by money, is a real national store of experience, wisdom, good sense, and moral feeling, transmitted with increase by each generation to its successor, and enables each generation to produce immensely more than by its own unaided powers it could possibly do.

Again, the system of Smith is one-sidedly British ; if it is innocuous on the soil of England, it is because in her society. the old foundations on which the spiritual and material life of the people can securely rest are preserved in the surviving spirit of feudalism and the inner connexion of the whole social system—the national capital of laws, manners, reputa- tion, and credit, which has been handed down in its integrity in consequence of the insular position of the country. For the continent of Enrope a quite different system is necessary, in which, in place of the sum of the private wealth of individuals being viewed as the primary object, the rcal wealth of the nation and the production of national power shall be made to predominate, and along with the division of labour its national union and concentra- tion—along with the physical, no less the intellectual and moral, capital shall be embraced. In these leading traits of Miiller's thought there is much which foreshadows the more recent furms of German economic and sociological speculation, especially those characteristic of the " Historical " school.

Another element of opposition was represented by Friedrich List (1798-1846), a man of great intellectual vigour as well as practical energy, and notable as having powerfully contributed by his writings to the formation of the German Zollverein. His principal work is entitled Das Nationale System der Politischen Oekonomie. (1841; 6th ed., 1877). Though his practical conclusions were different from Miiller's, he was largely influenced by the general mode of thinking of that writer, and by his stric- tures on the doctrine of Smith. It was particularly against the cosmopolitan principle in the modern eco- nomical system that he protested, and against the absolute doctrine of free trade, which was in harmony with that principle. He gave prominence to the national idea, and insisted on the special requirements of each nation accord- ing to its circumstances and especially to the degree of its development.

He refuses to Smith's system the title of the industrial, which he thinks more appropriate to the mercantile system, and desig: nates the former as ''the exchange-value system.'' He denies the parallelism asserted by Smith between the economic conduct proper to an individual and to a nation, and holds that the immediate private interest of the separate members of the com- munity will not lead to the highest good of the whole. The nation is an existence, standing between the individual and humanity, and formed into a

unity by its language, manners, historical development, culture, and constitution. This unity is the first condition of the security, wellbeing, progress, and civiliza- tion of the individual; and private economic interests, like all others, must be subordinated to the maintenance, completion, and strengthening of the nationality. The nation having a continuous life, its true wealth consists—and this is List's fundamental doctrine—not in the quantity of exchange-values which it possesses, but in the full and many-sided development of its productive powers. kts econonlic education, if we may so speak, is more important than the immediate production of values, and it may be right that the present generation should sacrifice its gain and enjoyment to secure the strength and skill of the future. In the sound and normal condition of a nation which has attained economic maturity, the three productive powers of agriculture, manufactures, and commerce should be alike developed. But the two latter factors are superior in importauce, as exercising a more effective and fruitful influence on the whole culture of the nation, as well as on its independence. Navigation, railways, all higher technical arts, connect themselves specially with these factors ; whilst in a purely agricultural state there is a tendency to stag- nation, absence of enterprise, and the maintenance of antiquated prejudices. But for the growth of the higher forms of industry all countries are not adapted—only those of the temperate zones, whilst the torrid resions have a natural monopoly in the pro- duction of certain raw materials; and thus between these two groups of countries a division of labour and confederation of powers spontaneously takes place. List then goes on to explain his theory

| of the stages of economic development through which the nations of the temperate zone, which are furnished with all the necessary conditions, naturally pass, in advancing to their normal economic state. These are (1) pastoral life, (2) agriculture, (3) agriculture united with manufactures; whilst in the final stage agriculture, manufactures, and commerce are combined. The economic task of the state is to bring into existence through legislative and admini- strative action the conditions required for the progress of the nation through these stages. Out of this view arises List's scheme of industrial politics. Every nation, according to him, should begin with free trade, stimulating and improving its agri- culture by intercourse

with richer and more cultivated nations, importing foreign manufactures and exporting raw products. When it is economically so far advanced that it can manufacture for itself, then a system of protection should be employed to allow the home industries to develop themselves fully, and save them from being overpowered in their earlier efforts by the competition of more matured foreign industries in the home market. When the national industries have grown strong enough no longer to dread this competition, then the highest stage of progress has heen reached ; free trade should again become the rule, and the nation be thus thoroughly incorporated with the universal indus- trial union. In List's time, according to his view, Spain, Portugal, and Naples were purely agricultural countries; Germany and the United States of North America had arrived at the second stage, their manufactures being in process of development ; France was near the boundary of the third or highest stage, which England alone had reached. For England, therefore, as well as for the agricultural countries first-named, free trade was the right economic policy, but not for Germany or America. What a nation loses for a time in exchange values during the protective period she much more than gains in the long run in productive power,—the tempor- ary expenditure being strictly analogous, when we place ourselves at the point of view of the life of the nation, to the cost of the industrial education of the individual. The practical conclusion which List drew for his own country was that she needed for her economic progress an extended and conveniently bounded territory reaching to the sea-coast both on north and south, and a vigorous expansion of manufactures and commerce, and that the way to the latter lay through judicious protective legislation with a customs union comprising all German lands, and a German marine with a Navigation Act. The national German spirit, striving after in- dependence and power through union, and the national industry, awaking from its lethargy aud eager to recover lost ground, were favourable to the success of List's book, and it produced a great sensation. He ably represented the tendencies' and demands of his time in his own country ; his work had the effect of fixing the attention, not merely of the speculative and official classes, but of practical men generally, on questions of political economy; and he had without doubt an important influence on German industrial policy. So far as science is concerned, the emphasis he laid on

the relative historical study of stages of civilization as affecting economic questions, and his protest against absolute formulas, had a certain valuc; and the preponderance given to the national development over the immediate gains of individuals was sound in principle ; though his doctrine was, both on its public and private sides, too much of a mere chrematistic, and tended in fact to set up a new form of mercantilism, rather than to aid the contem- porary effort towards social reform.

Most of the writers at home or abroad hitherto mentioned continued the traditions of the school of Smith, only developing his doctrine in particular directions, sometimes not without one-sidedness or exaggeration, or correcting minor errors into which he had fallen, or seeking to give to the exposition of his principles more of order and lucidity. Some assailed the abuse of abstraction by Smith's successors, objected to the conclusions of Ricardo and his followers their non-accordance with the actual facts of human life, or protested against the anti-social con- sequences which seemed to result from the application of the (so-called) orthodox formulas. A few challenged Smith's fundamental ideas, and insisted on the necessity of altering the basis of general philosophy on which his economics ultimately rest. But, notwithstanding various premonitory indications, nothing substantial, at least nothing effective, was done, within the field we have as yet surveyed, towards the establishment of a really new order of thinking, or new mode of proceeding, in this branch of inquiry. Now, however, we have to describe a great and growing movement, which has already considerably changed the whole character of the study in the conceptions of

Comte.

many, and which promises to exercise a still more potent influence in the future. We mean the rise of the His- torical School, which we regard as marking the third epoch in the modern developmient of economic science.

THE HISTORICAL SCHOOL.

The negative movement which filled the 18th century had for its watchword on the economic side the liberation of industrial effort from both feudal survivals and Govern- inental fetters. But in all the aspects of that movement, the economic as well as the rest, the process of demolition was historically only the necessary preliminary condition of a total renovation, towards which western Europe was energetically tending, though with but an indistinct con- ception of its precise nature. The disorganization of the body of opinion which underlay the old system outran the progress towards the establishment of new principles ade-

quate to forn a guidance in the future. The critical phi- |

losophy which had wrought the disorganization could only repeat its formulas of absolute liberty, but was powerless for reconstruction. And heuce there was seen throughout the West, after the French explosion, the remarkable spec- tacle of a continuous oscillation between the tendency to recur to outworn ideas and a vague impulse towards a new order in social thought and life, this impulse often taking an anarchical character.

From this state of oscillation, which has given to our century its equivocal and transitional aspect, the only possible issue was in the foundation of a scientific social doctrine which should supply a basis for the gradual con- vergence of opinion on human questions. The foundation of such a doctrine is the immortal service for which the world is indebted to Auguste Comte.

The leading features of sociology, as he conceived it, are the following :— (1) it is essentially one science, in which all the elements of a social state are studied in their relations and mutual actions ; (2) it includes a dynamical as well as a statical theory of society; (3) it thus elimin- ates the absolute, substituting for an imagined fixity the conception of ordered change ; (4) its principal method, though others are not excluded, is that of historical com- parison ; (5) it is pervaded by moral ideas, by notions of social duty, as opposed to the individual rights which were derived as corollaries from the jus nature ; and (6) in its spirit and practical consequences it tends to the realiza- tion of all the great ends which compose “the popular cause”; yet (7) it aims at this through peaceful means, replacing revolution by evolution. The several character- istics we have enumerated are not independent ; they may be shown to be vitally connected with each other.

Several of these features must now be more fully described ; the others will meet us before the close of the present survey.

In the masterly exposition of sociological method which is contained in the fourth volume of the Philosophie Positive (1839),1 Comte marks out the broad division between social statics and social dynamics—the former studying the laws of social coexistence, the latter those of social development. The fundamental principle of the former is the general consensus between the several social organs and functions, which, without unduly pressing a useful analogy, we may regard as resembling that which exists between the several organs and functions of an animal body. The study of dynamical is different from, and necessarily subordinated to, that of statical sociology, progress being in fact the development of order, just as the study of evolution in biology is different from, and subordinated to, that of the structures and functions

1 He had already in 1822 stated his fundamental principles in an opuscule which is reproduced in the Appendix to his Politique Positive.

| which are exhibited by evolution as they exist at the

several points of an ascending scale. The laws of social co-existence and movement are as much subjects for observation as the corresponding phenomena in the life of an individual organism. For the study of development in particular, a modification of the comparative method familiar to biologists will be the appropriate mode of research, The several successive stages of society will have to be systematically compared, in order to discover their laws of sequence, and to determine the filiation of their characteristic features.

Though we must take care that both in our statical and dynamical studies we do not ignore or contradict the fundamental properties of human nature, the project of deducing either species of laws from those properties independently of direct observation is one which cannot be realized. Neither the general structure of human society nor the march of its development could be so pre- dicted. This is especially evident with respect to dynami-

| cal laws, because, in the passage of society from one phase

to another, the preponderating agency is the accumulated influence of past generations, which is much too complex to be investigated deductively—a conclusion which it is important to keep steadily before us now that some of the (so-called) anthropologists are seeking to make the science of society a mere annex and derivative of biology. The principles of biology unquestionably lie at the foundation of the social science, but the latter has, and must always have, a field of research and a method of inquiry peculiar to itself, The field is history in the largest sense, includ- ing contemporary fact; and the principal, though not exclusive, method is, as we have said, that process of socio- logical comparison which is most conveniently called the historical method.

These general principles affect the economic no less than other branches of social speculation ; and with respect to that department of inquiry they lead to important results. They show that the idea of forming a true theory of the economic frame and working of society apart from its other sides is illusory. Such study is indeed provisionally indispensable, but no rational theory of the economic organs and functions of society can be constructed if they are considered as isolated from the rest. In other words, a separate economic science is, strictly speaking, an im- possibility, as representing only one portion of a complex organism, all whose parts and their actions are in a con- stant relation of correspondence and reciprocal moditica- tion. Hence, too, it will follow that, whatever useful indications may be derived from our general knowledge of individual human nature, the economic structure of society and its mode of development cannot be deductively-fore- seen, but must be ascertained by direct historical inves- tigation. We have said “its mode of development ””; f0E it is obvious that, as of every social clement, so of the economic factor in human affairs, there must be a dyna- mical doctrine, a theory of the successive phases of the economic condition of society ; yet in the accepted systems this was a desideratum, nothing but some partial and fragmentary notions on this whole side of the subject being yet extant. And, further, the economic structure and working of one historic stage being different from those of another, we must abandon the idea of an absolute system possessing universal validity, and substitute that

of a series of such systems, in which, however, the succes- sion is not at all arbitrary, but is itself regulated by law.

Though Comte's enterprise was a constructive one, his aim being the foundation of a scientific theory of society, he could not avoid criticizing the labours of those who before him had treated several branches of social inquiry. Amongst them the economists were necessarily considered ;

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and he urged or implied, in various places of his above- named work, as well as of his Politique Positive, objections to their general ideas and methods of procedure essentially the same with those which we stated in speaking of Ricardo and his followers. J.S. Mill shows himself much irritated by these comments, and remarks on them as showing " how extremely superficial M. Comte" (whom he yet regards as a thinker quite comparable with Descartes and Leibnitz) "could sometimes be," —-an unfortunate observation, which he would scarcely have made if he could have foreseen the subsequent march of European thought, and the large degree in which the main points of Comte's criticism have been accepted or independently reproduced.

Germany.—The second manifestation of this new move- ment in economic science was the appearance of the German historical school. The views of this school do not appear to have arisen, like Comte's theory of sociologi- cal method, out of general philosophic ideas; they seem rather to have been suggested by an extension to the economic field of the conceptions of the historical school of jurisprudence of which Savigny was the most eminent representative. The juristic system is not a fixed social phenomenon, but is variable from one stage in the progress of society to another—it is in vital relation with the other coexistent social factors ; and what is, in the jural sphere, adapted to one period of development is often unfit for another. These ideas were seen to be applicable to the economic system also; the relative point of view was thus reached, and the absolute attitude was found to be un- tenable. Cosmopolitanism in theory, or the assumption of a system equally true of every country, and what has been called perpetualism, or the

assumption of a system appli- cable to every social stage, were alike discredited. And so the German historical school appears to have taken its rise.

Omitting preparatory indications and undeveloped germs of doctrine, we must trace the origin of the school to Wilhelm Roscher. Its fundamental principles are stated, though with some hesitation, and with an unfortunate con- trast of the historical with the “ philosophical” method,1 in his Grundriss zw Vorlesungen tiber die Staatswirthschaft nach geschichtlicher Methode (1843). The following are the leading heads insisted on in the preface to that work.

“The historical method exhibits itself not merely in the external form of a treatment of phenomena according to their chronological succession, but in the following funda- mental ideas. (1) The aim is to represent what nations have thought, willed, and discovered in the economic field, what they have striven after and attained, and why they have attained it. (2) A people is not merely the mass of individuals now living; it will not suffice to observe con- temporary facts. (3) All the peoples of whom we can learn anything must be studied and compared fron: the economic point of view, especially the ancient peoples, whose development lies before us in its totality. (4) We must not simply praise or blame economic institutions; but few of them have been salutary or detrimental to all peoples and at all stages of culture ; rather it is a principal task of science to show how and why, out of what was once reasonable and beneficent, the unwise and inexpedient has often gradually arisen.” Of the principles enunciated in this paraphrase of Roscher’s words a portion of the third alone seems open to objection; the economy of ancient peoples is not a more important subject of study than that of the moderns; indeed the question of the relative importance of the two is one that ought not to be raised. For the essential condition of all sound sociologi-

1 This phraseology was probably borrowed from the controversy on the method of jurisprudence between Thibaut on the one hand and Savigny and Hugo on the other.

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cal inquiry is the comparative consideration of the entire series of the most complete evolution known to history — that, namely, of the group of nations forming what is known as the Occidental Commonwealth, or, more briefly, “the West.” The reasons for choosing this social series, and for provisionally restricting our studies almost alto- gether to it, have been stated with unanswerable force by Comte in the Philosophie Positive. Greece and Rome are, indeed, elements in the series ; but it is the development as a whole, not any special portions of it, that sociology must keep in view in order to determine the laws of the move- ment,—just as, in the study of biological evolution, no one stage of an organism can be considered as of preponder- ating importance, the entire succession of changes being the object of research. Of Roscher’s further eminent services we shall speak hereafter; he is now mentioned only in relation to the origin of the new school.

“ In 1848 Bruno Hildebrand published the first volume of a work, which, though he lived for many years after (d. 1878), he never continued, entitled Die Natvonaloko- nomie der Gegenwart und Zukunft. Uildebrand was a thinker of a really high order; it may be doubted whether amongst German economists there has been any endowed with a more’ profound and searching intellect. He is quite free from the wordiness and obscurity which too often characterize German writers, and traces broad out- lines with a sure and powerful hand. His book contains a masterly criticism of the economic systems which pre- ceded, or belonged to, his time, including those of Smith, Miiller, List, and the socialists. But it is interesting to us at present mainly from the general position he takes up, and his conception of the real nature of political economy. ‘The object of his work, he tells us, is to open a way in the economic domain to a thorough historical direction and method, and to transform the science into a doctrine of the laws of the economic development of nations. It is interesting to observe that the type which he sets before him in his proposed reform of political economy is not that of historical jurisprudence, but of the science of language as it has been reconstructed in the present century, a selection which indicates the compara- tive method as the one which he considered appropriate. In both sciences we have the presence of an ordered varia- tion in time, and the consequent substitution of the relative for the absolute.

In 1853 appeared the work of Karl Knies, entitled Dve Knies.

Politische Ockonomie vom Standpunkte der geschachtlichen Methode. This is an elaborate exposition and defence of the historical method in its application to economic science, and is the most systematic and complete manifesto of the new school, at least on the logical side. The fundamental propositions are that the economic constitu- tion of society at any epoch on the one hand, and on the other the contemporary theoretic conception of economic science, are results of a definite historical development ; that they are both in vital connexion with the whole social organism of the period, having grown up along with it and under the same conditions of time, place, and nationality ; that the economic system must therefore be regarded as passing through a series of phases correlative with the successive stages of civilization, and can at no point of this movement be considered to have attained an entirely definitive form; that no more the present than any previous economic organization of society is to be regarded as absolutely good and right, but only as a phase in a continuous historical evolution ; and that in like manner the now prevalent economic doctrine is not to be viewed as complete and final, but only as representing a certain stage in the unfolding or progressive manifestation of the truth.

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The theme of the book is handled with, perhaps, an undue degree of expansion and detail. The author ex- hibits much sagacity as well as learning, and criticizes effectively the errors, inconsistencies, and exaggerations of his predecessors. But in characterizing and vindicating the historical method he has added nothing to Comte. A second edition of his treatise was published in 1883, and in this he makes the singular confession that, when he wrote in 1852, the Philosophie Positive, the six volumes of which had appeared from 1830 to 1842, was entirely unknown to him and, he adds, probably to all German economists. This is not to the credit of their open- mindedness or literary vigilance, if we remember that Mill was already in correspondence with Comte in 1841, and that his eulogistic notice of him in the Logic appeared in 1843. When, however, Knies at a later period examined Comte’s work, he was, he tells us, surprised at finding in it so many anticipations of, or “ parallelisms” with, his own

conclusions. And well he might; for all that is really valuable in his methodology is to be found in Comte, applied on a larger scale, and designed with the broad and commanding power which marks the diz majores of philosophy.

There are two points which seem to be open to criticism in the position taken by some German economists of the historical school.

1. Knies and some other writers, in maintaining the principle of relativity in economic theory, appear not to preserve the due balance in one particular. The two forms of absolutism in doctrine, cosmopolitanism and what Knies calls perpetualism, he seems to place on exactly the same footing; in other words, he considers the error of overlooking varieties of local circumstances and nationality to be quite as serious as that of neglecting differenccs in the stage of historical development. But this is certainly not so. In every branch of sociology the latter is much the graver error, vitiating radically, wherever it is found, the whole of our investigations. If we ignore the fact, or mistake the direction, of the social movement, we are wrong in the most fundamental point of all—a point, too, which is involved in every question. But the variations depending on difference of race, as affecting bodily and mental endowment, or on diversity of external situation, are secondary ge aaa only; they must be postponed in studying the general theory of social development, and taken into account afterwards when we come to examine the modifications in the character of the development arising out of peculiar conditions. And, though the physical nature of a territory is a condition which is likely to operate with special force on economic phenomena, it is rather on the technical forms and comparative extension of the several branches of industry that it will act than on the social conduct of each branch, or the co-ordination and relative action of all, which latter are the proper subjects of the inquiries of the economist.

2. Some members of the school appear, in their anxiety to assert the relativity of the science, to fall into the error of denying economic laws altogether; they are at least unwilling to speak of ‘‘natural laws” in relation to the economic world. From a too exclusive consideration of law in the inorganic sphere, they regard this phraseology as binding them to the notion of fixity and of an invariable system of practical economy. But, if we turn

our attention rather to the organic sciences, which are more kindred to the social, we shall see that the term ‘‘natural law” carries with it no such implication. As we have more than once indicated, an essential part of the idea of life is that of development, in other words, of ‘‘ ordered change.” And that such a development takes place in the constitution and working of society in all its elements is a fact which cannot be doubted, and which these writers themselves emphatically assert. That there exist between the several social clements such relations as make the change of one element involve or determine the change of another is equally plain; and why the name of natural laws should be denied to such constant relations of coexistence and succession it is not easy to see. These laws, being universal, admit of the construction of an abstract theory of economic development ; whilst a part of the German historical school tends to substitute for such a theory a mere description of different national economies, introducing prematurely —as we have pointed ont—the action of special territorial or ethno- logical conditions, instead of reserving this as the ground of later modifications, in concrete cases, of the primary general laws dedueed from a study of the common human evolution.

To the three writers above named, Roscher, Hildebrand, and Knies, the foundation of the German historical school of political economy belongs. It does not appear that Roscher in his own subsequent labours has been much under the influence of the

method which he has in so inany places admirably characterized. In his System der Volkswirthschaft (vol. i., Grundlagen der Nationalékonomie, 1854, 15th ed. 1880; vol. ii, WM. O. des Ackerbaues, 1860, 10th ed. 1882; vol. iii. NW. O. des Handels und Gewerbfleisses, 3d ed., 1882) the dogmatic and the historical matter are rather juxtaposed than vitally combined. It is true that he has most usefully applied his vast learning to special historical studics, in relation especially to the progress of the science itself. His treatise Ueber das Verhiiliniss der Nationalikonomie zum classt-sehen Alterthume, his Zur Geschichte der Englischen Volkswirth-schaftslehre (Leipsic, 1851-2), and, above all, that marvellous monument of erudition and industry, his Geschichte der National- Ockonomik in

Deutschland (1874), to which he is said to lave devoted fifteen years of study, are among the most valuable extant works of this kind, though the last by its accumulation of detail is unfitted for general study outside of Germany itself. Several interesting and useful monographs are collected in his Ansichten der Volkswirthschaft vom geschichtlichen Standpunkte (3d ed., 1878). His systematic treatise, too, above referred to, abounds in historical notices of the rise and development of the several doc- trines of the science, But it cannot be alleged that he has done much towards the transformation of political economy which his earliest labours seemed to announce ; and Cossa appears to be right in saying that his dogmatic work has not effected any substantial modification of the principles of Hermann and Rau.

The historical method has exhibited its essential features more fully in the hands of the younger generation of scientific economists in Germany, amongst whom may be reckoned Lujo Brentano, Adolf Held, Erwin Nasse, Gustav Schmoller, H. Résler, Albert Schiffle, Hans von Scheel, Gustav Schénberg, and Adolf Wagner. Besides the general principle of an historical treatment of the science, the leading ideas which have been most strongly insisted on by this school are the following. I. The necessity of accentuating the moral element in economic study. This consideration has been urged with special emphasis by Schmoller in his Grundfragen (1875) and by Schiffle in his Das gesellschaftliche System der menschlichen Wirthschaft (3d ed., 1873). G. Kries (d, 1858) appears also to have handled the subject well in areview of J. S. Mill. Accord- ing to the most advanced organs of the school, three principles of organization are at work in practical economy ;. and, corresponding with these, there are three different systems or spheres of activity. The latter are (1) private economy; (2) the compulsory public economy; (3) the "'caritative" sphere. In the first alone personal interest predominates; in the second the general interest of the society ; in the third the benevolent impulses. Even in the first, however, the action of private interest cannot be unlimited ; not to speak here of the intervention of the public power, the excesses and abuses of the fundamental principle in this department must be checked and controlled by an economic morality, which can never be left out of account in theory any more than in practical applications In the third region above-named, moral influences are of course supreme. II. The close relation which necessarily exists between

economics and jurisprudence. This has been brought out by L. von Stein and H. Résler, but is most systematically established by Wagner—who is, without doubt, one of the most eminent of living German economists—especially in his Grundlegung, now forming part of the Lehrbuch der politischen Oekonomie in course of publication by him and Professor Nasse jointly. The doctrine of the jus nature, on which the physiocrats, as we have seen, reared their economic structure, has lost its hold on belief, and the old a priorz and absolute concep- tions of personal freedom and property have given way along with it. It is seen that the economic position of the individual, instead of depending merely on so-called natural rights or even on his natural powers, is conditioned by the contemporary juristic system, which is itself an historical product. The above-named conceptions, therefore, half economic half juristic, of freedom and property require a fresh examination. lt is principally from this point of

view that Wagner approaches economic studies. The point, as he says, on which all turns is the old question of the relation of the individual to the community. Whoever with the older juristic and political philosophy and national economy places the individual in the centre comes neces- sarily to the untenable results which, in the economic field, the physiocratic and Smithian school of free com- petition has set up. Wagner on the contrary investigates, before anything else, the conditions of the economic life of the community, and, in subordination to this, deter. mines the sphere of the economic freedom of the individual. Iil. A different conception of the functions of the state from that entertained by the school of Smith. The latter school has in general followed the view of Rousseau and Kant that the sole office of the state is the protection of the members of the community from violence and fraud. This doctrine, which was in harmony with those of the jus naturex and the social contract, was temporarily useful for the demo- lition of the old economic system with its complicated appa- ratus of fetters and restrictions. But it could not stand against a rational historical criticism, and still less against the growing practical demands of modern civilization. In fact, the abolition of the impolitic and discredited system of European Governments, by bringing to the surface the evils arising from unlimited competition, irresistibly demon- strated the necessity of public action

according to new and more enlightened methods. The German historical school recognizes the state as not merely an institution for the maintenance of order, but as the organ of the nation for all ends which cannot be adequately effected by voluntary individual effort. Whenever social aims can be attained only or most advantageously through its action, that action is justified. The cases in which it can properly interfere must be determined separately on their own merits and in relation to the stage of national development. It ought certainly to promote intellectual and esthetic culture. It ought to enforce provisions for public health and regula~ tions for the proper conduct of production and transport. It ought to protect the weaker members of society, espe- cially women, children, the aged, and the destitute, at least in the absence of family maintenance and guardianship. It ought to secure the labourer against the worst conse- quences of personal injury not due to his own negligence, to assist through legal recognition and supervision the efforts of the working classes for joint no less than individual self-help, and to guarantee the safety of their earnings, when entrusted to its care.

A special influence which has worked on this more recent group is that of theoretic socialism ; we shall see hereafter

that socialism as a party organization has also affected |

their practical politics. With such writers as St. Simon, Fourier, and Proudhon, Lassalle, Marx, Engels, Marlo, and Rodbertus (who, notwithstanding a recent denial, seems rightly described as a socialist) we do not deal in the present sketch (see SoctaLism) ; but we must recognize them as having powerfully stimulated the younger German economists (in the strict sense of this last‘word). They have even modified the scientific conclusions of the latter, especially through criticism of the so-called orthodox system. Schafle and Wagner may be especially named as having given a large space and a respectful attention to their arguments. In particular, the important consideration, to which we have already referred, that the economic position of the individual depends on the existing legal system, and notably on the existing organization of property, was first insisted on by the socialists. They had also pointed out that the present institutions of society in relation to property, inheritance, contract, and the

like are (to use Lassalle's phrase) "historical categories which have changed, and are subject to further change," whilst in the

orthodox economy -they are generally assumed as a fixed order of things on the basis of which the individual creates his own position. J.S. Mill called attention to the fact of the distribution of wealth depending, unlike its production, not on natural laws alone, but on the ordinances of society,

-but it is some of the German economists of the younger

historical school who have most strongly emphasized this view. To rectify and complete the conception, however, we must bear in mind that those ordinances themselves are not arbitrarily changeable, but are conditioned by the stage of general social development.

In economic politics these writers have taken up a posi- tion between the German free-trade (or, as it is sometimes with questionable propriety called, the Manchester) party and the democratic socialists. The latter invoke the omni- potence of the state to transform radically and immediately the whole economic organization of society in the interest of the proletariate. The free-traders seek to minimize stato action for any end except that of maintaining public order, and securing the safety and freedom of the individual. The members of the school of which we are now 'speaking, when intervening in the discussion of practical questions, have occupied an intermediate standpoint. They are op- posed alike to social revolution and to rigid laissez faire. Whilst rejecting the socialistic programme, they call for the intervention of the state, in accordance with the theoretic principles already mentioned, for the purpose of mitigating the pressure of the modern industrial system on its weaker members, and extending in greater measure to the working classes the benefits of advancing civilization. Schiiffie in his Capitalismus und Socialismus (1870; now absorbed into a larger work), Wagner in his Rede tiber die sociale Frage (1871), and Schonberg in his Arbettsdmter: eine Aufgabe des deutschen Reichs (1871) advocated this policy in relation to the question of the labourer. These expres- sions of opinion, with which most of the German professors of political economy sympathized, were violently assailed by the organs of the free-trade party,

who found in them “a new form of socialism.” Out of this arose a lively controversy ; and, the necessity of a closer union and a practical political organization being felt amongst the partisans of the new direction, a congress was held at Eisenach in October 1872, for the consideration of ‘the social question.” It was attended by almost all the professors of economic science in the German universities, by representatives of the several political parties, by leaders of the working men, and by some of the large capitalists. At this meeting the principles above explained were formulated. Those who adopted them obtained from their opponents the appellation of ‘‘ Katheder-Socialisten,” or “socialists of the (professorial) chair,” a nickname in- vented by H. B. Oppenheim, and which those to whom it was applied were not unwilling to accept. Since 1873 this group has been united in the “ Verein fiir Socialpolitik,” in which, as the controversy became mitigated, free-traders also have taken part. Within the Verein a division has shown itself. The left wing has favoured a systematic gradual modification of the law of property in such a direction as would tend to the fulfilment of the socialistic aspirations, so far as these are legitimate, whilst the majority advocate reform through state action on the basis of existing jural institutions. Schiffle goes so far as to maintain that the present “capitalistic” régime will be replaced by a socialistic organization ; but, like J. S. Mill, he adjourns this change to a more or less remote future, and expects it as the result of a natural development, or process of “social selection ;”! he repudiates any immediate

1 This should be remembered by readers of M. Leroy-Beaulieu’s recent work on Collectivism (1884), in which he treats Schiffle as the principal theoretic representative of that form of socialism.

or violent revolution, and rejects any system of life which | would set up “abstract equality” against the claims of individual service and merit.

The further the investigations of the German historical school have been carried, in the several lines of inquiry it has opened, the more clearly it has come to light that the one thing needful is not merely a reform of political

economy, but its fusion in a complete science of society. This is the view long since insisted on by Auguste Comte ; and its justness is daily becoming more apparent. The best economists of Germany now tend strongly in this direction. Schiffle, who is largely under the influence of Comte and Herbert Spencer, has actually attempted the enterprise of widening economic into social studies. In his most important work, which had been prepared by previous publications, Baz und Leben des socialen Korpers (1875-78 ; new ed., 1881), he proposes to give a compre- hensive plan of an anatomy, physiology, and psychology of human society. He considers social processes as analogous to those of organic bodies; and, sound and suggestive as the idea of this analogy, already used by Comte, undoubtedly is, he carries it, perhaps, to an undue degree of detail and elaboration. The same conception is adopted by P. von Lilienfeld in his Gedanken tiber die Socialwissenschaft der Zukunft (1873-79). A tendency to the fusion of economic science in sociology is also found in Adolph Samter's Sozial-lehre (though the economic aspect of society is there specially studied) and in Schmoller's treatise Ueber einige Grundfragen des Rechts und der Volkswirthschaftslehre ; and the necessity of such a trans- formation is energetically asserted by H. von Scheel in the preface to his German version (1879) of an English tract On the present Position and Prospects of Political Economy.

The name "Realistic," which has sometimes been given to the historical school, especially in its more recent form, appears to be injudiciously chosen. It is intended to mark the contrast with the "abstract" complexion of | the orthodox economics. But the error of these economics | lies, not in the use, but in the abuse of abstraction. All science implies abstraction, seeking, as it does, for unity in variety ; the question in every branch is as to the right constitution of the abstract theory in relation to the con- crete facts. Nor is the new school quite correctly dis- tinguished as "inductive." Deduction doubtless unduly' preponderates in the investigations of the older econo- mists ; but it must be remembered that it is a legitimate process, when it sets out, not from a priori assumptions, but from proved generalizations. And the appropriate method of economics, as of all sociology, is not so much induction as the specialized form of induction known as comparison, especially the comparative study of "social series" (to use Mill's phrase), which is properly designated as the "historical" method. If the

denominations here criticized were allowed to prevail, there would be a danger of the school assuming an unscientific character. It might occupy itself too exclusively with statistical inquiry, and forget in the detailed examination of particular provinces of economic life the necessity of large philosophic ideas and of a systematic co-ordination of principles. So long as economics remain a separate branch of study, and until they are absorbed into sociology, the thinkers who follow the new direction will do wisely in retaining their original designation of the historical school.

The members of the historical school have produced many valu- able works besides those which there has been occasion to mention above. Ample notices of their contributions to the several branches of the science (including its applications) will be found dispersed through Wagner and Nasse's Lehrbuch and_ the comprehensive Handbuch edited by Schonberg. The following list, which does

not pretend to approach to completeness, is given for the purpose of directing the student to a certain number of books which ought

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not to be overlooked in the study of the subjects to which they respectively refer :—-

Knies, Die Eisenbahnen und thre Wirkungen (1853), Der Telegraph (1857), Geld and Credit (1878-76-79); Rosler, Zur Kritik der Lehre vom Arbettslohn, 18613 Schmoller, Zur Geschichte der deutschen Kleingewerbe im 19 Jahrh., 1870; Schaffie, Theorie der ausschliessenden Absatzverhalinisse (1867), Quintessenz des Socialis- mus (6th ed., 1878), Grundsdtze der Steuerpolitik (1880); Nasse, Mittelalterliche Feldgemeinschaft in England, 1869; Brentano, On the History and Development of Gilds, prefixed to Toulmin Smith's English Gilds (1870), Die Arbeitergilden der Gegenwart (1871-72), Das Arbeitsverhdliniss gemédss dem heutigen Recht (1877), Die Arbeitsversicherung gemdss der heutigen Wirthschaftsordnung (1879), Der Arbettsversicherungszwang (1881); lleld (born 1844, aecidentally drowned in the Lake of Thun 1880), Die Linkommensteuer (1872), Die deutsche Arbetterpresse der Gegenwart (1873), Soztalismus, Sozialdemokratie, und Sozialpolitik (1878), Grundriss

fiir Vorlesungen tiber National-okonomie (24 ed., 1878); Zwei Ltcher zur socialen Geschichte Englands (posthumously published, 1881); Von Scheel (born 1839), Die Theorie der socialen Frage (1871), Unsere soctal-politischen Parteien (1878). To these may be added L. von Stein, Die Verwaltungslehre (1876-79), Lehrbuch der Finanzwissenschajgt (4th ed., 1878). E. Diihring is the ablest of the few German followers of Carey; we shall mention his history hcre- after. To the Russian-German school belongs the work of T. von Bernhardi, which is written from the historical point of view, Versuch einer Kritik der Griinde welche fiir grosses und kleines Grundeigenthum angefihrt werden, 1848, The free-trade school of Germany is recognized as having rendered great practical services in that eountry, especially by its systematic warfare against antiquated privileges and restrictions. Cobden has furnished the model of its politieal action, wlilst, on the side of theory, it is founded chiefly on Say and Bastiat. The members of this sehool whose names have been most frequently heard by the English publie are those of J. Prinec Smith, who may be regarded as its head; H. von Treitsehke, author of Der Socialismus und seine Gonner, 1875 (direeted against the Katheder-Socialisten); V. Bolmert, who has advoeated the participation of workmen in profits (Die Gewinnbetheiligung, 1878); and J. H. Sehultzc-Delitzsch, well known as the founder of the German popular banks, and a strenuous supporter of the systein of ‘co-operation. The socialist writers, as lias been already mentioned, are not included in the present historical survey, nor do we in general notice writings of the economists (properly so called) having relation to the history of socialism or the controversy with it.

The movement which created this school in Germany, with the developments which have grown out of it, have without doubt given to that country at the present time the primacy in economic studies. German influence has been felt in the modification of opinion in other countries — most strongly, perhaps, in Italy, and least so in France. In England it has been steadily making way, though retarded by the insular indifference to the currents of foreign thought which has eminently marked our dominant school. Alongside of the influence thus exerted, a general distaste for the “ orthodox ” system has been spontaneously growing, partly from a suspicion that its method was unsound, and partly from a profound dissatisfaction with the practice it inspired, and the detected hollowness of the

“Manchester” policy of mere laissez faire. Hence every- where a mode of thinking and a species of research have shown themselves, and come into favour, which are in harmony with the systematic conceptions of the historical economists. ‘Thus a dualism has established itself in the

‘economic world, a younger school advancing towards pre-

dominance, whilst the old school still defends its position, though its adherents tend more and more to modify their attitude and to admit the value of the new lights. Italy.—It is to be regretted that very little is known in England of the writings of the recent Italian eco- nomists. Luigi Cossa’s Guida, which was translated at the suggestion of Jevons, has given us some notion of the character and importance of their labours. The urgency of questions of finance in Italy since its political renas- cence has turned their researches for the most part into practical channels, and they have produced numerous monographs on statistical and administrative questions. But they have also dealt ably with the general doctrines of the science. Cossa pronounces Angelo Messedaglia (b. 1820), professor at Padua, to be the foremost of contem- porary Italian economists ; he has written on public loans (1850) and on population (1858), and is regarded as a master of the subjects of money and credit. His pupil Fedele Lampertico (b. 1833) is author of many writings, among which the most systematic and complete is his Economia dei popoli e degli stati (1874-1880). Marco Minghetti, distinguished as a minister, is author, besides other writings, of Heonomia pubblica e le sue attinenze colla morale e col diritto (1859). Luigi Luzzati, also known as an able administrator, has by several publications sought to prepare the way for reforms. The Sicilians Vito Cusu-

mano and Giuseppe Ricca Salerno have produced excellent works :—the former on the history of political economy in the Middle Ages (1876), and the economic schools of Ger- many in their relation to the social question (1875) ; the latter on the theories of capital, wages, and public loans (1877-8-9). Cossa, to whom we are indebted for most of these particulars, is himself author of several works which have established for him a high reputation, as his Scienza delle Finanze (1875 ; 3d ed., 1882), and his Primi

Ele- menti di Economia Politica (1875 ; 4th ed., 1878), which latter has been translated into several European languages.

Of greater interest than such an imperfect catalogue of writers is the fact of the appearance in Italy of the economic dualism to which we have referred as character- izing our time. There also the two schools—the old or so-called orthodox and the new or historical—with their respective modified forms, are found face to face. Cossa tells us that the instructors of the younger economists in northern Italy were publicly denounced in 1874 as Germanists, socialists, and corrupters of the Italian youth. In reply to this charge Luzzati, Lampertico, and Scialoja convoked in Milan the first congress of economists (1875) with the object of proclaiming their resistance to the idea which was sought to be imposed on them " that the science was born and died with Adam Smith and his com- mentators." M. de Laveleye's interesting Lettres d' Italie (1878-79) throw light on the state of economic studies in that country in still more recent years. Minghetti, pre- siding at the banquet at which M. de Laveleye was entertained by his Italian brethren, spoke of the "two tendencies " which had manifested themselves, and implied his own inclination to the new views. Carlo Ferraris, a pupil of Wagner, follows the same direction. Formal expositions and defences of the historical method have been produced by Schiattarella (Del metodo in Economia Sociale, 1875) and Cognetti de Martiis (Della attinenze tra L Economia Sociale e la Storia, 1865). A large measure of acceptance has also been given to the historical method in learned and judicious monographs by Ricca Salerno (see especially his essay Del metodo in Econ. Pol., 1878). Luzzati and Forti for some time edited a periodical, the Grornale degli Economisti, which was the organ of the new school, but which, we gather from Cossa, has ceased to appear. Cossa himself, whilst refusing his adhesion to this school on the ground that it reduces political economy toa mere narrative of facts,—an observation which, we must be permitted to say, betrays an entire misconception of its true principles,—admits that it has been most useful in several ways, and especially as having given the signal for a salutary, though, as he thinks, an excessive, reaction against the doctrinaire exaggerations of the older theorists.

france.—In France the historical school has not made so strong an impression,—partly, no doubt, because the extreme doctrines of the Ricardian system never obtained much hold there. It was by his recognition of its freedom from those exaggerations that Jevons was led to declare that “the truth is with the French school,” whilst he pro- nounced our English economists to have been “living in a fool’s paradise.” National prejudice may also have con- tributed to the result referred to, the ordinary Frenchman being at present disposed to ask whether any good thing can come out of Germany. But, as we have shown, the philosophic doctrines on which the whole proceeding of the historical school is founded were first enunciated by a great French thinker, to whose splendid services most of his fellow-countrymen are singularly dead. Perhaps another determining cause is to be looked for in official influences, which in France, by their action on the higher education, impede the free movement of independent con-

gave on the wider philosophic stage to the shallow eclecti- cism of Cousin. The tendency to the historical point of view has appeared in France, as elsewhere; but it has shown itself not so much in modifying general doctrine as in leading to amore careful study of the cconomic opinions and institutions of the past.

Much useful work has been done by Frenchmen (with whom Belgians may here be associated) in the history of political economy, regarded either as a body of theory or as a system—or series of systems—of policy. Blanqui’s history (1837-38) is not, indeed, entitled to a very high rank, but it was serviceable asa first general draught. That of Villeneuve-Bargemont (1839) was also interest- ing and useful, as presenting the Catholic view of the development and tendencies of the science. C. Perin’s Les doctrines économiques depuis un siéele (1880) is written from the same point of view. A number of valuable monographs on particular statesmen or thinkers has also been produced by Frenchmen,—as, for example, that of A. Batbie, on Turgot (Turgot Philosophe, Economiste, ct Administrateur, 1861); of Pierre Clément on Colbert (Histoire de Colbert et de son

Administration, 2d. cd., 1875); of H. Baudrillart on Bodin (J. Bodin

et son Temps; Tableau des Théories politiques et des Idées économiques au 16° siécle, 1853); of L. de Lavergne on the physiocrats (Les Economistes Frangais du 18° siéele, 1870). Works, too, of real im- portance have been produced on particular aspects of the industrial development, as those of Leonce de Lavergne on the rural economy of France (1857), and of England, Scotland, and Ireland (1854).

The treatise of Emile de Laveleye, De la Propriété et de ses formes Lave- primitives (1874; Eng. trans. by G. R. Marriott, 1878), is specially leye.

worthy of notice, not merely for its array of facts respecting the early forms of property, but because it co-operates strongly with the tendency of the new school to regard each stage of economic life from the relative point of view, as resulting from an historic past, harmonizing with the entire body of contemporary social conditions, and bearing in its bosom the germs of a future, predctermined in its essential character, though modifiable in its secondary dispositions. M. de Laveleye has done much to call attention to the general principles of the historical school, acting in this way most usefully as an interpreter between Germany and France. But he appcars in his most recent manifesto (Les Lois naturelles et lobjet de ? Economie Politique, 1883) to separate himself from the best members of that school, and to fall into positive error, when he refuses to economics the character of a true science (or department of a science) as distinguished from an art, and denies the existence of economic laws or tendencies independent of individual wills. Such a denial seems to involve that of social laws generally, which is a singularly retrograde attitude for a thinker of our time to take up, and one which cannot be excused since the appearance of the Philosophie Positive. The use of the metaphysical phrase “ neces- sary laws” obscures the question; it suffices to speak of laws which do in fact prevail. M. de Laveleye relies on morals as supplying a parallel case, where we deal, not with natural laws, but with ‘“‘imperative prescriptions,” as if these prescriptions did not imply, as their basis, observed coexistenccs and scquences, and as if there were no such thing as moral evolution. He seems to be as far from the right point of view in one direction as his opponents of the old school in another. All that his arguments have really any tendency to prove is the proposition, undoubtedly a true one, that economic facts cannot be explained by a theory which leaves out of account the other social

aspects, and therefore that our studies and expositions of economic phenomena must be kept in close relation with the conclusions of the larger science of society. We cannot do more than notice in a general way some of the expository treatises of which there has been an almost continuous series from the time of Say downwards, or indeed from the date of Germain Garnier's Abrégé des Principes de Eeonomie Politique (1796). That of Destutt de Tracy forms a portion of his Eléments Idéologie (1823). Droz brought out especially the relations of economics to morals and of wealth to human happiness (Lconomie Politique, 1829). Pellegrino Rossi,—an Italian, formed, however, as an economist by studies in Switzerland, professing the science in Paris, and writing in French (Cours a' Economie Politique, 1838-54),—gave in classic form an exposition of the doctrines of Say, Malthus, and Ricardo. Michel Chevalier (1806-1879), specially known in England by his tract, translated by Cobden, on the fall in the value of gold (La Baisse d'Or, 1858), gives in his Cowrs d' Eeo- none Politique (1845-50) particularly valuable matter on the most recent industrial phenomena, and on money and the production of the precious metals. Henri Baudrillart, author of Les Rapports de la Morale et de V Economie Politique (1860, 2d ed., 1883), and of Histoire du Luxe (1878), published in 1857 a Manuel d' Beonomie Politique (3d ed., 1872), which Cossa calls an '"'admirable compen- dium." Joseph Garnier (Traitédcl' Economic Politique, 1860, 8th ed., 1880) in some respects follows Dunoyer. J. G. Courcelle-Seneuil, the translator of J. S. Mill, whom Prof. F. A. Walker calls " perhaps

viction, as was seen notably in the temporary éclat they | the ablest economist writing in the French language since J. B.

Say," besides a T'raité théorique et pratique des opérations de Banque and Théorie des Enterprises Industrielles (1856), wrote a Traité de U Economie Politique (1858-59), whieh is held in much esteem. Finally, the Genevese, Antoine Elise Cherbuliez (d. 1869) was author of what Cossa pronounees to be the best treatise on the seience in the Freneh language (Précis de la Seience Economique, 1862). L. Walras, in Lléments d' Economie Politique pure(1874-77), and Théorie Mathématique de la Richesse Sociale (1883),

has followed the ex- ample of Cournot in attempting a mathematieal treatment of the subject.

England.—Sacrificing the strict chronological order of

the history of economics to deeper considerations, we have already spoken of Cairnes, describing him as the last original English writer who was an adherent of the old school pure and simple. Both in method and doctrine he was essentially Ricardian ; though professing and really feeling profound respect for Mill, he was disposed to go behind him and attach himself rather to their common master. Mr Sidgwick is doubtless right in believing that his Leading Principles did much to shake “the unique prestige which Mill’s exposition had enjoyed for nearly half a generation,” and in this, as in some other ways, Cairnes may have been a dissolving force, and tended towards radical change ; but, if he exercised this influence, he did so unconsciously and involuntarily. Many influ- ences had, however, for some time been silently sapping the foundations of the old system. The students of Comte had seen that its method was an erroneous one. The elevated moral teaching of Carlyle had disgusted the best minds with the low maxims of the Manchester school. Ruskin had not merely protested against the egoistic spirit of the prevalent doctrine, but had pointed to some of its real weaknesses as a scientific theory.1 It began to be felt, and even its warmest partisans sometimes admitted, that it had done all the work, mainly a destructive one, of which it was capable. Cairnes himself declared that, whilst most educated people believed it doomed to sterility for the future, some energetic minds thought it likely to be a positive obstruction in the way of useful reform. Miss Martineau, who had in earlier life been a thorough Ricardian, came to think that political economy, as it had been elaborated by her contemporaries, was, strictly speak- ing, no science at all, and must undergo such essential change that future generations would owe little to it beyond the establishment of the existence of general laws in one department of human affairs. The instinctive repugnance of the working classes had continued, in spite of the efforts of their superiors to recommend its lessons to them—efforts which were perhaps not unfrequently dictated rather by class interest than by public spirit. All the symptoms boded impending change, but they were visible rather in general literature and in the atmo- sphere of social opinion than within the

economic circle. But when it became known that a great movement had taken place, especially in Germany, on new and more hopeful lines, the English economists themselves began to recognize the necessity of a reform and even to further its advent. The principal agencies of this kind, in marshal- ling the way to a renovation of the science, have been those of Bagehot, Leslie, and Jevons,—the first limiting the sphere of the dominant system, while seeking to con- serve it within narrower bounds; the second directly assailing it and setting up the new method as the rival and destined successor of the old; and the third acknow- ledging the collapse of the hitherto reigning dynasty, proclaiming the necessity of an altered régime, and admit- ting the younger claimant as joint possessor in the future. Thus, in England too, the dualism which exists on the Continent has been established; and there is reason to

4 The remarkable book Money and Morals, by John Lalor, 1852, was written partly under the influence of Carlyle. There is a good monograph entitled John Ruskin, Economist, by P. Geddes, 1884.

expect that here more speedily and decisively than in France or Italy the historical school will displace its antagonist. that the preaching of the new views has been most

It is certainly in England next after Germany

vigorously and effectively begun.

Walter Bagehot (1826-1877) was author of an excellent Bagehot. work on the English money market and the circumstances

which have determined its peculiar character (Lombard Street, 1873; 7th ed., 1878), and of several monographs on particular monetary questions, which his practical ex- perience, combined with his scientific habits of thought, eminently fitted him to handle. On the general prin- ciples of economics he wrote some highly important essays collected in Economic Studies (edited by R. H. Hutton, 1880), the object of which was to show that the tradi- tional system of political economy—the system of Ricardo

and J. S. Mill—rested on certain fundamental assump- tions, which, instead of being universally true in fact, were only realized within very narrow limits of time and space. Instead of being applicable to all states of society, it holds only in relation to those “in which com- merce has largely developed, and where it has taken the form of development, or something like the form, which it has taken in England.” It is “the science of business such as business is in large and trading communities—an analysis of the great commerce by which England has. become rich.” But more than this it is not; it will not explain the economic life of earlier times, nor even of other communities in our own time; and for the latter reason it has remained insular; it has never been fully accepted in other countries as it has been at home. It is, in fact, a sort of ready reckoner, enabling us to calculate roughly what will happen under given conditions in Lombard Street, on the Stock Exchange, and in the great markets of the world. It is a “convenient series of deductions from assumed axioms which are never quite true, which in many times and countries would be utterly untrue, but which are sufficiently near to the principal conditions of the modern” English “ world to make it use- ful to consider them by themselves.”

Mill and Cairnes had already shown that the science they taught was a hypothetic one, in the sense that it dealt not with real but with imaginary men—“ economic men” who were conceived as simply “money-making animals.” But Bagehot went further: he showed what those writers, though they may have indicated, had not clearly brought out,? that the world in which these men were supposed to act is also “a very limited and peculiar world.” What marks off this special world, he tells us, is the promptness of transfer of capital and labour from one employment to another, as determined by differences in the remuneration of those several employments—a prompt- ness, about the actual existence of which in the contempor- ary English world he fluctuates a good deal, but which on the whole he recognizes as substantially realized.

Bagehot described himself as “ the last man of the ante- Mill period,” having learned his economics from Ricardo ; and the latter writer he appears to have to the end greatly over-estimated. But he lived long enough to gain some knowledge of the historical method, and with it he had “no quarrel, but rather much sympathy.” “Rightly conceived,” he said, “it is no

rival to the abstract method rightly conceived.” We will not stop to criticize a second time the term “abstract method” here applied to that of the old school, or to insist on the truth that all science is necessarily abstract, the only question that can arise being as to the just degree of abstraction, or, in general, as to the right constitution of the relation between the abstract and

2 Jones, whose writings were apparently unknown to Bagehot, had, as we have seen, in some degree anticipated him in this exposition.

the concrete. It is more apposite to remark that Bagehot’s view of the reconciliation of the two methods is quite different from that of most “orthodox ” economists. They commonly treat the historical method with a sort of patronizing toleration as affording useful exemplifications or illustrations of their theorems. But, according to him, the two methods are applicable in quite different fields. For what he calls the “abstract” method he reserves the narrow, but most immediately interesting, province of modern advanced industrial life, and hands over to the historical the economic phenomena of all the human past and all the rest of the human present. He hiniself exhibits much capacity for such historical research, and in particular has thrown real light on the less-noticed econo- mic and social effects of the institution of money, and on the creation of capital in the earlier stages of society. But his principal efficacy has been in reducing, by the considerations we have mentioned, still further than his predecessors had done, our conceptions of the work which the a prior method can do. He in fact dispelled the idea that it can ever supply the branch of general sociology which deals with wealth. As to the relations of economics to the other sides of sociology, he holds that the “abstract” science rightly ignores them. It does not consider the differences of human wants, or the social results of their several gratifications, except so far as these affect the production of wealth. In its view “a pot of beer and a picture—a book of religion and a pack of cards—are equally worthy of regard.” It therefore leaves the ground open for a science which will, on the one hand, study wealth as a social fact in all its successive forms and phases, and, on the other, will regard it in its true light as an instrument for the conservation and evolution —moral as well as material—of human societies.

Though it will involve a slight digression, it is desirable here to notice a further attenuation of the functions of the deductive method, which is well pointed out in Mr Sidgwick's recent remark- able work on political economy. He observes that, whilst J. S. Mill declares that the method a priori is the true method of the science, and that "it has been so understood and taught by all its most distinguished teachers," he yet himself in the treatment of production followed an inductive method (or at least one essentially different from the deductive), obtaining his results by '' merely analysing and systematizing our common empirical knowledge of the facts of industry." To explain this charactcristic inconsistency, Mr Sidgwick suggests that Mill, in making his general statement as to method, had in contemplation only the statics of distribution and exchange. And in this latter field Mr Sidgwick holds that the priort method, if it be pursucd with caution, if the simpli- fied premises be well devised and the conclusions '' modified by a rough conjectural allowance" for the elements omitted in the pre- mises, is not, for the case of a developed industrial society, ''essentially false or misleading." Its conclusions are hypotheti- eally valid, though "its utility as a means of interpreting and explaining concrete facts depends on its being used with as full a knowledge as possible of the results of observation and induction." We do not think this statement need be objected to, though we should prefer to regard deduction from hypothesis as a useful occasional logical artifice, and, as such, perfectly legitimate in this as in other fields of inquiry, rather than as the main form of method in any department of economics. Mr Sidgwick, by his limitation of deduction in 'distributional questions to "a state of things taken as the type to which civilized socicty generally approximates," scems to agree with Bagehot that for times and places which do not correspond to this type the historical method must be used—a inethod which, be it observed, does not exclude, but positively implies, " reflective analysis" of the facts, and their interpretation from "the motives of human agents " as well as from other determining conditions. In the dynamical study of wealth—of the changes in its distribution no less than its production—Mr Sidgwick admits that the method priori ''can occupy but a very subordinate place." We

should say that here also, though to a less extent, as a logical artifice it may somctimes be useful, though the hypotheses assuined ought not to be the same that are adapted to a mature industrial stage. But the essential organ must be the historical method, studying comparatively the different phases of social evolution.

Connected with the theory of modern industry is one

subject which Bagehot treated, though only in an incidental way, much more satisfactorily than his predecessors,— namely, the function of the entrepreneur, who in Mill and Cairnes is scarcely recognized except as the owner of capital. It is quite singular how little, in the Leading Principles of the latter, his active co-operation is taken into account. Bagehot objects to the phrase “wages of superintendence,” commonly used to express his “ reward,” as suggesting altogether erroneous ideas of the nature of his work, and well describes the large and varied range of his activity and usefulness, and the rare combination of gifts and acquirements which go to make up the per- fection of his equipment. It can scarcely be doubted that a foregone conclusion in favour of the system of (so-called) co-operation has sometimes led economists to keep these important considerations in the background. They have been brought into due prominence of late in the treatises of Profs. Marshall and F. A. Walker, who, however, have scarcely made clear, and certainly have not justified, the principle on which the amount of the remuneration of the entrepreneur is determined.

We have seen that Jones had in his dogmatic teaching anticipated in some degree the attitude of the new school ; important works had also been produced, notably by Thomas Tooke and William Newmarch (History of Prices, 1838-1857), and by James E. Thorold Rogers (History of Agriculture and Prices in England, 1866-82), on the course

of English economic history. But the first systematic Leslie,

statement by an English writer of the philosophic founda- tion of the historical method, as the appropriate organ of economic research, is to be found in an essay by T. E. Cliffe Leslie (printed in the Dublin University periodical, Hermathena, 1876; since included in his Essays Moral and Political, 1879). This essay was the most important publication on the logical aspect of economic science which had appeared since Mill's essay in his Unsettled Questions. Though Cairnes had expanded and illustrated the views of Mill, he had really added little to their substance. Leslie takes up a position directly opposed to theirs. He criticizes with much force and verve the principles and practice of the "orthodox" school. Those who are acquainted with what has been written on this subject by Knies and other Germans will appreciate the freshness and originality of Leslie's treatment. He points out the loose and vague character of the principle to which the classical economists profess to trace back all the pheno- mena with which they deal—namely, the "desire of wealth." This phrase really stands for a variety of wants, desires, and sentiments, widely different in their nature and economic effects, and undergoing important changes (as, indeed, the component elements of wealth itself also do) in the several successive stages of the social move- ment. The truth is that there are many different economic motors, altruistic as well as egoistic; and they cannot all be lumped together by such a coarse generalization. The a priort and purely deductive method cannot yield an explanation of the causes which regulate either the nature or the amount of wealth, nor of the varieties of distribu- tion in different social systems, as, for example, in those of France and England. "The whole economy of every nation is the result of a long evolution in which there has been both continuity and change, and of which the economical side is only a particular aspect. And the laws of which it is the result must be sought in history and the general laws of society and social evolution." The intel- lectual, moral, legal, political, and economic sides of social progress are indissolubly connected. Thus, juridical facts relating to property, occupation, and trade, thrown up by the social movement, are also economic facts. And, more generally, "the economic condition of English" or any

other “society at this day is the outcome of the entire movement which has evolved the political constitution, the structure of the family, the forms of religion, the learned professions, the arts and sciences, the state of agriculture, manufactures, and commerce.” To understand existing economic relations we must trace their historical evolution ; and “the philosophical method of political economy must be one which expounds that evolution.” This essay was the most distinct challenge ever addressed to the ideas of the old school on method, and, though its conclusions have been protested against, the arguments on which they are founded have never been answered.

With respect to the dogmatic generalizations of the “ orthodox” economics, Leslie thought some of them were false, and all of them required careful limitation. Early in his career he had shown the hollowness of the wage-fund theory, though he was not the first to repudiate it. The doctrine of an average rate of wages and an average rate of profits he rejected except under the restrictions stated by Adam Smith, which imply a “small and stationary world of trade.” He thought the glib assump- tion of an average rate of wages, as well as of a wage- fund, had done much harm “ by hiding the real rates of wages, the real causes which govern them, and the real sources from which wages proceed.” The facts, which he laboriously collected, he found to be everywhere against the theory. In every country there is really “a great number of rates; and the real problem is, What are the causes which produce these different rates?” As to profits, he denies that there are any means of knowing the gains and prospects of all the investments of capital, and declares it to be a mere fiction that any capitalist surveys the whole field. Bagehot, as we saw, gave up the doctrine of a national level of wages and profits except in the peculiar case of an industrial society of the contemporary English type; Leslie denies it even for such a society. With this doctrine, that of cost of production as determin-ing price collapses, and the principle emerges that it is not cost of production, but demand and supply, on which domestic, no less than international, values depend,— though this formula will require much interpretation before it can be used safely and with advantage. Thus Leslie extends to the whole of the national industry the partial negation of the older dogma introduced by Cairnes through the idea of non-competing groups. He does not, of course, dispute the real operation of cost of

production on price in the limited area within which rates of profit and wages are determinate and known; but he maintains that its action on the large scale is too remote and uncertain to justify our treating it as regulator of price. Now, if this be so, the entire edifice which Ricardo reared on the basis of the identity of cost of production and price, with its apparent but unreal simplicity, symmetry, and completeness, disappears; and the ground is cleared for the new structure which must take its place. Leslie pre- dicts that, if political economy, under that name, does not bend itself to the task of rearing such a structure, the office will speedily be taken out of its hands by sociology.

Leslie was a successful student of several special economic subjects—of agricultural economy, of taxation, of the distribution of the precious metals and the history of prices, and, as has been indicated, of the movements of wages. But it is in relation to the method and funda- mental doctrines of the science that he did the most

1 That service was due to F. D. Lon J DD! ge (Refutation of the Wage-Fund Theory of Modern Political Economy, 1866). lLeslie's treat- ment of the subject was contained in an article of Fraser's Magazine for July 1868, reprinted as an appendix to his Land-Systems and

i" Economy of Ireland, England, and Continental Countries,

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important, because the most opportune and needful work. And, though his course was closed too early for the interests of knowledge, and much of what he produced was merely occasional and fragmentary, his services will be found to have been greater than those of many who have left behind them more systematic, elaborate, and pretentious writings.

One of the most original of recent English writers on Jevons.

political economy was W. Stanley Jevons (1835-1882). The combination which he presented of a predilection and aptitude for exact statistical inquiry with sagacity and ingenuity in the interpretation of the results was such as might remind us of Petty. He tended strongly to bring economics

into close relation with physical science. He made a marked impression on the public mind by his attempt to take stock of our resources in the article of coal. His idea of a relation between the recurrences of commercial crises and the period of the sun-spots ~~gave evidence of a fertile and bold scientific imagination, though he cannot be said to have succeeded in establishing such a relation. He was author of an excellent treatise on Money and the Mechanism of Exchange (1875), and of various essays on currency and finance, which have been collected since his death, and contain vigorous discussions on subjects of this nature, as on bimetallism (with a de~~ cided tendency in favour of the single gold standard), and several valuable suggestions, as with respect to the most perfect system of currency, domestic and international, and in particular the extension of the paper currency in England to smaller amounts. He proposed in other writings (collected in Methods of Social Reform, 1883) a variety of measures, only partly economic in their character, directed especially to the elevation of the working classes, one of the most important being in relation to the conditions of the labour of married women in factories. This was one of several instances in which he repudiated the lazssez faire principle, which indeed, in his book on The State in Relation to Labour (1882), he refuted in the clearest and most con- vincing way, without changing the position he had always maintained as an advocate of free trade. Towards the end of his career, which was prematurely terminated, he was more and more throwing off “the incubus of metaphysical ideas and expressions” which still impeded the recognition or confused the appreciation of social facts. He was, in his own words, ever more distinctly coming to the conclusion “that the only hope of attaining a true system of economics is to fling aside, once and for ever, the mazy and prepos- terous assumptions of the Ricardian school.” With respect to method, though he declares it to be his aim to “investi- gate inductively the intricate phenomena of trade and industry,” his views had not perhaps assumed a definitive shape. The editor of some of his remains declines to under- take the determination of his exact position with respect to the historical school, The fullest indications we possess on that subject are to be found in a lecture of 1876, On the Future of Political Economy. He saw the importance and necessity in economics of historical investigation, a line of study which he himself was led by native bent to prose- cute in some directions. But he scarcely apprehended the full meaning of what is called the historical method, which he ‘erroneously contrasted with the

“theoretical,” and apparently supposed to be concerned with verifying and illustrating certain abstract doctrines resting on in- dependent bases. Hence, whilst he declared himself in favour of “thorough reform and reconstruction,” he sought to preserve the a priori mode of proceeding alongside of, and concurrently with, the historical. Political economy, in fact, he thought was breaking up and falling into several, probably into many, different branches of inquiry, prominent amongst which would be the “theory” as it

Toyn- bee.

‘that it succeeded in Jevons’s hands.

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had descended from his best predecessors, especially those of the French school, whilst another would be the “ historical study,” as it was followed in England by Jones, Rogers, and others, and as it had been proclaimed in general principle by his contemporary Cliffe Leslie. This was one of those eclectic views which have no permanent validity, but are useful in facilitating a transition. The two methods will doubtless for a time coexist, but the historical will inevitably supplant its rival. What Jevons meant as the “theory” he wished to treat by mathematical methods (see his Theory of Political Economy, 1871; 2nd ed., 1879). This project had, as we have seen, been entertained and partially carried into effect by others before him, though he unduly multiplies the number of such earlier essays when, for example, he mentions Ricardo and J. 8. Mill as writing mathematically because they sometimes illustrated the meaning of their propositions by dealing with definite arithmetical quantities. Such illustrations, of which a specimen is supplied by Mill’s treatment of the subject of international trade, have really nothing to do with the use of mathematics as an instrument for economic research, or even for the co-ordination of economic truths. We have already, in speaking of Cournot, explained why, as it seems to us, the application of mathematics in the higher sense to economics must necessarily fail, and we do not think His conception of ‘final utility” is ingenious, but we cannot regard it as either “positive” or fruitful. He offers as a valuable result of mathematical investigation the theorem that in every case of exchange the quantity of each of the articles

concerned multiplied by its utility is the same. But what is the unit of utility? If we cannot look for some- thing more tangible—not to say more serviceable—than this, there is not much encouragement to pursue such re- searches, which will in fact never be anything more than academic playthings, and which involve the very real evil of restoring the metaphysical entities previously discarded. The reputation of Jevons as an acute and vigorous thinker, inspired with noble popular sympathies, is sufficiently established. But the attempt to represent him, in spite of himself, as a follower and continuator of Ricardo, and as one of the principal authors of the development of economic theory (meaning by "theory" the old a priori doctrine) can only lower him in estimation by placing his services on grounds which will not bear criticism. His name will survive in connexion, not with new theoretical con- structions, but with his treatment of practical problems, his fresh and lively expositions, and, as we have shown, his energetic tendency to a renovation of economic method. Arnold Toynbee (1852-1883), who left behind him a beautiful memory, filled as he was with the love of truth and an ardent and active zeal for the public good, was author of some fragmentary or unfinished pieces, which yet well deserve attention both for their intrinsic merit and as indicating the present drift of all the highest natures, especially amongst our younger men, in the treatment of economic questions. He had a belief in the organizing power of democracy which it is not easy to share, and some strange ideas due to youthful enthusiasm, such as, for ex- ample, that Mazzini is "the true teacher of our age ;" and he fluctuates considerably in his opinion of the Ricardian political economy, in one place declaring it to be a detected "intellectual imposture," whilst elsewhere, apparently under the influence of Bagehot, he speaks of it as having been in recent times "only corrected, re-stated, and put into the proper relation to the science of life," meaning apparently, by this last, general sociology. He saw, however, that our great help in the future must come, as much had already come, from the historical method, to which in his own researches he gave preponderant weight. Its true

character, too, he understood better than many even of those who have commended it; for he perceived that it not only explains the action of

special local or temporary con- ditions on economic phenomena, but seeks by comparing the stages of social development in different countries and times to “discover laws of universal application.” Tf, as we are told, there exists at Oxford a rising group of men who occupy a position in regard to economic thought sub- stantially identical with that of Toynbee, the fact is one of good omen for the future of the science.

It is no part of our plan to pass judgment on the works of contemporary English authors,—a judgment which could not in general be final, and which would be subject to the imputa- tion of bias in a greater degree than estimates of living writers in foreign countries. But, for the information of the student, some opinions may be expressed which scarcely any competent person would dispute. The best brief exposition of political economy, substantially in accordance with Mill’s treatise, is to be found in Faweett’s Manual (6th ed., 1884). But those who admit in part the claiins of the new school will prefer Mr and Mrs Marshall’s Economics of Industry (2d ed., 1881). Better, in some respects, than either is the Political Economy of the American professor, Francis A. Walker (1883), whose special treatises on Money and on the Wages Question may also be recommended. Other meritorious works are J. E. T. Rogers’s Manwal of Political Economy, 1870; John Macdonnell’s Survey of Political Economy, 1871; and John L. Shadwell’s System of Political Economy, 1877. Prof. W. E. Hearn’s Plutology (1864) contains one of the ablest extant treatments of the subject of pro- duction. Mr Goschen’s is the best work on the foreign exchanges (10th ed., 1879). Mr Macleod, though his general economic scheme has met with no acceptance, is recognized as supplying much that is useful on the subject of banking. Prof. Rogers’s Six Centuries of Work and Wages (1884) is the most trustworthy book on the economic history of England during the period with which he deals. W. Cunningham’s Growth of English Industry and Com- merce, 1882, is instructive on the mercantile system. Dr W. Neilson Hancock has shown in a multitude of papers a most exten- sive and accurate knowledge of the social economy of Ireland.

On American political economy the reader will consult with advantage an article in the Fortnightly Review for September, 1880, by Cliffe Leslie, which was written after the publication of his collected essays. We can only mention some of the best-known works (besides those of F. A. Walker)

produced in the United States. Amongst them are E. Peshine Smith's Manwal of Political Economy, 1858; Francis Bowen's American Political Economy, 1870; Amasa Walker's Science of Wealth, 1867; A. L. Perry's Elements of Political Economy, 1866 (the two former writers are protectionist, the two latter free-traders; Perry is a disciple of Bastiat). The principal works on American economic history are those of A. S. Bolles, entitled Industrial History of the United States, and Financial History of the United States, 1774-1789,

1879.

We cannot here overlook a work like that of Mr Sidgwick (1883), to which we have already referred on a special point. It is impossible not to respect and admire the conscientious and penetrating criticism which he applies to the a priori system, of economics in its most mature form. But it is open to question whether the task was wisely undertaken. Itcannot be permanently our business to go on amending and limiting the Ricardian doctrines, and asking by what special interpretations of phrases or additional qualifications they may still be admitted as having a certain value. The time for a new construction has arrived ; and it is to this, or at least to the study of its conditions, that competent thinkers with the due scientific preparation should now devote themselves. It is to be feared that Mr Sidgwick's treatise, instead of, as he hopes, "eliminating unnecessary controversy," will tend to revive the stériles contestations and oiseuses disputes de mots, which Comte censured in the earlier economists. It is interesting to observe that the part of the work which is, and has been recognized as, the most valuable is that in which, shaking off the fictions of the old school, he examines independently by the light of observation and analysis the question of the industrial action of Governments.

Let us briefly consider in conclusion, by the light of the preceding historical survey, what appear to be the steps in the direction of a renovation of economic science which are now at once practicable and urgent.

I. Economic investigation has hitherto fallen for the most part into the hands of lawyers and men of letters, not into those of a genuinely scientific class. Nor have its cultivators in general had that sound preparation in the

sciences of inorganic and vital nature which is necessary whether as supplying bases of doctrine or as furnishing lessons of method. Their education has usually been of a metaphysical kind. Hence political economy has retained much of the form and spirit which belonged to it in the 17th and 18th centuries, instead of advancing with the times, and assuming a truly positive character. It is homogene- ous with the school logic, with the abstract unhistorical jurisprudence, with the a priort ethics and politics, and other similar antiquated systems of thought ; and it will be found that those who insist most strongly on the mainten- ance of its traditional character have derived their habitual mental pabulum from those regions of obsolete speculation. Wecan thus understand the attitude of true men of science towards this branch of study, which they regard with ill-disguised contempt, and to whose professors they either re- fuse or very reluctantly concede a place in their brotherhood.

The radical vice of this unscientific character of political economy seems to lie in the too individual and subjective aspect under which it has been treated. Wealth having been conceived as what satisfies desires, the definitely determinable qualities possessed by some objects of supply- ing physical energy, and improving the physiological con- stitution, are left out of account. Everything is gauged by the standard of subjective notions and desires. All desires are viewed as equally legitimate, and all that satisfies our desires as equally wealth. Value being regarded as the result of a purely mental appreciation, the social value of things in the sense of their objective utility, which is often scientifically measurable, is passed over, and ratio of exchange is exclusively considered. The truth is, that at the bottom of all economic investigation must lie the idea of the destination of wealth for the maintenance and evolution of a society. And, if we overlook this, our economics will become a play of logic or a manual for the market, rather than a contribution to social science ; whilst wearing an air of completeness, it will be in truth one-sided and superficial. Economic science is something far larger than the catallactics to which some have wished to reduce it. A special merit of the physiocrats seems to have lain in their vague perception of the close relation of their study to that of external nature; and, so far, we must recur to their point of view, basing our economics on physics and

biology as developed inourown time. Further, the science must be cleared of all the theologico-metaphysical elements or tendencies which still encumber and deformit. Teleology and optimism on the one hand, and the jargon of ‘natural liberty ” and “ indefeasible rights” on the other, must be finally abandoned.

Nor can we assume as universal premises, from which economic truths can be deductively derived, the con- venient formulas which have been habitually employed, such as that all men desire wealth and dislike exertion. These vague propositions, which profess to anticipate and supersede social experience, and which necessarily intro- duce the absolute where relativity should reign, must be laid aside. The laws of wealth (to reverse a phrase of Buckle’s) must be inferred from the facts of wealth, not from the postulate of human selfishness. We must bend ourselves to a serious direct study of the way in which society has actually addressed itself and now addresses itself to its own conservation and evolution through the supply of its material wants. What organs it has developed for this purpose, how they operate, how they are affected by the medium in which they act and by the co- existent organs directed to other ends, how in their turn they react on those latter, how they and their functions are progressively modified in process of time—these problems, whether statical or dynamical, are all questions of fact, as capable of being studied through observation

and history as the nature and progress of human language or religion, or any other group of social phenomena, Such study will of course require a continued ‘‘reflective analysis” of the results of observation; and, whilst eliminat- ing all premature assumptions, we shall use ascertained truths respecting human nature as guides in the inquiry and aids towards the interpretation of facts. And the employment of deliberately instituted hypotheses will be legitimate, but only as an occasional logical artifice.

IL. Economics must be constantly regarded as forming only one department of the larger science of sociology, in vital connexion with its other departments, and with the moral synthesis which is the crown of the whole

intellectual system. We have already sufficiently explained the philosophical grounds for the conclusion that the economic phenomena of society cannot be isolated, except provision- ally, from the rest,—that, in fact, all the primary social elements should be habitually regarded with respect to their mutual dependence and reciprocal actions. Especially must we keep in view the high moral issues to which the eco- nomic movement is subservient, and in the absence of which it could never in any great degree attract the interest or fix the attention either of eminent thinkers or of right-minded men. The individual point of view will have to be sub- ordinated to the social; each agent will have to be regarded as an organ of the society to which he belongs and. of the larger society of the race. The consideration of interests, as George Eliot has well said, must give place to that of functions. The old doctrine of right, which lay at the basis of the system of "natural liberty," has done its temporary work ; a doctrine of duty will have to be substituted, fixing on positive grounds the nature of the social co-operation of each class and each member of the community, and the rules which must regulate its just and beneficial exercise.

Turning now from the question of the theoretic constitu- tion of economics, and viewing the science with respect to its influence on public policy, we need not at the present day waste words in repudiating the idea that " non- govern- ment" in the economic sphere is the normal order of things. The laissez faire doctrine, coming down to us from the system of natural liberty, was long the great watchword of economic orthodoxy, and it had a special acceptance and persistence in England, in consequence of the political struggle for the repeal of the corn laws, which made economic discussion in this country turn almost altogether on free trade—a state of things which was continued by the effort to procure a modification of the protective policy of foreign nations. But it has now for some time lost the sacrosanct character with which it was formerly invested. This is a result not so much of scientific thought as of the pressure of practical needs—a cause which has modified the successive forms of economic opinion more than theorists are willing to acknowledge. Social exigencies will force the hands of statesmen, whatever their. attachment to abstract formulas ; and politicians have practically turned their backs on laissez faire. The state has with excellent effect proceeded a considerable way in the direction of controlling, for ends of social equity or public utility, the operations of

individual interest. The economists them- selves have for the most part been converted on the question ; amongst theorists Mr Herbert Spencer finds himself almost a vox clamantis in deserto in protesting against what he calls the ‘‘new slavery” of Governmental interference. He will protest in vain, so far as he seeks to rehabilitate the old absolute doctrine of the economic passivity of the state. But it is certainly possible that even by virtue of the force of the reaction against that doctrine there may be an excessive or precipitate tendency in the opposite direction. With the course of production or exchange considered in itself there will probably be in England little disposition

to meddle. But the dangers and inconveniences which arise from the unsettled condition of the world of labour will doubtless from time to time here, as elsewhere, prompt to premature attempts at regulation. Apart, however, from the removal of evils which threaten the public peace, and from temporary palliations to ease off social pressure, the right policy of the state in this sphere will for the present be one of abstention. It is indeed certain that industrial society will not permanently remain without a systematic organization. The mere conflict of private interests will never produce a well-ordered commonwealth of labour. Fretheit ist keine Lésung. Freedom is for society, as for the individual, the necessary condition precedent of the solution of practical problems, both as allowing natural forces to develop themselves and as exhibiting their spontaneous tendencies ; but it is not in itself the solution, Whilst, however, an organization of the industrial world may with certainty be expected to arise in process of time, it would be a great error to attempt to improvise one. We are now in a period of transition. Our ruling powers have still an equivocal character; they are not in real harmony with industrial life, and are in all respects imperfectly imbued with the modern spirit. Besides, the conditions of the new order are not yet sufficiently urider- stood. ‘The institutions of the future must be founded on sentiments and habits, and these must be the slow growth of thought and experience. The solution, indeed, must be at all times largely a moral one ; it is the spiritual rather than the temporal power that is the natural agency for redressing or mitigating most of the evils associated with industrial life.! In fact, if there is a tendency—and we may

admit that such a tendency is real or imminent—to push the state towards an extension of the normal limits of its action for the maintenance of social equity, this is doubtless in some measure due to the fact that the growing dissidence on religious questions in the most advanced communities has weakened the authority of the churches, and deprived their influence of social universality. What is now most urgent is not legislative interference on any large scale with the industrial relations, but the formation, in both the higher and lower regions of the industrial world, of profound convictions as to social duties, and some more effective mode than at present exists of diffusing, maintaining, and applying those convictions. This is a subject into which we cannot enter here. But it may at least be said that the only parties in contemporary public life which seem rightly to conceive or adequately to appreciate the necessities of the situation are those that aim, on the one hand, at the restoration of the old spiritual power, or, on the other, at the formation of a new one. And this leads to the con- clusion that there is one sort of Governmental interference which the advocates of laissez faire have not always dis- countenanced, and which yet, more than any other, tends to prevent the gradual and peaceful development of a new industrial and social system,—namely, the interference with spiritual liberty by setting up official types of philosophical doctrine, and imposing restrictions on the expression and discussion of opinions.

It will be seen that our principal conclusion respecting economic action harmonizes with that relating to the theoretic study of economic phenomena. For, as we held

that the latter could not be successfully pursued except as a duly subordinated branch of the wider science of sociology, so in practical human affairs we believe that no partial synthesis is possible, but that an economic re- organization of society implies a universal renovation, intellectual and moral no less than material. The indus- trial reformation for which western Europe groans and travails, and the advent of which is indicated by so many symptoms (though it will come only as the fruit of faith- ful and sustained effort), will be no isolated fact, but will form one

part of an applied art of life, modifying our whole environment, affecting our whole culture, and re- gulating our whole conduct—in a word, consciously directing all our resources to the conservation and evolu- tion of humanity.

The reader is referred for fuller information to the following works on the history of political economy, all of which have been more or less, and some very largely, used in the preparation of the foregoing outline.

GENERAL Historres.—Histotre de l’ Econonvie Politique en Europe demuis Ics anciens jusqw & nos jours, by Jeréme Adolphe Blanqui (1837-88) ; of which there is an English translation by Emily J. Leonard (1880). Histoire de Economie Politique, by Alban de Villeneuve-Bargemont (Brussels, 1839 ; Paris, 1841); written from the Catholic point of view. View of the Progress of Political Economy in Europe since the 16th Century, by Travers Twiss, D.C.L. (1847). Die geschichtliche Entwickelung der National- Oekonomik und threr Literatur, by Julius Kautz (2d ed. 1860); a valuable work marked by philosophical breadth, and exhibiting the results of extensive research, but too declamatory in style. Kritische Geschichte der Nationalikonomic und der Soctalismus, by Emile Diihring (1871 ; 3d ed. 1879); characterized by its author’s usual sagacity, but also by his usual perverseness and depreciation of meritorious writers in his own field. Guida allo studio dell’ Economia Politica, by Luigi Cossa (1876 and 1878; Eng. trans. 1880). Geschichte der Nationalikonomik, by H. Eisenhart (1881); a vigorous and original sketch. And, lastly, a brief but excellent history by H. von Scheel in the Handbuch der politischen Ockonomie (really a great encyclopedia of economic knowledge in all its extent and applications), edited by Gustav Schonberg (1882). To these histories proper must be added The Literature of Political Economy, by J. R. M‘Culloch (1845), a book which might with advantage be re-edited, supplemented where imperfeet, and con- tinued to our own time. Some of the biographical and critical notices by Eugéne Daire and others in the Collection des principauc Economistes will also be found useful, as well as the: articles in the Dictionnaire de ? Economie Politique of Coquelin and Guillaumin (1852-53), which is justly described by Jevons as ‘‘on the whole the best work of reference in the literature of the science.”

‘ SprcraL Histories.—Haly.—Storia della Economia Pubblica in Ttalia, ossia Epilogo critico degli Economisti Italiani, by Count Giuseppe Pecchio (1829), intended as an appendix to Baron Custodi’s collection of the Scrittori classtct Haliani di Economia Politica, 50 vols., comprising the writings of Italian economists from 1582 to 1804. There is a French translation of Pecclhio’s work by Leonard Gallois (1830). The book is not without value, though often superficial and rhetorical.

Spain.—Storia della Economia Politica in Espata (1863), by M. Colmeiro ; rather a history of economy than of economics—of policies and institutions rather than of theories and literary works.

Germany.—Geschichte der National-skonomik tm Deutschland (1874), by Wilhelm Roscher ; a vast repertory of learning on its subject, with oceasional side-glances at other economic literatures. Die neucre National-skonomie in ihren Hauptrichtungen, by Moritz Meyer (3d ed., 1882) ; a useful handbook dealing almost exclusively with recent German speculation and policy.

England.—Zur Geschichte der Englischen Volkswirthschaftslehre, by W. Roscher (1851-52).

The reader is also advised to consult the articles of the present work which relate directly to the several principal writers on political economy. (lo US, ils)

POLK, James Knox (1795-1849), eleventh president of the United States of America, was of Scoto-Irish

1 The neglect of this consideration, and the consequent undue exaltation of state action, which, though quite legitimate, is altogether insufficient, appears to us the principal danger to which the con- temporary German school of economists is exposed.

descent, his ancestors, whose name was Pollok, having

emigrated from Ireland in the 18th century. He was the

eldest of ten children, and was born 2d November 1795 in

Mecklenburg county, North Carolina, from which his

father, who was a farmer, removed in 1806 to the valley

of the Duck river, Tennessee. At an early age he was XIX. — 51

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placed in a merchant's office, but as he showed a disin- |

clination for business his father at last permitted him to begin preparatory studies for the university. In 1815 he entered the university of North Carolina, where in 1815 he graduated with the highest honours. in 1820, he speedily made for himself a high reputation, and in 1823 he entered the State legislature. 1825 he was chosen to represent his district in Congress, to which he was re-elected every succeeding two years until 1839. Asastrong supporter of Democratic opinions he identified himself with every important discussion, and, though he was not a brilliant speaker, his solid abilities, extraordinary energy, and indomitable will soon gave him a place in the front rank of politicians. In 1835 he was chosen speaker of the House of Representatives, to which he was re-elected in 1837, and in 1839 he was elected governor of Tennessee. In 1844 he was the Democrat candidate for the presidentship, and was chosen over Clay by a majority of sixty-five electoral votes. The election in 'great measure turned on the annexation of Texas, which was effected before his inauguration. One of the earliest questions with which his administration had to deal was the boundary of Oregon, which, although he had previously declared the title of the United States to Oregon to be 'clear and undisputed," was finally fixed at the parallel of 49° instead of 54° 40.' Following the annexation of Texas came the Mexican war, resulting in the treaty of Guadalupe Hidalgo, 2d February 1848, by which New Mexico and California were ceded to the United States. Other im- portant measures of his administration were the admission of Iowa and Wisconsin to the Union, the adoption of a low tariff in 1846, the organization of the department of the interior, and the adoption of the method of collecting Government revenues by specie without the aid

of the banks. Polk retired from office 4th March 1849, and died in Nashville, 15th June of the same year.

Life of the Hon. James Knox Polk, with a Compendium of his Speeches, 1844; Chase, History of the Polk Administration, 1850.

POLLACK (Gadus pollachius), a species of cod-fish, abundant on rocky coasts of northern Europe, and extend- ing as far south as the western parts of the Mediterranean, where, however, it is much scarcer and does not attain to the same size as in its real northern home. In Scotland and some parts of Ireland it is called Lythe. It is dis- tinguished from other species of the genus Gadus by its long pointed snout, which is twice as long as the eye, with projecting lower jaw, and without a barbel at the chin. The three dorsal fins are composed of respectively 12, 18 or 20, and from 17 to 19 rays, and the two anal fins of 31 and 19 or 20. A black spot above the base of the pectoral fin is another distinguishing mark. Although pollack are well-flavoured fish, and. smaller individuals (from 12 to 16 inches) excellent eating, they do not form any considerable article of trade, and are not preserved, the majority being consumed by the captors. Specimens of twelve pounds are common, but the species is said to attain 24 pounds in weight.

POLLAN (Coregonus pollan), a species of the Salmonoid genus Coregonus which has been found in the large and deep loughs of Ireland only. A full account of the fish by its first describer, W. Thompson, may be found in his Natural History of Ireland, vol. iv. p. 168.

POLLIO, Carus Astnius (76 B.c.-4 4.D.), a Roman orator, poet, and historian, who played a conspicuous part in the troubled history of his time, was born in 76 B.c. In his twenty-second year (54 B.c.) he impeached unsuccess- fully C. Cato, who in his tribunate (56) had acted as the tool of the triumvirs. In the civil war between Cesar and Pompey, Pollio sided with Czesar, and after the successful campaigns against the remnants of the Pompeian party

| 15, 44) Pollio was in Spain. Called to the bar |

In August |

in Africa and Spain he was raised tothe pratorship, and received the command of the war in Spain against Sextus Pompeius. At the time of Czsar's assassination (March He was defeated by Sextus Pompeius and fled for his life. But by Lepidus's influence a peace was patched up and Sextus left Spain, while Pollio remained with three legions under him. During the war between Mark Antony and the senate, Pollio, in a letter to Cicero, declared himself on the side of the senate, but found pretexts for waiting to cast in his lot with the victor. In fact no sooner had Octavian become reconciled to Antony and Lepidus, and compelled the senate to rescind the decrees against them, than Pollio joined Lepidus with two legions. Antony, Lepidus, and Octavian now formed the triumvirate (43), and Pollio was nominated consul for the year 40 B.c. Meantime he was entrusted by Antony with the administration of Gallia Trans- padana, and in superintending the distribution of the Mantuan territory amongst the veterans he used his influence to save from confiscation the property of the poet Virgil. When L. Antonius, brother of Mark Antony, revolted against Octavian and was besieged in Perusia (41-40), he entreated Pollio to hasten to his relief. Pollio advanced hesitatingly, but was fain to take refuge in Ravenna when Octavian marched to meet him. After the fall of Perusia Octavian and Antony were reconciled for a time by the peace of Brundisium, which Pollio helped to negotiate. He was now consul (40); Virgil's famous fourth eclogue is addressed to him in his consulship. Next year Pollio was sent by Antony against the Parthini, an Illyrian people who adhered to Brutus. He was success- ful, took the town of Salone, and celebrated a triumph in the same year. The eighth eclogue of Virgil is addressed to Pollio while engaged in this campaign. From the spoils of the war he constructed the first public library at Rome.! Thenceforward Pollio withdrew from active life and devoted hiniself to literature. When Octavian invited him to join in the war against Antony which ended in the battle of Actium, Pollio declined on the score of his former friend- ship with Antony. He seems to have maintained to a certain degree an attitude of independence if not of opposi- tion towards Augustus. He lived to a green old age, and died in his villa at Tusculum in 4 a.D.

Pollio was a distinguished orator; his specches showed ingenuity and care, but were marred by an affected archaism which rendered them somewhat crabbed and harsh. He wrote tragedies also, which Virgil declared to be worthy of Sophocles, and a prose history of the civil wars of his time from the first triumvirate (60 B.c.) down

1 The library was in the Atrium Libertatis, which was also erected by Pollio (Isidor., Orig., vi. 5; Suetou., Aug., 29; Ovid, Trisé., ili. 1, 71). The situation of this Atrium is uncertain. There was an older Atrium Libcrtatis near the Forum (Cic. Ad Att., iv. 16, 8), but we are precluded from identifying it with that°of Pollio by the lan- guage of Isidore and Suetonius, who imply that Pollio built a new Atrium. Perhaps Pollio's Atrium was connected with the temple of Liberty on the Aventine (Livy, xxiv. 16); this would be strongly confirmed by Martial (xii. 8, 6), if we could be sure that his "donius alta Remi" referred to the Aventine. Mr A. W. Verrall (Studies i Horace, p. 118) has made it probable that Dion Cassius (xlix. 43) confused the Pollian with the Octavian library, and that accordingly 33 B.c. is the date of the dedication of the former library and not of the latter, which we know from Plutarch (Afarc., 30) to have been dedicated not earlier than 23 B.C., the date of Marcellus'sdeath. But Mr Verrall's conjecture that "in the great reconstructions of Augustus " the Pollian library was absorbed in the Octavian seems negatived by Ovid, Trist., iii. 1, 69-72, where "atria" certainly refers to the Pollian library, and "templa—vicino juncta theatro," probably refers to the Octavian library, which was in the Porticus Octavie, adjoining the twin temples of Jupiter and Juno, and close to the theatre of Marcellus (see Burn, Rome and the Campagna, p. 306 sq.). Pliny (NV. H., xxxvi. 24) also refers to " Pollionis Asini monumenta" as being distinct from the Porticus Octavie. Moreover, there is no evidence that the two libraries were even near each other; if the Pollian was on the Aventine, they were separated by nearly the whole breadth of the city.

to the death of Cicero (43 B.c.) or perhaps to the battle of Philippi (42 B.c.) or even later. This history, in the composition of which Pollio received assistance from the grammarian Ateius, was used as an authority by Plutarch and Appian. As a literary critic Pollio was very severe. He

censured Sallust and Cicero and professed to detect in Livy’s style certain provincialisms of his native Padua ; he attacked the Commentaries of Julius Cesar, accusing their author of carelessness and credulity if not of deliberate falsification. Horace addressed one of his odes (ii. 1) to Pollio on the subject of his history. Pollio was the first Roman author who recited his writings to an audience of his friends, a practice which afterwards grew vcry common at Rome. At! his writings are lost excepta few fragments of his speeches (collected by Meyer, Orat. Rom. Frag.), aud three letters addressed to Cicero (Cic., 4d Fam., x. 31-33).

POLLNITZ, Kart Lupwic, Fremerr von (1692- 1775), known as a writer of memoirs, was born on the 25th February 1692. His father, G. Bernhard von Polnitz, was a major-general and minister of state in the electorate of Brandenburg. P6llnitz was a man of restless and adventurous disposition, and after squandering his fortune travelled from court to court, his pleasant manners generally securing for him a kind reception. He was made reader to Frederick the Great, and afterwards the director of a theatre; but before accepting these appoint- ments he had served as a soldier in Austria, the States of the Church, and Spain. He was repeatedly converted to Catholicism and re-converted to the Reformed faith ; but he died a Catholic on the 23rd June 1775.

The most famous work attributed to him is Za Saxe galante, which contains an account of the private life of Augustus of Saxony ; but it has been doubted whether he was the author of this book. His contemporaries expressed much admiration for the lively style of his Lettres et mémoires, avec nouveaux mémoires de sa vie et la relation de-ses premiers voyages, and gencral interest was excited by his Etat abrégé de la cour de Saxe sous le réegne @ Auguste III., roi de Pologne. He was probably the author of the Histoire seerée de la duchesse d’Hanovre, épouse de George I., roi de la Grande- Bretagne. After his death Brunn issued Alémotres de Péllnitz pour servir a Vhistoire des quatre derniers souverains de la maison de Brandebourg, royale de Prusse.

POLLOK, Rosert (1798-1827), was the author of The Course of Time, a poem that has passed through many editions, and is still a favourite in serious households in Scotland. The son of a small farmer, he was born in

1798 at Moorhouse, in the parish of Eaglesham in Renfrewshire, was originally destined for the plough, but trained himself for the university, took his degree at Glasgow, and studied for the ministry of the United Secession Church. Along with the very general ambition to wag his head in a pulpit he had a specific literary ambition ; he published Tales of the Covenanters while he was a divinity student, and planned and completed a poem on the spiritual life and destiny of man. This was the Course of Time. The unfortunate poet died within six months of its publica- tion, at the age of twenty-nine. Excessive study had quickened a tendency to consumption. The poem was published in March 1827, and at once became popular. It is written in blank verse, in ten books, in the poetic diction of the 18th century, but with abundance of enthusiasm, impassioned elevation of feeling, and copious force of words and images. The poet's view of life was strongly Calvinistic. :

POLLOKSHAWS, a burgh of barony in Renfrewshire, Scotland, situated near the White Cart, on the Glasgow and Kilmarnock Railway, 24 miles south by west of Glas- gow, of which it is now reckoned a suburb, connected by tramway. The streets are irregular, but contain many good houses and shops. The principal buildings are the town-hall, the mechanics' institute, and the public hbrary and reading-room. The staple industries are cotton-spin- ning, hand and power-loom weaving of silk and cotton fabrics, dyeing, bleaching, and calico-printing. There are also paper works, potteries, and large engineering works. The town was created a burgh of barony by royal charter in 1813, and is governed by a provost, a baillie,

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and six councillors. Population in 1871, 8921; in 1881,

9363.

POLLUX. See Castor anp PoLivx.

POLLUX, Juuius, of Naucratis in Egypt, a Greek sophist of the 2d century. His education was begun by his father, a man of literary culture, and was

continued by one Hadrian, but he is said neither to have attained to the excellencies nor fallen into the defects of his master. He taught at Athens, where, according to Philostratus, he was appointed to the professorship by the emperor Commodus on account of his melodious voice. He died at the age of fifty-eight, leaving ason behind him. Suidas gives a list of his rhetorical works, none of which have survived. Philostratus (Vit. Soph., ii. 12) recognizes his natural abilities, but speaks of his rhetoric in very moderate terms. He was ridiculed by Athenodorus, a contemporary teacher at Athens. It is a disputed point whether or not he is the butt of Lucian's scathing satire in the Lexiphanes and Teacher of Rhetoric. In the Teacher of Rhetoric Lucian lashes a vile and ignorant person who gains a reputation as an orator by sheer effrontery; the application of this—probably grossly exaggerated—portrait to Pollux derives some colour from the remark of Philostratus that the speeches of Pollux were more remarkable for boldness than art. The Lexiphanes, a satire upon the use of obscure and obsolete words, may conceivably have been directed against Pollux as the author of the Onomasticon. This work, which we still possess, is a Greek dictionary in ten books dedicated to Commodus, and arranged not alphabetically but according to subject-matter. Though mainly a dictionary of synonyms and phrases, it supplies much rare and valuable information on many points of classical antiquity. It also contains numerous fragments of writers now lost.

The first book treats of the gods and their worship, kings, speed and slowness, dyeing, traders and artisans, fertility and barren- ness, times and seasons, houses, ships, war, horses, agriculture, the parts of the plough and the waggon, bees. Book ii. treats of the ages and names of man, the parts of his body, his mind and soul, &c.; book iii. of kinship, marriage, citizenship, friend- ship, love, the relation of master and slave, mines, journeying, rivers, health, sickness, wealth, poverty, &c.; book iv. of the sciences and arts ; book v. of the chase, animals, compound words, love and hate, blame, fair grectings, inscriptions, &c.; book vi. of feasts, wine, food, the talkative man, the flattcrer, the passionate man, crimes, words compounded with éyo, ovy, &c., gifts, laughter and weeping, &c.; book vii. of trades ; book viii. of law and justice, magistrates, popular assemblies, &c.; book ix. of cities, coins, games, synonyms of likeness and unlikeness, &c., compounds in ev; book x. of vessels, instruments, and tools. The chief editions of Pollux's Onomasticon are those of Aldus (Venice, 1502); J. H. Lederlin and Tib.

Hemsterhuis (Amsterdam, 1706) ; W. Dindorf (Leipsic, 1824), containing the notes of previous commentators ; Im. Bekker (Berlin, 1846), containing the Greek text only.

POLO. This game, which is a species of " hockey on horseback," is of Eastern origin, and seems to have been a favourite pastime in Persia, Tartary, and the frontiers of India from prehistoric times. Every district has a differ- ent name for the game, and the rules under which it is played, although substantially identical, vary considerably on minor points. Thus in Little Tibet, Ladakh, and the adjacent districts the ground used is in the form of a parallelogram some hundred yards long with a goal at each end about 50 feet wide. Amongst the Manipuris, a semi-independent tribe on the north-east frontier of India, by whom the game is known as " kunjai," the ground is about 120 yards by 50 yards and the whole of each end forms a goal. In other places the goals are about 400 yards apart, and the ground is 120 yards wide at each end, increasing in width towards the centre. :

In some of the early matches in the United Kingdom the ground was about 400 yards long and 200 yards wide, the width of the goal being from 30 to 35 yards. Under the present rules of the Hurlingham Club, which is now

the principal authority on the game, it is provided that the goals shall be "not less than 250 yards apart and that each goal shall be 8 yards wide." The English name of the game is perhaps derived from '"'pulu," which is the Tibetan for a ball, and the pastime itself reached India from Persia through Afghanistan. It speedily gained favour with the officers of British cavalry regiments quartered in India, and was introduced into the United Kingdom in 1871 by the 10th Hussars. As far as can be ascertained the first match played on English soil took place at Aldershot in the spring of that year. This, how- ever, is not absolutely certain, as no records seem to have been preserved of the early contests. Under the rules of the game as now played the opposing parties may consist of from three to six players a side, the number in all matches for cups or prizes being limited to four. Each of the players is mounted on a pony which must not exceed fourteen hands and which must be free from any vice. As the description of the game as "hockey on horseback" would imply, the object of the pastime is to force a

ball by means of a stick, with which each player is furnished, through the goal of the opposing side. The size of the ball is 3 inches in diameter, and the sticks are 4 feet long with a cross piece at one end for the purpose of striking the ball. At the commencement of a game each side takes up its position behind the goal posts. A player on each side is appointed as goal-keeper. On a flag being dropped to notify the commencement of the game, the other players gallop towards the centre of the ground at full speed, their object being to reach the ball first and drive it in the direction of the opposite goal. When a ball is hit out of bounds it is thrown into play again by one of the umpires, of whom there is one ap- pointed for each side before the commencement of a match. When a ball is hit beyond the goal without passing through it the side defending goal is entitled to a “ hit off,” which must be made from the goal line. It is allowable in the course of play to impede an adversary and hinder his stroke by hooking his stick, but this must not be done either under or over his pony. Whilst it is permissible for a player to interpose his pony before his antagonist so as to prevent the latter reaching the ball, it is expressly forbidden to cross another player in possession of the ball except at such a distance as to avoid all possibility of collision. Should a player break his stick or have it broken he must ride to the appointed place where the sticks are kept and take one, and on no account is one to be brought to him, If he drops his stick he must dis- mount and pick it up, and is not allowed to hit the ball whilst dismounted. If a player is in front of a player of his own side who hits the ball, and has not two—or in case of matches of four a side, one—of the opposing side between him and the hostile goal, and has not come through the “bully,” he is “off side.” He does not then come ‘“‘on his side” until the ball has been hit or hit at by the Opposing side, or until the player on his own side who made the hit passes him. As long as he is “‘off side” he may not in any way impede a player of the opposite side. In all matches the duration of play is 1 hour 10 minutes, “eee an interval of 5 minutes after each 20 minutes ee Owing to the expense of maintaining a specially trained stud of ponies and a prepared ground for the pastime, the pursuit of the game of polo has always been confined to the wealthier classes in England. Its chief supporters are the younger members of the aristocracy and the officers of British cavalry regiments. POLO, Marco (c, 1254-1324), the Venetian, the most famous perhaps of all travellers. His history needs to be introduced by some account of the preceding generation of

his family, and of the state of the world which rendered their and his extensive travels possible.

Under Curna, in the introductory portion (vol. v. 627 sq.) we have briefly indicated the circumstances which in the last half of the 13th century and first half of the 14th threw Asia open to Western travellers to a degree unknown before and since. We first hear of the Polo family in the year 1260. The vast wave of Tartar con- quest, set in motion by Jenghiz Khan, and continuing to advance for some years after his death, had swept away all political barriers from the China Sea to the western frontier of Russia. This huge extent of empire continued for a time to own a supreme chief in the Great Khan, the head of the house of Jenghiz, whose headquarters were in the Mongolian steppe. Practically indeed the empire soon began to split up into several great monarchies under the descendants of his four sons, in order of age Juji, Jagatai, Oghotai, and Tuli. At the date we have named the supreme khanate had recently devolved upon Kublai, son of Tuli, and, after the founder, the ablest of his house. In the beginning of his reign Kublai carried out the transfer of the seat of rule from Karakorum on the northern verge of the Mongolian plains to the populous and civilized regions that had been conquered in the further East, a transfer which eventually converted the Tartar khan into a Chinese emperor.

Barka, the son of Juji, and the first of the house of Jenghiz to turn Moslem, reigned on the steppes of the Volga, where a standing camp, which eventually became a great city under the name of Sarai, had been established by his brother and predecessor Batu.

Hulagu, a younger brother of Kublai, after taking Baghdad, and putting the caliph Mosta‘sim to death, had become practically independent ruler of Persia, Babylonia, Mesopotamia, and Armenia,—though he and his sons and his sons’ sons continued to the end of the century to stamp the name of the Great Khan upon their coins, and to use the Chinese seal of state which he conferred.

The house of Jagatai had settled upon the pastures of the Ili and in the valley of the Jaxartes, and ruled also the populous cities of Samarkand and

Bokhara.

Kaidu, grandson of Oghotai, who had been the immedi- ate successor of Jenghiz, refused to recognize the transfer of supreme authority to his cousins, and through the long life of Kublai was a thorn in the side of the latter. His immediate authority was exercised in what we should now call Chinese Turkestan and Southern Central Siberia.

Northern China lad been conquered by Jenghiz and his successors from the Tartar dynasty called Kin or “Golden,” who had held it about a century. But southern China still remained in the hands of the native dynasty, whose capital was the great city now known as Hang-chow-foo. Their dominion was still substantially intact, but its subjugation was a task to which Kublai soon turned his attention, and it became the most pro- minent transaction of his reign.

In India the most powerful sovereign was the Turk sultan of Delhi; but, though both Sind and Bengal owned his supremacy, no part of peninsular India had yet been invaded. The Dravidian kingdoms of the south were still untouched by foreign conquest, and the accumulated gold of ages lay in their temples and treasuries an easy prey for the coming Moslem.

In the Indo-Chinese peninsula and the Eastern Islands a variety of kingdoms and dynasties were expanding and contracting, of which we have but dim and shifting glimpses. Their advance in wealth and art, far beyond what the present state of those regions would suggest, is attested by the vast and magnificent medizeval remains of architecture which are found at intervals over both the

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Indo-Chinese continental countries and the islands, as at Pagdn in Burmiah, at Ayuthia in Siam, at Ongkor and many other places in Camboja, at Borobodor and Bram- banan in Java. All these remains are deeply marked by Hindu influence.

Venetian genealogies and traditions of uncertain value trace the Polo family to Sebennico in Dalmatia, and before the eud of the 11th century names of

its members are found in the Great Council of the republic. But the ascertained line of the traveller begins only with his grandfather. Andrea Polo of S. Felice was the father of three sons, Marco, Nicolo, and Maffeo, of whom the second was the father of the subject of this article. They were presumably “noble,” 7.¢., belonging to the families who had seats in the Great Council, and were enrolled in the Libro d’Oro; for we know that Marco the traveller is officially so styled (nobilis vir). The three brothers were engaged in commerce; the elder Marco, resident apparently in Constantinople and in the Crimea, does not enter into the history.

In 1260 we find Nicolo and Maffeo at Constantinople. How long they had been absent from Venice we do not know. Nicolo was a married man, and had left his wife there. In the year named the two brothers went on a speculation to the Crimea, whence a succession of chances and openings carried them to the court of Barka Khan at Sarai, and further north, and eventually across the steppes to Bokhara. Here they fell in with certain envoys who had been on a mission from the Great Khan Kublai to his brother Hulagu in Persia, and by them were persuaded to make the journey to Cathay in their company. And thus thie first European travellers of whom we have any knowledge reached China. Kublai, when they reached his court, was either at CAMBALUC (q.v.), t.¢., Peking, which he had just rebuilt on a vast scale, or at his beautiful summer seat at Shangtu in the country north of the great wall (“In Xanadu did Cubla Khan,” &c.). It was the first time that the khan, a man full of energy and intelligence, had fallen in with European gentlemen. He was delighted with the Venetian brothers, listened eagerly to all that they had to tell of the Latin world, and decided to send them back as his envoys to the pope, with letters request- ing the despatch of a large body of educated men to instruct his people in Christianity and in the liberal arts. The motive of the khan’s request was doubtless much the same that some years back influenced the black king of Uganda on Lake Nyanza to make a similar request through the traveller Stanley. With Kublai, as with his predecessors, religion was chiefly a political engine. The khan must be obeyed ; how man should worship God was no matter to him. But Kublai was the first of his house to rise above the essential barbarism of the Mongols, and he had been able enough to discern that the Christian church could afford the aid he desired in taming his countrymen. It was only when Rome had failed lament- ably to meet his

advances that he fell back upon thie lamas and their trumpery as, after a fashion, civilizing instruments.

The brothers arrived at Acre in April 1269. They learned that Clement IV. had died the year before, and no new pope had yet been chosen. So they went home to Venice, where they found that Nicolo's wife was dead, but had left a son Marco, now a fine lad of fifteen.

The papal interregnum was the longest that had been known, at least since the dark ages. After the Polos had spent two years at home there was still no pope; and the brothers resolved on starting again for the East, taking young Mark with them. At Acre they took counsel with an eminent churchman, Tedaldo, archdeacon of Liége, and took from him letters to authenticate the causes that had

hindered their mission. They had not yet left Ayas on the Cilician coast (then one of the chief points for the arrival and departure of the land-trade of Asia), when news overtook them that a pope had been elected in the person of their friend Archdeacon Tedaldo. They hastened back to Acre, and at last were able to execute Kublai's commission and to obtain a papal reply. But, instead of the hundred teachers asked for by the Great Khan, the new pope (styled Gregory X.) could supply but two Domini- cans; and these lost heart and turned back, when they had barely taken the first step of their journey.

The second start from Acre must have taken place about November 1271; and from a careful consideration of the indications and succession of chapters in Marco Polo's book, it would seem that the party proceeded from Ayas to Sivas, and then by Mardin, Mosul, and Baghdad to Hormuz at the mouth of the Persian Gulf (see ORMUs), with the purpose of going on to China by sea; but that, some obstacle having interfered which compelled them to abandon this plan, they returned northward through Persia. Traversing Kerman and Khorasan they went on to Balkh and Badakhshan, in which last country—an Oriental Switzerland, as it has been called—they were long detained by the illness of young Marco. In a passage touching on the charming climate of the hills of Badakh- shan, Marco breaks into an

enthusiasm which he rarely betrays, but which is easily understood by those who have known what it is, with fever in the blood, to escape to the exhilarating air and fragrant pine-groves of the Himalaya. They then ascended tle upper Oxus through Wakhan to the plateau of Pamir (a name first heard in Marco's book). Those regions, so attractive to geo- graphers, were never described again by any European traveller till the spirited expedition in 1838 of that excellent officer the late Lieutenant John Wood of the Indian navy, whose narrative abounds in the happiest incidental illustration of Marco Polo's chapters. Crossing the Pamir highlands, the travellers descended upon Kash- gar, whence they proceeded by Yarkand to Khotan. These are regions which remained almost absolutely closed to our knowledge till within the last twenty years, when the temporary overthrow of the Chinese power, and the enterprise of travellers like the late Mr Johnson and Mr Robert Shaw, followed by the missions of Sir Douglas Forsyth and his companions, and of Mr Ney Elias, again made them known.

From Khotan they passed on to the vicinity of Lake Lop (or Lob), reached still more recently, for the first time since Marco Polo's journey, by the indefatigable Russian officer Prejevalsky, in 1871. Thence the great desert of Gobi was crossed to Tangut, as the region at the extreme north-west of China, both within and without the Wall, was then called.

In his account of the passage of the Gobi, or desert of Lop, as he calls it, Polo gives some description of the terrors with which the suggestions of solitude and desolation have peopled such tracts in most parts of the world, a descrip- tion which reproduces with singular identity that of the Chinese pilgrim Hwen T'sane (g.v.), in passing the same desert in the contrary direction six hundred years before.

The Venetians, in their further journey, were met and welcomed by the Great Khan's people, and at last reached his presence at Shangtu, in the spring of 1275. Kublai received them with great cordiality, and took kindly to young Mark, by this time about one and twenty years of age. The 'young bachelor," as the book calls him, applied himself diligently to the acquisition of the divers languages and written characters chiefly in use among the multifarious nationalities included in the khan's court and administration; and Kublai, seeing that he was both

clever and discreet, soon began to employ him in the public service. M. Pauthier, his most recent French editor, has found in the Chinese annals a record that in the year 1277 a certain Polo was nominated as a second- class commissioner or agent attached to the imperial council, a passage which we may without scruple apply to the young Venetian. ; .

His first public mission was one which carried him through the provinces of Shansi, Shensi, and Szechuen, and the wild country on the coast of Tibet, to the remote province of Yunnan, called by the Mongols Kardjang, and into northern Burmah (Mien). Marco, during his stay at court, had observed the khan's delight in hearing of strange countries, of their manners, marvels, and oddities, and had heard his frank expressions of disgust at the stupidity of envoys and commissioners who could tell of nothing but their official business. And he took care to store his memory or his note-book with all curious facts that were likely to interest Kublai, and these, on his return to court, he related with vivacity. This first journey led him through a country which twenty years ago was an almost absolute terra incognita,—though within that time we have learned much regarding it through the journeys of Cooper, Garnier, Richthofen, Gill, Baber, and others. In this region there existed, and there still exists, in the deep valleys of the great rivers, and in the alpine regions which border them, a vast ethnological garden, as it were, of tribes of very various origin, and in every stage of semi-civilization or barbarism ; and these afforded many strange products and eccentric traits of manners to entertain the emperor.

Marco rose rapidly in favour, and was often again employed on distant missions, as well as in domestic administration ; but we are able to gather but few details of his employment. At one time we know that he held for three years the government of the great city of Yang- chow ; on another occasion we find him visiting Kara- korunm on the north of the Gobi, the former residence of the Great Khans ; again in Champa, or southern Cochin- China; and, once more, on a mission to the southern states of India. We are not informed whether his father and uncle shared in such employments, though they are specially mentioned as having rendered material service to the khan, in forwarding the capture of the city of Siang-

yang-foo (on the Han river) during the war against southern China, by the construction of powerful artillery engines— a story, however, perplexed by chronological difficulties, which here we must pass over.

In any case the elder Polos were gathering wealth, which they longed to carry back to their home in the lagoons, and after their long exile they began to dread what might follow old Kublai's death. The khan, how- ever, was deaf to all suggestions of departure; and but for a happy chance we should have lost our medieval Herodotus.

Arghun, khan of Persia, the grandson of Kublai's brother Hulagu, lost in 1286 his favourite wife, Bolgana (Bulughén or "Sable") by name. Her dying injunction was that her place should be filled only by a lady of her own Mongol tribe. Ambassadors were despatched to the court of Khanbaligh to obtain such a bride. The message was courteously received, and the choice fell on the lady Cocachin (Kukachim), a maiden of seventeen, "moult bele dame et avenant." The overland road from Peking to Tabriz was not only of portentous length for so delicate a charge, but was then imperilled by war; so the envoys of Arghun proposed to return by sea. Having made acquaintance with the Venetians, and eager to profit by their experience, especially by that of Marco, who had just returned from his mission to India, they begged the khan

as a favour to send the Franks in their company. He con- sented with reluctance, but fitted out the party nobly for the voyage, charging them with friendly messages to the potentates of Christendom, including the king of England. They appear to have sailed from the port of Chwan-chow (or CHINCHEW, g.v.) in Fuhkien, which was then the great haven of foreign trade, and was known to Western strangers as Zaitun, in the beginning of 1292. The voyage was an ill-starred one, involving long detention on the coast of Sumatra, and in the south of India; and two years or more passed before they arrived at their destination in Persia. Two out of the three envoys, and a vast propor- tion of their suite perished by the way; but the three hardier Venetians survived all perils, and so did the young lady, who had come to look on them with filial regard. It proved that Arghun Khan had been dead even before they quitted China ; his brother reigned in his

stead ; and his son Ghazan succeeded to the lady's hand. She took leave of the kindly Venetians, not without tears; they went on to Tabriz, and after a long delay there departed for Venice, which they seem to have reached about the end of 1295.

The first biographer of Marco Polo was the famous geographical collector John Baptist Ramusio, who wrote more than two centuries after the traveller's death. Facts and dates sometimes contradict his statements, but his story is told with great life and picturesqueness, and we need not hesitate to accept, at least asa genuine tradition, a romantic story, too long for repetition here, of the arrival of the Polos at their family mansion in the parish of St John Chrysostom, of their appearance at its door in worn and outlandish garb, of the scornful denial of their identity, and of the shrewd stratagem by which they secured acknowledgment from the society of Venice.

Some years pass ere we hear more of Marco Polo ; and it is then in a militant capacity.

Jealousies, always too characteristic of Italian communi- ties, were in the case of Venice and Genoa sharpened by direct commercial rivalry, and had been growing in bitter- ness throughout the 13th century. In 1298 the Genoese made preparations on a great scale to strike a blow at their rivals on their own ground, and a powerful fleet of galleys, under Lamba Doria as admiral, made straight fer the Adriatic. Venice, on hearing of the Genoese arma- ment, hastily equipped a fleet still more numerous, and placed it under the command of Andrea Dandolo. The crew of a Venetian galley at this time amounted, all told, to 250 men, under a comito or master, but besides this

- officer each galley carried a sopracomito or gentleman com-

mander, who was usually a noble. On one of the galleys of Dandolo's fleet went Marco Polo in this last capacity.

The hostile fleets met before the island of Curzola on the 6th September, and engaged next morning. The battle ended in a complete victory to Genoa, the details of which may still be read, inscribed on the facade of the

church of St Matthew in that city. Sixty-six Venetian galleys were burnt in the Bay of Curzola, and eighteen were carried to Genoa, with 7000 prisoners, one of whom was Marco Polo. The captivity was of less than a year's duration ; for by the mediation of Milan peace was made, on honourable terms for both republics, by July 1299; and Marco Polo was probably restored to his family during that or the following month.

But his captivity was memorable as being the means of bringing about the record of his remarkable experiences in the East. Up to this time he had doubtless often related his stories of Cathay among his friends ; and from these stories indeed, and the frequent employment in them (as it would seem) of a numerical expression unfamiliar in those days, he had acquired the nickname of J/arco

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Million. Yet it would seem that he had committed nothing to writing.

The narratives not only of Marco Polo but of several other famous medizeval travellers (e.g., Ibn Batuta, Friar Odoric, Nieolo Conti) seem to have been extorted from them by a kind of pressure, and committed to paper by other hands. This indicates indeed how little the literary ambition which besets so many modern travellers weighed with the class in those days. It is also perhaps an example of that intense dislike to the use of pen and ink which still prevails among ordinary respectable folk on the shores of the Mediterranean.

But, in the prison of Genoa, Marco Polo fell in with a certain person of writing propensities, Rusticiano or Rustichello of Pisa, who also was a captive of the Genoese. His name is known otherwise to literary antiquaries as that of a respectable kind of literary hack, who abridged and recast several of the French romances of the Arthurian cycle which were then in fashion. He it was, apparently, who persuaded Marco Polo to defer no longer the com- mittal to paper of his wonderful experiences. In any case it was he who wrote down these experiences at Marco's dictation ; and he is

the man therefore to whom we owe the existence of this record, and possibly the preservation even of the traveller's name and memory.

We learn but little of Marco Polo's personal or family history after this captivity ; but we know that at his death he left a wife, Donata by name (perhaps of the family of Loredano, but this is uncertain), and three daughters, Fantina and Bellela married, the former to Marco Braga- dino, and Moreta then a spinster, but married at a later date to Ranuzzo Dolfino. One last glimpse of the traveller is gathered from his will, which is treasured in the library of St Mark's. On the 9th January 1324 the traveller, now in his seventieth year, and sinking day by day under bodily infirmity, sent for a neighbouring priest and notary to make his testament. We do not know the exact time of his death, but it fell almost certainly within the year 1324, for we know from a scanty series of documents, commencing in June 1325, that he had at the latter date been some time dead. He was buried in accordance with his will, in the church of St Lorenzo, where the family burying-place was marked by a sarcophagus, erected by his filial care for his father Nicolo, which existed till near the end of the 16th century. On the renewal of the church in 1592 this seems to have been cast aside and lost.

The copious archives of Venice have yielded up a few traces of our traveller. Besides his own will just alluded to, there are in the library the wills of his uncle Marco and of his younger brother Maffeo; a few legal documents connected with the house property in St John Chrysostom, and other papers of similar character ; and two or three entries in the record of the Maggior Consiglio. We have mentioned the sobriquet of Marco Millioni which he got from his young townsmen. Ramusio tells us that he had himself noted the use of this name in the public books of the commonwealth, and this statement has been verified of late years in one of those entries in the books of the Great Council (dated 10th April 1305), which records as one of the securities in a certain case the "Nobilis vir MJarchus Paulo Minox." It is alleged that long after the traveller's death there was always in the Venetian masques one individual who assumed the character of Marco Millioni, and told Munchausen-like stories to divert the vulgar. Such, if this be true, was the honour of our great man in his own country. One curious parchment among those preserved is the record of the

judgment of the court of requests (Curia Petitionum) upon a suit brought by the

been an agent of his, to recover the value of a certain quantity of musk for which Girardo had not accounted. Another curious document brought to light within the last few years is a catalogue of certain curiosities and valuables which were collected in the house of the unhappy Marino Faliero, and this catalogue comprises several objects that Marco Polo had given to one of the Faliero family. Among these are two which would have been of matchless interest had they survived, viz—‘“Unum anulum con inscriptione que dicit Cuibile Can Marco Polo, et unum torques cum multis animalibus Tartarorum sculptis que res donum dedit predictus Marcus quidam (cuidam) Fale- trorum.”

The most tangible record of Polo’s memory in Venice is a portion of the Ca’ Polo—the mansion (there is every reason to believe) where the three travellers, after their absence of a quarter century, were denied entrance. The court in which it stands was known in Ramusio’s time as the Corte del Millioni, and now is called Corte Sabbionera. That which remains of the ancient edifice is a passage with a decorated archway of Italo-Byzantine character per- taining to the 13th century. With this exception, what was probably the actual site of the mansion is now occupied by the Malibran theatre.

No genuine portrait of Marco Polo exists. There is a medallion portrait on the wall of the Sala dello Scudo in the ducal palace, which has become a kind of type; but it is a work of imagination no older than 1761. The oldest professed portrait is one in the gallery of Monsignor Badia at Rome, which is inscribed Afarcus Polus Venetus Totius Orbis et Indie Peregrator Primus. It is a good picture, but evidently of the 16th century at earliest, and the figure is of the character of that time. The Europeans at Canton have attached the name of Marco Polo toa figure in a Buddhist temple there containing a gallery of “Arhans” or Buddhist saints, and popularly known as the “temple of the five hundred gods.” There is a copy of this at Venice, which the Venetian municipality obtained on the occasion of the Geographical Congress there in 1881. But the whole notion was a groundless fancy.

The book indited by Rusticiano the Pisan, which has preserved Marco Polo's fame, consists essentially of two parts. The first, or pro- logue, as it is termed, is the only part unfortunately which consists of aetual personal narrative. It relates in a most interesting, though too brief, fashion the circumstances which led the two elder Polos to the khan's court, with those of their second journey accompanied by Marco, and of the return to the West by the Indian seas and Persia. The second and staple part of the book consists of a long series of chapters of very unequal length and unsystematic structure, descriptive of the different states and provinces of Asia, with occasional notices of their sights and products, of curious manners and remarkable events, and especially regarding the emperor Kublai, his court, wars, and administration. A series of chapters near the close treats in a wordy and monotonous manner of sundry wars that took place between various branches of the house of Jenghiz in the latter half of the 13th century. This last series is either omitted or greatly curtailed in all the MS. copies and versions except one.

It was long a doubtful question in what language the work was originally written. That this had been some dialect of Italian was a natural presumption, and a contemporary statement could be alleged in its favour. But there is now no doubt that the original was French. This was first indicated by Count Baldelli-Boni, who published an elaborate edition of two of the Italian texts at Florence in 1827, and who found in the oldest of these indisputable signs that it was a translation fromthe French. The arguinent has since becn followed up by others ; and a manuscript in rude and peculiar French, belonging to the National Library of Paris, which was printed by the Société de Géographie in 1824, has been demon- strated (as we need not hesitate to say) to be either the original or a very close transcript of the original dictation. A variety of its characteristics are strikingly indicative of the unrevised product of dictation,'and are such as would necessarily have disappeared either in a translation or in a revised copy. Many illustrations could be adduced of the fact that the use of French was not a eircumstance of a surprising or unusual nature ; for the language had at that

" Nobilis Vir Marcus Polo" against Paulo Girardo, who had | time, in some points of view, even a wider diffusion than at pre-

sent, and examples of its literary employment by writers who were not Frenchmen are very numerous. It is superfluous to allege instances here, when we observe that Rusticiano himself, tlic scribe of the narrative, was a compiler of French romances. ane

Some eighty MSS. of the book are known, and their texts exhibit considerable differences. These fall under four principal types. Of these type i. is found completely only in that old French codex which has been mentioned. ‘Type ii. is shown by several valuable MSS. in purer French, the best of which formed the basis of the edition prepared by the late M. Pauthierin 1865. It exhibits a text pruned and revised froni the rude original, but without any exactness, though perhaps under some general direction by Marco Polo himself, for an inscription prefixed to one of the MSS. records the presentation of a copy by the traveller himself to the Seigneur Thibault de Cepoy, a distinguished Frenchman known to history, at Venice in the year 1306. Type iii. is that of a Latin version prepared in Marco Polo’s lifetime, though without any sign of his cognizance, by Francesco Pipino, a Dominican of Bologna, and translated froman Italian copy. In this, condensation and curtail- ment are earried a good deal further than in type ii. Some of the forms under which this type appears curiously illustrate the effects of absence of effective publication, not only before the invention of the press, but in its early days. Thus the Latin version published by Gryneus at Basel in the Novus Orbis (1532) is different in its language from Pipino’s, and yet is clearly traceable to that as its foundation. In fact it is a retranslation into Latin from some version of Pipino (Marsden thinks the Portuguese printed one of 1502). Itintroduces also changes of its own, and is quite worthless as a text; and it is curious that Andreas Miiller, who in the 17th century took much trouble with editing Polo according to his lights, should have unfortunately chosen as his text this fifth-hand version. It may be added that the French editions published in the middle of the 16th century were translations from Grynzus’s Latin. Hence they complete this curious and vicious circle of translation —French, Italian, Pipino’s Latin, Portuguese, Gryneus’s Latin, French.

The fourth type of text deviates largely from those already men- tioned ; its history and true character are involved in obscurity. It is only represented by the Italian version prepared for the press by G. B. Ramusio, with most intcresting preliniinary dissertations, and published at Venice two years after his death, in the second volume of the Navigationi e Viaggi. Its peculiarities are great. Ramusio seems to imply that he made some use of Pipino's Latin, and various passages confirm this. But many new circumstances, and anecdotes occurring in no other copy, are introduced ; many names assume a new shape ; the whole style is more copious and literary in character than that of any other version. Whilst a few of the changes and interpolations seem to carry us further from the truth, others contain facts of Asiatic nature or history, as well as of Polo's alleged experiences, which it is extremely difficult to ascribe to any hand but the travcller's own.

We recognize to a certain extent tampering with the text, as in cases where the proper names used by Polo have been identified, aud more modern forms substituted. In some other cases the editorial spirit has been more meddlesome and has gone astray. Thus the age of young Marco has been altered to correspond with a date which is itself erroneous. Ormus is described as an island, contrary to the old texts, and to the facts of its position in Polo's time. In speaking of the oil-springs of Caucasus the phrase " camel- loads" has becn substituted for "ship-loads," in ignorance that the site was Baku on the Caspian. :

But on the other hand there are a number of new circumstances certainly genuine, which ean hardly be ascribed to any one but Polo himself. We will quote one only. Thisis the account which Ramusio's version gives of the oppressions exercised by Kublai's Mohammedan ministcr Ahmed, telling how the Cathayans rose agaiust him and murdered him, with the addition that Messer Marco was on the spot when all this happened. Not only is the whole story in substantial accordance with the Chinese annals, even to the name of the chief conspirator (Vanchu in Ramusio, lVang- chew in the Chinese records), but the annals also tell of the courageous frankness of " Polo, assessor of the privy council," in opening Kublai's eyes to the iniquities of his agent.

To sum up, we can hardly doubt that we have, imbedded in the text of this most interesting edition of Ramusio's, the supplemen- tary recollections of the traveller, noted down at a later period of his life, but perplexed by translation and retranslation and editorial mistakes. The most important desideratum still remaining in reference to Polo's book is the recovery of the original from which Ramusio derived the passages peculiar to his edition.

That Marco Polo has been so universally recognized as the prince of medixval travellers is due rather to the width of his experience, the vast compass of his journeys, and the romantic nature of his personal history than to transcendent superiority. of character or capacity. Enthusiastic biographers, beginning with Ramusio, have placed him on the same platform with Columbus. But he has left no trace of the genius and lofty enthusiasm, the ardent and

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justified previsions, which mark the great admiral as one of the lights of the human race. Itis a juster praise that the spur which his book eventually gave to geographical studies, aud the beacons which it hung out at the eastern extremities of the earth, helped to guide the aims, though hardly to kindle the fire of the greater son of the rival republic. His work was at lcast a link in the providential chain whieh at last dragged the New World to light.

But Polo also was the first traveller to trace a route across the whole longitude of Asia, naming and describing kingdom after kingdom, which hc had seen with his own eyes ; the first to speak of the new and brilliant court which had been established at Peking ; the first to reveal China in all its wealth and vastness, and to tell us of the nations on its borders, with all their eccentricities of manners and worship ; the first to tell more of Tibet than its name, to speak of Burmah, of Laos, of Siam, of Cochin-China, of Japan, of Java, of Sumatra, and of other islands of the Great 'Archipelago, that muscum of beauty and marvels, of Nicobar and Andainan Islands with their naked savages, of Ceylon and its sacred peak, of India, not as a dream-land of fables, but as a country seen and partially explored ; the first in medieval times to give any distinct account of the secluded Christian empire of Abyssinia, and of the semi-Christian island of Socotra, and to

speak, however dimly, of Zanzibar, and of the vast and distant Madagascar ; whilst he carries us also to the remotely opposite region of Siberia and the Arctic shores, to speak of dog-sledges, white bears, and reindeer-riding Tunguses. That all this rich catalogue of discoveries (as they may fitly be called) should belong to the revelation of one man and one book is ample ground enough to justify a very high place in the roll of fame.

Indeed it is remarkable in how large a proportion of the Old World modern travellers and explorers have been but developing what Marco Polo indicated in outline,—it might be said, without serious hyperbole, only travelling in his footsteps, most certainly illustrating his geographical notices. At the moment when these lines are written a British mission is starting to survey for political reasons a tract upon the Oxus; Marco Polo traversed this tract. For twenty years Russian and English explorers have been trying to solve the problem of the Pamir watershed ; Marco Polo explored it. Till within the last quarter century the cities of eastern Turkestan, such as Kashgar, Yarkand, and Khotan, were known only from the compilation of Oriental fragments ; Marco had visited them all. Within a shorter period dense darkness hung over the tracts between western China and Upper Burmah ; these also had been traversed by Marco Polo, France is now seattering the brands of war in Tong-king, in Fuhkien, and in Madagascar ; all these were within Marco Polo's knowledge and find mention in his book. And how vast an area has he described from personal knowledge which remains outside of the fields that we have indicated! Readers of the book would welcome a little more of egotistical detail. Imperson- ality is carried to excess ; and we are often driven to discern only by indirect and doubtful induction whether he is speaking of places from personal knowledge or from hearsay. In truth, though there are delightful exceptions, and though nearly every part of the book suggests interesting questions, a desperate meagreness and baldness does affect considerable parts of the narrative. In fact his work reminds us sometimes of his own description of Khorasan— " On chevauche par beaus plains et belles costieres, 14 ou ila moult beaus herbages et bonne pasture et frais assez … et aucune fois y treuve l'en un desert de soixante milles ou de mains, esquel desers ne treuve l'en point d'eauc ; mais la convient porter o lui!"

The diffusion of the book was hardly so rapid as has been some- times alleged. Itis true that we know from Gilles Mallet's catalogue of the books collected in the Louvre by Charles V., dating c. 1370-75, that no less than five copies of Marco Polo's work were then in the collection; but on the other hand the number spread over Europe of MSS. and early printed editions of Mandeville, with his lying wonders, indicates a much greater popularity. Dante, who lived twenty-three years after the book was dictated, and who touches so many things in the seen and unscen worlds, never alludes to Polo, nor, we believe, to anything that can be connected with him ; nor can any tracc of Polo be discovered in the book of his contemporary Marino Sanudo the elder, though this worthy is well acquainted with the work, later by some years, of Hayton the Armenian, and though many of the subjects on which he writes in his own book (De Secretis Fidelium Crueis') challenge a reference to Polo's experiences. Perhaps indeed the most notable circumstance bearing in the same direction is the fact that the author of Mande- ville, whocver he really was, and who plundered right and left, never plunders Polo, a thing only to be accounted for by his being ignorant of Polo's existence. The only literary work we know of belonging to the 14th century which shows a thorough acquaint- ance with Polo's book is the poetical romance of Baudouin de Sebourg, which borrows themes from it largely.

Marco Polo contributed so vast au amount of new facts to the knowledge of the earth's surface, that one might have expected his

1 Printed by Bongars in the collection called Gesta Dei per Francos, 1611.

book to have a sudden effeet upon geography. But no such result occurred for a long time. Doubtless several causes contributed to this, of which the unreal character attributed to the book asa collection of romantic marvels, rather than of geographical and

historical] facts, may have been one,—a view that the diffusion of |

Mandeville's fictions, far outdoing Polo's facts in marvel, perhaps tended to corroborate, whilst supplanting the latter in popularity. But the essential

causes were the imperfect nature of publication ;

the traditional character of the prevailing geography, which |

hampered the propagation of true statements; and the entire absence of scientific principle in what did pass for geography, so that there was no organ competent to the assimilation of so huge a mass of new knowledge.

The late Sir Francis Palgrave wrote a book called The Merehant and the Friar, in which it is feigned that Marco Polo comes to England, and becomes acquainted with Roger Bacon. Had Roger Bacon indeed known either the traveller or his book, we cannot doubt, from the good use he makes, in his Opus Majus, of William of Rubruk, that he would have turned the facts to good account.

centuries dealt was, in its outline, that handed down by traditions of the craft, as sanctioned by some fathers of the church, such as Orosius and Isidore, and sprinkled with a combination of classical and medieval legends. Almost universally the earth's surface fills a circular disk, rounded by the ocean,—a fashion that already was ridiculed by Herodotus (iv. 36), as it was in a later generation by Aristotle (Jfeteorol., ii, 5). This was the most persistent and the most obstructive dogma of the false geography. The central point of the circle is occupied by Jerusalem, because it was found written in Ezekiel :—" Hee dicit Dominus Deus, Ista est Jerusalem, in medio gentinm posui eam, et in circuitn ejus terras,'"—supposed to be corroborated by the Psalmist's expression, regarded as prophetic of our Lord's passion—" Deus autem Rex noster ante seecula operatus est salutein in medio terre" (Ps. Ixxiv. 12). Paradise occupied the extreme east, because it was found in Genesis that the Lord planted a garden eastward in Eden. Gog and Magog were set in the far north or north-east because it was again said in Ezekiel; " Ecce ago super te Gog principem capitis Mosoch et Thubal. . . et

ascendere te faciam de lateribus aquilonis." This last legend of Gog | and Magog, shut up by a mountain-barrier, plays a prominent part | in the romantic history of Alexander, which had such enormous |

currency in those ages, and attracted especial attention in the 13th

century, owing to the general identification of the Tartar hordes |

with those impnre nations whom the hero had shut up. It is not wonderful that the Tartar irruption into the West, heard of at first with as much astonishment as it would produce now, was connected with this old belief.

The loose and scanty nomenclature of the cosmography was mainly borrowed from Pliny and Mela, through such fathers as we have named; whilst vacant spaces were occupied by Amazons, Arimaspians, and the realm of Prester John. A favourite representa- tion of the inhabited earth was a great T within an O (sec MAP).

Such sehemces of the world had no place for the new knowledge. The first genuine attempt at a geographical compilation absolutely free from the traditional idola seems to be that in the Portulano Mediceo at Florence. In this, some slight use seems to be made of Polo. Buta far more important work is one of the next generation, the cclebrated Catalan map of 1375 iu the Paris library. This also is an honest endeavour on a large scale to represent the known world on the basis of collected facts, casting aside all theories, pseudo-scientific and pseudo-theological ; and a very remarkable work it is. In this work Marco Polo’s influence on maps is perhaps seen to the greatest advantage. As regards Central and Further Asia, and partially as regards India, his book is the basis of the map. His names are often much perverted, and it is not always easy to nnderstand the view that the compiler took of his itineraries. Still we have Cathay admirably placed in the true position of China, as a great empire filling the south-east of Asia. The trans-Gangetic

peninsula is absent, but that of India proper is, for the first time | in the history of geography, represented with a fair approximation | We really seem to see in this map |

to correct form and position. something like the idea of Asia that the traveller himself would have presented, had he bequeathed us a map.

In the following age we find more frequent indications that Polo’s book was diffused and read. And now that the spirit of discovery was beginning to stir, the work was regarded in a juster light as a book of facts, and not as a

mcre Romman du Grant Kaan. But the age produced new supplies of information in greater abundance than the knowledge c«f geographers was preparcd to digest or co-ordinate ; and, owing partly to this, and partly to his unhappy reversion to the fancy of a circnlar disk, the map of Fra Mauro (1459), one of the greatest map-making enterprises in history, and the result of immense labour in the collection of facts and the endeavour to combine them, really gives a much less accurate idea of Asia than the Carta Catalana.

When M. Libri, in his Hist. des Seienees Mathématiques, speaks of Columbus as ‘‘ jealous of Polo’s laurels,” he speaks yashly.

Tn fact |

Po tt 409

Columbus knew of Polo’s revelations only at second-hand, from the letters of the Florentine Paolo Toscanelli and the like ; we cannot find that he ever refers to Polo by name. Though, to the day of his death, Columbns was full of imaginations about Zipangu (Japan) and the land of the Great Khan, as being in immediate proximity to his discoveries, these were bnt accidents of his great theory, It was his intimate conviction of the absolute smallness of the earth, of the vast extension of Asia eastward, and of the consequent narrowness of the western ocean on which his life’s project was based.

When, soon after the discovery of the New World, attempts were made to combine the new and old knowledge, the results were unhappy. ‘The earliest of such combinations tried to realize the ideas of Columbus regarding the identity of his discoveries with the Great Khan’s dominions ; but even after America had vindicated its independent existence, and the new knowledge of the Portuguese had introduced China where the Catalan map had presented Cathay, the latter country, with the whole of Polo’s nomenclature, was shunted to the north, forming a separate system. Henceforward

| the inflnence of Polo’s work on maps was simply injurious ; and But the world with which the map makers of the 13th and 14th |

when to his names was added a sprinkling of Ptolemy's, as was usual throughout the 16th century, the result was a hotch-potch conveying no approximation to any representation of facts.

Gradually the contributions of Ptolemy and Polo are used more sparingly, but in Sanson's map (1659) a new clement of confnsion appears in numerous features derived from the "Nubian Geo- grapher," z.e., Edrisi.

It is needless to follow the mattcr further. With the increased knowledge of northern Asia from the Russian side, and of China from the maps of Martini, followed by the later Jesuit surveys, and with the real science brought to bear on Asiatic geography by such men as De VIsle and D'Anville, mere traditional nomenclature gradually disappeared ; and the task which Polo has provided for the geographers of later days has been chiefly that of determining the true localities which his book describes under obsolcte or corrupted names.

Before concluding, a word or two seems necessary on the subject of the alleged introduction of important inventions into Europe by Marco Polo. Assertions or surmises of this kind have been made in regard to the mariner's compass, to gunpowder, and to printing. Though the old assertions as to the first two are still occasionally repeated in books of popular character, no one who has paid any attention to the subject now believes Marco can have had anything to do with their introduction. But there is no doubt that the resemblance of early European block-books to those of China is in some respects so striking that it seems clearly to indicate the derivation of the art from that country. There is, however, not the slightest reason for connecting this introduction with the name of Polo. His fame has so overshadowed later travellers that the fact has been generally overlooked that for some years in the 14th century not only were missions of the Roman church established in the chief cities of eastern China, but a regular overland trade | was carried on between Italy and China, by way of Tana (Azoff), Astrakhan, Otrar, Kamul (Hami), and Kan-chow. Many a traveller other than Marco Polo might have brought home the block-books,

-and some might have witnessed the process of making them. This

is the less to be ascribed to Polo, because he so curiously oiits to speak of the process of printing, when, in describing the block- printed paper-money of China, his subject seems absolutely to challenge a description of the art. (Eee)

POLOTSK, a district town of the government of Vitebsk, at the confluence of the Polota with the Dwina (Diina), 5 miles from the Smolensk and Riga Railway, is one of the oldest towns of Russia. The continuous wars, however,

| of which, owing to its position on the line of communica-

tion between central Russia and the west, it was for many centuries the scene, have allowed almost nothing of its remarkable antiquities to remain. The “upper castle” which stood at the confluence of the rivers and had a stone-wall with seven towers, is now in ruins, as also is the “lower castle,” formerly enclosed with strong walls and connected with the upper bya bridge. The numerous monasteries and convents also have disappeared. The cathedral of St Sophia in the upper castle, built in the 12th century, and successively used as a place of worship by the Greek, the Catholic, and the “ United” Churches, fell to ruins in the 18th century, when the “United” bishop Grebnicki substituted a modern structure. ‘The town is now of trifling importance, and the population (12,200 in 1880, against 13,800 in 1865) is decreasing. Upwards of two-thirds of the inhabitants are Jews ; the remainder have belonged mostly to the Greek Church since XIX. — 52

1839, when they were compelled to abandon the Union. Flax, linseed, corn, and timber are the leading articles of the commerce of the town.

Polotesk or Poltesk is mentioned in 862 as onc of the towns given by Rurik to his men, together with Byelo-ozero and Rostoff. In 980 it had a prince of its own, Rogvolod, whose daughter is the subject of many legends. It remained an independent principality

until the 12th century, resisting the repeated attacks of the princes of Kieff; those of Pskoff, Lithuania, and the Livonian knights, however, proved more

powerful, and it fell under Lithuanian rule in the following ecntury. About 1385 its independence was de- stroyed by the Lithuanian prince Witowt. It was five times besieged by Moscow in 1500-18, and was taken by John the Terrible in 1563. Recaptured by Stephen Batory sixtcen years later, it beeame Polish by the treaty of 1582. It was then a populous city, which, enjoying the privileges of “ Magdeburg law

from 1498, carried on an active commerce, and covered a large area.

destroyed 15,000. The castles, the town, and its walls were burned in 1607 and 1642. The Russians continued their attacks, burning and plundcring the town, and twice taking possession of it for a few years, in 16338 and 1705. It was not definitively annexed, how- ever, to Russia until 1772, after the first dismemberment of Poland. In 1812 its inhabitants resisted the French invasion, and the town was partially destroyed.

POLTAVA, a government of south-western Russia, bounded by Tchernigoff on the N., Kharkoff on the E., Ekaterinoslaff and Kherson on the S., and Kieff on the W., and having an area of 19,265 square miles. Its surface is an undulating plain from 500 to 600 feet above sea-level, with a few elevations reaching 670 feet in the north, and gently sloping to the south-west, where its range is between 300 and 400 feet. Owing to the excavations of the rivers, their banks, especially those on the right, have the aspect of hilly tracts, while low plains stretch to the left. Low-lying districts with some marshes and sandy tracts are met with in the broad valley of the Dnieper, which skirts the province on the south-west. Almost the whole of the surface is covered with Tertiary deposits ; chalk appears in the north-east, at the bottom of deeper ravines. The government touches the granitic region of the Dnieper only in the south, below Krementchug. Lime- stone with dolerite veins occurs in the isolated hill of Isatchek, which rises above the marshes of the Sula. The whole is covered with a layer, 20 to 60 feet thick, of boulder clay, which, again, is often covered with a thick sheet of loess. Sandstone (sometimes suitable for grind- stones) and limestone are quarried, and a few layers of gypsum and peat bog are also known within the govern- ment. The soil is on the whole very fertile, with the exception of some sandy tracts. Poltava is watered by the numerous tributaries of the Dnieper, which flows along its border, navigable throughout. Deep sand

beds inter- sected with numberless ravines and old arms of the river stretch along the left bank, where accordingly the settle- ments are but few. It is joined by the Sula, the Psiol, the Vorskla, the Orel, the Trubezh, and several other tributaries, none of them navigable, although their courses vary from 150 to 270 miles in length. Even those which used to be navigated within the historical period, such as Trubezh and Supoy, are now drying up, while the others are being partially transformed into marshes. Only 5 per cent. of the total area is under wood; timber, wooden wares, and pitch are imported.

_ The population in 1881 reached 2,418,870, of whom 217,800 lived in towns. The great majority are Little Russians, there being only 20,000 Great Russians, less than 1000 White Russians some 2000 Poles, and 1500 Germans. In 1865 the Jews were estimated at 40,000. Agriculture is the chicf pursuit, there being 7,451,000 aeres (60 pcr cent. of the total arca) of arable land, and the average yield of the years 1870-77 being 6,302,000 quarters of corn and 703,200 quarters of potatoes. The erops chiefly grown are wheat, tye, and oats; the sunflower is largely cultivated especially for oil, and the culture of tobacco, always important, has recently made a very grcat advance, uow yielding about

Pestilences and conflagrations were its ruin; the plaguc of | 1566 wrought great havoc among its inhabitants, and that of 1600

200,000 ewts. Kitchen gardening, the culture of the plum, and the preparation of preserved fruits are also important branches of industry. At Lubory, where an apothccarics' garden is maintained by the crown, the collection and cultivation of medicinal plants is also a specialty. The main source of wealth in Poltava always has been, and still is, its cattle-brecding. In 1881 there were 209,000 horses, 882,000 cattle, 1,820,000 sheep (only 520,060 of these, as against 878,000 in 1862, being of finer brecds), 405,000 pigs, and 7000 goats. Black and grey sheepskins arc largely exported, as also is wool. Some of the wealthier landowners and many peasants now rear finer breeds of horses.

The aggregate value of the manufactures in 1879 was £1,112, 100, employing in their production 3755 hands; distilleries hold the leading

place (£717,500), after which come flour mills (£136,600), tobacco works (£79,700), machine-making (£35,700), tanneries (£27,700), saw-mills (£20,000), and sugar-works (£10,900). Wool is exported in a raw state, and the woollen manufactures amounted only to £5750. In the villages and towns several domestic trades are carricd on, such as the preparation of sheepskins, plain woollen cloth, leather, boots, and pottery.

The fair of Poltava is of great importauce for the whole woollen trade of Russia; leather, cattle, horses, coarse woollen cloth, skins, and various domestic wares are also cxchanged for manufactures imported from Great Russia. The value of merchandise brought to the fair reaches and sometimes exceeds 25,000,000 roubles. Several other fairs, the aggregate returns for which reach more than one-half of the above, are held at Romny (tobacco), Krementchug (timber, corn, tallow, and salt), and Kobelyaki (sheepskins). Corn is exported to a considerable extent to the west and to Odessa, as also saltpetre, spirits of wine, wool, tallow, skins, and plain woollen cloth. The navigation on the Dnieper is interfered with by want of water, and becomes active only in the south. The chief traffic is by railway.

The government is divided into fifteen districts, the chief towns of which are—Poltava (41,050 inhabitants), Gadyatch (9250), Khorol (5175), Kobelyaki (13,150), Konstantinograd (4320), Krementchng (46,620 with Krukoff), Lokhvitsa (9320), Lubny (9820), Mirgorod (7750), Pereyaslaff (13,350), Piryatin (5400), Priluki (13,100), Romny (12,310), Zolotonosha (7180), and Zyen- koff (8360). Glinsk (8250) and Gradijsk (7850) have also muni- cipal institutions, while several villages and towns (Sorotchintsy, Borispol, Smyeloye, Grufi, Ryeshetilovka, &c.) have from 6500 to 8000 inhabitants.

History.—At the dawn of Russian history the region now occupied by Poltava was inhabited by the Syeveryanes. As carly as 988 the Russians erccted several towns on the Sula and Trubezh for their protection against the Petchenegs and Polovtsy, who held the south-castern steppes. Population extended, and the towns Pereyaslaff, Lubny, Lukomy, Priluki, Piryatin, Romny, &c., begin to be mentioned in the 11th and 12th centuries. The Mongol invasion destroyed most of them, and for two centuries afterwards they totally disappear from Russian annals. About 1331 Gedimin

annexed the so-called “Syeversk towns” to Lithuania, and on the recognition of the union of Lithuania with Poland they were. included in the united kingdom along with the remainder of Little Russia. In 1476 a separate principality of Kieff under Polish rule and Polish institutions was formed out of Little Russia, and remained so until the rising of Bogdan Khmyelnitzkii in 1654. By the Andrusoff treaty, the left bank of the Dnieper being ceded to Russia, Poltava became part of the dominions of the Zaporogian hetman, and was divided into ‘‘ regiments,” six of which (Poltava, Pereyaslaff, Priluki, Gadyatch, Lubny, and Mirgorod) lay within the limits of the present government. They lost their independence in 1764, and serfdom was introduced in 1783, the Poltava region becoming part of the governments of Kieff and Ekaterinoslaff. The present government was instituted in 1802.

POLTAVA, capital of the above government, stands on the right bank of the Vorskla, 88 miles by rail to the west-south-west of Kharkoff. The town is built on a plateau which descends by steep slopes nearly on all sides; the buildings are separated by large yards and gardens. Several suburbs, inhabited by Cossacks, whose houses are buried amid gardens, and a German colony, surround the town. Water is scarce, and has to be brought a long distance, from the marshy Vorskla. The oldest buildings are the Krestovozdvijenskiy monas- tery, erected in 1650, and a wooden church visited by Peter I. after the battle of Poltava. There are two lyceums for boys and girls, a “realschule,” a military school for cadets, a theological seminary, and two girls’ colleges, besides Russian, German, and Jewish primary schools. The manufactures are insignificant (£58,000 in

1879) ; the principal are tobacco works (£27,500) and a

tannery (£14,400). The trade derives its importance from the four fairs that are held at Poltava. The chief of these, in July (noticed above), is visited by 30,000 to 40,000 people. In 1881 the population was 41,050.

Poltava is mentioned in Russian annals in 1174, under the name of Ltava, but does not again appear in history until 1430, when, together with Glinsk, it was given by Gedymin to the Tartar prince Leksada. Under Bogdan

Khmyelnitzkii it was the chief town of the Poltava “regiment.” Peter I. defcated Charles XII. in the immediate neighbourhood on June 27, 1709.

POLYENUS, a Macedonian, lived at Rome as a rhetorician and pleader in the 2d century. When the Parthian War (162-165 a.p.) broke out, Polyznus, too old to share in the campaign, dedicated to the emperors Marcus Antoninus and Lucius Verus a work, still extant, called Strategica or Strategemata, an historical collection of stratagems and maxims of strategy written in Greek and strung together in the form of anecdotes. It is not strictly confined to warlike stratagems, but includes also examples of wisdom, courage, and cunning drawn from civil and political life. The work is uncritically and negligently written, but is nevertheless important on account of the extracts it has preserved from histories now lost. It is divided into eight books, and originally contained nine hundred anecdotes, of which eight hundred and thirty-three are extant. Polyaenus intended to write a history of the Parthian War, but there is no evidence that he did so. His works on Macedonia, on Thebes, and on tactics (if

indeed this be not identical with the Strateyica) are lost.

His Strategics seems to have been highly esteemed by the Roman emperors and to have been handed down by them as a sort of heir- loom. From Rome it passed to Coustantinople ; at the end of the 9th century it was diligently studied by Leo VI., who himsclf wrote a work on tactics ; and in the middle of the 10th century Constantine Porphyrogenitus mentioned it as onc of the most valuable books in the imperial library. It was used by Stobus, Suidas, and the anonymous author of the work wep) amiotwy (Mythographi Greci, ed. Westermann, p. 823). It is arranged as follows :—bks. i., ii., ii., stratagems occurring in Greek history, from the mythical times of Dionysus and Hercules onward; bk. iv., stratagems of the Macedonian kings and successors of Alexander the Great; bk, v., stratagems occurring in the history of Sicily and the Greek islands and colonies ; bk. vi., stratagems of whole peoples (Carthaginians, Lacedemonians, Argives, &c.), togcther with some of individuals (Philopemen, Pyrrhus, Hannibal, &c.); bk. vii., stratagems of the barbarians (Medes, Persians, Egyptians, Thracians, Scythians, Celts) ; bk. viii., stratagems of Romans and women. This distri- bution is not, however, observed very strictly. Of the negligence or haste

with which the work was written there are many instances : e.g., he confounds Dionysius the elder and Dionysius the younger, Mithradates satrap of Artaxerxes and Mithradates the Great, Scipio the elder and Scipio the younger; he mixes up the stratagems of Cesar and Pompey; he brings into immediate connexion events which were totally distinct ; he narrates some events twice over, with variations according to the different authors from whom he draws. Though he usually abridges, he occasionally amplifies arbitrarily the narratives of his authorities. He never mentions his authorities, but amongst authors still extant he used Herodotus, Thucydides, Xenophon, Polybius, Diodorus, Plutarch, Frontinus, and Suetonius ; amongst authors of whom only fragments now remain he drew upon Ctesias, Ephorus, Timeus, Phylarchus, and perhaps Aristagoras, Dinon, Heraclides, Megasthencs, and Nicolaus Damascenus. His style is clear, but monotonous and inelegant. He heaps up participles and falls alternately into the opposite faults of accumulating and totally omitting conjunctions. A glaring instance of these faults is to be found in bk. iii. 9, 33. In the forms of his words he generally follows Attic usage.

His work was first printed in a Latin translation by Justus Vulteius (Basel, 1549); the Greek text wus first edited by Casaubon (Leyden, 1589), but mainly from a very inferior MS. Korais in his edition (Paris, 1809) eorrected the text in many plaees. The best edition is that of Wélfflin (Teubner, 1860), whose preface may be consulted with advantage.

POLYANTHUS. See Primross.

POLYBIUS, the historian, was a native of Megalo- polis in Arcadia, the youngest of Greek cities (Paus. viii. 9), but one which played an honourable part in the last days of Greek freedom as a staunch member of the Achean league. Polybius’s father Lycortas was the intimate friend of Philopcemen, himself also a citizen of Megalopolis, and on the death of the latter, in 182 B.c.,

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succeeded him as leader of the league. The date of Polybius’s birth can only be fixed approximately. He tells us himself that in 181 he had not yet reached the age (130 years, Polyb., xxix. 9) at which an Achzan was legally

capable of holding office (xxiv. 6). We learn from Cicero (Ad Fam., v. 12) that he outlived the Nu- mantine war, which ended in 132, and from Lucian (Macrob., 22) that he died at the age of eighty-two. We may therefore follow the majority of authorities in placing his birth between 214 and 204 B.c. Little is known of his early life. As the son of Lycortas he was naturally brought into close contact with the leading men of the Achzean league. With the foremost of them, Philopcemen, he seems to have been on intimate terms, Plutarch (ei mpeo., 12) describes him as sitting at the feet of the great Achzan soldier, of whom Polybius himself always writes in terms of affectionate admiration; and after Philope- men's tragic death in Messenia (182) he was entrusted with the honourable duty of conveying home the urn in which his ashes had been deposited (Plut., Phil., 21). The next year (181) witnessed what seems to have been his first entry into political life. Together with his father Lycortas and the younger Aratus, he was appointed, in spite of his youth, a member of the embassy which was to visit Ptolemy Epiphanes, king of Egypt,—a mission, however, which the sudden death of Ptolemy brought to a premature end (xxv. 7). The next twelve years of his life are a blank, but in 169 he reappears as a trusted adviser of the Achzans at a difficult crisis in the history of the league. In 171 war had broken out between Rome and the Macedonian king Perseus, and the Acheean statesmen were divided as to the policy to be pursued : to side with Macedon would have been suicidal ; Lycortas himself was in favour of neutrality, but there were good reasons for fearing that the Roman senate would regard neutrality as indicating a secret leaning towards Macedon, and indeed both Lycortas and Polybius himself had already incurred suspicion at Rome on this ground. Polybius therefore declared for an open alliance with Rome, and his views were adopted. It was decided to send an Achzan force to cooperate with the Roman general. Polybius was selected to command the cavalry, and was at once despatched to the Roman camp to announce the decision of the league (xxviii. 10 sq.). The Roman consul declined the proffered assistance, but Polybius accompanied him throughout the campaign, and thus gained his first insight into the military system of Rome. On his return home he was able to render an important service to his countrymen by checking the unauthorized attempt of a Roman officer to raise troops in Achaia (xxviii. 13). In the next year (168) both Lycortas and Polybius were ou the point of starting at the head of 1200 Achzans to take service in Egypt against the Syrians, when an intimation

from the Roman com- mander that armed interference was undesirable put a stop to the expedition (xxix. 23). The success of Rome in the war with Perseus was now assured, and it is possible that the readiness of Lycortas and Polybius to serve abroad was partly due to a belief that the fate of Macedon must soon be shared by Achaia. © If this was so, the belief was but too well founded. The final defeat of Perseus was rapidly followed by the arrival in Achaia of Roman commissioners charged with the duty of securely establishing Roman interests there. Asa result of their proceedings 1000 of the principal Achaans were arrested and carried off to Italy. Polybius was among the number, but, while his companions were condemned to a tedious incarceration in the country towns of Italy, he obtained permission to reside in Rome. This privilege he owed to the influence of A‘milius Paullus, and his two sons

Scipio and Fabius (xxxii. 9), wno seem to have made his acquaintance in Macedonia. At any rate Polybius was received into Amilius’s house, and became the instructor of his sons (Appian, Pun., 132). Between Scipio, the future conqueror of Carthage, and himself a friendship soon sprung up which ripened into a lifelong intimacy. To the last Scipio so constantly relied upon the advice and counsel of Polybius that it could be ‘said by the country- men of the latter that Scipio never failed when he followed the advice of his friend (Pausan., viii. 30). To Polybius himself his friendship with Scipio was not merely the chief pleasure of his life but of inestimable service to him throughout his career. It protected him from interfer- ence, opened to him the highest circles of Roman society, and enabled him to acquire a personal influence with the leading men, which stood him in good stead when he after- wards came forward to mediate between his countrymen and Rome. It placed within his reach opportunities for a close study of Rome and the Romans such as had fallen to no historian before him, and secured him the requisite leisure for using them, while Scipio’s liberality more than once supplied him with the means of conducting difficult and costly historical investigations (Pliny, V. H.,v. 9). In 151, after seventeen years of banishment, the few surviv- ing exiles were allowed to return to Greece. But the stay of Polybius in Achaia was brief. The estimation in which he was held at Rome is clearly shown by the anxiety of

the consul Mamilius (149) to take him as his adviser on his expedition against Carthage. Polybius started to join him, but broke off his journey at Corcyra on learning that ‘the Carthaginians were inclined to yield and that war was unlikely (xxxvi. 3). But when, in 147, Scipio himself took the command in Africa, Polybius hastened to join him, and was an eye-witness of the siege and destruction of Carthage (Appian, Pun., 132). During his absence in Africa, the Achzans had made a desperate and ill-advised attempt to assert for the last time their independence of Rome,—a passionate outbreak which Polybius had dreaded, and which his presence might have prevented. As it was he returned in 146 to find Corinth in ruins, the fairest cities of Achaia at the mercy of the Roman soldiery, and the famous Achean league shattered to pieces (Pol. ap. Strabo, p. 381). But there was still work to be done that he alone could do. All the influence he possessed was freely spent in endeavour- ing to shield his countrymen from the worst consequences of their rashness. The excesses of the soldiery were checked, and at his special intercession the statues of Aratus and Philopcemen were preserved (xxxix. 14). An even more difficult task was that entrusted to him by the Roman authorities themselves, of persuading the Achzeans to acquiesce in the new régime imposed upon them by their conquerors, and of setting the new machinery in working order. With this work, which he accomplished so as to earn the heartfelt gratitude of his countrymen (xxxix. 16), his public career seems to have closed. The rest of his life was, so far as we know, devoted to the great history which is the lasting monument of his fame. He died at the age of eighty-two of a fall from his horse (Lucian, Macrob., 22).

Of the forty books which made up the history of Polybius, the first five alone have come down to us ina complete form; of the rest we have only more or less copious fragments. But as to the general plan and scope of the work there is no room for doubt, thanks mainly to the clearness with which they are explained by Polybius himself. The task which he set himself was that of making plain, for the instruction of his own and future generations, how and why it was that ‘‘all the known regions of the civilized world had fallen under the sway of Rome”’ (iii. 1). This empire of Rome, unprecedented in its extent and still more so in the rapidity

with which it had been acquired, was the standing wonder of the age, and ‘‘ who,” he exclaims (i.1), “is so poor-spirited or indolent

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as not to wish to know by what means, and thanks to what sort of constitution, the Romans subdued the world in something less than fifty-three years?” These fifty-three years are those between 220 (the point at which the work of Aratus ended) and 168 B.c., and extend therefore from the outbreak of the Hannibalic war to the defeat of Perseus at Pydna. To this period then the main portion of his history is devoted from the third to the thirtieth book inclusive. But for clearness’ sake he prefixes in books i. and ii. such a preliminary sketch of the earlier history of Rome, of the first Punic War, and of the contemporary events in Greece and Asia, as will enable his readers more fully to understand what follows. This seems to have been his original plan, but at the opening of book iii., written apparently after 146, he explains that he thought it desirable to add some account of the manner in which the Romans exercised the power they had won, of their tempera- ment and policy, and of the final catastrophe which destroyed — Carthage and for ever broke up the Achean league (iii. 4, 5). To this appendix, giving the history from 168-146, the last ten books are devoted. ;

Whatever fault may be found with Polybius, there can be no question that he had formed a high conception of the task before him, and of the manner in which it should be executed. He lays repeated stress on two qualities as distinguishing his history from the ordinary run of historical compositions. The first of these, its synoptic character, was partly necessitated by the nature of the period with which he was dealing. The interests, fortunes, and doings of all the various states fringing the basin of the Mediter- ranean had become so inextricably interwoven that it was no longer possible to deal with each of them in isolation. The his- torian must deal with this eomplex web of affairs as a whole, if he would be able either to understand or to explain it properly. Polybius therefore claims for his history that it will take a compre- hensive view of the whole course of events in the civilized world, within the limits of the period with which it deals (i. 4). Iu doing so he marks a new point of departure in historical writing, “for we have

undertaken” he says ‘‘to record, not the affairs of this or that people, like those who have preceded us, but all the aflairs of the known world at a certain time.” In other words, he aims at placing before his readers at each stage a complete survey of the field of action from Spain in the West to Syria and Egypt in the East. This synoptic method proceeds from a true appreciation of what is now called the unity of history, and to Polybius must be given the credit of having first firmly grasped and clearly enforced a lesson which the events of his own time were especially well cal- culated to teach. Posterity too has every reason to be grateful, for, though, as will be seen later, this synoptic method frequently inter- feres with the symmetry and continuity of his narrative, yet it has given us such a picture of the 2d and 8d centurics before Christ as no series of special narratives could have supplied.

The second quality upon which Polybius insists as distinguishing his history from all others is its ‘‘ pragmatic” character. It deals, that is, with events and with their causes, and aims at an accurate record and explanation of ascertained facts. This ‘‘ pragmatic method” (ix. 2) has a double value. First of all it makes history intelligible by explaining the how and the why; and, secondly, it is only when so written that history can perform its trne function of instructing and guiding those who study it. For the great nse of history according to Polybius is to contribute to the right conduct of human life (i. 35), by supplying a storehouse of experience for the assistance of those who will usc it. But this it can only do if the historian bears in mind the true nature of his task. Above all things he mnst not content himself with merely writing a pleasant tale. He must remember that the historian shonld not write as the dramatist does to charm or excite his audience for the moment but to edify and instruct all serious students in the future (ii. 56). He will therefore aim simply at cxhibiting events in their true light, setting forth ‘‘the why and the how” in each case, not con- fusing causes and occasions, or dragging in old wives’ fables, prodi- gies, and marvels (ii. 16 ; iii. 48). He will omit nothing which can help to explain the events he is dealing with: the genius and tem- perament of particular peoples, their political and military systems, the characters of the leading men, the geographical features of the country, must all be taken into account. To this conception of the aim and methods of history Polybius is on the whole consistently faithful in practice. It is true that his anxicty to instruct leads

often to a rather wearisome iteration of his favourite maxims, and that his digressions, such as that on the military art, are occa- sionally provokingly long and didactic. But his comments and reflexions are for the most part sound and instructive (¢.g., those on the lessons to be learnt from the revolt of the mercenaries in Africa, i. 65; from the Celtic raids in Italy, ii. 85; and on the Romau character), while among his digressions are included such invaluable chapters as those on the Roman constitution (book vi.), the graphie description of Cisalpine Gaul (book ii.), and the account of the rise and constitution of the Achzan league (ii. 38 sq.). To his anxiety again to trace back events to their first causcs we owe, not only the careful inquiry (book iii.) into the origin of the

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Second Punic War, but the sketch of early Roman history in booki., | and of the early treaties between Rome and Carthage in iii. 22 sq. Among the many defects which he censures in previous historians, not the least serious in his eyes are their inattention to the political and geographical surroundings of the history (ii. 16; ili. 36), and their neglect duly to set forth the causes of events (ili. 6).

Polybius is equally explicit as regards the personal qualifications necessary for a good historian, and in this respect too his practice is in close agreement with his theory. Hc has a profound distrust of closet students and a profound belief in the valuc of a personal knowledge of affairs. Without such experience a writer will, he says, be guilty of endless blunders and omissions, and will inevitably distort the true relations and importance of events. History, he asserts, will not be satisfactorily written until either men of affairs undertake to write it, not asa piece of bye-work but as an honourable and necessary task, or until intending historians realize that somo actual experience of affairs is indispensable (xii. 28). Such ex- perience would have saved aceomplished and fluent Greek writers like Timezus from many of their blunders (xii, 25a), but the short- comings of Roman soldiers and senators like Q. Fabius Pictor show that it is not enough by itself, Equally indispensable is careful painstaking research. All available cvidence must be collected, thoroughly sifted, soberly weighed, and, lastly, the historian must be animated by a sincere love of truth and a

calm impartiality. What follows where any or all of these conditions and qualifica- tions are absent Polybius illustrates abundantly in his frequent and scathing criticisms on previous writers, In the case of Timeus, against whom he seems to cherish a peculiar animosity, nearly all that remains of book xii. is devoted to an exposition of his short- comings. Q. Fabius Pictor and Philinus are charged both with ignorance of important facts and with partiality (i. 14; ili. 9), while in the second book Phylarchus's account of the war between the Achan league and Cleomenes of Sparta is mercilessly dissected,

It is not possible here to discuss the question whether Polybius has been just to his vredecessors ; it is more important to consider how far he himself comes up to the standard by which he has tried others. In his personal acquaintance with affairs, in the variety of his experience, and in his opportunities for forming a correct judgment on events he is without a rival among ancient historians.

Of Polybius's anxiety to get at the truth no better proof can be given than his conscientious investigation of original documents and monumeuts, and his careful study of geography and topography —both of them points in which his predecessors, as well as his suc- cessor Livy, conspicuously failed. Polybius is careful constantly to remind us that he writes for those who are @iAouabels, lovers of knowledge, with whom truth is the first consideration. He closely studied the bronze tablets in Rome on which were inscribed the early treaties concluded between Romans and Carthaginians (see for these Rhein. Afws., 32, 614; iii. 22-26). He quotes the actual language of the treaty which ended the First Punic War (i. 62), and of that between Hannibal and Philip of Maeedon (vii. 9). In xvi. 15 he refers to a document which he had person- ally inspected in the archives at Rhodes, and in iii. 33 to the monument on the Lacinian promontory, recording the number of Haunibal's forces. According to Dionysius, i. 17, he got his date for the foundation of Rome from a tablet in the pontifical archives. As instances of his careful attention to geography and topography we have not only the fact of his widely extended travels, from the

African coast and the Pillars of Hercules in the west to the Euxine and the coasts of Asia Minor in the east, but also the geographical and topographical studies scattered throughout his history, such as the description of Sicily (i. 42), of Cisalpine Gaul (ii. 14), and of the Euxine (iv. 10), the discussion of Hannibal's route over the Alps, and the graphic picture of the scene of the battle of Lake Trasimene. Lastly, to judge from its extant fragments, book xxxiv. seems to have been actually a treatise on geography in general.

Next to the duty of original research, Polybius ranks that of impartiality. Some amonnt of bias in favour of one's own country may, he thinks, be pardoned as natural (xvi. 14) ; but it must not be gratified at the expense of truth. It is unpardonable, he says, for the historian to set anything whatever above the truth. And on the whole Polybius must be allowed here again to have practised what he preached. It is trne that his own sympathies and antipathies are not entirely concealed. His affection for and pride in Arcadia appear in more than one passage (iv. 20, 21), as also does his dislike of the olians (ii. 45; iv. 8, 16). His treatment of Aratus and Philopcemen, the heroes of the Achzan league, and of Cleomenes of Sparta, its most eonstant enemy, is perhaps open to severer eriticism—it is at any rate certain that Cleomenes does not receive full justice at his hands. Similarly his views of Rome and the Romans may have been influenced by his firm belief in the nccessity of accepting the Roman supremacy as inevitable, and by his intimacy with Scipio, the head of the great patrician house of the Cornelii. He has evidently a deep admira- tion for the great republic, for her well-balanced constitution, for her military system, and for the character of her citizens. He shares too the dislike of the Roman aristocraey for such men of the people as Flamiuius (ii. 21) and Varro (iii. 116). But, just as his patriotism does not blind him to the faults and follies of his countrymen (xxxviil. 4, 5, 6), so he does not scruple to criticize tome. He notices the incipient degeneracy of Rome after 146 (xviii, 35). He endeavours to hold the balance evenly between Rome and Carthage; he strongly condemns the Roman occupation of Sardinia as a breach of faith (iii. 28, 31); and he does full justice to the splendid generalship of Hannibal. Moreover, whether his liking for -Rome was excessive or not, there can be no doubt that he has sketched the Roman character in a masterly fashion. Their ambition, their invincible confidence in themselves, their dogged eourage which made

them more dangerous the harder they were pressed, and their devotion to the state are all clearly brought out. Nor does he show less appreciation of their practical sagacity, their readiness to learn from other peoples, their quickness in adapting their tactics both in war and diplomacy to changing circumstances, and their mastery of the art of ruling,

His interest in the study of character and his skill in its delinea- tion are everywhere noticeable. He believes, indeed, in an over- ruling Fortune, which guides the course of events. It is Fortune which has fashioned anew the face of the world in his own time (iv. 2), which has brought the whole civilized world into subjection to Rome (i. 4); and the Roman empire itself is the most marvellous of her works (viii. 4). But under Fortune not only political and geographical conditions but the characters and temperainenuts of nations and individuals play their part. Fortune selects the best instruments for her purposes. The Romans had been fitted by their previous struggles for the conquest of the world (i. 68) ; they were chosen to punish the treachery of Philip of Macedon (xv. 4); and the greatest of them, Scipio himself, Polybius regards as the especial favourite of fortune (xxxli. 15; x. 5).

The praise which the matter of Polybius's history deserves cannot be extended to its form, and in this respect he contrasts sharply with Livy, whose consummate skill as a narrator has given him a popularity which has been denied to Polybius. Some of the most serious defects which spoil Polybius's history as a work of art are due to an over-rigid adherence to those views of the nature of the task before him which have been described above. His laudable desire to be comprehensive, and to present a picture of the whole political situation at each important moment, is fatal to the con- tinuity of his narrative. The reader is hurried hither and thither from one part of the field to another in a manner at once wearisome and confusing. Thus the thrilling story of the Second Punic War is broken in upon by digressions on the contemporary affairs in Greece and in Asia. More serious, however, than this excessive love of synchronism is Polybius's almost pedantic anxiety to edify and to instruct. For grace and elegance of composition, and for the artistic presentation of events, he has a hardly concealed con- tempt. Hence a general and almost studied carelessness of effect, which mars his whole work. On the other hand he is never weary of

preaching. His favourite theories of the nature and aims of history, of the distinction between the universal and special histories, of the duties of an historian, sound as most of them arc in themselves, are enforced again and again at undue length and with wearisome iteration. No opportunity is lost of pointing out the lesson to be learnt from the events described, and more than once the reader is irritated, and the effect of a graphic picture is spoilt, by obtrusive moralizing. Nor, lastly, is Polybius's style itself such as to eompen-

sate for these defects. It is, indeed, often impressive from the evident earnestness and sincerity of the writer, and from his sense of the gravity of his subject, and is uuspoilt by rhetoric or conceit. It has about it the ring of reality; the language is sometimes pithy and vigorous ; and now and then we meet with apt metaphors, such as those borrowed from boxing (i. 57), from cock-fighting (i. 58), from draughts (i. 84). But, in spite of these redeeming features, the prevailing baldness of Polybius's style excludes him from the first rank among classical writers ; and it is impossible to quarrel with the verdict pronounced by Dionysius of Halicarnassus, who places him among those authors of later times who neglected the graces of style, and who paid for their neglect by leaving behind them works 'which no one was patient enough to read through to the end (wep) cuvbés. dvoudrwr, 4). ne eee are

It is to the value and variety of his matter, to his critical insight, breadth of view, and wide research, and not least to the surpassing importance and interest of the period with which he deals, that Polybius owes his place among the writers of history. What is known as to the fortunes of his histories, and the reputation they enjoyed, fully bears out this conclusion. The silence respecting him maintained by Quintilian and by Lucian may reasonably be taken to imply their agreement with Dionysius as to his merits as a master of style. On the other hand, Cicero (De Off, iii. 32) describes him as "bonus auctor in primis"; in the De Republica (ii. 14) he praises highly his accuracy in matters of chronology, 'nemo in exquirendis temporibus diligentior"; and Cicero's younger contemporary, Marcus Brutus, was a devoted student of Polybius, and was engaged on the eve of

the battle of Pharsalia in compiling an epitome of his histories (Suidas, s.v.; Plutarch, Brut., 4). Livy, however, notwithstanding the extent to which he used his writings (see Livy), speaks of him in such qualified terms as to suggest the idea that his strong artistic sensibilities had been wounded by Polybius's literary defects. He has nothing better to say of him than that he is '' by no means contemptible" (xxx. 45), and 'not an untrustworthy author" (xxxiii. 10). Posidonius and Strabo, both of them Stoics like Polybius himself, are said to have written continuations of his history (Suidas, s.v.; Strabo, p. 515). Arrian in the early part of the 2d and #lian in the 8d century both speak of him with respect, though with reference mainly to his excellence as an authority on the art of war. In addition to his Histories Polybius was the author of the following smaller works :—a life of Philopeemen (Polyb., x. 24), a history of the Numantine War (Cic., 4d Fam., v. 12), a treatise on tactics (Polyb., ix. 20; Arrian, Zactica; lian, TJact., i.). The geographical treatise, referred to by Geminus, is possibly identical with the thirty-fourth book of the Histories (Schweigh., Prejf., p. 184.

The complete books (i.~~v.) of the Histories were first printed in a Latin transla~~ tion by Nicholas Perotti in 1473, The date of the first Greek edition, that by Obsopus, is 1530. For a full account of these and of later editions, as well as of the extant MSS., see Schweighiiuser's Preface to his edition of Polybius. Our knowledge of the contents of the fragmentary books is derived partly from quotations in ancient writers, but mainly from two collections of excerpts; onc, probably the work of a late Byzantine compiler, was first printed at Basel in 1549 and contains extracts from books vi.—xviii. (wept mpeoBetwv, mepi apeTys Kat xaxtas); the other consists of two fragments from the "select passages" from Greek historians compiled by the directions of Constautine Porphyrogenitus in the 10th century. To these must be added the Vatican excerpts edited by Cardinal Mai in the present century.

The following are the more important modern editions of Polybius :—Ernesti (3 vols., 1763-64); Schweighauser (8 vols., 1793, and Oxford, 1823); Bekker (2 vols., 1844); L. Dindorf (4 vols., 1866-68, 2d cd., Teubner, 1882); Hultsch (4 vols., 1867- 71). For the literature of the subject, see Engelmann, Biblioth. Script. Class.: Script. Grect (pp. 646-650, 8th cd., Leipsic, 1880). (HEPES)

POLYCARP. The importance of Polycarp, bishop of Smyrna, for the earliest period of church history arises from his historical position. He was on the one hand a disciple of John and other apostles and disciples of Jesus ; on the other hand he was the teacher of Irenzeus, the first of the catholic fathers! In his letter to Florinus, Trenzeus (ap. Euseb., H.Z., v. 20) says :—

'* Tsaw you when I was yet, asa boy, in Lower Asia with Polycarp. . . . « Tcould even now point out the place where the blessed Poly- carp sat and spoke, and describe his going out and coming in, his manner of life, his personal appearance, the addresses he delivered to the multitude, how he spoke of his intercourse with John and with the others who had seen the Lord, and how he recalled their words. And everything that he had heard from them about the Lord, about His miracles and His teaching, Polycarp told us, as one who had re- ceived it from those who had seen the Word of Life with their own eyes, and all this in complete harmony with the Scriptures. To this I then listened, through the mercy of God vouchsafed to

me, with all eagerness, and wrote it not on paper but in my heart, and still by the grace of God I ever bring it into fresh remembrance.”

These are priceless words, for they establish a chain of tradition (Jesus, John, Polycarp, Irenzeus) which is without a parallel in history. It is all the more to be regretted that

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Irenxus in his great work? has said so little of Polycarp, and that neither Polycrates of Ephesus? nor Tertullian‘ mentions anything of importance.

The sources for the life and activity of Polycarp are as follows :—(1) a few notices of Irenzeus; (2) the epistle of Polycarp to the church at Philippi; (8) the epistle of Ignatius to Polycarp; (4) the epistle of the church at Smyrna to the church at Philomelium, giving an account of the martyrdom of Polycarp. Since these authorities have all been called in question, and some of them entirely rejected, by recent criticism, it is necessary to say a few words about each of them.

1. Of the statements of Irenzeus, those contained in the letter to Victor and in the large work have passed unchallenged. The letter to Florinus, however, which places Polycarp in unequivocal connexion with the apostle John, has been discredited, because, it is alleged, John never was in Asia Minor. But this denial of John’s residence in Asia Minor is itself a piece of critical arbi- trariness, and to assert that the epistle to Florinus is spurious is a desperate resource. The only argument which can be adduced against it with any sort of plausibility is the fact that in his great work Irenzeus does not satisfy the expectations which the letter to Florinus is apt to raise ina modern reader. It is certainly the case that he tells us very little about Polycarp and still less about John, But statements from the mouth of Polycarp of the very kind which the letter to Florinus would lead us to expect are not altogether wanting in the great work of Ireneus (sec iii. 8, 4; il. 22,5; v. 30, 1)®; and that they are so few is accounted for by the plan and object of the treatise. The facts mentioned by Ireneus, therefore, cannot be set aside, although the assertion that Polycarp was appointed bishop of the

church at Smyrna by the apostles (ii. 8, 4) is probably a deduction from the Catholic theory of the origin of the episcopate. If it was once understood that Polycarp had seen apostles, the necessary inference for the time of Irenzus was that he had received his office from the hands of the apostles.

2. Under the name of Polycarp we possess, in a Latin transla- tion, a complete letter to the church at Philippi, which was first published by Faber Stapulensis in 1498, Of the Greek original, which was first edited by Halloix in 1638, unfortunately only three- fourths has been preserved.® Since Iveneus (iii. 3, 4) expressly mentions and commends a letter of Polycarp to the church of Philippi, since Eusebius (H. £., iii. 36) was acquainted with the epistle as we have it and makes extracts from it, and since Jerome (De Vir. Ill., xvii.) testifies that in his time it was publicly read in the Asiatic churches, the external evidence in its favour is as strong as could be desired. But the internal evidence is also very strong. The occasion of the letter was a case of embezzlement, the guilty individual being a presbyter at Philippi. It shows a fine combination of mildness with severity; the language is simple but powerful ; and, while there is undoubtedly a lack of original ideas, the author shows remarkable skill in weaving together pregnant sentences and impressive warnings selected from the apostolic epistles and the first epistle of Clement. There is no trace of any tendency beyond the immediate purpose of maintain- ing the true Christian life in the church, and warning it against covetousness and against an unbrotherly spirit. In these circum- stances it would certainly never have occurred to any one to doubt the genuineness of the epistle, or to suppose that it had been inter- polated, but for the fact that in several passages reference is made to Ignatius and his epistles. In point of fact the historical situation which is presupposed by the epistle is this, that Ignatius, on his last journey to Rome, has just passed through Philippi, and that his letters are circulating in the churches. Hence all those scholars who hold the seven Ignatian epistles to be spurious are compelled to regard the epistle of Polycarp as also a forgery,’ or at least as having been largely interpolated. The interpolation hypothesis, however, breaks down in view of the fact that the first epistle of Clement is quoted even in those passages which are alleged to be interpolated ; and besides it is inconsistent with the very obvious arrangement and unity of the composition. On the other hand the

2 The lost writings of Irenzeus may have contained fuller informa- tion ; see the close of the Martyrium Polycarpt in the Cod. Mosq., and the letter of Irenzus to Victor in Eusebius (Hf. #., v. 24).

3 Euseb., H. H., v. 24, 4. * De Prescr. Her., 32.

5 Cf. “ Presbyterorum reliquize ab Irenxo servate,” in the Patr. App. Opp., ed. Gebhardt, Harnack, Zahn, vol. i. 2, p. 105 sq.

6 All the Greek MSS. are derived from a single archetype, in which the epistle of Barnabas followed that of Polycarp, but a sheet of four leaves had been torn out, so that the end of Polycarp’s epistle and the beginning of that of Barnabas are missing.

? So, for example, Lipsius, Hilgenfeld, and others.

8 So Dalleus, first of all, then Bunsen and Ritschl (Hntstehung der altkathol. Kirche, 2d ed., p. 584 sq.).

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assumption that the whole work is a forgery is untenable—(1) because in that case we should expect that its tone and language and tendency would be in keeping with the Ignatian epistles, which is very far from being the fact, and (2) because we must assume that Irenzus himself had been deceived by a forged epistle of Polycarp, or else that he had read the genuine epistle, but in the eourse of the 3d century it had been supplanted by a spurious substitute. Either of these suppositions is extremely improbable, and, since internal narks of forgery are altogether absent, we must rather reverse the argument and say that the epistle of Polycarp is a very iinportant piece of evidence for the historical existence of a bishop of Antioch named Ignatius, for his journey to martyrdom at Rome, and for the fact that on this journey he wrote several letters. In these circumstances it is very desirable that we should be able to fix the exact date of Polycarp’s epistle. This unfortu- nately is impossible, owing to the colourless character of the writing. Still it is noteworthy that there is not a single trace of the time of Trajan, that on the contrary an expression in the seventh chapter seems to presuppose the activity of Marcion.! In that case the letter cannot

have been written before 140 a.p. The Ignatian epistles and the history of Ignatius furnish no argument to the eontrary, for the idea that Ignatius was martyred under Trajan eannot be traced higher than the 3d century,? while the ehronological indications in the Ignatian epistles themselves point to a later period. The epistle of Polycarp is of more importance for the Ignatian problem than for Polycarp himself. It conveys no distinct impression of his individuality, beyond the fact that the writer of this letter lived wholly in the ideas of the older generation and of the apostles, and would admit no addition to their teaching. That, however, is a feature which harmonizes admirably so far as it goes with the description which Irenus gives of Polycarp in the letter to Florinus. On account of its dependence on older epistles, the epistle of Polycarp is of great value for the history of the canon. For the constitutional history of the ehurch also it contains valuable materials; but for the history of dogma it is of little use.

3. The epistle of Ignatius to Polycarp is an important docu- ment, whether it is genuine or not. It belongs at any rate to the 2d century, so that even if it were spurious it would at least show what conception of the bishop's character was then prevalent. Polyearp appears in the letter as a man of a passive disposition, with too little energy and decision for the vehement Ignatius. The admonitions which Ignatius thinks fit to bestow on Polycarp (c. 1-6) are surprising, when we remember that they are addressed to an old aud venerable man. But Ignatius was writing under the consciousness of impending martyrdom, and evidently felt, with all his affected modesty, that this gave him a right to censure the churches and bishops of Asia. To pronounce the epistle spurious on aceount of its tone is hazardous, because it is difficult to imagine how it eould have entered the head of a forger to subject the honoured Polycarp to such treatment at the hands of Ignatius,

4, The most valuable source for the history of Polycarp is the letter of the church in Smyrna about his martyrdom. Eusebius has preserved the greater part of this epistle in his Church History (iv. 15); but we possess it entire with various concluding observa- tions in several Greek manuscripts, and also in a Latin transla- tion. The epistle gives a minute description of the persecution in Smyrna, of the last days of Polycarp, and of his trial and martyrdom; and, as it contains many instructive details, and professcs to have been written not long after the events to which it refers, it has always

been regarded as one of the most precious remains of the 2d century. Certain recent critics, however, have questioned the authenticity of the narrative. Lipsius* brings the date of the epistle down to about 260, although he admits many of its statements as trustworthy. Keim® endeayours to show in a long dissertation that it could not possibly have been written shortly after the death of Polycarp, but that, although based on good information, it was not composed till the middle of the 3d century. But Keim's own investigation is sufficient to convince every unprejudiced mind that the genuineness of the epistle will bear the closcst scrutiny, for the arguments he advanges are of no value. The only positions which Keim (following in the wake of others") makes good are that a few slight interpolations ® have been

1 Compare vii. 1 with Iren. iii. 3, 4.

2 See Harnack, Die Zeit des Ignatius, 1878.

3 See Zahn, " Epp. Ignat. et Polye.," in Patr. App. Opp., vol. ii; Von Gebhardt in the Ztschr. f. d. histor. Theol., 1875, p. 356 sq. ; Harnack, Zeit des Ignatius, 1878.

4 Zischr. f. wissensch. Theol., 1874, p. 200 sq.

5 Aus dem Urchristenthum, p. 90 sq.

6 He lays stress especially on the miraculous elements and the ideal of martyrdom held up in the letters,

" See Schiirer, Zéschr. f. d. histor. Theol., 1870, p. 208.

8 Amongst these we ought probably to include the expression, 4

KaBorikh éxxAnota (Inscr., c. xvi. 19), kadoAreds being here used in the sense of " orthodox."

inserted in the epistle, and that it was written, not a few days, but perhaps a year or two after the death of Polycarp. The statement in the epistle that

Polycarp suffered martyrdom under the pro- consulate of Quadratus has quite recently given rise to a voluminous literature. Eusebius in his Chronicle gives 166 A.D. as the year of Polycarp's death, and until the year 1867 this statement was never questioned. In that year appeared Waddington's ‘‘ Mémoire sur la chronologie de la vie du rhéteur Allius Aristide” (Afém. de Institut. imp. de France, 1867, xxvi.), in which it was shown from a niost acute combination of circumstances that Quadratus was proconsul of Asia in 155-6, and that consequently Polycarp was martyred on the 23d of February 155.9 Since the date of Polycarp's death is of great importance for the chronology of many other events, and sinee it is an unusual thing in the history of criticism for the date of any occurrence to be thus put eleven years farther back, Waddington's arguments have been examined by a great number of critics. Renan,!° Aube,” Hilgenfeld,!? Gebhardt, ¥ Lipsius,!4 Harnack,! Zahn,}6 Egli,” and others have declared them- selves satisfied, although some scholars regarded 156 as also a possible date. On the other hand Keim, 8Wieseler, and Uhlhorn,”° join issue with Waddington and adhere to the date of Eusebius. The arguments on which they rely do not appear to the present writér to be convincing, and it may be asserted with great proba- bility that the martyrdom of Polycarp took place on the 23d of February 155.2!__ Besides these we have no other sources for the life of Polycarp. The Vita 8. Polycarpi auctore Pionio (published by Duchesne, Paris, 1881, and Funk, Apost. Patr. Opp., vol. ii. p. 315 sq.) is wortliless,”?

The chief facts to be gathered about the life of Polycarp from the above sources are these. He must have been born before the year 69, for on the day of his death he declared that he had served the Lord for eighty-six years (Martyrium, ix.). He became a Christian in his earliest youth, and was an associate of the apostle John and other disciples of Jesus who had come from Palestine to Asia Minor. What he heard from them he kept in life-long remembrance, and in his manhood and old age he used to gather the young people round him, and repeat to them what he had learned from those who had seen Christ in the flesh. Amongst these youthful hearers was Irenzus, who has recorded much of what he thus learned (for example, an encounter between John and Cerinthus in the bath, a statement about the age of Jesus, &c.). Especially when heresy began to raise its head, the aged Polycarp never ceased to appeal to the pure doctrine of the apostles. He lived to see

the rise of the Marcionite and Valentinian sects, and vigorously opposed them. Irenzus tells us that on one occasion Marcion “endeavoured to establish relations with him” (Iren,, iii. 3, 4), and accosted him with the words érvywookes judas; there is no doubt that Marcion wished to be on friendly terms with so influential a man; but Polycarp displayed the same uncompromising attitude which his master John had shown to Cerinthus, and answered émywdoKxw oe Tov TpwrdtoKov Tod Yarava. These stern words are again applied to Marcion in the epistle to the Philippians ; for it is undoubtedly Marcion who is referred to in the following passage (c. vii.) : —“ He who falsifies the sayings of the Lord after his own pleasure, and affirms that there is no resurrection [of the flesh] and no judgment, is the first-born of Satan.” The

9 He died on a “great Sabbath”—another expression which has given rise to much discussion—by which is meant the Sabbath after Easter. In 155 this fell on the 23d February, and this agrees with what the church of Smyrna says about the day of its bishop’s death: apo émta karevdav Maprlov.

10 Antechrist, 1878, p. 207. 1 Hist. des perséc., 1875, p. 325 sq.

12 Ztschr. f. wiss. Theol., 1874, p. 305 sq.

13 Ztschr. f. d. hist. Theol., 1875, p. 356 sq.

14 Zischr. f. wiss. Theol. 1874, p. 188; Jahrbb. f. prot. Theol., 1883, p. 525 sq. 1 Zischr. f. Kirchengesch., 1876, p. 305.

16 “Epp. Ignat. et Polyc.,” as cited ahove.

7 Zischr. f. wiss. Theol., 1882, p. 227 sq., 1884, p. 216 sq.

18 Aus dem Urchristenthum, p. 90 sq.

19 Die Christenverfolgungen der Caesaren, 1878, p. 34 sq.

20 Realencyk. f. prot. Theol., 2d ed., xii. p. 105.

21 See Salmon in the Academy, 21st July 1883, p. 46 sq.

22 See Harnack in the Theol. Lit. Zeitung, 1882, No. 12; Zahn, in the Gétting. Gel. Anz., 1882, Heft 10.

steady progress of the heretical movement, in spite of all opposition, was a cause of deep sorrow to Polycarp, so that in the last years of his life (Iren. ap. Euseb., v. 20) the words were constantly on his lips, “Oh good God, to what times hast thou spared me, that I must suffer such things.” He never allowed himself to engage in discussion with heretics, but as far as possible avoided their presence. Even in early life he had become the head of the church

of Smyrna, where he was held in the highest respect. The |

congregation looked up to him as an apostolic and pro- phetic teacher (J/a7t., xvi.), and consequently as combin- ing in himself all the spiritual gifts which God had con- ferred on Christendom. In his old age the members of the congregration vied with each other in providing for his support (did., xiii.). How great his reputation was is best shown by the fury of the heathen and the Jews in his martyrdom. He was arrested amidst shouts of “This is the teacher of Asia; this is the father of the Christians ; this is the destroyer of our gods; this is the man who has taught so many no longer to sacrifice and no longer to pray to the gods” (ibid., xii.). When sentence was pronounced against him, every creature of the Jewish and heathen rabble hastened to add something to the pile of wood on which he was to be burned (iid, xiii.) They refused to deliver up his bones to the Christians for burial, for, said the Jews to the mob, “The Christians will now forsake the Crucified, and worship Polycarp” (iid., xvii.). The sacrifice of Polycarp immediately quenched the fury of the multitude, and the persecution ceased. All these facts prove the great influence which the bishop had in the city. But his reputation extended far beyond the limits of his own diocese. His letter to the church at Philippi shows us how fully his apostolic spirit, his wisdom and justice, must have been recognized even in Macedonia ; otherwise he could not have ventured to interfere in the purely internal affairs of the Philippian church. Ignatius, the bishop of Antioch, begins his letter to him with the words (c. 1)—’Azrodexdmevds cov tiv ev bed yvdpnv, 7Spac- pany os ert wérpav dxivytov, trepdogalw, Karagiwbeis

Tov TpoowmTov Gov Tod éuouov, ob dvainyv ev Geq, and, in spite of his patronizing tone, evidently writes with deep respect. But even the church at Rome were to have an opportunity of making the acquaintance of the venerable bishop. It is one of the most interesting and important incidents in the church history of the 2d century that Polycarp, in the year before his death (when he was above ninety years of age) undertook the journey to Rome in order to visit the bishop Anicetus.1 Irenzeus, to whom we are indebted for this information (Her. iii. 3, 4; Lp. ad Victorem, in Eusebius, Z/.#., v. 24, 16-17), gives as the reason for the journey that differences existed between Asia and Rome, or between Polycarp and Anicetus, ‘with regard to certain things,” and especially about the time of the Easter festival, which it was desirable to remove. He might easily have told us what these “certain things” were, and given us fuller details of the negotiations between the two great bishops; for in all probability he was himself in Rome at the time (Mart., Epilog. Mosq.). But unfor- tunately all he says is that, with regard to the “certain things,” the two bishops speedily came to an understand- ing, while, as to the time of Easter, each adhered to his

1 Anicetus was bishop from 154 (156) to 166 (167) (see Lipsius, Chron. d. Rém. Bischdfe, § 263.) Those critics who reject Wad- dington’s view as to the date of Polycarp’s death use this as their principal argument, that according to it there is no room for Polycarp’s Journey to Rome. It is certainly remarkable that the journey can just be brought under Waddington’s calculations and no more; but, since after all it can be brought under them, no conclusive argument can be drawn from this circumstance. A voyage to Rome at a favour-

able season of the,year was not a very formidable affair, and that

Polycarp was still comparatively vigorous is shown by his conduct during the persecution (J@art., v. sq.).

‘ haired bishop conducted himself.

own custom without breaking off communication with the other. We learn further that Anicetus, as a mark of special honour, allowed Polycarp to celebrate the Eucharist in the church (the Eucharist must therefore have still been celebrated at Rome in the Greek tongue), that many Marcionites and Valentinians were converted by Polycarp in Rome (so that his visit must have lasted for a consider- able time), and that Polycarp took leave of Anicetus in peace. On his return to Smyrna he enjoyed only about six

| months of uninterrupted activity. Then, on the occasion of

the festive games, there arose, as in so many other instances, an outburst of popular feeling against the Christians, in which Polycarp was to die a martyr's death. From the letter of the church of Smyrna we see with what magnani- mity and manliness and true Christian spirit the grey- It leaves the most vivid impression of a man of dignity and noble demeanour, and at the same time of humble disposition and compassionate love. Every action he does, every word he speaks, in the prosecution and during the trial is noble and great ; even that quiet irony which we detect in his answer to Marcion does not forsake him (Jart., ix. 2). The proconsul was anxious to save him, and tried to induce him to recant, but he remained steadfast. He was delivered up to the

populace, and his body was burned. The Christians

present believed that they saw a dove soaring aloft from the burning pile, and it was reported that an odour issued from it like that of costly incense (dbid., xvi. 15). Such legends do not require years for their formation, but only a few hours. By his death Polycarp shielded his con- gregation from further persecution. (A. HA.) POLYCLETUS. Two Greek sculptors bore this name. For an account of the works of the elder, a native of Sicyon, see vol. ii. p. 357, and figs. 6,7. With him is some- times confounded his younger kinsman and namesake, pro- perly known as Polycletus the Argive. For the most part this younger Polycletus confined himself to statues of athletes who had won prizes at Olympia. In recent exca- vations there two bases of statues by him have been found, but no remains of his work. From the fact of his having executed a statue of Zeus Philios, 7.¢c., a combination of Zeus and Dionysus, for the town of Megalopolis, which was founded in 371 B.c., we may assign him to about that date. POLYCRATES, a

celebrated Greek tyrant of Samos, was the son of Ataces. After distinguishing himself by his liberality towards his poorer fellow-citizens he took advantage of a festival to Hera in order to make himself master of Samos (537 or 536 B.c.).2 Allied with Amasis, king of Egypt, he prospered greatly, so that his fame went forth through all Greece and Ionia. He had 100 ships and 1000 bowmen. He made war indiscriminately on friend and foe, declaring with grim humour that he gratified his friends more by returning to them their own than by not taking it at all. Many islands fell before him and many cities on the mainland. Amongst the former was Rhenea, which he attached by a chain to the neigh- bouring island of Delos, and dedicated to the Delian Apollo. When the Lesbians would have succoured Miletus, he conquered and captured them in a sea-fight and employed them to dig a moat round the walls of his fortress. According to Herodotus, he was the first within historical times who aimed at the sovereignty of the seas, and his ambitious schemes embraced not only the Greek islands but also Ionia. In magnificence none of the Greek tyrants save those of Syracuse could compare with him.

2 Eusebius gives the date as 1484 (year of Abraham) =Olymp. 61,4 = October 533 to October 532. But codex N of the Armenian ver- sion of Eusebius has Abrah. 1480=Olymp. 60,4= Oct. 537 to Oct. 536. The former date, accepted by Clinton, would leave only ten years for the tyranny of Polycrates, which seems too little.

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His great public works were executed, according to Aristotle, for the purpose of employing his subjects and diverting their thoughts from the recovery of their free- dom.! He imported Spartan and Molossian hounds, goats from Naxos and Scyros, sheep from Attica and Miletus. The splendour of his palace is attested by the design which many centuries later the emperor Caligula formed of rebuilding it. Foreign artists worked for him at high

wages: from Athens he brought Demacedes, the greatest | Polycrates |

physician of the age, at a salary of two talents. was also a patron of letters: he collected a library and lived on terms of intimate friendship with the poet Anacreon, whose verses were full of references to his patron. The philosopher Pythagoras, however, quitted Samos in order to escape his tyranny. The good fortune of Polycrates is the subject of a famous story. Amasis, moved with fear at the exceeding great prosperity of his friend, reminded him that God is jealous, and that the man who is uplifted very high must needs fall very low. Therefore he besought him, if he would avert the jealous wrath of heaven, to cast from him that which he valued most. Polycrates hearkened to him and flung into the sea an emerald signet set in gold, the work of the Samian artist Theodorus. But a few days after the signet was found in

the belly of a large fish which a fisherman had presented |

to the king. When Amasis heard of this he knew that Polycrates was doomed, and renounced his alliance.

Amasis died before his forebodings were fulfilled. When | the Persians under King Cambyses were preparing to |

invade Egypt, Polycrates, anxious to conciliate the growing power of Persia, sent forty ships to their help (525 B.c.). But the squadron was largely manned by malcontents whom Polycrates had hoped thus to get rid of ; hardly had it reached the island of Carpathus when the crews mutinied and turned the ships' heads back to Samos. They defeated the tyrant in an action at sea, but were themselves over- thrown in a land battle and compelled to flee the island. Having taken refuge in Sparta, they prevailed on the Spartans to make war on Polycrates. A powerful Spartan armament laid siege to Samos, but was fain to retire after forty days without effecting its object. Not very long afterwards Orcetes, the Persian satrap of Sardes, by work- ing on the avarice and ambition of Polycrates, lured him to Magnesia and put him to a shameful death (522 B.c.).

The name of Polycrates was also borne by an Athenian rhctorician of some repute, who flourished early in the 4th century B.c. He taught at Athens, and afterwards in Cyprus. He composed declama- tions on paradoxical themes—an Hncomium on Clytemnestra, an Accusation of Socrates, an

Encomium on Busiris (a mythical king of Egypt, notorious for his inhuinanity); also declamations on mice, pots, and counters. His Zncomiwm on Busiris was sharply criticized by his younger contemporary Isocrates, in a work still cxtant, and Dionysius of Halicarnassus characterises his style as frigid, vulgar, and inelegant. Nevertheless his works are said to have becn studied by Demosthenes. See Jcbb's Attic Orators, ii. p. 94; Cope on Aristotle's Rhetoric, ii. c. 24.

POLYGLOTT. A polyglott is a book which contains side by side versions of the same text in several different languages ; and the most important polyglotts are editions of the Bible, or its parts, in which the Hebrew and Greek originals are exhibited along with the gréat historical versions, which are of value for the history of the text and its interpretation. The first enterprise of this kind is the famous /exapla of Origen; but here only Hebrew and

1 Herodotus, our chief authority for the life of Polycrates, mentions three great engineering and architectural works for which Samos was

remarkable :—(1) a tunnel, about 1400 yards long, dug through a | mountain, and serving to bring water to the capital ; (2) a great mole |

or breakwater round the harbour; (3) a great temple (the temple of Hera, patron goddess of Samos), said by Herodotus to be the largest he had ever seen. But we cannot say what share Polycrates had in these works ; certainly the temple of Hera seems to have been begun before his time.

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Greek were employed (though the versions of Aquila, Symmachus, and Theodotion were shown as well as the Septuagint), so that the work was rather diglott than polyglott in the usual sense. After the invention of printing and the revival of philological studies, polyglotts became a favourite means of advancing the knowledge of Eastern languages (for which no good helps were available) as well as the study of Scripture. The series began with the Complutensian (Alcala, 1514-17), already spoken of in the article on its promoter Cardinal JmmENeEs or Ximenes ; next came the Antwerp Polyglott (1569-72, in 8 vols. folio) of which the principal editor

was Arias Montanus aided by Guido Fabricius Boderianus, Raphelengius, Masius, Lucas of Bruges, and others. This work was under the patronage of Philip II. of Spain ; it added a new language to those of the Complutensian by including the Syriac New Testament ; and, while the earlier polyglott had only the Targum of Onkelos on the Pentateuch, the Antwerp Bible had also the Targum on the Prophets, and on Esther, Job, Psalms, and the Salomonic writings. Next came Le Jay's Paris Polyglott (1645), which embraces the first prints of the Syriac Old Testament (edited by Gabriel Sionita, a Maronite, but the book of Ruth by Abraham Ecchelensis, also a Maronite) and of the Samaritan Pentateuch and version (by Morinus, g.v.). It has also an Arabic version, or rather a series of various Arabic versions. Le Jay's work is a splendid piece of typography, but its success was marred by the appearance of the cheaper and more comprehensive London Polyglott. Le Jay was ruined, and a great part of the impression went to the trunkmakers. The last great polyglott is Walton's (London, 1657), which is much less beautiful than Le Jay's, but more complete in various ways, including among other things the Syriac of Esther and several apocryphal books for which it is wanting in the Paris Bible, Persian versions of the Pentateuch and Gospels, the Psalms and New Tes- tament in Ethiopic. Walton was aided by able scholars, and used much new manuscript material. His prolego- mena, too, and collections of various readings mark an important advance in Biblical criticism. It was in con- nexion with this polyglott that E. Castle produced his famous Jeptaglott Lexicon (London, 2 vols. folio, 1669), an astounding monument of industry and erudition even when allowance is made for the fact that for the Arabic he had the great MS. lexicon compiled and left to the university of Cambridge by the almost forgotten W. Bedwell. The later polyglotts are of little scientific importance, the best recent texts having been confined to a single language; but every Biblical student still uses Walton and, if he can get it, Le Jay. Of the numerous polyglotts on parts of the Bible it may suffice to mention the Genoa psalter of 1516, edited by Giustiniani, bishop of Nebbio. It is in Hebrew, Latin, Greek, Chaldee, and Arabic, and is interesting from the character of the Chaldee text, from being the first specimen of Western printing in the Arabic character, and from a curious note on Columbus and the discovery of America on the margin of Psalm xix.

POLYGNOTUS, a Greek painter. For a description of his work see vol. ii. p. 358. It may here be added that an approximate date for his paintings at Delphi is obtained from the fact that one of them was inscribed with an epigram written by the poet Simonides, who died 467 s.c. As Simonides appears to have resided in Sicily during the last ten years of his life, the epigram was pro- bably composed previous to 477 B.c. This series of mural paintings at Delphi, embracing about one hundred and forty-six figures, seems to have occupied two opposite walls of an oblong building known as the Lesche. The figures, hardly under life size, were disposed in two or sometimes

three rows, the one higher up than the other, with appa- rently but very slight indications of the fact that the figures of the upper rows were to be understood as standing at a more remote distance. The several rows would run con- tinuously like sculptured friezes, and indeed this manner of composition is best illustrated by the friezes at Vienna recently found at Gjélbaxhi in Lycia, some of which present subjects and motives identical with those treated by Poly- notus.

POLYHISTOR, Cornettus ALEXANDER, a Milesian

and disciple of Crates,! who through the fortune of war became the slave and afterwards the freedman of Cornelius Lentulus (Suidas). He received the Roman citizenship from Sulla (Servius on dn. x. 388), and wrote an enormous number of books on historical and geographical subjects, of which more than a hundred and fifty fragments have been collected (Miiller, Wr. Hist. Gr., iii. 206 sq.). His account of the doctrines of Pythagoras has been largely drawn from by Diogenes Laertius, but the most interesting of the fragments refer to the history of the Jews, for which Alexander drew on historical and poetical works of Jewish and Samaritan Hellenists. What has been pre- served on this subject, mainly by Eusebius in the Pre- paratio Evangelica, is sufficient to throw a good deal of light, not

particularly favourable, on the intellectual activity of the Hellenists of the 2d century B.c.

See J. Freudenthal, Hellenistische Studien, i. ii. (Breslau, 1875), in which the subject of the sources of Polyhistor is fully dis- cussed.

POLYNESIA. In the last edition of the Hncyclopedia Britannica Polynesia was used to denote all the intertropical islands of the Pacific Ocean eastward of the Philippine Islands to the north and the New Hebrides to the south of the equator. The New Hebrides and other islands west of that group were included under the term Australasia. Of late years these islands (sometimes also including Fiji) have been known as Melanesia, while the western islands of the North Pacific have been known as Micronesia. Thus Polynesia has been restricted to the central and eastern islands inhabited by the brown or Sawaiori race, becoming an ethnographic rather than a geographical term. Articles dealing with the western islands north and south of the equator will be found under Micronesia and Metanesia. The present article is intended to give a comprehensive view of all the islands of the Pacific, their physical characteristics, natural productions, and the races of men found upon them. The name Polynesia is therefore here employed in a wide signification and solely as a geographical term. The western boundary of this region runs from the great barrier reef of Australia eastward of New Guinea and the Philippine Islands. All the inter- tropical islands of the Pacific eastward of this imaginary line are included, and also a few others which extend outside the tropic of Capricorn to nearly 30° S. lat. Any other divisions for geographical purposes, except those of groups of islands, appear to be unnatural and uncalled for. For ethnographical purposes special terms are used for the three different classes of people found in this wide area.

If we exclude New CaLeponta (9.v.), which is of older formation than the rest, all the islands of Polynesia are either of volcanic or of coral formation. Some are purely coral, either in the shape of low atolls or of elevated plateaus. In a few atolls there are remnants of earlier volcanic rocks ; and most of the volcanic islands are more or less fringed with coral reefs. But, notwithstanding

1 From the scholiast on Apoll. Rh. Polyhistor was a Milesian only by edueat sonese is named as his birthplace. was not 2 personal disciple of Crates,

i, 925, it would appear that ion, for here the Carian Cher- The dates seem to show that he

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this mixture, the islands must be divided broadly into those which are volcanic and those which are of coral formation. The coral islands must again be subdivided into (1) atolls, or low islands which usually have a lagoon within them, and (2) elevated table-lands.

The volcanic islands, with the exception of the Hawaiian archipelago, are all south of the equator. In Plate II. the great volcanic ridge is indicated by two lines which, commencing in 150° E., run in a south-easterly direction to about 140° W. long. With the exception of two curves, one in the lower line south of the New Hebrides, and one in the upper line at its eastern extremity, these are parallel, and are 10° apart. Within these two lines he all the volcanic islands of Polynesia, except two isolated groups, viz., the Marquesas and Hawaiian Islands. On this ridge there are no atolls. The upper boundary line sharply divides the volcanic ridge from the atoll valley. This valley is indicated by a third line running for more than 50° of longitude parallel with the other two, at 20° distance from that bounding the northern extremity of the voleanic ridge. Eastward of 155° W. long. this line bends towards the south to exclude the isolated volcanic centre of the Marquesas Islands ; then, curving around the Tuamotu archipelago, it joins the central line. Within the area thus enclosed lie all the atolls or low coral lagoon islands of Polynesia, and there are no volcanic islands within this region except in three or four instances, where are found the remnants of former islands which have sunk, but have not been quite submerged. Thisis the region of subsidence —stretching across fully 100° of longitude, and covering generally about 20° of latitude.

Within the volcanic region there are a few coral islands, but these are all more or less elevated. Since their formation they have participated in the upward movement of the ridge on which they are situated. They are indicated on the map by dotted lines. Two of the groups are within the lines marking the volcanic ridge; and one, the Loyalty group, lies close to the lower line.

The Volcanic Islands.—Most of the volcanic islands of Polynesia are high in proportion to their size. The taper- ing peaks, or truncated cones, which form their backbone present a picturesque appearance to the voyager as he approaches them. In some there are precipitous spurs jutting into the sea, while in others the land slopes gently from the central peak to the shore. Where there are these gentle slopes, and wherever there is any low land near the shore, there also will be found a coral reef fring- ing the coast at a smaller or greater distance, according to the steepness of the land under the water. Where the trend downwards is very gradual, the edge of the reef will sometimes be one, two, or even three miles to sea- ward. It has been thought that the absence of extensive reefs in some islands of the New Hebrides is due to “sub- terranean heat.” But the steepness of the slope of the islands under water is doubtless the reason why the reefs are small, As the reef-building coral polypes do not live and work below a certain depth —about 20 fathoms, or 120 feet—we easily see that the distance of the outer edge of the reef must be according to the slope of the island beneath the water. Opposite to the larger valleys, where there is a stream flowing out to sea, there is usually found a break in the reef. This is doubtless caused either by the fresh water, or by the sediment which it contains, injuring the coral polypes and preventing them from effectively carrying on their work in these spots. The conviction of the present writer is that it is the sediment contained in the water—especially during heavy rains and consequent freshets—which prevents the growth of the coral, rather than the mere action of fresh water upon the polypes. Where there are streams of considerable

size, and especially where they are subject to floods, there | When it reached Samoa it was carefully cultivated by one

are generally wide openings into the reef, and stretches of deep water forming natural harbours sufficient for the accommodation of even large vessels. There are a few land-locked harbours, but most are thus formed by breaks in the reef.

In a few spots active volcanoes are still found. These are in the neighbourhood of New Britain and New Ireland, in the Solomon, New Hebrides, and Tonga archipelagoes. In most of the islands there have been no recent erup- tions ; but now and again the inhabitants of islands where voleanic action has apparently long ceased have been startled by a new outbreak. Over the whole region earth- quakes are of frequent occurrence. Most of the craters in the islands of Samoa have immense trees growing in them, and there is only one crater in the entire group which shows signs of even a comparatively recent erup- tion, or concerning which there is a tradition among the people of one. Yet in 1867, after an almost continuous succession of earthquakes during a whole night, there was a submarine eruption between two of the islands. This lasted only a few days. A few months afterwards the writer was on board H.M.S. “Falcon” when soundings were taken on the spot. A cone was found the summit of which was 90 fathoms deep, while all around the sea was 120 fathoms deep. Thus the outpourings of this sub- marine volcano during only a few days raised a mound in the bed of the ocean 180 feet in height.

The soil in the volcanic islands is generally very fertile. The climate is hot and moist in most of them; conse- quently the vegetation is wonderfully rich. The islands are densely clothed with the most luxuriant verdure from the sea-beach to the summits of the mountains. While in a few islands, especially the comparatively barren ones (barren is only a comparative term as applied to any of the volcanic islands), there is sometimes grand and bold scenery, in most of them the jagged and precipitous rocks are so covered up and rounded off with the rich vegetation that they lose much of their grandeur. The atmosphere is so laden with moisture that ferns, club-mosses, and even small shrubs grow upon the faces of the steepest rocks. Mainly on this account the scenery can rarely be said to be grand; but nearly all these islands are truly beautiful. There isa freshness about the vegetation all the year round which is rarely seen in other portions of the world. The cocoa-nut palm groves, which are usually abundant on the low lands near the sea,

always give a charm to the islands as they are approached. In addition to several species of palms, beautiful ferns, draczenas, crotons, and other elegant foliage plants abound. Pines are found on some of the western islands. For flowers none of them will compare with the hedgerows and meadows of England. There are, it is true, many most beautiful and sweet-scented flowers, but they are not usually found in great profusion.

Fruits are abundant. Some of the indigenous kinds are good, and many of the best productions of other tropi- cal countries have been introduced and flourish. Oranges are very plentiful in many islands; also pine-apples, guavas, custard apples, and bananas. The mango has been introduced into some islands, and flourishes well. Most of these fruits have been introduced by missionaries. One of the fruits most abundantly used, both in a ripe state and cooked when unripe as a vegetable, is the Chinese banana, Afusa Cavendishii. The first plant of this carried to the islands was in a case of plants given by the duke of Devonshire to the missionary John Williams when he returned from England to the Pacific shortly before he was killed on Erromanga. During the long voyage all the plants in the case died except this banana.

of the missionaries and a stock of it was propagated. From the single plant all the Chinese bananas in Poly- nesia have sprung, and, that particular kind being greatly prized both by natives and foreign settlers, it is now grown largely wherever missionaries or traders have gone, and must produce annually hundreds of tons of nutritious food.

The natives live chiefly upon vegetable food. In most of the volcanic islands the taro (Colocasia esculenta) is the most important food-producer. Next to this comes the yam (Dioscorea satwa). Probably next in importance to this are the plantains and bananas, then the bread-fruit (Artocarpus wncisa) and arrowroot (Zacca pinnatifida). The bread-fruit is more or less plentiful in most of the volcanic islands, and during one season of the year the natives very largely subsist upon it. It is not, however, by ay means so nutritious as the taro or the yam. This vegetable is often spoken of in Britain as if it were a rich fruit, but one would as soon eat a raw potato as a raw bread-fruit. It has been over-estimated by many writers who have visited the Pacific. The present writer has noticed that the Samoans suffered in

condition, that sick- ness among children was very common and the rate of mortality high during the bread-fruit season, Although the raw cocoa-nut is not eaten to any considerable extent by the natives of volcanic islands, this must not be omitted in an enumeration of the principal articles of their food supply, for it enters into the composition of most of their made dishes in the form of expressed juice or oil; the soft half-grown kernel is used as a kind of dessert, and the liquid from it, when the kernel is only half developed, is one of their principal beverages. The Ava, or Kava, a narcotic drink largely used, is made from the root of a pepper (Piper methysticum).

In some islands the cocoa-nut is the chief article of commerce, ‘The fully-grown kernel is cut into slices, dried in the sun, and sold as “cobra,” from which much of the palm oil of commerce is expressed. On many islands cotton is largely grown, and on a few, especially in the Hawaiian archipelago, sugar cultivation has made consider- able progress. Many other vegetable products might be utilized if there were a demand for them. The candle-nut (Aleurites triloba) is abundant everywhere near the coast. Coffee has not been grown to any considerable extent. Wild ginger and wild nutmegs are abundant on some of the islands. In some places indigo has been introduced, and has spread so much as to become a nuisance. All the islands have numerous valuable fibre-producing plants be- longing to the Urticee and Malvacex, But the probability is that, on these hot, moist, and fertile islands, cocoa-nuts, cotton, or sugar will always be the most profitable crops to cultivate for exportation.

The indigenous fauna of Polynesia is poor in mammals but rich in birds. Mammals are represented by rats and bats, the latter including the flying foxes (Pteropus). Some say pigs are indigenous, but they were doubtless introduced by early navigators. Horses and cattle have been introduced. They degenerate very rapidly, unless they are continually improved by newly-imported stock. Sheep and goats are introduced into some islands, but sheep do not usually thrive. Dogs are plentiful, being kept by most of the natives, who are naturally fond of domestic animals; but they degenerate greatly. Pigeons and doves, especially the fruit-eating pigeons (Carpophaga) and doves of the genus Pézlonopus, are abundant. The Carpophaga furnish a very important article of food in some of the islands. Some of the species of Péelonopus are exceedingly beautiful. Megapodes

are found in a few of the western islands ; the kagu (Rhinochetus jubatus) has

its home on New Caledonia ; and in Samoa the Didunculus strigtrostris has its habitat.. This bird is remarkable as being the nearest relative of the extinct dodo. — Some time ago it was rarely found, and was becoming extinct. It fed and nested.on the ground, and was destroyed by cats and rats after they were introduced. Of late it has changed

its habits: it now feeds, nests, and roosts upon trees, and’

is, in consequence, increasing in numbers. Certain non- venomous snakes are found in many of the islands. Insect life is abundant, and some of the butterflies are very beautiful. ;

The lagoons formed by the coral reefs around the islands invariably abound in fish, many of them most gor- geous in their colouring,—vying in this respect with the parrots of Australia. Fish form a very important part of the food supply. |

One of the most wonderful creatures in the marine fauna of Polynesia is the palolo (Palola viridis), an annelid which appears upon the surface of the ocean, near the edge of the coral reef, at certain seasons of the year. The palolo are from 9 to 18 inches long, and about {th of an inch thick. They are eaten by the natives, and are esteemed a great delicacy. They live in the inter- stices of the coral reef, and are confined to’a few localities. About 3 o’clock on the morning following the third quartering of the October moon they invariably appear upon the surface of the water ; generally they are in such quantities that they may be taken up by the handful. Soon after the sun rises they begin to break, and by 9 o’clock a.m. they have broken to pieces and disappeared. The morning following the third quarter of the November moon they again appear in the samc manner, but usually in smaller quantities. After that they are not again seen until October of the next year. They appear thus to deposit their ova, which is done by the break- ing to pieces of the female worms; the males also break in the same manner, the ova being fertilized while floating in the water. Thus the parents are

destroyed in propagating their species. The eggs gradually sink down to the reef where they are hatched. The young papolo then live about the reef until the next year, when they repeat the process. Year by year these creatures appear according to lunar time. Yet, in the long run, they keep solar time. This they do by keeping two cycles, one of three years and one of twenty-nine years. In the short cycle there are two inter- vals of twelve lunations each, and one of thirteen lunations. These thirty-seven lunations bring lunar, time somewhat near to solar time. But in the course of twenty-nine years there will be suffi- cient difference to require the addition of another lunation ; the twenty-ninth year is therefore one of thirteen instead of twelve lunations. In this way they do not chauge their season during an entire century. So certain has been their appearance that in Samoa

they have given their name to the spring season, which is vae-—

palolo, or the time of palolo.?

The Atolls.—The atolls differ in almost every respect from the islands of volcanic origin. Little that is said of one class would be true of the other. These coral islands are all low, generally not more than 10 or 12 feet above high-water mark. They are simply sandbanks formed by the accumulation of debris washed on to the reefs during strong winds. Hence they are usually in the shape of a narrow band, varying from a few yards to one-third of a mile across, near the outer edge of the reef, with a lagoon in the centre. In some of the smaller atolls the circle of land is almost or entirely complete, but in most of those of larger dimensions there are breaks to leeward, and the sea washes freely over the reef into the lagoon. Where the circle of land is complete the sea-water gains access to the central lagoon through the reef underneath the islands. In some it bubbles up at the rise of the tide in the midst of the lagoons, forming immense natural fountains. This has been observed producing a specially fine effect at Nui in the Ellice group. Some of these atolls are not more than 3 or 4 miles in their greatest length. Others are many

miles long. They are not all circular, but are of all con- ceivable shapes.?

1 For fuller details, see article by th i i Zool. Soc. of Lond., 1875, p. 496. dilate? 2 On the formation of atolls and Cona.s, vol. vi. 877, and Pactric,

vol. xviii. p. 128.

of coral reefs generally, see | Ellice Islands the people domesticate frigate-birds.

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Two of the atolls known to the present writer are remarkable. The lagoons in them are of fresh water. One of these is Lakena in the Ellice group, the other Olosenga, or Quiros Island, in 11° 2’S. lat. and 171° W. long. Both are small circular islands, and in both the lagoon is shut off from the sea. Olosenga is less than 4 – miles in diameter, the lagoon occupying over 3 miles, leaving a ring of land around it less than half a mile across. In some places the lagoon is at least 6 fathoms deep. This bulk of fresh water cannot, therefore, be the result of drainage. There is much to favour the opinion that both this island and Lakena are situated over the craters of former volcanoes, and that there is submarine connexion between them and some of the larger islands situated on the volcanic ridge from which the body of fresh water must come. Olosenga is about 200 miles distant from Samoa. In that group mountain streams sometimes fall into chasms and totally disappear under- ground. In this way subterranean lakes may be formed in some of the cavities which we may suppose volcanic eruptions to leave. It is not difficult to suppose that there would be subterranean connexion between these lakes and an isolated crater 200 miles distant. If so, as the crater participated in the subsidence of the region on the edge of which it is situated, the water would rise in it until, if the supply were sufficient, it there found an outlet. This appears to be what occurs at Olosenga. The lake has never been properly examined and sounded. It is, however, of considerable depth in the centre, where the water is said sometimes to bubble up as if from a great spring, and at low tide it is seen to percolate through the sand on the outer or sea side of the land.

The vegetation of the atolls is extremely poor, not more than about fifty species of plants being found in the Tokelau, Ellice, and Gilbert groups, in all of which groups collec-. tions have been made. All the species consist of littoral plants found in the volcanic islands. Most of them have their seeds enveloped in thick husks, which specially fit them for being carried by currents. Doubtless it is in this way that the atolls have received their flora.

The cocoa-nut, is abundant on most of these islands. This most useful palm will grow on any sandbank in the tropics, and it is benefited by having its roots in soil saturated with sea water. Unlike the natives of volcanic islands, those dwelling on the atolls eat the raw kernel of the nut in large quantities. Indeed that, with fish and the fruit of

a screw-pine (Pandanus), constitutes the main food supply

on some atolls. The people make the pulp of the pandanus into a kind of cake, in appearance much like a quantity of old dates. In some atolls a somewhat elaborate system of cultivation has*been adopted, by means of which a coarse kind of taro, banana, the bread-fruit, &c., are grown. These low islands suffer much from drought, and the natural soil is nothing but sand. The people, therefore, form wide trenches by removing the sand until they get within about 2 to 3 feet of the sea-level. Into the trenches they put all the vegetable refuse and manure they can obtain, and, as there is more moisture at this level, those excavated gardens are comparatively fertile. Under the influence of a Christian civilization, which is growing, and by the introduction of new food-producing plants, the condition of the natives is improving; but they still suffer much at times from long-continued seasons of drought.

The fauna of the atolls consists mainly of a few birds, some lizards, and insects. Fish abound about the reefs, and most of the natives are deep-sea fishermen. In the Large numbers of these pets may be seen about the villages.

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As the birds are accustomed to visit different islands when the wind is favourable, the people send by them small presents (fish-hooks, &c.) to their friends. Christian mis- sionaries also occasionally use them as letter-carriers for communicating with one another.

Elevated Coral Islands.—There are comparatively few of the elevated coral islands in Polynesia, but they are so distinct from both the atolls and the

volcanic islands that they need a separate description. They all lie within or near the lines marking off the volcanic ridge upon the map. South of the volcanic ridge there are many coral reefs forming shoals. The elevated coral islands doubtless were once such reefs. Lying within the area of volcanic action, they have participated in the upward movement, and have been raised from shoals to become islands. Some have evidently been lifted by successive stages and apparently by sudden movements. This is clearly seen

in the Loyalty Islands. On approaching them one sees |

high coral cliffs, in appearance much like the chalk cliffs of England, except that they are often some distance inland and not close on the shore. The island of Maré may be taken as a good type of the class. Here, between the shore and the coral cliffs, there is a tract of level land varying from a few yards to perhaps one-fourth of a mile or more across. On this level tract the people mainly dwell. At the back of this there rises a perpendicular wall of coral, in some places as much as a hundred feet high. The cliff is water-worn, and has in it large caverns, showing that for a long period it was the coast-line. Still farther inland there are two similar though smaller cliffs, indicating that there were three distinct upheavals. These must have been at very long intervals. At present the island is fringed with a coral reef, and if it were now to be lifted from fifty to one hundred feet the present coast-line would form another cliff, while the present coral reef would form another low plot similar to that upon which the people now dwell.

These islands are old enough to have a considerable depth of vegetable soil upon them. The low land between the coast and the first cliff is well stocked with cocoa-nut and other trees. None of the islands can be compared with the volcanic islands for fertility, all having a less rich

soil and being much drier; still they are fairly fertile.

They suffer sometimes from drought, but are much less seriously affected in this way than the atolls.

The flora of the elevated coral islands is less rich than that of the volcanic islands, but much richer than that of the atolls. The island of Niue may be taken as a fair specimen of this class. Its flora probably contains between

400 and 500 species, nearly all being such as are found on adjacent volcanic islands. The fauna is also much richer than that of the atolls, but poorer than that of the volcanic islands. Birds are numerous. While most of the speciés are identical with those found in neighbouring volcanic islands, there are some interesting local variations well illustrating the modifications which take place from isola- tion under changed surroundings. In some _ instances the differences are so great that local forms have been classed not only as varieties but as distinct species.

Climate.—The climate of the islands varies considerably, as may be naturally expected when the wide area covered is remembered, and the vast difference there is between the islands themselves. Some, especially the elevated coral islands, are very healthy for tropical regions. Speaking generally, the average reading of the thermometer over a large extent of Polynesia is about 80° Fahr. It very seldom sinks lower than 60°, and, owing to the small size of most of the islands, and the prevalence of trade-winds during the greater portion of the year, the heat is always moderated, and rarely becomes intense. Yet, owing to the

| constant heat and to the humidity of the atmosphere,

the climate in the mountainous islands is trying to the European constitution. But in this respect there is a great difference even between groups which, looked at superficially, appear to be similar, and which lie within almost the same parallels of latitude. All the islands eastward from and including Fiji are much more healthy than are those to the west. In the eastern section fever and ague are of rare occurrence; in the western section European missionaries do not find it expedient to remain for long periods on the islands owing to the weakening effects of frequent attacks of these diseases. The most remarkable thing is that natives of the eastern section suffer even more than Europeans when they go to live in the western islands, the mortality among them being very great. Numerous attempts have been made to evangelize the New Hebrides through the agency of natives of the Samoan, Cook, and Society groups; but, owing to the great mortality among the agents, their efforts have failed. Yet these people have lived there under condi- tions very similar to those they were accustomed to at home, the heat being about the same, and the food similar, as well as the

general mode of life. The causes of the difference are as yet unknown. Possibly the explanation will be found in differences of natural drainage. It has often occurred to the present writer, though only as an unverified theory, that the bases of these western islands are, like that of New Caledonia, of older formation, and that the islands are only superficially volcanic. If so, this may account for their unhealthiness as compared with the purely volcanic islands within the same parallels of lati- tude. In comparison with most tropical countries there is little dysentery in Polynesia; but this also is more com- mon in the west than in the east.

The elevated coral islands are always much more healthy

-than are those of volcanic formation in their immediate

neighbourhood. They are drier, being always well drained, have much less dense vegetation, and receive the benefit of the trade-winds which blow right across them. They, however, sometimes suffer from drought such as is unknown on the volcanic islands. The atolls may be called—if the term can be applied to tiny islets scattered over the expanse of ocean—the deserts of the Pacific. The soil being almost entirely sand, and the vegetation afford- ing little shade, the heat and glare, especially of those lying close to the equator, are exceedingly trying to European visitors. Being so low—only a few feet above the ocean—there is nothing to attract the clouds, and the rainfall is small. The islands are therefore subject to frequent droughts, which are sometimes of month's dura- tion ; and at such times even the fronds of the cocoa-nut palm get a shrivelled appearance, and the trees cease to bear fruit. Sometimes the people suffer greatly during these long-continued droughts, many being starved to death. At best their food supply is confined to cocoa- nuts, pandanus, fruit, and fish, but in times of drought they are forced to chew the roots of shrubs. Hurricanes.—A great portion of southern Polynesia is subject to destructive cyclones. The tract over which they pass may be said to be, generally, that of the volcanic chain indicated by the lines on the map, although the northern edge of this region is not so subject to cyclones as the southern portion. A line drawn parallel to the lines of the map, through the middle of the New Hebrides group, and extending south of Fiji, will well represent the centre of the cyclone tract. The hurricane season is from December to April. Some islands are visited

by a more or less destructive cyclone nearly every year; Samoa lies on the upper edge of the tract, and gets one, on an average, about every seven oreight years. Although these cyclones

dre not usnally so severe as those which visit the seas of eastern Asia, they are often exceedingly destructive, sweeping almost everything down in their course. _ They last only a few hours. Heavy seas are raised in the line of progress, and vessels are generally exposed to greater danger when lying at anchor at the ports than when in the open sea. The cyclones are always accom- panied by considerable electric disturbances, especially when they are passing away.

Diseases.—Apart from the fever, ague, and dysentery already alluded to, there is comparatively little disease in any portion of Polynesia. The principal purely native diseases are such as affect the skin. A form of elephan- tiasis prevails more or less on all the damp mountainous islands. Many Europeans are subject to it, especially those who are much exposed to the sun by day and the dews by night. In some of the atolls where the people have little good vegetable food and eat a great quantity of fish, much of it often in a state unfit for food, skin diseases are even more common than in the mountainous islands. ‘There are reputed cases of leprosy in the Gilbert Islands, and that disease is well known to be one of the scourges of the Hawaiian archipelago. Several European diseases have been introduced into the islands,—those which are epidemic usually, at the first visitation, working great havoc among the natives. Many in Europe and America appear to attribute the great mortality which occurs among native races, when an epidemic is introduced among them, to weakness and want of stamina in their constitution ; but a more probable explanation is found in the fact that, on the introduction of measles or smallpox, all the inhabitants of an island are suitable subjects, that the population of entire villages are prostrated at once, that there are no doctors or nurses, none even to feed the sick or to give them drink, and not even the most ordin- ary care is taken by the sufferers themselves to lessen the danger.1 In some islands, especially the Hawaiian group syphilis, first imported by Captain Cook’s expedition, has wrought great havoc. It spread very rapidly, because, at that time, there

was almost promiscuous intercourse between the sexes; and this has been one of the chief causes of the physical deterioration and of the rapid decrease of the natives of Hawaii. The disease has been introduced into other islands in later times through the visits of European and American sailors ; but, owing to the influence of Christian teaching, which has in many cases gone first and has produced a change for the better in the relations of the sexes, it has not generally spread.

Races.—There are three different kinds of people inhabiting the islands of Polynesia. The region occupied by each is indicated by one of the colours on Plate III., and in the subjoined table of Indo-Pacific peoples the affinity of these races is exhibited.2 It will be seen that there are two broad and very distinct divisions, — the dark and the brown races. The dark people occupy Australia, the Andaman Islands, portions of the Indian archipelago, and western Polynesia, and have more or less remote affinity with the natives of South Africa. The brown people are found in Madagascar, the Indian Archipelago, Formosa, north-western and eastern Poly- nesia, together with New Zealand, and are clearly of Asiatic origin.

There are in Polynesia people who belong to both the dark and

the light sections of the Indo-Pacific races. At present the dark are found only in the western islands as far as Fiji. In some islands

1 In these warm islands the people are generally accustomed to bathe often. When measles prevailed in Fiji many of those who were in a high fever crawled to the bathing places to cool them- selves, and many died there. islands of the Ellice group about a fortnight after a trading vessel from Sydney, which had influenza on board. This vessel had taken some of the natives from one island to another as passengers, and at three of the islands the entire population was suffering from the epidemic. been utterly helpless.

2 Compare Mr Whitmee’s

aper on this subject in Journ, , Inst. Lond., 1879. = S subject in Journ. Anthrop

The present writer once visited several |

Had this been a more severe disease the people would have |

| some islands they are lighter than in others. | supposed that their hair grew in smal] tufts.

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they are considerably mixcd with the lighter race, and in many places within the region occupied by them are colonies of the light people who keep themselves distinct. For this dark race the name Papuan is here used. They have generally been known of late

| years as Melanesians, but Papuan is an older name which has | always been used for part of the race, and which clearly ought to _be extended to the whole.

The region which they inhabit is coloured yellow on the map, and the pink bands across it indicate the presence of some of the light race there.

The whole of eastcrn Polynesia is inhabited by a light brown people to whom the name Sawaidri is here given. They extend out of Polynesia to New Zealand. They have also formed colonies among the Papuans in various places, and in some instances they have become mixed in blood with the blacks among whom they have settled. The pink colour in the map indicates this region.

The third kind of people, here called Tarapon,* inhabit the northern portion of western Polynesia, the islands generally known as Micronesia (coloured green on the map).

The following table shows the relationship of the Indo-Pacific races (Polynesian names in italics):—

Races, Countries where found. (Austral. Australia. | ‘ Andaman Islands, . | ‘ gg | Negrito. Samang, &¢. ; Aru Islands, Polynesians. (Western New Guinea. Papuan. Solomon Islands, &c. New Hebrides, de. Indo- Fiji. Pacific Samoa, &e, Races of Hawati. Men. Sawatori, Cook Islands, cc. Socicty Islands, dc. New Zealand. ES mi: Malagasy. Madagascar. Heino: Formosan.

Formosa. : Malays of Sumatra, &c. \ Polynesians. | Malayan. a g Caroline Islands. Tarapon. Marshal Islands. Gilbert Islands.

I. The Papwans.—This name is that uscd by the Malays of the Indian Archipelago for the black, frizzly-haired people found in the Aru Islands and New Guinea. ‘That the inhabitants of the western portion of Polynesia ought to be classed with these Papuans there can be no doubt. The older name is therefore adopted here to include the whole, rather than the newer and less distinctive name Melanesian which has been applied to only a part of the race. A general description of the people is all that can be given here; for further details the reader is referred to the articles MELANESIA, New Guinea, &c. In speaking of the affinities of the Papuans

ith other peoples much caution is required; but there is some reason for thinking they may be remotely classified, together with all the other black people of the southern hemisphere, with the tribes of South Africa.’ See NEcRo.

The Papuans are mostly black, but are not of a jet black. In It was long popularly

This was, however, a mistake which probably arose from the manner in which many of them are accustomed to dress it, On some islands the men collect their hair into small bunches, and carefully bind each bunch round with fine vegetable fibre from the roots up to within about two inches of the ends. Dr Turner® gives a good description of this process. He once counted the bunches on a young man’s head, and

3 There has hitherto been no one well understood name used for this people. They are generally called “ Polynesians ” simply, some- times “ Malayo-Polynesians,” and recently the name “ Mahori” (a vile corruption of “ Maori”) has been proposed forthem. For evident reasons we need some more distinct name than Polynesian. Malayo- Polynesian cannot be confined to them, but must rather be extended to the whole family of which they are but a branch. Sawaiori is a compound from Sa-moa, Ha-wai-i, and Ma-ort, thus derived from the native names of the three principal peoples.

4 The name “ Micronesians” has been generally adopted. Mr Horatio Hale, in his great work on the Ethnography and Philology of the United States Exploring Expedition, adopted Térawa—the name of one of the Gilbert Islands, there being no native name for the entire group—for the language of that group. The present writer

| takes part of this name, 7ér-a-wa, and part of the name of the prin-

cipal island in the Caroline Islands, viz., Pon-a-pe, to form the com- pound name Jér-a-pon. > The Rev. R. H. Codrington believes the Papuan (Melanesian) lan- guages belong to the same stock as the rest of the Polynesian languages. But, as is pointed out by Prof. Keane, he entirely overlooks the phy- sical aspects of the question. See Journ. Anthrop. Soc. Lond., 1884. § Nineteen Years in Polynesia, pp. 77, 78; Samoa, pp. 308-310.

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found nearly seven hundred. He calls attention to the resemblance | between the head of a Papuan, with his hair thus dressed, and the |

conventional representation of the hair in Egyptian and Assyrian sculptures, and to what Dr Livingstone says about the Banyai of South Africa, who dress their hair in a similar manner. When allowed to grow naturally, the hair of a Papuan is always frizzly. Some of the people have a considerable beard.

In the features of the Papuans there is considerable difference ; but in a typical specimen the lips are thick, the nose is broad, often arched and high, and the jaws project; as a rule, thie race is prognathous. They are generally small in stature, but in some islands age large. Where, however, they are of large size, we in- variably’ find other evidence of their mixture with another race. Speaking, therefore, of typical Papuans, we may say they are small, with thin limbs, and are physically weak. In their natural condi- tion they are a savage people and are cannibals. They are broken up into hostile tribes, holding no intercourse with one another ex- cept by warfare. The languages or dialects! spoken by them are very numerous, owing, no doubt, to their hostility towards one another, which has produced complete

isolation. In grammatical structure there is considerable resemblance between their languages, but owing to long isolation the verbal differences have become very great. Several different dialects are often found on one island.

Among them women hold a very low position. Nearly all the hard work falls to their share, the men devoting themselves chiefly to warfare. The women cultivate the plantations, carry the burdens, and wait on the men. They take their food from the leavings of the men. Among most of them family life is not greatly elevated above the relationships existing among the lower animals, the relations between the sexes being of the inost degraded character. There is, however, considerable affection often manifested towards their children. The Papuans are impulsive and demonstrative in speech and action. They are generally a wild, noisy, boistcrous people, easily pleased and as easily offended. They differ so much in different islands, however, that it is extremely difficult to generalize concerning some of their characteristics. Many of them are decidedly low intellectually. On some islands they appear to be physically and intellectually a weak and worn-out race. Yet this must not be understood as applying to all. On some islands youths and men may be seen who are among the brightest and niost intelligent-looking people in the Pacific. A vast difference exists between the natives of parts of the New Hebrides and those of the Loyalty Islands, the latter .being much the finer. Mixture of blood may partly account for the difference. Difference of physical surroundings, doubtless, also has something to do with it. The dry, comparatively barren, and cooler islands of the Loyalty group ought to have a finer people upon them than the inalarious, hot, and moist islands of the New Hebrides. In Fiji some of the finest men in Polynesia are found, but many of the Fijians are considerably mixed with Sawaiori blood.

Asarule, the Papuans lack elaborate historical traditions, poems, and songs, such as are invariably found among the Sawaiori race. They do not naturally possess much religious feeling or reverence, and their religious systems are little more than fetichism. In this respeet, too, they present a marked contrast to the lighter race. In arts and manufactures they are comparatively low, although there are marked exceptions. Usually their houses are very poor structures. Onmany islands their canoes are of inferior

construction. As a race they are indifferent navigators. Their arms are, however, somewhat elaborately made; and most of them make a coarse kind of pottery. In some parts of the Solomon Islands the people build much better houses than are usually found among the Papuans, carving some of the woodwork rather elaborately. They also build good canoes or boats. In Fiji the natives build good houses and good boats, but there the people have learned some of their arts from the Sawaioris. It may be so also in the Solomon group. Indeed, throughout the whole of the Papuan region, there is evidence of more or less mixture of the two races. In some places there are pure colonies of Sawaioris, who keep themselves distinct from their darker-coloured neighbours; but in many other places the lighter immigrants have intermarried with the black race.

The following are some broad characteristics of the Papuan languages. Consonants arc freely used, some of the consonantal sounds being difficult to represent by Roman characters. Many of the syllables are closed. There does not appear to be any difference between the definite and the indefinite article, except in Fiji. Nouns are divided into two classes, one of which takes a pro- nominal suffix, while the other never takes such a suffix. The principle of this division appears to be a near or remote connexion between the possessor and the thing possessed. Those things which belong to a person, as the parts of his body, &c., take the pro- hominal suffix; a thing possessed merely for use would not take

a No great care is here taken to distinguish between the terms languages and dialects. While all the languages of Polynesia may be included under three classcs, we cannot speak of them as three languages, each with numcrous dialects, any more than we could speak of those languages which have grown out of the Latin as several dialects of one language.

-verbal particle.

it. Thus, in Fijian the word Juve means either a son or a daughter—one’s own child, and it takes the possessive pronoun suffixed, as lwvena; but the word ngone, a child, but not neces- sarily one’s own child, takes the possessive pronoun before it, as nona ngone, his child, 7.¢., his to look after

or bring up.? Gender is only sexual. Many words are used indiscriminately, as nouns, adjectives, or verbs, without change; but sometimes a noun is indicated by its termination. In most of the languages there are no changes in nouns to form the plural, but an added numeral indicates number. Case is shown by particles, which precede the nouns. Adjectives follow their substantives. Pronouns are numer- ous, and the personal pronoun includes four numbers—singular, dual, trinal, and general plural, also inclusive and exclusive. Almost any word may be made into a verb by using with it a The difference in the verbal particles in the different languages are very great. In the verbs there are causative, intensive or frequentative, and reciprocal forms.

II. The Sawatort Race.—The brown people who occupy the islands of eastern Polynesia are generally regarded as having affinities with the Malays of the Indian Archipelago, and are sometimes spoken of as a branch of the Malay race, or family. They cannot, however, with any accuracy be so described. The Malays, as they now exist, are a comparatively modern people, who have become what they are by the mixture of several elements not found in the more primitive race. The Sawaioris and the Tarapons of Polynesia, the Malagasy (Hovas) of Madagascar, and the Malays are allied races, but uo one of them can be regarded as the parent of the rest. The parent race has disappeared ; but the Sawaiori, as the earliest offshoot froin it, and one which, owing to the conditions under which it has lived, has remained almost free from admixture of blood, may be taken as most nearly representing what the parent was. The relationship which these Malayo-Polynesian 3 races bear to one another is seen from the ‘‘trce” on Plate III.

The absence of Sanskrit (or Prakrit) roots in the languages appears to indicate that the Sawaiori migration was in _pre- Sanskritic times. Whether we can fix anything like a definite date for this may well be questioned. Mr Fornander® has, how- ever, with great probability, traced back the history of the Hawaiians to the 5th century. He has studied the folk-lore of those islands exhaustively, and from this source comes to the con- clusion that the Sawaiori migration from the Indian Archipelago may be approximately assigned to the close of the first or to the second century. Most likely Samoa was the first group per- manently occupied by them. Owing to the admixture of the Sawaioris with the Papuans in Fiji some authorities have

thought – the first settlement was in those islands, and that the settlers were eventually driven thence by the Papuan occupiers. We can, how- ever, account for the presence of Sawaiori blood in Fiji in another way, viz., by the intercourse that has been kept up between the people of Tonga and Fiji. If the first resting-place of the Sawaioris was in that group, there is good reason to believe that Samoa was the first permanent home of the race, and that from Samoa they have spread to the other islands which they now occupy.

It used to be doubted whether these people could have gone from the Indian Archipelago so far eastward, because the prevailing winds and currents are from the east. But it is now well known that at times there are westerly winds in the region over which they would have to' travel, and that there would be no insuperable difficulties in the way of such a voyage. The Sawaioris are invariably navigators. There is ample evidence that in early times they were much better seamen than they are at present. Indeed their skill in navigation has greatly declined since they have becouic known. to Europeans. They used to construct decked vessels capable of carrying one or two hundred persons, with water and stores sufficient for a voyage of some weeks' duration. These vessels were made of planks well fitted and sewn together, the joints being calked and pitched.* It is only in recent times that the construc- tion of such vessels has ceased. The pcople had a knowledge of the stars, of the rising and setting of the constellations at different seasons of the year. By this means they determined the favourable season for making a voyage and directed their course.

The ancestors of the Sawaioris were by no means a savage people when they entered the Pacific. Indeed their elaborate historical legends show that they possessed a considerable amount of civiliza- tion. Those who are familiar with these legends, and who have studied Sawaiori manners and customs, sec many unmistakable proofs that they carried with them, at the time of their migration, knowledge and culture which raised them much above the status of savages, and that during their residence in these islands the

2 Hazlewood's Fijian Grammar, pp. 8 and 9.

3 Baron W. von Humboldt's name, Malayo-Polynesian, is here retained as a convenient term to include all these people, from Madagasear to Polynesia.

4 It is possible to make too much of the absence of Sanskrit (or Prakrit) roots, since, as remarked by Dr Rost, " there may have been no occasion for the intro- duction of ready-made terms into the language." Still the migration may be tentatively put in pre-Sanskritic times.

5 The Polynesian Race, vol. i. p. 168.

6 Cocoa-nut fibre and the gum which exudes from the bread-fruit tree are generally used for " ealking" and "pitehing" canoes,

race has greatly deteriorated. Some indications of their former condition will appear in the following account of the people.

The Sawaioris are, physically, a very fine race. On some islands they average 5 feet 10 inches in height. De Quatrefages, in a table giving the stature of different races of men,! puts the natives of Samoa and Tonga as the largest people in the world. He gives the average height of this race as being 5 feet 9°92 inches. 'They are well developed in proportion to their height. Their colour is a brown, lighter or darker generally according to the amount of their exposure to the sun,—being darker on some of the atolls where the people spend much time in fishing, and ainong fisher- men on the volcanic islands, and lighter among women, chiefs, and others less exposed than the bulk of the people. Their hair is black and straight; but in individual cxaimples it is sometimes wavy, or shows a tendeney to curl. They have very little beard. Their features are generally fairly regular ; eyes invariably black, and in some persons oblique; jaws not projecting, except In a few instances; lips of medium thickness ; noses generally short, but rather wide at the bases. Their foreheadsare fairly high, but rather narrow. When they are young many of the people of both sexes are good-looking. 'The men often have more regular features than the women. In former times more attention was paid to personal appearance and adornment among men than among the women.

As a race the Sawaioris are somewhat apathetic, They differ, however, in different islands, according to their surroundings. Most of them live in an enervating climate where nature is very lavish of her gifts. Hence they lead easy lives. On the more barren islands, and on those more distant from the equator, the natives have much more energy. Under certain eircumstances they become excitable, and manifest a kind of care-for-nothing spirit. This is only occasionally seen, and chiefly in time of war, in a family dispute, or on some other occasion when they are deeply moved. In the time of their heathenism they were strict in their religious observances, and religion came into almost every action of life. They were, in most instances, with comparative case led to accept Christianity, and this characteristic has remained under the new condition of things. They are a shrewd people, with quick intelligence, and they possess naturally a large amount of common sense. Where they have from early years enjoyed the advantages of a good education, Sawaiori youths have proved them- selves to possess intellectual powers of no mean order. They are almost invariably fluent speakers; with many of them oratory seems to be a natural gift; it is also carefully cultivated. A Sawaiori orator will hold the interest of his hearers for hours together at a political gathering, and in his speech he will bring in historical allusions and precedents, and will make apt quota- tions from ancient legends in a manner which would do credit to the best parliamentary orators. Many of thcin are very brave, and think little of self-sacrifice for others where dnty or family honour is concerned.

The terms for family among this race are used in two senses— (1) of a household, and (2) of all blood relations on both the male and the female side, including the wife or the husband, as the case may be, brought in by marriage, —also those who have been adopted by meinbers of the clan. In the following remarks the word family is used with the first meaning, and clan with the second. Each clan has a name which is usually borne by one of the oldest meinbers, who is the chief or head for the time being. This clan system no doubt generally prevailed in early times, and was the origin of the principal chieftainships. But changes have been made in most of the islands. In some the head of one clan has become king over several. In many cases large clans have been divided into sections under secondary heads, and have even been subdivided. The different classes of chieftainships may probably be thus accounted for.

As arule, near relations do not intermarry. In some islands this rule is rigidly adhered to. There have been exceptions, however, especially in the case of high chiefs; but usually great care is taken to prevent the union of those within the prescribed limits of consanguinity. Children generally dwell with their kin on the father's side, but they have equal rights on the mother's side, and sometimes they take up their abode with their mother's family. The only names used to express particular relation- ships are father and mother, son and daughter, brother and sister.

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1 The Human Species (International Scientific Series), pp. 57-60. :

2 Of various acts by Sawaioris which indicate the possession of bravery and self-possession under trying circumstances the following may serve as a sample. Some lads belonging to two villages in Samoa fell out, and began stone-throwing. One of them, who was the son of a chief, was struck and, it was feared, waskilled. As soon as this was known to the young men of the village they armed them- selves in order to go to the other village to seek reparation, according to a custom of former times, by killing some one belonging to the family of the boy who had thrown the stone. A report preceded thein that they were going, and a young man, @ Cousin of the boy, in order to prevent a fight, quietly walked out of the village to meet the avengers of blood. When he met them he calmly said, ‘‘ You are coming to avenge your brother. I am brother to the boy who killed him. Do not g0 further ; kill me and be avenged, so that our villages may remain at peace. His conduct somewhat disconcerted the party, and by the timely arrival of a Christian teacher matters were settled without bloodshed.

: relative of the deceased, as an additional wife.

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There is usually no distinction between brothers (or sisters) and cousins, all the children of brothers and sisters speak of each other as brothers and sisters, and they call uncles and aunts fathers and mothers. Above the relationship of parents all are simply ancestors, no term being used for grandfather which would not equally apply to any more remote male

ancestor. In the same way there is no distinctive term for grandchild. A man speaks of his grandchild as his son or daughter, or simply as his child.? Polygamy was often practised, especially by chiets, and also con- cubinage. In some places a widow was taken by the brother of her deceased husband, or, failing the brother, by some other Divorce was an easy inatter, and of frequent occurrence ; but, as a rule, a divorced wife would not marry again without the eonsent of her forimer husband. An adulterer was always liable to be killed by the aggrieved husband, or by some member of his clan. If the cnlprit himself could not be reached, any member of the clan was liable to suffer in his stead. In some islands female virtue was highly re- garded. Perhaps of all the groups Samoa stood highest in this respect. There was a special ordcal through which a bride passed to prove her virginity, and a proof of her immorality bronght dis- grace upon all her relatives. But in other islands there was much freedom in the relations of the sexes. Owing to the almost promiscuous intercourse which prevailed among a portion of the race, in some groups titles descended through the mother and not through the fathcr. In Hawaii there was a peculiar system of marriage relationship, ‘‘brothers with their wives, and sisters with their husbands, possessing each other in common.” There also, especially in the case of chiefs and chieftainesses, brothers and sisters sometimes intermarried. But these custonis did not pre- vail in other groups. It is almost certain that they did not prevail in Hawaii in early times, but that they were the result of that deterioration in the race which their traditions and many of their customs indicate.*

Women have always occupied a relatively high position among the Sawaioris. In most groups they have great influence and are treated with much respect. In some eases they take hereditary titles and hold high offices. As among their congeners in Mada- gascar, so also in parts of Polynesia, there may be a quecn or a chieftainess in her own right; and a woman in high position will command as much respeet, and will exercise as great authority, as a man would in the same position. Everywhere infanticide prevailed ; in some of the smaller islands it was regulated by law in order to prevent over-population. It was also a very common practice to destroy the foetus, yet, even before the reception of Christianity, parents were affectionate towards the children who were spared. The practice of adopting children was, and still is, common. Often there is an exchange

made between members of the same clan; but sometimes there is adoption from without. Tattooing generally prevailed among the men, different patterns being followed in different groups of islands, In some a larger portion of the body is tattooed than in others, A youth was con- sidered to be in his minority until he was tattooed, and in former times he would have no chance of marrying until he had, by sub- mitting to this process, proved himself to be a man. Puberty in the other sex was generally marked by feasting, or some other demonstration, among the female friends. Old age is generally honoured. Often an inferior chief will give up his title to a younger man, yet he himself will lose but little by so doing. The neglect of aged persons is extremely rare.

Property belonging to a clan is held in common. Each clan usually possesses land, an.l over this no one member has an exclusive right, but all have an equal right to use it. The chief or recog- nized head of the clan or section alone can properly dispose of it or assign its use for a time to an outsider; and even he is expected to obtain the consent of the heads of families before he alienates the property. Thus land is handed down through successive generations

3 Dr Lewis H. Morgan in Ancient Society, pp. 419-423, makes the Sawaioris to have distinctive terms for grandfather, grandmother, grandson, and grand- daughter. In this he is entirely mistaken. It is evident from his own lists that the Hawaiian kupuna means simply an ancestor. In like manner moopuna simply means a descendent of any generation after the first. :

- Morgan has founded one of his forms of family—the consanguine—on the supposed existence in former times among the Malays and Polynesians of the custom of ‘‘intermarriage of brothers and sisters, own and collateral, in a group.” All the cvidence he finds in support of this is (1) the existence of the custom above mentioned in Hawaii, and (2) the absence of special terms for the relaticn- ship of uncle, aunt, and cousin, this indicating, he thinks, that these were regarded as fathers, mothers, brothers, and sisters. He admits that “the usages with respect to marriage which prevailed when the system was formed may not prevail at the present time.” But he adds, “To sustain the deduction

it is not necessary that they should” (Ancient Society, p. 408). Morgan has given Special terms for grandfather and grandmother, because it would prove too much to show that the people had no grandfathers, &c. But these terms are used for ancestors of any generation, The terms used for grandchildren, in like manner, are used for any generation of descendants. He says (p. 406) the terms of husband and wife are used in common by a group of sisters or brothers, but tle fact is that the words used for husband and wife in Hawaii simply mean male and female. In some islands there are terms used for wife in the most strict

sense. The word wife is not uscd more cxclusively among us than among some Sawaiori people.

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under the nominal control of the recognized head of the clan or section for the time being. Changes have been made in many

the joint ownership of property in clans was common among the entire race in former times.

In early times the head of each clan was supreme among his |

own people, but in all matters he had associated with him the principal men or heads of families in the clan. Their united authority extended over all the members and the possessions of the clan, and they were independent of every other clan. some places vestiges of this primitive state of society still remain-

traced by means of the ancient legends in some islands, and in

others it is a matter of recent history. One clan being more |

numerous and stronger than another, and its chief being ambitious, itis easy to see how by conquering a neighbouring clan he increased the importance of his clan and extended his own power. In some

of the islands this transition process has hardly yet developed into |

an absolute monarchy. We may even sce two or three stages of the progress. In one instance a certain clan has the right to nominate the principal chief over an entire district ; though it is known as the ruling clan, its rule is mainly confined to this nomination, and to decision for or against war. In all other respects the district en- joys the privilege of self-government. In another case the nominal king over a district, or over an entire island, can be elected only from among the members of a certain clan, the monarchy being elective within that alone ; but this king has little authority. In other cases a more despotic monarchy has grown up—the prowess of one man Icading to the subjugation of other clans. Even in this case the chiefs or heads of clans sometimes still hold their property and rule over their own people, only rendering a kind of feudal service and paying tribute to the king.

The Sawaioris are exceedingly fond of rank and of titles. Much deference is paid to chiefs and to persons of rank ; and special terms are generally employed in addressing these. Every part of a chief's body and all his belongings have names different from those employed for common people. 'The grade of rank which a person occupies will often be indicated by the language in which he is addressed. Thus, in Samoa there are four different terms for to come :—sau is for a common man ; maliu mad is a respectful term for a person without a title ; swsw maz for a titled chief ; and ajio mai for a member of the royal family. In addressing chiefs, or others to whom one wishes to be respectful, the singular number of the personal pronoun is rarely used; the dual is employed instead, —the dual of dignity or of respect.

Offices and titles are seldom hereditary in our sense of the term, as descending from father to son. They are rather elective within the limits of the clan, or the division of a clan, A common practice is for the holder of a high title to nominate a successor ; and his nomination is generally confirmed by the chiefs, or heads of households, with whom the right of election rests. In ancient times the authority of a high chief or king did not usually extend to any details of government. But in Hawaii there are traditions of a wise king who interested himself in promoting the social

well- being of the people, and made good laws for their guidance.! Usnally all matters affecting a district or an island were settled by the chiefs of the district, while those of a single village were settled by a council consisting of the chiefs and heads of house- holds in the village. In some islands each clan, or each village, would fcel itself at liberty to make war on another clan or village, without consulting the vicws of any higher authority. Indeed the rule was for each clan or district to settle its own affairs. In the case of offences against individuals, either the person injured, or another member of his clan, would avenge the injnry done. For most offences there was some generally recognized punishment— such as death for murder or adultery ; but often vengeance would fall wpon another person instead of the wrongdoer. In avenging wrong, a member of the village or of the clan to which the offender belonged would serve equally well to satisfy their ideas of justice if the culprit himself could not be easily reached. Sometimes all the members of the fainily, or of a village, to which a culprit belonged would flee from their homes and take refuge in another village, or seek the protection of a powerful chief. In some places, in cases of crime, the members of the family or village would convey the

culprit bound—sometimes even carrying him like a pig that is to be |

killed—and place him with apologies before those against whom he had transgressed. The ignominy of such a proceeding was generally considered sufficient atonement for the gravest offences. There were slaves in many islands, either persons conquered in war, or those who had been condemned to lose their personal liberty on account of evil conduct.

Pottery was not manufactured by the Sawaioris. When any of them possessed it they obtained it from the Papuans. In most of their manufactures they were, however, in advance of the Papuans. They made use of the vegetable fibres abounding in the islands, the

1 See a remarkable example in Fornander’s Polynesian Race, vol. ii. p. 89.

There are in | _ and for making fishing nets. ing; the transition to a limited or to a despotic monarchy may be |

women manufacturing cloth, chiefly from the bark of the paper

| mulberry (Aforus papyrifera), but also in some islands from the islands in this respect ; but there can be little reason to doubt that |

bark of the bread-fruit trec, and the hibiscus. This in former times furnished them with most of their clothing. They also made various kinds of mats, baskets, and fans from the leaves of the pandanus, the bark of the hibiscus, from species of bohmeria or other Urticaceous plants. Some of their mats are very beauti- fully made, and in some islands they are the most valuable property the people possess. The people also use the various fibre-producing plants for the manufacture of ropes, coarse string, and fine cord, The nets are often very large, and are netted with a needle and mesh as in hand-nctting among our- selves. The Sawaioris are rather clever workers in wood. Canoe and honse-building are trades nsually confined to certain familics. The large canoes in which they formerly made long voyages are no longer built, but various kinds of smaller canoes are made, from the commonest, which is simply a hollowed-out tree cut into form, to the finely-shaped one built upon a keel, the joints of the various pieces being nicely fitted, and the whole stitched together with cord made from the husk of cocoa-nuts. Some of the larger canoes arc ornamented with rude carving ; and in some islands thcy are somewhat elaborately decorated with inlaid mother of pearl. The houses are gencrally well and elaborately made, but nearly all the ornamentation is put on the inside of the roof. The Sawaioris manufacture several wooden utensils for household use, sch as dishes or deep bowls, ‘‘pillows” or head-rests, and stools. They also make wooden gongs, or drums, which they beat as. they travel in their boats, in their dances, &c. They used to make wooden fishhooks, clubs, spears, and bows. They still make wooden fish- spears ; also carved and inlaid combs. They employ the bamboo for making drums and flutes. Formerly the knives the people used were made of bamboo, which is still sometimes used for that purpose. In the manufacture of these things they employed adzes made of stone, shell, or hard wood, and a wooden drill pointed with stone, shell, or bone. They made mother-of-pearl fishhooks, and they still use a part of those old hooks—or artificial bait—in combination with steel hooks, the native-made portion being generally shaped like a small fish. For water vessels, &c., ay employ gourds and large cocoa-nut shells, in preparing

whic they put water into them and allow the pulp or the kernel to decay, so that it may be removed without breaking the rind or shell. Their drinking cups are made of half a cocga-nut shell. Sharks' teeth, shells, and bamboo were formerly generally used as cutting instruments; shaving was done with them, as well as surgical operations. They employ vegetable dyes for painting their bark cloth, calabashes, &c. In some islands they also use a red earth for this purpose, Their cloth is generally ornamented with geometrical patterns. Any drawings of animals, &c., which they make are exceedingly inartistic, and no attempt is made at pcr- spective. Their musical instruments are few and rude—consisting of the drums and flutes already mentioned, and shell trumpets.

The Sawaioris were all polytheists. Without doubt many of their gods are deified men; but it is clear that some are the forees of nature personified, while others appear to represent human passions which have become identified with particular persons who have au existence in their historical myths.? But the conception which they had of Tangaloa (Taaroa and Kanaloa in some islands) is of a higher order. Among the Tahitians he was regarded as ‘‘the first and principal god, uncreated, and cxisting from the beginning, or from the time he emerged from po, or the world of darkness.”? ‘‘ He was said to be the father of all the gods, and creator of all things, yet was scarcely reckoned an object of worship.”4 Dr Turner says, ‘‘ the unrestricted, or unconditioned, may fairly be regarded as the name of this Samoan Jupiter.”

The worship of certain of the great gods was common to all the people ina group of islands. Others were gods of villages or of families, while others were gods of individuals. The gods of clans were probably the spirits of the ancestors in their own line. In some islands, when the birth of a child was expected, the aid of the gods of the family was invoked, beginning with the god of the father. The god prayed to at the instant of birth became the god of the child. In other places the name of the child's god was declared when the umbilical cord was severed. The gods were supposed to dwell in various animals, iu trees, or even in inanimate objects, as a stone, a shell, &c. In some islands idols bearing more or less resemblance to the human shape were made. But in all cages the material objects were regarded simply as the abodes of the immaterial spirits of the gods.

Their temples were either national, for a single village, or for the god of a family. They were sometimes large stone enclosures (marae), sometimes a grove, ora house. The principal priests were a particular order, the priesthood being hereditary. In some cases,

2 The following recent books may be consulted on this subjeet :—Rev. W. W. Gill’s Myths and Songs from the South Pacific; Dr Turner’s Samoa; and Mr Shortland’s Maori Religion and Mythology,

3 Polynesian Researches, vol. i. p. 323.

4 Tahitian Dictionary. 5 Samoa, p. 52.

however, the father of a family was priest in his own household and presented offerings and prayers to the family god.

There was, in the Socicty Islands, a privileged class known as the Areot. They were the special devotees of two celibate gods. They were not permitted to have children; any children they possessed when they entered the society, and all children subsequently born to them, were destroyed. The name Areoi beeame the synonym for all kinds of licence; the party wandered about from place to place conducting obscene entertainments, and was feasted with the best of all the people possessed. There were seven regular grades among the Areoi society, besides an irregular class of attendants.

In some islands human sacrifices were of frequent oeeurrence ; 1n others they were offered only on very rare and exceptional oecasions, when the demand was made by the priests for something specially valuable. The usual offerings to the gods were food. The system of tapu or tabu so common among the Sawaioris was connected with their religious rites. There were two ways by which things might become tapu, ~~— (1) by contact with anything belonging to the god, as his visible representation or his priest. Probably it was thought that a portion of the sacred essence of the god, or of a sacred per~~ son, was direetly communicable to objects which they touched. (2) Things were made tapu by being dedicated to the god; and it is this form of ¢apw whieh is still kept up. If, ¢.g., any one wishes to preserve his eoeoa-nuts from being taken, he will put something upon the trees to indicate that they are saered or dedicated. They eannot then be used nntil the tapu is removed from them. Disease and death were often connected with the violation of ¢apw, the offended gods thus punishing the offenders. Disease was generally attributed to the anger of the gods. Hence

offerings, &c., were made to appease their anger. The first-fruits of a crop were usually dedi- cated to the gods to prevent them from being angry; and new canoes, fishing-nets, &e., were dedicated by prayers and offerings, in order that the gods might be propitious to their owners in their use.

The Sawaiori people invariably believe in the existence of the spirit of man after the death of the body. Their traditions on the condition of the dead vary considerably in different groups; yet there is a general agreement upon main points. Death is caused by the departure of the spirit from the body. The region of the dead is subterranean. When the spirit leaves the body it is conveyed by waiting spirits to the abode of spirits. In most islands the plaec of descent is known. It is generally towards the west. In some tra- ditions there is a distinetion between chiefs and common people in the spirit world. In others all are much alike in condition. Some traditions indicate a marked distinction between the spirits of warriors and those of others: the former go to a place where they are happy and are immortal, while the latter are devoured by the gods and are annihilated. In some, however, the spirits are said to live again after being eaten. Some speak of the abode of spirits as being in darkness ; but usually the eondition of things is similar to that which exists upon earth. Amongst all the people it is believed that the spirits of the dead are able to revisit the scenes of their earthly life. The visits are generally made in the night, and are often greatly dreaded, especially when there may be any supposed reason for spite on the part of the dead towards living relatives. Some writers have connected cannibalism, where it existed among the Sawaioris, with religious customs. In the Cook and Society Islands, when a human being was offered as a sacrifice, the priest presented an eye of the victim to the king, who either ate it or pre- tended to do so. Probably the earliest human sacrifices were the bodies of enemies slain in battle. As it was supposed by some that the spirits of the dead were eaten by the gods, the bodies of those slain in battle may have been eaten by their victors in triumph. Mr Shortland appears to think that cannibalism among the Maories of New Zealand may have thus originated. Among the Sawaioris generally it appears to have been the practice at times to eat a por- tion of a slain enemy to make his degradation the greater. In several gronps there is evidence that this was doue. But where cannibalism was practised as a means of subsistence, it probably originated in times of actual want, such as may have occurred during the

long voyages of the people, when it was resorted to as a means of self-preservation. Being once accustomed to the practice, we can easily imagine how they might resort to it again and again in times of scarcity. The testimony of cannibals is that human flesh is the best of food, and among such a people there would not be strong moral reasons to restrain them from the indulgence.

The amusements of these people are very numerous. They are a light-hearted raee, usually living mnder easy conditions of life, and they have a largeamountof enjoyment. Some of their amuse- ments are boisterous and even savage, such as wrestling and boxing. In some islands they have a kind of '*hockey" and foot- ball. They have running races, walking matehes, and canoe- raeing. One of their most exeiting amusements is swimming in the surf. When there is a moderate sea on, great numbers often join in this exercise and find immense pleasure in it. Throw- ing the javelin, throwing at a mark with slings, and archery are

1 Maori Religion and M ythology, p. 26.

also practised. Some resort to cock-fighting. There are fishing matches; and at a particular season large companies used to resort to pigeon-catehing. In their houses they have a number of games. Betting is very often earried on in connexion with these. Much time is spent, especially after the evening meal, in asking riddles, in rhyming, &e. The recital of songs and myths is also a source of great amusement; and on special occasions there is dancing. The night dances were generally accompanied by much indecency and immorality, and for that reason were discountenanced on the introduction of Christianity.

Ill. The Tarapon Race.—These people have many points of resemblance to the Sawaioris, but, as a rule, they are of smaller stature and are less robust. They have straight black hair, which is more lank than that of the Sawaioris. The Tarapons, how- ever, differ considerably from one another, and are evidently a mixed race. The natives of the Caroline Islands are larger than the Gilbert Islanders. They are also much lighter in colour; they are more yellow, whereas the Gilbert Islanders are darker, than the Sawaioris. In

many respects the Tarapons bear a much closer resemblance to the people of some portions of the Indian Archi- pelago than do the Sawaioris. It is the belief of the present writer that the bulk of the Tarapons are the descendants of people who, in comparatively recent times, migrated from the Indian Archi- pelago, and that sinee they have been in Polynesia they have become mixed with people of other races. There appears to be a little Papuan admixture. Those in the Caroline Islands, especially, appear to have become mixed with Chinese and Japanese blood— probably more Japanese than Chinese. There are several well- authenticated instances of Japanese junks, with living people in them, having been found in various parts of the North Pacific. In 1814 the British brig “Forester” met with one off the coast of California (about 30° N. lat.), with three living men and fourteen dead bodies on board. In December 1832 a Japanese junk arrived at the Hawaiian Islands with four of the crew living. lf these junks could cross the Pacific in the latitude of Hawaii it is not at alk unlikely that others running in a south-easterly direction would reach some of the many atolls which stretch over about 35° of longitude, forming the Caroline and Marshall archipelagoes.

The traditions of the Gilbert Islanders tell us that their islands were peopled from the west and also from the east. Those who came from the east are expressly said to be from Samoa. Those from the west were more numerous than those from the east. There are also traditions of the arrival of other strangers at some of these islands. When the present writer was at the island of Peru, in the Gilbert group, in 1869 there was still there the remnants of a large proah which, from the description given, appears to have been like those used in the Indian Archipelago. So faras we have materials for examination, eraniometry confirms other evidence, and indicates that the Tarapon people are more mixed than either of the other Polynesian races,

All the Tarapon people are navigators, but, owing to the fact that upon their atolls they have little good timber, most of their canoes are inferior to those of the Sawaioris. Their houses are also inferior. Their arms are fairly well made. In the Gilbert Islands they manu- facture elaborate armour, to cover the entire body, from thie fibre of the cocoa-nut husk. In the Caroline Islands very fine mats are made; and a hand-loom is used, with which a coarse cloth is made.

Among the Tarapons women occupy a lower position than among the Sawaioris. The differenee is not, however, in the amount of work, or kind of drudgery, that is expected from them, but rather in the social and domestic influence they exert. The gods are chiefly the spirits of the great men of past ages. The chieftainship and priesthood are often eombined in the same persons. They are strict in the observance of their religious rites: The shrines of their gods are very numerous. In every house he visited in the Gilbert Islands, the present writer saw either a small circle or a square formed with pieces of coral or shells ; this was neatly covered with broken coral and shells from the beach, and in the centre stood a block of coral representing the god. These were the household shrines. In various places about the islands there were similar squares or circles, only larger, for the gods of villages or districts. Offerings of food were presented to them, and often the stones were garlanded with wreatns of cocoa-nut leaves. Some embalm their dead—especially the bodies of beloved children. Women often carry the skulls of deceased children, hung by a cord around the neck, as a token of affection.

In the Tarapon languages consonants are more freely used than in the Sawaiori. They have consonantal sounds which are not found in the latter, such as ch, dj,and sh. Closed syllables often occur ; occasionally doubled consonants are used, but ainong some of the people there is a tendency to introduce a slight vowel sound between them. Most words take the accent on the penult. In some languages there appears to be no true article ; but in the Gilbert Island language the Sawaiori ¢e is used for both the definite and the indefinite article. Gender issexualonly. Number in the noun is either gathered from the requirement of the sense, or is marked by pronominal words, ornumerals. Case is known by the

position of the noun in the scntcnce, or by prepositions. In the language of Ebon, one of the islands in the Marshall archipelago, nouns have the peculiarity which is characteristic of the Papuan languages: those which indicate close relationship—as of a son to a father, or of the members of a person’s body—take a pro- nominal suffix which gives them the appearance of inflexions. The present writer is not aware of the existence of this in any

other Tarapon language, but would not make too much of this negative evidence. Many words are used indiscriminately as nouns, adjec- tives, or verbs withont any change of form. In some languages the personal pronouns are singular, dual, and plural. In othcrs there are no special dual forms, but the numeral for two is used to indicate the dual. In the Ebon language there are inclusive and exclusive forms of the personal pronouns which, so far as has been ascertained, do not occurin any of the other Tarapon languages. The verbs usually have no inflexions to express relations of voice, mood, tense, number of person,—such distinctions being indicated by particles. In the Ebon language, however, the tenses are some- times marked ; but in that the simple form of the verb is frequently given. All have verbal directive particles. In Ponape, one of the Caroline Islands, many words of ceremony are used in address- ing chiefs, as they are used in Samoa. The custom of tabooing words is also found there as it is in the Sawaiori languages. For further particulars respecting the Tarapons, sce MICRONESIA.

Missions.—The first mission was commenced in Tahiti by the

agents of the London Missionary Society in 1797. Since then that society has continued and extended its labours until it now occupies the Society, Cook, Austral, Tuamotu, Samoan, Tokelauan, and Ellice groups, and several isolated islands, all peopled by the Sawaiori race, besides other islands in the Papuan and Tarapon areas. With the exception of a portion of the Tuamotu archi- pelago, all the people in the groups mentioned are now nominal Christians. There are only three groups peopled by the Sawaioris where the London Missionary Society’s agents do not labour ; and two of these are efficiently occupied by other societies—Hawaii mainly by the American Board, and Tonga by the Wesleyan Mis- sionary Society. These two groups are also entirely Christian. The Marqucsas Islands have not been Christianized, but are vartly occupied by missionaries from Hawaii. There are, there- ore, only two groups peopled by the Sawaioris where any heathen are found at the present day. An estimate of the number of this people, based upon actual counting in many islands, would be about 179,000, of which number about 161,500 are nominal Christians, leaving about 17,500 still heathen. Of the Papuans a smaller proportion arc Christians. In Fiji and Rotnma the great majority of the population have

become nominal Christians through the labours of Wesleyan missionaries. The Wesleyans have also successfully laboured in Duke of York Island, near New Britain. In. the Loyalty Islands most of the people have embraced Christianity through the labours of the London Missionary Society's agents, —a part, however, being Roman Catholics. Aneityum in the New Hebrides has become wholly Christian through the agency of Presbyterian missions. In a few other islands in the New Hebrides, also in Banks and Santa Cruz groups, small com- panies of converts have been gathered by the Presbyterian and the Episcopal (Melanesian) missions. The rest of the people in the Papuan area in Polynesia are still savages, and most of them are cannibals. The population of this area may be estimated at about 600,000. Of this number about 130,000 are nominal Christians. Excluding the inhabitants of the Ladrone and Pelew Islands, the Tarapon people may be estimated at about 84,000. The agents of the Hawaiian Board of Missions (taking the place of the American Board, under whose auspices the missionaries first laboured in this region) are the most numerous herc, occupying portions of the Gilbert, Marshall, and Caroline Islands. Six atolls south of the equator in the Gilbert group are occupied by native missionaries from Samoa in connexion with the London Missionary Society. The number of nominal Christians in these groups is about 38,000. The aggregate population of Polynesia may thus be estimated at 863,000, of whom 539,500 are heathen and 323,500 are nominal or baptized Christians. From the records of the variou' missionary societies it appears that out of this number 69,605, or very nearly one-fifth, arc communicants.

In addition to the missionary societies already mentioned, which have done the main work in the evangelization of the Polynesians, there are French Protestant missionaries in Tahiti, and Protestant Episcopal clergymen in Hawaii and in Fiji. There are also in many islands French Roman Catholic missionaries ; but these have a comparatively small number of adherents.

Wherever the missions have been planted schools have also been established, and the people have received more or less education. On the Christian islands nearly all the people can now read, most can write, and a large proportion are acquainted with the elements of arithmetic. General education, thus far, is much more common on those islands than it is at present in the British Isles. Advanced schools have been founded in

connexion with some of the missions, and many of the native youths have shown considerable aptitude

for some of the highcr branches of knowledge. In most of the larger groups colleges for the education of native ministcrs have long been conducted. In these colleges, in addition to Biblical exegesis and theology, other subjects, such as history and elemen- tary science, are taught. Many of the European and American missionarics have devoted themselves largely to literary work in the vernacular of the islands where they reside. Next to the translation of the Scriptures and the preparation of lesson books for the common schools, they have either translated works on history, science, &c., or they have written such books as they found the natives to need. In nearly every group occupied by the Sawaiori race there is now a considerable vernacular literature, embracing elementary works on most branches of knowledge. Amongst the other races the literature is of much smaller extent. The entire Bible has been translated into five of the principal Sawaiori languages of Polynesia. The entire New Testament, and a considerable portion of the Old, has been translated into a sixth language, besides smaller portions into others. The American Bible Society has supplied the Bibles for the Hawaiian Islands. Many portions of the Scriptures for other islands have been printed either in the islands or in Australia. Of the number of copies thus circulated no record is easily accessible, but the British and Foreign Bible Society has issued 153,462 entire Bibles or New Testaments in the Samoan, Tahitian, Tongan, Rarotongan, and Niuéan languages. As among this race one translation serves for an entire group, and in some cases for two or three groups, nearly all the people possess the Scriptures. In no part of the world is the Bible more read than it is by these islanders ; and it has not been necessary to give the Scriptures to them without charge in order to induce them to read.

In many islands the pastoral work is now mostly done by native ministers, —the foreign missionaries who remain devoting them. selves to superintendence, higher education, and literature. The native pastors are always supported by the voluntary gifts of the people to whom they minister. The people also build their own churches and schools, and meet

all the expenses connected with public worship and education, upon the voluntary principle. No portion of Christendom is better supplied with religious instruction than the Christianized islands of Polyaitte, aud nowhere is there miore regard paid by the people generally to Sabbath observance, to public worship, and to other outward duties of religion. Faanily worship is almost invariably observed.

With all this, too many of the people are religious only in namc ; and in the neighbourhood of ports, where casual visitors usually see and judge the native character, there are some who have added many of the white man's vices to their own. But in estimating the influence of Christianity upon these people we should remember that only about one-fifth of the nominal Christians are communi- cants. If they be judged fairly, taking into consideration their past history and the short time they have been under Christian infiaence, the present writer is convinced that the verdict will be favourable as compared with any Christian people in the world. Every one will admit that social, moral, and spiritual reformations are not completed in a gencration, but require time to bring thein to maturity.

Population—its alleged Deerease.—There is a general notion abroad that in all the islands of Polynesia the native races are rapidly decreasing ; and this supposed fact is sometimes attributed to the missionaries. The alleged diminution, however, is a gencral conclusion from particular premises, and facts drawn from wider observations do not confirm it. The question of the decrease of population in these islands is a wide one, which cannot be fully discussed within the limits of the present article ; but a few general observations, and a few particular facts, may help to throw some light upon it. (1) The estimates of population made by the first European or American visitors to Polynesia were far too high. In nearly all islands the people live almost entirely upon the coast ; hence it was an error to reckon the inland portions as having a population proportionate to the number of people seen upon the coast. Then, when the visits of foreign ships were a novelty, the people from other districts would crowd to the place where the ships anchored to see them. Thus the population of particular villages was over-estimated. In the last edition of this Encyclo- pedia the population of Samoa is said to be variously cstiinated at from 160,000 to as few as 38,000. It is now known that even the lowest estimate was somewhat over the actual

number.’ Most of the other groups werc also greatly over-estimated. Hence the decrease of population in any of the islands since they have become known is not so great as it is supposed to be. (2) Those who have resided in Polynesia, and who have made observations on the sub- ject, know that previous to the introduction of Christianity there had been a great decrease in the population of most of the islands. There are numerous evidences that they were formerly much more

1 In Nature, for 1876, vol. xiv. pp. 190-91, Mr Whitmee gave the latest census of Samoa, taken by actual counting, as being 34,265 in 1874. Yet, in his Austral- asia, published in 1879, Mr A. R. Wallace says the population of these islands ‘is variously estimated at 35,000 or 60,000.”

thickly peopled. Wars, infanticide, human sacrifices, and canni- palism are doubtless among the causes of depopulation, (3) Where the scourge of syphilis had not spread before Christianity was received, and the love of ardent spirits has not corrupted the people, there the population has generally increased. It 1s found from a record of births and deaths in some parts of Samoa, and from periodical census returns as a result of actual counting from the whole of that group, that, apart from the destruction caused by war, the population there increases at the rate of about 1 per cent. per annum. Although Samoa has suffered more from internecine wars than any other Christian group in Polynesia, there are more natives now living there than when they were first counted in 1843, the number then being 33,901. The increase in Tonga has been 25 per cent. in twenty years.’ On the island of Niué the in- crease is more than 8 per cent. per annum. On several other groups there has been increase, though figures are not available. The rapid decline of population in Hawaii is entirely exceptional. Commerce.—Information on this subject, as far as it is available, is given in the special articles on particular groups. The following is a fair specimen of the kind and extent of the commerce which has grown in Polynesia since Christianity has made the islands safe and profitable places for the residence of traders.2 From Cook Islands, containing a population of about 8000, and three atolls which lie north of that group, viz., Tongareva, Rakaanga, and Manihiki, with a population of about 4000, the exports

during 1883 were 150 tous of cotton free from seeds, 50 tons of coffee, 1000 tons of copra, 84 tons of pearl shell, and about 100,000 gallons of lime juice, besides 5000 crates of oranges, containing about 300 per crate. Mr Gill estimates the market value of this produce at £50,000,—miore than £4 per head for the native population. Part is purchased by merchants in Tahiti, and part goes to Auckland, New Zealand. There are not many islands whence fruit is exported, although, if there were markets within a few days' sail, a large quan- tity of fine oranges, pine-apples, and bananas might be provided. In 1878 the figures collected by the present writer relating to the trade in Samoa, Tonga, and several other islands in that neighbour- hood, showed that the exports averaged annually about £4 each for the entire population, and that the imports were only a little less. Prehistoric Remains. —The most remarkable of these are on Easter Island, which lies at the south-eastern extremity of Poly- nesia, nearly 2500 miles from South America. volcanie formation, and is about 11 miles long by 4 miles wide. The present inhabitants belong to the Sawaiori race. Here are found immense platforms built of large cut stones fitted together without cement. They are generally built upon headlands, and on the slope towards the sea, The walls on the sea-side are, in some of the platforms, nearly 30 feet high and from 200 to 300 feet long, by about 30 feet wide. Some of the squared stones are as much as 6 feet long. On the land side of the platforms there is a broad terrace with large stone pedestals upon which once stood colossal stone images carved somewhat into the shape of the human trunk. On some of the platforms there are upwards of a dozen images now thrown from their pedestals and lying in all directions. Their usual height is from 14 to 16 feet, but the largest are 37 feet, while some are only about 4 feet. They are formed from a grey trachytic lava found at the east end of the island. The top of the heads of the images is cut flat to receive round crowns made of a reddish vesicular tuff found at a crater about 8 miles distant from the quarry where the images were cut.. A number of these crowus still lie at the crater apparently ready for removal, some of the largest being over 10 fect in diameter. In the atlas illustrating the voyage of La Pérouse a plan of the island is given, with the position of several of the platforms. Two of the images are also represented ina plate. One statue, 8 feet in height and weighing 4 tons, was brought to England, and is now in the British Museum. In one part of the island are the remains of stone houses nearly 100 feet long by about 20 feet wide. These are built in courses of large flat

stones fitted together without cement, the walls being about 5 feet thick and over 5 feet high. They are lined on the inside with upright slabs, on which are painted geometrical figures and repre- sentations of animals. The roofs are formed by placing slabs so that each course overlaps the lower one until the opening becomes about 5 feet wide, when it is covered with flat slabs reaching from one side to the other. The lava rocks near the houses are carved into the resemblance of various animals and human faces, forming, probably, a kind of picture writing. Wooden tablets covered with various signs and figures have also been found. The only ancient imple- ment discovered on the island is a kind of stone chisel, but it seems impossible that such large and numerous works could have been executed with such a tool. The present inhabitants of Easter Island know nothing of the construction of these remarkable works ;

and the entire subject of their existence in this small and remote island is a mystery.

= This fact is stated on the authority of the Rev. Mr Moulton, a = residing there, and it is the result of counting. From figures supplied by the Rev. W. W. Gill, B.A.

This island is of |

POL—POL

On the island of Tonga-tabu, Tonga group, there is a remarkable monument. ‘Two large rectangular blocks of stone, about 40 feet in height, stand perpendicularly, with @ large slab lying across from one to the other. On the centre of the horizontal stone is a large stone bowl: The island upon which this monument is found is of coral formation slightly elevated. These immense stones must therefore have been conveyed thither by sea. The present inhabit- ants know nothing of their history, or of the object which they were intended to serve.

In Ponapé, one of the islands of the Caroline group, there are extensive iuins, the principal being a court about 300 feet in length, the walls of which are formed of basaltic prisms and are about 30 feet in height. Inside, on all four sides, next the wall is a terrace 8 feet high and 12 feet wide. The

court is divided into three by low walls, and in the centre of each division there is a covered chamber 14 feet square. The walls above the terrace are 8 feet thick, and some of the stones are 25 feet long by 8 feet in circumference. The basaltic columns of which this structure is built were apparently brought a distance of 10 miles from the central ridge of the island. There are other ruins of smaller extent on Ponapé, and also on the island of Kusaie in the same group. Ponapé and Kusate are rem- nants of larger islands which have been partially submerged. While the smaller islands around which the coral polypes built up the atolls have disappeared, these two remain as monuments of the past.

North-west from Ponapé, in the Mariana or Ladrone Islands, there are other remains in the shape of stone columns about 14 fect high, with a semi-globular stone nearly 6 fect in diameter on the top of eacli, the rounded side being uppermost.

Thus in four different and widely separated parts of Polynesia there are relics of prehistoric people. These together form one of the greatest puzzles the ethnologist has to deal with. (S. J. W.)

POLYPE. In its Greek and Latin forms the word polypus was first used as descriptive of the CUTTLE-FISH (q.v.). In speaking of the Acalephe Aristotle says, “They hold their prey as the polypus does with its feelers,” and there is no doubt that in this and other passages he referred to the octopus. The word was also, though less generally, applied to the woodlouse (Oniscus)—the reason for both usages being equally evident. Though the former meaning persists in the word poulpe, yet by the beginning of the 18th century it seems to have been for- gotten, and the word was by analogy transferred to a group of animals then beginning to attract much attention. Réaumur and Bernard de Jussieu were the first to fix the usage of the word polype as applicable to hydroids, corals, and Polyzoa. In following up the discoveries of Marsigli and Peysonelle in regard to the little coral organisms, Jussieu used the name polype definitely to describe those Sertularians, Alcyonians, sea-mats, &c., which were then (1742) known as animals. Trembley had previously rediscovered Leeuwenhoek’s /ydra, and described it as a freshwater polype in a work which appeared in 1744. A polyzoon too, discovered both by Trembley and Baker in 1741,

was called by the former Polype a Panache. We find the word used with the same content as Jussieu had assigned to it by Ellis in 1755, by Cavolini in 1783, and by others. In 1816 Lamouroux published his Histoure des Polypiers Coralligénes, in the preface of which he speaks of the varied character of this group of animals “nommés Hydres par Linné et Polypes par Réaumur.” In his own use of the term he applied it to sponges, hydroids, corals, and Ilustre. Lamarck too used the word very widely, and spoke of Polypei as (1) ciliati, including some Infusorians and Rotifers ; (2) denudati, including Hydra, Coryne, &c. ; (3) vaginati, including Difilugia, Spongilla, Tubularra, Millepores and Madrepores, Alcyonia, Cristatella, Flustra, &c.; and (4) natantes, including Pennatula, Virgularia, Encrinus, &c. Sometimes, however, he used the word in a more restricted sense. Cuvier (1819-1830) distinguished three classes of polypes:—(1) fleshy—Actinix and Lucer- nariz ; (2) gelatinous—Hydra, Cristatella, Coryne, Vorte- cella, &c.; and (3) Corallifere—Sponges, Madrepores, Millepores, Tubularia, Sertularia, Alcyonide, Flustrex, &e. Subsequently he improved on this and recognized (1) an Actinia group, (2) a group like Hydra and Sertularia, and (3) Polypes & Polypiers, which he again divided into

Anthozoa and Bryozoa. From 1830 onwards there was a distinct tendency to separate the Polyzoa from the polypes —they are spoken of as higher Poly, compound polypes, &c. In 1831 Ehrenberg described the Polyps or Curtalra as a class of the Phytozoa, and distinguished the true polypes or Anthozoa from the Bryozoa. Milne-Edwards expressly excludes the Bryozoa, and restricts the term polype to the Zoantharia and Alcyonaria inclusive of Hydra and Lucer- naria. In 1847 Frey and Leuckart placed the Polyzoa by themselves, and united the remaining Polype of Cuvier along with the Acalephe under the class name Coelenterata, which the latter afterwards (1853) divided into (1) Cteno- phora, (2) Medusx, and (3) Polypes. Modern anatomists generally agree in confining the term to the individuals (zooids or persone) of hydriform JL. ydromeduse and Actinozoa, and frequently restrict it to the former (see Hyprozoa, Corals).

POLYPTERUS, a genus of Ganoid fishes common in many rivers of tropical Africa, and known on the Nile by the name of aba bishtr. Their

body is cylindrical in shape, elongate, and covered with hard, polished, ganoid scales, which are arranged in oblique series. The head, with flattened snout and wide mouth, is protected by bony plates with ganoid external surface, of which a series of ‘‘supra-temporal” and “spiracular” ossicles are especially characteristic. Spiracles, or external openings of a canal leading into the pharynx are persistent throughout life, situated on each side of the parietal bone, and closed by an osseous valve. The lips are fleshy, but the space between the rami of the mandible is covered by a large “gular” plate. The vent is placed far backwards, in front of the anal fin, the tail being short, with a diphy- cercal termination of the vertebral column. The mouth is well provided with rasp-like teeth, forming broad bands in the jaws, on the vomer and palatine bones. The paired fins are supported by an axial skeleton. The structure of the dorsal fin is unique: its anterior portion is composed of isolated finlets, from eight to eighteen in number, each of which consists of a flattened spine with a bifurcate termination ; to the posterior aspect of the top of each spine several soft rays are attached, which result from the dichotomous division of a single ray, the basal portion of which is the spine. Posteriorly these finlets pass into the ordinary rays composing the caudal fin, which surrounds the tail. The ventral fins are well- developed, and inserted behind the middle of the length of the trunk. The respiratory apparatus consists of three and a half gills, and is protected by an osseous gill-cover.

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An external gill of considerable size in the form of a tapering band fringed with respiratory laminz exists in young examples, and is attached to the end of the gill- cover. ‘The air-bladder is double, and communicates with the ventral wall of the pharynx.

Such are some of the principal characteristics of one of the most interesting representatives of a type which in Polyptcrus has survived from the Devonian and Carboniferous formations to our period ; for further details of its internal organization see IcHTHYO- Locy. The centre of distribution of Polyptcrus is the lake region of tropical Africa, from which the Nile and the great rivers of West Africa take their origin. A very remarkable fact is its total absence in the East-African river systems which belong to the Indian

Ocean. Specimens of the bishir have been found in the Nile as low as Cairo, but it is very scarce throughont the middle and lower parts of that river; such individuals have evidently been carried by the current down from southern latitudes, and do not propagate the species in the northern parts. As mentioned above, the number of the rays which are modified into finlets varies considerably, and consequently several species have been distinguished by some naturalists, whilst others hold that there is one species of Polypterus only. The largest specimens observed had a length of 4 feet. Nothing is known of its habits and propagation, and observations thereon are very desirable. Some years ago an extremely interesting dwatf form of Polypterus was discovered in Old Calabar, and described under the name of Calamoichthys calabaricus. It much resembles the bishir but is smaller, and considerably more elongate.

POLYPUS, a term in surgery, signifying a tumour which is attached by a narrow neck to the walls of a cavity lined with mucous membrane. A polypus or polypoid tumour may belong to any variety of tumour, either simple or malignant. ‘The most common variety is a polypus of the nose of simple character and easily removed. Polypi are also met with in the ear, larynx, uterus, Vagina, and rectum. See SURGERY.

POLYSPERCHON, one of Alexander’s generals, and the successor of Antipater as regent in Macedonia in 318 B.c. He was driven from the kingdom by Cassander in 316. For the leading incidents of his brief term of office see Puocton (vol. xviii. p. 800) ; compare also Macrponta.

POLYXENA, in Greek legend, a daughter of Priam, last king of Troy, and Hecuba. She had been betrothed to Achilles, and after his death and the destruction of Troy the ghost of Achilles appeared to the returning Greeks as they were encamped on the Thracian Chersonese and demanded of them the sacrifice of Polyxena. The Greeks consented and Neoptolemus, son of Achilles, sacri- ficed Polyxena on his father’s grave. This tragic story is the subject of the Hecuba of Euripides and the Z’roades of Seneca. Of Sophocles’s tragedy Polywena a few fragments only remain.

POLYAOA

OLYZOA is the name applied by J. Vaughan Thompson

in 1830 (1)! to a group of minute polyp-like organisms which were subsequently (1834) termed “Btyozoa” by Ehrenberg (2). The forms included in this group were

stated by Thompson to be “in a general way the whole’

of the Flustraceze, in many of which I have clearly ascer- tained the animals to be Polyzoz,” they having been pre- viously considered by zoologists to be allied to the Hydra- like polyps. These organisms had previously been known by the hard corneous “cells” or chambers which are formed by the animals on the surface of their bodies, and build up, in consequence of the formation of dense colonies by bud- ding, complex aggregates known as “sea mats” and “sea mosses.” Thompson expressly stated the opinion that the organization of the animals detected by him led to the conclusion that “ they must be considered as a new type of the Mollusca Acephala.” I These numbers refer to the bibliography at the end of the article.

Subsequently (1844) Henri Milne-Edwards (3) pointed out the relationship of Thompson’s Polyzoa to the Brachio- poda, and, adopting the latter’s view as to their Molluscan affinities, proposed to unite these two classes with the Tunicata in a group to be called “Molluscoidea.” Re- cent researches have entirely separated the Tunicata from this association, and have demonstrated that they belong to the great phylum of Vertebrata. On the other hand the association of the Polyzoa with the Brachiopoda ap- pears at present to be confirmed, though the relationship of these two classes to the Mollusca has been shown to rest on mistaken identification of parts; see, however, Harmer (18).

The Polyzoa appear to be related to the Sipunculoid Gephyreean worms (Gephyrzea inermia) more nearly than to any other class of the animal kingdom. The study and interpretation of the facts of their ontogeny (growth from the egg) presents such extreme difficulty that in the pre- sent state of our knowledge it is necessary to regard them

ad interim as forming with the Brachiopoda and Sipuncu- loids an isolated group, to which the name “ Podaxonia

may be applied, pending the decision of their affinities by the increase of our knowledge of the embryology of import- ant members of the group.! ;

The forms included at the present day in Thompson's class of " Polyzoa" may then be thus classified :—

Puytum PODAXONIA: Ciass I.—STPUNCULOIDEA. Crass Il.—BRACHIOPODA. Cnass I1].—POLYZOA. Section 1.—VERMIFORMIA. Sole genus: Phoronis (figs. 4 and 5). Section 2, -PTEROBRANCHIA. Genus 1: Rhabdopleura (fig. 7). Genus 2: Cephalodiseus (figs: 8, 9, 10). Section 3.—EUPOLYZOA. Sub-class 1.—EHctoprocta. Order 1.—PHYLACTOLEMA. Examples: Lophopus, Plumatella (fig. 2, B), Cristatella (fig. 3), Hredericella. Order 2.—GYMNOLAMA. Sub-order 1.—Cyclostoma. Examples: Crisia (fig. 18, A), Ho-nera, Tubulipora, Discoporella. Sub-order 2.—Ctenostoma. Examples: Alcyonidiwm, Vesicularia, Serialaria, Bower- bankia (fig. 1, A), Paludieella (fig. 1, E and fig. 2, A). Sub-order 3.—Chilostoma. Examples: Cellularia, Serupocellaria, Kinetoskias (fig. 14), Bugula, Bicellaria, Flustra (fig. 1, G), Muero- nella (fig. 1, C, D, F), Membranipora, Lepralia, Eschara, Cellepora, Retepora. – Sub-class 2,—Entoprocta, Genera: Pedicellina (fig. 15), Loxosoma (fig. 16), Urna- tella, Ascopodaria.

We shall most readily arrive at a conception of the essential structure of a Polyzoon, and of the variations to which that essential structure is subject within the class, by first examining one member of the group in detail and subsequently reviewing the characters presented by the divergent sub-classes, orders, &c., above indicated.

The most convenient form for our purpose is Paludicella Ehrenbergu (fig. 2, A), belonging to the typical section of the class (the Eupolyzoa) and to the order Gymnolema, The organism occurs as minute tree-like growths (figs. 2, A and 1, E) attached to stones in freshwater streams and canals. The branches of the little tree are rarely more than an inch in length, and are regularly swollen and jointed at intervals. Each of the very numerous joints is about one- fifth of an inch long, and is in reality a tubular horny box attached above and below to the preceding and succeeding joints, and having on one side of it a spout-like aperture from which a crown of tentacles can be protruded. Each joint is thus inhabited by a distinct animal

which is more or less completely shut off from the one in front of it and the one behind it, although it originated from the hinder and has given rise to the fore-lying individual by a process of budding, and retains a continuity of substance with both.

A single cell or joint with its contained animal is repre- |

sented in fig. 2, A.

Paludicella produces an arboriform colony, the main trunk or stolon being adherent to some stone or piece of wood. The substance of the wall of the cells is formed by a chemical body allied to chitin. Other Polyzoa may form mat-like expansions—the cells being placed in one plane, side by side (fig. 1, C, D, F, G), as well as in linear series ; others again form solid masses, whilst many agree with Paludicella in the simple linear arrangement of their units. Phoronis and Loxosoma, on the other hand, do not form colonies at all—the former because it does not

1 The research of Harmer (18) on Loxosoma is published too late for due notice in this article. It tends to the conclusion that the Eupolyzoa are after all degraded Mollusca, and have no connexion

with the Vermiformia, Pterobranchia, Brachiopoda, and Sipunculoidea, The reader is referred to Mr Harmer’s memoir.

POUYAZOA

bud, the latter because the buds become detached from their parent as soon as formed, as do the buds of the Hydrozoon Hydra. :

On the whole Paludicella presents us with a very simple form of Polyzoon-colony (technically termed a “zoarium ”), in which the aggregate of budded persons, each of which

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Fig. 1.—Various forms of zoaria of Eupolyzoa.

. Bowerbankia pustulosa, one of the Ctenostoma ; natural size.

. A cluster of polypides of Bowerbankia pustulosa, some with expanded tentacles ; more highly magnified.

. Zocecia of Mucronella pavonella (Chilostoma); highly magnified.

. Zoarium of Mucronelia pavonelia, forming a disk-like encrustation on a picce of stone; natural size.

. Zoarium of Paludicella Ehrenbergti (Ctenostoma), natural size.

. Zowcia of Mucronella Peachii ; highly magnified. Compare with C in order to note specific characters.

G. Zoarium of Flustra securifrons; natural size.

is called a “ polypide,” does not exhibit any marked indi- viduation, but is irregular and tree-like. But, just as in the Hydrozoa we find the Siphonophora presenting us with a very definite shape and individuality of the aggregate or colony, so in the Polyzoa we find instances of high indi-

viduation of the zoarium of a similar kind. The most remarkable example is afforded by the locomotive zoarium or colony of Cristatella (fig. 3); and another very striking instance is that of the stalked zoaria of Kinetoskias (fig. 14) and Adeona.

The horny consistence of the cells which are produced by Paludicella is very usual in other Polyzoa; but we find frequently that the substance which forms the cells is gelatinous and soft instead of being horny, or again may be strongly calcareous. The term cenocium is applied to the mass of cells belonging to a colony or zoarium when considered apart from the living polypides which form it, Often such ccencecia are found retaining form and

structure when the soft living polypides have decomposed and dis- appeared. A single cell of the ccencecium, corresponding toa single polypide, is called by. the special students of the Polyzoa a zowciwm.

If we examine a single cell or zocecium of Paludicella more carefully whilst its polypide is alive, we discover that the horny cell is: nothing more than the cuticle of the polypide itself, to which it is absol- utely adherent. At the so-called “ mouth” or spout of the cell the cuticle suddenly changes its character and becomes a very delicate and soft pel- licle instead of being thickandhorny. There is no real discontinuity of the cuticle at this region, but merely a change in its qualities. This gives to that por- tion of the body of the polypide which lies beyond the spout a mobility and capacity for folding and pleat- ing which is entirely denied to that part where the cuticle is more dense (fig. 2, A). Accordingly we find that the anterior por- tion of the body of the polypide can be pulled into the hinder part as the finger of a glove may be tucked into the hand. It is, in fact, an “introvert” (for the use of this term see Motiusea, vol. xvi. p.652). This arrange- ment is universal in the Ectoproctous Eupolyzoa, but does

Fic. 2.—A, Polypide of Paludicella Ehrenbergit, seen as a transparent objeet in optical section and highly magnified (from Gegenbaur, after Allman), For natural size see fig. 1, E. a, anus; 67’, peristomial cirelet of ciliated ten- tacles; 7, thickened euticle of the body-wall, forming the horny eell or zoccium; m, median retractor muscle of the introversible part of the body; 7’, anterior retractor of the same; my, great retractor muscle of the same; o, ovary, passing from which to the stomach is the anterior mesentery or funiculus; ¢, testis ; e@, esophagus; v, stomach; 2, posterior mes- entery or funiculus; 2’, anterior mesentery or funiculus. Observe at the 1ight upper eorner of the figure the base of a second polypide and the ‘‘ rosette-plate” of separation.

B. Diagram of a polypide of Plumatella. Letters as above.

not obtain either in the Entoprocta, the Pterobranchia, or |

the Vermiformia. In Phoronis, Rhabdopleura, and Cepha- lodiscus the anterior part of the body can not be tucked or telescoped into the hinder part as it can in typical Eu- polyzoa. On the other hand it is very important to

note that the Sipunculoid Gephyreans are all pre-eminently characterized by possessing identically this arrangement. The introversion is effected in Paludicella (as in other Eu- polyzoa) by a series of long detached retractor muscles of

considerable power (fig. 2, A, mr, r’, m); the same is true of Sipunculus.

The view has been advanced by Allman (4) that the re- tractile part of the polypide is to be considered as a distinct individual budded from the basal portion, which is regarded as an equivalent individual. It does not appear to the present writer that such a theoretical conception tends to facilitate the understanding of the structure and relations of these animals.

An “ectocyst” and “‘endocyst” have also been distin- guished in former treatises, and these terms form part of a special “ polyzoarial” nomenclature, but do not appear to be any longer needful. Equally undesirable is the misap- plied term “endosare” lately introduced by Jolliet (5) to denote a certain portion of the Polyzoon structure which will not be referred to here by that name.

The retractile or introversible portion of the body of the polypide of Paludicella is terminated by a crown of sixteen stiff non-contractile tentacles (fig. 2, A, 47) which form a circle around a central aperture—the animal’s mouth. These tentacles are hollow and beset with vibratile’ cilia. The beating of the cilia causes a powerful current in the water by which food is brought to the animal’s mouth. Fach tentacle is also muscular, and can be bent and straightened at will. The tentacles not only serve to bring food into the mouth, but they are efficient as gill- filaments, being possibly homologous with (as well as func- tionally similar to) the gill-filaments of Lamellibranch Molluscs, They also serve as delicate tactile organs, and are the only sense organs possessed by the Eupolyzoa.

In Paludicella the platform around the mouth from which the tentacles arise, or lophophore, as it is termed, is circular. This is the case in all members of the large group of Gymnolema and in the Entoprocta. But in the Phylactolema the lophophore is drawn out on each side, right and left, so as

to present a horse-shoe shape (fig. 2, B), and in some forms, notably Lophopus and Aleyonella, the two arms or diverging rami of the horse-shoe are very strongly developed.

In the Pterobranchia the tentacles are confined in one genus (Rhabdopleura) to the two arm-like outgrowths of the lophophore, and are not simply hollow but contain a well-developed cartilaginoid skeleton (fig. 7). In the allied genus Cephalodiscus there are not merely a single pair of such arm-like processes, each bearing two rows of tentacles, but the lophophore is developed into twelve arm-like pro- cesses (fig. 9), which form a dense tuft of filaments around the anterior extremity of the animal.

In the Vermiformia (Phoronis) we again meet with a very perfect horse-shoe-shaped lophophore (fig. 4), The tentacles upon the crescentic or otherwise lobed circumoral region of the Sipunculoids are the representatives of the tentacles of the Polyzoa; whilst the tentaculiferous “arms” of the Brachiopoda appear to be the equivalents of the Polyzoon’s lophophore much drawn out and in most cases spirally rolled.

Just below the circular crown of tentacles in Paludicella we find an aperture which the study of internal anatomy proves to be the anus. In all Polyzoa the anus has this position near the mouth; and in this respect we again note an agreement with Sipunculus and the other so-called Gephyreea inermia. In one division of the Polyzoa alone is there any noteworthy variation in the position of the anus, namely, in the Entoprocta (sub-class of the section Eupolyzoa). In these forms the anus, instead of lying just below the lophophore or platform from which the

| tentacles spring, is included like the mouth within its

area (fig. 15, C). Passing now to the deeper structure of Paludicella, we find that it is a Coelomate animal; that is to say, there

exists between the body-wall and the wall of the aliment- ary tract a distinct space termed “ perigastric space,” “body-cavity,” or “ccelom.” This is true of all Polyzoa, though it has been erroneously stated by G. O. Sars that

Rhabdopleura does not possess such a cceelom. In Eu- polyzoa (excepting the Entoprocta) the ccelom Is very capacious ; it is occupied by a coagulable hemolymph in which float cellular corpuscles, and also the generative products, detached, as is usual in Coelomata, from definite “gonads” developed on its lining membrane (fig. 2, A, 9, ¢). This lining membrane or “ ccelomic epithelium ” is ciliated in the Phylactoleema, but its characters appear not to have been definitely determined in other Eupolyzoa. The ccelomic space and the tissues bounding it are continuous throughout the colony or zoarium of a Polyzoon—either directly without any constriction marking off one polypide from another, or through perforate septum-like structures as in Paludicella (see right-hand upper process of fig. 2, A), which form incomplete barriers between juxtaposed zocecia, and are termed “rosette-plates” or “communication-plates. ” The coelomic cavity is continued in Paludicella and probably in all Polyzoa into the tentacles, so that these organs expose the hemolymph fluid to a respiratory action, and hence may be called branchial.

The body-wall of Paludicella consists, alike in the anterior introversible region and in the posterior region, of an outer cuticle which has already been spoken of as thickened around the base of the polypide so as to become there the hard tube-like zocecium. Beneath this is the delicate layer of living epidermic cells which are the mother-cells or matrix of that cuticle. Beneath this again are a few scattered annuli of muscular fibre-cells arranged ring – wise around the cylindrical body; more deeply placed than these are five large bundles of longitudinally placed muscular fibre-cells which are attached at three different levels to the soft introversible portion of the body, and by their retraction pull it in three folds or tele- scopic joints into the capacious hinder part of the body. In some Polyzoa the muscular fibre-cells present trans- verse striations. These folds are shown in fig. 2, A;

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Fig, 3.—The locomotive zoarium of the freshwater Phylaetolemous Polyzoon Cristatella mucedo; magnified six times linear (after Allman). a,

individual polypides with their horse-shoe-shaped crown of tentacles exserted: 5 stato- blasts seen through the transparent tissues ; c, the muscular foot or base of the colony by means of which it crawls; d, portion of water-weed upon which the Cristatella is erawling,

but when the longitudinal muscles are completely con- tracted the tentacular crown would be pulled down far out of sight into the midst of the body by the great longitu- dinal muscle mr. Deeper than the longitudinal muscles, and clothing them and everything else which projects into the ccelom, is the ccelomic epithelium, not easily observed, and sufficiently known only in the Phylactolema. Part of it gives rise to the generative products (fig. 2 A, 0, ~~2). Other Eupolyzoa have a similar but not identical arrange~~ ment of the longitudinal muscles—acting essentially as retractors of the “introvert” or soft anterior region of the body—and asimilar structure of the body-wall which is in

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essential features identical with that of the Sipunculoid worms, the Cheetopod worms, and other typical Coelomate animals.

The alimentary canal of Paludicella forms a closely com- pressed U-shaped loop depending from the closely approxi- mated mouth and anus into the capacious ccelom. It is clothed on its ccelomic surface (in Phylactolema at any rate) with ccelomic epithelium, and beneath this are extremely delicate muscular layers. Within it is lined, except in the immediate region of the mouth (which is lined by the in-pushed outer cell-layer), by the enteric cell-layer—-the digestive cells derived from the archenteron of the embryo. We can distinguish in Paludicella a contrac- tile pharyngo-cesophagus (fig. 2, A, «), a digestive stomach y (the lining cells of which have a yellow colour), and an intestine which forms that arm of the loop connected with the anus. This simple form of alimentary canal is uni- formly present in Polyzoa. In Bowerbankia and its allies a muscular gizzard with horny teeth is interposed between cesophagus and digestive stomach.

The alimentary canal of Paludicella does not hang quite freely in the ccelomic cavity, but, as is usually the case in other classes where the ccelom is large, mesenteries are present in the form of fibrous (muscular?) bands

clothed with coelomic epithelium and suspending the gut to the body-wall. In Paludicella there are two of these mesen- teries, an anterior (x’) and a posterior (x). The presence of two mesenteric bands is exceptional. Usually in the Eupolyzoa we find one such mesentery only, corresponding to the hinder of the two in Paludicella. The special name Junrculus (Huxley) is applied to this mesenteric band, and it is noteworthy that the cells of the cceelomic epithelium, either upon its surface or at its point of insertion into the body-wall, are modified as reproductive elements, forming either the testis or ovary; in the Phylactolema they form here also special asexual reproductive bodies, the stato- blasts. The nervous tissue and organs of Paludicella have not been specially investigated, but in many Eupolyzoa an oval mass of nerve-ganglion cells is found lying between the mouth and anus, and there is no doubt that it is present in this case. In Plumatella nerve-fibres have been traced from this ganglion to the tentacles and other parts around the mouth (fig. 11, w, 2, y). A “colonial nervous system” was described some years ago by Fr. Miller in Serialaria; but modern histologists do not admit that the tissue so named by Miiller is nerve-tissue. The ganglion above mentioned is the only nervous tissue

_ at present known in Polyzoa (but see fig. 17, x).

No heart or blood-vessels of any kind exist in Paludi- cella nor in any of the Eupolyzoa or Pterobranchia. On the other hand the isolated vermiform genus Phoronis presents a closed contractile system of longitudinal vessels (dorsal and ventral) which contain nucleated corpuscles coloured red by hemoglobin (figs. 4, 5).

No excretory organs (nephridia) or genital ducts have been observed in Paludicella, nor have such organs been detected in the majority of the Polyzoa which have been studied. In the Entoprocta, however, a pair of minute ciliated canals are found in the nearly obliterated body- cavity opening to the exterior near the tentacular crown in both Pedicellina and Loxosoma, which represent the cephalic nephridia of worms. A definite pair of nephridia occur in Phoronis. A similar significance is perhaps to be attributed to the “intertentacular organ” of Farre—a ciliated pas- sage opening between two tentacles of the lophophore in Membranipora, Alcyonidium, and other forms—through which Hincks has observed the

spermatozoa to escape in large numbers. This organ occurs equally in female speci- mens of Membranipora, and is not therefore simply a spermatic duct.

POm YZOA

Paludicella, as we have seen, develops both ova and | spermatozoa in one and the same polypide. The details of impregnation and development have not been followed in this instance, but in some of the marine Eupolyzoa (Gymnolema) remarkable bud-like structures termed owcta are developed for the special reception of the ova, and in these organs fertilization takes place. In the Entoprocta there is a peculiar brood-pouch. The spermatozoa of one polypide probably in all cases fertilize the ova of another, but we have not yet in many cases a knowledge of how the spermatozoa get to the eggs, or how the eggs escape from the body-cavity of the parent. In the hippocrepian freshwater Polyzoa (Phylactolema) the ova appear to be fertilized and undergo the early stages of development within the body-cavity of the parent or in a hernia-like protrusion of it. Probably in such cases the embryos escape by the death of the parent and rupture of the parental tissues, as do also the peculiar asexual internal buds or statoblasts of these forms.

The embryo Polyzoon or “larva” swims freely in its early condition by means of cilia, and is in this condition a single polypide or “person.” The forms assumed by these ciliated larve in different Polyzoa are very various and exceedingly difficult of interpretation. We shall have more to say with regard to them below (see figs. 19, 20, 21). The ciliated larva then fixes itself and commences to produce polypides by a process of budding, the buds remaining not merely in contact but in organic continuity, and increasing continually in number so as to form a large colony or zoarium. In Paludicella we have seen that this colony has a simple tree-like form. The new buds form as wart-like growths, usually one, sometimes two in number, at the free end of a cell or zoccium near the spout-like process from which the tentacular crown is everted. In Paludicella all the polypides of a colony are alike; there is no differentiation of form or distribution of function amongst the members of the colony. In many Eupolyzoa this simplicity is by no means maintained, but a great variety of form and

function is assumed by various members of the aggregate. The only approach to a differentiation of the polypides in Paludicella is in the arrest of growth of some of the buds of a colony in autumn, which, instead of advancing to maturity, become conical and invested with a dark-coloured cuticle. They are termed hybernacula. Should the rest of the poly- pides die down in winter, these arrested buds survive and go on to complete development on the return of spring.

In Paludicella we have thus seen a fairly simple and central example of Polyzoon structure and life-history. The variations upon this theme presented in different groups of Polyzoa have been to some small extent noted in the preceding account, but we shall now be able to indicate them more precisely by considering the various groups of Polyzoa in succession. The limit assigned to this article necessitates very large omissions. The reader who wishes to have the fullest information on the many difficult and uncertain matters connected with this subject is referred to Allman, Freshwater Polyzoa (Ray Society, 1856); Hincks, British Marine Polyzoa (Van Voorst, 1880) ; Haddon, “ Budding in Polyzoa,” Quart. Journ. Mier. Sct., 1883; Balfour, Hmbryology, vol. i. p. 242 ; and the original memoirs cited by these writers.

THE VERMIFORMIA.

The first section of the Polyzoa comprises but a single genus, Phoronis. It differs from all other Polyzoa first

| the Ectoproctous Eu-

in its greater size (species 2 inches long are known) and elaboration of organization, and correlatively with that in the fact that it does not produce buds. Further,

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it does not produce a closely adherent cuticular zocecium as do Paludicella and the Eupolyzoa generally, but a leathery tube in which the animal freely moves, resem- bling that of some Chetopods (Sabel- la). Like some Sabelle, Phoronis forms closely packed aggregates of indi- viduals not brought

together by any process of budding, but each separately developed from an egg. Phoronis has an elongate, worm- like, unsegmented body, with a conical posterior termina- tion (like Sipuncu- lus), and anteriorly provided with a horse – shoe – shaped crown of tentacles surrounding the mouth (figs. 4, 5). There is an inter- tentacular “ web” between the bases of the tentacles as in the Phylactole- ma. Caldwell (6) has recently shown that the tentacles are supported by a

mesoblastic skele- Fra. 4.—Phoronis hippocrepia, Wright; magnified

: six times linear (from Allman), @, horse-shoe- ton, as is also the shaped 1 phophore with tentaeles; c, ep’stome case in Rhabdo- (pre-oral lobe or prostomium); d¢, cesophagus; /,

ventral vessel; g, g, two anterior vessels whieh unite to form f; 7, longitudinal museular eoat

leura, but appar- F 5 PP of the body-wall; &, intertentaeular membrane.

ently not the case in any other Polyzoa. Close to the mouth, as in all Polyzoa, is placed the anus, outside the horse-shoe-shaped lophophore or tenta-

cular platform (fig. 11, «). The tenta- cular crown is not

introversible ; in this point Phoronis differs from Paludicella and

polyzoa, and agrees with the Entoprocta and the Pterobranchia. Overhanging the mouth is a small pre- oral lobe or “epi- stome ” (figs. 4, 5, c). This organ is aborted in Paludicella, and in- deed in all the Gym- nolema, but is present in the other Polyzoa, and is especially large and well developed in Rhabdopleura and Ce- phalodiscus. It has been compared to the Molluscan foot, but undoubtedly in Phoronis it is the persistent representative of the pre-oral XIX. — 55

Fic. 5.—Lateral view of the anterior region of Phoronis. The tentaeles of the right arm of the lophophore are cut short in order to expose elearly the

mouth 6 and the overhanging ‘ epistome” or pre-oral lobe c. @, intestine ; 2, dorsal vessel. Other letters as in fig. 4.

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lobe of the larva (fig. 6), and therefore cannot be compared to the Molluscan foot. If we are right in associating Phoronis with the Polyzoa, this fact is sufficient to show that the epistome of the Phylactolema (fig. 11, ¢) and the buccal shield of Rhabdopleura (fig. 7, d@) and of Cephalodis- cus (fig. 9, 6) are also cephalic in nature, and cannot rightly be identified with the post-oral and ventral muscular lobe known as the foot in Mollusca. A circum-oral nerve ring occurs at the base of the tentacles and sends off a cord which runs along the left side of the body. The alimen- tary canal presents the same general form and regions as in Paludicella. It hangs in the body-cavity, to the walls of which it is suspended by definite mesenteries.

Phoronis presents a closed contractile vascular system containing red-coloured blood-corpuscles (figs. 4, 5, f, g, h). A pair of ciliated canals acting as genital pores is found near the anus; these have been shown by Caldwell to be typical nephridia.

The development of Phoronis is remarkable. The egg gives rise (after the usual phases of cleavage and gastrula- tion) to the larval form known as Actinotrocha (fig. 6). This larva possesses a hood-like region overhanging

a |!

Fra. 6.—Development of Phoronis and typical ciliate larve. (1), (2), (8), (8), (9), (10), stages in the development of Phoronis—(1), earliest larva; (2), lateral view of the Actinotrocha; (3), ventral view of the same; (8), the ventral in- vagination dv is formed; (9), the ventral invagination is everted, carrying with it a loop of intestine ; (10), the permanent relations of mouth, anus, and body (Podaxonia) are attained, (4), (5), Echinoderm larva with architroch, as in Actinotrocha, but band-like, not digitate. (6), Echinoderm larva, with the architroch divided into a pree-oral cephalotroch (Molluscan and Rotifer’s velum), and a post-oral branchiotroch. (7), Cheetopod trochosphere larva with cephalo- troch only, and elongation and segmentation of the oro-anal axis. a. anus; 0, mouth ; pr, prostomium ; tv,

ventral invagination of Phoronis larva. A B, oro- analaxis; V D, dorso-ventral axis. ;

the mouth and a number of ciliated post-oral processes or tentacles. The anus is placed at the extremity of the elongate body opposite to that bearing the mouth and

pree-oral hood. The prz-oral hood becomes the epistome, and the tentacles, by further development (new tentacles replacing the larval ones), become the horse-shoe-shaped group of tentacles of the adult. A very curious process of growth changes the long axis of the body and results in the anus assuming its permanent position near the mouth. An invagination appears on the ventral face of the larva between the anus and mouth, and attains con- siderable size. At a definite moment in the course of growth this invagination is suddenly everted, carrying with it in its cavity the intestine in the form of a loop. Thus a new long axis is suddenly established at right angles to the original oro-anal axis, and continues to de- velop as the main portion of the body. The short area extending from the pre-oral hood to the anus is thus the true dorsal surface of Phoronis, whilst the elongated body is an outgrowth of the ventral surface perpendicular to the primary oro-anal axis, as conversely in many Mollusca we find a short ventral area (the foot) between mouth and anus, and an outgrowth of the dorsal surface (the visceral hump) perpendicular to the primary oro-anal axis, forming the chief body of the animal. In these relations Phoronis (and with it the other Polyzoa) agrees with Sipunculus. On the other hand Echiurus, the Chetopods, Nemertine worms, and some other groups which start from a simple larval form not unlike that of Phoronis, present a continual elongation of the original oro-anal axis, and no transference of the long axis by the perpendicular or angular growth of either the ventral or the dorsal surface of the larva.

Phoronis was discovered originally in the Firth of Forth by Dr Strethill Wright. It occurs in the Mediterranean and in Australian seas (Port Jackson).

THE PTEROBRANCHIA.

This section of the Polyzoa also comprises forms which differ very widely from Paludicella. Inasmuch as their development from the egg is at present quite unknown, it may possibly prove that they have other affinities. Only two genera are known, Rhabdopleura (Allman) and Cephalodiscus (M‘Intosh), the former dredged by Dr

| Norman in deep water off the Shetlands (and subse-

quently in Norway), the latter taken by the “ Challenger” expedition in 250 fathoms off the coast of Patagonia.

The Pterobranchia have the mouth and anus closely approximated, and immediately below the mouth are given off a series of ciliated tentacles, but these do not form a complete circle as in Paludicella, nor is the lophophore (the

_ platform of their origin) horse-shoe-shaped as in Phoronis. _ The lophophore is drawn out into a right and a left arm in

Rhabdopleura (fig. 7), upon each of which are two rows of ciliated tentacles ; no tentacles are developed centrally in the region between the two arms, so that the mouth is not completely surrounded by these processes. The horse- shoe-shaped lophophore of Phoronis could be modified so as to represent the tentaculiferous arms of Rhabdopleura by suppressing both rows of tentacles at the curve of the horse-shoe, and leaving only those which occur on the arms or rami of the horse shoe (see fig. 4). The lopho-phore of Cephalodiscus presents us with twelve processes, each carrying two rows of ciliated tentacles; in fact we have six pairs of tantaculiferous arms instead of a single pair, and each of these arms is precisely similar to one of the arms. of Rhabdopleura (fig. 9), excepting that it terminates in a knob instead of tapering. There is no arrangement for introverting the anterior portion of the body into the hinder portion in the Pterobranchia.

The little epistome or pree-oral lobe of Phoronis is repre- sented in the Pterobranchia by a large muscular shield or disk-like structure (fig. 7, d and fig. 9, 6) which over- hangs the mouth and has an actively secreting glandular

surface by which the tube or case (tubarium) in which the | is a gelatinous, irregularly branched, and fimbriated mass

polypide is enclosed is secreted.

Both Rhabdopleura and Cephalodiscus produce colonies by budding ; but the colonies of the former are large, definite, and arborescent, whilst those of Cephalodiscus are remarkable for the fact that the buds do not remain long in organic continuity with their parent, but become detached and nevertheless continue to be enclosed by the same common envelope or secretion. The bud-formation of Rhabdopleura recalls that of Paludicella in the fact that it leads to the formation of continuous arboriform communities. That of Cephalodiscus resembles the budding of Loxosoma, since no two fully-formed individuals remain

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Fic. 7.—Rhabdopleura Normani, Allman (original drawings, Lankester). A. A single polypide removed from its tube and greatly magnified. a@, mouth; }, anus ; c, polypide-stalk or gymnoeaulus, the ‘contractile cord” of Sars; d, the pra-oral lobe (buccal shield or disk of Allman); e¢, intestine; jf, thoracie region of the polypide; g, one of the eiliated tentacles. B. Lateral view to show the form of the buccal shield and its pigment spot. g, ciliated tentacle (in outline); 4, basal ridge of theright arm of the lophophore. C. Lateral view of a polypide. #, ciliated patch (Sars’s organ) at the base of the lophophore-arm. Other letters as above. D. Part of a lophophore-arm, with soft tissues rubbed off to show the cartilaginoid skeleton. a, epithelium and soft tissues still adherent at the tip of a tentacle; 6, skeleton of tentacle; c, skeleton of axis. E. Portion of a colony of Rhabdopleura Normant, showing the branched tube- like cases formed by the polypides. The black line

within the tubes represents the retracted polypides eonnected together by their eommon stalk, the pecto- eaulus. Magnified to three times the size of nature.

in organic continuity. Both Rhabdopleura and Cephalo- discus (like Phoronis) produce cases or investments in which they dwell. These are free secretions of the organ- ism, and are not, like the coencecia of Eupolyzoa, cuticular structures adherent to and part of the polypide's integu- ment. The dwelling of Rhabdopleura is a branched system of annulated tubes of a delicate membranous con- sistency, each tube corresponding to a single polypide, the rings of which it is built being successively produced at the termination of the tube by the secreting activity of the pree-oral disk (fig. 7, E). The polypides freely ascend and descend in these tubes owing to the contractility of their stalks. On the other hand the dwelling of Cephalodiscus

(fig. 8), excavated bynumerous cavities which communicate withtheexterior. In these cavities are found the nu- merous detached small colonies of Cephalodiscus (fig. 9), or we should rather say the isolated budding polypides. The remaining important feature in the organization of the Ptero- branchia, namely, the parts connected with the forma- tion of buds, are best un- derstood by first examining Cephalodiscus. The body of Cephalodiscus is seen (fig. 9) to be an oval sac ; in this is suspended the U-shaped alimentary canal, and from the walls of its cavity (ccelom) the ova and the spermatozoa are de- veloped. Projecting from the ventral face of this oval sac is a muscular cy- lindrical stalk, into which the viscera do not pass, though the ccelom is con- tinued into it (fig. 9, ¢). This stalk is merely the outdrawn termination of oe, ees > es the body. It is about ag F!¢: 8 — Dwelling of gelatinous consistence ie os Gd Was ES Soke eee. rest of the animal, and it {inaly supplied by Prot. Mintosh, F-R.8). is from its extremity that 9,polypide within the jelly ; », cavity once the buds are produced (fig. ia ee aaa z 9, a). Before the buds have attained half the size of their parent they become detached, but continue to occupy some portion of the common gelatinous dwelling. 2

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Fic. 9.—A polypide of Cephalodiscus dodeca:ophus removed from the gelatinous “house (from an original drawing by Prof. M‘Intosh). No organic eonnexion has been severed in thus isolating this polypide with its attached buds a, a. The figure represents the furthest point to which eolony-formation attains in

this form. a, buds growing from the base of the polypide-stalk; 6, the pre-oral lobe (buceal shield or disk); c, the poly pide-stalk; d, the ciliated tentacles of the twelve lophophore arms (six pairs, each like the single pair of Rhab- dopleura) inextricably matted and confused; e, anterior margin of the pra- oral lobe; 7, posterior margin of the same. Magnified about fifty times linear. Turning to Rhabdopleura, we find that each polypide has a body of similar shape and character to that described for Cephalodiscus, and a similar ventrally developed

“stalk” (fig. 7, A,c). But, inasmuch as the buds deve-

loped on the stalk of a Rhabdopleura polypide do not | detach themselves, we find that we can trace the stalk of each polypide of a colony into connexion with the stalk of the polypide from which it was originally budded, which may now be considered as a “branch” bearing many- stalked polypides upon its greatly extended length, and such a “ branch-stalk” may be further traced to its junc- tion with the “stem-stalk” of the whole colony. The stem-stalk was at one time the simple terminal stalk of a single polypide, but by lateral budding it gave rise to other polypides, and so became a gemmiferous “branch” ; and further, when some of these in their turn budded and became branches, it became the main “stem” of a copious colony.

A serious error has been made in comparing the contrac- tile stalk of the Pterobranchiate polypide to the “funi- culus” or cord-like mesentery of Eupo- lyzoa. With this it has morphologi- cally nothing in common, since it

is § not an internal organ, but simply the 49 , " . . ~% elongated termination or stalk of the body, comparable to the stalk of Pedi- cellina (fig. 15) and Loxosoma (fig. 16), or to the hydrocaulus of such a Hydro- zoon colony as Cordylophora, The stalk where it bears only very young buds, or none at all, as is always its condition in Cephalodiscus and in many polypides of a Rhabdopleura colony, may be called a ‘‘ gymnocaulus”; when once its buds have devel- oped into full grown poly- pides, and it has elongated proportionally with their growth, it becomes a “ pec- tocaulus”; that is to say, it is to that part of it which bears such polypides that this term may be conveni- ently applied. The pecto- caulus of Rhabdopleura, both in the form of branch and stem, undergoes remarkable change of appearance as com- pared with the gymnocaulus. It loses its contractility, shrinks, and develops on its surface a hard, dark, horny cuticle (whence its name), compgrable precisely in its nature to the hardened cuticle which forms the zotecia of Eupo- lyzoa. It now has the appearance of a black cord or rod-like body lying within and adherent to the inner face of the much wider tubular stem, and branches formed by the gradual building up and arborescent extension of the annulated tubarium secreted by the individual polypides. It has been regarded both by Allman and by Sars as a special structure, and called by the former “the chitinous rod” or “‘blastophore,” by the latter “the axial cord.”

In reality it is the black-coloured pectocaulus of Rhabdopleura which corresponds to the ccencecium of an ordinary Polyzoon; whilst the term “ccencecium” is totally inapplicable morphologically to the annulated branched tube in which the Rhabdopleura colony lives, this having absolutely no parallel in the Eupolyzoa.

A sac-like testis has been discovered in Rhabdopleura opening by the side of the anus (Lankester, 7); but the ova have not yet been seen, nor is anything known of its development. Similarly the eggs of Cephalodiscus are observed within the body of the parent in the “Chal- lenger” specimens, but nothing further is known of its life-history.

A body-cavity is present (Lankester), though its exist- ence has been denied by Sars and by M‘Intosh. Neph- ridia and nerve ganglia are not described. Cephalodiscus |

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decalophus, from which the lophophore- tentacles and buccal shield have been removed in order to show the remark- able eyes. a, bus; c, stalk; g, eyes; h, post-ora] collar, hidden by the buccal shield ih fig. 9. (Original drawing by Prof. M‘Intosh. F.R.S.)

POLYZOA

has two remarkable eye spots dorsal to the cephalic disk (fig. 10, g). THE EUPOLYZOA.

Whilst it is necessary to include in the group Polyzoa, the forms we have already noticed as Vermiformia and Pterobranchia, there can be no doubt that those organisms to which we assign the name Eupolyzoa are primarily those upon which naturalists have framed their concep- tion of the group, and that they constitute a very con- sistent assemblage, held together by well-defined characters, and yet presenting an immense number of varied forms showing a wide range of modifications.

All the Eupolyzoa have closely approximated mouth and anus, and, like Paludicella, a complete range of hollow

‘ ciliate tentacles, describing either a circle or a horse shoe,

surrounding the mouth. The anus as well as the mouth is included in this area in a few exceptional forms (the Entoprocta); it lies near but outside the lophophore (as the area is termed) in the vast majority (the Ectoprocta). Except in the Entoprocta, where the movement is limited, the whole anterior portion of the body bearing the lophophore can be invaginated into the hinder part (as described above for the typical Eupolyzoon Paludicella). This character distinguishes the Eupolyzoa from both Vermiformia and Pterobranchia. The polypides of all the Eupolyzoa are minute, but all produce buds which remain in organic continuity with their parent (except in Loxo- soma) and build up very considerable and sometimes massive colonies.

In all Eupolyzoa the cuticle of the hinder part of each polypide is thick and dense, thus forming a hard-walled sac, the zocecium, This is peculiar to and universal in the Eupolyzoa (except Loxosoma), and is not to be confounded with the non-adherent tubes of Phoronis and Rhabdopleura or the jelly-house of Cephalodiscus. The connected zocecia of a colony of Eupolyzoa constitute a coencecium. A simple nerve ganglion between mouth and anus, a large body-cavity (except in Entoprocta), simple gonads without accessory glands or ducts, usually testis and ovary inthe same polypide, absence of a blood-vascular system, of any but the most rudimentary nephridia, and of eyes, otocysts, or other special sense-organs, are features characterizing all adult Eupolyzoa.

The section Eupolyzoa, with its vast number of species and genera, requires a somewhat elaborate classification. The forms in which the anus is enclosed within the tentacular circle are very few, and are peculiar in other respects. We follow Nitsche (8) in separating them as the sub-class Entoprocta from the majority of Eupolyzoa forming the sub-class Ectoprocta.

Sub-class 1. Ectoprocta, Nitsche.

Eupolyzoa with the anus not included within the area of the lophophore. Anterior portion of the body of the normal polypide introversible. Tentacles not individually capable of being coiled or flexed.

Order 1. PHytacrotama, Allman.

Ectoproctous Eupolyzoa in which the polypide possesses a pree-oral lobe or epistome, similar to that of Phoronis, and comparable to the more highly developed buccal shield or disk of the Pterobranchia. Lophophore (except in Fredericella, where it is nearly circular) horse-shoe-shaped (hippocrepian). Polypides of a colony equi-formal, that is, not differentiated in structure and function. Neighbouring zocecia are in free and open communication, the bud never becoming shut off by a perforated cuticular plate from its parent. Cuticle of the zocecia either gelatinous or horny, forming massive or else arborescent coencecia, in one genus

FOL YTAOA

(Cristatella) having the form of a plano-convex ellipse and , lophophore is perfectly circular. The polypides of a colony

locomotive (fig. 3).

production of new individuals from fertilized eggs which initiate new colonies, a reproduction by internal buds called “statoblasts,” comparable to the gemmz of Spon- gilla, has been observed in all the genera (fig. 3, 5). The statoblasts are developed from the funiculus (mesentery), and are enclosed in ornate lenticular capsules of chitinous substance, characteristic in form in each species.

The fertilized egg of the Phylactolema does not give rise to a zonociliate larva, but to a uniformly ciliate cyst- like diblastula, which develops directly and produces polypides by budding. The Phylactolzma are all inhabit- ants of fresh water (lacustrine).

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Fic. 11.—Semi-ideal view of part of the lophophore of Lophopus and its tentacles, —intended to show the nerve-gunglion, nerves, and parts around the mouth. The tentacles have been cut away all along the right arm of the lophophore and from the inner margin of the left arm. c, foramen placing the cavity of the epistome in communication with the body-cavity ; ¢’, body-wall; d, mouth; e, the epistome or pree-oral lobe; f, wall of the pharynx ; /, wall of the intestine; Zz, anus; &, lophophore; /, aciliated tentacle; , elevator muscle of the epistome; w, the nerve-ganglion; 2, 2’, nerves to lophophore and tentacles: y, nerve to pharynx.

The Phylactolema include the genera Lophopus, Cristatella, Alcyonella, Plumatella, and Fredericella, whic have been beauti- fully figured and described in Allman’s classical Freshwater Polyzoa, Ray Society, 1856. The

colonies of Lophopus are small, consist- ing of half a dozen polypides embedded in a massive glass-like ceencecium. Cristatella (fig. 8) is remarkable amongst all Polyzoa for its locomotive zoarium. Alcyonella forms massive ccencecia of many hundred polypides, as large as a man's fist. Plumatella and Fredericella are delicate arborescent forms commonly encrusting stones and the leaves of water-plants. All the genera known are British.

The Phylactolema furnish a remarkable instance of a well- marked zoological group being confined to fresh water. Their reproduction by statoblasts (not known in the marine Polyzoa) appears to be related to the special conditions of lacustrine life, since it is also observed under the same exceptional conditions in the single freshwater genus of another great group of animals, viz., Spongilla. Also related to their non-marine conditions of life is the development of the fertilized egg, which, as in so many similar cases, does not produce the remarkable banded forms of locomotive larvee which are characteristic of their marine congeners.

Order 2. GymnoLema, Allman.

Ectoproctous Eupolyzoa in which the polypide is devoid of any trace of the pre-oral lobe or epistome, whilst the

the first polypide of a colony is

In addition to the multiplication | are frequently highly differentiated as avicularia, vibracu- of polypides in a colony by budding, and to the annual |

laria, ocecia (egg-receptacles), and even as root and stem segments. The neighbouring polypides of a colony communicate (?) with one another by "rosette-plates" or " communication-plates "—perforated areas in the walls of contiguous zocecia, The greatest variety in the character of the cuticle forming the zocecia (gelatinous, horny, calcareous) and in the grouping of the polypides, as well as in the shape of their zocecia, is observed in different sub-orders and families. In addition to the ordinary sexual reproduction, there are various modifications of the process of budding, the full exposition of which would necessitate more space than is here allotted, and is not yet indeed within the possibilities of present knowledge. The

fertilized egg of the Gymnolema gives rise to remarkable ciliate larve of various forms (figs. 19, 20, 21), from which

developed by an extraordinary and unexplained series of changes. The Gymnolema are, with the single exception of the genus Palu- , dicella, inhabitants of the sea.

The Gymnolema are divided, accord- ing to the system of Busk, into three sub-orders characterized by the shape of their zocecia, and the nature of the mouth-like margin which it presents when the exsertile portion of the poly- pide is withdrawn within it. The

yclostoma have long tubular zocecia, often of large size and often calcified, placed side by side in cylindrical bun- dles, or in other definite grouping ; the mouth of the zoccium is circular and devoid of processes. There is little or no differentiation of the polypides con- stituting a colony. Most of this group are fossil, and the living genera belong mostly to southern seas. The genera Crisia (fig. 18, A), Diastopora, Tubuli- pora, and Hornera are typical. The Ctenostoma have usually a soft zoc- cium ; its orifice is closed by the folds of the retracted polypide or by a circlet of bristles which surround it. Alcyonidium gelatinosum is the com- monest representative of this group on the British coasts. Bowerbankia (fig. 1, A)and Paludicella (fig. 1, E) also belong here. The Chilostoma form the largest and most varied sub- order of Gymnolema. The zocecia are horny or calcified; their orifices can be closed by a projecting lip in the form of an operculum. The operculum is a separable plate developed on the cuticle of the retractile part of the polypide, and has muscles attaclicd to it (fig. 13, B,C, D). The surface of the zocecia is frequently sculptured, and its orifice provided with processes and spines (fig. 1,C, F). Very usually some of the polypides of a colony are modified asavicularia, vibracularia, radi- cal fibres, and owcia. The avicularium isa poly pide reduced to a simple muscu- lar apparatus working upon the modified operculum and zocecium so as to cause these hard parts to act asa snapping apparatus comparable to a bird’s head (fig. 12, 0). They are frequently found regularly distributed among the normal cells of a colony, and probably have a cleansing function similar to that attributed to the Pedicellaric of the Echinoderms. ‘‘ Vibracularia” are even more simplified polypides, being little more than motile filaments, probably

tactile in function. The opercula of zoccia, occia, and avicularia have recently been used by Busk in character- izing genera and species, in a systematic way. Stem-building and root-forming polypides are frequently found, being closed polypides which subserve anchoring or supporting functions for the benefit of the whole colony, The stem of Kinetoskias (fig. 14) is produced

Fic. 12.—Two zocecia of

in this way.

The Chilostoma include a large series of genera arranged in the sections Cellularina, Flustrina, Escharina,

and

Fic, 13.—A. Cancecium of Crisia eburnea, Lin., one of the Cyclostoma ; g, g, tubular zocecia with circular terminal mouths; 2x, ocecium, being a zocecium modified to serve as a brood-chamber.

B. Diagram of a single polypide of one of the Chilostoma in a state of expansion, in order to show the position and action of the operculum. a, operculum, a plate of thickened cuticle hinged or jointed to 6, the main area of dense cuticle of the antitentacular region known as the zocecium ; c, the soft-walled portion of the polypide in expansion.

C. The same zocwcium with the polypide invaginated (telescoped) and the operculum a shut down over the mouth of the zocecium.

D. a dctached, and seen from its inner face, to show the occlusor muscles d d,

Celleporina. For the systematic description of the highly complex and very varied colonial skeletons or ccenecia of the Gymnolema,

Fic. 14,—Kinetoskias (Naresia) cyathus (from Sir Wyville Thomson pides and zocecia are allied to Bugula, but the poll na as a whole ‘4 Fi oe for its

definite shape, consisting of a number of slightly branched gracefully bending filaments Supported like the leaves of a palm on a long transparent stalk, (See Busk, in Quart. Journ. Micr. Sci., 1881, for further details.)

the reader is referred to the works of Busk (9), Hincks (10), Smitt (11), and Heller (12). See also Ehlers (13) on Hypoubordlle _

POLYZOA

Sub-class 2. Entoprocta, Nitsche.

Eupolyzoa in which the anal aperture lies close to the mouth within the tentacular area or lophophore. Lopho- phore sunk within a shallow basin formed by the inversion of the broad truncated extremity of the cup-shaped body. Tentacular crown not further introversible, the individual tentacles (as in the Pterobranchia and unlike the Kcto- procta) capable of being flexed and partially rolled up so as to overhang the mouth (see fig. 15, B and C). Body- cavity (ccelon:) almost completely obliterated. The anti- tentacular region of the polypide's body is drawn out to form a stalk similar to the gymnocaulus of the Pterobran- chia. The extremity of this stalk is provided with a cement gland in the young condition which persists in the adult of some species (Loxosoma neapolitanum, fig. 16, shs). Cuticular investment (zocecium) of the polypides feebly developed. A pair of small nephridia are present.

The Entoprocta consist of the marine genera Pedi- cellina (fig. 15), Loxosoma (fig. 16), and probably the

Fig. 15.—A. Two polypides and buds of Pedicellina belgica, Van B. (after Van Beneden); greatly magnified. a, the polypide-stalk of a fwly developed polypide ; c, that of a less mature individual; 6,a bud. Allare connected by acommon stalk or stolon. B. and C. Two views of the body of the polypide of Pedicellina (after Allman). a, cuticle; 6, body-wall; c, permanently in- troverted anterior region of the body; d, margin of the tentacular cup or calyx thus formed; e, mouth; 7, pharynx; g, stomach; h, intestine; 7, anus; k, epistome or pre-oral lobe; 7, nerve-ganglion; m, gonad; , retractor muscle of the lophophore ; 0, lophophore.

insufficiently known freshwater American genus Urnatella of Leidy. To these must be added Busk's new genus Ascopodaria, as yet undescribed, based on a specimen dredged by the " Challenger," showing a number of Pedi- cellina-like polypides, carried as an umbel on a common stalk of very peculiar structure. Pedicellina is found at- tached to algze, shells, zoophytes, &c., and to the integu- ment of some Gephyrean worms (Sipunculus punctatus) and Annelids (Aphrodite) ; Loxosoma occurs on various worms, &c. Whilst the buds of Pedicellina remain connected so as to constitute a colony, those produced by Loxosoma are continually detached, so that the polypide is solitary. Further, the cup-like body of Pedicellina is deciduous, and frequently falls from the stalk and is replaced by new growth. There is less distinction between body and stalk in Loxosoma, and the former does not become detached. Apparently a very important feature in the structure of the Entoprocta is the absence of a body-cavity. This is, however, more apparent than real. The Entoprocta are true Coelomata, but the ccelom is partially obliterated by the growth of mesoblastic tissue. The nephridia presum- ably lie in a space which, small as it is, represents the ccelom. See Harmer (18) for details.

POLYZOA

Genealogical Relationships of the Groups of Polyzoa.

It is necessary that we should try to form some opinion:

as to which of the various groups of Polyzoa are most like the ancestral form from which they have all sprung, and what are the probable lines of descent within the group. Any attempt of the kind is speculative, but it is absolutely needful since zoology has become a science—that is to say, an investigation of causes and not merely a record of unexplained observations —to enter upon such questions.

Colonial organisms have necessarily descended from soli- |

tary ancestors, and it is probable that the ancestral form of Polyzoa was not only solitary, as are Phoronis and Loxosoma at the present day, but of relatively large size and more elaborately organized than the majority of living Polyzoa. Whilst the polypides have dwindled in size and

Fie. 16.—Diagram of Lorosoma Neapolitanum (after Kowalewsky). polypide devoid of buds. polypide-stalk.

A single m, mouth; st, stomach; shs, basal gland of the

lost some of their internal organs, the modern Polyzoa have developed part passw with this degeneration an elaborate system of bud-production and colony-formation. The new individuality (the tertiary aggregate) attains a high degree of development (Cristatella, Kinetoskias) in proportion as the constituent units merged in this new individuality have suffered a degeneration. The pre-oral lobe (epistome, buccal disk) present in all Polyzoa except the most minute and most elaborately colonial forms—namely, the Gymnolema—is to be regarded as an ancestral structure which has been lost by the Gymnolema. The horse-shoe-shaped lophophore, such as we see it in Phoronis and in Lophopus, is probably the ancestral form, and has given rise to the two other extreme forms of lophophore,— namely, the ‘“pterobranchiate,” associated with a great development of the epistome, and the “circular,” associated with a complete suppression of the epistome. The ento- proctous lophophore is a special modification of the horse- shoe-shaped, as shown in the diagram fig. 15, C. The

formation of zocecia, and so of an elaborate colonial |

skeleton, was not a primary feature of the Polyzoa.

Even

after budding and colony-formation had been established zocecia were not at once produced, but possibly dwellings

of another kind (Pterobranchia).

We are thus led to look

upon the Gymnolema as the extreme modification of the

Polyzoon type.

Starting with an organism similar to

Phoronis, we may suppos? the following branchings in the

pedigree to have occurred.

VERMIFORMIA

| A. The complete hippoerepian lophophore becomes specialized in the form of etenidia or gill- plumes; the epistome enlarged. = PTEROBRANCHIA.

a. The anti-tentacular region of the body elongated asa stalk gives rise to one or two rapidly detached buds (Ce- phalodiscus).

B. The stalk gives rise to buds which do not detach them- selves, but remain in eon- tinuity so as to form a colony of a hundred or more individuals (Rhabdo- pleura).

| B. The complete hippocrepian lophophore retains its form, but acquires a gradually increasing power of being telescoped into the hinder part of the body. =The Pro-Eupolyzoon. ,

A. The anti-tentacular region of the body beeomes stalk-like, and develops buds which either detach themselves as they form (Loxosoma) or remain to form a small colony (Pedicellina). The teleseopie introversibility of the lophophore does not advance be- yond an initial stage. Thearms of the lophophore grow round so as to embrace the anus. =Sub-class 1 (of the Eupoly-

zoa) Entoprocta.

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B. The complete hippocrepian lophophore remains in its origi- nal form, and also the pre-oral epistome, but the telescopie in- troversibility of the anterior region of the body is greatly de- veloped at the samo time that the cutiele of the hinder part of the body is increased in thiekness and toughness. Bud production, not from a stalk-like pedicle, but from all parts

of the body, now becomes eharaeteristic, the buds, whieh were at first deciduous, now remaining in permanent continuity so as to form colonies.

= The Pro-Ectoprocton.

A. The polypides aequire the property of earrying their young so as to avoid the disastrous influenees of fluviatile currents, and also the property of produc- ing resistent statoblasts, and thus are enabled to become isolated and to persist in the peculiar eonditions of fresh waters. =The Ist order (of Ectoprocta)

Phylactolema.

B. The polypides forming relatively larger colonies, and themselves becoming relatively more minute, lose by atrophy the pre-oral epistome ; and simul- taneously the arms of the hippo- crepian lophophore dwindle, and a simple cireum-oral eirelet of tentacles is the result. The cuticle of the hinder part of the polypide becomes more and more specialized as the cell or zow- cium, and in different polypides in various parts of the eolony aequires special forms—as egg- cases, snappers (avieularia), ten- tacles, stalk and root segments. =The 2d order (of Ectoprocta)

Gymnolema.

Distinctive Characters of the Polyzoa.

From all that has preceded it appears that the really distinctive characters common to all the Polyzoa may be summed up as follows :—

Ccelomata with closely approximated mouth and anus, the bulk of the - body forming a more or less elongate growth at right angles to the original (ancestral) oro-anal axis, and starting from the original ventral (z.e., oral) sur- face. A variously modified group of ciliated tentacles is disposed around the mouth, being essentially the develop- ment by digitiform upgrowth of a post-oral ciliated band.

As negative characters it is important to note the absence of all trace of metameric segmentation, of sete, and of paired lateral (parapodia of Appendiculata) or median ventral (podium of Mollusca) outgrowths of the body-wall.

Larval Forms of Polyzoa.

In the consideration of the probable pedigree and affinities of the Polyzoa, we are not at present able to make use of the facts of development from the egg, on account of the extreme difficulty which the study of the young stages of these organisms presents. In the case of Phoronis we have the only readily intelligible his- tory. The larva, to start with, is of that form known as an archi- troch (see Lankester, ‘‘ Notes on Embryology and Classification, Quart. Journ. Micr. Sci., 1876), having a pre-oral ciliated area (velum or cephalotroch) continuous with a post-oral ciliated band (the branchiotroch), which latter becomes developed into the ten- tacnlar crown of the adult.

The actinotrocha (Phoronis) larva is readily comparable with the trochosphere larve of Echinoderms, Chetopods, Gephyreans, and Molluscs. Its special character consists in the strong develop- ment of the post-oral ciliated band, whereas the pre-oral ciliated band is in most other classes (the Sipunculoids excepted) the predominant one. The Phoronis larva exhibits first of all an oro- anal long axis, and this is suddenly abandoned for a new long axis by the growth of the ventral surface of the larva at right angles to the primary axis (hence the term Podaxonia).

In the other Polyzoa we do not at present know of any larva which retains even in its earliest phases the original oro-anal long axis. They all appear to start at once with the peculiar and secondary long axis of the adult Phoronis, so that Balfour has diagrammatically represented the Polyzoon larva by the sketch given in fig. 19. This diagram applies, however, more especially to the Entoprocta, since the anus is represented as included in the area of thé post-oral ciliated ring. The development of Pedicellina has been very carefully followed by Hatschek, and may be said to be

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Fig. 17, Fig. 18.

Fie. 17,—Larva of Pedicellina (from Balfour, after Hatschek). v, vestibule (the cup-like depression of the tentaculiferous end of the body); m, mouth; 1, digestive gland; av.z, anal invagination ; fg, the ciliated disk (corresponding to the cement gland of Loxosoina (fig. 16, shs); z, so-called ‘‘ dorsal organ,” supposed by Balfour to be a bud, by Haimer (18) regarded as the cephalic ganglion,

Fie. 18.—Later stage of the same larva as fig. 17. Letters as before, with the addition of np, duct of the right nephridium ; a, anus; Ag, hind-gut.

the only instance among the Eupolyzoa in which the growth of

the different organs and the consequent relation of the form of the

larva to the form of the adult is understood (sce figs. 17 and 18). In the other Polyzoa, in spite of the painstaking and minute

studies of Barrois (14), the fact is that we do

not know what face of the larva corresponds to the tentacular area, what to the stalk or anti- tentacular extremity, what to the anterior and what to the posterior surface. The conversion of the larva into the first polypide has not sé. been observed in the case of these free-swim- ming forms, and it is even probable that no such conversion ever takes place, but that the first polypide forms as a bud upon the body- site wall of the larva. ; Fig, 19.—Diagram of an Two of the most remarkable forms of free- 4¢2! Polyzoon larva P ‘ (from Balfour). an, swimming larve of Gymnolema are repre- anus; m, mouth; sé, sented in figs. 20 and 21. In both, in addition stomach; ss, ciliated

to the chief post-oral ciliated band, a smaller ‘isk (7g in figs. 17, 18,

ciliated ring is observed, which is identified

and 21).

by Balfour with that which is found at the anti-tentacular extremity (base of the stalk) in the Pedicellina larva.

| theory, in Polyzoa it is

_ Polyzoa would fix themselves in | later growth by what corresponds _to the head or prostomium of

| genious as this speculation is, we | mustremember that it takes no

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It does not seem justifiable, in the face of the existing uncertain- ties as to identification of parts, and in view of the high probability that the Gymno- lema are extremely modified and degen- erate forms (a con- sideration which applies in some re- spects even more strongly to the En- toprocta), to assume that the larval form schematized in fig. p.¢ 90.—Larva of Alcyonidium mytili (from Balfoar 19 represents an an— after Barrois). m?, problematic structure; s¢, oral cestral condition of invagination (?) = Harmer's cephalic ganglion; s, cili- the Polyzoa. Pro- ated disk (corresponding to fg in figs, 17, 18, and 21). fessor Balfonr (15) was, however, led to entertain such a view ; and, assuming that the chief ciliated band (drawn as a broad black line) corresponds to the single pre-oral ciliated band of the trochosphere larva of Echinrus, Polygordius, ¢ Chetopods, and Mollus- ca, he pointed out that in both cases the ciliated girdle divides the larva into a hemisphere in which mouth and anus lie and a hemisphere which is the complement of this; in most classes the first hemisphere elongates and forms the bulk of the body, whilst the second hemisphere forms the prostomium or pree-oral lobe. But, ac- cording to Balfour's

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Fig, 21.—Larva of Membranipora (known as Cy- phonautes), m, mouth; a', anus; fy, ciliated vody; 2x, problematical body, supposed by Bal- four to be a bud, similar to the dorsal organ 7

the second hemisphere in figs, 17, 18, and to either s¢ or min fig. 20.

which enlarges and becomes the stalk-like body of the adult, whilst

the first hemisphere remains small and insignificant. Thus the

other animals, as do the Bar- nacles and the Ascidians, In-

account of the facts known as to Phoronis, nor of the Ptero- branchia, and that it is con- fessedly based upon the assump- tion that the larve of extremely degenerate and peculiar members of the group are not adaptive and modified, but retain primary and archaic characters. Further, it is to be distinctly borne in mind that the interpretation of parts upon which this speculation rests is, except in the case of Pedicellina, altogether hypo- thetical.

Relations of the Polyzoa to the Brachiopoda,

The Polyzoa were first asso- ciated with the Brachiopoda by H. Milne-Edwards. The inves- tigation of the development of Terebratulina by Morse (16) led to a further perception of the points of agreement in struc- ture between these two groups. Lastly, Caldwell (6) has shown that the mesenteries of Phoronis have precisely similar relations

to the lophophore, the nephridia, and the termination of the intes- tine as have the gastro-parietal and ilio-parietal bands or mes- enteries of the Terebratulide. The young Terebratulina (fig. 22)

Fie. 22,—Young Terebratulina at a stage when only six tentacles are present, sé, sete at the margin of the calyx; p, stalk comparable to the stalk ot Pedi- cellina, Loxosoma, Cephalodiscus, and Rhabdopleura; pa, cement gland at the apex of the stalk (after Morsc),

may be readily compared with Loxosoma (fig. 16),—the peduncle with its cement glands in the former being identical with the stalk

and basal gland of the latter.

The form of the alimentary canal

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and the disposition of the tentacular arms (fig. 23) is the same in Brachiopoda and Polyzoa. The uephridia (oviducts) of Terebratula have a position and relations similar to those of the nephridia (geni- tal ducts) of Phoronis. The chief difference between Polyzoa aud Brachiopoda cousists in the special development of the margin of the cupped end of the body, into which the lophophore is sunk, as in Pedi- cellina (see fig. 15, B, c). This up-standing margin is enormously

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Fig. 23. Fig. 24.

Fie. 23.—Lophophore and epistome of young Terebratulina, showing the horse- shoe shape; the arms are turned in the direction the reverse of that taken by the lophophore-arms in Polyzoa (see fig. 4).

h In later growth they will become spirally coiled. (After Morse.)

Fie. 24.—Larva of the Brachiopod Argiope (from Gegenoaur, after Kowalewsky). m, setigerous lobe; 6, sete; d, enteron.

increased in the Brachiopoda, so as to form a voluminous hood or collar, which surrounds the large tentacular arms, and forms a pro- tective chamber for them. It is notched right and left so as to be divided into two lobes, and on its surface is developed a horny or a calcareous shell in two corresponding moieties. Until recently it was held (see Lankester, 17) that both Brachiopoda and Polyzoa were modifications of the Molluscan type, and the Brachiopods’ collar was identified with the pallial fold of Mollusca. The resem- blance of the two structures must now be considered as purely

homoplastic, and not as having any real morphological (homo- genetic) significance.

_The larvae of the Brachiopoda (figs. 24, 25) are as exceptional and difficult of interpretation as those of Polyzoa, but no attempt has been yet made to show that the one can be reduced to a common form with the other.

The three segments presented by some Brachiopod larve (fig. 25) have been compared to the segments of Chetopod worms by some writers ; and these, together with the

POMBAL, Sepastian JosSEPH DE CARVALHO E MELLO, Marquis DE (1699-1782), the greatest statesman Portugal has produced in modern times, was the son of a fairly wealthy country gentleman, Emmanuel de Carvalho, and was born at Soure, near Pombal, on 13th May 1699. He was educated at the university of Coimbra, and was then for a short time in the army, but it was not until he was nearly forty and had been married some years that he received his first public appointment, and was sent as minister to London in 1739. There he studied English administration, but never learnt the English language, and was promoted to the embassy at Vienna by King John V. in 1745, and recalled in 1750 to become minister for foreign affairs. Before he reached Lisbon John was dead, and his successor King Joseph at once placed entire confidence in him. He soon began to show his strength: in 1751 he checked the Inquisition, by allowing no executions without the royal permission; he improved the navy, the police, and the finances, and freed the Indians of the Brazils from slavery. The great earthquake of Lisbon on lst November 1755 showed him in’his true greatness; when the king asked him despairingly what he should do, he answered briefly, “ Bury the dead and feed the living,” and by his calmness at that frightful moment gained an ascendency over the royal mind which lasted till Joseph’s death. His power was at once used to check the Roman Catholic Church, which, with the Jesuits and the Inquisition, had eaten the life out of the country, and in 1757 the Jesuits were ex- pelled from court (see Jusurrs, vol. xiii. p. 654). The

presence of sete, have been regarded as indicative of affinity between the Brachiopoda and Chetopoda (Morse). But it is sufficient, in order to dispose of this suggestion, to point out that the segments of the Chetopoda follow one another along the primary oro-anal axis, whilst those of Brachiopoda are developed along an axis at right angles to this (Caldwell).

The Brachiopoda must be classified together with the Polyzoa

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Fic. 25.—Surface views of ten stages in the development of Terebratulina, showing the free-swimming larva and its mode of fixation (after Morse). c, lophophoral segment; th, thoracic segment; p, peduncular segment; ds, deciduous set.

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and Sipunculoidea in a phylum (Podaxonia) characterized by the development of this secondary axis.

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Count d'Oeyras, as he was now made, then devoted him- self to internal administration; he founded the Oporto Wine Company, encouraged sericulture, rebuilt Lisbon, and improved on the Jesuit system of education, and in 1762 showed his concurrence in the hereditary policy of Portugal in helping England against Spain, when the Family Compact had united the interests of Spain and France. On the 3rd September 1769 an attempt on the king's life was frustrated by the count, who was in 1770 made marquis of Pombal. He remained in power till the death of the king in 1777, but the new sovereign, Queen Maria, at once accepted his resignation, and persecuted him till his death in 1782.

POMEGRANATE. The pomegranate (Punica Grana- tum) is of exceptional interest by reason of its structure, its history, and its utility. It forms a tree of small stature, or a bush with opposite, shining, lance-shaped leaves, from the axils of some of which proceed the brilliant scarlet flowers. These are raised on a short stalk, and consist of a thick fleshy cylindrical or bell-shaped calyx tube, with five to seven short lobes at the top. From the throat of the calyx proceed five to seven roundish, crumpled, scarlet or crimson petals, and below them very numerous slender stamens. The pistil consists of two rows of carpels placed one above another, both rows embedded in, and partially inseparate from, the inner surface of the calyx tube. The styles are confluent into one filiform thread. The fruit, which usually attains the size of a large orange, consists of a hard leathery rind, which is the enlarged calyx tube,

enclosing a quantity of pulp derived from the coats of the numerous seeds. . This pulp, filled as it 1s with refreshing acid juice, constitutes the chief value of the tree. The more highly cultivated forms contain more of it than the wild or half-wild varieties. The great structural peculiar- ity consists in the presence of the two rows of carpels one above another (a state of things which occurs exceptionally er in apples and oranges), and in the fact that, while in the lower series (fig. 1) the seeds are attached to the inner border or lower angle of the cavity, they occupy the outer side in the upper series (fig. 2), as if, during growth, the upper whorl had become completely bent over.

By Bentham and Hooker the genus Punica is included under Lythracex ; others consider it more nearly allied to the myrtles; while its peculiarities are so great as, in the opinion of many botanists, to justify its inclusion in a separate order. Not only is the fruit valuable in hot countries for the sake of its pulp, but the rind and the bark and the outer part of the root are valuable as astringents owing to the large quantity of tannin that they contain. The bark of the root is likewise valued in cases of tape-worm.

The tree is withont doubt wild in Afghanistan, north-western India, and the districts south and south-west of the Caspian, but it has been so long cultivated that it is difficult to say whether it is really native in Palestine and the Mediterranean region. It has been cited as wild in northern Africa, but this appears to be a mistake. Recently, however, Prof. Bayley Balfour met with a wild species, heretofore unknown, in the island of Socotra, the flowers of which have only a single row of carpels, which suggests the inference that it may have been the source of the cultivated varieties. But, on the other hand, in Afghanistan, where Aitchison met with the tree truly wild, a double row of carpels was present as usual. The antiquity of the tree as a cultivated plant is evidenced by the Sanskrit name Dadimba, and by the references to the fruit in the Old Testament, and in the Odyssey, where it is spoken of as cultivated in the gardens of the kings of Pheacia and Phrygia. The fruit is frequently represented on ancient Assyrian and Kgyptian sculptures, and had a religious significance in con- nexion with several Oriental cults, especially the Phrygian cult of Cybele (Arnob., v. 5 sg.; see also Baudissin, Studien, li. 207 sq.). It was well known to the Greeks and Romans, who were acquainted with its medicinal properties and its use as a tanning material. The name given by the Romans, malum punicum,

indicates that they received it from Carthage, as indeed is expressly stated by Pliny ; and this circumstance has given rise to the notion that the tree was indigenous in northern Africa. On a review of the whole evidence, botanical, literary, and linguistic, Alphonse de Candolle (Origine des Plantes Cultivées) pronounces against its African origin, and decides in favour of its source in Persia and the neigh- bouring countries. According to Saporta the pomegranate existed in a fossil state in beds of the Pliocene epoch near Meximieux in Burgundy. The pomegranate is sometimes met with in cultiva- tion against a wall in England, but it is too tender to withstand a severe winter. The double-flowered varieties are specially desirable for the beauty and long duration of their flowers.

POMERANIA (Germ. Pommern) is a maritime pro- vince of Prussia, bounded on the N. by the Baltic, on the W. by Mecklenburg, on the S. by Brandenburg, and on the E. by West Prussia. Its area is 11,620 square miles. The province is officially divided into the three districts of Stralsund, Stettin, and Céslin; but more historical interest attaches to the names of Vorpommern and Hinter- pommern, or Hither and Farther Pomerania, applied to the territory to the west and to the east of the Oder respectively. Asa whole Pomerania is one of the lowest and flattest parts of Germany, but to the east of the Oder it Is traversed by @ range of low hills, and there are also a few isolated eminences to the west. Off the west coast,

which is very irregular, lie the islands of Riigen, Usedom,

Fig iL

Fig. 2.

Transverse sections of the lower and upper parts of the berried fruit of the Pomegranate.

and Wollin; the coast of Farther Pomerania is smooth – in outline and bordered with dunes or sandbanks. Be- sides the Oder and its affluents, there are several small rivers flowing into the Baltic, none of which, however, are navigable except for rafts. Many of these end in small littoral

lakes, separated from the sea by a narrow strip of land, through which the water escapes by one. or more: outlets. The interior of the province is also thickly sprinkled with lakes, the combined area of which is equal to about one-twentieth of its entire surface. The soil of Pomerania is for the most part thin and sandy, especially to the east of the Oder; but patches of good soil occur here and there. About 55 per cent. of the surface is under tillage, while 19 per cent. consists of meadow and pasture and 20 per cent. is covered by forests. The principal crops are potatoes, rye, and oats, but wheat and barley are grown in the more fertile districts ; tobacco and beetroot for sugar are also cultivated. Agriculture is still in many respects carried on in.a somewhat primitive fashion, and the live stock is as a rule of an inferior quality. Large flocks of sheep are kept both for their flesh and wool, and geese and goose-feathers form lucrative articles of export. (A tabular view of the agricultural products of Pomerania will be found under Prussta.) Owing to the long coast-line and the numerous lakes, fishing forms a not unimportant industry, and large quantities of herring, eels, lampreys, &c., are sent from Pomerania to other parts of Germany. With the excep- tions of its inexhaustible layers of peat or soft coal, the mineral wealth of Pomerania is insignificant. Its indus- trial activity is also of no great importance, though there are a few manufactories of machinery, chemicals, tobacco, sugar, and other articles, chiefly in or near the larger towns, and linen-weaving is practised as a domestic industry. Shipbuilding is carried on at Stettin and other places on the coast. Commerce, however, is relatively much more flourishing. Stettin is one of the chief sea- ports of Prussia, and Stralsund, Greifswald, and Colberg also possess a foreign trade, the exports consisting mainly of grain, timber, and fish.

In 1880 Pomerania contained 1,540,084 inhabitants, all of whom were Protestants except 23,877 Roman Catholics and 13,886 Jews. The Slavonic element in the population is now represented only by a few thousand Poles and a handful of the ancient Cassubians on the east border. Pomerania is the most sparsely populated province in Prussia, the ratio being 132 inhabitants per square mile. About 67 per cent. of the population belong to the rural districts, while the remainder live in communities of 2000 and upwards. There are only nine towns with more than 10,000 inhabitants, at the head of which stands Stettin with 91,000. The Pomeranians belong mainly to the old Saxon stock, and are, as a rule, tall, strong, and well-built. They

somewhat resemble the Scots in their cautious and persevering character, their strong theological bias(which perpetuates the existence of numerous sniall Protestant sects), and their turn for dry humour ; but they are by no means so enterprising or so open to new ideas. In 1883 only 0°32 per cent. of the Pomeranian recruits were illiterate, a fact which speaks well for the educational system of the province. There is a university at Greifswald. The province sends 16 members to the reichstag and 26 to the Prussian house of representatives. The heir-presumptive of the Prussian crown bears the title of governor of Pomerania.

History.—In prehistoric times the southern coast of the Baltic seems to have been occupied by Celts, who afterwards made way for tribes of Teutonic stock. These in their turn migrated to other settlements and were replaced, about the beginning of the 6th century of our era, by Slavonians. The name of Pomore or Pommern, meaning “on the sea,” was attached to the district by the last of these immigrant races, and has often changed its political and geographical significance. Originally it seems to have denoted the coast district between the Oder and the Vistula, a territory which was at first more or less dependent on Poland, but which appears towards the end of the 12th century as divided between two native dukes owning the supremacy of the German emperor. Afterwards Pomerania spread much farther to the west, while correspondingly curtailed on the east, and a distinction was made between Slavinia, or modern Pomerania, and Pomerellen. The latter, corresponding substantially to the present province of West

Prussia, remained subject to Poland down to the beginning of the 14th: century, when part of it fell away to the Teutonic knights and part of it was anncxed to the duchy of Pomerania-Wolgast. Christianity was introduced in the 12th century, and its advance went hand in hand with tlie Germanizing of the district. The later medizval history of Pomerania is occupied with an endless succes- sion of subdivisions among different lines of the ducal houses, and with numerous expansions and contractions of territory through constant hostilities with the elector of Brandenburg, who claimed to be the immediate feudal superior of Pomerania, and with other neighbouring powers. The names Vorpommern and Hinterpom- mern were at first

synonymous with Slavinia and Pomerellen, but towards the close of the 14th century they were transferred to the two duchies into which the former (Pomerania proper) was divided. In 1625 the whole of Pomerania became united under the sway of Bogeslaus XIV., and, on his death without issue in 1637, Branden- burg laid claim to the duchy in virtue of a compact of 1571. The Swedes, however, had in the meantime occupied the country, and at the peace of Westphalia (1648) the elector had to content him- self with East Pomerania and see the other half awarded to Sweden. In 1720 Swedish Pomerania was curtailed by extensive concessions to Prussia, but the district to the west of the Peene remained in possession of Sweden down to the dissolution of the German empire. On the downfall of Napoleon, Sweden assigned her German pos- sessions to Denmark in exchange for Norway, whereupon Prussia, partly by purchase and partly by the cession of Lauenburg, finally succeeded in uniting the whole of Pomerania under her sway.

POMEROY, a city of the United States, in Meigs county, Ohio, lies on the right bank of the Ohio about half-way between Pittsburgh and Cincinnati. It is the terminus of the Ohio River division of the Columbus, Hocking Valley, and Toledo Railway, and has extensive coal-mines dating from 1833, salt works (14,000,000 bushels per annum), and bromine factories. Incorporated as a village in 1841 and as a city in 1868, Pomeroy had 5824 inhabitants in 1870 and 5560 in 1880.

POMFRET, Joun (1667-1703), holds a certain place in English letters as the author of a short poem, The Choice, which embodies in easy and happy Drydenic diction the refined Epicureanism of the 18th century, and was consequently widely popular throughout that century. Pomfret was an English clergyman, rector of Maulden in

Bedfordshire, son of the vicar of Luton in the same.

county. The story is preserved by Johnson that the bishop of London stopped him in some church preferment because in his Choice he declared that he would have no wife, although he expressed a wish for the occasional company of a modest and sprightly young lady. The poet was married in real life all the same, and, while wait- ing in London to clear up @ misunderstanding caused by the paganism of his poetry—the bishop

apparently think- ing that he had openly preferred a mistress to a wife—he caught small-pox and died at the age of thirty-five. Of his poetry Johnson happily says, “ He pleases many ; and he who pleases many must have some species of merit.”

POMONA, the old Roman goddess of tree-fruits (poma). Ovid (Met., xiv. 623 sq.) tells how she was loved by the silvan deities, the satyrs, pans, &c., and how Vertumnus, god of the turning year, wooed and won the shy goddess. Corresponding to Pomona there seems to have been a male Italian deity called Puemunus, who was perhaps identical with Vertumnus. At Rome Pomona had a special priest, the flamen Pomonalis, who ranked lowest among the fifteen flamens. About 12 miles from Rome on the way to Ostia there was a Pomonal, or place (perhaps grove) sacred to Pomona. She was also worshipped in the neighbourhood of Amiternum.

POMPADOUR, JEANNE ANTOINETTE Poisson LE Nor- MANT D’ETIOLES, Marquise DE (1721-1764), the most famous of all the mistresses of Louis XV., was born in Paris on 29th December 1721, and was baptized as the legitimate daughter of Francois Poisson, an officer in the household of the duke of Orleans, and his wife Madeleine dela Motte, in the church of St Eustache, but she was

Marigny, to be the child of a very wealthy financier, and farmer-general of the revenues, Le Normant de Tourne- hem. He at any rate took upon himself the charge of her education ; and, as from the beauty and wit she showed from childhood she seemed to be born for some uncommon destiny, he declared her ““‘un morceau de roi,” and specially educated her to be a king’s mistress. This idea was con- firmed in her childish mind by the prophecy of an old woman, whom in after days she pensioned for the correctness of her prediction. In 1741 she was married to a nephew of her protector and guardian, Le Normant d’Etioles, who was passionately in love with her, and soon became a queen of fashion. Yet the world of the financiers at Paris was far apart from the court world, where she wished to reign; she could get no introduction at court, and could only try to catch the king’s eye when he went out hunting. But Louis XV. was then under the influence of Madame de Mailly, who carefully prevented any further

intimacy with “la petite Etioles,” and it was not until after her death that the king met the fair queen of the financial world of Paris at a ball given by the city to the dauphin in 1744, and he was immediately subjugated. She at once gave up her husband, and in 1745 was established at Versailles as “ mattresse en titre.” Louis XV. bought her the estate of Pompadour, from which she took her title of marquise. She was hardly: established firmly in power before she showed that ambition rather than love had guided her, and began to mix in politics. Knowing that the French people of that time were ruled by the literary kings of the time, she paid court to them, and tried to play the part of a Meecenas. Voltaire was her poet in chief, and the founder of the physiocrats, Quesnay, was her physician. In the arts she was even more successful ; she was herself no mean etcher and engraver, and she encouraged and/ protected Vanloo, Boucher, Vien, Greuze, and the engraver Jacques Guay. Yet this policy did not prevent ber from being lampooned, and the famous Poissardes against her contri- buted to the ruin of many wits suspected of being among the authors, and notably of the Comte de Maurepas. The command of the political situation passed entirely into her hands ; she it was who brought Belle-Isle into office with his vigorous policy ; she corresponded regularly with the generals of the armies in the field, as her recently published letters to the Comte de Clermont prove; and she intro- duced the Abbé de Bernis into the ministry in order to effect a very great alteration of French politics in 1756. The continuous policy of France since the days of Richelieu had been to weaken the house of Austria by alliances in Germany ; but Madame de Pompadour changed this here- ditary policy because Frederick the Great wrote scandalous verses on her; and because Maria Theresa wrote her a friendly letter she entered into an alliance with Austria. This alliance brought on the Seven Years’ War with all its disasters, the battle of Rosbach and the loss of Canada ; but Madame de Pompadour persisted in her policy, and when Bernis failed her, brought Choiseul into office, and supported him in all his great plans, the Pacte de Famille, the suppression of the Jesuits, and the peace of Versailles. But it was to internal politics that this remarkable woman paid most attention ; no one obtained office except through her; in imitation of Madame de Maintenon she prepared all business for the king’s eye with the ministers, and con- trived that they should meet in her room; and she daily examined the letters sent through the post office with Janelle, the director of the post office. By this continuous labour she made herself indispensable to Louis.

Yet, when she had lost the heart of her lover after a year or two, she had a difficult task before her; to maintain her influ- ence she had not only to save the king as much trouble as

suspected, as well as her brother, afterwards marquis of | possible, but to find him fresh pleasures. When he first

began to weary of her, she remembered her talent for acting and her private theatricals at Etioles, and estab- lished the “ théAtre des petits cabinets,” in which she acted with the greatest lords about the court for the king’s pleasure in tragedies and comedies, operas and ballets. By this means and the “concerts spirituels” she kept in favour for a time; but at last she found a surer way, by encouraging the king in his debaucheries, and Louis wept over her kindness to his various mistresses. Only once, when the king was wounded by Damiens in 1757, did she receive a serious shock, and momentarily left the court ; but on his recovery she returned more powerful than ever. She even ingratiated herself with the queen, after the example of Madame de Maintenon, and was made a lady- in-waiting ; but the end was soon to come. “Ma vie est un combat,” she said, and so it was, with business and pleasure; she gradually grew weaker and weaker, and when told that death was at hand she dressed herself in full court costume, and met it bravely on 15th April 1764 at the age of forty-two.

See Capcfigue, Madame la Marquise de Pompadour, 1858; E. and J. de Gon- court, Les Mattresses de Louis XV., vol. ii., 1860; and Campardon, Madame de Pompadour et la Cour de Louis XV. au milieu du dix-huitiéme siecle, 1867. Far move valuable are Malassis’s two recently published volumes of correspondcnce, Correspondance de Madame de Pompadour avec son pére M. Poisson, et son frére M. de Vandiéres, &c., 1878, and Bonhomme, Madame de Pompadour, général darmée, 1880, containing her letters to the Comte de Clermont. For her artistic and theatrical tastes see particularly J. F. Letureq, Notice sur Jacques Guay, Graveur sur pierres fines du Rei Louts XV.: Documents inédits enanant de Guay et notes sur les euvres de gravure en taille douce et en pterres durs de la Marquise de Pompadour, 1873; and Adolphe Jullien, //istoire du Thédtre de Madame de Pompadour, dit Thédtre des Petits Cabinets, 1874.

POMPEII, an ancient town of Campania, situated on the shore of the Bay of Naples, almost immediately at the foot of Mount Vesuvius. To its proximity to that volcano it owes its celebrity,—the peculiar circumstances of its destruction by the great volcanic outburst of Vesuvius in

79 a.D., and of its rediscovery in modern times, having'

converted that which would otherwise have been known only as an obscure country town into a place of world-wide fame, as one of the most interesting relics preserved to us from antiquity. Of its previous history comparatively little is recorded, but it appears that, like most other towns in the beautiful region in which it was situated, it had a population of a very mixed character, and it passed succes- sively into the hands of several different nations, each of which probably contributed an additional element to its composition. Though its foundation was ascribed by Greek tradition to Heracles, in common with the neigh- bouring city of Herculaneum, no value can be attached to these mythological or etymological fables; it is certain that it was not a Greek colony, in the proper sense of the term, as we know to have been the case with the more important cities of Cum and Neapolis. Strabo, in whose time it was a populous and flourishing place, tells us that it was first occupied by the Oscans, afterwards by the Tyrrhenians (i.e, Etruscans) and Pelasgians, and lastly, by the Samnites. The conquest of Campania by the last-mentioned people is an undoubted historical fact, and there can be no doubt that Pompeii shared the fate of the neighbouring cities on this occasion, and afterwards passed in common with them under the yoke of Rome. But its name is only once mentioned during the wars of the Romans with the Samnites and Campanians in this region of Italy, and then only incidentally (Liv., ix. 38). At a later period, however, it took a prominent part in the outbreak of the nations of central Italy known as the Social War (91-89 B.c.), when it withstood a long siege by Sulla, and was one of the last cities of Campania that was reduced by the Roman arms. After that event the inhabitants were admitted to the Roman franchise, but 4 military colony was settled in their territory by the dictator Sulla, and there can be no doubt that the whole popula- tion became rapidly Romanized. Before the close of the

republic it became a favourite resort of the leading nobles of Rome, many of whom acquired villas in the neighbour- hood. Among the most prominent of these was Cicero, whose letters abound with allusions to his Pompeian villa, which was one of his favourite places of occasional resid- ence. The same fashion continued under the Roman empire, and there can be no doubt that during the first century after the Christian era, Pompeii, without rising above the rank of an ordinary provincial town, had become a flourishing place with a considerable population, for which it was indebted in part to its position at the mouth of the river Sarnus, which rendered it the port of the neighbouring towns in the interior. But two events only are recorded of its history during this period. In 59 a.p. a tumult took place in the amphitheatre of Pompeii between the citizens of the place and the visitors from the neighbouring colony of Nuceria, which led to a violent affray, in which many persons were killed and wounded on both sides. The Pompeians were punished for this violent outbreak by the prohibition of all gladiatorial and theatrical exhibitions for ten years (Tacitus, Ann. xiv. 17). A characteristic, though rude, painting, found on the walls of one of the houses, gives a representation of this untoward event.

- Only four years afterwards (63 A.D.) a much more serious disaster befell the city. An earthquake, which affected all the neighbouring towns, vented its force especially upon Pompeii, a large part of which, including most of the public buildings, was either destroyed or so seriously damaged as to require to be rebuilt rather than repaired (Tacit., Ann., xv. 21; Seneca, Q. W., vi. 1). The actual amount of the injuries sustained, which is intimated in general terms by Tacitus and Seneca, is more accurately known to us from the existing remains. For the inhabi- tants were still actively engaged in repairing and restoring

| the ruined edifices when the whole city was overwhelmed

by a much more appalling catastrophe. In 79 a.p. the neighbouring mountain of Vesuvius, the volcanic forces of which had been slumbering for unknown ages, suddenly burst into a violent eruption, which, while it carried devastation all around the beautiful gulf, buried the two cities of Herculaneum and Pompeii under dense beds of cinders and ashes. It is singular that, while we possess a detailed description of this famous

eruption in two well- known letters of the younger Pliny (£pust. vi. 16, 20), he does not even notice the destruction of Pompeii or Herculaneum, though his uncle perished in the immediate neighbourhood of the former city. But their unhappy fate is noticed by Dion Cassius, and its circumstances may be gathered with certainty from the condition in which it has been found. These were such as eminently to conduce to its preservation and interest as a relic of antiquity. Pompeii, was not, like Herculaneum, buried in a solid mass of volcanic tuff, but merely covered with a bed of lighter substances, cinders, small stones, and ashes, thrown out by the volcano, and falling from above on the devoted city. It is clearly established that the whole of this superincumbent mass, though attaining to an average thickness of from 18 to 20 feet, was the product of one eruption,—though the materials may be divided generally into two distinct strata, the one consisting principally of cinders and small volcanic stones (called in Italian “lapilli”), and the other and uppermost layer of fine white

ash, often consolidated by the action of water from above,

so as to take the moulds of objects contained in it like clay or plaster of Paris.

So completely was the unfortunate city buried under this overwhelming mass that its very site was forgotten, and even the celebrated topographer Cluverius in the 17th century was unable to fix it with certainty. This difficulty

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arose in part from the physical changes consequent on the | yards, but in general much less frequently. They are,

eruption, and it was not till 1748 that an accidental dis- covery drew attention to its remains, and revealed the fact that beneath the vineyards and mulberry grounds which covered the site there lay entombed the ruins of a city, far more accessible, if not more interesting, than those (pre- viously discovered) of the neighbouring Herculaneum. It was not till 1755 that

systematic excavations on the site were begun, and, though they were thenceforth carried on more or less continuously during the whole of that century, it was not till the beginning of the present century that they assumed a regular character ; and the work, which had received a vigorous stimulus during the period of the French government (1806-1814), was prosecuted, though in a less methodical and systematic manner, under the suc- ceeding rule of the Bourbon kings (1815-61). Of late years the process has been carried on, under the enlightened direction of Signior Fiorelli, in a much more careful and scientific manner than before, and the results have been in many respects of the highest interest. At the same time the invention of photography has enabled the directors to preserve a far more satisfactory record of every step in the explorations than could previously be attempted.

It would be impossible for us to present our readers in this place with anything like an idea of the results of these excavations. Interesting as are the numerous works of art that have been brought to light, and important as is their bearing upon the history of some branches of ancient art, they cannot compare in interest with the flood of light which this marvellous discovery has thrown upon ancient life in all its details, enabling us to picture to ourselves the ways and manners and habits of life of a cultivated and flourishing population eighteen centuries ago, in a manner which no amount of study of ancient literature could pos- sibly accomplish. We must confine ourselves in the present article chiefly to those points which bear more immediately on the topography and character of the town of Pompeii, referring our readers for other details to the numerous works in which they have been described and delineated.

The town was situated on a rising ground of small elevation, separated by a distance of less than a mile from the foot of the actual rise of the outer cone of Vesuvius. This eminence is itself undoubtedly due to an outflow of lava from that mountain, during some previous eruption in prehistoric times, for we know from Strabo that Vesuvius, though presenting in his time all the appearances of an extinct volcano, had been quiescent ever since the first records of the Greek settlements in this part of Italy. But the position of Pompeii in ancient times differed materially from that which it occupies at the present day. It was situated close to the sea-shore, from which it is now

more than a mile distant, and adjoining the mouth of the river Sarnus or Sarno, which now enters the sea nearly two miles from its site, but the present course of this stream is due in part to modern alteration of its channel, as well as to the effects of the great eruption. It is certain, however, that in Strabo's time Pompeii -owed much of its prosperity to its serving as the port of the adjoining plain, and the neighbouring towns of Nuceria, Nola, and Acerrz (Strabo, v. c. 4, § 8).

The area occupied by the ancient city was of an irregular oval form, and about two miles in circumference. It was surrounded by a wall, which is still preserved around more than two-thirds of its extent, but no traces of this are found on the side towards the sea, and there is no doubt that on this side it had been already demolished in ancient times, so as to give room for the free extension of houses and other buildings in that direction. These walls are strengthened at intervals by numerous towers, which occur in some parts at a distance of only about 100

however, of a different style of construction from the walls, and appear to have been added at a later period, probably that of the settlement of the Roman colony by Sulla. Similar evidences of the addition of subsequent defences are to be traced also in the case of the gates, of which no less than eight are found in the existing circuit of the walls. Some of these present a very elaborate system of defence, but it is evident from the decayed condition of others, as well as of parts of the walls and towers, that they had ceased to be maintained for the purposes of fortification long before the destruction of the city. The gates are now known by names given them in modern times from the direction in which they led, as, the gate of Herculaneum, of Stabiz, of Nola, &c. No trace has been found of their ancient appellations.

The general plan of the town is very regular, the streets being generally straight, and crossing one another at right angles or nearly so. But an exception is found in the street leading from the gate of Herculaneum to the forum, which, though it must have been one of the principal thoroughfares in the city, was crooked and irregular, as well as very narrow, in some parts not exceeding 12 to 14 feet in width, including the raised ¢rottoirs or footpaths on each side, which occupy a considerable part of the space, so

that the carriage-way could only have admitted of the passage of one vehicle ata time. The other streets are in some cases broader, but rarely exceed 20 feet in width, and the broadest yet found is less than 30, while the back streets running parallel to the main lines are only about 15 feet. They are uniformly paved with large polygonal blocks of hard basaltic lava, fitted very closely together, though now in many cases marked with deep ruts from the passage of vehicles in ancient times. They are also in all cases bordered by raised trottoirs on both sides, paved in a similar manner ; and for the convenience of foot passengers, these are connected from place to place

by stepping-stones raised above the level of the carriage-

way. Such an arrangement must have presented a con- siderable obstacle to the passage of vehicles ; and altogether it is evident that the streets of Pompeii, like those of most Roman towns, were calculated much more for foot passengers than for any extensive traffic of wheeled carriages. Inother respects they must have been far fron presenting the lively aspect of the streets of modern and even medieval towns, and must rather have resembled those of Oriental cities,—the living apartments all opening towards the interior, and showing only blank walls towards the street ; while the windows were generally to be found only in the upper story, and were in all cases small and insignificant, without any attempt at architectural effect. In some instances indeed the monotony of their external appearance was broken by small shops, occupying the front of the principal houses, as it were let in to the main build- ing; these were in some cases numerous enough to form a continuous facade to the street. This is seen especially in the case of the Street of Herculaneum, and that of Stabie, both of which were among the principal and most frequented thoroughfares.

The former of these main lines of street, which, as already described, led from the gate of Herculaneum to the forum, was crossed, a little before it reached that important centre, by a long straight line of street, which led directly to the gate of Nola. Two other parallel lines of street struck off from the forum itself towards the east, and these have been followed as far as the points where they cross nearly at right angles another main line of street, which leads direct from the gate of Vesuvius to that of Stabiz, near the

theatres, thus traversing the city in its whole width from north to south. Almost the

whole portion of the city which lies to the west of this last | public buildings or edifices of a commanding character.

line, towards the forum and the sea, has been more or less

completely excavated ; but the greater part of that on the | other side of it remains still unexplored, with the excep- |

tion of the amphitheatre, and a small space in its imme- | diate neighbourhood. Altogether it may be calculated | that about two-fifths of the whole extent has been already | excavated. But there can be little doubt that the portion |

already known is the most important, as it includes the forum, with the temples and public buildings adjacent to it, the thermz, theatres, amphitheatre, é&c.

The forum was unquestionably at Pompeii, as at Rome itself, and in all other Italian cities, the focus and centre of all the life and movement of the city, and was at once the resort of the lounger and the gathering place of men of business. Hence it was surrounded on all sides by

It was not, however, of large size, as compared to the open spaces in modern towns, being only 160 yards in length by 85 in breadth. Nor was it a centre of traffic in the modern sense of the word, being only accessible to any description of wheeled carriages at one angle, and the nature of its pavement, composed of broad flags of traver- tine, excluding the idea of its being intended for their passage. It was surrounded on three sides by a portico, or rather by a series of porticos, some supported on arcades, others in the Grecian manner on columns; and these porticos were originally surmounted by a gallery or upper story, traces of the staircases leading to

which still remain, though the gallery itself has altogether dis- appeared, It is, however, certain from the existing remains that both this portico and the adjacent buildings

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Plan of Pompeii.

A. Gate of Herculaneum. B. Gate of Vesuvius.

C. Gate of Capua.

D. Gate of Nola.

E. Gate of Sarno,

F. Gate of Nocera.

G. Gate of Stabiz,

H. Gate of the Seashore. I, Forum.

| J. Temple of Jupiter.

K. Basilica,

M. “ Pantheon.” N. Temple of Hercules. O. Great Theatre.

had suffered severely from the earthquake of 63, and that they were undergoing a process of restoration, involving material changes in the original arrangements, which was still incomplete at the time of their final destruction.

The north end of the forum, where alone the portico is wanting, is occupied in great part by a building, the most imposing in the whole city, which is now generally known, on grounds that may be considered satisfactory, as the temple of Jupiter. It was raised on a podium or base of considerable

elevation, and had a portico with six Corinthian columns in front, which, according to Sir W. Gell, are nearly as large as those in the portico of St Paul's. This magnificent edifice had, however, been evidently overthrown by the earthquake of 63, and is in its present condition a mere ruin. On each side of it were two arches, affording an entrance into the forum, but capable of being closed by iron gates. The principal

L. Building of Eumachia (* Chalcidicum").

P. Smaller Theatre.

Q. Gladiators' Barracks.

R. Amphitheatre.

8, T, U. Public Baths.

V. Temple (Fortuna Augusta).

Temple of Venus.

House of Pansa.

House of Sallust.

House of the Faun.

Villa of Arrius Diomedes.

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of these, at the north-east angle of the forum, was the approach by which that open space was entered in coming from the gate of Herculaneum; the passage, however, was barred to wheeled carriages by a descent of three small steps. On the east side of the forum were four edifices, all of them

unquestionably of a public character, but of which the names and attribution have been the subject of much controversy. The first (proceeding from the north) is generally known, though without doubt erroneously, as the Pantheon, or temple of the Twelve Gods; but it is very doubtful whether it is a temple at all, and the latest authorities are disposed to regard it as a macellum or meat-market, though the situation would seem to be unhappily chosen for such a purpose. Next to this comes a building generally regarded as the curia or senaculum—the meeting-place of the local senate, or town council. Beyond this comes another temple of small

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dimensions commonly called the temple of Mercury, but supposed also, on very slight grounds, to have been dedicated to Augustus; and beyond this again, bounded on the south by a street known as the Street of the Silver-smiths, is a large and spacious edifice, which, as we learn from an extant inscription, was erected by a priestess named Eumachia. Notwithstanding this, its purpose and character are open to considerable doubt ; but it resembles a basilica in its form and disposition, and was probably designed for similar purposes. The name of Chalcidicum, by which it is commonly known, is an erroneous inference from the inscription just referred to. The south end of the forum is occupied by three small buildings of very similar form and arrangement, which are supposed to have. served as courts of law, though their destination is a matter of much uncertainty; while the greater part of the west side is occupied by two large buildings,—a basilica, which is the largest edifice in Pompeii, and a temple, which presents its side to the forum, and hence fills up a large portion of the surrounding space. The former, as we learn from an inscription on its walls, was anterior in date to the consulship of M. Lepidus and Q. Catulus (78 B.c.), and therefore belongs to the Oscan period of the city, before the introduction of the Roman colony. The temple was an extensive edifice, having a comparatively small cella, raised upon a podium, and standing in the midst of a wide space surrounded by a portico of columns, outside which again is a wall, bounding the sacred enclosure. It is commonly called the temple of Venus, but without any evidence; the most recent authorities regard it, on somewhat better grounds, as dedicated to Apollo. Between this temple and the basilica a street of unusual width leads off direct to the gate which opens

towards the sea, and is still preserved, though the walls on this side of the city have ceased to exist.

Besides the temples which surrounded the forum, the remains of four others have been discovered, three of which are situated in the immediate neighbourhood of the theatres. Of these by far the most interesting, though the least perfect, is one which is commonly known as the temple of Hercules (an appellation wholly without founda- tion), and which is not only by far the most ancient edifice in Pompeii, but presents us with all the characters of a true Greek temple, resembling in its proportions that of Neptune at Pestum, and probably of as remote anti- quity. Unfortunately only the basement and a few capitals and other architectural fragments remain, and, though these suffice to enable us to restore its plan and design, of course its effect as a monument is wholly lost. The period of its destruction is unknown, for it appears certain that it cannot be ascribed wholly to the earthquake of 63. On the other hand the reverence attached to it in the later periods of the city is evidenced by its being left standing in the midst of a triangular space adjoining the great theatre, which is surrounded by a portico, so as to constitute a kind of forum, though scarcely deserving that appellation. In the immediate neighbourhood of, the preceding, and close to the great theatre, Stood a small temple, which, as we learn with certainty from the inscrip- tion still remaining, was dedicated to Isis, and was restored, or rather rebuilt, by a certain Popidius Celsinus, after the original edifice had been reduced to ruin by the great earthquake of 63. Though of small size, and by no means remarkable in point of architecture, it is interesting as the only remaining temple dedicated to the Egyptian goddess, whose worship became so popular under the Roman empire. There is nothing peculiar in the arrange- ments of the building itself, but a small edifice within the sacred enclosure, to which nothing similar was found in any other instance, was doubtless in some way connected |

| leading to the gate of Nola.

with the peculiar rites of the mysterious deity. Close to this temple was another, of very small size, and of little interest, commonly known as the temple of A‘sculapius, but by others supposed to have been dedicated to

Jupiter and Juno. No real foundation exists for either attribu- tion. More considerable and important was a temple which stood at no great distance from the forum, at the point where the street leading thither from the gate of Herculaneum was crossed by the wide line of thoroughfare We learn from an inscription that this was dedicated to the Fortune of Augustus (Fortuna Augusta), and was erected, wholly at his own cost, by a citizen of the name of M. Tullius, unfortunately no connexion of the orator. This temple appears to have suffered very severely from the earthquake, and at present affords little evidence of its original architectural orna- ment; but we learn from existing remains that its walls were covered with slabs of marble, and that the columns of the portico were of the same valuable material.

All the temples above described, except that ascribed to Hercules, agree in being raised on an elevated podiwm or basement,—an arrangement usual with all similar build- ings of Roman date. Neither their materials nor the style of their architecture exceed what might reasonably be expected in a second-rate provincial town; and the same may be said in general of the other public buildings. Among these the most conspicuous are the theatres, of which there were two, placed, as was usual in Greck towns, in close juxtaposition with one another. The largest of these, which was partly excavated in the side of the hill, was a building of considerable magnificence, being in great part cased with marble, and furnished with seats of the same material, which have, however, been almost wholly removed. Its internal construction and {arrange- ments resemble those of the Roman theatres in general, though with some peculiarities that show Greek influence, and we learn from an inscription that it was erected in Roman times by two members of the same family, M. Holconius Rufus and M. Holconius Celer, both of whom held important municipal offices at Pompeii during the reign of Augustus. It appears, however, from a careful examination of the remains that their work was only a reconstruction of a more ancient edifice, the foundations of which, and some other portions, may be distinctly traced. The smaller theatre, which was erected, as we learn from an inscription, by two magistrates specially appointed for the purpose by the decurions of the city, was of older date than the large one, and appears to have been constructed about the same time as the amphi- theatre, soon after the establishment of the Roman colony under Sulla. From the same source we learn that it was permanently covered—a rare

thing with Roman theatres ; but in the case of the larger theatre also the arrangements for the occasional extension of an awning (velarium) over the whole are distinctly found. The smaller theatre is computed to have been capable of containing fifteen hundred spectators, while the larger could accommodate five thousand persons.

Adjoining the theatres is a large rectangular enclosure, surrounded by a portico, the purpose of which has been the subject of considerable controversy, but it is now generally admitted to have been the quarters or barracks of the gladiators, who were permanently maintained in the city with a view to the shows in the amphitheatre. It is singular that it should have been at so considerable a distance from that building, which is situated at the south-eastern angle of the town, above 500 yards from the theatres. The amphitheatre was erected by the same two magistrates who built the smaller theatre, at a period when no permanent edifice of a similar kind had yet been

erected in Rome itself. But apart from its early date it | buildings of Pompeii, and valuable as is the light that they

has no special interest, and is wholly wanting in the ex- ternal architectural decorations that give such grandeur of character to similar edifices in other instances. Being in great part excavated in the surface of the hill, instead of the seats being raised on arches, it is wanting also in the picturesque arched corridors which contribute so much to the effect of those other ruins. Nor are its dimensions (430 feet by 335) such as to place it in the first rank even of provincial structures of this class, though it may still strike a visitor of the present day as surprisingly large for a town of the population of Pompeii. But, as we learn from the case of their squabble with the people of Nuceria, the games celebrated in the amphitheatre on grand occa- sions would be visited by large numbers from the neigh- bouring towns.

Adjoining the amphitheatre was found a large open space, nearly square in form, which has been supposed to be a forum boarium or cattle market, but,

no buildings of interest being discovered around it, the excavation was filled up again, and this part of the city has not been since examined.

Aniong the more important public buildings of Pompeii were the therm, or public baths, an institution that always held a prominent position in every Roman or Greco-Roman town. Three different establishments of this character have been discovered, of which the first, excavated in 1824, was for a long time the only one known. Though the smallest of the three, it is in some respects the most complete and interesting; and it was until of late years the principal source from which we derived our knowledge of this important branch of the economy of Roman life. The vast series of edifices known by the name of thermz at Rome, as well as those in other provincial towns, are in such a state of ruin as to throw little light upon the details of their arrangements. At Pompeii on the contrary the baths are so well preserved as to show at a glance the purpose of all the different parts—while they are among the most richly decorated of all the buildings in the city. We trace without difficulty all the separate apartments that are described to us by Roman authors—the apodyterium, frigidarium, tepidarium, caldarium, &c., together with the apparatus for supplying both water and heat, the places for depositing the bather's clothes, and other minor details which were for the first time revealed to us by the discovery of these interesting buildings. It is obviously impossible for us in this place to enter into a detailed description of these arrangements, for which we must refer our readers to the professed treatises on Roman antiquities, as well as to the larger works on Pompeii (see also Barus, vol. iii. p. 435). The

greater therms, which were not discovered till 1857, nor | fully excavated till 1860, so that they are not described in |

the earlier works on the subject, are on a much more extensive scale than the others, and combine with the special purposes of the building a palestra and other apartments for exercise or recreation. The arrangements of the baths themselves are, however, almost similar to those of the lesser therm. In this case an inscription records the repair and restoration of the edifice after the

earthquake of 63, but the period of its original construc- |

tion is unknown. It appears, however, that these two establishments were found inadequate to supply the wants of the inhabitants, and a third edifice of the same character, but on a still more extensive scale, was in course of construction when the town was overwhelmed. The remains of this, which were first discovered and excavated in 1877, are, however, of comparatively little interest from the incomplete state in which the buildings were left.

have in some instances thrown upon similar edifices in other ruined cities, far more curious and interesting is the insight afforded us by the numerous private houses and shops into the ordinary life and habits of the population of an ancient town. In this respect Pompeii stands alone, among all antiquarian discoveries,—the difficulties of exploration at Herculaneum having greatly checked all further investigations on that equally promising site. But

| here again it is impossible in an article like the present to

do more than briefly advert to the general results of the excavations (compare ARCHITECTURE, vol. il, p. 420-21, and Pl. XVII.). The houses at Pompeii are generally low, rarely exceeding two stories in height, and it appears certain that the upper story was generally of a slight construction, and occupied by small rooms, serving as garrets, or sleeping places for slaves, and perhaps for the females of the family. From the mode of destruction of the city these upper floors were in most cases crushed in and destroyed, and hence it was long believed that the houses for the most part had but one story; but recent researches have in many cases brought to light incontest- able evidence of the existence of an upper floor, and the frequent occurrence of a small staircase is in itself sufficient proof of the fact. The windows, as already mentioned, were generally small and insignificant, and contributed nothing to the external decoration or effect of the houses. In some cases they were undoubtedly closed with glass, but its use appears to have been by no means general. The principal living rooms, as well as those intended for the reception of guests or clients, were all on the ground floor, the centre being formed by the atrium, or hall, which was almost always open above to the air, and in the larger houses was generally surrounded with columns. Into this opened other rooms, the entrances to which seem to have been rarely protected by doors, and could only have been closed by

curtains. All the apartments and arrangements described by Vitruvius and other ancient writers may be readily traced in the houses of Pompeii, and in many instances these have for the first time enabled us to under- stand the technical terms and details transmitted to us by Latin authors. We must not, however, hastily assume that the examples thus preserved to us by a singular accident are to be taken as representing the style of build- ing in all the Roman and Italian towns. We know from Cicero that Capua was remarkable for its broad streets and wide-spread buildings, and it is probable that the Campanian towns in general partook of the same character. At Pompeii indeed the streets were not wide, but they were straight and regular, and the houses of the better class occupied considerable spaces, presenting in this respect no doubt a striking contrast, not only with those of Rome itself, but with those of many other Italian towns, where the buildings would necessarily be huddled together from the circumstances of their position, Even at Pompeii itself, on the west side of the city, where the ground slopes somewhat steeply towards the sea, houses are found which consisted of three stories or more.

The excavations systematically conducted for many years past have presented us with examples of houses of every description, from the humble dwelling-place of the artisan or proletarian, with only three or four small rooms, to the stately mansions of Sallust and Pansa,1—the last of which is the most regular as well as the most extensive of all,

1 It may be observed that the names given in most cases to the houses are either arbitrary, or founded in the first instance upon erroneous inferences. Hence they are frequently changed, and great confusion arises in consequence in comparing the different works on the subject. A few only of the best known may be considered as

Great as is the interest attached to the various public | established by long usage, among which are the two here referred to.

BOM PEA

and may be taken as an almost perfect model of a com- |

plete Roman house of a superior class. But the general similarity in their plan and arrangement is very striking, and in all those that rise above a very humble class the leading divisions of the interior, the atrium, tablinum, peristyle, &c., may be traced with unfailing regularity. Another peculiarity that is found in all the more consider- able houses in Pompeii is that of the front, where it faces one of the principal streets, being occupied with shops, usually of small size, and without any communication with the interior of the mansion. In a few instances indeed such a communication is found, but in these cases it is probable that the shop was used for the sale of articles grown upon the estate of the proprietor, such as wine, fruit, oil, &c., a practice that is still common in Italy. In general the shop had a very small apartinent behind it, and pro- bably in most cases a sleeping chamber above it, though of this the only remaining evidence is usually a portion of the staircase that led to this upper room. The front of the shop was open to the street, but was capable of being closed with wooden shutters, the remains of which have in a few instances been preserved. Of course it is only in a few cases that the particular purpose of the shop or trade of its owner can be determined, though, from the exceptional manner of their preservation, this can be done more frequently than might be expected. Thus not only have the shops of silversmiths been recognized by the precious objects of that metal found in them, but large quantities of fruits of various kinds preserved in glass vessels, various descriptions of corn and pulse, loaves of bread, moulds for pastry, fishing-nets, and many other objects, too numerous to mention, have been found in such a condition as to be identified without difficulty. Cooks' shops appear to have been numerous, as well as thermo-polit, where hot drinks were sold. Bakers' shops are also frequent, though arrangements for grinding and baking appear to have formed part of every large family establish- ment. In other cases, however, these were on a larger scale, provided with numerous querns or hand-mills of the well-known form, evidently intended for public supply. Another establishment on a large scale was a fullonica or fuller's shop, where all the details of the business were illustrated by paintings still visible on the walls. A dyer's shop, a tannery, and a shop where colours were ground and manufactured—an important business where almost all the rooms of every house were painted—are of special interest, as is also the house of a surgeon, where numerous surgical instruments were found, some of them of a very ingenious and elaborate description, but all made of bronze. Another

curious discovery was that of the abode of a sculptor, containing his tools, as well as blocks of marble and half-finished statues. The number of utensils of various kinds found in the houses and shops is almost endless, and, as these are in most cases of bronze, they are generally in perfect preservation.

Of the numerous works of art discovered in the course of the excavations the statues and large works of sculpture, whether in marble or bronze, are inferior to those found at Herculaneum, but some of the bronze statuettes are of exquisite workmanship, while the profusion of orna- mental works and objects in bronze and the elegance of their design, as well as the finished beauty of their execu- tion, are such as to excite the utmost admiration,—more especially when it is considered that these are the casual results of the examination of a second-rate provincial town. The same impression is produced in a still higher degree by the paintings with which the walls of the private houses, as well as those of the temples and other public buildings, are adorned, and which are not merely of a decorative character, but in many instances present us

with elaborate compositions of figures, historical and mythological scenes, as well as representations of the ordinary life and manners of the people, which are full of interest to us, though often of inferior artistic execution. An illustration of the character of the Pompeian wall- paintings is given in the article Murat Decoration, vol. xvii. p. 42, fig. 8. Our knowledge of ancient paint- ing is indeed derived to a much greater extent from Pompeii than from all other sources whatever ; and, when we contemplate the variety and beauty of what we find here entombed, we cannot but ask ourselves what would have been the result had a great and opulent city like Capua or Neapolis been preserved to us in the same manner as the comparatively insignificant Pompeii. The same character of elaborate decoration, guided almost uniformly by good taste and artistic feeling, is displayed in the mosaic pave- ments, which in all but the humbler class of houses fre- quently form the ornament of their floors. One of these, well known as the battle of Alexander, presents us with the most striking specimen of artistic composition that has been preserved to us from

antiquity (see Mosaic, vol. xvi. p, 851, where part of this composition is shown in fig. 2).

The architecture of Pompeii must be regarded as present- ing in general a transitional character from the pure Greek style to that of the Romanempire. The temples (as already observed) have always the Roman peculiarity of being raised on a podium of considerable elevation ; and the same characteristic is found in most of the other public buildings. All the three orders of Greek architecture —the Doric, Ionic, and Corinthian—are found freely employed in the various edifices of the city, but rarely in strict accordance with the rules of art in their proportions and details ; while the private houses naturally exhibit still more deviation and irregularity. In many of these indeed we find varieties in the ornamentation, and even in such leading features as the capitals of the columns, which remind one rather of the vagaries of medizval archi-

tecture than of the strict rules of Vitruvius or the monoton-

ous regularity of Greek edifices. One practice which is especially prevalent, so as to strike every casual visitor, is that of filling up the flutings of the columns for about one-third of their height with a thick coat of stucco, so as to give them the appearance of being smooth columns without fiutings below, and only fluted above. The un- pleasing effect of this anomalous arrangement is greatly aggravated by the lower part of each column being almost always coloured with red or yellow ochre, so as to render the contrast between the two portions still stronger. The architecture of Pompeii suffers also from the inferior quality of the materials generally employed. No good building stone was at hand; and the public as well as private edifices were constructed either of volcanic tuff, or brick, or the irregular masonry known to the Romans as opus incertum. Those which belong to the earlier or Oscan period of the city (before the establishment of the Roman colony) are for the most part of the former material, while those erected under the Roman empire, and especially those subsequent to the great earthquake of 63, are gene- rally of slighter construction, and of a less durable character. In the private houses even the columns are mostly of brick, covered merely with a coat of stucco. In a few instances only do we find them making use of a kind of travertine, found in the valley of the Sarno, which, though inferior to the similar material so largely employed at Rome, was better adapted than the ordinary tuff for purposes where great

solidity was required. The portion of the portico surrounding the forum which was in the process of rebuilding at the time when the city was destroyed was constructed of this material, while the earlier portions, as well as the principal temples that XIX. — 57

adjoined it, were composed in the ordinary manner of voleanic tuff. Marble appears to have been scarce, and was sparingly employed. In some instances where it had been freely introduced, as in the great theatre, it would seem that the slabs must have been removed at a period subsequent to the entombment of the city. ;

Outside the gate leading to Herculaneum is found a house of a different character from all the others, which from its extent and arrangements was undoubtedly a suburban villa, belonging to a person of considerable fortune. It is called—as usual without any authority— the villa of Arrius Diomedes; but its remains are of peculiar interest to us, not only for comparison with the numerous ruins of similar buildings which occur elsewhere, —often of greater extent, but in a mucli less perfect state of preservation,—but as assisting us in understanding the description of ancient authors, such as Vitruvius and Pliny, of the numerous appurtenances frequently annexed to houses of this description. The remains of a still more extensive suburban house which were discovered in 1764, and to which the name was given, without the slightest foundation, of the villa of Cicero, are no longer visible, having been covered up again with earth (as was frequently done in the last century) after the works of art had been removed.

In the vaulted corridors of the first villa were discovered no less than seventeen skeletons of the unfortunate in- habitants, who had evidently fled thither for protection. Almost all the skeletons and remains of bodies found in the city were discovered in similar situations, in cellars or underground apartments,—those who had sought refuge in flight having apparently for the most part escaped from destruction, or having perished under circumstances where their bodies were easily recovered by the survivors. Ac- cording to Dion Cassius, a large number of the inhabitants were assembled in the theatre at the time of the catas- trophe, but no bodies have been found there, and they were probably sought for and removed shortly

afterwards. Hence the whole number of such remains discovered is not so large as might at first be supposed. It cannot indeed be accurately estimated, the records of the excavations in the last century having been very imperfectly kept; but the total number as yet discovered can scarcely exceed three hundred. Of late years it has been found possible in many cases to take casts of the bodies found—a com-

plete mould having been formed around them by the fine |

white ashes, partially consolidated by water.

The road leading from the gate of Herculaneum towards that city is bordered on both sides for a considerable extent by rows of tombs, as was the case with all the great roads leading into Rome, and indeed in all large Roman towns. Without of course approximating to the stately structures that adorned the Via Appia or Latina, these tombs are in many instances monuments of considerable pretension, and of a highly ornamental character, and naturally present in the highest degree the peculiar advantage common to all that remains of Pompeii, in their perfect preservation. Hardly any scene even in this extraordinary city is more striking than the coup d'eil of this long street of tombs, preserving uninjured the records of successive generations eighteen centuries ago. Unfortunately the names are all otherwise unknown ; but we learn from the inscriptions that they are for the most part those of local magistrates and municipal dignitaries of Pompeii.

_ There appears to have been in the same quarter a con- siderable suburb, outside the gate, extending on each side of the road towards Herculaneum, apparently much resembling those which are now found throughout almost the whole distance from thence to Naples. It appears to have been known by the name of Pagus Augustus Felix.

No manuscripts have been discovered in Pompeii. In- scriptions have naturally been found in considerable nuin- bers, and we are indebted to them for much information concerning the municipal arrangements of the town, as well as the construction of various edifices and other public works. The most interesting of these are such as are written in the Oscan dialect,

which appears to have con- tinued in official use down to the time when the Roman colony was introduced by Sulla. From that time the Latin language was certainly the only one officially employed, though Oscan may have still been spoken by a portion at least of the population. Still more curious, and almost peculiar to Pompeii, are the numerous writings scratched or rudely painted upon the walls, which have in some instances a semi-public character, such as recommendations of candi- dates for municipal offices, but more frequently are the mere expression of individual impulse and feeling, not un- cominonly conveyed in rude and imperfect verses. In one house also a whole box was found filled with written tablets —diptychs and triptychs—containing the record of the accounts of a banker named L. Cecilius Jucundus.

The inscriptions of a more formal character have been published by Mommsen, first in his Jnscriptiones Regni Neapolitant Latine (fol., Leipsic, 1852) and again in the tenth volume of the great Corpus Inscriptionum Latinarum, published at Berlin (1883). The fourth volunie of the same work published in 1871 contains all the scratched and written inscriptions discovered up to that date, edited by Zangemeister (under the title Znscriptiones Parietariz Pompevane, Herculanenses, et Stabianx) ; but the number has been since greatly increased, and a supplementary volume is in the press. The Oscan inscriptions, which are not comprised in the above collections, have been published by Fiorelli.

Most of the movable objects from Pompeii are now in the Museo Borbonico at Naples (see vol. xvii. p. 189).

Of the numerous works devoted to the antiquities and description of Pompeii generally it must suffice to mention a few. The earlier works, especially that of Mazois (Les Ruines de Pompeii, with its coutinuation by Gau, 4 vols. fol., Paris, 1812-38), and the two well-known works of Sir W. Gell (Pompeiana, Ist serics, 2 vols. 8vo, London, 1824, 2d series, 1830), are still valuable for reference, though neeessarily very imperfect. The popular treatise published by the Society for Useful Knowledge (Pompeti, 2 vols. 8vo, London, 1831) gives a good account of what had been then discovered, and the light thrown by it on ancient manners and customs. The inore recent works of Breton (Pompeia, 8vo, Paris, 1855) and of Mr Dyer (Pompeii: its

History, Buildings, and Antiquities, 8vo, London, 1867) bring down the reeord to a later period; and the successive editions of Overbeck's Pompeii (first published in 1856) have been kept continually on a par with the progress of discovery and rescarch. The last edition of this valuable treatise (1884) is much the most complete and useful compendium of the whole subject that has yet aypeared, and will supply all the wants of the ordinary reader. More special students will find there detailed references to the official records of the later discoveries that have been made under the direction of Signor Fiorelli, and to the numerous dissertations to which they have given rise. The great illustrated works of Zahn (Berlin, 1827-29) and Presuln (fol., Leipsic, 1882) will furnish more elaborate representations of the decorative works with which almost all the buildings are adorned, while the student of ancient art may have recourse to the less am- bitious collection of the ancient paintings by Helbig (Wandge- mélde der von Vesuv verschiitteten Stidte Campaniens, Leipsic, 1868), with a supplementary volume published by Sogliano at Naples. A complete catalogue of all the works concerning Pompeii and Herculaneum will be found in a little book published at Milan in 1879 under the title of Bibliotheca Pompeiana. Unfortunately all works are rendered imperfect within a few years by the continued progress of the cxplorations and discoveries on the site. (E. H. B.)

POMPEY is the common English form of the Roman name Pompeius.

I. Cyerus Pompzrus Macnvus (106-48 B.c.), the great triumvir, whose name we always associate with Czsar and Crassus, may be said to have led a soldier's life from his boyhood to his death. Born in 106 z.c., he fouglit

by his father's side when a stripling of seventeen in the Social or Italian War on the side of Sulla against the party of Marius and Cinna. Thus early in life he con- nected himself with the cause of the aristocracy, and a decisive victory which he won in 83 over the Marian armies gained for him from Sulla the titie of ''imperator." He followed up his successes in Italy by defeating the Marians in Sicily and Africa, and on his return to Rome in 81, though he was still merely an "'eques" and not legally qualified to celebrate a triumph, he was allowed by general consent to enjoy this great distinction,

while Sulla greeted him with the surname of Magnus, a title he always retained and handed down to his sons. Yet in 79 he used his influence in getting elected to the consul- ship a man politically opposed to Sulla, AZmilius Lepidus, who threatened Rome with another revolution and civil war in the interest of the democratic party. Pompey, however, at this crisis was loyal to his friends, and with the defeat of Lepidus the danger passed away. With some fears and misgivings the senate permitted him to retain the command of his victorious army, and decided on sending him to Spain, where, under a leader of singular ability, Sertorius, the Marian party was still formidable. Pompey was fighting in Spain from 76 to 71, and though at first he met with serious reverses he was ultimately successful, his great opponent, Sertorius, having, it would seem, lost the confidence of some of the native Spanish tribes. In71 he was again in Italy at the head of his army, and won fresh glory by giving a finishing blow to the slave insurrection of Spartacus. That same year, amid great popular enthusiasm, but without the hearty concurrence of the senate, whom he had alarnied by talking of restoring the dreaded power of the tribunes, and though still merely an "eques," he was elected with Crassus to the consulship, and entered Rome in triumph for his Spanish victories. The following year saw the work of Sulla undone: the tribune- ship was restored, and the administration of justice was no longer left exclusively to the senate, but was to be shared by them with the wealthier portion of the middle class, the "knights," as from old time they had been called, and the farmers and collectors of the revenue. The change was really necessary, as the provincials could never get justice from a court composed of senators, and it was carried into effect by Pompey with Cvesar's aid. Pompey as a matter of course rose still higher in popularity, and on the motion of the tribune Gabinius in 67 he was entrusted with an extraordinary command over the greater part of the empire, specially for the extermination of piracy in the Mediterranean, by which the corn supplies of Rome were seriously endangered, while high prices of provisions caused great distress. man had been chosen for the work: the price of corn fell immediately on Pompey's appointment, and in forty days the Mediterranean was swept from end to end and the pirates cleared out of its waters. Next year, on the proposal of the tribune Manilius, he had a yet further extension of his powers, the whole of Rome's empire in the East being put under his control for three years with the view of finally terminating the war with Mithradates, king of Pontus, who had recovered

from the defeats he had sustained from Lucullus and regained his dominions. Both Csesar and Cicero supported the tribune's proposal, which was easily carried in spite of the interested opposi- tion of the senate and the aristocracy, several of whom held provinces which would now be practically under Pompey's command. Pompey was now by far the first man in the Roman world. His operations in the East were thoroughly successful, and, though no doubt he owed something to the victories of Lucullus, he showed himself an able soldier.

| vassals of Rome.

It soon appeared that the right |

Pan Y 451

Roman arins, and the king of Pontus himself fled from Asia across the Black Sea to Panticapeeum, the modern Kertch. In the years 64 and 63 Syria and Palestine were annexed to Rome's empire. After the capture of Jeru- salem Pompey is said to have entered the temple, and even the Holy of Holies. Asia and the East generally were left under the subjection of petty kings who were mere Several cities had been founded which became centres of Greek life and civilization. A really great work had been accomplished, and Pompey, now in his forty-fifth year, returned to Italy in 61 to celebrate the most magnificent triumph which Rome had ever witnessed, and to be hailed as the conqueror of Spain, Africa, and Asia.

The remainder of Pompey's life is inextricably inter- woven with that of Cesar. He was married to Czsar's daughter Julia, and as yet the relations between the two had been friendly. On more than one occasion Czesar had supported Pompey's policy, which of late had been in a decidedly democratic direction. Pompey was now in fact ruler of the greater part of the empire, while Czesar had only the two provinces of Gaul. The control of the capital, the supreme command of the army in Italy and of the Mediterranean fieet, the governorship of the two Spains, the superintendence of the corn supplies, which were mainly drawn from Sicily and Africa, and on which the vast population of Rome was wholly dependent, were entirely in the hands of Pompey. The senate and the aristocracy disliked and distrusted him, but they felt that, should things

come to the worst, they might still find in him a champion of their cause. At the same time the senate itself was far from unanimous: among many of its members there was a feeling that a military imperialism had become a necessity, while to the rich and idle world generally peace and quiet at any price seemed the best of all blessings. Hence the joint rule of Pompey and Cesar was not unwillingly accepted, and anything like a rupture between the two was greatly dreaded as the sure beginning

of anarchy throughout the Roman world. With the death

of Pompey's wife Julia, in 54, came strained relations be- tween him and Cesar, and soon afterwards he drew closer to what we may call the old conservative party in the senate and aristocracy. The end was now near, and Pompey blundered into a false political position and an open quarrel with Cesar. In 50 the senate by a very large majority revoked the extraordinary powers conceded to Pompey and Cesar in Spain and Gaul respectively. Pompey's refusal to submit gave Cesar a good pretext for declaring war and marching at the head of his army into Italy. At the beginning of the contest, the advantages were decidedly on the side of Pompey, but very speedily the superior political tact of his rival, combined with extraordinary promptitude and decision in following up his blows, turned the scale against him. Pompey's cause, with that of the senate and aristocracy, was finally ruined by his defeat in 48 in the neighbourhood of the Thessalian city Pharsalus. That same year he fled with the hope of finding a safe refuge in Egypt, but was treacherously murdered as he was stepping on the shore by one of his old centurions. He had just completed his fifty-eighth year.

Pompey, though he had some great and good qualities, hardly deserved his surname of "the Great." He was certainly a very good soldier, and is said to have excelled in all athletic exercises, but he fell short of being a first-rate general. He won great successes in Spain and more especially in the East, but for these he was no doubt partly indebted to what others had already done. Of the gifts which make a good statesman he had really none. As plainly appeared in the last years of his life, he was too weak and irresolute to choose a side and stand by it. Pitted against such a man as Cesar, he could not but fail. But to his credit be it said that in a corrupt time he never used his opportunities for plunder

and extortion, and his domestic life was pure and simple. A very complete life of Pompey will be found in Smith's Dict. of Greek and

The wild tribes of the Caucasus were cowed by the | Roman Biography. The allusions to him in Cicero's works are very frequent.

II. Sextus Pompgerus Maenus (75-35 B.c.), the younger son of Pompey the Great, born 75 B.c., continued after his father's death to prolong the struggle against the new rulers of the Roman empire. Cvsar's victory at Munda in 45 drove him out of Corduba (Cordova), though for a time he held his ground in the south of Spain, and defeated Asinius Pollio, the governor of the province. In 43, the year of the triumvirate of Octavius, Antony, and Lepidus, he was proscribed along with the murderers of Ceesar, and not daring to show himself in Italy he put himself at the head of a fleet manned chiefly by slaves or proscribed persons, by means of which he made himself master of Sicily, and from thence ravaged the coasts of Italy. Rome was threatened with a famine, as the corn supplies from Egypt and Africa were cut off by his ships, and it was thought prudent to negotiate a peace with him, which was to leave him in possession of Sicily, Sardinia, and Achaia, provided he would allow Italy to be freely sup- plied with corn. But the arrangement could not be carried into effect, as Sextus renewed the war and gained some considerable successes at sea. However, in 36 his fleet was defeated and destroyed by Agrippa off the north coast of Sicily, and in the following year he was murdered at Mitylene by an officer of Antony. He had his father's bravery as a soldier, but seems to have been a rough uncultivated man. (Ww. J. B.)

PONCE DE LEON, Luis. See Lron, Luis Ponce Dr.

PONCELET, Jean Victor (1788-1867), mathemati- cian, was born at Metz, July 1, 1788. From 1808 to 1810 he attended the Polytechnic School, and afterwards, till 1812, the Practical School at Metz. He then became lieutenant of engineers, and took part in the Russian campaign, during which he was taken prisoner and was confined at Saratoff on the Volga. It was during his imprisonment here that, 'privé de toute espéce de livres et de secours, surtout distrait par les malheurs de ma patrie et les miens propres,"

as he himself puts it, he began his researches on projective geometry which led to his great treatise on that subject. This work, the 7’razté des Propriétés Projectives des Figures, which was published in 1822 (2d ed., 1865), is occupied with the investiga- tion of the projective properties of figures, that is, such properties as are not altered by projection. In his inves- tigation he employs the ideas of continuity, of homologous figures, and of reciprocal polars; and by means of these, without any analysis, he was able to establish all the known

properties of lines and surfaces of the second degree, and |

to discover others unknown before. This work entitles Poncelet to rank as one of the greatest of those who took part in the development of the modern geometry of which Monge was the founder. From 1815 to 1825 he was occu- pied with military engineering at Metz; and from 1825 to 1835 he was professor of mechanics at the Practical School there. In 1826, in his Mémoire sur les Rowes Hy- drauliques & Aubes Courbes, he brought forward improve- ments in the construction of water-wheels, which more than doubled their efficiency. In 1834 he became a member of the Academy ; from 1838 to 1848 he was professor to the faculty of sciences at Paris, and from 1848 to 1850 com- mandant of the Polytechnic School, where he effected a reform in the course of study. At the London Interna- tional Exhibition in 1851 he had charge of the department of machinery, and wrote a report on the machinery and tools on view at that exhibition. He died December 22, 1867. Besides those referred to above, he wrote a number of works, and contributed many papers to Crrelle’s J ournal, &c., on different branches of engineering and mathematics.

POND, Joun (c. 1767-1836), astronomer-royal, was born about 1767 in London, where his father made a fortune in trade. He entered Trinity College, Cambridge, at the

age of sixteen, but took no degree, his course being interrupted by severe pulmonary attacks which compelled a prolonged residence abroad. THis travels extended from Lisbon to Constantinople and the Nile, and were turned to account for astronomical observation. In 1800 he settled at

Westbury near Bristol, and began to determine star-places with a fine altitude and azimuth circle of 23 feet diameter by Troughton. His demonstration in 1806 (Phil. Trans., xcvi. 420) of a change of form in the Greenwich mural quadrant led to the introduction of astronomical circles at the Royal Observatory, and to his own appointment as its head. Elected a fellow of the Royal Society, February 26, 1807, he married and went to live in London in the same year, and in 1811 succeeded Maskelyne as astronomer-royal.

During an administration of nearly twenty-five years, Pond effected a reform of practical astronomy in England comparable to that effected by Bessel in Germany. In 1821 he began to employ the method of observation by re- flexion ; and in 1825 he devised means (see Mem. R.A. Soc., ii. 499) of combining two mural circles in the determination of the place of a single object, the one serving for direct and the other for reflected vision. (By an invention of Airy's, the same object is now attained with one instru- ment.) During Pond's term of office the instrumental equipment at Greenwich was completely changed, and the number of assistants increased from one to six. The superior accuracy of his determinations was due in part to his systematic attention to the errors of his instruments, in part to his plan of multiplying observations. During a prolonged controversy (1810-24), he consistently denied the reality of Brinkley's imaginary star-parallaxes (see his papers in Phil. Trans., eviii. 477 ; exiii. 53). Delicacy of health impeded his activity, and compelled his retirement in the autumn of 1835. He died at Blackheath, September 7, 1836, and was buried beside Halley in the churchyard of Lee. The Copley medal was conferred upon him in 1823, and the Lalande prize in 1817 by the Paris Academy, of which he was a corresponding member. He published eight folio volumes of Greenwich Observations, translated Laplace's Systéme du Monde (in 2 vols. 8vo., 1809), and contributed thirty-one papers to scientific collections. His catalogue of 1112 stars (1833) was of great value.

See Mem. R. A. Soc., x. 857; Annual Biography and Obituary, 1837; Grant, Hist. of Phys. Astr., p. 491; Royal Society's Cat. of Sc, Papers.

PONDICHERRI, chief settlement of the French posses- sions in the East Indies, situated on the Coromandel coast, in 11° 56' N. lat. and 79° 53' E.

long. ; it is 86 miles south of Madras, and is connected with the South Indian Railway system. The territory consists of three districts—Pondicherri, Villianur, and Bahur—comprising an area of 112 square miles, with a population in 1881 of 139,210. The town is divided into a European and a native quarter, separated from one another by a canal. The French first settled at Pondicherri in 1674; it was besieged four times by the British, the last time in 1793; but it was finally restored in 1816. On the whole the town is considered very salubrious ; the purity of its water-supply is said to be unrivalled in any other town in southern India.

PONEVYEZH, a district town of Russia, in the govern- ment of Kovno, situated on the upper course of tho Nevyeja river, and connected by rail with Libau on tho north-west and with Diinaburg (80 miles distant) on the east. It isan old town which was almost totally destroyed by the pestilence of 1550, but was rebuilt and repeopled owing to its advantageous situation on the highway to the Baltic. After having suffered severely from wars in the 17th and 18th centuries it was annexed to Russia on the

third dismemberment of Poland, but had neither eine | facturing nor commercial importance until it was brought into railway connection with Libau, with which seaport it now carries on some trade in agricultural produce. Its population (8070 in 1865) had in 1881 reached 15,030, of whom nearly one-half were Jews.

PONIATOWSKI, a family of Poland, the earliest member of which to acquire high distinction was STANIS- LAus CronEK (1677-1762), regarding whose descent there are conflicting accounts,—some tracing it to the Lombard Counts Torelli, one of whom in the seventeenth century

married a daughter of Albert of Poniatow, and added the name of Poniatowski to his own, which he changed to its equivalent in Polish, Ciolek, while others affirm that the name Poniatowski was adopted by one of two brothers from an estate which fell to his share, while it is also asserted that Stanislaus Ciolek was the natural son of Prince Sapieha, and was adopted by a Polish nobleman named Poniatowski (see Szymanowski, Die Poniatowsk, Geneva, 1880). In any case he had sufficient influence and

ability to insure his rapid promotion in the army of Charles XII., and as major-general at the battle of Poltava in 1709 was able by his self-command in facilitating the passage of the Dnieper to save the retreating army. In 1711 he was sent on a special embassy to Constantinople, when he succeeded in obtaining from the sultan a promise to send an army to aid Charles in the war with Russia ; but on account of a change in the office of grand vizier the promise was never carried out. All possibility of undertaking a Russian invasion being therefore at an end, he was appointed by Charles governor of the duchy of Zweibriicken. After the death of Charles, he gave his adhesion to Augustus II., by whom he was in 1724 made grand treasurer of Lithuania, and in 1731 palatine of Mazovia. On the death of Augustus II. he sought to effect the promotion of Stanislaus Leszezynski to the throne, but ultimately he gave in his submission to Augustus III., and after holding under him several high offices was in 1752 appointed castellan of Cracow. He was the author of Remarques dun Seigneur Polonars sur V Histoire de Charles XII. par Voltaire, 1741, which was translated into English in the same year. He died in 1762, leaving by his marriage with Constance Princess Czartoryski four sons, the best known of whom was the second, SranisLaus Avueustus (1732-1798), king of Poland, born 17th January 1732. Sent by Augustus IIT. to the court of Russia, he won the favour of the grand- duchess Catherine, who succeeded to the throne by the assassination of her husband, 9th July 1762. Through her influence he was, 7th September 1764, chosen king of Poland. For an account of his despicable and disastrous rule see PoLanp (pp. 297-8). After signing his abdi- cation, 25th November 1795, he took up his residence at St Petersburg, where he enjoyed a pension of 200,000 ducats paid jointly by Austria, Russia, and Prussia. He died unmarried, 12th February 1798 (see Mémoires Secrets inédits de Stanislas II. Auguste, Leipsic, 1867, and De Mouy, Correspondance inédite de Roi Stanislas-Auguste et de Madame Geof’rin, Paris, 1875). Of the other sons of Stanislaus Poniatowski, Casimir (1721-1800), the eldest, was grand chamberlain of Poland and commander of the royal guard; Andrew (1735-1773) became an Austrian field marshal; and Michael (1736-1794) was ultimately promoted primate of Poland. JosepH ANTON (1762-1813), prince and marshal of France, son of Andrew Poniatowski

was born at Warsaw, 7th May 1762. At the age of sixteen he entered the service of Austria. After the resolution of the diet to reorganize the Polish army he was recalled and obtained the rank of major-general. On the outbreak of hostilities with Russia in 1792 he was made com- |

mander of the army defending central Poland. When tke king his uncle acceded to the confederation of Targovitza he resigned his commission, but on the outbreak of the insurrection in 1794 he enrolled himself as a volunteer under Kosciuszko, although Kosciuszko had previously held inferior military rank to his own. In command of a division he had charge of the defence of the northern side of Warsaw, and after its capitulation he went to Vienna. In 1798 he returned to Warsaw, having obtained from the Prussians a portion of his confiscated estates. On the arrival of Napoleon at Warsaw, 19th December 1806, Poniatowski accepted his invitation to become general of a national Polish army, which, fired by the hope of national independence, gathered to the number of 27,000, to assist Napoleon in his Russian campaign. After the peace of Tilsit, 7th July 1807, the duchy of Warsaw was created, and Poniatowski became minister of war. On the invasion of the duchy in 1809 he fought a desperate battle near the village of Raszyn, and, being permitted afterwards to retreat across the Vistula, invaded Galicia and compelled the Russians to evacuate Cracow. In Napoleon’s cam- paigns he held the command of the Polish army corps, distinguishing himself at Smolensk, Borodino, and Leipsic, where he took 1000 prisoners, and in token of his brilliant exploit was created by Napoleon a marshal of France the same evening. He was employed in covering the retreat from Leipsic, and while charging a column of Prussian infantry was wounded bya ball in the shoulder. When the enemy obtained possession of the suburbs he endeavoured to join the main army by plunging into the Elster, but was fired upon and, enfeebled by wounds, was drowned, 19th October 1813. Josepw (1816-1873), grandson of Casimir mentioned above, was born 4th February 1816, at Rome. Entering the Tuscan service, he went in 1849 as minister of Tuscany to London. In 1850 he took up his residence in Paris, and becoming a naturalized citizen was in 1854 chosen a member of the French senate. In 1870 he removed to

London, where he supported himself by teaching music. He was the composer of several operas. He died 3rd July 1873.

PONS, Jean Louis (1761-1831), French astronomer, born at Peyre (Haut-Dauphiné), 24th December 1761, received a place at the Marseilles observatory in 1789, and in 1819 became the director of the new observatory at Marlia near Lucca, which he left in 1825 for the obser- vatory of the museum at Florence. Here he died October 14, 1831. Pons was famous as a comet-hunter, discover- ing between 1801 and 1827 thirty-seven of these bodies, one of which (discovered 26th November 1818) is the famous comet named after Encke, who determined its orbit.

PONSARD, Francors (1814-1867), French dramatist, was born at Vienne in Dauphiné on the lst June 1814. He was bred a lawyer, and his first performance in litera- ture was a translation of Manfred (1837). But the first important, and indeed the most important, event of his life was the representation of his play Lucréce at the Théatre Frangais on the 1st April 1843. This date is a kind of epoch in literary and dramatic history, because it has been supposed to mark a reaction against the romantic style of Dumas and Hugo. In reality, however, Ponsard was only a romantic of a somewhat tamer genius than those who had gone before him. It so happened that the tastes and capacities of the most popular actress of the day, Rachel, suited his style of drama, and this contributed greatly to his own popularity. He followed up Lucréce with Agnés de Méranie (1846), Charlotte Corday (1850), and others. Ponsard accepted the empire, though with no very great enthusiasm, and received the post of librarian to the senate, which, however, he soon resigned, fighting a blood-

less duel with a journalist on the subject. L’Honneur et

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L’ Argent, one of his most successful plays, was acted in —

1853, and he became an Academician in 1855. For some years he did little, but in 1866 he obtained great success with Le Lion Amoureux. He died a

year later at Paris in July 1867, soon after his nomination to the commander- ship of the Legion of Honour. His widow was pensioned. Ponsard is no doubt in some ways a remarkable dramatist. Unlike most men who have achieved considerable success on the stage, he did not overwrite himself,.and most of his plays hold a certain steady level of literary and dramatic ability.. But, as has been said, his popularity is in the main due to the fact that he found an actress ready to hand for his pieces, and that his appearance coincided with a certain public weariness of the grander but also more extravagant and unequal style of 1830.

PONTANUS, Jovianvs (1426-1503), a famous Italian humanist and poet, was born in 1426 at Cerreto in the

duchy of Spoleto, where his father was murdered in one of.

the frequent civil brawls which then disturbed the peace of Italian towns. His mother escaped with the boy' to Perugia, and it was here that Pontano received his first instruction in languages and literature. Failing to recover his patrimony, he abandoned Umbria, and at the aye of twenty-two established himself at Naples, which con-

tinued to be his chief place of residence during a long |

and prosperous career. He here began a close friendship with the distinguished scholar, Antonio Beccadelli, through whose influence he gained admission to the royal chancery of Alphonso the Magnanimous. Alphonso discerned the singular gifts of the young scholar, and made him tutor to his sons. Pontano's connexion with the Aragonese dynasty as political adviser, military secretary, and chancellor was henceforth a close one; and the most doubtful passage in his diplomatic career is when he welcomed Charles VIII. of France upon the entry of that king into Naples in 1495, thus showing that he was too ready to abandon the princes upon whose generosity his fortunes had been raised. Pontano illustrates in a marked manner the posi- tion of power to which men of letters and learning had arrived in Italy. He entered Naples as a penniless scholar. He was almost immediately made the companion and trusted friend of its sovereign, loaded with honours, lodged in a fine house, enrolled among the nobles of the realm, enriched, and placed at the very height of social importance.

Following the example of Pomponio Leto in Rome and of Cosimo de' Medici at F lorence, Pontano founded an academy for the meetings of learned and dis- tinguished men. This became the centre of fashion as well as of erudition in the southern capital, and subsisted long after its founder's death. In 1461 he married his first wife, Adriana Sassone, who bore him one son and three daughters before her death in 1491. Nothing dis- tinguished Pontano more than the strength of his domestic feeling. Iie was passionately attached to his wife and children; and, while his friend Beccadelli signed the licentious verses of Hermaphroditus, his own Muse cele- brated in liberal but loyal strains the pleasures of conjugal affection, the charm of infancy, and the sorrows of a husband and a father in the loss of those he loved. Not long after the death of his first wife Pontano took in second marriage a beautiful girl of Ferrara, who is only known to us under the name of Stella. Although he was

at least sixty-five years of age at this period, his poetic |

faculty displayed itself with more than usual warmth and lustre in the glowing series of elegies, styled Hridanus, which he poured forth to commemorate the rapture of this union, Stella's one child, Lucilio, survived his birth but fifty days; nor did his mother long remain to comfort the scholar's old age. Pontano had already lost his only son

| manners than the sinilar lucubrations of Poggio.

by the first marriage; therefore his declining years were

'solitary. He died in 1503 at Naples, where a remarkable

group of terra-cotta figures, life-sized and painted, still adorns his tomb in the church of Monte Oliveto. He is there represented together with his patron Alphonso and his friend Sannazzaro in adoration before the dead Christ.

As a diplomatist and state official Pontano played a part of some

importance in the affairs of southern Italy and in the Barons' War, the wars with Rome, and the expulsion and restoration of the

| Aragonese dynasty. But his chief elaim upon the attention of pos-

terityis as a scholar. His writings divide themselves into disserta- tions upon such topics as the " Liberality of Princes" or " Feroeity," composed in the rhetorical style of the day, and poems. He was

| distinguished for energy of Latin style, for vigorous intellectual

powers, and for the faculty, rare among lis contemporaries, of expressing the facts of modern life, the actualities of personal emotion, in language sufficiently classical yet always characteristic of the man. His prose treatises are more useful to students of Yet it was prin- cipally as a Latin poct that he exhibited his full strength. An ambitious didaetic composition in hexameters, entitled Urania, embodying the astronomical science of, the age, and adorning this high theme with brilliant mythological episodes, won the admira- tion of Italy. It still remains a monument of fertile invention, exuberant facility, and energetic handling of inaterial. Not less excellent is the didactic poem on orange trees, De Hortis Hes- pertdum. His most original compositions in verse, however, are elegiac and hendecasyllabic pieces on personal topics—the De Con- Jjugali Amore, Eridanus, Tumuli, Nenixv, Baie, &c.—in which he uttered his vehemently passionate emotions with a warmth of southern colouring, an evident sincerity, and a truth of painting

| from reality which make the reader pardon an erotic freedom that

is alien to our present taste.. These lyrical compositions breathe the atmosphere of Naples, reproduce its scenery with wonderful brilhancy, and introduce us to the customs of its pleasure-loving pagan people. Yet, in spite of their excessive voluptuousness, we rise from their perusal convinced that their author was essentially a good man, a loving husband and father, and an attached friend. Pontano's prose and poems were printed by the Aldi at Venice. For his life see Ardito, Giovanni Pontano et suot Tempi, Naples, 1871; for his place in the history of literature, Symonds, L?ezais- sanee in Italy. (J. A. 8.)

PONTECORVO, a city of Italy in the province of Caserta, on the left bank of the Garigliano, with a popu- lation of 5172 in 1881 (commune 10,191), answers to the ancient Fregellz, a Volscian city, colonized in 323 B.c. by

_ the Romans, who thus occasioned the Second Samnite War.

The principality of Pontecorvo (about 40 square miles in extent), which Napoleon bestowed on Bernadotte in 1806, was in 1810 incorporated with the French empire. PONTEFRACT, or Pomrret, a market town and municipal and parliamentary borough in the West Riding of Yorkshire, England, finely situated on an eminence near the junction of the Calder and Aire, and on three railway lines, 13 miles south-east of Leeds, and 14 north-west of Doncaster. The streets are wide and regular, and there are many good houses and shops. A park over 300 acres in extent is used as a public recreation ground. The most important of the antiquarian remains are the ruins of the famous castle situated on a rocky height, originally cover- ing with its precincts an area of over 8 acres, and contain- ing in all eight round towers. The principal feature remaining is the keep. The castle is said to occupy the site of a fortress erected by Ailric, a Saxon thane. It was founded by Ilbert de Lacy shortly after the Conquest, and probably nearly completed by Ibert de Lacy the second, who died about 1141. From that time till its demolition in 1649 it was the great stronghold of South Yorkshire. It was the cradle of the dukes of Lancaster, and in it Richard II. was, after his deposition, “kept secretly” till his death. Many persons of rank and influence have been confined in it as political prisoners. During the wars of York and Lancaster it was a centre of intrigue and con- spiracy. In 1536 it surrendered to Aske, the leader of the “pilgrimage of grace.” At the beginning of the Civil War it was garrisoned for Charles, and it under- went four sieges, three of them by the Parliamentary

forces, and one by the Royalists. After its capitulation to Lambert in March 1649 it was dismantled. Below the castle is All Saints church, which suffered severely during the siege of the castle, but still retains some work of the 12th century. In 1837 the tower and transepts were fitted up for divine service. The church of St Giles, formerly a chapel of ease to All Saints, but made parochial in the 18th century, is of Norman date, but most

of the present structure is modern. The 17th-century spire was removed in 1707, and replaced by a square tower, which was rebuilt in 1797; the chancel was rebuilt in 1869. In Southgate is an ancient hermitage and oratory cut out of the solid rock, which dates from 1396. On St Thomas's Hill, where Thomas, earl of Lancaster, was beheaded in 1322, a chantry was erected in 1373, the site of which is now occupied by a windmill built of its stones. At Monkhill there are the remains of a Tudor building called the Old Hall, probably constructed out of the old priory of St John's. A grammar school of ancient foundation, renewed by Queen Elizabeth and by George III., is now in abeyance. The town-hall was built in 1796 on the site of one erected in 1656, which succeeded the old moot-hall, dating from Saxon times. Among other buildings are the court-house, the market-hall, the assembly rooms (a hand- some building adjoining the town-hall), and the dispensary. The principal alms-house, that of St Nicholas, dates from Saxon times. 'Trinity Hospital, was founded in the 14th century by the celebrated Sir Robert Knolles. There are extensive gardens and nurseries in the neighbourhood, and liquorice is largely grown for the manufacture of the cele- brated Pomfret cakes. The town possesses iron found- ries, sack and inatting manufactories, tanneries, breweries, corn mills, and brick and terra-cotta works. The popula- tion of the municipal borough (extended in 1875) in 1871 was 6432, and in 1881 it was 8798, the population of the parliamentary borough (area 7316 acres) in the same years being 11,563 and 15,322. The increase is mainly due to the fact that Pontefract is now a military centre.

There are indications that the Romans were stationed near the present town, which adjoins the Ermine Street. In Domesday it is ealled Tateshale, and is said previously to have been held by the king (Edward the Confessor). It then possessed a church and priest, one fishery, and three mills. Subsequently it is mentioned as Kirkby. Of the cause of the change of the name to Pontefract various nnsatisfaetory explanations are given. According to one account it was because when William advanced to the conquest of the north his passage was delayed by a broken bridge (but this was at Ferrybridge, 3 miles off); according to a seeond the name was bestowed on it by its Norman possessor from Pontfrete in Nor- mandy (which, however, never existed); and according to a third the name perpetuates the remarkable preservation from drowning of those who fell

into the river when the concourse of people made the bridge give way on the arrival of St William of Canterbury in 1153 (although all contemporary historians call the place Ponte- fraet when Archbishop Thurstan died there in 1140). The town reeeived a charter from Roger de Lacy in 1194, and was incorpor- ated in the time of Richard III. As early as 1297 it returned two members to parliament ; but there was a long discontinuance in the 14th, 15th, and 16th centuries. The practice was revived under James I. The ‘‘redistribution” measnre of 1885 deprives it of one of its members. ‘The municipal borough is divided into three wards, and is governed by six aldermen and eightecn councillors.

PONTEVEDRA, a maritime province of Spain, is bounded on the N. by Corufia, on the E. by Lugo and Orense, on the 8. by Portugal (Entre Douro e Minho), and on the W. by the Atlantic, and has an area of 1739 square miles. The general character of the province is hilly, with a deeply indented coast; its products are those common to all Gaticta (q.v.), of which historical province it formed a part. The population in 1877 was 451,946, the inunicipalities with a population over 10,000 being La Estrada (23,528), Lalin (16,217), Lavadores (13,658), PoNTEVEDRA (noticed below), Puentearéas (14,566), Redon- dela (10,073), Silleda (13,346), Tomiiio (11,150), Tuy

(11,710), and Vigo (13,416). Vigo is connected by rail with Tuy and Orense, and the line from Santiago to Vigo is open as far as to Carril.

PONTEVEDRA, capital of the above province, and an episcopal see, is a picturesque old granite-built town, pleasantly situated at the head of the Ria de Pontevedra, where the Lerez is spanned by the old oman bridge (whence the name—pons vetus). The inhabitants engage in agriculture, sardine fishing, and the manufacture of cloth and hats.. The population of the municipality in 1877 was 19,857.

PONTIANAK. See Borneo.

PONTIFEX. The principal college of priests in ancient Rome consisted of the pontijices, the rex sacrorum, and the jlamines, under the headship of the

pontifer maximus. The rex sacrorum was the functionary who under the republic succeeded to the sacrificial duties which in old time had been performed by the king; the flames were sacrificial priests of. particular gods, the most important

-being the jlamen Dialis, or priest of Jupiter, whose wife,

the jflaminica Dialis, was priestess of Juno. The pontijices on the other hand were not assigned to the service of particular gods, but performed general functions of the state religion ; and their head, the pontifex maximus, was the highest religious authority in the state. For, while the rex sacrorum succeeded to the liturgical functions of the king, it was the pontifex maximus who inherited the substance of power in sacred things; the other members of the college were his counsellors and helpers, but no more. It is probable that there was no supreme pontifex under the kings, but that in accordance with the general rule that sacred officers went in threes, following the number of the old tribes, the king sat as sixth and chief among the five pontifices whom Numa is sald to have instituted. The functions of pontifex maximus were indeed too weighty to be discharged by a subject in a monarchical government, and from Augustus to Gratian (382 a.D.) this supreme priesthood was held by the emperors in person. The original idea of the pontificate is as obscure as the name; it is by no means certain that pontifexr means bridge-maker (as the commonest etymology has it) with reference to the duty of maintenance of the sacred Sublician bridge, for there were pontzfices from of old in other parts of Italy. Marquardt conjectures that the name originally denoted atoning functions, from the same root as appears in purus, pena. In historical times the pontifices had a very extended sphere of duties, and claimed to possess professional ‘‘ knowledge of things human and divine.” The supreme pontiff was in the religion of the state what the father was in the religion of the family. His dwelling was in the regia close to the altar of Vesta, the sacred hearth of the state; and the most sacred objects of national worship, the penates publict and tue mysterious palladia of Roman sovereignty, were his special care. The flamens and vestal virgins were appointed by him and stood under his paternal power, and the stated service of their cults, as well as those exercises of public religion for which no special priests were provided, were under his charge or that of the college in which he pre- sided. The

pontiffs, moreover, supplied technical guidance and help in those religious functions in which the senate or magistrates had the first part ; while the charge of the calendar with its complicated intercalation and system of feast days gave them an important influence on affairs of civil life. The control of the calendar is closely connected with the duties pertaining to the pontifical archives, which, besides a mass of ritual directions and the like, embraced the calendars of past years (including the faste consulares) and the annales maximi or annual chronicle of public events. Further the pontiffs had the weighty function of

declaring and interpreting the laws of religion, which involved such importaut social matters as marriage and testamentary dispositions ; but this function was declara- tory and not magisterial; the state gave no executive power to the pontiffs, save only that the pontifex maximus exercised disciplinary authority over those priestly persons who stood under his paternal power. The pontifis, who held office for life, originally filled up the vacancies in their number by cooptation, but as early as 212 B.C. the head of their college was named by the voice of the people, and in 104 B.c. the choice of the members of the priestly colleges was also transferred to coma of a peculiar constitution. The uumber of pontifices Was gradually enlarged, first to nine and then, under Sulla, to fifteen, and the emperors exercised the right of adding supernumeraries at will.

PONTINE MARSHES. See Latium, vol xiv. p. 343.

PONTOISE, a commercial town of France, at the head of an arrondissement of the department Seine-et-Oise, 18

| bridges, which are for the most part supported on boats

‘ with his army vessels divided into portions, which were

miles by rail north-west of Paris, picturesquely situated on —

the right bank of the Oise where it is joined by the Viosne, and at the intersection of the railway from Paris to Dieppe by Gisors with that of the

valley of the Oise. The traffic on the main river is large, and the tributary drives numerous mills. churches that used to exist in the town two only remain : St Maclou, a church of the 12th century, was altered aud restored in the 15th and 16th centuries by Pierre Lemer- cier, the famous architect of St Eustache at Paris; and Notre Dame, of the close of the 16th century, coutains the tomb of St Gautier (13th century). Grain and flour are the principal staples of the trade of Pontoise ; the popula- tion in 1881 was 6675.

Pontoise existed in the time of the Gauls as Briva Isare (7.¢,, |

Bridge of the Oise). The Romans made it the seat of forges dedi- eated to Vulcan, and thus the district came to be distinguished as Pagus Vulcanius or the Vexin. Pontoise was destroyed by the Normans in the 9th century, united with Normandy in 1082, and aequired by Philip I. in 1064. Lying on the borders of the two states it often passed from one to the other. The English took it in 1419, and again in 1436. storm after a three months' siege. After belonging to the count of Charolais down to the treaty of Conflans, it was given as a dowry to Jeanne of France when she was divoreed by Louis XII. The parlement of Paris several times met in the town; and in

In 1441 Charles VII. took it by |

Of the many convents and.

country ; and to this day many of the great rivers in India are crossed, on the lines of the principal roads, by floating

such as are employed for ordinary traffic on the river.

But light vessels which can be taken out of the water and lifted on to carriages are required for transport with an army in the field. Alexander the Great occasionally carried

put together on reaching the banks of a river, as in crossing the Hydaspes; he is even said to have carried lis army over the Oxus by means of rafts made of the hide tents of the soldiers stuffed with straw, when he found that all the river boats had been burnt. Cyrus crossed the Euphrates on stuffed skins. In the 4th century the emperor Julian crossed the Tigris, Euphrates, and other rivers by bridges of boats made of skins stretched over osier frames. In the 17th century the Germans employed timber frames covered with leather as pontoons, aud the Dutch similar frames covered with tin ; and the practice of carrying about skins to be inflated and employed for the passage of troops across a river, which was adopted by both Greeks and Romans, still exists in the East, and has been introduced into America in a modified form, india-rubber being substituted for skins.

Pontoons have been made of a variety of forms and of

almost every conceivable description of material available

1561 the states-general convoked at Orleans removed thither after |

the death of Franeis II. During the Fronde it offered a refuge to Louis XIV. and Mazarin. Henry III. made it an apanage for his brother the duke of Anjou. duke of Conti. Down to the Revolution it remained a monastic town. Philip the Bold, founder of the house of Burgundy, the arehitects Pierre and Jacques Lemercier, and Tronson-Ducondray, one of the defenders of Marie Antoinette, are among the natives of Pontoise.

PONTOON. Pontoons are vessels employed to sup- port the roadway of floating bridges. They may be either open or closed, heavy and only movable when floated, or light enough to be taken out of the water and transported overland, as when required to form part of the equipment of an army in the field.

From time immemorial floating bridges of vessels bearing a roadway of beams and planks have been employed to facilitate the passage of rivers and arms of the sea. Xerxes crossed the Hellespont on a double bridge, one line supported on three hundred and sixty, the other on three hundred and fourteen vessels, anchored head and stern with their keels in the direction of the current. Darius threw similar bridges across the

At a later period it passed to the |

for the purpose of combining the two essential qualities of transportability over land and power of support in water. As these qualities are not only distinct but conflicting, one of them has been frequently sacrificed to the other. Thus history records many instances of bridges having failed because incapable of supporting all the weight they were called on to bear, or of resisting the force of the current opposed to them; it also records instances of important strategical operations being frustrated because the bridge equipment could not be brought up in time to the spot where it was wanted. Numerous expedients for lightening the equipment have been suggested, in America more particularly; but the proposers have not always re- membered that if a military bridge is intended to be carried with an army it is also intended to carry the army, with its columns of infantry and cavalry, its numerous © waggons, and its ponderous artillery, and it ought to do so with certainty and safety, even though a demoralized rabble should rush upon it in throngs.

Pontoons have been made of two forms, open as an

-undecked boat, or closed as a decked canoe or cylinder.

The advantage claimed for the closed pontoon is that it cannot be submerged by the river, but only by having

_to bear a greater load than its buoyancy admits of; the

disadvantages are that it is difficult to make and keep water-tight, it requires special saddles for the support of the baulks which carry the roadway, and it cannot be conveniently used as a row-boat. During the Peninsular War the English employed open bateaus, as did and still

do all the other European nations; but the experience

Bosphorus and the Danube in his war against the

Scythians, and the Greeks employed a bridge of boats to cross the river Tigris in their retreat from Persia. Float- ing bridges have been repeatedly

constructed over rivers in Europe and Asia, not merely temporarily for the passage

of an army, but permanently for the requirements of the

gained in that war induced the English to abandon the open bateau; for if large it was very difficult to transport across country, and if small it was only suited for tranquil streams, being liable to fill and sink should the river rise suddenly or become disturbed by the wind. Thus closed pontoons came to be introduced into the British army. General Colleton devised the first substitute for the open bateau, a buoy pontoon, cylindrical with conical ends and made of wooden staves like a cask. Then General Pasley introduced demi-pontoons, like decked canoes with pointed bows and square sterns, a pair, attached sternwise, forming a single “pier” of support for the roadway; they were constructed of light timber frames covered with sheet copper and were decked with wood; each demi-pontoon

POW rT OON

was divided internally into separate compartments by partitions which were made as water-tight as possible, and also supplied with the means of pumping out water ; when transported overland with an army, a pair of demi-pontoons and the superstructure of one bay formed the load for a single carriage weighing 3110 ib when loaded. The Pasley was superseded by the Blanshard pontoon, a tin | coated cylinder with hemispherical ends, for which great mobility was claimed, two pontoons and two bays’ super-structure being carried on one waggon, giving a weight of | about 5000 1b, which was intended to be drawn by four horses. The Blanshard pontoon was long adopted for the British army, but it is now being discarded ; experiments made with it in peace time showed that it would probably break down under the strain of actual warfare, and efforts were constantly made to improve on it; when immersed to a greater depth than the semi-diameter it became very unstable and lively under a passing load, a defect which Serjeant-Major Forbes proposed to remedy by giving it a triangular instead of a circular section, thus increasing the stability by presenting a continually increasing area of bearing surface up to the level of total immersion ; but the angles of these pontoons were found so liable to injury as to counterbalance any advantages over the cylinders.

After many years’ experience of the closed pontoon the English engineers came to the conclusion that it was desirable to return to the form of the open bateau to which the engineers of all the Continental armies had meanwhile constantly adhered. Captain Fowke, R.E., invented a folding open bateau, made of water-proof canvas attached to sliding ribs, so that for transport it can be collapsed like the bellows of an accordion and for use it can be extended by a pair of stretchers; it is very mobile, but it is also deficient in power of support, for whereas the buoy- ancy due to the outline form out of the water is 13,600 tb the actual buoyancy in the water is only 8640 tb, because of the cavities in the canvas between the ribs which are formed by the pressure of the water outside ; moreover, the surface irregularities cause the pressure exerted by a current upon a bridge formed of these collapsible pontoons to be about three times as much as upon one of equal power formed with Blanshard’s or Pasley’s pontoons ; there is thus great risk of the bridge being carried away bya strong current.

The following table shows the powers of various pontoons at present or recently in use by different nations. The “working power of support” has been calculated in most instances by deduct-

ing from the “available buoyancy” one-fourth for open and one- tenth for closed vesscls :—

The Powers of Various Pontoon Bridges.

ewe 2 | 2 |4 | on | ee] & | ose

8 eileae) & i? Ve | oo i22\8 | oe

a S. | oes 3 = i ao |ss8] 8 Zoe Pontoon. a s& wag Ee a = 25 |om | & | ges. . od Ro o = of; = ; em + S 2S ees s Zs sa | Bee = SE | @s 3 | 8a) 2 | 8h ®| 48 | BB | se5| 4 | #2 128) 82 | ey] 8 | ees 2 |) 2 ap SS eee) = cs] 12h] 2. lee |e | Bees a | Am “3 | BEA < Ea |Om| ae | oa] & | Sake

Ft. | Cub. Ft. Ib ib Ib tb Ft 1b ib Fi. |% th Gribeauval: open bateau, oak…….....00000sse0 36°3| 598 | 45,044] 8,044 | 37,000 | 27,750 | 22°8 |

1,215 | 840 | 15°6 | ° 35,568 Austrian: open, wooden, 1799. ...<.....sse0ee 27:0 | 354 | 22,123] 3,332 | 18,791 | 14,098 | 16°6 849} 560 |} 11-4) 18,924 Aust.-Birago: open, wooden; two pieces....., 28°0 | 803 | 18,907 | 3,249 | 15,658 11,744 | 21°7| 542} 560 | 9°38) 20,181 2 se ed 39°4| 445 | 27,791| 3,884 | 23,907 | 17,930 |21°7| 827] 560] 9:3] 20,181 5 , iron; two pieces .....644 28-0| 353 | 22,090| 3,698 | 18,392 | 13,794 | 21°7] 636} 560 | 9:3] 20,181 oF - ‘ime, TNE cugseertoeee 39°4| 530 | 83,135| 4,501 | 28,634 | 21,476 | 21:7 991 | 560 |] 9°38] 20,181 French: open, wooden; reserve.....ssoressees 30°9] 325 | 20,286] 3,608 | 16,678 | 12,509 | 19°7 685 | 560 | 10°5 | 20,685 rt ‘ y» advanced guard..... 19°7| 156 | 9,734| 1,506 | 8,228| 6,171|16-4| 376] 560 | 9°3| 15,252 np * rr MIA ieee Ge aneee eves 30°9| 321 | 20,065 | 3,158 | 16,912 | 12,684 | 19°7 644 | 560 | 9°8| 19,306 Prussian: open, wooden; open order..... 23°7| 164 | 10,226] 2,393 | 7,838] 5,875|/15°3) 384] 560) 9°9| 15,147 . - " i a 93°71 164 | 10,226] 2,213 | 8,013] 6,010|11°2| 535] 560 | 9:9] 11,088 5D OF ION OPO UME) ...6..c0n0+00e 24°7| 214 | 18,385] 2,209 | 11,176] 8,882|15°3| 561) 560 | 9°9 15,147 se va yy, CLOBRUOTUE 55 .5-s.0058 24°7| 214 | 13,885] 2,029 | 11,356] 8,517/11:2| 759] 560 | 9:9} 11,088 Italian: open, wooden; one piece.....0..00 19°6| 283 |17,660| 3,582 | 14,078 | 10,559 | 26°3| 402] 560 | 9°8 25,774 ; am 1, two pieces.....<u>...</u>-] 89°2| 565 | 35,320] 4,572 | 80,748 | 28,061 | 26°3| 878] 560 | 98) 25,774 9 miodifiedsseONO POCO . .aus…cdwaewaeasenss 24°6| 325 | 20,290] 3,401 | 16,889 | 12,669 | 23°0 551 | 560 | 9°8| 22,540 % tWO Pieces… sescesesesseeees 49°2| 649 | 40,580! 4,489 | 36,091 | 27,068 | 23-0 | 1,178 | 560 | 9°8| 22,540 oo { open, canvas on] open order….. 21:0} 209 13,042 | 2,355 | 10,687] 8,015 16°6 493 | 560 | 10°4] 17,264 an: wooden framework ; § close order…..|21°0| 209 | 13,042] 2,083 | 10,959] 8,219|11°7) 705) 560 | 10-4} 12,168 Belgian: open, irom; one pieCe…….....00.eeeees 24°8| 297 | 18,584] 3,386 | 15,248 | 11,436 | 19°7 580 | 560 | 9°5|] 18,715 e 5 i TMONPIORBSA:«csarewaaensas« 49°2) 595 | 37,168! 4,548 | 32,620 | 24,465 | 19°7 | 1,244 | 560 9°5| 18,715 ii ‘ ‘ india-rubber, three) open order..| 20°0 1380 8,125 |) 1,980 6,145 | 5,530 18°0 307} 580 | 11:0] 19,800 pee cylinders connected close order..| 20°0| 130 | 8,125] 1,824} 6,301] 5,761/14°7] 393] 560 |11°0| 18,870

English Pontoons.

Peninsular Qpeus tiny; WESENVElsnsse.----- seme 18°9|} 209 |13,092| 2,874 | 10,718] 8,089|16°8| 477] 560 | 10°0 16,800 equipment: » 9, advanced guard….. THA |] ~ 0) 7,520] 1,654 | 5,866| 4,400|14:0] 314] 560 | 9°0/ 12,600 Pasley: closed demi-canoe; copper…….....0s 25:0] 141 8,781 | 2,103 | 6,678| 6,010|}12°5} 481] 560 | 10°0 12,500 Blanshard: cylinder, tin ; open order……..... 2225) lO 6,785 | 1,600 | 5,185} 4,667|12°5| 373| 560 |10°0| 12,500 ” yy gg CLOSE OTe… .....000 22‘5| 109 | 6,785| 1,408 | 5,377| 4,889| 83] 581] 560/100; 8,300 bf a », infantry pattern….| 15°5 26 1,640 340 | 1,300] 1,170] 5:3) 220) 280] 7°0 3,710 Fowke : open, collapsible, canvas; open order.| 22°0| 134 8,460 | 1,246 | 7,214] 5,411 }10°0| 541) 560 | 10°0 10,000 Forbes: closed, spherangular, tin; open order..| 24°2| 128 7,977 | 1,689 | 6,288] 5,659|11°0| 514) 560 |410°0| 11,000 Blood : open, wooden; general…….....ssseseees 21°6| 280 | 17,500) 2,300 | 15,200; 13,350|15°0| 890} 560 | 10°0 15,000

In the English and French equipment the pontoons were originally made of two sizes, the smaller and lighter for the ‘‘advanced guard,” the larger and heavier for the “reserve”; in both equipments the same size pontoon is now adopted for general requirements, the superstructure being strengthened when necessary for very heavy weights. The Austrian and Italian pontoons are made in three pieces, two with bows and a middle piece without; not less than two pieces are ordinarily employed, and the third is introduced when great supporting power is required, but in all cases a constant interval is maintained between the pontoons. On the

other hand in the Prussian, Russian, Dutch, and American and in the English Blaushard equipments greater supporting power is obtained not by increasing the number of supports but by diminish- ing the central interval between the pontoons. Within certain limits it does not matter whether the buoyancy is made up of a large number of small or a small number of large vessels, so long as the water-way is not unduly contracted and the obstruction offered to a swift current dangerously increased ; but it is to be remembered that pontoon bridges have failed as frequently from being washed away as from insufficient buoyancy. Mik oo

On comparing the ‘available buoyancy” with the ** oreatest possible load at 100 tb per foot superticial of roadway ” for each of the bridge equipments in the preceding table, it will be seen that very few of the bridges are really capable of carrying the maximuin load they may be called on to bear. Strictly speaking the roadway superficies should in all instances be proportioned to the buoyancy of the pontoon, or, as the central interval between the pontoons cannot be reduced below certain limits, the width of the roadway should be proportioned to the buoyancy; in other words the ‘¢chesses” or planks which form the roadway should be made of a shorter length for a bridge which is designed for light traffic than for one which is designed for heavy traffic. The employment of chesses of different lengths for the pontoon equipment of an ariny would, however, be very inconvenient and troublesome, and this has led to the adoption of a constant breadth of roadway, on the under- standing that the traffic will always be controlled by the officer in charge of the bridge. rf ‘ :

The latest form of pontoon for the English army is one with which the name of Colonel Blood, R.E., is mainly associated. Its powers are given in the lowest line of the preceding table. It is an open bateau with decked ends and sides partly decked where the rowlock blocks are fixed. It consists of six sets of framed ribs con- nected by a deep kelson, two side streaks, and three bottom streaks. The sides and bottom are of thin yellow pine with canvas secured to both surfaces by india-rubber solution, and coated outside with marine glue. The central interval betwecn the pontoons in forming a bridge is invariably maintained at 15 feet ; for the support of the roadway five baulks are ordinarily employed, but mune for the passage of siege artillery and the heaviest loads; they fit on to saddles resting on central saddle beams. The pontoons are not immersed to within 1 foot of the tops of their “ coamings” when carrying ordinary loads, as of infantry in marching ordcr “in fours ” crowded at a check, or the 16-pounder gun, which weighs 4800 fb ; nor are they immersed to within 6 inches when carrying extraor- dinary loads, such as disorganized infantry, or the 64-pounder gun weighing 11,100 tb. In designing this pontoon the chief points attended to were—(1) improvement in power of support, (2) simpli- fication in bridge construction, (3) reduction of weight in transport, and (4) adaptation for use singly as boats for ferrying purposcs. One pontoon with the superstructure

for a single bay constitutes a load for one waggon, with a total weight belind horses of about 4500 Ib.

For the British army in India the standard pontoon for many years was the Pasley ; it was seldom used, however, for boats could almost always be procured on the spot in sufficient numbers wherever a floating bridge had to be constructed. Of late years an equipment has been prepared for the Indian army of demi-poutoons, similar to the Blood pontoon cut in half, and thercfore more mobile ; each has a bow and a square stern, and they are joined at the sterns when required to form a ‘“‘pier”; they are fitted with movable covers and can therefore be used in much rougher water than pontoons of the home pattern, and their power of support and breadth of roadway are the same.

For the British army there is a light form of the Blanshard pontoon suitable for infantry uncrowded, guns unlimbered, and cavalry insingle file. The Berthon collapsible boat, for infantry in single file, is also employed ; when open it is 9 feet long and 4 feet wide ; it weighs 109 Ib with a pair of oars and a removable thwart or seat (to enable it to be used as a boat), and can be slung on to a bamboo and carried by two men ; the superstructure for one bay weighs 97 Ib, and is also carried by two men ; the width of roadway is 18 inches; twelve boats are required to bridge a stream 100 feet in width.

The india-rubber pontoon does not appear to have been generally employed even in America, where it was invented. The engineer officers with the army of the Potomac, after full experience of the india-rubber pontoon and countless other inventions of American genius, adopted the French equipment, which they found ‘‘ most excellent, useful, and reliable for all military purposes.” The Russians in crossing the Danube in their war with Turkey in 1878 employed the Austrian equipment.

Authorities.—Colonel Lovell, R.E., Prof. Papers, Royal Engineers, vol. xii. 1863 ; Brig.-Gen. Culium, U.S.A. Engineers, System of Military Bridges in use by the United States Army, 1863; Gen. Barnard, U.S.A., Report on Army of

Potomac, 1863 ; Lord Wolseley, Pocket-Book for Field Service, 1882; Military Bridges, Chatham, 1879. (GES ie)

PONTOPPIDAN, Erik (1698-1764), a learned Danish author, was born at Aarhuus on August 24, 1698, and studied divinity at the university of Copenhagen. On finishing his education he was appointed travelling tutor to several young noblemen in succession, and in 1735 he became one of the chaplains of the king. In 1738 he was made professor extraordinarius of theology at Copenhagen,

and in 1747 bishop of Bergen, Norway, where he died on Deceniber 20, 1764.

| principal surviving evidences of his powers.

and in method of painting.

His principal works are —Theatrum Danizw veteris et modernx (4to, 1730), a description of the geography, natural history, antiquities, &c., of Denmark; Gesta et Vestigia Danorum extra Daniam (2 vols. 8vo, 1740), of which laborious work it is enough to remark that it was written before the rise of the niodern historical school; Annales Heelestz Danice (4 vols. 4to); Marmora Danica Seleetiora (2 vols. fol., 1739-41); Glossaritwm Norvegicum (1749); Det forste Forsig paa Norges naturlige Historie (4to, 1752-54; Eng. trans., Natural History of Norway, 1755), contain- ing curious accounts, often referred to, of the Kraaken, sca-serpent, aud the like; Origenes Hafnienses (1760). His Danske Atlas (7 vols. 4to) was mostly posthumous.

PONTORMO, Jacoro pa (1494-1557), whose family name was CARUCCI, a painter of the Florentine school, was born at Pontormo in 1494, son of a painter of ordinary ability, was apprenticed to Leonardo da Vinci, and after- wards took lessons from Pier di Cosimo. At the age of eighteen he became a journeyman to Andrea del Sarto, and was remarked as a young man of exceptional accomplish- ment and promise. Later on, but still in early youth, he executed, in continuation of Andrea’s labours, the Visita- tion, in the cloister of the Servi in Florence—one of the The inost extensive series of works which he ever undertook was a set of frescos in the church of 8. Lorenzo, Florence, from the Creation of Man to the Deluge, closing with

the Last Judgment. By this time, towards 1546, he had fallen under the dangerous spell of Michelangelo's colossal genius and superhuman style; and Pontormo, after working on at the frescos for eleven years, left them incomplete, and the object of general disappointment and disparagement. They were finished by his leading pupil Angelo Bronzino, but have long since vanished under whitewash. Among the best works of Pontormo are his portraits, which include the likenesses of various members of the Medici family; they are vigorous, animated, and highly finished. He was fond of new and odd experiments both in style of art From Da Vinci he caught one of the marked physiognomic traits of his visages, smiles and dimples. At one time he took to direct imitation or reproduction of Albert Diirer, and executed a series of paintings founded on the Passion subjects of the German master, not only in composition, but even in such peculi- arities as the treatment of draperies, &c. Italian critics, both contemporary and of later date, have naturally regarded this as a very perverse aberration. Pontormo died of dropsy on 2d January 1557, mortified at the ill success of his frescos in 8. Lorenzo; he was buried below his work in the Servi. He was a man of solitary self- neglectful habits, a slow worker, receiving comparatively little aid from scholars, indifferent to gain or distin- guished patronage, and haunted by an instinctive horror of death.

PONTUS was the name given in ancient times to an extensive tract of country in the north-east of Asia Minor, bordering on Armenia and Colchis (see vol. xv. Plate IT.). It was not, like most of the divisions of Asia, a national appellation, but a purely territorial one, derived from its proximity to the Euxine, often called simply Pontus by the Greeks. Originally it formed part of the extensive region of Cappadocia, which in early ages extended from the borders of Cilicia to the Euxine; but afterwards it came to be divided into two satrapies or governments, of which the northernmost came to be distinguished as ‘‘ Cappadocia on the Pontus,” and thence simply as “Pontus.” The term is not, however, found either in Herodotus or Xenophon, though the latter traversed a considerable part of the region, and it is probable that it did not come into general use until after the time of Alexander the Great. Under the Persian empire the province continued to be governed by a satrap, nominally subject to the great king, but apparently enjoying virtual independence, as no

mention occurs in Xenophon of the Persian authorities in | this part of Asia. The first of these local satraps who assumed the title of king was Ariobarzanes, about the beginning of the 4th century B.c., who was reckoned the founder of the dynasty ; but its history as an independent monarchy really begins with Mithradates IL, who com- menced his reign in 337 B.c. From this time Pontus con- tinued to be ruled by a succession of kings of the saine dynasty, mostly bearing the name of Mithradates, whose independence was respected by the Macedonian sovereigns of Asia, aud who, were able gradually to extend their power along the shores of the Euxine. The capture of the important city of Sinope by Pharnaces I. (about 183 B.c.) led to the extension of their frontier to that of Bithynia ; while under Mithradates VI., commonly known as the Great, their dominion for a time comprised a large part of Asia Minor. The history of the reign of that monarch and his wars with the Romans will be found uuder the heading Mirnrapates. After his final defeat by Pompey in 65 B.c., Pontus was again confined within its original limits, but was united with Bithynia as a Roman province, and this union generally continued to subsist, though not without interruption, under the Roman empire. A portion of the original dominion of the kings of Pontus was, however, separated from the rest by Antony in 36 B.c., and placed under the government of a Greek rhetorician named Polemon, whose descendants continued to rule it till the reign of Nero, when it was finally annexed to the Roman empire (63 a.p.). Hence this part of the country came to be known as Pontus Polemoniacus, by which epithet it was still distinguished as a Roman province. The interior district in the south-west, ad- joining Galatia, hence came to be known as Pontus Galaticus.

Pontus, in the proper sense of the term, as defined by Strabo, who was himself a native of the country, was bounded by the river Halys on the west, and by Colchis and the Lesser Armenia on the east. Its exact frontier in this direction is not specified, but it may be taken as extending as far as the mouth of the river Acampsis. The region thus limited may be considered as divided into two portions, differing much in their physical characters, The western half presents considerable plains and upland tracts in the interior, stretching away till they join the still more extensive uplands of Cappadocia

and Galatia. Besides the great river Halys that forms its boundary on the west, this region is traversed by tie river Iris, and its tributary the Lycus, both of which have their rise in the highlands on the frontiers of Armenia, and are very con- siderable streams, flowing through fertile valleys. The Thermodon, which enters the Euxine a little to the east of the Iris, is a much less important stream, though cele- brated from its connexion with the fable of the Amazons. On the other hand the eastern portion of Pontus, between Armenia and the Euxine, is throughout a very rugged and mountainous country, furrowed by deep valleys descending from the inland range of mountains, known to the ancients as Paryadres, which has a direction nearly parallel to the sca-coast, and is continued to the frontiers of Colchis under the name of Scydises and various other appellations. These mountains have in all ages been almost inaccessible, and even in the time of Strabo were inhabited by wild tribes who had never been really reduced to subjection by any government. But the coast from Trebizond westward is one of the most beautiful parts of Asia Minor, and is justly extolled by Strabo for its wonderful productiveness in fruits of every description.

The population of the greater part of Pontus was undoubtedly of the same race with that of Cappadocia, of which it originally formed a part, and was therefore clearly

of Semitic origin.! Both nations were frequently comprised by the Greeks under the term Leucosyri or White Syrians. But the rugged mountain districts in the north-east, towards the frontiers of Colchis and Armenia, were occupied by a number of semi-barbarous tribes, of whose etlinical relations we are wholly ignorant. Such were the Chaldzeans or Chalybes (identified by the Greeks with the people of that name mentioned by Homer), the Tibareni, the Mosynceci, and the Macrones. Some light is thrown on the manners and condition of these people by Xenophon, who traversed their country on his march from Trapezus to Cotyora (Anab., v.) but we have otherwise hardly any information concerning them.

The sea-coast of Pontus, like the rest of the south shore of the Euxine, was from an early period studded with Greek colonies, most of them of Milesian origin, though in many cases deriving their settlement directly from Sinope,

itself a colony of Miletus. Next to that city, between the mouth of the Halys and that of the Iris, stood Amisus, originally a colony direct from Miletus, but which subsequently received a body of Athenian settlers. It was one of the most flourishing of the Greek colonies on this coast, and is still a considerable town under the name of Samsun. Proceeding eastward from thence, we find Side, called in later times Polemonium ; Cotyora, a colony of Sinope, where Xenophon embarked with the ten thousand Greeks; Cerasus, afterwards named Pharnacia; and Trapezus, also a colony of Sinope, which was a flourishing and important town in the days of Xenophon, but did not attain till a later period to the paramount position which it occupied under the Roman and Byzantine empire, and which it still retains under the name of TREBIZOND (@.v.).

But, besides these Greek settlements, there were in the interior of Pontus several cities of considerable importance, which were of native origin, though they had gradually received a certain amount of Greek culture. The principal

_of these were Amasia, on the river Iris, the birth-place of

Strabo, which was made the capital of his kingdom by Mithradates the Great, but had previously been the burial-place of the earlier kings, whose tombs are still extant, and have been described by Hamilton and other travellers; Comana, higher up the valley of the same river, which, like the place of the same name in Cappadocia, was consecrated to a native goddess named Ma, identified by Strabo with the Greek Enyo, and derived great cele- brity from its sacred character, having a large fixed popu- lation under the direct government of the priests, besides being the resort of thousands of pilgrims; Zela, nearer the frontier of Galatia, which was in like manner conse- crated to a goddess named Anaitis; and Cabira, in the valley of the Lycus, afterwards called Neocesarea, a name still retained in the abbreviated form of the modern Niksar. Several smaller towns are mentioned by Strabo as giving name to the surrounding districts, of which he has left us the names of not less than fifteen; but these obscure appellations of local divisions are in themselves of little interest, and for the most part not mentioned by any other writer. (z. H. B. PONTUS DE TYARD (c. 1521-1605), one of the famous Pleiade who helped to reform

French literature in the 16th century, was the highest in rank and the most affluent in fortune of the seven. He was indeed in some sort an anticipator of Ronsard and Du Bellay, for lis Erreurs Amoureuses preceded their work. He was seigneur of Bissy in Burgundy, was born at the seignorial house in

1 Such at least was the general opinion of Greek writers. The Semitic or Aramezan origin of the Cappadocians has, whoever, in modern times been questioned by Noéldeke and other authorities on Semitic ethnology.

or about 1521, and died at a great age at Bragny on the Sadne, another seat of his, on September 25, 1605. He was thus the last survivor as well as one of the eldest of the group. His early poems, the Lrreurs Amoureuses, originally published in 1549, were augmented with other works in successive editions till 1573. Pontus de Tyard published Discowrs Philosophiques in 1587, and appears to have been a man of extensive knowledge and just thouglit. He was, moreover, a courtier and official of some standing for many years, and, entering the church, was made count-bishop of Chalon-sur-Saéne. In this high position he bore a character for political and religious moderation. On the whole his poetry is inferior to that of his com- panions, but he was one of the first to write sonnets in French (the actual priority belongs to Mellin de St Gelais) ; and one of these, the beautiful Sonnet to Sleep (it has been noted that the poetical name of his mistress in the Erreurs is, oddly enough, Pasithea, the name of the nymph beloved classically by the god of sleep), is a very notable and famous piece. It is also said that Pontus de Tyard introduced the sestine into France, or rather reintroduced it, for it is originally a Provengal invention.

PONTYPOOL, a town and urban sanitary district of Monmouthshire, England, situated on an acclivity above the river Avon Lwyd, on the Monmouthshire Canal, and on the Great-Western and Monmouthshire Railways, 8 miles north of Newport. The town-hall, in the Doric style, dates from 1856, the market-house from 1846, and the Baptist theological college from 1856. At one period Pontypool was famed for its japanned goods, invented by Thomas Allwood, a native of Northampton, who settled in the town in the reign of Charles IJ., but the manu- facture has long been transferred altogether to other towns. The present prosperity of Pontypool is

due to its situation on the edge of the great Pembrokeshire coal and iron basin. The earliest record of trade in iron is in 1588, but it was developed chiefly in the beginning of the 18th century by the Hanburys, the pro- prietors of Pontypool Park. The town possesses large forges and iron-mills for the manufacture of iron-work and tin-plate. The population of the urban sanitary district (area 800 acres) in 1871 was 4834, and in 1881 it was 5244.

PONTYPRIDD, sometimes also called NEwBRIDGE, a market town of Glamorganshire, Wales, situated on the Taff at its junction with the Rhondda, and on the Glamorganshire Canal, 12 miles north-north-west from Cardiff and 12 south from Merthyr-Tydfil. It receives its name from a remarkable bridge of one arch spanning the Taff, erected by William Edwards, a self-taught mason. The bridge is a perfect segment of a circle, the chord being 140 feet, and the height at low water 36 feet. A three-arched bridge was erected close to it in 1857. The principal buildings are the court-house, St Catherine's church, the masonic hall, and the town-hall. Near the town is a far-famed rocking stone 9} tons in weight, sur- rounded by so-called Druidical remains. In the beginning of the century Pontypridd was an insignificant village, and it owes its progress chiefly to the coal and iron in the neighbourhood. It possesses anchor, chain, and cable works, chemical works, and iron and brass foundries. The population in 1881 was 12,317.

PONZA, the principal island of a small volcanic group, the Pontian, Pontine, or Pontinian Islands (Insule Pontiz, Lsole Ponze), which lie 20 miles off the Circeian pro- montory (Monte Circello), the northern end of the Gulf of Gaeta, on the west coast of Italy. The two smaller islands are Palmarola (ancient Palmaria) and Zannone (Simonia), neither inhabited. Ponza is 5 miles long and very irregular in outline ; its soil is fertile; and in 1881 it had

3828 inhabitants. The old fortress is used as a penal establishment. ;

A Roman colony with Latin rights was settled on Pontia in 318 n.c. Under the empire the island was a place of banishment for political offenders. Nero, the eldest son of Germanicus, here perished by command of Tiberius;

here the sisters of Caligula were confined; and here, or in Palmaria, Pope Sylverius died. A Benedictine monastery was built on Ponza, and in 1572 Cardinal Farnese, as commendatory of the monastery, claimed to exercise lordship over the island. From the duke of Parma, who obtained possession in 1588, the feudal authority passed with Elizabeth to Philip V. of Spain. Ferdinand IV. attracted the inhabitants of Torre del Greco to the island by gifts of land and money. During the first French empire it was occupied and fortified by the English and Sicilian forces.

See Trieoli, Monografia per le isole del gruppo Ponztano, Naples, 1855; Mattel, L' Archipelago Ponziano, Naples, 1857; and Doelter, Vorldufige Mitthetlung tiber den geol. Bau der Pontinischen Insein, Vienna, 1875.

POOLE, a market town, municipal borough, county in itself, and seaport of Dorsetshire, on the south coast of England, is picturesquely situated on a peninsula between Holes Bay and Poole Harbour, 30 miles east from Dorchester and 120 south-west of London. The churches are modern, and possess no features of special interest. Among the principal public buildings are the town-house, 1721; the guild-hall, formerly the market-house, 1761; the old town-hall, built in 1572; the custom-house ; and the mechanics' institute. On Brownsea Island in the middle of Poole Harbour is a small castle erected as a fortress by Elizabeth and strengthened by Charles I. At low water Poole Harbour is entirely emptied except a narrow channel, but at full tide the water covers an area about 7 miles long by about 43 broad. The quays lincd with warehouses are about one mile in length, and can be approached by vessels of very large tonnage. There is a large general trade with the British colonies and the United States, and an important coasting trade, especially in corn to London, and Purbeck clay to the Staffordshire potteries. In 1883 the number of vessels that entered the harbour was 933 of 81,003 tons, the number that cleared 874 of 77,948 tons. Some shipbuilding is carried on, and there are manufactures of cordage, netting, and sail- cloth. The town also possesses large potteries, decorative tile works, iron-foundries, engineering works, agricultural im- plement works, and flour-mills. The area of the borough is 5111 acres, with a population in 1871 of 10,129, and in 1881 of 12,310 (5820 males and 6490 females).

Poole derives its name from being nearly surrounded by a sheet of water. There was a Roman road between it and Wimbourne. It is not mentioned in Domesday, being included in Canford, but it enjoyed ccrtain immunities before 1248, when it received a charter from William Longsword. Iu the reign of Edward III. it supplied four ships and 94 men for the siege of Calais. Much of its succeeding prosperity was due to the presence of Spanish merchants, and after the outbreak of war with Spain in the reign of Elizabethits trade for a time declined. Its charter was extended by Elizabeth, who reincorporated it, and erected it into a county in itself. It has a sheriff clected annually, and a separate court of quarter sessions. It is divided into two wards, and is governed by a mayor, six aldermen, and eighteen councillors. It returned two members to parliament as early as the reign of Edward III., but one only from 1868 to 1885.

See Hutchins, History of Poole, 1788; Sydenham, Jlistory of Poole, 1839; Hutchins, [Zistory of Dorset, 3d ed.

POOLE, MartrHew (1624-1679), author of a learned though now almost wholly antiquated Synopsis Criticorum Biblicorum, was born at York in 1624, was educated at Emmanuel College, Cambridge, and from 1648 till the passing of the Act of Uniformity held the rectory of St Mary le Querne, London. Subsequent troubles led to his withdrawal to Holland. He died at Amsterdam in 1679.

Besides the work with which his name is principally associated (Synopsis Criticorum Biblicorum, 5 vols. fol., 1669-76), he wrote Annotations on the Holy Bible, as far as to Isa. lviii.; the work was subsequently completed by several of his Nonconformist brethren,

and published in 2 vols. fol. in 1688. He was also the author of nunierous controversial tracts.

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POOLE, Paut Fatconrr (1806-1879), an eminent English painter, was born at Bristol in 1806. He was self-taught in the strictest sense, and to this deficiency in art training must be ascribed the imperfect drawing of the human figure which is to be observed in most of his work. But, in spite of

this drawback, his fine feeling for colour, his poetic sympathy, and his dramatic power have gained for him a high position among British artists. Gifted with an imagination of a high order, he boldly attempted lofty historical themes, and, if the result is not always equal to the vigour of his conception, we can easily see that the shortcoming was due to his imperfect education in art. His pictures show him to belong to that com- paratively small class of English painters who are keenly sensitive to the influence of beauty and of passion, rising on occasion to ambitious flights of fancy, and dominated by strong dramatic impulse. A keen observer of nature, but generally viewing it in a broad comprehensive aspect, he was truly a poet-painter, using the effects of a summer sky or of angry clouds to harmonize with the subject of his picture and to enforce its story. In his early days Poole worked along with T. Danby, and it is easy to trace the bond of sympathy between the two painters.

Poole's life was the simple uneventful record of the career of the artist. He exhibited his first work in the Royal Academy at the age of twenty-five, the subject being the Well—a scene in Naples. There was an interval of seven years before he again exhibited his Farewell, Farewell, in 1837, which was followed by the Emigrant's Departure, Hermann and Dorothea, and By the Waters of Babylon. This last picture attracted much attention from the fine poetic imagination which it dis- played. In 1843 his position was made secure by his Solomon Eagle, and by his success in the Cartoon Exhibi- tion, in which he received from the Fine Art Commis- sioners a prize of £300 sterling. After his exhibition of the Surrender of Syon House he was elected an Asso- ciate of the Royal Academy in 1846, and was made an Academician in 1861. In 1855 he received a medal of the third class at the Paris Universal Exhibition. His enthusiasm for his art was rewarded by success in life, though like many artists he passed through much hard- ship in his early days. He died in 1879, in his house at Hampstead, in his seventy-third year. In person he was tall and well built, with a lofty forehead, grey eyes, and short beard. The portrait sketch by Frank Holl, R.A., gives a very good idea of him in his last days,— a shy man but genial to his friends, fond of conversation and well read, especially in his favourites Shakespeare, Shelley, Spencer, and Chaucer, who were the sources of inspiration of many of his works.

Poole’s subjects easily divide themselves into two orders—one, without doubt the earlier, idyllic, the other dramatic. Of the former his May Day is a typical example. A rustic beauty crossing a brook, or resting on a hill side under bushes flecked with the light and shade of a bright sun and with cirrus clouds floating in a blue sky, is the frequent motive of these works, which are full of simple enjoyment of a beautiful country life. But in his later style he rises to loftier subjects and treats them powerfully. Of both styles there were excellent examples to be seen in the small collec- tion of his works shown at Burlington House in the Winter Exhibi- tion of 1883-84. These collected pictures recalled the attention of the public to a painter who had suffered neglcet for some years, alike from his own deficiencies as a draughtsman and also from a want of sympathy with the poetical character of his paintings, which never could lave been popular with the ordinary public. His reputation will stand or fall by the criticism of this gathering of his pictures, small though it was. There was to be seen one of his early dramatic pictures, painted in 1848, Solomon Eagle exhorting the People to Repentance during the Plague of 1665, terrible in its ghastly foree. Though exaggerated in the expression of horror and agony, weak in drawing, and defective in colour, it is clearly the

work of a powerful imagination. To this class belong also the Messenger announcing to Job the Irruption of the Sabeans and the

Slanghter of the Servants (exhibited in 1850), and Robert, Duke of Normandy and Arletta (1848). Finer examples of his more mature power in this direction are to be found in his Prodigal Son, painted in 1869 ; the Eseape of Glaucus and Ione with the blind girl Nydia from Pompeii (1860); and Cunstaunce sent adrift by the Constable of Alla, King of Northumberland, painted in 1868. Here Poole rises to a lofty height, and succeeds fully in realizing the impres- sion he aims at. ‘The expression of anguish and of resignation at Cunstaunce clasps her child to her bosom and turns her moon-lit face to heaven is rendered with great power, while the effect is heightened by the stormy sky, the dark rocks, and the angry sea.

More peaceful than these are the Song of Troubadours (painted 1854) and the Goths in Italy (1851), the latter an important his torical work of great

power and beauty. It represents the easy luxurious insolence of the barbarian conquerors, lying stretched on the grass in the gardens of Lucullus and Cicero, while the captive daughters of proud senators wait on them and offer wine in golden goblets. In the background is a circular temple overhanging the sea, while overhead is a beautiful sky—altogether a bold feat to attempt, yet Poole has succeeded in giving a great representation of a striking page in history.

Of a less lofty strain, but still more beautiful in its workmanship, is the Seventh Day of the Decameron, painted in 1857. In this picture Poole rises to his full height as a colorist. “In the fore- ground is Philomena, seated on the shore of a lake surrounded by high mountains, playing on a harp; eleven figures are grouped round her in various positions,” as described in the catalogue. The chief beauty of this work lies in its fine colour and quiet repose. The amphitheatre of rocky mountains reflected in the lake gives us a splendid example of Poole’s power in landscape, which is large and broad instyle. His treatment corresponded with his choice of sub- ject. In his pastorals he is soft and tender, as in the Mountain Path (1853), the Water-Cress Gatherers (1870), the Shepston Maiden (1872). But when he turns to the grander and more sublime views of nature his work is bold and vigorous. Fine examples of this style may be seen in the Vision of Ezekiel of the National Gallery, Solitude (1876), the Entrance to the Cave of Mammon (1875), the Dragon’s Cavern (1877), and perhaps best of all in the Lion in the Path (1873), a great representation of moun- tain and cloud form. This wild rocky landscape had a great fascination for him; every aspect of nature which showed the action of mighty force attracted him; hence his love of motytain sides scarred by ravines, and of trees torn and twisted by hurricanes. Caverns are a frequent thenie; indeed he used to say that he had been haunted all his life by them, and that he would travel far to see 2 new one.

POONA, a district in the Deccan, Bombay, situated

“between 17° 54’ and 19° 23’ N. lat. and 73° 24’ and

75° 13’ E. long. It has an area of 5347 square miles, and is bounded on the N. by the districts of Nasik and Ahmednagar, on the E. by those of Ahmednagar and Sholapur, on the S. by the Nira river, separating it from

Satara and Phaltan, and on the W. by the Bhor state and Sahyadri Hills. ‘Towards the west the country is extremely undulating, and numerous spurs from the hills enter the district. To the east it opens out into plains ; but a considerable area is now being put under forest. Poona is watered by many streams which, rising in the Sahyadri range, flow eastwards until they join the Bhima, a river which intersects the district from north to south. The Great Indian Peninsula Railway runs through it, and affords an outlet for its produce through the Bhor Ghat to Bombay; another railway is about to be com- menced which will put the district into communication with the southern Mahratta country. The Khadakvasla Canal, about 10 miles south-west of Poona, which it supplies with water, is one of its most important works. Although the district is not rich in minerals, trap rock suitable for road-making and stone for building pur- poses are found. Only in the west are wild animals met with, chiefly tigers, leopards, bears, and sambhar deer. The climate is dry and invigorating; the average annual rainfall is about 30 inches.

The population of the district in 1881 was 900,621 (455,101 males and 445,520 females), of whom 834,843 were Hindus, 42,036 Mohammedans, 1574 Parsis, 10,880 Jains, 9500 Christians, and 1788 of other religions. The only towns with a population cxceed- ing 10,000 are Poona (q.v.), Poona eantonment (30,129), and

Juunar (10,373).

Agriculture supports about half the population. Of a total area

of Government culturable land of 1,924,630 acres, 1,775,583 were eultivated during 1882-83. Of these 181,395 acres were fallow land and occupied waste, leaving 1,594,188 acres under actual cultivation, of which 28,035 were twice cropped. The ehief produets are eereals (ehiefly jowari and bajri) and pulse, and the principal manufaetures of the distriet are silk robes, coarse cotton cloth, and blankets; its brass and silver work is mueh admired. ‘The gross revenue in 1882-83 was £180,736, of whieh the land tax yielded £111,740, stamps £18,790, and excise £31,160. ; History.—The district passed from the last Hindu dynasty which reigned at Deogiri to the

Mohammedans between 1294 and 1312, and under the Bahmani kings the Ghat country was thoroughly subdued. On the disruption of the Bahmani kingdom alter the revolt of the governors of the provinees, the district fell to the share of the Ahmednagar kings and from them it passed to the Moguls, when the Nizamshahi dynasty finally eame to an end in 1637. The country north of the Bhima, ineluding Junnar, was annexed to the Mogul territory, and that south of it was made over to Bijapur. The power of the latter was, however, declining, and gave an opportunity to the Mahratta ehiefs to unite and assert themselves, and ended in their establishing a Mahratta kingdom at Satara. Intrigues atthe palaee led to the supremacy of the peshwas and the removal of the capital to Poona, where many stirring seenes in Mahratta history have been enacted. Holkar defeated the peshwa under its walls, and his flight to Bassein led to the treaty by which he put himself under British proteetion ; he was reinstated

in 1802, but, unable to maintain friendly relations, he attacked |

the British at Kirkee in 1817, and his kingdom passed from him.

POONA, the chief town of the above district, is situated in 18° 31’ N. lat. and 73° 55’ E. long., in a treeless plain about 2000 feet above the sea and overlooked by the Ghats, which rise 1000 feet above the plain. Its area is about 4 square miles, with a popylation in 1881 of 99,622 —males 50,814, females 48,808, The town stands on the right bank of the Muta river, and is about 80 miles south-east of Bombay. Until the year 1817, when it was taken by the British, the city was the residence of the peshwas of the Mahrattas.

POOR LAWS. Without embarking onan inquiry as to the causes of pauperism or the primary right of any persons to have their wants, however pressing, met by the state, it is sufficient to say that in Great Britain “there is no man so indigent or wretched but he may demand a supply sufficient for all the necessaries of life from the more opulent part of the community, by means of the several statutes enacted for the relief of the poor” (Blackstone). Moreover, apart from statute, by the common law of England the poor were sustainable “ by parsons, rectors of the church, and the parishioners, so that none of them die for default of sustenance” (Jfirror).

The great importance of the subject of relief of the poor is evinced, apart from other considerations, by the number of persons immediately affected, either as recipients of relief or as ratepayers, and by the sums expended in that relief. The number of paupers of all classes now in receipt of relief in England and Wales approaches 800,000, equi- valent to a thirty-fourth part of the entire population, and relieved at a yearly cost of considerably more than £8,000,000, representing a charge of between six and seven shillings per head of the estimated population.

Of existing legislation a statute of the beginning of the 17th century (43 Eliz. c. 2, 1601) is the earliest, under which, by parochial taxation, parish officers are directed to provide a stock of materials for “setting the poor on work” (that is to say, persons “married or unmarried having no means to maintain them [and that] use no ordinary and daily trade of life to get their living by ”), and further for setting to work their children; “and also competent sums of money for and towards the necessary relief of the lame, impotent, old, blind, and such others among them being poor and not able to work.” The same statute enacts “that the father and grandfather and the mother and grandmother and the children of every poor old, blind, lame, and impotent person, or other poor person not able to work, being of a sufficient

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ability, shall at their own charges relieve and maintain every such poor person.”

Although the statute of Elizabeth is spoken of as the Early principal foundation of existing legislation relating to the lesisla-

poor, it is an error to say that the relief of the poor ori-* ginated at that period. The common law of England has been already cited, and traces of poor laws, however far removed from a system, are found in all civilized states. An approximation to the principle may be discerned in the legislation of England at a very early period; and before the Norman Conquest laws of Athelstane, establishing a responsibility over households and landowners, although in- tended for good order and calculated to prevent the growth of vagabondage and violence, had also the effect of estab- lishing reciprocal

relations between the landless man and the landowner, between property and poverty, between the householder and the houseless,—casting upon one the duty of supervising the conduct and providing for the wants of the other, in some respects similar to the poor law of the present day. “The results of this legislation were like- wise, it may be presumed, not very dissimilar, for the improvident and the indolent would endeavour, with the smallest amount of labour, to obtain the largest amount of assistance from the householder who was liable for their support and responsible for their conduct, whilst the householder would as certainly endeavour to obtain the largest amount of labour in return for the cost and re- sponsibility to which he was subject.” Again, so long as serfdom and villenage prevailed, whether to be traced to the Norman Conquest or not, there could be no eall for any special provision for the destitute. “The persons who might, if free agents and in a destitute state, have been properly relieved out of a common stock, would as serfs or villeins have a claim on their masters, to whom they belonged, and who were bound to provide for them ” (Nichalls), As those old ties became more relaxed the change to freedom was accompanied by some evils, and led to a great increase of vagrancy; and from a period commencing before the close of the 14th century there was a stream of legislation on the subject. An Act of 12 Richard II., after providing for labour to pergons able to work (see LaBour and Lazpour Laws, vol. xiv. p. 167), enacts “that beggars impotent to serve shall abide in the cities and towns where they may be dwelling at the time of the proclamation of this statute, and, if the people of the cities and towns will not, or may not, suffice to find them, that these, the said beggars, shall draw them to other towns within the hundred, rape, or wapentake, or to the towns where they were born, within forty days after the proclama- tion made, and there shall continually abide during their lives.” This is the first enactment in which the impotent poor are directly named as a separate class, and on that aecount it has been mistakenly regarded as the origin of the English poor laws; but it makes no provision for their relief, and the chief characteristic of the statute is the fact of its having openly recognized the distinction between “ beggars able to labour” and “ beggars impotent to serve.” Passing over intermediate legislation, by an Act passed in 1530, “ directing how aged, poor, and impotent persons compelled to live by alms, shall be ordered, and how vagabonds and beggars shall be punished,” justices of the peace were re- quired to give licences under their seals to

such poor, aged, and impotent persons to beg within a certain precinct as they should think to have most need ; “and if any do beg out of his precinct he shall be set in the stocks two days and nights ; and if any beg without such licence he shall be whipped, or else be set in the stocks three days and three nights, with bread and water only. And persons being whole and mighty in body, and able to labour, who shall beg, or be vagrants and not able to account how they get

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their living, shall be whipped, and sworn to return to the place where they were born, or last dwelt by the space of three years, and there put themselves to labour” (22 Hen. PIE. cxd2):

Six years later an important and very interesting Act

was passed reciting that, although it had been ordained | that aged, poor, and impotent people should repair to the | hundred where they were born or had dwelt for three |

years before, no provision had been made how they should be ordered at their coming thither, nor how the hundred should be charged for their relief. It was therefore enacted that the mayors, sheriffs, constables, householders, and all other head officers of every city, shire, town, and

parish, at the repair and coming thither of such poor. creature should most charitably receive them, and all the | governors and ministers of every such place should succour, |

find, and keep them by way of voluntary and charitable

alms, as should be thought meet in their discretion, in |

such wise as none of the poor persons of very necessity should be compelled to go openly in begging, on pain of every parish making default forfeiting 20s.a month. The head officers and churchwardens, or two others of every parish in the realm, were required to gather and procure such voluntary and charitable alms of the good Christian people, by means of

boxes every Sunday, holiday, and other festival, in such good and discreet ways as the poor, impotent, lame, feeble, sick, and diseased people, being not able to work, may be provided, holpen, and relieved, so that in no wise none of them be suffered to go openly in begging, and such as be lusty may be kept in continual labour. Every preacher, parson, vicar, and curate, as well in their sermons, collections, bidding of the beads, as in time of confessions, and at the making of the wills or testaments of any' persons, at all times of the year shall exhort, move, stir, and provoke people to be liberal. Certain of the poor people were themselves appointed to collect and gather broken meats and fragments and the refuse drink of every householder in the parish, to be distributed equally among the poor at discretion. The overplus of collections in rich and wealthy parishes was distributable towards the sustentation of other poor parishes. The Act provided that, where the voluntary and unconstrained alms and charity, together with any moneys added or given from any monasteries or persons or bodies, _ proved insufficient, the officers and inhabitants should not incur the penalty nor be constrained to any contribution other than at their free will, provided that what was col- lected was justly distributed. Provision was made for duly accounting and for the punishmeut of embezzlement. Con- stables, churchwardens, and collectors of alms had, how- ever, allowance for their loss of time and their travelling expenses (27 Hen. VIII. c. 25).

A number of statutes were passed after the dissolution of the monasteries for further providing for the poor and impotent, who had increased in great numbers. Many of these statutes were specially directed against vagrancy, and have been referred to in the article already mentioned, as closely connected with compulsory labour.

At the commencement of the reign of Edward VI. (1547) a statute also affecting labourers and vagrants and dealing very harshly with them (see vol, xiv. p. 168), re- citing that there are many maimed and otherwise lamed, sore, aged, and impotent persons which, resorting together and making a number, do fill the streets or highways of divers cities, towns, markets, and fairs, who, if they were separated, might easily be nourished in the towns and places wherein they were born, or have been most abiding for

the space of three years, enacted that the mayor, con- stable, or other head officer of any city, town, or hundred

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otherwise cannot be taken for vagabonds, which were born within the said city, town, or hundred, or have been most conversant there by the space of three years and now de- cayed, bestowed and provided for of tenantries, cottages, or other convenient houses to be lodged in, at the costs of the place, there to be relieved and cured by the devotion of good people, and suffer no others to remain and beg there, but shall convey them on horseback, cart, chariot, or other- wise to the next constable, and so from constable to ccn- stable, till they be brought to the place where they were born, or most, conversant as aforesaid ; provided that, if they were not so lame or impotent but that they might do some manner of work, work was to be provided either in common, or place them with such persons as would find them work for meat and drink. For the furtherance of the relicf of such as were in " unfeigned misery," the curate of every parish was required on every Sunday and holiday, after reading the gospel of the day, to make- (according to such talent as God hath given him) a godly and brief exhortation to his parishioners, moving and exciting them to remember the poor people, and the duty of Christian charity in reliev- ing of them which be their brethren in Christ, born in the . same parish, and needing their help. There was a proviso that all leprous and poor bedridden creatures were at liberty toremain in houses appointed for such persons, and for their better relief such persons were allowed to appoint one or two persons for any one such house to gather the alms of all inhabitants within the compass of four miles (1 Edw. VL c. 3). This statute, however, was of bricf duration.

Subsequently, in the same reign, further legislation took place, having for its main object the restraint of vagrancy, providing that every vagabond and beggar being born in any other nation or country should be conveyed from place to place, or to the place or borders next adjoining to his native country or to the nearest port if there was a sea between, there to be kept of the inhabitants until they could be conveyed over, and then at the cost of the in- habitants of the port, if the vagrants had not themselves wherewith to defray the cost. The same statute made provision for children, reciting that many

men and women going begging, impotent and lame, and some able enough to labour, carried children about with them, which, being once brought up in idleness, would hardly be brought after- wards to any good kind of labour or service, and author- izing any person to take such child between the ages of five and fourteen to be brought up in any honest labour and occupation till such child, if a woman, attained tho age of fifteen or was married, and if a man child until eighteen, if the master so long lived (3 & 4 Edw. VI. c. 16).

Two years later the mayor or head officer of every city, borough, and town corporate, and in every other parish of the country the parson and churchwardens, having in @ book as well the names of inhabitants and householders as of needy persons, were required yearly “one holiday in Whitsunweek openly in the church and quickly after divine service to call the householders and inhabitants together and select two or more able persons to gather charitable alms for the relief of the poor, and directing such gatherers the week after their election, when tho people are at the church, and have heard God’s holy word, to gently ask and demand of every man and woman what they of their charity would be content to give weekly towards the relief of the poor, and write the result in the book, to gather and distribute the alms weekly to the poor and impotent persons without fraud or covin, favour or affection, in such manner as the most impotent had the most kelp, and such as could get part of their living to have the less, and by the discretion of the collectors to

shall see all such idle, impotent, and aged persons, who | be put in such labour as they were fit and able to do, but

Eliza- bethan legisla- tion,

none to go or sit openly a-begging.” It is noteworthy that, except a penalty of 20s. imposed on a person refusing the office of gatherer, duties were enforced by ecclesiastical censure. The gatherers were required to account for the money ; and if they refused the bishop of the diocese or ordinary was to conipel them by censures of the church to account before such persons as he appointed. Further, if any person, being able to further the

charitable work, “ do obstinately and frowardly refuse to give towards the help of the poor or do wilfully discourage others from so charitable a deed,” the parson, vicar, or curate, and churchwardens should “ gently exhort him, and if he will not be so persuaded” then on certificate the bishop should send for him “to induce and persuade him by charitable ways and means, and so according to his discretion to take order for the reformation thereof ”(5 & 6 Edw. VI. c. 2).

This statute was recognized in part after the accession of Mary, by altering the time of choosing collectors to Christmas and doubling the penalty for refusing to fill the office of collector, and moving wealthy parishes in cities and towns to contribute towards the relief of the poor in the less wealthy parishes. At the same time a material modification of the spirit of earlier legislation was effected by enabling justices to license the poor of parishes having more poor than they could relieve, to go begging into specified parishes, wearing a badge “both on the breast and back of their outermost garment” (2 & 3 P. & M. @, 5).

Early in Elizabeth’s reign the spiritual persuasion towards obstinate and froward persons withholding con- tributions was strengthened by the aid of the civil power, by directing the bishop or ordinary to bind all obstinate persons by recognizance to appear at the next sessions ; and then, the charitable and gentle persuasions of the justices failing, the latter could tax the obstinate person in a weekly sum according to good discretion, and in default commit him to jail until payment. A corresponding power was given to deal with collectors refusing to account (d Eliz. c. 3). A few years later (1572) legislation took a more vigorous turn “for the punishment of vagabonds and for relicf of the poor and impotent.” The Act 14 Eliz. c. 5, reciting that “all the parts of this realm of England and Wales be presently with rogues, vagabonds, and sturdy beggars exceedingly pestered, by means whereof daily happeneth in the same realm horrible murders, thefts, and other great outrages, to the high displeasure of Almighty God, and to the great annoy of the common weal, and for avoiding confusion by reason of numbers of Jaws concern- ing the premises standing in force together,” repealed the before-mentioned statutes of 22 Hen. VIII, 3 & 4 Edw. VL, and 5 Eliz. c. 3, and made provision for various matters, “as well for the utter suppressing of the said outrageous enemies to the common weal as for the

charitable relieving of the aged and impotent poor people.” Persons above fourteen and being rogues, vagabonds, or sturdy beggars, and ‘taken begging in every part of this realm, or taken vagrant, wandering and misordering themselves,” were upon their apprehension to be committed to prison to the next sessions or jail delivery without bail, and on conviction “shall be adjudged to be grievously whipped, and burnt through the gristle of the right ear with a hot iron of the com- pass of an inch about, manifesting his or her roguish kind of life and his or her punishment received for the same.” This jadgment was not to be executed if after imprison- ment “some honest person, valued at the last subsidy next before that time to five pounds in goods or twenty shillings in lands, or else some such honest householder as by the justices of the peace of the same county, or two of them, shall be allowed, will of his charity take such offender before the same justices into his service for one whole

year,” under recognizance to keep this poor person for that period and to bring him, if still living, before the justices at the year’s end; on the other hand the pauper departing within the year against the will of his master was to be whipped and burnt as above provided. ‘The offender was absolved from a second punishment for a short time, but if after threescore days, and being of the age of eighteen or more, he “do eftsoons fall again to any kind of roguish or vagabond’s trade of life,” then the said rogue, vagabond, or sturdy beggar, from thenceforth was “to be taken, adjudged, and deemed in all respects as a felon,” and should suffer as a felon,—subject, however, to like redemption as on the first charge, conditioned for two years’ service; but offending a third time he was to ‘“‘be adjudged a felon” and suffer pains of death and loss of lands and goods as a felon, without allowance or bencfit of clergy or sanctuary. Offenders under fourteen were punishable by whipping or stocking as provided by the repealed statutes.

A clause defining persons subject to the above punish- ment throws a light on the manners of the age, and is, as well as its exceptive provisions, of considerable interest ; but, as relating to vagrancy, and only indirectly to the relief of the really poor, it is not given here. It is to be observed, however, that the statute provided that it should be still lawful to masters and

governors of hospitals to lodge or harbour impotent or aged persons by way of charity according to their foundation, and to give money in alms as provided by the terms of their foundation. Harsh as was the treatment of rogues, vagabonds, and sturdy beggars, it was not so cruel as the short-lived legislation of the reign of Edward VI. imposing slavery in its worst form on wandering serving men (see vol xiv. p. 168).

Exceptional provision was made for persons provided with passes and safe conducts, as in former Acts. The statute goes on to say that, “ forasmuch as charity would that poor, aged, and impotent persons should as necessarily be provided for as the said rogues, vagabonds, and sturdy beggars repressed,” and that the former should have “convenient habitations and abiding places throughout this realm to settle themselves upon, to the end that they nor any of them should hereafter beg or wander about,” and enacts that justices of the peace in their different divi- sions “make diligent research and inquiry of all aged, poor, impotent, and decayed persons born within their said divisions and limits, or which were there dwelling within three years next before this present parliament, which live, or of necessity be compelled to live by alms of the charity of the people that be or shall be abiding within the limits of their commissions and authorities,” and to register in a book the names of the poor persons, and devise and appoint meet and convenient places at their discretion “to settle the same poor people for their habitations and abidings, if the parish within the which they shall be found shall not or will not provide for them.” The justices were also to number the poor people and “set down what portion the weekly charge towards their relief and sustentation would amount to ;” and, that donc, the justices, mayors, and other officers should “by their good discretions” tax the inhabitants dwelling within these limits to such weekly charge, and appoint collectors and also overseers of the poor for one year. Much as by

a previous statute of 1547, compulsory removal of poor

people from parish to parish (except the leprous and bed- ridden), not born or not having dwelt in the place, was pro- vided for. Poor people refusing to ‘‘ be bestowed in any of the said abiding places, but coveting still to hold on their trade of begging,” or afterwards departing, were for the first offence to

suffer as rogues or vagabonds in the first degree of punishment, and for a second offence to suficr

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the last degree of punishment already mentioned. The provisions as to putting out children of beggars contained in the statute of Edward VI. already noticed were repeated in nearly the same terms, but the age of male children was extended from eighteen to twenty-four for the duration of service.

The Act provided for justices' licences for poor to beg, ask, and receive relief in other parishes under similar cir- cumstances as badges had been granted under an earlier and repealed statute. The Act also contained many pro- visions and exceptions as to places and corporate bodies, and any person "able to further the charitable work" con- templated by the statute, and obstinately refusing to give towards the help and relief of the poor, or wilfully dis- couraging others from so charitable a deed, was to be summoned before justices to abide their order, and on refusal to be committed to jail, and 'there to remain until he be contented with their said order, and do perform the same."

There is extant a letter addressed to Lord Burghley by a, justice of the peace for Somerset, which shows that the great evils arising from habits of idleness amongst the poor began then to be understood, and strengthens the idea that one great object of the legislative provisions for the poor made about that time was to prevent able-bodied men from remaining unemployed. The writer advocated building houses of correction adjoining jails, to which vagrants, after conviction, should be transported "to be kept in work, except some person would take any of them into service," — adding, 'I dare presume to say the tenth felony will not be committed that now is" (Strype, Annals of Church and State).

In 1576 the statute 14 Eliz. c. 5 was explained and materially extended. 'To the intent youth may be accus- tomed and brought up in labour, and then not like to grow to be idle rogues, and to the intent also that such as be already grown up in idleness, and so rogues at this present, may not have any just excuse in saying that they cannot get any service or work, and that

other poor and needy persons being willing to labour may be set on work," it was ordained that within every city and town corporate, by appointment of the mayor and other head officer, and in every other market town or other place where the justices in their general sessions yearly shall think meet,

shall be provided a stock of wool, hemp, flax, iron, or |

other stuff, as that country is most meet for, and being wrought to be delivered to collectors and governors of the poor. Any person refusing to work, or begging, or living idly, or, taking such work, spoiling or embezzling it in such wise that after monition given the minister and church- wardens and the collectors and governors think such person not meet to have any more work delivered to him, was to be taken, ''in convenient apparel meet for such a body to wear," to the 'house of correction" estab- lished by the Act, and under the government of overseers of such houses, called censors and wardens, "there to be straitly kept, as well in diet as in work, and also punished from time to time." To the houses of correction were also taken and set on work not only the persons mentioned but also such "as be inhabitants in no parish or taken as rogues, or who had been once punished as rogues, or by reason of the uncertainty of their birth or of their dwelling by the space of three years, or for any other cause, ought to be abiding and kept in the county." An additional clause of the Act, reciting that by the earlier Act of 14 Eliz. no "pain" was incurred by any impotent person who having a competent allowance provided within his parish wandered abroad without licence "loitering and begging," enacted that he was to be whipped, and for a second offence to "suffer as a rogue and vagabond" (18 Eliz. c. 3), The

"stock" for work and the houses of correction were provided "of all the inhabitants to be taxed ;" but, " because it is to be hoped that many well-disposed persons, understanding the good success which will grow by setting people on work and avoiding of idleness, would from time to time give towards the sustentation and maintenance of that good purpose," persons were empowered during the next twenty years to give lands for the purposes without any licence of mortmain. A later Act, reciting that this power to erect hospitals or other abiding and working houses for the poor

had not its due effect by reason that no person could erect such house without special licence from the crown by letters patent, dispensed with such licence for twenty years (39 Eliz. c. 5).

The numerous charities and endowments and founda- tions of almshouses by will and otherwise of the 16th and 17th centuries, still extant in numerous buildings through- out the country, are illustrations of the spirit of the legis- lation here referred to. It is not improbable that legisla- tion sometimes prompted the donors, but more probable that such legislation was a reflex of the general disposition prevalent for generations after the ordinary channels of voluntary charity were obstructed.

In 1597 considerable progress was made towards estab- lishing a system of poor laws, not so much by introducing novelties as by entering more specifically into details, and especially by defining the legislation of some twenty years earlier (18 Eliz. c. 3) in the same reign. The appointment of overseers first mentioned in the earlier statute was provided for by enacting that the church- wardens of every parish and four subsidy men or other substantial householders nominated yearly in Easter week by justices should be called overseers of the poor of the same parish. The majority of the overseers were required with the consent of justices to set to work the children of persons unable to maintain them, and also all persons married or single and having no means of maintenance and no ordinary and daily trade of life to get their living by. The taxation weekly or otherwise of inhabitants and occupiers for providing a stock of flax, hemp, wool, thread, iron, and other necessary wares and stuff to set the poor on work, and also competent sums for the necessary relief of the lame, impotent, old, blind poor, unable to work, and the cost of erection, by leave of the lords of manors, of places of habitation on waste or common lands, was gathered according to the ability of the parish (or, if the parish was unable, then of other parishes in the hundred and county), and was enforceable by warrant of distress against-every one refusing to contribute, but with a power of appeal against the cess or tax. Parents and children being of sufficient ability were required to maintain their poor children or parents. Any person whatsoever wander- ing abroad and begging in any place, by licence or without, was punishable as a rogue, with a proviso exempting poor persons asking relief in victuals only in the parishes where they dwelt (39 Eliz. c. 3).

Four years after came “the famous statute” of 1601 Statute (43 Eliz. c. 2) already mentioned, out of which Dr Burn of 1601.

observes, “ more litigation and a greater amount of revenue have arisen, with consequences more extensive and more serious in their aspect, than ever were identified with any other Act of Parliament or system of legislation whatever.” It was the permanent establishment of the main provisions of the Act more than their novelty at the time the Act was passed that has fixed it as a kind of epoch in legislation for the maintenance of the poor. The Act re-enacts, verbatim for the most part, the above-mentioned statute of 1597 (39 Eliz. c. 3). The material alterations were defining the rateable property, and extending and defining the family obligation of support, and also the XIX. — 59

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formal apprenticing instead of placing out of children. The Act contains provisions for the rendering of accounts by the overseers. _

The foregoing short review of legislation exhibits the very gradual change by which the maintenance of the poor became much more a temporal than a spiritual concern. So gradual was this change that in some places the law was neglected and in others abused. The material changes in legislation subsequent to the reign of Elizabeth must now be briefly alluded to.

The efforts culminating in the statute of 1601 were not altogether attended with satisfactory results. At the end of eight years the Act 7 James I. c. 4 recited various defects. ‘‘Many wilful people finding that they, having children, have some hope to have relief from the parish wherein they dwell, and being able to labour, and thereby to relieve themselves and their families, do nevertheless run away out of their parishes and leave their families upon the parish.” Again, and more prominently, “ hereto- fore divers good and necessary laws and statutes have been made and provided for the creation of houses of correction, for the suppressing and punishing

of rogues, vagabonds, and other idle, vagrant, and disorderly persons ; which laws have not wrought so good effect as was expected, as well for that the said houses of correction have not been built according as was intended, as also for that the said statutes have not been duly and severely put in execution, as by the said statutes were appointed."

It was also convenient that the masters or governors of the houses of correction should have some fit allowance and maintenance " for their travel and care" to be had in the service, and also "for the relieving of such as shall happen to be weak and sick in their custody, and that the subjects of this realm should in no sort be over-charged, to raise up money for stocks to set such on work as shall be committed to their custody," and that there "shall be the more care taken by all such masters of the houses of correction that, when the country hath been at trouble and charge to bring all disorderly persons to their safe keeping, then they shall perform their duties in that behalf." Another grievance related to bastard children chargeable to the parish, of which more below.

The remedy for these and other grievances was putting in execution "all laws and statutes now in force made for the creating and building of houses of correction, and for punishing of rogues, vagabonds, and other wandering and idle persons," and providing restraints in the same direc- tion, and for the efficient discharge of duties of treasurers, constables, and other officers in rendering accounts.

In 1630 a royal commission was issued to inquire into the neglect of the poor laws, and directions given for their enforcement.

By a Commonwealth statute of 1656, reciting that "the number of wandering, idle, loose, dissolute, and disorderly persons is of late much increased by reason of some defects in the laws, and statutes heretofore made and provided for the punishment of rogues, vagabonds, and sturdy beggars (they being seldom taken begging), by means whereof divers robberies, burglaries, thefts, insurrections, and other misdemeanours have been occasioned, all and every idle, loose, and dissolute persons found and taken within the commonwealth of England, vagrant and wandering from their usual place of living or abode, and [who] shall not have such good and sufficient cause or business for such his or their travelling or wandering" as

justices of the peace or mayors or other chief officers approved, were adjudged rogues, vagabonds, and sturdy beggars, within the statute 39 Eliz. c. 4, although not found begging ; at the same time fiddlers and minstrels were also adjudged rogues, vagabonds, and sturdy beggars; and by a statute

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of the same year persons having no visible estate, profes- sion, or calling answerable to their rate of living expenses were indictable.

Soon after the Restoration attention was directed to the Charles ie

existing state of the law and some of its defects. 1662 the statute 13 & 14 Charles IJ. c. 12 recites that “the necessity, number, and continued increase of the poor, not only within the cities of London and Westminster, with the liberties of each of them, but also through the whole kingdom of England and dominion of Wales, is very great and exceeding burthensome, being occasioned by reason of some defects in the law concerning the settling of the poor, and for want of a due provision for the regulations of relief, and employment in such parishes or places where they are legally settled, which doth enforce many to turn incorrigible rogues, and others to perish for want, together with the neglect of the faithful execution of such laws and statutes as have formerly been made for the apprehending of rogues and vagabonds, and for the good of the poor.” ‘For remedy whereof and for the preventing the perishing of any of the poor, whether young or old, for want of such supplies as may be necessary,” numerous additional provisions were enacted. In the first place, ‘“‘by reason of some defects in the law, poor people are not restrained from going from one parish to another, and therefore do endeavour to settle themselves in those parishes where there is the best stock, the largest commons or wastes to build cottages, and the most woods for them to burn and destroy, and, when they have con- sumed it, then to another parish, and at last become rogues and vagabonds, to the great discouragement of parishes to provide stocks, where it is liable to be devoured by strangers.” Justices of the peace, upon com- plaint by the parish officers, within forty days after any such person’s coming to settle as before mentioned in any tenement under the yearly value of £10, were empowered by warrant to remove such person to the parish where he was last legally settled either as a native, houseliolder, sojourner, apprentice, or

servant for not less than forty days, unless he gave sufficient security for the discharge of the parish.

In this way the law of settlement arose, with its numer- ous complications and modifications engrafted by subse- quent legislation on this its original trunk. The statute of Charles, however, allowed (§ 3) any person ‘‘ to go into any county, parish, or place to work in the time of harvest, or any time to work at any other work,” provided he took with him “a certificate from the minister of the parish and one of the parish officers, that he or they have a dwelling house or place in which he or they inhabit, and have left wife and children, or some of them, there (or otherwise, as the condition of the persons shall require), and is declared an inhabitant or inhabitants there.” In such case, if the person did not return to his parish when his work was finished, or if he fell sick, it was not “counted a settlement,” and he was therefore removable, and, wilfully refusing, was punishable as a vagabond by being sent to the house of correction, or to a public work- house, provision for which and for corporate bodies in relation to the poor in London and Westminster, and places within the so-called bills of mortality, was made at the same time. Funds raised for the relief of the poor in the city of London were, however, previously in the hands of a corporate body for that purpose.

The same statute, reciting that “the inhabitants of the counties of Lancashire, Cheshire, Derbyshire, Yorkshire, Northumberland, the bishopric of Durham, Cumberland, and Westmoreland, and many other counties in England and Wales, by reason of the largeness of the parishes within the same,” could not reap the bencfit of the Act

Restraint

on re- moval of the poor.

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43 Eliz., extended the powers of the Act to townships and villages within these counties.

Power was given to justices at quarter sessions, to trans- port rogues, vagabonds, and sturdy beggars, in some cases with the approval of the privy council, or without such approval, if convicted and adjudged to be incorrigible, to any of the English plantations beyond the seas, “there to be disposed in the usual way of servants for a term not exceeding seven years.”

This Act, which, except as to the corporate bodies before mentioned, was limited to three years’ duration, was con- tinued by various Acts, and made perpetual in the reign of Anne. One of the Acts continuing the former provisions, and containing some minute provisions affecting settle- ments, affords strong evidence of want of care of the funds, and even of the frauds practised by parochial officers. Many inconveniences arose “by reason of the unlimited power of the churchwardens and overseers of the poor, who do frequently upon frivolous pretences (but chiefly for their own private ends) give relief to what persons and number they think fit; and such persons, being entered into the collection bill, do become after that a great charge to the parish, notwithstanding the occasion or pretence of their receiving collection oftentimes ceases, by which means the rates for the poor are daily increased.” This grievance was sought to be remedied by means of a register with names and dates, to be examined by the vestry, and those only to be relieved who were allowed by a justice, except in certain urgent cases. The Act mentions more direct frauds. “ Many churchwardens and overseers of the poor, and other persons intrusted to receive collections for the poor and other public moneys relating to the churches and parishes whereunto they do belong, do often misspend the said moneys and take the same to their own use, to the great prejudice of such parishes, and the poor and other inhabitants thereof,” owing to the law by which persons in any way interested in the funds, as parishioners, although the only persons who could prove the facts, could not give evidence on the trial of actions against the parish officers to recover the misspent money; and therefore parishioners, excepting almsmen, were rendered competent witnesses in such actions (3 Will. & Mary c. 11).

The injurious effects of the restraint placed on the free removal of the labouring classes is evinced by a statute towards the close of the 17th century. To make this in- telligible it is necessary to say that by the statute 1 James II. c. 17 (one of the Acts continuing the Act of Charles I1.) it was

enacted that, as poor persons “at their first coming to a parish do commonly conceal themselves,” the forty days continuance in a parish intended by the Act of Charles to make a settlement were to be accounted from the time of the person’s delivering a notice in writing of the house of abode and number of the family to the parish officer. Hence persons coming to work under a certificate, on its production, were removed back again, lest they gained a settlement at the end of forty days. The statute now to be noticed recited that, “forasmuch as many poor persons chargeable to the parish, township, or place where they live, merely for want of work, would, in any other place where sufficient employment is to be had, maintain themselves and families without being burthensome to any parish, township, or place, but not being able to give such security as will or may be ex- pected and required upon their coming to settle themselves in any other place, and the certificates that have been usually given in such cases having been oftentimes con- strued into a notice in handwriting, they are for the most part confined to live in their own parishes, townships, or

their labour is wanted in many other places, where the increase of manufactures would employ more hands.” This mischievous result of previous legislation was sought to be avoided by a certificate of acknowledgment of settle- ment, and then and not before, on becoming chargeable to another parish, the certificated person could be sent back to the parish whence it was brought (8 & 9 Will. III. c. 30). This provision led to additional legislation, com- plicating the law of settlement. It was not until towards

the close of the 18th century that an important inroad on

the law relating to the removal of the poor was made by requiring actual chargeability before removal to their place of settlement (35 Geo. IIT. c. 101); and at the same time justices were empowered to suspend removal in the case of sickness.

By the statute of William IIL. (8 & 9 Will. IIL. c. 30), “to the end that the money raised only for the relief of such as are as well impotent as poor may not be mis- applied and consumed by the idle, sturdy, and disorderly

beggars," persons receiving parochial relief and their wives and children were required (under the punishment for re- fusal of imprisonnient and whipping, or of having the reliefs abridged or withdrawn) to wear a badge on the shoulder of the right sleeve—that is to say, a large "'P" together with the first letter of the name of the parish or place, cut in red or blue cloth ; and a penalty was imposed on church- wardens and overseers relieving poor persons not wearing such badge. The provision (a revival of a much earlier law) continued down to 1810, when it was abolished.

In 1744 provision was made reviving rather than in- troducing a system of magisterial "passes" for passing persons apprehended as rogues and vagabonds to their place of settlement (17 Geo. II. c. 5). Great abuses in conveying persons by passes, attributed to the neglect of this Act, led to its amendment nearly half 'a century later. Although these statutes fell into disuse they were not finally repealed until after the introduction of the present poor-law system. _

In 1722 the system of farming the poor was introduced. By 9 Geo. I. c. 7, "for the greater ease of parishes in the relief of the poor," parish officers with the consent of the parishioners or inhabitants in vestry were authorized to purchase or hire houses, "and to contract with any person or persons for the lodging, keeping, maintaining, and em- ploying any or all such poor in their respective parishes, townships, or places, as shall desire to receive relief or collection from this same parish, and there to keep, main- tain, and employ all such poor persons, and take the benefit of the work, labour, and service of any such poor person or persons who shall be kept or maintained in any such house or houses, for the better maintenance and relief of such poor persons who shall be there kept or maintained." Any poor persons refusing to be so lodged were not to be entitled to relief. Small parishes could unite or contract with another parish for the maintenance of the poor.

A few years sufficed to develop the injurious effects of this mode of dealing with the poor, and the accumulated evils of the working of the poor laws led, in 1783, to the passing of the statute 22 Geo. III. c. 83, known as "Gilbert's Act," the principle of which was extensively adopted in subsequent legislation, The Act significantly recited that, notwithstanding the many laws now in being for the relief and employment of the poor, and

the great sums of money raised for those persons, their sufferings and distresses are nevertheless very grievous, and by the incapacity, negligence, or misconduct of overseers, the money raised for the relief of the poor is frequently misapplied, and sometimes expended in defraying the charges of litigations about settlements indiscreetly and

places, and not permitted to inhabit elsewhere, though | inadvisably carried on, and also recited the provisions of

Passes.

Farming

the poor.

Gilbert’s

Act.

Relief’ in and out of the work- house.

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the 9 Geo. I. c. 7, relating to contracts for the maintenance of the poor, and that such provisions, from the want of proper regulations and management in the poorliouses or workhouses that lave been purchased or hired under the authority of the said Act and for want of due inspection and control over the persons who have engaged in those contracts, have not had the desired effect, “but the poor in many places, instead of finding protection and relief, have been much oppressed thereby.” “For the remedy of these grievances and inconveniences, and in order to make better and more effectual provision for the relief and employment of the poor, and to introduce a prudent economy in the expenditure of the parish money,” much legislative machinery was introduced, which, although not compulsory, was very extensively adopted, and with many amendments remained on the statute book long after the Poor Law Amendment Act of 1834. Although the Act has now disappeared, having been expressly repealed (as it was by implication previously) in 1871, Gilbert’s Act is memorable as having first

introduced the representation of the poor by guardians, although not by the present system of election. The Act repealed 9 Geo. I. ¢. 7, as regarded the farming of the poor where Gilbert's Act was adopted, but agreements for the diet and clothing and work of poor in poorhouses, subsequently termed "houses of industry," were expressly sanctioned. The limits of this article do not admit even of an analysis of this im- portant statute. In many respects a double system of administration sprang up in parishes, single or united, adopting Gilbert's Act, and in parishes not under that Act. In both, the conflict between the administration of relief in and out of the poorhouse arose, and continued from the time of the establishment of places of work whether termed workhouses, poorhouses, or houses of

industry, and whether under special local or under general

Acts.

In 1795 the 36 Geo. III. c. 23, reciting that a pro- vision of the 9 Geo. I: ¢. 7, prohibiting relief to persons refusing to go into poorhouses, "has been found to have been and to be inconvenient and oppressive, inasmuch as

- it often prevents an industrious poor person from receiving

such occasional relief as is best suited to the peculiar case of such poor person, and inasmuch as in certain cases it holds out conditions of relief injurious to the comfort and doniestic situation and happiness of such poor per- sons," gave power to the overseers, with the approbation of the parishioners in vestry or of a justice of the peace, to distribute and pay collection and relief to industrious poor persons at their homes under certain circumstances of temporary illness or distress, and in certain cases respect- ing such poor persons or their families, or respecting the situation, health, or condition of any poorhouse, in any place wherein houses shall have been hired or built and a contract made with any person for lodging, maintaining, and employing the poor, although the poor persons refused to be so lodged and maintained. Justices had besides a "just and proper discretion" for special cause stated in writing to order relief for a time not exceeding a month. This Act, however, did not extend to places where houses of industry or other places were provided under Gilbert's Act or under any special Act.

The evils arising from farming the poor under the 9 Geo. I. c. 7 nevertheless continued in places not adopting Gilbert's Act. Contractors were often non-resident and not of sufficient responsibility to insure performance of their undertaking. In 1805 these special defects were sought to be met by requiring residence, sureties, and the approval of the contract by two justices (45 Geo. IIL «. 54). But these remedies did not touch the whole extent of the evil of neglect of the poor. The laws for regulating

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workhouses and poorhouses were found deficient and in- effectual, especially when the poor in such houses were "' afflicted with contagious or infectious diseases, in whicli cases particular attention to their lodging, diet, clothing, bedding, and medicine is requisite." A statute passed in 1790 (30 Geo. III. c. 49) enabled justices, or medical men authorized by them or the officiating clergynian of the parish, to visit workhouses, and on finding cause for com- plaint to certify to the quarter sessions, and thereupon the court was authorized to make orders for removing any cause of complaint ; and, moreover, without waiting for this dilatory process, if on the visitation any of the poor were found afflicted with any contagious or infectious disease, or in want of immediate medical or other assistance, or of sufficient food, or requiring separation or removal, justices of the division were empowered to. make an order for im- mediate relief according to the nature of the application. There can be no doubt that the legislation of five years later already noticed (36 Geo. IIL c. 23) had reference to cases of this kind as well as to the hardships inherent in the rigid application of the practice of confining relief to the workhouse.

In 1819 an Act (59 Geo. ITI. c. 12) was passed, the result Select

of the report of a committee appointed two years before, containing a variety of provisions relating to the poor, empowering the establishment of select vestries "for tlie concerns of the poor" and regulating their proceedings. Where these were established overseers were prohibited from giving relief other than that ordered by the vestries, except temporary relief in cases of sudden emergency or urgent necessity. Justices had the power, as under earlier provisions, to order temporary relief in such cases, but they were prohibited from ordering relief in parishes where select vestries were

established or in which the relief of the poor was under the management of guardians, governors, or directors, unless relief had been refused by such bodies.

An amelioration of the harsher features of the law, and Vagrants.

the separation of that branch of it relating to vagrancy, are found in the legislation of the 18th and early part of the 19th century. In early times, as has been pointed out, legislation affecting labour and vagrancy was blended. Very gradually labour was left to run a freer course. Provisions as to vagrancy and mendicity, including strin- gent laws in relation to constructive “sturdy beggars,” “rogues,” and “vagabonds,” still formed a prominent feature of poor-law legislation.

In 1713 an Act was passed for reducing the laws relating to rogues, vagabonds, sturdy beggars, and vagrants into one Act, and for more effectually punishing them and sending them to their homes, the manner of conveying them including whipping in every county through which they passed (12 Anne, st. 2,c. 23). This Act was in turn repealed in 1740 ; and the substituted Consolidation Act (13 Geo. II. c. 24), embracing a variety of provisions, made a distinction between idle and disorderly persons, rogues and vagabonds, and incorrigible rogues. Four years later a statute reciting that “the number of rogues, vagabonds, beggars, and other idle and disorderly persons daily increases, to the great scandal, loss, and annoyance of the kingdom,” deals with a great variety of offences, continuing the rough classification already mentioned, and including among “idle and disorderly persons” punishable with hard labour in the house of correction “all persons who shall run away and leave their wives or children to the parish” and “all persons who shall unlawfully return to the parish or place from whence they have been legally removed by order of justices, without bringing a certifi- cate,” and also “all persons who, not having wherewith to maintain themselves, live idly without employment and refuse to work for the usual and common wages given to

Trregular- ities of poor-law officers.

Evils and suggested remedies.

other labourers on the like work, in the parishes or places where they then are," and also all persons begging alms (17 Geo. IL «. 5).

The laws relating to idle and disorderly persons, rognes and vagabonds, incorrigible rogues, and other vagrants in England were again consolidated and amended in 1822 (3 Geo. IV. c. 40), but the Act being temporary and requiring amendment, was superseded two years later by the present Act, 5 Geo. IV. c. 83, commonly spoken of as the Vagrant Act, which with some additions and amend- ments includes the law relating to mendicity and some provisions concerning persons deserting or neglecting to support their families. Mendicity in the popular sense is now considered as appertaining to police rather than to poor laws. It must suffice here to note the change from former inhuman laws denoted by the fact that corporal punishment is confined by the Vagrant Act to the permis- sive infliction of whipping on male persons imprisoned as incorrigible rogues.

The misdoings of the " vagrant train," so often paraded by statute and so severely treated in former times, seem to have been trifling compared with the iniquities of some of those engaged in the administration of poor-law relief. In 1769 it was found necessary to prevent churchwardens and overseers from wilfully and knowingly making payments to or for the use of the poor in base and counterfeit money (9 Geo. III. « 37). For this heinous offence a penalty limited to twenty shillings was imposed. The curious may compare this mild punishment with that inflicted on a wanderer from his home; for as recently as 1816 it was thought right to declare that it should not be lawful for any governor, guardian, or master of any house of industry or workhouse on any pretence to chain or confine by chains or manacles any poor person of sane mind, a provision significant of what passed within the walls by its prohibition as well as by the limitation.

Such were the most salient features of the legislation respecting the relief of the poor previous to the reform of parliament itself in 1832. ;

It had long been seen that there was something wrong which legislation had failed to set right. Sir Matthew Hale framed a scheme which was written soon after the middle of the 17th century, although not printed until after his

death. he chief feature of his plan was “that the justices of the peace at the quarter sessions do set out and distribute the parishes in their several counties into several divisions, in each of which there may be a workhouse for the common use of the respective divisions wherein they are respectively placed,—to wit, one, two, three, four, five, or six parishes to a workhouse according to the greatness or smallness and accommodation of the several parishes,” and that providing “a stock” for work in and out of the workhouses should be made compulsory. His views are thus stated :—

“ At this day, it seems to me that the English nation is more deficient in their prudent provision for the poor than any other Christian state In some other countries a beggar isa a rare sight. Those that are unable to maintain themselves by age or impotency are relieved. And those that are able to supply their wants by their labour are furnished with employments suitable to their condition. And by this means there is not only a good and orderly education and a decent face of the public, but the more populous the state or country is the richer and the more wealthy it is. But with ns in England, for want of a due regula- tion of things, the more populous we are the poorer we are ; so that wherein the strength and wealth of a kingdom consists renders us the weaker and the poorer; and, which is yet worse poor families which daily multiply in the kingdom, for want of a due order for their employment in an honest course of life, whereby they may gain subsistence for them and their children, do unavoidably bring up their children either in a trade of begging or stealing, or such other idle course, which again they propagate over to their children; and so there is a successive multiplication of hurtful or at least

unprofitable people, neither capable of discipline nor beneficial employment.”

He further remarks that the continuance of the evils he depicted “must in time prodigiously increase and overgrow the whole face of the kingdom, and eat out the heart of it.” In lamenting the want of an industrious education he observes that “a man that has been bred up in the trade of begging will never, unless compelled, fall to industry; and, on the other side, it is a wonderful necessity indeed that shall bring one bred up in

civility or industry to beg.” Almost all subsequent schemes looked up to Hale as their model ; but all either were not accepted or did not succeed, although in some of the legislation of the 18th century imperfect attempts seem to have been made in this direction. Among other schemes Sir Josial Child, in the reign of Charles II, who speaks of the poor in England having always been ‘‘in a most sad and wretched condition,” proposed to abolish all settlements and receive every poor person that applied to incorporated societies or “fathers of the poor.” John Cary, writing about 1700, having for the burden of his tract, and the cure of existing evils, to ‘‘ provide work for those who are willing, and force them to work that are able,” makes some pithy remarks.

“We that walks the streets of London, and observes the fatigues used by the beggars to make themselves seem objects of charity, must conclude that they take more pains than an honest man doth at his trade, and yet seem not to get bread toeat. Beggary is now become an art or mystery, to which children are brought up from their cradles. Anything that may move compassion is madea live- lihood, a sore leg or arm, or for want thereof a pretended one. The tricks and devices I have observed to be used by those people have often made me think that those parts, if better employed, might be made useful to the nation.” “ Licences for alechouses were at first granted for good ends, not to draw men aside from their labour by games and sports, but to support and refresh them under it; whcreas alehouses are now encouraged to promote the income of excise,—not considering withal that the labour of eacli man, if well employed, whilst he sits in an alehouse, would be worth much more to the nation than the excise he pays.” “Our laws to set the poor at work are short and defective, tending rather to maintain then so than to give them to a better way of living. “Tis true, those laws design well; but, consisting only in gencrals, and not reducing things to practicable methods, they fall short of answer- ing their ends, and thereby render the poor more bold when they know the parish officers are bound either to provide them work or to give them maintenance.”

In 1735 Mr Hay, a member of the House of Commons, introduced a bill, which, however, was not passed, appoint- ing guardians of a district, chosen by divers occupiers out of a list of persons qualified by estate in land, with power to purchase land, and build and furnish workhouses, and provide

stock to set the poor to work, to be paid for by rate,—‘‘every person to be deemed to be legally settled where he continued a year without being chargeable, and if he gained no such settlement then at the place of his birth, and if not born in the kingdom then where he should happen to want relief,”—parochial settlement to be abolished, and a county settlement substituted.

In 1753 bills were introduced into parliament by the earl of Hillsborough and Sir Richard Lloyd, but neither was passed. Lord Hillsborough proposed to repeal all existing Acts, re-enacting much, but getting rid of the notion of settlements and removals, and establishing a county board as governors of the poor with officers to carry out their bye-laws, and hospitals for the impotent and the aged and their children, and for no other kind of poor. In the same year Fielding printed A Proposal for making an effectual Provision for the Poor, for amending their Morals, and for rendering them useful Members of the Society. His plan embraced county houses of correction, and places of work, maintenance, and punishment, includ- ing a “fasting room.” It may be regarded as supple- mentary to schemes of thesame period. Although all that fell from this author is worthy of attention, his plan cannot

be examined closely here; but what he says of the state of things at the period, evidently the result of his daily observations as a magistrate and inhabitant of Westminster, is too striking to be passed over.

“That the poor are a very great burden and even a nuisance to the kingdom, that the laws for relieving their distress and restraining their vices have not answered their purposes, and that they are at present very ill provided for and much worse governed are truths which every man will acknowledge. Every person who hath any property must feel the weight of that tax which is levied for the use of the poor; and every person who hath any understanding must see how absurdly it is applied. So very use- less, indeed, is the heavy tax, and so wretched its disposition, that it is a question whether the poor or rich are actually more dis- satisfied ; since the plunder of the one serves so little to the real advantage of the other. For while a million yearly is raised among the rich many of the poor are starved ; many

more languish in want and misery ; of the rest, numbers are found begging or pilfering in the streets to-day, and to-morrow are locked up in jails and bride- wells. If we were to make a progress through the outskirts of the metropolis, and look into the habitations of the poor, we should there behold such pictures of huinan misery as must move the compassion of every heart that deserves the name of human. What indeed must be his composition who could see whole families in want of every necessary of life, oppressed with hunger, cold, nakedness, and filth, and with diseases the certain consequence of all these! The sufferings indeed of the poor are less known than their misdecds ; and therefore we are less apt to pity them. They starve, and freeze, and rot among themselves; but they beg, and steal, and rob among their betters. There is not a parish in the liberty of Westminster which doth not swarm all day with beggars and all night with thieves."

The observations of Dr Burn, a name known to every one who has considered the poor laws, whether as legislator, magistrate, or lawyer, followed in 1764. Although the suggestions and observations in his History of the Poor Laws are worthy of the highest attention to any one enter- ing into an historical retrospect, it must suffice here to say that the result of his experience and knowledge was that the laws then in force should "stand as to the main" but be rectified on two points—begging, and the manage- ment of the poor by overseers. Dr Burn says :—

"But how shall begging be restrained ? which by a kind of pre- scriptive claim hath so long been accustomed to triumph above the laws. All sorts of severities, it appears, have been enacted against vagrants; and yet they wander still. Nevertheless, one would hope the disease is not past all remedy. If it is, let us ccase the unequal contention, and submissively give up our fortunes to the next that comes with a pass, and tells us a justice of the peace hath so ordered it; but let beggars and vagrants be doing. There is one infallible way to put an end to all this, and the easiest in the world, which consists merely in a non-feasance. Give them nothing. If none were to give, none would beg; and the whole mystery and craft would be at an end in a fortnight. Let the laws continue if you please to apprehend and punish the mendicants ; but let something also be done effectually against those who encourage them. If the principal is punished, it is not reasonable

the accessary should go free. In order to which, let all who relieve a common beggar be subject to a penalty.”

As to the other “fundamental defect,” as Dr Burn styles the leaving the management of the poor to overseers, the position of overseers and their action are so admirably painted, and the description so applicable to the mode of administration down to the reform of 1834, that the observations, written in a happy strain of irony, must be inserted.

“ As to overseers of the poor, it is true the law provides that they shall be substantial householders. But many a man may be a sub- stantial householder who is not fit to be an overseer of the poor. And in fact the office goes by rotation from one householder to another,—some perhaps tenants at rack rent, whose lease expires the next year, others ignorant and unexperienced, others not willing to charge themselves to disoblige their neighbours; and all of them wanting to get over the office with as little trouble to themselves as possible ; and if any, wiser than the rest, projects anything for the common good his office expires at the end of the year and his labour is frustrated, and in practice the office of an overseer of the poor seems to be understood to be this:—To keep an extraordinary look-out to prevent persous coming to inhabit with- out certificates, and to fly to the justices to remove them ; and if a man brings a certificate then to caution all the inhabitants not to

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let him a farm of £10 a year, and to take care to kecp him out of all parish offices ; to warn them, if they will hire servants, to hire them half-yearly or by the month, by the week or by the day, rather than by any way that shall give them a settlement, or if they do hire them for a year then to endeavour to pick a quarrel with them before the year’s end, and so to get rid of them. To maintain their poor as cheap as possibly they can ; at all events not to lay out two-pence in prospect of any future good, but ouly to serve the present necessity; to bargain with some sturdy person to take them by the lump, who yet is not intended to take them, but to hang over them in terroremif they shall complain to the justices for want of maintenance. To send others out into the country a begging (for why cannot they go as well as others they will meution, who are less able in body ?) and the feebler they are the

more profitable will be their peregrination. Tobind out poor children apprentices, no matter to whom or to what trade, but to take especial care that the master live in another parish. To move heaven and earth if any dispute happens about a settlement, and in that particular to invert the general rule, and stick at no expense. To pull down cottages. To drive out as many inhabit- ants and admit as few as possibly they can ; that is, to depopulate the parish in order to lessen the poor rate. To be generous, indeed, sometimes, in giving a portion with the mother of a bastard child to the reputed father, on the condition that he will marry her; or with a poor widow (for why should she be deprived of the comforts of matrimony ?)—always provided that the husband is settled else- where. Orif a poor man with a large family appears to be industri- ous they will charitably assist him in taking a farm in some neighbouring parish, and give him £10 to pay his first year's rent with ; and if any of their poor has a mercantile genius they will purchase for him a box, with pins, needles, laces, buckles, and such like wares, and send him abroad in the quality of a petty chapman, with the profits whereof, and a moderate knack of stealing, he can decently support himself, and educate his children in the same industrious way. But to see that the poor shall resort to church, and bring their children there to be instructed ; to con- tract with a master that he shall procure his apprentice at proper times to be taught to read and write; to provide a stock of materials to set the poor on work, to see the aged and impotent comfortably sustained, the sick healed, and all of them clothed with neatness and decency,—these and such like it is to be feared are not so generally regarded as the laws intended and the neces- sity of the case requires."

Dr Burn's remedy was not to abolish overseers altogether, but that, while they or a permanent overseer should collect the rate, a general superintendent over a certain number of parishes should be appointed by the justices at sessions, and the disposal of the rate directed accordingly.

How far the criticism and suggestions made, from those of Sir Matthew Hale downwards from time to time, in- fluenced the legislation already indicated of the 18th century and the early part of the 19th, it is impracticable to discover. One thing is certain, that evils grew apace: ratepayers on the one hand, the poor on the other, political economists and

philanthropists, magistrates and jurists, and observers of every kind were dissatisfied. For the general state of the poor in the beginning of the 19th century as presented to the accurately observant eye and ear of our English Juvenal, we glean more from his Borough than from a pile of statistics. Of the poor who were chargeable to the parish Crabbe says :—

‘To the most we give A weekly dole, and at their homes they live.”

Of the workhouse or house of industry, “the pauper palace which they hate to see,” he speaks mournfully. In prose he wrote of the poor who “must be considered in every place as a large and interesting portion of its inhabitants,” condemning the workhouse system, alike the pauper palace and the house rented for the poor,—the

‘¢ House that holds the parish poor, Whose walls of mud scarce bear the broken door.”

A closer examination of the system of maintaining the Enumera-

poor than could be obtained by casual visitors, or even constant residents having no special duty to examine or

tion and classifica- tion of

inquire, showed, in full accord with the public criticism ,.i),

already examined, and in spite of it, that the fund which the famious statute of Elizabeth directed to be employed in setting to work children and persons capable of labour, but using no daily trade, and in the necessary relief of

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the impotent, was by degrees applied to purposes opposed to the letter and still more to the spirit of that law, and destructive to the morals of the most numerous class and to the welfare of all. The great source of abuse was the relief afforded out of the workhouse to able-bodied persons,—a class never intended by the legislation as fit objects. The description of relief was also

very objection- able. Its most usual form was that of relieving the applicants either wholly or partially from the expense of obtain- ing house room. Partial relief from that expense was given or professed to be given by exempting the occupants of a cottage or apartment from the payment of rates on the ground of poverty, and in a great number of cases by paying the rent out of the parish fund. Relief afforded in money to the able-bodied on their own account or on that of their families was still more prevalent. This was gene- rally effected by one of the five following expedients :— (1) relief without labour, (2) the allowance system, (3) the roundsmen system, (4) parish employment, (5) the labour- rate system. (1) The relief without labour was by the parish giving to those who were or who professed to be without em- ployment a daily or weekly sum, without requiring from the applicant any labour. (2) " Allowance" sometimes com- prehended all parochial relief afforded to those who were employed by individuals at the average rate of wages of the district, and was sometimes confined to the relief which a person so employed obtained on account of his children, in that case any relief obtained on his own account being termed "payment of wages out of rates." In some places allowance was given only occasionally or to meet occasional wants, for instance, to buy clothing or food or to pay the rent of a cottage or apartment. Sometimes the income of the poor was regulated by the name of "scales"—giving in money the price of so many loaves of bread or of a specific measure of flour, according to the number of the family. (3) The roundsman (or, as it was sometimes termed, the billet, or ticket, or item) system was the parish paying the occupiers of property to employ the applicants for relief at a rate of wages fixed by the parish, and depend- ing, not on the services, but on the wants of the applicants, the employer being repaid out of the poor rate all that he advanced in wages beyond a certain sum. According to this plan the parish in general made some agreement with a farmer to sell to him the labour of one or more paupers at a certain price, paying to the pauper out of the parish funds the difference between that price and the allowance which the scale, according to the price of bread and the number of his family, awarded to him. It received the local name of billet or ticket system from the ticket signed by the overseer which the pauper in general carried to the farmer as a warrant for his being employed, and afterwards took back to the overseer, signed by the farmer, asa proof that he had fulfilled the conditions of relief. In other cases the parish contracted with a person to have some work performed for

him by the paupers, at a given price, the parish paying the paupers. In many places the

This was easily accounted for “by many causes, including the trouble and difficulty attendant upon superintendence on the part of parish officers.” (5) An agreement among the ratepayers that each of them should employ and pay out of his own money a certain number of the labourers settled in the parish, in proportion not to his real demand for labour but to his rental or to his contribution to the rates, or to the number of horses that he kept for tillage, or to the number of acres that he occupied, or to some other fixed standard, has been denominated the labour-rate system. This system was generally enforced by an addi- tional voluntary rate on those who did not employ their full proportion.

As illustrating the difficulties attendant upon providing for the poor, a temporary Act passed in 1832, which has disappeared from the statute book (as founded on vicious notions), may be noticed, applying to parishes where the poor rates exceeded 5d. in the pound. It recited that, notwithstanding the many laws in force for the relief and employment of the poor, many able-bodied labourers are frequently entirely destitute of work or unprofitably employed, and in many instances receive insufficient allowance for their support from the poor rates, and “ the mode of providing employment for the poor which may be expedient in some parishes may be inexpedient in others, and it may therefore be desirable to extend the powers of parish vestries in order that such a course may be pursued as may be best adapted to the peculiar circumstances of each parish,” and enabled vestries (without interfering with Gilbert’s Act), with the approval of justices at petty sessions, to make special agreements solely for the pur- pose of employing or relieving the poor of the parish.

The following table exhibits the growth of the poor rate from the middle of the last century to a date immediately preceding the reforms effected in 1834 :—

Per Head of

Years. Estimated Population Expended on the of England and Wales. | Relief of the Poor. | the Population. ge Gh Gh 1750 6,467,000 689,000 ee”

1760 6,736,000 965,000 3 0 1770 7,428,000 1,306,000 3. 6 1780 7,953,000 1,774,000 4 5 1790 8,675,000 2,567,000 5 11 1800 9,140,000 3,861,000 8 5 1810 10,370,000 5,407,000 10 8 1818 11,702,000 7,890,000 13 4 1820 12,046,000 7,329,000 12 2 1830 18,924,000 6, 829,000 9 9 1832 14,372,000 7,036,000 9 9

It will be observed that subsequent to 1818 there was an apparent diminution in the whole sum expended for the relief of the poor, making a difference of between 11 and 12 per cent.; but the decline in the prices of the necessaries of life (wheat alone had fallen considerably,— more than one-half in one of the intermediate years) was more than equivalent to the difference.

The conviction, arising principally from the increase of Commis. the poor rates, that a change was necessary either in the sion of in- poor law as it then existed or in the mode of its administra- quiry.

roundsman system was carried out by means of an auction, all the unemployed men being put up to sale periodically, sometimes monthly or weekly, at prices varying according

to the time of year, the old and infirm selling for less than the able-bodied. (4) As for parish employment, although work is made by the statute of Elizabeth a condition pre- cedent to relief otherwise than in the case of the impotent, and it is a duty of the parish officers to provide it, pay- ment by them for work was the most unusual form in which relief was administered. Scarcely more than one- twentieth part of the sum yearly expended for the relief of the poor at the period immediately preceding the inquiry that led to the amendment of the law in 1834 was paid for work, including work on the roads and in the workhouses.

tion led to the issuing of a commission in 1832 “to make diligent and full inquiry into the practical operation of the laws for the relief of the poor in England and Wales, and into the manner in which those laws were administered, and to report their opinion as to what beneficial altera- tions

could be made." The result of this inquiry was laid before parliament in 1834. The commissioners reported "fully on the great abuse of the legislative provision for the poor as directed to be employed by the statute of Elizabeth," finding "that the great source of abuse was the out-door relief afforded to the able-bodied on their own

Poor-Law Amend- ment Act,

1834.

Poor-Law Commis- sioners.

Forma- tion of districts and poor- law unions,

Cost of adminis- tration,

account or on that of their families, given either in kind or in money." They also reported that "great maladminis- tration existed in the workhouses." To remedy the evils they proposed considerable alterations in the law, and the principal portion of their suggestions was embodied in the Poor-Law Amendment Act, 1834 (4 & 5 Will. IV. c. 76).

The Act was based on the principle that no one should be suffered to perish through the want of what is necessary for sustaining life, but at the same time that if supported at the expense of the public he must be content to receive such support on the terms most consistent with the public welfare; and the objects of the Act were first to raise the labouring classes, that is to say, the bulk of the commun- ity, from the idleness, improvidence, and degradation into which the maladministration of the laws for their relief had thrown them, and, secondly, to immediately arrest the progress and ultimately to diminish the amount of the pressure on the owners of lands and houses.

Under the Act three commissioners were appointed (originally for five years, but subsequently continued from time to time) styled "the Poor-Law Commissioners for England and Wales," sitting as a board, and appointing

assistant commissioners and other officers. The adminis- tration of relief according to the existing laws was sub- ject to their direction and control, and to their orders and regulations for the government of workhouses and the guidance and control of guardians and vestries and the keeping and allowing of accounts and contracts, without interfering with ordinary relief in individual cases.

The favourable state of the country at the time present- ing many facilities for the introduction of the law, which it was important to render available with as little delay as possible, the whole of England and Wales was divided into twenty-one districts, to each of which an assistant commissioner was appointed. The commissioners under their powers (gradually put into operation—a circumstance which beneficially affected legislation of the period, as, for example, the commutation of tithes and the introduction of police) formed poor-law unions by uniting parishes for general administration, and building workhouses, guardians elected by the ratepayers (or ex officio) having the general government and administration of relief. The expense was apportioned to each parish on settled principles and rules, with power, however, to treat the united parishes as one for certain purposes. Outdoor relief might be given, on the order of two justices, to poor persons wholly unable to work from old age or infirmity. No rule appears to have been more fully sanctioned by practical results as of an advantageous nature than that under which the country was by degrees parcelled out into unions. In parishes no adequate power existed for carrying into effect the rules and regulations of the amended system. No principle of classification could be adopted within the workhouses, and the law was liable to be thwarted in its most material objects by petty interests of a local and personal character. With the aid of boards of guardians and their subordinate officers these interests were neutralized, and the law was rendered uniform in its operation. The economical advan- tages derived from acting on an enlarged scale are self- evident. Waste unavoidably takes place when the purchase of supplies for a single parish forms a separate transaction.

The second report of the commissioners showed that of one hundred and ten unions which had been in operation more than a year, the saving in forty-three of the largest was 46 per cent.; in twenty-four of the smallest

unions the rate of saving was not more than 29 per cent.; and im twenty-six unions of intermediate size a saving of 42 per cent. was effected. Even in many parishes not then included in a union the wide promulgation of the prin- ciples of the amending Act gave an impulse to improve-

ment in the administration of the poor laws, which was attended by a marked reduction in the expenditure.

The total amount of money expended in the relief of the poor in England and Wales during the twelve years prior to the passing of the Poor-Law Amendment Act (1823 to 1834) amounted to upwards of £76,096,000, and during the twelve subsequent years to less than £57,247,000. As the commissioners early remarked—

**Tt could not be expected that an Act which so materially dis- turbed the distribution of as large a sum of money as £7,000,000 per annum, which of neccssity changed the source from which a large portion of the inhabitants of the country derived their customary means of subsistence, and which in so doing opposed itself not only to the interests, the prejudices, and the fears of a large portion of the population, but pressed hardly on the sincere though mistaken notions of charity which were established in the hearts of others, could possibly be carricd into effect without difficulty and resistance.

The obstacles which the Act had to contend with in the The me- metropolis chiefly arose from the confusion and perplexity tropolis.

of jurisdiction which existed in the one hundred and seventy parishes comprised within the city of London and the metropolitan district, some of these containing govern- ing bodies of their own; in some the parish business was professedly managed by open vestries, in others by select vestries, and in addition to these there were elective vestries, under Sturges Bourne’s Act, Sir John Hobhouse’s Act, and other Acts; and the majority of the large parishes were managed under local Acts by boards of directors, governors, and trustees, These governing bodies executed a great variety of functions besides regulating the management of the poor. The power,

patronage, and the indirect advantages which arose from the administra- tion of the local funds were so great that much opposition took place when it was proposed to interfere by constitut- ing a board to be annually chosen and freely elected by the ratepayérs, on which the duty of regulating the expendi- ture for the relief of the poor wasto depend. The general management of the poor was, however, on a somewhat better footing in London than in the country.

Some opposition was experienced to the introduction of The old

the full benefits of the Act into the unions incorporated under Gilbert's Act, many provisions of which conflicted with the new system. On the early dissolution of seven- teen of those incorporations by the commissioners under their powers, it was found, however, that the rates were sensibly diminished. Much resistance of a general nature was encountered, Not only was the economical working of the new principles of management disputed, but a strong feeling was aroused against what was thought to be the inhumanity of the rigorous rules to which paupers had to submit in workhouses. While many proofs existed of the necessity for the introduction of a new system—such as that, while wheat was rotting in pauperized and as yet unreformed districts of the south of England for want of reapers at 21s. and 24s. an acre, at the very same time able-bodied healthy men were lying under the hedges in another part of the same county with a parish allowance of 3s. a week—on the other hand, it was felt as a grievance that old couples were refused relief at their own houses, and that if they entered the workhouse the sexes were separated. Throughout the country the reproachful name of " Bastille" was attached to the workhouse, and this is in many districts still retained, though no longer as an intended censure. In part of Devonshire prejudice was carried to the extent of a rumour leading poor persons to believe that the bread distributed by the relieving officers was mixed with poisonous ingredients.

Both Houses of Parliament were inundated for years with petitions against the new system; meetings were held at which inflammatory language was used; and in

Medical attend- ance.

soine instances riotous proceedings marked the opposition. It was remarked that the acts of violence were in the most pauperized districts, which had been conspicuous for the maladministration of the poor rates. The work, however, went forward, although three parliamentary committees (one of the Lords and two of the Commons) instituted a searching and severe scrutiny before the organization of the system was completed. Notwithstanding adverse cir- cumstances, including stagnation of trade, cold weather, and an epidemic of great severity, by the end of 1837 nearly the whole of England had bcen formed into unions ; the benefits of the new system were gradually recognized, and a poor law was introduced into Ireland (see IRELAND). As to poor-law administration in Scotland see ScoTLaND. The reform of the poor laws affected a variety of persons besides paupers and ratepayers. No question was morc widcly discussed than that of medical attendance on the sick poor. The outdoor relief of the sick was usually effected by a contract with a surgeon, which, how- ever, in general only included those who were parishioners. When non-parishioners became chargeable from illness, an order for their removal to their place of settlement was obtained, which was suspended until they could perform the journey ; in the meantime they were attended by the local surgeon, but at the expense of the parish to which they belonged. The poor-law commissioners in their report of 1834 stated that on the whole medical attend- ance scemed in general to be adequately supplied and economically, considering only the price and the amount of attendance. Great good was effected by the establish- ment of dispensaries promoted by Mr Smith of Southam to enable the labouring classes to defray, from their own resources, the expense of medical treatment. While stat- ing that the country was much indebted to him for his exertions, the commissioners were not prepared to suggest any legislative measures for their encouragement ; but dis- pensaries have been recently applied to the relief of the poor in the metropolis. The medical and surgical asso- ciation (now the British Medical Association), of which Sir Charles Hastings was president, took up the sub- ject, and a committee, over which Dr Davis (of Presteign) presided, made an inquiry and report,—by no means in hostility to, but in full accord with, the chiefs of the new poor-law administration. The present mode of giving

It is to be observed that the relief of the poor of every union governed by a local Act is administered by a board of guardians elected according to the Poor-Law Acts.

Although containing very important provisions, the Act of 1834 was rather to restore the scope and intention of the statute of Elizabeth by placing its administration in the hands of responsible persons chosen by the ratepayers, and themselves controlled by the orders of a central body, than to create a new system of poor laws.

The agents and instruments by which the administration of relief is afforded are the following.

The guardians of the poor regulate the cases and description of Guar- relief within the union; a certain number of guardians are elected dians.

from time to time by the ratepayers. The number is determined by the central board, by whom full directions as to the mode of election are given. In addition to those elected there are ex officio guardians, principally local magistrates. ‘The guardians hold their meetings frequently, according to the exigencics of the union. Indi- vidual cases are brought to their notice,—imost cascs of resident poor by the relieving officer of the union, the case of casual paupers by him or by the workhouse officers by whom they were admitted in the first instance. The resident poor frequently appear in person before the guardians. The mode of voting which the guardians fol- low in respect to any matter they differ on is minutely regulated, and all their proceedings as well as thosc of their officers are entered in prescribed books and forms. They havea clerk, generally a local solicitor of experience, who has a variety of responsible duties in advising, conducting correspondence and keeping books of accounts, and carrying out the directions of the guardians, who in their turn are subject to the general or special regulations of the central board. The various officers of the union from the medical officer to work- house porters, including masters and matrons of workhouses, are generally appointed by the guardians ; and the duties of all the officers are specifically prescribed by the regulations issued by the central board.

Among a multitude of miscellaneous duties and powers of the guardians, apart from the ordinary duties of ordering or refusing relief in individual cases and superintending the officers of the union, the duties devolve on them of considering the adjustment of contributions to the common fund whether of divided or added parishes, and matters affecting other unions, the building of work- houses and raising of money for that and other purposes, the taking of land on lease, the hiring of buildings, special provisions as to superannuation and allowances to officers, the maintenance and orders as to lunatics apart from individual instances, and the con- sideration of questions of settlement and removal.

: bate t ; 1883). In relation to expenditure the guardians have very con- “yatta ho a Pio pete . siderable but restricted powers. Among other officers they ap- Local After an intermediate transfer in 1847 of the powers of | point a treasurer for the union. Govern- the poor-law commissioners, and, the constitution of a fresh Overseers of the poor are still appointed under the statute of Over- eat board styled “commissioners for administering the laws | Elizabeth, and the guardians cannot interfere with the appoint- seers. Board. ment. As, however, the relief of the poor is now administercd by

for relief of the poor in England,” it was found expedient to concentrate in one department of the Government the supervision of the laws relating to the public health, the relief of the poor, and local government ; and this concen- tration was in 1871 carried out by the establishment (by Act of Parliament 34 & 35 Vict. c. 70) of the Local Govern- ment Board.

In the subsequent part of this article the governing board, whether the original poor-law commissioners or commissioners for administering the laws for relief of the poor, or the present local government board, is spoken of as the central board, as the orders at present in force are of various dates, and chiefly issued before the existence of

boards of guardians, the principal duties of overseers relate to the making and collecting of rates and payments. The guardians, by order of the central board, may appoint assistant overseers and collectors.

ing every workhouse and place wherein any poor person in receipt of relicf is lodged, attending meetings of boards of guardians and every local

mceting at which general questions may be raised or discussed, and taking part in meetings but not votingat them. The inspectors have great powers in calling before them and examining persons and books and proceedings. Besides the usual inspectors, persons may be appointed by the central authority to act im con- ducting special inquirics. ;

Provisions relating to cxpenditure and the audit of accounts are noticed in a subsequent part of this article.

Inspectors appointed by the central authority assist in Inspec- the execution of the poor laws by periodically visiting and inspect- tors.

Some principles connected with the system of poor-law Prin- adniinistration call for concise notice. eS

As the right to relief exists, the law recognizes the oe obligation to afford it to persons unable to maintain them- aqminis- selves. The refusal of the officers whose duty it is to give tration it is an indictable offence; and, although a means of of relief. punishment does not constitute a remedy, it scems a mandamus to guardians of the poor will, in extreme and exceptional cases, be granted. The lability to summary

the prescnt local government board.

By numerous Acts of Parliament passed subsequent to the Amendment Act of 1834 the administration of relief has been affected in various ways. It would be an unpro- fitable task, and inconsistent with the objects and limits of this article, to give a chronological summary of those Acts down to the present time, but they are taken into account in treating of various heads of poor-law adminis- tration.

Obliga- tion to make use of public provision.

Privatere- lief not an offence.

proceedings now, however, operates as a preventive to neglect of duty. If, by reason of the neglect of overseers to collect rates or to pay the guardians of the poor, any

relief directed by the guardians to be given to any poor |

person is delayed or withheld, or if overseers disobey a justice's order to give temporary relief, or if any officer wilfully neglects or disobeys the orders of the central board, penalties are incurred. The control of the central board is, except in very rare cases, found effective to secure the due administration of the law. :

The recognition of the right to relief as a legal claim allows and indeed necessitates the imposition of restraints, apart from provisions connected with the law of settlement and removal, more fully noticed hereafter. Persons, how- ever poor, wandering abroad to beg or gather alms, or placing themselves in any public place for that purpose, become subject to the vagrancy laws.

Private relief, pecuniary or otherwisc, may be asked for and obtained so long as it does not involve any false pretence or dishonest or prohibited means of gaining a livelihood. Any person able by work or other means to maintain himself or his family, who, by wilful refusal or neglect to do so, becomes chargeable for any part of his family, commits an offence. Poverty or idleness short of this, and apart from the case of liability in respect of children under elementary and industrial school Acts, is not an offence against the law.

There are circumstances, however, where relative lia- biliti¢s make it a duty for persons to avail themselves of the public provision for relief. The culpable neglect of a person to provide another under his contro] and in his legal custody, who is actually helpless, as an infant or lunatic, with the means of life constitutes a crime, and by the express provision of a poor-law Act any parent wilfully neglecting to provide adequate food, clothing, medical aid, or lodgings for his child, being in his custody under the age of fourteen, whereby the health of such child is or is likely to be seriously injured, may be summarily convicted (31 & 32 Vict. c. 122), in analogy to the law making it an indictable misdemeanour for a master or mistress who

is legally liable to provide any apprentice or servant with |

necessary food, clothing, or lodging, wilfully and without lawful excuse to refuse or neglect so to provide (24 & 25 Vict. c. 100). Something more than the mere abstention from seeking parochial relief without any intentional neglect is necessary to lay a criminal as distinguished from a moral responsibility on destitute persons.

Although under the vagrancy laws public begging is an

offence, the giver of such unlawful charity is not subject |

to legal restraint. In early times attempts were made to impose such restraints. An Act of 1349 (23 Edw. IIL c. 7) provided that none on pain of imprisonment should under colour of piety or alms give anything to a beggar who was able to labour, and nearly two centuries later an Act (22 Hen. VIII. c. 12) already noticed, relating to poor compelled to live by alms, and the punishment of vagabonds and beggars, provided that any person giving any harbour, money, or lodgings to any strong beggar who violated the statute should make such fine to the king as

the justices in sessions should appoint ; and as late as the |

commencement of the 17th century givers to beggars were subject to a penalty (1 Jas. I. c.7). These Acts, however, eventually disappeared from the statute book.

Dr Burn advocated, as has been seen, the infliction of a penalty for relieving a common beggar; but, although

aiders and abettors in the commission of even petty |

offences are now punishable, it is not attempted to apply the law to bestowers of charity, whether in the streets and highways or elsewhere.

It is in vain to impose the doctrines of political economy —

(11 & 12 Vict. c. 110).

family until they become “ emancipated.” | minority of a child there can be no emancipation, unless

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in restraint of natural instincts. Such doctrines are scattered as chaff before the wind when opposed by the teachings of the nursery rhymes of “The Beggar’s Petition,” or to the fascinating description where the beggar figures as “a well-remembered guest,” or to the sympathy enlisted by Charles Lamb’s essay “ A Complaint of the decay of Beggars in the Metropolis.”

Although in most cases the relief given to the poor is practically a gift, and does not constitute an available debt, the plan of giving relief by way of advance as a loan was introduced early in the present century, and the Poor-Law Amendment Act (1834) enacted that any relief, or the cost thereof, which shall be given to or on account of any poor person above the age of twenty-one or to his wife or any part of his family under the age of sixteen, and which the said commissioners shall by any rule, order, or regulation declare or direct to be given or considered as given by way of loan, and whether any receipt for such relief, or engagement to pay the same, or the cost price thereof, or any part thereof, shall have been given or not by that person to or on account of whom the same shall have been so given, shall be considered, and the same is hereby declared to be, a loan to such poor person (4 & 5 Will. [V. c. 76, § 58). By the same Act power was given to enforce payment by means of a summons before justices to attach wages. A subsequent statute gives power to the guardians to recover loans to paupers in the county court By order of the central board, guardians may, in the cases within the provision of the Poor-Law Amendment Act above set out, give relief by way of loan, but no relief contrary to the regulations can be given in this way. The restriction was necessary, as formerly some guardians granted outdoor relief by way of loan contrary to the recent principles of administration of relief.

The criminal liability of parents and others in loco parentis to provide sustenance has been considered. The purely civil liability for necessaries under implied con- tracts is of course outside the scope of this article, but there is an express liability created by the poor laws. The liability of the

father and grandfather and the mother and grandmother and the children of poor persons under the statute of Elizabeth has been set out in an earlier part of this article. The statute extends only to natural relations. The liability is enforced by orders of magis- trates after chargeability, who adjudicate as to the amount after hearing the facts and taking into consideration the ability of the relative. The relief of actual destitution should always precede investigation as to the liability of other persons than the parish to contribute to it. Indeed actual chargeability to the union is in general a condition precedent to an order upon the relative.

In treating of the persons entitled to relief it may be mentioned that, in accordance with the general law, a wife is to be treated as one with her husband who is compel- lable to maintain her ; and, as on the one hand the wife is

_ entitled under ordinary circumstances to relief equally

with the husband, the latter is the person to apply for and

| to receive relief.

With respect to children, they form part of the father’s During the

he marries and so becomes himself the head of a family,

_or contracts some other relation so as wholly and _ per-

manently to exclude the parental control. By the amendment of the poor laws in 1834 all relief

| given to or on account of the wife, or children under | sixteen, not being blind or deaf and dumb, is considered

as given to the husband or father as the case may be; and any relief given to children under that age of a

Relief by way of loan.

Liability of rela- tions.

The exigen- cies ne- cessitat- ing re- lief.

Nature

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widow is considered as given to her (4 & 5 Will. IV. c. 76, § 56); but this provision does not interfere with the liability imposed by the statute of Elizabeth. Further a man marrying a woman having legitimate or illegitimate children is liable to maintain them as part of his family, and is chargeable with all relief on their account until they attain sixteen or until the death of the mother (idid., § 57). A married woman having separate property is

liable for the maintenance of her husband and children |

on their becoming chargeable (45 & 46 Vict. c. 75).

The position of illegitimate children and their parents stands on a distinct foundation. Bya statute of 1576 (18 Eliz. c. 3) justices were einpowered at discretion to charge the mother and reputed father of bastards with their maintenance on the pain of imprison- inent in default. ‘The principle of this statute, renewed and not expressly repealed until recently, is carried out now, after receiving repeated attention, especially on the great reform of the poor laws and administration of relief in 1834, by an order of maintenance on the reputcd father, at the instance of the mother, or where the child is actually chargeable to a union or parish at the instance of the guardians. Such order is in force until the child is thirteen, and in some instances until sixteen. The main features of the Acts are concisely stated in the article BASTARDY.

The conditions of persons entitled to relief are indicated by the terms of the statute of Elizabeth. If they fall within the definitions there given they have right to relief. A fundamental principle with respect to legal relief of the poor is that the condition of the pauper ought to be, on the whole, less eligible than that of the independent labourer. The pauper has no just ground for complaint,

if, while his physical wants are adequately provided for, | his condition is less eligible than that of the poorest class |

of those who contribute to his support.

Although a fund has become a practical necessity, it should be always borne in mind that he who claims it is not honest if his own labour and work can suffice to pro- vide for his wants. It is as immoral and unjust to take unnecessarily from the industrious and saving by force of a law made and a tax raised for other objects as it would be for a labourer of equal means to pillage and take from the pocket of his fellow labourer.

If a state of destitution exists, the failure of third per- sons to perform their duty, as a husband, or relative men-

tioned in the statute of Elizabeth, neglecting those he |

is under a legal obligation to support, is no answer to the application. The relief should be afforded, and is often a condition precedent to the right of parish officers to take proceedings against the relatives or to apply to other poor unions. The duty to give immediate relief must, however, vary with the circumstances. wanderers under circumstances not admitting of delay may be different from that of persons resident on the spot where inquiry as to all the circumstances is practicable. The statute of Elizabeth contemplated that the relief was to be afforded to the poor resident in the parish, but it is contrary to the spirit of the law that any person shall be permitted to perish from starvation or want of medical assistance. Whoever is by sudden emergency or urgent distress deprived of the ordinary means of subsistence has a right to apply for immediate relief where he may happen to be. Persons comprehended within this class are called “casual poor,” although the term “casuals” is generally used in reference to vagrants who take refuge for a short time in the “casual wards” of workhouses.

Various tests are applied to ascertain whether applicants are really destitute. Labour tests are applied to the able- bodied, and workhouse tests are applied to those to whom entering a workhouse is made a condition of reliet.

As to the nature and kind of relief given under the

and kind poor Jaws the great distinction restored rather than intro-

of relief.

duced by the amendment of the poor-law system in 1834 was giving all relief to able-bodied persons or their families

The case of

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in well-regulated workhouses (that is to say, places where they may be set to work according to the spirit and inten- tion of the statute of Elizabeth), and confining outdoor relief to the impotent—that is, all except the able-bodied and their families. Although workhouses formed a con- spicuous feature in legislation for the poor from an early period, the erection of those buildings for unions through- out the country where not already provided followed imme- diately on the amendment of the system in 1834. Since that time there has been a constant struggle between the

| pauper class and the administrators of the law, the former

naturally wishing to be relieved at their own homes, and in many instances choosing rather ta go without aid than to remove within the walls of the workhouse.

Relief given in a workhouse is termed ‘‘in (or indoor) mainten- ance” relief, and when given at the homes of the paupersis termed ‘¢ outdoor relief.” The regulations, accounts, and returns to parlia- ment, as well as the principles governing relief, are based on these distinctions. It is impossible, however, to apply rigid principles very closely, or rather the exceptions in practice are so numerous that the majority of resident poor are relieved at their own homes by being supplied with necessaries in kind, or by payment either wholly or-in part in coin, as circumstances are held to demand or warrant. The general order is that every able-bodied person, male or female, requiring relief shall be relieved only in the workhouse, together with such of the family as may be resident with such able- bodied person, and not in employment, including his wife residing with him. The exceptions made are where the person requires relief on account of sudden and urgent necessity, or on account of any sickness, accident, or bodily or mental infirmity affecting such person or any of his family ; where relief is required for the pur- pose of defraying the expenses of burial of any of the family ; in the case of widows, relief in the first six months of her widowhood when she has legitimate children dependent upon her incapable of earning a livelihood, and has no illegitimate children born after her widowhood. Further relief in or out of the workhouse may be given by guardians in their discretion to a wife or children of an able-bodied man not resident within the union.

By the Industrial School Act any child found begging or receiving alms (whether actually or under the pretext of selling or offering for sale anything), or being in any street or public place for the purpose of begging or receiving alms, or found wandering and not having any home or settled place of abode or proper guardianship or visible means of subsistence, or found destitute, either being an orphan or having a surviving parent who is undergoing penal ser- vitude or imprisonment, or that frequents the company of reputed thieves (as also in some other cases recently added), may be sent to a certified industrial school, and while a school is being found justices may order detention for a week in the workhouse.

In the metropolis justices have power to cause inmates of dan- gerous structures to be received into a workhouse.

Besides workhouses, district asylums are provided for the desti- tute poor in certain places. Under the Poor-Law Amendment Act, 1844, reciting that it was expedient that more effectual means should be provided for the temporary relief of poor persons found destitute and without lodgings within the district of the metro- politan police or the city of London, and in Liverpool, Manchester, Bristol, Leeds, and Birmingham, district boards were established, by which provision is made for such temporary relief and setting to work therein of any poor person found destitute within any such district, not professing to be settled in any parish included in it and not known to have any place of abode there and not charged with any offence under the Vagrant Act.

In 1867 under the Metropolitan Poor Act of that year unions and parishes in the metropolis were by order of the board formed into asylum districts, in each of which there is one asylum or more for the reception and relief of the sick, insane, or infirm, under a body of managers partly elective and partly nominated by the board, who build or hire asylums and furnish them, and appoint committees. The attendance at the asylum of a special cominissioner of lunacy

| is provided for. Special provision is made as well for outdoor as

indoor medical relief by providing dispensarics and the dispensing of medicines, with regulations for the appointment of medical officers in the district.

The necessarily large expenditure for the asylums is principally defrayed by a fund called the metropolitan common poor fund, by contributions from the several unions, parishes, and places in the metropolis. The amount of the respective assessments is deter- mined by the local government board according to the valuation lists (noted hereafter) or on such other basis as the board direets, the contribution being enforced by a precept of the board ; and the bodies called on to pay levy the amount by a rate on occupiers of ratcable property in the naturc of a poor rate.

Work- house rules.

Admission to a workhouse may be by a written order of the board of guardians, or by the master or matron (or in their absence by the porter) withont an order in any ease of sudden or urgent necessity, or provisionally by a relieving officer, or overseer, or churechwarden. Any person who is brought by a polieeman as having been found wandering in a state of destitution may be admitted. It is to be observed generally, with respect to all per- sons who may apply for admission into the workhouse under circumstances of urgent necessity, that their destitution, eoupled with the fact of being within the union or parish, entitles them to relief, altogether independently of their settlement (sce below), if they have one, which is a matter for subsequent inquiry.

The regulations for the government of workhouses fall under two classes :—(1) those which are necessary for the maintenance of good order in any building in which considerable numbers of persons of both sexes and of different ages reside ; (2) those which are necessary in order that these establishments may not be alms- houses, but workhouses in the proper meaning of the term.

The inmates of a workhonse are necessarily separated into certain elasses. In no well-managed institution of this sort, in any country, are males and females, the old and the young, the healthy and the sick, indiscriminately mixed together. The general classification of paupers in the workhouse so far as the structure admits is as follows :—Class 1, men infirm through age or any other cause; Class 2, able-bodied men, and youths above the age of fifteen ; Class 8, boys above the age of seven and under fifteen ; Class 4, women infirm through age or any other cause ; Class 5, able-bodied women, and girls above fifteen; Class 6, girls above seven and under fifteen ; Class 7, children under seven. ‘To each class is assigned that ward or separate building and yard which may be best fitted for the reception of such class, and each class is without communication with those of any other class. Guardians are re- quired to divide the paupers into the seven elasses, and to subdivide any one or more of these classes in any manner which may be advis- able, and which the internal arrangeients of the workhouse admit; and the guardians are required from time to time, after consulting the medical officer, to make necessary arrangements with regard to persons labouring under any disease of body or mind, and, so far as circumstances

permit, to subdivide any of the enumerated classes with reference to the moral character or behaviour or the previous habits of the inmates, or to such other grounds as may seem ex- pedient.

For example, it is very desirable that females of dissolute and disorderly habits should be separated from those of a good character, for it is the duty of the guardians to take all reasonable eare that the morals of persons admitted into the house be not corrupted by intercourse with inmates of this description ; but this has reference to continued ill-conduct, and is not in any way to be a punishment for offences committed previous to entrance into the workhouse and discontinued before adinission.

The separation of married couples was long a vexed question, the evils on the one hand arising from the former unrestricted practice being very great, while on the other hand the scparation of old couples was felt as a great hardship, and by express statutory pro- vision in 1847 husband and wife, both being above the age of sixty, received into a workhouse cannot be compelled to live separate and apart from each other (10 & 11 Vict. c. 109, § 28). This exemption was carried somewhat further by contemporaneous orders of the board, under which guardians were not compelled to separate infirm couples, provided they had a sleeping apartment separate from that of other paupers ; and in 1876 guardians were empowered, at their discretion, to permit husband and wife where either of them is in- firm, sick, or disabled by any injury, or above sixty years of age, to live together, but every such case must be reported to the local government board (39 & 40 Viet. c. 61, § 10).

Children under seven are placed in such of the wards appropriated to female paupers as may be deemed expedient, and their mothers are permitted to have access to them at all reasonable times; fathers or mothers who may be desirous of seeing any child who is in the same workhouse have a daily interview; and arrangements are made for permitting members of the same family who are in different work- houses of the union to have occasional interviews with each other at such times and in such manner as best suits the discipline of the several workhouses,

Casual and poor wayfarers admitted by the master and matron are kept ina separate ward and dicted and set to work in such manner as the guardians

by resolution direct ; and whenever any vagrants or mendicants are received into a workhouse they ought (as a precaution necessary for preventing the introduction of infec- tious or contagious diseases) to be kept entircly separate from the other inmates, unless their stay exceeds a single night.

The guardians may direct that any pauper inmate of the work- house of any elass, except casual paupers, shall be detained in the workhouse after giving notice to quit it, for limited periods. A casual pauper (that 1s, any destitute wayfarer or wanderer applying a oF receiving relief) is not entitled to discharge himself from a

asual ward before 9 a.m. of the second day following his admission,

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or of the fourth day if he has been previonsly admitted more than once within a month, nor before he has performed the work prescribed for him (Casual Poor Act, 1882).

Infirmaries are attached to many workhonses, especially in the metropolis, and also in some cases there are infirmaries for the poor

| distinet from the workhouse ; all are governed and regulated under

the orders of a central board.

The outdoor labour test order of the local government board Outdoor directs that every able-bodied male pauper who may receive relief relief

within the union out of the workhouse shall be relieved in the following manner :—half at least of the relief given to such pauper shall be given in food, clothing, and other articles of necessity, and no such pauper shall receive relief from the guardians of the union or any of their officers or any overseer while he is employed for wages or other hire or remuneration by any person ; but every such pauper shall be set to work by the guardians. The kind of work is reported to the board. A departure from the order is, however, per- mitted if approved by the board.

To prevent the practice formerly prevailing in some parts whereby the poor rates were used for the payment of rents directly to the landlords, the guardians and parish officers are prohibited from paying the rent of the house or lodging of any pauper, or applying any relief in such payment directly or indirectly, This does not apply, however, to any shelter or temporary lodging procured in any case of sudden and urgent necessity, or mental imbeeility; nor does it prevent the guardians, in regulating the amount of relief to be afforded to any particular person, from considering the expense to be incurred in providing lodging. This allows of supplying to the pauper the means of paying for a lodging instead of requiring him to come into the workhouse in such exceptional cases.

Modern remedial legislation and public efforts conneeted with improved dwellings for labourers and artisans, as well as for the poor generally, are distinct from the laws for the compulsory relief of the poor, —although, like education, the whole subject of ameliora- tion of classes admits in some of its aspects of being viewed together. The allotment of land to industrious poor has been also of great service (Allotments Extension Act, 1882),

Guardians having greater provision for the reception of poor children in their workhouse than they require may with the eon- sent of the board contract with the guardians of any other union or parish for the reception, maintenance, and instruction of any poor children under sixteen being orphans or deserted by their parents or whose parents consent (14 & 15 Vict. c. 105; 29 & 380 Vict. e. 113),

A consolidated order comprising workhouse regulations Education prescribes that the boys and girls who are inmates of a and

workhouse shall, for three of the working hours at least every day, be instructed in reading, writing, arithmetic, and the principles of the Christian religion, and such other instruction shall be imparted to them as may fit them for service, and train them to habits of usefulness, industry, and virtue.

In relation to education of poor children out of the workhouse there has been much legislation. To go no farther back, the Act of 1855, providing for the education of children in the receipt of outdoor relief (18 & 19 Vict. c. 34, known as Denison’s Act), was superseded in 1873 by the Elementary

Education Act of that year (36 & 37 Vict. c. 86), containing a special clause for the education of children relieved out of the workhouse and the pay- ment of school fees, but this clause was in turn repealed by the Elementary Education Act, 1876 (39 & 40 Vict. ¢. 79), making it the duty of every parent to cause a child to receive efficient elementary instruction in reading, writing, and arithmetic. See Epucarion.

By this Act a provision substituted for that of 1873 enacts that where relief out of the workhouse is given by the guardians or by their order by way of weekly or other continuing allowance to the parent of any child above the age of five years who has not reached the standard in read-

| Ing, writing, and arithmetic prescribed by a certain code,

or who for the time being either is prohibited by the Act from being taken into full time employment, or who by any bye-law under the earlier Elementary Education Act of 1870 is required to attend school, it shall be a condi- tion for the continuance of such relief to the parent or child that elementary education in reading, writing, and aritlmetic shall be provided for such child, and the

Ap- prentice- ships.

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guardians are required to give such further relicf (if any) as may be necessary for that purpose. Such relief cannot be granted on condition of the child attending any public elementary school other than such as may be selected by the parent, nor refuscd because the child attends or does not attend any particular public elementary school. More- over the guardians have no power under this provision to give any relief to a parent in ordcr to enable such parent to pay more than the ordinary fee payable at the school which he selects, or more than the fee which under the provisions of the Act they can enable a parent to pay in any other case. All relief given by the guardians under this provision is deemed to be relief within the meaning of the poor laws and payable out of their common fund (39 & 40 Vict. c. 79, § 40; sce also § 34). A child can- not, as a condition of the continuance of relief out of the workhouse under the above provision, be required to attend

school further or otherwise than is obligatory by any bye-law of a school board (43 & 44 Vict. c. 23, § 5). Moncy given for the payment of school fees for any child of a parent who is not a pauper and is resident in any parish is charged by the guardians having jurisdiction to that parish with other parochial charges (39 & 40 Vict. § 35).

The education of poor children is closely connected with the system of "boarding out," as it is termed. The guardians of certain unions are empowered to board out pauper children in homes beyond the limits of the union, provided the guardians have entered into approved arrangements which include education (boarding-out order 1870); and by a statute of 1862 (still unrepealed, except so far as by implication provisions are superseded) the guardians of any parish or union may send any poor child to any school certified to the board as fit for their reception and charge the expenses in the same manner as other relief. Unless an orphan or deserted or having the consent of a parent, a child cannot be sent under this statute, and no child can be kept against its will if above fourteen. Such school is open to inspection (25 & 26 Vict. c. 43).

Under the last-mentioned statute, the amount which might be paid by a board of gnardians for the maintenance of a child in an institution certified under that statute was limited to the cost of the maintenance of the child in the workhouse ; but by the Divided Parishes and Poor-Law Amendment Act, 1882, the guardians may pay the reasonable expenses incurred in the maintenance, cloth- ing, and education of the child to an amount sanctioned by the local government board. The board has accordingly sanctioned vates of payment, and in practice, when issuing a certificate, specifics the maximum amount which may be paid by the guardians as a reasonable allowance towards the maintenance of any pauper child sent to the institution.

It is to be observed that the provisions of the Elementary Eduea- tion Acts as to the employment of children by employers in school districts not within the jurisdiction of a school board, consisting of a parish and not a borough, must be enforced by the school com- mittee of guardians of the ution (39 & 40 Vict. c. 79, § iD:

The daily average number of children of both sexes attending the schools of the union workhouses, &c., in England and Wales during the half-year ended at Lady Day 1883 was 26,170. Added to this total there is the average daily attendance at district schools, 7488, and 488 in the metropolitan asylum district, making a total of 34,146. The amount paid to boards of guardians and managers out of the parliamentary grant in respect of the salarics of work- house and district school teachers for the year ending Lady Day 1883 was £38,629, 11s.

Various provisions relating to the apprenticeship of poor children have been noticed in tracing the progress of legisla- tion. Cuardians are not restricted from binding as appren- tices children who are not actually in the receipt of relief or whose parents may not be in the receipt of relief as paupers at the time of the binding. Such children as may ordinarily be considered ‘* poor children” are within the scope of the provisions respecting the apprenticeship of pauper children. But apprenticeship under the poor laws is a species of relief which can only be given subject to the general or special regulations on the subject.

The general orders direct that no child under the age of nine years and no child (other than a deaf and dumb child) who cannot read and write his own name shall be bound apprentice by the guardians, and no child is bound to a person who is under twenty-

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| from the residence of the child at the time of binding.

| fourteen his own consent is required.

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one or who is a marricd woman, or to a person who is not a house- keeper or assessed to the poor rate in his own name, or who is a journeyman or a person not carrying ou trade or business on his own account. And no child can be bound, unless in particular cases, to a master whose place of business is more than 30 miles The term of apprenticeship is discretionary with the guardians, but no apprentice cau be bound for more than eight

years, and if the child is above If under sixteen his father’s consent (or, if his father is dead, his mother’s if living) is necessary. Various preliminaries to the binding are requisite, affecting the health and strength of the child and all attendant circuinstances. When any premium is given it must in part consist of clothes supplied to the apprentice and in part of money to the master. The duties of the master of a pauper apprentice are specially provided for both by statute and by the regulations adopted by the local government board.

In the administration of medical relief to the sick, the Medical are—(1) to provide medical aid for relief.

objects kept in view persons who are really destitute, and (2) to prevent medi- cal relief from generating or encouraging pauperism, and with this view to withdraw from the labouring classes, as well as from the administrators of relief and the medical officers, all motives for applying for or administering medical relief, unless where the circumstances render it

| absolutely necessary.

Unions are formed into medical districts limited in area and population, to which a paid medical officer is appointed, who is furnished with a list of all snch aged and infirm persons and persons permanently sick or disabled as are actually receiving relief and residing within the medical officer’s district. Every person nained in the list receives a ticket, and on cxhibiting it to the medical officer is entitled to advice, attendance, and medicine as his case may require. Medical outdoor relief in connexion with dispen- savics is regulated in asylum districts of the metropolis by the Metropolitan Poor Act, 1867 (30 & 31 Vict. c. 6).

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A lunatic asylum is required to be provided by a county or borough for the reception of pauper lunatics, with a committee of visitors who, among other duties, fix a weekly sum to be charged for the lodging, maintenance, medicine, and clothing of each pauper lunatic confined in such asylum. Medical officers of unions and_ parishes, having knowledge that any resident pauper is or is deemed to be a lunatic, give written notice to

relieving officers or other officers, and such officers, having knowledge either by such notice or otherwise of the fact, must apply to a justice, who requires the relieving officer to bring the pauper before him, or some other justice, calling to his assistance a duly qualified medical man (physician, surgeon, or apothecary), and upon his certificate, and the justice upon view or examination or other proofs being satisfied that such pauper is a lunatic and a proper person to be taken charge of and detained under care and treatment, a written order is made out directing the pauper to De received into such asylum. That is the ordinary mode, but justices may act on their own knowledge, and police – officers have power to apprehend wandering lunatics and take them before justices.

The Metropolitan Poor Act, 1867, already noticed, contains many provisions applicable to insane poor, including the right of the commissioners of lunacy to visit the asyluins.

In some cascs when duly authorized a lunatic may be received into a registered hospital or house duly licensed for the reception of lunatics. No lunatics can be kept in a workhouse more than fourteen days except under special circumstances ; minute pro- visions are made for the care, visitation, and discharge of the lunatics. The central board has made regulations respecting the detention of harmless idiots and other insane persons.

The cost of removal and maintenance is borne by the con:mon fund of the union, and justices sending the pamper, or the visiting justices of an asylum may draw upon the guardians for the amount of the pauper’s maintenance in favour of the treasurer, officer, or proprietor of the asylum. Any property of the lunatic is applic- able to his maintenance. Special provision is made for inquiry into the settlement and adjudicating it, and for payment of costs of maintenance in accordance with the adjudication (16 & dy Viet. c. 97, and subsequent Acts). There are also special provisions as to pauper criminal lunatics and sending them to an asylum at the cost of the common fund of the union as in other cases, —to which

Settle- nent.

Irremov- ability.

expenses, however, the aes property, if he have any (Criminal Lunatics Act, 1884, and Acts there referred to), is applicable.

An increase has taken place for many years past in the number of lunatic paupers. The total numiber of this class of paupers relieved on 1st January 1883 was larger by 1867 than it was on the corresponding day in 1882.

A settlement is the right acquired in any one of the modes pointed out by the poor laws to become a recipient of the benefit of those laws in that parish or place where the right has been last acquired.

No relief is given from the poor rates of a parish to any person who does not reside within the union, except where such person being casually within a parish becomes destitute by sudden distress, or where such person is entitled to receive relief from any parish where non-resi- dent under justice's order (applicable to persons under orders of removal and to non-resident lunatics), and except to widows and legitimate children where the widow was resident with her husband at the time of his death out of the union in which she was not settled, or where a child under sixteen is maintained in a workhouse or establish- ment for the education of pauper children not situate in the union, and in some other exceptional cases.

The progress of the law of settlement may be gathered from the statutes already referred to; and, without again adverting to legisla- tion already noticed, and much more not enumerated, it must be sufficient to point out that immediately before the passing of the Poor-Law Amendment Act, 1834, settlements were acquired by birth, hiring and service, apprenticeship, renting a tenement, estate, office, or payment of rates. In addition to these an acknowledgment (by certificate, of which mention has been made, by relief or acts of acquiescence) has practically the effect of a settlement, for, if unexplained, such an acknowledgment stops the parish from disputing a settlement in the parish acknowledg- ing. The Poor-Law Amendment Act, 1834, abolished settlement by hiring and service (or by residence under it) and by serving an office, and by apprenticeship in the sea service. Moreover

the guardians of a union might agree (subject to the approval of the commissioners) that all the parishes forming it a for the purposes of settlement be considered as one parish.

It is to be observed that, for the purposes of relief, settlement, and removal and burial, the workhouse of any parish is considered as situated in the parish to which each poor person is chargeable.

There may be a settlement by parentage, for legitimate children take the settlement of their father, or if he has no settlement they are entitled to the settlement of their mother ; and it is only when both these sources fail discovery that their right of settlement by birth accrues ; for until the settlement of the father or mother has been ascertained the settlement of a legitimate child, like that of a bastard, is in the place where the birth took place.

A settlement attaches te those persons who have a settlement of some kind. Foreigners born out of the country and not acquiring any in one of the modes pointed out must be provided for, if requiring relief, where they happen to be.

As the burden of maintaining the poor is thrown on the parish of settlement, when the necessity for immediate relief arises in another parish the important question arises whether the pauper canbe removed; for, although the parish where the pauper happens to be must afford immediate relief without waiting for removal, the parish of settlement cannot in general be charged with the cost unless the pauper is capable of being removed. The question of removability is distinct from settlement. A pauper often acquires a status of irremovability without gaining a settlement.

Irremovability is a principle of great public importance quite irrespective of the incident of cost as between one parish or another. Before the introduction of a status of irremovability removal might take place (subject to powers of suspension in case of sickness and otherwise) after any

interval during which no legal settlement was obtained Eas

mere length of residence without concurrent circumstances involving the acquisition of a settlement on obtaining relief gave no right toa person to remain in the parish where he resided.

In 1846 it was enacted that no person should be removed nor any warrant granted for the removal of any

person from any parish in which such person has resided for five years (9 & 10 Vict. c. 66). In 1861 three years was substituted for five (24 & 25 Vict. ¢. 55); and only four years later one year was substituted for three (28 & 29 Vict. c. 79). Apart from these reductions of time in giving the status of irremovability, actual removals to the parish of settlement were narrowed by provisions giving to residence in any part of a union the same effect as a residence in any parish of that union (24 & 25 Vict. c. 55). On the other hand the time during which parish relief is received, or during which the person is in any poorhouse or hospital or in a prison, is excluded from the computation of time (9 & 10 Vict. c. 66).

The removability as well as the settlement of the family, 7.¢., of the wife and unemancipated children, are practically subject to one and the same general rule. Wherever any person has a wife or children having another settlement, they are removable where he is removable, and are not removable from any parish or place from which he is not removable (11 & 12 Vict. ¢. 211).

It is to be borne in mind that no person exempted from liability to be removed acquires, by reason of such exemption, any settle- ment in any parish; but a residence for three years gives a quali- fied settlement (39 & 40 Vict. c. 61).

The cost of relief of paupers rendered irremovable is borne by the common fund of the union (11 & 12 Vict. c. 110, § 3) as union expenses (§ 6), and any question arising in the union with reference to the charging relief may be referred to and decided by the local government board (§ 4).

The statute of Elizabeth required overseers to account to justices for all moneys received by them under rules or otherwise, and all expenditure for the relief of the poor, and to deliver over balances to their successors (43 Eliz, ce. 2, § 2). By the amendment of the poor laws in 1834 the duty of making payments was thrown chiefly on the guardians, leaving' the overseers to assess and collect the rates out of which such payments are chiefly made. The accounts of expenditure and receipts by all parties, includ- ing officers of union and treasurers, form a very important part of poor-law administration. The duties, including the forms of books of account, are minutely prescribed by orders of the central board, and the accounts are examined and audited half-yearly by auditors appointed by the board in auditory districts, the auditing by justices having ceased. Full powers are given to the auditors to make this examination effectual and to allow and disallow

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Accounts

and ex pendi- ture.

accounts and items in them (see the Poor-Law Amend-.

ment Act, 1868, and Acts there recited).

It is to be observed that by various provisions in the poor-law Acts power has been given to raise money by borrowing. The Poor-Law Amendment Act 1835 author- izes applications for advances under several earlier Acts for building or enlarging workhouses or for purchasing land, and a subsequent Act authorizes the borrowing of money for payment of debts generally (5 & 6 Vict. c. 15).

The principal items comprised in the total amount expended in the relief of the poor in England and Wales during the years ending at Lady Day 1882 and 1883 are these :—

1882. 1883,

I. Indoor maintenance…….. ~~£1,831,595 | £1,869,505 oy Outdeor meets: eee ee 2,626,375 2,589,937 3. Maintenance of lunatics in asy~~ |

lums or licensed houses……., 1,059,460 1,098,322 4. Workhouse and other loans re- |

paid and interest ….....c.-..

and superannuations…….! 1,087,641 1,117,705 6. Other expenses of, or immediately

connected with, relief……. 1,296,523 1,303,416

Total relief to the poor…….) £8,252,797 | £8,409,070 DSCC MONIS ensuites… sna. ragaucuee 20,325 NAS

Adjusted cost of relief…..... ... £8, 232,472 | £8,353,292

1 To be made in consequence of the payments from the metropolitan common poor fund exceeding the payincnts made to that fund during cach year.

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The comparison between the two years shows that with the exception of the outdoor relief there has been an inerease in eaeh item of expenditure. In this respeet the year 1882-83 forms no exception to its predeeessors, for the out relief is the only item in whieh there has been any deerease of late years.

Bringing the expenditure down to a later period, the compara- tive cost of the half years ended at Lady Day 1883 and 1884 stood thus :—1883, in maintenanee £982,586, out relief £1,269, 700, total £2,252,286 ; 1884, in maintenanee £978, 287, out relief £1,226,730, total £2,205,017. Therefore the eost for the half year 1884 had deereased—the in maintenance by £4299, and the outdoor relief by £42,970. The average priee of wheat per imperial quarter during the same half years was—1883, 40s. 11d. ; 1884, 38s. 11d.

In the article Lonpon tables have been given of the system of poor relief there. It must suffiee here to notiee that the eost of relief in the metropolis, eomprising thirty unions, has inereased sinee 1875. On the other hand the proportion whieh the eost of ontdoor relief bears to the cost of in maintenanee in the metropolis is eontinually decreasing. In 1883 the in maintenance was £586,933 and the outdoor relief £199,013. The expenditure for in and out relief in the metropolis for the Lady Day half years 1883 and 1884 stood thus—1883, £417,614 ; 1884, £425,310, an inerease of £7696. In the paroehial year 1883 the adjusted cost of relief was £2,172,294, being equal to a rate of 1s. 63d. on the rateable value.

It is satisfactory to find that the adnlt able-bodied paupers have been steadily diminishing in numbers during the last four years, both among indoor and outdoor paupers. Comparing 1883 with 1878, it appears that there has been a diminution of 25,775, or no less than 20°6 per eent., in the mean number of adult able-bodied persons receiving relief, and, if we take into aceount the inereased population, we find that the diminution has been 30°0 per eent. In the parochial year 1883 the mean number of adult able-bodied paupers was—indoor 21,558, outdoor 77,592, total 99,150. The above numbers do not inelude vagrants.

Although for many reasons it is considered desirable that as far as practieable out relief should be given in kind rather than in money, it will be seen by the following table for the parochial year 1883 taken from the unaudited half-yearly statements (and exclusive of relief given by the guardians in respect of sehool fees) how mueli more is given in money :—

Out-Door Relief.

Poor-Law Divisions.

In Money. In Kind.

The metropolis …….0+—+seeses £156,272 £38,623 Syaynite) (e126 1112700 ha BRORASRUB ERO RECA aCOS 198,657 52,029 Soup eenellan dereer sree inaeeesstes 193,353 34,606 TREC TeOh opgacnondl ononoasodaanepeenaor 126,155 55,486 SOP -WVESHEEIN. .000c0.0.0c-creeneeee 298,371 29,146 Wiest TCO... crareINOUME WESheLNs

stnescececseseoccesi 202,070 14,366 Vian, Gap ease ncnenerendenséac 234,644 12,967 INODBETODIN «<5. Se OCs 127,113 1,639 WW OIIGE Tr con aneenaeen tage eo ude qoosconc 282,487 10,824 | | ee EP £2,250,310 £294,312

The great differenee which exists in the several divisions in the manner of administering out relief is apparent. In the eastern division (comprising Essex, Suffolk, and Norfolk) nearly one-third of the outdoor relief was given in kind; while in the northern division (comprising Northumberland, Durham, Cumberland, and Westmoreland) nearly the whole was given in money.

The cost per head of relief on the mean number was in 1883 £10, 18s. 6d.; in 1873 it was £8, 14s. 1d.

It may be stated here that, whilst in the metropolis the cost of outdoor relief was in 1883 little more than one-third of that of the in maintenance, the expenditure on out relief in the remainder of England, with the exeeption of the north-western division, was eon- siderably in excess of that on in maintenanee, being in Wales more than four and a half times as great.

The mean number of paupers relieved in 1883 was—indoor 182,932, and out paupers (inclusive of those ehargeable to the poor rates who are in eounty and borough asylums or in licensed houses) 599,490, or a total mean number of 782,422, being a ratio of 29°6 per 1000 of the population. The mean number of paupers relieved in 1883 was smaller in proportion to the population by 101,266 (or 11°5 per eent.) than the mean number relieved in 1873, ten years before—a deerease, however, entirely owing to a reduction in the number of outdoor panpers.

Some remarkable finetuations took place in the number of vagrants relieved during the ten years ending in 1883. In 1873 the mean number of this elass of paupers was 2700. In 1881 it had riscn to 6979, an inerease of 158°5 per eent. In 1883 it had fallen to 4790, After the end of that parochial year it still further

deereased owing to the operation of the Casual Poor Aet, 1882, extending the periods for whieh vagrants may be detained in casual wards.

The increased cost of relief is attributable to some extent to the faet that the proportion whieh the mean number of paupers relieved in the workhouse bears to the mean number of paupers of all elasses is larger than it formerly was ; but it is also attributed partly to expenses ineurred in the ereetion of improved buildings, the substitution of paid officers for pauper help, and other similar items of expenditure ineurred for the purpose of seenring the more efficient administration of relief. ‘The yearly eost per head on the mean number of outdoor paupers has diminished during the last few years, and was smaller during 1883 than in any other year sinee 1873 with the exeeption of the year 1880.

The poor rate is the fund from which the cost of relief Poor is principally derived. The parochial taxation for this tte.

purpose in the statute of Elizabeth has been already noticed. As regards the subject matter of taxation the only subsequent absolute interference is in relation to saleable underwood, and also to rights of fowling, shoot- ing, or taking game or rabbits, and of fishing, where severed from the occupation of lands, and to mines of every kind not mentioned in the Act (see the Rating Act, 1874). The statute of Elizabeth enforced what are called duties of imperfect obligation; for it was, as has been seen, a duty before that statute to relieve the poor and necessitous, and the provisions of that Act were adapted to the enforcing of those duties in the way in which they could be practically carried out by enabling the parish officers to tax the inhabitants, whose representatives those officers are, for the actual performance of the obligations.

The Act gives persons aggrieved by any such tax a right of appeal—a right which has been fully exercised as well as regulated and affected by much subsequent legisla- tion. By the Parochial Assessment Act, 1836 (6 & 7 Will. IV. c. 96), closely following the poor-law amendment of two years before, no rate for the relief of the poor is of any force which is not made upon an estimate of the net annual value of the several hereditaments rated, that is to say, of the rent at which the same might reasonably be expected to let from year to year free of all usual tenant’s rates and taxes, and tithe

commutation rent charge, if any, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent.

Nothing in the Act, however, altered or affected the principles or different relative liabilities according to which different kinds of hereditaments were previously liable. The statute of Elizabeth (extended in some respects as to places by 13 & 14 Charles IJ. c. 12) embraced two classes of persons subject to taxation— occupiers of real property and inhabitants in respect of personal property, although the rateability under the latter head was reluctantly conceded by the courts of law, and was in practice only partially acted upon. Inhabitants as such, in respect of ability derived fron the profits of stock — in trade or any other property, were, however, expressly relieved in 1840 by a temporary Act (3 & 4 Vict. c. a), since continued from time to time. It is solely by expir- ing laws continuance Acts (the last Act extending to the end of 1885) that the vast amount of personal pro- perty is relieved from the poor rate. This exemption, and the principle on which it is based, of course forms an important element in all questions of local and in many of imperial taxation.

As regards occupiers of land and houses, the correct principles as to the persons liable to be rated were, after many erroneous views and deeisions, established by the House of Lords in 1865 in the case of the Mersey docks. The only oeeupier exempt from the operation of the Aet of Elizabeth is the erown, on the general prin- ciple that such liabilities are not imposed on the sovereign unless expressly mentioned, and that principle applies to the direct and immediate servants of the crown, whose occupation is the oecupa-

tion of the crown itself. If there is a personal private beneficial occupation, so that the occupation is by the subject, that occupa- tion is rateable. Thus for apartments in a royal palace, gratui- tously assigned to a subject, who occupies them by permission of the sovereign but for the subject’s benefit, the latter is rateable ; on the other hand, where a lease of private property is taken in the name of a subject, but the oceupation is by the sovereign or her subjects on her behalf, no rate can be imposed. :

So far the ground of exemption is perfectly intelligible, but it has been carried a good deal further, and applicd to many cases in which it can scarcely be said naturally, but only theoretically, that the sovereign or the servants of the sovereign are in occupation. A long series of cases have established that when property is occu- pied for the purposes of the government of the country, including under that head the police, and the administration of justice, no one is rateable in respect of such occupation. And this applies not only to property occupied for such purposes by the servants of the great departments of state and the post office, the Horse Guards, and the Admiralty, in all which eases the oecupiers might strictly be called the servants of the crown, but to county buildings occupied for the assizes and for the judge's lodgings, to stations for the local constabulary, to jails, and to eounty courts where undertakings are earried out by or for the Government and the Government is in oecupation ; the same principles of exemption have been applied to property held by the office of works. ;

When the property is not de facto occupied by the crown or for the crown, it 1s rateable ; and, although formerly the uses of property for public purposes, even where the crown was not constructively interested in the way above pointed out, was treated as a ground for exeniption, it is now settled that trustees who are in law the tenants and oceupiers of valuable property in trust for public and even charitable purposes, such as hospitals or lunatic asylums, are in principle rateable notwithstanding that the buildings are actually occupied by paupers who are sick or insane, and that the notion that persons in the legal occupation of valuable property are not rateable if they occupy in a merely fiduciary character cannot be sustained.

With respect to the particular person to be rated where there is a rateable occupation, it is to be observed that the tenant, as dis- tinguished from the landlord, is the person to be rated ander the statute of Klizabeth ; but occupiers of tenements let for short terms may deduct the poor-rate paid by them from their rents, or the vestries may order such owners to be rated instead of the occupiers ;

such payments or deductions do not affect qualification and fran-, chises depending on rating (Poor-Rate Assessment and Collection |

Act, 1869, and Amendment Act, 1882).

To be rated the occupation must be such as to be of value, and in this sense the word beneficial occupation has been used in many eases. But it is not necessary that the occupation should be bene- ficial to the occupier ; for, if that were necessary, trustees oceupying for various purposes, having uo beneficial occupation, would not be liable, and their general liability has been established as indicated in the examples just given.

As to the mode and amount of rating it is no exaggeration to say that the application of a landlord-and-tenant valuation in the terms already given in the Parochial Assessment Act, with the deductions there mentioned, has given rise to litigation on which millons of pounds have been spent within the last half eentury, with respect to the rating of railways alone, although the established principle applied to them, after much consideration, is to calculate the value of the land as increased by the line.

The Parochial Assessment Act referred to (6 & 7 Will. IV. e. 96), comprising various provisions as to the mode of assessing the rate so far as it authorized the making of a valuation, was repealed in 1869, in relation to the metropolis, and other provisions made for securing uniformity of the assessment of rateable property there (32 & 33 Vict. ce. 67).

The mode in which a rate is made and recovered may be concisely stated thus. The guardians appoint an assessment committee of their body for the investigation and supervision of valuations, which are made out in the first instance by the overseers aecording to specific regulations and in a form showing among other headings the gross estimated rental of all property and the names of occupiers and owners, and the rateable value after the deductions specified in the Assessment Act already mentioned, and as prescribed by the central board. This valuation list, made and signed by the overseers, is published, and all persons assessed or liable to be assessed, and other interested parties, may, including the officers of other parishes, inspect and take copies of and extracts from that list. A multitude of provisions exist in relation to the valuation and supplemental valuation lists. Objections on the ground of unfairness or incorrect-

ness are dealt with by the committee, who hold meetings to hear and determine such objections.

by the committee, is delivered to the overseers, who proceed to

make _the rate in accordanee with the valuation lists and in a prescribed form of rate book. The parish officers certify to the examination and comparison of the rate book with the assessments,

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and obtain the eonscnt of justices as required by the statute cf Elizabeth. This consent or allowance of the rate is merely a ministerial act, and if the rate is good on the face of it the justices cannot inquire into its validity.

The rate is then published and open to inspection. Appeals may be made to special or quarter sessions against the rate, subject to the restriction that, if the objection were such that it might have been dealt with on the valuation lists, no appeal to sessions is permitted unless the valuation list had been duly objected to and the objector had failed to obtain such relief in the matter as he deemed to be just (see Union Assessment Acts).

In the metropolis a common basis of value for the purposes of government and local taxation is provided, including the promotion of uniformity in the assessment of rateable property. Provision is made for the appointment of an assessment committee by guardians

| or vestries, and for the preparation of valuation lists, and the

deposit and distribution of valuation lists, and for the periodical revision of valuation lists. Appeals against the valuation list are heard by justices in special sessions, upon whom spccial limited powers are conferred. General assessment sessions, principally for appeals affecting the tutal of the gross or rateable value of any parish as being too high or too low as compared with other parishes, are appointed for hearing and determining appeals, and. the lists are altered in accordance with their decisions, Those decisions may be questioned as in the case of decisions by courts of general or quarter sessions.

The valuation lists as approved by the assessment committee, or as altered on appeal, last for five years, and are conclusive evidence of gross and

rateable value for the purpose of various specified rates, including the poor rate ; and the poor rate is made by the parish officers in accordance with such valuation according to a form provided,—see Valuation (Metropolis) Act, 1869.

It is to be borne in mind that the amount raised by poor rates does not closely represent the amount actually expended on the relief of the poor. ‘The rates are made in reference to the prospec- tive amounts required, and various payments not connected with the maintenance of the poor are charged by various Acts of Parlia- ment on the poor rate.

Payment of poor rates, and of the costs incurred, is enforced on complaints to justices, and by distress warrants and imprisonment in default, Special statutory provision is made for this mode of recovery.

In conclusion, while giving full credit to the admirable way in which the English poor-law system, and the prin- ciples on which it is based, have been and continue to be promulgated and explained by the central authority to the guardians and others concerned in the administration of the laws (an advantage in which poor-law administration stands out distinct from any other), we must add that a consolidation of the statute law relating to poor is much needed. Dr Burn, writing a hundred and twenty years ago, spoke thus: —“If it may be reasonable to advance further still in speculation, perhaps a time may come when it shall be thought convenicnt to reduce all the poor laws into one. The laws concerning the poor may not improperly be compared to their apparcl. When a flaw is observed, a patch is provided for it, upon that another, and so on, till the original coat is lost amidst a variety of patch-work. And more labour and materials are expended (besides the clumsiness and motley figurc) than would have made an entire new suit.” Since that remote day the number of statutes has increased notwithstanding a multitude of re- peals. At the present time the Acts of Parliament affect- ing the poor laws of England alone, exclusive of Scotland and Ireland, number upwards of one hundred and thirty, and by far the greater portion of them have originated since the amendment of the poor laws in 1834.

Consoli- dation of “nglish poor laws desirable.

As to poor laws in other countries, the articles devoted Poor-law

to those countries must be referred to. that legal provision is made for paupers in every part of the United States. The poor-law system which obtains in the Statcs in its general features is similar to that which prevails in England so far as regards the mode of raising

the fund (viz., by way of rate) and the class of people to The valuation list, where approved | ie oF :) -_

whom relief is afforded. Each district (commonly a town, county, or city) provides for its own poor. In some of the States paupers having no legal settlement are re- lieved by the State Government (1834). The prevalence

It is to be observed systems of other

countries.

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of slavery in the Southern States until its abolition modi- fied the system of relief.

The searching inquiry into the administration of the poor laws in 1832-34 was not confined to the United King- dom or to the States of America. Returns were obtained through the foreign ministers, and the result as to Europe is thus comprehensively stated by Nassau Senior in 1835: —‘‘A legal claim to relief exists in Norway, Sweden, Rus- sia, Denmark, Mccklenburg, Prussia, Wiirtemberg, Bavaria, and the canton of Bern, but does not exist in the Hanse- atic towns, Holland, Belgium, France, Portugal, the Sar- dinian states, Frankfort, Venice, Greece, or Turkey.” In the north of Europe the great peculiarity of the system is stated to be “the custom of affording relief by quartering the paupers on the landholders in the country and on house- holders in the towns.” Senior arrived at the conclusion that, in those portions of the Continent in which the Eng- lish principle of acknowledging in every person a right to be supported by the public existed, the compulsory relief had not, except perhaps in the canton of Bern, produced evils resembling either in intensity or extent those then experienced in the United Kingdom, and that in the major- ity of the nations that had adopted it the existing system appeared to work well. The poor

laws of Russia, however, if they could be called poor laws, were merely parts of her system of slavery.

The absence of poor laws in France, and the charitable establishments, many of them under state management, are noticed in the article France. Senior arrived at the conclusion that the comprehensive and discriminate system of public relief established in France in relation to these institutions was not so complete asin Belgium. For the poor there see BeLcium, where benevolent and charitable institutions and hospitals, charity workshops and depéts of mendicity or workhouses, and the bureaux de bienfaisance are noticed. The power of expulsion pour vagabondage exercised as a matter of daily routine in France operates as a restraint on vagrancy, although having a wider range than the English vagrancy laws. The majority of the indigent who receive public relief in France are foreigners.

The beneficent, including eleemosynary, institutions of united Italy are treated of under that head in ITaty.

The “pauper colonies” of Holland, established in the first quarter of the present century (the first idea of which seems to have been derived from a colony of Chinese in Java), attracted public attention in England and Europe generally about the time the provision ‘for the poor and the administration of the poor laws were under considera- tion, immediately before their reform in 1834. The object of the institutions in Holland was to remove those persons who were a burden to society to the poorest waste lands, where under judicious regulations they were enabled to the number of many thousands to provide for their own sub- sistence. It is remarkable that various schemes put forth in the 17th and 18th centuries for the reform of the British poor laws already cited teem with comparisons favourable to Holland. Sir Matthew Hale refers to the industry and orderly management prevailing in Holland and Flanders. Sir J. Child and others do the like.

Among various works on poor laws see Burn’s History and the modern work of Sir G. Nicholls; Nassau Senior’s Poor Laws of European States; Const’s aud Davis’s treatises; Glen’s Poor-law Orders ; Reports of Poor-Law Commissioners ; Reports of Poor-Law and Local Government Boards from 1834. (J. E. D.)

POPAYAN, a city of the republic of Colombia, capital of the state of Cauca, is situated in 2° 26’ N. lat. and 76° 49’ W. long., at a height of 5948 feet (EK. André, 1876), on the banks of one of the head streams of the Cauca in the great plain in the heart of the cordilleras. It was founded by Belalcazar in 1538 on the site of an Indian settlement, and in 1558 it received a coat of arms from the

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king of Spain and the title of “Muy noble y muy leal.” Pope Paul HI. made it a bishop’s see in 1547. By means of its gold mines and its share in the commerce between Quito and the valley of the Magdalena Popayan became a large and flourishing city ; but political disturbances and earthquakes (1827 and 1834) have reduced it to a place of 7000 to 10,000 inhabitants (8485 in 1870). It has a cathedral built by the Jesuits, several considerable churches, two seminaries founded about 1870 by French Lazarists (who occupy and have restored the old Jesuit convent), a mint, and a bank. The university was at one time celebrated ; and the city is the birthplace of Caldas the astronomer and Mosquera the geographer.

The volcano of Puracc, 20 miles south-east of the town, had according to Caldas a height of 17,000 feet, but André’s measurement gave only 16,102 feet. Froma vent 6 feet across at a height of 14,970 feet (Boussingault, 1831) steam and gas are discharged with violence sufficient to blow a man away like a straw. On the flanks of the mountain are several hot sulphurous springs and those of Coconuco are frequented by the Colombians.

POPE is the name given in England to a small fresh- water perch (Acerina cernua), also called Rurrs, which is generally distributed in the rivers of central Europe and common in most fresh waters of England. It was first made known by Dr Caius, a keen observer who lived in the middle of the 16th century, and is well known by his work De Canibus Britannicis. He found the fish in the river Yar, and figured it under the name of Aspredo, the Latin translation of ruffe, which name refers to the re- markable roughness of the scales with which it is covered. In general structure, shape, and habits the pope resembles much the common perch, but rarely exceeds a length of seven inches, and differs in its coloration, which is olive- brown with irregular darker spots on the body and numerous blackish dots on the

dorsal and caudal fins. It is most destructive to the fry of other fish, but in many parts of the country is esteemed as food. It spawns generally in the month of April.

POPE, ALEXANDER (1688-1744), was the most famous English poet of his century. His own century dwelt most upon his merits; the 19th century is disposed rather to dwell upon his defects, both as a poet and as a man, with a persistency and minuteness that more than counter- balance any exaggeration in the estimate formed when it was the fashion to admire his verse and treat his moral obliquity as a foible. Substantially, the best judgment of the two centuries is at one, only different sides are pro- minent in the bulk of current criticism. All are agrecd that he was not a poet of the first rank, and nobody can deny that he did certain things in literature in a way that has been the despair of all who have since attempted the same kind of thing. The great point of difference lies in the importance to be assigned to such work as Pope's satires. The polemic against his title to the name of poet would be contemptible were it not that beneath the dispute about the name there is a desire to impress on the public a respect for the highest kinds of poetry. The 19th century takes the poet's mission more scriously than the 18th. Similarly with Pope's moral delinquencies. With the exception of some details recently brought to light with an industry worthy of a better subject, his con- temporaries were as well aware of these delinquencies as we are now, only none but his bitter enemies were so earnest in denouncing them. "In this design," Johnson says in his comments on the Dunciad, "there was petulance and malignity enough, but I cannot think it very criminal." And this was the general verdict of his contemporaries about the poct's moral weakness. They knew that he was insinccre, intriguing, touchy, and spiteful, but, as nobody was much harmed by his conduct, they could not think it very criminal, Perhaps his physical weakness made them

more indulgent to his elfish and sprite-like temper. But,

apart from this, intriguing was the way of his world, a | ; tof : ‘ed | education was desultory and irregular.

fact too much kept out of sight when Pope is denounced for his crooked ways in little matters, as if he had lived in our own straightforward and virtuous age.

If we are to judge Pope, whether as a man or as a poet, with human fairness, and not merely by comparison with standards of abstract perfection, there are two features of his times that must be kept steadily in view—the character of political strife in those days, and the political relations of men of letters. As long as the succession to the crown was doubtful, and political failure might mean loss of property, banishment, or death, politicians, playing for higher stakes, played more fiercely and unscrupulously than in modern days, and there was no controlling force of public opinion to keep them within the bounds of common honesty. Hence the age of Queen Anne is pre-eminently an age of intrigue. The government was almost as un-settled as in the early days of personal monarchy, and there was this difference that it was policy rather than force upon which men depended for keeping their position. Secondly, men of letters were admitted to the inner circles of intrigue as they had never been before and as they have never been since. A generation later Walpole defied them, and paid the rougher instruments that he considered sufficient for his purpose in solid coin of the realm; but Queen Anne’s statesmen, whether from difference of tastes or difference of policy, paid their principal literary champions with social privileges and honourable public appointments. Hence men of letters were directly in- fected by the low political morality of the unsettled time. And the character of their poetry also suffered. The most prominent defects of our Augustan age in 19th- century eyes—the lack of high and sustained imagination, the genteel liking for “nature to advantage dressed,” the incessant striving after wit—were fostered if not generated by the social atmosphere. The works of the serious imagination could not thrive in a fashionable society, feverishly interested in the daily chances of intrigue for place‘and power.

Pope was peculiarly fitted by nature to take the im- press of his surroundings—plastic, sensitive, eagerly covetous of approbation. Affection

and admiration were as necessary to his life as the air he breathed. ‘‘ Pope was from his birth,” Johnson says, “of a constitution tender and delicate, but is said to have shown remarkable gentle- ness and sweetness of disposition. The weakness of his body continued through his life; but the mildness of his mind perhaps ended with his childhood.” Perhaps; but certainly to a much less degree with the friends who loved and honoured him. With them he was always more or less sweet and docile; his petulance and malignity were directed as by an instinct of self-preservation against those who baulked him in his craving for admiration, a spiritual food literally and physically essential to the sustenance of his fragile being.

_ If Pope had been a man of more robust and self-suffic- ing constitution, he had one great advantage for resisting the spirit of his age. He was cut off by the religion of his parents from all public employment. His father was a Roman Catholic, a merchant in Lombard Street,} London, who retired from business with a small fortune in the year of the Revolution, and fixed his residence at Binfield in Windsor Forest. Pope was born at Lombard Street on

| According to his own statement to Spence, his ‘‘ Conversations ” with whom are the chief authority for all the incidents of his youth. The value of the authority is much suspected. ‘‘ He was more willing to show what his father was not than what he was,” and Johnson

accepted the statement that he was ‘‘a linen-draper in the Strand.”

Pope’s vanity also renders doubtful in some details what he says about his own precocity.

_ having had a regular education. _ particular) read originally for the sense, whereas we are

| Dryden’s translation of Virgil’s Fclogues.

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May 22, 1688, but his father’s retirement to Binfield took place soon after his birth. The delicate child’s book His father’s religion excluded him from

the public schools, if there was no other impediment to his being sent there. Before he was twelve he got a smattering of Latin and Greek from various masters, from a priest in Hampshire, from a schoolmaster at Twyford near Winchester, from another in Marylebone, from a third at Hyde Park Corner, and finally from another priest at home. “He thought him- self the better,” Spence says, “‘in some respects for not He (as he observed in

taught for so many,years to read only for words.” This helps to explain his attack on Bentley in the Dunciad. He afterwards learnt French and Italian, probably to a similar extent. As far as the sense was concerned, he

‘ could get a dilution of that at least in translations, for all

poets of note—Greek, Latin, French, and Italian—had been translated into English verse in the course of the previous century: Of these translations the precocious boy availed himself voraciously, and by the age of twelve, when he was finally settled at home and left to himself, he was not only a confirmed reader, but an eager aspirant to the high- est honours in poetry. When at school in London he had crept into Will’s coffee-house to look at Dryden; he had lampooned his schoolmaster, and made a play out of Ogilby’s Ziad for his schoolfellows ; and, thinking him- self the greatest genius that ever was, he retired to the solitude of the forest to write a great epic ona mytho- logical subject, his hero being Alcander, a prince of Rhodes.

Nothing of Pope’s was printed till 1709, when he was twenty-one. The detachment from contemporary life in London which his father’s religion and retirement might have occasioned was prevented by one of the accidents of that position. Fortunately or unfortunately for him, there were among the Papist families near Binfield men capable of giving a direction to his eager ambition, men of literary tastes, and connexions with the literary world. These families held together as persecuted sects always do, and the family priests were mediums of communica- tion.

Through some such medium the retired merchant’s pre- cocious son was brought under the notice of Sir William Trumbull, a retired diplomatist living at Easthampstead, within a few miles of Binfield. At Whiteknights, near Reading, lived another Roman Catholic, Mr Englefield, ‘“‘a great

lover of poets and poetry.” Through him Pope made the acquaintance of Wycherley and Harry Cromwell, and Wycherley introduced him to Walsh, then of great renown as a critic. Thus the aspiring poet, before he was seventeen, was admitted to the society of London “wits” and men of fashion, and he was cordially encouraged as a prodigy. It may be doubted whether the company of these veteran relics of Restoration manners was much for the benefit of the moral tone of the bookish youth, who learnt from them to speak and write of the fair sex with a very knowing air of rakish gaiety. But he discussed poetry also with them, as was then the fashion, and soon under their influence his own vague aspirations received shape and direction.

Walsh’s contribution to his development was the advice to study “correctness,” as the one merit that was still possible for an English poet. But before he was intro- duced to Walsh, which was in 1705, he had already written the first draft of his “‘ Pastorals,” a subject on which Walsh was an authority, having written the preface to Trumbull’s

influence was earlier and more extensive. For him may

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fairly be claimed the credit of having been Pope’s school- master in poetry. It was he who turned Pope’s attention to the French critics, out of the study of whom grew the Essay on Criticism ; he suggested the subject of Windsor Forest, and he started the idea of translating Homer. When Trumbull first saw the precocious boy, he was hard at work on his great epic. He had probably chosen his subject on the first impulses of his crude ambition, because it was an established maxim at the time that a great epic is the greatest work of which the human mind is capable. It says something for Pope’s docility at this stage that he recognized so soon that a long course of preparation was needed for such a magnum opus, and began steadily and patiently to discipline himself. The epic was put aside and afterwards burnt; versification was industriously practised in shorter “essays”; and an elaborate study was made of accepted critics and models. When we look at the subjects of Pope’s juvenile attempts, we cannot fail to be struck by a singular clearness of purpose in his poetic ambition, such as might have come from the judgment of the accomplished man of the world who was his

adviser. He not only chose kinds of poetry in which there was an interest at the time, and a consequent like- lihood of gaining attention and winning applause, but he had an eye to subjects that had not already been appro- priated by great English poets, and in which success was still open to all comers. At the beginning of the 18th century Dryden's success had given great vogue to trans- lations and modernizations. The air was full of theories as to the best way of doing such things. What Dryden had touched Pope did not presume to meddle with,—

Dryden was his hero and master; but there was much |

more of the same kind to be done. Dryden had rewritten three of the Canterbury tales; Pope tried his hand at the Merchant's Tale, and the Prologue to the Wife of Bath's Tale, and produced also an imitation of the House of Fame. Dryden had translated Virgil ; Pope experimented on the Zhebars of Statius, Ovid's Heroides and Metamor- phoses, and the Odyssey. He knew little Latin and less Greek, but there were older versions in English whose metre he could improve upon and from which he could get a clue to the sense ; and, when the correspondents to whom he submitted his versions pointed out mistransla- tions, he could answer that he had always agreed with them, but that he had deferred to the older translators against his own judgment. It was oney of Pope's little vanities—very venial in a nature requiring such support —to try to give the impression that his metrical skill was more precocious even than it was, and we cannot accept his published versions of Statius and Chaucer (published

in "miscellanies" at intervals between 1709 and 1714) as | indisputable evidence of his proficiency at the age of |

fifteen or sixteen, the date, according to his own assertion, of their composition. But it is indisputable that at the age of sixteen his skill in verse was such as to astonish a veteran critic like Walsh, and that his verses were handed about in manuscript and admired by men then in the foremost rank in literature.

Chaucer, Spencer, Rochester, and Dorset, though dexterity is their only merit. His metrical letter to Cromwell, which Mr Elwin dates in 1707, when Pope was nineteen, is also a brilliant feat of versification, and has turns of

wit in it as easy and spirited as any to be found in his mature satires. “Ode to Solitude” to Cromwell, and said it was written before he was twelve years old. He may have retouched this; in all probability he did; perhaps every line of it was written when he was twenty-one ; but there is abundance of external evidence of his extraordinary precocity

There is no better proof of | his dexterity than his imitations, or rather parodies, of |

Pope was twenty-one when he sent the —

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as a metrician. He was vain enough to try to make it appear still more extraordinary than it was; but the attempt was hardly more puerile and comically superfluous than the solemn efforts of criticism to reduce his preten- sions. They are too solidly founded to be shaken either by his own vain superstructure or by the outraged critic’s vindictive undermining.

Precocious Pope was, but he was also industrious; and he spent some eight or nine years in arduous and enthusi- astic discipline, reading, studying, experimenting, taking the advice of some and laughing in his sleeve at the advice of others, “poetry his only business,” he said, “and idleness his only pleasure,” before anything of his appeared in print. In these preliminary studies he seems to have guided himself by the maxim formulated (after a French model) in a letter to Walsh (written at the date he gives, or later) that “it seems not so much the perfection | of sense to say things that have never been said before, as | to express those best that have been said oftenest.” His first publication was his “ Pastorals.” Tonson the bookseller had heard these pastorals highly spoken of, and he sent a polite note to Pope asking that he might have them for one of his miscellanies. They appeared accordingly in May 1709 at the end of a volume containing contributions from Philips, Sheffield, Garth, and Rowe, besides Pope’s version of Chaucer’s Merchant’s Tale. We have not space to show what can be said on both sides about these artificial compositions, avowedly designed to represent the manners of an imaginary golden age, when men of “ wit and refinement ” were shepherds. The worst that can be | said of them was said by implication in the Gwardian in 1713, when a case, which was afterwards

justified by Allan Ramsay, was made out for the representation of real English country life. Johnson, though he did not approve of pastorals in the abstract, said a word of common sense against exaggerated depreciation of Pope's attempt. Few persons are likely nowadays to put them- selves in a position for making a fair historical estimate | of Pope's pastorals. There was a passing fashion for the _kind of thing at the time, and possibly he wrote them under the impression that they offered a new field for poetic ambition in English, not knowing or forgetting what had been done by Giles Fletcher and Milton. Or he may have thought that a great poet should begin as | Virgil began with pastorals. At any rate his pastorals, though Johnson was right in remarking the " closeness of thought" shown in their composition, cannot be ranked high as poetry, however much superior to everything else written in a passing fashion.

Pope's next publication was the Hssay on Criticism. "Tn every work regard the writer's end," is one of its sen- sible precepts, and one that is often neglected by critics | of the essay, who comment upon it as if Pope's end had been to produce an original and profound treatise on first | principles. His aim was much less lofty—being simply to condense, methodize, and give as perfect and novel ex- | pression as he could to floating opinions about the poet's aims and methods, and the critic's duties, to "what oft was thought but ne'er so well expressed." "The town" was interested in belles lettres, and given to conversing on the subject ; Pope's essay was simply a brilliant contribu- tion to the fashionable conversation. The youthful author said with delicious loftiness that he did not expect the sale to be quick because "not one gentleman in sixty, even of liberal education, could understand it." But he misjudged his audience. The town was fairly dazzled by it—such learning, such comprehensiveness of judgment, such felicity of expression, was indeed a marvel in one so | young. Many of its admirers, doubtless, like Lady Mary | Montague, would have thought less of it if they had not

believed all the maxims to be original ; but people of fashion are seldom wide readers, and they gave Pope credit for much that they might have found, where he found it, in Quintilian, Rapin, and Bossu. "' The truth is,"

Mr Elwin says, “that Addison, by his encomiums and authority, brought into vogue the exaggerated esti- mate entertained of the essay.” Nothing could be more preposterously far from “ the truth.”

A better illustration could not be found of the critical vice that Pope censures of “forming short ideas” by attending to parts to the neglect of the whole. If the whole of Addison’s paper is read, it stands out in its true colours as a kindly gentle attempt to throw cold water on the enthusiasm about a work which had been published for some months and was already, as the paper admits, “highly esteemed by the best judges.” It is “a master-piece in its kind”; but people expect too much from the kind—originality, for instance. And again, it is “a masterpiece in its kind,” worthy of a place beside Roscom- mon’s Hssay on Translated Verse and Mulgrave’s Essay on the Art of Poetry! Most exaggerated encomiums these! How kindly, too, the paper opens by giving prominence to trivial incidents in the essay, one or two passing strokes of satire at Blackmore and Dennis. Bad poets are given. to detraction; they try to raise themselves by pulling down the reputation of their brothers in the art. A third of the whole paper is devoted to warning the young poet against a spirit of envy and detraction, all because he had thrown a stone in passing at two of the common butts of their generation. But this was Addison’s kindliness ; he wished to give the promising youth a lesson against a bad habit. Read the whole paper (Spectator, No. 253) and judge.

The Rape of the Lock in its first form appeared in 1712 in Linton’s Miscellany; the “machinery” of sylphs and gnomes was an afterthought, and the poem was repub- lished as we now have it early in 1714. This was his first poem written on an inspiration from real life, from nature and not from books. A gentleman had in a frolic surreptitiously cut off a lock of a young lady’s hair, and the liberty had been resented ; Pope heard the story from his friend Caryll, who suggested that it might be a sub- ject for a mock-heroic poem like Boileau’s Lutrin. Pope caught at the hint; the mock-heroic treatment of the pretty frivolities of fashionable life just suited his freakish sprightliness of wit, and his studies of the grand epic at the time put him in excellent vein. The Rape of the Lock is almost universally admitted to be his masterpiece. English critics from his own time to the present have competed in lauding its airiness, its ingenuity, its ex- quisite finish. But M.

Taine’s criticism shows how much depends upon the spirit in which such humorous trifles are approached. The poem strikes M. Taine as a piece of harsh, scornful, indelicate buffoonery, a mere succession of oddities and contrasts, of expressive figures unexpected and grinning, an example of English insensibility to French sweetness and refinement. Mr Leslie Stephen objects on somewhat different grounds to the poet’s tone towards women. What especially offends the French critic’s delicate sense is the bearishness of Pope’s laughter at an elegant and beautiful woman of fashion. Pope de- scribes with a grin of amusement all the particulars of the elaborate toilet with which Belinda prepared her beauty for conquest, and all the artificial airs and graces with which she sought to bewitch the heart of susceptible man. The Frenchman listens without sympathy, without appreciation, with the contemptuous wonder of a well-bred man at clownish buffoonery. What is there to laugh at ? Is she not preparing a beautiful picture? She cannot do this without powders and washes and paint-pots. What

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is there to langh at in this? It is mere matter of fact. The entire surrender of the female heart to little artifices for little ends does not apparently strike the Frenchman as ludicrous. Mr Stephen’s laughter is checked by the serious thought that this is a misrepresentation of women, that women are spoken of in the poem as if they were all like Belinda. But the Frenchman is not moved to laughter at all; it would seem as if his delight in the finished picture, the elegant. graceful captivating woman, hallowed every ingredient used in the making of it. Such are the differences in national humour. With English readers the change of manners since the fashionable party rowed up the river to spend a happy day at Hampton ig more likely to be an obstacle to the enjoyment of Pope’s airy extravagance.

In the interval between the first and the enlarged

edition of the ape of the Lock, Pope gave the finishing

touches to his Windsor Jorest, and published it in March 1713, with a flattering dedication to the secretary at war and an opportune allusion to the peace of Utrecht. This was a nearer approach to taking a political side than

Pope had yet made. His principle had been to keep clear of politics, and not to attach himself to any of the sets into which literary men were divided by party. Although inclined to the Jacobite party by: his religion, he was on friendly terms with the Whig coterie, so friendly indeed as to offend some of his co-religionists. He had contri- buted his poem “The Messiah” to the Spectator; he had written an article or two in the Guardian; and he wrote a prologue for Addison’s Cato. But Pope’s advances had not been received in a way to satisfy a man of his petulant and exacting temper. Mr Elwin is much mistaken in supposing that Addison helped to bring Pope into notice in the Spectator. We have seen how he treated the Hssay on Criticism. When the Rape of the Lock was published, Addison is said to have praised it to Pope himself as merum sal, but he was much more guarded in the Spectator. There he dismissed one of the gems of English literature with two sentences of patronizing faint praise to the young poet whom he rejoiced to see getting on, coupled it with. Tickell’s “ Ode on the Prospect of Peace,” and devoted the rest of the article to an elaborate puff of “the pastorals of Mr Philips.” We have only to look at the shameless pufiery of the members of the little senate, not only in this article but throughout all the periodicals of the coterie, to see how little the young Mr Pope owed to Addison.

When Pope showed a leaning to the Tories in Windsor Forest, the coterie, so far from helping him, made in- sidious war on him—not open war but underhand war. Within a few weeks of the publication of the poem, and when it was the talk of the town, there began to appear in the Guardian a series of articles on “ Pastorals.” Nota word was said about Windsor Forest, but everybody knew to what the general principles referred. Modern pastoral poets were ridiculed for introducing Greek moral deities, Greek flowers and fruits, Greek names of shepherds, Greek sports and customs and religious rites. They ought to make use of English rural mythology—hobthrushes, fairies, goblins, and witches; they should give English names to their shepherds ; they should mention flowers indigenous to English climate and soil; and they should introduce English proverbial sayings, dress, and customs. All ex- cellent principles, and all neglected by Pope in Windsor forest. The poem was fairly open to criticism in these points ; there are many beautiful passages in it, -showing close though somewhat professional observation of nature, but the mixture of heathen deities and

conventional archaic fancies with modern realities is incongruous, and the comparison of Queen Anne to Diana was ludicrously

infelicitous. But the sting of the articles did not lie in the truth of the oblique criticisms. ‘The pastorals of Mr Philips,” published four years before, were again trotted out. Here was a true pastoral poet, the eldest born of Spenser, the worthy successor of Theocritus and Virgil ! Pope’s pastorals have their defects, great defects, but it was an unkind cut to him to prefer such trash, and with such audacious emphasis. It was an-affront, but so contrived that the sufferer could not retaliate without putting himself in the wrong, a mean backbiting provocation, the action of a critic “willing to wound and yet afraid to strike.”

Pope took an amusing revenge, which turned the laugh against his assailants. He sent Steele an anonymous paper in continuation of the articles in the Guardian on pastoral poetry, reviewing the poems of Mr Pope by the light of the principles laid down. Ostensibly Pope was censured for breaking the rules, and Philips praised for conforming to them, quotations being given from both. The quotations were sufficient to dispose of the pretensions of poor Philips, and Pope did not choose his own worst passages, accusing himself of actually deviating sometimes into poetry. Although the Gwardian’s principles were also brought into ridicule by burlesque exemplifications of them after the manner of Gay’s Shepherd’s Week, Steele, misled by the opening sentences, was at first unwilling to print what appeared to be a direct attack on Pope, and asked Pope’s consent to the publication, which was graciously granted.

The relations between Pope and his Whig friends were further strained by one or two little incidents about the same time. The truculent Dennis attacked both Pope’s Rape of the Lock and Addison’s Cato. Pope said nothing in his own defence, but—we were very obliging in those days—defended his friend Addison in a Narrative of the Frenzy of John Dennis. The attack was so coarse that Addison sent Steele to Dennis to disclaim all connexion with it. Then Pope asked his friend Addison’s advice about the enlargement of the Rape of the Lock, and Addison advised him to leave it as it was, which advice the man who had asked it attributed to jealousy.

The estrangement was completed in connexion with Pope's translation of Homer. This enterprise was defini- tively undertaken in 1713. The work was to be published by subscription as Dryden's Virgil had been. Men of all parties subscribed, their unanimity being'a striking proof of the position Pope had attained at the age of twenty- five. It was as if he had received a national commission as by general consent the first poet of his time. But the unanimity was broken by a discordant note. A member of the Addison clique, Tickell, attempted to run a rival version. There was nothing criminal in this, but it was an irritating continuation of the cold grudging treatment that Pope had all along received from the same quarter. Pope suspected Addison's instigation ; Tickell had at least Addison's encouragement. Pope's famous character of Ad- dison, if not true in the main, is at least a strictly fair description, inspired not by malignity but by legitimate resentment, if resentment is ever legitimate, of Addison's treatment of himself as he was rising into fame! Pope afterwards claimed to have been magnanimous, and he is suspected of having supported this claim by petty inven- tions in his account of the quarrel. Magnanimity he could not fairly claim ; but he did not attack without pro- vocation.

The translation of Homer was Pope's chief employment "1A very different view is argued by Mr Elwin (with strange blind- ness, as the present writer thinks, to the cardinal circumstances here set forth), in his introductions to Windsor Forest, the Essay on Criticism, and the Rape of the Lock. See also Mr Leslie Stephen's Pope, and Mr Courthope's Addison.

for twelve years. The new pieces in the miscellanies pub- lished in 1717, his "Elegy on an Unfortunate Lady" and his ''Eloisa to Abelard," were probably written some years before their publication. The Jliad was delivered to the subscribers in instalments in 1715, 1717, 1718, and 1720. For the translation of the Odyssey he took Fenton and Broome as coadjutors, who between them translated twelve out of the twenty-four books.? It was completed in 1725. The profitableness of the work was Pope's chief temptation to undertake it. He cleared more than £8000 by the two translations, after deducting all payments to coadjutors—a much larger sum than had ever been received by an English author before. Pope, with

his economical habits, was rendered independent by it, and enabled to live nearer London. The estate at Binfield was sold, and he removed with his parents to Chiswick in 1716, and in 1718 to Twickenham, to the residence with which his name is associated. Here he held his little court, and was visited by his intimates Arbuthnot, Gay, Bolingbroke (after his return in 1723), and Swift (during his brief visits to England in 1726 and 1727), and by many other friends of political eminence. Martha Blount, after his mother's death in 1733, was occasionally domiciled in his house.

The translation of Homer established Pope's reputation with his contemporaries, and has endangered it ever since it was challenged. It was the Homer chiefly that Words- worth and Coleridge had in their eye when they began the polemic against the "poetic diction" of the 18th century, and struck at Pope as the arch-corruptor. They were historically unjust to Pope, who did not originate this diction, but only furnished the most finished examples of it. Mr Leslie Stephen has asked in what the much abused pseudo-poetic diction consists. A long analysis would be required to answer the question in detail, but in substance it consisted in an ambition to "rise above the vulgar style," to dress nature to advantage—a natural ambition—when the arbiters of literature were people of fashion. If one compares Pope's "Messiah," or "Eloisa to Abelard," or an impassioned passage from the liad, with the originals that he paraphrased, one gets a more vivid idea of the consistence of pseudo-poetic diction than could be furnished by pages of analysis. But Pope merely used the established diction of his time. A passage from the Guardian, in which Philips was commended as against him, shows in a single example the great aim of fashion- able poets in those days. "It is a nice piece of art to raise a proverb above the vulgar style and still keep it easy and unaffected. Thus the old wish, 'God rest his soul,' is very finely turned :—

"Then gentle Sidney liv'd, the shepherd's friend, Eternal blessings on his shade attend."

Pope would have despised so easy a metamorphosis as this, for, just as dress is often valued for what it cost the wearer, so the poetic dress of nature was esteemed in pro- portion to the poet's labour and ingenuity in devising it. The work of his coadjutors and imitators in the Odyssey may be

distinguished by this comparative cheapness of material. Broome's description of the clothes-washing by Nausicaa and her maidens in the sixth book may be com- pared with the original as a luminous specimen.

The year 1725 may be taken as the beginning of the third period of Pope's career, when he made his fame as a moralist and a satirist. In point of sheer literary power the works then composed are his greatest, but the subjects chosen belong essentially to the lower levels of poetry. Why did Pope, when his independence was secured and he was free to choose, "take to the plains,"

21, 4, 19, and 20 are by Fenton; 2, 6, 8, 11, 12, 16, 18, 23 by Broome.

to use Wordsworth's plirase, "when the heights were within his reach"? His choice was determined partly by character and partly by circumstances. whether Pope had the staying power necessary for the composition of a great imaginative work, whether his crazy constitution would have held together through the strain. He toyed with the idea of writing a grand epic. He told Spence that he had it all in his head, and gave him a vague (and it must be admitted not very promising) sketch of the subject and plan of it. But he never put any of it on paper. He shrank as with instinctive repul- sion from the stress and strain of complicated designs. Even his prolonged task of translating weighed heavily on his spirits, and this was a much less formidable effort than creating an epic. He turned rather to designs that could be accomplished in detail, works of which the parts could be separately laboured at and put together with patient care, into which happy thoughts could be fitted that had been struck out at odd moments and in ordinary levels of feeling.

The Dunciad (1728) was the first work of the new period. Circumstances turned him to satire when he was free from the Odyssey, and from his edition of Shake- speare, a bookseller's commission completed in the same year. Young's satire, Zhe Universal Passion, had just appeared and been received with more enthusiasm than anything published since Pope's own early successes. This alone would have been powerful inducement to Pope's emulous temper. Swift was finishing Gulliver's Travels, and came over to

England in 1726. The survivors of the Scriblerus Club—Swift, Pope, Arbuthnot, and Gay— resumed their old amusement of parodying and otherwise ridiculing bad writers, especially bad writers in the Whig interest. A volume of their jeww @esprit was published in 1727. According to Pope's own history of the Dunciad, the idea of it grew out of this. Among the miscelldnies was a "Treatise on the Art of Sinking," in which poets were classified, with illustrations, according to their emin- ence in the various arts of debasing instead of elevating their subject. No names were mentioned, but the speci- mens of bathos were assigned to various letters of the alphabet, most of them taken at random. But no sooner was the treatise published than the infatuated scribblers proceeded to take the letters to themselves, and in revenge to fill the newspapers with the most abusive falsehoods and scurrilities they could possibly devise. "This gave Mr Pope the thought that he had now some opportunity of doing good, by detecting and dragging into light these common enemies of mankind," who for years had been anonymously aspersing almost all the great characters of the age.

The truth probably lies between this account and that adopted by those who take the worst view of Pope's character. This is that he was essentially vindictive and malignant, and that, as soon as his hands were free from Homer, he proceeded to settle old scores with all who had not spoken as favourably as he liked about himself and his works. The most prominent objects of his satire can be shown to have given him personal offence—Theobald, Cibber, Dennis, Lintot, and others. This indeed was avowed by Pope, who claimed that it was their attacks on himself that had given hima right to their names. We may admit that personal spite influenced Pope at least as much as disinterested zeal for the honour of literature, but in the dispute as to the comparative strength of these motives, a third is apt to be overlooked that was probably Stronger than either. This was an unscrupulous elfish love of fun, and delight in the creations of a humorous Imagination. Certainly to represent the Dunciad as the outcome of mere personal spite is to give an exaggerated

It may be doubted | | graceful in his malice, writing more in fun than in anger,

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idea of the malignity of Pope’s disposition, and an utterly wroug impression of the character of his satire. He was not a morose, savage, indignant satirist, but airy and

revengeful perhaps and excessively sensitive, but restored to good-humour as he thought over his wrongs by the ludicrous conceptions with which he invested his adver- saries. We do not feel the bitterness of wounded pride in his writings, but the laughter with which that pride was consoled. He loved his own comic fancies more than he hated his enemies. His fun at the expense of his victims was so far cruel that he was quite regardless of their sufferings, probably enjoyed them; but it was an impish and sprite-like cruelty, against which we cannot feel any real indignation because it is substantially harm- less, while its ingenious antics never fail to amuse. Even when he exults in the poverty and material distresses of his victims, the coarseness of the matter is redeemed by the irresponsible gaiety of the manner. Such things should not be taken too seriously, if a Scotsman may say so. Further, even if Pope is regarded as a bitter malignant, it must be with two important qualifications. His plea that he was never the aggressor in a quarrel, in spite of all Mr Elwin’s’ special pleadings to the contrary, was a truthful plea, though his sensitiveness to criticism was such as to make him faucy slights, and the with- holding of praise where praise was due would have been construed. by him as a positive offence. And his literary conscience was so strong that not one of his attacks on literary grounds was unjust. Pope was a most generous critic of real merit. The only doubtful exception is the case of Bentley, whom he satirized in the reconstruction and enlargement of the Dunciad made in the last years of his life at the instigation, it is said, of Warburton. Looked at apart from personal questions, the Dunciad is the greatest feat of the humorous imagination in English poetry.

There was much more of unjust judgment in Pope’s Satires and Epistles of Horace Imitated, published at intervals between 1733 and 1738, because in them he oftener wrote of what he did not personally know, and was the mouthpiece of the animus of his political friends. These friends were all in opposition to Walpole, who was then at the height of his power, and the shafts of Pope’s satire were directed at the adherents of the great minister. Pope’s satires give the concentrated essence of the bitter- ness of the

opposition. We see gathered up in them the worst that was thought and said about the court party when men's minds were heated almost to the point of civil war. To appreciate fully the point of his allusions requires of course an intimate acquaintance with the political and social gossip of the time. But apart from their value as a brilliant strongly-coloured picture of the time Pope's satires have a permanent value as literature. It is justly remarked by Pattison! that "these Jmita- tions are among the most original of his writings." The felicity of the versification and the diction is universally admired.

The Hssay on Man (1732-34) was also intimately con- nected with passing controversies.2 It belongs to the same intellectual movement with Butler's Analogy—the effort of the 18th century to put religion on a rational basis. But Pope was not a thinker like Butler. The subject was suggested to him by Bolingbroke, who is said also—and the statement is supported by the contents of his posthumous works—to have furnished most of the arguments. Pope's contribution to the controversy con- sisted in brilliant epigram and illustration. In this di-

' In his incomparable edition of the Satires and Epistles. 2 See Pattison's edition of the Essay on Man.

dactic work, as in his Hssay on Criticism, he put together on a sufficiently simple plan a series of happy sayings, separately elaborated, picking up the thoughts as he found them in miscellaneous reading and conversation, and try- ing only to fit them with perfect expression. The want of logical coherence in his system was shown by the very different interpretations put upon it. Dealing as it did in incomparably brilliant fashion with a subject of living interest, the Hssay at once attracted attention both at home and abroad, and Pope was attacked by a Swiss professor as an ally of the freethinkers. But a champion of his orthodoxy was found in Warburton. Pope was so delighted with the pugnacious paradoxist's reply to De Crousaz that he made Warburton's acquaintance. The readiness with which Pope allowed Warburton to take possession of himself and his works in his old age was not a symptom of senile weakness. It was an act of that characteristic business-like acuteness which he showed throughout in the

management of his reputation. He saw that as long as Warburton was the authorized com- mentator on his works there was not likely to be any lack of critical debate about him and about them.

The Lssay on Man, which may be said to contain the essence of the thought of men of the world in his genera- tion on its subject—such was the poet's skill and judg- ment in collecting the substance of floating opinion—was announced by Pope as part of a system of "'pieces on human life and manners." Whether Warburton was authorized or not in his sketch of Pope's intentions, the so-called Moral Essays (published at intervals between 1731 and 1735) which Warburton connected with the general plan have each an independent interest. They contain some of the most brilliant of Pope's satirical portraits, and his famous theory of "the ruling passion." If space permitted it might easily be shown that in this theory Pope proved himself a better psychologist than Macaulay, who subjects it to much misunderstanding ridicule.

Pope died on the 30th May 1744, and was buried in the church of Twickenham. His own ruling passion was what a poet of his generation described as the universal passion, the love of fame. Under the influence of this passion he tried to support his reputation by intrigues such as the statesmen of his time used in climbing the ladder and keeping themselves in place. He had no moral scruple where this was concerned—everything gave way before the ruling passion. or some of these intrigues, so incon- gruous with our idea of a poet's character, he has suffered severe retribution. Especially of late years he has been violently denounced as little better than a common swindler for his petty manceuvres in connexion with the publication of his letters—letters designed to exhibit him as a pattern of friendship, magnanimity, and all the virtues. These manceuvres, which were first tracked with great patience and ingenuity by Mr Dilke,! are too intricate to be recorded in short space. This, in effect, is what he seems to have done. He collected his letters from his friends, retouched them, changed dates and passages to suit the picture of himself which he wished to present, deposited the collection thus manipulated in the safe-keeping of the earl of Oxford, then sent a printed book of them to Curll, and intrigued to make it appear that they had been fraudulently pub- lished without his consent. It was a ridiculously petty action, but to characterize it as Mr Elwin

has done will be fair when it is customary to use similar language about the intrigues of statesmen and diplomatists. Pope at present is not to call a spade a spade, but a molehill a mountain. Recent revelations have not affected by one iota Johnson's judgment of his character. The man who

1 See Papers of a Critic.

To apply it to |

"played the politician about cabbages and turnips," and "hardly drank tea without a stratagem," was not likely to be straightforward in a matter in which his ruling passion was concerned. Against Pope's petulance and "general love of secrecy and cunning" have to be set, in any fair judg- ment of his character, his exemplary conduct as a son, the affection with which he was regarded in his own circle of intimates, and many well-authenticated instances of genuine kindliness to persons in distress. (w. M.) POPEDOM.? Both the ecclesiastical and the temporal authority formerly exercised and still claimed by the popes of Rome profess to be of divine appointment, appealing in the first place to the language of the New Testament, and in the next to the tradition of the church, handed down, as it is asserted, in unbroken continuity from apostolic times to the present age. According to the theory thus put forth, Peter the apostle was indicated by Christ Himself as superior to the rest of the twelve in faith and spiritual discernment, and as the one of the number whom it was His design to invest with special pre-eminence.

In like manner, the church itself which Peter was after- st Peter wards to found and to preside over was predestined to a at Rome.

like superiority among other churches, while his personal superiority was to be vested in perpetuity in his successors. In conformity with this divine design Peter, accompanied by Paul, went to Rome after Christ's death, and founded there a church over which he presided as its bishop for twenty-five years,—from the first year of the reign of Claudius, 41 A.D., to 67 a.p.,—eventually suffering martyr- dom in the same year and on the same day as St Paul, in the persecution under Nero. And, if we accept the records

preserved in the Roman Church, we shall believe that St Peter's successors, so long as Christianity was the object of state persecution, continued heroically to encounter the same glorious fate, the distinction of martyrdom being assigned in the Roman calendar to all but two of the bishops of Rome from Linus to Eusebius (see list at con- clusion of article).

In dealing with a subject in which the evidence is frequently ambiguous and conflicting, and sometimes of more than doubtful genuineness, and with a period of much obscurity, no amount of research will often serve to point to more than a conjectural conclusion. But, inas- much as it is on the basis of the assumptions involved in the above theory that the claims of the Church of Rome mainly rest, it will be desirable to state, as concisely as possible, the main facts and arguments on which those who deny these assumptions ground their contrary opinion.

The question whether or no St Peter was designed for Theory of pre-eminence among the apostles resolves itself, it is his pre-

evident, into one of New Testament criticism ; but from the time of Origen, who visited Rome early in the 3d century, when the theory first began to be put forward, there has always been a certain section in the church who have distinctly repudiated the affirmative assumption. "For if," says Origen, " you hold that the whole church was built by God on Peter alone, what will you say con- cerning John, the son of thunder, and each of the other apostles?" (Migne, Patrologia Greca, xiii. 397). Next, as regards the evidence for St Peter's presence in Rome and lengthened labours there, as the head of. a Christian con- gregation, it is maintained by the great majority of Protestant scholars that there is no proof that he was ever in Rome at all; that the "Babylon" referred to in his first epistle (ch. v. 13) is really the distant city of the

2 The design of the present article is simply to give the main outlines of the history of the Papacy as an institution ; the details connected with the personal history of each pontiff will be found under the respective names of the different popes. The dates immediately after the name of each pope denote the period of his pontificate.

The Jews at Rome.

Passage in Suet- onius.

East ; and that, even if his presence in Rome be admitted, his arrival there must have been long subsequent to that of his brother apostle, and his labours altogether subordi- nate in importance,—conclusions supported by the com- plete silence observed in the Acts of the Apostles respecting both him and his work in the capital of the empire. On the other hand, it is urged that, as no known tradition assigns the martyrdom of Peter to any other place than Rome, every allusion to that event is implicitly an argu- ment for his visit to the capital; and, generally speaking, it may be said that the most recent and authoritative research seems to point to the conclusion that he both visited Rome and taught there, but that his labours were carried on in a spirit of rivalry, not to say antagonism, to those of Paul, being bestowed exclusively on a Judaizing church, while those of his fellow-apostle were devoted to the Gentile community. Of the important feature which harmonizes perfectly with these conclusions—namely, that the Church of Rome, attaching itself directly to the church at Jerusalem, became the depositary of a Jewish-Christian rather than of a Pauline tradition—there can be no doubt whatever.

The existence of a considerable poor Jewish element in Rome as early as the latter half of the Ist century is attested by numerous facts and allusions in the classical writers. The Jews were everywhere actively engaged in commercial pursuits, and formed an influential section in all great centres. Josephus tells us that, when on one occasion the Jews of Palestine presented a petition to the emperor Augustus, it was supported by no less than eight thousand of their countrymen resident in the capital. The chief quarters of this Jewish colony were in the Trastevere, about the base of the Janiculum; and its members were distinguished by the fidelity with which they cherished their national customs and beliefs., Both Nome and the Jewish community in its midst must accordingly have appeared a field of primary importance in the work of evangelization ; and it is evident that the questions raised by the claims of Christianity would there be discussed with the greatest ardour, and the most strenuous endeavours be made to bring them to an ultimate issue. That such was really the case is suffi- ciently

proved by a well-known passage in Suetonius, who relates that about the middle of the lst century there were constant riots among the Jewish population, their ringleader being one “Chrestus,” and that Claudius in consequence expelled them from the city. There is no reason for supposing that this section of the community would be estranged to any great degree, by the pursuits and associations of their daily life, from those by whom they were surrounded. The influences that then pervaded alike the Roman literature, culture, and civilization were mainly Greek, and the Jewish element was no less affected by these influences than the Latin. Greek, again, was the ordinary medium of commercial intercourse throughout the Roman world, and the Jew was largely engaged in commerce. Greek therefore had, except in the Syrian provinces, become the language of his daily life, as it had long been that of his sacred books read aloud in the synagogues, and of the annals of his race as recorded by the national writers.

The importance of the passage above referred to in Suctonius, of which the very inaccuracy which it embodies is In itself highly significant, has perhaps hardly been sufficiently recognized, for it not only records an important fact but it sheds light on subsequent history. It enables us to understand that, when the Jewish population was permitted to return to Rome, its members, whether adherents of the national faith or converts to the new, would, in common with the whole Christian community,

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feel the necessity of extreme caution lest their religious observances or their religious differences should aga‘n attract the notice of the Roman magistrate and expose them to fresh persecution. Of this character would appear to be the sentiments indicated in. the epistle of Clemens Romanus (supposed by some to have been the same with the Clemens whose name is inserted as that of the third bishop of Rome) when he refers to the sudden and repeated “calamities and adversities which are befalling us”—a passage generally interpreted as having reference to the persecution under Nero and the impending persecution under Domitian (Lightfoot, Append., p. 267). In such considerations as these we may fairly consider that we have a

reasonable explanation of the fact that during the first two centuries of its existence we hear so little of the Christian church in Rome.

With such considerations before us, it is scarcely necessary to point out that Greek was also the language of the early Christian church in Rome. In whatever propor- tions, therefore, that church was composed of Christianized Jews or of Christianized pagans, its records would naturally be, as we find them to have been, in the Greek language. Hegesippus, “the father of church history,” makes a statement which is generally understood to imply that, being in Rome in the time of Anicetus (bishop 1551— 168 a.p.), he made a list of the bishops of the see. This list is not extant; but in Irenzeus, who wrote his Adversus Hereses a few years later, we have another Greek list of twelve bishops, which shows the succession accepted at Rome in the time of Eleutherius, the contemporary of Trenzeus, and at the head of which stand the names of both Peter and Paul. To these lists are to be added two other Greek lists, the one in the Chronicon of Eusebius, the other in the Zcclestastical History of the same writer. Of these, the former extends from Peter to Gaius (the last bishop before the Diocletian persecution), and gives the periods of office. It is derived from the Armenian translation, but is not contained in the version by Jerome. The first Latin list, the Catalogus Liberranus,—supposed by Mommsen to have been derived from the Chronicon of Hippolytus, bishop of Portus, and to have been in turn

‘the original from which the Catalogus Felicianus (the

oldest existing version of the Liber Pontificalis,—see infra) was taken,—is so called because it was compiled in the episcopate of Liberius, who succeeded 352 a.p. We have also two other Latin lists of some authority, in Augustine (£pist. 53; Migne, Patrol., xxxill. 195) and in Optatus (De Schism. Don., ii. 3).

It is undeniable that in all the foregoing lists there are considerable discrepancies. The Liberian catalogue gives us a certain “Cletus,” as the immediate predecessor of Anacletus; scholars lke Mommsen and Lipsius are divided in opinion as to whether Anicetus was the pre- decessor or the successor of Pius; while, as regards the duration of each episcopate, there are equally important discrepancies. But difficulties like these cannot justly

pre- judice our acceptance of the general tradition with which they are associated ; they are rather to be looked upon as supplying valuable incidental evidence with respect to the status of the Roman episcopate ; and, while the lists themselves prove, on the one hand, that before the termination of the 3d century the office was held to be of such importance that its succession was a matter of interest to ecclesiastics living in distant sees, the variations that the lists present indicate not less clearly that the Roman bishopric at this period could not have held that position in relation to the church—the parallel to that of the

1 For this date see article “ Pope” in Smith’s Dict. of Christian Antiquities, p. 1657.

Earliest lists of the Roman

bishops.

ROPEDO ™M

imperial office in the empire—claimed for it by writers like Bellarmine.

The comparative history of institutions would, in itself, incline us to look for a less precise and exalted conception of the office, as discharged by these early bishops, than when, after a lapse of centuries and a succession of varied experiences, its duties and responsibilities had become defined and developed ; but it is also a fact of considerable significance that those who were elected to the office from the time of Clement were for the most part men whose very names would probably not have survived but for their appearance in these lists, and that, even when, in one or two instances, their individual careers emerge from the general obscurity, they themselves appear as speaking and acting ina manner which seems hardly compatible with those exalted prerogatives which, as some maintain, were inherent in the office from its first commencement. In

Epistle of the recently recovered portion of the epistle of Clemens — Romanus, above cited, it is, for example, highly signi- omanus: ficant to find that the letter purports to emanate, not from

the “bishop of Rome,” but from “the church at Rome,” and to find again that, even so late as the 2d century,

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was on the occasion of a sentence of excommunication which Vicror I. (c. 190-202 a.p.) had pronounced upon certain bishops in the province of Asia Minor,! on account of their refusal to celebrate Easter at the particular time enjoined by the church in Rome. Victor appears not to have had recourse to this extreme measure until after he had consulted with his episcopal brethren in Palestine, Pontus, Gaul, and Corinth; but Irenzeus, notwithstand- ing, remonstrates boldly with him on the rigour of his proceeding, and on the impolicy of thus cutting himself off from an important section of the church on a mere matter of ceremonial observance. We find again Tertullian, who during his residence in Rome had acquired a certain practical knowledge of the administrative characteristics of its church, implicitly intimating his disapproval in his treatise De Pudicitia (sec. i.) of the assumption by the Roman bishop of the titles of “pontifex maximus” and ‘‘episcopus episcoporum”; in another of his treatises (De Virgin. veland.;? Migne, Patrol., pp. 767-8), he distinctly impugus the claim made by ZerpHyRINUS (202-218) of a certain superiority in the Roman see derived as a tradition from St Peter.

this letter is in like manner referred to as emanating from the community, and not from the individual. This feature, indeed, is not a little suggestive with respect to the de- velopment of the Roman supremacy. While the letter is

The evidence with which we are presented for the rest Evidence of the 3d century is of a similar character. Ca iisTus @forded (218-223), the successor to Zephyrinus, was originally a ale Christian slave in Rome during the bishopric of Victor, Canistus.

wanting inf anything that implies any special pre-eminence on the part of the Roman bishop, it is at the same time characterized by a certain admonitory tone, such as could hardly have been assumed if the community by whom it was sent had not been held to possess a recognized superi- ority over the community to whom it is written, but this superiority is not greater

than would naturally belong (not- withstanding their common founder) to the church in imperial Rome as contrasted with the church at subject Corinth,—to the church of the august capital from whence emanated the laws which governed the empire and the church of the fallen city which, two centuries and a half before, the Roman arms had well nigh effaced from existence.

If again we accept as genuine the evidence afforded in

Letters of those seven letters of Ignatius which most critics are dis-

Ignatins. posed to accept as genuine, the relations of the Roman | admission of candidates to ecclesiastical orders, and also Church to the other churches of the empire appear to be | undue connivance at marriages dishonourable to those pro- of the same character. Ignatius, when, on his way to | fessing the Christian faith ; while Zephyrinus is depicted Rome (probably early in the 2d century) to suffer | asa man of but little intelligence and of ignoble aims. martyrdom, addressed a letter to the Christian community | It is evident that when a suffragan bishop could venture in that city. In this letter there is again an equally | thus to criticize his metropolitan the authority wielded ° direct reference to a certain primacy of the church in | by the latter, even in his own diocese, was very far from Rome, which is addressed as “she who hath the presid- | meeting with unquestioning obedience. ency in the place of the region of the Romans.” But this The foregoing evidence, together with many other expression is immediately followed by a definition of this | similar facts which cannot here be enumerated, points primacy which is altogether incompatible with the theory | clearly to two important conclusions: first, that im the that it is derived from the episcopal succession in the | course of the 2d and 3d centuries the Church of Rome church ; it is spoken of as founded upon sentiments of | began to put forth unprecedented claims to a certain Christian fellowship, with the additional considerations | superiority among other churches; and, secondly, that attaching to the dignity and superior advantages belong- | these claims not unfrequently encountered considerable ing to the church of the capital. opposition as novel and unjustifiable. The conclusion to which the foregoing evidence points The circumstances which contributed to bring about Cireun- is again strongly confirmed by the general fact that, as | their

ultimate establishment were various. The Roman ae each new pretension on the part of the Roman see was | Church itself had, from the first, been associated with that, = ° put forward, it was called in question and repudiated by | severer type of Christian belief which had its chief seat Roman some one or other section of the Christian community. | at Jerusalem; and, after the Holy City and its temple were claims. Passage An obscure and doubtful passage in Irenzeus (Adv. LHeres., – in bk. ul. ¢. 5) testifies, at most, to nothing more than a 1 An expression which, it must be noted, is to be understood with Treneeus. fy]]er recognition of the primacy of the Roman Church, considerable qualification as applied to the Roman province. Denial while in the same writer, who, it will be remembered, was ‘ The evidence afforded in the above two treatises carries the greater of the bik f the church at Lyons, we have a notable instance weight in that they were not written until after Tertullian had become Roman ISHop – i a a F Wage “ a convert to the austere tenets of Montanism, when he must have suprem- Of a distinct repudiation of the claims of the Roman | been all the more inclined to favour the type of Christianity which acy. bishop to dictate to the bishops of other dioceses. This | then prevailed at Rome.

who (if we accept the narrative of Hippolytus) had been sent on account of his turbulence and dishonest practices to the mines in Sardinia. Victor, who was acquainted with the circumstances of his career, deemed him, not-withstanding, so little deserving of commiseration that, when, through the influence of Marcia, the mistress of the emperor Commodus, he had succeeded in bringing about the liberation of a certain number of Callistus’s Christian fellow-sufferers in Sardinia, he did not include in the list the name of Callistus himself. The latter, however, managed to regain his freedom, and ultimately himself became bishop of Rome. During his brief epis-copate his administration, as well as that of his prede- cessor Zephyrinus, was unsparingly criticized by Hip- polytus, the well-known bishop of Portus. Against Callistus Hippolytus alleges the greatest laxity in the

alike razed to the ground by Titus (70 a.p.), much of the reverence which had belonged to Jerusalem was transferred to Rome. In relation to the

episcopal office itself, again, it is to be noted that the general conception of its func- tions underwent, at this period, considerable change. On this point a passage in Jerome (Ad Tit., 1. 7) is of special significance. He here expressly attributes the institution of the episcopal order to the necessity which had arisen of repressing the numerous schisms in the church; and he goes on to observe that bishops would consequently do well to bear in mind that their office, with its involved authority over presbyters, was to be regarded rather as the result of custom and tradition than of divine appointment. As regards any special supremacy attaching to the Roman episcopate, the evidence afforded by another passage in Jerome is not less notable. In one of his most important

letters (Ad Rusticum; Migne, Patrol., xxii. 932) he fully |

recognizes the expediency and value of a central supreme authority, vested in a single individual. In support of his position he adduces examples from the animal kingdom, from the imperial power, from the judicial power, from the inilitary power, and then goes on to say, ‘‘so again each church has its one bishop, its one arch-presbyter, its one archdeacon, every ecclesiastical grade relying on its leader,” but to the clenching example, derivable from the supreme pontiff himself, no reference is made. It seems, accordingly, an inevitable inference that by one of the greatest of the Latin fathers, writing at the close of the 4th century, the Roman theory of the popedom was unrecognized. But the circumstance which perhaps most conduced to the acceptance of the papal pretensions was Creation the creation of a new office in the ecclesiastical organiza-

e the tion, that of the metropolitan. So long as Christianity menity of was the religion only of an obscure sect, or of a persecuted |

politan, Minority in the Roman state, lying also under the suspi- cion of political disaffection, it probably sought td avoid attracting further attention to itself by any elaborate attempt at organization. At the same time the political organization of the empire, from its long established and universally recognized territorial divisions, its system of intercommunication, and its arrangement of the executive power, must have obviously seemed to furnish the most practicable outlines for the administration of a great and growing ecclesiastical community. The chief

cities or metropolets of the several Roman provinces were accord- ingly from the first selected as the seats of the principal Christian churches—Antioch, Corinth, Ephesus, and Thessalonica respectively representing the chief ecclesias- tical centres of Syria, Achaia, Asia, and Macedonia. And when, again, under Constantine and his successors, the distribution of civil authority was further modified by the creation of four patriarchates, subdivided into twelve ‘‘dioceses” or major provinces, these changes were soon followed by corresponding modifications on the part of the church organization. understand how it is that we find the bishop of Rome successively assuming, as in the pontificates of Fabianus and Cornelius, the more extended authority of a metro-

In this manner we are able to |

| the antipopes.

politan,” and, as in the days of Julius I, and Siricius, the |

authority of a patriarch. But no external event exercised a more potent influence on the early history of the Roman Church than the Removal removal of the seat of imperial power to Constantinople

oii (330). For more than a century from that event it was ae ae a little doubtful whether the patriarch of ‘“ Nova Constan- oma” might not succeed in asserting an authority to

tinople. which even the Western pontiff might be compelled to * In the canons of the council of Nica (325) the authority of a

metropolitan is distinctly recogni i i sd gnized, and in those of the council of Antioch (341) it is defined with greater precision.

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defer. It became accordingly an object of primary importance with the latter to dissociate as far as possible

in the mind of Christendom the notion of an ecclesiastical supremacy derived, like that at Constantinople, mainly

from the political importance of the capital from the con-

ception of that supremacy which he himself claimed as the representative of the inalienable authority and privileges conferred on St Peter and his successors. For such a

policy an additional motive was created by the predilection

shown by Constantine for his new capital, and the convic-

tion which he is said to have entertained that the days of

ancient Rome were numbered.?, From henceforth it was

the key-note to the utterances of the Roman primate that

his supremacy, as a tradition from apostolic times, could

never depart from him and his successors, and that, as representing the authority of the two chief apostles, it

had claims upon the obedience and reverence of the

whole Christian church such as no other apostolica sedes

could produce. To the ultimate assertion of these pre- Rome be- tensions the long and fierce struggle carried on between comes a the followers of Arius and the supporters of orthodoxy a ‘ materially contributed. ‘The appeal to the arbitration of doxy. Rome, preferred both by Athanasius and by the Arian party, placed Junius I. (837-352) in the proud position of the recognized protector of the orthodox faith. In the year 339 Athanasius himself visited the Western capital and resided there for three years. His presence and exhortation confirmed the Roman pontiff still further in his policy; and from this time we perceive the see of Rome assuming, more distinctly than before, the right to define doctrine and the function of maintaining the true standard of faith amid the numerous heresies that were

then troubling the whole church. While Constantinople was conspicuous by its attachment to Arianism, Rome appeared as the champion of the orthodox belief. In another direction the Western see would appear to have been also advancing important and exclusive claims. If we accept as genuine the letter of Julius to the Eusebians, written after the acquittal of Athanasius, the pontiff already maintained that, in all proceedings whereby the conduct or orthodoxy of any of the higher ecclesiastical authorities was called in question, the canonical method of procedure required that the Roman see should be con- sulted before any initiative was taken. In other words, the council which had been convened at Tyre to try Athanasius had usurped the functions which belonged to the pontiff of Rome alone.

During the bishopric of Lipertus (352-366) we meet with the first instance of a schism in the Roman Church, and, in the person of Felix, with the first representative of that maintenauce of a rival claim to the see which in later history assumed such importance in connexion with The contested succession of Damasus (366-384), although attended by scenes of brutal violence and outrage, affords further illustration of the main ques- tion then at issue. Damasus, who had been the personal friend of Liberius, represented the cause of orthodoxy, and his triumph over his rival, Ursinus, was hailed with » exultation by the chief contemporary teachers of the church. During his tenure of the see Arianism in the West almost ceased to exist.

At the council of Niceea (325), one of the canons enacted (the sixth) had already assigned to the three gees, or patriarchates, of Rome, Alexandria, and Antioch, their honorary rank in the order of their enumeration. In the

First schism.

- The story of the ‘‘Donation of Constantine” and the long enumeration of the possessions which he bestowed on the church, preserved in the Liber Pontificalis, must be looked upon as accretions of a later period. It is supposed, however, that Constantine built the original Vatican basilica, the church of St Agnes, and the Lateran.

Counter preten- sions of Constan- tinople.

The De- cretals.

Division of the empire.

Popes of

the 5th century.

Tnnocent I,

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year 381 the council of Constantinople was convened ; it was an assembly in which the Western Church took no share, and its notable third canon was accordingly enacted without opposition. By this it was declared that the bishop of Constantinople, or Nova Roma, was entitled, although the representative of a non-apostolic see, to the next place after Rome, and consequently to precedence of the older and apostolic sees of Alexandria and Antioch. This distinguished position was assigned to him as the supreme ecclesiastical authority in the newcentre of political power, and a theory of the basis of ecclesiastical dignity was thus put forward by the church which was in direct conflict with that maintained by Rome.

The pontificate of Srricrus (384-398) is chiefly remark- able as that with which commences the series known as the Decretals—a collection of pastoral letters and of replies to questions submitted for their consideration sent by the popes to the churches of the West. These subsequently formed the basis of a vast and elaborate series of forgeries known as the decretals of the pseudo-Isidorus, of which we shall have occasion again to speak; but the genuineness of the letter of Siricius to Himerius, bishop of Tarragona, does not appear to have ever been called in question, and it takes its stand therefore as the earliest existing de- cretal. In the influence which they exercised upon Western Christianity neither Siricius nor his successor ANASTASIUS I. (398-401) could compare with their illustrious contem- porary, Ambrose, bishop of Milan, whom the emperor Theodosius pronounced to be the only true bishop whom he had known. But Ambrose, although acting in perfect independence of the Roman see, always professed to take it as his model in matters of discipline, and by the respect

which his example inspired in others for the episcopal office in general he indirectly augmented the conception of the papal prerogatives.

With the division of the empire in the year 395 the question of the Roman precedence of Constantinople was left for a time in abeyance; but in the West the authority of the bishop of Rome became more and more firmly established. In the following century the general condi- tions under which he was called upon to act became so materially modified as to constitute a new period in the history of our subject.

The characters of the men who filled the papal chair during this century, most of them of exemplary life, some of commanding genius, would alone suffice'to constitute it a memorable era. 'Upon the mind of Innocent I.," says Milman, "seems first distinctly to have dawned the vast conception of Rome's universal ecclesiastical supremacy." Innocent I. (402-417) seems indeed to have been the first of the popes who ventured to repudiate those political conceptions which threatened to circumscribe the extend- ing influence of his office. Writing in the year 415 to Alexander, bishop of Antioch, he implies that the church in that city, as an "apostolica sedes," is entitled to rank second only to Rome; "but not," he adds, "so much on account of the grandeur of the city itself as because it is shown to be the first apostolic see" (Mansi, Conczlia, vol. iii. p. 1055). In the same letter he distinctly repudiates the notion that the church is bound by political divisions ; the emperor may create two capitals (metropoleis), but it by no means follows that a second metropolitan is to be appointed by the church. In the year 412 he gave practical proof of his determination to assert his own theory of his prerogatives, by appointing the archbishop of Thessalonica his vicar over the extensive province of Illyricuin, of which but a small portion lay in the Western empire; and, when the bishops of the province showed themselves less amenable than he had anticipated to his directions in matters of discipline, he insisted with unpre-

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cedented explicitness on the jurisdiction of his see as "head of all the churches." Innocent was succeeded by Zosimus (417-418) and Boniracs (418-422). The former, whose pontificate lasted only twenty-one months, exhibits a, noteworthy exception to the traditions of his see, in the

disposition he at one time showed to temporize with Pela- gianism, and even to set aside in its favour the decrees of his predecessor. The pontificate of Boniface is notable as having been preceded by a contested election which afforded the emperor Honorius an opportunity for the exercise of his intervention, thereby establishing a precedent for imperial interference on like occasions. At the instance of Boniface himself, Honorius enacted an ordinance designed to avert the scandals incident to such contests. By the new pro- visions, all canvassing for the vacant chair was strictly prohibited ; in the event of a disputed election both candidates were to be deemed ineligible ; finally, it was essential to any election that the candidate should have been chosen by the unsolicited suffrages of the qualified clergy, and that their choice should have been ratified by the approval of the entire church community. The suc- cessor of Boniface was Caxestinus, I. (422-432). The evidence afforded by the events of his pontificate is some- what conflicting in character. On the one hand, we find the churches of Africa putting forward their latest recorded protest against the Roman pretensions, adducing the sixth canon of the council of Niczea in support of their protest ; on the other hand, the success with which Ccelestinus inter- vened in Illyricum, and again in connexion with the sees of Narbonne and Vienne, proves that the papal jurisdiction was being accepted with increasing deference in other parts of the empire. The effect with which his solicited decision was given in the controversy raised by Nestorius, the patriarch of Constantinople, and the synod held under his auspices in Rome (430) for the further consideration of the same question, likewise added to the reputation of his office.

Barbaric invasion, although resulting in the overthrow Effects of

of many of the institutions of civilization, aud in wide- spread suffering and social deterioration, served but to enhance the influence and importance of the Roman see. The apparent fulfilment of prophecy, pagan as well as Christian, when the city was taken and sacked by Alaric (410), seemed to complete the effacement of the tem- poral power in Rome. Neither the Western emperors nor the Gothic conquerors held their court in the ancient capital, where the pope was now at once the most import- ant and conspicuous authority. In the African provinces, the demoralization occasioned by the fierce controversies and dissensions concerning

Pelagianism and Donatism compelled the Catholic communities to exchange their former attitude of haughty independence for one of sup- pliant appeal, and to solicit the intervention and counsel which they had before rejected. Such was the aspect of

affairs in the West when Leo THE Great (440-461)— Leo the by some regarded as the true founder of the medizeval Great.

popedom—succeeded to the primacy. A citizen of Rome by birth, he exemplified in his own character many of the antique Roman virtues—a tenacious adherence to tradi- tion in matters of religious belief, an indomitable resolu- tion in the assertion of the prerogatives of his office, and the austere practice of the recognized duties of social life. This rigid maintenance of orthodoxy had been instilled into him (or at least confirmed) by the exhortations of Augustine, with whom he had become personally acquainted when on a mission to the African province; and before his election to the papal office the celebrated Cassian had conceived so high an opinion of his virtues and abilities as to dedicate to him his treatise on the Incarnation. Re- garded, indeed, simply as the able antagonist of the Mani-

cheean and Eutychian heresies, and as the first author of the Collect, Leo would fill no unimportant place in the annals of Latin Christendom ; but his influence on church history in other respects is of a far deeper and more potent kind. In none was it followed by more important results than by the success with which he established the theory that all bishops who, in questions of importance, demurred to the decision of their metropolitan should be entitled to appeal to Rome. He obtained the recognition of this principle not only in Illyricum, as his predecessor Inno- cent had done, but also in Gaul; and the circumstances

under which he did so in the latter province constitute the ‘ whole proceedings a memorable episode in church history. Celidonius, bishop of Besangon, had been removed from his bishopric by his metropolitan, the eminent Hilary of Arles, and determined to proceed to Rome to appeal against his sentence in person. He was followed thither by Hilary, who

courageously protested against any exercise of the pontifical authority which should trench upon his own as metropolitan, and for which, in the present instance, it seems to be generally admitted that the canons of the church down» to the time of Dionysius Exiguus (fl. 525) afforded no sanction.1 Leo, however, not only annulled the sentence of deprivation, but condemned

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patriarch of Alexandria, whom he designates as “frater et coepiscopus noster” (Thiel, Hpistole, p. 239). On Acacius refusing to recognize the legality of the letter of citation, he was excommunicated by Felix. The suc- cessor of Felix, Grtastus I. (492-496), refused to notify, as was customary, his election to the patriarch of Con- stantinople, and by his refusal implicitly put forward a fresh assumption, viz., that communion with Rome implied subjection to Rome. Throughout the pontificate of Gela- sius the primacy of the Roman see was the burden of his numerous letters to other churches, and he appears also to have been the first of the pontifis to enunciate the view that the authority which he represented was not con- trollable by the canons of synods, whether past or present. In Italy these assumptions were unhesitatingly accepted. The Palmary Synod, as it was termed, convened in Rome during the pontificate of Symmacuus (498-514) formally disavowed its own right to sit in judgment on his admin- istrative acts. Ennodius, bishop of Pavia (circ. 510), declared that the Roman pontiff was to be judged by God alone, and was not amenable to any earthly potentate or tribunal. It is thus evident that the doctrine of papal infallibility, though not yet formulated, was already virtu- ally recognized.

During the Gothic rule in Italy (493-553), its repre- The

Hilary’s entire conduct. The latter could only remonstrate ‘sentatives manifested the utmost tolerance in relation to Gothic

in terms of energetic but ineffectual protest, and then monarchs,

took his departure from the city to die soon after at Arles. Ilis name, along with that of Irenzeus, stands at the head of that long succession of able churchmen who, sometimes in conjunction with the temporal power and

sometimes in- dependently of it, have gained for the Gallican Church a character for systematic opposition to the encroachments of the Roman see which (if we except the Church of Utrecht) is unique among the communities of Western Catholicism. In a circular letter to the churches of Gaul, Leo subsequently passed a formal and deliberate censure upon Hilary's conduct; and this measure was followed up by an imperial edict, in which, again, we have a remark- able illustration of that compact between the state and the church which assumed such importance at a later period. In this decree of Valentinian III. (445) the primacy of Rome is placed upon a triple basis—the merits of St Peter, the majesty of the city of Rome, and the authority of a council (sacre synodi auctoritas). 'To which of the councils reference is intended is by no means clear; but all bishops are required by this imperial edict to present themselves when summoned at the tribunal of the Roman pontiff (Novellz, ed. Hanel, pp. 172-5). As, prior to this time, the emperors themselves had always claimed, though they had not invariably exercised, the right of representing a supreme court of appeal, this transfer of such a preroga- tive to Rome may fairly be regarded as marking the com- a of a new era in the conception of the papal office.

The chief obstacle to the recognition of the supremacy Influence of the Roman pontiff was now to be found in the revival of Arian- of Arianism, which, professed alike by the Goth and the a Vandal, represented the dominant faith in the chief cities

of northern Italy, as well as in Africa, Spain, and southern Gaul. But the rivalry thus generated only increased the disposition of the Catholic party to exalt the prerogatives of their head, and the attitude of Rome towards other churches continued to be more and more one of unques- tionable superiority. In the year 483 Pope Fetrx II. (or IIL) ventured upon' an unprecedented measure in citing Acacius, the patriarch of Constantinople, to Rome, to

1 That is, unless we admit the genuineness of the canons of the

council of Sardica (343), which probably few who have studied the evidence will be prepared to do.

Rome consti- tuted a court of appeal.

religious questions, and showed little disposition to impose any restraints on the policy of the popes, although each monarch, by virtue of his title of “king of the Romans,” claimed the right to veto any election to the papal chair. In the year 483, when Odoacer sent his first lieutenant, Basilius, from Ravenna to Rome, the latter was invested with the titles “‘eminentissimus” and “sublimis.” The pope accordingly appeared as politically the subject of his Arian overlord. The advantage thus gained by the tem- poral power appears to have been the result of its inter- vention, which Simpuicius (468-483) had himself solicited, in the elections to the papal office, and one of the principal acts of the Palmary Synod (above referred to) was to repudiate the chief measures of Basilius, which had been especially directed against the abuses that prevailed on such occasions, and more particularly against bribery by alienation of the church lands. The assertion of this authority on the part of the civil power was declared by the synod to be irregular and uncanonical, and was accordingly set aside as not binding on the church. The fierce con- tests and shameless bribery which now accompanied almost every election were felt, however, to be so grave a scandal that the synod itself deemed it expedient to adopt the ordinance issued by Basilius, and to issue it as one of its own enactments. In order more effectually to guard against such abuses, Bonirace IL, in the year 530, obtained from a synod specially convened for the purpose the power of appointing his own successor, and nominated one Vigilius—the same who ten years later actually suc- ceeded to the office. Buta second synod, having decided that such a concession was contrary to the traditions of episcopal succession, annulled the grant, and Boniface himself committed the former decree to the flames. At his death, however, the recurrence of the old abuses in a yet more flagrant form induced the senate to obtain from the court of Ravenna a measure of reform of a more com- prehensive character, and designed to check, not only the simoniacal practices within the church itself, but also the extortion of the court officials.

In the year 526 Dionysius Exiguus, a monk in Rome, Dionysius undertook the labour of preparing a new collection of the Exiguus.

canons of the councils, and, finding his production favour- ably received, proceeded also to compile a like collection of the papal letters or decretals, from the earliest extant

Results of sub- jection

to the Greek emperors.

Invasion of the Lom- bards,

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down to those of Anastasius IJ. in his own day. The letters of the popes were.thus placed on a level with the rescripts of the emperors, and in conjunction with the canons formed the basis of the canon law, which afterwards assumed such importance in connexion with the history of the church. The negative value of the collection formed by Dionysius may be said, however, almost to equal that of its actual contents; for, from the simple fact that it does not contain those yet earlier decretals subsequently put forth by the pseudo-Isidorus, it affords the most con- vincing disproof of their genuineness.

The substitution of the rule of the Greek emperors for that of the Gothic monarchs was inimical in almost every respect to the independence and reputation of the pope- dom. For a short interval before Justinian landed in Italy, AGAPETUS (535~536), appearing as the emissary of Theodotus to the Eastern court, assumed a bearing which inspired the emperor himself with respect, and his influ-

ence was sufficiently potent to procure the deposition of

one patriarch of the Eastern capital and to decide the election of another. But, after Belisarius entered Rome and the city had been reduced to subjection, the pontiff was seen to be the mere vassal of the emperor, and not only of the emperor but of the courtezan on the imperial throne. .The deposition of SinvEerius (536-540), and his mysterious fate at Pandataria, together with the elevation of Vicrnius (540-555), the nominee of the abandoned Theodora and her pliant slave, completed the degradation of the Roman see. ach successive pope was now little more than a puppet which moved at the pleasure of the Eastern court; and the apocrisiarius or deputy whom he maintained at that court was generally (as in the case of Pelagius I., Gregory I, Sabinian, Boniface III., Martin) his own successor—an

honour purchased, it can hardly be doubted, by systematic compliance with the imperial wishes. In the career and fate of Vigilius the papal office was dis- honoured as it had never been before, at once by the signal unworthiness of its bearer and by the indignities heaped upon him by the savage malice of his foes. So sinister, indeed, had become the relations between the Roman bishop and the Eastern court that Pznacrus I. (555-560) is said to have besought Narses to send him to prison rather than to Constantinople.

In the year 568 the Lombards invaded Italy. Like the Goths they become converts to Arianism; but they were also far less civilized, and looked with little respect on Roman institutions and Roman habits of thought, while their arrogance, faithlessness, and cruelty gained for them the special detestation of the Roman see. Their conquests

‘did not extend over all Italy. Ravenna and the Penta-

polis, Venice, Rome and its duchy (as the surrounding district was then termed), Naples, Calabria, and Sicily remained subject to the empire. In the peninsula the pope was, after the exarch of Ravenna, the niost powerful potentate, and the presence of a common foe caused the relations between himself and the empire to assume a nore amicable character. The emperor, indeed, continued to control the elections and to enforce the payment of tribute for the territory protected by the imperial arms ; but, on the other hand, the pontiff exercised a definite authority within the Roman duchy and claimed to have a voice in the appointment of the civil officers who administered the local government. From the time of Constantine the Great the church had possessed the right of acquiring landed property by bequests from indi- viduals, and the Roman see had thus become greatly enriched. Some of its possessions lay far beyond the con- fines of Italy. It was one of the last acts of Celestine I. to address to the emperor Theodosius JJ. an appeal for the imperial protection of certain estates in Asia, which

a lady named Proba had bequeathed to the Roman see for the maintenance of “the clergy, the poor, and cer- tain monasteries” (Coustant, ed. Schoenemann, p. 879). ‘“‘Ever since the restriction of the Western empire,”

says Mr Bryce, “‘had emancipated the ecclesiastical potentate from secular control, the first and most abiding object of his schemes and prayers had been the acquisition of territorial wealth in the neighbourhood of his capital. He had indeed a sort of justification, for Rome, a city with neither trade nor industry, was crowded with poor, for whom it devolved on the bishop to provide.” The motives for acquiring such wealth did not, accordingly, cease to actuate the pontiff, even when the paralysing influences of the imperial despotism were again very sensibly felt ; but the territory thus gained, known as the ‘ patrimonium Petri,” must not be supposed to have involved that claim to temporal sovereignty put forth at a later period. Ori- ginally bestowed mainly for the relief of the sick and desti- tute, the patrimonial revenues came, in course of time, to be applied to the maintenance of the pope himself and the clergy of his diocese, and to the erection and repair of churches. They were strictly inalienable ; and the pontiff himself was regarded simply as the steward, for the time being, of the estate.

Under Grecory J. (590-604), commonly known as Gregory “the Great,” this territorial wealth became largely aug- the Great.

mented ; and, although, amid the universal demoralization and widespread misery of his age, he professed to discern the unmistakable signs of the approaching end of the world, the efficient administration of the estates of the church was an object of his unceasing solicitude. Of noble descent, great wealth, and considerable learning, he possessed also a capacity for administration not inferior to that of his predecessor Leo, and his best energies were devoted to the interests of his diocese and the alleviation of the want and misery of which it was the constant scene. His Letters, which constitute a remarkable picture both of the man and his age, and attest the minute and unwearied care which he bestowed on everything relating to the affairs of his see, appear to have been taken as the model for the Liber Diurnus, or journal of the Roman curia, which was commenced in the following century. In other respects his genius for administration, his good sense and tact, are equally conspicuous. Through his influence with Theude- linda, the wife of Agilulf, the Lombard monarch, he not only succeeded in averting another siege of Rome, but he also managed to bring about the establishment of amicable relations between the Lombards and the Roman popula- tion. With the Byzantine court he did his best to

maintain a friendly intercourse, although in his zeal on behalf of monasticism he withdrew his apocrisiarius from Constan- tinople, when the emperor Maurice forbade his soldiers to assume the monastic life. It is perhaps the greatest blot on Gregory's memory that, when the emperor and his family were cruelly murdered by Phocas, who seized upon the imperial dignity, Gregory was not above congratulating the usurper on the circumstances of his accession, an act of adulation but insufficiently extenuated by his panegyrists, as taking its rise in feelings of genuine, though mistaken, religious enthusiasm. His efforts on behalf of primary edu- cation, which have caused him to take rank in the Roman calendar as the patron saint of school festivals, are deserv- ing of high praise; but, on the other hand, his illiberal condemnation of the pagan literature (in striking contrast to the Benedictine traditions of a later time) diminishes not a little our impression of his real greatness. He stands, however, among the foremost of the popes, and the impress of his character and teaching must be held to have permanently modified the views and policy of the Roman curia.

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The personal qualities and virtues of Gregory are

cessors of thrown into stronger relief by the comparative insigni- Gregory. ficance of his successors in the 7th century, whose tenure

of office was, for the most part, singularly brief and in- glorious. His immediate successor was SaBINIANUS (604— 606), who after a few months' tenure of office, and an inter- val of a whole year which remains entirely unaccounted for, was succeeded by Boniface III. (607). Boniface was the last apocrisiarius who had represented Gregory at the im- perial court, and he appears to have been successful in completely winning the favour of Phocas, who at his sug- gestion passed a decree declaring "the Apostolic Church of Rome" to be "the head of all the churches." He did this, says Paulus Diaconus, 'because the church of Constan- tinople had styled itself the first of all the churches."1 In this manner the imperial veto was distinctly pronounced on the claim of the Byzantine Church to be regarded as of universal authority—a claim which it now became the policy of the Church of Rome to assert on her own behalf on every possible

occasion. Thenew and intimate relations which Gregory and his emissaries had created between the church and the great Teutonic races especially favoured these assumptions. Frankland and England alike were brought within the range of influences of incalculable after importance, the development of which in the 7th and 8th centuries may fairly be looked upon as constituting a distinct era in the history of the popedom. In Rome itself, on the other hand, the interest of the drama becomes perceptibly lessened. In the long and rapid succession of the pontiffs, most of them pliant Greeks or Syrians, the nominees of the exarch of Ravenna, and intent on winning the favour of both the emperor and his representative, scarcely one appears as actuated by more than the tradi-

different spirit, and the civil power showed no disposition to welcome foreign interference even in connexion with ecclesiastical institutions. It is observed by Guizot that ‘ from the death of Gregory the Great to the time of Gregory ITI. (604-715) not a single document exists which can be cited as proof of intercommunication between the rulers of Frankland and the papacy. The series of events which led to such different relations, enabling the Roman pontiff eventually to shake off both his fear of the Lonibard and his long dependence on the Byzantine emperor, forms one of the most interesting passages in European history.

and Syrians in the papal chair was broken by the election HU. of a man of Roman birth and endowed with much of the strength of purpose that belonged to the ancient Roman. In Grecory IT. (715-731) men recognized no unworthy successor of his great namesake, and by Gibbon he is regarded as the true ‘founder of the papal monarchy.” In no respect were his care and religious sentiments more conspicuously manifested than in connexion with the evangelization of distant lands, and it was under his auspices that the celebrated Winfrid or Boniface first commenced his famous missionary work in Frankland. His rapid success in the work of converting the still heathen populations is a familiar story. From GrREGcorRY IIL. (731-741) Boniface received the appointment of papal legate; he took the oath of perpetual fidelity to the supreme pontiff, and wherever he went he preached the duty of a like submission. He enforced the theory of the Catholic unity

and of the obligation of the whole body of the clergy to render implicit obedience to the representative of that unity,—the successor of St Peter, the spiritual superior of all earthly tribunals.

In the year 715 the long succession of pliant Greeks Gregory

While bonds of union were thus being created in the Rupture West, theological differences were exercising a very differ- with the ent though not less important influence in the East. It ¢™P™

tional views of his office and its functions. One of them, who ventured to thwart the imperial purpose, paid dearly for his conscientiousness. The Byzantine capital, at this

period, was distracted by the interminable controversies carried on between the Monothelites and their opponents. The emperor, the half-insane Constans, arrogated to him- self the function of mediating between the contending parties, and sought to wring from Martin I. (649-653) an authoritative assent to a compromise of doctrine which, to that pontiff, appeared to involve the sacrifice of ortho- doxy. ‘The latter convened a council at the Lateran and

| was in the year 731 that Gregory IIL, the last of the pontiffs who received the confirmation of his privileges from Constantinople, issued a sentence of excommunication against the Iconoclasts. It was the papal rejoinder to the decree of Leo the Isaurian, passed in the preceding year, commanding that all images in the churches of the empire should be forthwith removed. Although he was a Syrian by birth, orthodoxy was dearer to Gregory than political

allegiance, and the sequel justified his policy. The emperor, indeed, retaliated by what could not but be | deemed a disastrous blow. All the dioceses within the /empire where the Roman pontiff had hitherto claimed years and feeble health, banished to a gloomy prison on the | obedience— Calabria, Sicily, and Dlyricum—were forth- Euxine, where he soon after died. with absolved from their ecclesiastical allegiance, and the Advances But, while thus menaced and dishonoured in Italy, the revenues from their rich “ patrimonies,” which had before eo by papal power was making

important advances in the west. | flowed into the papal treasury, were confiscated. But the ie In England the resistance offered by the representatives | tie which had hitherto bound the popedom to the empire the WeéRt. of the British Church was soon overcome, and from the was thus effectually broken. time of the council of Whitby (664) the teachings and | Under these circumstances a compact with the Lom- traditions of Gregory, as enforced by Augustine, Theodorus, | bards, who had by this time become converts from Wilfrid, and others, found ready acceptance. The human- | Arianism to the Catholic faith, would have seemed the izing influences which these representatives of the Roman | obvious policy on the part of Rome, had not the political culture diffused around them exercised a potent spell over | aims of the former stood in the way. The Lombard the minds and wills of the English population. Monas- | coveted the possession of the capital, and this design, the terles were founded ; cathedrals rose, each with its school , cherished design of centuries, marked him out as perforce of instruction for the young, and its charity for the needy; | the foe of the popedom. In his extremity, therefore, the Alliance and a spirit of filial though far from slavish devotion to Roman pontiff turned to the Frank, untainted by the with the Rome was everywhere created. heresy of Arianism, and already, as the result of the teach- C27! In Frankland, however, the Merovingian kings and ing of Boniface, disposed to assent to any claims of the — the populations of Neustria and Austrasia exhibited a papacy which did not involve the diminution of his own _ Vi Dale T onaotee ia: : ___,. | prerogatives or the restoration of alienated revenues. In reproduced by Ge ae ae he ge 565 : | the ‘ial 752 Pepin le Bref assumed the dignity and title a vat Anastasius, De Vitis Rom. Pont., in life of Boniface UI., Of “king of the Franks.” He did so, the annalists arc igne, Patrol. , exxviii. 671. unanimous in assuring us, with the consent and sanction

formally condemned the proposed solution. He was soon after induced to repair to Constantinople, and, having there been arraigned on a false charge of fomenting political in- trigue, was deprived of his see and, although in advanced

Relations to Frank- land.

State of

of Pope Zacharias, and he was anointed and crowned by Boniface—a momentous precedent in relation to European history. In the following year, during the pontificate of STEPHEN III. (753-757) Aistulf, the king of the Lombards, invaded the duchy of Rome with the avowed purpose of adding the capital itself to his dominions. He seized Ravenna and the exarchate ; and Stephen, finding remon- strance and entreaty alike unavailing, fled for protection to the Frankish territory and was received by King Pepin with every mark of sympathy and profound respect. Within a short time after, Pepin invaded the Lombard domain and wrested from its monarch an extensive terri- tory embracing Ravenna and the Pentapolis; and at a council held at Quiercy, in the same year (754), he handed over this territory to Stephen, “to be held and enjoyed by the pontifis of the apostolic see for ever.” Such appears to be the real origin of that ‘“donatio,” or gift of terri- tory (referred back, by the invention of after times, to the age of Constantine the Great), which constituted the pope a temporal ruler over what were subsequently known as the “States of the Church.” The munificence of Pepin was rivalled by that of his son. In the year 774, on the occasion of the visit of Charles (known as the Great) to Rome, the donation of his father was made the ground for soliciting and obtaining a yet larger grant, comprising much of the territory already bestowed, but extending to at least double the area stipulated for in the earlier donation.

It-will thus be seen that, towards the close of the 8th

the papal century, the germs of the chief papal claims were already

claims at

the close of the 8th century.

in existence, and only needed for their full development those favouring conditions which, with the lapse of time, were certain to occur, and for which, from its peculiar character as an institution, the popedom itself was so well able to watch and wait. Already the pontiff claimed the dispensing power, @e., the right to dispense with the observance of the existing canonical law under conditions determinable at his pleasure. Already he

claimed the right to confer privileges—a power subsequently wielded with enormous effect in enabling monastic and episcopal foundations to urge their encroachments on the rights and jurisdiction of the secular power. He assumed again, in Western Christendom at least, the rights of an universal metropolitan —demanding that in all elections to bishop- rics his sanction should be deemed essential; and the arrival of the pallium from Rome was aiready awaited with anxiety by all newly-elected metropolitans. By the encouragement which was systematically given to appeal to Rome, what had before been the exception became the practice, and that "extraordinary" authority, as it was termed, which had been introduced, in the first instance, only under the pretext of providing a fixed court of appeal in cases of dispute which threatened otherwise to prove incapable of adjustment, developed into an immediate and ordinary jurisdiction—into an authority, that is to say, which in all questions of graver import set aside that of the bishop, and even that of the metropolitan, and made reference to Rome the rule rather than the exception. In theory, although the claim was admitted neither by the rulers of Frankland nor by those of England, the Roman pontiff already claimed also to present to all benefices. Although he had not, as yet, assumed the distinctive insignia of his office—the triple crown and the upright pastoral staff surmounted by the cross—he more and more discouraged the application of the name of "papa" (pope) to any but himself. The title of "universal bishop," which both Pelagius II. and Gregory the Great had dis- claimed, seemed his by right after the decree of Phocas, and with the lapse of two centuries from that time was assumed by no other rival. The titles of '"apostolicus,"

"claviger" (the bearer of the keys), and "servus ser- vorum Dei" were claimed in like manner as exclusively his. One temporal potentate had already received his crown as a grant from the pontifical chair; the occupant of that chair was already himself a temporal sovereign.

That the medizeval conception of the papal office was Develop- one of gradual and slow development appears accordingly ment of

to be beyond all reasonable doubt, and this feature belongs tbe

for example, that the conception of the episcopal order and its functions grew with the increasing power and wealth of the church. In like manner if we compare the theory of the equality of bishops one with another, enunciated by Cyprian, with the prerogatives of a metro- politan, as laid down at the council of Antioch (341), and subsequently further magnified, we are conscious of the introduction of what is tantamount to a new theory. And, finally, we become aware of yet another hierarchical order, as we see rising up the patriarchates of Rome, Alexandria, Antioch, Jerusalem, and Constantinople, each invested by the church with an assigned order of preced- ence. Something, however, was yet wanting which should crown the gradations thus successively created, and com- plete the analogy to the Roman political organizations —the institution of the monarchical dignity. It was for this supreme honour that Rome and Constantinople con- tended, at a time when, from various causes and circum- stances, the other patriarchates had sunk into an inferiority too marked to admit of rivalry. In this contest the patriarch of Constantinople rested his claim on what may be termed the traditional political foundation—the honour due to the patriarch of the chief seat of empire ; this plea, although already sanctioned by the church, was met on the part of Rome by a counter appeal to the supreme reverence due to what was not merely an “apostolica sedes,” but a see founded by two apostles, of whom one was the chief of the apostolic order. In this remarkable abandonment of the ancient plea for pre-eminence and the limitation of the argument to that derivable from the claim to be an apostolic see, much of the difficulty and obscurity that belong to the earlier history of the papacy had probably its origin. And it seems but too probable that the endeavour to disguise this change, and to repre- sent the claims advanced by Innocent I., by Leo I., by Gregory the Great, and by Hadrian II., as already wrtu- ally asserted and admitted in the 4th century and in yet earlier times, has given rise to endless wrestings of isolated passages in writers of good authority, to deliberate falsi- fication of genuine documents, and to what are allowed on all hands to be direct and palpable forgeries. Another feature, which has been made subservient to no small amount of misrepresentation, must not be overlooked. From their earliest appearance, the distinctive claims advanced by the Roman see can only be regarded as a series of encroachments on that original conception of the episcopal office maintained by Cyprian. And so long as the other patriarchates—Alexandria, Antioch, and Jerusalem—maintained their ground, these encroachments

wore a comparatively inoffensive guise, being little more than the assertion of the rights of a patriarch or supreme metropolitan within the Roman diocese. But, in addition to and distinct from the patriarchal supremacy, there was the theory of the primacy of the bishop of Rome over all the bishops, patriarchs, and metropolitans—at first little more than an honorary distinction and carrying with it no definite authority or jurisdiction. When the patriarchates of Alexandria, Antioch, and Jerusalem could no longer appear as rivals and Rome was confronted by Constantinople alone, this theory was brought much more prominently forward; while at the same time, in order

9 : 5 R in common to the whole hierarchical system. We find, oe

the better to enforce the papal claims, a confusion was designedly and skilfully introduced of the honorary primacy derived from St Peter with the actual rights of the head of the Roman diocese. The precedents afforded by the former were adduced in support of the universal jurisdiction claimed by the latter, and in an ignorant and uncritical age were with little difficulty represented as affording sufficient warrant for a large proportion of the claims asserted in the 9th century. It is by the light which we derive from these considerations that we are enabled to discern what appears to be the only theory which offers a solution of the tradition respecting St Peter and his successors that is in harmony with the historical evidence. When we consider that in the course of the 5th century papal Rome, partly from the ambition of her pontifis, partly from the concurring influence of external circumstances, had acquired a position of authority in relation to Christendom at large which afforded the pro- spect of yet more complete and general pre-eminence, and that towards the assertion of such pre-eminence her claim to rank as the greatest and most honoured of the “apostolice sedes” seemed to offer effective aid, the appearance of ‘legends and spurious documents tending to support such a claim can excite no surprise in the minds of those familiar with the literature of the period. As in the 2d century the attempt to reconcile two earlier and corrupt traditions respecting St Peter’s presence and work in Rome gave rise to the tradition

of his five-and-twenty years' episcopate, so, we can understand, it was probably sought to substitute for the simple tradition preserved in "'Hegesippus " and Irenzeus, with respect to St Peter's suc- cessors, Official records (purporting to supply details such as no other church had preserved, and such as it is in the highest degree improbable that the church at Rome should have succeeded in preserving) of an early episcopal succes- sion; while the discrepancies of the different lists that profess to record this succession admit, again, of an adequate if not a satisfactory explanation, if we regard them as, for the most part, independent and purely con- jectural efforts to invest the earlier episcopal office with an historical importance to which in the first two centuries it certainly had not attained.

While the Western primate was thus growing in dignity, wealth, and influence, those ecclesiastical potentates who had once claimed an equal or coordinate rank, with the sole exception of the patriarch of Constantinople, alto- gether ceased to exist. The Saracen conquests in Syria and Egypt had involved the loss of Jerusalem to Christen- dom (637), and this had been speedily followed by the extinction of the churches of Antioch and Jerusalem. 'The patriarch of Constantinople represented, accordingly, the only spiritual power which could compare with that of Rome; but, while he continued to be the submissive vassal of the Byzantine court, that court was compelled to see the once no less submissive pontiff of Rome changed into a successful invader of its Italian possessions and into a determined repudiator of its articles of faith. In the year 800 Charles the Great received at the hands of Leo Ifl., in Rome, the imperial crown, and the titles of "emperor" and " Augustus." The authority by virtue of which Leo assumed the right to confer such dignities was probably by no means quite clear even to those who were witnesses of the imposing ceremony. It may perhaps be best described as derived partly from his sacerdotal func- tion, as displayed in the consecrating rites, and partly from the fact that he also acted as the representative of the people in their capacity of electors. To the Byzantine emperor, the whole ceremony and the titles conferred seemed a direct menace to his own prerogative, and com pleted the estrangement between the West and the East.

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From that time down to the 15th century Greek institu- tions and Greek culture were the special objects of dis- like and distrust to the papacy. The use of the Greek language had already been discontinued in the records of the Roman Church; and the study of its literature was now systematically discouraged. The assumption by Charles of the imperial dignity and the consequent rise of the ‘“ Holy Roman Empire” were events on the importance of which it is unnecessary here to dwell. By the theory thus established, a temporal supremacy or “ condominium ” was created corresponding to the spiritual supremacy of the popedom, and the Roman emperor claimed from all other rulers in Christendom an allegiance corresponding to that which the Roman pontiff claimed from all other ecclesiastical potentates. The imperial authority and papal authority were thus complementary the one to the other. The emperor claimed to confirm the papal elec- tions ; the pope claimed to confer the imperial crown upon the emperor. But the precise adjustment of these respec- tive claims, and the further assumptions which they sug- gested or favoured, according as the empire or the papacy proved for the time the stronger, gave rise to a series of memorable struggles which sometimes assume proportions that constitute them the pivot on which contemporary history throughout Europe may be said to revolve. The compact originally made between the empire and the pope- dom, however plausible in theory, was indeed attended with no little danger to both. At one time it appeared probable that the state would overwhelm the ecclesiastical organization and convert it into a machine for political

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purposes ; at another time it seemed no less likely that _

the latter would subjugate the former and reduce all Western Christendom to a vast spiritual tyranny. During the three centuries that followed upon the creation of the Holy Roman Empire—from the year 800, that is to say,

down to the Concordat of Worms (1122)—it was chiefly the former contingency that seemed the more probable. During the pontificate of Nicuoxas I. (858-867), how- ever, the papacy again made a perceptible advance. Nicholas intervened with signal effect in the disputed succession to the Eastern patriarchate, and asserted more distinctly than it had ever been asserted before the theory of the Roman supremacy. He dared, also, to forbid the divorce of Lothair (the powerful monarch of the vast terri- tory which stretched from the German Ocean to the Mediterranean) from his wife Theutberga, thereby estab- lishing an important precedent for papal interference in questions of private morality. And, finally, in his arduous struggle with Hincmar, metropolitan of Rheims, he gained an important victory over the powerful prelates on the Rhine in the question of appeal. It must, however, be admitted that this last advantage was gained only by the use of forged documents—the pseudo-Isidorian decretals, which seem to have first seen the light about the year 850; it was pretended that they had been compiled by Isidore of Seville, an eminent writer and ecclesiastic of the 7th century, and had been brought from Spain to Mainz by Riculfus, the archbishop of that city. This col- lection embodied a complete series of letters purporting to have been written by the popes of Rome from the time of Clemens Romanus down to that with which the collec- tion by Dionysius Exiguus commences, thus filling up the entire blank, and affording among other data ample prece- dent for appeals to Rome of the kind against which Hincmar had protested. When some doubt was raised as to the genuineness of the collection, Nicholas did not scruple to assure Hincmar that the originals had been lying from time immemorial in the Roman archives. Among many other fundamental positions laid down in these decretals was one to the effect that no council of the

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The false decretals.

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church had canonical validity unless it had been summoned with the sanction of the holy see. The assertion of this theory rendered it necessary considerably to extend the practice of appointing papal legates (/egati a latere), who now became the ordinary channels of communication between

Rome and the Western churches, and through whom all affairs of importance were transacted. The legate convened the provincial councils and presided over them, taking precedence even of the metropolitan. Such | encroachments enable us at once to understand how it was that Henry I. of England deemed it necessary to demand from Paschal II. a promise that no legate should be sent into the kingdom until the royal assent had been previously obtained. From the pontificate of Nicholas we date a |

was one of the worst of the pontiffs, ill repaid the service rendered to the see; and, foreseeing that the restoration of justice and law was likely to prove fatal to his own misrule, he proceeded to plot the emperor's overthrow. He was summoned to appear before a council presided over by the latter, to meet the accusations brought against him, and, having failed to appear, was formally dcposed.

On the same occasion the imperial right to confirm the

election to the papal office (which had been for some time in abeyance) was formally restored. Of the pontiffs whose names stand in the subsequent succession two were anti- popes, Benepict V. (964) and Bonirace VII. (984-985), set up by the party in rebellion against the imperial power.

With the restoration of law and order the ancient re-

notable diminution in the power of the metropolitans. | gard for the popedom regained its hold on the minds of

The false decretals have been described as the source to , men. Under the guidance of the celebrated Gerbert, the Gerbert which we may trace that great revolution in the relations | youthful enthusiasm of Otto III. aimed at making Rome and Otto of church and state which now gradually supervened. The once more the centre of political dominion and the seat of eae

Hadrian pontificate of Haprian IL. (867-872) is especially notable | the imperial power. Hugh Capet, too, professed himself IL. for the application

which he sought to make of some of the “defender of the church.” A strong sense began also the principles which they laid down. When Lothair, king to find expression of the infamy attaching to the associa- of Lotharingia, died without heirs, Hadrian claimed the | tions of the curia. At the first of the two councils convencd right to bestow the crown on the emperor Louis. Christian | at Rheims in 991 it was formally demanded, by what Europe, however, was not as yet prepared to accept this decree it was that “‘numberless priests of God, famed alike bold extension of the papal prerogatives. The kingdom for learning and virtue, were subjected to the rule of was seized by Charles the Bald, and Hadrian was reminded | monsters of iniquity wanting in all culture, whether sacred in a manifesto drawn up by the bishops of Germany that or profane.” The French monarchs were glad, however, to he could not at once be “universal pope and universal purchase the support of the papacy to aid them in their king.” But the weakness of Charles’s claim was unde- | struggle with the rebellious chieftains by whom the very niable, and we accordingly find him, five years later, con- “existence of their authority was menaced, and, until the senting to receive the imperial crown at the hands of Jonn action of the papal legates again roused the spirit of VIII. (872-882), not as his heritage but as a gift from the | national resistance, the Capetian dynasty was loyal to the pope. During the dark and stormy period that intervened Roman see. That it was so was in no small measure due between the death of Charles the Bald and the coronation | to the virtues and abilities of Grecory V. (996-999), the of Otto the Great at Rome (962), the Carlovingian empire kinsman of Otto ITI., a young man of considerable attain- broke up, and the results that followed were disastrous ments, austere morality, and great energy of purpose, who both for the popedom and the empire. The Saracens occu- | succeeded to the papal chair at the age of twenty-four. He pied southern Italy, and menaced on more than one occasion _ was succeeded by Gerbert, Pope Sitvester IT. (999-1003), the capital itself ; the Normans poured in successive waves | from whom Otto III. derived, as already stated, his ideas over Frankland; the ravages of the Magyars were yet | of Italian and papal regeneration. But in Germany neither wider spread and not less terrible. Alike in the civil and ; the nobility nor the episcopal order could contemplate with the ecclesiastical world the elements of strife and insub- | equanimity the projects of either pontiff or emperor, and ordination were let loose; and, while the feudal lords | Otto’s schemes were met with a stubborn

and paralysing defied the authority of their king, and the power of the , resistance. Then the feudal princes of the Roman states French monarch sank to the lowest ebb, the bishops in | rose in insurrection; and the ardent young reformer was like manner forsook their allegiance to the Roman pontiff. | taken off—it was believed, by poison—at the age of two The. archbishops of Ravenna and Milan appeared indeed | and twenty, to be followed in the next year by his faithful as his rivals, and the political influence which they com- | preceptor on the pontifical throne. manded more than equalled his: the 10th century has With the disappearance of these two eminent men the Ascen- been designated “the noon-day of episcopal independence.” | popedom relapsed into its former degradation. The feudal in bm Degrada- The history of the curia at this period is marked by the | nobility—that very “refuse” which, to use the expression Resi cee tion of — deepest moral degradation and the most revolting scenes. | of a contemporary writer, it had been Otto’s mission “to the curia. The papal jurisdiction was limited almost entirely to the sweep from the capital”— regained their ascendency, and capital itself, and even the succession of the pontiffs them- | the popes became as completely the instruments of their selves is with difficulty to be traced. The office, indeed, was | will as they had once been of that of the Eastern emperor. sometimes disposed of by the influence of immoral women. A leading faction among this nobility was that of the The pontificate of SrrpHen VI. (or VII., 896-897) is | counts of Tusculum, and for nearly half a century the remembered only for the inhuman manner in which he | popedom was a mere apanage in their family. As if to treated the lifeless corpse of his predecessor Formosus; mark their contempt for the office, they carried the election that of Sercius III. (904-911) for the virtual reign of | of Theophylact, the son of Count Alberic, a lad scarcely Theodora and her daughter, the two most notorious courtc- | twelve years of age, to the office. BENEDIcT Ix. (1033- zans of the age; StepHEeNn IX. (939-942) was disfigured 1045), such was the title given him, soon threw off even for life by the brutal treatment which he received at the | the external decencies of his office, and his pontificate was hands of the Roman mob. disgraced by every conceivable excess. As he grew to Ottoand Inthe dismembered empire, the kingdom of Germany | manhood his rule, in conjunction with that of his brother, John first exhibited signs of returning order and cohesion ; and | who was appointed the patrician or prefect of the city, a at the solicitation of Pope Joun XII. (955-963) King |

resembled that of two captains of banditti. The scandal Otto led an army into Italy, rescued the land from its | attaching to his administration culminated when it was cruel oppressor, Berengar, the feudal lord of the realm, | known that, in order to win the hand of a lady for whom and was anointed emperor at Rome. Jolin, however, who | lie had conceived a passion, he had sold the pontifical office

itself to another member of the Tusculan house, John, the arch-presbyter, who took the naine of GREGORY VE (1045- 46). His brief pontificate was chiefly occupied with endea- | vours to protect the pilgrims to Rome on their way to the capital from the lawless freebooters (who plundered them | of their costly votive offerings as well as of their personal | property), and with attempts to recover by main force the alienated possessions of the Roman Church. Prior, how- ever, to his purchase of the pontifical office, the citizens of Rome, weary of the tyranny and extortions of Benedict, had assembled of their own accord and elected another pope, John, bishop of Sabina, who took the name of SILVESTER ITI. (rival pope, 1044-46). In the meantime Benedict had been brought back to Rome by his powerful kinsmen, and now reclaimed the sacred office. For a brief period, there- fore, there were to be seen three rival popes, each denounc- ing the others' pretensions and combating them by armed force. But even in Rome the sense of decency and shame had not become altogether extinguished ; and at length a party in the Roman Church deputed Peter, their arch- deacon, to carry a petition to the emperor, Henry III, soliciting his intervention. The emperor, a man of deep religious feeling and lofty character, responded to the appeal. He had long noted, in common with other thoughtful observers, the widespread degeneracy which, taking example by the curia, was spreading throughout the.church at large, and especially visible in concubinage and simony,—alike regarded as mortal sins in the clergy. He forthwith crossed the Alps and assembled a council at Sutri. The claims of the three rival popes were each in turn examined and pronounced invalid, and a German, Suidger (or Suger), bishop of Bamberg, was elected to the office as CLement IT. (1046-47).

The degeneracy of the church at this period would seem

to have been in some degree compensated by the reform

of the monasteries, and from the great abbey of Cluny in |

The Ger- Burgundy there now proceeded a line of German popes, oe who in a great measure restored the dignity and repu- popes. tation of their office. But, whether from the climate,~

always illadapted to the German constitution, or from

poison, as the contemporary chronicles not unfrequently suggest, it is certain that their tenure of office was singu- larly brief. of his election. Damasus IT., his successor, held the office Leo IX. only twenty-three days. Lo IX., who succeeded, held it for the exceptionally lengthened period of more than five years (1049-54). nominee of the emperor, refused to ascend the throne until

his election had been ratified by the voice of the clergy |

and the people, and his administration of the office pre- sented the greatest possible contrast to that of a Benedict IX. or a Sergius ITI. In more than one respect it con- stitutes a crisis in the history of the popedom. In con- junction with his faithful friend and adviser, the great Hildebrand, he projected schemes of fundamental church reform, in which the suppression of simony and of married life (or concubinage, as it was styled by its denouncers) on the part of the clergy formed the leading features. In the year 1049, at three great synods successively convened at Rome, Rheims, and Mainz, new canons condemnatory of the prevailing abuses were enacted, and the principles

Clement II. died before the close of the year |

This pontiff, although a kinsman and

of monasticism more distinctly asserted in contravention of those traditional among the secular clergy. Leo’s | pontificate closed, however, ingloriously.

In an evil hour | he ventured to oppose the occupation by the Normans, whose encroachments on Italy were just commencing. His ill-disciplined forces were no match for the Norman bands, composed of the best warriors of the age. He was

| was given in favour of Alexander.

himself made prisoner, detained for nearly a twelvemonth in captivity, and eventually released only to die, a few

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days after, of grief and humiliation. But, although his own career terminated thus ignominiously, the services rendered by Leo to the cause of Roman Catholicism were

‘ great aud permanent; and of his different measures none

contributed more effectually to the stability of his see than the formation of the College of Cardinals. The title of The Go. “cardinal” was not originally restricted to dignitaries con- lege of

nected with the Church of Rome, but it had hitherto been ©#rdinals.

a canonical requirement that all who attained to this dignity should have passed through the successive lower ecclesiastical grades in connexion with one and the same foundation ; the cardinals attached to the Roman Church had consequently ‘been all Italians, educated for the most part in the capital, having but little experience of the world beyond its walls, and incapable of estimating church questions in the light of the necessities and feelings of Christendom at large. By the change which he intro- duced Leo summoned the leaders of the party of reform within the newly-constituted college of cardinals, and thus attached to his office a body of able advisers with wider views and less narrow sympathies. By their aid the administration of the pontifical duties was rendered at once more easy and more effective. The pontiff himself was liberated from his bondage to the capital, and, even when driven from Rome, could still watch over the inter- ests of both his see and the entire church in all their extended relations ; and the popedom

must now be looked upon as entering upon another stage in its history—that of almost uninterrupted progress to the pinnacle of power. According to Anselm of Lucca, it was during the pontifi- cate of Leo, at the synod of Rheims above referred to, that the title of “apostolic bishop” (Apostolicus) was first declared to belong to the pope of Rome exclusively. The short pontificate of Nicwoxas IT. (1059-61) is memorable Change chiefly for the fundamental change then introduced in the in the method of electing to the papal office. By a decree of the method of second Lateran council (1059), the nomination to the office la was vested solely in the cardinal bishops—the lower clergy, the citizens, and the emperor retaining simply the right of intimating or withholding their assent. It was likewise enacted that the nominee should always be one of the Roman clergy, unless indeed no eligible person could be found among their number. At the same time the direst anathemas were decreed against all who should venture to infringe this enactment either in the letter or the spirit. The preponderance thus secured to the ultramontane party and to Italian interests must be regarded as materially affecting the whole subsequent history of the popedom. The manner in which it struck at the imperial influence was

‘soon made apparent in the choice of Nicholas’s successor, the

line of German popes being broken through by the election of Anselm, bishop of Lucca (the uncle of the historian), who ascended the pontifical throne as ALExaNDeER IT. (1061- 73) without having received the sanction of the emperor. His election was forthwith challenged by the latter, and for the space of two years the Roman state was distracted by a civil war, Honorius IL. being supported as a rival candidate by the imperial arms, while Alexander main- tained his position only with the support of the Norman levies. The respective merits of their claims were con- sidered at a council convened at Mantua, and the decision Cadalous, such was the name of his rival, did not acknowledge the justice of the sentence, but he retired into obscurity; and the remainder of Alexander’s pontificate, though troubled by the disputes respecting a married clergy, was free from actual warfare. In these much vexed questions of church discipline Alexander, who had been mainly indebted for , his election to Hildebrand, the archdeacon of the Roman

Church, was guided entirely by that able churchman's

The crn- sades in relation to the papacy.

The De- cretum, of Gratian.

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advice, and in 1073 Hildebrand himself succeeded to the office as Grecory VIT.! (1073-85). From the memorable struggle between this pontiff and the emperor, Henry IV., we date the commencement of that long series of contests between the papal and the imperial power which distracted alike the holy see and the empire. In the two main ob- jects to which his policy was directed—the enforcement of a celibate life among the clergy and the prohibition of investiture (see INVESTITURE) by the laity—Gregory had on his side the sympathy of the best and most discerning minds of his age. Lay investiture was little more than a cloak for the inveterate and growing abuse of simony, for which the distribution of church patronage by secular potentates afforded special facilities, and the burden of which was now increased by those other forms of tribute, the '"regale," "jus spolii," and ''servitium," which the growth of the feudal system had developed. But in the hands of Gregory this scheme of ostensible reforms ex- panded first of all into independence of the temporal power, and finally into a claim to dominate over it. Other schemes (not destined to be realized) engaged his lofty ambition— the conquest of Constantinople, the union of the Eastern and Western Churches, and the expulsion of the Saracens from Christendom. He died in exile; but the theory of his office and its prerogatives which he asserted was brought by his successors to a marvellous realization.

The first crusade, which may be looked upon as gene- rated by Gregory's example and a reflex of the policy which led him to sanction the expedition of William of Normandy against England, materially favoured papal pretensions. It was proclaimed as a religious war, and it was as a mode of penance that the Norman and Latin warriors were enjoined to gratify their ruling passions of plunder and adventure. More especially it brought to the front of the drama of European action the Latin as opposed to the Teutonic elements,—the part taken by Germany in these gigantic expeditions in no

way corresponding to her position among European powers. It was impossible that the excommunicated emperor Henry IV. should place himself at the head of such an enterprise, and it was accordingly by Urpan II. (1088-99) that the direction was assumed, and it was under his auspices that the first crusade was proclaimed at Clermont. As the movement gathered force, the prestige of the popedom was still further enhanced by the fact that the warriors who had before appeared in the field under the banners of the empire now did so as loyal sons of the church. The new orders of chivalry,—the Knights of St John, the Templars, the Teutonic Order,—each bound by religious vows, received their commissions from the pontiff, were invested by him with the sword and the cross, and acknowledged no allegiance to the emperor.

But of all the schemes which Gregory's genius conceived and promoted none was more important in its after-effects than the expansion given to the pseudo-Isidorian decretals —in the first instance by Anselm of Lucca, again by Cardinal Deusdedit, and finally by the celebrated Gratian, a monk of Bologna, who lived about the middle of the llth century. By Gratian these accumulated forgeries were reduced to order and codified ; and his Decretum, as

Growth of it was termed, stands to the canon law (Canon Law) in

the canon law,

much the same relation that the Pandects of Justinian stand to the civil law. Further additions were subse- quently made by Gregory IX., Boniface VIII, and other pontiffs, and in this manner a vast code was gradually elaborated which, serving as the framework of the eccle- ssiastical jurisdiction in every land, was associated with

1 In assuming this name Hildebrand designed to imply that Gregory VL, whose title had been cancelled by Henry III. on account of simony, was a legitimate pontiff.

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separate courts and professed by a distinct body of jurists. The canonists were naturally ardent defenders of the sys- tem from whence they derived their professional existence, and everywhere represented the faithful adherents of Rome.

Another movement at this period, which gave effective aid in the diffusion of the papal influence and authority, was the rise of the new religious orders,—the Camaldules (c. 1012), the Cluniacs (c. 1048), the Carthusians (c. 1084), and the Cistercians (1098). Although each of these orders

| professed a distinct rule, and a sanctity and austerity of | life which put to shame the degenerate Benedictines, their

presence was far from proving an unmixed benefit to the districts where they settled. They rejected the episcopal jurisdiction, and purchased their local independence by com- plete and immediate subjection to the pope. Wherever, accordingly, their houses rose there was gathered a band of devoted adherents to Rome, ever ready to assert her jurisdiction in opposition to the ecclesiastical jurisdiction claimed by the secular clergy or the civil jurisdiction claimed by the temporal power.

On the death of Urban, Cardinal Rainerius, a native of Tuscany, and a man of considerable learning and capa- city, succeeded as Pascuat II. (1099-1118), During the earlier years of his pontificate he is unfavourably dis- tinguished by the manner in which he sanctioned, if he did not instigate, the cruel and unnatural revolt of the young prince Henry (afterwards the emperor Henry, V.) against his father. The later years of Paschal's rule seem mainly a record of the nemesis which overtook a policy dictated by the most heartless and selfish ambition. ‘‘ Paschal," says Milman, ‘‘is almost the only later pope who was reduced to the degrading necessity of being dis- claimed by the clergy, of being forced to retract his own impeccable decrees, of being taunted in his own day with heresy, and abandoned as a feeble traitor to the rights of the church by the dexterous and unscrupulous apologists of almost every act of the papal see." One of the most memorable phases of this long process of humiliation is marked by the treaty of Sutri (Feb. 1111), when the young emperor compelled Paschal to surrender all the territorial possessions and royalties which the church had received either from the emperor or from the kings of Italy since the days of

Charlemagne, together with numerous other political and fiscal privileges, while he himself renounced the right of investiture. The indignation of the ecclesi-

Rise of new monastic orders.

Paschal II.

astical world compelled Paschal to retire from this treaty,

and ultimately, after long evasions, to become party to a second, whereby the former conditions were completely reversed. The emperor resumed the right of investiture, and that burning question again lit up the flames of war. Paschal being too far pledged by his own solemn oath, a metropolitan council assembled at Vienne assumed to itself the authority of excommunicating the emperor, de- claring that the assertion of the rights of lay investiture in itself constituted a heresy. The great prelates of Germany rose in insurrection against the emperor. He retaliated by seizing on the vast possessions (comprising nearly a quarter of Italy) which Matilda, countess of Tuscany, at her death in 1115, had bequeathed to the Roman see. The pope and the cardinals responded by re- enacting the sentence of excommunication. Henry occu- pied Rome ; and Pope Paschal died in the Castle of St Angelo, exhorting the cardinals with his latest breath to greater firmness than he himself had shown in maintain- ing the rights of the church. Paschal was the first of the pontifis to discontinue the use of the imperial years in dating his acts and encyclicals, substituting instead the ear of his own pontificate. The short rule of Catrxtus II. (1119-24), disgraced although it was by the savage revenge which he perpetrated on his rival the antipope

Calixtus II.

Concordat

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Gregory VIII., was characterized by wise and resolute administration. A Frenchman by birth, he was the first to establish those intimate relations with France which rendered that state the traditional ally of the Roman see, and culminated in the secession to Avignon. Germany, on the other hand, appears from this time as generally heading the anti-papal party, espousing the cause of the antipope, and siding with Ghibelline faction. But the chief event in the pontificate of Calixtus, and one which may be looked upon as inaugurating a new era in the history of our sub- ject, was the Concordat of Worms of the year 1122.

By this memorable treaty, which, accepted as the law of

of Worms. Christendom, seemed to promise an ultimate conclusion of

Bernard are to be seen in tlie all-commanding influence of BERNARD _ he seized the occasion when it arrived,—such are the features of Clair- Of Crarrvaux (q.v.), the unswerving supporter of the | which combine to render the eighteen years' pontificate of Te papal claims, round whose career indeed the life of the | Innocent III. a period of unrivalled lustre and importance Western Church for half a century may be said mainly to | in the history of the popedom. It was now that the papal revolve. In the struggle, arising out of his disputed elec- | power may be said to have effectually impressed its theory tion, with the antipope, Anacletus II., Innocent succeeded | of sacerdotal government upon Europe; that the canon in gaining the support of Bernard, and through Bernard | law, wherein that theory was elaborated, began to be that of the emperor Lothair; and the narrative of his _ taught in the universities which rose throughout Europe restoration to his see by the imperial forces, after an exile | —Bologna, Padua, Paris, Orleans, Oxford, and Cambridge; of four years, is one of the most dramatic episodes in papal | that ecclesiastical discipline everywhere modelled itself history. Technically, at least, Anacletus had the better | on the practice of Rome; that the mendicant orders, claim to the papacy, having been elected by a majority of | especially those of St Dominic and St Francis of Assisi, the cardinals ; but Innocent secured the support of Lothair | with their irregular enthusiasm, skilfully converted by by making over to him the territory bequeathed by the | Innocent into a widely-diffused, untiring, and devoted countess Matilda. In return for this concession, Lothair | propaganda, roused a new spirit alike in the universities accepted the imperial crown from Innocent in the church of | and among the illiterate laity, and became a powerful the Lateran, and acknowledged himself the pope's vassal, | instrument wherewith to coerce to obedience the episcopal —in the language of the inscription recording the event, | order and the whole body of the secular clergy. "Post homo fit Pape, sumit quo dante coronam." The chief interest attaching to the pontificates of The Renewal 'The change in the imperial dynasty, involving as it did | Honorrus III. (1216-27), Grecory IX. (1227-41), and emperor ee the setting aside of Lothair's son-in-law as emperor, revived | Iynocent IV. (1243-54) arises from their connexion with Frederick Ste he the rivalry between the empire and the papacy ; and the | the policy and career of Frederick II. (emperor

1210-50). 7 empire. Ghibellines, or adherents of the Hohenstaufen (or Swabian) | To the whole traditions of the popedon Frederick was line, now represented a more distinctly defined party in | especially obnoxious, menacing on the one hand its standard opposition to the Guelfs, who sustained the traditional | of doctrine by his reputed scepticism, and its newly policy of the Saxon imperial line, and sided with the popes. | acquired possessions on the other by his schemes for the Frederick Barbarossa, although he consented to receive the | revival of imperial supremacy in Italy. In the sequel his imperial crown at the hands of Haprian IV. (1154-59), | designs were baffled by the ability and resolution of requircd that pontiff altogether to disavow the notion of | Gregory and Innocent; and at the general council of Lyons eb oe ae It as a beneficiwm upon a vassal, main- | (1245) Frederick was deposed both from his imperial and bese that, through the election of the princes, he held | his kingly dignities, and his subjects declared to be absolved us crowns (both kingly and imperial) of God alone. | from their fidelity. In this manner the power claimed by

the long struggle, an understanding was at last arrived at.

The emperor ceded the right of investiture by the ring |

and the pastoral staff,—thereby renouncing that at which the church most demurred, the appearance of assuming to be in any way the transmitter of the spiritual succession, but retaining the right of granting church benefices or

other property by the symbol of temporal power, the | The pope, on the other hand, consented that the | election of bishops and abbots should take place, according |

sceptre.

to canonical procedure in the presence of the emperor, but that neither bribery nor compulsion should be resorted to, and that, ia the case of disputed elections, there should be a right of appeal to the metropolitan and provincial bishops. In Germany the investiture with the regalia by the sceptre was to precede the consecration, the dependence of the higher

clergy being thus secured to the emperor; but in other countries the lay investiture was to take place within six months after consecration. In an appended clause a re- servation was made which afterwards became a fruitful germ of controversy: the elected dignitary bound himself to dis- charge his feudal obligations to the emperor arising out of

his investiture with the temporalities, “except in all things |

which are acknowledged to belong to the Roman Church.” During the pontificate of Innocent IL (1130-43) the importance of the new relations established with France

POPEDOM

During the pontificate of AnexanpEr III. (1159-81) Frederick supported the cause of the antipopes. A dis- puted election, in which the merits of the candidates are even yet more difficult to determine than in the election of Innocent II., gave rise to a series of counter claims, and Alexander, during his long pontificate, had to contend with four successive antipopes each backed by the imperial arms. Only the election of the first, Victor V. (antipope, 1159-64), however, had real canonical validity, the claims of the others having always been regarded by all orthodox Catholics as presumptuous. It was during the latter part of Alexander’s government that Rome achieved a great moral triumph in England in the reaction

| which followed upon the murder of Thomas Becket and

the abrogation of the Constitutions of Clarendon. Eight years later the attention of all Christian Europe was riveted by the memorable occurrence which marked the consum- mation of the truce of Venice (1178), when Frederick Barbarossa prostrated himself before the aged pontiff and held his stirrup as he mounted his palfrey.

Passing by the comparatively unimportant careers of the five popes whose names stand between those of Alexander

and Innocent ITI. (1198-1216), we find ourselves at the Innocent stage which marks the culmination of the papal power. IJ.

The august descent of this pontiff; his learning as a

_canonist and his comnianding genius ; the interdicts which

he could venture to impose on great realms, whether ruled by the astute sagacity of a Philip Augustus or by the

reckless folly of a John; his sentences of excommmunica-

tion, hurled with deadly effect at emperor and at kings ; the vigour with which he wrested whole provinces from the imperial domination—the march of Ancona and the duchy of Spoleto—to weld together into one conipact whole the Patrimonium and the Romagna ; the energy with which he repressed the heresies which threatened the unity

| of the church; the boldness with which he defined the

doctrine of transubstantiation ; his patience in working and waiting for opportunities, and the promptitude with which

Gregory

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The Prag- matic Sanction.

Boniface VII.

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the Roman pontiff of deposing even kings received the im- plicit sanction of a general council. The empire, worsted in Italy, broke down in Germany. In 1268 Conradin, the grandson of Frederick and the last representative of the Hohenstaufen dynasty, was cruelly put to death by Charles of Anjou, and the long contest of the empire witli the popedom came to an end.

The policy of Gregory X. (1271-76), a man of ability and moderation, deserves the praise of having apparently aimed at the general good of Christendom, so far, at least, as not incompatible with the overweening

pretensions which he continued to uphold. Gregory endeavoured to compose the bitter jealousies and long-continued strife of the Italian states by the establishment of a general pro- tectorate under Charles of Anjou, king of Naples, and to reconcile Guelf and Ghibelline by concessions to the leaders of the latter party. He effected a temporary agreement with the Eastern Church ; and he sought to put an end to the abuses and rivalries which now almost invariably accompanied each election to the pontificate by intro- ducing a new method of proceeding on such occasions. In the meantime, the growing spirit of nationality had already received a striking exemplification in France by the enact- ment of the Pragmatic Sanction (1268). Of this measure, which has been described as the foundation of the Gal- lican liberties, it will here suffice to say that it consists of a series of enactments expressly directed against all those encroachments of the popedom with respect to collations to benefices, elections to bishoprics, simoniacal practices, ecclesiastical promotions, imiposts, and other forms of exaction, such as we have already noted in their gradual growth. Shielded from criticism by the fact that it was sanctioned by the pious Louis IX., the loyal son of the church, the Pragmatic Sanction passed at the time unchal- lenged even by the papacy itself. Of the extent to which the latter was becoming more and more a political institu- tion we have striking evidence in the brief pontificate of CELESTINE V. (1294). A hermit of the Abruzzi, of austere and holy life, he had been elected pope in the hope that his reputation for virtue might in some measure restore the character of his office. Something more, however, than mere sanctity and blamelessness were now necessary for the discharge of the duties of a position which by its associa- tions demanded the exercise of statecraft, political intrigue, and a wide knowledge of affairs. In less than six months Celestine resigned an office for which by lack of experience and ability he was altogether unfitted, but leaving behind him a tradition of self-devoted and holy life which found expression in the institution of a new religious order, that of the Celestinians, afterwards blended with the Fraticelli, or Spiritual Franciscans. Upon Bonrrace VIII. (1294-1303) the signs of the times and the development of a spirit and of institutions incompatible with the pre- tensions of his predecessors were altogether lost. A man of considerable abilities, indomitable will, and imperious nature, he enunciated in yet more uncompromising terms the theory of the papal supremacy. In the memorable bull Unam sanctam Ecclesiam (18th Nov. 1302), he de- clared

that the church could have but one head—a two- headed church would be a monstrosity; and he explained away the traditional interpretation of the symbolic mean- ing of the two swords, by affirming that the temporal sword wielded by the monarch was borne only at the will and by the permission of the pontiff (ad nutwm et patientiam sacerdotis). Dazzled by the apparent success which at- tended his first measures, he was only confirmed in his policy by the resistance he encountered in France and England. In Philip the Fair, however, he was matched with an antagonist as resolute and unscrupulous as him- self and one who better understood the tendencies of the

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age. In the struggle that ensued Philip had the whole Frencli nation, including the episcopal order, on his side ; the pontiff was worsted, and his humiliation and sense of defeat hastened his end.

With the death of Boniface fell also the papacy of the Middle Ages, both in theory and in fact:—in theory, through the ascendency of counter views such as those put forth in the De Monarchia of Dante, and in the writings of Aigidius Colonna and John of Paris, which enforced the reasonableness and necessity of the supremacy of the political power; in fact, from the manner in which the French monarch succeeded not only in repelling the papal pretensions but in eventually reducing the Roman see itself to be a mere instrument of his will and a submissive agent in the furtherance of his policy.

The origin, the growth, the characteristics, the assump- tions, and the downfall of the medieval papacy having now been traced out, it remains to note, as concisely as practicable, the chief features in the later history of the institution. In the year 1305 Criement V. (1305-14), an Aquitanian by birth, was elected after long contention to the pontificate. He was invested with the tiara at Lyons, and subsequently (1309) transferred his court from Rome to Avignon. The pressure put upon him by King Philip is generally assigned as the cause of this step, but it is not improbable that he was only too glad to escape from the strife then waging between the two great fac- tions, the Orsinis and the Colonnas, at Rome. At Avignon, for a period of nearly seventy years, derisively styled the “Babylonian captivity,” pope after pope

held his court. Degraded to a state of splendid vassalage to France, their luxury, pride, rapacity, and avarice became a bye-word in Europe, while their complete subservience to the political aims of the French crown effectually alienated from them the good will and sympathy of England and Germany. When Joun XXII. (1316-34) sought to interfere in a double election to the empire, the diet at Frankfort de- nounced his whole policy in terms that startled Europe by their boldness ; and the electoral union at Rense in 1338 passed a resolution declaring that “whoever was chosen by the electors became at once both king and emperor, and did not require that his election should be approved and sanc- tioned by the apostolic see.” Other causes contributed effectually to lower the papacy in the estimation of Europe. Clement V. concurred in the infamous devices by which Philip procured the suppression of the Order of the Templars, and the barbarous cruelties inflicted on the noble victims produced in the popular mind a feeling of deepest aversion for the authors of those proceedings. The traffic in benefices was now again developing into a gigantic scandal and abuse. Annates and Peter’s pence were exacted with an insatiable rapacity. Italy itself, in- deed, torn between contending parties and impoverished by the interruptions to commerce, offered but a barren field for plunder, but in the countries north the Alps the pope’s emissaries were everywhere to be seen, ever intent on their errand of exaction. The wealth thus acquired was partly devoted towards extending the territorial pos- sessions of the see ; and Avignon and the county of Venais- sin, purchased in 1348 from the crown of Provence, remained papal until the French Revolution. It is not a little significant that this increase in wealth and territory should have been concomitant with the sinking of the moral influence of the papacy to its lowest ebb. In Eng- land the civil power endeavoured to check this system of extortion by re-enacting the Statutes of Preemunire and Provisors. In Germany the deep discontent to which it gave rise formed an important contributing element in the causes which brought about the Reforma- tion. In France the luxury and gross immorality of the

Fall of the medieval

papacy.

The popes at Avignon.

Their subser- vience to France.

Growth of abuses in the church.

‘The great schism,

court at Avignon, described in graphic and scathing language by Petrarch, are assigned by other contemporary writers as conducing largely to the corruption of morals throughout the realm. Even among the religious orders themselves there began to be signs of insubordination, and the Fraticelli, or Spiritual Franciscans, who now took their rise, openly avowed that the principles which they professed were designed as a protest against the appalling degeneracy of the curia; while great scholars in the uni- versities, like William of Occam and Marsilio of Padua, brought the dialectics and new philosophical tenets of the schools in the universities to bear with no little effect on the whole system of the popedom.

The outbreak of the great schism struck no less deeply at those sentiments of veneration and deference which had been wont to gather round the pontiff’s chair. The majority in the college of cardinals were Frenchmen, and, on the death of Gregory XI. in 1378, it seemed only too probable that another Frenchman would be elected his successor. The discontent of the citizens of Rome at the withdrawal of the curia from the capital had now, how- ever, reached a culminating point. This feeling, it is to be noted, was by no means one of mere sentiment and attachment to tradition, for the diversion of appeals, pil- grimages, deputations, and embassies, with their attend- ant influx of travellers, and of large streams of wealth and business from Rome to Avignon, had materially affected the prosperity of the former city. On the occasion of the new election the prevailing dissatisfaction found vent in menacing demonstrations on the part of the population, and even in scenes ofactual violence. In order to appease the city the terrified cardinals determined on the unani- mous election of an Italian, Prignani, archbishop of Bari, who assumed the title of Ursan VI. The election was singularly unfortunate. The new pontiff, intoxicated by his sudden and unexpected fortune, assumed stich arrogance of demeanour and showed himself so altogether wanting in moderation and self-control that the

cardinals put forth the plea that they had discharged their function as electors under intimidation, and declared the election invalid. In proceeding to elect another pontiff, their choice fell upon one of their own number, Robert of Geneva, known as Crement VII. (1378-94). For a period of thirty-eight years, Christian Europe was scandalized by the conten- tions of two rival popes, the one holding his court at Rome, the other at Geneva, each hurling anathemas, excommunication, and the foulest accusations at the other, and compared by Wyclif to “two dogs snarling over a bone ”—a simile which in itself affords significant proof

of the manner in which the popedom had fallen in the-

estimation of Christendom. The potentates of Europe, in declaring themselves “in the obedience,” as it was termed, of one or the other pontiff, were swayed almost entirely by political considerations, in which jealousy of France was the predominant sentiment. Italy, Germany, Bohemia, England, Flanders, Hungary, and Poland, all de- clared themselves in the obedience of the pope at Rome; Scotland, Savoy, Lorraine, declared themselves, ‘along with France, in that of the pope at Avignon. The Spanish kingdoms, which at first stood aloof, ultimately also decided, though from somewhat different motives, in favour of the latter pontiff. At last, at the commence- ment of the 15th century, an endeavour was made to prevail on both the reigning popes—Gregory XII. at Rome, Benedict XIII. at Avignon —to renounce their claims, with a view to the restoration of church union. The proposal was met by both popes with persistent and unscrupulous evasion. France, indignant at the subter- fuges of Benedict, withdrew her support, and he accordingly retired to Perpignan. The cardinals attached to either

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court met together at Leghorn, and agreed to summon a general council, to meet at Pisa on the 25th March 1409. In the meantime isolated scholars and divines throughout Europe, among the regular and the secular clergy alike, were pondering deeply the lesson taught by the papal history of the last six centuries, and in the place of the traditional theories of appeals to popes, to councils, or to emperors there was growing up another conception, that of the essential falsity of the axioms on which the theory of the papal

supremacy had been built up, and of Scrip- tural authority as the only sure and final source of guid- ance in deciding upon questions of doctrine and morality.

But as yet, before ideas such as these had been suffi- The great ciently developed and events had prepared the popular councils

mind for their reception, the remedy that most commended itself to the leading minds of Christendom was that of a true general council. Such was the idea which influential churchmen of the age—men like Peter D'Ailly, cardinal of Cambrai, and John Gerson, chancellor of the university of Paris, who, while they deplored the discipline, still assented to the doctrines of the church—believed to be the best solution of the difficulties in which that church had become involved. The opinions of the doctors of the canon law and of theology at the universities had been taken, and at Oxford as in Paris it had been decided that a general council might be summoned even against the will of the pope, and that, when thus convened, its authority was superior to his. Such were the circum-

stances under which in 1409 the council of Pisa was Council summoned. The council enunciated the dogma of its own of Pisa.

supremacy; it deposed the rival popes; it constituted the two separate bodies of cardinals a single conclave, and by this conclave a new pope, ALEXANDER V. (1409-10) was elected. Schemes of general ecclesiastical reform were dis- cussed ; and then after a four months' session the assembly adjourned, to resume, at an interval of three years, its yet more memorable deliberations at Constance. In the intervening time, Alexander V. died, not without strong suspicion of his having been removed by poison through the machinations of his successor, the notorious Balthasar Cossa, who assumed the title of Jonn XXIII. (1410-15), and took up his residence in Rome. It is with this pontiff that the gross abuse of indulgences is said to have first arisen. In the year 1416 the council of Constance met, amid the most sanguine expectations on the part of re- ligious Europe, but it achieved practically nothing in the direction of church reform. It deposed John XXIII, but Martin V. (1417-31), by whom he was succeeded, although in some respects an estimable pontiff, skilfully availed himself of the disturbances in Bohemia and the hostile inroads of the Turks to postpone all

questions of reform toa future occasion. On the other hand, the actual results of its deliberations were reactionary in their tend- ency. The council burned John Huss, one of the first to assert the rights of the individual conscience in opposition to the prevailing hierarchical system ; it crushed the party of reform in the university of Paris, and banished their great leader.

general council over the pope, found, when it sought to proceed to the more practical reforms involved in placing restrictions on the abuses practised under the papal sanc- tion, that it had assumed a task beyond its powers. Under the pretext of bringing about a reconciliation with the Eastern Church, and inviting its delegates to the delibera- tions of the council, Evcentus IV. (1431-47) proposed to transfer the place of meeting from Basel to some Italian city. The council, well knowing that such a measure would be fatal to its independence, refused its assent ; Eugenius retaliated by dissolving the council; the council, by

The council of Basel (1431-49), although Council it re-enunciated the principle of the superiority of a of Basel.

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suspending the pope. Thereupon Eugenius summoned

Council another council at Ferrara, which was afterwards removed of to Florence. The council of Basel, as a last resource, Florence.

arrogated to itself the papal functions, and then proceeded to elect Amadeus, duke of Savoy, pope, with the title of Fetix V. In this extreme measure it failed, however, Policy of to carry with it the more influential European powers. the chief Germany, after an ineffectual endeavour to mediate be- European : : 2 powers, ween the rival popes, assumed, in the first instance, an attitude of strict neutrality, but was ultimately won over by the crafty /ineas Sylvius (afterwards Pius IT.) to conclude the notable Concordat of Vienna (1448). By this mercenary arrangement the newly-elected emperor, Frederick IIT., altogether renounced whatever advantages had, down to that time, been gained by the labours of the council of Basel, receiving in return from Nicholas V. certain concessions with respect to all

episcopal elections in his own hereditary dominions, together with a hundred of the most valuable benefices, the visitatorial rights in relation to the monasteries, and a tenth of the monastic revenues. The policy adopted by France was of an alto- gether different character. She preferred to adjust her ecclesiastical liberties on the basis defined and sanctioned by the royal authority at the congress of Bourges. The Pragmatic Sanction there enacted was registered by the parliament of Paris, 13th July 1439,—thus becoming part of the statute law of France. In this celebrated mani- festo the spirit of Gerson and the university of Paris spoke again; but, while its twenty-three provisions rendered it peculiarly obnoxious to the Roman see, the manner in which it set aside all royal nominations made it no less distasteful to the monarchy. Louis XI., feigning to yield to the pressure put upon him from Rome, abolished it, but it was re-enacted by Louis XII. Eventually, in the year 1516, amid the full flow of the advantages which he had gained by the victory of Marignano, Francis I. permitted the Pragmatic Sanction to be superseded by Concor- the Concordat of Bologna,—a disastrous compromise of dat of —_ principles, wherein, while some important concessions were Bologna. ade to Leo X., the crown interference with the admin- istration of the church was more effectually established than ever, and the independence of the Gallican clergy reduced to a shadow. The concordat made no mention of the councils of Constance, Basel, and Bourges, or of their fundamental conception of the superiority of a general council over the pope; and it left the opportunity open for the reintroduction of annates. On the other hand, the monarchical authority achieved a signal triumph ; and, although the parliament of Paris loudly protested, and even ventured to set aside some of the royal nominations sub- sequently made, its voice was silenced by a peremptory decree issued in the year 1527.

To return to the council of Basel. Although supported at first by the electors of Germany, it was, in the sequel, completely circumvented by the machinations of the able but unscrupulous Aineas Sylvius; and Pope Eugenius, at his death, seemed almost to have regained the allegiance of Christendom. Under Nicuonas V. (1447-55), the work of reunion was brought to a completion. The council of Basel dissolved itself; and Felix V., laying aside his empty title and dignity, retired into Savoy, and was shortly after promoted to the rank of cardinal by Nicholas himself. The popedom was not destined ever again to witness the phenomenon of a rival pontiff;

and no council since the council of Basel has ever ventured to assert its authority as superior to that of the Roman chair. At the council of Florence that theory had been Bore. definitely contravened (1439) by the enunciation of the fol- macy at lowing canon, in which the counter theory first received a Florence. complete and distinct exposition :—‘ We define the holy

Defini- tion of the papal

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apostolic see and the Roman pontiff to have primacy over the whole earth, and the Roman pontiff to be himself the successor of the blessed Peter, chief of the apostles, and the true vicar of Christ, and to exist as head of the whole church and father and teacher of all Christians; and that to him, in the blessed Peter, our Lord Jesus Christ has com- mitted full power of feeding, governing, and directing the universal church, even as is [also]! contained both in the acts of the cecumenical councils and in the sacred canons.”

Thus re-established and confirmed in his own theory of The curia his office and its functions, the Roman pontiff regained and the somewhat of his former hold on the estimation of Europe. Popedom

There was also at the same time discernible a marked ain

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improvement, so far as regarded external decorum, in the century.

associations of the curia; and, until the ascendency of the Borgias, the names of Nicuonas V. (1447-55), Pros IT. (1458-64), and Srxrus IV. (1471-84) redeemed the reputation of the Roman see, if not for sanctity, at least for learning. The last-named pontiff, however, lies under the imputation of having been the first to institute trials for witchcraft, an example which spread, in later times, far wider than the boundaries of Roman Catholicism itself. In the latter half of the 15th century the popedom retires altogether into the background of European history. The pretensions of the pontiff were not, indeed, in any way retracted or modified, but his actual policy was no longer commensurate with these, and the former weapons of the

interdict and the anathema had fallen into disuse. The popes became little more than territorial princes, their politi- cal and ecclesiastical influence being exerted mainly with reference to the material interests of the States of the Church. It was one of the most baneful results of these changed external relations that each more ambitious pontiff —the Farnesi, the Borgias, the Della Roveres, and the Medici—aspired to found an hereditary sovereignty or principality in connexion with his own family, and the most valuable possessions of the church were successively alienated. By the next pontiff the holders of such pro- perty would be not unjustly regarded as usurpers, and it would be the first aim of himself and his party to eject them from the lands and revenues thus acquired. In this manner deadly feuds were generated, which became heredi- tary in the different families, and proved an unfailing source of sanguinary feuds and bitter animosities.

With the tacit surrender of the theory of the supremacy of general councils, the Holy Roman Empire itself came

also virtually to an end; and Germany, broken up into a The

number of independent principalities, internecine strife, presented a striking contrast to the advances which France and Spain were making in the direction of consolidation and order. The papacy found a direct apparent advantage in fomenting this disunion, and in no country were the exactions of its emissaries more shameless or extortionate. Eventually, however, both these phases of its policy proved eminently detrimental to the Roman interests. For, while the unscrupulousness of its agents did much to foster a strong aversion to the tenets which they inculcated, and thus paved the way for the reception of Lutheran doctrines, the isolation to which

1 Kad’ dv tpdmov kal ev Tots mpaxtixois THv oikovpevtK@y cuvddwv Kal év Tots iépors Kdvoot SiadauBdvera. Fora long time these words were correctly rendered in the Latin, ‘‘ quem ad modum et in gestis cecumenicoruin conciliorum et in sacris canonibus continetur,” and the passage is invariably thus quoted by the 15th and early 16th century theologians. In the Roman edition of Abraham Cretensis, however, the obvious meaning of the Greek, viz., that the prerogatives of the pope are to be determined and exercised according to the canons of the ancient councils, is done away with by the change of e¢ to etiam ; and the sense of

the passage (which thus becomes merely a confir- matory reference) is, that the prerogatives enumerated belonged to the pope, and were also recognized in the ancient councils.

often involved in P2pal policy in

Germany.

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each German state was reduced proved favourable to its freer action, and enabled it, in no small measure, to pur- sue that independent policy which, in several instances, materially aided the progress of the Reformation. The history of the popedom from this point (¢c. 1517) to the commencement of the council of Trent (1545) will be found in the article on the REFORMATION.

The distinctive features of the doctrinal belief formu- lated by the council of Trent were mainly the outcome of Jesuit influences (see Jusurrs); and, enforced as these tenets were by the terrorism of the Inquisition, the Increased freedom of thought which during the revival of learning

ye oad had passed comparatively unchallenged within the pale ie) e@

Council of Trent.

a must at the same time be admitted that, concurrently thought. with this tendency to greater rigidity of doctrine, Roman

Catholicism became characterized by far greater earnest- ness of religious teaching, displayed a remarkable activity in the cultivation of theological learning, and abolished, or sought to abolish, many glaring abuses. In this amend- ment, however, Rome had at first but small share. The Reformation movement within the church took its rise in Spain; and the purely political feeling which now con- stituted so considerable an element in the papal policy led each pontiff to regard with no little jealousy the overween- ing aggrandizement of the Spanish monarchy. Political considerations, in fact, sometimes prevailed over theologi- cal sympathies. Pavz III. (1534-49), in

endeavouring to trim his sails between the contending influences of France and Spain, more than once took side with the powers who were fighting the battle of Protestantism. While thus involved in antagonism to the chief of the Financial Catholic powers, the Roman see found its difficulties not a Pca little enhanced by the alienation of the revenues formerly earl derived from those countries which now professed the Paces Protestant faith. Prior to the 16th century the States of the Church had enjoyed an almost unrivalled prosperity. That prosperity was mainly owing to their immunity from dircct taxation. Nothing had contributed so much to the unpopularity of Hadrian VI. as his endeavour to levy a small hearth-tax, in order to replenish to some extent the coffers emptied by the prodigality of his predecessor. The loss of the revenues alienated by: successive pontiffs was now aggravated by the failure of the supplies derived from the collection of Peter's pence and annates in Protest- ant countries. Even the sums levied in those kingdoms which continued to profess Catholicism suffered consider- able diminution before they reached the Roman treasury, and the main source of revenue at this period appears to have been that represented by the sale of offices. In the serious financial embarrassment in which the curia now found itself involved, every expedient was had recourse to in order to meet the inevitable expenditure ; and it is to the example of the papal treasury that Von Ranke attri- butes the commencement of national debts. In default of the contributions no longer levied in England, in the United Provinces, and in northern Germany, the pope found himself under the necessity of taxing his own territory; and in this manner the Romagna, once so prosperous, was crushed by a weight of taxation which ultimately embraced every article of merchandise. The farmer and the peasant left the land; and the papal pro- vinces, formerly the most fertile and prosperous in Italy, degenerated into a series of ill-cultivated, unwholesome, and unproductive wastes.

If left to rely solely on the loyalty of its adherents and the prevalent impression of its abstract merits, the position of the popedom at this period, viewed in connexion with its financial difficulties, might well have seemed almost hopeless, had not its interests been so closely interwoven

Relations to the temporal power.

of the church was now effectually extinguished. But it |

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with those of the secular power. The latter indeed was frequently induced to connive at the papal exactions from the mere fact that it shared largely in the proceeds ; and in France the very advantages gained by the crown led it to regard with complacency a system by which the royal influence and the royal revenues were alike so largely augmented. The temporal ruler was thus sometimes found a firm supporter of the popedom, even although involved in hostilities with the reigning pope.

During the pontificate of Junrus ITIL. (1550-55), who dreamed away his closing years in the splendid palace and gardens which he had himself designed near the Porta del Popolo, the curia played a merely passive part in the great European drama; but with the accession of Cardinal Caraffa, who assumed the title of Paun IV. (1555-59), Paul IV. it became animated by another spirit. An energetic supporter of the doctrines already promulgated by the council of Trent, devoted to the cause of the church, but hating the Spaniard with the traditional hatred of a Neapolitan, his support was given entirely to the French interests in European politics. He proclaimed himself at once the liberator of Italy and the reformer of the church. In his plans of reform, although he relied mainly on the Inquisition, he included alike the monastic orders and the secular clergy. His successor, Prus IV. (1559-65), Pius IV. although a man of different character, pursued a similar policy. The council of Trent assembled again under his auspices, but its discussions now concerned only points of Roman doctrine and discipline, and the rupture with the Protestant communions was complcte. With the acces- sion of Prus V. (1566-72), who had filled the office of Pius V. chief inquisitor in Rome, the conditions of the papal policy had become less embarrassing. Spain now stood at the head of the Catholic powers, and England at the head of the Protestant. In France the issue of the dcadly struggle that was being waged between the Huguenots and the League, which scemed likely to decide the religious destinies of Europe, was still doubtful. Philip IT. accord- ingly appeared as the natural ally of the popedom, and Pius, having once accepted the position, remained true to this alliance throughout. The lavish expenditure of Grecory XIII. (1572-85)

brought back the former con- dition of financial embarrassment. He not only made large grants to aid the cause of Catholic education, and especially the newly-founded colleges of the Jesuits, but he systematically subsidized the powers who fought on the side of the church. Although the revenues of the papal states were again on the increase, the rate of exchange during Pope Gregory's pontificate was never once in their favour. At last the pressure became insupportable. The spirit of Guelf and Ghibelline revived. The Romagna rose in insurrection; and, eventually, the aged pontiff died broken-hearted amid the disorganization and lawless- ness which surrounded him on every side. But already the tide of Protestantism was beginning to ebb; and the famous bull In Cana Domini, which Gregory promulgated in 1584, enjoining the extirpation of the different heresies in Germany, indicated the growing weakness of the Lutheran communities.

The five years embraced by the pontificate of SIXTUs Sixtus V. V. (1585-90), the last of the really great pontiffs, mark another great crisis in the history of the popedom. At his accession, the papal authority had dwindled to its narrowest limits, being recognized scarcely anywhere save in Spain and Italy, and in a few islands of the Mediterranean. To his tact, ability, and good sensc, con- joined with the widespread activity of the Jesuits, and aided by the dissensions that prevailed among the Pro- testant sects, Catholicism was mainly indebtcd for the remarkable reaction in its favour which set in with the

Henry IV. of France.

E\lict of Nantes.

Annales of Baro- hius.

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closing years of the 16th century—an episode of which the 7th book of Ranke's History of the Popes supplies a comprehensive sketch. Sixtus conciliated the great landed proprietors whom his predecessor had driven into insur- rection by calling in question the validity of their title- deeds and by attempts to reappropriate their lands; he repressed the prevailing brigandage with merciless severity ; notwithstanding his lowly extraction,

he suc- ceeded in winning the favour of the great houses—the Colonnas and Orsinis; he developed the industries and manufactures of the States; no pontiff ever effected so much for the improvement and adornment of the capital; its population, which under Paul IV. had sunk to forty-five thousand, rose to one hundred thousand; “for the third time,” says Ranke, “Rome stood forth to view as the chief city of the world.” Another reform introduced by Sixtus was that by which the college of cardinals, before a fluctuating body, was definitely fixed at seventy. The inconsistencies of his foreign policy are probably to be partly explained by the fact that, although the promo- tion of the interests of the church was his most cherished object, he had conceived a thorough distrust of Philip II. At the same time, while he believed that those interests would be most effectually served by the establishment of peace and order, he necessarily regarded with aversion the revolutionary doctrines of the League, democratic in poli- tics although ultramontane in doctrine. From Henry of Navarre, indeed, he could not withhold his tribute of admiration; and on the death of Henry III. he revoked the sentence of excommunication which he had pronounced against the great Huguenot leader, and by his general policy facilitated his return to the communion of the church. In like manner, although he sanctioned the scheme of the Spanish Armada, and even promised a mag- nificent subvention to the enterprise, as soon as he learned that, if successful, it might result in the annexation of England to the crown of Spain, he withdrew his support, and, when the failure of the expedition was known, could not conceal his satisfaction.

From the time of Sixtus V. the chief importance and interest of papal history are to be found in its relations to France and Spain and to the Jesuit order (see JESUITS, vol. xiii. pp. 652-656) and, somewhat later, to Jesuitism and Jansenism (see JANSENISM, vol. xiii. p. 566) combined. During the rest of the reign of Henry IV. France witnessed a virtual triumph of Gallican principles; and, although he himself became a humble suppliant for readmission within the communion of the Roman Church, it was only to give more effectual expression to the principles of religious toleration. The edict of Nantes (1598) was promulgated, in fact, in defiance of the strongly expressed disapproval of Crement VIII. (1592-1605). The per- mission accorded to the Jesuits to return to France (1603) was a measure resolved upon by Henry in op- position to the advice of both De Thou and Sully. He

appears to have been actuated simply by motives of ex- pediency, but his expectations proved singularly fallacious. The Jesuits turned the opportunity thus afforded them to signal account, and succeeded in establishing a powerful ascendency in France throughout the 17th and the first half of the 18th century. The pontificate of Clement was distinguished by two other events, the one memorable in politics, the other in literature. Of these, the former was the reversion of the duchy of Ferrara, claimed from the house of Este by the apostolic see as an escheated fief ; the other was the publication of the greater part of the Annales Ecclesiastici of Baronius, a work of immense labour and research, which, although it could not stand the test of later criticism, rendered material support to the pretensions of the papacy. Baronius himself always maintained that

the papacy was more indebted to France than to any other European power ; and on the death of Clement his claim to the papal chair was strongly supported by the French party in the conclave, his election being, however, lost through the opposition of the party of Spain.

It was chiefly by skilful manceuvring that, after the few days' pontificate of Leo XL, the election of the Car-

dinal Borghese, as Paun V. (1605-21), was carried, not- Paul V.

withstanding the opposition of the saine party. Paul's election had really been in no small measure owing to the fact that his previous career had not happened to involve him in enmity with any of the cardinals. It is stated that Cardinal Bellarmine would have been chosen in his place, but the conclave dreaded the consequences of raising a Jesuit to the papal chair. Paul affected, how- ever, himself to regard his election as owing to the special intervention of Providence, and assumed the air and de- meanour which he held suitable to one divinely commis- sioned to restore the pontifical office to its former dignity. No pontiff ever insisted with more inflexible rigour on the attributes and exclusive powers of his office. In the measures which he initiated for the purpose of extending the influence and possessions of the church, Paul soon found himself involved in a conflict with the powerful and flourishing republic of Venice. opposing the institution of monastic and

other religious P foundations, of conniving at the alienation of ecclesiastical property and at the suspension of the authority of the ecclesiastical courts. Finding those whom he addressed less amenable to his wishes than he anticipated, he pro- ceeded to lay the whole republic under an interdict. Such a sentence rendered it obligatory on the religious orders throughout the province to discontinue all the customary religious services; the republic, however, en- joined them, under pain of banishment, to continue those services as before. The Jesuits, along with two other newly-founded orders, the Capuchins and the Theatines, alone ventured to disobey, and were banished from the province. A fierce controversy ensued, in which the con- duct of the republic was vindicated by the able pen of

Fra Paolo Sarpi (better known as "' Father Paul"), while Fra Paolo Baronius and Bellarmine defended the cause of Rome. S27Pi.

By Englishmen at that time resident in Italy, such as Sir Henry Wotton and the eminent Bedell (afterwards bishop of Ardagh), and by the English court, the contest was watched with lively interest as affording hopes of an Italian Reformation. The quarrel was skilfully fomented by Spain, and actual hostilities were averted only by the mediation of Henry IV. of France. The later years of Paul's pontificate present him in the more favourable light of a reformer of many abuses which had crept into the law-courts of the States, and the author of numerous im- provements in the capital. He enlarged both the Vatican and the Quirinal ; and the Borghese family from his time ranked as one of the wealthiest in the city.

The protection extended to the Jesuits by Paul was

continued by his successor, Grecory XV. (1621-23), and Gregory

was well repaid by their devotion and energy as pro- XV. pagandists. Gradually, in kingdom after kingdom, in principality after principality,

fession, was in a great measure recovered. In Boheinia in Silesia, and in Moravia the Protestant ministers, if not put to death or imprisoned, were driven out, their churches closed, and their congregations forbidden to assemble. Even in the United Provinces numerous converts were made, and a footing regained for Catholic teaching which has never since been lost,

while in Asia and in America new territories were won which might fairly seem to com- pensate the church for all that had been wrested from XIX. — 64

He accused the Signory of The re-

the ground won by Pro- Services

testantism, whether of the Lutheran or the Reformed econ- aa

» Jesuits.

Urban VILLI.

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it in the Old World. The cordial co-operation of the curia with the society of Jesus was suspended, however, during the pontificate of Urpan VII (1623-44). A man of resolute and imperious nature, his conception of his own prerogatives is indicated by his memorable retort,

- when, on one occasion, he was confronted with a quota-

Innocent

whe

Rela- tions with France during reign of Louis XIV.

tion from the pontifical constitutions, that the dictum of a living pope was worth more than those of a hundred dead ones. He claimed, indeed, the promptest deference for his decisions ; while the college of cardinals, which he but rarely assembled in consistory, was treated by him with little respect. A Florentine by birth, he had witnessed in his earlier years the bitter struggle between the popedom and Spain; and it had become the cherished design of his life to render the States powerful and independent, and himself, as pontiff, the representative of a formidable political confederation. To this end he deemed it essen- tial to prevent the duchy of Mantua from falling into the hands of a ruler who represented an influence

antagonistic to, or independent of, Spain; and in pursuit of this policy he sought the aid of Richelieu. It was the time when the great cardinal was maturing his designs against the house of Hapsburg; and, somewhat singularly, the pope- dom was thus brought into political alliance with the statesn.cn who was aiming at the overthrow of the very power to which Roman Catholicism had been most indebted for its restoration. In the policy of Richelieu and that of Urban there was indeed a similar inconsist- ency. The former, while he persecuted the Huguenots at home, allied himself with Protestant powers like England, the United Provinces, and the northern German principali- ties ; the latter, while he had recourse to the most rigorous measures for the suppression of Protestantism in Germany, allied himself with the power on which that Protestant- ism mainly relied for support. It is scarcely too much to affirm to say that Protestantism, in the first half of the 17th century, owed its very existence on the Continent to the political exigencies of the popedom. During Urban's pontificate, in the year 1634, the duchy of Urbino was incorporated, like Ferrara, into the papal dominions, which now extended from the Tiber to the Po, uninterrupted save by the little republic of San Marino.

The policy of InNocent X. (1644-55) was a complete reversal of that of his predecessor, whose family he perse- cuted with implacable animosity. So injurious indeed were the effects of the contentions produced by these family feuds on the peace and prosperity of the city that ALEx- ANDER VII. (1655-67) on his election took an oath before the crucifix that he would never receive his kindred in Rome. Not less serious were the dissensions produced by the strife of political parties. We find an English visitor to Rome, during Innocent's pontificate, deeming it prudent to place himself under the protection of two cardinals—the one representing the French, the other the Spanish faction. In Innocent's eyes the treaty of Westphalia assumed the aspect of a twofold disaster: in the humiliation which it inflicted on the house of Hapsburg ; and in the distinctness with which it proclaimed the superiority of the state over the church, by the declaration that all ordinances of the canon or civil law which might be found to be at variance with the provisions of the treaty should be considered null and void. Innocent even went so far as to denounce the treaty and to threaten those who assented to its provisions with excommunication—a menace treated with contemptu- ous indifference even by the Catholic powers.

Throughout the reign of Louis XIV., indeed, there existed a perfect understanding between that monarch and the Jesuits; and with their support he could set the pope himself at defiance with impunity. Louis asserted more unreservedly than any of his predecessors the royal privileges known

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as the droit de regale. By this ancient right the crown claimed, whenever a bishopric was vacant, both the revenues and the distribution of patronage attached to the see as long as the vacancy continued. But in the southern provinces of Guienne, Languedoc, Provence, and Dauphiné this right had hitherto never been enforced. In an edict issued in 1673, however, Louis declared that the drott de regale would in future be enforced throughout the whole extent of the royal dominions. It was in vain that Innocent protested and threatened to excommunicate those who espoused the royal claims. Louis, who was supported by the great mass of the French clergy, remained firm; and nine years later a further blow was aimed at papal predominance by the promulgation of the famous Declaratio Cleri Gallicani. In this notable manifesto, which was drawn up at St Germains in 1682 and revised by Bossuet, a formal denial was given to the theory that the pope had any power over the temporalities of kings ; the superiority of a general council over the pope was once again affirmed; the administration of the affairs of the church by the pontiff, it was declared, ought in all cases to be subject to the canon law, and the papal authority to be exercised exclusively in connexion with questions of dogma, but even in such matters the de- cisions of the pontiff were not infallible and were subject to revision.

resolutions to be null and void, and severely censured the French bishops who had assented to them. His repu- tation for integrity and a genuine desire to reform the church gave additional force to his protest. Among other measures for restoring order in Rome he had deprived the French ambassador of the much-abused right of asylum which, by long tradition, attached to the embassy and its extensive precincts, and afforded shelter to many of the most desperate characters in the city. The ambassador refused to yield up the privilege, and Innocent thereupon excommunicated him. Louis now seized upon Avignon, took the papal nuncio prisoner, and convened a general council. Jt was even believed that he had at one time

con- ceived the design of creating the archbishop of Paris, who seconded and approved his policy, patriarch of France, and thus severing the last ties that bound the Gallican Church to the popedom. The courage and resolution which Inno- cent exhibited under these trying circumstances were by no means inspired solely by the conviction of the justice of his causc. Perhaps at no period are the interests and sym- pathies of religious parties to be found presenting a more complicated study. All Europe at this time was watching with alarm the rapid aggrandizement of the French mon- archy ; and Innocent, in his desire to see some check placed on that aggrandizement, was even far from wishing that the Huguenots should be expelled from France. With William of Orange he openly avowed his sympathy, and it was from secret papers in the cabinet of his minister of state that Louis, through the agency of a spy, first learned the prince's designs upon England. While the Jesuits, again, were co-operating with Louis in his assertion of the Gallican liberties, the Protestant powers were giving in- direct support to the maintenance of the papal pretensions. From the Jesuits Louis also received valuable aid in the question of the Spanish succession; and it is to their machinations that contemporary writers ascribe the fact that the Bourbon, Philip of Anjou, was named by Charles II. as the heir to the Spanish monarchy.

The virtues and milder wisdom of Innocent XII. (1691- 1700) won from Louis what the unconciliatory attitude of his two predecessors, Innocent XI. and ALexanper VIII. (1689-91) had not been able to obtain. In 1693 Louis

| himsclf notified to the pontiff that the " Declaration" would

Innocent XI. (1676-89), who had in the Innocent meantime succeeded to the papal chair, declared these X!.

The buil Uni- genitus.

Expul- sion of the Jausen- ists from France.

Decline of the popedom in politi- cal im- portance.

Tncreas- ing un- popu- larity of the Jesuit order.

no longer be imposed as obligatory on the Gallican clergy. Innocent responded by giving his assent to the above- mentioned disposition of the Spanish crown by Charles II. Other circumstances concurred to bridge over the breach

which for half a century had separated the French monarchy | from the popedom. The revocation of the edict of Nantes |

(1685) had conciliated both the curia and the Jesuits ; and in 1699 the feeling of accord between the French monarch and Innocent was confirmed by the condemnation of Fénelon's Maximes des Saints. While Protestantism was being crushed in France, Catholicism was obtaining in other countries the immunities which it would not grant. In 1697 the elector Frederick Augustus II. consented to declare himself a Catholic in order to gain the crown of Poland, and by this means a certain toleration was secured for Roman doctrine among a population bigotedly attached to Lutheranism. In 1713 the celebrated constitution Uni- gentus Dei Filius promulgated by CLEMENT XI. (1700-21) not only proved a death-blow to Jansenism, but involved in nearly the same fate that party which had hitherto fought the battle of liberalism in the Gallican Church. 'All the extravagancies," says a recent writer, "engendered by Jan- senism in its later and more questionable developments recoiled, however unjustly, upon the system of ecclesiastical policy vindicated by Gerson, De Marca, and Bossuet. Jan- senism became manifestly dangerous to public order and the security of the state; Gallicanism, in the view of a despotic Government, seemed involved in the same odious category ; and it was deemed necessary, in consequence, to visit both with an impartial exhibition of the same perse- cuting rigour" (Jervis, Church of France, ii. 278). Many of the Jansenists, driven from France, retired to Utrecht, a church which, without professing Jansenist principles, long continued to uphold the standard of doctrine fixed by Tridentine canons in opposition to the dangerous advance of Jesuitism. The Jansenists were always distinguished by their resolute opposition to the theory of papal infalli- bility, and with their fall a chief obstacle to the promulga- tion of that dogma was removed.

But, while, with respect to the acceptance of doctrine, the losses of the 16th century were thus materially retrieved, the popedom was sinking rapidly in political importance. Its influence in the Italian peninsula dwind- led to within the limits of the States of the Church ; and the dynastic succession in Naples and Sicily, in Parma and Piacenza, underwent a total change without the curia or the pontifical interests being in any way consulted. The results of the War of the Spanish Succession dis- appointed in every way the hopes of Clement XI.; and his chagrin, when he found himself compelled to recognize the pretensions of the archduke Charles to the Spanish crown, was intense. The manner in which the conclusion of the war demonstrated the growing power of England was again a sinister omen for the permanence of the papal system.

The order to whose efforts, notwithstanding an excep- tional experience in France, the popedom had in other countries been largely indebted was also destined to a signal reverse. The conviction had long been growing up in the chief cities of the Continent that wherever the representatives of Jesuitism obtained a footing the cause of public order and domestic peace was placed in jeopardy. And, while, in distant lands, the vaunted successes of the Jesuit missionaries too often represented the diffusion of a merely nominal Christianity, their activity as traders was a constant source of irritation to the mercantile communi- ties. We find, accordingly, the statesmen of Catholic Europe exhibiting, in the middle of the 18th century, a remarkable unanimity in their estimate of Jesuitism as a inischievous element in society, and also showing an in-

tions more and more under the control of the civil power. Carvalho, the Portuguese minister, who had himself become involved in a deadly struggle with the order at court, called upon BrEnepict XIV. (1740-58) to take measures for enforcing fundamental reforms among the whole body. Benedict, who recognized perhaps more fully than any other

| pontiff of the century the signs of the times, and who intro- | duced not a few salutary reforms in the general relations

of the curia, was far from disinclined for the task, but died before his schemes could be put in operation. His suc- cessor, CLEMENT XIII. (1758-69), on the other hand, pro- fessed to discern in the Jesuit body the surest stay of the church, and in 1765 gave his formal sanction to the peculiar form of devotion which they had introduced, known as the worship of the Sacred Heart. In 1768 he condemned their expulsion from France as “a grievous injury inflicted at once upon the church and the holy see.” The dissensions fomented by their agency at the Bourbon courts continued, however, to increase; and in 1769 the representatives of the chief Catholic powers at the Roman court received instructions to present each a formal demand that the Jesuit order should be secularized and abolished. Clement, who had vainly appealed to the empress Maria Theresa for the exertion of her influence, died suddenly of apoplexy on the day preceding that on which a consistory was to have been held for the purpose of giving effect to the demands of the powers. It was expressly with the view that he should carry out the task which his predecessor had sought to evade that Car-

dinal Ganganelli, Clement XIV. (1769-74), was raised to Clement the pontifical chair, chiefly through the Bourbon interest. XIV.

Originally a Franciscan friar, and a man of retiring un- worldly disposition, the new pontiff was painfully embar-

rassed by the responsibilities attaching to the policy which of the At length, after four years order.

he was expected to carry out. spent in balancing conflicting evidence and overcoming the scruples of his own mind, he issued the brief Dominus et Redemptor Noster, for the suppression of the order, which he declared to have merited its ruin by ‘its rest- lessness of spirit and audacity of action.” The remorse which he was said to have subsequently exhibited, com- bined with his sudden and mysterious end, were not with-

out considerable effect upon his successor, Prus VI, (1775— Pius VI.

99), who observed the utmost caution in carrying out the decree of Clement, and devoted his main efforts during his long pontificate to diverting the mind of Christendom from questions of doctrine to others of a practical and

more pleasing character. The austere simplicity which had dis- tinguished the Roman court in the time of Clement was exchanged for more than regal pomp and magnificence, while the pontiff's own subjects were benefited by the draining of the Pontine marshes, a work of immense labour, whereby a vast district extending along the sea-coast south of Rome was converted from an unhealthy swamp into a plain that subserved in some measure the purposes both of agriculture and commerce. That the suppression of the Jesuit order had been attended with no little danger to the interests of the Roman see was clearly shown by the progress which liberal opinions now began to make in Germany. The valuable researches of Muratori, which appeared in the earlier half of the 18th century had thrown a flood of light on all the circumstances of the develop- ment of the mcdizval papacy, and his labours as an editor had served, at the same time, to render the successive contemporary writers accessible for the first time to the ordinary scholar.

a profound impression. It was entitled On the State of

creasing determination to bring all ecclesiastical institu- ; the Church and the Legitimate Power of the Roman Bishop,

In the year 1763 the famous treatise Treatise of Nicholas von Hontheim, suffragan bishop of Treves, of " Feb- published under the pseudonym of " Febronius," produced TS

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and was mainly devoted to pointing out how largely |

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which was before long destined to so sudden an eclipse.

the false decretals, and the application of their doc- | Latin Christendom, observes Bunsen, seems throughout its trines, had been made to subserve the later pretensions | history to have been ever vacillating between two extremes of Rome, and more especially her claims to assert the | —that of the grossest superstition and that of the pro- supremacy of the pontiff over

general councils. On the | foundest scepticism, of bigotry and of atheism. It can Policy accession of Joseph IL, in 1780, to the throne of Austria, | scarcely, indeed, be doubted that the tolerance and indiffer- of the a new era commenced throughout the empire. Half the | ence, the results of contempt with respect to all religious ae monasteries and friaries were suppressed. The bulls Uni- | questions, which followed upon the Revolution largely ae genitus and In Cena Domini were declared null and void favoured the reintroduction of Roman doctrine. By the within the limits of the empire. Toleration was extended | curia itself the experiences of the past were interpreted in to Protestant sects and to members of the Greek Church; | a manner eminently favourable to its own pretensions ; the and the introduction of papal dispensations within the | altar, it was asserted, was ever the surest support of the Austrian dominions was declared unlawful, unless it could | throne, and the spiritual authority claimed by the supreme be shown that they were obtained without payment. Pius | pontiff afforded the best security for the maintenance of Restora- VI. vainly endeavoured to divert the emperor from his | really free institutions. Pius VIL, who as Cardinal Chiara- ne of policy of reform bya personal visit to Vienna in 1782. | monte had at one time affected to approve of democratic dor: Bal He was received with enthusiasm by the populace, but | principles, succeeded in gaining the good will of Bonaparte, gona- with coldness by the emperor, and by prince Kaunitz, the | and his accession was shortly followed by the concordat of parte. emperor’s chief adviser, with absolute rudeness. A few | 1801. The First Consul had already astonished the world The years later the outbreak of the French Revolution seemed | by the startling change of opinion to which he gave ex- French to portend for the popedom a like fate to that which had | pression in the Declaration of Milan, to the effect that Revolu- overtaken the Jesuit order. A movement which abolished | “society without religion is like a ship without a compass” ; ee tithes, rejected Catholicism as the state religion, and con- | and, having now resolved on the restoration of a monarchical fiscated the property of the church and the monastic | form of government, he effected an apparent reconciliation orders in France was not likely, when its representatives | with the Roman pontiff in order to strengthen his own appeared in Italy, to deal leniently with papal institutions. | hands. Catholicism was re-established as the state religion The demeanour of the National Assembly towards Pius | of France; but the confiscated property of the church was himself had not been

disrespectful; but the outrages on | not restored, while the prétended reintroduction of the religious sentiment and decency itself perpetrated by the | papal authority was deprived of all real validity by append- Convention drove the alarmed pontiff into the arms of | ing to the concordat certain ‘articles organiques” which Austria, with whom and the several reigning Italian | effectually debarred the pontiff from the exercise of any princes he hastily concluded an offensive league. In the | real jurisdiction within the realm. Inthe concordat made Italian campaign he met accordingly with no mercy at | with the Italian republic in 1803 the canon law was the hands of the Directory, and of Bonaparte acting as’| revived as the code whereby all questions not provided their representative. In 1797, first of all at Bologna and | for in new articles were to be decided. Notwithstanding subsequently at Tolentino, the most rigorous conditions | that he warmly resented the manner in which he had were imposed. The pontiff was compelled to cede to | been duped, Pius was ultimately prevailed upon by the France not only Avignon and the Venaissin, but also the | consummate address of Talleyrand to crown Napoleon as legations of Bologna, Ferrara, and the Romagna—an | emperor in Paris. The immediate result of this imprudent extent of territory representing fully a third of the papal | act, as regarded the popedom, was the assertion of imperial dominions; while at the same time a heavy pecuniary | rights in Rome itself on the part of the new emperor, and contribution was levied. Shortly after the peace of | a demand that the pontiff should henceforth make common Tolentino (February 1797) Pius was seized with an illness | cause with him against the enemies of France. On his Aboli- which seemed likely, at his advanced time of life, to prove | refusal Pius was made a prisoner, and the temporal sove- tion of fatal; and Napoleon, in anticipation of his death, gave | reignty of the Roman see declared to be at an end. At el . instructions that no successor to the office should be | Fontainebleau, in 1813, a new concordat was wrung from onl Aboli- elected, and that the papal government should be abolished. | the infirm and aged pontiff (whose position and treatment tion of The sequel, however, having disappointed these expecta- | strongly recalled those of his predecessor), and he was ea tions, the French ambassador in Rome proceeded through | compelled to surrender almost the last remnants of his govern. bis agents to foment an insurrection—a design for which | authority in France and to disown all claim to rank as a ment. the demoralized condition of the capital afforded unusual | temporal ruler. Pius VII.

survived, however, not only to facilities. The outbreak that ensued was immediately | witness the overthrow of his oppressor, but to regain with made the pretext for abolishing the existing rule, and | the Restoration both his spiritual and temporal preroga- in its place the Roman republic was proclaimed (15th | tives; and it was a notable feature in the proceedings February 1798). Neither his estimable character nor | that his resumption of the traditional pontifical rights in his advanced years served to shield the dethroned pontiff | connexion with the legations was effected, in opposition to from wanton cruelty and indignities. He was treated as | the wishes of Austria, with the support of England. He virtually a prisoner, his private property confiscated, and | regained his chair, indeed, amid the best wishes of the at last, after having been removed from one place of con- | Protestant powers,—a sympathy which, had he chosen to finement to another, he expired at Valence, in August | throw his influence into the scale that favoured advance- 1799, at the age of eighty-two. ment and reform, he might have retained unimpaired to It was under the protection of a schismatic power,— | the close of his pontificate. His policy, however, was Pd that of the emperor of Russia,—that, after a lapse of eight | thenceforth altogether reactionary. On the one hand he 1us .

months, Prus VIT. (1800-23) was elected pope at Venice. To ordinary observers the condition of the papacy at this time seemed almost hopeless; and the skill with which those who guided its policy converted the very theories and events of the Revolution itself into a ladder whereby to regain the ancient vantage-ground is in its way not less re-

suppressed the circulation of the Scriptures in the verna- cular; on the other, by a bull of 7th August 1814, he recalled the Jesuits, who since their dispersion in Latin Christendom had transferred the scene of their labours to Prussia and Russia.

ae. or In other respects Pius’s adminis- g, aces.

tration of his office was exemplary, and the same may be gors of

markable than that contemporary career of military genius | said of that of his successors, Lzo XII. (1823-29), Prus Pius VIL

VIII. (1829-30), and Grecory XVI. (1831-46). The adversities arising out of the Revolution had proved a salutary discipline. Nepotism ceased to disgrace the papal court. Lcclesiasticism itself assumed another tone: its morality was pure; its zeal in the performance of its duties conspicuous. In France there arose a new school,

The known as the Part: Prétre, the school of Chateaubriand, a Lamennais, and Montalembert, which rejected the ancient *rétTe.

Gallican claims and principles, and everywhere inculcated loyalty and submission to Rome as the first duty of the Reaction Catholic. In Germany neither the enlightened and inGer- strenuous efforts of Wessenberg nor the statesmanlike

a ctee policy of Metternich could produce concerted action among where, the several states, which were accordingly eventually re-

duced to the necessity of each making separate terms with the curia on an independent basis. The result, in nearly all cases, was that, in reconstructing its ecclesiastical or- ganization, and endeavouring at the same time to estab- lish a certain modus vivends in its diplomatic relations with

Rome, each state was compelled to make concessions which largely favoured the re-establishment of ultramontane in- stitutions. The signal failure of Wessenberg, in his ad- ministration of the see of Constance, to reintroduce the principles advocated by ‘‘ Febronius,” may be cited as one of the most notable instances of the defeat of liberal principles. In the Netherlands and in Silesia similar reactionary movements took place. In England, the Catholic Emancipation Act (1829), although conceived in a spirit of conciliation, proved, in the embittered rela- tions then existing with Ireland, of little avail, and in reality only imparted fresh strength to the machina- tions of the ultramontane party. The main facts in the history of the popedom from this period will be found under the head of Prus IX. (1846-77), pp. 156-8, supra, The following list taken from Gams (Series

Episcoporum Romanex Ecclesix) gives the succession of the pontiffs as accepted by the Roman Church and recorded in its registers.

List of the Pontiffs of the Roman Church.

Date of Election

or Consecration. Date of Death.

c.41 3B. Perrus 29 vi, ¢, 65-67 6.67 S. Linus f 23 ix, Cuno c.79 S. Cletus (Anencietus) t 26 iv, ce. 91 c.91 S. Clemens I. T 23 xi, c. 100 c.100 S. Evaristus Te ORXe c. 109 c.109 S. Alexander ne GiAg ce. 119 c.119 S. Sixtus (Xystus) T, Gin; c.126 ?128 S. Telesphorus if ie 137 c.138 S. Hyginus sp Lika 142 c.142 S. Pius ¢ 11 vii, c. 156 c.157 S. Anicetus iP ees VET. 168 S. Soter te22a, ce. LG alrite S. Eleutherus + 26 v, 189 c.190 S. Victor 1. Tt 20 iv. c. 202 c.202 S. Zephyrinus f 26 viii, 217 218 S. Calixtus 1. taliex. 222 222, S. Urbanus I. F225: V5 230 | 230 S- Pontianus res. 28 Ix, 235 235 (21 xi, ord.) | S. Anterus Te is 236 236 S. Fabianus faecoui 250 | 251 (iii, el.) S. Cornelius ¢ 14ix, 253 | 258 el. S. Lucius – oil, 254 | 254 (12 v?, el.) S. Stephanus I. t 2 viii, 257 257 viii S. Sixtus (Xystus) 11. t 6 viii, 258 259 22 vii, el. S. Dionysius + 26 xii, 268 | 269 5 i, cl, S. Felix t 30 xii, 274 | 275 ¢. di S. Eutychianus ip és) eek, 283 | 283 17 xii S. Gaius {22h 296 | 296 30 vi S. Marecllinus iP OPE =), 304 | 307 el. S. Mareellus Todos, 309 | 309 iv, el. S. Eusebius ¢ 17 viii, 309 310 2 vii S. Melchiades (dfilttades) jp 314 | 314 31i S. Sylvester + 31 xii, 335 336 18i S. Marcus ap OT BS 836 | 337 6 ii, el. S. Julius Tazalvs 352 352 22 v S. Liberius + 24 ix, 366 | 366 ix S. Damasus ¢ 10 xii, 384 | 384 xii S. Siricius if eset 398 | 39 3 xi-xii §. Anastasius I. f vert, anno 401-2 402 S. Innocentius I. Tlplit, 417 417 18 iii, cs. S. Zosimus ¢ 26 xii, 418 418 28 xii S. Bonifaclus I. + 4 ix, 422 | 422, ¢.10ix S. Coelestinus 1. Riceeo vii, 432 | 432 31 vii S. Sixtus III. + 18 viil, 440 | 440 viii, el. S. Leo I. + 10 xi, 461 461 12 xi, es. S. Hilarus t 21 ii, 468 468 25 ii, es. S. Simplicius sp} 483 483 S. Felix 111. fc. 25 ii, 492 492 1 lii, es. S. Gelasius SP IB) 385 496 496 c. 24 xi, es. S. Anastasius IT. f et sep, 19 xi, 498 498 22 xi S. Symmaclius t et sepult, 19 vii, 514 | 514 20 vii, es. S. Hlormisdas ¢ sepult, 7 vilti, 523 523 18 viii S. Joannes I. + 18 v, 526 | 526 12 vii, cs. S. Felix IV. ft sepel. 12 x (2) 530 530 17 ix, el. Bonifacius II. t sepel. 17 x, 5382 532 31 xii, cs. Joannes II. tT sepel. 27 v, 535 | 535 8 vi, cs. S. Agapetus I. ip eee iv, 536 536 8 vi, cs. S. Silverius, exul + sepel. 20 vi, c.

538 537 29 iil, cs. Vigilius t+ 7 vi, 555 555 p.7 vi, es. Pelagius I. t 3 iii, 560 560 14 vii, cs. Joannes III. t sepel. 18 vii, 573 574 8 vi, cs, Bencdictus I f 31 vii, 578 578 27 xi, cs. Pelagius II. t sepel. Gii, 590 590 3 ix, cs. S. Gregorius I. t sepel. 12 iii, 604 604 13 ix, es. Sabinianus ft 22 ii, 606 607 19 ii, es. Bonifacius III. + senel. 12 xi, 607 | 608 15 ix, cx. S. Bonifacius 1V. t sepel. 25 V, 615 615 19 x, es. S. Deusdedit } sepel. 8 xi, 618 | 619 28 xii, es. Bonifacius V t sepel. 25 x, 625 625 3 xi, cs. Ironorius F sepel. 12 x, 638 640 28 v, es. Sevcrinus f sepel. 2 viii, 640 640 25 xii, es. Joannes IV. t sepel. 12 x, 642 642 24 xi, cs, Theodorus I. t sepel. liv, 649 649 vi-vii, cx. S. Martinus t exrul 16 ix, 655 654 10 viii,es. | S. Eugenius I. tsepel. 3 vi, ears

Date of Election or Consecration. | Date of Death. 657 30 vii, es. S. Vitalianus f sepel. 27 i, 672 672 11 iv, es, Adeodatus t sepel. 16 vi, 676 676 2 xi, es. Donus f sep. 11 iv, 678 678 vi-vii, cs. S. Agatho ¢ sep. 101, 681 682 17 viii, cs. S. Leo II. ft sep. 8 vii, 683 684 26 vi, es. S. Benedictus II. tsep. 8yv, 685 685 28 vii, es. Joannes V. t 2 viii, 686 686 21x, cs. Conon ¢ sepel. 22 ix, 687 687 x-xii, el. S. Sergius I, f sepel. 8 ix, 701 701 30 x, es. Joannes VI. f sepel. 10-11 i, 705 705 1 iii, cs. Joannes VII. ft sep. 18 x, 707 708 18 i(?) Sisinnius f sep. Tii, 708 708 25 iii, ¢3. Constantinus I. ip ike, 715 715 19 v, es. S. Gregorius IT. fisepel, 11 ii, 731 731 11 ii, e. S. Gregorius II1. f sep. 29 xi, 741 741 8 xii, es. S. Zacharias t sep. 15 iii, 752 752 iii, el. Stephanus II. Gs ae 752 752 ex. iii, el. Stephanus ILI. f sep. 26 iv, 757 757 29 v, es. S. Paulus I. ft 28 vi, 767 767 5 vii, ¢s. Constantinus IT. depos. 6 viii, 768 768 7 viii, cs. Stephanus 1V. aelcil, ities 772 1 ii, el. Hadrianus i. ¢ 25 xii 795 795 26 xii, el. S. Leo 11, f sep. 12 vi, 816 816 vi, el. Stephanus V. 24 i, 817 817 25 i, es. S. Paschalis I. fic, Tay: 824 824 v-vi Engenius I1. t viii, 827 827 Valentinus t ez. ann, 827 827 ex. ann. Gregorius IV. jaeels 844 844i Sergius 11. + 274; 847 847 10 iv, cs. S. Leo IV. ¢ 17 vii, 855 Boo aus, Cs. Benedictus III. ft Tiv, 858 858 24 iv, cs. S. Nicolaus I. ¢ 13 xi, 867 867 14 xii, cs. Hadrianus II. Pe: Tex} 872 872 14 xii Joannes VIII. ¢ 15 xii, 882 882 c. xii Marinus I. 1 % 884 884 ¢. v, el. Hadrianus II. fe. viii-ix, 885 885 c. ix, el. Stephanus V1. Fic: ix, 891 891 ¢. ix Formosus op 2) Vey 896 896 c. 23 v, el. Bonifacius VI. cr Gavi, 896 896a.11vi,intrus,; Stephanus VI. (VIL) amot.¢ vii, 897 897 vii, es. Romanus Tae. xi, 897 897 c. xi. Theodorus II. + post 20 dies 898 c. vi, cs. Joannes 1X. vii, 900 900 6-26 vii Benedictus IV. t viii, 903 908 ¢. viii Leo V. dacs ix, 903 903 ¢. x Christophorus amot. i, 904 904 291, es, Sergius III. tp. 41x, 911 911 ¢. ix,

es. Anastasius fete xl, 913 913 ¢. xi, cs. Lando TA % 914 914 15 Vv, es. Joannes X. f in carcere 929 928 c. vii, cs. Leo VI. fies sil, 929 929 ¢. ii, ¢s. Stephanus VIII. ¢ 15 iii, 931 931 c. ili, es. Joannes XI. 1, i, 936 936 a, 9 i, es. Leo VI. (VII.) Ti vii, 939 939 a.19 vii, cons. | Stephanus IX. anc: xX, 942 942 a,11xi, cons. | Marinus II. fe. iv, 946 946 c. iv Agapetus II. fT Ce moiX: 955 955 ¢. xi, cs. Joannes XII1. (amot. 4 xii, 963) ft 14 v, 964 968 4 xii, el. Leo VIII. fe iit 965 964 v, el. Benedict V. exul 965 965 1 x, es. Joannes XIII. t Giz, 972 973 19 i, es. Benedict VI. f occis. vii, 974 974 x Benedictus VII. ies 983 983 ex. ann. Joannes XIV. f occts, 20 viii, 984 | 984 Bonifacius VLI. qi vii, 985 985 1 ix, es. Joannes XV. t in. iv, 996 996 3 v, ¢s. Gregorius V. ii, 999 999 zn. iv, cs. Sylvester II. (Gerbert) fj leivs 1008 1008 18 vi, es. Joannes X VIL. (Sicco) tT 7 xii, 1003 1008 25 xii, es. Joannes XVIII. yr Mal 1009 1009 p. 20 vi, es. | Sergius IV. t 16-22 vi, 1012 1012 22 vi, es. Benedict VIII. ip ike 1024 1024 24 vi-15 vii,es.| Joannes XIX. ta 1033 1033 i, es. Benedictus 1X, resignat, lv, 1045 1045 1 vy, intr. Gregorius VI. ~ resignat, 20 xii, 1046

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| Date of Death.

Date of Election or Consecration.

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Date of Death.

Date of Election or Consecration.

1389 2 xi Bonifacius LX. +. ple 1404 1404 17x Innocentius VIT. 7 Gres 1406 1406 2 xii Gregorius XII. (t 1419) resignat. 4 vii, 1415 1409 26 vi Alexander V. 3, 1410 1410 l7 v Joannes XXIII, (} 22 xi, 1419) amoz, 24 v, 1415 1417 11 xi Martinus V. F 20 ii, 1431 1431 8 iii Eugenius IV. + 23 ii, 1447 1447 6 iii Nicolaus V. + 24 iii, 1455 1455 8 iv Calixtus III. 6 viii, 1458 1458 19 viii Pius II. 15 viii, 1464 1464 31 viii Paulus II. 28 vii, 1471 1471 9 viii Sixtus 1V. 12 viii, 1484 1484 24 viii Innoeentius VIII. 25 vii, 1492 1492 11 viii Alexander VI. 18 viii, 1503 1503 22 ix Pius III. 18 x, 1503 1508 1 xi Julius IT. ASHE 1513 1513 15 iii Leo X. TT siti 1521 USA

CI Hadrianus VI. 14 ix, 1523 1523 19 xi Clemens VII. 25 ix, 1534 1534 13 x Paulus ITI. 10 xi, 1549 1550 8 ii Julius IIT. 28 iii, 1555 1555 9 iv Marcellus II. 30 iv, 1555 1555 23 v Panlus IV. 18 viii, 1559 1559 25 xii Pius IV. Sbxti; 1565 1566 17 i, cs. S. Pius V. ILA 1572 1572 26 v Gregorius XIII. 0 iv, 1585 1585 1 v, cs. Sixtus V. i 1590

1590 15 ix, cl.

1590 5 xii 1591 29 x, el.

Urbanus VII. Gregorius XIV. Innocentius IX,

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1346 25 xii, cs. Clemens II. Ties 1047 1048 17 vii, es. Damasus II. t 9 viii, 1048 1049 12 ii, cs. S. Leo IX. ¢ 19 iv, 1054 1055 13 iv, cs. Victor II. tT 28 vii, 1057 1057 2 viii, el. Stephanus X. Teen, 1058 1058 5 iv, el. Benedict X. expuls, ¢. i, 1059 1059 24 i, cs. Nicolaus II. ft 27 vii, 1061 1061 1 x, el. Alexander II. + 21 iv, 1073 1073 22 iv, el. S. Gregorius VII. Tt 25 v, 1085 1086 24 v, cl. Victor III. ft 16 ix, 1087 1088 12 iii, el. Urbauus II. T 29 vil, 1099 1099 18 viii, el. Paschalis II. ft 211, 1118 1118 24 i, cl. Gelasius II. t 291, 1119 1119 2 ii, el. Calixtus IT. t 13-14 xii 1124 1124 15-16 xii, el. | Tonorius II. ¢ Lii, 1130 1130 14 ii, el. Innocentius II. } 24 ix, 1143 1143 26 ix, el. Ceelestinus II. Taal, 1144 1144 12 iii, el. Lucius II. + 16 ii, 1145 1145 15 ii, el. Eugenius III. + 8 vii, als 3 ; 1153 12 vii, es, Anastasius IV. + 3 xii, 1154 | 1154 4 xii, cl. Hadrianus IV. teed Lob: 1159 | 1159 7 ix, el. Alexander III. + 30 viii, 1181 1181 1 ix Lucius ITI. + 25 xi, 1185 1185 25 xi Urbanus ITI. $20 x; abbey / 1187 21 x, el. Gregorius VIII. tel Rais 1187 ITS7 19au, cl: Clemens III. . ba 1191 1191 30 iii, el. Coelestinus ITI. ip tdek 1198 1198 8i Innocentius ITI. + 16 vii, 1216 1216 18 vii llonorius III. + 18 iii, 1227 1227 19 iii Gregorius IX. ¢ 21 viii, 1241 1241 x Ceelestinus LY. ¢ 17-18 xi, 1241 1243 25 vi Innocentius IV ¢ 18 xii, 1254 1254 25 xii Alexander IV. { 25 Vv, 1261 1261 29 viii Urbanus IV. T9205 1264 1265 5ii Clemens IV. ip 2 sab 1268 POWd 1s Gregorius X. Tales 1276 1276 23 ii, cs. Innocentius V. Gp 22 wal, 1276 1276 12 viiyel. Hadrianus V. + 17 viii, 1276 1276 13 ix Joannes XXI. Tt) Love 1277 1277 25 xi Nicolaus IIT. t 22 viii, 1280 1281 22 ii Martinus IV. + 28 iii, 1285 1285 2 iv llonorius IV. + opive 1287 1288 15 ii Nicolaus IV. t+ 4iv, 1292 1294 5 vii S. Celestinus V. (f 19 v, 1296) res.

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Authorities.—The great series known as the Annales Ecelesiastiet of Baronius, continued by Raynaldus, 42 vols. fol. (1738-56), represents a laborious but uneritical collection of materials from

the earliest times down to the Reformation. A. Theiner, embracing the period 1572-85, is of higher value. In a critical investigation of the original sources, the great work of F. Maassen, Geschichte der Quellen und der Literatur des canonischen Rechts in Abcndlande (1871 sq.) is indispensable. Milman's Jistory of Latin Christianity continues to be the fullest and most impartial source of information in English from the lst to the 15th century; this may be supplemented by Gregorovius, Geschichte der Stadt Rom tm Miticlalter vom 5ten bis 16ten Jahrhundert, 8 vols. (1859-72), which throws considerable light on the political and social relations of the city and the papal States; and also by Thomas Greenwood, Cathedra Petri, a political History of the great Latin Patriarchate, 6 vols. (1856-65). This latter work, although published subse- quently to the first edition of Milman, was written before it, and, according to the author, without reference to its pages ; it deserves the praise of being, at least in the earlier volumes, a piece of learned and laborious research on the part of a layman of considerable ac- quirements and candid disposition. In a comparison of the views and treatment of the two foregoing works, Win. von Giesebrecht's Geschiehte der deutschen Kaiserzeit, 5 vols. (5th ed, now publishing), will be found useful. 4 History of the Papacy during the Period of the Reformation, by Canon Creighton (only partly published), promises to furnish a valuable account of this period, derived from the original sources. From the Reformation, Leopold von Ranke, Die rimischen Pépste in den letzten vicr Jahrhunderten, 8 vols. (7th ed., 1878), is the classic work. A translation of the first edition into English by Sarah Austin appeared in 1840, and has

been fre- quently reprinted. H. Geffcken, Church and State, translated by i. F. Taylor, 2 vols. (1877), supplies additional illustration, more especially of the relations in Germany. Nippold, Handbueh der neuesten Kirehengeschichte, 2 vols. (1880-83), traces the subject from the Reformation to the present time. The difficulties attach- ing to the first commencement, the earlier chronology, and the episcopal succession are elaborately treated by R. A. Lipsius, Die Quellen der rémischen Petrussage (1872), and Chronologie der rémi- schen Bischife bis zur Mitte des vierten Jahrhunderts (1869). For

The continuation by.

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the abstract treatment of the subject, ‘Thomassin, Vetus ct nova Ecclesie Disciplina (1773), supplies the views of the moderate adherent of the Gallican Church as opposed to the ultramontanists; while the classic though somewhat antiquated discussion by Bingham in his Antiquities of the Christian Church (1st ed., 1708- 22) gives the corresponding view‘of the modzrate Anglican. The treatise of R. Baxmann, Die Politik der Pépste, von Gregor I. bis auf Gregor VII., 2 vols. (1868-69), is of considerable merit. The Regesta Pontifiewm Romanorwm, edited by Jaffe and Potthast, 3 vols., gives a kind of catalogue raisonné of the pontifical briefs, letters, and encyclicals from 67 to 1304 A.p. Of the letters them- selves no complete collection has appeared ; the volume edited by Coustant (1796) comes down only to 437, the more recent collection by Thiel embraces only the period 461-523. The Bulls of Innocent IV. and Benedict XI. have recently been ,edited from the original MSS. in the Vatican, the former by M. Elie Berger, the latter by M. Grandjean. For information on technical points involving the relations of the popedom to the canon law and the church at large, see J. F. von Schultz, Lehrbuch des katholischen Kirehenrechts, 2 vols. (1856-60). The manual by F. Walter, Lehrbueh des Kirehen- rechts aller christlichen Confessionen (14th ed., 1871), of which the first edition appcared in 1822, illustrates the departure from the older ecclesiastical code which took its rise in the anti-Febronian movement. The abuses that arose ont of the papal nepotism are depicted by Gregorio Lcti (a convert from Romanism in the 17th century) in a well-known volume,—‘“ ll Nipotismo di Roma, or the ITistory of the Pope’s Nephews from the time of Sixtus IV. to the death of Alexander VIT., in two parts: written originally in Italian

and Englished by W. A., London, 1669.” The tombs of the pontiffs and the associations they recall are admirably described by Gregoro- vius in a little volume entitled Die Grabdenkméler der Papste (2d ed., 1881). (J. B. M.)

POPLAR (Populus), the name of a small group of arborescent amentaceous plants, belonging to the order Salicacex. The catkins of the poplars differ from those of the nearly allied willows in the presence of a rudimentary perianth, of obliquely cup-shaped form, within the toothed

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bracteal scales; the male flowers contain from eight to j

thirty stamens ; the fertile bear a one-celled (nearly divided) ovary, surmounted by the deeply cleft stigmas; the two- valved capsule contains several seeds, each furnished with a long tuft of silky or cotton-like hairs. The leaves are broader than in most willows, and are generally either deltoid or ovate in shape, often cordate at the base, and frequently with slender petioles vertically flattened. Many of ‘the species attain a large size, and all are of very rapid growth. The poplars are almost entirely confined to the north temperate zone, but a few approach or even pass its northern limit, and they are widely distributed within that area; they show, like the willows, a partiality for moist ground, and often line the river-sides in otherwise treeless districts. The number of species cannot be very accurately defined,—several, usually regarded as distinct, being prob- ably merely variable forms of the same type. All yield a soft easily-worked timber, which, though very perishable when exposed to weather, possesses sufficient durability when kept dry to give the trees a certain economic value.

Of the European kinds, one of the most important and best marked forms is the White Poplar or Abele, P. alba, a tree of large size, with rounded spreading head and curved branches, which, like the trunk, are covered with a grey- ish-white bark, becoming much furrowed on old stems. The leaves are ovate or nearly round in general outline, but with deeply waved, more or less lobed and indented margins and cordate base; the upper side is of a dark green tint, but the lower surface is clothed with a dense white down, which likewise covers the young shoots,— giving, with the bark, a hoary

aspect to the whole tree. As in all poplars, the catkins expand in early spring, long before the leaves unfold; the ovaries bear four linear stigma lobes; the capsules ripen in May. A nearly related form, which may be regarded as a sub-species, P. canescens, the Grey Poplar of the nurseryman, is distinguished , from the true abele by its smaller, less deeply cut leaves, which are grey on the upper side, but not so hoary beneath as those of P. alba; the pistil has eight stigma lobes. Both trees occasionally attain a height of 90 feet or more, but rarely continue to form sound timber beyond the first half- century of growth, though the trunk will sometimes endure for a hundred and fifty years. The wood is very white, and, from its soft and even grain, is employed by turners and toy-makers, while, being tough and little liable to split, it is also serviceable for the construction of packing cases, the lining of carts and waggons, and many similar purposes ; when thoroughly seasoned it makes good flooring planks, but shrinks much in drying, weighing about 58 ib per cubic foot when green, but only 33} tb wheu dry. The white poplar is an ornamental tree, from its grace- ful though somewhat irregular growth, aud its dense hoary foliage ; it has, however, the disadvantage of throwing up numerous suckers for some yards around the trunk.

The grey and white poplars are usually multiplied by long cuttings; the growth is so rapid in a moist loamy soil that, according to Loudon, cuttings 9 feet in length, planted beside a stream, formed in twelve years trunks 10 inches in diameter. Both these allied forms occur throughout central and southern Europe, but, though now abundant in England, it is doubtful whether they are there indigenous. /P. alba suffers much from the ravages of wood-eating larve, and also from fungoid growths, especially where the branches have been removed by prun- ing or accident; trunks have occasionally acquired a diameter of 3 feet and upwards.

The aspens form an important section, of which the Common Aspen of Europe, P. tremula, may be taken as the type,—a tall fast-growing tree with rather slender trunk, and grey bark becoming rugged when old; the

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orbicular leaves, toothed on the margin, and slightly downy when young, are afterwards smooth, dark-green on the upper and greyish-green on the

lower surface; the long slender petioles, much flattened towards the outer end, allow of free lateral motion by the slightest breeze, giving the foliage its well-known tremulous character.

The aspen is an abundant tree in the northern parts of Britain, even as far as Sutherland, and is occasionally found in the coppices of the southern counties, but in these latter habitats seldom reaches any large size; throughout northern Europe it abounds in the forests,—in Lapland flourishing even in 70° N. lat., while in Siberia its range extends to the Arctic Circle ; in Norway its upper limit is said to coincide with that of the pine; trees exist near the western coast having stems 15 feet in circumference. The wood of the aspen is very light and soft, though tough ; it is employed by coopers, chiefly for pails and herring-casks ; it is also made into butchers' trays, pack-saddles, and various articles for which its lightness recommends it; sabots are also made of it in France, and in medieval days it was valued for arrows, especially for those used in target practice; the bark is used for tanning in northern countries ; cattle and deer browse greedily on the young shoots and abundant suckers. Aspen wood makes but indifferent fuel, but charcoal prepared from it is light and friable, and has been employed in gunpowder manufacture. The powdered bark is sometimes given to horses as a vermifuge; it possesses likewise tonic and febrifugal properties, containing a considerable amount of salicin. The aspen is readily propagated either by cut- tings or suckers, but has been but little planted of late years in Britain. P. trepida, or tremuloides, is closely allied to the European aspen, being chiefly distinguished by its more pointed leaves ; it is a native of most parts of Canada and the United States, extending northwards as far as Great Slave Lake. The American Aspen is a smaller tree than P. tremula, seldom rising to a greater height than 30 feet, and rarely forming timber of any value ; the wood burns better in the green state than that of most trees, and is often used by the hunters of the north-west as fuel; split into thin layers, it was formerly employed in the States for bonnet and hat making; the bark is of some value as a tonic and febrifuge. LP. grandidentata, the Large-leaved American Aspen, is a tree of larger growth, with ovate or roundish leaves deeply and irregularly serrated onthe margin. The wood is strong, and considered durable for indoor use ; it is also employed in some districts for fences ; split into slender strips, it has been applied to the manufacture of hats, like that of the Canadian aspen.

Some of the most valuable trees of the genus belong to a section remarkable for the elongation of the fertile catkins, which become lax towards maturity. P. nigra, the Black Poplar, one of the most important of tliis group, is a tree of large growth, with dark deeply-furrowed bark on the trunk, and ash-coloured branches; the smooth deltoid leaves, serrated regularly on the margin, are of the deep green tint which has given name to the tree; the petioles, slightly compressed, are only about half the length of the leaves. The black poplar is common in central and southern Europe and in some of the adjacent parts of Asia, but, though abundantly planted in Britain, is probably not there indigenous. The wood is of a yellowish tint. In former days this was the prevalent poplar in Britain, and the timber was employed for the purposes to which that of other species is applied, but has been superseded by 2. monilifera and its varieties ; it probably furnished the poplar-wood of the Romans, which, from its lightness and soft tough grain, was in esteem for shield-making ; in continental Europe it is still in some request ; the bark, in Russia, is used for tanning leather,

while in Kamchatka it is sometimes ground up and mixed with meal; the gum secreted by the buds was employed by the old herbalists for various medicinal purposes, but is probably nearly inert ; the cotton-like down of the seed has been converted into a kind of vegetable felt, and has also been used in paper-making. A closely related form is the well-known Lombardy Poplar, P. fastigiata, remark- able for its tall cypress-like shape, caused by the nearly vertical growth of the branches. Probably a mere variety of the black poplar, its native land appears to have been Persia or some neighbouring country ; it was unknown in Italy in the days of Pliny, while from remote times it has been an inhabitant of Kashmir, the Punjab, and Persia, where it is often planted along roadsides for the purpose of shade; it was probably brought from these countries to southern Europe, and derives its popular name from its abundance along the banks of the Po and other rivers of Lombardy, where it is said now to spring up naturally from seed, like the indigenous black poplar. It was introduced into France in 1749, and appears to have been grown in Germany and Britain soon after the middle of the last century, if not earlier. The Lombardy poplar is valuable chiefly as an ornamental tree, its timber being of very inferior quality ; its tall erect

growth renders it use- ful to the landscape-gardener as a relief to the rounded forms of*other trees, or in contrast to the horizontal lines of the lake or river-bank where it delights to grow. In Lombardy and France tall hedges are sometimes formed of this poplar for shelter or shade, while in the suburban parks of Britain it is serviceable as a screen for hiding buildings or other unsightly objects from view ; its growth is extremely rapid, and it often attains a height of 100 feet and upwards, while from 70 to 80 feet is an ordinary size in favourable situations.

P. canadensis, the ‘‘ Cotton-wood”’ of the western prairies, and its varieties are perhaps the most useful trees of the genus, often forming almost the only arborescent vegetation on the great American plains. The P. canadensis of Michaux, which may be regarded as the type of this group, is a tree of rather large growth, with rugged grey trunk, and with the shoots or young branches more or less angular ; the glossy deltoid leaves are sharply pointed, somewhat cordate at the base, and with flattened petioles; the fertile catkins ripen about the middle of June, when their opening capsules discharge the cottony seeds which have given the tree its common western name; in New England it is sometimes called the ‘* River Poplar.” The cotton-wood timber, though soft and perish- able, is of value in its prairie habitats, where it is frequently the only available wood either for carpentry or fuel; it has been planted to a considerable extent in some parts of Europe, but in England a kindred form, P. monilifera, is gencrally preferred from its larger and more rapid growth. In this well-known variety the young shoots are but slightly angled, and the branches in the second year become round; the deltoid short-pointed leaves are usually straight or even rounded at the base, but sometimes are slightly cordate; the capsules ripen in Britain about the middle of May. This tree is of extremely rapid growth, and has been known to attain a height of 70 feet in sixteen years ; the trunk occasionally acquires a dia- meter of from 3 to 5 feet, and, according to Emerson, a tree near New Ashford, Massachusetts, measured 20 feet 5 inclies in circum- ference ; it succeeds best in deep loamy soil, but will flourish in nearly any moist but well-drained situation. The timber is much uscd in some rural districts for flooring, and is durable for indoor pur- poses wlien protected from dry-rot ; it has, like most poplar woods, the property of resisting fire better than other timber. The native country of this sub-species has been much disputed; but, though still known in many British nurseries as the “

Black Italian Pop- lar," it is now well ascertained to be an indigenous tree in many parts of Canada and the States, and is probably a mere variety of P. canadensis ; it seems to have been first brought to England from Canada in 1772. In America it seldom attains the large size it often acquires in England, and it is there of less rapid growth than the prevailing form of the western plains; the name of ''cotton- wood " is locally given to other species. P. macrophylla or candi- cans, eommonly known as the Ontario Poplar, is remarkable for its very large heart-shaped leaves, sometimes 10 inches long; it is found in New England and the milder parts of Canada, and is frequently planted in Britain; its growth is extremely rapid in moist land ; the buds are covered with a balsamic secretion. The

true Balsam Poplar, or Tacamahac, P. balsamifera, abundant in most parts of Canada and the northern States, is a tree of rather large growth, often of somewhat fastigiate habit, with round shoots and oblong-ovate sharp-pointed leaves, the base never cordate, the petioles round, and the disk deep glossy green above but somewhat downy below. This tree, the "liard" of the Canadian voyageur, abounds on many of the river sides of the north-western plains ; it occurs in the neighbourhood of the Great Slave Lake and along the Mackenzie river, and forms much of the drilt-wood of the Arctic coast. In these northern habitats it attains a large size ; the wood is very soft; the buds yicld a gum-like balsam, from which the common name is derived; considered valuable as an antiscorbutic, this is said also to have diuretic properties; it was formerly imported into Europe in small quantities, under the name of "baume focot," being scraped off in the spring and put into shells. This balsam gives the trec a fragrant odour when the leaves areunfolding. The tree grows well in Britain, and acquires occasion- ally a considerable size. A very closely allied variety abounds in Siberia and Dauria, chiefly distinguished by its wider leaves, rounded growth, and the darker tint of its wood ; a kind of wine, esteemed as a diuretic, is prepared in Siberia from the buds. Its fragrant shoots and the fine yellow green of the young leaves recommend it to the ornamental planter. It is said by Aiton to have been intro- duced into Britain about the end of the 17th century. (C. P.J.)

POPLIN, or TABINET, is a mixed textile fabrie consist- ing of a silk warp with a weft of worsted yarn. As the weft is in the form of a stout cord, the fabric has a ridged structure, like rep, which gives depth and softness to the lustre of the silky surface. Poplins are used for dress purposes, and for rich upholstery work. The manufacture is of French origin ; but it was brought to England by the Huguenots, and has long been specially associated with Ireland. The French manufacturers distinguish between popelines unies or plain poplins and popelines & dispositions or Lcossaises, equivalent to Scotch tartans, in both of which a large trade is done with the United States from Lyons.

POPOCATEPETL (Aztec popocani, “smoking,” tepett, “ mountain”), a burning mountain in Mexico, in 18° 59’ 47” N. lat. and 98° 33’ 1” W. long., which along with the neighbouring and somewhat lower summit of Ixtaccihuatl (Aztec “White Womau”) forms the south-eastern limit of the great valley in which the capital is built. As it lies in the province of Puebla, and is the great feature in the view from that city, it is also called the Puebla Volcano. With the single exception of Mount Elias in Alaska, Popocatepetl appears to be the highest peak in North America, rising as it does in a regular snow-covered cone to an altitude of 17,853 feet. The main mass of the mountain consists of andesite, but porphyry, obsidian, trachyte, basalt, and other similar rocks are also repre- sented. Between the pine forest (Pinus occidentalis), which ceases at a height of 12,544 feet, and the snow limit, 14,960 feet, there lies a tract of loose sand, largely composed of grains of sulphur, which renders the asceut tedious and at times dangerous, though the first 1600 feet can be accomplished on horseback. On the summit is an enormous crater measuring 5000 feet across aud with a sheer depth of 2000 feet. The vapours rising from the solfataras, the mixture of sulphur yellow and ash grey in the caldron, the dazzling snow on the edges of the crater walls, and the deep blue of the sky above produce the most indescribable effects of colour. The highest point of the mountain is a softly rounded eminence about 30 feet only from the rim. Sulphur from the crater is regularly worked by a number of Indians who have their huts at the foot of the cone, at a height of 12,000 feet. The material is shot down a slide for a distance of between 2000 and 3000 feet, and the workmen also avail thein- selves of this means of descent. At the foot of the east slope of Popocatepetl stretches a vast lava field—the Malpays of Atlachayacatl,

which gives birth to the Rio Atlaco. According to Humboldt, it rises from 60 to 80 feet above the plain, and extends 18,000 feet from east to west with a breadth of 6000 feet. The date of its formation

must be of great antiquity. There have been only two or three moderate eruptions during the last 300 years, though smoke continually issues from the crater, and from time to time vast showers of cinders and stones are shot up.

In 1519 Cortes sent a party of ten men to climb a smoking mountain which was evidently Popocatepetl ; and in 1522 Francisco Montaiio not only reached the summit but had himself let down into the crater a depth of 400 or 500 feet. Nosecond ascent of the mountain is recorded till April (see Brantz Mayer, Mexico, vol. ii.) and November 1827. Other ascents have been made in 1834, 1848, and subsequent years.

POPPAKA SABINA. See Nero.

POPPY OIL is obtained by pressure from the minute seeds of the garden or opium poppy, Papaver somniferum (see Opium, vol. xvii. p. 787). The white-seeded and black-seeded varieties are both used for oil-pressing ; but, when the production of oil is the principal object of the culture, the black seed is usually preferred. The qualities of the oil yielded by both varieties and the proportion they contain (from 50 to 60 per cent.) are the same. By cold pressure seeds of fine quality yield from 30 to 40 per cent. of virgin or white oil (hudle blanche), a transparent limpid fluid with a slight yellowish tinge, bland and pleasant to taste, and with almost no perceptible smell. On second pressure with the aid of heat an additional 20

to 25 per cent. of inferior oil (huile de fabrique or huile |

russe) is obtained, reddish in colour, possessed of a biting taste, and a linseed-ltke smell. The oil belongs to the linoleic or drying series, having as its principal constituent linolein ; and it possesses greater drying power than raw tinseed oil. Its specific gravity at 15° C. is 6°925; it remains limpid at ~ 15° C., but forms a thick white mass at — 20° C., which does not again

become fluid till the temperature rises to —2° C. Poppy oil is a valuable and much used medium for artistic oil painting. The. fine qualities are largely used in the north of France (huile de eillette) and in Germany as a salad oil, and are less liable than olive oil to rancidity. The absence of taste and characteristic smell in poppy oil also leads to its being much used for adulterating olive oil. The inferior qualities are principally consumed in soap-making and varnish-making, and for burning in lamps. The oil is very extensively used in the valley of the Ganges and other opium regions for food and domestic purposes. By native methods in India about 30 per cent. of oil is extracted, and the remaining oleaginous cake is used as food by the poor. Ordinary poppy-oil cake isa valuable feeding material, rich in nitro-genous constituents, with an ash showing an unusually large proportion of phosphoric acid. The seed of the yellow horned poppy, Glaucium luteum, yields from 30 to

35 per cent. of an oil having the same drying and other |

properties as poppy oil; and from the Mexican poppy,

Argemone mexicana, is obtained a non-drying purgative |

oil useful as a lubricant and for burning.

POPULATION. The phenomena of population are the product of physical forces the nature of which it will be necessary to investigate. It will, however, be con- venient to consider population, in the first place, as a statical phenomenon, that is, to observe and classify the principal features it presents, without attempting to in- vestigate the system of causes of which they are the effects. Thereafter the dynamical aspects of the subject, namely, the general laws governing the forces whose joint action has produced population, will receive attention.

I. Population, statically considered, may be defined as “the totality of human beings existing within a given area at a given moment of time.” This definition is identical with that adopted by Haushofer (p. 87), except that that eminent authority thought it unnecessary to add the clause relating to time. The totality just mentioned is ascertained in modern times and by civilized nations by the statistical

| operation known as the Census (9.v.). It is usual to | obtain by means of a census a good deal of information beyond the bare fact of the number of persons whose existence is, for the purposes of the census, taken cognizance of. Part of this information is obtained for purposes connected with the administration of the state, such as that contained in replies to questions as to the religion, profession, &c., of the individuals numbered. But these facts, though highly important, are not facts of popula- tion strictly speaking. There are two very important characteristics common to all considerable populations— namely, the approximate constancy of the distribution of the population as regards sex and age. A census which did not distinguish between the number of maleand the number of female persons composing the population of which it takes cognizance would be seriously defective, Inquiries as to the height and the girth round the chest of individuals are usually made in countries where military service 1s compulsory, and the degree of prevalence of

_ bodily defects, such as blindness and deafness, is also noted _for similar reasons; but such inquiries are the work of

| specialists, official and other, and in any case are not in-

cluded in the information obtained from a census. The age of each individual is, however, easily obtained in the course of the operations of the census. We shall now briefly set forth the general characteristics of a population, examined at a particular point of time and without refer-

ence to similar phenomena at previous points of time.

Population of the World.—The total population of the world is, to a large extent, an estimate, inasmuch as in some countries a proper census has never been taken, while in many the interval that has elapsed since the last opera- tion is so long as to reduce it to the level of serving as a basis for a calculation in which estimates play a large part.

So great, indeed, is the uncertainty in which all such calculations are involved that an eminent French statis- tician, M. Block, abandons all

attempt to deal with the problem, dismissing the subject in the following note (Traité, &e., p. 401),—“‘Nous abstenons de donner le chiffre de l’ensemble de la population de la terre ; personne ne con- nait ce chiffre.” With this view of the matter we entirely agree, without, however, any disparagement to the valuable work done by Behm and Wagner, who have made the popu- lation of the earth their special study, and are under no illusions as to the accuracy of the results they have to offer. The work of these two eminent men of science has at any rate drawn attention to the /acunx in our present

TABLE I.—E£stimates of the Population of the World.

Author of Estimate Year. Number (in Millions). RaeerOlate. secssscsceteeeseteeers seek 1660 1,000 Sussmillch’ 2. oonseeseeosneeee eee 1742 950-1,000 AVG) EINEM orem eennermenqonoas cscose ois 1753 1,600 AVGIUIGRY2 Bosarnenenneinecoedand coscbcace 1804 437 IBIMKE REO Meroe serene eee eres 1805 700 IRM, 32 – sears wacecane nec reeeee meee 1805 700 ING ies) BYU Th eee seeseeeacaecnnconoodcd 1810 640 INE OHSC ceege center. cus oeeecnach eee 1812 766 | (Graber) vaeLlemsOrcm nesses —eaee 1813 686 [Sallis cc coo see aetsadecaeaeeee scene 1816 704 AVeTEMALC sc cceecs aces soce sees coneeceee 1822 He, NSS CMs sce owen soe accescennconmoeeee 1824 938 SHOU eyes cc cos aces secon ore eee 1833 872 STE TVA Bap cee depen De nnennceecns .anpesico> 1838 950 nV, MOUSE MICMibs, ccs. sceccssesemee 1838 850 @mralns delalllOy canescens sees 1840 750 PPEMMOU es cc .<0s cece aaeee eee eees 1840 764 VSN OOMIE sc qecer ns tens eeton ace eeeee 1840 864 | Berohawst.. cco -.assec oes seseeeee 1842 1,272 | Bailly: . vexsaacstencxckecsessosmeeeeeess 1843 739 |

60) | ee eer ene eeccoere 1868 1,270 | Belmnvan deh Vaene ries. ccncssce. <- 1880 1,456 re AEE escodcesnac 1882 1,434 |

XIX. — 65

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knowledge, besides arranging and co-ordinating the great multiplicity of well-ascertained facts at our disposal. As civilization advances the area of

the unknown or partially known, which is at present large, will gradually diminish.

Table I. (p. 513 supra), taken from Haushofer’s work (Lehr- u. Handbuch, p. 90, note 1), will show how greatly the estimates of the world’s population have varied since people first began to make them. We venture to say that any person of fair intelligence and ordinary education would, even without any statistical training, come to the conclusion that there was nothing certain to be known on the subject which these figures profess to illustrate. The fact that Behm and Wagner’s latest estimate is less than that published by them two years previously shows how difficult the subject is. We should add that the reasons given by them for this dis- crepancy, for even a tyro would have expected a slight increase, are quite satisfactory, and add to our confidence in that part of the investigation for which they profess to give figures approximating to accuracy.

According to Behm and Wagner (Die Bevélkerung der Erde, vii.) the following (Table II.) may be taken as the population of the sections of the world indicated in June

1 882 SE Areaunisawece Inhabitants. | KSIVONYEETES? ||| amclgg: gine ane anne EEE lita Number. Per Sq. Kilo.|Per Sq. Mile. JD]UONG] NS Rena noe 9,730,576 327,743,400 34°0 88°0 Asia…….....| 44,580,850 795,591,000 18°0 46°6 eodavenes 29,823,283 205,823,200 7:0 18°1 Seesce 38,473,138 100,415,400 2°6 6°7 Australasia.. Seg ae: ae oe Polynesia. vet 8,952,855 4,232,000 0°5 1:3 Polar regions} 4,478,200 82,500 : = Total..| 136,688,872 | 1,433,887,500 10°5 ell

Sex.—The obstacles which make it difficult to attain even an approximate statement of the population of the world prevent us from obtaining any accurate knowledge what- ever as to the sexual constitution of that population. We have, however, tolerably accurate information on this subject for most of the countries of Europe, for the United States, and for Canada. From the figures available it is evident that no general proposition can be laid down on the subject of the normal proportion of females to males, except that in so-called “old” countries there is usually a slight excess of the former.

TABLE V.—Statement of the ‘‘ Age Scale”

Persons in the Population.

POPUL A Pn0’R

TABLE III. —Statement of the Number of Females living in the under-mentioned Countries for every Thousand Males in the Year mentioned (Haushofer, p. 216) :—

Females to each

aia 1000 Males. Gennanelimpibesesrcess essence 1875 1,036 England*and Wales… -...02:-2.<0 1871 1,054 Scotlamd@n.. ...ccaceeeemeee eee a 1,096 i bee) ers UR arpeeeeeonacncanoneanaacaasences 55 1,044 ID) CTMAVATICS oncccuaactccee pene saseeemes 1870 1,026 INIG@IAWEAY caadosasoanpnoncodsdecnqcao nos: 1865 1,036 Siwied etiericeccucss soos coeemecesee nets 1870 1,067 PAVISEDI Aes occu sedse etceaesesececen ores 1869 1,041 IS TUINEETAY nn hb cossnsqsonsgsedocacosgcnrac bs 1,002 NEG nantponepenre nen peraccocicusccance 1870 989 Snmuivacrd ENGL esanaanecossosdesnadoasosc " 1,046 | MRATIUGS a ceenaaasoenoaodoncsGsanaorinsnods 1872 1,008 Belowumie ec... oeeaeae. See 1866 O88 TEID ENG sonenneceeeeeerocennaneeesoaa00 1869 1,029 Winnted@States™, ..cassssssseedsosse see 1870 972 c CHa ee RnR emo ane nocuenadonic 5 939

The census of England and Wales for 1881 gave 1055 females to 1000 males. A slight tendency to an increase in the proportion is perceptible in some countries, and to a decrease in others, as the following table (IV.) given by Wappius and quoted by Haushofer (p. 217) will show. The reader will observe that Wappaus’s figures are the proportions to 100, not to 1000, as in Table III.

Females | Females

Year. | to 100 Year. | to 100

Males. ° Males.

England …..... 1851 | 104°16 j) Sweden. .....- 1850 | 106-40 Dcotlamdumescs:: rf HO sO2)i MWeanicer..c.. 2.0. 1851 | 101-12 Ireland. .- a..5 o>. | LOS S27 ft Belaium…..... 1846 | 100°47 Denmark …..... 1850 | 103°30 | Holland…..... 1849 | 103°96 Norway …....., 1855 | 104-14 || United States..} 1850 95:05

The 1880 census of the United States states the propor- tion of females to males at 96°54 per cent., which is rather smaller than that shown in 1870 (97:2 per cent.); but immigration is still a potent factor in the growth of the population of that country.

With regard to the causes of the excess of females, as in most other social phenomena, our knowledge is very small at present. The reason for the broad distinction between Europe and North America is pretty obvious. New countries are continually receiving many male and fewer female immigrants. Probably also, life being very rough in the more unsettled portions of such countries, the rate of mortality among females is a little higher than in

(Altersaufbau) of the Population in each of the undermentioned Countries; showing by Semi- Decennial Periods up to 30 Years, and Decennial Periods subsequently,

the Number of Persons of cach Age out of every Thousand

0-5 5-10. 10-15. 15-20. | 20-25. | 25-80. | 30-40. | 40-50. | 60-60. 80-90. | Over 90.

German Empire…..... 1875 | 134 ile 102 95 83 76 134 103 84 4 0:2 [PravESNGl Scagmecasennesosee 1871 135 It) 107 96 88 78 128 100 73 5 O°4 Scotland..cceceeceeeeee » | 136 | 120 | 111 | too | ay | Me | Gu 96 | 71 6 0°6 IGRel avavel….crosmasscaacseant s 120 105 103 116 | 106 71 103 99 83 8 ial Bemmark. 202.25 sae seceee 1870| 124 107 102 93 81 75 130 114 85 6 O°4 INGLWayccee-.cssncsee as 1865 135 i) 106 94 81 70 131 107 67 if 07 Sweden ROSRROD COR Cone eaeee 1870} 118 116 106 91 ao 73 131 ILS) 85 5 0°3 ANISEUIR ea. osce ts oemee ere 1869; 1380 108 og 93

85 82 138 1138 84 3 0°2 Hungary …cccecceee. . | tr } aio aug 95 | 82 | 86 | 141 | 106 | 70 9 0°3 Italy. Recerasssie ues ene ene 1870} 115 109 100 90 87 Ti 134 HAs 84 6 0°6 SwltZenlandesees cess eee a 113 106 97 84 81 80 141 ig, 89 4 0°2 France tagunscessscceyses sas 1872 93 91 87 84 88 YB 139 IS 104 he 0°4 eloiume sce sees sec: 1866} 120 105 92 88 84 78 1S 112 89 6 0-4 Jato MyiWdl aoseconnoes BdoERE 1869; 130 109 94 92 We 78 135 113 84 5 0°3

Average for Europe…....} 121 108 100 92 87 78 134 112 85 5 0-4 United States…..... 1871 140 124 123 105 96 80 128 93 59 3 04 C12) rere 1861 174 132 128 ile alii 110 76 49 3 0°5

General average…..... 125 111 104 94 | 166 tas 108 81 5 0-4

1 For more minute information see Petermann's Mittheilungen, " Erginzungsheft" No. 69.

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places where women can receive more protection from hard- ship. On the other hand, even in Europe men run many risks to which women are not exposed. The subject is a very interesting one, but cannot be adequately treated except at much greater length than is possible here, and we must refer our readers to special works for further information.

Age.—The characteristics of a population from the point of view of age, which German writers term " Altersaufbau," can only be treated very generally. Table V. on p. 514 is quoted by Haushofer (p. 213) from Von Scheel's Hand- buch der Statistrk.

This "age scale" shows us the proportion in which per- sons of various categories of age are found combined to form populations. The general characteristics of the groups are tolerably obvious. It must be remembered that after thirty years the periods are decennial. The difference between the age scale of Europe and that of North America is con- siderable. In the latter, owing mainly to the fact that emigrants are usually young, a much larger proportion of the population than in Europe are under thirty years of age. On the other hand the age scale of France presents a feature of an

opposite kind, namely, a deficiency of persons under fifteen years of age, and an excess of those over forty, as compared with the average of Europe. This conformation of the age scale may be compared with that of Hungary, where the number of children is larger and the number of persons over forty less than the average. It is probable that the smaller number of children in the one case and the larger in the other directly lead respectively to a smaller infant mortality in France than in Hungary. As M. Block observes (Z'raité, p. 409), " Nous avons moins d'enfants ; mais, grace & une moindre mortalité dans le jeune age, nous avons plus d'adults." It is obvious that ceteris paribus it is easier to pay the requisite attention to the rearing of a small number of children than to do the same for a larger number.

Careful inquiries into age scales are of very recent origin, the data required for evaluating those relating to earlier periods being absent. Moreover, erroneous state- ments as to their age are made by a much larger number of persons than might be supposed, sometimes from careless- ness or ignorance, but also intentionally. The tendency of women over twenty-five to understate their age, combined with overstatements of age by girls and young women under twenty, always tends to make the twenty to twenty-five section of the age scale unduly large (see Census of England and Wales, 1881, vol. iv., "General Report"). We must regard even the age scales now in existence as merely first approximations, for it is evident that observations obtained from several censuses must be reduced and combined before we can feel certain that accidental causes of error have been eliminated. This is all the more necessary as the age scale of any given population cannot be regarded as fixed, any more than the magnitude of the population itself, both being liable to modifications arising out of the varying dynamical conditions existing at different periods. And this brings us to the second portion of our inquiry, in which we shall indicate in the most general way the nature of the proximate causes which underlie the pheno- mena of population considered as a fact existing at a particular moment of time.

IT. Population, dynamically considered, is the result of two pairs of opposing forces, whose combined action may, for convenience, be theoretically conceived of as balancing each other, but which never do so

balance as a matter of fact. A comparison of two successive censuses invariably shows some “movement of population.” In nearly all civilized countries the movement shown is one of growth when the body of population examined is large. ‘The population of a village or a small town may, quite con-

old

ceivably, show a reduction in number for the period between two censuses, but this can hardly be the case with a large town, and still less with a nation, unless as the consequence of some great calamity such as an earth- quake or a pestilence or a change in the climatic or economic conditions of the country inhabited. A great war, of course, produces a certain retardation of the rate of increase. Although some of the uncivilized peoples of the world are rapidly disappearing, the tendency of the population of the whole world is evidently to increase—at what rate it is impossible to say, for reasons already mentioned ; and our inquiry will, therefore, be confined to peoples regarding whose population we have compara- tively accurate information for an adequate number of years.

The causes of the movement of population are internal and external. The internal arise out of the numerical rela- tion between the births and deaths of a given period, there being an increase when there are more births than deaths, a decrease in the contrary case. Haushofer expresses this by a formula which is sometimes convenient :—“ There is an increase where the intervals between successive births are smaller than those between successive deaths” (p. 115). The external are immigration and emigration. The intensity of these two forces operating on population depends on a variety of causes, into which we do not propose to enter. Generally speaking, it may be said that “new” countries, where the density of population is small, attract immigrants from countries in which the density of population is great. The density of population is expressed by the figure denoting the number of inhabit- ants per square mile (or square kilometre) of the territory they occupy. For a discussion of the various political, social, and economic causes which determine density of population, we must refer our readers to the works of Haushofer (p. 173) and Block (p. 456). Before ana- lysing the components of the movement of population it will be useful

to examine briefly that movement itself, and ascertain what is its normal rate in civilized countries. The mode of expressing this rate which is most com- monly adopted in the exposition of statistics of population is to state the number of years in which a given popula- tion “doubles itself.” It is not a very scientific method of expressing the facts, since it assumes that the rate of a few years will continue for a period of many years, but, in deference to custom, we give a table constructed in accordance with it.

TABLE VI.—Statement of the Yearly Rate of Inerease of the Popu- lation of the undermentioned Countries during the following Periods, with the Number of Years in whieh the said Popu-

lations would double themselves, on the supposition that the rates remain unehanged (Wappaus, quoted by Haushofer).

Basis of Caleulation. 5 Approximate Doubling Years. Annual Percentage Years.

of Inerease.

1845-55

Us 61 0°89 71 0°88 79 0°84 83

Sweden Saxony

Prussia

Belgium

Great britain s….-.. Austria

We now proceed to give a table (VIJ.) constructed by Signore Luigi Bodio on the best principles, which shows the annual rates of increase of a number of countries, for two distinct periods, taking account of the important changes

of frontier which have occurred during the whole period covered by the table. If this rectification had not been made it is obvious that the figures resulting from the observations of the two periods would not have been com- parable in the case of Italy and several other states (Block, p. 405; Haushofer, p. 120). We may mention that the actually observed yearly rate of increase in the population of England and Wales between 1871 and 1881 was 1°44 per cent. of the population in 1871.

rs

Period | Yearly | period | Yearly Observed. | Observed. Fete IDR NGEs6 peaneenoocebeuoss ose 1800-60 0°48 | 1860-77 | 0°35 IRGRIKY o.- seononescenbaoeca conoct 1800-61 0°61 | 1861-78 | 0°71 United Kingdom…..... 1801-61 0°98 | 1861-78 | 0°92 | England and Wales …... 1801-61 | 1°37 | 1860-75 | 1°24 | lipelleiaye! . ae eanecpnenecaeecnn 1801-61 0°17 | 1861-78 | 0°461 Wennnnankee sce sss2terctsecess 1801-60 0°93 | 1860-78 | 1:11 SIOCEM ponesaneconeednonods: 1800-60 0°82 | 1860-78 | 1:15 IST@IRWIENY casensdneooe copeanace 1800-60 0-99 | 1860-78 | 0°86 Russia in Europe …..... 1851-63 | 1°20 | 1863-75 | 1°11 Austria (Cisleithan)..... 1830-60 | 0°64 | 1860-78 | 0°86 | PACA es Fe. nore esnese 1830-60 | 0°27 | 1860-77 | 0°55 Switzerland =. -se.ccsssssen 1837-60 | 0°59 | 1860-78 | 0°60 Prussia (without recent

BINNS «HATS cooconosonde 1820-61 1:21 | 1861-75 | 0°98 Prussia (with recent an-

MEXAPHONS)).. 4.6.55. 62 1830-61 1:16 | 1861-75 | 0°83 IBY ERE Oe nabendccsencacoanncec 1818-61 | 0°55 | 1861-78 | 0°54 Sip dOlIN 7, coohermAnnocsnecsCene 1820-61 | 1°41 } 1861-78 | 1°56 IW iUilsbennnbenOurns-c-ca-ctte 1834-61 0°34 | 1861-78 | 0°76 olla deeseces sc ocseeaaetens 1795-1859 | 0°71 1859-77 | 0°95 1BE ETI nes son eesoooebopenane 1831-60 0°48 | 1860-78 | 0°82 LECLEN DA oe 1801-61 | 0°39 | 1861-74 | 1:17 NE 2 ieee oeisnice ss see 1800-60 | 0°66 | 1860-77 | 0°35 Jo rtd eats: cco eeSeeeeaaee eee 1823-58 0°72 | 1858-77 | 1°95 (CBeee …. 5. eee scaesss6 ss. 1821-61 1:22 | 1861-77 | 0°97 IVOIAVIG.. . « xc emesis scion ~ << sin 1834-59 1°92 | 1859-78 | 1°19 Wmited Stateste…....+... 1860-70 | 2:04 | 1870-80 2°61

1 Decrease.

It must be noted that, while the table may be relied on so far as Signior Bodio's treatment of the data goes, the data for the earlier part of the century are very defective, and the results deduced from them must be regarded as less trustworthy than those for the more recent of the two periods.

The above tables of increase of population include the effects of immigration and emigration, regarding which we have nothing further to say in this article, as the causes of these phenomena are too heterogeneous for general treatment. Moreover, except in comparatively unimport- ant cases—unimportant, that is, from our point of view, but by no means so from the standpoint of the statesman— the effects of these two causes are small, the main cause of the growth of population being the internal forces already mentioned, namely, the birth-rate and the death-rate.

During the earlier half of the century the rate of in- crease in the United States ranged from 2? to 3 per cent. per annum in the successive decades from census to census. The increase in the population of the United States has hitherto depended so much on immigration that at present inquiries into the normal birth and death rates of that country are very difficult, except in the eastern States. Of the total population, 50,442,066, as shown in the census of 1880, no less than 6,619,943, or over 13 per cent., were foreigners. The fact already mentioned, that the proportion of women to men is unusually low, serves to remind us that normal phenomena of population must not as yet be looked for in the American Union.

The Birth-Rate.—The birth-rate of a population is the proportion borne by the number of births in a year to the number of the population. It might seem that it is easy to obtain this rate, but as a matter of fact it is practically

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impossible to do so. It is not difficult to ascertain, with sufficient accuracy, the number of births; the difficulty is to ascertain what is the number of the population, for that number is never the same for two days together. It is obvious that it would never do to evaluate the birth- rate of the United

Kingdom, say for 1885, by means of the figures obtained in the census taken on April 4, 1881, and the error would be greater next year, and greater still the year after. The growth of the population since the last census must, therefore, be taken into account; but, even when it has been decided to adopt this plan, there is the difficulty of fixing on the date up to which the additions are to be made. The usual practice is to take the popula- tion of a date as near as possible to the middle of the year for which the birth-rate is required as the basis for the calculation. We mention these difficulties as a caution to students of statistics. The following table (VIII) quoted by Haushofer, 123, is taken from Bodio's Movimento dello Stato Civile (Rome, 1880) ; the figures for the minor countries have been omitted, and still-births are excluded :— ;

Average Yearly Number of Births to 100 Inhabitants.

Period Observed.

Peal eres. ee N ce Clee! 1865-78 3°70 TRING cponaanen - conasannenoacacse 1865-77 2°58 England and Wales…... ... 1865-78 3°56 Scotlatidiescs. peueecesses eee ro : Bo Tine Fin Glis..n. 5208 ees Sees ose Ag 2°67 PRTG SIA ete cic. « ce ce se eters Be 3°87 [SES ADIGE) Ane eon SEER ena pene Ap 3°94 SEDROMNY Ae caecess sree eens sen oh 4:17 JSURTONE a8sano copsencncMeneen en anac a 3°88 MUA ATG lets sisaisaieceienesess eee 1865-77 4°18 Sivaiizen) andeerrenee ce cee acer 1870-78 3°08 IBYS) GaitG Yo aaccnensensnesocdenecon: 1865-78 3°21 18 ell earoy Pee teen eereenc eer oe 1865-77 3°56 Simeq@entnc a acepeerae crete cae 1865-78 3°04 pe RMR ccc aca ox aes sev edeaes 1865-70 BD (Greecewene:..eates: acteerenerae 1865-77 2°88 FROWMMATIM Age aelars 2cae eee castes sles 1870-77 3°04 Russia in Europe!..... 1867-75 4°95 Roller eee ow ccteeae ceo 1865-77 423

1 Excluding Poland.

The birth-rate in different countries is influenced by various circumstances into which it is not possible to enter at length. The most important circumstance is the pro- portion borne by the number of women of child-bearing age to the whole population. There are other circum- stances which must be kept in mind in comparing the birth-rates of different countries,

such as the character of the age scale as a whole, and the density of population, besides climatic and other physical characteristics of the environment of the populations examined. The birth-rate is high in new countries, where there is always a larger proportion of young men than in old states, and where the proportion of women of child-bearing age is also large. The latter circumstance is, we may point out, quite con- sistent with the statement already made, that in new countries the proportion of women to men is smaller than in old ones. For an unusually large proportion of the total number of wonien in new countries are young.

Some facts relating to the absolute number of births may here be briefly referred to. The most important of these is its composition as regards sex. We have already seen that in most populations there are more women than men. This is not a consequence of there being more girls born than boys, for the fact is just the contrary. The following table (IX.) shows the number of male births to every 100 female births which took place in the under-mentioned countries during the periods stated (Movimento, &e., p. 126 ; Haushofer, p. 218) :—

Por Uk Pio NN

Os Oipecen: ae Niel Peretti cancanrnin Soe ers 1865-78 104 IMMERSE Oy sie oe ate sec concorde 1866-77 1038 Enelandend Wales:..... 1865-78 104 NSO MIRON es eile lov a aeons nates 1865-75 106 Aigelahin cline see .caco8 wie essecvectvecas 1865-78 106 JPRS. «yale acon e Sree ee eee 1865-78 104]ByS WRITE doece ROSE an Sonne ere 1865-78 103 BAUS [lel MEME e one rics viaisscaceece 1865-78 106 EPI re. 2 ee E ete oss sscsunies vse 1865-77 104 SVMIEACHANTGY, 6.505504 s cases essenesee 1872-78 99 eR Wrist (sc tos ese cvehsay senna ves *IBGE eee eae ace eben Seca ne ere ane 1865-77 102 SAVE CLE TI Mene Uae au ee eee cers sa ee se J 1865-78 106 a ee ee 1865-70 104 (Gixzcc ei Ree cet ee ee 1870-77 g4 JESCUDUTT E011 Wear esis Sera ee 1870-77 105 MEUM aeMG MVOC. ...0…+¢s0*

On the somewhat anomalous figures we must observe that those relating to Greece and Servia are possibly to be explained by the hypothesis of inaccurate returns. We may add that, if a distinction is made between legitimate and illegitimate children, it is usually found that the excess of

male births is greater among the latter. In countries, therefore, where the proportion of illegitimate to legitimate births is high there will usually be a higher proportion of male to female births than in countries where there are not relatively so many illegitimate births (Block, p. 429).

Interesting inquiries lave been made into the facts regarding. the distribution of births during the year, showing that there are, as a rule, more births in some months than in others, and also as to the influence high prices for the primary necessaries of life have on the number of births (Mayr, p. 235). :

The Death-Rate.—The death-rate of a population is the proportion borne by the number of deaths in a year to the number of the population. The population is to be reckoned as has been already described in dealing with the birth-rate. This very important statistical quantity is sometimes confused with another relating to the same phenomenon,—namely, the mean duration of life. The difficulties in obtaining an accurate death-rate are, if any- thing, greater than in the case of the birth-rate.

TABLE X.—Statement of the Average Annual Death-rate in the undermentioned Countries, during the Years stated, excluding Still-births (Movimento, in Haushofer, p. 137).

Average Yearly Countries. Period Observed. Number of Deaths to 100 Inhabitants, lok: eee 1865-78 2-99 JETRO 2 ances cones 5 Honea OBE OHIEne 1865-77 2°40 England and Wales…..... 1865-78 2°20 eet lemidler ct os acauscetesse: 1865-78 OR | ligellainclaptanascos teen ce ee 1865-78 il JEVEOSIS31G a ach irra ne 1865-78 Dale JEyEW iH) AAR 3 BRE eee 1865-78 3°09 ATS nla eee. -o eeGicn ae secets ~~SGV ANOI ye oe geese aces veces eee 1865-78 2°32 PTOMMANTU Mecca coscvs arnvctieeseeadee 1865-77 2°49 CCL GMM sack cores sseenieece nese. 1865-78 1°92 SOME erate elec sso wien caesea« eRe 1885-70 Soe (COREE CONN Neer. insane site we caeis ee 1865-77 2°09 IRVOMIIMATIT etree ae toes ee see | 1870-77 2°65 ussiaiimeliunope:....—..... 1867-75 3°67~~

~~This table is sufficient for our purpose, which is to give a general idea as to the death-rate of these countries. Much more accurate approximations are, however, needed for actuarial purposes, and very elaborate valuations of~~

~~the death-rate will be found in G. F. Knapp's work Ueber die Ermittelung der Sterblichkeit (Leipsic, 1868).~~

~~O17~~

~~Great pains have been taken by most civilized states to~~

~~| obtain accurate figures as to the mortality of the popula- _ tion, and the literature dealing with the subject is of great~~

~~extent.~~

~~We must now show how the death-rate is usually com- posed as regards age. The following table (XI.) shows the uumber of persons out of every hundred deaths who died at the undermeutioned ages in each of the countries named (Haushofer, p. 143; quoted from the Afovimento):—~~

~~. . see : oOo ean , = 5 i=} :~~

~~eles |tsles| a | es is ls Prt~~

~~ma | Es laa | 24 | oh | 4 [Soa] fs | BES~~

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~~It will be seen that from nearly one-fifth to nearly one- third of the deaths were those of children less than twelve months old. The very high proportion of deaths at this age in Bavaria was some years ago made the subject of a special inquiry by Dr Mayr, and it was found to be largely due to the bad mode of bringing up infants peculiar to certain localities (Mayr, pp. 91, 319).~~

~~The composition of the death-rate in regard to sex must be touched on briefly. As we have seen, more boys are born than girls. Owing, however, to the greater mortality among the former their uumber is rapidly reduced during the first few years of life, so that at any given moment the population is composed as stated in the age scales. The exact mode in which a given number of persons born in the same year disappears by death is shown in the elaborate tables of mortality used by actuaries. These tables are different for different countries and for males and females. Very elaborate tables of survival were pre- pared for the British Government in 1883-84 for calculating annuities.~~

~~We cannot here deal with what is known as the “population question.” Any adequate discussion of that highly important subject would involve considerations outside the limits of this article. The “population ques- tion” is a question of conduct, while the present article seeks only to point out certain well-ascertained facts regarding the phenomenon of superorganic evolution called population. The facts in question are general, and, though sufficient to indicate the nature of the pheno- meuon, and the broad divisions which are most convenient for its further investigation, are quite insufficient as the basis for the formation of any ethical judgment regarding the actions of the individuals composing the population.~~

~~Among the works that may be consulted to the greatest ad- vantage by the student are the following :—the numerous works of the late Dr William Farr, F.R.S., formerly registrar-general ; various works by Dr W. A. Guy, F.R.S.; those of Adolphe Quetelet ; various monographs by Dr Ernst Engel, and other eminent statists in the official publications of the Prussian Statistical Office ; various publications of the Italian Statistical Bureau; the~~

~~publications of the International Congress of Statistics. Systematic treatment of the whole subject of population will be found in the following works :—Pertillon, Aowvements de la Population dans divers états de l Europe, Paris, 1877; Maurice Block, Traité théorique et pratique de statistique, Paris, 1878; L. Bodio, Movimento dello stato civile, Rome, 1878 (publication of the Italian Statistical Bureau); A. Gabaglio, Storta e teoria della statistica, Milan, 1880; M. Haushofer, Lekr- und Handbuch der Statistik, Vienna, 1882 (W. HO.)~~

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~~PORBEAGLE, the name of a shark (Lamna cornubica), mentioned in the works of older British authors as " Beaumaris Shark." The short and stout form of its body contrasts strikingly with its much attenuated tail, which, however, is strengthened by a keel on each side and terminates in a large and powerful caudal fin. The snout is pointed, and the jaws are armed with strong lan- ceolate teeth, each of which bears a small cusp on each side of the base (see fig.). The teeth are not adapted for cut- ting, like the flat triangular teeth of man-eating sharks, but rather for seizing and holding the prey, ? which consists chiefly of various kinds of fishes and cephalopods. In the upper jaw there are from thirteen to sixteen vo, teeth on each side, the third being~~

~~remarkable for its small size; in the Upper and lower tooth lower jaw from twelve to fourteen. The of Lamna. gill-openings are very wide. The porbeagle attains to a length of 10 or 12 feet, and is a pelagic fish, not rare in the North Atlantic and Mediterranean, and frequently wandering in pursuit of its prey to the British and more rarely to the American shores. The same species has been found in Japan and New Zealand, and perhaps also on the coast of California, so that the completion of the evidence as to its cosmopolitan range is merely a matter of time. Other closely-allied species (LZ. spallanzanii, L. glauca) are known to occur in the southern parts of the Atlantic, from the Mediterranean to the Cape of Good Hope. Very little is known of the mode of propagation of the por- beagle, beyond the isolated statement by Pennant that two embryos were found in a female. No opportunity should be lost of making further observations on this point, and of preserving if possible the foetuses in their enveloping tunics.~~

~~*PORCELAIN. See PotrEry.*~~

~~*PORCUPINE. This word, derived from the French porc-épic, or "spiny pig," is applied to the members of the Hystricidz, a family of rodents whose most prominent peculiarity is their covering of long stout spines, which*~~

~~*Porcupine.*~~

~~*form a highly efficient protection against enemies, and which are better developed in this family than in any other mammal. Zoologically the porcupines are allied to the cavies, chinchillas, agoutis, &c., and with them form the great section Hystricomorpha or porcupine-like rodents (see MamMatta, vol. xv. p. 420).*~~

~~*The Hystricide are readily divisible into two sub- families according to their geographical distribution, the Hystricina or True Porcupines being confined to the Old World, and the Synetherina to the New. The Hystricina*~~

~~*POR—POR*~~

~~*are distinguished by their semi-rooted molars, imperfect collar-bones, cleft upper lips, rudimentary pollices, smooth soles, six mammz, and by many important cranial char- acters. They range over the south of Europe, the whole of Africa, India, and the Malay Archipelago as far east- wards as Borneo. They are all stout heavily-built animals, with blunt rounded heads, fleshy mobile snouts, and coats of thick cylindrical or flattened spines, which form the whole covering of their body, and are not intermingled with ordinary hairs. Their habits are strictly terrestrial. Of the three genera in this section, the first and best-known is Hystrix, characterized by its curiously inflated skull, in which the nasal chamber is often considerably larger than the brain-case, and by its short tail, tipped with numerous slender stalked open quills, which make a loud rattling noise whenever the animal moves. Its longest-known member is the Common Porcupine (H. cristata), which occurs throughout the south of Europe'and North and West Africa, but is replaced in South Africa by H. africx- australis, and in India by the Hairy-nosed Porcupine (ZZ. leucura), whose habits are described in the following notice extracted from Jerdon's Mammals of India.*~~

~~“ Hystriz leucwra is found over a great part of India, from the lower ranges of the Himalayas to the extreme south, but does not occur in lower Bengal, where it is replaced by H. bengalensis. It forms extensive burrows, often in societies, in the sides of hills, banks of rivers and nullahs, and very often in the bunds of tanks, and in old mud walls, &c. &c. In some parts of the country they are very destructive to various: crops, potatoes, carrots, and other vegetables. They never issue forth till after dark, but now and then one will be found returning to his lair in daylight. Dogs take up the scent of the porcupine very keenly, and on the Nilghiris I have killed many by the aid of dogs, tracking them to their dens. They charge backwards at their foes, erecting their spines at the same time, and dogs generally get seriously injured by their strong spines, which are sometimes driven deeply into the assailant. The porcupine is not bad eating,—the meat, which is white, tasting something between pork and veal.”~~

~~Besides the three large crested species of Lystrix above- mentioned, there are some four or five smaller species without nuchal crests occurring in north-east India and in the Malay region, from Nepal to Borneo. The second genus of Old-World porcupines is Atherura, the Brush- tailed Porcupines, much smaller animals than the last, with long tails tipped with bundles of peculiar flattened spines. Of the three species two are found in the Malay region and one in West Africa. TZrichys, the last genus, contains but one Bornean species, 7. lipura, externally very like an Atherura, but differing from the members of that genus in many important cranial characteristics.~~

~~The New-World porcupines, the Synetherina, have rooted molars, complete collar-bones, uncleft upper lips, tuberculated soles, no trace of a pollex, and four mammez only. Their spines are toa great extent mixed with long soft hairs; they are less strictly nocturnal in their habits ; and, with one exception, they live entirely in trees, having in correspondence with this long and powerful prehensile tails. They consist of three genera, of which the first is formed by the common Canadian Porcupine (Hrethizon dorsatus), a stout heavily-built animal, with long hairs almost or quite hiding its spines, four anterior and five posterior toes, and a short stumpy tail. It is a native of the greater part of Canada and the United States, where- ever there is any remnant of the original forest left. Syn- etheres, the~~

~~second genus, contains some eight or ten species, known as Tree Porcupines, and found throughout the tropical parts of South America, one of them extending northwards into Mexico. They are of a lighter build than the ground porcupines, are covered with short, close, many- coloured spines often mixed with hairs, and their tails are always prehensile. Their hind feet have only four toes, owing to the suppression of the hallux, but instead they have a peculiar fleshy pad on the inner side of the foot,~~

~~between which and the toes boughs and other objects can be firmly grasped as with a hand. The last genus is Chetomys, distinguished by the shape of its skull and the greater complexity of its teeth. It contains only one species, C. subspinosus, a native of the hottest parts of Brazil.~~

~~PORDENONE, It (1483-1539), whose correct name was GiovaNNI ANTONIO Liernio, or Licrno, was an eminent painter of the Venetian school. He was commonly named Il Pordenone from having been born in 1483 at Corticelli, a village near Pordenone,—a city of Italy, in the province of Udine (Friuli). He himself ultimately dropped the name of Licinio, having quarrelled with his brothers, one of whom had wounded him in the hand ;_ he then called him- self Regillo, or De Regillo. His signature runs " Antonius Portunaensis," or 'De Portunaonis." He was created a cavaliere by Charles V.~~

~~As a painter Licinio was a scholar of Pellegrino da S. Daniele, but the leading influence which governed his style was that of Giorgione; the popular story that he was a fellow-pupil with Titian under Giovanni Bellini is incorrect. The district about Pordenone had been some- what fertile in capable painters; but Licinio excelled them all in invention and design,-and more especially in the powers of a vigorous chiaroscurist and flesh-painter. Indeed, so far as mere flesh-painting is concerned he was barely inferior to Titian in breadth, pulpiness, and tone ; and he was for a while the rival of that great painter in public regard. The two were open enemies, and Licinio would sometimes affect to wear arms while he was painting. He excelled Giorgione in light and shade and in the effect of relief, and was distinguished in perspective and in portraits ; he was equally at home in fresco and in oil- colour. He executed many works in Pordenone and else-~~

where in Friuli, and in Cremona and Venice as well; at one time he settled in Piacenza, where is one of his most celebrated church pictures, St Catherine disputing with the Doctors in Alexandria; the figure of St Paul in con- nexion with this picture is his own portrait. He was formally invited by Duke Hercules II. of Ferrara to that court; here soon afterwards, in 1539, he died, not with- out suspicion of poison. His latest works are compara- tively careless and superficial; and generally he is better in male figures than in female—the latter being somewhat too sturdy—and the composition of his subject-pictures is scarcely on a level with their other merits. Pordenone appears to have been a vehement self-asserting man, to which his style as a painter corresponds, and his morals were not unexceptionable. Three of his principal scholars were Bernardino Licinio, named Il Sacchiense, his son-in- law Pomponio Amalteo, and Giovanni Maria Calderari.

The following may be named among Pordenone's works :—the picture of S. Luigi Giustiniani and other Saints, originally in S. Maria dell' Orto, Venice ; a Madonna and Saints, in the Venice academy ; the Woman taken in Adultery, in the Berlm museum ; the Annunciation, at Udine, regarded by Vasari as the artist's masterpiece, now damaged by restoration. In Hampton Court is a duplicate work, the Painter and his Family ; and in Burghley House are two fine pictures now assigned to Pordenone—the Finding of Moses and the Adoration of the Kings. These used to be attributed to Titian and to Bassano respectively.

PORIFERA. See SPoncEs.

PORISM. The subject of porisms is perplexed by the multitude of different views which have been held by famous geometers as to what a porism really was and is. This article must therefore be limited to a short historical account (1) of the principal works of the Greek mathe- maticians which we know to have been called Porwsms, and (2) of some of the principal contributions to the elucidation of these works, and conjectures as to the true signification of the tern. :

The treatise which has given rise to the controversies on this subject is the Porisms of Euclid, the author of the

~~Elements. For as much as we know of this lost treatise we are indebted to the Collection of Pappus of Alexandria, who mentions it along with other geometrical treatises, and gives a number of lemmas necessary for understanding it. Pappus states that the porisms of Euclid are neither theorems nor problems, but are in some sort intermediate, so that they may be presented either as theorems or as problems; and they were regarded accordingly by many geometers, who looked merely at the form of the enuncia- tion, as being actually theorems or problems, though the definitions given by the older writers showed that they better understood the distinction between the three classes of propositions. The older geometers, namely, defined a theorem as 76 mpotewdpevov cis ardbeiEiv abtod tod mpotervopévov, a problem as 76 mpoBadAdpevov eis Kata- okevyv attod Tov mpotevoyevov, and finally a porism as TO Tr POTELVOJLEVOV €iS Tropic Lov avTOU TOU TPOTELVOMEVOD, Pappus goes on to say that this last definition was changed by certain later geometers, who defined a porism on the ground of an accidental characteristic as 75 Actzov brobéce: ToTUKOV Gewpypuatos.~~

~~Proclus gives a definition of a porism which agrees very well with the fact that Euclid used the same word répiocpa in his Llements for what is now called by the Latin name "corollary." Proclus's definition is To S€ répurpa AéyeTar pev ext mpoBAnpdtwv Tivwy, ofov Ta EvKXeider yeypappéeva mopiopata, Aéyerar 5 iSiws, dtav ék Tv dmodederypevwv GAXo te fowadhavy [evvarodavy (1)] Gedpyps, pi) mpobe- pévov jpav, 6 Kat dia TodTo Toépicpa KeKAHKaoL GoTeEp TL Képoos Ov THS exvoTypoviKys amobetEews Tapepyov (Procl., Comment. Fucl., p. 58; ef. p. 80).~~

~~Pappus gives a complete enunciation of a porism derived from Euclid, and an extension of it to a more general case. This porism, expressed in modern language, asserts that, Given four straight lines of which three turn about the points in which they meet the fourth, uf two of the points of inter- section of these lines lie each on,a fixed straight line, the remaining point of intersection will also le on another straight line ; or, If the sides of a triangle are made to turn each about one of three fixed points in a straight line, and uf two of the vertices are made to move on two fixed straight lines,~~

~~taken arbitrarily, the third vertex describes a third straight line. The general enunciation applies to any number of straight lines, say (n + 1), of which » can turn about as many points fixed on the (n + 1)th. These x~~

~~: é . nn-1)., n(n—1) straight lines cut, two and two, in a points, oe being a triangular number whose side is (n—1). If, then, they are made to turn about the m fixed points so that any (n—1) of their a (n — 1) given fixed straight lines, then each of the remaining~~

~~: n-1)(n—2). ‘ points of intersection, ea in number, describes~~

~~points of intersection lie on~~

~~a straight line. Pappus gives also a complete enuncia- tion of one porism of the first book of Euclid’s treatise. This may be expressed thus: If about two fixed points P, Q we make turn two straight lines meeting on a given straight line L, and if one of them cut off a segment AM from a fixed straight line AX, given in position, we can determine another fixed straight line BY, and a point B fixed on it, such that the segment BM’ made by the second moving line on this second fixed line measured from B has a given ratio A to the first segment AM. The rest of the enunciations given by Pappus are incomplete, and he merely says that he gives thirty-eight lemmas for the three books of porisms ; and these include 171 theorems. The lemmas which Pappus gives in connexion with the porisms are interesting historically, because he gives (1)~~

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~~the fundamental theorem that the cross or anharmonic ratio of a pencil of four straight lines meeting in a point is constant for all transversals; (2) the proof of the harmonic properties of a complete quadrilateral ; (3) the theorem that, if the six vertices of a hexagon lie three and three on two straight lines, the three points of con- course of opposite sides lie on a straight line.~~

~~During the last three centuries this subject seems to have had great fascination for mathematicians, and many geometers have attempted to restore the lost porisms. Thus Albert Girard expresses in his 7’ratté de~~

~~*Trigonométrie a hope that he will be able to restore them. About the same time Fermat wrote a short work under the title Porismatum Euclideorum renovata doctrina et sub forma isagoges recentioribus geometris exhibita. He seems to have concerned himself only with the character and object of Euclid's work ; but, though he seems to assert that he has restored the work, the examples of porisms which he gives have no connexion with those propositions indicated by Pappus. Fermat's idea of a porism was that it is nothing more than a locus. We may next mention Halley, who published the Greek text of the preface to Pappus's seventh book with a Latin translation, but with no comments or elucidations, remarking at the end that he has not been able to understand this description of porisms, which (he maintains) is made unintelligible by corruptions and lacunee in the text. Robert Simson was the first to throw real light on the subject. His first great triumph was the explanation of the only three propositions which Pappus indicates with any completeness. This explana- tion was published in the Philosophical Transactions in 1723; but Simson did not stop there. After his first success he set himself to investigate the subject of porisms generally, and the result appears in a work entitled De porismatibus tractatus ; quo doctrinam porismatum satis explicatam, et in posterum ab oblivione tutam fore sperat auctor. This work, however, was not published until after Simson's death; it appeared at Glasgow in 1776 as part of a volume, Roberts Simson, matheseos nuper in academia Glasguenst professoris, opera quedam reliqua. Simson's treatise, De porismatibus, begins with definitions of theorem, problem, datum, porism, and locus. Respect- ing the porism Simson says that Pappus's definition is too general, and therefore he will substitute for it the follow- ing: 'Porisma est propositio in qua proponitur demon- strare rem aliquam vel plures datas esse, cui vel quibus, ut et cuilibet ex rebus innumeris non quidem datis, sed que ad ea que data sunt eandem habent relationem, convenire ostendendum est affectionem quandam com- munem in propositione descriptam. Porisma etiam in forma problematis enuntiari potest, si nimirum ex quibus data demonstranda sunt, invenienda proponantur."*~~

~~*P'O°R 1s 'Fi*~~

~~*tween theorems and problems, and were called " porisms." Playfair accordingly defined a porism thus: "A proposition affirming the possibility*~~

~~*of finding such conditions as will render a certain problem indeterminate or capable of in- numerable solutions." This definition, he maintained, agreed both with Pappus's account and Simson's definition, the obscurity of which he attempts to remedy by the following translation: "A porism is a proposition in which it is proposed to demonstrate that one or more things are given, between which and every one of innumerable other things not given, but assumed according to a given law, a certain relation, described in the proposition, is to be shown to take place." ! This definition of a porism appears to be most generally accepted, at least in England. How- ever, in Lerouville's Journal de mathématiques pures et appliquées (vol. xx., July, 1855) P. Breton published Recherches nouvelles sur les porismes d' Huclide, in which he propounded a different theory, professedly based on the text of Pappus, as to the essential nature of a porism. This was followed in the same journal by a controversy between Breton and A. J. H. Vincent, who disputed the interpretation given by the former of the text of Pappus, and declared himself in favour of the idea of Schooten, put forward in his MJathematicx exercitationes (1657), in which he gives the name of "'porism" to one section. According to Schooten, if we observe the various nunterical relations between straight lines in a figure and write them down in the form of equations or proportions, then the combination of these equations in all possible ways, and of new equations thus derived from them, leads to the discovery of innumerable new properties of the figure, and here we have a porism. It must be admitted that, if we are to judge of the meaning by the etymology of the name, this idea of a porism has a great deal to recommend it. We must, however, be on our guard against applying, on this view, the term "'porism" to the process of discovery. The Greek word zépicpa should no doubt strictly signify the result obtained, but the name is still indicative of the process. The porism is the result as obtained by the pro- cess, which is itself the cause of the name. So great an authority as Chasles wrote in 1860 (Les trois livres de por- ismes d' Euclide) that, in spite of the general assent which Playfair's theory met with, he considered it to be unfounded.*~~

~~*The Porisms of Euclid are not the only representatives of this class of propositions. We know of a treatise of Diophantus which was entitled Portsms. But it is uncer- tain whether these lost Porisms formed part of the Arith- metics or were an independent treatise. Diophantus refers to them in*~~

~~*the Arithmetics in three places, introducing a proposition assumed as known with the words ¢yopev ev tots ropicpaciw. These propositions are not, however, all similar in form, and we cannot by means of them grasp what Diophantus understood to be the nature of a porism. So far as we can judge of his treatise it seems to have been a collection of a number of ordinary propositions in the theory of numbers, some of them being mere algebraical identities. Again, Diophantus should probably be included among the vedrepor who are said to have substituted a new definition for that of the ancients, looking only to accidental not essential characteristics of a true porism. And yet, in so far as Diophantus's Porisms had no connexion with geometry, they do not in the least conform to the second definition of Pappus.*~~

~~*We have by no means exhausted the list of writers who have pro- pounded theories on the subject of porisms. It must, however, suffice merely to mention the chief among the rest of the contribu- tions to the subject. These are, besides the papers of Vincent and*~~

~~*1 This view of porisms is known exclusively by the name of Play- fair, though, as he himself says, Dugald Stewart had several years before defined a porism to be "'a proposition affirming the possibility of finding one or more of the conditions of an indeterminate theorem."*~~

~~*PO R—*~~

~~*Breton, the following books or tracts on the Porisms of Euclid :—Aug. Richter, Porismen nach Simson bearbeitet (Elbing, 1837) ; Ch. Housel, "Les Porismes d'Euclide," in Liowville's Journal de mathé- matiques pures et appliquées (2d ser., vol. i., 1856); M. Cantor, "Ueber die Porismen des Euklid und deren Divinatoren," in Schlémilch's Zeitsch. f. Math. u. Phy., 1857, and Literaturzeitung, 1861, p. 3 sg.; Th. Leidenfrost, Die Porismen des Euklid (Pro- gramm der Realschule zu Weimar, 1863); Fr. Buchbinder, Euclids Porismen und Data (Programm der kgl. Landesschule Pforta, 1866). (T. L. H.)*~~

~~*POROS, or Poro ("The Ford"), an island off the east coast of the Morea, separated at its western extremity by only a narrow channel from the mainland at Troezen, and consisting of a mass of limestone rock and of a*~~

~~*mass of trachyte connected by a slight sandy isthmus. The town, which is at the head of an eparchy with 5414 inhabitants (1879), has its 'houses perched among the volcanic rocks," and looks down on the beautiful harbour between the island and the mainland on the south, which between 1830 and 1877 was the seat of a national arsenal.*~~

~~*The ancient Calauria, with which Poros is identified, was given, according to the myth, by Apollo to Poseidon in exchange for Delos ; and it became in historic times famous for a temple of the sea-god, which formed the centre of an amphictyony of seven maritime states—Hermione, Epidaurus, Agina, Athens, Prasiz, Nauplia, and Orchomenus. It was there that Demosthenes took sanctuary with "' gracious Poseidon," and, when this threatened to fail him, sought the more inviolable asylum of death. The build- ing was of Doric architecture and lay on a plateau near the middle of the limestone part of the island, which now contains a mon- astery. In the neighbourhood of Poros-Calauria are two small islands, the more westerly of which contains the ruins of a small temple, and is probably the ancient Spheria! or Hiera mentioned by Pausanias as the seat of a temple of Athena Apaturia. It was at Poros that the English, French, and Russian plenipotentiaries met in 1828 to discuss the basis of the Greek government.*~~

~~*See Chandler, Travels; Leake, Morea; Le Bas, Voyage archéologique ; Curtius,*~~

~~*Peloponnesos ; Pouillon-Boblaye, Recherches ; Bursian, Geographie von Griechen- land ; and Rangabé, " Ein Ausfiug nach Poros," in Deutsche Revue, 1883.*~~

~~*PORPHYRY, a name originally applied to a reddish or purple rock (zop@vpeos, purple) found in Upper Egypt, principally at Jebel Dokhan, and much used by the ancients asa decorative stone. This porphyry, the por- fido rosso antico of Italian antiquaries, consists of a dark crimson or chocolate-coloured felsitic base, with dissemi- nated crystals of white felspar, probably oligoclase. It was a favourite material with Roman sculptors under the lower empire, and notwithstanding its excessive hardness was worked into large sarcophagi and other objects, ornamented in some cases in elaborate relief. This porphyry was also ingeniously used for the lower part of the busts of Roman emperors, the head being executed*~~

~~*in another material, while the porphyry was used for the drapery, the colour of the stone suggesting that of the imperial purple. The antique red porphyry is often confounded with the rosso antuco, which, being merely a red marble, is a much softer stone.*~~

~~*The term "porphyry" has been gradually extended to a variety of rocks which contain distinct crystals of any mineral sprinkled through a fine-grained ground. Among the best known of the ancient porphyries is the porjido verde antico, or lapis Lacedemonius, a beautiful rock with pale-green crystals of labrador-felspar, found at Mount Taygetusinthe Morea. Themeaning of the word "porphyry" has become so vague, in consequence of its application to many rocks 'widely differing from each other in composi- tion, that there is a tendency among modern petrologists to abandon its use as a substantive, and merely to retain the adjective "porphyritic" as a convenient designation for all rocks which exhibit a structure like that of the ancient porphyry. Any rock, whatever its mineralogical composition, may therefore become porphyritic by contain-ing isolated crystals developed in a compact or micro-crys-*~~

~~*1 Some writers identify Calauria with one half only of Poros, and consider that the other half was in antiquity a separate island, to be identified with Spheria.*~~

~~*POR 521*~~

~~*Britain are the porphyritic granites of Cornwall and of Shap in Westmoreland ; the elvans, or quartz-porphyries (see vol. x. p. 233), which occur as dykes.cutting through the slates and granites of Cornwall; the peculiar rock termed "luxullianite " (see vol. xi. p. 49); and the green and red porphyritic felstones of Cumberland. A beautiful brown porphyritic felstone occurs at Buchan Ness, on the coast of Aberdeenshire ; while a rock closely resembling the antique green porphyry is found on Lambay Island, near*~~

~~*Dublin. For a description of porphyrite, see vol. x. p. 234. PORPHYRY (c. 233-306). See NEOPLATONISM, vol. XVil. p. 336 sq.*~~

~~*PORPOISE (sometimes spelled Porpus and Porpxssz). The word is apparently derived from the French pore and poisson, or the Italian porco and pesce, and thus corresponds with some of the English vernacular appellations, "hog- fish," '"sea-hog," "herring-hog," and the German Meer- schwein, whence the usual modern French name of the animal, marsouin. 'Porpoise" is commonly used by sailors to designate all the smaller cetaceans, especially those numerous species which naturalists call "dolphins"; but in scientific language it is restricted to a particular form constituting the genus Phocena of Cuvier, of which the Common Porpoise of the British seas, Phocena commums, Cuvier (Delphinus phocena, Linnzus), is the type. The essential characters by which the genus is separated from the other members of the order Cetacea are described in the article Mammatia (vol. xv. p. 398).*~~

~~*The common porpoise, when full grown, attains a length*~~

~~*Fig. 1.—Phocena communis.*~~

~~*of 5 feet or a little more. The dimensions of an adult female specimen from the English Channel were as follows: —length in straight line from nose to median notch between the flukes of the tail, 624 inches; from the nose to the anterior edge of the dorsal fin, 29 inches; height of dorsal fin, 44 inches; length of base of dorsal fin, 8 inches; length of pectoral fin, 94 inches; breadth of pectoral fin, 34 inches; breadth of tail flukes, 13 inches. The head is rounded in front, and differs from that of the true dolphins in not having the snout produced into a distinct "beak" separated from the frontal eminence by a groove. The under jaw projects about half an inch beyond the upper one. The aperture of the mouth is tolerably wide, and is bounded by stiff immobile lips, and curves slightly upwards at the hinder end. The eye is small, and the external ear represented by a minute aperture in the skin, scarcely larger than would be made by the puncture of a pin, situ- ated about 2 inches behind the eye. The dorsal fin is placed near themiddle of the back, and is lowand triangular. The pectoral fins are of moderate size, and slightly falcate. XIX. — 66*~~

~~*The horizontally-expanded caudal fin is of the form common to all Cetacea. The external surface, as in the rest of the order, is smooth, shining, and devoid of hair, though in the foetal condition a few bristles are found near the nose. The upper parts are dark grey, or nearly black, according to the light in which they are viewed, and the state of moisture or otherwise of the skin ; the under parts are pure white. The line of demarcation between these colours is not distinct, washes or splashes of grey encroaching upon the white on the sides, and varies somewhat in different individuals. Usually it passes from the throat (the anterior part of which, with the whole of the under jaw, 1s dark) above the origin of the pectoral fin, along the middle of the flank, and descends again to the middle line before reaching the tail. Both sides of the pectoral and caudal fins are black. The anterior edge of the dorsal fin is often furnished with a row of small rounded horny spines or rather tubercles of very variable number, which have been thought to indicate a specific distinction between the animals possessing them (Phocena tuberculifera, Grey) and those without them, :*~~

~~*but this has not been confirmed by other characters. One of the most characteristic ana- tomical distinctions be- tween the porpoise and other members of the Delphinidz is the form of the teeth, which (numbering twenty-three to twenty-six on each'side of each jaw) instead of the usual conical, sharp-pointed, recurved shape, all have expanded, flattened, spade-like crowns, with more or less marked vertical grooves, giving a tendency to a bilobed or often trilobed form (see fig. 2).*~~

~~*The porpoise is sociable and gregarious in its habits, being usually seen in small herds, and frequents coasts, bays, and estuaries rather than the open ocean. It is the commonest cetacean in the seas around the British Isles, and not unfrequently ascends the river Thames, having been seen as high up as Richmond; it has also been observed in the Seine at Neuilly, near Paris. It frequents the Scandinavian coasts, entering the Baltic in the summer; and it is found as far north as Baffin's Bay, and as far west as the coasts of the United States. Southward its range is more limited than that of the common dolphin, as, though very common on the Atlantic coasts of France, it is not known to enter the Mediterranean.*~~

~~*It feeds on fish, such as mackerel, pilchards, and herrings, of which it devours large quantities, and, following the shoals, is often caught by fishermen in the nets along with its prey. In former times it was a common and esteemed article of food in England and in France, but is now rarely if ever eaten, being commercially valuable when caught only for the oil obtained from its blubber. Its skin is some- times used for leather and boot-thongs, but the so-called "porpoise hides" are generally obtained from a different and larger species of cetacean, the Beluga of the northern seas.*~~

~~*A closely similar if not identical species from the American coast of the North Pacific has been described under the name of Phocena vomerina, and another from the mouth of the Rio de la Plata as P. spinipennis. Another nearly allied form is Neomeris phocenoides, a small species from the Indian Ocean and Japan, with teeth of the same form as those of the common porpoise, but fewer in number (eighteen to twenty on each side of each jaw) and of larger size, and more distinctly notched or lobed on the free edge. It is distinguished from the common porpoise externally by its entirely black colour and the complete absence of a dorsal fin.*~~

~~*PORPORA, Niccoza (or Niccoto) ANTONIO (1686- 1767), operatic composer and teacher of singing, was born in Naples on 19th August 1686, and educated at the Con- Servatorio di Santa Maria di Loreto by Gaetano Greco*~~

~~*ADDO AR yyy yp mero By: Las*~~

~~*Twice*~~

~~*Fig, 2.—Teeth of Porpoise. natural size.*~~

~~*POR—POR*~~

~~*and Francesco Mancini. His first opera, Basilio, was pro- duced at Naples, his second, Berenice, at Rome. Both were very successful, and he followed them up by in- numerable compositions of like character; but his fame rests chiefly upon his power of teaching singing—an art in which he has never been surpassed, if even equalled. At the Conservatorio di San Onofrio and the Poveri di Gesu Cristo he trained the finest voices of the age. Farinelli—*~~

~~*the greatest singer who ever lived—Caffarelli, Mingotti, Salimbeni, and other celebrated vocalists owed all they ever knew to his teaching. Still his numerous engagements did not tempt him to forsake composition. In 1725 he visited Vienna, but the emperor Charles VI. disliked his florid style, especially his constant use of the trillo, and refused to patronize him. After this rebuff he settled in Venice, teaching regularly in the schools of La Piet' and the Incurabili. In 1728 he removed to Dresden, where he was received with great cordiality by the electoral princess Maria. In 1729 he was invited to London as a rrval to Handel ; but his visit was an unfor- tunate one. Little less disastrous was his second visit to England in 1734, when even the presence of his pupil, the great Farinelli, failed to save the dramatic company known as the "Opera of the Nobility" from ruin. In order to fulfil his English engagement he procured a release from that previously contracted in Dresden ; but he finally quitted London in 1736, and again settled in Venice. There he remained until 1745, when he returned to Vienna in the suite of the Venetian ambassador, giving lessons in 1754 to the young Joseph Haydn, and returning in 1759 to his birthplace, Naples. From this time Porpora's career was a series of misfortunes. His last opera, Camilla, failed ; and he became so miserably poor that the expenses of his funeral were paid by subscription. Yet at the moment of his death (1767) Farinelli and Caffarelli were living in princely splendour on fortunes for which they were indebted to the excellence of the old maestro's teaching.*~~

~~*Porpora was a learned scholar, an accomplished linguist, and a genial wit. Some excellent stories are told in illustration of this last-named characteristic. His compositions are masterly and brilliant, but less remarkable for depth of feeling than for technical display. The style of his oratorios and cantatas is far more elevated than that of his numerous operas.*~~

~~*See*~~

~~*PORSENA or Porsenna, king of Clusium. Errvria, vol, vii. p. 635, and Rome.*~~

~~*PORSON, RicHarp (1759-1808), in some respects the greatest of modern Greek scholars, was born on Christmas Day 1759 at East Ruston, near North Walsham, in Nor- folk, the eldest son of Mr Huggin Porson, parish*~~

~~*clerk of the place. His mother was the daughter of a shoemaker named Palmer, of the neighbouring village of Bacton. He was sent first to the village school at Bacton, kept by Mr John Woodrow, and afterwards to that of Happisburgh, kept by Mr Summers. Here his extraordinary powers of memory and aptitude for arithmetic were soon discovered ; his skill in penmanship, which attended him through life, was very much due to the care of Mr Summers, who be- came early impressed with his abilities, and long afterwards stated that during fifty years of scholastic life he had never come across boys so clever as Porson and his two brothers. He was well grounded in Latin by Mr Summers, remaining with him three years. His father also took great pains with his education, making him repeat at night the lessons he had learned in the day. He would frequently repeat without making a mistake a lesson which he had learned one or two years before and had never seen in the interval. For books he had only what his father's cottage supplied—a book or two of arithmetic, Greenwood's England, Jewell's Apology, an odd volume of Chambers's Cyclopedia picked up from a wrecked coaster, and eight or ten volumes of the Unwersal Magazine.*~~

~~*PORS ON*~~

~~*The brilliant promise of the parish clerk's son naturally became known to the clergyman; and when he was eleven years old the Rev. T. Hewitt, the curate of East Ruston and two neighbouring villages, took charge of his educa- tion, keeping him and one of his brothers at his house at Bacton during the week, and sending them home for the Sunday. Mr Hewitt taught him with his own boys, taking him through the ordinary Latin authors, Cesar, Terence, Ovid, and Virgil; before this he had made such progress in mathematics as to be able to solve questions out of the Ladies' Diary. In addition to this Mr Hewitt brought him under the notice of Mr Norris of Witton Park, who sent him to Cambridge and had him examined by Professor Lambert, the two tutors of Trinity, Postlethwaite and Collier, and the well-known mathematician Atwood, then assistant tutor; the result was so favourable a report of his knowledge and abilities that Mr Norris determined to provide for his education so as to fit him for the university. This was in 1773. It was found impossible to get him into Charterhouse, and he was entered on the foundation of Eton in August 1774.*~~

~~*Of his Eton life Porson had not very pleasant recollec- tions, but he was a popular boy among his schoolfellows ; and two dramas he wrote for performance in the Long Chamber are still remembered. His marvellous memory was of course noticed ; but at first he seems to have some- what disappointed the expectations of his friends, as his composition was weak, and his ignorance of quantity kept him behind several of his inferiors, He went to Eton too late to have any chance of succeeding to a scholarship at King's College. In 1777 he suffered a great loss from the death of his patron Mr Norris; but contributions from Etonians to aid in the funds for his maintenance at the university were readily supplied, and he found a successor to Mr Norris in Sir George Baker, the well-known phy- sician, who was at that time president of the college of physicians. And chiefly through his means Porson was entered of Trinity College, Cambridge, as a pensioner on*~~

~~*28th March 1778, and commenced his residence there soon — afterwards, matriculating in April of that year. It is said |*~~

~~*that what first biassed his mind towards critical researches was the gift of a copy of Toup's Longinus by Dr Davies, the headmaster of Eton, for a good exercise; but it was Bentley and Dawes to whom he looked as his immediate masters. His critical career was begun systematically while an undergraduate ; and it was doubtless during the period of his residence at Cambridge that his marvellous stores of learning were laid up for future use. He became a scholar of Trinity College in 1780, won the Craven uni- versity scholarship in 1781, and took his degree of B.A. in 1782, as third senior optime, obtaining soon afterwards the first chancellor's medal for classical studies. The same year he was elected Fellow of Trinity College, a very un- usual thing for a junior bachelor of arts, as the junior bachelors were very rarely allowed to be candidates for fellowships, a regulation which lasted from 1667 when Isaac Newton was elected till 1818 when Connop Thirl- wall became a fellow. Porson graduated M.A. in 1785. Having thus early secured his independence, he turned his thoughts to publication. The first occasion of his ap- pearing in print was in ashort notice of Schutz's Zschylus in Maty's Review, written in 1783. This review contains several other essays by his hand ; especially may be men- tioned the reviews of Brunck's Aristophanes (an admirable specimen of clear and*~~

~~vigorous English, and containing a very able summary of the Greek comic poet's chief excel- lences and defects), Weston's Hermesianax, and Hunting- ford's Apology for the Monostrophics. But it was to the tragedians, and especially to Auschylus, that his mind was then chiefly directed. He began a correspondence with~~

~~David Ruhnken, the veteran scholar of Leyden, requesting to be favoured with any fragments of A®schylus that Ruhnken had come across in his collection of inedited lexicons and grammarians, and sending him, as a proof that he was not undertaking a task for which he was un- equal, some specimens of his critical powers, and especially of his restoration of a very corrupt passage in the Supplices (673-677) by the help of a nearly equally corrupt passage of Plutarch's Hroteus. As the syndics of the Cambridge press were proposing to re-edit Stanley's schylus, the editorship was offered to Porson; but he declined to undertake it on the conditions laid down, namely, of re- printing Stanley's corrupt text and incorporating all the variorum notes, however worthless. He was especially anxious that the Medicean MS. at Florence should be col- lated for the new edition, and offered to undertake the collation at an expense not greater than it would have cost if done by a person on the spot; but the syndics re- fused the offer, the vice-chancellor (then Mr Torkington, master of Clare Hall) observing that Mr Porson might collect his MSS. at home.~~

~~In 1786, a new edition of Hutchinson's Anabasis of Xenophon being called for, Porson was requested by the publisher to supply a few notes, which he did in conjunc- tion with the Rev. W. Whiter, editor of the Hlymologicon universale. These give the first specimen of that neat and terse style of Latin notes in which he was afterwards to appear without a rival. They also show already his intimate acquaintance with his two favourite authors, Plato and Athenzus, and a familiarity with Eustathius's commentary on Homer.~~

~~The next year, 1787, the Notx breves ad Toupit Emenda- tiones in Suidam were written, though they did not appear till 1790 in the new edition of Toup's book pub- lished at Oxford. These first made Porson's name known as a scholar of the first rank, and carried his fame beyond England. The letters he received from Heyne and Her- mann, still preserved in the library~~

~~of Trinity College, and written before his Huripides was published, afford a sufficient proof of this. In his notes he does not hesitate to point out the errors of Toup and others; at the same time he speaks of Toup's book as "opus illud aureum,"~~

~~and states that his writing the notes at all is due to the~~

~~admiration he had for it. They contain some very brilliant emendations of various authors; but the necessity of having Toup's own notes with them has prevented their ever being reprinted in a separate form.~~

~~During this year, in the Gentleman's Magazine, he wrote the three letters on Hawkins's Life of Johnson which have been reprinted by Mr Kidd in his 7'racts and Criticisms of Porson, and in the volume of Porson's Correspondence. They are admirable specimens of the dry humour so characteristic of the writer, and afford also proofs of his intimate acquaintance with Shakespeare and the other English dramatists and poets. In the same periodical, in the course of the years 1788 and 1789, appeared the Letters to Archdeacon Travis, on the spurious verse 1 John v. 7 (collected in 1790 into a volume), which must be considered to have settled the question as to the spurious- ness of the verse for ever. Gibbon's verdict on the book, that it was "the most acute and accurate piece of criticism since the days of Bentley," may be considered as some- what partial, as it was in defence of him that Porson had entered the field against Travis. But in the very masterly sketch of Gibbon's work and style in the pre- face Porson does not write in a merely flattering tone. It is to be wished that on such a subject the tone of levity had been modified. But Porson says in his preface that he could treat the subject in no other manner, if he treated it at all: "To peruse such a mass of falsehood and~~

~~sophistry and to write remarks upon it, without sometimes giving way to laughter and sometimes to indignation, was, to me at least, impossible." Travis has no mercy shown him, but he certainly deserved none. One is equally struck with the thorough grasp Porson displays of his subject, the amount of his miscellaneous learning, and the humour that pervades the whole. But it was then the unpopular side: the publisher is said to have lost~~

~~money by the book ; and one of his early friends, Mrs Turner of Norwich, cut down a legacy she had left Porson to £30 on being told that he had written what was described to her as a book against Christianity.~~

~~During the years that followed he continued to contri- bute to the leading reviews, writing in the Monthly Renew the articles on Robertson's Parian Chronicle, Edwards's Plutarch, and Payne Knight's Essay on the Greek Alphabet. He gave assistance to Beloe in one or two articles in the British Critick, and probably wrote also in the Analytical Review and the Critical Review.~~

~~In the year 1792 his fellowship was no longer tenable by a layman ; and, rather than undertake duties for which he felt himself unfit, and which involved subscription to the Articles (though he had no difficulty as to signing a statement as to his conformity with the liturgy of the Church of England when elected Greek professor), he determined not to take holy orders, which would have enabled him to remain a fellow, and thus deprived him- self of his only means of subsistence. He might have been retained in the society by being appointed to a lay~~

~~fellowship, one of the two permanent lay fellowships which~~

~~the statutes then permitted falling vacant just in time. It is said that this had been promised him, and it was certainly the custom in the college always to appoint the senior among the existing laymen, who otherwise would vacate his fellowship. But the master (Dr Postlethwaite), who had the nomination, used his privilege to nominate a younger man (John Heys), a nephew of his own, and thus Porson was turned adrift without any means of support. A subscription was, however, got up among his friends to provide an annuity to keep him from actual want; Mr Cracherode, Mr Cleaver Banks, Dr Burney, and Dr Parr took the lead, and enough was collected to produce about £100 a year. He accepted it only on the condition that he should receive the interest during his lifetime, and that the principal, placed in the hands of trustees, should be returned to the donors at his death. When this occurred they or their survivors refused to receive the money, and the Porson prize at Cambridge was founded with this sum to perpetuate his name.~~

~~*After the loss of his fellowship he continued chiefly to reside in London, having chambers in Essex Court, Teniple, — occasionally visiting his friends, such as Dr Goodall at Eton and Dr Parr at Hatton. It was at Dr Goodall's house that the Letters to Travis were written, and at one period of his life he spent a great deal of time at Hatton. While there he would generally spend his mornings in the library, and for the most part in silence; but in the evenings, especially if Parr were away, he would collect the young men of the house about him, and pour forth from the rich stores of his memory torrents of every kind of literature — pages of Barrow, whole letters of Richard- son, whole scenes of Foote, favourite pieces from the periodical press." The charms of his society are described as being then irresistible. "Nothing," said one of his friends, "could be more gratifying than a tête-A-tête with him ; his recitations from Shakespeare, and his ingenious etymologies and dissertations on the roots of the English language were a high treat." "Nothing," says another, "came amiss to his memory; he would set a child right in his twopenny fable-book, repeat the whole of the moral*~~

~~*POR SOW*~~

~~*tale of the Dean of Badajos, or a page of Athenzeus on cups, or Eustathius on Homer." An anecdote is told of his repeating the Rape of the Lock, making observations as he went on, and noting the various readings ; of which one of the company said, "Had it been taken down from his mouth and published, it would have made the best edition of that poem yet in existence."*~~

~~*In 1792 the Greek professorship at Cambridge became vacant by the resignation of Mr Cooke. To this Porson was elected without opposition, and he continued to hold it till his death. The duties then consisted in taking a part in the examinations for the university scholarships and classical medals. It was said he wished to give lectures ; but lecturing was not in fashion in those days, and he did far more to advance the knowledge and study of the Greek language by his publications than he could have done by any amount of lecturing. It must be re- membered that the emoluments of the professorship were only £40 a year. The authors on which his time was chiefly spent were the tragedians, Aristophanes, Athenzus, and the lexicons*~~

~~*of Suidas, Hesychius, and Photius. This last he twice transcribed (the first transcript having been destroyed by a fire at Perry's house, which deprived the world of much valuable matter that he had written on the margins of his books) from the original among the Gale MSS. in the library of Trinity College. Of the bril- liancy and accuracy of his emendations on Aristophanes, the fragments of the other comic poets, and the lexico- graphers he had a pleasing proof on one occasion when he found how often in Aristophanes he had been anticipated by Bentley, and on another when Schow's collation of the unique MS. of Hesychius appeared and proved him right in 'fan incredible number ' of instances.*~~

~~*In 1795 there appeared from Foulis's press at Glasgow an edition of AXschylus in folio, printed with the same types as the Glasgow Homer, without a word of preface or anything to give a clue to the editor. Many new read- ings were inserted in the text with an asterisk affixed, while an obelus was used to mark many others as corrupt. It was at once recognized as Porson's work ; he had super- intended the printing of a small edition in two vols. 8vo, but this was kept back by the printer and not issued till 1806, still without the editor's name. There are corrections of many more passages in this edition than in the folio ; and, though the text cannot be considered as what would have gone forth if with his name and sanction, yet more is done for the text of Aschylus than had been accomplished by any preceding editor. It has formed the substratum for all subsequent editions. It was printed from a copy of Pauw's edition corrected, which is still preserved in the library of Trinity College.*~~

~~*Soon after this, in 1797, appeared the first instalment of what was intended to be a complete edition of Euripides, —an edition of the Hecuba.*~~

~~*In the preface he pointed out the correct method of writing several words previously incorrectly written, and gave some speci- mens of his powers on the subject of Greek metres. The notes are very short, almost entirely critical ; but so great a range of learn- ing, combined with such felicity of emendation whenever a corrupt passage was encountered, is displayed that there was never any doubt as to the quarter whence the new edition had proceeded. He expressly avoided the office of interpreter in his notes, which may well be wondered at on recollecting how admirably he did translate*~~

~~when he condescended to that branch of an editor's duties: "si quis erat locus Anglice exhibendus," says Dobree, "tum vero omnes in stuporem dabat."~~

~~His work, however, did not escape attack; Gilbert Wakefield had already published a Tragediaruwm Delectus ; and, conceiving himself to be slighted, as there was no mention of his labours in the new Hecuba, he wrote a 'diatribe extemporalis" against it, a tract which for bad taste, bad Latin, and bad criticism it would not~~

~~be easy to match. And Gottfried Hermann of Leipsic, then a very young man, who had also written a work on Greek metres, which~~

~~POR—POR~~

~~Dr Elmsley has styled "a book of which too much il] cannot easily be said," issued an edition of the Hecuba, in which Porson's theories were openly attacked. Porson at first took no notice of either, but went on quietly with his Euripides, publishing the Orestes in 1798, the Phenisse in 1799, and the Medea in 1801, the last printed at the Cambridge press, and with the editor's name on the title-page. But there are many allusions to his antagonists in the notes on such points as the final », the use of accents, &c. ; and on v. 675 of the Medea he holds up Hermann by name to scorn in caustic and taunting language. And it is more than probable that to Hermann's attack we owe the most perfect of his works, the supplement to the preface to the Hecuba, prefixed to the second edition published at Cambridge in 1802. Porson's dislike of composition made him indolent, but he came forward now in his own defence, and probably of all the pieces of minute criticism that have appeared on those subjects the first place must be given to this. The beauty of the style, the steps by which the reader is carried on from one point to another, and the richness of illustration make it one of the most entertaining of diatribes. The metrical laws promulgated are laid down clearly, illustrated with an ample number of examples, and those that militate against them brought together and corrected, so that what had been beyond the reach of the ablest scholars of preceding times is made clear to the merest tyro. It is here that the laws of the iambic metre are fully explained, and the theory of the pause stated and proved, which had been only alluded to in the first edition. A third edition of the Hecwba~~

~~*appeared in 1808, and he left corrected copies of the other plays, of which new editions appeared soon after his death ; but these four plays were all that was acconiplished of the projected edition of the poet. Porson lived six years after the second edition of the Hecuba was published, but his natural indolence and procrastination led him to put off carry- ing on the work till death.put a stop to this and all other literary projects. He found time, however, to execute his collation of the Harleian MS. of the Odyssey, published in the Grenville Homer in 1801, and to present to the Society of Antiquaries his wonderful conjectural restoration of the Rosetta stone.*~~

~~*In 1806, when the London Institution was founded (then in the Old Jewry, since removed to Finsbury Circus), he was appointed principal librarian with a salary of £200 a year and a suite of rooms; and thus his latter years were made easy as far as money was concerned.*~~

~~*Among his most intimate friends was Perry, the editor of the Morning Chronicle; and this friendship was cemented by his marriage with Perry's sister, Mrs Lunan, in Novem- ber 1796. The marriage was a happy one for the short time it lasted, as Porson became more attentive to times and seasons, and would have been weaned from his habits of drinking ; but she sank in a decline a few months after her marriage (12th April 1797), and he returned to his chambers in the Temple and his old habits. Perry's friend- ship was of great value to him in many ways; but it induced him to spend too much of his time in writing for the Morning Chronicle; indeed he was even accused of "giving up to Perry what was meant for mankind," and the existence of some of the papers he wrote there can be*~~

~~*only deplored.*~~

~~*For some months before his death he had appeared to be failing: his great memory was not what it had been, and he had some symptoms of intermittent fever; but on 19th September 1808 he was seized in the street with a fit of apoplexy, and after partially recovering sank on the 25th of that month at the comparatively early age of forty-nine. He was buried in Trinity College, close to the statue of Newton, at the opposite end of the chapel to*~~

~~*where rest the remains of Bentley.*~~

~~His library was divided into two parts, one of which was sold by auction ; the other, containing the transcript of the Gale Photius, his books with MS. notes, and some letters from foreign scholars, was bought by Trinity College for 1000 guineas. His note-books were found to contain, in the words of Bishop Blomfield, "a rich treasure of criticism in every branch of classical hterature—every- thing carefully and correctly written and sometimes rewritten— quite fit to meet the public eye, without any diminution or addi- tion." They have been carefully rearranged of late years, and illustrate among other things his extraordinary penmanship and power of minute and accurate writing. Much still remains un- published, though much has been given to the world. Monk, his successor as Greek professor, and Blomfield (both afterwards bishops) edited the Adversaria, consisting of the notes on Athenzus and the Greek poets, and his prelection on Euripides ; Dobree,~~

~~afterwards Greek professor, the notes on Aristophanes and the lexicon of Photius. Besides these, from other sources, Professor Gaisford edited his notes on Pausanias and Suidas, and Mr Kidd collected his scattered reviews. And, when Bishop Burgess attacked his hterary character on the score of his Letters to Travis, Professor Turton (afterwards Bishop of Ely) came forward with a vindication.~~

~~_In claiming for Porson the very high place he has always occu- pied among Greek scholars, it is with those who went before him that he must be compared, if we would judge fairly of the advances he made in the knowledge of the language. In learning he was superior to Valckenaer, in accuracy to Bentley. It must be remem- bered that in his day the science of comparative philology had scareely any existence ; even the comparative value of MSS. was scarcely considered in editing an ancient author. With many editors MSS. were treated as of pretty much the same value, whether they were really from the hand of a trustworthy scribe, or what Bentley calls "scrub manuscripts" or " scoundrel copies." Thus, if we are to find fault. with Porson's way of editing, it is that he does not make sufficient difference between the MSS. he uses, or point out the relative value of the early copies whether in MS. or print. Thus he collates very minutely Lascaris's edition of~~

~~*the Medea, mentioning even misprints in the text, rather from its rarity and costhness than from its intrinsic value. And his wonderful quickness at emendation has sometimes led him into error, which greater investigation into MSS. would have avoided ; thus, in his note on Eur., Phawn., 1873, an error, perhaps a misprint (xe for pe), in the first edition of the scholiast on Sophocles has led him into an emendation of v. 339 of the Z"rachiniz which clearly will not stand. But his most brilliant emendations, such as some of those on Athenzus, on the Supplices of Aschylus, or, to take one single instance, that on Eur., Helen., 751 (00d "Enevos for ovd€év ye ; see Maltby's Thesaurus, p. 299), are such as convince the reader of their absolute certainty ; and this power was possessed by Porson to a degree no one else has ever attained. No doubt his mathematical training had something to do with this; frequently the process may be seen by which the truth has been reached.*~~

~~*A few words are called for on his general character. No one ever more loved truth for its own sake ; few have sacrificed more rather than violate their consciences, and this at a time when a high standard in this respect was not common. In spite of his failings, few have had warmer friends ; no one more willingly communicated his knowledge and gave help to others; scarcely a book appeared in his time or for some years after his death on the subjects to which he devoted his life without acknowledging assistance from him. And, ifit be remembered that his life was a continued struggle against poverty and slight and ill-health, rather than complain that he did little, we should wonder how he accomplished so much.*~~

~~*The chief sources for Porson's life will be found in the memoirs in the Gentle- man's Magazine for September and October 1868, and other periodicals of the time (mostly reprinted in Barker's Porsonitana, London, 1852); Dr Young's memoir in former editions of the Encyclopedia Britannica (reprinted ibid. and in his works); Weston's (utterly worthless) Short Account of the late Mr Richard Porson, London, 1808, reissued with a new preface and title-page in 1814; Dr Clarke's narrative of his last illness and death, London, 1808 (reprinted in the Classical Journal); Kidd's " Imperfect outline of the life of R. P.," prefixed to his collection of the Tracts and Criticisms; Beloe's Sexagenarian (not trustworthy), vol. i., London, 1817 ; Barker's Parriana, vol. ii., London, 1829 ; Maltby's " Por-*~~

~~*soniana," published by Dyce in the volume of Recollections of the Table-Talk of Samuel Rogers, London, 1856; a life in the Cambridge Essays for 1857 by H. R. Luard ; and a lengthy life by J. 8S. Watson, London, 1861.*~~

~~*The dates of Porson's published works are as follows: Notz# in Xenophontis Anabasin, 1786; Appendix to Toup, 1790; Letters to Travis, 1790; Aischylus, 1795, 1806 ; Euripides, 1797-1802 ; collation of the Harleian MS. of the Odyssey, 1801; Adversaria (Monk and Blomfield), 1812; Tracts and Criticisms (Kidd), 1815 ; Aristophanica (Dobree), 1820 ; Notz in Pausaniam (Gaisford), 1820; Photit*~~

~~*Lexicon (Dobree), 1822 ; Notz in Suidam (Gaisfordy, 1834 ; Correspondence (Luard,*~~

~~*edited for the Cambridge Antiquarian Society), 1867. Dr Turton's vindication (H.*~~

~~*appeared in 1827. L.) PORTA, Baccto DELLA. See Baccto DELLA PorTA. PORTA, GIAMBATTISTA DELLA (c. 1543-1615), natural*~~

~~*philosopher, was born of a noble and ancient family at*~~

~~*Naples about the year 1543. In early youth he travelled*~~

~~*extensively not only in Italy but also in France and Spain,*~~

~~*and he had scarcely emerged from boyhood when he published MJagiz naturalis, sive de miracults rerum natur- alium lib. IV. (1558), the first draft of his Magia naturalis, in twenty books, published in 1569. At an early age he founded in Naples the Academia Secretorum Nature, other- wise known as the Accademia dei Oziosi, of which the history has been briefly sketched elsewhere (see ACADEMY, vol. i, p. 70); and in 1610 he became a member of the*~~

~~*Aceademia dei Lincei at Rome. He died at Naples on*~~

~~*4th February 1615.*~~

~~*The following is a chronological list of the principal writings of this prolific author :—De miraculis rerum naturaliwm, in four books*~~

~~*(1558) ; De furtivis litterarum notis, in five books (1563, and fre-*~~

~~quently afterwards, entitling him to high rank among the early writers on cryptography) ; Alagia naturalis (1569, and often re-~~

~~printed, also translated into English in 1658, into French, Spanish, and other languages) ; Phytognomonica (1583, a bulky treatise on the physiology of plants as then understood) ; De humana phystogno- monia, in six books (1591) ; Villa, in twelve books (1592 ; an inter- esting practical treatise on farming, gardening, and arboriculture, based upon his own observations at his country seat near Naples) ; De refractione, optices parte, in nine books (1593) ; Pnewmatica, in three books (1601) ; De celesti physiognomonia, In Six books (1601) ; Elementa curvilinea (1601) ; De distillatione, in nine books (1604) ; De munitione, in three books (1608) ; and De aeris transmutation- dbus, in four books (1609). Porta also wrote several Italian comedies (Olimpia, 1589 ; La Fantesea, 1592; La Trappolaria, 1597 ; I Due Fratelli Rivali, 1601; La Sorella, 1607 ; La Chiappinaria, 1609 ; La Carbonaria, 1628; La Cintia, 1628). Among all the above- mentioned works the chief interest attaches to the Magia naturalis, in which a strange medley of subjects is discussed, including the reproduction of animals, the transmutation of metals, pyrotechny, domestic economy, statics, hunting, the preparation of perfumes ; in book xvii. he describes a number of optical experiments. They include a description of the camera obscura. If, says he, a small aperture is made in the shutter of a dark room, distinct images of all exterual objects will be depicted on the opposite wall in their true colours ; and he further adds that, if a convex lens be fixed in the opening so that the images are received on a surface at the dis- tance of its focal length, the pictures will be rendered so much more distinct that the features of a person standing on the outside of the window may be readily recognized in his inverted image. He applied this instrument to a sort of magic lantern, the representation of eclipses of the sun, and of hunting and other scenes, battles, and other events produced by movable pictures and drawings. He considered the eye as a camera obscura, the pupil as the hole in the window contracting and dilating with different lights, and the crystalline lens as the principal organ of vision, though he seems to have regarded it not as his convex lens but as the tablet on which~~

~~*the images of external objects were formed, the cornea being, no doubt, in his estimation, the part of the eye which formed the picture. After speaking of spectacles and the like, he professed to know a combination of lenses by which "we may contrive to recog- nize our friends at the distance of several miles, and those of weak sight may read the most minute letters from a distance. It is an invention of great utility, and grounded on optical principles, nor is it at all difficult of execution ; but it must be so divulged as not to be understood by the vulgar, and yet be clear to the sharp-sighted." The obscure description which follows does not, how- ever, make it at all probable that he had really anticipated Galileo.*~~

~~*In his De refractione Porta treats of binocular vision. He repeats the propositions of Euclid on the dissimilar pictures of a sphere when seen with each eye and when seen with both; and he quotes from Galen on the dissimilarity of the three pictures thus seen. But, maintaining as he does that we can see only with one eye at a time, he denies the accuracy of Euclid's theorem ; and, while he admits that the observations of Galen are correct, he endeavours to explain them on other principles. In illustrating Galen's views on the dissimilarity of the three pictures he gives a diagram in which can be recognized not only the principle but the construction of the stereoscope. It contains a view, represented by a circle, of the picture of a solid as seen by the right eye, of the picture of the same solid as seen by the left, and of the combina- tion of these two pictures as seen by both eyes, placed between the first two pictures. These results, as exhibited in three circles, are then explained by copying the passage from Galen, and he requests the observer to repeat the experiments so as to see the three dis-similar pictures when looking at a solid column.*~~

~~*PORT ADELAIDE, South Australia. See vol.i.p. 151.*~~

~~*PORTADOWN, a market-town of Armagh, Ireland, is situated on the river Bann, and on the Great Northern Railway, 25 miles west-south-west of Belfast and 10 north-north-east of Armagh. The Bann, which is connected with the Newry Canal and falls into Lough Neagh about 5 miles north of the town, is navigable for vessels of 90 tons burden. It is crossed at Portadown by a stone bridge of seven arches, originally built in 1764, but since then re-erected. The town consists of a principal street, containing a number of*~~

~~*good shops and houses, and with several streets inhabited by the working-classes branching from it at various points. The only public building of importance is the court-house and news-room. The manufacture of linen and cotton is carried on, and there 1s a considerable trade in pork, grain, and farm produce. The manor in the reign of Charles I. was bestowed on John Obyns, who erected a mansion and a few houses, which were the beginning of the town. A grain-market*~~

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~~*was established in 1780. The population in 1871 was 6735, and in 1881 it was 7850.*~~

~~*PORTALIS, Juan Etvenne Marts (1745-1807), French jurist and the principal author of the Code Civil, which as the Code Napoléon has been declared the greatest monu- ment of the reign of the emperor, came of a bourgeois family, and was born at Bausset in Provence on Ist April 1745. He was educated by the Oratorians at their schools in Toulon and Marseilles, and then went to the university of Aix; while a student there he published his first two works, Observations sur Emile in 1763 and Des Préjugés in 1764. In 1765 he became an avocat at the parlement of Aix, and soon obtained so great a reputation that he was instructed by Choiseul in 1770 to draw up the decree authorizing the marriage of Protestants. From 1778 to 1781 he was one of the four assessors or administrators of Provence, and in 1783 he brought about the countess of Mirabeau's separation from her husband in spite of the impassioned pleading of the great Mirabeau himself. In 1788 he protested on behalf of the avocats of Aix against Loménie de Brienne's May edicts, but in the following year, probably owing to Mirabeau's influence, he was not elected to the States-General. He entirely disapproved of the great changes brought about by the Constituent Assembly ; and, after refusing to be one of the royal com- mission for splitting up Provence into departments, he retired, first to his country house and then to Lyons, and took no further part in politics. In November 1793, after the republic had been proclaimed, he came to Paris, and was thrown into prison, being the brother-in-law of Siméon, who was the leader of the federalists in Provence. He was soon removed through the*~~

~~influence of Barere to a maison de santé, where he remained undisturbed till the fall of Robespierre. On being released he practised as a lawyer in Paris; and in 1795 he was elected by the capital to the Council of Ancients, at once becoming a leader of the moderate party opposed to the directory. His reports, however, were chiefly on questions of law reform, and he commenced the labours which have made his name famous. As a leader of the moderates he was proscribed at the coup d'étét of Fructidor, but, unlike Pichegru and Barbé-Marbois, he managed to escape to Switzerland, and did not return till Bonaparte became First Consul. Bonaperte knew his value, and made him a conseiller d'état in 1800, and then charged him, with Tronchet, Bigot de Préameneu, and Jacques de Maleville, to draw up the Code Civil. Of this commission he was the most industrious member, and many of the most im- portant titles, notably those on marriage and heirship, are his work. In 1801 he was placed in charge of the depart- ment of cultes, or public worship, and in that capacity had the chief share in drawing up the provisions of the Con- cordat. In 1803 he became a member of the Institute, in 1804 minister of public worship, and in 1805 a knight grand cross of the Legion of Honour. He soon after be- came totally blind; and after undergoing an unsuccessful operation he died at Paris on 23d August 1807.~~

~~The work of Portalis appears in the Code Napoléon, but see also Frederick Portalis's Doewments, rapports, ct travaux inédits sur le Code Civil, 1844, and Sur le Concordat, 1845 ; for his life, see the biography in the edition of his @wwres by F. Portalis, 1823, and René Lavollée, Portalis, sa vie ct ses euvres, Paris, 1869.~~

~~PORT AU PRINCE (originally L'H6rrrat, and for brief periods Port Henri and Port Ripusricarn), the capital of the republic of Hayti (western portion of the island of Haymtt, g.v.), lies in 18° 34' N. lat. and 72° 20' W. long. at the apex of the vast triangular bay which strikes inland for about 100 miles between the two great peninsulas of the west coast, and has its upper recesses protected by the beautiful island of Gonaives (30 miles long by 2 broad). The city (an archbishopric since the~~

~~concordat of 1860) is admirably situated on ground that soon begins to rise rapidly towards the hills; and it was originally laid out by the French on a regular plan with streets of good width running north and south and inter-sected by others at right angles. Everything has been allowed to fall into disorder and disrepair, and to this its public buildings—a state-house, a national bank, a hos- pital, a lyceum, a custom-house, &c.—form no exception. The national palace remains as the flames of revolution left it in 1869, and the president lives in an ordinary house. The principal church is an "overgrown wooden shed." Every few years whole quarters of the town are burned down, but the people go on building the same slight wooden houses, with only here and there a more substantial warehouse in brick. The state of the streets is deplorable in the extreme ; and, in spite of the old French aqueduct, the water-supply is defective ; while the harbour is rapidly being filled by fetid deposits. From June to September the heat is excessive, reaching 95° to 99° in the shade. According to Ad. Ackerman, the average rainfall for the four years 1864-67 was 61°35 inches, distributed over an average of 152 days. The population, mostly Negroes and mulattoes, is estimated at 20,000. Port au Prince was first laid out by M. de la Cuza in 1749. In 1751 and again in 1770 it was destroyed by earthquakes.~~

~~See Edgar La Selve (professor in the Port au Prince lyceum), in Tour du Monde, 1879, and Spenser St John, Hayti, or the Black Liepublic, 1884.~~

~~PORT ELIZABETH, a seaport town of Cape Colony, at the head of an electoral division of the south-eastern pro- vince, lies in 33° 55' §. lat. on Algoa Bay, about 7 miles south of the mouth of the Zwartkop river. Built along the base and up the rocky slopes of the hills that rise for a height of 200 feet above the bay, it has rather.a bare appearance as seen from the water, but on landing the stranger finds himself in the midst of a prosperous Euro- pean town with substantial buildings and fine streets. A small and somewhat muddy stream, Baker's River, divides it into two parts, that to the east being mainly occupied by Malay fishermen. The whole length of the place is about 2 miles, and its breadth varies from a quarter to 1 mile. The main street runs up from the harbour, with its large wool and other warehouses, to the market-place, which is adorned with a handsome granite obelisk. Port Eliza- beth owes its prosperity to the fact that it has become~~

~~*the great emporium for the whole interior of the country to the south of the Zambesi, being the terminus of the Eastern and Midland Railways which run inland to Graaff Reinet, Cradock (182 miles, since 1880), and Grahamstown (since 1879). The two great hindrances to development have been want of drinking-water and want of protection and convenient landing-places in the harbour. The former has been fully met by an aqueduct (28 miles) from Van Staanden's River (1878; see J. G. Gamble's Report to Inst. Civ. Eng., 1883), and the harbour was improved in 1881 by extending the old landing-pier to a total length of 900 feet and constructing a similar pier 800 feet long. The value of the imports has increased from £376,638 in 1855 to £4,001,658 in 1881 and £2,364,891 in 1883; that of the exports from £584,447 in 1855 to £2,583,737 in 1881 and £2,341,123 in 1883. The exports are mainly wool (£1,508,280 in 1881), ostrich feathers (£131,279), and Angora goat's hair (£257,596), as well as ivory, hides,*~~

~~*diamonds. The population, which was not much above 4000 in 1855, reached 13,049 in 1875. The town dates from 1820.*~~

~~*PORTER, Jane (1776-1850), a novelist whose life and reputation are closely linked with those of her sister Anna Marra Porrer (1780-1832) and her brother Sir Ropert Ker Porrer (1775-1842). Their father, an*~~

~~*officer in the English army, having died shortly after the birth in 1776 of the younger sister, the mother removed from Durham, their birthplace, to Edinburgh, where the inherited passion for the romance of war which gave character to the works of each appears to have been stimu- lated by their association with Flora Macdonald and the young Walter Scott. To develop the artistic ability dis- played by the brother, the family moved in 1790 to London, and the sisters subsequently resided at Thames Ditton and at Esher with their mother until her death in 1831. The ability of Anna Maria Porter was the first to manifest itself in the premature publication of her Artless Tales (1793-95), these being followed by a long series of works, of which the more noteworthy are Walsh Colwille (1797), Octama (1798), The Lake of Killarney (1804), A Sailor's L'riendship and a Soldier's Love (1805), The Hungarian Brothers (1807), Don Sebastian (1809), Ballads, Romances, and other Poems (1811), The Recluse of Norway (1814), The Knight of St John*~~

~~*(1817), The Fast of St Magdalen (1818), The Village of Mariendorpt (1821), Roche Blanche (1822), Honor O' Hara (1826), and Barony (1830). Jane Porter, whose intellectual power, though slower in deve- lopment and in expression, was of a stronger nature than that of her sister, had in the meantime gained an immediate and wide popularity by her first work, Thaddeus of Warsaw (1803), which was translated into several languages and procured her election as canoness of the Teutonic order of St Joachim. Seven years later her Scottish Chiefs anti- cipated in some measure the works of Sir Walter Scott in the field of national romance, though it is wanting in the higher qualities of the historic novel. Her chief subse- quent works were The Pastor's Fireside (1815), Duke Christian of Lüneburg (1824), Coming Out (1828), and The ied of Forty Footsteps (1828). In conjunction with her sister she published in 1826 the Zales round a Winter Hearth, and the intervals between her larger works were filled up with frequent contributions to current periodical literature. Str Edward Seaward's Diary (1831)—a work displaying considerable skill in the realistic reproduction of the style and mode of thought of an earlier period — has been persistently, though erroneously, attributed to her. The claim of her eldest brother, Dr William Ogilvie Porter, to its authorship has been fully established, her share in its publication having been solely that of editor. In 1832 Anna Maria died, and for the next ten years Jane became "'a wanderer" amongst her relations and friends. While his sisters had been winning esteem in literature, Robert Ker Porter had in his own way been scarcely less successful. After two years of study at the Royal Academy he had gained reputation as a painter of altar-pieces and battle-scenes of imposing magnitude. He went to Russia as historical painter to the emperor in 1804, accompanied Sir John Moore's expedition in 1808, married the princess Mary de Sherbatoff in 1811, was created knight commander of the order of Hanover in 1832, and became British consul at Venezuela. Accounts of his wanderings are to be found in his Travelling Sketches in Russia and Sweden (1808), Letters from Portugal and Spain (1809), Narrative of the late Campaign in Russia (1813), and Z'ravels in Georgia, Persia, Armenia, Ancient Babylonia, &c., during the years 1817-20 (1821-22). After leaving Venezuela he again visited St Petersburg, but died there suddenly on 4th May 1842. Jane Porter, who had joined him in Russia, then returned to England and took up her residence with her eldest brother at Bristol, where she died, 24th May 1850, PORT GLASGOW, a seaport,*~~

~~*market-town, burgh of barony, and parliamentary burgh of Renfrewshire, Scot- land, is situated on the south side of the Clyde, 24 miles east of Greenock and 20 west of Glasgow. The elevated ridges to the back of the town are clothed with trees,*~~

~~*their lower slopes being occupied with villas. The streets are wide, regular, and well-paved. The principal buildings are the court-house in the Grecian style, the town-hall, and the custom-house. On the adjoining slopes to the east are the picturesque ruins of Newark Castle, the ancient seat of the Maxwells. There are large and commodious harbours, a wet dock, and a graving dock. The port carries on an extensive trade with British North America, the United States, the Indies, and the Levant, the principal exports being iron, steel, machinery, and textile manufactures. The trade, though checked for a time by the rapid progress of Greenock, has been for some years on the increase. The shipbuilding-yards give employment to a large number of persons both in the town and the neighbouring burgh of Greenock. Connected with the shipbuilding industry there are manufactures of sail-cloth, ropes, anchors, and chain cables, also engineering and riveting works, and iron and brass foundries. The population of the police burgh in 1851 was 6986, which in 1871 had increased to 10,823, and in 1881 to 13,224. The population of the parlia- mentary burgh in 1881 was 10,802.*~~

~~*Originally the district formed part of the adjoining parish of Kilmalcolm, the nucleus of the town being the small village of Newark attached to the barony of that name. In 1688 it was purchased from Sir Patrick Maxwell of Newark by the magistrates of Glasgow, to provide a convenient harbour for vessels belonging to the city. In 1695 it was disjoined from Kilmalcolm and erected into a separate parish under the name of New Port Glasgow, after- wards Port Glasgow. In 1710 it was made the chief custom-house port for the Clyde, but is now under the control of the Greenock office; and in 1775 it was created a burgh of barony. Under the Municipal Act of 1883 the town is governed by a provost, two bailies, and six councillors. Since the first Reform Act it has been included in the Kilmarnock parliamentary district of burghs.*~~

~~*PORT HOPE, a town and port of entry of Canada, in Durham county, Ontario, on the north shore of Lake Ontario, lies 63 miles north-east of Toronto by the Grand Trunk Railway (which is there met by the midland branch of the Grand Trunk Railway), and is connected with Charlotte, the port of Rochester, New York, by a daily steamboat service. The town is picturesquely situated on the side and at the foot of hills overlooking the lake ; and Smith's Creek, by which it is traversed, supplies abundant water-power. Flour, plaster, woollen goods, leather, beer, carriages, agricultural implements, and steam-engines and boilers are among the objects of the local industries, and trade is carried on in lumber, grain, and flour. The value of the exports was $1,326,706 in the year ending 30th June 1884, and that of the imports $221,830. The popu- lation in 1881 was 5585.*~~

~~*PORT HURON, a city and port of entry of the United States, county seat of St Clair county, Michigan, lies 58 miles by rail north-east of Detroit, at the southern extremity of Lake Huron and on the west bank of the St Clair river, which is there joined by the Black river. Port Huron is a point of great importance in the railway system, being the terminus of the Chicago and Grand Trunk and the Port Huron and North-Western Railways (lines to East Saginaw, Sand Beach, Almont, and Port Austin), and connected by ferry to Sarnia with the Great Western of Canada and the Grand Trunk Railways. It is also the terminus and a stopping-place of several lines of lake steamers. It has a large lumber trade, ship-yards, dry docks, saw-mills, flour-mills, planing-mills. The population was 5973 in 1870, 8883 in 1880, and 10,396 in 1884. Commenced in 1819, Port Huron was incorporated as a village in 1835, and as a city in 1857.*~~

~~*PORTICT, a town of Italy, 5 miles south of Naples, on the shores of the bay and at the foot of Vesuvius, a little to the north of the site of Herculaneum. It is traversed by the high road and the railway from Naples (only 5 miles distant) to Salerno. The palace, erected in 1737,*~~

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~~*POR*~~

~~*once contained the Herculanean antiquities, now removed to Naples, and since 1882 it has been a school of agriculture. There is a small harbour. The*~~

~~*population (9963 in the town in 1881, and 12,709 in the commune, which includes Addolorata) is partly engaged in the fisheries, silk-growing, and silk-weaving.*~~

~~*PORT JERVIS, a large village of the United States, in Deerpark township, Orange county, New York, situated at the intersection of the boundaries of New Jersey, New York, and Pennsylvania, at the junction of the Neversink with the Delaware. It is the terminus of the eastern divi- sion of the New York, Lake Erie, and Western Railroad, and of the Port Jervis and Monticello Railroad, and it has extensive repair-shops. The beauty of the surrounding scenery attracts summer visitors. Port Jervis was named after John B. Jervis, engineer of the Delaware and Hudson Canal, which connects the Pennsylvanian coal-fields with the tidal waters of the Hudson. In 1875 the Erie Railway bridge, the Barrett bridge, and many buildings were carried away by an icegorge. The population of the village was*~~

~~*"6377 in 1870, and 8678 in 1880 (township 11,420).*~~

~~*PORTLAND, a city and port of entry of the United States, capital of Cumberland county, Maine, lies on Casco Bay, in 43° 39' N. lat. and 70° 13' W. long. By rail it is 108 miles north-north-east of Boston and 297 south- east of Montreal. The pen- insula on which it is mainly built runs out for about 3 miles, has a breadth of about # mile, and rises in the west to 175 feet in Bramhall's Hill and in the eastto 161 in Mun- joy's Hill, which is crowned by an observatory. As seen from the harbour, the whole city has a pleasant and pic- turesque appearance, and the streets are In many parts so j "__-: ——— umbrageous with trees that Fria. 1.—Environs of Portland. Portland has obtained the sobriquet of the " Forest City." A large number of the houses are built of brick. Congress street, the principal thoroughfare, runs along the whole ridge of the peninsula, from the western promenade, which looks down over the suburbs from Bramhall's Hill to the eastern promenade, which commands the bay; it passes Lincoln Park (24 acres) and the eastern cemetery, which contains the graves of Commodore Preble and Captains Burroughs and Blythe, of Revolutionary fame. On Bram- hall's Hill is the reservoir (12,000,000 gallons) of the water company, which was established in 1867 to supply the city from Lake Sebago, whose beautiful expanse (14 miles long by 11 wide) was the favourite haunt of*~~

~~*Nathaniel Hawthorne's boyhood. The more conspicuous buildings of Portland are the city hall (1859), with a front in olive- coloured freestone, 150 feet long; the post-office (1872), constructed of Vermont white marble in the medieval Italian style; the custom-house (1872), in granite, with rich marble ornamentation in the interior; the marine hospital (1855), a large brick erection ; the Maine general hospital, 1868 ; the Roman Catholic cathedral ; the Roman Catholic episcopal palace ; and several fine churches. The Portland Society of Natural History, established in 1843 and incorporated in 1850, though it has twice lost its property by fire (1854 and 1866), has again acquired very valuable collections. The Portland institute and public library, dating from 1867, had 30,000 volumes in 1884. A medical school was founded in 1858. Portland is in the main a commercial city, with an extensive transit trade, drawing largely from Canada and the Far West. Connected with Boston by rail in 1842, and with Montreal*~~

~~*in 1853, it has now become a terminus of six different railroads ; and, since the gauge of the Grand Trunk Rail- road was altered, it can import direct from San Francisco. As the harbour (which lies along the south side of the city) is seldom closed by ice, it has been long used as the winter port for the great ocean steamers between Great Britain (Liverpool and Glasgow) and Canada, which in summer ascend the St Lawrence to Montreal and Quebec. At low water vessels drawing 22 feet and at high water vessels drawing 30 feet can come up to the wharves with*~~

~~*Fra, 2.—Plan of Portland, Me.—*~~

~~*safety in any season ; and there is secure anchorage within a mile of the shore. The dry dock is one of the deepest in the United States. The following figures show the extent of the foreign trade :—*~~

~~*Imports. Exports. Average 1876-80 $9, 368,044 $11,044,389*~~

~~*1881 11,078,612 12,476,389 1882 11,748,183 950,787 1883 10,235,991 138, 847,574*~~

~~Among the staple imports are wood, coal, potatoes (from Europe), salt, sugar and molasses, fish, earthenware, and textile manufactures; and among the staple exports to foreign countries fresh and preserved provisions of all kinds, grain, hay, cattle, wood, copper ore, tallow, shoes, potash, cotton, lumber (mainly to South America), and ice. In 1870 the total receipts of grain amounted to 1,516,875 bushels, in 1875 to 2,152,829, in 1878 to 4,492,952, and in 1883 to 4,964,158 bushels, or, adding flour, 7,543,873 bushels. The number of entrances from foreign ports in 1883 was 338 (164,711 tons), clearances for foreign ports 501 (226,420 tons); entrances in the coasting trade 479 (403,166 tons), and clearances 389 (394,500 tons). In the same year the Portland-owned vessels numbered 368 (105,642 tons); and 116 were em- ployed in the mackerel and cod fisheries. Fish-curing (cod, mackerel, and sardines), preserving meat, Indian corn, and other kinds of provisions, boot and shoe making, furniture-making, carriage-building, machinery-making, engine-building, and sugar-refining are all prosecuted on a considerable scale for the size of the town; and a large number of minor industries are also represented. In 1884 there were six national banks, with an aggregate capital of $3,250,000, and two savings banks, with deposits of $8,966,879. In 1880 the capital invested in manufactur-~~

~~ing was $4,659,375, the value of the annual production $9,569,523, and the amount of wages paid $1,547,375. Portland is divided into seven wards, and is governed by a mayor, a board of aldermen, and a common council. It is the seat of the sessions of the United States courts for the district of Maine. The assessed value of property was $30,723,936 in 1874, and $33,030,020 in 1883. The population was 3704 in 1800, 20,815 in 1850, 31,413 in 1870, and 33,810 in 1880. If the adjoining villages be included, the total is raised to between 45,000 and 50,000.~~

~~The name of Portland as applied to this city dates only from 1786; the Indians knew the place as Machigonne. The first European settlers (1632) called it Casco Neck, and after it passed to Massachusetts in 1658 it was denominated Falmouth. During the rest of the 17th century and the early years of the 18th hos- tilities on the part of the French and the Indians~~

~~*prevented the growth of the town, which by 1764, however, had increased to about 2000 inhabitants. In 1775 it was bombarded by four British vessels under Captain Mowatt, but it was rebuilt in 1783, and formally incorporated in 1786. A city charter was obtained in 1832. The great fire of 1866 swept over a third of the city and caused a loss of from $6,000,000 to $10,000,000. Portland is the birthplace of Henry W. Longfellow, N. P. Willis, Sara P. Parton ("Fanny Fern"), Erastus and James Brooks, Commodore Preble, John Neal, and Neal Dow.*~~

~~*PORTLAND, the largest city of Oregon, in the United States, the capital of Multnomah county and the seat of the United States courts for Oregon, is situated at the head of ship navigation (river craft ascend 126 miles farther) on the west bank of the Willamette, 12 miles above its junction with the Columbia river and about 120 from the ocean. It is a well-built and rapidly-growing city, laid out on a piece of level ground gradually rising from the river bank, and enclosed on the west by a semi- circle of fir-clad hills. Except in the business parts, the streets, which are remarkably well kept, are planted with maple trees ; and a park about 200 feet broad runs through nearly the whole length of the city from north to south. Besides the schools, several of which are especially note- worthy, the public buildings comprise a county court- house, a United States custom-house and post-office, three public halls, three theatres, and spacious markets. In 1883 no less than $4,039,100 were expended on building enterprises, $2,000,000 of this sum being for business and manufacturing establishments. Portland is the natural centre of the rapidly developing railway system of Oregon and the neighbouring Territories (see OREGON, vol. xvii. p. 824). It is the terminus of the Oregon Railway and Navigation Company's system, which forms the connecting link with tide water of the Northern Pacific and Union Pacific Railroads, thus making Portland virtually the Pacific coast terminus of these two transcontinental lines. Vessels drawing from 19 to 21 feet of water can load at its wharves, and, though it is still dependent on San Francisco for a large proportion of its foreign supplies, it trades directly with Great Britain, China, the Sandwich Islands, the South-American republics, &c. Wheat, flour, tinned salmon, and lumber are the principal articles of export. In 1883 the value of the exports amounted to $10,984,963 and that of the imports to $27,668,787. The manufacturing establishments—foundries, saw-mills, breweries, soap-works, boot and shoe factories, &c.—had in*~~

~~1883 an aggregate production valued at $11,423,000, or an increase on the production in 1880 of $8,521,000. The valuation of property for the purposes of taxation was $9,622,750 in 1877 and $19,397,750 in 1883. The popu- lation, which was only 2874 in 1860 and 8293 in 1870, had increased by 1880 to 17,577, or, including the suburban city of East Portland, 20,511; and it is estimated that the present (1884) total is about 40,000. A separate district is inhabited by the Chinese, who number several hundreds.~~

~~Portland was laid out in 1845, and became a city in 1851. In December 1872 it was visited by a destructive fire, and it had hardly~~

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~~recovered when, on 2d August 1873, a more disastrous conflagration destroyed about twenty blocks in one of the most crowded parts of the city, and caused a total loss of $1,345,400.~~

~~PORTLAND, Istx oF, a small island or peninsula of England, in the English Channel, 44 miles south of Weymouth, Dorsetshire, connected with the mainland by a long narrow ridge of shingle called the Chesil Bank. There is communication with Weymouth both by rail and steamer. The island is 4} miles long by 1} broad, the area being 2890 acres. The coast-line is wild and precipitous, and Portland is inaccessible from the sea on all sides except the south. The highest elevation is 490 feet. Numerous caverns have been excavated by the action of the waves, and off Portland Bill, the southern extremity of the island, is a bank called the Shambles, between which and the land there flows a dangerous current called the Race of Port- land. The substratum of the island is Kimmeridge clay, above which rest beds of sands and strata of Oolitic lime- stone, widely famed as a building stone. The extensive quarries have supplied the materials for St Paul's Cathedral and many other important public buildings in London and elsewhere, about 70,000 tons of stone being now exported annually. In the "dirt-bed" resting upon the Oolitic strata. numerous specimens of petrified wood are found, some of them of great size. The soil, though shallow, is fertile, and mutton fed on the grass has a peculiarly rich flavour. Agriculture, fishing, and especially quarrying give employment to the~~

~~*inhabitants, who are tall and handsome, and retain some singular customs, among which may be mentioned that of conveying land by "church gift" (see Reau Estate). By the construction of a break- water 24 miles in length, the building of which occupied twenty-three years, from 1849 to 1872, a harbour of refuge 2100 acres in extent has been formed, affording a safe and convenient anchorage for a very large fleet of vessels. It is defended by two forts of great strength, mounted with heavy ordnance. A convict prison, erected on Portland in 1848, has cells for 1500 prisoners.*~~

~~*Portland Castle, built by Henry VIII. in 1520, is generally occu- pied by the commander of the engineers or of the regiment stationed on theisland. On the east side of the island are the remains of a more ancient fortress, ascribed to William Rufus. The Isle of Portland is not mentioned in the time of the Romans. In 837 it was the scene of an action against the Danes, and in 1052 it was plundered by Earl Godwine. In 1643 the Parliamentary party made them- selves masters of the island and castle, but shortly afterwards these were regained by the Royalists through a clever stratagem, and not recovered again by the forces of the Parliament till 1646. The island is under the government of a local board of health. The population in 1871 was 9907, and in 1881 it was 10,061,*~~

~~*including 550 on board vessels, 861 in Verne Citadel barracks, and 1620 in the convict prison.*~~

~~*PORTLAND, Winiiam BENTINCK, FIRST Ear oF (d. 1709), was descended from an ancient and noble family of Guelderland, and became page of honour to William, prince of Orange, from which he was advanced to be gentleman of the bedchamber. In this capacity he accompanied the prince to England in 1670, and along with him was created doctor of civil law by the university of Oxford. Afterwards he became a colonel in a Dutch regiment of guards. When the prince of Orange was attacked with smallpox he, in accordance with a suggestion of the physicians, volunteered to lie in bed with him, that the heat of his body might check and expel the disease. This remarkable act of self-sacrifice secured him throughout life the special friendship of the prince, and by his prudence and ability, no less than by his devotedness, he fully justi- fied the confidence that was placed in him. In 1677 he was sent by the prince to England to solicit the hand of the princess*~~

~~*Mary, eldest daughter of James, then duke of York. At the Revolution he was the chief medium of communication between the prince and the English nobility, and in the delicate negotiations his practical shrewdness*~~

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~~*greatly facilitated the arrival at a proper understanding. After superintending the arrangements in connexion with the prince's expedition, he accompanied him to England, and was made groom of the stole, privy purse, first gentle- man of the royal bedchamber, and first commissioner on the list of privy councillors. On 9th April 1689 he was created Baron Cirencester, Viscount Woodstock, and earl of Portland. With the rank of lieutenant-general he dis- tinguished himself in command of the Dutch cavalry at the battle of the Boyne in 1690, and he was also present at the battle of Landen in 1693, and at the siege of Namur in 1695. Along with marshal de Bouflers he prepared the terms of the peace of Ryswick in 1697, and shortly afterwards was appointed ambassador-extraordinary to Paris. Notwithstanding his diplomatic skill, his grave and cold manner rendered him unpopular with the English nobility, and his brusque honesty caused him to be sometimes wanting in outward respect to the king. Gradually his influence at the court was supplanted by that of the earl of Albemarle, who was more skilled in the arts of popularity ; and in 1700, notwithstanding the efforts of the king to soothe his wounded vanity, he resigned his offices and retired to his seat at Bulstrode, Bucks, where he occupied his leisure in gardening and in works of charity. For receiving grants of land in Ireland, and for his share in the partition treaty, he was impeached by parliament, but the prosecution did not succeed. He died 23d November 1709, and was buried in Westminster Abbey. PORTLAND, Witi14m Henry CAVENDISH BENTINCK, THIRD DUKE oF (1738-1809), prime minister of England, was the grandson of Henry, second earl and first duke of Portland, who was son of William, first earl. He was born 14th April 1738, and was educated at Oxford university, where he graduated M.A. in 1757. In 1761 he was elected to represent the borough of Weobly (Hereford) in parliament, but in May of the following year he was called to the Upper House on the death of his father. Under the marquis of Rockingham he was, from July 1765 to July*~~

~~*1766, lord chamberlain, and on the return of the marquis of Rockingham to power in 1782 he was made lord-lieutenant of Ireland. After the short ministry of Shelburne, succeeding the death of Rockingham, the duke of Portland was selected by Fox and PORTLAND CEMENT. See Buixprne, vol. iv. p. 459, and CEMENTS, vol. v. p. 328. PORTLAND VASE. See Grass, vol. x. p. 649. PORT LOUIS. See Mauritius, vol. xv. p. 640. PORT LYTTELTON, a municipal borough of New Zealand, formerly called Port Cooper and Port Victoria, lies on the north-west side of Banks Peninsula, on the east coast of South Island. The town, situated in 43° 36'S. lat. and 172° 44' E. long., stands on the north shore of a small bay 4 miles south-west from the heads. A fixed*~~

~~*white light, visible 30 miles in clear weather, is placed on Godley Head on the north-west side of the entrance to the bay. Harbour works, costing over £300,000, have made Port Lyttelton a first-rate commercial port. Protecting breakwaters have created a fine, accessible wet dock of about 110 acres in extent and contiguous to the town; there is ample wharf accommodation for large vessels and every appliance for loading, discharging, and storing cargo. A graving-dock, closed by a caisson, is 450 feet long, 82 feet broad between the copings and 46 feet on the floor, and has a depth of 23 feet of water on the sill. The shipping, excluding coasters, entered inwards at Port Lyttelton during 1883 amounted to 124 vessels of 83,117 tons, and 140 of 120,328 tons cleared outwards. Imports have increased in value from £629,457 during 1872 to £1,400,106 during 1883, and exports from £829,260 to £1,944,035. Port Lyttelton is surrounded by steep hills, and is connected by rail with Christchurch, 7 miles inland. There is steam communication twice a week with the chief ports of New Zealand, and weekly with Melbourne. The population in the census of 1881 was 4127. The town, which is supplied with water and gas, and with electric light lamps on the wharves and the railway bridge, has post and telegraph offices, a time observatory, a jail for long-service prisoners, a state school, a sailors' home, and an orphanage.*~~

~~*PORT MAHON, or Manon, a city and seaport in the Mediterranean, on the east coast of the Spanish island of Minorca (see BaLEaric IsLanps), lies on*~~

~~*a height near the head of an inlet of the sea 34 miles long by from 400 to 1200 yards wide, which, though of less importance than formerly, is still an admirable harbour of refuge. The city presents a fine appearance from the sea, and is solidly built of excellent stone, but contains few features of in- terest. Many of the houses bear the stamp of the English occupation, which has also left curious traces in the life of the people. Shoemaking is the principal trade, and shoes and the building stone already mentioned are the only important exports. The population was 21,976 in 1860, and 15,842 in 1877. At Cala Figuera (a cove to the south- east of the town) is a cotton-factory ; the King's Island (I. del Rey, so called as the landing-place of Alphonso III. of Aragon in 1287) contains a hospital built by the admiral of the English squadron in 1722; farther south- east on the shore lies the village of Villa Carlos or George Town (1746 inhabitants in 1877), with ruins of extensive English barracks; and at the mouth of the port, on the same side, are the remains of Fort San Felipe, which was originally erected by Charles V. and twice became the scene of the capitulation of British troops. Opposite San Felipe is the easily-defended peninsula of La Mola (256 feet high), which is occupied by extensive Spanish fortifi- cations now in course of completion. Mahon is one of the principal quarantine stations of Spain; the hospital, erected between 1798 and 1803, stands on a long tongue of land, separated from La Mola by Cala Taulera..*~~

~~*Mahon is the ancient Portus Magonis, which under the Romans was a municipium (Mun. Flaviwm Magontanwm), probably includ- ing under its authority the whole island. As the name suggests, 1t had previously been a Carthaginian settlement. The Moors had for some time been in possession when they were expelled by Don Jayme of Aragon in 1232. Barbarossa of Algiers besieged and cap- tured the city in 1535; and in 1558 it was sacked by a corsair called Piali. The English, who under James Stanhope, afterwards Earl Stanhope, seized the island in 1708, made Mahon a flourishing city, and in 1718 declared it a free port. In the year 1756 it fell into the hands of the French, through the failure of the unfortunate Admiral Byng to relieve the garrison of St Philip's (San Felipe). Restored to the English in 1762, it was in 1782 heroically but un- successfully defended by General Murray. In 1802 it was finally ceded to Spain by the treaty of Amiens. ;*~~

~~*PORTO ALEGRE, a city and seaport of Brazil, the capital of the province of Rio Grande do Sul, lies in 30° 2*~~

~~*OdL S. lat. and 51° 12' W. long, at the northern extremity of the Lagéa dos Patos (Duck Lagoon), where it receives the waters of the Jacuhi, Sino, Cahi, and Gravatahi, whose confluence opposite the city is sometimes distinguished by the name of Lagéa Viamao. Like the other towns on this lagoon, Rio Grande do Sul and Pelotas, Porto Alegre is the seat of a very considerable trade, but it is impossible to say precisely what share belongs to each of the three. (See Rio GRANDE Do Suz.) Its harbour is accessible to vessels drawing 10 to 12 feet; it is the terminus of a rail- way running by Sao Leopoldo to Neuhamburg; and it serves as a centre for the various German colonies in the province. A cathedral, a seminary, a lyceum, a provincial library, government offices, a theatre, a large hospital, and a market-house are among the public buildings. The population is about 25,000.*~~

~~*Porto Alegre was founded in 1743 by immigrants from the Azores, and was at first known as Porto dos Cazaes. In 1770 it was chosen by José Marcellino de Figuereido as his residence and obtained its present name. 'Three years later it had 5000 inhabitants. The title of "town" with the full name Sio José de Porto Alegre was bestowed in 1808, and in 1812 Sao José became the governor's residence for the comarca, which till 1821 comprised both Rio Grande do Sul and Santa Catharina. In 1822 it was raised to the rank of a city, and in 1841, as a reward for its loyalty, was distinguished with the epithets "eal y valorosa."*~~

~~*PORTO BELLO (Span., Puerto Bello), a town in the republic of Colombia and state of Panama, situated on the coast of the Caribbean Sea, about 23 miles east of Colon in 9° 32'N. lat. and 78° 38' W. long. As the name (bestowed by Columbus in 1502) implies, it possesses a fine natural harbour, the bay between Drake's Point in the north and Buenaventura Island in the south being easy of entrance and having a depth of 8 to 16 fathoms, Founded in 1584, the city rapidly grew in importance, becoming the great depét for the gold and silver from Peru, which were brought across the isthmus from Panama, and here conveyed on board the royal galleons. It is now best remembered through the unexpected success which*~~

~~*attended Admiral Vernon's attack in 1739. 'Within forty-eight hours after his appearance in the harbour," he was in possession of the place, and before he left he utterly destroyed the fortifica- tions. At that time the city contained about 10,000 inhabitants ; it now barely numbers 1000, including the Negroes, who live in the quarter known as Guinea. A few public buildings, such as the principal church and the treasury, remain as indications of former prosperity. The decline is due much less to Admiral Vernon than to the extreme unhealthiness of the situation, and the fact that trade has taken to quite other channels.*~~

~~*PORTOBELLO, a municipal burgh of Scotland, in the county of Midlothian, lies on slightly sloping ground on the south shore of the Firth of Forth, 3 miles by rail east of Edinburgh. At the west end are extensive brickfields, two potteries (working English clay), two bottle-works, and a paper-mill. Southwards and eastwards the houses are those of a residential suburb of Edinburgh and a summer watering-place. Among the more conspicuous edifices are the new municipal buildings (1878), the old town-hall (1863), a United Presbyterian church (1880), the Free church (1876-77), the Episcopal. church (1826), and the School Board schools (1876). Portobello beach is a fine reach of firm clean sands, but these have been to some extent spoiled by the vicinity of manufacturing works and sewage outlets. A marine parade was constructed in 1860 and a promenade pier (1250 feet long) in 1871. The popula- tion was 5481 in 1871 and 6794 in 1881. What used to be the separate village of Joppa is now included in Portobello.*~~

~~*Portobello occupies part of a formerly desolate piece of ground known as the Figgate Whins. The first house was built by a sailor who had served under Admiral Vernon at the capture of Porto Bello*~~

~~*in Central America in 1739; but the real beginning of the town dates from the discovery in 1765 of a bed of clay and the consequent*~~

~~*erection of brick and tile works. Reform Act of 1832-33.*~~

~~*PORT OF SPAIN. See TRinrpap.*~~

~~*PORTO MAURIZIO, a city of Italy, chief town of a province and centre of a maritime district, lies on the coast of the Ligurian Sea, 46 miles by rail east of Nice and 70 miles west of Genoa, and consists of a picturesque old town situated on the heights and a modern town of villas on the lower slopes. The principal church, designed by Gaetano Cantone, is perhaps the most notable building of its class in the whole Riviera; the roof is divided into arches, domes, and semi-domes resting on massive piers. A few remains of the old city walls may still be seen. In 1881 the population of the city was 6309 and of the com- mune 6827. About 2 miles east of Porto Maurizio is the town of Oneglia, with a fine church, S. Giovanni Battista, designed by Gaetano Amoretti, a hospital (1785), and a national penitentiary on the cell-system. Its population in 1881 was 7286, that of the commune 7433. Both Porto Maurizio and Oneglia lie on the same bay, and schemes are under discussion for uniting their harbours into one great port. At Porto Maurizio an extension is. being made (1884) in the western mole. The foreign traffic of the two ports was represented in 1883 by 154 sailing vessels and 27 steamers entering or clearing (the steamers all prefer- ring Porto Maurizio), and the coasting trade by 627 vessels. Both towns are embowered amid olive groves, and the dis- trict is famous for the quality of its oil.*~~

~~*Porto Maurizio appears as Portus Mauricit in the Antonine Itinerary. After being subject to the marquises of Susa (11th century), of Savona (12th century), and of Clavesana, it was sold by Boniface of Clavesana in 1288 to Genoa for a yearly pension ; in 1354 it became the seat of the Genoese vicar of the western Riviera, and remained in the possession of the republic till it was merged in the kingdom of Sardinia. Oneglia, formerly situated inland at the place called Castelvecchio (Old Castle), has occupied its present site from about 935. The bishops of Albenga sold it in 1298 to the Dorias of Genoa, who in their turn disposed of it in 1576 to Emanuel Philibert. In the various wars of the house of Savoy Oneglia often changed hands. In 1614 and 1649 the Spaniards and in 1623 and 1672 the Genoese obtained possession ; in 1692 it had to repulse an attack by a French squadron ; in 1744-45 it was again occupied by the Spaniards, and in 1792 bombarded and burned by*~~

~~the French. Pellegrino Amoretti, assistant secretary to Charles V., and Andrea Doria, the famous admiral, were natives of Oneglia.~~

~~PORTO RICO (Span., Puerto Rico), one of the Spanish West India Islands, lies 70 miles east of Hayti between 17° 50' and 18° 30' N. lat. and 65° 35' and 67° 10' W. long. It forms an irregular parallelogram, 108 miles long and 37 broad, and has an area of 3530 square miles, or rather less than that of Jamaica. From east to west it is traversed by a range of hills so situated that the streams flowing northward are much longer than those flowing~~

~~It was made a burgh by the~~

~~Porto Rico.~~

~~south. The highest district, however, and the highest peak—E]l Yunque (3600 feet)—are situated in the Sierra de Loquillo near the north-east corner. As the hills inter- cept the north-east trade-winds with their rain-clouds there 1s sometimes almost a superabundance of moisture in the northern lowlands, while in the south severe droughts occur and the land demands artificial irrigation, as yet carried~~

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~~out with too little co-operation and system. The island is, however, exceptionally well watered, 1300 streams being enumerated, of which forty-seven are considerable rivers ; and its general appearance is very beautiful. Forests still cover all the higher parts of the hills, and differ from those of the other West Indian Islands mainly in the comparative absence of epiphytes. Among the noteworthy trees Baron Eggers (see Nature, 6th December 1883) mentions the Coccoloba macrophylla, or " ortegon" of the natives, which forms extensive woods in some places, chiefly near the coast, and is conspicuous by its immense yard-long purple spikes ; a beautiful Zalawma, with white odorous flowers, and yielding a timber called "'sabino" ; an unknown tree with purple flowers like those of Sexvola Plumieri; a large Heliconva ; and several tree-ferns (Cyathea Serra and an Alsophila). Besides the two staples—sugar and coffee— tobacco, cotton, rice, maize, Caladium esculentum, yams, and plantains, as well as oranges,~~

~~cocoa-nuts, and other tropical fruits, are commonly cultivated. The rice, which is the principal food of the labourers, is a mountain variety grown without flooding. On the lowland pastures, covered mainly with Hymenachne striatum, large herds of excellent cattle are reared to supply butcher-meat for St Thomas, the French islands, &c. In general Porto Rico may be described as extremely fertile, and its exports more than double in value those of Jamaica. In 1883 the prin- cipal items were—sugar and molasses, 78,482 tons, valued at £1,036,595 ; coffee, 16,801 tons, at £955,948 ; honey, 30,378 tons, at £148,148; and tobacco, 1730 tons, at £114,614. Of the tobacco a large proportion is sent to Havana to be manufactured into cigars. The total value of exports and imports has increased from £2,219,870 in 1850 to £5,118,712 in 1883. The great want of the island is still roads and bridges, though the Government has done good work in this department in recent years; the journey across the hills can only be performed on~~

~~'horseback, and even along the coast-route wheeled traffic~~

~~is at times interrupted. Gold, iron, copper, coal, and salt are all found in Porto Rico, but the last alone is worked.~~

~~The island, which was declared a province of Spain in 1870, is divided into the following seven departments :—Bayamon, near the north-east end of the island (containing the capital, San Juan Bautista, and Toa-Alta, Toa-Baja, NaranjJito, Vega-Alta, &c.), Arecibo (Arecibo, Hatillo, Camuy, Quebradillas, &c.), Aguadilla (Aguadilla, Moca, Aguada Lares or San Sebastian), Mayaguez (Maya- guez, Afiaico, San German), Ponce (Ponce, Guayanilla, Pefiuclas, Coamo), Humacao (Humacao, Naguabo, Luquillo), Guayama (Hato- Grande, Gurabo, &c.). And the island of Viequez (with the town of Isabel Segunda) is attached as an eighth department, and used as a military penal station. The total population of Porto Rico was not more than 319,000 in 1830; by 1860 it reached 583,308 ; and by 1880 754,313. At this last date 429,473 (219,418 males and 210,055 females) were white and 324,840 (162,352 males and 162,488 females) coloured. There is still plenty of room for further expan- sion. Among the'people of European origin are Spaniards, Germans, Swedes, Danes, Russians, Frenchmen, Chuetas or descendants of Moorish Jews from Majorca, and natives of the~~

~~*Canary Islands. There are also a number of Chinese. The Gibaros or small land- holders and day-labourers of the country districts are a'curious old Spanish stock largely modified by Indian blood. Till 1856 it was believed that no trace of the original inhabitants of the island remained ; archeological collections, however, have since been made and are now preserved in the Smithsonian Institution, the Ethno- logical Museum in Berlin, and elsewhere. They comprise stone axes, spear-heads, and knives, stone and clay images, and fragments of earthenware. At Gurabo, on the banks of the Rio Grande de Loiza, there is a curious rude stone monument, on the upper surface of which appear several strange designs (see L. Krug, "Ind. Alterth. in Porto Rico," in Z. fiir Ethn., Berlin, 1876).*~~

~~*Principal Towns.—San Juan Bautista or St John's (24,000 inha- bitants in town and district), the capital, lies in 18° 29' N. and 66° 7' W. on the north coast, on a small island (Morro) connected with the mainland by bridges. It isa place of some strength and con- tains a governor's palace in the old fort of Santa Catalina, a palace erected by Ponce de Leon, a cathedral, a town-house, a theatre, &c. The harbour is one of the best in the West Indies, having a com- paratively unobstructed entrance, and along the wharves a depth*~~

~~*at low water of 10 to 13 feet, and at high water 114 to143. Ponce (38,000 inhabitants in town and district) lies about 3 miles inland from the south coast. Its public buildings are frequently of brick or stone, but the private houses are of wood. It contains a town- hall (situated, like the principal church, in the main square), a public hospital (1875), and an English Episcopal church, and it is lighted with gas by an English company. Mayaguez (27,000 inhabit- ants in town and district), on the west coast, is also situated several miles inland, and is separated from its port by a river. An iron bridge, however, was constructed about 1875-76. The town has military barracks, clubs, and gasworks. The harbour, accessible only to vessels drawing less than 16 feet, is silting up, as indeed is the case with almost all the harbours of Porto Rico. Other towns are Guayama on the south coast, with its harbour at Arroya, and San Carlos de Aguadilla on the*~~

~~*west coast. The seaports are St John's, Ponce, Mayaguez, Naguabo, Fajardo, Aguadilla, and Viequez.*~~

~~*History.—Porto Rico, the Borinquen of the aborigines, was dis- covered by Columbus in November 1493. In 1510 Ponce de Leon founded the town of Caparra, soon after abandoned, and now known as Puerto Viejo, and in 1511, with more success, the city of San Juan Bautista. The native inhabitants—probably not very numer- ous, though, with their usual exaggeration, old chroniclers rate them at 600,000—were soon subdued and swept away. In 1595 the capital was sacked by Drake, and in 1598 by the duke of Cumber- land. In 1615 Baldwin Heinrich, a Dutchman, lost his life in an attack on the Castello del Mono. The attempt of the English in 1678 was equally unsuccessful, and Abercromby in 1797 had to retire after a three days' siege. In 1820 a movement was made towards a declaration of independence on the part of the Porto Ricans, but Spanish supremacy was completely re-established by 1823. The last traces of slavery were abolished in 1873 by the abrogation of the system of forced labour.*~~

~~*See Antonio de Herrera, " Descripcion de la isla de Puerto Rico, 1582," in Boletin de la Soc. Geogr. de Madrid, 1876; Bello y Espinosa, " Geschichtl., geogr., und stat. Bemerk. itiber Puerto Rico," in Zeitschr. fiir Ethnologie, 1872; Inigo Abbad, Historia .. . de la Isla de S. J. B. de Puerto Rico, Madrid, 1788, re- published by José Julian Acosta of Porto Rico.*~~

~~*PORT ROYAL, a town and naval station of Jamaica, occupies the outer end of a narrow strip of land called the * Palisades," which, projecting westward for about 9 miles, forms the natural breakwater of the noble bay on which Kingston, the present capital of the island, is built. Asa town Port Royal (though in the 17th century it was re- puted the finest in the West Indies) is now a wretched place of 1205 inhabitants (1881), with narrow and ex- tremely dirty streets, and contains no buildings of note except a hospital (200 patients) and the spacious admiralty house, which is surrounded by beautiful gardens; but as a naval station it is still of very considerable importance, has well-equipped machine-shops, and is defended by a number of forts and batteries partly of quite modern erection.*~~

~~*The first great blow struck at the prosperity of Port Royal was the earthquake of 1692, which swallowed up whole streets and forts and sunk a*~~

~~*considerable part of the site into the sea, where remains of buildings are still visible under water in clear weather. In 1703 the whole town, except the royal forts and magazines, was reduced to ashes ; on 22d August 1722 most of the houses were swept into the sea by a hurricane; in 1815 another conflagration proved nearly as destructive as the first; and in 1880 another hurricane did grievous damage.*~~

~~*PORT ROYAL, a celebrated Cistercian abbey, occupied a low and marshy site in the thickly-wooded valley of the Yvette, at what is now known as Les Hameaux near Marly, about 8 miles to the south-west of Versailles. It was founded in 1204 by Mathilde de Garlande, wife of Matthieu de Montmorenci-Marli, during his absence on the fourth crusade, and in its early years it received a variety of papal privileges, including (1223) that of affording a retreat to lay persons who desired to withdraw from the world for a season without binding themselves by permanent vows. Apart from the famous reforms begun here in 1608 by Jacqueline Marie ARNAULD (g.v.), the Mére Angélique, the history of Port Royal presents little of general interest until about ten years after the establishment (1626) of the sister house in Paris, when the community fully came under the influence of Duvergier de Hauranne (see vol. vii. p. 567), abbé of St Cyran, the friend of Jansen, and leader NS Ribak ee ee ee*~~

~~*1 A detailed account of their manners, translated from Abbad by Mr Bidwell, will be found in the Consular Reports, 1880.*~~

~~*of the anti-Jesuit movement in France. The religious views of St Cyran spread rapidly in Port Royal de Paris, and among the members and connexions of the Arnauld family; and it was under his influence that in 1637 Antoine Le Maitre (1608-1658), a nephew of the Mére Angélique, resolved to abandon his brilliant prospects as an advocate and seek a life of ascetic retirement. He found a lodging for himself at Port Royal des Champs (as the mother house came to be called for distinction's sake), which since the departure of the nuns in 1626 had been untenanted. In the following year he was joined in his religious retreat by his younger brothers Simon de Séri- court (1611-1658), who had served in the army, and Louis Isaac (1613-1684), better known in the world of letters by his assumed*~~

~~*name of De Sacy. They were at various times joined by others until in 1646 the "solitaries of Port Royal," apart from merely occasional visitors, had risen to the number of twelve. From almost the beginning of his sojourn Le Maitre, carrying out the ideas of his imprisoned master St Cyran, devoted a considerable part of his time to teaching ; the number of pupils and also of teachers gradually increased until in 1646 and following years the "Petites Ecoles," as they were modestly called, around Port Royal les Champs and in Paris, although de- stined to be short-lived, attained a great and widespread success (compare vol. vii. p.675). Of the regular teaching staff probably the most distinguished were Claude Lance- lot (1615-1695)? and Pierre Nicoxz (q.v.); of the pupils it is enough to mention TILLEMONT (q.v.) and RACINE (¢.2.). In 1648 the Mére Angélique with some of the nuns re- turned from Paris to Port Royal des Champs, which in the interval had been considerably enlarged, while the neigh- bourhood had been rendered more salubrious by the labours of the solitaries, who now removed to the farmhouse of Les Granges on the height above. In the same year Antoine ARNAULD (q.v.), the apologist of the Augustinus, came into residence, and thenceforward the "gentlemen of Port Royal" became closely identified in the public mind with the Jansenist cause. The open struggle, which began with the publication in 1653 of the bull of Pope Innocent X. condemning the five propositions (see JANSENISM), came to a disastrous crisis in 1656, when Arnauld was expelled the Sorbonne, and he, as well as Sacy, Fontaine, and Nicole, had to go into hiding. The publication of the Provincial Letters in the course of the same year did not tend to soothe the Jesuits, but the timely " miracle of the Holy Thorn" (24th May 1656; see vol. xviii. p. 335) helped to postpone somewhat the evil days that were coming on the Port Royalists. But only for a time; for in 1661 the young and ardently orthodox Louis XIV. caused the Petites Ecoles to be broken up and the postulants and novices of the two religious houses to be dispersed. For continued contumacy both houses were in 1664 laid under interdict, which was only removed when the " peace of the church" was established by Clement IX. in 1669. In the same year, however, Port Royal de Paris was separated from the parent house with a grant of one-third of the revenues, and placed under Jesuit management. The nuns of the abbey of Port Royal des Champs were allowed to take in children as pupils, but not to receive any accessions to their own number, and the Petites Ecoles were not resumed. The "peace," such as it was, was again destroyed by the*~~

~~bull of Clement XI. in 1705, and in 1708, the nuns proving inflexible, a papal bull was granted for the final suppression of Port Royal des Champs and the transference of the whole property to Port Royal de Paris. The dispersion of the aged sisters took place in the following year; the~~

~~2 Author of Nouvelle Méthode pour apprendre la Langue Grecque (1655), Nouvelle Méthode pour apprendre la Langue Latine (1656), Grammaire générale et raisonnée (1660), and other educational works.~~

~~buildings were levelled with the ground in 1710; and in | 1711 the bodies (to the number, it is said, of nearly 3000) that lay buried within the desecrated precincts were disin- terred and removed to other places. Port Royal de Paris continued to subsist in obscurity until 1790.~~

~~See Sainte-Beuve, Port Royal (3 vols., 1842-48 ; 4th ed., 6 vols., 1878), an exhaustive work, by which all the earlier histories have been superseded.~~

~~PORT SAID, a town and seaport of Lower Egypt, which owes its existence to the Suez Canal (1859-69), and was named after Sa'id Pasha, patron of the enterprise. It lies on the west side of the canal, on the low narrow, treeless, and desolate strip of land which separates the Mediter- ranean from Lake Menzaleh (see plate XXXVI., vol. iv.) ; the supply of fresh water brought from the sweet-water canal at Ismailia by a conduit is barely sufficient for the wants of the town, which is regularly laid out and has some streets of substantial houses. The population rose from 12,332 in 1880 to 16,560 in 1882. Nearly half of this number reside in a miserable native suburb about 500 yards to the west of the town proper. The British subjects (405) are nearly all Maltese. Port Said, having no direct means of communication with the interior, is essentially a coaling station for steamers, and is entirely dependent on the canal trade. The steamers from Alex- andria to the Syrian ports call here, and there is a daily steamboat to Ismailia. The outer harbour is formed by the terminal piers of the canal, and the inner harbour comprises three sheltered basins,—the commercial dock, the arsenal dock, and the Sherif dock. The third is flanked by buildings originally erected by Prince Henry of the Netherlands asa depét for Dutch trade. Besides a Catholic and a Greek church, the town contains~~

~~a hospital and five schools, one of which is maintained by the Capuchin friars, and another by the freemasons.~~

~~PORT ST MARY. See PuErro pE Santa Marta.~~

~~PORTSMOUTH, a municipal and parliamentary bor- ough, seaport, and naval station of Hamp- . shire, England, consists of an aggregate of towns situated in the south-western corner of Portsea Island, opposite the Isle of Wight, 18 miles south by east of South- ampton and 74 south-west of London by the London and South-Western Railway. For the general position of Portsmouth, see y= plate VII. vol. xi. The original town is \~ not now nearly so populous as the suburbs \,. comprised in the general name of Portsea (including Portsea proper) on the north and west, Landport on the north, and Southsea on the east. Portsmouth proper is the barrack and garrison town; at Port- sea is situated the great naval dockyard ;~~

~~Ry \~~

~~\(emme Forton~~

~~4 = Fortan i St Rathea~~

~~Landport is occupied chiefly by the houses ie aa of artisans; and Southsea, as possessing i om facilities for bathing, is resided in by the | 3]) common~~

~~5~~

~~Portsmouth, which is now continuous with | [feria the Commercial Road from the Landport [@”“=——* side, forms a spacious and busy central thoroughfare 2 miles in length, with nu- merous fine buildings, including the new and old post-office, the new offices of the Bie Waterworks Company and Gas Company, |oyicer | “y the Central or Town Railway station, the |e”! “7 new Government House with its pleasure-~~

~~grounds, the quaint old building occu-~~

~~pied by the new free library, and the grammar- school, which was founded in 1732, though the new building was opened in 1879. Since the demolition~~

~~*of the ancient*~~

~~*wealthier classes. The old HIgh Street of (eS*~~

~~*PO R—*~~

~~*! — \ pBarracks a) PA DD Sy 3*~~

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~~=~~

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~~*ramparts and unwholesome moats a few years ago there have sprung up a handsome people's park and recreation grounds for the naval and military forces, and improve- ments are still being vigorously carried forward. Much of the Government work has been done by convict labour, notably at the north-east of Landport, where 1300 convicts have been engaged in the formation of a new island (Whale Tsland), on which gunnery experiments are carried out in connexion with the training-ships of the gunnery school. The towns constitute one of the strongest fortresses of the kingdom, being protected by a chain of detached forts, the outer line of which on the land side north of the harbour extends along the Portsdown Ridge, the inner line protect- ing the approach by Stokes Bay and Gosport on the west side, while eastwards are the HIlsea lines, within which are also the Royal Artillery and cavalry barracks of HIlsea and the powder-magazine of Tipner. On the south side the forts are built in the sea, each being provided with an Artesian well sunk into the seabed, from which a plentiful supply of fresh water can at all times be obtained. The coast to the eastward is lined by the forts of "Cumberland" and " Southsea Castle," which complete the circle. There are 8 barracks—5 in Portsmouth, 1 in Southsea, and 2 in Portsea—and at Eastney are the extensive buildings which constitute the headquarters of the Royal Marine Artillery; on the Gosport side of the harbour are those of the Ports- mouth division of the Royal Marines. In the church of St Thomas a Becket (12th cent.) the chancel and transepts form part of the original structure ; the nave and tower were erected in 1698. The garrison chapel near the grand parade, in the Early English style, formed*~~

~~*originally a portion of the hospital of St Nicholas (1212), and was restored in 1866. Among more recent buildings may be mentioned the new jail and county lunatic asylum, both situated on the outskirts. In the centre of the town and adjoining the people's park are the new cathedral and buildings of the Roman Catholic schools, the new Pres-*~~

~~*\ LEZ*~~

~~*Gosport.) 9 \ GOSPORT ®\) Sms*~~

~~*Scale of half a Mile*~~

~~*Plan of Portsmouth, England.*~~

~~*byterian church, the seamen and marines orphan schools, the offices of the board of guardians and the borough overseers. At Portsea a new railway station has been*~~

~~*POR—POR*~~

~~*built on piles driven into the harbour bed. Besides these, amongst other public buildings may be mentioned the town-hall, the county court, and the theatre. At Portsea is Aria College, opened in 1874 for the training of Jewish ministers. In the same town is situated the convict prison, which superseded the hulks in 1852. Landport has a freemasons' hall (1879-80), and a people's park of eight acres opened in 1878. Southsea, which is only of recent origin, possesses assembly-rooms and baths, a pier (1879), and a fine esplanade 2 miles in length. Southsea Castle, built by HIenry VIII., was taken by the Parlia- mentary forces in 1642 and partly dismantled, but it has now been refortified. The creek which formerly separated Portsmouth and Portsea was filled up in 1876.*~~

~~*The port of Portsmouth extends eastwards 9 miles to Emsworth, and westwards 5 miles to HIll HIead at the entrance to Southampton Water. About 3 miles to the south of the harbour is the well-known anchorage of Spit- head, protected by the Isle of Wight. The harbour, one of the best in the kingdom, stretches 4 miles inwards to the north-west of the town, with an entrance 220 yards in breadth, permitting access to vessels of the largest*~~

~~tonnage at low tide. There is an anchorage within the basin at low tide of 380 acres, and a portion of the harbour is per- manently occupied by dismantled vessels and the reserved fleet of the navy. There is a graving-dock built by the cor- poration, with 18 feet of water on the blocks, and a patent slip. Extending along the eastern shore are the ordnance gun wharf between Portsmouth and Portsea and to the north of it the great naval Government dockyard, which has lately been much enlarged (see Dockyarp, vol. vii. 313). At Gosport (¢.v.) are the royal Clarence victualling yard and the Haslar hospital. Portsmouth has a consider- able trade in coal, timber, fruits, and agricultural produce. In 1883 the total number of vessels that entered the port from British and foreign possessions and coastwise was 2094 of 210,210 tons burden, the number that cleared 2079 of 216,926 tons. The borough of Portsmouth is governed by a mayor, fourteen aldermen, and forty-two councillors. The area of the borough is 4320 acres, with a population in 1871 of 113,569, and in 1881 of 127,989. Of the latter number 120,022 were included in Portsea.~~

~~To the north of Portsmouth harbour is Porchester Castle, a ruined Norman fortress occupying the site of the Portus Magnus of the Romans. The Saxon Chronicle mentions the arrival of Port and his two sons on the coast in 501, but the derivation of the name Portsmouth is too evident to require a mythical invention to ex- plain it. Portsmouth, though a small town soon after the Norman invasion, did not possess a church till 1140. It received its first charter from Richard I. In the beginning of the 13th century it had grown to be a naval station of some importance, and for the accommodation of the king's galleys the docks were enclosed by a strong wall. A large portion of the town was burned by the French in 1372. Great additions were made to the fortifications by Edward IV., and the works were continued by later sovereigns, especially Elizabeth and James II. Its importance as a naval dockyard commences about 1544. The English fleet assembled at Portsmouth in 1545 before the naval engagement with the French off Spithead. In 1628 Villiers, duke of Buckingham, wheu on the oint of embarking at Portsmouth with the army for the relief of Dasolle was killed by Felton. The town was taken by the Par- liamentary forces in 1642. In 1662 the nuptials of Charles II. with Catherine of Braganza were celebrated at Portsmouth in the chapel of the garrison. In 1782 the "'~~

~~*Royal George," with Admiral Kem- penfeldt on board, having been careened to stop a leak, wert down in the harbour. About 1792 Portsea began to be built on the common to the north of the town. Among eminent persons con- nected with the town mention may be made of Charles Dickens, Jonas Hanway, Sir Isambard Brunel, Sir F. Malden.*~~

~~*Allen, History of Portsmouth, 1817 ; Saunders, Annals of Portsmouth, 1878.*~~

~~*PORTSMOUTH, a city and port of entry of the United States, one of the two shire-towns of Rockingham county, New Hampshire, and alternately with Concord the seat of the sessions of the United States courts for the district of New Hampshire, lies on a peninsula on the right bank*~~

~~*5395*~~

~~*of the Piscataqua, 3 miles from its mouth, in 43° 4' N. lat. and 70° 45' W. long. By rail it is 57 miles north- north-east of Boston. Quiet and old-fashioned beyond most of the New England cities, with shaded streets and many quaint antique houses, survivals from colonial times, Portsmouth is a favourite summer resort. Not- withstanding the excellence of its harbour—which is from 35 to 75 feet deep, safe, free from ice at all seasons, and capable of containing 2000 vessels—it has very little foreign trade. There are cotton-mills (Kearsarge), brew- eries, boot and shoe factories, and some other industrial establishments in the city; and shipbuilding, which is the principal industry, has long been extensively prose- cuted. The United States navy yard, though situated on Continental or Navy Island, on the north side of the river, in the township of Kittery (Maine), is generally known as Portsmouth yard. It contains a fine balance dry dock, 350 feet by 105. Among the more conspicuous buildings in Portsmouth are the old church of St John, the athen- zum (15,000 volumes), and the custom-house. There is a public library of 8000 volumes. At Little Harbour, 2 miles distant, is Governor Wentworth's mansion, dating from 1750. The entrance to the harbour is defended by earthworks at Jaffrey's Point and Gerrish's Island. The population was 9738 in 1850, 9211 in 1870, and 9690 in*~~

~~*1880.*~~

~~Settled in 1623 under the Laconia Company, Strawberry Bank (as it was first called) was named Portsmouth in 16538, and incor- porated as a city in 1849. It was the capital of the colony and State of New Hampshire till 1807, when that rank was bestowed on Concord. The "Ranger," afterwards commanded by Paul Jones, and the first ship to carry the stars and stripes, was built at Ports- mouth for the American Congress in 1777. The New Hampshire Gazette, started at Portsmouth in 1756, is the oldest of all the existing newspapers of the United States, and the Portsmouth Journal, established in 1793, is also still published. T. B. Aldrich, J. T. Fields, Eliza B. Lee, and B. P. Shillaber ("Mrs Partington"') are natives of the city.~~

~~PORTSMOUTH, a city of the United States, capital of Scioto county, Ohio, lies at the confluence of the Scioto with the Ohio, and is the southern terminus of the Ohio and Erie Canal, and of a branch line of the Cincinnati, Washington, and Baltimore Railroad (Hamden to Ports- mouth, 56 miles), as well as an important station on the Scioto Valley Railway. As the entrepdt for the rich mineral regions of southern Ohio and north-eastern Ken- tucky, and for the productive valley of the Scioto, Ports- mouth has a large and growing trade both by rail and river; and it also contains iron-furnaces, rolling-mills, foundries, saw-mills, planing-mills, breweries, flour- mills, shoe-factories, hub and spoke factories, &c. Among the public buildings are an opera-house and a masonic temple. The charitable institutions include a hospital, a children's home, and a home for destitute aged women. 'The city has also two libraries, water-works, and tramways. The population was 6268 in 1860, 10,592 in 1870, and 11,321 in 1880. Portsmouth was laid out in 1803, and the charter of the city dates from 1814.~~

~~PORTSMOUTH, a city of the United States, capital of Norfolk county, Virginia, lies on the west bank of Elizabeth river, opposite Norfolk. It is the eastern terminus of the Seaboard and Roanoke Railroad (part of a great passenger route between Boston and New Orleans), has one of the best harbours on the Atlantic coast, is the seat of the United States Gosport navy yard (with a dry dock built of granite at a cost of $974,536, and a large naval hospital), and exports cotton, lumber, pig-iron, and early vegetables. The population was 9496 in 1860, 11,390 in 1880, and 14,870 in 1884, Portsmouth was founded in 1752. On 20th April 1861 the navy yard—then~~

~~*employ- ing 1000 men—was destroyed by fire, the loss being esti- mated at several million dollars.*~~

~~*Bound- aries.*~~

~~*Coasts.*~~

~~*Capes.*~~

~~*Islands.*~~

~~*Mount- ains.*~~

~~*Rivers.*~~

~~*536*~~

~~*PO RIT WGe & PART I.—GEOGRAPHY AND STATISTICS. Plate IV. eae kingdom of Portugal, which is geographically a |*~~

~~*province of the Iberian Peninsula on its west coast, is bounded on the N. by the Spanish province of Galicia, on the E. by the Spanish provinces of Leon, Estremadura, and Andalusia, and on the S. and W. by the Atlantic Ocean. It lies between 36° 56' and 42° 10' N. lat. and 6° 15' and 9° 30' W. long. It is 362 miles in length by 140 in breadth, and contained by the latest (1878) com- putation! 34,4194 square miles. Its coast-line is nearly 500 miles in length, and only one province, Tras-os-Montes, is not washed by the sea. On the extreme north the coast is low, but farther south it becomes rocky and steep for a few miles near Povoa de Varzim. From that town to Cape Carboeiro the coast of Beira is flat, sandy, and marshy,*~~

~~*closely resembling the French Landes; after another stretch of dunes it again becomes steep and rugged from Cape Roca to Cape Espichel, and along the northern side of the Bay of Setubal, and then remains low throughout the rest of the coast-line of Estremadura (Portuguese). In Alemtejo the coast is low and in places rocky and full of shallows ; and, although at Cape St Vincent the cliffs are steep and inaccessible, the general coast-line of Algarves, the southernmost province of Portugal, is*~~

~~*low and sandy. The chief capes, which form the only cliffs on the other- wise flat and sandy coast, are Cape Mondego, Cape Car- boeiro, Cape Roca, Cape Espichel, Cape Sines, Cape St Vincent, and Cape Santa Maria, and the chief bays are those of Figueira, Ericeira, Setubal, and Sines. The only islands off the coast are the dangerous Farilhées and the Berlengas off Cape Carboeiro, which would be uninhabited but for an old castle, now used as a prison, on the largest island of the latter group.*~~

~~*The mountain-systems of Portugal can only be adequately treated under Spain (g.v.), as they are in every instance continuations to the west or south-west of the great Spanish ranges. Thus the mountains of the Cantabrian Pyrenees in Galicia spread themselves over the two northern provinces of Portugal, Entre Minho e Douro and Tras-os- Montes, in various short ranges, of which the most im- portant are the Serra do Gerez (4815 feet) and the Serra de Marao (4665 feet), the latter extending down the left bank of the Tameja and sheltering the wine-districts of Tras-os-Montes from the east winds. In Beira the granite Serra da Estrella (6540 feet), the loftiest range in Por- tugal, forms part of the system of the Guadarramas and a continuation of the Sierra de Gata, and terminates in the Serra de Lousio (3940 feet), while the chalk mountains in the south of the province, such as the Monte Junto near Santarem (2185 feet) and the Serra de Cintra, which runs into the sea at Cape Roca, belong to a different geological period, The chalk mountains of the Serra de Arrabida (1537 feet) to the south of the Tagus correspond with the Serra de Cintra, and form Cape Espichel; but the other low ranges to the south of the river in Alemtejo, such as the Serra de San Mamede (3363 feet) and the Serra de Ossa (2130 feet), belong to the system of the mountains of Toledo. The continuation of the Sierra Morefia, which separates Algarves from the rest of Portugal, forms various small ranges and isolated mountains, such as the Serra do Malhao (1886 feet) and Monte Figo, and then closes with the Serra de Monchique (2963 feet) and runs into the sea in the steep cliffs of Cape St Vincent.*~~

~~*The river-system of Portugal is also merely a portion of that of Spain. Its three most important rivers, the*~~

~~*1 Strelbitsky, Superficie de ? Europe, 1882. aa*~~

~~Douro, the Tagus, and the Guadiana, all rise in Spain and flow through that country; but they all enter the sea in Portugal, and at the mouths of the Douro and the Tagus are situated the two most important cities of the kingdom, Oporto and Lisbon. The chief Portuguese tributaries of the Douro are the Tameja, the Tua, and the Sabor on the north, and the Agueda, the Coa, and the Paiva on the south ; of the Tagus, the Elja, the Ponsul, and the Zezere on the north, and the Niza, the Sorraya, and the Canha on the south ; while into the Guadiana, on its right or Port- uguese bank, flow the Caia, the Oeiras, and the Vascao. The other important rivers are the Minho, which forms the boundary of Portugal and Galicia in the lower part of its course, the Limia, the Cavado, the Vouga, and the Mondego to the north of the Tagus, and the Sado, the Mira, the Odelouca, and the Silves to the south of it. Important as are the rivers of Portugal, it has no inland lakes worthy of mention, though it abounds in hot and other medicinal springs, such as the Caldas de Monchique ; and beautiful little mountain-lakes are numerous on the tops of the Serra da Estrella.~~

~~The climate of Portugal is particularly equable and Climate.~~

~~temperate, and its salubrious qualities were recognized by the English doctors of the 18th century, who used to send many patients to winter there, including Fielding the novelist ; and, though Portugal has been superseded as a _ winter resort by the Riviera and Algiers, there are signs that it may again become a European health-resort of the first importance. To prove the temperate nature of the climate it is not enough to state that the average mean temperatures of Lisbon, Coimbra, and Oporto are 61°-3, 61°°1, and 60°:2 Fahr. respectively ; more instruct- ive is it to mention that the mean average temperature for the month of January is only 50°:2 at both Coimbra and Oporto, and for July only 69°-4 and 70°:3 for the same two cities, showing a difference between summer and winter of about 20°. This equability of temperature is partly caused by the very heavy rainfall which is pre- cipitated on Portugal as one of the most westerly king- doms of Europe and one most exposed to the Atlantic, and which has reached as much as 16 feet in a year; but it is noticeable that this heavy rainfall comes down in gradual showers spread over the whole year, and not in the torrents of the tropics. This great humidity has its drawbacks as well as its advantages, for, though it makes the soil rich, it produces also heavy fogs,~~

~~which render the Portuguese coast exceedingly dangerous to ships. This charming climate and equability of temperature are not, however, universal in Portugal; they are to be enjoyed mainly in the highlands of Beira, Estremadura, and in the northern provinces, especially at Cintra and Coimbra. In the deep valleys, even of those favoured provinces where the mountains keep off the cool winds, it is ex- cessively hot in summer; while on the summits of the mountains snow lies for many months, and it is often extraordinarily cold. Even in Lisbon itself the tempera- ture, though its mean is only the same as that of Coimbra, varies from 38°°1 in January to 90°°6 Fahr. in July, a difference of more than 50°. In Alemtejo the climate is very unfavourable, and, though the heat is not so great as in Algarves, the country presents a far more deserted and African appearance, while in winter, when heavy rains swell the Tagus and make it overflow its banks, damp unhealthy swamps are left, which breed malaria. Not- withstanding that Algarves is hotter than Alemtejo, and~~

~~the climate there very sultry owing to the sea-breezes being intercepted by the Serra de Monchique and other mountains, a profuse vegetation takes away much of the tropical effect, so that it is a far shadier and more agree- able province than Alemtejo. Although such a rainy country, Portugal is very rarely visited by thunderstorms ; but, on the other hand, shocks of earthquake are frequently felt, and recall the great earthquake of Lisbon in 1755.~~

~~The geology, flora, and fauna of Portugal are essentially the same as those of Spain, and will be studied under SPAIN (g.v.).~~

~~Population. — The population of Portugal, according to the census of 1st January 1878, was 4,160,315, and in 1881 it was calculated to be 4,306,554, or 125 persons to the square mile. The following is a table of the popula- tions of the different provinces and districts according to the census of 1878 and the official estimate of 1881 :—~~

~~Population. Population. Districts, Provinces.~~

~~1878. 1881. 1878. 1881.~~

~~Vianna do Castello} 201,390 } 211,539 1D ee 319.464 | 336,248 jHntre Minhoe Douro 982,735 1,014,768 PROTO sce. s oc 6- 461,881 | 466,981 Villa Real…..... 224,628 | 225,090 Braganza |... 168,651 | 171,586 Tras-Os-Montes ….| 393,279 | 396,676 Aveiro fs 257,049 | 270,266 eel Beira | Byala ee — oimbra 292,037 | 307,426 : — Garda va (| 228/494 | 234,368 Bei Ae 1,323,134 {1,377,432 Castello \ a { 173,983 | 178,164 ! Branco vy Leiria 199,645 Samtarem … 2.1… ; 227,943 > Estremadura …....) 911,922| 946,472 (UIsbOn) Wisae ss occ 498,059 | 518,884 Bort Alegre ..—.. 101,126 | 105,247 {DiGiEe eeenccece 06,858 | 112,735 } /Alemtejo…..... 350,103 | 367,169 SC) wie' cain de cee 142,119 | 149,187 THATO! sect swieoes 199,142 | 204,037 |Algarves ……..... 199,142 | 204,037 Onto Aes sass ce eo sivie sere eee 4,160,315 |4,306,554 EROS Wis csi nee eee 259,800} 269,401 Bede aes oe cn eee 130,584 | 132,293 Pio tale ee 4,550,699 /4,708,178~~

~~According to the census of 1878 the following towns had a population of more than 10,000 each :—Lisbon, 246,343; Oporto, 105,838; Braga, 19,755; Setubal, 14,798; Loulé, 14,448; Coimbra, 13,369; Evora, 13,046; Tavira, 11,459; Covilha, 10,809; Elvas, 10,471; Povda de Varzim, 10,365 ; Ovar, 10,022.~~

~~The ethnological composition of the population is most mixed: in the two northern provinces the population is essentially Galician, but farther south the mixture be- comes obvious ; not only did the conquering Portuguese largely intermarry with the Arabs, but in the places where they exterminated them they replaced them by colonies of crusaders of all nations, chiefly French, English, Dutch, and Frisian, who have left their mark on the features and character of the nation, and they also largely intermarried with the Jews. No Jews were so wealthy or so cultivated as those of Portugal, who, though for many centuries keeping strictly apart from the Christians, yet after their forced conversion or expulsion by King Emmanuel largely intermarried, especially with the people of Lisbon. Farther south an African physiognomy appears, derived from the thousands of negro slaves imported to till Alemtejo and Algarves, from the days of Dom Henry till the decline of the Portuguese power.~~

~~*Emigration is thinning the population, or rather keeping it from rapidly increasing; and the following are the results of the statistics published by the Royal Geographical Society of Lisbon for 1872-81. There emigrated in the ten years between 1871 and 1881 from Entre Minho e Douro 51,531 persons, from Tras-os-Montes 7799, from Beira 31,487, from Estremadura 12,769, from Alemtejo 42, from Algarves 225, from the Azores 22,794, from Madeira 6410, making a grand total of 188,007. Of these emigrants 129,549 were bound for America, the whole number in all probability for the Brazils,*~~

~~*1 The Azores and Madeira are regarded as colonies and as an integral part of the country.*~~

~~*POR TU ea tL*~~

~~*Da7*~~

~~*3348 for the Portuguese colonies in Africa, and 95 for Asia. It will be noticed that the majority of these emigrants come from the wealthy northern provinces and the sober population of Entre Minho e Douro, while the number from the fever-stricken Alemtejo is practically nil.*~~

~~*Colonies.—See AZORES, CAPE VERD IsLANDs, GOA, MACAO, Colonies,*~~

~~*Mapetra, MozaMBiQue, and Cotony (vol. vi. p. 161).*~~

~~*Commerce.—The commerce of Portugal has not rapidly, though Com- it has steadily, increased during the last thirty years; the chief merce.*~~

~~*countries with which it trades are, in order of value, England and her colonies, Brazil, the United States, France, and Spain ; but it is hardly fair to mention commerce with Spain, because the large amount of smuggling which takes place makes it impossible to estimate the real amount of trade between the two countries. The following table of exports and imports in nineteen classes, compiled by Mr George Brackenbury, British consul at Lisbon, dated 24th April 1884, is published in the Consular Reports for 1884, and contains the latest information on Portuguese trade and commerce. It will be noticed that the chief imports are bread- stuffs, metals,*~~

~~cottons, and minerals, and the chief exports fer- mented liquors, live stock (which is nearly all sent to England), and timber.~~

~~Imports. Exports. Tariff Classes. 1882, 1883. 182. | 1883, To Mhivevanimnals :<. cs... 60... £228,3292) £221,908 | £605,916 | £640,950 2. Animal products..... 423,204 392,101 138,397 105,798 SeBLISHOLICS isizy.,.<.)200 2 sae ae 345,432 325,304 141,160 152,104 4) Wool and Wait <..5.....- 495,441 514,166 59,058 | 58,544 Jem S UKMe Voretebte trys as cacarsite 202,551 212,818 13,638 6,554 GMECobton ashe) neve, nee 850,363 | 870,001 19,743 15,498 7. Flax and similar materials 169,986 169,944 5,654 5,940 SRPRIGMDEr Aay..-aeteiee « «.c.c-e.ce ee 230,514 236,093 602,116 585,272 9! Bread-stuffs .....2.-..0 1,694,163 | 1,272,540 93,466 74,452 10. Colonial produce (so called)) 752,145 684,921 30,393 20,511 11. Divers vegetable substances} 166,183 171,956 401,222 336,704 WOM Metala Wen. 2, ee a 1,057,334 | 1,359,768 | 616,189 | 148,569 NSS MINeTAIS Soe oe s:5 32.013 493,736 525,770 348,823 | 341,072 14. Fermented liquors 44,031 27,848 | 2,217,511 | 2,479,218 15. Glass and ceramic ware…. 81,016 64,728 4,353 3,854 16. Paper, and manufactures in} 102,120 103,496 16,473 11,551 which it is used 17. Chemical products …..... 76,125 73,658 89,445 98,029 18. Produce and compositions) 133,844 117,699 7,693 7,852 of various kinds 19. Manufactures of various; 537,234 468,459 89,762 70,114 materials | | Total….'|£8,083,751 |£7,813,178 |£5,501,012 |£5, 162,586~~

~~Agriculture.—The state of agriculture in Portugal is still deplor- Agricul- able ; the wealth and energy of the country have been thrown into ture.~~

~~the wine trade, and the production and cultivation of cereals have been so much neglected that, in spite of its being eminently adapted for such cultivation, nearly all its cereals are imported from the United States, to the value in 1883 of over £1,000,000. The wine production, on which Portugal has so long depended, was the work of the Methuen treaty of 17038, for it was not until after that treaty that the barren rocks of the Alto Douro were covered with vines. But now, though the returns show slight alteration, there must soon be a great change. The phylloxera has utterly destroyed thousands of vineyards in Entre Minho e Douro and in Beira. The labours of the phylloxera commission .seem unable to check its ravages ;* the~~

~~commissioners themselves are hindered by the people,—an inspector having been even shot at in the district of Riguengo.* The reason why no great alteration is to be perceived in the returns is that the great Oporto shippers have such vast stocks that it may be years before the want comes to be felt. To remedy the failure, which can be only a matter of time, tobacco-growing has been proposed (see Consul Crawfurd's Report), and will probably be tried in place of vine-culture. Portugal has lately become a great exporter of live stock to England, as also of large quantities of fruits and early vegetables, including oranges (especially from Condeixa), lemons, limes, peaches (from Amarante), and the celebrated Elvas plums. The difference in the character of the inhabitants of dif- ferent provinces is well shown by the fact that in the north the peasant not only tends his vines but in many instances rears silk- worms and even possesses olive trees, while in Alemtejo he is content to live upon chestnuts and to take care of his pigs and goats.~~

~~Manufactures.—Nothing proves more decidedly the agricultural Manu- character of the Portuguese than the repeated failures to establish factures.~~

~~manufactures among them. This has often been ascribed to the provision respecting the importation of English goods in the Methuen treaty ; but not all the efforts of Pombal or of the modern protectionist cabinets have been able to establish any important manufactures. The following table, extracted from Consul Bracken- bury's Report, gives a list of the chief establishments—for manu-~~

~~2 In the Consular Reports 1 milrei is taken to be equivalent to 4s, 54d. 3 See Consul Crawfurd's Report, Oporto, 1884.~~

~~4 Mr Baring's Report. XIX. — 68~~

~~Finance,~~

~~factories they can hardly be called—in Portugal, with the number of workmen and the value of the products.~~

~~*ee Opera- Daily Value of*~~

~~*Fa ae aety tives. Wages. Products.*~~

~~*arpentering\.. - 2.50.50 50656- $3 5,109 £256 £165,006 WaXcWROUUCESH s1.5 05. s1006 = <1 21 39 2 12,584 (ORs WEIS po 9o sogodaoooccc 43 2,045 97 72,079 STI Cig Mc cters cisicvciev selcc sic 51 6,748 459 63,584 MORK WORKSio: «<< oicicle:s s1c)+ o\sleicrc 22 1,612 92 224,672 WinsWIES Wee cagecpcopugl base 93 823 44 323,489 DIS LIMcLICS cic. ccc ccc esses 79 364 Bi 101,924 Food products …….+— Bi 2,367 116 517,392 Mic SULIPAy ga ecccennceupeeen se 171 5,215 325 439,669 Flour, &c., mills ……. 62 3,182 iy 125,467 Paper factories ……- 31 1,364 69 93,293 Firewood-making …….— 18 206 7 6,977 Soap-works ……-----+ce-: 13 83 6 74,204 Tobacco-worksS ……..+++ 22 4,021 252 1,249,236 Cotton, linen, &c., weaving .. 97 39,597 330 Se ie2 Woollen-weaving ……... 161 8,964 736 864,518 Silke weavin@) osc lee eel 24 854 53 51,393 Typographical establishments 66 591 42 82,444 (CHIMIONE Bo cakecadbeoodeecade 134 5,328 150 348,073 Glasssw@rks) =: .—\:.cjcaeis seo. & 903 28 37,417 Various industries ……. 97 1,503 22 117,485 Totals… 1150 90,918 | £3129 £6,073,658*~~

~~*Some of these establishments ought to be more successful, for the glass-works of Leiria, the lace-works of Vianna and Peniche, and the potteries of Aveiro had an immense reputation in the 18th century, which they have now lost, as the table clearly shows. Portugal possesses plenty of mineral wealth, though not so much as Spain, but from want of capital and enterprise such resources as exist are neglected. A very few of the chief mines may be noted—the lead-mines of Coimbra, one of antimony near Oporto, and above all the very important copper-mines of San Domingos near Beja, worked by an English company, which contributed thirteen-sixteenths of the total exports of minerals in the six months between January and June 1883, Of greater importance are the fisheries,—the fishermen both of Beira and Algarves being famous for their courage; and large quantities of sardines and preserved tunny fish are exported to Italy and France, and an even larger quantity of oysters to England.*~~

~~*Finance.—The revenue of Portugal has for many years ceased to balance its expenditure, and the deficit has had to be met by borrowing, but it is only fair to remark that vigorous attempts have been made to reduce the expenditure of recent years. The estimated revenue for 1883-84 and 1884-85 was classified under six heads.*~~

~~*1883-1884. 1884-1885.*~~

~~*Din eet ba xespercce(oesearicteieieisieiele renee £1,387,790 £1,395,753 SATS Gach ae copacaosedcoumccodccoc 763,777 721,778 Tndimeet taxes. 2 cece ccs ie oc. 0sesiners ee 8,643,811 3,587,136 Additional 6 per cent. (since 27th April 240,889 234,889*~~

~~*1882)*~~

~~*Domains and sundries ……- 655,573 801,449 FRO PBYMREMGS secs serelsere 2.6 sie: celetelecceciacsis 238,069 244,788 Total ordinary revenue…. £6,929,909 £6,985,793*~~

~~*A few of the sub-heads which help to swell these various classes of revenue are worth detailing.*~~

~~*1883-1884. 1884-1885.*~~

~~*Direct taxes—*~~

~~*Land tax*~~

~~*Industrial tax*~~

~~*Income tax*~~

~~*Inhabited house tax*~~

~~*Dividends tax*~~

~~*Bank tax*~~

~~*Titles and concessions tax*~~

~~*Servants and carriage tax Indirect taxes—*~~

~~*Import duties*~~

~~*Tobacco duties*~~

~~*Bread-stuffs*~~

~~*Octroi at Lisbon …*~~

~~***Real de agua”*~~

~~*Additional customs*~~

~~*Salt tax*~~

~~*Exports*~~

~~*Special 2 per cent. on export of wine Domains and sundries—*~~

~~*Railways*~~

~~*Post-office and telegraphs*~~

~~*Military exemption tax*~~

~~*Suppressed religious establishments Repayments—*~~

~~*Interest on stock held by the*~~

~~*treasury*~~

~~*£700,444*~~

~~*243,222 88,322 $8,778 66,889 35,489 40,667 23,333*~~

~~*1,637,555 703,555 302,667 297,778 220,000 128,444*~~

~~*60,000 52,844 48,889*~~

~~£700,444~~

~~250,000 89,044 86,556 67,667 36,791 41,222 93,111~~

~~1,647,112 718,467 287,222 311,333 214,222 145,496~~

~~25,778 48,089 46,222~~

~~274,678 151,671 64,444~~

~~SP tuL~~

~~281,756 177,778 60,000 33,333~~

~~197,978 197,978~~

~~POR TU Ga &~~

~~[STATISTICS.~~

~~The last item deserves particular notice, as it proves the confused manner in which Portuguese financiers keep their accounts ; they prefer to pay into their treasury interest on bonds held by it, instead of extinguishing that amount of the national debt.~~

~~Against this revenue must be set the expenditure (which always exceeds it), causing a deficit of £194,141 on the ordinary balance- sheet, and of £1,558,142 when the extraordinary expenditure is taken into account, in 1884-85. The chief items in the estimates for that year compared with the estimates for 1883-84 are—~~

~~1883-1854. | 1884-1885.~~

~~Public debt (of which interest on debt took up| £2,901,850 | £2,909,712 £2,882,769 in 1883-84 and £2,882,784 in 1884-85)~~

~~*THAIS DAY OE shi RR Ao eo onoa soe pocuconoebesmeds 1,329,208 | 1,463,955 Ministryyotgubennbenl Ore.. «1. -¢-1 1.01 se sere eels eine 482,565 491,787 MGI? CLIT SIBSR ARBs so qao5 Coenaennaagauanceaaaa 142,455 149,233 GPITS TNA t We eae co oa eS ONeced © JURE CnDeencton don 1,019,821 | 1,079,683 Ministry of the marine and colonies ……. 379,120 372,528 Ministry of foreign MAIS)... eece es eens ess oe 70,065 73,327 Ministry, Gispublienwoerks) <2: co. - (estes ess: o>. 618,405 639,709*~~

~~*£6,943,489 | £7,179,984*~~

~~*Under the head of the "ministry of finance" there was an esti- mated sum of £600,367 in 1883-84 and of £672,202 in 1884-85 for interest of debt, which in any other system of finance would have been put down to the head of "public debt." The extraordinary expenditure was estimated to amount to £1,364,000 in 1884-85, the chief items of which were for the ministry of public works, chiefly spent on the fortifications of Lisbon, and for the minister of the colonies, for in only two colonies—Cape Verd Islands and Macao—do the colonial revenues meet their expenditure, the mother-country having to afford substantial help to her African colonies*~~

~~*every year. The estimated balance-sheet for 1884-85 was— Ordinary expendi tunescs <./2)1s:ciss eclsis el elelelsleieinedslerersieleiee ioe £7,179,934 ROVE. oy oases ave 6015 ee aieleinis ois ¢ cove nie cians] sievaie chevsoeteierseisieyervierete 6,985,793 Dene Meets coe eee £194,141*~~

~~*It is very difficult to give any exact estimate of the extent of the public debt of Portugal owing to the financial confusions noted above, but on 30th June 1883 it was estimated at £96,175,692,*~~

~~*namely— Intemalidebt, News PCRiGeNtS: 6… ssc cc es siecaes esc £52,369,291 ISvoOME LGB shaqooocsdbonnoussopeucse054 by.ne be DDUd de od 43,372,530 Old debt, to be converted ……..2. afeaeieaisalevs ier otarere (ete 433,871*~~

~~*Ti gedl es baoacgaan spoon ne on poL ees Wie oer but of this amount the treasury holds about £8,000, 000.*~~

~~*Government.—The government of Portugal is an, hereditary and Govern- constitutional monarchy, exercised under the charter of 1826, as ment.*~~

~~*modified in 1852 and 1878, under which the king is charged with the executive and shares the power of making laws with two chambers. His civil list amounts to £144,000 a year, and he is advised in all matters of administration and assisted in nominating peers by a council of state appointed for life, but depends for advice in legislative and executive matters on a cabinet of seven members selected from the chambers by a premier, summoned by the king. The House of Peers consists of 150 members nominated by the king for life, and contains many of the most eminent professors and authors, as well as men of wealth, and additions may be made to its number by the king on the advice of the premier, with the consent of the council of state. All the members of the House of Peers do not possess titles, nor do all titled persons belong to the House of Peers; legislation and the titular and hereditary aristo- cracy are kept quite apart. The House of Deputies consists of 173 members, elected directly by all male citizens of twenty-five years of age, either paying in direct taxes 4s. 6d. a year, or deriving an annual income of 22s. from real estate, while all graduates, priests, officers, and certified teachers have votes without further qualifica- tion. The president of the chamber is selected by the king out of five elected candidates, and the deputies are paid. The Azores and Madeira elect members to the House at Lisbon. For adininis- trative purposes Portugal is divided into seventeen districts, for judicial purposes into twenty-six districts or "comarcas," with appeal courts at Lisbon and Oporto, and a supreme court at Lis- bon, and for military purposes into four divisions. The Roman Catholic is the state religion, but others are tolerated, and the power of the priests has been greatly checked by the wholesale suppression of monasteries in 1834. The church in Portugal is governed by a patriarch at Lisbon, two archbishops at Braga and Evora, and fourteen bishops, of whom the most important is the bishop of Oporto. For purposes of local government the districts are under the rule of civil governors, who have much the same powers as prefects in France, while in the 292 "concelhos," or administrative councils, there arc elected*~~

~~*councillors, and in the 3960 "freguezias" or parishes the villagers elect a magistrate, who has the same powers as an English justice of the peace.*~~

~~*Army and Navy.—Under a decree dated 19th May 1884 the Army Portuguese army has been reorganized. The effective war strength andnavy.*~~

~~*is to be maintained at 120,000 men. The term of service is for 12*~~

~~*Educa- tion.*~~

~~*Early history.*~~

~~*HISTORY.|*~~

~~*years, of which 3 are to be with the colours, 5 in the first reserve, and 4 in the second reserve. The force is divided into 36 regiments of infantry, 10 regiments of cavalry, 4 regiments, 1 brigade, and 4 companies of artillery, and 1 regiment of engineers. -In 1883, under the old regulations, the army contained 41 general officers ; its effective strength in time of peace was 33,231 men with 1643 officers, and on a war footing 75,336 men with 2688 officers. For colonial service there is one regiment of 1148 soldiers and 50 officers divided into 3 battalions, of which one is always stationed at Goa and another at Macao. The officers are trained in the military academy at Lisbon, and there is an asylum for the sons of soldiers. The navy is no longer the power it used to be, but, though small, it is equipped in modern fashion and furnished by the naval arsenal at Lisbon. It consisted in 1884 of 30 steam-ships, of which one was an armoured corvette mounting 7 guns, and 5 others cor- vettes mounting 46 guns, aud of 14 sailing ships, of which one was a frigate mounting 19 guns. Its personnel consisted of 283 officers and 3235 sailors.*~~

~~*Public Instruction.—The public instruction of Portugal is regu- lated by the law of 1844, which enacted that all children should be bound to attend a primary school, if there was one within a mile, from the age of seven to fifteen, under penalty to the pareuts of a fine and deprivation of civil rights. Under this law there were in Portugal, in 1874, 2649 primary schools with 122,004 pupils of both sexes. Secondary education is not neglected, and under the same law of 1844 17 lycées have been established in the seven-*~~

~~*teen continental districts, and from them it is possible for a pupil to enter either the university of Coimbra, which during the present century has recovered some of its ancient lustre, or the special schools. These special schools are very ably conducted, and modern Portuguese policy gives, as we have seen, a higher status to teachers*~~

~~*PORTUG 2 L*~~

~~*539*~~

~~*and professors of all grades than they obtain in most other countries. The most important of these schools are the polytechnic school at Lisbon, the polytechnic academy at Oporto, the medical schools and industrial institutes in both these cities, the institute-general of agriculture, the royal and marine observatories, and the academy of fine arts—all four at Lisbon. The valuable public libraries of Lisbon, Evora, Villa Real, and Braga, supported by the state, and in addition the free library at Oporto, ought also to be mentioned, as well as the archives at the Torre del Tombo, with which a school of paleeography and diplomacy has lately been connected.*~~

~~*Public Works.—On 1st January 1884 there were 1245 miles of Public railway open (944) and in course of construction (301), also 50 miles works, of tramways were open, and 2900 miles of telegraph were in operation; and every recent loan has been raised for the purpose of extending these important public works. The chief lines of rail- way open are those from Lisbon to Valencia de Alcantara, and thence by Talavera to Madrid, and from Lisbon to Oporto, Tua, Nine, and Braga, while the line to Faro, which is to connect Algarves with the capital, has been already extended beyond Beja as far as Casevel. There is also an alternative line to Madrid open through Elvas and Badajoz, which connects Lisbon with the Andalusian system and gives a short route to Seville, Cadiz, and Malaga. As to smaller lines opening up Beira, the line from Figueira da Foz to Villar Formosa through Celorico and Guarda is completed, and one is projected parallel to the Lisbon-Oporto line from Villar Formosa to Alcantara on the south, which is to be connected with Oporto through Tua towards the west. The telegraph system is already very complete, and the last touch has been put to it by laying down a submarine cable from Lisbon to Rio de Janeiro,*~~

~~*binding the mother-country still more closely with what was once her greatest colony. (H. M. 8.)*~~

~~*PART IJ.—HISTORY.*~~

~~*It has been stated that geographically the kingdom of Portugal is an integral part of the Iberian Peninsula; the only reason why it has retained its independence, while the other medizval states of that peninsula have merged into the kingdom of Spain, is to be found in its history. When Philip H. of Spain annexed Portugal it was a century too late for it to coalesce with Spain. It had then produced Vasco de Gama and Affonso de Albuquerque, and its language had been developed from a Romance dialect into a literary language by Camoens and Sa de Miranda. Conscious of its national history, it broke away again from Spain in 1640, and under the close alliance of England maintained its separate and national existence during the 18th century. A union with Spain might have been possible, however, during the first half of the present century had not a generation of historians and poets arisen, who, by recalling the great days of the Portu- guese monarchy, have made it impossible for Portugal ever again to lose the consciousness of her national existence.*~~

~~*The history of Portugal really begins with the gift of the fief of the Terra Portucalensis or the county of Porto Cale to Count Henry of Burgundy in 1094; for any attempt to identify the kingdom of Portugal and the Portuguese people with Lusitania and the Lusitanians is utterly with- out foundation. With the rest of the Iberian Peninsula, Portugal was colonized by the Phcenicians and conquered by the Carthaginians ; and the Roman province of Lusi- tania, whether according to the division of Iberia into three provinces under Augustus or into five under Hadrian, in no way coincided with the historical limits of the kingdom of Portugal. In common with the rest of the Peninsula, it was overrun by the Vandals, Alans, and Visigoths, and eventually conquered by the Arabs in the 8th century. It was not until the 15th century that an attempt was made by Garcia de Menezes to identify Lusitania with Portugal. Under the influence of the Renaissance, Bernardo de Brito insisted on the identity, and claimed Viriathus as a Portu- guese hero. Other writers of the same epoch delighted in calling*~~

~~*Portugal by the classical name of "Lusitania," and Camoens, by the very title of his great epic, Os Lusiadas, has immortalized the appellation.*~~

~~*For two centuries Portugal remained subject to the*~~

~~*Omayyad caliphs, and under their wise rule the old Roman colonize and municipia, such as Lisbon, Lamego, Viseu, and Oporto, maintained their Roman self-govern- ment and increased in wealth and importance. Towards the close of the 10th century, as the Omayyad caliphate grew weaker, the Christian princes of Visigothic descent who dwelt in the mountains of the Asturias began to grow more audacious in their attacks on the declining power, and in 997 Bermudo IJI., king of Galicia, won back the first portion of modern Portugal from the Mohammedans by seizing Oporto and occupying the province now known as Entre Minho e Douro. In the beginning of the 11th century the Omayyad caliphate finally broke up, and inde- pendent emirs established themselves in every large city, against whom the Christian princes waged incessant and successful war. In 1055 Ferdinand the Great, king of Leon, Castile, and Galicia, invaded Beira ; in 1057 he took Lamego and Viseu, and in 1064 Coimbra; and his son Garcia, who succeeded him as king of Galicia in 1065, maintained Nuno Mendes, count of Oporto, and Sesnando, a renegade Arab wazir, count of Coimbra, as feudal vassals of his court. In 1073 Alphonso VI., the second son of Ferdinand the Great, united once more his father's three kingdoms, and for a time rivalled his father's successes, until a fresh outburst of Mohammedan fanaticism ended in the rise of the Almoravide dynasty, and the defeat of the Christian king at Zalaca in 1086 by Yusuf ibn Tesh- ufin. To resist this revival of the Mohammedan power, Alphonso VI. summoned the chivalry of Christendom to his aid, and among the knights who came to his assistance were Counts Raymond and Henry of Burgundy. In the days of his success Alphonso had compelled Motawakkil of Badajoz to cede to him both Lisbon and Santarem, but the fortune of war had changed, and Stir, the general of the Almoravide caliph Yusuf, retook both cities. Al- phonso felt the need of a valiant warrior on his Galician frontier, and in 1094 he combined the fiefs of Coimbra and Oporto into one great county and conferred it upon Henry of Burgundy with the hand of his illegitimate daughter Theresa, while to Raymond he gave Galicia and his legitimate daughter and heiress Urraca.*~~

~~*Count Henry of Burgundy, the first count of Portugal,*~~

~~*540*~~

~~*Henry of was the second son of Henry, third son of Robert, first*~~

~~*Bur- gundy.*~~

~~*Affonso Hen- riques.*~~

~~*duke of Burgundy, and was in every way a typical knight of his century, a brave restless warrior, and a crusader ; but when once firmly established in his county he thought much more about his chances of succeeding his father-in- law as king than of trying to carve a kingdom for him- self out of the dominions of the Mohammedan caliphs. When, therefore, Alphonso VI. died in 1109 and left his thrones to his daughter Urraca, and nothing to Henry, the Burgundian at once invaded Leon. For five years the Christian princes, Henry of Burgundy, Alphonso Raimundes (the son of Count Raymond), Alphonso of Aragon, and Queen Urraca, fought together, while Sir was consolidating the Almoravide power, until Count Henry died suddenly at Astorga in 1112, leaving his wife Theresa to rule the county of Portugal during the minority of his infant son, Affonso Henriques.*~~

~~*Theresa, who ruled at Guimaraens during her son's minority, was a beautiful and accomplished woman, who devoted all her energies to building up Affonso's dominions into an independent state, and under her rule, while the Christian states of Spain were torn by civil wars, the Portuguese nobles were prevented from interfering, and began to recognize Portugal as their country, and to cease from calling themselves Galicians. Her regency was a stormy one in spite of all her efforts to maintain peace: in 1116 she was persuaded by Gelmires, bishop of Santiago, to try and extend her frontier towards the north, and seized Tuy and Orense ; in 1117 she was besieged by the Moham- medans in Coimbra; and in 1121 her sister Urraca took her prisoner, but, through the interposition of Bishop Gelmires and Mauricio Burdino, archbishop of Braga, peace was quickly made between them. For the next few years a curious parallelism appears between the careers of the two sisters: Urraca showered favours on her lover, Pedro de Lara, until her young son Alphonso Raimundes, or*~~

~~*Alphonso VII. of Leon and Castile, with the help of Bishop Gelmires, revolted against her; and with equal blindness Theresa favoured her lover, Fernando Peres de Trava, whom she made governor of the cities of Oporto and Coimbra, until she was detested by the boy Affonso Henriques, and Paio, archbishop of Braga. They did not, however, break out into open revolt until after a successful invasion by Alphonso VII. of Leon and Castile, who forced Theresa to recognize his supremacy in 1127. Her son refused to ratify her submission, and rose in rebellion with Archbishop Paio, Sueiro Mendes, Sancho Nunes, and others ;*~~

~~*and at the battle of San Mamede on 14th June 1128 Theresa*~~

~~*was taken prisoner, and then wandered about in Galicia with her lover until her death in 1130.*~~

~~*Affonso Henriques, who at the age of seventeen assumed the government, was one of the heroes of the Middle Ages ; he succeeded to the rule of the county of Portugal when it was still regarded as a fief of Galicia, and after nearly sixty years' incessant fighting he bequeathed to his son a powerful little kingdom, whose independence was unques- tioned, and whose fame was spread abroad throughout Christendom by the reports of the victories of its first king over the Mohammedans. The four wars of independence which Affonso Henriques waged against Alphonso VII. lasted more than twelve years, and were fought out on the Galician frontier with varying success, until the question of Portuguese independence was peaceably established and confirmed by the valour of the Portuguese knights, who overcame those of Castile in the famous tournament of Valdevez, and Affonso Henriques assumed the title of the king of Portugal. The independence of Portugal from Galicia being thus finally achieved, Affonso Henriques abandoned the idea of extending his dominions towards the north, and devoted the next twenty-five years of his*~~

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~~*[HISTORY.*~~

~~*life to one long crusade against the Mohammedans, and to extending his frontier towards the south. The state of the Mohammedan power in Spain*~~

~~*was particularly favour- able to his enterprise. The wave of Moslem fanaticism which had created the Almoravide dynasty had exhausted itself, and independent chiefs had established themselves again in the different provinces, while in Africa 'Abd al- Mumen, the successor of the Almohade mahdi, was de- stroying the power of the Almoravides by means of yet another wave of fanaticism. As early as 1135 Affonso had built the castle of Leiria to protect his capital, Coimbra, but for some years he left the task of attacking the Mohammedans to the Knights Templars and Knights Hospitallers, who made incessant incursions from their headquarters at Soure and Thomar. But the castle of Leiria had soon fallen; and in 1139, after the flower of Mohammedan Spain had crossed over to Africa under Teshufin, the last Almoravide caliph, to fight the Almo hades, and when Alphonso VII. was making his second incursion into the heart of Andalusia, Affonso Henriques collected his whole army and invaded the province of the Kasr ibn Abi Danes. Advancing to the south of Beja, he met the united forces of all the neighbouring cities under a wali named Ismar, and completely routed him at Orik or Ourique on 25th July. This battle has been sur- rounded with a mass of legends: it was solemnly asserted two hundred years afterwards that five kings and 200,000 Mohammedans were utterly defeated, and that after the battle Affonso was proclaimed king by his soldiers. Such legends hardly need contradiction ; the victory was a great one, but it was obtained over provincial emirs; and it was not by victories over Mohammedans but by struggles with his Christian cousin Alphonso VII. that independ- ence was to be won. Of still later invention was the fiction of the cortes of Lamego, and the passing of the fundamental laws of the monarchy, on which Vertot and other writers have expended so much eloquence. Of great significance with regard to the legendary splendour of the victory is the fact that in the very next year Ismar or Omar, the emir who was defeated at Ourique, was able to take the field again, when he once more seized the castle of Leiria, and destroyed it. In 1143 a regular peace was*~~

~~*concluded between Alphonso VII. and Affonso Henriques Portugal*~~

~~*at Zamora through the mediation of the cardinal Guy de 4 Vico, when Affonso Henriques was finally recognized as king, and promised to be a vassal of the pope, and to pay him four ounces of gold annually. For many*~~

~~subsequent years the history of Portugal is merely a narration of wars against the Mohammedans. Abu Zakaria, wazir of San- tarem and Mohammedan leader in the Belatha (a district including the banks of the Tagus and the cities of Lisbon, Santarem, and Cintra), defeated the Templars at Soure in 1144, but in 1147 Santarem itself was surprised and taken on 15th March. Of still more importance was the capture of Lisbon in the same year. A number of German crusaders from the Rhine and Flanders under Count Arnold of Aerschot and Christian Ghistell, and of English crusaders under their constables, Hervey Glanvill, Simon of Dover, Andrew of London, and Saher d'Arcellis, put in at Oporto on their way to Palestine, and were persuaded by the bishop to commence their holy work by assisting in the siege of Lisbon. With their help the ancient city, which claimed to have been founded by Ulysses, and which had three times—in 792, in 851, and in 1093—been taken by the Christians and held for a short time, was finally captured on 24th October by Affonso Henriques, who also persuaded many of the crusaders to settle and form colonies in Portugal. The series of conquests con- tinued: Cintra, Palmella, and Almada quickly surrendered, and at last, after a failure in 1152, the great city of Alcdcer~~

~~king- om.~~

~~Sancho IJ.~~

~~HISTORY. |~~

~~do Sal was taken in 1158. In 1161 Affonso Henriques met with his first important check. The Almohade caliphs, having at last triumphed in Africa, determined to extend their power to Spain, and on the arrival of their troops the Portuguese king was defeated. Then the character of the war changed. A disputed succession weakened the Almohade caliphate, and independent bands of "'salteadors," who were little better than brigands or free-lances, began to establish themselves in the cities of Alemtejo ; such was Giraldo Sempavor, who took Evora in 1166.~~

~~Affonso Henriques became ambitious to win the great city of Badajoz, although by a treaty signed at Cella Nova with Alphonso VII. he had undertaken to confine his con- quests to the right bank of the Guadiana. No doubt it was owing to the death of his cousin and the separation of the~~

~~kingdoms of Castile and Leon that he believed he could effect his purpose. But his son-in-law, Ferdinand of Leon, would not allow such a breach of treaty, and determined to oppose it; and Affonso Henriques made the fatal mistake of again mixing himself up in Spanish affairs by invading Galicia in 1167. At last, in 1169, he formed the siege of Badajoz; Ferdinand at once invested the besieger in his camp, and the Portuguese hero was severely wounded and taken prisoner. To gain his freedom he was compelled to surrender his conquests in Galicia, and Ferdinand nobly inflicted no harsher terms ; nevertheless the old king never recovered from the effect of his wound, and the remaining exploits of his reign were the work of his son Dom Sancho. By 1169 the internal dissensions of the Mohammedans were over, and the new Almohade caliph, Yusuf Abu Ya'kub, crossed over to Spain with a large army. He speedily reconquered all the Portuguese acquisitions in Alemtejo, and in 1171, after a vain attempt to take Santarem, made a truce for seven years with Affonso Henriques, who in the following year admitted his son Sancho as king with himself, and left him all the duties of war. Dom Sancho proved himself the worthy son of his father, and for twelve years Alemtejo was one great battle-ground. The greatest struggle was in 1184, when Yusuf brought over fresh forces from Africa, and again besieged Santarem ; but pestilence defended the city, and on 4th July Sancho utterly defeated the fever-stricken army of the besiegers, Yusuf himself being mortally wounded in the battle. This triumph worthily closed the reign of the great crusader king, Affonso Henriques, who died on 6th December 1185.~~

~~The fame of Dom Sancho I., "the Povoador " or " City- builder," rests more on his internal administration than on his early exploits as a soldier. But before he had time to obey his inclinations he had to continue a war of life and death with the Mohammedans. In 1189 he conquered Algarves and took Silves, the capital of the province, with the help of some English, Dutch, Danish, and Frisian crusaders ; but the conquest was not final, for in 1192 Yusuf Abu Ya'kub reconquered not only Algarves but the whole province of Alemtejo, including Alcdcer do Sal, failing only before Santarem. Finding the Mohammedans under their great Almohade caliph too dangerous to attack again, Dom Sancho made peace with them, and for some years, until 1200, concerned himself with the affairs of Spain, waging continuous war against Alphonso IX. of Leon without any particular result.~~

~~His internal adminis- tration was far more important. During his father's reign there had been nothing but fighting, and, except in Lisbon and Oporto, where a large trade for that period had arisen, and in the northern provinces of Entre Minho e Douro and Tras-os-Montes, where agriculture survived, the scanty population lived chiefly on the spoils taken in their yearly incursions on the Mohammedans. Sancho therefore both~~

~~encouraged the growth of towns and fostered agriculture. The Portuguese towns had almost without exception pre- served their old Roman local self-government, which had been taken advantage of by the Mohammedans; and Sancho wisely followed their example, while he encouraged the increase of population by wise laws, and furthered immigration, especially from the crusaders of England, France, and the north of Europe. The country districts he treated on a different principle. He granted large tracts of land to noblemen and cities and the military orders, on condition that they should be cultivated and occupied. The later years of Sancho's reign were filled with disputes with Pope Innocent III. This struggle bears a curious resemblance to the quarrels of Henry II. with the pope, which had raged a few years earlier in England. Dom Sancho had insisted on priests accom- panying their flocks to battle, and also on making them amenable to the secular courts. This seemed monstrous to Innocent, who sent legate after legate to demand Sancho's submission and the payment of the tribute to the Holy See. But the king had in his chancellor Julido the first Portuguese student who studied the revival of Roman law at Bologna, and who had imbibed broad views there as to the papal power, and he in Sancho's name asserted the king's full right even to dispose of the estates of the church in his kingdom if he liked. This general quarrel was complicated by the behaviour of Martinho Rodrigues, bishop of Oporto, who was hated alike by his chapter, the king, and the people of his city, and who, after being besieged in his palace for five months, escaped to Rome, and claimed the pope's protection in 1209. Sancho was now in weak health and in no mood to con- tinue the struggle, so in 1210 he yielded to all the de- mands of the pope and the bishops; then, after giving large estates to his sons and~~

~~*daughters, he retired to the convent of Alcobaca, where he died in 1211, leaving a reputation as a warrior and a statesman only second to that of his father.*~~

~~*The reign of Affonso II. "the Fat" is chiefly important Affonso in the constitutional history of Portugal, and for one!*~~

~~*memorable feat of arms, the recapture of Alcdcer do Sal. On his father's death, Affonso, probably by the advice of the chancellor Juliaéo, summoned a cortes or parliament, consisting of the bishops, "'fidalgoes," and '"'ricos homens" of the realm, which is the first on record, as that at Lamego in 1143 is apocryphal. The king assented to the final compact which his father had made with the church, and propounded a law of mortmain, probably drawn up. by Juliaéo, by which the church could receive no more legacies of land, because it could not perform military service. Affonso himself proved to be no warrior, but he was very tenacious of the wealth and power of the crown, and refused to hand over to his brothers the large legacies which Dom Sancho had left to them ; and it was not until after a long civil war, in which Alphonso IX. of Leon joined, that he gave his sisters their legacies, at the same time taking care that they all became nuns, while his brothers went into exile, and never obtained their lands at all. Though Affonso himself was no soldier, the Portuguese infantry showed how free men could fight at the battle of Navas de Tolosa in 1212 ; and his ministers, bishops, and captains took advantage of the weakness of the Almohades after this great defeat to reconquer Alemtejo, and in 1217 they retook Alcdcer do Sal, and defeated the walis of Andalusia with the help of a body of crusaders. In this expedition the king took no part; he was more bent upon filling lus treasury, which soon brought him again into conflict with the church. HIs chancellor, Gongalo Mendes, inherited the policy of Julido, and encouraged him to lay hands on the lands of the archbishop of Braga, Estevaéo Soares,*~~

~~*Sancho II.*~~

~~*Affonso Ill.*~~

~~*whereupon Pope Honorius III. excommunicated the king and laid an interdict upon the kingdom until Affonso should make compensation and should expel his chancellor from court. This Affonso refused to do, and he was still under the interdict of the church when he died in 1223.*~~

~~*Sancho II. was only thirteen when he succeeded his father, and, as might have been expected during a minority, the turbulent nobility and intriguing bishops tried to undo the late king's labours to consolidate the royal power. The old statesmen of Affonso II.—Gongalo Mendes, the chan- cellor, Pedro Annes, the "mordomo mor" or lord steward, and Vicente, dean of Lisbon—saw that it was necessary to get the interdict removed if there was to be peace during the king's minority, and so they prudently retired into the background. Estevdo Soares, the archbishop of Braga, then became the most powerful man in the kingdom, and, with Abril Peres, the new mordomo mor, he agreed with Alphonso IX. of Leon that the Portuguese should attack Elvas at the same time that the Spaniards laid siege to Badajoz. The siege of Elvas was completely successful ; the young king greatly distinguished himself, and in the following year, 1227, felt strong enough to reinstate his father's old friends in office, making Vicente chancellor, Pedro Annes once more mordomo mor, and Martim Annes '"Calferes mor" (standard-bearer). This change of power greatly disconcerted the bishops and clergy, who began to intrigue for the overthrow of the young king, but he wisely continued to occupy himself with fighting the Mohammedans, knowing well that the pope would not dare to attack a crusading monarch. He endeavoured to imitate closely his cousin St Louis of France, and his wise policy secured him the protection of the pope, who in 1228 sent John of Abbeville as legate, with full powers to re- buke the Portuguese bishops. The legate made the chan- cellor, Vicente, bishop of Guarda, and highly commended the favour shown by the king to the friars, who had been introduced into Portugal by his aunts, and to the military orders. But in 1237 Dom Sancho II. had another serious quarrel with the church, and an interdict was laid on the kingdom; but prompt submission to Pope Gregory IX. secured immediate pardon. Meantime his old and wise councillors had mostly died, and his court was thronged with gay young knights and troubadours. He again attacked the Mohammedans, and invaded Algarves ; and in 1239 he took Mertola and Ayamonte, in 1240 Cacello, and in 1244 Tavira. Unfortunately in the interval between 1240 and 1244 the king fell in*~~

~~*love with a Castilian lady, Donna Mencia Lopes de Haro, the widow of Alvares Peres de Castro, whom he probably married. This union was most distasteful to the Portuguese people, and furnished the bishops with a pretext for forming a party and over- throwing him, provided they could find a leader and obtain the assistance of the pope. In 1245 the king's brother, Affonso, who had settled at the court of his aunt, Blanche of Castile, queen-dowager of France and mother of Louis IX., and who had there married the heiress of Boulogne, offered himself as a leader to the Portuguese malcontents. The pope at once issued a bull, deposing Sancho, and Jodo Egas, archbishop of Braga, Tiburcio, bishop of Coimbra, and Pedro Salvadores, bishop of Oporto, went to Paris and offered Affonso of Boulogne the crown of Portugal on cer- tain conditions, which he accepted and swore to obey. In 1246 Affonso arrived at Lisbon, and solemnly declared him- self the defender of the kingdom; and for two years a civil war raged, which ended in Dom Sancho's retiring to Toledo, where he died on 8th January 1248.*~~

~~*With such a commencement it might have been expected that the reign of Affonso III. would have been a period of civil war and internal dissension, or at least of complete submission to the church and the feudal nobility, but, on*~~

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~~*[HISTORY.*~~

~~*the contrary, it was from a constitutional point of view the most important of all the early reigns, and also that in which Portugal concluded its warfare with the Moham- medans and attained to its European limits. In short, Affonso IIT. was essentially a politic king, if not a high- principled man. On his brother's death he exchanged his title of " visitador" or "curador" of the kingdom for that of king, and at once prepared to complete the conquest of Algarves. Aided by his uncle Dom Pedro and the Knights Hospitallers under Gongalo Peres Magro, he speedily re- duced the remainder of the province. This rapid extension of the Portuguese territory was by no means agreeable to Alphonso X. "the Wise," king of Leon and Castile; but, after a short war, Affonso IIT. consented to marry Alphonso's illegitimate daughter, Donna Beatrice de Gusman, and to hold Algarves in*~~

~~usufruct only. He then turned his at- tention to his own position in Portugal, and determined to bridle the power of the bishops, in spite of his oath at Paris. Perceiving that this could only be done with the help of the mass of the people, he summoned a cortes at Leiria in 1254, to which representatives of the cities were elected and sat with the nobles and higher clergy. With the help of this cortes—one of great importance in the constitutional history of Portugal—he dared the interdict laid upon the kingdom for having married again (the daughter of Alphonso the Wise) whilst his first wife (Matilda, countess of Boulogne) was alive. Finally, how- ever, on the petition of the archbishops and bishops of Portugal, Pope Urban IV. legalized the disputed marriage in 1262 and legitiniated his elder son, Dom Diniz, while in 1263 Alphonso X. made over to him the full sovereignty of Algarves. On the other hand, the people made use of their power, and in a full cortes at Coimbra in 1261 the representatives of the cities boldly denounced Affonso's tampering with the coinage, and compelled recognition of the fact that taxes were not levied by the inherent right of the king but by the free consent of the people. Aftera prosperous and successful reign Nemesis came upon Affonso in the rebellion of his eldest son Diniz in 1277, which con- tinued until 1279, in which year the king died.~~

~~The period of war and of territorial extension in the Diniz,~~

~~Peninsula was now over, and the period of civilization was to dawn. Territorially and constitutionally Portugal was now an established kingdom ; it remained for it to become civilized and thoroughly homogeneous before the great heroic period of exploration and Asiatic conquest should begin. No better man for such work than the new king, Dom Diniz, could have been found : he was himself a poet and loved letters; he was a great administrator and loved justice ; above all he saw the need of agriculture and the arts of peace to take the place of incessant wars, and nobly earned the title of the "Ré Lavrador," or '" Denis the Labourer." From all these points of view his reign is of vast importance in the history of Portugal, though, like all reigns of peaceful progress, it is not signalized by many striking events. It began with a civil war between Diniz and his brother Affonso, who disputed his legitimacy, which ended in a compromise; and in 1281 Diniz married Isabel, daughter of Pedro III. of Aragon, who for her~~

~~*pure and unselfish life was canonized in the 16th century. His reign is only marked by one war with Sancho IV. and his successor, Ferdinand IV., of Castile and Leon, which was terminated in 1297 by a treaty of alliance, according to the terms of which Ferdinand IV. matried Constance, daughter of Diniz, while Affonso, the heir to the throne of Portugal, married Beatrice of Castile, sister of Ferdinand. Still more interesting are the king's relations with Edward I. of England, with whom he ex- changed many letters, and with whom he made a com- mercial treaty in 1294. He corresponded also often with*~~

~~*Affonso IV.*~~

~~*Pedro I.*~~

~~*Ferdi- nand.*~~

~~*HISTORY. |*~~

~~*Edward IT. of England, and agreed with him in 1311] that the Knights Templars had been greatly maligned ; and on their suppression by Clement V., recollecting the great services which the military orders had rendered to Portugal and their great power, Dom Diniz founded the Order of Christ, and invested it with the lands of the Templars, thus at once obeying the pope and avoiding a serious dis- turbance at home. The king showed his love of agricul- ture by the foundation of agricultural schools and homes for farmers' orphans, as well as by encouraging improved farming, and by establishing the pine forest of Leiria, his love of justice by wise laws, checking, though not abolish- ing, the feudal courts, and by the appointment of royal corregidors in every town of which the crown possessed the franchise, and his love for commerce by his commercial treaty with England, and by the foundation of a royal navy, of which a Genoese, named Emmanuel Pessanha, was the first admiral. But his real affection was for litera- ture: he encouraged a school of Portuguese poets at his court, and established a university at Lisbon, which, after many changes, found a permanent home at Coimbra. At the end of this reign war broke out between the king and the heir-apparent, and a pitched battle was only prevented in 1323 by St Isabel riding between the armies and making a*~~

~~*peace between her husband and her son, which lasted until the death of the great peace-monarch, the Ré Lavrador, in 1325.*~~

~~*Affonso IV. pursued his father's policy of making family alliances with the kings of Aragon and Castile, and in 1328 married his daughter, Donna Maria, to Alphonso XI. of Castile, who neglected her, and for her sake Affonso IV. declared war against Castile. Peace was made through the intervention of St Isabel in 1340, when Dom Pedro, son of Affonso, married Constance Manuel, daughter of the duke of Penafiel, and Affonso IV. himself promised to bring a strong Portuguese army to the help of Alphonso XI. against the emir of Morocco, Abi Hamem, who had crossed the straits to assist the sultan of Granada. The united Christian armies won a decisive victory at the river Salado, in which Affonso especially distinguished himself, and earned the title of "the Brave"; from that time he re- mained at peace with Castile, and further strengthened his position in Spain in 1347 by marrying his daughter, Donna Leonora, to Pedro IV. of Aragon. The later years of the reign of Affonso IV. were stained by the tragedy of Donna Ines de Castro. (See vol. v. p. 202.)*~~

~~*The first act of Dom Pedro on ascending the throne in 1357 was to punish the murderers of Ines; and further, to show his love for her, he had her dead body disinterred and crowned, and afterwards solemnly buried with the kings and queens of Portugal in the convent of Alcobaga. The spirit of stern, revengeful justice which had marked the commencement of his reign continued to show itself in all matters of administration ; he punished priest and noble with equal severity, and the people gave him the title of "Pedro the Severe." Like his grandfather, he greatly valued the friendship of England, and was on intimate terms with Edward IIL, who in 1352 had ordered his subjects by proclamation never to do any harm to the Portuguese. A curious sequel to the commercial treaty of 1294 was executed in 1353, when Affonso Martins Alho, on behalf of the maritime cities of Portugal, signed a treaty with the merchants of London guaranteeing mutual -good faith in all matters of trade and commerce. This is the most interesting feature of Dom Pedro's short reign.*~~

~~*The accession in 1367 of Ferdinand, the only son of Pedro by Constance, marks a crisis in the history of the Portu- guese monarchy. Asa natural*~~

~~*result of the long peace which had succeeded the final conquest of Algarves, the people of Portugal had grown richer, more cultivated, and*~~

~~*more conscious of their nationality, while the court had grown more and more dissolute and more out of conson- ance with the feelings of the people. If the Portuguese monarchy was to continue to exist, it was obvious that it must become again a truly national monarchy, as it had been in the days of Affonso Henriques, and that the kings must remember their duties and not think only of their pleasures. The life and reign of Dom Ferdinand are marked, like those of his father, by a romantic amour, which, if not so tragic as the story of Ines de Castro, had far greater political importance. Ferdinand was a weak and frivolous but ambitious king, who, after binding him- self to marry Leonora, daughter of the king of Aragon, suddenly claimed the thrones of Castile and Leon in 1369 on the death of Pedro the Cruel, through his grandmother, Beatrice of Castile, and was favourably received at Ciudad Rodrigo and Zamora. But the majority of the Castilian nobles did not wish to see a Portuguese monarch on their throne, and welcomed the illegitimate Henry of Trastamare as Henry II. of Castile. The contest ended in 1371 through the intervention of Pope Gregory XI., Ferdinand agreeing to surrender his claims on Castile and to marry Leonora, daughter of Henry II. However, in spite of the pope, this treaty was never carried out; Ferdinand had seen and fallen passionately in love with Donna Leonora Telles de Menezes, daughter of a nobleman in Tras-os-Montes and wife of Jo&o Lourenco da Cunha, lord of Pombeiro. For love of this lady, whom lhe eventually married, he refused to fulfil his treaty with Castile; but Henry II. strongly resented this insult, and taking up arms invaded Port- ugal and laid siege to Lisbon. Ferdinand entered into negotiations with John of Gaunt, who also claimed Castile through his wife Constance (daughter of Pedro the Cruel), and he signed a treaty of alliance through his ambassador, Joio Fernandes Andeiro, with Edward III. of England, Donna Leonora, however, did not approve of the English alliance, and in 1374 Ferdinand made peace with Castile through the mediation of Cardinal Guy of Boulogne. The queen was now supreme, and terrible in her*~~

~~*tyranny. She had not even the merit of constancy, for she fell in love with Andeiro, the late ambassador to England, and in- duced the king to make him count of Ourem. Ferdinand himself continued to aspire to the throne of Castile; and in 1380, after the death of Henry II. he again sent Andeiro to England to procure assistance for a new war against Henry's successor, John I. Richard II. of England received the ambassador graciously, and in 1381 the earl of Cambridge, brother of John of Gaunt, arrived with a powerful force, and his son Edward was betrothed to Donna Beatrice, Ferdinand's only child, who had been recognized as heiress to the throne by a cortes at Leiria in 1376. But the Portuguese king, as usual, failed to keep faith, and in 1383, under the influence of the queen, he deserted the English, who then ravaged Portugal and made peace with John I. of Castile at Salvaterra. By this treaty John I. engaged to marry Donna Beatrice, and it was arranged that Queen Leonora should be regent of Portugal until Beatrice's eldest son came of age. Six months after- wards, on 22d October, King Ferdinand died, and Donna Leonora assumed the regency.*~~

~~*But she did not hold it long. The whole Portuguese Regency*~~

~~*people detested her, and their feeling of nationality was of outraged by the contemplated union of their crown wit that of Castile. Dom John, grandmaster of the Knights of St Bennett of Aviz, and an illegitimate son of Pedro the Severe, shared both the personal hatred for the queen and the political desire for independence, and on 6th December he headed an insurrection at Lisbon and slew the queen's lover, Andeiro, in the precincts of the palace. Leonora fled to Santarem and summoned John I. of Castile to her*~~

~~*i Leonora.*~~

~~*John I.*~~

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~~*help, while Dom John was proclaimed defender of Portugal, Joio das Regras being appointed chancellor and Nuno Alvares Pereira constable. Dom John sent to England for assistance, which was promised him, and put the capital in a state of defence. In 1384 John of Castile entered Portugal*~~

~~*and formed the siege of Lisbon. The resistance was worthy of the cause; the archbishop of Braga fought like a knight; but a pestilence in the besiegers' camp did them more mischief than even the bravery of the besieged, and John I. had to retire defeated. Before doing so he discovered that Donna Leonora had plotted to poison him, so he seized her and imprisoned her in the convent of Tordesillas, where she died in 1386. But it availed little to have repulsed one Castilian army ; the relative sizes of Portugal and Castile made it obvious that the struggle would be a severe one; the independence of Portugal was at stake, and the Portuguese fought as men fight for their existence as a nation. The heroic constable, who won the surname of the '"'Holy Constable," defeated the Castilians at Atoleiro and Trancoso. On 6th April 1385 a cortes assembled at Coimbra, and declared the crown of Portugal to be elective, choosing, at the instance of the chancellor, Dom John to be king of Portugal. King John then called all his chivalry together, with the freemen of his cities, and, with the help of 500 English archers, utterly defeated a superior Castilian army at Aljubarrota on 14th August, and in the following October the Holy Constable destroyed another army at Valverde. These blows greatly weakened the prestige of Castile and increased that of Portugal, and when John of Gaunt arrived the following year with 2000 lances and 3000 archers the king of Castile sued for peace. King John of Portugal perceived the advantage of the friendship and alliance of England, and on 9th May 1386 was signed the treaty of Windsor, by which the two countries were to be allies for ever in every transaction. He drew the alliance still closer in 1387 by marrying Philippa of Lancaster, a daughter of John of Gaunt by his second marriage ; and a truce was made between Portugal and Castile, and renewed at intervals until a final peace was signed in 1411. The only attempt made to disturb King John I. was an incursion by the eldest son of Ines de Castro, Dom Diniz, in 1398, assisted by Henry III. of Castile, but the legitimate claims of the prince carried no weight against the conqueror of Aljubarrota, and he retired discomfited. The long reign of John I. was, like that of King Diniz, a reign of peaceful development: Diniz had settled and united the country after the Moorish wars ; John did the same after the obstinate war with Castile, and at the end of his reign saw Portugal beginning to ex- pand beyond the sea. The keynotes of his foreign policy were friendship with England and peace with Castile. Henry IV., Henry V., and Henry VI. of England all suc- cessively ratified the treaty of Windsor; Richard II. sent*~~

~~*troops to help King John against Dom Diniz in 1398; Henry IV. made him a knight of the Garter in 1400 ; and Henry V. sent him help in the expedition to Ceuta in 1415. John's internal government was not so happy, for, though personally a clever administrator, he had had, in order to maintain himself when he claimed the crown, to grant vast privileges and estates to the nobles, who became more and more powerful, and, by their exercise of full feudal rights, almost independent. It was at the earnest request of his three elder sons, Dom Duarte or Edward, Dom Pedro, and Dom Henry, that he consented to invade Africa in 1415. The young princes desired to win their knightly spurs; there were no enemies at home; and what could be more proper than to attack the old hereditary foes of Portugal, the Moors, in Morocco itself? The queen from her death- bed sent her blessing; the princes proved themselves worthy sons of their father ; and by the occupation of Ceuta the*~~

~~*VGA Eh*~~

~~*Portuguese made their first conquest beyond the limits of their country. The expedition over, the elder princes each followed his own bent: Dom Edward assisted his father in the labours of government ; Dom Pedro, who was made duke of Coimbra, travelled throughout Europe, and showed himself everywhere a learned and accomplished as well as brave knight; and Dom Henry, who was master of the Order of Christ, governor of Algarves, and duke of Viseu, established himself at Sagres, and devoted his life to the encouragement of maritime exploration, for an account of which see vol. x. pp. 179, 180. Portuguese discoveries thus made illustrious the closing years of the reign of King' John, who died in 1433.*~~

~~*[WISTORY.*~~

~~*Contrary to expectation, the reign of King Edward (so Edward.*~~

~~*called after Edward III. of England) proved, in spite of his own great qualities, but short, and was marked by one signal disaster. On ascending the throne he summoned a full cortes at Evora and secured the passing of the Lei Mental, or the provision which was supposed to be in the mind of King John when he gave his extensive grants to the nobility, namely, that they could only descend in the direct male line and on failure should revert*~~

~~*to the crown. By this means Edward hoped to check the excessive power of the nobles, many of whom fled to Castile. He supported his father's policy, married a princess of Aragon, and, after confirming the treaty of Windsor, was made a knight of the Garter in his father's room. He also encouraged the explorations of Dom Henry; but the king's hfe was shortened and Dom Henry's explorations were checked for a time by the fatal expedition to Tangiers in 1436. At the earnest request of his youngest brother Dom Ferdinand and of Dom Henry himself, and in spite of the remon- strances of the pope and Dom Pedro, the king sent a fleet to attack Tangiers; the army was cut off, and it was only by sacrificing Dom Ferdinand as a hostage that the troops were allowed to retire to their ships. The imprisonment of his brother preyed on King Edward's mind, and he died in 1438, while Dom Ferdinand, after a long and cruel captivity at Fez, borne with such exemplary piety as to win him the title of 'the Constant Prince," died from ill- treatment in 1443.*~~

~~*The new king, Affonso V., was a minor, and his reign Affonso*~~

~~*began with a struggle for the regency between his mother, V- Donna Leonora, and his uncle, Dom Pedro, duke of Coimbra. The people of Lisbon supported the latter, who was re- cognized as regent ; and his conduct justified the choice. He pursued his brother's policy of curbing the pretensions of the nobles, and encouraged Dom Henry's work of dis- covery, which advanced every year. Dom Pedro's power was seemingly at its height in 1447 when Affonso V. was declared of age and at the same time married his cousin Leonora, daughter of Dom Pedro; but the duke of Bra- ganza poisoned the king's mind against his uncle, and schemed his dismissal from court. Then, not satisfied with this, he marched against him with a royal army, largely recruited by the nobility, who hated the duke of Coimbra. The two forces met at Alfarrobeira on 20th May 1449, when the regent was slain, to the great regret of the Portuguese people. The young king fell more and more under the influence of the duke of Braganza and his sons, who humoured his desire for knightly fame and his dream of sitting on the throne of Castile, and who secured to themselves vast grants of royal property. This knightly idea appears in Affonso's three expeditions to Africa, which won him the surname of 'the African": in 1458 he took Aledcer Seguier; in 1461 he failed; and in 1471 he took Arzilla and Tangiers.*~~

~~*Meanwhile maritime exploration went on apace; but in 1460 Dom Henry the Navigator, the heart and soul of these mari- time enterprises, died. The "Ré Cavalleiro" or knightly*~~

~~*John II.*~~

~~*HISTORY. |*~~

~~*king was now bent on the old chimerical scheme of win- ning Castile ; for that purpose he married in 1475 his own niece, the infanta Joanna, only daughter of Henry IV. of Castile, and claimed the kingdom ; but the Castilians pre- ferred the infanta Isabella, who had married Ferdinand, king of Aragon. The rival parties took up arms; and the king of Portugal was utterly defeated at Toro in 1476, which sent him hurriedly to France to beg help from Louis XI. ; but his mission was in vain, and he saw no alterna- tive save signing the treaty of Alcantara (147 8), by which his newly-won wife was sent to a convent. He remained*~~

~~*inconsolable at his loss, and alternately abdicated and*~~

~~*returned until his death in 1481.*~~

~~*His successor, John II., was a monarch of a very different type: though he had proved himself a brave and valiant soldier at the battle of Toro, he pursued the old policy of the house of Aviz, that of peace and family alliances with Castile and of commercial intimacy with England. But he was also a typical king of this period, and followed the example of Louis XI. in France and Henry VII. in England in breaking the power of the nobles, with the hearty acquiescence of the people. Besides political reasons for this policy, he remembered that he was the grandson of the great duke of Coimbra, and bound to revenge his murder at Alfarrobeira. The first act of his reign was to summon a full cortes at Evora, at which it was decreed that the royal corregidors should have full right to admin- ister justice in all the feudal dominions of the nobility. This act brought him of course into direct conflict with the nobility, who were headed by Ferdinand, duke of Braganza, to the king's great delight, for, as he said, the wanton liberality of his father had left him only the high roads of Portugal for his inheritance. Hence the duke of Braganza was naturally the first object of the king's*~~

attack. He was the wealthiest nobleman not only in Por- tugal but in the whole Peninsula; his brothers held the high offices of constable and chancellor of the kingdom, and they too had all assisted in the overthrow of the duke of Coimbra. He believed himself to be safe because he and the king had married sisters, but he was promptly arrested for high treason, and after a very short trial exe- cuted at Evora on 22d June 1483. His own and the king's brother-in-law, Ferdinand, duke of Viseu, a grand- son of King Edward, succeeded to the leadership of the nobles ; but John IL, imitating Louis XI.'s policy of not sparing his own family, stabbed him with his own hand at Setubal on 23d August 1484, and afterwards executed some eighty of the leading nobles, breaking the feudal power of the class for ever. This terrible struggle over, he occupied himself with such success in administration that he won the surname of "the Perfect King." But he did not intend to keep the Portuguese in idleness. He was surrounded by the gallant knights who had been trained by his father, and who, though now frightened out of treason, yet needed some occupation, and at his court were the famous navigators trained by Dom Henry. In 1484 he built a fort at La Mina or Elmina to cover the increasing trade with the Gold Coast, and in 1486 Bartholomeu Dias rounded the Cape of Good Hope and reached Algoa Bay. The king was full of plans for reach- ing India and discovering Prester John ; besides despatch- ing a special expedition for this purpose in 1487, he sent Pedro de Evora and Gongalo Annes to Timbuctoo, and Martim Lopes to Nova Zembla to find a north-east road to Cathay. With all his perspicacity, he made the great mistake of dismissing Columbus in 1493 as a visionary ; but he was occupied to the very last day of his life in getting ready the fleet with which Vasco de Gama was to find out the passage to India by the Cape of Good Hope (see vol. x. p. 181 sg.).. It was in his reign, in 1494, that

the pope issued his famous bull dividing the undiscovered parts of the world between Spaniards and Portuguese. A great sorrow darkened the later years of John II. in the death of his only son Affonso, who in 1490 had

~~*married Isabella, eldest daughter of Ferdinand and Isabella of Spain ; and he himself died in the flower of his age in 1495,*~~

~~*The reign of Emmanuel "the Fortunate," brother of Emman- the murdered duke of Viseu, is the heroic period of Ul*~~

~~*Portuguese history. The great men and brave knights of the reigns of Affonso V. and John II. were still living, and Vasco de Gama, Francisco de Almeida, and Affonso de Albuquerque were to make their king's reign for ever glorious. Yet Emmanuel personally contributed but little to this glory; his one idea was to sit on the throne of Castile. To gain this end he proposed to marry Isabella, eldest daughter of Ferdinand and Isabella and widow of Dom Affonso, and to win her hand he consented to expel the Jews from Portugal, although they were the richest and most useful class of people in the kingdom, and had been faithfully protected ever since the days of Affonso Henriques. He married Isabella in 1497, and was on a progress through Spain in the following year for the pur- pose of being recognized as heir to the throne, when she died suddenly at Toledo, and with her disappeared his great hopes. Even then he did not despair, but in 1500 married his deceased wife's sister, Maria, though her elder sister Joanna was also married, and had a son, who was afterwards the emperor Charles V. While the king was thus occupied great things were being done in Asia by his subjects. In 1497 Vasco de Gama had crossed the Indian Ocean and reached Calicut ; in 1500 Pedro Alvares Cabral discovered Brazil on his way to India; in 1502 Vasco de Gama paid his second visit to the Malabar coast ; in 1503 Duarte Pacheco defended Cochin and with 900 Portuguese defeated an army of 50,000 natives; and in 1505 Francisco de Almeida was appointed first viceroy of India. This is not the place to dilate on the great deeds of ALBUQUERQUE (g.v.) and of the Portuguese in India; it is enough here to mark the dates of afew of the most important dis- coveries and feats of arms which illustrate the reign of Emmanuel. In 1501 Jofo da Nova discovered the island of Ascension and Amerigo Vespucci the Rio Plata and Paraguay ; in 1509 Diogo Lopes de Sequieira occupied Malacca ; in 1510 Affonso de Albuquerque occupied Goa ; in 1512 Francisco Sendo discovered the Moluccas; in 1515 Lopes Soares built a fort at Colombo in the island of Ceylon; in 1517 Fernando Peres Andrada established himself at Canton, and made his way to Peking in 1521 ; and in 1520 Magalhies*~~

~~(Magellan), a Portuguese sailor, though in the Spanish service, passed through the straits which bear his name.~~

~~The reign of John III, who succeeded Emmanuel in John II.~~

~~1521, is one of rapid decline. The destruction of the feudal power of the nobility by John II. had not been an unmixed good: it had fatally weakened the class of leaders of the people ; the nobility lost all sense of patriotism and intrigued for "moradias," or court posts; and, in short, their position was much the same as that of the French nobility before the Revolution of 1789. The overthrow of their power had also made the king absolute; having now no feudal nobility to combat, he had no need of the support of the people, and the newly-created Indian trade brought him an income greater than that of any prince in Europe, so that he had no need of taxes. There was, however, a more serious cause of the declining power of Portugal than the absolutism of the government, and that was the rapid depopulation of the country. Alemtejo and Algarves had never been thoroughly peopled ; the devasta- tion produced by constant war could not be easily repaired; and, though the exertions of Diniz the Labourer had made XIX. — 69~~

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~~Beira the garden of Europe, the southern part of the king- dom was chiefly in the hands of the military orders, who did not sufficiently encourage immigration. The great dis- coveries of the 15th century quickened the depopulation of Portugal. Not only did the bulk of the young men gladly volunteer as soldiers and sailors to go in search of wealth and honour, but whole families emigrated to Madeira and the Brazils. Also the Portuguese who did continue to live in their native country flocked to Lisbon, which trebled in population in less than eighty years, owing to the large fortunes which could be made there in trade. The king, the nobles, and the military orders were quite unconcerned at this extensive emigration, for their large estates were cultivated much more cheaply by African slaves, who were imported from the time of the first voyages of Dom Henry in such numbers that Algarves was entirely cultivated by them, and even in Lisbon itself they outnumbered the free- men by the middle of the 16th century. In this respect the condition of Portugal resembled that of Italy at the time of the decline of~~

~~*the Roman empire, as the wealth of Lisbon resembled that of imperial Rome, while in another respect the utter corruption of the officials in the factories and Indian settlements too far resembled the peculation and corruption of the Roman proconsuls. While the Portuguese nation was exhibiting these signs of a rapid decline, another factor was added by the religious zeal of John III. This king inherited his father's bigotry and fanaticism, and was anxious to introduce the Jesuits and the Inquisition into Portugal. The Church of Rome was not likely to hinder his pious desire, but for several years the "neo-Christians"—the name given to the half-hearted converts made from the Jews as the condition of their remaining in Portugal—managed to ward off the blow. But the king's earnest wish was gratified at last, and in 1536 the tribunal of the Holy Office was established in Portugal with the bishop of Ceuta as first grand inquisitor, who was soon succeeded by the king's brother, the cardinal Henry. The Inquisition quickly destroyed all that was left of the old Portuguese spirit, and so effectu- ally stamped out the Portuguese revival of literature that, while towards the close of the 16th century all Europe was becoming civilized under the influence of the Renais- sance, Portugal fell back and her literature became dumb. The king had his reward for his piety: he was permitted to unite the masterships of the orders of Christ, Santiago, and Aviz with the crown, and to found new bishoprics at Leiria, Miranda, and Porto Alegre; but it was left to St Francis Xavier to show the real beauty of Christianity in his mission to the Indies.*~~

~~*It was in India that the decline of the Portuguese was most perceptible. Nuno da Cunha, son of the discoverer Tristan da Cunha, governed the Indian settlements worthily till 1536, and then corruption undermined all prosperity until the arrival of Dom Jodo de Castro in 1545. He was a Portuguese hero of the noblest type; and for three years the friend of St Francis Xavier revived the glories of Albu- querque by winning the battle of Diu, and then died in the missionary's arms. Everything went afterwards from bad to worse, till even observers like the Dutchman Cleynaerts saw that, in spite of all its wealth and seeming prosperity, the kingdom of Portugal was rotten at the core and could not last. King John III, satisfied with peace and the establishment of the Inquisition in his kingdom, did nothing to check the decline; and he endeavoured to secure his aims by the marriage of his only surviving son John to his niece Joanna, a daughter of*~~

~~*Charles V., but he had the misfortune to outlive his son, who died in 1554. When he himself died in 1557 he left the crown to his*~~

~~*grandson, a child of three years old, the ill-fated Dom Sebastian.*~~

~~*UGAL*~~

~~*[HISTORY.*~~

~~*Nothing could be more disastrous for Portugal than the Sebas- Under the will of tian.*~~

~~*succession of a minor at this juncture. John III. the regency was assumed by Queen Catherine and the cardinal Henry, his widow and his brother, but all power was exercised by the brothers Luis and Martim Gongalves Camara, of whom the former was the young king's tutor and confessor and the latter prime minister. In 1568 Dom Sebastian was declared of age by the Camaras, who thus excluded the cardinal from even a semblance of power. As the king came to take more interest in affairs, the mixture of imperiousness, fanaticism, and warlike ambi- tion which made up his character began to make its mark upon his reign. He tried to check the luxury of his people by a sumptuary edict that no one might have more than two dishes for dinner; he encouraged the Inquisition ; and he dreamt of a new crusade in Africa for the conquest and conversion of the Moors. His crusading ardour was most objectionable to his people, who had highly approved of John IIT.'s surrender of all ports in Africa except Ceuta, Tangiers, Arzilla, and Mazagan, but the Jesuits and young courtiers about his person encouraged him in his wild ideas. In 1574 he paid a short visit to Ceuta and Tangiers, and in 1576, to his great delight, Mouley Ahmed ibn 'Abdallah, after being disappointed in his application to Philip IZ. for help against Mouley 'Abd al-Melik, sultan of Morocco, applied to Sebastian. The king proceeded to raise money by harsh taxes on the converted Jews and by partial bankruptcy, and set sail for Africa on 24th June 1578 with 15,000 infantry, 2400 cavalry, and 36 guns ; of this army only some 10,000 were Portuguese, the rest consisting of Spanish and German volunteers and mer- cenaries, and 900 Italians, under Sir Thomas Stukeley, whom, when on his way to deliver Ireland from Elizabeth, Sebastian had stopped. On reaching Africa the Portuguese king was joined by Mouley Ahmed with 800*~~

~~*Mohammed- ans. He at first amused himself with hunting, and then, just as Dom Ferdinand had done in 1436, he foolishly left his base of operations, his fleet, and the sea, and began to march over the desert to attack Larash (El-Araish). Mouley 'Abd al-Melik, who had previously endeavoured to dissuade the young king from his purpose, collected an army of 40,000 cavalry, 15,000 infantry, and 40 guns, and, feeling that he was himself on the point of death from a mortal disease, ordered an instant attack upon the Portuguese at Alcdcer Quibir, or Al-kasr al-Kebfr, on 4th August 1578. Dom Sebastian behaved like a brave knight, though he had not been a prudent commander, and when all was lost he was determined to lose his own life also. According to the most trustworthy account, Christovaéo de Tavora, his equerry, had shown a flag of truce, and had offered to surrender with the fifty horsemen who still remained about the king, when Sebastian sud- denly dashed on the Moorish cavalry, who, irritated by this breach of faith, instantly slew him and the brave equerry who had followed his master. The slaughter was terrible ; Mouley "Abd al-Melik died during the action ; Mouley Ahmed was drowned ; Sir Thomas Stukeley was killed, with many of the chief Portuguese nobles and pre- lates, including Don Jayme de Braganza (brother of the sixth duke of Braganza), the duke of Aveiro (who had com- manded the cavalry), and the: bishops of Coimbra and Oporto, while among the prisoners were the duke of Bar- cellos and Duarte de Menezes. The sad news was brought to Lisbon by the admiral of the fleet, Dom Diogo de Sousa,*~~

~~*and the cardinal Henry was proclaimed king of Portugal Henry I.*~~

~~*as King Henry I.*~~

~~*Hardly had the new king been crowned when intrigues began about his successor. He could not live long; but he determined not to examine the question himself, and so summoned a cortes at Lisbon at once to decide it. Of*~~

~~*Philip IT. of Spain.*~~

~~*HISTORY. |*~~

~~the seven candidates only five need be seriously considered, for Pope Gregory XITI.,who claimed as heir-general to a car- dinal, and Catherine de'Medici, who claimed through Affonso~~

~~IIT. and his first wife, the countess of Boulogne, require no further notice ; the relationship of the other five to Em- manuel can be best perceived from the following table :—~~

~~Emmanuel.~~

~~| SS = ee~~

~~John III., Isabel, Beatrice Louis Ferdinand Affonso Henr Bava d. b. 1502, d. 1557, b. 1503, d. 1539, _. 1504, d. 1588, — _b, 1506, d. 1545, b. 1507, d. 1834, B. 1509, d. 1540, b. 1512, ri 1580, b. 1515, d. 1545 m. Catherine of Austria. m. Charles V. m. Charles ITT. of duke of Beja. dukeofGuarda. cardinal and cardinal and duke of Guimariens, Savoy. archbishop of king. m. Isabel of Braganza,. Lisbon. John, Philip II. Philibert Emmanuel Antonio Catherine Maria b. 1537, d. 1554, duke of Savoy. prior of Crato m. duke of Braganza, m, duke of Parma. m. Joanna of Spain. (illegitimate).~~

~~Sebastian, b. 1554, d. 1578.~~

~~It clearly appears that the heiress to the throne was Catherine, duchess of Braganza, and failing her heirs the duke of Parma, and that the claims of Philip II. and of the duke of Savoy were only valid in case of the extinction of the line of Dom Edward. Yet, though the university of Coimbra declared in favour of the duchess of Braganza, Philip II. set to work to win over the majority of the cortes. Money and lavish promises assisted the eloquence of his two chief supporters, Christovao de Moura and Antonio Pinheiro, bishop of Leiria ; and when the cardinal- king died on 31st January 1580 the cortes was quite ready to recognize Philip, although the people, or rather that small portion of the inhabitants who were really Portu- guese, felt their old disinclination towards the union of Spain and Portugal. Philip~~

~~*prevented any movement on the part of the duke of Braganza by promising him Brazil with the title of king, and a marriage between the prince of the Asturias and his daughter, which, as the duke hated war and loved ease, were readily accepted ; but to Philip's | surprise a competitor whom he had taken no account of, Antonio, the prior of Crato, declared himself king at San- tarem, and then entered Lisbon and struck money. Port- ugal, however, enervated by wealth, oppressed by the Inqui- sition, and reduced in free population, felt no inclination to make a powerful stand against Philip, who had all the prestige of being the son of Charles V., while the hot-*~~

~~*Ranuccio, duke of Parma.*~~

~~*were Portuguese of low birth, who were recognized by a few people in the vicinity of their native villages, and easily captured in 1584 and 1585; the third, Gabriel Espinosa, was given out as Dom Sebastian by a Portuguese Jesuit, and introduced as such to Donna Anna, a natural daughter of Don John of Austria, who believed in him, but he was executed in 1594; while the fourth, a poor Calabrian named Marco Tullio, who could not speak a word of Portuguese, asserted his pretensions at Venice as late as 1603, twenty-five years after Dom Sebastian's death, and, after obtaining some success in Italy, was also captured, sent to the galleys, and afterwards executed. Of more importance were the renewed attempts of the prior of Crato to assert his claims with the assistance of foreign allies. In 1582 he proceeded to the Azores with a strong French fleet under Philip Strozzi, but his ill-fortune fol- lowed him: Strozzi was defeated and killed in a battle*~~

~~*_with the Spanish admiral Don Alvaro de Bacam, and Dom*~~

~~*Antonio fled to England. There Elizabeth received him kindly, and in 1589 she sent a strong fleet under Drake and Norris to help him win back his "kingdom"; but Drake and Norris quarrelled, Portugal showed no willingness to receive him, nothing was done, and the English retired. The unfortunate prior, finding that Elizabeth would do nothing more for him, again returned to Paris, where he died in poverty in 1594.*~~

~~*headed but incapable prior of Crato could not be compared to the great John I. ; and the cortes, which had in 1385, under the honeyed words of Joao das Regras, enthusiasti-*~~

~~*"The sixty years' captivity," as the domination of Spain Domina- over Portugal from 1580 to 1640 is called, was a time of tion of disaster for the country: not only did the English sack Spain.*~~

~~*cally fought for Portugal, in 1580 listened to the promises of Christovaéo de Moura and rejected the prior of Crato. The duke of Alva entered Portugal at the head of a Spanish army and easily defeated Dom Antonio at Alcantara, after which Philip was declared king of Portugal.*~~

~~*The other candidates were obliged to acquiesce in Philip's success ; the duke of Braganza, though greatly dis- appointed at receiving only the office of constable and the order of the Golden Fleece instead of the whole of Brazil, was, like the majority of his countrymen, too apathetic to strike a blow. Philip pledged himself to recognize the individuality of Portugal in a cortes held at Thomar in 1581, when he promised that he would maintain the rights and liberties of the people, that the cortes should be as- sembled frequently, that all the offices in the realm should be given to Portuguese alone, that no lands or jurisdiction in Portugal should be given to foreigners, and that there should be a Portuguese council, which should accompany the king everywhere and have entire charge of all Portu- guese affairs. But the lower classes refused to believe | that Dom Sebastian was dead,—a belief encouraged by the stratagem of a wounded noble on the evening of the battle of Al-kasr al-Kebir to gain admission into the city of Tangiers by asserting that he was the king; and four successive impostors arose, who assumed the name of the dead monarch. The first two, who were mockingly called | the "king of Pennamacor" and the "king of Ericeira," |*~~

~~*Faro in 1595, but Dutch, English, and French all preyed upon its great colonial possessions; the Dutch in particular, after beating the Portuguese in India, took from them the greater part of the lucrative Indian trade. This they did with the more ease since, with the true commercial spirit, they not only imported merchandise from the East to Holland but also distributed it through Dutch merchants to every country of Europe, whereas the Portuguese in the days of their commercial monopoly were satisfied with bringing over the commodities to Lisbon, and letting foreign nations come to fetch them. The Dutch incursion into the Indies was directly caused by Philip's closing the port of Lisbon to them in 1594; and in 1595 Cornelius*~~

~~*Houtman, a Dutchman, who had been employed by the Portuguese as an Indian pilot and then imprisoned by the Inquisition, offered to lead a Dutch fleet to the Indies, and in 1597 they erected a factory in Java. They speedily extended their sphere of operations by occupying the Moluccas and Sumatra, and in 1619 they built Batavia as a rival commercial capital in the East to Goa. The English quickly followed their example; in the reign of Elizabeth the English captains had been content to ravage Pernambuco in 1594-95, Fort Arguin in 1595, and the Azores in 1596, and in the reign of James I. the East India Company was established in the Indies at Surat. The French also settled themselves in Brazil and opened a flourishing trade with South America and the*~~

~~*Revolt of*~~

~~*Portu- guese.*~~

~~*John IV.*~~

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~~*west coast of Africa; and even the Danes struck a blow against the monopoly of the Portuguese by building a factory at Tranquebar. To make up for these losses, what had Portugal received from Spain? The promises made to the cortes at Thomar were all broken; the cortes was only summoned once in 1619 to recognize Philip, the eldest son of King Philip IIL, as the heir to the throne on the occasion of his only visit to Lisbon; Lerma and Olivares, the all-powerful ministers of Philip III. and Philip IV., appropriated to themselves large territories within the realm of Portugal; and, whenever it was pos- sible, Spaniards were installed in Portuguese bishoprics and civil offices.*~~

~~*At last a blow was struck against this supremacy of Spain in the revolution of 1640 and the elevation of the house of Braganza to the throne of Portugal. Things had been tending towards a revolution for a long time, but the final impulse came from the energy of certain noble- men, conjoined with the weakness of Spain and the hope of assistance from France.*~~

~~*The general discontent was shown by risings in Lisbon in 1634 and in Evora in 1637, where for a short time the mob ruled the city; and, when Spain was hampered by the Catalan revolt and the French war, the opportunity seemed favourable for the Portuguese. The difficulty was to find a leader; the eighth duke of Braganza, grand- son of the infanta Catherine, daughter of Dom Edward, was a pleasure-loving, easy-tempered man, fond of music and hunting, quite happy in his palace at Villa Vicosa ; but the energy of his wife, Luiza de Guzman, Castilian though she was, secured his passive co-operation, and his confidential adviser, Jodo Pinto Ribeiro, soon formed a powerful band of conspirators among the Portuguese noblemen, when the news arrived in 1640 that the arriére-ban of Portugal was summoned to fight against the Catalans. Portugal was at that time under the nominal government of Margaret of Savoy, duchess of Mantua, who was surrounded with Spaniards and Italians ; but the real government was in the hands of the tyran- nical secretary of state, Miguel de Vasconcellos de Brito. Ribeiro had no difficulty in collecting together many daring and discontented noblemen, of whom the chief were Miguel de Almeida, Pedro de Mendonga Furtado, Antonio and Luis de Almada, Estevéo and Luis da Cunha, Rodrigo and Emmanuel de Sd, and Jorge de Mello; and the archbishop of Lisbon himself, Rodrigo da Cunha, if not actually a conspirator, certainly must have had a know- ledge of what was going on through his relatives the Almadas and Da Cunhas. The plot was carefully elabo- rated, parts being assigned to the leading conspirators, and the day fixed was the lst of December. The plot was completely successful ; the archbishop of Lisbon was appointed lieutenant-general of the kingdom, with Almeida, Mendonga, and A. de Almada for councillors, and expresses were sent off to the duke of Braganza to inform him of all that had passed and to offer him the crown. IIe was at first unwilling to accept the honour thrust upon him, but the duchess, on whom a prophecy that she should be a queen had had a great effect, persuaded him to go to Lisbon, where he was crowned as King John IV. on 13th Decem- ber 1640. The whole of Portugal at once rose and ex- pelled the Spaniards, and on 19th January a full cortes met at Lisbon, which recognized King John as king of Portugal, and his son Theodosius as heir-apparent.*~~

~~*The Portuguese knew well that, in spite of the Catalan rebellion and the terrible wars in which Spain was engaged, they were not strong enough to*~~

~~*maintain their independ- ence without foreign help, and at once sent ambassadors to France, Holland, and England. Richelieu was charmed with the success of the revolution, hoping to make Portugal*~~

~~*Po hT UG 3 iL*~~

~~*[HISTORY.*~~

~~*a thorn in the side of Spain, such as Scotland had been to England in former days, and he at once sent a fleet under De Brezé to the Tagus ; the Dutch also sent a fleet under Gylfels ; but Charles I. of England was too much occupied with his quarrels with his parliament to do more than merely recognize the new king.*~~

~~*The Portuguese were at first successful, owing to the many wars in which Spain was involved, and, after the defeat which Mathias de Albuquerque inflicted on the baron of Molingen at Montijo on 26th May 1644, felt at their ease in spite of the serious plot of the duke of Caminha and the archbishop of Braga, until it became obvious that Mazarin would desert them without compunction if it suited his purpose. The old Portuguese colonies at once declared for their fatherland, and this brought about a colonial war with Holland, in which indeed the Portuguese generals won many successes, but which deprived them of the assistance of the Dutch in Europe. Mazarin's refusal to insist on their independence at the congress at Miinster, though he protected their envoys against the Spaniards, made them despondent; and a very curious letter of Mazarin's (4th October 1647), offering the crown of Portugal to the duke of Longueville, exhibits at once the feeble character of John IV., the despair of the Portu- guese, and their dependence on France. Mazarin's deser- tion did not at first do great harm, for the war between France and Spain continued, though peace was made with the empire. In the midst of this universal war John IV. died in 1656.*~~

~~*As the prince of Brazil, Dom Theodosio, the eldest son of A the late king, had predeceased him, his second son Affonso, V a boy of thirteen, succeeded to the throne as Affonso VI. under the regency of his mother. The queen-regent, who had always been more energetic than her husband, deter- mined to pursue the war with Spain with more vigour and summoned*~~

~~*Marshal Schomberg to organize her armies. The result of Schomberg's presence soon appeared, and on 14th January 1659 Dom Antonio Luis de Menezes, count of Cantanhede, won a victory over Don Luiz de Haro at Elvas. This victory in one way injured the Portuguese cause, for it so incensed Don Luiz de Haro that, during the famous conferences at the Island of Pheasants with Mazarin which led to the signature of the treaty of the Pyrenees in 1659, he not only would not hear of any intercession for the Portuguese but insisted on the in- sertion of a secret article in the treaty to the effect that France would promise to entirely abandon them. Neither Mazarin nor Louis XIV. intended to keep this secret article and give up the advantage of having such a useful ally in the Peninsula, and they accordingly looked about for some means to evade it. England offered the oppor- tunity ; Charles IT. was seeking a wife and gladly accepted the suggestion that he should marry Catherine of Braganza, sister of the king of Portugal, both because Portugal had sheltered his cousins Prince Rupert and Prince Maurice in 1650, and because the colonial cessions which the queen- regent offered as her daughter's dowry would be very popular in England. The marriage was accordingly agreed upon in 1661, and in 1662 the earl of Sandwich came to bring the bride from Lisbon, while the English occupied Tangiers, Bombay, and Galle as her dowry, and promised to send troops to Portugal, and to make peace between the Dutch and the Portuguese. Before, however, the English soldiers arrived and the final struggle with Spain began, a family revolution had taken place in Portugal. The young king, a feeble vicious youth, was very wroth that his mother had exiled a favourite valet to the Brazils, and by the advice of two noblemen about his person suddenly declared himself of age in 1662 and transferred the government to the able hands of Luis de Sousa e*~~

~~*Pedro II.*~~

~~*HISTORY.] POBT Vasconcellos, count of Castel Melhor. The queen retired to a convent chagrined, but Castel Melhor continued her policy, and formed the English soldiers, who had arrived under the earl of Inchiquin, some French and German volunteers and mercenaries, and the newly-organized Portu- guese levies into a powerful army, of which Schomberg was the real, though not the ostensible, commander. With this army a series of victories were won, which caused Affonso VI. to be surnamed "Affonso the*~~

~~*Victorious," though his own successes, such as they were, were con- fined to the streets of Lisbon. On 8th June 1663 the count of Villa Flor with Schomberg by his side utterly defeated Don John of Austria, and afterwards retook Evora; on 7th July 1664 Pedro Jacques de Magalhies defeated the duke of Ossuna at Ciudad Rodrigo ; on 17th June 1665 the marquis of Marialva destroyed a Spanish army under the marquis of Carracena at the battle of Montes Claros, and Christovéo de Brito Pereira followed up this victory with one at Villa Vicosa. These successes entirely broke the power of Spain, and peace was only a matter of time, when Castel Melhor decided to increase both his own power and that of Portugal by marrying the king to a French princess. Such an alliance was highly approved of by Louis XIV., and the bride selected was Marie Frangoise Elisabeth, Mademoiselle d'Aumale, daughter of the duke of Savoy-Nemours and grand- daughter of Henry IV. of France. The marriage was celebrated in 1666 ; but Castel Melhor found that, instead of increasing his power, it worked his ruin. The young queen detested her husband, and fell in love with his brother Dom Pedro ; and after fourteen months of a hated union she left the palace and applied for a divorce on the ground of non-consummation to the chapter of the cathedral- church of Lisbon, while Dom Pedro shut up King Affonso in a portion of the palace and assumed the regency. He was recognized as regent by the cortes on Ist January 1668, and at once signed a peace with Spain on 13th February, by which the independence of Portugal was re- cognized in return for the cession of Ceuta. This peace, signed at Lisbon, was chiefly negotiated by the earl of Sandwich and Sir Richard Southwell, the English ambas- sadors at Madrid and Lisbon. On 24th March the queen's divorce was pronounced and confirmed by the pope, and on 2d April she married the regent. His rule was gladly submitted to, for the people of Portugal recognized his sterling qualities, which compared favourably with those of the unfortunate Affonso VI. Castel Melhor fled to France, and the king—for Dom Pedro only called himself "regent"—was imprisoned, first in the island of Terceira and then at Cintra, till his death in 1683, the very same year in which the queen also died.*~~

~~*As long as Affonso VI. lived, Dom Pedro's power was not thoroughly established, but in 1683 he was proclaimed king as Pedro II. His reign was marked by good internal administration, the breaking out of the War of the Spanish Succession, and the Methuen treaty. His good adminis- tration kept*~~

~~*him from being short of money, and enabled him to dispense with the cortes, which never met between 1697 and 1828; but the war of the succession almost emptied his treasury. He had in 1687, at the earnest request of the duke of Cadaval, his most intimate friend, consented to marry again in order to have an heir, and had selected Maria Sophia de Neuburg, daughter of the elector palatine, rather to the chagrin of Louis XIV., who, in the prospect of the death of Charles II. of Spain, had counted on the support of Pedro's first wife, a French princess, and who now sought to form a strong party at the court of Lisbon. He was so far successful that on the death of Charles II. King Pedro not only recognized Louis XIV.'s grandson as Philip V. of Spain but in 1701 protected a*~~

~~*UGAL 549*~~

~~*French fleet in the Tagus under the count of Chastenau against Sir George Rooke. The great Whig ministry of England was not likely to submit to this desertion on the part of England's ancient ally, and sent the Right Honourable John Methuen in 1703 to Lisbon with full powers to make a treaty, both political and commercial, with Portugal. On 27th December 1703 he signed the famous Methuen treaty, by which Portuguese wines were to be imported into England at a lower duty than those from France or Germany, in return for a similar concession to English textile fabrics. The immediate result was that Pedro acknowledged the archduke Charles, and the ulterior that Englishmen drank port wine instead of claret or hock throughout the last century, while the Portuguese imported nearly everything they wanted from England and remained without manufactures. On 7th March 1704 Sir George Rooke arrived at Lisbon, convoying 10,000 English troops under Lord Galway and the archduke Charles himself. The English army at once advanced with a Portuguese auxiliary force and took Salvaterra and Valenga. In the following year but little was done on the Portuguese frontier, because the archduke had sailed round to Barcelona, and Dom Pedro, who was slowly dying, handed over the regency to his sister Catherine, queen-dowager of England. Had he been conscious he might have learned of the great successes of the allied army under Jo&o de Sousa, marquis das Minas, and Lord Galway, who in rapid succession took Alcantara, Coria, Truxillo, Placencia, Ciudad Rodrigo, and Avila, and even for a short time occupied Madrid, and of their equally rapid retreat ; he*~~

~~never recovered sufficiently, however, to know of these movements ; he gradually sank, and died at Alcantara on 9th December 1706.~~

~~The long reign of John V., who assumed the royal John V.~~

~~state at once from the regent Catherine, resembles the reign of John III. At its commencement he left the power in the hands of his father's friend, the duke of Cadaval, who continued Dom Pedro's policy and prosecuted the war against Philip V. Cadaval bound the king more surely to the Anglo-Austrian party by marrying him to the archduchess Marianna, daughter of the deceased emperor Leopold I., who was escorted to Lisbon by an English fleet under Admiral Byng in 1708. Yet the war itself did not go favourably for the allies in Spain, for the Spaniards had become enthusiastic partisans of Philip V.; and in 1709 a Portuguese army under the marquis of Fronteira was beaten at Caia, while in 1711 Duguay Trouin took and sacked Rio de Janeiro, afterwards the capital of Brazil. The war languished all over Europe after the accession of the archduke Charles to the empire, and on 6th February 1715, nearly two years after the treaty of Utrecht, peace was signed between Portugal and Spain at Madrid by the secretary of state, Lopes Furtado de Mondonga, count of Cérte-Real. The king, as soon as he began to pay more attention to affairs, exhibited his attach- ment to the papacy, and in 1717 sent a fleet at the pope's bidding on a crusade against the Turks, which won a naval victory off Cape Matapan. The king declined to join the war against Alberoni, and disclosed a tendency to imitate Louis XIV., especially in building. The only indication of policy he showed was his determination to maintain peace by a close alliance with Spain: his daughter Maria Barbara was married to the infant Don Ferdinand, eldest son of Philip V., who succeeded to the throne of Spain as Ferdinand VI., while the Spanish infanta Marianna was married to the Portuguese heir-apparent, Dom Joseph. The enormous sums of money which John V. lent to the pope, to the real impoverishment of his country, brought him rewards which were of no real value, but which were such as he highly esteemed ; namely, the archbishopric of~~

~~Joseph.~~

~~Maria I. and Pedro HiT.~~

~~*Lisbon was erected into a patriarchate, and the title of “ Fidelissimus” or ‘“ Most-Faithful” was conferred upon the kings of Portugal, to correspond with those of “ Most Christian” and ‘Most Catholic” attributed to the kings of France and Spain respectively.*~~

~~*Joseph, who succeeded his father in 1750, had the merit of perceiving the pre-eminent powers of Sebastido de Carvalho, who governed Portugal throughout this reign, and who, under his title of the marquis of Pombal (see Pompat), ranks among the very greatest of 18th-century statesmen. In everything—in his great internal and ad- ministrative reforms, in his financial reforms, in the re- organization of the army, in the abolition of slavery, and in the great struggle with the Jesuits—Joseph supported his minister. Pombal made the king more absolute than ever, and exalted the royal prerogative while using it for purposes of reform; and in return the king maintained Pombal in power in spite of the violent protests of the priests and the opposition of his wife. Circumstances greatly helped the minister to establish an ascendency over the king’s mind: his conduct at the time of the great earthquake on 1st November 1755 secured him his high position over the other two secretaries of state; the Tavora plot gave him the influence which enabled him to overthrow the Jesuits in 1759; and the second attempt on the king’s life in 1769 strengthened his hands in his negotiations with Rome and ensured the suppression of the order in 1773. The only war in which Portugal was engaged during this reign was caused by the close alliance with England, for, when Choiseul made the Family Com- pact and Spain entered upon the Seven Years’ War, a Spanish army under the marquis of Sarria invaded Port- ugal and took Braganza and Almeida in 1762. Pombal immediately applied to England for help, when the count of Lippe-Biickeburg came over with a body of English troops and set to work to organize the Portuguese army ; and, mainly owing to the brilliant services of Brigadier- General Burgoyne, the Spaniards were defeated at Valencia de Alcantara and Villa Velha, and peace was made on 10th February 1763. The close of the reign was disturbed by disputes with Spain as to the possession of Sacramento in South America, which were still unsettled when King Joseph died on 20th February 1777, leaving four*~~

~~*daughters, of whom the eldest, Donna Maria Francisca, had married the king's brother, Dom Pedro.*~~

~~*The accession of Donna Maria was the signal for the overthrow of the great marquis and the reversal of his policy. The new queen was a weak woman, and her husband, Dom Pedro, who was proclaimed king, was a weak man ; coins were struck in the names of Pedro III. and Maria I, but both sovereigns were ruled by the queen- dowager, who hated Pombal, and eventually sentenced him never to come within twenty leagues of the court. The incapacity of his successor soon became manifest, while the queen, who was completely under the sway of her confessor, Dom Ignacio de San Caetano, found her greatest happiness in raising and sending large sums of money to the Latin convent at Jerusalem. Such was the state of Portugal when the great crisis in the world's history caused by the French Revolution was at hand ; and, when in 1792 it became evident that affairs could no longer go on in this haphazard fashion, it was also evident that the queen was no longer fit even for the slight fatigue she had to undergo. Her brain had given way in 1788, after the successive deaths of her husband, of her eldest son Dom Joseph, who had married his aunt, Donna Maria Benedicta, and of her confessor, and Dom John found it necessary to take the management of affairs into his own hands, though he was not actually declared regent until 1799.*~~

~~*POR? G 2 bh*~~

~~*[HISTORY.*~~

~~*About the time that Dom John became regent the wish to check the spread of the principles of the French Revolution, which were as much feared in Portugal as in all other Continental states, led to the great activity of Dom Diogo Ignacio de Pina Manique, the intendant- general of police. He eagerly hunted down all Portuguese gentlemen suspected of encouraging French principles or of being freemasons, expelled all Frenchmen from the kingdom, and kept a jealous eye on the American consul, Edward Church, and a merchant named Jacome Ratton, whom he declared to be at the head of a republican con- spiracy. Moreover, the Portuguese ministers not only combated the dreaded French principles at home, they also believed it a holy duty to join in the general war against France, and therefore a corps*~~

~~*of 5000 men was sent into the eastern Pyrenees to serve under General John Forbes Skelater, and four ships under the marquis of Niza joined the English fleet in the Mediterranean. The Portuguese force under Forbes Skelater served in all the actions in the eastern Pyrenees, shared in the successes of General Ricardos, and in the defeats of the count de la. Union and General Urrutia; but nevertheless the Spanish Government, then under the influence of Godoy, the Prince of the Peace, did not hesitate to desert Portugal and make a separate peace with the French republic at Basel in July 1795. This naturally drove Portugal into a still closer alliance with England ; and, when, after the treaty of San Ildefonso (1796), by which Spain declared war against England, and the secret convention between Pérignon and Godoy to divide Portugal between them, Spanish troops were massed on the Portuguese frontiers, an urgent supplication for help was sent to England. In response the House of Commons voted Portugal a subsidy of £200,000 ; a force of 6000 men was despatched under Major-General Sir Charles Stuart, which deterred the Spaniards from attempting an invasion; and the prince of Waldeck, like the count of Lippe in former days, was sent to reorganize the Portuguese army. Yet the English party was not strong enough to carry the day entirely; Sir Charles Stuart was soon withdrawn, and an effort made to secure peace with France through the mediation of Spain. But the concessions of the French party were of no avail; the First Consul was as violently opposed to Portugal, as being a province of England, as the Convention and Directory had been, and in 1800 Lucien Bonaparte was sent to Madrid with instructions from his brother to insist on the abandonment of the English alliance, on the opening of Portuguese ports to France and the closing of them to England, on the extension of French Guiana to the Amazons, on the cession of a portion of Portugal to Spain, until the recovery from England of Trinidad, Port Mahon, and Malta, and on the payment of a large sum of money, and. he was authorized to offer to Spain a corps of 15,000 Frenchmen if these hard terms were rejected. The Portu- guese ministers did reject them, and immediately Leclerc's corps entered Spain. The campaign lasted but a few days. Olivenza and Campo Mayor fell into the hands of the Spaniards, who also won bloodless victories at Arronches and Flor da Rosa. Peace was made at Badajoz with Spain, by which Portugal ceded Olivenza, and at Paris with France, by which it consented to the extension of French Guiana to the Amazons, and promised a large indemnity. Napoleon Bonaparte was*~~

~~*anything but satisfied with the treaty of Badajoz, and received Lucien on his return with but little favour, for his aim was utterly to destroy Portugal as a nation ; and it was with a full intention to excite her to war that he sent one of the roughest and least educated of his generals, Lannes, as ambassador to Lisbon. Lannes acted fully up to his chief's expectations: he ordered the dismissal of all the ministers who favoured England, and*~~

~~*The Pen- insular War.*~~

~~*HISTORY. |*~~

~~*was obeyed both from fear of France and from a dislike of England owing to her high-handed naval policy. Even this humble submission of the regent did not satisfy Napoleon, and in 1804 he replaced Lannes by Junot, whom he ordered to insist upon Portugal's declaring war against England. Then fora time he desisted from executing his plans against the country owing to his great campaigns in Europe, and made a treaty of neutrality with the Portu- guese Government. At length in 1807, having beaten Austria, Prussia, and Russia, Napoleon again turned his thoughts to his project for the annihilation of Portugal, which had become more than ever a thorn in his side, since it refused to co-operate in his Continental schemes for ruining England. He resolved at first to act with Spain and Godoy, as Pérignon had done in 1797, and on 29th October 1807 signed the treaty of Fontainebleau, by which it was arranged that Portugal should be conquered and divided into three parts: the northern portion should be given to the king of Etruria in the place of his Italian kingdom, which Napoleon desired to annex, while the southern portion was to be formed into an independent kingdom for Godoy, and the central provinces were to be held by France until a general peace. The signature of the treaty was followed by immediate action: Junot moved with an army rapidly across Spain, and, together with a Spanish force under General Caraffa, entered Portugal from the centre, while General Taranco and General Solano with two other Spanish armies occupied the Minho and Alemtejo. With amazing rapidity Junot accomplished the march, and the Portuguese hardly knew that war was imminent until on 27th November Colonel Lecor rushed into Lisbon with the news that the French were in posses- sion of Abrantes. This alarming intelligence unnerved the regent, who listened to the strongly-*~~

~~worded advice of Sir Sidney Smith, commander of the English ships in the Tagus, to abandon his kingdom for the Brazils, and leave the English to defend Portugal; and on 27th November Dom John, after naming a council of regency, went on board the English fleet with his whole family, including the queen Maria I. The English ships had hardly left the Tagus when a small force of wearied French soldiers, who were all that remained from the terrible fatigues of the march, entered Lisbon on 30th November.~~

~~Nothing proves more certainly the widely-spread exist- ence of what were called French principles—that is to say, democratic ideas—in Portugal than the hearty reception which Junot met with from the first. At Santarem a deputation of the freemasons of Portugal, who were there, as in other Continental countries, a secret society for the propagation of democratic principles, welcomed him ; the marquis of Alorna with the army instantly submitted to him ; and the council of regency, knowing the temper of the citizens, made no attempt to hold Lisbon against him. But Junot showed no desire to grant the Portuguese a constitution, and after seizing all the money in the royal treasury he divided the country into military governments under his generals, issuing on 1st February a proclamation that the house of Braganza had ceased to reign. He then began to hope that he himself might succeed the Braganzas, and for this purpose sought to conciliate the Portuguese by reducing the requisition demanded by Napoleon from forty millions of francs to twenty millions, and commenced a negotiation with the radical or French party in Portugal through Luca de Scabra da Silva to induce them to send a petition or deputation to the emperor, asking for Junot to be their king. But his attempts at conciliation were of no avail; and, when the Spanish general Bellesta, who had succeeded Taranco at Oporto, seized the French governor, General Quesnel, declared for the regent, and marched into Galicia, Junot departed from Lisbon, leaving~~

~~the city in the hands of a regency, headed by the bishop of Oporto. The bishop at once sent to England for help, and encouraged fresh revolts all over the kingdom, till nearly every city in Portugal rose against the French~~

~~*and established its own junta of government. Meanwhile the English Government had willingly listened to the request of the bishop of Oporto, and ordered the small army which had been collected at Cork, under the command of Lieu- tenant-General Sir Arthur Wellesley, for an expedition to South America, to proceed to Portugal. Sir Arthur landed at the mouth of the Mondego river, advanced towards Lis- bon, and, after defeating Laborde's division at Rolica on 17th August 1808, routed Junot himself at Vimieiro on 21st August. These victories were followed by the con- vention of Cintra, by which Junot agreed to vacate Portugal and give up all the fortresses in his possession ; this con- vention, however disappointing from a military point of view, was eminently satisfactory to the Portuguese people, who saw themselves as speedily delivered from the French as they had been conquered by them. The regency was again established, and at once despatched Domingos Antonio de Sousa Coutinho, a brother of the count of Lin- hares, to London, to ask that an English minister with full powers should be sent to Lisbon, and that Sir Arthur Wellesley might be appointed to reorganize their army. Their requests were complied with: the Right Honourable J.C. Villiers was sent to Lisbon, and, as Sir Arthur Welles- ley could not be spared, Major-General Beresford, who had learned Portuguese when governor of Madeira, which he had occupied in the preceding year, was sent to command their army. Portugal, however, was not yet safe from the French ; Sir John Moore's advance to Salamanca and his retreat to Corunna had left the country but slightly gar- risoned, and, in spite of the braggadocio of the bishop, Oporto quickly fell into the hands of Marshal Soult. Fortunately Soult, ike Junot, was led away by the idea of becoming king of Portugal, and did not advance on Lisbon, thus giving time for Sir Arthur Wellesley again to arrive in the country with a powerful army. In the interval the Portuguese, in spite of some spirited fights by General Silveira, had shown how little they could do in their disorganized state, and the English Government determined to send out English officers to organize them and to take 10,000 Portuguese into English pay. Mean- while Sir Arthur Wellesley had driven Soult from Oporto, had advanced into Spain, and won the battle of Talavera. From these successes of the English general it is pitiable to turn to the Portuguese regency. With the departure of the king all the able men of the royal party seemed to have left the country; the leaders of the radical party were either in disgrace or had fled to France; and none were left to compose the regency save a set of*~~

intriguers, whose chief idea was to get as much money from England as possible. The best part of the nation had entered the army, hence Marshal Beresford, aided by the adjutant- general Manuel de Brito Mousinho, soon organized a force which at Busaco proved itself worthy to fight beside the English soldiery. The regency got from bad to worse, till neither Beresford nor Wellington could work with it, and the English cabinet had to demand that Sir Charles Stuart (son of General Sir Charles Stuart), their ambas- sador at Lisbon, should receive a place upon it. His great ability and tact soon made him master, and a certain portion of the money sent by England to pay the Portuguese troops did then find its way to its proper destination. Yet the regency, even when thus strengthened, failed to make itself popular ; and that there wasa large radical party in Lisbon is sufficiently proved by the deputation of eighteen journal- ists to the Azores in September 1810. The troubles of Portugal were not yet over; the most formidable invasion

of all was to come. During the time of Masséna's cam- paign in Portugal the Portuguese showed the valour of a truly heroic nation. When Lord Wellington determined to retire to the lines of Torres Vedras, he commanded all the peasants to desert their fields and leave nothing for the French to subsist upon, and they obeyed him with touching fidelity. The Portuguese troops fully proved their value as soldiers when led and trained by such English generals as Pack and Ashworth, Bradford and John Hamil- ton, on every battlefield in the Peninsula and the south of France, and especially at Salamanca and the Nivelle. They well deserved the praise bestowed upon them by Wellington and Beresford, and the enthusiastic reception which they met with when they returned home in 1814.

Shortly after the conclusion of the war, in 1816, the mad queen Maria I. died, and the regent succeeded to the throne as King John VI. The English Government earnestly pressed him to return to Lisbon, where dissensions in the regency and the universal discontent urgently summoned him. But the new king was perpetually hampered by his intriguing and ambitious wife, Carlota Joaquina, who,

~~*in order to raise a party in her favour, had as early as'*~~

~~*1805 promised a constitution to the Portuguese, and in 1812 had plotted to become independent queen of Brazil. The regency had become intensely unpopular, for Sir Charles Stuart and Marshal Beresford ruled despotically ; and the mass of the people, who had been willing to endure the despotism of the English during the terrible war for existence, as well as the army, which had willingly obeyed the English officers on the field of battle, grew weary of foreign rule in time of peace and raised the cry of Portugal for the Portuguese. Directly after the war, in 1817, the first rising took place in Lisbon in the form of a pronun- cilamento of General Gomes Freire de Andrade, who had commanded the Portuguese contingent in the Russian campaign of 1812; but it was instantly and cruelly sup- pressed by Beresford and the regency, and the general and eleven others were executed. Yet the radical party was by no means conquered, and when Beresford went to Rio de Janeiro in 1820 advantage was taken of his absence by the people of Oporto, headed by certain officers in the garrison, to raise the cry for reform; the regency, unable to act without Beresford, gave way before a similar rising at Lisbon; the English officers were everywhere expelled ; a new regency was proclaimed ; Beresford was not allowed to land when he returned from Brazil; and a constituent assembly was summoned. The new assembly, consisting largely of men of the most radical opinions, at once abol- ished the Inquisition and the relics of feudalism, and pro- ceeded to draw up an impracticable constitution, which showed that they had studied the glowing speeches of the men of the French Revolution and had not profited by a knowledge of their mistakes. Prussia, Austria, and Russia withdrew their ambassadors, and England insisted on John's returning to his kingdom. He accordingly left the Brazils to the government of his elder son Pedro, and set out for Portugal, where in 1822, at the earnest request of that son, he solemnly swore to obey the new constitution. He was at once met by the opposition of the queen and his younger son Dom Miguel, who refused to recognize the constitution; in consequence they were expelled from Lisbon. This event, with the invasion of Spain by the French to put down the rebellion of 1823, encouraged Francisco da Silveira, count of Amarante, to raise a pro- nunciamento in Tras-os-Montes; but the king at Lisbon declared, amid loud applause, that the constitution of 1822 was abrogated and his own absolutism restored,*~~

~~*and he appointed the count of Palmella, the head of the English or constitutional party, to be his minister. But the abso- lutist party did not aim at a new form of constitutional*~~

~~*Pon Te G & L*~~

~~*[HISTORY.*~~

~~*government; they were desirous to reinstate the old abso- lutism. The queen and Dom Miguel headed a new plot ; the king's friend, the marquis of Loulé, was assassinated ; Palmella was imprisoned and the king himself shut up in his palace. The united action of the foreign ministers who had remained in Lisbon freed the king; the new in- surrection was suppressed ; Palmella was again appointed minister; and the king, with the two chief conspirators, the queen and Dom Miguel, left Portugal once more for the Brazils. In the following year (1826) John VI. died, leaving by his will his daughter, the infanta Isabel Maria, as regent, to the great disappointment of Dom Miguel, who had returned to Portugal with the expectation of re- ceiving it as his inheritance, while his brother Dom Pedro ruled in Brazil.*~~

~~*The next twenty-five years are the darkest in the whole history of Portugal and the most complicated to analyse, for the establishment of parliamentary government was no easy task ; it is almost impossible to follow the rapid changes which succeeded each other, and quite impossible to understand the varying motives of the different states- men and generals. The keynote to the whole series of the disturbances is to be found in the influence of the army. Beresford's creation was a grand fighting machine; but armies, and more particularly generals, are almost'certain to intrigue in times of peace. On ascending the united*~~

~~*thrones Dom Pedro IV. proceeded to draw up a charter Pedro containing the bases of a moderate parliamentary govern- IV.*~~

~~*ment and sent it over to Portugal by the English minister, Sir Charles Stuart, and then abdicated the crown of Portugal in favour of his daughter, Donna Maria da Gloria, a child only seven years old, on condition that she married his brother Dom Miguel, who was to recognize the new con- stitution. The charter was received with joy by the parlia- mentary party,*~~

~~*and Palmella became prime minister; but in 1827 the king foolishly appointed Dom Miguel to be regent in Portugal. This ambitious prince was exceedingly*~~

~~*popular with the old nobility, the army, and the poor ; and,*~~

~~*having declared himself absolute king, he drove the whole constitutional or chartist party—Palmella, Saldanha, Villa Flor, Sampaio, and their adherents—into exile. They fled to England, where the young queen then was, but, although they found popular opinion strongly in their favour; they found also that the duke of Wellington and his Tory ministry highly approved of Dom Miguel's behaviour, and that they persisted in confounding the moderate and the radical parties, and in believing that Palmella was a democrat. Meanwhile the reign of Dom Miguel had be- come a reign of terror, and a new movement was begun by the conjoined chartist and radical parties, who respectively advocated the charter of 1826 and the constitution of 1822, but who sank their differences to oppose Dom Miguel. The island of Terceira (Azores) had never submitted to this prince, and there in 1829 the marquis of Palmella, the count of Villa Flor, and José Antonio Guerreiro declared them- selves regents for the young queen; and on 11th August 1830 they defeated in Praia Bay the fleet sent against them by Dom Miguel. This victory was the first ray of hope to the chartist party; all who could get away from Portugal hastened to the Azores ; and in 1831 Dom Pedro, having resigned the imperial crown of Brazil to his infant son, came to London to join his daughter and prepare for a vigorous struggle against his brother. He met with acquiescence, if not encouragement, from the Liberal Gov- ernment of Earl Grey, and managed to raise a large loan ; then he betook himself with all the troops he could raise*~~

~~*'to the Azores, where he appointed the count of Villa Flor*~~

~~*general-in-chief and Captain Sartorius of the English navy commander of the fleet. In July 1832 Dom Pedro arrived at Oporto with 7500 men, being enthusiastically welcomed*~~

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~~*by the citizens; Dom Miguel instantly laid siege to the city. The siege was a terrible one; want within the walls and cholera among the besiegers decimated the armies, and the only real success gained was the victory of Sartorius over the fleet of Dom Miguel on 11th October. In 1833 more vigorous action began; Major-General Joio Carlos Saldanha de Oliveira e Daun, count of Saldanha, an old officer of Beresford's and a member of the Palmella Govern- ment in 1825, took the command in Oporto and beat off the French general Bourmont, who had been engaged by Dom Miguel to command his forces; the count of Villa Flor sailed from Oporto to Algarves, defeated General Telles Jordio, and after a triumphal march northwards occupied Lisbon ; and Captain Charles Napier, who had succeeded Sartorius, destroyed Dom Miguel's fleet off Cape St Vincent in 1833. In this year Queen Maria came to Lisbon and was received with transports of delight, while Dom Pedro as regent again proclaimed the charter of 1826. The year 1834 was one of unbroken success for the chartists ; England and France recognized the queen, and the Spanish ministry of Queen Isabella, knowing Dom Miguel to be a Carlist, sent two corps under Generals Rodil and Serrano to the help of Dom Pedro. Saldanha defeated the forces of the usurper at Torres Novas and Alamoster ; Napier reduced Beira; Villa Flor, who had been made duke of Terceira, reduced Tras-os-Montes and won a victory at Asseiceira ; 84 de Bandeira reduced Alemtejo ; the com- bined Spanish and Portuguese armies surrounded the rest of Dom Miguel's adherents at Evora Monte; and Dom Miguel himself capitulated on 26th May. By the con- vention of Evora Monte the usurper, on condition of re- ceiving a pension, promised to leave Portugal for ever ; and the cortes at Lisbon not only declared him and his heirs ineligible for the throne but forbade them to return to Portugal under penalty of death. This same cortes attempted to arrange the finances, and abolished the orders of the friars, who had hitherto kept alive the party of rebellion in the villages, and finally, at Dom Pedro's request—for he felt his health failing—declared the queen of age on 18th September 1834. Dom Pedro, who had through- out been the heart and soul of his daughter's party, retired to Queluz (near Lisbon), where he died six days after- wards from the effects of his great labours and fatigues. "The death of Dom Pedro deprived Queen Maria II., who was now only fifteen, of her greatest support, but a very strong ministry was formed, with the duke of Palmella as president and the duke of Terceira at the war office. Such a ministry might have lasted for a long time, but neither the*~~

~~queen, the nobility, nor the people understood the prin- ciples of real constitutional government, and the army was a constant source of danger. Members of different parties, while not conceiving that all alike loved Portugal, believed sincerely in their own opinions: the party in power pro- scribed and exiled its opponents, while the party in opposi- tion invariably appealed to arms instead of seeking to obtain office by legitimate parliamentary means. In addi- tion, the country was ravaged by bands of brigands, who called themselves '"Miguelites," and who perpetually escaped into Spain when attacked in force ; and, as each Government refused to recognize or pay interest upon the loans raised by its predecessors, the financial credit of Portugal soon fell to a very low ebb in the money markets of Europe. It is unprofitable to examine here the prin- ciples of the chief statesmen of the time as new Govern- ments quickly succeeded each other ; it will be sufficient to notice only the chief pronunciamentos and appeals to arms, and to remark the gradual approach to real parlia- mentary government. Queen Maria da Gloria's reign is one of violent party struggles, for they can hardly be called civil wars, so little did they involve, and that of~~

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~~King Luis the reign of definite and peaceable parliamentary government. In her earlier years the queen was chiefly under the influence of her stepmother, the second wife of Dom Pedro, Amelia of Bavaria, and in 1835 she married the queen-dowager's brother, Augustus Charles Eugéne Napoleon, duke of Leuchtenberg, second son of Eugéne Beauharnais by the princess Augusta of Bavaria, who died two months after his marriage, in March 1835. In the following January Maria married Prince Ferdinand of Saxe-Coburg-Gotha, nephew of Leopold, the first king of the Belgians; and it was his nomination to the post of commander-in-chief that brought about the first appeal to arms. In September 1836 Fernando Soares da Caldeira headed a pronunciamento in Lisbon for the re-establish- ment of the constitution of 1822, which was completely successful, and resulted in the drawing up of a new con- stitution. The constitution of 1838, which was really that of 1822 slightly modified, managed to work till 1842, when one~~

~~of the radical ministers, Antonio Bermudo de Costa Cabral, suddenly declared the charter of 1826 at Oporto. The duke of Terceira headed a successful pro- nunciamento in favour of the charter, and came into office with Costa Cabral as home secretary and virtual prime minister. Costa Cabral, who in 1845 was created count of Thomar, made himself very acceptable to the queen, and, interpreting the charter in the most royalist sense, even attempted to check the freedom of the press. It was now the turn of the radicals or Septembrists to have recourse to arms: after an attempt to place Saldanha in office, the opposition broke out into open insurrection under the viscount of S4 de Bandeira, the count of Bomfim, and the count das Antas. This new insurrection is known as the War of Maria da Fonte or "patuleia," and was not sup- pressed until the conclusion of the convention of Granada on 29th June 1847, when a general amnesty was declared, Saldanha being continued in power. Queen Maria da Gloria died on 15th November 1853, and her husband, the king-consort, Dom Ferdinand II., assumed the regency until his eldest son Dom Pedro V. came of age.~~

~~The era of peaceful parliamentary government which succeeded the stormy reign of Queen Maria II. has been one of prosperity for Portugal, and much of that peace and prosperity is due to the great literary and historical revival which is signalized by the names of Joio Baptista de Almeida Garrett and Antonio Feliciano de Castilho, of Alexandre Herculano de Carvalho e Araujo and Luis Augusto Rebello da Silva. Men were not wanting in the early part of the 19th century to advocate the formation of an Iberian republic or kingdom, comprising the whole of the Peninsula; but the revival of national pride in recall- ing the glorious past of Portuguese history, which has been the work alike of Herculano and Almeida Garrett in dif- erent lines, has breathed afresh the spirit of patriotism into a people who had been almost wearied out by continual pronunciamentos. The only political event of any import-~~

~~ance during the reign of Dom Pedro V., who came of age Pedro V.~~

~~and assumed the government in 1855, and who in 1857 married the princess Stephanie of Hohenzollern, was the affair of the "Charles et Georges." This French ship was engaged in what was undoubtedly the slave-trade, though slightly disguised, off the coast of Africa, when it was~~

~~seized by the authorities of Mozambique, and, in accord- ance with the laws and treaties against the slave-trade, its captain, Roussel, was condemned to two years' imprison- ment. The emperor Napoleon III., glad to have a chance of posing before the French people, and counting on his close alliance with England, instantly sent a large fleet to the Tagus under Admiral Lavaud, and demanded compen- sation, which, as England showed no signs of assistance, Portugal was compelled to pay. The whole country, especi- XIX. —- 70~~

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~~ally the city of Lisbon, was ravaged by cholera and yellow fever during this reign, itself evidence of the extreme neglect of all sanitary precautions ; and on 11th November 1861 the king, who refused to quit the pestilence-stricken capital, died of cholera, and was speedily followed to the grave by two of his brothers, Dom Ferdinand and Dom John.~~

~~At the time of Dom Pedro's death his brother and heir, Dom Luis, was travelling on the Continent; and his father, Dom Ferdinand, again assumed the regency until his son's return, soon after which Luis married Maria Pia of Savoy, daughter of Victor Emmanuel, king of Italy. The new king followed his brother's policy and allowed his ministers to fight their battles in the chambers without interference from himself. During his reign the old combatants of the reign of Maria da Gloria died off one by one,—Palmella, Terceira, Thomar, Saldanha, and SA de Bandeira. Their successors in political leadership, the duke of Loulé, Aguiar, the mar- quis of Avila, and Antonio Manuel Fontes Pereira de Mello, though not inferior in administrative ability, always avoided an appeal to arms, and therefore, if they do not contribute striking pages to the history of Portugal, certainly con- tributed more to the prosperity of the country. The last pronunciamento, or rather attempt at a pronunciamento, of the last survivor of Queen Maria's turbulent statesmen, the duke of Saldanha, in 1870, only proved how entirely the day of pronunciamentos had gone by. He conceived the notion that the duke of Loulé, as a freemason and an advanced progressist, was a favourite with the king, after the manner of the duke of Polignac and Charles X. of France ; so, recalling a few such historical~~

~~*examples to the king's mind, he insisted on the duke's dismissal, and threatened an appeal to arms. The king, perceiving that Saldanha was in earnest, and knowing the great influence of the old man, consented to dismiss the duke of Loulé. After keeping Saldanha himself in office for four months, Luis sent him as ambassador to London notwithstanding his eighty years, where he could do no mischief, and where he died in 1876. The steady prosperity of Portugal has been largely due to the present form of government based on the charter of 1826, as modified in 1852, and is borne witness to by the reconstitution of the House of Peers in 1878 from an hereditary assembly to one of life peers. It is a notable fact that the two loans raised by the Portu- guese Government in 1880 and in 1882 were quickly sub- scribed, and mainly within Portugal itself. Of recent years much attention has been drawn to the Portuguese settlements in Africa, since the opening up of the interior has made them of vast importance on both the east and the west coast. The king, ministers, and people of Portu- gal are fully aware of the new vista to their prosperity thus disclosed to them, and the Portuguese travellers Serpa Pinto, Roberto Ivens, and Brito Capello have taken an important share in the explorations which have opened up the interior of Africa and paved the way for its develop- ment. Public works, however, have not been neglected, and Fontes Pereira de Mello, the leader of the "regener- ador" party, who has been prime minister three times—from 1871 to 1877, from 1878 to 1882, and from 1883—has steadily improved and extended the railway and tele- graph systems, and carried out the more difficult labours of sanitary reform. Education also has not been neglected, and a good system of secondary and primary education has been established, mainly owing to the labours of the Portuguese poet, Antonio Feliciano de Castilho. The share taken by the leaders of the great literary and historical revival—which dates from the conclusion of the civil wars of 1846 and the publication of the first volume of Hercu- lano's History of Portugal in 1848—in Portuguese political*~~

~~*and social reform is a marked feature of the modern parlia- |*~~

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~~*mentary life of the country ; and not only have the poets Almeida Garrett and Mendes Leal and the historian Rebello da Silva held office, but many of the most promising of the new generation of literary men, such as Latino Coelho and Pinheiro Chagas, have distinguished themselves in politics. Few countries so well realize the advantages of a constitu. tional and parliamentary form of government as Portugal ; socialism possesses there a reforming, not a revolutionary force ; unity of pride in their country inspired by great writers has made the modern Portuguese ambitious to revive the glories of the past, and united men of all shades of opinion in acommon patriotism. The Camoens celebra- tion of 1880 showed that the Brazilians were still proud of their mother-country, and that the Portuguese race all over the world was ready to develop new energy and per- severance, and to prove its true descent from the men who under Affonso Henriques overthrew the Moors, who under John I. and John IV. rejected the rule of the Spaniards, under Affonso de Albuquerque and Jo&o de Castro con- quered the East, and who by the voyage of Vasco de Gama created a new era in the history of the world. Bibliography.—The best continuous history of Portugal is still that of Heinrich Schaefer, in Heeren and Ukert's Europdische Staats-Geschichte, 1840-46, partly translated into Portuguese by J. L. Domingues de Mendonga (Lisbon, 1842-47), which quite eclipsed the very ordinary works of Diogo Lemos (20 vols., 1786-1820), Sousa Monteiro (10 vols., 1838), and J. F. Pereira (3 vols., 1846-48), and the two chief English and Frencl. histories up to that date,—J. Dunham's (along with that of Spain) in Lardner's Cabinet Cyclopedia (1838-43), and Bouchot's, in Duruy's Jistotre Uni- verselle (1846). After the publication of Schaefer's ZZistory, and not uninfluenced by it, Alexandre Herculano commenced his great work, the Historia de Portugal (4 vols., 1848-53), in which he overthrew old legends and treated history scientifically. Owing, however, to the persecution and libellous pamphlets of such men as Francisco Recreio, J. D. Fonseca Pereira, and A. C. Pereira, he closed his work at the year 1279; but from 1854 to 1857 he pub- lished his Da Origem ¢ Estabelecimento da Inquisi¢do em Portugal, which also caused a great outcry. Nevertheless his example was followed, and a series of extremely good histories has been issued during the last twenty years, notably L. A. Rebello da Silva's Historia de Portugal pendente XVI. e XVIT. Seculos (5 vols., 1860-71), which covers the failure of Dom Sebastian and the revolu- tion of 1640; J. M. Latino Coelho's Historia de Portugal desde*~~

~~os Jins do XVIII. Seculo até 1814 (1874); J. F. Fonseca Benevides's Las Rainhas de Portugal (1878); and the extremely interesting and illustrated Historia de Portugal in 37 parts by Antonio Ennes, B. Ribeiro, Edouard Vidal, G. Lobato, L. Cordeiro, and Pinheiro Chagas (1877-83). The new historical school, headed by the vis- count of Santarem, has also spent much time upon the conquests of the Portuguese in India, and Herculano edited the Rotetro de Vasco de Gama; nor must the admirable editions of the old Portuguese navigators and travellers published by the Hakluyt Society be omitted, or the well-known Life of Prince Henry of Portugal, by R. H. Major (London, 1868), which has been trans- lated into Portuguese by J. A. Ferreira Brando (1876). The new school has paid attention to the publication of the early chronicles of Portugal, and since 1856 several volumes of Portugallie Monu- menta Historica have been issued by the Lisbon Academy of Sciences under the direction of Herculano; but this work was not neglected by their predecessors, as appears in the Collecctio dos Livros ineditos de Historia Portugueza, edited by J. F. Corréa da Serra for the academy (11 vols., 1790-1804), and the Collecéo dos principaes Aucores da Historia Portugueza, published in the same manner (1806). Federa, too, were not neglected during the present century ; there exist two good collections: one, commenced by the viscount of Santarem as Quadro elementar das Relacées politicas e diplomaticas de Portugal, and continued by Rebello da Silva for the academy as Corpo diplomatico Portuguez, extends from the early days of the monarchy till 1640 (36 vols., 1856-78); the other, which is practically a continuation of the first, is called a Collecctio dos Actos publieos celebrados entre a Coroa de Portugal eas mais Potencias desde 1640 até ao Presente, commenced by J. Ferreira Borges de Castro, and continued by J. Judice Biker (8 vols., 1856-66). Two works on constitutional history here deserve mention, Memorias para a Historia das Inquiracoes dos primeiros Reinados de Portugal, published (1816) by the Lisbon College of Diplomatics, and Memorias para a Historia e Theoria das Cortes, by the viscount of Santarem (Lisbon, 1828). Before noticing books treating exclusively of the history of the present cen- tury, a few special works and articles ought to be enumerated, such as the chevalier de Jant's Relations de la France avec le Portugal~~

~~Trouba- dours.~~

~~*Proven- gal influ- ence.*~~

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~~*au temps de Mazarin, by Jules Tessier (Paris, 1877); Vertot's |*~~

~~*Revolutions de Portugal (Paris, 1678); Miguel d'Antas, Les faux D. Sebastien (Paris, 1866); R. Carte's History of the Revolutions of Portugal from the Foundation of that Kingdom to the year 1677, with Letters of Sir R. Southwell during his Embassy there to the Duke of Ormond (London, 1740), which are the best books on their respective subjects, and two articles in vol. ii. of the Annaes das Serencias Moraes e Politicas, "D. Jo&io II. ela Nobreza," by L. A. Rebello da Silva, and " Apontamentos para a Historia da Conquista de Portugal por Filippe IT.," by A. P. Lopes de Mendonca. The literature of the history of the last hundred years requires careful*~~

~~*e do Kstabelecimento do Governo parlementar em Portugal, by Simiao José da Luz Soriano (8 vols., 1866-82); for the Peninsular War*~~

~~*see, besides Napier's history, the Historia gceral da Invasdéo dos ;*~~

~~*| 1870). selection ; the best work is, however, the Historia da Guerra etvil |*~~

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~~*Francezes em Portugal, by Accursio das Neves (Lisbon, 1810-11), and Excerptos historicos relativos a Guerra denominada da Peninsula, c¢ as anteriores de 1801, de Roussillon e Catalufia, by Claudio de Chaby (1863). The period of the war of Dom Miguel is best seen in the Memorias para a Historia do tempo que duron a Usurpacdo de D. Miguel, by J. L. Freire de Carvalho (Lisbon, 1841-43); the Historia da Liberdade em Portugal, by J. G. Barros Cunha (Lisbon, 1869) ; The Civil War in Portugal, and the Siege of Oporto by a British Officer of Hussars [Colonel Badcock] (1835) ; and The Wars of Succession of Spain and Portugal, by William Bollaert (vol. i., For the ensuing period consult the Despachos e Correspond- eneia do*~~

~~*Duque de Palmella (8 vols., 1851-54) ; the Correspondencia oficial de Conde de Carneira com 0 Duque de Palmella (1874) ; and the Memoirs of the Duke of Saldanha, by the count of Carnota (2 vols., 1880). GEE WES)*~~

~~*PART III.—LITERATURE.*~~

~~*Portugal has a distinct literature as well as a distinct history, and one which is intimately bound up with the growth of the nation. The biographies, histories, and travels of the 16th cen- tury are unrivalled of their age in brilliancy and vigour, while the poetry of a land where all men are singers is not only admirable in itself but illustrates a continuous and undecided struggle between native and foreign schools. The period of the growth of national independence and of the victories over the Moors was that of the brilliant poetry of the Portuguese troubadours, which became at last truly characteristic ; but the brilliancy speedily died away with peace and national unity, to be revived in the heroic period of Vasco de Gama and Albuquerque. For in the 16th century, after the classical school of Sa de Miranda had given a polish to the language, the national epics of Camoens and his followers were produced, which might have yielded more lasting results had not the Spanish dominion paralysed all national life. In more modern times the reaction against mere imitations of foreign literature has resulted in the formation of a new native school by which much good work both in poetry and in historical research has already been accomplished.*~~

~~*12th to 14th Century.—The Portuguese, Gallegan, and Bable dialects are subdivisions of that form of the Lingua Romana Rustica which was spoken in Galicia and the western provinces of the Iberian Peninsula, and which until the 15th century was the literary language of Castile itself. The remains of the early poets are necessarily scanty, but they are sufficient to show that the courtly troubadours of Portugal and Castile were certainly not inferior to the more noted singers of Provence. In some respects they were even superior, since, not being tied to the forms of a merely literary language such as the Provencal, they were able to borrow both form and matter from a vigorous national poetry which can be traced through the different races which successively occupied Portugal. The "alalala," which afterwards developed into the "aravia," the earliest form of the epic, is probably a legacy from the original Turanian inhabitants; the "guayado," a*~~

~~*short lyric with the refrain "ay " or "guai," was derived from their Celtic successors ; the "cantos de ledino ' are evidences of the Roman conquest, which in turn gave place to the "chacones" or dance-songs of the Visigoths; while during the Arab dominion the sensuous "serranilhas" and "cantos de amigo" found a place in the family "cancioneiros,"" which were then compiled in imitation of the divans or tribal songs of the ruling race. This national poetry, however, was for long affected in its literary form by foreign influences. From the beginning of the reign of Affonso Henriques (1112) to the death of Dom Sancho II. (1248) the court was under direct Provengal influence; and it isnot improbable that in 1146 thecelebrated trouba- dour Marcabrun was himself attached to the suite of Donna Matilda on her marriage with Affonso Henriques, since he was certainly a*~~

~~*' visitor at the court in 1147. The poets Egas Moniz Coelho and*~~

~~*Goncgalo Herminguez are commonly, though erroneously, referred to the time of Affonso Henriques, who was himself a poet ; but the name (and poem) of only one undoubtedly Portuguese troubadour of this period has survived, Joao Soares de Panha (1145-1204). The history of Galician literature properly belongs to that of Spain, but it is important to remember that Portugal is perhaps even more than Castile the heir of its early efforts. Amongst the Galician poets who frequented the court of Sancho I. (1185-1211) and formed a strong opposition to the Italo-Provencal school were Affonso Gomez, Fernam Goncalves de Senabria, and Joio Soares de Paiva. The most famous of their Provengal rivals, who doubtless were the more readily welcomed owing to the king's marriage with a daughter of Raymond Berenger IV., count of Provence and king of Aragon, were Peire Vidal, Peire Valeira, and Gavaudan o Velho, who in a "sirvente" written about 1210 incited the Christians to a crusade against the Moors. Affonso ITI. (1248-1279) returned from his residence at the court of St Louis of France imbued with northern rather than with southern sentiments, and consequently during his reign French influences prevailed. The nobles who had accompanied him were "trouvéres" rather than " tronbadours*~~

~~*and to one of them, Affonso Lopes de Bayam, belongs the honour of writing the first Portuguese gesta, a Gesta de Maldizer, Other celebrated poets of*~~

~~*this Franco-Provengal school were the "privados," or court poets, Joao de Aboim, the author of several sirventes and tensons, but, like De Bayam, the writer also of cantos de amigo and cantos de ledino, Fernio Garcia Esgaravunha, and Jofio Garcia o Pinto, his brother. The privados were in their turn satirized by Martim Moxa and Lourengo and Diogo Pezelho, who belonged to the less privileged class of " segreis," a term applied to those singers who wandered from court to court. The king's songs have been lost, or at least cannot be identified, but he is reputed to have been no mean poet, and a sirvente against Alphonso X. of Castile, which appears from internal evidence to have been written by him, is still extant. To this period also belonged the privados Fernao Fernandes Cogominho, the writer of cantos de amigo and serran- ilhas, and Estevam Coelho, of whose works two lovely serranilhas remain of the purest Galician form and feeling. The works of these poets show that, notwithstanding foreign influence, the national forms had already obtained some degree of favour at court. Similarity in the literary language led to considerable intercourse between Portugal and Castile, and the Galicians Pero da Ponte and Affonso Eanes de Coton were entertained by Affonso III., while the Portuguese poets Pero Gomes Barroso, Payo Gomes Charrinho, and Gongalo Eanes do Vinhal enjoyed the patronage of Alphonso the Wise. On the accession of Diniz (1279-1325) the court literature showed the decided southern and Provencal tendencies of this king, who from the number, variety, and beauty of his songs was himself the greatest poet of his time. Educated by Aymeric d'Ebrard of Cahors, afterwards bishop of Coimbra, he at first affected the mannerisms of the decaying school of Provence. With the courts of Love which he introduced came the Limousin decasyllabic in place of the national octosyllabic metre, and the ancient forms were lost in the intricacies of the ritournelle. This king's songs are marked by an exaggerated subjectivism, but among them quaint and graceful " pastorellas"' are found, full of poetic life and truth, which show that the king was not blind to the beauty of his people's lyrics. Admiration led to imitation, and the close of his reign is marked by a distinct literary revival of the national poetry, which at his hands received a polish it had somewhat lacked before. The effects of Diniz's influence pervade the whole of Portuguese poetry, for not only was he in his pastorellas the forerunner of the great pastoral school, but by sanctifying to literary use the national storehouse of song he perpetuated among his people, even to the present*~~

~~day, lyric forms of great beauty. Dom Diniz completely overshadows the poets who were his courtiers and contemporaries, but amongst them the most notable were Estevam da Guarda, Ayras Peres Veyturon, Ruy Goncalves, Joao Eanes, and Jofio de Guilharda, though the last-named was rather a musician than a poet. Dom Affonso Sanches, a natural son of Dom Diniz, wrote partly in the Limousin and partly in the Galician style, and another son, Dom Pedro, Conde de Barcellos, who com- piled a "livro das cantigas" anda "nobiliario" or peerage, was the author of several poems, but in an affected strain, which marked the approaching decay of lyric poetry. With the reign of Affonso IV. (1825-1357) began the reaction of the Castilian language against the Portuguese, but the quarrels of Ferdinand (1367-1383) with Henry II. of Castile were the fortunate cause of the formation of a second national school. For amongst its founders were the Galician poets who took refuge at the court of Portugal, and who were followers of Macias and Padron, including Vasco Pires de Camées, ancestor of the great Luis, while to this period must be properly assigned the poems of Egas Moniz Coelho and Gongalo Herminguez.~~

~~Epic poetry was in Portugal as in Provence a later literary Epic The popular aravias must have been poetry.~~

~~development than lyric. numerous, to judge from the remains which arc still found in the Azores and in the provinces of Beira and Algarves; and to the 13th century may be referred the Locnda de Santa Iria and the Cancdéo do Figueiral. In its literary form the Breton "lai" was~~

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~~known to Dom Pedro, brother of Affonso II. (1211-1223), and a few poems in this style with music attached were written by him. The Roman de Brut is also quoted by Diniz, but it was through the marriage of John I. with Philippa of Lancaster (1387) that a knowledge of the Arthurian cycle spread through the Peninsula and led to the popularity of the Prophecies of Merlin and kindred works down to the 16th century. The patriotic pride of the people, which had before found vent in the aravias or tales of contests with the Arabs, sought a new literary expression for the rising national~~

~~*greatness, and the parent of Camées's great epic is the poem in which Affonso Giraldes celebrates the victory won by the united armies of Portugal and Castile over the Moors at the battle of the Salado (1340). Only a small portion is extant, but it shows considerable vigour and foreshadows the development which national pride was afterwards to take in the Lusiads. –*~~

~~*The revolt against the subjectivism of lyric poetry which appeared in the narrative spirit of the epic showed itself now in another form, and to Affonso LV. belongs the credit of fully appreciating the new tendencies. Acting under his instructions, Vasco de Lobeira (d. 1403) became the author of the first Portuguese novel by turning into prose the romance of Amadis of Gaul, which led the way for a host of imitations bearing a similar title. The historical records of this period are comprised chiefly in the Chronica da Conquista do Algarve, the Livro velho das Linhagens, and the Nobiliario do Collegio dos Nobres. The theological tendencies of the people are aptly illustrated by works which, although in Latin, deserve men- tion. They are the Concordantiz Morales and Interpretatio Mystica by St Anthony of Lisbon (1195-1231), and the writings of Cardinal Alvaro Paes (d. 1353). The most learned scholar, however, of this period was Pedro Hispano, who became Pope John XXI. (d. 1277), and whose universal learning recalled the days of the great schoolmen.*~~

~~*Fifteenth 5th Century.—During this century lyric poetry was under the*~~

~~*century.*~~

~~*National and classical schools.*~~

~~*increasing influence of the Spanish school and of its leader Juan de Mena, whose praises were sung in some couplets by the infante Dom Pedro, son of John I. The chief imitators of this style were Luis de Azevedo, Ayres Telles (d. 1515), and Diogo Brandao (d. 1530). The Arthurian romances of Dom Eurives and Branca-Flor may be referred to this century; and the poems on the death of the infante Dom Pedro by Luis de Azevedo, and on the death of John II. by Diogo Brandao exhibit the literary form of the epic. The coustable, son of Dom Pedro, felt the influence of the Italian Renaissance, and consequently became the founder of the Dantesque or allegorical*~~

~~*school. His Satyra da felice e infelice Vida is an allegorical piece of some merit, but a better specimen of this style is the Viséo by Duarte de Brito, a compound of the Roman de la Rose and the Divina Commedia. The Fingimento de Amorc by Fernao Brandao also possesses many beauties.*~~

~~*The principal prose works of the time are the Book of the Chase written for John I. (1383-1433), the vivid and interesting Chronicles of Fernéo Lopes (1380-1459), the Froissart of Portugal, and the Chronicles of Gomes Eanes de Azurara (d. 1473), Ruy de Pina (1440-1520), and Duarte Galvao (1445-1517). King Edward him- self (1433-1438) was the author of The Faithful Councillor and Instructions in Horsemanship, while a Treatise on Tactics with several other works showed the powers of Affonso V. (1488-1481) as a general mathematician and natural philosopher, the cultivation of which may have been in part due to the lessons learned from the Cyropxdia translated for him by Vasco de Lucena.*~~

~~16th and 17th Centuries. —The golden age of Portuguese literature had now arrived, and to Bernardim Ribeiro (¢. 1500) is due the honour of founding its characteristic school of romantic pastoral poetry. The rivers and mountains of his native land are the natural framework of a poet's fancy, and the revival of classical learning showed him in the Eclogues of Virgil a model which he was not slow to imitate. His Eclogues, written in "redondilhas" (octosyllabic nine or ten-lined stanzas), are accordingly the earliest in modern Europe, and, while replete with the charms and conceits of versification of the troubadours, show a truly poetic love of nature. He was also the writer of the first " sextinas " in redondilhas, and of many beautiful cantigas and elegies. To the same school, which was now the representative of all national feeling, belong Christovio Falcio, whose smaller poems are quite equal to those of Ribeiro, Garcia de Resende (1470-1554), compiler of the Cancionetro Geral, a magnificent collection of poems by almost three hundred writers, beginning with Affonso Henriques, Gil Vicente (1470-1536), J orge Ferreira de Vasconcellos (d. 1585), and Fernio Rodrigues Lobo Soropita (c. 1600). The last-named is chiefly known from three comic satires on the classical school and his Introduction to the poems of Camoens, which formed the basis of Faria e Sousa's Com- mentary. Except for the fact that a master-mind belongs to no school, Camoens himself might be claimed by these writers as a fellow-worker, for he was systematically either ignored or abused by the opposing school of classicists. His works are treated of at length elsewhere (see CAMOENS), but it is not out of place to remark here that his beauties are those of the national school and his defects the result of an imitation of the classicisms affected by his~~

~~opponents. These were the followers of the school founded by Francisco de Sa de Miranda (1495-1558) on his return from Italy, where he acquired a love not only for the Renaissance, whose in- fluence had been already felt by Ribeiro, but for the forms in which the new culture found expression. Much praise is due to him for the polish he gave to his country's literature, but by his classical affectations and the favour he showed to the Spanish~~

~~*language, in which his best works were written, he sowed the seeds of that decay which afterwards overtook Portuguese poetry. The eclogues, epistles, odes, elegies, and sonnets of this school are often perfect in form and contain much real poetry, but the classicisms which at first are graceful in their novelty weary in the end by their unreality, and in the hands of inferior artists degenerate into mere stage properties, used to conceal the want of genius. The shepherds and shepherdesses are no longer the idealized peasants of the troubadours but courtiers in masquerade, and the sense of this lowering of the ideal is sufficient to destroy the pleasure which would otherwise be derived from the polished language and poetic imagination. The imitators of Miranda were very numerous ; the chief among them were Antonio de Ferreira (1528-1569), who was Horatian rather than Virgilian in feeling, and consequently pro- duced but inferior eclogues, while his didactic epistles were the earliest Portuguese examples of that style, Diogo Bernardes (d. 1599), whose sacred songs are particularly good, Pedro de Andrade de Caminha (d. 1589), Fernéio Alvares do Oriente (b. 1540), Don Manuel de Portugal (d. 1606), and Estevdo Rodrigues de Castro (1559-1637). Among the lyric poets of the 17th century the chief of those who by their satirical and comic verses showed an inclination to the national rather than the classical school were Thomas de Noronha (d. 1651) and Jacinto Freire de Andrade (1597-1657), author of the Fabulas de Narciso and of various songs and sonnets published in the Fenix Renascida (1716-1728). Antonio Barbosa Bacellar (1610-1663) was the first writer of "saudades," and was followed in the same style by Simao Torrez&o Coelho (d. 1642). Sonnets were of course written by every man of culture, but they rarely rose above the standard of mediocrity. Those of Manuel de Faria e Sousa (1590-1649), Duarte Ribeiro de Macedo (1618-1680), and André Nunes da Sylva (1630-1705) may, however, be reckoned among the best. The sacred poems of the last-named are also very good, but are surpassed by the Jardim do Ceo by Eloi de Sa Soto- maior, and by the poems of Sister Violante do Céo (1601-1698). The didactic epistles of Antonio Alvares da Cunha (1626-1690) are fair specimens of this class of poem.*~~

~~*The truly heroic life of Portugal during this period naturally Epies of demanded to be sung in a fitting strain, and the 16th and 17th 16th and The earliest of 17th een- these was the Creacéo do Homem by André Falco de Resende (d. turies.*~~

~~*centuries were consequently the era of epic poems.*~~

~~*1598), which from its similarity in style has been often attributed to Camoens (1524-1579), whose Lusiads appeared in 1572. Though the sole masterpiece of the country and the age, this last not unworthily eclipses other epics in.which the brilliant passages are more or less numerous. Such are the Primeiro Cerco de Diu by Francisco de Andrade (1540-1614), the Naufragio de Sepulveda and the Segundo Cerco de Diu by Jeronymo Cérte-Real (1540-1593), both rather above the average, the Elegiada (1588) by Luis Pereira Brandao, the Affonso Africano (1611) by Vasco Mousinho de Quebedo, who shares with Cérte-Real the honour of ranking next after Camoens, the Ulysséa by Gabriel Pereira de Castro (1571-1632), the Viriato Tragico by Braz Garcia Mascarenhas (1596-1656), the Malaca Conquistada by Francisco de Sa de Menezes (d. 1664), the Ulyssipo by Antonio de Souza de Macedo (1606-1682), and the Destruigéo de Hespanha (1671) by André da Silva Mascarenhas.*~~

~~*The drama in Portugal was stifled in its birth. The miracle- Drama.*~~

~~*plays of the people attained a high degree of excellence in the "autos" or sacred Christmas plays of Gil Vicente (1470-1536), but this writer was born half a century too soon for his work. His comedies, of which the best is Znez Pereira, are full of the rough wit which is found in the early Latin writers, but show a want of — polish and dramatic conception which is fatal to their claims to high rank as works of art. The comedies of his contemporaries, Antonio Prestes, Jorge Pinto, and Jeronymo Ribeiro Soares, all show considerable talent, and the Zufrosina of Jorge Ferreira de Vasconcellos (d. 1585) most nearly approaches to a modern standard of excellence. Francisco Manuel de Mello (1611-1666) was the author in Portuguese of the Auto do Fidalgo Aprendiz as well as of several poems, but most of his works are in the Spanish language. Among the classicists Miranda was the author of the comedies Os Lstrangetros and Os Vilhalpandos, but his plays are inferior to those of Ferreira, whose dramatic works are in some respects superior to his poems. The chief of them, which was produced only a few years later than the Sophonisba of Trissino, is the tragedy Inez de Castro, but, though his subject was so fine, his treatment of it was not altogether satisfactory. There are also several plays by Camoens ; but the*~~

~~*influence of the Spanish language was by this time irresistible, and the result was that all serious dramas were written in Castilian, while Portuguese was reserved only for the lighter and more popular pieces, the best of which were collected*~~

~~*Ro- mances, &c.*~~

~~*History.*~~

~~*Religious religious works may*~~

~~*works.*~~

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~~*by Coelho Rebello in A Musa entretenida de varios Entremeses (Coimbra, 1658).*~~

~~*In prose the imitations of Amadis of Gaul were followed by the school of the Palmeirims, which originated in the romance of chivalry Palmeirim d' Inglaterra. The first and second parts of this work were probably by the Spaniard Hurtado, and were only trans- lated by Francisco de Moraes (d. 1572) ; the third and fourth parts were written by Diogo Fernandes (c. 1580), and the fifth and sixth by Balthasar Gongalves Lobato (c. 1600). But Moraes, though thus missing the honour of being an originator, was probably the author of the scarcely less celebrated Palmeirim de Oliva. The Livro de Cavallaria by Fernio Lopes da Castanheda (d. 1559), the Chronica do Emperador Clarimundo by Joio de Barros (1496-1570), several works by Francisco Rodrigues Lobo (c. 1600), and the Chronica do famoso Principe D. Clarisol de Bretanha (1602) by B. G. Lobato arc of a similar character. The pastoral novel originated in the Menina e Moga by Bernardim Ribeiro, a composition in prose and verse which gave rise through its imitation in Spanish by Jorge de Monte Mor (d. 1561) to the school of the Dianas. This style was in its turn imitated in Portuguese by Fernéo Alvares do Oriente (b. 1540) in the Lusitania Transformada, and among other examples may be noted the Ribeiras do Mondego (1628) by Eloi de Sa Sotomaior, and the Primavera, O Pastor Peregrino, and O Desenganado (1601) by F. R. Lobo. The last-named was also the author of*~~

~~*the more meritorious Cérte na Aldéa, a sort of Friends in Council, which was afterwards imitated in the Serdo politico by Felix da Costanheira Turacem, the nom-de-plume of Lucas de St Catherina (1660-1740). To the pastoral novel succeeded the allegories, of which Grand Cyprus, Clelia, and Astrea are the best examples. The Inquisition, how- ever, laid its ban upon them when they showed mystical tendencies, as in the Pé de Rosa Fragrante, Cerva Branca, &c.; but an adapta- tion of the Pilgrim's Progress was published by the inquisitor Alexandre de Gusmao (1629-1724), with a view to proving the efficacy of infant baptism, which was certainly not the intention of Bunyan. The Decameronic tales took the form in this period of the Contos e Historias de Proveito e Exemplo (1589) by Gongalo Fernandes Trancoso, the Infortunios tragicos da constante Florinda (1625) by Gaspar Pires de Rebello, and the Alivio de Tristes (1672), Retiro de Cuidados-(1681), and Roda da Fortuna (1692) by Mattheus Ribeiro. The pride in the national greatness which found poetical expression in the epic also caused the rise of a great school of historians. The older royal chroniclers were followed by Garcia de Resende (1470-1554), Christovióo Rodrigues Acenheiro (b. 1474), and Damiao de Goes (1501-1573). Their chronicles are graphic and interesting, though inferior in style to the works of their successor, who was the most brilliant early historian Portugal can boast. This was Joao de Barros (1496-1570), author of the Conquest of the Indies, which was afterwards continued in the Asia Portugueza by Manuel de Faria e Sousa (1590-1649), a learned and facile writer, from whose pen are also the Europa, Africa, and America Portugueza, a Commentary on Camoens, and numerous other works. The style of Barros is both elegant and energetic, and the criticism and accuracy which he displays make him still an authority of the first fank. The next greatest historian after Barros was the monk Bernardo de Brito (1569-1617), author of Afonarchia Lusitana, of which there is a continuation by Antonio Brandao (1584-1637), and of the Chronicles of the Cistercians and of D. Sebastido. The elegant Latinist and best antiquary of the 16th century, André de Resende (1498-1573), whose talénts were recognized by Erasmus, produced the De antiquitatibus Lusitani# and the Life of the Infante D. Duarte ; and the History of the Discovery and Conquest of India by Fernao Lopes de Castanheda (d. 1559), the Chronicles of D. Sebastiao by Bernardo da Cruz (1530-1586) and by Manuel de Menezes (d. 1628), the Life of D.*~~

~~*Jodo de Castro by Jacinto Freire de Andrade (1597- 1657), which is still the type of perfect biography, the Chronicles of*~~

~~*-Scanderbeg and D. John ITI. by Francisco de Andrade (1540-1614),*~~

~~*the Commentaries of Affonso d' Albuquerque (1500-1580), compiled by his son, and the works of Diogo do Couto (1542-1616) and Duarte Nunes do Ledo (d. 1608) supply a mass of interesting historical material. To Antonio Barbosa Bacellar (1610-1663) is due an account of the Siege and Capture of Recife; and the True Account of Prester John (1540) by Francisco Alvares, the Travels in China, Tartary, &c., of Fernio Mendes Pinto (1509-1580), and in Persia (1610) of Pedro Teixeira, the account of the Mission of Aleixo de Menezes to the Christians of S. Thomas by Antonio de Gouvea (d. 1628), and the History of Tangier by Fernando de Menezes (1614-1699) are all classical works and full of interest. Among be mentioned those of Diogo de Paiva de Andrade (1528-1575) and of Diogo de Gouvea (d. 1576), the Com- mentaries of the Hebrew scholar Jeronymo de Azambuja (1520-1565),*~~

~~*the Life of S. Francis Xavier by Joao de Lucena (1550-1600), the'*~~

~~*Commentaries on the Minor Prophets by Bernardo de Brito (1569- 1617), the Lives of S. Dominic and other saints by Luis de Sousa (1555-1632), the Agiologio Lusitano by Jorge Cardoso (1616-1669), the Sermons of the great preachers Gaspar Pires de Rebello (c. 1625) and Antonio Vieira (1608-1697), the Clavis Prophetarum of the last-named, and the works of Bartholomeu do Quental (1626-1698),*~~

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~~*founder of the Portuguese branch of the Oratorians.*~~

~~*the cosmographer Pedro Nunes (1492-1577), one of the greatest ma- thematicians of his time, Estevao Rodrigues de Castro (1559-1637) author of a Commentary on Hippocrates and various other medical works, and the astronomer Manuel Boccarro Francez (1588-1662).*~~

~~*18th Century.—During the preceding century there had been Eight-*~~

~~*\ The scientific Scientific writers of the period are not numerous, being represented chiefly by writers.*~~

~~*founded in imitation of the Italians numerous "arcadias " or literary eenth*~~

~~*clubs under fantastic titles, such as " Ambientes," "Solitarios," &c. century.*~~

~~*Their influence was insignificant, and their existence would call for no remark were they not the forerunners of the academies, which during the 18th century saved Portuguese literature from total extinction. In the year 1714 was founded the Lisbon Royal Academy of Sciences, which was succeeded by the Portuguese Academy, whose first president was the learned historian Francisco Xavier de Menezes, count of Ericeira (1673-1743), author of the epic Henriqucida. His numerous translations of the works of Boileau and other French writers had considerable influence on Portuguese literature, and the founding in 1757 of the " Arcadia de Lisbéa," in which the great minister the marquis of Pombal was supreme, led to a wider spread of the teachings of the Encyclo- pedists. The arcadia ceased to exist in 1774, but was followed in 1779 by the Royal Academy of Sciences, founded by the duke of Lafodes, and by the " Nova Arcadia," which flourished between 1790 and 1806. As regards poetry these academies were little more than manufactories of verse, the only lyric poets of the early part of the century being Thomas Pinto Brando (1664-1743) and Antonio de Lima Barros Pereira (b. 1687) ; but their members, though wanting in poetical originality, showed considerable industry in historical research. The Bibliotheca Lusitana by Diogo Barbosa Machado (1682-1772) is a complete biographical dictionary of the Peninsula, and the Life of the Infante D. Henrique by Francisco José Freire (1719-1773) and the General History of Portugal by Damiaio Antonio de Lemos (1715-1789) are standard works, while the Jfemorias de LIntteratura of the Royal Academy of Sciences contains much infor- mation about the literature of the 16th and 17th centuries. But the real founder of scientific history in Portugal, as opposed to merc collections of legends and traditions, was Joao Pedro Ribeiro (1759- 1839), whose Researches in Portuguese Chronology show an historical scepticism far in advance of hisage. To the*~~

~~same group of workers for the academy in the historical department belong Francisco de St Luis, cardinal-archbishop of Lisbon (1766-1845), Francisco Manuel Trigoso (1777-1838), and José Francisco Corréa da Serra (1750-1823), who edited the Harly Portuguese Chronicles. In the latter half of this century a revival in poetry also took place, and the works of Antonio Diniz da Cruz e Silva (1731-1800), author of Hyssope, acquired for him the title of the Portuguese Boileau. With him were associated Pedro Antonio Corréa Garcfio (1724-1772), author of the comedy Assemblea and the Cantata de Dido, Domingos dos Reis Quita (1728-1770), the best pastoral poet of the period, and the Brazilian Claudio Manuel da Costa (1729-1789). But to Francisco Manuel do Nascimento (1734-1819), who wrote under the nom-de- plume of Filinto Elysio, must be assigned the honour of being the reviver of letters in Portugal, not only by his elegant lyric poems but more especially by his miscellaneous writings and by his opposition to foreign imitations. His school of " Filintists " found rivals in the " Elmanists" led by Manuel Maria de Barbosa du Bocage (1766-1806), who, though less original than Nascimento, had perhaps greater influence. His poetical works are numerous, and he was, besides, the author of three tragedies, Viriatus, Affonso Henriques, and Vasco de Gama, which had some success. The poems of Antonio Ribeiro dos Sanctos (1745-1818), the satires of Nicolau Tolentino de Almeida (1741-1811), and the sonnets of Paulino~~

~~Antonio Cabral de Vasconcellos (b. 1720) are all reckoned among °~~

~~the good work of the 18th century. But the best as well as the last work of this school is the epic Oriente (1814) by José Agostinho de Macedo (1761-1831), whose contemporary, José Anastasio da Cunha, was condemned by the Inquisition for the heresy contained in his Oracgdéo Universal. The tragedies Osmia, by Catharina de Sousa, countess of Vimieiro (1749-1824), and Nova Castro, by Joao Baptista Gomes (d. 1803), call for especial notice, as do the vaude- villes Don Quixote and Hsopaida by Antonio José da Silva (1705- 1739), while the national taste further showed itself in the favourable reception given to the comedies of his successor, Alexandre Antonio de Lima (b. 1699).~~

~~19th Century.—The political troubles of 1820 led to the expatria- Modern tion of Joio Baptista de Almeida Garrett (Jonio Duriense) (1799- verse,~~

~~1854) and Alexandre Herculano (1810-1879), and the retreat to a monastery of Antonio Feliciano de Castilho (Memnide Egynense) (1800-1875). The first two were followers of Nascimento, the last of Bocage; but, while the enforced studies of Castilho only increased his classicist proclivities, the exile of Garrett and Herculano brought them into contact with romanticism. The effects arc seen in Garrett's D. Branca, Joéo Minimo, and Flores sem Fructo, and later on in his most famous work, the Folhas Cahidas. R. A. de Bulhao Pato, F. Gomes de Amorim, and E. Vidal have also written in the same style, but their poems have a less truthful ring than~~

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~~Modern prose.~~

~~_ vol, xviii. p. 586.~~

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~~those of Garrett, who is also the author of both the earliest and the best examples of the modern Portuguese drama, Gil Vicente, Alfageme, and Luis de Sousa. The principal works of Castilho are A Primavera, Amor e Melaneolia, and Exeavagées Poeticas; and the writers who may chiefly be claimed as his followers are Sarmento, J. M. de Costa e Silva the dramatist, Cabral de Mello, and Fernandes Leitéo. The publication in 1848 of O Trovador, a collection of modern lyrics, marks the foundation of the school of Coimbra. Its leader, Joao de Lemos, the lyric poet, found fellow-workers in José Freire de Serpa, the impressionable author of Soldos, and José da Silva Mendes Leal, author of the dramas 4 Alva Estrella, A Madre Silva, and Os Homens de Marmore, and various lyric poems. The most popular modern poet Luis Augusto Palmeirim, the dramatist A. Pereira da Cunha, Antonio de Serpa, and Jodo de Andrade Corvo, author of the novel Um Anno da Cérte, all belong to this school, the prevailing characteristic of which at ifs foundation was a profound adntiration for Chateaubriand and hisroyalist and religious opinions. The second phase of this school dates~~

~~*from the Novo Trovador, in which the influence of Aimé Martin and Krause on its originator Soares de Passos is plainly visible. The poems of Passos are tinged with a melancholy which presaged his early death, and he philoso- phizes in the Firmamento, the Eseravo, and the Morte de Soerates somewhat in the same strain as the English Lake poets. The third phase of the school of Coimbra is represented by the Flores do Campo and Folhas Soltas of Joao de Deus, the poet of love and revolution. Of the same school the Visdéo dos Tempos by Theophilo Braga is an attempt at a newrevelation, and the Odes Modernas by Anthero do Quental are socialistic, but both writers show more than ordinary power. Other modern poets are Alberto Telles, Sousa Viterbo, Candido de Figueiredo, Gomes Leal, Thomas Ribeiro, A. J. Viale, and Guilherme de Azevedo. The plays of C. C. Branco and Ernesto Biester are above the average, and King Luis has worthily followed the traditions of his race in his translations of the plays of Shake- speare. The historical novels of Herculano are much admired by his countrymen, as well as those of L. A. Rebello da Silva; and the works of J. G. Gomes Coelho (Julio Diniz), A. de Oliveira Marreca, Mendes Leal, Bernardim Ribeiro, Arnal do Gama, Teixeira de Vasconcellos, and Camillo Castello Branco, with his accuracy of description, have some reputation; but the best modern novel, judged by an English standard, is O Crime do Padre Amaro by Eca de Queiroz. As the growth of Portuguese inde- pendence was coeval with the work of the troubadours, and the discoveries and conquests of the heroic age gave birth to the epic of Camoens, so, in like manner,'the political revival of the 19th century has given rise to a school of great historians, the chief of whom was Alexandre Herculano. The exile of Herculano had brought him into contact with both English and French roman- ticism, as appears in his early poems and his historical novels, in which the influence of Lamartine and Scott is plainly visible, but in later life he was attracted to the new German school of historians founded by Ranke, and perceived that his true vocation was scientific history. His chief work has been the disentangle-*~~

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~~*ment of the early history of Portugal from the mass of legends which had clustered round it, and his History of Portugal and The Origin of the Inquisition in Portugal are lasting monuments of industry and criticism. But Herculano perceived that, before a true knowledge could be gained of Portuguese history, a critical study must be made of early documents, so, using his official position, he commenced the publication for the academy of a magnificent edition of the Origines of Portuguese history. The viscount of Santarem began a similar work in his collections of Federa, though his fame will rest rather on his researches into the history of the great maritime discoveries of the 15th and 16th centuries. L. A. Rebello da Silva continued the work of Santarem in the publica- tion of the Corpo Diplomatico, and his History of Portugal in the 17th and 18th Centuries is only inferior to the great work of Herculano. These historians inspired many others, among whom may be mentioned Fonseca Benevides, F. F. de la Figaniere, Claudio de Chaby, and Simao José dawLuz Soriano. The strength of this school is no doubt partly due to the extreme vigour of the reaction- aries who were first called into existence by Herculano's attacks on superstitious legends. Their work is brilliant if not convincing, and it would not therefore be right to pass over without mention such names as F. Recreio, Pinheiro Chagas, and Affonso Ennes, In general literature the name of Francisco Alexandre Lobo (17638- 1844) stands out prominently as the foremost man of the century, and the Portuguese equal of De Maistre, whilst Thomas de Car-valho, Rodrigo da Fonseca, Cesar Machado, Lopes de Mendonga, F. Adolpho Coelho, Theophilo Braga, Innocencio Francisco da Silva, and F. D, Vieira have all won a position as critics and essayists. Political liberty has gone hand in hand with the freedom of the press, and here again Herculano appears as the founder of the Panorama, in which he had the assistance of most of the writers above-mentioned. Besides these the most influential journalists are Teixeira de Vasconcellos, Rodrigues de Sampaio, and J. M. Latino Coelho. While the press remains free and can boast of such writers Portuguese literature will certainly increase in strength and vigour, and maintain the feeling of national pride and independence which appears so strongly in the works of*~~

~~*-Garrett and Herculano, and will always prevent a union with*~~

~~*Spain.*~~

~~*Bibliography.—For the general history of Portuguese literature, Bouterwek, Hist. of Span. and Port. Literature (London, 1823); Sismondi, Hist. of the Litera- ture of the South of Europe (London, 1823); and J. F. Denis, Résumé de V'hist. litt. de Portugal (Paris, 1826) may be consulted ; also the " Notice on Literature" by Theo. Braga, in vol. i. of Vieira's Grande Diccionario (Oporto, 1871), ahd the same writer's Introductions to the Antologia Portugueza (Oporto, 1876) and the Parnaso Portuguez Moderno (Lisbon, 1877). For the troubadour period, see the Introductions to Trovas e Cantares, ed. Varnhagen (Madrid, 1849), and the Cancionetro Portuguez, ed. Braga (Lisbon, 1878). The Memorias of the academy and the Introduction to the Parnaso Lusitano (Paris, 1826) may be consulted for the classical period ; and the Memorias de Litt. contemporanea by A. P. Lopes de Mendonga (Lisbon, 1855) and La Littérature Portugaise by J. M. Pereira da Silva (Rio, 1866) give a fair account of contemporaneous literature. The best biographical dictionaries are the Bibliotheca Lusitana by Machado (Lisbon, 1741) and the Diccionario Bibliographico Portuguez by Innocencio F. da Silva (Lisbon, 1858). (H. B. B.)*~~

~~*PORUS, the name of the Indian king who withstood Alexander the Great on the banks of the Hydaspes (Jhelum). He was afterwards confirmed in his kingdom by the conqueror, and still held the position of a Mace- donian satrap when assassinated some time between 321 and 3158.c. See Inpta, vol. xii. pp. 786, 787, and PErsta, His cousin, also named Porus, with whom he was on bad terms, ruled over Gandaris beyond the Hydraotes (Ravi), and was subdued by Hephestion.*~~

~~*POSEIDON, the ancient Greek god of the sea and of water generally, was fabled to be the son of Cronus and Rhea, and brother of Zeus and Pluto. When the three brothers deposed their father Cronus the kingdom of the sea fell by lot to Poseidon. With his wife, Amphitrite, he dwelt in the depths of the sea; at Auge he had a golden house beneath the waves. In his hand he bore a trident (a three-pronged fish-spear), wherewith he lashed the sea into fury. But, while he caused storms and shipwrecks, he could also send favouring winds. He was the god of navigation, adored by all who sailed the sea. His temples stood especially on headlands and isthmuses. As god of the sea he disputed with other deities for the possession of the land—with Athene for Athens and Treezen, with Helios for Corinth, with Hera for*~~

~~*Argos, with Zeus for Aigina, &c. Earthquakes were thought to be produced by Poseidon shaking the earth,—hence his epithet of*~~

~~*‘“‘arth-shaker,” and hence he was worshipped even in inland places, like Apamea in Phrygia, which had suffered from earthquakes. Hence also may have arisen the custom in some places of sacrificing moles to him. The great sea- wave which often accompanies an earthquake was also his work ; the destruction of Helice in Achaia by such a wave (373 B.c.) was attributed to his wrath. Once when an earthquake shook the ground where a Spartan army was encamped, the whole army sang a hymn to Poseidon. The island of Delos was thought to have been raised by him from the bottom of the sea, and in 237 B.c., when a new island appeared between Thera and Therasia, the Rhodians founded a temple of Poseidon on it. Thessaly was said to have been a lake until this god opened a way for the waters through the Vale of Tempe. Poseidon was also the god of springs, which he produced by striking the rock with his trident, as he did on the acropolis of Athens when he was disputing with Athene for the sovereignty of Athens. This dispute was represented on the western pediment of the Parthenon. As he gave, so he could withhold springs of water; thus the waterless neighbour-hood of Argos was supposed to suffer from his anger. Black bulls were sacrificed to him ; in Ionia and Thessaly bull-fights took place in his honour ; at a festival of his at Ephesus the cupbearers were called “bulls,” and the god himself was surnamed “Bull Poseidon.” The horse was*~~

~~*especially associated with his worship ; he was said to have produced the first horse by striking the ground in Thessaly with his trident. At a fountain in Argolis horses bitted and bridled were sacrificed to him by being drowned in the water, and similarly Sextus Pompeius sought to propitiate him by throwing horses into the sea. He bore the surname of “Horse Neptune,” and was regarded as the tamer as well as the creator of the steed. His worship was thought by Herodotus to have been derived from the Libyans. It had special seats in Thessaly, Boeotia, and the Peloponnesus. He had a famous cave-like temple at Teenarum in Laconia. On the island of Tenos he was worshipped as the physician, and crowds gathered from the neighbouring islands to offer sacrifice. At Mycale in Asia Minor the*~~

~~*Panionium, or place of general assembly of the Jonian Greeks, was sacred to him. In the Trojan War Poseidon sided with the Greeks because he had been cheated of his reward by Laomedon, the former king of Troy, for whom he had built the city walls. The offspring of his numerous amours were mostly wild and cruel like the sea; such were the Lestrygones, Polyphemus, Cycnus, Antzus, Busiris, Pro- crustes, Sciron, and Orion. Alcinous, king of the sea- faring Pheacians in the Odyssey, traced his lineage to Poseidon. By far the most famous of the festivals of Poseidon was that celebrated every second year on the Isthmus of Corinth and hence called the "Isthmian festival" (see vol. x. p. 65). Pine trees were sacred to Poseidon ; a row of them stood close to his temple on the isthmus. Amongst the Jonians the stormy month which precedes the winter solstice was called by the name of Poseidon. He was described as dark-haired, broad-breasted, and blue-eyed. In works of art he appeared holding a trident and with a dolphin on his hand or under his feet ; sometimes he was represented riding a bull, a horse, or a sea-horse, or in a chariot, often surrounded by the Tritons, Nereids, and other fabulous creatures of the sea. There were colossal statues of him at Helice in Achaia, on the Isthmus of Corinth (set up by the Greeks after the Persian wars), and at Tenos. The derivation of his name is uncertain ; some refer it to the same root as wdtos, worapds, &c.; others compare wétvia. In modern Greece St Nicholas has taken the place of Poseidon as patron of sailors. But the Zachynthians have a special sea-god, half man, half fish, who dwells under the sea, rides on dolphins or in a car drawn by dolphins, and wields a trident. He seems to combine the attributes of Poseidon and Nereus. For the Roman sea-god, see NEPTUNE.*~~

~~*POSEN, a province in the east of Prussia, with an area (11,180 square miles) nearly equal to that of Belgium, is bounded on the N. by the province of Prussia, on the E. by Russian Poland, on the S. by Silesia, and on the W. by Brandenburg. It belongs physically to the great north German plain, and consists of a low plateau intersected by the beds of the Netze, the Warthe, and the Obra. The three rivers just named drain into the Oder, but part of the province falls within the basin of the Vistula, which forms the frontier for a short distance on the north-east. The surface of the whole district is dotted with small lakes and ponds, and there are many broad fens and marshes. The soil on the whole is light and sandy, but much of the land reclaimed in the boggy districts is very fertile. Up- wards of 61 per cent. of*~~

~~the area is under cultivation, while 13 per cent. is occupied by pasture and meadows and 20 per cent. by forests. The principal crops are wheat, rye, oats, barley, potatoes, and hops (compare PRusstA) ; the vine is cultivated to some extent in the south-west corner, and tobacco is also grown. The marshy tracts often afford excellent pasture and support large numbers of cattle, sheep, and goats. The mineral resources of the province are practically restricted to brown coal and salt,~~

~~about 26,000 tons of the former and 75,000 tons of the latter being raised in 1882. The industry is confined to a few points, and is of comparatively little importance. Besides beer and brandy, the chief products are machinery, cloth, tobacco, and bricks. Trade, carried on briskly in timber and agricultural produce, is facilitated by the net- work of navigable rivers and canals. Both industry and trade are somewhat cramped by the duties imposed at the Russian frontier. The population of the province in 1880 was 1,703,397, including 1,112,962 Roman Catholics, 532,498 Protestants, and 56,609 Jews. The Roman Catholics are mainly Poles, of whom there are about 950,000 in Posen, while the great bulk of the 750,000 Germans are Protestants. About 65 per cent. of the popu- lation is returned as "rural" in spite of the large number of so-called "towns," only seven of which, however, have more than 10,000 inhabitants. The largest are Posen and Bromberg. The province of Posen enjoys the unenvi- able distinction of being the worst educated corner of the German dominions, a fact illustrated by the high ratio of illiterate recruits (9°75 per cent. in 1882-83). It is re- presented in the German reichstag by fifteen and in the Prussian parliament by twenty-nine deputies.~~

~~History.—The history of the district of Posen, comprehending great part of the cradle of the old kingdom of Poland, including its most ancient capital (Gnesen), falls properly within the scope of the article PoLAND (g.v.). Its political connexion with Prussia began in 1772, when the districts to the north of the Netze fell to the share of that power in the first partition of Poland. The rest followed in 1793, and was united with the Netze district to form the province of South Prussia. After the peace of Tilsit Posen was in- corporated with the grand-duchy of Warsaw, but in 1815 it reverted to~~

~~*Prussia under the style of the "grand-duchy of Posen." In 1848 the Polish inhabitants of the province revolted and had to be put down by force; and a thoroughly harmonious union of the two elements of the population is still unattained.*~~

~~*The tide of German immigration into Posen began at an early period and flowed very strongly in the 13th and following centuries. The industrious German settlers were heartily welcomed by the Polish nobles and were the founders of most of the towns, in which they lived after their own customs and were governed by their own laws. They established the few manufactures of which the district can boast, introduced the cultivation of hops, reclaimed the waste soil, and did much to improve agriculture generally. In the 16th century Protestantism was widely diffused by their means. A strong reaction, however, set in in the following century, and persecution of the Protestants went hand in hand with the ravages of war in hastening the political, intellectual, and agricultural decline of the territory. By the 18th century the burghers had sunk to the level of "stadtische Bauern," or peasants with municipal privileges, and poverty and misery were widely spread. The Prussian rule, in spite of many defects, proved so beneficial that even Napoleon was compelled to praise it.*~~

~~*Posen contains a numerous Polish noblesse, many of the members of which are very poor. A double transformation is going on in the ownership of the ground, the large estates passing into the hands of the peasants and Polish proprietors giving place to German. A few years ago between 60 and 70 per cent. of the soil was occupied by "latifundia," whileat present it is pretty equally divided between those and peasant holdings. In the four years 1878-81, inclusive, the land in the possession of Germans increased at the expense of Polish landowners by upwards of 100,000 acres. The peasant-farmers are generally deeply in debt, partly owing to the educational and communal burdens, but mainly owing to the pernicious custom of "Leibgedinge," according to which an able-bodied man in the prime of life will give up his holding in return for an annuity from his successor. In some instances two annuitants of this kind are found living on the same small patch of ground in addition to the actual cultivator. ;*~~

POSEN (Polish, Poznan), capital of the above province, the seat of a Roman Catholic archbishop, and the head- quarters of a corps of the. German army, is situated at the confluence of the Cybina and Warthe, 150 miles to the east of Berlin and 90 miles to the north of Breslau. It is a fortress of the first rank and of great strategic import- ance; the works consist of a citadel and inner line of bastions, and an outer circle of twelve detached forts. The principal part of the town lies on the west bank of the Warthe, and comprises the so-called Altstadt and the

well-built modern quarter that has sprung up under the Prussian régime. On the other bank is the Wallischei, a poor district inhabited by Poles. Among the older build-

ings none calls for remark except the town-house, a quaint specimen of the Slavonic adaptation of Romanesque forms. The chief modern buildings are the various military and public offices, the law courts, the theatre, the real school, and the Raczynski library. The churches are devoid of architectural interest, but the cathedral contains numerous

of the first Christian kings of Poland, by Rauch. The manufactures of Posen are multifarious enough, including machinery, carriages, tobacco, copper boilers and vats, military requisites, chemicals, &c.; but there is nothing that can be called a staple industry. A lively trade is carried on in the agricultural products of Russia and Poland, and several well-attended fairs and markets are held. In 1880 Posen contained 65,713 inhabitants, in- cluding 35,725 Roman Catholics, 22,869 Protestants, and 7063 Jews. The German inhabitants are at present con- siderably more numerous than the Poles, though it would seem that the latter have increased in a greater ratio since 1875. The Jewish element is stronger here (10-7 per cent.)

than in any other town in Germany. The garrison consists of 7000 men.

~~*Posen, one of the oldest towns in Poland and the residence of some of the early Polish princes, became the seat of a Christian bishop towards the end of the 10th century. The original settle- ment was on the east bank of the Warthe, but the new or German town, established on the west bank about the year 1250, soon be- came the more important half of the double city. Posen was a royal free town, and was directly represented in the Polish diet down to 1733. In the Middle Ages it became a great depdt of the trade between Germany and the west of Europe on the one hand and Poland and Russia on the other. Numerous foreign merchants took.up their abode here, including a strong colony of Scotsmen, who exported raw produce to Edinburgh. The town attained the climax of its prosperity in the 16th century, when its population is variously estimated at from 30,000 to 80,000. The intolerance shown to the Protestants, the troubles of the Thirty Years' War, the visitation of the plague, and other causes, however, soon conspired to change the state of affairs, and in the 18th century the town had only 5000 inhabitants. New life was infused into it on its annexation bY Prussia at the second partition of Poland, and since then its progress has been limited only by its position as a fortress. The relations of the German and Polish elements of the population continue to be somewhat strained.*~~

~~*POSIDONIUS, a distinguished Stoic philosopher, the most learned man of his time (c. 130-50 B.C.) and per- haps of all the school; by birth a Syrian from Apamea, a pupil of Panetius, he spent after his teacher's death many years in travel and scientific researches in Spain (particu- larly at Gades), Africa, Italy, Gaul, Liguria, Sicily, and*~~

~~*on the eastern shores of the Adriatic. When he settled as a teacher at Rhodes his fame attracted numerous scholars ; next to Panztius he did most, by writings and personal intercourse, to spread Stoicism in the Roman world; he became well known to many of the leading men, as Marius, Rutilius Rufus, Pompey, and Cicero. The last-named studied under him (78-77 B.c.), and speaks as his warm admirer and personal friend.*~~

~~*Strabo mentions him as a contemporary. The date of his birth has not been fixed ; it may have been 185, 180, or 125 B.c. ; accord- ing to Lucian, he lived to be eighty-four. He visited Rome—e.g., in 86 B.c. on an embassy; but*~~

~~*it is doubtful if he ever resided there asa teacher. HIs works, now lost, were written in an attract- ive style and proved a mine of information to later writers. The titles and subjects of more than twenty of them are known. In common with other Stoics of the middle period, he displays eclectic tendencies. HIs admiration for Plato led him to write a comment- ary on the Tim#us; in another way it is shown by important modifications which he made in psychological doctrine. Unques- tionably more of a polymath than a philosopher, he appears to us uncritical, or credulous even, and superficial. But at the time his spirit of inquiry provoked Strabo's criticism as something alien to the school (76 aizodoyexdv cal 7d dpucrorédfov, 8rep éxxdlvovow oi nuérepor). In natural science he took a genuine interest, as his contributions to geography, natural history, mathematics, and astronomy sufficiently attest. HIe sought to determine the distance and magnitude of the sun, to calculate the diameter of the earth and the influence of the moon on the tides. HIs history of the period from 146 to 88 B.c., in fifty-two books, must have been a valuable storehouse of facts. Cicero, who submitted to his criticism the memoirs which he had written in Greek of his consul- ship, made use of writings of Posidonius in De Natura Deorwm, b. i, and De Divinatione, b. i., and the author of the pseudo-Aristotelian treatise De Mundo also borrowed from him.*~~

~~*Zeller, Philosophie der Griechen, iii. 1, 570-584 (in Eng. trans., Eélecticism, 56- 70); C. Miiller, Fragmenta HIstoricorum Greecorum, iii. 245-296 ; J. Bake, Posidonti Rhodii Reliquiz, Leyden, 1810 (a valuable monograph); R. Scheppig, De Posidonio rerum gentium terrarum scriptore, Berlin, 1869; R. HIrzel, Untersuchungen zu Ciceros philosophischen Schriften, i. 191 sq. ; ii. 257 sq., 325 sg., 477-535, 756-789 ; ili. 342-378 (Leipsic, 1877). See Srorersm.*~~

~~*POSITIVISM, or Posrtrve Pumosopuy. See Comts.*~~

~~*POSSESSION is a legal term derived from Roman law. The Roman conception of possession has been generally adopted, but the Roman deductions from the conception have not been universally followed. The subject of pos- session, in itself a difficult one, has become more difficult owing to the various senses in which the term has been interpreted. Thus it has been said to be either a right or a fact conferring a right, or both*~~

~~*together. The latter is the view of Savigny, the leading authority upon the subject (Recht des Besitzes, translated by Sir Erskine Perry, 1848). Further, there isa want of agreement among legal writers as to the amount of right or rights that it confers. All that can be said with safety is that possession stands in a position intermediate between simple detention and absolute ownership, and that it implies two elements, a physical and a mental one,—physical detention and mental intention to hold the thing possessed as one's own. In the words of the Digest, "' Apiscimur possessionem corpore et animo, neque per se animo aut per se corpore" (xli. 2, 3,1). The difficulties which have been stated being borne in mind, the definition of Professor Hunter may be accepted as being at least as good as any other that has been sug- gested: 'Possession is the occupation of anything with the intention of exercising the rights of ownership in respect of it" (Roman Law, p. 209). Possession is inchoate or incom- plete ownership ; it is on its way to become ownership. In the case of the public domain of Rome (ager publicus) the possession was really the important matter, the dominium being practically of no value. Possession in Roman law was either natural or civil, The former was mere occupa- tion, the latter such occupation as ripened by prescription into ownership. Possession exclusive against the world (including the true owner) was called "adverse possession." A servitude, such as a right of way, could not be held in true possession, but was said to be in ' quasi-possession." The quasi-possessor had, however, possessory remedies.*~~

~~*PO Seah ses 1 O-N*~~

~~*In Roman law a broad distinction was drawn between possession and ownership (dominium).!1 They were pro- tected by different remedies,—possession by interdict, ownership byaction. This difference can only be explained by history. Here again, unfortunately, authorities differ. According to Savigny, a Roman citizen who had become a tenant of part of the ager publicus could not by any length of holding obtain more than a quasi-ownership, but one of which it would have been morally unjust to have deprived him. 'The only legal remedies of which the tenants could avail themselves, if ejected or threatened with disturbance, were the possessory interdicts, summary processes of Roman law which were either expressly devised by the praetor for their protection, or else, according to*~~

~~another theory, had in older times been employed for the provisional maintenance of possessions pending the settlement of questions of legal right" (Maine, Ancient Law, ch. viii.). Savigny regards the protection of possession as an exten- sion of the protection of the person. The same view was taken by the English Court of Exchequer in Rogers ». Spence, 13 Meeson and Welsby's Reports, 581. According to Professor HIunter (Roman Law, pp. 206, 221), Savigny overlooked the needs of aliens. It was the needs of aliens, incapable of the full proprietary rights of Roman citizens, that led to the invention by the pretor of a means of giving them equitable rights in the land, and protecting them in the enjoyment of these rights. Savigny attributes only two rights to possession in Roman law—acquisition of ownership by possession for a given time (usucaguo, longi temporis possessio) and protection of possession from dis- turbance (interdictum). Others have included further rights,—inter alia, the right to use force in defence of pos- session, and the right to have the burden of proof, ina contest as to the title, thrown upon the adversary: "In pari causa possessor potior haberi debet." The position of the possessor in Roman law was a very strong one. If a bona fide possessor, he could bring an action for furtum even against the owner ; if a mala fide possessor of land, he was so far protected that he could not: be ejected by force. A mala fide possessor of movables could, however, acquire no rights.?~~

~~It has been already stated that there is both a physical and a mental element in the conception of possession. This does not necessarily mean that corporal contact is in all cases requisite, or that the intention to hold the thing possessed as one's own may not be abandoned for a time. The control may be potential as well as actual. An estate may be possessed without the possessor going upon the land at all, and the possession of goods may be given by delivering the key of the warehouse in which they are stored. In international law the possession of part as giving the right to the whole has been of great importance. The possession of the coast of a newly-discovered country gives a right to the inland territory within certain limits (see Twiss, International Law, vol. i. p. 170). Where goods are pledged or bailed for a specific purpose the intention of the pledgor or bailor to hold them as his own is suspended during the existence of the limited right of the pledgee or bailee, to whom a fragment of the posses- sion has passed. In Roman law the pledgor had possessto ad usucapionem, the pledgee possessio ad~~

~~*interdicta. The possession of the pledgee or bailee has been called "deriva- tive possession." Possession may be exercised through another ("animo nostro, corpore alieno"), as through a*~~

~~*1 The distinction is very important, as it affects the contract of sale. The contract was not to transfer ownership, as in English law, but*~~

~~*only vacua possessio. ; ; 2 This does not agree with English law, where in certain cases a*~~

~~*thief can give a good title to stolen goods, though he has no title himself.*~~

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~~*servant, who has not true possession.* Possession so exer- cised has been called "representative possession." As soon as the representative determines to assume control on his own behalf or to submit to the control of another, the possession of the principal is gone. Possession may be transferred or lost. It is lost when either the corpus or the animus (to use the terms of Roman law) ceases to exist. It may be lost by the representative in cases where the principal might have lost it.*~~

~~*In both Roman and English law the possessory tended to supersede the proprietary remedies from their greater convenience,—that is to say, the plaintiff based his claim or the defendant his right upon possession rather than property. The English possessory action may have been directly suggested by the interdict. Bracton (103b) identifies the assise of novel disseisin, the most common form of possessory action, with the interdict unde vw. In England ejectment had practically superseded other real actions before the latter were (with the exception of dower, writ of dower, and guare impedit) expressly abolished by 3 and 4 Will. IV. c. 27, s. 36. The action for the recovery of land, introduced by the Judicature Acts, is the modern representative of the action of ejectment. The right of a party to recover possession is enforced by a writ of possession,*~~

~~*Possession gives in English law, speaking generally, much the same rights as in Roman law. Thus it serves to found a title (see LimiraTion, PRESCRIPTION), and to throw the onus of proof upon the claimant. In an*~~

~~*action for the recovery of land the defendant need only allege that he is in possession by himself or his tenant, and (where such an allegation is necessary) that he had no notice to quit. The chief differences between Roman and English law, arising to some extent from the differences in the history of the two systems, are that the former did not give to derivative possessors (except in the case of pledge) the remedies of possessors, as does English law, and that Roman law is stricter than English in requiring that possession to found usucapio should (except in the case of jus aque ducendx) be ex justo titulo, or under colour of right (see Prescription). There is one case of constructive possession which is peculiar to English law, —that is, where possession is said to be given by a deed operating under the Statute of Uses (see 'Orme's Case," Law Reports, 8 Common Pleas, 281).*~~

~~*In English law the doctrine of possession becomes practically important in the following cases. (1) Possession serves as a con- venient means of division of estates (see REAL ESTATE), One of the divisions of estates is into estates in possession and estates in reversion or remainder. It also serves as a division of PERSONAL Estate (q.v.). A chose in action is said to be reduced into pos- session when the right of recovery by legal proceedings has become aright of enjoyment. (2) Possession gives a title against a wrong- doer. In the case of real property it is regarded as prima facie evidence of seisin.* In the case of personal property the mere pos- session of a finder is sufficient to enable him to maintain an action of trover against one who deprives him of the chattel® (see the leading case of Armory v. Delamirie, 1 Strange's Reports, 504). (3) What is called "unity of possession" is one of the means whereby an easement is extinguished. Thus the owner of close A may have had a right of way over close B, while the latter belonged to a different owner. If the two closes come to be owned*~~

~~*3 Much of the law of master and servant is based upon the Roman law of master and slave. The servant, like the slave, has not posses- sion of his master's goods even though they are in his custody, unless, indeed, the circumstances are such that he ceases to be a servant and becomes a bailee.*~~

~~*4 "*Seisin"' and " possession" are used sometimes as synonyms, as generally by Bracton; at other times they are distinguished : thus there can*~~

~~*be possession of a term of years, but no seisin (Noy, Maxims, p. 2). It seems doubtful, however, how far in English law a tenant for years has true possession, for he is in law only a bailiff or servant of the landlord. But he certainly has possessory remedies, like the quasi-possessor in Roman law. ;*~~

~~*5 Compare the Code Napoléon, art. 2279: "En fait de meubles la possession vaut titre."*~~

~~*by the same person, the right of way is extinguished, but may under certain circumstances revive on the separation of the owner- ship. (4) Possession is very important as an element in deter- mining the title to goods under 18 Eliz. c. 5, the Bills of Sale Act, 1878 (41 and 42 Vict. c. 31, ss. 4, 8), and the Bankruptcy Act, 1883 (46 and 47 Vict. c. 52, s. 44). It may be said that as a general rule retention of possession by the transferor on an absolute assignment or a colourable delivery of possession to the transferee is strong prima facie evidence of fraud. 'Apparent possession ' is defined by section 4 of the Bills of Sale Act. (5) Possession of goods or documents of title to goods is generally sufficient to enable agents and others to give a good title under the Factors' Acts (see Facrors). (6) In criminal law the question of possession 1s important in founding the distinction between larceny and embezzle- ment. If the goods are in the possession of the master and he gives them to the custody of his servant for a specific purpose, and the servant steals them, it is larceny ; if they have never come into the master's possession, as if a clerk receives money on his master's behalf, it is embezzlement. Recent possession of stolen goods is always regarded as a presumption that the person in whose pos- session they are stole them or received them knowing them to have been stolen. In the case of a charge of receiving stolen goods evidence may be given that there was found in the possession of the accused other property stolen within the preceding period of twelve months, 34 and 35 Vict. c. 112, s. 19. (For possession in criminal law, see Stephen, Digest of the Criminal Law, note xi.). (7) Actions of possession of ships fall within the jurisdiction of the Admiralty Division. This jurisdiction in the case of British vessels depends upon the Admiralty Court Act, 1861 (24 Vict. ¢. 10, s. 8), in the case of foreign vessels (in which*~~

~~*the jurisdiction is rarely exercised) upon the general powers of the court as a maritime court.*~~

~~*The doctrines of adverse possession (in the old English sense, which was not identical with the Roman law, for the real owner must have actually or by fiction been disseised) and of possessio fratris*~~

~~*POS—POS*~~

~~*are now of only antiquarian interest. The Statutes of Limitation, 3 and 4 Will. IV. c. 27 and 387 and 88 Vict. c. 57, have super- seded the first. The only question now is, not whether possession has been adverse or not, but whether twelve years have elapsed since the right accrued (see LimiraTion). The maxim " possessio fratris de feodo simplici sororem facit esse heredem'"' (Coke upon Littleton, 14b) has been altered by the rules of descent introduced by 8 and 4 Will. IV. c. 106, under which descent is traced from the purchase1. At one time possessory suits were occasionally maintained in England, and more frequently in Ireland, for the quieting of possession after proof of three years' possession before the filing of the bill. But such suits are now obsolete (see Neill ». Duke of Devonshire, 8 Appeal Cases, 146). There was one character- istic case in old English law in which possession was maintained by means of what was called " continual claim," made yearly in due form, where the person having the right was prevented by force or fear from exercising it (Coke upon Littleton, 253b). Continual claim was abolished by 3 and 4 Will. IV. c. 27, s. 11. Scotland.—In Scotland possessory actions still exist co nomine, Actions of molestation, of removing, and of maills and duties are examples. A possessory Judgment is one which entitles a person who has been in possession under a written title for seven years to con- tinue his possession (Watson, Law Dict.,s.v." Possessory Judgment"'). United States.—Here the law in general agrees with that of England. But in Maryland, New Hampshire, North Carolina, and Vermont the doctrine of possessio fratris apparently still exists (Bouvier, Law Dict., " Possessio Fratris"). Possessory rights are taxed in some of the States. Louisiana follows Roman law closely. Possession of incorporeal rights (to use the unscientific language of the Code) is called quasi-possession, and the division of possession into natural and civil is maintained (Civil Code, §§- 3389-3419).*~~

~~*In addition to the authorities cited may be mentioned Smith, Dict. of Anti-quities, s.v. '*Possessio" ; Markby, Elements of Law, ch. viii.; Holland, Elements of Jurisprudence, ch. xi.; Holmes, The Common Law (lect. vi.). (J. Wt.)*~~

~~*POS T-OF FIC &*~~

~~*HE germ of the modern postal systems of the world is*~~

~~*to be looked for, obviously, in the earliest organized establishment of a staff of Government couriers. When, or under what precise circumstances, such an establishment was first made available by a state for the carriage of the*~~

~~*occur in the wardrobe accounts of the kings of England of payments to royal messengers—variously designated "' cokinus," "nuncius," or "garcio"——for the conveyance of letters to various parts of the country. In the super- vision of these royal messengers lies the germ of the office*~~

~~*letters of private persons there is no satisfactory evidence to show. That there must have been, even in early times, a connexion, more or less authorized, between the trans-*~~

~~*of postmaster-general. The first English postmaster of Six- whom a distinct account can be given is Sir Brian Tuke, teenth who is described (1533) in the records as " Magister Nun-°™""Y-*~~

~~*mission of public and of private correspondence is highly probable. Even financial reasons would soon dictate a formal permission to Government couriers to carry letters for individuals—under regulation and restriction, of course—although at the outset such a practice may well have been rather connived at than allowed. In the postal system of Spain and the German empire there is express*~~

~~*record of such a permission in the month of April 1544 ;-*~~

~~*and within fifteen or sixteen years that permission had grown into a legalized and regulated monopoly, whence the counts of Taxis drew part of their profits as post- masters-general. For the purposes of this article, how-*~~

~~*ever, it is enough to note that in Great Britain existing private letters of the 15th century—some, perhaps, of the 14th—bear endorsements which show that they were con- veyed by relays of men and horses maintained under the control of the Government, and primarily intended for its special service. In several Continental states the univer- sities had inland postal establishments of a rudimentary sort at an early date. The university of Paris, for exam- ple, organized a postal service almost at the beginning of the 13th century, and it lasted in a measure until the year 1719. In various parts of Europe mercantile guilds and brotherhoods were licensed to establish posts for commer- cial purposes. But everywhere—as far as the accessible evidence extends—foreign posts were under state control.*~~

~~*GREAT BRITAIN. Early History (c. 1533-1836). As early as the middle of the 13th century entries*~~

~~*ciorum, Cursorum, sive Postarum," 'both in England and in other parts of the king's dominions beyond the seas." But long subsequent to this appointment of a postmaster- general the details of the service were frequently regulated by proclamations and by orders in council. Thus, in the curious collection of royal proclamations in the library of the Society of Antiquaries there is one of Philip and Mary (undated, but apparently of 1555) which regulates the supply of horses for the conveyance of letters to Dover. Again, in July 1556 the lords of the council ordered "that the postes betweene this and the Northe should eche of them keepe a booke, and make entrye of every lettre that he shall receive, the tyme of the deliverie thereof unto his hands, with the parties names that shall bring it unto him." Much of the business of the foreign postal service to and from England during the earlier years of Queen Elizabeth was managed by the incorporated "merchant strangers," who appointed a special postmaster amongst themselves. When that office chanced to fall vacant in 1568 they quarrelled about a successor; and the quarrel cost them their privilege.?*~~

~~*The accession of James I. to the English throne, by Under necessitating a more frequent communication between James 1.*~~

~~*London and Scotland, led to improvements in the postal*~~

~~*1 In his able account of this remarkable collection the late Mr Robert Lemon has overlooked the proclamation here referred to, prob- ably from its want of a date, his own arrangement being chronological.*~~

~~*2 F. Windebank to Sir W. Cecil : " All the Italians were unwilling to give their voices to Raphael, . . . but inclined to favour Godfrey " (Dom. Cor. Eliz., xlviii. § 65, State Paper Office). Raphael was a German, Godfrey an Englishman.*~~

~~*service. Some years earlier special posts had been estab- lished by the magistrates of certain Scottish towns for the conveyance of their despatches to and from the court. Thus in 1590 a messenger was appointed by the magis- trates of Aberdeen with the title of "council-post."! The new royal orders of 1603 directed (1) that the postmasters at the various stages should enjoy the privilege of letting horses to "those riding in post (that is to say) with horn and guide," by commission or otherwise, and to that end they were charged to keep or have in readiness a sufficient number of post-horses ; (2) that the lawful charge for the hire of each horse should be, for public messengers, at the rate of 24d. a mile, "besides the guides' groats," private travellers being left to make their own agreements. Fin- ally, it was directed that every postmaster should keep at least two horses for the express conveyance of Government letters, and should forward such letters within a quarter of an hour of their receipt, and that the posts should travel at the rate of not less than 7 miles an hour in summer and 5 miles in winter.?*~~

~~*In 1607 the king granted to James Stanhope, first Lord Stanhope of Harrington, and to his son Charles Stanhope, afterwards second Lord Stanhope, jointly and to the sur- vivor of them, the postmastership of England under the title of " Master of the Posts and Messengers," with a fee of 100 marks a year, together with all "avails and profits " belonging to the office. In 1619 a separate office of " post- master-general of England for foreign parts" was created, by new letters patent, in favour of Matthew de Quester ? and Matthew de Quester the younger. The new office was*~~

~~regarded by the existing postmaster-general, Charles, Lord Stanhope, as an infringement of his own patent. A long dispute ensued in the King's Bench and before the Lords of the Council. In 1626 by an order in council liberty was granted to all companies of merchants, includ- ing the Merchants Adventurers, to send their letters and despatches by messengers of their own choosing. A year afterwards this liberty was revoked, except for the Company of Merchants Adventurers. Lord Stanhope, however, continued to carry letters abroad by his agents, and obtained a warrant prohibiting De Quester from interfering. It shows strikingly the confusion of postal affairs at this period to find a statement addressed to the privyccouncil by the postmasters of England to the effect that they had received no payments "ever since the last day of November 1621 till this present time, June 1628,"—the arrears amounting to £22,626.~~

~~The rights of the postmasters were also infringed by private individuals, as by one Samuel Jude in 1629 in the west of England. In 1632 the foreign postmastership was assigned by the De Questers to William Frizell and~~

~~1 Kennedy, Annals of Aberdeen, vol. i. p. 262.~~

~~2 Book of Proclamations, p. 67 (S. P.0.; now in Rolls HOuse) ; Report from the Secret Committee on the Post-Offce, 1844, Appendix,~~

~~. 88-40.~~

~~= Or "De l'Equester," as he is called in Latch's Reports of King's Bench Cases, p. 87.~~

~~4 These disputes were much embittered by the growing jealousies of English against foreign merchants. The proofs of this in the state correspondence of Elizabeth's day are abundant, but there were many statesmen who took larger views. See, ¢.g., John Johnson's " Brief Declaration for the . . . erecting and maintaining of the Staple . . in England" (June 1582), Dom. Corresp. Eliz., cliv., No. 30; and compare the same writer's "Discourse for the repairing the decayed State of the Merchants," &c. (22d July 1577), i., cxiv., No. 39, with Leake's "' Discourse," &c., of the same year (#., cxi. 1 sq.), and with John HIales's "Letter to Sir W. Cecil" (20th March 1559), 10. iii, where he describes the merchant strangers as being ' spies for foreign~~

~~*princes," and with Cecil's "Reasons to move a Forbearing of the Restitution of the Intercourse to Antwerp" (1564), 7b., xxxv., No. 38 (in Rolls House).*~~

~~*° eal Index to the Remembrancia, 418, as quoted by H. B. Wheatley in the Academy of 27th December 1879, p. 464.*~~

~~*POs Preowr Tere' i*~~

~~*563*~~

~~*Thomas Witherings. Letters-patent were granted to them Wither- Witherings took the labour- ings.*~~

~~*jointly, 15th March 1633.° ing oar, and probably ought to rank as the first of the many conspicuous postal reformers in the long history of the British post-office. Under him one Richard Poole obtained a special postmastership for the service of the court. A petition subsequently presented by him to the House of Lords contains curious proof of the jealousies which Witherings's successful administration of his office excited. Among the earliest measures of improvement taken under the new patent was an acceleration of the Continental mail service. For this purpose the patentees made a contract with the count of Thurn and Taxis, here- ditary postmaster of the empire and of Spain. At this time there was still but one mail weekly between London, Antwerp, and Brussels, and the transit occupied from four to five days. By a subsequent contract with Count Thurn two mails weekly were secured and the transit made ordinarily in two days.' In June 1635 Witherings sub- mitted to the king a proposal (still preserved in the State- Paper Office) "for settling of staffets or pacquet-posts betwixt London and all parts of His Majesty's dominions, for the carrying and re-carrying of his subjects' letters," which contains some curious incidental notices of the state of the internal communication of the kingdom at that time. The nett charge to the crown of the existing posts is stated to be £3400 per annum. Letters, it is said, "being now carried by carriers or footposts 16 or 18 miles a day, it is full two months before any answer can be received from Scotland or Ireland to London. If any of His Majesty's subjects shall write to Madrid in Spain, he shall receive answer sooner and surer than he shall out of Scotland or Ireland." By the new plan it was*~~

~~*proposed that all letters for the northern road should be put into one "portmantle," and directed to Edinburgh, with separate bags directed to such postmasters as lived upon the road near to any city or town corporate. The journey from London to Edinburgh was to be performed within three days. The scheme was approved of on 3lst July 1635, the proclamation establishing eight main postal lines,— namely, the great northern road, to Ireland by Holyhead, to Ireland by Bristol, to the marches of Wales by Shrews- bury, to Plymouth, to Dover, to Harwich, and to Yarmouth. The postage of a single letter was fixed at 2d. if under 80 miles, 4d. if between 80 and 140 miles, 6d. if above 140 miles, 8d. if to Scotland. And it was further provided that from the beginning of this service no other messengers or footposts should carry letters to any places so provided, except common known carriers, or a particular messenger "sent on purpose with a letter by any man for his own occasions," or a letter by a friend, on pain of exemplary punishment. In February 1638 another royal proclama- tion ratified an agreement between Witherings and De Noveau, postmaster to the French king, for the convey- ance of the mails into France by Calais, Boulogne, Abbe- ville, and Amiens.?*~~

~~*But in 1640 the active postmaster was accused of divers abuses and misdemeanours, and his office sequestrated into the hands of Philip Burlamachi of London, merchant, who was to execute the same under the inspection of the prin- cipal secretary of state.!0 Witherings then assigned his patent to Robert. Rich, earl of Warwick, and a long contest*~~

~~*6 Minute in " House of Lords' Papers" (1633), Fourth Report of Hist. MSS. Commission, 1874, App. The papers there calendared contain many proofs of Witherings's activity and ability. See also appendix to Fifth Report, 1875, and ""'A proclamation concerning the Postmaster of England for Forraigne Parts" (19th July 1632), in Rymer's Federa, xix. 385.*~~

~~*7 Egerton MS. (Brit. Mus.), No. 2548, f. 5 sq.*~~

~~*8 Rymer, Federa, xix. 649. ® Ibid., xx. 192.*~~

~~*10 Thid., xx. 429.*~~

~~*Under Crom- well.*~~

~~*ensued in both Houses of Parliament. The sequestration was declared by a vote in parliament in 1642 to be illegal. Nevertheless the dispute gave repeated occupation to both Houses during the period from 1641 to 1647, and was diversified by several affrays, in which violent hands were laid upon the mails. In 1643 the post-office yielded only £5000 a year. In 1644 the Lords and Commons by a joint ordinance appointed Edmund Prideaux "'to be master of the posts, messengers, and couriers." In 1646 the opinion of the judges was taken on the validity of Wither- ings's patent (assigned to Lord Warwick), and they pro- nounced that "the clauses of restraint in the said patent are void and not good in law; that, notwithstanding these clauses be void, the patent is good for the rest."1 It is evident, therefore, that any prohibition to carry letters must be by Act of Parliament, to have force of law.*~~

~~*In 1650 an attempt was made by the common council of London to organize a new postal system on the great roads, to run twice a week. This scheme they temporarily carried into effect as respects Scotland. But Mr Attorney-General Prideaux speedily obtained the intervention of the council of state. He urged on the council of state that, if the new enterprise were permitted, besides in- trenching on the rights of the parliament, some other means would have to be devised for payment of the post- masters. Both Houses resolved (1) that the offices of postmasters, inland and foreign, were, and ought to be, in the sole power and disposal of the parliament, and (2) that it should be referred to the council of state to take into consideration all existing claims in relation thereto. Of these there were no less than five under the various patents which had been granted and assigned. There-upon the Protector was advised that the management of the post-office should be entrusted to John Thurloe by patent under the broad seal of the Commonwealth immediately upon the expiration of John Manley's existing contract. Thurloe was to give security for payment of the existing rent of £10,000 a year. Ultimately the posts, both inland and foreign, were farmed to John Manley for £10,000 a year, by an agreement made in 1653. Meanwhile, and pending the decision of the council upon the question so*~~

~~*submitted to it, a remarkable step in postal reform was taken by an attorney at York, named John Hill, who placed relays of post-horses between that city and London, and undertook the conveyance of letters and parcels at half the former rates of charge. He also formed local and limited partnerships in various parts of the kingdom for the extension of his plan, which aimed to establish event- ually a general penny postage for England, a twopenny postage for Scotland, and a fourpenny postage for Ireland. But the post-office was looked upon by the Government of the day as, first, a means of revenue, and secondly, a means of political espionage.2 The new letter-carriers were*~~

~~*1 Journals of the House of Commons, ii. 81, 82, 95, 470, 498, 500, 501, 658 sq. ; Journals of the House of Lords, v. 848, 387, 450, 469- 473, 500 sy.; Report from Secret Committee on the Post-Offce, Appendix, 60-69.*~~

- ~~*Some instructive illustrations of this may be seen (in the state- paper department of the General Record Office) among the correspond- ence between secretary Sir John Coke and Lord Conway, and also in many other state letters, as well after the outbreak of the great rebel- lion as before it. And there is in the Bodleian Library at Oxford (MS. Rawlinson, A. 477) a curiously minute account of the methods alleged to have been pursued in the systematic and periodical examination of letters entrusted to the post-office. The paper is not authenticated by any signature, and is undated. But it is an original document of the time of Charles II., addressed to Mr Bridgman, clerk of the council, and drawn up in order to recommend the adoption of a like practice, but with greater dexterity in the manipulation than was used by Dr Dorislaus and Samuel Morland, who, according to this narrative, formed the Cromwellian board of examiners for post-office*~~

~~*letters, and who read without exception all that were addressed to foreign parts.*~~

~~*POS T-O FEF AUGS*~~

~~*[HISTORY.*~~

~~*(literally) "trampled down" by Cromwell's soldiery. The inventor had a narrow escape from severe punishment. He lived to publish (1659) the details of his plan, at the eve of the Restoration, in a pamphlet entitled A Penny Post: or a Vindication of the Liberty and Birthright of every English-man in carrying Merchants and other Man's letters, against any Restraint of Farmers, &c. It is very probable that this publication * helped to prepare the way for those measures of partial but valuable and far-reaching reform which were effected during the reign of Charles II. The rates of postage and the rights and duties of postmasters were settled under the Protectorate by an Act of Parliament of 1657, c. 30. In 1659 the item, "by postage of letters in farm, £14,000," appears in a report on the public revenue.**~~

~~*The Government of the Restoration continued to farm Under the post-office upon conditions very similar to those im- Charles*~~

~~*posed by the Act of 1657, but for a larger sum. Henry Bishop was the first postmaster-general in the reign of*~~

~~*Charles IT., and he contracted to pay to the king a yearly*~~

~~*rent of £21,500, these new arrangements being embodied in the Act 12 Charles II. c. 35, entitled "An Act for Erecting and Establishing a Post-Office." A clause pro- posing to frank all letters addressed to or sent by members of parliament during the session was, after considerable debate, ultimately rejected by the Lords. But the indent- ure enrolled with the letters-patent contained a proviso for the free carriage of all letters to or from the king, the great officers of state, and also the single inland letters only of the members of that present parliament during the continuance of that session. It also provided that the lessee should permit the secretaries of state for the time being, or either of them, from time to time, to have the survey and inspection of all letters at their discretion. Bishop was succeeded by Daniel O'Neill®> in 1662, on similar terms. In the consequent proclamation, issued on 25th May 1663, it was commanded that "no postmasters or other officers that shall be employed in the conveying of letters, or distributing of the same, or any other person or persons, . . . except by the immediate warrant of our principal secretaries of state, shall presume to open any letters or pacquets not directed unto themselves." In 1677 the general post-office comprised in the chief office, under Henry*~~

~~*Bennet, earl of Arlington, as postmaster- general, seventy-five persons, and its profits were farmed for £43,000 a year. There were then throughout England and Scotland 182 deputy postmasters, and in Ireland 18 officers at the Dublin office and 45 country postmasters. "The number of letters missive," says a writer of the same year, "is now prodigiously great. . . . A letter com- prising one whole sheet of paper is conveyed 80 miles for twopence. Every twenty-four hours the post goes 120 miles, and in five days an answer may be had from a place 300 miles distant."6*~~

~~*By an Act of the 15th Charles IT. ("An Act for Settling the Profits of the Post-Office on H.R.H. the Duke of York, and his Heirs-Male"), and by a subsequent proclamation issued in August 1683, it was directed that the postmaster- general should 'take effectual care for the conveyance of all bye-letters, by establishing correspondences . . . in all considerable market-towns with the next adjacent post- stage," and the rights of the postmasters as to hiring horses were again emphasized.*~~

~~*3 There is a copy in the library of the British Museum, from which Mr H. B. Wheatley has given the abstract quoted above.*~~

~~*4 Journals of the House of Commons, vii. 627.*~~

~~*5 The trusted friend but not always the trusted adviser of the duke of Ormonde. O'Neill's correspondence exists among the duke's papers, in part at Kilkenny Castle, in part (extensively) amongst the Carte MSS. in the Bodleian; and it abounds in incidental illustrations of postal administration in both England and Ireland.*~~

~~*§ Quoted in Gent. Mag. (1815), xxxv. pp. 309, 310.*~~

~~*1533-1836.] PONS Teor fic £ 565 Dock- It was during the possession of the post-office profits by | The Government of New York in 1672 established "a post to goe ie — the duke of York that a London penny post was estab- monthly from New York to Boston," advertising "those that bee ay lished by the joint enterprise of (Wallan Dockwra, a gag to eae — to ae them to the secretary's office, post. searcher at the customs house, and of Robert Murray, a ais eaieamall perabiia iri ae ae a i a eeecaled clerk in the excise office. The working-out of the plan | up."? Thirty years later this monthly*~~

~~*post had pestle a fort. fell to the first-named, and in his hands it gave in April | nightly one, as we see by the following paragraph in the Boston 1680—although but for a short time—far more extensive We "By See of u Se yg es of North oper a. ese are to i postal facilities to the Londoners than even those SO | 6th of December, the Wels Doe Cee, Bic i eevee memorably afforded 160 years later by the plans of Sir | sets, out once a fortnight, the three winter months of December Rowland Hill. The London of that day was small, and January, and February, and to go alternately from Boston to Say- easily manageable. Dockwra carried, registered, and in- uo ong Peed oi eee mayle of letters with the sured, for a penny, both letters and parcels up to a pound York Ryder on anacad night the Sut sae a een in weight and £10 in value. He took what had been the | turn he sets out at Boston on Monday night the 20th currant, to mansion of Sir Robert Abdy in Lime Street as a chief | meet the New York Ryder at Hartford, on Saturday night the 25th office, established seven sorting and district offices (thus oe repel a al pomege ees anticipating one of the most recent improvements of the | notified first to pay the gen Reena: This a oe present time) and between 400 and 500 receiving-houses | master-general for America had been created in 1692. and wall-boxes. He established hourly collections, with a We have now traced the postal communications of dif- Act of maximum of ten deliveries daily for the central part of the | ferent portions of the British empire from their earliest consoli- city, and a minimum of six for the suburbs. Outlying | beginnings until the eve of the passing of the Act of cation: villages, such as Hackney and Islington, had four daily } the 9th of Queen Anne which consolidated them into one deliveries ; and his letter-carriers collected for each despatch | establishment, and which, as to organization, continued to of the general post-office throughout the whole of the city | be the great charter of the post-office until the date of the and suburbs. Suits were laid against him in the court of | important reforms of 1838-50, mainly introduced by the King's Bench for infringing on the duke of York's patent, | energy, skill, and characteristic pertinacity of Sir Rowland and the jealousies of the farmers eventually prevailed. | Hill. The Act of Anne largely increased the powers of the The penny post was made a branch of the general post. | postmaster-general. It reorganized the chief letter-offices Dockwra, after the Revolution of 1688, obtained a pension } of Edinburgh, Dublin, and New York, and settled new of £500 a year (for a limited term) in compensation of | offices in the West Indies and elsewhere.*~~

~~*It established his losses. In 1697 he was made comptroller of the | three rates of single postage, viz., English, 3d. if under London office. Eleven years later his improvements were | 80 miles and 4d. if above, and 6d. to Edinburgh or outvied by Charles Povey, the author of schemes for im- | Dublin. It continued to the postmaster-general the sole proving coinage, and also of a very curious volume, often | privilege "' to provide horses to persons riding post." And wrongly ascribed to Defoe, entitled Zhe Visions of Str | it gave, for the first time, parliamentary sanction to the Heister Ryley. Povey took upon himself to set up a foot- | power, formerly questionable, of the secretaries of state post under the name of the "' halfpenny carriage," appointed | with respect to the opening of letters, by enacting that receiving-houses, and employed several persons to collect | "from and after the first day of June 1711 no person or and deliver letters for hire within the cities of London and | persons shall presume . . . to open, detain, or delay .. . Westminster and borough of Southwark, 'to the great | any letter or letters . . . after the same is or shall be prejudice of the revenue," as was represented by the post- | delivered into the general or other post-office, . . . and master-general to the lords of the treasury. Povey was | before delivery to the persons to whom they are directed, compelled to desist. or for their use, except by an express warrant in writing Early = At this period the postal system of Scotland was distinct from | under the hand of one of the principal secretaries of state,*~~

~~*Scottish that of England. It had been reorganized early in the reign of*~~

~~*postal Charles II., Who in September 1662 had appointed Patrick Grahame*~~

~~*system. of Inchbrakie to be postmaster-general of Scotland for life at a salary of £500 Scots. But it would seem from the proceedings of the Scottish privy council that the rights and duties of the office were ill defined ; for immediately after the appointment of Grahame the council commissioned Robert Mein, merchant and keeper of the letter-office in Edinburgh, to establish posts between Scotland and Ireland, ordained that Linlithgow, Kilsyth, Glasgow, Kilmarnock, Dumboag, Ballantrac, and Portpatrick should be stages on the route, and granted him the sum of £200 sterling to build a packet- boat to carry the mail from Portpatrick to Donaghadee.*~~?

~~*Karly The colonial post-office at this period was naturally more rudi-*~~

~~*colonial mentary still. Perhaps the earliest official notice of it is to be seen*~~

~~*posts. in the following paragraph from the records of the general court of Massachusetts in 1639. 'It is ordered that notice be given that Richard Fairbanks his house in Boston is the place appointed for all letters which are brought from beyond the seas, or are to be sent thither to be left with him; and he is to take care that they are to be delivered or sent according to the directions; and he is allowed for every letter a penny, and must answer all miscarriages through his own neglect in this kind." That court in 1667 was petitioned to make better postal arrangements, the petitioners alleging the frequent "loss of letters whereby merchants, especially with their friends and employers in foreign parts, are greatly dam- nified ; many times the letters are imputed (?) and thrown upon the Exchange, so that those who will may take them up, no person, without some satisfaction, being willing to trouble their houses therewith." In Virginia the postal system was yet more primitive. The colonial law of 1657 required every planter to provide a messen- ger to convey the despatches as they arrived to the next plantation,*~~

~~*1 Lang, Historical Summary of the Post-Office in Scotland, 4, 5.*~~

~~*for every such opening, detaining, or delaying."*~~

~~*Nine years after the passing of the Act of Anne the Cross-*~~

~~*cross-posts were farmed to the well-known "humble" cee 4 Posts.*~~

~~*Ralph Allen,—the lover of peace and of humanity. Allen became the inventor of the cross-roads postal system, having made an agreement that the new profits so created should be his own during his lifetime. His improvements were so successful that he is said to have netted during forty-two years an average profit of nearly £12,000 a year.*~~

~~*The postal revenue of Great Britain, meanwhile, stood thus :—*~~

~~*TABLE I.—Gross and Nett Income, 1724-1774.*~~

~~*Gross Produce. Nett Revenue.*~~

£ 8s. a. £ 8.

1724 178,071 16 9 96,3389 7 5

1734 176,334 3 1 sil 7Ol iil

1744 194,461 8 7 85,114 9 4 1754 214,300 10 6 97,865 5 1 1764 225,326 5 8 116,182 8 5 1774 313,032 14 6 164,077 8 4

2 Miles, " History of the Post- Office," in the American Banker's Magazine, n. s., vii. 358 sq. 3 Buckingham, Specimens of Newspaper [nterature (Boston, 1850), i, 16jeh7. " "4 "Ts there a variance ? enter but his door, Balked are the courts; the contest is no more." Pope's "humble Allen" was also the " Allworthy " of Fielding.

POs TOW 1G

ever, appointed Palmer to be comptroller-general of postal revenues, an office which was soon made too hot for him

[HISTORY.

566

Perman- The system of burdening the post-office revenue with pensions, ent pen- nearly all of which had not the slightest connexion with the postal service, and some of which were unconnected with any sort of service

seas: that fly be alle' public, avis Beeun by Ohials II, auto to hold. He obtained a pension of £3000 a year, and at can ublic, : : ; granted be Betbace aMewemy ot Cleveland, £4700 a year, and to the ultimately, by the Act 3 Geo. HL. . 157, after his oe earl of Rochester £4000 a year, out of that revenue. The example | had received the sanction of five successive majorities was followed until, in 1694, the list of pensions so chargeable stood against Government, an additional sum of £50,000. Every thus :— sort of obstruction was placed in the way of his reward, i al Ga) oe? Sogepaedeoso od £2,000 HTS eS. : 20 LE Ba Gee although nearly a million had been added to the annual Westies 1… 500 public revenue, and during a

~~quarter of a century the lea ee ae TORRES as Iara £21,200 | mails had been conveyed over an aggregate of some en Peet acest saat ee seventy millions of ass without the occurrence of one borough, charged in like manner. In March 1857 the existing serious mail robbery. nensions ceased to be payable by the post-office, and became charge- Scotland shared in the advantages of the mail-coach system from Scottish I : the first. Shortly before its introduction the local penny post was and Irish able to the consolidated fund. : : t penny p ihe Frees tant and enduring impulse to the develop- set on foot in Edinburgh by Peter Williamson, the keeper of a post- € first important and en es ion P- | coffee-room in the hall of Parliament House. He employed four office, ment of the latent powers of the post-office, both as a | jetter-carriers, in uniform, appointed receivers in various parts of 1708- public agency and as a source of revenue, was given by | the city, and established hourly deliveries? The officials of the 1801. the shrewdness and energy of the manager of the Bath ee eae the success of ite tian Hadi becoute pe lan a Palmer's theatre, John Palmer. Palmr's notice wWaseatimacted to | "ee ee : : : : : of which was subsequently confirmed by the Act 34 Geo. III. c. sea — the subject in October 1782. His avocations had made | 17 4 dead-letter office was established in 1784. The entire staff~~

~~him familiar with that great western road which was still in such peculiar favour, alike with people of fashion and with the gentlemen of the highway. So habitual were the robberies of the post that they came to be regarded by its officials as among the necessary conditions of human affairs. They urged on the public the precaution of send- ing all bank-notes and bills of exchange in halves, and pointed the warning with a philosophical remark, that " 'there are no other means of preventing robberies with effect, as it has been proved that the strongest carts that could be made, lined and bound with iron, were soon broken open by a robber."~~

~~At this period, in addition to the recognized perils of the roads, the postal system was characterized by extreme irregularity in the departure of mails and delivery of letters, by an average speed of about 34 miles in the hour, and by a rapidly-increasing diversion of correspond- ence into illicit channels. The nett revenue, which had averaged £167,176 during the ten years ending with 1773, averaged but £159,625 during the ten years ending with~~

~~1783.~~

~~coaches of a construction expressly adapted to run at a good speed, by furnishing a liberal supply of horses, and by attaching an armed guard to each coach the public would be greatly benefited, and the post-office revenue consider- ably increased, the officials pertinaciously opposed the plan and maintained that the existing system was all but perfect. Lord Camden, however, brought the plan under the personal notice of Pitt. No sooner was the minister convinced of its merits than he insisted on its being tried. The experi- ment was made in August 1784, and its success exceeded all anticipation. The following table will show the rapid progress of the postal revenue under the new arrangements.~~

~~TABLE II.—@ross and Nett Income, 1784-1805.~~

~~Yet, when Palmer suggested that by building mail-.~~

~~of the Edinburgh post-office, which consisted in 1708 of seven persons, now comprised twenty-five, the cost of the office being £1406. In1796 the number of functionaries had increased to forty, and the cost to £3278.3 Butin Ireland the old state of things con- tinued until the present century. In 1801 only three public carriages in the whole country conveyed mails. There were, indeed, few roads of any sort, and none on which coaches could travel faster than four miles an hour.* At this period the gross receipts of the Trish post-office were £80,040; the charges of management and collection were £59,216, or at the rate of more than 70 per cent. ; whilst in Scotland the receipts were £100,651, and the charges £16,896, or somewhat less than 17 per cent.5~~

~~In the American colonies postal improvements may be dated from Frank- the administration of Franklin, who was virtually the last colonial lin.~~

~~postmaster- general, as well as unquestionably the best. In one shape or another he had forty years' experience of postal work, hav- ing been appointed postmaster at Philadelphia as early as October 1737. When he became postmaster-general in 1753 he bestirred himself for the improvement of his department in that practical painstaking way with which he was wont to guide any plough he had once put his hand to, whatever the~~

~~ground it had to work in. He visited all the chief post-offices throughout Pennsylvania, New Jersey, New York, and New England, looking at everything with his own eyes. His administration cannot be better summed up than we find it to be in a sentence or two which he wrote soon after his dismissal. Upto the date of his appointment, he says, "the American post-office had never paid anything to that of Britain. We [t.e., himself and his assistant] were to have £600 a year be- tween us, if we could make that sum out of the profits of the office. . . . In the first four years the office became above £900 in debt tous. But it soon after began to repay us; and before I was dis- placed by a freak of the minister's, we had brought it to yield three times as much clear revenue to the crown as the post-office of Ireland. Since that imprudent transaction they have received from it—not one farthing."'~~

~~The interval between the development of Palmer's improved methods (as far as that development was permitted by the authori- ties), which we take to be pretty nearly contemporaneous with the parliamentary settlement of his claims, and the still more import- ant reforms introduced twenty-seven years later by Sir Rowland Hill, is chiefly marked by the growth of the packet system, under the influence of steam navigation, and by the elaborate investiga- tions of the revenne commissioners of 1826 and the following years.~~

~~vo Crossilincome: Rai: Reree. Undoubtedly the inquiries of these comniissioners attracted a larger~~

~~share of public attention to the management of the post-office than~~

~~£ Bb alle £ 8s. da. had theretofore been bestowed on it; but, if anything had been~~

~~Bs IMT Serre 420,101 1 8 196,513 16 7 wanted to throw into bolder relief Hill's intelligent and persevering bys Beir ses beaten ee 463,753 8 4 261,409 18 2 exertions, these reports supply the want in ample measure. In NUN) Senapeood ceoneoososse eG) il 331,179 18 8 some important particulars they mark out practical and most valu- Ho ney eee 745,238 0 0 414,548 11 7 able reforms, but they are so clumsy in arrangement, so resilient NE S(0)0): asc seers San Gea 1,083,950 0 0 720,981 17 1 in the treatment of the various branches of the service, and so TEGO Sime~~

egensenedasceewodor Leu, 844 O © 944,382 8 4 crowded with petty details as to contrast most unfavourably with the Incid order and vigorous reasoning of Rowland Hill's Post-

It had been at first proposed to reward Palmer by a 1 Debates of both Houses of Parliament in 1808 relative to the Agree-

grant for life of two and a half per cent. on a certain proportion of the increased nett revenue, which would eventually have given him some £10,000 a year; but this proposition fell through, in consequence either of technical difficulties created by the Post-Office Act or of the opposition of the post-office authorities. Pitt, how-

ment for the Reform and Improvement of the Post-Offce, passim.

2 Lang, Historical Summary of the Post-Office in Scotland, 15.

3 Appendix to Seventh Report from Select Committee on Finance (1797), reprinted in collective series of reports, xii. 209.

4 Minutes of Evidence before Select Committee on Taxation of In- ternal Communication (1837), evidence of Sir Edward Lees, 397.

5 Report, &c., of Select Committee on Postage.

Packet services.

Govern- mental interfer-

corre- spond- ence.

. &c.

1836-1842.

Office Reform. While the functionaries of the post-office are criticized with a severity so salient as to wear an appearance at times of almost personal hostility, the truth that a very large and liberal inerease of public facilities would be likely to benefit the revenue much more materially than small

~~*economies in salaries and perquisites seems scarcely to have dawned on the minds of the commissioners. Even in dealing with a new accommodation actually provided—that of the money-order office—whilst taking just exception to the unofficial character of its management, they incline rather to its abolition than to its reform.*~~

~~*As early as 1788 the cost of the packets employed by the post- office attracted parliamentary attention. In that year the "com- missioners of fees and gratuities" reported that in the preceding seventeen years the total cost of this branch had amounted to £1,038,133 ; and they naturally laid stress on the circumstance that many officers of the post-office were owners of such packets, even down to the chamber-keeper. At this time part of the packet service was performed by hired vessels, and part by vessels which were the property of the crown. The commissioners recommended that the latter should be sold, and the entire service be provided for by public and competitive tender. The subject was again in-*~~

~~*. quired into by the Finance Committee of 1798, which reported*~~

~~*that the recommendation of 1788 had not been fully acted upon, aud expressed its concurrence in that recommendation. The plan was then to a considerable extent enforced. But the war rapidly increased the expenditure. The average (£61,000) of 1771-87 had increased in 1797 to £78,489, in 1810 to £105,000, in 1814 to £160,603. In the succeeding years of peace the expense fell to an aycrage of about £85,000. As early as 1818 the " Rob Roy" plied regularly between Greenock and Belfast ; but no use was made of steam navigation for the postal service until 1821, when the post- master-general established crown packets. The expenditure under the new system, from that date to 1829 inclusive, was thus reported by the commissioners of revenue inquiry in 1830.*~~

~~*TABLE III.—Cost of Packet Service, 1820-1829.!*~~

~~*144,592*~~

~~*The. general administration of postal affairs at this period was still characterized by repeated advances in the letter rates, and the twenty years previous to Rowland Hill's reforms by a stationary revenue. The following*~~

~~*table (IV.) will show the gross receipts, the charges of collection and management, and the nett revenue (omitting fractions of a pound) of the post-office of Great Britain. We give the figures for the year 1808 for the purpose of comparison.*~~

~~*Charges per cent of Gross | Income.*~~

~~*| Charges of Collection,*~~

~~*Population of United Kingdom.*~~

~~*Nett Revenue.*~~

~~*Gross In-*~~

~~÷~~

~~*| Year, come.*~~

~~*£451,431 29 £1,100,606*~~

~~*594,045 27 719,622 636,290 29 655,914 29 747,018 31 609,220*~~

~~*686,768 29*~~

~~*1808 £1,552,037*~~

~~*1815-16 1818-19 1820-21 1824-25 1826-27 1836-37 1838-39*~~

~~*19,552,000*~~

~~*20,928,000 22,362,000*~~

~~*25,605,000*~~

~~*i) ee ise}*~~

~~*A) bo Sc) on*~~

~~bs bo on a bo ow~~

~~=)~~

~~2,346,278~~

~~Before passing to the reform of 1839 we have to revert to that important feature in postal history,—the interference with corre- spondence for judicial or political purposes. We have already seen~~

~~ence with (1) that this assuinption had no parliamentary sanction until the~~

~~enactment of the 9th of Queen Anne ; (2) that the enactment differed from the royal proclamations in directing a special warrant for each opening or detention of correspondence. It is a significant gloss on the statute to find that for nearly a century (namely, until 1798 inclusive) it was not the practice to record such warrants regularly in any official book.4 Of the use to which the power was applied the state trials afford some remarkable instances. At the trial of Bishop Atterbury, for example, in 1728 certain letters were offered in evidence which a clerk of the post-office deposed on oath "to be true copies from the originals, which were stopped at the post-office and copied, and sent forward as directed."" Hereupon Atter- bury very naturally asked this witness "if he had any express warrant under the hand of one of the principal secretaries of state for opening the said letters." But the Lords shelved his objection and put a stop to his inquiry on the grounds of public inexpediency.~~

~~1 Twenty-second Report of the Commissioners of Revenue Inquiry, 4-6. 2 Last year of exclusive sailing packets.~~

~~3 First year of steam-packets.~~

~~4 Report of Secret Committee on the Post-Offce (1844), p. 9.~~

~~*Twenty-nine peers recorded their protest against this decision.> But the practice thus sanctioned appears to have been pushed to such lengths as to elicit in April 1735 a strong protest and censure from the House of Commons. In the preceding February com- plaints were made by several members that not only were their letters charged at the post-office, but they were often broken open and perused by the clerks, that the practice of breaking open letters was become frequent, and was so publicly known that 'the liberty given to break open letters . . . could now serve no purpose but to enable the idle clerks about that office to pry into the private affairs of every merchant and of every gentleman in the kingdom."® A committee of inquiry was appointed, and after receiving its report the House resolved that it was "an high infringement of the privi- leges of the . . . Commons of Great Britain in Parliament for any postmaster, his deputies, or agents, in Great Britain or Ireland, to open or look into, by any means whatever, any letter directed to or signed by the proper hand of any member, without an express warrant in writing under the hand of one of the principal secretaries of state for every such opening and looking into; or to detain or delay any letter directed to, or signed with the name of any niember, unless there shall be just reason to suspect some counterfeit of it, without an express warrant of a principal secretary of state for every such detaining or delaying."*~~

~~*Sir Rowland Hill's Reforms (1836-1842).*~~

~~*Rowland Hill's pamphlet (Post- Office Reform) of 1837 Rowland*~~

~~*took for its starting-point the fact that, whereas the postal revenue showed for the past twenty years a positive though*~~

~~*slight diminution, it ought to have showed an increase of form.*~~

~~*£507,700 a year in order to have simply kept pace with the growth of population (see Table IV. above), and an increase of nearly four times that amount in order to have kept pace with the growth of the analogous though far less exorbitant duties imposed on stage-coaches. The stage- coach duties had produced in 1815 £217,671; in 1835 they produced £498,497. In 1837 there did not exist any precise account of the number of letters transmitted through the general post-office. Hill, however, was able to*~~

~~*prepare a sufficiently approximate estimate from the data of the London district post, and from the sums collected for postage. He thus calculated the number of chargeable letters at about 88,600,000, that of franked letters at 7,400,000, and that of newspapers at 30,000,000, giving a gross total of about 126,000,000. At this period the total cost of management and distribution was £696,569. In the finance accounts of the year (1837) deductions are made from the gross revenue for letters "refused, missent, redirected," and the like, which amount to about £122,000. An analysis of the component parts of this expenditure assigned £426,517 to cost of primary distribution and £270,052 to cost of secondary distribution and miscellane- ous charges. A further analysis of the primary distribu- tion expenditure gave £282,308 as the probable outgoings for receipt and delivery and £144,209 as the probable outgoings for transit. In other words, the expenditure which hinged upon the distance the letters had to be conveyed was £144,000, and that which had nothing to do with distance was £282,000. Applying to these figures the estimated number of letters and newspapers (126,000,000) passing through the office, there resulted a probable average cost of ;%45 of a penny for each, of which*~~

~~*Too Was cost of transit and 3'y9 cost of receipt, delivery, &c. Taking into account, however, the much greater*~~

~~*weight of newspapers and franked letters as compared with chargeable letters, the apparent average cost of transvt became, by this estimate, but about 85, or less than 515 of a penny.*~~

~~*A detailed estimate of the cost of conveying a letter from London to Edinburgh, founded upon the average weight of the Edinburgh mail, gave a still lower propor- tion, since it reduced the apparent cost of transit, on the average, to the thirty-sixth part of one penny. Hill in-*~~

~~*> Lords' Journals, xxii. 183-186; Howell's State Trials, xvi. 540 sq.*~~

~~*6 Parliamentary History, ix. 842 sq.*~~

~~*Parlia- mentary action.*~~

~~*068 POS T-OP FTCSE*~~

~~ferred that, if the charge for postage were to be made proportionate to the whole expense incurred in the receipt, transit, and delivery of the letter, and in the collection of its postage, it must be made uniformly the same from every post-town to every other post-town in the United Kingdom, unless it could be shown how we are to collect so small a sum as the thirty-sixth part of a penny. And, inasmuch as it would take a ninefold weight to make the expense of transit amount to one farthing, he further in- ferred that, taxation apart, the charge ought to be pre- cisely the same for every packet of moderate weight, with- out reference to the number of its enclosures.~~

~~At this period therate of postage actually imposed (be- yond the limits of the London district office) varied from 4d. to ls. 8d. for a single letter, which was interpreted to mean a single piece of paper not exceeding an ounce in weight ; a second piece of paper or any other enclosure, however small, constituted the packet a double letter. A single sheet of paper, if it at all exceeded an ounce in weight, was charged with fourfold postage. The average charge on inland general post letters was nearly 9d. for each. Apart from the necessary commercial evils of an excessive taxation, the effects upon the postal service itself were injurious,—on the one hand, a complicated system of accounts, involving both great waste of time and great temptation to fraud in their settlement, and, on the other, a constant invitation to the violation of the sacredness of correspondence, by making it part of daily official work to expose letters to a strong light expressly to ascertain their contents. These mischiefs it was proposed to remove by enacting that the charge for primary distribution,—that is to say, the postage on all letters received in a post-town, and delivered in the same or in any other post-town in the British Isles,—should be at the uniform rate of one penny for each half-ounce,—all letters and other papers, whether single or multiple, forming one packet, and not weighing more than half an ounce, being charged one penny, and heavier packets, to any convenient limit, being charged an additional penny for each additional half-ounce. And it was further proposed that stamped covers should be sold to the public at such a price as to include the postage, which would thus be collected in advance. By the public generally, and pre-eminently by the trading public, the plan was received with great favour. By the functionaries of the post-office it was at once denounced as ruinous and ridiculed as visionary. Lord Lichfield, then postmaster- general, said in the House of~~

~~*Lords that, if the anticipated increase of letters should be realized, the mails would have to carry twelve times as much in weight, and therefore the charge for transmission, instead of being £100,000 as then, must increase to twelve times that amount. The walls of the post-office would burst; the whole area in*~~

~~*which the building stood would not be large enough to'*~~

~~*receive the clerks and the letters.2. The latter part of this prediction indeed has been abundantly verified, but not within the period or under the circumstances then referred to. In the course of the following year (1838) petitions were poured into the House of Commons. A select com- mittee was appointed, which reported as follows :—*~~

~~*'*The principal points which appear to your committee to have been established in evidence are the following :—(1) the exceed- ingly slow advance and occasionally retrograde movement of the post-office revenue during the… . last twenty years ; (2) the fact of the charge of postage exceeding the cost in a manifold proportion ; (3) the fact of postage being evaded most extensively by all classes of society, and of correspondence being suppressed, more especially among the middle and working classes of the people, and this in consequence, as all the witnesses, including many of the post-office ——— a Ee ee*~~

~~*1 Post-Ofice Reform, 27 sq. * Mirror of Parliament, debate of 18th December 1837. But Lord*~~

~~*Lichfield was an excellent public servant, and many reforms were made by him.*~~

~~*[HISTORY.,*~~

~~*authorities, think, of the excessively high scale of taxation ; (4) the fact of very injurious effects resulting from this state of things to the commerce and industry of the country, and to the social habits and moral condition of the people ; (5) the fact, as far as conclusions can be drawn from very imperfect data, that whenever on former occasions large reductions in the rates have been made, these reductions have been followed in short periods*~~

~~of time by an extension of correspondence proportionate to the contraction of the rates ; (6) and, as matters of inference from fact and of opinion— (i.) that the only remedies for the evils above stated are a reduc- tion of the rates, and the establishment of additional deliveries, and more frequent despatches of letters; (ii.) that owing to the rapid extension of railroads there is an urgent and daily-increas- ing necessity for making such changes ; (iii.) that any moderate reduction in the rates would occasion loss to the revenue, without in any material degree diminishing the present amount of letters irregularly conveyed, or giving rise to the growth of new corre- spondence ; (iv.) that the principle of a low uniform rate is just in itself, and, when combined with prepayment and collection by means of a stamp, would be exceedingly convenient and highly satisfactory to the public."~~

~~During the session of parliament which followed the presentation of this report about 2000 petitions in favour of uniform penny postage were presented to both Houses, and at length the chancellor of the exchequer brought in a Bill to enable the treasury to carry that reform into effect. The measure was carried in the House of Commons~~

~~by a majority of 100, and became law on 17th August~~

~~1839. A new but only temporary office under the treasury Nature~~

~~was created to enable Rowland Hill to superintend (al- ee ie) orms.~~

~~though, as it proved, under very inadequate arrangements the working out of his plan. The first step taken was to reduce, on 5th December 1839, the London district postage to 1d. and the general inland postage to 4d. the half-ounce (existing lower rates being continued). On 10th January 1840 the uniform penny rate came into operation through- out the United Kingdom,—the scale of weight advancing from 1d. for each of the first two half-ounces, by gradations of 2d. for each additional ounce, or fraction of an ounce, up to 16 ounces. The postage was to be prepaid, and if not to be charged at double rates. Parliamentary franking was abolished. Postage stamps (see below, p. 585 sq.) were intro- duced in May following. The facilities of despatch were soon afterwards increased by the establishment of day mails.~~

~~*But on the important point of simplification in the internal economy of the post-office, with the object of reducing its cost without diminishing its working power, very little was done. In carrying out the new measures the officers were, as the chancellor of the exchequer (Baring) expressed it on one occasion, ‘ unwilling horses.” Nor need a word more be said in proof of the assertion than is contained in a naive passage of Colonel Maberly’s evidence before the postal committee of 1843. ‘My constant language to the heads of the departments was,— ‘This plan, we know, will fail. It is your duty to take care that no obstruction is placed in the way of it by the heads of the department, and by the post-office. The allegation, I have not the least doubt, will be made at a subsequent period, that this plan has failed in consequence of the un- willingness of the Government to carry it into fair execu- tion. Itis our duty, as servants of-the Government, to take care that no blame eventually shall fall on the Government through any unwillingness of ours to carry it into proper effect.’” And again: “After the first week, it was evi- dent, from the number of letters being so much below Mr HIll’s anticipations, that it must fail, inasmuch as it wholly rested upon the number of letters ; for without that you could not possibly collect the revenue anticipated.”*~~

~~*The plan, then, had to work in the face of rooted mis- trust on the part of the workers. Its author was (fora term of two years, afterwards prolonged to three) the officer, not of the post-office, but of the treasury. HIe could only recommend measures the most indispensable through the chancellor of the exchequer ; and, when Goulburn succeeded*~~

~~*Results.*~~

~~*Opening and de- tention of letters.*~~

~~*1842-1885.]*~~

~~*Baring, the chancellor was very much of Colonel Maberly’s way of thinking. It happened, too, that the scheme had to be tried and carried through at a period of severe commercial depression. Nevertheless, the results actually attained in the first two years were briefly these :—(1) the chargeable letters delivered in the United Kingdom, exclusive of that part of the Government correspondence which theretofore passed free, had already*~~

~~increased from the rate of about 75,000,000 a year to that of 196,500,000 ; (2) the London district post letters had increased from about 13,000,000 to 23,000,000, or nearly in the ratio of the reduction of the rates; (3) the illicit conveyance of letters was substan- tially suppressed ; (4) the gross revenue, exclusive of re- payments, yielded about a million and a half per annum, which was about 63 per cent. of the amount of the gross revenue in 1839. These results at so early a stage, and in the face of so many obstructions, amply vindicated the policy of the new system. But by its enemies that system was loudly declared to be a failure, until the progressive and striking evidence of year after year silenced opposition by an exhaustive process.~~

~~Seven years later (1849) the 196,500,000 letters de- livered throughout the United Kingdom in 1842 had increased to nearly 329,000,000. In addition, the follow- ing administrative improvements had been effected :—(1) the time for posting letters at the London receiving-houses extended ; (2) the limitation of weight abolished ; (3) an additional daily despatch to London from the neighbouring (as yet independent) villages ; (4) the postal arrangements of 120 of the largest cities and great towns revised ; (5) unlimited writing on inland newspapers authorized on payment of an additional penny; (6) a summary process established for recovery of postage from the senders of unpaid letters when refused ; (7) a book-post established ; (8) registration reduced from one shilling to sixpence ; (9) a third mail daily put on the railway (without additional charge) from the towns of the north-western district to London, and day-mails extended within a radius of 20 miles round the metropolis; (10) a service of parliamentary re- turns, for private Bills, provided for; (11) measures taken, against many obstacles, for the complete consolidation of the two heretofore distinct corps of letter-carriers,—an improvement (on the whole) of detail, which led to other improvements thereafter.!~~

~~Improvements, more conspicuous still, in the money-order branch of the postal service will be noticed in a subsequent section of this article (page 572).~~

~~Later History (1842-1885).~~

~~When Sir R. Hill initiated his great reform the post- mastership-general was in the hands of the earl of Lich- field, the thirty-first in succession to that~~

~~*office after Sir Brian Tuke. It was under Lord Lichfield that the legis- lation of 1839 was carried out in 1840 and in 1841. In September of the last-named year Lord Lichfield was succeeded by Viscount Lowther.*~~

~~*In the summer of 1844 public attention was aroused in a re- markable manner to a branch of post-office administration which hitherto had been kept almost wholly out of sight. The state- ment that the letters of Mazzini, then a political refugee, who had long been resident in England, had been systematically opened, and their contents communicated to foreign Governments, by Sir James Graham, secretary of state for the home department, aroused much indignation. The arrest of the brothers Bandiera,? largely*~~

~~*1 Hill, History of Penny Postage (1880), Appendix A (Life, &c., ii, 438). Part of the strenuousness of the opposition to this measure arose, it must be owned, from the "high-handedness" which in Sir R. Hill's character somewhat marred very noble faculties. The change worked much harm to some humble but hardworking and meritorious functionaries.*~~

~~*2 Ricordi det frateli Bandiera e dei loro compagni di martirio in Cosenza (Paris, 1844), p. 47.*~~

~~*rest Or ric &*~~

~~*569*~~

~~*in consequence of information derived from their correspondence with Mazzini, and their subsequent execution at Cosenza made a thorough investigation into the circumstances a public necessity. The consequent parliamentary inquiry of August 1844, after retrac- ing the earlier events connected with the exercise of the discretional power of inspection which parliament had vested in the secretaries of state in 1710, elicited the fact that in 1806 Lord Spencer, then secretary for the home department, introduced for the first time the practice of recording in an official book all warrants issued for the detention and opening of letters, and also the additional fact that from the year 1822 onwards the warrants themselves had been pre- served. 'The whole number of such warrants issued from 1806 to the middle of 1844 inclusive was stated to be 323, of which no less*~~

than 53 had been issued in the years 1841-44 inclusive, a number exceeding that of any previous period of like extent. It further appeared that the whole recorded number of warrants from the beginning of the century was 372, which the committee classified under the following heads :—

Subject-Matters in relation to which Warrants were issued for the Opening of Letters, 1799-1844.

Bank ofbmeland |) <2… 0-20 13 | etters netumed:...2.— .---.. — 7 SATU LGY <5. eee iene see DPAGdress copied! <- 0.2.6 oes oe 1 Murder, theft, fraud, &c. ..... VELL Txosreres [Spec Clic | AAn mae ooo coe Gas. 1 Treason, sedition, &c. ..... HMO Gerbalice treeless 89 HSOMers OlMVaAL'.- - e\siiiaeis eel ei 13 —_ NRGVEWING: oc 25s sifieis es siecle ss ate 5 thiol aa eeesenetac ne aOIso8 372 Foreign correspondence …..... 20

The committee of 1844 proceeded to report that "the warrants issued during the present century may be divided into two classes, — 1st, those issued in furtherance of criminal justice, . . . 2d, those issued for the purpose of discovering the designs of persons known or suspected to be engaged in proceedings dangerous to the State, or (as in Mazzini's case) deeply involving British interests, and carried on in the United Kingdom, or in British possessions beyond the seas. . . . Warrants of the second description originate with the home office. The principal secretary of state, of his own discretion, determines when to issue them, and gives instructions accordingly to the under-secretary, whose office is then purely ministerial. The mode of preparing them, and keeping record of them in a private book, is the same as in the case of criminal warrants. There is no record kept of the grounds on which they are issued, except so far as correspondence preserved at the home office may lead to infer them.?. . . The letters which have been detained and opened are, unless retained by special order, as sometimes happens in criminal cases, closed and resealed, without affixing any mark to indicate that they have been so detained and opened, and are forwarded by post according to their respective super- scriptions." 4

Almost forty years later a like question was again raised in the House of Commons (March 1882) by some Irish members, in relation to an alleged examination of correspondence at Dublin for political reasons. Sir William Harcourt on that occasion spoke thus: 'This power is with the secretary of

~~*state in England… . In Ireland it belongs to the Irish Government. . . . Itis a power*~~

~~*which is given for purposes of state, and the very essence of the |*~~

~~*power is that no account [of its exercise] can be rendered. To render an account would be to defeat the very object for which the power was granted. If the minister is not fit to exercise the power so entrusted, upon the responsibility cast upon him, he is not fit to occupy the post of secretary of state."° The HOuse of Commons accepted this explanation ; and in view of many recent and grave incidents, both in Ireland and in America, it would be hard to justify any other conclusion.*~~

~~*The increase in the number of postal deliveries and in that of the receiving-houses and branch-offices, together with the numerous improvements introduced into the working economy of the post-office, when Rowland HIll at length obtained the means of fully carrying out his reforms by his appointment as secretary, speedily gave a more vigorous impulse to the progress of the nett revenue than had theretofore obtained. During the seven years 1845-51 inclusive the average was but £810,951. During the seven years 1852-57 inclusive the average was £1,166,448,—the average of the gross income during the same septennial period having been £2,681,835. The following table (V.) shows the details (omitting fractions of a pound) for the entire period from 1838, the last complete year of the old rates of postage, to 1857 inclusive :—*~~

~~*3 Report from the Secret Committee on the Post-Ofice (1844), p. 11. 4 Tbid., pp. 14-17. 5 Hansard, Debates, vol. cclxvii. cols. 294-296 (session of 1882),*~~

~~*NOD = 72*~~

~~*Tncrease*~~

~~*in postal business*~~

~~*(1839- 57).*~~

~~*Growth and changes*~~

~~(1858- 85).~~

~~570~~

~~Number of Letters ; Gross and Nett Income, 1838-1857.~~

~~imated Postage ; NO. of Gross | fe ee Nett charged Year ending Chargeable Income. me Revenue, jon Govern- Letters. HSL: ment. 5 $7313 1 669. 424 ne 2,339,737 | 687, 652, ; ve Z Wee es 2°346,278 | 686,768 1,659,500 45,156 1840 | 75,908,000 | 2,390,763 | 756,9 633, 2 » a4 | 168,768,344 | 1,359,466 | 858,677 | 500,789 | 90,761 * — yg42 | 1967500,191 | 1,499,418 | 938,168 | 561,249 | 113,255 443 | 2087434,451 | 1,578,145 | 977,504 | 600,641 | 122,161 » — ig4a | 2207450,306 | 1,620,867 | 980,650 | 640,217 | 116,508 1845 | 249091,684 | 1,705,067 | 985,110 | 719,957 | 109,232 > 3846 | 271,410,789 | 1,887,576 | 1,125,594 | 761,982 | 101,190 " 3847 | 2907586,762 | 1,963,857 | 1,138,745 | 825,112 | 100,354 > — tgag | 3227146,243 | 2,181,016 1,196,520 | 984,496 | 121,290 " 849 | 328,830,184 | 2,143,679 | 1,403,250 | 740,429 | 115,602 > 3850 | 337,399,199 | 2,165,349 | 1,824,562 | 840,787 | 106,928 1851 | 347:069,071 | 2,264,684 | 1,460,785 | 803,898 | 109,523 " 1852 | 360,647,187 | 2)422,168 | 1,304,163 | 1,118,004 | 167,120 > 3853 | 379,501,499 | 2,494,326 1,343,907 | 1,090,419 | 124,977 1854 | 410/817,489 | 2,574,407 | 1,400,679 | 1,173,727 | 134,112 Dee? 31,1854 | 443,649,301 | 2,701,862 | 1,506,556 | 1,195,306 | 185,236 1855 456,216,176 | 2,716,420 1,651,364 | 1,065,056 | 173,560 " 1856 | 478,393,808 | 2,867,954 | 1,660,229 | 1,207,725 | 1545229 » 1857 | 504,421,000 | 3,035,713 | 1,720,815 | 1,314,898 | 135,517~~

~~Briefly, within a period of eighteen years under the penny rate the number of letters became more than sixfold what it was under the exorbitant rates of 1838. When the change was first made the increase of letters was in the ratio of 122°25 per cent. during the year. The second year showed an increase on the first of about 16 per cent. During the next fifteen years the average increase was at the rate of about 6 per cent. per annum. Although this enormous increase of business, coupled with the increasing pre- ponderance of railway mail conveyance (invaluable, but costly), carried up the post-office expenditure from £757,000 to £1,720,800, yet the nett revenue of 1857 was within £320,000 of the nett re- venue of 1839. During~~

~~*the year 1857 the number of newspapers delivered in the United Kingdom was about 71,000,000, and that of book-packets (the cheap carriage of which is one of the most serviceable and praiseworthy of modern postal improvements) about*~~

~~*6,000, 000.*~~

~~*During the succeeding quarter of a century, 1858-84, the achieve- ments of the period 1835-57 have been eminently surpassed. The postmasters-general of the new epoch have been assisted and seconded by a series of public servants, not a few of whom added to the conspicuous energies of Sir R. Hill more of those not less estimable qualities—suavity of manner, tact in dealing with large bodies of inferiors, reverence for the good doings of past times— than had fallen to his lot. Salient amongst such stand the names of Sir John Tilley, Mr Frank Ives Scudamore, and Mr Stevenson Blackwood. Among the postmasters-general the Earl of Elgin (1859), Lord Stanley of Alderley (1860), Lord Hartington (Decem- ber 1868), Lord John Manners (February 1874), and the forty-fourth postmaster-general Henry Fawcett! (April 1880 to November 1884) hold eminent place.*~~

~~*This period includes—(1) the establishment of postal savings banks (1861), in which Mr Gladstone, as chancellor of the ex-*~~

~~*1 The Right Hon. Henry Fawcett (1833-1884), under whose excep- tionally vigorous, able, and statesmanlike administration many improve- ments of the postal system were introduced, was born at Salisbury in 1833. He was educated at King's College, London; and Trinity Hall, Cambridge, and after graduating in 1856 as seventh wrangler began his studies for the English bar. A weakness in the eyes had occasionally interrupted his studies before the great calamity which befell him while out shooting in September 1858, when a gun accident totally deprived him of sight. The exceptional interest of his career lies in its com- plete fulfilment of his resolution that he would not allow the calamity "to interfere with his discharge of duty or the enjoyment of life." Even as regards physical exercise his resolution was practically ful- filled, for he continued to engage in riding, fishing, skating, swimming, and rowing with as keen enjoyment as before. As regards the chief interests of his life the result of the accident was probably beneficial rather than otherwise. Returning to Cambridge, he devoted himself to the*~~

~~*systematic study of political economy, and in 1863 he was chosen professor of that subject. In 1867 he was married to Millicent, daughter of Mr Newson Garrett of Aldeburgh, Suffolk, who assisted him in the preparation of several of his works on political economy, and also wrote independently on the same subject. The best known of Mr Faweett's treatises is his Manual of Political Economy (1868). In this science he followed substantially the old lines, but a certain freshness attaches to his views from his deep practical interest in the welfare of the working-classes. After several attempts to enter parlia- ment, he was in 1865 chosen for Brighton, which he represented till 1874. Shortly after losing his seat for that borough he was returned for Hackney. On the accession of Mr Gladstone to office in 1880 he was made postmaster-general, and a member of the privy council. He died from pleurisy, after a few days' illness, 7th November 1884.*~~

~~*rus T-O FYTCOE*~~

~~*(1842-1885,*~~

~~*chequer, had a very large share, and (2) the transfer to the state of the telegraphic service (1870). The origin and growth of each of these pregnant improvements is narrated in a separate section of this article. Scarcely less important than these are (3) the introduction of postal cards (October 1870) and (4) the establish- ment (August 1883) of a parcel post. The last-named measure will probably, in its results, prove to be a public boon of almost unexampled magnitude. At its outset it checks railway abuses, both of overcharge and of excessive delays, which had grown to be enormous evils. Minor but most valuable ameliezations of the postal service begin with the abolition of the half-ounce limit (1877), and include the provision of new and excellent post-office buildings, great improvement of the system of registration, extensive accel- erations of mails in various parts of the empire, increased postal deliveries, and, not least in importance, a most just amelioration (greatly needed) of the position of sub-postmasters, of clerks, of sorters, and of letter-carriers. Certain minor improvements cannot be more briefly or better epitomized than in the words of a writer in the Standard newspaper of 10th January 1879.*~~

~~*"The half-ounce weights chanced to be just above the weight of a letter written on full-sized post paper, and, when that was the maximum weight*~~

allowed, the margin was so fine that a little thicker paper than usual, or slightly larger envelope, sufficed to turn the scale, and all but strictly business correspondents were continually landing those whom they favoured with their com- munications in the annoyance of a surcharge for deficient prepay- ment of postage. By the extension to an ounce all that worry and annoyance has been swept away, and no inconsiderable benefit has been conferred besides on people whose missives are of necessity somewhat more ponderous than ordinary. Quite recently the post- office has introduced another great improvement, which the public, not having yet had time to appreciate, do not utilize to the extent it deserves, —that is, the system of ensuring, which is little less than absolute security for money and articles of value sent through the post by means of registration. The fee for a registered letter, which was at one time as much as half a crown, and has within easy recollection been as high as a shilling, was reduced early in 1878 from 4d. to 2d., with the result that something like 6,500,000 of registered letters were sent in 1878, as compared with 4,316,000 in the previous year, and with 1,300,000 twenty years ago. This number would be largely increased if all the official registered packets were included. Not only has the fee been reduced to what may be considered the lowest possible point, but letters are registered by rural postmen on their rounds, and registration envelopes have been issued by the department to facilitate registration by the public. The envelopes have been devised with care, and seem well suited for the purpose, being strong as well as cheap. They are sold at prices varying from 23d. to 3d. each (which includes the registration fee), and are in five useful sizes, from small note size to a large cover suitable for bankers and merchants. But the re- duction in the charge and the sale of envelopes are not the only iniprovements which have been made in the registration system, for the post-office now undertakes to make good, up to £2, the value of any registered letter which it loses, simply stipulating, in the case of money, that one of its own envelopes shall be used. It is on every account most desirable that money and articles of value should not be loosely committed to the post, and with the facilities for transmitting letters securely which are now offered, people who choose to run the risk of loss deserve very little sympathy if the chance goes against them. As regards international communica- tion it is enough to merely mention the beneficent results of the postal union, under which the postage to most places on the Conti- nent and abroad has been reduced to the uniform rate of 24d. for a

~~*letter not exceeding half an ounce in weight; while to a second category of more distant places under foreign dominion the charge for the letter of half an ounce is 6d."*~~

~~*Table VI. gives the estimate of the number of letters (only) which passed in both directions between the United Kingdom and foreign countries and colonies in 1864.*~~

~~*France West Indies, Pacific, and*~~

~~*Canada, British North STEVENS) sors rsco.csseicicscie tte 1,727,000 America, and United TRG) ARTIC, Seenemeanance do 924,000 RSTRLCES) casi cpeiaeier elersiaue ANTEC) |W WIN? soaadogs oo saadocns 827,000*~~

~~*Prussia, Hamburg, an PODAMAE oie isceislerece ois a are 617,000 IBEMMEN siete eisio, cts, ecevatels 4403;000 | Holland) 2.0. .0..0.5.5- 600,000*~~

~~*East Indies, China, &c. ..3,632,000 ==*~~

~~*UA CINDER pete senescdade cs 2,915,000 Total…... 27,281,000*~~

~~*There were also about 21,500,000 books, papers, and patterns.*~~

~~*Meanwhile the estimated number of chargeable letters delivered Latest*~~

~~*within the United Kingdom during the year had grown from*~~

~~*504,421,000, at which it stood in 1857, to upwards of 700,000,000 (1885).*~~

~~*in 1867, and to 1,057,732,000 in 1877. In the year 1884 the number was reported? as 1,322,086,900 (exclusive of 153,586,100 post-cards). The growth of other departments of the postal service is fully in proportion to that of the letters of inland delivery, as may be seen by the following tables (VII., VIII., 1X.).*~~

~~*2 Thirtieth Report of the Postmaster-General, 1884, p. 1; cp. Statis- tical Abstract of United Kingdom (1884), p. 157.*~~

STATISTICS. | POST-OFFICH 571

TABLE VII.—United Kingdom. Estimated Inland Delivery of Letters, 1889-1884."

EE na a a= clk. tliat = ws VT. 4 Delivered in England and Wales. rl Be # 5 3 # 5 i: E P ‘ ts lk Totalin |. 5| 8% Pal ee 2 2|8# (Ce sz Year ending 31st December Ss. In London Ss |! poland |SElES) Total |S8/28,|| Total S2\265|| Totalin |S2|26 until 1876, and thereafter By > &A| District, |» BS ae a ee | ous in ae aa Be ra United | S| = the Financial Year ending] Country |44;@! including 3.3 2]| way 2& | &S || Scotland. | 3° | &S || Ireland. | 2 =| 8S |) Kingdom. | 2 aS 31st March. Offices. |2 8: Local |28 ae ales. |S 0/55 Sodje SS\/as gs\Es8 3 53s Letters oss Be So BES 6 a SS ies ca ie "1S fel leslee B |4e! A |< ia |< EstimatedNo.of Letters,1839] —-- a s > 60,000,000) .. had 8,090,000) .. ba} | 8,000,000, -. 1 { 76,000,000] .. \s Franks, 1839 x a — 5,172,000] .. 336,000] .. || 1,055,000) .. 6,563,000| .. os Letters,1840} 88,000,000) _.. 44,000,000} .. 132,000,000|120°0} § 19,000,000|143°5| 7 ||18,000,000/119°2) 2 169,000,000)22°2 7 Average of 5 years, 1841-45 122,000,000) 10°7 57,000,000) 9°0 179,000,000) 10-2) il 24,000,000] 9:2) 9 |‘24,000,000, 9-5) 3 227,000,000|10°0 8 op 1846-50 {180,000,000| 5°5 79,000,000) 5°5 259,000,000} 5:2; 15 34,000,000; 4:2, 12 ||34,000,000| 5:0} 4 327,000,000; 5°0 | 12 " 1851-55 |233,000,000| 6°5 97,000,000, 5:0 330,000,000) 6-0) 18 41,000,000| 5:2; 14 ||39,000,000| 3°5| 6 410,000,000} 5°7 | 15 a 1858-60 (302,000,000 4:2 125,000,000| 5:5 || 427,000,000) 4-5) 22 ||.51,000,000) 3-2, 16 45,000,000] 3:0, 7 || 523,000,000) 4-2 | 18 ‘: 1861.85 |373,000,000| 5:7 161,000,000| 5:7 |) 534,000,000| 5-7, 29 |) 61,000,000] 0-5 20 |‘53,000,000/ 3:2, 9 || 648,000,000) 5:5 | 22 nA 1866-70 [472,000,000 4:2 192,000,000) 3:2 664,000,000) 4:0; 31 76,000,000} 4:7, 24 ||60,000,000| 3:2) 11 800,000,000) 4°0 | 26 Were ieyal oeésoceeeceagneee 501,000,000] 0°5 220,000,000; 7°0 721,000,000) 2-5) 32 80,000,000/ 1°2 24 |/66,000,000) 3°0) 13 867,000,000| 2°3 | 27 i ee 580,081,400| 4:8 266,771,000, 6°5 || 846,852,400, 5:3) 35 || 90,976,400, 0°9, 26 ||70,563,800; 0°8| 18 ||1,008,302,100) 46 | 31 j PERS SOhe wens. eee 640,033,900 22 310,077,990| 4-8 |} 950,111,800, 3-0) 38 |}101,948,300| 3-0 28 ||75,937,400| .. | 14 ||1,127,997,500) 28 | 38 fy OSI ee eis 650,952,700, 1°7 330,419,300, 6°6 || 981,372,000 3-3] 88 ||104,995,200) 3:0, 20

~~|/78,799,700| 3°8, 15 _||1,165,166,900/ 3°3 | 34 ay dlislle Vi accoseoncossec 685,169,600] 5°3 352,147,100] 6°6 1,037,316,700; 5:7} 40 {|109,799,900| 4°6, 29 ||82,238,200| 4-4) 16 1,229,354,800| 5°5 | 35 a. ee es 713089,100| 4°1 364,558,100] 3°5 ||1,077,647,200, 3-9] 41 ||116,509,800| 6-1) 31 /'86,479,200| 5-2, 17 _|)1,280,636,200) 4°2 | 36 eo 2 ee 736,962,700| 3°3 375,229,500, 2-9 |171197192'200| 3-2| 41. ||1227204,800| 4-6, 32 87,689,900, 14) 17 ||1,322,086,900, 3-2 | 37 6 } The statistics of post-cards, book- packets, and newspapers Meanwhile the position of many efficient workers in the postal delivered in the United Kingdom in different years from 1872 to | service, who had helped to bring about these satisfactory results, 1884 stand thus (Table VIII.) :— stood greatly in need of improvement. The humbler class of = -»| clerks, most of the sorters, and the entire body of metropolitan Estimated Number of Post-Cards.? letter-carriers were prominent in expressing discontent, and they England & Wales.| Scotland. Ireland. [United Kingdom.| | Were able to show good grounds for it. The telegraphists soon — - —| | followed with like representations, though their hardships were g¢ Ba Sa & 8 | | assuredly less. The result has been a large measure of amelioration Ag forn=; sg 3 . . aii ff A Year AGS ae 2 Bk in pay and in position, effected in part by Lord John Manners, and Number. | 48, |Number.| 3 5 | Number.) § 8, | Number. | § 6, | | more especially by Mr Fawcett, who in 1883 estimated that these 5a 54 54 5 | | improvements would involve an annual cost of about £63,000. ae ag ae aS : ' ae, a = 8 m3 = 3 The systematic employment of women in Her Majesty's postal Employ- = a San and telegraph service was for a long time an experiment and a ment of Be 5 .. | 76,000,000] .. : ve pee 16 ae 67 a ose 55 | 87,116,300) 10°7 problem. It may now be said, most accurately, that, on the whole, women. 1878-79] 94,471,500| 9°8 [11,599,000 4°8 | 5,375,200, 5:0 |111,445,700)_9°0 the experiment is grandly successful, and the problem fully solved. 1881-82)114,251,500| 10°4 |14,651,400| 9°3 oa ae Le Od a In telegraphic labour female counter-clerks and telegraphists were Teese Saat ae aanaad as Ur ane 54 153,586,100! 6-6 actively employed before the transfer to the state. 'The postmaster- eee mare' te Teak | : general of 1870 (Lord Hartington) did but accept what he found Estimated Number of Book-Packets and Circulars. established. Under the new regulation, he employed women as tele- . 1872 | 90,000,000] .. [13,000,000| .. [11,000,000;_ .. Eel ae graphists for eight hours daily, at scales of pay which varied from } ie 79 ee ye bpp ie veer obs 6-7 Tee sen 1 eight shillings~~

~~a week to thirty, according to age, intelligence, and 1861.5‘298,999 400] 12°3 |27°875,000| 15-0 {14,164,300| 16-9 1271,038,700) 12°8 practical experience of the work. At first the women were put into 1882-831244,713,800| 6-9 |28,896,000| 3-7 |14,596,600| 3°1 288,206,400, 6°3 separate galleries, afterwards into the same galleries with men and 1883-84|249,347,000! 1°9 /31,353,700; 7°8 }13,892,900 A 294,594,500, 2°2 boys ; and the change was found to work advantageously for all. ae ae So j As regards the postal service proper, the general introduction there- 2 aioe me “ani aa : oe into of female labour was effected, under the rule of Lord John 1872 87,000,000! .. [12,000,000] .. ; ou | 30 ; a — ; ayy 1875 | 93.345,600| 2:3 |13,819,100| 4-5 |13,884,700| 10-2 121,049,400] 3°4 Manners, by Sir oe Cowl The an cagersy sought i) 1878-791100,424,300| 2-2 |14,477,500[.. |15,993,500| 3:6 180,895,300] 1:8 for. At the close of 1880 there were in the three capital cities of 1881-82‘108,651,700| 5°7 |15,477,300} 2°4 |16,660,100) 4-7 |140,789,100} 52 London, Edinburgh, and Dublin alone very nearly a thousand | .. [15,784,600| 2°0 Pega a ree er oo 15 | | female telegraphists ; and throughout the kingdom a number not 1ees-24 OM OADIRG 125 ee Oia ames much inferior of women of various grades, employed in minor~~

~~postal services, over and above the number of those whose employ-~~

~~| 1882-83 108,613,500 / ment is but an incident of their family position, as the wives and~~

~~Table IX. (compare with Table VI.) gives the estimated number~~

~~} of letters, &c., which passed between the United Ge ae sie daughters of sub-postmasters and the like. The best and the most | 4 countries abroad during the year ending 31st March 1885" Shuts encoosstel experiment of all was that of 1875, which offered 7; * Received from Despatched to postal clerkships expressly to “ gentlewomen,” and conspicuously to i Countries abroad, | Countries abroad. the daughters of officers of the army and navy and of officials in the os <= civil service, admissible only between seventeen and twenty years~~

~~Letters | packets | Letters | packets | Total. of age after six months’ satisfactory probation, and organized. in~~

~~aos and ra and 1876 into two classes, each under a lady superior, who holds the~~

~~Jas, | Nene crda, | News- position of a staff-officer. All promotions are made according to~~

~~asia Jerse merit. Those of class I. have £80 to £100, and the "principal~~

~~female clerks £100 to £150 a year; class II. £40 to £75. The same work which formerly occupied male clerks at £80 to £240 is now equally well done by female clerks at £40 to £75, and so in~~

~~African Colonies (Brit.) | 1,049,000} 885,000 | 1,645,600 | 2,832,600 6,412,200. Argentine Republic…. 96,200 55,300; 168,700; 182,000 502,200 'Australia and New| 1,801,500} 1,949,500 2,229,000 | 4,431,300 | 10,411,300~~

~~7~~

~~Zealand | proportion with the other classes." ¢ Ly = peel pee, aes ae iee Nise en tee | Subjoined are (1) the latest financial statement of postal eapendt- mee ae "t77'300| 50,100 266,400] 343,200| 837,000 | | ture for the year 1883-84, and (2) some comparisons of the nett (ShaGbi.oon eguqucogsner 1,505,000 | 1,120,800 | 1,862,200 | 2,139,200| 6,627,200 | revenue of the post-office at various periods. Denmark …...~~/del>~~-0~~+ + 443,400 ie 453,900 + eee 1,273,700 er 452,400| 184,700] 684,500| 565,200] 1,886,800 , ; ; : Face and Algeria …. 7,555,700 7,127,700 8,247,200 4,079,400 27,500,000 | United Kingdom. —Expenditure for year ending 1st March 1884. Germany …...~~2.—00: 6,880,800 | 2,963 129, 43,500 | 20,116,900 a i ings banks, annuities branch, &c. £4,507,500 ST etree: *193/600| " 4-900| '128,000| °135,000| 487,400) | FOR oniee Sorte, Po anne neice ccessseessstseseenereves—12D 100 HYOMAMG os csetec ne * UPD Ne a NE ket OT ld Ne | Telegraph service ….....sseeeeeeeeeeeeees nooo jooagcgsaussse 1,707,000 India and Ceylon ….. 2,248,000 oe hy Reng epee. eee | Wallyena. <2 essere 1,821,500 | 2,738 ' Cee | « 0C"CO"~C~*«*«s eg... cv eee eee 6,935.6 me a '362,200| 62,000| 457,800| 159,800] 1,041,800 Grand total ..... £6,935,600 Portugal .....~~+ + + + + + + 399,800 | 83,800 351,900) 337,000) 1,172,500 In 1643 the

nett revenue was about £5000 a year. In 1653 it GIN oa oss ane Sate 628,200| 251,600} 718,000| 477,800} 2,075,600 'tee Sica aeegeaseneonoe se 846,400 | 467,400' 909,500] 858,400] 3,081,700 | Was farmed to John Manley for £10,000 a year, and ten years Sweden… 2 /0: ⊢ serie 377,800 | 95,300| 460,700| 239,300) 1,173,100 | afterwards to Daniel O'Neill for £21,500. In 1677 the farm rent Switzerland…... AGES 892,900| 384,100; 985,500} 617,200 2,879,700 was raised to £43,000. In 1685 the nett revenue had grown to Turkey Poa pa none 337,300 89,100} 392,600) 461,800 1,280,800 £65.000, in 1707 to £111,426, in 1790 to £331, 180, in 1800.40 Onilted Seas o….< 7,579,800 | 7,851,400 | 9,088,900 | 8,389,800 | 32,909,900 ,00Y, een 'a oe ee 266,500} 109,200| 355,700] 597,800} 1,328,200 | £720,982. In 8 the nett revenue (for Great Britain) was

West Indies (British) ..

£1,100,606, in 1820-21 £1,495,945, in 1839 £1,659,510, in 1849

1 Thirtieth Report of the Postmaster-General, 1884, p. 14. SS ee 2 Tbid., at ' 3 Ibid., pp. Gr elins 4 Quarterly Review, 1881, vol. cli. p. 187—an article by Lady John Manners.

Money orders.

Postal notes.

572

£740,429, in 1859 £1,349,676, in 1869 £2,198,220,1 in 1881 £2,597,768, in 1882 (inclusive of telegraphs) £3,100,475, in 1883 £3,061,748, and in 1884 £2,897,427.

Money-Order Department.

The money-order branch of the post-office was for forty years the private enterprise of three post-office clerks known as "Stow and Company." It was commenced in 1792, with the special object of facilitating the safe con-veyance of small sums to soldiers and sailors, but was soon extended to all classes of small remitters. The postmaster- general sanctioned the scheme

~~*without ihterposing in the management. Each of the three partners advanced £1000 to carry it on; and each of them seems, during the greater portion of the period, to have derived about £200 a year in profit, In 1830 the amount of remittances from London was only about £10,000. The percentage was eightpence in the pound, out of which threepence were allotted to each of the postmasters receiving and paying, the remaining twopence forming the profit of the partners. On 6th December 1838 the office was converted into an official department under the postmaster-general,—the then partners receiving due compensation. The commission was reduced to a fixed charge of ls. 6d. for sums exceed- ing £2 and under £5, and of 6d. for all sums not exceed- ing £2. In 1840 these rates were reduced to 6d. and 3d. respectively. The number and aggregate amount of the orders issued (inland, colonial, and foreign) in different periods from the reorganization (1839) until 1884 are as follows (Table X.) :—*~~

~~*Years. Number. Amount. 1839 188,921 £313,124 MOA ee canccores padecuasneeeeeee 2,806, 803 5,695,395 SAD ee vattisinve ovcentscessss ene 4,248,891 8,152, 643 DB Aan t ec code Noone eeeen 5,466,244 10, 462,411 1861-65 (average) ..... 8,055, 227 16,624,503 TUCO STAD arenceneeeeepeene scoen: 9,720,030 19,847,258 UGS eac acon sHanner eater caacs06 16,819,874 27,688,255 1876 (first three months 4, 436, 858 7,194,943*~~

~~*only) 1S7S-ie 7.x " SrSeer esenaeosnder 17,740, 622 27,303,093 DP OROESO ie aenceniceeawac eesses 17,307,573 26,371,020 SSO SU. cv esaates cosets aces 16,935,005 26,003, 582 LS STCSQES Laer ea ae 15,383,033 25,393,574 eto ele3) iodagneckoacoboqneractese 15,090,858 27,597,883 TESSEC aie sonens eos sects ome 14,663,635 27,629,879*~~

~~*From 1871 to the end of 1877, the rates having been reduced to 1d. for sums under 10s., and 2d. for sums of 10s. and under 20s., increasing by a graduated scale of 1d. for each additional £1 or fraction thereof, inland orders failed to be remunerative ; and it was only by reckoning as profit the amount of unclaimed and forfeited orders that the cost to the office of inland orders could be covered. But, as the loss was only on orders for very small sums, Mr Chetwynd proposed to meet it by issuing postal notes payable at any post-office without previous notice. When the plan was*~~

~~*submitted to a committee appointed by the treasury, it was objected that the postal note as a remitting medium would be less secure than the money order. The objection was met in part by giving a discretionary power to fill in the name of the post-office and also that of the payee, and no practical inconvenience or cause of complaint seems to have resulted. And in like manner another*~~

~~*1 Average of five years, and exclusive of telegraphs.*~~

~~*2 In the Thirtieth Report of the Postmaster-General (1884) the amount is stated as £2,687,100. The statement in the text is from the Analysed Account of the Public Income and Expenditure, pre- sented to parliament by the treasury in July 1884, and is unquestion- ably the correct one. The comparative deficiency as compared with 1883 is due to the expenditure of £350,000 for plant in the telegraphs and parcel-post departments.*~~

~~*° From 1877 onwards the official accounts are made up to 31st March in each year.*~~

~~*e The figures for this year are those given in the general tabular recapitulation of the appendix to the Twenty-eighth Report of Post- master-General, 1882,.p. 40. In the body of the same report (p. 8) they are stated at 14,880,821 and £23,848,936 respectively. The tabular figures are those also of the Twenty-ninth Report, 1883, and of the Thirtieth Report, 1884.*~~

~~*[MONEY ORDERS.*~~

~~*objection which was urged against the new form of money order in several quarters, and very strongly in the Banker's Magazine—namely, that they would prove to be an issue of Government small notes under another name—has derived no support from experience. "It is found," says the postmaster-general, "that the average time [during] which these orders are in circulation is six days,—a fact which shows that there was no foundation for the idea that they would be used as currency."5 The statistics of notes issued under the provisions of the Postal Orders Act, 43 and 44 Vict. c. 33 (1880), are as follows (Table XI.) :—*~~

~~e+. i eeeeeeeeeeSsSeSsssssSsFMHssesFeFefeFsese~~

~~Number. Value. 1881 (quarter ending 31st March) ..... 646,989 £292,150 HS SUS2 caeeee< eicieyeie eieisie eben eae 4,462,920 2,006,918 TES Se MOE Sinise edeuny ges Boat: 7,980,328 3,451,284 ATS BUSES 07s ck, Senn ened ene 12,286,556 5,028,663 Tiel sos 25,376,793 | £10,779,015~~

~~The postal notes most largely in request are those of 1s., 58., 10s., and 20s. In 1884 plans were under the postmaster-geueral's con- sideration for improving the regulations and for extending the system to the colonies. Meanwhile the money-order business, which for several years past had been constantly declining both in number and in value, was on the increase. In foreign® and in colonial orders the increase was in the number as well as in the amount. The inland orders showed an increase in value of nearly two millions sterling (£1,856,091) in 1882-83 as compared with 1881-82, although their number was smaller by 386,531. In 1883- 84 there was a decrease of 0°84 per cent. in the value as compared with that of 1882-83, whilst the increase in the number of postal orders during the same year was more than four millions, the increase in value being more than £1,500,000.~~

~~The relative amount of the money-order business of the chief towns of the United Kingdom is shown in Table XII." It states the number and amount of the orders paid in each town on one day only (5th May 1876), and for the sake of comparison the cor- responding figures for one day in 1884 (5th May) are appended :—~~

~~Total of Orders Paid through paid. Bankers. 5th May 1876. aoe Amount. Dee Amount. London (general post-office) .....] 8778 | £14,802 8339 | £14,073 LOGI G6 ST ye" NaS eee ene Ae 594 5 380 657 [DE SSIS caren Seer eterna aero mepiees 1181 1,550 ail 983 MGM CHES GET <5 eerrcice/osicieres oes ene ee 1056 2,166 215 506 WIV CL DOO Mare sont tenon 1019 2,466 73 115 GES COW eran ore ee ee ene 882 1,855 526 1,169 ISTASUO Aoccraicstsyoin seers eee e eee Bao 1,140 171 493 MBE US arard a crete cisrcersie tree rele 500 948 95 253 PERT 3 estetevsis: 2c ace aieiseseis serene De 393 935 – 13 20 ———————— ee eee eee ee eee Total of Orders Paid through paid. Ze Postal Orders. 5th May 1884. pies Amount. | Number. | Amount. = Amount London (general) 9117 | £16,278 8,784 £15,608 39 £24 post-office) Edinburgh® ....| 420 760 254 385 307 134~~

Duplin. scaecss sel) (so 1,350 776 1,112 547 198 Manchester…...} 960 1,914 | no record | no record |} 519 210 Liverpool…....| 1074 2,755 Pe 3 371 166 Glasrow …....- 1088 2,174 $5 oF 93 93 IBWSEO). «ecco. 339 752 = 53 271 114 NECEA SY «est ics 420 765 A By 319 148 MEM ee ee ssterenetenee 294 617 a A 158 67

Postal Savings Banks.

The establishment of post-office savings banks was prac- Savings tically suggested in the year 1860 by Mr Charles William banks.

Sykes of Huddersfield, whose suggestion was cordially received by Mr Gladstone, then chancellor of the exchequer, to whose conspicuous exertions in parliament the effectual working-out of the measure and also many and great improvements in its details are substantially and unques- tionably due. Half a century earlier (1807) it had been proposed to utilize the then existing (and very rudimentary) money-order branch of the post- office for the collection and

> Twenty-eighth Report of Postmaster-General, 1882, p. 8.

6 The rate of commission on foreign money orders was reduced on 1st January 1883 by one-third. To all countries within the Postal Union (see infra, p. 583 sq.) it is now 6d. for sums not exceeding £2; 1s. for £5; 1s. 6d. for £7 ; 2s. for £10.

7 Fractions of £1 are omitted.

8 The figures for 7th May are given, as the 5th was a partial holiday in Edinburgh.

BE Osc reo rr IC E BY 2

Any depositor in the post-office savings bank can invest Invest- his deposit in Government stock by making proper appli- ment in cation to the controller of the savings bank department, ¢°ve™ London, provided that the sum be not less than £10, or — than the amount of the current price of £10 stock together with the commission, whichever sum is the smaller ; not

~~more than £100 stock can be credited to an account in any year ending 3lst December, or £300 stock in all.~~

~~Within seven days from the receipt of the application~~

~~SAVINGS BANKS. |~~

~~transmission of savings from all parts of the country to a central savings bank to be established in London, A Bill to that effect was brought into the House of Commons by Mr Whitbread, but it failed to receive adequate sup- port, and was withdrawn. When Mr Sykes revived the proposal of 1807 the number of savings banks managed. by trustees was 638, but of these about 350 were open only for a few hours on a single day of the week. Only~~

~~twenty throughout the kingdom were open daily. Twenty- four towns containing upwards of ten thousand inhabitants each were without any savings bank. Fourteen entire counties were without any. In the existing banks the average amount of a deposit was £4, 6s. 5d.~~

~~Mr Gladstone's Bill—entitled "An Act to grant addi- tional facilities for depositing small savings at interest, with the security of Government for the due repayment thereof "—received the royal assent on the 17th of May 1861, and was brought into operation on the 16th of Sep- tember following. The banks first opened were situated in places theretofore unprovided. In February 1862 the Act was brought into operation both in Scotland and in Ireland. Within two years nearly all the money-order offices of the United Kingdom became savings banks ; about 367,000 new deposit accounts were opened, repre- senting an aggregate payment of £4,702,000, including a sum of more than £500,000 transferred from trustee sav- ings banks the accounts of which were closed. At the end of 1863 the number of accounts in the post-office banks was 319,669, with an aggregate deposit of £3,37 7,480. The average amount of each deposit was £3, 2s. 1lld. In 1867 the number of post-office savings banks in the United Kingdom was 3629, that of depositors in them 854,983, the amount standing to their credit £9,749,929. The average amount of each deposit was about £2, 18s. At the end of 1878 there were in the United Kingdom 5831 post-office savings banks; the number of depositors was 1,892,756; and the amount standing to their credit, inclusive of interest, was £30,411,563. At the end of 1882 the~~

~~*number of banks was 6999, the number of depo- sitors 2,858,976, and the amount standing to their credit £39,037,821. This sum was increased at the end of the ordinary financial year, 31st March 1883 (the savings banks accounts being made up, in conformity with the Act of 1861, to 31st December), to £40,087,000. The average amount of each deposit was about £2, as against £4, 6s. 5d. in the trustee savings banks prior to the passing of the Act of 1861.*~~

~~*On 31st December 1883 the number of depositors was 3,105,642, and the aggregate amount standing to their credit (including interest) was £41,768,808 ; the amount of expenses remaining unpaid was about £11,000. The aggregate value of securities and amount of cash in the hands of the national debt commissioners was £43,294,949. The amount of cash in the hands of Her Majesty's post- master-general was £316,853. The aggregate assets were £43,697,932. The surplus of assets over liabilities was £1,918,116. At the beginning of 1884 the total amount received from depositors, including interest, stood at £173,660,388, the total amount repaid to depositors at £131,891,580. The aggregate number of deposits from the outset of postal savings banks was 62,154,832, that of withdrawals 21,612,727, the number of accounts opened 9,225,575, that of accounts closed 6,119,933, that of accounts remaining open "3,105,642. The total cost of these banks was £2,698,547. The aggregate number of transactions of all kinds was 83,767,559. The average cost of each transaction was 77d. It marks the accuracy of the Government actuaries to note that, prior to the pass- ing of the Savings Banks Act of 1861, the estimated cost of each transaction thereunder was stated at 7d.*~~

~~*the depositor's account is charged with the current price of the stock purchased, with the commission, the de- positor receiving an investment certificate as evidence of the transfer.*~~

~~*As to investments in stock, the postmaster-general re-*~~

~~*ports in 1884 that the total amount of Government stock on 31st December 1883 standing to the credit of depositors was £1,519,983 held by 20,767 persons, against £1, 143,717 held by 16,609 persons in 1882,—an increase of £376,266 in amount and of 4158 in the number of stockholders. The average amount of stock held by each person at the end of the year was*~~

~~£73, 3s. 10d., as compared with £68, 17s. 3d. in 1882. During the seven years 1877 to 1883, inclusive, the average sum annually paid into the exchequer (under § 14 of the Act above named) as the excess of accruing interest was £127,192.~~

~~The apportionment of the outstanding accounts and~~

~~their relation in each part of the United Kingdom to the population, respectively, stood as follows at the close of each of the years 1881, 1882, and 18831:—~~

~~TABLE XIII.—Nwmber and Amount of Open Accounts in Post-Ofice Savings Banks.~~

~~Year 1881. Year 1882. No. Amount.2 No. Amount.2 TBS eh pope quae eneeOoae 2,318,113 |£32,670,307 SEG Slag be Gn aogpqodeanos es 1,016,920 2,643,785 Smallislands ……..- 5,779 84,183 ie 99‘566 | _ 699,688 ||’ 108,701 | ¢#3%037,821 Hrebemidley scotch cae e seh 97,100 | 1,723,395 106,490 Total. 2,607,612 |£36,194,495 2,858,976 | £39,037,821 Year 1883. .,| Proportion | Average No. oe to Popula | of each~~

~~Interest. tion. Deposit.~~

~~England, Wales, and ad- jacent isles ……..-~~

~~2,874,458 1to9 |£13 10 6 116,208 }| £41,768,808 | 4 1 to 33 mene 114,976 1to44 | 171611~~

~~3,105,642~~

~~Scotland… ….-----=-.-s Iga ICL~~

~~During the year 1883 nearly two millions and three quarters sterling (£2, 730,987) of postal savings bank deposits were made in excess of those of the year 1882. Only seven small trustee savings banks were closed during the year 1883. During that year 323 new postal savings banks were opened in England and Wales, 33 in Scotland, and 14 in Ireland. At the close of the year the total number for the United Kingdom was 7369. On 31st March~~

1884 that number was increased to 7475. The year 1874 counts among the flourishing years of trade, 1884 among the depressed years. But since 1874 the aggregate amount of savings deposits in postal banks has very nearly doubled without any noticeable diminution in the business transacted by the trustee savings banks, and the number of depositors has also nearly doubled.

In England the county of Middlesex ranks first with 512,229 depositors (1881) and an aggregate deposit of £7,146,375 ; in Wales, Glamorganshire with 32,573 depositors and £371,419; in Scotland, Lanarkshire with 14,763 depositors and £104,550; in Treland, Dublin county with 26,480 depositors and £367,672. At the close of 1882 the aggregate sum due to depositors in the last- named county had increased to £398,994. 'The increase of late years in the Irish deposits is, it may be added, very conspicuous, (2 (2 2h eee ee eS

1 The figures of 1881 are from a return dated 10th August 1882 (Commons' Session Papers, 1882, No. 347). The figures of 1882 are from Twenty-ninth Report of the Postmaster-General, 1883 ; those of 1883 from the Thirtieth Report, 1884.

2 Including fractions of £1, omitted in the particulars above.

574

and extends to every county of the kingdom. The aggregate sum due to depositors throughout Ireland in 1873 was. £845,550; in 1878 it was £1,325,806, and in 1882 £1,925,460, in addition to £125,000 of Government stock standing to the credit of depositors, or, in the whole, £2,050,460. ; ; ; 7 Of the 638 trustee savings banks which existed in the United Kingdom at the date of the establishment of the post-office system 230 have been closed. Fifteen new trustee banks have been opened ; so that the number now existing is 423, as compared with 7475 post-

office savings banks. Under ihe Act 45 and 46 Vict. c. 51 (1882) the postmaster-

Poe SF Or a aia F

~~| TELEGRAPHS,~~

~~person not under five years of age. The transactions take placc through the medium of the savings bank departments. Husband and wife may each purchase an annuity up to the maximum amount, and each may be insured up to the full amount of £100. Condi- tions of contract in the case of annuities depend upon the age and sex of the purchaser, together with, where the annuity is deferred, the number of years which are to elapse before the commencement of the annuity ; they also vary according as the purchase money is to be returned or not. The premiums charged for insurances vary with the age of the insurer and the mode in which the insur- ance is effected. The insurer, if not under sixteen years of age,~~

~~Annui- : Z : a ee ties and general will insure the lives of persons of either sex between the | enjoys the right of nominating the person to whom the money due life in- ages of fourteen and sixty-five, inclusive, for any sum not less than at his or her death is to be paid. The contracts for annuities and surances. £5 or more than £100; but where the amount docs not exceed £5 life insurances in connexion with the savings bank branch of the the earlier limit of age is eight years. An annuity, immediate or | post-office began on 17th April 1865. The following table (XIV.) deferred, for any sum not less than £1 or not more than £100 will | shows the amount of business done in different periods down to be granted by the postmaster-general, under the same Act, to any the year 1883 :— ANNUITIES. LIFE INSURANCES. Immediate. Deferred. } a | Fees.2 acs Receipts Payments Contracts Re Contracts || . | . 1 entered into. ; 8 diene into. | ceipts. Payments. entered into. |! Receipts. Eauencts, Year. ———— | | — an Sy | seul Sy seg! |eoude ey Sy si) seve ee 22s 1g 2seg 2 gage 5B = ee 25 2cGs No. a B'S # No. ag No. BES $ || No. aS Be g | No. e | 8 No | 38 No. Be | Noe es 2 = é Be EE eS BE Sam | 3 Ba ze £88 ae | gee a4 4335 ae eu | = @ = <£ au 450AG | | eae ss = a 1865 87 | £2,100 || £22,738 32 £423 45 £949 67 £1342 26 2 £139 547 |£40,647 1,076 | £1,165 35 ac 18703) 306 | 6,120 67,738 2,529 26,099 57 1195 514 3529 9 | £346 347 385 | 31,254 9,274 5,877 39 | £1676 1875 | 582 | 7,926 85,781 || 11,129 63,641 34 768 661 | 3543) 0 526 421 370 | 32,022 || 14,549 9,500 i 84 3127 1880 | 892 | 13,249 | 146,562 |} 14,933 | 101,734 41 847 621 | 4406 ; 119 | 1570 695 258 | 20,278 || 15,379 | 10,506 i 125 3886 1881 | 956 | 16,434 || 184,737 |} 15,808 | 121,111 66 1376 686~~

~~5243 | 131 1763 873 300 | 23,900 || 15,883 | 10,967 F 114 3675 1882 | 799 | 13,435 || 155,528 || 16,729 | 122,123 |) 72 1502 772 6449 156 | 2327 727 234 | 18,447 |} 16,039 | 11,069 || 141 5694 1883 | 770 | 14,141 | 159,630 |; 17,302 | 130,053 |) 104 2120 830 | 7240 163 1898 790 256 | 20,600 }} 16,156 | 11,333 | 129 5431 b { ul it endorsed by the other chambers of commerce throughout Postal Telegraphs. the kingdom. When the inquiry of 1865 was instituted Early To the chamber of commerce of Edinburgh belongs the | the total number of places supplied with telegraphic com- ry honour of effectually originating that public demand for | munication by all the companies collectively was about posals.~~

~~the transfer of the telegraphic service of the United King- dom from commercial companies to the state which led to the passing of the Acts of Parliament of 1868 and 1869. There had, indeed, been several like proposals by indi- viduals in preceding years. Mr Thomas Allan proposed such a transfer in 1854. Two years later the scheme was advocated by Mr Baines of the general post-office, and afterwards by Mr Ricardo. But these proposals had no practical effect until after the action taken at Edinburgh, mainly at the instance of Mr (now Sir) George Harrison, convener of the chamber. The committee of inquiry then appointed showed conclusively that the telegraphic service, as managed by the companies, (1) maintained excessive charges, (2) occasioned frequent and vexatious delays in the transmission of messages, and inaccuracies in the rendering of them, (3) left a large number of important towns and districts wholly unprovided for, and (4) placed special difficulties in the way of that newspaper press which had, in the interest of the public, a claim so just and so obvious to special facilities. The committee also proved that, great as were the just causes of public com- plaint at the date of its inquiry, they would have been greater still but for a considerable reduction of charge~~

~~effected by, and in consequence of, the establishment in 1861 of the United Kingdom Company,—a company opposed by a formidable combination of its competitors, which forced it to abandon the uniform shilling rate, irre-~~

~~1000, whereas the number of places having postal com- munication at the same date was 10,685. The telegraph offices were placed most inconveniently for the service of the population generally, and especially for~~

~~that of the suburbs of large towns; and under the then existing telegraphic tariff the charge in Great Britain was a shilling for a twenty-word message over distances not exceeding 100 miles ; 1s. 6d. for a like message over distances from 100 to 200 miles ; 2s. when exceeding 200 miles. Fora message between Great Britain and Ireland the charge ranged from 3s. to 6s.; to Jersey or Guernsey it was 7s. 8d. There were also innumerable extra charges, under con- tingent regulations of great complexity, which commonly added 50 per cent. to the primary charge, and frequently doubled it.~~

~~The Edinburgh committee considered in turn the re- spective merits of three several remedial measures: (1) a regulated amalgamation of the existing companies; (2) the establishment of entire free-trade in public telegraphy ; (3) the transfer of the service to the post-office. It tended towards a preference of the last, but agreed to recom- mend the appointment of a royal commission of inquiry prior to legislation. In the result the needful preliminary inquiries, and also the preparation of the Bills for parlia- ment to which those inquiries led, came to be made by the direct authority of the postmaster-general, and were mainly entrusted to Mr Frank Ives Scudamore, second secretary ©~~

~~spective of distance, with which it started.4 The Edin- burgh chamber was unanimous in supporting the plan of~~

~~of the post-office. The Electric Telegraph Act of 1868 (31 and 32 Vict. Electric~~

~~a uniform sixpenny rate, and that proposal was speedily | c. 110) authorized the postmaster-general, with consent of ae Ta 1 Prior to the year 1875 the payments consisted of purchase money the treasury, to purchase for the purposes of the Act the ly of~~

~~whole, or such parts as he should think fit, of any existing 1g ¢9 69, telegraphic company, " provided always that no such pur- chase be made . . . until the proposed agreement, and a treasury minute thereupon, shall have lain for one month upon the table of both HIouses of Parliament without dis- approval." The Bill in its original form gave to the~~

~~returned only, no annuities being payable till after the lapse of ten years,~~

~~2 On immediate and deferred annuity contracts, the charges on monthly allowances being included in the premium. ; 3 Claims on surrender value of life insurance contracts commenced in this year.~~

- ~~Papers on Electric Telegraphs, 1868, pp. 58, 55, 202 sq.~~

~~orders by telegram.? Finally, it had to amalgamate into one staff bodies of men who had formerly worked as rivals, upon opposite plans and with different instruments, and to combine the amalgamated telegraph staff with that of the postal service.~~

~~When under examination by the Commons' committee of 1868 Mr Scudamore had very modestly disclaimed * the honour of originating anything with respect to the proposed transfer. Every part of the scheme had, he said, been borrowed from somebody else, and tried suc- cessfully elsewhere: the amalgamation of the telegraphic and postal administration in Victoria, New South Wales, Belgium, Switzerland, and to a certain extent in France ; the institution of places of deposit for messages, in addi- tion to the offices of transmission, in Belgium, as well as the gratuitous grant of postal facilities for telegraphic messages; telegraphic stamps in Belgium and France; a telegraphic money-order office in Switzerland and Prussia. But it is quite certain that Mr Scudamore, had he been put under examination at a later date, could have pointed to no precedent for labours like those imposed upon him and his able assistants by the Telegraph Acts of 1868-69.~~

~~So zealously was the work of improvement pursued that within little more than six years of the transfer (viz., in 1876) the aggregate extent of road wires in the United Kingdom was already 63,000 miles, that of railway wires 45,000,—in all 108,000 miles. The number of instruments in the telegraphic offices was 12,000. At that date the superintending and managing staffs of the post-office com- prised 590 persons, the staff of the old companies with the relatively insignificant traffic of 1867—less than 6,000,000 messages as compared with 20,000,000—having been 534~~

~~*persons. For supervision exclusively the number of officers was 88 against 86, and the relative cost £16,900 to the post-office as against £15,000 to the companies.® At this date there were still no less than 1720 miles of the road wires carried over houses and across streets. In 1882 more than 1300 miles of these had been gradually removed and underground wires substituted.*~~

~~*The following table (XV.) shows the gross and nett revenue derived by the post-office from the telegraph service since the date of the actual transfer (Jan. and Feb. 1870).*~~

~~*post-office the exclusive right of public telegraphy. But the committee of the House of Commons to which the Bill was referred made a special report of their opinion "that it is not desirable that the transmission of messages for the public should become a legal monopoly in the post-office." They also recommended that it should be left to the dis- cretion of the postmaster-general, with the consent of the treasury, to make special agreements for the transmission of certain classes of messages at reduced rates ; that security should be taken for ensuring the secrecy of messages, by making its violation punishable as a misdemeanour ; and, finally, that submarine cables acquired by the postmaster- 'general should at first be leased to companies, although ultimately it might become expedient that the post-office should work them.! The Act of 1869 (32 and 33 Vict. c. 78), entitled "An Act to alter and amend the Telegraph Act, 1869," gives to the post-office the exclusive privilege of transmission, —withheld inthe previous Act, —empowers the purchase of telegraphic undertakings other than those included in that Act, and enables certain companies to require the postmaster-general to make such purchase. It also directs the raising by the treasury of a sum of £7,000,000 for the purposes of the Acts. The Act 33 and 34 Vict. c. 88 (1870) extended the post-office tele- graphic system to the Channel Islands and to the Isle of Man ; and that of the 34 and 35 Vict. c. 75 (1 871) author- ized the raising of an additional million. These sums collectively proved to be quite insufficient, and eventually the capital sum so raised exceeded £10,000,000. This large excess led to very blamable irregularities, during two or three years, in the post-office accounts by the temporary application of savings banks' balances, and the like, to telegraph expenditure,—irregularities which attracted the express censure both of the treasury and of the House of Commons. Probably no more arduous task was*~~

~~ever thrown upon a public department than that imposed on the post-office by this transfer of 1868-70. The reforms which it was to bring about were eagerly and impatiently demanded by the public. The utmost ingenuity that some of the old companies could exert, employ, or in- directly incite was used at first to prevent or impede the transfer and then to make it as difficult and as costly as possible."~~

~~c 5 Total Telegraph~~

~~This great operation had to be effected without for Receipts ae Working Ex- ee one hour interrupting the public service. Thereupon the || Year ended 3ist March. tenets oad sre of interest om department had immediately to reduce and to simplify the for Porterage Vote.8 Puce~~

~~deducted).~~

~~charges of transmission throughout the kingdom. It had to exteud the hours of business at all the offices. It had to extend the wires from railway stations lying outside of~~

~~£62,273 | £38,487~~

~~1870 (two months) £100,760 394,477 | 308,457~~

~~ie ete. | 97,9349~~

~~co . 2~~

~~town populations to post-offices in the centre of those vee a aaa gaarea e 1 BL er 1 nee ye~~

~~populations and throughout their suburbs. It had also || ig77 UE) Ysisi107 | 1,128,790 189,317~~

~~to extend the wires from towns into rural districts thereto- || 1879.…....:0:cseeeeereeeees 1,346,892 1,089,392 257,500 holly devoid of telegra hic communication. It had WG Cilbese eeeeee eee ceces ces 1,610,907 1,242,092 368,815~~

~~*asst Herons —. or eee 1,630,443 | 1,365,633 | 264,810*~~

~~*to effect a complete severance of commercial and domestic telegraphy from that of mere railway traffic; and in order to this severance it had to provide the railways with some 6000 miles of wires in substitution of those of which theretofore they had been joint users. It had, further, to provide at low charges, by all sorts of agencies, an effective "free trade" (so to speak) in the collection of news for the newspaper press, of which collection hitherto the old telegraph companies had possessed a virtual mono- poly. It had to facilitate the transmission of money*~~

~~*1,504,204 | 235,859*~~

~~*1,709,506 51,393*~~

~~*ee ee ee*~~

~~*3 Enumerated (Scudamore, Supplementary Report, p. 142) as amongst the objects aimed at by the post-office in accepting the transfer.*~~

~~*4 Minutes of Evidence taken by Commons' Committee on proposed Transfer, &c., passim.*~~

~~*5 Report of the Select Committee on Telegraphs, 1876 (Commons' Session Papers, No. 357), p. ili. sq.*~~

~~*6 Lord John Manners to the treasury ; see Papers relating to Post- Office Telegraphs, 1876 (Session Papers, No. 34), p. 2.*~~

~~*7 Thirtieth Report of Postmaster-General, 1884, p. 58.*~~

~~*8 This return is taken from the Reports of the postmaster-general, and is drawn up according to the appropriation account of each financial year. There are certain additional expenses (for buildings, stationery, manufacture of stamps, and rates) on account of the telegraph service which that account does not include. They raise the total cost of the telegraph service for 1881 to £1,308,454, for 1882 to £1,440, 728.*~~

~~9 Mr Scudamore's original estimate of yearly revenue was put at £608,000 (Supplementary Report to Postmaster-General, 1868, p. 147).~~

~~1 Report of Commons' Committee on Electric Telegraph Bill (Session Papers of 1868, No. 435).~~

~~2 Two instances out of more than twenty may suffice. The North- Eastern Railway Company claimed in compensation for its telegraphic department £540,292, besides a very large sum for interest ; it was awarded, in all, £168,696. The metropolitan railway companies claimed, in all, £433,000, and were awarded £51,907 (Twenty -fifth Report of Postmaster-General, 1879, p. 21).~~

~~Progress The reduction of the unit of charge from a shilling department at the same time itself establishing exchanges in other i ; . + s places. The principle which underlay this arrangement was that nie to anal = et ree " vas zs "A ailhie 5 it only one telephone system should be established in any one town. Cm a Poa (Thar i i sal. y Pe Ultimately he came to the conclusion that it was undesirable . . . was originally proposed, in the Edinburgh chamber of | to create a monopoly in the matter of telephonic communication ; commerce, at the outset of the public movement which | and ee tee a seg! be oe from responsible persons for licences to establish exchanges under con- ~ to the yaraigmdbtten oe Fobis rt ita BR ditions which may be regarded as giving adequate protection to pon successive pos g 7 : w" | the public and to the department." § London Society of Arts. On one of those occasions it According to the Sitwation des Réseaux Téléphoniques for 1883, was admitted by the postmaster-general that even at a | published by the International Telephonic Company at Paris, the sixpenny rate the telegraphs would eventually more than contract between the British post-office and the London and Globe Pp 1 nau ie iy iecties tal Saket Telephone and Maintenance Company is for a term of twenty- pay aL oayeees, See i: & current rate or interest | nine years. The licence granted to the Telephone Company of upon the capital expended.?_ Two years later the urgent | Ireland provides that no exchange to be established thereunder by necessity of this reform was expressly stated by the same | that company shall be within less than 4 miles of any post-office high authority in answer to a question put to him in the | ¢change. But, liberal as they were, the~~

~~*concessions made by Mr H f Commons. Bui be cilulaiad Heok doch & Fawcett in 1883 failed to satisfy the large and constantly-increasing —* 4 claims of the telephonic interest. They claimed (1) entire practical would involve a loss to the revenue for the first three freedom of control for their respective enterprises, (2) the reduc- years, which would probably amount to nearly £420,000 | tion of the subsisting state royalty by one-half, (3) the extension in the aggregate. of the commercial telephonic radius to 15 miles. As an alter- The chief dates in the history of the electric-telegraph service | Dative, they offered to continue the subsisting royalty if every may be stated briefly thus. The first public line to work the sort of restriction and control were removed, Mr Fawcett firmly patent of Wheatstone and Cooke was laid from Paddington to | Mmtained the right of Her Majesty's post-office to continue the Slough on the Great Western line* in 1843, The charge for a existing royalty, to establish at its discretion its own telephone message up to fifty words was Is. Before the end of the year 1845 | °XChanges throughout the realm, and to grant new licences irre- lines exceeding in the aggregate 500 miles were at work in Eng- | SPective of the old ones; he consented to abolish all limitations land on the same patent. In the following year the Electric Tele- of radius or area, to Subject trunk wires and exchange wires to graph Company was established with a tariff of 1s. for 20 words | like conditions, to withdraw the claim heretofore made by the within a radius of 50 miles, 1s. 6d. within 100 miles, 5s. if | Gepartment for an unlimited supply of the patented instruments exceeding 100 miles. Remittance messages or telegraphic money- Fe ve a eS and to ie the establishment by Sage orders were established in 1850. In October of that year the ii a ee. ie: aompany as to. Be first oceanic telegraph was worked for the Submarine Telegraph licensed to receive and deliver written messages at any point. By Company. In June 1854 a writer in the Quarterly Review 4 put the this restriction telegraphic and telephonic messages were practically question: "Is not telegraphie communication as much a function ——- in service, although identical in law. ' hi of Government as the conveyance of letters?" In January 1870 e subjoined table (XVI) shows the total number? of telegraphic Tele- the telegraphs became, in pursuance of the Acts of 1868 and 1869, | ™°SS®ges forwarded in England and Wales, Scotland, and Ireland, grape practically a branch of the post-office. In 1881 telephone exchanges severally, at different years, since the transfer. eatin were established, both by the post-office and by private companies England*~~

~~and Wales Total of under its licence, for terms of years, upon payment of a royalty. Year : Scotland.| Ireland. | United In 1884 (August and September) definitive arrangements were Provinees.| London. | Total. Kingdom. made between the post-office and the telephonic companies, thus arr pean | SAaeees Leeks | Meee | eae eee a long controversy and removing many mercantile | |is/1‘15 | 6’s04°s00 3,612,772 | 10,207,362 | 173887434 | 878/000 | 127473,796 eart-burnings. 1876-77 | 11,232,704 | 6,561,930 | 17,794,634 | 2,402,347 | 1,529,162 | 21,726,143 Tele- When the telegraphs were taken over by the Government tele- | | 1881-8210] 14,204,479 | 12,071,034 | 26,275,513 | 3,207,994 | 1,862,354 Spend phonic phonic communication had not yet come into practical use. But | | 1882-83 | 14,554,015 | 12,374,707 | 26,928,722 | 3,244,202 | 1,919,102 | 32,092, com- the principle and base of both methods are the same ; and the Acts 1883-84 | 14,920,413 | 12,686,433 | 27,606,846 | 3,299,428 | 1,936,846 | 32,843,120 munica- were framed to give the state a right to profit by improvements. . . ——— tion. In the course of the year 1880 several telephone companies estab- The number of telegrams sent in proportion to population is now~~

~~576~~

~~In the year 1882 a large increase in the working expenses became necessary for the further improvement and exten- sion of the service, and for a very just increase in the re- muneration of the telegraphists. In the report of that year the postmaster-general writes as follows :—“ The annual interest on the capital sum of £10,880,571, raised by the Government for the purchase of the telegraphs, has not previously been included in the postmaster-general’s accounts, because the amount is not provided for out of post-office votes; but in estimating the financial position it ought to be borne in mind that the chancellor of the exchequer has to meet a charge of £326,417 for this service out of the consolidated fund.”!~~

~~lished telephone exchanges in various parts of the kingdom. Means were imniediately used by the postmaster-general to vindi- cate the law. Ou the 20th December of that year the question was brought to an issue in the Exchequer Division of the HIgh Court of Justice. It was contended by the companies that ‘the telephone differed essentially from the telegraph,—the~~

~~one trans- mitting electric signals, the other carrying the human voice by means altogether unknown when the post-office monopoly was granted." In the course of his judgment Mr Justice Stephen observed that, 'if the telephone really transmitted the human voice, then communication by it could not be more rapid than the velocity of sound, whereas in fact it was instantaneous. In beth SE EE ea i a gS~~

~~: Twenty-eighth Report of Postmaster-General, 1882, p. 10. Journal of the Society of Arts, 1880, vol. xxviii. p. 739. The preliminary experiments of Wheatstone and Cooke had been successfully made on the North-Western line, between Euston station and Camden Town station, but at that date the North-Western Company~~

~~declined to give facilities for working out the new enterprise. 4 Vol. xev. p. 151.~~

~~POST-OFFICE~~

~~[TELEGRAPHS,~~

~~the communication is by electric signals." The Exchequer decision of December 1880 establishes once for all, not only that the tele- phone companies are quite outside of "the terms of the exceptions in section 5 of the Act of 1869," but also that " the Government monopoly is not limited to the property it acquired. It extends to all improvements in telegraphic communication."> The post- master-general used his victory with generous moderation. As the companies, he wrote, "were apparently under the belief that they had infringed no law, I held myself ready to meet them with liberal terms. The system of telephonic intercommunication is therefore now being extended partly through the agencies of com- panies and partly by the post-office."® In the next annual report (1882) he added: " Licences were granted to the United Telephone Company,' as representing the companies defendants to the suit, and to other private agencies to carry on the business of a tele- phone exchange in London and in various provincial towns, the —~~

~~much greater in England than it is in the countries which were cited in the evidence of 1868 as in that particular outstripping others. The old~~

companies, "by maintaining high charges as long

as they could, by reducing those charges . . . only under pressure, by the confinement of their operations to important towns, and by planting their, offices mainly in the business-centres of those towns, had brought speculative men, and speculative men only, to a free

5 See Law Jowrnal Reports of January 1881.

§ Twenty-seventh Report of Postmaster-General, p. 5.

7 Upon an average this company paid to the post-office, under the arrangement so initiated, a sum of £15,150 a year. Its aggregate payments up to 31st December 1883 were only £35,500 (Postal Gazette, 1884, p. 490). In other countries the telephonic companies pay much more for their privilege. In Italy, for instance, there are fixed annual payments to the state over and above the royalty of 10 per cent., as in Britain.

8 Twenty-eighth Report, 1882, pp. 5, 6.

® Compiled from Reports of postmaster-general.

16 Including certain press messages, which previous to 1878-79 were not included in the returns.

Adminis- trative position.

ADMINISTRATION, ETC. |

use of the telegraph."! The development of the service will be apparent when it is stated that at the date of transfer to the state (1870) the number of telegraph offices did not exceed 3700. The number of messages in a year was 8,606,000. In 1884 they were respectively 5873 and (as above) 32,843,120. The yearly increment has lately averaged nearly 700,000. More striking still is the con- trast of cost. In 1851 twenty words sent from London to Edin- burgh cost 10s.; as late as 1862 they cost 4s.; since 1880 the cost has been reduced to 1s.; in August of the present year (1885) it will be reduced to 6d. Among the latest minor improvements of detail in the

~~*telegraph service is that which was effected in November 1882 by the abolition of the distinctive telegraph stamp, and the adoption of ordinary postage stamps for the payment of messages. Tele- grams thus posted are conveyed, without extra charge, at the next collection of letters to the nearest telegraph office, whence they are transmitted by the wires at the earliest possible moment."*~~

~~*During 1883 and 1884 great improvements were made in the telegraphic service of Scotland and also in the communication between Great Britain and Ireland. An additional cable was established between Fishguard and Blackwater. Four new land- lines were laid in connexion therewith, namely, from London to Fishguard, and from Blackwater to Dublin, Cork, and Limerick. There are now twenty-four wires available for use between Britain and Ireland contained in six cables. A new cable depét has been erected at Woolwich, and a cable-ship constructed (1883) expressly for post-office service. But the marvellous growth of telegraphy and telephony is best seen when we compare their statistics in individual towns. The daily average of messages in London, for example, was 450 in 1870 and nearly 6000 in 1883 ; in Derby 218 in 1870 and 898 in 1883. 'The staff at Derby in the former year was fourteen, in the latter year forty-six, and the instruments employed in the same years were respectively seven aud twenty-seven.*~~

~~*Government, Organization, Staff, and Regulations.*~~

~~*Originally and essentially the post-office is part of the domain of the crown of England. Practically its adminis- tration is controlled and regulated by statute. There were in 1883 no less than twenty-one several Acts of Parliament, or parts of Acts, which affected the postal administration, although at the commencement of the reign of Victoria the existing Post-Office Acts and parts of Acts (some- what more numerous still) were consolidated into a single statute,—a measure which had been previously resolved upon and in part prepared under the administration of the duke of Wellington. The responsibilities of common carriers do not extend to the postmaster-general or to any of his deputies. Buta sub-postmaster is answerable in the ordinary courts of law for individual acts of negligence. And all subordinates of the postal service are, of course,*~~

~~*1 Scudamore, Report on the Reorganization, &c., p. 17.*~~

~~2 Twenty-eighth Report of Postmaster-General, 1882, p. 5.~~

~~3 The details are given at length in the Law Journal Reports for 1884. A good summary may be found in The Postal and Telegraphic Gazette, 1884, pp. 660-662.~~

~~4 Hansard, Parliamentary Debates, series iii., vol. i. pp. 706, 779. We cannot here enumerate the subsisting Acts es than in briefest form. (1) The general administration and working of the department, the rates of postage, and the appropriation of the revenue thence accru- ing are governed by—7 William IV. and 1 Vict. c. 33 (July 1837) ; 3 and 4 Vict. c. 96; 10 and 11 Vict. c. 85 (1847) ; 33 and 34 Vict. c. 79 (1870), and ibid. c. 98, §§ 9-12; 34 and 35 Vict. ¢. 30 (1871); 38 and 39 Vict.c. 22 (June 1875); 44 and 45 Vict. c. 19 (1881), and ibid. c. 12, § 47. (The Act 33 and 34 Vict., amongst other valuable improvements, extends the book-parcel post, and contains an express clause empowering the treasury to regulate by warrant postage rates from time to time. Yet there is a whole series of subsequent Acts regulating such rates. The Act 38 and 39 Vict. arose out of the provisions of the international postal treaty at Bern of 9th October 1874 (see below, p. 584), and empowers the treasury to regulate foreign and international rates of postage in accordance with these provisions.) (2) The money-order branch is regulated by 3 and 4 Vict. c. 96, § 38 (1840), and by 48 and 44 Vict. c. 33. (8) The savings banks branch is regulated by 22 and 23 Vict. c. 53 (1859); 24 and 25 Vict. c. 14 (1861) ; and 37 and 38 Vict. c. 73 (1874). (4) The annuities and life insurance branch is governed by 27 and 28 Vict. c. 43 (1864) ; this statute applies also to savings banks managed by trustees (see Savines BanKs). (5) The telegraphs branch is regulated by 31 and 32 Vict. c. 110 (1867-68) ; 32 and 33 Vict. c. 73 (1868-69) ; 34 and 35 Vict. c. 75 (1871); and 41 and 42 Vict. c. 76 (1878). (6) The acquisition of lands for post-office purposes is facilitated by 44 and 45 Vict. c. 20 (1881). Finally, (7) the parcel-post branch is provided for by 46 and 47 Vict. c. 58 (1883). |~~

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~~*responsible to the postmaster-general, who may, and upon due cause will, besides other and official punishment, re- quire them to make good to the sufferers losses which have been inflicted by proven breach of duty.®*~~

~~*The staff of the post-office department was composed as follows Staff.*~~

~~*on 31st March 1884 (Table XVII.) :—*~~

~~*Males. | Females.| Total.*~~

~~*1. Chief officers, secrétariat, and surveyors 63 1 64*~~

~~*2. Elead-postimastersr, ...-ceisic0< « sssceise << ° 789 130 919*~~

~~*3. Sub-postmasters and letter-receivers ….] 12,038 2,790 14,828*~~

~~*4. Clerks and superintending officers …... 229) 616 2,909*~~

~~*5. Supervisors, countermen, sorters, tele-| 10,074 Pais) 12,189*~~

~~*graphists, &c.*~~

~~*6. Postmen, porters, Ge… 25… 5-.2-:.2- 15,269 8 15,277*~~

~~*7. Assistants and servanis of various grades| 28,829 16,139 44,968 (unestablished)*~~

~~*8. Colonial postmasters and foreign agents 29 1 30*~~

~~*Grandgbotaleneeeye seis. es 69,384 21,800 91,184*~~

~~*The general post-office, London, is organized in seven principal departments, viz., (1) secretary's, (2) solicitor's, (3) receiver- and accountant-general's, (4) money-order, (5) savings banks, (6) tele- graphs, (7) circulation. The secretary's office has a general control over all the others.*~~

~~*At the beginning of 1858 the total number of post- offices in the United Kingdom was 11,101; at the beginning of 1884 it was 15,951. Of the former*~~

~~*number 810 were head post-offices, of the latter number 921. In 1858 the number of street and road receiving-boxes was 703, im 1884 15,749.*~~

~~*The quarterly Post-Ofice Guide is now so widely known that we Letter Whilst a letter not rates, &c.*~~

~~*need say very little about rates of postage. exceeding 1 oz. passes for 1d., and one not exceeding 2 oz. for 14d., one not exceeding 12 oz. is charged 4d., but for every weight exceed- ing 12 oz. a penny for each ounce, beginning with the first, is charged. There is no express limit to weight, but no letter, unless it be from or to a Government office. must exceed the dimensions of 1i8×9×6 inches. The uniform rate for a registered newspaper is $d., unregistered newspapers pay the book-rate of 3d. for every 2 oz. In weight no book-packet must exceed 5 Tb, nor must it exceed in dimensions those prescribed for letters. The official post-card is impressed with a $d. stamp; cards for reply, bearing two stamps, may be transmitted not only between places within the United Kingdom but between such places and many foreign countries (see Post-Ofice Guide). Petitions and addresses to Her Majesty and to the Houses of Parliament are exempt from charge up toa weight of 2 tb. Parliamentary proceedings are charged at the book rate, but are unlimited as to weight or size, and prepay- ment is optional, without entailing any increased rate of charge. The rates of the parcel post (Ist August 1883) are—for 1 ib or part thereof, 3d. ; not exceeding 3 tb, 6d. ; not exceeding 5 fb, 9d. ; not exceeding 7 Ib, 1s. The limits of size are 3 feet 6 inches in greatest length, and in length and girth combined 6 feet. In all cases par- cels must be prepaid in adhesive stamps. The rule as to registration is held to be inapplicable to postal parcels ; but in January 1885 a useful system of stamped certificates of the postage of parcels was introduced. For foreign rates of postage and for all like details we necessarily refer to the Post-Ofice Guide above-mentioned.*~~

~~*In social importance no branch of postal administration exceeds its savings banks system and the dependencies attached toit. At every post-office forms can be obtained on which twelve penny postage stamps can be fixed, which will be received as a postal savings bank deposit for a shilling, provided a due declaration be made that the depositor has no account with any other savings bank. When the deposit reaches £1, interest at the rate of 6d. a year*~~

~~on each pound is given. The depositor can withdraw his money (which may accrue to the limit of £30 in any one year) from any one of the 7475 post-office banks. At any such office a person who wishes to invest £10 or any larger sum up to £100 in Government stock can do so at the current price of the day.~~

~~In conclusion we add a brief retrospective survey of the more salient~~
~~Résumé.~~

~~incidents, in chronological order, of the British post-office. (1533) First appointment ofa postmaster-general for England; (1591) partial organization of rudimentary English post-office; (1619) appointment of a special postmaster-general for ‘“‘foreign parts” ; (1635) reorganization of English post-office under Thomas Wither- ings; (1665) settlement of post-office revenue on James, duke of York, and his heirs-male ; (1680) establishment of a metropolitan penny post by William Dockwra ; (1711) consolidation of Postal Acts by statute 9 Queen Anne, c. x. ; (1720) organization of cross- road and rural posts under Ralph Allen; (1753) organization of post-office of American colonies under Benjamin Franklin ; (1784)~~

~~5 Compare the judgment given in Lane v. Cotton, in Lord Raymond’s Reports, i. 646, with that in Whitfield v. Lord Le Despencer (post- master-general, 1766-1781), in Cowper’s Reports, 754, and with that in Browning v. Goodchild, in Wilson’s Reports, iii. 443.~~

~~XIX. — 73~~

~~Australia~~

~~578~~

~~establishment of improved mail-coaches and of well-organized mail- routes, under John Palmer of Bath; (1821) first conveyance of mails by steam-packet ; (1830) first mail-coach by railway ; (1834, August) postage stamp invented at Dundee by James Chalmers ; (1835) establishment of the overland route to India, mainly by exertions of Licutenant Waghorn ; (1837) Sir R. Hill’s postal reform initiated ; (1838) establishment of postal money-~~

~~*order office ; (1840, January) general and uniform penny post (per half ounce) established ; (1855, March) first street letter-box put up in London ; (1855, June) book-post organized ; (1856) metropolitan postal dis- tricts established and Postal Guide issued ; (1861) postal savings banks instituted ; (1870) transfer of telegraphs to the state ; (1870) postal cards introduced; (1870) improved postal treaty with Napoleon III. concluded ; (1871) postal unit of charge reduced to one penny per ounce; (1874) International Postal Union estab- lished at Bern; (1875) further consolidation of the post-office statutes; (1881, January) postal orders issued; (1883, August) parcel post established ; (1884, October) entrance of the Australian colonies into the Postal Union.*~~

~~*Bibliography.—John Hill, Penny Post, or a Vindication of the Liberty of every Englishman in carrying Letters, against any Restraint of Farmers of such Employ- ment, 1659; '*The Case of the Officers of His Majesty's Penny Post," in the Ninth Report of the Commissioners on the Post-Ofice Department, 1698 ; " Post- Office," in Reports on the Revenues of the Crown, 1811 sq.; " Post-Office," in Re- ports of the Commissioners of the Revenue Inquiry, 1826-30; Reports of the Com- missioners… on the Management of the Post-Office, 1835-38 ; Rowland Hill, Post- Office Reform: tis Importance and Practicability, 1837 (three editions in 1837 ; reprinted in the Postal Gazette, 1884); Reports of [Commons'] Select Committee on Postage, 1837-38; Papers issued by the Mercantile Commitice on Postage, 1839; Post Circular, ed. by Henry Cole ; Correspondence on Post-Office Reform, ed. by R. Hill, 1843; R. Hill, State and Prospects of Penny Postage; Reports of Postmaster- General, 1855-84 (annually); Post-Ofice Guide (quarterly, by authority), 1856-85 ; Postal Oficial Circular (a revised re-issue of an earlier publication entitled Daily Packet List), 1858-85 ; W. Lewin, Her Majesty's Mails: an Account of the British Post-Office, 1864; R. Hill, History of Penny Postage (appended to G. B. Hill's Life of Sir R. Hill), 1880; P. Chalmers, The Penny Postage Scheme of 1837: was it an Invention or a Copy? 1881, and The Position of Sir R. Hill made plain, 1882 (with many other tracts by the same author during 1882-84); Pearson fy i ae to Mr Chalmers; Henry Fawcett, The Post-Ofice and Aids to*~~

~~*"hrift, 1881.*~~

~~BriTisH COLONIES AND DEPENDENCIES. Australia and New Zealand. — In 1873 there were 2668 post-~~

~~and New offices open ; 38,930,852 letters (including South Australian and~~

~~Zealand.~~

~~Canada.~~

~~New Zealand packets) and 22,018,483 newspapers and packets were transmitted ; 303,741 money orders, amounting to £754,847, were issued ; there were 185,202 depositors in the post-office savings banks, whose deposits amounted to £2,081,288 ; over 20,559 miles of telegraph lines were open ; 2,100,272 messages were transmitted, from which an income of £211,276 was derived, while the expendi- ture (exclusive of South Australia) amounted to £186,681. Western Australia is omitted from these figures owing to the inadequacy of the Government returns. These figures, compared with the population of 1873, show that over 18 letters and over 10 news- papers and packets per head were transmitted ; that money orders were issued to 1 in about every 7 persons, at an average value of nearly £2, 10s. per order ; that deposits in the post-office savings banks averaged a little over 1 in 11 of the entire population, at an average value of £11, 4s. per deposit ; that of telegraph messages there was about one to each person.~~

~~In 1883 there were 4410 post-offices open ; 123,614,387 letters and post-cards, 10,434,461 packets, and 60,889,570 newspapers (in- cluding South Australian packets) were transmitted ; the revenue of the postal department amounted to £1,057,100, and the expendi- ture to £1,287,679 ; 783,701 money orders were issued, amounting to £2,608,915 ; there were 254,510 depositors in the post-office savings banks, and their deposits amounted to £4,537,706 ; there were over 57,174 miles of telegraph, and 7,083,163 messages were transmitted, the value of which was estimated at £476,683; the expenditure of the telegraph departments amounted to £345,590, but it must be explained that the Victorian, South Australian, and West Australian expenditures were included in those of the postal departments. These figures, compared with the population of 1883, show that there were transmitted per head nearly 40 letters and post-cards, and over 23~~

~~*newspapers and packets; to every third person a money order was issued, at an average value of about £3, 6s. 6d. per order; the number of deposits in the post-office savings banks averaged about 1 in every 12 of the population, and their average value was over £17, 6s. per deposit ; the telegraph Inessages were transmitted at the rate of rather more than two messages to each person,*~~

~~*Canada.—During the year which ended on 30th June 1884 the number of letters conveyed by the mails throughout the Dominion of Canada was 66,100,000 as against 62,800,000 in the correspond- ing year 1883; that of post-cards was 13,580,000 as against 12,940,000. The number of letters registered was 3,000,000 against 2,650,000. The number of money-orders issued was 463,502, their aggregate value being £2,068,726. Of this amount £1,638,060 was for inland orders, £430,666 for foreign orders. The number of Canadian post-offices was 6837 against 6395 in 1883; the length of postal routes open was 47,131 miles, showing an increase over the previous year of 2488 miles. The distance traversed thereon*~~

~~*by the mails in 1884 was 20,886,316 miles. Of the 6837 post- offices 866 were also money-order offices. In 1884 international money orders were extended to the principal countries of the Postal Union and to all British possessions abroad. In 1884 the amount of foreign money orders paid in Canada was £252,600. In 1884 the number of post-office savings banks was 348, the number of depositors' accounts 66,682 (an increase of 5623 over 1883), and total amount in deposit £2,650,000.*~~

~~*India.—In order to illustrate the growth of the post-office in India.*~~

~~*India we give the salient statistics for 1873 and 1883. In British India and the native states the total number of post-offices in 1883 was 5310, showing an increase of 2304 since 1878. In 1888 the number of letters of all descriptions that passed through the post- office was 135,709,147, in 1873 it was 83,127,098. Post-cards were not issued until 1880, when they numbered 7,471,984, which number had increased to 29,844,347 in 1883.*~~

~~*In the last-quoted year 18,501,171 newspapers, parcels, and packets passed through the post and 10,030,216 in 1873. In 1883 2,565,904 postal money orders, representing a value of £6,468,418, were issued. Adding the number of money orders to the total of letters, newspapers, &c., for the year 1883 we obtain an aggregate of 186,620,569, equal to 0°73 per head of population. Post-office savings banks were opened in India on 1st April 1882; during the first year the deposits reached a total of £485,356, or including interest (£4902) £440, 258. Deposits amounting to £160,578 were withdrawn during the year, leaving a balance of £279,680 on 31st March 1883. The total length of Government telegraph lines increased from 46,386 miles in 1873 to 84,700 miles in 1883. The expenditure in both years under consideration exceeded the receipts: whilst in 1873 the figures were respectively £704,193 and £677,047, in 1883 they were £983,779 and £971,639. (E. ED.)*~~

~~*UNITED STATES.*~~

~~*The early history! of the post-office in the British Early colonies in North America has been briefly referred to history.*~~

~~*above (pp. 565, 566). Benjamin Franklin was removed by the home department from his office of postmaster- general in America in 1774. On 26th July 1775 the American Congress assumed direction of the post-offices, re-appointing Franklin to his former post. Shortly after- wards, when Franklin was sent as ambassador to France, his son-in-law, Richard Bache, was made postmaster- general in November 1775.*~~

~~*In 1789 the number of post-offices was 75, in 1800 908, in 1825 5677, in 1875 35,734, and in 1884 50,017. In 1789 the gross revenues of the postal service were $30,000, in 1800 $280,804. In 1860 the gross revenues had in-creased to $8,518,067 and in 1875 to $26,671,218. In 1884 they amounted to $43,338,127°08. In 1860 there was a deficit in the postal income of $10,652,542°59, occasioned through lavish expenditure and then existing abuses. Annual deficiencies had occurred for nine years previous to 1860, and continued for twenty-one years thereafter. In 1882 a surplus of $1,394,388-°92 was shown, and in 1883 a profit of $1,001,281°83. The percentage of deficit continued steadily to decrease after 1860, and in 1882, for the first time in thirty-one years, the postal service ceased to be a*~~

~~*burden upon the treasury. It is not to be doubted that adverse natural conditions operated for many years to prevent or to postpone this favourable result, among them the vast extent of territory embraced within the confines of the republic, entailing costly service over long routes, and the extraordinarily rapid development of the western States and Territories, conditions which militate against the United States in a comparison of the statistics of its postal service during that period with those of the service of countries having more limited areas.*~~

~~*Until 1863 the rates of postage were based upon the distances over which the mails were conveyed. In 1846 these rates were—not exceeding 300 miles, three cents ; exceeding 300 miles, ten cents. In 1851 the rates were reduced to three cents for distances not exceeding 3000 miles and ten cents for distances exceeding 3000 miles. The use of adhesive postage stamps was first authorized*~~

~~*1 For early statistics (1790-1856) of the United States post-office, see HIncy. Brit., 8th ed., vol. xviii. pp. 419, 420.*~~

~~*Convey- ance of mails.*~~

~~*UNITED STATES. |*~~

~~*by Act of Congress, approved 3d March 1847, and on Ist June 1856 prepayment by stamps was made compulsory. In 1863 a uniform rate of postage without regard to dis- tance was fixed at three cents, and on lst October 1883, after satisfactory evidence had been given of the surplus income from the operations of tke post-office establishment for the two preceding fiscal years, the rate was further reduced to two cents, the equivalent of the British penny postage. It will be seen that no time was lost in giving to the public the benefit of the change for the better in the condition of the postal finances, and to this liberality is undoubtedly due in great measure the deficit of $5,204,484‘12 for the year 1884, a deficiency which, how- ever, it is reasonable to expect, will decrease from year to year under the stimulus given to correspondence by the cheapened rate. It is hardly remarkable, in view of the great area of the United States, that for a long time dis- tance should have formed a very material element in the calculations for levying postal tribute.*~~

~~*The franking privilege, which had grown to be an in- tolerable abuse, was finally abolished in 1873, and the post-office now carries free under official "penalty" labels or envelopes (#.¢., envelopes containing a notice of the legal penalty for their unauthorized use) nothing but matter which is of a strictly official character, with the single exception of newspapers circulated within the county of publication. As late as 1860 the mails conveyed nothing but written and printed matter. They now admit nearly every known substance which does not exceed four pounds in weight (this restriction does not apply to single books), and which from its nature is not liable to injure the mails or the persons of postal employés.*~~

~~*The railway mail service, including the "fast mail," the character of which is from the necessity of the case peculiar, and which, in its methods and results, has reached a perfection attainable only in a country of great extent, was inaugurated in 1864 after a successful experiment upon a few of the large railroad lines with important termini. In 1865 one thousand and forty one miles of railway post-office service were in operation, employing sixty-four clerks. The service was reorganized in 1874 with eight territorial divisions, each in charge of a superin- tendent subordinate to a general superintendent at the seat of government. This service was one of the earliest exponents of a classified civil service in the more recent acceptation of that term in the United States, appointment of railway postal clerks having always been made for a probationary period, permanent appointment conditioned upon satisfactory conduct and service, and removal based upon good cause only. On Ist July 1884 there were about four thousand clerks in the railway mail service, and the length of the routes was 117,160 miles. The annual transportation (aggregate distance over which the mails were conveyed) was 142,541,392 miles. At the same date the length of the "star service" routes (i.e. mail service other than by railway or steamboat) was 226,779 miles and the annual transportation 81,109,052 miles, while the length of the steamboat routes was 15,591 miles with an annual transportation of 3,882,288 miles, which does not include conveyance of mails by sea to foreign countries.*~~

~~*The penny post existed in a number of cities of the Union in 1862, the carriers remunerating themselves by the collection of a voluntary fee of from one to two cents on each piece of mail delivered. A uniform free*~~

~~delivery system was first authorized by law on 3d March 1863, and was established on the succeeding 1st of July in forty- nine cities. The number of carriers employed the first year was 685. On Ist July 1884 there were 3890 letter- carriers in one hundred and fifty-nine "' free delivery cities."~~

~~F Op T-OF PfIC Ez~~

~~579~~

~~To the European reader this number will doubtless appear to be remarkably small in a country whose population, according to the census of 1880, was over 50,000,000, but it should be observed that, outside of the larger cities and towns, the people as a rule reside on detached farms of greater or less size, at considerable distances from each other, and not, as in many of the European states, congregated in small towns or villages, separated from their farms ; from this circumstance it happens that rural factors or carriers have never been, and could not well be, employed as in European countries.~~

~~The registry system, in which great improvements have been made within the last few years, did not attain any degree of excellence until after 1860; and the money-order system was first established in 1864. The aggregate num- ber of money orders, domestic and foreign, issued during the fiscal year 1883-84 was 8,314,963, of the value of $129,810,038°51. Postal notes for small sums, payable to bearer, and resembling the British postal orders except in that they are not drawn for fixed amounts, were first issued to the public in September 1883, and during the first ten months there were 3,689,237 notes sold of the aggregate value of $7,411,992°48. Money orders are ex- changed, in pursuance of postal conventions for the pur- pose, with most of the important countries of the world which have money-order systems of their own.~~

~~The total staff of the post-office in 1884 numbered Late — 71,671, of whom 50,017 were postmasters. For the same Statistics.~~

~~year the total number of letters delivered in 159 cities was 524,431,327. The number of post-cards delivered in the same cities was 166,652,429, and the number of news- papers 231,645,185. The number of registered letters and parcels sent through the mails was 11,246,545, and the total~~

~~*ascertained losses numbered 516, or in the ratio of 1 to 21,795. During the same year the total number of pieces of mail handled or distributed en route on the cars by railway postal clerks was 4,519,661,900, of which number 2,795,447,000 were letters,—a total increase over the previous year of 134 per cent., the transactions of that year having themselves exceeded those of the year 1882 by nearly 16 per cent. The sales of stamps, &c., for the year amounted to $40,745,853-66, showing that almost the entire revenues of the service are derived from postages. The total estimated number of letters sent to foreign countries was 33,328,014, of post-cards 1,672,458, of packets of newspapers, &c., 20,712,464, and of packages of samples of merchandise 297,048. There were received from foreign countries 28,404,035 letters, 1,288,673 post- cards, 21,747,784 packets of newspapers, &c., and 519,561 packets of samples of merchandise. The total number of articles of undelivered mail received in the dead-letter office was 4,843,099, of which number 4,752,483 were letters, being nearly a million less than the number which reached the British returned-letter office. Useful printed matter which cannot be returned is distributed amongst the inmates of various hospitals, asylums, and charitable and reformatory institutions in the District of Columbia, and in 1884 23,152 magazines, pamphlets, &c., were thus disposed of.*~~

~~*Three years after the passage by the British parliament of the Tele- Electric Telegraph Act (1868-69) the subject of a similar transfer graphs.*~~

~~*of the rights of the telegraph companies to the post-office of the United States was strongly urged by the postmaster-general of that country, Mr Creswell, and he renewed his recommendations the succeeding year ; the subject also recurred at intervals in the annual reports of the post-office department for subsequent years. In 1882 Mr Howe admitted that he had been "forced to the con- clusion that the time has fully come when the telegraph and postal service should be embraced under one management"; a year later, however, Mr Gresham states that he " should hesitate to sanction a measure providing that the United States shall become the proprietor of telegraph lines and operate them by its officers and*~~

~~*Savings banks.*~~

~~*Early history.*~~

~~agents." Mr Hatton in his first report as postmaster-general, that for 1884, is silent upon this subject.~~

~~Mr Creswell took occasion in 1871 to recommend also the estab- lishment of postal savings banks in the United States, and this subject he made of peculiar interest at the time by the sugges- tion that the money needed to purchase existing telegraph lines could be raised through the postal savings banks, certainly a timely suggestion to accompany the two simultaneous recommendations. The establishment of postal savings banks has also been the fre- quent subject of departmental and congressional discussion without decisive action. 'The utility and expediency of the measure have not been doubted, but singularly enough what has seemed to be an insuperable obstacle to the inauguration of the system has been encountered. The policy of the Government, with its vast surplus revenue of late years, has been to gradually and surely reduce the national debt, which, it would seem from the progress already made in that direction, is certain of ultimate extinction in the course of a few years. It is plain, however, although the difficulty does not seem to have occurred to many of the advocates in the United States of a savings banks system, that to be lasting it must be founded upon a permanent Government debt, a condition which does not and is not likely to exist in that country. Interest cannot be paid to depositors for funds which are not needed and which cannot be pro- fitably employed. Until this problem is solved, it is not probable that this feature will be added to the postal system of the United States, where, however, the practice of careful economy has not yet become a cominon habit of the masses of the people, and where the security for small savings afforded by Government institutions would tend to foster habits of thrift. A Bill to establish a postal savings depository as a branch of the post-office department was introduced in the House of Representatives on 8th February 1882, and an elaborate report was made thereon, 21st February 1882, by the committee on the post-office aud post-roads, to whom the Bill had been referred. The measure was never acted upon and has not since been revived. (W. B. C*.)**

~~FRANCE.~~

~~*The French postal system was founded by Louis XI. (19th June 1464), was largely extended by Charles IX. (1565), and received considerable improvements at various periods under the respective Governments of Henry IV. and Louis XIII. (1603, 1622, 1627 sq.).! In the year last-named (1627) France, so often during long ages pre- eminent in "teaching the nations how to live," originated a postal money-transmission system, expressly prefaced by those cautions about transmission of coin in ordinary letters which are now familiar to all eyes in the windows of English post-offices (but which no eyes saw there a dozen years ago), and in the same year it established a system of cheap registration for letters. The postmaster who thus anticipated 19th-century improvements was Pierre d'Alméras, a man of high birth, who gave about £20,000 (of modern money) for the privilege of serving the public. The turmoils of the Fronde wrecked much that he had achieved. 'The first farm of postal income was made in 1672, and by farmers it was administered until June 1790. To increase the income postmasterships for a long time were not only sold but made hereditary. Many adminis- trative improvements of detail were introduced, indeed, by Mazarin (1643), by Louvois (c. 1680 sgq.), and by Cardinal de Fleury (1728); but many formidable abuses also continued to subsist. The revolutionary Government transferred rather than removed them. Characteristically, it put a board of postmasters in room of a farming post-master-general and a controlling one. The keen and far-seeing mind of Napoleon (during the consulate *) abol- ished the board, recommitted the business to a postmaster- general as it had been under Louis XIII, and greatly improved the details of the service: Napoleon's organiza- tion of 1802 is, in substance, that which obtains in 1885, although, of course, large modifications and developments have been made from time to time.®*~~

~~*1 For the details, see HIncy. Brit., 8th ed., vol. xviii. pp. 420-424, and Maxime Du Camp, "L'Administration des Postes," in Revue des Deux Mondes (1865), ser. 2, xvii. 169 sq.*~~

~~*2 28 Pluviose, an XII.=18th February 1804.*~~

~~*3 Le Quien de la Neufville, Usages des Postes, 1730, pp. 59-67, 80, 121-123, 147-149, 286-291; Maxime Du Camp, op. cit., passim; Pierre*~~

~~*POST-OFFICE*~~

~~[FRANCE,~~

~~The university of Paris, as early as the 13th century, possessed a special postal system, for the abolition of which in the 18th it received a large compensation. But it continued to possess certain minor postal privileges until the Revolution.*~~

~~Mazarin's edict of 3d December 1643 shows that France Growth.~~

~~at that date had a parcel post as well as a letter post. That edict creates for each head post-office throughout the kingdom three several officers styled respectively (1) comptroller, (2) weigher, (3) assessor; and, instead of remunerating them by salary, it directs the addition of one-fourth to the existing letter rate and parcel rate, and the division of the surcharge between the three. Fleury's edicts of 1728 make sub-postmasters directly responsible for the loss of letters or parcels ; they also make it necessary that senders should post their letters at an office, and not give them to the carriers, and regulate the book-post by directing that book parcels (whether MS. or printed) shall be open at the ends.2 In 1758, almost eighty years after Dockwra's establishment of a penny post in London, an historian of that city published an account of it, which in Paris came under the eye of a man of similar spirit and enterprise to Dockwra. Claude Piarron de Chamousset ® obtained letters-patent to do the like, and, before setting to work or seeking profit for himself, he issued a tract with the title, Mémoire sur la petite-poste établie & Londres, sur la modéle de laquelle on pourraat en établir de semblables dans les plus grandes villes d@ Europe. The reform so worthily begun was successfully carried out.~~

~~By this time the general post-office of France was pro- ducing a considerable and growing revenue. In 1676 the farmers had paid to the king £48,000 in the money of that day. A century later they paid a fixed rent of £352,000, and covenanted to pay in addition one-fifth of their nett profits. In 1788—the date of the last letting to farm of the postal revenue—the fixed and the variable payments were commuted for one settled sum of £480,000 a year. The result of the devastations of the Revolution and of the wars of the empire together is shown strikingly by the fact that in 1814 the gross income of the post-office was but little more than three-fifths of the nett income in 1788. Six years of the peaceful government of Louis XVIII. raised~~

~~*the gross annual revenue to £928,000. On the eve of the revolution of 1830 it reached £1,348,000. Towards the close of the next reign the post-office yielded £2,100,000 (gross). Under the revolutionary Govern- ment of 1848-49 it declined again (falling in 1850 to £1,744,000) ; under that of Napoleon III. it rose steadily and uniformly with every year. In 1858 the gross re venue was £2,296,000, in 1868 £3,596,000.*~~

~~*The most important postal reforms in France (other than those which we have already noticed) are briefly these :— (1) the extension of postal facilities to all the communes of the country,—effected under Charles X., placing the France of 1829 in certain postal particulars in advance of the United States of 1879 ; (2) the adoption of postage Clément, Appréciation des Conséquences de la Réforme postale, passim; Loret, Gazette rimée, 16th August 1653; Furetiere, Le Roman Bour- geots (in Du Camp, ut supra); "Die ersten Posteinrichtungen, 1L.S.W.," in L'Union Postale, viii. 138; Ordonnances des Rois de France, as cited by A. de Rothschild, Histoire de la Poste-aux-Lettres, i. 171, 216, 269 (3d ed., 1876). We quote M. de Rothschild's clever book with some misgivings. It is eminently sparkling in style, and most read- able ; but its citations are so given that one is constantly in doubt lest they be given at second or even at third hand instead of from the sources. The essay of M. Du Camp is, up to its date, far more trust- worthy. He approaches his subject as a publicist, M. de Rothschild as a stamp-collector.*~~

~~*4 There are several charters confirmatory of this original privilege. The earliest of these is of 1296 (Philip "the Fair'"').*~~

~~*5 Ordonnances, &c., as above.*~~

~~*6 There is an interesting biographical notice of Piarron de Chamousset in Le Journal Officiel of 5th July 1875.*~~

~~*Money orders.*~~

~~*Letter tariff, &c.*~~

~~*Pigeon and balloon posts.*~~

~~stamps,—effected under the presidency of Louis Napoleon (1849) ; (3) the organization of an excellent system of not only transmitting but insuring articles of declared value, whatever their nature,— effected under Napoleon III. (1859) ; (4) the issue of postal notes payable to bearer (1860); (5) the establishment of a post-office library (1878) ; (6) the creation of postal savings banks (1880).~~

~~France, as we have seen, possessed a postal money- transmission service as early as 1627. But for almost two centuries the thing the remitter delivered at the post-office was the thing given to the payee, whether it were coin or paper money. In 1817 the money-transmission service became a money-order service. In that year the aggre- gate value of inland money orders was £364,000, in 1830 £528,000, in 1845 £844,000, in 1864 £4,520,000, in 1868 £6,280,000, in 1877 £9,238,644, in 1878 £11,036,712, in 1881 £18,793,188, in 1882 £19,655,117, in 1883 £20,770,078. The average amount of each order varied very little during the fifty-eight years 1821 to 1878, rang- ing only between 28 francs 62 centimes and 30 francs (twenty-four shillings). The number of orders was in the first-named year only 317,642. In 1868 the number was (in round figures) 5,320,000; in 1878 it had grown to 9,304,840, in 1881 to 14,626,117, in 1882 to 15,791,774, and in 1883 to 16,808,627.1 The average amount of each order has been, since 1878, somewhat upon the increase.? France may also fairly claim to have been in advance of the United Kingdom not only in facilities for the safe transmission of money and other precious commodities but also in the facilities of book post and parcel post. In the tariff for ordinary correspondence, however, it has always contrasted unfavourably. Whilst under the regulations of January 1849 and of July 1854 respectively the letter tariff was double that of Great Britain, it has come to be treble since the adoption by the latter country of the one- ounce unit of charge; 14d. is the French rate under the regulation (M. Cochery's) of 1st May 1878 for a half-ounce letter ; 1d. is the English rate for an ounce letter. Post- cards are charged double the English rate.? The growth of postal correspondence in France prior to the great check inflicted by the calamities of 1870-71 may, very briefly, be shown thus :—~~

TABLE XVIII.—Comparative Numbers of Letters, Newspapers, and Books conveyed.

| Ordinary Letters.4 | Registered Letters.

—

1848 | 126,480,000 176,000 c. 4,500,000 1857 252,921,942 i e

1867 P . c. 15,000,000 |

1868 349,335,000 4,850,000 –

The ingenuity of the French postal authorities was severely tried by the exigencies of the German War of 187 0-71; but they proved themselves singularly successful in maintaining a correspondence, inland and foreign, under difficulties which were probably greater than any postal staff had ever before had to encounter since posts were known. The first contrivance was to organize a pigeon service,° Oe SSG I

1 These figures apply ouly to inland orders issued.

2 Bernard, "Notice sur le Service postal en France," in Journal des Economistes, ser. 3, xv. 866-385; Statistique générale du Service postal, 1881, Vv. sq. : ;

3 Recueil de Renseignements sur le Régime postal, 5; Annuaire des Postes, for various years, to 1883 inclusive, passim. Comp. Reports of Secretaries of Embassy, &c., France (1879), 5. :

4 During the years from 1849 to 1857 ordinary letters in France increased at the annual rate of 124 per cent. (under Napoleon III. as president and as emperor) ; during the rest of his rule the yearly rate of increase is calculated (to 1869 inclusive) at 34 per cent. only.

5 The employment of pigeons as carriers of despatches dates from a very early period, the curious annals of which are given in Die Tauben- post (Berlin). It was not, however, until the commencement of the present century that they were systematically utilized as bearers of messages to the sporting

~~and other papers. Before the organization of the electric telegraph pigeons were regularly employed by the members~~

~~ROS FT-OF-FICE~~

~~581~~

~~carrying microscopic despatches prepared by the aid of photographic appliances.6 The number of postal pigeons employed was 363, of which number fifty-seven returned with despatches. During the height of the siege the English postal authorities received letters for transmission by pigeon post into Paris by way of Tours, subject to the regulations that no information concerning the war was given, that the number of words did not exceed twenty, that the letters were delivered open, and that 5d. a word, with a registration fee of 6d.,' was prepaid as postage. At this rate the postage of the 200 letters on each folio was £40, that on the eighteen pellicles of sixteen folios each, carried by one pigeon, £11,520. Each despatch was repeated until its arrival had been acknowledged by balloon post ; consequently many were sent off twenty and some even more than thirty times. The second step was to establish a regular system of postal balloons, fifty-one being employed for letter service and six for telegraphic service. To M. Durnouf belongs very much of the honour of making the balloon service successful. On the basis of experiments carried out by him a decree of 26th September 1870 regulated the new postal system. Out of sixty-four several ascents, each costing on the average about £200, fifty-seven achieved their purpose, notwithstanding the building by Krupp of twenty guns, supplied with telescopic apparatus, expressly for the destruction of the postal balloons. Only five were captured, and two others were lost at sea. The aggregate weight of the letters and newspapers thus aerially mailed by the French post-office amounted to about eight tons and a half, including upwards of 3,000,000 letters ; aud, besides the aeronauts, ninety-one passengers were conveyed. The heroism displayed by French balloon postmen was equalled by that of many of the ordinary letter-carriers in the conveyauce of letters through the catacombs and quarries of Paris and its suburbs, and, under various disguises, often through the midst of the Prussian army. Several lost their lives in the discharge of their duty, in some cases saving their despatches by the sacrifice. No less than eighty-~~

~~five faced the extremity of danger. During the war the Marseilles route for the Anglo-Indian mails was, of course, aban- doned. They were sent through Belgium and Germany, by the Brenner Pass to Brindisi, and thence by Italian packets to Alexan- dria. The French route was resumed in 1872.9~~

~~Before dealing with the latest statistics of the French postal Latest system, it may be of interest to cite from L'Union Postale of Bern statistics.~~

~~(ii. 87 sq.) a brief comparison of the mail matter within the limits of Paris with that of the state at large in the year 1874 (Table BO EX):~~

~~Paris. France. 1. Ordinary chargeable letters…..... 95,791,000 343,808,000 2. Registered chargeable letters …..... 1,730,000 6,786,000 Gy, iris) eine ee eeeoeeso one eeseaoe 8,935,000 56,534,000 4, Newspapers, books, mercantile patterns..} 242,613,000 368,782,000 Bb. Mine ysOrdeusn yee. «tet os scl steele + leelei 647,400 4,793,680 Grand total of mailed articles…..... 349,716,400 780,703,680 10~~

~~The reader will observe on glancing from this table to Table~~

~~of the stock exchange for conveying early intelligence of the state of the money markets in Paris, &., the entire journey being broken up into short relays, so that transmission of messages inight be secured even during unfavourable weather.~~

~~At the present time all the important fortresses in France and Germany have their staff of voyageur or homing pigeons that are well trained for 50 to 100 miles, so that they could be relied on for holding communication with the fortress in case it should be surrounded by hostile troops. The utility of these birds in conveying messages from the sea in case of war has not yet been recognized in Britain.~~

~~6 The despatches carried by the pigeons were in the first instance photographed on a reduced scale on thin sheets of paper, the original writing being preserved, but after the ascent of the twenty-fifth balloon leaving the city an improved system was organized. The communica- tions, whether public despatches or private letters, were printed in ordinary type, and micro-photographed on to thin films of collodion. Each pellicle~~

~~*measured less than 2 inches by 1, and the reproduction of sixteen folio pages of type contained above 3000 private letters. These pellicles were so light that 50,000 despatches, weighing less than 1 gramme, were regarded as the weight for one pigeon. In order to ensure their safety during transit the films were rolled up tightly and placed in a small quill which was attached longitudinally to one of the tail feathers of the bird. On their arrival in Paris they were flattened out and thrown by means of the electric lantern on to a screen, copied by clerks, and despatched to their destination. This method was after- wards improved upon, sensitive paper being substituted for the screen, so that the letters were printed at once and distributed.*~~

~~*7 Seventeenth Report of the Postmaster-General, p. 7.*~~

~~*8 Boissay, "La Poste et la Télégraphie pendant le Siége de Paris," in Journal des Economistes, ser. 8, xxii. 117-129 and 273-282. Com- pare Postal Gazette, i. 7 (1883).*~~

~~*9 Sixteenth Report of the Postmaster-General, p. 8.*~~

~~*0 Statistique générale du Service postal (Bern, 1882-83), passim.*~~

~~*582*~~

~~*XVII. that in 1874 the ordinary correspondence of France had not recovered its former extent, as it stood in 1868, although a large relative increase is shown in the number of registered letters during 1874 as compared with those of 1868. Taken as a whole, the postal traffic did not fully recover itself until 1878 ; and even then, although the mailed articles exceeded those of the year imme- diately preceding by 124,310,199, the gross revenue accruing from letters, newspapers, and parcels showed a diminution of £788,150 as compared with the gross revenue of 1877. Thenceforward the progress is rapid. 'The chief postal laws now in force are of 6th May 1827, 4th June 1859, 25th January 1873, 3d May 1876, 6th April 1878, 5th February 1879, and 9th April 1881. _*~~

~~*The comparative postal statistics for all France during the years 1881, 1882, and 1883 stand thus :—*~~

~~*TABLE XX.—WNumber of Letters and Post-Cards.*~~

~~*Tunis and*~~

~~*1881. 1882. 1883. Algiers*~~

~~*1883.*~~

~~*Inland letters…….+. 535,541,373 | 544,193,583 | 563,524,119 | 8,550,266*~~
~~*Inland post-cards …... 29,589,094 | 30,710,500 | 31,394,427 69,068 | »*~~
~~*reply post-cards 37,326 | 48,430 50,000 3,492 |*~~

~~*Foreign letters sent …. 84,368,985 35,377,335 36,777,164 331,283*~~

~~*Foreign post-cards sent 1,216,948 1,390,950 1,462,815 10,755*~~

~~*» reply post-cards 30,005 41,184 53,323 808 oseosenone 600,783,731 |*~~
~~*611,761,982 | 633,261,848 | 8,965,172 |*~~

~~*In 1882 the gross revenue of the entire French postal service was £6,170,146, the total expenditure £5,338,273, and the nett revenue £831,873. In 1883! the gross revenue amounted to £6,429,101, the expenditure to £5,678, 851, and the nett revenue to £750,250. In 1881 the number of post-offices throughout France was 6158 plus 53,182 letter-boxes, making the total number of postal receptacles 59,340. In 1884 the number of post-offices proper had increased to 6565.2. The aggregate of the postal and telegraphic staff was 49,121 persons in 1881, 50,268 in 1882, and 52,636 in 1883.2 The relative number of letters (including post-cards) to each inhabitant was 16 in 1881 as compared with 27 to each inhabitant in the United States, and with 38 to each in the United Kingdom. In 1882 the proportion was 167%; as compared with 4034 in Great Britain, in 1883 168; and 41%, respectively. Were it possible to deduct in each case the useless, the merely undesired advertising communi- cations, France would contrast with Britain, and still more with America, far less disadvantageously than, on the mere face of the figures, it seems to do.*~~

~~*The savings banks system of France, so far as it is connected with the postal service, dates only from 1875, and began then (at first) simply by the use of*~~

~~*post-offices as agencies and feeders for the pre-existing banks. Prior to the postal connexion the aggregate of the deposits stood at £22,920,000. In 1877 it reached £32,000,000. Postal savings banks, strictly so called, began only during the year 1881. At the close of 1882 they had 210,712 depositors, with an aggregate deposit of £1,872,938 sterling; and on 31st December 1883 375,838 depositors, with an annual deposit of £3,097,765. A convention lately made between France and Belgium enables depositors in either country to transfer their accounts to the other free of charge.* M. Auguste de Malarce has greatly distinguished himself in the promotion of savings banks of all kinds, and imost especially in urging the formation of penny banks and school banks. These, however, are not directly connected with the postal service.*~~

~~*The union of the telegraph with the post-office dates only from 1878. Prior to the amalgamation the number of telegraph offices was 4561; in 1883 it was already increased to 6448. At the former date (1878) the lineal extent of the telegraphs was 57,090 kilometres (35,453 miles) ; it is now (1885) upwards of 87,000 (54,027 miles). The postal administration having begun its new work by obtaining a credit for further extensions and for plant, amounting to nearly £100,000, the tariff was reduced (21st March 1878) to one half- penny for each word, with a minimum charge of 5d.5 In April 1884 France had 5535 subscribers to postal telephonic exchanges (against about 4000 in all Germany at the same date, according to the Revue des Postes), working under post-office licences of five years' duration, and paying (as in Great Britain) a royalty of 10 per cent. The postal telephonic system began in 1879. Upto the close of 1883 the royalties had produced £17,324. At Rheims, Troyes, Roubaix, Tourcoing, and St Quentin the post-office has its own exchanges. The aggregate number of inland postal money orders issued in France in 1881 was 14,626,117. In 1882 the uuniber of inland orders increased to 15,791,774 (value £19,655,117), m 1883 to 16,808,627 (value £20,770,078). As compared with the population, the figures for 1883 show an average of 454% to every*~~

~~*1 Stat. gén. d. Serv. post., 1883.*~~

~~*2 Archiv fiir Post und Telegraphte, 1884, p. 570.*~~

~~3 Postal Union return for 1883. The figures quoted are exclusive of the boy messengers attached to the telegraphic service.~~

~~" 4 Auguste de Malarce, in Journal des Economistes, various years ; Twenty-ninth he of the Postmaster-General, 1883, App. 46.~~

~~Archiv fiir Post und Tele hi : A i Soma 6 or graphie, 1882, 570, 571; Journal des Economistes,~~

~~POs f-O Pres~~

~~[AUSTRIA-HUNGARY.~~

~~100 inhabitants, the corresponding figure for England being 707,, for the United States 17,5, and for Italy 143%. 'The French parcel post forwarded in 1883 11,494,072 inland parcels, and 944,795 parcels abroad. A word must be added upon a special feature of the French post-office. Many years ago it began to collect books upon postal subjects ; but up to 1878 it had less than 900 volumes, and less than 200 visits to consult them were made ina year. In 1884 there were about 8000 volumes—postal, telegraphic, statistical—and the annual visits for consulting them averaged 2500. These books are madc accessible to the general public as well as to the postal staff, five rooms being set apart for the books, periodicals, and readers.~~

~~On thc whole, it may be said that the recent record of the Frencli postal service is a very honourable record, giving good augury of further improvements to come. Nor is it one of the least honour- able items in that record to observe that, when the minister proposed to the chamber of deputies® in 1877 an increased vote of £18,200 for the better remuneration of the rural letter-carriers, the chamber voted £69,600 instead.~~

~~Bibliography.—P. d'Alméras, Réglement sur le Port des Lettres, 1627 ; Le Quien de la Neufville, Usages des Postes, 17830; Rowland Hill, Report to the Chancellor of the Exchequer on the French Post-Office, 1837; Annuaire des Postes, 1850-84 ; M. Du Camp, "De l Administration . . . et de Hétel des Postes," in Revue des Deux Mondes, ser. 8, 1865; Revue des Postes et Télégraphes, 1870-84; A. de Rothschild, Histotre de la Poste-aua-Lettres,~~

1875; ‘“‘ Entwickelung des Post- u. Telegraphenwesens in Frankreich,” in Archiv f. Post u. Telegraphie, 1882;

‘Die franzésischen Postsparkassen,” and other articles, in L’Union Postale, Bern, vols. viii., ix.

AUSTRIA-HUNGARY, GERMANY, AND ITALY.

1. Austria-Hungary.—The Austrian postal system is amongst Austria- the oldest on record. Vienna, too, possessed a local letter post and Hungary.

a parcel post, on the plan of prepayment, as early as May 1772, at which date no city in Germany possessed the like. Curiously enough, this local post was established by a Frenchman (M. Hardy) and managed by a Dutchman (Schooten).’? Thirteen years after its organization it became merged in the imperial post. The separate postal organizations of the empire (Austria) and of the kingdom (Hungary) date from 1867. In Austria the post-office and the tele- graph-office are placed under the control of the minister of com- merce, in Hungary under that of the minister of public works. In Austria the department has twenty-one travelling post-offices ; in Hungary it has ten such. Within the limits of the whole Austrian empire the lineal extent of the postal telegraph lines was 20,875 English miles in 1877, and in 1883 32,380 miles. The total number of telegraph stations was 3958. The aggregate number of tele- graphic messages in 1877 (Austria-Hungary) was 5,358,544, in 1883 9,974,993. The aggregate of mailed articles in Austria? was 357,352,270 in 1877, and in 1878 358,427,000. Deducting from these figures the number of newspapers, book-packets, and parcels, there remains for letters and cards, jointly, an aggregate of 233,801,870 in 1877, and of 282,867,000 in 1878. In 1880 the letters and cards were 245,660,700, in 1881 255,618,100. In Hungary!? the aggregate of letters and post-cards was 61,064,856 in 1877, in 1878 59,612,000, in 1880 78,080,804, in 1881 82,592,040. The gross revenue from posts and telegraphs stood thus in 1882 (accord- ing to the financial estimates for that year): Austria £2,307,300, Hungary £2,128,065, total £4,435,365, of which sum the postal revenue proper (z.¢., letter and parcel services) supplied about two and a half millions. In 1883 the gross revenue of Austria was £2,002,073 ; that of Hungary was £790,839 ; in the same year the respective expenditures were £1,647,373 and £605,185. In Novem- ber 1881

~~*a collecting service for bills and invoices was organized. In January 1883 the unit of weight for inland letters was increased from half an ounce to two-thirds of an ounce, the rate being 14d.; and in June of the same year the collection service above-named was made international between Austria-Hungary and the German empire, on the basis of the couutry of origin retaining all fees, and the country of payment remitting all sums collected by money orders at the usual rate of commission. In 1882 and 1883 the chief postal statistics of both divisions of the empire were as follows" (Table X XI.) :—*~~

~~*Austria, Hungary.*~~

~~*1882 1883. 1882. 1883.*~~

~~*Inland letters……. 190,737,600 | 203,865,600 | 69,894,598 | 72,522,335*~~
~~*Inland post-cards …... 43,826,800 | 48,613,700) 16,478,170 | 18,037,872*~~
~~*Foreign letters sent ….| 31,084,900 | 33,357,300 | 1,406,574) 1,580,09418*~~
~~*Foreign post-cards sent 4,113,100 4,536,400 153,206 149, 74218 Totalse. soe 269,762,400 | 290,373,000 | 87,982,548 | 92,290,043*~~

~~*6 L' Union Postale, ii. 33 sq.*~~

~~*7 Loeper, " Organisation des Postes de Ville," in L'Union Postale, vii. 1 sq.*~~

~~*8 Priewe, "' Le Service des Bureaux ambulants," in L' Union Postale, vii. 25 sq.*~~

~~*8 With a population of 21,944,336 eae*~~

~~*10 With a population of 15,564,533 (end of 1876).*~~

~~*11 [' Union Postale, vii. 285, viii. 190.*~~

~~*12 Statistique générale du Service postal, 1883, pp. 2-16.*~~

~~*13 Exclusive of 3,406,134 letters and 797,066 post-cards which passed between the two countries of Hungary and Germany.*~~

~~*Ger- many.*~~

~~GERMANY, ITALY. |~~

~~2. German Empire.. —The Prussian postal system—now devel- oped (mainly by the ability and energy of Dr Stephan, to whom the organization of the International Postal Union is so largely indebted) into the admirably organized post and telegraph office of the empire—began with the Great Elector, aud with the establish- ment in 1646 of a Government post from Cleves to Memel. Frederick II. largely extended it, and by his successor the laws relating to it were consolidated. In Strasburg a messenger code existed as early as 1448. A postal service was organized at Nuremberg in 1570. In 1803 the rights in the indemnity-lands (Enfschddigungslinder) of the counts of Taxis as hereditary imperial postmasters were abolished. The first mail steam-packet was built in 1821 ; the first transmission of mails by railway was in 1847; the beginning of the postal administration of the telegraphs was in 1849; and, by the treaty of postal union with Austria, not only was the basis of the existing system of the posts and telegraphs of Germany fully laid but the germ was virtually set of that International Postal Union which is now become so widely fruitful. That pregnant treaty was made for ten years on 6th April 1850, and was immedi- ately accepted by Bavaria. It came into full operation on the 1st July following, and then included Saxony, Mecklenburg-Strelitz, and Holstein. Other German states followed; and the treaty was renewed in August 1860.~~

~~Between 1850 and 1860 the number of post-offiees in Prussia increased by 204 per cent., that of letters conveyed by 115 per cent. The postal staff during that term increased from 9029 to 15,471. In 1860 the aggregate number of letters was 135,377,086, that of ordinary parcels 13,765,336, that of registered parcels, with value declared (£178, 937,360), 10,807,293.2 In 1872 the post-offices of the empire, exclusive of those in Bavaria and Wiirtemberg (each of which countries retains in postal and telegraphic matters its own organization), numbered 5784, in 1883 11,646. Adding the number of letter-boxes, the total of postal receptacles in those years respect- ively was 33,362 and 65,175.3 The aggregate postal staff was 49,945 persons in 1872, in 1883 74,393.4 These figures include large numbers of persons who are connected with the transit of travellers, as well as with that of letters, parcels, and telegraphic messages. In 1872 the aggregate number of letters, cards, book- packets, and newspapers~~

~~conveyed was 718,233,000, in 1883 1,468,315,000, or, with the addition of Bavaria and Wiirtemberg,~~

~~1,649,845, 000.~~

~~For Berlin itself a private letter and parcel post was established by the commercial guild of the grocers and druggists in September 1800, and continued to work under their rule until 1806, when it was abolished. A regular delivery by letter-carriers, attached to the state postal organization, existed in Berlin as early as 1712.° In 1876 the Berlin office employed a special staff of 3705 persons, which in 1883 had increased to 6120. It delivered in 1883 postal articles amounting to 199,500,000 in number. It received an annual income for postage of £796,517 in 1888.~~

~~The nett revenue accruing from the whole of the imperial postal and telegraphic service in 1874 was only £349,301 sterling ;° in 1881 it was £1,060,310 sterling, in 1882 £1,066,860, and in 1883 £1,172,348. The lineal extent of telegraphic lines in the whole of Germany was 74,313 kilometres (46,148 miles) at the close of 1882 as compared with 72,577 kilometres (45,070 miles) in the preceding year. There were 10,803 telegraphic offices (10,308 in preceding year). The aggregate number of messages transmitted in 1883 was 15,300,816 as against 12,721,290 in 1879. Collectively, the total number of money orders issued by the postal service throughout the German empire in 1882 was 52,537,440, showing an annual average a little exceeding one to each inhabitant; in 1883 53,935,556 money orders, worth a total of £1 61,622,221, were issued. In 1883 the aggregate number of ordinary inland parcels forwarded by the German parcel post was 79,245,700, that of registered parcels with declared value was 5,410,800, the aggregate declared value being £201,469,460. The parcels sent abroad were—ordinary 3,231,970, registered with declaration of value 262,620.~~

~~Bibliography.—Von Beust, Versuch einer ausfiihrlichen Erkladrung des Post-.~~

~~regals,... insbesondere in Anschauwng d. h. rom. Reichs Teutscher Nation, 3 vols., Jena, 1747-48; Avis instructif aw Public… pour la petite Poste [de Vienne], 1772; Ueber die kleine Post in Wien, 1780; A. Flegler, Zur Gesch.~~

~~d. Posten, 1858; Stephan, Hein. Gesch. d. preuss. Post, 1859 ; Fischer, Die Verkehrsanstalten des deutschen Reichs, 1873; Von Linde, Haftverbindlichkeit d. Postanstalt ; W. Kompe, Das Handelsgesetzbuch uw. das Postrecht ; Gad, Die Haftpflicht d. d. Postanstalten, 1863; Eug. Hartmann, Entwickelungsgesch. d. Posten, 1868 ; 12, DY,~~

~~2S ee ee SSS~~

~~1 The figures in this section have been kindly revised by the Reichs- postamt in Berlin.~~

~~2 Aemtliches preussisches Handelsarchiv, Nos. 15-17 (1863), as quoted in Hildebrand's Jahrbicher fur Nationalékonomie, i. 396-398 ; K. A. H. Schmid, " Zur Geschichte der Briefporto-Reform in Deutsch- land," in Hildebrand's Jahrbiicher, iii. 1-51 (1866); Journal des Economistes, ser. 4, ii. 68-71.~~

~~3 Statistisches Jahrbuch fir das deutsche Reich, 1884, 97 sq.~~

~~4 These, like the other figures, are exclusive of Bavaria and Wiirtem- berg.~~

~~oo fiir Post und Telegraphie, 1884, p. 97.~~

~~6 Hildebrand, Jahrbiicher, xxvii. 207 sq. (1876).~~

~~POST-OFFICE~~

~~583~~

~~Fischer, Die d. Post- und Telegraphie-Gesetzgebung, 1876; O. Dambach, Das Gesetz tiber das Postwesen des deutschen Reichs, 1881; Archiv f. Post u. Telegraphie, 1873-85 ; F. X. von Neumann-Spallart, Uebersichten tiber Verkehr in d. Weltwirth- schaft, 1885; Deutsche Verkehrszeitung, 1881-85; W. Lenz, Katechismus d. d. Reichspost, 1882.~~

~~3. Italy.—The history of the Italian post-office is in many Italy.~~

~~respects one of special interest. But the limits of this article admit only of a very brief statement of results. Its origin may be traced virtually to Venice~~

~~and to the establishment of the "Corrieri di Venezia" early in the 16th century. As early as 1818 the Sardinian post-office issued stamped letter-paper. The total number of letters, newspapers, and book- packets conveyed in 1862 was but 111,733,319. Ten years later there was au aggregate of 232,242,677, and in 1882 one of 333,242,148. The comparative growth of postal traffic in letters and post-cards may be shown thus: in 1869 the aggregate number was 87,613,348, in 1870 89,430,261, in 1880 189,207,627, in 1881 194,587,021, in 1882 204,644,355," in 1883 216,944,382.~~

~~The growth of postal savings banks in Italy is on the whole care as will be seen by a glance at the following table~~

~~wr~~

~~No. of Accounts | Amount of Deposits~~

~~No. of Banks.~~

~~(31st Dec.). (31st Dec.). 1876 1989 57,354 £97,736~~

~~1879 3259 238,869 1,049,291 1881 3406 471,094 2,679,876 1882 3488 692,018 3,398,049 1883 3584 805, 988 4,485,135~~

~~In the year 1881 the accounts opened were 143,410 and 249,741 in 1883 ; those closed were 12,161 in 1881 and 35,771 in 1883. The average of each deposit increased (omitting fractions) from £1, 4s. 3d. in 1876 to £3, 16s. 1d. in 1881, and decreased to £3, 4s. 8d. in 1888. The average sum standing to the credit of each depositor was £5, 12s. 11d. in 1881 and in 1883 £5, 11s. 3d. The number of accounts opened in 1883 was 249,741 as against 144,485 opened in 1882. This rapid increase, and the corresponding diminution in the average amount of each deposit and of the average sum stand- ing to the credit of each depositor, are due to the regulation of 18th February 1888, which came into operation on 1st May follow- ing, and by which post-office savings banks were authorized to accept as deposits cards bearing sufficient ten-centime postage stamps to make up the sum of one lira (9}d.). Between Ist May and 3lst December 193,763 such cards were deposited. The financial results of the post-office savings banks service for~~

1883 show a nett gain of £29,768 ; the total gain from 1876 to 1883 was £90,345. It is the purpose of the postal administration to make by degrees the number of the postal savings banks identical with that of the post-offices.® That administration is now (1885) a dependency upon the ministry of public works. There were issued in 1883 for Italy itself 4,207,544 money orders, valued at £21,706,968, and for countries abroad 17,087, valued at £164,174.

The Italian parcel post despatched in the first three months of 1882 489,687 articles, in the corresponding period of 1883 869,280 ; it received respectively 486,814 (1882) and 978,559 (1888).9 The number of parcels, both inland and foreign, conveyed in 1882 was 2,877,201. In 1883 3,747,182 inland and 180,828 foreign parcels were despatched by parcel post. The nett postal revenue in 1882 was £197,257 (against £152,676 in 1881), to which sum the parcel post contributed £27,078.1° The nett postal revenue in 1883 was £213,537. The parcel post of Italy dates only from 1881 (October), since which time it has carried more than nine millions of parcels, which it registers, paying for loss or damage during transit. But the service is so excellently organized that the administration has hitherto (1885) had to pay but a very insignificant sum as compen- sation.

PosTaAL CoNGRESSES AND INTERNATIONAL POSTAL UNION AT BERN.

Substantially, the first step towards an effectual postal Confer- union was taken at Paris in June 1863, when delegates fd of

from France, Great Britain, Austria, Prussia, Italy, Spain, Belgium, Holland, Portugal, Switzerland, Denmark, the Hanseatic towns, the United States of America, and Costa Rica met in congress, under the presidency of M. Vandal, the then postmaster-general of France. The conference recommended (1) an optional prepayment of foreign letters, with a reduction of the differential charge between paid and unpaid; (2) a readjustment of the regulations concern- ing the international weighing and taxing of letters; (3) a

7 Statistique générale, 1882. 8 Ann. di Statist. ii. 263. 9 LT Union Postale, viii. 164. 10 "Je Service des Colis postaux en Italie," in L'Union Postale,

~~*November 1884, ix. 229 sq.*~~

~~*Treaty*~~

~~*584*~~

~~*reduction of the transit tariff ;! (4) an improved regulation as to the choice of routes of transit for letters addressed to remote parts of the world; and (5) great improvements in the international money-order system, and in the postal transmission of articles of special value.?_ Thus a basis was practically laid for the treaty of Bern of 1874. What was achieved in 1874 and extended in 1878 had also been largely promoted by the proceedings and example of several local conferences on postal affairs held at various dates in Germany. Certain intermediate international conferences, more or less largely constituted, also helped to prepare the way for the great results of 1874. Though here necessarily limited to brief notices of the treaty of Bern and of the congress at Paris (four years later), a word or two must be afforded to a curious anticipation by an enterprising Swiss of a social reform destined to be realized at a distance of almost two centuries. Amongst the many political schemes which the dread of the advance of France towards a pre- dominating sway in Europe gave rise in the 17th century was that of Beatus Fischer, who strove zealously to seat at Bern a postal union—representing Austria, the empire, the electorate of Brandenburg, Great Britain, the Nether- lands, Italy, Spain, and Switzerland—which should organize and administer a great network of postal routes, independ- ently of France. But France was still too strong, and the incidental difficulties too great. The attempt, however, led to minor postal reforms in various places.~~

~~*At Bern in 1874 postal delegates of twenty-two states*~~

~~*of Bern. assembled, representing an aggregate population of 350*~~

~~*millions. An eminent Frenchman had given a great im- pulse to the initiatory movement in 1863; a Belgian (M. Vinchent) and a Prussian (Dr Stephan) were the principal leaders of its development in 1874.4 Both had already rendered distinguished service to their respective countries. A half-ounce unit of weight for ordinary letters ; a uniform charge, wholly*~~

~~*irrespective of distance, of 24d. for a letter from any one country within the Union to any other; uniform rates for newspapers (ld. for 4 oz.) and for book-parcels, law-papers, mercantile samples (1d. for every 2 oz.); a transit rate greatly reduced ; a regulation (very fruitful in good results) that "each post-office shall retain its own collections, and that payments due for transit shall be estimated only from accounts taken twice in each year," were among the chief improvements effected. M. Vinchent (17th September 1874) suggested the creation of an international board ; and the proposal met with the zealous support of Dr Stephan, of Dr William Ginther (whose death in December 1882 was a great loss to the post-office of Germany), and of other leaders of the conference. The office so established is supported by contributions, graduated roughly—not merely according to extent of postal traffic but in part according to national rank—from the several administrations. There are six classes of such contribu- tories. Each country in the first class contributes 25 parts of the total expense, each of the second class 20 parts, of the third 15, of the fourth 10, of the fifth 5, and of the sixth 3 parts. It is covenanted that the total*~~

~~*1 All the envoys, the Italian envoy excepted, advocated such a tariff as should leave some surplus, by way of reserve fund, for improve- ments in the services. And in 1863 adherence to a distance-scale, albeit a liberal one, obtained favour universally.*~~

~~*2 Various contemporary reports in periodicals; Schmid, 'Der deutsche Briefporto-Tarif," &c., in Jahrbicher, ii. 187-205.*~~

~~*& The details are given in Z' Union Postale (of August 1883), viii.*~~

~~*, 'a Full and able reports of the proceedings will be found in the pre- liminary numbers of L'Union Postale, October to December 1875, and additional particulars in later numbers. A good summary is given by M. Bonnaud, "Le Congrés Postal," &c., in Journal des Econo- mistes, ser. 4, ii, 419 sq.*~~

~~*5 Treaty of Bern, 9th October 1874 (Sessional Papers of House of Commons, " presented by command").*~~

~~*POS T-O Fr Pie*~~

[POSTAL UNION.

expense shall not exceed £3000 a year. No rule was laid down as to the composition of the board. But the persons entrusted wisely determined that "it should be inter- national in composition as in attributions." All its pro- ceedings are reported in its official organ, L' Union Postale, which is trilingual (German, French, English) and appears monthly. Dr Stephan did not err by over-enthusiasm when he said at the close of the proceedings, " You enter upon one of the most important fields of action in the intercourse of nations; . . . you are promoting an eminent work for their peace and their prosperity." The work so successfully begun at Bern was extended at Paris, when from representing twenty-two states the Union came to represent thirty-three, and the 350 millions of (in a certain sense) its "constituents" had grown to 653 millions.

The work before the convention at Paris in June 1878

Conven-

consisted mainly in the application of four years' experi- tion at

ence, in the postal administrations of the constituent states, to the improvement of details. It made improved regula- tions with respect to transit between countries within the Union and those which still remained outside of it. It guaranteed rights of transit throughout the entire Union. It extended stipulations, made at Bern, to postal exchanges between members of the Union and extraneous countries, in cases wherein the postal service of two at least of the contracting countries were employed. It provided that ex- penses of transit should be borne by the country of origin. Tn some cases it slightly enhanced the unit of charge whilst considerably extending the unit of weight. It made valu- able improvements in the regulations concerning compensa- tions for loss during transit. Finally, it made provision for a postal congress to revise and to improve all pending rules and matters at least once in every five years. 'The last congress was held at Lisbon in February 1885. One of the matters which claimed its attention calls impera- tively for some notice here. Whilst the growing action of the Postal Union tends constantly to simplification and identity of postal systems, there still exists great diversity of national practice and of national

~~*law on the important point of the ownership of a letter whilst in transit. In Great Britain it lies, for the time being, in the queen, as represented by her postmaster-general and her secretary of state. Neither sender nor addressee can claim to inter- fere with a letter whilst in the post-office. Only the war- rant of a secretary of state can stay its delivery. In Her Majesty's Indian empire, however, the sender has virtually a property in the letter until delivery, and may (under regulations) recall it. So is it in Belgium, in Austria and Hungary, in Portugal, in Russia, and in the Scandinavian states, whilst in Canada the letter belongs to its addressee as soon as it is posted. In the Netherlands there is no precise law, but the sender may claim return prior to actual postal despatch; the case is virtually similar in France. In Italy, in Spain, and in Greece the addressee (as in Canada) has an absolute property in the letter when once posted.? A very recent decision of the French council of state extends the French provision,® practically, in favour of the sender up to actual delivery, leaving it to the postal administration to regulate the forms.*~~

~~*Subjoined is a tabular view (Table XXTIL) of postal statistics of the principal countries comprised within the Postal Union for the year 1883.*~~

~~*a al*~~

~~*6 Convention of Paris (Commons' Papers of 1879, No. 2309) ; Bon- naud, "Le Congrés Postal," in Journal des Economistes, ser. 4, ii. 418 sq.*~~

~~*7 "Das Eigenthumsrecht an die Postsendungen,' Post und Telegraphie, 1882, p. 239 sq.*~~

~~*8 "Bulletin mensuel des Postes," August 1884, in L' Union Postale, September 1884 (ix. 208).*~~

~~*>in Archiv fir*~~

~~*Paris,*~~

~~*1878.*~~

~~*Congress*~~

~~at Lis- on,~~

~~1885.~~

~~POSTAGE STAMPS. |~~

~~TABLE XXIII.— Comparative Table of the position of the Postal Service in the principal Countries belonging to the Postal Union, Sor the year 1883.1~~

~~ZS. 2 |g : aS = |e sal Po. a & S 43 Pm gas oo lta = Bes ae | ee |e ead so | Mc o Has SS | og Ss) ye 3 Rn ac n SEs ao | S's a Gross | Nett Revenue 623 Ba} mS ° ' ay aa | Sc ed Revenue.| or Deficit. SES (as|8s| & goa ° He 3 Ee? [e8|ye] ay s {1s , qh Ae Argentine Re- 11,995,473 | 2487 | 4 958 {£110,443 £191 [deficit] public Austria ….| 290,373,000! 29] 13 | 15,763 |2,002,073| 354,700 | Hungary ..| 92,290,043; 39] 10 | 6,447] 790,839] 185,654 Belgium ….} 107,662,590| 13] 19 | 4,802] 535,819! 202,271 Canada …... 78,340,000 | 501 | 18 | 7,225 452,876| 84,602 [deficit] Guill sic" "| aeonree | "sa | 1p | gaer| ameis| age enmar' 88 Egypt …... 5,002,000| 1501] 1 | 570} 94,678] 14,932 France …... 633,261,848 | 32 | 17 | 52,636 |6,429,101| 750,250 Germany ….| 843,397,870| 15] 19 | 79,384 [8,897,608 | 1,172,343 pe eee) 2) RE CCCw eisie <1 sis £ Holland 79,398,859| 10| 19 | 4,713| 432,234! 113,571 India3 …... 165,439,644 | 142| 1 | 36,943 [1,003,798 | 15,906 [deficit] Italy …. 0… 216,944,382 | 32] 7 | 18,790 1,418,469 | 213,537 Japan 86,435,182 | 27] 2 | 19,028] .... i Norway ….| 13,977,444| 119| 7 | 1,491| 112,879; 2,505 Portugal ….| 18,2477577| 34 | 4 | 2,457] 126,321| 10,908 [deficit] Roumania 9,491,214 | 261] 2 | 1,410] 163,245] 50,030 Russia 1247555,076 | 1829 | 1 15,808 2,608,323 230,600 [deficit] Spain …... 101,111,070| 74] 6 112! 635,706 | 336,269 Sweden…... 37,500,044 90| 8 | 3,905| 337,352, 39,468 Switzerland..| 71,930,625] 5] 25 | 5,936] 679,476| 49,833 United States]... 83 | .. | 69,020 |9,610,393 | 443,569~~

~~The crowning improvement in postal matters, that of an international transit entirely free, is merely a question of time. It is the logical, the necessary complement of the work initiated at Paris in 1863, organized at Bern in 1874, revised and methodized again at Paris in 1878. One postal territory, one code of postal regulations, one uniform postal tariff, free~~

~~conveyance between nation and nation, will be the outcome of this important movement.~~

~~Comparing the postal traffic of the various quarters of the globe for the year 1882 we find that out of a total of 8,280,000,000 articles mailed European countries claimed nearly two-thirds, while America had considerably more than one-fourth. The total was distributed as follows :—~~

~~Puro Pe s.. .s.2c2eess 5, 624,000,000 | Australia…….. 73,000,000 I NWNETEG! cag qapesoas: 2,366,000,000 | Africa …..... .....42,000, 000 Asia 205,000,000~~

~~Bibliography.—In addition to books already quoted the reader may consult K. Loeper, Stammbuch der neueren Verkehrsmittel, 1881 ; 'Die Post in d. Welt- literatur," in L'Union Postale, ix. 12-161, 1884; and 'Die Disinfection der Postentsendungen als Schiitzmassregel gegen die Hinschleppung der Cholera," in Archiv f, Post, April, 1884. See also J. G. Borel, L''Europe synoptique des Postes et des Télégraphes, 1882; Recueil de Renseignements sur le Régime postale en vigueur dans le Service interne des Pays de VUnion Postale Universetle.~~

~~PostaGE STAMPS.~~

~~For all practical purposes the history of postage stamps begins in the United Kingdom, and with the great reform of its postal system in 1839-40. A post-paid envelope was in common use in Paris in the year 1653. Stamped postal letter-paper (carta postale bollata) was issued to the public by the Government of the Sardinian states in November 1818 (above, p. 583), and stamped postal envelopes were issued by the same Government from 1820 until 1836.4 Stamped wrappers for newspapers were made experimentally in London by Mr Charles Whiting, under the name of " go-frees," in 1830. Four years later (June 1834), and in ignorance of what Mr Whiting had already done, the stamp-office authorities, in a letter addressed to Lord Althorp, then chancellor of the~~

~~1 Statistique générale du Service postal, Bern, 1884.~~

~~2 The number on Ist November 1882.~~

~~*3 Exclusive of French and Portuguese possessions.*~~

~~*4 Stamp-Collector's Magazine, v. 161 sq. 3 J. E. Gray, Illustrated Catalogue of Postage Stamps, 6th ed., 167.*~~

~~*rPOUST-OTrIC E*~~

~~*085*~~

~~*exchequer, by Mr Charles Knight, recommended similar wrappers for adoption. Finally, and in its results most important of all, the adhesive stamp was made experi- mentally by Mr James Chalmers in his printing-office at Dundee in August 1834.5 These experimental stamps were printed from ordinary type, and were made adhesive by a wash of gum. Their inventor had already won local distinction in matters of postal reform by his strenuous and successful efforts, made as early as the year 1822, for the acceleration of the Scottish mails from London. Those efforts resulted in a saving of forty-eight hours on the double mail journey, and were highly appreciated in Scotland. There is evidence that from 1822 onwards his attention was much directed towards postal questions, and that he held correspondence with the postal reformers of his day, both in and out of parliament. It is also plain that he was far more intent upon aiding public improve- ments than upon winning credit for them. He made adhesive stamps in 1834, and showed them to his neigh- bours, but took no step for publicly recommending their adoption by the post-office until long after such a recom- mendation had been published—although very hesitatingly—by the author of the now famous pamphlet, entitled Post-Office Reform.6 Mr Hill brought the adhesive stamp under the notice of the commissioners of post-office inquiry on. 13th February 1837. Mr Chalmers made no public mention of his stamp of 1834 until December 1837.*~~

~~*Only a fortnight before his examination by the above- named commissioners Mr Hill, in his letter to Lord Mont- eagle (then Mr Spring Rice and chancellor of the exchequer), seemed to have no thought of the adhesive stamp. He recommended to the treasury that "stamped covers and sheets of paper be supplied to the public from the stamp- office, or post-office, . . . and sold at such a price as to include the postage. . . . Covers at various prices would be required for packets of various weights. Each*~~

~~should have the weight it is entitled to carry legibly printed with the stamp. . . . Should experience warrant the Govern- ment in making the use of stamped covers universal,' most important advantages would be secured. The post- office would be relieved altogether from the collection of the revenue."® Then, upon suggestion, it would seem, of some possible difficulty that might arise from the occa- sional bringing of unstamped letters to a post-office by persons unable to write, he added : "Perhaps this difficulty might be obviated by using a bit of paper just large enough to bear the stamp, and covered at the back with a glutinous wash." It is a quite fair inference that this alternative had been suggested from without. In reviewing the sub- ject, long afterwards, in his History of Penny Postage, Sir R. Hill says: "The post-office opinions as to the use of stamps for . . . prepayment were, on the whole, favour- able." Ina paper of 1839, entitled On the Collection of Postage by means of Stamps, the author continued to look upon "stamped covers or envelopes as the means which the public would most commonly employ ; still believing that the adhesive stamp would be reserved for exceptional~~

~~5 Patrick Chalmers, Sir Rowland Hill and James Chalmers, Inventor of the Adhesive Stamp (London, 1882), passim. See also the same writer's pamphlet, qntitled The Position of Sir Rowland Ifill made plain (1882), and his The Adhesive Stamp: a Fresh Chapter in the History of Post-Offce Reform (1881). Compare Mr Pearson Hill's tract, A Paper on Postage Stamps, in reply to Mr Chalmers, reprinted from the Philatelic Record of November 1881. Mr Hill has therein shown conclusively the priority of publication by Sir Rowland Hill. He has also given proof of Mr James Chalmers's express acknowledgment of that priority. But he has not weakened the evidence of the priority of ¢nvention by Mr Chalmers.~~

~~6 Ninth Report of Commissioners of Post-Office Inquiry, 1837, pp. 32, 33, reprinted in Sir R. Hill's " History of Penny Postage" (Lie, &c., ii. 270).~~

~~7 T.e., by prohibiting the prepayment of letters in money.~~

~~8 Ninth Report, as above.~~

~~*Inven- tion of adhesive stamp.*~~

~~*Mantu-*~~

~~*586*~~

~~*cases."! Mulready's well-remembered allegorical cover came into use on Ist May 1840, together with the first form of the stamped letter-paper, and the adhesive labels." They all met at first, but only for a few days, with a large sale. That of the first day yielded £2500. Soon after- wards the public rejection of the "Mulready envelope," writes Rowland Hill, "' was so complete as to necessitate the destruction of nearly all the vast number prepared for issue." Whilst, on the other hand, the presses of the stamp-office were producing more than half a million of [adhesive] labels, by working both night and day, they yet failed to meet the demand."* It was only after many*~~

~~*factureof weeks, and after the introduction of a series of mechanical stamps. improvements and new processes, due to the skill and*~~

~~*ingenuity, in part of Mr Edwin Hill of the stamp-office, in part of Mr Perkins, an engraver, that the demand could be effectually answered. To find an obliterating ink which worked effectually, without damaging the letters, was also a special difficulty.*~~

~~*In the production of the stamps both cheapness and security against forgery had to be combined. "The queen's head was first engraved on a single matrix, the effigy being encompassed with lines too fine forany . . . but the most delicate machinery to engrave. The matrix, being subse- quently hardened, was employed to produce impressions on a soft steel roller of sufficient circumference to receive twelve, and this, being hardened in turn, was used under very heavy pressure to produce and repeat its counterpart on a steel plate,"* capable of working off, at each impres- sion, 240 stamps. Engravers, printers, chemists, and arti- ficers of several kinds had to combine their efforts before the desired results could be secured. Long afterwards (June 1856) a question was raised in the House of Com- mons as to an alleged preference of one manufacturing firm over all its virtual competitors without preliminary inquiry or actual competition. The*~~

~~operation, it was replied, was confided to Messrs De La Rue & Co., because they "had the best means of accomplishing it (¢.e., the production of the adhesive stamp) within the time required. No public notice calling for tenders for printing and gumming was given to the trade, nor is there any trade to which such notice could have been given, the operation being the making of the stamps, as well as the printing and gum- ming, and that operation being to a great extent experi- mental."> The total cost of the manufacture of each million of stamps was £30, Os. 11d. (viz., paper, £5, 14s. 5d. ; print- ing and gumming, £22, ls. 9d.; perforating,® £1, 8s. 1d. ; salaries, 16s, 8d). To this is to be added a sum of £45, 2s, 4d. for poundage and commission upon the sale, making in all £75, 3s, 3d., the whole of which forms a deduction from the produce of sale. In the event about three thousand millions of stanrps were produced from the original matrix. At the end of fifteen years a second matrix was obtained, after the deepening of the lines by hand, from the first. From 1st May 1840 up to the end of the year 1884 more than thirty-one thousand three hundred millions of postage stamps had been printed,~~

~~1 "History of Penny Postage" (Life, i. 345, 346).~~

- ~~'Considerable diversion was created in the city to-day [Ist May~~

~~1840] by the appearance of the new penny-post devices for envelopes, half-sheet letters, and bits of sticking-plaster for dabbing on to letters. . . . [The elephants on the Mulready cover] are sym- bolic of the lightness and rapidity with which Mr Rowland Hill's penny-post is to be carried on. . . . Withal the citizens are rude enough to believe that these graphic embellishments will not go down at the price of 1s, 3d. per dozen for the envelopes, . .. and of 1s. 1d. per dozen for the . . . sticking-plaster." This good-humoured banter is from the money article of an eminent daily paper.~~

~~; Hill, ut supra, p. 398. 4 Sir R. Hill, op. ett., p. 407.~~

~~Returns relating to Stamped Postal Envelopes, &c., 24th July~~

~~1856, House of Commons' Papers, No. 392.~~

~~6 This item only after the year 1853.~~

~~POST-OFFICE~~

~~[POSTAGE STAMPS.~~

~~varying in value from £5 to a halfpenny. The details~~

~~are as follows (Table XXIV.) :—~~

~~Adhesiverstampstaticco sss. ceaeece aoe 84,000 iy el . ..cee 285,054 bs Te. ace ee 461, 438 ce oe ee eee 6,413, 686 i ee ae ae 789,884 35 AB cneniss esas eee ssiassie 6,715,820 * ae, eee 225,378,060 Ss 11 eae eae 5,963,476 is Ode) 5c eee es 11,235,080 s 5… eee 4,608,720 as BAe ce ee 217,048, 960 a ae… ae 26,413,680 6) A NY REG 223,381,000 — 5 re 284,475,696 i Be 385,171,080 es ti 105,603,360 9 MCI sciseiiepie Goose ssaes es 26, 651, 930,040 . _ a oe 2,970,705, 120~~

~~Total number…... | 81,301,885,334~~

~~The first contract for the ordinary stamped envelope, with the embossed queen's head, was entered into with Messrs Dickinson & Longman on 22d May 1840. The average cost of each million of this envelope was £376 ; of which sum £359, 6s. was repaid by the produce of its sale, over and above the value of the stamp, leaving a nett deduction from the aggregate value of £16, 14s. upon each million sold.' In November 1850 a second contract was entered into with Messrs De La Rue & Co., the contractors for the adhesive stamp. In the ten years 1847 to 1856 inclusive the aggregate number of envelopes manufactured and sold was 186,124,000. Under both these contracts the outside of the envelope was impressed with a coloured embossed device in the place of a seal.8 And this small device—the cost of which was infinitesimal—vwhilst it obviously improved the appearance of the envelope, added still more to its security. Of late years the device has been omitted, and the security of letters impaired for a very contemptible saving.~~

~~The little canton of Zurich was the first foreign state to adopt postage stamps, in 1843. The stamps reached America in the same year, being introduced by the Govern- ment of Brazil. That of the United States did not adopt them until 1847 ; but a tentative issue was made by the post-office of~~

~~*New York in 1845. An adhesive stamp was also issued at St Louis in the same year, and in Rhode Island in the next. In Europe the Swiss cantons of Geneva (1844) and of Basel (1845) soon followed the ex- ample set by Zurich.? In the Russian empire the use of postage stamps became general in 1848 (after preliminary issues at St Petersburg and in Finland in 1845). France issued them in 1849.1° The same year witnessed their*~~

~~*7 This great difference of the deduction from the postal revenue accruing from the nett produce of stamped envelopes of only £16, 14s. upon each million sold, as against £75, 3s. upon each million of the labels, may well have weighed much with Sir Rowland Hill in his long preference for stamped covers to adhesive labels. If the 23,415 millions of adhesives sold up to 1879 could have been sold in the form of envelopes the gain to the revenue would have been more than £1,358,070. Besides, the security of the cover is greater.*~~

~~*8 Return, &c., as above (Sessional Paper of 1856, No. 392, p. 8).*~~

~~*® On the whole, within the course of seven years the postage stamp was adopted in three Swiss cantons, throughout the United States, in Russia, and in Brazil. So curiously inexact is the statement which appears in Mr Lewin's volume—one in many respects of eminent ability—entitled Her Majesty's Mails, p. 261: " For eight long years the English people may be said to have enjoyed a complete monopoly in postage stamps." It is still more curious to observe in Sir Rowland Hill's own " History of Penny Postage" (Life, &c., ii. 18) this passage: "'It is remarkable . . . that the first countries to adopt the improvement—Spain and Russia—should be two so far from taking a general lead in civilization."*~~

~~*10 The date of the law authorizing the introduction is 30th August 1848. It became operative on 1st January 1849.*~~

~~*Stamped envel- opes.*~~

~~*Intro- duction of post- age stamps.*~~

~~*. Deface- ment marks.*~~

~~*Postage stamps in*~~

~~*France,*~~

~~*In Ger- many,*~~

~~*rors lO Pl if Cr*~~

~~*introduction into Tuscany, Belgium, and Bavaria, and also into New South Wales. Austria, Prussia, Saxony, Spain, Italy, followed in 1850. The use of postage stamps seems to have extended to the Sandwich Islands (1851-4) a year before it reached the Dutch Netherlands (1852). Within twenty-five years of the first issue of a postage stamp in London, the known varieties, issued in all parts of the world, amounted to 1391. Of these 841 were of European origin, 333 were American, 59 Asiatic, 55 African. The varieties of stamp issued in the several countries of Oceania were 103. Of the whole 1391 stamps no less than 811 were already obsolete in 1865, leaving 580 still in currency.*~~

~~*It was not until 1853 that the admirable improvement of perforating the stamp-sheets was introduced by the purchase for £4000 (pursuant to the recommendation of a select committee of the House of Commons of 1852) of a perforating machine invented by Mr Henry Archer. Other improvements of value have also been made in the obliterating process. The defacement mark now serves to show the official consecutive numbers of the town in which each particular letter was posted. For England that num- ber appears within circular lines; for Scotland, between parallel lines ; for Ireland, it appears diamond-wise. The general post-office mark also denotes the hour of posting. The metropolitan district marks indicate the office number within oval lines under the initials of each district. Paper for the embossed stamps of all the recognized values is received by the Board of Inland Revenue from all persons who offer it, under favourable regulations.*~~

~~*The collection and sale of specimen postage stamps as a branch*~~

~~*of commerce has already attained dimensions little anticipated*~~

~~*by those who watched the origin of the new pursuit, as a sort of toy for children, some quarter of a century ago. Before stamp- collection became conspicuous commercially, it came to have a recognized educational value, in its degree, as an amusing aid to the early knowledge of geography, more especially in the political aspect.*~~

~~*When the legislation of August 1848 directed the introduction of postage stamps into France the first endeavour of the postal administration was to make a contract for their manufacture in England. But the terms proposed were thought to be too high. A contract was then made with M. Hulot of the Paris mint, and the die approved of was engraved by M. Barre, also of that establish- ment. M. Hulot became "director of the manufacture of postage stamps," and under the early contracts was allowed, in lieu of salary, one france (10d.) on each thousand stamps for the first two hundred millions, 9d. per thousand for the next two hundred millions, and 8d. per thousand for all above. In 1869 these terms were reduced to 6d. per thousand upon the first five hundred millions, and 5d. upon all above.! The cost of mere manufacture was slightly below that of the stamps of the United Kingdom, each million being estimated to cost about £25, 10s., of which sum paper, printing, and gumming absorbed somewhat more than £20.?*~~

~~*During the war, in November 1870, a contract was entered into between the Provisional Government and a M. Delebecque and others for the manufacture of postage stamps at Bordeaux. The contractor bound himself to deliver, after a day determined, 4000 sheets of stamps daily, each containing 300 stamps, at the price of 3q. for each sheet. The stamps were to be of the several values of 8d., 4d., 3d., 2d., 1d., $d., and of one, two, three, and four centimes respectively, in such proportions as the post-office should direct. The first plate which was sent to the press was made from a matrix drawn with the pen; afterwards lithographic processes were employed. 'The post-office suspended the contract by notice in March 1871, but was immediately obliged by the communal insur- rection to license its continuance, and the manufacture was resumed at Bordeaux until June. On the whole, 125,387,075 postage stamps were produced from the presses at Bordeaux.? ; ;*~~

~~*The first postage stamp used in Germany was issued in the king- dom of Bavaria in 1849. It is of quite inartistic character, though originating in a state so famous for its cultivation of the plastic arts. The earliest type shows with the name of the country only the postal tariff. None of the many subsequent varieties displays the royal effigy ; even the embossed royal arms were not used until*~~

~~*BS*~~

~~*1 Ordinances of the minister of finance, 30th January 1860 and 30th January 1869 respectively, as cited in Rothschild, List. de la Poste- aux-Lettres, ii. 1380-133.*~~

~~*2 Rothschild, ii. 125. 3 Tbid., ii. 202.*~~

~~*587*~~

~~*1866. Stamps made specially for the use of the army bear the figure sometimes of a Bavarian trooper, sometimes of an infantry- man or artilleryman. The earliest Prussian stamp is of November 1850, and bears the effigy—laureated—of King William, in filigree, to which in 1861 succeeded the Prussian eagle. The duchy of Anhalt and several petty principalities placed themselves under its wing by adopting almost from the outset the Prussian stamp. 'Three weeks after its first appearance in Prussia, Hanover (December 1850) issued a stamp bearing the name of the kingdom with the royal arms. 'The first stamp having the royal effigy is an envelope of 1857. The effigy appears first upon adhesive stamps in 1859. The earliest Saxon type (1850) shows merely the postal tariff, but the second, of the same year, bears the king's head. The first Baden stamp resembles that of Saxony. The head of the grand- duke appears upou an envelope of October 1858. From 1860 the adhesives bear the arms of the duchy. Within the Thurn and Taxis district stamps were first used in 1852, and they continued until 1866. The earliest stamp of Schleswig-Holstein is that of an insurrectional Government patronized by Prussia and bears the national arms. 'The insignia of Denmark take their place in 1852 and continue until 1864. In that year separate stamps appear for Schleswig and for Holstein, to be succeeded for a short time by a common one in 1865.*~~

~~*In January 1868 the postage stamps of Prussia, Hanover, Saxony, Oldenburg, of the two Mecklenburgs, of Brunswick, of Schleswig-Holstein, and of the free cities of Bremen, Hamburg, and Liibeck virtually disappear and are replaced by the new stamp of the North German Confederation. For a while the postage envelopes of such of those states as had issned any continued to appear, but with the significant super-addition of the confederation stamp. That, in its turn, after a currency of nearly four years, made room (15th December 1871) for the imperial stamp of the new Germany. The grand-duke of Baden presently adopted it. Only Bavaria and Wiirtemberg retain their special postage stamps and their separate administration. Certain tariff stamps, how- ever, for merely fiscal purposes continue to be used in Saxony, Saxe-Coburg-Gotha, Brunswick, Oldenburg, Hesse, Mecklenburg- Schwerin, Schaumburg-Lippe, Schwarzburg-Sondershausen, and in the city of Bremen.**~~

~~*This brief review of atelic phenomena in Germany alone—the limits of this article make it impossible to give similar details for the rest of Eyrope—may suffice to show that the pretension of stamp-collectors to illustrate, in degree, the course and currents of political geography has its justification in fact.*~~

~~*The earliest postage stamps of Austria-Hungary date from 1850, In Aus-*~~

~~*and display the imperial arms. It is only in 1858 that the emperor's tria-*~~

~~*head takes their place. reappears, followed again and continuously, as regards adhesive stamps, by the imperial effigy. The stamped wrappers for news- papers and books bear sometimes a figure of Mercury, sometimes the double-headed eagle. Stamped envelopes were first issued in 1861; they bear, indifferently, the imperial effigy or the armorial eagle. The imperial stamps are adopted in the principality of Liechtenstein. The special stamps for Hungary bear date from 1868. The postal card is of Austrian origin, and was first issued in August 1869. Taking all kinds of postal stamps together, the aggregate number of types (39) and of varieties (123) issued through- out the empire from 1850 amounted in 1883 to 162.°*~~

~~*In the Russian empire the province of Finland takes the initia- tive. As early as 1845 its lion within a crowned escutcheon appears upon a postal*~~

~~*envelope. Its adhesive stamps (1856) date a few months earlier than the earliest formalized issue for the empire generally (1857). These Finnish stamps are of similar type to the envelopes, but they continue to bear the arms of the province only until 1860. The Russian stamps bear the imperial eagle and the imperial crown ; but none of them bears the head of the emperor. For a short time (1858-1864) unhappy Poland has the appearance—it is little more—of a certain differentiation in the stamps issued at Warsaw from those of the enrpire at large. But early in 1865 these slight peculiarities disappear, along with the local postal administration of Warsaw. All the Polish stamps are now obsolete, and have been superseded by those of the Russian empire. Many other local posts, however, survive in all parts of the empire ; and their stamps have peculiarities which are eminently curious. Some bear the arms, as in the case of Finland, of a province or of a great town. Others, and the greater part, bear symbolic and curious emblems: at Kherson, a wheatsheaf, a scythe, and a rake ; at Elizabethgrad, an open book, sheaves, a scythe, and a plume of feathers interlaced ; at Tamboff, a beehive; at Bogorodsk, Saint George on horseback. The varieties of Russian local stamps are so great, and some of them so scarce, as to cause to the ardent*~~

~~*4 Bulletin de la Société francaise de Timbrologie, 1875, No. 1; Rothschild, op. cit., pp. 251-266.*~~

~~*5 Gray, Illustrated Catalogue of Postage Stamps, 6th ed., pp. 1-9 and 79-82; Rothschild, ut supra.*~~

~~*6 Gray, Illustrated Catalogue, 6th ed., p. 167.*~~

~~*In Rus-*~~

~~***s***~~

~~***I***~~

~~*In 1863 and 1864 the armorial eagle Hungary,*~~

~~***ae***~~

collector many a heartache. M. Koprowski has of late come to his solace by devoting a volume to their history. Stamp — collecting has for some years past possessed a literature large enough to fill a respectable bookcase ; it bids fair ere long to need a large library for its storage. Of Russian stamps, general and local together, the total number of types exceeded 135 up to the year 1875.

The table (XXV.) which follows will give the reader the chrono- logical sequence of postage-stamps in all parts of the world.

Countries. Year. Countries.

Roman States, Parma, Modena, Brunswick, Thurn and Taxis post-district, | Netherlands, Luxemburg, Isle of Réunion.

Portugal, Cape of Good Hope, Tasmania.

1840 | United Kingdoin. Zurich, Brazil. Geneva. ; Basel,St Petersburg (experimen- | tal), Finland (envelopes), New | 1853 York 1 (tentatively), St Louis.

1846 Rhode Island. 1854 | Norway, British India, Philip- 1847 | United States, Mauritius (?).2 pines, West Australia. 1848 , Russia (envelopes).? 1855 | Sweden, Bremen, Cuba, Porto 1849| France, Belgium, Bavaria, Rico, South Australia, New Vaud, Winterthur, Tuscany, + Zealand. ' s New South Wales. 1856 | Mecklenburg Schwerin, Fin 1850 | Austrian empire, Italy, Prussia, | land (adhesives), Uruguay. | Saxony, Schleswig — Holstein, | 1857 Liibeck (?),8 Ionian Isles, Rou-

mania, Russia (adhesive stamps), Mexico, New Bruns- wick, Newfoundland, Ceylon, St Helena, Natal.

Naples, Poland, Moldavia, Nova Scotia, Buenos Ayres, Argentine, Peru.9

Spain, Switzerland, Hanover, Baden (?), British Guiana (®), Victoria (2.5

~~*1851 | Baden, Wiirtemberg, Denmark, Oldenburg, Canada, Trinidad, || 1858 Chili,é Sind (tentatively)," Sandwich Islands (?).*~~

~~*Po T= Por*~~

~~*Countries.*~~

~~*t*~~

~~*1*~~

~~*Year.| Countries. ||Year.*~~

~~*1859 | Sicily, Romagna, Hamburg, St || 1866 | Servia, Honduras, _ Virgin Lucia, Bahainas, New Gran- Islands, Shanghai, Kashinir, ada, Venezuela. Deccan, Sarawak.*~~

~~*1860 | Poland, Malta, Jamaica, Prince | 1867 | Heligoland, St Salvador, Guad- EdwardIsland, Dutch West In- alajara, Bolivia, Malacca, dies, Liberia, New Caledonia. | South African Republic.*~~

~~*1861 | Greece, Bergedorf, British Col- | 1868 | Azores, Madeira, Orange River, umbia, St Vincent, Nevis, Fernando Po.*~~

~~*Sierra Leone, Queensland. 1869 | Gambia, St Thomas, Angola.*~~

~~*1862} Roumania, Livonia, San Do-|| 1870) St Christopher, Paraguay. mingo, Antigua, Nicaragua, || 1871 | Guatemala, Japan.*~~

~~*Costa Rica, United States of || 1872 | Portuguese Indies, Persia, Fiji. Colombia. 1873 | Iceland, Dutch Guiana, Cura-*~~

~~*1863 | Turkey, Turk's Islands. coa, Cabul.*~~

~~*1864 | Mecklenburg -Strelitz, Dutch || 1874| Montenegro, Dominica, Lagos East Indies. (Gold Coast).*~~

~~*1865 | Vancouver, Bermuda, Egypt.10 || 1875 | Punjab.*~~

~~The extent of the commercial traffic which has so rapidly grown Stamp- out of the increasing taste for collecting postage stamps is marked ¢ollect- (sufficiently for our purposes) by a record of three facts: (1) the ing,~~

~~ageregate number of manuals, periodicals, and current catalogues relating thereto, in English, French, and German alone, exceeds seventy ; (2) for a collection of postage stamps, made by Sir Daniel Cooper (of Australia) between 1862 and 1878, £3000 sterling was given in the last-named year by M. Philippe de Ferrari; (3) the Galliera collection at Paris is said, upon credible authority, to have cost, up to 1883, in acquisition and arrangement together no less a sum than £57,600 (1,440,000 francs). Next to these two collections ranks that of M. A. de Rothschild. (EH. ED.)~~

~~POTASSIUM METALS. Under this heading we treat of potassium, rubidium, and cesium ; Soprum and Liruium, being less closely allied to potassium, have special articles devoted to them.~~

~~Potassium.—The three metals under consideration are all very widely diffused throughout nature; but only potassium is at all abundant, and therefore we begin with it. The richest natural store is in the ocean, which, according to Boguslawski's calculation (in his Oceanographie) of its total volume and the present writer's analysis of sea water, contains potassium equal to 1141 times 10" tons of sulphate, K,SO,. This inexhaustible store, however, is not much drawn upon at present; the "'salt-gardens" on the coast of France have lost their industrial importance as potash-pro- ducers, if not otherwise, since the rich deposits at Stassfurt in Germany have come to be so largely worked. These deposits, in addition to common salt, include the following minerals :—sylvine, KCl; carnallite, KCl. MgCl, + 6H,O (transparent deliquescent crystals, often red with diffused oxide of iron); kainite, K,SO,.MgSO,.MgCl, + 6H,O (hard crystalline masses, permanent in the air); kieserite (a hydrated sulphate of magnesia which is only very slowly dissolved by water); besides boracite, anhydrite (CaSO,), and other minor components lying outside the subject of this article. The potassium minerals named are not confined to Stassfurt ; far larger quantities of sylvine and kainite are met with in the salt-mines of Kalusz in the eastern Carpathian Mountains, but they have not yet come to be worked so extensively. The Stassfurt potassiferous minerals owe their industrial~~

~~importance to their solu- bility in water and consequent ready amenability to chemical operations. In point of absolute mass they are insignificant compared with the abundance and variety of potassiferous silicates, which occur everywhere in the earth's crust ; orthoclase (potash felspar) and potash mica may be quoted as prominent examples. Such potassiferous silicates~~

~~1 A provisional issue by the post-office prior to legislation. * According to Gray, 1852; according to Earle (Stamp-Collector's Mag., xi. 168 sq.), 1850. 4 i Embossed arms, crown, and post-horns on a circular dish. According to Gray, 1849 (Cat., 6th ed.); according to both Earle (Stamp-Collector's Mag., xi. 168) and A. de Rothschild (Hist. de la Poste, ii. 208), 1876. : According to De Rothschild (23., 215), 1851. fk Rothschild's date is 1852 (p. 218). 7 By Sir Bartle Frere. Both Gray and Rothschild date 1859. Earle (ut supra) describes a Liibeck stamp of 1847. 9 Rothschild's date is 1857.~~

~~are found in almost all rocks, if not as normal at least as subsidiary components ; and their disintegration furnishes, directly or indirectly, the soluble potassium salts which are found in all fertile soils. These salts are sucked up by the roots of plants, and by taking part in the process of nutrition are partly converted into oxalate, tartrate, and other organic salts, which, when the plants are burned, assume the form of carbonate, K,CO,. It is a remarkable fact that, although in a given soil the soda may pre-dominate largely over the potash salts, the plants growing in the soil take up the latter by preference: in the ashes of most land plants the potash (calculated as K,O) forms upwards of 90 per cent. of the total alkali (K,O or Na,O).¥ The proposition holds, in its general sense, for sea plants likewise. In ocean water the ratio of soda (Na,O) to potash (K,O) is 100 : 3:23 (Dittmar) ; in kelp it is, on the average, 100 : 5-26 (Richardson). Ashes particularly rich in potash are those of burning nettles, wormwood (Artemisia Absin- thium), tansy (Tanacetum vulgare), fumitory (Fumaria officinals), tobacco. In fact the ashes of herbs generally are richer in potash than those of the trunks and branches of trees ; yet, for obvious reasons, the latter are of greater industrial importance as sources of carbonate of potash. Carbonate of Potash (K,CO,) in former times used to be made exclusively from wood-ashes, and even now the industry survives in Canada, Russia, Hungary, and other countries, where wood is used as the~~

~~*general fuel. In some places—for instance, in certain districts of Hungary—wood is burned expressly for the purpose; as a rule, how- ever, the ashes produced in households form the raw material. The ashes are lixiviated with water, which dissolves all the carbonate of potash along with more or less of chloride, sulphate, and a little silicate, while the earthy phosphates and carbonates and other insoluble matters remain as a residue. The clarified solution is evaporated to dryness in iron basins and the residue cal- cined to burn away particles of charcoal and half-burned organic matter. In former times this calcination used to be effected in iron pots, whence the name "potashes" was given to the product ; at present it is generally conducted — in reverberatory furnaces on soles of cast-iron. The cal-*~~

~~*cined product goes into commerce as crude potashes. The*~~

~~*10 Gray (6th ed., p. 258). Both Rothschild and Earle give the date as 1866.*~~
~~*11 See Stamp-Collector's Magazine, 1878.*~~

~~*12 Compare the interesting paper by C. Bischoff in the Journ. f. Pract. Chem., vol. xlvii. p. 198 (1849).*~~

~~*PO mas os FU*~~

~~*composition of this substance is very variable,—the per- centage of real K,CO, varying from 40 to 80 per cent. The following analysis of an American "potashes" is quoted as an example.*~~

~~*Carbonate of potaen " <./0 8 I Vittetge eestor sconce ene 4°5*~~

~~*a Soames 2°3| Insoluble matter …... el) Sulphate of potash …... 14°4 == Chloride of potassium… 3°6 98-9*~~

~~*Crude potashes is used for the manufacture of glass, and after being causticized for the making of soft soap. For many other purposes it is too impure and must be refined, which is done by treating the crude product with the mini- mum of cold water required to dissolve the carbonate, removing the undissolved part (which consists chiefly of sulphate), and evaporating the clear liquor to dryness in an iron pan. The purified*~~

~~carbonate (which still contains most of the chloride of the raw material and other im- purities) is known as “ pearl ashes.”~~

~~Large quantities of carbonate used to be manufactured from the aqueous residue left in the distillation of beetroot spirit, z.¢., indirectly from beetroot molasses. The liquors are evaporated to dryness and the residue is ignited to obtain a very impure carbonate, which is purified by methods founded on the different solubilities of the several components. Such potashes, however, is exceptionally rich in soda: Grandeau found in crude ashes from 16 to 21 per cent. of potash and from 23 to 50 of soda carbonate. This industry would have expired by this time were it not that the beetroot spirit residues are worked for tri- methylamine (see Mrruyz, vol. xvi. p. 196), and the carbonate thus obtained incidentally. Most of the car- bonate of potash which now occurs in commerce is made from Stassfurt chloride by means of an adaptation of the ‘“‘Leblane process” for the conversion of common salt into soda ash (see Soprum).~~

~~Chemically pure carbonate of potash is best prepared by the ignition of pure bicarbonate (see below) in iron or (better) in silver or platinum vessels, or else by the calcina- tion of pure bitartrate (see TarTaric AcipD). The latter operation furnishes an intimate mixture of the carbonate with charcoal, from which the carbonate is extracted by lixiviation with water and filtration. The filtrate is evaporated to dryness (in iron or platinum) and the residue fully dehydrated by gentle ignition. The salt is thus obtained as a white porous mass, fusible at a red heat (838° C., Carnelley) into a colourless liquid, which freezes into a white opaque mass. The dry salt is very hygro- scopic; it deliquesces into an oily solution (“oleum tar- tari”) in ordinary air. 100 parts of water dissolve—~~

~~at 0° C. 20° C. 135° C. (boiling point of saturated solution)~~

~~83 94 205~~

~~parts. Carbonate of potash, being insoluble in strong alco- hol (and many other liquid organic compounds), is much used for the dehydration of the corresponding aqueous pre- parations. From its very concentrated solution in hot water the salt crystallizes on cooling with a certain pro- portion of water; but these crystals are little known even to chemists. Pure carbonate~~

~~of potash is being constantly used in the laboratory, as a basic substance generally, for the disintegration of silicates, and as a precipitant. The industrial preparation serves for the making of flint-glass, of potash soap (soft soap), and of caustic potash. It is also used int medicine, where its old name of "sal tartari" is not yet quite obsolete.~~

~~Bicarbonate of Potash ($K_2OCO_3 + H_2OCO_3 = 2KHCO_3$) is obtained when carbonic acid is passed through a cold solution of the ordinary carbonate as long as it is absorbed. If silicate is present, it likewise is converted into bicar- bonate with elimination of silica, which must be filtered~~

~~off. The filtrate is evaporated at a temperature not exceeding 60° or at most 70° C.; after sufficient concen- tration it deposits on cooling anhydrous crystals of the salt, while the chloride of potassium, which may be present as an impurity, remains mostly in the mother-liquor ; the rest is easily removed by repeated recrystallization. If an absolutely pure preparation is wanted, it is best to follow Wohler and start with the "black flux" produced by the ignition of pure bitartrate. The flux is moistened with water and exposed toa current of carbonic acid, which, on account of the condensing action of the charcoal, is absorbed with great avidity. The rest explains itself. Bicarbonate of potash forms large monoclinic prisms, permanent in the air. 100 parts of water dissolve—~~

~~at 0° 10° 20° — 60° 70°~~

~~19°61 23°23 26°91 41°35 45°24 parts of salt. At higher temperatures than 70° the solu- tion loses carbonic acid quickly. The solution is far less violently alkaline to the taste and test-papers than that of the normal carbonate. Hence it is preferred in medicine as an anti-acid. When the dry salt is treated it breaks up below redness into normal carbonate, carbonic acid, and water.~~

~~Caustic Potash (Hydrate of Potassium), KHO.—It has been known for a long time that a solution of carbonate of potash becomes more intensely alkaline, acts more strongly on the epidermis, and dissolves fats more promptly after it has been treated with slaked lime. It used to be supposed~~

~~that the latent fire in the quick-lime went into the "mild" alkali and made it "caustic," until Black, about the middle of last century, showed that the chemical difference between the two preparations is that the mild is a compound of carbonic acid and the caustic one of water with the same base (potash),—the causticizing action of the lime consisting in this, that it withdraws the carbonic acid from the alkali and substitutes its own water. Add to this that the exchange takes place only in the presence of a sufficient proportion of water, and that it is undone if the mixture is allowed to get concentrated by evaporation beyond a certain (uncertain) point, and you have a full theory of the process. A good concentration is twelve parts of water for one of carbonate of potash; the lime is best employed in the shape of a semi-fluid paste, made by slaking quick-lime with three parts of water poured on at a time. The alkali solution is heated to boiling in a cast-iron vessel (industrially by means of steam-pipes) and the lime paste added in instalments until a sample of the filtered mixture no longer effervesces on addition of an excess of acid. The mixture is then allowed to settle in the iron vessel, access of air being prevented as much as practicable, and the clear liquor is drawn off by means of a syphon. The remaining mud of carbonate and hydrate of lime is washed, by decantation, with small instalments of hot water to recover at least part of the alkali diffused throughout it, but this process must not be continued too long or else some of the lime passes into solution. The united liquors are boiled down in an iron vessel until the desired degree of concentration is reached. In obedience to an old tradition, the concentration is habitually continued until the specific gravity of the cold ley is 1°333, which is a rather inconveniently high degree of strength for most purposes, but in the case of the ordinary commercial article offers this advantage, that any sulphate of potash which may be present as an impurity crystallizes out completely on standing (Liebig). If solid'caustic potash is wanted, the ley (after removal of the deposit of sulphate, é&c.) is trans- ferred toa silver dish, and the evaporation continued until, instead of steam, the heavy vapour of KHO itself is seen to go off. The residual oily liquid is then poured out into~~

~~a polished iron tray, or into an iron mould to produce the customary form of "sticks," and allowed to cool. The solidified preparation must be at once~~

~~bottled up, because it attracts the moisture and carbonic acid of the air with great avidity and deliquesces. According to the present writer's experience (Journ. Soc. Chem. Ind., May 1884), nickel basins are far better adapted than iron basins for the concentration of potash ley. The latter begin to oxidize before the ley has come up to the traditional strength, while nickel is not attacked so long as the percentage of real KHO is short of 60. For the fusion of the dry hydrate nickel vessels cannot be used ; in fact, even silver is perceptibly attacked as soon as all the excess of water is away ; absolutely pure KHO can be produced only in gold vessels. Regarding the action of potash on platinum, see PLATINUM (supra, p. 191). Glass and (to a less extent) porcelain are attacked by caustic potash ley, slowly in the cold, more readily on boiling.~~

~~Frozen caustic potash forms an opaque, white, stone-like mass of dense granular fracture; specific gravity =2°1. Tt fuses considerably below and is perceptibly volatile at a red heat. It is extremely soluble in even cold water, and in any proportion of water on boiling. The solution is intensely "alkaline" to test-papers. It readily dissolves the epidermis of the skin and many other kinds of animal tissue,—hence the well-known application of the "sticks" in surgery. A dilute potash ley readily emulsionizes fats, and on boiling "saponifies" them with formation of a soap and of glycerin. Caustic potash is the very type of an energetic (mono-acid) basic hydrate (see CHEMISTRY, vol. v. pp. 486, 488).~~

~~According to Tiinnermann's and Schifi's determinations, as calculated by Gerlach, the relation in pure potash ley between specific gravity at 15° C. and percentage strength is as follows :—~~

~~Specific Gravity, if | Specific Gravity, if~~

~~on at percentage refers to | HO iO. percentage refers to | KO. | KHO. _ 0. |_KHO. 0 1:000 1:000 25 1°285 1°230 1 1°010 1°009 30 1°355 1°288 10 1:099 | 1°083 | 40 1°504 | 1°411 | 15 1-154 | 1128 50 1-660 | 1°539 20 1°215 WP | 60 1°810 1°667~~

~~All commercial caustic potash is contaminated with ex- cess of water (over and above that in the KHO) and with carbonate and chloride of potassium ; sulphate, as a rule, is absent. Absolutely pure potash has perhaps never~~

been seen ; @ preparation sufficing for most purposes of the analyst 1s obtained by digesting the commercial article in strong (85 per cent. by weight) pure alcohol. The hydrate KHO dissolves in the alcohol of the solvent ; the chloride and the carbonate unite with the water and form a lower layer or magma, from which the alcoholic solution of the KHO is decanted off, to be evaporated to dryness and fused in silver vessels (" potasse & 'alcool ").

The metal (potassium) has been known to exist since Lavoisier, but was first obtained as a substance by Hum- phry Davy in 1807. He prepared it from the hydrate by electrolysis. Gay-Lussac and Thénard subsequently found that this substance can be reduced to the metallic state more easily by passing its vapour over white hot metallic

iron ; but even their method as a mode of preparation was'

soon superseded by Brunner's, who, to the surprise of his contemporaries, produced the metal by simply distilling its carbonate with charcoal—applying an old-established principle of ordinary metallurgy. Brunner's process is used to the present day for the production of the metal.

One of those cylindrical, neckless, wrought-iron bottles which

serve for the storing of quicksilver is made into a reto i rt by takin out the screw-plug at the centre of one of the round calls =

o

4

PxOr Tas ers Usa

substituting for it a short, ground-in, iron outlet pipe. This retort is charged with a black flux made from a mixture of pure and crude bitartrate so adjusted that the flux contains as nearly as possible the proportion of free carbon demanded by the equation K,CO,+2C=2K+3CO. It is then suspended horizontally within a powerful wind-furnace, constructed for coke as fuel. At first a mixture of coke and charcoal is applied, to produce

~~the right tem- perature for chasing away the moisture and enabling one to, so to say, varnish over the retort with borax and thus protect it against the subsequent intense heat. After these preliminaries coke alone is used and the fire urged on to, and maintained at, its maximum pitch, when potassium vapour soon begins to make its appearance. The condensation of this vapour, however, demands special methods, because even the cold metal would quickly oxidize in the air and act most violently on liquid water. Brunner used to condense the vapour by passing it into a small copper vessel charged with rock- oil (see PARAFFIN, Vol. xviii. p. 237), in which liquid the condensed metal sinks to the bottom and thus escapes the air. Donné and Maresca dispense with rock-oil altogether ; they receive the vapour in a dry condenser made of two flat rectangular trays of wrought iron which fit closely upon each other, enclosing a space such as might be used as a mould for casting a thin cake of any ordinary inetal. This condenser has a short neck into which the outlet pipe of the retort fits; and the pipe must be as short as possible, be- cause it is essential (Donné and Maresca) that the hot vapour pass abruptly from its original high to a low temperature, to evade a certain range of medium temperatures at which the metal com- bines with carbonic oxide into a black solid, which may obstruct the outlet pipe. The formation of this bye-product cannot be altogether avoided ; hence a long borer is inserted into the con- denser from the first to enable one to clear the throat of the retort atamoment's notice. The condenser is kept as far as possible cold by the constant application to it of damp cloths. As soon as the distillation is finished the (still hot) condenser is plunged into a bucketful of rock-oil, to cool it down, the mould opened (under the oil), and the now solid metal taken out. The crude metal is always contaminated with some of the black solid and other mechanical impurities. 'To remove these the best method is to redistil it from out of a small iron retort and condense the vapour in rock- oil according to Brunner's original plan. The purified metal is soft enough to be moulded (under rock-oil) into globular pieces, which are preserved in bottles filled to the top with the protecting liquid. But even this does not prevent gradual oxidation ; bright metallic potassium can be maintained in this condition only by preserving it in a sealed-up glass tube within a vacuum or in an atmosphere of hydrogen or some other inert gas. The black solid above referred to is a most dangerous substance. When exposed to the air it turns red and then explodes either spontaneously or on the slightest provocation~~

~~by friction or pressure. Even if kept under rock-oil it gradually becomes explosive. The distillation of potassium, in fact, is a dangerous operation, which had better be left in the hands of specialists.~~

~~Pure potassium is a bluish-white metal ; but on exposure to ordinary air it at once draws a film of oxide, and on prolonged exposure deliquesces into a solution of hydrate and carbonate. At temperatures below 0° C. it is pretty hard and brittle ; at the ordinary temperature it is so soft that it can be kneaded between the fingers and cut with a blunt knife ; specific gravity =0°865. It fuses at 62°°5 C. (Bunsen), and at 720° to 730° C. (Carnelley and Williams), ¢.c., considerably below its boiling point, begins to distil with formation of an intensely green vapour. When heated in air it fuses and then takes fire and burns into a mixture of oxides. Most remarkable, and charac- teristic for the group it represents, is its action on water. A pellet of potassium when thrown on water at once bursts out into a violet flame and the burning metal fizzes about on the surface, its extremely high temperature precluding absolute contact with the liquid, except at the very end, when the last remnant, through loss of temperature, is wetted by the water and bursts with explosive violence. What really goes on chemically is that the metal decom- poses the water thus, K+ H,O=KHO+H, and that the hydrogen catches fire, the violet colour of the flame being due to the potassium vapour diffused throughout it. Similar to that on water is its action on alcohol: the alcohol is converted into ethylate, while hydrogen escapes, K+C,H,.OH=C,H,.OK +H, this time without inflam- mation. So strong is the basilous character of the element that, in opposition to it, even ammonia behaves like an~~

~~acid. When the oxide-free metal is heated gently within the dry gas it is gradually transformed into a blue liquid, which on cooling freezes into a yellowish-brown or flesh- coloured solid. This body is known as “ potassamide,” KNH,. When heated by itself to redness the amide is decomposed into ammonia and nitride of potassium, 3NH,K =NK,+2NH,. The nitride is an almost black solid. Both it and the amide decompose water readily with for- mation of ammonia and caustic potash. Potassium at temperatures from 200° to 400° C. “occludes” hydrogen gas, as palladium~~

~~*does (see " Palladium," under PLatinum, supra, p. 193). The highest degree of saturation corre- sponds approximately to the formula K,H for the "alloy," or to about 126 volumes of gas (measured cold) for one volume of metal. In a vacuum or in sufficiently dilute hydrogen the compound from 200° upwards loses hydro- gen, until the tension of the free gas has arrived at the maximum value characteristic of that temperature (Troost*~~

~~*and Hautefeuille).*~~

~~*Potassium Oxides, singularly, can be produced only from the metal, and another remarkable fact is that 'the one with which all chemical students imagine they are so familiar—namely, "anhydrous potash," K,O—is little more than a fiction. According to Vernon Harcourt, when the metal is heated cautiously, first in dry air and then in dry oxygen, it is transformed into a white mass (K,0, 2), which, however, at once takes up more oxygen with formations ultimately of a yellow powdery tetroxide (K,O,), fusible at a red heat without decomposition. Ata white heat it loses oxygen and leaves a residue of lower oxides (KO ?). When heated in hydrogen it is reduced to ordinary potash, KHO. When dissolved in excess of dilute acid it yields a mixed solution of the respective potash salt and peroxide of hydrogen, with abundant evolution of oxygen gas.*~~

~~*Potassium Salts. —There is only one series of these known,— namely, the salts produced by the union of potash (KHO) with acids.*~~

~~*Chloride, KCl.—This salt (commercial name, "muriate of potash") is at present being produced in immense quantities at Stassfurt from the so-called " Abraumsalze." For the purpose of the manu- facturer of muriate these are assorted into a raw material contain- ing approximately in 100 parts—55-65 of carnallite (representing 16 parts of chloride of potassium); 20-25 of common salt ; 15-20 of kieserite, a peculiar, very slowly soluble sulphate of magnesia, MgSo,.H,O; 2-4 of tachhydrite (CaCl,.2MgCl,+12H,0); and minor components. This mixture is now wrought mainly in two ways. (1) The salt is dissolved in water with the help of steam, and the solution is cooled down to from 60° to 70°, when a quantity of impure common salt crystallizes out, which is re- moved. The decanted ley deposits on cooling and standing a 70 per cent. muriate of potash, which is purified, if desired, by washing it by displacement with*~~

~~cold water. Common salt prin- cipally goes into solution, and the percentage may thus be brought up to from 80 to 95. The mother-liquor from the 70 per cent. muriate is evaporated down further, the common salt which separates out in the heat removed as it appears, and the suffi- ciently concentrated liquor allowed to crystallize, when almost pure carnallite separates out, which is easily decomposed into its components (see infra). (2) Ziervogel and Tuchen's method. The crude salt is ground up and then heated in concentrated solution of chloride of magnesium with mechanical agitation. The carnallite principally dissolves and crystallizes out relatively pure on cooling. The mother-liquor is used for a subsequent extraction of fresh raw salt. The carnallite produced is dissolved in hot water and the solution allowed to cool, when it deposits a coarse granular muriate of potash containing up to 99 per cent. of the pure substance. The undissolved residue produced in either process consists chiefly of kieserite and common salt. It is worked up either for Epsom salt and common salt, or for sulphate of soda and chloride of magnesium. The potassiferous bye- products are utilized for the manufacture of manures.~~

~~Chemically pure chloride of potassium is most conveniently pre- pared from pure perchlorate (see infra) by dioxygenating it in a platinum basin at the lowest temperature and then fusing the residue in a well-covered platinum crucible. The fused product solidifies on cooling into a colourless glass. Chloride of potassium dissolves in water and crystallizes from the solution in anhydrous~~

~~cubes. 100 parts of water dissolve— at 0° 10° 20° 50° 100° C. 29°2 320 34:7 42°8 56°6~~

~~parts of the salt. When a sufficiency of hydrochloric-acid gas is passed into the solution the salt is completely precipitated as a fine powder. If the original solution contained chloride of mag- nesium or calcium or sulphate of potash, all impurities remain in the mother-liquor (the SO; as KHSO,), and can be removed by~~

~~washing the precipitate with strong hydrochloric acid. Chloride of potassium fuses at 738° C. (Carnelley), and at a red heat vola- tilizes rather~~

~~abundantly.~~

~~Chlorate, KClO,.— This industrially important salt was dis- covered in 1786 by Berthollet, who correctly designated it as "»eroxidized muriate." Chlorine gas is largely absorbed by cold caustic-potash ley with formation of chloride and hypochlorite, 2KHO+Cl,=KCl1+KClO+H,0. When the mixed solution is boiled it suffers, strictly speaking, a complicated decomposition, which, however, in the main comes to the same as if the hypo- chlorite broke up into chloride and chlorate, 3KClO=2KC1+ KC10,. Hence chlorate of potash is easily produced by passing chlorine into hot caustic- potash ley so as at once to realize the change, 6KHO +3Cl,=3H,0 +5KC1+KC10;; and this method used to be followed industrially until Liebig pointed out that five-sixths of the potash can be saved by first substituting milk of lime, Ca(OH),=2caOH, for the potash ley and from the mixed solution of lime-salts precipitating, so to say, the chloric acid as potash salt by adding 1KCl for every 1caClO, present, concentrating by evaporation, and allowing the KCl10, to crystallize out. This is the present industrial process. For the technical details we must refer to the handbooks of chemistry. Suffice it to say that in practice about 1°03 times KCl are used for every 1caClO;, and that the salt produced is almost chemically pure after one recrys- tallization. By repeated recrystallization every trace of impurities is easily removed. The crystals are colourless transparent mono- clinic plates, which, nnless formed very slowly, are very thin, so as often to exhibit the Newton's colours. 100 parts of water dissolve—~~

~~at 0° 15° 50° 104° (on boiling) 3°3 6 19 60~~

~~parts of the salt (Gay-Lussac). The salt is almost insoluble in strong alcohol. Itis permanent in theair. It fuses at 359°C. (Carnelley), and at about 18° above the temperature of its formation the liquid gives off oxygen with evolution of heat, and formation ultimately of chloride (and oxygen). The salt accordingly, in opposition to any combustible matter with which it may be mixed, behaves at the same time as a store of highly-condensed loosely-combined oxygen and of potential heat. Hence its manifold applications in artillery and pyrotechnics are easily understood. To give one example of the readiness with which it acts as a burning agent: a mixture of it and sulphur when struck with a hammer explodes loudly, the mechanical~~

blow sufficing to produce locally the temperature neces- sary for starting the reaction. When the salt was still a novelty it was tried as a substitute for the nitre in gunpowder. Such powder, however, proved too good to be safe. More recently a mixture of 49 parts of the chlorate, 23 of sugar, and 28 of prussiate of potash was recommended by Pohl as a preferable substitute for gunpowder, but this powder has never come into actual use any- where. We must not forget to point out that mixtures of chlorate of potash and combustible substances must on no account be made in a mortar; this would be sure to lead to dangerous explosions. The several ingredients must be powdered separately and only then be mixed together on a sheet of paper or on a table, all unnecessary pressure or friction being carefully avoided.

The decomposition of chlorate of potash by heat is greatly facili- tated by adinixture of even small proportions of certain solid oxides, ¢.g., oxide of copper, of iron, or of manganese. The oxygen, in the case of binoxide of manganese, for instanee, comes off below the fusing point of the salt. Hence a salt contaminated with even a small proportion of heavy metallic chlorate cannot (in general) be fused without decomposition. The writer observed this anomaly with a commercial chlorate which happened to contain about one half per cent. of chlorate of zinc. The aqueous solution of the salt is neutral and bears prolonged boiling without decomposition. On acidification with dilute sulphuric aeid it assumes the reactions of a solution of chloric acid, 7.¢., of a powerful but readily controllable oxydant. In this capacity it is used in calico-printing as a "discharge." In the same industry it serves for making the chlorate of soda needed for the production of aniline black. In the chemical laboratory it is in constant requisition as a source of oxygen and as an oxidizing agent. In the hands of Marignac it served for the determination of the important ratio KC]: 30.

Perchlorate, KC1O0,.—The decomposition of chlorate of potash by heat, if catalytic agents like MnO,, &c., are absent, proceeds by two stages. In the first the salt breaks up thus, 2KClO,=KC1+0, + KC10,; in the second the perchlorate at a higher teniperature is decomposed into chloride and oxygen. The termination of the first stage is marked by a slackening in the evolution of the oxygen and by the residual salt (which, at the beginning, is a thin fluid) becoming pasty. From the mixture KC]+KCI1O, the clioride is

~~*extracted by lixiviation with successive instalments of cold water. The residual perchlorate is very easily purified by recrystallization (compare pure chloride of potassium, swpra). Perchlorate of potash dissolves in 88 parts of water of 10°C., and in far less of boiling water. It is absolutely insoluble in absolute alcohol. It begins to give off its oxygen at about 400° C., which is below its fusing point.*~~

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~~*The salt has been recommended as a substitute for chlorate in pyrotechnic mixtures, because it contains more oxygen, and yet, on account of its greater stability, is a less dangerous ingredient. Bromide, KBr.—This salt is formed when bromine is dissolved in caustic-potash ley. The reaction is quite analogous to that go-*~~

~~*ing on in the case of chlorine ; only the hypobromite (KBrO) first*~~

~~*roduced is far less stable than hypochlorite, and vanishes after short heating. The addition of bromine is continued until the liquid is permanently yellow and retains its colour after short heat- ing. The solution is then evaporated to dryness and the bromate decomposed by cautious heating. A small portion of the bromate breaks up into K,0+ Br, +50; hence the residual bromide is con-*~~

~~*taminated with a little free alkali; but this is easily set right by*~~

~~*neutralizing its solution with hydrobromic acid. The salt crystal-*~~

~~*lizes in colourless transparent cubes, easily soluble in water. It*~~

~~*is used in medicine for quieting the nerves,—to cure sleeplessness, for instance ; also (internally) as a local anesthetic preparatory to operations on the larynx or the eye. The dose of the pure (KI free) salt for adults can safely be raised to 2 grammes (about 30 grains). It is also used in photography. ;*~~

~~*Iodide, K1.—Of the very numerous methods which have been recommended for the preparation of this important salt the simplest (and probably the*~~

~~best) is to dissolve in a caustic-potash ley (which~~

~~is dilute enough to hold the rather difficultly soluble iodate KIO, in solution) enough iodine to produce a permanent yellow colour~~

~~(the iodine passes at once into 5KI+KI0,; the hypo body KIO has no existence practically) and to deoxidize the iodate, which is done most conveniently by adding a sufficiency of powdered char- coal to the solution, evaporating to dryness in an iron vessel, and heating the residue. The oxygen goes off as CO, at a lower tem- perature than that which would be needed for its expulsion as oxygen gas. The residue is dissolved, and the solution filtered and evaporated to crystallization. The salt comes out in colourless transparent cubes, very easily soluble in even cold water. The commercial salt forms opaque milk-white crystals, which, as a matter of habit, are preferred to the clear salt, although they are produced by causing the salt to crystallize from a strougly alkaline solution and by drying the crystals (finally) in a stream of hot air, and although through the former operation they are at least liable to contain carbonate. Iodide of potassium acts far more powerfully ou the human system than bromide, and therefore is administered in smaller doses. It is used against skin-diseases, and also for eliminating the mercury which 'settles in the system after long-continued administration of mercurial medicines. It is also used, far more largely than the bromide, in photography. See PHoTo- GRAPHY, passim.~~

~~Sulphate (K,SO,) used to be extracted from kainite, but the process is now given up because the salt can be produced cheaply enough from the muriate by decomposing it with its exact equi- valent of oil of vitriol and calcining the residue. To purify the erude product it is dissolved in hot water and the solution filtered and allowed to cool, when the bulk of the dissolved salt crystallizes out with characteristic promptitude. The very beautiful (anhydrous) crystals have as a rule the habitus of a double six-sided pyramid, but really belong to the rhombic system. They are transparent, very hard, and absolutely permanent in the air. They have a bitter~~

~~salty taste. 100 parts of water dissolyve— at 0° 128 100° C. 8°36 10 26~~

~~parts of the salt. Sulphate of potash fuses at a strong red heat, and at this temperature volatilizes, for an alkaline salt, rather slowly. The chloride,~~

~~weight for weight, volatilizes at ten times the rate (Bunsen). Sulphate of potash used to be employed in medicine, but is now obsolete. The crude salt is used occasionally in the manufacture of glass.~~

~~Bisulphate (KHSO,) is readily produced by fusing thirteen parts of the powdered normal salt with eight parts of oil of vitriol. It dissolves in three parts of water of 0° C. The solution behaves pretty much as if its two congeners, K,SO, and H,SO,, were present side by side of each other uncombined. An excess of alcohol, in fact, precipitates normal sulphate (with little bisulphate) and free acid remains in solution. Similar is the behaviour of the fused dry salt at a dull red heat; it acts on silicates, titamates, &c., as if it were sulphuric acid raised beyond its natural boiling point. Hence its frequent application in analysis as a disintegrating agent.~~

~~For the following potash salts we refer to the articles named :—~~

~~Chromates, see CHROMIUM; Cyanide and Ferrocyanide, Prussi>~~

~~ACID ; Chloroplatinate, PLATINUM (supra, p. 192); Nitrate, Nrrro- GEN (vol. xvii. p. 518); Phosphates, PHospHorus (vol. xviii. pp. 818-1 9); Oxalates, Oxatic Acip; Sulphides and Sulphites, SULPHUR; Silicates, GLAss (vol. x. p. 655 sq.) and Sinica; Tartrates, TARTARIC Act. For potash salts not named, see the handbooks of chemistry.~~

~~Lubidium and Cxsium.—When Bunsen and Kirchhoff~~

~~in 1860 applied their method of spectrum analysis to the alkali salts which they had extracted analytically from Diirkheim mineral water, they obtained a spectrum which,~~

~~PoTA®S © rus~~

~~in addition to the lines characteristic for sodium, potassium,~~

~~and lithium, exhibited two blue lines which were foreign to any other spectrum they had ever seen. They accord- ingly concluded that these lines must be owing to the presence of a new alkali metal, which they called "cesium." Bunsen at once resumed the preparation of the mixed alka- line~~

~~*salt with 44,000 litres of Diirkheim water, with the view of isolating the caesium in the form of a pure salt ; and he was more than successful—for the new alkali salt, after elimination of all the ordinary alkali metals, proved to be a mixture of the salts of two new alkali metals, which he succeeded in separating from each other. For one he retained the name already chosen ; the other he called "rubidium," on account of the presence in his spectrum of certain characteristic red lines. Since Bunsen's time these two metals have been discovered in a great many native potassiferous materials—minerals, mineral waters, plant ashes, &c.—but in all cases they form only a small fraction of the alkali, the cesium in general amounting to only a fraction of even the rubidium. One solitary exception to both rules is afforded by a rare mineral called "pollux," which is found only on the island of Elba. Plattner analysed this mineral in 1846 and recognized it as a compound silicate of alumina, oxide of iron, soda, potash, and water ; but his quantitative analysis came up to only 92°75 per cent., and he could not account for the 7:25 per cent. of loss. After Bunsen's discovery Pisani analysed the mineral again, and he found that it contained no potash at all, but, instead of it, a large percentage (34°1) of cxsia. Recalculating Plattner's analy- sis on the assumption that the presumed chloroplatinate of potassium was really chloroplatinate of cesium, he found that the corrected numbers did add up to near 100 and agreed with his own. Rubidium, singularly, is absent from this mineral.*~~

~~*That both rubidium and cesium are contained in sea water might well be taken for granted; but it is worth while to state that Schmidt of Dorpat actually proved the presence of rubidium, and even determined it quantita- tively.*~~

~~*For the preparation of rubidium compounds one of the best materials is a mixture of alkaline salts, which falls as a bye-product in the industrial preparation of carbonate of lithia from lepidolite. A supply of this salt mixture which Bunsen worked up contained 20 per cent. of chloride of rubidium, 33 of chloride of potassium, and 36 of common salt, but very little cesium ; his supply came from the Saxon or Bohemian mineral. The lepidolite of Hebron, Maine, United States, on the other hand, is rich in cesium. Another practically available source for cesium is the mother-*~~

~~*liquor salt of Nauheim in Germany. It yielded to Bottcher 1 per cent. of its weight of the chloroplatinate PtCl,Csp.*~~

~~*Bunsen's method for the extraction of the two rare potassium metals from a given mixture of alkaline salts is founded upon the*~~

~~*different solubility of the several alkaline chloroplatinates. Accord- ing to him 100 parts of water dissolve—*~~

~~*Potassium Rubidium Cxsium at Oc 0°74 0°13 0-024 5 20ne 1-12 0°14 0-079 » 100°C 5°18 0°63 0°377*~~

~~*parts of the several salts, The chloroplatinates of sodium and lithium are easily soluble even in cold water, so that chloride of platinum does not precipitate these two metals at all. Hence, supposing we boil a given mixture of chloroplatinatcs of potassium and (say) rubidium with a quantity of water insufficient to dissolve the whole, part of both salts will dissolve ; but the residual chloro- platinate will be richer in rubidium than the dissolved part. And supposing, on the other hand, we add to a mixed solution of the two chlorides a quantity of chloroplatinic-acid solution insufficient to bring down the whole of both metals, the rubidium will accumu- late in the precipitate and the potassium in the solution. It is also easily understood that, if the amount of reagent added falls short even of that which would be needed by the rubidium if present alone, a very nearly pure PtCl,Rb, may be expected to come down. Any dry chloroplatinate is easily reduced to a mixture of metallic platinum and alkaline chloride by the simple operation of heat- ing in hydrogen to about 800°C. The chloride can be dissolved out, and thus again made anienable to fractional precipitation by*~~

~~*POT—POT*~~

~~*platinum solution, and the platinum be reconverted into reagent by means of aqua regia. Hence the process is not so expensive as it might at first sight appear.*~~

~~*Redtenbacher has worked out an analogous process to Bunsen's, founded upon the different solubility of the three alums—A1.R(SO,.)o + 12H,0. At*~~

~~17° C. 100 parts of water dissolve of the alum of~~

~~Potasstum Cesium~~

~~13°5 0°62 parts. Sodium and lithium alum are very easily soluble in water, and remain dissolved in the first mother-liquor when the mixed alum of K, Rb, and Cs crystallizes out. These three alums are parted by repeated crystallization, and the rare alkalis recovered from their respective alums by precipitation with chloride of platinum.~~

~~The separation of rubidium and cesium offers great difficulties. According to Godeffroy an approximate separation may be effected by dissolving the mixed chlorides in strong hydrochloric acid, and adding a solution of terchloride of antimonyin the same menstruum ; the cxsium (chiefly) comes down as SbCl,+6CsCl; the bulk of the rubidium remains dissolved. The two rare alkali metals are so closely similar to potassium that it will suffice to give a tabular statement of the principal points of difference. By way of intro- duction, however, we may state that rubidium metal was prepared by Bunsen from the black flux obtained by igniting the bitartrate, by Brunner's method for potassium. Metallic cesium, it seems, cannot be thus obtained ; but in 1883 Setterberg made it by the electrolysis ofa fused mixture of the cyanides of cesium and barium.~~

~~Rudidiwm Di,~~

~~Potassium. Rubidium. Cesium. Atomie weights O=16 …...K=39°136 Rb=854 Cs=133°0 Free Metals— Specific gravity …..... 0°S65 1752 1°S8 IMSin Gg POlNts…. oceans) Ome 88°°5 26° to 27° C.~~

~~Volatility increases >—> Hydrates, RHO—Very similar to one another ; the basility increases >—>~~

~~f Vide supra. Permanent in air. Deliquescent. Chlorides, RCl…….~4 Almost insoluble More soluble than KCl. {in alcohol. Soluble in alcohol. Sulphates, RoSOj— 100 parts of water dis- { At— 2°C.§ ? 159 OM Cian comeme > oer sme 10:3 42 ? Carbonates, Eee ae very soluble in water. 100 parts of alcohol dis- ° ” : RGIS case eeeeee At 19°C. 0 sia _ Alums~~

~~*ee decreases >—>*~~

~~*Chloroplatinates (vide supra).*~~

~~*Analysis.—In this section we treat of the detection and determin- ation of alkali metals generally. If the given substance is a solid, a good preliminary test is to heat about one centigramme of it at one end of a fine platinum wire in the flame-mantle of a Bunsen lamp, or in a blow-pipe flame just at the end of the inner cone. Most alkali salts are sufficiently volatile to impart to the flame the colour characteristic of the respective metallic vapour. Certain native silicates and certain other compounds do not volatilize, but these can be rendered amenable to the test by mixing them with sulphate of lime and then applying the flame, whereupon alkaline sulphate is formed which volatilizes. The flame-colours are—*~~

~~*Potassium, Rubidium, Cesium. Lithium. Violet. Red.*~~

~~*Sodiwm. Yellow.*~~

~~*These flame-reactions are very delicate but not conclusive, because in the case of mixtures several colours may be radiated out at the same time, and one may eclipse all the rest—this holds, for instance, for things containing sodium, whose flame-colour is more intense than that of any other metal—or a mixed colour may be produced which the eye is incompetent toanalyse. The spectrum apparatus here comes in usefully ; and by means of it it is in general possible to see the lines characteristic of the several metals in presence of, or at least after, one another, because as a rule the several metals are present as compounds of different volatility.*~~

~~*For a thorough analysis it is necessary to begin by bringing the substance into aqueous or acid solution, and next to eliminate all that is not alkali metal by suitable methods. A certain set of heavy metals can be precipitated as sulphides by means of sulphur- etted hydrogen in the presence of acid, all the rest of these by means of sulphide of ammonium from an alkaline solution. From the filtrate, barium, strontium, and calcium are easily precipitated by means of carbonate of ammonia on boiling, so that, if the filtrate from these carbonates is evaporated to dryness and the residue kept at a dull red heat long enough to drive away the ammonia salts, nothing*~~

~~can be left but salts of alkali metals and magnesium. This residue is dissolved in a small quantity of water, and any residual basic salt of magnesium filtered off. The filtrate is then ready to be tested for alkali metals as follows: ¢f magnesia be absent, potassium or rubidium (not cesium) can be detected by addition (to a neutral or feebly acetic solution) of a saturated solution of bitartrate of soda. Potassium and rubidium come down as crys- talline bitartrates. The reaction may take some time to become manifest, but can be accelerated by vigorous stirring. Ina separate quantity of the solution lithium may be searched for by means of carbonate of soda or trisodic phosphate as explained under LirHiuM~~

~~'ordinary circumstances, formed on roots.~~

~~093~~

~~(vol. xiv. p. 697). For soda we have no characteristic precipitant. In any case the spectrum apparatus should be used for controlling aud, if necessary, supplementing the wet-way tests. The case of magnesia being present need not be specially considered, because the qualitative method will easily be deduced from what is said in the following paragraph.~~

~~Quantitative Determinations.—An exhaustive treatment of this subject would be out of place here. We confine ourselves to two cases. (1) A mixture of alkaline chlorides only. In this case the potassium (including Rb and Cs) is best separated out by adding a quantity of chloroplatinic-acid solution sufficient to convert all the metals into chloroplatinates, to evaporate to dryness over a water-bath, and from the residue to extract the lithium and sodium salts by lixiviation with alcohol of 70 per cent. (by weight). The residual chloroplatinate is collected on a filter, dried at 110° C., and, if Rb and Cs are absent, weighed as chloroplatinate of potassium, PtCl],K. (PtCl,K, x 0°3071=2KCl). The chloride of sodiuin is deter- mined by difference—if lithium be absent. The case of its presence cannot be here considered. (2) A mixture of alkalis combined with sulphuric acid, or such volatile acids as can be expelled by sulphuric. In this case it is best to begin by converting the whole into neutral sulphates, and then to apply the method of Finkener, which, amongst other advantages, offers the one that it does not demand the absence of magnesia. The mixed sulphate is dissolved in water and the solution mixed with a little more than the volume of~~

~~chloroplatinic acid ("platinum solution") demanded by the pot- assium (Rb and Cs). The mixture is placed in a water bath and, if necessary, diluted with sufficient water to bring the whole of the precipitated chloroplatinate into hot solution. The solution is then evaporated very nearly to dryness (on the water bath, with continu- ous stirring towards the end to avoid formation of crusts), allowed to cool, and the residue mixed, first with twenty times its volume of absolute alcohol, then with ten volumes of absolute ether. The mixture is allowed to stand in a well-covered vessel for some hours, to enable the precipitate to settle completely. The precipitate con- tains all the potassium as chloroplatinate, and most of the sodium and magnesium, and also part of the lithium in the sulphate form. It is washed with ether-alcohol (to complete filtrate A), and then lixiviated as quickly as possible with cold concentrated solution of sal-ammoniac, which dissolves away the sulphates (filtrate B). The residual chloroplatinate is dried within the filter in a porcelain cru- cible, which is next heated so as to char the paper at the lowest tem- perature. The residue is then ignited gently in hydrogen, and from the resulting residue the chloride of potassium is extracted by water, to be determined as chloroplatinate, as shown in (1), or otherwise. From the undissolved residue the charcoal is burned away and the residual platinum weighed to check the potassium determination. After removal of the ether and alcohol from filtrate A by dis- tillation, the two filtrates A and B are mixed, evaporated to dry- ness, the ammonia salts chased away by heating, and the residue is reduced (at about 300° C.) in hydrogen to bring the platinum into the form of metal, from which the magnesia and alkali salts are easily dissolved away by means of water or dilute acid. The whole of the salts are then made into neutral sulphate, which is weighed and then dissolved in a known weight of water. The lithium and the magnesium are determined in aliquot parts of the solution and calculated as sulphates. The soda is found by difference. A case intermediate between (1) and (2) often presents itself in practice. We refer to the commercial muriate from Stassfurt. In such an impure muriate the potassium can be determined promptly and accurately by adding to the very concentrated solution of the substance a large excess of a very concentrated solution of chloro- platinic acid, —" excess' meaning more platinum than necessary to make all the metals into chloroplatinates. The precipitate is allowed to settle, collected on a small filter, and washed, first with successive instalments of a platinum solution (containing 5 per cent. of~~

~~metal), then with ordinary alcohol; it is next dried, and weighed as above (Tatlock's method slightly modified). In exact analyses the small quantity of potassium which passes into the filtrate is recovered—ultimately by Finkener's method—and allowed for. (W. D.)~~

~~POTATO. The potato (Solanum tuberosum) is too well known to need detailed description. It owes its value to the peculiar habit of developing underground slender leafless shoots or branches which differ in character and office from the true roots, and which gradually swell at the free end and thus produce the tubers with which we are so familiar. The nature of these tubers is further . rendered evident by the presence of "eyes" or leaf-buds, which in due time lengthen into shoots and form the haulm or stems of the plant. Such buds are not, under What the determining cause of the formation of the tubers may be~~

~~is not known ; the object evidently is to secure a method of propagation independently of the seed. Starch and other matters are stored up in the tubers, as in the perisperm of a seed, and in due season are rendered available for the nutrition of the young shoots when they begin to grow. The young shoots, in fact, derive their nourishment from the parent tuber until by the produc- tion of roots and leaves they are enabled to shift for themselves. When grown under natural circumstances (without being earthed up, as is usually done by the cultivator) the tubers are relatively small and close to the surface of the soil, or even lie upon it. In the latter case they become green and have an acrid taste, which would probably render them objectionable to. predatory animals or insects, and which certainly renders them unpalatable to human beings, and, in consideration of the known poisonous qualities of many Solanacex, might probably cause them to be unwholesome. HIence the recommenda- tion to keep the tubers in cellars or pits, not exposed to the light, for the green colouring matter is, in this case, developed in the tubers independently of the direct action of light on the leaves. Among the six hundred species of Solanum less than a dozen have this property of forming tubers, but similar growths are formed at the ends of the shoots of the common bramble, of the Convolvulus sepium, of~~

~~*the Helianthus tuberosus, the so-called Jerusalem arti- choke, of Sagittaria, and other plants. Tubers are also sometimes formed on aerial branches, as in some Aroids, Begonias, &c. The production of small green tubers on the haulm, in the axils of the leaves of the potato, is not very unfrequent, and affords an interesting proof of the true morphological nature of the underground shoots and tubers. The so-called fir-cone potatoes, which are elongated and provided with scales at more or less regular intervals, show also very clearly that the tuber is only a thickened branch with "eyes" set in regular order, as in an ordinary shoot. The potato tuber consists mainly of a mass of cells filled with starch and encircled by a thin corky rind. A few vessels and woody fibres traverse the tubers.*~~

~~*The chief value of the potato as an article of diet consists in the starch it contains, and to a less extent in the potash and other salts. The quantity of nitrogen in its composition is small, and hence it should not be relied on to constitute the staple article of diet, unless in admixture with milk or some other substance containing*~~

~~*nitrogen. Letheby gives the following as the average composition of the potato— Nitrogenous matters 2-1 | Saline matter …..... 0°7 ISRO, Ake, Ganarosanone SE Sia BVWatere Sess ess.cece 215°0 REI aseoste nee oas tence 372 Hae ame ecvanacectesuntes 0°2 100°0*~~

~~*—a result which approximates closely to the average' of nineteen analyses cited in How Crops Grow from Grouven. In some analyses, however, the starch is put as low as 13°30, and the nitrogenous matter as 0°92 (Dehérain, Cours de Chimie Agricole, p. 159). Boussingault gives 25°2 per cent. of starch and 3 per cent. of nitrogenous matter. Warington states that the proportion of nitro- genous to non-nitrogenous matter in the digestible part of potatoes is as 1 to 10°6. The composition of the tubers evidently varies according to season, soils, manur, ing, the variety grown, é&c., but the figures cited will give a sufficiently accurate idea of it. The "ash" contains on the average of thirty-one analyses as much as 59°8 per cent. of potash, and 19-1 per cent. of phosphoric acid, the other ingredients being in very minute proportion. Where, as in some parts of northern Germany, the potato 1s grown for the purpose of manufacturing spirit great attention 1s necessarily paid to the quantitative analysis of*~~

~~the starchy and saccharine matters, which are found to vary much in particular varieties, irrespective of the con- ditions under which they are grown. ;~~

~~The origin and history of the potato are better known than in the case of many long-cultivated plants. It is to the Spaniards that we owe this valuable esculent, "optimum benigni Numinis donum, dapes grata diviti, pauperi panis," as it has been called by an eminent botanist. The Spaniards met with it in the neighbourhood of Quito, where it was cultivated by the natives. In the Cronica de Peru of Pedro Ciega, published at Seville in 1553, as well as in other Spanish books of about the same date, the potato is mentioned under the name " battata" or "papa." Hieronymus Cardan, a monk, is supposed to have been the first to introduce it from Peru into Spain, from which country it passed into Italy and thence into Belgium. Carl Sprengel, cited by Professor Edward Morren in his biographical sketch entitled Charles de V Escluse, sa Vie et ses Huvres, and to which we are indebted for some of the historical details given below, states that the potato was introduced from Santa Fé into England by John Hawkins in 1563 (Garten Zeitung, 1805, p. 346). If this be so, it is a question whether the English and not the Spaniards are not entitled to the credit of the first introduction ; but, according to Sir Joseph Banks, the plant brought by Drake and Hawkins was not our potato but the SwEet Potato (see below).~~

~~In 1587 or 1588 De l'Escluse, better known under the Latinized appellation of "' Clusius," received the plant from Philippe de Sivry, lord of Waldheim and governor of Mons, who in his turn received it from some member of the suite of the papal legate. At the discovery of America, we are told by Humboldt, the plant was cultivated in all the temperate parts of the continent from Chili to New Granada, but not in Mexico. Nearly a hundred years afterwards, in 1585 or 1586, potato tubers were brought from North Carolina and Virginia to Ireland on the return of the colonists sent out by Sir Walter Raleigh, and were first cultivated on Sir Walter's estate near Cork. The tubers introduced under the auspices of Raleigh were thus imported a few years later than those mentioned by Clusius in 1588, which must have been in cultivation in Italy and Spain for some years prior to that~~

~~*time. Be this as it may, the earliest representation of the plant is to be found in Gerard's Herbal, published in 1597. The plant is mentioned under the name Papus orbiculatus in the first edition of the Catalogus of the same author, published in 1596, and again in the second edition, which was dedicated to Sir Walter Raleigh (1599). It is, how- ever, in the Herbal that we find the first description of the potato, accompanied by a woodcut sufficiently correct to leave no doubt whatever as to the identity of the plant. In this work (p. 781) it is called " Battata Virginiana sive Virginianorum, et Pappus, Potatoes of Virginia." Gerard says—*~~

~~*'*The roote is thicke, fat and tuberous ; not much differing either in shape, colour or taste from the common Potatoes, saving that the rootes hereof are not so great nor long; some of them as round as a ball, some ouall or egge-fashion, some longer and others shorter ; which knobbie rootes are fastened unto the stalks with an infinite number of threddie strings. . . . It groweth naturally in America where it was first discovered, as reporteth C. Clusius, since which time I have received rootes hereof from Virginia otherwise*~~

~~*called Norembega which growe and prosper in my garden, as in their owne native countrie."*~~

~~*The 'common Potatoes" of which Gerard speaks are the tubers of Convolvulus batatas, the Sweet Potato, which nowadays would not in Great Britain be spoken of as common. Evidently the author attached great importance to the potato, for in the frontispiece to his volume he is represented with the flower and foliage of the plant in his hand. In his opinion it was, like the common potato,*~~

~~*Por AT 0*~~

~~*"a foode as also a meate for pleasure equall in goodnesse and wholesomenesse unto the same, being either rosted in the embers, or boiled and eaten with oile, vinegar and pepper, or dressed any other way by the hand of some cunning in cookerie." A second edition of the Herbal was published in 1636 by Thomas Johnson, with a different illustration from that given in the first edition, and one which in some respects, as in showing the true nature of the tuber, is superior to the first. The phenomenon of growing out or " super-tuberation " is shown in this cut. Previous to this*~~

~~*(in 1629) Parkinson, the friend and associate of Johnson, had published his Paradisus, in which (p. 517) he gives an indifferent figure of the potato under the name of Papas seu Battatas Virginianorum, and adds details as to the method of cooking the tubers which seem to indicate that they were still luxuries rather than necessaries. Chabreeus, who wrote in 1666, tells us that the Peruvians made bread from the tubers, which they called '"'chunno." He further tells us that by the natives " Virginieer insule" the plant was called "openauk," and that it is now known in European gardens, but he makes no mention of its use as an esculent vegetable, and, in- deed, includes it among "plante maligne et venenate." Heriot (De Bry's Collection of Voyages), in his report on Virginia, describes a plant under the same name "with roots as large as a walnut and others much larger; they grow in damp soil, many hanging together as if fixed on ropes ; they are good food either boiled or roasted." The plant (which is not a native of Virginia) was probably introduced there in consequence of the intercourse of the early settlers with the Spaniards, who derived the plant from Peru or other parts of South America, and perhaps provisioned their ships with its tubers. In any case the cultivation of the potato in England made but little pro- gress, even though it was strongly urged by the Royal Society in 1663; and not much more than a century has elapsed since its cultivation on a large scale became general. The source of the potato being known, it is a matter of interest to determine the particular species from which the cultivated forms have descended and the exact part of the great American continent in which it is indigenous. As to the first point, botanists are agreed that the only species in general cultivation in Great Britain is the one which Bauhin, in his Phytopinax, p. 89 (1596), called Solanum tuberosum esculentum, a name adopted by Linnzus (omit- ting the last epithet), and employed by all botanical writers. This species is native in Chili, but it is very doubtful if it is truly wild farther north. Mr Baker (Journal of the Lirnean Society, vol. xx., 1884, p. 489) has reviewed the tuber-bearing species of Solanum from a systematic point of view as well as from that of geographical distribution. Out of twenty so-called species he considers six to be really distinct, while the others are merely synonymous or trifling variations. The six admitted tuber-bearing species are S. tuberosum, S. Maglia, S. Commersoni, S. cardiophyllum, S. Jamesii, and S. oxycarpum.*~~

~~*S. tuberosum is, according to Mr Baker, a native not only of the Andes of Chili but also of those of Peru, Bolivia, Ecuador, and Colombia, also of the mountains of Costa Rica, Mexico, and the south-western United States. It seems most probable, how- ever, that some at least of the plants mentioned in the northern part of the American continent have no claim to be considered absolutely wild, but are the descendants of cultivated forms. S. Maglia is a native of the Chilian coast as far south as the Chonos Archipelago, and was cultivated in the garden of the Horticultural Society at Chiswick in 1822, being considered by Sabine, in his paper on the native country of the wild potato, to be the true S. tuberosum and the origin of the cultivated forms. This species was also found by Darwin in Chili, and was considered by him, as by Sabine before him, to be the wild potato. It is remarkable, says Darwin, that the same plant should be found in the sterile mountains of central Chili, where a drop of rain does not fall for more than six months, and within the damp forests of these*~~

~~*595*~~

~~*southern (Chonos) islands. The explanation, according to Baker, is that the plant of the dry mountains is S. twberosum, that of the coast is S. Afaglia. It must, however, be stated that, although Mr Baker refers to the plants figured by Sabine (Zrans. Hort. Soc. Lond., vol. v. p. 249) as being without doubt S. Maglia, A. de Candolle (Origine des Plantes eultivées, p. 40) is equally emphatic in the opinion, "ce qui saute aux yeux," that the plant grown. from Chilian tubers and figured in the plate before cited is S. tuberosum. S. Commersont occurs in Uruguay, Buenos Ayres, and the Argentine Republic, in rocky situations at a low level. Under the name of S. Ohrondii it has lately been introduced into western France, where it is not only hardy but produces abundance of tubers, which arc palatable, but have a slightly acid taste. The tubers give promise of improvement under cultivation. S. cardio- phyllum, described by Lindley in the Journal of the Horticultural Society, is a native of the mountains of central Mexico at elevations of 8000 to 9000 feet. S. Jameszi is a well-defined species occurring in the mountains of Colorado, New Mexico, and Arizona, and also in Mexico. In a wild state the tubers are not larger than marbles, but as the plant is now in cultivation in England it may be expected to improve in*~~

~~*this particular. S. oxyearpwm is stated by Mr Baker to be a little known but very distinct tuberous species from central Mexico.*~~ ~~+~~

~~*Mr Baker looks upon the forms enumerated not only with the eye of a systematic botanist but with the tendencies of one whose object is to assign varying forms to one common type from which they have, or may probably have, arisen. But from a practical point of view the forms in question require careful analysis rather than synthesis. Their morphological peculiarities and chemical constitution deserve attentive consideration as to their degree of constancy, and more particularly as to any relation that may be traced between them and the climatic circumstances under which they grow naturally, and their power of resistance to the attacks of disease. A review of the localities in which the presence of S. tuberosum and its tuber-bearing allies has been ascertained shows that, broadly, these varieties may be divided into moun- tainous and littoral. In either case they would not be subjected, at least in their growing season, to the same extremes of heat, cold, and drought as plants growing on inland plains. Again, those forms growing at a high elevation would probably start into growth later in the season than those near the coast. The significance of these facts from a cultural point of view is twofold: for, while a late variety is desirable for culture in Great Britain, as ensuring more or less immunity from spring frost, which would injure the early sorts, it is, on the other hand, undesirable, because late varieties are more liable to be attacked by the potato disease, which as a rule makes its appearance at or about the time when the earliest varieties are ready for lifting, but before the late varieties are matured, and consequently while they are still exposed to the destructive influences of the fungus.*~~

~~*1 Although these six are the only species admitted as such by Mr Baker, it is well to note some of the forms or varieties, because, although they may not be entitled to specific rank, which after all is a matter of opinion, they may yet be of importance in the future. First of all may be mentioned the S. etuberosum of Lindley, differmg from the common S, tuberoswm in not producing tubers. This was found in Chili, and is probably not specifically distinct, although exceptional, for it is by no means very unusual to find even cultivated plants pro- duce no tubers. S. Fernandezianwm is, according to Baker, a form of S. tuberosum, but if so its habitat in the*~~

~~*mountain woods of Juan Fernandez is climatically different from that in the dry mountains of central Chili, where, as we have seen, the true S. tuberosum grows. S. otites was found recently by M. André on the summit of Quindiu in Colombia, at a height of 11,483 feet, in a rigorous climate, only about 3300 feet below the perpetual snows of Tolima. It produces tubers of the size of anut. S. Andreanum, found by M. André at Cauca, at an elevation of 6234 feet, was considered by the traveller to be the true S. tuberosum, but this view is not shared by Mr Baker, who named it after the discoverer. Its tubers, if it produces any, have not been seen. S. cmmite is probably only a slight variety of S. tuberosum, as are also the Venezuelan S. colombianum, S. verrueosum, S. demissum, and S. utile. S. Fendleri, a native of the mountains of New Mexico and Arizona, was considered by Asa Gray to be likewise a form of S. tuberosum.*~~

~~In cultivation! the potato varies very greatly not only as to the season of its growth but also as to productive- ness, the vigour and luxuriance of its foliage, the presence or relative absence of hairs, the form of the leaves, the size and colour of the flowers, &c. It is probable that a more careful investigation of these peculiarities, and especially of those connected with the microscopical ana- tomy of the leaves, would give serviceable indications of the varieties most or least susceptible to the disease,— a point at present hardly if at all attended to. As to the tubers, they vary greatly in size, form, and colour ; gardeners divide them into rounded forms and long forms or "kidneys"; '"lapstones" are more or less flattened ; and "pebble" varieties are long potatoes broader at one end than at the other. The colour of the rind, yellowish, brown, or purple, furnishes distinctions, as does the yellow or white colour of the flesh. The colour of the eyes and their prominence or depression are relatively very constant characteristics. These variations have originated chiefly by cross-breeding, but not invariably so, as some varieties rarely, if ever, produce flowers in Britain, and yet "sports" have been observed in their tubers and have become the parents of new varieties. Various methods have been pro- posed for the prevention or arrest of the ravages of the fungus which causes the " potato disease" (see below). In addition to different modes of cultivation, attempts have been made to secure varieties less liable than others to disease, and, although no great measure of success has been attained, still the matter is not without promise, seeing how the early varieties, as before stated, escape the full virulence of the malady. Other attempts have been made to infuse a hardier constitution by hybridizing the potato with hardy species such as S. Dulcamara and S. ngrum. HHybrids were accordingly raised by Mr Maule, but they all suffered from. the disease as much as the parents, and it is to be feared that the hybrids raised between the common potatoes and some of the six species mentioned by Mr Baker may suffer a like fate. This, however, remains to be proved. Mr Maule, disappointed with his hybridization experiments, then tried the effect of grafting. With this view he grafted S. nigrum on to a shoot of the potato. New tubers were formed, the foliage being wholly that of S. nigrum. In another ex- periment he grafted the potato on to S. Dulcamara. In one case tubers were produced on the graft~~

~~(the potato), but none on the Dulcamara stock, either above or below ground, while in another case tubers were actually pro- duced on the underground portions of S. Dulcamara. Mr Maule's experiments were most ingenious, but the theory he gave in his The Potato, what is it? (Bristol, 1876) will not commend itself to physiologists, and there is no evidence to show whether the grafts he obtained were attacked by the parasite or even whether they had a chance of being so. Mr Maule's experiments, especi- ally the one last mentioned, afford confirmation of the possibility of graft hybridization being effected. Various experimenters, especially Mr Fenn, have asserted that by engrafting an eye of one variety into the tuber of another, not only will adhesion take place but the new tubers will present great variety of character; and this indeed seems to be the case from the numerous specimens shown by Mr Fenn at the Royal Horticultural Society, but it can hardly, be considered as established that the variations in questioui were the result of any commingling of the essences of the two varieties. The wound may simply have set up that variation in the buds the occasional existence of which has been already noted. The last-cited experiment of Mr Maule's, however, is much more conclusive. Mr A, Dean also (Gardeners' Chronicle, 24 September 1876, p. 304)~~

~~' See HorticuLturE, vol. xii. p. 286.~~

~~POW 2. .~~

~~succeeded in grafting the potato on to the tomato, with the result that, although no tubers were found on the root of the tomato, numerous tubers were produced on the sides of the branches of the potato. Another experiment may be here mentioned as throwing light on the formation of tubers, one wherein Mr Burbidge observed the production of tubers at the portion of an ordinary cutting of S. Com- mersont inserted in the soil, In this case no tubers were formed above ground. (M. T. M.)~~

~~Potato DISEASE.~~

~~There are few agricultural subjects of greater importance than the culture of the potato and the losses entailed by potato disease. The number of acres in Great Britain alone under cultivation for potatoes is generally more than half a million (543,455 in 1883, 562,344 in 1884); the average weight of~~

~~*the produce per acre may be taken at five tons, the average price about £5 per ton, so that the commercial value of each year's crop commonly ranges between £13,000,000 and £15,000,000. It is not unusual in bad seasons for a single grower to lose from £1000 to £1500 through disease; for the market grower some- times not only loses the entire produce, or nearly so, but loses also the value of the seed, the guano, the farm-yard manure, the rent, and the labour. Growers sometimes lose £30 per acre in one season, for, exclusive of the dis- eased produce, £10 may be put down to guano and dung, £4, 10s. to rent, tithes, and taxes, £6, 10s. for seed, and £2 for digging; added to this there are ploughing, har- rowing, overlooking, earthing up, sacks, carriage to and fro, and many minor expenses. The losses range in amount according to the virulence and general extent of the dis- ease. In extreme cases every tuber is lost, as the produce will not even pay the cost of lifting. The year of the great potato famine in Britain was 1845, but the Rev. M. J. Berkeley, in his famous essay on the potato murrain published by the Royal Horticultural Society of England in 1846, stated that a very serious disease of the potato named the "curl" had at that time been known in Britain for more than half a century. We now know that the "curl" is a condition of the true potato murrain. Asa rule, although there are a few exceptions, the disease occurs wherever the potato is grown. It is known in South America, in the home of the potato plant.*~~

~~*The disease of potatoes is caused by the growth of a fungus named Peronospora infestans, Mont., within the tissues of the host plant, and this fungus has the peculiar property of piercing and breaking up the cellular tissues, and setting up putrescence in the course of its growth. The parasite, which has a somewhat restricted range of host plants, chiefly invades the potato, Solanum tuberosum,*~~

~~*'L.; the bittersweet, S. Dulcamara, L.; S. demissum, Lind. ;*~~

~~*and S. cardiophyllum, Lind. It is also very destructive to the tomato, Lycopersicum esculentum, Mill., and to all or nearly all the other species of Lycopersicum. At times it attacks petunias and even Scrophulariaceous plants, as Anthocersis and Schizanthus. A second species of Perono- spora is known on Solanaceous plants, viz., P. Hyoscyam, D.By., a parasite of the common henbane.*~~

~~*In England the disease is generally first seen during the last ten days of July ; its extension is greatly favoured by the warm and showery weather peculiar to that period of the year, and according as the warm and humid weather of autumn is late or early the murrain varies a little in its time of appearance. To the unaided eye the disease is seen as purplish brown or blackish blotches of various sizes, at first on the tips and edges of the leaves, and ultimately upon the leaf-stalks and the larger stems. On gathering the foliage for examination, especially in humid weather, these dark blotches are seen to be putrid,*~~

~~*rota TG*~~

~~*and when the disease takes a bad form the dying leaves give out a highly offensive odour. The fungus, which is chiefly within the leaves and stems, seldom emerges through the firm upper surface of the leaf; it commonly appears as a white bloom or mildew on the circumference of the disease-patches on the under surface. It grows within the tissues from central spots towards an ever- extending circumference, carrying putrescence in its course. As the patches extend in size by the growth of the fungus they at length become confluent, and so the leaves are destroyed and an end is put to one of the chief vital functions of the host plant. On the destruction of the leaves the fungus either. descends the stem by the interior or the spores are washed by the rain to the tubers in the ground. In either case the tubers are reached by the fungus or its spores, and so become diseased. The fungus which undoubtedly causes the mischief is very small in size, and under the microscope appears slightly whitish or colourless. The highest powers are required to see all parts of the parasite.*~~

~~*The accompanying illustration, drawn from nature, shows the*~~

~~*habit and structure of the fungus, Peronospora infestans, Mont. The letters A B show a vertical section through a fragment of a*~~

~~*Peronospora infestans, Mont.—Fungus of Potato Disease.*~~

~~*potato leaf, enlarged 100 diameters ; A is the upper surface line, and B the lower ; the lower surface of the leaf is shown at the top, the better to exhibit the nature of the fungus growths. Between A and B the loose cellular tissue*~~

~~*of which the leaf is partly built up is seen in section, and at C the vertical pallisade cells which give firmness to the upper surface of the leaf. Amongst the minute spherical cells within the substance of the leaf numerous transparent threads are shown ; these are the mycelial threads or spawn of the fungus ; wherever they touch the leaf-cells they pierce or break down the tissue, and so set up decomposition, as indicated by the darker shading. The lower surface of the potato leaf is furnished with numerous organs of transpiration or stomata, which are narrow orifices opening into the leaf and from which moisture is transpired in the form of fine vapour. Out of these small openings the fungus threads emerge, as shown at D, D, D. When the threads reach the air they branch in a tree-like manner, and each branch carries one or more ovate reproductive bodies termed "spores" or " conidia," bodies roughly comparable with seeds, as shown at E, E, E, Sometimes other reproductive bodies roughly comparable with the anthers and pistils of flowering plants are borne inside the leaf, stem, or tuber, as at F; the larger body of these is female, and is termed an "oogonium," and the smaller, which at length pierces the oogonium, is male, and is termed an*~~

~~*'fantheridium." When the spores or conidia are magnified 400 diameters they are seen as at F', and the contained protoplasm often breaks up into a definite number of parts, as at G. When a spore like F germinates it protrudes an ameeba-like mass of protoplasm, as shown at H, which is capable of reproducing the potato fungus at once; and when a differentiated conidium as at G germinates it expels about eight minute mobile bodies called **zoospores," each zoospore being furnished with two extremely attenuated vibrating hairs termed "cilia," as shown at J. These zoospores swim about in any film of moisture, and on going to rest take a spherical form, germinate, and produce threads of mycelium as at K ; the mycelium from the germinating conidia or zoospores soon finds its way into the tissues of the potato leaf by the organs of transpiration, and the process of growth already described is re- peated over and over again till the entire potato leaf, or indeed the whole plant, is reduced to putridity.*~~

~~*The oogonium and antheridium as seen at F are further enlarged to 400 diameters at L;it will here be seen that the smaller male organ or*~~

~~*antheridium has projected a fine beak through the walls of the oogonium or female organism ; through this beak some of the protoplasm from the antheridium passes into and mingles with the protoplasm of the oogonium ; this is the act of fertilization, and an oospore or resting spore (M, N), a body roughly comparable with a seed, is the result. After fertilization the oospores quickly drop from their supporting threads and become free like most ripe fruits. As the potato fungus causes the potato to become putrid the mature oospores or resting spores are necessarily confined to the portions of the potato plant which have been destroyed by the fungus, 7.¢., either to the decayed leaves or stems or to the diseased tubers ; they are brown in colour and generally more or less spinulose or warted. They will not germinate till after a rest of nine, ten, or twelve months, or in some instances even two years. They germinate by protruding threads, which speedily bear spores or conidia as at H, or more rarely zoospores as at J. The resting spores were seen by Dr Rayer and Dr Montague in 1845, and named (in ignorance of their true nature) Artotrogus hydnosporus. The Rev. M. J. Berkeley shortly afterwards identified them as the resting spores of the potato fungus; but they were not seen by any one between the years 1845 and 1875, when in the latter year they were discovered in great abundance and artificially produced from the potato fungus by the writer of this article. At first believed to be rare, they are now known to be amongst the commonest of vegetable productions. The potato fungus is easily made to produce resting spores, and their germination after a year's rest is an observation of no special difficulty. At one time these resting spores were confused by some botanists with a little fugitive transparent fungus, bearing oogonia not half the size of the oogonia of Peronospora infestans, and named Pythiwm vexans, D.By.; the latter plant perfects itself in twenty-four hours or at most a day or two, instead of taking a year or more as do the resting spores of the fungus of the potato disease. Pythiwm vexans has no connexion whatever with the fungus or the potato disease.*~~

~~*The germinating conidia of the potato fungns, as at HK, are not only able to pierce the leaves and stems of the potato plant, and so gain an entry to its interior through the epidermis, but they are also able to pierce the bark of the tuber, especially in young examples. It is therefore obvious that, if the tubers are exposed to the air where they are liable to become slightly cracked by the sun, wind, hail, and rain, and injured by small animals and*~~

~~*insects, the spores from the leaves will drop on to the tubers, quickly germinate upon the slightly-injured places, and cause the potatoes to become dis- eased. Earthing up therefore prevents these injuries, but where practised to an immoderate extent it materially reduces the pro- duce of tubers. The labour entailed in repeated earthing up is also considered a serious objection to its general adoption.*~~

~~*All diseased potato material should be gathered together and either deeply buried or burnt, as the hibernating germs of the disease (oospores) rest in the decaying potato refuse, and the my- celium itself sometimes hibernates.*~~

~~*See Berkeley's essay, "On the Potato Disease," in Journal of the Royal Horti- cultural Society, vol. i., 1846; Professor A. de Bary, "On the Nature of the Potato Fungus," in Jowrnal of Royal Agricultural Society, vol. xii., 1876; Earl Catheart, "The Cultivated Potato," in Journal of Roy. Agr. Soc., 1884; J. G. Baker, "The Tuber-bearing Species of Solanum," in Journal of the Linnean*~~

~~*Society, vol. xx., 1884; and Worthington G. Smith, Diseases of Field and Garden Crops (1884). In the latter work a full bibliography is given. (W. G. SM.)*~~

~~*POTATO, Sweet. This plant (the Convolvulus batatas, or Ipomea batatas of some authors) is generally culti- vated in the West Indies and most tropical countries for the sake of its tuberous root, which is an article of diet greatly in request. It is a climbing perennial with cordate, entire, or palmately-lobed leaves borne on slender twining stems. The flowers are borne on long stalks in loose clusters or cymes, and have a white or rosy funnel- shaped corolla like that of the common bindweed of English hedges. The edible portion is the root, which dilates into*~~

~~*large club-shaped masses filled with starch. It is ill suited to the climate of the United Kingdom, but in tropical countries it is as valuable as the potato is in higher latitudes. The plant is not known in a truly wild state, nor has its origin been ascertained. A. de Candolle con- cludes that it is in all probability of American origin, though dispersed in Japan, China, the*~~

~~*South Sea Islands, Australia, &c. Its migrations are only explained by him on geological grounds of an entirely hypothetical character. It is mentioned by Gerard as the "potato," or "notatus," or "potades" in contradistinction to the "potatoes a Virginia (Solanum tuberosum). He grew it in his garden, but the climate was not warm enough to allow it to flower, and in winter it perished and rotted. But as the appella- tion "common" is applied to them the roots must have been introduced commonly. Gerard tells us he bought those that he planted at "the Exchange in London," and he gives an interesting account of the uses to which they were put, the manner in which they were prepared as " sweetmeats," and the invigorating properties assigned to them. The allusions in the Merry Wives of Windsor and other of Shakespeare's plays in all probability refer to this plant, and not to what we now call the " potato." POTATO BEETLE or Cotorapo BEETLE. See CoLzo- pTERA (Doryphora decemlineata), vol. vi. p. 134. POTEMKIN, Grucory ALExanpDrRovicy (1739-1791), Russian soldier and statesman, was born in 1739 in the village of Domnovo, in the government of Smolensk. His father was a poor nobleman of Polish extraction, but the family had been settled for some time in Russia. Owing to the slender means of his parents, Potemkin's first plan seems to have been to devote himself to the church ; but he did not show much inclination for this profession, and eventually embraced the calling of a soldier. His fortunes rose from the time when he assisted the empress Catherine in her conspiracy against her husband on the memorable 10th of July 1762. On this occasion, when Catherine rode through the ranks, Potemkin, perceiving that she had no plume in her hat, offered her his own. Soon afterwards he became one of the leading favourites and his rise was rapid. We first find him serving under Marshal Roumantzoff against the Turks, but, after having spent some time in the camp, he returned to St Petersburg, where he became more influential than ever. From 1778 till his death the foreign policy of Russia was almost entirely in hishands. By his agency the Crimea was annexed in 1783, the khan being induced to put himself under Russian pro- tection. In January 1787 the empress set out with Potem- kin to survey her new conquests. The description of this journey and of the fantastic luxury which accompanied it has been often given, and need not be recapitulated here. At Kherson Catherine was met by the emperor Joseph, who had travelled from Austria for that purpose. She there passed under a triumphal arch, on which was inscribed, in Greek letters, " The way to Byzantium."*~~

~~*The empress went as far south as Bakhchisarai and Stari Krim, at which point she turned back, reaching St Petersburg on the 22d of July. Soon afterwards war was declared against Turkey and the siege of Otchakoff commenced in July 1788. Here Potemkin acted as commander-in-chief, with 150,000 men at his disposal, but it is difficult to say if he had*~~

~~*any talent as a soldier, as many able men, among others:*~~

~~*Souwaroff, served under him, and he was able to appropriate the fruits of their labour and ability. According to some he showed military genius, according to others he was entirely destitute of it. He is said to have introduced Some very useful changes in the dress and discipline of the Russian armies. Otchakoff was taken in December 1788, with terrible slaughter on both sides, and was followed by the victories of Souwaroff at Bender and Ismail,*~~

~~*POT—P OT*~~

~~*the latter of which was taken in 1790, when Souwaroff sent his celebrated couplet to Catherine : 'Slava Bogu ! Slava Vam ! Krepost vsiata i ya tam.”'?*~~

~~*In March 1791 Potemkin made his triumphal entry into St Petersburg. The description of the banquet which he gave in honour of the empress at his Taurian palace rivals any scene of Oriental magnificence. But his constitution was now breaking ; his body at a comparatively early age was worn out by his labours and excesses. Yet he refused to have recourse to medicine, lived upon salt meat and raw turnips, and drank strong wines and spirits. In the latter part of the year 1791 he went to the south of Russia, the scene of his former triumphs, and lay ill for some time at Jassy, whence he attempted to move to Otchakoff, but after travelling a few versts he could no longer endure the motion of the carriage. He accordingly was lifted out and a carpet was spread for him at the foot of a tree, upon which he soon expired in the arms of his niece, Countess Branicka, on the 15th of October 1791. His body was interred at Kherson, but, from inquiries made on the spot by the traveller Edward Clarke at the commencement of the present century, it seems to have been disinterred and thrown into a ditch by order of the emperor Paul, who hated him.*~~

~~During his lifetime Potemkin did not escape the censure of his countrymen, in proof of which may be cited the attacks of Derzhavin and Radistcheff. Strange stories are told of his extravagance aud whimsicality, among others that he had in his library several volumes of bank notes bound together: He seems to have "sickened of a vague disease" in the midst of all his splendour. His wealth was boundless, as, besides his personal property, he had large landed estates and many thousands of serfs. He was arrogant and capri- cious, a thorough despot, and a man of grossly licentious life. That he was possessed of some ability cannot be doubted, but, taking him all in all, we must say that the prominence of a man of such character has left a deep stain upon the annals of Russia.~~

~~POTENZA, a city of Italy, the chief town of Potenza (Basilicata), lies in the heart of the country, on an isolated hill in the valley of the Basento or Busento (Casuentus or Masuentum), 69 miles by rail east of Salerno and 51 west- north-west of Metapontum, where the Basento reaches the Gulf of Taranto and the railway joins the line between Taranto and Reggio. It is much exposed to stormy winds, and has in general a far more northern climate than its astronomical position (40° 40' N. lat.) implies. Along with Marsico Nuovo the city forms an episcopal diocese dependent on Acerenza, and under the Bourbon Govern- ment it was considered a fortified place of the fourth class. The buildings of chief note are the cathedral, the seminary, and the hospital of San Carlo (1869). The population was 18,295 in 1871 and 16,968 in 1881 (com- mune, 20,281).~~

~~The hill on which Potenza now stands was originally occupied only by the citadel of the ancient Potentia, which spread out in the valley below, and must have been, to judge by its numerous inscriptions, a flourishing municipium during the Roman empire. The old town was destroyed by Frederick II., and again by earth- quake in 1278; the erection of the new town on the hill probably dates from this latter event. By the Angevines Potenza was made a domain of the San Severino family ; in the beginning of the 15th century it was held by Francesco Sforza, and in 1485 it passed to the Guevara family ; the Loffredi, who succeeded by marriage, continued in possession till the abolition of the great fiefs. In 1694 there was a severe earthquake ; and the more terrible earthquake which on 16th and 17th~~

~~*December 1857 passed through southern Italy, and in the Basilicata alone killed 32,475 persons, proved parti- cularly disastrous at Potenza, laying the greater part of the city in ruins.*~~

~~*POTI, a seaport town of Trans-Caucasia in the govern- ment of Kutais (Mingrelia), lies at the mouth of the Rhion (Phasis) on the coast of the Black Sea, 193 miles west- north-west of Tiflis, with which it is connected by a railway*~~

~~*Glory to God ! glory to you ! The fortress is taken and I am there.*~~

~~*POT—POT*~~

~~*opened (except the tunnel of Suram) in 1872. The white walls of the fortress may be seen at'a great distance con- trasting with the green trees which surround them, and the lighthouse, 117 feet high, is visible 17 miles. Situated in a low and marshy delta not more than 2} feet above the level of the river, Poti is extremely unhealthy, fever and ague prevailing in summer and autumn. Ever since the Russians obtained possession of the place they have laboured to improve the town and port, but with compara- tively limited success. The houses are built of wood and supported on piles. After Batoum was transferred to Russia in 1878 it was thought that Poti would be aban- doned as a port, but the Commission of Inquiry appointed in 1883 decided in its favour. Works estimated to cost 2,365,000 roubles and to be finished in four years were accordingly undertaken. The population of the town is given as 3112 in the Russian Calendar for 1882.*~~

~~*Poti represents the ancient Phasis, a commercial colony of the people of Miletus. The present fortress was built in 1578 by Amurath III. at the time of the war with Persia. In 1640 it was destroyed by the Imeritians, but it was again restored and enlarged, the ancient ruins in the neighbourhood yielding the necessary material. The town was a great market for the trade in slaves. It was captured by the Russians in 1812, and again in 1829.*~~

~~*POTOMAG, a river of the United States, which joins Chesapeake Bay by a considerable estuary after a course of about 400 miles. The northern branch of the upper river rises in the Alleghanies, West Virginia, the southern in the Shenandoah Mountains. Affluents are received from*~~

~~*Pennsylvania, Maryland, Virginia, and West Virginia,—the most important of all being the Shenandoah, which joins it at Harper's Ferry, below which the united stream breaks through the line of the Blue Ridge. Ships ascend for a short distance above Washington (the capital of the United States), or a total distance from the sea of 125 miles.*~~

~~*POTOSI (not to be confounded with San Luis Potosi, the state and state capital in Mexico) is a town of Bolivia, at the head of the department of Potosi, in 19° 36' S. lat. and 65° 46' W. long. It stands in a bleak and barren country not far from the sources of the Pilcomaya, and thus belongs to the great basin of the La Plata system. Situated at the height of about 13,280 feet above the sea, it is one of the highest inhabited places in the world, and the Cerro de Potosi,! at the foot of which it stands, reaches a height of 16,150 feet. The wealth of silver ore drawn from it up to 1846 is stated at upwards of £300,000,000 sterling ; and, though the works had for a time to be dis- continued as heavier machinery and greater capital were required, the store is far from being exhausted. The city is still the seat of the national mint. It consists of nine streets about 30 feet broad, running north and south and crossed at right angles by others of varying breadth. The houses (two-storied in the heart of the town, but only of one story in the outskirts) are built of adobe and white- washed. Besides the cathedral (restored in 1858) there are a large number of churches, several convents, and other public buildings ; but the city as a whole has that dilapi- dated and melancholy appearance which is the result of a greatly diminished population. In 1611 its inhabitants are said to have numbered 160,000; at present they are probably not more than 11,000, though Hugo Reck about 1867 gave 22,850 and Ondarza in 1882 repeated exactly the same figures.*~~
~~©~~

~~*The foundation of the town dates from 1547, two years after the first discovery of silver ore on Cerro de Potosi. In 1825 a monu- ment to Bolivar was erected in the public square. The history of Potosi from its origin till 1702 will be found in Don Vicente Ballivian y Rojas's Bolivian Archives.*~~

~~*POTSDAM, the seat of government for the Prussian province of Brandenburg, and the summer residence of the emperor of Germany, lies 16 miles to the south-west of*~~

~~1 For a description of this mountain, see Botrvia (vol. iv. p. 18).~~

~~599~~

~~Berlin, on the river Havel, which here expands into a series of small lakes. The town is handsomely built, though with a monotonous regularity that betrays its artificial origin, and is situated amid the prettiest scenery of the Mark of Brandenburg, consisting of an oasis of wood and hill and lake in the centre of a sandy and un- attractive plain. Except during the summer months,~~

~~when its streets are enlivened by endless streams of excur- sionists from Berlin, Potsdam usually presents a somewhat~~

~~Potsdam.~~

~~its extensive garrison. The greater part of the town lies on the right bank of the Havel and is connected with the Teltow suburb. on the opposite bank by a long bridge. At the north end of this bridge rises the royal palace, a large quadrangular building of the 17th century, with a colonnade, chiefly interesting for the numerous relics it contains of Frederick the Great, who made it his favourite residence. It also contains reminiscences of Voltaire, who also resided here for several years. The principal churches are the Nicolaikirche, a handsome edifice with a dome; the garrison church, containing the remains of Frederick the Great and his father; and the Friedens- kirche or church of peace, erected by Frederick William IV. as a "positive and Christian counterpart to the worldly negative of Sans Souci." Among other conspicuous build- ings are the large barracks, orphanages, and other military establishments ; the town-house; the district courts ; the theatre; and the Brandenburg gate, in the style of a Roman triumphal arch. The Lustgarten, Wilhelmsplatz, and Plantage are open spaces laid out as pleasure-grounds and adorned with statues and busts. In spite of its some- what sleepy appearance, Potsdam is the seat of a varied if not very extensive industry, of which sugar, cotton and woollen goods, chocolate, and tobacco are the chief pro- ducts. Market-gardening affords occupation to many of the inhabitants, and the cultivation of winter violets is important enough to be mentioned as a specialty. The Havel is well stocked with fish.~~

~~*In 1880 Potsdam con- tained 48,447 inhabitants, mainly Protestant. The garri- son consists of about 7000 men.*~~

~~*Potsdam is almost entirely surrounded by a fringe of royal palaces, parks, and pleasure-grounds, which fairly substantiate its claim to the title of a "German Versailles." Immediately to the west is the park of Sans Souci, laid out by Frederick the Great, and largely extended by Frederick William IV. It is in the formal French style of the period, and is profusely embellished with primly- cut hedges and alleys, terraces, fountains, statuary, and artificial ruins. Adjacent to the palace is the famous windmill (now royal property) which its owner refused to sell to the king, meeting threatened violence by an appeal to the judges of Berlin; the whole story, however, is now doubted. A little farther on is the so-called Orangery,*~~

~~*Plate V.*~~

~~*600*~~

~~*an extensive edifice in the Italian style, containing numer- ous pictures and other works of art. The park also includes the Charlottenhof, a reproduction of a Pompeian_ villa. At the west end of the park stands the New Palace, a huge brick edifice 375 feet in length, erected by Frederick the Great at enormous expense in 1763-69, and now occu- pied by the crown prince of Germany. It contains other reminiscences of Frederick and Voltaire, a few pictures by ancient masters, a theatre, and a large hall gorgeously decorated with shells and minerals. The spacious build- ings at the back are devoted to the "Lehrbataillon," a battalion of infantry composed of draughts from differ- ent regiments trained here to ensure uniformity of drill throughout the army. To the north of Potsdam lies a small Russian village, established in 1826 to accommodate the Russian singers attached to the Prussian guards. A little to the east of it is the New Garden, containing the Marble Palace. The list of Potsdam palaces may be closed with two situated on the left bank of the Havel—one at Glienicke and the other on the hill of Babelsberg. The latter, a picturesque building in the English Gothic style, in the midst of a park also in the English taste, is the summier residence of the present emperor of Germany.*~~

~~*Potsdam was originally a Slavonic fishing-village named Potsdu- pimi, and is first mentioned in a document of 993. It did not, however, attain any importance until the Great Elector established a park and palace here about 1660; and even at the close of his reign it only contained 3000 inhabitants. Frederick William I, (1688-1740) greatly enlarged Potsdam, and his stiff military tastes — are reflected in the monotonous uniformity of the streets. Frederick the Great willingly continued his father's work, and is the real creator of the modern splendour of the town, of which his memory may be said to form the predominant interest. His successors have each contributed his quota towards the embellishment and extension of the town.*~~

~~*POTTER, Joun (c. 1674-1747), archbishop of Canter- bury, was the son of a linen-draper at Wakefield, York- shire, and was born about 1674. At the age of fourteen he entered University College, Oxford, and in 1693 he published, at the suggestion of the master of his college, various readings and notes on Plutarch's De audiendis poetts and Basil's Oratio ad juvenes. In 1694 he became a fellow of Lincoln College, and in 1697 his edition of Lycophron appeared. It was followed by his Archeologia Greca (2 vols. 8vo, 1697-99), once a very popular work. A reprint of his Lycophron in 1702 was dedicated to*~~

~~*TN eee*~~

~~*| Greevius, and the Antiquities was afterwards published*~~

~~*a: OT*~~

~~*in Latin in the Thesaurus of Gronovius. In 1704 he be- came chaplain to Archbishop Tenison, and shortly after- wards was made chaplain-in-ordinary to Queen Anne. From 1708 he was regius professor of divinity and canon of Christ Church, Oxford; and from 1715 he was bishop of Oxford. In the latter year appeared his edition of Clemens Alexandrinus (frequently reprinted and still valued). In 1707 he published a Discourse on Church Government, and he took a prominent part in the controversy with Hoadly, bishop of Bangor, being complimented by that author as the antagonist of whom he was most afraid. In January 1737 Potter was unexpectedly appointed to succeed Wake in the see of Canterbury. His primacy was in no way re- markable, but had the effect of checking the movement for revision*~~

~~*of the formularies and confessions of the church and of the subscription to them. He died on 10th October 1747. His Theological Works, consisting of sermons, charges, divinity lectures, and the Discourse on Church Government, were published in 3 vols. 8vo, in 1753.*~~

~~*POTTER, Patz (1625-1654), animal painter, was born at Enkhuizen, Holland, in 1625. He was instructed in art by his father, Peter Potter, a landscape and figure painter of some merit, and by the time he had attained his fifteenth year his productions were already much esteemed. At the age of twenty he settled at The Hague, and there married in 1650. He was patronized by Maurice, prince of Orange, for whom he painted the life-size picture of the Young Bull, now one of the most celebrated works in the gallery of The Hague. In 1652 he was induced by Burgomaster Tulk of Amsterdam to remove to that city. The constitution of the painter seems to have been feeble, and his health suffered from the unremitting diligence with which he pursued his art. He died in 1654 at the early age of twenty-nine.*~~

~~*His paintings are generally on a small scale ; his animals are de- signed with a careful accuracy which bears witness to the artist's close and constant study from nature ; while the landscape back- grounds are introduced with spirit and appropriateness. His colour is clear and transparent, his execution firm and finished without being laboured. He executed a series of some twenty etchings, mainly of animals, which are simple and direct in method and handling. Here, as in painting, his precocity was remarkable ; his large plate of the Herdsman, produced when he was only eighteen,*~~

~~*and that of the Shepherd, which dates from the following year, show him at his best as an accomplished master of the point.*~~

~~*POTTERY AND PO@ORCEHIAID*~~

~~*HE word "pottery" (Fr. poterte) in its widest sense | includes all objects made of clay, moulded into form while in a moist plastic state, and then hardened by fire. Clay, the most widely spread and abundant of all mineral substances, consists essentially of a hydrated sili- cate of alumina (see vol. x. p. 237), admixed, however, in almost all cases with various impurities.*~~

~~*Thus it usually contains a considerable proportion of free silica, lime, and oxides of iron, its colour chiefly depending on the last in- gredient. The white kaolin clays (see Kaoxrn) used in the manufacture of porcelain are the purest ; they consist of silicate of alumina, with 5 to 7 per cent. of potash, and only traces of lime, iron, and magnesia.*~~

~~*The making of pottery depends on the chemical change that takes place when clay is heated in the fire; the hydrated silicate of alumina becomes anhydrous, and, though the baked vessel can absorb mechanically a large quantity of water, the chemical state, and with it the hard- ness of the vessel, remains unaltered. A well-baked piece of clay is the most durable of all manufactured substances. In preparing clay for the potter it is above all things necessary that it should be worked and beaten, with suffi-*~~

~~*cient water to make it plastic, into a perfectly homogeneous mass. Any inequalities cause an irregular expansion during the firing, and the pot cracks or flies to pieces. In early times the clay was prepared by being kneaded by the hands or trampled by the feet (see Isa. xli. 25); modern manu- facturers prepare it on a larger scale by grinding it between mill-stones, and mixing it in a fluid state with an addi- tional quantity of silica, lime, and other substances. During the process of firing all clays shrink in volume, partly through the loss of water and partly on account of in- crease of density. What are called "fat" clays—those, that is to say, which are very plastic and unctuous—shrink very much, losing from one-third to one-fourth of their bulk ; they are also very liable to crack or twist during the firing. "Lean" clays—those that have a large percentage of free silica—shrink but little, and keep their form unaltered under the heat of the kiln ; they are not, however, so easy to mould into the required shape, and thus a certain com- promise is frequently required. Lean and fat clays are mixed together, or silica (sand or ground and calcined flints) is added to a fat clay in sufficient quantity to enable*~~

~~*| it to stand the firing. The same result may be attained*~~

~~*vitreous coatings to clay, whether enamel or glaze, is this. The materials are ground fine and mixed with water to the consistency of cream. mixture, or*~~

~~*the fluid is applied with a brush ; it is then set to dry, and finally fired in the kiln, which must be heated sufficiently to fuse the component parts of the glaze or enamel into one smooth vitreous coating, while on the other hand it must not be hot enough to soften or melt the clay body of the vessel. The use of oxide of lead enables*~~

~~*by the addition of broken pots, crushed or ground, an ex-*~~

~~*pedient practised during the earliest stages of the develop-*~~

~~*ment of the art of pottery.*~~

~~*Classification—Many attempts have been made to classify pottery and porcelain according to their mode of manufacture. The classification of M. Brongniart (7rasté des Arts Céramiques, Paris, 1854) has been followed by most later writers. With some modifications it is as follows :—*~~

~~*(a) Bisewit.—Simple baked clay, porous and without gloss. Example, a common modern flower-pot.*~~

~~*(b) Glossy.—Fine clay covered with an almost imperceptible vitreous glaze. Example, most Greek vases.*~~

~~*(c) Glazed.—Clay covered with a perceptible coating of glass. Example, common white earthenware plates.*~~

~~*(d) Enamelled.—Clay covered with a vitreous*~~

~~*1. Soft pottery, easily fusible.*~~

~~*601*~~

~~*The pot is dipped in the*~~

~~*a glaze to be applied to a clay body which would not stand the high temperature necessary to combine and fuse a pure silico-alkaline glaze. In order to prevent the glaze or enamel from blistering or cracking off there must be a certain similarity of substance between the clay body and the vitreous coating. A fine silicious glaze or enamel will not adhere to a soft*~~

~~*fat clay unless the proportion of silica in the latter is increased either by admixture of a harder, more silicious clay, or by the addition of pure silica either*~~

~~*coating made opaque by white oxide of*~~

~~*U tin. Example, Italian majolica. (a) Very silicious clay covered with a lead vitreous glaze. Example, old grey*~~

~~*in the form of sand or of ground flint. The Potter's Wheel.—All pottery, except the rudest and Potter's most primitive sorts, is moulded or "thrown" by the aid wheel.*~~

~~*"Tech- nical terms.*~~

~~*- forming ornaments in relief, as in the case of some Roman*~~

~~*2. Stoneware, very hard and infus- ible.*~~

~~*Flemish ware.*~~

~~*(b) Silicious clay covered with a salt glaze. Example, a modern brown ginger — beer bottle.*~~

~~*(a) Hard Porcelain.—Natural kaolinic clay covered with a felspar glaze. Example, porcelain of China and Japan.*~~

~~*(b) Soft Porcelain.—Artificial paste covered with a lead vitreous glaze. Example, early Sévres porcelain.*~~

~~*This classification is necessarily imperfect, some pottery coming under two heads, as, for instance, much of the Italian majolica, which is both enamelled and glazed. For this reason in the following article pottery will be treated according to its age and country, not according to its method of manufacture. Porcelain differs from pottery in being whiter, harder, less fusible, and (most essential difference) in being slightly translucent. The paste of which it is formed is a purer silicate of alumina than the clay of which pottery is made. It will therefore be de- scribed under separate heads (p. 633 s¢., infra).*~~

~~*For the sake of clearness it will be well to define the sense in which technical words relating to pottery are used in this article. Body or paste is the clay of which the main bulk of a pot is made. Slip is clay finely ground and mixed with water to the consistency of cream. It is usually applied over the whole surface of a vessel in order to give it a finer face or a different colour from that of the body of the pot. It is also sometimes applied partially,*~~

~~*3. Porcelain, white, semi- transpar — ent, and only fused at a high temperature.*~~

~~*ware and the coarse 17th-century pottery of Staffordshire described below. Glaze is a thin coating of glass, evenly fused over the surface of a clay vessel to make it harder, and also to render it impervious to water. Clay simply baked without a vitreous coating is called bescuit; its surface is dull, and it is more or less porous. The sim- plest and oldest form of glaze is a pure silicate of soda ; the addition of oxide of lead makes the glaze more fusible, but less hard and durable. For decorative purposes glazes may be coloured by various metallic oxides without losing their transparency. namel is a glaze with the addition of some substance to render it opaque. Binoxide of tin has the peculiar property that when even a small quantity is added to a transparent glass it renders it opaque and white without otherwise altering its character. Great con- fusion has been caused in various works on pottery by a careless use of the terms "glaze" and "enamel"; they are both of the nature of glass, but the best distinction to make is to apply the word "enamel" to a vitreous coating that is opaque, and the word "glaze" to one that is trans- parent; both may be coloured. The method of applying*~~

~~*of a very simple contrivance, a small round table fixed on a revolving pivot. Fig. 1, from a tomb-painting at Thebes, shows its simplest form. The potter at intervals gives a spin to the table, which continues to re- volve for some time without a fresh impulse. This form of wheel, used by the Egyptians (as is shown by existing fragments of pottery) about 4000 B.c., is still employed without any alteration by the pot- g ters of many parts of India. A later improvement introduced in Egypt under the Ptolemies was to have another larger circular table, fixed lower down on the same axis, which the potter*~~

~~*set in movement with his feet, and thus was able to keep up a regular speed and leave his hands free for the manipulation of the clay (see fig. 2). No process in any handicraft is more beautiful than that of a potter ER moulding a vessel on the wheel. The ease with which the plastic clay answers to the touch of the hand, and rises or falls, taking a whole succession of symme- trical shapes, and seeming, as it were, instinct with the life and thought of the potter, makes this art beautiful and striking beyond all others, in which the desired form can only be at- tained by comparatively slow Frc. 2.—Potter's wheel of the and laborious methods. Ancient time of the Ptolemies, moved poetry is full of allusions to this. a , a warts es ond Homer (1., vile 600) omer 65, the wheel on Se risk pares the rhythm of a dance to the measured spin of a potter's wheel; and the rapid ease with which a clay vessel is made and remade in a new form is described by Jeremiah (xviii. 3-4) in one of his most forcible similes (compare Horace, A. P., 21-22). Among the Egyptians of the Ptolemaic period the potter was used asa type of the Creator. Nouf or Knoum, the divine spirit, and Pthah, the creator of the mundane egg, are symbolized by human figures moulding clay on the potter's wheel.! The wheel and egg are shown above in fig. 2. 1 See Rossellino, Monumenti dell' Egitto, pl. xxi. and xxii, 1844, XIX. —76*~~

~~*Fig. 1.—Potter moulding a vessel on the wheel, from a painting in a tomb at Thebes about 1800 B.c. Compare the wheel on the left in fig. 55.*~~

~~*Kilns.*~~

~~*Pre- historic.*~~

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~~*Kilns for firing Pottery.—The earliest form of kiln, as represented in Egyptian wall-paintings, is a tall circular chamber of brick, with a perforated floor near the bot- tom. The fuel was introduced from an opening on one side, and raked in under the brick floor. The pottery to be baked was piled up in the upper part of the chamber. Fig. 3, from a potter's votive tablet from Corinth, shows an early Greek form of kiln, with a place for the fuel on one side, and a door in the side of the up- per chamber through*~~

which the pottery could be put in and withdrawn. The Cor- inthian kiln differs from the Egyptian kiln in being domed

Fie. 3.—Early Greek pottery-kiln, about 700-600 3.c., from a painted votive tablet found at Corinth, now in the Louvre. The

over, but it is the section shows the probable construction of

same in principle, the kiln. 7

Even at the present day kilns shaped almost exactly like

this early Greek one are still largely used.

SECTION J.—PREHISTORIC.

The art of making pottery is one of the most extreme antiquity ; with the exception of the cave-dwellers of the Drift or Paleolithic period it was practised by all known prehistoric races from the Neolithic age downwards. The sepulchral barrows of Britain and other European countries have supplied vast stores of this earliest kind of pottery. It is mostly formed of coarse clay, generally brown in colour, though sometimes grey or reddish; some few specimens are fine in texture and have a slightly glossy surface. The clay, while moist, has been kneaded with some care, and is often mixed with a proportion of gravel, coarse sand, quartz crystals, or pounded pottery. The more carefully made specimens, chiefly those of the bronze and iron ages, are frequently covered with a smooth slip, made of the same clay as the body, but finely pounded and thoroughly mixed. All are alike "hand-made," without any assistance from the potter's wheel; some of the smaller ones are scooped out of a solid ball of clay, while in some cases great skill has been shown in the building up, by the unaided hand, of the thin walls of larger vessels, some of which are so round and neatly formed as to appear at first sight to be wheel- made. This, however, is never the case with the pottery of the three great prehistoric periods.

~~*The shapes found in the sepulchral barrows of Britain, France, Scandinavia, and other countries are usually classified thus—(1) cinerary urns, (2) food vessels, (3) drinking-cups, and (4) the so-called "incense cups" (see fig. 4).*~~

~~*(1) Cinerary urns, usually found full of burned bones, are the largest, varying from 12 to 18 inches in height. They are mostly less ornamented and less carefully made than the smaller vessels. Most have their decoration confined to a band round the upper part of the pot, or often only a projecting flange lapped round the whole rim. A few have small handles, formed of pierced knobs of clay, and sometimes projecting rolls of clay looped, as it were, all*~~

~~*round the urn. (2) Food-vessels va i in si) ry considerably in size and form. Some are shaped like a tea-cup, with a handle on one side ; others*~~

~~*»*~~

~~*POTTERY,*~~

~~*[PREHISTORIC.*~~

~~*are like small cinerary urns, either quite plain or with pierced knob-handles and bands of ornaments incised or impressed. (8) Drink-*~~

~~*" Tncense cups."*~~

~~*Drinking-cup. Domestic bowl.*~~

~~*Fig. 4.—Various forms of prehistoric pottery.*~~

~~*ing-cups, mostly from 6 to 8 inches high, vary but little in form, and are usually completely covered with ornament. They are often made with considerable care and skill, and are not ungraceful in shape. The names given to the preceding three classes possibly express their real use, but the name of the fourth class, "incense cups," is purely imaginary. Under this head are comprised a number of small] vessels of very varied shape, some with their sides pierced through with square or lozenge-shaped openings,*~~

~~while others, almost globular in shape, have several pierced knob-handles, as if for suspension. Some are quite plain, and others are covered with ornament. Their use is unknown; one possible suggestion is that they were intended to carry fire from some sacred source to light the funeral pyre. Canon Greenwell, probably the best authority on this subject, believes, contrary to the opinion of many anti- quaries, that none of the above classes of barrow-pottery were intended for domestic use, but that they were made.solely to be buried with the dead. He considers that a fifth class of pottery, chiefly in the form of bowls, which has occasionally been found, not in barrows but in dwellings, is the only kind that was actually used for domestic purposes by prehistoric man (see Greenwell, British Barrows, 1877). ,~~

~~The ornament which is often lavishly applied on prehistoric pottery is of especial interest. It frequently consists of lines of smal] dots impressed from a notched piece of wood or metal, arranged in various patterns—crosses, chevrons, or zigzags. All the patterns were stamped into the body of the pot before it was hardened by fire. The lines were frequently made by pressing a twisted thong of skin against the moist clay, so that a sort of spiral sunk line was produced. Other bands of ornament were made by wooden stamps ; the end of a hollow round stick was used to form a row of small circles, or a round stick was used sideways to produce semicircular depressions. In some cases the incised lines or dots have been filled up with a white slip of pipeclay. Con- siderable taste and invention are shown by many of these combined ornaments, and a certain richness of decorative effect is produced on some of the best drinking-cups ; but one thing is to be noted: all the main lines are straight, no wavy lines or circles appearing, except in very rare instances—a fact which points to the very limited artistic development attained by the prehistoric races.~~

~~Prehistoric pottery has sometimes been described as "sun-baked," but this is not the case; however imperfectly baked, the pieces have all been permanently hardened by fire, otherwise they would certainly not have lasted to our time. This was done in a very rough and imperfect manner, not in a kiln but in an open fire, so that in some cases the pots have received a superficial black colour from the smoke of the fuel. Great quantities of this pottery have been found in the sepulchral barrows of Great Britain and~~

~~*Ireland ; those from the latter country are usually very superior in neatness of execution to the British specimens. The British Museum is specially rich in this class of pottery, chiefly the result of excava- tions made in British barrows by Canon Greenwell.*~~

~~*For prehistoric pottery, see Greenwell, British Barrows, 1877; Lubbock, Prehistoric Times, 1865; Boyd Dawkins, Early Man in Britain, 1880; D. Wilson, Prehistoric Man, 3d ed., 1876, and Prehistoric Annals of Scotland, 1851 ; Keller, Lake-Dwellings in Switzerland (tr., by Lee, 1878); Bonstetten, Recuetl @ Antiquités Suisses, 1855-57; Perrin, Etude Préhistorique, 1870; Troyon, Habitations Lacustres, 1860 ; Borlase, Nenia Cornubie, 1872.*~~

~~*Mate-*~~

~~*| rials.*~~

~~*Ename!l- led clay plaques.*~~

~~*ANCIENT EGYPTIAN. |*~~

~~*Section I].—ANcIENT EGYPTIAN.*~~

~~*But few examples remain which date from the time of the earlier dynasties of Egypt, though from the XVIIIth Dynasty downwards a great quantity of specimens exist. Broken fragments, embedded in the clay bricks of which some of the oldest pyramids are built, supply us with a few imperfect samples whose date can be fixed. The early pottery of Egypt is of many varieties of quality: some is formed of coarse brown clay moulded by hand without the aid of the wheel; other specimens, thin and carefully wheel-made, are of fine red clay, with a slight surface gloss, something like the "'Samian" pottery of the Romans. Some fragments of brown clay have been found, covered with a smooth slip made of a creamy white or yellowish clay. The early uss of fine coloured enamels, afterwards brought to such perfection in Egypt, is shown by the enamelled clay plaques in black, white, and greenish blue which decorated the doorway of the great step-pyramid at Sakkara. Each plaque has a pierced projection at the back, so that it could be firmly fixed by means of a wood or metal dowel.*~~

~~*Egypt is rich in materials for pottery, both glazed and enamelled. The finest of clays is washed down and deposited by the Nile; the sandy deserts supply pure silica ; and a great part of the soil is saturated with the alkali necessary for the composition of vitreous enamels and glazes. In spite, however, of this abundance of materials the Egyptians never learned to apply either their enamels or their glazes, both of great beauty, to their larger works in pottery made of the fine Nile clay. The reason probably was that the clay was too fat, and there- fore a vitreous coating would have flaked off during the firing, while they had not discovered the simple expedient of mixing with the native clay an addition of sand (silica), which would have enabled both glazes and enamels to form a firm coating over the body of the vessel. The colours used for Egyptian enamels and glazes are very varied, and of great beauty and brilliance. The glazes themselves are pure alkaline silicates, free from lead. The enamels are the same, with the addition of oxide of tin. The metallic oxides used to give the colours are these,—various shades of blue and green, protoxide of copper, or more rarely cobalt ; purple and violet, oxide of manganese ; yellow, iron or antimoniate of lead; red, sub-oxide of copper or iron ; black, magnetic oxide of iron or manganese. The white enamel is simply silicate of soda with oxide of tin. The blues and greens, whether used in transparent*~~

~~*'glazes or opaque enamels, are often of extreme magnifi-*~~

~~*cence of colour, in an endless variety of tints,—turquoise, ultramarine, deep indigo, and all shades of blue passing into green. The most remarkable specimens of Egyptian enamel work are some clay plaques or slabs, about 10 inches high, which were used to decorate the walls of Rameses II.'s palace at Tel al-Yahudfya, in the Delta (14th cent. B.c.). These have figures of men and animals executed in many different colours in the most complicated and ingenious manner. They are partly modelled in slight relief, and then covered with coloured enamels ; in other parts a sort of mosaic has been made by mixing fine clay and enamels into soft pastes, the design being fitted together and modelled in these coloured pastes while moist. The slab was then fired, and the enamel pastes were at once vitrified and fixed in their places by the heat. A third process applied to these elaborate slabs was to fit into cavities left for them certain small pieces of coloured glass or brilliant enamels, giving the effect of precious stones,*~~

~~*which were fused into their places by a second firing. The chief figures on the plaques are processions of captives, about 8 inches high ;*~~

~~*POTTERY*~~

~~*‘ outline with figures and hieroglyphs, have*~~

~~*603*~~

~~*the enamel flesh is varied according to the nationality of the prisoners: negroes are black, others white, red, or yellow. Some of the dresses are represented with great richness: various embroidered or textile patterns of the most minute scale are shown by enamel inlay of many colours, and even jewel ornaments are shown by the inserted bits of glass; the dress of some Assyrian captives has patterns of great beauty and richness, —the sacred tree between the guardian beasts, and other figures. Besides these elaborate figure-reliefs an enormous number of smaller pieces of clay inlaid with different-coloured pastes were used to form a sort of mosaic wall-decoration in this wonderful palace, the ruins of which have supplied a perfect museum of all kinds and methods of enamelled work as applied to pottery. The British Museum and the Louvre have the finest specimens of these wall-slabs (see Birch, Ancient Pottery, p. 51, 1873).*~~

~~*The term “Egyptian porcelain” has sometimes been given Mummy to the small mummy-figures in brilliant blues and greens. figures.*~~

~~*This is a misnomer. The little figures, about 3 to 6 inches high, of which immense numbers have been found, mostly dating from about the XXth Dynasty downwards, are simply formed of sand (silica) with a little alkali, and only sufficient clay to cement them together, so that they could retain the form given them by the mould into which they were pressed. The result of analysis is silica 92, alumina 4, and a slight but varying proportion of soda, They are covered with a silicious glaze, brilliantly coloured with copper oxide, and are sometimes painted under the glaze with manganese, a deep purple-violet. A few of these figures, and also small statuettes of deities, have had oxide of tin mixed with the paste; the figure has then been exposed to sufficient heat to fuse the whole into one homogeneous vitreous mass, and thus the statuette has become a solid body of fine blue enamel. A*~~

~~few small objects—such as libation cups, bowls, and chalice-like goblets—were also made of the same sandy paste, covered with blue-green glaze. They are thick and clumsy owing to the very unplastic nature of their paste, which necessitated their being pressed in a mould, not | wheel-made. The splendour of their | colour, however, i makes them objects of great beauty ; they usually have a little painting, lightly executed in outline with manganese purple, generally a circle of fishes swimming or designs taken from the lotus-plant (see fig. 5).~~

~~aie Fic, 5.—Egyptian blue-glazed pottery.~~

~~During the XVIIIth and XIXth Dynasties and later Wall- pottery was used in many ways for wall-decoration. tiles.~~

~~Bricks or tiles of coarse brown clay were covered fine white slip and glazed with brilliant colours. Another method was a sort of in- lay, formed by stamping incised patterns _ into slabs of clay and filling up the sinkings # with a semi-fluid clay of some other colour, exactly like the 16th-century Oiron ware. A number of brilliant wall-tiles covered with deep blue glaze, and painted in black~~

~~with a~~

~~y~~

~~Fic. 6.—Egypt- ian Canopic vase.~~

~~been found in many places in Lower Egypt ; the painting is very simple and decorative in effect, drawn with much skill and precision of touch.~~

~~The Canopic vases are an important class and great Canopic~~

~~quantities have been found in Egyptian tombs. generally made of plain brown-red clay, and have a lid in~~

~~604~~

~~the shape of a human head. On them hieroglyphs are coarsely painted in black or colours (see fig. 6). They contained parts of the viscera of the~~

~~*corpse. The mummies themselves are frequently decked out with pectoral plates, necklaces, and other ornaments, made of clay covered with blue and other coloured énamels. Some of the pectoral plates are very elaborate works of the same class as the figure-reliefs from Tel al-Yahudtya, richly decorated with inlay of different-coloured pastes and enamels.*~~

~~*POTTERY*~~

~~*[ASSYRIAN*~~,

~~*SECTION Ti].—ASSYRIAN.*~~

~~*But little remains to us of the pottery of the primitive Accadian races of Babylonia and Assyria. It was all extremely simple and undecorated, partly hand-made and partly wheel-made, mostly graceful and natural in form, owing its beauty chiefly to the simple elegance of its shape and the fine material of which it was made,—the close-grained light yellow and brown clays in which the country between the Tigris and the Euphrates is so*~~

~~*: During the Ptolemaic period a quantity of graceful and é has = ae a pottery ae : i rich. The great city of Babylon—"figulis munitam period. made in fine red and brown urbem," as Juvenal (x. 171) calls. it—was essentially a*~~

~~*clay, mostly without any painted decoration. Some of the vases are of good form, owing tothe influence of Greek taste (see fig. 7); others are coarsely decorated with rude painting in blue, green, red, yellow, and brown, either in simple bands or with lotus and other flower-patterns (see fig. 8). Both the body of the vases and the colours are usually quite devoid of any gloss. The duller colours are various*~~

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~~*Se ee eee Se eee*~~

~~*Fig. 7.—Egyptian pottery under the Ptolemies, showing Greek*~~

~~*brick city, and depended for its magnificence to a great extent on such decoration as the potter could supply. Herodotus and Ctesias describe its lofty circuits of brick walls, the two inner walls lined with bricks enamelled in various colours, with figure-subjects, scenes of war and hunting (see BaByton). The technical methods and enamel pigments used in Assyria and Babylonia were for the most part the same as those used in Egypt; but the Assyrian potters understood the use of oxide of lead as a flux to mix both with glazes and enamels,—an admixture which, though it to some extent injures the durability of the vitreous surface, enables it to be applied with greater ease, and to less silicious clays, without fear of its cracking off or blistering in the kiln.*~~

~~*indinenes dn the alinpes, The ruined palaces of Babylon and Nineveh have supplied Painted*~~

~~*earths, ochre,and white chalk, ‘ great quantities of bricks painted in various colours, some bricks.*~~

~~*while the bright blues and greens are produced by mixing*~~

~~*powdered enamel of the required colour with light-coloured clay, the depth of the tint de- , aoe A pending on the proportion of } — | the clay or chalk.*~~

~~*Certain very gaudy and |; ugly pots were made to imr ,i tate granite and steatite ves- sels (see fig. 8). They are of brown clay, rudely dabbed | and speckled with brown, red, yellow, and grey colours to represent the markings of the stone ; others are yellow, with grey streaks —imitations of marble ; most have a painted white tablet, on which are hieroglyphs in black. The pigments are very shiny in texture, and appear to be unfired. Among the most deli- cate and carefully made kinds of Egyptian pottery are the round flat flasks shaped rather like the medieval “ pil- grim-bottle” (see fig. 9). They are sometimes made of blue paste, fine clay coloured. with oxide of copper, and are delicately enriched with im- pressed ornaments, stamped from a mould, in low relief or slightly incised. The orna- ment is often designed like a gold necklace hung round the bottle ; others have tablets with inscriptions. The surface is biscuit; and the flasks range in colour from light turquoise to deep ultramarine, the colour not being*~~

~~*superficial but of equal strength all through the paste. Small vases of other forms, made of this same material, also occur, but they are rare.*~~

~~*Fic. 8.—Egyptian pottery with painted ornament aud sham marbling.*~~

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~~*Fig. 9.—Egyptian pottery made of fine blue paste.*~~

~~*Literature.—Wilkinson, Ancient Egyptians (ed. Birch, 1878) ; Birch, Ancient Pottery, 1878. A large number of works on ancient Egypt have some account of the pottery, but none are specially ee Pe subject. epee: valuable contribution to the*~~

~~*‘ gical arrangement of Egyptian pottery is contained in an — by Flinders Petrie, published in ibs Livhinae deol Journal ae vol. xl p. 269. See also Pierret, Dictionnaire d’ Archéo-*~~

~~*ogue Egyptienne, 1875; De Rougé, Etudes Egyptologiques, 1880; and Mariette, Monuments du Musée… a Boulagq, 1864.*~~

~~*_as early as the 12th century B.c.*~~

~~*The colours applied are of two distinct classes,—(1) thoroughly wtrified enamels, often coarse and bubbly in texture, and applied in con- siderable body, which are mostly brilliant though harmoni- ous in tint, with a hard vitreous surface ; (2) earth colours, chiefly ochres in various shades of quiet yellows and browns, owing their colours to different iron oxides and a pure white made of lime. The earth colours are very thinly applied, and have no surface gloss. Paintings executed in this manner were neither so hard nor so durable as those in the vitrified enamels, and were prob- ably used mainly for panels of ceilings and the upper parts of walls, which were out of the reach of ordinary wear or injury. In a few paintings both methods are combined, The bricks themselves are of light brown or yellowish clay, with which a considerable quantity of straw was mixed. This was burned out in the firing, and so cavities were left, making the bricks light and*~~

~~*porous. Many of the enamelled bricks are moulded in relief, with simple patterns of leaves, interlacing bands, waves, and the like, and were used to form cornices and running bands above and below the flat friezes or dados painted with human figures. The reliefs are picked out in colours with enamel, white, yellow, deep orange, soft red, brown, green, and blue, the enamel being sometimes nearly one- eighth of an inch thick. A common size for the bricks is 12 to 14 inches long by 6 to 7 wide, and about 4 inches thick. Sometimes two or three courses go to make a single moulded band. The British Museum and the Louvre possess the best specimens of these enamelled architectural features. The finest examples of pictured bricks were found in the great palace at Nimrud; they appear, judging from the imperfect fragments that remain, to illustrate a victorious expedition by the Assyrians against a foreign nation. The paintings represent long lines of captives, and processions of the conquering Assyrians on foot, on horseback, and in chariots. They are executed on grounds of different colours—dull green, yellow, and blue—and show a strong feeling for harmony of colour and great skill in decorative arrangement ; the figures are about 9 inches high. Some complete paint- ings were executed on one slab or panel. A fine one,*~~

~~*_ decora- ‘) tions.*~~

~~*Literary use of pottery.*~~

~~*Vases and vessels.*~~

~~*ASSYRIAN. |*~~

~~*about 9 inches by 12, also found at Nimrud, and now in the -British Museum, has a picture of the Assyrian king under a fringed canopy giving audience to an officer. The king is followed by an attendant eunuch.*~~

~~*In addition to figure-subjects and ornaments, large wall- surfaces were covered with cuneiform inscriptions, having letters about 14 inches high painted in white and yellow on blue or green grounds; these are executed on large slabs of coarse brown clay, to which a smooth surface, fit for painting, has been given by a thin coating or slip of fine- ground yellowish clay. Large slabs with pendants for ceilings, painted in the same way with*~~

very graceful patterns, have been found, all in simple earth colours. Another even more magnificent application of the potter's art to wall-decoration was by the use of coloured enamel pastes, like those described under the pottery of Egypt. These are reliefs modelled by hand, or pressed into clay moulds and then touched up by a modelling tool. The smaller ones, with delicately-executed figures in low relief, are all in paste of one colour—blue—with sufficient enamel added to the clay to give it a brilliant tint, but not sufficient for complete vitrification. Other fragments exist of life-size or even colossal figures, both in the round and in high relief, worked in pastes of many colours in a kind of mosaic fashion, extremely brilliant and striking in effect.

The most remarkable application of pottery in Assyria and Babylonia was its use for literary records. Tablets, cylinders, and polygonal prisms were impressed with cunei- form characters in the moist clay, and then baked, thus forming the most imperishable of all kinds of MSS. (ep. BABYLONIA, vol, iii. p. 191). The large inscribed cylinders and prisms were made hollow, and turned on the potter's wheel. The prisms were first moulded in a circular shape, the sides being afterwards made flat by slicing. All are circular inside, and bear distinct ring-like marks, showing the movement of the wheel as they were scooped out by the potter's thumb.

The vases and domestic vessels of Assyria may be divided into four classes, —(1) plain biscuit clay, undecorated ; (2) biscuit clay with painted decorations ; (3) fine clay stamped with minute reliefs; (4) clay glazed or enamelled.

(1) By far the greater proportion of the pottery belongs to the first class. It is frequently graceful in shape, is well made and

baked, and is of a fine close clay, generally light in colour. Fig. 10

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POTTERY

patterns in gold leaf, applied after the ware was fired. (3) A very fine sort of Assyrian pottery, of which examples exist dating from the 10th to the 8th century B.c., is made of a close-grained ivory-white clay, or else a hard greyish black clay; the surface is biscuit, and is ornamented with bands of human figures in relief, —soldiers, captives, royal personages, and others, with representa- tions of cities, all most minutely executed, the figures scarcely an inch high. Other bands have cuneiform inscriptions, also in deli- cate relief. The bands appear to have been formed by rolling a cylinder die or mould over the surface of the clay while soft and moist. The few specimens of this pottery that have been found are mostly in the form of cylindrical drinking-cups. This method of decoration is one largely used in the earliest variety of Etruscan

pottery. (4) Glazed and enamelled pottery (see fig. 11) is more

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Fig. 11.—Assyrian glazed and enamelled pottery.

abundant ; it consists chiefly of small articles of fine clay, bottles, two-handled jugs, miniature amphore, and pilgrim-flasks, very carefully made,

~~*and apparently articles of luxury. Some are of white clay, covered with a colourless glaze of silicate of soda, rendered more fusible by the addition of oxide of lead. Partly owing to this addition the glaze is generally in a very decom- posed state, often presenting the most brilliant iridescent colours. Other examples are coated in a similar way, except that the trans- parent glaze is tinted a brilliant blue or green with oxides of copper, very like the blue glaze so much used in Egypt, but usually less hard and bright in colour. A few small specimens have been discovered coated with a white tin enamel. Both the glazed and the enamelled pottery is undecorated by any painting.*~~

~~*At Warka (the Chaldean Erech) a large number of Clay very curious clay coffins were found in cave-tombs stacked coffins.*~~

~~*closely one upon another. They are made of coarse clay, and bear outside patterns rudely stamped in blunt relief ; the whole is covered with a plumbo-silicious green glaze. They are about 7 feet long and very peculiar in form; the body was introduced through an oval opening at the head, over which a similarly glazed clay lid fitted closely. These coffins are probably not earlier than the Sasanian period. Clay coffins of much greater antiquity have been found in Babylonia, but they are of plain biscuit clay.*~~

~~*Literature.—Layard, various works on Nineveh and Babylon ; Rich, Babylon and Persepolis ; Loftus, Chaldxa and Susiana, 1857 ; Oppert, Expédition Scientifique en Mésopotamie; Lepsius, Denk- mdler, part ii. p. 168; Botta, Monwment de Ninive, 1847-50; Place, Ninive et ? Assyrie, 1866-69.*~~

~~*Section [V.—PHaNICIAN AND OTHER ARCHAIC CLASSES.*~~

~~*The discoveries of recent years have opened out a new Pheni-*~~

~~*field in the history of the origin and growth of Hellenic art, ea pottery.*~~

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~~*Fic. 10.—Assyrian biscuit pottery.*~~

~~*shows some of the commonest forms. Some specimens have cunei- form inscriptions incised with a pointed tool in the same way as the cylinder letters. The coarser clays are usually covered with a fine whitish slip, and a rather rare variety of the pottery is made throughout of a close-grained almost white clay. One sort of pottery, of which very few specimens have been found, has simple patterns incised on the grey body of the vessel; these patterns were then made conspicuous by being filled in with white clay, a method of inlay like that used in Egypt. (2) Very few examples of the second class are known. Some vases of brown clay, covered with white slip, have rude paintings of human figures, bowmen and other soldiers, executed in brown outline, with rapid and skilful touch. Others have cuneiform inscriptions and geometrical floral patterns painted in silica and lime-white with yellow and brown ochres. They appear to belong to the 9th century B.c. Both the clay body and the earth pigments are quite free from any vitreous gloss in all this class of ware. A few fragments have been found of a coarse brown pottery, decorated with simple*~~

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~~*especially as relating to pottery. Excavations in Cyprus, Rhodes, Thera (Santorin), the plains of Troy, Mycene, Attica, and the coasts of southern Italy have revealed the existence of an abundant class of pottery of great antiquity, a large part of which, in its forms and decora- tion, appears to have been due, directly or indirectly, to the Phoenicians. The designs are of a curiously complex character. Purely Assyrian motives, such as the sacred tree with its guardian "cherubs," are mingled with figures and ornaments peculiar to Egypt; other characteristics which modify and blend these two styles seem due to the Pheenicians themselves ; while, lastly, various local influ- ences are shown in the representations of such plants and animals as were commonest in the special place where the pottery happened to be made. Possibly some of the designs, such as the sacred tree of Assyria, might be traced farther back still, to the distant Asiatic home of the Indo-European races; but any derivation of this kind would, in our present state of knowledge, be purely conjectural.*~~

~~*Forms and mate- rials.*~~

~~*The islands of Thera, Rhodes, and Cyprus, which were colonized by the Phoenicians at a very early period (see Puantcta, vol. xviii. p. 804 sq.), have supplied large quantities of archaic pottery, ornamented with charac- teristically Phoenician patterns and figures. The equally rich finds of pottery from Mycene and the Troad, though not free from Pheenician influence, have mostly a more native style of decoration. Though in some few cases the finding of Egyptian objects with dated hieroglyphs sug- gests a probable age for the pottery they were found with, yet in the main it is impossible to give even an approx! mate date to this large class of archaic pottery. Its pro- duction evidently extended over many centuries, and little or no help towards a chronological classification is given by any clearly-defined stages of artistic development. Some of the earlier specimens may possibly be as old as the 18th century B.C. (scarabs of Amenhotep III. were found with pottery in Rhodes), while later ones, not very different in style, were probably made as late as the 8th century."*~~

~~*Forms and Materials of Archaie Pottery.—There is a special charm about this early pottery. Graceful as the Greek vases of the best period of art are, there is some- thing rigid and slightly mechanical in their highly-finished beauty, their polished surface, and their shape, accurately produced after some fixed model, from which but little deviation was permitted. Endless varieties of form occur in archaic pottery, changing with the mood and indi- viduality of each potter ; full of spirit and life, in their easy grace and the multiplicity of their flowing lines, these simple clay vessels give one—more perhaps than any other works of art—that keen esthetic pleasure which consists in a retrospective sympathy with the joy that the artist took in his own handiwork. Extreme fertility of inven- tion, as well as the utmost freedom of touch in the manipulation of the revolving mass of clay, are its chief characteristics. Fig. 12 gives some of the many forms.*~~

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~~*Fie. 12.—Shapes of archaic pottery. It is usually thin, light, and well baked, formed either of pale buff, whitish, or straw-coloured clay ; or, if a darker clay is used, the surface is generally covered with a fine white slip composed of silica, lime, and a little alumina. This forms a ground for the*~~

~~*painting, which is executed in ochre earths, browns, and reds of different shades, the*~~

~~*colours of which are due to oxides of iron. Most of the*~~

~~*pottery is biscuit, clay ground and painted ornament being * See Schliemann, Mycene (1877), Tro hs , A y (1875), and IZéos (1880) ; Cesnola, Cyprus, 1877 ; Dumont, Les Céramiques as la rh reg Salzmann, Vécropole de Camiros, 1874-75.*~~

~~*PrOT THEY*~~

~~*[PH@NICIAN AND ARCHAIC.*~~

~~*alike free from any gloss; but in some cases silica and an alkali (probably carbonate of soda) have been added to the ochre pigment, which has thus become vitrified in the kiln and acquired a glossy surface. This does not occur among the earlier specimens.*~~

~~*Enameled Pottery—In some of the tombs in A'gina and Rhodes a quantity of small vases, statuettes, and other objects have been found, executed under Egyptian influence, with decoration of various coloured enamels. The colours used and the methods of manipulation re- semble the enamel work of Egypt so closely as to need no special description. Some fine pilgrim-flasks of blue and green have blundered copies of hieroglyphs and repre-sentations of Egyptian deities incised in the moist clay. Less purely Egyptian in style are certain small vases (see fig. 13), coarsely ornamented with bands and chevrons in various enamels—white, blue, green, purple-brown, and yellow. The Louvre and the British Museum have the best specimens of these. Small vases, ex- actly similar in design and execution to those from AXgina and Rhodes, have been found in the tombs of Vulci and other places in Etruria, probably brought there by Pheenician traders, to whose inter- course with Egypt and knowledge of the Egyptian designs and mechanical pro-*~~

~~*'Fria. 13.—Enamelled*~~

~~*cesses the existence of the enamelled pot- pottery from tombs*~~

~~*tery of Rhodes is probably due. Other ™ ,Rhodes, made 3 ; : under Egyptian in-*~~

~~*specimens have been found in the re- fyence.*~~

~~*cently discovered Etruscan necropolis on*~~

~~*the Esquiline in Rome.? One curious variety of early pottery is of a fine glossy red like the later Samian ware. Its smooth surface of rich red is due to the application of a thin finely-ground mixture of silica, soda, and some alu- mina, forming a vitreous enamel to which the opaque red colour was given by a large proportion of oxide of iron*~~

~~*(see fig. 14). Some of this red pottery is of extreme anti- aie A*~~

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~~*| ! *= (c | y ; V*~~

~~*’¥Fia. 14.—Prehistoric red pottery from the Troad and Mycene.*~~

~~*quity; it is either smooth and undecorated, or has rudely- incised hatchings and zig-zags, scratched down to the clay body of the vessel through the red enamel. Another variety of very early pottery from Mycenz and the Troad is of a hard black clay, with glossy surface (see fig. 15).*~~

~~*Painted Ornament on Archaic Vases.—This may be divided roughly into four classes. (1) Hatchings, concentric circles, chevrons, and other simple com- binations of lines, arranged fre- quently in designs obviously suggested by matting or textile fabrics, and also various ar- rangements of spirals, apparently taken from patterns used in metal-work. Some of the designs of this class seem*~~

~~*2 See Ann. Inst. 1882,p.2*~~

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~~*Fig. 15.—Prehistoric black pottery from the Troad and Mycene.*~~

~~*Enamel- led vases, C.*~~

~~*PHENICIAN AND ARCHAIC.* |~~

~~*common to all races of men in an elementary stage of*~~

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~~*Fia. 16.—Archaic vessels decorated with simple line ornament.*~~

~~*plants (often seaweeds) and marine animals, such as cuttle- fishes, meduse, and star-fishes, or occasionally aquatic birds. This class of ornament appears to be more native in character—derived, that is, from various objects with*~~

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~~*Fic. 17.—Archaic pottery decorated with natural objects—cuttle-fish, aquatic plant, and strips of seaweed.*~~

~~*which the potter was familiar—and not to have been a Pheenician import (see fig. 17). (3) Conventional orna- ment, a decorative arrangement in bands or scrolls of certain plants, such as the lotus or papyrus and the palm- tree. This class of ornament is distinctly Phoeni- cian, and shows a predominance, sometimes of As- syrian, sometimes of Egyptian influ- ence (see fig. 18). (4) Very rude and badly-drawn fig- ures of men and. animals, Theyare mostly purely decorative and meaningless, are often merely drawn in outline, and have little or no help from incised lines, which became so important in the next stage of the development of pottery. Some of the figures are strongly Assyrian in character, while others of the rudest execution seem to be native.*~~

~~*It appears at first sight as if there was a distinct chronological order of development in these four classes of ornament—growing from simple line-patterns to the copying of easily represented natural objects, then to the invention of regular geometrical floral patterns, and lastly arriving at the rude depiction of human figures. Various points, however, combine to contradict such a theory of arrangement, such as the combinations in which these vessels have been found, the manner in which the various classes of ornament are mingled on the same vase, and lastly the fact that some elaborate and highly-finished vases, obviously of later date, are decorated solely with the straight-line and hatched patterns of the first of the four classes of ornament. Again, the ornament of the*~~

~~*Konan anna en anne QM nnn*~~

~~*Fig, 18.—Archaic pottery with flower ornament worked into conventional patterns.*~~

~~*second class, which appears to be native and local, can hardly be so altogether. Pottery found at places so far distant as Rhodes and Mycenz has*~~

~~*in some cases exactly similar painting of this sort, showing that a common artistic influence was at work in both places. The whole subject is a very difficult one, and little that is really definite can be asserted about it with safety—at least as yet.*~~

~~*Fig. 19 gives two vases of great interest. One shows the com- mon decoration with wheel-applied circles, and also the Assyrian*~~

~~*between guardian beasts.*~~

~~*altar-like object between two beasts ; the other, from Cyprus, has the Assyrian sacred tree, with similar guardian animals. One of the most striking characteristics of archaic pottery of all classes, and especially of the earliest, is the great use made of the potter's wheel in applying the painted ornaments. Very many of the vessels are decorated with a number of encircling bands or lines, or on their sides with a number of concentric circles. These were easily applied, and very trué circles were obtained by setting the pot (after it was dried in the sun) for a second time on the wheel, in the required position, either on its side or upright as it was ori- ginally turned. A brush held against the revolving vessel marked out the bands or circles. A very interesting votive tablet from Corinth (now in the Louvre), probably 700-600 B.c., shows a potter at work in his shop, applying painted bands in this way. He sets the wheel in motion with one hand, while with the other he holds the brush against the revolving pot. The wheel here shown (see fig. 20) is one of the earliest form, without the lower foot-*~~

~~*Fig, 20.—Votive tablet from Corinth, full size; a potter applying painted bands while the vessel revolves on the wheel.*~~

~~*turned disk.! The smaller circles were struck out with compasses, the central point of which has usually left a deep mark. The patterns used on the first class of pottery consist mostly of straight lines, hatched and crossed, arranged in squares, chevrons, triangles, and other simple figures, combined with concentric circles or, more rarely, wavy bands, the whole arranged frequently in very com- plicated and effective patterns. The second class has frequently varieties of seaweed and many marine creatures, all treated very simply, but drawn with great skill and appreciation of the character- istics of each object and its decorative*~~

~~capabilities. The third class—that of geometrical floral patterns—has but little variety. Some of the lotus patterns are almost identical with those used in Egypt and Assyria, and continued in use for vase decoration down to the most flourishing period of Greek art, though latterly in a stiff and rather lifeless form. The fourth class—that of figure- paintings—is of great interest; the earlier patterns are merely drawn in outline. Fig. 21 shows an cenochoe from Cyprus, now in the British Museum, of rather coarse red clay with yellow slip, on which is pencilled in outline a one-horse chariot driven at full speed by a slave; behind him stands a bowman shooting an arrow; the whole is strikingly Assyrian in style. Another ceno- choe, found in Attica, of more primitive style, has a central band~~

~~1 The writer of the article in Ann. Inst. (1882) on this painting has missed the chief point of interest, which is that the potter is using his wheel, not to mould the vase, but to apply the bands of colour round it.~~

~~covered with a number of warriors with round shields, all alike, most rudely executed; almost exactly similar figure-paintings occur on some of the Mycenze pottery, and also on a large amphora from Cyprus (now in the British Museum), which has many bands, on which are painted in red ochre lines of men with crested heads (looking like North – American Indians) riding long weasel-shaped horses. Other bands on the same vase have centaurs, foot-soldiers, and various beasts, the latter, especially some stags, rather better drawn. 'They are painted in coarse dabs, and, except for a few of the eyes, have no incised lines. Smaller ornaments, such as the svas- tica FU and simple forms of rosettes, are often used to decorate the ogee eee and fill up spaces, but not to~~

~~so great ai ealoaa asin the FIG. 2 succeeding class of pottery.~~

~~Among the earlier pottery from Mycenz and the Troad are several very strange vases in coarse clay rudely modelled to indicate a human form. Some have the upper part formed like a head, very like the Egyptian Canopic vases.~~

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~~*1.—(CEnochoe with painted bow- man in a chariot, Assyrian in style.*~~

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~~*[ARCHAIC METHODS.*~~

~~*extremely early period, was used in ancient Chaldzean art, and was handed on by the Sasanians to the Moslem con- querors of Persia ; it | survived, though al- tered and after its meaning was long forgotten, till even the 15th century in the textile fabrics worked in Italy after Orientaldesigns. The column between the beasts occurs on the Lion Gateof Mycenz, Tn the later art of the Persians a fire-altar takes the place of the column.*~~

~~*Before passing on to consider the vari- ous classes of distinctly Hellenic pottery it will be con- venient to give a list of the technical methods employed in all classes of pottery found in Hellenic sites, and also some account of the inscriptions and various forms of letters which are found on Greek vases.*~~

~~*Technical Methods and Inscriptions—Archaic and Greek Vases.*~~

~~*Fig. 23.—Examples of small ornaments with which the ground of early vases is often studded.*~~

~~*1. Prehistoric Pottery from Mycenzx, the Troad, and other Hellenic From Sites.—Materials: yellow, red, or black clays; composition, sili- Hellenic cate of alumina, with free silica and lime, coloured by different sites.*~~

~~*A great number of "pithi" (7/001), enormous vases shaped something like amphorz, have been discovered in Rhodes,*~~

~~*the Troad, and other places, some as much as 7 feet high. Such vessels are often decorated with patterns in relief, chiefly combinations of spirals and the like, some closely resembling the designs on the sculptured architrave from the "Treasury of Atreus" at Mycenz.*~~

~~*oxides of iron; slip, made of similar clays ground to a smooth paste. Methods of treatment: (a) plain biscuit clay; (0) clay covered with fine slip ;*~~

~~(c) ornament of incised patterns, scratched through the slip upon the body of the pot, and sometimes filled in with whiter slip to make a conspicuous pattern ; (d) pottery of hard fine clay, made glossy by a mechanical polish. Most if not all of this pottery was made without the wheel ; but some was so skilfully~~

~~Vanes Vases aren ees OF hea qf Anumals "seg Grounds modelled as to make it difficult to distinguish between hand-made with ani- sprinkled with Flowers.—This is a very large and important | 314 wheel-made vessels. o— _* class, and very numerous specimens have been found widely 2. Phenician and other Archaic Pottery.—This and all succeeding Pheeni-~~

~~scattered over the shores of the Mediterranean (see fig. 22). The production of vases of this style appears to have lasted for many centuries ; the earlier ones are rudely executed indull ochre colours on biscuit clay, like most~~

~~classes are wheel-made. quite white slip was also used, made of a natural sort of pipeclay, or in some cases of a mixture of lime and silica with a little clay to bind it together. Pigments: earth-colours, made of brown and red ochres, occasionally mixed with an additional quantity of oxide of iron and free silica. Methods: the white or yellow slip was usually applied while the vase was revolving on the wheel, either with a~~

~~Materials: clays and slip as class 1; acian, '&c.~~

~~brush or by the potter dipping his hands into a bowl of fiuid slip~~

~~just. before finishing the final modelling or throwing of the vase ;~~

~~In some cases it has been applied by dipping the pot into the slip.~~

~~The method of applying the painted bands is shown above in fig.~~

~~20. Asarule these vases were not fired at a sufficient heat to give~~

~~them a vitreous gloss, though in some cases the heat has been enough to partly vitrify those of the ochre colours which contained~~

~~a proportion of free silica and alkali.~~

~~*“3. Vases with Black Figures and Ineised Lines.—Materials : (a) With clay, silica 56 per cent., alumina 19, red oxide of iron 16, lime 74, black magnesia 14 per cent.,—the average of many analyses ; (0) slip, the figures same clay finely ground, and sometimes tinged a deeper red with and in- additional red oxide of iron,—the white slip is like that in classcised — 2; (c) glaze, of almost imperceptible thickness, a silicate of soda ; lines.*~~

~~*archaic pottery, while the later ones have paintings in brilliant black enamel on a ground of red clay, thinly covered with a true vitreous glaze. This class of vase- painting, though mostly the work of Greek potters, is dis- tinctly Oriental in character, probably Assyro-Pheenician. It is of extreme decorative*~~

~~*richness: the surfaces of the vases are well covered, and the designs, though simply treated, are very effective, in many ways far more success- ful as works of decorative art than the elaborate and exquisitely drawn figure- pictures on later Greek vases. The ground is thickly covered with small decorative patterns; fig. 23 shows those used on more archaic vases. The animals that occur most fre- quently on the bands are lions, leopards, bulls, goats, deer, with various birds, such as cocks and swans, and also griffins, sphinxes, and sirens. A favourite motive of design is the sacred tree or a sort of column, each with a guardian beast at the sides. This is one of the most interesting of all designs in the history of ornament; it dates from an*~~

~~*Fic. 22.—Vase with bands of ani-*~~

~~*mals, Oriental in style.*~~

~~*(British Museum.)*~~

~~*(d) black pigment,—a true vitreous enamel, which owes its deep black to the magnetic oxide of iron (composition—soda 17, silica 46, alumina 12, black peroxide of iron 17, lime 6 per cent.) ; (¢) chocolate-red pigment, an ochre red sometimes mixed with finely- ground fragments of red pottery ; (/) white pigment, like the white slip of class 2,—various analyses, silica 54 to 62, alumina 34 to 43, lime 4 to 84 per cent. Methods: the vase was first turned on the wheel, and, in order to give the pot a surface of deeper red, the slip was applied by a brush or by the hands of the potter while it was still*~~

~~*revolving. The outline of the design was next roughly sketched, either with a point or in light-red ochre with a brush. After the vase had dried sufficiently in the sun so as to become firm, it was again put on the wheel, and the glaze, finely powdered and mixed with water, was applied to it with a brush as it revolved. The vase then appears, at least in some cases, to have been for the first time fired in the kiln in order to get a smooth almost non-absorbent surface for the use of the painter. In other cases the materials of the red slip and the silicate glaze were mixed, and the two applied together, as was done in the case of the Roman Samian ware. The painter next set to work and put on the black enamel*~~

~~*ing class with the addition of bright red, blue, green, and gold. Poly- The red used on some vases is an oxide of iron; buta very brilliant chro- minium crimson also occurs, which appears to have been added after matic the final firing, and is not therefore, properly speaking, a "ceramic" vases.*~~

~~*figures and ornaments with a brush. Ifa part of the vase round its whole circumference was to be black, such as the foot and neck, the vase was again set on the wheel and the black enamel put on as it revolved. This repeated use of the wheel for the application*~~

~~*of slip, glaze, and black enamel was in order to secure an even coating with uniform grain, far more difficult to get with the un- aided brush. The grain thus produced can usually be distinctly traced in each of the three coatings. The firing of the black enamel must have been done with great care and skill, as a very slight chemical change in the black oxide of iron converts it into the red oxide. Thus the same stroke of a brush is often (in the earlier vases of this class) half black and half vermilion-red, or one side of a vase is red and the other black, according as it has been played upon by oxidizing or deoxidizing products of combustion in the kiln. In the finest vases the black enamel is of great beauty, with wonderful rich softness of texture, which no modern skill has been able to approach. The tombs of Nola, Capua, and other places in Magna Grecia have supplied the most technically perfect vases, both for the fineness of their clay and the*~~

~~*brilliance of ,jtheir black enamel. After the firing of the enamel the details were drawn in by incised lines, cutting through the enamel down to the clay body of the vase. The clear and slightly-chipped edges of the lines show that they were done after firing, when the black enamel was in a hard vitreous state. This must have been done with some very sharp and hard point, probably a natural crystal of diamond or corundum, such as was used for engraving gems; the incised details on some vases are of almost microscopic minuteness.! The "non-vitreous" colours, red and white, were sometimes put on before, sometimes after the incised lines. They were fixed in their place by a slight firing, not enough to vitrify them or to soften the edges of the incised lines in the enamel. Both these changes have been shown to take place under a not very violent heat, by experi- ments made by the present writer on fragments of such vases. The white was used to depict the flesh of females and of some of the gods, such as Eros, or for the bodies of horses and the hair of old men. Chocolate-red was mostly used for ornamental touches on dress, armour, harness, and the like. Both are used in painting the heraldic beasts or ornaments which so often occur on the round shields of Greek warriors. Both the white and red are applied over the black. Thus the female figures are first completely painted in black, and the white afterwards applied over the face, hands, or other nude parts."*~~

~~*pigment. The blue and green are different oxides of copper, fused with silica and soda to make a bright vitreous enamel, which was then finely powdered and mixed with a proportion of white pigment (silica and lime) according to the strength of the tint required. This powdered enamel pigment is the "smalto " of medieval Italian painters. The gold was applied in leaf, not on the flat surface of the vase, but on a ground modelled in slight relief with semi-fluid slip of ordinary fine red clay, thus very much enhancing the effect produced by the gold leaf. Necklaces, bracelets, and other gold ornaments are always modelled in perceptible relief, producing a rich effect which no merely flat application of gold could give. Polychromatic vases may be divided into four main classes. (a) Vases in which the colours are used as additional decoration to the ordi- nary red figures, c.g., the celebrated amphora from Camirus (Rhodes), with the scene of Peleus winning Thetis as his bride (see Plate V.). (6) Vases painted in brown outline, on a fine white slip, with the addition of red and yellow ochre colours, and occasionally a little gold, ¢.g., the cylix in the British Museum with*~~

~~*Aphrodite seated on a flying swan (see Plate V.); this isa rare and usually very beautiful variety, and is more fully described below (p. 613). (c) Attic funeral lecythi, which have the neck and foot in brilliant black (wheel-applied) enamel and the main body of the vase covered with a non-vitreous white slip. The design was sketched in rough outline and the red pigment put on with a small brush over the white gronnd. The drawing is generally careless and rapid, but often shows great skill and beauty of touch. The colours, generally red, blue, or green, were then thickly and often clumsily applied over parts of the red outline drawing, mostly over the draperies. These vases were not meant to be handled, as their colours rub off very easily: they were simply intended for sepulchral purposes, either to hang on the stele or within the tomb. (d) Vases, especially from Magna Grecia, such as rhytons, small cenochoz, and others, moulded skilfully in a variety of fanciful shapes, heads of animals or deities, sphinxes, and other figures, either grotesque or beautiful. They are decorated partly with the usual red figures, and with the most brilliant black enamel, while other parts are painted in white and brilliant crimson with further enrichments in gold leaf. These bright colours seem to have been applied after the last firing, and not to be true ceramic colours. *~~

~~*/ With red 4. Vases with Red Figures.—The materials employed and the figures. first stages in the manufacture of this class are the same as those — of class 3; but, instead of the jigures being painted in black, the ground is covered with black enamel, and the figures left, showing*~~

~~*6. Black Vases of Metal-like Designs.—These vases often have the Metal- finest sort of black enamel, especially the large amphore from Capua like and other places in Magna Grecia, covered all over with fluting or black*~~

~~*the glazed red slip which covers the whole vase. This method pro- duced a great artistic advance in the beauty of the figures, the de- tails and inner lines of which could be executed with freedom and ease by brush-marked lines instead of by the laborious process of cutting incised lines through the very hard black enamel. The outline of the figures was drawn, with wonderful precision and rapidity, with a brush fully charged with fluid enamel, boldly applied so as to make a broad line or band about one-eighth of an inch wide all round each figure, one edge of the band giving the*~~

~~boundary of the required form. Details and inner markings were then added with a fine-pointed brush capable of making the thinnest and most delicate strokes. On many of the finest vases the contour- lines of muscles and other markings intended to be less salient were painted in pale brown instead of black. Last of all, the main part of the ground between the black outline bands was filled in. The greater thickness of the enamel, where it was more concentrated in the bands, is generally visible; the enamel used for filling in was~~

~~gadroons. imitations of gold necklaces modelled in slip, slightly in relief, and afterwards covered with gold leaf. A number of " phiale omphale " (saucer-shaped vessels), of about 200 B.c., were made by being pressed into a mould, and were thus stamped with figures in relief, such as processions of deities driving chariots. Some of these, made in Magna Grecia after its conquest by the Romans, have Latin inscriptions. One made at Cales is inscribed with the potter's name C.CANOLEIOS.L.F. FECIT. CALENOS (see Ann. Jnsi., 1883, p. 66). Small asci were decorated with highly – finished figure-subjects, stamped on emblemata or tablets of clay, which were embedded in the vase while it was soft. Such elaborate and metal-like pieces of pottery are entirely covered with black enamel. They are often of great beauty, both in the composition of the relief figures and in their delicate execution. Vases of this class have ae found entirely covered with gold or silver leaf, copies of metal plate.~~

~~Some have wreaths of vine, olive, and other plants, or vases.~~

~~7. Vases, such as large asci, many from Magna Grecia, made of Vases simple yellowish biscuit clay, and modelled into shapes of female with heads, or covered with a number of statuettes of female figures. statu- They are generally painted simply in distemper in "non-ceramic " ettes.~~

~~thinner because it spread over a larger space as it flowed from the brush. In some cases a face or other part has had a thin black out- line before the wider band was put on; and then ¢éhree distinct thicknesses of enamel can be seen, the thin outline standing out~~

~~perceptibly more than the rest. It is evident that the fluid black enamel was applied in a somewhat thick viscid state, and thus a slight degree of relief~~

~~was often produced, enabling black lines to show over the black ground, as is the case sometimes with the strings of lyres. This slight relief often gives additional effect to the treatment of curly hair, represented by a series of dots or glob- ules, as in the transitional amphora described below (p. 612). This method recalls the free use of the drill in the representation of hair on early engraved gems. Touches of white and red were occasionally used, as in the preceding class of vases, but to a much more limited extent. Some of the finest black and red vases, especially speci- mens from Nola, Vulci, and Capua, have enrichments in gold applied in relief.~~

~~5. Polychromatic Vases.—Materials : the same as in the preced-~~

~~= A eee ee aS ee eee 1 A very remarkable early vase, in the collection of Countess Dzialinska in~~

~~Paris, is decorated with incised lines only, the whole being covered with the black enamel.~~

~~2 Unfortunately many Greek vases have been much injured while in the hands of dealers by the restoration of the white and red pigments. Vases which have been thus treated should be washed carefully with spirits of wine, which removes the modern touches without injury to the ancient pigments.~~

~~colours ; but they fall rather under the head of TERRA-COTTA (q.1.). Some are of very great beauty, and are covered with statuettes very like those found at Tanagra.~~

~~8. Greek Vases of Debased Style, last period.—These have the Debased usual red figures on a black enamel ground, of the same materials, Greek and applied in the same way as on the earlier vases, except that vases.~~

~~the black enamel is much thinner and very inferior in quality, fre- quently having a hard metallic gloss instead of the soft richness of the earlier vases. A great part of the figures and ornaments is executed in white, red, brown, and yellow pigments, with shading and gradations of colour, used to produce an effect of relief, which is unsuited to vase-painting, and, especially in the later examples, is executed with extreme rudeness and~~

~~*clumsiness of drawing. Vase- painting became degraded in style at a period when the other arts of Greece showed but little signs of decadence, and ceased altogether to be practised nearly a century before the Christian era. No painted vases were found in the buried cities of Pompeii, Hercu- laneum, and Stabie ; and Suetonius (Julius Cxsar, c. 81) mentions the eagerness with which certain Greek vases found in tombs near 3 See Otto Jahn, Vasen mit Goldschmuck, Leipsic, 1865.*~~

~~*q XIX, — 77*~~

~~*Inscrip- tions.*~~

~~*610*~~

~~*Capua were sought for. The floral ornaments on these later vases are very elaborate and realistic compared with those of the earlier period. Bands of graceful scroll-work with growing foliage are much used, often, in spite of their attempted relief, very beautiful and much superior to the figure- subjects which accompany them. Some strikingly resemble in style the painted friezes on Pompeian walls, and have lost all purely ceramic character. ame*~~

~~*Two abnormal and comparatively rare methods of vase-painting must be mentioned. One occurs on a number of Corinthian vases mostly now in the Louvre, pseudo-archaic in style, but apparently of the 5th century B.c. Such were first covered with white slip, which was in turn completely covered over with black enamel. The design was then made by the awkward process of cutting away the black in parts so as to leave black figures on a white ground— a kind of "sgraffiato." Another strange method was practised in southern Italy during the extreme decadence of vase- painting. The whole surface was covered with black enamel, and the figures were afterwards painted in red over the black so as to imitate the ordinary Greek vases with red figures and a black enamel painted round them. Most specimens are mere feeble imitations of the works of an earlier period ; but a cylix in the British Museum is painted in this style with a graceful seated figure of Adonis or Meleager,—a very remarkable work, executed in warm browns and yellows, giving the effect of flesh, and shaded and touched with high*~~

~~*lights in a thoroughly pictorial manner, which, though e a miniature scale, recalls the best wall-paintings of Pompeii or*~~

~~*ome.*~~

~~*Inscriptions on Vases.—Inscriptions are very numerous during the middle period of Greek art, while on the most archaic vases and those of the decadence they are mostly absent. They are of great interest in the history of Greek paleography, but are not always a safe guide as to the dates of vases, because archaic forms of letters were often used by vase-painters long after other forms of letters had come into general use. Vase-inscriptions may be divided roughly under two heads—Ionian and Dorian, the latter occurring mostly on the numerous vases from Corinth and her colonies. The accompanying table! shows the usual forms of letters which differ from the New-Attic alphabet ; the latter is still in use, and has been but little changed since about 400 B.c., when the long vowels were introduced. Some of the early letters have no representative in the later Greek alphabet, e.g., the digamma F, the koppa 9, and the aspirate H or H.*~~

~~*DORIAN. IONIAN.*~~

~~*OLD ATTIC. NEW ATTIC.*~~

~~*PO ra ih ¥*~~

~~*[INSCRIPTIONS.*~~

~~*Rhodes and now in the British Museum. Each figure has its name*~~

~~*MEPRAM QoTa4*~~

~~*SV@OPBOM*~~

~~*for MENEAA®, EKTOP (retrograde), and EYPOPBOX. This curious inscription has the Ionian form of E, the Dorian M (san) for &, and a common archaic form of © for ®, a very strange and exceptional combination of characters, The Burgon Panathenaic amphora (see fig. 25) has a very curious Old-Attic inscription, written downwards—*~~

~~*IMJ :YOJO4MOI4IO44OT*~~

~~*for TON AOENEO[EIN AOAON E/[T]MI, 'I am one of the prizes from Athens," the usual inscription on prize vases. Vase- inscriptions are usually painted, if on a red ground in black or brown, if on a black ground in red or white. Some are incised, scratched after the vase was fired ; but such occur less often. They are written both retrograde and from left to right, apparently with- out any fixed rule. Both methods frequently occur in the same inscription. A fine early Corinthian crater, found at Cere and now in the Louvre, with black figures representing Heracles feasting with Eurytius, has the names of the persons represented inscribed in the characteristic early Dorian manner—*~~

~~*BYPYTSOM MOT3O3A ASODA MS1AATAE*~~

~~*for EYPYTIOX, FIPITOX, FIOAA (Viola, a lady present at the feast), and HEPAKAEX. On the handle of the crater is scratched 0, for Corinth, the place where it was made." Another Dorian inscription of great interest occurs on a votive clay tablet dedicated to Poseidon, about 4 by 24 inches, now in the Louvre. Poseidon is represented at full length, holding a trident and a wreath, in black with incised lines ; at each corner is a hole for fixing the tablet to the temple wall. It is inscribed—*~~

~~*VAA34ATON ("oP MANROBKB*~~

~~*for HOTEIAAN .. . ON M'ANEOHKE, "— on dedicated me to Poseidon." This curious tablet was found at Corinth; the letters are very archaic in form, though the painting can hardly be earlier than the 6th century B.c.*~~

~~*The great majority of vases have inscriptions in Old-Attic*~~

~~*characters, such as are shown in the two following examples. The Subjects*~~

~~*subjects of the inscriptions may be divided into five heads, though of in-*~~

~~*other miscellaneous ones also occur. scrip- (1) On early vases rudely scratched trade-marks, or potters' tions.*~~

~~*RB digamma .— 6*~~

~~*One of the earliest vase-inscripti i i*~~

~~*- ptions known is that mentioned yey (see fig. 24, p. 611) as occurring on a "'pinax," or large flat platter, with archaic painting in brown, found at Camirus in*~~

~~*1 :*~~

~~*Those letters which have the same form in all three lists are omitted.*~~

~~*marks, indicating the number of vases in a special batch and their prices. (2) Potters' and artists' names. The majority have only one name, possibly that of the master-potter, ¢.7.,*~~

~~*BYVXSIQBRO$ EPOIESEN*~~

~~*for Evél@eos éroincev. In other cases, mostly on the finest vases, the name of the painter occurs as well as that of the potter, ¢.g.,*~~

~~*MAKPON EAPAPSEN*~~

~~*for Mdxpay éypawev. Some artists, probably distinguished for their skill, painted the vases of several potters; other painters' names chiefly occur on the vase of one special potter. (8) Names of people, animals, and even things represented on the vases, A large proportion of the earlier vases have a name by the side of each figure, or at least by the side of the most important ones. Names of horses and dogs occasionally occur, and in a few instances even inanimate objects are designated by a name, ¢.g., the balance on the cylix of Arcesilans in the Paris Bibliothéque and Zeus's throne on an early amphora in the Louvre. (4) Speeches uttered by the vase figures, ¢.g., in a scene representing a game at ball one of the players says XPHZAN MOI TAN S4[A]IPAN, 'Throw me the ball." Other vases have words of compliment or greeting, such as XAIPE, "Hail!" or words relating to their contents, ¢.g., HAY2 OINO32, " The wine is sweet." (5) Names of owners, often with the adjective KAAOZS or KAAK (if a lady), possibly intended for gifts, like the majolica plates inscribed with a lady's name fol-*~~

~~2 See Mon. Inst., vol. vii.~~

~~HELLENIC. |~~

~~lowed by the epithet "diva" or "bella." An amphora with a very curious inscription has recently been found at Orvieto, in early Attic characters—ZH AION MIA MOVAAOYA (retrograde) —meaning 50' 6Bedw kal we Olyes, " Two obols, and you have me."?~~

~~A quite different species of inscriptions occurs on vases of the latest class. Artists' and potters' names cease to appear with the rapidly- increasing decadence of the art. A black crater in the British Museum has a dedicatory inscription painted in white round the neck, AIOXZ ZATHIPOS, " Zeus the Saviour." A fine black fluted amphora has the owner's name, APICTAPXO APICTONO2, in which the late C form of % occurs. On a small black ascus in the British Museum is scratched rudely ITPOITINE MH KATOHI®>, "Drink, do not set me down." And some plain black measures have their capacity incised on them, e.g., H iMI- KOTVAION, "Half a cotylion," on a cup-shaped vessel from Coreyra. One of the earliest known instances of Greek cursive~~

~~writing occurs on a covered pyxis divided into four compartments (in the British Museum). the ashes of a Roman called Sergius. scratched—~~

~~bi eee evi CEP KALE VE~~

~~It appears to have been used to contain Under the foot is rudely~~

~~'My beloved Sergius, farewell."" The last word is blundered And on the inside of the lid is a similar incised inscription—~~

~~Tagoc €ctiv JeuTegoc~~

~~"It is the second interment." The pyxis is apparently much older than the inscription, a supposition which is confirmed by the note as to its being a later burial.~~

~~One sort of inscription, used more largely by the Romans than~~

~~*the Greeks, was impressed from incuse stamps, a method chiefly |*~~

~~*used for large amphore and other vessels of plain biscuit clay, especially those made in Rhodes and Cnidus. 'These inscriptions, which date from the time of Alexander the Great down to the Ist century after Christ, usually give the name of an eponymous magis- trate or chief priest, and have frequently in addition one of the thirteen months of the Doric calendar. Some of the stamps are circular, copied from current Rhodian coins, and have the legend round a front face of Helios, or the rose-blossom fédov, which was the badge of the island. Other stamps are square or lozenge-shaped ; they are usually impressed on the neck or handle of jars."*~~

~~*Having considered the technical methods employed in the manufacture of Greek vases and the various classes of inscriptions which occur upon them, we will now return to the styles of vase-paintings and the subjects which are*~~

~~*most frequently represented.*~~

~~*Sreerion V.—HELLENIC.*~~

~~*Archaic Class—The manner in which the styles of ornament on early pottery merge almost insensibly one into another makes it difficult to arrange it in distinct classes, and it is not easy to say at what precise stage the term "Hellenic" can be given to the archaic vessels. The presence of Greek inscriptions makes, however, a convenient starting-point.*~~

~~*Probably the earliest known Greek ceramic inscription occurs on the Rhodian pinax mentioned above (see fig. 24). The painting on this, though rudely executed in brown and red ochres on a pale yellow slip-covered clay, the same in method as the earlier non-Hellenic paintings, shows a marked artistic advance by the fact that it represents a definite historical scene taken from the iad. No incised lines are used except for the feathers of the heraldic eagle on Hector's shield. A large number of other pinaces were found at Camirus, of the same date, but without inscrip- tions and with purely decorative paintings, such as geome- trical lotus-patterns, and spirited figures of bulls, sheep, and other animals, or sphinxes and gorgons' heads. Some large clay coffins, also found at Camirus, and others at Clazomene, belong to this class of pottery. One of those*~~

~~1 See Ann. Inst., 1882, p. 58.~~

~~2 See Dumont, Jnscr. Céram. de Gréce, Paris, 1872; and Corp. Inser. Gr.~~

~~3 Journal of Hellenic Studies, 1883.~~

~~from Camirus is in the British Museum. The top is decorated with painting in red and brown ochre colours.~~

~~WN~~

~~sm ys (@ yoo > », —~~

~~Fic, 24.—Early inscribed pinax from Rhodes, with contest of Menelaus and Hector over the body of Euphorbus.~~

~~At the head is a bull between two lions, and below them two curious helmeted heads of warriors drawn in profile, both unfortunately much injured by restoration. Other parts are decorated with figures of beasts on a ground studded with rosettes and other small designs, in which some antiquaries see varieties of solar symbols ; but, what- ever their original meaning may have been, they appear on this pottery to be used merely as decoration. Other vases of a very early period with figure-subjects and inscrip- tions, probably of the 7th and 6th centuries B.c., have been found at Corinth, such as the '"Dodwell pyxis," now at Munich, on the lid of which is painted the scene of the Calydonian boar hunted by various heroes in the presence of Agamemnon ; each figure has an inscribed name. At Corinth also curious votive tablets have recently been found, some inscribed, with painted figures either of the god or of the donor ; one of these is shown in fig. 20. It is very early in date.~~

~~The "Burgon amphora," so called from its finder, now in the British Museum (see fig. 25), is a very interesting specimen of this early class ; it is one of the prize amphoree which, filled with sacred olive oil, were given to~~

the victors at the games held during the Panathenaic festival. It was found at Athens, filled with the ashes of its owner, and is no doubt the work of an Athenian potter. On one side is the usual figure of Athene Promachos in black, except the goddess's flesh, which is white, and the inscription and touches on the dress, which are in crimson. On the reverse side is the winner of the vase driving a biga, apparently in the act of winning the race which gained him the prize. On the neck of the vase is the owl sacred to Athene. The drawing of the figures is very rude, probably dating from the 6th century B.C.

The "Frangois crater," found at Chiusi, now in the Etruscan Museum in Florence, is another important ex- ample of this early class. It is signed as the work of the potter Ergotimus and the painter Clitias, and is painted with a long series of subjects, all relating to the life and death of Achilles. It has no less than 115 explanatory inscriptions. Of about the same date, 6th century B.c.,

4 Bull. Inst., 1845, pp. 118, 120, and Ann. Inst., 1848, p. 382.

Red vases with black figures,

612

is the cylix of Arcesilaus found at Vulci, now in the Paris Bibliothéque. It is painted in black and red on a cream-

di scainins RE SG MGR aoe eee WE cteemami ad mater denbnonnines te

Fig. 25.—The Burgon Panathenaic amphora, with early Greek inscription.

white slip, and represents Arcesilaus, one of the Cyrenian kings of this name, superintending the weighing of a number of bags of the silphium plant. All the figures and even the scales have their names painted by their side. It is executed with great neatness and technical skill, but the drawing is stiff and awkward. The scene, which is repre- sented with great dramatic vigour, appears to be on board a ship, judging from the complicated cordage overhead and the yard-arm from which the large balance is suspended.

~~*It is at present impossible to fix with any certainty the dates of this early Hellenic pottery, as is also the case with the still older pottery of Rhodes and Mycenz, but the increase of our knowledge on the subject tends to give a much more remote period to its production than has been hitherto assigned to it by the majority of writers on the subject. The foregoing class of pottery forms a link, with various stages of development, from the glossless vases painted in dull ochre browns and reds to that large and important class of Greek pottery which has figures painted in glossy black enamel, on a red, slightly glazed, clay ground, or less frequently on a cream-white ground. The vases of this class, found in large quantities over a wide area in Greece, Italy, and Sicily, include paintings of the most different kinds, from the rudest almost shapeless daubs to the most carefully-executed pictures, drawn with great beauty of composition and firm accuracy of form, though always retaining some amount of archaic stiffness and conventionalism. Though the faces are nearly always represented in profile, the eyes are shown front-wise, a method of treatment which continued in use even on the earlier vases of the next period, those with red figures on a black ground. Fig. 26 shows the progressive treatment*~~

~~*> SP DPP*~~

~~*Fic, 26.—Series of human eyes from painted vases, showing the develop-*~~

~~*ment of drawing, and power of representing the eye in profile.*~~

~~*of the human eye by vase-painters, from the earliest intro- duction of figures down to the end of the 4th century B.C.*~~

~~*PoTTrekh''yT*~~

~~*[HELLENIC.*~~

~~*Many of the floral ornaments of this period still retain clear signs of their Oriental origm. The sacred tree of Assyria, in an elaborate and highly conventionalized form, very frequently occurs, or, worked into a running pattern, it forms a continuous band of decoration, out of which the Greek so-called "honeysuckle pattern" seems to have been developed. These vases have far greater variety and richness in their decorative patterns than*~~

~~*those with the black ground, the natural result of the great ease and freedom of hand with which delicate floral designs could be touched in with the brush in black, while in the later manner the red patterns had to be laboriously left out by working the black ground all round them. Hence the stiffness and poverty of invention which are so remarkable in the decorative patterns on the vases of the "best period." Many of the black figures of men and animals are executed with extraordinary minuteness, owing largely to the engraved gem-like treatment with which the incised lines are applied, especially in the representation of the hair of men or animals, and also in the rich textile patterns with which the draperies are often covered. Some of the vases, judging from their general form and thin band-like handles, were evidently copied from metal vessels, as, for ex- ample, a number of small amphoree found in various places, executed in the workshop of Nicosthenes, a rather inartistic potter, who appears to have turned out a large number of vases with little or no variety in shape or ornament.*~~

~~*-The later vases, with black figures, were produced simultaneously with the earlier ones decorated with red figures; and during this transitional period (about the middle of the 5th century B.c.) some vase-painters worked in both styles, both kinds of painting sometimes occurring even on the same vase. The British Museum possesses one of the finest specimens of these, a large amphora with nobly-designed paintings. On one side are two seated figures of Greek warriors, probably Ajax and Achilles, playing at a game like draughts. They are painted in black with chocolate-red touches, and minute details, such as the drapery over their armour and their wavy hair, executed in incised lines of extreme fineness and gem-like treatment. The other side of the vase has red figures on a black ground, a most powerfully drawn group of Heracles strangling the Nemzan lion in the presence of Iolaus, and an archaic statue-like figure of Athene. As in the painting with black figures, some touches of red areused, The treatment of Heracles's hair is peculiar and again recalls gem-engraver's work, in which hair is represented by a series of drilled holes; in this painting the stiff curls are given by a number of round dots of the black enamel, applied in considerable body so as to stand out in relief. This treatment frequently occurs on the fine vases of this and later periods, and the same method is occasionally used in a very effective way to represent bunches of grapes and the like.*~~

~~*Vases with Black Ground and Red Figures.—After about the middle of the 5th century B.c. this method superseded that with the black figures, and to this class belong the finest vases of all. The drawing of the earlier specimens is strongly sculpturesque in style, sometimes recalling the noble though slightly archaic pediment figures from Aigina, while the vase-paintings of a few years later seem to belong to the Phidian school ; the forms are noble and massive, treated with great breadth and simplicity, and kept strictly to one plane; faces are nearly always drawn in profile, and all violent foreshortening of limbs is avoided. Some vase-painters of this period (c. 450-400) retain a slight touch of Oriental feeling in their drawing, as, for in- stance, the beautiful amphora by Euxitheus in the British Museum, which has single figures of Achilles and Briseis, one on each side (see fig. 27).*~~

~~*Transi- tion.*~~

~~*Black vases with red figures.*~~

~~*HELLENIC. |*~~

~~*POTTERY*~~

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~~*It should be remarked that the style of vase-paintings | began to gain in softness and grace, while losing something*~~

~~*is generally rather archaic as compared with other branches*~~

~~*owner cena wenn mene e = BO | rn >*~~

~~*Fic. 27.—Amphora by Euxitheus (c. 450 B.c.), figure of Briseis ; the other side has Achilles. of contemporary art, as was the case with their inscrip- tions, and a certain conventionalism of treatment, such as . would not be found in sculpture, lingers till quite the end of the 5th century B.c. Fig. 28 shows a painting from*~~

~~*Fia. 28.—Peleus leading home his bride Thetis ; painting inside a cylix found in a tomb at Vulci (¢. 440-420 B.c.).*~~

~~*the inside of a cylix, remarkable for the severe beauty and simple grace of its drawing and composition. The scene represents the moment when Peleus has won Thetis for his bride, and is leading her away in triumph, gently overcoming her modest reluctance ; her shrinking and yet yielding attitude is drawn in the most refined and masterly manner possible.!*~~

~~*In the succeeding century both drawing and composition*~~

~~*1 The same design, though with inferior execution, is repeated on a cylix found at Corneto; see Mon. Inst., xi, table xx.*~~

~~*of their old vigour. Vase-paintings become more pictorial, and the compositions more elaborate and crowded; the British Museum has an amphora from Camirus (Rhodes), one of the most beautiful of this later class, elaborately decorated on one side with various coloured pigments and gold applied over the finished black and red figures. As in the earlier cylix of fig. 28 the scene represents the final triumph of Peleus in his pursuit of Thetis; in order to fill up the space some of the figures are placed, as it were, in the air, a method of composition peculiar to the later vase-paintings. Though not highly finished in details, such as the hands and feet, this picture is a perfect marvel of skilful touches rapidly applied, and of extreme beauty of form and general composition (see Plate V.). The funeral lecythi from tombs in the neighbourhood of Athens are a remarkable class of vases, c. 350-300 B.c. (see fig. 29). On these, over a white ground, are painted scenes representing mourners , visiting sepulchral stelze with | offerings in their hands. They are drawn carelessly, but with | great skill, in red outline and | then coarsely filled in with | colours. Some of the seated |! females are designed with | wonderful grace and pathos, the whole pose full of a ten- | der longing for the departed one. Besides the funeral | lecythi a few pieces of pot- . tery have been found, dating from about the same period, which have paintings exe- cuted on a ground of white slip. Some of them are of most extraordinary beauty ; perhaps the finest of all is a cylix from a Rhodian tomb, now in the British Museum, on the inside of which is a drawing, chiefly in outline, representing Aphrodite seated on the back of a*~~

~~*flying swan. from a tomb near Athens. For delicacy of touch and re- (British Museum.)*~~

~~*fined beauty of drawing this painting is quite unrivalled.*~~

~~*Ic. 29.—Sepulchral lecythus*~~

~~*| The exquisite loveliness of Aphrodite's head and the pure*~~

~~*grace of her profile, touched in with simple brush-formed lines, are quite indescribable, and show a combination of mechanical skill united to imaginative power and realiza- tion of the most perfect and ideal beauty such as no people but the Greeks can ever have so completely possessed (see Plate V.).*~~

~~*Vases of the Decadence.—The vases of this class are often Vases of of enormous size, covered with very numerous figures, often the de-*~~

~~*possessing much graceful beauty in form, but very inferior in execution and purity of drawing to the earlier paintings. The figures, especially in the later specimens, are thoroughly pictorial in treatment ; many of them are painted in cream- white, with shaded modelling in yellows and browns. Effects of perspective are introduced in some of the archi- tectural features, particularly in the bands of rich floral scroll-work. In the 2d century, till about 100 B.c., when painted vases ceased to be made, the paintings became extremely coarse and devoid of any merit whatever, though even at this time moulded vases, either decorated with reliefs all over or with small inserted emblemata, con- tinued to be made of great artistic beauty. The extreme degradation to which vase-painting of this period fell seems to be due not so much to the general decay of the*~~

~~*Dates of vases.*~~

~~*Shapes and uses.*~~

~~arts among the Greeks as to the fact that the vases were no longer made by able artists, but were turned out in large quantities from the hands of an uneducated class of artisans. This was probably partly owing to increasing wealth and love of display, which created a demand for gold and silver plate rather than for the cheaper but more~~

~~artistic beauty of painted clay.~~

~~The dates of Greek vases are difficult to fix, partly from a natural tendency to archaism, which varies with the productions of different places, and partly because in some cases there was an artificial reproduction of old styles and methods. The following chronological classification, which is commonly accepted, is only very roughly correct, and is not applicable in all instances : (1) black figures on red ground, about 8th century to 440 B.c. ; (2) red figures on black ground, of the best period, e. 440-300 B.c. ; (3) period of decadence, ¢. 300-100 B.c. Fine moulded black vases, and vases with polychromatic paintings of good style, were made towards the end of the 4th and early part of the 3d century B.c.~~

~~Shapes of Vases and their Use.—From the 5th century and after- wards but little scope was left to the fancy of the individual potter in the forms of his vases. One special pattern was pretty closely adhered to for each sort, though, of course, modifications in shape took place as time went on. Fig. 30 gives the forms of the chief~~

~~tombs, and it is probable that the ornamental vases were selected for sepulchral purposes, while a plainer and less decorated class was employed for actual domestic use.~~

~~Panathenaie Amphorx.—This is a very important class of vases,! extending over a long period, from the 6th to the end of the 4th century B.c. Fig. 25 above gives the earliest known specimen. They all have on one side a figure of Athene Promachos, and on the other a scene from the public athletic games. They are inscribed TON AOENEOEN A@OAON EIMI, and some of~~

~~*the later ones have the name of the eponymous archon as well, ¢.g., HYOOAHAOX APXQN on an amphora from Czere, now in the British Museum. Pythodelus was archon in 336 B.c., and so the date of the vases thus inscribed can be accurately determined. A number found at Benghazi and Teuchira in the Cyrenaica are now in the British Museum and the Louvre. Some of the archons' names on them are these—Nicocrates (333 B.c.), Nicetes (332 B.c.), Euthy- critus (328 B.c.), Cephisodorus (323 B.c.), Archippus (321 B.c.), and Theophrastus (813 B.c.). The figure of Athene on all of them is rudely painted in pseudo-archaic style—the figure in black and white, with incised lines, on a red ground ; the other side is painted in the same way, but is not archaicin drawing. Long vowels occur in the archons' names, but sometimes the same amphora has the obverse inscription written in the old way. They are all poor as works of art. One in the British Museum is of special interest from the design painted in white on Athene's shield. This is the celebrated sculptured group of Harmodius and Aristogiton by Critias and Nesiotes, of which an ancient copy exists in the Naples Museum, though the bronze original is lost.*~~

~~*Subjects of Vase-paintings.—These are of great interest, and are Subjects — almost endless in number ; only the scantiest outline can be given of vase- here, and, with so wide a range, any classification is necessarily paint-*~~

~~*ee ce*~~

~~*Hydria. Lecythus. Cylix. Lebes. Amphora. Cantharus. Crater. Aryballus. Cinochoe.*~~

~~*Fie. 80.—Principal shapes of Greek vases and their names.*~~

~~*sorts of vases; a large number of others exist, each with its special name. Amphore and hydrie are the largest and most im- portant, and have the grandest picture-subjects painted on them. The cylices frequently have paintings of wonderful delicacy and beauty ; the later Athenian lecythi are remarkable for their poly- chromatic decoration. The uses of the painted vases is a very difficult question ; few show any signs of wear, though they are made of soft clay easily scratched, and most of those which are represented in use on vase-pictures are plain black without any paintings. A beautiful little pyxis, or perfume-box, in the British Museum, shows in its*~~

~~*pictured scene of a lady's toilet several painted vases, which are set about the room as ornaments, and have flowers or olive-branches in them (see fig. 31). Many vases*~~

†

~~*Fig. 31.—Painting from a small toilet-box or pyxis, showing painted vases used to decorate a lady's room. On the left is a gilt pyxis with a tall lid, and an cenochoe on a low table; on the right two tall vases (lebes) on a plinth. All except the pyxis are decorated with painted figures, and contain flowers.*~~

~~*are blank on one side, or have on the reverse side a painting of ae execution, apparently because they remained set against a wall or in a niche. Nearly all those now existing came from*~~

~~*imperfect. (1) Stories of the gods, scenes such as the Gigantomachia or the birth of Athene. (2) Scenes from the heroic age, as the achievements of Theseus and Heracles, the wars of Thebes, the battles with the Amazons, the voyage of the Argonauts, the Trojan War, the return of the Greeks from Troy, and the like. (3) Dionysiac subjects, such as orgies of Dionysus and dances of satyrs. (4) Scenes from real life, such as the vintage, olive-gathering, marriages, feasts, dancing, hunting, sacrifices, and theatrical subjects. (5) Funeral subjects, as mourners bewailing the dead or bringing offerings to a tomb. (6) Scenes from the gymnasium and various athletic exercises. (7) Allegorical subjects, with figures of happiness, wealth, youth, and the like. (8) Historical subjects, which, however, are rare : a very fine vase in the Louvre, of the best period, has Creesus on his funeral pyre; the cylix of Arcesilaus has been mentioned above ; Anacreon playing on his lyre, and followed by his pet dog, occurs on several fine vases; the meeting of Sappho and Alceus is also represented ;. other portrait-figures appear, chiefly of poets and philosophers, many with inscribed names which are now unknown. (9) Humorous subjects: these are common on the vases of the latest period and are usually very coarsely painted ; caricatures of mytho-logical subjects frequently occur in which the gods are represented as dwarfs or hunchbacks.?*~~

~~*Places where Greek Vases have been found.—Till within the last Locali-twenty years most were discovered in the tombs of Magna Grecia, ties.*~~

~~*Sicily, and Etruria. Capua, Nola, and Vulci supplied a very large quantity of vases of the finest sort with the most rich and brilliant enamel. Special characteristics of style and technique can be traced in the production of special localities, but these differences are.not very important. Of late years Attica, the isthmus of Coririth, and other places on Hellenic soil have yielded a great many fine vases; the islands of the Agean Sea and the western shores of Asia Minor are rich in sepulchral stores of these and all branches of Greek art. Athens possesses a fine and rapidly- increasing collection chiefly from Attica. The British Museum collection is on the whole the finest for Greek vases of all periods, though it is very poor in Etruscan pottery. The other chief collections of Europe are in the Louvre, at Naples, in the Vatican, at Florence, and Turin; Munich, Vienna, Berlin, and St Peters- burg also have very fine collections ; and there is a small one in the Bibliothéque, Paris.*~~

~~*Section VI.—PREHISTORIC AND ETRUSCAN IN ITALY.*~~

~~*Very many of the numerous vases discovered in the tombs of Erruria (q.v.) are imports either from Greece and its islands or from the neighbouring country of Magna Grecia. Nevertheless there is a large class of pottery which is distinctly native, extending over a very long period, from quite prehistoric ages down to the time when the Roman rule extended throughout the peninsula. This*~~

~~*1 See Ann. Inst., 1830, p. 209, and 1877, p. 294; also Mon. Inst., x., tables xlvii., xlviii. 2 See Heydemann, Humoristische Vasenbilder, Berlin, 1873.*~~

~~*The following list includes the majority of subjects. ings.*~~

~~*Pre- historic.*~~

~~*Etruscan black ware.*~~

~~*smother kiln."*~~

~~*ETRUSCAN.* |~~

~~*pottery may be divided into six classes,—(1) prehistoric; (2) black glossy Etruscan; (3) pottery rudely painted with figures of purely Etruscan design ; (4) plain biscuit clay, unpainted, but decorated with stamped reliefs; (5) later vases, badly-executed imitations of painted Greek vases, but having Etruscan subjects, or Greek subjects treated in a distinctly Etruscan manner ; (6) large clay slabs, with painted figures, used for the wall-decoration of tombs.*~~

~~*1. Prehistoric.—This is the work of the Siculi, Oscans, Umbrians, and other occupiers of Italy before the arrival of the Etruscans. It is mostly small, made without the wheel, of coarse brown or blackish clay, slightly orna-mented with ridges of clay modelled in relief. One curious variety is in the form of a primitive Oscan hut, with a movable door, fixed with pegs.1 The Museo del Collegio Romano has a fine aoiction of the prehistoric*~~

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~~*ys i, J*~~

~~*<---- 3*~~

~~*Fie. 32.—Padhsatewh potiary from Italy.*~~

~~*pottery of Italy, Sardinia, and other places. shows some of the commonest forms.*~~

~~*2. Etruscan Black Ware.?—It is remarkable that the Etruscan race, though so extraordinarily skilful in most of the handicrafts, did not excel at any period in their pottery. They were especially famed for their skill in metal-work, and hence perhaps this largest and most numerous class of their*~~

~~*fictile ware is mostly shaped after metal forms and decorated with designs not specially suited to clay. The clay of which this black ware is com- posed consists (taking the average of many analyses) of the following ingredients, —silica 63, alumina 15, peroxide of iron 8, lime 34, magnesia 2, and carbon 2. It is hard and metallic in appearance, generally of a sey black, but sometimes grey. Its black E is partly due to the super- ficial presence of free car- bon, showing that the vases were fired in a close kiln, under the direct contact of the carbonaceous smoke from the fuel, a process called in modern times "the If heated to a bright red in an open fire the ware loses its black colour and becomes greyish white or brown. Its forms and the figures stamped in blunt relief all suggest that \& they were copied from metal ~ originals, a supposition ' strongly borne out by the fact that many of them are completely covered with gold or silver leaf (see fig. 33). The reliefs upon them consist of lions and other animals, sphinxes, chimere, human figures, or geometri- cal patterns, all coarsely executed, and very blunt in their forms, partly from want*~~

~~*1 See Virchow, Die italienischen und deutschen Haus-Urnen, Berlin, 1884.*~~

~~*2 See Lenormant, "Vases Htrusques de terre noire, Archéologique, 1879.*~~

~~*Fig. 32*~~

~~*Fig. 33.—Etruscan cenochoe, of black ware, with figures in relief. (Brit ish Museum.)*~~

~~*" in Gazette*~~

~~*POTTERY*~~

~~*615*~~

~~*of sharpness in the moulds they are stamped from, and partly through the shrinkage of the clay in the kiln. Some of the shapes are graceful, especially those undecorated by reliefs (see fig. 34). Others are very fanciful, worked into*~~

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~~Z y Fic. 34.—Plain Etruscan black pottery. forms most unsuited for clay, such as "situlee" or buckets, with movable ring handles ; incense cups supported on thin bands of clay stamped with reliefs; and jugs shaped like hollow rings. A few have their shapes copied from Greek vases, ¢.g., a number of small amphore of exactly the same form as those made by the Greek potter Nicosthenes. A common form of Etruscan vase has a lid shaped like a human head, copied apparently from Egyptian Canopic vases. Some have human arms rudely modelled in clay and fastened on by pegs. Besides the black vases of this form, there exist many made of red clay covered with yellow slip. 3. Etruscan Painted Vases—A number of very strange large covered jars have been found at Cere (see fig. 35), more than 3 feet high, and rudely A painted in dull colours (black, red, and white) with large figures of animals,—lions, wolves, horses, various birds, and some almost shapeless figures of men. There is considerable spirit in the drawing & of the animals, as is often the case even when there was no power to delineate human beings. The finest of these vases are in the Louvre and at Orvieto. Some have only geo- — metrical patterns,—bands of simple Fic. 35.—Early Etruscan leaf-ornament,platbands, orchequers. Painted jar. (Louvre.) Others are shaped like large round boxes on a foot, with lids, nearly 2 feet high. One of those in the Louvre, of red clay blackened by smoke, has a very curious drawing in white pigment, coarsely executed. It represents a mer- chant-ship under full sail being attacked by a war-ship impelled only by oars; the latter is crowded with soldiers bearing round shields, each with an heraldic device. The other vessel has only one combatant, a bowman, who, mounted on the yard-arm, discharges an arrow at the enemy. 'This appears to be a pirate scene, and, though very rudely painted, it is not without strong dramatic force.® 4, Vases in Biscuit Clay with Bands of Stamped Reliefs. —These are mostly large pithi (see fig. 36) about 3 feet high, or thick pinaces (platters) 1 to 2 feet across. Some are of dull red clay, covered with bright red slip; others are yellow. The clay is coarse, mixed with crushed granite, sand, or pounded pottery, to which the coating of fine clay- slip gives a smooth surface. Their chief peculiarity con- sists in the bands of figures in relief with which they are decorated,~~

~~*and which were impressed on the soft clay by rolling along it wheels about 1 inch thick and 7 or 8 inches in circumference. Incuse figures were cut on the edges 3 A similar vase is illustrated in Mon. Inst., ix., table iv.*~~

~~*ae ee*~~

~~*Etruscan painted vases.*~~

~~*Biscuit vases with stamped reliefs.*~~

~~*Imita- tion vases.*~~

~~*616*~~

~~*of the wheels, which, when rolled over the clay, printed (like seals) rows of figures, and they were of course repeated every 7 or 8 inches, ac- cording to the size of the wheels. These stamped reliefs, mostly about an inch high, represent processions of animals,—lions, leopards, boars, ibexes, deer, horses, or griffins. Some have human figures, horse- men fighting with chimers. One in the Louvre has a curious hunt- ing-scene, a man, with two dogs, throwing short knobbed sticks to drive hares into a net. The bands are arranged, singly or double, round the rims of the pinaces and 2 the shoulders of the pithi; the latter p,. 36—Btruscan_pithus are also ornamented with rude orjar, with wheel-stamped fluting or "reeding" below the band, and fluted body. bands, or have occasionally reliefs, (Louvre.)*~~

~~*2 to 3 inches square, stamped at intervals all round them instead of the continuous lines of figures.*~~

~~*5. Later Vases with Imitations of Greek Paintings.— These are mostly copies of Greek forms, but very inferior, both in drawing and technical execution, to the real Greek vases, the black enamel especially being thin, and hard in texture. In appearance they resemble Greek vases of various periods, but are distinguishable by having paintings that are not Hellenic in subject or treatment, or by their Etruscan inscriptions. An amphora, now in the British Museum (see fig. 37), of early style, with black figures*~~

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~~*Fic. 87.—Etruscan amphora, Greek style, with contest between Hercules and Juno, and bands of birds and animals; black, with incised lines.*~~

~~*and incised lines, has a painting of a scene which belongs specially to Latin mythology, viz., the contest at Pylus between Hercules and Juno Sospita; Minerva stands behind Hercules and Poseidon behind Juno. On each side of Juno is a caldron full of snakes, probably an allusion to the sacred serpent which was kept in the grove of Juno at Lanuvium. Another amphora in the Paris Bibliothéque has a painting of the scene where Admetus takes leave of Alcestis before her descent to Hades (see fig. 38). Two hideous demons are depicted,*~~

~~*POT TEE Y*~~

~~*[ETRUSCAN.*~~

~~*waiting to seize their prey: one, Charun, with winged feet, brandishes a massive hammer; the other, Mantus,*~~

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~~*be, (*~~

~~*Fae Hi Mh | ee Nn W ie | Ms i LN | 4 d me con ms. ” lly will sh *~~

~~*Fic. 38.—Etruscan painting, an amphora of later Greek style; parting scene of Alcestis and Admetus, with Etruscan inscriptions. with great white wings, holds a serpent in each hand; both have a fiendish aspect, with grinning teeth, like the devils in medizval pictures of hell, and thoroughly un- Greek in spirit. This vase is in the style of the decadence*~~

~~*of vase-painting, probably about 200 B.c.*~~

~~*6. Painted Wall-slabs were used to decorate the walls Painted of tombs ; they are from 4 to 5 feet high, about 2 feet wall- wide, and about 1 inch*~~

~~*thick. The upper part some-'!@>*~~

~~*times has a moulded cornice and a painted frieze with geometrical ornament. The lower part is covered with chequered squares or some other simple pattern. On the intermediate space are painted pictures with figures, about 2 feet high, representing sacrificial scenes, religious pro- cessions, and other subjects. The drawing shows Greek influence, but the costumes are Etruscan. The pigments are mostly simple earth-colours, red, brown, and yellow ochres, with black, white, and bluish grey; but bright greens and blues also occur, the latter made from oxides of copper, like the smalto on the Attic lecythi. The colours are all applied quite flatly; the female flesh is white, the male red ; and the whole painting is emphasized by strong black outlines. The costumes are interesting ; many of the garments fit tightly to the body, and the men mostly wear a peculiar sort of high boot turned up at the tip. It is doubtful whether they are executed in true ceramic colours fired in the kiln. They may possibly be only tempera paintings, like those on the tuff-walls of some of the excavated tombs. The great size of the well- baked clay slabs on which they are painted shows that the Etruscans must have constructed pottery-kilns of considerable dimensions.~~*

~~*Inscriptions on Etruscan Vases.—Painted words or phrases are Inscrip- not uncommon on the vases which are imitated from the Greek ; tions.*~~

~~*they are usually illustrative of the subject, as, for example, the vase mentioned above with the parting scene of Alcestis and Ad- metus, which has, in addition to the names of the two principal figures, a sentence in the Etruscan language, spoken by Charun— '*Kica ersce nac aqrum wlerorce" (I bear thee to Acheron). The names of Admetus and Alcestis are written retrograde,? thus—*~~

~~*AWA thovA*~~

~~*Several. Etruscan vases of black ware have been found with the complete Etruscan alphabet rudely scratched upon them. They give early forms of the twenty-two Phceenician letters, and are arranged in the Semitic order.? A cup in the museum at Grosseto has two Greek letters added after the twenty-two which composed the Etruscan alphabet. Some late vases, not earlier than about 200 3.c., are interesting from having inscriptions painted*~~

~~*in white, which give early forms of the Latin language. They are mostly dedicatory, with names of Latin deities, ¢.g., VOLCANI POCVLOM, "the cup of Vulcan"; BELOLAI POCVLOM, **the cup of Bellona," and others.*~~

~~*Dates of Etruscan Potiery.—These can only be roughly estimated. Dates.*~~

~~*1 See Dennis, Cities of Etruria, ed. 1878. 2 See Birch, Ancient Pottery, 1873, p. 460. 5 See Taylor, Alphabet, 1888, vol. ii. p. 78.*~~

~~*Local- ities,*~~

~~*SAMIAN. |*~~

~~*The black moulded ware (class 2) seems to range from about the 8th to the 3d century B.c. The large jars with stamped bands (class 4) appear to be all very early in date, about the 8th century B.c. They are not found in those tombs which contain painted vases. The large vessels with rude native paintings (class 3) are probably of the 6th and 7th centuries. The vases with imitations of Greek paintings extend over a long period, from about the 6th to the 2d century B.c.*~~

~~*The greatest quantities of Etruscan pottery have been discovered in the tombs of Tarquinii, Ceere, Veii, Cervetri, Chiusi, and near Or- bitello, Volterra, Orvieto, and other places in central Italy, but above all at Vulci. The best collections are in the Louvre and the Vati- can, at Florence, Naples, Turin, Bologna, Brescia, and many small towns in Italy in the neighbourhood of the various Etruscan ceme- teries, such as Orvieto, Perugia, Grosseto, Volterra, Arezzo, and at Capua, where a very important ceramic museum is being formed.*~~

~~*Literatwre.—The best articles on the subject of Greek and Etruscan pottery are scattered through the numbers of various archeological publications, espe- cially the Annali, the Monwmenti, and the Bulletino dell' Instituto di Corri- spondenza Archeologica, Rome, 1829, and still in progress. See also the Bulletino Archeologico Napolitano, 1842-59; Stephani, Compte rendu de la Commission Archéologique, St Petersburg, 1859 (in progress); Bull. de Cor. Hellen., in pro- gress; Archdologische Zeitung, Berlin ; Philologus: Zeitschrift fiir das klassische Alterthum ; Rheinisches Musewm fiir*~~

~~*Philologie, Archxologia, Soc. Ant. London ; Berichte der sdchsischen Gesellschaft der Wissenschaften ; Panofka, Antiques du Cabinet Pourtalés, 1834; C. T. Newton, Catalogue of Greek Vases, British Museum, 1851-70; Gerhard, Antike Bildwerke (1828-44), Auserlesene griechische Vasenbilder (1840-58), and Griechische und etruskische Trinkschalen (1840); Benndorf, Griech- aische und sicilienscne Vasenbilder, 1877, in progress (with fine coloured plates, all full size); Helbig, Wandgemdlde Campaniens, 1868; Inghirami, Pittwre di Vasi fittili, 1832-89; Millingen, Unedited Monuments, London, 1822-26: Lenor- mant and De Witte, Monuments Céramographiques, 1844-61 ; Raoul-Rochette, Monuments d' Antiquité Grecque, &c., 1833; Lahn, Gemdlde aus Pompei, &c., 1828-59; Bréndsted, Thirty-two Greek Vases, 1832; Fiorelli, Vast dipinti, &c., 1856; Gargiulo, Vast fittili Italo-Greci, 1831; Heydemann, Griechische Vasen- bilder, 1870, and Die Vasensammlungen des Museo zu Neapel, 1872; Jahn, Ueber Darstellungen griechischer Dichter auf Vasenbildern, 1861, and Vasensammlung zu Miinchen, 1854; Levezoff, Verzeichniss der antiken Denkméiler, 1834; Stephani, Die Vasensammlung der Ermitage, 1869; De Witte, Vases peinis de U Etrurie, 1837, and Vases peints de la Collection Castellani, 1865; Brunn, Probleme im der Geschichte der Vasenmalerei, 1871; Dumont, Peintwres céram. de la Gréce, 1874, and Vases peints de la Grece, 1873; Dumont and Chaplain, Les Céramiques dela Grece, Paris, 1883 (in progress, with excellent illustrations) ; Kekuleé, Griech. Vasengemdlde im Mus. zu Bonn, 1879; Roulez, Vases du Musée de Leide, Ghent, 1854 ; Collignon, Caé. des Vases du Mus. d' Athénes, Paris, 1877 ; Froehner, Ana- tomie des Vases Grees, Paris, 1880; Thiersch, Die hellen. bemalten Vasen, Munich, 1848, The following works deal specially with the vases found in Etruria :— Inghirami, Museo Chiusino, Fiesole, 1833, and Mon. Etruschi, 1845 ; Conestabile, Mon. -di Perugia, 1855-70; Noel Desvergers, L'Btrurie, Paris, 1862-64; Bull. degli Scavi d. Soc. columbaria, Florence, in progress ; Gozzadini, Necropoli a Marzabotto (1865-70), Sepoleri d. Necropoli Felsinea (1868), Necropoli di Villanova (1870), and Sepolcri nell' Arsenale di Bologna (1875); Yannoni, Scavi d. Certosa dt Bologna (1871), Scavi Arnoaldi (1877), and Scavi di via d. Pratello (1878); all these works by Gozzadini and Zannoni are printed at Bologna. See also Pindar, Nemwan Ode, x. 64-67, and Strabo, viii. p. 381. For inscriptions on vases, see Ephemeris Epigraphica, and Bockh, Corp. Iscr. Gr.*~~

Section VII.—Graco-RoMAN AND RoMAN.

Some specimens of very peculiar glazed pottery have been found at Cyrene, Cyme, Pergamum, Smyrna, Tarsus, and other Roman colonies in Asia Minor. _It is very deli- cate and often graceful in shape (see fig. 39), with very thin handles, fashioned more like glass than pottery. Itis remarkable for being coveréd with a thick vitreous glaze, usually coloured either green, orange, or purple-brown, with oxide of copper, an- timoniate of lead, or manganese, quite unlike the thin almost imperceptible glaze of Greek vases. This pottery is | mostly small; some pieces are in the shapes of cenochoz, two-handed cups, or asci, the latter covered with graceful patterns of vines or other plants moulded _ in slight relief. Statuettes and delicate « S y reliefs, parti-coloured with different pg, 39,—Greco-Ro- glazes or enamels, have been found at mancenochoe, highly

——= —yA 2 “<== ——

several of the above places, and also glazed ware, from

larger vessels, craters, and bottle-shaped am Minor. (British é useum.)

vases, decorated with moulded clay em-

blemata, wholly covered with a fine blue glaze. The

Louvre and the British Museum have the best specimens of this rare ware, which probably dates from the 1st cen- tury B.c. downwards.

“Gamian” ware, the characteristics of which are de- scribed below, was made in Italy during the first period of Graeco-Roman art. In 1883 some moulds for cups and bowls were found at Arezzo, all of the most wonderful beauty and gem-like delicacy of execution. The figures

on them are from about 3 to 4 inches high, but are large and sculpturesque in their breadth of treatment. Some of the exquisite reliefs represent dancing

~~*fauns and bacchanals, with flowing drapery, on a background enriched with vine plants in slight relief. Another has a love scene of extra- ordinary grace and refined beauty. The modelling of the nude throughout is most masterly. The treatment of these reliefs recalls the school of Praxiteles, though they are probably not earlier than the Ist or 2d century B.c.*~~

~~*Roman Pottery, Ist Century B.c. to 5th Century A.D.—Throughout Italy, Spain, France, Germany, Britain, and other countries occupied by the Romans great quantities of pottery have been found, varying but little in design or manner of execution. The principal varieties of this large and widely-spread species of ware may be classified thus—(1) Samian ware; (2) plain biscuit clay; (3) pottery decorated with slip in relief; (4) black ware ; (5) glazed ware.*~~

~~*1. The first class is a fine glossy red ware called Samian "Samian" from its resemblance to the red pottery pro- Ware*~~

~~*duced in the Greek island of Samos. The name is a con- venient one, and as it is used by Pliny (HZ. W., xxxv. 46) and other early writers it is well not to discard it, though probably the real Greek Samian pottery bore little resem- blance to that made by the Romans except in colour and glossy surface. It is of a fine red sealing-wax-like colour, of pleasant texture, and is generally decorated with moulded reliefs. Materials: the clay body usually consists of silica 50-64 parts, alumina 18-25, red oxide of iron 7-10, and lime 2-9 parts; these proportions vary in different- speci- mens. 'The red vitreous glaze, or rather enamel, which gives the ware its fine glossy surface consists of silica 64 parts, soda 20, and red oxide of iron 11 (average analysis). Method of manufacture: the bowls, cups, and other vessels, richly decorated outside with reliefs, were made thus. In the case of a bowl, a mould was first prepared, of hard well-burned clay, covered inside with incuse designs ; these sunk patterns were made either by hand-modelling or, more usually, with the aid of stamps modelled in relief. Thus the inside of the bowl-mould corresponded to the outside of the future Samian bowl, which was first turned on the wheel quite plain, but of the right size to fit into the mould. Then, while it was still soft it was pressed into the mould, and afterwards both were put upon the wheel together. As the wheel revolved, the potter could at the same time press the clay into the sunk*~~

~~ornaments of the mould and finish neatly the inside of the vessel. In some cases he raised the walls of the bowl high above the mould by adding clay, and thus with the same mould could pro- duce a variety of forms, though the lower or decorated portion always remained the same. A fine crater in the Louvre was made in this way. The vessel was then re- moved from the mould and the reliefs touched up by hand (in the finer specimens) with bone or wooden modelling- tools. The reliefs thus produced are often very graceful in design, but are mostly wanting in sharpness, many being blunted by the touch of the potter's fingers in handling the pot after it was removed from the mould.! It was next covered with the materials for the red enamel, very finely ground and fired in the usual way. Fig. 40 shows a design of typical character. The outer reliefs consist generally of graceful flowing scroll-work of vines, ivy, or other orna- ments, mixed occasionally with human figures and animals. The finest sorts of Samian ware were made at Arezzo (Aretium) in Italy? and Saguntum in Spain (the modern~~

~~1 In some rare cases the reliefs were moulded separately and then applied to the plain wheel-turned vessel while yet soft, but this was exceptional.~~

~~2 See Fabroni, Vasi jittili Aretini, 1841, and Inghirami, Mon.~~

~~Murviedro). many, and the discovery of a York makes it * appear probable <;~~

~~in Britain, where great quantities of it have been found. This ware is of great beauty, both in colour and in its delicate surface reliefs ; it is the mostartistic sort of pottery that the Romans produced. It appears to have been highly valued, as many Samian bowls have been found carefully mended with bronze or lead rivets. In addition to the moulded ware many vessels of the same class were made plain from the wheel; others have a~~

~~*peculiar scale ornament in relief applied by the potter's thumb, a form of decoration common in other varieties of Roman pottery.*~~

~~*2. Plain Biscwt Pottery is made of simple unglazed clay, without decoration, of a soft body and quite porous. The clay is mostly composed thus: silica 48-69 per cent., alumina 10-22, oxide of iron 8-13, lime 14-18 per cent., but it, of course, varies according to the locality where the pottery was made. Fig. 41 shows some of the forms of*~~

~~*Fic. 40.—Bowl of Samian ware, with moulded patterns in slight relief.*~~

~~*<----------G Nn ——— ==>*~~

~~*Fic. 41.—Typical shapes of common Roman biscuit pottery.*~~

~~*this simple ware. It was specially used for amphore, often nearly 2 feet high, sepulchral urns, and vessels for common domestic use. The forms are mostly graceful and natural. The clay is of many colours, including all shades of red, grey, brown, yellow, and (rarely) almost pure white. Some of this pottery has the grain which had been pro- duced by the wheel carefully smoothed out by a tool or the potter's hand, or in some cases by dipping the piece into a bath of thin fluid slip, but it is more commonly left without any attempt at smoothness or high finish.*~~

~~*3. Pottery with Reliefs applied in Slip.—This is a very remarkable kind of decoration, in which great skill was shown by the Roman potters. The slip, finely- ground clay, was mixed with water to about the consistency of very thick cream, and was allowed to run slowly or drop*~~

~~*POTTERY*~~

~~*It was also produced in France and Ger- | off a wooden point or flat spatula upon the outside of Samian bowl-mould at | ordinary wheel-made pottery. Very spirited figures of*~~

~~*[ROMAN.*~~

~~animals (see fig. 42)—hares pur- sued by dogs, lions, goats, horses, deer, or even complicated sub- jects with human figures such as gladiators' combats—and a great variety of graceful scroll-orna- F¢ ments of vine, ivy, or convolvulus were produced in this way with wonderful ingenuity. Both the outline and the modelling were given with curious precision by . = _ a_i the quantity of semi-fluid slip Fic. 42.—Roman cup, with which was allowed to flow off the reliefs of a stag pursued by a tool. The body, eg., of a dog ge executed in semi-fluid would be poured off a sort of >~~

~~small palette-knife, and its thinner legs formed by trailing along a point dipped in the slip. Tools for this purpose have been found near Roman kilns. One of the most elaborate specimens of this kind of pottery is a cup in the Colchester Museum, covered with reliefs of chariot-races and gladiators' combats, done with great vigour and even minuteness of detail considering the difficulties of the process. In some cases, especially when the designs are simple scroll or geometrical ornaments, additional effect is produced by the use of a slip coloured differently from the body of the pot. Frequently the relief-patterns are white, made of pipeclay, applied to a red or dark coloured vessel. The vessels with this class of decoration are mostly small bowls, cups, or bottle-like vases. Some few are made of the Samian ware, but more commonly they are grey or blackish with body and slip both of the same clay. A great deal of coarse Roman pottery is rudely decorated with a thin slip of red, white, or yellow clay, put on with a brush in coarse bands or scroll-patterns. The slip in this case is treated as a pigment of the sim- plest kind, and does not stand out in relief. With this trifling exception, nothing in the form of painted vases was produced by the potters of Roman times.~~

~~4, Black Pottery is usually made from a very silicious or Black sandy clay, composed thus—(average of several analyses) ware.~~

~~silica 76 parts, alumina 10, oxide of iron 9, lime 2. It owes its black colour and rather metallic gloss to the direct contact of smoke in a close or smother kiln. If heated in an open fire it burns out usually to a greyish white. A great deal of this ware belongs also to class 3, as it is frequently decorated with simple patterns in white slip; the presence of the white clay on the black body implies a second firing, free from the contact of smoke,~~

~~*and not high enough in temperature to burn the black out of the body of the pot. This ware was largely made at many places in Germany along the Rhine, in France, and especially at Castor in Northamptonshire, where remains of many Roman kilns have been found. It varies very much in shape and in method of decoration. Some of the numerous specimens from Bonn and Rhein- zabern are treated in a manner different from the British varieties. A few are coated with a black similar to that used by the Greeks, but very thin and poor in quality. Others have a mechanical polish applied after firing, whilst the pot was again set on the wheel, by rubbing it with black lead, occasionally applied in bands of alternately dull and bright black all round the pot. A fine specimen from Coblentz, now in the Sévres Museum, has a curious com- bination of stamped work and reliefs formed in fluid slip. The design represents a lion running through vine-branches. The body of the lion and the grapes are stamped from a mould, the rest being done in slip. Cups and small jars of this ware are frequently modelled into strange shapes by*~~

~~*Glazed ware.*~~

~~*Mortaria.*~~

~~*ROMAN.*~~ |

~~*being pinched in at various places by the potter's fingers while they were fresh from the wheel. Others are deco- rated with groups of dots, made of semi-fluid slip, appa- rently applied through a pierced stencil-plate (see fig. 43). The dots are arranged in close rows, forming rectangular patches, ar- ranged round the body of the vessel,—a very < dull kind of ornament, which may, however, ——— have had a practical use _———*~~

~~*in making the pottery Fria. 48.—Roman black ware decorated*~~

~~*: E with groups of dots in relief, and tt "ede om a blackened in the smother kiln.*~~

~~*5. Glazed Pottery.—This is rare, but has been found in most of the countries once occupied by the Romans. Some of the best specimens resemble that described above as Greco-Roman glazed ware. Most are, however, very*~~

~~*inferior, both in execution and in the quality of the glaze, which isa true glass, usually coloured light green or brown- ish yellow. A cake of semi-fused greenish glass, appa- rently intended for this purpose, was found in the ruins of a kiln in Britain. This glazed pottery is small, and is decorated in various ways, by incised lines, or groups of dots in relief, or by brush-applied stripes of red or white clay.*~~

~~*aia 542" Sosa*~~

~~*In addition to the forms of Roman domestic pottery shown in the above figures one peculiar shape occurs very frequently, namely, the " mortarium," a large shallow dish, made of thick clay, with a spout at one side, used for triturating cooked vegetables or other soft substances. The inside of these mortar-like dishes is often roughened by being sprinkled, while in a soft state, with crushed*~~

~~*. quartz or pottery, apparently to aid the process of pounding.*~~

~~*Clay lamps.*~~

~~*Baked | bricks.*~~

~~*Roman kilns.*~~

~~*They are made of various kinds of ware, especially red Samian and yellow biscuit clay. '*~~

~~*Clay lamps were very largely used by the Romans, mostly made of plain biscuit clay, but the finest specimens are in the red Samian ware. A few have been found with a thick vitreous glaze, coloured like the rest of the Roman glazed wares (see LAmp, vol. xiv. p. 247).*~~

~~*An extensive use of baked clay was made by the Romans in the manufacture of bricks, roofing -tiles, flue-tiles, drain-pipes, baths, and even coffins. The bricks are generally very large and thin, some 15 to 18 inches long, and only 14 inches thick, and walls were entirely built of them. They were also used to form alternating bands in stone walls, the brick bands usually consisting of from three to five courses. In Rome bricks were merely used as*~~

~~a facing to concrete walls. They are always triangular in shape, except such as were set at the angles of walls and used as facing to arches. Those used for the latter purpose are generally two Roman feet square (about 1 foot 114 inches English). See Romz. The system of heating employed by the Romans in their houses and baths was very ingenious and complete. Sometimes the whole walls of a room were lined with clay flue-pipes, square in section, which, being con- nected at the bottom with the hypocaust, carried the hot air over the whole wall-surface as well as under the floor (see BATH), the mosaic and concrete area of which (the " suspensura"') was supported on large clay slabs carried on short brick pillars. Flanged tiles, similar to those used for roofing, were often built up on edge, with others set across the top, to form graves, and to protect the sepul- chral urns and other buried objects from being crushed by the weight of earth upon them.~~

~~Roman Pottery-kilns. Great numbers of Roman kilns have been found in various countries, but none quite perfect. They are small, round, or oval structures of brick, with a place for the fuel at one side, and a floor made of pierced slabs of clay, on which the pots were piled, the fiames and hot air passing through the holes in the clay floor. Most kilns were probably covered by a brick dome with a central opening, exactly the same in principle as the early Corinthian kiln shown in fig. 3. The smother kilns may, how- ever, have been arranged rather differently, so as to fire the pots in*an atmosphere of heated smoke; or this may have been done by partly closing the aperture at the top, in order to half smother the fire, and prevent its burning with a hot clear flame. Fig. 44 shows the remains of one of the Castor kilns, about 7 feet in diameter, with an arched opening for the insertion of the fuel, and a pierced floor, made of large clay slabs radiating to a central point, where they were supported by a brick pillar. Other kilns have been found in the Upchurch marshes (Kent), along the Severn banks in Shrop- shire, at Ashdon (Essex), Colchester, London, York, and many other Romano-British towns. Though varying in shape, yet in general~~

~~*principle Roman kilns, in whatever country they are found, are practically the same.*~~

~~*Inscriptions on Roman Pottery.—Potters' names, impressed from oblong or circular-incuse stamps, occur very frequently on many varieties of Roman pottery, especially on the plain biscuit and*~~

~~*TTS a Ty*~~

~~*ay*~~

~~*Fic. 44.—Roman kiln found at Castor. The low arch is for the inser- tion of the fuel ; the pots rested on the perforated floor, made of clay slabs; the top of the kiln is missing,—it was probably a dome.*~~

~~*Samian wares. Teutonic and Gaulish names sometimes appear, showing that in certain cases native potters worked at the Roman potteries. When the potter's name is in the nominative, it is followed by F. or FECIT; if in the genitive, by MANV or OFFICINA, usually in some contracted form. In addition to the potter's name those of the owner of the workshop and of the estate from which the clay came occasionally occur, as, for example, OP(US) DOLIUTARE) L. IVLI THEOD E(QVITIS) R(OMANI) FIG SAL EX PR(AEDIS) FL(AVII) TITIANT C. V. (clarissimi viri), " Pot-work from the salarian manufactory belonging to L. Julius Theodotus, a Roman knight, (the clay taken) from the estate of Flavius Titianus, a most distinguished person," this last being a title used like the English "esquire." This brick stamp is from a house built against the ancient wall round the Capitoline hill, and dates from the middle of the 2d century A.D. Few brick stamps found in Rome are older than the end of the 1st century A.D. ; but some have been found at Velia in Cisalpine Gaul dated with the names of the consuls for 75 B.c. Others have also the name of therulingemperor. Roman soldiers were often employed to make bricks and tiles; and many such are stamped with the mark or number of a Roman legion, ¢.g., LEG. VI. for " legio sexta." " Amphore were occasionally inscribed, in rudely-painted ochre colours, with words to indicate the quality of wine they contained or their measure of capacity, but such inscrip- tions were probably added when the amphore were in their owner's cellar, and were simply painted in tempera. Numbers of large amphore were frequently embedded in the*~~

~~*concrete of which Roman vaults were made, especially during the 3d and 4th centuries a.D., one object of this being to gain lightness without much loss of strength. The circus of Maxentius and the mausoleum of the empress Helena, both outside the walls of Rome, are examples of this curious use of pottery.*~~

~~*Literature.—Pliny, H. N., xxxv.; Birch, Ancient Pottery, 1873; Jewitt, Ceramic Art of Great Britain, vol. i., 1877; Artis, The Durobrive: of Antoninus, 1828 ; Church, Corinium Museum, 1871; Cochet, Archéologie céramique, 1860 ; Roach-Smith, Roman London, 1859; Wright, The Celt, the Roman, and the Saxon, 1861; Marcilly, L' Art céramique en Gaule, 1874; Fabroni, Vasi fittili Aretini, 1841 (Samian ware); Robert, Les figures des poteries rougedtres antiques,*~~

~~*1865 ; Shortt, Sylvia antiqua Iscana, 1841. See also many articles in Arch#xo- logia, the Archxological Journal, and other societies' Proceedings.*~~

~~*Section VIII.—PrErsian aND MosLEM.*~~

~~*It is convenient to class under this head all the numerous varieties of pottery which were the work of Moslem races. In all this pottery, with the exception of that included under the head "Hispano-Moorish" (see p. 622), there is a great similarity in character of design and in methods of execution, both of which appear to a great extent to have been originated and brought to highest perfection under the Persians, who seem to have inherited, through the Sasanians, much of the skill in manipulating clay and manufacturing enamels and glazes which was possessed by the people of ancient Assyria. The Persians of the 10th to the 17th century, perfect masters of all the de- corative arts to a degree possessed probably by no other*~~

~~*Inscrip- tions.*~~

~~*Mate- rials.*~~

~~*Lustred ware,*~~

Ancient coarse pottery.

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POTTS &

[PERSIAN.

race or age, excelled in pottery as in other handicrafts. | pation of Egypt down toa very recent period. To this

Their enamels and glazes are made and applied with the greatest skill; their colours are brilliant and yet harmoni- ous; and the patterns painted on their pottery are designed with the most wonderful grace and freedom, together with a perfect sense of the right kind of ornament to use for each special place and material.

Materials used by Persian Potters.—In most cases the clay body of Persian pottery is completely covered either with a white enamel or with slip, and therefore any sort of clay sufficiently plastic for the wheel suited the purpose, whatever its colour. The enamel was much the same as that used by the ancient Assyrians, except that it con- tained a much larger proportion of oxide of lead, of which there were often three parts to one of oxide of tin and five of silicate of soda. The white slip is silicate of alumina with some alkali. The glaze is either a pure silicate of soda, or has in addition a little oxide of lead to increase its fusibility. The pigments are oxides of cobalt and copper for the blues and greens, manganese for the purples, oxides of copper and iron for the reds, magnetic oxide of iron for the black, and antimony for the yellow; a rich warm orange was produced by a mixture of anti- mony and red oxide of iron. It is not always possible without actual analysis to tell whether the white ground of Persian pottery is a tin enamel or a glazed slip, especially as in many cases a glaze is applied over the enamel ; but this is not a point of great importance, as the decorative treatment of the white ground was in either case much the same.

The following are the chief varieties of Persian pottery.

~~*1. Lustred Ware.—The application of lustre colours requires a special process of firing. The following descrip- tion applies equally to the other two classes of pottery in which lustre pigments were largely used, namely, Hispano- Moorish and Italian majolica. The special beauty of the lustre depends on the decomposition of a metallic salt, usually silver or copper; the required design was painted in a pigment composed mainly of this salt over the sur- face of the smooth enamel or glaze after it had been fired. The vessel with the lustre pigments was then fired again in a kiln specially so arranged that the heated gases and smoke should come into contact with the metallic pig- ments ; the minute and heated particles of carbon in the smoke combined with the oxygen of the salt, setting free the metal, which was left, in a finely-divided state, fixed on the surface of the enamel. In this way a beautiful prismatic effect was produced like the colours of mother-of-pearl. The lustre colours when looked at from one point of view are simply various shades of browns and yellows, but when seen at an angle they appear shot with the most brilliant violets, blues, purples, and red. They were used generally, and with best effect, over a white*~~

~~*ground (see fig. 45), but also over deep-blue or green*~~

~~*enamels. Lustre colours were specially used by the Persians for wall-decoration (see TrLxs), but they also used them on both white and blue enamel grounds to ornament hookah- bottles, bowls, plates, ewers, and tall rose-water bottles. The lustre is generally used alone, and not, as in the Italian majolica, combined with other non-lustre pigments. Its use 1s very early in Persia: dated specimens exist of the 10th century; and its manufacture has continued down to the present time, though that now made is of a very inferior quality.*~~

~~*2. Coarse pottery covered with a fine white silicious slip, on which arabesques and other simple patterns are pated in black, the whole then covered by a transparent green glaze. This is a very ancient sort of ware, made in Egypt during the XVIIIth Dynasty and many centuries after by Moslem potters, from the early years of their occu-*~~

~~*class belong the "bacini" or large dishes with which some*~~

~~*Fig. 45.—Persian ewer, white enamelled ground, with pattern in brown copper lustre; the upper part has a blue ground. The mount- ing is gilt bronze, Italian 16th-century work. (British Museum.)*~~

~~*of the 12th-century churches in Pisa and other towns in*~~

~~*Italy were decorated. They were built in on the outside walls of the campanili, or used in rows to form friezes. In design and method of execution they have nothing in common with Italian majolica, and the oft-repeated story of their being the models from which the Italians learned to make their majolica appears to be a baseless fable.*~~

~~*3. Sgraffiato Ware.—These are certain large bowls or Sgratii- jars decorated in a peculiar way, being covered first with ato ware.*~~

~~*a coating of white enamel and then with a complete coat- ing of brown or deep-blue enamel. The pattern, usually graceful branches of plants with pointed leaves, is formed by cutting through the upper coloured layer down to the white enamel underneath before firing in the kiln. Thus the design appears in white with a coloured ground. The white is, of course, slightly sunk below the coloured layer. Bowls thus decorated are mostly white inside, with a little simple painting in blue, the sgraffiato or incised work being only on the outside.*~~

~~*4, The next class is the reverse of the incised ware in White treatment : the whole vessel is covered with brown or blue enamel*~~

~~*enamel, and the design, either arabesques geometrically treated or natural sprays of foliage, is painted over it in white enamel, thickly applied so as to stand out in slight relief. This and the preceding class are usually glazed over the enamels, a common Persian practice, to gain addi- tional richness and brilliance of surface. Somewhat akin to this ware in style is a very beautiful sort of pottery with most graceful and delicate designs touched on with a fine brush over a white enamel ground. The pigments are blue, green, grey, and a very rich orange tending to red, and are all thickly but very delicately put on ; these pieces are of extreme beauty both in colours and in design. Tall jars, bottles, bowls, plates, and hookah-jars are the*~~

vessels usually decorated in this way. Some of the large plates are perfect marvels of decorative beauty of the most refined and graceful kind.

_ 5. Damascus Ware.—Under this head is generally Damas- included a good deal of Persian pottery made at other-cus ware.

places besides Damascus, but of similar style and colour- ing. It is mostly remarkable for the fineness of its white enamel or slip, its rich glaze, and the beauty of the designs and colours. One class is painted wholly in various tints

RHODIAN. |

of blue, the design being often regular and treated with some geometrical stiffness. Other sorts have in addition a soft olive green, and purple-brown made of manganese (see fig. 46). One of the finest specimens of the ware is

Fra. 46.—Plate of Damascus ware, painted in several tints of blue, a quiet green, and manganese purple. (British Museum.)

a lamp taken from the Dome of the Rock at Jerusalem,

_ and now in the possession of Mr Drury Fortnum, F.S.A.

Rhodian.

(see fig. 47). It is inscribed in large blue letters with pious sayings of Mohammed, and in small black charac- ters round the lower rim, 'In the year 956, in the month Jumada 'l-ula. The painter is the poor, the humble Mus- tafa." According to our reckoning this date is June 1549 A.D., the year when the Dome was re- stored by Sultan Suleiman, who was probably the donor of this beautiful lamp. One class of painted decoration used in Damascus ware has flowers treated in a simple way, yet with much natural beauty, such FI asthe rose, hyacinth, tulip, carnation, and others, arranged on large plates and bowls with the most perfect skill and good taste. The plate shown above (fig. 46) is a good example of this sort of design,

~~6. Rhodian ware, so called because it was largely manufactured by Oriental potters in the island of Rhodes, is made of rather coarse clay, covered with a fine white silicious slip, on which the decorations are painted, the whole being then covered with a thick glaze formed of silica, oxide of lead, and soda. Its chief characteristic is the use of a fine red pigment, which owes its colour to~~

~~g. 47.—Lamp from the Dome of the Rock, painted in the same colours as fig. 46. (Collection of Mr Drury Fortnum.)~~

~~the red oxide of iron. This pigment was applied in very thick body, so that it stands out in actual relief like drops of sealing-wax. Plates, tall bottles, jars, mugs, and pitchers with handles are the usual forms. They are all decorated with patterns of great beauty and splendour of colour, brilliant blues, greens, and the peculiar red being the chief (see fig. 48). The designs are mostly flowers, exactly the same in drawing and ar- rangement as those ¢\ on the last-men- 4 tioned sort of Dam- 4 ascus ware. Other © more geometrical patterns are also used, but mostly for wall-decoration. The finest specimens of # Rhodian ware date | from the 16th and first half of the 17th centuries. Other pieces of this pot- tery, which appear to have been made for European buyers, have coats of arms or human figures, the latter very coarsely executed, and prob- ably later in date than the purely Ori- ental designs. The town of Lindus, where ruined kilns yet remain, was one of the chief places in Rhodes for the production of this kind of-pottery. With other Oriental wares it was imported into western Europe during the 16th century. Some specimens exist with English silver mounts of the time of Elizabeth, very elaborately wrought. It was probably included under the title of "' Damas ware," a name which often occurs in medieval inventories, and appears to include many varieties of Oriental pottery, all of which were very highly valued in France, Italy, and England during the long period when the native pottery in those countries was of a very rude description. The South Kensington Museum and the Hétel Cluny in Paris have the finest collections of this magnificent class of Oriental pottery ; some very choice specimens are in the British Museum and the Louvre.~~

~~*Fic. 48.—Rhodian jug.*~~

~~*7. Pottery made in Persia under Chinese Influence.—This Perso- includes several varieties more or less strongly Chinese in Chinese It is recorded that “ ””**~~

~~*method of execution or in design. Shah ‘Abbas I., a great patron of all the arts, about the year 1600, invited a number of Chinese potters to establish themselves at Ispahan for the sake of introducing improve- ments in the manufacture of pottery. Though no hard porcelain like that of China appears to have been made in Persia, several new methods of work were introduced, and a new style of decoration, half-Chinese and half-Persian, was largely used for a long period after the arrival of the Chinese potters*~~

~~*“The main varieties of this Perso-Chinese ware are the following. (1) A sort of semi-porcelain, called by English dealers, quite with- out reason, “Gombroon ware,” which is pure white and semi-trans- parent, but, unlike Chinese porcelain, is soft and friable where not protected by the glaze. It is composed of silicate of alumina, with free silica, and an alkaline flux ; in the heat of an ordinary porcelain furnace it fuses into a transparent glass. It is very fragile, but is of an extremely pleasant texture and slightly creamy tint. It is frequently decorated with simple ges pierced through the sides of the vessel; the holes are filled up by the transparent glaze which covers the whole, thus forming, as it were, ‘little windows of clear glass. It is also often decorated with painted flowers or*~~

~~*Hispano-*~~

~~*arabesques in cobalt blue and manganese purple. The forms of the ware are small and delicate, mostly cups, plates, bowls, and flower-vases with many necks; these were made from the 17th down to the 19th century. (2) Céladon, very like that made in China, but greyer in tint, is common earthenware covered with a green enamel. It was much valued by the Persians and other nations on account of the belief that a cup of this ware betrayed the presence of poison either by breaking or by changing colour. The Persians call it “jachmi” (jade), from its resemblance to that valuable*~~

~~*stone. (3) Pottery of coarse clay, modelled with blunt reliefs, and the whole covered with green enamel. Another variety is covered with a bright blue enamel, chiefly used for ewers, hookah-bottles, and tall jars. The moulded reliefs are either flowers or human figures, poor both in design and execution. This kind of decoration was much used for heavy square bottles or tall jars; it has little or no trace of the usual Persian tastefulness of design, and the colour is harsh. Most of this ware is not older than the 18th and 19th centuries. It is very largely Chinese in style. (4) Pottery painted in cobalt blues on a white ground, with some black, used chiefly for outlines. This is the largest class of Perso-Chinese pottery, and of it were made large dishes, bowls, bottles, ewers, and almost all forms of domestic and ornamental vessels. In some the design is purely Persian, in others almost purely Chinese, while in others the two styles are mingled. The Chinese grotesque dragons and mannered treatment of fir-trees and even human figures frequently occur, but the more graceful designs have flowers and foliage arranged with that great decorative skill and good taste for which the Persians are soremarkable. Fig. 49 shows a dish from the South Kensing-*~~

~~*Fic, 49.—Persian plate painted in blues only. (South Kensington Museum.)*~~

~~*ton Museum in which there is little or no Chinese influence in the design ; it is painted only in blues, and dates from the 17th century. Some few pieces have figures and flowers moulded in low relief, merely indicating the form, and then painted in blues and black lines. On the whole this class of pottery is very decorative in effect ; the glaze is thick, and the blues frequently softened by having run a little in the firing ; the different shades of blue are very varied and harmonious, ranging from indigo to a deep ultramarine.*~~

~~*Hispano-Moorrsh Pottery, and Enamelled Lustre Wares*~~

~~*Moorish. produced under Oriental Influence in Sicily and the Balearic*~~

~~*Isles.—To the earlier or Arab period of Oriental rule in south-west Europe no existing specimens of pottery can be attributed, though there are sufficient records to show that the Arab potters of Spain, as of other parts of the world, were highly distinguished for their skill and the artistic beauty of their wares. The existing specimens of Hispano-Moorish pottery, which are*~~

very numerous, date from the early years of the Moorish occupation, towards the end of the 13th century, and continue down to the 17th century. During this long period three stages were passed through, each with characteristics of its own, but passing imperceptibly one into another,—(1) pottery made by the Moors for their own use ; (2) pottery made by

cess was this. After the pot had been thrown on the wheel, ae

them for the use of their Christian conquerors; (3) pottery made by Spanish potters who imitated the techni- cal methods of the Moors, and to some extent their designs and style of decoration.

Technical Methods, Colours, &c.—The technical methods Tech- remained the same throughout all three periods. The pro- nical

a rather coarse red or yellowish clay being used, it was dipped into a cream-like mixture of the materials for its white enamel coat. This, like the white enamel of Persian pottery, was simply a glass rendered white and opaque by the addition of oxide of tin. When fired, the vessel was covered with a smooth coat of enamel, slightly creamy in colour and very pleasant in texture. Only two colours were used for decoration, and very often only one. The chief of these was a lustre, made with oxides of copper or silver, and varying in tint from a pale lemon yellow to a deep coppery red. The peculiar application of lustre-colour has been described above under the head of "lustred ware" (p. 620). The other colour is a deep indigo blue, varying in tint, and produced sometimes with copper and sometimes with cobalt oxides. The blue was applied before the lustre, which always required a special and final firing under differ- ent conditions from those necessary for the fusion of the white enamel and the blue pigment. The chief towns in which the ware was manufactured were Malaga, Valencia, and Manises (in the province of Valencia); the celebrated amphora-shaped vase found in the Alhambra was probably from the first of these places. Ibn Batuta (14th century) describes the beauty of the "gold-coloured pottery" of Malaga, and says that it was largely exported into distant countries. Marineo (Cosas memorables de Espata, 1517) and Ercolano (Historia de Valencia, 1610) both praise highly the "gilt pottery" made at Valencia and Manises. The term "gilt" refers to the metallic golden colour of the lustre. Pieces of Valencia ware occur with the accompany- ing mark (No. 1). The

usual forms of this pottery chiefly consist of deep dishes and bowls, jars, drug-pots, goblets, and large bucket-shaped vessels. The early ones, such as the Alhambra amphora, dating from the early part of the 14th century, are decor- ated with delicate and graceful arabesque patterns, or branches of a plant like the briony, the leaves of which are often alternately in blue and in yellow Potter's lustre. A few have Arabic inscriptions. The de- ae

: : o. 1. signs are most masterly, drawn with great freedom of touch, and very decorative in effect. The delicacy and minuteness of the painting are often increased by white lines on the yellow lustre, done with a wooden point by wiping out the lines through the lustre pigment before it was fired ; this could be done easily, because the lustre was painted on the hard smooth enamel after it was fired, not on an absorbent biscuit surface.

The pottery of the earlier period has mostly a lustre of pale Classes almost lemon yellow made with oxide of silver, while the later and of ware. coarser varieties have a deep-red lustre made from copper, which is rather harsh and too metallic in appearance. The decorations of the second period are very frequently heraldic in character. A favourite design for large dishes is a lion rampant or a displayed eagle, the latter used as the emblem of St John the Evangelist, the patron saint of Valencia; others have shields with the arms of Castile and Aragon or of royal personages. Many of the grandly- decorated dishes are not only ornamented on the front but also have their backs elaborately covered with rich and graceful ara- besques. Some of this ware is moulded in slight relief; plates have slightly projecting ribs, and goblet-shaped cups have swelling gadroons, a form copied from metal originals. Fig. 50 shows a fine dish, now in the British Museum, painted in copper lustre and blue ; though Moorish in style, it has a Spanish inscription, SENTA CATALINA GVARDA NOS. The pottery of the third class is very inferior in all respects to the work of the Moorish potters. Not only is the lustre harsh in quality but the designs are very coarse and often rudely executed, though still for the most part retaining strong traces of their Oriental origin. The

cinerary urns are very much the same whether they are Cinerary found in Germany, Scandinavia, Britain, or France: they ¥s.

~~*mark appended (No. 2) is attributed to the manufactory of Manises, which was very productive in the 17th century.*~~

~~*TEUTONIC, GAULISH, ETC.*~~ |

~~*Balearic pottery.*~~

~~*In addition to the lustred pottery of this sort made in Spain ware of similar design and execution was produced in the Balearic Islands. Many pieces exist bearing the arms of Inca in Majorca. The beauty of Balearic pot- tery is mentioned by Giovanni da Uzzano, who wrote a treatise on trade and navigation in 1442. It was also alluded to by J. C. Scaliger (Evxercitationes, xcii.) in the 16th century. This pottery was largely imported into Italy, where it no doubt influenced the design of some of the so-called "majolica," though it can hardly Potter's*~~

~~*yy)*~~

~~*Great quantities of sepulchral urns have been found dating from the departure of the Romans from Britain to the 10th century, but almost no specimens exist of the domestic pottery of this period. The shapes, the char- acter of the clay, and the ornamental patterns on the*~~

~~*mostly show traces of Roman influence; some are even coarsely-executed copies of red Samian ware, and are skil- fully wheel-made and well fired. Others are very rude,*~~

~~*hand-made, and scarcely to be distinguished from the*~~

~~*pottery of the early iron age. In the main, however, the urns are much neater, more glossy, and more elaborately ornamented than the prehistoric pottery. They are made of hard well-burned clay, generally grey, brown, or blackish*~~

~~*a ana its manufacture, as has so often been "ani in colour. The decoration is often very elaborate, with Siculo- Another class of pottery has been attributed to the No. 2. incised lines, some arranged in Wary. bands, others in wheel- Moorish. Moslem conquerors of Sicily, though without much distinct evi- made rings. The most characteristic ornaments are simple*~~

~~*dence. It is very similar to the arrose Mea ware, except that | geometrical patterns, stars, crosses, the svastika, and others,*~~

~~*the lustre is painted over a great blue not whiteenamel. Some impressed in the soft clay from wooden stamps (see fig. 51).*~~

~~*: h 5 j*~~

~~*%*~~

~~‘ ‘—_|~~

~~*Fic. 51.—Saxon cinerary urns; the stamped patterns are*~~

~~*shown full size.*~~

~~*Many urns have a ring of bosses pressed out from the inside by the potter's thumb, and some few have bands or ‘ stripes in coarse ochre colours or white. The surface of the urns is frequently glossy, partly from the hard silicious | quality of the clay, but often because it has been mechani- De Se eae é ; cally polished. A black shining surface was sometimes*~~

~~*Fic. 50.—Hispano-Moorish plate, painted in blue and copper lustre. given with graphite (plumbago), as was ,the case with some*~~

~~*other pottery, with paintings in blue with black outlines, on a of the Roman black pottery. A lump of graphite was*~~

~~*white silicious slip, and covered by a thick vitreous glaze, may | found with blackened urns in a tomb at Hogelberg.!*~~

~~*be the work of Siculo-Moorish potters. The designs are very bold | Medieval Pottery of England and France, 11th to 15th English*~~

~~*and effective, often with inscriptions in large Arabic characters, or C*~~
~~*Though 7 baa grotesque horses and other animals, boldly drawn. The*~~
~~*attribu- entury.—Though great quantities of pottery for domestic nk tion of*~~
~~*Moslem pottery to special localities is always difficult and | use were made*~~
~~*during this period it was extremely fragile, | cainval uncertain, owing to the*~~
~~*great similarity in design and in methods and, being of very coarse ware,*~~
~~*without artistic beauty, few ware.*~~

~~*of execution that is always common to Moslem races wherever they*~~
~~*specimens have been preserved to our times. It consisted*~~

~~*may have chanced to settle. tie of tall 3 hakGal "ich hil '*~~

~~*The Kensington Museum and the Hétel Cluny have the best mostly Of tall*~~
~~*Jugs, giobular pitchers, bowls, dishes, and collections of Persian and*~~
~~*Hispano-Moorish wares. The British drinking-cups, all of which were made*~~
~~*for some centuries Museum, the Louvre, and the Archeological Museum of*~~
~~*Madrid with but little variation in shape or quality. Fig. 52 have many very*~~
~~*choice specimens. Others are scattered through | shows a selection the*~~
~~*various museums of Europe. f cori lena*~~

~~*Other In other parts of the world, especially among the Moslem people Of*~~
~~*See eee A Moslem of India, Persia, and northern Africa, very graceful*~~
~~*pottery 1s now usually made of countries, made, especially the plain biscuit*~~
~~*varieties, in accordance with | coarse red or yel- \ ~~" traditional forms*~~
~~*and methods. The common pottery of Egypt is | low clay, often cov- very*~~
~~*beautiful in shape and often pleasant in colour and texture; | . oq with hit*~~
~~*=)*~~

~~*at several places on the banks of the Nile a fine red ware, very like | S82*~~
~~*way a*~~

~~*the Roman "Samian," is still largely manufactured, and the water- slip, and*~~
~~*partly \ jars made of the common brown clay are generally fashioned in |*~~
~~*glazed with a green shapes of almost Hellenic beauty, which seem to have*~~
~~*been con- | or yellow vitreous Ey tinually used since the time of the*~~
~~*Ptolemies.] Jawoll*~~

~~*Literature.—For the subject of the preceding section the reader may consult | 84428, rendere Vy Chardin, Voyages en Perse, c. 1650 (printed in 1811); Rochechouart, Souvenirs | more fusible bythe @un Voyage en Perse, 1867; Henderson, Collection of Pottery, &c., 1868 ;*~~

~~*Fortnum, South Kensington Musewm Catalogue of Pottery, 1873; Davillier, Les | presence of a large Fic. 52.—Common forms of medieval pottery ; + sicese Poe ee 1861; and many works on the general history proportion of oxide the upper part of the slender jug is covered : of lead. Somehave with a green vitreous lead glaze; the other*~~

~~*Srctron IX.—Txutonic, Saxon, AND GAULISH. coarse painted is unglazed with stripes of red ochre.*~~

~~*stripes in coloured ochres ; others have heraldic badges or fanciful ornaments, rudely modelled, and fastened to the body of the pot; and some grotesque jugs are formed in*~~

~~*1 See Du Cleuzion, La poterie Gauloise, 1872, and Cochet, Archéo- logie céramique, 1860.*~~

~~*Sgraffi- ato ware.*~~

~~*Majolica.*~~

~~*624*~~

~~*the shape of animals or knights on horseback. The most graceful in shape were pilgrim-bottles, flattened globes, very like one of the forms common I Egyptian and Assyrian pottery. The common domestic pottery of the Middle Ages was made and used in enormous quantities. Though it was wonderfully cheap, yet the ease with which it was broken made it a serious and often-recurring 1tem in the household expenses of rich or royal personages. The list of expenses of a feast on the anniversary of Queen Eleanor's death (wife of Edward I.) contains this item, "pro M® et D discis, tot platellis, tot salseriis, et CCCC chiphis xliis,"—that is, 42s. for 1500 dishes, 1500 plates, 1500 saucers, and 400 cups. The 42s, are perhaps equal to £25 of modern money, a small sum for 4900 pieces of pottery.*~~

~~*Section X.—MEDILZVAL AND MoDERN ITALIAN,*~~

~~*Sgrafiato Ware was made by covering a vessel of red clay with a coating of white slip made of some natural white earth like pipeclay. This was done by dipping or by pouring the fluid slip over the red vessel. When the white coating was dry the design was formed by cutting it away so as to expose the red body underneath. In this way bowls, dishes, ewers, and other vessels were decorated with human figures, or with graceful scroll-patterns of foliage and flowers. The patterns were then picked out*~~

~~*with bright colours,—yellow, blue, and green ; and finally the whole was glazed with a very fusible lead glaze (see*~~

~~*Fic. 58.—Italian sgraffiato plate, 16th century. (South Kensington Museum.)*~~

~~*decoration of pottery in various parts of Italy ; but only few existing specimens are older than the second half of the 15th century. Some of the earlier specimens have very graceful designs, of almost Gothic style, executed with great spirit, and very decorative in effect. Sgraffiato ware continued to be made during the 16th and 17th centuries, especially in the neighbourhood of Pavia; it was, however, but little esteemed owing to the greater popularity of painted majolica. Rude imitations of it were made in Germany and France.*~~

~~*Ltalian Majolica.1\—The history of this ware in its early stages of development is almost unknown. According to popular tradition, it was first copied from certain plates brought by the Pisans from the island of Majolica (or Majorca) in the 12th century. This is extremely improb- able ; the fabrication and use of a white tin enamel were*~~

~~*_ 1 In this article the word " majolica" is used in its modern sense to include non-lustred pottery,*~~

~~*POTTERY*~~

~~*[ITALIAN*~~

~~*known to Italian potters long before they found out the secret of lustre colours, a discovery not made in Italy till the 15th century. We know from various sources that lustred pottery from the Balearic Islands was largely im- ported into Italy during the 15th century (see above), and it is quite possible that the sight of the brilliant lustre on the imported Moorish ware set the potters of Italy to work, and led them to find out, either by experiments or from some traveller who had visited the Balearic kilns, how to compose and fire the metallic salts required to produce the lustre ; but this occurred long after the Pisan victory at Majorca. It was to the lustred ware only that the Italians gave the name of " majolica," though now it is commonly applied to all the Italian enamelled pottery of the 15th and 16th centuries. It was the lustre only that was a fresh discovery in the 15th century; enamelled ware had been made by Italian potters many years before. This is an Important point, and it should be noted that the accounts given by Vasari and several other old Italian writers on the subject are quite misleading. " Mezza- majolica" is a word of rather uncertain meaning which occurs in early writers on Italian pottery. It has been used to mean pottery covered not with a tin enamel but with a white slip, made of a white clay like that found at Vicenza; and in many museums the earlier and ruder sorts of majolica have been arranged under this name. The fact, however, seems to be that even the rudest and earliest specimens of majolica in the various museums of 'Europe are covered with a true tin enamel. Curious specimens of pottery, covered with a rude enamel made of the white kaolinic "terra di Vicenza" mixed with an alkaline silicate, have recently been found in tombs of the 11th and 12th centuries in various parts of Italy. These earliest attempts at what we now call majolica are coarsely decorated in green, yellow, and blue, on a white ground, with patterns of semi-Oriental style. The pigments used appear in some cases to be simply coloured glass reduced to powder,—a kind of smalto. This style of pottery is probably the mezza-majolica of Vasari. It is evidently the first step towards the production of the true majolica, in which the kaolinic clay of Vicenza is replaced by a tin enamel. This discovery is of great importance as regards the early history of Italian pottery. The few pieces yet known are mostly preserved in the office of public instruc- tion in Rome, and are not yet exhibited in any museum. Very few early examples of developed Italian majolica are now known. One of the most important is a small jug, 5 inches high, in the Sévres Museum, which is made of reddish clay covered with a*~~

~~white tin enamel, and painted with a shield and simple ornaments in manganese purple and bright green (oxide of copper). It is supposed to have been made at Rimini, and dates from the 13th or 14th century (see fig. 54). It was not, however, till the second half of the 15th century that Italian , majolica began to be largely produced. | Owing to the great difficulty of determining | the special towns where the earlier varie- ties were made, it will be convenient to ;§ treat this ware according to style and date | rather than under the heads of the different potteries. During the earlier and more im- portant period the production of majolica "pene te pro. was confined to a very small part of Italy. bably the a ia Bologna on the north, Perugia on the south, known specimen Siena on the west, and the Adriatic on the of Italian majol- east roughly indicate the limits within i@ (Gévres Mu- which the chief majolica-producing towns eS were situated ; these were Forli, Faenza, Rimini, Cafag- giolo, Pesaro, Urbino, Castel Durante, Gubbio, Perugia, and Siena. Towards the middle of the 16th century distant~~

~~Tienes~~

~~Fic. 54.—Ewer of~~

~~MAJOLICA. |~~

~~Pert Ee Bz~~

~~cities such as Venice also produced fine majolica, but of the later style.~~

~~625~~

~~potters at work throwing vessels on the wheel. The wheel itself Manu- ("torno"') consists of a vertical axle, with a large lower wooden facture.~~

~~Mate- rials.~~

~~Materials.—Fortunately ample information on this sub- ject has been preserved to us. A potter of Castel Durante occupied himself for some time in writing a full description of the materials, the methods of using them, the ""throwing- wheels," the kilns, and all the varied processes of his craft. His original MS., copiously illustrated with clever pen- sketches, is in the~~

~~*library of the South Kensington Museum, and the work was printed, with facsimiles of the drawings, at Pesaro in 1879. It is called J tre libri dell'*~~

~~*arte del Vasajo by Cipriano Piccolpasso of Castel Durante, and is dated 1548.*~~

~~*Piccolpasso himself did not produce lustred ware, but he describes the process and the special kiln it required ; his descrip- tion of materials and methods, though not written till 1548, applies in all important points to the majolica of the second half of the previous century. Various receipts differing in the proportions of their ingredients are given ; the following examples are selected as typical instances.*~~

~~*1. The clay body, " terra," was to be, if possible, clay deposited by a river. It was carefully prepared for use by being beaten, ground in a mill, and passed through a sieve, so as to bring it into a smooth homogeneous plastic state, fit for being moulded on the wheel. It wasall the better for being dug out a long time before it was used.*~~

~~*2. The white enamel, " bianco," was composed of thirty parts of '**marzacotto" to twelve of oxide of tin. The marzacotto was simple powdered glass, a pure silicate of potash, made from clean sand and the alkaline tartar deposited by wine. According to Piccolpasso the decorations were painted on the enamel ground sometimes before it was fired, and sometimes after. This was an important difference. The enamel before firing formed a slightly granular and very absorbent ground, like clay in the biscuit state; and the paintings on it had to be bold and broadly decorative, not delicate and miniature-like ; the touch of the brush had to be rapid*~~

~~*and certain ; little or no alteration could be made, as the unfired*~~

~~*enamel sucked the pigment out of the brush and absorbed it below the surface. The earlier and more boldly decorative sorts of majolica appear to have been painted in this way on the wnfired enamel, and owe much of their richness of effect to the fact that the different pigments have sunk below the surface of the ground. This process may be compared to that of painting in true fresco, while the painting on the fired enamel resembles the more deliber- ate method of the painter in oil. After passing through the kiln the*~~

~~*whole character of the enamel was completely changed; it formed then a hard, smooth, non-absorbent, vitreous surface, on which the finest lines and the most minute paintings could be executed, and any part of it could easily be altered or wiped out. It was in great part owing to this change of method that the later majolica paintings became more pictorial and more minute in exe- cution, the almost inevitable result of painting on a hard glassy ground. In some instances it is not easy to decide which method of painting has been adopted, though in most cases there is a dis- tinct difference in the quality of the lines. One peculiarity is a sure test: when delicate patterns in white have been formed by covering the enamel ground with some colour, and then wiping out the pattern by using a pointed piece of stick or ivory on the soft pigment, in that case the enamel certainly was fired first. The colour could not be wiped cleanly out from an absorbent biscuit surface. Much of the delicate beauty of the Persian lustre paint- ings, especially those on wall-tiles, is due to this method of getting minute patterns in white. It was also practised, though in a much more limited way, on some of the Italian majolica. The difference of handling between "under-glaze" and "over-glaze" painting cor- responds exactly to that of the unfired and fired enamel; but in the latter case another important difference is introduced: under- glaze pigments require much greater heat than those over the glaze and are consequently very limited in range of colour, while in majolica painting the same pigments were used in either case.*~~

~~*3. The glaze, "coperta," an ordinary glass, made more fusible by the presence of lead, consisted of oxide of lead 17 parts, silica (sand) 20, alkali 12, and common salt 8 parts.*~~

~~*4, Pigments, "colori," all owe their colour to a metallic oxide, yellow being derived from oxides of iron and antimony, green from oxides of copper and antimony, blue from oxide of copper, red from Spanish oxide of iron, Armenian bole, and red ochre, and black from black oxide of copper and manganese. Most of these had a certain proportion of oxide of lead, not to affect the colour but to make them more fusible. Other tints were produced by combinations of these pigments, and different gradations of tone were obtained by adding more or less of the ingredients of the white enamel.*~~

~~*Methods of Manufactwre.—Piccolpasso gives sketches of the*~~

~~*disk for the potter's foot to keep it revolving, and a smaller upper disk on which the clay was moulded by the potter's hands,—an apparatus which differs in no respect from that used in Egypt under the Ptolemies, and is still employed in the great porcelain factory at Sevres. The potter to the right of fig. 55 is working with a wheel like that drawn by Piccolpasso. The earlier kind of majolica is almost wholly wheel-moulded, but during the 16th century a good many plates and vases were formed after shapes copied from silver-work, with sunk bosses or gadroons. These were formed by pressing thin disks of soft clay into moulds made of plaster ("gesso"'), bone-ash, and pounded marble. An elaborate description of the method is given in Piccolpasso's MS. Another practice also had arisen in his time, that of finishing the pottery on a joiner's lathe when it was dry, but before it was enamelled or fired,—a practice unfortunately common at the present day, which makes the form of the vessel more mathematically correct, but greatly injures the freedom and spirit of touch given by the potter's hand. After the pottery was brought to the required shape it was dipped into a bath of the materials for the white enamel, finely ground and mixed with water ; and, after being allowed to dry, it was fired for the first time. The painted decoration was applied on the white enamel with brushes of various sizes, and the vessel was then dipped into a second bath of the glaze materials, finely ground and mixed with water like the enamel. It was afterwards fired a second time. If it had lustre colours, they were put on over the glaze, and a third firing in a different kiln was necessary for the reasons explained above under the head of 'Persian pottery." The application of the transparent glaze over the enamel was not absolutely necessary, and was occasionally omitted, but the finer sorts of majolica usually had it for the sake of the increased brilliance which it gave to the non-lustre colours, The kiln for the ordinary colours and first two firings, as drawn by Piccolpasso, is exactly the same in principle as that used by the potters of ancient Greece and Rome,—that is, an arched chamber in two stories, with a perforated floor between—the lower compartment for the fire, the upper for the pottery. A sketch is also given in Piccolpasso's MS. of the lustre-kiln, in which the pottery is enveloped in flames and heated smoke. Fig. 55, from a Venetian woodcut of the middle of*~~

~~*ULLAL ATE wi*~~

~~*the 16th century, shows majolica potters at work throwing pots on the wheel. Two different wheels are being used; the man on the left keeps his going by giving it a succession of spins with one hand, the other works his wheel by the help of a lower foot- turned disk. 'To the extreme left a small kiln is shown; the lower arched opening is for the insertion of the fuel, the upper for the pottery ; the holes at the top are for the escape of the heated air and smoke.*~~

~~*Styles of Decoration.—In general character the painted Decora- decoration on the majolica of the latter part of the 15th tion.*~~

~~*and beginning of the 16th century is very different from that of a few years later. The first retains much of medieval purity and simplicity of design, while the later sort follows the richer and more florid style brought into fashion by the rapidly-approaching decadence of art. The principal variety of the early class is the ware painted in blues with a yellow lustre, manufactured chiefly in the workshops of Pesaro, Gubbio, and Deruta. With these two simple colours effects of the greatest decorative beauty were produced, far more truly artistic and suited to their special purpose than the elaborate pictures in many colours painted some years later in the workshops of Urbino and Durante. In the firm precision of the drawing and extreme skilfulness of touch in the blue outlines one is reminded of the paintings on Greek vases of the best period. Some of the large plates of this ware have XIX.—79*~~

~~*626*~~

~~*figure-subjects, usually sacred scenes. A very beautiful one in the Louvre has a Madonna and Child enthroned, drawn and composed with the simple grace of Raphael's early manner. Most, however, have portraits of ladies*~~

~~*drawn in profile, the background filled up with simple flowers, and an inscribed scroll, often with the lady's name and the word "bella" or "diva," or with epigram- matic mottoes (see fig. 56).*~~

~~*The design is first drawn in*~~

~~*Fig. 56.—Early majolica plate, in blue and yellow lustre only, made at Pesaro or Gubbio, c. 1500. The motto on the scroll is '* Chi bene guida sua barcha s'entfa in porto" (He who steers well his ship will enter the harbour). (Louvre.)*~~

~~*blue outline, with a little delicate blue shading over the white flesh and a blue edging on the ground round the outline. The dress and the ornaments on the ground and rim of the plate were finally filled in with the yellow lustre, which was sufficiently transparent to let all the blue line details over which it was painted show through. Another rarer sort of early majolica, similar in style, has a deep ruby lustre, employed instead of the golden yellow. Fig. 57 shows a fine example of it, probably*~~

~~*Fic. 57.—Gubbio plate, with portrait in ruby lustre and blue outline. (South Kensington Museum.)*~~

~~*produced at Gubbio, which had almost a monopoly of this special lustre, afterwards used so largely in the workshop*~~

~~*POTTERY*~~

~~*[ITALIAN*~~

~~*of Maestro Giorgio. Other early varieties of majolica, painted in a simple and unpictorial way, have no lustre colours, but are remarkable for their brilliant and rather harsh green, with a good deal of manganese purple. Plates of this sort with female portraits, not generally in profile, and heraldic animals, frequently occur, as well as slabs or plaques intended for wall-decoration. Faenza and Forli appear to have been the chief places for their production. The Cluny Museum is very rich in speci- mens. Cafaggiolo and Faenza also produced, during the early period, some very beautiful and highly-decora- tive plates, painted without lustre, but with a variety of colours arranged with a most com- plete harmony of tint. Some have patterns _ingeni- ously devised after a motive suggested by peacocks' feathers (see fig. 58). The chief colours are yellow and orange, various blues, and occasionally a rich deep red. Amatory plates ("amatorii"), with ladies' portraits, are also painted in this way, with more elabora- tion and detail but not greater decorative beauty than the simple blue and yellow*~~

~~*lustre of the early Pesaro and Gubbio ware. Specimens of the later Cafaggiolo ware bear the accompanying mark (see No. 3). Forli was one of the earliest towns to produce a fine class of*~~

~~*majolica ; specimens exist dated 1470, of very*~~

~~*noble design and firm outline. A fine set of*~~

~~*plates and vases was made there (c. 1480-85)*~~

~~*for Matthias Corvinus, king of Hungary. The*~~

~~*flesh of the figures, like that on the early Pesaro*~~

~~*feather design, in blues, yellow, and orange-*~~

~~*red. (South Kensington Museum.)*~~

~~*and Deruta ware, is white, delicately shaded with _Potter's blue ; but the early Forli potters used a greater ae O. Os*~~

~~*variety of colours than were employed at most other towns: in addition to the blues they had yellow,*~~

~~*bright green, and purple-brown, all non-lustre colours.*~~

~~*To Forli or Faenza must be attributed a very curious*~~

~~*and rudely painted plate in the Sevres Museum, decorated*~~

~~*with a youth on horseback in blue outline; it has a*~~

~~*date which appears to read 1448; if so, this is the ear-*~~

~~*liest dated specimen of majolica. The enamel is coarse*~~

~~*and crackled all over, but the method of execution is that*~~

~~*of true majolica.*~~

~~*Majolica of Maestro Giorgio Andreoli of Gubbio.—The Giorgio workshop of this artist, most of whose dated works fall of Gub- between 1517 and 1537, was one of the largest and most aa" important of his time. Its productions, as well as those with the signature "' M? G? da Ugubio," or as in No. 4, are*~~

~~*No. 5. Potters' marks.*~~

~~*very unequal in merit, and even the best of them are very inferior as specimens of true decorative art compared with the majolica of the earlier classes described above.*~~

~~*Urbino pictured wares,*~~

~~*MAJOLICA.* |~~

~~*The mark used most frequently by Giorgio is shown in No. 5. A somewhat similar monogram was used by an earlier potter ; an example dated 1491 is shown in No. 6. Though not the inventor of the ruby lustre, which was then so much admired, Giorgio appears to have been the chief potter of his time who used it. The fact is, the pro- cess was a difficult one and required special skill, not in the preparation of the oxide of copper pigment but in the firing, so as to expose the colour to actual contact with the reducing flame without the pottery itself being shattered to pieces. Even with the best skill of the Gubbio potters a large proportion of the lustred ware perished in the kiln. The majolica potters of many other towns were in the habit of sending their otherwise 'finished wares to Gubbio for the sake of having the additional brilliance derived from lustre colours. In some cases a space for the lustres was left white ; in others rude dabs and splashes of ruby and yellow lustre were applied over completely finished paint- ings of landscapes or figure-subjects, often in a very coarse and tasteless fashion. Some delicately painted plates are quite spoiled and vulgarized by the heavy touches of lustre that have been put over them. The ruby is in fact rather strong and hard in tone, and needed very careful applica- tion to make it harmonize with the quieter non-lustre colours ; it is far more salient and metallic-looking than the fine yellow lustre of the early ware. In addition to the ruby, "gold" and "silver" lustres were used at Gubbio. The latter are a deep and a pale yellow. The pale silver lustre was made from*~~

~~*oxide of silver; the gold was a mix- ture of copper and silver oxides. A great deal of the pro- duce of Giorgio's workshop is very rude and of no artistic merit, while the best and most carefully painted wares*~~

~~*"usually err, in accordance with the rapidly declining taste*~~

~~*of hig time, in being far too pictorial. Copies of pictures crowded with figures, arranged without regard to the shape of the vessel they were meant to decorate, and painted with all the colours of the potter's palette, were most highly esteemed. Many of them are from designs by Raphael and other great painters, but are really quite unsuited for ceramic decoration. Giorgio's earlier works are, on the whole, in better taste, and some later portrait heads are very good. Fig. 59 shows a fine tazza in the Louvre signed at the back "ex 0.) Giorg.," which is both nobly drawn and harmoni- ous in colour ; itsdate isabout 1525. The fav- ourite subjects on the pictured ("istoriata") majolica of Gubbio and elsewhere are scenes from Roman mytho- logy, especially Ovid's Meta- morphoses, and stories from classical _his- tory. Unluckily contemporary history is rare ; the British Museum has a good specimen, a plate painted with the defeat of Francis I. at the battle of Pavia.*~~

~~*Tt was at Urbino and Castel Durante that the produc- tion of elaborate pictured majolica was mostly carried on, SS Oe see p. 619 supra.*~~

~~*Fic. 59.—Gubbio tazza by Maestro Giorgio, with lady's portrait and inscription " Julia bella."*~~

~~*POTTERY*~~

~~*627*~~

~~*especially between the years 1530 and 1560, under the patronage of the reigning dukes of the Della Rovere family. Francesco Xanto Avelli, Guido Fontana, and Niccola da Urbino were specially celebrated for this class of work, and often used Marc Antonio Raimondi's engravings from Raphael's designs to decorate their plates and vases.? Many of these are painted with great delicacy and richness of effect in spite of their unsuitability for their special purpose and the comparative poverty of the potter's palette, which*~~

~~*was, of course, limited to colours that would stand the severe heat of the kiln. The pictured wares of Urbino sometimes have the Gubbio lustre colours, but the best are without them. Another class of design was also used at Urbino with much better decorative effect. It con- sisted of fanciful and graceful arabesques or floral scroll- work mingled with grotesque figures or Cupids, all skil- fully arranged to emphasize the main contours of the plate or vase. Branches of the oak tree in flowing and slightly geometrical lines are a frequent motive of de- sign, chosen in compliment to the Della Rovere dukes, who bore an oak on their coat of arms. All | these, but especially the pictured wares, were highly paid for, and sometimes were valued as much as silver plate. They were mostly*~~

~~*Potter's mark. No. 7. "piatti di pompa,'—meant, that is, to hang on walls or*~~

~~*ornament sideboards rather than for actual use. Some of the early productions of one of the Urbino potteries are marked with the graceful monogram No. 7.*~~

~~*In ashort sketch like this it is impossible to give even an outline*~~

~~*of the many varieties of majolica produced in such profusion during the 16th century, but a few others of the more important kinds may*~~

~~*be mentioned. The Faenza potteries produced one of the most Faenza.*~~

~~*beautiful of the later varieties, chiefly plates with wide flat rims and deep centres, called "tondini," the borders decorated with delicate and minute arabesques, painted in several tints of a deep ultramarine blue of wonderful richness and decorative effect. In the centre is usually a coat of arms or a single figure, with a brilliant jewel-like touch of orange or deep red, which sets off to the utmost the blues of the border (see fig. 60). One of the most remarkable specimens of majolica painting, treated with the deli- cate minuteness of an illuminated MS., is on a plate in the British Museum from the Faenza workshops. It is a scene of the death of the Virgin, sur- rounded by the apostles, copied withslightadap- _ tations from an engraving by the German master Martin Schon- gauer. The Italian ceramic inter has slightly but skil- fully altered the composition to fit it to the cir- cular form of the plate, and has*~~

~~*also given a more graceful cast to the mannered German faces of as : the original. The pit execution 1s won- —*~~

~~*derfully delicate Fig. 60.—Faenza plate (tondino), with border in deep and miniature- yltramarine blues, and central coat of arms in rich*~~

~~*like, almost orange and red. (South Kensington Museum.) wholly done in*~~

~~*different tints of blue, with a little yellow to suggest flesh colour, and high lights touched in with pure white enamel, the main enamel ground being white slightly tinged with pink. It is evi- dently the work of a very able artist, and is a little picture of gem-*~~

~~*2 A namesake and relation of Raphael's was a skilful painter of istoriati pieces; and hence has arisen the tradition that the great painter occasionally decorated majolica (see RAPHAEL).*~~

~~*Siena.*~~

~~*Florence.*~~

~~*Venice.*~~

~~*Later majolica.*~~

~~*No. 9.*~~

~~*IR*~~

~~*like beauty, though in no way specially suited to the requirements*~~

~~*Some fine early*~~

~~*a common later ae SS*~~

~~*Scourging of Christ. This highly-laboured and minute style of*~~

~~*rich russet-brown or orange ground. 'Tondini from Siena are often*~~

~~*than an inch and a half in diameter, have a wonderful suggestion*~~

~~*before Porsena, is signed on the back, "fata i Siena da Me Bene-*~~

~~*with a central painting of a hermit and landscape background,*~~

~~*blue enamel is a rare variety, and has OD*~~

~~*Florentia." It has no L R 7 a A*~~

~~*pottery of Persia men-*~~

~~*with flutings and bosses after a metal design ; very few pieces exist.*~~

~~*second half of the 16th century. In the earlier part of that century*~~

~~*is very decorative in effect, and has paintings of graceful and*~~

~~*deeper shades of blue with high lights*~~

~~*and flowers in yellow, green, and blue,*~~

~~*the 16th century there was a rapid*~~

~~*came thin and poor, with very often a*~~

~~*marine blue enamel ground, on which a Nile All through the 17th and 18th centuries majolica in a degraded*~~

~~*and yellows of rather harsh tint, was largely produced at Turin,*~~

~~*Turin ware is No. 13 ; and on Savona majolica one of the two forms*~~

~~*of ceramic art, for which a bolder and less realistic style of treat-*~~

~~*ment is really the*~~

~~*most suitable. A O N S I O RSI O*~~

~~*plates of Faenza*~~

~~*make are signed I4X G*~~

~~*with No. 8 mark ;*~~

~~*mark is the mono- Reels sere , PY*~~

~~*gram FA(enza)—see No. 9. Another plate, also in the British Museum, has a painting copied from a design by Albert Durer, the painting was largely practised in the potteries of Siena, which produced plates of great beauty, with borders of graceful scroll-work and grotesques in white and different tints of blue, with usually a decorated in this way with a central medallion containing a minute landscape, painted with wonderful minuteness and finish. The landscapes are very delicate in colour, and, though often not more of atmosphere and distance which recalls the lovely sunset-lit backgrounds of Perugino's pictures. A very beautiful plate in the British Museum, painted in this minute style with the scene of Scevola detto." Other plates by the same very clever and refined painter are decorated only in blue, with touches of pure white on the creamy enamel ground. The Kensington Museum has a good specimen, surrounded by a delicate border of arabesques. Little is known of the artist. Another signature which occurs on Siena ware is No. 10, in one case conjoined with the date 1542. Majolica with plain*~~

~~*been attributed to Luca or Andrea della*~~

~~*Robbia, some pieces being marked as in*~~

~~*No.11, apparently for " Luca della Robbia,*~~

~~*painting, but was partly*~~

~~*gilt; in colour the enamel ,*~~

~~*resembles the plain blue*~~

~~*tioned above. It consists No. 10. No, 11.*~~

~~*mostly of vases moulded Potters' marks.*~~

~~*The beautiful sculpture in enamelled terra-cotta made by the Della*~~

~~*Robbia family will be treated of under the head of Rosia. Venetian majolica was not largely produced till towards the*~~

~~*the few potters of Venice appear to have chiefly occupied themselves*~~

~~*with attempts to produce true porcelain. The earliest dated speci-*~~

~~*men of Venetian majolica is of the year 1540. Some of this ware*~~

~~*elaborate foliage, scroll-work, and arabesques, designed with great*~~

~~*intricacy. It is in blue and white, the main enamel ground being*~~

~~*a very pale blue, and the design in*~~

~~*in pure white. Others have land- 3X*~~

~~*scapes in blue and white, with grace-*~~

~~*ful, but too realistic borders of fruit*~~

~~*somewhat later in style. Mark No.*~~

~~12 occurs on some of the finest Vene-~~

~~tian majolica. Towards the end of~~

~~falling off in the artistic beauty of~~

~~majolica paintings, and not solely in~~

~~the execution: the pigments also be-~~

~~disagreeable "granular" look. Some~~

~~effective pottery was produced at~~

~~Venice, ¢. 1590-1620, with a deep ultra-~~

~~designs were painted in white, a style of ware which was largely~~

~~manufactured at Nevers in France a few years later (see fig. 62~~

~~below).~~

~~form was produced at many placesin Italy; but most of the old~~

~~kilns, such as those of Deruta, Gubbio, aud Faenza, fell into disuse.~~

~~The latest kind of majolica, decorated with coarse paintings in blues~~

~~Genoa, Venice, Savona, Castello, Naples, Montelupo, and other~~

~~cities. The older potteries at Pesaro and Urbino still continued in~~

~~work, but produced nothing of real merit. A common mark on~~

~~in No. 14 often occurs. In the beginning of the 17th century~~

~~spirited copies were made of the magnificent Rhodian pottery,~~

~~such as that shown in fig. 48 above, but with pigments very inferior~~

~~[ITALIAN MAJOLICA.~~

~~to those of the originals. At Capo di Monte, near Naples, a manu- factory of pottery and porcelain was started under royal patronage in 1736; but it was more celebrated for the production of porcelain than of enamelled wares. Of late years clever imitations of the old majolica have been produced in Italy, especially from the workshop e~~

~~of the marquis Ginori. Even No. 14~~

~~the old lustre colours are hte cua" successfully reproduced ; but .~~

~~most of the modern majolica is marred by a want of spirit and freedom, the natural result of its being a too servile copy of a bygone style.~~

~~No. 18.~~

~~Shapes of Majolica.—The most carefully finished and finest paint- Shapes.~~

~~ings are asa rule on plates, which were of various forms, from almost flat disks to the tondini with wide fiat rims and deep bowl-like centres. Many of the jugs, vases, and ewers are extremely graceful in form, some suggested by the bronze vessels of ancient Rome, others taken from Greek vases. Piccolpasso gives sketches of the principal shapes, and a long list of special names, not now of much importance, as they varied in different manufactories and even workshops in the same town. The character of the non-pictorial decorations combines many different elements of style. In some of the patterns we see a survival of earlier medieval and native Italian taste and invention. Others, especially the large ewers of Cafaggiolo and Faenza, have flowers taken from Persian pottery, but treated in a thoroughly original way. Some plates, painted in the silver lustre only, are almost imitations of Hispano- Moorish ware or actual majolica made in the Balearic Islands. In all the scroll-patterns, mingled with grotesques, it is easy to trace the influence of the ancient wall-decorations from the baths of Titus and other buried buildings, the discovery of which at the beginning of the 16th century did so much to destroy the lingering medizval spirit and~~

~~*substitute a pseudo-classical style, which finally had so fatal an effect on all branches of art in Italy.*~~

~~*Collections.—The chief collections of the majolica of Italy are Collec- those of the South Kensington Museum (perhaps the most com- tions.*~~

~~*pletely representative of all), the Bargello in Florence, the museums of Milan, Venice, Turin, Pesaro; Urbino, and other places in Italy. The Hétel Cluny and the Louvre in Paris, the Ceramic Museum at Sévres, as well as Limoges, Berlin, Vienna, Munich, and St Peters- burg, have good collections. The British Museum collection is not large, but it is one of the most important, from the number of "sioned" pieces that it contains, and from the fact that nearly all its specimens are remarkable for their exceptional beauty or*~~

~~*some point of special interest.!*~~

~~*Literature.—For Italian majolica, see Vasari, Lives of Battista Franco, Buon- talenti, and Luca della Robbia (ed. Milanesi, 1882); Meurer, Italienische Majolica- jliessen, 1881 ; Corona, La Ceramica, 1879; Vanzolini, Istorie delle fabbriche di Majoliche, Pesaro, 1879 (a most valuable reprint of the best old treatises on the subject, including Piccolpasso's illustrated MS.); Darcel and Delange, Fatences Italiennes, 1864; Fortnum, South Kensington Museum Catalogue of Majolica, 1873; Jacquemart, Les Majoliques de la collection Campana, 1862, also article in Gaz. des Beaux-Arts, xiii. p. 289; Drake, Venetian Ceramics, 1868; Lazari, Notizia della raccolta Correr, 1859; Raffaelli, Maioliche lavorate in Castel Durante, 1846; Bonghi, Majoliche di citta di Castello, 1856; Casati, Les Fatences de Diruta, 1874; Campori, Maiolica di Ferrara, 1871; Delsette, Matoliche di Pesaro, 1845; Frati, Maioliche di Pesaro, 1844; Torteroli, La Maiolica Savonese, 1856; Pungileoni, Pitture in Matoliche di Urbino, 1857 ; Brancaleoni, Mastro Giorgio di Gubbio, Pesaro, 1857. For information on the marks on majolica, see Genolini, Maiol. ital., Marche e Monogrammi, Milan, 1881; and De Mély, La Céramique ital., Sigles et Monogrammes, Paris, 1884. Many valuable articles on majolica are scattered through the volumes of the Gaz. des Beaux-Arts.*~~

~~*Section XI.—SpPaNISH AND PORTUGUESE.*~~

~~*Spanish.—Spanish pottery is for the most part a coarse Spanish imitation of Italian majolica, chiefly made at Valencia, pottery.*~~

~~*Triana (Seville), and Talavera. Some of the enamelled ware made at the last-named town is elaborately painted with figure-subjects in blues, yellow, green, and manganese purple, of extremely bad taste and feebleness of drawing.? The simpler pottery made at Valencia a little before and after the year 1700, though rudely painted, is very decora- tive in effect. Large plates often have conventional flowers or profile heads, somewhat after the style of some of the earliest majolica of Italy, and are coarsely painted in blue and yellow. In the 18th century good enamelled pottery*~~

~~*1 The year 1884 will be memorable in the history of majolica for the sale and dispersal of the important collection formed in the 18th century by Sir Andrew Fountaine of Narford. A few specimens were secured for the South Kensington and British Museums, but some of the finest pieces were bought for France, especially a magnificent Faenza plate, dated 1508, which fetched £966. Several of the Pesaro*~~

~~*and Urbino dishes sold for between £200 and £300. 2 See Casati, Les Faiences de Talavera, 1874.*~~

~~*Portu- guese.*~~

~~*Biscuit wares.*~~

~~*SPANISH, ETC. |*~~

~~*was made at Alcora, painted only in blues, often in the Chinese style. Some large vases of Moorish shape have very effective blue and white paintings of animals, flowers, and landscapes.! A quite different style of enamelled pot- tery was made at Puente del Arzobispo in the 16th or 17th century. Specimens are rare ; they consist chiefly of plates decorated in a very skilful and effective way, somewhat after the fashion of Moorish wall-tiles, "azulejos" (see T1Lzs). They are made of coarse red clay covered with white enamel, through which (before firing) the outline of the design was scratched down to the red body. The spaces between the incised lines were filled in with coloured enamels, rich blue, green, and orange, and the whole*~~

~~*glazed with a very fusible lead glaze. The simple and mosaic-like patterns thus formed, either conventional flowers or heraldic animals, are extremely decorative and telling.*~~

~~*Portuguese.—Little or no enamelled pottery of Portu- guese workmanship earlier in date than the 17th century is known to exist. Rato was one of the chief places for the manufacture of enamelled wares, which are coarsely painted, like the latest and poorest kinds of Italian ma- jolica, and are not earlier in date than 1767, when the Rato potteries were first started. Other earlier specimens of unknown make also exist, and are marked with an "R," like the Rato ware, to which they are very superior both in design and execution. The best are in blue and white only ; many are marked with various dates during the 17th century.*~~

~~*Biscuit Pottery of Spain and Portugal.—The earliest kinds now existing of Spanish pottery without either enamel or glaze are chiefly large wine-jars, "'tinajas," about 3 or 4 feet high, of graceful amphora-like shape, stamped with simple patterns in relief. Some of them date from the time of the Moorish occupation. Both Spain and Portugal have always been remarkable for the fineness and beauty of their potter's clays, and consequently have for long excelled in the production of simple biscuit wares, uncovered by either enamel or glaze. Very graceful*~~

~~*pottery of this sort is manufactured even at the present | reignof FrancisI. day, the shapes being traditional, handed down from | There are eleven century to century with but little change, many vessels | piecesof thisware being still modelled after the old Roman forms. Some | in the Louvre ; of this ware is of a white porous clay, like pipeclay, and | the Kensington some is of a fine red, close in texture, with slight sur- | Museum has five;*~~

~~*face gloss, almost like the Roman "Samian." One com- mon kind is decorated in a very fanciful and ingenious fashion by the application of simple but rich surface orna- ments, modelled by hand in relief, or applied in the state of semi-fluid slip. Other curious water-jars are made double, the outer vessel being pierced with patterns of open-work. A third variety has sparkling particles of quartz stuck on its surface while moist, a very old method of decoration, which was even practised by the potters of prehistoric times. On the whole, the modern biscuit wares of Spain and*~~

Portugal are among the most truly artistic and interest- ing of any that are now made in Europe. It is still a living art, with simple beauty both in material and shape, not a laboured revival of a dead style, or dull copy of the artistic productions of a far-off time when fitness linked with grace came naturally to the humblest workman.

Section XIJ.—FRENCH FRoM THE 16TH To THE 18TH CENTURY.

execution. This rare and curious ware, of which only about forty pieces are known, was made by a potter called Fran- cois Cherpentier for his patron, a rich and artistic widow lady, named Héléne de Hangest, who established a work- shop and kiln at her Chateau d'Oiron, in the province of Thouars, between the years 1524 and 1537. The manufac- ture was carried on by Hélene de Hangest's son for some years after her death, but the pieces then produced are inferior in quality, and soon ceased to be made at all. This ware is not enamelled ; it is simply a fine white pipeclay, to which a delicate cream-tint is given by a very slight tinge of yellow in the lead glaze. Its forms are very elabor- ate, sometimes extremely graceful, but occasionally too fanciful, and overloaded with ornament. It consists of plates, tazze, holy-water pots, ewers, salt-cellars, and other varieties of shape, generally forms more suited to metal than to clay, ornamented with very graceful interlaced strap-work and arabesques, such as were much used by the great Augsburg and Nuremberg workers in silver. The method in which many of the ornaments are executed is the chief peculiarity of the ware: they are first incised or stamped into the soft clay of the vessel, and then the sunk patterns are filled up with different clay pastes, tinted with dark brown, soft yellow, or buff. Many of the delicate leaf- ornaments appear to have been formed with a metal stamp ; some are exactly the same as those used by contemporary bookbinders. The ornaments are not all done in this labo- rious manner; some are simply painted under the glaze, especi- ally on the later productions of Oiron. Monograms and em- blems occur frequently, the sala- mander of Francis I.,the "H. D." for Henri deux, the royal inter-

~~*laced crescents, or coats of arms (see No. 15). Fig. 61 shows a beautiful covered tazza in the Louvre, made during the*~~

~~*Potter's mark. No. 15.*~~

~~*but the greater number of known specimens are in the possession of members of the Rothschildfamily. It was at one time thought to be the production of a pottery under the patronage of Henry IL, and hence the name by which it was formerly known ; but its real origin was established from clear documentary evidence published in M. Fillon's valuable monograph on the subject.*~~

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~~*Fic. 61.—Tazza of Oiron pottery. (Louvre.)*~~

~~*The other, Oiron pottery, popularly called oiron "'faience Henri deux," is very different both in design and pottery.*~~

~~*During the 16th century two very different but equally remarkable sorts of pottery, decorated with great elabora- tion, were made in France. One was that invented and*~~

~~*Throughout the period we are now considering enamelled pottery Nevers was produced at a very large number of French towns, often with enamel- the help of potters from Italy ; and the introduction of the tin led enamel soon superseded the earlier sort of ware with a bright green pottery.*~~

~~*manufactured by Bernard Palissy, which was a fine earthen- ware, usually modelled in relief, covered with a white tin enamel, and painted with many bright colours (see 1 See Riafio, Spanish Handbook, South Kensington Museum, 1879.*~~

~~*or blue glaze, which at the end of the 15th and beginning of the 16th century was the chief and most artistic kind of pottery that was made in*~~

~~*France. The change was not wholly a gain, as pieces of the older ware were moulded in relief with designs of great beauty*~~

~~*Rouen.*~~

~~*Mous- tiers, &c.*~~

~~*630*~~

~~*—mostly Gothic in feeling—especially those made at Avignon, Savigny, and Beauvais; the reliefs on the older French ware are very delicate and sharp, and often of great decorative effect. Nevers was one of the chief manufactories of enamelled ware; from about 1570 to the end of the 17th century it produced mostly poor copies of the later sort of Italian majolica. After that a strong Oriental influ- ence set in, and a peculiar ware with a deep-blue enamel ground was made, very like that produced by the Venetian potters. Some of this, painted in white enamel only, with Persian designs, is effective and pleasant in colour (see fig. 62). Other pieces have flowers, treated in a more realistic way, painted in harsh yellow, green, and red, quite out of harmony with the rich blue ground. J. Bourdu, a potter work- ing at Nevers from 1602 to 1620, signed his ware with mark No. 16 ; another, named H. Borne, used No. 17… During the 18th century Nevers chiefly produced pottery of Chinese forms, painted in blue with Chinese figures and flowers, and also a large quantity of pottery painted in many colours with coarse designs, somewhat after the Delft style. The 17th- century enamelled pottery of Rouen is the finest of the later French wares. It is mostly painted in rich red and blue only, with very minute and well- designed arabesques of geometrical form,*~~

~~*adapted, not copied, with great fs B 7 fe) :*~~

~~*skill and taste from Oriental de-*~~

~~*signs (see fig. 63). Very large*~~

~~*plates, wine-coolers, hanging cis-*~~

~~*terns, and ewers are made of it. 8*~~

~~*One very rare variety has the blue 3 6 | De ound, but itis very inferior in No. 16. ‘ No. 17.*~~

~~*artistic effect to that on the Potters’ marks.*~~

~~*white ground. The finest specimens were made before 1700 ; after*~~

~~*that time the painting became coarser. Copies of Chinese wares*~~

~~*Fia.62.—Ewer of Nevers pottery; the design in white on dark- blue enamelled ground ; Per- sian style.*~~

~~*and red pattern on a deep orange*~~

~~*Fie. 63.—Dish of Rouen enamelled pottery, painted in blues and deep red.*~~

~~*were also made at Rouen in the 18th century, all gaudy in colour, and mostly poor in execution. The Rouen Museum has the best collection of its native ware ; there are very fine specimens also in the South Kensington Museum. During the 18th century Moustiers produced some very decorative pottery, painted in various shades of blue, with delicate wreaths, masks, and arabesques, somewhat after the Rouen fashion. Other colours were also used in very minute*~~

~~*POTTERY*~~

patterns, but the simple blue and white is the best. Blue and white pottery with fairly good designs was also manufactured at St Cloud, Sceaux, and Saint Amand, as well as many other French towns, during the first half of the 18th century. Most, however, of the French wares of this date are little better than imitations of porce-

lain, and their decoration feeble copies of Chinese or Japanese designs.

Literatwre.—For Oiron ware, see Delange, Recueil de… Faience… dite de Henri II., 1861; Fillon, Les Faiences d'Oiron, 1863 (best work); Tainturier, Les Faiences dite de Henri IT., 1860. For Rouen ware, see Delisle, Faience de Rouen, 1865; Pottier, Histoire de la Faience de Rouen, 1870; Ris-Paquot, Faiences de Rowen; 1870. For other French potteries the reader may consult Clement-de Ris, Faiences Frangaises, Musée du Louvre, 1871; Mareschal, Fatences Anciennes et Modernes, 1867 ; Tainturier, Porcelaine et Fatence (Alsace et Lor- raine), 1868; Houdoy, La Céramique Lilloise, 1869; Davillier, Faience de Moustiers, 1863; De Segange, La Faience de Nevers, 1863; Pouy, Les Faiences ad' Origine Picarde, 1874; Fillon, L'Art de Terre chez les Poitevins, 1864. The various volumes of the Gaz. des Beaux-Arts contain many valuable articles on the whole subject.

Section XIII.—Mepiazvat German, Dutcn, &c.

Though little is known of the early ceramic history of Germany, it is certain that the application of a tin enamel and enamel colours was known to the potters of that country even in the 13th century. Some plaques, with heads in relief, painted in various colours over a white enamel ground, still exist at Leipsic ; they were made for wall-decoration, and are said to be of the year 1207. At Breslau there is a monument of enamelled clay to Henry IV. of Silesia, made about 1300. According to one story, the use of a white tin enamel was perfected at Schele- stadt by an Alsacian potter who died in 1283. Other examples exist, though few in number, at various places in Germany, sufficient to show an early acquaintance with the method of producing enamelled ware, which, however, seems to have fallen into disuse, and during the 15th and 16th centuries to have been superseded by

~~*the fine sorts of stoneware, in the manufacture of which the German potters were so widely celebrated.*~~

~~*Grey stoneware, richly decorated with delicate stamped patterns in relief, and generally, though not always, covered with a lead glaze, was produced in great quan- tities in Germany, Flanders, and Holland from the end of the 14th century till quite modern times, and was very largely imported into England and France. Much of this stoneware (called by the French "grés de Flandres") is decorated with great delicacy and taste ; its tint, grey, brown, or cream-white, is very soft and agreeable. The earlier specimens have reliefs of a Gothic character, always stamped with great crispness and sharpness, not the least blunted by the process of firing; many have elaborate coats of arms, or branches of simple foliage, which spread gracefully over the surface of the vessel; others have bands of figures, very minutely treated in slight relief. Another method of decoration was by incised patterns, impressed from relief-stamps ; sometimes, as was the case with the Oiron ware, bookbinders' dies were used for forming such patterns in the soft clay. cream-white ware is left unglazed, but most kinds have a vitreous lead glaze, either colourless or mixed with oxide of cobalt or manganese. These two colours, indigo- blue and purple-brown, are often used to pick out the relief-patterns, thus making the design more effective. Owing to the use of old stamps and traditional designs much of this pottery has patterns considerably older than the ware itself, the date being frequently introduced among ornaments which look very much earlier than they really are. Fig. 64 shows a common form of jug, called a "greybeard" from the grotesque head modelled on the neck. The body of the jug is covered with very graceful scroll-work of oak branches in low relief.*~~

~~*Another curious variety of German pottery, consisting*~~

~~*Some of the*~~

~~*Use of tin enamel.*~~

~~*Stone- ware.*~~

~~*Tmita-*~~

~~*chiefly of tankards and jugs, made to imitate enamelled tion*~~

~~*metal-work, was manufactured mostly at Kreussen in Bavaria. The body is of hard red clay, covered with a dark-brown enamel, the designs in slight relief being taken from the Augsburg or Briot style of metal-work,*~~

~~*metal- work enamel.*~~

~~*Cologne | stone- | ware.*~~

~~*ware.*~~

~~*Holland.*~~

~~*Sgraffiato ‘“‘ Cologne” stoneware.*~~

~~*DUTCH, SCANDINAVIAN. |*~~

~~*—strap-work, wreaths, grotesques, or human figures. A favourite design has reliefs of the twelve Apostles, little*~~

~~*Fia. 64.—Stoneware jug or “ greybeard” ; Flemish ware, early 17th century. (South Kensington Museum.)*~~

~~*more than an inch high, under flat architectural canopies ;*~~

~~*a strong Gothic feeling in the treatment of such figures occurs on tankards made as late as the end of the 17th century. The coloured decoration of this ware is very brilliant ; the minute figures or ornaments are picked out in bright enamel colours—red, green, blue, and yellow—altogether producing a very striking but thoroughly unceramic effect. A quite plain stoneware, with surface slightly mottled with grey and brown, appears to have been one of the most esteemed varieties during the 16th century, judging from the beauty of the silver rims and lids with which wine-jugs of this kind were usually mounted. The mottling was produced by the brownish glaze running in the kiln into a granular surface, which formed a pleasant texture, something like that on an ostrich’s egg. The best qualities were made at Cologne, and largely imported into England under the name of A rude kind of sgraffiato ware was also made in Germany and Holland during the 17th*~~

~~and 18th centuries. Coarse red-clay vessels were covered with a‘slip of white pipeclay, and rude figures, often of saints or kings, were scratched through the~~

~~white down to the red body. The whole~~

~~was then glazed with a yellowish lead glaze.~~

~~Bottger, the first maker of Meissen porcelain, manufactured curious varieties of pottery at~~

~~the beginning of the 18th century,—especially Potter’s mark. a ware like red jasper, which was so hard that me: 1m~~

~~it was cut and polished by the lapidary’s wheel. usually marked with No. 18.~~

~~Good collections of German pottery are in the museums of Berlin, Dresden, Munich, Lowenberg, Minden, and pri- vate collections at Nuremberg; the Kensington Museum has also a number of fine specimens.~~

~~Holland.—Holland, especially the town of Delft,! pro- duced very large quantities of pottery covered with a fine~~

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~~coats of arms surrounded by graceful borders, formed of medallions and wreaths. A clever arrangement of pea- cocks’ feathers is a common and very effective motive, used especially for plates. Other sorts of very inferior artistic merit have paintings of flowers or human figures, coarsely executed in rather harsh colours—yellow, green, and red~~

~~—mingled with the more har- | V K~~

~~monious cobalt blues and man- ganese purple. Many pieces of No.19 No. 20. Delft ware are marked with Epatase, eanks: maker’s initials, as No. 19~~

~~*or No. 20, probably two mem- bers of the Kulick family, of about the middle of the 17th century.*~~

~~*But little pottery of any real artistic value was produced in any Western country during the 18th century, with the exception of the commoner and cheaper sorts of wares, with little or no orna- ment, which were still made after the old traditions. The fact is that the increasing introduction of: Chinese and Japanese wares and the widely-spread manufacture of porcelain in the West gave the death-blow to the production of pottery designed and decorated after simple and natural methods. The enamelled pottery of the 18th century was mostly little better than a bad imitation of porce- lain, a material which has a beauty quite its own, and requires forms and methods of decoration very different from those that are suited even to the most finely-enamelled earthenware.*~~

~~*Literature.—See Menard van Hoorebeke, Recueil des Antiquités, 1867; Weckher-*~~

~~*lin, Vases en Gres des XVI¢ et XVIT® Sivcles, 1860; Jouveaux, Histoire de… Bottger, 1874.*~~

~~*Scandinavian.*~~

~~*The pottery of Denmark, Norway, and Sweden for the Scandi- most part resembles that of Germany. Sweden, especially 24”*~~

~~*during the 18th century, was very active in the production of enamelled pottery, but little of it possesses any origin- ality either in form or design. Perhaps the best variety is a ware made at Stockholm, covered with bluish white enamel, on which simple patterns are painted in white. The potteries of Marieberg and Rérstrand? also turned out large quantities, painted mostly with very weak designs; some are imitations of Oriental wares, while other kinds are decorated in a realistic French style.*~~

~~*Section XIV.—ENGLISH FROM THE 16TH CENTURY.*~~

~~*Little except the commonest sort of domestic pottery was made in England during the 16th century. The grey mottled stoneware described above,*~~

which was largely used for sack-jugs and tankards, appears to have been wholly a foreign import, mostly from Cologne. A common item in 16th-century inventories is—"'a stone jugge or pott, garnished with silver and double gylted." The silver- mounted lids were often added by English silver-workers, and are frequently very elaborately embossed and chased.

It was not till quite the end of the century that certain Stone- Dutch potters started in London the making of stoneware. W@7¢-

This English-made ware is hardly to be distinguished from that of Cologne or Holland, as it was designed and manufactured in the foreign way. Large globular jugs, stamped in relief with a grotesque bearded face and other ornaments, were one of the favourite forms. Such were called " greybeards" or "' bellarmines," from the unpopular cardinal of that name, of whom the bearded face was supposed to be a caricature (see fig. 64 above). Great numbers were made in the Low Countries and copied by the Dutch potters in London. In 1688 two German potters named Elers settled in Staffordshire, and there produced hard stoneware of very fine quality. Their pro-

white enamel. The early specimens date from the end of the 16th century. Much of this ware is very soft and plea- gant in tone, and very decorative in effect, especially that in blue and white only. Designs of great variety occur, some copied from Persian or Chinese originals, others with

1 See Havard, Faience de Delft, 1878.

cess, however, soon became known to other potters.

The common wares of this time were mainly produced Stafford- in the Staffordshire potteries ; some were decorated in a Shire very rude but effective way by dropping fluid white slip Vi" through a quill on to the surface of vessels made of red ;

2 See Céramiques Suédoises du XVIIT Siecle, 1872.*

John Dwight.

~~Lambeth~~

~~clay. The whole was then covered with a coarse lead glaze, made from powdered lead ore (sulphide of lead), sprinkled through a sieve on to the soft clay. The process of firing produced a vitreous glaze, composed of silicate of lead, the silica being taken up from the clay body. Thomas and Ralph Toft made a number of large plates, drinking mugs or "tygs," and candlesticks, decorated in this way with rather elaborate designs (see fig. 65). The potter's name and the date frequently occur among the slip ornaments, which are some- times in red and brown on a white ground, as well as whiteonred. About the year 1680a new \ sort of glaze was in- vented, very useful for the common kindsof hard stone- ware, and = ex-~~

~~tremely durable, Se namely, the "galt Fic. 65.—Coarse earthenware dish, with de-~~

~~" : coration in slip, signed by Thomas Toft, c. — paaulite aots 1670. (Museum of Geology, London.)~~

~~salt (chloride of sodium) into the hot kiln when the pro- cess of firing was nearly complete. The salt was volatilized and decomposed ; the soda combined with the free silica in the clay, and a coating of hard silicate of soda was formed. A very high temperature is required for this process, which is chiefly used for drain-pipes and vessels to hold corrosive acids, the salt glaze being almost indestructible.~~

~~Towards the end of the 17th century a gentleman named John Dwight spent many years in experiments to improve the manufacture of pottery, and also to discover the secret of true transparent porcelain. He appears to have been an artist of great ability, and not only made domestic pottery of Cologne ware but also modelled figures and large busts in pale-grey glazed stoneware ; the British Museum possesses a fine portrait bust of Prince Rupert by him, modelled with great truth and spirit, almost recalling the touch of the old Florentine sculptors in terra-cotta. In 1671 John Dwight took out a patent for his special methods of pottery and porcelain work, and set up kilns at Fulham. Many of his receipts for porcelain exist, and have~~

been published in Jewitt's valuable work on The Ceramic Art of Great Britain (1877), but no specimens of this early English porcelain are now known.

The Lambeth potteries were established at a very early

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potteries. neriod, but it was not till the 17th century that they

produced ware superior to the common biscuit or lead- glazed varieties. Some pieces of about 1660 are marked with No. 21 mark. Certain Dutch potters settled at Lambeth early in the century, and started the manufacture of a finer sort of pottery, covered C. II ' with a tin enamel. Most of this is in the Potter's mark. style of the Delft wares, painted either in No. 21. cobalt blues alone or with the coarse green, yellow, and manganese purple used in the more gaudy kind of Delft. The Lambeth potters also imitated Palissy ware, with high reliefs of human figures or plants and reptiles,—very poor copies of Palissy's originals, the modelling being extremely blunt. The enamel ground has a pink tinge, and the re- liefs are picked out in various colours. Some specimens of this Lambeth ware are dated on the back in blue with varlous years during the reigns of Charles I. and Charles th Another variety has coarse imitations of late Italian majolica, while other pieces have English designs,—coarse

'| round the jug.!

portraits of Charles IT. and his queen, with arabesque borders, all very rudely executed.

~~*The beginning of the 18th century in England saw a great increase of activity in the production of many kinds of pottery. Numbers of patents were taken out and new kilns set up at a great many different places. Though many improvements were made in the preparation and combination of different clays and considerable advances in technical skill were gained, yet little pottery of any artistic value was made.*~~

~~*Wedgwood Ware.—The Wedgwoods were an old Stafford- Wedg- shire family, and one member at least was a potter in the wood 17th century. This was John Wedgwood (1654-1705), ¥9"* the great-uncle of Josiah, who in the next century founded the great pottery which he called " Etruria." Only one piece signed by John Wedgwood is known to exist; it is in the interesting historical collection of ceramic wares in the Jermyn Street Museum of Geology, London. It isa "puzzle jug" with three spouts and a hollow handle, made of coarse brown clay, covered with the usual green lead glaze. The potter's name and the date 1691 are incised*~~

~~*In the middle of the 18th century, when Josiah Wedg- wood was a young man, a great impulse had been given to the study and appreciation of classical art, partly through the discovery of the buried cities of Pompeii and Herculaneum, and also on. account of the growing enthu- siasm for the beautiful Greek painted vases, which were then being sought for with great avidity in the tombs of*~~

~~*Etruria and Magna Grecia. Josiah Wedgwood devoted ; his life and great talents to an attempt to reproduce the | severe beauties of the Greek and Roman pottery. Unfor*~~

~~*tunately in this not unpraiseworthy aim he neglected ; the special requirements of fictile work. His productions,*~~

~~*delicate and beautiful as they often are, have the charac-*~~

~~*teristics of anything rather than pottery. With great*~~

~~*labour and expense he turned out from his workshops imitations, necessarily unsuccessful, of ancient engraved*~~

~~*gems and camei, of jasper, basalt, or mottled marbles, of gem-like cut glass, such as the Portland vase, and dull copies, feeble in drawing and hard in texture, of beautiful painted Greek vases. Of natural methods of decoration suitable to pottery, or of the life and freedom of the plastic clay rising into graceful forms under the touch of the thrower's hand aided by the rhythmical movement of the wheel, he knew nothing. Nearly all his pottery is dully scholastic and archeological in style, and therefore must, on the whole, be regarded as a failure, though often a very clever and even beautiful failure.*~~

~~*Wedgwood's most characteristic ware, in the production of which he was aided by Flaxman and other able artists, consists of plaques and vessels, vases, cups, plates, and other forms moulded in clay, delicately tinted blue, brown, and various colours, on which minute cameo reliefs in white paste were applied while they were soft, and were then fixed by firing. Many of them have very beautiful figures, some copied from Greek and Roman gems or vases, others being specially designed for him; but all are classical in style. Some of his pieces are quite astonishing for their microscopic delicacy of detail; others have wreaths, foliage, and minute diaper ornaments applied in the same way. Wedgwood also produced very fine and porcelain-like varieties of white enamelled pottery, some even decorated with a metallic lustre, purple in colour, and mottled to imitate marble ; some are cleverly modelled to imitate large sea-shells. Indeed his technical methods were varied with the utmost ingenuity, and would need a treatise to them- selves if even a rough outline were given of all the varieties.*~~

~~*1 For a full account of the Wedgwood family and their ware, see Jewitt, Life of Josiah Wedgwood, 1865 ; and Meteyard, Wedgwood and his Works, 1873.*~~

~~*ANCIENT MEXICAN, ETC. |*~~

~~*Towards the end of the 18th century many imitations were made of the Wedgwood cameo ware by different English manufacturers, and even at Sévres it was copied in porce- lain, though with original French designs. None, how- ever, are equal to Wedgwood's work, either in beauty of design or delicacy of execution.*~~

~~*Until quite recently little or no pottery of any artistic merit has been produced in England during the present century, partly owing to the absurd notion that pottery is a sort of inferior porcelain, and should be made to resemble it as much as possible, and also very largely on account of the invention in the 18th century of a process (described below) for printing patterns under the glaze, so as to avoid the labour of painting them by hand. Other modern so-called improvements of manufacture have done much to destroy all true art in English pottery ; such are the too finely ground and artificial mixtures of different materials, the great use of the mould in preference to the potter's wheel, and, most fatal of all, the fact that, when the pottery és thrown on the wheel, it is afterwards handed over to a workman who turns it on a lathe and rubs it down with glass-paper, as if it were a block of wood, thus remov- ing all the surface put on the vessel by the touch of the thrower's hand. Indeed, the great manufactory of Sévres has now so com- pletely lost all sense of the natural and reasonable treatment of plastic clay that the larger vases are cast whole by being poured in a fluid state into a mould, a method reasonable enough for iron or bronze but ludicrously inappropriate to plastic clay. Some few manufacturers have, however, of late tried to produce pottery shaped and decorated in a more natural way. The Lambeth pot- tery produces a good deal of excellent work, especially ware covered (after the Japanese fashion) with one brilliant enamel colour. Mr William De Morgan of Chelsea and Merton has perhaps made the greatest advances of all, having rediscovered the way to make and use the beautiful thickly-glazed blues and greens of the old Persian ware, and also the fine silver and copper lustres of Gubbio and*~~

~~*Spain. He uses these splendid colours in designs conceived and drawn with the old spirit, but of sufficient originality to make them a real stage in the development of ceramic art, not a mere archeological revival of styles and methods which have long ceased to have a significance and life of their own.*~~

~~*Sad though the confession is, it must be admitted that, to find a class of pottery designed with lines of natural beauty and pro- duced in accordance with the simple requirements of plastic clay, it is, for the most part, necessary to go, not to the centres of our boasted 19th-century civilization with its countless devices for turn- ing out work cheaply and rapidly, but rather to the humble work- shops of more primitive races, among whom the commercial spirit*~~

~~*has not yet destroyed all inborn feeling for true art and beauty. Literature. —For English pottery, see Jewitt, Ceramic Art of Great Britain, 1877: Solon, Old English Potter, 1883; Owen, Ceramic Art in Bristol, 1873; Wallis and Bemrose, Pottery of Derbyshire, 1870; Mayer, Art of Pottery in Potting in Worcester from 1751 to 1851, 1865 ; Church,*~~

~~*Liverpool, 1855 ; Binns, these works deal more with porce-*~~

~~*Catalogue of English Pottery, 1870; some of jain than pottery.*~~

~~*Section XV.—Ancrent Mexican, Peruvian, &c.*~~

~~*The pottery of ancient Mexico and Peru, certainly older than the Spanish conquests in America, and possibly dating from a much more remote age, has many points of interest. Large quantities in good preservation have been discovered in the tombs of chiefs and other important persons of those once powerful and (in a somewhat barbaric way) artistic races. Much of their pottery is grotesque and even hideous in shape, modelled in the forms of semi-human monsters ; it is often made of a hard black 2 clay, well burned, something like the early black wares of Etruria. Another kind is grace- ful and natural in shape, formed with great taste and skill on the potter's wheel. Many of the forms seem to have been sug- gested by vessels madeof gourds. The decoration is very curious ; many of the simple painted patterns with geometrical de- signs and hatched lines call to mind*~~

~~*theearliesttypeof painted Fr. decoration on the archaic pot- tery of Mycene and the Greek islands. The clay is fine in texture and has a slight surface-gloss, apparently the re-*~~

~~*66.—Ancient Peruvian ves-*~~

~~*sel. (British Museum.)*~~

~~*POTTERY*~~

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~~*sult of mechanical polishing. Fig. 66 shows a typical form.! The British Museum has a good collection of this ware. The natives of Arizona and other uncivilized races of America even now make simple pottery decorated with taste and true decorative feeling.*~~

~~*Section XVI.—Porrery AND PoRCELAIN oF CHINA AND JAPAN.*~~

~~*In the methods of treatment employed in China and Japan the usual distinctions between pottery (earthenware) and porcelain (kaolinic ware) are not always observed. In many cases these two different materials are treated in exactly the same way and decorated after the same fashion. It will therefore be convenient to describe them both together.*~~

~~*History of Chinese Porcelain.—The chronological arrange- ment of Chinese wares isa matter of great difficulty. Man of the professedly historical records of the Chinese them- selves are quite untrustworthy; as with all other arts, they have claimed for the manufacture of porcelain an antiquity far beyond the actual facts of the case. This exaggerated estimate of the antiquity of Chinese porcelain was for a long time supported by the supposed discovery in Egypt of certain small bottles made of real porcelain, and in- scribed with Chinese characters, which were said to have been found in tombs at Thebes dating as early as 1800 B.c. The fact, however, that they are inscribed with quotations from Chinese poets of the 8th century 4.D., and have characters of a comparatively modern form, shows that the whole story of their discovery is a fraud. The only native work which gives trustworthy information on the development of Chinese*~~

~~*porcelain is a History of the Manufactory of King-te-chin, compiled from earlier records in 1815 by a native official, which was translated into French by M. Julien, under the title Histoire de la Fabyi- cation de la Porcelaine Chinoise (Paris, 1856). Accord- ing to this work, the manufacture of pottery is said to have commenced in 2697 3.c., and that of porcelain during the Han dynasty, 206 zc. to 25 ap. The Tsin dynasty (265-419 a.p.) was remarkable for its blue porcelain, and the Suy dynasty (581-618 a.p.) for its fine green ware. One of the most celebrated kinds of porcelain was that made about 954 a.p., deep sky-blue in colour, very glossy in texture, extremely thin, and sounding musically when struck. Even small fragments of it are treasured up by the Chinese, and set like jewels. Most dynasties seem to have been famed for a special variety of porcelain. The earlier sorts appear not to have been decorated with painting, but were all of one rich colour. Decorative painting did not apparently come into general use before the Yuen dynasty of Mongols (1260-1368), and was brought to great perfection under the Mings (1368-1644). The porcelain of the last-named dynasty is classified in periods, four of which (from 1426 to 1567) were greatly esteemed. Probably few specimens of Chinese porcelain known in Europe are earlier in date than the time of Kang-he, the second emperor of the Tsing dynasty (1661-1722). During all periods Chinese potters were constantly in the habit of copying earlier styles and of forging their marks, so that very little reliance can be placed on internal evidence. Indeed, the forgeries often deceive the Chinese collectors of old porcelain.*~~

~~*Manufacture of Porcelain.—It is made from two sub- stances, "pe-tun-tse." and "kao-lin"; the latter is @ white pasty substance derived from the decomposition of felspathic rocks such as granite. It is a hydrated silicate of alumina (Al,0,.2S8i0, + 2H,O), and derives its name from a hill near King-tih-chin, where it was first found (see Kaotty). The precise nature of pe-tun-tse is not*~~

~~*I See Rivero and Von Tschudi, Antiguedades Perwanas, 1851.*~~

~~*Manu- facture.*~~

~~*Decora- tion.*~~

~~*Plain white,*~~

~~*One enamel colour.*~~

~~*exactly known, but it appears to resemble kaolin, with the addition of a considerable proportion of free silica. The result of their mixture is shown in the following analysis by M. Laurent of the body of white Chinese porcelain—silica 70°5 per cent., alumina 20°7, potash 6, lime 0°5, protoxide of iron 0°8 per cent., Magnesia a trace. The white pastes of which the porcelain is made are very carefully washed, finely ground, and mixed in due pro- portion. The paste is "thrown" on the potter's wheel in the usual way and set to dry; its coloured decoration is then applied, and over that the transparent glaze is laid. This is a very hard and beautiful substance, which requires great heat to fuse it; it is made of almost pure felspar with an alkaline flux. It is finely ground with water, and either blown with a pipe on to the vessel or the vessel is dipped into it. The porcelain is next packed in clay boxes or "saggers," piled one above another in the kiln, in order to protect it from discoloration from the smoke. After the kiln has been heated for a considerable time to a very high temperature, the fire is withdrawn ; and the porcelain is allowed to cool slowly in the clay saggers before the kiln is opened and its contents removed. Additional decoration is frequently added over the glaze, generally in enamel colours, applied thickly so as to stand out in perceptible relief; gilding is also added over the glaze. The porcelain is afterwards fired a second time in a more open kiln, and at a lower temperature.*~~

~~*The methods of decoration on Chinese porcelain are ex- tremely varied, and are applied with the most skilful hand and wonderful fertility of design; but they are always: dainty and feebly pretty rather than artistic, except when there is a Persian element present. The Chinaman is a born maker of graceful toys, full of ingenuity and perfect deftness of touch, but hardly worthy to be classed as a producer of serious works of art. The general*~~

forms of the porcelain are mostly feeble, and often of extreme ugliness, while the skill in drawing is mostly confined to representations of flowers, some of which, especially the chrysanthemum and the peony, are painted with great truth and enjoyment. With the beauties of the human form the Chinaman has no acquaintance or sympathy, and he never possessed the wonderful skill of the Japanese in the delineation of animals and birds.

Only a few chief examples among the many methods of decorative treatment can be mentioned here. A useful classification has been adopted by Mr A. W. Franks in his valuable catalogue of his own collection of porcelain, formerly exhibited at Bethnal Green, and now (1885) in the British Museum.

1. Plain white, of a delicate ivory colour and a rich satin-like

glaze. Some of it is crackled, not accidentally, but by a careful process, one of the methods of which is this. Powdered steatite

1s mixed with the materials of the felspathic glaze, and the porce-

lain vessel or statuette, after the glaze is applied, but before firing,

is set in the rays of a hot sun, which causes it to be covered with

a network of fine cracks, going through the skin of glaze down to

the porcelain body. Red pigment or black Chinese ink is then

rubbed into the minute cracks, which are thus made more con- pate ee

spicuous, and prevented from quite closing up in the heat of the kiln. Many speci- mens have two sets of crackle, first the coloured cracks produced before firing, and secondly an intermediate uncoloured set, produced in the glaze by the action of the kiln (see fig. 67). Most of this white ware is decorated with delicate surface-reliefs of flowers or figures very sharply moulded. Old specimens of it are now highly valued in China. It was frequently copied in the early European porcelain manufactories, such as Saint Cloud, Meissen, and Chelsea. ' 2. Porcelain covered with one Enamel FIG. 67.—Chinese ie Colour.—Enamels of many varieties of tint | With

~~*crackle glaze. and great brilliance were used : the finest are blue, from copper or cobalt ; deep red, another oxide of copper ; yellow, antimoniate of*~~

~~*St*~~

~~*PO rTEe Y*~~

~~*[CHINESE PORCELAIN.*~~

~~*lead ; and black, oxides of iron and manganese. One of the most beautiful is that sea-green tint called "céladon," which was early exported into England, and highly valued in medieval times from its supposed property of changing colour at the contact of poison. New College, Oxford, possesses a bowl of this ware, mounted in silver richly worked, of about 1500 a.p., and presented to the college by Archbishop Warham early in the 16th century. A speci- men of this céladon ware is probably referred to among the list of new-year's gifts to Queen Elizabeth as "a cup of grene pursselyne" given by Robert Cecil. The fine old yellow porcelain was only made for the use of the emperor of China, and it is consequently rare ; it is very thin and transparent, almost like a vitreous enamel. Some of the Chinese enamelled wares are made of pottery, not of porce- lain ; earthenware, in many cases, was equally good for the purpose, as the body of the vessel was hidden by the coloured enamel.*~~

~~*3. Porcelain decorated with several Enamels or Glazes of different Several Colowrs.—This ware is = enamels frequently moulded in and relief, with dragons, colours. flowers, or various ani- mals, picked out in dif- ferent colours, often very harsh and gaudy in effect. Fig. 68 showsa pilgriin- bottle painted in enamel colours. The beauty both of form and of decoration for which this piece is very re- markable is mainly due to Persian influence.*~~

~~*4. Porcelain painted in White Enamel over a Grownd of Coloured Enamel. —This isa very decorative sort of ware 2 the designs, such as flowers, birds, and in- sects, are applied thickly in the white pigment, and are sometimes care- fully modelled in low relief. The method was*~~

~~*largely imitated by the ea ied es 620 Fic. 68.—Chinese pilgrim-flask, painted with above). enamel colours; Persian style.*~~

~~*5. Porcelain painted only in Blue.—This is really thé most artistic Blue.*~~

~~*and highly decorative of all the varieties of Chinése painted wares, Some of the large plates and jars have very good designs, treated in a not too realistic manner. 'Much of the finest porcelain of this class both in form and decoration shows a strong Persian influence, the result of the intercourse between China and Persia and the visit of Chinese potters to Ispahan mentioned above in the account of Persian pottery. N anking porcelain, painted with the so-called 'hawthorn pattern," really a kind of Prunus which produces its blossoms before its leaves, was largely imported into England during the last century, and now fetches very exorbitant prices. Unluckily during the 18th century a great deal of the fine blue and white china brought into England was painted over the glaze with harsh gaudy colours in English and French porcelain manufactories, to please the degraded taste of the time, and was thus completely spoiled. Other combinations of Chinese and European work occur. Sets of porcelain were painted in China with French or English designs to suit the European market ; or plain white porcelain was sent from China to be decorated at Chelsea or Bow. Very ludicrous results were produced in some cases by this mixture of style ; engravings were sent from Europe to be copied on porcelain by the Chinese potters, who have in many cases laboriously painted an exact facsimile of the copper-plate lines with all their hatchings and scratchy look. Some of these were done for Jesuit missionaries in China, and Chinese plates with Catholic sacred subjects and figures of saints exist in considerable quantities. Statuettes of the Madonna were also made in China for the missionaries, carefully modelled in white porcelain after European originals ; some appear to be copies from 14th-century French ivory figures, and (even in the hands of the Chinese potter) have preserved a strong resem- blance to their medieval original. The type of the Holy Mother thus introduced appears to have been adopted by the Chinese Buddhists as a fitting representation of their goddess Kwan-lin, many figures of whom were made with but little alteration from the statuettes of the Catholic Madonna.!*~~

~~*6. Porcelain painted in many Colours under the Glaze.—This Poly- very large class includes all varieties of form and decoration. The chrome colours are often harsh and inharmonious, and the more elaborate under figure-subjects are nearly always grotesque and ugly. Additional glaze. ee E —E—E——E———————*~~

~~*1 See Watkins Old, Indo-European Porcelain (Hereford, 1882).*~~

~~——~~

~~*\\ White on coloured*~~

~~*Japanese Hizen about 1513.*~~

~~*pottery.*~~

~~*Satsuma ware.*~~

~~*JAPANESE. |*~~

~~*richness of effect is often given by the over-glaze colours, added by a second firing. Many other varieties might be mentioned, but the student must be referred for further information to the list of works on this subject given below.*~~

~~*Both pottery and porcelain have been used on a large scale for architectural purposes in China. The so-called "porcelain tower" of Nanking was the most prominent example. It was a very ela- borate structure (see NANKING), mostly constructed of pottery covered with enamels of different colours. The usual name is misleading, as only the white portions were of real porcelain. The Jermyn Street and British Museums have specimens of its bricks and elaborate architectural features.*~~

~~*Japanese Pottery and Porcelain.—In the main the technical methods used in Japan and the styles of painted ornament were introduced from China, and also to a less extent from the adjacent peninsula of Corea. Glazed pottery was first made at Seto about 1230 a.p. by a potter who had visited China. Porcelain manufacture was introduced in a similar way into the*~~

province of On the whole the Japanese are more remarkable for their skill and almost endless methods in the production of pottery than of porcelain. No people ever approached them for marvellous fertility of invention and skill in the manipulation of all sorts of clay, pastes, enamels, and pigments. One of the most remarkable characteristics of Japanese pottery is its wonderful success in the imitation of all kinds of materials and texture of

'surface, one great object apparently being to make it re-

semble anything rather than what it really 1s. Wood, with its varying colours and delicate grain, ivory, bronze, lac, marble, basket-work, fruits, and countless other substances are imitated in Japanese pottery with the most perfectly de- ceptive effects. The utmost amount of labour and patience is often spent with this one object, any notions of real artistic beauty being apparently never even considered.

A great deal of Japanese ceramic ware is simply copied from Chinese porcelain, and often has forged Chinese marks. It is very difficult to find out what notions the Japanese themselves really have as to what is admirable in pottery. A purely archeological interest in old sorts of ware appears to affect them strongly, and they often put the highest value on what appears a very ordinary and rudely-made kind of pottery. As Mr A. W. Franks has pointed out in his introduction to a native report on Japanese pottery, published by the Science and Art Depart- ment, 1880, the high value which they put on rude speci- mens of glazed pottery is partly kept up by the existence of certain curious old tea-drinking ceremonies, solemnly performed as if they were religious rites. Everything used and every detail of the performance were strictly prescribed by rule. The bowl or cup out of which the tea was drunk by the guests was to be an archeeological curiosity remark- able for its age, not for any intrinsic merit. Some of these cups which have been brought to Europe are of coarse clay, illformed, thick, highly glazed, and quite without orna- ment. One in the Sévres Museum, said to be Seto ware of the 14th century, is made of mottled yellowish brown clay, with a thick vitreous glaze. It looks quite worthless, but has evidently been highly valued by its Japanese owner, for it has a beautifully made ivory lid, and is protected by three cases,—first, fine white silk with gold cord ; second, a box of polished bamboo ; and, outside of all, a case of

~~figured linen lined with silk. Others of these precious tea- bowls are red, purple, black, or grey, all very thick and coarse, but highly glazed, and carefully fitted into silk cases.~~

~~Some of the Japanese methods for the decoration of pottery are simple and effective, especially a ware made of grey clay with incised patterns—birds, flowers, and the like—filled in with white paste, and the whole glazed,—similar in method to the 16th-century Oiron ware.~~

~~The most magnificent sort of pottery is the Satsuma ware, originally introduced from Corea. It was at first~~

~~POrwrTrE h Y~~

~~635~~

~~manufactured in a private factory belonging to the prince of Satsuma, but afterwards produced for public sale. The most highly-decorated kinds with many colours were not made till the end of the 18th century. In minute richness it is probably the most elaborate ware ever produced. The body is a fine ivory-white clay, covered with a minutely crackled glaze. Over this, miniature-like paintings of human figures or flowers are executed in brilliant enamel colours, some of which stand out like jewelled reliefs. It is further decorated with delicately moulded patterns in gold, and, though very weak in real decorative effect, is a marvel of rich workmanship. Most of the so-called Satsuma now sold is a poor imitation of, the ware, and is made in great quantities at Awata and Ota.~~

~~It should be observed that nearly all the very elaborate Decora- and magnificent methods of ceramic decoration now so tion.~~

~~much employed by the Japanese are of quite modern origin ; before the present century the simpler methods of China were almost exclusively followed in Japan. During the last century great quantities of porcelain, chiefly deco- rated in gold, green, and a rich red, were made expressly for export, and largely brought into Europe, where they were frequently copied, especially in the porcelain works of Dresden and the early china manufactories of England.~~

~~*The Japanese have little or no sense of the best kind of decorative art; their paintings of flowers or birds, beautiful as they are, are mostly, as it were, flung across the vessel they are meant to ornament without any regard to its shape or the space to be occupied. Like the Chinese, they have no feeling for the beauty of the human form, or even of some of the nobler animals, such as the horse. The figures most frequently represented on their ceramic wares—the seven gods of good fortune—are all grotesquely hideous ; and downright ugliness of the most repulsive sort is often selected and treated with wonderful ingenuity. Many of the paintings have a symbolical meaning ; emblems of longevity (considered by the Japanese the chief of all blessings) are perhaps the favourite, such as the sacred tortoise, the crane, or the combination of three trees—the fir, the plum, and the bamboo—all of which have this special meaning.*~~

~~*Within the present century a new and elaborate method of decorating porcelain has been practised in Japan, the chief object of which seems to be to make a porcelain vessel look like a metal one. Brass cloisonné enamel is applied to the outer surface of porcelain vases or bowls; the strips of brass set on edge which form the outline of the design, instead of being soldered to a metal plate, are fixed in some almost incomprehensible fashion to the surface of the porce- lain, and then the compartments are filled in with coloured enamels and fired in the usual way,—a marvel of technical skill and wasted ingenuity.*~~

~~*Collections of Chinese and Japanese Porcelain.—The Dresden Collec- collection is the most important historically, having been formed tions.*~~

~~*chiefly between 1694 and 1705. 'The British Museum is rich through the recent munificence of Mr A. W. Franks, who has presented to it the whole of his fine collection. The South Kensing- ton Museum and the museums at Leyden, 'he Hague, and Sévres are rich in these wares, as are also those at Vienna, Berlin, and St Petersburg.*~~

~~*Literature.—For Chinese and Japanese porcelain, see Jacquemart and Le Blant, Histoire de la Porcelaine, 1861-62 ; Jacquemart, Histoire de la Céramique, 1873; Audsley and Bowes, Keramic Art of Japan, 1275-80 ; Du Sartel, La Porce- laine de Chine, 1881; Graesse, Catalog der k. Porzellan- wnd Gefaiss-Sammlung zu Dresden, 1873 ; Stanilas Julien, Histoire de la*~~

~~Porcelaine de Chine, 1856; Franks, Cat. of Coll. of Oriental Porcelain, 1878, and 'Japanese Pottery," in South Kensington Museum Handbook, 1880.~~

~~Ssction XVII.—PorcELaIn IN EUROPE. Early Development.~~

~~In various places in Europe, especially in Italy and France, attempts to produce translucent porcelain like that produced by the Chinese were almost continually being made from the end of the 15th century down to the~~

~~beginning of the 18th. The word "porcelain" is usually derived from the Italian " porcellana," a white shell, to the smooth polished surface of which the Chinese wares bear some resemblance. Hence it should be observed that in medieval inventories "a cup of porcelain" often means one made of shell or mother-of-pearl. In Italy the finer sorts of majolica were often called "porcellana," and a plate decorated "alla porcellana " meant one with a special style of painting, and did not refer to its material. During medizval times, when real Eastern porcelain is meant, some other word expressing where it came from was frequently added, e.g., in French 15th-century inventories " porcelaine de Sinant" is sometimes mentioned. From the 13th to the 15th century Chinese porcelain was very sparingly brought into Europe, and generally occurs among royal possessions or gifts as an object of great value. The name "china," from the country where porcelain was made, was given to it not later than the 16th century, and perhaps earlier, having been used by the Arabs long before: " china dishes" are mentioned by Shakespeare (Measure for Mea- sure, act li., scene i.) as being things of value.~~

~~The main reason of the very slight success gained for so many years in the attempts to make porcelain in Europe was the fact that it was regarded as a highly arti- ficial substance, something between pottery and glass; the many beds of kaolinic clays which exist in Europe were never thought of as being the true material of which to make it, or, if used at all, were only employed partially and in an accidental way. The earliest attempts at the production of translucent porcelain which had any practical success took place at Venice about 1470.1 An alchemist named Antuonio succeeded in making~~

~~*and firing in a kiln at San Simone, near Venice, " porcelane trasparenti e vaghissime," described, in a document dated 1470, as being as beautiful in glaze and colour as "the porcelain from barbarous countries." Difficulties, however, seem to have arisen, and the manufacture was not proceeded with till 1504, when a few sample specimens were made in Venice, and others again in a spasmodic way in 1518 and 1519. No specimens of the early Venetian porce- lain are now known, nor any pieces of the porcelain made at Ferrara for Duke Alphonso II. about 1565-67 by Giulio da Urbino, and mentioned with high praise*~~

~~*POTTE & F*~~

~~*[PORCELAIN.*~~

~~*II." Some pieces have a rude representation of the great dome of the Florentine cathedral, and the letter "F." for "Florentia" (see No. 22). Scarcely forty specimens of the ware are known, which are mostly in the possession of the Rothschilds and Mr Drury Fortnum, in the royal collec- tion at Lisbon, and the museums of South Kensington and Sevres. They are all of a slightly creamy white, with a beautiful pearly texture, due to the rich glaze and the slight transparency of their paste ; the glaze varies in thickness, and in some instances is slightly Potter's mark. crackled. Nearly allare simply decorated in No 2% cobalt blue, under the glaze; the designs are of various styles, some purely Italian, others Persian or Chinese in character ; a few have one flower painted in the middle of the space in a graceful and almost realistic way. A plate at Lisbon has a figure of St John with his eagle. Their forms are pilgrim-flasks, plates, ewers, and vases of differ- ent shapes, some very graceful and original.*~~

~~*The earliest dated example is among the five specimens in the Sévres Museum; it is a square bottle with the arms of Spain painted in blue and a few touches of man- ganese purple; the date 1581 is introduced among the ornaments at a corner of the bottle; it was probably a gift from Francesco I. to the king of Spain. The com- position of this porcelain has recently been discovered from a contemporary MS. in the Magliabecchian Library at Florence. The paste consisted of 24 parts of white sand, 16 of a crystalline frit (powdered rock-crystal 10, and soda 8), and Faenza white earth 12 parts. To 12 parts of this mixture 3 of the kaolinic clay of Vicenza were to be*~~

~~added. Probably to secure greater whiteness, the vessels were covered, under the glaze, with a white enamel ; but this addition appears needless. They were then glazed with an ordinary silicious lead glaze. Though the final result has the beauty and some of the special qualities of the Chinese natural porcelain, yet it will be observed that this end was gained in a very difficult and elaborate manner, which must have been very costly. This, no doubt, is the reason why so few pieces were made, and why its manu- facture ceased altogether with the death of Francesco de' Medici, in 1587.~~

~~=~~

~~(CALAN~~

~~A Aa~~

~~After the Medici ware ceased to be made there is a blank French — of nearly a century in the history of European porcelain, porce- In 1664 a patent was granted to Claude Reverend, a citizen !#™~~

~~by Vasari.2 The composition of this earliest European porcelain is not known, but it probably was partly made of the white clay of Vicenza—a true kaolinic paste —~~

~~often used by the majolica potters to give whiteness and fine grain to their clay.~~

~~Medici Porcelain.—The earliest manufactory of porcelain of which known specimens exist is that started in Florence, for Francesco I. de' Medici, about the years 1575-80 by Bernardo Buontalenti (see Vasari). Francesco de' Medici took the greatest interest in the manufacture, and, as is recorded by Galluzzi (Istoria di Toscana, 1781), moulded some of the vessels with his own hands, as compliment- ary presents to other princes. According to Galluzzi, Buontalenti did little more than improve on the method invented a few years earlier by the majolica potters Camillo da Urbino and Orazio Fontana, assisted by a Greek who had learned the secret of true porcelain in China. The discovery of the existing specimens of Medici porcelain is due to Alessandro Foresi, who observed its peculiar texture and, in some cases, slight transparency, and found pieces marked at the back in a way that quite~~

~~*confirmed his theory. These marks are the Medici arms, with its "palle" or balls, inscribed with "F. M. M. E. D. IL." for "Franciscus Medici Magnus Etrurize Dux*~~

~~*1 See Davillier, Les Origines dela Porcelaine en Europe, 1882.*~~

~~*2 Lives of Artists, last section. 3 See Foresi, Sulle Porcellane Medicee, 1869.*~~

~~*of Paris, which gave him the privilege of making " imita- tion porcelain, as fine as that from the East Indies." No known specimens can be attributed with certainty to his workshop, though some pieces which bear mark No. 23 may have come from his hands. In 1673*~~

~~*another patent was conceded to Louis Poterat, x who certainly did produce artificial eee" & PE porcelain at Rouen. Some small FR*~~

~~*pieces, salt-cellars and mustard- °*~~

~~*pots, in the museums of Rouen and Sévres, are attributed to him, and are therefore the earliest undoubted examples of French porcelain. They are of a pearly white colour, with rich glaze, not unlike the Medici porcelain in softness of texture. The ornaments, simple and delicate arabesques, are painted under the glaze in cobalt blue only. Some pieces are signed with No. 24.*~~

~~*Saint Cloud was the next place in France where porcelain was produced, the manufactory being carried on by the Chicanneau family, to whom a privilege was granted in 1695. The patent mentions that they had made porcelain since 1693. This early Saint-Cloud porcelain is fine in texture and glaze, and is decorated in many different styles : it is pure white, moulded with slight reliefs copied from the*~~

~~*No. 23. No. 24. Potters' marks,*~~

~~*Royal | manu-° factory.*~~

~~*Soft and | hard | 'porce- lain.*~~

~~*SEVRES.* |~~

~~*Chinese ; or painted in many bright colours and gold with*~~

~~*Chinese designs; or thirdly, with paintings in blues only*~~

~~*of flowery scroll-work and grotesques. It is marked either*~~

~~*with a sun, or with "S. C." combined with "T." (see No.*~~

~~*25), and other makers' initials. Martin Lister, physician*~~

~~*to Queen Anne, in an account of his travels in*~~

~~*France during 1698, mentions a visit which fy*~~

~~*he paid to the Saint-Cloud porcelain works,*~~

~~*and speaks with great adiniration of their*~~

~~*productions. The privilege was frequently ed is*~~

~~*renewed during the first half of the 18th*~~

~~*century, and the Saint-Cloud manufactory Potter's mark.*~~

~~*continued to be the most important in France Be 2*~~

~~*till the establishment of the royal manufactory at Sévres. Other places in France during this period, from 1700*~~

~~*to 1745, produced a certain quantity of artificial porcelain.*~~

~~*These were Lille, from 1711, marked with No. 26; Paris,*~~

~~*1722, a branch of the*~~

~~*Saint-Cloud works ; and*~~

~~*Chantilly, from 1725. ° 4 ' B*~~

~~*The porcelain of Chan-*~~

~~*tilly was specially in- v*~~

~~*tended to imitate old No. 26. , No. 27.*~~

~~*Japanese ware. Like the a*~~

~~*Medici porcelain, it has a white tin enamel over the paste.*~~

~~*It is marked with a hunting-horn (see No. 27) and painter's*~~

~~*initials. Porcelain of every variety of style was also made*~~

~~*at Mennecy-Villeroy from 1735, under the patronage of the*~~

~~*duke of Villeroy, with whose initials, "D.V.," all the pro-*~~

~~*ductions of the manufactory are marked. All these early*~~

~~*varieties of porcelain were of the artificial or soft kind, called*~~

~~*by the French " porcelaine & pate tendre."*~~

~~*Sevres.*~~

~~*The increasing success and popularity of the porcelain produced in Germany and England induced Louis XV. to establish a private royal manufactory of porcelain, which was first started at Vincennes, with a privilege granted to Charles Adam and others in 1745. In 1753 the king himself became a partner in the works, with a third share in the property. The seat of the manufactory was then transferred to Sévres, and the official title was assumed of "manufacture royale de porcelaine de France." Before 1753 the royal porcelain was simply marked with two crossed L's for Louis, but from that year a date-letter was made compulsory,—A for 1753 (see No. 28), B for 1754, and so on till 1777, after which a new doubled alphabet was started AA (see No. 29), BB, &c. ; this lasted down to RR (1793), : and then a less regular Potters' marks. series of marks came into use. Till 1792 the date-letter was put between the crossed L's, but in that year the republic*~~

~~substituted the letter R. Later various royal monograms and marks were used.~~

~~Till about 1770 all French porcelain was artificial or "soft" (pate tendre); the discovery of kaolinic clays in France then brought about the manufacture of natural hard porcelain (pate dure) like that made in China and Japan. This gradually superseded the soft kind, which ceased to be made at the end of the 18th century. Its manufacture has recently been revived at Sévres to some slight extent. M. Brongniart, the director of the Sévres porcelain works from 1800 to 1847, in his most valuable Traits des Arts Céramiques (1854), gives a full account of the materials and methods used at Sevres during all periods. The soft porcelain was composed of white sand 60 per cent., nitre 22, common salt 7-2, alum 3°6, soda 3°6, and~~

~~No. 28. No. 29.~~

~~POTT E.R ¥~~

~~- without breadthof decorative~~

~~637~~

~~gypsum 3°6 per cent. This compound was roasted at a high temperature, then ground to a fine powder, and washed with boiling water. To nine parts of this mixture or frit two parts of white chalk and one of a sort of pipe- clay were added. The whole was again ground, and passed several times through a fine silk sieve. Water was added to make the powder into a paste, and it was then fit for the thrower on the wheel or the moulder. Owing to the very unplastic nature of this elaborate mixture, black soap and size or glue made from parchment were added to bind the paste.together under the moulder's hands. The glaze used for the pate tendre was an ordinary silico-alkaline glass, made fusible by oxide of lead. The coloured decorations and gilding were added after the firing of the glaze. The hard porcelain is made of natural kaolinic clays, and is glazed with almost pure felspar,—both substances very hard and infusible. The superior softness and richness of effect possessed by the pdte tendre are due to the fact that the paintings on the softer and more fusible glaze sink slightly into it under the heat of the kiln, and are, though almost imperceptibly, blended one with another. It is~~

~~*easy to distinguish the two pastes and glazes: pieces of the one kind can be scratched by a knife, while those of the other resist it. Nevertheless the difference in beauty between the two kinds of porcelain has been much exaggerated, and the extravagant prices which are given for the pdte tendre are greatly due to its rarity, and to its having been produced earlier than the other. The whole question, in fact, of the value of Sévres porcelain is a highly artificial and conven- tional one, which can hardly be considered in accordance with the ordinary rules or canons of art. Certain special qualities were aimed at, such as brilliant colours, with abso- lute smoothness of surface, microscopic delicacy of paint- ing, and the most perfect accuracy and neatness of execu- tion throughout ; and it must be admitted that the porce- lain-makers gained their object with the help of ingenuity, technical skill, and unwearied patience, which must com- mand our respect and even admiration, whatever may be our verdict as to the artistic result of their labours. Still, with all possible allowances, there is no doubt that rarity, the necessary result of the slow and laborious processes employed, is the chief reason for the extraordinary value now set on this porcelain. 2 The £10,000 which three flower-vases of pdte tendre fetched at a public auction a few years ago can be ac- counted for on no other hypo- € thesis. The colours of Sévres porcelain are generally harsh, and out of harmony with the pictures they surround ; the forms of the various vessels too are frequently very un- graceful, and utterly unsuited to any plastic substance. The whole of this porce- lain ware, in fact, labours | under the serious artistic dis- advantage of being designed and decorated with no regard to suitability of material or" method ; the elaborate pic- ture-subjects would have*~~

~~*SS*~~

~~*a MM*~~

~~*a |*~~

~~*been far more fit for ivory Fic. 69.—Sevres vase, pdte tendre ;*~~

~~*green body and gilt imitation mounting. (South Kensington Museum.)*~~

~~*miniature-work, and are quite*~~

~~effect, while the shapes of the more elaborate vases are often deliberate imitations of gold and "or moulu," which in no way suggest the special pro-~~

~~Decora- | Sevres porcelain made for actual use, such as tea-sets upon it, thus forming the outside or back of the clate, which. ae | sit : : . r back of the plate, w ; t ais and dessert-services, are usually painted with flowers or | revolves against the edge, has all super'iuous pale cctaped, hem it figure-subjects, often in many tints, and enriched with | and is accurately formed into the required shape. When the plate gilding, but on a plain white ground. It is the purely | or other vessel has been shaped it is allowed to dry, and is finished decorative pieces, such as vases and flower-vessels, that are ee Pai a ee Tubbed smooth with sand-paper. : and all projecting ornaments are moulded, ther ornamented with the greatest splendour. They generally | cast, by pouring the paste in " fluid state into Hisco: senile suse have panels with pictures on a white ground surrounded | of plaster of Paris, which take to pieces and set free the casting by frames of gold scroll-work ; the main body of the piece | which is then fixed on the vessel it belongs to with a little more is covered with one deep or brilliant colour. The chief | Suid slip used asa "lute." The moulded ornaments are afterwards e carefully finished by hand with ordinary modelling tools. E J : ; ; ing : ce are haa ae very dark blue ; blew du cate deep statuettes and groups of figures are eae finished oe this ee ramarine ; a bri 1ant turquoise blue; a bright pink, | The vase with its attached ornaments, after being thoroughly dried the favourite colour of Madame Pompadour, but generally | is ready for the first firing. called "rose Du Barry"; a bright yellow, a violet, and three The kilns are like tall circular towers tapering towards the top, Firing. shades of green were also used. These brilliant colours pi Lode ee He en at ey her ge ae : E : Ps 5 perforated brick vaults between t Se fire, are often further decorated with gold; a ground with cir | fed either with white wood or coke, is in the est sage the cular groups of gold spots scattered over it is called "ceil | chamber next to the fire is of course the hottest, and the top one de perdrix"; other kinds of diaper were also used. The | the least hot of the three. These different degrees of heat are most gorgeous variety ofall isthe jvelled Scores, not made | Hue, ageordie to fhe tmpersare raed or cach Bg : , which on : till about 1780, and generally having a ground of blew dw | a moderate heat to prepare them for being~~

~~glazed, are Piaisaiine rot or ultramarine. It is richly set with imitation jewels, highest chamber, and those that are being glazed in the lowest. chiefly turquoises, pearls, and transparent rubies, made of | 1 order to keep the white paste from being discoloured by the coloured enamel pastes, hardly to be distinguished in effect a are pen Le PE Se Sah j 3 ish "saggers"'), from real stones. They are set in gold, slightly modelled fea ed in hich ee The al ee ee Se ce f 2 | ugh p s chambers of the kilns have in actual relief, like the gilt ornaments on the richest sort | small openings, closed with transparent talc, through which the of Japanese Satsuma ware. | progress of the baking can be watched, and test-bits of porcelain Forms. The forms of Sevres procelain are very varied, and, in an. lo olay = Se couee tint according to the : at 1v 1S subjected to, are withdrawn from time to time to sh ie " in great use of plaster moulds, many reproduc- | what temperature has been reached. Asa rule the fire is apt tip lons of the same design were rarely produced. Clocks, | for about thirty-six hours, and the kiln with its contents is allowed barometers, and various other objects were made of porce- | from four to six days to cool before being opened. on and richly decorated, and also painted panels or ne es ies eee dee . m bis ae oe plaques used for furniture,—always, how: i Bae fq ee ge tea 1s made of felspar and quartz crystals and de- ee pee: oH ae a Sot with most (pure silica) ; it is finely ground with water, and the porcelain is corating. oe : — y modelled statuettes in white | dipped into it, until sufficient of the fluid mixture adheres to the porcelain were made by some of the ablest sculptors absorbent biscuit to form a coat of glaze. When dry it is fired of the 1 8th century ; these usually have pedestals elabo- for the second time, but in the lowest and hottest compartment of rately gilt and painted. Perhaps the worst taste of all is the kiln, this natural rock-glaze being very infusible. About 1600° chown, ener Oh hich h C. is the usual temperature for this process. aes vases Which have scrolls and sham The painted decoration is always applied over the glaze; but metal-wor moulded and gilded to produce the effect of | within recent years a new method of under-glaze ornament has been a porcelain vase set in or moulu mounts,—a method of much used, called. "pate sur pate," similar in method to the "slip so-called decoration which was much imitated at Chelsea Sei tee perc eae "es ee a another sonst oie ' — iscult ground of the vase is first tinted a uniform colour, and ace i s n works. The recent 'Jones bequest " | then the same white paste of which the porcelain is made is nixed fe. ou ensington~~

~~Museum contains a large variety with water and applied in successive layers with a brush, thus pro- of the most costly specimens of the pdte tendre of Sevres. ane ee cameo-like reliefs. Very beautiful designs of figure- oe ee, — ; sudjects or Howers are put on in this way, and additional effect is Fane ee eee se "ale od ee eee gained by the coloured ground shining through the thinner parts this Teese ein We orca ert tae a s ee or | of the semi-transparent white reliefs, _The whole is then glazed in odio ve At oat te € most com- | the usual way. To return to the painted porcelain, when it has Saint Chee Ie ewe building ie pee ie the he of | come from the second firing in a white highly glazed state it is ready Musoun leh coniagethe Mee eT o ee ae eramic | for the painter. Almost endless varieties of coloured pigments are of all pales eet gid rigeacchinsionar eee pace Ug gained by the use of elaborately prepared chemical compounds, all of dhe mete WPEWER. 0! the was ae see oe oe different salts of metals. In the main the blues are from cobalt, (adn ald woe tee Biiloved ithe weer aie e a L an Is the turquoise colour from copper, the rose-pink from gold, the gree 7 and modeliteate soba. avtees af col ae y painters | from chrome and copper, and the violets from manganese. A far Mixing Themaenie oes sity eael ae eee 'a oe. greater variety and brilliance of colour can be gained in over-glaze oe mostly from Limousin, but also imported from Conta llth 41 ae Satenor an Se ean mould- is mixed a proportion of white chalk and fine sand (silica). E ' are very inferior in softness and decorative beauty, and are fre- ing the material is finely ground between mill-stones, and carefi ay ie ee ieee Pete ee ee ee paste. by being agitated with "wach "tlhe Tene? Ga r : y washed | ent temperatures, and three distinct firings are used at Sévres for and the lighter impurities are care off * ae Ane Ge ae i m marge Only: they are called "grand feu," "demi-grand feu," various ingredients are then mixed thorough] i oleae Hie h sian siet se duanar he OM ae an shly tog vith enough | divided state is obtained by chemical solution and precipitation.~~

~~perties of a fictile material (see fig. 69). It is difficult to realize the amount of thought and labour that was spent on the production of Sévres porcelain. The chief chemists of France devoted their energies to the invention of brilliant and varied pigments which would stand the severe test of the kiln. The works of the best painters were used for reproduction among the~~

~~*painted decorations of the porcelain, and many artists of real talent spent their lives in painting these gaudy toys—on the whole a sad waste of labour and skill.*~~

~~*water to bring them to the consistence of cream. When the mixing es ey ee ee the cream-like fluid is run off into absorbent renee poe S, which take up the superfluous water and leave the*~~

~~*om 'po oe pasty state. The paste is next turned over fre- q y on a Hoor so as to expose the whole of it to the air, and it*~~

~~*POTTER Y*~~

~~*[PORCELAIN.*~~

~~*is thoroughly kneaded like baker's dough by men's feet and hands to make it more plastic for the wheel or mould. The wheel turned by the thrower's foot is exactly like that used in Egypt under the Ptolemies, or by the majolica potters, as shown in fig. 55. While moulding his vessel the thrower keeps dipping his hands into a basin of fluid paste ("barbotine" ov slip). He also increases the smoothness of surface on the revolving vessel by holding a sponge soaked in the slip between his fingers. Vessels of which a number are required all exactly alike, such as a set of plates, are partly shaped in a mould and partly formed by a steel "template" or gauge. 'lhe thrower forces a thin disk of paste over a convex mould shaped to give the inside of the plate; he then sets it, mould and all, on the revolving wheel, and a steel knife-like gauge shuts down*~~

~~*The gold requires a special kiln, and firing at a higher temperature than the colour-pigments, and therefore, in the case of pate dure, is applied first. The colours have to be put on and fired in order according to the degree of heat they require, thus very much add- ing to the painter's difficulties, which are also increased by the*~~

~~*GERMAN, ETC. |*~~

~~*fact that all the colours alter in the kiln, the unfired pigments often bearing no resemblance to their fired state. Thus an ela- borately painted and gilt*~~

~~*Sevres vase passes through six separate firings, and often a seventh when it needs final retouching.*~~

~~*The porcelain & pate tendre is now made in small quantities at Savres. Its materials have been described above. In most respects it goes through the same processes as the pdte dure, but the gold is applied after the painting, as it requires a less degree of heat to fix it on the more fusible glaze used for pdte tendre.*~~

~~*Modern Sévres porcelain has two marks—first, the mark of the paste or undecorated vase, painted in green; second, a mark in ted or gold to show that it has been painted at Sévres. Slightly defective pieces in the white glazed state are sometimes sold and decorated elsewhere. In this case the green mark is cancelled by the cut of a lapidary's wheel before it leaves the manufactory. M. Brongniart, in his Aris Céramigques, has given a complete set of plates, showing all the processes, the machinery, and the kilus used at Sévres in his time,—that is, from 1800 to 1847. "Other processes are now practised. One is for making very thin cups and saucers, like Eastern "egg-shell china," which are formed by merely rinsing out a plaster mould with fluid paste, when sufficient of the paste to make the thin walls of the.cup adheres to the absorbent mould ; and thus porcelain is made much thinner than it could be by use of the wheel and lathe. Another recent invention is of great importance in the forming of large vases with bodies thin in proportion to their size. Such would be liable to collapse from their own weight while the paste was soft. To prevent this, the vase is set in an air-tight chamber, its mouth being carefully closed, and the air in the chamber round it is exhausted, so that the soft vase is kept in shape by the expansive pressure of the air within it. The converse method is also used in some cases, by compressed air being forced into the vase. When the paste is sufficiently dry all fear of failure from this cause is over. In this way vases as much as 12 feet in height have been successfully made and fired.*~~

~~*In addition to porcelain shaped and painted after the 18th-*~~

~~*(see pp. 630-31); but in 1710 he seems to have been in some way set on the track of the secret of porcelain manu- facture. HIs first attempts were unsuccessful: the paste is grey and defective, and there is little or no glaze. So far no real progress had been made towards the discovery of true porcelain. But in 1710 a lucky accident, com- bined with the young chemist's ready powers of observa- tion, revealed the true nature of the required paste. HIaving noticed the unusual weight of some new hair-powder with which his wig was dressed, he inquired what it was made of, and, finding that it was a finely-powdered white clay from Aue, near Schneeberg in Saxony, he pro- cured some of the clay. HIe made vessels of it and fired them, and found that he had discovered the material of true hard porcelain, like that from China and Japan. When Augustus IT. learned the importance of the dis- covery he established the porcelain manufactory at Meissen with Béttger as its director. This establishment, 5 miles from Dresden, was more like a prison than a factory, being surrounded by high walls and shut in by port- cullises: none except workmen were ever admitted, and they were sworn to secrecy under pain of penal servitude for life. The kaolin from Aue was dug out, packed in sealed bags, and brought to Meissen with every care pos- sible to avoid betraying the secret of its importance; no possible precaution was omitted, and yet, in one case at least, all attemps to keep the monopoly were in vain (see below, " Vienna porcelain ").*~~

~~*The earliest productions of the Meissen (Dresden) porce- Decora- lain- works are copies from the Chinese and Japanese. tions of Some are plain white, with flowers or fruit in low relief ;*~~

~~*century fashions, and the new pdte sur pate process, the present manufactory produces a great deal of fine porcelain copied exactly from the fanciful and elaborate wares of China and Japan, such as ' the delicate double cups and vases, with outer shells of minute*~~

~~*Bottger.*~~

~~*open work pierced through, and many other varieties requiring great technical skill and patience. Unhappily the old faults and misdirected aims still prevent the laboured products of this great factory from having much real artistic value, or even strong decora- tive effect. The paintings on the*~~

~~*porcelain are still pictures like miniatures on iyory, and the treatment and forms of the most elaborate vases are not such as would arise from a natural and rational treatment of plastic clay. The ingenious resources of modern chemistry have produced pigments of countless variety of tint, but they are mostly over-gaudy and harsh in combination ; and the modern habit, not peculiar to Sévres, of applying paintings over the glaze, wilfully rejects the special soft richness of effect*~~

~~*which a vitreous coating gives to the pigments under it.*~~

~~*Literature.—On French porcelain, consult Jacquemart, Histoire de la Céram- ique, 1873; Davillier, Les Porcelaines de Sevres, 1870, and Les Fatences et Porcelaines de Moustiers, &c., 1863; Jacquemart and Le Blant, 7 istoire de la Porcelaine, 1861-62; Lejeal, Recherches sur la Porcelaine de Valenciennes, 1868; Milet, L'In- wention de la Porcelaine & Rowen, 1867; Guide du Visiteur, Sévres, 1874; Cool, Peinture sur Porcelaine, 1866; Bastenaire-Daudenart, L'Ari de fabriquer la Porcelaine, 1827. See also the general list of works on ceramic art.*~~

~~*German and Austrian.*~~

~~*The porcelain of Germany was, from the first, composed of a hard natural paste, a true kaolinic clay. Its success- ful production was the result of a single, almost accidental, act of discovery, and not, like that of the French, of a long series of experimerits with different materials, ending in the invention of a highly artificial imitation of true porcelain. In the year 1700 a young chemist, or rather alchemist, of great ability, called Frederick Bottger (1682-171 9), a native of Saxony, fled to Dresden under the accusation of prac- tising magical arts and searching for the *¢ philosopher's stone." He was there taken under the protection of Augustus IL. elector of Saxony, who employed him to make experiments, at first connected with medical chemistry and afterwards with the composition of pastes and clays for ceramic ware. From 1701 he worked for his royal patron, partly at Dresden and partly "at the castle of Meissen, carefully guarded, and kept in seclusion almost like a prisoner, in order that his discoveries might remain secret, and also to prevent his leaving the country. For nine years Béttger only produced stoneware, though of a finer and harder quality than had hitherto been made*~~

~~*brated blue and white china of Nanking. The first pieces painted with other colours are imitations of old Japanese china in green and red with enrichments in gold. Bottger died in 1719, and was succeeded in his directorship by George Héroldt, who introduced certain improvements in the processes of the manufacture, and increased the quan- tity of its annual production. In his time Chinese designs were still copied, mostly very ugly figure-subjects on white panels, the rest of the vase being coloured yellow, green, or grey, and decorated with elaborate gilt seroll-work in the worst possible taste.*~~

~~*After about 1725 the Eastern style of design was superseded by ela- borate miniature paint- ings of flowers and in- sects, or copies from Dutch and Flemish painters. All notion of true ceramic decoration was gone, and the porce- lain was only regarded as a ground on which to paint an imitation of an_ oil- painting. Another style of decor- ation soon came into fashion : china was de- corated in relief with ~*~~

~~*the "honeycomb" or —*~~

~~*" may-flower " pattern. Fic. 70.—Dresden vase, pdie dure; may- In the latter kind (flower pattern in relief, coloured blue he eee S€€ andgold. (South Kensington Muscum.) fig. 70) the vessel is*~~

~~*closely studded with blossoms of the may, moulded in a realistic way, with thin crisp edges, and then coloured and gilded, very laborious to execute, and extremely disagree-*~~

~~*AA*~~

~~*Marks.*~~

~~*Vienna porce- lain.*~~

~~*Berlin porce- lain.*~~

~~*able in effect. Perhaps the chief specialty of Dresden porcelain consists in its statuettes and group of figures, the best of which were made between 1731 and 1756 under the superintendence of a sculptor named Kandler. Some of these, especially the Watteau-like shepherds and shep- herdesses, have a sort of feeble prettiness ; but most have only little merit, and some are grotesque and wilfully ugly. They are generally decorated with colours and gilding ; the best, however, are in plain glazed white. Elaborate can- delabra, clocks, and other objects were largely made, into the designs of which figures in the round, flowers realistic- ally modelled, and rococo scroll-work were introduced, generally in a feeble and ungraceful way. For some years after 1774 designs of more classical form, purer in outline and less crowded with clumsy ornament, came into fashion. Since then nothing of any real value has been produced in the Dresden china-works, Of late years, since the increase of prices given for old Dresden, the directors of the manu- factory have begun to reproduce their old designs, and even to use some of the worn-out moulds; the result is that the china thus produced is very blunt and spiritless, quite devoid of merit.*~~

~~*The old Dresden porcelain is of a fine paste, and has a good glaze, but its white is of a rather cold tint, occasion- ally even having a bluish shade. It is, however, both in quality of material and in design, the best porcelain that Germany has produced. During the early period the monogram "AR" interlaced (for Augustus Rex) marks the pieces made either for the king's use or from his design. Between 1712 and 1715 pieces made for sale were marked with a rudely-sketched snake twining round a stick. Since 1721 two crossed swords have been used as a general mark ; the addition of a dot or star marks special periods (see No. 30). The swords were the arms of the elector*~~

~~*of Saxony as arch-marshal of the em- Ae*~~

~~*pire. Some pieces have "MPM" for*~~

~~*"Meissenen Porzellan Manufactur." a oO. .*~~

~~*As at Sevres, china from Dresden, if sold undecorated, has the cross-swords mark cancelled by the cut of a wheel. In 1863 the china-works were moved*~~

~~*from the fortress of Meissen and established in a new and more convenient building.*~~

~~*Vienna Porcelain.—In 1720 one of the workmen escaped from the prison-like manufactory of Meissen and brought the secrets of the porcelain clay to Vienna, where he set up kilns and workshops in partnership with a Frenchman named Du Pasquier. They ob- tained a special patent, but had little practical success; and the Vienna porcelain was not made in large quantities till after 1744, when the manufactory was carried on under the patronage of Maria Theresa and the emperor Joseph. In 1785 there were thirty-five kilns in working order, and 500 work-people were employed. Vienna porcelain is not of a pure white, but is greyish in tint ; its paintings are very poor, and it depends for its effect chiefly on gilt-moulded scroll-work in delicate relief. Its manufacture was suspended in 1864 on account of the heavy expense it entailed on the Austrian Government.*~~

~~*Berlin porcelain was first made in 1751 by a potter named Wegely, who marked his ware with No. 31. It was not, however, a commercial success till Frederick the Great took it in hand. He sent a number of skilled workmen from the Meissen (Dresden) china-works to Berlin, WY and also ordered the manufactory to be supplied with the kaolinic clay from Aue, of which Meissen hitherto had preserved the monopoly. In quality Potter's mark. the Berlin porcelain comes next to that of Dresden ; No. 81. it is often decorated with a bright rose-pink, the favourite colour of Frederick, which was unknown at the Meissen works. Large quantities of porcelain are still made at Berlin.*~~

~~*Other Continental Porcelain of the 18th Century.*~~

~~*A very large number of other places in Germany pro- duced hard natural porcelain during the 18th century, but none of their work is of any special interest or beauty. It became, in fact, the fashion for every king or reigning*~~

~~*prince to be the patron of a porcelain manufactory. Porce- lain was produced at Amsterdam and The Hague; at Brussels, Copenhagen, and Zurich; and in Russia at St Petersburg and Moscow.*~~

~~*In Italy also fine soft porcelain was made,—at Doccia as early as 1735, some of which, ornamented in under-glaze blues only, is very decorative and in good taste. Venice produced clever copies of Japanese porcelain, painted with chrysanthemums and other flowers in enamel. The royal manufactory at Capo di Monte, close to Naples, founded in 1736 by Charles IIL, pro- duced a great deal of porce- Wy oS lain decorated in many styles, mostly in very bad taste. N RE The best are Oriental designs , painted in blues only. The Agta meat, « BG accompanying marks (No. 32) were used, the fleur-de-lis in 1736, the crowned N after 1759, and the RF after 1780. All the Italian porcelain is of the soft artificial sort.*~~

~~*The porcelain-works in the Buen-Retiro gardens at Madrid were also established by Charles III. after he succeeded to the throne of Spain. Much of this (soft) porcelain is classical in form, and is decorated with minia-*~~

~~*ture paintings in colours or monochrome. Charles III. 74 transferred thirty-two work- o VE men and painters from Capo : Potter' ks. No. 33. di Monte when he founded the ve ere ie Buen-Retiro manufactory, and hence the productions of the two factories are very similar in style. One of the marks used, the lis, was common to both ; the usual forms on the Buen-Retiro porcelain were those in No. 33. LIvterature.—See Falke, Geschichte der k. Porzellan-Fabrik in Wien, 1867; Graesse, Geschichte der Gefdssbildneret, Porzellan- Fabrication, &c., 1853; Karner, Die Porzellan-Malerei, &c., 1870; Kolbe, Geschichte der Porcellanmanufactur zw Berlin, 1863 ; Klemm,*~~

~~*Die k. stichsische Porzellan- und Gefiss-Sammlung, 1833 ; Kriinig, Cyclopedia, s.v. ' Porzellan."*~~

~~*English.*~~

~~*The early history of English porcelain is rather obscure. John Dwight (see p. 632 above) was apparently the first English manufacturer who took out a patent for the pro- duction of transparent porcelain ; but no specimens made by him are now known.*~~

~~*Chelsea Porcelain.—According to Jewitt (Ceramic Art Chelsea of Great Britain), John Dwight probably founded the factory. porcelain-works at*~~

~~*Chelsea, which rank first among English manufactories both in date and importance. In 1745 they were in full activity; and the popularity in France of English porcelain was one of the causes which led to the establishment of the royal manufactory at Sévres. The owner of the Chelsea works was a Frenchman called Nicholas Spremont, who continued to manufacture fine porcelain till his retirement from business in 1764.*~~

~~*This porcelain is very varied in style, as was the case with most of the 18th-century makes. Some of it is simply imitated from Eastern china, either in blue and white, or in the old Japanese style, which was then so popular, chiefly painted in rich red and green, with a good deal of gilding. Other pieces, more elaborate and costly, resemble Sévres porcelain, and have miniature paintings on white panels, the rest of the vase being coloured with one uniform tint, such as the French blew du rot or "rose Pompadour." One colour, peculiar to Chelsea, is a deep claret-red. Most of the vases have a great deal of gild- ing, both applied in patterns on the body of the vase, and also used solidly to decorate the elaborate moulded scroll- work which was fixed on the sides of the porcelain. The writhing masses of gold on Chelsea ware are prob- ably the most meaningless and stupid attempts at decora-*~~

~~*ENGLISH.* |~~

~~*tion that have ever been produced. Many of them are designed with apparently not even an attempt at beauty of form or grace- rin fulness of curve, and are quite without the vig- our that is often possessed by the grotesques of China or Japan. f Chelsea vases of this _ elaborate sort are rare, as their production was slow, and they now fetch very high prices: £2000 has been given fora single vase such as that Shown in fig. 71.*~~

~~*It should be*~~

~~*observed _ that, till the discovery _ Ss of the half-de- pyre, 71.—Early Chelsea vase, dark-blue body, with composed kao- gilt scroll-work atthe sides. (South Kensington linie clay of Museum.) Cornwall about 1755 by Cookworthy, all English porcelain was of the soft variety (@ pdte tendre), and was really an artificial compound with an ordinary vitreous lead glaze. The painted decoration, like that of Sevres, was applied over the glaze, with the exception of a fine cobalt blue, which was painted on the china in a*~~

~~*biscuit state. This colour is much the finest and most truly decorative of any of the pigments, very superior in richness of effect to the much brighter over-glaze colours. That used at the Derby porcelain-works is the most beautiful in tint.*~~

~~*The early success of the Chelsea porcelain was partly due to the patronage of George II., who, following the royal fashion of the age, took a great interest in the manufactory, and not only bought large quantities of its productions but also aided it by importing kaolinic clay, models, and even skilled workmen from Saxony. In 1769 the Chelsea porcelain-works were put up to auction, and bought by William Duesbury, the owner of the Derby china-factory. Till 1784 he carried on the manufacture of porcelain at both places, but in that year he pulled down the Chelsea kilns and transferred all the movable plant and the workmen to Derby. The Chelsea mark is usually an anchor, either painted in red or gold, or moulded in relief; the anchor is often double (see No. 34), and in some cases has the ad- dition of one or more daggers.*~~

~~*Some specimens first noted by*~~

~~*Mr. Jewitt! have quite different Potter's marks. No. 34. marks, incised on the paste before glazing, which are of special interest as being the earliest dated specimens of English porcelain. Such marks are a triangle, with the addition " Chelsea 1745."*~~

~~*Bow Porcelain (Stratford-le-Bow).—In 1744 Edward in. Heylyn and Thomas Frye, the latter a painter of some repute, took out a patent for the manufacture of porcelain at Bow. The composition they used was a curious one, being almost a hard porcelain. The clay, which was called '"unaker," was brought from America, and was probably an jmpure kind of kaolin. It was ground and washed to separate the sand and mica; and to it was added pounded glass—a pure alkaline silicate—varying in proportion from*~~

~~*1 See " History of Chelsea China," in Art Journal for 1863.*~~

~~equal parts of clay and glass to one-fifth of glass. The glaze was a similar mixture, with less of the American kaolinic clay. This paste and glaze must have been difficult to manage, since in 1748 the partners took out a fresh patent for a more artificial and softer kind of porcelain, with a more fusible lead glaze. In 1750 the Bow works came into the hands of Messrs Weatherby and Crowther, and were then called "“New Canton.” For some time the manufactory was successful, and employed 300 hands ; but before long one of the partners died, and the survivor, “John Crowther, chinaman,” was gazetted bankrupt in 1763, and the whole stock was sold off. Crowther, however, in spite of his failure, carried on the works till 1775, when they were bought by William Dues- bury, the owner of the Chelsea, Derby, and other china- factories ; he pulled down the Bow kilns and transferred the plant to Derby, as he did afterwards in the case of the Chelsea manufactory. The Bow porcelain is of a fine soft milky white; many of the imitations of Chinese figures are hardly to be distinguished from the originals. Some of the Bow china, decorat-~~

~~ed only in the rich under- glaze blue, with Eastern designs, is very effective. A good many pieces are~~

~~painted in the Dresden~~

~~style, and coloured statu- eee: ettes or groups of figures, also after German models, were largely produced. The Bow marks are very numerous, some not distinguishable from those of Chelsea; No. 35 shows four varieties,~~

~~Potter’s marks,~~

~~Derby porcelain is supposed to have been made as early Derby as 1750, possibly by Andrew Planché, a clever French re- factory.~~

~~fugee, who in 1756 entered into partnership with Heath and Duesbury, the last of whom afterwards became the chief china-manufacturer of England. The purchase by Duesbury of the Bow and Chelsea works has already been mentioned. The Derby porcelain is often very large, ela- borately moulded, and profusely decorated, generally rather in the Dresden style, weak in form and gaudy in colour. The Derby under-glaze blue was remarkably fine, and many of the plain blue and white pieces, with Chinese patterns, are~~

~~highly decorative, as are also, though in a less degree, those porcelain services that were painted in the "old Japanese style." One of the chief specialties of the Derby works was the production of delicate white figures in biscuit china, often modelled with great skill and refinement. Unfortunately the practice of printing the under-glaze patterns, instead of painting them by hand, was introduced at Derby about 1764, and did much to destroy all the artistic value of the work (see below). The marks used were these,—first a '"" "D" combined with an anchor (No. 36), or a crowned anchor (No. 37), used during the earlier part of the time when Duesbury was carrying on both the Chelsea and the Derby factories, 1769-84 ; next the crown was used, either over the "D" only (No. 38), or, more usually, with a saltire or crossed~~

~~D2)~~

~~No. 36. No. 37. Potters' marks.~~

~~aX~~

~~No. 38. No. 39.~~

~~swords immediately under it. Another variety has crossed~~

~~lines under the crown (No. 39). The Derby works con-~~

~~tinued in the possession of the Duesbury family till 1814~~

~~or 1815, when Robert Bloor became the lessee and finally XIX. — 81~~

~~Worces- ter porcelain.~~

~~Bristol porcelain.~~

~~642~~

~~the owner of the place. He soon realized a large fortune, though to some extent at the expense of the credit and high reputation for excellence of work which had been gained and kept up by the various members of the Dues- bury family. He gained a great deal of money by selling off the stock,~~

~~*accumulated during many years, of slightly defective pieces of porcelain, which the Duesbury family would not allow to go into the market."*~~

~~*Worcester Porcelain.—The china-works at Worcester were founded by a very remarkable man—Dr Wall, who appears to have possessed unusual skill as a physician, artist, and chemist. After some years spent In attempts to discover a fine artificial porcelain, he, in conjunction with other practical men and capitalists, started the Worces- ter Porcelain Company in 1751. The early productions of this factory are very artistic; they are chiefly copies of the fine Nanking porcelain, painted under-glaze in blues only, with very boldly decorative designs. Old Japanese ware was also successfully imitated. After that the most ambitious pieces of Worcester porcelain were mostly dull reproductions of the elaborately painted wares of Sevres and Chelsea. Transfer printing was first used at Worcester for designs on china in 1756, though it had been invented and employed some years earlier for the decoration of the Battersea enamelled copper. This process was no less injurious at Worcester than elsewhere to the artistic value of the paintings. Dr Wall died in 1776, and after that the porcelain-works passed through various hands. A great impetus was given to its success by George III., who visited the factory in 1788 and granted it the title of "The Royal Porcelain Works." The earliest marks are a '""W" or a crescent; others used are crossed arrows or varieties of sham Chinese marks (see No. 40).2 The manufacture of china at Worcester is still continued with great ac- tivity ; the fineness of the paste and the skilful processes employed leave nothing to be desired. Un- fortunately the old fault of a too realistically pictorial style of painted decoration still prevails, and an immense amount of artistic skill and patient labour is practically wasted in producing minute but not truly decorative work. Some of the modern Worcester copies of Eastern porcelain and enamels are very delicate and beautiful, and the cameo-like method of pdte sur pate de- coration is practised with great skill and often good effect.*~~

~~*Bristol porcelain is of interest as being the first hard natural porcelain made in England. As early as 1766 attempts were made by Richard Champion to make an artificial paste, with the help of the American "' unaker" or kaolinic clay, which was being used successfully at Bow, but, no results of any importance seem to have followed his experiments. The successful production of Bristol porcelain was due to the discovery in*~~

~~*Cornwall of large beds of kaolinic "' growan" stone or "china" stone, first brought into use by William Cookworthy, a Plymouth potter. This discovery and the succeeding one of similar beds in Devonshire were of great commercial importance to England, and the beds have ever since produced enor- mous quantities of material for the manufacture of fine hard porcelain both in England and abroad.*~~

~~*This china stone (see Cock, Treatise on China Clay, 1880) is not a pure kaolinic clay like that found in China, but is simply a granitic rock, partially decomposed, and soft and friable, but still retaining both quartz and mica in addition to the felspar, which*~~

~~*My the essential base of kaolin. In China the processes of nature save carried the decomposition and sorting of the different com-*~~

~~*: See Haslem, Old Derby China Factory, 1876. For fuller information, see Binns, Potting in Worcester, 1865.*~~

~~*UtH*~~

~~*Potter's marks. No. 40.*~~

~~*' POTTERY*~~

~~*CUR*~~

~~=<~~

~~*ponent parts of granite to a further stage. There the decomposed felspar has, by the action of rain and running streams, been deposited in an almost pure and finely-divided state in beds by itself, almost free from quartz and flakes of mica. In using the Cornish china stone, therefore, various natural processes have to be artificially performed before the paste is sufficiently white and pure for use; but when this is done it is little if any inferior to the Chinese kaolin. The stone when dug out is white with grey specks, and is so friable as to be easily reduced to powder between mill- stones. It is agitated with water, and run through a series of settling troughs ; thus the lighter flakes of mica, which are very*~~

~~*injurious to the paste, are washed away, and the pure felspathic kaolin is deposited free from impurities. Free silica is added in a fixed proportion ; it is usually obtained from flints, first calcined and then finely ground to powder, which are an important ingredient in the composition of both fine pottery and porcelain. The Jermyn*~~

~~*Street Museum has a complete collection of all the materials used*~~

~~*in china manufacture. '*~~

~~*William Cookworthy at once recognized the value of his discovery, and set up china-works both at Plymouth and at Bristol. No. 41 shows the mark of the Plymouth porce- lain, and No. 42 those that were used at Bristol. In 1774 he sold the Bristol fac- tory to Richard Cham- >< pion, still retaining a P large royalty on the ov china stone. Champion signed his ware with " nK No. 43. The produc- . No. 42, No. 48. No. 44. tion of Bristol porcelain Potters' marks. continued till 1781, when the works were sold to a Staffordshire company, and the manufacture of hard porce- lain was no longer carried on there. Though fine in paste and unusually transparent, the Bristol porcelain has no special artistic merits. As with most other English wares, the best in colour and design are copies, with more or less adaptation from Easternchina; some of them are very large and magnificent. The figures and flower-reliefs in biscuit porcelain are also delicate, and often cleverly modelled, with wonderful realism.*~~

~~*Some fine blue and white china was produced towards Other the end of the last century at Lowestoft, and at Liverpool china- as early as 1756 ; and many other china-works were estab- ome lished in various parts of England. In the beginning of the present century Swansea and Nantgarw in South Wales produced porcelain which was highly esteemed; but the delicate shades of difference in the paste, glazes, and styles of decoration of these numerous varieties of British porce- lain are not such as can be described in a few words ; nothing but careful examination of the wares themselves will enable the student to distinguish between the produc- tions of the different manufactories. Swansea ware bears various marks, of which No. 44 is one example.*~~

~~*Modern Methods of Manufacture.—The methods and materials Manu-*~~

~~*now employed at Sévres in the production of porcelain are in all facture. essential points much the same as those practised elsewhere (see above). 'The chief centre in England of the manufacture of pottery or nou-translucent earthenware is in Staffordshire, near the borders of Cheshire, where a large district devoted to this industry goes by the name of "The Potteries." Worcester, Lambeth, and many other places in England also turn out annually large quantities of pottery. The processes employed may be divided under the following heads : —(1) choice and mixture of clays; (2) washing and grinding the materials ; (3) throwing on the wheel and moulding; (4) kilns and methods of firing ; (5) glazes; (6) pigments and methods of decoration.*~~

~~*1. Choice and Mixture of Clays.—The extensive beds of fine Dorset Mixture or Poole clay supply the chief ingredient in the manufacture of of clays. English pottery. This is too fat a clay to be used alone, and is therefore mixed with a certain proportion of free silica to prevent it from twisting or cracking in the kiln. Another ingredient is added to the mixture for the finer wares, namely, the Cornish or Devonian china stone, a kaolinic substance used in the manufacture of porcelain (see above), which makes the paste finer in texture, whiter, harder, and less brittle. These three substances are mixed in various proportions. The following makes a fine cream-coloured ware,—Dorset clay 56 to 66 parts, silica (flint) 14 to 20, china stone 17 to 30 parts.*~~

~~*Prepara- sion of materials.*~~

~~*Glazes.*~~

~~*into shape upon his wheel.*~~

~~*PO T—*~~

~~*2. Washing and Grinding the Materials.—The Dorset or Poole clay is finely ground between mill-stones, mixed with water to the consistency of cream or slip, and then passed through fine silk sieves to strain out all grit or palpable particles. The china stone is treated in the same way, with the additional precaution of wash- ing away all the flakes of mica, which come from the decomposition of the granitic rock from which the china stone is*~~

~~*derived. The silica is obtained from flints, which are easily ground to fine powder after being heated red-hot and thrown into water. These three substances, brought into the state of fluid slip, are repeatedly pumped up from vats and passed through the sieves ; they are then easily mixed in due proportion by being pumped into graduated vats. The water is next evaporated from the fluid mixture in large boilers heated by a complicated arrangement of flues, and the com- pound is left in a soft pasty state, full of air-bubbles, which have to be got rid of by constantly turning over and beating the paste till it is quite smooth and compact, and sufficiently plastic to be thrown on the wheel. Coloured earthenware, such as that Wedg- wood used to make, was prepared by the addition of various sub- stances to the fluid slip. A black colour was given by protoxide of iron and manganese, red by red ochres or red oxide of iron, blue by oxide of cobalt, and green by protoxide of chrome. These coloured pastes are but little used now.*~~

~~*3. Throwing and Moulding.—After sufficient kneading, the clay is made up into balls of a convenient size for the thrower to mould The methods both of throwing and of moulding are the same for porcelain as for pottery (see p. 638 above). Unfortunately in England, as at Sévres, the thrown vessels are usually finished on the lathe; only the commonest kinds of ware escape this process, which takes away all life and spirit from the wheel-formed pottery. Consequently it is the cheapest and com- monest wares that now, as a rule, have most natural beauty of form and really artisticspirit. Handlesand other parts which are shaped in piece-moulds are either cast by pouring fluid slip into the plaster- moulds, or are formed by pressing and dabbing thinly-rolled pieces of soft clay into moulds made in two parts. The moulded halves of the spout or handle are fastened together while still wet, and the edges at the junction pared down and trimmed with a modelling tool. Plates, basins, and the like are formed by the combination of a mould and a shaped gauge as described above (Sévres).*~~

~~*4, Kilns and Firing.—After the vessel with its moulded handles or spout is thoroughly dry it is ready for the first firing. The usual Staffordshire biscuit-kiln is a circular building, about 18 feet in internal diameter at the base, narrowing towards the top. It is about 18 to 20 feet high, and is very carefully built of refractory fire-bricks, strengthened by rings of wrought-iron which clasp the outside. It is surrounded by eight to ten furnace*~~

~~*openings, with flues arranged to distribute the heat equally throughout the kiln. The pottery is fired in drum-shaped "saggers" or boxes, made of fire-clay, which are piled one above the other, asin the case of the Sevres porcelain. The fire is kept up from thirty to fifty hours, and is then allowed to die out. Several days are allowed for cooling before the kiln is opened and the saggers with their contents withdrawn.*~~

~~*5. Glazes.—The composition of glazes for pottery varies very much according to the custom of each manufacturer. For the most part they are transparent silicates of alumina, rendered fusible by oxide of lead; this compound is made by a mixture of Cornish china stone, flint, and white lead. The best quality of glazes have borax and some alkali added as a flux, in which case the proportion of lead is reduced. Those glazes that contain much lead are easily scratched, and can be decomposed by many acids; thus there is always a risk of lead-poisoning if vessels coated in this way are used for cooking purposes. The materials for the glaze are finely ground with water and made into a thin white fluid. The biscuit pottery is rapidly dipped into vats of the milky mixture, and suffi- cient to form the glaze adheres to the absorbent clay in an even coating all over the surface. After being dried the pottery is ready for the second firing in the glazing kiln, which is very similar in construction to the biscuit-kiln, only, as a rule, rather smaller. It is packed in clay saggers, as in the first firing, but a stronger heat is required to fuse the finer kinds of glaze than was necessary for the baking of the raw pottery. Salt-glazing has been described above (p. 632), and is only used for the coarser sorts of ware.*~~

~~*6. Methods of Decoration.—In the case of pottery decoration is usually applied on the biscuit-ware before it is glazed by the trans- fer-printing process. The required design is engraved on copper plates; the pigment is ground fine and mixed with a tenacious compound of oil and gums. An ordinary rolling press is used to print the engraved patterns in the oily pigment upon strips of tissue-paper, which are carefully applied and pressed face down-*~~

~~*Oo 2 643*~~

~~*wards on the biscuit-ware while the oil is yet wet; and so the pattern is transferred to the absorbent clay. This requires great dexterity from the*~~

~~difficulty there is in fitting the printed strips neatly on to curved surfaces. The paper is then washed off, and the printed ware is baked at a moderate temperature in what is called the "hardening" kiln, which is done before the glaze is applied, in order to drive off the oily medium with which the pig- ment was mixed. The transfer process is quite fatal to all artistic beauty in the designs ; itis hard, clumsy, and mechanical, the very opposite of a rational method for the decoration of pottery, which above all things demands freedom of hand and a spirited touch. Painted decoration which is executed by hand is now usually applied over the glaze, both because it is easier to do, not requiring go certain a touch, and also because the soft subdued colours of the under-glaze pigments do not suit the modern taste for what is bright and showy. The pigments used are necessarily oxides and salts of metals which will stand the heat of the kiln. Only those few which can stand the very high temperature of the glazing kiln can be used under the glaze. The over-glaze colours, on the other hand, only need sufficient heat to fix them on the surface of the already fired glaze; and this is often done in a very slight and imperfect way. These colours not only lose in effect from want of the softening vitreous coat through which under-glaze colours are seen, but they are also very inferior through being unprotected, and therefore easily injured by scratches and ordinary wear. In old times the value of a protecting coat of glaze was so strongly felt that even paintings on enamel, like those on Persian pottery and Italian majolica, usually had a thin vitreous glaze added over the smooth enamel, with the double object of protecting the paint- ing and increasing its soft richness of effect.~~

~~The discoveries of modern chemistry have added very greatly to Pig- the number of metallic salts which are available for the decoration ments.~~

~~of pottery. Almost every possible tint can be produced for over- glaze painting. Oxides of cobalt are used for various shades of blue and grey up to black; antimony, usually combined with lead, gives yellow; oxides of copper give deep red or brilliant blues and greens according to the proportion of oxygen that they con- tain ; oxide of chromium gives a good quiet green; manganese gives violet and even black; gold gives a fine ruby red; and uranium a rich orange. The various oxides of iron give a great variety of colours,—reds, yellows, and browns. Oxide of zinc is largely~~

~~*used, not as a pigment in itself, but in combination, to 'modify other colours. The oxides of iron, cobalt, and chromium give very stable colours, capable of bearing a very high temper- ature, and can therefore be used for under-glaze painting ; most of the others can only be employed for over-glaze work. Over-glaze pigments cannot be used alone, but require a flux to make them combine with the glaze. Oxide of lead, borax, nitre, carbonates*~~

~~*of potash or soda, and other substances are used for this purpose.*~~

~~*Literature.—English porcelain: Nightingale, Early English Porcelain, 1881 ; Binns, Potting in Worcester, 2d ed., 1877; Owen, Ceramic Art in Bristol, &c., 1873; Porter, Manufacture of Porcelain, &c., 1832; Tiffin, Chronograph of Bow, Chelsea, and. Derby Porcelain, 1875; Wallis and Bemrose, Pottery and Porce- lain of Derbyshire, 1870; Jewitt, Ceramic Art of Great Britain, 1877,—the most complete and comprehensive work.*~~

~~*In England the Jermyn Street Museum of Geology has a small but very widely-illustrative collection of pottery and the various materials used in its manufacture. The South Kensington Museum is rich in almost all kinds of medieval and modern pottery, but it is unfortunately very badly arranged. The British Museum possesses a very large number of specimens of prehistoric pottery, Greek vases, medieval English, and very choice examples of Persian and majolica wares. The other chief European museums are mostly each rich in some special department of ceramic art.*~~

~~*General Literature on Pottery.—Brongniart, Traité des Arts Céramiques, 1854 ; Jacquemart, Histoire de la Céramique, 1873; Marryat, Pottery and Porcelain, 3d ed., 1868; Birch, Ancient Pottery, 1873; Catalogue of Pottery, Museum of Geo- logy, Jermyn Street, 1876 (a very useful and well-illustrated work) ; Bonneville and Jaunez, Les Arts Céramiques, 1873 ; Brongniart and Riocreux, Musée de Sévres, 1845; Figuier, Les Merveilles de Industrie, 1873-75; Greslou, Recherches sur la Céramique, 1864; Guillery, Les Arts Céramiques, 1854; Jacquemart, Les Mer- weilles de la Céramique, 1866-69; Magnier, Manuel du Porcelainier, Faiencier, &c., 1864; Mareschal, Les Faiences Anciennes et Modernes, 1867 ; Maze, Recherches sur la Céramique, 1870 ; Ris-Paquot, Histoire de la Faience Ancienne, 1873-74 ; Salvetat, Lecons de Céramique, 1857 ; Waring, Ceramic Art in Remote Ages, 1875 ; Ziegler, Etudes Céramiques, 1850;*~~

~~*Jéinnicke, Grundriss der Keramik, Stuttgart, 1879; Champfleury, Bibliographie Céramique, Paris, 1881 (gives a very large and complete list of works on pottery and porcelain, in all languages); Soden Smith, List of Works on Pottery and Porcelain in the Kensington Art Library, 1875.*~~

~~*On Pottery and Porcelain Marks the reader may consult Barth, Porzellan-Marken und Monogramme, 1873 ; Chaffers, Handbook of Marks and Monograms, 1874; Demmin, Guide de l Amateur de Faiences et Porcelaines, 1873; Graesse, Guide dev Amateur de Porcelaine, &c., 1873 ; Palliser, The China Collector's Com- panion, 1874-75 ; Ris-Paquot, Dictionnaire des Marques et Monogrammes, 1874 ; Hooper and Phillips, Manual of Marks, 1876; Bowes, Japanese Marks, 1882. Many other lists of ceramic marks occur also in the various works mentioned under previous heads. (J. H. M.)*~~

~~*POTTSTOWN, a borough of Montgomery county, Pennsylvania, United States, is picturesquely situated on the Schuylkill river, in a plain surrounded by hills. It is 18 miles east-south-east of Reading and 40 miles west-*~~

~~*north-west of Philadelphia, at the junction of the Phil- adelphia and Reading (main line) and the Colebrookdale | Railroads, and has communication also by the Schuylkill*~~

~~*Valley branch of the Pennsylvania Railroad. There are*~~

~~*Museums illustrative of the General History of Pottery—The Musée Céramique Mu- of Sévres is the best and most complete for the student of all kinds of pottery. seyms,*~~

~~*644*~~

~~*in and near Pottstown six rolling-mills, two blast-furnaces, three iron and brass foundries, two nail-factories, and large bridge works, besides minor industries. The population of Pottstown was 4125 in 1870, and 5305 in 1880.*~~

~~*POTTSVILLE, a city of the United States, capital of Schuylkill county, Pennsylvania, lies 35 miles north-west of Reading, on the north side of the Schuylkill river, in the gap by which it breaks through Sharp Mountain. It is the terminus of the main line of the Philadelphia and Reading Railroad, and the great emporium of the Schuyl- kill coal region, which extends north and east and west, and has an annual yield of about 6,000,000 tons. Fur- naces, rolling-mills, machine-shops, planing-mills, a spike- mill, a pottery, &c., are among the industrial establish- ments; and the public institutions include a court-house, a jail, a town-hall, a union hall, an opera-house, a children's home, a lyceum, and a free reading-room. The German and Welsh elements in the population are strong enough to be represented each by several churches. Pottsville as a city dates from 1825. In 1850 it had 7515 inhabitants, 12,384 in 1870, and 13,253 in 1880.*~~

~~*POUGHKEEPSIE, a city of the United States, capital of Duchess county, New York, lies on the east bank of the Hudson river, 73 miles north of New York. It is on the New York Central and Hudson River Railroad, and communicates with the New York, West Shore, and Buffalo Railway by ferry from Highland, and with the Hartford and Connecticut Western Railroad by the Poughkeepsie, Hartford, and Boston Railroad (37 miles). The site con- sists for the most part of a tableland which rises from 150 to 200 feet above the river, and is backed towards the east by College Hill, 300 feet in height. Well laid out with regular and shaded streets and abundantly sup- plied with water (pumped from the river to a reservoir on College Hill), Poughkeepsie is a pleasant place of resid-*~~

~~*ence, and it enjoys a special reputation for its educational*~~

~~*institutions. Vassar College (2 miles east of the city), the earliest and one of the greatest women's colleges in the world, was founded and endowed in 1861 by Matthew Vassar, a wealthy Poughkeepsie brewer; in 1884 it had 300 students, and possessed a library of 14,150 volumes, together with collections of water-colours and of American birds, both of great value, an astronomical observatory, and a chemical laboratory. Two miles north of the city, on an eminence above the Hudson, stands the Hudson River State Hospital for the Insane, an immense building erected between 1867 and 1871, with 300 acres of ground attached. Within the city are an opera-*~~

~~house, a free public library, a large young men's Christian association building with a free reading-room, St Barnabas and Vassar Brothers Hospital, and homes for aged men and women. It also contains iron-furnaces, breweries, and manufactories of shoes, glass, mowing machines, pottery, hardware, and various minor industries, The population was 14,726 in 1860, 20,080 in 1870, and 20,207 in 1880.~~

~~Poughkeepsie (forty-two different spellings of the name are said to be found in old records) was settled by the Dutch about 1698- 1700. Two sessions of the State legislature were held in the place in 1777 and 1778; the former gave assent to the articles of con- federation, and the latter ratified the national constitution. The city charter dates from 1854.~~

~~POULPE, or Octopus. See CurruE-risH, vol. vi. p. 735, and Moruusca, vol. xvi. p. 669 sg.~~

~~POULTRY. The term "poultry" (Fr. oiseaum de basse cour) is usually regarded as including the whole of the domesticated birds reclaimed by man for the sake of their flesh and their eggs.!_ The most important are the Common Fowl, which is remarkable as having no distinctive English~~

~~1 Although pigeons are not generally included among poultry, yet, on account of their close connexion, it has been deemed advisable to add a short section on them to this article.~~

~~POT—POU~~

~~name, the Turkey, and the Guinea-fowl, all members of the family of birds known as Phasiamdez, 'The Pheasants them- selves, belonging to the restricted genus Phasianus, are not capable of being domesticated, and the Peacock is to be regarded rather as an ornamental than as a poultry bird. The aquatic birds which are strictly entitled to be con- sidered domesticated poultry are the Duck and the Goose, two species of the latter having been perfectly reclaimed.~~

~~The common fowl belongs to the restricted genus Gallus, of which four wild species are known,—the Bankiva Jungle fowl (G. ferrugineus), the Sonnerat Jungle fowl (G. sonnerati), the Ceylon Jungle fowl (G. stanleyi), and the~~

~~*Forked-tail Jungle fowl (G@. furcatus). The range of these species is given under Fow. (vol. ix. pp. 491-492). The origin of the domesticated breeds is ascribed by Dar- win, Blyth, and other naturalists to the Bankiva fowl, much stress being laid on the comparative want of fer- tility in the hybrids produced between this species or the domesticated breeds and the other three forms of wild Galli, but it is probable that this want of fertility was due in great part to the unnatural conditions under whicli the parent and offspring were placed, as, if bred under more natural conditions, there is no difficulty in rearing these hybrids or in breeding from them with the domesticated varieties. The number of distinctive breeds of the domesti- cated fowl has very greatly increased of late years, owing to the emulation excited by poultry shows. Darwin, in his Variation of Animals, &c., under Domestication, enumer- ated thirteen principal breeds with numerous sub- varieties, but several very distinctive races have come into notice during the last ten years, varieties having been formed by careful selection that may be relied on for reproducing their own distinctive peculiarities in the descendants, and hence constituting what are regarded by fanciers as pure breeds. The classification of the known varieties is not an easy task; each is capable of interbreeding with every other, and so great an intermixture of local races has taken place that the arrangement of the breeds is as difficult in poultry as in dogs.*~~

~~*Game Fowls.—Game fowls differ less from the wild Bankiva than any other variety; they are, however, con- siderably larger, and carry the tail more erect than the wild birds. In some parts of India sportsmen find it not easy to distinguish between the wild and the domesticated birds. Game fowls in England have been long cultivated not only as useful poultry but on account of their com- bative tendencies, which have become so intensified by care- ful selection that they have extended even to the other sex, and hens have been not unfrequently fought in the cock- pit. The comb in the Game is single, the beak massive, the spurs strong and very sharp. There is a tendency towards the assumption of the female plumage by the males, and distinct breeds of '"henny" Game are known. The peculiarity is not associated with any loss of com- bativeness, the birds being highly valued. for their courage and endurance in the pit. Economically considered, Game are highly esteemed for the table on account of their plump- ness, the amount of the breast-meat, owing to the size of the pectoral muscles, being*~~

very great, from which cause, combined with their hardihood, they are most valuable for crossing with other breeds, as the Dorking. English-bred Game have been reared of many varieties of colour, retain- ing in all cases their distinctive peculiarities of form. Within the last few years Game fowls have been reduced in size by selective breeding, and the exceedingly minute Game bantams have been produced with the distinguishing characters of the larger breed. During the last twenty years Game fowls have been considerably altered in form, owing to the influence of poultry shows,—the legs and necks having been greatly lengthened. This has been

accomplished by careful selection in breeding and not by crossing with any other breed.

Malayan Fowls.—The Malayan type has been long recog- nized as of Eastern origin. The birds are of large size, close and scant in plumage, with very long legs and necks. The Gallus giganteus of Temminck, which he regarded erroneously as a distinct species, belonged to this group, as did the Kulm fowl and the Grey Chittagong of the United States. The Malays are of savage disposition. Several smaller breeds of a somewhat similar type are known as Indian Game; some of these, as the Aseels, are of indomitable courage. Until the arrival of the so-called Cochin breeds from the north of China, Malays were the largest fowls known in Europe and were employed to impart size to other varieties by crossing.

Cochins.—This type, which must be regarded as in- cluding not only the birds generally so called but, also the Brahmas and Langshans, is of very large size, some of the males reaching the great weight of 16 or 17 Ib. They are distinguished by a profusion of downy plumage, with small wings and tails; they are incapable of long flight, and the pectoral muscles are consequently but feebly developed. The Cochins originally imported from Shanghai were of several colours; some of the grey birds in America were crossed with the grey Chittagong, the Brahmas being the result of the cross, and they have been long since estab- lished as a pure breed, faithfully reproducing their own type. The Langshans are a more recent importation ; since their introduction they have been bred by careful selection for eating, and have fuller breasts and less abun- dant plumage than the older-known

~~*Cochins and Brahmas. Recently a sub-variety of Cochin has been raised in America by crossing with a cuckoo-coloured breed long known as Dominiques. These have become fashionable under the name.of Plymouth Rocks. They are cuckoo-coloured, viz., each feather is marked with transverse grey stripes on a lighter ground, and, as in all cuckoo-coloured breeds, the cocks are of the same colour as the hens; their legs are not feathered, and the plumage is not so loose as that of the more typical Cochins. They are admirable layers, but the intense yellow of the skin lessens their value for the table.*~~

~~*Spanish.—The Spanish or Mediterranean type is well marked. 'The birds are of moderate size, with large single erect combs and white ear-lobes. In the black Spanish the whiteness of the ear-lobe extends over the face, and its size has been so greatly developed by cultivation that in some specimens it is 6 or 7 inches in length and several in breadth. Closely related to the Spanish, differing only in colour of plumage and extent of white face and ear- lobe, are the white and brown Leghorns, the slaty-blue Andalusians, the black Minorcas, &c. All are non-incu- bators, the desire to sit having been lost in the tendency to the increased production of eggs, which has been de- veloped by the persistent and long-continued selection of the most fertile layers.*~~

~~*Hamburghs—The Hamburghs, erroneously so called from a name given them in the classification adopted at the early Birmingham shows, are chiefly breeds of English origin. They have double combs and small white ear- lobes. There are various sub-varieties. Those with a dark crescent-like mark on the end of each feather of the hen are termed Spangled Hamburghs. Others are of uniform black plumage. A somewhat similar breed of smaller size, with each feather of the hens marked with trans- verse bands of black on a white or bay ground, is termed Pencilled Hamburghs ; they were formerly known as Dutch everyday Layers. These breeds are all non-sitters and lay a remarkably large number of eggs.*~~

~~*Crested Fowls.—The crested breeds have long been culti-*~~

~~*vated on the Continent and are admirably delineated in the pictures by Hondekoeter and other early Dutch artists. In Great Britain they are erroneously termed Polish. The development of the feathered crest is accompanied by a great diminution in the size of the comb, which is some- times entirely wanting. The wattles also are absent in some breeds, their place being occupied by a large tuft of feathers, forming what is termed the "beard." In all the crested breeds there is a remarkable alteration of the cranium, the anterior part of the skull forming a prominent hollow tuberosity which contains a very large part of the brain. This portion of the brain-case is rarely entirely ossified. There are numerous sub-varieties of crested fowls. The best-known breeds in England are the spangled, with a dark mark at the end of each feather. This mark often assumes a crescent shape, the horns of the crescent sometimes running up each margin of the feather so as to form a black border ; feathers so marked are termed "laced" by poultry-fanciers. There are also white Polish and a buff variety. A very distinct sub-variety is the black breed with a white crest on the head and large pen- dent wattles. A variety with the arrangement of these colours reversed was formerly known, but it has now be- come extinct. Some of the larger breeds of the west of Europe are closely related to the Polish. The Créve-cceur is a crested breed of uniform black colour; it is of large size and of great value for the table and for egg-produc- tion. The Houdan is a black and white breed of very similar character. In some breeds the form of the body and structure of bones of the face closely resemble those of the Polish, but there is an absence of the feathered crest, the crescent-shaped comb becoming more largely deve- loped ; such are those known as Guelders, Bredas, and La Fléche, the latter being the best French fowl for eating. A small white-crested variety, profusely feathered on the legs, was received some twenty years since (1864) from Turkey ; they are now known as Sultans. The crested breeds are all non-incubating.*~~

~~*Dorkings.—The Dorking type includes fowls that have for many generations been bred for the supply of the London markets. They are all fleshy on the breast and of fine quality. The Dorkings have an extra toe, a mon- strosity which leads to disease of the feet. The Surrey and Sussex fowls are four-toed. The coloured Dorkings were greatly increased in size some few years since by crossing with an Indian breed of the Malay type. The birds of the Dorking type are fair layers and good sitters. They are rather*~~

~~delicate in constitution and are chiefly bred in the south of England. Crossed with the Game breed they furnish a hardy fowl, plumper than the Dorking and larger than the Game, which is of unsurpassed excellence for the table. Mating a Dorking cock with large Game hens is found to be the most advantageous.~~

~~Silk Fowls.—These constitute a singular variety, in which the barbs of the feathers are not connected by barbules and the entire plumage has a loose fibrous appearance ; similar variations are found amongst other species of birds, but are soon lost in a wild state. The silk fowl best known is that in which the plumage is perfectly white, whilst the skin, cellular tissue between the muscles, and the periosteum covering the bones are a deep blue-black, the comb and wattles being a dark leaden blue. The birds are admir- able sitters and mothers, and are much valued for rear- ing pheasants, being of somewhat small size. Though of remarkable appearance when cooked, they are of good quality. In crosses with other breeds the silky character of the plumage is generally lost, but the dark skin and intermuscular cellular tissue remain and greatly lessen the value of the birds in the market.~~

~~Frizeled fowls are birds in which each feather curls out-~~

~~wards away from the body. They are common in India, but are not adapted to the climate of Britain, as the plum- age offers an imperfect protection against wet.~~

~~Rumpless fowls are those in which the coccygeal vertebree are absent; there is consequently no tail. By crossing, rumpless breeds of any variety may be produced. They are not desirable to cultivate, as, from the structural peculi- arities, the eggs are very apt to escape being fertilized.~~

~~Dumpies or Creepers are birds in which the bones of the legs are so short that their progression 1s consider- ably interfered with. The best known are the Scotch dumpies.~~

~~Long-tailed fowls, under the various names of Yokohama or Phoenix fowls, or Shinotawaro fowls, are singular varieties recently introduced from~~

~~*Japan, in which the sickle-feathers of the tail are 6 or 7 feet long. In Japan they are said to assume a much greater length. One bird in the museum at Tokio is stated to have sickle-feathers 17 feet long ; but examination is not permitted. In other respects the fowls are not peculiar, resembling the birds of the Game type.*~~

~~*Bantam.—This term is applied to fowls of a diminutive size without any reference to the particular breed. By careful selection and crossing with small specimens any variety can be reduced to the desired size. The Chinese had in the summer palace at Peking small Cochins weigh- ing not more than 1 tb each. Game bantams of less size have been established during the past twenty-five years. The Malays have been reduced to bantam size within a very few years, as have the crested breeds. The Japanese have long possessed a dwarf breed with enormous tail and comb, and with very short legs. One of the most artificial breeds is the Sebright bantam, named after its originator. This bird has the laced or marginal feather of the Polish combined with the absence of male plumage in the cocks, so that it may be described as a hen-feathered breed with laced plumage. When perfect in marking it is of singular beauty, but is not remarkable for fertility.*~~

~~*In breeding the domestic fowl for useful purposes it is desirable to follow toa greater extent than is usual the natural habits and instincts of the bird. The wild fowl is a resident in forests, coming out to feed in the open; in addition to green vegetables and fruit it lives on grain, seeds, worms, grubs, and insects, which it obtains by scratching in the soil; it roosts in the higher branches of trees, and the hen deposits her eggs on the ground, usually in a concealed situation, laying one egg every other day until the number is com- pleted, when she sits for twenty-one days. On the chickens being hatched they do not leave the nest for twenty-four or thirty hours, being nourished by the absorption of the yolk into the intestinal canal. When they are sufficiently strong to run after the hen she takes them in search of food, which she obtains by scratching in the ground or amongst decaying vegetable matter.*~~

~~*A domesticated hen allowed to make her own nest in a hedge or coppice always brings out a much larger, stronger, and healthier brood than one that sits in the dry close atmosphere of a hen-house. Wherever the nest is*~~

~~*placed it should always be made of damp earth so as to supply the requisite moisture and cool the under surface of the eggs as compared with the upper. When hatched the chicken should not be removed for twenty-four hours, feeding not being required. The first food should be egg and milk—equal parts— beaten together and heated until it sets into a soft mass; this may be given with a little canary seed for the first day or two, or millet or wheat ; newly-ground sweet oatmeal is good, but pungent rancid meal very injurious. The chickens do much better if the hen is allowed to scratch for them than when she is shut upinacoop. If a coop must be used it should be so constructed as to include a plot of grass and be moved daily. The perches in a hen-house should be on one level, or the fowls fight for the highest. All should be low, so that in flying down the breast-bone and feet may not be injured by coming violently in contact with the ground.*~~

~~*Keeping poultry without an extended range in which they can obtain a large portion of their own food is not desirable, nor has the establishment of poultry-farms, in which large numbers of birds are kept in one locality, ever under any conditions been attended with success. In all cases in which a large number of fowls are congre- gated together the ground becomes contaminated by the excrement of the birds ; the food is eaten off the soiled surface ; disease breaks*~~

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~~*out amongst the adults ; and rearing chickens successfully is out of the question. There are no poultry-farms in France, the eggs and chickens being produced by the peasant-proprietors. In England many poultry-farms have been started, but none have ever proved successful. Poultry-rearing is an industry adapted to the small holder, to the rearer for home consumption, or as an adjunct to the work of a large farm, but as an industry of its own it is never likely to be worked to advantage. There is no difficulty whatever in hatching any number of chickens, but when the young birds are crowded together and are living on tainted soil they invariably be- come diseased and die with extreme rapidity. The conditions of a crowded poultry-run necessarily reseinble those of an army encamped without due sanitary precautions, which cannot be adopted in the case of the birds. The*~~

~~*inevitable result is that they perish of diseases of a typhoid character which are quite beyond the power of the owners to control or alleviate.*~~

~~*Turkeys.—The origin of the domesticated turkey is probably of a composite character ; by Mr Gould and other naturalists this bird is generally regarded as having been derived from the Mexican species Meleagris mexicana ; but this has recently been crossed with the North-American M. gallo-pavo, with great advantage as to size and hardi- hood. The varieties of the turkey differ chiefly as to colour. The principal English breeds are the bronze or Cambridgeshire, the black or Norfolk, the fawn, and the white. Of these the first, especially when crossed with the American, is the largest and most desirable.*~~

~~*Turkeys are not so extensively raised in Great Britain as in France, from a prevalent opinion that they are very delicate and difficult to rear ; this idea arises in great part from errors in their management and feeding. The chicks, when thatched after twenty-eight days' incubation, should be left undisturbed for twenty-four or thirty hours, during which time they are digesting the yolk that is absorbed into the intestinal canal at birth. No attempt should be made to cram them; their first food should consist of sweet fresh meal, soft custard made with equal parts of egg and milk set by a gentle heat, and, above all, abun- dance of some bitter milky herb, as dandelion, or, much better, lettuce running to seed, on which they can be reared successfully with very little food of any other de- scription. The young turkeys progress much better if the hen has the range of a small enclosure from the first than if she is confined to a coop; thus reared they are much hardier than when cooped and corn-fed, and not so susceptible to injury from slight showers; but a damp locality should be avoided. Turkey-hens are most per- severing sitters, and are employed in France to hatch successions of sittings of hens' eggs. Turkeys can often be most advantageously reared by cottagers, as one or two hens only can be kept, one visit to the male being sufficient to fertilize the entire batch of eggs. The young turkeys find a larger proportion of their own food than fowls, and with a good free range cost but little until they are ready for fattening for the table. In places where the opportunity serves they may be allowed to roost in the trees with great advantage. Some wild flocks treated like*~~

~~*pheasants are to be found in several of the large parks in Scotland as well as in England.*~~

~~*Guinea-fowls.—The Common Guinea-fowl (Vumida meleagris) is a native of eastern Africa, from whence it has been carried to many parts of the world, in some of which, as the West Indian Islands, it has become wild. It has also been reared in a half-wild state in many English preserves ; under these conditions it flourishes exceedingly, but has the disadvantage of driving away the pheasants. In any dry locality guinea-fowls may be successfully reared, provided they have a good range and trees in which they can roost. The hen lays an abundance of eggs, which are generally hidden. The birds are useful as furnishing a supply of poultry for the table in the interval that ensues between the time when game are out of season and that before chickens arrive at maturity. On a dry, sandy,*~~

~~*and chalky soil and in a warm situation they are reared with ease, but are quite unsuited to damp cold localities. The continued vociferation of the hen-birds renders their maintenance near a house very objectionable, as the cry is continued throughout great part of the night. Several variations of colour exist, but they do not require any detailed description.*~~

~~*Ducks.—All the varieties of the domesticated duck are descended from the Common Mallard or Wild Duck, Anas 'boschas, a species which, though timid in its wild state, is easily domesticated, and suffers changes of form and colour in a few generations. The most important breeds are—the Rouen, which, retaining the colour of the original species, grows toa large size; the Aylesbury, a large white breed with an expanded lemon-coloured bill; the Pekin, a white breed with a pale yellowish tint in the plumage, and a very bright orange bill; two breeds which are entirely black. The smaller of these, which has been bred down to a very diminutive size, is remarkable for the extreme lustre of its feathers and the fact that its eggs are covered with a dark black pigment, which becomes less in quantity as each suc-cessive egg is deposited. It is known by the equally absurd names of East Indian, Labrador, or Buenos Ayres duck. The larger black variety, the Cayuga duck, has been recently introduced into England. Decoy or call ducks are small breeds of a very loquacious character, which were*~~

~~*originally bred for the purpose of attracting the wild birds to the decoys. Some are of the natural colour, others are white. Amongst the less known breeds are the Duclair ducks of France, evidently the result of crossing white and coloured varieties. Among the breeds differing in structure may be mentioned the Penguin duck, so called from its erect attitude, the Hook-billed and the Tufted ducks, &c., but these are not of practical importance. For table and mar- ket purposes no breed surpasses the Aylesbury ; its large size, great prolificacy, early maturity, and white skin and plumage cause it to be reared in immense numbers for the London markets. By good feeding the ducks are caused to lay in the winter months, when the eggs are hatched under Cochin or Brahma hens, the young ducklings being reared in artificially-warmed buildings or in the labourers' cottages ; they are fed most liberally on soft food, soaked grits, boiled rice with tallow-melters' greaves, and in ten or twelve weeks are fit for the market; if killed before moulting their quills, which they do when about twelve weeks old, they are heavier than afterwards and much better eating. When ducklings are required for the early spring markets the old birds must be fed most freely to cause the production of eggs in cold weather, corn being given in vessels of water, and the birds must be shut up at night, or the eggs will be laid in the water, where they sink and become putrid. Duck-rearing is a very profitable industry, very high prices being paid for ducklings in the early months of the year. The so-called Muscovy duck is a Brazilian species, Cairina moschata, which is not reared for the market, although the young birds are edible. The drake not unfrequently mates with the common duck, and large but sterile hybrids are the result.*~~

~~*Geese.—The domestic goose of Europe is undoubtedly the descendant of the migratory Grey Lag Goose, Anser cinereus, from which it differs chiefly by its increased size. Although domesticated since the time of the Romans, it has not been subject to much variation. The most im- portant breeds are the large grey variety known as the Toulouse, the white breed known as the Embden, and the common variety frequently marked with dark feathers on the back, and hence termed "saddlebacks." There has al$o been introduced from the Crimea since the Russian war a variety in which the feathers are singularly elongated, and even curled and twisted ; this-breed, which is termed*~~

~~the Sebastopol, is of small size and more important as a fanciers' breed than from a practical point of view. In some countries a second species is domesticated ; it is usually termed the Chinese, knob-fronted, or swan goose, Anser cygnoides. Though perfectly distinct as a species, having a different number of vertebrae in the neck and a loud clanging voice, it breeds freely with the common goose, and the hybrids produced are perfectly fertile, the late Mr Blyth asserting that over a large tract of country in the East no other geese except these cross-breds are ever seen. Geese are much more exclusively vegetable-feeders than ducks, and can only be kept to profit where they can obtain a large proportion of their food by grazing. The old birds should not be killed off, as they continue fertile to a great age. Geese are readily fattened on oats thrown into water, and the young, when brought rapidly forward for the markets, afford a very good profit. The Chinese, if well fed, lay at a much earlier date than the common species, and, if their eggs are hatched under large Cochin hens, giving three or four to each bird, the young are ready for the table at a very early period. The nest, as in all cases of ground-nesting birds, should be made on the earth and not in boxes, which become too dry and over-heated. In breeding for the market or for the sake of profit, the very large exhibition birds should be avoided, as many are barren from over-fatness, and none are so prolific as birds of fair average size.~~

~~In this article the Pea-fowl (see Pracock, vol. xviii. p. 443) has not been included, as, although long since domes- ticated, it is to be regarded rather as an ornamental than as a useful bird, and in congenial localities in which it can avail itself of the shelter of trees it requires no manage- ment whatever beyond feeding, nor should the slightest interference with the sitting hen be practised.~~

~~Pigeons.—All the different breeds of pigeons which are known to the fancier have descended from the wild blue Rock-dove, Columba livia, and return to the coloration and form of the wild original if allowed to interbreed without interference. When reared as articles of food pigeons are generally treated most disadvantageously ; with due care and proper management six or seven couples of young can be raised from each old pair during the year,~~

~~*and a continuous supply of young birds for the table can be depended on. The ordinary pigeons' houses are most objectionable, the birds being exposed to rain and extremes of temperature at all seasons. To be reared successfully pigeons should be housed in a room or loft, with shelves 9 or 10 inches in width running round the walls about 10 inches apart ; each shelf should be divided into com- partments not less than 16 inches long; this arrangement gives room for a nest at each end and enables the old birds to go to nest again before the young are able to fly. If coarse earthen saucers or nest-pans are used the young will be kept out of the dung, which is ejected over the sides and can be easily removed. 'They are first fed with a secretion from the crops of the parents, and afterwards with dis- gorged corn; when required for the table they should be killed before the old birds cease to feed them, as when they begin to feed themselves they lose weight, become thin, and are much less marketable. To obtain a con- tinuous supply of young pigeons the old birds must be well fed with grain and pulse ; clean water and a supply of old mortar rubbish mixed with salt should be always access- ible; the loft and nest should be kept clean and well ventilated, and the birds have free access to the open air. The breed should be of fair size, the blue rocks being too small to be of full market value as dead birds, though in great request for pigeon-shooting, and, unless a consider- able number are kept so as to prevent close interbreeding, some birds from other lofts should be introduced occasion-*~~

~~*ally. The numerous fancy breeds and those employed for conveying messages (see vol. xiii. p. 159 and p. 581 supra) do not fall within the scope of this article. (Ww. B. T.) POUND, an enclosure in which cattle or other animals found straying are retained until they are redeemed by the owners, or when taken in distraint until replevined, such retention being in the nature of a pledge or security to compel the performance of satisfaction for debt or damage done. A pound belongs to the township or village*~~

~~*and should be kept in repair by the parish. The pound-*~~

~~*keeper is obliged to receive everything offered to his custody and is not answerable if the thing offered be ille- gally impounded. By the statute 1 and 2 Phil. and Mary c, 12 (1554), no distress of cattle can be driven out of*~~

~~*the hundred where taken unless to a pound within 3 miles of the place of seizure. Where cattle are impounded the impounder is bound to supply them with sufficient food and water (12 and 13 Vict. c. 92, and 17 and 18 Vict. c. 60); any person, moreover, is authorized to enter a place where animals are impounded without food and water more than twelve hours and supply them without being liable to an action for such entry, and the cost of such food is to be paid by the owner of the animal before itis removed. The statute 2 Will. and Mary, sess. 1 c. 5 (1690), gives treble damages and costs against persons guilty of pound breach ; and by 6 and 7 Vict. c. 30 (1843) persons releasing or attempting to release cattle impounded or damaging any pound are liable to a fine not exceeding £5, awardable to the person on whose behalf the cattle were distrained, with imprisonment with hard labour not exceeding three months in default. In the old law books a distinction is drawn between a common pound, an open pound, and a close pound; these terms have now, however, lost much of, if not all, their significance. By statute 11 Geo. II. c. 19 (1738), which was passed for the benefit of landlords, any person distraining for rent may turn any part of the premises upon which a distress is taken into a pound pro hac vice for securing of such distress.*~~

~~*POUSHKIN, ALEXANDER (1799-1837), the most cele- brated of Russian poets, was born at Moscow, 7th June 1799. He belonged to an ancient family of boyars, and in a clever poem, many of the sallies of which were too trenchant to pass the censorship, he has sketched some of the more important of his progenitors.*~~

~~*In 1811 the poet entered the newly-founded lyceum of Tzarskoe Selo, situated near St Petersburg. To his stay in this college Poushkin has alluded in many of his poems. On quitting the lyceum in 1817 he was attached to the ministry of foreign affairs, and in this year he began the composition of his Ruslan and Lyudmila, a poem which was completed in 1820. The scene is laid at Kieff, in the time of Vladimir, the "bright sun" of the old Russian legends. Meanwhile Poushkin mixed in all the gayest society of the capital, and it seemed as if he would turn out a mere man of fashion instead of a poet. But an event occurred which, however disastrous it might appear to him at first sight, was fraught with the happiest consequences to his muse. A very daring Ode to Liberty written by him had been circulated in*~~

~~*manuscript in St Petersburg. This production having been brought to the notice of the governor, the young author only escaped a journey to Siberia by accepting an official position at Kishineff in Bessarabia, in southern Russia. Here he found himself surrounded by a world of new associations. If we follow the chronological order of his poems, we can trace with what enthusiasm he greeted the ever-changing prospects*~~

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~~*of the sea and the regions of the Danube and the Crimea. In some elegant lines he sang the Fountain of Bakhchisaraa, the old palace of the khans near Simpheropol. This foun- tain and the legend connected with it he afterwards made the subject of a longer poem.*~~

~~*At this time Poushkin was, or affected to be, overpowered by the Byronic "Weltschmerz." Having visited the baths of the Caucasus for the re-establishment of his health in 1822, he felt the inspiration of its magnificent scenery, and composed his next production of any considerable length, The Prisoner of the Caucasus, narrating the story of the love of a Circassian girl for a youthful Russian officer who has been taken prisoner. This was followed by the Foun- tain of Bakhchisarat, which tells of the detention of a young Polish captive, a Countess Potocka, in the palace of the khans of the Crimea. About the same time he composed some interesting lines on Ovid, whose place of banishment, Tomi, was not far distant. To this period belongs also the Ode to Napoleon, which is far inferior to the fine poems of Byron and Manzoni, or indeed of Lermontoff, on the same subject. In the Lay concerning the Wise Oleg we see how the influence of Karamzin's History had led the Russians to take a greater interest in the early records of their country. The next long poem was the Gipsves (Tzuigani), an Oriental tale of love and vengeance, in which Poushkin has admir- ably delineated these nomads, whose strange mode of life fascinated him. During his stay in southern Russia he allowed himself to get mixed up with the secret societies then rife throughout the country. He also became em- broiled with his chief, Count Vorontzoff, who sent him to report upon the damages which had been committed by locusts in the southern part of Bessarabia. Poushkin took this as a premeditated insult, and sent in his resignation ; and Count Vorontzoff in his official report requested the*~~

~~*Government to remove the poet, "as he was surrounded by a society of political and literary fanatics, whose praises might turn his head and make him believe that he was a great writer, whereas he was only a feeble imitator of Lord Byron, an original not much to be commended." The poet quitted Odessa in 1824, and on leaving wrote a fine Ode to the Sea. Before the close of the year he had returned to his father's seat at Mikhailovskoe, near Pskoff, where he soon became embroiled with his relatives, but grew more at ease when the veteran, who led the life of reckless expenditure of the old-fashioned Russian boyar, betook himself to the capital. The father survived his celebrated son, and it was to him that Zhukovski addressed a pathetic letter, giving him an account of his death. His mother died a year before her son; and Poushkin, when choosing a burial-place for her, marked out a spot for himself and expressed a presentiment that he had not long to live. He had now involved himself in trouble on all sides ; for so obnoxious had he become to the authorities even during his retreat in the country that he was put under the supervision of the governor, the marshal of the nobility, and the archimandrite of the neighbouring mon- astery of Svyatogorski. In his retirement he devoted a great deal of time to the study of the old Russian popular poetry, the buzlinas, of which he became a great admirer. Recollections of Byron and André Chenier gave the inspira- tion to some fine lines consecrated to the latter, in which Poushkin appeared more conservative than was his wont, and wrote in a spirit antagonistic to the French Revolution. In 1825 he published his tragedy Boris Godunof, a bold effort to imitate the style of Shakespeare. Up to this time the traditions of the Russian stage, such as it was, had been French. Plays of all kinds had appeared,—transla- tions of Moliére, Corneille, and Racine, or adaptations of them, and even glimpses of Shakespeare conveyed through the medium of the paltry versions of Ducis.*~~

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~~*In 1825 the unfortunate conspiracy of the Dekabrists broke out, the ostensible aim of which was to defend the claims of the grand-duke Constantine against his brother Nicholas, but the real purpose was to set up a republican form of government in Russia, for which the country was not by any means prepared. Many of the conspirators were personal friends of Poushkin, especially Kiichelbecker and Pustchin. The poet himself was to a*~~

~~*certain extent compromised, but he succeeded in getting to his house at Mikhailovskoe and burning all the papers which might have been prejudicial to him. He had resolved to go to St Petersburg, possibly to throw in his lot with his friends there, but was stopped by what are considered portents by the Russian people. As soon as he had left the gates of his house he met a priest, and he had not gone a verst*~~

~~*before three hares crossed his path. These were such bad*~~

~~*omens that there was nothing for him to do, as a genuine Russian and at all times a superstitious man, but to return home at once. Through influential friends he succeeded in making his peace with the emperor, to whom he was presented at Moscow soon after his coronation. The story goes that Nicholas said to Count Bludoff on the same evening, "'I have just been conversing with the most witty man in Russia." In 1828 appeared Poltava, a spirited narrative poem, in which the expedition of Charles XII. against Peter and the treachery of the hetman Mazeppa were described. The best part of the poem is the picture of the battle itself, where the colours are laid on very boldly. In 1829 Poushkin again visited the Caucasus, on this occasion accompanying the expedition of Prince Paskewitch. He wrote a pleasing account of the tour ; 'many of the short lyrical pieces suggested by the scenery and associations of his visit are delightful, especially the lines on the Don and the Caucasus. In 1831 Poushkin married Mademoiselle Natalia Goncharoff, and in the fol- — lowing year was again attached to the ministry of foreign affairs, with a salary of 5000 roubles. He now busied himself with an historical work, an account of the revolt of the Cossack Pugacheff, who almost overthrew the empire of Catherine and was executed at Moscow in the latter part of the 18th century. While engaged upon this he wrote The Captain's Daughter, one of the best of his prose works. In 1832 was completed the poem Mugene Onyegin, in which the author attempted a completely new style, moulding his production upon the lighter sketches of Byron in the Italian manner. The poem is, on the whole, very successful. The metre is graceful and sprightlyand well adapted for serio-comic verse. The characters of Lenski, Onyegin, Tatiana, and Olga are drawn with a vigorous hand, and each is a type. No one can accuse Poushkin of want of nationalism in this poem: it is Russian in every fibre. In 1837 the poet, who had been long growing in literary reputation, fell mortally wounded in a*~~

~~*duel with Baron George Heckeren d'Anthés, the adopted son of the Dutch minister then resident at the court of St Petersburg. D'Anthés, a vain and frivolous young man, had married a sister of the poet's wife. Notwithstanding this he aroused Poushkin's jealousy by some attentions which he paid Natalia; but the grounds for the poet's anger, it must be confessed, do not appear very great. Poushkin died, after two days' suffering, on the afternoon of Friday, 10th February. D'Anthés was tried by court-martial and expelled the country. In the year 1880 a statue of the poet was erected at the Tver Barrier at Moscow, and fétes were held in his honour, on which occasion many interest- ing memorials of him were exhibited to his admiring countrymen and a few foreigners who had congregated for the festivities. The poet left four children; his widow was afterwards married to an officer in the army named Lanskoi ; she died in 1863.*~~

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~~*Poushkin remains as yet the greatest poet whom Russia has produced. The most celebrated names before him were those of Lomonosoff and Derzhavin ; the former was a composer of merely scholastic verses, and the latter, in spite of great merits, was too much wedded to the pedantries of the classical school. Since Poush- kin's death, Lermontoff and Nekrasoff have appeared, both distinctly writers of genius, but they are confessedly inferior to him. His poetical tales are spirited and full of dramatic power. The influence of Byron is undoubtedly seen in them, but they are not imitations, still less is anything in them plagiarized. Boris Godunoff is a fine tragedy ; on the whole HLugene Onyegin must be considered Poushkin's masterpiece. Here we have a great variety of styles— satire, pathos, and humour mixed together. The character-paint- ing is good, and the descriptions of scenery introduced faithful to nature. The poem in many places reminds us of Byron, who him- self in his mixture of tlie pathetic and the huinorous was a disciple of the Italian school. Poushkin also wrote a great many lyrical pieces. Interspersed among the poet's minor works will be found many epigrams, but some of the best composed by him were not so fortunate as to pass the censorship, and must be read in a supple- mentary volume published at Berlin. As a prose writer Poushkin has considerable merits. Besides his History of the Revolt of Pugacheff, which is perhaps too much of a*~~

~~compilation, he pub- lished a small volume of tales under the nom de plume of Ivan Byelkin. These all show considerable dramatic power ; the best are The Captain's Daughter, a tale of the times of Catherine II., The Undertaker, a very ghostly story, which will remind the English reader of some of the tales of Edgar Poe; The Pistol Shot ; and The Queen of Spades. Of the letters of Poushkin, which originally were to be found scattered over many magazines aud literary journals, a fairly complete collection was published in the new edition of his works which appeared at Moscow under the editorship of M. Yefrimoff. (W. RB: OL.)~~

~~POUSSIN, Nicozas (1594-1665), French painter, was born at Les Andelys (Eure) in June 1594. Early sketches, made when he should have been learning Latin, attracted the notice of Quentin Varin, a local painter, whose pupil Poussin became, till he went to Paris, where he entered the studio of Ferdinand Elle, a Fleming, and then of the Lorrainer L'Allemand. He found French art in a stage of transition: the old apprenticeship system was disturbed, and the academical schools destined to supplant it were not yet established ; but, having been brought into rela- tions with Courtois the mathematician, Poussin was fired by the study of his collection of engravings after Italian masters, and resolved to go to Italy. After two abortive attempts to reach Rome, and when he was again on the road, he fell in with the chevalier Marini at Lyons. Marini employed him on illustrations to his poems, took him into his household, and in 1624 enabled Poussin (who had been detained by commissions in Lyons and Paris) to rejoin him at Rome. There, his patron having died, Poussin fell into great distress; but his high qualities had won him friends amongst his brother artists, and on his falling ill he was received into the house of his compatriot Dughet and tenderly nursed by his daughter Anna Maria, to whom in 1629, when his affairs were easier, Poussin was married. Amongst his first patrons were Cardinal Barberini, for whom was painted the Death of Germanicus (Barberini Palace) ; Cardinal Oimodei, for whom he produced, in 1630, the Triumphs of Flora (Louvre); Cardinal de Richelieu, who commissioned a Bacchanal (Louvre) ; Vicenzo Giusti- niani, for whom was executed the Massacre of the Inno- cents, of which there is a first sketch in the British Museum ; Cassiano dal Pozzo, who became the owner of the first series of the Seven Sacraments (Belvoir Castle) ; and Fiéart de Chanteloup, with whom in 1640 Poussin, at the call of Sublet De Noyers,~~

~~*returned to France. He was well received by Louis XIII., who conferred on him the title of "first painter in ordinary," and in two years at Paris he produced not only several pictures for the royal chapels (the Last Supper, painted for Versailles, now in the Louvre) but eight cartoons for the Gobelins, the series of the Labours of Hercules for the Louvre, the Triumph of Truth for Cardinal Richelieu (Louvre), and much minor work; but in 1643, annoyed and disgusted*~~

~~*by the intrigues of Simon Vouét, Feuquiéres, and the architect Lemercier, Poussin withdrew to Rome. There, in 1648, he finished for De Chanteloup the second series of the Seven Sacraments (Bridgewater Gallery), and also his noble landscape with Diogenes throwing away his Scoop (Louvre); in 1649 he painted the Vision of St Paul (Louvre) for the comic poet Scarron, and in 1651 the Holy Family (Louvre) for the duke of Créqui. Year by year he continued to produce an enormous variety of works, many of which are included in the list given by Félibien, in which we find the names of Pointel the banker, Cardinal Manimo, Madame Mauroi, and others. He is said to have settled in a house on the Pincio, but in 1656, the year of the plague, he is entered in the census as living with his wife in the Via Paolina. He died in November 1665 and was buried in the church of St Lawrence in Lucina, his wife having predeceased him.*~~

~~*The finest collection of Poussin's paintings as well as of his drawings is possessed by the Louvre ; but, besides the pictures in the National Gallery and at Dulwich, England possesses several of his most considerable works: the Triumph of Pan is at Basildon (Berkshire), and his great allegorical painting of the Arts at Knowsley. At Rome, in the Colonna and Valentini Palaces, are notable works by him, and one of the private apartments of Prince Doria is decorated by a great series of landscapes in distemper, which are little known. 'Throughout his life he stood aloof from the popular movement of his native school. French art in his day was purely decorative, but in Poussin we find a survival of the impulses of the Renaissance coupled with conscious reference to classic work as the standard of excellence. In general we see his paintings at a great disadvantage, for the colour, even of*~~

~~*the best preserved, has changed in parts, so that the keeping is disturbed ; and the noble construction of his designs can be better seen in engravings than in the original. Amongst the many who have reproduced his works the two Audran, Claudine Stella, Picart, and Pesne are the most successful.*~~

~~*Poussin left no children, but he adopted as his son Gaspar Dughct, his wife's brother, who took the name of Poussin. GAsPAR POUSSIN (1613-1675) devoted himself to landscape painting and rendered admirably the severer beauties of the Roman Campagna ; a note- worthy series of works in tempera representing various sites near Rome is to be seen in the Colonna Palace, but one of his finest easel-pictures, the Sacrifice of Abraham, formerly the property of the Colonna, is now, with other works by the same painter, in the English National Gallery. The frescos executed by Gaspar Poussin in S. Martino di Monti are in a bad state of preservation. The*~~

~~*Louvre does not possess a single work by his hand. Gaspar died at Rome in 1675.*~~

~~*Sandrart, Acad. nob. art. pict. ; Lettres de Nicolas Poussin (Paris, 1824); Feli- bien, Entretiens ; Gault de St Germain, Vie de Nicolas Poussin; D'Argenville, Abrége de la Vie des Peintres; Bouchitté, Poussin et son Giuvre; Emilia F. 8. Pattison, " Documents inédits, Le Poussin," in L' Art (1882).*~~

~~*POUT, also Wurtinc-Povt or Bra (Gadus luscus), a small species of cod-fish locally abundant on the coasts of northern and western Europe, but less so in the Mediterranean. It is distinguished from other species of the genus Gadus by having a deep short body; a short and obtuse snout, not longer than the eye; the upper jaw the longer; and a long barbel at the chin. The three dorsal fins are com- posed of respectively twelve, twenty or twenty-two, and nineteen or twenty rays, the two anal fins of from twenty- nine to thirty-two and nineteen or twenty.*~~

~~*POWAN, or PowEn (Coregonus clupeotdes), a species of the Salmonoid genus Coregonus, which seems to be peculiar to Loch Lomond in Scotland, the great lakes of Cumber- land, where it is called "schelly," and Lake Bala in Wales, the Welsh name of the fish being "gwyniad." It is not found in*~~

~~other European waters; but of the numerous Continental species of this genus the lavaret of the Swiss lakes resembles it most. Powan, or, as they are sometimes called, freshwater herrings, live in the deepest parts of the~~

~~| lakes mentioned and come to the surface only occasionally,~~

~~either in the winter time in order to spawn, or at certain times of the day during summer, approaching, it is said, the shores in search of food. Large numbers may then be taken with nets, and are mostly consumed on the spot. The powan rarely exceeds a length of 14 inches ; it has been fully described and figured by Parnell (Annals of Natural History, 1838, vol. i. p. 162) under the names of Coregonus lacepedet and Coregonus microcephalus ; the specimens to which the latter name was given are, however, not specifically different from the typical powan.~~

~~POWERS, Hrram (1807-1873), American sculptor, was the son of a farmer, and was born at Woodstock, Vermont, on 29th June 1807. In 1819 his father removed to a farm in Ohio, about six miles from Cincinnati, where the son attended school for about a year, staying meanwhile with his brother, a lawyer in Cincinnati. After leaving school he found employment in superintending a reading-room in connexion with the chief hotel of the town, but, being, in his own words, "forced at last to leave that place as his clothes and shoes were fast leaving him," he became a clerk in a general store. His second employer in this line of business having invested his capital in a clock and organ factory, Powers set himself to master the construction of the instruments, displaying an aptitude which in a short time enabled him to become the first mechanic in the fac- tory. In 1826 he began to frequent the studio of Mr Eckstein, and at once conceived a strong passion for the art of sculpture. His proficiency in modelling secured him the situation of general assistant and artist of the Western Museum, kept by a Frenchman, M. Dorfeuille, where his ingenious representation of the infernal regions to illustrate the more striking scenes in the poem of Dante met with extraordinary success, After studying thoroughly the art of modelling and casting, he in the end of 1834 went to Washington, and a friend having secured for him as sitters the president and some of the leading statesmen his remarkable gifts soon awakened general attention. In~~

~~*1837 he settled in Florence, where he remained till his death. While from pecuniary considerations he found it necessary to devote the greater part of his time to busts, his best efforts were bestowed on ideal work. In 1838 his statue of Eve excited the warm admiration of Thor- waldsen, and in 1839 he produced his celebrated Greek Slave, which at once gave him a place among the greatest sculptors of his time. Among the best known of his other ideal statues are the Fisher Boy, Il Penseroso, Proserpine, California, America (modelled for the Crystal Palace, Sydenham), and the Last of his Tribe. Among the eminent men whose busts he modelled are many of the leading con- temporary statesmen of America. HIs genius was strik- ingly realistic and unconventional, a quality doubtless in some degree attributable to the nature of his early training, but it was the close and thorough study of the works of the great masters which finally disciplined his powers to their highest perfection of purity and refinement. He died on 27th June 1873.*~~

~~*Among various obituary notices of Powers one of the most inter- esting is that by his intimate friend T. A. Trollope in Lippincott's Magazine for February 1875.*~~

~~*POZZO DI BORGO, Carto AnpREa (1764-1842), Russian diplomatist, was descended from an old Corsican family, and was born at Alata near Ajaccio on 8th March 1764. After completing his legal studies at Pisa he became advocate at Ajaccio, where in 1790 he joined the party of Paoli, to whom the Buonaparte family was strongly opposed. In his early years he had been on terms of the closest intimacy with Napoleon, but from this time a feel- ing of enmity sprang up between them, which on the part of Pozzo di Borgo increased as the career of Napoleon*~~

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~~*developed, until it became the ruling passion of his life. Ultimately his hatred of Napoleon knew no bounds, and, regarding him as the "scourge of the world," he sought to compass his ruin with a pertinacity which discourage- ments and difficulties served only to whet and kindle into redoubled ardour. In 1794 he was.chosen president of the Board of Council, under the English viceroy, and when the British were expelled from the island in 1797 he went to London, where he carried on a secret mission on*~~

~~*behalf of the Bourbons. At Vienna in 1798 he assisted in effect- ing a coalition between Austria and Russia against France, and in 1803 he entered the Russian service, where he became councillor of state, and was employed by the czar in all his most important diplomatic negotiations. He attempted in vain to form a new coalition after the battle of Jena, and retired, first to Austria, then to England. Recalled to Russia in 1812, he exerted all his influence to urge a continuance of the war with France till the power of Napoleon should be broken. In addition to this he secured the alliance of the Swedish crown prince Berna- dotte, and also went to London to secure the active co- operation of England. He it was who counselled the allies to bring matters to a crisis by marching on Paris, and it was he who penned the famous declaration that they waged war against Napoleon, not against the French people. He gave warning to the congress of Vienna of the possibility of Napoleon returning from Elba, was pre- sent at the battle of Waterloo, where the power of Napoleon was finally crushed, and on 20th November 1815 enjoyed the supreme satisfaction of signing the treaty of Paris as Russian ambassador. In 1826 he was appointed to repre- sent Russia at Paris. He retired from public life in 1835, and died at Paris on 15th February 1842.*~~

~~*Stein et Pozzo di Borgo, 1846, English trans., 1847 ; Vuhrer, Notice biographique sur le Comte Pozzo di Borgo, 1842.*~~

~~*POZZUOLI, the ancient Pureott, a city of Italy, on the northern shore of the Bay of Pozzuoli (Sinus Puteo- lanus or Cumanus),—the western portion of the Gulf of Naples, separated from the larger eastern portion by the promontory of Posillipo and from the open sea on the west by the peninsula which terminates in Cape Miseno. It is a place of 11,967 inhabitants (1881) and the centre of a commune, which, including Bacoli (3130; the ancient Bauli) and Nisida (1202), numbers 17,269. Its small flat-roofed houses cluster picturesquely on a tongue of land projecting south-west into the bay. The cathedral of St Proculus occupies the site of a temple erected to Augustus by L. Calpurnius and contains the tomb of Per- golesi. The harbour is still visited by 500 or 600 sailing vessels in the course of the year. But the true riches of Pozzuoli are its ruins. First in point of interest is the Serapeum or temple of Serapis. This consisted of a rect- angular court enclosed by forty-eight massive columns and having in the centre a round*~~

~~*temple with sixteen Corinthian pillars of African marble. The three great columns of the portico, about 40 feet high, still stand. The perforations of a boring mollusc show that they must for a time have been submerged 13 feet in the sea. The new upheaval of the ground appears to have begun before 1530 and to have been hastened by the great Monte Nuovo eruption of 1538. A gradual subsidence has again been observed since the beginning of the 19th century. The pillars of the round temple are now in Caserta, and the statue of Serapis is in the National Museum at Naples. The amphitheatre (482 feet long by 383 broad), erected in the time of the Flavian dynasty on the hill behind the town, was seated for 30,000 spectators, and had an arena 286 feet. long and 138 feet broad. Among the populace the building is known as the Prison of St Januarius, be- cause, according to the legend, that saint and his com-*~~

~~*panions were here condemned to fight with wild beasts. At an earlier date it had been the scene of the spectacle in which Nero, in presence of King Tiridates of Armenia, displayed his personal prowess. To the west of the Sera- peum lie traces of various minor ruins, a temple of Neptune, &c., and especially the site of Cicero's villa (Puteolanum or Academia), which was afterwards occupied by a temple in honour of the emperor Hadrian. The whole neigh-*~~

~~*bourhood has proved rich in epigraphic remains.*~~

~~*Puteoli first appears under the name of Diczarchia as a port of the people of Cume. The statement made by Stephanus of Byzan- tium and Eusebius, that the city was founded by a colony of Samians, probably refers to some secondary accession of population from that quarter. The Romans in 215 B.c. introduced a garrison of 6000 men to protect the town from Hannibal; and in 194 B.c. a Roman colony was established. In the Civil War the citizens sided first with Pompey and afterwards with Brutus and Cassius. Augustus strengthened the colony with a body of his veterans (hence Colonia Augusta), and Nero admitted the old inhabitants into it. The remains of Hadrian, who died at the neighbouring town of Baiz, were burned at Puteoli, and Antoninus Pius, besides erecting the temple to his memory already mentioned, instituted sacred games to be held in the city*~~

~~every five years. It was mainly, however, as a great commercial port that Puteoli was famous in ancient times. It was one of the two places in Italy (Rome was the other) where the Tyrian merchants had a regular trading station ; it trafficked with Syria (merchants from Berytus are mentioned among its residents), Egypt, Africa, and Spain, and spices from the East, corn from Alexandria, iron from Populonium were stored in its warehouses. Like Ostia, Puteoli was considered a special port of Rome, and, on account of the great safeness and convenience of its harbour, it was preferred to Ostia for the landing of the more costly and delicate wares. Like Ostia, consequently, it was treated as practically part of Rome, and with it enjoyed the peculiar distinction of being enrolled in the Palatine tribe. The artificial mole was probably of earlier date than the reign of Augustus ; and by that time there were docks large enough to contain the vessels employed in bringing the obelisks from Egypt. Remains of the piles of the mole still exist, and are popularly known as Caligula's Bridge, from the mistaken idea that they belong to the temporary structure which that emperor flung across the bay from the mole at Puteoli to the shore at Baie. Alaric (410), Genseric (455), and Totila (545) successively laid Puteoli in ruins. The restoration effected by the Byzantines was partial and short-lived. Sacked by Grimoald of Beneventum in 715, harassed by the Saracens in the 10th century, captured by John duke of Naples in 1014, and again sacked by the Turks in 1550, the city could hardly have continued prosperous even apart from the earth-**

~~quakes of 1198 and 1538.~~

~~Works on Puteoli have been written by Mazzella (1594), Capaccio (1604), Sarnellius (1691), Parrino (1709), Jorio (1817 and 1830). See the bibliography in Corp. Inser. Lat., vol. x. part i. pp. 182, 317.~~

~~PRADIER, James, French sculptor, was born at Geneva in 1790 and died in Paris on 5th June 1852. He wasa member of the Academy and a brilliant and popular sculptor of the pre-Romantic period, representing in France the drawing-room classicism which Canova illustrated at Rome. His chief works are the Son of Niobe, Atalanta, Psyche, Sappho (all in the Louvre), Prometheus (Tuileries Gardens), a bas-relief on the triumphal arch of the~~

~~*Car- rousel, the figures of Fame on the Arc de 'Etoile, and a statue of J. J. Rousseau for Geneva.*~~

~~*See Afagazin pittoresque, iii., vi., and xi.; Barbet de Jouy, Sculptures modernes du Louvre.*~~

~~*PRAED, WintHror Mackwortu (1802-1839), one of the most illustrious English writers of vers de société, was the third and youngest son of William Mackworth Praed, serjeant at law. The name of his father's family had been originally Mackworth, and the circumstances under which the additional title of Praed was adopted are set out in the Parochial HIstory of Cornwall (iii. 101). Winthrop, a cognomen famous across the Atlantic as borne by the governor of Massachusetts, was his mother's maiden name, and the union of these three consonantal names in the person of Winthrop Mackworth Praed formed the combina- tion over which Miss Mitford expressed righteous indig- nation. HIe was born at 35 John Street, Bedford Row, London, 26th July 1802, and almost as soon as he could read was taught by his father to "lisp in numbers." HIs*~~

mother died in 1809, whereupon the child was sent to the preparatory school of Langley Broom near Colnbrook, where he remained until he was removed (28th March 1814) to Eton. Towards the close of his schoolboy days he started a manuscript periodical called Apis Matina. This was succeeded in October 1820 by the Hitonzan, a paper pro- jected and edited by Praed and Walter Blunt, which appeared every month until July 1821, when the chief editor left the "glade" of Eton and the paper died. Henry Nelson Coleridge, William Sidney Walker, and John Moul- trie were the three best known of his coadjutors in this periodical, which was published by Charles Knight, and of which many interesting particulars are set out in Knight's Autobiography and in Maxwell Lyte's Eton College. Before Praed left school he succeeded in establishing over a shop at Eton a "boy's library" for the use of the higher Etonians, the books of which are now amalgamated in the official "boy's library" in the new buildings. His career at Cambridge, where he matriculated at Trinity College, Octo- ber 1821, was marked by exceptional brilliancy. Thrice he gained the Browne medal and twice the chancellor's medal for English verse. He was bracketed third in the classical tripos in 1825, won a fellowship at his college in 1827, and three years later carried off the Seatonian prizes. At the Union his speeches attracted the admiration of his fellow-undergraduates ; he struggled, and not unequally, with Macaulay and Austin. The character of Praed dur- ing his university life is described by Bulwer Lytton in the first volume of his Life (pp. 227-239, 244-246). At Cam- bridge, as at Eton, the poet was drawn by Charles Knight into the pleasures of magazine-writing. Knight's Quarterly Magazine was started in 1822 with Praed as one of the principal contributors, and, after languishing for some time, it expired when three octavo volumes had been issued. For two years (1825-27) he resided at Eton as private tutor to Lord Ernest Bruce, a younger son of the marquis of Ailesbury. During part of this time he was occupied in preparing himself for the profession of the law, and on 29th May 1829 he was called to the bar at the Middle Temple. He travelled on the Norfolk circuit, where his prospects of advancement were bright, but the bias of his feelings in- clined him towards politics, and after a year or two he devoted himself entirely to political life. Whilst at Cain- bridge he leaned to Whiggism, and even to the

~~*autumn of 1829 his feelings were bent towards the same side, but with the dawning of the Reform Bill he passed into the opposite ranks, and when he was returned to parliament for St Germans (17th December 1830) his election was due to the kindness of Mr Herries, a zealous member of the Tory party. He sat for that borough until December 1832, and on its extinction contested thé borough of St Ives, within the limits of which the Cornish estates of the Praeds are situated. The squibs which he wrote on this occasion were collected in a volume printed at Penzance in 1833 and entitled Z'rash, dedicated without respect to James Halse, Esq. M.P., his successful competitor. Praed subsequently sat for Great Yarmouth from 1835 to 1837 and for Aylesbury from the latter year until his death. During the progress of the Reform Bill he advocated the creation of three-cornered constituencies, in which each voter should have the power of giving two votes only, and maintained that freeholds within boroughs should confer votes for the boroughs and not for the county. Neither of these suggestions was then adopted, but the former ulti- mately formed part of the Reform Bill of 1866. Praed was for a few months (December 1834 to April 1835) secretary to the Board of Control, and he was much grati- fied at receiving the appointment of deputy high steward of his beloved university of Cambridge. 'The last years of his life were racked by the pains of phthisis, though*~~

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~~*all that sympathy and devotion could effect to alleviate his sufferings was accomplished by his wife, Helen, daughter of Mr George Bogle, whom he had married in 1835. He died at Chester Square, London, on 15th July 1839, and was buried at Kensal Green on 23d July.*~~

~~*Praed's lighter poetry, was the perfection of ease. It abounded in allusions to the characters and follies of the day and passed with playful touch from puns to politics. In his humorous effusions he was the chief of a school which in these latter days has found numerous imitators. Many of his poems were marked by much pathetic feeling, for his talents were by no means limited to puns and jests. Several American issues of his works appeared before the comprehensive English edition of his Poems, "with a memoir by*~~

~~Rev. Derwent Coleridge," was published in 1864. Ata later date a selection from his poems by Sir George Young was given to the world.~~

~~PRAFECT (prefectus) was the title of various Roman officials, both civil and military. A prefect was not one of the magistrates proper; he was, strictly speaking, only the deputy or lieutenant of a superior magistrate or com- mander. The following were the most important classes of preefects.~~

~~1. The city prefect (prefectus urbv) acted at Rome as the deputy of the chief magistrate or magistrates during his or their absence from the city. Thus he represented in the earliest times the king and in later times the consul or consuls when he or they were absent on a campaign or on other public duties, such as the celebration of the annual Latin festival on the Alban Mount. The absence of the chief magistrate for more than a single day rendered the appointment of a prefect obligatory ; but the obligation only arose when ald the higher magistrates were absent. HIence so long as the consuls were the only higher magis- trates their frequent absence often rendered the appoint- ment of a prefect necessary, but after the institution of the pretorship (367 B.c.) the necessity only arose excep- tionally, as it rarely happened that both the consuls and the praetor were absent simultaneously. But a prefect continued to be regularly appointed, even under the empire, during the enforced absence of all the higher magistrates at the Latin festival. The right and duty of appointing a prefect belonged to the magistrate (king, dictator, or consul) whose deputy he was, but it seems to have been withdrawn from the consuls by the Licinian law (367 B.c.), except that they still nominated prefects for the time of the festival. No formalities in the appointment and no legal qualifications on the part of the praefect were required. The prefect had all the powers of the magistrate whose deputy he was, except that he could not nominate a deputy to himself. HIs office expired on the return of his superior. There could only be one city prefect at a time, though the dictator Cesar broke the rule by appointing six or eight preefects simultaneously.~~

~~Under the empire there was introduced a city prefecture which differed essentially from the above. Augustus occa- sionally appointed a city prefect to represent him in his absence from Italy, although the preetors or even one of the consuls remained in the capital. In the absence of Tiberius from Rome~~

~~*during the last eleven years of his reign (26-37 a.D.) the city prefecture, hitherto an excep- tional and temporary office, became a regular and pernia- nent magistracy ; in all subsequent reigns the prefect held office even during the presence of the emperorin Rome. He was always chosen by the emperor and usually from men who had held the consulship ; his office was regarded, like the censorship under the republic, as the crowning honour of a long political career. It was not conferred for any definite length of time, but might be held for years or for life. As under the republic, the prefect was not allowed to quit the city for more than a day at atime. His duty was the preservation of peace in the capital; he was, in fact, the chief of the police, being charged with the super-*~~

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~~*intendence of the streets, markets, and public buildings. He was further entrusted by Augustus with a summary criminal jurisdiction over slaves and rioters, which was,*~~

~~*however, gradually extended till in the time of Severus or*~~

~~*even earlier it embraced all offences by whomsoever com- mitted. Further, he had the power of dealing with civil cases where his interference seemed requisite in the inter- ests of the public safety, but such occasions were naturally few. By the beginning of the 3d century, and perhaps earlier, appeals to the emperor in civil cases were handed over by him to be dealt with by the preefect. Except where special restrictions interfered, an appeal lay from the pre- fect to the emperor. Though not a military officer, the prefect commanded the city cohorts (cohortes urbanz), which formed part of the garrison of Rome and ranked above the line regiments, though below the guards (see PRzTORIANS). The military power thus placed in the hands of the chief of the police was one of the most sorely-felt innovations of the empire. The constitutional changes of Diocletian and Constantine extended still farther the power .of the prefect, in whom, after the disbanding of the guards and the removal from Rome of the highest officials, the whole military, administrative, and judicial powers were centred.*~~

~~*2. Under the republic judicial preefects (prefectt jurt dicundo) were sent annually from Rome as deputies of the pretors to administer justice in*~~

~~*certain towns of the Italian allies. These towns were called "prefectures" (prefecture). After the Social War (90-89 B.c.), when all Italy had re- ceived the Roman franchise, such prefectures ceased to exist in fact, though the narne was sometimes retained.*~~

~~*3. Under the empire the preetorians or imperial guards were commanded by one, two, or even three preefects (pre- fectt pretorio), who were chosen by the emperor from among the knights and held office at his pleasure. From the time of Alexander Severus the post was open to senators also, and if a knight was appointed he was at the same time raised to the senate. The position was one of great influ- ence and importance ; the preetorian prefect stood under the immediate orders of the emperor, of whom he was the natural representative and sometimes the rival. Down to the time of Constantine, who deprived the office of its military character, the prefecture of the guards was regu- larly held by tried soldiers, often by men who had fought their way up from the ranks. In course of time the com- mand seems to have been enlarged so as to include all the troops in Italy except the corps commanded by the city prefect (cohortes urbanx). Further, the preetorian prefect acquired, in addition to his military functions, a criminal jurisdiction, which he exercised not as the delegate but as the representative of the emperor, and hence it was decreed by Constantine (331) that from the sentence of the pre- torian prefect there should be no appeal. A similar juris- diction in civil cases was acquired by him not later than the time of Severus. Hence a knowledge of law became a qualification for the post, which under Marcus Antoninus and Commodus, but especially from the time of Severus, was held by the first jurists of the age (¢.g., Papinian, Ulpian, and Paullus), while the military qualification fell more and more into the background. Under Constantine the institution of the magistri militum deprived the prx- torian prefecture altogether of its military character, but left it the highest civil office of the empire.*~~

~~*The title of "prefect" was borne by various other Roman officials, of whom we may mention the following.*~~

~~*4, Preefectus Socium (soctorwm).—Under the republic the con- tingents furnished to the Roman armies by the Italian allies were commanded by*~~

~~*Roman officers called prafecti sociwm (soctorum), who were nominated by the consuls and corresponded to the*~~

~~*tribunes in the legions. 5. Prefectus Classtum.—Down to near the close of the republic a*~~

~~*| ge ee 653*~~

~~*naval command was never held independently but only in connexion with the command of an army, and, when the general appointed an officer to command the fleet in his room, this lieutenant was styled "preefect of the fleet" (prafectus classium). When in 311 B.C. the people took the appointment of these lieutenants into their own hands the title was changed from "prefects" to duo viri navalcs, or "two naval men"; but uuder the empire the admirals went by their old nanie of preefects.*~~

~~*6. Prefectus Fabrum.—tThe colonel of the engineer and artillery corps (fabri) in a Roman army was called a prefect; he did not belong to the legion, but was directly subordinate to the general in command.*~~

~~*7. Prefectus Annone.—The important duty of provisioning Rome was coninitted by Augustus (between 8 and 14 a.pD.) to a prefect, who was appointed by the emperor from among the knights and held office at the imperial pleasure.*~~

~~*8. Prefectus gypti (afterwards Prefectus Augustalis).—Under the empire the government of Egypt was entrusted to a viceroy with the title of "prefect," who was selected from the knights, and was surrounded by royal pomp instead of the usual insignia of a Roman magistrate. HIe stood under the immediate orders of the emperor. The exceptional position thus accorded to Egypt was due to a regard on the part of the emperors to the peculiar character of the population, the strategic strength of the country, and its political importance as the granary of Rome. (J. G. FS:)*~~

~~*PRAEMONSTRATENSIANS. See Assey, vol. i. p. 20, and MonacuisM, vol. xvi. p. 709.*~~

~~*PRASMUNIRE, the name given to a writ originating in the 14th century in the attempt to put restraint on the action of the papal authority in regard to the disposal of ecclesiastical benefices in England before the same became vacant, and subsequently, to the prejudice of the rightful patron, and also in the encouragement of resort to the Roman curia rather than to the courts of the country, in disregard of the authority of the crown, leading thereby to the creation of an imperium in imperio and the paying that obedience to papal process which constitutionally belonged to the king alone. The word "premunire"! is applied also to the offence for which the writ is granted, and furthermore to the penalty it incurs. The range and description of offences made liable to the penalties of premunire became greatly widened subsequently to the Reformation, so that acts of a very miscellaneous character were from time to time brought within the scope of enactments passed for a very different purpose. The offence is of a nature highly criminal, though not capital, and more immediately affects the crown and Government. The statute 16 Rich. II. c. 5 (1392) is usually designated the Statute of Premunire ; it is, however, but one only of numerous: stringent measures (many of which are still unrepealed) resulting from the enactment of the Statute of Provisors (35 Edw. I. c. 1), passed in a previous reign, which according to Coke (/nstit.) was the foundation of all the subsequent statutes of preemunire. Cowel (Law Dict.) describes a provisor as one who sued to the court of Rome for a provision which was called gratia expectiva.*~~

~~*The penalties of preemunire involved the loss of all civil rights, forfeiture of lands, goods, and chattels, and im- prisonment during the royal pleasure. In the Habeas Corpus Act (31 Car. II. c. 2, 1679) the committing of any man to prison out of the realin was made preemunire unpardonable even by the king. It thus appears that, whilst the crown by its prerogative might at any time remit the whole or any part of the punishment incurred by a premunire, an exception was made in transgressions of the Statute of Habeas Corpus. The Royal Marriage Act (12 Geo. IIL. c. 11) of 1772 is the last statute which sub- jects any one to the penalties of a premunire as ordained by 16 Rich. II.*~~

~~*It cannot be doubted that the legislation exemplified in the Statutes of Premunire and Provisors was felt by the*~~

~~1 Preniunire is a corruption of the Latin praemonere, to pre-admonish or forewarn, and is taken from the words of the writ itself, which runs "Premunire facias" A. B., &c., t.¢e., eause A. B. to be forewarned that he appear to answer the contempt wherewith he stands eharged.~~

~~popes to be a great check on their freedom of action. In the hands of Henry VIII. preemunire became eventually a lever for the overthrow of papal supremacy. The last ancient statute concerning preemunire, until the Reforma- tion, was the 2 Hen. IV. c. 3 (1400), by which all persons who accepted any provision from the pope to be exempt from canonical obedience to their proper ordinary were subjected to the penalties prescribed. Bishop Stubbs,! in summing up his account of the various statutes of pree- munire, succinetly says of them that they were intended to prevent encroachments on and usurpations of jurisdiction on the part of the pope, and he adds that the more 1mport- ant statute was that of 16 Rich. IL. c. 5 (1392), which he describes as one of the strongest defensive measures taken during the Middle Ages against Rome, and which was called for in consequence of the conduct of the pope, who had forbidden the bishops to execute the sentences of the royal courts in suits connected with ecclesiastical patron- age. Tomlins (Law Dict.) states that there is only one instance of a prosecution on a premunire to be found in the state trials, in which case the penalties were inflicted upon some persons for-refusing to take the oath of allegi- ance to Charles II. It may be added that on an indict- ment for preemunire a peer might not be tried by his peers.~~

~~See Coke, Instit.; Collier, Eccl. Hist., 1708; Hallam, Middle Ages, 1868; Stephen, Comm., 1853, and Hist. Crim. Law; and Stubbs, Constit. Hzst., 1880.~~

~~PRASNESTE (now PaEsTRINA), a very ancient city of Latium, lies 22 miles east of Rome on a spur of the Apen- nines facing the Alban Hills. To the natural strength of the piace and its commanding situation Preeneste owed in large measure its historical importance. The local tradition (adopted by Virgil) named Czculus, son of Vulcan, as founder. From the remains of Cyclopean masonry and other indications the foundation of the city has been referred to the 8th century B.c., and objects in metal and ivory~~

~~*discovered in the earliest graves prove that as early as this or the following century Preeneste had reached a considerable degree of civilization and stood in com- mercial relations not only with Etruria but with the East. At this time the city was probably under the hegemony of Alba Longa, then the head of the Latin League. In 499, according to Livy, Preneste withdrew from the Latin League and formed an alliance with Rome, but this state- ment seems irreconcilable with a. passage in Dionysius Halicarnensis (Ant. Rom., v. 61). After Rome had been weakened by the Gallic invasion (390), Praeneste joined its foes in a long struggle with Rome. The struggle cul- minated in the great Latin War (340-338), in which the Romans were victorious, and Preneste was punished for its share in the war by the loss of part of its territory. It was not, however, like the other Latin cities, enibodied in the Roman state, but continued in the position of a city in alliance with Rome down to the Social War, when it, like the rest of Italy, received the Roman franchise (90 or 89). As an allied city it furnished contingents to the Roman army and possessed the right of exile (jus exilit), t.e., persons banished from Rome were allowed to reside at Preeneste. To judge from the works of art and _inscrip- tions of this period (338 to 90 B.c.), it must have been for the place a time of prosperity and even luxury. The nuts of Preoneste were famous and its roses were amongst the finest in Italy. The Latin spoken at Preeneste was some- ae ee oe ee eee*~~

~~*: Constit. Hist. of Eng. (1880), iii. 356 sq.*~~

~~*. Thus the Preenestines shortened some words: they said conia for cicoma, tammodo for tantummodo (Plaut., Truc., iii. 2, 23; Id., = eo Al, ils Se cp. Comment. on Festus, p. 731, ed. Lindemann),*~~

~~*criptions exhibit the forms Acmemeno and Tondrus for Aga- memno and Tyndarus. They said nefrones for nefrendes in the sense*~~

~~*of testiculi, and tongitio for notio (Festus, s.v. “ hr giti .v. “nefrendes” and “tongere”). Cp. Quintilian, Jnstit., i. 5, 56.*~~

~~*PRA—PR & :*~~

~~*Marius was blockaded in the town by the Sullans (82 B.c.); and on its capture Marius slew himself, the male inhabitants were massacred in cold*~~

~~*blood, and a military colony was settled on part of its territory. It was prob- ably about this time that the city was extended from the hill to the plain and that the temple of Fortune was enlarged so as to include much of the space occupied by the ancient city. Under the empire Preneste, from its elevated situation and cool salubrious air, became a favour- ite summer resort of the wealthy Romans, whose villas studded the neighbourhood. Horace ranked it with Tibur and Baie, the Bath and Brighton of Rome. Augustus resorted thither ; here Tiberius recovered from a danger- ous illness, and here Hadrian built himself a villa. Anto- ninus erected a palace to the east of the town. Amongst private persons who owned villas at Praeneste were Pliny the younger and Symmachus.*~~

~~*But Preeneste was chiefly famed for its great temple of Fortune and for its oracle, in connexion with the temple, known as the "Przenestine lots" (sortes Prenestine). As extended by Sulla the sanctuary of Fortune occupied a series of six vast terraces, which, resting on gigantic sub- structions of masonry and connected with each other by grand staircases, rose one above the other on the hill in the form of the side of a pyramid, crowned on the highest terrace by the round temple of Fortune proper. This immense edifice, probably by far the largest sanctuary in Italy, must have presented a most imposing aspect, visible as it was froma great part of Latium, from Rome, and even from the sea. The goddess Fortuna here went by the name of Primigenia (First-Born, but perhaps in an active sense First-Bearer) ; she was represented suckling two babes, said to be Jupiter and Juno, and she was especially worshipped by matrons.? The oracle of the Preenestine lots was very ancient and continued to be con- sulted down to Christian times. Constantine and Theodo- sius forbade the practice and closed the temple. In 1297 the Colonna family who then owned Preeneste (Palestrina) revolted from the pope, but in the following year the town was taken and razed to the ground. In 1437 the city, which had been rebuilt, was captured by the papal general Cardinal Vitelleschi and once more utterly destroyed. It was rebuilt and fortified by Stefano Colonna in 1448. In 1630 it passed by purchase into the Barberini family. Preeneste was the native town of ASlian and in modern*~~

~~*times of the great composer Palestrina.*~~

~~*The modern town of Palestrina, a collection of narrow and filthy alleys, stands on the terraces once occupied by the temple of Fortune. On the summit, of the hill (2546 feet), nearly a mile from the town, stood the ancient citadel, the site of which is now occupied by a few poor houses (Castel San Pietro) and a ruined medieval castle of the Colonnas. The magnificent view embraces Soracte, Rome, the Alban Hills, and the Campagna as far as the sea. Considerable portions of the southern wall of the ancient citadel, built in very massive polygonal (Cyclopean) blocks of limestone, are still to be seen ; and the two walls, also polygonal, which formerly united the citadel with the lower town, can still be traced. The ruins of the villa of Hadrian stand in the plain near the church of S. Maria*~~

~~*3 Hence Fernique (Ktude sur Préneste) ingeniously conjectures that Fortuna was originally a goddess of maternity, and that the view of her functions as a goddess of chance was later, being due to the in- fluence of Greek mythology, in which Chance (T'xy) was a goddess. Fortuna contains the same root as ferre, "to bear." Fernique observes that the worship of Fortuna was often associated with that of Feronia. Statuettes in terra-cotta representing a woman with a child at her breast have been found at Preneste. These are supposed by Fernique to be votive offerings, representing not the goddess but the mothers who offered them at the shrine in fulfilment of vows. Fortuna was some- times represented in the form of two (or possibly more) females, so at Antium (Macrobius, Sat., i. 23, 18 ; Sueton., Cal., 57), and perhaps at Preeneste (Statius, Sylv., i. 3, 80); in one of the Roman temples of Fortuna there was a mysterious veiled figure. Analogous to Fortuna in her double capacity as prophetess and patron of mothers was Car- menta, and she too was sometimes represented in double form (Ovid, Fastt, i. 617 sg. ; Aulus Gellius, xvi. 16).*~~

~~*della Villa, about three-quarters of a mile from the town. Here was discovered the well-known statue of Antinous, now in the Vatican. Not far off was found in 1773 the calendar which, as Suetonius tells us, was set up by the grammarian M. Verrius Flaccus in the forum of Preneste. Excavations made, especially since 1855, in the ancient necropolis, which lay on a plateau sur- rounded by valleys at the foot of the hill and of the*~~

~~town, have yielded important results for the history of the art and manufactures of Preneste. Of the objects found in the oldest graves, and sup- posed to date from about the 7th century B.c., the cups of silver and silver-gilt and most of the gold and amber jewellery are Pheeni- cian (possibly Carthaginian), or at least made on Pheenician models ; but the bronzes and some of the ivory articles seem to be Etruscan. No objects have been discovered belonging to the period inter- mediate between the 7th and 3d centuries B.c. ; but the graves of the 3d and 2d centuries have yielded many precious relics, bronze caskets (cista#), convex metal mirrors, strigils, &. Among these is the famous Ficoroni casket, engraved with pictures of the arrival of the Argonauts in Bithynia and the victory of Pollux over Amycus. It was found in 1774. The inscriptions on the caskets are all Latin ; those on the mirrors are mostly Etruscan ; those on the strigils are Latin, Greek, and Etruscan. The Latin inscriptions seem to belong to the 3d century. On the whole it appears that between the 3d and 2d centuries there existed at Preeneste a native Latin art, which was, however, beginning to be affected by Greek art. Most of the objects discovered in the necropolis are preserved in the Roman collections, especially the Kircher Museum (which possesses the Ficoroni casket) and the Barberini Library. Besides these there is preserved in the Barberini Palace at Palestrina a large mosaic, considered one of the most important in existence. It was found on the site of the temple of Fortune and probably dates from the age of Augustus or Tiberius. It represents scenes from the Nile, with animals and figures in Egyptian and Greek costume. (J. G. FR.) PRATOR (pre-tor, "he who goes before," "a leader "), originally a military title, was in classical times the designa- tion of the highest magistrates in the Latin towns. The Roman consuls were at first called "preetors"; in the early code of the Twelve Tables (450 B.c.) they appear to have had no other title. By the Licinian law of 367 B.c., which abolished the military tribunes with consular power and enacted that the supreme executive should henceforward be in the hands of the two consuls, a new magistrate was at the same time created who was to be a colleague of the consuls, though with lower rank and lesser powers. This new magistrate was entrusted with the exclusive jurisdic- tion in civil cases ; in other respects his powers resembled those of the consuls. HIs distinctive title was the "city pretor" (pretor urbanus), and in after time, when the num- ber of praetors was increased, the city praetor always ranked first. To this new magistrate the title of '" przetor" was thenceforward properly~~

~~*restricted! About 242 B.c. the increase of a foreign population in Rome necessitated the creation of a second pretor for the decision of suits between foreigners (peregrint) or between citizens and foreigners. . This praetor was known at a later time as the "foreign pretor" (pretor peregrinus). About 227 B.c. two more pretors were added to administer the recently acquired provinces of Sicily and Sardinia. The conquest of Spain occasioned the appointment of two more in 197 B.c., of whoin one goverhed Hither and the other Further Spain. The number of pretors, thus augmented to six, remained stationary till Sulla's time, 82 B.c. But in the interval their duties vastly multiplied. On the one hand, five new provinces were added to the Roman dominions—Macedonia and Achaia in 146 B.c., Africa in the same year, Asia in 134, Gallia Narbonensis in 118, Cilicia probably in 102. On the other hand, new and permanent jury courts (ques- tiones perpetux) were instituted at Rome, over which the pretors were called on to preside. To meet this increase of business the tenure of office of the preetors and also of*~~

~~*1 Some writers, following Livy, vi. 42, assert that at first the pretor- ship was open to patricians only, but Mommsen (Adm. Staatsrecht, ii. p. 195) shows that this is probably a mistake. The election of a plebeian to the office for the first time in 337 B.c. was certainly opposed by the consul who presided at the election, but there appears to have been no legal obstacle to it.*~~

~~*the consuls was practically prolonged from one to two years, with the distinction that in their second year of office they bore the titles of "' propreetor " and " proconsul" instead of "preetor" and "consul." The prolongation of office, together with the participation of the proconsuls in duties which properly fell to the preetors, formed the basis of Sulla's arrangements. He increased the number of the pretors from six to eight, and ordained that henceforward all the eight should in their first year administer justice at Rome and in their second should as propreetors undertake the government of provinces. The courts over which the preetors presided, in addition to those of the city preetor and the foreign preetor, dealt with the following offences : —oppression of the provincials (repetundarum), bribery (ambitus), embezzlement (peculatus), treason*~~

~~(majestatis), murder (de sicarits et venefics), and probably forgery (falst). A tenth province (Gallia Cisalpina) was added to the pre- vious nine, and thus the number of judicial and provincial departments corresponded to the annual number of przetors, proprectors, and proconsuls. The proportion, however, was not long maintained: new provinces were added to the empire —Bithynia in 74 B.c., Cyrene about the same time, Crete in 67, Syria in 64 —and one or more new law courts were instituted. To keep pace with the increase of duties Julius Cesar increased the number of preetors successively to ten, fourteen, and sixteen ; after his time the number varied from eight to eighteen.~~

~~The preetors were elected, like the consuls, by the people assembled in the comitia centurvata and with the same formalities. (See Consun.) They regularly held office for a year; only in the transition period between the republic and the empire was their tenure of office some- times limited to a few months. The insignia of the preetor were those common to the higher Roman magis- trates,—the purple-edged robe (toga pretexta) and the ivory chair (sella curulis); in Rome he was attended by two lictors, in the provinces by six. The pretors elect cast lots to determine the department which each of them should administer. A pretor was essentially a civil judge, and as such he was accustomed at or before his entry on office to publish an edict setting forth the rules of law and pro- cedure by which he intended to be guided in his decisions. As these rules were often accepted by his successors the pretor thus acquired an almost legislatorial power, and his edicts thus continued, corrected, and amplified from year to year became, under the title of the 'perpetual edicts," one of the most important factors in moulding Roman law. Their tendency was to smooth away the occasional harsh- ness and anomalies of the civil law by substituting rules of equity for the letter of the law, and in this respect the Roman pretor has been compared to the English chancellor. HIs functions were considerably modified by the introduc- tion of the standing jury courts (quxstiones perpetux). HItherto the preetor had conducted the preliminary inquiry as to whether an action would lie, and had appointed for the actual trial of the case a deputy, whom he instructed in the law applicable to the case and whose decisions he enforced. The proceedings before the praetor were tech- nically known as jus in distinction from judecvwm, which was the actual trial before the deputy judge. But in the standing jury courts (of which the~~

~~first—that for repetundz —was instituted in 149 B.c.), or rather in the most import- ant of them, the pretors themselves presided and tried the cases. These new courts, though formally civil, were substantially criminal courts; and thus a criminal juris- diction was added to the original civil jurisdiction of the pretors. Under the empire various special functions were assigned to certain preetors, such as the two treasury preetors (pretores xrarti), appointed by Augustus in 23 B.c.; the spear pretor (pretor hastarius), who presided over the~~

~~court of the Hundred Men, which dealt especially with cases of inheritance; the two trust preetors (pretores Jideicomissarii), appointed by Claudius to look after cases of trust estates, but reduced by Titus to one; the ward pretor (pretor tutelaris), appointed by Marcus Antoninus to deal with the affairs of minors; and the liberation pretor (pretor de liberalibus causis), who tried cases turn- ing on the liberation of slaves. There is no evidence that the preetors continued to preside over the standing courts after the beginning of the 3d century A.D., and the foreign preetorship disappears about this time.' Even the juris- diction of the city praetor seems not to have survived the reforms of Diocletian, though the office itself continued to exist. But of the preetorships with special jurisdiction (especially the ward preetorship and the liberation preetor- ship) some lasted into the 4th century and were copied in the constitution of Constantinople.~~

~~Besides their judicial functions, the przetors, as colleagues of the consuls, possessed, though in a less degree, all the consular powers, which they regularly exercised in the absence of the consuls; but in the presence of a consul they exercised them only at the special command either of the consul or, more usually, of the senate. Thus the preetor possessed military power (¢mpertum) ; even the city preetor, though attached by his office to Rome, could not only levy troops but also in certain circumstances take the command in person. As provincial governors the preetors had frequent occasion to exercise their military powers, and they were often accorded a triumph. The city preetor presided over popular assemblies for the election of certain inferior magistrates, but all the preetors officiating in Rome had the right to summon assemblies for the pur- pose of legislation. In the~~

~~*absence of the consuls the city pretor, and in default of him the other preetors, were em- powered to call meetings of the senate. Public religious duties, such as the fulfilment of state vows, the celebration of sacrifices and games, and the fixing of the dates of mov- able feasts, probably only fell to the praetors in the absence of the consuls. But since in the early times the consuls as a rule spent only the first months of their year of office in Rome it is probable that a considerable share of religious business devolved on the city preetor ; this was certainly the case with the Festival of the Cross-roads (compitalia), and he directed the games in honour of Apollo from their institution in 212 Bc. Augustus in 22 B.c. placed the direction of all the popular festivals in the hands of the preetors, and it is not without significance that the preetors continued thus to minister to the pleasures of the Roman mob for centuries after they had ceased almost entirely to transact the business of the state. For the preetor as provincial governor, see ProvincE. (J. G. FR.)*~~

~~*PRETORIANS (pretoriant) was the name borne by the body-guards of the Roman emperors. The name was derived from the pretorian cohort, a picked body of troops who in the time of the republic formed the guard of a general in command of an army, the old Latin name for a general being pretor and his quarters in the camp being known as the pretorium. As the emperor was commander- in-chief the headquarters (pretoriwm) were established at Rome, and one of the earliest measures of Augustus was the new organization of the guard. The command of the preetorians rested legally with the emperor, but after 2 B.c. 1t was practically exercised by one or more colonels chosen by the emperor with the title of "pratorian prefects" (preefecti prextorio, see Prarect). The preetorians were divided into cohorts of 1000 men each, horse and foot, and hence they are often referred to as the preetorian cohorts. ee ee eee ee*~~

~~*1 Marquardt conjectures with much probability that when Caracalla*~~

~~*extended the Roman franchise to the whole empi h ; abolished the foreign pretorship. pire he at the same time*~~

~~*Ph A*~~

~~*PR A*~~

~~*Augustus raised nine corps, of which he quartered three in different parts of Rome and the rest in neighbouring cities. One cohort kept guard in the palace. Under Tiberius the crafty and energetic pretorian prefect Sejanus collected the pretorians into a permanent fortified camp outside the Viminalian Gate of Rome. Thus united they acquired and exercised the power of making and unmaking emperors. The number of the cohorts was raised temporarily by Vitel- lius to sixteen ; from 112 a.pD. to the end of the 3d century, and probably to the time of Constantine, the number was ten. At first they were recruited exclusively from Italy, but afterwards from the Romanized provinces also of Spain, Noricum, and Macedonia. Their pay was nominally double, but really more than double, that of the legionaries ;? their period of service was shorter, being sixteen years instead of at least twenty ; and from the time of Claudius it was the custom of the eniperors on their succession to the throne to purchase the favour of their powerful guards by a liberal donative. But the sense of their own power, to which these special privileges bore witness, fostered the pride, while the luxurious life of the capital relaxed the disci- pline, of the pretorians. Their insolence culminated when they murdered the virtuous Pertinax, put the empire up to auction, and knocked it down to the highest bidder (193). In the same year they were disgraced and disbanded by Severus, only, however, to be replaced by a still more numer- ous corps,? which was now recruited indifferently from all parts of the empire. Diocletian reduced their numbers, and they were finally suppressed by Constantine in 312.*~~

~~*PRATORIUS,* Micwarn (1571-1621), German musical historian, theorist, and composer, was born at Kreuzberg in Thuringia on 15th February 1571. HIe acted as kapell- meister at Liineburg early in life, was engaged first as organist and later as kapellmeister and secretary to the duke of Brunswick, and was eventually rewarded for his long services with the priory of Ringelheim, near Goslar. HIe died at Wolfenbiittel on 15th February 1621. Of his very numerous compositions copies are now so scarce that it is doubtful whether a complete set is anywhere to be found. The most important are—Polyhymnia (15 vols.), Muse Stomz (16 vols.), and Afusa Aonia (9 vols.), all written partly to Latin and partly to German words. But more precious than all these is the Syntagma musicum (3 vols. and a cahier of plates, 4to, Wittenberg and Wolfenbiittel, 1615-20). Only two copies of this very rare work are believed to exist in England, one in the library of the*~~

~~*Rev. Sir F. A. Gore-Ouseley and the other in that of Mr Alfred Littleton. In the original prospectus of the work four volumes were promised, but it is certain that no more than three were ever published. The fourth volume mentioned in Forkel's catalogue is clearly nothing but the cahier of plates attached to vol. ii.*~~

~~*? The legionaries received 10 asses daily, or 3600 asses (= 225 denarii) annually ; the pretorians received twenty asses daily, or 7200 asses annually. But, whereas in paying the legionaries the as was reckoned at its current value of 16 to the denarius, in paying the pretorians it was reckoned at its old and higher value of 10 to the denarius, and hence the 7200 asses of a pretorian were equal to 11,520 asses at the current rate, or 720 denarii. This is Mommsen's highly ingenious and probable explanation of the apparent discrepancy between the state- ments of Dio Cassius (liii. 11, 55) and Tacitus (Ann., i.17). See Mar- quardt's Rdmische Staatsverwaltung, ii. p. 480. Pliny (WV. H., xxxiii. 45) states that after the value of the as was lowered it continued to be reckoned at its old value in the payment of soldiers. But by combin- ing the statements of Suetonius (C#s., 26, and Domit., 7) we see that Julius Cesar, while he nominally and really raised the pay of the soldiers, paid it in asses of the current value, and hence after his time it was only the pretorians who retained the privilege of having their pay reckoned in asses of the old value (see Marquardt, op. cit., p. 95).*~~

~~*3 According to Herodian (iii. 18, 4) Severus increased the troops in Rome fourfold.*~~

- ~~*German Schultz or Schultze (Schultheiss), meaning the head-man of a township, Latinized into Pretor or Preetorius. Many other members of the family of Pretorius were eminent as musicians.*~~

~~*PRA—PRA*~~

~~*The chief value of this very remarkable work lies in the informa- tion it gives concerning the condition of instrumental music in the early years of the 17th century. The plates include excellent representations of all the musical instruments in use at the time they were published, together with many forms even then treated only as antique curiosities. Many of these instruments are known to us only through these representations and the*~~

~~*descriptions with which they are accompanied, the instruments themselves having long fallen into disuse, and no real examples having been preserved to us. Among the most important instruments described and figured are the whole family of flutes, oboes, and bassoons; the different kinds of trombone, many of which exactly resemble those now in use; trumpets and horns of all conceivable varieties ; viols, violins, and basses; the entire family of stringed and keyed instruments, including the psaltery, the spinet, the harpsichord, and a curious combination of the harpsichord and viol called the " Nurembergisch Geigenwerck," known only through this description ; and finally the organ, to the historical and technical description of which an entire section is devoted. The work thus throws a light upon the earlier forms of instrumental music which to the historian is invaluable. In fact, without the information bequeathed to us by Pretorius it would be impossible to reconstruct in theory the orchestra of the earlier half of the 17th century, during which the opera and the oratorio both sprang into existence, or even to understand the descriptions left us by other less careful writers.*~~

~~*_ PRAGMATIC SANCTION, the technical name given to some decrees which have been issued as fundamental laws. The term is of Byzantine origin, the edicts of the Eastern emperors having been called "pragmatics." There is a famous document known as the Pragmatic Sanction of St Louis, which contains six articles directed against the assumptions of the papacy; but there are reasons for doubt- ing its genuineness. In 1438 Charles VII. of France issued at Bourges a pragmatic sanction which embodied the most important decisions of the council of Basel. This decree formed the basis of the liberties of the Gallican Church. Louis XI. entered into negotiations with the papacy for its revocation ; but it continued in force until the time of Francis I., who substituted for it a concordat with Pope Leo X. The decisions of the council of Basel were also embodied: in a pragmatic sanction by a diet which met at Mainz in 1439; but by the concordat of Vienna, concluded in 1448 by the emperor Frederick ITI. with Pope Nicholas V., most of the advantages which the diet had hoped to secure for the church in Germany were abandoned. The most famous of all pragmatic sanctions was that of the emperor Charles VI. In 1713 it was issued as a family statute, but, as the emperor proposed that it should become a fundamental law of the state, it was afterwards submitted to the diets of the*~~

~~*lands ruled by the house of Austria by hereditary right. Having been accepted by the estates of Lower Austria and Bohemia in 1720, by the Hungarian diet in 1722, and by the remaining diets between 1720 and 1724, it was pro- claimed as a fundamental law on the 6th of December 1724. By this edict it was decreed that the Austrian lands should always be united ; that they should be ruled by Charles VI.'s male descendants; that, if he had no male descendants, his territories should pass to his female descendants; and that, if his female descendants died without issue, the right of succession should belong to the daughters of his brother Joseph and to their male and female offspring in accordance with the law of primogeniture. In the interest of his daughter Maria Theresa the emperor spared no pains to secure from the empire and from the other powers guarantees for the execution of this law; and, when his nieces, who as the daughters of his elder brother might prove to be dangerous rivals of Maria Theresa, were married, one to the electoral prince of Saxony, the other to the electoral prince of Bavaria, he caused them to declare on oath that they abandoned their claims. Nevertheless after his death the pragmatic sanction led to the War of the Austrian Succession. In 1759 a pragmatic sanction was issued by Charles III. of Spain granting the throne of the Two Sicilies to his third son and his descendants.*~~

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~~*PRAGUE (German, Prag ; Bohemian, Praha), the capi- tal of Bohemia, the seat of an archbishop, and the third largest town of the Austrian-Hungarian monarchy, lies on both banks of the Moldau in 50° 5' N. lat. and 14° 25' E, long., 150 miles to the north-west of Vienna and 75 miles to the south-south-east of Dresden. Its position, near the centre of the country and at the only point where the valley of the Moldau expands sufficiently to make room for a great city, marks it out as the natural capital of Bohemia, and the picturesque effect of its masses of build- ings and innumerable spires and towers, filling the valley and climbing the hills on either side, is enhanced by their stirring historical background. The heights on the left bank descend somewhat rapidly to the river and are crowned by the venerable Hradschin, or palace of the Bohemian kings, which forms the dominant feature in every view of the town. On the other bank there is a considerable level space between the river and the base of the hills. An additional charm is lent to*~~

~~*the scene by the pleasant green islands in the Moldau, which is here 500 to 1500 feet in width. The general features of the situation recall those of Budapest, and the smaller scale is fully compensated for by the greater variety and interest of the buildings.*~~

~~*The town proper consists of four main divisions, the Altstadt and the Neustadt on the right bank of the Moldau, and the Kleinseite and the Hradschin on the left. Imme- diately beyond the old line of circumvallation are the suburbs of Carolinenthal, Wyscherad, Smichow, and Wein- berg, while these in turn are adjoined by various outer suburban districts. Down to 1866 Prague was surrounded with walls and bastions, which, however, had long lost their military importance, and have since been, to a great*~~

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~~*Plan of Prague.*~~

~~*1. Imperial Palace. 10. Church of the Knights 17. Nat. Bohem. Museum. 2. St Vitus's Cathedral. of the Cross. 18. Maria Schnee Church. 8. Belvedere Villa. 11. Clementinum. 19. Savings Bank.*~~

~~*4, Palace Waldstein. 12, Count Clam Gallas's 20. Bohemian Theatre.*~~

~~5. St Nicholas Church. Palace. 21. Neustadt Town-house. 6. Capuchin Monastery. 13. Town-house. 22. Technical College.~~

~~7. St Loretto Church. 14. Teyn Church. 23. Emmaus Church.~~

~~8. Strahow Monastery. 15. Carolinum. 24. Carlshof Church.~~

~~9. Rudolfinum. 16. Civil Courts. 25. Jewish Cemetery.~~

~~extent, removed. The two sides of the river are connected by seven bridges, of which the most important are the Kaiser Franz suspension bridge, the new Palacky bridge, and the fine old Carls bridge. This last, erected between 1350 and 1500, is closed at each end by a medieval gate- tower, of which that to the east is particularly interesting. The numerous buttresses are adorned with statues of saints, XIX. — 83~~

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~~among them that of St J ohn Nepomuk, who earned his title to be regarded as the patron saint of bridges from the fact that he here allowed himself to be thrown into the Moldau at the order of King Wenceslaus rather than divulge the queen's confidences in the confessional (1393). The statue is regarded with great veneration and is visited by thousands of devotees on the saint's anniversary (16th May).~~

~~The Altstadt, or old town, is the most densely populated part of Prague and the principal seat of traffic. Most of the streets are narrow and irregular, but the centre of the district is occupied by a spacious square called the Grosser Ring, and the side next the Moldau is bordered by wide quays embellished with handsome monuments to Charles IV. and Francis I. On one side of the Ring stands the town-house, to a great extent rebuilt, but still comprising part of the medizval structure that witnessed so many of the stormy scenes of Bohemian history. Opposite is the Teyn church, or old church of the Calixtine Hussites, built in 1407, and containing the tomb of Tycho Brahe, the Danish astronomer. Another interesting structure is the Late Gothic Pulverthurm, a relic of the old wall that once separated the Altstadt from the Neustadt. The Altstadt is also the seat of the university and several other educa- tional establishments. The university, founded by~~

~~Charles IV. in 1348, was the first in the German empire, and was attended by 10,000 to 15,000 students, until invidious distinctions made between Bohemians and Germans led the latter to secede in a body and found academies for themselves in other parts of Germany. The institution, however, still ranks high among European seats of learning and numbers above 2600 students. Lectures are delivered both in Bohemian and in German, and students may graduate in either language. The faculties of medicine and law occupy the Carolinum near the town-hall, while those of theology and philosophy are established in the Clementinum, a huge old Jesuit college, which also com- prises the university library (180,000 vols.), several chapels, a school, and the archiepiscopal seminary. The most con- spicuous modern buildings are the civil courts, the savings bank, and the Rudolfinum, a large Renaissance edifice on the quay, containing an academy of art, a conservatorium for music, and an industrial museum. The church of the Knights of the Cross (Kreuzherrenkirche) is an imposing building modelled on St Peter's at Rome, and the palace of Count Clam Gallas is a tasteful Renaissance structure of 1701. Enclosed within the Altstadt is the Josephstadt, or Jewish quarter, a labyrinth of crowded and dingy streets, to which the Jews were strictly confined down to 1848. The Jewish colony of Prague is one of the most ancient in Europe; the Jewish cemetery, with its thousands of closely-packed tombstones interspersed with shrubs and creeping plants, is one of the most curious sights in Prague.~~

~~The Neustadt, or new town, surrounds the old town in~~

~~the form of a semicircle, reaching the river both to the~~

~~north and to the south of it. The site of the old wall and nioat that formerly separated the two quarters is now occupied by a line of the handsomest and busiest streets in Prague, and the rest of the Neustadt also consists of broad and well-built streets and squares. Conspicuous among the buildings are the numerous hospitals and asylums on the south side, forming a phalanx of charitable institutions that do great credit to the philanthropy of the citizens. 'The town-house, now used as a criminal court, 1s Interesting as the spot where the Bohemian Hussite war was inaugurated by the hurling of several unpopular councillors from the window. Other noteworthy edifices are the Bohemian museum, the Bohemian technical college (1500 students),~~

~~*the magnificent new Bohemian theatre (erected at a cost of £200,000), and the churches of*~~

~~*PRAGUE*~~

~~*Carlshof, Emmaus, and Maria Schnee. To the south the Neustadt is adjoined by the Wyscherad, or citadel, the oldest part of Prague. The original fortress was almost entirely destroyed by the Hussites, and the present fortifi- cations are modern.*~~

~~*The Kleinseite, or Little Prague, on the left bank of the Moldau, occupies the slopes of the Laurenzberg and the Hradschin and is the headquarters of the aristocratic and official classes. Like the Altstadt, its centre is formed by a "ring," containing the large and handsome Jesuit church of St Nicholas and a fine monument to Marshal Radetzky. The most generally interesting of the numer- ous palaces of the Bohentian noblesse is the Palace Wald- stein or Wallenstein, an extensive edifice built by the hero of the Thirty Years' War and still occupied by his descendants. Kleinseite also contains the hall of the Bohemian diet and the residence of the statthalter or governor of Bohemia. To the north it ends in the plea- sant promenades named after the crown-prince Rudolf, which stretch along the bank of the Moldau.*~~

~~*The Hradschin, or castle hill, rises abruptly behind the Kleinseite to a height of about 240 feet. The imperial palace, a vast and irregular group of buildings crowning the height, is remarkable rather for its situation and extent than for architectural importance. It is said to have been founded by Princess Libussa, and was greatly enlarged by Charles IV. and others, but now offers little of a medieval character with the exception of two or three towers. Few of the 440 rooms it is said to contain are of any special interest; in the council chamber is still pointed out the window from which the imperial council- lors Martinitz and Slavata were hurled in 1618. Within the large court of the palace stands the cathedral of St Vitus, begun in 1344, in evident imitation of the cathedral of Cologne, but consisting of little more than the extensive Late Gothic choir (1385). Efforts are now being made to bring it to completion. The tower was originally 500 feet high, but lost two-fifths of its height by a fire. The interior enshrines several works of con- siderable interest and value, such as the mausoleum of the*~~

~~*Bohemian kings, a fine Renaissance work in alabaster and marble by Alex. Colin of Mechlin (1589); the shrine of St John Nepomuk, said to contain 14 tons of solid silver ; and the chapel of St Wenceslaus, the walls of which are encrusted with jasper, chalcedony, and amethyst. In the treasury are the Bohemian regalia. The palace precincts also enclose the church of St George, dating from the 12th century, and one of the few Romanesque edifices of which Prague can boast. To the west of the imperial palace is a wide square with three large palaces, one belonging to the archbishop of Prague. Farther on is another square, surrounded by the extensive palace of Count Czernin (now a barrack), a large Capuchin monastery, and the church of St Loretto, an imitation of the wandering Casa Santa. At the extreme west of this quarter, adjoining the wall, is the imposing monastery of Strahow, possessing a good collection of pictures and a large library. To the north of the imperial palace is a picturesque gorge called the Hirschgraben, beyond which are the palace gardens, con- taining the Belvedere, a villa erected by Ferdinand I. in 1536, and considered one of the most tasteful reproduc- tions of Italian architecture to the north of the Alps.*~~

~~*Prague is unusually well supplied with public parks and gardens, as, in addition to those already mentioned, pleasure-grounds have been laid out on the islands in the Moldau, on the slopes of the Laurenzberg, and on part of the ground occupied by the old fortifications. Among the most popular resorts are the charming grounds of the Baumgarten, a mile to the north of the Kleinseite. Both the industry and the commerce of Bohemia have their*~~

~~*focus in Prague, the chief seats of the former being the large manufacturing suburbs of Smichow (21,000 inhabit- ants) and Carolinenthal (20,000 inhabitants), the one to the south of the Kleinseite and the other to the north- east of the Neustadt. The most prominent items in a very miscellaneous list of industrial products are linen, cotton, calico, and leather goods, gloves, machinery, con- fectionery, beer, and chemicals. Garnet wares also form a specialty. 'Trade is facilitated by an extensive system of roads and railways, but the river navigation is unim- portant owing to the numerous weirs and the insufficient depth. In 1880 Prague*~~

~~*proper contained 162,323 in- habitants, or including the suburban districts about 250,000 ; and at the beginning of 1885 the total popula- tion was officially stated at 272,333. Nearly five-sevenths of these are of Slavonic race, while all are Roman Catholics with the exception of 20,000 Jews and 5000 Protestants. The Germans, however, though diminishing in relative numbers, still claim to represent the bulk of the capital*~~

~~*and culture of the city. The garrison consists of from 8000 to 10,000 men.*~~

~~*The foundation of Prague is ascribed to the princess Libussa, who appears at the beginning of the 8th century of our era as ruling the Bohemians from her stronghold of Wyscherad on the right bank of the Moldau. It is at least certain that the town made rapid progress under the fostering care of the early Bohemian sovereigns, and in the 138th century it was able to bid defiance to the Tatar hordes that then overran the country. Its chief period of prosperity was the reign of Charles IV. (1346-1378), who by found- ing the university, establishing fairs, and investing the town with valuable privileges attracted to it numerous strangers. At this time Prague was perliaps the most important town in Germany, and could even boast of an independent school of art. Afterwards, however, Prague became the centre of the agitation that culmi- nated in the Hussite wars, and thus brought upon itself a long train of misfortunes. The Hussites took possession of the city soon after defeating the emperor Sigismund, aud allowed their re- ligious zeal to carry them so far as to destroy many of the most interesting old churches in the city—a fact that accounts for the want of venerable ecclesiastical edifices in Prague. The town was, however, afterwards rebuilt by the imperialists upon an improved scale. Under Rudolf IJ. (1576-1612) a second season of prosperity was enjoyed ; Copernicus, Tycho Brahe, and other men emineut in science, art, or letters flocked to the court of this enliglitened monarch and contributed to the importance of his capital. Prague suffered its full share of the evils of the Thirty Years' War, which may be said to have begun here with the precipitation of the councillors from the window of the Hradschin (1618), and to have ended here with the occupation of the Kleinseite by the Swedes in 1648. The town was occupied by the imperialists after the defeat of the Protestants at the White Hill in 1620, and its Protestant sympathies caused it to find scant grace in the eyes of tlie victors. It was taken by the Swedes in 1631, by Wallenstein in 1632,*~~

~~by the French and Bavarians in 1741, and by Frederick the Great in 1744. In 1757 it narrowly escaped a second capture by Frederick, who held it closely invested after defeating the Austrians at the battle of Prague, but was compelled to raise the siege by the disaster of Kolin. This was the last time Prague underwent a siege, though it was occupied by the Prussians in 1866. During the present century its material advance has been unbroken, but its harmonious social development has been hampered by the disunion between the Czechish and German elements of its population. The revolutionary ideas of 1848 found a warm response in the nationalist party of Bohemia, and a Pan-Slavonic congress was opened at Prague in May of that year. Unfortunately, however, a collision took place between the military and the populace, and Prince Windiscligritz forcibly dissolved the congress and bombarded the town for two days. Jn 1862 a new impetus was given to the Slavonic agitation by the formation of a Bohemian diet, and since then the fissure between the warring races has grown wider rather than diminished. The Slavs seem to be steadily gaining ground at the expense of the Germans both in numbers and influence. Among the celebrated natives of Prague the most eminent in public interest are John Huss (1369-1415) and Jerome of Prague (c. 1865-1416).~~

~~PRAIHRAN, a city of Victoria, Australia, is situated about 34 miles south-east of Melbourne, with which it is~~

~~connected by the Melbourne and Brighton Railway, and by road over a fine iron girder bridge which crosses the~~

~~Yarra. It is a well-built city, with handsome shops and numerous villas. Among the public buildings are the town-hall, with a lofty tower, containing the rooms of the free library, and the mechanics' institute. There are a number of charitable institutions. Prahran was created a municipality in 1856, a borough in 1863, and a city in 1879. The area of the city is 2320 acres, with a popula- tion in 1881 of 21,169.~~

~~PRAIRIE DOG. See Marmot, vol. xv. p. 560.~~

~~*PRAKRIT (praékrta, "common," as contrasted with samskrta, " perfect") is the term applied to the vernacular languages of India derived from Sanskrit. In the San- skrit drama all except the highest male characters speak Prakrit. Prakrit grammar was written in the Hindu scientific style—on the lines of Panini—by Vararuci, one of the "nine gems" of Vikramaditya's court,! and by Hemacandra ; these grammarians distinguish at least four different kinds of Prakrit, the relations and localization of which are by no means clear. The word Prakrit is some- times used of all the still spoken Aryan vernaculars of India. See SANSKRIT.*~~

~~*PRAM, CuristeN HENRIKSEN (1756-1821), Scandi- navian poet, was born in Gudbrandsdal, Norway, in 1756, and educated in Copenhagen, where in 1781 he received an appointment in the chamber of commerce, which gave him considerable leisure for literature. In 1785 he pub- slished Stxrkodder, a romantic epic based on some of the old Scandinavian legends, in fifteen cantos, and in the same year he began to edit Jfinerva, a journal of some influence in Danish literature. He also wrote two trage- dies (Damon and Pythias and Frode and Fingal), several comedies, and a number of tales characterized by bright- ness and humour. In 1819 he removed to the West-Indian island of St Thomas, where he died on 25th November 1821. His select poetical works were after- wards edited, with a biography, by his friend K. L. Rahbek (6 vols., 1824-29). Compare DENMARK, vol. vil. p. 91.*~~

~~*PRATINCOLE, a word apparently invented by Latham (Synopsis, v. p. 222), being the English rendering of Pratincola, applied in 1756 by Kramer (Zilenchus, p. 381) to a bird which had hitherto received no definite name, though it had long before been described and even re- cognizably figured by Aldrovandus (Ornithologia, xvii. 9) under the vague designation of "hirundo marina." It is the Glareola pratincola of modern ornithologists, forming the type of a genus Glareola, founded by Brisson ? in 1760, and unquestionably belonging (as is now generally ad- mitted) to the group Limicolx, being either placed in the Family Charadrudz or regarded as constituting a separate Family Glareolide. The Pratincoles, of which some eight or nine species have been described, are all small birds, slenderly built and mostly delicately coloured, with a short stout bill, a wide gape, long pointed wings, and a tail more or less forked. In some of their habits they are thoroughly Plover-like, running very swiftly and breeding on the*~~

~~*ground, but on the wing they have much the appearance of Swallows, and like them feed, at least partly, while flying.? The ordinary Pratincole of Europe,*~~

~~*1 The era of Vikramaditya is reckoned from 56 u.c., but many authorities place him 550 a.D.*~~

~~*2 Not by Gmelin as inadvertently misstated (ORNITHOLOGY, vol. xviii. p. 19, note 1).*~~

~~*3 This eombination of characters for many years led systematizers astray, though some of them were from the first eorreet in their notions as to the Pratineole's position. Linnzus, even in his latest publication, placed it in the genus Hirundo ; but the interleaved and annotated copies of his Systema Naturz in the Linnean Society's library shew the species marked for separation and insertion in the Order Gralle—Pratincola trachelia being the name by whieli he had meant to designate it in any future edition. He seenis to have been indueed to this change of view mainly through a specimen of the bird sent to him by John the brother of Gilbert White; but the opinion*~~

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~~*G. pratincola, breeds abundantly in many parts of Spain, Barbary, and Sicily, along the valley of the Danube, and in Southern Russia, while owing to its great powers of flight it frequently wanders far from its home, and more than a score of examples have been recorded as occurring in the British Islands. In the south-east of Europe a second and closely-allied species, G. nordmanni or G. melanoptera, which has black instead of chestnut inner wing-coverts, accompanies or, further to the eastward, replaces it ; and in its turn it is replaced in India, China, and Australia by G. orientalis. Australia also possesses another species, G. grallaria, remarkable for the great length of its wings and much longer legs, while its tail is scarcely forked—peculiarities that have led to its being considered the type of a distinct genus or subgenus Sttia. Two species, G. lactea and G. cinerea, from India and Africa respectively, seem by their pale coloration to be desert forms, and they are the smallest of this curious little group. The species whose mode of nidification is known lay either two or three eggs,*~~

~~*stone-coloured, blotched, spotted, and streaked with black or brownish-grey. The young when hatched are clothed in down and are able to run at once — just as are young Plovers. Pee 7)*~~

~~*PRATO, a city and bishop's see of Italy, in the province of Florence, on the north edge of the alluvial plain which extends between Florence and Pistoia. By rail it is dis- tant from the former city 114 miles and from the latter 93. The cathedral of St Stephen, which stands in a square surrounded by houses of the 16th century, is partly of the 12th and partly of the 14th and 15th centuries. The facade, in alternate bands of white calcareous sand- stone and green serpentine, has a fine doorway and a bas- relief by Luca della Robbia ; but the most striking external feature is the lovely open-air pulpit at an angle of the building, erected (1428) by Donatello and Michelozzo for displaying to the people without risk the Virgin's girdle, brought from the Holy Land by a knight of Prato in 1130. The chapel of the Girdle has frescos by Agnolo Gaddi and a statue of the Virgin by Giovanni Pisano ; and the frescos in the choir are considered the most im- portant work of Fra Filippo Lipri (qg.v.). The municipal palace also possesses a collection of Lippi's paintings. Prato is a busy industrial town, the seat of a great straw- plaiting establishment, paper-mills, brass-foundries, é&c., and outside of the gates which pierce the old city walls several small suburbs have grown up. The city had 13,410 inhabitants in 1881 (inclusive of the suburbs, 15,510) and the commune 16,641.*~~

~~*Prato is said to be first mentioned by name in 1107, but the cathedral appears as early as 1048 as the parish church of Borgo Cornio or Santo Stefano. In 1313 the town acknowledged the authority of Robert, king of Naples, and in 1350 Niccola Acciajoli, seneschal of Joanna, sold it to the Florentines for 17,500 florins of gold. In 1512 it was sacked by the Spaniards under General Car- dona. In 1653 it obtained the rank of city.*~~

~~*PRATT, Cuartzs. See Campen, Eart.*~~

~~*PRAXITELES, a Greek sculptor, son and apparently also pupil of the Athenian Cephisodotus. An account of his works is given in vol. ii. p. 361; but since that was written there has been found at Olympia, where it still remains, a marble statue from his hand, Hermes carrying the infant Dionysus. Though a work of comparatively youthful years, as may be*~~

~~*inferred from his obvious in- debtedness to his father Cephisodotus, particularly in the published in 1769 by Scopoli (Ann. I. hist. naturalis p. 110) had doubtless contributed thereto, though the earlier judgment to the same effect of Brisson, ag mentioned above, had been disregarded. Want of space here forbids a notice of the different erroneous assign- ments of the form, some of them made even by recent authors, who*~~

~~*neglected the clear evidence afforded by the internal structure of the*~~

~~*Pratincole. It must suffice to state that Sundevall in 1878 (Tentamen,*~~

~~*86) placed Glareola amon apri Y iti i g the Caprimulgide osteology shews cannot be maintained or a Haecaness" oe ee*~~

~~*PRA—PRE*~~

~~*figure of Dionysus, it is nevertheless a masterpiece in those qualities for which Praxiteles was famed in antiquity, the representation of what is called sympathetic types of human or divine beings, and the rendering of very subtle phases of emotion. 'The Hermes, while massive in build, is flexible and sensitive in his skin and flesh, indolent in his attitude, his mind sufficiently occupied for the moment in trifling with the infant on his left arm. In recent years it has been sought to prove that certain of the sculptures attri- buted in antiquity to Praxiteles were really the work of a grandfather of his of the same name. But the tendency of investigation has rather been to dispel these views as illusory.*~~

~~*PRECEDENCE. This word in the sense in which it is here employed means priority of place, or superiority of rank, in the conventional system of arrangement under which the more eminent and dignified orders of the com- munity are classified on occasions of public ceremony and in the intercourse of private life. In the United Kingdom there is no complete and comprehensive code whereby the scheme of social gradation has been defined and settled, once and for all, on a sure and lasting foundation. The principles and rules at present controlling it have been formulated at different periods and have been derived from various sources. The crown is the fountain of honour, and it is its undoubted prerogative to confer on any of its sub- jects, in any part of its dominions, such titles and dis- tinctions*~~

~~*and such rank and place as to it may seem meet and convenient. Its discretion in this respect is altogether unbounded at common law, and is limited in those cases only wherein it has been submitted to restraint by Act of parliament. In the old time all questions of precedence came in the ordinary course of things within the juris- diction of the Court of Chivalry, in which the lord high constable and earl marshal presided as judges, and of which the kings of arms, heralds, and pursuivants were the assessors and executive officers. When, however, points of unusual moment and magnitude happened to be brought into controversy, they were occasionally considered and decided by the sovereign in person, or by a special commission, or by the privy council, or even by the parlia- ment itself. But it was not until towards the middle of the 16th century that precedence was made the subject of any legislation in the proper meaning of the term.!*~~

~~*In 1539 an Act "for the placing of the Lords in Parlia- ment" (31 Hen. VIII. c. 10) was passed at the instance of the king, and by it the relative rank of the members of the royal family, of the great officers of state and the household, and of the hierarchy and the peerage was de- finitely and definitively ascertained? In 1563 an Act "for declaring the authority of the Lord Keeper of the Great Seal and the Lord Chancellor to be the same " (5 Eliz. c. 18) also declared their precedence to be the same. In 1689 an*~~

~~*1 Ample materials for the satisfaction of the curiosity of those who are desirous of investigating the history of precedence under its wider and more remote aspects will be found in such writers as Selden or Mackenzie, together with the authorities quoted or referred to by them—Selden, Titles of Honor, part ii. p. 740 sg. (London, 1672); Mackenzie, Observations upon the Laws and Customs of Nations as to Precedency (Edinburgh, 1680, and also reprinted in Guillim, Display of Heraldry, 6th ed., London, 1724).*~~

~~*? Sir Bernard Burke, Ulster king of arms, in his Book of Precedence, cites 1 Edw. VI. c. 7,an Act " for the Continuance of Actions after the death of any king of this Realm," as a statute bearing on precedence, since, he says, "it enumerates the then names of dignity." But, as the late Sir Charles Young, Garter king of arms, has pointed out in one of his privately printed tracts, the object of the Act was simply to prevent the abatement of suits under certain circumstances, and the names of dignity therein enumerated are*~~

~~enumerated in their wrong order. If the statute of Edward VI. had any effect on precedence, dukes would precede the archbishops, barons the bishops, and knights the judges,~~

~~which they have never done, and which parliament could never have intended that they should do.~~

~~2~~

~~PREACH DENCE~~

~~Act "for enabling Lords Commissioners of the Great Seal to execute the office of Lord Chancellor or Lord Keeper " (1 Will. and Mary c. 21) gave to the commissioners not being peers of the realm place next to the speaker of the House of Commons and to the speaker place next to the peers of the realm. In 1707 the Act of Union with Scotland (6 Anne c. 11) provided that all peers of Scotland should~~

~~be peers of Great Britain! and should have rank immedi-.~~

~~ately after the peers of the like degrees in England at the time of the Union and before all peers of Great Britain of the like degrees created after the Union. In 1800 the Act of Union with Ireland (39 and 40 Geo. III. ¢. 67) pro- vided that the lords spiritual of Ireland should have rank immediately after the lords spiritual of the same degree in Great Britain, and that the lords temporal of Ireland should have rank immediately after the lords temporal of the same degree in Great Britain at the time of the Union, and further that "'peerages of Ireland created after the Union should have precedence with peerages of the United Kingdom created after the Union according to the dates of their creation." At different times too during the current century several statutes have been passed for the reform and extension of the judicial organization which have very materially affected the precedence of the judges, more especially the Judicature Act of 1873 (36 and 37 Vict. ce. 66), under which the lords justices of appeal and the justices of the High Court now receive their appointments. But the statute of Henry VIII. "for the placing of the Lords" still remains the only legislative measure in which it has been attempted to deal directly and systematically with any large and important section of the scale of general precedence ;~~

~~*and the law, so far as it relates to the ranking of the sovereign's immediate kindred whether lineal or collateral, the principal ministers of the crown and court, and both the spiritual and temporal members of the House of Lords, is to all practical intents and purposes what it was made by that statute nearly 350 years ago. Where no Act of parliament applies, precedence is determined either by the will and pleasure of the sovereign or by what is accepted as "ancient usage and established custom." Of the sovereign's will and pleasure the appropriate method of announcement is by warrant under the sign-manual, or letters patent under the great seal. But, although the crown has at all periods very frequently conceded special privileges of rank and place to particular persons, its interference with the scale of general precedence has been rare and exceptional. In 1540 it was provided by warrant from Henry VIII. that certain officers of the house-hold therein named should precede the secretaries of state when and if they were under the degree of barons.2, In 1612 James I. directed by letters patent, not without long and elaborate argument in the Star Chamber, that baronets, then newly created, should be ranked after the younger sons of viscounts and barons, and that a number of political and judicial functionaries should be ranked between knights of the Garter and such knights bannerets as should be made by the sovereign in person "'under his Standard displayed in an Army Royal in open war."? Four years later he further directed, also by letters patent, that the sons of baronets and their wives and the daughters of baronets should be placed before the sons of knights and their wives*~~

~~*1 For the parliamentary rights of Scottish peers, see PEERAGE, vol. xviil. p. 466.*~~

~~*2 Quoted by Sir Charles Young from State Papers: published by Authority (4to, 1830) p. 628, in Privy Councillors and their Pre- cedence (1850) p. 15.*~~

~~*3 Patent Rolls, 10th Jac., part x. mem. 8. It is commonly stated that the bannerets here referred to could be made by the prince of Wales as wellas by the king. But the privilege was conferred by James J. on Henry, the then prince of Wales, only (Selden, Titles of Honor, part ii. p. 750).*~~

~~*and the daughters of knights " of what degree or order so- ever." And again in 1620 the same king commanded by warrant ""'after solemn argument before his Majesty" that the younger sons of earls should precede knights of the privy council and knights of the Garter not being "' barons or of a higher degree."® If we add to these ordinances the provisions relating to precedence contained in the statutes of several of the orders of knighthood which since then have been instituted or reconstructed, we shall nearly, if not quite, exhaust the catalogue of the interpositions of the sovereign with regard to the rank and place of classes as dis- tinguished from individuals. Of "ancient usage and estab- lished custom " the records of the College of Arms furnish the fullest and most trustworthy evidence. Among them in particular there is a collection of early tables of preced- ence which were published by authority at intervals from the end of the 14th to the end of the 15th century, and to which peculiar weight has been attached by many success- ive generations of heralds. On them, indeed, as illustra- tive of and supplementary to the action of parliament and the crown, all subsequent tables of precedence have been in great measure founded. 'The oldest is the "' Order of All Estates of Nobles and Gentry," prepared apparently for the coronation of Henry IV. in 1399, under the super- vision of Ralph Nevill, earl of Westmoreland and earl marshal ; and the next is the " Order of All States of Wor- ship and Gentry," prepared, as announced in the heading, for the coronation of Henry VI. in 1429, under the super- vision of the lord protector Humphrey, duke of Gloucester, and the earl marshal, John Mowbray, duke of Norfolk. Two more are of the reign of Edward IV., and were sever- ally issued by John Tiptoft, earl of Worcester and lord high constable, in 1467, and by Anthony Widvile, Earl Rivers and lord high constable, in 1479. The latest is commonly and shortly known as the "' Series Ordinum," and was drawn up by a special commission presided over by Jasper Tudor, duke of Bedford, it is presumed for observance at the marriage of Henry VII. and Elizabeth of York in 1486. 'To these may be added the "' Order for the Placing of Lords and Ladies," taken at a grand enter- tainment given by command of Henry VIII. at the king's manor-house of Richmond in 1520 by Charles Somerset, earl of Worcester, lord chamberlain of the household, to the French ambassador, Olivier de la Vernade, seigneur de la Batie; the "Precedency of All Estates," arranged in 1594 by the commissioners for executing the office of earl marshal ; and the " Roll of the King's Majesty's most Royal Proceeding through London"*~~

~~*from the Tower to Whitehall on the eve of the coronation of James I., also arranged by the commissioners for executing the office of earl marshal. On many isolated points, too, of more or less importance special declaratory decisions have been from time to time propounded by the earls marshal, their substitutes and deputies ; for example, in 1594, when the younger sons of dukes were placed before viscounts ; in 1625, when the rank of knights of the Bath and their wives was fixed ; and in 1615 and 1677, when the eldest sons of the younger sons of peers were placed before the eldest sons of knights and of baronets. It is from these miscellaneous sources that the precedence among others of all peeresses, the eldest sons and their wives and the daughters of all peers, and the younger sons and their wives of all dukes, marquesses, and earls is ascertained and established. And further, for the purpose of proving continuity of practice and disposing of minor questions not otherwise and more conclusively set at rest, the official programmes and accounts preserved*~~

~~*4 Patent Rolls, 14th Jac., part. ii. mem, 24; Selden, Titles of Honor, part ii. p. 752.*~~

~~*5 Cited by Sir Charles Young, Order of Precedence, with Authorities and Remarks, p. 27 (London, 1851).*~~

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~~*by the heralds of different public solemnities and proces- sions, such as coronations, royal marriages, state funerals, national thanksgivings, and so on, have always been con- sidered to be of great historical and technical value.?*~~

~~*1.—General Precedence of Men.*~~

~~*The sovereign; (1) prince of Wales; (2) younger sons of the sovereign; (3) grandsons of the sovereign ; (4) brothers of the sovereign; (5) uncles of the sovereign ; (6) nephews of the sovereign ;? (7) archbishop of Canter- bury, primate of all England; (8) lord high chancellor of Great Britain or lord keeper of the great seal; (9) archbishop of York, primate of England ;* (10) lord high treasurer of Great Britain ;* (11) lord president of the privy council; (12) lord keeper of the privy seal ;° (13) lord great chamberlain of*~~

~~England; (14) lord high constable of England; (15) earl marshal; (16) lord high admiral ; (17) lord steward of the household ; (18) lord~~

~~1 Selden, Titles of Honor, part ii. p. 753.~~

~~2 The precedence of the members of the royal family depends on their relationship to the reigning sovereign and not on their relation- ship to any of the predecessors of the reigning sovereign. It is pro- vided by 31 Hen. VIII. c. 10 that uo person, "except only the King's children," shall have place "at the side of the Cloth of Estate in the Parliament Chamber," and that "the King's Son, the King's Brother, the King's Nephew, or the King's Brother's or Sister's Sons" shall have place before all prelates, great officers of state, and peers, Lord Chief Justice Coke was of opinion that the king's nephew meant the king's grandson or nepos (Institutes iv., cap. 77). But, as Mr Justice Blackstone says, "under the description of the King's children his grandsons are held to be included without having recourse to Sir Edward Coke's interpretation of nephew" (Commentaries, i. ch. 4). Besides, if grandson is to be understood by nephew, the king's grand- son would be placed after the king's brother. The prince of Wales is not specifically mentioned in the statute "for the placing of the Lords'; but, as he is always, whether the son or the grandson of the sovereign, the heir-apparent to the crown, he is ranked next to the sovereign or the queen-consort. With the exception of the prince of Wales, all the male relations of the sovereign are ranked first in the order of their degrees of consanguinity with him or her, and secondly, in the order of their proximity to the succession to the crown; thus the members of the several groups into which the royal family is divided take precedence according to their own seniority and the seniority of their fathers or mothers, the sons of the sons or brothers of the sovereign being preferred to the sons of the daughters or sisters of the sovereign among the sovereign's grandsons and nephews.~~

~~3 By 31 Hen. VIII. c. 10, the king's vicegerent "for good and due ministration of justice in all causes aud cases touching the ecclesi- astical jurisdiction" is placed immediately before the archbishop of Canterbury. The office of vicegerent or vicar-general was then held by Thomas, Lord Cromwell, afterwards earl of Essex, together with that of lord privy seal, and it was never conferred on any other person. By the Act of Union with~~

~~*Ireland the archbishops of Ireland had place next to the archbishops of England, and if consecrated before and not after the disestablishment of the church in Ireland they retain this position under the Irish Church Act of 1869. At the coronation of William IV. the lord chancellor of Ireland walked next after the lord chancellor of Great Britain and before the lord president of the council and lord privy seal. In Ireland, if he is a peer he has precedence between the archbishops of Armagh aud Dublin, and if he is not a peer after the archbishop of Dublin. But, except in the House of Lords, the precedence of the lord chancellor of Great Britain or the lord keeper of the great seal is the same whether he is a peer or a commoner. The lord keeper has the same precedence as the lord chancellor under 5 Eliz. c. 18. But the last appointment to the lord keepership was that of Sir Robert Henley, afterwards Lord Henley, lord chancellor, and earl of Northington, in 1757, and the office is not likely to be revived.*~~

~~*4 The last lord high treasurer was Charles Talbot, duke of Shrews- bury, in 1714; since then the office has been executed by commission and as a dignity is practically extinct. None of the commissioners— neither the first lord, who is now always the prime minister, nor any of the other or junior lords—of the treasury have any official precedence whatever.*~~

~~*5 The lord president of the council and the lord privy seal, if they are peers, are placed by 31 Hen. VIII. c. 10 before all dukes except dukes related to the sovereign in one or other of the degrees of con- Sanguinity specified in the Act. And, since the holders of these offices have been and are always peers, their proper precedence if they are commoners has never been determined.*~~

~~*PRECEDENCE*~~

~~*chamberlain of the household ;® (19) dukes ;7 (20) mar-*~~

~~*6 It is provided by 31 Hen. VIIL c. 10 that "the Great Chamber- lain, the Constable, the Marshal, the Lord Admiral, the Grand Master or Lord Steward, and the King's Chamberlain shall sit and be placed after the Lord Privy Seal in manner and form following : that is to say, every one of them shall sit and be placed above all other personages being of the same estates or degrees that they shall happen to be of, that is to say the Great*~~

~~*Chamberlain first, the Constable next, the Marshal third, the Lord Admiral the fourth, the Grand Master or Lord Steward the fifth, and the King's Chamberlain the sixth." The lord high steward of England is not mentioned in the Act for the placing of the Lords, " because it was intended," Lord Chief Justice Coke says, "that when the use of him should be necessary he should not endure longer than hac vice" (Inst. iv., 77). But it may be noted that, when his office is called out of abeyance for coronations or trials by the House of Lords, the lord high steward is the greatest of all the great officers of state in England. The office of lord great chamberlain of England is hereditary, and is held jointly during alternate reigns by the heads of the houses of Willoughby de Eresby and Cholmondeley as representing co-heiresses of the Berties, dukes of Ancaster, who de- rived it from an heiress of the De Veres, earls of Oxford, in whose line it had descended from the reign of Henryl By a private Act, 1 Geo. I. c. 8, passed previous to the advancement of Robert Bertie, marquess of Lindsey, to the dukedom of Ancaster in 1715, it was provided that the tenure of the great chamberlainship should not give him and his heirs precedence of all other dukes except when in the immediate dis- charge of the functions of the office; and Sir Bernard Burke still restricts the precedence of the lord great chamberlain to him " when in actual performance of official duty" (Book of Precedence, p. 10). But, as Sir Charles Young justly contends, "the limitations of this statute (1 Geo. I. c. 8) failed on the death of the last Duke of Ancaster in 1809 {he should have said "'the last duke of Ancaster, who held the great chamberlainship in 1779"], when the precedence of the office of Great Chamberlain fell under the operation of the 31st of Henry VIII." (Order of Precedence, p. 20). The office of lord high constable of England is called out of abeyance for and pending coronations only. The office of earl marshal is hereditary in the Howards, dukes of Norfolk, premier dukes and, as earls of Arundel, premier earls of England, under a grant in special tail male from Charles II. in 1672. The office of lord high admiral, like the office of lord high treasurer, is practically extinct as a dignity. Since the reign of Queen Anne there has been only one lord high admiral, namely, William, duke of Clarence, afterwards William IV., for a few mouths in the Canning administration of 1827. The office is executed by commission, the lords of the admiralty being as destitute of any official precedence as the lords of the treasury, although the first lord of the admiralty is invariably a leading cabinet minister. The lord steward aud the lord chamberlain of the*~~

~~household are always peers, and have seldom been under the degree of earls. We may here remark that both the Scottish and Irish Acts of Union make no reference to the precedeuce of the great officers of state of Scotland and Ireland. Not to mention the prince of Wales, who is by birth steward of Scot- land, the earl of Shrewsbury is hereditary great seneschal of Ireland, and the earl of Errol is hereditary lord high constable of Scotland ; but what places they are entitled to in the scale of general precedence is altogether doubtful and uncertain. In Ireland the great seneschal ranks after the lord chancellor if he is 2 commoner, and after the archbishop of Dublin if the lord chancellor is a peer, and in both cases before dukes (" Order of Precedence," Dublin Gazette, 3d June 1848). Again, on George IV.'s visit to Edinburgh in 1821 the lord high constable had place as the first subject in Scotland immediately after the members of the royal family. At every coronation from that of George III. to that of Queen Victoria, the lord high constable of Scotland has been placed next to the earl marshal of England, and, although no rank Has been assigned on these occasions to the hereditary great seneschal of Ireland, the lord high constable of Ireland appointed for the ceremony has been at all or most of them placed next to the lord high constable of Scotland. It is worthy of notice, however, that Sir George Mackenzie, writing when lord advocate of Scotland in the reign of Charles II., says that "the Constable and Marischal take not place as Officers of the Crown but according to their creation as Earls," and he moreover expresses the opinion that "it seems very strange that these who ride upon the King's right and left hand when he returns from his Parliaments and who guard the Parliament itself, and the Honours, should have no precedency by their offices" (Odser- vations, &c., p. 25, in Guillim's Display of Heraldry, p. 461 sg.3 but see also Wood-Douglas, Peerage of Scotland, vol. i. p. 557).~~

~~7 Both Sir Charles Young and Sir Bernard Burke place " Dukes of the Blood Royal" before dukes, their eldest sons before marquesses, and their younger sons before marquesses' eldest sons. In the " Ancient Tables of Precedence," which we have already cited, dukes of the blood royal are always ranked before other dukes, and in most of them their eldest sons and in some of them their younger sons are placed in a corresponding order of precedence. But in this connexion the words of the Act for the placing of the~~

~~*Lords are perfectly plain and unam- biguous: "All Dukes not aforementioned," ¢.e., all except only such*~~

~~*PREECE*~~

~~*quesses ; (21) dukes' eldest sons ;! (22) earls; (23) mar- quesses' eldest sons; (24) dukes' younger sons; (25) vis- counts ; (26) earls' eldest sons ; (27) marquesses' younger sons; (28) bishops; (29) barons ,;? (30) speaker of the House of Commons; (31) commissioners of the great seal ;* (32) treasurer of the household ; (33) comptroller of the household ; (34) master of the horse ; (35) vice-chamber- lain of the household; (36) secretaries of state ;* (37)*~~

~~*as shall happen to be the king's son, the king's brother, the king's uncle, the king's nephew, or the king's brother's or sister's son, '¢Marquesses, Earls, Visconnts, and Barons, not having any of the offices aforesaid, shall sit and be placed after their ancienty as it hath peen accustomed." As Lord Chief Justice Coke and Mr Justice Black- stone observe, the degrees of consanguinity witk the sovereign to which precedence is given by 31 Hen. VIII. c. 10 are the same as those within which it was made high treason by 28 Hen. VIII. c. 18 for any man to contract marriage without the consent of the king. Queen Victoria, by letters patent under the great seal in 1865, ordained that, " besides the children of Sovereigns of these realms, the children of the sons of any of the Sovereigns of Great Britain and Ireland shall have and at all times hold and enjoy the style or attribute of 'Royal Highness' with their titular dignity of Prince or Princess pre- fixed to their respective Christian names, or with their other titles of honour." But, notwithstanding this, their rank and place are still governed by the Act for the placing of the Lords. Thus the duke of Cambridge, although he is, as the son of a son of George III., pro- perly designated " Royal Highness " under the letters patent of 1865, has no precedence as the first cousin of the sovereign under the statute of 1539. In the same way the duke of Cumberland has no precedence as the first cousin once removed of Queen Victoria, and being the grandson only of a son of George III. would not bea " Royal Highness" at all if his father had not been, like his grandfather, king of Hanover. In Garter's Roll of the Lords Spiritual and Temporal, the official list of the House of Lords, the duke of Cambridge is entered before*~~

~~*the archbishop of Canterbury, instead of in the precedence of his dukedom after the duke of Leinster, while the duke of Cumberland is entered in the precedence of his dukedom after the duke of Northumberland. By the etiquette of society, however, both of them are regarded and treated as royal dukes, and even in parliament they are always alluded to not as '"'noble"' but as "illustrious." Under the combined opera- tion of the Act for the placing of the Lords and the Acts of Union * with Scotland (art. 23) and with Ireland (art. 4), peers of the same degrees, as dukes, marquesses, earls, viscounts, and barons, severally, have precedence according to priority in the creation of their respective peerages. But peerages of England created before 1707 precede peer- ages of Scotland created before 1707, peerages of Great Britain created between 1707 and 1801 precede peerages of Ireland created before 1801, and peerages of Ireland created before 1801 precede peerages of the United Kingdom and of Ireland created after 1801, which take precedence in common. The relative precedence of the members of the House of Lords, including the representative peers of Scotland and Treland, is officially set forth in Garter's Roll, which is prepared by the Garter king of arms at the commencement of each session of parliament, that of the Scottish peers generally in the Union Roll, and that of the Irish peers generally in Ulster's Roll, a record which is under the charge of and is periodically corrected by the Ulster king of arms. The Union Roll is founded on the " Decreet of Ranking" pronounced and promulgated by a royal commission in 1606, which, in the words of an eniinent authority in such matters, " was adopted at once as the roll of the peers in Parliament, convention, and all public meetings, and continued to be called uninterruptedly with such alterations upon it as judgments of the Court of Session upon appeal in modification of the precedency of certain peers rendered necessary, with the omission of such dignities as became extinct and with the addition from time to time of newly created peerages—down to the last sitting of the Scottish Parliament on the lst May 1707" (The Earldom of Mar, &c., by the earl of Crawford (25th) and Balcarres (8th), vol. ii. p. 16). As the crown was precluded by the Act of Union from creating peerages of Scotland after the Union, all Scottish peers in their several degrees have rank and place before all peers of Great Britain, Ireland, and the United Kingdom.*~~

~~*1 Eldest sons of peers of any given degree are of the same rank as, but are to be placed immediately after, peers of the first degree under that of their fathers; and the younger sons of peers of any given degree are of the same rank, but are to be placed immediately after peers of the second degree and the eldest sons of peers of the first degree under that of their fathers.*~~

~~*2 Secretaries of state, if they are barons, precede all other barons under 31 Hen. VIII. c. 10. But if they are of any higher degree their rank is not influenced by their official position.*~~

~~*3 Under 1 Will. and Mary c. 21, being the only commissioners for the execution of any office who have precedence assigned to them.*~~

~~*4 The officers of the household who, under Henry VIII.'s warrant of 1540, precede the secretaries of state have been for a long time*~~

~~*DENCE 663*~~

~~*viscounts' eldest sons; (38) earls' younger sons; (39) barons' eldest sons; (40) knights of the Garter;> (41) privy councillors ;® (42) chancellor of the exchequer ; (43) chancellor of the duchy of Lancaster ; (44) lord chief justice of England ; (45) master of the rolls; (46) lords justices of appeal ;? (47) judges of the High Court of Justice ;§ (48) knights bannerets made by the sovereign in person ; (49) viscounts' younger sons; (50) barons' younger sons ; (51) baronets ;9 (52) knights bannerets not made by the sovereign in person ; (53) knights of the first class of the Bath, the Star of India, and St Michael and St George ;!° (54) knights of the second class of the Bath, the Star of India, and St Michael and St George ;! (55) knights bachelors ;!? (56) eldest sons of the younger sons of peers; (57) baronets' eldest sons; (58) knights' eldest sons ; (59) baronets' younger sons ; (60) knights' younger*~~

~~*always peers or the sons of peers, with personal rank higher, and usually far higher, than their official rank. The practical result is, seeing also that the great seal is only very rarely indeed in commission, that the secretaries of state, when they are commoners whose personal precedence is below a baron's, have official precedence immediately after the speaker of the House of Commons. The principal secretaries, for so they are all*~~

~~*designated, are officially equal to one another in dignity, and are placed among themselves according to seniority of appointment.*~~

~~*5 During more than two centuries only one commoner has been indebted for his precedence to his election into the order, and that was Sir Robert Walpole, the minister, who at the coronation of George II. in 1727 was placed as a knight of the Garter immediately before privy councillors. The proper precedence of both knights of the Thistle and knights of St Patrick is undecided.*~~

~~*6 Privy councillors of Great Britain and of Ireland take precedence in common according to priority of admission. The chancellors of the exchequer and of the duchy of Lancaster, the lord chief justice of England, the master of the rolls, and the lords justices of appeal are always members of the privy council, and have rank and place as privy councillors, if they are not also peers.*~~

~~*7 The lords justices of appeal have precedence among themselves according to seniority of appointment. Until recently they were pre- ceded by the lord chief justice of the Common Pleas and the lord chief baron of the Exchequer (divisions of the HIgh Court of Justice). But under existing arrangements these offices have fallen into abeyance, although they have not been formally abolished. The vice-chancellors used to follow the lords justices of appeal; but, in spite of the fact that there is still one vice-chancellor remaining, the office of vice- chancellor is practically extinct and will altogether disappear on his decease. In Ireland all these offices are in existence; but they have no precedence allotted to them in England; as the judges holding them are invariably privy councillors, however, they are ranked accordingly. And it is the same with regard to the lord justice-general and the lord justice-clerk in Scotland.*~~

~~*8 The judges of all the divisions of the HIgh Court of Justice are ranked together according to seniority of appointment. Neither the senators of the College of Justice in Scotland nor the judges of the various divisions of the HIgh Court in Ireland have any precedence in England. The precedence of the Scottish judges among themselves is settled by a royal warrant of 1729, which is printed in full by Nisbet in his System of HIeraldry (vol. ii. p. 277). The precedence of the Irish judges among themselves is the same as the*~~

~~*precedence of the English judges among themselves used to be before the offices of chief justice of the Common Pleas and chief baron of the Exchequer were suspended.*~~

~~*9 It is a question whether baronets ought or onght not to have pre- cedence, like peers, according as they are of England, Scotland, Great Britain, Ireland, or the United- Kingdom. Baronets are not referred to in either the Scottish or the Irish Act of Union; and Sir Bernard Burke contends that, since the Acts of Union are silent with regard to them, they are still entitled to whatever precedence was originally conferred on them. He therefore places the.whole body of the baronets together in the order merely of the dates of their several creations, and in this he appears to us to have both law and reason on his side.*~~

~~*10 These knights consist of grand crosses of the first, grand com- manders of the second, and grand crosses of the third order, and have precedence in their respective orders according to seniority of creation. By the statutes of the order of the Bath as revised in 1847 it is ordained that the knights grand crosses are to be placed "next to and immediately after baronets," thus superseding knights bannerets not created by the sovereign in person.*~~

~~*11 Knights commanders of all three orders are placed in each order according to seniority of creation.*~~

~~*22 Knights bachelors are ranked together according to seniority of creation, whether they are made by the sovereign or the lord lieutenant of Ireland.*~~

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~~*sons ;! (61) companions of the Bath, the Star of India, St Michael and St George, and the Indian Empire ;? (62) esquires ;® (63) gentlemen.**~~

~~*1 The sons of all persons, when any specified rank is assigned to them, are placed in the precedence of their fathers. Eldest sons of the younger sons of peers were ranked before the eldest sons of knights by order of the earl marshal, 18th March 1615, and before the eldest sons of baronets by order of the earl marshal, 6th April 1677. But no precedence has been given to*~~

~~*the younger sons of the younger sons of peers, although precedence is given to the younger as well as the eldest sons of baronets and knights by James I.'s decree of 1616. Moreover, no precedence has been given to either the eldest or the younger sons of the eldest sons of peers. — But in practice this omis- sion is generally disregarded, and the children of the eldest sons of dukes, marquesses, and earls, at all events, are accorded the same rank and titles which they would have if their fathers were actual in- stead of quasi peers of the degree next under that of their grandfathers. Sir Charles Young says that 'by decision (Chap. Coll. Arms of 1680) if the eldest son of an Earl died in his father's lifetime leaving a son and heir, such son and heir during the life of the Earl his grandfather is entitled to the same place and precedence as was due to his father : so had the father been summoned to Parliament as the eldest son of a peer the grandson would succeed to the dignity even during the grandfather's lifetime" (Order of Precedence, p. 27). And, of course, what applies to the grandson and heir of an earl applies equally to the grandsons and heirs of dukes and marquesses. But the grandsons and heirs of viscounts and barons are differently sitnated, and have neither honorary additions to their names nor any ascertained place and precedence even by the etiquette of society.*~~

~~*2 Companions are members of the third class of the first three orders aud the only members of the fourth order, except the sovereign and the grand master. Sir Charles Young and Sir Bernard Burke concur in placing the companions of these orders before the eldest sons of the younger sons of peers, on the ground that under their statutes they are entitled to precede "all Esquires of the Realm." But the sons of peers themselves—the eldest as well as the younger —are merely esquires, and are ranked before, and not among, other esquires because they have a particular precedence of their own assigned to them. Similarly the eldest sons of the younger sons of peers and the eldest sons of baronets and of knights who are also esquires, and likewise the younger sons of baronets and of knights who are not esquires, have a particular precedence of their own assigned to them. All of them are placed before esquires as a specific grade in the scale of general precedence, and it seems clear enough that it is before esquires considered as a specific grade that the companions of the orders ought to be placed and not before any other persons who, whether they are or are not esquires,*~~

~~*have a definite and settled rank which is superior to that specific grade in the scale of general precedence.*~~

~~*5 It appears to be admitted on all hands that the following persons are esquires and ought to be so described in all legal documents and processes: first, the eldest sons of peers in the lifetime of their fathers, and the younger sons of peers both in and after the lifetime of their fathers ; secondly, the eldest sons of the younger sons of peers and their eldest sons in perpetual succession, and the eldest sons of baronets and knights; thirdly, esquires created with or without the grant of armorial bearings by the sovereign; fourthly, justices of the peace, barristers at law, and mayors of corporations ; and fifthly, those who are styled esquires in patents, commissions, or appointments to offices under the crown in the state, the household, the army or navy, and elsewhere. Sir Bernard Burke 'accords precedence to serjeants at law and masters in lunacy, not only before esquires as such but also before the companions of the orders of knighthood. It is, however, enough to observe with regard to the first, since no more of them are to be created, that, in spite of the extravagant pretensions which have been frequently urged by them and on their behalf, 'they have not in the general scale," as Sir Charles Young says, "any precedence, and when under the degree of a Knight rank only. as Esquires," and with regard to the second that the statute 8 and 9 Vict. c. 100, on which the Ulster king of arms bases their claims, simply provides that they "shall take the same rank and precedence as the masters in ordinary of the HIgh Court of Chancery," who are now extinct, "apparently," to recur to Sir Charles Young, "assuming the rank of the masters without defining it." 'The masters, however," he adds, "as such have not a settled place in the order of general precedency emanating from any authority by statute or otherwise" (Order of Precedence, p. 71). Sir William Blackstone says that before esquires "the Heralds rank all Colonels, Serjeants at Law, and Doctors in the three learned professions" (Commentaries, i. c. 12). But the only foundation for this statement seems to be a passage in Guillim, which is obviously without any authority.*~~

~~*i beens and lawyers are agreed that gentlemen are those who, an en . grant from the crown, are entitled to bear coat oke, Inst. iv., c. 77; Blackstone, Comm., i. ch. 123*~~

~~Selden, Ti Blackstone, ¢ ar ee . 06). Honor, pt. ii. ch. 8; Guillim, Display of Heraldry,~~

~~PRECEDENCE~~

~~2.—General Precedence of Women.~~

~~The queen ;® (1) princess of Wales; (2) daughters of the sovereign ; (3) wives of the sovereign's younger sons; (4) granddaughters of the sovereign; (5) wives of the sovereign's grandsons; (6) sisters of the sovereign ; (7) wives of the sovereign's brothers; (8) aunts of the sove- reign; (9) wives of the sovereign's uncles; (10) nieces of the sovereign; (11) wives of the sovereign's nephews ; ® (12) duchesses ;" (13) marchionesses ; (14) wives of the eldest sons of dukes; (15) dukes' daughters ;® (16) countesses ; (17) wives of the eldest sons of marquesses ; (18) marquesses' daughters; (19) wives of the younger sons of dukes ; (20) viscountesses ; (21) wives of the eldest sons of earls; (22) earls' daughters; (23) wives of the younger sons of marquesses ; (24) baronesses ; (25) wives of the eldest sons of viscounts ; (26) viscounts' daughters ; (27) wives of the younger sons of earls; (28) wives of the eldest sons of barons; (29) barons' daughters; (30) maids of honour to the queen ;? (31) wives of knights of the Garter; (32) wives of knights bannerets made by the sovereign in person; (33) wives of the younger sons of viscounts ; (34) wives of the younger sons of barons; (35) baronets' wives ; (36) wives of knights bannerets not made by the sovereign in person ; (37) wives of knights grand crosses of the Bath, grand commanders of the Star of India, and grand crosses of St Michael and St George ; (38) wives of knights commanders of the Bath, the Star of India, and St Michael and St George ; (39) knights bachelors' wives ; (40) wives of the eldest sons of the younger sons of peers ; (41) daughters of the younger sons of peers; (42) wives of the eldest sons of baronets ; (43) baronets' daughters ; (44) wives of the eldest sons of knights; (45) knights' daughters ; (46) wives of the younger sons of baronets ; (47) wives of the younger sons of knights ;1° (48) wives of companions of the Bath, the Star of India, St Michael and St George, and the Indian Empire; (49) wives of esquires ;1! (50) gentlewomen.!?~~

~~5 The queen-consort is the second personage in the realm, and has precedence of the queen-dowager. But the husband of a reigning queen has~~

~~*no rank or place except such as is specially accorded to him by the sovereign.*~~

~~*6 There is no Act of parliament or ordinance of the crown regulating the precedence of the female members of the royal family. But the above is the gradation which appears to have become established among them, and follows the analogy supplied by the Act for the placing of the Lords in the case of their husbands and brothers.*~~

~~*7 Peeresses in their own right and peeresses by marriage are ranked together, the first in their own precedence and the second in the pre-cedence of their husbands.*~~

~~*8 Among the daughters of peers there is no distinction between the eldest and the younger as there is among the sons of peers. Their precedence is immediately after the wives of their eldest brothers, and several degrees above the wives of their younger brothers. They are placed among themselves in the precedence of their fathers. But the daughter of the premier duke or baron ranks after the wife of the eldest son of the junior duke or baron.*~~

~~® *Maids of honour to the queen are the only women who have any official precedence. They have the style or title of honourable, and are placed immediately after barons' daughters by Sir Bernard Burke, the rank which is accorded to them by the etiquette of society. But Sir Charles Young does not assign any precedence to them, and we do not know on what authority the Ulster king of arms does so, although he is by no means singular in the course he has taken.*~~

~~*10 The wives of baronets and knights, the wives of the eldest sons and the daughters of the younger sons of peers, and the wives of the sons and the daughters of baronets and knights are all placed sever- ally in the precedence of their respective husbands, husbands' fathers, and fathers.*~~

~~*ll "squire" and "gentleman" are not names of "dignity" but names of "worship," and esquires and gentlemen do not, in strictness, convey or transmit any precedence to their wives or children (see Coke, Jnst. ii., "Of Additions," p. 667).*~~

~~*12“ And generosus and generosa are good additions: and if a gentle-woman be named Spinster in any original writ, 7.e., appeal or indict- ment, she may abate and quash the same, for she hath as good right to that addition as Baroness, Viscountess, Marchioness, or Duchess have to theirs” (Coke, Inst. ii., ““Of Additions,” p. 668).*~~

~~*PREC P ENC EH*~~

~~*Attention to the foregoing tables will show that general precedence is of different kinds as well as of several degrees. It is first either personal or official, and secondly either substantive or derivative. Personal precedence belongs to the royal family, the peerage, and certain specified classes of the commonalty. Official precedence belongs to such of the dignitaries of the church and such of the ministers of state and the household as have had rank and place accorded to them by parliament or the crown, to the speaker of the HIouse of Commons, and to the members of the privy council and the judicature. Substantive pre- cedence, which may be either personal or official, belongs to all those whose rank and place are enjoyed by them independently of their connexion with anybody else, as by the archbishop of Canterbury, the lord high chancellor or the lord great chamberlain, peers and peeresses, baronets, knights, and some esquires. Derivative precedence, which can only be personal, belongs to all those whose rank and place are determined by their consanguinity with or affinity to somebody else, as the lineal and collateral relations of the sovereign, the sons, daughters, and daughters-in-law of peers and peeresses in their own right, and the wives, sons, daughters, and daughters-in-law of baronets, knights, and some esquires. It is to be observed, however, that the precedence of the sovereign is at once official and personal, and that the precedence of peeresses by marriage is at once derivative and substantive. In the case of the sovereign it is his or her actual tenure of the office of king or queen which regulates the rank and place of the various members of the royal family, and in the case of peeresses by marriage, although their rank and place are derivative ‘in origin, yet they are substantive in continuance, since during coverture and widowhood peeresses by marriage are as much peeresses as peeresses in their own right, and their legal and political status is precisely the same as if they had acquired it by creation or inheritance.*~~

~~*Bearing the above definitions and explanations in mind,the following canons or rules may be found practically useful.*~~

~~*1. AnybcJy who is entitled to both personal and official preced- ence is to be placed according to that which implies the higher rank. If, for example, a baron and a baronet are both privy coun- cillors, the precedence of the first is that of a baron and the pre- cedence of the second is that of a privy councillor. And similarly, except as hereafter stated, with respect to the holders of two or more persoual or two or more official dignities.*~~

~~*2. Save in the case of the sovereign, official rank can never supply the foundation for derivative rank. HIence the official preced- ence of a husband or father affords no indication of the personal precedence of his wife or children. The wives and children, for example, of the archbishop of Canterbury, the lord high chancellor, or the speaker of the HIouse of Commons do not participate in their official rank but only in their personal rank whatever it may be.*~~

~~*3. Among subjects men alone can convey derivative rank, except in the case of the daughters and sisters of the sovereign, or of peer- esses in their own right. But no man can acquire any rank or place by marriage. The sons-in-law or brothers-in-law of the sovereign and the husbands of: peeresses in their own right have as such no precedence whatever. And the daughter and heiress of the premier duke of England, unless she happens to be also a peeress in her own right, does not transmit any rank or place to her children.*~~

~~*4, Within the limits of the peerage derivative rank is asa rule always merged in personal, as distinguished from official, substantive rank. If, for example, the younger son of a duke is created a baron or inherits a barony, his precedence ceases to be that of a duke's younger son and becomes that of a baron. But, where the eldest son of a duke, a marquess, or an earl is summoned to the HIouse of Lords in a barony of his father's, or succeeds as or is created a baron, he is still, as before, "commonly called" by some superior title of peerage, as marquess, earl, or viscount, and retains his derivative precedence on all occasions, except in parliament or at ceremonies which he attends in his character as a peer. The younger sons of all peers, however, who are created or who inherit peerages—which they*~~

~~*often do under special limitations—are every- where placed according to their substautive rank, no matter how inferior it may be to their derivative rank. But if the son of a duke or a marquess, whether eldest or younger, or the eldest son of an earl is consecrated a bishop his derivative rank is not merged*~~

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~~*in his substantive rank, because it is official, and his derivative and personal rank implies the higher precedence. Again, the daughters of dukes, marquesses, and earls who become peeresses by marriage or creation, or who inherit as peeresses, are placed according to their substantive and not according to their derivative rank, although they may thereby be assigned a far lower precedence than that to which their birth entitles them.*~~

~~*5. The widows of peers and baronets have precedence immedi- ately before the wives or widows of the next successors in their husbands' dignities. But the sons and daughters of peers and baronets have precedence immediately before the sons and daughters of the holders of the dignities to whom their fathers succeeded. The reason of this is that the first are senior in the dignities and the second are nearer in the line of succession to them.*~~

~~*6. The widows of peers who marry again either share the pre- cedence of their second husbands or resume the precedence belong- ing to them independently of their marriage with their first husbands. Thus, if the daughter of a duke or an esquire marries first au earl and secondly a baron, although she remains a peeress, she is placed as a baroness instead of a countess. But if either of them should marry a commoner as her second husband, whatever may be his rank or degree, she ceases to be a peeress. While, however, the duke's daughter, if her second husband were not the eldest son of a duke, would resume her precedence as the daughter of a duke, the esquire's daughter would share the precedence of her second husband, whether he were a peer's son, a baronet, a knight, or an esquire. By the etiquette of society, however, the widows of peers who marry again do not forfeit the titles and precedence acquired by their marriage with their first husbauds unless they choose to lay them aside, or unless their own rank or the rank of their second husbands is equal or superior to that of their first husbands.*~~

~~*7. The widows of the eldest and younger sons of dukes and marquesses and of the eldest sons of earls, and also the widows of baronets and knights who marry again, are permitted by the eti- quette of society to keep the titles and rank acquired by their first marriage if their second marriage is with a commoner whose pre- cedence is considerably lower. But the widows of the younger sons of earls and of the eldest and younger sons of viscounts and barons, although their precedence is higher than that of the widows of baronets and knights, are not allowed to retain it, under any circumstances, after a second marriage.*~~

~~*8. Marriage does not affect the precedence of peeresses in their own right unless their husbands are peers whose peerages are of a higher degree, or, being of the same degree, are of more ancient creation than their own. If, for example, a baroness in her own right marries a viscount she is placed and described as a viscountess, or if she marries a baron whose barony is older than hers she is placed in his precedence and described by his title. But if she marries a baron whose barony is junior to hers she keeps her own precedence and title.*~~

~~*9. The daughters of peers, of sons of peers, baronets, and knights retain after marriage the precedence they derive from their fathers, unless they marry peers of any rank or commoners of higher rank than their own. Hence, for example, the daughter of a duke who marries the eldest son of a marquess is placed as a duke's danghter, not as the wife of a marquess's eldest son, and the daughter of a baronet who marries the younger son of a knight is placed asa baronet's daughter and not as the wife of a knight's younger son.*~~

~~*10. What are termed "titles of courtesy" are borne by all the sons and daughters of peers and peeresses in their own right, who in this connexion stand on exactly the same footing. The eldest sons of dukes, marquesses, and earls are designated by the names of one or other of the inferior peerages of their fathers, usually a mar- quessate or an earldom in the first, an earldom or a viscounty in the second, and a viscounty or barony in the third case. But, whatever it may be, it is altogether without effect on the rank and place of the bearer, which are those belonging to him as the eldest son of his father. The younger sons of dukes and marquesses are styled*~~

~~*“lords” followed by both their Christian names and surnames. The younger sons of earls and both the eldest and the younger sons of viscounts and barons are described as “ honourable” before both their Christian names and surnames. The daughters of dukes, marquesses, and earls are styled “ladies” before both their Christian names and surnames. The daughters of viscounts and barons are described as “honourable” before both their Christ- ian uames and surnames. If the eldest son of a marquess or an earl marries a woman of rank equal or inferior to his own, she takes his title and precedence; but if she is of superior rank she retains, with her own precedence, the prefix “lady” before her Christian name followed by the name of her husband’s title of courtesy. Again, if the younger son ofa duke or a marquess marries a woman of rank equal or inferior to his own, she is called ‘“‘ lady,” with his Christian and surnanie following, and is placed in his precedence ; but, if she is of superior rank, she retains, with her own precedence, the prefix “lady” before her Christian name and his surname. If the daughter of a duke, a marquess, or an earl*~~

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~~*marries the younger son of an earl, the eldest or younger son of a*~~

~~*viscount or baron, a baronet, a knight, or an esquire, &c., she retains, with her own precedence, the prefix “lady” before her Christian name and her husband’s surname. If the daughter of a viscount marries the younger son of au earl or anybody of inferior rank to him, or the daughter of a baron marries the younger son of a viscount or anybody of inferior rank to him, she retains her owl precedence with the prefix “honourable” before the addition “Mrs and his surname or Christian name and surname. But, if her hus- band is a baronet or a knight, she is called the Honourable Lady Smith or the Honourable Lady Jones, as the case may be. The wives of the younger sons of earls and of the eldest and younger sons of viscounts and barons, if they are of inferior rank to their husbands, take their precedence and are described as the Honour- able Mrs, with the surnames or Christian names and surnames of their husbands following. It was because the judges were placed by James I. before the younger sons of viscounts and barons that they were accorded the title of “honourable,” and that they are*~~

~~*designated as the Honourable Mr Justice Hawkins or the Honour- able Mr Justice Stephen, instead of as Sir Henry Hawkins or Sir James Stephen, which would connote their inferior personal dignity of knighthood. But in this addition their wives do not participate, since it is merely an official distinction.*~~

~~*It is manifest on even a cursory examination of the tables we have given that, although they embody the only scheme of general precedence, whether for men or for women, which is authoritatively sanctioned or recognized, they are in many respects very imperfectly fitted to meet the circumstances and requirements of the present day. In both of them the limits prescribed to the royal family are pedantically and inconveniently narrow, and stand out in striking contrast to the wide and ample bounds through which the operation of the Royal Marriage Act (12 Geo. III. c. 11) extends the disabilities but not the privileges of the sovereign's kindred. Otherwise the scale of general precedence for women compares favourably enough with the scale of general precedence for men. If, indeed, it includes the queen's maids of honour and the wives of the companions of the knightly orders, there certainly does not see to be any good reason why it should omit the mistress of the robes and the ladies of the bedchamber, or the ladies of the royal order of Victoria and Albert and the imperial order of the Crown of India. But these are trifling matters in themselves, and concern only an extremely minute fraction of the community. The scale of general precedence for men is now in substantially the same condition as that in which it has been for be- tween two and three centuries, and the political, to say nothing of the social, arrangements to which it was framed to apply have in the interval undergone an almost com- plete transformation. The consequence is that a good deal of it has come down to us in the shape of a survival, and has ceased to be of any practical use for the purpose it was originally designed to effect. While it comprises several official and personal dignities which are virtually obsolete and extinguished, it entirely omits the great majority of the members of Government in its existing form, and whole sections of society on a less exalted level, to whom it is universally felt that some rank and place at all events are both in public and in private justly due.*~~

~~As we have already said, it accords no precedence what- ever to the prime minister, whether as premier or as first lord of the treasury. In the same way it ignores not only the first lord of the admiralty but also the presidents of the Board of Trade and the Local Government Board, the post- master-general, the vice-president of the council, and all the~~

~~law officers of the crown.1_ And, when it does confess the Se 2 ee eee eee eee~~

~~ae There are no doubt certain public ceremonials of State, snch as Coronations, Royal Public Funerals, and Processions of the Sovereign me Parliament, ees wherein various pnblic fimetionaries walk and have Mt am certain places assigned to them, lmt which they may fans cate, find the same, as it hy no means follows that they are Fs ae aoe to the same place for having been there once: there age ain extent a precedent furnished thereby, and in some he uniformity of precedence in regard to one class over another~~

~~PRECEDENCE~~

~~presence of any of the sovereign's principal ministers, it commonly places them in positions which are out of all keeping with their actual eminence and importance. It ranks the lord president of the council and the lord privy seal before dukes, while it places the chancellor of the ex- chequer after the younger sons of earls and the eldest sons of barons, and the secretaries of state after the master of the horse and the vice-chamberlain of the household. The lord chancellor still has precedence as the first of the great officers of state, which was allotted to him not as what he is, the head of the judicature, but as what he once was, the prime minister of the sovereign ; and the lord chief justice, who is next to him in regular judicial rank, as presiding over the Common Law Courts, as he presides over the Courts of Equity, is placed after the chancellors of the exchequer and of the duchy of Lancaster, who still have the precedence which was allotted to them not as ministers, which they are, but as judges, which they are no longer. Neither the lord lieutenant of Ireland, the viceroy of India, nor the governor-general of Canada has any rank or place at St James's, where, as well as at Westminster, the lord steward or the lord chainberlain of the household is a much greater and more splendid personage. Again, in the scale of general~~

~~*precedence there are no clergymen except bishops, no lawyers except judges, and no officers'of either the army or the navy from field-marshals and admirals of the fleet downwards. Nor, of course, are any colonial governors or lieutenant-governors entered on it. It contains no mention of under-secretaries of state, chairmen or commissioners of administrative boards, comptrollers or secretaries of Govern- ment departments, lord lieutenants or sheriffs of counties, deputy lieutenants or justices of the peace, members of the House of Commons, or graduates of the universities. It is true that among some of these classes definite systems of subordination are established by either authority or usage, which are carefully observed and enforced in the particular areas and spheres to which they have reference. But we have seldom any means of determining the relative value of a given term in one series as compared with a given term in another series, or of connecting the different steps in the scales of local, professional, or academical pre- cedence with the different steps in the scale of general precedence, to which such scales of special precedence ought to be contributory and supplementary. We know, for example, that major-generals and rear-admirals are of equal rank, that with them are placed commissaries-general and inspectors-general of hospitals and fleets, that in India along with civilians of thirty-one years' standing they immediately follow the vice-chancellors of the Indian uni- versities, and that in relation to the consular service they immediately precede agents-general and consuls-general. But there is nothing to aid us in determining whether in England they should be ranked with, before, or after deans, queen's counsel, or doctors in divinity, who are as destitute as they are themselves of any recognized general precedence, and who, as matters now stand, would certainly have to give place to the younger sons of baronets and knights and the companions of the knightly orders.*~~

~~*The subjoined tables of special precedence, although their authority would not always be admitted in the Col-*~~

~~*has in such cases become established. 'This applies, for instance, to the places of the Gentlemen of the Privy Chamber, Law Officers of the Crown, and Masters and Six Clerks in Chancery, who have no definite or fixed place in the tables of precedency regulating the general orders of society, though in reference to State ceremonials they have certain places assigned*~~

~~*in the order of procession in right of their offices, which, however, give them no general rank. Upon such occasions, nevertheless, the legal rank and precedence which they hold in the Courts of Law is observed, and so far establishes among themselves, and in respect to their several classes, their precedency"' (Sir Charles Young, Order of Precedence, &c., pp. 59-61).*~~

~~*PRECEDENCE*~~

~~*lege of Arms, may perhaps assist towards the solution of some of the problems which occasionally arise in ordinary society.*~~

~~*1. Ecclesiastical Precedence.—(1) Archbishop of Canterbury; (2) archbishop of York ; (3) archbishop of Armagh ; (4) archbishop of Dublin ; (5) bishop of London ; (6) bishop of Durham; (7) bishop of Winchester ; (8) other bishops*~~

~~*of England ; (9) bishop of Meath ; (10) other bishops of Ireland ; (11) suffragan bishops of England ; (12) bishop of Sodor and Man; (13) bishops of Scotland ;*~~

~~*- (14) colonial bishops ; (15) deans of cathedrals ; (16) archdeacons ; (17) canous 5*~~

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~~*(18) rural deans ; (19) rectors ; (20) vicars ; (21) curates.*~~

~~*2. Legal Precedence.—(1) Lord chancellor of Great Britain ; (2) lord chancellor of Ireland ; (3) lords of appeal in ordinary in the HIouse of Lords ; (4) members of the judicial committee of the privy council ; (5) lord chief justice of England ; (6) lord justice-general and president of the Court of Session of Scotland ; (7) lord chief justice. of Ireland; (8) master of the rolls in England ; (9) lord justice-clerk and president of the second division of the Court of Session of Scotland ; (10) master of the rolls in Ireland ; (11) lords justices of appeal in England ; (12) lords chief justice of the Common Pleas, chief baron of the Exchequer, and justices of appeal in Ireland ; (13) vice-chancellor in England ; (14) vice-chancellor in Ireland ; (15) judges of the HIgh Court of Justice in England ; (16) senators of the College of*~~

~~*Justice in Scotland ; (17) judges of the High Court of Justice in Ireland ; (18) attorney-general for England ; (19) lord advocate of Scotland ; (20) attorney-general for Ireland ; (21) solicitor-general for England ; (22) solicitor-general for Scotland; (23) solicitor-general for Ireland ; (24) queen's counsel ; (25) serjeants-at-law ; (26) masters in lunacy ; (27) recorder of London ; (28) treasurers of the Inns of Court; (29) dean of the faculty in Scotland; (30) barristers ; (31) advocates ; (32) president of the Incor- porated Law Society ; (33) solicitors ; (34) writers to the signet ; (85) writers.*~~

~~*8. Military Precedence.—(1) Field-marshals; (2) generals; (3) lieutenant-generals ; (4) major-generals, inspectors-general of hospitals after three years' service or with an army in the field, and commissaries-general ; (5) brigadier- generals, deputy paymasters-general, and inspectors-general of hospitals of under three years' service and not with an army in the field; (6) colonels, deputy judge advocate, and deputy inspectors-general of hospitals after five years' service ; (7) lieutenant-colonels, deputy commissaries-general after five years' service, deputy inspectors-general of hospitals, and surgeon-majors ; (8) majors, deputy commissaries-general under five years' service, assistant com- missaries-general, inspectors of army accounts, staff or regimental surgeons, chaplains attached to brigades, deputy judge advocates if not at the head of their department, storekeepers of the ordnance, and barrack masters of the first and second classes; (9) captains, deputy assistant commissaries-general, assistant deputy paymasters-general, regimental paymasters, principal examiner of military accounts, staff or regimental assistant surgeons after ten years' service, veterinary surgeons after twenty years' service, chaplains attached to regiments, deputy Seereket ro of the ordnance, and barrack masters of the third and fourth classes;! (10) lieutenants, acting deputy assistant com- missaries-general, examiners of military accounts, assistant surgeons, apothe- caries of less than fifteen years' service, deputy medical purveyors, and veterinary surgeons after ten years' service; (11) second lieutenants, com- missariat clerks, clerks in the paymaster-general's and military accounts departments, medical and ordnance clerks, and veterinary surgeons under ten years' service ; (12) superintending schoolmasters.*~~

~~*4, Naval Precedence.—(1) Admirals of the fleet ; (2) admirals ; (3) vice-admirals; (4) rear-admirals and inspectors-general of hospitals and fleets ; (5) coinimodores ; (6) captains of over three years' seniority, deputy inspectors-general of hospitals and fleets, secretaries to admirals of the fleet, paymaster-in-chief, chief inspec- tors of machinery, and inspectors of machinery of eight years' standing; (7) captains of under three years' seniority ; (8) staff captains, secretaries to com- manders-in-chief of five years' standing, and inspectors of machinery of under eight years' standing ; (9) commanders ; (10) staff commanders, fleet surgeons, secretaries to commanders-in-chief of under five years' standing, paymasters of fifteen years', chief engineers of ten, and naval instructors of fifteen years' standing ; (11) lieutenants of eight years' seniority ; (12) navigating lieutenants of eight years' seniority, staff surgeons, secretaries to junior flag officers, pay- masters of eight, naval instructors of eight, and chief engineers of under ten years' standing ; (13) lieutenants of under eight years' seniority ; (14) navigating lieutenants of under eight years' seniority, surgeons, secretaries to commodores of the second class, paymasters and naval instructors of under eight and assistant paymasters and engineers of over eight years' standing ; (15) sub-lieu- tenants ; (16) navigating sub-lieutenants, assistant paymasters and engineers of under eight years' standing, chief carpenters, and assistant engineers ; (17) chief gunners and chief boatswains ; (18) gunners, boatswains, and carpenters ; (19) midshipmen and clerks ; (20) naval cadets and assistant clerks.*~~

~~*5. Relative Military and Naval Precedence.—{1) Field-marshals with admirals of the fleet; (2) generals with admirals; (8) lieutenant-generals with vice- admirals ; (4) major-generals with rear-admirals; (5) brigadier-generals with commodores ; (6) colonels with captains of over three years' seniority ; (7) lieu- tenant-colonels with captains of under three years' seniority and staff captains, and before commanders and staff commanders ; (8) majors with lieutenants and navigating lieutenants of eight years' seniority ; (9) captains with lieutenants and navigating lieutenants of under eight years' seniority ; (10) lieutenants with sub-lieutenants and navigating sub-lieutenants ; (11) second lieutenants with midshipmen. —*~~

~~*6. Diplomatic and Consular Precedence.—(1) Ambassadors immediately after the royal family and the sons and brothers of sovereigns, and before*~~

~~arch- bishops, great officers of state, and dukes ; (2) envoys and ministers accredited to the sovereign after dukes and before marquesses ; (3) chargés d'affaires who are accredited, not to the sovereign, but to the minister of foreign affairs, have no ak ew: general precedence ; (4) military or naval attachés of higher rank than colonel in the army or captain in the navy, next to the head of the mission ; (5) agents-general and consuls-general with but after major-generals and rear- admirals ; (6) consuls-general with but after brigadier-generals and commo- dores; (7) secretaries of embassy ; (8) secretaries of legation ; (9) military or naval attachés of or under the rank of colonel in the army or captain in the navy, next to the secretary of embassy or legation ; (10) consuls with but after colonels in the army and captains in the navy ; (11) second secretaries of em- bassy ; (12) second secretaries of legation; (13) vice-consuls with but after majors in the army and lieutenants in the navy of eight years' seniority ; (4) third secretaries of embassy; (15) third secretaries of legation ; (16) consular agents with but after captains in the army and lieutenants in the navy of under eight years' seniority ; (17) attachés.~~

~~7. Colonial Precedence generally.—(1) The governor or lieutenant-governor or officer administering the government ; (2) general in command of the troops and admiral in command of the naval forces; (3) the bishop; (4) the chief justice ; (5) colonel or lieutenant-colonel in command of the troops and thie officer of equivalent rank in command of the naval forces ; (6) members of the ee eee~~

~~1 Town or fort majors, if officers under the rank of captain, rank as the~~

~~junior captains in the garrison, and apothecaries after fifteen years' service rank immediately before lieutenants.~~

~~*executive council; (7) president of the legislative council; (8) members of the legislative council; (9) speaker of the house of assembly; (10) puisne judges; (11) members of the house of assembly ; (12) colonial secretary not being in the executive council; (13) commissioners or Government agents of provinces or districts ; (14) attorney-general ; (15) solicitor-general ; (16) major or other senior officer in command of the troops and the officer of equivalent rank in command of the naval forces ; (17) the archdeacon ; (18) treasurer, pay- master-general, or collector of internal revenue ; (19) auditor-general or inspector of general accounts; (20) commissioner of crown lands; (21) collector of customs ; (22) comptroller of customs ; (23) surveyor-general ; (24) clerk of the executive council ; (25) clerk of the legislative council; (26) clerk of the house of assembly.*~~

~~*8. Precedence in the Dominion of Canada.—(1) The governor-general or officer administering the government; (2) general commanding the troops and admiral commanding the naval forces; (3) lieutenant-governor of Ontario ; (4) lieutenant-governor of Quebec ; (5) lieutenant-governor of Nova Scotia ; (6) lieutenant-governor of New Brunswick; (7) archbishops and bishops; (8) members of the cabinet; (9) speaker of the Senate; (10) chief judges of the courts of law and equity; (11) members of the privy council; (12) generals and admirals not in chief command ; (18) colonel in command of the troops and naval officer of equivalent rank in command of the naval forces ; (14) members of the Senate; (15) speaker of the HIouse of Commons ; (16) puisne judges ; (17) members of the HIouse of Commons ; (18) members of provincial executive councils within their province ; (19) speaker of legislative councils within his province; (20) members of legislative councils within their province; (21) speaker of legislative assemblies within his province ; (22) members of legis- lative assemblies within their province.*~~

~~*9. Precedence in the Indian Empire—(1) Governor-general and viceroy of India ; (2) governors of Madras and Bombay ; (3) president of the council of the governor-general ; (4) lieutenant-governors of Bengal, the North-West Provinces, and the Punjab when in their own territories ; (5) commander-in-chief in India ; (6) lieutenant-governors of Bengal, the North-West Provinces, and the Punjab ; (7) chief justice of Bengal; (8)*~~

~~bishop of Calcutta, metropolitan of India; (9) ordinary meinbers of the council of the governor-general ; (10) commanders-in- chief in Madras and Bombay ; (11) commander-in-chief of the naval forces un- less senior in relative rank to the above ; (12) chief justices of Madras, Bombay, and the North-West Provinces ; (13) bishops of Madras and Bombay ; (14) ordi- nary embers of council in Madras and Bombay ; (15) chief commissioners and resident at Hyderabad, and agents to the governor-general in Rajputana, Cen- tral India, and Baroda; (16) puisne judges of the High Courts of Calcutta, Madras, Bombay, and the North-West Provinces ; (17) military officers above major-generals ; (18) additional members of the councils of the governor-general ; (19) secretaries to the Government of India; (20) commissioner in Sind ; (21) judges of the Chief Court in the Punjab ; (22) additional members of the councils of the governors of Madras and Bombay ; (23) chief secretaries to the Govern- ments of Madras and Bombay ; (24) members of the legislative council of the lieutenant-governor of Bengal; (25) vice-chancellors of Indian universities. First class: (26) civilians of thirty-one years' standing and major-generals ; (27) advocate-general, Calcutta ; (28) advocates-general, Madras and Bombay ; (29) members of the boards of revenue, Bengal, Madras, and the North-West Provinces, and commissioners of revenue and customs, Bombay ; (30) financial commissioner, Punjab ; (31) judicial commissioners and recorder of Rangoon ; (32) comptroller-general of accounts in India ; (33) commissioners of divisions within their own divisions, and residents, political agents, and superintendents, on pay of Rs.2000 per mensem or more (not being collectors or deputy com- missioners of British districts), within their own charges; (34) civil and military secretaries to Governments of Madras and Bombay, and civil secretaries to Governments of Bengal, North-West Provinces, and Punjab; (35) surveyor- general of India, and directors-general of the post-office and of telegraphs ; (36) chief engineers, first class ; (37) archdeacons of Calcutta, Madras, and Bombay ; (88) brigadier-generals. Second class: (89) civilians of twenty-three years' standing and colonels; (40) commissioners of divisions, and commissioners of police, Calcutta ; (41) private secretary to the viceroy ; (42) residents, political agents, and superintendents on pay of Rs.2000 per mensem or more (not being collectors or deputy cominissioners of British districts); (43) superintendent of the trigonometrical survey ; (44) commissioner of inland customs ; (45) sani- tary commissioner of the Government of India;~~

~~*(46) Supers of the Geological Survey ; (47) inspector – general of forests in India; (48) standing council to the Government of India; (49) military accountant – general ; (50) directors of public instruction under local governments ; (51) accountant-general for local governments ; (52) inspectors-general of police under local govern- ments; (53) director of revenue settlement and superintendent of revenue survey, Madras, survey and settlement commissioners, Boinbay, and com- missioner of settlements, Punjab; (54) remembrancers of legal affairs and Government advocates in the North-West Provinces, the Punjab, and British Burmah; (55) consulting engineers to the Government of India for guaranteed railways, Calcutta and Lahore, and chief engineers (second and third classes) under local governments ; (56) district and sessions judges, col- lectors and magistrates of districts, deputy superintendent of Port Blair, and the chief officer of each presidency municipality, within their respective charges ; (57) officers of the first class graded list of civil offices not reserved for members of the Covenanted Civil Service. Third class: (58) civilians of eighteen years' standing and lieutenant-colonels; (59) political agents and superintendents on pay of Rs.1000 and less than Rs.2000 per inensem (not being collectors or deputy commissioners in British districts) within their own charges ; (60) military secretary to the Government, Punjab, and civil secretaries to local administrations ; (61) private secretaries to governors ; (62) directors of public instruction under local administrations ; (63) administrators-general, Calcutta, Madras, and Bombay; (64) inspectors-general of jails and of registration, sanitary commissioners, inspectors, and conservators of forests under local governments, and postmasters-general; (65) accountants- general for local administrations ; (66) consulting engineer to the Government of India for guaranteed railways, Lucknow, and chief and superintending engineers when secretaries to local administrations or to agents to the governor-general ; (67) inspectors-general of police under local administrations ; (68) senior chaplains ; (69) superintendent of marine, Bombay ; (70) master attendants ; (71) sheriffs within their own charges ; (72) officers in the second class graded list of civil offices not reserved for members of the Covenanted Civil Service. Fourth class: (73) civilians of twelve years' standing and majors ; (74) political agents and superintendents of less than Rs.1000 per mensem within their own charges ; (75) Government solicitors; (76) inspectors-general of jails and of registration, sanitary commissioners, and conservators of forests under*~~

~~local administrations; (77) officers in the third class graded list of civil offices not reserved for members of the Covenanted Civil Service.? een eee ee~~

~~2 Aj] ladies to take place according to the rank herein assigned to their respective husbands, with the exception of wives of Peers and of ladies having precedence in England independently of their husbands and who are not in rank below the daughters of Barons, such ladies to take place according to their several ranks with reference to such precedence in England immediately after the wives of members of council at the presidencies in India" (Royal Warrant, 18th October 1876).~~

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~~10. Academical Precedence.—{(1) Chancellors; (2) high stewards; (3) vice-chancellors; (4) rectors; (5) principals; (6) heads of colleges and halls pe doctors of divinity ; (8) doctors of law; (9) doctors of medicine ; (10) doe ors of music; (11) bachelors of divinity ; (12) proctors; (13) professors ; (z masters of law ; (15) masters of arts; (16) bachelors of law; (17) bachelors 0 medicine; (18) bachelors of music; (19) bachelors of arts. Offices in a universities are more or less different in each of them, and those whic. are peculiar to any one vary so much from those which are peculiar to the others that it is not convenient to enumerate and distinguish them. Among graduates of all of them the senior take precedence of the id according to their several faculties and degrees and the relative antiquity o their universities in the order of Oxford, Cambridge, St Andrews, Glasgow, Aberdeen, Edinburgh, Dublin, London, Durham, Queen's, Sydney, Melbourne, Catholic, Royal, and Victoria. (F. DR.)~~

~~PREDESTINATION is a theological term, sometimes used with greater latitude to denote the decree or purpose of God by which He has from eternity immutably deter- mined whatever comes to pass ; sometimes more strictly to denote the decree by which men are destined to everlasting happiness or misery ; and sometimes with excessive strict- ness to denote only predestination to life or election.)~~

~~The question to which the theory of predestination supplies an answer, although it has a special interest to Christian thought, yet arises in all~~

~~minds which are occupied with the problems of human existence. That question is, To what. cause can we refer the diversities in human character, fortunes, and destiny? The Greek tragedians made it their business to exhibit the helplessness of man in his strife against fate. Sometimes indeed they explicitly distinguish fate from a mere pitiless and non-moral sove- reignty and identify it with the Nemesis which pursues hereditary or individual guilt; and sometimes—as in the case of Gidipus—they follow the history of the sufferer for the sake of showing how the predestined and inevitable. transgression and punishment educate the character. But the idea which fascinates and pursues them is that man can- not escape his destiny, that his life is woven with a "shuttle of adamant," and that when God means to destroy a man He makes evil seem good to him (Soph., Antig., 622-24). The Greek philosophy tended in the same direction ; and the Stoic doctrine of necessity or providence, though based on a broad and thoroughly philosophical view of nature and of man's place in it, was entangled in the very diffi- culties which attach to Calvinism.~~

~~Among the Jews the Sadducees carried their defence of free will so far as to deny predestination ; while the~~

~~1 This restricted use of the term is favoured by Lutherans (" Ac- cipitur preedestinatio vel improprie, quomodo destinationem et ad vitam et ad mortem complectitur, . . . vel proprie, quomodo phrasi scripture tantum ordinationem ad vitam notat," Quenstedt). In a different interest, the Westminster Confession seems to incline to restrict the use of the word " predestinate " to the decree which secures to some men life eternal, while for the obverse of that decree, by which the rest of men are consigned to everlasting death, it prefers the term "foreordained" : its words are, " By the decree of God, for the manifestation of His glory, some men and angels are predestinated unto everlasting life and others foreordained to everlasting death. These angels and men, thus predestinated and foreordained," &c. Dr Cunningham (Historical Theol., ii. 422) tells us that this distinction is not grounded either on etymology or on the usage of theologians, "but Calvinists, in general, have held that there is an important dif- ference between the way and manner in which the decree of election bears or operates upon the condition and fate of those who are saved, and that in which the decree of reprobation, as it is often called,~~

~~*bears or operates upon the condition of those who perish ; and the e2istence of this difference, though without any exact specification of its nature, the compilers of the Confession seem to have intended to indicate, by restricting the word ‘ predestinate’ to the elect, the saved ; and using the word ‘foreordained’ in regard to the rest.” Probably a signi- ficance slightly more definite shonld, however, be attached to the Introduction of this distinction ; for as early as the age of Augustine objection was taken to the expression “ predestinati ad interitum” on the specific ground that it seemed to impose upon men a necessity of _Perishing. And Bishop Davenant, while he does not shrink from using the term “ predestinate to death,” gives this significant explana- tion: “if by predestinating ad interitum we understand the causing and effectual working of any man’s destruction, God cannot be said predestinare ad interitum: but if we only understand the foreordain- Ing of those to damnation whom God foresaw deserving and working*~~

~~*the same, we neither think nor speak otherwise than the orthodox Fathers did (Animadversions, &c., p. 41).*~~

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~~*Pharisees and Essenes ran to the other extreme and left no place for human freedom (Josephus, Antig., xviii. 1, 3, 4 ; Mi. <0):*~~

~~*In Islam the subject of predestination has produced endless controversy. The orthodox doctrine is thus stated by Al-Berkevi. “It is necessary to confess that good and evil take place by the predestination and predetermination of God, that all that has been and all that will be was de- creed in eternity and written on the preserved table; that the faith of the believer, the piety of the pious, and their good actions are foreseen, willed, predestinated, decreed by the writing on the preserved table produced and approved by God: that the unbelief of the unbeliever, the impiety of the impious, and bad actions come to pass with the foreknowledge, will, predestination, and decree of God, but not with His satisfaction and approval. Should any ask why God willeth and produceth evil, we can only reply that He may have wise ends in view which we cannot comprehend.”*~~

~~*Some Mohammedan teachers (disciples of Al-Ash'ari) endeavour to maintain the consistency of this doctrine with man's freedom and responsibility ; but prac- tically the Sunnite or orthodox Mohammedans believe that by the force of God's eternal decree man is constrained to act thus or thus. From this there has resulted, on the one hand, the Epicurean pessimism of 'Omar Khayy4am—*~~

~~*"°Tis all a chequer-board of nights and days*~~

~~*Where destiny with men for pieces plays :*~~

~~*Hither and thither moves, and mates, and slays,*~~

~~*And one by one back in the closet lays ""— or the weak recklessness of the poet Faizi: '" Before thou and I were thought of, our freewill was taken from us; be without cares for the Maker of both worlds settled our affairs long before we were made." On the other hand, there has resulted the freethinking (Mo'tazilite) reaction, to which the Shiahs incline and which rehabilitates freewill © at the expense of the divine sovereignty.*~~

~~*Within the Christian church there have in like manner always existed two opposed beliefs regarding predestina- tion, which have received their ultimate development and expression in the Calvinistic and Arminian systems respect- ively. The Calvinistic doctrine of predestination is that "from all eternity God chose or elected some men—certain definite persons of the human race—to everlasting life ; that He decreed or determined certainly and infallibly, and not conditionally and mutably, to bring those persons to salvation by a Redeemer ; that in making this selection of some men, and in decreeing to save them, He was not in- fluenced or determined by anything existing in them or foreseen in them—such as faith or good works—by which they were distinguished from other men, or by anything out of Himself, or by any reason known to us or compre- hensible by us; and that this eternal purpose or decree He certainly and infallibly executes, in regard to each and every one included under it; while all the rest of men not thus elected He decreed to pass by,—to leave in their natural state of sin and misery, and finally to punish eter- nally for their sin." The Arminian doctrine of predestina- tion (see ARMINIUS) is that God has from eternity decreed to give eternal life to as many as repent and believe, and foreseeing*~~

~~who shall repent and believe He has determined to give life to these. The "peremptory" election of indi- viduals to life eternal proceeds only on the foreknowledge of their faith and obedience, so that, as the Remonstrants explicitly affirmed, the decree proper in predestination is that decree by which it is determined on what grounds or conditions God assigns sinners to salvation.2 The differ- ence between these two views of predestination is wide, and, when logically carried out, radical. The Calvinist~~

~~? "Sententia Remonstr.," in Hales's Letters from Dort, pp. 174- 175 ; also Apol. Conf. Remonstr., p. 102.~~

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~~maintains that God absolutely decrees the salvation of a certain fixed number of definite persons, and in pursuance of this decree infallibly secures their salvation; the Armi- nian maintains that God's decree, so far as it concerns the salvation of individuals, is conditional upon their use of the means of grace. That which constitutes Arminianism is the denial that God absolutely elects individuals to eternal life; and that which lies at the root of Calvinism, and out of which all that is characteristic of the system springs, is the-affirmation that God does absolutely elect certain in- dividuals to life eternal, and in pursuance of this decree works in them all that constitutes life eternal. Accord- ing to Calvinism, salvation is the work of God. Seeing men to be all alike helplessly involved in sin and misery, God determined to save some, not on account of any good in them but for sonie inscrutable but necessarily wise and just reasons, and because of this determination He gives to those whom He wills to save, and enables them to receive and retain, all that is involved in salvation,—renewal of will, union to Christ, holiness of life, the indwelling Spirit.~~

~~The doctrine of predestination was first formulated in the church by Augustine. The Pelagian idea that man is competent to determine his own character, conduct, and destiny was repugnant to him, and he strove to show that the initial and determining element in the salvation of.the individual is not the human but the divine will. He based his position upon the doctrine of original sin and the consequent depravity of the will. This~~

~~doctrine represents the whole human race as involved in moral ruin, guilty and sinful, incapable of self-regeneration or of willing what is good. By God alone, therefore, can regeneration and deliverance be accomplished. The salvation designed by God must not be allowed to depend for its efficacy on the depraved and incapable will of man ; it must be an absolute act of power on God's part. Provision must be made not only for the offer but for the acceptance of grace. In a word, grace must be effectual or irresistible. Hence Augustine distinguished between 'assistance without which a thing cannot be done" and "assistance by which a thing is done" (the Jansenist adjutorvum sine quo non, and adjutorium quo, assisting and efficacious or irresistible grace). By every device of language he throws the whole work of salvation upon God ("facit credentes," "data sunt et ipsa merita quibus datur," "non solum mentes bonas adjuvat, verum etiam bonas eas facit"). This is the distinctive characteristic of the dispensation of redemption, that it depends not on man's will but on God's. 'A dispensation which left the salvation of man dependent on his will was highly suitable as a first one, suitable alike to the justice of the Creator and the powers of the untried creature, and such as we should naturally expect at the beginning of things ; but such having been the nature of the first, the second must, for that very reason, be a dispensation of a different kind, effecting its design not by a conditional but by an absolute saving act." This absolute saving act being an act of God, and it being maintained by all theologians that whatever God Himself does in time He has from eternity decreed to do, we have the doctrine of predestina- tion. As Aquinas tersely puts the kernel of the Augus- tinian doctrine: "It is manifest that whatever is of grace is the effect of predestination." With Augustine grace is nothing else than predestination realized. Grace is irresistible because it is God's instrument in fulfilling His decree. This carries with it a refutation of the three modified forms of predestinarian doctrine which continually seek to make good for themselves a position within the church. It maintains (1) that men are elected not to mieans of grace only but to grace itself. Salvation is infallibly secured to the elect (De Dono Persev., passim).~~

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~~It maintains (2) that not nations or the church but individuals are the object of predestination,—a certain fixed number, "'so certain that no one can be~~

~~added to it or taken from it" (De Corr. et Gratia, 13). And (3) this predestination must be founded, not on foreseen good in man, but on the inscrutable but necessarily just will of God (De Pred. Sanct., 17).~~

~~As Augustine thus constructed the doctrine of pre- destination as an integral part of the evangelical system, he necessarily spoke much more of election than of re- probation ; but he did not shrink from acknowledging, with all intelligent predestinarians, that the election of some involved the passing by (preteritio) of the rest : "for the rest, where are they but in that mass of perdition where the Divine justice most justly leaves them?" (De Dono Persev., 14). "If God from eternity absolutely elected some unto the infallible attainment of grace and glory, we cannot but grant that those who are not com- prised within this absolute decree are as absolutely passed by as the others are chosen" (Bishop Davenant's Animad- versions, p. 4). All men being naturally under condem- nation, it seemed to Augustine no injustice that in some that condemnation should take effect; and, if it is sug- gested that it would at all events have been better had all been saved, he is content to reply, " Who art thou, O man, that repliest against God?" He has no hesita- tion, therefore, in using the expressions "' preedestinati ad interitum," or "ad sternam mortem," or '" damnationi preedestinati"; and in using these expressions he indicates that there are some to whom God has decreed not to give saving grace, and that He foresaw that these persons would sin and be damned. He does not bring the decree of reprobation into direct, and of course not into causal, connexion with the sins of the reprobate, holding that, while the decree of God is the efficient cause of all good in the elect, the cause of sin in the reprobate is the evil will of man. He denies that God's foreknowledge of man's sin makes that sin necessary, but he nowhere ex- haustively discusses the distinction between foreknowledge and decree. When pushed to defend God's justice in creat- ing those whose damnation He foreknew, he responds to the challenge sometimes by showing that, so far as the Creator's responsibility is concerned, the creature which sins with free will is of a higher kind than that which cannot sin because it has no free will; sometimes on the ground that it contributes to God's glory that His retributive justice should be manifested ; and sometimes on the ground that in the destruction of sinners the elect will see what God's goodness has saved them from.~~

~~About the middle of the 9th century Gottschalk attempted to revive Augustinianism (see GOTTSCHALR). His teaching regarding predestination was precisely that of his master, and as such it was maintained by Remigius of Lyons in opposition to the blundering and intolerant Hincmar of Rheims. Hincmar admitted predestination to life and also the consequent abandonment of the rest of men to their sinful state, and yet he mercilessly persecuted Gottschalk for maintaining a predestination to punish- ment, and sought to establish a distinction befween leaving men in a state which involves punishment and ordaining them to punishment. Remigius exposed the futility of such a distinction, and showed that "the abandonment of a certain portion of mankind to the state of sin in which they are born is predestinarian reprobation, whether we express it as abandonment to sin or as ordaining to punishment." The discussion, however, extensive and heated as it was, did not go deeply into the substance of the controversy. The incident which gave a distinctive character to this period of the development of the doctrine~~

~~1 See Mozley, Augustinian Doctrine of Predestination.~~

~~was the appeal for aid which Hincmar made to John Scotus Frigena ; for in the tract on predestination which Erigena wrote in response to this appeal he introduced the terms and methods of philosophy and sought a solu- tion for the problem in the nature of God. He argued that, God being eternal, foreknowledge and predestination, which are temporal relations, could only improperly be predicated of Him. He argued also that sin and its con- sequences in death and misery are nonentities, the mere corruption, defect, or privation of their opposite realities, and that therefore they can neither be caused by God nor be known by Him. Reprobation is therefore impossible. Still further, he argued that evil is only a stage in the development of good, and that the ultimate issue of the development is universal return to God. This orthodoxy was considered more dangerous than the heresy it was called in to resist. Prudentius, Ratramnus, Lupus, and Florus denounced the introduction of this style of discus- sion, for which indeed the mind of the church was not at that time prepared. Not only did interested individuals resist the teaching of Erigena, but two councils~~

~~*condemned his treatise as containing "' heereses plurimas, ineptas ques- tiunculas, et aniles pzne fabellas, pluribus syllogismis conclusas, Scotorumque pultes puritati fidel nauseam in- ferentes." Accordingly no additional light on the problem was received by the church at this time.*~~

~~*This controversy, however, was merely the prelude to a discussion which was maintained throughout the scholastic period, and in which the Thomists adopted the more rigid Augustinian view, while the Scotists leaned to Semi- pelagianism. Anselm and Peter Lombard were moderately and guardedly Augustinian. Thomas Bradwardine (arch- bishop of Canterbury, d. 1349) complained that almost the whole world had fallen into Pelagianism, and strenu- ously opposed this tendency. But it is in Aquinas (Summa, 1, Q. xxiii.) that we find the clearest and most compact treatment of the subject. His doctrine is sub- stantially that of Augustine. In express terms he teaches that predestination is an essential part of the divine providence, and that, as some, and these a fixed number, are ordained to life eternal, so by the same divine providence others are allowed to fail of this end ("et hoc dicitur reprobare"). He teaches further that this pre- destination does not depend upon any foreseen difference of character ("preescientia meritorum non est causa vel ratio predestinationis"). Aquinas derives his doctrine of predestination directly from his doctrine of God (not from his anthropology, as Augustine had done). His idea of God was the Aristotelian "first mover, itself unmoved." That God is in all things by His power, presence, and essence he explicitly maintains against three forms of error regarding the connexion of God and the world. The divine will is the cause of all things past, present, and to come.*~~

~~*But the contribution made by Aquinas consists in his theory of the divine concurrence, by which he seeks to provide a philosophical basis for Augustinianism. The divine providence governs all things by means of two great classes of secondary causes, the necessary or natural and the contingent or voluntary. The mediate or proxi- mate causes of all that takes place in the natural world are necessary ; the proximate causes of human action are the voluntary motions of the will. But both are set in motion by God, the First Cause: as the actings of natural causes remain natural, though they are moved by God, so do the actings of voluntary causes*~~

remain voluntary though moved by God.!_ But obviously this theory leaves only an appearance of free will. 'Free will is here reconciled

*1 «tq; * * Sicut naturalibus causis, movendo eas, non aufert quin actus earum sint naturales, ita movendo causas voluntarias, non aufert quin actiones earum sint voluntariz, sed potius hoc in eis facit."*

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and made consistent with the divine power, brought into the same scheme and theory. But it is of itself a sufficient test that a system is necessitarian, that it maintains the divine power in harmony with free will. The will as an original spring of action is irreconcilable with the divine power "—at least with the scholastic idea of the divine power—'"'a second first cause in nature being inconsistent with there being only one First Cause." Besides, every theory of predestination which bases itself on the idea that God is the sole originating and true cause must give an account of the origin of evil. Aquinas recognizes this and endeavours to meet the requirement by showing (1) that to a complete universe all kinds of creatures are requisite, not only the highest but the lowest ; (2) that there cannot be a perfect universe without the existence of free will, but that this involves the risk of evil; and (3) that evil is a negation. Of these arguments there are hints in the writings of Augustine and Erigena, and none of them is satisfactory, although they certainly point in the right direction. °

At the Reformation the discussion was drawn back from the endeavour initiated by the schoolmen to find for the doctrine of predestination a scientific basis in the nature of God and HIs connexion with the world. The more circumscribed method of Augustine was reverted to, and it was deemed sufficient to show that predestination was indispensable to the ideas of grace which found a response in the devout Christian consciousness, and that it was In harmony with Scripture. Not only Calvin, but much more unguardedly Luther, and even Melanchthon in the earliest (1521) edition of his Loce Communes, taught the most rigid Augustinian doctrine. In the later editions (1535, 1543) Melanchthon greatly modified his opinions and inclined more to the synergistic view, though even in this he was not thoroughgoing. But the attempt to terminate the synergistic controversy saddled the Lutherans with a symbol—the formula concordix—which,

~~*awkwardly enough, rejected both the Semipelagian theory of co-opera- tion and the Augustinian doctrine of predestination. The consequence has been that later Lutheran theologians, in their efforts to purge their church of this inconsistency, have devised the theory that man, unable as he is to will any good thing, can yet use the means of grace, and that these means of grace, carrying in themselves a divine power, produce a saving effect on all who do not volun- tarily oppose their influence. Baptism, ¢.g., confers grace which, if not resisted, is saving. And God, foreseeing who will and who will not resist the grace offered, pre- destinates to life all who are foreseen as believers.*~~

~~*The theory of Calvin (Jnst., i. 15-18; iii. 21-24) need not be detailed, because it is Augustinian not only in its substance but in the methods and grounds by which it is sustained.2 Hagenbach (Hist. of Doctrines, iii. 103) and others have indeed asserted that Calvin held the supra- lapsarian theory, and in so far differed from Augustine. But in order to prove Calvin or any one else a supra- lapsarian it is not enough to show that he believed that the fall was decreed, for this is admitted by Augustine and all sublapsarians; it must be shown that the fall was decreed as a means towards carrying out a previous decree to save some and leave others to perish,—a view which Calvin turns from as an otiosa curtositas. The supra-lapsarian view was, however, adopted by Beza and other Calvinists, as it had been held by some of the Augustinian schoolmen; and indirectly this led to the reopening of the controversy in the beginning of the 17th century. For it is said to have been the extreme supralapsarianism of Perkins which repelled Arminius from Calvinism and*~~

~~*2 Compare Burnet, On the XXXIX. Articles, and Mozley's Augustin. Doct., where this agreement is affirmed.*~~

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~~*led him to promulgate the opinions which are known as Arminianism, and which led to the summoning of the synod of Dort (see ARMINIUS and Dort). 'The canons of Dort, while not definitively exclusive of supralapsarianism, are favourable to the sublapsarian view; and the West-*~~

~~minster divines followed the lead of Dort in constructing their Confession so as to admit of signature by either party.~~

~~Meanwhile the Church of Rome had been torn by similar diversities of opinion. The council of Trent was careful not to offend the Doniinicans by explicitly repudi- ating Augustinian doctrine. But, as time went on, the Jesuit MoLina (q.v.) stirred the sleeping controversy by a well-meant and decidedly able attempt to reconcile free will and God's foreknowledge. A still more serious dis- turbance was created by the strenuous efforts of Jansen to revive the decaying Augustinianism of the church. But neither then nor in more recent times has anything essential been added to the argument on either side; and until our knowledge of the freedom of the will becomes more scientific—that is, more accurate, thorough, and reliable—it is impossible that the argument can advance. During the last two centuries the discussion in England has turned not so directly on the truth or falsity of Calvinism as upon the question whether the Church of England Articles are or are not Calvinistic. This question has been reopened at various times—at the dismissal of Baro from the Margaret professorship at Cambridge at the close of the 16th century; on occasion of Dr Samuel Clarke's plea for Arian subscription ; in connexion with the Wesleyan claim that the Articles favoured Arminianism ; and again, in this century, in the Bampton lectures of Archbishop Lawrence. The arguments which may be gathered from the actual terms of the seventeenth Article itself are very fairly stated by Bishop Burnet, who, though himself an Arminian, frankly allows that Calvinists can**

_ sign the Article with less scruple than Arminians, "since

the Article does seem more plainly to favour them." The historical facts regarding the theological school to which the frainers of the Articles belonged are very fully given in Goode's Effects of Infant Baptism.1 In Germany, not- withstanding Herder's dismissal of the subject of pre-destination with the curse, "'May the hand wither that shall ever bring it back," theologians still range them- selves in opposite camps,—Kliefoth, Frank, and Sartorius advocating the Augustinian doctrine, while Thomasius, Hofmann, and Luthardt attempt a middle course.

Lipsius justly observes that the solution of the problem of pre- destination is the solution of the religious problem in general. The Augustinian theory is

~~not an isolated doctrine which may be accepted or rejected without any material alteration of fundamental beliefs. It is rather a deliverance upon the relation which subsists between God and the world,—that is, upon the radical problem of philosophy. No doubt it is rather in a theological than in a philosophical interest that the subject has usually been debated. It has been felt that the Augustinian theory accords better with the devout humility of the religious spirit, and lays a sure ground for hopeful confidence ; while the opposed theory is considered to be more likely to excite human effort and secure a more satisfactory level in conduct, if not a higher spiritual condition. Both parties have been influenced by a perhaps somewhat officious zeal for the divine reputation, the one party being concerned to maintain God's sovereignty, the other His goodness. Our ignorance of the divine nature, aud our inability to apprehend the subtlety of His connexion with the world, have not been sufficiently allowed for by either party. Is God the absolute sovereign without whose will no indi- vidual act isdone? Is He in all things by His essence and will? Then the Calvinistic scheme seems alone legitimate. As Calvin himself argues, if God has not absolutely decreed all things, then "ubi erit illa Dei omnipotentia, qua secundum arcanum consilium, quod aliunde non pendet, omnia moderatur?" (Jnst., iii. 23, 7). And yet, if God's sovereignty is thus universal, can the freedom of the human will be preserved in more than name? Is not the world~~

~~1 A review of the controversy and its literature will be found in Cunningham's Reformers and Theology of the Reform., Essay iv.; and, on the other side, Hardwick's Hist. of the Articles may be consulted.~~

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~~of human thought and action reduced to a mere play of puppets, a pantheistic sham? If God's will has determined all that is to be, what real power of origination is left to man? He who determines upon a certain event sets in operation such causes as will produce it, and is himself its proper efficient cause. If God is thus the real cause of all that is, the universe would seem to be merely God evolving Himself, and there has been no true creation, no bringing into being of wills separate from His own.~~

~~The grave difficulty, therefore, with which the strict doctrine of predestination has always to contend is its apparent inconsistency with~~

~~*human accountability. It is accused generally of colliding with human freedom, and particularly of representing God as the author of sin. This consequence of their teaching Calvinists repudiate. They maintain that by God's foreordination of whatsoever comes to pass "violence is not offered to the will of the creature"; and they have adopted various methods of relieving their doctrine from the odium of this charge. The character of an act has been separated from its substance or actuality, and, while its character is ascribed to man's free will, its actuality is referred to God's sustaining energy. Or it has been supposed that God may have created men with the power of originating action, so that, though dependent upon God for life, yet when kept in life men can act freely. But this scarcely meets the difficulty, for Calvinism maintains that each individual act is determined by God. Others again prefer to relegate these seeming contradictions to the region of the unknowable, and to say with Locke: "I cannot have a clearer perception of anything than that I am free, yet I cannot make freedom in man consistent with omnipotence and omniscience in God, though I am as fully per- suaded of both as of any truth I most firmly assent to; and there- fore I have long since given off the consideration of that question, resolving all into the short conclusion that if it be possible for God to make a free agent, then man is free, though I see not the way of it." M. D.)*~~

~~*PRE-EMPTION. See Sate.*~~

~~*PRELATE. See Azszot and BisHop.*~~

~~*PRELLER, Friepricu (1804-1878), German landscape- painter, was born at Eisenach on 25th April 1804. After studying drawing at Weimar, he went in 1821, on Goethe's advice, to Dresden, where he made such progress that in 1824 he was invited to accompany the grand-duke of Weimar to Belgium, where he became a pupil in the academy at Antwerp. From 1827 to 1831 he studied in Italy, and in the last-named year he received an appoint- ment in the Weimar school of art. In 1834-36 he exe- cuted in tempera six pictures on subjects taken from the Odyssey in the "Roman HIouse" at Leipsic, in 1836-37 the landscapes with scenes from Oberon in the Wieland room in the grand-ducal palace at Weimar, and in 1836- 48 six frescos in Thuringian subjects commissioned by the grand-duchess. In 1840 he visited Norway and produced a number of easel works, some of which are*~~

~~preserved at Weimar. In 1859 he revisited Italy, and on his return in 1861 he completed for the grand-ducal museum the landscapes illustrative of the Odyssey, which are held to constitute his chief claim to fame, entitling him to rank with Poussin and Claude Lorraine in the hierarchy of painters. Preller, who was also a successful etcher, died at Weimar on 23d April 1878.~~

~~PRELLER, Lupwice (1809-1861), author of well-known works on Greek and Roman mythology, was born at Ham- burg on 15th September 1809. He studied philology at Leipsic under Gottfried Hermann, at Berlin under Bockh, and at Gottingen under O. Miiller, graduating at the last- nained university in 1832. After "'habilitating" as privat- docent in Kiel, he was called in 1838 to an ordinary pro- fessorship at Dorpat, which, however, he speedily resigned along with several other German professors in consequence of misunderstandings with the Russian governing body. He afterwards spent some time in Italy, but settled in Jena in 1844, where he became professor in 1846. In the same year he removed to Weimar as head librarian and hofrath. In 1852 he travelled in Greece and Asia Minor. His death occurred at Weimar on 21st June 1861.~~

~~Preller's chief works are—Demeter wu. Persephone (1837), Griechische Mythologie (1854-55 ; 3d_ed., 1872-75), and Romische Mythologie (1858 ; 3d ed., 1878). He also co-operated with H. Ritter in the preparation of a useful Historia philosophiew grec et romanz~~

~~ex fontium locis contexta (1838 ; 4th ed., 1869), and contributed extensively to Ersch and Gruber's -Allgem. Encykl. ae~~

~~PRENZLAU, or PRENZLOW, a town of Prussia, in the province of Brandenburg, lies on the lower Ucker See, 60 miles north by east of Berlin and 30 miles west by south of Stettin. It is a busy little place with various branches of industry, among the chief of which are wool cleaning and spinning, iron-founding, and sugar-refining. A good deal of tobacco is grown in the neighbourhood, and there is a cigar manufactory in the town. A brisk trade is carried on also in cattle and grain. The Gothic church of the Virgin, dating from 1340, is one of the finest churches in the district, and~~

~~*the remains of the old town gates and walls are also interesting. In 1880 Prenzlau contained 16,933 inhabitants, nearly all Protestants and many of French descent. The garrison consists of about 800 men.*~~

~~*Prenzlau is first mentioned in a document of the close of the 12th century, and received its municipal charter in 1235. As the capital of the old Ucker mark it was a frequent object of dispute between Pomerania and Brandenburg until finally incorporated with the latter about 1480. It was at Prenzlau that Prince Hohenlohe, with his corps of 12,000 men, surrendered to Murat on the retreat after the battle of Jena.*~~

~~*PRERAU (Slav. Prerov), one of the oldest towns in Moravia, lies on the Beczwa, 13 miles to the south-east of Olmiitz. It is an important railway junction and carries on a considerable trade. The chief industries are sugar- boiling (from beetroot), rope-making, and the manufacture of agricultural and other machinery. The only buildings of interest are the old castle, once occupied by Matthias Corvinus, and the Gothic town-house. The population in 1880 was 10,985.*~~

~~*PREROGATIVE, in law, is an exclusive privilege of the crown. The word, originally an adjective, is derived from the centuria prerogativa, or century which voted first on a proposed law (rogatio) in the Roman comatia centuriata. In English law, Blackstone says, "' by the word prerogative we are to understand the character and power which the sovereign hath over and above all other persons, in right of his regal dignity ; and which, though part of the common law of the country, is out of its ordinary course. This is expressed in its very name, for it signifies, in its etymology, something that is required or demanded before, or in pre- ference to, all others; and, accordingly, Finch lays it down as a maxim that the prerogative is that law in the case of the king which is law in no case of the subject " (Stephen's Comm., vol. ii. bk. iv. pt. i. ch. vi.). The prerogative is sometimes called jura regalia or regalia, the regalia being either majora, the regal dignity and power, or minora, the revenue of the crown. The word "prerogative" is used to denote the whole privilege of the crown or any part of it ; in the latter sense it may be used in the plural number.*~~

~~*_The theory of English law as to the prerogative of the king seems to be not quite consistent. On the one hand, he is a perfect and irresponsible being,*~~

~~holding his office by divine right ; "Victoria, by the grace of God of Great Britain and Ireland Queen,"! is still the heading of every writ. On the other hand, his powers are defined and limited by law. This is laid down as early as the 13th century: "Rex non debet esse sub homine sed sub Deo et sub lege, quia lex facit regem" (Bracton, 5b),—a strik- ing contrast to the rule of Roman law, "quod principi placuit legis habet vigorem." A consequence of this posi- tion is that the prerogative may be confined or extended by the supreme legislative authority, and that the courts have jurisdiction to decide whether or not any alleged right falls within the prerogative. The prerogative of the crown, still of great extent, has been gradually limited by a long~~

~~1 There is no difference in the prerogative as exercised by a king or 4 queen regnant, so that the word "king"' in its constitutional sense~~

~~includes queen. That the queen regnant has the i king was declared by 1 Mary sess. es He :~~

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~~series of enactments, the most worthy of notice being Magna Carta, Confirmatio Cartarum, Prerogatwa Regis, the Petition of Right, the Habeas Corpus Act, the Bill of Rights, and the Act of Settlement. (SeeENcLanp.) Where a prerogative was abolished by statute, in some instances compensation was granted in return for the surrender, in others no compensation was given. An example of the former is the statute 12 Car. II. c. 24, by which excise duties were granted to the crown in return for the aboli- tion of military tenures and their incidents ; of the latter, the statute 16 Car. I. c. 20, abolishing the prerogative of imposing compulsory knighthood or a fine in its place. The prerogative has also been limited by judicial decision. and by tacit abandonment. Thus monopolies were de- clared illegal (in the respectful language of the judges the queen was held to have been deceived in her grant) in the reign of Elizabeth by The Case of Monopolies (11 Coke's Reports, 84), and the right to exclude a member from par- liament was abandoned by the same queen in 1571. The most important of the obsolete prerogatives, other than those named, which have been at one time claimed and exercised are the following. (1) The right to impose a tax upon the subject without the consent of parliament was the~~

~~subject of contest for centuries. Sums were raised at various times under the names of talliage, scutage, hydage, subsidies, aids, benevolences, tonnage and poundage, tolls, ship-money, tenths, fifteenths, &c. (2) The right to dispense with the obligation of statutes, by the insertion in a grant of the clause non obstante statuto, was frequently asserted by the crown down to the Revolution. An end was finally put to this and the last right by the Bill of Rights. (3) The right of purveyance and pre-emption—that is, of buying up provisions at a valuation without the consent of the owner—and the right of impressing carriages and horses were finally abolished by 12 Car. II. c. 24. (4) The authority to erect tribunals not proceeding according to the ordinary course of justice was declared illegal by 16 Car. I. c. 10 (the Act dissolving the Star Chamber, the court of the marches of Wales, and the court of the president and council of the north). (5) The revenue from first-fruits and tenths, annexed to the crown by Henry VIII., was vested by Queen Anne in trustees for the augmentation of poor benefices, 2 and 3 Anne c. 11. This is what is usually called "Queen Anne's bounty." (6) The right of corody—that is, of sending one of the royal chaplains to be maintained by a bishop until the bishop promotes him to a benefice—has become obsolete by disuse. (7) The right by forfeiture to the property of a convict upon his convic- tion for-treason or felony was abolished by the Felony Act, 1870. (8) The immunity of the crown from payment of costs has been taken away in almost all cases. The crown is liable to costs in revenue cases by 18 and 19 Vict. c. 90, in petitions of right by 23 and 24 Vict. c. 34. (9) The right to alienate crown lands by grant at pleasure was taken away by 1 Anne c. 8, passed in consequence of the improvident alienations of land by William III. In very few cases has the prerogative been extended by statute ; 34 and 35 Vict. c. 86 is an example of such extension. By that Act the jurisdiction of lords-lieutenant of counties over the auxiliary forces was revested in the crown.~~

~~The prerogative may be exercised in person or by dele- gation. The prerogative of conferring honours is generally (though not necessarily) exercised by the king in person, as in the case of investment with knighthood and military or civil decorations. The delegation of the prerogative often takes place by commission, issued with or without a joint address from both Houses of parliament. An ex- ample of a commission~~

~~*issued on a joint address is the commission to inquire into the existence of corrupt prac- tices after an election (15 and 16 Vict. c. 57). In most*~~

~~*cases a commission is issued by the prerogative alone with- out any address from parliament ; thus the assent of the crown to a Bill may be given by commission, and rights of command may be granted by commission to officers in the army and navy. The delegation of the prerogative in judi- cial matters is illustrated by commissions of the peace and commissions of assize. The prerogative may still further be delegated by a delegate; thus commissions of lunacy are and commissions of bankruptcy were issued by the lord chancellor as the representative of the crown. Parts of the prerogative—generally in the nature of profit, and so in derogation of the revenue of the crown—may be con- ferred upon subjects by grant in letters patent, which will be presumed after enjoyment by the subject for a certain time. What in the king is a prerogative becomes a fran- chise in the subject, e.g., chases, warrens, wrecks, treasure- trove, courts-leet.*~~

~~*The existing prerogatives may be divided, with Blackstone, into such as are direct and such as are by way of exception ; or perhaps better, with Chief Baron Comyns, into those affecting external relations and those affecting internal relations. Under the first class would fall the power of making war and concluding peace. As incidents to this power the king has the right of sending and receiving ambassadors, of concluding treaties, and of granting pass- ports, safe-conducts, letters of marque, and reprisals. These rights may be limited by international agreement ; thus the Declaration of Paris, 1856, abolished privateering as far as the assenting nations (of whom Great Britain was one) were concerned.*~~

~~*The prerogatives affecting internal relations may be conveniently, if not scientifically, classified as personal, political, judicial, ecclesi- astical, and fiscal.*~~

~~*Personal.—In order that there may always be an existing head of the state the king is regarded as a corporation. He cannot die ; there can be only a demise of the crown,—that is, a transfer of the royal authority to a different person. On the same principle the 'king cannot be under age, though in*~~

~~*cases where the king has been of tender years a protector or regent has usually been appointed for administrative purposes. The king is personally irresponsible for crime or tort, it being an ancient common law maxim that the king can do no wrong, and that any injury suffered by a subject at the hands of the king is to be attributed to the mistake of his advisers. A curious consequence of this irresponsibility is that the king is apparently the only person in the realm who cannot under any circumstances arrest a suspected felon, for no action for false imprisonment would lie against him, and in the event of the arrest of an innocent person there would be a wrong without aremedy. He cannot be guilty of laches or negligence. The maxim of the common law is "Nullum tempus occurrit regi." This is still the law in criminal matters. With avery few exceptions, such as prosecutions for treason and offences against the customs, no lapse of time will in England (though it is otherwise in Scotland) bar the right of the crown to prosecute. In civil matters the crown is barred of its right in suits relating to land by the lapse of sixty years (9 Geo. III. c. 16). The king is exempt from taxation on the ground that, as the revenue of the realm is his prerogative, it is useless for him to tax himself. But lands purchased by the privy purse are liable to taxation (89 and 40 Geo. III. c. 88, s. 6). He is also exempt from tolls (which can only exist as a franchise granted by him), and from the poor-rate, as he is not mentioned in the Poor Law Acts. His person cannot be arrested, or his goods distrained or taken in execution. The privilege of exemption from taxation applies to his palaces and to the public buildings of the state. No kind of judicial process can be executed in a palace as long as it continues to be a royal residence. The privilege does not attach to palaces which the king has ceased to use as a dwelling, such as Hampton Court, with the one exception of Holyrood House, with the precincts, which still affords a sanctuary from civil process. It does not, however, protect criminals or crown debtors. The king has also several personal privileges of minor importance, such as the title of "majesty," the right to a royal salute, to the use of the royal standard and of special liveries, &c.*~~

~~*Political.—The king is the supreme executive and co-ordinate legislative authority. As such authority he has the attribute of sovereignty } or pre-eminence, and the right to the allegiance of his subjects. All land is mediately or immediately held of him (see Lanp). Land derelict suddenly by the sea, land newly discovered by subjects, and islands arising in the sea*~~

~~are his. As paramount authority in parliament he can dissolve or prorogue it at pleasure, but cannot prolong it beyond seven years. In theory parliament~~

~~1 The word 'sovereign '"' is frequently applied to the king in legal works. It should'be borne in mind at the same time that the king is not a sovereign in the strict sense in which the term is used by Austin.~~

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~~only exists at his will, for it is summoned by his writ, and the vote fora member of parliament is only a franchise, not a right existing independently of his grant. He can refuse his assent to a Bill passed by the Houses of parliament. This right has, however, not been exercised since 1707, when Queen Anue re- fused the royal assent to a Scottish Militia Bill. The king has power to issue proclamations and (with the assent of the privy council) orders in council, in some cases as part of the ancient pre- rogative, in others under the provisions of an Act of parliament. Proclamations are only binding so far as they are founded upon and enforce the laws of the realm. They cannot alter the common law or create a new offence. By 31 Hen. VIII. c. 8 it was enacted that the king's proclamations should, under certain conditions, have the force of Acts of parliament, but this Act was repealed by 1 Edw. VI. c. 12. The king is not in general bound by an Act of parliament unless named therein. He can, by virtue of his supreme executive authority, recall a subject from abroad, or forbid his leav- ing the realin by the writ of ne exeat regno. This writ at the pre- sent day is not used for state purposes, but merely to prevent a party to an action from going abroad. To order aliens to leave the realm is apparently a matter not falling within the prerogative, as, where such a course is necessary, an Act of parliament is passed ; 11 and 12 Vict. c. 20 is an instance of ath an Act passed for a temporary purpose. The right of the crown to grant letters of denization to aliens is preserved by 33 and 84 Vict. c. 14, s. 18. The king is the fountain of honour ; as such he has the valuable power of granting peerages at will, so far as he is not restrained by any Act of parliament, and so far as he keeps within certain constitu- tional limits, ¢.g., he cannot insert a shifting clause in a patent of peerage. He also confers all other titles of honour, whether here- ditary or not, and grants precedence and armorial bearings. The~~

~~*great, officers of state are appointed by the king. The only restric- tion upon the creation of offices is that he cannot create new offices with new fees attached to them, or annex new fees to old offices, for this would be to impose a tax upon the subject without an Act of parliament. The king, as head of the state, is in supreme com- mand of the army and navy for the defence of the realm. This right, contested by the Long Parliament, was finally declared by 138 Car. II. ¢. 6 to be in the king alone. All supplies for the mainte- nance of the army and navy are voted annually, so that it is prac- tically impossible for the king to use his position to the detriment of the state. The army is an annual institution, the Army Act of each session (which corresponds to the Mutiny Act passed annually up to 1878) reciting the provision of the Bill of Rights, 'that the raising or keeping a standing army within the kingdom in time of peace, unless it be with consent of parliament, is against law." The right of command carries with it as an incident the right to build forts and defences, to impress seamen in case of necessity, and to prohibit the importation of munitions of war (39 and 40 Vict. c. 36, s. 48), also the right to the soil of the foreshore and of estuaries of rivers, and the jurisdiction over territorial waters. (See Navi- GATION Laws.) Other rights which fall under the political branch of the prerogative may be called the commercial rights, including the coining of money, the regulating of weights and measures, the establishing of markets and fairs, and the erecting of beacons, lighthouses, and sea-marks. The king also has the power of con- stituting corporations, A royal grant to inhabitants makes them a corporation for the purposes of the grant. The king is presumed to be the visitor of all civil corporations. As parens patriw he is ex officio guardian of infants, idiots, and lunatics. It is scarcely necessary to point out that all these prerogatives (except the con- ferring of honours and such prerogatives as are purely personal) are exercised through responsible ministers, practically in these days members of the party to which the majority of the House of Com- mons belongs. Thus the jurisdiction over infants, &c., is exercised in England by the lord chancellor, and over beacons, &c., by the Trinity House, under the general superintendence of the Board of Trade.*~~

~~*Judicial.—The king is the fountain of justice, and the supreme conservator of the peace of the realm. " By the fountain of justice," as has been well said by Blackstone, "the law does not mean the author or original, but only*~~

~~*the distributor. Justice is not derived from the sovereign, as from his free gift; but he is the steward of the public, to dispense it to whom it is dwe. He is not the spring, but the reservoir, from whence right and equity are conducted, by a thousand channels, to every individual " (Stephen's Comm., vol. ii. bk. iv. pt. i. ch. vi.). The king was bound to the observance of justice by the well-known words of Magna Carta, "Nulli ven- demus, nulli negabimus aut differemus, rectum aut justiciam." As supreme judge the king has the appointment of all judicial officers (other than those in certain local courts), who act as his deputies. He may constitute legal courts for the administration of the general law of the land, but he cannot erect tribunals not proceeding ac- cording to the known and established law of the realm, such as the Star Chamber (see above) or the commissions of martial law forbidden by the Petition of Right. Nor can he add to the juris- diction of courts; thus he cannot give a spiritual court temiporal*~~

~~*X.—85*~~

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~~*powers. In early times the kings sat in person in the curia regres. 'The growth of a permanent judicature seems to be due to the increase of judicial business, making it impossible for the king to hear all the suits in the curia regis in person. Appeals from the colonies, the Channel Islands, and the Isle of Man still lie to the crown in council, a jurisdiction now practically exercised by the judicial committee of the privy council. The king is still (or was until very recently) in theory present in court. Actions in the Queen's Bench were until modern times said to be coram rege ipso, and the king could not be non-snited, for a non-suit implied the uon-appearance of the plaintiff in court. The king enforces judg- ment by means of the sheriff, who represents the executive authority. As supreme conservator of the peace, the king, through the lord- lieutenant in counties and through the lord chancellor in citics and boroughs, appoints justices of the peace. In the same capacity he is the prosecutor of crimes. All indictments still conclude with the words "against the peace of our lady the Queen, her crown and dignity." As it is the king's peace that is broken by the commission of a crime, the king has, as the offended party, the power of remission. The king cannot be sued by ordinary action. He may sue by ordinary action, but he*~~

~~*has the advantage of being able to use prerogative process (see below). He has the right of intervention in all litigation where his rights are concerned, or in the interests of public justice, as where collusion is alleged between the decree nisi and the decree absolute in divorce. Crown debts have priority in administration and bankruptcy.*~~

~~*Ecclesiastical.—The king is recognized as head of the church by 26 Hen. VIII. c. 1 and 1 Eliz. c. 1. By this prerogative he con- venes and dissolves convocation and nominates to vacant bishop- rics and other ecclesiastical preferments. He is also guardian of the temporalities during the vacancy of a see, but this is now merely a nominal prerogative. The dean and chapter of a cathedral can- not proceed to the election of a bishop without the king's per- inission to elect (congé d'élire).. When any benefice is vacant by the promotion of the incumbent to a bishopric other than a colonial bishopric the king has the patronage pro hac vice. He is the supreme court of appeal in ecclesiastical cases. This appellate jurisdiction is now vested in the judicial committee of the privy council, with the assistance of archbishops and bishops as assessors (39 and 40 Vict. c. 59, s. 14). The king cannot create new ecclesi- astical jurisdiction in England or in colonies other than crown colonies. (See BrsHop.) Where a new bishopric is created it is under the powers of an Act of parliament. It seems to be as head of the church that the king grants licences to hold in mortmain, though the right now extends to lay as well as ecclesiastical corpora- tions. The right is acknowledged by 7 and 8 Will. III. ¢. 37.*~~

~~*Fiscal.—The theory of the constitution is that the king, being entrusted with the defence of the realm and the administration of justice, must have sufficient means given him for the purpose. The bulk of the revenue of the Norman and Plantagenet kings was derived from crown lands and feudal dues. At the present day the rents of crown lands form a very small part of the revenue, and the feudal dues do not exist except in the pecuniarily unimportant cases of escheat, royal fish, wrecks, treasure-trove, waifs and strays, &c. Of the revenue a comparatively small part (the civil list) is paid to the king in person, the rest (the consolidated fund) is applied to public purposes.*~~

~~*Prerogative Process.—This is the name given to certain methods of procedure which the crown alone has the right of using ; such are inquest of office (an inquiry by jury concerning the right of the crown to land or goods), extent (a mode of execution), scire facias (for the resumption of a grant), and information (by which pro- ceedings are commenced in the name of the attorney-general for a public wrong or for injury to crown property).*~~

~~*Prerogative Writs.—Certain writs are called "prerogative writs," as distinguished from writs of right, because it is within the pre- rogative to issue or reissue them. In order to induce the court to issue them a prima facie case must be made out by the applicant. Writs of right, on the other hand, are ea debito justitiz, and cannot be refused. Examples of prerogative writs are certiorari, habeas corpus, mandamus, procedendo, prohibition, quo warranto.*~~

~~*Prerogative Courts.—This was the name given to the provincial courts of Canterbury and York, as far as regarded their jurisdiction over the estates of deceased persons. They had jurisdiction to grant probate or administration where the diocesan courts could not entertain the case owing to the deceased having died possessed of goods above the value of £5 (bona notabilia) in each of two or — dioceses. The jurisdiction of the prerogative courts. was*~~

~~*ransferred to the Court of Probate in 1857 by 20 and 21 Vict. c. 77, and is now vested in the Probate, Divorce, and Admiralty Division of the High Court of Justice by the Judicature Act, 1873 (36 and 37 Vict. ¢. 66, s. 34). : Hele State of New J ersey, United States, the court having juris- a over probate matters is called the Prerogative Court (Kent's*~~

~~*omm., vol. li. p. 427).*~~

~~*Besides the authorities cited and the writer ituti i A 3 on constitutional history, the reader is referred to Allen, Inquiry into the Rise and Growth of the Papel Pre-*~~

~~*rogative in Englund ; Chitty, The Prerogative of the Crown ; Staunforde, Expost-*~~

~~*tion of the King's Prerogative; Comyns, Digest, art. " Prerogative"; Broom,*~~

~~*Constitutional Law. (J. Wt.) PRESBYTER. 'Towards the end of the 2d century the*~~

~~*organization of the Christian congregations throughout the Roman empire, at least of all the greater ones, was identical. At the head of each was the bishop, whose function it was to conduct public worship, control the church funds, and keep watch over the manners of his flock. The free prophets and teachers having almost everywhere died out, the duty of religious instruction and edification also fell on him. In conducting the worship and in ministering to the wants of the poor he was assisted by the deacons as his subordinates. The presbyters formed a college, whose business was that of advising the bishop. Of this college he was the president, and as such he was himself a presbyter, and conversely the presbytery, in- clusive of the bishop, formed the governing body of the community.! Outside of the presbytery the individual presbyter as such had no definite official duties. If he baptized, celebrated the eucharist, preached, or the like, this was only as commissioned and deputed by the bishop.? Such deputation was frequently necessary, and therefore the presbyter behoved as far as possible to be qualified to teach. As member of the college, which before everything had to do with jurisdiction and discipline, it was required of him that he should be of blameless life, that he should administer just judgment without respect of persons, and that in private life also he should as occasion offered exhort and admonish the faithful and set before them the law of God. The presbyters, who as a rule were expected to be men of advanced years, were, like the bishop and the deacons, chosen by the congregation. Their number was unrestricted, but there were small communities in which they did not exceed three or even two. In rank they were above the deacons, but below the bishop, yet in such a way that the bishop could call them his '" co-presbyters."% As the bishop was not unfrequently chosen from among the deacons, even although in many congregations it may have been the case that the office was invariably bestowed on presbyters, and as the deacons stood in closer personal relation with the bishop than the presbyters, cases*~~

~~*of invasion of the rights of the latter by the former began to occur from an early period. There can be no doubt that at the end of the 2d century all presbyters were elected office-bearers, but the way in which Irenzus speaks makes it quite clear that at an earlier date "presbyter" was also a title of honour borne by worthy and prominent persons in the congregations, who, in virtue of their advanced years, were witnesses for the purity of tradition. Irenzeus, frequently speaking (as he does) of bishops simply as "presbyters," also proves that there must have been a time in which the bishop as member of the "synedrium " of the church cannot have held a higher position than the other members of this college.*~~

~~*Tracing the history upwards from Irenzus, we find in the Epistles of Ignatius, which may be assigned perhaps to about 140, the presbyters holding essentially the same*~~

~~*1 Tertull., Apol., 39: '* President probati quique seniores, honorem istum non pretio sed testimonio adepti."*~~

~~*2 Tertull., De Bapt., 17: '" Baptismi dandi habet jus summus sacer- dos, qui est episcopus; dehinc presbyteri . . . non tamen sine episcopi auctoritate." In the oldest constitution of the Catholic Church which has come down to us relating to presbyters a regular service of some presbyters in public worship is indeed presupposed (Kavéves éxxAn- ciao. T. ay. arooré\wy, c. 18), but this fact is unique of its kind.*~~

~~*3 Compare the regulations laid down in the Arabic text of the Canones Hippolyti (c. 4): " At the ordination of a presbyter every- thing is to be done as in the case of a bishop, save that he does not seat himself upon the throne. The same prayer also shall be said as for a bishop, the name of bishop only being left out. The presbyter shall in all things be equal with the bishop save iu the matters of pre- siding and ordaining, for the power to ordain is not given him."*~~

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~~*position as they have at the end of the century. With Ignatius also the presbyters come into account only as a college ; according to him they constitute a senate, as it were; he compares them to the college of the apostles, but gives great prominence to their subordination under the bishop, whom he likens to our Lord Himself. Except in the Ignatian Hpzstles, however, one finds the presbyters holding a different position within the Christian commu- nities of the period from 90 to 140. This is not at all surprising, for there was not at that time any rigid and uniform organization of the congregations at all; as yet no one bishop stood at the head of each congregation, and as yet the church constitution was not determined by the idea of office alone, that of charismata (spiritual gifts) still having wide scope alongside of the other. Church organization was still influenced by a variety of ways of looking at the question—ways which sometimes crossed each other, and from the combination of which it cannot be doubted that a variety of constitutions resulted. We are not in a position to give a complete view of these, the historical material being insufficient, but points of leading importance can be established. Before all it is of conse- quence to recognize that in the congregations a threefold organization had place. (1) The duty of edifying and of preaching the gospel was not yet attached to an office but toa charisma. 'Service in the word" was the business of apostles, prophets, and teachers who had been awakened by the Spirit and by the Spirit endowed. These were the jyryobpevoe in the congregations; they alone in the first instance form the class of persons entitled to honour in Christendom ; they never belonged to any one congregation exclusively, but were held to be "organs of the Spirit," given by God to the whole church. (2) In so far as each local church embraced a system of higher and lower functions—each was indeed a little world to itself—it possessed a governing body (otxovémor). For the care of the poor, for worship, for correspondence,—in a word, for its "economy," in the widest sense of that word, the con- gregation needed controlling officials. These were the bishop and the deacons,—the former for higher, the latter for inferior services; they owed their official position to the congregation, and in the nature of their offices there was, strictly speaking, nothing which could have laid the foundation of any special rank or exaltation. Many of the functions discharged by them nevertheless had the result of making the post of a bishop a very influential one (charge of the worship, control of the funds), and in so far as their service rested upon*~~

~~a charisina (xapurpa Ths dvrtAjpwews) a certain inner relation between them and the teachers endowed with the gift of the Spirit was established. (3) In so far as the individual congregation was an actual organism in which the varieties of age, of sex, of experience, of manner of life, and of ethical culture continued to exist and which had to be admonished, dis- ciplined, and heeded, it from the nature of the case divided itself into leaders and led, a distinction which would assert itself in every sphere of the congregation's activities. The leaders were, as might be expected, the "elders" (of zpec- Birepor), or, so to speak, the patrons; the led were the "younger" members (of vedrepor). Out of this distinction arose equally naturally—for it was impossible for all the "elders" to take part in the conduct of affairs—the separa- tion of an elected ruling college (of rperButepor ot rpoic- tdpevot) from the rAROos (plebs, Aads). Thus an "order" (ordo) arose, placed over the congregation by the congrega- tion itself! To the presbyters belonged a tyu7 KaPjKovca, —that is to say, the honour which naturally came from their a~~

~~1 Tertull., De exhort. cast., 7: "Differentiam inter ordinem et~~

~~plebem constituit ecclesie auctoritas et honor per ordinis consessum sanctificatus."~~

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~~position in life. In some congregations it may have been long before the elders were chosen, in others this may have come very soon ; in some the sphere of the competency of the presbyters and patrons may have been quite indefinite and in others more precise. In some congregations, lastly, as in those of Asia Minor, the presbyters may have enjoyed particular honour for the special reason that they had known apostles or disciples of apostles personally ;? in the majority of congregations this was not the case. With the congregational administration, properly so called, in any case, they had nothing to do. ;~~

~~We may call the first-named organization the spiritual, the second the administrative, the third the patriarchal. It is obvious that from the first it was impossible they should coexist side by side without coming into contact. Here two facts are of the highest importance. (1) If in any~~

congregation prophets and teachers were wanting, then the administrative officials charged themselves with their function. (2) The bishops had as such a seat and a voice in the presbyters' college; every bishop was at the same time a presbyter, whether, old or young, but every presbyter was not necessarily also a bishop. In many communities, indeed—as, for example, at Philippi,* at Ephesus,® and in Crete ®—all the presbyters may possibly also have been bishops, although this is by no means cer- tain; but in other cases—as, for example, in that of Rome, as we learn from the Pastor of Hermas—all presbyters were not also bishops. Thus it is not the case that origin- ally the bishops were simply identical with the presbyters, and that the one bishop was a gradual development out of the presbyters' college ; on the contrary, the attributes of presbyters and bishops were originally distinct. But, since the bishops had a seat and a voice in the college and exercised special functions of importance besides, they ultimately acquired a higher place.

The office of presbyter was not during the oldest period (90-140) a spiritual one. The apostle, the pro- phet, the teacher, in a certain sense also even the old bishop and deacon, had a spiritual character, for they pos- sessed a charisma. It was not so with the presbyters ; they had no charisma, and the respect in which they were held arose out of the natural position which they took within the congregations. Hence the newly-discovered Asay?) Tv daooréAwv has nothing to say at all about presbyters, but only about apostles, prophets, teachers, bishops, and deacons. The design of that writing was to give those institutions of the apostles which are peculiar to the Christian community. The system of leaders and led is, however, a matter of order; it does not depend upon the special Christian charismata, and therefore does not impart to the Christian community its peculiar character. But, on the other hand, that the community is God's building is shown by such marks as these, that the apostles spread the gospel by their inspired preaching, that prophets and teachers edify the churches, that everywhere bishops and deacons are found at work in the churches, endowed with the gift of government and of loving service. Other communities also—towns, temples, synagogues, and the like—have presbyters, but they have no persons endowed with the gift of the Spirit. A sure proof of the correctness of the view just given is found in the cir- cumstance that before the time of Domitian we do not

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~~*2 Compare what is said by Papias, Irenzus, and also by Clement of Alexandria.*~~

~~*3 See Arday) trav dmtooré\wv, 15. According to 1 Tim. v. 17 those presbyters are to be counted worthy of special honour of xomidvres év 6yw Kal &dackadig. But this makes it plain that the presbyters were under no obligation to teach.*~~

~~*+ Polyc., Ad Philinp., 5, 6, 11.*~~

~~*5 1 Tim. and Acts xx, 17, 28.*~~

~~*6 Ep. to Titus.*~~

~~*Refor- mation theories.*~~

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~~*possess in Christian literature a single sure testimony to the existence of presbyters. In the genuine epistles of St Paul and in the Epistle to the Hebrews they are not mentioned. In 1 Cor. xii. 28 Paul says that God has given to the church apostles, prophets, teachers, miracles, gifts of healing, help, government ; but of presbyters he has not a word to say. Even from passages where he is speaking of the jurisdiction of the congregation—as, for example, in 1 Cor. v., vi—the presbyters are absent, while in Phil. i. 1 it is the bishops and deacons that he mentions. In the Epistle of James, in the First Epistle of Peter, in the Acts of the Apostles, and in the pastoral epistles the presbyters certainly occur, but no one is able to show that any of these writings are earlier than the age of Domitian. Even Clement of Rome (Ad Cor., 42, 4) does not say that the apostles had appointed presbyters in the congregation ; he speaks only of bishops and deacons. For this very reason is the statement in Acts xiv. 23 to be looked upon with suspicion. It would be much too pre- cipitate to assert that before the time of Domitian there were no presbyters in the Christian churches ; on the con- trary, it may be assumed that the distinction between*~~

~~"elder" and "younger" would not fail from the very first to assert itself in these communities, organized as they were so largely on the model of the family. But in this there is no reason for assigning any special importance to the distinction. Out of it there grew very gradually a special rank and gradually the presbyters had assigned to them definite functions ; or, in other words, the functions which they had exercised from the first, of exhorting, rebuking, superintending, becanie recognized ecclesiastical duties and privileges. There is accordingly no need for answering the question whether the Christian "elder" is akin to the Jewish or to any kind of heathen "elder." This, however, can well be affirmed, that the pattern of the civic senates was not without its influence upon the later development of the presbyterate. As for the com- munities of Jewish Christians, we know nothing certain about their constitution, and are therefore unable to say anything definite about their presbyters.~~

~~See Hatch, Organization of the Early Christian Churches (2d ed., 1882), and Harnack's excursus in the German translation of this work (1883); also Harnack, Die Lehre der zwolf Apostet (1884). (A. HA.)~~

~~PRESBYTERIANIS@®~~

~~HE Presbyterian form of church government began at the Reformation and attained development only in the churches commonly called ' Reformed." The Saxon Reformers were not indeed fundamentally averse to Pres- byterian principles. Melanchthon, for instance, expressly declared that no minister, without a college of elders and the consent of worthy members of the congregation, might excommunicate ; and, in a letter to Nuremberg (1540), Bugenhagen, Jonas, Luther, and Melanchthon say, "Resti- tuatur et excommunicatio . . . adhibitis in hoc judicium senioribus in qualibet ecclesia." On the other hand, the 'Reformed " churches did not all accept the system, ¢.., Zwingli and the Zurich congregation.~~

~~In 1526 John Brenz drew up at Halle (Swabia) a scheme including elders, ministers chosen from the elders, and councils, by which the elders were~~

~~*chosen by the Govern- ment, who also had the final decision in all questions of importance. Franz Lambert, at the same time, provided for the church at Hesse provincial synods, representative of the churches, and a general or land synod, under the control of the Government. Within the limits of a con- gregation the scheme was purely congregational. At Ziegenhain in 1539 a decided advance was made towards autonomy, as only half the elders, who had extended powers, were there chosen by the Government. Zwingli theoretically gave the power to the congregation, practic- ally to the civil power, as being the representative of the church. Jn Basel in 1529 the clergy alone had the power of church discipline. In 1530, however, Cicolampadius, fearing a spiritual tyranny, wished to join a body of elders with the clergy, to be chosen by the council partly from its own body and partly from the congregation, four from each, who with the clergy would form the "censorum consensus." But the council, fearing the imperium in wmperto, preferred four colleges, one for each parish, each college being formed by two members of the council, one of the congregation, and the minister; and the council also retained the final decision regarding excommunication. At Strasburg (1531) the council created an assembly of the ministers of the seven churches, with three life elders from each, nominated by the council. In 1534 this system was modified: ordinary matters were settled each fort- night by the minister and three of the twenty-one elders. Difficult. questions were carried to the twenty-one, and*~~

~~*discipline, short of excommunication, to them with the seven imninisters. Capito's system at Frankfort differed from this in that only three out of nine elders were elected by the council, and that the office was for three years only.*~~

~~*These all remained mere theories, limited, fragmentary, Calvin's Calvin set himself to create a majestic system.*~~

~~*and abortive. and comprehensive system and to give to it the double authority of argumentative statement and practical realiza- tion. He saw that the impulses and the aspirations of the Reformation were, for want of discipline, robbed of a large part of their dynamic force. He threw these forces and aspirations into the mould of his own genius, developed order*~~

~~out of tumult, and created a definite, yet elastic code, which should match the discipline of Rome and at the same time frustrate the anarchical tendencies of extreme Pro-~~

~~testantism. The contrast with Luther is complete: Luther~~

~~created, Calvin fashioned ; “‘the watchword of the one was war, of the other order.” Calvin, surrounded by Catholic powers, felt more strongly than Luther that a definite pro- test as to church government was necessary. His leading principles are that—(1) a separate ministry is an ordinance of God (Jnst., iv. 3, 1-3); (2) ministers duly called and ordained may alone preach and administer sacraments (iv. 3, 10); (3) a legitimate ministry is one where suitable per- sons are appointed with the consent and approbation of the people, but that other pastors should preside over the elec- tion to guard against inconstancy, intrigue, or confusion (iv. 3, 15), the final act of ordination, the laying on of hands, being confined to the pastors; (4) to co-operate with the pastors there should be “‘ governors,” whom he “ appre- hends” to be persons of advanced years, selected from the people to join with the pastors in admonishing and in exercising discipline (iv. 3, 8); (5) discipline, the ordering of men’s lives, is all-important and is the special business of the governors aforesaid. Calvin arrived at these principles as follows. From Eph. iv. 11 sg., Rom. xii.7, and 1 Cor. xii. 28 he deduced five orders, of which three—apostles, prophets, and evangelists—were extraordinary and had lapsed, but two—pastors and doctors—were for all time. Doctors are concerned only with interpretation and exposi- tion, pastors with preaching, sacraments, discipline. From the pastors some are singled out (1 Tim. v. 17), called, and ordained to “labour in the word,” to occupy them- selves, in fixed charges, with preaching and administering~~

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~~sacraments ; while the rest are invested with jurisdiction in the correction of manners and with the care of the poor.~~

~~*the state, Calvin was utterly opposed to the Zwinglian Calvinon theory, whereby all ecclesiastical power was handed over ae*~~

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~~*For, although Christ gave to the whole congregation the power of excommunication, as in the Jewish Sanhedrim, and although, therefore, the elders are to use their power only with the consent of the congregation, yet the crowd are not to rule, lest arbitrariness and confusion enter. Deacons (or elders who have the care of the poor) are of two kinds, those who administer alms and those who attend to the sick. For additional sanction to his views Calvin often refers to the primitive church and the writ- ings of the fathers. But with respect to this his position is best indicated by his own words in the preface to the Institutes: "We so read their writings as always to keep in view the saying of Paul (1 Cor. iii. 21-23) that all things are ours, to serve us that is, and not to rule over us, while we ourselves belong to the Lord, whom, without exception, we must all obey." (1) His system, while preserving the democratical theory in so far as it recognized the congrega- tion as the holder of church power, was in practice strictly aristocratic, inasmuch as the congregation is never allowed any direct use of that power, which is invested in the whole body of elders; and the system constantly tended to development in the aristocratic direction. (2) The great object is discipline of life: '"We come now to the third branch of the power of the church, and that which is the principal one in a well-regulated state, which, we have said, consists in jurisdiction. The whole jurisdiction of the state relates to the discipline of manners" (iv. 11, 1). In his correspondence too Calvin is ever on this subject, while the eldership itself is seldom mentioned ; at Stras- burg his mind was constantly occupied with it; it was the first business that he set his hand to in Geneva; it was for insisting upon this that he was banished ; and he made it his first condition for return (iv. 12). (3) Although the Presbyterian form of church government has to thank Calvin for its vertebrate existence, he nowhere makes the true church depend upon this or any other form of govern- ment. The inner life is what he insists upon, not the out- ward form ; all that is needed for a true church, he asserts, is the word of God duly preached and the pure adminis- tration of the sacraments. He held the jus divinum of the ministerial office as admitting of no question—'"'that mode of governing the church by its~~

ministers which the Lord appointed to be of perpetual continuance" (iv. 3, 1-3)—but the manner in which the ministerial office is divided is to some extent in his mind a matter of argument and '"'apprehension." The same elasticity and desire for adapta- tion may often be noticed in his words, as, for example, when on the very question of election of ministers, whether it should be by the congregation or not, he says, ""We must be guided in this respect by times and circumstances" (Henry, i. 371).1 Nor does he put forward any theory as to the details—the number, method of choice, or period of office. All these he leaves to each individual 'church. (4) He does not include synods as necessary. Should contro- versy arise respecting doctrine (iv. 9, 13), there is no better or more certain remedy, he says, than to assemble a council of true "bishops," in which the controverted doc- trine may be discussed. Regarding the question histori- cally he gives to the ancient councils a modified approbation, but he denies the power of councils to frame new doctrine.

With regard to the relations between the church and

1 On the question of the jus divinum of the eldership, see Lorimer, On the Eldership, especially the tract therein by James Guthrie, who first suggested the idea in the middle of the 17th century, and two papers in the Records of the First General Presbyterian Council, 1877 (pp. 52, 98), by Dr Cairns and Professor Lee, in the latter of which it is stated with wonderful confidence that 'Calvin himself holds that we may rest the doctrine of a divine warrant for the ruling eldership on the ground mentioned in Jnst., iv. 3, 8."

*to the state. The political administration, he says, is as * necessary to human weakness as are food 'and light and air; but it has not the right to legislate for religion or divine worship, though it must take care that the gospel religion is not insulted or injured. "The church of God stands in need of a certain spiritual polity, which, however, is entirely distinct from civil polity, and is so far from obstructing or weakening it, that on the contrary it highly conduces to its assistance and advancement" (iv. 11, 2). "The church does not assunie to itself what belongs to the magistrate, nor can the magistrate execute that which is executed by the church." Thus, the magistrate imprisons a man for drunkenness ; the church excommunicates*

~~*him, and regards him spiritually as an outlaw. Should he re- pent, the magistrate takes no cognizance of his repentance, but the church can do so by allowing him to return to communion. The magistrate makes laws, and God makes laws; the breach of the one is a "crime," that of the latter is a "sin," though perhaps no crime; it is with the sin that the church deals. The magistrate may neglect to punish magisterially; the church, with spiritual penalty, supplies the neglect.*~~

~~*But, though the church disclaims interference with the domain of the state, she expects the state to support her. Indeed, while Calvin utterly abjures the thought of an umpertum im tmperio, while he spends much labour in showing how the papacy, by continual encroachments, secured the civil power, and in condemning this confusion of two distinct spheres of action, the function of giving support to the church is in the Calvinistic system really the raison Wétre of the state. Ina very remarkable passage (iv. 20, 3) Calvin's position is clearly shown. A well- ordered state, that for which the best of the popes strove, is a theocracy. There can be no question as to what doctrine is right, for the law of God, the only possible doctrine, is plainly stated in the Bible. That law is the highest thing that a state can regard ; it is indeed the very life of the state, and the position of the state towards the church follows at once. The words '"'toward the church" alone introduce the difficulty. They should be "toward God." If the state fail to support the church, it fails to support, not a human, but a divine organization. In the infliction of punishments, for example, the magistrate should regard himself merely as executing the judgments of God. So that the objection of the empertum in imperio, the assertion that the church claims spiritual liberty inde- pendent of the judgment of the state, while at the same time insisting on the support of that state whose authority she thus disregards, falls to the ground. The civil magis- tracy is as much a divine institution as is the ministry of Christ ; the state and the church are as much one as are the veins and the blood which permeates and vivifies them.*~~

~~*The fallacy in all this is obvious. The argument neces- sarily presupposes a theocracy, and such a thing did not exist in Europe. A state church, claiming at once inde- pendence of the state and support from the state, must bring about contest and complication where the state is not prepared to recognize the claim. The imperium in imperio difficulty (expressed most*~~

~~*briefly by James I.'s "No bishop, no king") arises acutely at once, however much the church may refuse to admit it. This was the case in Scotland. And where, as was the case in France, it is not a state church but a union of persons holding a religion, and therefore views on important matters, which differ from those of the Government, oppression must arise in an age ignorant of religious liberty, and the oppressed will become a polttical party opposed to the Government, however much they may disclaim the position.*~~

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~~*Tt can now be seen how far Calvin was able to carry out his theory. But for his life the theory, like those which preceded it, would probably have had no universal historical interest.*~~

~~*Calvin's The course of events in Geneva had developed a theo-*~~

~~*relations cratical feeling; and the essence of a theocracy seemed*~~

~~*ba gained when the citizens were summoned by tens in*~~

~~*enevae 1536 to swear the confession contained in Calvin's first*~~

~~*Catechism (really an analysis of the Institutes). They*~~

~~*swore as citizens, and those who refused lost their citizen-*~~

~~*ship. As soon, however, as Calvin attempted to make*~~

~~*this a reality trouble followed. His ruling idea was dis-*~~

~~*cipline, and this was exercised against both the moral*~~

~~*and the spiritual libertines,—against those who objected*~~

~~*to the discipline of manners and those who disliked sub-*~~

~~*mission to the confession. As the reins were drawn*~~

~~*tighter these two bodies gained influence in the council, and inveighed against the new popedom. At length, in 1538, when Calvin, Farel, and Conrad refused to give the communion in a city which, as represented by the council, would not submit to church discipline, the storm broke out. The three preachers were banished, and Calvin retired to Strasburg. This refusal of the sacrament is important as a matter of ecclesiastical history, because it is the essence of that whole system which Calvin subsequently introduced, and which rests on the principles that the church has the right to exclude those who, according to her judgment, appear unworthy, and that she is in no way subject to the state in matters of religion. For the present the state had refused to admit the claims of the church. Calvin laid down as the conditions of his return the recognition of the church's independence, the division of the town into parishes, and the appointment by the council of elders in each parish for excommunication. The feeling, however, was for three years too strong ; the banishment was confirmed on the specific ground that the*~~

~~*insistence on excommunication was an attempt at despotic*~~

~~*power. Calvin's absence left the town a prey to anarchy:*~~

~~*one party threatened to return to Romanism, another to*~~

~~*give up their independence to Bern. It was felt to be a*~~

~~*political necessity to recall Calvin, and in 1541 he returned*~~

~~*on his own terms. Meanwhile he had been maturing and*~~

~~*carrying out his system (Jnst., iv. 8) in the French and Walloon churches in Strasburg.*~~

~~*Church By the Ordonnances Ecclésiastiques de 1'Eglise de Genéve,*~~

~~*organiza- which represent the terms on which Calvin consented to*~~

~~*pt 9 be pastor in Geneva and which were published on 20th*~~

- ~~*November 1541 in the name of Almighty God by the*~~

~~*syndics, the small and great councils, and the people, there*~~

~~*are, as in the /nstitutes, the four orders,—pastors, doctors,*~~

~~*elders, deacons. (1) The pastors preach, administer the*~~

~~*sacraments, and, in conjunction with the elders, exercise*~~

~~*discipline. In their totality they form the '"'vénérable*~~

~~*compagnie." It was the duty of each minister, with the*~~

~~*elders of his parish, to be diligent in house-to-house visita-*~~

~~*tion, to catechize, and, generally, to supervise family life.*~~

~~*After being approved as to knowledge and manner of life,*~~

~~*and ordained by the pastors already in office, and settled in a fixed charge by the magistrate with the consent of the congregation, the newly-made pastor vowed to be true in office, faithful to the church system, obedient to the laws and the civil government (with reservation of freedom in doctrine and the rights of office; compare Becket's "saving our order"), and, in especial, to exercise discipline with-out fear or favour. (2) The doctors teach the faithful in sound learning and guard the purity of doctrine. They too are subject to "discipline." (3) The work of the elders (" Anciens, Commis ou Députez par la Seigneurie ou Consistoire") Calvin regarded as the sinew and essential substance of the system. They were the bond of union*~~

~~*PRESBYTERAANASS*~~

~~*[GENEVA.*~~

~~*between church and state, and therefore the most important element of the theocratic government. Their business was to stuipervise daily life, to warn the disorderly, and to give notice to the consistory of cases requiring church chastise- ment. They were nominated by the small council and confirmed by the "two hundred." Two were chosen from the small council, four from the "sixty," eight from the "two hundred"; some were to live in each quarter, that the whole might be well supervised. After a year's pro- bation an elder might be dismissed or confirmed by the small council. If confirmed, he held office for life. To form the "consistoire " or church court, all the elders,*~~

~~*with the pastors, met every Sunday under the presidency of one of the four syndics. This court was erected purely as a — means to secure discipline. It could award punishments up to exclusion from the sacrament. It had, too, great authority (with appeal to the civil Government) in marriage questions. An officer of the Government was placed at its disposal to summon persons before it; should they refuse to appear, the Government itself compelled attendance. Moreover, the consistoire was bound to give notice of every excommunication to the Government, which attached to it certain civil penalties: "et que tout cela ne face en telle sorte que les ministres n'ayent aucune jurisdiction civile et que par ce consistoire ne soit rien derogué & l'authorité de la seigneurie, ni & la justice ordinaire, ainsi que la puissance divine demeure en son entier."*~~

~~*The inevitable quarrel arose in 1546-53, when the council overruled the decision of the consistory in a ques- tion of excommunication. The deniers of the autonomy of the church referred to the clause which laid down that excommunications were to be notified to the small council; but Calvin argued that the aim of this was merely that in extreme cases the Government should support the action of the church, not criticize it, and he won the victory. His position gradually became stronger. In 1557 banishment was awarded to any one who contemned the sacrament or the sentence of the consistoire. In 1560 it was ordered that the names of the elders should be published, honoris causa ; and in the same year the appearance of state con- trol, by the presence of a syndic with his staff of office at the consistoire, was done away with. He was present, but not officially as a syndic, and without his staff.*~~

~~*It should be noticed (1) that the provision that in cer- tain cases the censure of the consistoire should be followed by civil penalties is in keeping with the theocratic view. So too is the provision that members of political bodies alone were eligible to the eldership. The rights of the church as distinct from the state authority were preserved by the condition that the meeting of the consistoire was summoned by the ministers. (2) In the Institutes ecclesi- astical power is ascribed to the congregation, to be exer- cised by foreknowledge of and in agreement with the acts of the ecclesiastical jurisdiction. But in the Ordonnances the congregation as a unit is passed over in silence as regards discipline and the choice of elders. (3) It must be*~~

~~*remembered that Calvin never professed to regard this as a perfect plan, but as good as under the circumstances he could hope for. It was a compromiise, and showed the practical character of the man. If he could secure the essence of his longed-for church discipline he was willing to waive the question of privilege.*~~

~~*To sum up the characteristics of early Presbyterianism — (1) It is an organization for discipline. Whatever else they may be, the elders of the Reformed churches are, primarily, censors of morals. (2) The institution claims the triple ground of Scripture, history, expediency. (3) The Lutheran doctrine of universal priesthood is wanting. (4) No voice is raised for the choice of elders by the congregation. As to eligibility there is as little anxiety :*~~

~~*Organi- zation of*~~

~~*SCOTLAND. |*~~

~~*Brenz says, "from among the citizens"; Cicolampadius and Capito, partly from the Government, partly from the congregation ; Calvin theoretically leaves it unsettled, but in practice gives it only to the political bodies. As to period of office, Capito wishes for regular change ; the rest leave it in theory undetermined. Geneva retained per- manence as the rule and change as the exception. (5) Synods have no place except with Lambert.*~~

~~*In 1549 Lasky, who had established a flourishing church at Emden, was driven to London. There in 1550 he became superintendent of the foreign congregation, which was independent of the state church, but which was in- tended by the king to serve as a model to be followed when England should be ripe for reform. This church was in two congregations, French and German. The French kept the Genevan system, the German a modification of it. In this latter the ministers, elders, and deacons were chosen by the written votes of the congregation, with revision and final decision by the officers already existing, though any objection on the part of the congregation must be duly considered. The strictest discipline was carried out. Not merely the congregation but the ministers also were subject to the elders. Every three months ministers and elders came together for mutual censure. Deacons were subordinate to the elders. The eldership was for life,*~~

~~*the diaconate for a year. The essential difference be- tween this and Calvin's system is that here the congre- gation has a very real though a limited share in the choice of the officers; the ground-work of Lasky's prin- ciple is subdued Congregationalism. Lasky held also that the ministers should have a fixed president, selected from themselves. This office he regarded as a permanent one. Under the Marian persecution the London system found in a modified form a new home in Frankfort and on the lower Rhine. At Frankfort, in the French congregation, in choosing elders, the church council selected twice as many names as were wanted, and out of them the con- gregation made its choice.!*~~

~~*Scotland.—The initial conditions of Scottish Presby- terianism are seen in the historical facts—(1) that the Reformation was the form taken by the triumph of a violent and grasping aristocracy over the encroachments of the sovereign and an alien church; and (2) that Jolin Knox was its spiritual leader. Under his advice the Pro- testant nobles in December 1557 formed themselves into a covenanted body called "The Lords of the Congregation" ; in 1559 Perth declared itself Protestant, and Knox's sermon there on 11th May was the manifesto of revolt. In 1560, being hard pressed, the lords concluded with England the Pacification of Berwick, and a few months later the treaty of Edinburgh, whereby the whole government was placed in their hands.*~~

~~*To the parliament which now assembled a petition was addressed praying (1) that a "true kirk of God" and the*~~

~~*"sound doctrines of the Reformation might be established,*~~

~~*(2) that the true discipline of the ancient church might be restored, and (3) that the ecclesiastical revenues might be applied to the support of the ministry, schools, and the poor. Meanwhile the Reformers garrisoned, as it were, the country. Under Knox's agency Edinburgh, St Andrews, Aberdeen, Jedburgh, Perth, Dunfermline, and Leith had fixed ministers appointed, whilst wider districts were placed under superintendents or travelling ministers. To*~~

~~*1 On the pre-Calvin reformers and Lasky, see Lechler, Geschichte der Presbyterial- und Synodal-Verfassung seit der Reformation ; Richter,*~~

~~*Gesch. der evang. Kirchenverfassung in Deutschland, and Evang. Kirchenordnungen, &c.; Herzog, Real-Encyklopddie ; Allix, Hist. of the Waldenses; and other works. For Calvin, see Institutes and Cor- respondence ; Lechler, as above; Henry, Life and Times; Mosheim, Eccles. History; Hagenbach, Works; Cunningham, Hist. Theology ; Ranke, Franzésische Geschichte ; Richter, ué supra.*~~

~~*meet the first prayer of the petition Knox and five other ministers drew up a scheme of doctrine and discipline. The Confession of Faith, produced within four days and ratified by the three estates on 17th July 1560, was natur- ally aggressive and uncompromising. It expresses abhor- rence especially of the blasphemy of them "that affirme that men who live according to equity and justice sall be saved what religioun soever they have professed," and of all the doctrines of the Anabaptists. The civil magistrate is appointed for the "suppressing of idolatrie and supersti- tioun whatsoever." Above all, no mercy was to be shown to Catholicism : the celebration of mass was to be punished by death. To accomplish the second prayer of the petition the Reformed ministers and the leading Protestant nobles met at Edinburgh on 20th December 1560. This was a purely church meeting ; parliament had in it no part what- soever. Even in its birth the Scottish Church announced its independence. It will, however, be observed that there were in the forty-six members comprising it but six minis- ters. At this assembly was drawn up the Jirst Buk of Discipline, which, though not accepted by the privy council, was on 27th January 1561 signed by the great majority of the members, and by the chiefs of the great Protestant families, on the noteworthy condition that the deposed prelates were allowed to enjoy their benefices during life. This book, which was a grand effort to reconstruct society, and for which, its authors asserted, 'they took not their example from any kirk in the world,—no, not from Geneva," was nevertheless on the Genevan principle. It deals solely with the congregation ; the idea only of synods may be traced. As regards the relations of church and state, the eldership, and the economy of the church generally, especially the supervision of life and manners, its views are those of Calvin.*~~

~~*Doctors or teachers are not mentioned until the edition of 1621, published by Calder- wood in Holland. The order of deacons was of the utmost service in poor relief. It was abolished, of course, at the Restoration, and the want of it was shown by the fact that in 1688 one-fifth of the population were beggars. Upon the restoration of Presbyterianism the evil was again grappled with, and in 1709 so great a change had taken place that the justices of the peace were instructed to leave the whole question of poor relief to the kirk sessions.? Besides the regular orders there were two others, called for by the exigencies of the situation, superintendents and readers. The latter of these was temporary, lasting only until 1581; it was required by the lack of highly-qualified men for the ministry. Readers were appointed to read the common prayers and the Scriptures; in process of time they might become ministers. The superintendents travelled through their districts—of which there were to be ten—establishing churches, settling ministers, and generally putting the church in order. Moreover, com- missions were given, lasting for a year only, for special needs. It has been asserted that this office of superin- tendent was also intended to be temporary ; but it is not stated so, as in the case of the readers; on the contrary, the whole language points to permanence. It is obvious that it is only by the most strained use of language that this institution can be used as an historical argument for Episcopacy in any modern sense. Not only was the super- intendent in all respects subject to the same rule as his brethren, but in the last exhortation upon election he is*~~

~~*| strictly charged, "Usurpe not dominion nor tyrannical*~~

~~*authority over thy brethren." In June 1562, however,*~~

~~*subjection of ministers to superintendents, as far at any*~~

~~*rate as receiving admonition, was enacted; and in December*~~

~~*1562 the superintendent received the power, with the con-*~~

~~*sent of the majority of the ministers in his district, to trans- 2 Hetherington, ii, 243.*~~

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~~*late ministers. In 1665 his functions increased vitally; he might then call a disobedient minister before himself, accom- panied only by the nearest discreet ministers, who might suspend the delinquent from ministry and stipend until the next general assembly. In 1575 it was ordered that superintendents should be elected yearly, to avoid ambition.*~~

~~*Care was taken to preserve the rights of the congrega- tion: "It apperteaneth to the Pepill, and to everie several congregation, to elect their minister. . . . Altogether this is to be avoided that any man be violently intrused or thrust in upon any congregation." But, once elected, he is irremovable, except for heinous crimes or by the majority of the whole kirk. Of course he is strictly "examinated" as regards both "lyiff and maneris" and "doctryne and knawledge," and especially as to his grasp of the chief points of controversy with Papists, Anabaptists, dc. No special method of nomination of elders is laid down, but from those nominated the whole congregation is to choose, special care being taken "that every man may gyf his vote freelie." The liberty of the churches is preserved by making the elections of elders and deacons annual. The affairs of each congregation were managed by the kirk session (French "'consistoire"), which met at least once a week. In every considerable town another weekly meet- ing was held, called the "' exercise of prophesying," which in course of time became the presbytery or classical assembly (colloque). It was formally erected in 1579, and gener- ally introduced in 1581. Then, again, the superintendent, with the ministers and delegated elders of his district, formed what developed into the provincial assembly. To this any one aggrieved by the kirk session might appeal, and, if necessary, the appeal went to the general assembly. This right of appeal was given in 1563. The general assembly, composed of delegated ministers and elders, into the constitution of which a change similar to that in France in 1565 was introduced in 1568, met as occasion served.*~~

~~*A splendid educational system was sketched. Parish schools, where grammar and Latin should be taught ; colleges in every important town, with professors of logic, rhetoric, and the tongues; universities at Glasgow, St Andrews, and Aberdeen,—such was what Knox desired. (The parish schools were not established till 1696.) The principle was affirmed that education was the affair of the state. "No fader, of what estait and condition that ever he be, use his children at his own fantasie, especially in their youthheade, but all must be compelled to bring up their children in learnyng and virtue." Compulsion and free education for the poor were Knox's idea. In 1567 parliament compelled patrons who had " provestries, pre- bendaries, altarages, or chaplaincies at their gift to present bursars to them to studie in anie college or universitie of this realm."*~~

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~~*assemblies, the independence of which was the essence of the kirk's existence. Against Mary's able secretary, Mait- land of Lethington, he threw himself with his whole vigour into this vital contest, and so far won the day that all Mary could gain was the compromise (important in prin- ciple) that a representative of the crown should have a place in the meetings.*~~

~~*The next struggle was on the question of patronage. The church requested that the vacant benefices, about 200 in number, might be filled by duly qualified persons. Mary answered that she would not give up her right of patronage. The church replied that no claim was made on this right, only it was desired that the places should be filled, and that the church should have the right of collat- ing, after approval by examination, those presented by the crown or patron. The church, in fact, was compelled to admit the principle of lay patronage. This was accepted in 1567, and no change was made until twenty years later, when all church lands not already bestowed inalienably on the nobles were annexed to the crown. James VI. gave these lands lavishly away with their patronages, which thus became lay patronages. Charles I. and Laud used their best efforts, but in vain, to regain them. The church pro- tested until March 1649, when lay patronage was altogether abolished. It was naturally restored at the Restoration, and remained until the Revolution. On 19th July 1690 the system was again*~~

~~abolished, and the nomination to a vacancy was placed in the hands of the Protestant heritors and elders with a veto to the whole congregation. In 1712, under the influences of the Jacobite revival, the English parliament reimposed lay patronage. This Act, as violating the Act of Security, has never been admitted as valid by the purer Presbyterians.~~

~~During the troublous years 1566-67 the kirk, stable in a time of confusion, consolidated her strength, and. within her own bounds established the strictest discipline. In 1567 parliament made the monarchy Protestant, ratified the rights of the church to collation, and established the important principle, resisted from time to time, that the "thrids" of benefices should be henceforth collected by persons nominated by herself, and that she should pay the surplus into the exchequer after satisfying the ministers' stipends. Her progress may be gathered from the fact that, while in 1560 the general assembly contained only 6 ministers and 34 laymen, in 1567 she contained 252 ministers and 467 readers. Her power is seen in the cen- sure passed upon the countess of Argyll, the earl being the most powerful of the nobility, for assisting at the baptism of Mary's son with Catholic rites.~~

~~To the nobility, which retained the old turbulence of feudalism that had long ceased to be tolerated in any other country in Europe, this power of the church was hateful,~~

~~bu _ To carry out these schemes and one for composition of | and after the death of Murray their enmity became out- "hy ® tithes Knox proposed to apply the revenues of the disestab: | spoken. Morton, acting under English influence, led the~~

~~lished church. But he was completely baffled by the nobles,~~

~~fe attack. In 1571, the Roman Catholic archbishop of St who hastened to divide the spoil. The absolute irrecon-~~

~~and the crown.~~

~~cilability of the views of these feudal barons, who were Re- formers because their supremacy was threatened by crown and church, and because they coveted the abbey lands, with those of Knox and his fellow-labourers was at~~

~~*once brought into strong relief. His petitions were disregarded; the privy council would not ratify the Book; the lords determined that "the kirkmen shall intromett with the 2 parts of their benefices, and the third part be lifted up to the ministers' and Queene's use," or, as Knox bitterly said, two parts were "freelie given to the Devill" and the third part was "divided between God and the Devill." Even the sixth part allowed to the ministers was irregularly paid, a leading subject of complaint for many years. Knox's next struggle was to maintain the right to hold*~~

~~*Andrews having died, Morton obtained a grant of the archbishopric and of the two-thirds of his revenues dis- posable, and, by appointing a minister on condition that he himself should retain the greater part of the income, gained a strong footing within the church. In January 1572 the earl of Mar got together the superintendents and some ministers at Leith, on pretence of consultation. This convention, under the influence of the nobility, assumed the functions of a general assembly, and restored the titles of "archbishop" and "bishop" and the bounds of the dioceses, on the conditions that they should be chosen by a chapter of learned ministers, that they should have no more power than the superintendents, and that they should be subject to the general assembly in spiritual matters. These were the "tulchan" bishops. The general*~~

~~*Andrew Melville.*~~

~~*SCOTLAND.*~~ |

~~*assembly of August 1572 was not strong enough to resist. The effect of this arrangement, however, was to rob Episco- pacy, as a system, of all title to respect. It soon became the earnest belief of all who were truthful and independent in the nation that the Presbyterian system was the one divinely appointed mode of church government, from which it was sinful to deviate in the slightest degree.*~~

~~*In 1574 Andrew Melville appeared on the scene, and, by steady persistence and firm defiance of Morton's violence, gave fresh life to the church. The Second Book of Disci- pline, sanctioned by the general assembly in April 1578, and ordered in 1581 to be registered in the acts of the church, represents her determination to repel the aggres- sions of the nobility. It*~~

~~was decreed that no more bishops should be appointed, that the existing ones should be called by their own names, not by their titles, and that they~~

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~~liament met secretly and, having been thoroughly corrupted by the court, passed the "Black Acts." Act 2 declared Melville's claim to be treason ; Act 4 forbade presbyteries, synods, and assemblies, as being not allowed by parliament ; Act 20 re-established Episcopacy and made it treason to speak against any of the three estates (¢.g., bishops). king was made supreme in all cases and over all persons, while none were to presume "to meddle with the affairs of his Highness and estate." The course of events from 1584 to 1592, the fear of Catholic Spain, the league with England, and especially the ability of Robert Bruce led to a settlement, by which in May 1592 Presbyterianism was restored and ratified by parliament. It was of course a compromise, as is shown in the provision that, if a presby- tery refuse to admit a qualified minister, the patron may retain the income.~~

~~The —~~

~~should submit to the general assembly for disposal. The first Book of Discipline occupied itself chiefly with the congregation, the Second Book with the dependence~~

~~The quarrel, however, was not to be settled. For re- Struggle jecting the bill of attainder against the popish lords the with the synod of Fife excommunicated James and convened a °°W2~~

~~of the congregation upon higher courts. It did away with superintendents and established complete parity among ministers, transferring discipline and authority from indi- viduals to bodies of men. These were four. (1) The kirk session, which in 1587 was ordered to be subject to the presbytery. (2) The presbytery or eldership, which had the oversight of a number of neighbouring congregations, and consisted of all the ministers of the district, and as many olders as congregations, so that clergy and laity were equally represented. It had authority to control the kirk session, try~~

~~candidates, ordain or depose ministers. It constituted, in fact, the prominent feature of the system. (3) The provincial synod, composed of all the members of the presbyteries in its district, had jurisdiction of appeal over these presbyteries. (4) The general assembly, con- sisting of ministers and elders, chosen, be it observed, not from the provincial synod, but from the presbytery. Thus the presbytery took the same commanding position in Scotland as, it will be seen, the provincial synod did in France. The importance of these church courts politically, in the organization which they effected of the middle classes against the aristocracy, cannot be overrated.~~

~~The ruling elder was now to hold office for life,—an important limitation of the power of the congregation. The general tendency henceforward, natural in a complex society, was towards centralization ; the rights of the congregation were gradually diminished, those of the presbytery increased. This tendency was strengthened as time went on by the passionate hatred of the Presbyterians for the congregational system. Thus in 1639 Baillie declares that if the congregation is to have a veto upon the appointment of the minister it is "sheer Brownism" (vol. i. p. 241); and on 30th July 1643, although " William Rigg and the people" were against an appointment, the intruder was de- cerned by the general assembly to be admitted, since the patron, presbytery, and provincial synod were in favour of it. As the position of elder increased relatively to that of simple members of the congregation, so the position of minister increased relatively to that of elder. The supremacy of ministers and the subordination of the elders reached their height after the great rising of 1638.~~

~~The contest which was waged during 1582-84 between the kirk and the crown was chiefly concerned with the denial by Melville of the primary jurisdiction of the privy council over ministers summoned for offences committed in their ministerial capacity. He demanded in his own case to be tried, in the first instance, by the ecclesiastical courts. A more important case of the same claim, because connected with less important persons, occurred in 1591, and the de- mand of the church was allowed so far that the offender was tried in both courts concurrently. In May 1584 the par-~~

~~meeting from the whole kingdom to complain of his con- duct. A little later Andrew Melville, when sent on a deputation, called James "God's silly~~

~~*vassal," and told him that there were two kings and two kingdoms in Scot- land, King James the head of the commonwealth and Christ Jesus the head of the church, whose subject he was. James, however, was strong enough to remain inflexible and to secure a victory on the question of the church courts, which, in the case of David Black, one of the ministers of St Andrews, who had in a sermon reflected upon the queen and Church of England, had arisen in its most acute form.*~~

~~*Two alternative steps were now suggested for prevent- ing future strife, the establishment of Episcopacy or the admission into parliament of representatives of the church without any title or jurisdiction derived from the crown. In a general assembly opened at Perth on 29th February 1597, and packed with ministers from the remote northern presbyteries, where the democratic spirit of the High Presbyterians of the South was unknown, James obtained leave to suggest in a future assembly alterations in the existing government of the church, a disapproval of the discussion of state questions and of the denunciation of individuals from the pulpit, and the forbidding of extra- ordinary conventions. Ministers were also to confine their discourses strictly to their own congregations, and summary excommunication was abolished. He had previously with a high hand put down the opposition of the Edinburgh ministers, Bruce and others seeking safety in flight.*~~

~~*In April, at Dundee, an assembly similar to that of Perth consented that commissioners should be appointed to advise the king on church affairs, which step in a great degree freed him from the general assembly. These com- missioners were easily induced to petition that the church might be represented in parliament. Parliament thereupon passed an Act allowing those to sit there who might be ap- pointed by the king, as bishop, abbot, or other prelate, the duties of their offices to be determined in conference with the assembly. At the second assembly of Dundee, how- ever, which met on 7th March 1598, and at which Andrew Melville was refused admittance by James on frivolous though legal grounds, it was resolved that fifty-one repre- sentatives of the church, chosen partly by the king and partly by the church, should vote in parliament. At a convention held at Falkland on 25th July, at which three representatives of each synod and six doctors of the universities were present, it was decided that the repre- sentatives should be*~~

~~nominated by the king out of a list of six as vacancies occurred. They were to be respon- sible to the general assembly, and were to propose nothing unless instructed to doso by the church. Of these two~~

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~~plans, the parliament's and the church's, James greatly to induce the church to agree to it to the general assembly at~~

~~At Montrose the assembly Falkland convention by~~

~~preferred the former ; he held a conference previous Montrose in 1600, but in vain. put limitations to the plan of the insisting that their representatives should sit but for one year, and that at the end of that year they should resign and account for their conduct to the assembly, which might depose them. They were to be called commissioners only. Six were to be nominated for each province, from whom the king was to choose one. The commissioner was to have no power above that of other ministers, was to perform full pastoral work, and was to lose his vote in parliament if deposed from the ministry. Victory James at length took a decisive step. On 14th October of James 1600 he summoned a convention of commissioners from we the various synods, and by some means secured its consent to the appointment of three bishops in addition to those formerly nominated and still living. They took their seats and voted in parliament next November ; but the church, disowning the authority of the convention, refused to ac- knowledge the appointment as valid, and assigned them no place in her own organization. The quarrel became intensified when James was master of the power of corrup- tion with English money. The proposals for union between the kingdoms at once brought out the views of the church. "The realmes," said Melville, "could not be united with- out the union of the kirk; neither could the kirkes be united in discipline, the one being Episcopal and the other Presbyterian, unless one should surrender to the other." When James twice prorogued the meeting of the general assembly nine presbyteries met at Aberdeen in defiance. The Government at once struck hard: eight ministers were banished to remote charges and six to France. Next followed the alienation of church lands and revenues and their erection into temporal~~

~~*lordships, the re-establishment of seventeen prelacies, and the restoration of the bishops. The immense step was taken of recognizing the king as "absolute prince, judge, and governor over all estates, persons, and causes, both spiritual and temporal." In 1606 another packed assembly declared for constant moderators of presbyteries and for the supremacy of the bishops in their own presbytery and provincial synod. In 1609 the bishops gained the right of fixing ministers' stipends. In 1610 courts of high commission with most arbitrary powers were erected at Glasgow and St Andrews ; and in June the general assembly placed the whole ecclesi- astical power in the king's hands. In 1618, under threats of violence, the general assembly of Perth passed the Five Acts, which enforced kneeling at communion, observance of holy days, Episcopal confirmation, private baptism, and private communion. These were ratified by parliament on Black Saturday, 4th August 1621. Thus matters remained until the death of James. Almost the first act of Charles I. was to proclaim the strict observance of the articles of Perth. In November 1625 he revoked all the Acts of his father prejudicial to the crown, as a first step toward the resumption of the church lands. This, of course, met with the vehement opposition of the nobility, and the scheme in the end had to be given up. In 1630 Maxwell, in Laud's confidence, was sent to Scotland to try to force upon the people the English liturgy. It is significant of the change in feeling that a paper of grievances sent in by ministers was sup- ported by several of the nobility. Their hatred was always directed to the nearest enemy, against the crown before le Mae and during its early stages, against the ormed Church of late years, now against the crown again. In 1633 Charles came to Edinburgh and forced through the convention the " Act anent his Majesty's Pre-*~~

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~~*[SCOTLAND.*~~

~~*rogative and Apparel of Churchmen," a combination of two Acts passed in 1606 and 1609 respectively. All pro- tests were disregarded and the whole nation was thrown into a state of anger and disappointment. The attack on Balmerino still further alienated the lords. In 1635 dio- cesan courts were erected with the most vexatious powers, and the Book of Canons, subversive*~~

~~*of Presbyterianism and insulting in language, was distributed ; and in 1636 the people were ordered to adopt Laud's book of public wor- ship ; while in July 1637 the prelates 'obtained an order of outlawry against ministers who should be backward in re- ceiving the liturgy. As Baillie said, they were like to go "to Rome for religion, to Constantinople for policy." On 23d July, however, the outburst of St Giles's took place. Fina The history of the great rising cannot be traced here. National Covenant, which was its outcome, drawn up by Alexander Henderson and Johnston of Warriston, consisted of the Second Book of Discipline, a recapitulation of the Acts of Parliament condemning Popery and ratifying the acts of the general assembly, and the application of the whole to present times.*~~

~~*After some months of trickery and evasion, frustrated with firmness and ability by the Covenanters, the general assembly met on Wednesday, 21st November 1638. When they determined to sit in judgment on the prelates, Hamilton, the king's commissioner, dissolved the assembly. It, however, continued its sitting, refused to acknowledge the assemblies which had introduced prelacy, condemned the Acts of Perth and*all the late innovations, and abjured all Episcopacy different from that of a pastor over a parti- cular flock. Baillie alone made a stand for not rejecting Episcopacy as represented by the superintendents of Knox's time. Eight prelates were excommunicated, four deposed only, two reduced to the simple pastorate. All church assemblies were restored, and the principle that the con- sent of the congregation was necessary to a minister's appointment was re-enacted. Schools and schoolmasters were at once to be provided. In August 1639 an Act was passed, called the, Barrier Act, that no change should be made in the laws of the church until the proposal had been submitted to all provincial synods and presbyteries.*~~

~~*The church was now secure. She had gained the day, because on this occasion the zeal of her ministers and the interests of the nobles had been both enlisted in her service. The victory had been won in her name and the influence of her ministers was vastly increased. For the spiritual tyranny which they introduced the reader should refer to Mr Buckle's famous chapter ; or, if he think those statements to be partial or exaggerated, to original records, such as those of the presbyteries of St Andrews and Cupar.*~~

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~~*The success of the*~~

~~*church,*~~

~~*The arrogance of the ministers' pretensions and the readi- Rule of*~~

~~*ness with which these pretensions were granted, the appal- ™mini*~~

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~~*ling conceptions of the Deity which were inculcated and the ane absence of all contrary expression of opinion, the intrusions on the domain of the magistrate, the vexatious inter- ference in every detail of family and commercial life and the patience with which it was borne, are to an English reader alike amazing. 'We acknowledge," said they, "that according to the latitude of the word of God (which is our theame) we are allowed to treate in an ecclesiastical way of greatest and smallest, from the King's throne that should be established in righteousness, to the merchant's ballance that should be used in faithfulness." The liber- ality of the interpretation given to this can only be judged of after minute reading.*~~

~~*Up to this point the Kirk had worked out her own salvation ; the problem had been purely Scottish ; hence- forward her history is in close connexion with that of England and assumes a different complexion. Her first difficulties, however, arose in her own midst. Under the*~~

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~~*Restora- tion of Episco- pacy.*~~

~~*SCOTLAND. |*~~

~~*prelatic rule conventicles had arisen, which after the re- storation of Presbyterianism caused great searchings of heart. Whatever he had to say about popery, prelacy, or arbitrary power, the true Presbyterian reserved his fiercest hatred and his most ferocious language for anything which savoured of Congregationalism. At the instance of Henry Guthrie, who under Charles II. became a bishop, the general assembly of 1640 limited family worship to the members of each family, and forbade any one to preach who was not duly ordained and approved. This was but the beginning of dissension.*~~

~~*Passing over the events of the next six years, as coming more conveniently under the head of England, we notice that the moment external danger was removed the natural and abiding antipathy between a licentious and entirely selfish aristocracy and a masterful, censorious, and demo- cratic church broke out. Two parties showed theinselves, —that of the ministers, who insisted that no arrangement should be come to with Charles unless he would take the Covenant (compare the French "consistoriaux"), the other, headed by Hamilton, Lanark, Lauderdale, and others, who "engaged" to raise an army for him on condition, ostensibly, that he would confirm Presbyterian church government for three years. The real conditions, as long believed but only just discovered, contain not a word about the church, but are entirely concerned with the privileges of the Scottish nobility. A vehement disruption of the church at once took place and did not cease until the defeat of Hamilton. Then the ministers were once more masters. Parliament repealed the Act of Engagement and passed the Act of Classes, whereby all those to whom the church deemed it inexpedient to give political power were regis- tered in four classes according to their faults. It was by this parliament that lay patronage was abolished, and that the rights of the congregation as to election of ministers were settled for the time. After the battle of Dunbar, when troops were being hastily raised, the Act of Classes stood much in the way. In spite of the remonstrances of Patrick Gillespie and the western Covenanters, the com- mission of the assembly (which sat en permanence during the recess of the assembly itself) resolved to allow all persons to serve who were not professed enemies to the Covenant or excommunicated. The parliament went further and rescinded the Act of Classes altogether. Against this union of the church with the "malignants" Gillespie's faction protested, and henceforward the rivalry*~~

~~*and bitter- ness between Resolutioners and Protesters, the latter being favoured by Cromwell, deprived the church of much of its power of resistance. Both parties, absorbed in their quarrel, looked on while Monk, after the battle of Worcester (1651), took the matter into his own hands by refusing to allow any general assembly whatever to meet, though he permitted the continuance of the other assemblies.*~~

~~*Within two years of the Restoration the Presbyterian Church ceased to exist. Weariness, internal dissension, the indifference or positive hatred of the nobles, and the extremity of treachery in James Sharp? brought about the downfall. The steps by which Episcopacy was restored were these. The leaders of the strict Covenanting party were imprisoned, while a quibbling proclamation was issued by Charles which served to keep the Resolutioners in play. Proclamations were issued against all unlawful meetings, and papers such as Rutherford's Lea Rex and Guthrie's Causes of God's Wrath were called in. In January 1661 a bribed and packed parliament passed an oath of allegiance in which the king was acknowledged as supreme over all persons and in all causes. With scarcely an exception,*~~

~~*1 See Lauderdale Papers, vol. i. p. 8 (Camden Society).*~~

~~*2 For proof of his active participation in the re-establishment of Episcopacy, see Lauderdale Papers, vol. ii., App. III.*~~

~~*Cassilis being the only one of note, the nobility took the oath. Next the acceptance of the Solemn League and Covenant was declared null and void, and its renewal was prohibited. And, by way of clearing the field entirely, a Rescissory Act was passed annulling all the parliaments since 1633 and thereby suspending the Presbyterian system. The parliament then declared that the church government was to be such as was most agreeable to the word of God, to monarchical government, and to public peace; remonstrances were disregarded and synods suppressed or corrupted. Argyll and James Guthrie were judicially murdered. Finally, on 14th August 1661, Episcopacy was restored by proclamation ; Sharp, Fairfoul, Hamilton, and*~~

~~— Leighton were consecrated in London ; and on 2d January 1662 all Presbyterian assemblies of every sort, unless autho- rized by the prelates, were forbidden. On 8th May the proclamation was enforced by Act of parliament. All reli- gious covenants and leagues, protestat'ons and petitions, were made treasonable, nor might any one be professor, minister, schoolmaster, or private tutor without a bishop's licence. On 5th September 1662 the abjuration of the National Covenant and all other religious covenants was made a condition for public trust. Finally, the Act of Indemnity, which had been delayed as long as possible, contained a schedule of persons of the Presbyterian interest who were punished with heavy fines. Dangerous ministers were banished from Edinburgh and all were ordered to attend the bishops' courts when suzimoned, while by the Glasgow Act ministers who had taken charges since 1649 were ousted from home, parish, and presbytery unless be- fore 1st November they obtained presentation from the patron and collation from the bishop. This led to the ejectment of 400 ministers. Ejectment led, of course, as in England, to conventicling, and on 17th June and 13th August 1663 severe Acts were passed against these meet- ings. Presbyterian ministers from Ireland were forbidden to reside in Scotland, and absentees from public worship were vigorously proceeded against. The system of perse- cution was now complete, and the triumph was signalized by the execution of Johnston of Warriston, who had been kidnapped in France and who was now put to death with flippant cruelty. In 1664, at the suggestion of the arch- bishops Sharp and Burnet, a court of high commission was erected with unlimited powers.~~

~~Revolt soon followed ; it was crushed at Pentland and ruthlessly punished. But the nobles speedily became jealous of the growing power of the prelates. Lauderdale in especial saw his influence threatened. He reported to Charles that Prelacy was becoming as great a danger to the crown as Presbyterianism had been, "so unwilling are churchmen, by whatever name tliey are distinguished, to part with power." Sharp was easily threatened and cajoled, and Burnet, after a struggle of three years, was forced to resign. It was not, however, until after the fall of Clarendon in 1667 that indulgence was seriously tried there as in England. In July 1669 ten ministers, of whom Hutcheson was the chief, who were willing to admit te ecclesiastical supremacy of the king and to accept tue bishops' collation,~~

~~were allowed to return to their livings, and were henceforth known as the "bishops' curate." This subservience caused a renewal of the breach in the hurch; from henceforward the feud between the "Tndulged" and the "non-Indulged" took the place of that between Resolutioners and Protesters. Forty-two ministers accepted the indulgence. A second indulgence followed in 1672. From Lauderdale's marriage with Lady Dysart until 1687 there ensued a policy of extermination, borne with marvellous fortitude. To Covenanters had succeeded Protesters, to Protesters Conventiclers, to Conventiclers now succeeded Hamiltonians, to Hamiltonians~~

~~Presby- terian- ism once more supreme.~~

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~~Cameronians or Society People. Want of space prevents us from giving even the names of a series of Acts which would disgrace any nation however barbarous, in any age however intolerant, and under which, it is asserted with great probability, 18,000 persons died. In February 1687 James II. proclaimed indulgences to moderate Presby- terians as far only as regarded private worship. By the same proclamation the profession of Roman Catholicism was made absolutely free. In March a more extended indulgence and in June the suspension of all penal laws, except as regarded field-preaching, were granted. The party which had throughout refused compromise refused it still. In their Znformatory Vindication they scouted the claim of the sovereign to "indulge" or to "tolerate" an inalienable right, and went on with their field-preaching as though nothing had happened. The death of Renwick, their leader, closes the awful story of the rule of the later Stuarts in Scotland.~~

~~On 5th November 1688 William landed at Torbay ; the bishops' curates were ejected without violence ; no retri- bution was taken, but Presbyterianism quietly reasserted itself as the form of church government natural to the Scottish mind. Presbyterianism, however, was not now what it had been in the days of Andrew Melville or in 1638. The last twenty-six years had thoroughly cowed a great part of the nation, and a new generation had come to manhood who could not even remember the time when Scotland was not Episcopal. The nobles had no interest to serve in re-establishing the old form ; the very ministers were those who had~~

~~conformed or had accepted indulgence. Out of the 400 ejected in 1663 only sixty now survived. Moreover, Scotland had not escaped the wave of latitudi- narianism that had come over all forms of Protestant reli- gion. Most of all, the character of William III. and his confidential adviser Carstares affected the nature of the settlement. William was above all a statesman, and a toler- ant statesman, and he wished for union of the moderate parties in both kingdoms ; on taking the coronation oath he refused to swear the clause binding him to root out heretics and enemies of the true worship of God. The claim of right, too, avoids any assertion of the jus divinum of Presby- terianism. But on 22d July 1689 its declaration that prelacy had been an insupportable grievance was made into an Act by the convention of estates, and all Acts in favour of Episcopacy were rescinded. In April 1690 the Act of Supremacy was also rescinded; ministers ejected since 1661 were replaced, and the Presbyterian government of 1592 (thus avoiding all mention of the covenants) restored ; lay patronage was abolished, but pecuniary compensation was granted. On 16th October 1690 the first general assembly since 1653 met, when the preliminary act was to receive into the national church the remaining three ministers of the Cameronians (Thomas Lining, Alexander Shields, and William Boyd). Their followers, however, regarded this as a compromise with Satan, and kept them- selves aloof.! Episcopalian ministers who subscribed the confession and obeyed the Presbyterian government re- tained their livings, and all sentences of Resolutioners and Protesters against one another were rescinded. Mr Hether- ; . They remained without a minister until 1707, when they were joined by John M'Millan, minister of the parish of Balmaghie, who had been summarily deposed for principles akin to those of the Society People. The accession of Thomas Nairn, one of the ministers of the Secession Church, made a "Reformed Presbytery" possible in 1743 ; this became a synod of three presbyteries in 1811. The first "Testi- mony," published in 1761, was afterwards superseded by that of 1839, which thenceforward was regarded as one of the "subordinate stand- ards " of the Reformed Presbyterian Church. In 1876 before the union with the Free Church (see vol. ix. p. 746) the denomination in Scotland numbered 6 presbyteries, 38 niinisters, and 40 congregations.~~

~~It also had six missionaries in the New Hebrides. For the fortunes of the Reformed presbyteries in Ireland and the United States, see below.~~

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~~*[SCOTLAND.*~~

~~*ington well says, 'Without a clear conception of this point it is impossible to understand the subsequent history of the Church of Scotland. In consequence of the introduction of the prelatic party the church thenceforward contained within its pale two systems, that of the old and true Pres- byterian, subsequently known as the ' evangelical,' and that of the new and semi-prelatical, subsequently known as the 'moderate.' Thenceforward the history of the Church of Scotland is the history of the protracted struggle between these two systems, which were necessarily irreconcilable."*~~

~~*In the first case of friction with the crown, which occurred in 1691, a compromise was effected,—the church success- fully asserting its autonomy by granting only part of the privileges which William desired for the Episcopal clergy. The critical dispute occurred when parliament imposed a new oath of allegiance, the taking of which was made a necessary qualification for sitting in the assembly. The church denied the right of the crown to impose a civil oath as a condition of spiritual office ; and a serious breach would have occurred but for the efforts of Carstares, who induced the king to give way at the last moment. Having thus asserted her independence, the church conceded to William nearly all he had asked for on behalf of the Episcopalians. In 1696 the parish schools were estab- lished. In 1698, to vindicate the church from the charges of backsliding, the general assembly published the Season- able Admonition, which claimed in emphatic language the dependence of the church on Christ alone, and repudiated the doctrine that the inclination of the people was the foundation of Presbyterianism. In 1701 the first con- demnation of heresy took place.*~~

~~*The spirit of watchfulness on the part of the church increased during Anne's reign. In naming commissioners for the Union the parliament forbade them to mention the church. The extreme section indeed regarded the Union itself as a violation of the Solemn League and Covenant. The Act of Security provided that the Con- fession of Faith and the Presbyterian government should "continue without any alteration to the people of this land in all succeeding ages," and the first oath taken by the queen at her accession*~~

~~*was to preserve it. The Union, however, teuded to Anglicize the upper classes and thus to increase the latitudinarianism which was finding its way within the church. Politically speaking, the settlement of the Scottish Church was of great importance to the Govern- ment during the Jacobite intrigues, for its attitude was one of vigilance against all that was favourable to Prelacy, and its influence consolidated opinion against the Stuarts.*~~

~~*The HIgh-Church revival of 1710, however, had its effect upon the church. In 1711 an Episcopalian named Greenshields used the English liturgy in Edinburgh. HIe was condemned by the Court of Session; but the HIouse of Lords reversed the decision and imposed heavy damages on the magistrates who had closed his chapel. In 1712 a Bill of Toleration, which allowed Episcopalian dissenters to use the English liturgy, was hurried through both HIouses, in spite of the urgent remonstrances of the Scottish commissioners, and on 22d April lay patronage was restored. This latter Act, as violating the Act of Security, has never been regarded as valid by the severer Presby- terians. That no further resistance was made than by protests and petitions shows how far the '" moderatizing " spirit had spread. The remnant of the Cameronians, who were outside of and discouraged by the church, alone met and renewed the Covenant after solemnly acknowledging the sins of the nation.*~~

~~*The progress towards Arminianism, due to the influence Schisms.*~~

~~*of Baxter's writings and to the training of the young ministers in HIolland, may be seen in the treatment of Professor Simson and in the Auchterarder case. It was*~~

~~*Early move- ments.*~~

~~*ENGLAND.*~~ |

~~*now that Neonomianism, or the doctrine that the gospel is a new law, promising salvation upon the condition of the abandonment of sin, began. Its first victory was when the general assembly condemned the doctrines of the Marrow of Modern Dimnity, and rebuked the twelve ministers who had sent in a representation against the decision. The Patronage Act was*~~

~~*rapidly being accepted and was showing its effects chiefly in the neglect shown to the wishes of the congregations. In 1731 the right was given to the heritors and elders to "elect and call" instead of to "name and propose the person to the whole congregation to be approven or disapproven," and was made law without having first been submitted to the pres- byteries according to the Barrier Act of 1639. This led to the first great schism. Ebenezer Erskine denounced the action of the assembly in two sermons. Being rebuked by the synod of Perth and Stirling, he appealed to the assembly, who approved the rebuke. With three other ministers he protested. 'The four were temporarily deposed by the assembly, and on 6th December 1733 they formed the "Associate Presbytery." In 1737 their number was largely increased, and they published their manifesto, the "Declaration and Testimony." Their final deposition, and the first schism, occurred on 15th May 1740.*~~

~~*For several years the wishes of congregations were ignored; wherever the presbytery refused to appoint at the will of the assembly, a 'riding committee," often assisted by military force, carried out the decision. The civil courts were bound to obey the Act of Patronage, and therefore never upheld the congregation against a legal appoint- ment. At length in 1752 the leader of the "moderate" 'party, Principal Robertson, seeing in this refusal of pres- byteries the elements of endless confusion, and that tem- porary substitutes, e.g., riding committees, were uncon- stitutional and bad in principle, determined that the presbyteries themselves should be compelled to carry out the decisions of the assembly. From the deposition of Thomas GILLESPIE (g.v.), a member of the presbytery of Dunfermline, who refused to act in accordance with the assembly's decision, is dated the second or 'Relief " schism. Principal Tulloch says upon this: "The policy was so far successful ; but the success was of that nature which is almost worse than defeat. It introduced order within the church. It crushed the revolt of presbyteries. It silenced in many cases popular clamour. But it quietly and gradually alienated masses of the people from the estab- lishment." So rapidly did dissent spread that from a report presented to the general assembly in 1765 it appears that 'there are now 120 meeting- houses erected, to which more than 100,000 persons resort, who were formerly of our communion, but have separated them- selves from the Church of Scotland. This secession," the report adds, "is most extensive in*~~

~~*the greatest and most populous towns." For the subsequent history of Presby- terianism in Scotland, see FREE CHurcH, UNITED PRESByY-TERIAN CHURCH, and ScoTLAND (CHURCH oF).}*~~

~~*England.—Several faint traces may be noted of the presence of Presbyterian ideas in England within a few years of the Reformation. During the reign of Edward*~~

~~*1 Chief References.—Calderwood, List. of the Kirk; Knox, Hist. of the Reformation, and Works (ed. Laing) ; Hetherington, Hist. of the Church of Scotland ; M'Crie, Life of Knox and Life of Melville ; Cunningham, Historical Theology; Rudloff, Geschichte der Ref. in Schottland ; Neal, Hist. of the Puritans ; St Giles' Lectures (1st ser.) ; Records of the First Pan-Presbyterian Council (Edinburgh, 1877) ; James Melville, Diary; Burton, List. of Scotland; Laing, Hist. of Scotland ; Wodrow, Church History and Miscellanies ; Baillie, Letters and Journals; Records of Presbyteries of St Andrews and Cupar ; Buckle, History; Burnet, Hist. Reform; Robertson, Mist. of Scotland ; Spottiswoode, Hist. of Church of Scotland; Kirkton, Mist. of the Church ; Stevenson, I/ist. of the Church ; Lamont, Diary ; Gardiner, History of England, ch. 2; Lauderdale Papers (Camden Society).*~~

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~~*VI, for instance, Bucer, with Cranmer's goodwill, laid before the king a sketch of church discipline and reform of episcopal government. Each bishop was to have a council of presbyters, and provincial synods with a royal commissioner were to meet twice a year. Many English joined Lasky's foreign church, and when it was dispersed under Mary settled chiefly in Frankfort, where the dispute took place in which the adherents of the Prayer Book de- feated Knox and his followers. These came to England filled with Calvinistic views regarding church and state, only to find the royal supremacy absolute, and uniformity enforced under crushing penalties. Even the foreign Pro- testants were compelled to choose the bishop of the diocese as their superintendent. The contest, which began after a scheme of reform had been lost in convocation by one vote in 1562,*~~

~~was ostensibly concerning vestments and cere- monies ; really it rested on a far wider basis, one which found place even in Cambridge disputations, viz., " whether the civil magistrate has authority in ecclesiastical affairs." That the Puritans? did not look for a speedy setting up of "discipline " may be seen in Cox's letter to Gualter, ."' We have some discipline among us with relation to men's lives, such as it is; but if any man would go about to persuade our nobility to submit their necks to that yoke, he may as well venture to pull the hair out of a lion's beard." In 1566 took place the first separation of several deprived London ministers, who determined in future to use the Geneva service book, which they did until they were ar- rested in Plumbers' Hall on 19th June 1567. During 1567 and 1568 the persecutions in France and Holland drove thousands of Protestants, chiefly Presbyterians, to England. In 1570 the leading Presbyterian views found an exponent in Thomas Cartwright at Cambridge (the headquarters of advanced Puritanism) ; and the temper of parliament is shown by the Act of 1571 for the reformation of disorder in the church, in which, while all mention of discipline is omitted, the doctrinal Articles alone being sanctioned, ordination by presbyters without a bishop is implicitly recognized. It is to be observed that Cartwright and the leading Puritan theologians opposed the idea of separation. The voluntary association of bishop, ministers, and laity at Northampton is interesting as showing how earnest men were thinking. Their discipline was strict and their tone with regard to the state and to the existing con- stitution of the church was too bold to allow of indulgence. In spite, however, of constant deprivation, especially in the midland and eastern counties, the obnoxious doctrines spread ; and in 1572 the first formal manifesto was put forth in the Admonition to Parliament of Field and Wilcox, with theassent of others. Equality of ministers, choosing of elders and deacons, election of ministers by the congrega- tion, objection to prescribed prayer and antiphonal chant- ing, the view that preaching is a minister's chief duty and that the magistrate should root out superstition and idolatry, are leading points. The controversy which followed between Whitgift and Cartwright showed how impossible agreement was when the one side argued that the Holy Scriptures were the only standard as well for church government as of faith, and the other that a system of church government was nowhere laid down in Scripture, and might be settled by and accommodated to the civil government under which men happen to be living. On 20th November 1572~~

~~*the authors of the Admonition set up at Wandsworth what has been called the first presby- tery in England. They chose eleven elders and put out*~~

~~*2 We use this word in its widest sense to include all who desired purity in church government and doctrine. They consisted at first of the returned exiles of the Marian persecution, and separated under the stress of Elizabeth's action into Independents and Presbyterians, the latter remaining inside the church.*~~

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~~*a purely Presbyterian system, the Orders of Wandsworth. Similar associations were erected in London and in the midland and eastern counties. When, however, an attempt was made to join the foreign churches in London, the privy council forbade it. Jersey and Guernsey, whither large numbers of Huguenots had fled after the massacre of St. Bartholomew's, alone were Presbyterian by per- mission. Cartwright and Snape were pastors there, and from 1576 to 1625 a completely appointed Presbyterian church existed, confirmed by synods (held at Guernsey and Jersey on 28th June 1576 and 17th October 1577) and authorized by the governor. Meantime Cartwright and Travers had drawn up a scheme, never realized, by which ministers were bound to refuse ordination by a bishop unless they had previously been "called " by a congre- gation and approved by a church classis. Ceremonies in dispute might be omitted; should this cause danger of deprivation the classis was to decide. The doctrinal Articles might be subscribed, but not the Prayer Book. Churchwardens might easily be converted into elders and deacons ; and classical, comitial, and provincial assemblies were to be held.*~~

~~*The suppression of independent life in the church at length drove numbers out, known in the future as Brownists or LNDEPENDENTS (q.v.). Those who remained still strove for reform. They were met by a new court of high com- mission and the "ex officio" oath,—an increase of severity strongly opposed by Burghley and the privy council. These views are expressed in*~~

~~*Travers's Disciplina Ecclesiz ex verbo Dei descripta, printed at Geneva in 1574, trans- lated with additions by Cartwright in 1584, then sup- pressed and not again published until 1644, when it was officially recognized as the Directory of Government.' Its leading principles were those of French Protestantism.*~~

~~*terianism Jt was signed by some 500 ministers, Cartwright among*~~

~~*them. The action of the Commons in 1584, stimulated by the opposition of the Lords, shows that the principles of Presbyterianism were very strong in the country. Bills were introduced to limit the stringency of subscription, and to confine the penalties of suspension and deprivation to cases of heresy or scandalous life, to reduce the posi- tion of. a bishop wellnigh to that of merely primus inter pares, for placing the power of veto in the congregation, for abolishing the canon law and all spiritual courts, and for establishing a presbytery in every parish. All these proposals were, however, cut short by the unflinch- ing exercise of the queen's prerogative; and, with some slackening during the great year of peril, the Puritans suffered extreme persecution. In 1588 they held a pro- vincial synod at Warwick, and also again at Michaelmas. It is noticeable, as showing the growth side by side with Presbyterianism of the spirit directly its opposite, that on 12th January 1588 Bancroft for the first time maintained the jus divinum of Episcopacy. There seems no doubt that during the later years o Elizabeth Presbyterianism declined. The position of the conforming Puritan was in every way a weak one. He had sworn to the queen's ecclesiastical supremacy, and this supremacy was what he most hated; he was compelled to have recourse to the figment that, although she had this supremacy, she could not exercise it ecclesiastically, but could merely give her sanction to whatever was enacted by the church. On the other hand, in appearing to attack the church he appeared to attack the nationality of the country when the national spirit was most intense. The nation was rapidly becoming conscious of a vivid and energetic national life, and whatever impaired the national*~~

~~*unity was regarded with impatience and resentment at a*~~

~~*_1MCrie, Annals of Presbytery, says that the Orders of Wands- worth were the Directory.*~~

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~~*time when the political condition of Europe was fraught with such danger to England herself. The Scottish Presbyterian had triumphed over a hated and alien church, and the bishops whom he overthrew were evil-living and oppressive men ; the English Presbyterian knew that his church was the symbol of freedom and that her bishops had been holy men martyred for the sake of that freedom. Finally, in England there had existed among the common people, as there had not in Scotland, an absence of inter- ference and an independence of private life which would naturally form the strongest obstacle to the introduction of the longed-for Presbyterian discipline. The difference between English and Scottish Presbyterianism was clear to James when in the millenary petition the reforming clergy disclaimed all idea of affecting parity in the church _ or of attacking the royal supremacy, and merely requested the redress of certain abuses in rites and ceremonies. Even with regard to the "ex officio" oath they asked only that it might be more sparingly used. The Puritans had evidently lost faith in themselves and had been unable to spread their views. 'Elizabeth had drained the life out of Puritanism by destroying the Armada and by her subse- quent policy in taking the leadership of the Protestant interest in Europe." It needed the abuses of the reign of James I. to restore it. The king was still further en- couraged by the servile support of the universities, which had quite lost their Puritan tone. At the Hampton Court Conference in January 1604, Dr Reynolds as spokesman of the Puritans desired permission for clerical assemblies every three weeks, " prophesyings" in rural deaneries, and that appeals might lie from the archdeacon's invitation to the diocesan synod, composed of the bishop and his The coarse and menacing rejection of these demands made clear the weakness of the reforming party within the church as opposed to the cordial alliance between the High Church and the crown. The breach was wider than at any time under Elizabeth. The struggle was becoming political. Divine right of Episcopacy, Arminianism, and prerogative in the crown were becoming ranged against Presbyterianism in church government, Calvinism in creed,*~~

~~*and moderate republicanism in politics. In 1604 James put out the Book of Canons, by which, Persecu- every clergyman was forced to subscribe, "willingly and ex tion of animo," (1) the spiritual and ecclesiastical supremacy of the r. oe crown, (2) the Book of Common Prayer, (3) the Thirty- the nine Articles of 1562, as being all and every one of them Stuarts. agreeable to the word of God. The Book was passed under the great seal, but was never ratified by parliament. As the result,a large number of ministers, variously reckoned at from 45 to 300, were deprived of their benefices. Henceforward the persecution was steady and grievous, and an exodus took place to Holland, where the exiles erected Presbyterian churches which in their turn reacted con- tinually upon opinion in England. By far the larger part of the Puritans, however, clung to the church. As late as 1607 they eagerly expressed their desire "above all earthly things" to continue their ministry "as that without which our whole life would be wearisome and bitter to us." And in 1605, in answer to the attacks from both the extreme parties, William Bradshaw published his Lnglish Puritanism. The system herein developed, so far from being Presbyterian, is Congregationalism under state con- trol. While each congregation is to be entirely inde- pendent of all other ecclesiastical courts, the election of its officers and other important matters are ostentatiously given to the civil magistrate. Not the slightest intrusion by ecclesiastical officers upon civil authority may be allowed ; and all church preferment is absolutely in the hands of the crown, which is supreme over the constitution and pro- ceedings of synods, and whose commands may not be*~~

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~~*actively resisted. The king himself is subject to his own particular church alone, and even though apostate or an evil liver he retains his full supremacy. It is clear that the denial, in the Scottish sense, of the state supremacy is not expressed by the English Puritan: that which galled him was the jurisdiction of other ecclesiastics.*~~

~~*From the synod of Dort in 1618 Arminianism gained ground in England in spite of the fact that Abbot, the primate, was head of the "doctrinal" (or old Calvinist) Puritans. As soon as Laud came into power the Govern- ment*~~

~~*attacked Presbyterianism wherever it was found. Guernsey was compelled to accept Episcopacy, as Jersey had been in 1605, and the ten foreign congregations in England were placed under the control of the English Church. The English congregations in Hamburg and the Netherlands were also ordered to relinquish their synods. The system of the church was aristocratic exclusiveness..*~~

~~*One effect of the Scottish outburst in 1638 and of the events which followed was of course largely to strengthen in especial the Presbyterian interest. The action of the church tended constantly to cut off waverers. Baxter, for in- stance, was led toexamine and finally to throw off Episcopacy by the "et cetera" oath in 1640. Nevertheless at the opening of the Civil Wars, if he is to be believed, Noncon- formity, and in especial Presbyterianism, was very weak. "Where I was bred before 1640, which was in divers places, I knew not one Presbyterian clergyman or layman. . . . About as many Nonconformists as counties were left, and those few stuck most at subscription and ceremonies, and but few of them studied or understood the Presby- terian or Independent disciplinary causes." Those who sat in the Westminster Assembly were almost all such as had conformed.*~~

~~*In 1640 Henderson, Baillie, Blair, and Gillespie came with the Scottish commission to London, the ministers there having written to the general assembly expressing their desire for the establishment of the Scottish system. They at once set themselves to turn the current of Puritan- ism into the Presbyterian channel, and to bring about a union on the Presbyterian basis. Their preaching attracted large crowds, and, by a common mistake, they judged of all England from the London ministry, which was largely Presbyterian and which in December 1641 had petitioned for a synod (a desire expressed also in the Grand Remon- strance) to include ministers from foreign parts. The parties, however, which were to join issue at the assembly were already clearly recognizing one another, for we hear that "the separatists are like to be of some help to hold up the bishops through their impertinence." For the views of moderate men on church reform the speeches of Sir E. Deering are important. It is clear that had the bishops been willing to become the allies of a reforming parliament Presbyterianism would not have been seriously discussed.*~~

~~*In September, 1642 the Long Parliament abolished Episcopacy, the abolition to date from the 5th November 1643; the question what form of Puritanism should succeed it was that for which the Westminster Assembly was sum- moned by parliament on 12th June 1643. The interven- ing months were marked by a great increase of sects, of whom all were by nature opposed to the iron domination of Presbyterianism, which in its turn found support in the English ministers of Dutch congregations. It is important at the outset to notice that the assembly was born in Erastianism, the spirit which, from the whole course of English history for several centuries, may be regarded as national. It was a mere council of advice to the parlia- ment of England, a creature of the parliament alone. Its members, two from each county, though some counties had but one, were chosen by parliament, and 'nearer agreement with the Church of Scotland" is one of the*~~

~~*chief points in the ordinance. In 1643 also the Long Parliament, needing Scottish support, and willing to bid high, formed the Solemn League and Covenant. In this the English, struggling for civil liberty, cared only for a political league; moreover, "they were," says Baillie, "more nor we could consent to, for keeping of a doore open in England to Independencie. Against this we were peremptorie." To the Scots "its chief aim was the pro- pagation of our church discipline to England and Ireland." The title was a compromise, utterly distasteful to the Scots, who refused to call it anything but the "Covenant."*~~

~~*The number summoned to the assembly was 151, 10 being lords, 20 members of the House of Commons, 121 ministers. About one-half attended regularly. Besides the Episcopalian clergy, who did not attend, there were four parties—(1) moderate Reformers of Presbyterian tem- per, (2) Presbyterians of Scottish views, (3) Erastians, and (4) Independents. At the request of the parliament six Scottish commissioners, without a vote, of whom five (the sixth was Maitland, afterwards the celebrated duke of Lauderdale) were. informed with the intensest spirit of Scottish Presbyterianism, attended the assembly. To them their mission was a holy*~~

~~*one, being no less than "to estab- lish a new platform of worship and discipline for this people for all time to come." That this was to be Presbyterian was the one thought that possessed their minds,—at first with eager hope, changing to apprehension and then to disappointment so bitter that it broke the heart of Alex- ander Henderson and made Baillie bewail the distance of the Scotch army. They struggled with pathetic earnestness against influences whose strength they had not realized,— the hated sentiment of Erastianism and the still more hated sentiment of Independency. The first of these was chiefly in the background in parliament, where it did not express itself fully until late in the proceedings ; within the assem- bly it was consummately represented by Lightfoot, Cole- man, and Selden, who held that 'parliament is the church." The Independents, numbering only ten or eleven in all, their principal representative being Nye, were also men of great ability and clear views, who knew that they could depend on the support of the party led by Cromwell.*~~

~~*The assembly began in September by considering what to substitute for the Thirty-nine Articles. On 12th October, however, in deference to Scottish pressure, the parliament instructed them to take up at once the questions of church government and a liturgy. Church officers were first dis- cussed. The Independents disputed every inch of ground : "to the uttermost of their power they have studied pro- crastination of all things, finding that by tyme they have gained." The long discussion which they forced on the question of the identity of pastor and doctor (in which, holding the offices to be distinct, and that every congrega- tion ought to have both, they were opposed both by the Scots on the latter and by the Anglicans on the former ground) was but one example of their skill in obstruction. The grand battle, however, began on 22d November over the ruling eldership—the essence of the 'Scots' disci- pline,"—against which Independents and Erastians alike did their best. All were willing to admit elders "in a prudential way," i.e, as expedient, but "sundry of the ablest were flat against the institution of any such offices by divine right," and the Independents kept them "in a pitiful labyrinth these twelve days." In the end a com- promise was effected, grievous to the Scots, by which it was merely declared "agreeable to, and warranted by, the word of God, that some others besides the ministers of the word should join in the government of the church." An attempt further to*~~

~~define their office failed. By the end of the year the Scots became anxious: "as yet a presbyterie to this people is conceaved to be a strange~~

~~monster." Ina minor point they had experienced a rebuff. They had done, as true Presbyterians, all they could to induce the assembly to sit on Christmas Day, church fes- tivals being to them an abomination; but they only pre- vailed so far "that both houses [of Parliament] did profane that holy day, by sitting on it, to our joy and some of the assembly's shame." 'The observance of saints' days and holidays was not abolished until 8th June 1647.' On 9th January 1644 the pressing question of ordina- tion was brought forward. The committee reported that preaching presbyters should alone ordain. 'To this the Independents of course objected and kept the assembly in debate until 21st January. The House of Lords pressing for a settlement, it was next day proposed that "certain ministers of the city be desired to ordain ministers in the city and vicinity jure fraternitatis." On this and on the essential question, how far the consent of the congregation should be necessary, the Independents kept up the struggle until 19th April, when the latter point was determined in the non-intrusionist sense. The bitterness of the Scots against the Independents increased daily ; they were fairly puzzled at the want of enthusiasm for that which was the breath of their lives. 'This stupid and secure people, . . . this fainting and weak-hearted people," Baillie calls them, and adds, "the humour of this people is very various, and inclinable to singularities, to differ from all the world and from one another, and shortly from themselves." No people, he says, had so much need of a presbytery. The hatred was fully returned. An intrigue! was set on foot for a union between the Independents and the moderate royalists to keep out Scots and Presbyterianism on the basis of the restoration of Charles. So anxious did this render the Presbyterians that they offered to make a com- promise whereby to strengthen their cause in parliament ; and, probably at the suggestion of their chiefs there, the five leading Independents published (February 1644) their Apologetical Narrative, which traversed their whole contro- versy with the Presbyterians and was addressed, not to the assembly, but to the parliament. This manifesto, as well as the Antapologia and other answers from the Pres- byterians, is well analysed by Hetherington. From the moment of this publication there was~~

no longer any object in delaying the main battle. 'The Independents are resolute to give in their reasons to parliament against us, and that shall be the beginning of an open schism : lykelie we shall be forced to deal with them as open enemies." On 6th February it was proposed that "the Scripture holdeth forth that many particular congregations may be under one Presbyterian government." After six weeks' incessant debate, in which both Erastians and Independents used their utmost ability, and in which Nye ostentatiously and successfully appealed to the jealousy of the imperium wm umperio, they were forced to yield. In this discussion the English Presbyterians were less disposed to compronise than the Scottish, who were keenly anxious for the success of their mission. The ruling eldership was then voted, and 'on Fryday, after a week's debate, we carried, albeit hardlie (27 to 19), that no single congregation has the power of ordination." On 31st May Baillie adds, "our church sessions, to which the Independents gave all, and their opposite nothing at all, we have gotten settled with unanimity in the Scots' fashion." The Presbyterians were, however, by no means easy ; they felt their triumph to be yet but a barren one. "The chief point we wish were proven is the real authority, power, and jurisdiction of synods and classical presbyteries over any the members of i whole of a particular congregation ; also I wish that power of presbyteries classical to ordaine and excom-

1 For the first time investicated and h i i . stig rought to light by Prof : R. Gardiner (Camden M. iscellany, 1888). : i

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municate were cleared. Many beside the Independents are brought to give the rights of both these actions to the congregational presbyteries, much against our mind and practice." The great question, the power of parliament in ecclesiastical affairs, was yet unsettled; and here they looked anxiously at 'Selden and others, who will have no discipline at all in any church jure divino, but settled only on the free will and pleasure of the Parliament," and they had forebodings that "Erastus' way will triumph." Their fears were soon realized. On 15th November 1644

~~*the assembly reported to parliament all that had been done, Parlia- and the House at once debated the jus divinum question, mentary Glynn and Whitelocke spoke vehemently and at great ®tom*~~

~~*length, and then upon the question it was carried to lay aside the point of jus divinum, and the House gave them thanks for preventing a surprise. It was resolved, how- ever, that the Presbyterian government should be estab- lished, and that if upon trial it was not found acceptable it should be reversed or amended. ;*~~

~~*Cromwell, who had shortly before "expressed himself with contempt of the assembly of divines," terming them "'persecutors" and saying that "they persecuted honester men than themselves," and who had told Manchester that "in the way they [Scots] now carried themselves he could as soone draw his sword against them as against any in the king's army," came to the rescue of the Inde- pendents in the asseinbly by procuring on 13th September an order from the parliament to refer to a committee of both kingdoms the accommodation or toleration of the Independents. This committee, lasting until 15th October, was no doubt intended to gain time, for time was against the Scots, and it did nothing else. The Independents then, with written reasons against the propositions respecting church government, with objections on the question of excommunication, with their "model" and their remon- strances, managed to protract discussion until March 1646, and in the end to leave matters unsettled and without prospect of settlement. In January 1645 the abortive negotiations at Uxbridge took place, at which each party asserted the jus divinum. The conditions proposed to the king had been drawn up by Johnston of Warriston and approved by the Scottish parliament; they included the acceptance of the Covenant. In the compromise offered by the king he assented to the limitation of the bishops' power by a council of the lower clergy, and even by lay- men to be elected by this council, in each diocese,*~~

~~*In April (Self-Denying Ordinance) and again in October 1645 (the battle of Naseby having been fought in June) the parliament passed a vote which was gall and worm- wood to the Scots, for it provided a power of appeal from the national assembly to the parliament. It also insisted that there should be two ruling elders for each minister in a church meeting, and*~~

~~allowed censures to be passed only in cases which it enumerated. No way remained to stay the mischief, Baillie felt, except by "hastening up our army, well recruited and disciplined." On 20th February 1646 they resolved that a choice of elders should be made throughout the kingdom ; but on 14th March Baillie him- self bewails that "the House of Commons has gone on to vote (by a majority of one) a committee in every shire to cognosce on sundry ecclesiastical causes, which will spoil all our church government." The fact was that, the king? being now very weak, Scottish friendship was daily grow- ing of less importance. When the commissioners from the Scottish parliament urged the speedy erecting of presby- teries, the English expressed their dread of "granting an~~

- ~~At Newcastle in November 1646 the king offered to sanction the Presbyterian establishment, with all its forms and the order of public worship already adopted, for a period of three years, without preju- dice to his own personal liberty~~

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~~arbitrary and unlimited power to near 10,000 judicatories within this kingdom," and declared that, experience having shown that the parliament had preserved the Reformation and purity of religion, they had no reason "to part with this power out of the hand of the civil magistrate." On~~

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~~provincial or national assemblies," except royal chapels and peers' houses. In October 1648 Charles at Newport offered to accept Ussher's scheme,? and, in answer to an address from London, consented to a temporary alienation of church property for the maintenance of Presbyterian~~

~~ministers. In November, however, the army asserted it- Under self ; it afterwards purged the parliament when it found the~~

~~30th April 1646 the House proposed queries which practi-~~

~~*cally challenged: the jus divinum position from one end to d Common-*~~

~~*the other. The assembly at once set themselves to answer these captious questions ; but of questions and answers the parliament took care that for the present no more should be heard. When, however, on lst December 1646 the London ministers published their manifesto Jus divinum reguminis ecclestastict, the House of Commons called for the assembly's answers, which do not appear to have been forthcoming. Throughout the contest the Scottish com- missioners, especially Baillie, organized the opposition, im- mortalized in Milton's sonnet, of the London ministers against the parliament's action. The king, however, hav- ing fled in April to the Scots, parliament thought it need- ful to temporize. On 5th June, therefore, both Houses ratified the ordinance establishing presbyteries; on the 9th they ordered it at once to be put into execution; and— a still more significant step—they rescinded the clause for provincial committees which had given Baillie such vexa- tion. The order, however, remained a dead letter until 22d April 1647. Twelve presbyteries were then erected for London; Lancashire and Shropshire were organized, and Bolton was so vigorous in the cause as to gain the name of the Geneva of Lancashire ; but the system spread no farther in the ungenial soil and air of England. Even here the difference between Scottish and English Presby- terianism is shown by the fact that two-thirds of every classis or presbytery were necessarily laymen. The first meeting of the London synod was on 3d May 1647, and it met half-yearly until 1655. That of Lancashire met at Preston in February 1648. After all, however, it appeared that the votes of the Houses were permissive only ; for on 13th October 1647 the Lords voted to ask the king for his sanction to the proviso that "no person shall be liable to any question or penalty only for Non-Conformity to the said government or to the form of the divine services appointed in the ordinances," while such as would not con- form were to be allowed to meet for religious exercise in a fit place so long as the peace was not disturbed! The language of the Commons was almost equally indulgent, while on Ist November the "agitators" declared that "matters of religion and the ways of God's worship are not at all entrusted by us to any human power." Presby- terlanism was wellnigh as far from being established at the close of the assembly as in the days of Elizabeth. English Protestantism had been a protest, not against Roman Catholicism, but against papal supremacy; the country was as little disposed to accept Presbyterian*~~

~~*supremacy. The reader will gain some idea of the parti- cular forms of tyranny which England had declined in "The Harmonious Consent of the ministers of the pro- vince within the County Palatine of Lancaster, &c." (Hal- ley, Lancashire, its Nonconf., p. 467). In May 1648 the*~~

~~*that there was an accommodation between Charles an the Presbyterians, and killed the king. With the founda- tion of the Commonwealth the dream of Presbyterian supremacy passed away. The Presbyterians are hence- forth to be regarded as a political far more than as a religious body. They now formed the nucleus of that party which desired the restoration of monarchy on good conditions. Opposing the toleration granted to all forms of Protestantism by Cromwell, they became his most dangerous opponents by their sympathy with the Scots and their refusal to take the "engagement," as is illus- trated by the plot for which Love was executed. The parliament meanwhile secured them in their livings. As Cromwell said to the Scots, "The ministers in England are supported and have liberty to preach the Gospel, though not to rail at their superiors at discretion, nor under a pretended privilege of character to overtop the civil powers." In the Instrument of Government (1653) Cromwell expressly retained all the laws in their favour and appointed some of them on the list of triers. They had their classical presbyteries for ordination, but these, having no coercive power, gradually became merely meet- ings of ministers of all denominations. The position of Baxter and his followers is worthy of notice, and should be read in his own words (Orme's Bacter, vol. i. p. 92). Nominally a Presbyterian, he disliked the lay eldership ; he disliked their intolerance ; he disliked the subordinate position ascribed to the civil magistrate ; in his own terse language, "Till magistrates keep the sword themselves, and learn to deny it to every angry clergyman who would do his own work by it, . . . the church will never have unity and peace." On the question of the independence of congregations he was an Independent in sympathy and practice. His absorbing idea was union ; with Ussher, he says, he had agreed in half an hour; among rigidly de- fined parties it is not possible to find him a place; but in the light of that idea he appears perfectly consistent. John Owen was another man who illustrates the light and shade of English opinion. He opposed the London ministers, though he held a Presbyterian appointment. In 1644 he upheld Presbyterianism against Independency ; in 1646 he became formally connected with the*~~

~~*Independ- ents. The Presbyterian was above all, on the political side, a hater of the army and a parliamentarian, and therefore, especially after Richard Cromwell's resignation, a monarchist. Monarchy and parliaments were co-ordi- nated in the English mind. Baxter preaching before the Commons on 30th April 1660 said, 'Whether we should be loyal to our king is none of our differences. . . . For the concord now wished in matters of religion it is easy for moderate men to come to a fair agreement." To take*~~

~~*advantage of this feeling Charles IT. used all the resources Under of duplicity ; the deputation of divines was easily and Charles entirely tricked, and on his entry into London the Presby- ue terian ministers received him with acclamation. Until*~~

~~*parliament, now that army pressure was removed, passed the celebrated 'ordinance against blasphemy and heresy." If ordinances could have fought against the inherited instincts of centuries Presbyterian government would have*~~

~~*run riot. On 29th August it was again decreed that 'all parishes and places whatsoever within England and Wales shall be under the government of congregational, classical,*~~

~~*1 In December 1647 Charles, at Carisbrooke, again agreed with the commissioners from the Scottish Kirk to the conditions formerly offered at Newcastle, in consideration of their promise to take up arms for his cause. The establishment of Presbyterianism, the extirpation of sectaries, and covenant uniformity were demanded by the English.*~~

~~*the actual Restoration the ascendency of Presbyterianism,*~~

~~*2 Ussher's scheme suggested (a) three synods, namely, one of the clergy of the rural deanery, meeting once a month; one of the clergy of the whole diocese, meeting once or twice a year ; and representatives of the clergy of the province, meeting once in three years, the arch- bishop presiding ; (6) if parliament were sitting, the two provincial synods were to unite, and the whole government of the church was to be in their hands. There was no representative of the laity in the*~~

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~~subsequent to Monk's entry into London, had seemed com- plete. The couucil was almost exclusively Presbyterian ; Presbyterians commanded the garrison towns and the fleet, and had possession of the universities. The last acts of the Long Parliament had been to establish Presbyterianism as the religion of the state. It was therefore necessary. on the part of Charles and Clarendon to temporize. Pro- mises were made from Breda; hopes of comprehension and preferment were placed before the Presbyterian minis- ters; conferences were arranged between them and the leading Episcopal clergy. There is no sign, however, that the most ardent Presbyterian hoped for more than Ussher's model. They were sufficiently bound over by the Cove- nant, the oath of allegiance, the traditional connexion of parliament and monarchy, and, above all, by their jealousy of the Scots, to restore the king.~~

~~The solemn farce began. Ten ministers were made royal chaplains, and Charles II. expressed his intention of doing his best to heal the differences in religion. He wished to know their desires. They asked for a resident ministry, Sunday observance, Ussher's model, the revision of the Prayer Book, extemporary prayer, that kneeling at communion and the observance of saints' days might not be enforced, and that bowing at the name of Jesus, making the sign of the cross in baptism, and the use of the surplice might be abolished. Baxter also suggested that the suffragan bishop should be elected by the clergy of the rural deanery. The bishops replied in writing, refusing all concession, ex- cept, perhaps, as regarded the cross, bowing, and the surplice, and taunting their opponents with '" scruple-mongering." Charles now put out his declaration, which included a proviso that the presbyters' advice and assistance should be necessary to certain episcopal functions, and especially to church censures. This, and the Bill to turn it into a law, kept the Presbyterians in play ; by Clarendon's influ- ence the Bill was thrown out on the second reading, and the convention parliament was dissolved. The parliament which followed was Episcopahan. The church at once struck hard. The Corporation Act, 20th December 1661, destroyed Presbyterian influence in the large towns, the centres of its~~

~~*power; the Act of Uniformity, 19th May 1662, compelling "assent and consent" to everything in the Book of Common Prayer, destroyed it in the church. Under circumstances of open deceit and flippant cruelty 2000 ministers were, on St Bartholomew's Day, deprived of their offices. It is important to notice that the Papists and other Dissenting bodies opposed toleration to the Presbyterians ; they felt that the only chance of a general toleration was in the failure of the Presbyterians to obtain comprehension. ;*~~

~~*Between these two Acts the Savoy Conference had been held, beginning 25th March 1662; it met apparently to signalize the church's triumph. It was intended to fail, as the Hampton Court Conference had been intended to fail, and is of interest merely as being the last attempt at union by conference.*~~

~~*With regard to toleration Charles II. and James II. were Bourbons, and they wished to carry out the policy of their ancestor, Henry IV. of France. They hoped to use the grati- tude and dependence of the sects whereby to sustain them against the church. Cromwell had done the same ; tolera- tion and military despotism had been parallel ideas. Charles desired that the church should not tolerate, but that he should. Thus he hoped to have a despotism founded upon the support of the sects. The greater part of his reign presents a constant struggle of the church and parliament to frustrate his views. To gain the power of suspending the penal laws was the great object in the com- prehension scheme of 26th December 1662. In au instant church opposition began ; the primate and the parliament*~~

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~~*spoke with equal sternness, and the suggestion was dropped. As had happened in Scotland, the ejection of St Bartholo- mew's Day had led to conventicles ; the first Conventicle Act, 16th May 1664, was an expression of the hatred of the Anglican Church to Charles's scheme.*~~

~~*In 1665 the plague occurred; the pulpits of London were deserted by the Episcopal clergy, with a few brillant exceptions. The Presbyterians and Independents came forward to fill them. The jealousy of the church was*~~

~~*aroused, and at its demand, and in return for a supply for the Dutch War, Charles passed the Five Mile Act. The extent to which these successive acts of persecution affected the country varied greatly. In some parts the justices refused to convict, or were languid. Thus Seth Ward, in one of his reports to Sheldon from Exeter (in 1663), says, "Your Grace shall know that there are, in this county of Devon onely, . . . at least fourteen Justices of the peace who are accounted arrant Presbyterians." The bishop of Chester makes the same complaint in 1667.2, With the fall of Clarendon the idea of toleration at once revived. In February 1667 Charles recommended it to parliament and relaxed the penal laws. But the idea had taken possession of the English mind that what Charles wanted to tolerate was Popery; wherever Charles wrote "dissent " the English mind read "pope of Rome." Some questions drawn out by Sheldon against toleration may be seen in the Sheldon MSS., and are worth reading. It was this fear, and the belief that the integrity of the Church of England was the great safeguard against Popery, that had to answer for much of the persecution. By 176 votes against 70 parliament voted against comprehension, and by 144 against 78 for the continuance of the Con- venticle Act, while on 2d March 1670 a second Conventicle Act of special severity was forced from Charles.*~~

~~*On 15th March 1672 the king made another attempt by his famous Declaration of Indulgence, in which he boldly claimed the suspensory power. This caused great searchings of heart among the Dissenters, for they must either refuse the indulgence or uphold an unconstitutional proceeding. Ought they to accept anything short of comprehension? Their doubts were cut short by the withdrawal of the Indulgence only three months after its utterance, and the Test Act signalized the victory of the church. The church became more and more exclusive ; the parliament, drawing its life from the people, gradually changed its tone. In 1663 the Anglican Church wished to triumph over Dissent ; in 1673 Protestants wished only to secure themselves against Popery. The Commons there- fore passed a Bill for the ease of Dissenters, which was, however, dropped in the Lords.*~~

~~*No further change occurred in the legal status of the Presbyterians, Their party continually increased in in- fluence under Shaftesbury's guidance, and in 1680 the Commons agreed to a scheme of comprehension for all Dissenters who would subscribe the doctrinal Articles ; the surplice was to*~~

~~*be omitted except in cathedrals or royal chapels; and ceremonies were to be regarded as in- different. This attempt at union came to nothing, how- ever, through church opposition, as did a final attempt at toleration by Charles in 1684. Throughout his reign the church had held him in a never-relaxing grasp. The intervening years were a period of constant annoyance to the Presbyterians, who were discredited by the Rye*~~

~~*1 By this Act all who refused to declare that they "would not at any time endeavour any alteration in church or state" were made in- capable of teaching in schools, and prohibited from coming within 5 miles of any city, corporate town, or parliamentary borough, or within 5 miles of any parish, town, or place, where they had since the Act of Oblivion been parson, vicar, or lectnrer, or where they had preached*~~

~~*in any conventicle, on any pretence whatever. 2 Sheldon MSS., Bodleian Library,*~~

~~*Merged in Dis- sent gener- ally.*~~

~~*IRELAND. |*~~

~~*House Plot. Such were the relations of the Presbyterians to the church. Their relations to the Independents were the old ones of jealousy and hostility. They themselves always looked for a position in the establishment ; the principles of the Independents excluded the idea. Attempts at union occurred, but they were useless.*~~

~~*From this time the history of the Presbyterians is lost in that of Dissent generally. James refused to enforce the penal laws ; but they enforced themselves, and Baxter was one of the first to suffer. Monmouth's attempt only increased their sufferings. In 1687 their prospects bright- ened. James II., following his brother's policy, issued his Declaration for Liberty of Conscience, as he had already done in Scotland and Ireland. The motive, as Hallam says, was that already mentioned, "to enlist' under the standard of arbitrary power those who had been its most intrepid and steadiest adversaries." In the addresses of thanks sent up the leading Dissenters (except the Quakers) refused to join; indeed, at a general meeting of ministers a resolution was passed directly condemning the dispensing*~~

~~*power. The action of James, by which the work of the Cor- poration Act was in a great measure undone and the power in corporations once more thrown into Dissenting hands, was equally unsuccessful. Throughout his reign the king failed to comprehend that the Dissenters were, first of all, Protestants. William III.'s declaration from Torbay recom- mended comprehension, and in March 1689 he urged it upon parliament. A Bill was brought into the Lords for abrogating the oaths of allegiance and supremacy, and for abolishing the Test Act so far as Dissent was concerned. The High-Church party, however, was strong enough to secure its failure. Another Bill with the same intent, as well as attempts to relieve the Dissenters of kneeling at the sacrament and using the cross in baptism, and to ex- plain away "assent and consent," as required by the Act of Uniformity, was also jealously and successfully opposed. By the Act of Toleration, however, all the penal laws, ex- cept the Corporation and Test Acts and those against the deniers of the Trinity, were removed. But it did not abrogate the statutes of Elizabeth and James I., which exacted certain penalties on such as absented themselves from the parish church. Heresy, too, was still subject to the church courts. A last attempt was made, by an ecclesi- astical commission of thirty divines, to frame a scheme of comprehension. It was vehemently opposed in convoca- tion ; the High Churchmen withdrew from it; and it was never submitted to parliament. Thus ended the last of the fruitless attempts to comprehend Dissent within the estab- lishment. During William's reign the hatred of the church to the Presbyterians had been obliged to lie dormant. Anne's accession, however, led at once to an attempt on the part of the churchmen to revenge themselves by the intro- duction of the Occasional Conformity Bill for the toleration which they had heen compelled to practise. This, however, they were unable to carry through against the opposition, of which Burnet was the foremost champion.*~~

~~*Having secured toleration, the Dissenters began to think of their own internal condition. A coalition of Presby- terians and Independents was thought desirable. The mere mention of such a thing shows how profoundly the complexion of affairs had changed. Under the name of "United Brethren" about eighty ministers of London inet and drew up heads of an agreement, in nine articles, on church government and ecclesiastical discipline. Article 8 provided that the union should not discuss doctrine, and named as auxiliaries to Scripture the Articles, the Savoy Confession,*~~

~~*and the Westminster Catechism. Mutual con- cessions were now made. The Independents gave up the necessity of the consent of a church to the ordination of a minister, and only made it desirable ; and the office of*~~

~~*doctor, as distinct from pastor and ruling elder, was passed over. But the Presbyterians gave up far more, viz., the authoritative power of synods over individual churches. In other words, the Presbyterians gave up and the Inde- pendents retained each the kernel of their system. Excom- munication was emasculated. The prerogative of synods was reduced to occasional meetings and a reverential regard for their judgment. But this arrangenient only affected London and its neighbourhood. Moreover, while their views of church government were so profoundly modified in the Independent direction, a change equally noticeable took place in their doctrinal views. From the beginning of the 18th century the greater number of their congregations becanie Unitarian, while those which remained orthodox joined themselves to the Scottish Church. The fact that at a time when full toleration was enjoyed the Presbyterian principle ever grew weaker shows how little it had pene- trated into the English mind. During the present century a new establishment of Presbyterian congregations has taken place upon the Scottish models, and indeed at first as an offset of the Scottish Church itself. In May 1836, how- ever, the synod of the Presbyterian Church of England was established, in entire independence of, though in friendly union with, the Scottish Church, containing at the present time (1885) 10 presbyteries with 280 congregations.1*~~

~~*Treland.—Presbyterianism in Ireland dates from the plantation of Ulster, by which a large part of Ireland ceased to be Papist and was peopled afresh by Scotsmen and Englishmen. An independent Protestant church was settled in James I.'s reign, and at the convocation of 1615 the first confession of faith was drawn up by James Ussher, which implicitly admitted the validity of Presbyterian ordination and denied the distinction between bishop and presbyter. It was not, however, until 1626 that the begin- ning of the Presbyterian system was laid by HIugh Campbell, a Scot, who, having become converted, "invited some of his honest neighbours . . . to meet him*~~

~~*at his house on the last Friday of the month. . . . At last they grew so numerous, that the ministers thought fit that some of them should be still with them to prevent what hurt might follow." Within the Episcopal Church, and supported by its endowments, Blair, Livingstone, and others maintained a Scottish Pres- byterian communion. From 1625, however, to 1638 the history of Presbyterianism in Ireland is one of bare exist- ence, not of progress. The ministers, silenced by Went- worth, fled finally to Scotland, after an ineffectual attempt to reach New England, and there took a leading part in the great movement of 1638. In 1639 the "black oath," which forbade the making of any covenants, was forced by Wentworth upon the Ulster Scots. His absence in 1640 raised hopes which were destroyed by the Irish rebellion of 1641, whereby the Protestant interest was for the time ruined. The violence of the storm had, however, fallen upon the Episcopal Church, and her desolation made the rise of Presbyterianism more easy. A majority of the Ulster Protestants were Presbyterian, and in the great revival which now took place the ministers who accom- panied the Scottish regiments took a leading part. Sessions were formed in four regiments, and the first regular presby- tery was held at Carrickfergus on Friday 10th June 1642, attended by five ministers and by ruling elders from the four regimental sessions. This presbytery supplied ministers to as many congregations as possible, and for the remainder the ministers were sent from Scotland with full powers of ordination. Many of the Episcopal clergy also joined the*~~

~~*1 Chief References.—Neal, Ilist. of the Puritans ; Brook, Cart- wright ; Strype, Whitgift ; Hetherington, Hist. of Westminster As- sembly ; Mitchell, Hist. of Westminster Assembly; Orme, Baxter and Owen; Halley, Lancashire, its Nonconformity; Toulmin, Hist. of Dis- senters; Marsden, Puritans; Parl. Wist.; Philip Henry, Diary; and the various English histories.*~~

~~*Modern*~~

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~~*tend- encies.*~~

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~~Estab- lished in Ulster.~~

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~~winning side, and by the end of 1643 the Ulster church was fairly established. Ireland was included in the Solemn League and Covenant, though the oath was not taken until March 1644. So strong were the Presbyterians that their request that the whole army should be subjected to their discipline was at once granted; and, when a number of Episcopal ministers formed themselves into a presbytery of their own, but without lay eldership and subjection to higher courts, the jealous zeal of the Scots found means to break it up. Meanwhile they were in constant communication with Scotland, of whose system Ulster can best be regarded as a part. In 1645 they were~~

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~~Restoration, in which they heartily co-operated, assisting Sir C. Coote in the coup de main which secured Dublin for~~

~~the king. There were now in Ulster seventy ministers in.~~

~~fixed charges, with nearly eighty parishes or congregations, containing 100,000 persons. These ministers were in five presbyteries, holding monthly nieetings and annual visita- tions of all the churches within their bounds, and coming together in general synod four times a year. An entire conformity with the Scottish Church was maintained, and strict discipline was enforced by kirk sessions, presbyteries, and house-to-house visitations.~~

~~At the Restoration the determination of the Govern- History~~

~~ment to put down Presbyterianism was speedily felt in since the~~

~~strengthened by the Scots who fled from Montrose, and : Restor Ireland. In January 1661 the lords justices forbade all ,0~~

~~by the presence of the commissioners of the parliament,~~

~~*tion.*~~

~~*who ordered that the covenant should be tendered to all who had not yet taken it. The commissioners also gave the tithes of parishes to ministers who applied for them, and their sanction as a civil power to the presbyteries to censure and punish scandalous ministers. It should be noted that this assumption by the civil power was much scrupled by the ministers as savouring of Erastianism, and the commissioners had to explain away their action. The celebrated vote of the English House of Commons on 14th March 1646 was the first check ; the second was the crush- ing defeat of the Scottish troops at Benburb by O'Neill. Nevertheless by 1647 there were, besides the chaplains of Scottish regiments, nearly thirty ordained ministers with fixed charges in Ulster. When the affair of the "engage- ment" took place, both the Scottish parliament and the general assembly sent to secure the Irish vote. The pres- byteries obeyed the church, the regiments the parliament.*~~

~~*unlawful assemblies, under which head were placed meet- ings of presbyteries, as exercising ecclesiastical jurisdiction not warranted by the laws of the kingdom. In a discus- sion with Jeremy Taylor they upheld the jus divinum of Presbyterianism and refused to take the oath of supremacy without the qualification suggested by Ussher. At first their parishes were merely declared vacant and Episcopal clergy appointed to them; but shortly afterwards they were forbidden to preach, baptize, or publicly exhort. In Ulster alone sixty-one ministers were ejected ; only seven out of seventy conformed. Conventicles, of course, arose, conducted chiefly by young Covenanting ministers from Scotland, of whom the ablest, most indefatigable, and most obnoxious to the authorities was Michael Bruce.*~~

~~*The abortive attempt of Blood, in which he endeavoured to associate the Presbyterians, brought fresh trouble, and the Ulster ministers were with a few exceptions compelled*~~

~~*Inde- After the Scottish defeat at Preston the English parliament, | to leave the kingdom. Ormonde, indeed, refrained from pendency now entirely anti- Presbyterian, determined to attack the | harassing them; but it was not until 1665 that the un- supreme Scots in Ulster. In this they were so well served by Monk | molested return of the ministers enabled them to revive that by*~~

~~*the end of 1648 the Independents, as opposed both | their worship and discipline. Presbyteries without ruling to Prelatists and Presbyterians, were superior, and by the | elders were organized in private houses, parishes were regu- end of the year were supreme. Independency became the | larly visited, chapels were built, baptisms were performed, state church, and the Presbyterian clergy were excluded | help was sent to the brethren in Holland, and offenders from the garrison towns. In spite, however, of their | once more came under the active discipline of presbyteries downfallen condition, they absolutely refused to take the | and kirk sessions. A committee which met in place of the oath of the engagement, which bound men to be faithful | regular synod went so far as to insist that all irregular to the Commonwealth without a king or House of Lords, | baptisms should be regularly performed. The toleration whereupon the most important among them were arrested, | afforded them is remarkable when compared with that in while the rest fled to Scotland. During 1651 they were | England and Scotland. excluded from the pulpit and deprived of their tithes, and Hitherto, thanks to the wise Act of Bangor, the church in March they were formally banished by a council of war, | had had peace within her own borders. It was not until while the engagement oath was pressed on all classes. 1671-72 that this was broken by David Houston, who Presby- Upon Henry Cromwell's arrival, the Protector's object | showed an impatience of ecclesiastical restraint and opposed terianism being to reconcile all parties to his sovereignty, the penal- | the settled ministry. This led to the drawing up in*~~

~~*restored.*~~

~~*ties for refusing the engagement were remitted ; ministers were allowed to officiate without restraint; and the banished ministers returned. So rapidly did their number increase that by 1655 three bodies performing all the functions of regularly constituted presbyteries had been formed, acting under commission of the whole presbytery. Meanwhile, however, no settled maintenance was available, and it was with great difficulty that the council was induced to afford two years' salary. One illustration of the united state of this church and of its autonomy is to be found in its action regarding the schism in Scotland between Pro- testers and Resolutioners. Ata general meeting at Bangor it was determined, by the Act of Bangor, 1654, that,*~~

~~*"though some differed in opinion from the rest, yet there should be no mutual contestings about the differences in Scotland among themselves, nor any owning of them on either side In public preaching or prayer. But, whatever mention might indirectly be made of these divisions, it should be in order to healing them in Scotland." Under Henry Cromwell all sects pursued their course in peace, and the Presbyterians especially increased their strength until the*~~

~~*February 1672 of a series of regulations as to conducting the trials, ordination, and settling of ministers. Houston left Ireland in 1673, but the schism created by him lasted till 1840 in the Reformed Presbyterian Church of Ireland. In 1672 the Presbyterian Church received from Charles II. a sum of £600 from the secret service fund.*~~

~~*For several years the church prospered, not only in the north, but in the south and west as well. In 1679 the rising in Scotland, which ended in the battle of Bothwell Brigg, brought trouble on the Irish Presbyterians, in spite of their loyal addresses disowning it. It was not, how- ever, until 1682 that they again lost the privilege of public ministry and that oppression became so severe. They cor- dially concurred with the Episcopalians against James II., though they had benefited by his Declaration of Indulg- ence, and were the first to congratulate William III. on his arrival in England. During the war several of them took an active part in the siege of Londonderry ; the rest fled to Scotland. A list sent in by them to the general assembly shows that there were then in Ireland a hundred congre- gations, seventy-five with fixed ministers, and that there*~~

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~~*(1) Ministers were not elected by the congregation (not Church even by a minister and his consistoire), but by two or three officers.*~~

~~*FRANCE. |*~~

~~*were eighty ministers under five presbyteries. With the close of the war came the close of their troubles, as under*~~

~~*William they enjoyed complete toleration. So hopeful were they of regaining supremacy that they sent up a petition to the crown that, since the north of Ireland was almost entirely peopled by Scottish Presbyterians, Epis- copacy might be done away with in that part. In 1731 again a deputation of ministers and elders went to Dublin with the vain request that their church might receive legal recognition and be placed on an equal footing with the Episcopal Church. Irish Presbyterianism presents no feature of note until 1840, when the original synod of Ulster and all seceding Presbyterian churches united themselves in the "'General Assembly of the Presbyterian Church of Ireland." In 1881 there were 36 presbyteries with 552 congregations, containing 101,403 communi- cants, with 621 ministers. Their synods meet in Belfast. Entirely independent of other churches, they, like those in England, live in friendly union with the Scottish Church. Both English and Irish Churches are in sympathy with the Free Church on the questions which brought about the Disruption of 1843.1*~~

~~*France.—The extension of the Genevan system on the synodal side became necessary as soon as it was applied to a large community. Up to 1555 the organization of the 'French churches had been incomplete: there had been no settled clergy nor regular administration of the sacraments. In that year, however, at the suggestion of De la Ferriére, a church was formed at Paris on the Genevan plan, com- plete in all points, with La Riviére for pastor ; and in a few years the organization was set up in Meaux, Angers, Poitiers, Bourges, Nimes, Blois, Tours, and Orleans. By 1559, according to Théodore de Béze, there were in France 2150 organized churches; in 1562 Cardinal St Croix reckoned the Huguenots as being one-half of the population. These churches were isolated, and therefore weak. The step needed to repair their weakness was taken as it were by accident. Antoine Chandieu, minister at Paris, while at Poitiers in 1558, found there several ministers from the neighbourhood. It struck them that it would be serviceable to have a common confession of faith and system of government. Thereupon the consistoire of Paris summoned a synod, not, however, to attribute to this church any special pre-eminence or dignity. On 26th May 1559 the representatives of eleven churches met in the first national synod and laid down a confession of faith (drawn up by Chandieu) and a system of discipline. The confession, in forty articles, was purely Calvinistic. The emphasis with which the right and duty of the magistrate to interfere on*~~

~~*behalf of the truth are insisted upon is important. Foremost in the discipline, as in the confession, comes the fundamental statement of perfect equality : " Aucune église ne pourra prétendre primauté ni domination sur autre; ni pareillement les ministres d'une église les uns sur les autres; ni les anciens, ou diacres, les uns sur les autres." A breach of this law was sternly condemned by the synod of Orleans in 1562.*~~

~~*Next to the consistoire, which, as being well understood, is not mentioned, came the colloque (not finally settled until 1572), consisting of the minister and an elder from each church of the district. In 1637 a colloque was com- posed of representatives from about ten churches. This met twice a year at least and took cognizance of disputes, but had no initiative power. Each province contained in 1637 three or more colloques. Above the colloque was the pro- vincial synod, also containing a minister and an elder or deacon for each church in the province. This synod met once a year. Finally, there was the national synod, which met every year if possible.*~~

~~*T See Reid, /ist. of Presby. in Ireland ; Carte, Ormond.*~~

~~*ministers with their consistoires, by the provincial synod, or by the colloque. If the congregation objected, the con- sistoire was to inquire how far the objection was valid ; if the consistoire upheld the congregation, the provincial synod had the final right of decision (art. 7). In 1572, however, the synod of Nimes laid down the principle that no minister might be imposed upon an unwilling people. (2) In the first forming of a church the elders and deacons were elected by the people; but here the power of the con- gregation ceased. Future vacancies were filled up by the votes of those remaining. The eldership was not to be for life; but there was always a tendency to make it so. In 1565 the synod of Paris warned the churches not to change without urgent cause, so too in 1572 at Nimes. In 1596, however, it was decided that they were to be changed when- ever expedient. (3) The office of deacon was of great im- portance; besides having the charge of the poor and sick, he might catechize and, if the minister were ill, offer prayer and read a written sermon. He was a member of the consistoire, but apparently without the right to vote. In 1572 his dignity was increased, and (compare "readers" in Scotland) he was regarded as preparing for the ministry. As regards the consistoire,—if a parish was without one, it must be*~~

~~created ; if a great lord had a congregation in his own family, one must be formed from it. In 1565 the power of excommunication was given to it, and it might depose elders and deacons, with appeal to the provincial synod. Its right to manage the affairs of its own church was strongly asserted in 1563, 1565, and 1571 at the synods of Lyons, Paris, and La Rochelle. One of the ministers was president, but only as primus inter pares. Over all marriage and baptismal questions it had jurisdiction so long as it avoided interference with the civil Government by dissolving marriages. The attention paid to marriage by Presbyterianism in all countries is worthy of notice. The ruling idea is the intense sanctity of the tie. Only in case of adultery might it be broken in France. A contract of marriage was declared indissoluble by the synod of Lyons (art. 44) in 1563, though the woman averred that she had been forced into it and that the man had a loathsome dis- ease. Still more remarkable examples might be quoted.? The office of elder was far more limited than in Geneva ; his supervision over morals was, for example, confined to reporting scandals to the consistory ; but in 1572 this was greatly extended. The remarkable feature of the French system is its aristocratical nature: the consistory, by the method of co-optation, was a purely aristocratic council, and the greatest pains were taken by the various synods to crush all attempts towards giving power to the congre- gations (¢.g., the condemnation of Jean Morelli, 1562-72, and the synods of Verteuil in 1567 and La Rochelle in L5G).~~

~~In the national synods, also, the aristocratic formation Synods.~~

~~soon asserted itself. Up to 1565 every church sent a minister with one or two elders or deacons. On questions of discipline elders or deacons might vote, on doctrinal questions only as many laymen as ministers. In 1565, however, to avoid overcrowding, the national synod of Paris determined that for the future only one or two ministers and one or two elders, chosen by each provincial synod, should be admitted. Thus the national synod, which had hitherto represented single churches, now repre- sented only the provincial synods, which of course gained immensely in importance.~~

~~The church disclaimed any encroachments upon the civil~~

~~2 For the method of constituting a consistory, for its supervision of private life and public morals, see Borrel, Histoire de VEglise de Nimes, pp. 61, 96,~~

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~~cism.~~

~~possible ; extermination for one of the conflicting faiths, or their concurrent existence, were the alternatives. The edict of January 1562 marked the conditions on which the latter was adopted. One remarkable provision was that ministers should swear before the civil magistrate to preach according to the word of God and the Nicene creed. By March war had begun ; the peace of Amboise in March the next year gave the Protestants some privileges, which, however, were afterwards much restricted, especially in the matter of synods, in August 1564; and the armed truce lasted until 1567. During these years the churches con- solidated themselves, At Nimes, for example, the Genevan~~

~~694 PRESBYTERIANISM [FRANCE, Rela- authority (compare the national synods of Lyons, Figeac, discipline was ag gS in 7 — The ey of tions to La Rochelle, Montauban, 1563, 1579, 1581, 1594). Butin the consistory to rae ri 7 e civil domain was shown the state. 17 Borrel's work, especially valuable as showing what went in many ways, while ae close y paerand naa of the~~

~~on in a single church, we find that so early as 1561 Pres- French system appeared from the fact that at each annual~~

~~byterianism was following its natural bent. "A mesure election the outgoing members formed a body called the que son pouvoir grandit, il impiéta sur le domaine du | "old consistory, which was ie with the new consistory gouvernement civil, et crut pouvoir prendre des mesures | for election of ministers and all ordinary affairs. Its pour la défense . . . pour ordonner, qui plus est, les levers ministers were of two classes—the one ordinary and per- dargent. . . . En un mot, la police, la garde de la ville, petual, the other temporary, such as the professors at the Vinspection de la conduite des habitants, . . . devinrent | theological college. 4 graduellement Vobjet de ses déliberations et de ses régle- The wars of 1567 displayed the value of the facility ments." And a stern stand was made against the supre- | for union, which was one of the most important features macy of the state. In 1571 the minister of Bordeaux re- | of the Presbyterian polity. During three years of~~

~~horrors ported to the synod of La Rochelle "qu'un médecin soutient | meetings both of consistories and of provincial synods were que le magistrat est le chef de Péglise et que ce que les | held. In April 1571, at the peace of St Germain en Laye, ministres entreprennent n'est que tirannie." The synod | the seventh national synod at La Rochelle reaffirmed the rejected "Verreur du dit médecin et de tous autres qui | confession of faith. In May 1572 a very important synod veulent abolir la discipline de Véglise en la confondant avec | was held at Nimes, in which the whole church system was le gouvernement civil." The language of the synods will | carefully revised and developed In many important respects, be found to vary as their political prospects vary. some of which have been mentioned. The rigidity of the Progress The cause of the astonishing progress of Protestantism | Calvinistic faith was illustrated by the sentence of excom- of Pro- and the extent to which it was but one phase of a general | munication against ministers or elders who caused any testant- movement for reform may be seen in the proceedings of | dispute touching doctrine, ceremonies, or discipline, and the anal the states-general at Orleans in December 1560, where, | Puritan temper by the prohibition "assister aux spectacles both in the noblesse and in the tiers-état, loud complaints | profanes, comme aux danses de théAtre, aux comédies," were uttered against the clergy (Félice, p. 117), and free- | &c. The church senate, the difference of which from the dom of worship was demanded. Only afew months after- | consistory it is difficult to trace, was now merged in it, and wards a proposal was made by a magistrate of Autun to | care was taken to get rid of wandering and uncertificated sell all the church lands, to retain a fourth of the sum for | ministers by drawing up a "réle des vagabonds."~~

~~the support of the priests, and with the rest to pay off By the end of 1573 the positions of the Catholics and of~~

~~the crown debts and encourage agriculture and commerce. | the 'religion prétendue réformée," as it was henceforward~~

~~The disbelief in the possibility of two widely varying | officially known, had greatly altered. Against the Italian~~

~~religions living side by side is shown in the proposals of | and Spanish influences, as represented by Catherine and~~

~~*ail the speakers for a national council to settle vari- | the Guises, there had after St Bartholomew's Day arisen ances. "Otons ces noms diaboliques," said De l'Hépital, | a patriot Catholic party ; while the Presbyterians had*~~

~~*"ces noms de partis, factions, et séditions—Luthériens, | become sharply divided into two bodies,—one the Consis-*~~

~~*Huguenots, Papistes—ne changeons pas le nom de Chrétien." | toriaux (the Covenanters of France), careful only for the*~~

~~*Great forces were contending for Protestantism ; it had | purity and free exercise of their religion, and the other the*~~

~~*the goodwill of three-fourths of the nobles and of the bour- | Aristocracy (as in Scotland), who, having become Presby- Political*~~

~~*geoisie in the principal towns. But against it were ranged | terians for political purposes, were now fearful of seeing Presby- the strength of tradition and of habit ; the craft of Cathe- | themselves excluded from political life, and were therefore trian*~~

~~*rine de' Medici, to whom all religions were equally matters | anxious for union and compromise. This party formed a*~~

~~*of policy ; the ambition of the Guises, backed by Spain ; | league with the Catholic patriots, and, as the " tiers-parti,"*~~

~~*the interests of the clergy, backed by the pope; and the | was so threatening that Henry III., to sever the alliance,*~~

~~*Paris mob. And there was another influence, perhaps | offered to the Calvinist Aristocracy the free exercise of*~~

~~*still more powerful. One of the greatest obstacles to the | their religion, and, what they were far more anxious*~~

~~*success of a new religious movement in a country of strong | about, full participation in public employments and the national feeling will be the existence of a strong national | re-establishment of their chiefs in their*~~

~~*former positions. church. The church of France was Gallican, anti-papal, | Fighting, however, again broke out in the beginning of practically and essentially national. In spite of manifold 1577, and was adverse to the Presbyterians, who never-*~~

~~*corruptions she had become the centre of much national | theless held a national synod at Sainte Foy in 1578,*~~

~~*attachment. As was the case in England, she represented | attended by a commissioner from Henry of Navarre. Very*~~

~~*the idea of nationality in a concrete form, and in this lies | remarkable is the strictness with which in a time of desola- to a great measure the explanation of the fact that the | tion the laws of the church were maintained. The luke-*~~

~~*Huguenots had so long to fight for the right to exist. warmness of the Presbyterian Aristocracy had made the Struggles By September 1561 the situation had become intoler- | ministers stern and unyielding, and they now gained great eek able. _ The colloquy of Poissy then met, as desired by De | influence. In this respect too the course of things was Catholi- YHopital. It made but one thing clear: union was im- very analogous to that in Scotland. In both countries*~~

~~*the ministers threw themselves upon the lower middle classes as distinct from and opposed to the aristocracy. In 1585 Henry ITI. came to terms with the Guise faction at Nemours on condition of exterminating Calvinism. This, however, was under the stress of circumstances ; his policy was to play off one party against the other, and he soon became lukewarm in persecution. Along with Henry of Navarre he was excommunicated by the pope ; he replied by defiance, murdered Guise, was compelled by the abhor- rence thus created to join the Protestants, marched with Navarre on Paris, and was there, in 1589, assassinated. To gain the Catholics and to retain the Presbyterians was*~~

~~FRANCE. |~~

~~Henry IV.'s task after Ivry. To secure the latter he put out an edict of toleration; to gain the former he was "converted" to Catholicism in 1593. The Presbyterian Aristocracy now took a most important step. In May 1594 they held a political meeting at Sainte Foy and formally established a political imperium im imperio of the most decided character. France was divided into ten sections for administrative purposes. There was a general council of four nobles, four bourgeois, two clergy,—the numbers being afterwards raised to twelve, twelve, and six. Under the general council were the provincial councils of five or seven members, of whom only one was necessarily a minister. The general council acted as an intermediary between the whole body of the Calvinists and the king. Owing doubtless to its operation Henry, whose leading idea was national unity, in April 1598 ("Van de salut") put forth the Edict of Nantes, which practically conceded entire liberty of conscience to the Presbyterians. The truce lasted during the rest of Henry's reign. Synods were re- gularly held, and the language of controversy became more bitter. At Gap, in 1603, the pope was declared to be Antichrist, and this declaration was in force until 1637, when the synod of Alengon was compelled to expunge it. At the synod of Gap it was reported that there were 760 organized churches, with 565 ministers. The ministry now received from the king a subsidy of 40,000 crowns, the distribution of which took up a large part of the time of subsequent synods. In spite of the confirmations of the Edict which followed Henry's death, the anxious Presby- terians held another political synod at Saumur in 1611, when they swore faith to the crown, "le souverain empire de Dieu demeurant toujours en son entier." In 1620 the political assembly met at La Rochelle, when they confis- cated all property belonging to Catholic churches, struck a great seal, levied arms and taxes, organized the church, and divided France into eight military districts. The aus- terity and intolerance displayed at the synods at this time were intense (see Buckle, vol. ii. p. 57, ed. 1867). The war, however, was disastrous to the Presbyterians, and at the peace of Montpellier the cessation of political meetings was insisted upon. The policy of Richelieu was that of Henry IV.,—protection as regarded religion, and a stead- fast refusal to permit any political "league" which tended against the concentration of French~~

~~*nationality. The result of his treatment of combined conciliation and repres-sion and of the attractions of the court on the nobility was that the Presbyterians, as a political party, ceased to exist. The number of churches, too, greatly diminished : in 1603 there were 760, in 1619 only 700. Mazarin pursued the same course ; and his assent in 1660 to the synod of Loudun was the last favour they received.*~~

~~*The action of the fourteen synods held since 1600 had been (as was also the case in Scotland) in the direction of increasing the power of the minister and diminishing that of the elders and congregations (Vitré in 1603, La Rochelle in 1607, and Gap in 1617), and to define the relations with the state. From 1623 (Charenton) a royal commissioner was always present, and year by year the*~~

~~*or who had studied in Geneva, Holland, or England, the hot-beds of republicanism. The Presbyterians showed a corresponding desire for union with other Protestants. In 1620 they accepted the confession of the synod of Dort ; in 1631, for the first time, they held out the hand of fellow- ship to the Lutherans. In 1614 an attempt had been already made to convene a general council of orthodox churches from all Protestant countries ; and an oath of union was taken among themselves, repeated at Charenton in 1623. With two parties alone they would accept no union, Roman Catholics and Independents.*~~

~~*Of the time of horrors which reached its climax in the revocation of the Edict of Nantes in 1685 we can give no account here. The provincial synods were held continu- ously and were of great importance in preserving the vitality and spirit of the church. Thus in 1661 the pro- vincial synod of Nimes checked defection by compelling every minister within its bounds to swear that he had not thought of joining "light to darkness and God to Belial."? It is reckoned that under the persecution, in addition to the killed, from four to five millions of French Protestants left the country. Armed resistance took place, but no settled struggle until 1702, when the war of the Camisards took place in Languedoc,—a war of uneducated peasants*~~

~~without arms or leaders of rank. Like the Cameronians, they believed that they received direct communications from God ; they had their prophets or "inspirés"; they lived in a state of religious ecstasy, and bore with patient defiance spoliation, the galleys, and death ; and, when opportunity offered, they exercised against their enemies reprisals as cruel as was the persecution itself. For three years every effort to crush them was made in vain; and they yielded at last only to the moderate measures of Villars.~~

~~To abolish the undisciplined rule of the "inspirés" and to Antoine~~

~~restore Presbyterianism, which had ceased since the revo- Court.~~

~~cation, was the work of Antoine Court, the most notable figure produced by Protestant France. From 1715 to 1730, without a day's rest, this man accomplished a work truly marvellous. He was but eighteen years old when he began it. In momentary peril of death for fifteen years, he restored in the Vivarais and the Cevennes the Presby- terian constitution in all its integrity. On 21st August 1715 he assembled his first colloque, consisting of the preachers of the Cevennes and several laymen. In 1718 he held a synod of forty-five members, and again in 1723, when the old discipline was restored. In 1726 he held another synod attended by three ministers and forty-four elders, and again in the next year; and in 1744, in a re- mote spot of Bas Languedoc, the first national synod since 1660 brought together representatives from every province formerly Protestant. This alarmed the Government, and persecution again began. From 1760, however, thanks to the gradual spread of the sceptical spirit and to the teach- ings of Voltaire, more tolerant views prevailed ; synods were held without disturbance; and in 1787 Turgot, whose great object was to separate the civil and the spiritual domains, put out the Edict of Tolerance. In 1789 all citizens were made equal before the law, and the position~~

~~of Presbyterianism improved up to 1791. Napoleon in Napo- 1801 and 1802 took into his own hands the independence ¢on's of both Catholic and Protestant churches. ome~~

~~increasing subserviency of their language shows that the national synods were coming more and more under royal~~

~~*control. The consistory ,;*~~

~~*Period of national synods with the provinces.*~~

~~*= for the choice of ministers were prohibited, and then nN.*~~

~~*In 1637 (Alengon) the royal commissioner, who openly taunted them with their powerlessness, forbade not only the provincial synods but even intercourse of the In 1657 meetings*~~

~~*the colloques were suppressed. At Loudun in 1659 the national synod was forbidden and the provincial synods were restored. The greatest jealousy, too, was shown by the crown in respect of communication with other countries. No one might be a minister who was not born in France,*~~

~~*was abolished and replaced by an ‘“église consistoriale,” uniting several churches. Representation on the “premier consistoire ” of this “église” was now determined by taxa- tion instead of by choice of the people. Five “ églises consistoriales” formed a “ synode d’arrondissement,” which superseded the provincial synod. It consisted of ten mem- bers only, and was absolutely under state control. The*~~

~~*1 See Borrel for this and for a most interesting account of the action of the consistory of Nimes in 1663.*~~

~~*tion.*~~

~~*Consti- tution of*~~

~~*1852.*~~

~~*Position in the Nether- lands.*~~

~~*696*~~

~~*national synod was abolished. “ C’était une liberté interne et murée dans les temples. II y avait rigoureuse défense de faire aucun bruit, aucun mouvement dans les choses de réligion, ni journaux, ni associations, ni controverse, ml prosélytisme ; et si quelqu’ idée ou action réligieuse osait*~~

~~*franchir l'enceinte ow elle était emprisonnée, la main de fer de Napoléon l'y refoulait immédiatement." Its life was taken from the church, and in 1807 it numbered less than 200 ministers. ;*~~

~~*In 1848, however, all but three of the ninety-two "'églises consistoriales" sent a deputy to an assembly at Paris. From this assembly, when it refused to discuss points of doctrine, a secession took place, and the secessionists with the independent churches which had sprung up formed the "Union des églises évangéliques de France." This society held a synod in 1849 and there laid down a con- fession of faith and an ecclesiastical discipline. Mean- while the established church set itself to the work of reconstitution on the basis of universal suffrage (with re- strictions), the particular church being an essential element, with provincial synods, and a general synod meeting at regular intervals ; but no result was arrived at. In 1852 a change took place in its constitution. The "églises con- sistoriales" were abolished, and in each parish a presby- terial council was erected, the pastor being president, with from four to seven elders chosen by the people. In the large towns there were consistoires composed of all the pastors and of delegates from the various parishes. Half the elders in each assembly were subject to re-election every three years. Above all was the central provincial council, consisting of the two senior pastors and fifteen members nominated by the state in the first instance. All property qualification for eldership was abolished. In 1858 there were 617 pastors, and the subvention from the state amounted to 1,375,936 francs. The " Union des églises évangéliques" numbered twenty-seven churches.!*~~

~~*The Netherlands—From the geographical position of the Netherlands Presbyterianism took there from the be- ginning its tone from France. In 1562 the Confessio Bel- gica was revived, according to the French Confession of 1559, and publicly acknowledged ; and in 1563 the church system was similarly arranged. In 1572, however, in the northern provinces alone, which had been chiefly Lutheran or Melanchthonian, serious schisms took place. The in- vasion of Alva of course destroyed all Protestant order, and it was not until the Union of Utrecht in 1579 that the exiled Presbyterians returned. Previous to this, how- ever, in 1574, the first provincial synod of Holland and Zealand had been held ; but William of Orange would not allow any action to be taken independently of the state.*~~

~~*The Reformed churches had established themselves in independence of the state when that state was Catholic ; when the Government became Protestant the church had protection, and at the same time became dependent: it was a state church. The independence of the church was not consistent with that of the communes and provinces, each of which by the Union of Utrecht had the regulation of its own religion. Thus the history of the church is one of constant conflict. Both church and state were divided, the former into Zwinglian and Calvinist, the latter into those who desired and those who refused a non-Erastian church. In most cases it was insisted on as necessary that church discipline should remain with the local authority. Ing W57 6 William, with the support of Holland, Zealand, and their allies, put forth forty articles, by which doctors,*~~

~~*1 For Presbyterianism in France, see De Félice, IWist. des Protestants de France ; Aymon, Synodes Nationaux des Eglises Réformées de France ; Borrel, Itist. de (Eglise Réformée de Nimes; Beze, Hist. Ecclésiastique; Weber, Geschichtliche Darstellung, &c. ; Coquerel,*~~

~~*Hist. des Eglises du Désert ; Vincent, Vue sur le Protestantisme en France ; Buckle, History.*~~

~~*PRESBYTERGANGSEA*~~

~~*[NETHIERLANDS,*~~

~~*elders, and deacons were recognized and church discipline given to the elders, with appeal to the magistrate, but which placed the church in absolute dependence on the state. These articles, however, never came into operation; and the decisions of the synod of Dort in 1578, which made the church independent, were equally fruitless. In 1581 the Middelburg synod divided the church, created pro- vincial synods and presbyteries, but could not shake off the civil power in connexion with the choice of church officers. Thus, although Presbyterian congregations remained the rule, the civil Government retained overwhelming influence. As the Leyden magistrates said in 1581, "If we accept everything determined upon in the synods, we shall end by being vassals of the synod. We will not open to church- men a door for a new mastership over Government and subjects, wife and child."*~~

~~*The contest between Zwinglian and Calvinist came to a decision at the synod of Dort, 1618. Arminius, on the one hand, inveighed against church autonomy as a new pope- dom; Gomarus defended it. The oligarchy supported Arminius; the democratic party, headed by the stadt- holders, held with the Calvinists. The question at first was whether synods should be provincial or general. The independent provinces were naturally for provincial synods, as Arminius wished, the states-general fora national synod. The synod of Dort, wherein were represented all Reformed churches, decided against Arminius. When that was settled, the church system, as laid down in 1586 at the synod of The Hague (called by the earl of Leicester), and including general synods, was confirmed. This, however, was accepted only in Utrecht and Guelders; and from 1619 to 1795 there were seven church republics with more or less state inter- ference. The synodal form predominated, except in Zealand, and the Presbyterian form also, except in a few congregations which did not choose elders. As a rule elders held office for only two years. The "kerke raad," or kirk session, met weekly, the magistrate being a member ex officio. The colloque consisted of one minister and one elder from each congregation. At the annual provincial synod, held by consent of the states, two ministers and one elder attended from each colloque. Every congregation was annually visited by ministers appointed by the pro- vincial synod. The old controversy broke out again in the middle of the 17th century, Johann Cocceius and Gisbert Voet being the Arminian and Calvinist cham- pious. The state made good its power in every case.*~~

~~*In 1795, of course, everything was upset; and it was not until after the restoration of the Netherland states that a new organization in 1816 was formed. Its main features were that it was strictly synodal, with a national synod, and Presbyterian. But the minister was greatly superior to the elder, and the state had wide powers, especi- ally in the nomination of higher officers. In 1827 a new organ was brought into play, viz., a permanent commission of the general synod, consisting of seven members, chosen by the king from twice their number nominated by the synod, meeting twice a year. This was revived in 1847. In 1851 the system now in force was formed. In every congregation sufficiently large there is a church council of all the officers. In large congregations with three or more ministers the ministers and elders alone form one college, the deacons another. The congregation*~~

~~chooses all officers. There are 43 presbyteries in 10 provincial districts; in 1850 there were 1273 congregations with 1508 ministers and over 1,500,000 people. The special provincial synod (1619-1795) has ceased. In its place is the provincial authority of as many ministers as presbyteries in the pro- vince ; it chooses its own president. It meets three times a year, and has general superintendence, with power of examining, placing, and deposing ministers. A general~~

~~Rhine pro- vinces,~~

~~Poland,~~

~~PALATINATE, ETC. |~~

~~synod meets at The Hague every July; the ten provincial authorities send each one minister and three elders, chosen by each of those authorities in turn, and a deputy from each of the three theological colleges of Leyden, Utrecht, and Groningen. The commissions for the Walloon, East and West Indian, and Limburg churches also send each a representative. The permanent commission is chosen by the synod itself, and altogether the church is independent of the state.~~

~~Rhine Provinces.—In the Palatinate the spirit of the Presbyterian organization, though not the thing itself, had been active since the middle of the 16th century; and in 1568 Wither of Heidelberg, an Englishman, urged the establishment of the eldership. In 1570 Frederick III. established a church college in every congregation. Elders were for life. Besides the college or kirk session there was the church council in Heidelberg, consisting of three theologians and three laymen; one of the latter presided. These were all nominated by the Government. Between the church council and the various colleges were superintend- ents or inspectors. Finally there were synods, provincial and general, of ministers only. This arrangenient was a compromise between the Lutheran and Presbyterian systems. From 1576 to 1583, after Frederick's death, the system was again Lutheran, but was made Presbyterian once more by John Casimir, tutor to Frederick IV., and so it remained. The churches of the lower Rhine were formed at first entirely by foreign refugees. Walloons fled from Charles V.'s persecution in 1545, and again in 1553- 54. In 1564 the Heidelberg catechism was~~

introduced. Thousands of Protestants were driven hither by Alva in 1567-68, and in the latter year a synod was held at Wesel of forty-six preachers and elders from twenty Netherland churches. The Presbyterian system was now fully intro- duced. For the election of ministers and elders, until synods could be regularly established, twice as many were to be nominated as were wanted, and then the congregation was to choose by individtal voting. A ‘“‘collegium pro- phetarum ” was to be formed of all the officers and learned laymen for Bible exposition every week or fortnight. In 1571 the synod of Emden determined that half the elders and deacons were to give up office every year, but might be re-elected. Readers, on the Scottish plan, were appointed, and entire parity among all the church officers and the congregation insisted on. The synods are as in France, the members of the general synod being chosen from the provincial synod. The system was in fact partly French and partly Scottish. The congregations were in three divisions—(1) Germany and East Friedland, (2) Netherlands, (3) England. In 1586 a synod was held at Nassau, and the system was partially introduced in West- phalia in 1588 ; in general, however, in Lutheran countries Presbyterianism made but little way against the consistories. Its prevalence in Germany generally was too partial and obscure, and it partook too much of the consistorial char- acter, to require notice here.

Poland, &c.—The Polish nobility and all of Slav blood accepted the “Reformed” doctrine and discipline, the aristocratic republican system suiting the national polity. The German elenient, however, retained Lutheran syin- pathies. The first synod was held at Pinkzow in 1550; from 1556 John Lasky worked in the interests of Calvinism ; in 1570 all parties were united at the synod of Sandomir. By this a common confession was agreed to, but church government was left to be settled by each church. Another general synod was held at Cracow in 1573. In spite of the earnest endeavours of the church leaders, it was found impossible to introduce stringent discipline in the congre- gations ; on the synodal side, however, the system flour- ished, and the nobles were able to convert the synods into

~~*new aristocratic assemblies. It must be remembered that the Reformation was confined to the nobility, the serfs being neglected. Many of the nobles relapsed to Roman- ism; this and internal divisions weakened the Reformed cause. In 1634 a synod was held to meet the taunt of the Catholics that no two churches had the same system. From 1655, when the Swedes were in Poland, the influ- ence of synods practically ceased.*~~

~~*The Bohemian Brethren were known of in 1450; in Bohe- by the mian whole congregation, had an important place; in the 16th a:*~~

~~*their statutes (1457) discipline, entirely managed*~~

~~*century it was specialized, elders being chosen to act with the minister. After the Schmalkald War in 1544 the Brethren were driven to Prussia and Poland. During the 16th century they developed rapidly ; their system, sanc- tioned in 1609, had many peculiarities; it placed, for instance, the supervision of the women with female eiders. In 1630 they printed at Lissa their Ratio discipline ordin- asque. The Thirty Years' War destroyed them, except in Great Poland, where they were led by Comenius. Just as different civil governments—e.g., monarchical, aristocratic, democratic—suited different peoples, he said, so it was with religious governments, e.g., Episcopal, Consistorial, Presbyterian. Let all three be welded into one, and we shall have unity from the first, association from the second, propagation from the third. Accordingly their system was a combined one of Episcopacy, consistories, and synods.*~~

~~*In Hungary up to 1550 the Lutherans were supreme ; Hungary.*~~

~~*but in 1557 the Calvinists had the majority, and their system was accepted in its entirety in 1558. The race division here also decided the ecclesiastical system. All of German blood in Hungary and Transylvania remained true to Lutheranism, whilst the Magyars and Slavs ac- cepted Calvinism. Continual contests with both Unitarians and Jesuits prevented the free development of Presbyter- ianism ; hence it was confined to the synodal side, and the synods, in which the nobles had special rights, were entirely clerical.*~~

~~*In 1689 the Waldenses introduced Presbyterianism of a Wal- The consistory was the civil authority as denses.*~~

~~peculiar type. well as the church authority. For choice of elders each urban district chose three laymen, from whom the consis- tory chose the district elders for supervision of manners and of the poor. The consistory itself was subject to a church council, consisting of three spiritual and two lay members, which had supreme authority, especially when no synod was sitting. Synods were called by consent of the congregations and of the king. Two laymen were present for each ecclesiastic. (0. A.)~~

~~UNITED STATES.~~

~~Presbyterianism in the United States is a reproduction and further development of Presbyterianism in Europe. Jt differs from the latter in that the various types produced in Great Britain and on the continent of Europe combined to produce a new American type.~~

~~1. Zhe Colonial Period.—The earliest Presbyterian Colonial emigration consisted of French Huguenots under the period.~~

~~auspices of Admiral Coligny, led by Ribault in 1562 to the Carolinas and in 1565 to Florida. But the former enterprise was soon abandoned, and the colonists of the latter were massacred by the Spaniards. The Huguenots also settled in Nova Scotia in 1604 under De Monts. The later Huguenot colonists mingled with the Dutcli in New York and with the British Presbyterians and Episcopalians in New England and the Carolinas. A Huguenot church was formed on Staten Island, New York, in 1665; in New York city in 1683 ; at Charleston, South Carolina, in 1686; at Boston, Massachusetts, in 1687 ; at New Rochelle, New York, in 1688; and at other places. XIX. — 88~~

~~Presby- tery of Phila- delphia.~~

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~~The Charleston church alone maintains its independence at present. :~~

~~English Puritanism emigrated under the auspices of the Virginia Company to the Bermudas in 1612. In 1617 a Presbyterian church, governed by ministers and four elders, was established by Lewis Hughes, and the liturgy~~

~~*of the isles of Guernsey and Jersey was used. From 1620 on- wards English Puritanism colonized New England. This was of the two types which developed from the discussions of the Westminster Assembly (1643-48) into Presbyterian- ism and Congregationalism. They co-operated in New England as they did in Old England in the county associa- tions. The Plymouth colony was more of the Congrega- tional type, the Massachusetts Bay colony more of the Presbyterian type. A mixed system was produced which has been happily called by Henry M. Dexter "a Congre- gationalized Presbyterianism or a Presbyterianized Congre- gationalism . . . which was essentially Genevan within the local congregation and essentially other outside of it." Presbyterianism was stronger in Connecticut than in Massa- chusetts. Thence it crossed the borders into the Dutch settlements on the Hudson and the Delaware, and mingled with other elements in Virginia, Maryland, and the Caro- linas. Nine of these Puritan Presbyterian churches were established on Long Island, New York, from 1641 to 1670, and three in Westchester county, New York, from 1677 to 1685. In New York city Francis Doughty in 1643 ministered to a congregation of Puritan Presbyterians, and was succeeded by Richard Denton in 1650. Francis Doughty also preached in Virginia and Maryland from 1650 to 1659, and was followed by Matthew Hill in 1667 and others subsequently. Francis Doughty was the father of British Presbyterianism in the middle colonies, but he left it in an unorganized condition.*~~

~~*Dutch Presbyterianisin was planted in New Amsterdam, New York, in 1628, when the first Reformed Dutch church was organized by Jonas Michaelius with two elders and fifty communicants. This had a strong Huguenot and Walloon representation. Services were held in the Dutch and the French languages, and subsequently in the English language also. The Dutch churches spread along the valleys of the Hudson, the Mohawk, the Raritan, and the Passaic, and also on the Delaware. They continued in subor- dination to the classis of Amsterdam, Holland, until 1747.*~~

~~*Irish Presbyterianism was carried to America by an un- known Irish niinister in 1668, by William Traill in 1683, and especially by Francis Makemie in the same year, an ordained missionary of the presbytery of Laggan, who was invited to minister to the Maryland and Virginia Presby- terians. He was a merchant and a man of executive ability, and was the*~~

~~*chief instrument in establishing the presbytery of Philadelphia, and interesting the Presby- terians of London, Dublin, and Glasgow in the feeble state of their church in America. In 1704 he obtained aid from the London ministers and returned to America with two ordained missionaries, John Hampton (Irish) and George Macnish (Scotch).*~~

~~*Meanwhile the New England ministers had sent several missionaries to the banks of the Delaware: Benjamin Woodbridge and Jedidiah Andrews went to Philadelphia in 1698-1700; John Wilson became pastor of a Presby- terlan church at Newcastle, Delaware, in 1698; Samuel Davis and Nathaniel Taylor supplied other churches in the vicinity. Seven of these ministers organized the presbytery of Philadelphia in 1706. It was a meeting of members for ministerial exercise "to consult the most proper measures for advancing religion and propagating Christianity." The presbytery only a ieerenigs to exercise oversight over the churches. The ministers con- stituting it were from many lands and of many types of*~~

~~*Presbyterianism, and could agree only in a loosely organ- ized body. During the existence of the original presbytery the chief sources of support were London, Glasgow, and Dublin in the United Kingdom, and Boston, Massachusetts, and Fairfield county, Connecticut, in New England. Its Presbyterianism was of the broad, tolerant type that we might expect from a happy union of English, Irish, Scottish, and Welsh Presbyterians, with a few Dutch, Germans, and French. In 1716 the presbytery divided itself into four "subordinate meetings, or presbyteries," after the Irish model, and increased its number by a large accession of Puritan churches and ministers from eastern New Jersey and New York.*~~

~~*The synod remained without a constitution and without subscription until 1729. It assumed the functions of Presbyterian government and discipline only gradually, as circumstances required. It developed naturally from its own inherent vitality, and adapted itself to the circum- stances of the New World without anxiety as to its con- formity to stereotyped models in the Old World. How- ever, two parties developed with the growth of the church. The*~~

~~*stricter section urged the adoption of the Westminster standards and conformity thereto ; the broader party were unwilling to sacrifice their liberty. The former followed the model of the Church of Scotland ; the liberal party sympathized with the London and Dublin Presbyterians. The result of the conflict was union under the Act of 1729, which adopted the Westminster symbols "'as being, in all the essential and necessary articles, good forms of sound words and systems of Christian doctrine." It allowed scruples as to "articles not essential and necessary in doctrine, worship, or government." The presbytery was to judge in the case and not the subscriber. 'This Adopt- ing Act (largely influenced by the Irish pacific articles of 1720) established the American Presbyterian Church on a broad generous basis ; but the happy union was brief. In 1730 the stricter party in the presbyteries of Newcastle and Donegal insisted on full subscription, and in 1736, in a minority synod, carried a deliverance interpreting the Adopting Act according to their own views. The liberal men paid no attention to it, except to put themselves on guard against the plotting of the other side. Friction was increased by a contest between Gilbert Tennent and his friends, who favoured Whitefield and his revival measures, and Robert Cross and his friends, who opposed them. The Tennents erected the Log College to educate candidates for the ministry ; and the synod passed an arbitrary Act, aimed at the Log College, that all students not educated in the colleges of New England or Great Britain should be examined by a committee of synod, thus depriving the presbyteries of the right of determining in the case. The presbytery of New Brunswick declined to yield, and the body became more and more divided in sentiment. The Cross party charged the Tennents with heresy and dis- order; the Tennents charged their opponents with un- godliness and tyranny. Passions were deeply stirred when the synod met in 1741. The moderate men remained away. The Cross party brought in a protestation to the effect that the Tennent party were no longer members of the synod ; and thus the synod suddenly broke in two. The New York presbytery declined at first to unite with either party, and endeavoured to bring about a union, but in vain. The Tennent party were found at length to be more reasonable, and the New York presbytery combined with them in establishing the synod of New York, which was called the New Side in contradistinction to the synod of Philadelphia, which was called the Old Side.*~~

~~During the separation the New Side established Nassau New~~

~~Hall at Elizabethtown in 1746, and the Log College of the ee 1de.~~

~~Tennents was merged into it. It was removed to Princeton~~

~~aq~~

~~UNITED STATES. |~~

~~in 1755, large funds being received from England, Ire- land, and Scotland in its aid. Thus the Presbyterians of~~

~~Great Britain showed their sympathy with the broad and~~

~~tolerant Presbyterians of the synod of New York ; and the~~

~~college at Princeton was based upon the pledges of Davies~~

~~and Tennent as to liberal subscription in terms of the original Adopting Act. The Old Side adopted the academy at New London, which had been organized by Francis Alison in 1741, as their own. Thus each side gained an important institution of learning. The division continued until 1758. During this period the synod of Philadelphia decreased from twenty-six ministers to twenty-two, whereas the synod of New York increased from twenty to seventy- two. The New Gide reaped all the fruits of the wonderful revival that spread over the colonies under the influence of Whitefield and his successors. The barriers to union were the different views as to subscription and discipline, and the arbitrary act of excision; but they were after a while happily removed, and the Adopting Act was re- established in its original breadth as the foundation of the reunited church. 'The reunion was signalized by the formation of the presbytery of Hanover in Virginia. The synod increased with great rapidity, by the reception of new ministers, new churches, and also entire presby- teries, until the outbreak of the Revolution and the close of the colonial period, when the synod numbered 11 pres- byteries and 132 ministers.~~

~~*The synod of New York and Philadelphia embraced only a portion of the Presbyterian ministers of the middle colo- nies. Inthe Carolinas Presbyterianism had an independent development. There was a considerable Scottish emigra- tion between 1684 and 1687. William Dunlop ministered to them until 1688, when he returned to become principal of the university of Glasgow. A mixed congregation of English Puritans and Scottish Presbyterians was organized at Charleston in 1690. _ In 1710 there were five churches, which combined to form the presbytery of James Island in 1722-23. This presbytery went through the same struggle with reference to subscription as the synod of Philadelphia, and the parties separated in 1731 into subscribers and non-subscribers.*~~

~~*In 1718 Irish Presbyterianism from Ulster established itself at Londonderry in New England. The church at Londonderry grew into a presbytery in 1726-29, including the Huguenot church-of Boston. A second presbytery was organized at Salem in 1745. The original presbytery became extinct owing to internal strife in 1765; but the presbytery of Salem grew into the synod of New England, 31st May 1775, composed of three presbyteries and sixteen ministers. Besides this synod the presbytery of the East- ward was organized at Boothbay, Maine, in 1771 and re- mained independent. A presbytery of the Puritan type was organized at Grafton, New Hampshire, and continued from 1776 to 1796 independent of other presbyteries.*~~

~~*The Scottish' Presbyterians from the established church combined with the American Presbyterian Church, but the separating churches of Scotland organized independent bodies. The Reformed Presbyterian Church ("Cove- nanters") sent Cuthbertson in 1751 (or 1752); he was joined by Lind and Dobbin from the Reformed presbytery of Ireland in 1774, and they organized an American Re- formed presbytery. 'The Anti-Burgher synod sent Alex- ander Gellatly and Andrew Arnot in 1752, and they or- ganized the Associate presbytery of Pennsylvania in 1754 ; they were joined by the Scotch Church in New York city in 1657, a split from the American Presbyterian Church ; they had grown to two presbyteries and thirteen ministers in 1776. The Burgher synod sent Telfair and Clark in 1764; the latter settled at Salem, New York ; they united with the Associate presbytery of Pennsylvania.*~~

~~*Dutch Presbyterianism in 1747 formed a ccetus which grew into a classis in 1755 independent of the classis of Amsterdam. A minority adhered to the mother classis and organized under its supervision a conference which grew into an assembly in 1764. In 1770 Queen's (now Rutgers) College was organized at New Brunswick, New Jersey. A union of the two parties was accomplished through the efforts of Dr J. H. Livingston in 1772, and a synod of five classes was organized, of 100 churches and 34 ministers. At the outbreak of the Revolution they numbered 44 ministers and 105 churches.*~~

~~*German Presbyterians began to emigrate into Pennsyl- vania in 1684, but not in large numbers until 1709, when a tide of emigration set in from the Palatinate and Switzerland. These attached themselves to the Dutch churches, but, where such did not exist, they organized churches of their own. In accordance with the advice of the German mother churches, in 1730 they put themselves under the care of the classis of Amsterdam, Holland. In 1747 the German churches organized a ccetus under the influence of Schlatter, who had found forty-six churches scattered over a wide region in Pennsylvania, but only four ordained ministers. He acted as general superintendent and was very efficient. He sought aid from all quarters, but this excited internal jealousies and controversies. At the outbreak of the Revolution it is estimated that the German churches numbered twenty-five ministers andsixty churches.*~~

~~*The classis of Amsterdam had a magnificent opportunity at the opening of the 18th century. The Dutch, German, and French churches in America were under its care. If it had organized them into classes and a synod at an early date the Reformed Church of America would have been the strongest Presbyterian body in the country, but by keeping them in pupilage it separated the various nation- alities and prevented closer union with British Presby- terians. The strength of Presbyterianism in the colonies which became the United States of America may be esti- mated at the close of the period as 3 synods, 20 presby- teries, 5 classes, 1 ccetus, and 260*~~

~~*ministers. The synod of New York and Philadelphia was a trifle stronger than all the others combined.*~~

~~*2. From the Revolution to the Civil War.—During the From the war of the Revolution the Presbyterian churches suffered Revolu- severely. The ministers and people, with scarcely an ex- es ..*~~

~~*‘ ea 3 e Civil*~~

~~*ception, entered upon the struggle for constitutional liberty wa). with all their souls. The Presbyterian Church was the church of constitutional government and orderly liberty. The Presbyterians exerted great influence in the con- struction of the constitution of the United States, and the government of the church was assimilated in no slight degree to the civil government of the country.*~~

~~*At the close of the war the Presbyterian bodies began at once to reconstruct themselves on more solid bases. In 1782 the presbyteries of the Associate and Reformed Churches united and formed the Associate Reformed synod of North America. But there were a few dissenters in both bodies, so that the older Associate and Reformed presbyteries were still continued. The Associate presby- tery of two members, Marshall and Clarkson, continued to exist until 1801, when it was subdivided and became the Associate synod of North America. In 1798 the Re- formed presbytery of North America was reconstituted by M‘Kenney and Gibson from Ireland ; it grew into a synod of three presbyteries in 1809, and in 1823 into a general synod. In 1781 the Dutch Reformed organized them- selves into a synod and classes. In 1784 they founded a theological seminary, which was settled at New Brunswick, and in 1792 adopted a constitution with general synod, particular synods, and classes. In 1792 the German Re- formed declared themselves independent of the classis of*~~

~~*Cumber- land presby- tery.*~~

~~*Period of*~~

~~*revivals,*~~

~~Amsterdam, and adopted a constitution in 1793 having 150 churches and 22 ministers. ; ;~~

~~In 1785 the synod of New York and Philadelphia took steps for the organization of a general assembly and also with a view to the union of all the Presbyterian bodies into one. In 1789 the synod resolved itself into a general assembly of four synods, which, after revising the chapters relating to church and state, adopted the Westminster symbols as their constitution, "as containing the system of doctrine taught in the Holy Scriptures," and they made them unalterable without the consent of two-thirds of the presbyteries and the general assembly. In 1798 another effort was made for union with the Reformed Dutch and the Associate Reformed, which failed. Three years after- wards a plan of union with the general association of Con- necticut was agreed upon by the general assembly, and the work of home missions in the western section of the country was prosecuted jointly. The result was mixed churches in western New York and the new States west of the Alleghany Mountains, which grew into presbyteries and synods having peculiar features midway between Pres- byterianism and Congregationalism.~~

~~The revivals in Kentucky brought about differences which resulted in the high-handed exclusion of the re- vivalists. These formed themselves into the presbytery of Cumberland, 4th February 1810, which grew in three years into a synod of three presbyteries. In 1813 they revised the Westminster confession and excluded, as they claimed, fatalism and infant damnation. If they had appealed to the general assembly they might have received justice, or possibly the separation might have been on a larger scale. In 1822, under the influence of John M. Mason, the Associate Reformed synod combined with the general assembly of the Presbyterian Church, but the majority was too slender to make the union thorough. The greater part of the ministers decided to remain separate, and accordingly three independent synods were organized —WNew York, Scioto, and the Carolinas. In 1858 the Associate synods of the north and west united with the Associate synod as the United Presbyterian Church. In 1833 the Reformed Presbyterian Church divided into New Lights and Old Lights in a~~

~~*dispute as to the propriety of Covenanters exercising the rights of citizenship under the constitution of the United States.*~~

~~*A great and widespread revival marked the opening years of the century, resulting in marvellous increase of zeal and numbers in the churches. New measures were adopted, doctrines were adapted to the times and occasions, and ancient disputes were revived between the conserva- tive and progressive forces.- Theological seminaries had been organized at Princeton in 1812, at Auburn in 1820, at Hampden Sydney in 1824, Allegheny in 1827, Columbia in 1828, Cincinnati in 1829, and Union Seminary, New York, in 1836. Differences in doctrine as well as polity and discipline became more and more prominent. Puritan theology had developed in New England into Edwardism and then into Hopkinsianism, Emmonsism, and Taylorism. A new theology had sprung up which was held to be an improvement and adaptation of Calvinism to modern thought. This new theology had entered the Presbyterian Church in the form of a milder Calvinism, which was represented to be more in accordance with the original type. On the other side the scholastic type of Calvinism, as represented by Francois Turretin and the Zurich Consensus, was insisted on as the true orthodoxy. The doctrinal differences came to a head in the trials of Albert Barnes, George Duffield, and Lyman Beecher, which, how- ever, resulted in the acquittal of the divines, but increased friction and ill-feeling. The differences developed were chiefly between general atonement and atonement for the*~~

~~*elect only and between mediate imputation and immediate imputation. But there was a middle party which regarded these differences as forced, and held that the rival views were alike inadequate if taken alone and that they were really complementary.*~~

~~*The agitation with reference to African slavery threw old and the bulk of the Southern Presbyterians on the Old Side, New which was further strengthened by the accession of the Side.*~~

~~*Associate Reformed. The ancient differences between Old and New Side were revived, and once more it was urged that there should be (1) strict subscription, (2) ex- clusion of the Congregationalized churches, and strict Presbyterian polity and discipline, (3) the condemnation and exclusion of the new divinity and the maintenance of scholastic orthodoxy. In 1834 a convention of the Old Side was held in Philadelphia, and the "Act and Testi- mony" was adopted charging doctrinal unsoundness and neglect of discipline upon the New Side, and urging that these should be excluded from the church. The moderate men on both sides opposed this action and strove for peace or an amicable separation, but in vain. In 1837 the Old Side obtained the majority in the general assembly for the second time only in seven years. They seized their oppor- tunity and abrogated the "Plan of Union," cut off the synod of Western Reserve and then the synods of Utica, Geneva, and Genesee, four entire synods, without a trial, and dissolved the third presbytery of Philadelphia without | providing for the standing of its ministers. This revolu- tionary proceeding brought about the second great rupture in the Presbyterian Church. The New Side men met in convention at Auburn in August 1837 and adopted measures for resisting the wrong. In the general assembly of 1838 the moderator refused to recognize the commis- sioners of the four exscinded synods. An appeal was made to the assembly and the moderator's decision reversed. A new moderator was chosen, while the assembly adjourned to another place of meeting. The Old Side remained after the adjournment and organized themselves, claiming the historic succession. Having the moderator and clerks from the assembly of 1837, they retained the books and papers. Thus two general assemblies were organized, the Old and the New School. An appeal was made to the civil courts, which decided in favour of the New School; but this decision was overruled on a technical point of law by the court in bank and a new trial ordered. It was deemed best, however, to cease litigation and to leave matters as they were.*~~

~~*Several years of confusion followed. In 1840 we have the first safe basis for comparison of strength.*~~

~~*| Ministers. Churches. Communicants, Old Side … 1308 1898 126,583 New Side … 1234 1375 102,060*~~

~~*The churches remained separate throughout the re- mainder of this period. The North was especially agitated by the slavery question, and the auti-slavery element be- came so strong that the Southern synods of the New School assembly felt constrained to withdraw in 1858. They organized the United Synod of 4 synods, 15 presby- teries, 113 ministers, 197 churches, 10,205 communicants. Just before the outbreak of the Civil War in 1861 these churches numbered :—*~~

~~*Synods. — Ministers. |Churches.| Communicants. Old Side…... 33 171 2656 S531 292,927 (1860) New Side … re, 104 1523 1482 134,933 (1860) UnitedSynod, 4 in| is 197 | 10,205 (1858) | Cumberland | Presbyterian| 23 96 890 | 1189 | 82,008 (1859)*~~

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~~*The several branches of the Scottish separating churches continued 'to grow independently until the year 1858, when the United Presbyterian Church was formed by a union of three synods,—one of the Associate and two of the Associate Reformed Churches.*~~

~~*Presby- pe cs Communi-| Theological*~~

~~*teries. Ministers. | Churches. cants. | Seminaries. Associate Associate Reform-*~~

~~*ed (4 synods) 5 Synods*~~

~~*The Dutch Reformed increased, though not without slight internal struggles; in 1822 there was a secession of thirteen ministers. The name "Dutch" was dropped in 1867 because it was found hurtful to the progress of the denomination. At the outbreak of the Civil War they numbered 1 general synod, 3 particular synods, 31 classes, 387 ministers, 370 churches, 50,427 communicants.*~~

~~*The German Reformed in 1816 improved their organi- zation. In 1819 the constitution was revised and the church divided into synods and classes. In 1824 they were divided into two independent synods. In the next year they established a theological seminary at Carlisle, which was removed to*~~

~~*Mercersburg, and finally to Lan- caster (all in Pennsylvania). This institution became the centre of the liturgical party in the church. The Ohio synod established Heidelberg College in 1850. At the outbreak of the Civil War this denomination numbered 2 synods, 24 classes, 391 ministers, 1045 churches, 92,684 coramunicants.*~~

~~*In 1826 the first Calvinistic Methodist Church in America was organized in Oneida county, New York, and a presbytery was constituted a few years afterwards. This little denomination, which is in entire sympathy with other Presbyterian bodies, is composed almost ex- clusively of Welshmen, wio have settled in communities by themselves.*~~

~~*Period 3. From the Civil War to 1885.—The Civil War in*~~

~~*since the separating the people of the North from the people of*~~

~~*= the South also brought about a separation of churches.*~~

- ~~*Some of the breaches have been healed, others remain until now.*~~

~~*In 1861 the Southern section of the Presbyterian Church withdrew from the Northern and organized the general assembly of the Presbyterian Church in the Confederate States of America, with 11 synods, 47 presbyteries, about 700 ministers, 1000 churches, and 75,000 communicants. In 1865 this body united with the United Synod of the South, and increased its strength by 120 ministers, 190 churches, and 12,000 communicants. After the close of the war the name of the denomination was changed to "the Presbyterian Church in the United States." In 1867 this church was joined by the presbytery of Patapsco, in 1869 by the synod of Kentucky, and in 1874 by the synod of Missouri, all of which had separated from the Northern church.*~~

~~*The war also united the Northern churches more closely together, and there was an increasing desire for organic union. An effort was made to combine all the Presby- terian bodies of the North in 1867, but in vain. In 1869, however, the Old and New School churches of the North combined on the basis of the common standards. A memorial fund of $7,883,983 was raised, and the church entered with renewed strength upon a fresh career of use- fulness. An effort to unite the Dutch and German Re- formed Churches*~~

failed, as also the effort to combine the Presbyterian Churches of the North and the South. The German Reformed synods in 1863 united in a general

synod with 26 classes, 447 ministers, and 98,775 com- inunicants. Ursinus College was founded by it in 1869. All branches of Presbyterians have increased with the growth of the United States. The present strength of the churches is as follows :—

es a Ri) 2 9 33 Se & o 34 'toh se; 25) 2 fe ifs So) RB we, re Soe 36 OF 2, £1 8 = | 5 < | ae] oO Eto || S| Presbyterian Church in U.S.A.| 1 | 23, 182 | 5,218 600,695 | 12 Presbyterian Church in U.S. ..| 1 {13} 67 | 1,070 127,017 | 2 Cumberland Presbyterian Ch. | 1 | 27) 116 | 1,439 130,000 | 1 United Presbyterian Church ..| 1 9| 60 730 85,443 | 3 Reformed Presbyterian Church, ULL ee tes eset Boas 1 6 6,700! 1 Reformed Presbyterian Church, | SMG visings OMS OOS copesmaneeeeeal| of 1 8 6,648} 1 Reformed Church in America | 11 | 4] 342 569 516 80,156 | 2 Reformed Church in U.S.A. ..}] 1} | 7! 522 783 | 1,465 169,530; 3 Calvinistic Methodist ……..| 1 | 6) 16 4) 175] 9,563! .. TOUMS:...1501) = 92 | 552 | 10,121 | 13,728 | 1,226,377 | 26

The American Presbyterian churches have always been marked by a zeal for missions. John Eliot, the apostle to the Indians in New England, was a Puritan Presby- terian. The synod of New York carried on mission work among the Indians through David Brainerd and others, with the help of the Society in Scotland for the Promotion of Christian Knowledge. The Presbyterian churches generally co-operated with the Congregationalists in the work of the American Board of Commissioners for Foreign Missions, established in 1710, until 1832, when the Re- formed Church in America set the example of organizing a denominational board. Each denomination now has its board of missions. The summary of missionary operations, as reported to the council of the Reformed churches hold- ing the Presbyterian system which met at Belfast in June 1884, was 230 ordained missionaries, 25 male lay agents, and 359 female, all sent out by the societies. These were aided by 138 ordained converts and 1115 other agents from among the converts, and there was a total of 25,235 communicants and 29,060 day-school pupils. The work of home missious is equally extensive, and is especi- ally important in the United States, where the church has to attend

~~*to the wants of an immense population constantly flowing from Europe, and the natural increase of population in the country itself also enlarges the older towns and States and creates new ones with astonishing rapidity.*~~

~~*The tendency of Presbyterianism in the United States is to adapt itself to the circumstances of the country. The divisions are chiefly the result of differences of nationality, and traditional doctrines and modes of worship brought by the immigrants from the countries of Europe. These are gradually wearing off, and the churches are assimilat- ing themselves to the country and its institutions, and thus are growing closer together. We may expect at no very distant date a combination of them all into one organism.*~~

~~*The chief authorities for the study of American Presbyterianism are—Charles Hodge, Constitutional History of the Presbyterian Church in the United States of America, 1706-1788 (2 vols., Phil- adelphia, 1840) ; Records of the Presbyterian Church in the U.S.A. from 1706 to 1788 (Philadelphia, 1841); Richard Webster, History of the Presbyterian Church in America (Philadelphia, 1857) ; EK. H. Gillett, History of the Presbyterian Church in the U.S.A. (2d ed., Philadelphia, 1873) ; Presbyterian Reunion (New York, 1870); E. B. Crisman, Origin and Doctrines of the Cumberland Presbyterian Church (St Louis, 1877); E. T. Corwin, Alanual of the Reformed Church in America (New York, 3d ed., 1879); Reformation Prin- ciples (Philadelphia, revised ed., 1863); C. A. Briggs, American Presbyterianism, New York, 1885. (C. A. BR.)*~~

~~*1 "General Synods." 2 "Classes."*~~

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~~*PRESCOT, a market-town of Lancashire, is situated on rising ground on the Liverpool and Wigan branch of the London and North-Western Railway, Liverpool and 28 west of Manchester. It is of considerable antiquity, and received a grant for a market and fair in the 7th year of Edward III. A church existed in the 13th century. The present edifice, in various styles, with a lofty tower and spire and carved timber roof, underwent extensive restoration in 1875-76. Among the other public buildings are the town-hall (1765) and the market-hall (1859). The chief industry is the making of watch hands and wheels, &c., first introduced in 1730 by J ohn Miller from*~~

~~Yorkshire. Coarse earthenware is also manufactured. The population of the urban sanitary district (area, 268 acres) in 1871 was 5990, and in 1881 it was 6419.~~

~~PRESCOTT, Winuiam Hickxuine (1796-1859), his- torian, was born in Salem, Massachusetts, on 4th May 1796, his ancestors, of the old Puritan stock, having migrated from Lancashire about 1640 and established themselves in Middlesex county, Massachusetts. He re- ceived his earlier education in his native city until the removal of his family in 1808 to Boston, where he was placed under the tuition of Dr Gardiner, a pupil of Dr Parr. His schooldays appear to have been in the main typical rather than prophetic, though in his passion for mimic warfare and for the narration of original stories some indication of the historical bias may perhaps be dis- cerned. A healthy aversion to persistent work, which even in later years broke at times through his rigorous system of self-discipline, did not hinder him from making a good if somewhat desultory use of his permission to read at the Boston athenzeum,—an exceptional advantage at a time when the best books were by no means readily accessible in any part of the United States. He entered Harvard College in the autumn of 1811, therefore, with a fairly thorough mental equipment, but almost at the outset his career was interrupted by an accident which affected the whole subsequent course of his life. A hard piece of bread, flung at random in the Commons Hall, struck his left eye with such force that he fell to the ground ; and, though the first shock speedily passed, the**

sight was irremediably destroyed. He resumed his college

work, however, with success in classics and literature,

though he abandoned the study of mathematics as one in

which he could not attain even an average proficiency. After graduating honourably in 1814 he entered his father's office as a student of law; but in January 1815 the un- injured eye showed dangerous symptoms of inflammation, which for some time refused to yield to remedies. When at last in the autumn he was in condition to travel, it was determined that he should pass the winter at St Michael's and in the spring obtain medical advice in Europe. His visit to the Azores, which was constantly broken by

~~*con- finement to a darkened room, is chiefly noteworthy from the fact that he there began the mental discipline which enabled him to compose and retain in memory long pass- ages for subsequent dictation ; and, apart from the gain in culture, his journey to England, France, and Italy (April 1816 to July 1817) was scarcely more satisfactory. The verdict of the physicians consulted by him was that the injured eye was hopelessly paralysed, and that' the pre- servation of the sight of the other depended upon the maintenance of his general health. His further pursuit of the legal profession seemed out of the question, and on his return to Boston he remained quietly at home listening to a great deal of reading, but with no fixed object in view. On 4th May 1820 he was married to Miss Susan Amory. Prior to his marriage he had made a few experiments in composition which had obtained no further publicity than that of his own circle of friends, but he now finally decided*~~

~~*to devote his life to literature. It must be admitted that he had not hitherto displayed any remarkable aptitude ;*~~

~~*8 miles east of | but having once determined his future occupation he set*~~

~~*himself strenuously to the task of self-preparation. With almost amusing thoroughness he commenced the study of Murray's Grammar, the prefatory matter of Johnson's Dictionary, and Blair's Rhetoric, reading at the same time for general purposes of style a series of the standard English writers from the period of Elizabeth onwards. A review of Byron's Letters on Pope in 1821 constituted his first contribution to the North American Review, to which he continued for many years to send the results of his slighter researches. He next turned to French literature, the irksomeness with which he regarded his studies in this subject being mitigated by incursions into the early Eng- lish drama and ballad literature. Of the direction and quality of his thought at this time he has left indications in his papers on Lssay-Writing (1822) and on French and English Tragedy (1823). In pursuance of his method of successive studies he began in 1823 the study of Italian literature, passing over German as demanding more labour than he could afford ; and so strongly did he feel the fasci- nation of the language that for some time he thought of selecting it as his chief sphere of work. In the*~~

~~*following year, however, he made his first acquaintance with the literature of Spain under the influence of his friend and biographer, Ticknor, who was then lecturing upon it; and, while its attractiveness proved greater than he had at the outset anticipated, the comparative novelty of the subject as a field for research served as an additional stimulus.*~~

~~*In the meantime his aims had been gradually concen- trating. HIstory had always been a favourite study with him, and Mably's Observations sur [Histoire appears to have had considerable influence in determining him to the choice of some special period for historic research. The selection, however, was not finally made without prolonged hesitation. The project of a history of Italian literature held a prominent place in his thought and found some tentative expression in his article on [talian Narrative Poetry (1824) and in the reply to Da Ponte's criticism (1825); but he had also in contemplation a history of the revolution which converted republican Rome into a monarchy, a series of biographical and critical sketches of eminent men, and a Spanish history from the invasion of the Arabs to the consolidation of the monarchy under Charles V. It was not till the 19th of January 1826 that he recorded in the private memoranda begun by him in 1820 his decision "to embrace the gift of the Spanish subject." The choice was certainly a bold one. On the one hand, he had no great liking for, if he had not, as he alleged, an absolute detestation of the investigation of latent and barren anti- quities, while, on the other, he had not the visual power which others besides Milton have deemed indispensable to an historian. The first he might and did overcome, but the second seemed likely to prove a permanent disqualifi- cation. HIe could only use the eye which remained to him for brief and intermittent periods, and as travelling affected his sight prejudicially he could not anticipate any personal research amongst unpublished records and historic scenes. HIe was happy, however, in the possession both of ample means and admirable friends to supply so far as might be the necessary materials, and of a wide leisure in which to give them literary shape and polish; and he sketched with no undue restriction or hesitancy the plan of the HIstory of the Reign of Ferdinand and Isabella —his first great work. Mr English, one of his secretaries, has furnished a picture of him at this period seated in a study lined on two sides with books and darkened by green screens and curtains of blue muslin, which required read- justment with almost every cloud that passed across the*~~

~~*Paka owe OFT*~~

~~*sky. His writing apparatus—a noctograph—lay before him, and he kept his ivory style in his hand to jot down notes as the reading progressed. In accordance with his general method these notes were in turn read over to him until he had completely mastered them, when they were worked up in his memory to their final shape. So pro- ficient did he become that he was able to retain the equiva- lent of sixty pages of printed matter in his memory, turn- ing and returning them as he walked or drove. The rate of progress in preparation was therefore necessarily slow, apart from any liability to interruption by other under- takings and failures in bodily health. He still continued his yearly experimental contributions to the Worth Amert- can Review, elaborating them with a view as much to ultimate historical proficiency as to immediate literary effect, the essays on Scottish Song (1826), Novel-Writing (1827), Mfoliére (1828), and Irving's Granada (1829) belonging to this preparatory period. The death of his eldest daughter in 1828 also led him aside to the study— afterwards renewed in the interval between the Ferdinand and Isabella and the Conquest of Mextco—of Christian evidences, with the result that he convinced himself of the fundamental truth of Christianity, though he did not accept all the tenets of orthodoxy. On the 6th of October 1829 he began the actual work of composition, which was continued without more serious interruptions than those occasioned by the essays on Asylums for the Blind (1830), Poetry and Romance of the Italians (1831), and English Literature of the 19th Century (1832), until 25th June 1836, when the concluding note was written. Another year, during which his essay on Cervantes appeared, was spent in the final revision of the History for the press, in which the author was ably assisted by two friends, of whom Gardiner, the son of his old schoolmaster, criticized the style and Folsom verified the facts. Its success upon its publica- tion in Boston was immediate, the five years' contract being discharged in a few. months. Arrangements were speedily made for its publication in England, and there its success was not less marked. From the position of an ob- scure reviewer Prescott suddenly found himself elevated to the first rank of contemporary historians. Daniel Webster spoke of him as a comet which had suddenly blazed out upon the world in full splendour, and American, British, and Continental reviewers were equally laudatory. Its re- ception determined the nature of all his subsequent work. Hitherto he*~~

~~had still inclined towards the history of literature rather than to that of polity and action, on the ground that the former was more consonant with his previous studies and a more suitable sphere for the display of his special powers. A close examination of his work in the department of literary criticism does not, however, bear out this estimate of his own genius, and the popular voice in approving his narrative faculty gave him the re- quired impetus in the right direction. After coquetting for a short time with the project of a life of Moliére he decided to follow in the track of his first work with a History of the Conquest of Mexico. Washington Irving, who had already made preparations to occupy the same field, generously withdrew in his favour; and in May 1838 Prescott began his first reading in the subject. The work was completed in August 1843, the five years' labour having been broken by the composition of reviews of Lockhart's Life of Scott (1838), Kenyon's Poems (1839), Chateaubriand (1839), Bancroft's United States (1841), Mariotti's Italy (1842), and Madame Calderon's Life in Mexico (1843), and by the preparation of an abridgment of his Ferdinand and Isabella in anticipation of its threatened abridgment by another hand. On 6th December 1843 the Conquest of Mexico was published with a success pro- portionate to the wide reputation won by his previous~~

~~work, the contracted number being sold off in four months and London and Paris editions meeting with a similar reception. The careful methods of work which he had adopted from the outset had borne admirable fruit. While the consultation of authorities had been no less thorough, his style had become more free and less self-conscious ; and the epic qualities of the theme were such as to call forth in the highest degree his powers of picturesque narra- tion. It was only a step from the conquest of Mexico to that of Peru, and scarcely three months elapsed before he began to break ground on the latter subject, though the actual composition was not commenced until the autumn of 1844. While the work was in progress and before the close of the year his father died,—a heavy blow to him, inasmuch as the elder and younger members of the family had continued to share the same home upon almost patri- archal terms, and the breach was therefore in a chain of constant association extending over a period of forty-eight years. In February 1845 he received the announcement of his election as~~

corresponding member of the French Institute in place of the Spanish historian Navarrete, and also of the Royal Society of Berlin. The winter found him arranging for the publication in England of the selection from his articles and reviews which appeared in 1845 under the title of Critical and Historical Essays, and which was issued almost contemporaneously at New York under the title of Biographical and Critical Miscellanies. After some minor interruptions—his removal from the old mansion-house in Bedford Street to the house in Beacon Street, visits to friends, and a renewed failure of sight—the Conquest of Peru was completed in November 1846 and published in March following. His misgivings as to its reception were at once set at rest, and it was speedily issued in translations into French, Spanish, Ger- man, and Dutch, in addition to the English editions of New York, London, and Paris. He was now over fifty and his sight showed serious symptoms of enfeeblement. Although during the composition of the Ferdinand and Isabella it had been of very intermittent service to him, it had by his careful regimen so far improved that he could read with a certain amount of regularity during the writing of the Conquest of Mexico, and also, though in a less degree, during the years devoted to the Conquest of Peru. Now, however, the use of his remaining eye had been reduced to an hour a day, divided into portions at wide intervals, and he was driven to the conclusion that whatever plans he made for future work must be formed on the same calculations as those of a blind man. He had been for many years collecting materials for a history of Philip II., but he hesi- tated for some time to attempt a work of such magnitude, occupying himself in the meantime with the slighter labours of a memoir of Mr John Pickering for the Massa- chusetts Historical Society and the revision of Ticknor's History of Spanish Iaterature. Butin March 1848 he set himself with characteristic courage to the accomplishment of the larger project, though with the intention of writing memoirs rather than a history, as admitting a more ram- bling style and less elaborate research. He had been for- tunate in obtaining the aid of Don Pascual de Gayangos, then professor of Arabic literature at Madrid, by whose offices he was enabled to obtain material not only from the public archives of Spain but from the muniment rooms of the great Spanish families. With an exceptional range of information thus afforded him, he wrote the opening of his history at Nahant, his summer residence, in July 1849 ; but, finding himself still unsettled in his work, he decided in the spring of the following year to carry out a long projected

~~visit to England. His reception there was of the most cordial and gratifying kind, and he returned re- invigorated to his work. The idea of writing memoirs~~

~~was dismissed in favour of the more elaborate form, and in November 1855 the first two volumes of his uncom- pleted History of Philip II. were issued from the press, their sale eclipsing that of any of his earlier books. This was his last great undertaking; but as Robertson's Charles V., in the light of new sources of information, was inade- quate to take its place as a link in the series, he repub- lished it in an improved and extended form in December 1856. A slight attack of apoplexy on the 4th of February 1858 foretold the end, though he persevered with the preparation of the third volume of Phalip LJ. for the press, and with the emendation and annotation of his Conquest of Mewico. On the morning of the 27th of January 1859 a second attack occurred, and he died in the afternoon of~~

~~the same day in his sixty-third year.~~

~~In personal character Preseott possessed many admirable and amiable qualities, his eourageous bearing and persistent labour being by no means without their heroic element, though the greater portion of his life was passed with his friends and his books. A certain habit of striving to be habitual is euriously prominent from his boyhood till his death, the desire for an objective stimulus finding expression in numberless formal resolutions and in frequent wagers with his seeretaries or friends. Necessarily a valetudinarian, the smallest details of life had to be considered by him, even to the adjustment of the weight of his dress to the state of the weather and the thermometer. Yet the formalism, whether voluntary or enforced, was never obtrusive, and the final impression made upon his eontemporaries was that of a frank, spontaneous, and thoroughly manly life. Asan historian he stands in the direct line of literary deseent from Robertson, whose infiuenee is elearly diseernible both in his method and style. But, while Robertson was in some measure the initiator of a movement, Preseott eame to his task when the range of information was ineomparably wider and when progress in soeiologie theory had thrown innumerable convergent lights upon the progress of events. He worked,~~

therefore, upon more assured ground; his sifting of authorities was more thorough and his method less restricted both in the selection of details and in their graphic presentation. At the same time he cannot be classed as in the highest sense a philosophic historian. His power lies chiefly in the clear grasp of fact, in selection and synthesis, in the vivid narration of incident. For extended analysis he had small liking and faculty ; his critical insight is limited in range, and he confines himself almost wholly to the concrete elements of history. When he does venture upon more abstract criticism his standards are often commonplace and superficial, and the. world-scheme to which he relates events is less profound than the thought of his time altogether warranted. If these things, however, indicate failure from the point of view of ideal history, they at least make for popularity. Few historians have had in a higher degree that artistic feeling in the broad arrangement of materials which en- sures interest. The course of his narrative is unperplexed by doubtful or insoluble problems; no pretence at profundity or subtlety saps the vitality of his characters or interrupts the flow of incident with dissertation and digression. The painting is filled in with primary colours and with a free hand; and any sense of crudity which may be awakened by close inspection is compensated by the vigour and massive effectiveness of the whole. Though he did not bring to his work the highest scientific grasp, he brought to it scientific conscientiousness and thoroughness within his limitations, while his dominant pictorial faculty gave to his treatment a super- scientific brilliancy. The romance of history has seldom had an abler exponent, and the large number of editions and translations of his works attests their undiminished fascination at certain stages of popular culture. (R. M. W.)

PRESCRIPTION in the broadest sense of the word denotes the acquisition or extinction of rights by lapse of time. The term is derived from the prescriptio of Roman law, originally a matter of procedure, a clause inserted before the formula on behalf of either the plaintiff or, in early times, the defendant, limiting the question at issue. (See Praepina.) It was so called from its preceding the formula, One of the defendant's prescriptiones was long temporis or longa possessionis prescriptio (afterwards super- seded by the exceptio), limiting the question to the fact of possession without interruption by the defendant for a certain time (see

~~*Possession). It seems to have been introduced by the praetor to meet cases affecting aliens or ae ee _ e*~~

~~*oe Prescriptiones autem appellatas esse ab eo quod ante formulas prescribuntur ” (Gaius, iv. § 132),*~~

~~*PR E—*~~

~~*Pe ae*~~

~~*lands out of Italy where the wsucapro of the civil law (the original means of curing a defect of title by lapse of time) could not apply. The time of acquisition by usucapio was fixed by the Twelve Tables at one year for movables and two years for iminovables. Prescriptio thus constituted a kind of pretorian usucapio. In the time of Justinian usucapto and prescriptio (called also longi temporis possessio), as far as they affected the acquisition of ownership, differed only in name, usucapio being looked at from the point of view of property, prescriptio from the point of view of pleading. By the legislation of Justinian movables were acquired by three years’ possession, immovables by ten years’ possession where the parties had their domicile in the same province (inter presentes), twenty years’ possession where they were domiciled in different provinces (inter absentes). Servitudes could not be acquired by usucapio proper, but were said to be acquired by quasi usucapio, probably in the same time as sufficed to give a title to immovables. There was also a longissimi temporis possessio of thirty years, applicable to both movables and immov- ables, and requiring nothing but bona jides on the part of the possessor. Where the right sought to be established was claimed against the church, a still longer period of forty years (at one time a hundred) was necessary. Im- memorial prescription was required in a few cases of a public character, as roads.? Prescriptio was also the term applied to lapse of time as barring actions upon contracts or torts under various provisions corresponding to the Eng- lish Statutes of Limitation. The prescription of Roman law (and of modern systems based upon it) is thus both acquisitive and extinctive. It looks either to the length of time during which the defendant has been in possession, or to the length of time during which the plaintiff has been out of possession. In English law the latter kind of prescription is called LimrraTion (q.v.).*~~

~~*The tendency of law is to substitute a definite for an indefinite period of prescription.*~~

~~*In English law prescription is used in a comparatively narrow sense. It is acquisitive only, and is very limited initsapplication. A title by prescription can be made only to incorporeal hereditaments—that is, in legal language, hereditaments that are or have been appendant or appurte- nant to corporeal hereditaments—and to certain exemp- tions and privileges.2 The rights claimable by prescription for the most part consist of rights 7m alieno solo, The most important are advowsons, tithes, commons, ways, watercourses, lights, offices, dignities, franchises, pensions, annuities, and rents. Land or movables cannot be claimed by prescription. The foundation of prescription is the pre- sumption of law that a person found in undisturbed enjoy- ment of a right did not come into possession by an unlawful act (see Williams, Rights of Common, 3). "In the English courts this presumption was, perhaps it may be said still is, based upon the fiction of a lost grant, viz., that at some time in the past there had been a grant of the heredita- ment by a person capable of granting it to a person capable of taking it, and that the grant had been lost. The jury were instructed to find the loss of a once existing grant in whose existence no one really believed. The enjoyment of the right must have been from a time whereof the memory of man runneth not to the contrary. The period of legal memory was after a time necessarily fixed for purposes of convenience at a certain date. The date adopted varied at first with the time during which the demandant in a writ of right must have proved seisin in himself or his*~~

~~*° "Vie vicinales, quarum memoria non extat" (Dig., xliii. 7, 3).*~~

~~*3 Prescription seems at one time to have borne a wider meaning. A claim by prescription to land is mentioned in 32 Hen. VIII. e. 2. And it seems that tenants in comn:on may still make title to land by prescription (Littleton's Tenures, § 310).*~~

~~*Poe Be tel Pet ON*~~

~~*ancestors. After one or two previous enactments the date was finally fixed by the Statute of Westminster the First (3 Edw. I. c. 39) at the reign of Richard I., which was in- terpreted to mean the first year of the reign of*~~

~~*Richard I. The inconvenience of this remote date, as time went on, led to the gradual growth of a rule of evidence that proof of enjoyment for twenty years was prima facie evidence of enjoyment from time immemorial. But evidence of the beginning of the enjoyment at however remote a date, if subsequent to 1 Ric. I. was sufficient to destroy the claim. This is still the law with respect to claims not falling within the Prescription Act, mostly rights in gross, —that is, where there is no dominant or servient tenement, €.g., a right to a pew or to a several fishery in gross. The twenty years' rule was of comparatively late introduction; it does not seem to have been known in the time of Elizabeth, and was perhaps introduced in analogy to the Statute of Limitations, 21 Jac. I. c. 16. With respect to claims of profits @ prendre and easements a change was made by the Prescription Act, 2 and 3 Will. IV. c. 71 (extended to Ireland by 21 and 22 Vict. c. 42, but not to Scotland). By that Act claims to rights of common and other profits a prendre are not to be defeated after thirty years' enjoy- ment by any person claiming right thereto without inter- ruption for thirty years by showing only the commencement of the right, and after sixty years' enjoyment the right is absolute and indefeasible unless had by consent or agree- ment by deed or writing (§1). In claims of rights of way or other easements the periods are twenty years and forty years respectively (§2). The right to access and use of light is absolute and indefeasible by twenty years' enjoy- ment without interruption unless by consent or agreement by deed or writing (§3). The before-mentioned periods are to be deemed those next before suits, and nothing is to be deemed to be an interruption unless acquiesced in for one year (§4). In pleading, the enjoyment as of right may be alleged during the period mentioned in the Act, and without claiming in the name or right of the owner of the fee (§5). No presumption is to be made in favour of a right exercised for a less period (§6).. The time during which a person otherwise capable of resisting a claim is an infant, idiot, non compos mentis, feme covert, or tenant for life, or during which an action or suit has been pending until abated by the death of a party, is to be excluded in.the computation of the periods unless where the right or claim is declared to be absolute and indefeasible (§ 7). In the period of forty years a term of life or more than three years is to be excluded in case the claim be resisted' by the reversioner within three years after the determination of the term (§ 8). An Act to define the period of prescription for a modus decimandt, or an exemption from tithes by composition, was passed the*~~

~~same year (2 and 3 Will. IV. c. 100; see Tirnes). The Prescription Act is only supplemental to the common law, so that a claim may be based upon the Act or, in the alternative, upon the common law. Nor does the Act alter the conditions necessary at common law for a good claim by prescription. The claim under the statute must be one which may be lawfully made at common law. The prin- cipal rules upon the subject are these. (1) The title is founded upon actual usage. The amount of actual usage and the evidence necessary to prove it vary according to the kind of claim. For instance, in continuous easements (such as a watercourse) the enjoyment may go on without any active interference by the person claiming the right ; in discontinuous easements (such as a right of way) the right is only enjoyed at intermittent periods. (2) The enjoyment must (except in the case of light) be as of right, a rule sometimes expressed by the words nec w nec clam nec precario, derived from Roman law,—that is to say, peace-~~

~~able, openly used, and not by licence. These words bear a meaning less strict than they did in Roman law. The enjoyment in Roman law must (except in the case of jus aque ducendx) have been ex justo titulo in order to found usucapio or guasi usucapio; in English law there is no doubt that enjoyment may be good by prescription, even though it began in trespass, as a footpath or arent. (3) The prescription must be certain and reasonable. Examples of claims by prescription which have been held to be bad on this ground are a claim to take out of the land of another as much clay as is required for making bricks at a certain kiln, and a claim to a marriage fee which, though reasonable now, would have been an unreasonable amount to have been paid in the reign of Richard IL, looking to the difference in the value of money. Inhabitants cannot claini by prescription, as they are an uncertain and fluctuat- ing body, unless under a grant from the crown, which con- stitutes them a corporation for the purposes of the grant. (4) The prescription must be alleged in a que estate or in aman and his ancestors. Prescription in a que estate lies at common law by reason of continuous and immemorial enjoyment by the claimant, a person seised in fee, and all those whose estate he has (toux ceux que estate il ad). The Prescription Act fixes a definite period and does away with the necessity which existed at common law of prescribing in the name of the person~~

~~seised in fee. Prescription in a man and his ancestors is not of ordinary occurrence in practice. 'I am not aware of more than two cases in modern times," says Mr Joshua Williams (Rights of Com- mon, 9), "'where a prescription of this kind, viz., a pre- scription of enjoyment by a man and his ancestors, irre- spective of the possession of land, has been set up." Corporations, however, occasionally claim by a prescription analogous to this, viz., in the corporation and its prede- cessors. Such claims by either a person or a corporation are not within the Prescription Act, which applies only where there are dominant and servient tenements. By 32 Hen. VIII. c. 2 no person can make any prescription by the seisin or possession of his ancestor unless such seisin or possession has been within threescore years next before such prescription made. (5) A prescription cannot lie for a thing which cannot be granted, as it rests upon the presumption of a lost grant. Thus a lord of a manor cannot prescribe to raise a tax or toll upon strangers, for such a claim could never have been good by any grant. Prescription and Custom.—Prescription must be care- fully distinguished from custom. Prescription, as has been said, is either in a que estate or in a man and his ancestors,—that is to say, it is a personal claim ; custom is purely local,—that is to say, it is a usage obtaining the force of law within a particular district. In the time of Littleton the difference between prescription and custom was not fully recognized (see Littleton's Zenures, § 170), but the law as it exists at present had become established by the time of Sir Edward Coke. "J.S. seised of the Mannor of D. in fee prescribeth thus; That J. S. his ancestors and all those whose estate he hath in the said Mannor have time out of mind of man had and used to have Common of pasture &c. in such a place &c., being the land of some other &c. as pertaining to the said Mannor. This property we call a Prescription. A custome is in this manner ; A copyholder of the Mannor of D. doth plead that within the same Mannor there is and hath been for time out of mind of man used, that all the Copy- holders of the said Mannor have had and used to have Common of pasture &c. in such a waste of the Lord, parcel of the said Mannor &c." (Coke upon Littleton, 113b). A custom must be certain, reasonable, and exercised as of right. Like prescription at common law, it must have existed from time immemorial. On this ground a custom XIX.—89~~

~~*to erect stalls at statute sessions for hiring servants was held to be bad, because such sessions were introduced by the Statute of Labourers, 23 Edw. III. st. 1 (Simpson v. Wells, Law Reports, 7 Queen's Bench, 214). Some rights may be claimed by custom which cannot be claimed by prescription, eg., a right of inhabitants to dance on a village green, for such a right is not connected with the enjoyment of land. On the other hand, profits @ prendre can be claimed by prescription but not by custom, unless in two or three exceptional cases, such as rights of copy- holders to common in the lord's demesne, or to dig sand within their tenements, rights to estovers in royal forests, and rights of tin-bounders in Cornwall.*~~

~~*United States.—The law of the United States (except in Louisiana) is based upon that of England, but the period of enjoyment necessary to found a title by pre- scription varies in the different States. An easement or profit & prendre is acquired by twenty years' enjoyment in most States, following the English common law rule. In Michigan the term is twenty-five years, Pennsylvania twenty-one years, Connecticut and Vermont fifteen years, South Carolina five years. In Louisiana the period varies according to the subject from three to thirty years, and property other than incorporeal hereditaments may be claimed by prescription as in Roman law (see Kent's Comm., vol. iii. 442). In the case of ancient lights the tendency of the decisions of many of the State courts seems to have been against the English doctrine, that a prescriptive right to light may be gained by mere enjoy- ment not necessarily under a claim of right (Washburn's Law of Real Property, vol. ii. 318).*~~

~~*International law uses the term "prescription" in its wider or Roman sense. "The general consent of mankind has established the principle that long and uninterrupted possession by one nation excludes the claim of every other" (Wheaton, Jnt. Law, § 165). Historic instances of rights which were at one time claimed and exercised by pre- scription as against other nations are the sovereignty of Venice over the Adriatic and of Great Britain over the Narrow Seas, and the right to the Sound dues long exacted by Denmark. But such claims were rejected by the highest authorities on international law (e.g., Grotius), on the ground that they were defective both in justus tetulus and in de facto possession. 'There is no special period fixed, as in municipal law, for the acquirement of international rights by*~~

~~*lapse of time. prescription is treated as part of the lex fori or law of procedure. (See Limrration.) (3. WT.)*~~

~~*Scotland.—In the law of Scotland " prescription" is a term of wider meaning than in England, being used as including both pre- seription and limitation of English law. In its most general sense it may be described as the effect which the law attaches to the lapse of time, and it involves the idea of possession held by one person adverse to the rights of another. Though having its basis in the common law, its operation was early defined by statute, and it is now in all respects statutory. The most appropriate mode of treat- ing the preseription of Scotch law is to regard it (1) as a mode of acquiring rights—the positive prescription; (2) as a mode of extin- guishing rights—the negative prescription ; (3) as a mode of limit- ing rights of action—the shorter prescriptions. It must, however be observed with reference to this division that the distinction between (1) and (2) is rather an accidental (due to a loose inter- pretation of the language of the Act 1617, c. 12) than a logically accurate one. It is, moreover, as will immediately be seen, strictly confined to heritable rights, having no application in the case of movable property. But, though the distinction has been com- plained of by the highest anthority as tending to ereate embar- Tassinent in the law (see opinion of Lord Chancellor St Leonards*~~

~~*in Dougall v. Dundee Harbour Trustees, 1852, 24 Juri 85), 1*~~

~~*J E $: 2 wrist, 385), it is — too well settled to be departed from. i*~~

~~*. Positive Preseription.—The positive prescripti yas intr ption was intro- aos me the Act 1617, c. 12,—a statute which has been described ie Or : Kames as "the palladium of our land proprictors." After oa forth in the preamble the inconvenience resulting from the oss of titles and the danger of forgery after the means of improba-*~~

~~*In private international law*~~

~~*PRES*®S¢ Prien*~~

~~*tion are lost by the lapse of time, it enacts that whatever heritages the lieges, their predecessors or authors, have possessed by them- selves or*~~

~~*others in their names peaceably, in virtue of infeftments for the space of forty years, continually and together, from the date of their said infeftments, and without any lawful interruption during the said space, they shall not be disturbed therein, provided they produce a written title on which their possession has pro- ceeded. Such written title must be either a charter and sasine preceding the forty years, or, when no charter is extant, instrn- ments of sasine proceeding upon retours or precepts of clare constat. Though the statute in its literal construction only applied to such heritable subjects as had been conveyed by charter and sasine, it was at an early date interpreted so as to include other heritable rights, as servitudes, tacks, pubhe rights of way, &e., where no charter could be supposed to exist. Thus forty years' possession of aroad by members of the public is held to establish a right of way. And any member of the public who uses or may have occasion to use the road is considered to have a good title to plead prescrip- tion. Thus in the celebrated Glen Tilt case a path through Glen Tilt was established as a right of way in an action at the instance of three gentlemen, one of whom was a residenter in Edinburgh and another in Aberdeen (sce Torrie v. Duke of Atholl, 1849, 12 Dun- lop's Reports, 328 ; affirmed in House of Lords, 1852, 1 Macqueen's Tteports, 65). This valuable Act of 1617 was so well framed that it continued to regulate the prescription of land rights till the year 1874. By the Conveyancing Act of that year (37 and 38 Vict. c. 94, s. 34) the period of prescription was shortened from forty years to twenty. It was provided that possessions for twenty years upon 'an ex facie valid irredeemable title recorded in the appropriate register of sasines" should in future give the same right as forty years' possession upon charter and sasine under the earlier law. This Act of 1874 docs not, however, apply to all the cases which fell under the Act of 1617. Thus it has been decided that twenty years' possession on a charter of adjudieation followed by sasine and a declarator of expiry of the legal is insufficient to give an unchallengeable right, an adjudication not being an " ex facie irre- deemable title." (Hinton v. Connel's Trustees, 1883, 10 Rettie's Reports, p. 1110). It is further specially provided by the Act of 1874 that the twenty years' prescription is not to apply to servi- tudes, rights of way, and public rights generally. The following rules apply to the positive prescription. (a) The possession which is required for it must be peaceable, continuons (" continually and together," as the Act of 1617 has it), and uninterrupted. (6) The prescription runs de momento in momentum. (e) The*~~

~~*person against whom the prescription rnns must be major and swi jusis,—a rule which, as regards minority, was specially provided for by the Act of 1617, and as regards other cases of incapacity by the application of the principles of the common law. Under the Conveyancing Act, however, it is provided that in all cases where the twenty years' prescription applies, the lapse of thirty years is to exclude any plea on the ground of minority or want of eapacity.*~~

~~*2. Negative Preseription.—This prescription was introduced by the Act 1469, e. 28, and re-enacted with some modification by 1474, c. 55. At first restricted to personal claims of debt, it was gradually extended in practice and ultimately made applicable to heritable bonds and other heritable rights by the above-men- tioned Act of 1617. By the Act of 1469 it is declared that the person having interest in an obligation must follow the same within the space of forty years and take document thereupon, otherwise it shall be prescribed. The negative prescription accordingly extin- guishes in toto the right to demand performance of an obligation after forty years, the years being reckoned from the day on which fulfilment of the obligation can be first demanded. The lapse of this period of time creates a conclusive presumption—one incapable of being redargued—that the debt or obligation has been paid or fulfilled. But it must be kept in view that the negative pre- scription does not per se—without the operation of the positive— establish a right to heritable property (Erskine, Znst., b. iii. tit. 7, § 8). Thus, as has been observed, "If A has possessed for a hundred years but was not infeft, any competitor who has neglected his right for that time may completely establish it, if his right was better than A's" (yer Lord Corehouse, in Cubbison v. Hyslop, 183, 16 Shaw's Reports, p. 112). Soa right of patronage has been held incapable of being lost by the negative prescription ; but, on the other hand, it is settled that servitudes and public rights of way may be so extinguished. As regards the character of the pre- scription, it is requisite, in the same way as in the case of the positive, that the years shall have run continuously and without interruption, z.e., without any act done on the part of the creditor which indicates his intention to keep alive the right. Such inter- ruption may, for instance, take place by the payment of interest on the debt, or citation of the debtor in an action for the debt, or by a claim heing lodged in the debtor's sequestration. In the same*~~

~~*Way as in the positive, the currency of the negative prescription is suspended by the debtor being minor or non valens agere.*~~

~~*3. Shorter Prescriptions.—There are certain short prescriptions recognized by Scotch law—corresponding to the limitations of*~~

~~*PRE—PR HE*~~

~~*English law—which operate not as extinguishing rights but as _ excluding the ordinary means of proving them. The following require to be noticed. (a) Vicennial prescription. By the Act 1617, c. 13, a vicennial prescription of retours was introduced, and in modern practice the same prescription is applicable to an extract decree of service which has taken the plaee of a retour (31 and 32 Vict. c. 101, § 37). This prescription protects a person who has been served as heir for twenty years against action by any other person claiming to be heir. By the Act 1669, c. 9, holograph missive letters aud bonds in compt books also prescribe in twenty years. The debt, however, is not in this case extinguished, as within forty years it may be proved by the defender's oath. (b) Decennial prescription. By the Act 1669, c. 9, all actions by minors against their tutors and curators, and vice versa, must be prosecuted within ten years from the expiration of the guardian-ship (Erskine, Just., iii. 7, 25). (e) Septennial prescription. By the Act 1695, c. 5, it is provided that no person binding himself for and with another, conjunctly and severally, in any bond or contract for sums of money shall be bound for more than seven years after the date of the obligation. But it is necessary that the cautioner either be bound expressly as such in the bond, &c., or, if bound as co-principal, that there be either a clause of relief in the bond or in a separate baek bond duly intimated (7.e., notarially or in some formal way) to the creditor. This prescription does not apply to guarantees for the fulfilment of an office, or to security for a bill of exchange, or to judicial bonds. (d) Sexennial prescription. This prescription applies to bills and promissory notes, so as to deprive them of their privileges. After the lapse of six years the holder of the bill or note can no longer found on it except as an adminicle of evidence to prove his debt. This pre- scription was first introduced by 12 Geo. III. c«. 72. (¢) Quin- quennial prescription applies to bargains concerning movables, such as sales of goods, loans, deposits, &c.—in short, to all mercantile transactions except such as pass*~~

~~*into current accounts and fall under the triennial prescription noticed below. By the Act 1669, c. 9, such bargains prescribe in five years, and can thereafter only be proved by the debtor's writ oroath. The same statute also made ministers' stipends, multures, and maills and duties prescribe in five years unless proved by writ or oath. (f) Triennial prescription. This valuable prescription was introduced so far back as the year 1579. By the Act 1579, c. 83, it was provided that "actions of debt for house maills, men's ordinaries, servants' fees, merchants' accounts, and others the like debts not founded on written obligations " shall prescribe in three years. Under the terms "like debts" have been held to fall such debts as workmen's wages, law agents' accounts, and rents due on verbal lease. All such debts must be pursued within three years, otherwise they cannot be proved execpt by the writ or oath of the party sued. The period from which this pre- scription begins to run is the date of the last item in the account. With regard to all the minor prescriptions it is to be observed generally that the respective periods of time must have run without interruption, and that, except when the contrary is expressed in the Act constituting the prescription, the years of minority and non valentia agere are not taken into account. (H. GO.)*~~

~~*PRESERVED- FOOD. 'The perfect preservation of any substance for use as food implies the retention of its full nutritive power, sapidity, and digestibility, with its natural odour and colour unimpaired, for such length of time as may be required. The process employed must be sufficiently cheap to allow of the preserved food being placed in the market at a price which will insure a demand for it. The operations connected with the preparation of many food-substances are partly directed to the produc- tion of food in a new and more convenient form from that in which it is yielded by nature, and partly with the view of preserving the alimentary body. Cheese is an example of such a food-preparation, and to a smaller extent so also are butter and other edible fats and oils, as well as fruit and vegetable jellies and conserves. Con- centrated foods and extracts, such as Liebig's extract of beef, belong to the same category, consisting of certain essential principles of animal food easily preserved, and prepared partly on that account.*~~

Many of the most important food-staples require nothing more than favourable natural conditions for their preser- vation, till they are ordinarily required for consumption. Such is the case with the cereal grains, which are suffi- ciently ripened and dried in the harvest field, and with all hard farinaceous and oleaginous seeds, nuts, and fruits. Most soft succulent fruits and vegetables, on the other

hand, and all varieties of animal food require artificial preservation, and it is to these that the various processes in use are applied. These processes resolve themselves into four groups,—(1) drying, (2) use of antiseptics, (3) exclusion of air, and (4) refrigeration. Several hundreds of patents have been obtained in the United Kingdom alone for preservative processes coming under one or more of these heads; but in reality the methods of preservation in practical operation are not many.

1. Drying is the most ancient and primitive of all processes for preserving food, and, although it answers but imperfectly for most animal substances, yet in dry hot countries it is very extensively practised. In the River Plate regions of South America a large quantity of beef is annually prepared for export to Brazil and the West Indies under the name of "tasajo" or '"'charqui dulce," principally by drying. The meat is simply cut into pieces, freed from fat, bone, and tendon, powdered with maize meal, and dried hard by exposure to the sun, care being taken to keep it protected from rain. The dried product has about one-fourth the weight of fresh meat, and is of a dark colour. It requires to be soaked in water and cooked for a long time, yielding at best a tough indigestible meat ; but it makes a well-flavoured nutritive soup. The greater part of the charqui or jerked beef of South America is, however, slightly salted as well as sun-dried ; and among many races where drying is practised the use of salt and smoking are also appreciated. Many attempts have been made to introduce dried meat in the form of powder or meal. For this purpose fresh meat, deprived of fat, is cut into thin slices and slowly dried at a low heat in an oven or heated chamber till the meat is hard, crisp, and dry. When powdered, such a preparation keeps well if it is not exposed to damp; but it cannot be said to offer any advantages for general use, although it might be of value to an army during

~~*a campaign. Nevertheless a company, under the name of the Carne Pura Company, has been established in Berlin within the last few years for the manufacture of such med&t-powder. Of an ana- logous nature are the concentrated soup tablets or cakes, prepared, principally in Russia, by the rapid evaporation of rich soups, with which dried vegetables and flour are sometimes incorporated in proportion sufficient to yield a good soup on dilution with boiling water. These soups are generally deficient in aroma and have frequently an unpleasant gluey consistency and taste. Concentrated meat biscuits, in which flour and extract of beef are prepared in a thoroughly dry condition, and which were largely used in the American Civil War, the German pea sausage ("Erbsenwurst"), made famous during the Franco-Prussian War, and pemmican are examples of food in which dried meat may be well preserved in conjunction with farinaceous substances. Preservation by simple dry- ing is extensively practised among the Chinese for their gelatinous foods, such as trepang, dried tendons, skins, mussels and other molluscs, and fish. Milk also may be preserved in the form of a dry powder, but the result is not sufficiently attractive to command a market.*~~

~~*Succulent fruits and vegetables 'are satisfactorily pre- served by simple drying. The principal dried saccharine fruits of commerce are raisins, currants, figs, dates, and prunes. 'These differ in their nutritive properties con- siderably from the natural fruits they represent, as do also the farinaceous fruits and vegetables preserved by drying, such as the banana, bread-fruit, mandioc, &c. A process of drying and compressing ordinary pot-vegetables and potatoes, invented by M. Masson about 1845, is now carried out on a large scale by Messrs Chollet & Co. of Paris. The vegetables to be treated are carefully picked, plunged into boiling water to coagulate the vegetable al-*~~

~~*bumen, shred, and promptly dried in a current of heated air. They are then submitted to powerful hydraulic pres- sure, condensing them into thin dense cakes, which retain from 9 to 15 per cent. of the weight of the original green substances, or 20 per cent. of the weight in the case of potatoes, but all in greatly reduced compass. The saving of space is, equally with the*~~

~~*preservation, of the utmost importance for use on board ship or by soldiers in the field. Within the space of a cubic metre 25,000 rations of Chollet's compressed vegetables can be packed, each ration weighing 25 grammes and representing about 200 grammes of green vegetables. As anti-scorbutics such preserved vegetables are inferior; but they are neverthe-less exceedingly useful, and when well cooked almost equal in taste to the fresh vegetables.*~~

~~*2. Use of Antiseptics.—The variety of antiseptic sub- stances which have been experimented with for the curing of food is numberless. Bodies solid, liquid, and gaseous have been proposed, and these have been variously recom- mended for superficial application, for injection, and for forming an artificial atmosphere around the substance to be preserved ; and further, it has been suggested that the creature whose flesh is to be preserved should, before killing, be impregnated with the antiseptic by inhalation or otherwise. In practice the antiseptics used are very few in number, since many of them have a physiological effect on the digestive and other internal organs into which they are introduced with the food, and so must injure the health. Besides, many proposed antiseptics are either in themselves unpleasant in smell or taste, or alter the appearance, colour, taste, or consistency of the food preserved. The least objectionable are substances which enter into human food themselves, such as certain salts, sugar, vinegar, and alcohol. The most ancient, most com- monly used, and throughout most effective is common salt. Salt acts on meat by withdrawing the animal juices, the place of which it takes, and by hardening the muscular tissue. Consequently it seriously lessens the nutritive value of animal food, and renders it much less digestible than fresh meat. It appears to be least injurious in the case of pork, the fat of which it renders more digestible, and, as a consequence, no animal food is more largely pre-served by the process of salting. A certain proportion of other saline bodies, notably saltpetre (nitrate of potash), and of sugar is frequently combined with salt in curing, and so also are other antiseptic and preservative agencies. Bacon, for example, is both salted and smoked, while tongues and fish are not only salted and smoked but also dried. Smoking alone is very effective in preserving and flavouring fish intended for consumption within a limited time after curing. The quantity of fish prepared for human food by salting, smoking, and drying, together or separately, is incalculably great.*~~

~~*Of other antiseptics which have been suggested, and which may be used effectively for the pre- servation of food, few possess any advantage whatever over common salt, which is certain in its action, abundant, cheap, and, within limits, harmless. Among the substances which have of recent years come into prominent notice are bisulphite of lime and various preparations of boracic acid, notably that known as "glacialin" salt and the boro-glycerin introduced by Professor Barff. Boracic acid 1s a powerful, inodorous, and tasteless preservative ; but in repeated small doses it exercises a specific influence on the excretory organs which must be detrimental to health. Salicylic acid has also been extensively tried as a food- preserver, more especially for milk, but, in addition to the unpleasant taste it communicates to the substances, there are physiological objections to its use,*~~

~~*The use of non-saline preservative agents is exemplified on a large scale in the pickling in vinegar of succulent fruits*~~

~~*PRESERVED FO'; D*~~

~~*and vegetables (see Picxies, p. 80 above). Sugar plays a similar part in the preparation of jams, jellies, candied fruits, &c., and alcohol is also occasionally employed as a medium for the preservation of fruits. Oil acts as a preservative more by its power of excluding atmospheric air than from any antiseptic influence it possesses, and therefore comes under the next category.*~~

~~*3. Exclusion of Atr.—The principal method of food preservation dependent on the exclusion of air is the invention of Francois Appert and dates from 1809. It consists essentially in securing cooked food in hermetic- ally sealed vessels from which the atmospheric air is as far as possible driven off before sealing, and in killing by heat or otherwise such germs or ferments as may remain within the vessel either before or after it is sealed up. The process does not depend for its success on the perfect exclusion of air,—indeed, originally there was no attempt to drive it off, but air sealed up with the food was im- mediately submitted to a temperature sufficiently high to kill all germs introduced with it and existing in the food itself. Quite recently experiments have been conducted by Mr J. J. Coleman, the inventor of the cold-air process described below, with the view of*~~

~~*preserving food in her- metically sealed vessels, which, instead of being exposed to heat, are subjected to an intense cold, supposed to be sufficient to kill all minute putrefactive organisms ; but he has found that a cold of 130° Fahr. below freezing-point is insufficient to destroy all organic germs. At present the innumerable varieties of tinned foods, both animal and vegetable, are entirely the result of the application of Appert's principle. In practice there are several processes of ' "tinning" food, but the general method adopted is everywhere uniform in principle.*~~

~~*The tins used are manufactured with the greatest care, and most ingenious machinery has been devised for their thorough and ex- peditious preparation. The proper quantity of meat, generally, though not necessarily, free from bone, tendon, and undue propor- tion of fat, is weighed out and placed raw in the tin, over which the cover is soldered. In the cover a small " pin-hole"' is left, and the tins are placed in a bath or boiler of solution of chloride of calcium, which boils at a temperature of from 260° to 270° Fahr. Each tin is immersed to within an inch or two of the top, and as the heat is gradually raised steam issues from the pin-hole, carrying off the atmospheric air from within the tin. When all the air has been expelled the pin-hole is promptly closed with a drop of solder, and the tin, hermetically sealed, is entirely immersed for some time in the superheated solution. When withdrawn and cooled, the tins are placed in a heated testing-house, in which after a few days those that have been imperfectly treated manifest their defects by a bulging of the sides, due to the generation of gases from the putrefying mass they contain. Those which have been successfully preserved generally show both ends collapsed or depressed by the pressure of the air outside; and usually on a well-preserved tin being pierced the air is audibly sucked in.*~~

~~*The process is applicable to all classes of food, vegetable as well as animal, which may without destruction be sub- mitted to a temperature sufficient to render putrefactive organisms inert, and in experience the amount of heat to which different substances must be exposed varies very con- siderably. The variety of substances preserved by tinning is now very great, and the total weight of human food so stored is enormous. Numerous modifications of the air- exclusion principle, effectual within certain limits, are in use. The preservation of sardines is due partly to cooking them in oil and*~~

~~*surrounding them with it and partly to sealing them in tins, and potted meats, the "conserves fines" of the French, are partly preserved by the use of fat. The most effective means of preserving eggs consists in coating the shells, as soon as they are laid, with butter or some other fat, gum, or varnish. Such coating prevents the transfusion of water from the egg which ordinarily goes on, the place of the water being taken by atmospheric air, rendering the egg specifically lighter and promoting its putrefactive change. Processes for the exclusion of air*~~

~~*by the substitution of an atmosphere of some inert gas have not proved successful, neither has the method pro- posed and patented by Dr Redwood, which consisted in coating meat with a layer of paraffin.*~~

~~*4. Refrigeration.—That cold checks putrefaction has long been known from ordinary experience. Bodies of the prehistoric mammoth have been found in the ice of the Siberian tundra so well preserved that the flesh was eaten by dogs. Ice is much used by fish merchants and other provision dealers for the temporary preservation of their perishable stores ; but the cost and inconvenience of the process in temperate, and still more in hot, climates render it applicable only for brief spaces of time and to the more costly of food-products. But about the year 1875 ice began to be used on a large scale for the preservation of fresh meat during its transit from America to the European markets. This, the first practically successful method of preserving fresh meat for such a period as enabled it to be sold in remote markets, consisted in cooling a large meat chamber hung full of carcases by continually blowing into it air which had previously been cooled to near the freezing point by being made to pass through reservoirs of ice. The process was not all that could be desired, but it successfully solved a question which had previously been attempted many times and ways. It continued to be the method by which large quantities of fresh meat were brought in good condition to the European market, till in 1879 Mr J. J. Coleman inaugurated a new era by the introduction, in conjunction with Mr H. Bell and Mr J. Bell, of his Bell-Coleman dry- air refrigerator.*~~

~~*In the Bell-Coleman machine atmospheric air is compressed to one-fourth or one-third of its normal bulk in an air-pump by means of a steam cylinder.*~~

~~*The air so condensed becomes hot, and is cooled by injecting water into the air-compressor, after which it is still further reduced in temperature and freed from moisture by passing it through a range of pipes in the cold air of the chamber that is being refrigerated. Being then conveyed to the expanding cylinder, the work or energy it contains in virtue of its compression is expended in moving a piston which forms part of the machinery. From the piston the air, now cooled as much as 50° to 100°, or even 200° Fahr., according to the degree of com- pression to which it has been subjected, is distributed through the cold chamber by suitable pipes. Mr A. Seale Haslam has since brought out a refrigerator in which the temperature of the air is lowered by passing it through pipes cooled externally, instead of by injecting water into the tubes containing it.*~~

~~*Numerous other machines have also been produced, the principle and action of which are illustrated in the article Icx, vol. xii. p. 612. By means first of the Bell-Coleman and subsequently of the Haslam method, fresh meat has been regularly imported into Europe from America since March 1879, when the Anchor liner "Circassia" delivered the first cargo. In February 1880 the first shipment from Australia, consisting of 34 tons of beef and mutton, was delivered in London by the "'Strathleven," and in June 1882 the sailing ship "' Dunedin" brought from New Zea- land to London, after a passage of ninety-eight days, 4909 carcases of sheep and twenty-two pigs, all in perfect con- dition, notwithstanding the prolonged voyage and the ex- cessive heat encountered during the passage. The dry-air refrigerators have also been largely adopted in passenger and emigrant vessels for preserving fresh provisions for daily use throughout their voyages, and preserving cham- bers and freezing chambers have been erected on land at the ports of lading and delivery. The machinery at present in use is capable of freezing upwards of 300,000 tons of meat per annum, and it is rapidly being added to ; and. it may be said that these machines have accomplished a perfect solution of the great problem of fresh-meat pre- servation and distribution.*~~

~~*Comnvrce.—lt is impossible to tabulate any reliable figures relating to the trade in products which are properly classed as*~~

preserved food. Within the first five years in which the Bell- Coleman machine was in use there were brought from America by its agency alone 563,568 quarters of beef and 113,633 carcases of mutton. The following figures illustrate the development of the frozen-mutton trade from the great sheep-growing localities, giving the number of carcases imported.

1881. 1882. 1883. 1884.

New Zealand …..... ™ 8,840 98,754 398,859 'Australia …. ⁺ ..... — 18,771 55,087 60,717 107,437 River Plate ……..... — _ = 54,369

As these imports bear only an insignificant relation to the supplies which might be drawn from the several countries at the present moment, it is obvious that a most important factor has been intro- duced into the meat trade which will exercise a powerful influence on the markets. (J. PA.)

PRESSBURG (Hung. Pozsony, Lat. Posoniwm), capital of the county of the same name and in former times also of the country, is a royal free town in Hungary, situated on the left bank of the Danube, in 48° 8' N. lat. and 17° 6' E. long. Pressburg is the see of an evangelical bishop, and the headquarters of one of the fifteen army-corps of the Austrian-Hungarian army and of a honved district ; its civil departments include finance, posts, land-survey- ing, state forestry, public instruction, river regulation, and Government buildings; it has also a district court of justice, a superior law court, and a chamber of trade and commerce. Among its numerous educational and benevolent institu- tions the following are specially worthy of mention—the academy of jurisprudence and philosophy, a Roman Catholic upper gymnasium, an evangelical lyceum, an evangelical seminary, an upper real school, a Government training school for governesses and another of midwifery, schools of music and drawing, two free libraries, a lazaretto, a lunatic asylum, six hospitals, two workhouses, two public kitchens, &c. The most prominent buildings are—a fine cathedral, dating from the 11th century (in which many of the Hungarian kings were crowned), twelve other Roman Catholic churches, two evangelical churches, two syna- gogues, the ancient town-hall, the parliament house (which served for this purpose until 1848), the now uninhabited palace of the archbishop of Esztergom (Gran), a number of palaces of nobles, and the theatre. On the Schlossberg there stood a royal

~~*castle (destroyed by fire in 1811), which was a strong fortress during the wars with the Turks. The inhabitants in 1881 numbered 48,326, of whom 8000 were Protestants, 5000 Jews, and the rest Roman Catholics; as to nationality, 30,000 were Germans, 9000 Slavs, and the rest (chiefly the upper classes) Hungarians. The inhabited houses numbered 2015. The town has five newspapers (three in Hungarian and two in German). A large business is carried on in tobacco and cigars, paper, ribbons, leather wares, chemicals, liqueurs, confectionery, biscuits, &c. There is also a good trade in corn and wine. The Danube, here of considerable width, is crossed by a pontoon bridge. There is a large traffic by water with both Vienna and Budapest. Pressburg is the terminus of the Vale of Vag Railway and is also one of the most important stations on the Austrian-Hungarian State Railway system. Although one of the finest towns in the country, its chief charm is its vicinity, which is of singular beauty. Eastwards and southwards stretches a long fertile plain, whilst to the north and west the town is enclosed by the lovely hills of the Little Carpathian range.*~~

~~*Little is known of the early history of Pressburg. The name does not occur before the 9th century. In 1042 it was destroyed by the Germans, but was soon afterwards rebuilt and so strongly fortified that it sustained two other attacks and was not taken again until 1271. From its strategic situation it has always been an import- ant place. When in 1541 Buda was taken by the Turks, Pressburg became the Hungarian capital, place of coronation, and seat of all the Government offices, and it remained so a good while after the Turks were driven from the country. It was here that the Austrian*~~

~~*and Hungarian malcontents concluded the treaty with Archduke Matthias against Rudolf II. In 1619 Pressburg was taken by the Protestant leader Bethlen Gabor; but it was recovered by the im- perialists in 1621. It was also the scene of that memorable session of parliament, 1687, at which the Hungarians renounced their right of choosing their king and accepted the hereditary succession. In 1784 the capital was removed to Buda. Peace was made here be- tween Napoleon and Francis I. after the battle of Austerlitz, 26th December 1805, and in 1809 Davoust bombarded the place for a*~~

~~*whole month. It continued to be the seat of parliament until 1848, and it was the scene of the great reform debates during the session*~~

~~*of 1847-48.*~~

~~*PRESS LAWS. 'The liberty of the press has always been regarded by modern political writers as a matter of supreme importance. " Give me liberty to know, to utter, and to argue freely according to conscience, above all other liberties," says Milton in the Areopagitica, At the present day the liberty of the press in English-speaking countries is (with perhaps the single exception of Treland) a matter of merely historical importance. The liberty was a plant of slow growth. Before the invention of printing the church assumed to control the expression of all opinion distasteful to her. (See BrsrioGRaPHy, vol. ii. pp. 658, 659, INDEX Lisrorum Prouiprrorum, Inquisirion.) The authority of parliament was invoked in England to aid the ecclesi- astical authority. There is an ordinance as early as 1382, 5 Ric. II. st. 2, c. 5 (not assented to by the Commons, but appearing upon the parliament roll), directed against unlicensed preachers. After the invention of printing the ecclesiastical censorship was still asserted, but only as col- lateral with the censorial rights of the crown, claimed by virtue of its general prerogative. After the Reformation the greater part of the rights of censorship passed to the crown, which at the same time assumed the power of grant- ing by letters patent the right of printing or selling books as amonopoly. The grant, if made to the author himself, was an equivalent of copyright ; if made to a person other than the author, it seems to have always been subject to the author's copyright as it existed at common law.*~~

~~*Censorship was either restrictive or corrective, 7.¢., it interfered to restrict or prevent publication, or it enforced penalties after publication. Repression of free discussion was regarded as so necessary a part of government that Sir Thomas More in his Utopia makes it punishable with death for a private individual to criticize the conduct of the ruling power. Under Mary printing was confined to members of the Stationers' Company, founded by royal charter in 1556. Under Elizabeth the Star Chamber, the great censorial authority of the Tudor period, assumed the right to confine printing to London, Oxford, and Cam- bridge, to limit the number of printers and presses, to prohibit all publications issued without proper licence, and to*~~

~~*enter houses to search for unlicensed presses and publications (Order of 1585, Strype's Whitgift, App. 94). The search for unlicensed presses or publications was entrusted to an officer called the "messenger of the press." The Stuart kings followed the example of their predecessors. Thus in 1637 was issued a stringent order of the Star Chamber forbidding the importation of books printed abroad to the scandal of religion or the church or the Government, and the printing of any book not first lawfully licensed. Law books were to be licensed by one of the chief justices or the chief baron, books of history and state affairs by one of the secretaries of state, of heraldry by the earl marshal, of divinity, philosophy, poetry, and other subjects by the archbishop of Canterbury or the bishop of London, or the chancellors or vice-chan- cellors of the universities. . There were to be only twenty Inaster printers and four letter-founders. The punishment was at the discretion of the court (Rushworth, Historical Collections, vol. ui, App. 306). The same principle of press restriction was carried out by the Long Parliament*~~

~~*PRE—PRHE*~~

~~*after the abolition of the Star Chamber, and it was an ordi- nance of that body issued in 1643 that called forth Milton's Areopagitica, a Speech for the Liberty of Unlicensed Printing, itself an unlicensed book. The parliament appointed committees for printing, who appointed licensers, but the licensing was really left in a great measure to the wardens of the Stationers' Company. At the Restoration Sir John Birkenhead acted as licenser, appointed apparently under the general prerogative. It was, no doubt, too, under the general prerogative that Charles IL, by a proclamation in 1660, called in and suppressed Milton's Defensio pro Populo Anglicano. Then followed the Licensing Act of 1662 (13 and 14 Car. II. c. 33), limited to two years, The provisions as to importation of books, the appointment of licensers, and the number of printers and founders were practically re-enactments of the similar provisions in the Star Chamber order of 1637. Printing presses were not to be set up without notice to the Stationers' Company. A king's messenger had power by warrant of the king or a secretary of state to enter and search for unlicensed presses and printing. Severe penalties by fine and imprisonment were denounced against offenders. The Act was success- ively renewed up to 1679. Under*~~

~~*the powers of the Act Sir Roger L'Estrange was appointed licenser, and the effect of the supervision was that practically the newspaper press was reduced to the London Gazette. (See NEWSPAPERS, vol. xvii. pp. 414,415.) The objections made to lines 594- 599 of the first book of Paradise Lost by the archbishop of Canterbury's chaplain, acting as licenser, are well known. The Act expired in 1679, and for the remainder of the reign of Charles IL, as in the reign of George III., the restrictions on the press took the form of prosecutions for libel. The twelve judges resolved in 1680 "that all persons that do write or print or sell any pamphlet that is either scandalous to public or private persons, such books may be seized and-the person punished by law ; that all books which are scandalous to the Government may be seized, and all persons so exposing them may be punished. And further, that all writers of news, though not scan- dalous, seditious, nor reflective upon the Government or the state, yet, if they are writers (as there are few else) of false news, they are indictable and punishable upon that account" (Harris's case, State Trials, vii. 929). In 1685 the Licensing Act was renewed for seven years (1 Jae. II. c. 8, § 15). "No mention of the liberty of the press was made in the Bill of Rights. On the expiration of the Licensing Act in 1692 it was continued till the end of the existing session of parliament (4 and 5 Will. and Mary, c. 24,§ 14). In 1695 the Commons refused to renew it. The immediate effect of this was to lay authors open to the attacks of literary piracy, and in 1709 the first Copyright Act (8 Anne, c. 19) was enacted for their protection. The power of a secretary of state to issue a warrant, whether general or special, for the purpose of searching for and seizing the author of a libel or the libellous papers them- selves—a power exercised by the Star Chamber and con- firmed by the Licensing Act —was still asserted, and was not finally declared illegal until the case of Entick v. Car- rington in 1765 (State Trials, xix. 1030). In 1776 the House of Commons came to a resolution in accordance with this decision. The compulsory stamp duty on news- papers was abandoned in 1855 (18 Vict. c. 27), the duty on paper in 1861 (24 Vict. c. 20), the optional duty on newspapers in 1870 (33 and 34 Vict. c. 38). From that time the English press may be said to date its complete freedom, which rests rather upon a constitutional than a legal foundation. It is not confirmed by any provision of the supreme legislative authority, as is the case in many countries. A declaration in favour of the liberty of the press is usually a prominent feature in the written*~~

~~*Pats > LAWS*~~

~~*constitutions of foreign states. Its legal aspect in England cannot be better expressed than in the words of Lord Wynford :— .*~~

~~*"My opinion of the liberty of the press is that every man ought to be permitted to instruct his fellow-subjects ; that every man nay fearlessly advance any new doctrines, provided he docs so with proper respect to the religion! and government of the country; that he may point out errors in tle measures of public men, but he must not impute criminal conduct to them. 'The liberty of the press cannot be carried to this extent without violating another equally sacred right, the right of character. This right can only be attacked in a court of justice, where the party attacked has a fair opportunity of defending himself. Where vituperation begins, the liberty of the . ends" (Rex v. Burdett, Barnewall and Alderson's Reports, iv. 182).*~~

~~*The few existing restrictions on the liberty of the press are presumed to be imposed for the public benefit. They are in some cases of great historical interest. The rights of private persons are in general sufficiently protected in one direction by the law of Lipen (¢.v.), in another by the law of Copyricut (9.v.), while the criminal law provides for the cases of press offences against morality, public justice, &c. Thus the courts have power to punish sum- marily as a contempt the publication of comments upon proceedings sub judice or reflexions upon the conduct of judicial officers. (See Contempt or Court.) The last relic of the censorship before publication is to be found in the licensing of stage plays. By 6 and 7 Vict. c. 68 no new plays or additions to old plays can be acted for hire at any theatre in Great Britain until they have been sub- mitted to the lord chamberlain, who may forbid any play or any part of a play. The penalty for acting a play before it has been allowed or after it has been disallowed is a sum not exceeding £50 for every offence and the for- feiture of the licence of the theatre in which the offence occurred. This jurisdiction is exercised by an official of the lord chamberlain's department called the 'examiner of stage plays." The last relic of the monopoly of print ing formerly granted to licensees of the crown is found in the exclusive right of the queen's printer and the univer- sities of Oxford and Cambridge to print the Bible? and the Book of Common Prayer, and of the queen's printer to print Acts of parliament and other state*~~

~~*documents. The privileges of the universities are confirmed by 13 Eliz. c. 29. The rights of the queen's printer are protected by severe penalties. A maximum term of seven years' penal servitude is incurred by any person who prints any Act of parliament or other Government document, falsely pur- porting to be printed by the queen's printer or under the authority of Her Majesty's stationery office (8 and 9 Vict. ce. 113; 45 Vict. c. 9). The rights of the printers of the journals of either House of parliament are protected by 8 and 9 Vict. c. 113. The publication of parliamentary debates in any form by any other persons than the printers of the journals of the two Houses is still in theory a breach of privilege, but in practice they have been fully reported since 1771. The other restrictions upon the press are to a great extent those imposed for police purposes. By 32 and 33 Vict. c. 24 (confirming in part previous enactments applying to Great Britain) the printer of any paper or book for profit is required under penalties to print thereon his name and address or the name of a university press, and is to keep a copy of everything printed, with a few exceptions. Penalties must be sued for within three months, and no proceeding for penalties can be commenced*~~

~~*1 This is to be read subject to the remark of Lord Coleridge that the application of the principles of law is to be changed with the changing circumstances of the time (Reg. v. Ramsay, in Cox's Criminal Cases, xv. 235). What was blasphemous in law a hundred years ago is not necessarily so now.*~~

~~*2 The monopoly of the queen's printer does not extend to any trans- lation other than the authorized version, and not to that if it be accompanied by new notes or marginal readings.*~~

~~*lil*~~

~~*unless in the name of the attorney-general or solicitor- general of England or the lord advocate of Scotland. By the Newspaper Libel and Registration Act, 1881 (44 and 45 Vict. c. 60, which applies to England and Ireland, but not to Scotland), newspaper proprietors are, except in the case of joint-stock companies, to be registered and to make annual returns of the title of the newspaper and the names of all the proprietors, with their occupations, places of business, and places of residence. By the Corrupt Practices*~~

~~*Prevention Acts, 1883 and 1884 (46 and 47 Vict. c. 51, s. 18, and 47 and 48 Vict. c. 70, s. 14), the name and address of the printer must be printed on all bills, placards, &c., referring to a parliamentary or muni- cipal election. By 6 and 7 Vict. c. 68, s. 7, the name and place of abode of a manager of a theatre are to be printed on every play-bill announcing a representation at such theatre. Offences against decency by the press are provided for by 20 and 21 Vict. c. 83, 25 and 26 Vict. cc. 101, s. 251 (for Scotland), and 2 and 3 Vict. c. 47, s. 54 (for the metropolis). The importation of obscene literature into the United Kingdom is forbidden by 39 and 40 Vict. c. 36, s. 42. By the Larceny Act, 1861, any person who prints or publishes an advertisement offering a reward for the return of stolen goods with- out questions asked is subject to a penalty (24 and 25 Vict. c. 96, s. 102). This penalty cannot, however, be sued for without the sanction of the attorney-general or solicitor-general of England or Ireland (33 and 34 Vict. cc. 65). The advertisement in the United Kingdom of foreign or illegal lotteries is prohibited by 6 and 7 Will. IV. c. 66, betting advertisements by 16 and 17 Vict. ¢. Ae 1, "amd 31 Vaet.¢. 85…*~~

~~*The right of an author or publisher to the full profits of his undertaking was at one time restricted by the Copy- right Act of Anne (8 Anne, c. 19, s. 4), by which the arch- bishop of Canterbury and other authorities were empowered to lower the price of a book upon complaint that the price was unreasonable. The only restriction of the kind now existing is the obligation of delivering (without request) to the British Museum a copy of any work published within the United Kingdom, and of delivering (on request) copies for the use of the university libraries at Oxford and Cambridge, the library of the faculty of advocates at Edinburgh, and the library of Trinity College, Dublin (5 and 6 Vict. c. 45, ss. 6-10).*~~

~~*Scotland.—Printing became, as in England, a royal monopoly. The exclusive right of printing was granted by James IV. to Walter Chepman, who printed the first book in Scotland. The monopoly of printing Acts of the Scottish parliament was granted by James V. to the printer chosen by the clerk register and specially licensed by the king (1540, c. 127). Printers are forbidden by 1551, c. 27, to print, whether in Latin or English, without licence from ordinaries deputed in that behalf by the crown. No book treating of religion or of the kirk was to be printed without a licence from*~~

~~*the general assembly (1646, c. 164), or of the kingdom without a licence from one of the judges or the secretary (c. 165). The council were empowered to prohibit presses at their discretion by the order of 30th March 1655. The importation of "famous" books and libels in defence of the pope was prohibited by 1581, c. 106. Press offences were treated with the utmost severity. By 1585, c. 1, the author of a libellous writing against the king was punishable with death. It is scarcely neces- sary to say that since the Union the press of Scotland has enjoyed no less liberty than that of England.*~~

~~*In the case of Bibles, Old and New Testaments, Psalm Books, the Book of Common Prayer, the Confession of Faith, and the Larger and Shorter Catechisms a licence for printing is still required. The licensing authority is*~~

~~*the lord advocate, but all proposed publications are sub- mitted for approval to the body officially known as i Her Majesty's sole and only Master Printers in Scotland," con- sisting of the lord advocate, the solicitor-general, the moderator of the general assembly, and four other mem- bers, A licence is also required for printing Acts of parlia- ment ; but a general licence granted in 1848 to a firm of printers in Edinburgh is still operative, and their publi- cations are not submitted for approval. As its work is practically confined to Bibles and the other religious publi- cations enumerated, the above-mentioned body commonly receives the name of the Bible Board.*~~

~~*Treland.—This is the only part of the United Kingdom in which the press cannot be said to be free. The policy of successive Governments has generally been in favour of restrictions. By the Prevention of Crime Act, 1882 (45 and 46 Vict. c. 25), the lord-lieutenant was empowered to order the seizure of any newspaper appearing to contain matter inciting to the commission of treason or of any act of violence or intimidation (§ 13). He may also by war- rant direct the search for and seizure of any papers or documents suspected to be used or to be intended to be used for the purpose of or in connexion with any secret society existing for criminal purposes (§ 14).*~~

~~*United States.*~~

~~*The constitutions of Pennsylvania, Delaware, Maryland, and North Carolina, all enacted in 1776, are interesting as containing the earliest declarations of any legislative authority in favour of the liberty of the press. The same principle was afterwards adopted in the constitution of the United States. By art. i. of the amended constitution, "Congress shall make nolaw . . . abridging the freedom of speech or of the press." Art. iv. secures against warrants for the seizure of papers, except on probable cause supported by oath or affirmation and particularly describing the thing to be seized. The constitution of Louisiana is that in which the right of liberty of the press is declared with the greatest minuteness. By art. vi. s. 21 of the constitution of that State, " Printing presses shall be free to every person who undertakes to examine the proceedings of the legislature or any branch of the government, and no law shall ever be made to restrain the right thereof. The free communication of thoughts and opinions is one of. the invaluable rights of man, and every citizen may freely speak, write, and print on any subject, being responsible for the abuse of that liberty." The Acts of Congress dealing with the press are not numerous, as each State has for the most part its own legislation on the subject, dealing generally with, among other matters, the registration of newspapers, the monopoly of the State printer, and the right of giving the truth in evidence in defence to proceedings for libel. The Act of 18th August 1856 forbids diplomatic or consular officers of the United States to correspond with any foreign news-paper in regard to the affairs of a foreign state. The Act of 3d March 1873 prohibits the printing and circulation of obscene literature. By the Act of 23d June 1860 the congressional printer has, except where otherwise provided by law, the monopoly of printing for the Senate or House of Representatives and the executive and judicial depart- ments. State prosecutions for seditious libel were not infrequent in the early years of the republic; examples will be found in Wharton's State Trials.*~~

~~*Press Laws in the British Colonies and India.*~~

~~*Colonies.—In the British colonies the press is as free as it is in England. Each colony has its special legislation on the subject for police and revenue purposes. Where there is a Government printer, his monopoly is protected*~~

~~*by the Documentary Evidence Act, 1868 (31 and 82 Viet. e. 37), which imposes a maximum*~~

~~*LAWS*~~

~~*penalty of five years' penal servitude upon any person printing a copy of any proclamation, order, or regulation which falsely pur- ports to have been printed by the Government printer, or to be printed under the authority of the legislature of any British colony or possession. The Act is, however, subject to any law made by the colonial legislature.*~~

~~*India.—During the governor-generalship of Lord Lytton was passed the "Act for the better control of publications in Oriental languages," Act ix. of 1878. (1) By this Act copies of newspapers published out of British India are liable to forfeiture and seizure by warrant throughout the whole of British India if the papers "contain any words, signs, or visible representations likely to excite disaffection to the Government established by law in British India, or antipathy between any persons of different races, castes, religions, or sects in British India." The governor-general may, by noti- fication in the Gazette of India, exclude newspapers, books, &c., from British India. (2) In places to which the Act is extended by order of the governor-general in council, a magistrate may require the printer aud publisher of a newspaper to enter into a bond, with a deposit, not to publish a newspaper containing "any words, signs," &c. (as in 1), or to use or attempt to use it for the purpose of extortion or threat. The consequences of offending are forfeiture of the deposit, papers, press, &c. Books used for the illegal purposes above-mentioned are subject to forfeiture, but no bond or deposit is required previous to publication of books, as in the case of newspapers.*~~

~~*Foreign Press Laws.*~~

~~*Liberty of the press is the rule in most European states. This liberty is in almost every case secured by a constitution or organic law, the earliest being those of Sweden and Spain in 1812. In some states there is a tax upon newspapers and advertisements ; in others, as in Sweden and Norway, there is none. In most states there is a Government official newspaper, and a Government printer, enjoying peculiar privileges.*~~

~~*Austria-Hungary.—Restraints upon the press were formerly very stringent, especially in the Italian provinces. Severe penalties against unlicensed printing were denounced by the penal code of 1808. Fora second offence the offender was forbidden to deal in books. Private printing presses were forbidden under a fine of 500 florins. Inciting to emigration was one of the most reinarkable press offences contained in this code. Two censors of the press were appointed in 1810. Booksellers were put under police supervision in Hungary in 1847. In 1848 the press became free for a time, until a restrictive law was again imposed in 1852. Strict censorship ceased in 1863. By the fundamental law concerning the rights of citizens, 21st December 1867, art. 13, every one has the right of freely ex- pressing his thoughts by the press within the limits imposed by law. The press cannot be controlled by ceusorship, or restrained by the system of authorization. Administrative and postal inter- diction is never to extend to matters printed in the realm. By the law of the same date on judicial authority, art. 11, press offences are to be tried by jury. The constitution of 1867 (on the basis of that proposed in 1848) secures liberty of the press in Hungary.*~~

~~*Belgium.—It was the prosecution of political writers by the Dutch Government that directly led to the independence of Belgium in 1830. By the Belgian constitution of 7th February 1831, art. 18, it is declared that the press is free, that censorship shall never again be established, that sureties cannot be exacted from writers, editors, or printers, and that when the author is known and domi- ciled in Belgium the printer or bookseller cannot be prosecuted. By art. 98 press offences are to be tried by jury. The penal law of the press is contained in the decree of 20th July 1831, made perpetual in 1833. By this law it is made an offence, apart from the penal code, (1) to incite to the commission of a crime by placards or printed writings in a public meeting ; (2) to attack the obligatory force of the laws,*~~

~~*or to incite to disobedience of them ; (3) to attack the constitutional authority or inviolability of the king, the constitu- tional authority of the dynasty, or the authority and rights of the chambers. Every copy of a journal must bear the name of the printer and the indication of his domicile in Belgium. Proceedings for offences against the law must be taken in some cases within three months, in others within a year. .*~~

~~*Brazil.—By art. 179 of the constitution of 1824 every one is entitled to express his thoughts by words and writings and publish them in print without liability to censure, but he is answerable for abuses committed in the exercise of this right.*~~

~~*(In most, if not all, of the Central and South American republics liberty of the press is one of the rights secured by the constitution. Thus in Chili it is secured by the constitution of 1833, in the Argentine Republic by that of 1860.)*~~

~~*Denmark.—Press offences were at one time punished with great severity. By the code of Christian V. (1683) libel was punished with infamy and hard labour for life, and, if against a magistrate,*~~

~~*I The writer wishes to take this opportunity of acknowledging the assistance rendered him by representatives of several foreign Govern- ments.*~~

~~*PRESS*~~

~~*with death. Censorship was abolished and the press declared free by art. 86 of the constitution granted by Frederick VII. on 5th June 1849, and confirmed by Christian IX. in 1866. Art. 81 for- bids the search for or seizure of printed matter in a dwelling-house, unless after judicial proceedings.*~~

~~*France.—The Government began early to impose stringent re- strictions upon printing. An edict of Henry II. in 1559 made it punishable with death to print without authority. The university of Paris originally claimed the right of licensing new theological works, a jurisdiction vested in the crown by an ordinance of 1566. Offences against religion were severely punished by the secular authorities. Thus the parliament of Toulouse sent Vanini to*~~

~~*the stake in 1619 for the crime of publishing a heretical work. A few years later, in 1626, Cardinal Richelieu declared it a capital offence to publish a work against religion or the state. In 1723 appeared a regulation forbidding any but licensed booksellers to deal in books. Many later regulations were directed against unlicensed presses, the employment of more than a certain number of workmen, &c. At the Revolution all these restrictions were abolished, aud the assembly declared it to be the right of every citizen to print and publish his opinions. This new liberty quickly needed a cheek, which was attempted as early as 1791, but no effectual restraint was imposed until the law of 5th February 1810 established a direction of the press. The charter of Louis XVIII. in 1814 gave liberty to the press in express terms, but restrictions soon followed. In 1819 a system of suretics (cautionnements) replaced the censor- ship. The Revolution of 1830 was caused by, inter alia, one of the ordinances of St Cloud (25th July 1830) for suspension of the liberty of the press. Restrictions on the liberty were removed for the time in 1830 and 1852, only to be succeeded as usual by the press laws of 1835 and 1852. During the second empire Govern- iment prosecutions for libel were used as a powerful engine against the press. The proceedings against Montalembert in 1858 are a well-known instance. Between 1858 and 1866 many newspapers were suppressed by proclamation. With the republic: liberty of the press was completely re-established. A decree of 27th October 1870 submitted press offences to trial by jury. The law of 29th July 1881, by which the French press is now regulated, begins by asserting the liberty of the press and of bookselling. The principal limitations of this liberty are the prohibition to publish criminal proceedings before hearing in public, or lists of subscriptions for indemnifying an accused person, and the power of forbidding the entrance of foreign newspapers under certain circumstauces (see vol. xvii. p. 427). The order of responsibility for printed matter is (1) the manager or editor, (2) the author, (3) the printer, (4) the vendor or distributor. Proceedings for breaches of the law must be taken within three months. As to taxation, the decree of 5th September 1870 abolished the stamp duty upon newspapers, but it is still imposed upon public notices (afiches) other than those of public anthorities. None but the notices of public authorities may be printed on white paper.*~~

Germany.—Censorship was introduced by the diet of Spires in 1529. From that time till 1848 there were nnmerous restrictions on the liberty of the press. One of the most important was a resolution of the diet of 20th September 1819, by which newspapers were subject to licence and police supervision in each state. Liberty dates, as in Austria and Italy, from 1848. Soon after that year, however, it became necessary to establish press laws in most of the German states, as in Bavaria in 1850, Prussia and Baden in 1851. Since the establishment of the new empire eensorship has dis-appeared. By art. 74 of the constitution of the empire (1871) every one attacking the empire or its officers through the press is liable to punishment in his own state. By art. 4 the laws relat- ing to the press are under imperial and not local control. The press law of 7th May 1874 is therefore in force throughout the whole empire. At its beginning it affirms the liberty of the press. Its main provisions aré these. The name and address of the printer must appear on all printed matter. Newspapers and periodicals must in addition bear the name of some one person, domiciled in

the empire, as responsible editor, and a copy of every number must |

be deposited with the police authorities of the district in which it is published. Foreign periodicals may be exeluded by proclamation of the imperial chancellor for two years, if twice within the year they have been guilty of certain offences against the penal eode. Criminal proceedings are not to be reported while still sub judice. The order of responsibility for offences is the same as in France. Proceedings must be taken within six months. In certain cases printed matter may be seized without the order of a court. This may take place where (1) the publication does not bear the name of printer or editor, (2) military sceerets are revealed in time of war, (3) justice would be defeated by the publication not being immediately seized. A judicial tribunal is to decide at once upon the legality of the seizure. The press law is not to affect regulations made in time of war or internal disturbance. A temporary law passed in 1878 gave the police large powers in the case of socialistic publications.

I See Dalloz, Jurisprudence Générale, s.v, " Presse" ; Id., Titles Alphabétiques, 1845-77, s.v. ' Presse."*

~~*Greece.—The constitution of Epidaurus, Ist January 1822, did not specially mention, though no donbt it implied, liberty of the press. Under Otho censorship was exercised up to 1844. By the constitution of 18th March 1844 every one may publish his thoughts by means of the press, observing the laws of the state. he press is free, and censorship (Aoyoxpicia) is not permitted. Responsible editors, publishers, and printers of newspapers are not required to deposit money on the ground of surety. Publishers of newspapers must be Greek citizens, art. 10. The legislature may exclude reporters from its sittings in certain eases, art. 48. Press offences are to be tried by jury, except when they deal only with private life, art. 93.*~~

~~*Holland.—The press has been free since the existence of the present kingdom of the Netherlands, which dates from 1815. Liberty of the press is expressly secured by art. 8 of the constitu- tion of 1848. By art. 286 of the penal code seditious books and newspapers may be seized. By art. 283 of the same eode and by a royal decree of 25th January 1814 the name of the printer must appear upon newspapers. Press offences are not tried by jury.*~~

~~*Italy.—The strict licensing of the press in Italy excited the derision of Milton. In the Areopagitica he gives examples of the lieences of that period which were usually imprinted at the beginning of a book. The laws of the different states varied in severity. Tlus it was a matter of complaint against Venice by Paul V. that she allowed the publication of works censured at Rome. The power of the ehurch is seen in the fate of Bruno and Galileo. By art. 27 of the political code of Sardinia, granted by Charles Albert on 4th March 1848, and still in foree, the press is free, but abuses of the liberty are restrained by law. Bibles, catechisms, and liturgieal works must be licensed by the bishop. The present press law of Italy is contained in the law of 26th March 1848, as altered by later enactinents. Everything printed in typographical characters, or by lithography or any similar means, must indicate the place and the date of printing and the name of the printer. A copy of everything printed must be deposited with certain officials and at certain libraries. Before the publication of any newspaper or periodical, notice of the intended publication must be given at the office of the secretary of state for internal affairs. The notice must contain (1) a declaration of the legal qualification of the person intending to publish,*~~

~~*whether as proprietor or editor, (2) the nature of the publication, and (3) the name and residence of the responsible editor. Every newspaper is bound to insert gratuitously a contradiction or explanation of any charge made against a person in its columns. For contravention of these and other regulations there is a statutory penalty not exceeding 1000 lire (£40). The publication of a newspaper may be suspended until the payment of a fine. The publication of parliamentary debates is permitted. Press offences are tried by a jury of twelve. By a law of 11th May 1877 it is forbidden to publish any indication of the way in which individual judges or jurors voted in their deliberations.*~~

~~*Mexico.—A board or "junta" of censors existed during the Spanish dominion. The fundamental law of Mexico is now the constitution of 1857, as amended by subsequent additions. By art. 6 the expression of ideas cannot be the object of any judicial or administrative inquiry, unless in case of attacks on morality, public order, &c. By art. 7 the liberty of writing and publishing writings on any subject is inviolable. Censorship is abolished, and press offences are to be tried by one jury which testifies the act and another which applies the law and defines the penalty.*~~

~~*Norway.—The liberty of the press is secured by art. 100 of the constitution of 1814. No one can be punished for any writing unless he, or some one by his instigation, offend against the state, law, religion, or decency, or make infamous accusations against any one. Criticism of the Government is expressly permitted.*~~

~~*Ottoman Empire.—By art. 12 of the constitution of 23d December 1876 the press was recognized as free, subject to the limits imposed by law. Press laws had been previously enacted on 5th March 1865 and 12th March 1867.*~~

~~*Portugal.—It is stated by Braga and others that a free press existed up to the establishment of the Inquisition, and that Gil Vicente (died 1536) was the last writer who dared to express his thoughts freely. At a later period Bocage was imprisoned for writings displeasing to the authorities. Boards of censorship under the names of the "Real Mesa Censoria," or the " Mesa do Desembargo do Paco," assumed to license publications. Liberty of the press was, however, finally secured, and censorship limited, by art. 7 of the constitution granted by John VI. in 1821. By art. 8 a special tribunal was*~~

~~*constituted in both Portugal and Brazil to protect the liberty of printing. The censorship was con- fined to that exercised by the bishops over theological or dogmatic works. The debates in the legislature and proceedings in the courts of justice are not generally reported.*~~

~~*Roumania.—By the constitution of 30th June 1866, art. 5, Roumanians enjoy liberty of the press. By art. 24 the constitution guarantees to all the liberty of communicating and publishing ideas through the press, every one being liable for abuse in cases deter-*~~

~~*mined by the penal code. Press offences are to be tried by jury. Censorship is abolished, and is never to be. re-established. No previous authorization is necessary for the publication of newspapers. No sureties are to be demanded from journalists, writers, editors, or printers. The press is not to be subjected to regulation of ad- vertisements. No newspaper or publication is to be suspended or suppressed, Every author is responsible for his writings ; 1n default of the author, the manager or editor is responsible. Every news- paper must have a responsible manager in the possession of civil and political rights. : ;*~~

~~*Russia.—The position of the Russian press generally is regulated by a law of 6th April 1865. The effect of that law is to exempt from preventive censorship (if published in St Petersburg or Moscow) all newspapers, periodicals, and original works and trans- lations not exceeding a certain number of pages, and (wherever published) all Government publications, matter printed by aca- demies, universities, and scientific bodies, and maps, plans, and charts. Everything printed and published that does not fall within any of these categories must, before issue to the public, be submitted for the approval of Government censors stationed in different parts of the empire. The minister of the interior has power to dispense with the preventive censorship in the case of provincial newspapers and periodicals. In St Petersburg and Moscow the periodical press is subject to corrective censorship for infringement of the numerous restrictive regulations contained in the code, and supplemented at times by secret instructions*~~

~~*from the minister of the interior to editors and publishers. It should be observed that, apart from the code, the sustained display of a spirit hostile to the Govern- inent renders the publisher of a periodical liable to punishment. The penalties established by the law of 1865 for offences against the press regulations consist in the infliction of a series of warnings published in the Official Gazette. A first warning merely enjoins more care for the future; a second is followed by suspension for a certain period, sometimes by a prohibition to insert advertisements ; a third by suppression, and perhaps prosecution of the offending conductor. Ly imperial ukase of 2d June 1872 the jurisdiction of the judicial tribunals over press offences was practically transferred to the minister of the interior, except in the case of violation of private rights, as by libel. The law of 1865 was modified in 1874 by a regulation to the effect that all publications appearing at longer intervals than one week should be submitted to the central board of censors. This is applied to all periodicals that had been formerly published without preventive censorship. By a ukase issued in 1881 a committee of four menibers is entrusted with the decision of all matters relating to the press submitted to it by the minister of the interior. The strictest supervision is exercised over the foreign press, periodical and otherwise. None but a few privi- leged individuals, such as members of the royal family, foreign diplomatists, and editors of newspapers in the capital, may receive foreign publications free of censorship. 'The censorship consists in blackening out, and sometimes in the excision, of whole columns and sheets of publications that may be deemed pernicious. Only such periodicals as are placed on a list approved by the board of censors are allowed to be received through the post-office by non- privileged persons. Telegraphic messages to newspapers are subject to strict censorship. The Russian telegraphic press agency is entirely under official management.*~~

~~*_ Spain.—There was probably no country where restrictions on the liberty of the press were at one time more stringent than in Spain. From the first use of printing up to 1521 censorship was exercised by the crown ; after that date the Inquisition began to assume the right, and continued to do so up to its suppression in 1808. In 1558 Philip II. denounced the penalty of death against even the possessor of a book upon the Index Expurgatorius of the Inquisition. Some of the greatest names in Spanish literature were*~~

~~*sufferers : Castillejo, Mendoza, Mariana, and Quevedo incurred the displeasure of the Inquisition ; Luis Ponce de Leon was imprisoned for his translation of the Song of Solomon. 'The last Jdex appeared in 1790.1 In 1812 the constitution promulgated by the regency in the name of Ferdinand VII. provided by art. 371 that all Spaniards should have liberty to write, print, and publish their political ideas without any necessity for licence, examination, or approbation pre- vious to publication, subject to the restrictions imposed by law. Art. 13 of the constitution of 30th June 1876, promulgated on the accession of Alphonso XII., practically re-enacts this provision.*~~

~~*Sweden.—The press law of 16th July 1812 is one of the funda- mental laws of Sweden. It is an expansion of art. 86 of the con- stitution of 6th June 1809. Liberty of the press is declared to be the privilege of every Swede, subject to prosecution for libellous writing. Privileges of individuals as to publication are abolished. The title and place of publication of every newspaper or periodical must be registered, and every publication must bear the name of the printer and the place of printing. Press offences are tried by a Jury of nine, chosen respectively by the prosecutor, the prisoner. and the court. The verdict of two-thirds of the jury is final. i*~~

~~*? See Ticknor, Hist. of Span. Lit., vol. i. p. 422 sq., vol. iii. p. 366.*~~

~~*PRE—PRE*~~

~~*Switzerland.—Liberty of the press is secured by art. 45 of the constitution of 1848, re-enacted by art. 55 of the constitution of 29th May 1874. Each canton has its own laws for the repression of abuse of the liberty, subject to the approbation of the federal council. The confederation can impose penalties on libels directed against itself or its officers. (J. Wt.)*~~

~~*PRESTER JOHN. The history of Prester John is that of a phantom, taking many forms. It no doubt originally was based on some nucleus of fact, or connected itself with some such nucleus, though what that nucleus was has been much controverted and is extremely difficult to deter- mine. But the name and the figure which it suggested occupied so prominent a place in the mind of Europe for two or three centuries that a real history could*~~

~~*hardly have a stronger claim' to exposition here than this history of a will-o'-the-wisp.*~~

~~*Before Prester John, eo nomine, appears upon the scene we find the way prepared for his appearance by the pre- sentation of a kindred fable, and one which certainly en- twined itself with the legends about Prester John after his figure had lodged itself in the popular imagination of Europe. This is the story of the appearance at Rome (1122), in the pontificate of Calixtus II., of a certain Oriental ecclesiastic, whom one account styles "Jolin, the patriarch of the Indians," and another "'an archbishop of India." This ecclesiastic related the most wonderful stories of the shrine of St Thomas in India, and of the posthumous and still recurring miracles which were wrought there periodically by the body of the apostle, including the distribution of the sacramental wafer by his hand, and many other marvellous things. We cannot regard the appearance at Rome of the personage who related these marvels in presence of the pope as a mere popular fiction : it rests on two authorities apparently independent (one of them a letter from Odo of Rheims, abbot of St Remy from 1118 to 1151), for their discrepancies show that one was not copied from the other, though in the principal facts they agree.*~~

~~*Nearly a quarter of a century later Prester John appears upon the scene, in the outline, at least, of the character which long adhered to him, viz., that of a Christian con- queror and potentate of enormous power and splendour, who combined the characters of priest and king, and ruled over vast dominions in the far East. This idea was uni- versal in Europe from 'about. the middle of the 12th century to the end of the 13th or beginning of the 14th. The Asiatic story then gradually died away, but the name remained as firmly rooted as ever, and the royal presbyter was now assigned a locus in Ethiopia. Indeed, as we shall see, it is not an improbable hypothesis that from a very early date in the history of this phantom its title was assigned to the Abyssinian king, though for a time this identification was overshadowed by the prevalence of the Asiatic legend. At the bottom of the double allocation there was, no doubt, that association or confusion of Ethiopia with India which is as old as Virgil, and perhaps much older.*~~

~~*The first mention of Prester John occurs in the chronicle of Otho or Otto, bishop of Freisingen. This writer states that when at the papal court in 1145 he met with the bishop of Gabala (Jibal in Syria), who related how "not many years before one John, king and priest (rex et sacer- dos), who dwelt in the extreme Orient beyond Persia and Armenia, and was, with his people, a Christian but a Nes- torilan, had made war against the brother kings of the Persians and Medes, who were called Samiards (or Sanjards), and captured Egbatana their capital. The battle with those princes endured three days, but at last Presbyter John—for so he was wont to be styled—routed the Pe sians with immense slaughter. After this victory the aforesaid John was advancing to fight in aid of the church*~~

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~~*PER OTT eR JOHN*~~

~~*at Jerusalem; but, when he arrived at the Tigris, and found no possible means of transport for his army, he turned northward, as he had heard that the river in that quarter was frozen over in winter-time. After halting on its banks for some years (per aliquot annos) in expectation of a frost he was obliged to return to his own land. This personage was said to be of the ancient race of the Magi mentioned in the gospel, to rule the same nations that they ruled, and to have such a plenitude of wealth and glory that he used none but a sceptre of solid emerald. It was as fired by the example of his ancestors (they said) that he was proposing to go to Jerusalem when thus obstructed." We cannot say how far the report of the bishop of Gabala, or other rumours of the events on which this was founded, made an impression on Europe at that time. But there can be no doubt about the impression that was made some twenty years later (c. 1165) by the wide circulation of a letter which purported to have been addressed by the poten- tate in question to the Greek emperor Manuel. This letter, professing to come from "' Presbyter Joannes, by the power and virtue of God and of the Lord Jesus Christ, Lord of Lords," is filled with the most extravagant details of the greatness and splendour of the writer. He claims to be the greatest monarch under heaven, as well as a devout Christian and protector of Christians. And it was his desire to visit the Holy Sepulchre with a great host, and to subdue the enemies of the Cross. Seventy-two kings, reigning*~~

~~*over as many kingdoms, were his tributaries. HIs empire extended over the three Indies, including that Further India where lay the body of St Thomas, to the sun-rising, and back again down the slope to the ruins of Babylon and the tower of Babel. All the wild beasts and monstrous creatures commemorated in current legend were to be found in his dominions, as well as all the wild and eccentric races of men of whom strange stories were told, including those unclean nations whom Alexander Magnus walled up among the mountains of the north, and who were to come forth at the latter day,—and so were the Amazons and the Bragmans. HIs dominions contained the monstrous ants that dug gold and the fish that gave the purple; they produced all manner of precious stones aud all the famous aromatics. Within them was found the Fountain of Youth; the pebbles which give light, restore sight, and render the possessor invisible ; the Sea of Sand was there, stored with fish of wondrous savour ; and the River of Stones was there also ; besides a subterranean stream whose sands were of gems. HIs territory produced the worm called "salamander," which lived in fire, and which wrought itself an incombustible envelope from which were manufactured robes for the presbyter, which were washed in flaming fire. When the king went forth to war thirteen great crosses made of gold and jewels were carried in waggons before him as his standards, and each was followed by 10,000 knights and 100,000 footmen. There were no poor in his dominions, no thief or robber, no flatterer or miser, no dissensions, no lies, and no vices. HIs palace was built after the plan of that which St Thomas erected for the Indian king Gondopharus. Of the splendour of this details are given. Before it was a marvellous mirror erected on a many-storied pedestal (described in detail) ; in this speculum he could discern everything that went on throughout his dominions, and detect conspiracies. HIe was waited on by seven kings at a time, by sixty dukes and 365 counts; twelve archbishops sat on his right hand, and twenty bishops on his left, besides the patriarch of St Thomas's, the protopope of the Sarmagantians (Samarkand 1), and the archprotopope of Susa, where the royal residence was. There was another palace of still more wonderful character, built by the presbyter's father in obedience to a heavenly command, in the city of Bribric.*~~

~~*ZU5*~~

~~*Should it be asked why, with all this power and splendour, he calls himself merely "presbyter," this is because of his humility, and because it was not fitting for one whose sewer was a primate and king, whose butler an archbishop and king, whose chamberlain a bishop and king, whose master of the horse an archimandrite and king, whose chief cook an abbot and king, to be called by such titles as these. But the extent of his power and dominion could only be told when the number of the stars of heaven and of the sands of the seashore could be told.*~~

~~*How great was the popularity and diffusion of this letter may be judged in some degree from the fact that Herr Zarncke in his elaborate treatise on Prester John gives a list of close on a hundred MSS. of it. Of these there are eight in the British Museum, ten at Vienna, thirteen in the great Paris library, fifteen at Munich. There are also several renderings in old German verse. Many circum- stances of the time tended to render such a letter accept- able. Christendom would welcome gladly the intelligence of a counterpoise arising so unexpectedly to the Moham- medan power; whilst the statements of the letter itself com- bined a reference to and corroboration of all the romantic figments concerning Asia which already fed the curiosity of Europe, which figured in the world-maps, and filled that fabulous history of Alexander which for nearly a thousand years supplanted the real history of the Macedonian throughout Europe and western Asia.*~~

~~*The only other surviving document of the 12th century bearing on this subject is a letter of which MS. copies are preserved in the Cambridge and Paris libraries, and which is also embedded in the chronicles of several English annal- ists, including Benedict of Peterborough, Roger Hovedon, and Matthew Paris. It purports to have been indited from the Rialto at Venice by Pope Alexander III. on the 5th day before the calends of October (27th September), data which fix the year as 1177. The pope addresses himself as Alexander episcopus, servus servorum dei, carissimo in Christo filio Johannt, illustro et magnifico indorum regi [Hovedon's copy here inserts sacerdoti sanctissimo], salu- tem et apostolicam benedictionem. He recites how he had heard of the monarch's Christian profession, diligence in good works, and piety by manifold narrators and com- mon report, but also more particularly from his (the pope's) beloved son Master Philip, his physician and confidant (medicus et familiaris noster), who had received*~~

~~*informa- tion from honourable persons of the monarch's kingdom, with whom he had intercourse in those (Eastern) parts. Philip had also reported the king's anxiety for instruction in Catholic discipline and for reconciliation with the apostolic see in regard to all discrepancies. Philip had also heard from the king's people that he fervently desired to have a church in Rome and an altar at Jerusalem. The pope goes on to say that he found it too difficult, on account of the length and obstructions of the way, to send any one (of ecclesiastical position?) a latere, but he would despatch the aforesaid Philip to communicate instruction to him. And on accepting Philip's communications the king should send back honourable persons bearing letters sealed with his seal, in which his wishes should be fully set forth. "The more nobly and magnanimously thou conductest thyself, and the less thou vauntest of thy wealth and power (quanto . . . minus de divitiis et potentia tua videris inflatus), the more readily shall we regard thy wishes both as to the concession of a church in the city and of altars in the church of SS. Peter and Paul, and in the church of the Lord's Sepulchre at Jerusalem, and as to other reasonable requests."*~~

~~*There is no express mention of the title " Prester John" in what seem the more genuine copies of this letter. But the address and the expression in the italicized passage*~~

~~*716*~~

~~*just quoted (which evidently alludes to the vaunting epistle of 1165) hardly leave room for doubt that the pope supposed himself to be addressing the (imaginary) author of that letter. 'To whom the reports of Philip the physician in reality referred is a point that will be discussed below. We do not know how far the imaginations about Prester John retained their vitality in 1221, forty-four years after the letter of Pope Alexander, for we know of no mention of Prester John in theinterval. But in that year again a rumour came out of the East that a great Christian conqueror was taking the hated Moslems in reverse and sweeping away their power. Prophecies current among the Christians in Syria of the destruction of Mohammed's sect after six centuries of duration added to the excitement attending these rumours. The name ascribed to the con- queror was David, and some called him the son or the grandson of Prester John of India. He whose conquests and*~~

~~*slaughters now revived the legend was in fact no Christian or King David but the famous Jenghiz Khan. The delusion was dissipated slowly, and even after the great Tartar invasion and devastation of eastern Europe its effects still influenced the mind of Christendom and caused popes and kings to send missions to the Tartar hordes with a lingering feeling that their khans, if not already Christians, were at least always on the verge of conversion.*~~

~~*Before proceeding farther we must go back on the bishop of Gabala's story and elucidate it as far as we can. The most accomplished of modern geographical antiquaries, M. d'Avezac, first showed to whom the story must apply. The only conqueror whose career suits in time and approxi- mates in circumstances is the founder of Kard-Khitdi, which existed as a great empire in Central Asia during the latter two-thirds of the 13th century. This personage was a prince of the Khitdéi or Khitaian dynasty of Liao, which had reigned over northern China and the regions beyond the Wall during a great part of the 10th and 11th centuries, and from which came the name Khitai (Cathay), by which China was once known in Europe and still is known in Russia. On the overthrow of the dynasty about 1125 this prince, who is called by the Chinese Yeliu Tashi, and who had gone through a complete Chinese education, escaped westward with a body of followers. Being well received by the Uighurs and other tribes west of the desert, subjects of his family, he gathered an army and commenced a course of conquest which eventually extended over eastern and western Turkestan. He took the title of Gur Khan or Kor Khan, said to mean "universal" or "supreme" khan, and fixed at Balasaghun, north of the Tian Shan range, the capital of his empire, which became known as that of Kara-Khitdi (Black Cathay). In 1141 the assistance of this Khitaian prince was invoked by the shah of Kharezm against Sanjar, the Seljuk sovereign of Persia, who had expelled the shah from his kingdom and killed his son. The Gur Khan came with a vast army of Turks, Khitaians, and others, and defeated Sanjér near Samarkand (September 1141) in a great battle, which the historian Ibn al-Athir calls the greatest and most san- guinary defeat that Islam had ever undergone in those regions. Though the Gur Khan himself is not described as having extended his conquests into Persia, the shah of Kharezm followed up the victory by invading Khordsan and plundering the cities and treasuries of Sanjar. In this event—the defeat of Sanjar, whose brother's son, Mas'id, reigned over western Persia—occurring just four years before*~~

~~*the story of the Eastern conqueror was told at Rome to Bishop Otto, we seem to have the destruction of the Samiardi fratres or Sanjér brothers, which was the germ of the story of Prester John.*~~

~~*There is no evidence of any profession of Christianity on*~~

~~*PRES TER TC*~~

~~*the part of the Gur Khan, though it is a fact that the daughter of the last of his race is recorded to have been a Christian. The hosts of the Gur Khan are called by Moslem historians Al-J'urk-al-Kuffdr, the kafir or infidel Turks; and we know that in later days the use of this term "kafir" often led to misapprehensions, as when Vasco da Gama's people were led to take for Christians the Banyan traders on the African coast, and to describe as Christian sovereigns so many princes of the farther East of whom they heard at Calicut. Of the rest of the accretions to the story little can be said except that they are of the kind sure to have grown up in some shape when once the Christianity of the conqueror was assumed. We have said that Prester John was a phantom ; and we know out of what disproportionate elements phantoms are developed. How the name John arose is one of the obscure points. Oppert supposes the title 'Gur Khan" to have been con-founded with Yukhanan or Johannes ; and of course it is probable that even in the Levant the stories of "John the patriarch of the Indies," repeated in the early part of this article, may have already mingled with the rumours from the East.*~~

~~*The obvious failure in the history of the Gur Khan to meet all points in the story of the bishop of Gabala led Professor Bruun of Odessa to bring forward another candidate for identity with the original Prester John, in the person of the Georgian prince John Orbelian, the "sbasalar," or generalissimo under several kings of Georgia in that age. Space forbids our stating all the ingenious arguments and coincidences with which Professor Bruun supported his theory. Among other arguments he does show some instances, in documents of the 15th century, of the association of Prester John with the Caucasus. In one at least of these the title is applied to the king of Abassia, 7.¢., of the Abhasians of Caucasus. Some con- fusion between Abash (Abyssinia) and Abhas seems to be possibly at the bottom of the imbroglio. An abstract of Professor Bruun's arguinent will be found in*~~

~~*the 2d edition of Afarco Polo, vol. ii. pp. 539-542. We may quote here the conclusion arrived at in winding up that abstract. 'Professor Bruun's thesis seems to me more than fairly successful in paving the way for the introduction of a Caucasian Prester John; the barriers are removed, the carpets are spread, the trumpets sound royally,—but the conquering hero comes not. He does very nearly come. The almost royal power and splendour of the Orbelians at this time is on record . . . (see St Martin, Mém. sur T Arménie, ii. 77) . . . Orpel Ivane, 4.¢., Jolin Orbelian, Grand Sbasalar, was for years the pride of Georgia, and the hammer of the Turks. . . . But still we hear of no actual conflict with the chief princes of the Seljukian house, and of no event in his history so important as to account for his being made to play the part of Presbyter Johannes in the story of the Bishop of Gabala." As regards any real foundation for the title of " Presbyter"' we may observe that nothing worth mentioning has been alleged on behalf of any candidate.*~~

~~*When the Mongol conquests threw Asia open to Frank travellers in the middle of the 13th century their minds were full of Prester John ; they sought in vain for an adequate representative, nor was it in the nature of things that they should not find some repre- sentative. In fact they found several. Apparently no real tradi- tion existed among the Eastern Christians of such a personage ; the myth had taken shape from the clouds of rumour as they rolled westward from Asia. But the persistent demand produced a supply ; and the honour of identification with Prester John, after hovering over one head and another, settled for a long time upon that of the king of the Nestorian tribe of Kerait, famous in the histories of Jenghiz under the name of Ung or Awang Khan. We may quote an illustration from geographical analogy: " Pre-Columbian maps of the Atlantic showed an island of Brazil, an island of Antillia, founded—who knew on what?—whether on the real adventure of a vessel driven in sight of the Azores or Bermudas, or on mere fancy and fogbank. But when discovery really came to be undertaken, men looked for such lands and found them accordingly. And there they are in our geographies, Brazil and the Antilles." ?*~~

~~*In Plano Carpini's (1248) single mention of Prester John as the king of the Christians of India the Greater, who defeats the Tartars by an elaborate stratagem, Oppert recognizes Jalaluddin of Kharezm and his brief success*~~

~~*over the Mongols in Afghanistan. In the Armenian prince Sempad's account (1248), on the other hand, this Christian king of India is aided by the Tartars to defeat and harass the Saracens, and becomes the vassal of the Mongols. In the nar- rative of William Rubruquis (1253), though distinct reference is made to the conquering Gur Khan under the name of Coir Cham of*~~

~~*1 App. to Marco Polo, 2d ed., ii. 543.*~~

~~*PRESTER J 0 HN*~~

~~*Caracatay, the title of "King John" is assigned to Kushluk, king of the Naimans, who had married the daughter of the last lineal representative of the gur khans.1_ And from the remarks which Rubruquis nakes in connexion with this King John, on the habit of the Nestorians to spin wonderful stories out of nothing, and of the great tales that went forth about King John, it is evident that the intelligent traveller supposed this king of the Naimans to be the original of the widely-spread legend. He mentions, however, a brother of this Jolin called Une.who ruled over the Crit and Merkit (or Kerait and Mekrit, two of the great tribes of Mongolia), whose history he associates with that of Jenghiz Khan. Une Khan reappears in Marco Polo, who tells much about him as "a great prince, the same that we call Prester Jolin, him in fact about whose great dominion all the world talks." This Unc was in fact the prince of the Kerait, called by the Chinese Tuli, and by the Persian historians of the Mongols Toghral, on whom the Kin emperor of north China had conferred the title of "wang" or king, whence his coming to be known as Awang or Ung Khan. He was long the ally of Jenghiz, but a breach occurred between them, and they were mortal enemies till the death of Ung Khan in 1203. In the narrative of Marco Polo ' Unc Can," alias Prester John, is the liege lord of the Tartars, to whom they paid tribute until Jenghiz arose. And this is substantially the story repeated by other European writers of the end of the 13th century, such as Ricold of Monte- eroce and the Sieur de Joinville, as well as by one Asiatic, the famous Christian writer, Gregory Abulfaraj. We can find no Oriental corroboration of the claims of Ung Klian to supremacy over the Mongols. But that his power and dignity were consider- able appears from the term " Padshah," which is applied to him by the historian Rashiduddin.*~~

~~*We find Prester John in one more phase before he vanishes from Asiatic history, real or mythical. Marco Polo in the latter part of the 18th century, and Friar John of Montecorvino, afterwards archbishop of Cambaluc, in the beginning of the 14th, speak of the descendants of Prester John as holding territory under the great khan in a locality which can be identified with the plain of Kuku- Khotan, north of the great bend of the Yellow River and about 280 miles north-west of Peking. The prince reigning in the time of these two-writers was named King George, and was the "6th in descent from Prester John," 7.e., no doubt from Awang Khan. Friar Odoric, about 1326, visited the country still ruled by the prince whom he calls Prester John ; "but," he says, "as regards him, not one hundredth part is true that is told of him." With this mention Prester John ceases to have any pretension to histori- cal existence in Asia (for we need not turn aside to Mandeville's fabulous revival of old stories or to the barefaced fictions of his contemporary, John of Hese, which bring in the old tales of the miraculous body of St Thomas), and his connexion with that quarter of the world gradually died out of the memory of Europe."*~~

~~*When next we begin to hear his name it is as an African, not as an Asiatic prince; and the personage so styled is in fact the Christian king of Abyssinia. The learned Ludolf has asserted that this application was an invention of the Portuguese and arose only in the 15th century. But this is a mistake; for in fact the application had begun much earlier, and probably long before the name had ceased to be attached by writers on Asia to the descend- ants of the king of the Kerait. It is true that Simon Sigoli, who visited Cairo in 1384, still speaks of " Presto Giovanni" as a monarch dwelling in India; but it is the India which is conter- minous with the dominions of the soldan of Egypt, and whose lord is master of the Nile, to close or open its discharge upon Egypt.* Thirty years earlier (c. 1852) John Marignolli speaks of Ethiopia where the Negroes are, and which is called the land of Prester John.* Going back still farther, Friar J ordanus, who returned from the East before 1328, speaks of the emperor of the Ethiopians 'quem vos vocatis Prestre Johan."*~~

~~*But, indeed, weshall have strong probability on our side if we go back much farther still, and say that, however vague may have*~~

~~*1 It has been pointed out by Mr Alexander Wylie that Kushluk was son of a powerful king of the Naimans, whose name Ta-Yang-Khan is precisely "Great King John" as nearly as that could be expressed in Chinese.*~~

~~*2 The stories of Khitai as a Christian empire, which led the Jesuits at the court of Akbar to despatch Benedict Goes in search of it (1601), did, however, suggest to Jerome Xavier, their chief, that the country in question "was the Cathay of Marco Polo, and its Christian king the representative of the famous Prester John"—a jumble of inaccuracy.*~~

~~*3 So Ariosto—*~~

~~*'¢ Si dice che '] Soldan Re dell' Egitto A quel Re da tributo e sta soggetto, Perch' é in poter di lui dal cammin dritto Levare il Nilo e dargli altro ricetto, E per questo lasciar subito afilitto Di fame il Cairo e tutto quel distretto.*~~

~~*Senapo detto é dai suddetti suoi ; Gli diciam Presto o Prete Ianni noi."*~~

~~*4 In a Spanish work of about the same date, by an anonymous Franciscan, we are told that the emperor called "Abdeselib, which means 'servant of the Cross,' is a protector of Preste Juan, who is the patriarch of Nubia and Ethiopia, and is lord of many great lands, and many cities of Christians, though they be black as pitch, and brand themselves with the sign of the cross in token of their baptism" (Libro del conosciemento de todos reynos, &c., printed at Madrid,*~~

~~*1877).*~~

~~*TAZ*~~

~~*been the ideas of Pope Alexander III. respecting the geographical position of the potentate whom he addressed from Venice in 1177, the only real person to whom the letter can have been sent was the king of Abyssinia. Let it be observed that the "honourable per- sous of the monarch's kingdom" whom the leech Philip had met with in the East must have been the representatives of some real power, and not of a phantom. It must have been a real king and not a rumour-begotten ignis fatuus who professed to desire*~~

~~recon- ciliation with the Catholic Church and the assignation of a church at Rome and of an altar at Jerusalem. Moreover, we know that the Ethiopic Church did long possess a chapel and altar in the Church of the Holy Sepulchre, and, though we have been unable to find travellers' testimony to this older than about 1497, it is quite possible that the appropriation may have originated much earlier.>5 We know from Marco Polo that about a century after the date of Pope Alexander's epistle a mission was sent by the king of Abyssinia to Jerusalem to make offerings on his part at the Church of the Sepulchre. It must be remembered that at the time of the pope's letter Jerusalem, which had been taken from the Moslem in 1099, was still in Christian possession. Abyssinia had been going through a long period of vicissitude and distraction. In the 10th century the royal line had been superseded by a dynasty of Falasha Jews, followed by other Christian families ; but weakness and disorder continued till the restoration of the 'House of Solomon" (c. 1268). Nothing is more likely than that the princes of the " Christian families" who had got possession of the throne of northern Abyssinia should have wished to strengthen themselves by a connexion with European Christendom, and_to establish relations with Jerusalem, then in Christian hands. We do not know whether the leech Philip ever reached his destination, or whether a reply ever came back to the Lateran.®~~

~~Baronius, who takes the view for which we have been arguing, supposes it possible that the church in Rome possessed in his own time by the Abyssinians (St Stephen's in the Vatican) might have been granted on this occasion. But we may be sure that this was a modern concession during the attempts to master the Ethiopian Church early in the 16th century. Ludolf intimates that its ocen- pancy had been taken from them in his own time after it had been held "for more than a century."~~

~~In the legendary history of the Translation of the three Blessed Kings by John of Hildesheim (c. 1370), of which an account and extracts are given by Zarncke (Abhandl. ii., 154 sq.), we have an evident jumble in the writer's mind between the Asiatic and the African location of Prester John ; among other matters it is stated that Prester John and the Nubians dug a chapel out of the rock under Calvary in honour of the three kings: "et vocatur illa~~

~~*capella in partibus illis capella Nubiyanorum ad reges in preesentem diem, sed Sarracini . . . ob invidiam obstruxerunt (p. 158).”*~~

~~*There is no need to proceed further. From the 14th century onwards Prester John had found his seat in Abyssinia. It is there that Fra Mauro’s great map (1459) presents a fine city with the rubric, ‘* Qui il Preste Janni fa residentia principal.” When, nearer the end of the century (1481-95), King John II. of Portugal was prosecuting inquiries regarding access to India his first object was to open communication with “ Prester John of the Indies,” who was understood to be a Christian potentate in Africa, and regarding whom information was sought “through Abyssinian monks whio visited these Spanish regions, and also through certain friars who went from this country to Jerusalem.” And when Vasco da Gama went on his memorable voyage from Mozambique northwards he began to hear of “Preste Joham” as reigning in the interior, — or rather, probably, by the light of his preconceptions of the exist- ence of that personage in east Africa he thus interpreted what was told him. More than twenty years later, when the first book on Abyssinia was composed—that of Alvarez,—the title, constantly and as a matter of course designating the king of Abyssinia, is*~~

~~*5 Indeed, we can carry the date back half a century further by the evidence of a letter translated in Ludolf(Comment., p. 303). This is addressed from Shoa by the king Zara Jacob in the eighth year of his reign (1442) to the Abyssinian monks, dwellers at Jerusalem. The king desires thein to light certain lamps in the Church of the Sepulchre, including “three in our chapel.” In the Pilgerfahrt des Ritters Arnold von Harff (1496-99), Cologne, 1860, p. 175, we find it stated that the Abyssinians had their chapel, &c., to the left of the Holy Sepulchre, between two pillars of the temple, whilst the Armenian chapel was over theirs, reached by a stone staircase alongside of the Indians (or Abys- sinians). This exactly corresponds with the plan and references given in Sandys’s Travels (1615, p. 162), which shows the different chapels. The first on the south, i.e., the left looking from the body of the church, is “ No, 35.—The chappell of the Abisines, over which the chappell of the Armenians.” A refer- ence to Jerusalem, which we procured through the kindness of Mr Walter Besant, shows that the Abyssinians no longer have a chapel or privileges in the Church of the Sepulchre. Between the Armenians and the Copts they have*~~

been deprived of these, and even of the keys of their convent. The resentment of King Theodore at the loss of these privileges was one of the indirect causes which led to the war between him and England in 1867-68.

6 Matthew Paris gives a letter from Philip, prior of the Dominicans in Pales- tine, which reached the pope in 1237, and which speaks of a prelate from whom he had received several letters, "qui preest omnibus quos Nestoriana heresis ab ecclesia separavit (cujus prelatio per Indiam Majorem, et per regnum sacer- dotis Johannis, et per regna magis proxima Orientidilatatur)," We have little doubt that Abyssinia was the "regnum" here indicated, though it was a mis- take to identify the Abyssinian Church with the Nestorians.

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'Prester John," or simply "'the Preste." The name occurs on almost every page of the narrative beginning with page 1, though in the translation printed for the Hakluyt Society that which the editor calls " general index" gives no indication of the fact.

The name of ' Prester John" suggested alike to scholars and sciolists, first in its Oriental and then in its Ethiopian connexion, many fanciful and strained etymologies, from Persian, Hebrew, Ethiopic, and what not, and on the assumption that neither '«Presbyter" nor "John" was any proper element of the name.

But for these dreams this passing notice must suffice. — On the whole subject in its older aspects, see Ludolf's Historia Aithiopica and its Commentary, passim. The excellent remarks of M. d'Avezac, comprising a conspectus of alinost the whole essence of : the subject, are in the Recueil de Voyages et de Mémoires, published by the Société de Géographie, vol. iv., Paris, 1839, pp. 547-564. Two German works of importance which have been used in this article are the interesting and suggestive Der Presbyter Johannes in Sage

und Geschichte, by Dr Gustav Oppert (2d ed., Berlin, 1870), and, most import-.

~~*ant of all in its learned, careful, and critical collection and discussion of all the passages bearing on the subject, Der Priester Johannes, by Friedrich Zarncke of Leipsic (1876-79), still unfortunately unfinished, and without the summing up which is required to complete the subject. The present writer has given considerable attention to the subject, and discussed it partially in Cathay and the Way Thither, p. 173 sqq., and in Marco Polo, 2d ed., i. 229-233, fi, 539-543. (H. Y.) PRESTON, a market-town and municipal and parlia- mentary borough of Lancashire, is situated on the north bank of the Ribble, on the Lancaster Canal, and at the junction of several railway lines, 28 miles north-east of Liverpool and 31 north-west of Manchester. It consists chiefly of one long street, running from east to west along a steep ridge above the Ribble, which is crossed by six bridges, three of which are railway bridges. The parish church of St John, rebuilt in 1855 in the Decorated style, occupies the site of a very ancient structure. A large number of ecclesiastical parishes have been formed within recent years, but none of the churches possess special*~~

~~*architectural features. The Catholic church of St Wal-*~~

~~*1000 Yards*~~

~~*Plan of Preston.*~~

~~*purgis or St Walpurge is an elaborate structure in the Early Decorated style, erected in 1854, and since then extensively altered. There are several good public build- ings, including the town-hall (1867 in the Early Gothic style, from designs by Sir Gilbert Scott), the prison (1789), the corn exchange and market-house (1824), the court- house (1829), the borough magistrates' court (1858), the covered market (1870), the county offices (1882), the public baths, and the barracks. The most important public institution is the free public library and museum, estab- lished in 1879. The building was erected, from designs by Mr J. Hibbert, at a cost of £75,000 by the trustees of Mr E. R. Harris, whose name it bears, a further sum of £30,000 being appropriated by them to furnish and endow*~~

~~*the library and museum, which are to be maintained in efficiency for ever by the corporation. This body gave the site in the principal market-place at a cost of £30,000. Here is placed Dr Shepherd's library, founded in 1761, of nearly 9000 volumes, as well as a collection of pictures, &c., valued at £40,000, bequeathed by Mr R. Newsham. The Harris Institute, endowed by the above-named trustees with £40,000, is established in a building of classical style erected in 1849, wherein are held science and art classes, and where is placed a thoroughly equipped chemical laboratory. For the grammar-school, founded in 1550, a building in the Tudor style was erected in 1841 by private shareholders, but in 1860 they sold it to the corporation, who now have the management of the school. The blue-coat school, founded in 1701, was in 1817 amalgamated with the national schools. Preston is well supplied with public recreation grounds, including Aven- ham Park, the Miller Park with a statue of the 14th earl of Derby, and the Moor Park. Winckley Square, near the centre of the town, has a monument to Sir Robert Peel.*~~

~~*Formerly " proud" Preston was a place of "fashion and society "; but the introduction of the linen manufacture at the end of the 18th century completely altered its charac- ter. The inventions of Sir Richard Arkwright, who was a native of the town, found in Preston early acceptance; and owing to its convenient communications by river, canal, and railway, aided by native enterprise, it has become one of the principal seats of the cotton manufacture in Lancashire. There are also iron and brass foundries, engineering works, cotton-machinery works, and steam- boiler works, and a considerable and increasing coasting trade with Ireland and England. In 1826 Preston became a creek of Lancaster ; in 1839 it was included in the new port of Fleetwood ; and in 1843 it was constituted an independent port. The number of vessels that entered the port in 1883 was 129 of 9365 tons, the number that cleared 137 of 9854 tons. By the deepening of the Ribble vessels of considerable tonnage can now unload at the new quay. But much more extensive operations in connexion with the improvement of the port have (1885) been projected. At an estimate cost of £800,000 the Ribble is to be deepened for a distance of about 12 miles to the point where it falls into the Irish Sea, and a new wet dock is to be constructed, with an area of 40 acres, in the centre of the Ribble valley, between the existing river-course and the intended diversion of the channel. The dock will be 13,240 feet long*~~

~~and 600 feet wide. Four large warehouses are to be erected along the entire length of its east side. In addition to the main dock a timber dock of 25 acres is to be constructed, and also two large graving-docks, enabling vessels up to 1000 tons burden to be constructed.~~

~~The population of the parliamentary borough in 1811 was 17,115, in 1841 50,073, in 1871 85,427, and in 1881 93,720; that of the municipal borough, the area of which was extended in 1880 to 3721 acres, amounted in 1881 to 96,537 (males 44,264, females 52,273). Preston returns two members to the House of Commons.~~

~~At Walton-le-Dale, close to Preston, where the Roman road crosses the Ribble, there are remains of a Roman post. Saxon ware, as well as Roman remains and coins, have been found in the neighbourhood. The mound at Penwortham, to the south-west of the town, was probably a mote-hill of the Saxons. Preston owes its rise to the decay of Ribchester, which it gradually superseded as the port of the Ribble. In the reign of Athelstane the whole district of Amounderness was granted to the cathedral-church of York. ; The capital of the hundred, on account of this ecclesiastical connexion, came to be known as " Priest's town," afterwards changed to "Preston." It possessed two monastic foundations, (1) a convent of Grey Friars founded in 1221 by Edmund, earl of Lancaster, son of Henry II, a little to the west of the Friargate, and occupied after~~

~~the dissolution first as a private residence, then until 1790 as the house of correction, and subsequently as cottages, and now super-~~

~~PRE—P RE~~

~~his having first enunciated the theory of exchanges (see~~

~~seded by an iron-foundry ; and (2) an ancient hospital dedicated to St Mary Magdalen, now occupied by the Roman Catholic church of St Walpurgis. The town is celebrated for its merchant guild celebrations, of which the earliest on record is that of 1329. On account of the devastations to which the district was subjected by the Danes the church of York abandoned its possessions, and Tostig, brother of Harold, beeaime lord paramount. At the Conquest it was granted, along with other possessions, to Roger de~~

~~*Poictou, and on his defection was forfeited to the crown. It possessed at an early period the charter of "a guild merchant, with hanse" and other customs belonging to such guild. Another charter was granted by Henry II., conferring on the inhabitants similar privileges and liberties to those enjoyed by the inhabitants of Newcastle-on-Tyne. Its privileges were confirmed and extended by King John, and in the 23d of Edward I. it obtained the right to send members to parliament. In 1323 Robert Bruce partly destroyed it by fire. In 1617 it was visited by James I. on his return from Scotland. On*~~

~~*the outbreak of the Civil War it declared for King Charles, but on >*~~

~~*the 12th February 1643 it was taken by the Parliamentary forces under Sir John Seaton. Near the town, on the 17th of August 1648, the Scots under Hamilton sustained an overwhelming defeat from Oliver Cromwell. On the 9th of November 1715 Preston was occupied by the troops of the Pretender, and by their surrender on the 13th of the same month the death-blow was given to his cause. On the 27th of November 1745 it was entered by Charles, the young Pretender, on his Quixotic march towards London. By the Muni- cipal Act of 1835 the borough is divided into six wards, comprising the ancient borongh of Preston and the township of Fishwick, and is governed by a mayor, twelve aldermen, and thirty-six councillors.*~~

~~*Whittle, Historical Account of Preston, 1821-37 ; Dobson, History of the Parlia- mentary Representation of Preston, 1856, 2d ed. 1868; Id., Preston in the Olden Time, 1856 ; Id., History of Preston Guild, 1862; Hardwick, History of Preston, 1857 ; Hewitson, History of Preston, 1883.*~~

~~*PRESTWICH, a township of Lancashire, is situated on a branch of the Lancashire and Yorkshire Railway, 4 miles north-west of Manchester and 5 south of Bury. It possesses cotton manufactures, but consists chiefly of handsome mansions and villas inhabited by Manchester merchants. The church of St Bartholomew occupies an eminence overlooking the Irwell. In the neighbourhood is the county lunatic asylum. The population of the urban 'sanitary district (area, 1917 acres) in 1871 was 6820, and in 1881 it was 8627.*~~

~~*PRESUMPTION. See Evipencg, vol. vill. p. 742 sq.*~~

PREVESA, the chief town of a sandjak in the Turkish vilayet of Janina, commanding the entrance to the Gulf of Arta. Its harbour is sinall, but it is a port of call for the steamers of the Austrian Lloyd and has a considerable trade in the export of oil, wool, valonia, &c. Prevesa, which represents the ancient Nicopo.is (q.v.), has a popu- lation of about 7000.

PREVOST, Pierre (1751-1839), son of a Protestant clergyman in Geneva, was born in that city on 3d March 1751, and was educated for a clerical career. But he for- sook it for law, and this too he quickly deserted to devote himself to education and to travelling. He became inti- mate with J. J. Rousseau, and, a little later, with Dugald Stewart, having previously distinguished himself as a trans- lator of and commentator on Euripides. Frederick II. of Prussia secured him in 1780 as professor of philosophy, and made him member of the Academy of Sciences in Berlin. He there became acquainted with Lagrange, and was thus led to turn his attention to science. After some years spent on political economy (as in Adam Smith's Wealth of Nations) and on the principles of the fine arts (in connexion with which he wrote, for the Berlin Memoirs, a remarkable dissertation on poetry) he returned to Geneva and commenced his works on magnetism and on heat. In- terrupted occasionally in his studies by political duties, in which he was often called to the front, he remained pro- fessor of philosophy at Geneva till he was called in 1810 to the chair of physics. He died at Geneva on 8th April 1839. Prévost published much on philology, philosophy, and political economy ; but he will be remembered mainly on two accounts—(1) his having published, with additions of his own, the posthumous memoirs of the ingenious Le Sage (see Arom, vol. iii, p. 46, and ATrRacrion) ; and (2)

RADIATION), on which has been bascd one of the grandest experiinental methods of modern times. He was distin-

guished as much for his moderation, precision, and truth-

fulness as for his extraordinary versatility.

PREVOST D'EXILLES, Antoine Francois (1697- 1763), more commonly called the abbé Prévost, one of the most important French novelists of the

~~*18th century, was born at Hesdin in Artois on Ist April 1697. His father was of good family, and held legal employments of some importance. Prévost was educated by the Jesuits, first at Hesdin and then at Paris. At the age of sixteen he left the Collége d'Harcourt and enlisted. This was, however, at the close of the War of the Spanish Succession, and he soon returned to the Jesuits, and was almost persuaded to enter the order. According to some accounts he actually did so, but a truant disposition once more came on him and he again joined the army, apparently obtaining some com- mission. It is, however, not easy to make his statement that he passed five or six years thus tally with the positive assertion that in 1719 he once more sought the cloister, this time joining the famous learned community of the Benedictines of St Maur. He took the vows finally in 1720, and it would appear that for some seven years he devoted himself without repining to study at various houses of the order, preaching, teaching, and writing some part of the Gallia Christiana. In 1727, however, or thereabouts (for the details of Prévost's life, though un- usually interesting, are most vaguely and insufficiently recorded) he once more broke bounds and fled to Holland. It is said that the immediate occasion was nothing more than a wish which he had formed to be transferred to Cluny, and which made him commit some technical mis- demeanour. However this may be, he was for six years an exile in Holland and England, and one story even asserts that he contracted a regular or rather irregular marriage during this period. He certainly published the first of his remarkable novels, the Afémoires dun Homme de Qualité, in 1728, and continued them for some years. Besides this he produced much miscellaneous work—Cléve- land, another novel; Manon Lescaut, his masterpiece (which is a kind of appendix to his first book) ; and a periodical publication, partly in the style of the Spectator and partly in that of a literary review, called Le Pour et le Contre. All these were begun and most of them were finished before 1735, when he was back in France and produced his last novel of importance, the Doyen de Kullérine, in which, as in Cléveland, he made much use of his English sojourn. He returned to France openly and with the royal permission, being allowed to wear the dress of the secular priesthood. Among his patrons the cardinal de Bissy and the prince de Conti are named ; the latter made him his chaplain, He lived for nearly thirty years longer, composing, though not for bread, an extraordinary num- ber of books, some of them original, some compilations. Amongst them were an Histoire Générale des Voyages, his- torical*~~

~~compilations on William the Conqueror and Margaret of Anjou, letters, moral essays, semi-scientifie works, trans- lations (including Pamela and Clarissa), and some original pieces. Of all these the novel called Hestoire Pune Grecque Moderne (1741) has alone attracted some attention in modern times. Prévost was a facile writer and a fair critic, but except for his first three novels, and especially for Manon Lescaut, he would hardly be remembered save as a man of a curiously eventful and very imperfectly recorded life. His death itself has a kind of legendary character, and some of the circumstances are, it may be hoped, ficti- tious. He lived in a small cottage (for, despite his im- mense literary work on subjects which for the most part occupy only writers for money, he seems to have written~~

~~purely for love) at Chantilly, and it was his custom to walk much in the woods there. What is agreed is that he was struck with apoplexy during one of these walks, on 23d November 1763, and was found senseless. The legend adds the hideous particular that he was not dead, and that a clumsy village surgeon, heedlessly beginning what he sup- posed to be a post-mortem examination, at once recalled his patient to life and killed him. Even without this detail there is sufficient romantic interest (without other stories, some of them demonstrably fictitious, such as that he was accidentally the cause of his father's death) about this life of a man who is at the same time uniformly represented as an indefatigable student and one of a quiet and easy- going temperament.~~

~~Prévost's three chief romances, the Afémoires, Cléveland, and the Doyen de Killérine, are not unremarkable, because they hold a kind of middle place between the incident-romance of Le Sage and Defoe and the sentiment-romance of Marivaux and Richardson ; but they all have the defect of intolerable length and of an indefinite fluency. Jfanon Lescaut, his one masterpiece, and one of the greatest novels of the century, is in both these respects so different that it might seem impossible that the same man should have written it. It is very short, it is entirely free from improbable incident, it is penetrated by the truest and the most cunningly managed feeling, and almost every one of its characters is a triumph of that analytic portraiture which is the secret of the modern novel. The chevalier des Grieux, the hero,~~

~~*is probably the most perfect example of the carrying out of the sentiment "All for love and the world well lost" that exists in fiction (it is curious that Prévost translated Dryden's play of the name), at least where the circum-stances are those of ordinary and probable life. Tiberge, his friend, is hardly inferior in the difficult part of mentor and reasonable man. Lescaut, the heroine's brother, has vigorous touches as a bully and Bohemian ; but the triumph of the book is Manon herself. Animated by a real affection for her lover, and false to him only because her incurable love of splendour, comfort, and luxury prevents her from welcoming privation with him or for him, though in effect she prefers him to all others, perfectly natural and even amiable in her degradation, and yet showing the moral of that degradation more Vividly than a hundred characters drawn with a less compla- cent pencil could have done, Manon is one of the most remarkable heroines in all fiction. She had no literary ancestress ; she seems to have sprung entirely from the imagination, or perhaps the sympathetic observation, of the wandering scholar who drew her. Only the Princesse de Cleves can challeuge comparison with her before or near to her own date, and in Manon Lescaut the plot is much more complete and interesting, the sentiments less artificial, and the whole story nearer to actual life than in Madame de la Fayette's masterpiece. It is not easy to name a novel on the same scale which is more directly and naturally affecting at a first reading, and which on subsequent study approves itself more thoroughly as a work of art, than Manon Lescaut.*~~

~~*There is no complete edition of Prévost's works. Muvres Choisies were pub-*~~

~~*lished in 1783, and again in 1806. Of Manon Lescaut the editions are very numerous.*~~

~~*PREVOST-PARADOL, Lucien AnaTouE (1829-1870), a writer whose career, except in its unhappy end, was typical of the importance of journalism in France, was born at Paris on the 8th of August 1829. His mother was an actress; little is said of his father. He was educated at the Collége Bourbon, showed great brilliancy and precocity, and entered the Ecole Normale. In 1855 he was appointed professor of French literature at Aix. He held the post, however, barely a year, resigning it to take up the pen of a leader-writer on the Journal des Débats. He also wrote in the Courrier*~~

~~*du Dimanche, and for a very short time in the Presse. Even before his appointment at Aix he had produced a book, Revue de l'Histoire Universelle (1854), and he continued to publish at short invervals, his chief work being a collection of essays on politics and literature, which appeared between 1859 and 1866, and some Essais sur les Moralistes Francais (1864). He was, however, rather a journalist than a writer of books, and was one of the chief opponents of the empire on the side of moderate liberalism. culties of a journalist under that régime, and was once imprisoned. In 1865, at the extraordinarily early age of thirty-five, he was elected an Academician. He was twice*~~

~~*He underwent the usual and popular diffi- |*~~

~~*PRE—PRI*~~

~~*a candidate for election to the Chamber, but failed each time. Three years later he visited England and was publicly entertained at Edinburgh, an entertainment which was the occasion of some rather undignified and very foolish contrasts drawn in the English press between the position of journalists in the two countries. The accession of Kmile Ollivier to power was fatal to Prévost-Paradol. There is no reason for doubting that, in common with some of the best men in France, he believed in the possibility of a liberal empire, and he accepted the appointment of envoy to the United States. This was the signal for the most unmeasured attacks on him from the republican party. He had scarcely installed himself in his post before the outbreak of war between France and Prussia occurred. Either an exaggerated feeling of patriotism, or the dis- appointment of his hopes in the combined wisdom of M. Ollivier and the emperor, or (as his enemies said) remorse at having betrayed his party for nothing, or more probably the action of startling news on an excitable temperament and a mind weakened and irritated by the personal in- vectives to which he had been subject, threw his intellect and will out of gear. He committed suicide at New York on 20th July 1870. Prévost-Paradol was not in any sense a strong man, and, except for his tragic end, his name is not very likely to live either in literature or politics. His style was light and facile, but at the same time flimsy, and his thoughts were rarely profound. But he had fora time "Vesprit*~~

~~*de tout le monde" in France, and the personal system of journalism forced him into unnatural prominence and productiveness.*~~

~~*PRIAM. See Troy.*~~

~~*PRIAPUS, the Greek god of teeming flock and fruit- ful field. He was unknown to the earliest Greek poets Homer and Hesiod, but in later times his worship pre- vailed on the fertile coasts of Asia Minor. Lampsacus on the Hellespont, nestling in its vineyards, claimed to be his birthplace. According to the people of Lampsacus he was the son of Dionysus and Aphrodite. Having the misfortune, as a child, to be plain-looking, Priapus was abandoned by his heartless parents, but a gentle shepherd who chanced to pass that way found and reared the help- less babe like his own son. As the youthful god grew to manhood he repaid his benefactor by making: the flocks and herds to bring forth and multiply. So the simple shepherds worshipped him and brought him offerings of the fatlings of their flocks,—lambs and goats and heifers, and even, it is said, donkeys. As the god and guardian of gardens, vineyards, and orchards he received sacrifices of fruits and vegetables, and images of him were set up in gardens to frighten birds and thieves. Bees too were his especial care, and he had power to disarm the evil eye. Fishermen prayed to him for an abundant harvest of the sea, and sailors in their sore distress called on him, and he answered and saved them. On many a wave-beaten bluff his image stood and his altar smoked, decked with flowers the earliest of the year, when winter storms were over and summer seas allured the mariner to launch his bark again. In the rites of Dionysus homage was paid to the rural god with mirth and laughter. From Greece he passed to Italy, and continued in his new home to discharge his old functions of garden-god and scarecrow.*~~

~~*PRIBRAM or PrziperaM, a prosperous mining town of Bohemia, is situated about 32 miles 8.W. of Prague. The lead-mines in the vicinity have been worked for several centuries and are especially important on account of the large quantity of silver extracted from the ore. In average years this amounts to 70,000 ib, representing a money value of nearly £300,000. The mines belong to the Government and employ about 5000 persons. One of the shafts, 3350 feet deep, is among the deepest in the world. Besides*~~

~~*mining, the inhabitants occupy themselves in making glass beads, soap, candles, beer, and liqueurs. The most interesting buildings are the old deanery and church, and the archiepiscopal palace, now converted into a mining academy. At the top of the Heiliger Berg, a hill rising above the town, is a church with a wonder-working image of the Virgin, which attracts numerous pilgrims. The population of Pribram in 1880 was 11,171, or, including the adjacent Birkenberg, where the largest mines are situated, 14,881.*~~

~~*PRICE, Ricuarp (1723-1791), philosopher, son of a Dissenting minister, was born on 23d February 1723, at Tynton, in the parish of Llangeinor, Glamorganshire. His education was conducted partly by private tutors, partly at private schools. His father was a bigoted Calvinist and seems to have been a person of morose temper, facts which may account, on the principle of reaction, for the liberal opinions and the benevolent disposition of the son. Young Price appears at an early age to have studied the works of Clarke and Butler, and to have conceived a special admiration for the theological and philosophical works of the latter writer. In his eighteenth year he removed to a Dissenting academy in London, and, having completed his education, became chaplain and companion to a Mr Streatfield at Stoke-Newington. While still occupying this position he officiated in various Dissenting congrega- tions, such as those in the Old Jewry, Edmonton, and Newington Green. By the death of Mr Streatfield and of an uncle in 1756 his circumstances were considerably improved, and in the following year, the year in which he first published his best-known work, a Review of the Principal Questions in Morals, he married a Miss Sarah Blundell, originally of Belgrave in Leicestershire. Price now resided at Newington Green, where his time appears to have been mainly occupied in the performance of his ministerial duties, though he made occasional excursions into the regions of mathematics and philosophy. In 1767 he published a volume of sermons, including one on the future state, which attracted the attention and gained him the acquaintance of Lord Shelburne, an event which had much influence in raising his reputation and deter- mining the character of his subsequent pursuits. Soon after this date he added to his duties at Newington Green those of morning preacher to a congregation at Hackney, where his audience appears to have been more*~~

~~numerous and appreciative than any which he had heretofore suc- ceeded in keeping together.~~

~~But it was not so much in the capacity of a religious teacher as a writer on financial and political questions that Price was destined to become known to his countrymen at large. In 1769 he wrote some observations addressed in a letter to Dr Franklin on the expectation of lives, the in- crease of mankind, and the population of London, which were published in the Philosophical Transactions of that year ; and, again, in May 1770, he communicated to the Royal Society some observations on the proper method of calculating the values of contingent reversions. The pub lication of these papers is said to have exercised a most beneficial influence in drawing attention to the inadequate calculations on which many insurance and benefit societies had recently been formed. In the year 1769 Price re- ceived the degree of D.D. from the university of Glasgow. In 1771 he published his Appeal to the Public on the Subject of the National Debt, of which subsequent editions appeared in 1772 and 1774. This pamphlet excited con- siderable controversy at the time of its publication, and is supposed to have influenced Pitt in re-establishing the sinking fund for the extinction of the national debt, which had been created by Walpole in 1716 and abolished in 1733. That Price's main object, the extinction of the~~

~~national debt, was a laudable and desirable one would now probably be universally acknowledged. The particu- lar means, however, which he proposed for the purpose of effecting this object are described by Lord Overstone' as "ca sort of hocus-pocus machinery," supposed to work '"'with- out loss to any one," and consequently purely delusive. As Lord Overstone says, all the sinking funds that have been set on foot have been supported either by loans or by the produce of taxes, and have never paid off a single shilling of debt by their own agency. In 1829 Pitt's sinking fund was abolished by Act of parliament.~~

~~A subject of a much more popular kind was next to employ Dr Price's pen. Being an ardent lover of civil and religious liberty, he had from the first been strongly opposed to the war with the American colonies, and in 1776 he published a pamphlet entitled Observations on Civil Liberty and the~~

~~*Justice and Policy of the War with America. Several thousand copies of this work were sold within a few days; a cheap edition was soon issued ; the pamphlet was extolled by one set of politicians and abused by another ; amongst its critics were Dr Markham, archbishop of York, John Wesley, and Edmund Burke ; and its author rapidly became one of the best-known men in England. In recognition of his services in the cause of liberty by the publication of this pamphlet Dr Price was presented with the freedom of the city of London, and it is said that the encouragement derived from this book had no inconsiderable share in determining the Americans to declare their independence. A second pamphlet on the war with Anierica, the debts of Great Britain, and kindred topics followed in the spring of 1777, and whenever the Government thought proper to proclaim a fast-day Dr Price took the opportunity of declaring his sentiments on the folly and mischief of the war. HIs name thus became identified, for good repute and for evil repute, with the cause of Anierican independence. HIe was the intimate friend of Franklin; he corresponded with Turgot; and in the winter of 1778 he was actually invited by Congress to transfer himself to America and assist in the financial administration of the insurgent States. This offer he refused from unwillingness to quit his own country and his family connexions, concluding his letter, however, with the prophetic words that he looked ‘“‘to the United States as now the hope, and likely soon to become the refuge, of mankind.” °*~~

~~*One of Price’s most intimate friends was the celebrated Dr Priestley, but this circumstance did not prevent them from taking the most opposite views on the great questions of morals and metaphysics. In 1778 appeared a published correspondence between these two liberal theologians on the subjects of materialism and necessity, wherein Price maintains, in opposition to Priestley, the free agency of man and the unity and immateriality of the human soul. Both Price and Priestley were in theological opinion what would now vaguely be called “ Unitarians,” though they occupied respectively the extreme right and the extreme left position of that school. Indeed Price’s opinions would seem to have been rather Arian than Socinian.*~~

~~*After the publication of his pamphlet on the American war Dr Price became an important personage. HIe now preached to crowded congregations, and,*~~

~~*when Lord Shel- burne acceded to power, not only was he offered the post of private secretary to the premier, but it is said that one of the paragraphs in the king's speech was suggested by him and even inserted in his very words.*~~

~~*In 1786 Mrs Price died, and as there were no children by the marriage, and his own health was failing, the remainder of Price's life appears to have been somewhat*~~

~~*1 Lord Overstone reprinted in 1857, for private circulation, Price's and other rare tracts on the national debt and the sinking fund.*~~

~~*clouded by solitude and dejection. It was illuminated, however, by one bright gleam, the eager satisfaction with which he witnessed the passing events of the French Revolution. "TI could almost say, Lord, now lettest thou thy servant depart in peace, for mine eyes have seen thy salvation. After sharing in the benefits of one Revolution, I have been spared to be a witness to two other revolutions, both glorious."! The darker side of the picture he happily did not live to see. On the 19th of April 1791 he died, worn out with suffering and disease. HIs funeral was conducted at Bunhill Fields by Dr Kippis, and his funeral sermon was preached on the following Sunday by Dr Priestley, names which, like his own, are specially honourable in the roll of English Nonconformist*~~

~~*divines.*~~

~~*On the 4th of November 1789 Price had preached at the meeting-house in the Old Jewry, before the Society for commemorating the Revolution in Great Britain, his celebrated sermon on the Love of our Country. This sermon, together with a speech subsequently made by him at a public dinner at the London Tavern, rendered him peculiarly obnoxious to Burke, and brought down upon him some of the fiercest denunciations of that brilliant but impassioned writer in his Reflections on the Revolution*~~

~~*in France.*~~

~~*Price's reputation rests mainly upon the position which he occupies in the history of moral philosophy. HIs ethical theories are contained in the treatise already mentioned, a Review of the Principal Questions in Morals, the third edition of which, express- ing "the author's latest and maturest thoughts," was published in 1787. This work is professedly directed against the doctrines of Hutcheson, but the treatment as a whole is constructive rather than polemical. Price's views approximate more closely to those of Cudworth than to those of any other English moralist ; but they are mainly interesting in the history of morals on account of their resemblance to the theories subsequently propounded by Kant. The main positions of Price's treatise are three, which may be stated as follows :—(1) actions are in themselves right or wrong ; (2) right and wrong are simple ideas incapable of analysis ; (3) these ideas are perceived immediately by the intuitive power of the reason or understanding, terms which he employs indifferently.*~~

~~*To the first of these positions it is not, at first sight, easy to attach any precise ineaning, nor does even a careful perusal of the work altogether remove the ambiguity. The most natural inter- pretation, perhaps, of the expression that "an action is right in itself" is that it is right without any relation to the nature of the agent, the end aimed at, or the circumstances under which it is performed. But, apart from the fact that the objections to such a theory would be too obvious to be overlooked, the following passage is sufficient to show that Price cannot have entertained it: 'All actions being necessarily right, indifferent, or wrong ; what deter- mines which of these an action should be accounted is the truth of the case, or the relations and circumstances of the agent and the objects. In certain relations there is a certain conduct right. There are certain manners of behaviour which we unavoidably approve, as soon as these relations are known. Change the rela tions, and a different manner of behaviour becomes right. Nothing is clearer than that what is due or undue, proper or improper to be done, must vary according to the different natures and circum- stances of beings. Ifa particular treatment of one nature is right, it is impossible that the same treatment of a different nature, or of all natures, should be right" (ch. vi.). What, then, does he mean by the phrase that 'an action is right or wrong in ttself" ? Excluding the meaning which we have set aside, he may wish to*~~

~~express either that actions are right or wrong irrespectively of their consequences, or that the same action would appear right or wrong not to man only but to all intelligent beings, or, as seems to be the case, he may sometimes wish to express one of these meanings and sometimes the other.~~

~~__ The second and third positions, that right and wrong are simple ideas incapable of analysis, and that they are perceived by an intuitive act of the reason, are succinctly stated in the following passage: "''T'is a very necessary previous observation that our ideas of right and wrong are simple ideas, and must therefore be ascribed to some power of immediate perception in the human mind. HIe that doubts this, need only try to give definitions of them, which evil amount to more than synonymous expressions" (ch. i. sect. 1). ae sie passages the question in dispute between the~~

~~al schools of moralists is brought to a definite issue. Does~~

~~1 Sermon on the Love of our Country.~~

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~~the term "right" admit ofany explanation, definition, or analysis, or is it simply inexplicable? 'The majority of moralists have adopted the former alternative, and have endeavoured to explain the idea of right in subordination to that of good. Any course of action which has, on the whole, a tendency to promote the happiness or to alleviate the misery of mankind they denominate as right ; and any course of action which has a contrary tendency they denomi- nate as wrong. Price, on the otherr hand, maintains that when we say an action is right we can give no further account of it, that we state an ultimate fact which neither requires nor can receive any further explanation. The connexiou of the third with the first and second positions is obvious. Right and wrong, being simple ideas, and being, moreover, qualities of actions, considered in them- selves, are regarded by Price as being perceived immediately by the reason just in the same way that colour is perceived by the eye or sound by the ear. That they are perceived immediately follows from the fact that they are simple ideas, incapable of analysis ; that they are perceived by the reason or understanding, and not by a sense, is maintained in an elaborate course of~~

~~*argument against Hutcheson. When the reason or understanding has once apprehended the idea of right, it ought to impose that idea as a law upon the will; and thus it becomes, equally with the affections, a spring of action.*~~

~~*The place of the emotional part of our nature in this system is not very clear. The predominant view, however, appears to be that, while it is the source of all vicious action, it may, when enlightened by reason, aid in the determination of virtuous conduct. The school of Hutcheson, on the other hand, maintains that the emotions are, in the last analysis, the original source of all conduct, be it virtuous or vicious.*~~

~~*As already stated, the English moralist with whom Price has most affinity is Cudworth. The main point of difference is that, while Cudworth regards the ideas of right and wrong as vojuara or modifications of the intellect itself, existing firstin germ and after- wards developed by circumstances, Price seems rather to regard them as acquired from the contemplation of actions, though acquired necessarily, immediately, and intuitively.*~~

~~*Those who are familiar with the writings of Kant (which arc posterior to those of Price) will recognize many points of resemblance both in the fundamental ideas and in the modes of expression. Amongst these points are the exaltation of reason ; the depreciation of the affections ; the unwillingness of both authors to regard the '*partial and accidental structure of humanity," the "mere make and constitution of man," as the basis of morality,—in other words, to recognize ethical distinctions as relative to human nature; the ultimate and irresolvable character of the idea of rectitude ; the notion that the reason imposes this idea as a law upon the will, becoming thus our independent spring of action; the insistence upon the reality of liberty or "the power of acting and deter- mining"; the importance attached to reason as a distinct source of ideas; and, it may be added, the discrimination (so celebrated in the philosophy of Kant) of the moral (or practical) and the speculative understanding (or reason)."*~~

~~*Price's ethical theories are almost the antithesis of those of Paley, whose Moral and Political Philosophy appeared in 1785. Speak- ing of this work in his third edition Price says, " Never have I met with a theory of morals which has appeared to me more exception- able."*~~

~~*Most of Price's more important works have been already mentioned. To these may be added an Essay on the Population of England (2d ed., 1780); two Fast-day Sermons, published respectively in 1779 and 1781; and Observations on the importance of the American Revolution and the means of rendering it a benefit to the World, 1784. A complete list of his works is given as an appendix to Dr Priestley's Funeral Sermon. Notices of Price's ethical system occur in Mackintosh's Progress of Ethical Philosophy, Jouffroy's Introduction to Ethics, Whewell's History of Moral Philosophy in England, Bain's Mental and Moral Sciences, the article on Etutes (vol. viii. pp. 603, 604), and a monograph on*~~

~~*Shaftesbury and Hutcheson by the writer of this article in Sampson Low & Co.'s series of English Philosophers. The authority for his life is a memoir by*~~

~~*his nephew, William Morgan. (T. F.) PRICHARD, James Cowzs (1786-1848), the founder of ethnology or anthropology in England, was born on 11th February 1786 at Ross in Herefordshire. His parents were of the Society of Friends, and his career in after life partly turned on his not receiving the then narrow course of school education, but a wider home training in modern languages and general literature. Living at Bristol, he occupied himself much in examining the natives of different countries who were to be met with amongst the shipping of the port, and he would occasionally bring a foreigner to his father's house. Thus in early life he laid a foundation for his later researches, and he was mainly led to adopt medi- cine as a profession from the facilities which its study offered*~~

~~*? Price does not, like Kant, distinguish between the words "reason" and " understanding."*~~

~~*PRI—PRI*~~

~~*for the investigation of man. He took his degree at Edin- burgh, afterwards reading for a year at Trinity College, Cambridge, whence, joining the Church of England, he migrated to St John's College, Oxford, afterwards entering as a gentleman commoner at Trinity College, Oxford, but seeking no degree in either university. In 1810 he settled at Bristol as a physician, and in 1813 published his Re- searches into the Physical History of Man, in*~~

~~*2 vols., after- wards extended to 5 vols. The central principle of the book is the primitive unity of the human species, acted upon by causes which have since divided it into permanent varieties or races. Dr Prichard states that he was led into this inquiry by the diversity of races being alleged as a disproof of the Mosaic records ; in argument, however, he endeavoured not to rely on theology, but to proceed "' by the ordinary method of observation and experience." The work is dedicated to Blumenbach, whose five races of man are adopted. But where Prichard excelled Blumenbach and all his other predecessors was in his grasp of the principle that people should be studied by combining all available characters, and he accordingly discusses them at large with regard at once to bodily form, language, and state of civilization. One investigation begun in this work requires special mention, the bringing into view of the fact, neglected or contradicted by philologists, that the Celtic nations are allied by language with the Slavonian, German, and Pelasgian (Greek and Latin), thus forming a fourth European branch of the Asiatic stock (which would now be called Indo-European or Aryan). Prichard, whose own Celtic descent is shown by his name, was a fitting pro- mulgator of this leading principle of Celtic research. His special treatise containing Celtic compared with Sanskrit words appeared in 1831 under the title Hastern Origin of the Celtic Nations. It is remarkable that the essay by Adolphe Pictet, De PAffinité des Langues Celtuques avec le Sanscrit, which was crowned by the French Academy and made its author's reputation, should have been published in 1837 in evident ignorance of the earlier and in some respects stricter investigations of Prichard. His work has been re-edited since by Dr R. G. Latham (London, 1857), with large additions of Celtic material. Prichard's Analy- sts of Egyptian Mythology (London, 1819) had some popu- larity at the time, and was translated into German with a preface by A. W. v. Schlegel; its comparison of the Egyptian religion with Brahmanisin is now obsolete, and its author was unwise in bringing out a new edition in 1838, after Champollion's Grammar and Dictionary had opened the actual Egyptian inscriptions to scholars. Dr Prichard's last important book was a revision and condensation of his researches into a Natural History of Man (London, 1843), which has gone through several editions, and remains a standard work of the anthropologist's library. Towards the end of his life, in recognition of his services, he was made a commissioner of lunacy, and in consequence re- moved from Bristol to London, where he died in 1848.*~~

~~A memoir by his friend Dr Hodgkin will be found in the Journal of the Ethnological Society, of which he was one of the early presidents.~~

~~PRIDE, Tuomas (d. 1658), Parliamentary officer, was of humble origin, and is stated to have been brought up by the parish of St Bride's, London. Subsequently he was a drayman and a brewer. At the beginning of the Civil War he served as ensign under the earl of Essex, and gradually obtained promotion to the rank of colonel. He distinguished himself at the battle of Preston, 17th August 1648, and in Cromwell's Scottish campaign he held command of a brigade. He was noted for his resolute character and extreme anti-Royalist sentiments. After the Commons had voted that the king's concessions at Newport were a basis for a settlement, he was chosen by the army~~

~~chiefs to effect their purpose of "' purging" the Commons. Taking his stand at the entrance of the House of Commons with a written list in his hand, he caused the arrest of the Royalist members who were pointed out to him, and placed them in custody. After about a hundred members had been dealt with by this ordinance, subsequently known as '"Pride's Purge," the mutilated House of Commons proceeded to bring the king to trial. Pride was one of the judges of the king and signed his death-warrant. Under Cromwell he received the honour of knighthood, and was also chosen a member of the new House of Lords. He died at Nonsuch on 23d October 1658, and after the Restoration his body was dug up and suspended on the gallows at Tyburn along with that of Cromwell.~~

~~Noble, Lives of the Regicides; Bate, Lives of the Prime Actors and Principal Contrivers of the Murder of Charles I. ; Carlyle, Cromwell.~~

~~PRIDEAUX, Humpnurey (1648-1724), dean of Nor- wich, was the third son of Edward Prideaux of Place in Padstow, Cornwall, by his wife Bridget, daughter of John Moyle of Bake in the same county. Both families were of good repute in the west of England, and that of Prideaux was especially influential, as is shown by the elaborate pedigrees in Sir John Maclean's Deanery of Trigg Minor (ii. 194-242). He was born at Place on 3d May 1648, and received the rudiments of his education at the gram- mar-schools~~

~~*of Liskeard and Bodmin. In 1665 he was placed at Westminster under Dr Busby, and after staying there for three years was admitted a student at Christ Church, Oxford, taking his degrees in the following order, B.A. in 1672, M.A. 1675, B.D. 1682, and D.D. 1686. It was the rule of that house that its best scholars should, after they had taken their first degree, be employed in editing some classical writer, and Prideaux was accordingly deputed to superintend a new edition of Lucius Florus and to prepare for the press, from a Greek MS. in the Bodleian, a work by Johannes Malalas. The first of these works is now exceedingly scarce, if indeed a copy be in existence, and the second was, on his advice, left in manuscript. The famous Arundel marbles had just been given to the university, and Prideaux was instructed to undertake the task of describing the gift, his transcript of the inscriptions, with a commentary and additions from the Selden marbles, appearing in 1676. In 1679 he was appointed to the rectory of St Clement's, Oxford, and in the same year became Hebrew lecturer at Christ Church, whereupon he published two Hebrew tracts of Maimonides with a Latin translation and annotations. Prideaux con- tinued tutor at Christ Church until February 1686, hold- ing for the last three years the rectory of Bladon with Woodstock ; but in 1686 he exchanged for the benefice of Saham in Norfolk, and took up his residence in that county, with which he had for some time been connected through his appointment in August 1681 to a prebendal stall in Norwich cathedral. The sympathies of Prideaux inclined to Low Churchism in religion and to Whiggism in politics, and during the years which immediately preceded and succeeded the Revolution of 1688 he took an active part in the controversies of the day, publishing in quick succession the following pamphlets—7Zhe Validity of the Orders of the Church of England (1688), Letter to a Friend on the Present Convocation (1690), The Case of Clandestine Marriages stated (1691). Prideaux was promoted to the archdeaconry of Suffolk at the close of 1688 and to the deanery of Norwich in June 1702, and it was the wish of some of the members of the episcopal bench that he should have been appointed to the bishopric of Norwich, but their desires were not gratified. In 1694 he was obliged, through ill-health, to resign the rectory of Saham, and after having held the vicarage of Trowse for fourteen years*~~

~~(1696-1710) he found himself incapacitated, by repeated attacks of stone, from further parochial duty. — He died at Norwich on lst November 1724, and was buried in the cathedral on 4th November. His wife, Bridget, only daughter and sole heir of Anthony Bokenham of Helming- ham, Suffolk, died at Norwich in November 1700; they were married on 16th February 1686.~~

~~Many of the dean's writings were of great value, and their popu- larity continued unimpaired down to the present century. His Life of Mahomet, originally published in 1697, had passed through eight editions by 1723, and his Directions to Churchwardens, first issued in 1701, reached a twelfth edition in 1871. But the favour with which these volumes were received, great as it was, contrasts but badly with the extraordinary success of his account of The Old and New Testament connected in the History of the Jews, a work of great research and learning. This has been many times reissued since the appearance of the first part in 1716, and has been trans- lated into the French, German, and Italian languages. Le Clere subjected it to a critical examination. A series of remarks upon it is contained in Walter Moyle's works, and continuations were com- piled by Samuel Shuckford and Michael Russell. Prideaux published several small tracts, and many volumes of manuscript collections are in the possession of his descendant at Place. These, with par- ticulars of the dean's letters in print and in manuscript and with bibliographical details of his numerous publications, are described in the Bibliotheca Cornubiensts, ii. 527-533 and iii. 1319. A volume of his letters to John Ellis, some time under-secretary of state, was edited by Mr E. M. Thompson for the Camden Society in 1875, and contained a vivid picture of Oxford life after the Restoration ; but it will always be regretted that some passages in his correspond- ence should betray feelings unworthy of the writer. An anonymous life of Dean Prideaux appeared in 1748, but it was mainly compiled from a larger memoir by his son.~~

~~PRIESSNITZ, VINcENz. p. 542 sq.~~

~~PRIEST (Ger. Priester, Fr. prétre) is a contracted form of " presbyter" (mpeoBurepos, "elder"; see PRESBYTER), a name of office in the early Christian church, already men- tioned in the New Testament. But in the~~

~~*English Bible the presbyters of the New Testament are called "elders," not "priests"; the latter name is reserved for ministers of pre-Christian religions, the Semitic D273 (kahdntm, sing. kohén) and DY23 (kemarim), or the Greek tepe?s. The reason of this will appear more clearly in the sequel ; it is enough to observe at present that, before our English word was formed, the original idea of a presbyter had been over- laid with others derived from pre-Christian priesthoods, so that it is from these and not from the etymological force of the word that we must start in considering historically what a priest is. The theologians of the Greek and Latin Churches expressly found the conception of a Christian priesthood on the hierarchy of the Jewish temple, while the names by which the sacerdotal character is expressed—epevs, sacerdos—originally designated the ministers of sacred things in Greek and Roman heathen- ism, and then came to be used as translations into Greek and Latin of the Hebrew kohén. Kohén, icpevs, sacerdos, are in fact fair translations of one another; they all denote a minister whose stated business was to perform, on behalf of the community, certain public ritual acts, particularly sacrifices, directed godwards. Such ministers or priests existed in all the great religions of ancient civilization, and indeed a priesthood in the sense now defined is generally found, in all parts of the world, among races which have a tribal or national religion of definite character, and not merely an unorganized mass of super- stitious ideas, fears, and hopes issuing in practices of sorcery. The term "priest" is sometimes taken to include*~~

~~*sorcerer," just as religion is often taken to include the*~~

~~*See HypropartHy, vol. xii.*~~

~~*belief in mysterious or superhuman powers which can be:*~~

~~*constrained by spells, but this is an abuse of language. Religion begins when the relation of the divine powers to man is conceived—on the analogy of the relations of formed human society—as having a certain stable personal*~~

~~*character on which the worshippers can calculate and act. The gods of the ancient religions might do arbitrary acts, but their conduct towards man was not habitually arbi- trary. In so far as they could be reckoned on, they had a religion ; in so far as they were still arbitrary, or them- selves subject to the influence of unknown forces, room was left for the persistence of sorcery and similar superstitions, which history proves to have always renewed their strength in times when religious faith failed, when men ceased to be fully persuaded that the favour and help of the gods were sure if certain known conditions were fulfilled. In the best times of the antique religions no such doubts were felt ; the real interest of the gods in their worshippers was certain, for all good things came from their hands, and the actions on the part of individuals or of the state by which their favour was maintained, lost, or regained were matter of undisputed tradition, The main points of this tradition were known to every one concerned, and difficult cases were resolved by experts—such as the Greek é&nynrat—or referred, through some form of oracle, to the gods themselves. The relations of the gods to men, as thus traditionally defined, were not so much to individuals as to families, tribes, or states, and it was the business of the community to see that they were maintained on a sound footing. This was partly done by watching over the conduct of individuals, for every one had certain religious duties ; and conversely, certain acts of a private as well as of a public character were hateful to the gods, and, unless expiated, might bring calamity to the whole community. But it was also necessary to honour the gods by direct acts of homage, by images and temples, by feasts and sacrifices. To attend to these things was an essential part of the right government of the state, the right ordering of tribal and family life, and they could not be wholly left to the spontaneity of individuals, but necessarily fell to be per- formed on behalf of the community by its natural head or by specially appointed officials. In either case the service done to the gods on behalf of many may properly be called "priestly service," though in the former case the priesthood, being only one of the many functions of domestic or civil authority, was not necessarily recognized by a special name. Both kinds of priesthood are found in the old civilization of southern Europe: thus Homer knows special priests who preside over ritual acts in the temples to which they are attached ; but his kings also do sacrifice on behalf of their people. The king, in fact, both in Greece and in Rome, was the acting head of the state religion, and when the regal power came to an*~~

~~*end his sacred functions were not transferred to the ordinary priests, but either they were distributed among high officers of state, as archons and prytanes, or the title of "king" was still preserved as that of a religious functionary, as in the case of the rex sacrorum at Rome and the archon basileus at Athens. In the domestic circle the union of priesthood and natural headship was never disturbed ; the Roman paterfamilias sacrificed for the whole family. On the other hand, gentes and phratriz, which had no natural head, had special priests chosen from their members ; for every circle of ancient society, from the family up to the state, was a religious as well as a civil unity, and had its own gods and sacred rites. The lines of religious and civil so- ciety were identical, and so long as they remained so no antagonism could arise between the spiritual and the temporal power. In point of fact, in Greece and Rome the priest never attained to any considerable independent importance ; we cannot speak of priestly power and hardly even of a distinct priestly class. In Greece the priest, so far as he is an independent functionary and not one of the magistrates, is simply the elected or hereditary minister of a temple charged with " those things which are ordained*~~

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~~*to be done towards the gods" (see Aristotle, Pol., vi. 8), and remunerated from the revenues of the temple, or by the gifts of worshippers and sacrificial dues. The position was often lucrative and always honourable, and the priests were under the special protection of the gods they served. But their purely ritual functions gave them no means of establishing a considerable influence on the minds of men, and the technical knowledge which they possessed as to the way in which the gods could be acceptably approached was neither so intricate nor so mysterious as to give the class a special importance. The funds of the temples were not in their control, but were treated as public moneys. Above all, where, as at Athens, the decision of questions of sacred law fell not to the priests but to the college of é£yynrai, one great source of priestly power was wholly lacking. There remains, indeed, one other sacred function of great importance in the ancient world in which the Greek priests had a share. As man approached the gods in sacrifice and prayers, so too the gods declared themselves to men by divers signs and tokens, which it was possible to read by the art of*~~

~~*Divination (q.v.). In many nations divination and priesthood have always gone hand in hand; at Rome, for example, the augurs and the XVviri sacrorum, who interpreted the Sibylline books, were priestly colleges. In Greece, on the other hand, divina- tion was not generally a priestly function, but it did belong to the priests of the Oracles (see OraciE). The great oracles, however, were of Panhellenic celebrity and did not serve each a particular state, and so in this direction also the risk of an independent priestly power within the state was avoided.)*~~

~~*In Rome, again, where the functions of the priesthood were politically much more weighty, where the techni- calities of religion were more complicated, where priests interpreted the will of the gods, and where the pontifis had a most important jurisdiction in sacred things, the state was much too strong to suffer these powers to escape from its own immediate control: the old monarchy of the king in sacred things descended to the inheritors of his temporal power ; the highest civil and religious functions met in the same persons (comp. Cic., De Dom., i. 1) ; and every priest was subject to the state exactly as the magistrates were, referring all weighty matters to state decision and then executing what the one supreme power decreed. And it is instructive to observe that when the plebeians extorted their full share of political power they also demanded and obtained admission to every priestly college of political importance, to those, namely, of the pontiffs, the augurs, and the XVviri sacrorum. The Romans, it need hardly be said, did not have hereditary priests.'*~~

~~*The same close connexion between state and religion meets us, under the forms of Oriental despotism, in the great civilizations of Egypt and Babylonia. Here all civil and religious power has its source in the king, and he is therefore himself the centre and head of the priesthood. Nowhere is religion more thoroughly a part of statecraft than in ancient Egypt; the official religion of the united monarchy is plainly an artificial structure built up by priestly fable and speculation out of the old religions of the several nomes and dedicated to the service of the monarchy. The priesthood accordingly has large functions, including, besides the service of the temples, astrology and divination, and the development and preservation of a sort of official theology and ritual theory, by which the conflict-*~~

~~*npn an*~~

~~*1 For the Greek priests, see, besides Schémann and other works on Greek antiquities, Newton, Essays on Art and Archzology, p. 136 sq. (from epigraphic material).*~~

~~*2 On the Roman priests, see in general Marquardt, Rémische Staats-verwaltung, vol. iii., and for the pontiffs in particular PoNTIFEX, supra, p. 455.*~~

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~~*ing elements of local religion and mythology were recon-*~~

~~*ciled. It has a strict bureaucratic organization, hke any other branch of the administration ; the higher priests are great officers of state, with civil and even military power ; under Smendes (XXIst Dynasty) the priests of Amon at Thebes actually ascended the throne. An absolute mon- archy, in which the king is revered as himself a divine person and in which the ministers of religion are the organs of a comprehensive and mysterious statecraft, obviously offers to sacerdotalism a far greater career than was pos- sible among the free peoples of Greece and Rome; and the priests held in their hands the whole wisdom of the Egyptians, and so kept all parts of culture in such strict subservience, alike to the gods and to the monarchy, as to make the empire of the Nile the ideal type of absolutism based on divine right. In this respect, however, the Babylonian system, of which we have less ample details, probably fell little short of the Egyptian. HIere also we find, as in Egypt, a state religion built on a priestly fusion of older cults, and therefore also a mythological theology which is not folk-lore but priest-lore. The older elements of religion are worked into a theoretic system of astral powers, and this in turn gives rise to a priestly study of astrology containing elements of real science. This com- plicated and many-sided lore gave to the priesthoods of Chaldzea and the Nile the character of a learned class, which is quite wanting in Greece and Rome, and it also produced a sacred and sacerdotal literature quite different in range and importance from such Western analogues as the Sibylline books or the libri augurales.*~~

~~*Against the genuine intellectual achievements of the Chaldean and Egyptian priests must be set the incorpora- tion of magic and sorcery in the circle of priestly sciences. The ordinary functions of religion are directed to conciliate or persuade the gods, but magic pretends to constrain the supernatural powers, and belongs, as we have seen, to super- stition rather than to religion. But in Egypt and Baby- lonia the state religion was an artificial mosaic of old beliefs, in which the crassest superstitions had their place, and thus magical arts received a state recognition and were part of the business of the state priests in a way unknown in the West. Occult arts, in fact, are part of the machinery of government. Now when we go still farther east to the Aryans of India we again find the idea prominent that certain formulas have the power of con- straining the gods, but in a form somewhat different from that of mere sorcery, and less primitive. All ancient peoples sought victory from the gods, and they sought it by sacrifice and prayer; but nowhere is the power of sacrifice more strongly felt than among the ancient Aryans; it was Agni, the sacrificial flame, as ancient legend has it, that led the conquerors of India from victory to victory. But there were also bloody struggles among the Aryans themselves, between men who invoked the same deity, and here the issue was not whether Indra was stronger than the gods of the non-Aryans, but which of the rival sacrifices he would accept. Now the priests accompanied sacrifice with songs of invocation, and so it became essential to have the most powerful song, which the god could not resist. The knowledge of these songs and of all that accompanied their use was handed down in priestly families, whose aid became indispensable to every sovereign, and at last out of these families there grew up the great and privileged caste of Brahmans. For further details as to the development of the priestly caste and wisdom in India the reader must refer to BRAHMANISM; here it is enough to observe that among a religious people a priesthood which forms a close and still more an hereditary corporation, and the assistance of which is indispensable in all religious acts, must rise to practical supremacy in society except*~~

~~*under the strongest form of despotism, where the sovereign is head of the church as well as of the state. ; Among the Zoroastrian Iranians, as among the Indian Aryans, the aid of a priest to recite the sacrificial liturgy was*~~

~~*necessary at every offering (Herod., i. 132), and the Iranian priests (4thravans, later Magi) claimed, like the Brahmans, to be the highest order of society ; but a variety of conditions were lacking to give them the full place of their Indian brethren. Zoroastrianism is not a nature religion, but the result of a reform which never, under the old empire, thoroughly penetrated the masses ; and the priesthood, as it was not based on family tradition, did not form a strict hereditary caste. Under the Sdsdnians, however, Zoroastrianism was a state religion in the strictest sense, and the priests attained very great power, their assistance being absolutely necessary not only in the public ritual of the fire-temple but for the constant guidance of every individual in the minute details of ceremonial observance, which make up the chief body of the religious system of the sacred books, and every breach of which involved penance. It is thus easily understood that the clergy formed a compact hierarchy not inferior in influence to the clergy of the Christian Middle Ages, had great power in the state, and were often irksome even to the great king. But the best established hierarchy is not so powerful as a caste, and the monarchs had one strong hold on the clergy by retaining the patronage of great ecclesi-astical places, and another in the fact that the Semitic provinces on the Tigris, where the capital lay, were mainly inhabited by men of other faith.1 In this rapid glance at some of the chief priesthoods of antiquity we have hitherto passed over the pure Semites, whose priesthoods call for closer examination because of the profound influence which one of them—that of the Jews—has exercised on Christianity, and so on the whole history of the modern world. But before we proceed to this it may be well to note one or two things that come out by comparison of the systems already before us. Priestly acts—that is, acts done by one and accepted by the gods on behalf of many—are common to all antique religions, and cannot be lacking where the primary subject of religion is not the individual but the natural community. But the origin of a separate priestly class, distinct from the natural heads of the community, cannot be explained by any such broad general principle; in some cases, as in Greece, it is little more than a matter of convenience that part of the religious duties of the state should be con-fided to special ministers charged with the care of particu- lar temples, while in others the intervention of a special priesthood is indispensable to the validity of every religious act, so that the priest ultimately becomes a mediator and the vehicle of all divine grace. This position, we see, can be*~~

~~*reached by various paths: the priest may become in- dispensable through the growth of ritual observances and precautions too complicated for a layman to master, or he may lay claim to special nearness to the gods on the ground, it may be, of his race, or it may be of habitual practices of purity and asceticism which cannot be com- bined with the duties of ordinary life, as, for example, celibacy was required of priestesses of Vesta at Rome. But the highest developments of priestly influence are hardly separable from something of magical superstition ; the opus operatum of the priest has the power of a sorcerer's spell. The strength of the priesthood in Chaldea and in Egypt stands plainly in the closest connexion with the survival of a magical element in the state religion, and Rome, in like manner, is more priestly than Greece because it is more superstitious, In most cases, however, where an ancient civilization shows us a strong priestly system 1 Compare especially Noldeke's Tabari, p. 450 sg."*~~

~~*Pil me i*~~

~~*we are unable to make out in any detail the steps by which that system was elaborated ; the clearest case per- haps is the priesthood of the Jews, which is not less interesting from its origin and growth than from the influ- ence exerted by the system long after the priests were dispersed and their sanctuary laid in ruins.*~~

~~*Among the nomadic Semites, to whom the Hebrews be- longed before they settled in Canaan, there has never been any developed priesthood. The acts of religion partake of the general simplicity of desert life ; apart from the private worship of household gods and the oblations and salutations offered at the graves of departed kinsmen, the ritual observances of the ancient Arabs were visits to the tribal sanctuary to salute the god with a gift of milk first-fruits or the like, the sacrifice of firstlings and vows (see Nazar- ITE and Passover), and an occasional pilgrimage to dis- charge a vow at the annual feast and fair of one of the more distant holy places (see Mecca). These acts required no priestly aid ; each man slew his own victim and divided the sacrifice in his own circle; the share of the god was the blood which was smeared upon or poured out beside a stone (nosb, ghabghab) set up as an altar or perhaps as a symbol ofthe deity. It does not appear that any portion of the sacrifice was burned on the altar, or that any part of the*~~

~~*victim was the due of the sanctuary. We find therefore no trace of a sacrificial priesthood, but each temple had one or more doorkeepers (sddin, hdjib), whose office was usually hereditary in a certain family and who had the charge of the temple and its treasures. The sacrifices and offerings were acknowledgments of divine bounty and means used to insure its continuance; the Arab was the "slave" of his god and paid him tribute, as slaves used to do to their masters, or subjects to their lords ; and the free Bedouin, trained in the solitude of the desert to habits of absolute self-reliance, knew no master except his god, and acknowledged no other will before which his own should bend. Hence the other side of Arab religion was to look for divine direction in every grave or difficult concern of life; what could not be settled in the free council of the tribesmen, or by the unenforced award of an umpire, was referred to the command of the god, and the oracle was the only authority by which dissen- sions could be healed, lawsuits determined, and judgment authoritatively spoken. The voice of the god might be uttered in omens which the skilled could read, or con- veyed in the inspired rhymes of soothsayers, but frequently it was sought in the oracle of the sanctuary, where the sacred lot was administered for a fee by the sddin. The sanctuary thus became a seat of judgment, and here too compacts were sealed by oaths and sacrificial ceremonies. These institutions, though known to us only from sources belonging to an age when the old faith was falling to pieces, are certainly very ancient. Their whole stamp is primitive, and they correspond in the closest way with what we know of the earliest religion of the Israelites, the only other Semitic people whose history can be traced back to a time when they had not fully emerged from nomad life. And, in fact, the fundamental type of the Arabic sanctuary can be traced through all the Semitic lands, and so appears to be older than the Semitic disper- sion ; even the technical terms are mainly the same, so that we may justly assume that the more developed ritual and priesthoods of the settled Semites sprang from a state of things not very remote from what we find among the heathen Arabs. Now among the Arabs, as we have seen, ritual service is the affair of the individual, or of a mass of individuals gathered in a great feast, but still doing worship each for himself and his own private circle ; the only public aspect of religion is found in connexion with divination and the oracle to which the affairs of the com-*~~

~~munity are submitted. In Greece and Rome the public sacrifices were the chief function of religion, and in them the priesthood represented the ancient kings. But in the desert there is no king and no sovereignty save that of the divine oracle, and therefore it is from the soothsayers or ministers of the oracle that a public ministry of religion can most naturally spring. With the beginning of a settled state the sanctuaries must rise in importance and all the functions of revelation will gather round them. A sacri- ficial priesthood will arise as the worship becomes more complex (especially as sacrifice in antiquity is a common preliminary to the consultation of an oracle), but the public ritual will still remain closely associated with oracle or divination, and the priest will still be, above all things, arevealer. That this was what actually happened may be inferred from the fact that the Canaanite and Pheenician name for a priest (kdhkén) is identical with the Arabic kahin, a "soothsayer." Soothsaying was no modern im- portation in Arabia; its characteristic form—a monotonous croon of short rhyming clauses—is the same as was prac- tised by the Hebrew " wizards who peeped and muttered " in the days of Isaiah, and that this form was native in Arabia is clear from its having a technical name (saj'), which in Hebrew survives only in derivative words with modified sense.1 The kahin, therefore, is not a degraded priest but such a soothsayer as is found in most primitive societies, and the Canaanite priests grew out of these early revealers. In point of fact sonie form of revelation or oracle appears to have existed in every great shrine of Canaan and Syria,? and the importance of this element in the cultus may be measured from the fact that at Hierapolis it was the charge of the chief priest, just as in the Leviti- cal legislation. But the use of "kahin" for "priest" in the Canaanite area points to more than this: it is connected with the orgiastic character of Canaanite religion. The soothsayer differs from the priest of an oracle by giving his revelation under excitement and often in a frenzy allied to madness. In natural soothsaying this frenzy is the necessary physical accompaniment of an afflatus which, though it seems supernatural to a rude people, is really akin to poetic inspiration. But it is soon learned that a similar physical state can be produced artificially, and at the Canaanite sanctuaries this was done on a large scale. We see from 1 Kings xviii, 2 Kings x., that the great Baal temples had two classes of ministers, kohdnim and nébiim, "priests" and '~~

~~prophets," and as the former bear a name which primarily denotes a soothsayer, so the latter are also a kind of priests who do sacrificial service with a wild ritual of their own. HOw deeply the orgiastic character was stamped on the priesthoods of north Semitic nature-worship is clear from Greek and Roman accounts, such as that of Appuleius (Afetam., bk. viii.). Sensuality and religious excitement of the wildest kind went hand in hand, and a whole army of degraded ministers of a religion of the passions was gathered round every famous shrine. The Hebrews, who made the language of Canaan their own, took also the Canaanite name for a priest. But the earliest forms of Hebrew priesthood are not Canaanite in character ; the priest, as he appears in the older records of the time of the Judges, Eli at Shiloh, Jonathan in the private temple of Micah and at Dan, is much liker the sddin than the kahin.? The whole structure of Hebrew~~

~~1 Méshugga', 2 Kings ix. 11, Jer. xxix. 26,—a term of contempt applied to prophets.~~

~~2 For examples, see PALMYRA and PHILISTINES ; see further, Lucian, De Dea Syria, 36, for Hierapolis ; Zosimus, i. 58, for Aphaca; Pliny, HT N., xxxvii. 58 (compared with Lucian, ut supra, and Movers, Phoe- nizier, i. 655), for the temple of Melkart at Tyre.~~

~~3 This appears even in the words used as synonyms for " priest," Mwn, 4D WY, which exactly correspond to sadin and hajih. 'That the name of {73 was borrowed from the Canaanites appears certain,~~

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~~society at the time of the conquest was almost precisely that of a federation of Arab tribes, and the religious ordi- nances are scarcely distinguishable from those of Arabia, save only that the great deliverance of the Exodus and the period when Moses, sitting in judgment at the sanctuary of Kadesh, had for a whole generation impressed the sovereignty of Jehovah on all the tribes, had created an idea of unity between the scattered settlements in Canaan such as the Arabs before Mohammed never had. But neither in civil nor in religious life was this ideal unity expressed in fixed institutions; the old individualism of the Semitic nomad still held its ground. Thus the firstlings, first-fruits, and vows are still the free gift of the individual which~~

~~no human authority exacts, and which every house- holder presents and consumes with his circle in a sacrificial feast without priestly aid. As in Arabia, the ordinary sanc- tuary is still a sacred stone (N2Y!D = nosh) set up under the~~

~~open heaven, and here the blood of the victim is poured out as an offering to God (see especially 1 Sam. xiv. 34, and compare 2 Sam. xxiii. 16,17). The priest has no place in this ritual; he is not the minister of an altar,* but the guardian of a temple, such as was already found here and there in the land for the custody of sacred images and palladia or other consecrated things (the ark at Shiloh, 1 Sam. iii. 3; images in Micah's temple, Judges xvii. 5; Goliath's sword lying behind the " ephod" or plated image at Nob, 1 Sam. xxi. 9; no doubt also money, as in the Canaanite temple at Shechem, Judges ix. 4). Such trea- sures required a guardian ; but, above all, wherever there was a temple there was an oracle, a kind of sacred lot, just as in Arabia (1 Sam. xiv. 41, Sept.), which could only be drawn where there was an "ephod" and a priest (1 Sam. xiv. 18 Sept. and xxiii. 6 sg.). The Hebrews had already possessed a tent-temple and oracle of this kind in the wilderness (Exod. xxxiii. 7 sq.), of which Moses was the priest and Joshua the eedituus, and ever since that time the judgment of God through the priest at the sanctuary had a greater weight than the word of a seer, and was the ultimate solution of every controversy and claim (1 Sam. ii. 25; Exod. xxi. 6, xxii. 8, 9, where for "judge," "judges," read "God"). The temple at Shiloh, where the ark was preserved, was the lineal descendant of the Mosaic sanctuary—for it was not the place but the palladium and its oracle that were the essential thing— and its priests claimed kin with Moses himself. In the divided state of the nation, indeed, this sanctuary was hardly visited from beyond Mount Ephraim; and every man or tribe that cared to provide the necessary apparatus (ephod, teraphim, &c.) and hire a priest might have a temple and oracle of his own at which to consult Jehovah (Judges xvii., xviii.) ; but there was hardly another sanc- for that out of the multiplicity of words for soothsayers and the like common to Hebrew and Arabic (either formed from a common root or expressing exactly the same idea—"3))1), 'arraf ; 72m, habir ; mtn, Ms, hazi; DDP, comp. istiksaim) the two nations should have chosen the same one independently to mean a priest is, in view of the great difference in character between old Hebrew and Canaanite priest- hoods, inconceivable. Besides j73 Hebrew has the~~

~~word 795 (pl. 0°93), which, however, is hardly applied to priests of the national religion. This, in fact, is the old Aramaic word for a priest (with suffixed article, kKwmra). Its origin is obscure, but, as it belongs to a race in which the mass of the people were probably not circumcised (Herod., ii. 104, compared with Joseph., Anz., viii. 10, 3, and C. Ap., i, 22) while the priests were (Dio Cassius, Ixxix. 11; Mp. Barnabe, ix. 6; comp. Chwolson, Ssabier, ii. 114), it may be conjectured that kumra means the circumcised (Ar. kKamara, "glans penis").~~

~~4 Tt is not clear from 1 Sam. ii. 15 whether even at Shiloh the priest had anything to do with sacrifice, whether those who burned the fat were the worshippers themselves or some subordinate ministers of the temple. Certainly it was not "the priest' who did so, for he in this narrative is always in the singular. Hophniand Phinehas are not~~

~~called priests, though they bore the ark, and so were priests in the sense of Josh. iii.~~

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~~tuary of equal dignity. The priest of Shiloh is a much greater person than Micah's priest Jonathan ; at the great feasts he sits enthroned by the doorway, preserving decorum among the worshippers ; he has certain legal dues, and if he is disposed to exact more no one ventures to resist al Sam. ii. 12 sg., where the text needs a slight correction). The priestly position of the family survived the fall of Shiloh and the captivity of the ark, and it was members of this house who consulted Jehovah for the early kings until Solomon deposed Abiathar. Indeed, though priesthood was not yet tied to one family, so that Micah's son, or Eleazar of Kirjath-jearim (1 Sam. vii. 1), or David's sons (2 Sam. viii. 18) could all be priests, a Levite—that is, a man of Moses' tribe—was already preferred for the office elsewhere than at Shiloh (Judges xvii. 13), and such a priest naturally handed down his place to his posterity (Judges xviii. 30).~~

~~Ultimately, indeed, as sanctuaries were multiplied and the priests all over the land came to form one well-marked class, "Levite" and legitimate priest became equivalent expressions, as has been explained in detail in the article Levites. But between the priesthood of Eli at Shiloh or Jonathan at~~

~~*Dan and the priesthood of the Levites as described in Deut. xxxiii. 8 sq. there lies a period of the iuner history of which we know almost nothing. It is plain that the various priestly colleges regarded themselves as one order, that they had common traditions of law and ritual which were traced back to Moses, and common interests which had not been vindicated without a struggle (Deut., ut sup.). The kingship had not deprived them of their functions as fountains of divine judgment (comp. Deut. xvii. 8 sg.); on the contrary, the decisions of the sanctuary had grown up into a body of sacred law, which the priests administered according to a traditional preced- ent. According to Semitic ideas the declaration of law is quite a distinct function from the enforcing of it, and the royal executive came into no collision with the purely declaratory functions of the priests. The latter, on the contrary, must have grown in importance with the unifica- tion and progress of the nation, and in all probability the consolidation of the priesthood into one class went hand in hand with a consolidation of legal tradition. And this work must have been well done, for, though the general corruption of society at the beginning of the Assyrian period was nowhere more conspicuous than at the sanctu- aries and among the priesthood, the invective of Hos. iv. equally with the eulogium of Deut. xxxiii. proves that the position which the later priests abused had been won by ancestors who earned the respect of the nation as worthy representatives of a divine Torah.*~~

~~*The ritual functions of the priesthood still appear in Deut. xxxili. as secondary to that of declaring the sentence of God, but they were no longer insignificant. With the prosperity of the nation, and especially through the absorp- tion of the Canaanites and of their holy places, ritual had become much more elaborate, and in royal sanctuaries at least there were regular public offerings maintained by the king and presented by the priests (comp. 2 Kings xvi. 15). Private sacrifices, too, could hardly be offered without some priestly aid now that ritual was more complex; the pro- vision of Deut. xviii. as to the priestly dues is certainly ancient, and shows that besides the.tribute of first-fruits and the like the priests had a fee in kind for each sacrifice, as we find to have been the case among the Pheenicians accord- Ing to the sacrificial tablet of Marseilles. Their judicial functions also brought profit to the priests, fines being exacted for certain offences and paid to them (2 Kings xii. ee oe 8; Amos ii. 8). The greater priestly offices sadinitie pe ee = cg respect very important places,*~~

~~*e royal sanctuaries were among the*~~

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~~*grandees of the realm (2 Sam. viii. 18; 2 Kings x. 11, xii. 2); minor offices in the sanctuaries were in the patronage of the great priests and were often miserable enough,) the petty priest depending largely on what "customers" he could find (2 Kings xii. 7 [8]; Deut. xviii. 8). That at least the greater offices were hereditary—as in the case of the sons of Zadok, who succeeded to the royal priesthood in Jerusalem after the fall of Abiathar—was almost a matter of course as society was then constituted, but there is not the slightest trace of an hereditary hierarchy officiating by divine right, such as existed after the exile. The sons of Zadok, the priests of the royal chapel, were the king's servants as absolutely as any other great officers of state ; they owed their place to the fiat of King Solomon, and the royal will was supreme in all matters of cultus (2 Kings xil., xvi. 10 sg.); indeed the monarchs of Judah, like those of other nations, did sacrifice in person when they chose down to the time of the captivity (1 Kings ix. 25; 2 Kings xvi. 12 sg.; Jer. xxx. 21). And as the sons of Zadok had no divine right as against the kings, so too they had no claim to be more legitimate than the priests of the local sanctuaries, who also were reckoned to the tribe which in the 7th century B.c. was recognized as having been divinely set apart as Jehovah's ministers in the days of Moses (Deut. x. 8, xviii. 1 sg.).*~~

~~*The steps which prepared the way for the post-exile hierarchy, the destruction of the northern sanctuaries and priesthoods by the Assyrians, the polemic of the spiritual prophets against the corruptions of popular worship, which issued in the reformation of Josiah, the suppression of the provincial shrines of Judah and the transference of their ministers to Jerusalem, the successful resistance of the sons of Zadok to the proposal to share the sanctuary on equal terms with these new-comers, and the theoretical justifica- tion of the degradation of the latter to the position of mere servants in the temple supplied by Ezekiel soon after the captivity, have already been explained in the article LevITEs and in PENTATEUCH (vol. xviii. p. 510), and only one or two points call for additional remark here.*~~

~~*It is instructive to observe how differently the prophets of the 8th century speak of the judicial or "teaching" functions of the priests and of the ritual of the great sanctuaries. For the latter they have nothing but con- demnation, but the former they acknowledge as part of the divine order of the state, while they complain that the priests have prostituted their office for lucre. In point of fact the one rested on old Hebrew tradition, the other had taken shape mainly under Canaanite influence, and in most of its features was little more than the crassest nature- worship. In this respect there was no distinction between the temple of Zion and other shrines, or rather it was just in the greatest sanctuary with the most stately ritual that foreign influences had most play, as we see alike in the original institutions of Solomon and in the innovations of Ahaz (2 Kings xvi. 10 sg., xxiii. 11 sqg.). The Canaanite influence on the later organization of the temple is clearly seen in the association of temple prophets with the temple priests under the control of the chief priest, which is often referred to by Jeremiah; even the viler ministers of sensual worship, the male and female prostitutes of the Phoenician temples, had found a place on Mount Zion and were only removed by Josiah's reformation.2 So, too, the more com- plex sacrificial ritual which was now in force is manifestly not independent of the Pheenician ritual as we know it from the Marseilles tablet. All this necessarily tended to make the ritual ministry of the priests more important*~~

~~*1 See 1 Sam. ii. 36, a passage written after the hereditary dignity of the sons of Zadok at Jerusalem was well established.*~~

~~*2 2 Kings xxiii.7; comp. Deut. xxiii. 18, where " dogs" = the later Galli; comp. Corp. Insc. Sem., i. 98 sq.*~~

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~~*than it had been in old times; but it was in the dark days of Assyrian tyranny, in the reign of Manasseh, when the sense of divine wrath lay heavy on the people, when the old ways of seeking Jehovah's favour had failed and new and more powerful means of atonement were eagerly sought for (Micah vi. 6 sg.; 2 Kings xxi.; and comp. Motoen), that sacrificial functions reached their full importance. In the time of Josiah altar service and not the function of " teach- ing" has become the essential thing in priesthood (Deut. x. 8, xviii. 7); the latter, indeed, is not forgotten (Jer. ii. 8, xviii. 18),*~~

~~*but by the time of Ezekiel it also has mainly ‹o do with ritual, with the distinction between holy and profane, clean and unclean, with the statutory observances at festivals and the like (Ezek. xliv. 23 sg.). What the priestly Torah was at the time of the exile can be seen from the collection of laws in Lev. xvii.-xxvi., which includes many moral precepts, but regards them equally with ritual precepts from the point of view of the maintenance of national holiness. 'The sacrificial ritual of the Priestly Code (see PENTATEUCH) is governed by the same principle. The holiness of Israel centres in the sanctuary, and round the sanctuary stand the priests, who alone can approach the most holy things without profanation, and who are the guardians of Israel's sanctity, partly by protecting the one meeting-place of God and man from profane contact, and partly as the mediators of the continual atoning rites by which breaches of holiness are expiated.*~~

~~*The bases of priestly power under this system are the unity of the altar, its inaccessibility to laymen and to the inferior ministers of the sanctuary, and the specific atoning function of the blood of priestly sacrifices. All these things were unknown in old Israel: the altars were many, they were open to laymen, and the atoning function of the priest was judicial, not sacrificial. So fundamental a change as lies between Hosea and the Priestly Code was only possible in the general dissolution of the old life of Israel produced by the Assyrians and by the prophets; and indeed, as is explained under PenrATEUCH, the new order did not take shape as a system till the exile had made a tabula rasa of all old institutions; but it was undoubtedly the legitimate and consistent outcome of the latest develop- ment of the temple worship at Jerusalem before the exile. It was meant also to give expression to the demands of the prophets for spiritual service and national holiness, but this it did not accomplish so successfully; the ideas of the prophets could not be realized under any ritual system, but only in a new dispensation (Jer. xxxi. 31 sq.)s when priestly Torah and priestly atonement should be no longer required. Nevertheless, the concentration of all ritual at a single point, and the practical exclusion of lay- men from active participation in it—for the old sacrificial feast had now shrunk into entire insignificance in compari- son with the stated priestly holocausts and atoning rites?—lent powerful assistance to the growth of a new and higher type of personal religion, the religion which found its social expression not in material acts of oblation but in the language of the Psalms. In the best*~~

~~*times of the old kingdom the priests had shared the place of the prophets as the religious leaders of the nation; under the second temple they represented the unprogressive traditional side of religion, and the leaders of thought were the psalmists and the scribes, who spoke much more directly to the piety of the nation.*~~

~~*But, on the other hand, the material influence of the priests was greater than it had ever been before; the temple was the only visible centre of national life in the ages of servitude to foreign power, and the priests were the only great national functionaries, who drew to them-*~~

~~*1 Compare the impression which the ritual produced on the Greeks, Bernays's Theophrastus, pp. 85, 111 sq.*~~

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~~*selves all the sacred dues as a matter of right and even appropriated the tithes paid of old to the king. The great priests had always belonged to the ruling class, but the Zadokites were now the only hereditary aristocracy, and the high priest, who now stands forth above his breth- ren with a prominence unknown to the times of the first temple, is the one legitimate head of the theocratic state, as well as its sole representative in the highest acts of religion (comp. PENTATEUCH, vol. xviii. p. 510). When the high priest stood at the altar in all his princely state, when he poured out the libation amidst the blare of trumpets, and the singers lifted up their voice and all the people fell prostrate in prayer till he descended and raised his hands in blessing, the slaves of the Greek or the Persian forgot for a moment their bondage and knew that the day of their redemption was near (Ecclus.1.). The high priest at such a moment seemed to embody all the glory of the nation, as the kings had done of old, and when the time came to strike a successful blow for freedom it was a priestly house that led the nation to the victory which united in one person the functions of high priest and prince. From the foundation of the Hasmonean state to the time of Herod the history of the high-priesthood merges in the political history of the nation; from Herod onward the priestly aristocracy of the Sadducees lost its chief hold over the nation and expired in vain controversy with the Pharisees. (See Israzt.)*~~

~~*The influence of the Hebrew priesthood on the thought and organization of Christendom was the influence not of a living institution, for it hardly began till after the fall of the temple, but of the theory embodied in the later*~~

~~*parts of the Pentateuch. Two points in this theory were*~~

~~*laid hold of—the doctrine of priestly mediation and the system of priestly hierarchy. 'The first forms the text of the principal argument in the Epistle to the Hebrews, in which the author easily demonstrates the inadequacy of the mediation and atoning rites of the Old Testament, and builds upon this demonstration the doctrine of the effectual high-priesthood of Christ, who, in His sacrifice of Himself, truly "led His people to God," not leaving them outside as He entered the heavenly sanctuary, but taking them with Him into spiritual nearness to the throne of grace. This argument leaves no room for a special priesthood in the Christian church, and in fact nothing of the kind is found in the oldest organization of the new communities of faith. The idea that presbyters and bishops are priests and the successors of the Old Testament priesthood first appears in full force in the writings of Cyprian, and here it is not the notion of priestly mediation but that of priestly power which is insisted on. Church office is a copy of the old hierarchy. Now among the Jews, as we have seen, the hierarchy proper has for its necessary condition the destruction of the state and the bondage of Israel to a foreign prince, so that spiritual power is the only basis left for a national aristocracy. The same conditions have produced similar spiritual aristocracies again and again in the East in more modern times, and even in antiquity more than one Oriental priesthood took a line of development similar to that which we have traced in Judea. Thus the hereditary priests of Kozah (Ko(é) were the chief digni- taries in Idumea at the time of the Jewish conquest of the country (Jos., Ant., xv. 7, 9), and the high priest of Hierapolis wore the princely purple and crown like the high priest of the Jews (De Dea Syria, 42). The kingly insignia of the high priest of the sun at Emesa are described by Herodian (v. 3, 3), in connexion with the history of Elagabalus, whose elevation to the Roman purple was mainly due to the extraordinary local influence of his sacer- dotal place. Other examples of priestly princes are given by Strabo in speaking of Pessinus (p. 567) and Olbe XIX.—92*~~

~~672).1 As no such hierarchy existed in the West, it is plain that if the idea of Christian priesthood was influ- enced by living institutions as well as by the Old Testa- ment that influence must be sought in the East (comp. Lightfoot, Philippians, p. 261). The further development of the notion of Christian priesthood was connected with the view that the Eucharist is a propitiatory sacrifice which only a consecrated priest can perform. The history of this development is still very obscure, especially as regards its connexion with heathen ideas, but something will fall to be said on it under the heading of Sacririce. It is sufficient to remark here that the presentation of the sacri- fice of the mass came to be viewed as the essential priestly office, so that the Christian presbyter really was a sacerdos in the antique sense. Protestants, in rejecting the sacrifice of the mass, deny also that there is a Christian priesthood "like the Levitical," and have either dropped the name of "priest" or use it in a quite emasculated sense.~~

~~There is probably no nature religion among races above mere savagery which has not had a priesthood ; but an ex- amination of other examples would scarcely bring out any important feature that has not been already illustrated. Among higher religions orthodox Islam has never had real priests, doing religious acts on behalf of others, though it has, like Protestant churches, leaders of public devotion (imams) and an important class of privileged religious teachers ('ulem4). But a distinction of grades of holiness gained by ascetic life has never been entirely foreign to the Eastern mind, and in the popular faith of Mohammedan peoples something very like priesthood has crept in by this channel. For where holiness is associated with ascetic practices the masses can never attain to a perfect life, and naturally tend to lean on the professors of special sanctity as the mediators of their religious welfare. The best example, however, of a full- blown priestly system with a monastic hierarchy grafted in this way on a religion originally not priestly is found in Tibetan Buddhism (see Lamaism), and similar causes undoubtedly had their share in the development of sacerdotalism in the Christian church. The idea of priestly asceticism expressed in the celibacy of the clergy belongs also to certain types of heathen and especially Semitic priesthood, to those above all in which the priestly service is held to have a magical or theurgic quality. (WwW. R. 8.)~~

PRIESTLEY, Josepu (1733-1804), was born on 13th March 1733 at Fieldhead near Birstal, in the West Riding of Yorkshire. HIs father, Jonas Priestley, was a woollen- cloth dresser and apparently of very moderate means. His mother was the only child. of Joseph Swift, a farmer at Shafton near Wakefield. The paternal grandfather, also named Joseph, was a churchman whose high moral char- acter became a sacred tradition in his family. The young Joseph's parents were Nonconformists. They had six children in eight years, and on the birth of the last, in the hard winter of 1739, the mother died. During those years Joseph lived a good deal with his maternal grand- father at Shafton. But he relates that his mother "was careful to teach him the Assembly's Catechism," and that, with a view of impressing on his mind "a clear idea of the distinction of property," she on one occasion made him carry back a pin which he had picked up at the house of an uncle. Three years after the loss of his mother, his father's sister, Mrs Keighley, a lady in good circum- stances, having no children of her own, took the boy to live with her.

At the age of twelve he was sent to a neighbouring endowed school, where, under the tuition of a clergyman, Mr Hague, he made rapid progress in classics, while on holidays, by way of recreation, he learned Hebrew from

1 See also Mommsen, Hist. of Rome, Eng. trans., iv. 150.

Mr Kirkley, a Dissenting minister. On the removal of the clergyman Mr Kirkley opened a school of his own, and Priestley became entirely his pupil. From the age of sixteen to nearly twenty his health was unsatisfactory, and he attended neither school nor college, but still con- tinued his studies in private with occasional assistance. It was thought that his constitution would be better adapted to an active than to a sedentary life, and with a view to commerce he learned French, Italian, and German without assistance. But the aunt, Mrs Keighley, had set her heart on making a minister of him, and young Priestley's own aspirations took the same form. When, therefore, his health improved, the offer of a mercantile situation in Lisbon was surrendered, and Priestley in his twentieth year (1752) was sent to Daventry, where there existed a Non- conformist academy, originally

~~*founded by Dr Doddridge at Northampton, and removed after his incapacitation by illness or on his death in 1751.*~~

~~*There is no mention of any hesitation on the part of Priestley or his friends as to whether he should enter the established church or not. But there was certainly nothing in his theological creed at this period to have prevented his taking orders. The hindrance, therefore, must have been his adherence to the Nonconformist tradition on ques- tions of ecclesiastical polity and ritual. There were, how- ever, in his early associations some elements which not only help to explain his after career but throw a curious light on the fluid condition of Nonconformist denominations in those days as compared with their sectarian fixedness now. He was brought up in the principles of Calvinism. But he tells us his aunt's house 'was the resort of all the Dissenting ministers in the neighbourhood without dis- tinction ; and those who were most obnoxious on account of their heresy were almost as welcome to her, if she thought them honest and good men—which she was not unwilling to do—as any others." Notwithstanding the comparative freedom of the conversations to which he listened, young Priestley at seventeen was strictly orthodox, and anxiously endeavoured to realize the experiences he supposed to be necessary to conversion. His chief trouble was that he could not repent of Adam's transgression, a difficulty he never surmounted. The pressure of this im- possibility forced his candid mind to the conclusion that there must be a mistake somewhere, and he began to doubt whether he was really so much entangled in Adam's guilt as he had been taught. Accordingly he was refused admission into the communion of the Independent church which his aunt attended. His adhesion to Calvinism was now considerably relaxed. But this did not interfere with his entrance at Daventry. Dr Doddridge had not confined his educational aims to students for the ministry, and he not only refused to impose theological tests but he incurred reproach by resolutely refusing to press his own orthodox creed on the heterodox pupils occasionally re- ceived. Priestley's intellectual preparation previous to his entrance is noteworthy. Besides being a fair classic, he had improved his Hebrew by giving lessons in that lan- guage. He had acquired three modern languages. He had 'learned Chaldee and Syriac, and just begun to read Arabic"; nor was he disproportionately backward in mathematics. He had also mastered 's Gravesande's Ele- ments of Natural Philosophy, and various text-books of*~~

~~*the time in logic and metaphysics. It cannot surprise us that he "'was excused all the studies of the first year and a great part of those of the second.' At Daventry he stayed three years, taking a prominent part in the singularly free discussions that seem to havé formed a considerable part of the academical exercises. "In this situation," he says, ""T saw reason to embrace what is generally called the heterodox side of almost every question." His chief tutors*~~

~~*PELRWseTainy*~~

~~*were Dr Ashworth of conservative and the Rev. Samuel Clark of decidedly liberal tendencies. Priestley's specula- tions at this time were philosophical rather than scientific. Under the influence of Hartley's Observations on Man and Collins's Philosophical Enquiry he exchanged his early Calvinism for a system of "necessarianism,"—that is, he learned to hold that the invariable connexion of cause and effect is as inviolable in the moral as in the material world. During these early years he began his enormous industry as a writer, and in particular laid down the lines of his Institutes of Natural and Revealed Religion.*~~

~~*From Daventry he went in 1755, at twenty-two years of age, to take charge of a small congregation at Needham Market in Suffolk. This church was halting between Presbyterianism and Independency, being subsidized by both. Priestley insisted on dropping the Independent con- nexion. As a consequence he had to content himself with a salary of £30, and succeeded in living on less. His studies had not in the least chilled his devotion to the sacred work, which indeed to the end of his life he counted his highest honour. He was diligent in preaching and teaching, but his intellectual freedom, together with a physical difficulty in speech, prevented his attaining popularity. To cure the defect in speech he paid twenty guineas, given by his aunt, to a London specialist or quack. But this difficulty turned out to be as irremediable as his intellectual unconformability ; and the only per- manent advantage derived from his visit to the metropolis was an introduction to various scholars of the day, such as Dr Price, also Dr Benson and Dr Kippis, friends of Lardner. Later on he made the acquaintance of the last also through some manuscript notes on the doctrine of atonement, which attracted the great scholar's attention.*~~

~~*In 1758 Priestley removed to Nantwich, obtaining a more congenial congregation; and there he established a school, which increased his income but lessened his literary activity. Always bringing his best intelligence to bear on everything he undertook, he varied his element- ary lessons with instruction in natural philosophy, illus- trated by experiments, for which he could now afford the needful instruments. "These," he says, "I taught my scholars in the highest class to keep in order, and to make use of ; and by entertaining their parents and friends with experiments, in which the scholars were generally the operators, and sometimes the lecturers too, I con- siderably extended the reputation of my school." Up to this time his studies had been entirely literary and theologico-philosophical. It is noteworthy that his efforts to liberalize education turned his attention to science. He was probably one of the very first teachers to appreciate the importance of physical science to early culture.*~~

~~*In 1761 he was appointed classical tutor in a Noncon- formist academy, then recently established at Warrington on the same liberal principles as the institution at Daventry. In this position he passed six of his happiest years, pursuing his scientific studies, especially in chemistry and electricity, enjoying congenial intercourse with Dr Turner of Liverpool, also with Wedgwood's partner Mr Bentley, Dr Enfield, and various Manchester men whose sons or grandsons helped to form the '"'Manchester school." In 1762 he married the daughter of Mr Isaac Wilkinson, an ironmaster of Wrexham. At Warrington Priestley received the complimentary degree of LL.D. from Edinburgh, apparently in recognition of his Chart of History. On a, visit to London he made the acquaintance of Dr Franklin, and his researches in electricity procured his election to the Royal Society in 1766.*~~

~~*In the following year (1767) Dr Priestley removed to Leeds to take charge of Mill Hill chapel ; and in the same year was published his History of Electricity, a work*~~

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~~*suggested by Dr Franklin, and contributing greatly to the author's fame. to speculative theology, and surrendered_the Arianism he had hitherto loosely held, adopting instead definite Socinian*~~

~~*Now, however, he turned once more*~~

~~*views. In addition to preaching and teaching diligently in his congregation he carried on his chemical researches with results considered at the time startling. Chemistry was hardly in its infancy; it was unborn. "The vast science," says Mr Huxley, 'which now passes under that name had no existence." Living next door to a brewery Dr Priestley amused himself with experiments on the "fixed air" (carbonic acid) produced there, and succeeded in forcing it into water. Thus commenced his researches*~~

~~*on "different kinds of air," remarkable rather for the*~~

~~*impulse they gave to controversy and experiment than for any mature scientific results. He had a keen instinct for surmise, but no adequate method of research and verification. On this point Roscoe and Schorlemmer observe in their treatise on Chemistry (vol. i. p. 18) that "Priestley's notion of original research, which seems quite foreign to our present ideas, may be excused, perhaps*~~

~~*justified by the state of science in his day. He believed*~~

~~*that all discoveries are made by chance, and he compares the investigation of nature to a hound, wildly running after, and here and there chancing on game (or, as James Watt called it, 'his random haphazarding'), whilst we would rather be disposed to compare the man of science to the sportsman, who having, after persistent effort, laid out a distinct plan of operations, makes reasonably sure of his quarry." At this time also he wrote various*~~

~~*political tracts and papers, always in favour of popular rights, and in particular hostile to the attitude of the Government towards the American colonies.*~~

~~*In 1771 he was nearly appointed to accompany Captain Cook to the South Seas. But the Government of the day was shocked at the idea of giving official position to a Socinian minister, and Priestley was disappointed. Shortly afterwards he accepted the somewhat anomalous situation of "literary companion" and librarian to Lord Shelburne. With this nobleman he travelled in Holland and Germany, returning by Paris, where he spent a month in 1774. The position gave him ample leisure for his scientific and literary pursuits. But on the completion of his most noteworthy philosophical treatise, Disquisitions on Matter and Spirit, the connexion was dissolved. It has been surmised that the patron feared to share the unpopularity of his client's views. Those views Priestley himself considered to be "materialistic." It is a question of words. Seeing that he denied impenetrability to matter, it is difficult to say why the substance he left might not as well be called spirit as anything else.*~~

~~*In 1780 he removed to Birmingham, where he enjoyed the friendship of James Watt and his partner Boulton, also of Dr Darwin, grandfather of the illustrious man in whom the honours of the name culminated. Here Dr Priestley again took charge of a congregation, and resumed his theological efforts in a controversy with the bishop of Waterford, and in a laborious History of the Corruptions of Christianity. But bad times were at hand. The French Revolution excited passionate controversy, and Priestley was naturally on the side of the revolutionists. In 1791 the anniversary of the capture of the Bastille was observed in Birmingham by a dinner at which he was not present, and with which he had nothing to do. But the mob wished to testify by some signal deed their abhorrence of the un-English notions propounded at the dinner, and there- fore burned down Priestley's chapel and house. Before the deed was done they waded knee deep in torn manuscripts, and amused themselves with futile efforts to make an electric machine avenge its owner's impiety by firing*~~

~~*the papers with a spark. The blow was a terrible one. Priestley and his family had escaped violence by timely flight, but every material possession he valued was de- stroyed and the labours of years annihilated. But neither despair nor bitterness possessed him. He left Birmingham, and for three years preached in Hackney, then a suburban village, and in 1794 he went out to the young States whose cause he had advocated, to spend the last ten years of his life in the land of the future. He resided at Northumber- land in Pennsylvania, eager as ever for controversy and research. His materialism, so-called, never dimmed his hope of immortality. His religion to the end was char- acterized by a childlike simplicity of spirit. On his death- bed he would have his grandchildren to kneel by his side for their daily prayers, and listened with pleasure to the hymns they lisped. On the 6th of February 1804 he clearly and audibly dictated a few alterations he wished to make in some of his publications. 'That is right," he said, "I have now done"; and within an hour he quietly expired.*~~

~~*The interest of Dr Priestley's life lies not so much in any splendid achievements, either literary or scientific, but rather in the character of the man. His career also affords a typical illustration of the mutual relation and interaction of several great factors of human progress at a very critical period. Asa Nonconformist minister, born into a Calvin- istic circle, educated in an Independent academy, develop- ing into a Socinian divine, yet maintaining always the most friendly relations with clergymen, priests, and orthodox ministers, he gives us a curious insight into the condition of English religion just before its sectarian divisions had hardened into their modern form. As a pioneer in the investigation of gases and the discoverer of oxygen he helped—but, it must be admitted, as often by his mistakes as by his successes—to erect. chemistry into a science. As a professed materialist whose doctrines seemed at the same time to merge matter in force he, amongst others, prepared the way for the modern agnosticism, which declines to look behind phenomena. As a politician he anticipated nine- teenth-century radicalism. In general, as an exceptionally single-eyed and fearless searcher after truth he bore the brunt of persecution by vulgar ignorance, and in his dis- appointments illustrated how little can be practically accomplished by isolated enlightenment apart from popular education.*~~

The works of Dr Priestley, as collected and edited by John Towill Rutt, fill twenty-five octavo volumes, one of which, however, con- sists of memoirs and correspondence. The date of this collected edition is 1832. It contains upwards of 130 separate works, varying in size from brief pamphlets to treatises in four volumes, and his labours range over almost all possible subjects of human knowledge or speculation. Mathematics, chemistry, physiology, grammar, logic, mental and moral philosophy, history, theology, Interpretation of prophecy, politics, and sociology, alt alike fur- nished themes for Priestley's untiring pen, and if he did not write on any of them with striking originality he treated all with freedom and intelligence. In 1761 he issued his first published works, a treatise ou the Scripture Doctrine of Remission and The Rudiments of English Grammar. From that date till 1767 he was content with publishing something every alternate year. But from 1767 to 1804 he allowed only two years to go by unmarked by one or more publications, many of them remarkable as monuments of con- scientious and laborious industry. HIs first scientific work, The HIstory and Present State of Electricity, with Original Experiments, was published in 1767. The rapid advance of science has left to this and similar works of his little more than an antiquarian inter- est. But the treatise illustrates his prophetic spirit, inasmuch as it shows how far he was in advance of his contemporaries in appreci- ation of the prospects of physical research. In 1774 he issued his first volume of Experiments and Observations on Different Branches of Air, ec. In this volume he announced his discovery of "de- phlogisticated air," now known as oxygen. The then prevalent theory of phlogiston, or the combustible principle in matter, betrayed him into great confusion, evident enough in the very name he gave to his new 'branch of air." Nevertheless it is said of him in Roscoe and Schorlemmer's Chemistry (vol. i. p. 16) that "no one

obtained more important results or threw more light upon the chemical existence of a number of different gases than Joseph Priestley." These HLaperiments and Observations were continued through five volumes, of which the last appeared in 1780. Perhaps the limit of Priestley's power of growth is illustrated by the persist- ency with which he clung to phlogiston notwithstanding the dis- coveries of Black, Lavoisier, and Cavendish. In

~~*1800 he issued a treatise called 7'he Doctrine of Phlogiston established, and that of the Composition of Water refuted. In a letter of that year to the Rev. T. Lindsay he says, "I have well considered all that my opponents have advanced, and feel perfectly confident of the ground I stand upon. In this definitive treatise I insert all that is contained in my former publications on the subject, with many new experiments. Though nearly alone, I am under no apprehension of defeat." Dr Priestley clearly failed to appreciate the progress of the science he had done so much to promote. But the attempt made by Lavoisier to claim for himself a concurrent discovery of oxygen at the saine time as Priestley's was certainly unjustifiable. This achievement, together with the first preparation of nitric oxide, nitrous oxide, hydrochloric acid, and other important gases, constitutes the true ground of his fame as a scientific pioneer (see Roscoe and Schor- lemmer, J.¢.).*~~

~~*Priestley's chief theological works were the Institutes of Natural and Revealed Religion, A History of the Corruptions of Christianity, and A General History of the Christian Church to the Fall of the Western Empire. Bishop Horsley's criticisms on the second of these works produced letters in reply, " with additional evidence that the primitive church was Unitarian." His principal meta- physical writings were Disqwisitions relating to Matter and Spirit and various essays and letters on necessarianism. A complete list of his works will be found in vol. i. part ii. of Rutt's collected edition. (Gl, AES apes)*~~

~~*PRIM, Juan, Marquis DE Los CASTILLEJOS, COUNT DE Reuss (1814-1870), Spanish soldier and statesman, was the son of Lieutenant-Colonel Pablo Prim, and was born at Reuss in Catalonia on 12th December 1814. He entered the free corps known as the volunteers of Isabella II. in 1834 and greatly distinguished himself throughout the Carlist War, in the course of which he rose to the rank of lieutenant-colonel and had two orders of knighthood conferred upon him. After the pacification of 1839 he entered political life, and as a progressist opposed to the dictatorship of Espartero he was sent into exile. How- ever, in 1843 he was elected deputy for Tarragona and issued a pronunciamento against Espartero at Reuss; and after defeating Espartero at Bruch he entered Madrid in triumph with Serrano. The regent Maria Christina recog- nized his services, promoted him to the rank of major- general, and made him count of Reuss. Prim now*~~

~~*looked forward to peace under a settled constitutional monarchy, but Narvaez, the prime minister, failed to understand what constitutional freedom meant, and Prim, on showing signs of opposition, was sentenced to six years' imprisonment in the Philippine Islands. The sentence was not carried out, and Prim remained an exile in England and France until the amnesty of 1847. He then returned to Spain, but kept aloof from politics, and was first employed as captain- general of Porto Rico and afterwards as military represent- ative of Spain with the sultan during the Crimean War. In 1854 he returned to Spain on being elected to the cortes, and gave his support to O'Donnell, who promoted him to be lieutenant-general in 1856. In the war with Morocco, at the head of his division, he did such good service at Los Castillejos or Marabout, Cabo Negro, Guad al Gelu, and Campamento in 1860 that he was made mar- quis de los Castillejos and a grandee of Spain. He next commanded the Spanish expeditionary army in Mexico, when he acted in exact accordance with the treaty of London and refused to consent to the ambitious schemes of Napoleon III. On his return to Spain he joined the opposition, heading pronunciamentos in Catalonia against Narvaez and O'Donnell. All his attempts failed until the death of Narvaez in April 1868, after which Queen Isa- bella fell more and more under the influence of the Jesuits, and became increasingly tyrannical, until at last even Serrano was exiled, and more than 10,000 persons, includ-*~~

~~*ing every journalist of position, were in prison. In Sep- tember 1868 Serrano and Prim returned, and Admiral Topete, commanding the fleet, raised the standard of revolt at Cadiz. For the public events of the subsequent ten months the reader is referred to the article Spain. In July 1869 Serrano was elected regent, and Prim became president of the council and was made a marshal. On 16th November 1870 Amadeo, duke of Aosta, was elected king of Spain, but Prim was not destined to receive the new monarch, for on leaving the chamber of the cortes on 28th December he was shot by unknown assassins and died two days later. The cortes at once declared that he had deserved well of his native land, and took his children as wards of the country; three days afterwards King Amadeo I. swore in the presence of the corpse to observe the new Spanish constitution.*~~

~~*Two biographies of Prim down to 1860 were published in that year by Gimenez y Guited and Gonzalez Llanos ; see also L. Blairet,*~~

~~*Le Général Prim et la situation actuelle de V Espagne, Paris, 1867, and Guillaumot, Juan Prim et V Espagne, Paris, 1870.*~~

~~*PRIMATE (primas, i.e., primus), a title more than once bestowed in the Codex Theodosianus on various civil func- tionaries, came about the beginning of the 4th century to be used also, especially in Africa, as a designation of the "prime sedis episcopus." In the canon law the word "primate" is regarded as essentially the Western equiva- lent of the Eastern "patriarch." See ARCHBISHOP and PATRIARCH.*~~

~~*PRIMOGENITURE. The term "primogeniture" is used to signify the preference in inheritance which is given by law, custom, or usage to the eldest son and his issue, or in exceptional cases to the line of the eldest daughter. The practice prevailed under the feudal codes throughout all the Western countries. It is now almost entirely con- fined to the United Kingdom, having been abolished (ex- cept in the succession to the crown) by the various civil codes which have superseded feudalism on the Continent, and having been universally rejected in the United States of America as being contrary to the spirit of their institu- tions. The system has of late years been persistently attacked in Great Britain, chiefly on the ground of hard- ship in cases of intestacy where the property is small; but the rule was found to operate so successfully in former times towards keeping large properties together that it seems likely to be still maintained by law; and even if abolished as a rule of law it would most probably be main- tained in full vigour as a habit or rule of practice.*~~

~~*In dealing with the whole subject it will be convenient to state in the first place the nature of the rules of primo- geniture as they now exist in England, with some notice of the exceptional usages which illustrate the meaning and origin of the system, and in the second place to give an account of those archaic customs in which we may find the actual origiri of primogeniture before it was altered and extended by the policy of the feudal sovereigns, and by traditional usages which governed their succession to the throne. The English law provides that in ordinary cases of inheritance to land the rule of primogeniture shall prevail among the male children of the*~~

~~*person from whom descent is to be traced, but not among the females; and this principle is applied throughout all the degrees of relationship. There are exceptions to this rule in the gavelkind lands of Kent, where all the males take equally in each degree, in the burgage tenements of certain ancient boroughs, where the descent is to the youngest son under the custom called "borough-English," and in the copyhold lands of a great number of manors, where customs analogous to those of gavelkind and borough-English have existed from time immemorial. In another class of exceptions the rule of primogeniture is applied to the inheritance of*~~

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~~*females, who usually take equal shares in each degree. The necessity for a sole succession has, for example, intro- duced succession by primogeniture among females in the case of the inheritance of the crown, and a similar necessity led to the maxim of the feudal law that certain dignities and offices, castles required for the defence of the realm, and other inheritances under "the law of the sword" should not be divided, but should go to the eldest of the co-heiresses (Bracton, De Legibus, ii. c. 76; Co. Litt., 165a). In the case of dignities the rule of sole succession is adopted without reference to the right of primogeniture, the dignity lying in abeyance until the line of a particular co-heiress is selected by the sovereign as "the fountain of honour." Another exceptional usage gives a preference to the line of the eldest daughter in the inheritance of customary holdings in the Isle of Man, in various lordships in Cumber- land, Westmoreland, and Durham, as well as in isolated manors in Surrey and Sussex, and in other parts of the southern and midland counties. At Tynemouth in North- umberland it was the custom that the eldest daughter surviving her parents should inherit her father's estate for her life, and in some of the southern manors already mentioned the rule of primogeniture among females is not. confined to daughters but is extended to the eldest sister or aunt, or even to female relations in more remote degrees. There are many other special customs by which the ordi- nary rules of descent are varied according to manorial usage, as that the youngest son shall inherit if the father dies. seised, but otherwise the eldest, or that fee-simple shall go to the youngest and entailed land to the eldest, or that the special custom shall only affect lands of a certain value. (as is said to be the usage in several manors near London),*~~

~~*or that male and female issue should share together (as. formerly was the practice at Wareham and Exeter and in certain other ancient boroughs, as well as in some of the copyholds belonging to the see of Worcester), or that the eldest or the youngest should be preferred among the daughters in the claim to a renewal of a customary estate for lives, with other analogous variations.*~~

~~*It will be seen that the English law of inheritance creates a double preference, subject to the exceptions already mentioned, in favour of the male over the female and of the firstborn among the males. This necessitates. the rule of representation by which the issue of children are regarded as standing in the places of their parents. This is called "representative primogeniture." The rule appears to have been firmly established in England during the reign of Henry IIL., though its application was favoured as early as the 12th century throughout the numerous con- tests between brothers claiming by proximity of blood and their nephews claiming by representation, as in the case of King John and his nephew Prince Arthur (Glanville, vii. c. 3; Bracton, De Legibus, ii. c. 30). We must now describe some of those ancient usages in which the origin of primogeniture is to be sought.*~~

~~*In addition to the rule of eldership as applied to inherit- ances of land there are traces of a multitude of customs which applied a similar rule to certain classes of ** prin-. cipals" or heirlooms, such as the best bed or piece of fur- niture, or horse and cart, and the like, which descended to the eldest son; and by a similar rule of the common law the ancient jewels of the crown are heirlooms which descend to the successor according to the rule of primo- geniture. In the district of Archenfield near the Welsh border the house and lands were divided between the sons on their father's death, but certain "principals" passed to the eldest as heirlooms, such as the best table and bed, "all which the men of Archenfield retained as derived to them from great antiquity, even before the Norman Con- quest " (Quo Warranto Roll, 20 Edw. L., "Trchinfield ").*~~

~~*Zot*~~

~~*A similar usage existed in some of the lands in Sussex belonging to Battle Abbey; and by the custom of the hundred of Stretford in Herefordshire the*~~

~~*eldest son was entitled to keep the best article of every kind of chattel, as the best of the chests and cups, or the best table and chair (Co, Litt., 18b). This right resembles in many respects the privilege of the youngest co-heir to take the hearth- place or covert del astre, which formerly prevailed in the gavelkind lands of Kent according to the Kentish custumal, and privileges of the same kind which were customary in the district round Amiens and in many parts of Flanders under the tenures called ‘“maineté,” ‘ quévaise,” and ‘“madelstad ” (Bouthors, “ Couttimes Locales du Bailhiage d’Amiens,” Cout. Gén., i. 699, ii. 901). This exceptional law does not seem to have prevailed in Scotland or Ire- land; but in the Shetland Islands it appears to have been the custom, as also in several of the Continental instances, that the youngest child of either sex should have the house when the property came to division. Similar benefits were reserved to the youngest son by the Welsh laws, which provided that when brothers divided a patrimony contain- ing a habitation “the youngest should have the principal messuage and all the buildings and eight acres of land, and the hatchet, the boiler, and the ploughshare,” and a preference of the same kind prevailed in some parts of Devon and Cornwall and in very extensive lordships in Brittany. Traces of the same or analogous usages may be found in many parts of Germany, Switzerland, Russia, Hungary, and other countries.)*~~

~~*The custom of giving a preferential birthright to the eldest son or child did not prevail so extensively in ancient times, though it was known in some parts of Germany as well as in France, where it is called “le préciput.” The eldest son or eldest child got the house and a piece of fur- niture and a plot of land “as far as a chicken could fly,” as being traditionally exempt from the general partition. In the Ordinances of St Louis we find a rule that a gen- tleman having daughters only should divide the rest of his property equally among them, “ mais |’ainée outre sa portion aura la maison paternelle et le vol du chapon.”*~~

~~*Instances of this kind are found among the rural customs of England and Normandy, which serve to indicate the source of one part at least of the English system of primo- geniture. The rights of the eldest, however, have been collected from many quarters. Sir Henry Maine has traced the modern form of this system to the growth of the power of the chieftain and its*~~

~~development in feudal times. The medieval jurists are responsible for many exaggerations of the principle of sole succession to rights of dominion. But it is at any rate important to observe that there were Teutonic customs giving a benefit of eldership before the feudal system was invented, which appear to have much less connexion with the power of the patriarch or chieftain than with the sentiment that gave the father's house to the eldest son under the Athenian law or secured to him a larger set of rights under the Laws of Manu (Demosth., Pro Phorm., 34; Coulanges, Cité Antique, c. 6). It should also be remembered that at least one tribe of Germans was accustomed in the days of Tacitus to allow the father's war-horse to descend as an heirloom or "principal" to the eldest son (Germ., cc. 18, 20, 32), and that the strict rule of primogeniture appears to have existed in Scandi- navia from the most ancient times. To the English in- stances already mentioned may be added a passage from Bede's life of St Benedict which shows that some sub- stantial birthright was reserved in his time for the eldest~~

~~1 Reports on Tenure of Land, 1869 ; Grimm, Deutsche Alterthiim.,~~

~~475 ; Wenckebach, Jus Theelacticum Redivivum, 1759 6 3 ach, F . 3; Kovy, Summ. Juris Hungarici, 351 ; MesdkGvesel, Les Bachkirs, ke, ili, 81.~~

~~PRIN CeCe VLU ERS~~

~~Northumbrian laws, '"'Quomodo terreni parentes, quem primum: fuderint, eum principium liberorum suorum cog- noscere et ceteris preferendum ducere solent" (Bede, Vit. Bened.,s. 11). This may refer to some system of double portions, like the Jewish rule as to "birthright" (Deut. xxi. 15, 16), or it may denote a preference in parti- tion which secured the dwelling-house or principal chattels to "the first-fruits of the family." A passage from Glan- ville, which is applicable to England and Scotland in the 12th century, shows that in the case of a rustic holding the custom of the district determined whether it should be divided among all the sons or reserved for the eldest or youngest. "If he were a free sokeman, the inheritance in that case will be divided among all the sons according to their number in equal shares, if the holding was partible by ancient custom, the chief messuage being, however, reserved for the first-born son in honour of his seniority, but on the terms of his making compensation to his brothers from the rest of~~

~~*his property. But if it was not anciently partible, then by the custom of some places the first-born son will take the whole inheritance, but by other customs the youngest son is the heir" (Glanville, vii. c. 3). In the time of Bracton, a century later, the presumption that primogeniture was an exceptional rule had been reversed, and special proof was required in freehold lands of a custom to exclude the eldest. He still speaks, however, of customs in favour of the eldest or youngest son in the case of the " villein-socage " holdings, which afterwards developed into copyholds. 'When a free sokeman dies leaving several heirs to share, if the inheritance is partible from ancient times, they shall all have their equal shares; and if there is only one messuage that shall remain entire for the eldest, but so that the others shall have up to its value out of the common stock. But if the inheritance has not been divided from ancient times then it shall remain to the eldest. But if it be villein-socage then the custom of the place is to be observed, for it is the usage in some parts for the youngest to be preferred to the eldest, or the contrary" (De Leg,, ii. c. 76). The ancient rule of inheritance among socage tenants in Scotland was the same as that described by Glanville.*~~

~~*These customs of "rural primogeniture" can be traced, as we have seen, in some parts of the Continent, but their existence is rarely to be distinguished where the influence of the Roman law prevailed in the barbarian kingdoms, as in Italy, Spain, and Provence. In Normandy and Picardy, however, these usages long remained in an exceptionally vigorous form,—a fact which may be due to the Scandi- navian origin of the Normans, or perhaps, as Richebourg suggested in his note on the Coutiime de Caux, the custom may have lasted down as a tradition from Gaulish times. The laws of the Channel Islands still preserve a special benefit for the eldest son; but the Coutémier Général affords several examples of a more ample birthright which can hardly be attributed to any feudal influence. By the custom of Normandy "' the eldest son in right of his elder- ship might take and choose as a préciput such fief or terre noble as he pleased; and if there were but one manoir roturier on the land the eldest before the division might declare that he retained it with court and garden, making recompense to his younger brothers" (Coutéme de Nor- mandie, 337, 356). "L'aisné faisant partage . . . peut retenir par précipu le lieu chevels . . . anciennement appelé hébergement, soit en ville ou en champs, de quelque estendue qu'il*~~

~~soit" ("Usage de Bayeux," Cout. Gén., iv. 77, 78, 94). The usage of the district of Caux, on the frontier of Picardy, was even more favourable to the eldest son: " Demeurant le manoir et pourpris en son integrité au profit de l'aisné sans qu'il en puisse étre disposé & son préjudice, ny qu'il soit tenu en faire récompense ausdits puisnés" ("'Suce. Bailliage de Caux," zbid., 74).~~

~~PRIM OC EHR ITU RE~~

~~This last instance appears to give usa clue to the origin of the strict English primogeniture as applied to the rustic holdings, sometimes called jiefs de roturier or '" plough- man's fee," which in most parts of the Continent, as in almost every district in England before the Norman Con- quest, descended to all the sons in equal shares, with some customary privilege or birthright in favour of the eldest or youngest son. The strict rule of the custom of Caux was deliberately applied by the Norman kings of England not only to military fiefs but also (wherever it was possible) to agricultural tenancies. This was effected partly by reversing the presumption of partibility, as shown by the passage from Bracton cited above, and partly by direct enactments of the king or of his greater tenants, who assumed or received the prerogative of abolishing incon- venient modes of inheritance. The urban customs of the "French" portions of Hereford and Nottingham appear to have been altered in this way. (See Muwicrpariry.) Simon de Montfort, by his charter in 1255, granted to the burgesses of Leicester that the eldest son should be his father's heir instead of the youngest; and an analogous right was exercised under the name of "disgavelling" by the archbishop of Canterbury in Kent. About the reign of Edward II. the idea first began to prevail that such alterations of descent could not be carried out without the consent of parliament, and it was eventually held that even the king had no such prerogative (Robinson, Gavel- kind, i. c. 5). The earlier view is very clearly stated in a charter by which Edward I. disgavelled certain lands of John de Cobham (Charter Rolls, 4 Edw. I., No. 17). The most important clauses of this document were in effect as follows : —~~

~~'Tt pertains to our prerogative to abolish such laws and customs as diminish instead of increasing the strength of the kingdom, or at least to~~

~~*change them by our special favour in the case of our deserving and faithful followers ; and since it has often happenced by the Kentish custom that lands, which when undivided in certain hands are quite sufficient for the service of the state and the maintenance of many, are afterwards divided and broken up among co-heirs into so many parts and particles that no one portion suffices even for its owner's maintenance, we.therefore grant to J. de Cobham that all the gavelkind lands and tenements which he now holds in fee simple shall descend to his eldest son or other heir at common law in the same way as his estates held by serjeauty or knight-service."*~~

~~*A similar change of tenure was effected by Acts of parliament for many estates in Kent in 11 Hen. VIL., 15 Hen. VIIL, 31 Hen. VIIL, 2 and 3 Edw. VI, 1 Eliz, 8 Eliz., and 21 James I., and primogeniture was introduced in the same way into the soke of Oswaldbeck in Notting- hamshire in 32 Hen. VIII. and into the city of Exeter by the Act of 23 Eliz. c. 12. The customary descent of copyhold lands (where primogeniture had not been estab- lished in ancient times by the ordinances of the lords or by an application of the current presumption) has been changed in a greaf number of cases by other private Acts of parliament or has been destroyed by enfranchisement. The Welsh custom of partition was altered in some respects, especially by forbidding the inheritance of bastards, by the Statute of Wales passed in the 12th year of Edward I.; the custom as modified was confirmed when the prin- cipality was united in 27 Hen. VIII. to the kingdom of England, but it was soon afterwards enacted by the Act 34 and 35 Hen. VIII. c. 26 that freehold lands in Wales should thenceforth be "holden as English tenure to all intents according to the common laws of this realm of England, and not be partible amongst heirs-male after the custom of gavelkind as heretofore in divers parts of Wales was used and accustomed." The change in the Irish customs was carried out in a different way. There is evidence that before the adoption of the English law several systems of customary inheritance were known in Treland.*~~

~~*discretion. a competent portion of land, assembled all the sept and having put*~~

~~*whole ; in which partition. .*~~

~~*Besides the law of tanistry, which will be described after- wards, there are indications in the Brehon tracts not only*~~

~~*of arrangements in favour of the youngest branch, such as have been already mentioned, but also of a preference in some cases for the eldest son, "the cattle and land being*~~

~~*equally divided, but the house and offices going in addition*~~

~~*to his own share to the eldest son" (Hearn, Aryan House- hold, 80, 82; O'Curry, Lectures, clxxix.). cases we have the record of that system of " Irish gavel- kind " which was described by Spenser and Davis, and which has been shown by Sir H. S. Maine to be closely connected with very early Aryan institutions still surviving in practice among the Hindus.*~~

~~*Besides these*~~

~~*'The lands in that kingdom possessed by the mere Irish were*~~

~~*divided into several territories or countries, and the inhabitants of every Irish 'country' were divided into several septs or lineages, in every one of which there was a chief called Canjinny or 'caput cognationis,' and all the inferior tenancies in these territories were partible among the males in gavelkind ; but the estate which these inferior tenants had was not an estate of inheritance, but a tempo- rary or transitory possession, for these lands were not partible among the next heirs of him that died, but among all the males of this sept or clan in this manner: the Canjinny (who was generally the*~~

~~*oldest man in the sept) made all these partitions according to his This Canfinny, after the death of every one who had*~~

~~*all their possessions into hotchpot made a new partition of the . he allotted to every one of the sept according to his age a better or larger part" (Robinson, Gavelkind,*~~

~~*i.c.2; Davis's Reports, 37, " Case of 'Tanistry ").*~~

~~*This is obviously the description of a joint family similar to those which have been found in the Scottish Highlands, in France, in the Slavonic countries, and in India, and, as it would seem, the various modes and periods of redistributing such joint possessions are merely matters of detail and convenience. It would be of greater importance to our subject to know whether any special property was reserved for one of the dead man's sons, as in the case of the Frisian ‘“‘theel-lands.” It was resolved in the great case cf tanistry in the third year of James I. that this Irish “custom of gavelkind ” was void in law as being unreason- able and as being “a mere personal custom” not binding the descent of the inheritance, “‘and therefore all the lands in these Irish territories were adjudged to be descendible according to the course of the common law, notwithstanding the Irish usage.” By one of the penal statutes against Roman Catholics in Ireland (2 Anne c. 6), the usage of partibility was to some extent revived, it being enacted that the lands of Roman Catholics should be divided among all the sons “as in gavelkind,” unless the heir should be a Protestant; but this harsh law was fortunately repealed by the Irish Act of 18 Geo. III. c. 49.*~~

~~*The remote origin of all these ancient forms of primo- geniture may probably be traced to a system of family religion that prevailed among the tribes from which the Aryan nations have descended. We are told in the Laws of Manu that the eldest son had his very being for the purpose of accomplishing the rites of the family religion, of offering the funeral cake, and of providing the repasts for the spirits of the dead ancestors. “The right of pro- nouncing the prayers belongs to him who came into the world the first. A man must regard his elder brother as equal to his father. By the eldest at the moment of his birth the father discharges his debt to his own progenitors ; the eldest son ought therefore before partition to manage the whole of the patrimony ” (Laws of Manu, ix. 105, 126; Coulanges, La Cité Antique, c. 6, “La Droit d'Ainesse”). This view seems to account for the widespread usage that the eldest son should keep the house, or hearthplace, or the parents' furniture as part of his share of the inheritance, It is said that among the Hindus the right to inherit a dead man's property is exactly coextensive with the duty of performing his obsequies, and we are told that in ancient*~~

~~Rome an inheritance could not be distributed under a will "without a strict apportionment of the expenses of these ceremonies among the different co-heirs" (Maine, Anc. Lau, 191). Some support is also given to this theory by the custom which is said to have prevailed in Norway by which particular lands were set apart for funeral expenses, and if a man had no kinsman to give him proper burial le might leave his property as "' brande-erbe " or '"burning- land" as an endowment for burial, and the friend who accepted the duty was allowed to keep the property as "odal land" or privileged family inheritance (Robertson, Early Kings, ii. 323). Numerous other illustrations might be given from the analogous customs in which the youngest son is preferred. 'There seems to be no reason why the eldest should be preferred by one nation and the youngest by another; but something may perhaps be due to the acci- dent that the one set of tribes was civilized enough to have fixed family habitations, and the other may have lived ina nomad fashion, so that the youngest would be most likely to remain in the parents' tent and to be ready to perform the duties of the hearthplace. Sir Henry Maine draws a distinction between the archaic customs of the tribe and that strict form of primogeniture which he has traced to the power of the chieftain. Taking primogeniture in the sense of an exclusive succession of the eldest son to pro- perty, he finds no sign of its existence before the destruction of the Roman empire by the barbarians. "Even when the Teutonic races spread over western Europe they did not bring with them primogeniture as their ordinary rule of succession." He considers the "birthright" given to the eldest in the instances which have been mentioned to be in the nature of a reward or a security for impartial distribution (Zarly Hist. Inst., 197,198). 'Primogeniture, as we know it in our law, had rather a political than a civil origin, and comes from the authority of the feudal lord and probably from that of the tribal chief; but here and there on the Continent there are traces of it as a civil institution, and in such cases the succession of the eldest son does not exclude provision for the younger sons by what are called appanages. The evidence of ancient law and usage would, however, seem to show that it was usually the youngest son who remained at home with his father to serve him through life and succeed to his remaining property at his death" (Karly Law and Custom, p. 260). As regards the political origin of a great part of~~

~~*the English system of primogeniture a distinction should be made between royal and feudal successions. The devolu- tion of the crown in European countries 'has usually been regulated by some kind of primogeniture, based partly on the rules which have governed private successions, partly on the indivisible character of the empire as it survived into modern times, and partly again on that "law of the sword" or rule of public policy which forbids the dis- integration of the state. It is possible also that the Irish system of tanistry contained some of the elements of this method of royal succession. The custom was described by Spenser in his View of the State of Ireland shortly before the abolition of the Brehon law in the reign of James I. as follows: "It is a custom among all the Irish that, pre- sently after the death of any of their chief lords or captains, they do presently assemble themselves . . . to choose another in his stead, where they do nominate and elect for the most part not the eldest son nor any of the children of the lord deceased, but the next to him of blood that is eldest and worthiest, as commonly the next brother, if he have any, or the next cousin and so forth, as any is elder in that kindred or sept, and then next to him they choose the next of the blood to be tanaist, who shall succeed him in the said captaincy if he live thereunto." This system may be described as the election of an elder*~~

~~*PRIMOGANTTU BE*~~

~~*to be head of the sept (like the analogous election of a patriarchal "house- father" in a joint family), with an additional choice of an elder in reversion, to avoid dis- putes as to succession in times of war. A similar rule may have obtained among the Teutonic tribes (Maine, Early Hist. Inst., 202); as the smaller chiefs sank into the position of nobles and were succeeded by their eldest sons (for reasons connected with the priestly character of the king) in the possession of their offices and demesnes, a rule of the same kind might grow up with regard to the king or ruling chieftain, by which the eldest son would get not only his private demesne but also that "portion of land attached to the seignory or chiefry which went without partition to the tanaist." In this way a prin- ciple of inheritance might be formed 'which first of all extended from the demesne to all the estates of the holder of the seignory, however acquired, and ultimately deter- mined the law of succession for the privileged classes throughout feudalized Europe" (zbid.,*~~

~~204, 208). This part of the subject is confessedly very obscure ; and it must not be forgotten that there were other and stranger modes of succession to chieftainships in Ireland and Scotland, which appear to have been unconnected with any such rules of primogeniture (Girald. Cambr., Zop. Hibern., iii. 25; Ware, Ant. Hib., 11. 64 ; Ailred's Chron., ed. Twysden, 348 ; Robertson, Karly Kings, i. 36). Bede has left us a description of the rule among the Picts. 'It was the custom in Pictland," as the saying went, that the kingdom should come from women rather than from men. (Com- pare the similar customs among the ancient Spartans, Lycians, and Iberians in M'Lennan's Studies, 101, 145.) The dignity never went from father to son, but when the king died the crown went to his next brother, or in default to his sister's son, or in any event to the nearest male relation claiming through a female and on the female side. The list of kings contains no instance of a son bearing his father's name, or of the same name belonging to both father and mother; and the only fathers of kings of whom any account has survived are certainly known to have been foreigners, the one being a prince of Strathclyde and the other a grandson of the king of Northumbria. One and the same rule of primogeniture has been applied in England to royal and to private estates, with the exception as to the succession of the eldest daughter which has already been mentioned. The system varied greatly in the Conti- nental countries according to the circumstances of each case. In France the crown was regarded as a partible in- heritance under the first two dynasties. At the beginning of the 11th century primogeniture had become the rule as to fiefs, offices, and dignities, and partly no doubt from ana- logy and partly for reasons of public policy the crown was brought within the same rule under the house of Capet (Montesquieu, Lsprit des Lois, xxxi. 32; Kenny, Law of Primogeniture in England, 10). But in this case there was a singular modification, known as the "Salic law" or '*Salic rule" (as if it had been derived froni the customs of the Salian Franks), by which the succession was event- ually limited to males claiming through males. The origin of this law has been found in the fact that "the kings sprung from Hugh Capet succeeded one another, son to father, or brother to brother, for more than 300 years" previously to the disputes which arose in the 14th century as to the succession of an heir claiming through a female (Maine, Early Law and Custom, 154). The rule was adopted because it corresponded to the facts which had existed; it was extended because it suited the circumstances of those states in which the~~

~~*sovereign had a large authority ; in constitutional countries the rule has been considered to be against public policy, partly perhaps because the reign of a femalesovereign isregarded as favourable to popular liberties.*~~

~~*PRI—PRI*~~

~~*The history of primogeniture as applied to feudal suc- cession is simpler than that of the inheritance of the crown. When a fief was regarded not strictly as an estate in land but rather as being in the nature of an office there was at first no room for the notion of its descent toan heir. HeId first at will and afterwards for short fixed periods, the fiefs or benefices came gradually to be regarded as inheritances. When this idea was first established the fief was usually treated as being partible among all the sons, and it was not until 1138 that Frederick Barbarossa, for reasons of public policy, forbade the greater tenancies to be sub- divided. The Assises de Jérusalem had laid down the same rule in 1099, though the king was then allowed to select any one of the children for succession. "In Brittany, primogeniture was not introduced till 1185, even for nobles and knights. ... Down to the French Revolution a German baron had to make a family settlement and to get the consent of his younger sons, if he wished his land to descend to the eldest son alone" (Kenny, 11). In France the eldest son began to gain pre-eminence in the division of fiefs about the beginning of the 11th century, and the usage spread with more or less vigour through all the Western countries. '"'Usu ad omnia feuda serpsit, ut vel ex asse majori cedant, vel major preecipuum aliquod in iis habeat" (Zoesius, cited in Co, Litt., 191a). In countries where the Roman law prevailed the privileges of the eldest son were secured by a legal fiction, the jurists deciding that every noble was a "miles" or soldier on service entitled to exceptional benefits. In Spain the inheritance was con- sidered to be divisible into fifteen shares, of which seven in all (being one-fifth of the whole and one-third of the residue, known as the customary "fifth and third") were within the parent's disposal as a majoratus ; and this was usually entailed upon the eldest son. Similar privileges by way of majorat have been given to particular land-owners in France at various times since the abolition of primogeniture in the great Revolution. The feudal primogeniture of England was firmly established in the reigns of the first two Norman kings, with a temporary provision for the case of estates lying both in England and*~~

~~*Normandy, in which the Norman estate was allotted to*~~

~~*the eldest son and the English estates to the second. Its origin, as we have seen, is to be found partly in old modes of customary inheritance surviving both in England and in Normandy, but mainly in the deliberate policy of the sovereigns, who wished to keep the military estates together, and took advantage of the strictness of the "custom of Caux" to carry out the objects of the "law of the sword." (com By) PRIMROSE.! The genus Primula contains numerous species distributed throughout the cooler parts of Europe and Asia, and found also on the mountains of Abyssinia and Java. 'They are all herbaceous perennials, possessing a permanent stock, from which are emitted tufts of leaves and flower-stems which die down in winter; the new growths formed in autumn remain in a bud-like condition ready to develop themselves in spring. They form the typical genus of Primulacex, the floral conformation of which is very interesting on several accounts independently of the beauty of the flowers. Thus the five stamens spring- ing from the tube of the corolla, instead of being placed alternately with or between its lobes, are opposite or 'super posed ." to them, an arrangement accounted for by some on the supposition that an outer row of stamens (which, if present, would render the flower symmetrical) is suppressed. In support of this view the case of Samolus, an allied genus*~~

~~*1 Lat. primula; Ital, and Span. primavera ; Fr. primevére, or in some provinces primerole, Strangely enough, the word was applied, according to Dr Prior, in the Middle Ages to the daisy (Bellis perennis), the present usage being of comparatively recent origin.*~~

~~*aT in which there are five petaloid stamens as well as five fertile ones, may be cited. By others the anomaly is ex- plained on the hypothesis that the corolla is suppressed, what appears to be such being merely an outgrowth from the stamens. But this view is not borne out by observa- tion of the development of the flower. Within the base of the corolla tube is the one-celled superior ovary, rising up into the centre of which is a dome-shaped placenta, quite detached from the walls of the ovary and studded with ovules. The origin and explanation of this free central placenta have formed the subject of a copious literature, the point at issue being whether the placenta is a direct pro- longation from the axis of the plant or an*~~

~~*outgrowth from the walls of the carpels.2 The variation in the length of the stamens and of the style in the flowers of this genus has attracted much attention since Darwin pointed out the true significance of these varied arrangements. Briefly it*~~

~~*-may be said that some of the flowers have short stamens*~~

~~*anda long style, while others have long stamens, or stamens inserted so high up that the anthers protrude beyond the corolla tube, and a short style. Gardeners and florists had for centuries been familiar with these variations, calling the flowers from which the anthers protruded "thrum-eyed" and those in which the stigma appeared in the mouth of the tube "pin-eyed." Darwin showed by ex- periment and research that the most perfect degree of fertility, as shown by the greatest number of seeds and the healthiest seedlings, was attained when the pollen from a short-stamened flower was transferred to the stigma of a short-styled flower, or when the pollen from the long stamens was applied to the long style. As in any given flower the stamens are short (or low down in the flower- tube) and the style long, or conversely, it follows that to ensure a high degree of fertility cross fertilization must occur, and this is effected by the transfer of the pollen from one flower to another by insects. Incomplete fertility arises when the stigma is impregnated by the pollen from the same flower. The size of the pollen-grains and the texture of the stigma are different in the two forms of flower. The discovery of the physiological significance of these variations in structure, which had long been noticed, was made by Darwin, and formed the first of a series of similar observations and experiments recorded from time to time in the Journal of the Linnean Society and elsewhere by himself and subsequent observers. Among British species may be mentioned the Common Primrose (P. vul- garis) ; the Cowslip (P. verts), which is the original source of the Polyanthus of the gardens; the true Oxlip (P. elatior), a rare plant only found in the eastern counties ; and the Common Oxlip, by some considered to be a form of the Common Primrose but provided with a stem supporting the flowers. Darwin's experiments go to prove that the first-named three are species, while the last-named is a hybrid between the cowslip and the primrose. In addition to these species two others occur in Britain, namely, P. farinosa, found in Wales, the north of England, and southern Scotland, and P. scotica, which occurs in Orkney and Caithness.*~~

~~These two species are found also in high Arctic latitudes, and P. farinosa, or a very closely allied form, exists in Fuego.~~

~~The Awricula of the gardens was formerly considered to be a form of P. Auricula, a yellow-flowered species, a native of the Swiss mountains, but it has been recently shown by Kerner that in all probability the origin of the Awricwla was P. pubescens, supposed to be a natural hybrid between P. Auricwla and P. hirsuta. The Polyanthus has already been mentioned as a variety of the cowslip,~~

~~but it may further be added that some very remarkable forms which have been cultivated for centuries owe their peculiarities to 2 For a full discussion of this and other points in the morphology of the flower, the reader may refer to Dr Masters's paper in the Pro- ceedings of the Linnean Society, 2d ser., vol. i. (1877) p. 285, or to Eichler's Bliithen- Diagramme. XIX, — 93~~

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~~the assumption by the ordinarily green calyx of a petaloid con- dition ; Slen this is complete we have the condition called "hose in hose" by the gardeners. This may, however, arise from actual duplication of the corolla within the calyx. The Chinese Primrose, now so much cultivated in gardens, is derived from P. prwnitens. The Japanese Primrose is nearly or quite hardy, and is the stateliest of the genus ; its flowers of varied colours are placed tier above tier, like the branches of a fir tree. P. cortusoides is another Japanese species of which many forms are now cultivated. P. simensis, with mealy leaves and yellow flowers, is the Abyssinian Primrose of gardens. The Himalayas are rich in species of primrose, often very difficult of determination or limitation, certain forms being peculiar to particular valleys. Of these P. denticulata, Stuartii, sikkim- mensis, nivalis, may be mentioned as frequently cultivated, as well as the lovely rose-coloured species P. rosea.~~

~~PRINCE. "Prince" and "princess" are names or de-~~

~~scriptions implying either political authority or social rank~~

~~*in the persons to whom they relate or are accorded. We have in "prince" the English and French form of the Latin princeps, which with more or less modification has been adopted into nearly every language of modern Europe, and of which the original and common use was to indicate priority or pre-eminence of any sort. In an honorary sense it was, to begin with, applied by the Romans to the first or most distinguished members of the senate and the equestrian order respectively, and their appellations of princeps senatus and princeps juventutis were afterwards appropriated to the emperors themselves and to their adopted heirs and successors in the empire. Hence the attribute princeps became definitely associated with the notions of sovereignty and dominion, and its derivatives have been always and everywhere employed as titles of dignity and expressions of awe or respect.*~~

~~*In English the word "prince" may be used in certain connexions in the original wide sense of the Latin word. More definitely it is applicable to supreme rulers of both sexes and almost all kinds. Thus the emperor of Russia, the queen of England, and the king of the Belgians are equally princes or monarchs, and the consorts of emperors and kings are princesses. But the presidents of republics are neither princes nor monarchs. Prince, however, unlike monarch, applies to rulers who are subordinate as well as to rulers who are supreme, to sueli minor potentates as the electors of the old German empire or the feudal peers of France once were, and the reigning grand-dukes or dukes of Germany now are. Again, all the children and many of the descendants and other relations of monarchs and princes of every class and grade are themselves princes or princesses, although it often happens that they have also some special name or personal dignity by which they are ordinarily known. The eldest son of the emperor of Russia, for instance, is called the "cesarewich," as the eldest son and next brother of the king of France under the ancien régime were called the "dauphin" and "monsieur." In England for several centuries the younger sons of the sovereign have had dukedoms conferred on them, as in the cases of the dukes of Edinburgh, Connaught, and Albany, and from the reign of Edward IV. until the reign of Victoria the dukedom of York was always given to the second son and the dukedom of Gloucester to the third, unless it was already appropriated. The princes and princesses of Russia are "grand-dukes" and "grand-duchesses," of Austria*~~

~~"archdukes" and "archduchesses." and of Spain "infants" and "infantas." Some of the eldest sons of kings are "dukes," as the duke of Brabant in Belgium and the duke of Sparta in Greece. But, when they are not dukes, or princes with a territorial title, as the prince of Wales or the princes of Naples in Italy and oe me they are described as "princes" with Pa ae 'i ge de 4 crown," "royal," or "here- renee. bee Rl en the name of the dominions~~

~~elrs-apparent. The eldest sons~~

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~~of reigning grand-dukes or dukes, however, are called "hereditary grand-dukes" or "hereditary dukes," their younger brothers and their sisters being all the same princes and princesses. The Prussian fashion of call- ing the eldest daughter of the sovereign the 'princess royal" was introduced into England by George II. It was not the custom, however, for the daughters of English monarchs to be entitled "' princesses" at all until the reign of Charles I. The two daughters of Henry VIII. were the Lady Mary and the Lady Elizabeth until they ascended the throne, for, although there is a tradition that they were both made princess of Wales successively, there is no evidence whatever to support it. As late as the reign of Charles II. the granddaughters of Charles I., daughters of James, duke of York, the heir-presumptive to the crown, were called the Lady Mary and the Lady Anne until they became princesses by marriage, the one as the wife of William, prince of Orange, and the other as the wife of Prince George of Denmark. It is difficult to say when the younger sons of English sovereigns were originally called "' princes." But the practice of so calling them prob- ably began as early as the reign of Henry VIL, although there was no opportunity of observing it again before the reign of James I., when it was certainly established.~~

~~In France before the Revolution the designation of "'nrinces du sang," or " princes of the blood," was common from generation to generation to all the male descendants of the French kings, and they had precedence according to their proximity to the crown of all dignitaries and nobles. It was not, however, until the reign of Charles VIL or Louis XI. that they were called "princes," their earlier appellation having been "seigneurs du sang" or "seigneurs du lignage du roi." In France, too, the natural children of the~~

~~*king were, when formally acknowledged, termed "princes légitimés," at any rate from the reign of Louis XIV., and although they were excluded from the line of succession to the throne they were ranked imme- diately after the princes du sang. The princely character of all the male descendants of the imperial, royal, and other reigning families of the Continent, when neither illegitimate nor the issue of a morganatic marriage, is perpetual and indelible. Moreover, the families which were formerly reigning within the boundaries of the old German or existing Austrian empires, despite that they have now ceased to reign, are in this respect still in the full possession of their earlier privileges. But in England, on the contrary, it was considered necessary only about a quarter of a century ago to make express provision by royal authority that the titles of "' prince" and " princess " should be enjoyed by the children of the sons as well as by the sons and daughters of any sovereign of the United Kingdom. It may therefore be concluded that they had no previous claim to the attributes of prince and princess, and that they will not transmit them to their posterity.*~~

~~*Besides the more or less general uses of the words "prince" and ' princess" which we have already noticed, there are the particular applications of them, first to a dis- tinct class of rulers, and secondly to a particular order of nobility. Princes regarded as the political chiefs of states are inferior to emperors and kings, and not necessarily superior to reigning grand-dukes or dukes. Very few ex- amples of them at present exist,—those of Waldeck and Pyrmont, Montenegro, Bulgaria, and Monaco alone occur- ring tous. None of the great feudatories of the Middle Ages, whether in Germany, France, or Spain, were formally described as princes, and of the mediatized families still extant who once supplied members to the imperial diet, many of them from a remote period, not one had the de- signation of "prince" before the commencement of the 17th century, while not more than five or six had it before the*~~

~~*comniencement of the 18th century. The old Italian and Welsh princes and the more modern princes of Orange are in fact nearly the only reigning princes who are remembered in history. As a name of dignity, neither of dominion on the one hand nor of courtesy on the other, "' prince" is*~~

~~*common enough among the nobility of the Continent. But in England it is never conferred on anybody except the heir-apparent to the crown, and his principality is a peerage. Since the reign of Edward III. the eldest sons of the kings and queens of England have always been dukes of Cornwall by birth, and, with a few exceptions, princes of Wales by creation. Before that Edward I. had con- ferred the principality on his eldest son, afterwards Edward II., who was summoned to and sat in parliament as prince of Wales. But Edward the Black Prince was the original grantee of the principality as well as of the dukedom, under the special limitations which have continued in force to the present day. The entail of the former was "to him and his heirs the kings of England" and of the latter '"'to him and his heirs the first-begotten sons of the kings of England." Hence when a prince of Wales and duke of Cornwall succeeds to the throne the principality in all cases merges at once in the crown, and can have no sepa- rate existence again except under a fresh creation, while the dukedom, if he has a son, descends immediately to him, or remains in abeyance until he has a son if one is not already born. If, however, a prince of Wales and duke of Corn- wall should die in the lifetime of the sovereign, leaving a son and heir, both dignities are extinguished, because his son, although he is his heir, is neither a king of England nor the first-begotten son of a king of England. But, if instead of a son he should leave a brother his heir, then— as was decided in the reign of James I. on the death of Henry, prince of Wales, whose heir was his brother Charles, duke of York—the dukedom of Cornwall would pass to him as the first-begotten son of the king of England then alive, the principality of Wales alone becoming merged in the crown. It has thus occasionally happened that the dukes of Cornwall have not been princes of Wales, as Henry VI. and Edward VIL. and that the princes of Wales have not been dukes of Cornwall, as Richard II. and George III. It was in direct imitation of these dignities that the princi- pality of the Asturias and the dukedom of Rothesay were created by John J. of Castile and Robert IL of Scotland in favour of their eldest sons and the eldest sons of their successors. In the new kingdoms of Holland and Italy the principalities of Orange and Naples have been appropriated to the eldest sons of the sovereigns. Under the monarchy in France princes invariably yielded precedence to dukes, unless of course they were "princes du sang" or " princes légitimés," as the princes of Condé, of Conti, or of Lamballe. Several of the French dukes numbered principalities among their inferior titles, as the duke of La*~~

~~Rochefoucauld also prince of Marcilla¢, and the duke of Gramont also prince of Bidache, while several of the French princes were the heads merely of junior branches of ducal families, as the princes of Léon and of Soubise of the Rohan family, and the princes of Tingry and of Robecq of the Montmorency family. When Napoleon established the empire and reintroduced titles into France, princes were made the first and dukes the second order of the new nobility. But only a few princes were created—Talleyrand, prince of Bénévent; Bernadotte, prince of Ponte Corvo; Berthier, prince of Wagram ; Davoust, prince of Eckmiihl ; Masséna, prince of Essling ; and Ney, prince of Moskowa, nearly if not quite exhausting the list. In Germany and Austria the title of "prince" is represented by "Prinz" when it appertains to the members of imperial and royal families, as Kronprinz von Oesterreich or Prinz Wilhelm von Preussen, and by "Fiirst" when it appertains to the members of mediatized or noble families,~~

~~as Fiirst von Salm-Salm or von Hohenlohe-Langenburg, and Fiirst von Metternich-Winneburg or von Bismarck- Schénhausen. According to its identification with '" Prinz" or " Fiirst" it is a higher or lower dignity than " Herzog" (duke). In the old empire, however, the Churfiirsten or electors were always next to the emperor and the king of the Romans. In Italy, as well as in Belgium and Hol- land, princes are inferior to dukes as members of a parti- cular order of nobility. In Spain and Portugal we are not aware that the title of "prince" has ever been conferred on a subject outside of the royal family except in the well- known case of Godoy, Prince of the Peace. Among the Russian nobility there are neither dukes nor marquesses, the orders being princes, counts, and barons. It is to be observed, however, that in no part of the Continent does precedence depend exclusively as in the United Kingdom on the apparent rank of titular distinctions or the relative positions which they nominally occupy in formal classifi- cation. F. DR.~~

~~PRINCE EDWARD ISLAND, formerly called Isle St See North America, Plate IV. . and 62° and 64° Yo *¥¥-~~

~~Jean, a province of Canada, in British lies between 45° 58' and 47° 7' N. lat.~~

~~*27' W. long., on the south side of the Gulf of St Lawrence. It is separated from Nova Scotia on the south and from New Brunswick on the south and west by Northumberland Strait, which varies from 9 to 30 miles in width. Its greatest length is nearly 150 miles, its general breadth 34 miles, and the area 2133 square miles (1,365,120 acres).*~~

~~*Physical Features.—Prince Edward Island resembles a crescent in its northern outline, the two horns being North and East Capes, and it is altogether irregular in form. Its surface is slightly rolling, the elevations of land, how- ever, rising nowhere higher than 500 feet., The coast-line is indented with numerous bays and projecting headlands, the more prominent of the latter being North Cape on the north-west, West Cape on the west, East Cape on the east, Cape Bear on the south-east; others are Stewart, Bell, Prim, Gallas, Black, Amherst, and Fifteen on the south, Kildare, Aylesbury, Turner, Cablehead, and Campbell on the north, Durell and Bruce on the east, and Seal Point on the west. The principal bays are Richmond on the north, Egmont on the south-west, Hillsborough on the south, and Cardigan on the east. These inlets, piercing the land from opposite directions, form narrow isthmuses which divide the island into three distinct peninsulas. Other bays are St Peter's, Grenville, Harrington, and Tignish on the north; Colville, Rollo, Fortune, and Bough- ton on the east ; Orwell and Pownal on the south. Along the coasts there are several small islands, viz., Grover, Fish, Burnbury, Lennox, Robinson's, Boughton, Panmore, Wood, Governor, St Peter's, and Brae. The chief rivers are North, Elliott or West, Hillsborough or East, Ellis or Grand, Percival, Trout, Boughton, Murray, Dunk, and Morrell. The Grand river is the seat of a large and in- creasing oyster and codfish trade. The Dunk is a fine salmon and trout stream. The principal harbours are Charlottetown, Georgetown, Bedeque, Port Hill, Cascum- peque, Souris, Murray, Savage, Bedford, and Westmore- land. The island is well watered, and by the disintegration of the soft red sandstones a bright red loamy soil of great fertility is produced. To this the province owes its re- markable prodtictiveness as an agricultural district, and the gently undulating surface, the rich fields, and pretty homesteads embowered in trees give variety and beauty to the landscape.*~~

~~*Geology.—The oldest geological formations in Prince Edward Island are represented by beds of brown, grey, and red sandstone and shale, with*~~

~~layers of coarse concre- tionary limestone and fossil plants. These are of newer Carboniferous (or in part of Lower Permian) age, and have~~

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~~been named by Sir William Dawson the Permo-carbonifer- ous series. They appear in the peninsula between Orwell Bay and Pownal Bay, in Governor's Island, in Hillsborough Bay, and on the coast between West and North Capes, as well as in other localities on the south and west. But the prevalent rocks are bright red sandstones with calcareous cement, alternating with beds of red and mottled clay, and with occasional white bands and layers of concretionary limestones and conglomerate, which in mineral character resemble the Trias or New Red Sandstone of Nova Scotia. The formation may be divided into two sections: "the lower, representing," says Dawson, "the Bunter Sandstein of Europe, is characterized by the prevalence of hard con- cretionary calcareous sandstones and obscure fossil plants, while the upper (representing, perhaps, the Keuper of Europe) has softer and more regularly bedded sandstones and clays." Owing to the similarity of the Permo-carboni- ferous and Triassic beds, and the general covering of soil, it is not possible definitely to mark the limits of the two formations. Drift deposits, viz., boulder clay, stratified sand and gravel containing in some places sea- shells of species now living and occasional boulders (this deposit comparatively rare), and loose boulders, overlie the surface of the more solid rocks in the greater part of the island. Beds of peat, dunes of drifted sand, alluvial clays, and mussel mud (valuable as a fertilizer) occur in creeks and bays. The portions of country occupied by the Upper Carboniferous series are generally flat, and this applies, observe Drs Dawson and Harrington, to a portion of the Triassic region north of Bedeque, where the beds seem to have been subjected to severe aqueous denudation. The minerals are unimportant, neither coal, gypsum, nor gold eing found in.any part of the island. .**

~~Climate and Vegetation.—The climate of Prince Edward Island is much milder than that of the adjacent provinces, and, though the winter is severe and cold, the air is in- vigorating and salubrious. The coldest month is January, when the thermometer registers a daily average of 15°°9. Fogs~~

~~seldom occur. In the summer the heat is less extreme than in Quebec, the mean being 62°:3, and the pleasant autumn months attract visitors from all parts of the American continent. Vegetation develops rapidly, and agriculture is extensively prosecuted. Wheat, barley, oats, pease and beans, potatoes, turnips, and other crops ripen to perfection.~~

~~The amount of land under crop in 1881 was 467,211 acres, and in pasture 126,935 acres. The chief pro- duce raised in that year was 546,986 bushels of wheat, 119,368 of barley, 3,538,219.of oats, 90,458 of buckwheat, 6,042,191 of potatoes, 1,198,407 of turnips, 42,572 of other roots, 143,791 tons of hay, and 15,247 tons of grass and clover seed. Of live stock there were 31,335 horses, 45,895 milch cows, 44,743 other horned cattle, 166,496 sheep, and 40,181 swine. 1,688,690 tb of butter, 196,273 of cheese, 14,945 of honey, and 25,098 of maple sugar were made during the year. Prince Edward Island does not grow much fruit, but the apple crop is usually good, though not large, and grapes, plums, and currants are grown in small quantities. The land which is not cul- eo consists of soft spongy turf which may be used or fuel.~~

~~Commerce.—The forests of the island used to be very extensive, but lumbering operations, destructive fires, and the needs of the husbandmen have reduced them, though many trees still remain, the principal being beech, birch, pine, maple, poplar, spruce, fir, hem- lock, larch, cedar, &c. The exports in 1888 were valued as follows :— produce of the forest, $28,385 ; agricultural produce, $377,614 ; animals and their produce, $238,952 ; manufactures, $188,986, the ie Peng $1,318,549 ; that of the imports (manufactured goods, eae ae ane spirits, tobacco, tea, coffee, sugar, molasses,~~

~~Industries.—Shipbuilding in former years was a very active~~

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~~industry. It is still carried on, but to a considerably smaller extent,—the number of vessels built in 1883 having been only seventeen, with a tonnage of 5348. On the 31st of December 1883 the vessels registered in the~~

~~*province and remaining on the registry books of the several ports amounted to 241, with a tonnage of 40,400. In that year there were engaged in the coasting trade (including steamers) 1162 vessels, representing a tonnage of 113,117. The manufactures are chiefly for domestic use, and include the making of woollen cloth, saws and files, saddles and harness, sashes, doors, and blinds; there are also saw-mills, starch factories, tan- neries, tin and sheet-iron works, tobacco-pipe factories, &c. In 1881 the amount of capital invested in industries was $2,085,776, giving employment to 5767 hands, and the value of the products was $3,400,208.*~~

~~*Fisheries.—The fisheries are exceedingly valuable, particularly those on the north coast, the catch being chiefly mackerel, haddock, cod, hake, and herrings, though other kinds are taken. Of late years increased impetus has been given to this industry, and many men and boats are employed in conducting it. Enormous quan- tities of lobsters and oysters are annually shipped to all parts of the American continent as well as elsewhere. The value of the fisheries in 1883 was nearly half a million dollars.*~~

~~*Game, &c.—Wild ducks, teal, brant, wild geese, woodcocks, partridges, pigeons, and snipe occur in great abundance, Birds number 260 species. Of wild animals the principal are bears (found occasionally only), lynxes, foxes, musk-rats, hares, squirrels, &c. In the summer and autumn seals in large numbers frequent the shores.*~~

~~*Communication.—Good waggon roads are to be found wherever there is a settlement. The Prince Edward Island Railway, 200 miles long, runs from one end of the island to the other, and branches off to every town or point of importance. The main line extends from Souris and Georgetown on the east to Tignish on the north-western extremity, connecting with Summerside and Charlottetown, the capital. During the season of navigation regular communication is had by steamer with Nova Scotia, New Brunswick, Quebec, and Boston. Navigation usually closes about the middle of December and opens before the first of May. In winter the mails and passengers are conveyed across the strait in ice-boats, which ply between Cape Traverse in Prince Edward Island and Cape Tormentine in New Brunswick. A steamer runs between Georgetown and Pictou, Nova Scotia, nearly the whole season. There isa post-office to every 400 of the*~~

~~*inhabitants. Tele- graphic communication is maintained with America and Europe by means of a submarine cable about 10 miles in length, connecting the island with New Brunswick. Telegraph offices are established throughout the province and along the line of railway.*~~

~~*Population.—The province is divided into three counties, viz., King's, Queen's, and Prince, which are subdivided into sixty-seven townships and three royalties. The population is of mixed origin, a large proportion being emigrants from Great Britain, and the remainder natives of the country, descendants of the French Aca- dians, Scottish, English, and Irish settlers, and the loyalists who went to the island after the American revolution. The Indians number 281. In 1881 the population was 108,891 (54,729 males and 54,162 females). The Roman Catholic diocese is situated at Charlottetown, and authority over the spiritual affairs of the Episcopalians is exercised by the bishop of Nova Scotia. The following table shows the chief religious denominations and the number of their adherents :—*~~

~~*Church of Rome ……..47,115 | Church of England …..... 7,192*~~
~~*Presbytertans …0.0.cs0ee SBGSS || EEOC Sees asrsmasoan 6,236*~~
~~*Methodists inf. <:-siciciewiees oc 13,485*~~

~~*The chief towns are Charlottetown (11,485), the capital of the island and the county town of Queen's, Summerside (2853), capital of Prince county, and Georgetown (1118), capital of King's county. Princetown is a flourishing seaport on Richmond Bay, and Rustico, famous for its bathing facilities, is a place of popular summer resort. Tignish and Alberton are stations much frequented by fishermen, and Souris, 60 miles east of Charlottetown, well furnished with harbour accommodation, is the outlet for the exports of the greater part of King's county. Other rising villages are Mount Stewart, Kensington, Montague, Breadalbane, and Crapaud.*~~

~~*Administration, Finanee, &e.—The affairs of the province are administered by a lieutenant-governor and an executive council consisting of nine members, three with portfolios and six without, assisted by a legislative council of thirteen members and a legisla- tive assembly of thirty members, both elective. The lieutenant- governor is appointed by the governor-general of Canada in council. A system of responsible government has existed in the island since 1851. Prince Edward Island returns six members*~~

~~*to the Canadian House of Commons, and four senators are appointed to the Canadian Senate by the crown. All males owning a freehold or leasehold property to the value of $400, or partly freehold and partly lease- hold amounting together to $400, and in possession of the same for at least twelve months previous -to election, have the right to vote for a member of the Legislative Council. The franchise*~~

~~*for the House of Assembly is practically residential manhood suffrage.*~~

~~*In 1882 the public revenue was $233,464 and the expenditure $257,228. The chief source of revenue is the yearly subsidy granted by the Dominion Government under the terms of the British North America Act. In 1883 it amounted to $164,674. The remainder of the receipts is derived from the sale of Government lands, licences, and miscellaneous fees. The provincial legislature meets at Char- lottetown, where the public offices are situated. The judiciary con- sists of a supreme court with one chief and two assistant judges ; a court of chancery, of which the lieutenant-governor is ex officio chancellor, and the judicial powers of which are exercised by a master of the rolls and vice-chancellor; a court of marriage and divorce, of which the lieutenant-governor and members of the executive council are judges; a court of vice-admiralty with one judge and two deputies; acourt of probate and wills with one judge ; three county courts with one judge for each ; and stipendiary magis- trates and justices of the peace. The province has authority to make its own civil laws, but in all criminal cases the form employed in the courts is the criminal law of the Dominion. Prince Edward Island is the twelfth military district in the militia of Canada. The established strength of the active force, by arms, is composed of three batteries of garrison artillery, one company of engineers, and ten companies of infantry,—total, 54 officers and 608 non-commis- sioned officers and men. The period of service in time of peace is three years.*~~

~~*Education.—The free-school system has obtained in the island since 1852. Previous to that date the schools were mainly supported by voluntary subscription and such local assistance as could be obtained. In 1877 the Public Schools Act—an ample and liberal measure—was passed, and a department of education was instituted. Two years later ladies were*~~

~~*admitted to Prince of Wales College, an institution established in 1860, and amalgamated in 1879 with the normal school, and since then the department has introduced many improvements into the system. The total number of teachers in 1883 was 473, of school districts 419, and of schools 424. The number of pupils enrolled was 21,495, and the average daily attend- ance was 11,759. The total expenditure for education was, by the provincial Government $101,193, by the school districts $35,624, total $136,817. The Bible is read in all public schools. Besides the institutions named there are St Dunstan's College (exceedingly well conducted, and Roman Catholic in religion), a model school, thirteen high schools, and several private schools and academies. The local government maintains a hospital for the care of the in- sane, and the marine hospital is under the control of the Dominion authorities.*~~

~~*History.—Sebastian Cabot is said to have discovered this island in 1497, but the authority on which this statement rests is at least doubtful. Certain it is that Jacques Cartier had the credit of naming it Isle St Jean when he discovered it on 24th June 1534 during one of his voyages up the St Lawrence. That name clung to it for 265 years. Champlain, early in the next century, took possession of it for France, and in 1663 a grant was made of it to Captain Doublet, an officer in the army, who, however, failing to make settlements im the colony, soon afterwards lost his grant. Little attention was paid to the island until after the peace of Utrecht, when the French, allured by its fertility, made efforts to colonize it. In 1719 it was granted, en seigneurie, to the count of St Pierre, who tried to establish fisheries and a trading company. HIe lavished considerable means on his enterprise, but the scheme proved unsuccessful and his grant was revoked. In 1755 the island was captured by the British, but after the treaty of Aix-la-Chapelle it was restored to France, from which it was again wrested in 1758. It was afterwards placed under the administration of Nova Scotia, and some years later it was erected into a separate government. The first parliament was called together in 1778, and a constitution was given to the colony. In November 1798 the legislature passed an Act changing the name of the province to Prince Edward Island, out of compliment to the duke of Kent, who was at that time com- =nander of the forces in British North America. In February 1799 the Act was confirmed by the king in council.*~~

~~After the peace of 1763 a plan was agreed to by which the island was divided into townships of about 20,000 acres each. Grants of these lands were made to individuals supposed to have claims on the Government. They were to paya small sum as quit rents, and the conditions imposed provided for the establishment of churches and wharves, and bona fide settlement. The grantees, however, were in most cases mere speculators, who had no mind to brave the trials of colonization in a new country. Many promptly dis- posed of their "lots," and the lands fell into the hands of a large number of non-residents. The land question remained a vexed point of contention until 1860, when the Government was compelled to appoint a commission to appraise the rights of the absentee owners, and to formulate ascheme of adjustment. The commission advised the Government to buy the lands and resell them to the tenantry. A Bill for that purpose was passed, but the imperial authorities dis- allowed it. Asecond attempt proved more successful, and a measure,~~

~~having the same object in view, was agreed to, The agitation was silenced, and the tenants eagerly availed themselves of their privi- leges. At the close of 1882, out of the 843,981 aeres of land acquired~~

~~by the Government, only 142,011 acres remained to be disposed of. Of that amount about 75,000 acres represented land held by parties who had not yet purchased.~~

~~Prince Edward Island declined to accept the Act of Confederation in 1867, but in July 1873 it entered the union of American colonies which constitute the Dominion of CANADA (9.1.). (Cio SHE)~~

~~PRINCE OF WALES ISLAND,! the official name of the island popularly known as Penanc or PuLo-PENANG (i.e, Areca Nut Island), which lies 8 or 9 miles off the west coast of the Malay peninsula in 5° 20' N. lat. and 100° 20' E. long. The island is about 15 miles long by 5 broad and has an area of 107 square miles or 69,000 acres, considerably less than the Isle of Wight. When in 1785 it was ceded to the English by the rajah of Kedah in re- turn for an annual pension of 10,000 dollars, it was almost uninhabited; at the census of 1881 its population amounted to 90,951 (comprising 612~~

~~*Europeans, 21,772 Malays, 45,135 Chinese, 15,730 natives of India), and it has since been increased mainly by further Chinese and Indian im- migration. The people from the east coast of India are locally known as Klings, a Malay corruption of Telinga or Telugu ; and the half-breed race between Indian and Malay is distinguished as Jawi-Pekan. About two-fifths of Penang are lowland and the rest consists of hills, which towards the north reach their culminating point, 2922 feet above the sea, in the peak now utilized as a sanatorium. A con- siderable portion of the surface is still uncleared, and from the summit of the peak the whole island presents very much the appearance of a forest, the villages always lying in the midst of groves of the cocoanut palm. On the whole, however, vegetation is not so rich as on the neigh- bouring mainland. Apart from the cocoa-nuts and areca- nuts, the principal products are sugar, coffee, and pepper ; but increasing attention is again being given to nutmegs and cloves, which can be grown on the hillsides. Of the landholders 2280 were Chinese and 1482 Malays in 1882. In the lowlands the temperature ranges from 80° to 90°, but on the peak from 60° to 75°. The rainfall in 1882 was 126-50 inches—somewhat above the average. George- town or Penang, the only town on the island, lies on the east coast on a low plain stretching out into the sea; its harbour, always well filled with both European vessels and native craft, is the strait between island and mainland. Water-works were undertaken in 1865. Among the public buildings are the town-hall (1872-80), the post-office (1881), the free school with upwards of 600 pupils, the Christian Brothers' school, several Tamil schools, the general hospital (1882), and the pauper hospital. An important leper hospital is maintained on Pulo-Jarajah, a small but lofty island in the strait opposite the town. Though Singapore has withdrawn much of the trade that formerly found its way to Penang, there has been a great increase both in exports and imports, the aggregate value for 1859-60 being £3,530,000 and for 1882 £8,855,919.*~~

~~*The attention of the East India Company was first called to Pulo- Penang by Captain Light in 1771, and it was under his personal command that the settlement was founded in July 1786. At his death in 1794 he left "a compact little township with fort and public buildings." In 1798 Sir George Leith (for the purpose mainly of rooting out piracy) purchased from the rajah of Kedah for 2000 dollars the tract of land opposite Prince of Wales Island, which has since become known as Province Wellesley (area in 1885,*~~

~~234 square miles). In 1806 the island was made a presidency of equal rank with Madras or Bombay ; and after Singapore and Malacca were incorporated with it in 1826 it remained the seat of the general government till 1832, The commercial part of the town was destroyed by fire in 1808.~~

~~1 Prince of Wales Island is also the name of an island separated by Endeavour Strait from York Peninsula in Queensland, Australia, discovered by Captain Cook in 1770, and since famous for its pearl fishery.~~

~~PRINCE OF WALES LAND, a large insular tract in the northern Arctic region opposite Boothia Felix, from which it is separated by Franklin Strait.~~

~~PRINCES ISLANDS, the Demonesi or Demonnesi of the ancients, a beautiful cluster in the Sea of Marmora opposite that part of the Asiatic coast which trends south- east from Scutari to the entrance of the Gulf of Ismid (Nicomedia). They are nine in number—Prote (Turkish, Tinaki), Antigone, Khalki or Karki (Chalcitis or "copper- mine island" of the ancients), Plate, Oxeia, Pitys, Antiro- bido (Terebinth or Rabbit Island), Neandro, and Prinkipo. Prinkipo or Principo (with an Italian ¢), Kyzyl-Ada or Red Island of the Turks, the largest of the group, is a broad green hill of red quartz rising with soft and verdant out- lines into two peaks, the higher of which (500 feet) is crowned by the ex-monastery of St George, embosomed amid its oaks. On the height above the town of Prinkipo is the monastery of the Transfiguration and on the coast opposite Antirobido that of St Nicholas. A white-flowered heath (Erica arborea), two species of cistus (Cistus villosus and salvifolius), and lavender give character to the luxuri- ant vegetation. Khalki contains three convents and an Ottoman naval college; and the whole group, especially Khalki and Plate, form a great summer resort for the Greeks of Constantinople, from which city there is a regular steamer service.~~

~~The Princes Islands are intimately associated with Byzantine history. A convent in Prinkipo (now a mass of ruins at the spot called Kamares) was a place of exile for the empresses Irene, Euphrosyne, Zoe, and Anna Dalassena. Antigone was the prison of the patriarch Methodius, and its chapel is said to have been built by Theodora. In Khalki the monastery of~~

~~*the Theotokos (originally of St John), which since 1831 has been a Greek com- mercial school, was probably founded by John VIII. Palologus, and was rebuilt about 1680 by the famous Panagiotaki, and again by Alexander Ypsilanti of Moldavia. Close beside it is the tomb of Edward Barton, second English ambassador to the Porte. Hagia Trias (a school of theology since 1844) was rebuilt by the patriarch Metrophanes of bibliographical memory. Antirobido is associated with the exile of Ignatius and Theodosius ; and Plate contained subterranean state-prisons hewn out of the rock.*~~

~~*See Gustave Schlumberger, Les Iles des Princes, Paris, 1884; Grisebach, Rume- lien und Brussa, 1839.*~~

~~*PRINCETON, a borough and township of the United States, in Mercer county, New Jersey, on the Delaware and Rariton Canal, 3 miles north by rail from Princeton Junction, which is 48 miles south-west of New York and 42 north-east of Philadelphia on the Pennsylvania Rail- way. Standing on high ground, it commands a fine prospect towards the east and south. The town is the seat of Princeton or New Jersey College, founded in 1746 by menibers of the presbytery of New York, chartered in the same year, and opened at Elizabethtown (now Eliza- beth) in 1747, removed to Newark in the same year and rechartered in 1748, and finally transferred in 1756 to Princeton, where Nassau Hall, so called in honour of William ITI. of England, had. been erected. Nassau Hall has been twice burned down, in 1802 and 1855, but was restored in 1856 in the old style. This building, Reunion Hall (1870), West College (1836), East College (1833), and the halls of the American Whig and Cliosophic literary societies enclose a quadrangle ; and eastward, in the line of Nassau Hall or the north front, stand the library build- ings (1873), consisting of an octagonal centre with two wings, the Dickinson Hall (1870), and the John C. Green School of Science (1873). Along the western border of the grounds are University Hall (1876), the Halstead observatory (1867), the gymnasium (1869), Witherspoon Hall (1876), and Edwards Hall (1879), while on the east are the Marquand Chapel (1881), Murray Hall (1877) and the residence of the president. Almost all these buildings are the gifts of generous benefactors, the most*~~

~~*munificent of whom was Mr John C. Green, by whom and by the trustees of his estate not less than $1,500,000 has been given in buildings and endowments. In 1884 the college, which is steadily growing, had 39 professors and 519 students, and the library contained 77,000 volumes. The endowments amount to $1,392,000. The governor of the State of New Jersey is ex officio president of the board of trustees, who are twenty-five in number besides the president of the college. The trustees appoint the members of the faculty and have entire control over the funds and property of the college. They fill all vacancies in their own body. Besides the Halstead observatory, there is another well-equipped observatory at the School of Science, and the laboratories and museum are well furnished for scientific study. In the cemetery, which lies to the north of the college, are the tombs of Jonathan Edwards, Aaron Burr, &c. Princeton is also the seat of the oldest theological seminary of the Presbyterian Church in the United States (founded in 1812), with 7 professors, 1 instructor, about 150 students, and an endowment of about a million dollars. The population of the township in 1870 was 3986 and of the borough 2798, and in 1880 respectively 4348 and 3209.*~~

~~*At Princeton on 3d January 1777 Washington defeated the British forces ; the Continental Congress met in the town (Nassau Hall) from 26th June to 4th November 1783.*~~

~~*PRINGLE, Sir Joun (1707-1782), a distinguished physician, was the younger son of Sir John Pringle of Stitchel, Roxburghshire, and was born on the 10th of April 1707. He was educated at home under a private tutor, and subsequently at St Andrews, at Edinburgh, and at Leyden, where he took the degree of doctor of physic. At the last-named university he was an intimate friend of Van Swieten and [faller. He at first settled in Edinburgh as a physician, but was soon after appointed assistant and successor to the professor of moral philosophy in the university. In 1742 he became physician to the earl of Stair, then commanding the British army in Flanders, and in 1745 was appointed by the duke of Cumberland physician-general to the forces in the Low Countries. In 1749, having settled in London, he was made physician in ordinary to the duke of Cumberland ; and he afterwards received other court appointments as physician, and im 1766 a baronetcy. He read a series of papers to the Royal Society, which*~~

~~are to be found in the Z'vansactions, and which gained for him the Copley gold medal. HIs first book was Observations on the Nature and Cure of Hospital and Jayl-Fevers (London, 1750). He married in 1752 a daughter of Dr Oliver, a physician in Bath; and in the same year he published his important work, Observations on the Diseases of the Army in.Camp and Garrison, which went through many editions and was also translated into French, German, Italian, and Spanish. After having acted for many years as a member of the council of the Royal Society, he was in November 1772 elected president of that body. In this capacity he delivered and published, in connexion with the annual assignments of the Copley medal, six '" discourses," which were afterwards collected into a single volume (1783). In 1776 he published A Discourse on Improvements in preserving the Health of Mariners. After passing his seventieth year he resigned his presidency and removed to Edinburgh in 1780, but returned to London in September 1781, and died in Janu- ary following. There isa monument to him in Westminster Abbey, executed by Nollekens.~~

~~_ A Life of Pringle by Kippis is prefixed to the volume contain- ing the Six Discourses. The library of the College of Physicians of Edinburgh possesses ten folio volumes of tis unedited MSS., in-~~

~~cluding an essay "on air, climate, diet, and exercise." There are Eloges on Pringle by Vicq d'Azyr and Condorcet.~~

~~PRINTING, Typocrapnic. See TyPpoGRAPHY.~~

~~PRI—PRI~~

~~PRIOR, Matruew (1664-1721), the most distinguished of English society poets, was the nephew, as Chaucer was the son, of a London vintner, and the lives of the two poets were parallel in a good many other respects. Their art earned for both of them social advancement and political employment ; both had a turn for business and diplomacy ; both were employed on embassies, both even in secret missions; both were officers of the royal household, and both were rewarded with posts in Government offices of trade; and there was besides not a little in common between them as poets. There are not two careers in literature that offer more numerous or more curious points of parallelism. The vintner's nephew in the reign of Charles~~

~~*II. (born, July 21, 1644, either, it would appear, at Wimborne in Dorsetshire, or in or near London) attracted the notice of a noble patron while still at school at Westminster, under the famous Dr Busby. 'The earl of Dorset was with a party at the tavern, and the school- boy was called in to decide some debate that had arisen about a passage in Horace. According to the story, Prior acquitted himself so well that the earl, the Mzecenas of his generation, at once undertook to send him to Cambridge, and he was entered at St John's in 1682. As it happened a fellow schoolboy at Westminster was Charles Montague, who afterwards became earl of Halifax. The two con- tinued comrades at Cambridge, and together wrote in 1687 the City Mouse and Country Mouse, in ridicule of Dryden's Hind and Panther. It was an age when satirists were in request, and sure of patronage and promotion. The joint production made the fortune of both authors. Montague, who was an earl's grandson, was promoted at once, and Prior had to languish only three years as a fellow of his college when hewas gazetted secretary to the embassy at The Hague. After four years of this employment he was re- called to England, and appointed one of the gentlemen of the king's bedchamber. Apparently also he acted as one of the king's secretaries, and in 1697 he was secretary to the plenipotentiaries who concluded the peace of Ryswick. Prior's talent for affairs was doubted by Pope, who had no special means of judging, but it is not likely that King William would have employed in this important business a man who had not given proof of diplomatic skill and grasp of details. The poet's knowledge of French is specially men- tioned among his qualifications, and this was recognized by his being sent in the same year to Paris in attendance on the English ambassador. At this period Prior could say with good reason that "he had business enough upon his hands and was only a poet by accident." To poetry, however, which had laid the foundation of his fortunes, he still occasionally trusted as a means of maintaining his position, and composed odes on various public events that required celebration. His wit made him a favourite as a member of the English legation at Paris, although he used it sometimes in a patriotic manner at the expense of the French. After his return from France, and a brief tenure of other offices, Prior succeeded Locke as a commissioner of trade. In 1701 he sat in parliament for East Grinstead. About the sante time for some undiscovered reason he changed his side in politics, and allied himself with Harley and St John. Perhaps in consequence of this for nine years there is no mention of his name in*~~

~~connexion with any public trans- action, But when the Tories came into power in 1710 Prior's diplomatic abilities were again called into action, and till the death of Anne he held a prominent place in all negotiations with the French court, sometimes as secret agent, sometimes in an equivocal position as am- bassador's companion, sometimes as fully accredited but very unpunctually paid ambassador. From this greatness the poet had a sudden fall when the queen died and the~~

~~Whigs regained power. He was considered of sufficient consequence not to be allowed to escape into obscurity. He was specially examined by a committee of the privy council, and kept in close custody for three years. During this imprisonment, maintaining his cheerful philo- sophy, he wrote his longest humorous poem, Alma, or The Progress of the Mind. This, along with his most am- bitious work Solomon, and a collection of Poems on several Occasions, was published by subscription in 1718. The poet did not long survive his enforced retirement from public life, although he bore his ups and downs with rare equanimity. He died at Wimpole, Cambridgeshire, a seat of the earl of Oxford, September 18, 1721, and was buried in Westminster Abbey, where his monument may be seen in Poets' Corner. Prior had very much the same easy pleasure- loving disposition as Chaucer, combined with a similar capacity for solid work. Johnson lays stress with justice on the variety and the uniform excellence of Prior's poetry. This distinction may fairly be claimed for a poet who has received the enthusiastic praise, in different views of his work, of two men so different as John Wesley and Mr Swinburne. Prior tried many kinds of grave and gay, and in the face of such testimony it would seem as if we ought to reconsider Johngon's verdict that he never rises high above mediocrity in any kind. Johnson might have been more lenient to Prior's love-verses if he had not made so much use in them of classical fictions. This was the one thing that the great critic would on no account tolerate ; frigid allusions to Venus, Cupid, Diana, Ganymede, and such like "easy fictions and vulgar topics," put him out of temper at once, and excluded the unlucky composition from all chance of fair consideration at his hands. The truth was that what Johnson desiderated in love-verses was honest fervent passion. He had no taste for such elegant trifling as the poems in playful praise of Cloe. Even~~

~~the pretty compliments in the love-letter to the lady of quality aged five would not have moved him to any ecstasy of admira- tion. "Whatever Prior obtains above mediocrity," he says, "seems the effort of struggle and of toil. He has many vigorous but few happy lines ; he has everything by purchase, and nothing by gift… .. His expression has every mark of laborious study; the line seldom seems to have been formed at once; the words did not come till they were called, and were then put by constraint into their places, where they do their duty, but do it sullenly." This criticism is too unqualified. It applies very happily to many of Prior's verses, but not to Prior at his best ; and, even when he is at his worst, it strikes us that the failure is rather owing to his not having laboured long enough to conceal the labour. If Prior has nothing by gift, it is equally true—and Johnson admits this also— that he has nothing by theft. He is eminently original, and this will probably help to keep his reputation alive with students of poetry for a very long time. There isa fresh intellectual force and a pregnancy of thought in his writing that has made Prior exceedingly serviceable read- ing for subsequent poets, and there are some of his short poems in which every stanza has been the cause of happy thought and perfect expression in his successors. "Prior is a lady's book," Johnson once said to Boswell. He might have said with more propriety that Prior is a poet's book —a very good book, not exactly to steal from, but to get stimulus from. (w. M.) PRISCIAN (Prisctanus C#SARIENSIS), the most cele- brated Latin grammarian, lived about 500 a.D., 7.2. some- what before Justinian. Thisis shown by the facts that he addressed to Anastasius, emperor of the East 491-518, a laudatory poem, and that the MSS. of his Institutiones Grammatice contain a subscription to the effect that the work was copied (526, 527) by Flav. Theodorus, a clerk in~~

~~the imperial secretariat ("memorialis saeri scrinii episto- larum"). Threeminor treatises are dedicated to Symmachus (the father-in-law of Boetius). Cassiodorus, writing 1n the ninety-third year of his age (560? 573%), heads some extracts from Priscian with the statement that he taught at Constantinople in his (Cassiodor's) time (Keil, G7. Lat., vii. p. 207). His title Cxsarensis points, accord- ing to Niebuhr and others, to Caesarea in Mauretania. Priscian's teacher was Theoctistus, '"noster preeceptor, omnis~~

~~eloquentize decus, cui quicquid in me sit doctrinze post deum imputo" (Inst. Gr., vi. 51), who also wrote an Institutio artis grammatice (ibid., xviii. 56). A later gram- marian, Eutyches, pays Priscian himself a still higher com- pliment—"de quibus Romanz lumen facundiz, meus, immo communis omnium hominum, preceptor, summa cum subtilitate copiosissime grammaticus Priscianus disser- uisse cognoscitur." (Eutych., i. 8; Keil, Gr. Lat., v. p. 456). Priscian was quoted by several writers in Britain of the 8th century—Aldhelm, Bede, Alcuin—and was abridged or largely used in the next century by HIrabanus Maurus of Fulda and Servatus Lupus of Ferrara. Of the general use made of his great work the best proof is that, as HIertz says, there is hardly a library in Europe that did not and does not contain a copy, and that there are now about a thousand MSS, of it. The greater part of these contain only books i-xvi. (sometimes called Priscianus major) ; a few contain (with the three books Ad Symmachum) books XVii., xviii. (Priscianus minor); and a few contain both parts. The earliest MSS. are of the 9th century, though a few fragments are somewhat earlier. All are ultimately derived from the copy made by Theodorus. The first printed edition was in 1470 at Venice. It may fairly be said that from the beginning of the 6th century until recently Priscian has reigned over Latin grammar with almost as generally recognized an authority as Justinian has over Roman law. Some account of so remarkable a treatise may reasonably be required.~~

~~The Jnstitutiones Grammatice is a systematic exposition of Latin grammar, dedicated to Julian, consul and patri- cian, whom some have identified with the author of a well- known epitome of Justinian's Wovellx, but the lawyer appears to be somewhat later than Priscian. In length the treatise is about twice the size of Quintilian's Jnstitutio Oratoria, and about equal to Madvig's Latin Grammar. It is divided into eighteen books, of which the first sixteen deal mainly with sounds, word-formation, and inflexions, the last two, which form from a fourth toa third of the whole work, deal with syntax. Priscian informs us in his preface that he has translated into Latin such pre- cepts of the Greeks HIerodian and Apollonius as seemed suitable, and added to them from Latin grammarians. Of the latter he occasionally refers to Caper, Donatus, Probus, and Servius; and more rarely to Charisius, Dio- medes, Asper, Nonius, Remmius Palemon, and others. HIe proceeds in orderly and almost exhaustive fashion, though with some~~

~~*digressions and repetitions, gives defini- tions, rules, examples, and exceptions, and constantly quotes passages from various writers to illustrate the use of a form. He has thus preserved to us numerous frag- ments which would otherwise have been lost, e.g., from Ennius, Pacuvius, Attius, Lucilius, Cato,and Varro. But the authors whom he quotes most frequently are Virgil, and, next to him, Terence, Cicero, Plautus; then Lucan, Horace, Juvenal, Sallust, Statius, Ovid, Livy, and Persius. His industry in collecting forms and examples is both great and methodical. His style is somewhat heavy, but sensible and clear ; it has not the admirable grace of Quin- tilian, nor the adroit use of a technical language such as is found in the Roman jurists ; but there isno attempt at fine writing, and it is free not of course from usages of late*~~

~~*rpRe ioe fT AN*~~

~~*Latin, but from anything that can be called barbarism. Considering the time at which it was written, it is very creditable to the author, and not unworthy of the high place it obtained in the grammatical world. Its defects are such as were till lately common more or less to all grammars.*~~

~~*These defects may be referred in the main to four heads. (1) Priscian avowedly treats Greek writers on (Greek) grammar as his supreme authorities (¢f. 1. 13; vi. 1; xii. 13, &c.), and, though noticing differences between the two languages, bears too little in mind that each has a history of its own and is a law to itself. (2) There had been no scientific study of phonetics, and consequently the changes and combinations of languages are treated in a mechanical way: ¢.g., 7 passes into a, as genus, generis, generatum ; into o as sax, saxosus (1. 33); g passes into s as torqueo, torsi (i. 48), &c. (3) The resolution of a word into root or stem and inflexional or derivative affixes was an idea wholly unknown, and the rules of formation are often based on unimportant phenomena, and yet are invested with an authority which is irrational and mis- leading: ¢g., Venus, like other names ending in ws, ought to have genitive Veni, but, as this might be taken for a verb, it has Veneris (vi. 86; viii. 5). Ador has no geni- tive because two rules conflict; for neuters in ov have a short penult (e.g., equor, xqguoris), and adoro, from which it is derived, has a long penult (vi. 49; viii. 6). (4) The practical meaning of the inflexions is not realized, and syntactical usages*~~

~~are treated as if they were arbitrary or accidental associations. Thus, after laying down as a general rule for declinable words that, when they refer to one and the same person, they must have the same case, gender, and number, Priscian adds, that when there are transitive words we may use different numbers, as doceo discipulos, docemus discipulum (xvii. 153-155). He often states a rule too broadly or narrowly, and then, as it were, gropes after restrictions and extensions.~~

~~His etymologies are of course sometimes very wild: eg., celebs from celestium vitam ducens, b being put for wu because a consonant cannot be put before another conson- ant (i. 23); deterior from the verb detero, deteris; potior (adj.) from potior, potiris (iii. 3); arbor from robur (vi. 48); verbum from verberatus aeris (vill. 1), &c. Nor is he always right in Greek usages: thus, in illustrating Latin moods by Greek he frequently uses the future optative with dy, ¢.9., ekdvcowro ay, muaTevooyn av (xviii. 106), and still more strangely treats dpa as identical in force with dy, é.g., quasi tolleretur ac constitueretur, éraiporo dy kat katarattoito apa, and misuses both particles, e.g., im me causam conferebat quod eum codicem obsignassem, éoppayira av nro eodpayicds cinv dpa (xviii. 110). He evidently regarded dy or dpa as normally required with the Greek optative or other moods corresponding to the Latin sub- junctive (xviii. 117, &c.).~~

~~A rapid notice of the order and of some salient points will show both merits and defects in the treatment of his subject-matter. The references are to the book and to Krehl's paragraphs.~~

~~Book i. treats of vocal sound and of letters, their changes and com- binations. Elementa are vowels, semi-vowels, or mutes. Vowels are named from their own sound; semi-vowels sound a vowel before them ; mutes sound a vowel after them (i. 7). As semi- vowels he classes f, 1, m, n, 7, s, x, and in Greek names z. FF was, among the earliest Latins, the Holie digamma, but afterwards was equivalent to g. It is, however, rather a mute, because it is not found at the end of a word, and can be placed before 7 and 7 in the same syllable (7b. 13). K is quite superfluous; g merely shows that a u following has no metrical effect ; 4 is a mere aspiration ; 7 and uw sometimes pass into consonants, and then have a different metri- cal effect~~

~~*from what they have as vowels (ib. 14-17). D has often the sound of 2: ¢.g., in mcridies, hodie (ib. 31).*~~

~~*Book ii. treats of the syllable and of the letters used to end it, then of the parts of speech. A syllable is an ordered combination of letters uttered with one accent and one breath (ii. 1). A word (dictio) is the unit of orderly speech (ib. 14). Speech (oratio) is a suitable arrangement of words expressing a complete meaning (7d.*~~

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~~*Pie iS i*~~

~~*15). The parts of speech are, according to Priscian, eight, viz., noun, verb, participle, pronoun, preposition, adverb, interjection, conjunction. Infinites (7.¢., infinitive moods) are included under the verb, because they have tenses and nocases. Participles are not included, because they have cases and genders but no moods (4d. 18). Priscian obtains a framework for the arrangement of his facts from the "accidents" of each part of speech, and subordinate classifications are taken from the endings of the words. Nouns have the following accidents :—specics, genus, numerus, figura, casus. As regards specics ("class") nouns are proper or appel- lative, and each of these classes are subdivided into many others. Adjectives are (rightly) treated by Priscian in cominon with other nouns (il, 22 sg.). The rest of this book and books iii. and iv. treat of the formation of the different classes of nouns, c¢.g., of patronymics, possessives, comparatives, superlatives, diminutives, and other derivatives. Book v. treats of gender, number, figure, and case. For gender, nouns are discussed by their endings. Figure is either simple or composite or decomposite (¢.e., derivative from composite), as, magnus, magnanimus, magnanimitas (v. 61). There are four modes of composition :—(1) cx dwobus integris, as tribunusplebis ; (2) ex duobus corruptis, as benivolus ; (8) ex integro*~~

~~*et corrupto, e.g., mnimicus ; (4) ex corrupto ct integro, as impius | There are six cases, thus arranged :—(1) the nominative |*~~

~~*(v. 58). as the original ; (2) the genitive, because it is born fron the nomin- ative, and begets the other oblique cases; (3) the dative, "qui magis amicis*~~

~~*convenit;" (4) the accusative, " qui magis ad inimicos attinet ;" (5) the vocative as the most imperfect ; (6) the ablative as hew and peculiar to the Latins (v. 74). mation of the genitive is discussed, each nominative termination being taken in order, irrespective of the declension. Book vii. treats of the other cases in each of the five declensions. modern grammars. Hic, hujus, &c., are often prefixed as symbols of gender and case.*~~

~~*Books viii.—x. decal with the verb. Verbs have eight accidents:— genus, tempus, modus, species, figura, conjugatio, persona, numerus. Some verbs (as other parts of speech) are defective, either by natural necessity or by chance. Necessity may lie in the meaning (c.g., puerperus is not found) or in the incompatibility of sound (e.g., cursor but not cursrix). Chance may lie simply in non-use, ¢.g., faux, prex, dicio, for, dor; or because the form would be un- pleasant, ¢.g., metuturus or mctuiturus, nutritrix (from nutritor), for which nutriz is used. Sometimes a word isnot used in order to avoid confusion, ¢.g., conjunxz has conjugis, lest conjungis should be taken fora verb ; maneohas manst, not manut ; fac, duc avoid con- fusion with ablatives face, duce, &c. (viii. 4-6).*~~

~~*Genus or significatio verbi is its being active or passive. Verbs in o are active, neuter, and neutro-passive, ¢.g., amo, spiro, gawdeo (of. xi. 28). Verbs in or are passive, common, and deponent, ¢.g., amor, osculor te and a tc, sequor. Verbs whose meaning and use do not correspond with the form are enumerated (tb. 7-39). Tempus is present, past, and future. Past time is divided into past imper- fect, past perfect, past pluperfect. Present and future time are not divided by the Romans (7b. 38). Dzxcro is called the subjunc- tive future (b. 55, 57). The indicative and subjunctive have all tenses ; the imperative has present, future, and, in passive, a past (e.g., amatus sit). The optative and infinite have one form ex- pressing both present and past imperfect, and another expressing perfect and pluperfect (7b. 38-43). The present tense embraces to some extent both past and future (¢.g., Priscianus vocor, seribo versum). The perfect corresponds to Greek aorist as well as to perfect (7b. 51-54). Priscian makes five moods, —the optative (same in forms as the subjunctive) always requiring an adverb of wishing ; the subjunctive, requiring not only an adverb or conjunction, but also another verb, e¢.g., cum faciam venito. In expressions of com- mand, as ne dicas, another verb is not required (7b. 68). Supines and gerunds*~~

~~*(sometimes confused, sometimes distinguished, by Priscian) are nouns used in place of the infinite. Amandus, &c., is called participiale or nomen verbale (ib. 44, 70). Impersonal verbs have a peculiar meaning (2b. 69).*~~

~~*In class verbs are primitive or derivative. Derivatives are nuimerously classified as inchoatives, frequentatives, &c. (ib. 72 sq.). In figure verbs are simple or compound (2d. 81). Conjugations in Latin are determined by the vowel of the 2nd person, and are thus four only, while the Greeks have ten. Person and number close the eighth book. ero, volo, edo are specially treated (ix. 4-11). The formation of the perfect is first treated generally (ix. 13), and then the perfects and supines of 1st and 2nd conjugations and (in book x.) of 3rd and 4th conjugations.*~~

~~*Book xi. deals with participles, which were invented to act as verbs applied to nouns, especially in oblique cases. Hence we can say not only bonus homo loquebatur but bont hominis loquentis orationem audivi, &c. (xi. 8). The participle has six accidents :— genus, casus, significatio, tempus, numerus, figura (ib. 13),—where genus is gender, and significatio and figura have same application as in verbs. The formation of the participles, especially of the past participle, is fully discussed.*~~

~~*Neither | here nor in the books on the verb are full paradigins set out asin |*~~

~~*In book vi. the for- |*~~

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~~*145*~~

~~*Books xii. and xiii. deal with pronouns, They have six acci- dents :— species, persona, genus, numerus, figura, casus. There are four declensions, viz., personal, ile, &c., meus, &c., nostras, &e. Priscian classes as nouns, and not as pronouns, gis, qualis, talis, quantus, tantus, tot, unis, solus, totus, alius, nullus, uter, alter, and their compounds (xiii. 11, 29-35).*~~

~~*Having finished the four declinable parts of speech, Priscian turns to the four indeclinable. Prepositions (book xiv.) are (except some- times in verse) put before nouns both by apposition and com- position ; before pronouns*~~

~~only by apposition ; before all elsc by composition (xiv. 8). He treats first of prepositions used with the accusative case, then of those used with the ablative, and lastly of those occurring only in composition. Adverbs (book xv.) have species, significatio, figura, where species refers to their being primi- tive or derivative, and signtficatio to their meaning as temporal, local, confirmative, optative, &c. Some are used with all tenses and moods, others with some only. They are arranged for discus- sion under their endings (zb. 7). Under the endings ind are treated also ablatives of nouns used as adverbs, e¢.g., una, qua, Roma, and also other local uses of nouns, ¢.g., Roma sum, Romam co, &e. (tb. 9). Interjections are separated from adverbs by Roman writers, because they express fully an emotion of the mind, ¢.9., pape, quid video, where paps =miror (ib. 40). Conjunctions have figura and species, species denoting meaning and use as copulative, causal, disjunctive, &c. Some conjunctions belong to several of these classes.~~

~~The two books on syntax are looser in arrangement, and are not so clear and exhaustive as the former books. The truth is, Priscian lacked a good frainework for the facts of construction, and first tries one and then another. The seventeenth book rests mainly on Apollonius ; the eighteenth is less dependent on him, and ends with a long miscellaneous list, in alphabetical order, of Greek idioms, chiefly verbal, which he compares with corresponding Latin usages. Part of this list occurs twice over. Omitting duplicates, there are nearly 300 such comparisons. Hertz suggests (Pref. ili. p. vii.) that it was only closed by the fortunate occurrence of xopta (omar, illustrated by a line of Terence which ended with satwr! These idioms are illustrated by copious quotations from Demosthenes and Plato, and not a few from Homer, Herodotus, Thucydides, and Xenophon, besides Latin authors. .~~

~~The syntax commences with showing the analogy of elements, words, and speech. In each of these we have repetition, omission, conjunction, transposition, &c. (xvii. 3 sq.). Then Priscian dis- cusses why interrogatives are all of two parts of speech only, viz., nouns and adverbs (7b. 22): why not also verbs (2b. 36)? He dis- cusses the difference of pronouns from one another, their use with impersonals, particularly enterest, refert (tb. 92), the use of the pos- sessive and reflexive pronouns. He says that met ager may be used for meus ager, but also for " the land of my husband" (2b. 129,~~

~~130). There are many possible unions and interchanges of different parts of speech and of their accidents. Such unions as tlle ego qui quondam, &c., are justified analogically by the union of different cases, e.g., animalium quedam sunt mortalia, or by the rise of compounds from different cases, as mediterraneus a medio terrz (ib. 144-152). Different numbers and genders arc combined, as pars secant; aperite aliquis; in Hunuchum suam ; or different eases, as urbem quam statuo vestra est; or different times, as post-quam ccecidit. .. Ilion et omnis humo fumat Troja (tb. 155-168). Often we find interchange, ¢.g., of parts of speech, as sublime (volas) for an adverb, genus unde Latinum for ex quo, &c. (tb. 168).~~

~~In the eighteenth book he discusses the use of the cases. The nominative and vocative are absolute, and with substantival or vocatival verbs of the first or second person they do not require a pronoun, ¢.g., homo sum, Cicero nominor, but with other verbs they do, ¢.g., ego Priscianus scribo, tu Apollonius (or Apollont) scribis. Tu may, however, be omitted with the vocative, but Priscianus scribo is a solecism, because nouns by themselves and participles, without the vocative case, are of the third person (7b. 2-4). Ifa noun requires an oblique case, we must have the verb substantive or participle, ¢.g., filius Hercules sum. In filius Peleit Achilles multos interfecit, the participle ens (" for which we now use qu? est or qui fuit") must be understood (7b. 6). The nominative is joined to the genitive when possession and a possessor are meant. In Hector filius Priami the genitive denotes the possessor ; in magne virtutis vir it denotes the possession. In the latter use the Latins often have the ablative, as they have also for the Greek geni- tive of consequence, euod (avros =me vivo (ib. 14). The geni-tive after comparatives and superlatives and after verbals in -or and riz is mentioned ; also such usages as jidens animi, dives lactis (ib. 18, 19). In doctus grammaticam we have a participle ; in doctus grammatice a noun (ib. 21). The dative is used acquisi tively, e.g., commodus tibi swm, also after verbals in -J's and -dus. Words of equivalence or subjection or the reverse are used in any order with either genitive or dative, ¢9., pater filii, or filio est pater; so similis, par, amicus, &c. Nominatives are joined to accusatives when what belongs to a part is assigned to the whole, e.g., fortis dextram for fortem dextram habens. In all (even in oblique) cases we must understand qui est, as albi colorem equi~~

~~=equi cjus qui est albi coloris (ib. 27). The ablative 1s joined to the nominative to express the instrument, the possession, the con- sequence (see above). It is used also with words of passive mean- ing, ¢g., viduus pharetra, dignus morte, : 32). He then proceeds (in awkward language) to point out that the nominative which is joined to a verb remains unchanged, and either takes no oblique cases of another declinable word or only such as are construed with the verb, ¢.9., Terentius ambulat ; Cesar vincit Pompeiwm ; pater indulget filro. But the nominative, which in consequence of the nature of the noun itself takes oblique cases, takes those cases, be its own case what it may; ¢g., victor Pompei Cxsar interfectus est a Bruto ; victoris Pompett Caxsaris filia fit Julia; victori Pompett Caxsari, &c. (ib. 85, 36). Similarly datives like curzx, cordi, &c., are used with all cases, ¢.9., cordi hominis for jucundi hominis (ib. 38; xi. 24). Priscian would have found it difficult to give an instance of this. PP, Date~~

~~The syntax of the verb follows. The infinite is taken first as the most general. Infinites are often joined to nouns, ¢.9., bonwm est legere, and, by a beautiful figure, to adjectives, ¢.g., fortis bellare ; also to verbs aud participles (xviii. 40-46). All verbs may be resolved into infinites, ¢.g., ambulo=dico me ambulare, scribebam =scribere cept. Hence cepit was sometimes omitted, ¢.g., ego tllud sedulo negare factwm (ib. 48). Participials and supines have the same case as the verb; verbal nouns in -dus have the same case as the nouns to which they are joined (7. 61-63). All transitive verbs are joined either to a genitive or dative or accusative or ablative, eg., egeo tut, insidior tibi, &c. Similarly participials or supines, e.g., miscrendo tut moveor, nocitum tibt propero, nocitu tibt gaudet (4b. 61). An instance of the last would be hard to find.~~

~~The uses of indicative, imperative, and optative moods are briefly treated. The subjunctive, which is the same in form as the optative (ib. 82), requires always to be joined to another mood or to another verb of the same mood. It is especially frequent with s?, when expressing doubt and put for édy (2b. 80). With the indica- tive si used for e? shows confirmation and belief. In siqua id for- tuna vetabit, vetabit is put metri gratia for vetet. The~~

~~subjunctive expresses doubt or approval or possibility, ¢.g., doubt in eloquar an sileam, approval in si non perteswm thalamt tedaxquc fuisset, where fuisset = éyeydver Spa. Ut and qui, que, quod, giving a reason or expressing a doubt, are often used with subjunctive (2b. 82-98). In discussing ut for tva, his examples carefully give the same tense of the principal verb (whether indicative or subjunctive) as that of the dependent subjunctive, ¢.g., doces ut proficias, doceres ut pro- ficeres, docuisti ut profeceris, docuissces ut profecisses, docebis ut profeceris (future subjunctive). But he also notes that fecissem or faccrem are equally right with nisi impedires, and that faciam or — is used with either nist impedias or tmpedires (1b. 101-~~

~~104).~~

~~After then discussing the cases used after verbs according to the meaning of the verbs as transitive, passive, common, absolute (e.g., rubeo pudore), or expressing various affections of the body or mind é 127-167), he proceeds to the long list of idioms spoken of above.~~

~~Priscian's three short treatises dedicated to Symmachus are on weights and measures, the metres of Terence, and some rhetorical elements. He also wrote De nomine, pronomine, et verbo (an abridg- ment of part of his Znstitutiones), and an interesting specimen of the school teaching of grammar in the shape of complete parsing by question and answer of the first twelve lines of the neid (Par- titiones «it. versuum Aineidos principaliwm). The metre is discussed first, each verse is scanned, aud each word thoroughly and instruct- ively examined. Its meaning, its form, its accent, its class, its other cases or tenses, its compounds and derivatives are all required from the pupil, as well as the rules to which they ought to conform. Such parsing, rarely, if ever, takes place in modern schools. A treatise on accents is ascribed to Priscian, but is rejected by modern writers on the ground of matter and language. He also wrote two poems, notin any way remarkable, viz., a panegyric on Anastasius in 312 hexameters with a short iambic introduction, and a faithful translation into 1087 hexameters of Dionysius's Periegesis or geogra- oe survey of the world. A few passages have, says Bernhardy,~~

~~een altered by Priscian on account of their heathen contents.~~

~~*The grammatical treatises have been critically edited, in excellent fashion, in Keil's Grammatict Latini, vols. ii. and iii., 1855-60; the Jnstitutiones by Martin Hertz ; and the smaller treatises by Keil. The poems have been recently edited by Bahrens, in his Poete Latini Minores, vol. y., 1883. H. J.*~~

~~*PRISCILLIANISTS, an heretical sect which rose to some prominence in Spain towards the end of the 4th century and continued to subsist, in varying numbers, there and in Gaul, until after the middle of the 6th. Its founder was Priscillian, a wealthy and influential layman of considerable reading and ability who had devoted his life to a self-denying study of the occult sciences and the deeper problems of philosophy. In the course of his speculations he came under the influence of two teachers,*~~

~~*and in comparisons (70. |*~~

~~*PRI—PRI*~~

~~*Elpidius and Agape, who professed to have derived their views from a certain Marcus, a native of Egypt who had settled in Spain. The creed which Priscillian now formu- lated appears to have combined various features of Gnosti- cism and Manicheism: he seems, for example, to have held the theory of emanations—high in rank among these being the heavenly powers whom he called by the name of the twelve patriarchs, and brought also into close relation with the signs of the zodiac—the doctrine of the demiurge, the pre-existence of souls, the eternity of the devil, the essen- tial sinfulness of the flesh, the unlawfulness of procreation, and the like. He and his followers retained their con- nexion with the Catholic Church,—insisting, however, on fasting on Sundays, and refusing the bread in the sacra- ment; but they also held separate meetings in private at which they were accused by their adversaries (with what truth is not known) of practising magic and indulg- ing in licentious orgies. Many women joined the sect, and among the more prominent of its converts were two bishops, named Instantius and Salvianus. Bishop Hyginus of Cordova, who had been the first to raise the alarm against the new doctrines and practices, himself soon afterwards joined the sect; but through the exer- tions of Idacius of Emerita the leading Priscillianists, who had failed to appear before the synod of Spanish and Aquitanian bishops to which they had been summoned, were excommunicated at Saragossa in October 880. The*~~

~~*same synod passed certain canons against the heresy, and*~~

~~*Ithacius of Ossonuba was charged with the publication of its decisions. Meanwhile, however, Priscillian was made bishop of Avila, and the orthodox party found it necessary to appeal to the emperor (Gratian), who issued an edict threatening the sectarian leaders with banishment. Pris- cillian, Instantius, and Salvianus now passed through Gaul to Italy with the object of enlisting the sympathies of Ambrose of Milan and Pope Damasus, but without result. They succeeded, however, by bribing the pro- consul, it is said, in procuring the withdrawal of Gratian's edict, and the attempted arrest of Ithacius. With the murder of Gratian and accession of Maximus (383) the aspect of matters again changed ; Ithacius fled to Treves, and in consequence of his representations a synod was held (384) at Bordeaux where Instantius was deposed. Priscillian for his part appealed to the emperor, with the unexpected result that along with six of his companions he was condemned to death and executed at Treves in 385. This first instance of the application of the Theo- dosian law against heretics caused a profound sensation throughout the Catholic world ; it had the approval of the synod which met at Treves in the same year, but Ambrose of Milan and Martin of Tours can claim the glory of having lifted up their voices against it, and of having in some measure stayed the hand_of persecution. The heresy, notwithstanding the severe measures taken against it, con- tinued to spread in France as well as in Spain; and the barbarian invasions of the 5th century appear to have helped its further diffusion. About 444 it attracted the attention of Leo I. at Rome, along with other forms of Manicheism, and something was done for its repression by a synod held at the pope's instance by Turribius of Astorga in 446 and by that of Toledo in 447; as an openly pro- fessed creed it wholly disappeared after the second synod of Braga in 563.*~~

~~*PRISHTINA, or Pristina, a town of European Turkey, since 1877 at the head of a liwa in the vilayet of Kossovo, lies on an affluent of the Sitnitza, a subtribut- ary of the Morava, and gives its name to one of the stations on the Salonica-Uskub-Mitrowica Railway, which runs at a distance of 6 or 7 miles to the west of the town. It stands at a height of 1700 feet above the sea on undu-*~~

~~lating ground, and presents in the distance a pleasant | appearance with the minarets erected, according to the legend, by Turkish women whose husbands fell in the | battle of Kossovo fought in the neighbourhood. Prishtina | is the seat of a Greek bishop. Its population is estimated at from 8000 to 10,000. To the south-east lies the partly ruined monastery of Gratchanitza founded by King Milutin of Servia, who reigned from 1275 to 1321. Itisa graceful building with a large central dome surrounded by four smaller domes and a variety of arches, of which the higher are pointed and the lower round. Among the frescos are portraits of the founder and his queen Simonida, daughter of Andronicus IJ. Paleeologus, and a remarkable head of Christ in the dome. See Mackenzie and Irby, The Slavonic Provinces of Turkey.~~

~~PRISON DISCIPLINE. Authority in every age and in every country has claimed to impose penalties on all who offend against-it. Either coercion or protection has been the moving principle: the master extorted submis- sion, or society, through its rulers, defended itself against evil doers. 'The most common punishments in early times were naturally those most easily inflicted. Offenders paid in their persons: they were put to death with every variety of the capital sentence, were branded, mutilated, or sold as slaves. They were fined also, were degraded, or for- feited civil rights, or yet again were simply banished from their homes. Enforced detention, incarceration within four walls, was another method of coercion which grew and gained favour under the feudal system. The lord temporal or spiritual or corporate body could thus hold the vassal safe until he yielded fealty or submitted to extortion. A dungeon told no tales, and served conveni ently to bury the victims of medieval oppression. The unrestrained and unjustifiable exercise of the power to im- prison lingered long in lands where personal liberty was unknown ; nor did arbitrary imprisonment terminate with the destruction of the Bastille. In England, however, free- dom from illegal arrest, the dearest of the Briton's pri- vileges, was resolutely fought for and early achieved. The Great Charters conceded it; and, although often in danger, it was confirmed finally and beyond all question by the Habeas Corpus Act passed in the reign of Charles IT. But the theory was better than the practice: numbers always languished in jail, the victims of needlessly severe or~~

~~*misinterpreted laws, who nowadays would have been at large. Through long years of trouble and dis- quiet, when the country was torn with religious and political dissensions, the prisons were always full. Intoler- ance appealed to the strong arm, and the jail was the antechamber of the scaffold or stake. When party warfare ran high, when kings struggled for larger powers or their ministers and myrmidons ruled with a high hand, incar- ceration was the easy recompense for all on the losing side. The commercial laws of a nation wedded to trade kept a large contingent always in jail. The debtor was at the mercy of his creditor, who could command the best efforts of the law to assist him in recovering his own again. Irregu- larity in the administration of justice contributed largely to fill the prisons. Jail deliveries were frequently de-*~~

~~*layed indefinitely; while, even when tardy trial ended in an acquittal, release was not always accorded, and innocent men, unable to meet extortionate demands in fees, were carried back to prison. This was one reason why jails were full; yet another was the laxity or entire absence of discipline which suffered the families of accused persons to share their confinement. Under such conditions, more or less universal, the state of prisons, not in England alone, but throughout the then civilized world, was deplorable in theextreme. Yet the terrors of incarceration were long but vaguely understood. Glimpses of light sometimes pene-*~~

~~*trated the dark recesses of the prison house, as when the atrocities perpetrated by the keepers of the chief debtors' prisons in London were made the subject of parliamentary inquiry. This was in 1730, forty-three years before the revelations of Howard. But in the interval voices were occasionally raised in protest, and there was a general sense of uneasiness throughout the country to which the great philanthropist gave point and expression. Howard began his journeys of inspection in 1773; in the following year he was examined by the House of Commons, and received the thanks of the House for his arduous and self-sacrificing labours for the mitigation of suffering in jails. What Howard found is sufficiently well known. The prisons of tue kingdom were a disgrace to humanity: they were for the most part poisonous pestiferous dens, densely over- crowded, dark,*~~

~~*foully dirty, not only ill-ventilated, but de- prived altogether of fresh air. The wretched inmates were thrown into subterranean dungeons, into wet and noisome caverns and hideous holes to rot and fester, a prey to fell disease bred and propagated in the prison house, and de- prived of the commonest necessaries of life. For food they were dependent upon the caprice of their jailers or the charity of the benevolent ; water was denied them except in the scantiest proportions ; they were half naked or in rags; their only bedding was putrid straw reeking with exhalations and accumulated filth. Every one in durance, whether tried or untried, was heavily ironed ; women did not escape the infliction. All alike were subject to the rapacity of their jailers and the extortions of their fellows. Jail fees were levied ruthlessly, —" garnish" also, the tax or contribution paid by each individual to a common fund to be spent by the whole body, generally in drink. Drunken- ness was universal and quite unchecked ; gambling of all kinds was practised; vice and obscenity were everywhere in the ascendant. Idleness, drunkenness, vicious inter- course, sickness, starvation, squalor, cruelty, chains, awful oppression, and everywhere culpable neglect—in these words may be summed up the state of the jails at the time of Howard's visitation.*~~

~~*It must be borne in mind that all this time the prisons were primarily places of detention, not of punishment. The bulk of those committed to their safe keeping were accused persons awaiting trial in due process of law, or debtors; and of these again by far the most numerous class were the impecunious and the unfortunate, whom a niistaken system locked up and deprived of all means of paying their liabilities. Now and again an offender was sentenced to be imprisoned in default of payment of fine, or to pass the intervals between certain periods of dis- graceful exposure on the pillory. Imprisonment had as yet no regular place in the code of penalties, and the jail was only the temporary lodging of culprits duly tried and sentenced according to law. The punishment most in favour in these ruthless times was death. The statute- book bristled with capital felonies, and the gallows was in perpetual requisition. These were days when the pick- pocket was hanged; so was the sheep-stealer, and the forger of one-pound notes. Well might Sir Samuel Romilly, to whose strenuous exertions the amelioration of the penal code is in a great measure due, declare that the laws of England were written in blood. But even then there was another and a less sanguinary penalty. The deportation of criminals beyond seas grew*~~

~~naturally out of the laws which prescribed banishment for certain offences, The Vagrancy Act of Elizabeth's reign contained in it the germ of transportation, by empowering justices in quarter sessions to banish offenders and order them to be conveyed into such parts beyond the seas as should be assigned by Her Majesty's privy council. Full effect was given to this statute in the next reign, as is proved by a letter~~

~~748~~

~~of James I., dated 1619, in which the king directs "a hundred dissolute persons" to be sent to Virginia. An- other Act of similar tenor was passed in the reign of Charles II., in which the term "transportation " appears to have been first used. A further and more systematic development of the system of transportation took place in 1718, when an Act was passed by which offenders who had escaped the death penalty were handed over to con- tractors, who engaged to transport them to the American colonies. These contractors were vested with a property in the labour of the convicts for a certain term, generally from seven to fourteen years, and this right they fre- quently sold. Labour in those early days was scarce in the new settlements; and before the general adoption of negro slavery there was a keen competition for felon hands. 'The demand was indeed so great that it produced illegal methods of supply. An organized system of kid- napping prevailed along the British coasts; young lads were seized and sold into what was practically white slavery in the American plantations. These malpractices~~

~~were checked, but the legitimate traffic in convict labour || landed at Port Jackson, where it entered and occupied the~~

~~continued until it was ended peremptorily by the revolt of the American colonies and the achievement of their inde- pendence. In 1776 the British legislature, making a virtue of necessity, discovered that transportation to His Majesty's colonies (which three years previously had de- clared their independence) was bound to be attended by various inconveniences, particularly by depriving the king- dom of many subjects whose labour might be useful to the community ; and an Act was accordingly passed which provided that convicts sentenced to transportation might be~~

~~*employed at hard labour at home. At the same time the consideration of some scheme for their disposal was*~~

~~*entrusted to three eminent public men—Sir William |*~~

~~*Blackstone, Mr Eden (afterwards Lord Auckland), and John Howard. The result of their labours was an Act for the establishment of penitentiary houses, dated 1778. This Act is of peculiar importance. public enunciation of a general principle of penal treat- ment, and shows that even at that early date the system since nearly universally adopted was fully understood. The object in view was thus stated. It was hoped, by sobriety, cleanliness, and medical assistance, by a regular series of labour, by solitary confinement during the inter- vals of work, and by due religious instruction, to preserve and amend the health of the unhappy offenders, to inure them to habits of industry, to guard them from pernicious company, to accustom them to serious reflexion, and to teach them both the principles and practice of every Christian and moral duty. The experience of a century has added nothing to these the true principles of penal discipline ; they form the basis of every species of prison system carried out since the passing of the Act 19 Geo. ITT. c. 74 in 1779.*~~

~~*The first step towards giving effect to this Act was the appointment of a commission of three " supervisors" to select and acquire a site for the first penitentiary house. Howard was one, and no doubt the most influential, of these ; but he could not agree with his colleagues as to the most suitable situation. One was for Islington, another for Limehouse, while Howard insisted upon some site which was healthy, well supplied with water, and in such a convenient spot that it could be readily visited and in- spected. It is interesting to observe that the great phil- anthropist anticipated modern English practice in his pre- paration of the plans for the construction of the prison. He was strongly of opinion that the penitentiary should be built by convict labour, just as in recent years the new prison has been erected at Wormwood Scrubs, and large blocks added to the prisons of Chatham, Portsmouth, and*~~

~~*It contains the first |*~~

~~*PRISON DIsStITLIR®*~~

~~*Dartmoor. Howard, however, withdrew from the com- mission, and new supervisors were appointed, who were on the eve of commencing the first penitentiary when the discoveries of Captain Cook in the South Seas turned the attention of the Government towards these new lands. The vast territories of Australasia promised an unlimited field for convict colonization, and for the moment the scheme for penitentiary houses fell to the ground. Public opinion generally preferred the idea of establishing penal settlements at a distance from home. "There was general confidence," says Merivale in his work on colonization, "in the favourite theory that the best mode of punishing offenders was that which removed them from the scene of offence and temptation, cut them off by a great gulf of space from all their former connexions, and gave them the opportunity of redeeming past crimes by becoming useful members of society." These views so far prevailed that an expedition consisting of nine transports and two men- of-war, the "first fleet" of Australian annals, sailed in March 1787 for New South Wales. This first fleet reached Botany Bay in January 1788, but passed on and*~~

~~*harbour of Sydney, one of the finest and most secure havens in the world. We shall return further on to the proceedings of these first criminal colonists when the pro- gress of transportation as a secondary punishment will be described.*~~

~~*The penitentiary scheme was not, however, abandoned on the adoption of transportation to New South Wales. It was revived and kept alive by Jeremy Bentham, who in 1791 published a work on prison discipline entitled The Panopticon or Inspection House, and followed it next year by a formal proposal to erect a prison house on his own plan. Bentham's main idea was "a circular building, an iron cage glazed, a glass lantern as large as Ranelagh, with the cells on the outer circumference." Within, in the centre, an inspection station was so fixed that every cell or part of a cel! could be at all times closely observed,— the prisoners being themselves at liberty to communicate with visitors and make known their complaints by means of tubes. He hoped to effect much in the way of reforma- tion from a system of solitude or limited seclusion, with constant employment on work in the profits of which the prisoners were to share. His project was warmly*~~

~~*approved by Pitt, but secret influences—the personal hostility, it was said, of George III. to Bentham as an advanced*~~

~~*‘ Radical—hindered its adoption until 1794. A contract*~~

~~*was then made between the treasury and Bentham, by which the latter was to erect a prison for a thousand convicts, with chapel and other necessary buildings, for £19,000. A portion of this sum was advanced, and Bentham also acquired on behalf of the Government certain lands in the neighbourhood of Tothill Fields. But the undertaking languished, and never took practical shape. Nearly fifteen years later, when the penitentiary question was again revived, Bentham’s claims were referred to arbitration, and the Government proceeded to erect the prison on its own account, “fully recognizing the import- ance of attempting reformation by the seclusion, employ- ment, and religious instruction of prisoners.” This had been tried already on a small scale but with satisfactory results, first at the Gloucester prison erected in 1791 and afterwards in the house of correction at Southwell. A larger and more ambitious experiment was resolved upon, worthy of the state ; and the great penitentiary still stand- ing after many vicissitudes, but practically unaltered, at Millbank was the result of this determination. It was built on the lands originally acquired by Bentham, and the work commenced in 1813 was continued at great out- lay until 1816, when a portion was ready for the reception*~~

~~*PRiSsenw VAS CIPEINE*~~

~~*of prisoners. A great flourish attended its opening. Its affairs were entrusted to a specially appointed committee of eminent and distinguished personages, the chairman being the Speaker of the House of Commons. Crowds of visitors—royal dukes, foreign princes, the élite of society—came to see the new prison; most elaborate arrange- ments were made for its internal government, and no money was spared either upon the staff or upon the com- pletion of the buildings. The sum total expended upon the latter amounted to half a million of money, and the yearly charges of the establishment were a heavy burthen on the exchequer.*~~

~~*The erection of Millbank was, however, a step in the right direction. The energy with which it was under- taken was the more remarkable because*~~

~~*elsewhere through- out the United Kingdom the prisons, with but few exceptions, remained deplorably bad. Mr Neild, who in 1812 followed in the footsteps of John Howard, found that the old conditions, overcrowding and indiscriminate inter- course, remained unchanged. "The great reformation produced by Howard," to use Neild's own words, " was merely temporary ; prisons were relapsing into their former horrid state of privation, filthiness, severity, and neglect." Yet the legislature was alive to the need for prison reform. Besides the building of Millbank it had promulgated many Acts for the amelioration of pri- soners. Jail fees were once more distinctly abolished ; the appointment of chaplains was insisted upon ; the erec- tion of improved prison buildings was rendered impera- tive upon local authorities. But these with other and much older Acts remained in abeyance. Thus an Act which provided for the classification of prisoners had re- mained a dead letter; even the separation of the males from the females was not an universal rule. Humane pro- visions intended to secure the good government of prisons, their cleanliness and ventilation, and the proper supply of food, clothing, and bedding to the prisoners were still sys- tematically ignored. Roused by these crying evils, a small band of earnest men, philanthropists and members of the Society of Friends, formed themselves into an association for the improvement of prison discipline, and devoted themselves with rare energy and singleness of purpose to their self- constituted task. They perambulated the country inspecting all the prisons; they issued lengthy interrogatories to prison officials; they published periodi- cal reports giving the result of their inquiries, with their views on the true principles of prison management, and much sound advice, accompanied by elaborate plans, on the subject of prison construction. The labours of this society brought out into strong relief the naked deformity of the bulk of the British jails. It was the old story. Jails, speaking broadly, were lamentably inadequate for the numbers crowded into them. Hence there was the most terrible overcrowding : by day in some prisons it was nearly impossible to push through the throngs in the yards; by night the wretched prisoners ran the risk of suffocation. Prisoners were still very generally obliged to wear heavy irons. They had no regular diet—at best only dry bread. Speaking of St Albans from his personal observation, Mr Buxton, a most active member of the Society, says, " All were in ill health ; almost all were in rags; almost all were filthy in the extreme. The state of the prison, the desperation of the prisoners, broadly hinted in their*~~

~~*conversation and plainly expressed in their con- duct, the uproar of oaths, complaints, and obscenity, the indescribable stench, presented together a concentration of the utmost misery and the utmost guilt." This was no over-coloured picture; nor did it portray a solitary instance. The reports of the Society laid bare the exist- ence of similar horrors in numbers of other jails. Yet this*~~

~~*was in 1818, when the legislature was setting a praise- worthy example—when half a million had been spent in providing large airy cells for a thousand prisoners. Even in London itself, within easy reach of this palatial Mill- bank penitentiary, the chief prison of the city, Newgate, was in a disgraceful condition. This had been exposed by a parliamentary inquiry as far back as 1814, but nothing had been done to remedy the evils laid bare. All the shameful conditions of neglect, ill-treatment, and over- crowding were present in Newgate, and to the same extent as in any of the provincial prisons. The state of the female side had already attracted the attention of that devoted woman, Mrs Fry, whose ministrations and wonder- ful success no doubt encouraged, if they did not bring about, the formation of the Prison Society. Mrs Fry went first to Newgate in 1813, but only as a casual visitor. It was not till 1817 that she entered upon the great and noble work with which her name will ever be associated. She worked a miracle there in an incredibly short space of time. The ward into which she penetrated, although strongly dissuaded by the officials, was like a den of wild beasts; it was filled with women unsexed, fighting, swearing, dancing, gaming, yelling, and justly deserved its name of "hell above ground." Within a month it was transformed, and presented, says an eye witness, "a scene where stillness and propriety reigned." The wild beasts were tamed. It was not strange that such marvellous results should be bruited abroad, that public attention should be attracted to Mrs Fry's labours, and that others should seek to follow in her footsteps. Movements similar to that which Mrs Fry headed were soon set on foot both in England and on the Continent, and public attention was generally directed to the urgent necessity for prison reform.*~~

~~*Stimulated no doubt by the success achieved by Mrs Fry, the Prison Discipline Society continued its useful labours. Hostile critics were not wanting; many voices were raised in protest against the ultra-humanitarianism which sought to make jails too comfortable and tended to pamper criminals. But the society pursued its way undeterred by sarcasm, through evil and good report striv- ing earnestly after the objects it had in view. Many of these are now accepted as axioms in prison treatment. It is, for instance, established beyond question that female officers only should have charge of female prisoners, that prisoners of both sexes should be kept constantly employed. Yet these principles were unacknowledged at that time, and were first enunciated in Acts such as the 4 Geo. IV. ¢. 65 and the 5 Geo. IV. c. 85 (1823-24), the passing of which were mainly due to the strenuous exertions of the Prison Discipline Society. It was laid down in these that over and above safe custody it was essential to preserve health, improve morals, and enforce hard labour on all prisoners sentenced to it. These Acts also provided that male and female prisoners should be confined in separate buildings, that matrons should be appointed, and schoolmasters, and that there should be divine service daily in the jails. Now at last irons were strictly forbidden except in cases of "urgent and absolute necessity," and it was ruled that every prisoner should have a bed to himself,—if possible a separate cell, the last being the first formal statement of a principle upon which all future prison discipline was to be based.*~~

~~*The importance of these Acts cannot be overestimated as supplying a legal standard of efficiency by which all prisons could be measured. Still the progress of iniprove- ment was extremely slow, and years after the managers of jails still evaded or ignored the Acts. Many local authorities grudged the money to rebuild or enlarge their jails; others varied much in their interpretation of the*~~

~~*rules as to hard labour and the hours of employment. One great drawback to general reform was that a large number of small prisons lay beyond the reach of the law. Those under small jurisdictions in the boroughs and under the petty corporate bodies continued open to the strongest reprobation. Not*~~

~~*only were they wanting in all the in- dispensable requirements as laid down by the most recent Acts, but they were often unfit for the confinement of human beings, and were described "as fruitful sources of vice and misery, debasing all who are confined within their walls." They thus remained until they were swept away by the measure which brought about the reform of the municipal corporations in 1835. But by this time a still more determined effort had been made to establish some uniform and improved system of prison discipline. In 1831 a select committee of the House of Commons went into the whole subject of secondary punishment, and re- ported that, as the difficulties in the way of an effective classification of prisoners were insurmountable, they were strongly in favour of the confinement of prisoners in separate cells, recommending that the whole of the prisons should be altered accordingly, and the expense borne by the public exchequer. There can be little doubt that this committee, like every one just then, was greatly struck by the superior methods of prison discipline pursued in the United States. The best American prisons had recently been visited by two eminent Frenchmen, MM. Beaumont and De Tocqueville, who spoke of them in terms of the highest praise. It was with the object of appro- priating what was best in the American system that Mr Crawfurd was despatched across the Atlantic on a special mission of inquiry. His able and exhaustive report, published in 1834, was a valuable contribution to the whole question of penal discipline, and it was closely and attentively studied at the time. Another select committee, this time of the House of Lords, returned to the subject in 1835, and after a long investigation re- enunciated the theory that all prisoners should be kept separate and apart from one another. It also urged in strong terms the necessity for one uniform system of treatment, more especially as regarded dietaries, labour, and education, and strongly recommended the appointment of official inspectors to enforce obedience to the Acts. These recommendations were eventually adopted, and formed the basis of a new departure. This was the first indication of a system which, although greatly modified, enlarged, and improved, is in its main outlines the same as that now in force.*~~

~~*It must, however, be borne in mind that the prisons at home still formed an item only, and not the largest, in the scheme of secondary punishment. The jail was only a place of temporary detention, where prisoners awaited trial, suffered short terms of imprisonment, or passed on to the gallows or the*~~

penal colonies. The last-named was the chief outlet, for by this time the country was fully committed to the system of deportation. Since the first fleet in 1787 convicts had been sent out in constantly increas- ing numbers to the antipodes. Yet the early settlement at Sydney had not greatly prospered. The infant colony, composed of such incongruous materials, of guards and criminals, had had a bitter struggle for existence. It had been hoped that the com- munity would raise its own produce and speedily become self-sup- porting. But the soil was unfruitful ; the convicts knew nothing of farming ; there was no one fully competent to instruct them in agriculture. All lived npon rations sent out from home ; and when convoys with relief lingered by the way famine stared all in the face. The eolony was long a penal settlement and nothing more, peopled only by two classes, convicts and their masters— eriminal bondsmen on the one hand who had forfeited their inde- pendence and were bound to labour without wages for the state, on the other officials to guard and exact the due performance of tasks. From the first it had been felt that the formation of a steady respectable class was essential to the future healthy life of the colony. But such an element was not easy to infuse into the community. A few free families were encouraged to ek but they were lost in the mass they were intended to eaven, swamped and outnumbered by the convicts, shiploads of

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whom continued to pour in year after year. As the influx in- creased difticulties arose as to their employment. Free settlers were too few to give work to more than a small proportion. Moreover, a new poliey was in the ascendant, initiated by Governor Macquarie, who considered the convicts and their reha- bilitation his chief care, and steadily discouraged the immigration of any but those who "came out for their country's good." The great bulk of the convict labour thus remained in Government hands. This period marked the first phase in the -history of transportation. The penal colony, having triumphed over early dangers and difficulties, was crowded with convicts in a state of

| semi-freedom, maintained at the public expense, and utilized in the

development of the latent resources of the country. The methods employed by Governor Macquarie were not perhaps invariably the best ; the time was

~~*hardly ripe as yet for the erection of palatial buildings in Sydney, while the congregation of the workmen in large bodies tended greatly to their demoralization. But some of the works undertaken and carried out were of incalculable ser- vice to the young colony; and its early advance in wealth and prosperity was greatly due to the magnificent roads, bridges, and other facilities of inter-communication for which it was indebted to Governor Macquarie.*~~

~~*But now the criminal sewage flowing from the Old World to the New was greatly increased in volume under milder and more humane laws. Many now escaped the gallows, and mnch of the over-crowding of the jails at home already mentioned was caused by the gangs of convicts awaiting transhipment to the antipodes. They were packed off, however, with all convenient despatch, and the numbers on Government hands in the colonies multiplied exceedingly, causing increasing embarrassment as to their disposal. Moreover, the expense of the Australian convict establishments was enormous, and some change in system was inevitable. These were the conditions that brought about the plan of "assign- ments," in other words of freely lending the convicts to any who would relieve the authorities of the burdensome charge. By this time free settlers were arriving in greater number, invited by a different and more liberal policy than that of Governor Macquarie.*~~

~~*Inducements were especially offered to persons possessed of capital,*~~

~~*to venture in the development of the country. Assignment developed rapidly ; soon eager competition arose for the convict hands that were at first very reluctantly taken. Great facilities existed for utilizing them on the wide areas of grazing land and on the new stations in the interior. A pastoral life, without temptations and contaminating influences, was well snited for convicts. As the colony grew richer and more populous, other than agricultural employers became assignees, and numerous enter-*~~

~~*prises were set on foot. The trades and callings which minister to —*~~

~~*the needs of all civilized communities were more and more largely pursued. There was plenty of work for skilled convicts in the towns, and the services of the more intelligent were highly prized. It was a great boon to secure*~~

~~*gratis the assistance of men specially trained as clerks, book-keepers, or handicraftsmen. Hence all manner of intrigues and manveuvres were set agoing on the arrival of drafts, and there was a scramble for the best hands. Here at once was a flaw in the system of assignment. The lot of the con- vict was altogether unequal. Some, the dull unlettered and unskilled, wete drafted to heavy manual labour at which they remained, while clever and expert rogues found pleasant, con- genial, and often profitable employment. The contrast was very marked from the first, but it became the more apparent, the anomaly more monstrous, as time passed on and some were still engaged in unlovely toil while others, who had come out by the same ship, had already attained to affluence and ease. For the latter transportation was no punishment, but often the reverse. It meant too often transfer to a new world under conditions more favourable to success, removed from the keener competition of the old. By adroit management, too, they often obtained the com- mand of funds, the product of nefarious transactions at home, which wives or near relatives or unconvicted accomplices presently brought out to them. It was easy for the free new-comers to secure the assignment of their convict friends ; and the latter, although still nominally servants and in the background, at once assumed the real control. Another system prodnetive of much evil was the employment of convict clerks in positions of trust in various Government offices ; convicts did much of the legal work of the colony ; a convict was clerk to the attorney-general ; others were schoolmasters, and were entrusted with the education of youth. Under a system so anomalous and uncertain the main object of transportation as a method of penal discipline and repression was in danger of being quite overlooked. Yet the state could not entirely abdicate its functions, although it surrendered to a great extent the care of criminals to private persons. It had established a eode of penalties for the coereion of the ill-conducted, while it kept the worst, perforce, in its own hands. The master was always at liberty to appeal to the strong arm of the law. A message carried to a neighbouring magistrate, often by the culprit himself, brought down the prompt retribution of the lash. Con-*~~

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~~*victs might be flogged for petty offences, for idleness, drunkenness, turbulence, absconding, and so forth. At the out-stations some show of decorum and regularity was observed, although the work done was generally scanty, and the convicts were secretly given to all manner of evil courses. The town convicts were worse, because they were far less under control. They were nominally under the surveillance and supervision of the police, which amounted to nothing at all. They came and went, and amused themselves after working hours, so that Sydney and all the large towns were hot-beds of vice and immorality. The masters as a rule made no attempt to watch over their charges; many of them were absolutely unfitted to do so, being themselves of low character, " emanci- pists " frequently, old convicts pardoned or wlio had finished their terms. No effort was made to prevent the assignment of convicts to improper persons; every applicant got what he wanted, even though his own character would not bear inspection. Al] whom the masters could not manage—the incorrigibles upon whom lash and bread and water had been tried in vain—were returned to Government charge. These, in a word, comprised the whole of the refuse of colonial convictdom. Every man who could not agree with his master, or who was to undergo a penalty greater than flogging or less than capital punishment, came back to Govern- ment, and was disposed of in one of three ways—the road parties, the chain gangs, or the penal settlements. The convicts in the first might be kept in the vicinity of the towns or marched about the country according to the work in hand; the labour was irk- some, but, owing to inefficient supervision, never intolerable; the diet was ample, and there was no great restraint upon independ- ence witlin certain wide limits. To the slackness of control over the road parties was directly traceable the frequent escape of des- peradoes, who, defying recapture, recruited the gangs of bush- rangers, which were a constant terror to the whole country. In the chain or iron gangs, as they were sometimes styled, discipline was far more vigorous. It was maintained by the constant presence of a military guard, and, when most efficiently organized, was governed by a military officer who was also a magistrate. The work was really hard, the custody close—in hulk, stockaded barrack, or caravan; the first was at Sydney, the second in the interior, the last when the undertaking required constant change of place. All were locked up from sunset to sunrise; all wore heavy leg irons; and all were liable to immediate flagellation. The convict "scourger" was one of the regular officiais attached to every chain 'gang.*~~

~~*The third and ultimate receptacle was the penal settlement, to which no offenders were transferred till all other methods of treatment had failed. These were terrible cess- pools of iniquity, so bad that it seemed, to use the words of one -who knew them well, "the heart of a man who went to them was taken from him and he was given that of a beast." The horrors accumulated at Norfolk Island, Moreton Bay, Port.Arthur, and Tasman's Peninsula are almost beyond description. The convicts herded together in them grew utterly degraded and brutalized ; no wonder that reckless despair took possession of them, that death on the gallows for murder purposely committed, or the slow terror from starvation following escape into surrounding wilds, was often welcomed as a relief.*~~

~~*The stage which transportation was now reaching, and the actual condition of affairs in the Australian colonies about this period, do not appear to have been much understood in England. Earnest and thoughtful men might busy themselves with prison discipline at home, and the legislature might watch with peculiar interest the results obtained from the special treatment of a limited nuinber of selected offenders in Millbank penitentiary. But for the great mass of criminality deported to a distant shore no very active concern was shown. 'The country for a long time seemed satisfied with transportation. Portions of the system might be open to criticism. Thus the Commons committee of 1882 freely condemned the hulks at Woolwich and other arsenals in which a large number of convicts were kept while waiting embarka- tion. The indiscriminate association of prisoners in them produced more vice, profaneness, and demoralization than in the ordinary prisons. After dark the wildest orgies went on in them—dancing, fighting, gambling, singing, and so forth; it was easy to get drink and tobacco, and see friends from outside. The labour hours were short, the tasks light; "altogether the situation of the convict"' in the hulks, says the report, "cannot be considered penal; it is a state of restriction, but hardly of punishment." But this same committee spoke well of transportation, considering it "a most valuable expedient in the system of secondary punish- ment." All that it felt necessary to suggest was that exile should be preceded by a period of severe probationary punishment in England, a proposal which was reiterated later on and actually adopted, as we shall see. It was in the country most closely affected that dissatisfaction first began to find voice. Already in 1832 the most reputable sections of*~~

~~*Australian society were beginning to find grave fault with transportation. It had fostered the growth of a strong party—that representing convict views—and these were advocated boldly in unprincipled prints. This*~~

~~*Tol*~~

~~| party, constantly recruited from the emancipists and ticket-of- ie~~

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~~eave holders, gradually grew very numerous, and threatened soon to swamp the respectable and untainted parts of the community. As years passed the prevalence of crime, and the universally low tone of morality due to the convict element, became more and more noticeable, and created greater disgust. At length, in 1835, Judge Burton raised a loud protest, and in a charge to the grand jury of Sydney plainly intimated that transportation niust cease. While it existed, he said, the colonies could never rise to their proper position; they could not claim free institutions; in a word, Anstralia suffered in its whole moral aspect. This bold but forcible language commanded attention. It was speedily echoed in England, and by none more eloquently than Archbishop Whately, who logically argued that transportation failed in all the leading requisites of any system of secondary punishment. It was not formidable—criminals did not dread it; it was not corrective, but tended obviously to produce further moral debasement; it was not cheap—on the contrary it entailed great outlay without bringing any adequate returns. In the first most important object it had certainly failed. Transportation exercised no salutary terror in offenders; it was no longer exile to an unknown inhospitable region, but to one flowing with milk and honey, whither innumer- able friends and associates had gone already. There was every chance of doing well in the new country. The most glowing de- scriptions came back of the wealth which any clever fellow miglit easily amass ; stories were told and names mentioned of those who had made ample fortunes in Australia in a few years. As a matter of fact the convicts, or at least large numbers of them, had pro- spered exceedingly. Some had incomes of twenty, thirty, even forty thousand pounds a year. They owned shops and farms and public houses and ships, drove in carriages, and kept up grand establishments. It. could be no great punishment to be put within reach of such advantages. As regarded the deteriorating effects of the system, these were plainly manifest on the surface from the condition of the colony—the profligacy of the towns, the leniency shown to crimes and those who had committed them. Down below, in the depths where the dregs rankled perpetually, in the openly sanctioned slavery called assignment, in~~

~~*the demoralizing chain gangs, and in the inexpressibly horrible penal settlements, were more abundant and more awful proofs of the general wick- edness and corruption. Moreover, these appalling results were accompanied by a vast expenditure. The cost of the colonial con- vict establishments, with the passages out, amounted annually to upwards of £300,000; another hundred thonsand was expended on the military garrisons; and various items brought the whole outlay to about half a million per annum. It may be argued that this was not a heavy price to pay for peopling a continent and laying the foundations of our vast Australasian empire. But that empire could never have expanded to its present dimensions if it had depended on convict immigration alone. There was a point, too, at which all development, all progress, would have come to a full stop had it not been relieved of its stigma as a penal colony.*~~

~~*That point was reached between 1835 and 1840, when a powerful party eame into existence in New South Wales, pledged to procure the abandonment of transportation. A strongly hostile feeling was also gaining ground in England. In 1837 a new committee of the HIouse of Commons had inade a patient and searching investigation into the merits and demerits of the system, and freely condemned it. The Government had no ehoice but to give way ; it could not ignore the protest of the colonists backed up by sneh an authori- tative expression of opinion. In 1840 orders were issued to suspend the deportation of criminals to New South Wales. But what was to become of the convicts? It was impossible to keep them at home. The hulks, which might have served, had also failed ; the faultiness of their internal management had been fully proved. The committee last mentioned had recommended the erection of more penitentiaries. But the costly experiment of Millbank had been barren of results. The model prison at Pentonville, now in process of construction under the pressure of a movement towards prison reform, could offer but limited accommodation. A proposal was put forward to construct eonvict barracks in the vicinity of the great arsenals ; but this, which contained really the germ of the present British penal system, was premature. The Government in this dilemma steered a middle course, and resolved to adhere to transportation, but under a greatly modified and, it was hoped, much improved form. The colony of Van Diemen's Land, younger and less self-reliant than its neighbour, had also endured convict immigration, but had made no protest. It was resolved to*~~

~~*direct the whole stream of deportation upon Van Diemen's Land, which was thus constituted one vast colonial prison. The main principle of the new system was one of probation ; hence its name. All con- victs were to pass through various stages and degrees of punishment according to their conduct and character. Some general depét was needed where the necessary observation could be made, and it was found at Millbank penitentiary. Thence boys were sent to the prison for juveniles at Parkhurst; the most promising subjects*~~

~~*among the adults were selected to undergo the experimental disci- pline of solitude and separation at Pentonville ; less hopeful cases went to the hulks; and all adults alike passed on to the antipodes. Fresh stages awaited the convict on his arrival at Van Diemen's Land. 'The first was limited to "lifers" and colonial convicts sen- tenced a second time. It consisted in detention at one of the penal stations, either Norfolk Island or Tasmau's Peninsula, where the disgraceful conditions already described continued unchanged to the very last. The second stage received the largest number, who were subjected in it to gang labour, working nnder restraint in various parts of the colony. 'These probation stations, as they were called, were intended to inculcate habits of industry and subordination ; they were provided with supervisors and religious instructors ; and, had they not been soon tainted by the vicious virus brought to them by others arriving from the penal stations, they might have answered their purpose for a time. But they became as bad as the worst of the penal settlements, and contributed greatly to the deplorable breakdown of the whole system. The third stage, and the first step towards freedom, was the concession of a pass which permitted the convict to be at large under certain conditions to seek work for himself; the fourth was a ticket-of-leave, the possession of which allowed him to come and go much as he pleased ; the fifth, and last, was absolute pardon, with the prospects of rehabilitation.*~~

~~*This scheme seemed admirable on paper; yet it failed completely when put into practice. Colonial resources were quite unable to bear the pressure. Within two or three years Van Diemen's Land was fairly inundated with convicts. Sixteen thousand were sent out in four years ; the average annual*~~

~~*draft in the colony was about thirty thousand, and this when there were only thirty-seven thousand free settlers. Half the whole number of convicts remained in Government hands, and were kept in the probation gangs, engaged upon public works of great utility ; but the other half, pass-holders and ticket-of-leave men in a state of semi-freedom, could get little or no employment. The supply greatly exceeded the demand ; there were no hirers of labour. Had the colony been as large and as prosperous as its neighbour it could scarcely have absorbed the mass of workmen ; but it was veally on the verge of bankruptcy—its finances were embarrassed, its trades and industries at a standstill. But not only were the convicts idle; they were utterly depraved. It was soon found that the system wliich kept large bodies always together had a most pernicious effect upon their moral condition. "The congregation of criminals in large batches without adequate supervision meant simply wholesale widespread pollution," as was said at the time. These ever-present and con- stantly increasing evils forced the Goveruinent to reconsider its position ; and in 1846 transportation to Van Diemen's Land was temporarily suspended for a couple of years, during which it was hoped some relief might be afforded. The formation of a new con- vict colony in North Australia had been contemplated ; but the project, warmly espoused by Mr Gladstone, then under secretary of state for the colonies, was presently abandoned ; and it now became clear that no resumption of transportation was possible.*~~

~~*Some fresh scheme had to be devised, and that with- out delay. The task fell upon Sir George Grey as home secretary, who, in dealing with it laid the foundations of the present British penal system. This system was to consist (1) of a limited period of separate confinement in a home prison or penitentiary, accompanied by industrial employment and moral training; (2) of hard labour at some public works prison either at home or abroad; and (3) of exile to a colony with a conditional pardon or ticket- of-leave. No pains were spared to give effect to this plan as soon as it was decided upon. Pentonville was available for the first phase ; Millbank was also pressed into the service, and accommodation was hired in some of the best provincial prisons, as at Wakefield, Leicester, and else- where. Few facilities existed for carrying out the second stage, but they were speedily improvised. Although the hulks at home had been condemned, convict establish- ments in which these floating prisons still formed the principal*~~

~~*part were organized at Bermuda and Gibraltar. Neither of these, it may be stated at once, was a con- Spicuous success ; they were too remote for effective super- vision; and, although they lingered on for some years, they were finally condemned. The chief efforts of the authorities were directed to the formation of public works prisons at home, and here the most satisfactory results bal soon obtained. The construction of a harbour of reluge at Portland had been recommended in 1845 sn*~~

~~*1847 an Act was passed to facilitate the purchase of land*~~

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~~*there, and a sum of money taken up in the estimates for the erection of a prison, which was commenced next year. At another point Dartmoor, a prison already, stood avail- able, although it had not been occupied since the last war, when ten thousand French and American prisoners had been incarcerated in it. A little reconstruction made Dartmoor into a modern jail, and in the waste lands around there was ample labour for any number of convict hands. Dartmoor was opened in 1850; two years later a convict prison was established at Portsmouth in con- nexion with the dockyard, and another of the same class at Chatham in 1856. The works undertaken at these various stations were of national importance, and the results obtained extremely valuable, as will presently be shown. 'The usefulness of these public works prisons and the need for their development soon became apparent. Although the authorities still clung to the principle of transportation, that punishment grew more and more difficult to inflict. The third stage in Sir George Grey's scheme contemplated the enforced emigration of released convicts, whom the discipline of separation and public works was supposed to have purged and purified, and who would have better hopes of entering on a new career of honest industry in a new country than when thrown back among vicious associations at home. The theory was good, the practice difficult, No colony would accept these ticket- of-leave men as a gift. Van Diemen's Land, hither- to submissive, rebelled, and positively refused to receive them, even though this denial cut off the supply of labour, now urgently needed. Other colonies were no less resolute in their opposition, The appearance of a convict ship at the Cape of Good Hope nearly produced a revolt. Athough Earl Grey addressed a circular to*~~

~~all colonial Governments, offering them the questionable boon of trans-portation, only one, the comparatively new colony of Western Australia, responded in the affirmative. But this single receptacle could not absorb a tithe of the whole number of convicts awaiting exile. It became necessary therefore to find some other means for the disposal of those so rapidly accumulating at home. Accordingly, in 1853 the first Penal Servitude Act was passed, substitut- ing certain shorter sentences of penal servitude for trans- portation. It was only just to abbreviate the terms; under the old sentence the transportee knew that if well conducted he would spend the greater part of it in the comparative freedom of exile. But, although sentences were shortened, it was not thought safe to surrender all control over the released convict ; and he was only granted a ticket-of-leave for the unexpired portion of his original sentence. But no effective supervision was maintained over these convicts at large. They speedily relapsed into crime; their numbers, as the years passed, became so great, and their depredations so serious, especially in garotte robberies, that a cry of indignation, led by general alarm, was raised against the system which exposed society to such dangers, 'There was a vague desire to return to transportation—to rid the country once more, by removal to far-off points, of the criminals who preyed uponit. The usual panacea for all public grievances was presently tried, and the system with which Sir Joshua Jebb's name had come to be identified was arraigned before a select com- mittee of the House of Commons in 1863.~~

~~Before reviewing the report of this committee, it will be well to retrace our steps and examine the phases through which prison discipline had passed since 1836. We left this, which embraces the preliminary stages of secondary punishment, at a date when public attention was very generally drawn to it. The true object of penal treatment had begun to be understood, and keen controversy had arisen as to the best methods for securing it. This~~

~~object, broadly stated, was to compass the reformation of the convicted offender and at the same time deter others from crime. The chief experiments in this direction had been made in the United States, where two remarkable systems of penal discipline had for some time been in operation.~~

~~*Each had its warm supporters and friends. One had originated with the Quakers of Pennsylvania, who, as far back as 1786, had abolished capital punishment and all other purely personal penalties, and had subjected all offenders instead to solitary confinement without occupa- tion for mind or body. This, as developed in the years following, became the purely solitary system, and was the first of the two methods mentioned above. The idea, although not absolutely new, having been already accepted in the United Kingdom both in the Gloucester penitentiary and the Glasgow bridewell, was hailed with enthusiasm as a solution of all difficulties of prison treatment. Many other States in the Union followed the lead of Pennsyl- vania. That of New York built the great Auburn peni- tentiary in 1816 to carry out the new principles. There every prisoner was kept continuously in complete isolation. He saw no one, spoke to no one,.and did no work. But within a short period very deplorable results began to show themselves at Auburn. Many prisoners became insane ; health was impaired, and life greatly endangered. Mr Crawfurd, whose mission to the United States has been already referred to, was in favour of solitary confinement, but he could not deny that several cases of suicide followed this isolation. Some relaxation of the disastrous severity seemed desirable, and out of this grew the second great system, which was presently introduced at Auburn, and afterwards at the no less renowned prison of Sing Sing. It was called the silent system. While the prisoners were still separated at night or meals, they were suffered to labour in association, but under a rule of silence ruth- lessly and rigorously maintained. The latter, entrusted to irresponsible subordinates, degenerated into a despotism which brought the system into great discredit. All discipline officers were permitted to wield the whip sum- marily and without the slightest check. 'The quantity of punishment," says Mr Crawfurd, "' is entirely dependent on the will of the overseers, against whose acts there is no appeal." Under such a system the most frightful excesses were possible, and, many cases of brutal cruelty were laid bare. Reviewing the merits and demerits of each system, Mr Crawfurd gave in his adhesion to that of unvarying solitude as pursued in the Eastern Penitentiary in Penn- sylvania. "I have no hesitation in declaring my con- viction," he says, " that its discipline is a safe and efficacious mode of prison management"; of the opposite system, that of Auburn, he reports that, notwithstanding the order and regularity with which its discipline was enforced, " its effects were greatly overrated."*~~

~~*Mr Crawfurd came back from the United States an ardent champion of the solitary system. To use his own words, ‘“‘so greatly does increasing experience prove the importance of solitude in the management of prisons that I could not, if circumstances admitted, too strongly ad- vocate its application in Great Britain, for every class of offenders as well as for persons before trial, under modifica- tions which would divest seclusion of its harshest character.” He saw great difficulties in making this the universal rule, chief among which was the enormous expense of providing suitable prisons. Some niodification of the rule of unbroken solitude would be inevitable ; but he strongly urged its adoption for certain classes, and he was equally convinced of the imperative necessity for giving every prisoner a separate sleeping cell. It is clear that the Government endorsed Mr Crawfurd’s views. Where it was possible they gave effect to them at once.*~~

~~*with its spacious solitary cells, the rule of seclusion was more and more strictly enforced under the supervision of a reverend governor, also a warm partisan of the system. Ere long permissive legislation strove to disseminate the new principles. In 1830 Lord John Russell had given it as his opinion that cellular separation was desirable in all prisons. But it was not until 1839 that an Act was passed which laid it down that individuals might be con- fined separately and apart in single cells. Even now the executive did not insist upon the construction of prisons ona new plan. It only set a good example by under- taking the erection of one which should serve as a model for the whole country. In 1840 the first stone of Pen- tonville prison was laid; and, after three years of very considerable outlay, its cells, 520 in number, were occupied on the solitary, or more exactly the separate, system, —the latter being somewhat less rigorous and irksome in its restraints. To the credit of many local jurisdictions, they speedily followed the lead of the central authority. Within half a dozen years no less than fifty-four new prisons were built on the Pentonville plan, which now began to serve generally as a “model” for imitation, not in England alone, but all over the world. That able administrator Sir Joshua Jebb, who presided over its*~~

~~*erection, may fairly claim indeed to be the author and originator of modern prison architecture.*~~

~~*Other jurisdictions were less prompt to recognize their responsibilities, the city of London among the number. They were satisfied with small makeshifts and modifica- tions, without entering upon that complete and radical reconstruction which could alone meet the case. From this inertness there followed a lamentable want of uni- formity in the administration of legal penalties. Crimi- nals suffered niore or less punishment according to the locality in which they were incarcerated. Dietaries differed—here too high, there too low. The amount of exercise allowed varied greatly; there was no universal rule as to employment. In some prisons hard labour was insisted upon, and embraced treadwheels or the newly invented cranks; in others it was industrial, devoted to manufactures ; while in some it did not exist at all. The cells inhabited by prisoners (and separate cellular con- finement was now very general) were of different dimen- sions,—variously lighted, warmed, and ventilated. The time spent in these cells was not invariably the same, and as yet no authoritative decision had been made between the solitary and silent systems. The first-named had been tried at Pentonville, but the period for which it was deemed possible had been greatly reduced. The duration had been at first fixed at eighteen months, but it was in- contestably proved that the prisoners' minds had become enfeebled by this long isolation, and the period was limited to nine months. In many jurisdictions, however, the silent system, or that of associated labour in silence, was still preferred ; and there might be prisons within a short distance of each other at which two entirely different systems of discipline were in force. In 1849 Mr Charles Pearson, M.P., moved for a select committee to report upon the best means of securing some uniform system which should be at once punitive, reformatory, and self- supporting. He urged that all existing plans were ineffi- cacious, and he advocated a new scheme by which the labour of all prisoners should be applied to agriculture in district prisons. The result of a fuil inquiry was the reiteration of views already accepted in theory, but not yet generally adopted in practice. The comnuittee re- comniended separation, so long as it was conducted under proper safeguards ; it animadverted upon the great variety which still existed in prison discipline and the*~~

~~At Millbank, | construction of jails and strongly urged the legislature to~~

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~~entrust full powers to some central authority who would exact adherence to the rules laid down. Thirteen more years elapsed and still no such steps had been taken. A new committee sat in 1863, and in its report again re- marked, and in no measured terms, upon the many and wide differences that still existed in the jails of Great Britain as regards construction, diet, labour, and general discipline, 'leading to an inequality, uncertainty, and inefficiency of punishment productive of the most pre- judicial results." Even yet separation was not univer- sal; labour, dietaries, education— everything varied still. Matters could only be mended by the exercise of legisla- tive authority, and this came in the Prison Act of 1865, an Act which consolidated all previous statutes on the subject of prison discipline, many of its provisions being still in force. It promulgated minute and precise regula- tions on every item of prison management, and backed them up with pains and penalties that ought to have ensured attention. Yet the years passed and uniformity was still far from secured; it was impossible, indeed, while prison administration was still left to a number of local authorities, no two of which were often of the same mind. Great varieties of practice still obtained. The number of feet ascended at hard labour on the treadwheel differed in different districts ; each jurisdiction still pleased itself as to dietaries; and it was still, as of old, a mere accident of locality whether imprisonment was light or heavy. The legislature had tried its best, but its best had failed. It had exercised some supervision through its inspectors, had forbidden cells to be used until duly certi- fied as fit, had threatened to withhold exchequer contri- butions from prisons of which unfavourable reports were re- ceived. Such penalties had exercised no sufficient terrors. It began to be understood, moreover, that the prisons under local jurisdictions were not always conveniently and economically situated. In one district there might be too many, in another not enough; one prison was empty and its neighbour full to overflowing; yet there was no power to make transfers and equalize accommodation. All this produced excessive, even wasteful, expenditure. Nor was its incidence, under altered~~

~~*conditions, exactly fair. Crime, with the many facilities offered for rapid locomotion to those who committed it, had ceased to be merely local, and the whole state rather than individual communities ought to be taxed; prison charges should be borne by the exchequer, and not by local rates. These considerations gained strength, and led at length to the introduction of the Prison Bill which became law in 1877, and which is the last Act passed for the regulation of prisons. By the Act of 1877 the control of all jails was vested in a body of prison commissioners appointed by, and responsible to, the home secretary. These commis- sioners had power to consolidate by closing superfluous prisons, to establish one system of discipline, and gene- rally by watchful supervision, aided by the experience of specialists, to maintain that much desired uniformity which had been so long and unsuccessfully sought. At the same time the co-operation of the local magistrates was invited so far as advice and assistance were concerned ; but all real power and control had passed from their hands into that of the commissioners of prisons. The system established by the Act of 1877 is that now in force, and we shall recur to it directly, in recapitulating the whole of our present method of secondary punishment.*~~

~~*_ Meanwhile considerable changes had been introduced into penal servitude, the punishment reserved for the gravest offences. We left this branch of the subject at a date (1863) when its efficiency was about to be tested by a parliamentary inquiry. The verdict given was in the main satisfactory; but doubts were expressed as to the*~~

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~~*severity of the discipline inflicted, the principal features of which were moderate labour, ample diet, and substantial gratuities. The first was far less than the work free men did for a livelihood, the second larger, the third exces- sive, so that convicts often left prison with thirty, forty, even eighty pounds in their pockets. Penal servitude, to use the words of the lord chief justice, Sir Alexander Cockburn, one of the members of the committee, " was hardly calculated to produce on the mind of the criminal that salutary dread of the recurrence of the punishment which may be the means of deterring him, and through his example others, from the commission of crime." The chief recommendations put forward to mend the system*~~

~~*comprised lengthening of all sentences, a diminution in the dietaries, the abolition of large gratuities, and, speak- ing broadly, a general tightening of the reins. The most notable change, however, was in regard to labour, the quantity and value of which was to be regulated in future by the so-called "mark system." This plan had originated with Captain Maconochie, at one time superintendent in Norfolk Island, who had recommended that the punish- ment inflicted upon criminals should be measured, not by time, but by the amount of labour actually performed. In support of his theory he devised an ingenious system of recording the convicts' daily industry by marks, which on reaching a given total would entitle them to their release. The mark system had already been tried with good results in Ireland, where the Irish system, as it was called, introduced by Sir Walter Crofton had attracted widespread attention from the extraordinary success which seemed to follow it. There had been a very marked diminution in crime, attributable it was supposed to the system, which was in almost all respects the same as the English, although the Irish authorities had invented an "intermediate stage" in which convicts worked in a state of semi-freedom, and thus practised the self-reliance which in many superinduced reform. As a matter of fact the diminution in crime was traceable to general causes, such as a general exodus by emigration, the introduction of a poor law, and an increase in the facilities for earning an honest livelihood. It may be added here that, judged by later experience, the Irish system has evinced no transcendent merits, and it is now (1885) moribund. But we owe something to the Irish practice which first popularized the idea of maintaining a strict supervision over convicts in a state of conditional release, and it recon- ciled us to a system which was long wrongfully stigmatized as espionage. The mark system, as recommended by the committee of 1863, and as subsequently introduced, had, however, little in common with either Maconochie's or the Trish plan. It was similar in principle, and that was all. According to the committee every convict should have it in his power to earn a remission—in other words, to shorten his sentence by his industry. This industry was to be measured by marks, earned by hard labour at the public works, after a short probational term of close "separate" confinement. But the remission gained did not mean absolute release. All males were to be sent, during the latter part of their sentences, "without disguise to a thinly peopled colony," to work out their time and their own rehabilitation. The committee, it will be seen, still clung to the old theory of*~~

~~*transportation, and this in spite of the lively protests of some of its members. The one outlet remaining, however, that of Western Australia, was soon afterwards (1867) closed to convict emigrants ; and this part of the committee's recommendations became a dead letter. Not so the mark system, or the plan of earning remission by steady industry. This was carried out on a broad and intelligent basis by officials prompt to avail themselves of the advautages it offered ; a readiness*~~

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~~*to move with the times, to adopt suggestions tending towards improvement, and generally to benefit by external advice and experience, has always characterized convict prison administration in recent years. Remedies have been at once applied where flaws were found. Thus in 1877-78 efforts were made to minimize contamination by segrevating the worst criminals, and restricting conversa- tion at exercise. Again, the recommendation of the latest commission of inquiry, that of 1878-79, tending in the same direction was immediately adopted, and a special class was fornied in 1880 in which all convicts "not versed in crime," first offenders or at least comparatively innocent men, are now kept apart from the older and more hardened criminals. While these concessions have been cheerfully made, the stern necessities of a penal system have been rigorously maintained. The committee last quoted gave it as their opinion that " penal servitude as at present administered is on the whole satisfactory ; it is effective as a punishment and free from serious abuses ; a sentence of penal servitude is now generally an object of dread to the criminal population." This change is ascribed to the various improvements in- troduced —" longer sentences, spare diet, and generally a more strict enforcement of work and discipline."*~~

~~*Having thus traced the history of secondary punish- ments and prison discipline in England from the earliest times to the present day, it will be well to describe briefly the system of penal repression as now actually in force. This will best be effected by following those who break the law through all stages from that of arrest, through conviction, to release, conditional or complete. After a short detention in a police cell—places of durance which still need improvement — an offender, unless disposed of*~~

~~summarily, passes into one of Her Majesty's local prisons, there to await his trial at sessions or assizes. The period thus spent in the provinces will never exceed three months ; in London, with the frequent sittings at Clerkenwell and of the Central Criminal Court, it is seldom more than one month. While awaiting trial the prisoner may wear his own clothes, provide his own food, see and communicate with his friends and legal adviser, so as to prepare fully for his defence. His fate after conviction depends on his sentence. If this be imprisonment, so called to distin- guish it from penal servitude, although both mean depriva- tion of liberty and are closely akin, it is undergone in one of the "local" prisons—the prisons till 1878 under local jurisdiction, but now entirely controlled by the state through the home secretary and the commissioners of prisons. The régime undergone is cellular ; able-bodied prisoners are kept in strict separation for at least one month, and during that time subjected to first-class hard labour, which is purely penal in character; and nowa-~~

~~days, under the uniform system introduced by the commis.,~~

~~sioners, consists of the treadwheel, in which each indivi- dual ascends 8640 feet in a day's work, or six hours' work on cranks or hard labour machines is exacted where there are no treadwheels; and the labour, whether of treadwheel or crank, is generally utilized as the motive power for grinding corn or pumping water for prison use. Beating oakum with a heavy beater and mat-making with heavy implements are also considered first-class hard labour. A system of progressive stages not unlike the mark system has been adopted in the local prisons, and the prisoner's progress through each depends on his own industry and good conduct. During the first month he sleeps on a plank bed, a wooden frame raised from the floor, with bedding but without mattress. When he has earned the proper number of marks, which at the earliest cannot be until one month has elapsed, he passes into the second stage, and is allowed better diet, and a mattress twice~~

~~a week. The third stage, at the end of the third month, gives him further privileges as regards diet and bed. The fourth stage concedes to the~~

~~prisoner a mattress every night, and the privilege, if well conducted, to communi- cate by letter or through visits with his friends outside. These stages are applicable to females except as regards the plank bed; while youths under sixteen and old men above sixty are also allowed mattresses. A small gratuity may be earned during the second and three following stages, amounting in the aggregate to ten shillings. The labour, too, may be industrial, and include instruction in tailoring, shoemaking, basket-making, book-binding, printing, and many more handicrafts. Throughout the sentence the prisoner has the advantage of religious and moral instruction ; he attends divine service regularly and according to his creed, is visited by the chaplain, and receives educational assistance according to his needs. His physical welfare is watched over by competent medi- cal men ; close attention is paid to the sanitary condition of prisons; strict rules govern the size of the cells, with their lighting, warming, and ventilation. Dietaries are everywhere the same; they are calculated with great nicety according to the terms of durance, and afford variety and ample nutrition without running into excess. In a word, as regards discipline, labour, treatment, exactly the same system obtains throughout the United Kingdom from Bodmin to the far north, from Cork to Belfast. Where the sentence passes beyond two years it ceases to be styled imprisonment and becomes penal servitude, which may be inflicted for any period from five years to life. The prisoner becomes a convict, and undergoes his penalty in one or more of the convict prisons. These are entirely under state management. A sentence of penal servitude, as now administered, consists of three distinct periods or stages : —(1) that of probation endured in separate confinement at a so-called "close" prison ; (2) a period of labour in association at a public works prison; and (3) conditional release for the unexpired portion of the sentence upon licence or ticket-of-leave. (1) In the first stage, which is limited to nine months for reasons already given, the convict passes his whole time in his cell apart from other prisoners, engaged at some industrial employment. He exercises and goes to chapel daily in the society of others, but holds no com- munication with them; his only intercourse with his fellow creatures is when he is visited by the governor, chaplain, schoolmaster, or trade instructor. This period of almost unbroken solitude, when the mind, thrown in on itself, is supposed to be peculiarly open to lessons of ad- monition and warning, is one of severely penal character, and its duration has therefore been wisely limited. It is deemed, moreover, that perpetual seclusion in a~~

cell is an artificial state of existence, that its infliction for long terms would altogether unfit an offender for a return to the ordinary conditions of daily life. (2) The second is a longer stage, and endures for the whole or a greater part of the remainder of the sentence,—its duration being governed by the power a convict holds in his own hands to earn a remission. It is passed at a public works prison,—either at Borstal, Chatham, Chattenden, Ports- mouth, Portland, Dartmoor, or (for the present) Worm- wood Scrubs. While cellular separation, except at work, at prayers, or exercise, is strictly maintained, labour is in association under the close and constant supervision of officials. Intercommunication no doubt takes place ; men working together in qnarry, brickfield, or barrow-run, and out of earshot of their guardians, may and do converse at times. But the work is too arduous to allow of long and desultory conversation ; while the chance of mutual con- tamination is now minimized by the separation of the less

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hardened from the old offenders in the manner already pointed out. There is no reason to suppose that any

great evils result from this association, and without it the-

execution of the many important national public works which now attest its value would have been impossible. Among these may be mentioned the following :—~the quarrying of stone for the great Portland breakwater, which is nearly 2 miles in length, and between 50 and 60 feet deep in the sea, with the defensive works on the Verne, batteries, casemates, and barracks intended to render the island of Portland impregnable, and the enlarge ment and extension of the dockyards at Chatham and Portsmouth; at the former three grand basins 20, 21, and 28 acres respectively in extent have been completed on the marshy lands and reaches of the Medway, and at the latter extensive operations of the same kind have long been in progress. At Borstal a line of forts intended to protect Chatham on the southern and western side are being erected by convicts; they are also building maga- zines at Chattenden on the left bank of the Medway ; they will soon be at work at Dover on the vast improve- nents for the enlargement of the harbour and port. Be- sides this, convict labour has been usefully employed in the erection of prison buildings at new points or

~~*in exten- sion of those at the old; at Borstal cells for five hundred, and at Wormwood Scrubs for ten hundred and fifty-two have been built, with chapel, quarters, hospitals, and so forth ; large additions have been made to the prisons of Woking, Pentonville, Chatham, Portsmouth, Dartmoor, Parkhurst, and Brixton. In all cases the bricks have been made, the stone quarried and dressed, the timber sawn, the iron cast, forged, and wrought by the prisoners ; only one article was bought ready made, and that was the locks. The great merit of this system is the skill acquired in handicrafts by so many otherwise idle and useless hands. Convict mechanics are rarely found ready made. A return dated July 1882 shows that 82 per cent. of the total number employed at trades had learnt them in prison. These results are no doubt greatly aided by the judicious stimulus given to the highest effort by the mark system. The chief objection to enforced labour has been the difficulty in ensuring this; but the convict nowadays eagerly tries his best, because only thus can he win privi- leges while in prison and an earlier release from it. Every day's work is gauged, and marks recorded according to its value ; upon the total earned depend his passage through the stages or classes which regulate his diet and general treatment, and more especially his interviews and com- munications with his relations and friends. Yet more; steady willing labour continuously performed will earn a remission of a fourth of the sentence, less the time spent in separate confinement. It must be borne in mind that the marks thus earned may be forfeited at any time by misconduct, but only to this extent does conduct affect remission, and the latter is really directly dependent upon industry. The full remission ina five years' sentence is one year and twenty-three days; in seven years, one year two hundred and seventy-three days; in fourteen, three years one hundred and eighty-one days; in twenty, four years eighty-six days. "' Lifers" cannot claim any remis- sion, but their cases are brought forward at the end of twenty years, and then considered on their merits. (3) Having earned his remission, the convict enters upon the third stage of his punishment. He is released, but only conditionally, on licence or ticket-of-leave. This permis- sion to be at large may easily be forfeited. Stringent conditions are endorsed upon the licence, and well known to every licence holder. He has to produce the licence when called upon ; he must not break the law, nor asso- ciate with notoriously bad characters, nor lead an idle*~~

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~~*dissolute life, without visible means of obtaining an 'honest livelihood. The observance of these rules is enforced by the police, to whom Acts known as the Prevention of Crimes Acts give large powers. The licence holder is ordered to report himself at intervals to the police, to whom also he must notify any change in his place of residence; he must take care that he is not found in any suspicious locality under suspicious circumstances. A breach of the regulations may entail the forfeiture of the licence, with imprisonment and the obligation to return to a convict prison to serve out the unexpired term of penal servitude. Police supervision by special sentence of a court may be extended in the case of habitual criminals to longer periods than that of the original sentence. An elaborate machinery also exists for the registration of these habitual criminals, and voluminous official records are regularly published and circulated giving detailed in- formation, distinctive marks, and previous history, to enable the police in all parts of the country to identify habitual criminals. A system so rigorous towards offenders who have already expiated their crimes may be deemed to bear heavily on any who have repented of their evil ways and are anxious to turn over a new leaf. To be ever sub- jected to the intrusive watchfulness of the myrmidons of the law must often increase the licence holder's difficulty of leading an honest life. The struggle is often severe ; employers of labour are not too ready to accept the services of "jail birds," and free workmen often resent the admission of an old convict amongst their number. Private charity has happily come forward to diminish or remove this hardship, and many societies have been called into existence for the special purpose of assisting dis- charged prisoners. The first of these, now honoured with the title of "' Royal," was organized in 1856, and had assisted, up to 1879, some eleven thousand prisoners. This society labours chiefly in the metropolis; it is sup- ported by private subscriptions, but it has control also over the gratuities of the licensees who accept its aid. The prisoners on release are first examined at the society's office as to their prospects and wishes; they are given some pocket money out of their own gratuities ; and their "liberty clothing," a present from the prison, is changed for more suitable clothes. They are then placed in respectable lodging-houses until in due course employ- ment is obtained for them, after which the society under- takes the reporting to the police, and by its own agents exercises a watchful care over its protegés.*~~

~~There are now upwards of twenty societies established in various parts of the country, and the number is rapidly increasing.~~

~~The foregoing system is applicable more particularly to adult males; but for females the rules are much the same as regards imprisonment and penal servitude. But the remission a female convict can earn is greater, and amounts to a third of the sentence, less the separate con- finement. Moreover, female convicts whose conduct and character warrant a hope of complete amendment are admitted into "refuges" nine months before the date of their conditional release on leave. There are two of these refuges, which are more like "homes" than prisons,—the Westminster Memorial Refuge at Streatham for Protest- ants, and the East End House, Finchley, for Roman Catholics. The training of these refuges is calculated to fit the licensee for more complete freedom, and many of the women who go from them into the world do well. The aid societies also help effectually in obtaining situations, often very good ones, for the released female convicts.~~

~~Juvenile criminals are now subjected to special 'treat- ment. Young offenders, although liable to be treated as adults by the court before which they are brought, are generally dealt with summarily under various powers,~~

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~~exercised, in some cases in England and Ireland, with the consent of the accused, or, in the case of a child, of the parent or guardian. The discretionary powers of summary courts are wide, ranging in many cases from dismissal (although the charge is proved) to payment of damages and costs, or fine, or limited imprisonment, and in the case of a male child with private whipping either in addition to or instead of any other punishment; and whipping in addi- tion to other punishment may be imposed by all courts on the trial of male offenders under sixteen for the majority of offences. For the very important power of relegating juvenile offenders to reformatory schools and vagrant and neglected children to industrial schools see the separate article, REFORMATORY AND INDUSTRIAL SCHOOLS (g.v.).~~

~~Juvenile offenders and children while detained in re- formatory: or industrial schools are not subject to prison discipline, but the rules for the~~

~~*management and dis- cipline of the schools and the detention in them may be enforced by imprisonment. Very beneficial results as re- gards the diminution of crimes are undoubtedly obtained by various institutions, both public and private. The possible criminal is removed from evil associations while still amenable to better influences; and while still malle- able he is taught to labour honestly with his hands. Prison statistics, more especially of the convict prisons, show a marked decrease in the number of youthful offenders in durance, and it is reasonble to suppose that from the causes above mentioned there is a gradual stoppage in the supply. In the ten years between 1871 and 1881 the number in custody of ages between fifteen to twenty-four fell from 2948 to 1957, and this although the general population had increased four millions. The same reduction has shown itself as regards the number of the same ages in local prisons; and it is clear that the improvement is general.*~~

~~*Uniformity in prison discipline is now general through—*~~

~~*out the United Kingdom. The Prisons Act of 1877 also extended to Scotland and Ireland, and in both those countries the system of imprisonment for terms of two years and under has been assimilated to that in force in England. As regards penal servitude, convicts pass through the same stages or periods; but Scottish convicts, after undergoing their separate confinement in the general prison at Perth, have been drafted into the English public works prisons. Of late there has been a movement towards securing some of the advantages of convict labour for works north of the Tweed, and it is probable that harbour works will soon be undertaken at one or more points on the Scottish coast. For Ireland, the progressive periods are passed in that country,—separate confinement in Mountjoy prison, public works at Spike Island. The administration of prisons has also been assimilated in Great Britain and Ireland, and has been centralized in each capital under the authority of the state. Boards of prison commissioners in London, Edinburgh, and Dublin, and acting under the immediate orders of the executive, control all local prison affairs, including finance, victualling, clothing, the appoint- ment of officers of all grades, and the discipline of prisoners. The English convicts are still managed by an independent board called the directors of convict prisons, but both commissioners and directors have the same chairman and chief, while the*~~

~~staff of clerks and accountants and store- keepers—in a word, the whole administrative machinery— is identical for both. The welfare of the inmates of all prisons is not, however, left entirely at the discretion of official managers. The local magistracy have still a certain jurisdiction in the local prisons ; through elected re- presentatives styled " visiting committees," they constantly inspect the prisons and exercise supervision over their inmates. They have retained their power to punish and~~

~~generally deal with all cases of aggravated misconduct. The functions exercised by these visiting committees might seem to constitute a dual authority in prison management. But so far the two powers have worked harmoniously and well. Since 1880 unofficial and unpaid visitors have also been appointed to undertake an inde- pendent inspection of the convict prisons. This practice was introduced, not on account of any administrative failure in the system, but as a safeguard against possible abuses, and to strengthen public confidence. These visitors can give no orders, but they are empowered to make full inquiries into the state of the prisoners and the condition and discipline of the prison.~~

~~The sum voted in 1883-84 for convict establishments in England was £414,463, but this includes £18,100 for expenditure in colonies where a few imperial convicts still survive, and grants in aid of colonial magistrates, police, and jails. The vote for local prisons in the same year was £481,852. The returns from male prisoners' labour in the convict prisons in 1883-84 amounted to £248,995, 11s. 3d. Of this total, £121,956, 5s. 2d. represented the estimated value, by measurement, of labour on public works, and £42,159, 8s. 4d. more the value of prison buildings erected, while the earnings in manufactures amounted to £37,581, 8s. 8d. The balance was the farm and the work performed for the prisons. The female convicts' labour amounted in the same year to £9933, 9s. 5d., half of which was in washing and manufactures. In the local prisons in England manufactures brought in £39,790, 3s. 11d. The value of the labour on prison buildings was £24,510, 4s. 2d., and that in the service of the prisons £59,562, Os. 8d. The prison vote in Scotland for 1883-84 was £110,170, the returns from earnings £6000; in Ireland the vote was £145,689 and the earnings £4000. The~~

~~above terms of expenditure include all outlay—staff (superior and sub-ordinate), maintenance, travelling expenses, «ce.~~

~~Most civilized nations have considered the question of prison discipline from time to time, and have endeavoured, but with varying degrees of earnestness, to conform to accepted modern ideas as to the proper method of dealing with criminals, The subject has also been dealt with at two international congresscs, one of which assembled in London in 1873, and the other at Stockholm in 1878, wheu views were exchanged and matters of much interest discussed. It is proposed now to supplement the foregoing account of British prison discipline by a brief survey of the prison systems in force in the British dependencies and in various other countries.~~

~~British Colonies and India.—The prison systems of most of the British colonies have been assimilated as far as possible to that in force in the mother country. In all the larger colonies there are convict prisons and local prisous, and in all cellular separation for the whole or part of the sentence is the rule. This is the case in the Australian colonies, in Tasmania, and in New Zealand.~~

~~The prison system of Canada is advanced and enlightened. The numbers incarcerated are not great, and crime is not very prevalent. Six establishments suffice for the Dominion—Kingston, St Vincent de Paul (for the province of Quebec), Halifax, Manitoba, British Columbia, and Dorchester. The last-named has replaced that at St John's. All these are cellular prisons; and they receive prisoners of all categories, for trial and after sentence whatever the term. Females have a special quarter in each prison. Isolation is strictly carried out for all short sentences ; but for tle longer labour is in association. A great deal of good work is turned out in the Canadian prisons. All the rolling stock for railways in Government hands, iron-work, clothing, and boots and shoes are produced at the varions prisons, but not to an extent to allow all prisoners to be instructed in trades. Most of the prisons possess land in their vicinity which is tilled by the prisoners. There are no prisoners' aid societies as yet in Canada, although their formation has been earnestly recom- mended.~~

~~For the Cape of Good Hope there is a good prison at Cape Town. In Ceylon, since 1867, cellular separation has been enforced for the whole~~

~~period of short sentences, and the first six months of long sentences. In Jamaica there are several kinds of prisons, but only the principal, the general penitentiary, has any number of separate sleeping cells.~~

~~In India the jails number upwards of 230, with an indefinite number of small lock-ups. There is also the large convict depét at Port Blair in the Andaman Islands, Very few of the Indian jails~~

~~are entirely cellular ; two in particular may be mentioned, that of Utakamand and that of Hazaribagh, both of which are for European convicts. 'The remainder," says Dr Mouatt, formerly inspector general of prisons in Bengal, "are built on every conceivable plan ; a large number of them are miserable mud structures, which are constantly being washed away by heavy rain, and as constantly pro- vide work for the prisoners in repairing them." A few of them are radiating, and nearly all provide for the separation by night of the male and female prisoners ; and there is a certain rough classifica — tion according to sentence. All work is in association, except when prisoners are kept in cells for misconduct. The proportion of cell accommodation, when Dr Mouatt wrote, was barely 10 per cent. Work is mostly intramural, and generally remuncrative and in- dustrial. Prisoners are occasionally employed out of doors in gangs upon canalsand other public works. The ironing of prisoners where prisons are insecure still prevails as a safeguard against escape. Prison punishments are generally severe, and include flogging, fetters, penal labour, and complete isolation. The whole question of prison discipline in India is strictly subordinated to financial considerations, and the svstem in consequence lacks uniformity and completeness.~~

~~Austria.—It was not until 1867 that the Austrian Government declared in favour of a system of cellular imprisonment. Tull then all prisoners had been kept in association, but at the date above mentioned a recommendation that separation should be the rule was made to the reichsrath and approved. Owing to the expense of reconstructing or converting prisons, the principle could not be generally adopted ; moreover, the Austrian authorities were not in favour of continuous isolation. Hence the practice adopted was a combination of the two methods. Short~~

~~imprisonments might be endured entirely in separate cells; every prisoner might pass the first part of a long term in a cell, but the isolation was not to exceed eight months, the reniainder of the sentence to be undergone in association or collectively, due regard being had to the classifica- tion of the prisoners brought together. This classification is based upon the individual's age, education, state of mind, and former life, and the nature of his crime. The progress made in the erection of cellular prisons has not been very rapid. Although the total number of prisoners in Austria-Hungary exceeds 17,000, up to the end of 1879 only 1050 cells had been provided, viz., at Gratz 252, at Stein 348, at Pilsen 387, and at Karthaus 68, while two small prisons for trial prisoners have also been built at Cilli and Reichen- berg. These new prisons are, however, very complete and perfect ; they have all modern appliances, chapels, hospitals, workshops, and baths ; the cells are spacious, and well ventilated, lighted, and warmed. Two days of cellular imprisonment, after three months have elapsed, count as three in association. There is no distinctly penal labour. In separation prisoners follow such trades as shoe- making, tailoring, weaving, button-making, wood-carving ; women are employed in embroidery, spinning, quill-pen making, and knitting. In association the principal employments are carpenter- Ing, coopering, smith's work, brick-making ; and a number of the more trustworthy prisoners have helped to construct railways and lay down roads. Asa rule the prisoners' labour is let out to con- tractors ; this plan is preferred as relieving the state of all risks, while officials are more at liberty to attend to the pure disciplinary treatment of the prisoners. As a rule every prisoner who enters ignorant of a trade is taught one in prison. Prisoners can earn substantial wages ; where contractors are employed, the prisoners receive half what is paid over, after all costs have been deducted. Half of the earnings may be spent in the prison canteen in the purchase of luxuries, including beer and tobacco, or in the support of a prisoner's family, or in the purchase of clothing to be worn on discharge. 'There is only one " Liberated Prisoner Aid Society," which is established at Vienna, and which does good service in supporting prisoners until they find occupation, and providing them with money, clothes, and tools. Speaking generally, there are three classes of prisons 'in Austria-Hungary, viz., for minor offences, and for prisoners sentenced to terms less than one year and to terms of one year and upwards respectively. The treatment of the incarcerated is humane : their diet is sufficient ; they have good beds and~~

~~bed- ding ; the sick are cared for in hospitals; the labour of the able- bodied is not excessive, although supposed to extend over ten hours daily. Religious services are provided for, and non-Roman-Catholic prisoners may be seen by ministers of their own form of faith. Prison administration is under the minister of justice, who dele- gates his powers to an inspector general of prisons. Commissions of inspection are appointed to visit all the cellular prisons monthly, and there are also local boards of management and control.~~

~~, Belgiwm.—Prison discipline has perhaps received as close atten- tion in Belgium as anywhere in the world. In 1835, when the great movement towards prison reform was in progress, Belgium first adopted the cellular system experimentally by constructing thirty- two cells in connexion with the old prison at Ghent. After a trial of nine years a verdict was passed in favour of cellular separa- tion and it was authoritatively adopted in 1844. Progress was steady if not rapid; by degrees many cellular prisons were built ;~~

~~PRISON DWISCIPLene~~

~~and up to the present date (1885) twenty-four are in existence. A model prison for 600 on the same plan is in process of construction at Brussels, and three others, smaller, will soon be finished. Bel- gium has unhesitatingly accepted the rule of absolute separation as regards all prisoners, whatever the duration of their sentences. That solitude which disastrous results in England have strictly limited to either nine months, or, under certain modifications, to two years, may be enforced in Belgian prisons for at least ten years. At the end of that period a prisoner may claim to go into associa- tion, and they are then removed to Ghent, where they work and eat in company but have separate sleeping cells. Separation, again, is not insisted upon with the sickly, or those whose minds appear weak ; while all upon whom cellular imprisonment has failed may aiso in due course be removed to association. But for the rest the separate system is the invariable rule, and it is carried out with careful and unvarying sternness. The prisoner never leaves his cell save for chapel or exercise ; at the former he is in a separate box or compartment; the latter he takes alone in a narrow yard. HIs life, however, is not one of absolute solitude. HIe is~~

~~*visited fre- quently by his warders and schoolmasters and trade instructors ; chaplain, governor, and doctor also break the monotony of his life. According to the Belgian view of the case, he "lives in association with the prison staff," not with his fellow criminals. It is claimed for this system, which aims prinarily at the reformation of indivi- duals, that no evil consequences have as yet been seen to follow from the treatment. Official statistics may be searched in vain for the record of cases of suicide or of mental alienation; neither are abnormally frequent. On the other hand the Belgian authorities insist that the dread of the. punishinent has had a marked effect upon crime, and that there isa diminution in the number of second sentences. " Recidivists," or reconvicted prisoners, are, moreover, subjected to a more rigorous discipline.*~~

~~*There are three classes of prisons in Belgium ;—the maisons darrét, or prisons of detention, for accused persons undergoing examination or awaiting trial; the masons de sireté, or prisons for the infliction of short sentences ; and the matson centrales, which correspond to the English convict prisons. Prisoners awaiting trial, and still innocent in the eyes of the law, are treated with much leniency and consideration. An arrangement peculiar to the French and Belgian prisons is the privilege of the " pistole." A prisoner on payment of a certain charge is conceded better accommodation ; he has a room, not a cell, decently furnished, and may provide his own food, have books, sce his friends, and do no work. Offenders of the better class, and never previously convicted, arc sometimes relegated specially to the pistole by the tribunals ; and the local boards of visitors have also power to transfer prisoncrs to this privileged class. Independent of the pistole the law provides three kinds of penalty—correctional imprisonment, seclusion, and imprisonment with hard labour. But, except the slight differences as regards privileges of letters and visits, the treatment is identical in all three categories. It is correctional for all ; all prisoners are kept in seclusion ; and there is no hard laboury as we understand it. Purely penal labour does not exist in the Belgian prisons. Public works are obviously impossible; and there arc no tread- mills or cranks. The labour is entirely industrial; but its object is rather to reform individuals than to produce profit to the state. With strict cellular confinement the range of prison indus- tries is generally limited to sedentary employment; but, besides weaving, tailoring, shoemaking, book-*~~

~~*binding, and so forth, various handicrafts are practised. The prisoner's labour is partly let out to contractors, partly utilized by the authorities. A portion of the earnings for work done goes to the prisoners; and part of the money may be spent in the purchase of better food or tobacco, where it is permitted, from the canteen. No pains are spared to instruct the prisoners ; those ignorant of any trade are regularly appren- ticed and taught, the idea being to provide every one with a means of livelihood on release. The severity, not to say cruelty, of the strict rule of separation is mitigated as far as possible by the pater- nal solicitude of the authorities. The administrative arrange- ments of the Belgian prisons are nearly perfect. The buildings are spacious—the halls lofty, light, and airy; the cells are of ample dimensions, carefully ventilated, well-lighted, and well-warmed. An abundant water supply assists the sanitary services ; dietaries are sufficient and well-chosen, soup with plenty of vegetables forming an especial feature in them. School instruction is available for all. There are well-supplied libraries. The hospitals are clean and spacious, fitted with every necessary, and the percentage of patients under treatment is usually small. An epidemic of ophthalmia was, however, long present in the reformatory prison of St Hubert. An independent system of visitation is supposed to protect the prisoners from ill usage ; local boards composed of local functionaries exercise constant supervision and control over the prisons in their*~~

~~*'vicinity. The central administr:tion is intelligent ; and the prison*~~

~~*service being esteemed highly hoxourable attracts good men to recruit its ranks. Female prisons are exclusively managed by the nuns of some religious order in the locality. Besides the prisons of punishment for adults, there are two evtablishments in Belgium*~~

~~*lee*~~

~~*PRIiBON DISCIPLINE*~~

~~*which deal exclusively with juvenile crime. These are at St | Hubert in Luxemburg, and at Namur. The first, dating from 1840, is an agricultural colony which receives all youths up to the age of fourteen ; the labour is exclusively in the fields. Young criminals belonging to the towns are sent to Namur, where the work is mechanical but more sedentary. A good education*~~

~~both moral and practical is received at these reformatories, which are more like schools than prisons. There are also philanthropic schools for vag- rants and non-criminal children. At present no societies labour to assist prisoners on release. A complete organization once existed for the purpose, but it was wholly official, and those whom it was supposed to benefit suspected and kept aloof from it. It may be added that, although there is no power in the prisoners' own hands of working out remission by steady industry and good conduct, sen- tences may be abbreviated on these grounds on the recommendation of the prison authorities. All sentences, too, have been shortened since the general introduction of cellular. imprisonment ; as the treatment was more severe, justice demanded a curtailment of the penalties. Capital punishment, although not definitively abolished, is never inflicted, and all sentenced to death pass into prison for life. But after ten years they too are transferred to Ghent for the remainder of their days.~~

~~Brazil.—The present emperor of Brazil has long taken an active interest in prison reform. He has encouraged the prison adminis- tration of his country to introduce a scheme which is in many respects the same as that in force in England. Prisoners, after sentence, are subjected to a period of close cellular confinement enduring eight months; they then pass to another prison, where cellular separation is still enforced, but the daily labour is in associa- tion and insilence. This is styled the reformatory stage ; after that comes the third stage, which is reached by marks gained through industry and good conduct. In this last stage, called the testing stage, prisoners work together ; they may converse, May wear their own clothes, and are under the care and supervision of the most trustworthy of their fellows. They sleep in large dormitories, not in cells, are allowed to cultivate a piece of garden ground on their own account, and a large portion of their earnings is placed to their credit and handed over to them on release.~~

~~Denmark.—The prison system in force in Denmark dates from 1840, previous to which time the arrangements were extremely unsatisfactory. In the early part of the century Danish prisons were in as deplorable condition as any in Europe; after enduring indescribable 'horrors, the worst malefactors passed on to hard labour in the fortresses or in the fleets. But a commission was appointed in 1840 to report, and recommended the~~

~~adoption of the cellular system for all prisoners awaiting trial, and under short- term sentences,—thosé condemned to long imprisonments to be put to hard labour in association. The necessary prisons were con- structed at a eost, within a quarter of a century, of two millions of pounds. There are a large number of small detention prisons, and four principal prisons for the convicted ; one cellular for males at Vridslocsville, and two associated at Horsens and Viborg, one for females combined cellular and associated at Christianshavn. Abont 75 per cent. of the whole are sentenced to separative con- finement in cells ; its infliction is limited to first offenders, youths, or those sentenced to six months and upwards to three years and a half; the associated or aggregate system applies to the reconvicted, and for terms from two years to life. There is no distinctly penal labour in the prisons ; the industrial prevails, and is in the hands of contractors. Prisoners in cells are constantly visited ; religious and secular instruction is imparted ; the dietaries are carefully cal- culated, and the régime generally intelligent and humane.~~

~~A number of aid societies have been established at the seat of the large prisons, which assist prisoners on release who have been dili- gent and well conducted in confinement. Work is found, tools and subsistence given, asin England. It is interesting to note that the first aid society was formed at Copenhagen in 1841 through the exertions of Mrs Fry. Besides the regular prisons, there are three reformatories for juveniles modelled on the French school at Mettray ; they have been founded by private benevolence, but re- ceive aid from the state. Agriculture is the principal employment of the inmates.~~

~~France.—Prisons and their management have not attracted close or continuous attention in France. Dynastic changes, wars, revolu- tions, and intestinal troubles may be pleaded as the excuse. A system based on the principle of individual separation as practised in the United States was on the point of being adopted in France when the legislation to secure it was interrupted by the revolution~~

~~of 1848. Under the empire the question was generally subordinated to more pressing political needs. Cellular imprisonment was, how- ever, adopted partially, but only to alimited extent, for persons await- ing trial. Central~~

~~*prisons in which the prisoners lived and worked in association had been established early in the century, and their use was extended, 'They received all sentenced to the shorter terms. The long-term convicts went to the bagnes, the great convict prisons at the arsenals of Rochefort, Brest, and Toulon; and in 1851, a few years after it had been abandoned by England, transportation |*~~

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~~*to penal colonies was adopted by France. In 1869 Napoleon III. appointed a commission to inquire and report upon the whole question, but its labours were. rudely interrupted by the Franco- German War. Three years later a fresh commission, appointed by the national assembly to discuss parliamentary reform, made a most exhaustive report in 1874. It unhesitatingly recommended cellular confinement, and the principle became law the following year. This system of prison discipline then became applicable to all persons awaiting trial, to those sentenced to any term up to a year and a day, and to those for longer terms provided they asked to be kept separate and apart. It was calculated by the commission first mentioned that there were nearly eight thousand cells already in existence and available, but an additional twenty-one thousand would have to be econstrueted at an outlay of sixty-three millions of francs in order to meet the demands of this new system. A model cell was designed and plans for model prisons, but the expense the change would entail appears to have deterred French authorities, both the central executive and the conseils généraux, from promptly making it. There are not more than ten or a dozen cellular prisons in Franec, and two of them are in Paris—Mazas (for trial prisoners) and La Santé, but the latter is not entirely cellular. The construction of others has been contemplated, but in few cases proceeded with, and many years will probably elapse before any uniformity in penal treatment is established in France. Prison administration is complex in Francc, and there are many kinds of prisons, —a few of them being under the authority of the minister of the interior :—(1) the mazson d'arrét, temporary places of durance in every arrondissement for persons charged with offences, and those sentenced to more than a year's imprisonment who are awaiting transfer to a maison centrale; (2) the maison de justice, often part and parcel of the former, but only existing in the assize court towns for*~~

~~*the safe custody of those tried or condemned at the assizes ; (3) the depdt situated on the island of Re, for all sentenced to travaux foreés awaiting deportation to New Caledonia (Arabs so sentenced wait at Avignon their removal to French Guiana) ; (4) departmental prisons or houses of correction, for summary con- victions, or those sentenced to less than a year, or, if provided with sufficient cells, those amenable to separate confinement; (5) the maisons centrales, or central prisons, for all sentenced to more than a year, or for men and women above sixty sentenced to travaux forcés ; (6) maisons de force, for women senteneed to travaux forces, or both sexes condemned to seclusion; (7) prisons for those sen- tenced to simple detention; (8) penal settlements in Corsica, more particularly at Chiavari, Casabianca, and Castellucio, the régie of which is the same as in the maisons centrales; (9) reformatory establishments for juvenile offenders ; and (10) depéts de streté, for prisoners who are travelling, at places where there are no other prisons. The total number of prisons of all classes in France, exclusive of the last, exceeds 500, and the prison population averages 50,000 daily. Besides the foregoing there are a certain number of military prisons under the war minister seated at the great garrison towns, or in Algeria ; and at all the seaports there are maritime prisons for soldiers or sailors who have broken laws civil or military. he latter are under the minister of marine, who also has special charge of the penal settlements at a distance from France, including French Guiana and New Caledonia, where there are several prisons and hulks adapted for the confinement of convicts. The dis- ciplinary treatment of all prisoners in separate confinement is much the same in France as elsewhere; the isolation while it lasts is com- plete and is broken only by the frequent visits of officials. The exer- eise is solitary, and at chapel the same rule obtains by each prisoner occupying a separate box, or by having service in the centre of the prison, to which all the cell doors, slightly opened, converge. It may be stated here that religious tolerance prevails everywhere ; and prisoners not Roman Catholics may receive the ministration of clergymen of their own erced. Female prisons are mostly managed by nuns or members of the female religious orders. There is one at Doullens especially kept for Protestant female prisoners, and managed by a Protestant sisterhood. The evils of association in the congregate prisons are diminished by classification, so far as it goes. But prisoners are at least kept in categories: trial prisoners are together ; those for a year are kept*~~

~~apart from the summary convictions, and convicts en route for the island of Ré from all the rest. Males and females occupy different prisons. As almost all prisons have at least a few separate cells, these are utilized either for the recidivists and those of worst character, or for any well-disposed prisoners who exhibit a real desire to amend. The diet, although coarse, is liberal. It may be supplemented by purchase made from the canteen, at which both wine and tobacco may be obtained by all who can pay for it. Each person may thus spend a certain proportion of his earnings or péerle, the rest being reserved for his discharge. What remains of the product of the prisoner's labour is handed over to the contractor, who also receives a grant per prisoner from the state. Labour is only obligatory upon those so sentenced ; it is purely industrial; penal labour, such as treadmill or crank, does not exist in French prisons. In the smaller it is not easy to find occupation for the inmates, but in the~~

~~larger many and varions industries are carried on. Among the more ordinary trades the manufacture of 'articles de Paris," toys, neat bonbon boxes, hosiery, and cabinet-making produce good finan- cial returns. The labour of the prisoners in Corsican settlements has been usefully directed upon the reclamation of marshy lands, the clearing of forests, and the tilling of the less fertile districts. The agricultural results have been good as regards the cultivation of the orange, olive, and vine; mulberry trees have been planted for the silk-worm, and the wheat fields have returned rich harvests of grain, much esteemed in Italy and the south of France. Good roads and many canals have been made, to open up the interior. These Corsican prisons have long suffered from the unhealthiness of their neighbourhood, but the draining of the marshes, the develop- ment of irrigation, and the plantation of trees have all combined to improve their sanitary conditions. ;~~

~~The efforts made in France, more particularly by private bene- volence, to cope with juvenile delinquency have been very praise- worthy. French reformatories are of two classes—those that are punitive or correctional, and those that are simply reformatory. To the first, where the discipline is severe, are sent all youths con- victed of offences committed with full~~

~~*knowledge of their crimi- nality, and these relegated from the re formatories as insubordinate ; to the second, children proved guilty but not responsible for their acts, or the ill-conducted whose parents cannot manage them. The first-named are public institutions maintained by the state; the latter are private, and may be supported entirely by subscriptions. There are in all thirty-eight of the former, as well as five penal colonies, and five juvenile quarters attached to various departmental prisons; of the latter there are twenty-eight. All these are for males. For females there are twenty-three private establishments and one public. The most important of the public reformatories for boys is that of La Petite Roquette in Paris, immediately opposite the convict prison of the same name, in front of which executions are carried out. Of the private institutions that of Mettray near Tours, started by the benevolent enterprise of M. de Metz, has a world-wide reputation. A very successful female re- formatory is that of Darnétal near Rouen, where the women are employed in farming and field operations.*~~

~~*As regards the most heinous offenders, France not only clings to deportation, but is disposed to enlarge and multiply her penal settlements. In 1884 the Government had under consideration the necessity for sending out all "recidivists" to the Polynesian islands. This, however, has been hindered for the moment by the energetic protest of the Australian colonies, and, instead of the number sent to New Caledonia being increased, French Guiana will probably be more largely utilized. In the former islands most of the evils which attended the early days of transportation to Australia have been appareut. The French convicts either remain in the hands of the Government incarcerated in badly constructed prisons, where discipline and supervision are unsatis- factory or incomplete, or they pass into a state of semi-freedom to work for free settlers on their own account. There are not enough of the latter to afford much employment, and the conditions of the soil of New Caledonia are not such as to encourage the convicts to work for themselves. It is extremely improbable that the penal settlement will ever grow into a prosperous self- supporting colony, and thus the chief end of deportation remains unachieved. At present the French penal settlements beyond sea are merely badly-built indifferently-managed prisons at a long dis- tance from home.*~~

~~*Germany.—There isa similarity in the prison discipline of the various units of the German empire. In the grand-duchy of Baden there are four kinds of prisons—district prisons, fortresses, houses of correction, and central prisons. The punishment in the two first named is simply detention or privation of liberty,—the district prisons being for persons under examination and waiting trial, or those sentenced to less than six weeks' imprisonment. Sentences above that time are endured in the central_prisons. The principle of cellular imprisonment is the general rule, but it is not extended, unless at a prisoner's wish, beyond three years, For youths between twelve and eighteen the limit is six months. Prisoners unfit for solitary confinement and those who have en- dured three years' detention are kept together, but they are not associated during working hours. Both systems are supposed to be attended with good results in Baden. Both have their merits, but Popular feeling inclines most to the cellular plan as conducing to reform while it keeps the prisoners from mutual contamination. The chief cellular prison is at Bruchsal, where there is accommoda- tion for five hundred, but there are a certain number of separate cells attached to many other prisons. The labour in the prisons is industrial as opposed to penal; contractors are not encouraged; and in most prisons the administration itself keeps the employment of oe rison In its own hands, Forty per cent. of the prisoners on admission are ignorant of any trade, but they do not leave prison without learning one. Prisoners' aid societies exist in twenty-nine*~~

~~*out of fifty-nine districts, and they achieve good resul their aid is not too frequently cee = go sults, although*~~

~~*PRISON DISCTIPECRYD*~~

~~*The bulk of the prisons in Bavaria, mostly converted castles and convents, are on the collective system, but there are four cellular prisons—one at Nuremberg, and three other district prisons for those awaiting trial. The prisons are much the same as in Baden. There are police prisons for first arrests ; district prisons mentioned above, which also take short sentences ; prisons for three months' sentences and upwards, and for juveniles; and houses of correction. There are also special prisons set apart for persons convicted of theft, fraud, robbery, receiving, whose sentences exceed three*~~

~~*months ; and a system of classification exists which separates all likely by their previous character to exercise a baneful influence on their fellows. For the long-term prisoners the labour may be npon public works beyond the walls of the jail, and prisoners may de- mand to be soemployed, or in work for which they are fit. Industry and good conduct will secure a remission of sentence. After three months of the sentence have been served there.is no purely penal labour. Industrial labour is conducted by the prison authorities, who are not in favour of the employment of contractors, which is thought to jeopardize discipline. Secular education is not over- looked ; there are hospitals, chapels, libraries, and the adniinistra- tion generally is humane. There are numerous societies to assist discharged prisoners, which, however, are said to be much hainpered in action by the ignorance and prejudice of the public. One at Munich has nevertheless done great good.*~~

~~*There are but few prisons in Prussia in which isolatign is exclu- sively carried out. But in forty-six cellular and associated im- prisonment exist side by side ; the total number of cellsis, however, small when compared with the total population in prison. The advantage of introducing the system of "progressive stages," of passing from strict separation to labour in association, is anxiously discussed, but nothing yet has been donc. Prussian prisons may be classed as—(1) those exclusively for hard labour, (2) those for im- prisonment and simple detention, and (3) those of a mixed character. Hard-labour sentences may be for any term from one year to life; the labour is compulsory, without restriction, both inside and be- yond the walls. The maximum of simple imprisonment or deten- tion is for five years, during which time a prisoner is not compelled to work except in accordance with his capacity and the position he occupied in social life; nor need he work outside the prison against his will. Imprisonment in a fortress, which may be for life and the minimum of which is for one day, means simple deprivation of liberty. There is also a detention on summary conviction for vag- rants and beggars limited to six weeks. These may be made to work inside or outside the prison. There is no penal labour; but much variety and enterprise exist as regards the prison industrial employ- ments, which, in addition to the ordinary kinds, include feather- scraping, leather-dressing, turning, carving, illuminating, &c. The males also farm; the women make gloves, cigars, and tapestry, embroider, knit, weave, and spin. The work is*~~

carried on through contractors, who pay a certain sum on the amount produced. A portion of their earnings goes to the prisoners,—half of it to be expended in buying extra food, half accumulated against release. To reduce evils of association it is ordered that first sentences shall be separated from hardened offenders, but this classification is not always possible ; juvenile prisoners are, however, kept apart in cells. Release, provisionally, may take place after three-fourths of the sentence has been endured with good conduct, but the licence to be abroad may be revoked for a breach of law. There are many prisoners' aid societies, the best being in Rhenish Prussia and Westphalia, but the results obtained have not been very satis- factory. Employers and free workmen will not receive liberated prisoners freely, and the aid societies would effect more if they were more centralized and worked more together. Prussian prisons are on the whole well organized ; the discipline is severe yet just ; order reigns everywhere ; secular instruction and religious minis- trations are ample, and the employment of prisoners according to their capacities is carefully attended to. But many of the prisons require rebuilding or reconstruction ; isolation at night should be the universal rule ; and more cells are needed to ensure the separa- tion of the trial prisoners and short sentences. Administrative centralization is much needed in Prussia.

Prison discipline has attractéd close attention in the kingdom of Saxony since 1850, when the penitentiary at Zwickau was first opened and conducted with satisfactory results. In 1854 it was decreed that all Saxon prisons should follow the same system, which is that of treatment either solitary or associated according to individual wants; neither rule obtains exclusively, and the prisons have facilities for both. Work, education, and diet are supposed to be carefully allotted to prisoners. The prisons follow the usual classification of German prisons; there are those for severe punishment, two in number, three for less severe punish- ment, and two for the older offenders. Besides these there are the fortresses and the prisons of detention. The labour is purely industrial, not penal ; Saxony is a very industrial country, and its prisons produce nearly every article of manufacture. Work is carried out in them partly by contractors and partly by the authorities. In the five reformatories agriculture is the principal

~~*occupation. A graduated system of remission of sentences is in force, dependeut on industry and conduct.*~~

~~*In /Viirtemberg the cellular system was adopted for women in 1865, and a prison on that plan erected at Heilbronn, which has sinee been utilized exclusively for men. The bulk of the Wirtem- berg prisons are, however, still on the eollective system; but at all prisons there are places for the isolated detention of a certain number of prisouers. The classification of prisous is much the same as in other parts of the German empire under the penal code of the empire. There is no distinction between penal and industrial labour ; the latter is of the varied character followed in other German prisons, and is partly in the hands of contractors, partly in that of the administration. An aid society has existed in Wiirtemberg since 1831, and it has numerous ramifications through the country. It does good service in obtaining work, providing tools, and assisting emigration.*~~

~~*Italy.—There is a want of uniformity in the prison system of the Italian kingdom, which is not strange, having regard to the recent unification of the country. The various units which were till recently independent of each other had each its own views. Many varieties of prison discipline, therefore, still remain in force. There are some prisons in which complete isolation is the rule, others where the labour is associated with cellular separa- tion at uight. But the largest number are on the collective system. All new prisons of detention are built on the principle of isolation, and this rule is as far as possible strictly observed for all prisoners awaiting trial. This period of detention may be spent in a provincial (careere centrale), district (circondarale), or communal (mandamentale) jail. Sentences are carried out accord- ing to their character in different prisons. There are prisons for those condemned to simple confinement and detention ; others for "'velegates" ; others again for reclusion accompanied with hard labour ; and twenty are bagnios or hard-labour prisons for those sentenced for long periods (up to life), to undergo the punish- ment of the ergastolo or galera. The discipline is progressive. In the ordinary prisons a gradual amelioration of condition may be secured by good conduct; in the bagnios, besides the exemption from fetters, convicts may gain the privilege of completing the last half of their sentences in one or other of the agricultural colonies. These have been.established in various islands of the Tuscan*~~

~~*archipelago, as at Pianosa and Gorgona; and an intermediate prison has been established on the island of Capraia for well-conducted prisoners in a last stage of semi-liberty. Associated convict labour has produced good results in Italy. By it all necessary prison buildings have been erected at the penal colonies and at various points on the mainland: it has also been applied to agriculture, the reclamation of land, the construction of storehouses, docks, salt works, and ou the improvement of various ports. In the prisons or penitentiaries the labour is industrial, and follows the usual lines. Contractors have generally the control of this labour, receiving the results after deductions for prisoners' earnings to be spent in the usual way and with the obligation to teach trades. On the latter condition contractors are granted the exclusive right to the labour of juveniles in houses of correction ; and there are a number of reformatory schools, mostly on a charitable basis, into which are drafted all juveniles, vagrants, and idlers sentenced to compulsory detention.*~~

~~*Mexico.—In Mexico the rule of constant separation for all pris- oners has been accepted, but not yet carried out entirely. The oll prisons were on the associated system; but new cellular prisons have recently been built, or are in process of construction at Jalisco, Durango, Puebla, and Mexico. These will receive trial prisoners and those sentenced. There is an " hospicio de pobres " for young children ; also a special reformatory establishment for children between nine and eighteen. Political offenders are kept apart from ordinary offenders. All convicted prisoners may earn conditional release on completion of half their whole sen- tence. This form of release is called preparatory liberty, and for a' short time preceding it they are allowed to leave the jails to run errands or seek work. The labour in Mexican prisons is indus- trial, not penal, and in theory at least the advantages of learning a trade in prison are fully understood. Contracts for prison labour are forbidden. A portion of the proceeds goes to the prisoners, and may be spent in purchasing food or furniture or articles of comfort. There are 'protective boards" who visit and seek to improve the prisoners, and independent philanthropists are also admitted. Prisoners on release go to the protective boards, who assist in obtaining them an honest livelihood.*~~

~~*The Netherlands.—Here the treatment a condemned prisoner undergoes depends mainly upon the sentence awarded. The judge at his discretion may*~~

~~*direct the imprisonment to be on the solitary or the associated system. This power as regards the first is, however, limited to half the whole term of sentence, and in 1851 it could only be applied to sentences of one year; this was extended in 1864 to two years, and in 1871 to four years,—so that now the maximum of cellular imprisonment to be inflicted is actually limited to two years. There are several prisons on the cellular |*~~

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~~*plan ; but in most the two kinds of imprisonment exist side by side. There are four classes of prisons :—(1) the central prisons for persons sentenced to eighteen months and upwards ; (2) detention prisons for less than eighteen months ; (8) prisons of arrest for those sen- tenced to three months or less; and (4) police or central prisons for those condemned to one month and under. In the three last named are also kept prisoners awaiting trial. As regards classifica- tion nothing more is attempted where association is the rule than the separation of the most hardened and previously convicted offenders from other prisoners. Imprisonment is either simple detention or accompanied by hard labour. 'The latter is industrial only, never penal, and embraces a great variety of handicrafts, most of which are carried out under contractors. But work is also done on account of the state, with the advantage that it is not subject to the fluctuations of supply and demand. All prisoners, except those for short terms, are, if possible, taught a trade. The earnings go in part to the prisoners, to be expended by them in the -usual way. Remissions of sentence not exceeding six months may be accorded to all originally condemned to not less than three years, and who have undergone at least half. There is a society for the moral amelioration of prisoners in the Netherlands, which has numerous ramifications, and is devoted to prison visiting and the welfare of prisoners generally. This extends to efforts to obtain employment for them on release, which are praiseworthy, and on the whole eminently successful.*~~

~~*Norway.—Prisons in Norway may be divided into two princi- pal classes, the Strafarbeidesanstalter, or penal institutions where prisoners are compelled to labour, and the district prisons estab- lished in 1857 for detention and simple imprisonment. (1) The first may be further subdivided into fortress prisons, houses of correction, and the cellular prison or*~~

~~*penitentiary of Christiania. This last takes the first convicted for short terms between the ages of eighteen aud thirty, the fortresses the longer sentences, aud the houses of correction the intermediate terms. All these prisons except that of Christiania are on the associated system, with no attempt at classification beyond the separation of the worst from the least corrupt in workshops or dormitories. The hours of labour are long—fourteen in summer and ten in winter. The labour, conducted solely by the authorities, is industrial; at Christiania cloth manufacture is a principal trade, at Akershuus it is stonecutting. Most prisoners learn a trade if they are ignorant of one on reception. No portion of the proceeds of their labour goes to the prisoners. There is no regular system of granting remis- sions. All the penal institutions have chaplains, schools, libraries, and hospitals. Released prisoners are, as far as possible, preserved from relapse by the eare taken to provide them with work when free. There are a few aid societies, but their operations are somewhat circumscribed from want of means. (2) The district prisons, fifty-six in number, take summary convictions from four to two hundred and forty days. Imprisonment may be endured on bread and water with regnlated intervals, or on the jail allowance. Prisoners in these prisons are not compelled to work, but they can have employment if they wish it. These district jails are also used for the detention of all persons apprehended and awaiting trial, and as debtors' prisons. They are mostly on the cellular plan, especially in the cases of those sentenced to solitary confine- ment on bread and water and those committed for trial.*~~

~~*Portugal is still behindhand as regards its prison administra- tion. he jails are extremely defective in construction ; the disei- pline is lax and the management careless. All prisons are on the associated plan; they stand mostly in the market places of the large towns, with the first-floor windows upon the public thorough- fares, so that the inmates are at liberty to talk and communiecate with the passers by, whom they importune constantly for alms. Little less lamentable than the neglect of prison discipline is the practice of indefinitely postponing jail deliveries, with the inevit- able consequence of frequent failures of justice. Juries often will not conviet, alleging that the accused have been sufficiently pun- ished by long detention awaiting trial.*~~

~~*Russia.—Prison discipline was much discussed in Russia as far back as the commencement of the present century, and in the year 1819a society, now known as the Imperial Society, was established to watch over the administration of prisons. This society still exists, and is affiliated to the ministry of the interior. Its central committee and the provincial committees working under it select the staff of the prisons, and exercise a general surveillance over them. Various classes of prisons have existed in European Russia. As at present organized they consist of—(1) the fortresses, for grave offenders, especially the political and revolutionary,—in these the discipline is very severe; (2) the military prisons, in which the discipline is not less strict; (8) the house of detention, the ancient ostrog or stronghold which every town has always had for the safe keeping of prisoners charged with offences,—in these were detained also prisoners awaiting corporal punishment or deporta- tion to a penal colony; (4) the hard-labour prisons, in which were located the labour parties or correctional corps instituted by the emperor Nicholas, organized and disciplined on a military basis ;*~~

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~~*(5) the amendment prisons or houses of industry established by the empress Catherine. These are all on the associated system, and fall very far short of accepted ideas on prison management. But an entirely new cellular prison has recently been erected in St Peters- burg, which is a model ofits kind. It is a house of detention for persons awaiting trial, and contains upwards of a hundred cells. 'All the internal arrangements of this prison are exeellent; but it may be doubted whether the Russian Government will embark upon the expenditure necessary to build others of the class. The eman- cipation of the serfs in 1867, followed by the substitution of im- prisonment for corporal punishment, added enormously to the prison population of Russia. A great lucrease of prison aceom- modation became necessary, and a comniission was appointed to frame a new peuitentiary system. This, as now adopted, although not entirely earried out, consists of two parts—punitive lmprison- nent for short sentences, and penal probationary detention as a pre- liminary to banishment toa colony. For the first, central prisons, associated not cellular, are being constructed at various points,*~~

~~*and a regulated system of labour will be introduced following the lines of that in force in other European countries. For the second, at the end of the probationary period banishment, or, as it is styled in official language, enforced colonization, will be the rule. Deportation to Siberia began in 1591. It was principally used for political prisoncrs, insurgents, religious dissenters, and con- spirators. Large numbers of Poles were exiled in 1758 ; others again in 1830, and now, since the Nihilist movement, numbers of these implacable foes to the existing régime are regularly despatched to Siberia, The total number deported varies from 17,000 to 20,000 per annum, but this includes. wives and children who may elect to accompany the exiles, The sentences are of two kinds—(1) the loss of all rights and (2) the loss of particular rights. The first includes degradation, the rupture of the marriage tie, inability to sign legal documents, to hold property, or to give a bond. The exile must wear prison dress, and have his head half-shaved. He may be flogged, and if murdered would not be much missed. After a lengthened period of probation in prison the exile becomes a colonist and may work on his own account. Those sentenced to the loss of particular rights are only compelled to live in Siberia, where they may get their living as they can. Many, however, are condemned to spend a portion of their time in confinement but without hard labour. The exiles are sent from all parts of the empire by rail or river to Ekaterinburg, and thence to Tiumen, whence they are distributed through Siberia. Those deprived of partial rights are generally located in western Siberia. Those deprived of all rights go on to eastern Siberia. The latter go by river generally to Tomsk ; thence they walk to their ultimate rest- ing place, which may be Irkutsk or Yakutsk or Tchita, or the island of Saghalien, and the journey may occupy months. Not long ago a party of convicts was despatched by sea to the last-named destina- tion, embarking at Odessa and travelling through the Suez Canal and by the Pacific Ocean. There are several hundred prisons in Siberia. They are of three kinds:—(1) the efape, which afford temporary lodgings for prisoners on the line of march ; (2) the prisylnie, where the detention is often for several months during the winter or until the ice is broken up ; and (8) the ostrog, the generic Russian name for a prison, which is the place of durance for all exiles not ou their own resources. Few of the large prisons in Siberia were built for the purpose. They are converted buildings—old factories, distilleries, and so forth. 'hey are all upon the associate principle, containing a number of large rooms to*~~

~~*accommodate any number from twenty-five to a hundred.. The great central prison near Irkutsk, called the Alexandrefisky, oue of the most important in Siberia, generally holds from 1600 to 2000 prisoners all under sentence of hard labour, and awaiting transfer to the mines. Dr Lansdell, who visited this prison in 1879, found the prisoners very short of work. Some were engaged in making cigarette papers, others in shoemaking and brickmaking. The prison is a huge stone-built building, very different from the ordinary run of Siberian prisons, which are usually built of logs caulked with moss to keep out the cold. They are surrounded by a high wooden palisade. Each prison has its hospital, chapel, generally a schoolroom, and a few workshops. The prisoncrs themselves are not unkindly treated. At most of the stations there are local committees to watch over the welfare of the prisoners. This is an extension of the Imperial Society of St Petersburg already mentioned. The committees supply books and visit the prisoners. They clothe and educate the prisoners' children, and help their wives to employ- ment. They also augment the prisoners' diet from funds obtained by subscription. The regulation rations of Siberian exiles seem very liberal. The Russian prisoner has nearly twice the amount of solid food that an English prisoner receives, and he is at liberty to add to his diet out of his own means, which the English prisoner a a The prisoners are also supplied with ample clothing if E oe sel none of their own, those sentenced _to deprivation of all g eing obliged to wear convict dress. The discipline of the prisons 1s now in aecordance with European ideas. Prison offences awe punished by relegation to a solitary cell, a certain number of*~~

~~*PRISON DiIsCiPrLAtre*~~

~~*which exist at all the prisons. Diminutions of diet are also inflicted, and an obligation to wear irons if they are not already worn. All exiles wear leg- irous for a certain time. These are riveted on to the ankles, and caught by a chain which is carried suspended to a belt round the waist. The irons are worn for various periods from eighteen months to four and even eight years. Very heinous offenders or those who have escaped frequently are chained to a wheelbarrow, which they are obliged to pull about with them wherever they go. A more severe punishment when confinement and irons fail is birching with a rod, for the knout is now abolished. The rod consists of switches so small that three nay be passed together into the muzzle of*~~

~~amusket. The punishment is described as not more severe than that inflicted at English public schools. There is another flagellator, however, called the plete, a whip of twisted hide, which is still retained at a few of the most distant Siberian prisons and only for the most incorrigible, on whom irons, the birch, and other punishments have had no effect. The eostli- ness of deportation is enormous and the results it obtains doubtful. The slow colonization of this vast territory may follow eventually, but there are already great difficulties in finding employment for the mass of labour in the Government's hands. The mines of gold, silver, and coal are passing into private hands, and there are no other public works. Hence part of the Russian criminals who would have gone to Siberia are detained in the large prisons in Russia, where they are employed in manufactories or in the labours of ordinary mechanics, or any outdoor work such as making bricks, mending roads, and manufacturing salt. Nevertheless recent visit- ors to Russian prisons, whether in Russia proper or in the heart of Siberia, describe the prisoners as generally idle. The principle of progressive stages by which a prisoner can gain a remission of sen- tence or milder treatment prevails throughout. The well-conducted persons can earn wages, and may spend the money in buying an increase to their diet. The bulk of the worst convicts gravitate to the island of Saghalien, where the number in 1879 was about 2600. Half of those were kept in prison, half remained comparatively free. The discipline here is very severe. The diet is said to be scanty, and as the island is barren everything has to be imported. Fish, how- ever, is found in large quantities. There are four large prisons at Dui, the principal post on the island, which are insufiiciently heated in winter and generally overcrowded. The convicts are chiefly employed in raising coal from mines which are let to a company. Very conflicting evidence is current as regards the Siberian prisous. Prince Kropotkine, an exile, speaking with some authority, de- nounces them as hotbeds of vice and cruelty. Dr Lansdell on the other hand, a reputable eyewitness, does not on the whole speak unfavourably of them. He describes them as rough, perhaps; but so are Siberian dwellings. He thinks that as compared with the English convict the Siberian is not badly off. The labour is lighter ; he has more privileges ; friends may see him oftener and bring him food ; and he passes his time neither in the seclusion of a cell nor in unbroken silence, but among his fellows with whom he may lounge, talk, and speak. The Russian convict, however, misses those intellectual, moral, and religious influences which~~

are abun- dantly showered upon the English. There are no prisoners' aid societies in Siberia, and the convict, after release, when suffered to begin life again on his own account, carries with him always the convict stain and is hindered rather than helped to begin life afresh. Dr Lansdell sums up his opinion in these words :—

"Taken at the worst, condemnation tothe mines is not so bad as it seems; and, in the case of peasant exiles willing to work, J cannot but think that many of them have a better chance of doing well in several parts of Siberia than at home in some parts of Russia. There is reason to suppose that reports of tlie ill-treatment of Russian prisoners have been greatly exaggerated by careless, ill-informed, or malicious writers. No doubt some years ago there were good grounds for serious complaint. It is very evident that now the political prisoner, beyond exile, and temporary confinement in the jail, is not ill-used. He is not always subjected to the ordinary discipline of the criminal convict, nor is he obliged to associate with them. A fabulous story has long been current that the worst criminals were buried alive in quicksilver mines, where they were speedily killed by the unhealthy fumes. There are no quicksilver mines in Siberia, and the principal mines, those of Nertchinsk, are now passing out of Government hands. These are mostly of silver, although other minerals and gems are found in the neighbourhood, The hours of labour in the Nertchinsk mines were thirteen, and it was the same at the Kara gold mines. The convicts arrange their hours of work themselycs. No definite amount of mineral was required, so they might work hard or not as they pleased. No doubt the lot of convicts in these mincs was hard. Besides the laxity of discipline, the herding together of the worst characters andthe deprivation of social, intellectual, and religious privileges must have made life a burden to many."

Spain, like Portugal, still lags behind. It is not to the credit of a country in which prison discipline was discussed three centuries ago that now at the close of the 19th its prison system is about the worst in Europe. Till very recently the posts of governors in the jails were sold to the highest bidder, and pur- chasers were suffered to recoup themselves out of the unfortunate wretches committed to their charge. The principal prison in the capital of the kingdom was nothing more than a converted slaughter house where pigs were killed and salted, as its name, the Saladero, implied. This dark, dirty,

~~*noisome den, although generally con- demned, continues to serve even now. Numerous efforts to provide amore suitable prison have been made from time to time. The*~~

~~*PRISO® DISBUVUIPLINE*~~

~~*construction of model prisons was decreed as far back as 1847, but in 1860 nothing had been done, and a new project was brought forward. Again in 1869 a fresh scheme replaced the previous ones, which were still dead letters. Seven more years elapsed, and in 1876 a new law was passed providing for the construction of a new cellular prison in Madrid with cells for a thousand prisoners. This law too hung fire, and the prison is not yet completed. The bulk of the prison population in Spain is still sent to presidios, or convict establishments, where general association both in the prison and at labour is the rule. The principal of these are situated at Cartagena, Valencia, where there are two prisons, Valladolid, Granada, and Burgos. There are also prisons at Alcala, Tarragona, Saragossa, and Santofia. Persons convicted of grave crimes are deported to the Balearic Islands or to the penal settlements in Africa, the principal of which are situated at Ceuta and Melilla. Throughout these establishments there is an utter absence of sanitary regulations; the diet is coarse and meagre , the discipline is brutal ; the authorities are quite callous ; and morality does not exist. The Spanish authorities, however, claim the credit of having abolished corporal punishment in their prisons.*~~

~~*Sweden.—A great impetus was given to prison reform in Sweden by the interest taken in the question by King Oscar I. in 1840. Following special legislation, thirty-eight new cellular prisons were built in the various provinces of the kingdom. These prisons have been used since for all prisoners awaiting trial, those condemned to reclusion and those sentenced to imprisonment with hard labour for two years and under. Persons sentenced to pay fines, but unable to pay, go to the cellular prisons. The isolation is continuous day and night. Besides these cellular there are a number of associated prisons for terms longer than two years and up to life. The labour in the first-named is of the usual kind—tailoring, shoemaking, and some kinds of carpentry. Trade instructors are specially appointed, so as to provide a prisoner on liberation with some employment. In the*~~

~~*associated prisons there is more variety of work: linen and woollen cloths are manufactured, timber split up for matches, granite cnt and dressed for buildings and pavements. The female prisoners weave textile fabrics, and make match boxes. A portion of the earnings is granted to prisoners, which, to a limited extent, may be spent in buying extra food. There is no purely penal labour, nor any regulated system of granting remissions for industry or good conduct. Many aid societies were formed about twenty- five years ago, but throngh want of success or funds their number has dwindled down to two.*~~

~~*Switzerland.—From the complete independence of each canton, each has its own special penal system and places of imprisonment. Hence the systems are various, and are not all equally good. The prisons of Switzerland may be divided into four groups :—(1) those of the cantons of Uri, Schwyz, Unterwalden, and Valais, which are still of a patriarchal character; (2) those of Fribourg, Basel (rural), and Lucerne, which are on the associated plan and un- satisfactory from every point of view; (3) those of the cantons of St Gall, Vaud, Geneva, and Zurich, which have prisons for asso- ciated labour and separation at night, while Soleure, Grisons, Bern, and Schaffhausen are labouring to raise their prisons to this level ; (5) the penitentiaries of Lenzburg, Basel (urban), Neuchatel, and Ticino, which are good modern prisons in which the cellular system is completely applied. The system is one of progression, the pris- oner passes through several stages of isolation, employment in association, and comparative freedom ; but only at Neuchatel is there separation by day as well as night. The general principle is one of collective imprisonment ; but there is an attempt at classifi- cation, according to degrees of morality, in the best prisons. Sen- tences may be either to imprisonment or reclusion with hard labour. The first may be from twenty-four hours to five years ; the second from one year to fifteen, twenty, thirty years, or to life. An ab- breviation of punishment- may under all the cantonal laws be obtained, but such reduction is rarely made according to fixed rules. In most of the cantons prisoners have a share in their own labour. This labour is chiefly industrial, but there is a form of penal labour to be seen where the plan has survived of employing certain pris- oners to sweep the streets, make roads, or dyke the rivers. Such labour is felt to have a bad moral effect, and industrial labour is preferred. The latter is conducted by the administration itself, and not by contractors.*~~

~~*It is thought that the state can introduce a greater variety of employments, and control the prisoner better when at labour than could free employers. Aid societies exist in most of tle cautons; the first was established at St Gall about 1845. Wherever they exist the societies protect prisoners in durance and assist prisoners on release by providing tools and employment with private persons. The only drawback in the Swiss aid societies is the want of organization and uniformity of action.*~~

~~*United States.—There is no uniform prison system in the United States. The variety of jurisdictions following the constant ex- tension of territory and development of communities more or less populous perpetuates changing conditions, and the supreme Goveru- ment has not concerned itself greatly with prison affairs, and has claimed uo supervision or special control. The rule of local self-*~~

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~~*government has left each jurisdiction to manage its prison according to its own ideas, and hence the utmost diversity of practice still obtains. While some prisons are as good as need be, others are marked with many defects. There is a wide distinction between the best and the worst. In the country which initiated prison reform, numbers of prisons exist nowadays which fall far below the commonest requirements of a good prison system. Taken broadly, the prisons of the Union may be classed into—(1) State prisons; (2) district prisons ; (3) county prisons ; (4) municipal or city prisons. Each State asa rule has its own State prison, but Pennsylvania and Indiana have two and New York three such prisons. The cellular system, or the rule of continuous separation, to which refer- ence has been made already (see p. 753), was at first followed by several States, but gradually abandoned in favour of the so-called silent system, or that of labour in association under the rule of silence, with cellular separation at night. At the present time there is but one prison, the Eastern Penitentiary of Philadelphia, inanaged on the purely solitary plan. Of the long-sentenced con- victs 96 per cent. are now confined in congregate prisons. There are about forty State prisons in*~~

~~*all. Of the district prisons inter- mediate between the State and the county prisons there are but few. The county prisons are by far the most nwmereus. The county in the United States is the unit of political organization under the State, and, with area and population comparatively limited, is a convenient subdivison for the purposes of the criminal law. Hence it has been asserted that no one knows exactly the number of county prisons in the United States, but it has been computed at upwards of two thousand. 'The city or municipal prisons are also very numerous and constantly increasing. Each and every one, as in the State prisons, is managed locally by local authorities, with the inevitable result of the utmost diversity in practice, and often enough the utmost neglect of the commonest rules of prison dis- cipline. A self-constituted body inspected a couple of hundred of these jails a few years back, and reported that they were mostly defective from a sanitary point of view, insecure, and-so constructed as to compel the promiscuous association of all classes old and young, the guilty and innocent, the novice and the hardened in crime. The sexes even were not invariably separated. Little or no employ- ment was provided for the prisoners, and in few prisons was any effort made to compass religious or intellectual culture. An eye- witness, Dr Wines, reporting of other jails of the same class still more recently, unhesitatingly condemned them. " Ohio, to-day," says the Ohio Board of Charity, " supports base seminaries of crime "In our jail system lingers more barbarism than in all our other State institutions together." Yet there arc a few and conspicuous exceptions to the general verdict of condemna- tion. The discipline and management of the district prisons at Albany, Detroit, Rochester, and Pittsburgh are excellent. The good example is gradually becoming more and more largely imitated. Where good prisons exist it will be found that their admiuistration remains for some length of time in intelligent hands, free from the "' nernicious influence of partisan politics." The chief drawback to improvement is the uncertainty no less than the complexity of the governing bodies. These are apt to be changed capriciously ; and, what is worse, they are needlessly intricate and often far too numer- ous. They act independently, without reference to each other, and they are not too ready to benefit by example and experience. What is wanted is a supreme central authority over all the prisons of a State, if not throughout the Union. Wherever there is the nearest approach to this the results are most satisfactory.*~~

~~*It is not strange that under these conditions discipline should also vary greatly, or, as has been said, " every variety of discipline, lack of discipline, or abuse of discipline is found." Neither the deterrent nor the reformatory agencies are properly or uniformly brought to bear. Prison punishments are still severe ; although flog- ging is nominally abolished, it is said to be still practised in prisons where it is forbidden ; and some more ancient methods such as the yoke, the shower bath, and the iron crown have not yet entirely disappeared. There is, however, often good secular and religious instruction. The dietaries are fuller than on the opposite side of the Atlantic, meat is a more common ingredient, and Indian meal is very largely issued. The financial results obtained are not un- satisfactory: many of the State prisons are now self-supporting, and an examination of the labour returns will prove that much cuter- prise has been displayed in finding employment for the prisoners. There is no purely penal labour, although much of the labour performed is sufficiently severe. There may be no treadwheel or cranks, but convicts in Alabama and Texas have been employed to build railways ; they have raised cotton in Mississippi, and have worked mines in Tennessee and New York, while in many States they are utilized in gardening and agriculture. A great deal of labour has been expended on quarrying and dressing stone for building, or for burning into quicklime ; at Auburn there is a large manufactory of agricultural tools ; Ohio employs saddlers ; Massa- chusetts prisoners make ornamental iron work; in Michigan they tan leather ; and at Dannemora, in northern New York, iron ore is quarried, smelted, forged, and wrought into nails by the prisoners.*~~

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~~*In general the labour is hired by contractors at a fixed sum per day, which varies from a few cents to as much as a dollar. The chief cause for the present inadequacy of the American prisons, over and above the faults in administration already mentioned, is probably the rapidly increased demand on their accommodation in recent years. This is due partly to the growth of population, partly also to the influx of * coloured" criminals since the emancipation. In the days of slavery the slave was punished summarily by his master, but now he is arraigned and sent to prison. The result has been that the prisons were suddenly crowded before any uew and improved system could be introduced. ; ;*~~

~~*While there are but few agencies for the assistance of discharged prisoners, considerable care is devoted in the United States to the treatment and checking of juvenile crime. Reformatories have existed since 1825, when the first was established on Randall's Island within the limits of the city of New York. Others followed ; but these did not form part of the penal system of the States till 1847, when the State reform school at Westborough was established by law. They soon increased and multiplied, and now between sixteen and twenty are to be found within the principal States. There are also a number of semi-public schools. The average reformatory population is about 15,000. The results are said to be very satisfactory. The percentage of youths reformed and trained into good citizens has been placed as high as 60, 75, even 80 per cent. Parents may in some States contribute to the support of their children in reformatories, but as a rule the inmates are orphans or abandoned children or those whose parents are very poor. The best system for training and caring for juvenile offenders probably is that which obtains in Massachusetts. (A. G.)*~~

~~*PRISREND, Prispren, PrisprAa, PIspRA, PISREN, or PisrA, in Roumelia, the chief town of a sandjak and the seat of a Greek and a Roman Catholic archbishop, in the Turkish vilayet of Kossovo (formerly Monastir), stretches for 2 or 3 miles along the north-western base of the Scardus or Shar-dagh, and is traversed by the rapid waters of the Resna Mitritza, which, issuing from a deep gorge a little above the town, joins the Drin (White or Albanian Drin) a few miles below. To the north-north-west of Prisrend, which lies at a height of 1577 feet above the sea, a great undulating and fertile plain extends for more than 40 miles towards Ipek. In 1865 the Roman Catholic archbishop estimated the total at 50,000 (8000 Moham- medan families, 3000 Greek, and 150 Latin). It is now about 46,000. There is a castle on the buttress of the Scardus, at the foot of which lies the Christian quarter, with a small brick-built ancient-looking Byzantine church. The old cathedral, now a mosque, is also a Byzantine build- ing. Prisrend, doubtfully identified with Tharendus, was at one time the capital of Servia, and the district is still called Old Servia. At present the town owes much of its importance to its manufacture of arms; and it also pro- duces glass, pottery, and saddlery.*~~

~~*PRIVATEER is an armed vessel belonging to a private owner, the subject of a belligerent power, conimissioned by the sovereign of that power. The*~~

~~commission is either a commission of war or of marque and reprisals in time of peace. It was marque in this sense which was granted to aggrieved subjects of the realm of England as early as the statute 4 Hen. V. c. 7. The term "letters of Inarque," however, is now generally applied less strictly to the commission under which a privateer sails in time of war. 'The acceptance of a commission from a belligerent power by a neutral, though not piracy by the law of nations, has frequently been made so by treaty. Accept- ance of such a commission by a British subject is for- bidden by the Foreign Enlistment Act, 1870. A vessel with a commission from each of two powers at war with one another is a pirate by the law of nations. Privateers stand in a position between that of a public ship of war anda merchant vessel. They are not entitled to the full rights which the comity of nations extends to public ships of war ; e.g., by the municipal regulations of most nations they may not carry the flag of a public ship of war. A~~

~~a Instances will be found in Phillimore, Znternational Law, vol, i. pt. iii. ch. xx. ; Twiss, Law of Nations, vol. ii. ch. x.~~

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~~capture made by a privateer may either become the pro- perty of the captor or, following the general rule of inter- national law, the property of the state (see Prize). In Great Britain, in order to encourage privateering, the prize taken by a privateer was formerly divided between the owners and the captors, and the rights of the crown were specially excluded in numerous Prize Acts. But now, by the Naval Prize Act, 1864, a prize made by a privateer belongs to the crown in its office of admiralty. By the United States Prize Act of 1864, the whole pro- ceeds of a prize made by a privateer go, unless it is other- wise provided in her commission, to the captors. The sum awarded is divided, in the absence of agreement, equally between the owners and the ship's company.~~

~~Privateering is now a matter of much less importance than it formerly was, owing to the terms of Art. 1 of the Declaration of Paris, April 16, 1856, "Privateering is and remains abolished." The Declaration binds only the powers who are signatories or who afterwards assented, and those only when engaged in war with one another. The United States, Mexico, Uruguay, and Spain have not acceded to it, and thus it would not hold in~~

~~*case of a war be- tween the United States and any other power, whether the latter were bound by the Declaration or not. By the constitution of the United States, Congress has power to grant letters of marque and reprisal. Congress, by an Act of March 8, 1868, authorized the issue of letters of marque by the president, but they were never in fact issued either by the United States or Confederate Government.*~~

~~*In the Franco-Prussian War of 1870, Prussia, in spite of the Declaration of Paris, took a course very little removed from priva- teering in the creation of a volunteer fiect.*~~

~~*PRIVET (Ligustrum), the vernacular name? of a genus of Oleacex. There are several species, all of them shrubs or low trees with evergreen or nearly evergreen opposite entire leaves, and dense cymes of small white tubular four-parted flowers, enclosing two stamens and succeeded by small, globular, usually black berries, each with a single pendulous seed. The best-known species is the common European privet, which makes good hedges in cases where no great powers of resistance to the inroads of cattle, &c., are required. ZL. ovalifolium thrives by the seaside and even in towns, and is thus a valuable all but evergreen shrub. JL. lucidum is taller and handsomer. There are several other species, mostly natives of China and Japan, some of which when attacked by a species of scale-insect (Coccus) yield a waxy substance.*~~

~~*PRIVILEGE, in law, is an immunity or exemption conferred by special grant in derogation of common right. The term is derived from privilegiwm, a law specially passed in favour of or against a particular person. In Roman law the latter sense was the more common; in modern law the word bears only the former sense. Privi- lege in English law is either personal or real,—that is to say, it is granted to a person, as a peer, or to a place, as a university. The most important instances at present existing in England are the privilege of parliament (see PARLIAMENT), the privilege which protects certain com- munications from being regarded as libellous (see LiBen), and certain privileges enjoyed by the clergy and others, by which they are to some extent exempt from public duties, such as serving on juries. Privileged copyholds are those held by the custom of the manor and not by the will of the lord. There are certain debts in England, Scotland, and the*~~

~~United States which are said to be privileged, that is, such debts as the executor may pay before all others—for example, funeral expenses or servants' wages. In English law the term "preferred" rather than "privi- leged" is generally applied to such debts. There are certain deeds and summonses which are privileged in Scotch law, the former because they require less solemnity than ordinary deeds, the latter because the ordinary~~

~~? Another form of the name, primprivet, primprint, or primet, like ligustrum itself, used at one time to be applied to the primrose.~~

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~~induciz are shortened in their case (see Watson, Law Dict., s.v. "Privilege").~~

~~In the United States the term privilege is of considerable politi- eal importance. By Art. 1V. § 2 of the constitution, "the citizens of each State shall be entitled to all privileges and immunities of citizens in the several States." By Art. XIV. § 1 of the amend- ments to the constitution (enacted July 28, 1868), "no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States." It will be noticed that Art. IV. applies to citizens of the States, Art. XIV. to citizens of the United States. "Thc intention of this clause (Art. IV.) was to confer on the citizens of each State, if one may so say, a general citizenship, and to communicate all the privileges and immunities which the citizens of the same State would have been entitled to under the like circumstances" (Story, Constitw- tion of the United States, § 1806). The clauses have several times been the subject of judicial decision in the supreme court. Their practical effect may be thus illustrated. With regard to Art. 1V., it was held that a State licence tax discriminating against commodities the production of other States was void as abridging the privileges and immunities of the citizens of such other States (Ward v. State of Maryland, 12 Wallace's Keports, 418). With regard to Art. XIV. 1, it was held that its main purpose was to protect from the hostile legislation of the States the privileges and immunities of citizens of the United States, looking more especi- ally to the then recent admission of negroes to political rights. Accordingly it was held that a grant of exclusive right or privilege of maintaining slaughter-houses for twenty-one years, imposing at the same~~

~~*time the duty of providing ample conveniences, was not unconstitutional, as it was only a police regulation for the health of the people (The Slaughter-House Cases, 16 Wallace, 36). The same has been held of a refusal by a State to grant to a woman a licence to practise law (Bradwell v. The State, 16 Wallace, 130), of a State law confining the right of suffrage to males (Minor v. Happersett, 21 Wallace, 162), and of a State law regulating the sale of intoxicating liquors (Bartemeyer v. Iowa, 18 Wallace, 129). Suits to redress the deprivation of privilege secured by the consti- tution of the United States must be brought in a United States court. It isa crime to conspire to prevent the free exercise and enjoyment of any privilege, or to conspire to deprive any person of equal privileges and immunities, or under colour of law to subject any inhabitant of a State or Territory to the deprivation of any privileges or immunities (Revised Statutes of United States, §§*~~

~~*5507, 5510, 5519).*~~

~~*PRIVY COUNCIL. In England the king almost of necessity has been at all times guided by a council. The council, as it existed in the Norman period under the name of curia regis (a branch of the larger commune con- cilium regni), exercised judicial, legislative, and administra- tive functions. It contained the germs of the courts of law and equity, the Houses of Parliament, and the privy council. The Courts of King's Bench and Common Pleas were gradually separated from it and became only courts of first instance, subject to appeal to the king's council. From the time of Edward I. the concilium ordinarium, the ordinary or standing council of the king, superseded the curia regis. It exercised high judicial functions as the ultimate court of appeal, as the adviser of suitors on petition what court to choose for redress, and as the resort of those who failed to obtain justice in the ordinary course. It was also the supreme administrative body, and as such issued ordinances on matters of a local or temporary nature, with not infrequent usurpations at a later period of juris- diction belonging more properly to the common law courts or to parliament. The council "consisted of the chief ininisters, the chancellor, treasurer, lord steward, lord admiral, lord marshall, the keeper of the privy seal, the chamberlain, treasurer, and comptroller of the household, the chancellor of the exchequer, the master of the ward- robe; and of the judges, king's serjeant, and attorney- general,*~~

~~the master of the rolls, and justices in eyre, who at that time were not the same as the judges at West- minster" (Hallam, Middle Ages, vol. iii. p. 205). The growing power of the ordinary council (it does not seem to have been called the privy council until after the reign of Henry VI.) led to many complaints on the part of the Commons, some of which found their expression in statutes. The most worthy of notice is 25 Edw. III. st. 5,¢. 4,~~

~~characterized by Hallam as probably the most extensively beneficial enactment in the whole body of our laws. Among other provisions it prohibited arbitrary imprison- ment and the determination of pleas of freehold before the council. The power of the council expanded or con- tracted according to the vigour of the king. Its authority was finally reduced by the Long Parliament in 1640 by means of 16 Car. I. c. 10. Assumption of jurisdiction over freeholds was still a grievance, for the Act specially declared that the king's council has no jurisdiction over any man's land, goods, or chattels. From the beginning of Edward. III.'s reign the council and the House of Lords were often blended into one assembly, called the magnum concilium or great council. As it met only when summoned by writ and not daily, like the ordinary council, it could scarcely have exerted as much authority as the latter. It is therefore not surprising to find it soon split permanently into its two component parts, each retaining both judicial and legislative authority. The privy council still exercises authority of both kinds, though not as completely as the House of Lords. The political importance of the privy council has almost entirely disappeared since the duties of government have been assumed by the cabinet. Its modern legislative jurisdiction is of a subordinate char- acter. Its position as.a court of appeal from the foreign possessions of the crown is a strictly logical one. It was always the court for redress where no other redress could be obtained. For the sake of convenience this jurisdiction in cases of what is now called equity was exercised by the chancellor, originally the president of the ordinary council when it sat as a court of justice. But in cases for which equity made no provision, as being out of the bounds of the realm, the privy council still exercises to the full one of the most ancient parts of its jurisdiction. Appeals lay from foreign possessions by virtue of the prerogative, but are now generally regulated by statute. The jurisdiction of~~

~~*the HIgh Court of Delegates over ecclesiastical and admiralty cases was transferred to the privy council in 1832. The council lost its probate appeal jurisdiction in 1857, its admiralty jurisdiction in appeals from England in 1875, from Ireland in 1877.*~~

~~*At the present day members of the privy council become so at the will of the crown, but it is understood that persons in certain positions have an ex officio claim to be nominated. The conncil consists of princes of the royal family or of some of the great officers of state, such as the principal members of the Government, the archbishops and the bishop of London, the judges of the HIouse of Lords, the judicial committee, and the court of appeal, diplo- matists of high rank, &. Members of the privy council have the title of "right honourable" and social precedence next after knights ofthe Garter. Ireland has its own privy council. Scotland has had none of its own since 6 Anne c. 40, which provided for one privy council for Great Britain. The modern jurisdiction of the privy council may be divided into two branches, administrative and judicial.*~~

~~*Administrative.—This jurisdiction chiefly depends upon statutory authority, which practically makes of the privy council a subordinate legislature. It is exercised either by the whole council or by committees to which matters are referred by the crown in council. Examples of the latter are the board of trade, the committee of council on education, the local government board (see PuBLIC HEALTH), the universities committee, with temporary powers under the Universities Act, 1877, and the committee of council for the con- sideration of charters of incorporation under the Municipal Corpora- tions Act, 1882. Cases affecting the constitutional rights of the Channel Islands are referred to a committee for the affairs of Jersey and Guernsey. The comunittees report to the crown in council, and their report is adopted and enforced by an order in council, published in the Gazette. Among other Acts conferring administrative powers upon the privy council are the Pharmacy Act, 1852, as amended by 31 & 32 Vict. c. 121, the Medical Act, 1858, the Foreign Enlistment Act, 1870, the Destructive Insects Act, 1877, the Contagious Diseases (Animals) Act, 1878, the Dentists Act, 1878, the Veterinary Surgeons Act, 1881.*~~

~~*Judicial.—Up to 1833 the judicial authority of the privy council was exercised hy judicial committees appointed from time to time for the hearing of appeals referred to them by the crown*~~

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~~*in council. In 1833 the judicial committee of the privy council was established as a permanent court by 3 & 4 Will. IV. c. 41. Under this and later Acts the judicial committee now consists of the lord president, the lord chancellor, and other persous who fill or have filled high judicial offices (all unpaid), of two retired Indian or colonial judges who receive an allowance for attending the sittings of the committee, and of paid members, now two in number, appointed under 84 & 85 Vict. c. 91. The Appellate Jurisdiction Act, 1876, provides for what is in effect the union of the House of Lords and of the privy council in their judicial capacities by the lords of appeal in ordinary gradually becoming judges of both courts. After the death or resignation of the present paid members these two high judicial bodies will be practically combined, and a near approach will be inade to the medieval magnum concilium in an ultimate court of appeal from the whole of the British dominions. = :*~~

~~*In proceedings under the Church Discipline Act archbishops and bishops who are members of the privy council are members of the judicial committee, 3 & 4 Vict. c. 86. In proceedings under the Public Worship Act, 1874, archbishops and bishops attend as assessors according to rules made by order in council, 39 & 40 Viet. c. 59, § 14. The jurisdiction of the judicial committee is either original or appellate. The original jurisdiction is the less important, and consists of ecrtain powers conferred by the Copy- right, Patent, Endowed Schools, and other Acts. The power most frequently exercised is that of extending the term of patents. The appellate jurisdiction is entirely regulated by statute, with the exception of the rarely occurring appeal from orders made by the lord chancellor of Great Britain or of Ireland in exercise of powers conferred by royal sign manual for the custody of idiots and lunatics. Appeals lie fromthe Arches Court of Canterbury, from a vice-admiralty court abroad, and from the Channel Islands, the Isle of Man, India, and the colonies. Appeals are either of right*~~

~~*or by leave. Appeals lie as of right when the value of the matter at issue is of a certain amount (the amount varying according to the appeal rules of the different forcign possessions), and in a few other cases. Appeals lie at the discretion of the judicial committee, on leave being obtained by petition for special leave to appeal. The proceedings in all cases alike, whether original or appellate, are by petition (see PETITION). The petition is addressed to the crown in council in the first instance.*~~

~~*See, in addition to the writers on constitutional history, Sir Harris Nicolas, Proceedings and Ordinances of the Privy Council of England; Dicey, The Privy Cowncil ; Macpherson, Practice of the Judicial Committee of the Privy Council. (J. Wt.)*~~

~~*PRIZE, or Prizz or War, denotes the ship or goods of an enemy, or i transitu to an enemy, captured at sea. Goods captured on land are not prize, but booty of war. To be good prize the capture must be on the high seas or in the territorial waters of one of the belligerents, and must be by an armed vessel duly commissioned by the sovereign of the captor. A capture made in neutral waters is a violation of neutrality, and may be restored at the discretion of the neutral power. Most nations have municipal regulations upon the subject. Thus prize cap- tured in breach of the neutrality of Great Britain may be restored by the High Court of Justice (Admiralty Division) under the powers of the Foreign Enlistment Act, 1870, 33 & 34 Vict. c. 90, § 14. Capture may be actual or constructive. Constructive or joint captors are those who have assisted the actual captors by conveying encourage- ment to them or intimidation to the enemy. All public ships of war within signalling distance are usually held entitled to share in the proceeds of the capture. This Tule is incorporated in the United States code of prize law, the Act of Congress of June 30, 1864. It is not all enemy's property that is good prize. The conflicting interests of neutrals have led to modifications of the general belligerent right of seizing enemy's property wherever found, a right which had become established as part of the general maritime law as early as the Consolato del Mare (see vol. vi. p. 317, and Sra Laws). By the rules laid down in the Consolato neutral vessels or neutral goods were to be restored to the owners without com- pensation for the loss of time and other inconveniences attending capture. This may be said to have been the*~~

~~*general law of the sea down to 1856. At the same time it 1s to be noticed that two doctrines inconsistent with the*~~

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~~*original rule had met with the sanction of certain nations, viz., (1) the French doctrine of hostile infection, by which neutral property on an enemy's ship or a neutral ship carrying enemy's property was good prize; (2) the Dutch doctrine, by which the character of the ship alone was regarded—free ship made free goods, enemy ship enemy goods (see Twiss, Law of Nations, vol. ii. ch. v.). In 1856 the Declaration of Paris adopted an intermediate system. To this Declaration most nations have acceded (see PRIVATEER). By article 2 of the Declaration, "the — neutral flag covers enemy's goods, with the exception of contraband of war." By article 3, "neutral goods, with the exception of contraband of war, are not liable to capture under an enemy's flag." Contraband of war, speaking generally, includes all articles, such as provisions and munitions of war, likely to add to the military or naval resources of the enemy (see CoNTRABAND). After the capture has been made, the next proceeding is the determination of its legality. It is now an understood rule of international law that the question of prize or no prize must be determined by a qualified prize court (see below). Captors: should send their capture to a conveni- ent port, if possible a port of their own nation or an allied power, for adjudication. They may forfeit their rights by misconduct in this respect. The property in the prize vests in the sovereign, in accordance with the old maxim of law Parta bello cedunt reipublice. This right attaches both in cases of capture and recapture, subject in the latter case to what is called the jus postliminit, that is, the right of the owner of property recaptured from the enemy to have it returned—formerly if the recapture has taken — place before the property had been taken within the enemy's territory (infra presidia), at present if less than twenty-four hours has elapsed between the capture and recapture. The right of the recaptors to salvage on recap- ture is regulated by the municipal law of different nations. By English law one-eighth of the value is the sum usually awarded, but this may be increased to one-fourth under special circumstances. The right does not exist at all if the vessel has been fitted out as a vessel of war by the enemy, 27 & 28 Vict. c. 25, § 40. One-eighth is awarded for recapture from pirates, 13 & 14 Vict. c. 26,§ 5. In the*~~

~~*United States, by the Prize Act of June 30, 1864, salvage on recapture is allowed according to the circum- stances of the case. There is no sum fixed as in England. Although the prize vests in the sovereign, it has been held in England that the captors have an insurable interest in the prize immediately after capture and before condemna- tion on the ground that under the Prize Act the captors have a certain expectation of profit upon the safe arrival of the prize in port,.and that they are liable to condemna- tion in damages and costs if the capture be unjustifiable. By the general maritime law a prize may be released upon ransom; but it has been the general policy of European nations to discountenance ransom as less beneficial to the state than the detention of a prize. Thus an Act of 1782, and subsequent Acts, avoided ransom bills given by British subjects, and subjected a commander giving one to an enemy to penalties, unless in either case the circum- stances were such as to justify the giving or taking of the bill. The Naval Prize Act, 1864, is less strict in its terms. It enacts that the queen in council may from time to time in relation to any war make such orders as are expedient as to contracts for the ransoming of a ship or goods ; contravention of the orders makes the contract void and renders the offender liable to a penalty not exceeding £500, 27 & 28 Vict. c. 25, § 45. By the Naval Discipline Act, 1866, a commanding officer making an unlawful agreenient for ransom is liable to be dismissed from the service, 29 & 30 Vict. c. 109, § 41. The*~~

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~~*United States have never prohibited ransom bills. The rights of the sovereign to prize may be waived, as was formerly done by the crown of Great Britain in the case of privateers (see PRIVATEER).*~~

~~*Many statutes dealing with prize have been enacted at different times in England. The first general Prize Act was 6 Anne c. 12. The Act that now regulates prize is the Naval Prize Act, 1864, already referred to. Various offences in relation to prize are dealt with by the Naval Prize Act and the Naval Discipline Act. Such are false swearing in a prize cause or appeal, taking money, &c., out of a ship before condemnation, ill-using persons on board the prize, &c., or breaking bulk with a view to embezzlement. Prize is subject to the usual customs regulations. The United States Prize Act is the*~~

~~*Act of June 30, 1864, just seven days later in date than the British Prize Act. The two Acts are similar in character, but the United States Act is more full and definite than the British, as it deals with some matters which in Great Britain are left to the discretion of the executive.*~~

~~*Prize Court.—This is a court sitting by the commission of the the sovereign of the captor for the determination of prize causes. A capture does not become good prize until condemnation by a prize court. As a general rule the court must be commissioned by the sovereign, must sit in the country of the captor, and must be in possession of the prize. In the case of allied powers, it is usually agreed (as it was between Great Britain and France in 1854) that the decision shall be made by a court of the country to which the officer in command belongs. A prize court may sit in the territory of an ally, though this is irregular ; but it is a violation of neutrality to constitute a prize court within the limits of a neutral power. A prize may, however, in case of necessity be brought into a neutral port and sold there under the decree of a prize court, subject to objection on the part of the neutral Government. The sentence of a prize court is, where the jurisdiction is well-founded, a judgment in rem and entitled to universal respect. In the British dominions the prize courts are such courts as the crown or parliament invests with authority in prize matters. In practice these are the HIgh Court of Justice (Admiralty Division) and the Vice-Admiiralty Courts abroad. By the Naval Prize Act, 1864, the HIgh 'Court of Admiralty of England (now represented by the Admiralty Division) has jurisdiction asa prize court throughout the British dominions. It is to be noticed that this jurisdiction is entirely derivative ; the court has no original prize jurisdiction as it has original instance jurisdiction. The prize jurisdiction of Scotch courts was vested in the HIgh Court of Admiralty of England by 6 Geo. IV. c. 120, § 57. Art. III. § 2 of the constitution, "The judicial power, shall extend ae all cases of admiralty and maritime jurisdiction") the prize courts are the district courts, the State courts having no jurisdiction. The procedure of a prize court is simple in its character. In Great Britain and the United States standing inter- rogatories are administered to the captors. The case is heard upon the depositions of the witnesses in answer to the interrogatories, and upon the ship's papers, which it is the duty of the captor to forward to a port of 'his country for deposit in the court. The flag is regarded as prima facie evidence of the nationality of a captured vessel. The pleadings are not*~~

~~*technical. A libel is filed, followed by a monition to parties interested. If the cause be not prosecuted, the court will issue a monition to the captors to proceed. A prize court has power to order matters incidental to the cause, such as unlivery and appraisement and sale. It also distributes prize money in some cases (see below). The procedure of prize courts in the British dominions may be regulated by order in council under the powers of the Naval Prize Act, 1864; in the United States it depends upon the Prize Act of June 30, 1864; An appeal lies in England from the Admiralty Division to the Court of Appeal and thence to the House of Lords, from the Vice-Admiralty Courts abroad to the Judicial Committee of the Privy Council. In the United States it lies to the supreme court where the matter in dispute exceeds 2000 dollars, or involves a question of general importance. In addition to prize proper, prize courts have had jurisdiction in some analogous matters conferred on them by statute. Thus a prize court in the British dominions has juris- diction over (1) enemy's property captured in a conjunct expedi- tion of land and naval forces, 2 & 3 Will. IV. c. 53, § 30, or captured on land by a naval or naval and military force acting either alone or with allied forces, 27 & 28 Vict. c. 25, 8§ 34, 35 ; (2) petitions of right where the subject-matter of a petition arises out of the exercise of any belligerent right by the crown, or would be cognizable in a prize court if the same were a matter in dispute between private persons, § 52. Questions of booty of war may be referred to the Admiralty Division as a prize court, 3 & 4 Vict. c. 65, § 22. The United States prize courts have by the Act of 1854 jurisdiction over property captured in an insurrection.!*~~

~~*1 For the procedure of prize courts see Story, On Prize Courts; Phillimore, International Law, vol. iii, | t. xi.; Lushington, Manual of Naval Prize Law.*~~

~~*In the United States (in accordance with |*~~

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~~*Prize Money.—The term prize money is used in a wider sense than the term prize. It extends toany reward granted by the state for the capture of enemy's property whether by land or sea. (1) The Act consolidating the right to and distribution of army prize money is the Army Prize Act, 1832, 2 & 3 Will. 1V. c. 53. The right and interest of troops to prize money and bounty money is at the discretion of the crown, and is to be distributed in*~~

such propor- tions as the crown may direct. It is to be noticed that capture by troops of an enemy's ship in a road, river, haven, or creek of the enemy gives a right to prize money in this sense, though it is not prize proper, not having been captured at sea by an armed ship. Deserters are uot entitled to prize money. Shares not claimed within six years are forfeited. A list of persons entitled is trans- mitted to Chelsea Hospital, the treasurer of which distributes the money either to such persons or their assignees, or to the regi- mental agent, according to the rules laid down in the Act. Prize money may be assigned subject to certain conditions. In the case of officers the assignment must express the consideration money actually paid for the assignment ; in the case of non-commissioned officers or seamen the assignment is ouly valid where there is no regimental agent. In conjunct expeditions of land and naval forces, the share of the land forces is to be paid to the treasurer of Chelsea Hospital. By 27 & 28 Vict. c. 36, § 3, prize money not exceeding £50 may be paid without probate or letters of administration. By 39 Vict. c. 14, the accounts are to be laid before parliament. In the United States provision was made by several Acts of Congress that officers and soldiers who had served in certain wars should be entitled to warrants for bounty-lands as a reward for their services. (2) For the right to prize money where the captor at sea is nota public ship of war, see PRIVATEER. Where the captor is a public ship of war of Great Britain, the officers and crew have only such interest in the proceeds of prize as the crown may from time to time grant

| them. This interest is subject to forfeiture for misconduct in rela-

tion to the prize, 27 & 28 Vict. c. 25, §§ 36, 55. In the United States, by the Prize Act of 1864, the whole proceeds go to the captor where the prize is of superior or equal force, one-half to the eaptor and one-half to the United States where the prize is of inferior foree. The prize money accruing to the United States forms part of the fund for pensions. Besides a share of the prize, prize bounty is generally given. By the Naval Prize Act, 1864, this is at the rate of £5 for caeh person on board the enemy's ship, if a ship of war, 27 & 28 Vict. c. 25, § 42. By the United States Act of 1864, the rate is 200 dollars if the prize is of superior or equal force, 100 if of inferior foree. The distribution of prize money and prize bounty in Great Britain is regulated by the Naval Agency and Distribution Act, 1864, 27 & 28 Vict. c. 24. The

~~*money is distributed under the direction of the lords of the Admiralty in the proportions speci- fied in a royal proclamation or order in council, 'The proportions are graduated according to rank (see vol. xvii. p. 298). Assign- ment of a share by a petty officer or seaman or a non-commissioned. officer of marines or marine is void unless in accordance with orders in council. All forfeited and unclaimed shares, and a percentage of 5 per ceut. out of the proceeds and grants, are carried to the account of the naval prize cash balance. The Admiralty Division has the sole right of determining disputes as to distribution or investment. In the United States the distribution is regulated by the Act of 1864. The distribution is by the district court; it isa judicial act, not, as in Great Britain, the act of a Government department. The proportions too are fixed by statute—uot left, as in Great Britain, to the discretion of the executive. The command- ing officer of a fleet or squadron has one-twentieth allotted to him, of a division one-fiftieth, a fleet captain one-hundredth, the com- mander of a single vessel one-tenth of the amount awarded to the vessel; the residue share in proportion to their pay. Prize money is paid into the treasury of the United States to be distributed according to the decree of the court. Ransom mouey, salvage, bounty; and proceeds of condemned property are distributable as prize money. Assignments of prize money must be attested by the commanding officer and the paymaster. There are certain cases where money is granted to the officers and crew of vessels making . captures which are not prize in the strict sense of the word. Under this head may be classed the salvage on recapture already men- tioned, besides the cases provided for in the following enactments. By 22 & 28 Car. II. c. 11, § 10, 2 percent. of the value of the ship defeuded may be awarded to those wounded and the representatives of those slain in the defence of a merchant ship against pirates. By the Customs Act, 1876, 39 & 40 Vict. c. 36, §$ 210-216, rewards may be granted to officers of the customs out of the penalties for goods seized. By the Slave Trade Act, 1873, 36 & 37 Vict. c. 88, §§ 11, 12, a bounty of £5 per slave or of £4 per ton is payable to the officers and crew of one of Her Majesty's ships upon capture of aslaveship. Where the capture is not by a ship of war, the Lounty is one-third of the value of the ship seized, and a bounty of £5 for each slave. By an Act of Congress of March 3, 1819, a bounty of 25 dollars is given for each slave captured, and the proceeds of con- demned slave ships are divided between the United States and the captors, half to eacli. (J. Wt.)*~~

~~HE mathematical theory of probability is "a science~~

~~which aims at reducing to calculation, where possible,~~

~~the amount of credence due to propositions or statements,~~

~~or to the occurrence of events, future or past, more especi-~~

~~ally as contingent or dependent upon other propositions or events the probability of which is known. }~~

~~Any statement or (supposed) fact commands a certain amount of credence, varying from zero, which means con- viction of its falsity, to absolute certainty, denoted by unity. An even chance, or the probability of an event which is as likely as not to happen, is represented by the fraction }. It is to be observed that } will be the probability of an event about which we have no knowledge whatever, because if we can see that it is more likely to happen than not, or less likely than not, we must be in possession of some information respecting it. It has been proposed to form a sort of thermometrical scale, to which to refer the strength of the conviction we have in any given case. Thus if the twenty-six letters of the alphabet have been shaken together in a bag, and one letter be drawn, we feel a very feeble expectation that A has been the one taken. If two letters be drawn, we have still very little confidence that A is one of them; if three be drawn, it is somewhat stronger; and so on, till at last, if twenty-six be drawn, we are certain of the event, that is, of A having been taken.~~

~~Probability, which necessarily implies uncertainty, is a consequence of our ignorance. To an omniscient Being there can be none. Why, for instance, if we throw up a shilling, are we uncertain whether it will turn up head or tail? Because the shilling passes, in the interval, through a series of states which our knowledge is unable to predict or to follow. If we knew the exact position and state of motion of the coin as it leaves our hand, the exact value of the final impulse it receives, the laws of its motion as affected by~~

~~*the resistance of the air and gravity, and finally the nature of the ground at the exact spot where it falls, and the laws regulating the collision between the two substances, we could predict as certainly the result of the toss as we can which letter of the alphabet will be drawn after twenty-five have been taken and examined.*~~

~~*The probability, or amount of conviction accorded to any fact or statement, is thus essentially subjective, and varies with the degree of knowledge of the mind to which the fact is presented (it is often indeed also influenced by passion and prejudice, which act powerfully in warping the judgment),—so that, as Laplace observes, it is affected partly by our ignorance partly by our knowledge. Thus, if the question were put, Is lead heavier than silver?*~~ ~~*some persons would think it is, but would not be surprised if they were wrong ; others would say it is lighter ; while to a worker in metals probability would be superseded by certainty. Again, to take Laplace's illustration, there are three urns A, B, C, one of which contains black balls, the other two white balls ; a ball is drawn from the urn C, and we want to know the probability that it shall be black. If we do not know which of the urns contains the black balls, there is only one favourable chance out of three, and the probability is said to be 4. But ifa person knows that the urn A contains white balls, to him the uncertainty is confined to the urns B and C, and therefore the proba- bility of the same event is 4. Finally to one who had found that A and B both contained white balls, the probability is converted into certainty.*~~

~~*_ im common language, an event is usually said to be likely or probable if it is more likely to happen than not,*~~

~~*or when, in mathematical language, its probability exceeds 3; and it is said to be improbable or unlikely when its probability is less than 4. Not that this sense is always adhered to; for, in such a phrase as "It is likely to thunder to-day," we do not mean that is more likely than not, but that in our opinion the chance of thunder is greater than usual; again, "Such a horse is likely to win the Derby," simply means that he has the best chance, though according to the betting that chance may be only 4, Such unsteady and elliptical employment of words has of course to be abandoned and replaced by strict definition, at least mentally, when they are made the subjects of*~~

~~*mathematical analysis. Certuinty, or absolute conviction, also, as generally understood, is different from the mathematical sense of the word certainty. It is very difficult and often impossible, as is pointed out in the celebrated Grammar of Assent, to draw out the grounds on which the human mind in each case yields that con- viction, or assent, which, according to Newman, admits cf no degrees, and either is entire or is not at all! If, when walking on the beach, we find the letters "' Constantinople " traced on the sand, we should feel, not a strong impression, but absolute certainty, that they were characters not drawn at random, but by one acquainted with the word so spelt. Again, we are certain of our own death as a future event; we are certain, too, that Great Britain is an island ; yet in all such cases it would be very difficult, even for a practised intellect, to present in logical form the evidence, which nevertheless has compelled the mind in each instance to concede the point.2 Mathematical certainty, which means that the contrary proposition is inconceivable, is thus different, though not perhaps as regards the force of the mental conviction, from moral or practical certainty. It is questionable whether the former kind of certainty is not entirely hypothetical, and whether it is ever attainable in any of the affairs or events of the real world around us. The truth of no conclusion can rise above that of the premises, of no theorem above that of the data. That two and two make four is an incon- trovertible truth ; but before applying even it to a concrete instance we have to be assured that there were really two in each constituent group; and we can hardly have mathematical certainty of this, as the strange freaks of memory, the tricks of conjurors, &c., have often made apparent.*~~

~~*There is no more remarkable feature in the mathematical theory of probability than the manner in which.it has been found to harmonize with, and justify, the conclusions to which mankind have been led, not by reasoning, but by instinct and experience, both of the individual and of the race. ? At the same time it has corrected, extended, and invested them with a definiteness and precision of which these crude, though sound, appreciations of common sense were till then devoid. Even in cases where the theoretical result appears to differ from the common-sense view, it often happens that the latter may, though perhaps unknown to the mind itself, have taken account of circumstances in the case omitted in the data of the*~~

~~*1 "There is a sort of leap which most men make from a high pro- bability to absolute assurance . . . analogous to the sudden consilience, or springing into one, of the two images seen by binocular vision, when gradually brought within a certain proximity."—Sir J. Herschel, in Hidin. Review, July 1850.*~~

~~*2 Archbishop Whately's jeu d'esprit, Historic Doubts respectiny Napoleon Bonaparte, is a good illustration of the difficulties there may be in proving a conclusion the certainty of which is absolute.*~~

~~*rPEODe wi PIT y*~~

~~*theoretical problem. Thus, it may be that a person accords a lower degree of credence to a fact attested by two or more independent witnesses than theory warrants,—the reason being that he has unconsciously recognized the possibility of collusion, which had not been presented among the data. Again, it appears from the rules for the credibility of testimony that the probability of a fact may be diminished by being attested by a new witness, viz., in the case where his credibility is less than 3. This is certainly at variance with our natural impression, which*~~

~~*is that. our previous conviction of any fact is clearly not. |*~~

~~*weakened, however little it be intensified, by any fresh evidence, however suspicious, as to its truth. But on reflexion we see that it is a practical absurdity to suppose the credibility of any witness less than $—that is, that he speaks falsehood oftener than truth—for all men tell the truth probably nine times out of ten, and only deviate from it when their passions or interests are concerned. Even where his interests are at stake, no man has any preference for a lie, as such, above the truth; so that his testimony to a fact will at worst leave the antecedent probability exactly what it was.*~~

~~*A celebrated instance of the confirmation and comple- tion by theory of the ordinary view is afforded by what is known as James Bernoulli's theorem. If we know the odds in favour of an event to be three to two, as for instance that of drawing a white ball from a bag contain- ing three white and two black, we should certainly judge that if we make five trials we are more likely to draw white three times and black twice than any other*~~

~~combination. very uncertain; instead of three white, we might draw white 0, 1, 2, 4, or 5 times. But if we make say one thousand trials, we should feel confident that, although the numbers of white and black might not be in the proportion of three to two, they would be very nearly in that proportion. And the more the trials are multiplied the more closely would this proportion be found to obtain. This is the principle upon which we are continually judg-~~

~~ing of the possibility of events from what is observed in a.~~

~~certain uumber of cases.! Thus if, out of ten particular~~

~~infants, six are found to live to the age of twenty, we |~~

~~judge, but with a very low amount of conviction, that nearly six-tenths of the whole number born live to twenty. But if, out of 1,000,000 cases, we find that 600,000 live to be twenty, we should feel certain that the same propor-tion would be found to hold almost exactly were it possible to test the whole number of cases, say in England during the 19th century. In fact we may say, considering how seldom we know a priort the probability of any event, that the knowledge we have of such probability in any case is en-~~

~~tirely derived from this principle, viz., that the proportion |~~

~~which holds in a large number of trials will be found to hold in the total number, even when this may be infinite, —the deviation or error being less and less as the trials are multiplied.~~

~~Such no doubt is the verdict of the common sense of mankind, and it is not easy to say upon what considera- tions it is based, if it be not the effect of the unconscious habit which all men acquire of weighing chances and probabilities, in the state of ignorance and uncertainty which human life is, It is now extremely interesting to see the results of the unerring methods of mathematical analysis when applied to the same problem. It isa very~~

~~1 So it is said, "the tree is known by its fruits"; " practice is better than theory"; and the universal sense of mankind judges that the safest test of~~

~~any new invention, system, or institution is to see how it works. So little are we able by a priori speculations to forecast~~

~~the thousand obstacles and disturbing influences which manifest them- selves when any new cause or agent is introduced as a factor in the~~

~~world's affairs.~~

~~Still, however, we should feel that this was |~~

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~~difficult one, and James Bernoulli tells us he reflected upon it for twenty years. His methods, extended by De Moivre and Laplace, fully confirm the conclusions of rough common sense; but they have done much more. They enable us to estimate exactly how far we can rely on the proportion of cases in a large number of trials, truly representing the proportion out of the total number—that is, the real probability of the event. Thus he proves that if, as in the case above mentioned, the real probability of an event is 2, the odds are 1000 to 1 that, in 25,550 trials, the event shall occur not more than 15,841 times and not less than 14,819 times,—that is, that the deviation from 15,330, or 2 of the whole, shall not exceed 5 of the whole number of trials.~~

~~The history of the theory of probability, from the celebrated question as to the equitable division of the stakes between two players on their game being inter- rupted, proposed to Pascal by the Chevalier de Méré in 1654, embracing, as it does, contributions from almost all the great names of Europe during the period, down to Laplace and Poisson, is elaborately and admirably given by Mr Todhunter in his //istory of the subject, now a classical work. It was not indeed to be anticipated that a new science which took its rise in games of chance, and which had long to encounter an obloquy, hardly yet extinct, due to the prevailing idea that its only end was to facilitate and encourage the calculations of gamblers, could ever have attained its present status—that its aid should be called for in every department of natural science, both to assist in discovery, which it has repeatedly done (even in pure mathematics), to minimize the unavoid- able errors of observation, and to detect the presence of causes as revealed by~~

~~*observed events. Nor are com- mercial and other practical interests of life less indebted*~~

~~*.to it: 2 wherever the future has to be forecasted, risk to be*~~

~~*provided against, or the true lessons to be deduced from statistics, it corrects for us the rough conjectures of common sense, and decides which course is really, accord- ing to the lights of which we are in possession, the wisest for us to pursue. It is su generis and unique as an application of mathematics, the only one, apparently, lying quite outside the field of physical science. De Moivre has remarked that, 'some of the problems about chance having a great appearance of simplicity, the mind is easily drawn into a belief that their solution may be attained by the mere strength of natural good sense"; and it is with sur- prise we find that they involve in many cases the most subtle and difficult mathematical questions. It has been found to tax to the utmost the resources of analysis and the powers of invention of those who have had to deal with the new cases and combinations which it has pre- sented. Great, however, as are the strictly mathematical difficulties, they cannot be said to be the principal. Especially in the practical applications, to detach the problem from its surroundings in rerum natura, discard- ing what is non-essential, rightly to estimate the extent of our knowledge respecting it, neither tacitly assuming as known what is not known, nor tacitly overlooking some datum, perhaps from its very obviousness, to make sure that events we are taking as independent are not really connected, or probably so,—such are the preliminaries necessary before the question is put in the scientific form to which calculation can be applied, and failing which the*~~

~~*2 Men were surprised to hear that not only births, deaths, and mar- riages, but the decisions of tribunals, the results of popular elections, the influence of punishments in checking crime, the comparative values of medical remedies, the probable limits of error in numerical results in every department of physical inquiry, the detection of causes, physical, social, and moral, nay, even the weight of evidence and the validity of logical argument, might come to be surveyed with the lynx-eyed scrutiny of a dispassionate analysis. —Sir J. Herschel.*~~

~~*result of the mathematician will be but an ignoratio elenchi — a correct answer, but to a different question. ;*~~

~~*From its earliest beginnings, a notable feature in our subject has been the strange and insidious manner 1n which errors creep in—often misleading the most acute minds, as in the case-of —D'Alembert—and the difficulty of detecting them, even when one is assured of their presence by the evident incorrectness of the result. This is probably in many cases occasioned by the poverty of language obliging us to use one term in the same context for different things—thus introducing the fallacy of ambiguous middle; ¢g., the same. word * probability * referring to the same event may sometimes mean its pro- bability before a certain occurrence, sometimes after ; thus the chance of a horse winning the Derby is different after the Two Thousand from what it was before. Again, it may mean the probability of the event according to one source of information, as distinguished from its probability taking everything into account; for instance, an astro- nomer thinks he can notice in a newly-discovered planet a rotation from east to west; the probability that this is the case is of course that of his observations in like cases turning out correct, if we had no other source of informa- tion; but the actual probability is less, because we know that at least the vast majority of the planets and satellites revolve from west to east. It is easy to see that such employment of terms in the same context must prove a fruitful source of fallacies; and yet, without wearisome repetitions, it cannot always be avoided. But, apart from mere logical errors, the main stumbling-block is no doubt the uncertainty as to the limits of our knowledge in each case, or—though this may seem a contradiction in terms — the difficulty of knowing what we do know; and we certainly err as often in forgetting or ignoring what we do know, as in assuming what we do not. It is a not uncommon popular delusion to suppose that if a coin has turned up head, say five times running, or the red has won five times at roulette, the same event is likely to occur a sixth time ; and it arises from overlooking (perhaps from the imagination being struck by the singularity of the occurrence) the a priort knowledge we possess, that the chance at any trial is an even one (supposing all perfectly fair); the mind thus unconsciously regards the event simply as one that has recurred five times,*~~

~~*and therefore judges, correctly, that it is very likely to occur once more. Thus if we are given a bag containing a number of balls, and we proceed to draw them one by one, and the first five drawn are white, the odds are 6 to 1 that the next will be white,—the slight information afforded by the five trials being thus of great importance, and strongly influencing the probabilities of the future, when it is all we have to guide us, but absolutely valueless, and without influence on the future, when we have a priori certain information. The lightest air will move a ship which is adrift, but has simply no effect on one securely moored.*~~

~~*It is not to be supposed that the results arrived at when the calculus of probabilities is applied to most practical questions are anything more than approxi- mations ; but the same may be said of almost all such applications of abstract science. Partly from ignorance of the real state of the case, partly from the extreme intricacy of the calculations requisite if all the conditions which we do or might know are introduced, we are obliged to substitute in fact, for the actual problem, a simpler one approximately representing it. questions, assumptions such as that the centre of gravity of an actual sphere is at its centre, that the friction of the rails on a railway is constant at different spots or at different times, or that in the rolling of a heavy body no depres- sion 1s produced by its weight in the supporting substance,*~~

~~*Thus, in mechanical |*~~

~~*PaR-ore ab wi Tey*~~

~~*are instances of the convenient fictions which simplify the real question, while they prevent us accepting the result as more than something near the truth. So in probability,*~~

~~*the chance of life of an individual is taken from the*~~

~~*general tables (unless reasons to the contrary are very palpable) although, if his past history, his mode of life, the longevity of his family, &c., were duly weighed, the general value ought to be modified in his case ; again, in attempting to estimate the value of the verdict of a jury, whether unanimous or by a majority, each man is supposed to give his honest opinion,—feeling*~~

~~*and prejudice, or pressure from his fellow-jurors, being left out of the account. Again, the value of an expectation to an indi- vidual is taken to be measured by the sum divided by his present fortune, though it is clearly affected by other circumstances, as the number of his family, the nature of his business, &c. Anevent has been found to occur on an average once a year during a long period : it is not difficult to show that the chance of its happening in a particular year is 1~e-}, or 2 to 1 nearly. But, on examining the record, we observe it has never failed to occur during three years running. This fact increases the above chance ; but to introduce it into the calculation at once renders the question a very difficult one, Even in games of chance we are obliged to judge of the relative skill of two players by the result of a few games ; now one may not have been in his usual health, &c., or may have designedly not played his best; when he did win he may have done so by superior play, or rather by good luck ; again, even in so simple a case as pitch and toss, the coin may, in the con- crete, not be quite symmetrical, and the odds of head or tail not quite even.*~~

~~*Not much has been added to our subject since the close of Laplace's career. The history of science records more than one parallel to this abatement of activity. When such a genius has departed, the field of his labours seems exhausted for the time, and little left to be gleaned by his successors. It is to be regretted that so little remains to us of the inner working of such gifted minds, and of the clue by which each of their discoveries was reached. The didactic and synthetic form in which these are pre- sented to the world retains but faint traces of the skilful inductions, the keen and delicate perception of fitness and analogy, and the power of imagination—though such a term may possibly excite a smile when applied to such dry subjects—which have doubtless guided such a master as Laplace or Newton in shaping out each great design—only the minor details of which have remained over, to be supplied by the less cunning hand of commentator and disciple.*~~

~~*We proceed to enumerate the principal divisions of the theory of probability and its applications. Under each we will endeavour to give at least one or two of the more remarkable and suggestive questions which belong to it,—especially such as admit of simplification or improvement in the received solutions; in such an article as the pre- sent we are debarred from*~~

~~attempting even an outline of the whole. We will suppose the general fundamental principles to be already known to the reader, as they are to be now found in several elementary works, such " Todhunter's Algebra, Whitworth's Choice and Chance,~~

~~e~~

~~Many of the most important results are given under the apparently trifling form of the chances in drawing balls from an urn, &c., or seem to relate to games of chance, as dice or cards, but are in reality of far wider application,— this form being adopted as the most definite and lucid manner of presenting the chances of events occurring under circumstances which may be assimilated, more or less closely, to such cases,~~

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~~I. DETERMINATION OF THE PROBABILITIES OF CoMPOUND EVENTS, WHIEN THE PROBABILITIES OF THE SIMPLE EVENTS ON WHICH THIEY DEPEND ARE KNOWN.~~

~~1. Under this head come a very large and diversified range of questions ; a very few of the most important are all that we can give. One great class relates to the fulfilment of given conditions in repeated trials as to the same event, knowing the probability of what will happen in each trial.~~

~~2. Let there be an event which must turn out in one of two ways, W and B(as in drawing a ball from an urn containing white and black balls only) ; let the respective probabilities for each trial be y,¢; sothat p+q=1. Let two trials be made: the four possible cases which may arise are~~

~~WW, WB, BW, BB. The probability of the first is p?, of the second pg, of the third ng, of the fourth g% Thus the probability of a white and a black ball being drawn in an assigned order is pq; but that of a white and a black in any order is 2pq.~~

~~Suppose now 7 trials to be made. The probability of W every time is p"; that of B once and W (m—1) times in an assigned order is p"-1q, but if the order~~

~~*is indifferent it is np”-1q; that of B occurring twice only is p”-°q? if the order is given, but*~~

~~*min 1) jn-292 in any order; and so on. We have then this*~~

~~*2*~~

~~*result :—in the binomial expansion (p+gy”=1 =pr+npr-2q4 Dyn-2q2 +*~~

~~*ig ee ae. See*~~

~~*the terms in their order give the probabilities of the event W happening m times ; of W (n—1) times and B once; of W (n-2) times and B twice; and so on,—the sum of the whole giving 1, that is, certainty.*~~

~~*3. Asan example, let A and B be two players whose respective chances of winning one game are p and q; to find the probability of A winning m games before B wins n games, the play terminat- ing when either of these events has occurred.*~~

~~*The chance of A winning the first m games is py. The chance of his winning in the first m+1 games is mp™-!q.p=mp™q; for he must have won m—1 games out of the first m, and then win the (m+1)th; otherwise we should be including the first case. Again, the chance of A winning in the first m+2 games is, in like*~~

~~*(m <4 1 J sm Panag a Now the*~~

~~*match must be decided at latest by the (m+n —1)th game; for, if A fails to win m games by that time, B must have won 2. Hence the chance of A winning the match is*~~

~~*pr {14mg BOE _m(m+1) Tame hE*~~

~~*Thus, if A’s skill be double that of B, the chance that A wins*~~

~~*‘ ~· 412 Je» an SBE four games before B wins two is 943° That of B winning is 343° If A and B agree to leave off playing before the match is decided, the stakes ought clearly to be divided between them in proportion to their*~~

~~*respective probabilities of winning, as given above, —putting for m and n the numbers of games required to be won, at any given point of the match, by A and B respectively. This was one of the questions proposed to Pascal] by the Chevalier de Méré in the year 1654. 4, In the expansion (1) it may be asked which combination of the events W, B is most likely to occur in the » trials. As the ratio of the 2d term to the 1st is 7 of the 3d to the 2 oe A*~~

~~*2*~~

~~*n—-r+1lq*~~

~~*<=*~~

~~*manner, qg?; and so on.*~~

~~*ee*~~

~~*and of the (r+1)th to the rth*~~

~~*continues to increase the terms will increase. therefore, for the 7th term to be the greatest is*~~

~~*r+1 arhte tt or > (n+1)9;*~~

~~*~, so long as this ratio*~~

~~*The condition,*~~

~~*r*~~

~~*that is, v is the next integer above (x+1)g.*~~

~~*We conclude that if 7 is the next integer below (n+1)q the (r+1)th term is the greatest—that is, it is most likely that the event W occurs" —r times and Br times. If(z+1)q should be an integer (r), B is as likely to occur 7 as r+1 times; and either is more probable than any othernumber. 'Thus, in twelve throws of a die, the ace is more likely to turn np twice than any other number ; while in eleven throws it is as likely to turn up once only as twice.*~~

~~It is important to remark that, if the number of trials » be very large, we may treat qn and pn as whole numbers, and conclude that the event W is more likely to happen pn times and B qn times than in any other proportion.~~

~~5. Among the many questions which relate to the occurrence of~~

~~different combinations in successive trials as to the same event, one is as to the chances for a succession, or run, of the same result several times.~~

~~Let us consider the very simple case—In x throws of a coin, what is the chance that head occurs (at least) twice running ?~~

~~This will be an instance of the aid afforded by the calculus of finite differences in questions on probability. Let w,=the number of cases of r throws of a coin in which head turns up twice running, the whole number of cases being of course 2", Now if we consider the value of tn43, it includes 2%n+42, because the (n+3)th throw may turn up two ways; but it includes also those cases when head turns up in the last two throws, tail in the preceding one, and no run of two heads oecurs in the m preceding ones. The number of these cases is 2"—wy. We have therefore the equation~~

~~tes = 2a Fao Me ee 6 If E be an operator such that Ew, =u,41, equation (2) is (E3 — 2K? + 1)u,= 2" ; or, (E— 1)(E?- E-1)u,=2" ; so that, if we put a, B for the roots of the equation E?- E-1=0, th=2A- Bat +CA" 2.9. 3 2 6 (ee since U,=2" is a particular solution of (2),—A, B, C being three undetermined constants.~~

~~Now in two throws there is one case where head turns up twice, and in three throws there are three cases ; hence we have~~

~~U,=0=2+A+Ba+Cp Uy=1=4+A-+ Ba? +Cp? Uz =38=8+A+4+Ba*+Cp'; and, remembering that a?=a+1, 6?=8+1, we shall easily find from these 5.~~

~~(2).~~

~~A=0,B=5"_, c=;~~

~~a a n+2 _ gn+2~~

~~so that tl ome wl by a wine get OR~~

~~=~~

~~Now ann te p=,~~

~~expanding by the binomial theorem and reducing,~~

~~+2 n+1 +1)n(n—1)(n—2 a fi+S hey ON aa aie | a a. 1.)~~

~~Un = 2" —5+~~

~~'dividing by the total number of cases 2", we have for the proba-~~

~~bility of head turning up at least twice running in » throws~~

~~big ee ~· ? .. (6).~~

~~92nFi Another method of obtaining the same result is to consider the number of cases in which head never occurs twice running ; let an be this number, then 2"— 2, must be the number of cases when head occurs at least twice successively. Consider the value of Unio; if the last or (n+2)th throw be tail, #4, includes all the eases (tn+,) of the »+1 preceding throws which gave no succession of heads ; and if the last be head the last but one must be tail, and these two may be preceded by any one of the wu, favourable cases for the first » throws. Consequently~~

~~Unt2= UntitUn, lf a, 8, as before, are the roots of the quadratie E?- H-1=0, this equation gives~~

~~tig = Ka? BB". Here A and B are easily found from the conditions u,=2, w.=8 ; viz.,~~

~~: a2 B? 5 eel as ae , _n+2 (n+1)n~~

~~whence Un= Sati '1 133 5+ &c. ;~~

~~as in eq. (5). The probability that head never turns up twice running is found by dividing this by 2", the whole number of cases. This probability of~~

~~course becomes smaller and smaller as the number of trials (7) is increased.~~

~~6. Let us consider the chance of a run of three heads or tails during » throws,—that of a run of two heads or tails being~~

~~i evidently bg =1- gai» 98 there are but two cases out of the 2" which are alternately head and tail.~~

~~Let 2, be the number of cases, during 7 throws, which give at least one succession of three heads or three tails. Consider the value of tng; it includes 2uv,+4,, as the last throw may be head or tail ; but, besides these, every case of the first » throws which contains no run of three gives rise to one new case of thez+3 having a run of three ; thus, if the th throw be head, the last four may be HTTT, or THHHH if the nth be tail. HIence~~

~~Unt3= 22n+2 +2”? —Un,~~

~~C72~~

~~the same equation of differences as(2). Its solution is equation (Sp in which, if we determine the constants by the conditions m=0, U,=0, Ug=2, and divide by 2”, we find for the probability of a run of three of either event during 1 trials~~

~~Un 4 Saas unrest… 17)~~

~~aon~~

~~m1 3 5+ Comparing this result with (6) we find that the chanee of a run of two heads in n trials is equal to the chanee of a run of three, of either heads or tails, in n+1 trials, ; ,~~

~~7. If an event may turn out on each trial in a+6 ways, of which a@ are favourable and & unfavourable (thus a card may be drawn from a pack in fifty-two ways, twelve of which give court cards), and if we consider the probability that during 7 trials there shall occur a run of at least p~~

~~*favourable results, it is not difficult to see that (u» denoting the number of ways this may occur In r trials)*~~

~~*Untp+1 = (a+ b)tUnty + ba? { (a +5)" — ttn} '*~~

~~*aS Untp+, includes, besides (a+)tn+p, those cases in which the last p trials are favourable, the one before unfavourable, and the n preceding eontaining no such run as stated. ;*~~

~~*We will not enter on Laplace's solution of this equation, or rather of one equivalent to it, especially as the result is not a simple one (see Todhunter, p. 185). ;*~~

~~*8. Let the probability of an event happening in one trial be p, that of its failmg q; we have seen (art. 4) that, if a large number N of trials be made, the event is most likely to happen pN times and fail gN times. The chance of this oceurring is, however, extremely sinall, though greater than that in favour of any other proportion. We propose now to examine the probability that the proportion of successes shall not deviate from its most probable value by more than a given limit—that is, in fact, to find the probability that in N trials the number of times in which the event happens shall lie between the two limits pN +r.*~~

~~*Let m=pN , n=@N, which are taken to be integers. The proba- bility of the event happening m times is the greatest term T of the expansion (1), viz.,*~~

~~*|N*~~

~~*"fin*~~

~~*yang" A*~~

~~*The caleulation of this would be impracticable when N, m, x are large numbers, but Stirling's theorem gives us*~~

~~*1.2.3… w=attte-2/2n,*~~

~~*very nearly, when 2 is large ; and by substituting in the preceding value of T, and reducing, we easily find*~~

~~il~~

~~(y es 8 . /2mpqN ” Now the terins of the expansion (1) on either side of T are n(n—1)_ p? np, m q m(m—1) 92 ot Gh e atig’ Haris taenery et (O- But if z is much greater than a, &-a=xe7; nearly, so that 142+ ...(s—1 = n(n—1)(n-2).. . (s terms) =n%e— HEE CT) ns ;~~

~~(s+]),~~

~~2m~~

~~also~~

~~(m+1)(m+2)... (s terms) =m Hence the sth term before T in (9) is~~

~~(<) s(s—1) = 1 2 aS m~~

~~s(s+1) NG Ns? m—n Qn © 2m (2) I, or Cana Hae.~~

~~The sth term after T is~~

~~Ns? m—n €~· Imn~· Imn*T.~~

~~Now the probability that the event shall happen anumber of times comprised between m+7r and m—r is the sum of the terms in (9) from the rth term before T to the rth term after T. (N.B., though r may be large, it is supposed small as compared with N, m, or 7.) Now the sth term before T+ the sth term after T= 20-5,~~

~~C x —7 Ne nN since e” +e ~·=2, when z= Sj ss LE » 2mn Hel~~

~~Taking then each~~

~~term before T wi ; ‘ 5 i eco: with the corresponding term after T, and putting~~

~~if a aed 2mn 2qN * (10). we have for the required probability Pr =2(5T + To # 4 Te 2 eBoy pyre)~~

*If we now consider the curve whose equation is —72 y=Te—**

>

PROBRABTLIT ¥

and take a series of its ordinates corresponding to x=0, a, 2a, 3a… . 7a, where a is very small, and if A be its area from x=0 to z=ra, then A _ a (frst + last ordinates) - + sum of intermediate ordinates a

4G JO; "A + last ordinate,

re _2 i 6 Oda + Te a 0

il . or pea ig fy 0 State Jao a/2pqNa 9. We refer to the integral calculus for the methods of com-

puting the celebrated integral /e "dz, and will give here a short table of its values.

Table of the Values of the Integral Ir] ye 1 ee.

(11).

}

*T I T I | 7 I T I 0°00 | 0:00000 | 2 20270 Wl aes 93401 Det 99931 'O01 01128 'a "a2000 I) 1 95229 2°5 99959 02 "02256 |i "4 49839 || 1°5 96611 M548) 99976 "03 "03384 || °5 SOO5O Ge 16 97635 DH 99986 "04 04511 6 "60386 eye 98379 wes 99992 05 05637 " 67780 1°8 98909 2°9 99996 : "06 06762 | °8 7420 We 1G 99979 3°0 -99998 07 07886 || °9 79691 | 2:0 99532 co |1:°00000 08 | °09008 || 1°0 84270 Bell 99702 09 THOUS af mall *88020 || 2:2 99814 ll NG ||) lee 91031 |} 2°3 99886*

If the value of I is 0°5, or 4, r= °4769.

10. The second term in formula (11) expresses the probability that the number of occurrences of the event shall be exactly m+r or m—r, or more correctly the mean of these two pro- babilities. It may be neglected when the

~~number of trials N is : very great and the deviation 7 not a very small number.~~

~~We see from the foregoing table that when~~

~~Tr \/2pqN it becomes practically a certainty that the number of occurrences~~

~~will fall between the limits m-+r. Thus, suppose a shilling is tossed 200 times in succession; here~~

~~If therefore = 30, it may be called~~

~~i~~

~~2pqN 10 a certainty that head will turn up more than 70 and less than 130 times.~~

~~In the same case suppose we wish to find the limits m-+r such that it is an even chance that the number of heads shall fall between them, if the second term of (11) be neglected, we see from the table that~~

~~p= q=i and a=~~

~~it oa ed 48, .°.7=4°8; so that the probability that the number of heads shall fall between 95 and 105 is il 104/r rather more than an even chance. 11. Neglecting the second term of (11), we sce that p, depends solely on the value of ra, or that of oN ; so that, if the number of~~

~~Pso= 52+ e—t= '57 nearly,~~

~~trials N be increased, the value of 7, to give the same probability, tnereases as the square root of N; thus, if in N trials it is practically ' certain (when ra=8) that the number of occurrences lies between PNr, then, if the number of trials be doubled, it will be certain that the occurrences will lie between 2pN+ra/2. In all cases, if N be given, r can be determined, so that there is a probability amounting to certainty that the ratio of the number of occurrences to the whole number of cases shall lie between the limits~~

~~*pie 5 Now if N be increased re 4/N ; so that these limits are C pty ? © being a constant. Hence it is always possible to imerease the number of trials till it becomes a certainty that the proportion of occurrences of the event will differ from p, its probability on a single*~~

~~*trial, by a quantity less than any assignable. This is the celebrated*~~

~~*theorem given by James Bernoulli in the Ars Conjectandt. (See Todhunter's History, p. 71.)*~~

~~*PROBABILITY*~~

~~*12. We will give here a graphical representation (fig. 1), taken from M. Quetelet's Lettres sur la Théorie des Probabilités, of the facilities of the different numbers of successes which may occur in 1000 trials as to any event which is equally likely to happen as not in each trial,—as in 1000 tosses of a coin, or 1000 drawings from an urn containing one white and one black ball, replacing the ball each time,—or again in drawing 1000 balls together from an urn containing a great number of black and white in equal proportion.*~~

~~*As p=q=3, we find from formula (8) that the chance of exactly half the entire number drawn, viz., 500, being white is*~~

~~*tT ok 02523 ;*~~

~~*4/500*~~

~~*and the chance for any number 5004s is found by multiplying 82 f*~~

~~*T by e 500.*~~

~~*If then we take the central ordinate to represent T on any scale, and arrange along the horizontal line AB the different num- bers of white balls which may occur, and erect opposite each number an ordinate representing the probability of that number, we have a graphical diagram of the relative possibilities of all possible proportions of black and white in the result.*~~

~~*We see from it that all values of the number of white balls drawn less than 450, or greater than 550, may be considered impossible, the probabilities for them being excessively small.*~~

~~*500*~~

~~*Fig. 1.*~~

~~*The probability of the number of white balls falling between any two assigned limits, as 490 and 520, is found by measuring the area of the figure comprised between the two ordinates opposite those numbers, and dividing the result by the total area.*~~

~~*490° 480*~~

~~*IJ. PropaBinity of Future EVENTS DEDUCED FROM EXPERIENCE.*~~

~~*13. In our ignorance of the causes which influence future events, the cases are rare in which we know a priori the chance, or "facility," of the occurrence of any given event, as we do, for instance, that of a coin turning up head when tossed. In other cases we have to judge of the chances of it happening from experience alone. We could not say what is the chance that snow will fall in the month of March next from our knowledge of meteorology, but have to go back to the recorded facts. In walking down a certain street at 5 o'clock on three different days, I have twice met a certain individual, and wish to estimate from these data the likelihood of again meeting him under the same circumstances—in ignorance of the real state of things, viz., that 'he lives in that street, and returns from his business at that hour. Such is nearly the position in which we stand as to the probabilities of the future in the majority of cases.*~~

~~*We have to judge then, from certain recorded facts, of the pro- bability of the causes which have occasioned them, and thence to deduce the probabilities of future events occurring under the operation of the same causes. The term " cause" is not here used in its metaphysical sense, but as simply equivalent to 'antecedent state of things."*~~

~~*Let us suppose two urns, A containing two white balls, B con- taining one white and one black ball, and that a person not know- ing which is which has drawn a white ball from one, to find the probability that this is the urn A. This is in fact to find, suppos- ing a great number of such drawings to be made, what proportion of them have come from the urn A. If a great number N of drawings are made indiscriminately from both urns, 4N come from the urn A and are all white, N white come from the um B, and }N black. The drawing actually made is either one of*~~

~~*C73*~~

~~*| the 4N white from A, or of the }N white from B. As it is equally likely to have been any one of these, the chance that it came from A is 4N+#2N, or 2.*~~

~~*Suppose there had been two urns A and three urns B, and a white ball has been drawn from one of the five; as in a great number N of drawings 3N come from A and are white, 3N from Band 4 of them are white, the chance that it came from one of the urns A is*~~

~~*GH (R+EB)=F.*~~

~~*In general suppose an event to have occurred which must have been preceded by one of several causes, and let the antecedent probabilities of the causes be*~~

~~*| a a) ee*~~

~~*and let p, be the probability that when the first canse exists the event will follow, p, the same probability when the second cause exists, and so on, to find, after the event has occurred, the pro- babilities of the several causes or hypotheses.*~~

~~*Let a great number N of trials be made; out of these the number in which the first cause exists is P,N, and out of this number the cases in which the event follows are p,P,N; in like manner the cases in which the second cause exists and the event follows are P2P,N ; andso on. As the event has happened, the actual case is one out of the number*~~

~~(pi P, + poP.psP3 &c.)N,~~

~~and as the number in which the first cause was present is p,P,N the a posteriori pro- bability of that cause is~~

~~= PyPy~~

~~PP + PoPyt+pzP3+&c. * So likewise for the other causes,—the sum of these a posteriori probabilities being~~

~~Mk Wot Wet sw co =~~

~~Supposing the event to have occurred as above, we now see how the probability as to the future, viz., whether the event will happen or fail in a fresh trial, is affected by it. If the first cause exists, the chance that it will happen is y,; hence the chance of its happening from the first cause is p,r,; so likewise for the second, third, &c. Hence the probability of succeeding on a second trial is~~

~~Ty 2).~~

~~Py™ + PyT. + Pg™3 + (18). 14. To give a simple example: suppose an~~

~~= ai = urn to contain three balls which are white or black; one is drawn and found to be white. It is replaced in the urn and a fresh drawing made ; find~~

~~the chance that the ball drawn is white. There are three hypo- theses, which are taken to be equally probable a priori, viz., the urn contains three white, two white, or one white,—-that of none white being now impossible. The probability after the event of the first is by (12)~~

~~=SB= B+33+54 °° that of the second is 4, that of the third 4.~~

~~Hence the chance of the new drawing giving a white ball is~~

~~$+$-3+43=$.~~

~~15. The calculations required in the application of formulas (12) and (13) are often tedious, and such questions may often be solved in a simpler manner. Let us consider the following :—~~

~~An urn contains 7 black or white balls. A ball is drawn and replaced ; if this has been done 7 times, and in every case a white ball has appeared, to find the chance that the (r + 1)th drawing will give a white ball.~~

~~If s drawings are made successively from an urn containing 2 balls, always replacing the ball drawn, the number of different ways this may be done is clearly n'.~~

~~If there be » + 1 such urns, one with 0 white balls, one with 1 white, one with 2 white, &c., the last with » white, the whole number of ways in which 7 drawings can be made from any one of them is (n + 1)n".~~

~~Now the number of ways in which r drawings, all white, can be made from the first is 0, from the second 1, from the third 2", from the fourth 37, and so on; so that the whole number of ways in which r drawings of a white ball can be made from the » + 1 urns is~~

~~ree is ait HIence the chance that if r drawings are made from an urn containing n black or white balls all shall be white is 1°4 + 274 + -3" + 2… mr (1 + 1)n7~~ ,

~~774~~

~~for all we know of the contents of such an urn is that they are | equally likely to be those of any one of the n + 1 urns above.~~

~~If now a great number N of trials of r drawings be made from such urns, the number of eases where all are white isp-N. Ifr + 1 drawings are made, the number of eases where all are white 1s prtiN ; that is, out of the prN cases where the first r drawings are white there are ,4,N where the (7 + 1)th is also white ; so that the probability sought for in the question is~~

~~OOO 0 euce © ies aes ee 1 a ee oe~~

~~16. Let us consider the same question when the ball is not replaced. First suppose the 7 balls arranged in a row from A to Bas below, the white on the left, the black on the right, the arrow marking the point of separation, which point is unknown (as it would be to a blind man), and is equally likely to be in any of its n+1 possible positions.~~

~~ntti~~

~~A ik 2 B oo0o0o0o0o0ogOoOo Oo.~~

~~Now if two balls, 1 and 2, are selected at random, the chanee that both are white is the chance of the arrow falling in the divi- sion 2B of the row. But this chanee is the same as that of a third ball 3 (different from 1 and 2), chosen at random, falling in 2B,— which chance is 4, beeause it is equally probable that 1, 2, or 3 shall be the last in order. It is easy to see that these chances are the same if we reflect that, the ball 3 being equally likely to fall in Al, 12, or 2B, the number of possible positions for the arrow in each division always exceeds by 1 the number of positions for 3; therefore as 8 is equally likely to fall in any of the three divi- sions, so is the arrow.~~

~~The chanee that two balls drawn at random shall both be white is thus 4; in the same way that for three balls is 3, and so on. Hence the chanee that r balls drawn shall all be white is~~

~~I Poe r+ 1 ? the same chance for 7+1 balls is Pr +1> r+2 > thus, as in a large number N of trials the number of cases where the first 7 drawn are white is p,N, and the number where the first r+1 are white is p,.;,N, we have the result :—~~

~~If r balls are drawn and all prove to be white, the chance that~~

~~the next drawn shall also be white is~~

~~woth ttl De tet 2~~

~~This result is thus independent of n, the whole number of balls. This result applies to repeated trials as to any event, provided we have really no a priori knowledge as to the chanee of suecess or failure on one trial, so that~~

~~all values for this chanee are equally likely before the trial or trials. 'Thus, if we see a stranger hit a mark four times running, the chance he does so again is 3; or, ifa person, knowing nothing of the water where he is fishing, draws up a fish each time in four easts of his line, the same is the chanee of his succeeding a fifth time.?~~

~~In eases where we know, or rather think we know, the facility |~~

~~as to a single trial, if the result of a number of trials gives a large differenee in the proportion of suceesses to failures from what we should anticipate, this will afford an appreciable presumption that our assuniption as to the facility' was erroneous, as indeed eommon sense indicates. Ifa eoin turns up head twenty times running, we should say the two faees are probably not alike, or that it was not thrown fairly. We shall see later on, when we eome to treat of the combination of separate probabilities as to the same event, the method of dealing with such eases (see art. 39).~~

~~We will give another example which may be easily solved by means of (12), or by the simpler proeess below.~~

~~There are 7m horses in a race, about which I haye no knowledge exeept that one of the horses A is black ; as to the result of the race I have only the information that a blaek horse has eertainly won: to find the chanee that this was A—supposing the propor- tion of black among raechorses in general to be p; 1.¢., the pro- bability that any given horse is black is p. ie~~

~~Suppose a large number N of trials made as to such a case. A~~

~~wins in a of these. Another horse B wins in Iy, ont of these 7"~~

~~1It may be asked why the above reasonin 3 . g does not apply to the ease of oe chance of a coin which hag turned up head 7 times dung so onee more. = Bsa ig is that the anteeedent probabilities of the different hypotheses are ey equal. Thus, let a shilling have turned up head once; to find the chanee : rip Nae a second time. In formula (12) three hypotheses may be made as — { aa :—throw 1° two heads, 2° a head and tail, 3° two tails; but the proba- a poh A pepe om ie eaeeee * 4, 4; rps by (12) the probability of the oe G+ }~~

~~-4)=}; that of the second is also }; the probability of succeeding on a cy trial is i tia a~~

~~FRORABIL IPT~~

~~B is black in Np. Likewise for C; andsoon. Ifence the actual~~

~~| ease which has oecurred is one out of the number~~

~~1 n—1 and, as of these the eases in which A wins are "N, the required~~

~~ehance that A has won is~~

~~1+(a-1)p-~~

~~17. We now proceed to consider the important theorem of Bayes (see Todhunter, p. 294; Laplace, Théorie Analytique des Prob., chap. 6), the object of which is to deduce from the experience of a given number of trials, as to an event which must happen or fail on each trial, the information thus afforded as to the real facility of the event in any one trial, which facility is identieal with the proportion of suceesses out of an infinite number of trials, were it possible to make them.~~

~~Thus we find in the Carlisle Table of Mortality that of 5642 persons aged thirty 1245 died before reaching fifty ; it beeomes then a question how far we ean rely on the real facility of the event, that is, the proportion of mankind aged thirty who die before fifty not differing from the ratio 324$ by more than given limits of excess or defect. Again, it may be asked, if 5642 (or any other number of) fresh trials be made, what is the probability that the number of deaths shall not differ from 1245 by more than a given deviation ?~~

~~The question is equivalent to the following :—An urn contains a very great number of black and white balls, the proportion of each being unknown ; if, on drawing m+ balls, m are found white and a black, to find the probability that the proportion of the numbers in the urn of each eolour lies between given limits.~~

~~The question will not be altered if we suppose all the balls ranged in a line AB (fig. 2), the white ones on the left, the black on the right, the point Vv X where they meet being unknown and all positions for it in AB being a priort equally probable. Then, m + n points having Xx been ehosen at random : in AB, mare found to Fig. 2. fall on AX, non XB. That is, all we know of X is that it is the (m + 1)th in order beginning from A of m + n + 1 points chosen at random in AB. If we put AB=1, AX=z, the number of eases when the point X falls on the element dz, is measured by~~

~~|m + n fae ia" —x)"dx ,~~

~~K B~~

~~since for a specified set of m points, out of the m + n, falling on AX, the measure would be x(1—2)*dz, and the number of such [m + n |m |n* ing this differential from 1 to 0; and the number in which X falls between given distances a, 6 from A is found by integrating from Btoa. Hence the probability that the ratio of the white balls in the urn to the whole number lies between any two given limits a, B is~~

~~Pa Pom(1— ayn ' = ee ne, ee~~

~~i m(] — nm fw eae~~

~~The curve of frequency for the point X after the event—that is, the ordinate of which at any point of AB is proportional to the fre- queney or density of the positions of X in the immediate vicinity of that point—is~~

~~sets is Now the whole number of eases is given by integrat-~~

~~y=am(1— 2)" 5 the maximum ordinate KV occurs at a point K, dividing AB in the ratio m : n,—the ratio of the total numbers of white and black balls being thus more likely to be that of the numbers of each aetually drawn than any other.~~

~~Let us suppose, for instanee, that three white and two blaek have been drawn ; to find the chance that the proportion of white balls is between 2~~

~~and 4 of the whole; that is, that it differs by less than + + from 2, its most natural value.~~

~~4~~

~~, *¢3(1 — x)*da P= aS i ee ee f 23(1 — x)*da at a 18. An event has happened m times and failed » times in m + n~~

~~trials. To find the probability that in + g further trials it shall happen p times and fail g times,—that is, that, p + q more points~~

~~ERO@OMASBIUMIET Y~~

~~being taken at random in AB, p shall fall in AX and q in XB. The whole number of cases is measured by~~

~~«3 [m + n 7? : jm + n = ” (AB)pt4 x(1 — 2) ae xm(1—a)“dx. A Peet ele Sl)~~

~~[m [un J~~

~~The number of favourable cases, when any particular set of p points, out of the » + ¢q additional trials, falls in AX, is measured~~

~~by ’~~

~~| m + ae (a) tides~~

~~[mn J,~~

~~because, the number of cases as to the m + points being, when X falls on the element dz,~~

~~eer~~

~~fei each of these affords ~ ?(1 — x)2 cases where p new points fall on AX, and gon XB.~~

~~Now, the number of different sets of p points being~~

~~the required probability is~~

~~1~~

~~m+ — p\n+4/7: Eo P(1 —a)” +4dx~~

~~I (15); x™(1 —x)“dx~~

~~or, by means of the known janie of these definite integrals, [peed imitate | matettigge litera~~

~~Ip la’ |m|2 °|m+n+pt+qt1-~~

~~For instance, the chance that in one more trial the event shall~~

~~(16).~~

~~nt This is easy to verify, as the line AB has been divided into m+n+2 sections by the m++1 points taken on it (including X). Now if one more trial is made, ¢.¢., one more point taken at random, it is equally likely to fall in any section; and m-+1 sections are favourable. A~~

~~19. When the number of trials m+ in art. 17 is large, the pro- bability is considerable that the facility of the event on a single~~

~~m+n more than a very small deviation. To make this apparent, we shall have to modify the formula (14), which gives for the chance that this faeility lies between the limits a and 8 (by substi- tuting for the denominator its known value),~~

~~happen is~~

~~trial will not differ from its most natural value, viz.,~~

~~|jm+n+1 78 ‘ ” or m1 — 7), p mn, 71 — aye (17) To find now the probability that the facility lies between the Pe m me se limits = cae 5, and OS emia 8, where 6 is small. Put for m A me, and (17) becomes~~

~~|m+n+~~

~~5~~

~~if in Si a — s \mt + n~~

~~|an | %~~

~~m n m + n~~

~~Now if # is small, and we put w=(@ + 2)”,~~

~~- wv) de 5~~

~~logw=m] ape gu=m log a a oe~~

~~mx mx? rs m ————) Ua “Cra Daz~~

~~correct as far as the square of ~· Hence the two factors under the~~

~~sign of integration become~~

~~mm (m + n)? nn (m + n o. maa ee a SAE ee 9 (m + nym° 2m 7, and Geen’ oe~~

~~so that § m + nu + 1 mn” Coe = ae — a |m [7 rae Qmn ~· dx (18).~~

~~Now, since by Stirling’s theorem |m=mv”t4e-”,/2z, the constant coefficient here becomes (m + n + 1)(m + nyrtrtte-m-n,/2e mim” (m + nyt mn, e-™-“2arn/mn (m + nynt” /2mne taking m + n + 1=m- + n. Now if we substitute in (18)~~

~~%~~

~~A/2mn~~

~~i ee~~

~~= ioe. et):~~

~~, rather infinitesimal, strictly speaking.~~

~~C75~~

~~z= where A gan) (20), A/2mn~~

~~2 ; 2~~

~~or finally resp Cat END).~~

~~for the approximate value of the probability that the real facility "£8 m+n Thus, if out of 10,000 trials, the event has happened 5000 times, the probability that, out of an infinite number, the number of successes shall lie between 4-545, or between $24 and °,, of the whole, will be~~

~~of the event hes between the limits~~

~~p= 678 =2 nearly,~~

~~6~~

~~for we find from (20) A "TT -aop= 7 nearly; and, referring to the table in art. 9, we find the above value for the integral (21).~~

~~We must refer to the sixth chapter of Laplace for the investigation of how far the number of successes in a given number of fresh trials may be expected to deviate from the natural proportion, viz., that of the observed cases—as also for several closely allied questions, with important applications to statistics.~~

~~III. On EXPeEcTATION.~~

~~20. The value of a given chance of obtaining a given sum of money is the chance multiplied by that sum ; forin a great number of trials this would give the sum actually realized. The same may be said as to loss. Thus if it is 2 to 1 that a horse will win a race, it is considered a fair wager to lay £10~~

~~to £20 on the result; for the value of the expected gain is % of 10, and that of the expected loss § of 20, which are equal. Thus, if the probabilities for aud against an event are p, g, and I arrange in any way to gain a sum a if it happens and lose a sum 0 if it fails, then if ya=qb I shall neither gain nor lose in the long run; but if the ratio a@: b be less than this, my expectation of loss exceeds that of gain; or, in other words, I must lose in the long run.~~

~~The above definition is what is called the mathematical expecta- tion ; but it clearly is not a proper measure of the advantage or loss to the individual ; for a poor man would undoubtedly prefer £500 down to the chance of £1000 if a certain coin turns up head. The importance of asum of nioney to an individual, or its moral value, as it has been called, depends on many circumstances which it is impossible to take into account; but, roughly and generally, there is no doubt that Daniel Bernoulli's hypothesis, viz., that this importance is measured by the sum divided by the fortune of the individual \ —is a true and natural one. Thus, generally speaking, £5 is the same to a man with £1000 as £50 to one with £10,000; and it may be observed that this principle is very generally acted on, in taxation, &c.~~

~~21. To estimate, according to this hypothesis, the advantage or moral value of his whole fortune to the individual, or his moral fortune, as Laplace calls it, in contradistinetion to his physical fortune, let x=his physical fortune, y=his moral fortune, then, if the former reeeive an increment dx, we have, from Daniel Ber- noulli's principle,~~

~~Cie dy =k— - 3~~

~~.Y=k logs : (22), k, h being two constants. & and y are always positive, anda>h; for every man must possess some fortune, orits equivalent, in order to live.~~

~~22. To estimate now the value of a moral expectation. Suppose a person whose fortune is @ to have the chance p of obtaining a sum a,'q of obtaining f, 7 of obtaining y, &c., and let~~

~~(DSEGHIEPSE oh 5 lly~~

~~only one of the events being possible. Now his moral expectation from the first chance—that is, the increment of his moral fortune into the chance—is~~

~~ph) log“** — log =pk log(a+a)-pkloga.~~

~~Hence his whole moral expectation is~~

~~E=kp log (a+a)+kqlog (a+ B)+krlog(at+y)+... —kloga;~~

~~1 This rule must be understood to hold only when the sum is very small, or It would lead to absurdities if it were used for large inerements (though Buffon has done so; see Todhunter, p. 345), Thus, to 2 man possessing £100, it is of the same importanee to reeeive a gift of~~

~~; £100 as two separate gifts of £50; but this rule would give as the measure of~~

~~the importanee of the first }§8—=1; while in the other ease, it would give ,§2,+ Yis=%. The real measure of the importanee of an increment when not small is a matter for caleulation, as shown in the text.~~

~~2 It is important to remark that we should be wrong in thus adding the expeetations if the events were not mutually exclusive. For the mathematical expectations it is not so.~~

~~776~~

~~and, if Y stands for his moral fortune including this expectation, that is, & log < +E, we have~~

~~Y=kplog(ata)+kg g(a+B)+..- klogh. (23). Let X be the physical fortune corresponding to this moral one, by (22) Y=klog X—k log h. Hence X= (a+a)r(at+p)(aty)”..— (24); and X—a will be the actual or physical increase of fortune which is of the same value to him as his expectation, and which he may reasonably accept in lieu of it. Rk: The mathematical value of the same expectation 1s patqBtryt+... .- (25). 23. Several results follow from (24). ‘Thus, if the sums a, B, . . are very sinall, it is easy to see that the moral expectation coincides with the mathematieal, for ee i, eee. _ on 2. 2 \s~~

~~X=a (1+ 2yO+8)... a (1tpt+cb+.... .. A=a+patqBt+ ... 24. We may show also that it is disadvantageous to play at even a fair game of chance (unless the stakes are very small, in which case the last article applies). Thus, suppose a nan whose fortune is a plays at a game where his chance of winning a sum a is p, and his chance of losing asum Bisg=1—p. If the game is fair, pa=qB. Now by (24) the physieal fortune which is equivalent to his prospeets after the game is X=(a-+a)P(a — B), Ee. ites X=(a+a)*tha— pet , Now the geometrical mean of r quantities is less than the arith- metical,! so that if there are B quantities a+a, aud a quantities a&— B,~~

~~or~~

~~1 :~~

~~B a)otB ~3(a+a)+a(a-— 8B)) (a+ a) (a py = ae ; or Mea, so that he must expect morally to lose by the game.~~

~~25. The advantage of insurance against risks may be seen by the following instance. A merehant, whose fortune is represeuted by 1, will realize a sum ¢ if a eertain vessel arrives safely. Let the probability of this be p To make up exactly for the risk run by the insuranee company, he should pay them a sum~~

~~(1-p)e. If he docs, his moral fortune Beles by (22), l+pe .~~

~~k log ——— :~~

~~while, if he does not insure, it will be (23).~~

~~kp log e~~

~~Now the first of these exceeds the second, so that he gains by | in | thus :—~~

~~insuring on these terms ; because~~

~~log(1+pe) >p log (1+e),~~

~~1~~

~~that is (L+pe)? >1+e;~~

~~for, putti =-——~~

~~or, putting p=—— = m(1+e)+n\mtn (m+n) eo (be)~~

~~because (see note art. 24), if m (1+¢)+mis divided into m+n equal parts, their product is greater than that of m parts each equal to 1+e and m parts each equal to 1. The merchant will still gain by paying, over and above what eovers the risk of the company, a sum a, at most, which satisfies log (1-a+pe)=plog(1+e); *, a=1+pe-—(1+e).~~

~~By paying any sum not exceeding this value, hc still gains, while~~

~~1 A very simple proof of this principe is as follows :—let aa e ; :—lefi a number N be divided into r parts a, b, c, &c.; if any two of these, as a, 6, are unequal, since~~

~~a+b\2 (‘>) > ab, it follows that the product abed .. . is increased by substituting and b, HIence as long as any two are unequal we can divide~~

~~to obtain a greater product; product is greatest, or~~

~~a+b a+b ce a~~

~~N differently so as and therefore when the parts are all equal the~~

~~(a abc…~~

†

~~rae ota BI Pee~~

~~the insurance office also makes a profit, which is really a certainty when it has a large business ; so that, as Laplace remarks, this example explains how such an office renders a real service to the public, while making a profit for itself. In this it differs from a gambling establishment, in which ease the public must lose, in any sense of the term.~~

~~It may be shown that it is better to expose one's fortune in separate sums to risks independent of each other than to expose the whole to the same danger.? Suppose a merchant, having a for- tune @, has besides a sum e which he must receive if a ship arrives in safety. By (24) the value in money of his present fortune is~~

~~X=(a+e)Pat, where p= chance of the ship arriving, and g=1-p.~~

~~Now suppose he risks the same sum in two equal portions, in two ships. We cannot apply (28), as the events are not mutually exclusive ; but we see that, if both ships arrive, the chance of this being py", he realizes the whole sum «; if one only arrives, the chance being 2pq, he receives $e ; if both are lost, the chance being gq', he loses all. Thus (24) he is now worth a sum~~

~~X' = (a-+e)P"(a + $e)? aad? Now this sum is greater than the former ; for (a+e)??—-P, (a+he)?Pt. a?—%>1,~~

~~that is, (a+e)~·?Ua+ 4e)Pla-Pe > 1 ; (a+4e) for ae a il~~

~~as is obviously true. Now suppose he risks the sum e in ¢hree separate ventures. fortune will be~~

~~X"=(ate)". (a + Ze)P"2, (a + Le) PVa® ; and we have to show that this is worth more than when there were~~

~~His~~

~~two. If we put a outside each bracket, and put a= 3 we have to prove (1+33)P9(1 + 28)87@, (1 + 8)8P@? >(14+.38)P2, (1+4+38)°P2 ; (14+38)??—-P, (1 428)8?%1 4 8)?2? > (1+88)°2 ; or, since p?~· p= — pq, (1+33)—?(1 + 25)9P(1 +8)°2 >(1 + 38),~~

~~or~~

~~25)3~~

~~ee roe now (1+28)?< (1+ 8)3(1+38);~~

~~hence the fraction in the brackets is always less than its yth power as p<1; and we can now show that~~

~~(L2aF 3 2 ae : aL 3 _ (Tess sept?) oe 0 that is, (14+ 28)? >(1+35)(1+ $8), or 1463+ 1252+ 853 >1+65 + 4232 + 2733.~~

~~Laplace shows (ch. x.) that the gain continues to inerease by subdivision of the risk ; it eould no doubt be shown by ordinary algebra. He shows further that the moral advantage tends to become equal to the mathematical. 'This may be done more easily~~

~~The expression is, when e is divided into r equal parts,~~

~~eal -292 d~~

~~. Z rpt-lg X=(a+6"(ate-£) (a+~~

~~and we have to find the limit towards which this tends as 7 becomes infinitely great. Put z=a+e;~~

~~rpr-lq r(r—1) 7-2 92 rg' — 1p qr X=2"(2-5) (=-2£) 2 a ; "(2-(r-0)5) (<-«) ;~~

~~Now in the binomial expansion~~

~~y—-1. r(r—1) v2 2 a ae p a.~~

~~the greatest term is the (gr+1)th, viz., Bilge ||) ee (7p +1) rp rq = 12°3…7 " qT'~~

~~The faetor in X corresponding to this is~~

~~/ e\T (2 = gs) if we put U=z-ge. : Let us now express the binomial series before and after T thus : l=... +7,+T,4+7T,4+T+§+4+6+..~~

~~2e~~

~~eS = 2 Via~~

~~l=p"+rp~~

~~U~~

~~?~~

~~2 The familiar expression not to " put all one's eggs in the same basket " shows us how general common sense has recognized this principle.~~

~~PE ODteLetiL rT ¥~~

~~and we have~~

~~ae (u+28)"(U4 = ou — £\M(u-28)", 7 7 r r ,~~

~~The factors towards the beginning and end may be all taken as 1, because the terins of the binomial increase rapidly in value from either end when r= o, and we shall have the true limit for X by taking an indefinitely great number of factors on either side of U, which number, however, may be infinitely less than r.~~

~~As the sth factors before and after U may be expressed thus (s being always very small compared to 7)—~~

~~th e \ts (ueia)" (uvva)'*~~

~~and as… T,+T,+T+¢,+é,... =1, we have~~

~~€ x-Uert 56 Di gd th pins 5)~~

~~Now we have seen in art. 8 that~~

~~See ae EE~~

~~T,=Te Qpqr* 2pgr* , t= Te 2pgr 2pqr® ae Heuce T,—ts=Te—apgr oa ag s2~~

~~Hence the exponent of ¢ above becomes~~

~~uf Pisa rU° pg i~~

~~Ss, 52 s?~~

~~0 7° TF~~

~~s, being the extreme limit for s.~~

~~If we put x =~~

~~a/r?~~

~~tlhe above sum is~~

~~$1~~

~~1 2 5) = rt o10)+0(=)+9(G)+ is o(3)an [p(a)dex . Now it is easy to prove that oo) ee XZ °c K dz is finite;~~

~~and much more is it so when the superior limit is finite. Hence the exponent of ¢ becomes~~

~~x2 and x°¢—an9=9(2),~~

~~eta, go Oe ee) TU pq BR U-" pg ae where K is finite; so that the exponent becomes infinitesimal when 7=00, The limit therefore towards which X tends is X=U=z-qe=at+pe, that is, the mathematical value of the fortune. The very important applications of probability to annuities and insurance are to be found in the articles on those subjects, to which therefore we refer the reader.~~

~~IV. PROBABILITY OF TESTIMONY.~~

~~26. We have here to treat of the probability of events attested by several witnesses of known credibility, or which have several different probabilities in their favour, derived from different inde- pendent sources of information of any kind, of known values.!~~

~~A witness may fail in two ways: he may be intentionally dis- honest, or he may be mistaken ; his evidence may be false, either because he wishes to decéive, or because he is deceived himself. However, we will not here take separate accouut of these two sources of error, but simply consider the probability of the truth of a statement made by a witness, which will be a~~

~~true measure of the value of his evidence. To estimate this probability in any given case is not an easy matter ; but if we could examine a large number of statements made by a eertain person, and find in how many of them he was right, the ratio of these numbers would give the pro- bability that any statement of his, taken at random, whether past or future, is a true one.~~

~~27. Suppose a witness, whose credibility is p, states that a fact occurred or did not occur, or that an event turned out in one way, when only two ways are possible. Hf nothing was known a priori as to the probability of the fact, or if its real facility was 4, it is clear that the probability that it did occur is p. For ifa great~~

~~1 The question now before us is quite different from that of the chance of an event happening or having happened which may happen in different ways, in which case we add the separate probabilities. Thus if there are but two horses~~

~~in a race, of equal merit and belonging to one owner, his chance of winning is | But suppose I only know that one of the two is his, and, besides, some |~~

~~4+4=1,~~

~~one whose credibility is } tells me he has won the race; here I have two separate probabilities of 4 each for the same event; but it would clearly be wrong to add them together,~~

~~at~~

~~number N of trials were made (either really as to the event, if its facility is known to be 4, as in tossing a coin ; or as to it and other eases resembling it as to our ignorance of the real facility, if such is the state of things) in 4N the event happens, and out of these the witness asserts in 4yN eases that it did happen. Now, out of the whole number, he asserts in $N cases that it happened, as there is no reason for his affirming oftener than he denies (or, it may be said, he affirms in 4pN cases where it did happen, and in 4(1— p)N eases where it did not). Hence, dividing the whole number of cases when it happens and he affirms it by the whole number of cases where he affirms it, we find 4pN-+4N =p.~~

~~We have entered at length on the proof of what is almost self- evident (perhaps indeed included in the definition) in this case, because the same method will succeed in other eases which are not so easily to be discerned.~~

~~28, Let us now consider the same question when the a priori pro- bability of the fact or event is known. Suppose a bag contains 2 balls, one white and the rest black, and tle same witness says he has seen the white ball drawn; what is the chance that it was drawn ?~~

~~A great number N of trials being made, the number in which~~

~~: : awl a 5 the white ball is drawn is a and out of these he states it in~~

~~n-1pN cases. Out of the remaining (1-2-1!) N cases where a black ball was drawn, he says (untruly) that in (1—yp) (1-2-1) N cases it was white.~~

~~Now, dividing the number of favourable cases, viz., those where he says it is white and it is so, by the whole number of cases, viz., those where lke says it is white, we have for the probability required~~

~~&- n~lp a Dp = np+(1—n-(1—p) n—-1—(n—2)p~~

~~This holds for any event whose a priori probability is 2-1.~~

~~If 2 be very large, this probability will be very small, unless p is nearly =1; and, indeed, if we go back to the common sense view, it is elear we should hesitate to believe a man who said he had drawn the white ball from a bag containing 10,000 balls, all but — being black. It may be observed that if n=2, w=p, as in Be Palle~~

~~We have thus a'scientific explanation of the universal tendency rather to reject the evidence of a witness than to accept the truth of a fact attested by him, when it is in itself of an extraordinary or very improbable nature.~~

~~29. "wo independent witnesses, A and B, both state a fact, or that au event turned out in a particular way (only two ways being possible), to find the probability of the truth of the statement.~~

~~*Supposing nothing is known @ priori as to the event iu question, let a great number N of trials be made as to such events; the number of successes will be 4N ; out of these the witness A affirms the success in 4pN cases; out of these the witness B affirms it, too, in 4pp'N eases.? Out of the 4N failures A affirms a success in 4(1-p)N cases; and out of these B also affirms one in 4(1—p)(1—p')N cases. Hence, dividing the favourable cases by the whole number, the probability sought is*~~

~~*ṫ*~~

~~*Ss = Ss pp' +(1—p)(1 -p') where », yp' are the credibilities of the two witnesses.*~~

~~*This very important result also holds if p be the probability of the event derived from any source, and y' the credibility of one witness, as in art. 28; or if p and p' be any independent proba- bilities, derived from any sources, as to one event.*~~

~~*30. We give another method of establishing the formula (27). Referring to art. 13, the observed event is the concurrent evidence of A and B that a statement is true. There are two hypotheses —that it is true or false. Antecedent to B's evidence the pro- babilities of these hypotheses are p and 1—yp (art. 27), as A has said that it is true. The observed event now is that B says the same. On the first hypothesis, the probability that he will say this is p' ; on the second, it is 1—p'. Hence by formula (12) the 'pro- bability a posteriori of the first hypothesis, viz., that the joint statement is true, is, as before,*~~

~~*pp" pp +(1—p)(1-p')*~~

~~*31. If a third witness, whose credibility is p", concurs with the two former, we shall have to combine p" with @ in formula (27) ;*~~

~~*hence the probability @' of the statement when made by three witnesses is ae ap = ppp"*~~

~~*ap +(1—@)1-p") ppp" +(1-p) -—p)(1—p")*~~

~~*and so on for any number.*~~

~~*(26).*~~

~~*(27),*~~

~~*(28);*~~

~~*2 Here we are assuming the independence of the witnesses. If B, forinstance, were disposed to follow A's statements or to dissent from them, he would affirm the success here in more or less than 4pp'N cases.*~~

~~*a:*~~

~~*(Us)*~~

~~*As an example, let us find how many witnesses to a faet, the odds against which are 1,000,000,000,000 to 1, would be required to make it an even ehanee that the faet did oceur, supposing the credibility of each witness to be p= 4%.*~~

~~*Let x be the number.*~~

~~*10-12p7 ae ¥ 10-p= 4 (1—10-®)(1—p)* pt + 10% —p}*'*~~

~~*i=*~~

~~*2*~~

~~*so that thirteen such witnesses would render the chanee more than an even one. é*~~

~~*32, Let us now eonsider an event which may turn out in more than two ways, and let each way be equally probable a priori, and suppose a witness whose eredibility is p states that it turned out in a eertain way; what is the ehance that it did so?*~~

~~*Thus if a die has been thrown, and he states that aee turned up ; or if tickets in a lottery are numbered 1, 2, 8, &e., and he states that 1 was drawn ; to*~~

~~find the chance that he is right.~~

~~Take the case of the die, and suppose a great number N of throws. In 4N the ace turns up, and he says so in 3pN cases. In 4N the two tums up, and he is wrong in 3(1—p)N cases out of these ; but he says ace in only } of these, as there is no reason why he should give it more or less often than any of the five wrong numbers. In the same way for the other throws ; so that the whole number of cases where he says aee turned up is~~

~~tN +5-G(1—p)N=GN 5~~

~~and, the number, out of these, when it actually turned up being 4pN, we find the chance it did turn up is p, the credibility of the witness. In any such case, this result will hold. We might indeed safely have argued that when the die is thrown a great number of times, any witness, whatever his veracity, will quote each face as often as any other, as there is no reason for one to turn up oftener than another, nor for him to affirm, rightly or wrongly, one rather than another; so that he will say aee in aN of the throws, while he says aee in ayN out of the 3N cases where it does turn up.~~

~~This result compared with art. 28 affords an apparent paradox. If a large number of tickets are marked 1,0,0,0,0,0….anda witness states that 1 has been drawn from the bag, we see from art. 28 that the chance he is right is very small; whereas if the tickets were marked 1,2,3,4,5,6…. and he states that 1 has been drawn, the chance he is right is p, his own credibility. However, we must remember that in the first case he is limited to two statements, 1 and 0, and he makes the first, which is very improbable in itself; whereas in the other case, the assertion he makes is in itself as probable as any other he can make—c.g., that 2 was the ticket drawn—and therefore our expectation of its truth depends on his own credibility only.~~

~~33. Suppose now that two witnesses A, B both assert that the event has turned out in a certain way,—there being, as in art. 32, n equally probable ways.~~

~~Both, for instance, say that in a lottery numbered 1,2,3,4,5…. No, 1 has been drawn. A large number N of drawings being made, 1 is drawn in-n-1N cases; out of these A says 1 in n-1pN cases, and out of these B also says 1 in~~

~~n-lpp'N. 'No. 2 is drawn in 2~1N eases; here A is wrong in n-1(1—p)N, but says 1 in only (n-1)-'m-\(1-—p)N; and B will also say 1 in (1—p')\(n ~1)-1 of these; that is, both agree that 1 has been drawn in~~

~~(w—1)-*n-(L—p)(1—p')N~~

~~eases. So likewise if No. 3 has been drawn, and so on; hence, when No. 1 has not been drawn, they both say that it has in~~

~~mn—1)-\1 -p)(1—p')N~~

~~eases. Hence the number of cases where they are right divided hy the whole number of eases where they make the statement, that is, the probability that No. 1 has been drawn, is~~

~~a ae~~

~~PP nee map) * If 7 be a large number the chance that they have named the ticket drawn is nearly certainty. Thus, if two independeut witnesses both select the same man out of a large number, as the one they have seen commit a erime, the presumption is very strong against him. Of eourse, for the ease to eome under the above ae it is supposed that some one of the number must be~~

~~uilty.~~

~~34. In the same ease, when the event may turn out in » ways not equally probable, as in a race between n horses Ay BAC ae)... witese chanees of winning area, b,c… .,sothatatb+e+... =i. if one witness. whose eredibility is p states that A has won, it is~~

~~(29).~~

~~BPrOBADBILIVY~~

~~easily shown by the same reasoning as in art. 33 that the pro- bability A has really won is ae . = pe (iat ey OS and if two witnesses say so, it is~~

~~app'~~

~~app' + (1-a)(n—1)-(1—p)(1—p') ° It is easily shown in formula (30) that if p>n~-1 the probability zis inereased by the testimony, beyond a, its anteeedent value. Thus, suppose there are ten horses in a race, and that one of them, A, has a chanee 4 of winning, and that just after the race I learn that a blaek horse has won, black being A's eolour; now, if I kuow that % of raeeliorses in, general are blaek, this gives me a new chanee + (see art. 16) that A has won. Therefore from. (30) the chanee of the event is now 74=2.~~

~~35. To illustrate the effeet of discordant testimony. In art. 29 let A have asserted that the faet oecurred, and let B deny it. It is easy to see that 1—yp' is to be put for p', so that the probability that it did occur is~~

~~(81).~~

~~a=~~

~~ee ey) (l-p) + p" —p) if there had been an a priori probability @ in favour of the fact this would have been~~

~~(32);~~

~~a ap(1—p') : ap(1—p')+p'(1-a)(1—p) * Thus if the credit of both witnesses were the same, y=p', and we find from (33) w=a, so that the evidence has not altered the likelihood of the event.~~

~~36. Where the event may turn out in » equally probable ways as in art. 38, and the witness A asserts one to have oeeurred, say the ticket marked 1 to have been drawn, while the witness B asserts another, say the tieket marked 2; to find the chance that No. 1 was drawn.~~

~~By the same reasoning as in art. 83 we find for the chance~~

~~pl-p') 7 p-p + — py) |~~

~~This result will also follow if we consider B's evidence as testi- mony vm favour of No. 1 of the value (1—')(7-1)-1,~~

~~When the number of tiekets 7 is very great, (84) gives~~

~~iz, wa — f 1-pp~~

~~37. As remarked in art. 26, the methods we have given for de- termining the probability of testimony apply to cases where the evidence is derived from other sources. Thus, suppose it has been found that a eertain symptom (A) indicates the presence of a certain disease in three cases out of four, there is a probability ? that any patient exhibiting the symptom has the disease. This, however, must be considered in conjunction with the a priori probability of the presenec of the disease, if we wish to know the value of the evidence dedueed from the symptom being observed. For instanee, if we knew that ? of the whole population had the disease, the evidenee would have no value, and the eredibility of the symptom per se would be 4, telling us nothing either way. For if @ be the a priori probability, = that after the evidence, p the credibility of the evidence, we have found~~

~~(33).~~

~~pie ae Hs, | oap + (1=a)(1 =p) ' so that, if w=a, p=3.~~

~~If wand a are given, the credibility p of the evidence is deduced from this equation, viz.,~~

~~(l-a)e~~

~~Pa teen Gee a~~

~~38. Suppose now the probability of the disease when the symptom A oeeurs is w (that is, it is observed that the disease exists in wN eases out of a large number N where the symptom is found), and likewise the same probability when another independent symptom B oeeurs is a'. What is the probability of the disease where both symptoms oecur ?~~

~~Let a be the a priori probability of the disease in all the cases ; then the value of the evidenee of B is, as explained above,~~

~~,. (ame. ate' —2ae' and this has to be combined with w, which is the probability of the disease after A is observed. We find the probability (I) required to be a wp' + (1—-w)(1-p)'~~

~~*PHOQOBABILET Y*~~

~~*= (1l-a)aa' . (l-ajeu'+al-sll-w) (35). Thus, if the @ priori probability of the disease in all the patients was 7/5, and 3 out of 4 have the disease where A is observed, and also 3 out of 4 where B is observed, the chance is $4 that the*~~

~~*disease exists when both symptoms are present.*~~

~~*This question illustrates the exceeding delicacy and care required in reasoning on probabilities. If we had combined the two given probabilities in the usual way without considering the @ priori value (as would be correct if this were quite unknown, or=4) we should have had*~~

~~*whence Tl*~~

~~*U War*~~

~~*— +(l-aw)(1l-a')° The fallacy of so doing will appear if we consider a large population, and a very uncommon disease, and that the latter 1s observed to exist in 4 the cases where the symptom A occurs, and also in 4 for the symptom B; this formula would give 4 for the chance when both are present. This is elearly absurd ; for, both the disease and the symptoms being by hypothesis extremely rare, and the symptoms being independent, that is, having no connexion with each other, it is next to impossible that any one individual of the 4N(A)—calling N(A) the number who have the sympton1 A — who have not the disease should also be comprised in the 4N(B) who have not the disease, because this 4N(A), 4N(B) are very small numbers (relatively) taken indiscriminately from the whole population who are free from the disease. It is different for the 4N(A), 4N(B) cases who have the disease ; these cases all come out of the very small number N(D) who have the disease ; therefore several individuals will be probably common to both; hence, if both symptoins coexist, it is highly probable that the ease is one of the disease. We find from (35) the true probability to be in the preseut case*~~

~~*T=1-a,*~~

~~so that, if only 1 in 1000 have the disease, the chance is 999 to 1, instead of an even one.~~

~~39. If a coin thrown m times has turned up_head every time, the |~~

~~chance derived from this experience alone that the real facility for head exceeds 4 is, by formula (14),~~

~~1 m 2 dx 5 =| 1 1 —" Om-+1 ° fy en 2 i)~~

~~But there is here a very strong a priori presumption that the facility is 4; suppose then that there is a very small a priori probability (p) that either in the coin itself or the way it is thrown there is something more favourable to head than to tail ; after the new evidence the probability of this will be pe _ | (ae Tp pat(l—p)(l-@) (2"41-2)p4+1° Thus if there is an a priori probability zg¢yz, and if the coin has turned up head 5 times and never tail, the probability that the facility for head exceeds that for tail becomes 63 «6~~

~~62+1000 1000~~

~~40. From art. 19 we see that if a large number of trials m+™ be made as to any event, m being favourable, it may be considered certain that the real facility differs from m/(m+m) by a very small fraction at most. If then our @ prior? idea as to the facility gives it outside the limits derived from formula (21), the evidence from experience will overrule our a priori presumption. Thus, if a shilling thrown up 1000 times gives head 560 times and tail 440, the evidence thus afforded that the throws were not fair is so much stronger than any antecedent conviction we could have to the contrary that we may conclude with certainty that, from some cause or other, head is more likely than tail. 41. Closely allied to the subject of our present section are the applications of the theory of probabilities to the verdicts of juries, the decisions of courts, and the results of elections. Our limits,~~

~~a=~~

~~nearly.~~

~~1 Or thus: let N = whole population and m,n' the numbers who show the symptoms A and B respectively, all these numbers being large. Now aN= whole number who have the disease; an, w'n' the numbers out of n,n' who have~~

~~.it. Now wn, wn' are both comprised in aN; and, out of an', the number also included in wn is the same fraction of wn that an' is of aN; that is, the number who hare both symptoms and the disease is~~

~~an' ann? and those who have both symptoms and have not the disease is : (l—a')n' (-—a)" q—an , so that, if both symptoms are present, the odds that it is a case of the disease are as aa (l—a\(l-z') re 1—a@ :~~

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~~however, will hardly allow of even a sketch of the methods given by Condoreet, Laplace, and Poisson, as it is not possible to render them intelligible within a short compass. We must therefore refer the reader to Todhunter's HIstory, as well as the original works of these writers, especially to Poisson's Recherches sur la Probabilité des Jugements. .~~

~~42. We will consider here one remarkable question given by Laplace, because the mathematical difficulty may be solved in a simpler way than by deducing it as a case of a general problem given in his chap. ii., or than Todhunter's method (see his p. 545), which depends on Lejeune Dirichlet's theorem in multiple integrals.~~

~~An event (suppose the death of a certain person) must have pro- ceeded from one of ~ causes A, B, C, &c., anda tribunal has to pronounce on which is the most probable.~~

~~Let each member of the tribunal arrange the causes in the order of their probability according to his judgment, after weighing the evidence. To compare the presumption thus afforded by any one judge in favour of a specified cause with that afforded by the other judges, we must assign a value to the probability of the cause derived solely from its being, say, the rth on his list. As he is supposed to be unable to pronouuce any closer to the truth than to say (suppose) H is more likely than D, D more likely than L,~~

~~&c., the probability of any cause will be the average value of all those which that probability can have, given simply that it always occupies the same place on the list of the probabilities arranged in order of magnitude. As the sum of the 7 probabilities is always 1, the question reduees to this—~~

~~Any whole (sueh as the number 1) is divided at random into » parts, and the parts are arranged in the order of their magnitude— least, second, third, . . . greatest; this is repeated for the same whole a great number of times; required the mean value of the least, of the second, &c., parts, up to that of the greatest.~~

~~A B | |”~~

~~Let the whole in question be represented by a line AB=a, and let it be divided at random into parts by taking x —1 points indis- criminately on it. Let the required mean values be~~

~~Mgt, Nels AyS- 2 os Bethy~~

~~where Aj,A,A3- — . must be constant fractions. Asa great number of positions is taken in AB for each of the m points, we may take a as representing that number; and the whole number N of cases will be N=a”-!,” The sum of the least parts, in every case, will be S; = Naya = Aa”.~~

~~Let a small increment, Bb= 8a, be added on to the line AB at the end B; the increase in this sum is 6S, =2A,a”~18a.~~

~~But, in dividing the new line Ad, either the n—1 points all fall on AB as before, or 7—2 fall on AB and 1 on Bd (the cases where 2 or more fall on Bd are so few we may neglect them). If all fall on AB, the least part is always the same as before except when it is the last, at the end B of the line, and then it is greater than before by Sa; as it falls last in n-! of the whole nuinber of trials, the increasc in 8, is z-‘a”-18a. But if one point of division falls on Bb, the number of new cases introdueed is (n-1)a”-78a ; but, the least part being now an infinitesimal, the sum S, is not affected ; we have therefore~~

~~59, =na,a”- a=n-la”- 8a ; oo. Ay=n 2,~~

~~To find A, reasoning exactly in the same way, we find that where one point falJs on Bd and »—2 on AB, as the least part is infinitesimal, the second least part is the least of the n—1 parts made by the n— 2 points ; consequently, if we put A’, for the value of A, when there are —1 parts only, instead of n,~~

~~58, =7a,0" 8a=n-) a®-l8a+(n-1)a”2r’aba , ‘. MAg=n!; but Ay=(m—-1)-? 2; *, NMAg=n-1(n—1)-}. In the same way we can show generally that NAp=n-)+(M—-1)aA’r-13 and thus the required mean value of the rth part is Ane=an-IIn-+(n-1) 34+ (n-2) 4… (m-rt+1)1}. . (86). Thus each judge implicitly assigns the probabilities~~

~~ae 1,1 1/i, 1,1 nm?n\n n-1/’ n\n n-1 n-2)’? °°? 2~~

~~to the causes as they stand on his list, beginning from the lowest. Laplace now says we should add the numbers thus found on the different lists for the cause A, also for B, &c.; and that cause which has the greatest sum is the most probable. This doubtless seemed self-evident to him, but ordinary minds will hardly be convinced~~

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~~of its correctness without proof. be, beginning from the lowest,~~

~~ee eR Bee ees Ceres Liter Ges Probabilities ipiR wiht Nag here 202"~~

~~ini j reight, the As the opinions of all the judges are supposed of equal weight, aie H Aner is as likely as the cause K; but the probability that H or K was the cause is}~~

~~Let the lists of two of the judges~~

~~Ag tAg- Hence prob. (H)+prob. (K)=2 prob. (H)=A2+Aq4 3 .*. prob. (H) =3(Ag+Ay,) 5~~

~~that is, the probability of any eause is the mean of its probabili- ties on the two lists, the circumstance being elearly immaterial~~

~~*whether the same cause K is found opposite to it or not. The same follows for 3 or more lists. 43, Laplace applies the same method to elections. Suppose*~~

~~*there are 2 candidates for an office ; each elector is to arrange them in what he believes to be the order of merit ; and we have first to find the numerical value of the merit he thus implicitly attributes to each candidate. Fixing on some limit a as the maximum of merit, 2 arbitrary values less than a are taken and then arranged in order of magnitude—least, second, third, ... greatest; to ind the mean value of each.*~~

~~*os*~~

~~*A Xx Y Z B*~~

~~*Take a line AB=a, and set off ~ arbitrary lengths AX, AY, AZ.… . beginning at A; thatis, 2 points are taken at random in AB. Now the mean values of AX, XY, YZ,.... are all equal; for if a new point P be taken at random, it is equally likely to be Ist, 2d, 3d, &c., in order beginning from A, because out of n+1 points the chance of an assigned one being 1st is (x+1)-1; of its being 2d (7+1)-1; and so on. But the chance of P being Ist is equal to the mean value of AX divided by AB; of its being 2d M(XY)+AB; and so on. Hence the mean value of AX is AB (n+1)-!; that of AY is 2AB(x~+1)-1; and so on. mean merit assigned to the several candidates is*~~

~~*an+1)-1, 2Za(n+1)-1, 8a(n+1)-)... . ma(n+1)-1.*~~

~~*Thus the relative merits may be estimated by writing under the names of the candidates the numbers 1, 2,3,.... mn. The same being done by each elector, the probability will be in favour of the candidate who has the greatest suin.*~~

~~*Practically it is to be feared that this plan would not succeed, though certainly the most rational and logical one if the conditions are fulfilled—because, as Laplace observes, not only are electors swayed by many considerations independent of the merit of the candidates, but they would often place low down in their list any candidate whom they judged a formidable competitor to the one they preferred, thus giving an unfair advantage to candidates of mediocre merit.*~~

~~There are, however, many eases where such objections would not apply, and therefore where Laplace's method would be certainly the most rational. Thus, suppose a jury or committee or board of examiners have to decide on the relative merit of a number of prize essays, designs for a building, &c.; each member should place them in what he judges to be the order of merit, beginning with the worst, and write over them the numbers 1, 2, 3, 4, &c. ; then the relative merit of each essay, &., would be represented by the sum of the numbers against it in each list. No doubt there would be cases where a juror would observe a great difference in merit between one essay and the one below it, which difference wonld not be adequately rendered by an excess of 1 in the number. But even then, as such superiority could not fail to be recognized by the other members of the tribunal, it is not likely that any injustice would result.~~

~~44. An argument advanced in support of a proposition differs from the ease of testimony in that, if the arguinent is bad, the previous probability of the conclusion is unaffected. Let p be the @ priort probability of the proposition, g the chance that the argument is eorreet ; then, ina large number N of eases, in gN the argument is good, and therefore the proposition is true ; and out of the remaining (1—q) N, where the argument is bad, there are~~

~~p(l-gN cases where the proposition is nevertheless true. HIence the probability of the conclusion is~~

~~PT 99.~~

~~HIence any argument, however weak, adds something to the foree of preceding arguments.~~

~~Thus the~~

~~1 This is the same as if there was onl j eauses in the same order the pr ni No~~

~~now one judge transposes two cause P ot hee oes S, he does not alter the ehance that one or~~

~~this chance solely depends th iti 5 Orne le : h y dep on the positions of renting to ae a lists, and is the same whatever the arrangements as to the~~

~~PROBABILITY~~

~~V. ON MEAN VALUES AND THE THEORY oF Errors.~~

~~45. The idea of a mean or average among many differing magnitudes of the same kind is one continually employed, and of' great value. It gives us in one result, easily pictured to the mind and easily remembered, a general idea of a number of quantities which perhaps we have never seen or observed, and we can thus eonvey the same idea to others, without giving a long list of the quantities themselves. We could searcely form any clear coneep- tion as to the duration of human life, unless by taking the average, — that is, finding the length of life each individual would have if the whole sum of the years attained by each were equally divided among the entire population. How, again, could we so easily form an idea of the eliniate of Rome or Niece as by learning the mean of the temperatures of each day for a year, ora series of years? Here, again, it will be an important addition to the information to find also the mean summer temperature and the mean in winter, as we thus learn what extremes of heat and cold are to be expeeted. We may even go further and inquire the diurnal variation in the temperature in summer or in winter; and for this we should know the average of a number of partieular cases.~~

~~It may be said that the whole value of statistics depends on the doctrine of averages. The price of wheat and of other commodities, the inerease or deerease of a particular crime, the age of marriages both for men and women, the amount of rain at a given locality, the advance of education, the distribution of wealth, the spread of disease, and numberless other subjects for inquiry—are instances where we often see hasty and misleading conclusions drawn from one or two particular cases which happen to make an impression, but where the philosophical method bids us to observe the results in a large number, and then to present them as summed up and represented by the average or mean.~~

~~46. There is another application of averages of a different nature from the foregoing. Different estimates of the same thing are given by several~~

~~*independent authorities: thus the precise moment of an earthquake is differently stated by correspondents in the papers ; different heights are given for a mountain by travellers ; or suppose I have myself measured the height of a building a number of times, never obtaining exactly the same result. In all such cases (if we have no reason to attach greater weight to one result than to another) our common sense tells us that the average of all the estimates is more likely to be the truth than any other value. In these eases, as M. Quetelet remarks, there is this important distinction from the preceding, that the mean value represents a thing actually existing; whereas in the others it merely serves to give a kind of general idea of a number of indi- viduals essentially different, though of the same kind. Thus if I take the mean of the heights of 200 houses in a long street, it does not stand for any real entity, but is a mere ideal height, repre- senting as nearly as possible those of the individual houses, whereas, in taking 200 measurements of the same house, their mean is intended to give, and will very nearly give,-the actual height of that house.*~~

~~*47. So far it is obvious how to proceed in such eases; but it becomes a most important question in the theory of probabilities, to determine how far we can rely on the mean value of the different observations giving us the true magnitnde we seek,—or rather, as we never can expect it to give exactly that value, to ascertain with what probability we may expect the error not to exceed any assigned limit. Such is the inquiry on which we are about to enter,*~~

~~*This investigation is of the more importance, because we find what is really the same problem present itself again under cireum- stances different from what we have been considering. In the ineasurement of any whole by means of repeated partial measure- ments—as, for instance, in measuring a distance by means of a chain—the error in the result is the sum of all the partial errors (with their proper signs) incurred at each successive application of the chain. If we would know, then, the amount of confidence we may have in the accuracy of the result, we must determine, as well as we can, the probability of the error—that is, the sum of all the partial errors—not exceeding assigned limits; and to this end, we have in the first place to try to determine the law of facility, or frequency, of different values of this sum. The problem only differs from the preceding in that here we seek for*~~

~~*the facility of the sum of the errors; in the former, of the ath part of that sum.*~~

~~*In both these eases, we may reasonably and naturally suppose that the error incurred in each observation, or each measurement, follows the same law as to the frequency of its different possible values and as to its limits, as each is made by the same observer, under the same circumstances, though what that law is may be unknown to us. But there is another class of cases where the same problem presents itself. An astronomical observation is made (say) of the zenith distance of a star at a particular instant ; the error in this determination is a complex one, caused by an error in the time, an error in the refraction, errors of the instru-*~~

~~*PR ORs Pir' vy*~~

~~*ment, personal error of the observer, and others. The error of the observation is in fact the suin of the partial errors arising from these different sources; now these evidently cannot be taken each to follow the same law, so that we have here a more general problem of the same species, viz., to combine a number of partial errors, each having its own law of facility and limits.*~~

~~*There is every reason to suppose that the error incurred in any single observation or measurement of any kind is generally due to the operation of a large number of independent sources of error; if we adopt this hypothesis, we have the same problem to solve in order to arrive at the law of facility of any single error.*~~

~~*48. We will consider the question as put by Poisson (Recherches, p. 254; see Todhunter, HIstory, p. 561), and will adopt a method which greatly shortens the way to the result.*~~

~~*Let « be the error arising from the combination or superposition of a large number of errors ¢, €,, €g. . . . each of which by itself is supposed very small, then*~~

~~*; C= €) + €o + €g+ ss (¢ . ° ° ° (37). Kach partial error is capable of a number, large or small, of values, all small in themselves ; and this number*~~

~~may be quite different fOmeach error €; €5, €g- ... » There may be more positive than negative, or less, foreach.1 If n,, 2,23… . be the numbers of values of the several errors, the number of different values of the compound error « will be~~

~~MyNyNe . .~~

~~We will suppose it, however, to take an indefinite number of values N, some multiple of the above, so that the 2, 22,3… . different values are repeated, but all equally often, so as to leave the relative facility of the different values unaltered. We will suppose the same number N of values in every case, whether more or fewer of the partial errors ¢,, «,, «;. . . . are included or not.~~

~~Let the frequency of an error of magnitude x be called y, and let the equation expressing the frequency be : Vj) eee 6 eke t.¢., yde—=number of values of x between x and «+da. The whole number of values is~~

~~Le — N= ve "(ade~~

~~where y, w' are the sums of the higher and lower limits of all the partial errors.~~

~~If now a new partial error e be included with the others, let it have 2 particnlar values ¢, e, e'. ... . 3; if it had but the one value ¢, then to every value x of the old compound error would correspond oue x' of the new, such that +e=2'; and the number of values of the new from 2' to x'+dz' is the same as of the old from x to x+dx—that is, f(x)dx, or f(z'- edz'. Now the next value é gives, besides these, the number /(z'—e')dx', and soon. Thus the whole number of values of the new compound error between a' and x'+dz' is~~

~~{ f(a!—e)+f(a'—c)+fla'—e")+... shea HIence the equation of frequency for the new error is (dropping the accent, and dividing by n—that is, reducing the total number of values from Nn to N, the same as before)~~

~~y=n-l{ f(w—e)+f(w—e)+f(e-e")+...}. . (89).~~

~~(38);~~

~~etete' +...~~

~~Hence yaf(e) — Frey ty —~~

~~neglecting higher powers of e, ce'... .~~

~~Hence 7 @ new partial error e, whose mean value=a, and whose mean square is r, be superposed on the compound error (88) resulting from the combination of a large number of partial errors, the equa- tion of frequency for the resulting error is~~

~~Y =f (a) — of (a) + Zaf"(x) =(1 — aD + $aD*) f(x) (40).~~

~~It thus appears that each of the small errors only enters the result by its mean value a, and mean square A.~~

~~If a second error were superposed, we should thus have~~

~~y=(1-—a,D+4a,D?)(1 — aD +4aD?) f(x); 'y= {1 —(a+a,)D+(G4(a "+ Ay) + 4a,)D?} f(x) g as A is a lower infinitesimal than a, we retain no other terms.~~

~~A+ — a? —a,?+(a+a,)? eC~~

~~Thus any two errors enter the result in terms of a+ a, and A+A" —a* —a,?; as this holds for any two, it is easy to see that all the partial errors in (37) enter the equation of frequency (38) only in terms of m and h-7; putting~~

~~M=a,+G+ag+ ... =sum of mean errors,~~

~~=D Ag Ag+ . .. =sum of mean squares of errors, (41). t=aita;,ta?+... =sum of squares of mean errors,~~

~~Me APs Se Le (nr Cs Ae oe 7"),~~

~~"Y= 1-(a+a,)D+~~

~~. 1 An error may have all its values positive, or all negative. In estimating the instant when a star crosses the meridian we may err in excess or defect, but in estimating that when it emerges from behind the moon, we can only errin excess. We have heard this instance given by Clerk Maxwell.~~

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~~Thus, y=f (“=F (a, m, h-7).~~

~~Let m receive an increment dm; this is equivalent to superposing a new error whose inean value is 6m, and mean square infinitely. smaller (¢.g., let its values be all +, or indeed we may take it to have but the single value 5m) ;~~

~~ieee a 5 Oy ae : by= 7 Oe dno by (40); dy a ”’ du dx~~

~~Hence y is a function of z—m; so our equation must be of the form~~

~~y=F(a—m, h-7) (42). Let 2% receive an increment 52; or conceive a new error whose mean value a=0, and whose mean square=6h ; we have (40)~~

~~AY oy PY~~

~~dh ae ‘ dy _ dy 2 = QS AB Hence Ie ah (43)~~

~~Let us now suppose in (37) that all the values of every error are increased in the ratio 7; all the values of x are increased in the sanie ratio ; consequently there are the same number of values of x from rx to r(c+dx) as there were before from x to «+dz. This~~

~~ives P F(a-m, h-i)dx=F(rxe—-rm, rh—1))rdz, for m is increased in the ratio 7, and % aud 7 in the ratio 72. Let us write for shortness~~

~~f=“-m, n=h—-t,~~

~~so that y=FE,n) . . . (44) ; we have r-1F(E, n)\=F (ré, 77m). Let r=1+., where wo is infinitesimal ; (1- @)ySF(E+ wk, 4+ 20m) 5 oe y-ay=y+ ott aP Zong) 3 dy dy 2 ES SY by 45). This equation, and c= oe a (46), identical with (43), contain the solution of the problem. Thus, (45) gives by~~

~~integration y=ny-*(e'n-1) (47) Again, combining (45) and (46), Oo ae Te ap bade y=0, af dy y or Sel gh tay 95 dy ve nge tty = x(n). Substitute for y the value (47); and we find 2kq~ by'(EPn 2) + En BYE') = x(n) 5 that is, a function of é)~? identical with a function of y. This~~

~~cannot be, unless both sides are constant.~~

~~Now c=0, for = vanishes with é, by (47); and, y being always~~

~~dy H y = ence Nag + ty =e.~~

~~finite, the left hand number vanishes with ¢ ; 2 DY (By 7}) + Wen 1) =0. 2°. (E29 1) = Ce 884-29}, Substituting in (47) and restoring the values of £, 7, we find the form of the function (42) to be~~

~~: (rx—m)? y=C(h-t)-te~ ogra . (48). C is a constant depending on the number N.~~

~~The probability of the error falling between x and x#+dz is~~

~~found by dividing ydx by the whole area of the curve (48); i.e.,~~

~~(x—m)?~~

~~p= {2n(h- t)} 4e s@aa dx (49). 49. If, instead of eq. (37), we had put E=1€1 t+ Yolo t ysegt .— (50),~~

~~where 7), Yo Y3- — are any numerical factors, the formula (49) gives the probability for x, provided A, 7, m are taken to be M= 10+ Yolo t Ygagt — + — h=irytypratyirgt. — t= ia tyiegtysegt--- instead of the values in (41). 50. If we take the integral of eq. (49), between any two limits #, v, it gives us the probability that the sum 2 of the errors lies~~

~~(51),~~

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~~between p and y—that is, that the mean of all the errors lies between pr-) and yr-}, if r is the number of the partial errors in (37). The most likely~~

~~value of x (that is, for which the frequency 1s greatest) is of course =m, and the chance that xz does not differ from m by more than +6 is — ™~~

~~ay fim h—-i)4 mS~~

~~In this put (2-m){2(h-2)t=t; .°. dw=dtN2h—%). The limits m8 for z become+5{2(h-4)}-} for ¢; hence, putting 7=5{2(h-7)}-3,~~

~~to and remembering that ee dt= vA eat,~~

~~=~~

~~2—~~

~~we find wos fie ie 3)~~

~~is the probability that the sum x of the errors in (37) lies between the~~

~~limits m1 2h—2); wis also the probability that the mean of all the errors, zr-1, lies between the limits~~

~~nr-lArr-lV/2(h=7) .~~

~~51. The important result (48), which is the key to the whole theory of errors, contains several particular cases which Laplace gives in his fourth chapter. We may first make one or two rciarks on it.~~

~~(1) 4-7 is always positive ; for in (41)~~

~~(rm)? é€ 2(h—i) dx.~~

~~IS ECHO NG Cy (lap because the mean of the squares of n numbers is always greater than the square of the mean.! (2) To find the mean value M(x) of the sum 2, and the mean value of its square M(x”), we have~~

~~Sryde Z Sxrydz the limits being +0. Hence~~

~~M(ax)=m ; M(2*?)=m?+h-7.~~

~~The first is obvious from the fact that to every value m+z for x there corresponds another m—z. Both results also easily follow from common algebra: the case is that of a sum, a,~~

~~@=eE retest, &e, where each quantity e,, €), €,.... poe through an independent series of values ; and it is easily proved that M(x)=M(e,)+ M(e.)+M(e3)+ ... M(x") = M(e?)+ M(e2)+M(e2)+ ... =(2Me,)?— 3(Me,)? + SM(e?).~~

~~52. One particular case of the general problem in art. 48 is when the errors €;, €2, €g. . . . in (37) all follow exactly the same law; as, for instance, if €, €,,¢€3. . . . are the errors committed in observing the same magnitude, under exactly the same circumstances, a great number of times; and we are asked to find the chance that the sum of the errors, or that their arithmetical mean, shall fall between given limits. Here the law of facility for each error is of course the~~

~~same, though we may not know what it is. We have then from (41) :~~

~~— wea ecm. 2 M=ra,, h=rr,, t=7ra?,~~

~~ma =Me, 3 +23{M(¢,)M(eq)}~~

~~so that in eq. (52), 9 a =a~~

~~a a) é t is the probability that the mean of all the errors shall lie between a brV2r-Ka, =a) ty here is the mean of all the possible values of the error in this par- ticular observation, which are of course infinite in number ; and (53) shows us, what is evident beforehand, that the more the number 7 of observations is increased the narrower do the limits for the mean error become for a given probability @; so that if, suppose, we take 7=3, and r=oo, we have very nearly wz=1, and it becomes practically certain that the mean of the actual observations will differ from a, by an infinitesimal deviation.~~

~~53. What we have found hitherto would be of very little practi- cal use, because the constants involved suppose the amounts of the errors known, and therefore the true value known of the quantity which is observed or~~

~~measured. _ It is, however, precisely this true value which we usually do not know and are trying to find. Let us how suppose a large number 7 of measurements, which we will call~~

~~UUs 5 6 Ue made of a magnitude whose true but unknown value is A.~~

~~1 This may be very easil i I asily proved by re; employed in the note on aveele a3. os~~

~~(53).~~

~~asoning precisely analogous to that~~

~~Pio aA hirer:~~

~~The (unknown) errors of the observations will be~~

~~€j=0,-A, €:=G@,—-A, C3=a,A…; we Ter tegt .. . Cr) =7 ay, Gg ... dr)—A; or M(e,)=M(a,)—A;~~

~~or the mean of the errors is the error committed in taking the mean of the observations as the value of A.~~

~~Hence (53) @ is the probability that the error committed in taking the mean of the observations as the truth shall lie between~~

~~Ogee N of (toe~~

~~Here a, is the true inean of the errors of an infinite number of observations, A, the ncan of their squares. As we have no means of determining a, (except that it is nearly equal to the mean of the errors we are dealing with, which would give us no result), we have to limit the generality of the question by assuming that the law of error of the observation gives positive and negative crrors with equal facility ; if so a,=0, and we have the probability @ that the error~~

~~lies between t¢7 V ips .~~

~~*Here A,, which is the mean of the squares of all possible values of the error of the observation, will be at least very nearly the mean square of the actual values of the errors, if 7 is large ;*~~

~~*oe Ag=rWeit+ept+ ... e); wt. AL=r-1{(a,-A)??... (ay -A)*} ; or Ay = M(a7) — 2AM (a,) + A? = M(a?) — (Ma,)?+ (Ma, — A)?. Rejecting the last term, as the square of a very small quantity, Ay=M(a2) — (May), and we have the probability z (in (53)) that the error in taking the mean of the observations as the truth lies between rN 2y-1{ M(a2) — (Ma,)?} (54), a value depending on the mean square, and mean first power, of the observed values. These imits may be put in a different form, rather easier for*~~

~~*calculation. If f,, fo, fa… fr be the apparent errors, that is, not the real ones, but what they would be on the hypothesis that the*~~

~~*mean is the true value, then, putting M for r-'(a,a, .. . dr), A=%-M, f,=a,M,... f=a,—M; .. M(f7)=M(a{) — 2M. M+ M?= M(a?) — (Ma,)?; so that A=M(/7), and (54) may be written Sear) eat… — fae — (55).*~~

~~*54. In the last article we have made no assumption as to the law of frequency of the error in the observation we are considering, except that it gives positive and negative values with equal facility. If, however, we adopt the hypothesis (see art. 47) that every error in practice arises from the joint operation of a number of independ- ent causes, the partial error due to each of which is of very small importance, then the process in art. 48 will apply, and we may con- clude that the errors of every series of observations of the same mag- nitude made in the same circumstances follow the law of frequency in formula (48); aud if we suppose, as is universally done, that _ positive and negative values are equally probable, the law will be*~~

~~*Zia ee: y= Ce — le -x-e and the probability (49) will be 2) See pata age =" "oe where ¢ is a constant, which is sometimes called the modulus of the system.*~~

~~*Every error in practice, then, is of the form (56), and is similar to every other. Ifc be small, the error has small amplitudes, and the series of observations are accurate.*~~

~~If, as supposed in art. 58, a set of observations have been made, we can determine the modulus c, with an accuracy increasing with the number iu the set. For (art. 51)~~

~~3c?= true mean square of all possible values of the error.~~

~~This we have called A, in last article, and have shown it nearly equal to M(a,?) — (Ma,)? or M(fq?) ; so that 3c? =mean square of obs. — (mean of obs.)?=mean square of apparent errors.~~

~~55. Thus, if a set of observations have been made, and ¢ thus determined from them, it is easy to see that~~

~~Mean error = ter-?=0°5642c Mean square of error= $c Probable error = +0°4769¢~~

~~The mean error means that of all the positive or all the negative errors. The probable error is the value which half the errors exceed and half fall short of, so that it is an even chance that the error of any particular observation lies between the limits +0°4769c. Its value is found from the table in art. 9, taking I=}.~~

~~56. We have often to consider the law of error of the sum of~~

~~(56),~~

~~(57).~~

~~PROP AGAL IY Yr~~

~~several magnitudes, eaeli of which has been determined by a set of observations. Suppose A and B two such magnitudes, and X their sum, to find the law of error in X=A+B. Let the funetions of error for A and B be Comte eae, feo lge es ~· 7p.~~

~~In formula (49) let m=o0, ¢=0, 2h=c?; then the funetion for A is the law for the sum of a number of errors (37) the sum of whose mean squares is h=4c*; likewise that for B is the law for the sum of a number the sum of whose mean squares is ¥f2; the saine formula (49) shows us ¢hat the law~~

~~for the sum of these two series of errors—that is, for the sum of the errors of A and B—is~~

~~{a(c? +f)} ~·4g-22(c2+f2) gy , that is, the modulus for X or A+B is Jen Probable error of X =*4769/c? f? .*. (p.e. of X)?=(p.e. of A)?(p.e. of B)? . So likewise for the mean error. If X were the difference A—B, (58) still holds.~~

~~If X be the sum of m magnitudes A, B, C. . . instead of two, its probable error is in like manner~~

~~(p.e. X)?=(p.e. A)??, &e.; and if the function of error for A, B,C. . . be the same for all (p.e. X)?=m(p.e. A)}?, Also the probable error in the mean M(A)=m-(A+B+C+4+...) is the mth part of the above ; .*. p.e. of M(A)=m-# p.e. of A) (59).~~

~~Airy gives the following example. The eo-latitude of a place is found by observing m times the Z.D. of a star at its upper cul- mination and " times its Z.D. at its lower eulmination ; to find the probable error.~~

~~Hence~~

~~(58).~~

~~By (59) p.e. upper Z.D. =m~·*(p.e. of an upper obs.) ; p-e. lower Z.D. =n-i(p.e. of a lower obs.) ; Now eo-latitude=4(U.Z.D. + L.Z.D.). Hence (58)~~

~~(p.e. eo-lat.)?=3m-l(p.e. up. obs.)? + 32-\(p.e. low. obs. ae If the upper Z.D. observations are equally good with the lower,~~

~~p-e. eo-lat. =4(p.e. an obs.),/m-14+n71,~~

~~57. The magnitude to be found is often not observed directly, but another magnitude of which it issome function. Let A=true but unknown value of a quantity depending on another whose true unknown value is a, by the given function~~

~~A=f(q) ; let an observed value for a be v, the corresponding value for A being V, then~~

~~V=f(v).~~

~~Let e=error of v, then the error of V is V-A=f(a+e)-f(a)= f® as v is nearly equal to a. Suppose now the same magnitude A also a given funetion Fila) of a seeond magnitude a,, which is also observed and found to be %; also for a third, and so on ; henee, writing C= f' (v), Cp=7"1(2,),~~

~~&e. V-A=/"(v). e=Ce V,-A=f'(y)) =Cye 7. Vo at A =f'(V2). €,= Coe,~~

~~(60),~~

~~1);~~

~~and we have to judge of the best value for the unknown quantity, whose true value is called A. The arithmetical mean of V,Vi, Ve — Seems the simplest, but it is not here the most probable, and~~

~~we shal] assume it to be a different mean, viz.,~~

~~x eV +m Vi mV_ Base M+tM+M,+ . (As V,V,,V. ... . are very nearly equal, it would be easy to show that any other way of eombining them would be equivalent to this.) The factors m, m, m.… . . remain to be determined. From (61) the error of X is KH A MCE +m Oye, + MCoeg + ree M+m,+ Mgt.…~~

~~Let the moduli of the errors €, €],€ Demc.GnCoue a = (See art, 56); then (see art. 49) for modulus of the error X— A we have (mod.)2= m?C*¢c* +m? 0%? + m2C2c2? +... (63) (M+m,myt...)? ; . are determined so us to make this~~

~~(62).~~

~~If the faetors mm,m, . .~~

~~783~~

~~modulus the least possible, the importanee of the error X — A is the least possible. Differentiate with regard to m, and we find~~

~~mO%e a ee + mi Ore + ae~~

~~M+Mm+Myt… Likewise for m,, and so on. Hence~~

~~mO?c? = m,Cici =m,02c2 =, &c.; so that the most accurate mean to take is NE octave me oy aa i ead (CAR Chee * Cae The modulus of error in this value is, from (63), 1 1 1 il (mod.)? C22 * Gee? T Oza t pant ee) 58. The errors ¢,¢,€... . areunknown. We have as to the~~

~~first V-A=ef'(v)=(v-a) f®. Let the values of the quantities observed corresponding to the value X for that sought be w, ,... so that X=f(x)=f(%)=fo(2) . . — then X-A=(x-a)f"(v) ; and, subtracting, V—-X=(v-2)f'(v)=(v-2)C. Here V — X is the apparent error in V, v—z the apparent error of the observation v, taking X, x as the true values. Of course we have also Vi X=(4,)0], Ve—-X=(t%-m)C,,-...~~

~~If now we were to determine X so as to render the sum of squares of apparent errors of the observations, each divided by the square of tts modulus, a minimum,—that is,~~

~~Cae Fa eV — AY, (Vg Vg XP a or es ee Circ? Gee? a minimum,—we shall find the same value (64) for X.~~

~~Of course if the modulus is the same for all the observations the sum of squares simply is to be made a minimum.~~

~~To take a very simple instance. An observed value of a quantity is P ; an observed value of a quantity known to be the square root of the former is Q; what is the most probable value ?~~

~~If X be taken for the quantity, the apparent error of P is P—X ; the apparent error of Q is found from~~

~~(Q-e'=X; »*. €=(Q?— X)/2Q ; .. (P-X)?+(Q?- X)?/4Q?= minimum ; .. X= (4P + 1)Q?/(4Q?+ 1) ;s the weight of both observations being supposed the same.~~

~~Again, suppose a circle is divided by a diameter into two semi- circles ; the whole circumference is measured and fonnd to be L; also the two~~

~~*semicircles are found to be M and N respectively. What is the most probable value of the circumference ?*~~

~~*If X be taken as the circumference, the apparent error in L is , L-X; those of Mand N are M-4X, N-4X. HIence, if all the measurements are equally good,*~~

~~*(L—X)??(N -3X)?=minimun, .. A=3(M+N+2L) is the most probable value. The modulus of error of this result is (65) found to be (mod.)?=2(miod. of measurements)?*~~

~~*; (64).*~~

~~*ig sires*~~

~~*+ +, &c.,*~~

~~*so that probable errer= (prob. error of a measurement),/?.*~~

~~*59. In the last article we have explained the method of least squares, aS applied to determine one unknown element from more than one observation of the element itself or of others with which it is eonnected by known laws. If several observations of the element itself are made, it is obvious that the method of least squares gives the arithmetical mean of the observations as the best value, thus justifying what eommon sense seems to indicate. If the observations are rot equally good, the best value will be*~~

~~*x VV FV + eVot ae WW + Uyt… calling w, w,, W., .. . the weights of the different observations V,V;, V2 v*~~

~~*1.6, w=c-?, wy=¢,-2, Wo=C,7?,, &c.*~~

~~*It would earry us beyond our assigned limits in this article to attempt to demonstrate and explain the method of least squares when several elements have to be determined from a number of observations exeeeding the elements in number. We must there- fore refer the reader to the works already named, and also to the following :—Gauss, Theoria Combinationis Observationum ; Gauss, Theoria Motus; Airy, Theory of Errors of Observation; Leslie Ellis, in Camb. Phil. Trans., vol. viii.*~~

~~The rule in such cases is that the sum 0 f errors is to be made a minimum, as in the case of a singl~~

~~To take a very simple example :— ; ; A pe ciatb is weighed, and the weight is found to be W. It is~~

~~adhe ; : : 7 ee then divided into two portions, whose weights are found to and Q. What is the most probable weight of the body ? Taking A and Bas the weights of the two portions, the apparent errors are P— A, Q — B, and that of the whole is W- A—B; hence~~

~~(P- A)?? (W-A- ByY=minimum there being two independent variables A, B. ., P-A+W-A-B=0; Q-B+W-A-B=0; or 2A+B=P+W 2B+A=Q+W ., A+B=} (P+Q+2W); A=4(2P+W-Q); B=4(2Q+W-P); which are the most probable weights of the whole and the two parts.~~

~~f squares of the apparent e element.~~

~~VI. On LocaL PROBABILITY.~~

~~60. It remains to give a brief acconnt of the methods of deter- mining the probabilities of the fulfilment of given conditions by variable geometrical magnitudes, as well as the mean values of such magnitudes. Recent researches on this subject have led to many very remarkable results; and we may observe that to English mathematicians the credit almost exclusively belongs. It is a new instance, added to uot a few which have gone before, ofa revival for which we have to thank the eminent men who during the 19th century have enabled the country of Newton to take a place less unworthy of her in the world of mathematical science.~~

~~At present the investigations on this subject have not gone beyond the theoretical stage ; but they should not be undervalued on this account. The history of the theory of probabilities has sufficiently shown that what at first seems merely ingenious and a matter of curiosity may turn out to have valuable applications to practical questions. HIow little could Pascal, James~~

~~*Bernoulli, and De Moivre have anticipated the future of the science which they were engaged in creating ? :*~~

~~*61. The great naturalist Buffon was the first who proposed and solved a question of this description. It was the following :—*~~

~~*A floor is ruled with equidistant parallel lines ; a rod, shorter than the distance between each pair, being thrown at random on the floor, to find the chance of its falling on one of the lines.*~~

~~*Let « be the distance of the centre of the rod from the nearest line,*~~ ~~the inclination of the rod to a perpendicular to the parallels, 2a the common distance of the parallels, 2c the length of rod; then, as all values of « and*~~ ~~*between their extreme limits are equally probable, the whole number of cases will be represented by*~~

~~*fof peed =r0. 0 f_*™ 3 ‘*~~

~~*‘ ‘ 2 Now if the rod crosses one of the lines we must have c> are*~~

~~*so that the favourable cases will be measured by*~~

~~*3 ccosé of ao fe deo= 2c,*~~

~~*= 0 2*~~

~~*Thus the probability required is p=2c/ra.*~~

~~*Laplace in solving this question suggests that by making a great number of trials, and counting the cases where the rod falls on a line, we could determine the value of x from this result, He further considers, for a given value of a, what length 2c should be chosen for the rod so as to give the least chance of error in a given large number N of throws.*~~

~~*In art. 8 we have shown that the chance that the number of successes shall lie between pN-+r is*~~

~~*a= Zs a Seal! a/rJ0*~~

~~1~~

~~where a? = ——— _es—7" 2p(1—p)N~~

~~For a given probability =, ra is given. We have then a given~~

~~chance that the number of successes shall differ from its most pro-~~

~~ws value pN by an error r which is the least possible fraction of~~

~~the latter when r/pN, or when 1/apN, or when «/p(1— is the~~

~~least possible ; that is, when p-} =i =7a/2c nf ae least~~

~~1 = 2~~

~~Tf S=number of successes, we have an assigned chance @w that S lies~~

~~between pN—r; that is, the value of m lies between a6 Sar' or = te)~~

~~a r a isa Henes the error in z is least: when 2cr/S? is least. Now roc /PA—p), 2cccp, and Scop nearly; hence /~1—p)/p is to be the least possible.~~

~~EROBABAU UTE~~

~~possible, or when ¢ is the greatest possible. Now the greatest value of ¢ is a; the rod therefore should be equal to the distance between the lines.~~

~~*Laplace's answer is incorrect, though originally given right, (see Todhunter, p. 591; also Czuber, p. 90).*~~

~~*62. Questions ou local probability and mean values are of course reducible, by the employment of Cartesian or other coordinates, to multiple integrals. Thns any one relating to the position of two variable points, by introducing their coordinates, can be made to depend on quadruple integrals,—whether in finding the sum of the values of a given function of the coordinates, with a view to obtaining its mean value, or in finding the number of the favourable cases, when a probability is sought. The intricacy and difficulty to be encountered in dealing with such multiple integrals aud their limits is so great that little success could be expected in attacking such questions directly by this method ; and most of what has been done in the matter consists in turning the difficulty by various considerations, and arriving at the result by evading or simplifying the integrations. We have a certain analogy here in the variety of contrivances and artifices used im arriving at the values of definite integrals without performing the integrations. We will now select a few of such questions.*~~

~~*63. Ifa given space S is included within a given space A, the chance of a point P, taken at random on A, falling on 8, is*~~

~~*p=S/A. But if the space S be variable, and M(S) be its mean value p=M(S)/A. .. . (66).*~~

~~*For, if we suppose S to have » equally probable valnes S,, S,,*~~

~~*S3… ., the chance of any one 8, being taken, and of P falling*~~

~~*py=n-1S,/A 5 now the whole probability p=p,+p.pgt ..*~~

~~*once to the above expression. The chance of two points falling on S is, in the same way,*~~

~~*p=M(8?)/A?.*~~

~~*., which leads at*~~

~~(67) ;~~

~~and so on.~~

~~In such a case, if the probability be known, the mean value follows, and vice versa. Thus, we might find the mean value of the nth power of the distance XY between two points taken at random in a line of length J, by considering the chance that, if n more points are so taken, they shall all fall between X and Y. This chance is"~~

~~M(XY)"/"=2(n+1)-'n+2)-?; for the chance that X shall be one of the extreme points, out of the whole (n+ 2), is 2(2+2)-1; and, if it is, the chance that the other extreme point is Y is(n+1)-1. Therefore < M(XY)" = 27" (n+1)-'(m+2)-1.~~

~~64. A line / is divided into ~· segments by »—1 points taken at random ; to find the mean value of the product of the x segments.~~

~~Let a, b,c, . .. be the segments in one particular case. If » new,points are taken at random in the line, the chance that one falls on each segment is~~

~~4.23. do BME LAS = hence the chance that this occurs, however the line is divided, 1 | wl-*"M(abew. .).~~

~~Now the whole number of different orders in which the whole 2n-1 points may occur is |2~—1; out of these the number in which one of the first series falls between every two of the second is easily found by the theory of permutations to be~~

~~|n|n-1. Hence the required mean value of the product is~~

~~|n-1~~

~~|Qn-1 ~~

~~65. If M be the mean value of any quantity depending on the positions of two points (e.g., their distance) which are taken, one in a space A, the other in a space B (external to A); and if M' be the same mean when both points~~

~~are taken indiscriminately in the whole space A+B; Mz, Ms the same mean when both points are taken in A and both in B respectively ; then~~

~~_ (A+B)?M'=2ABM + A?M,+ BM. If the space A=B,~~

~~Mabe. . .)~~

~~4M'=2M+M,+Mb;~~

~~2M'=M+Mg.~~

~~66. The mean distance of a point P within a given area from a fixed straight line (which docs not meet the area) is evidently the distance of the centre of gravity G of the area from the line. Thus, if A, B are two fixed points on a line outside the area, the mean value of the area of the triangle APB=the triangle AGB.~~

~~From this it will follow that, if X, Y, Z are three poiuts taken at random in three given spaces on a plane (such that they cannot~~

~~if, also, Mz =Msz,~~

~~PRO@®AS-LLIT ¥~~

~~all be cut by any one straight line), the mean value of the area of the triangle XYZ is the triangle GG'G", determined by the three centres of gravity of the spaces. For example—~~

~~Two points X, Y are taken at random within a triangle. What is the mean area M of the triangle XYC, formed by joining them with one of the angles of the triangle ?~~

~~Biseet the triangle by the line CD; let M, be the mean value when both points fall in the triangle ACD, and M, the value when one falls in ACD and the other in BCD; then 2M=M,+M,. But M,=4M; and M,=GG'C, where G, G' are the centres of gravity of ACD, BCD, this being a case of the above theorem; hence M,=3ABC, and~~

~~M=;;ABC.~~

~~*Hence the chance that a new point Z falls on the triangle XYC is 4; and the chance that three points X,Y,Z taken at random form, with a vertex C, a re-entrant quadrilateral, is §.*~~

~~*67. If M be a mean value depending on the positions of 2 points falling on a space A; and if this space receive a small increment a, and M' be the same mean when the ~ points are taken on A+a, and M, the same mean when one point falls on a and the remaining m—1 on A; then, the sum of all the cases being M'(A+a)", and this sum consisting of the cases (1) when all the points are on A, (2) when one is on a the others on A (as we may neglect all where two or more fall on a), we have*~~

~~*M(A+ a)"=MA"+nM,aA"-1; .. (M'-M)A=no(M,-M). . . . . (68), as M' nearly=M.*~~

~~*As an example, suppose two points X, Y are taken in a line of length 7, to find the mean value M of (XY)*, as in art. 63.*~~

~~*lf 7 receives an increment d/, formula (68) gives*~~

~~*ldM =2di(M, — M).*~~

~~*Now M, here=the mean nth power of the distance of a single point taken at random in 7 from one extremity of 7; and this is i(m+1)-1 (as is shown by finding the chance of other points falling on that distance) ; hence*~~

~~*idM =2di(i"(n + 1)-1-M); .*. dM + 2Mdl=2(n + 1)-Wnul, or l-1.d.MP=2(n+1)-Udl ; ate MP =2(0-+4 1)-L inHg] =21"42(n + 1)-\n+2)-14C ; ot. M=22"(n+1)-'(n4+-2)-}, r as in art. 63, C being evidently 0.*~~

~~*68. Ifp is the probability of a certain condition being satisfied by the points within A in art. 67, p' the same probability when they fall on the space A+a, and p, the same when one point falls on a and the rest on A, then, since the numbers of favourable cases are respectively p'(A+a)", pA", np,aA"-1, we find*~~

~~*(p'-p)A=no(p,-p) . . . ~ ~ ~ (69).*~~

~~*Hence if p'=p then p,=p; this result is often of great value. Thus if we have to find the chance of three points within a circle forming an acute-angled triangle, by adding an infinitesimal con- centric ring to the circle, we have evidently p'=p; hence the required chance is unaltered by assuming one of the three points taken on the circumference.*~~

~~*Again, in finding the chance that four points within a triangle shall form a convex quadrilateral, adding to the triangle a small band between the base and a line parallel to it, the chance is clearly unaltered. Therefore by (69) we may take one of the points at random in the base of the triangle without altering the pro- bability.*~~

~~*69. HIstorically, it would seem that the first question given on local probability, since Buffon, was the remarkable four-point problem of Prof. Sylvester' It is, in general, to find the pro- bability that four points taken at random within a given boundary shall form a re-entrant quad- rilateral. It is easy to see that this problem is identical with the problem of finding the mean area of the triangle formed by three points taken at random; for, if M be this inean, and A the given area, the chance of a fourth point falling on the triangle is M/A; and the chance of a re-entrant quadrilateral is four times this, or 4M/A. * yet é*~~

~~*Let the four points be Eig, & taken within a triangle. We may take one of them W (fig. 3) at random on the base (art. 68); the others X, Y, Z within the triangle. Now the four lines from the vertex B to the four points are as likely to occur in any specified order as any other. HIence it is an even chance that X, Y, Z fall on one of the triangles ABW, CBW, or that two fall on one of these triangles and the*~~

~~*B*~~

~~*785*~~

~~*Hence the probability of a re-entrant*~~

~~*EP, + 3Pr ' where p,=prob. (WXYZ re-entrant), X,Y,Z in one triangle ; Pr= O55 X in one triangle, Y in the other, Z in either.*~~

~~But p,=% (art. 66). Now to find p,; the chance of Z falling within the triangle WXY is the mean area of WXY divided by ABC. Now by the principle in art. 66, for any particular position of W, M(WXY)=WGG', where G, G' are the centres of gravity of ABW, CBW. It is easy to see that WGG'=3ABC=}, putting ABC=1. Now, if Z falls in CBW, the chance of WXYZ re- entrant is 2M(IYW), for Y is as likely to fall in WXZ as Z to fall in WXY;; also if Z falls in ABW the chance of WXYZ re-entrant is 2M(IXW). 'Thus the whole chance is p,=2M(1YW + 1XW)=#.~~

~~Hence the probability of a re-entrant quadrilateral is~~

~~b-$44-3-8- That of its being convex is 2.~~

~~70. If three points X, Y, Z are taken at random iu a triangle, the mean value of the triangle XYZ= 7, of the given triangle. For we have seen that the chance of four points forming a re-entrant figure is 4M/A, where M is the required mean and A the given triangle ; as this has been shown to be 3,~~

~~M=;54. 71. Let the three points be taken within a circle; and let M be~~

~~the mean value of the triangle formed. Adding a concentric ring a, aoe Or~~

~~A~~

~~remaining one on the other. quadrilateral is~~

~~we have (68) since M':M as the areas of the circles, M'=~~

~~1% A-;M=80e(M, — M) ; .. M=2M,,~~

~~where M, is the value of M when one of the points is on the~~

~~circumference. Take O fixed ; we have to find the mean value of OXY (fig. 4). Taking (p, 0) (p', 0') as coordinates of X, Y,~~

~~M, =(xa?) -*/[pdpde //p'dp'de'. (OXY). . Mj =(a*) Uff sep" sin (0 — 6')pp'dpdp'dode' =(rat)-}, 4 ff ¥rrr'. sin (6 — 6')dedé' , putting r=OH, r'=OK; as r=2asin@, 7' =2asin&, 1 (2a)8 T 8 me Sah ta U = $ — 6 dade'~~

~~. M, = ir og ve sin 30 sin 39' sin (6 — 0')d6a Professor Sylvester has remarked that this double integral, by means of the theorem~~

~~ff te ydxdy= f° "F(a -y,a— x)dedy ;~~

~~is easily shown to be identical with~~

~~a 8 A ae aff sin 44 sin°@' cos gaede'— ff sin89d0 =4~~

~~0/0~~

~~_ 85a? . . {= 35 kg "ae i ae HIence the probability that four points within a circle shall form a re-entrant figure is~~

~~1°3°~~

~~_ 35~~

~~p= 127? *~~

~~72, Professor Sylvester has remarked that it would be a novel question in the calculus of variations to determine the form of the convex contour which renders the probability a maxi- mum or minimum that four points taken within it shall give a re-entrant quadri- lateral. It will not be difficult to show, by means of the principles we have been examining, that the circle is the contour which gives the minimum.~~

~~For, if p be the probability of a re- entrant figure for four points within a circle of area A, p' the same probability when a small addition a, of any kind~~

~~Fig. 4.~~

~~which still leaves the whole contour convex, is made to the circle, we have by (69)~~

~~(p'-p)A=4a(p,-p); J . where p,=the probability when one point is taken in a —that is, in the limit, when one point is taken on the circumference.of the circle. But p,~p, as is shown in art. 68; hence~~

~~*yp =p=e, Hence any infinitesimal variation of the contour from the circum-ference of the circle gives dp, the variation of the probability, zero,— the same method being applicable when portions are taken away, instead of being added, provided the contour is left convex.*~~

~~*XIX. — 99*~~

~~*786*~~

~~*Hence, for the circle, the probability is a maximum or minimum. It will be a minimum, because in the formula (68) for the mean triangle formed by three points*~~

~~*(M'- M)A=3a(M, — M). M,, which is the mean triangle when one point is in a, is really greater than when it is on the circumference, though the same in the limit ; hence*~~

~~*M,>4M; .. (W'-M)A>aM ; . M/(Ata)>M/A.*~~

~~*Therefore, if we consider infinitesimals of the second order, the chance of a re-entrant figure is increased by the addition of the space a to the circle. It will be an exercise for the reader to verify this when the space is subtracted. 7*~~

~~*For an ellipse, being derived by projection from the circle, the probability is the same, and a minimun.*~~

~~*It is pretty certain that a triangle will be found to be the con- tour which gives the probability the greatest.*~~

~~*Mr Woolhouse has given (Hduc. Times, Dec. 1867) the values of p for*~~

~~*Triangle. Parallelogram. Reg. Hexagon. Circle. p= : th | aR te? or °3333 "3056 2973 "2955*~~

~~*73. Many questions may be made to depend upon the four-point problem. Thus, if two points A,B are taken at random in a given convex area, to find the chance that two others C, D, also taken at random, shall lie on opposite sides of the line AB.*~~

~~Let » be the chance that ABCD is re-entrant. If it is, the chance is easily seen to be 4 that any two of the four lie on opposite sides of the line joining the two others. If ABCD is convex, the same chance is 4; hence the required probability is~~

~~w=tp+3(1—-p)=h+ép. Or we might proceed as follows, ¢.g., in the case of a triangle :—~~

~~The sides of the triangle ABC (fig. 5) produced divide the whole triangle into seven spaces. Of these, the mean value of those marked ais the same, viz., the mean value of ABC, or 7, of the whole triangle, as we have shown, —the mean value of those marked 8 being 3 of the triangle. .~~

~~This is easily seen : for instance, if the whole area =7, the mean value of the space PBQ gives the chance that if the fourth point D be taken at random B shall falt within the triangle ADC ; now the mean value . of ABC gives the chance that D Fig. 5. shall fall within ABC ; but these two chances are equal. Hence we see that if A, B, C be taken at random, the mean value of that portion of the whole triangle which lies on the same side of AB as C does is 44 of the whole, and that of the opposite portion is 3%. Hence the chance of C and D falling on opposite sides of AB is 4%. _ 74. We can give but few of the innumerable questions depend- Ing on the position of points in a plane, or in space. Some may be solved without any aid from the integral calculus, by using a few very evident subsidiary principles. As an instance, we will state the following two propositions, and proceed to apply them to one or two questions :— Gs~~

~~; (1) In a triangle ABC, the frequency of any direction for the line CX is the same when X is a point taken at random on the base AB as when X is taken at random in the area of the triangle.~~

~~(2) If X (fig. 6) is a point taken at random in the triangle AB (Bb being infinitesimal), the ae eagles SL!~~

~~frequency of the distance meee) ig AX is the same as that of 4 Med ad AZ, Y and Z being two Pig: ©.~~

~~points taken at random in AB, and Z denoting always that one~~

~~of the two which is nearest to B. For the frequency in each case |~~

~~1s proportional to the distance AX or AZ. _ Let us apply these to the follow- ing question :—~~

~~A point O is taken at random in a triangle (fig. 7) ; if m more points are taken at random, to find the chance that they shall all lie on some one of the three triangles AOB, \ AOC, BOC. So fc be joined with all the points mM question, every joining line is Ls , pie equally likely to be nearest to CB. Fig. 7. Hence the chance that all the n points fall on the triangle ACD is~~

~~(m+1)-1,~~

~~B~~

~~PROBABILITY~~

~~If this isso, we have to find the chance that all he on AOC. Now if O range over the infinitesimal: triangle DCd, we may, by prin- ciple (2) above, suppose it to be the nearest to D of two points taken at random in CD. If so, the chance that AO is nearer to AD than any of the lines from A to the x points is~~

~~2(n+2)-2 ;~~

~~for, by (1) above, we may suppose all the points taken at random in CD; now any one of the n+2 is equally likely to be the last; and O is the last of the two additional points. Hence, if O is in the triangle CDd, the chance that the » points fall on AOC is~~

~~2(n+1)-(n4+2)-1;~~

~~therefore this is the chance wherever O falls in ABC.~~

~~Therefore the required chance that the n points fall on some one~~

~~of the triangles AOB, AOC, BOC is P=6(n+1)-n4+2)-!.~~

~~*Again, if O be taken at random in the triangle, and three more points X, Y, Z be also taken at random in it, to find the chance that they shall fall, one on each of the triangles AOB, AOC, BOC.*~~

~~*First, two of the points are to fall on one of the triangles ACD, BCD, and the remaining one on the other; say two on ACD, the chance of this is }, as CO must then be the third in order of the four distances from C. If this is so, the chance that the point X in BCD falls on BOC is 3. For, as above, if O ranges over the triangle CDd, we may take it to be the lowest of two points taken at random on CD; and the chance that, if another point be also taken at random in CD, it shall be lower than O is 4. Now if one of the points X is in BOC, the frequency of O in CDd will be the same as that of the lowest of three points taken on CD; and the chance that one of the remaining points shall fall in AOC and the other in AOD is the chance that O, the lowest of three particular points out of five, all taken at random in CD, shall be the fourth in order from C. Itis easy to see that this chance is #3. Hence the chance that one point falls on BOC, one on AOC, and the third on AOD is*~~

~~*4°3-Lo=20- And it will be the same for the case where the third falls on BOD. Hence the chance that one point falls on each of the three triangles above is double this, or 75.*~~

~~*75. Straight lines falling at random on a Plane.—If an infinite number of straight lines be drawn at random in a plane, there will be as many parallel to any given direction as to any other, all directions being equally probable ; also those having any given direction will be disposed with equal frequency all over the plane. Hence, ifa line be determined by the coordinates p, w, the perpen- dicular on it from a fixed origin O, and the inclination of that perpendicular to a fixed axis, then, if p, w be made to vary by equal infinitesimal increments, the series of lines so given will represent the entire series of random straight lines. Thus the number of lines for which p falls between p and p + dp, and w between w and w + dw, will be measured by dpdw, and the integral*~~

~~*S/apde '*~~

~~*between any limits, measures the number of lines within those limits.*~~

~~*It is easy to'show from this that the number of random lines which meet any closed convex contour of length L is measured by L. For, taking O inside the contour, and integrating first for p, from 0 to p, the perpendicular on the tangent to the contour, we*~~

~~*have J pd ; taking this through four right angles for w, we have by Legendre's theorem on rectification, N being the measure of the*~~

~~*number of lines,*~~

~~*: 2*~~

~~*N= ie "pd =L,!*~~

~~*θ*~~

~~*Thus, if a random line meet a given contour, of length L, the chance of its meeting another convex contour, of length /, internal to the former, is*~~

~~*p=lL.*~~

~~*If the given contour be not convex, or not closed, N will evi-*~~

~~*1 This result also follows by considering that, if an infinite plane be covered by an infinity of lines drawn at random, it is evident that the number of these which*~~

~~*| meet a given finite straight line is proportional to its length, and is the same*~~

~~*whatever be its position. HIence, if we take 7 the length of the line as the measure of this number, the number of random lines which cut any element ds of the contour is measured by ds, and the number which meet the eontour is therefore measured by 3L, half the length of the boundary. If we take 2/ as the measure for the line, the measure for the eontour will be L, as above. Of eourse we have to remember that each line must meet the eontour twice. It would be possible to rectify any elosed curve by means of this principle. Suppose it traced on the surfaee of a cireular disk, of circumferenee L, and the disk thrown a great number of times on a system of parallel lines, whose*~~

~~*distance asunder equals the diameter, if we count the number of cases in which the closed curve meets one of the parallels, the ratio of this number to the whole number es ot will be ultimately the ratio of the circumference of the curve to that of ne circle.*~~

~~*PROBABLE LT Y.*~~

~~*dently be the length of an endless string, drawn tight around the contour.*~~

~~*76. Ifa random line meet a closed convex contour, of length L, the chance of it meeting s another such contour, external to the former, is*~~

~~*p=(X-Y)/L,*~~

~~*where X is the length of " an endless band envelop- ing both contours, and crossing between them, and Y that of a band also enveloping both, but not crossing. This may Fig. 8.*~~

~~*be shown by means of Legendre's integral above ; or as follows :—*~~

~~*Call, for shortness, N(A) the number of lines meeting an area A; N(A, A') the number which meet both A and A'; then (fig. 8) :*~~

~~*N(SROQPH) + N(S'Q'OR'P'H') = N(SROQPH +S'Q'OR'P''H') +N(SROQPH, 8'Q'OR'P'H'), since in the first member each line meeting both areas is counted twice. But the number of lines meeting the non-convex figure consisting of OQPHSR and OQ'S'H'P'R' is equal to the band Y, and the number meeting both these areas is identical with that of those meeting the given areas Q, (; hence X=Y+N(Q,).*~~

~~*Thus the number meeting both the given areas is measured by X-Y. Hence the theorem follows.*~~

~~*77. Two random chords cross a given convex boundary, of length L, and area ©; to find the chance that their intersection falls inside the boundary.*~~

~~*Consider the. first chord in any position ; let C be its length, considering it as a closed area, the chance of the second chord meeting it is*~~

~~*ac/L ;*~~

~~*and the whole chance of its coordinates falling in dp, dw and of the second chord meeting it in that position is*~~

~~*2C dpdw*~~

~~*'L f/fapde*~~

~~*But the whole chance is the sum of these chances for all its positions ;*~~

~~*= FCdpde :*~~

~~*+, prob. =2L-2//Cdpda.*~~

~~*Now, for a given value of w, the value of I Cdp is evidently the area Q; then, taking w from z to 0,*~~

~~*required probability =27QL~°. The mean value of a chord drawn at random across the boundary*~~

~~*is * TI Cdpaw 1Q Lipdo ©*~~

~~*78. A straight band of breadth ¢ being traced on a floor, and a circle of radius r thrown on it at random; to find the mean area of the band which is covered by the circle. (The cases are omitted where the circle falls outside the band.)!*~~

~~*If S be the space covered, the chance of a random point on the circle falling onthe band is."*~~

~~*p=M(S)/xr°.*~~

~~*This is the same as if the circle were fixed, and the band thrown on it at random. Now let A (fig. 9) be a 5 Saat of the random point; the*~~

~~*avourable cases are when HK, the bisector of the band, meets a circle, centre A, radius 4c; and the whole number are when HK meets a circle, centre O, radius 7+4c¢; hence the probability is*~~

~~M~~

~~ya 2m: BC _¢ DP On(r+4e) Irte.~~

~~This is constant for all positions of A; hence, equating these two values of p, the mean value required is~~

~~M(S) =c(27+¢)-197°. The meaui value of the portion of the circumference which falls~~

~~: : c a on the band is the same fraction as of the whole circumference.~~

~~1 Or the floor may be supposed painted with parallel bands, at a distance asunder equal to the diameter; so that the circle must fall on one.~~

~~(87~~

~~If any convex area whose surface is Q and circumference L be thrown on the band, instead of a circle, the mean area covered is~~

~~M(S)=a2e(L+7e)-10,~~

~~For as before, fixing the random point at A, the chance of a~~

~~random point in © falling on the band is p=ln.tee/L,~~

~~where L' is the perimeter of a parallel curve to L, at a normal distance $e fromit. Now~~

~~L/= Li 29. $e. _ MS) ze TA, Lee~~

~~79. Buffon's problem may be easily deduced in a similar manner. Thus, if 27=length of line, a=distance between the parallels, and we conceive a circle (fig. 10) of diameter a with its centre at the middle O of the line,? rigidly attached to the latter, and thrown with it on the parallels, this circle must meet one of the parallels; if it be thrown an in- finite number of times, we shall thus have an infinite number of chords crossing it at random. : Their number is measured by 2x. $a, and the Fig. 10. number which meet 2r~~

~~is measured by 4r. Hence the chance that the line 27 meets one of the parallels is~~

~~p=4rlra.~~

~~80. To investigate the probability that. the inclination of the line joining any two points in a given convex area (shall lie within given limits. We give here a method of reducing this question to calculation, for the sake of an integral to which it leads, and which is not easy to deduce otherwise.~~

~~First let one of the points A (fig. 11) be fixed ; draw through it a chord PQ =C, at an inclination to some fixed line; put AP=r, AQ=r'; then the number of cases for which the direction of the line joining A and B lies between 6 and 6+dé is measured by~~

~~£(7?+72)\d0. 3~~

~~Now let A range over the space be- Hig. At tween PQ and a parallel chord distant dp from it, the number of cases for which A lies in this space and the direction of AB is from 6 to 64+dé is (first considering A to lie in the element drdp)~~

~~Cc sdpao/, (72 +92) dr =4C%dpde .~~

~~Let p be the perpendicular on C from a given origin O, and | let w be the inclination of p (we may put dw for dé), C will be | a given function of p, w; and, integrating first for » constant,~~

~~the whole number of cases for which falls between given limits~~

~~w', w" is a 1 oe fe du [C ap ;~~

~~the integral /Cdp being taken for all positions of C between two tangents to the boundary parallel to PQ. The question is thus reduced to the evaluation of this double integral, which, of course, is generally difficult enough ; we may, however, deduce from it a remarkable result ; for, if the integral~~

~~1 /f Cdpdw~~

~~*be extended to all possible positions of C, it gives the whole number of pairs of positions of the points A, B which lie inside the area ; but this number is 0? ; hence*~~

~~*S/Cdpdw = 30,3 the integration extending to all possible positions of the chord C,— its length being a given function of its co- ordinates p, w.*~~

~~*Cor. Hence if L, Q be the perimeter and area of any closed convex contour,*~~

~~*two concentric similar ellipses); let the Fis, 12." annular area between them be called A; atic,*~~

~~*the mean value of the cube of a chord from a point X taken at random on this annulus draw tangents*~~

~~*Q*~~

~~*drawn across it at random is 30°/L.*~~

~~*81. Let there be any two convex boundaries (fig. 12) so related that a tangent at any point V to the inner cuts off a constant segment S from the outer (¢.9.,*~~

~~*2 The line might be anywhere within the circle without altering the question.*~~

~~*3 This integral was given by the present writer in the Comptes Rendus, 1869, p. 1469. An analytical proof was given by Serret, Annales scient. de Ecole Normale, 1869 p. 177.*~~

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~~*XA, XB to the inner. shall find ' M(AB)=LS/A,*~~

~~*L being the whole length of the inner curve ABY.*~~

~~*We will first prove the following lemma :— |*~~

~~If there be any convex are AB (fig. 18), and if N, be (the measure of) the number of random lines which meet it once, N, the number which meet~~

~~it twice, 2arc AB=N,+2N,. Fig. 13.~~

~~For draw the chord AB; the number of lines meeting the convex figure so formed is~~

~~N,+N,=are+chord (the perimeter) ; but N,=number of lines meeting the chord =2 chord ; .. 2arct+N,=2N,+2N,, .°. 2arc—N,+2Ny.~~

~~Now fix the point X, and draw XA, XB. Ifa random line cross the boundary L, and p, be the probability that it meets the are AB once, 7, that it does so twice, Cr~~

~~2AB/L=p, + 2p, ; eee.~~

~~Find the mean value of the are AB. We~~

~~B~~

~~and if the point X range all over the an- nulus, and 7,, p, are the same probabilities for all positions of X, 2M(AB)/L=p, + 2p,. Let now IK (fig. 14) be any position of~~

~~it is easy to see that it will cut the arc AB ;~~

~~twice when X is in the space marked a, Fig. 14.~~

~~and once when X isin either space marked § ; hence, for this posi- tion of the line, 2a+268 28~~

~~the random line ; drawing tangents at I, K, Dp + 2p,= Vom «, which is constant; hence~~

~~M(AB)_S~~

~~a i Hence the mean value of the arc is the same fraction of the perimeter that the constant area § is of the annulus. If L be not related as above to the~~

~~*outer boundary,*~~

~~*M(AB)/L=M(S)/A,*~~

~~*M(S) being the mean area of the segment cut off by a tangent at a randoni point on the perimeter L.*~~

~~*The above result may be expressed as an integral. If s be the are a included by tangents from any point (2, y) on the annulus,*~~

~~*S{sdedy =LS.*~~

~~*It has been shown (Phil. Trans., 1868, p. 191) that, if 0 be the angle between the tangents XA, XB,*~~

~~*S/odxdy =1(A- 28). The mean value of the tangent XA or XB may be shown to be*~~

~~*s*~~

~~*oar?*~~

~~*where P=perimeter of locus of centre of gravi –*~~

~~*nee € gravity of the seg 82. If C be the length of a chord crossing any convex area Q;*~~

~~*3, 3' the areas of the two segments into which it divides the*~~

~~*area ; and p, w the coordinates of C, viz., the perpendicular on C*~~

~~*from any fixed pole, and the angle made by p with any fixed axis ;*~~

~~*then ST Adpde=6 J/s3! dpa, both integrations extending to all possible values of DP, w which give a line meeting the area, : This identity will follow by proving that, if p be the distance between two points taken at random in the area, the mean value of*~~

~~*p will be | M()=0-2 //23'dpdes .*~~

~~*M(XA)=*~~

~~*(1),*~~

~~*and also M(p)=30-3//Ctdpde . (2),*~~

~~*The first follows by considering that, if a random li area, the chance of its passing betes the two mee 21 IM, x L being the perimeter of Q. "Again, for any given position of the random line C, the chance of the two points lying on opposite sides of it is 233/0-2; therefore, for all positions of C, the chance*~~

~~*is 20-2) "ys , ule ae ae but the mean value M(33'), for all positions of*~~

~~*M(zz') J ST sx'dpdeo nd Lf/* 'dpa 'Vie L Sdpdea .*~~

~~*PROBA TLE?*~~

~~*To prove equation (2), we remark that the mean value of p is found by supposing each of the points 2 A, B to occupy in succession every pos- — sible position in the area, and dividing the sum of their distances in each case by the whole number of cases, the mea-___- sure of which number is 9%. Confin- ™ ing our attention to the cases in which the inclination of the distance AB to some fixed direction lies between and 6+d8, let the position of A be fixed (fig. 15), and draw through it a chord HH'=C, at the inclination @; the sum of the cases found by giving B all its*~~

~~*positions is wer Fig. 15.*~~

~~*a0 fe . pap +a0f" p. pdp=43(7 +1°)d0 ,*~~

~~*where r=AH, 7'=AH'. Now let A occupy successively all posi- tions between HH' and hh', a chord parallel to it at a distance =dp; the sum of all the cases so given will be*~~

~~*C aaodp f, (73+ 73)\dr = 4dédp}z2C = tdedpC}. Now, if A moves over the whole area, the sum of the cases will be 1d0fChdp , where p= perpendicular on C from any fixed pole O, and the integration extends to all*~~

~~parallel positions of C between two tan- gents T, T' to the boundary, the inclination of which is 6. Remov-~~

~~ing now the restriction as to the direction of the distance AB, and giving it all values from 0 to a, the sum of all the cases is~~

~~T of dé} Cidp ;~~

~~or, if w= inclination of p, dw=dé, and the sum is~~

~~+ ST Cidpdw .~~

~~The mean value of the reciprocal of the distance AB of two points taken at random in a convex area is easily shown to be~~

~~Mp-!=02-2//C*dpde .~~

~~Thus, for a circle,~~

~~It may also be shown that the mean area of the triangle formed by taking three points A, B, C within any convex area is~~

~~M(ABC)=02.- 09-3//08x%dpdw.~~

~~83. In the last question if we had sought for the mean value of the chord HH' or C, which joins A and B, the sum of the cases when A is fixed and the inclination lies between~~ and ~~+d6 would have been~~

~~C.4(r?+7')d0 ,~~

~~and when A lies between HH' and hh' Cc 4Cdodp rf (024. 7)dr=3dddpCs ; and finally, the mean value of C is~~

~~M©= 10 "2 ff Ctdpdeo ,~~

~~Thus the mean value of a chord, passing through two points taken at random within any convex boundary, is double the mean dis- tance of the points.~~

~~84. We have now done enough to give the reader some idea of the subject of local probability. We refer him for fuller information to the very interesting work just published by Emanuel Czuber of Prague, Geometrische Wahrscheinlichkeiten und Mittelwerte, Leip- sic, 1884 ; also to the HducationaI Times Journal, in which most of the recent theorems on the subject have first appeared in the form of questions, under the able editorship of Mr Miller, who has him- self largely contributed. In Williamson's Integral Calculus, and : 4 by Prof. Crofton, Phil. Trans., 1868, the subject is also~~

~~reated.~~

~~Literature.—Besides the works named in the conrse of this article, see De Morgan's treatise in the Encyclopedia Metropolitana; Laurent, Traité du Calcul des Probabilités, Paris, 1873; Gourand, HistoIre du Calcul des Prob., Paris, 1848; J. W. L, Glaisher, "On the Law of Facility of Errors of Observations, and the Method of Least Squares," Zrans. R.A.S., vol. xxxix.; Cournot, Théorie des Chances; Liagre, Calcul des Prob.; General Didion, Calcul des Prob. appliqué au tir des projectiles, Those who are interested in the metaphysical aspect of the question may consult Boole's Laws of Thought, also J. S. Mill's Logic. To these and the other works we have named we refer the reader for an account of what we have had to omit, but above all, to the great work of Laplace, of which it is sufficient to say that it is worthy of the genius of its author—the Théorie analytique des Probabilités. It is no light task to master the methods and the reasonings there employed; but it is, and will long continue to be, one that must be attempted by all who desire to understand and to apply the theory of probability. (CM. W. C.)~~

~~PhRO—PRO 789~~

~~EROBATE. See, WIxt.~~

~~PRCBUS, Marcus AURELIUS, Roman emperor from 276 to 282 A.D., was a native of Sirmium on the Save, and son of a military officer of moderate fortune. HIe early entered the army, where he recommended himself to the emperor Valerian, and against all rule became tribune while still amere lad. In these times there were abundant oppor- tunities for a capable officer, and~~

~~*Probus served with great distinction in all parts of the empire. Under:Aurelian he operated against the Palmyrene realm in Egypt and had a large part in the restoration of Roman authority in the East. On Aurelian's death he was quite the most pro- minent military officer of Rome, and had a great hold on the troops by his constant care for their comfort, his judicious discipline, and his unselfishness. Tacitus is said to have hesitated to assume the purple which Probus was better fitted to wear, and it is certain that he felt the support of Probus indispensable, and raised him to the rank of commander of the whole East. Ina few months the purple actually fell to him, for on the news of Tacitus's death his soldiers at once made him emperor, Florianus, who had claimed to succeed his brother, was put to death by his own troops, and the senate were eager to ratify the choice of the army. The reign of Probus was mainly spent in successful wars by which he re-established the security of all the frontiers ; the fiercest and most bloody of these operations was directed to clearing Gaul of the Germans. Probus had also to put down three usurpers, Saturninus, Proculus, and Bonosus. One of his principles was never to allow the soldiers to be idle, and to employ them in time of peace on useful works, such as the plant- ing of vineyards in Gaul, Pannonia, and other districts where a selfish policy had previously forbidden this forn1 of husbandry. 'This increase of duties was naturally unpopular with the troops, and while the emperor was urging on the draining of the marshes of his native place he was attacked and slain by a sudden mutiny. Scarcely any emperor has left behind him so good a reputation ; his death was mourned alike by senate and people, and even the soldiers presently repented and raised a monument in honour of ' Probus imperator vere probus." According to the Chron. Alex. Probus was fifty years old at the time of his death; he left a family, but they withdrew into private life in northern Italy, and the empire fell to Carus.*~~

~~*PROCESS, in law, denotes in the widest sense of the word any means by which a court of justice gives effect to its authority. In the old practice of the English com- mon law courts process was either original or judicial. Original process was a means of compelling a defendant to compliance with an original writ (see Writ). Judicial process was any compulsory proceeding rendered necessary after the appearance of the defendant. Process was also divided in civil matters into original, mesne, and final. Original process in this sense was any means taken to compel the*~~

~~appearance of the defendant. A writ of sum- mons is now the universal means in the HIgh Court of Justice. Mesne process was either any proceeding against the defendant taken between the beginning and the end of the action, such as to compel him to give bail, or was directed to persons not parties to the action, such as jurors or witnesses. Arrest on mesne process was abolished in England by the Debtors Act, 1869. Final process is practically coexistent with execution. It includes writs of jfiert facias, capias, elegit, sequestration, and attach- ment. Incriminal matters process only applies where the defendant does not appear upon summons or otherwise. A warrant is now the usual form of such process. Service of process on Sunday is void, except in cases of treason, felony, or breach of the peace, 29 Car. II, c. 7. Recent legislation gives facilities for service and execution of~~

~~certain kinds of process of the courts of one part of the United Kingdom in another part. Thus by 44 & 45 Vict. c. 24 process of an English court of summary jurisdiction may be served in Scotland, and vice versa. A writ of summons in the HIgh Court of Justice may be served out of the jurisdiction in certain cases (Rules of the Supreme Court, 1883, Ord. xi.).~~

~~Stet processus was a technical term used in old common law practice. It consisted of an entry on the record by consent of the parties for a stay of proceedings. Since the Judicature Acts there has been no record, and the stet processus has disappeared with it.~~

~~In Scotch law process is used in a much wider sense, almost equivalent to practice or procedure in English law. Process in the English sense corresponds rather to diligence. Where papers forming steps of a process are borrowed and not returned, diligence of process caption lies for their recovery.~~

~~In the United States process is governed by numerous statutes, both of Congress and of the State legislatures. The law is founded upon the English common law.~~

~~PROCIDA, an island less than 2 miles off the west coast of southern Italy between Capo Miseno (or rather Monte Procida) on the mainland and the island of Ischia, forming part of the circondario of Pozzuoli and the pro-~~

~~vince of Naples. Its total area is not much more than 14 square miles, but it is fertile, well-cultivated, and thickly peopled (10,788 inhabitants in 1871, 10,891 in 1881). Like the neighbouring mainland it is largely of volcanic origin, and the ancient Greek name Prochyte (Ipoyvry), Latinized as Procita, possibly refers to this fact. The two fine bays on the south coast are remains of craters, and the soil is almost exclusively tuff. The coasts are usually a rocky scarp ; the general surface of the island is compara- tively low and flat. Procida, the chief town, lies on the isthmus of a peninsula, at the landward extremity, looking out over a spacious bay. It contains a castle, now used as a prison, and an old royal palace of the Bourbons, who had a hunting park in the island ; and the harbour is defended by a fort. Inthe Piazza dei Martiri is a monument to the twelve who were executed as political offenders in 1799. The islanders are mainly engaged in market-gardening, vine-growing, the fisheries, and the coasting trade; but the number of fishing-boats belonging to Procida is much smaller than it used to be. In accordance with their claim to be of Greek descent the women are accustomed to wear on the festival of St Michael a picturesque Greek costume and to dance the tarantula.~~

~~In the 13th century the island was the feudal possession of Gio- vanni da Procida, the chief conspirator in the Sicilian Vespers. The capture off the coast, by the Ottoman fleet, of a number of Andrea Doria's galleys in 1522 was the last of many instances in which Procida was made to realize the hostility of Mohammedan powers. In 1799, from 1806 to 1809, and again in 1813 it was occupied by the English.~~

~~PROCLUS. See NEoPLaToNIsM.~~

~~PROCONSUL. See Consut, vol. vi. p. 315, and PROVINCE.~~

~~PROCOPIUS, the most eminent historian of the Eastern Roman empire, was born at Ceesarea in Palestine, then one of the chief cities of the Ronian East, towards the end of the 5th century, probably between 485 and 495 a.p. Of his family and earlier life nothing is known, but it has been plausibly conjectured from the aristocratic sympathies he manifests that he belonged to one of the better families of his city, and from the place of his birth that lhe was educated at the great law school of Berytus (Beirut). He became a lawyer, probably at Constantinople, and was in 526 appointed avpPovdos~~

~~to Belisarius, who was proceed- ing to command the imperial army in the war against the Persians (Proc., Pers., i. 12). The chief duties of this office, which is also described as that of rdpedpos or cvyxédedpos,, seem to have been the giving of legal advice to the general,~~

~~who had a measure of judicial as well as administrative |~~

~~power, and have been well compared by Mr Hodgkin (Italy and Her Invaders, vol. iii. p. 638) to those of an English judge advocate. When the Persian War was suspended Procopius probably returned with his general to Constanti- nople ; and when Belisarius was despatched against the Vandals of Africa in 533 Procopius again accompanied him, as he subsequently did in the war against the Ostro- goths of Italy which began in 536. Whether he held the same position of legal assessor through these campaigns or was merely a member of the large personal following which Belisarius had we do not know. Suidas calls him the secre- tary (iroypapets) of Belisarius, but this may be merely a reference to his original appointment as ovpPovdos in the Persian campaign. He was evidently much valued by Beli- sarius, who twice employed him on difficult and important missions—once in 533 to obtain from Syracuse provisions for the Roman fleet and information as to the preparations of the Vandals, and again in 537, when the historian was despatched from Rome, which Belisarius was holding against the Goths, to collect troops and corn in Campania and bring them in a fleet to Ostia. On both occasions Procopius ac- quitted himself with skill and success. He passes lightly over his own performances, and nowhere strikes us as eager for an opportunity of singing his own praises.~~

~~After the capture of Ravenna in 539 Procopius would seem to have returned to Constantinople, where he was in 542, the year of the great plague, which he has minutely described (ers., ii. 22). It does not appear whether he was with the Roman armies in the later stages of the Gothic War, when Belisarius and afterwards Narses fought against Totila in Italy, though his narrative of these years is so much less full and minute than that of the earlier warfare that probably he was not an eye-witness of these campaigns. Of his subsequent fortunes we know nothing, except that he was living in 559. He was an advocate by profession (Agathias, Evagrius, and other~~

~~*Byzantine writers call him fyrwp), but whether he practised law after his return from the Italian wars may be doubted, for he must have been then occupied with the composition of his his- tories, and his books show that he spent a good deal of time in travel. HIe seldom refers to legal matters, and shows little interest in them, mentioning only in the most cursory way the legislation and codification of Justinian. Whether he was the Procopius who was prefect of Con- stantinople in 562 (Theophanes, Chronographia, 201, 202) and was removed from office in the year following cannot be determined. Little can be founded on the name, for it was a common one in that age, and had this Procopius been our historian one might have expected some of the subsequent writers who refer to the latter to have men- tioned this fact about him. On the other hand the historian was evidently a person of note, who had obtained the rank of Ilustris (Suidas calls him "IAAovezpios), and a passage in the Anecdota looks as if he had risen to be a senator (Anecd., c. 12), so that there is no improbability in his having been raised to the high office of prefect.*~~

~~*There has been some controversy as to his religion. So far as external profession went, he must have been a Christian ; for paganism, persecuted by Justinian, would hardly have been tolerated in so conspicuous a person ; nor is there any evidence for his being a heathen other than the cool indifference with which (except in the De didi- Jictis) he speaks about Christian beliefs and practices. HIe seems to have been so far a Christian as to have believed in a God and have held Christ to be a supernatural being, but he frequently expresses himself in sceptical language, ee God and Fate as if practically synonymous, and*~~

~~*ertained great contempt for the theological controversies which raged so hotly in his own time,*~~

~~*PR OC OrkEUS*~~

~~*Procopius's writings fall into three divisions—the /is- tories (Persian, Vandal, and Gothic Wars) in eight books, the treatise on the Buildings of Justinian (De Aidificiis) in six books, and the Unpublished Memoirs (ra '"Avéxdora, HIstoria Arcana), here cited as the Anecdota.*~~

~~*The Histories are called by the author himself the Books about the Wars (ot trép rév wodkepwv Adyot). They consist of—(1) the Persian Wars, in two books, giving a narrative of the long struggle of the emperors Justin and Justinian against the Persian kings Kobad and Chosroes Anushirvan down to 550 ; (2) the Vandal War, in two books, describ- ing the conquest of the Vandal kingdom in Africa and the subsequent events there from 532 down to 546 (with a few words on later occurrences); (3) the Gothic War, in four books, narrating the war against the Ostrogoths in Sicily and Italy from 536 till 552. These three treatises were written continuously to form one connected history ; but, as the arrangement of events is geographical, not chronological, they overlap in time, the Persian War carry- ing its narrative over a large part of the period embraced in the Vandal War and the Gothic War. The fourth and last of the four books of the Gothic War is really a general history of the empire, designed to continue the Persian War as well as the Gothic. It was written after the year in which the preceding seven books had been published, and was itself published apparently in 554 or 555. These eight books of Histories, although mainly occupied with military matters, contain notices of some of the more im- portant domestic events, such as the Nika insurrection at Constantinople in 532, the plague in 542, the conspiracy of Artabanes in 548. They tell us, however, comparatively little about the civil administration of the empire, and nothing about legislation. On the other hand they are rich in geographical and ethnographical information, often of the highest value for our knowledge of the barbarian and particularly of the Teutonic tribes who lived on the borders of the empire and were either its enemies or the material of its armies.*~~

~~*As an historian, Procopius would have deserved honous in any age, and is of quite unusual merit when one con- siders the generally low literary level of the age which produced him. From the 4th to the 15th century the Eastern empire has no lay writer of gifts approaching his. He is industrious in collecting facts, careful and impartial in stating them; his judgment is sound, his reflexions generally acute, his conceptions of the general march and movement of things not unworthy of the great events he has recorded. His descriptions, particularly of military operations, are clear, and his especial fondness for this part of the subject seldom leads him into unnecessary minuteness. The style, although marked by mannerisms, by*~~

~~*occasional affectations and rhetorical devices, is on the whole direct and businesslike, nor is the Greek bad, when one considers the time. Thucydides and Herodotus are the two models whom he keeps always before his eyes: he imi- tates the former in the maxims (yv@par) he throws in, and the speeches which he puts into the mouth of the chief actors ; the latter in his frequent geographical digressions, in the personal anecdotes, in the tendency to collect and attach some credence to marvellous tales. It need hardly be said that he falls far short of the vigour and profundity of the Attic, as well as of the genial richness, the grace, the simplicity, the moral elevation, the poetical feeling of the Ionic historian. posed by Procopius himself, rarely showing any dramatic variety in their language, but they seem sometimes to con- vey the substance of what was said, and even when this is not the case they frequently serve to bring out the points of a critical situation. The geographical and ethnological notices are precious. Procopius is almost as much a geo-*~~

~~*The speeches are obviously com-*~~

~~*PE@*eceorrtus*~~

~~*grapher as an historian—it is one of his merits to have perceived the importance of each science to the other—and his descriptions of the peoples and places he himself visited are generally careful and thorough. Although a warmly patriotic Roman, he does full justice to the merits of the barbarian enemies of the empire, and particularly of the Ostrogoths; although the subject of a despotic prince, he criticizes the civil and military administration of Justinian and his dealings with foreign peoples with a*~~

~~*freedom which gives a favourable impression of the toler- | His chief defects are a somewhat |*~~

~~*ance of the emperor. pretentious and at the same time monotonous style, and*~~

~~*a want of sympathy and intensity, which prevents him |*~~

~~*from giving full life and reality to the personages who figure in his narrative, or raising it to a level worthy of the great and terrible scenes*~~

~~*which he has sometimes to describe.*~~

~~*The De Adificiis, or treatise on the Buildings of Jus- tinian, contains an account of the chief public works executed during the reign of the emperor down to 558, in which year it seems to have been composed, particularly churches, palaces, hospitals, fortresses, roads, bridges and other river works. All these are of course ascribed to the personal action of the monarch. The treatise is a litle longer than the average length of one single book of the eight books of the Histories. Its arrangement is geogra- phical ; beginning from Constantinople, it describes works executed in the Mesopotamian provinces, in Armenia and the Caucasian countries, in Thrace and Macedonia, in Asia Minor and Syria, in Egypt and Africa as far as the Pillars of Hercules. If not written at the conimand of Justinian (as some have supposed), it is at any rate semi- official, being evidently grounded on official information, and is full of gross flattery of the emperor and of the (then deceased) empress. In point of style it is greatly inferior to the Histories—florid, pompous, and affected, and at the same time tedious. Its chief value lies in the geographi- cal notices which it contains.*~~

~~*The Anecdota, or Secret History, in length almost equal to the De Adificits, and somewhat shorter than the aver-*~~

~~*age length of a book of the Histories, purports to be a | supplement to these, containing explanations and additions | _ ITistories, and have the air of being unfinished or at least*~~

~~*which the author could not place in the //istories for fear of Justinian and Theodora. It is a furious invective*~~

~~*against these sovereigns, their characters, personal con- |*~~

~~*duct, and government, with attacks on Belisarius and his wife Antonina, and on other official persons of note in the civil and military services of the empire—attacks whose effect is weakened by the passion the author betrays.*~~

~~*Frequent references to the Hzstories are interspersed, but | the events of the wars are seldom referred to, the main | topic being the personal and official*~~

~~*misdeeds of the rulers | The ferocity and brutality of |*~~

~~*as shown in domestic affairs. this scandalous chronicle astonish us, for modern writings*~~

~~*of the same order have usually been the work of vulgar | | of Trajan or Hadrian.*~~

~~*and anonymous scribblers, not of an able, accomplished, and highly placed man such as Procopius was. its authenticity has been often called in question, and a few words are needed both on that question and on the further question of the credibility of its contents.*~~

~~*It was unknown to Agathias and Evagrius, younger contemporaries of Procopius who frequently mention his LTistories, and is first referred to by Suidas (writing in the 10th century), who ascribes it to Procopius. Two MSS. (since lost) are mentioned as having been brought to Italy in the days of the Renaissance, but the first publication was made by Nicholas Alemanni, an official of the Vatican, who found a MS. in that library and edited it with copious and learned notes and a Latin translation (Lyons, 1623). Since his day several jurists (led thereto by jealousy for*~~

~~*Hence |*~~

~~*791*~~

~~*Justinian's reputation) and other scholars have denied it to be the work of Procopius, among whom it is sufficient to refer to the latest, J. H. Reinkens.! The external argunient against its genuineness, drawn from its not being mentioned till four centuries after the death of Procopius, appears weak when we recollect that it was obviously not written to be published at the time, and may well have remained concealed for generations. The internal argument from the difference between the view of Justinian it presents and that given in the De Zdijicus will impress no one who has observed the almost patent insincerity of the latter book, and the censure, severe though carefully guarded, which the Hzstories frequently bestow on Justinian's policy. On the other hand the agreement in many points of fact between the L/istories and the Anecdota, and the exactness of the references from the*~~

~~latter to the former, point to unity of author- ship; while the similarity of opinions, ideas, beliefs, pre- judices, and still more the similarities of literary manner, style, and language, supply an overwhelming body of evidence that the Anecdota are a.genuine, and so far as his deep-seated feelings go the most genuine, work of Procopius. The question, which ought never to have been deemed doubtful, has been set at rest by the careful com- parison of the use of words and phrases in the acknow- ledged works of Procopius and in the Anecdota, which we owe to the industry of Dr Felix Dahn, and which is set forth in his excellent book mentioned at the close of this article. It is less easy to pronounce on the credibility of the picture which the Anecdota give of the court and government of Justinian. Plainly there are many exag- gerations and some absurdities; yet, when we find some of the severest statements of the book confirmed by other annalists and others substantially tallying with or explain- ing those made by Procopius himself in the HIstories, we are led to conclude that there is a substantial basis of fact for the charges it brings. It is of course often difficult, sonietimes impossible, to say what deductions must be made from the form these charges take; but after study-~~

~~'ing the book closely one becomes rather less than more~~

~~sceptical. In point of style, the~~

~~unrevised. Their merit lies in the furious earnestness with which they are written, and which gives them a force and reality sometimes wanting in the more elaborate books written for publication.~~

~~The character of a man who could revenge himself for~~

~~having been obliged to bestow gross flattery on his sove-~~

~~reign by ferocious invective meant to be launched after his death inspires little respect. Otherwise Procopius is a favourable specimen of his age. HIe is patriotic, with a strong feeling for the greatness of the empire, its dignity, the preservation of its ancient order. HIe is a worshipper of the past, whose ideal is such a government as that HIs ethical standard is scarcely affected by Christianity, but is that of a Greek of classical times, with too great a tolerance of deceit when practised against barbarian enemies, and~~

~~doubtless also with a de- ficient sense of honour and personal independence. Yet his patriotism does not prevent him from doing justice to the valour of the Persians, or the still finer qualities of the Goths as he had learnt to know them in Italy. He is, however, frigid in sentiment as well as in style, and throws little geniality into his narratives and de- scriptions. In his attitude towards the unseen world he is at once sceptical and superstitious —sceptical in that he speaks with equal hesitation about the practices~~

~~1 Anecdota sintne scripta a Procopio Cesariensi inguiritur, Breslau,~~

~~1858.~~

~~and doctrines of different faiths, and declares his persua- sion that nothing more can be known about God than that He is all-wise and all-powerful ; superstitious in his readiness to accept all kinds of marvels, omens, prophecies, apparitions, and to find in the sudden changes of human affairs the action of a spiteful fortune which delights to startle men and confound their schemes. Procopius has little philosophy in his history; he is a vague and incon- sistent thinker, and is strongest when he is describing events or facts, or drawing such direct inferences from them as strike an acute man of the world.~~

~~The best edition of Procopius is that by Dindorf in the Corpus Scriptorum Historiz Byzanting, 3 vols., Bonn, 1833-388. The best criticisms and examinations of his writings are those by W. 8. Teuffel, in his Studien und Charakteristiken zur Litera- turgesehichte, Leipsic, 1871; and F. Dahn, Prokopius von Cisarea, Berlin, 1865. (J. BR.)~~

~~PROCOPIUS. Two leaders of this name are mentioned in connexion with the wars of the Hussirss (q.v.).~~

~~J. ANDREAS Procoprivs, surnamed "the Great" or "the Bald," was a native of Bohemia, born about 1380. He had travelled extensively in Europe, and had even visited Jerusalem before he received priestly orders. On the outbreak of the Hussite War he joined Zizka, and was chosen to succeed him after his death in 1425. From 1426 onwards he met with a~~

~~*succession of military suc- cesses in Austria, Moravia, Silesia, and Hungary which compelled various potentates to purchase peace, and dis- posed even the council of Basel to a spirit of compromise. Procopius and his " Taborites" were, however, dissatisfied with the "Compactata" which the " Calixtines" accepted, and resolved to carry on the contest. He perished in the decisive battle fought near Bohmischbrod on May 80, 1484.*~~

~~*II. Of Procopius surnamed "the Little" nothing is known save that he co-operated with Procopius " the Great" from 1427 onwards, and that he shared his fate.*~~

~~*PROCTER, Bryan Water (1787-1874), poet and iniscellaneous writer, was born on the 2lst November 1787. At an early age he was sent to a small boarding school near London, and thence in his thirteenth year to Harrow, where he had for contemporaries Lord Byron and Sir Robert Peel. On leaving school he was placed in the office of a solicitor at Calne, Wiltshire, remaining there until about 1807, when he returned to pursue his legal studies in London. By the death of his father in 1816 he became possessed of a small property, and soon after entered into partnership with a solicitor; but in 1820 the partnership was dissolved, and during the temporary difficulties thus occasioned he supported himself in part by literary work under the pseudonym of Barry Cornwall. After his marriage in 1824 to Miss Skepper, a daughter of Mrs Basil Montague, he returned to his professional work as conveyancer, and was called to the bar in 1831. {In the following year he was appointed metropolitan com- missioner of lunacy—an appointment annually renewed until his election to the permanent commission constituted by the Act of 1842. He resigned office in 1861. During the last years of his life a failure of speech led him to withdraw increasingly from society, and his death took place on October 4, 1874. The period of his poetic pro- ductiveness had closed many years previously, the larger proportion of his verse having been composed between 1815, when he began to contribute to the Interary Gazette, and 1823, or at latest 1832.*~~

~~*His principal works in the verse forni were—Dramatic Seenes and other Poems (1819), A Sicilian Story (1820), Mirandola, a tragedy performed at Covent Garden with Macready, Charles Kemble, and Miss Foote in the leading parts (1821), The Flood of Thessaly Cee and English Songs (1832).*~~

~~He was also the author of ee Poetica (1824), Life of Edmund Kean (1835), Essays and~~

~~ales in Prose (1851), Charles Lamb; a Memoir (1866), and of memoirs of Ben Jonson and Shakespeare for editions of their works,~~

~~PRO—PRO~~

~~A posthumous autobiographical fragment with notes of his literary friends, of whom he had a wide range from Bowles to Browning, was published in 1877. His genius cannot be said to have been entirely mimetic, but his works are full of subdued echoes. His songs have caught some notes from the Elizabethan and Cavalier lyrics, and blended them with others from the leading poets of his own time ; and his dramatic fragments show a similar infusion of the early Victorian spirit into pre-Restoration forms and cadences. The results are somewhat heterogeneous, and without the impress of a pervading and dominant personality to give them unity, but they abound in pleasant touches, with here and there the flash of a higher, though casual, inspiration.~~

~~His daughter, ADELAIDEANNE PROCTER (1825-1864), also attained some distinction asa poet, her principal works being her Legends and Lyrics, of which a first series, published in 1858, ran through nine editions in seven years, and a second series issued in 1860 met with a similar success. Her unambitious verses dealing with simple emotional themes in a simple manner have a charm which is scarcely explicable on the ground of high literary merit, but which is due rather to the fact that they are the cultured expression of an earnest and beneficent life. Latterly she became a convert to Roman Catholicism, and her philanthropic zeal appears to lave hastened her death, which took place February 38, 1864.~~

~~PROCTOR, the English form of the Latin procurator, denotes a person who acts for another, and so approaches very nearly in meaning to AGENT (¢.v.). The word is used in three senses. (1) A particular kind of university official. (2) A representative of the clergy in convocation.~~

~~There are no proctors in the United States. In Scotland the original term procurator is used to denote a law agent who practises in an inferior court.~~

~~*A procurator has been, since the Law Agents Act, 1878, exactly in the same legal position as other law agents. The procurator-fiscal is a local officer charged with the prosecution of crimes. He is appointed by the sheriff. He also performs the duties of an English coroner by holding inquiries into the circum- stances of suspicious deaths.*~~

~~*PRODICUS of Ceos, whose birth is conjecturally assigned to 465-460 B.c., was a humanist of the first period of the Sophistical movement. He was still living in 399 Bc. Visiting Athens, in the first instance (it is said) as the accredited agent of his native island, he be- came known in the intellectual capital as a good speaker and a successful teacher. Like Protagoras, he professed to train his pupils for domestic and civic affairs ; but it would appear that, while Protagoras's chief instruments of education were rhetoric and style, Prodicus made ethics prominent in his curriculum. Asa moralist he seems to have been orthodox, neither impugning nor developing traditional notions. In his literary teaching he laid special stress upon distinctions in the use of words. The Platonic Socrates (as well as Aristophanes) speaks of Prodicus with a certain respect, earned perhaps by his simple though conventional morality; but it is easy to see that Plato thought him affected and pedantic, and did not rank him either with Protagoras as a thinker or with Gorgias as*~~

~~*PRO*~~

~~*Two of Prodicus's discourses were especially | mandamus) was repealed as to England by 46 & 47 Vict.*~~

~~*a stylist. famous: one, "on propriety of language," is repeatedly alluded to by Plato; the other, entitled dpa, contained the celebrated apologue of the choice of Heracles, of which the Xenophontean Socrates (J/em., ii. 1, 21 sq.) gives a summary. Theramenes, Euripides, and Isocrates are said to have been pupils or hearers of Prodicus. For some personal traits, and a caricature of his teaching, see Plato's Protagoras, 315 C sq., 337 A sq. }*~~

~~*On the Sophistical movement, as well as for bibliographical information, see SOPHISTs.*~~

~~*PROHIBITION is defined by Blackstone as "a writ directed to the judge and parties of a suit in any inferior court, commanding them to cease from the prosecution thereof, upon a surmise either that the cause originally or some collateral matter arising therein does not belong to that jurisdiction, but to the cognizance of some other court."*~~

~~*Prohibition lies either before or after judgment. In order that proceedings should be restrained after judgment it is necessary that wanf of jurisdiction in the inferior court should appear upon the face of the proceedings, that the party seeking the prohibition should have taken his objection in the inferior court, or that he was in ignorance of a material fact. A prohibition goes either for excess of jurisdiction, as if an ecclesiastical court were to try a claim by prescription to a pew, or for transgression of clear laws of procedure, as if such a court were to require two witnesses to prove a payment of tithes. It will not as a rule be awarded on a matter of practice. The remedy in such a case is appeal. Nor will it go, unless in excep- tional cases, at the instance of a stranger to the suit. The procedure in prohibition is partly common law, partly Statutory. By 50 Edw. III. c. 4 prohibition is not to be awarded after consultation, i.e., after the judges of the superior court have remitted the case as within the juris- diction of the inferior court. 1 Will. IV. c. 21 (an Act to improve the proceedings in prohibition and on writs of*~~

~~*c. 49, but it still applies to Ireland, to which it was extended by 9 & 10 Vict. c. 118. Application for a pro- hibition is usually made ex parte to a judge in chambers on affidavit. The application may be granted or refused. If granted, a rule to show cause why a writ of prohibition should not issue goes to the inferior judge and the other party. In prohibition to courts other than county courts pleadings in prohibition may be ordered. These pleadings are as far as possible assimilated to pleadings in actions. They are rare in practice, and are only ordered in cases of great difficulty and importance. In prohibition to county courts they cannot be ordered, 19 & 20 Vict. c. 108, § 42. Further statutory regulations as to prohibition to county courts are contained in §§ 40, 41, and 44 of the same Act, and in 13 & 14 Vict. c. 61, § 22. Much learning on the subject of prohibition will be found*~~

~~*in the opinion of Mr Justice Wills delivered to the House of Lords in The Mayor and Aldermen of London v. Cox (Law Leports, 2 Eng. and Ir. Appeals, 239).*~~

~~*In Scotch Jaw prohibition is not used in the English sense. The same result is obtained by suspension or reduction. In the United States the supreme court has power to issue a prohibition to the district courts when proceeding as courts of admiralty and maritime jurisdiction. Most of the States have also their own law upon the subject, generally giving power to the supreme judicial authority in the State to prohibit courts of inferior jurisdiction.*~~

~~*PROJECTILES. See Mecuanics (vol. xv. pp. 682 sq., 706 sq.) and GUNNERY.*~~

~~*PROJECTION. If from a fixed point S in space lines or rays be drawn to different points A,B,C, . . . in space, and if these rays are cut by a plane in points A',B,C',. . . the latter are called the projections of the given points on the plane, Instead of the plane another surface may be taken, and then the points are projected to that surface instead of toa plane. In this manner any figure, plane or in space of three dimensions, may be projected to any surface from any point which is called the centre of pro- jection. If the figure projected is in three dimensions*~~

~~*| then this projection is the same as that used in what is*~~

~~*generally known as perspectwe.*~~

~~*In modern mathematics the word projection is often taken with a slightly different meaning, supposing that plane figures are projected into plane figures, but three- dimensional ones into three-dimensional figures. Projec- tion in this sense, when treated by coordinate geometry, leads in its algebraical aspect to the theory of linear substi- tution and hence to the theory of invariants and co-variants.*~~

~~*In this article projection will be treated from a purely geometrical point of view.*~~

~~*We shall first and principally treat of the projection of plane figures into plane figures, and consider a number of special cases due to special positions of the two planes or of the centre of projection. We shall next consider the representation of figures of three dimensions by plane figures (orthographic projections, drawing in plan and elevation, &c.), then treat of perspective in its ordinary sense, and speak shortly of projections to curved surfaces.*~~

~~*References like (G. § 87) relate to section II. of the article GEOMETRY, vol. x. pp. 388 sq.*~~

~~*§ 1. ProgEcTION oF PLANE FicurEs.—Let us suppose we have in space two planes wand x', Inthe plane 7 a figure is given having known properties ; then we have the problem to find its projection from some centre S to the plane x', and to deduce from the known properties of the given figure the properties of the new one.*~~

~~*Ifa point A is given in the plane w we have to join it -to the centre S and find the point A' where this ray SA cuts the plane aw'; it is the projection of A. On the other hand if A' is given in the plane a', then A will be its projection in 7. Hence # one figure in x' is the projection of another in m, then conversely the latter ts also the projection of the former.*~~

~~*A point and its projection are therefore also called corresponding points, and similarly we speak of corresponding lines and curves, &¢,*~~

~~*XD == ice*~~

~~*794*~~

~~*§ 2. We at once get the following properties :—*~~

~~*The projection of a point is a point, and one pont only, ;*~~

~~*The projection of a line (straight line) as a line ; for all points = a line are projected by rays which lie in the plane determined by and the line, and this plane cuts the plane 7' in a line which is the*~~

~~*rojection of the given line. Ase" I F 7 a point lies in a line its projection lies in the projection of the ees*~~

~~*The projection of the line joining two points A, B is the line whic joins the projections A', B' of the points ALM i or the projecting plane of the line AB contains the rays SA, SB which project the points A, B. 7 : . ? "¢ th*~~

~~*The projection of the point of intersection of two lines a, b ts the point of intersection of the projections a', b' of those lines.*~~

~~*Similarly we get—*~~

~~*The projection of a curve will be a curve.*~~

~~*The projections of the points of intersection of two curves are the points of intersection of the projections of the given curves. ;*~~

~~*If a line cuts a curve in n points, then the projection of the line cuts the projection of the curve in m points. Or –*~~

~~*The order of a curve remains unaltered by projection. ar*~~

~~*The projection of a tangent to a curve is a tangent to the projection of the curve. For the tangentis a line which has two coincident points in common with a curve. ;*~~

~~*The number of tangents that can be drawn from a point to a curve remains unaltered by projection. Or*~~

~~*The class of a curve remains unaltered by projection.*~~

~~*Example.—The projection of a circle is a curve of the second order and second class.*~~

~~*§ 3. Two figures of which one is a projection of the other ob- tained in the manner described may be moved out of the position in which they are obtained. They are then still said to be one the projection of the other, or to be projective or homographic. But when they are in the position originally*~~

~~*considered they are said to be in perspective position, or (shorter) to be perspective.*~~

~~*All the properties stated in §§ 1, 2 hold for figures which are projective, whether they are perspective or not. 'There are others which hold only for projective figures when they are in perspective position, which we shall now consider.*~~

~~*If two planes and a' are perspective, then their line of inter- section is called the axis of pryection. Any point in this line coincides with its projection. Hence*~~

~~*All points in the axis are their own projections. ence also*~~

~~*Every line meets tts projection on the axis.*~~

~~*The property that the lines joining corresponding points all pass through a common point, that any pair of corresponding points and the centre are in a line, is also expressed by saying that the figures are co-linear ; and the fact that both figures have a line, the axis, in common on which corresponding lines meet is expressed by saying that the figures are co-axal.*~~

~~*The connexion between these properties has to be investigated.*~~

~~*For this purpose we consider in the plane m a triangle ABC, and let the lines BC, CA, AB be denoted by a, b, c. The projection will consist of three points A', B', C' and three lines a' ,0,c'. These have such a position that the lines AA', BB', CC' meet in a point, viz., at S, and the points of intersection of @ and a', band 0', cand c' lie on the axis (by § 2). The two triangles therefore are said to be both co-linear and co-axal. Of these properties either is a consequence of the other, as will now be proved.*~~

~~*§ 4. DEsARcuE's THEOREM.—Jf two triangles, whether in the same plane or not, are co-linear they are co-axal. Or*~~

~~*If the lines AA', BB', CC' joining the vertices of two triangles meet in a potnt, then the intersections of the sides BC and BC', CA and C'A', AB and A'B' are three points in a line. Conversely,*~~

~~*If two triangles are co-axal they are co-linear. Or*~~

~~*Ff the intersection of the sides of two triangles ABC and A'B'C',, viz., of BC and B'C', of CA and C'A', and of AB and A'B', lie in a line, then the lines AA', BB', and CC' meet am @ point.*~~

~~*roof.—Let us first suppose the triangles to be in different planes. By supposition the lines AA', BR CO' (fig. 1) meet ina point S. But three intersecting lines determine three planes, SBC, SCA, and SAB. In the first lie the points B, © and also B', C'. Hence the lines BO and B'C' will intersect at some point P, because any two lines in the same plane intersect. Similarly CA and C'A' will intersect at some point Q, and AB and A'B' at some point R. These points P, Q, R lie in the plane of the triangle ABC because*~~

~~*Fig. 1. they are points on the sides of this triangle, and similarly in the*~~

~~*plane of the triangle A'B'C'.*~~

~~*le A Hence they lie in the intersection of two planes, —that is, in a line.*~~

~~*PROJECTION*~~

~~*Secondly, If the triangles ABC and A'B'C' lie both in the same plane the above proof does not hold. In this case we may consider the plane figure as the projection of the figure in space of which we have just proved the theorem. Let ABC, A'B'O' be the co-linear triangles with S as centre, so that AA', BB', CC' meet at S. Take now any point in space, say your eye E, and from it draw the rays projecting the figure. . 1u the line ES take any point S,, and in EA, EB, EC take points A,, B,, C, respectively, but so that S,, A;, B,, C, are not in a plane. In the plane ESA which projects the line S,A, lie then the line S,A, and also EA'; these will therefore meet in a point A', of which A' will be the projec- tion. Similarly points B'), C') are found. Hence we have now in space two triangles A,B,C, and A',B',C', which are co-linear. They are therefore co-axal, that is, the points P,, Q,, R,, where A,B,, &c., meet will lie in a line. Their projections therefore lie in a line. But these are the points P, Q, R, which were to be proved to lie in a line.*~~

~~*This proves the first part of the theorem. The second part or converse theorem is proved in exactly the same way. For another proof see (G. § 37).*~~

~~*§ 5. By aid of Desargue's theorem we can now prove a funda- mental property of two projective planes,*~~

~~*Let s be the axis, S the centre, and let A, A' and B, B' be two pairs of corresponding points which we suppose fixed, and ©, C' any other pair of corresponding points. Then the triangles ABC and A'B'C' are co-axal, and they will remain co-axal if the one plane a' be turned relative to the other about the axis. They will therefore, by Desargue's theorem, remain co-linear, and the centre will be the point S', where AA' meets BB', Hence the line joining any pair of corresponding points C, C' will pass through the centre S'.. The figures are therefore perspective. This will remain true if the planes are turned till they coincide, because Desargue's theorem remains true.*~~

~~*THEOREM.—/f two planes wre perspective, then if the one plane be turned about the axis through any angle, especially if the one plane be turned till tt coincides with the other, the two planes will remain perspective ; corresponding lines will still meet on a line called the axis, and the lines joining corresponding points will still pass through a common centre § situated in the plane.*~~

~~*Whilst the one plane is turned this point 8 will move in a circle whose centre lies in the plane r, which is kept fixed, and whose plane ts perpendicular to the axis.*~~

~~*The last part will be proved presently. As the plane r' may be turned about the axis in one or the opposite sense, there will be two perspective positions possible when the planes coincide.*~~

~~*§ 6. Let (fig. 2) , wr' be the planes intersecting in the axis s whilst S is the centre of projection. To project a point A in w we join A to S and seé where this line cuts 7'. This gives the point A'. But if we draw through S any line parallel to x, then this line will cut r' in some point I', and if all lines through S be drawn which are parallel to w these will form a plane parallel to + which will cut the plane 7' in a line 7' parallel to the axis s. If we say*~~

~~*that a line parallel to a plane cuts the latter at an infinite distance, we may say that all points at an infinite distance in x are projected into points which lie in a straight line z', and conversely all points in the line are projected to an infinite distance in Fie. 2 m, whilst all other points are projected =< to finite points. We say therefore that all points in the plane at an infinite distance may be eonsidered as lying in a straight line, because their projections lie ina line. Thus we are again led to =o points at infinity in a plane as lying in a line (comp. G. §§ 2-4),*~~

~~*Similarly there is a line j in » which is projected to infinity in x'; this projection shall be denoted by j' so that ¢ and j' are lines at infinity.*~~

~~*§ 7. lf we suppose through S a plane drawn perpendicular to the axis s entting it at T, and in this plane the two lines SI' parallel to and SJ parallel to r', then the lines through I' and J parallel to the axis will be the lines 7' andj. At the same time a parallelogram SJTI'S has been formed. If now the plane 7' be turned about the axis, then the points I' and J will not move in their planes ; hence the lengths TJ and TI', and therefore also SI' and SJ, will not change. If the plane a is kept fixed in space the point J will remain fixed, and S describes a circle about J as centre ser — SJ as radius. This proves the last part of the theorem in § 5.*~~

~~*§ 8. The plane 7' may be turned either in the sense indicated by the arrow at Z or in the opposite sense till 7' falls into 7. In the first case we get a figure like fig. 8; 2' and 7 will be on the same side of the axis, and on this side will also lie the centre S;*~~

~~—~~

~~*PROTEC TIGON*~~

~~*and then ST=SJ+SI' or SI'=JT, SJ=I'/T. In the second case (fig. 4) 7' and j will be on opposite sides of the axis, and the centre*~~

~~*u*~~

~~*$*~~

~~: T ; J —— ee Fig. 3. Fig. 4.~~

~~S will lie between them in such a position that I'S=TJ and V'T=SJ. If I'/S=SJ, the point S will lie on the axis.~~

~~It follows that any one of the four points S, T, J, I' is completely determined by the other three: if the axis, the centre, and one of the lines 7' or j are given the other is determined ; the three lines s, ', j determine the centre ; the centre and the lines 7', 7 deter- mine the axis.~~

~~§ 9. We shall now suppose that the two projective planes x, 7' are perspective and have been made to coincide.~~

~~THEOREM.—/Jf the centre, the axis, and either one pair of corre- sponding points on a line through the centre or one parr of corre- sponding lines meeting on the axis are given, then the whole projection is determined.~~

~~Proof.—If A and A' (fig. 1) are given corresponding points, it has to be shown that we can find to every other point B the cor- responding point B'. Join AB to cut the axis in R. Join RA'; then B' must lie on this line. But it must also lie on the line SB. Where both meet is B'. That the figures thus obtained are really projective can be seen by aid of Desargue's theorem. For, if for any point © the corresponding point C' be found, then the triangles ABC and A'B'C' are, by construction, co-linear, hence co-axal ; ands will be the axis, because AB and AC meet their corresponding lines A'B' and A'C' on it. BC and B'C' therefore also meet on s.~~

~~If on the other hand a, a' are given corresponding lines, then any line through S will cut them in corresponding points A, A' which may be used as above.~~

~~§ 10. Rows and pencils which are projective or perspective have been considered in the article GtomETRY (G. §§$ 12-40). All that has been said there holds, of course, here for any pair of correspond- ing rows or pencils. The centre of perspective for any pair of corresponding rows is at the centre of projection S, whilst the axis contains coincident corresponding elements. Corresponding pencils on the other hand have their axis of perspective on the axis of projection whilst the coincident rays pass through the centre.~~

~~*We mention here a few of those properties which are indepen- dent of the perspective position :—*~~

~~*The correspondence between two projective rows, or pencils, is com- pletely determined if to three elements in one the corresponding ones in the other are given. If for instance in two projective rows three pairs of corresponding points are given, then we can find to every other point in either the corresponding point (G. §§ 29-36).*~~

~~*If A, B,C, D are four points in a row and A', B', C', D' the corre- sponding points, then thetr cross-ratios are equal (ABCD) =(A'B'C'D'), —where (ABCD)=AC/CB : AD/DB.*~~

~~*If in particular the point D lies at infinity we have (ABCD)= — AC/CB=AC/BC. If therefore the points D and D' are both at infinity we have AC/BC=AD/BD, and the rows are similar (G. § 39). 'This can only happen in special cases. For the line joining corresponding points passes through the centre; the latter must therefore lie at infinity if D, D' are different points at infinity. But if D and D' coincide they must lie on the axis, that is, at the point at infinity of the axis unless the axis is altogether at infinity.*~~

~~*HEnce—Jn two perspective planes every row which is parallel to the axis is similar to its corresponding row, and in general no other row has this property.*~~

~~*But if the centre or the axis is at infinity then every row is similar to its corresponding row.*~~

~~*In either of these two cases the metrical properties are particu- larly simple. If the axis is at infinity the ratio of similitude is the same for all rows and the figures are similar. If the centre is at infinity we get parallel projection; and the ratio of similitude changes from row to row (see §§ 16, 17).*~~

~~*In both cases the mid-points of corresponding segments will be corresponding points.*~~

~~_§ 11. Invorution.—If the planes of two projective figures coin- cide, then every point in their common plane has to be counted twice, once as a point A in the figure , once asa point BY' in the figure w'. The points A' and B corresponding to them will in general be different points ; but it may happen that they coincide. Here a theorem holds similar to that about rows (G. §$ 76 sq.).~~

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~~THEOREM.—Jf two projective planes coincide, and if it happens that to one point in their common plane the same point corresponds, whether we consider the point as belonging to the first or to the second plane, then the same will happen for every other potnt—that is to say, to every point will correspond the same point in the first as in the second plane.~~

~~In this case the figures are said to be in tnvolution.~~

~~Proof.—Let (fig. 5) S be the centre, s the axis of projection, and let a point which has the name A in the first plane and B' in the second have the property that the points A' and B corresponding to them again coincide. Let C and D' be the names which some other point has in the two planes. If the line AC cuts the axis in X, then the point where the line XA' cuts SC will be the point C' corresponding to C (§ 9). The line B'D' also cuts the axis in X, and therefore the point D corresponding to D' is the point where XB cutsSD'. But this is the same point as Ce Q@EhD~~

~~This point O' might also be got by drawing CB and joining its intersection Y with the axis to B'. Then C' must be the point where B'Y meets SC. This figure, which now forms a complete quadrilateral, shows that in order to get involution the correspond- ing points A and A' have to be harmonic conjugates with regard to S and the point T where AA' cuts the axis.~~

~~THEoREM.—If two perspective figures are in involution, two cor- responding points are harmonic conjugates with regard to the centre and the point where the line joining them cuts the axis. Similarly—~~

~~Any two corresponding lines are harmonic conjugates with regard to the axis and the line from their point of intersection to the centre.~~

~~*Conversely—IJf in two perspective planes one pair of corresponding points are harmonic conjugates with regard to the centre and the point where the line joining them cuts the axis, then every pair of corresponding points has this property and the planes are in involu- tion.*~~

~~*§ 12., PRosJECTIVE PLANES WHICH ARE NOT IN PERSPECTIVE POSITION. —We return to the case that two planes m and x' are pro- jective but not in perspective position, and state in some of the more important cases the conditions which determine the correspondence between them. Here it is of great advantage to start with another definition which, though at first it may seem to be of far greater generality, is in reality equivalent to the one given before.*~~

~~*Derinition.— We call two planes projective if to every point im one corresponds a point in the other, to every line a line, and to a point in a line a point in the corresponding line, in such a manner that the cross-ratio of four points in a line, or of four rays in @ pencil, ts equal to the cross-ratio of the corresponding points or rays.*~~

~~*The last part about the equality of cross-ratios can be proved to be a consequence of the first. But as space does not allow us to give an exact proof for this we include it in the definition.*~~

~~*If one plane is actually projected to another we get a correspond- ence which has the properties required in the new definition. This shows that a correspondence between two planes conform to this definition is possible. That it is also definite we have to show. It follows at once that—*~~

~~*Corresponding rows, and likewise corresponding pencils, are pro- jective in the old sense (G. $$ 25, 30). Further,*~~

~~*Tf two planes are projective to a third they are projective to each other.*~~

~~*THEOREM. — The correspondence between two projective planes w and x' is determined tf we have given either two rows u, vine and the corresponding rows u', v' in w', the point where u and » meet corre- sponding to the points where u' and v' meet, or two penctis U, V in 3 and*~~

~~*the corresponding pencils U', V' in m', the ray UV joining the centres of the pencils in m corresponding to the ray U'V'.*~~

~~*It is sufficient to prove the first part. Let any line a cut u, v in the points A and B. To these will correspond points A' and B' in u' and v' which are known. To the line a corresponds then the line A'B'. Thus to every line in the one plane the corresponding line in the other can be found, hence also to every point the corre- sponding point.*~~

~~*§ 13. THEoREM.—/J/ the planes of two projective figures coincide, and if either four points, of which no three lie in a dine, or else four lines, of which no three pass through a point, in the one coincide with thetr corresponding points, or lines, in the other, then every point and every line cotncides with its corresponding point or line so that the figures are identical.*~~

~~*If the four points A, B, C, D coincide with their corresponding points, then every line joining two of these points will coincide with its corresponding line. Thus the lines AB and CD, and therefore also*~~

~~*Fig. 5.*~~

~~*796*~~

~~*their point of intersection E, will coincide with their corresponding elements. The row AB has thus three points A, B, E coincident with their corresponding points, and is therefore identical with it (§ 10). As there are six lines whieh join two and two of une Jour points A, B, C, D, there are six lines such that each point in either eoineides with its corresponding point. Every other line will thus have the six points in which it cuts these, and therefore all points, coincident with their corresponding points. The proof of the second part is exactly the same. It follows——— a*~~

~~*§ 14. If two projective figures which are not identical lie in the same plane, then not more than three points which are not im a line, or three lines whieh do not pass through a point, ean be eoineident with their corresponding points or lines. ;*~~

~~*If the figures are in perspective position, then they have in common one line, the axis, with all points in it, and one point, the centre, with all lines through it. No other point or line can there- fore coincide with its corresponding point or line without the figures becoming identical.*~~

~~*It follows also that— ;*~~

~~*The correspondence between two projective planes is completely determined if there are given—either to four points in the one the corresponding four points in the other provided that no three of them lie in a line, or to any four lines the corresponding lines provided that no three of them pass through a point.*~~

~~*To show this we observe first that two planes 7, 7' may be made projective in such a manner that four given points A, B, C, D in the one correspond to four given points A,' B', C', D' in the other ; for to the lines AB, CD will correspond the lines A'B' and C'D', and to the intersection E of the former the point E' where the latter meet. The correspondence between these rows is therefore determined, as we know three pairs of corresponding points. But this determines a correspondence (by § 12). To prove that in this case and also in the case of § 12 there is but one correspondence possible, let us suppose there were two, or that we could have in the plane 2m' two figures which are each projective to the figure in + and which have each the points A'B'C'D' corresponding to the points ABCD in m Then these two figures will themselves be projective and have four corresponding points coincident. They are therefore identical by § 13.*~~

~~*THEOREM.—7'wo projective planes will be in perspective position if one row coincides with its corresponding row. The line containing these rows will be the axis of projection.*~~

~~*Proof.—As in this case every point on s coincides with its corre- sponding point, it follows that every row a meets its corresponding row a' on s where corresponding points are united. The two rows a, w are therefore perspective (G. § 30), and the lines joining corresponding points will meet in a point S. If 7 be any one of these lines cutting a, a' in the points A and A' and the line s at K, then to the line AK correspouds A'K, or the ray 7 corresponds to itself. The points B, B' in which r cuts another pair 0b, b' of*~~

~~corresponding rows must therefore be corresponding points. Hence the lines joining corresponding points in 6 and 0' also pass through 8. Similarly all lines joining corresponding points in the two planes w and 7' meet in S; hence the planes are perspective,~~

~~The following proportion is proved in a similar way :—~~

~~THEOREM. —T'wo projective planes will be in perspeetive position if one peneil cotneides with its corresponding one. The centre of these penetls will be the centre of perspective.~~

~~In this ease the two planes must of course coincide, whilst in the first case this is not necessary.~~

~~§ 15. We shall now show that two planes which arc projective according to definition § 12 can be brought into perspective position, hence that the new definition is really equivalent to the old. We use the following property :—If two coincident planes 7 and 7' are per- spective with S as centre, then any two corresponding rows are also perspective with S as centre. This therefore is true for the rows J and 7' and for 7 and 7', of which 7 and J are the lines at infinity in the two planes. If now the plane x' be made to slide on x so that each line moves parallel to itself, then the point at infinity in each line, and hence the whole line at infinity in a', remains fixed. So does the point at infinity on j, which thus remains coincident with its corresponding point on j', and therefore the rows j and j' remain perspective, that is to say the rays joining corresponding points in them meet at some point T. Similarly the lines joining cor- responding points in 7 and 7' will meet in some point T'. These ae eel T and T" originally coincided with each other and~~

~~Conversely, if two projective planes are placed one on the other, = " soon as the lines / and 7' are parallel the two points T and I" can e found by Joining corresponding points in j and j', and also in ¢ and v. If now a point at infinity is called A as a point in + and B' as a point in 7', then the point A' will lie on 7 and B on j, so that the line AA' passes through T' and BB' through T. These two lines are parallel. If then the plane 2' be moved parallel to itself till TY eomes to T, then these two lines will coincide with~~

~~each other, and with them will coincide the lines AB and A'B' This line and slnilarly every line through T will thus now coincide~~

~~PROEUTIOCR~~

~~with its corresponding linc. The two planes are therefore accord- ing to the last theorcin in § 14 in perspective position.~~

~~It will be noticed that the plane w' may be placed on 7 in two different ways, viz., if we have placed 7' on x we may take it off and turn it over in space before we bring it back to m, so that what was its upper becomes now its lower face. For each of these positions we get one pair of centres T, T', and only one pair, because the above process must give every perspective position. It follows—~~

~~In two projective plains there are in general two and only two pencils in either such that angles in one are equal to their eorrespond- ing angles in the other. If one of these peneils is made eoineident with its eorresponding one, then the planes will be perspeetive.~~

~~This agrees with the fact that two perspective planes in space can be made coincident by turning one about their axis in two different ways (§ 8).~~

~~In the reasoning employed it is essential that the lines 7 and 7' are finite. If one lies at infinity, say j, then 7 and / coincide, hence their corresponding lines 7' and j' will coincide; that is, 2' also lies at infinity, so that the lines at infinity in the two planes are correspond- ing lines. If the planes are now made coincident and perspective, then it may happen that the lines at infinity correspond point for point, or can be made to do so by turning the one plane in itself. In this case the line at infinity is the axis, whilst the centre may be a finite point. This gives similar figures (see § 16). In the other case the line at infinity corresponds to itself without being the axis ; the lines joining corresponding points therefore all coincide with it, and the centre S lies on it at infinity. The axis will be some finite line. This gives parallel projection (see § 17). For want of space we do not show how to find in these cases the perspective position, but only remark that in the first case any pair of corresponding points in + and w' may be taken as the points T and T', whilst in the other case there is a pencil of parallels in x~~

~~such that any one line of these can be made to coincide point for point with its corre- sponding line in 7', and thus serve as the axis of projection. It will therefore be possible to get the planes in perspective position by first placing any point A' on its corresponding point A and then turning 7' about this point till lines joining corresponding points are parallel.~~

~~§ 16. SimILar Ficures.—If the axis is at infinity every line is parallel to its corresponding line. Corresponding angles are there- fore equal. The figures are similar, and (§ 10) the ratio of simili- tude of any two corresponding rows is constant.~~

~~If similar figures are in perspective position they are said to be similarly situated, and the centre of projection is called the centre of similitude. To place two similar figures in this position, we observe that their lines at infinity will coincide as soon as both figures are put in the same plane, but the rows on them are not necessarily identical. They are projective, and hence in general not more than two points on one will eoincide with their corresponding points in the other (G. § 34). To make them identical it is either sufficient to turn one figure in its plane till threc lines in one are parallel to their corresponding lines in the other, or it is necessary before this can be done to turn the one plane over in space. It can be shown that in the former case all lines are, or no line is, parallel to its cor- responding line, whilst in the second case there are two directions, at right angles to each other, which have the property that each line in either direction is parallel to its corresponding line. We also sec that—~~

~~If in two similar figures three lines, of whieh no two are parallel, are parallel respeetively to their corresponding lines, then every line has this property and the two figures are similarly situated ; or~~

~~Two similar figures are similarly situated as soon as two ecorre- sponding triangles are so situated.~~

~~If two similar figures are perspective without being in the same plane, their planes must be parallel as the axis is atinfinity. HIence~~

~~Any plane figure is projected from any centre to a parallel plane into a similar figure.~~

~~*If two similar figures are similarly situated, then corresponding points may either be on the same or on different sides of the centre. If, besides, the ratio of similitude is unity, then corresponding points will be equidistant from the centre. In the first case therefore the two figures will be identical. In the second case they will be identi- cally equal but not coincident. They can be made to coincide by turning one in its plane through two right angles about the centre of similitude S. The figures are in involution, as is seen at once, and they are said to be symmetrical with regard to the point S as centre. If the two figures be considered as part of one, then this is said to have acentre. Thus regular polygons of an even number of sides and parallelograms have each a centre, which is a centre of symmetry.*~~

~~*§ 17. PARALLEL Prosecrion.—If, instead of the axis, the centre be moved to infinity, all the projecting rays will be parallel, and we get what is called Parallel Projection. In this case the line at in- finity passes through the centre and therefore corresponds to itself, — but not point for point asin the case of similar figures. To any point I at infinity corresponds therefore a point I' also at infinity but different from the first. Hence to parallel lines mecting at I cor-*~~

~~*PROJECTION*~~

~~respond parallel lines of another direction meeting at I'. Further, in any two corresponding rows the two points at infinity are cor- responding points; hence the rows are similar. This gives the principal properties of parallel projection :—~~

~~T6 parallel lines correspond parallel lines; or~~

~~To a parallelogram corresponds a parallelogram.~~

~~The correspondence of parallel projection is completely determined as soon as for any parallelogram in the one figure the corresponding parallelogram in the other has been selected, as follows from the general ease in § 14. '~~

~~Corresponding rows are similar (§ 10).~~

~~The ratio of similitude for these rows changes with the direction :~~

~~If a row is parallel to the axis, its corresponding row, which is also parallel to the aais, will be equal to it, because any two pairs AA' and BB' of corresponding points will form a parallelogram.~~

~~Another important property is the following :—~~

~~The areas of corresponding figures have a constant ratio.~~

~~We prove this first for parallelograms. Let ABCD and EFGH be any two parallelograms in «, A''B'C'D' and E''F'G'H' the _ corre- sponding parallelograms in x'. Then to the parallelogram KLMN which lies (fig. 6) be- tween the lines AB, CD and EF, GH will correspond a_parallelo- gram K'L'M'N' formed in exactly the same manner. As ABCD and KLMN are between the same parallels their areas are as the bases. Hence~~

~~ABCD _ AB A"B'C'D. _ A'B' KLMN KL' K'LM'N' KL'~~

~~But AB/KL=A'B'/K''L', as the rows AB and A'B' are similar.~~

~~Hence ABCD — KLMN 5 danke EFGH KLMN ABCD ~ KL MN? ODO SUNNY PEGA KU MN"~~

~~*Hence also*~~

~~*Fig. 6.*~~

~~*and similarly*~~

~~*ABCD _EFGH |. A'BC'D' E'F'G'H'*~~

~~*This proves the theorem for parallelograms and also for their halves, that is, for any triangles. As polygons can be divided into triangles the truth of the theorem follows at once for them, and is then by the well-known method of exhaustion extended to areas bounded by curves by inscribing polygons in, and circumscribing polygons about, the curves.*~~

~~*Just as (G. § 8) a segment of a line is given a sense, so a sense may be given to an area. This is done as follows. If we go round the boundary of an area, the latter is either to the right or to the left. If we turn round and go in the opposite sense, then the area will be to the left if it was first to the right, and vice versa. If we give the boundary a definite sense, and go round in this sense, then the area is said to be either of the one or of the other sense according as the area is to the right or to the left. The area is generally said to be positive if it is to the left. The sense of the boundary is indi- cated either by an arrowhead or by the order of the letters which denote points in the boundary. Thus, if A, B, C be the vertices of a triangle, then ABC shall denote the area in magnitude and sense, the sense being fixed by going round the triangle in the order from A toBtoC. It will then be seen that ABC and ACB denote the same area but with opposite sense, and generally ABC=BCA= CAB= - — ACB= — BAC= — CBA;; that is, an interchange of two letters changes the sense. Also, if A and A' are two points on opposite sides of, and equidistant from, the line BC, then ABC= -A'BC.*~~

~~*mene account of the sense, we may make the following state- ment :—*~~

~~*If A,A' are two corresponding points, if the line AA' cuts the axis in B, andif C is any other point in the axis, then the triangles ABC and A'BC are corresponding, and*~~

~~ABC AB AB, A'BC A'R- BA" or The constant ratio of corresponding areas is equal and opposite to the ratio in which the axis divides the segment joining two corre- sponding points, § 18. Several special cases of parallel projection are of interest. OrrHocrapuic Prosection.—If the two planes x and a' have a definite position in space, and if a figure in m is projected to w' by rays perpendicular to this plane, then the projection is said to be orthographic. If in this case the plane w be turned till it coincides with 7' so that the figures remain perspective, then the projecting rays will be perpendicular to the axis of projection, because any one~~

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~~of these rays is, and remains during the turning, perpendicular to the axis.~~

~~The constant ratio of the area of the projection to that of the original figure is, in this ease, the cosine of the angle between the two planes x and x', as will be seen by projecting a rectangle which has its base in the axis.~~

~~Orthographic projection is of constant use in geometrical drawing and will be treated of fully later on in this article (§ 28 sq.).~~

~~SHEAR.—If the centre of projection be taken at infinity on the axis, then the projecting rays are parallel to the axis; hence cor- responding points will be equidistant from the axis. In this case therefore areas of corresponding figures will be equal.~~

~~If A, A' and B, B' (fig. 7) are two pairs of corresponding points on the same line, parallel to the axis, then, as correspond- ing segments parallel to the axis are equal, it follows that AB=A'B', hence also AA'= BB'. If these points be joined to any point O on the axis, then AO and A'O will be corresponding lines ; they will therefore be cut by any~~

~~Fig 7.~~

~~line parallel to the axis in corresponding points. therefore C, C' and also D, D' will be pairs of corresponding points~~

~~In the figure~~

~~*and CC'=DD'. As the ratio CC'/AA' equals the ratio of the dis- tances of C and A from the axis, therefore—*~~

~~*Two corresponding figures may be got one out of the other by moving all points in the one parallel to a fixed line, the axis, through distances which are proportional to their own distances from the axis. Points in a line remain hereby in a line.*~~

~~*Such a transformation of a plane figure is produced by a shearing © stress in any section of a homogeneous elastic solid. For this reason Sir William Thomson has given it the name of shear.*~~

~~*A shear of a plane figure is determined if we are given the axis and the distance through which one point has been moved ; for in this case the axis, the centre, and a pair of corresponding points are given.*~~

~~*§ 19. SYMMETRY AND SxkEW-SYMMETRY.—If the centre is not on the axis, and if corresponding points are at equal distances from it, they must be on opposite sides of it. The figures will be in involution (§ 11). In this case the direction of the projecting rays is said to be conjugate to the axis.*~~

~~*The conjugate direction may be perpendicular to the axis. If the line joining two corresponding points A, A' cuts the axis in B, then AB=BA'. Therefore, if the plane be folded over along the axis, A will fall on A'. HIence by this folding over every point will coincide with its corresponding point. The figures therefore are identically equal or congruent, and in their original position they are symmetrieal with regard to the axis, which itself is called an axis of symmetry. If the two figures are considered as one this one is said to be symmetrical with regard to an axis, and is said to have an axis of symmetry or simply an axis. Every diameter of a circle is thus an axis; also the median line of an isosceles triaugle and the diagonals of a rhombus are axes of the figures to which they belong.*~~

~~*In the more general case where the projecting rays are not per- pendicular to the axis we have a kind of twisted symmetry which may be called skew-symmetry. It can be got from symmetry by giving the whole figure a shear. It will also be easily seen that we get skew-symmetry if we first form a shear*~~

~~*to a given figure and then separate it from its shear by folding it over along the axis of the shear, which thereby becomes an axis of skew-symmetry;*~~

~~*Skew-symmetrical and therefore also symmetrical figures have the following properties :—*~~

~~*Corresponding areas are equal, but of opposite sense.*~~

~~*Any two corresponding lines are harmonic conjugates with regard to the axis and a line in the conjugate direction.*~~

~~*If the two figures be again considered as one whole, this is said to be skew-symmetrical and to have an axis of skew-symmetry. Thus the median line of any triangle is an axis of skew-symmetry, the side on which it stands having the conjugate direction, the other sides being conjugate lines. From this it follows, for instance, that the three median lines of a triangle meet in a point. For two median lines will be corresponding lines with regard to the third as axis, and must therefore meet on the axis.*~~

~~*An axis of skew-symmetry is generally called a diameter. Thus every diameter of a conic is an axis of skew-symmetry, the conjugate direction being the direction of the chords which it bisects.*~~

~~*§ 20. We state a few properties of these figures useful in mechanics, but we omit the easy proofs :—*~~

~~*Tf a plane area has an axis of skew-symmetry, then the mass-eentre (centre of mean distances or centre of inertia) lies on i.*~~

~~*Tf a figure undergoes a shear, the mass-eentre of its area remains the mass-centre ; and generally—*~~

~~*In parallel projection the mass-centres of corresponding areas {or of groups of points, but not of eurves) are corresponding points.*~~

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~~*The moment of inertia of a plane figure does not change of the figure undergoes a shear in the direction of the axis with regard to 'which the*~~

~~moment has been taken. : .~~

~~Tf a figure has an axis of skew-symmetry, then this axis and the conjugate direction are conjugate diameters of the momental ellipse for every point in the axis. ka ;~~

~~Tf a figure has an axis of symmetry, then this is an axis of the momental ellipse for every point tn vt.~~

~~The truth of the last propositions follows at once from the fact that the product of inertia for the lines in question vanishes. ;~~

~~It is of interest to notice how a great many propositions of Euclid are only special cases of projection. The theorems Euel. I. 35-41 about parallelograms or triangles on equal bases and between the same parallels are examples of shear, whilst I. 43 gives a case of skew-symmetry, hence of involution. Figures which are identi- eally equal are of course projective, and they are perspective when~~

~~laced so that they have an axis ora centre of symmetry (comp. Hensel Elementary Geometry, Congruent Figures). In this case again the relation is that of involution. The importance of treat- ing similar figures when in perspective position has long been recognized ; we need only mention the well-known proposition about the centres of similitude of circles.~~

~~APPLICATIONS TO CONIES.~~

~~§ 21. THrorEM.—Any conie can be projected into any other conie. This may be done in such a manner that three points on one conie and the tangents at two of them are projected to three arbitrarily selected points and the tangents at two of them on the other.~~

~~Proof.—lf wand wu' are any two conics, then we have to prove that we can project w in such a manner that five points on it will be projected to points on wu'. As the projection is determined as soon as the projections of any four points or four lines are selected, we cannot project any five points of w to any five arbitrarily selected points on w'. But if A, B, C be any three points on u, and if the tangents at B and C meet at D, if further A', B', C'~~

~~are any three points on w', and if the tangents at B'and C' meet at D', then the plane of « may be projected to the plane of w' in such a manner that the points A, B, C, D are projected to to A', B', C', D'. This determines the correspondence (§ 14). The conic wu will be projected into a conic, the points A, B, C and the tangents BD and CD to the points A', B', C' and the lines B'D' and C'D', which are tangents to wu' at B' and C'.. The projection of w must therefore (G. § 52) coincide with w', because it is a conic i has three points and the tangents at two of them in common with w'.~~

~~Similarly we might have taken three tangents and the points of fons of two of them as corresponding to similar elements on the other.~~

~~If the one conic be a circle which cuts the line j, the projection will cut the line at infinity in two points; hence it will be an hyper- bola. Similarly, if the circle touches j, the projection will be a parabola; and, if the circle has no point in common with J, the projection will be an ellipse. These curves appear thus as sections of a circular cone, for in case that the two planes of projection are separated the rays projecting the circle form such a cone.~~

~~Any conte may-be projected into ttself.~~

~~If we take any point § in the plane of a conie as centre, the polar of this point as axis of projection, and any two points in which a line through S cuts the conic as corresponding points, then these will be harmonic conjugates with regard to the centre and the axis, We therefore have involution (§ 11), and every point is projected into its harmonic conjugate with regard to the centre and the axis, — hence every point A on the conic into that point A' on the conic in which the line SA' cuts the conic again, as follows from the harmonic properties of pole and polar (G. § 62 sq.).~~

~~_ Pwo conies which eut the line at infinity in the same two points are similar figures and similarly situated, —the eentre of similitude being tn general some finite point.~~

~~To prove this, we take the line at infinity and the asymptotes of one as corresponding to the line at infinity and the asymptotes of the other, and besides a tangent to the first as corresponding to a parallel tangent to the~~

~~other. The line at infinity will then correspond to itself point for point; hence the figures will be similar and similarly situated. é~~

~~§ 22. Angas oF Parapotic SEGMENTS.—One parabola may always be considered asa parallel projection of another in such a manner that any two points A, B on the one correspond to any two points A', B' on the other; that is, the points A, B and the point at infinity on the one may be made to correspond respectively to the points A', B' and the point at infinity on the other, whilst Ma pone at A and at infinity of the one correspond to the~~

~~ngent at B' and at infinity of the other. This completely deter- mines the correspondence, and it is parallel projection because the line at infinity corresponds to the line at infinity. Let the tangents at A and B meet at ©, and those at A', B' at C'; then OC, C' will correspond, and so will the triangles ABC and A'B'C' as well as the parabolic segments cut off by the chords AB and A'B'. If (AB)~~

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~~denotes the area of the segment cut off by the chord AB we have~~

~~therefore (AB)/ABC =(A'B')/A'BC' ; or~~

~~The area of a segment of a parabola stands in a constant ratioto the area of the triangle formed by the chord of the segment and the tangents at the end points of the chord.~~

~~If then (fig. 8) we join the point C to the mid-point M of AB, then this line 7 will be M bisected at D by the parabola (G. § 74), and the tangent at D will be parallel to AB. Let this tangent cut AC in E and CB in F, then by the last theorem~~

~~(AB)_(AD)_(BD)_~~

~~ABC ADE BFD ' where m is some number to be determined. The figure gives (AB)=ABD + (AD) +(BD). Combining both equations, we have ABD=m (ABC- ADE – BFD). But we have also ABD=4 ABC, and ADE=BFD=} ABC; hence 4 ABC=m (1-3-3) ABC, or m=32.~~

~~*The area of a parabolic segment equals two-thirds of the area of the triangle formed by the chord and the tangents at the end points of the chord.*~~

~~*§ 23. ELtutiptic AREAS.—To consider one ellipse a parallel projec- tion of another we may establish the correspondence as follows. If AC, BD are any pair of conjugate diameters of the one and A'C', B'D' any pair of conjugate diameters of the other, then these may be made to correspond to each other, and the correspondence will be completely determined if the parallelogrdm formed by the tangents at A, B, C, D is made to correspond to that formed by the tangents at A', B', C', D' (§§ 17 and 21). As the projection of the first conic has the four points A', B', OC', D' and the tangents at these points in common with the second, the two ellipses are pro- jected one into the other. Their areas will correspond, and so do those of the parallelograms ABCD and A'B'C'D'. Hence*~~

~~*The area of an ellipse has a constant ratio to the area of any inseribed parallelogram whose diagonals are conjugate diameters, and also to every eireumseribed parallelogram whose sides are parallel to conjugate diameters.*~~

~~*It follows at once that*~~

~~*All parallelograms inseribed in an ellipse whose diagonals are conjugate diameters are equal in area; and*~~

~~*All parallelograms eireumseribed about an ellipse whose sides are parallel to conjugate diameters are equal in area.*~~

~~*If a, b are the length of the semi-axes of the ellinse, then the area of the eireumscribed parallelogram will 'be 4ad and of the inscribed one 2ab.*~~

~~*For the circle of radius r the inscribed parallelogram becomes the square of area 27? and the circle has the area r*x ; the constant ratio of an ellipse to the inscribed parallelogram has therefore also the value $7. Hence*~~

~~*The area of an ellipse equals abr.*~~

~~§ 24, ProgecTIVE PropEertigs.—The properties of the projection of a figure depend partly on the relative position of the planes of the figure and the centre of projection, but principally ou the pro- perties of the given figure. Points in a line are projected into points in a line, harmonic points into harmonic points, a conic into a conic ; but parallel lines are not projected into parallel lines nor right angles into right angles, neither are the projections of equal segments or angles again equal. There are then some pro- perties which remain unaltered by projection, whilst others change. The former are called projective or descriptive, the latter metrical properties of figures, because the latter all depend on measurement.~~

~~To a triangle and its median lines correspond a triangle and three lines which meet in a point, but which as a rule are not median lines.~~

~~In this case, if we take the triangle together with the line at infinity, we get as the projection a triangle ABC, and some other line 7 which cuts the sides a, 0, ¢ of the triangle in the points A,, B,, Cj. If we now take on BC the harmonic conjugate A, to A, and similarly on CA and AB the harmonic conjugates to B, and C, respectively, then the lines AA,, BB,, CC, will be the projections of the median lines in the given figure. Hence these lines must meet in a point.~~

~~As the triangle and the fourth line we may take any four given lines, because any four lines may be projected into any four given lines (§ 14). This gives a theorem :—~~

~~If each vertex of a triangle be joined to that point in the opposite side which is, with regard to the vertices, the harmonic conjugate of the point in which the side is cut by a given line, then the three lines thus obtained meet in a point.~~

~~We get thus out of the special theorem about the median lines~~

~~Fig. 8.~~

~~PROJ E~~

~~*of a triangle a more general one. But before this could be done we had to add the line at infinity to the lines in the given figure. In a similar manner a great many theorems relating to metrical properties can be generalized by taking the line at infinity or points at infinity as forming part of the original figure. Conversely special cases relating to measurement are obtained by projecting some line in a figure of known properties to infinity. This is true for all properties relating to parallel lines or to bisection of segments, but not immediately for angles. It is, however, possible to establish for every metrical relation the corresponding projective property. Todo this it is necessary to consider imaginary elements. These have originally been introduced into geometry by aid of*~~

~~*coordinate geometry, where imaginary quantities constantly occur |*~~

~~*as roots of equations.*~~

~~*Their introduction into pure geometry is due principally to Poncelet, who by the publication of his great work Traité des Propriétés Projectives des Figures became the founder of projective geometry in its widest sense. Monge had considered parallel projection and had already distinguished between permanent and accidental properties of figures, the latter being those which depended merely on the accidental position of one part to another. Thus in projecting two circles which lie in different planes it depends on the accidental position of the centre of projection whether the projections be two conics which do or do not meet. Poncelet introduced the principle of continuity in order to make theorems general and independent of those accidental positions which depend analytically on the fact that the equations used have real or imaginary roots. But the correctness of this principle re- mained without a proof. Von Staudt has, however, shown how it is possible to introduce imaginary elements by purely geometrical reasoning, and we shall now try to give the reader some idea of his theory.*~~

~~*§ 25. IMAGINARY ELEMENTS.—If a line cuts acurve and if the line be moved, turned for instance about a point in it, it may happen that two of the points of intersection approach each other till they coincide. The line then becomes a tangent. If the line is still further moved in the same manner it separates from the curve and two points of intersection are lost. Thus in considering the rela- tion of a line to a conic we have to distinguish three*~~

~~*cases—the line cuts the conic in two points, touches it, or has no point in common with it. This is quite analogous to the fact that a quadratic equation with one unknown quantity has either two, one, or no roots. But in algebra it has long been found convenient to express this differently by saying a quadratic equation has always two roots, but these may be either both real and different, or equal, or they may be imaginary. In geometrya similar mode of expressing the fact above stated is not less convenient.*~~

~~*We say therefore a line has always two points in commoi with a conic, but these are either distinct, or coincident, or invisible. The word imaginary is generally used instead of invisible ; but, as the points have nothing to do with imagination, we prefer the word "invisible" recommended originally by Clifford.*~~

~~*Invisible points occur in pairs of conjugate points, for a line loses always two visible points of intersection with a curve simultane- ously. This is analogous to the fact that an algebraical equation with real coefficients has imaginary roots in pairs. Only one real line can be drawn through an invisible point, for two real lines meet in a real or visible point. The real line through an invisible point contains also its conjugate.*~~

~~*Similarly there are invisible lines—tangents, for instance, from a point within a conic—which occur in pairs of conjugates, two con- jugates having a real point in common.*~~

~~*The introduction of invisible points would be nothing but a play upon words unless there is a real geometrical property indicated which can be used in geometrical constructions—that it has a definite meaning, for instance, to say that two conics cut a line in the same two invisible points, or that we can draw one conic through three real points and the two invisible ones which another conic has in common with a line that does not actually cut it. We have in fact to give a geometrical definition of invisible points. This is done by aid of the theory of involution (G. § 76 sq.).*~~

~~*An involution of points on a line has (according to G. § 77 (2)) either two or one or no foci. Instead of this we now say it has always two foci which may be distinct, coincident, or invisible. These foci are determined by the involution, but they also determine the involution. If the foci are real this*~~

~~*follows from the fact that conjugate points are harmonic conjugates with regard to the foci. That it is also the case for invisible foci will presently appear. If we take this at present for granted we may replace a pair of real, coincident, or invisible points by the involution of which they are the foci.*~~

~~*Now any two pairs of conjugate points determine an involution (G. § 77 (6)).*~~

~~*Hence any point-pair, whether real or invisible, is completely determined by any two pairs of conjugate points of the involution ap has the given point-pair as foci and may therefore be replaced*~~

~~*y them.*~~

~~*CTION 799*~~

~~*Two pairs of invisibie points are thus said to be identical if, and only if, they are the foci of the same involution.*~~

~~*We know (G. § 82) that a eonic determines on every line an in- volution in which conjugate points are conjugate poles with regard to the conic—that is, that either lies on the polar of the other. This holds whether the line cuts the conic or not. Furthermore, in the former case the points common to the line and the conic are the foci of the involution. Hence we 'now say that this is always the case, and that the invisible points common to a line and a conic are the invisible foci of the involution in question. If then we state the problem of drawing a conic which passes through two points given as the intersection of a conic and a line as that of drawing a conic which determines a given involution on the line, we have it in a form in which it is independent of the accidental circumstance of the intersections being real or invisible. So is the solution of the problem, as we shall now show.*~~

~~*§ 26. We have seen (§ 21) that a conic may always be projected into itself by taking any point S as centre and its polar s as axis of projection, corresponding points being those in which a line through S cuts the conic. If then (fig. 9) A, A' and B, B' are pairs of corresponding points so that the lines AA' and BB' pass through §, then the lines AB and A'B', as corresponding lines, will meet at a point Ron the axis, and the lines AB' and*~~

~~*A'B will meet at another point R' on the axis. These points R, R' are conjugate points in the involution which the*~~

~~*Fig, 9. conic determines on the line s, because the triangle RSR' is a polar triangle (G. § 62), so that R' lies on the polar of R.*~~

~~*This gives a simple means of determining for any point Q on the line s its conjugate point Q'. We take any two points A, A' on the conic which lie on a line through 8, join Q to A by a line cutting*~~

~~*the conic again in C, and join C to A'. This line will cut s in the point Q' required.*~~

~~*ProsLEeM.—Z'o draw some conic which shall determine on a line s a given involution.*~~

~~*Solution. —We have here to reconstruct the fig. 9, having given on the line s an involution. Let Q, Q' and R, R' (fig. 9) be two pairs of conjugate points in this involution. We take any point B and join it to R aud R', and another point C to Q and Q'. Let BR and CQ meet at A, and BR' and CQ' at A'. If nowa point P be moved along sits conjugate point P' will also move and the two points will describe projective rows. The two rays AP and A'P' will therefore describe projective pencils, and the intersection of corre- sponding rays will lie on a conic which passes through A, A', B, and C. This conic determines on s the given involution.*~~

~~*Of these four points not only B and C but also the point A may be taken arbitrarily, for if A, B, C are given, the line AB will cut s in some point R. As the involution is supposed known, we can find the point R' conjugate to R, which we join to B._ In the same way the line CA will cut s in some point Q. Its conjugate point Q' we join to C. The line CQ' will cut BR' in a point A', and then AA' will pass through the pole S (comp. fig. 9). We may now inter- change A and B and find the point B. Then BB' will also pass through S, which is thus found. fAt the same time five points A, B, ©, A', B' on the conic have been found, so that the conic is completely known which determines on the line s the given involu- tion. HIence—*~~

~~*THEOREM.—Through three points we can always draw one conte, and only one, which determines on a given line a given involution, all the same whether the involution has real, coincident, or invisible*~~

~~*oct. In the last case the theorem may now also be stated thus :—*~~

~~*THEOREM.—ZJt ts always possible to draw a conic which passes through three given real points and through two invisible points which any other conic has in common with a line.*~~

~~*§ 27. The above theory of invisible points gives rise to a great number of interesting consequences of which we state a few.*~~

~~*The theorem at the end of § 21 may now be stated :—*~~

~~*THEOREM.—Any two conics are similar and similarly situated if they cut the line at infinity in the same two points—real, coincident, or tnvistble.*~~

~~*It follows that*~~

~~*Any two parabolas are similar ; and they are similarly situated as soon as their axes are parallel.*~~

~~*The involution which a circle determines at its centre is circular (G. § 79); that is, every line is perpendicular to its conjugate line. This will be cut by the line at infinity in an involution which has the following property: —The lines which join any finite point to two conjugate points in the involution are at right angles to each other. Hence all circular involutions in a plane determine the*~~

~~*800*~~

~~*same involution on the line at infinity. The latter is therefore called the eireular involution on the line at infinity; and the involution which a circle determines at its centre is called the circular involution at that point. All circles determine thus on the line at infinity the same involution ; in other words, they have the same two invisible points in common with the line at infinity.*~~

~~*THEOREM.—AII circles may be considered as passing through the same two points at infinity. e : .*~~

~~*These points are called the cirewlar points at infinity, and by Prof. Cayley the absolute in the plane. They are the foci of the circular involution in the line at infinity. ; :*~~

~~*Conversely—Every conte which passes through the etreular points is a circle; because the involution at its eentre is circular, hence conjugate diameters are at right angles, and this property only circles possess. ;*~~

~~*We now see why we ean draw always one and only one circle through any three points: these three points together with the cireular points at intinity are five points through which one conic only ean be drawn. ;*~~

~~*Any two circles are similar and similarly situated because they have the same points at infinity (§ 21). ;*~~

~~*Any two eoneentrie etreles may be considered as having double contact at infinity, because the lines joining the common centre to the circular points at infinity are tangents to both circles at the circular points, as the line at infinity is the polar of the centre.*~~

~~*Any two lines at right angles to one another are harmonie conjugates with regard to the rays joining their intersection to the cireular points, beeause these rays are the focal rays of the circular involution at the interseetion of the given lines.*~~

~~*To bisect an angle with the vertex A means (G. § 23) to find two rays through A which are harmonic conjugates with regard to the limits of the angle and perpendicular to each other. These rays are therefore harmonic with regard to the limits of the given angle and with regard to the rays through the circular points. Thus perpendieularity and bisection of an angle have been stated in a projective form.*~~

~~*It must not be forgotten that the cireular points do not exist at all; but to introduce them gives us a short way of making a state- ment which would otherwise be long and cumbrous.*~~

~~*We can now generalize any theorem relating to metrical pro- perties. For instanee, the simple fact that the chord of a circle is touched by a concentric circle at its mid point proves the theorem:*~~

~~*If two conies have double contaet, then the points where any tangent to one of them euts the other are harmonic with regard to the point of contact and the point where the tangent cuts the chord of contaet.*~~

~~*DESCRIPTIVE GEOMETRY.*~~

~~*For many, especially technical, purposes it is of the utmost importance to represent solids and other figures in three dimensions by a drawing in one plane.*~~

~~*A variety of methods have been introduced for this purpose. The most important is that which towards the end of the last century was invented by Monge under the name of "descriptive geometry." We give the elements of his method. It is based on parallel projections to a plane by rays perpendicular to the plane. Such a pro- jection is called orthographic (§ 18). If the plane is horizontal the projection is called the plan of the figure, and if the plane is vertical the elevation. In Monge's method a figure is represented by its plan and elevation. It is therefore often called drawing in plan and elevation, and sometimes simply orthographic projection.*~~

~~*§ 28. We suppose then that we have two planes, one horizontal the other vertical, and these we call the planes of plan and of dlera- tion respectively, or the horizontal and the vertical plane, and denote them by the letters m, and ,. Their line of intersection is ealled the axis, and shall be denoted by the letter x.*~~

~~*If the surface of the drawing paper is taken as the plane of the plan, then the vertical plane will be the plane perpendicular to it through the axis a To bring this also into the plane of the drawing paper we turn it about the axis till it coincides with the horizontal plane. This process of turning one plane down till it coincides with another is called rabatting one to the other. Of*~~

~~*course there is no necessity to have one of the two planes hori-*~~

~~zontal, but even when this is not the case it is convenient to retain~~

~~the above names,~~

~~F The whole arrangement will be better understood by a glance at~~

~~wh = ; Y sae " in = is ar projected by the perpendicular 1 g to the planes 7, and z,, so that A, and 1~~

~~horizontal and vertical projections of A. pated ose~~

~~If we remember that a line is perpendicular to a plane that~~

~~PROJECTION~~

~~is perpendicular to every line in the plane if only it is perpen- dicular to any two intersecting lines in the plane,! we see that the axis which is perpendicular both to AA, and to AA, is also per- pendicular to A,A, and to A,A, becanse these four Lites are all in the same plane. Hence, if the plane +, be turned about the~~

~~Fig 11. axis till it coincides with the plane m,, then A,A, will be the con-~~

~~tinuation of A,;Ay. This position of the planes is represented in fig. 11, in which the line A, A, is perpendicular to the axis x.~~

~~Conversely any two paints A,, A, in a line perpendicular to the axis will be the projections of some point in space when the plane a, is turned about the axis till it is perpendicular to the plane 7, because in this position the two perpendiculars to the planes 7, and zw, through the points A, and A, will be in a plane and there- fore meet at some point A.~~

~~REPRESENTATION oF Pornts.—We have thus the following method of representing in a single plane the position of points in space :— we take in the plane a line x as the axis, and then any pair of points Ay, A, in the plane _on a line perpendicular to the axis represent a point A im space. If the line A,A, cuts the axis at Ay, and if at A, a perpendicular be erected to the plane, then the point A will be in it at a height A|A=A,A, above the plane, This gives the position of the point A relative to the plane 7,. In the same way, if~~

~~*ina perpendicular to w, through A, a point A be taken such that A,A=A,A,, then this will give the point A relative to the plane 7.*~~

~~*§ 29. The two planes 7, w, in their original position divide space into four parts. These are called the four quadrants. We suppose that the plane 7m, is turned as indicated in fig. 10, so that the point P comes to Q and R to 8, then the quadrant in which the point A lies is called the first, and we say that in the first quadrant a point lies above the horizontal and in front of the vertical plane. Now we go round the axis in the sense in which the plane a, is turned and come in succession to the second, third, and fourth quadrant. In the second a point lies above the plane of the plan and behind the plane of elevation, and soon. In fig. 12, which represents a side view of the planes in fig, 10 the .P quadrants are marked, and in each a point with its projection is taken.*~~

~~*Fig. 11 shows how these are repre- 8 sented when the plane z, is turned down. We see that A point lies in the first quadrant B 5*~~

~~*Uf the plan lies below, the elevation 0 <¢ above the axis; in the seeond if plan*~~

~~*and elevation both lie above; in the ry third ¢f the plan lies above, the eleva-*~~

~~*tion below; in the fourth if plan and elevation both lie below the axis.*~~

~~*Tf a point lies in the horizontal Fic. 12 plane, its elevation lies in the axis sg and the plan coineides with the point itself. If a point les in the vertieal plane, its plan lies in the axis and the elevation coincides with the point itself. Jf a point lies in the axis, both its plan and elevation lie in the axis and coincide with it.*~~

~~*Of each of these propositions, which will easily be seen to be true, the converse holds also.*~~

~~*§ 30, REPRESENTATION OF A PLANE.—As we are thus enabled to represent points in a plane, we can represent any finite figure by representing its separate points. It is, however, not possible to represent a*~~

~~*plane in this way, for the projections of its points com- pletely cover the planes 7, and w,, and no plane would appear different from any other. But any plane a cuts each of the planes ™, 7 in aline, These are called the traces of the plane. They cut each other in the axis at the point where the latter cuts the plane a.*~~

~~*A plane is determined by its two traces, which are two lines that meet on the axis, and, conversely, any two lines which meet on the axis determine a plane.*~~

~~*SSS eee ee*~~

~~*1 It is very convenient here to make use of the modern extension of the mean- ing of an angle according to which we take as the angle between two non-inter- secting lines the angle between two interseeting lines parallel respectively to the given ones. If this angle is a right angle, the lines are called perpendiculars. Euelid's definition (XI, def. 8), and theorem (XI. 4) may then be stated as in the text. Compare also article Gzometry (EUCLIDIAN), § 75, vol. x. p. 386.*~~

~~*PROJ KE*~~

~~*Tf the plane is parallel to the axis its traces are parallel to the axis. Of these oue may be at infinity; then the plane will cut one of the planes of projection at infinity and will be parallel toit. Thus a plane parallel to the horizontal plane of the plan has only one finite trace, viz., that with the plane of elevation.*~~

~~*If the plane passes through the asis both its traces coincide with the axis. This is the only case in which the representation of the plane by its two traces fails. A third plane of projection is there- fore introduced, which is best taken perpendicular to the other two. We call it simply the third plane, and denote jt by ;. As it is perpendicular to 7, it may be taken as the plane of elevation, its line of intersection y with a, being the axis, and be turned down to coincide with w,. This is represented in fig. 18, OC is the axis x whilst OA and OB are the tracesof the third plane. They lie in one line y. The plane is rabatted about y to the horizontal plane. A plane a through the axis x will then show in ita trace ag. In fig. 18 the lives OC aud OP will*~~

~~*thus be the traces of a plane through the axis « which makes an angle POQ with the horizontal plane.*~~

~~*We can also find the trace which any other plane makes with a3. In rabatting the plane 7, its trace OB with Q the plane aw, will come to Fi the position OD. Hence a ig. 13, plane B having the traces CA and CB will have with the third plane the trace B,, or AD if OD=OB,*~~

~~*It also follows immediately that—*~~

~~*If a plane a is perpendicular to the horizontal plane, then every point in it has its horizontal projection in the horizontal trace of the plane, as all the rays projecting these points lie in the plane itself.*~~

~~*Any plane which is perpendicular to the horizontal plane has tts vertical trace perpendicular to the axis.*~~

~~*Any plane which is perpendicular to the vertical plane has tts horizontal tracee perpendicular to the axis and the vertical projections of all points in the plane lie in this trace.*~~

~~*§ 81. REPRESENTATION OF A LINE. —A line is determined either by two points in it or by two planes through it. We get accord- ingly two representations of it either by projections or by traces.*~~

~~*First.—-A line a ts represented by its projections a, and a, on the two planes 7, and w,, These may be any two lines, for, bringing the planes m,, 7, into their original position, the planes through these lines perpendicular to 7, and 7, respectively will intersect in some line a which has a, a as its projections.*~~

~~*Secondly.— line a is represented by its traces—that is, by the points in which it cuts the two planes m, m, Any two points may be taken as the traces of a line in space, for it is determined when the planes are in their original position as the line joining the two traces. This representation becomes undetermined if the two traces coincide in the axis. In this case we again use a third plane, or else the projections of the line.*~~

~~§ 82. The fact that there are different methods of representing points and planes, and hence two methods of representing lines, snggests the principle of duality (G. § 41). It is worth while to keep this in mind. It is also worth remembering that traces of planes or lines always lie in the planes or lines which they repre- sent. Projections do not as a rule do this excepting when the point or line projected lies in one of the planes of projection.~~

~~§ 38. Having now shown how to represent points, planes, and lines, we have to state the conditions which must hold in order that these elements may lie one in the other, or else that the figure formed by them may possess certain metrical properties. It will be found that the former are very much simpler than the latter.~~

~~Before we do this, however, we shall explain the notation used ; for it is of great importance fo have a systematic notation. We shall denote points in space by capitals A, B, C; planes in space by Greek letters a, B, y; lines in space by small letters a, 0, ¢; horizontal projections by suffixes 1, like Aj, a; vertical pro- jections by suffixes 2, like A,, a); traces by single and double dashes a' a', a' a'. Hence P, will be the horizontal projection of a point P in space; a line a will have the projections a, a2 and the traces a' and a"; a plane a has the traces a' and a'.~~

~~§ 34. If a point lies in a line, the projections of the point lie in the projections of the line.~~

~~Lf a Vine lies in a plane, the traces of the line lie in the traces of the plane.~~

~~These propositions follow at once from the definitions of the projections and of the traces.~~

~~If a point lies in two lines its projections must lie in the pro- jections of both. Hence~~

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~~If two lines, given by their projections, intersect, the intersection of their plans and the interseetion of their elevations must lie in a line~~

~~*perpendicular to the axis, because they must be the projections of the point common to the two lines.*~~

~~*Similarly—If two lines given by their traces lie in the same plane or intersect, then the lines joining their horizontal and vertical traces respectively must meet on the axis, because they must be the traces of the plane through them.*~~

~~*§ 35. To find the projections of a line which joins two points A, B given by their projections A,, Ag and B,, By, we join A,, B, and A,, By; these will be the projections required. For example, the traces of a line are two points in the line whose projections are known or at all events easily found. They are the traces them- selves and the feet of the perpendiculars from thein to the axis.*~~

~~*Hence if a', a" (fig.. 14) are the traces of a line a, and ·f the per- pendiculars from them cut the axis in P and Q respectively, then the line a'Q will be the horizontal and a'P the vertical projection of the line.*~~

~~*Conversely, if the projec- tions a, a of a line are given, and if these cut the axis in Q and P respectively, then the perpendiculars Pa' and Qa" to the axis drawn through these points cut the projections a, and a, in the traces a' and a".*~~

~~*To find the line of intersec- tion of two planes, we observe that this line lies in both planes; its traces must therefore lie in the traces of both. Hence the points where the horizontal traces of the given planes meet will be the horizontal, and the point where the vertical traces meet the vertical trace of the line required.*~~

~~*§ 36. To decide whether a point A, given by its projections, lies in a plane a, given by its traces, we draw a line p by Joining A to some point in the plane a and determine its traces. If these lie in the traces of the plane, then the line, and therefore the point A, lies in the plane ; otherwise not. This is conveniently done by joining A, to some point p' in the trace a'; this gives p,; and the point where the perpendicular from p' to the axis cuts the latter we join to A,; this gives p,. If the vertical trace of this line lies in the vertical*~~

~~*trace of the plane, then, and then only, does the line p, and with it the point A, lie in the plane a,*~~

~~*§ 37. Parallel planes have parallel traces, because parallel planes are cut by any plane, hence also by 7, and by 7, in parallel lines.*~~

~~*Parallel lines have parallel projections, because points at infinity are projected to infinity.*~~

~~*Tf a line is parallel to a plane, then lines through the traces of the line and parallel to the traces of the plane must meet on the aats, because these lines are the traces of a plane parallel to the given*~~

~~*lane. : § 38. Todrawa plane through two intersecting lines or through two parallel lines, we determine the traces of the lines; the lines joining their horizontal and vertical traces respectively will be the horizontal and vertical traces of the plane. They will meet, at a finite point or at infinity, on the axis if the lines do intersect.*~~

~~*To draw a plane through a line and a point without the line, we join the given point to any point in the line and determine the plane through this and the given line.*~~

~~*To draw a plane through three points which are not tn a line, we draw two of the lines which each join two of the given points and draw the plane through them. If the traces of all three lines AB, BC, CA be found, these must lie in two lines which meet on the axis.*~~

~~*§ 39. We have in the last example got more points, or can easily get more points, than are necessary for the determination of the figure required—in this case the traces of the plane. This will happen in a great many constructions and is of considerable importance. It may happen that some of the points or lines obtained are not convenient in the actual construction. The horizontal traces of the lines AB and AC may, for instance, fall very near together; in which case the line joining them is not well de- fined. Or, one or both of them may fall beyond the drawing paper, so that they are practically non-existent for the construction. _ In this case the traces of the line BC may be used. Or, if the vertical traces of AB and AC are both in*~~

convenient position, so that the vertical trace of the required plane is found and one of the horizontal traces is got, then we may join the latter to the point where the vertical trace cuts the axis.

Furthermore the draughtsman will never forget that the lines which he draws are not mathematical lines without thickness. For this reason alone every drawing is affected by some errors. And inaccuracies also come in in drawing the lines reqnired in the con- struction. It is therefore very desirable to be able constantly to check the latter. Such checks always present themselves when the same result can be obtained by different constructions, or

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Fig. 14.

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when, as in the above case, some lines must meet on the axis, or Tine points must lie in a line. A careful draughtsman will always avail himself of these checks. _ ; x

§ 40. To draw a plane through a given point parallel to a given plane a, we draw through the point two lines which are parallel to the plane a, and determine the plane through them ; or, as we know that the traces of the required plane are parallel to those of the given one (§ 37), we need only draw one line i through the point parallel to the plane and find one of its traces, say the vertieal trace 7'; a line through this parallel to the vertical traee of a will be the vertical traec 8" of the required plane 8, and a line parallel to the horizontal trace of a meeting B" on the axis will be the

horizontal trace p'. ; : rx, j

Let A, Ay (fig. 15) be the given point, a' a" the given plane, a line J, through A, parallel to a' and a horizontal line 1, through

~~*A, will be the projec- ip" a tions of a line 7through A parallel to the plane, beeause the horizontal plane through this line will cut the plane a in a line ¢ which has its horizontal projection é, parallel to a'.*~~

~~*' § 41. We now come to the metrical proper- ties of figures.*~~

~~*A line ts perpendicu-*~~

~~*Fig. 15. lar to a plane tf the projections of the line are perpendicular to the*~~

~~*traces of the plane. We prove it for the horizontal projection. If a line p is perpendicular to a plane a, every plane through » is per- pendicular to a; hence also the vertical plane which projects the line p to p,. As this plane is perpendicular both to the horizontal plane and to the plane a, it is also perpendicular to their intersection — that is, to the horizontal trace of a. It follows that every line in this projecting plane, therefore also p,, the plan of p», is perpendicu- lar to the horizontal trace of a. E.D.*~~

~~*To draw a plane through a given point A perpendicular to a given line p, we first draw through some point O in the axis lines y', y" perpendicular respectively to the projections p, and p, of the given line. These will be the traces of a plane y which is perpendicular to the given line. We next draw through the given point A a plane parallel to the plane y; this will be the plane required.*~~

~~*Other metrical properties depend on the determination of the real size or shape of a figure.*~~

~~*In general the projection of a figure differs both in size and shape from the figure itself. But figures in a plane parallel to a plane of projection will be identical with their projections, and will thus be given in their true dimensions. In other cases there is the problem, constantly recurring, either to find the true shape and size of a plane figure when plan and elevation are given, or, con- versely, to find the latter from the known true shape of the figure itself. To do this, the plane is turned about one of its traces till it is laid down into that plane of projection to which the trace belongs. This is technically called rabatting the plane respectively into the plane of the plan or the elevation. As there is no difference in the treatment of the two cases,*~~

~~we shall consider only the case of rabatt- ing a plane a into the plane of the plan. The plan of the figure is a parallel (orthographic) projection of the figure itself. The results of parallel projection (§§ 17 and 18) may therefore now be used. The trace a' will hereby take the place of what formerly was called the axis of projection. Hence we see that corresponding points in the plan and in the rabatted plane are joined by lines which are perpen- dicular to the trace a' and that corresponding lines meet on this trace. We also see that the correspondence is completely deter- mined if we know for one point or one line in the plan the corre- sponding point or line in the rabatted plane.~~

~~Before, however, we treat of this we consider some special cases.~~

~~§ 42. To determine the distance between two points A, B given by their projec- tions Ay, B, and A, By.~~

~~Solution.—Thetwo points A, B in space lie vertically above their plans A,, B, (fig. 16) and A,A=A,A,, B,B=B,B,. The four points A, B, A,, B, therefore form a plane quadrilateral on the base A,B, and having right angles at the base. This plane we rabatt about A,B, by drawing A,A and B,B perpendicular to A,B, and~~

~~Fig. 16.~~

~~oes eae, B,B=B,B,. Then AB will give the length~~

~~The construction might have been performed in the elevation by~~

~~PROJECTION~~

~~making A,A=A,A, and B,B=B,B, on lines perpendicular to A,B,. Of course AB must have the same length in both cases.~~

~~This figure may be turned into a model. "We cut the paper along A,A, AB, and BB, and fold the piece A, ABB, over along A,B, till it stands upright at right angles to the horizontal plane. The points A, B will then be in their true position in space relative to 7. Similarly if B,BAA, be cut out and turned along A,B, through a right angle we shall get AB in its true position~~

~~*relative to the plane m,. Lastly we fold the whole plane of the paper-along the axis x till the plane 7, is at right angles to 7. In this position the two sets of points AB will coincide if the drawing has been accurate.*~~

~~*Models of this kind can be made in many cases and their construc- tion cannot be too highly recommended in order to realize ortho- graphic projection.?*~~

~~*§ 43. To find the angle between two given lines a, b of which the projections ay, b, and ay, by are given.*~~

~~*Solution. —Let a, b, (fig. 17) meet in Py, a», by in T, then if the line P,T is not perpendicular to the axis the two lines will not meet. In this ease we draw a line paral- lel to 6 to meet the line a. This is easiest done by drawing first the line P,P, perpendicular to the axis to meet a, in P,, and then drawing through P, a line é, parallel to by; then by, é, will be the projections of a line e which is parallel to 6 and meets a in P. The plane a which these two lines determine we rabatt to the plan. We determine the traces a'*~~

~~*Fig. 17.*~~

~~*and e' of the lines a and ¢; then ae' is the trace a' of their plane. Ou rabatting the point P comes to a point S on the line P,Q per- pendicular to a'e', so that QS=QP: But QP is the hypothenuse*~~

~~*of a triangle PP,Q with aright angle P,. This we construct by making QR=P,P,; then P}R=PQ. The lines a'S and e'S will therefore inelude angles equal to those made by the given lines. It is to be remembered that two lines include two angles which are supplementary. Which of these is to be taken in any special case depends upon the cireumstances.*~~

~~*To determine the angle between a line and a plane, we draw through any point in the line a perpendicular to the plane (§ 41) and determine the angle between it and the given line. 'The eomple- ment of this angle is the required one.*~~

~~*To determine the angle between two planes, we draw through any point two lines perpendicular to the two planes and determine the angle between the latter as above.*~~

~~*In special cases it is simpler to determine at once the angle between the two planes by taking a plane section perpendicular to the intersection of the two planes and rahatt this. This is especially the case if one of the planes is the horizontal or vertical plane of projection.*~~

~~*Thus in fig. 18 the angle P,QR is the angle which the plane a makes with the horizontal plane.*~~

~~*§ 44. We return to the general case of rabatting a plane a of which the traces a' a" are given.*~~

~~*Here it will be convenient to determine first the position which the trace «"—which is a line in a—assumes when rabatted. Points in this line coincide with their elevations. Hence it is given in its true dimension, and we can measure off along it the true distance between two pointsinit. Ifthere- fore (fig. 18) P is any point in a" originally coincident with its elevation P,, and if O is the point where a" cuts the axis x, so that O is also in a', then the point P will after rabatting the*~~

~~*Fig. 18. plane assume such a position that OP=OP,. At the same time*~~

~~*the plan is an orthographic projection of the plane a. Hence the line joining P to the plan P, will after rabatting be perpendicular toa'. But P, is known; it is the foot of the perpendicular from P, to the axis z. We draw therefore, to find P, from P, a perpen- dicular P,Q to a' and find on it a point P such that OP=OP,.*~~

~~*1 In order to makea along this line,*~~

~~*sharp crease along A,B, it is well to place a straight edge and then to turn the piece A, ABB, up against it.*~~

~~*PROJECTION*~~

~~*Then the line OP will be the position of a" when rabatted. This line corresponds therefore to the plan of a"—that is, to the axis 2, corresponding points on these lines being those which lie on a per- pendicular to a'.*~~

~~*We have thns one pair of corresponding lines and can now find for any point B, in the plan the corresponding point B in the rabatted plane. We draw a-line through B,, say B,P,, cutting a' in C. To it corresponds the line CP, and the point where this is cut by the projecting ray through By, perpendicular to a', is the re- quired point B.*~~

~~*Similarly any figure in the rabatted plane can be found when the plan is known; but this is usually found in a different manner with- out any reference to the general theory of parallel projection. As this method and the reasoning employed for it have their peculiar advantages, we give it also.*~~

~~*Supposing the planes 7, and 7, to be in their positions in space peipendicular to each other, we take a section of the whole figure by a plane perpendicular to the trace a' about which we are going to rabatt the plane a. Let this section pass through the point Q in a'. Its traces will then be the lines QP, and P,P, (fig. 18). These will be at right angles, and will therefore, together with the section QP, of the plane a, form a right-angled triangle QP,P, with the right angle at P,, and having the sides P,Q and P,P, which both are given in their true lengths. This triangle we rabatt about its base P\|Q, making P\|R=P,P,. The line QR will then give the true length of the line QP in space. If now the plane a be turned about a' the point P will describe a circle about Q as centre with radius QP=QR, in a plane perpendicular to the trace a'. HIence when the plane a has been rabatted into the horizontal plane the point P will lié in the perpendicular P,Q to a', so that QP=QR.*~~

~~*If A, is the plan of a point A in the plane a, and if A, lies in QP), then the point A will lie vertically above A, in the line QP. On turning down the triangle QP,P., the point A will come to Ag, the line A, A) being perpendicular to QP}. HIence A will be a point in QP such that QA=QA,.*~~

~~*If B, is the plan of another point, but such that A,B, is parallel to a', then the corresponding line AB will also be parallel to a'. HIence, if through A a*~~

~~*line AB be drawn parallel to a', and B, B*~~

~~*'perpendicular to a', then their intersection gives the point B. Thus of any point given in plan the real position in the plane a, when rabatted, can be found by this second method. This is the one most generally given in books on geometrical drawing. The first method explained is, however, in most cases preferable as it gives the draughtsman a greater variety of constructions. It requires a somewhat greater amount of theoretical knowledge.*~~

~~*If instead of our knowing the plan of a figure the latter is itself given; then the process of finding the plan is the reverse of the above and needs little explanation. We give an example.*~~

~~*§ 45. Propiem.—It is required to draw the plan and elevation of a polygon of which the real shape and position in a given plane a are known.*~~

~~*Solution.—We first rabatt the plane a (fig. 19) as befcre so that P, comes to P, hence*~~

~~*é OP, toOP. Let the given polygon in a be ' the figure ABCDE. We project, not the*~~

~~*vertices, byt the sides. To project the line*~~

~~*P AB, we produce it to cut «' in F and OP in*~~

~~*G, and draw GG, perpendicular to a'; then*~~

~~*G, corresponds to G, therefore FG, to FG. In the same manner we might project all the other sides, at least those which cut OF and in convenient points. It will be best, however, first to produce*~~

~~*all the sides to cut OP and a' and then to draw all the projecting rays through A,B,C . . . perpendicular to a', and in the same direc-*~~

~~*tion the lines G,G,, &c. By drawing FG we get the points Aj, B, on the projecting ray through A and B. We then join B to the point M where BC produced meets the trace a'. This gives C,. So we go on till we have found E,. The line A, E, must then meet AE in a', and this gives a check. If one of the sides cuts a' or OP beyond the drawing paper this method fails, but then we may easily find the projection of some other line, say of a diagonal, or directly the projection of a point, by the former methods. The diagonals may also serve to check the drawing, for two corre- sponding diagonals must meet in the trace a'.*~~

~~*Having got the plan we easily find the elevation. The elevation of G is above G, in a", and that of F is at F, in the axis. This gives the elevation F,G, of FG and in it we get A,B, in the verticals through A, and B, As a check we have OG=OG,. Similarly the elevation of the other sides and vertices are fonnd.*~~

~~*§ 46. We have now obtained the ABC of descriptive geometry, and proceed to give some applications to the representation of solids and of the solution of problems connected with them.*~~

~~*PROBLEM.—Of a pyramid are given tts base, the length of the perpendicular from the vertex to the base, and the point where this perpendicular cuts the base ; it is required first to develop the whole surface of the pyramid into one plane, and second to determine tts section by a plane which euts the plane of the base ina given line and makes a given angle with it.*~~

~~*Solution.—(1) As the planes of projection are not given we can take them as we like, and we select them in such a manner that the solution becomes as simple as possible. We take the plane of*~~

~~*the base as the horizontal plane and the vertical plane perpen- Let then (fig. 20) ABCD be*~~

~~*dicular to the plane of the section. the base of the pyramid, V, the plan of the ver- tex, then the elevations of A, B, C, D will be in the axis at A,, B,, Cy, D,, and the vertex at some point V, above V, at a known distance*~~

~~: from the axis. The lines V,A, V,B, &c., will be the plans and the lines V,A,, "V,B,, &c., the elevations of the edges of the pyramid, of which thus plan and eleva- tion are known.~~

~~We develop the surface into the plane of the base by turning each lateral face about its lower edge into the horizontal plane by the method used in § 43. If one face has been turned down, say ABV to ABP, then the point Q to which the vertex of the next~~

~~'| face BCV comes can be got more simply by finding on the line~~

~~V,Q perpendicular to BC the point Q such that BQ= BP, for these lines represent the same edge BV of the pyramid. Next R is~~

~~'found by making CR=CQ, and so on till we have got the last~~

~~vertex—in this case S. The fact that AS must equal AP gives a convenient check.~~

~~(2) The plane a whose section we have to determine has its hori- zontal trace given perpendicular to the axis, and its vertical trace makes the given angle with the axis. This determinesit. To find the section of the pyramid by this plane there are two methods applicable: we find the sections of the plane either with the faces or with the edges of the pyramid. We use the latter.~~

~~As the plane @ is perpendicular to the vertical plane, the trace a' contains the projection of every figure in it; the points E,, F,, G,, H, where this trace cuts the elevations of the edges will there- fore be the elevations of the points where the edges cut a. From these we find the plans Ej, F,, Gy, Hy, and by joining them the~~

~~804 Pa Od E~~

~~plan of the section. If from Ty, F, lines be drawn perpendicular to AB, these will determine the points E, F on the developed face in which the plane a cuts it ; hence also the line EF. Similarly on the other faces. Of course BF must be the same length on BP and on BQ. If the plane abe rabatted to the~~

~~*plan, we get the real shape of the section as shown in the figure in EFGH. This is done easily by making Hoe Ogee. i the figure representing the development of the pyramid, or better a copy of it, is cut out, and if the lateral faces be bent along the lines AB, BC, &c., we get a model of the pyramid with the section marked on its faces. This may be placed on its plan ABCD and the plane of elevation bent about the axis x. The pyramid stands then in front of its eleva- tions. If next the plane a with a hole cut out representing the true section be bent along the trace a' till its edge coincides with a', the edges of the hole onght to coincide with the lines EF, FG, &c., on the faces.*~~

~~*§ 47. Polyhedra like the pyramid in § 46 are represented by the projections of their edges and vertices. But solids bounded by curved surfaces, or surfaces themselves, cannot be thus represented.*~~

~~*For a surface we may use, as in case of the plane, its traces—that is, the curves in which it cuts the planes of projection. We may also project points and curves on the surface.*~~

~~*Thus the tangents drawn from any finite centre to a sphere form a right circular cone, and this will be cut by any plane in a conic. It is often called the projection of a sphere, but it is better called the contour-lne of the sphere, as it is the boundary of the projec- tions of all points on the sphere.*~~

~~*If the centre is at infinity the tangent cone becomes a right circular cylinder touching the sphere along a great circle, and if the projection is, as in our case, orthographic, then the section of this cone by a plane of projection will be a circle equal to the great circle of the sphere. We get such a circle in the plan and another in the elevation, their centres being plan and elevation of the centre of the sphere.*~~

~~*Similarly the rays touching a coné of the second order will lie in two planes which pass through the vertex of the cone, the contour-line of the projection of the cone consists therefore of two lines meeting in the projection of the vertex. These may, however, be invisible if no real tangent rays can be drawn from the centre of projection; and this happens when the ray projecting the centre of the vertex lies within the cone. In this case the traces of the cone are of importance. Thus in representing a cone of*~~

~~*revolution with a vertical axis we get in the plan a circular trace of the surface whose centre is the plan of the vertex of the cone, and in the elevation the contour, consisting of a pair of lines intersecting in the elevation of the vertex of the cone. The circle in the plan and the pair of lines in the elevation do not determine the surface, for an infinite number of surfaces might be conceived which pass through the circular trace and touch two planes through the contour lines in the vertical plane. The surface becomes only completely defined if we write down to the figure that it shall represent a cone. The same holds for all surfaces. Even a plane is fully represented by its traces only under the silent understanding that the traces are those of a plane. a*~~

~~*§ 48. Some of the simpler problems connected with the repre- sentation of surfaces are the determination of plane sections and of the curves of intersection of two such surfaces, The former is constantly used in nearly all problems concerning surfaces. Its solution depends of course on the nature of the surface.*~~

~~*To determine the curve of intersection of two surfaces, we take a plane and determine its section with each of the two surfaces rabatting this plane if necessary. This gives two curves which lie in the same plane and whose intersections will give us points on both surfaces. It must here be remembered that two curves in space do not necessarily intersect, hence that the points in which their projections intersect are not necessarily the projections of points common to the two curves. This will, however, be the case if the two curves lie in a common plane. By taking then anumber of plane sections of the surfaces we can get as many points on their ee of intersection as we like. These planes have, of course, to*~~

~~*e selected in such a way that the sections are curves as simple as*~~

~~*ee ae of, and such that they can be easily and accurately*~~

~~*vn. us when possible the sections should be straight lines*~~

~~*or circles. This not only saves time in drawing but determines all*~~

~~points on the sections, and therefore also the points where the two curves meet, with equal accuracy.~~

~~h ee give few examples how these sections have to be selected.~~

~~y every plane through the vertex in lines, and if~~

~~CT TOR~~

~~| it is a cone of revolution by planes perpendicular to the axis in~~

~~circles.~~

~~A cylinder is cut by every plane parallel to the axis in lines, and if it is a cylinder of revolution by planes perpendicular to the axis in circles.~~

~~A sphere is cut by every plane in a circle.~~

~~Hence in case of two cones situated anywhere in space we take sections through both vertices. These will cut both cones in lines. Similarly in case of two cylinders we may take sections parallel to the axis of both. In case of a sphere and a cone of revolution with vertical axis, horizontal sections will cut both surfaces in circles whose plans are circles and whose elevations are lines, whilst vertical sections through the vertex of the cone cut the latter in lines and the sphere in circles. To avoid drawing the projections of these circles, which would in general be ellipses, we rabatt the plane and then draw the circles in their real shape. And so on in other cases.~~

~~Special attention should in all cases be paid to those points in which the tangents to the projection of the curve of intersection are parallel or perpendicular to the axis x, or where thiese projections touch the contour of one of the surfaces.~~

~~PERSPECTIVE.~~

~~§ 50. We have seen that, if all points in a figure be pro- jected from a fixed centre to a plane, each point on the pro- jection will be the projection of all points on the projecting ray. A complete representation by a single projection is therefore possible only when there is but one point to be~~

~~*projected on each ray. This is the case by projecting from one plane to another, but it is also the case if we project the viszble parts of objects in nature ; for every ray of light meeting the eye starts from that point in which the ray, if we follow its course from the eye, backward nieets for the first time any object. Thus, if we project from a fixed centre the visible part of objects to a plane or other surface, then the outlines of the projection would give the same impression to the eye as the outlines of the things projected, provided that one eye only be used and that this be at the centre of projection. If at the same time the light emanating from the different points in the picture could be made to be of the saine kind—that is, of the same colour and intensity and of the same kind of polarization—as that coming from the objects themselves, then the projection would give sensibly the same impres- sion as the objects themselves. The art of obtaining this result constitutes a chief part of the technique of a painter, who includes the rules which guide him under the name of perspective, distinguishing between linear and aerial perspective,—the former relating to the projection, to the drawing of the outlines, the latter to the colouring and the shading off of the colours in order to give the appearance of distance. We have to deal only with the former, which is in fact a branch of geometry consisting in the applications of the rules of projection.*~~

~~*§ 51. Our problem is the following:—There is given a figure in space, the plane of a picture, and a point as centre of projection ; ut is required to project the figure from the point to the plane.*~~

~~*From what has been stated about projection in general it follows at once that the projection of a point is a point, that of a linea line. Further, the projection of a point at infinity in a line is in general a finite point. Hence parallel lines are projected into a pencil of lines meeting at some finite point. This point is called the vanishing point of the direction to which it belongs. To find it, we project the point at infinity in one of the parallel lines; that is, we draw through the eye a line in the given direction. This cuts the picture plane in the point required.*~~

~~*Similarly all points at infinity in a plane are projected to a line (§ 6) which is called the vanishing line of the plane and which is common to all parallel planes.*~~

_All lines parallel to a plane have their vanishing points in a line, viz., in the vanishing line of the plane.

All lines parallel to the picture plane have their vanishing points at infinity in the picture plane; hence parallel lines which are parallel to the picture plane appear in the projection as parallel lines in thetr true direction.

The projection of a line is determined by the projection of two points in tt, these being very often its vanishing point and its trace on the picture plane. The projection of a point is determined by the pro- jection of two lines through it.

PEGE TION

These are the general rules which we now apply. We suppose

the picture plane to be vertical.

§ 52. Let (fig. 21) S be the centre of projection, where the eye is situated, and which in perspective is called the point of sight, ABKL the picture plane, ABMN a horizontal plane on which we suppose the ob- jects to rest of which a perspective drawing is to be made. The lowest plane which contains points that are to appear in the picture is generally selected for this purpose, and is therefore called the ground plane, or some- times the geometrical plane. It cuts the picture plane in a horizontal line AB called the ground line or base line or funda- mental line of the picture. Fi A horizontal line SV, ig. 21. drawn through the eye S perpendicular to the picture, cuts the latter at a point V called the centre of the picture or the centre of vision. The distance SV of the eye from the picture is often called the distance simply, and the height ST of the eye above the ground the height of the eye.

The vanishing line of the ground plane, and hence of every hori- zontal plane, is got by drawing the projecting rays from S to the points at infinity in the plane—in other words, by drawing all hori- zontal rays through S. These le in a horizontal plane which cuts the picture plane in a horizontal line DD' through the centre of vision V. This line is called the horizon in the picture. It con- tains the vanishing points of all horizontal lines, the centre

~~*of vision V being the vanishing point of all Lines parallel to SV, that is perpendicular to the picture plane. To find the vanishing point of any other line we draw through S the ray projecting the point at infinity in the line; that is, we draw through S aray parallel to the Tine, and determine the point where this ray cuts the picture plane. If the line is given by its plan on the ground plane and its elevation on the picture plane, then its vanishing point can at once be deter- mined ; it is the vertical trace of a line parallel to it through the eye (comp. § 35).*~~

~~*§ 538. To have construction in a single plane, we suppose the pic- ture plane turned down into the ground plane; but before this is done the ground plane is pulled forward till, say, the line MN takes the place of AB, and then the picture plane is turned down. By this we keep the plan of the figure and the picture itself separate. In this new position the plane of the picture will be that of the paper (fig. 22). On it are marked the base line AB, the ceutre of vision V, and the horizon DD', and also the limits ABKL of the actual picture. These, however, need not necessarily be marked. In the plan the picture plane must be supposed to pass through A,B, and to be perpendicular to the ground plane. If we further suppose that*~~

~~*the horizontal plane ame! through the eye which A Qw, R, B, cuts the picture plane Fig. 22*~~

~~*in the horizon DD' be 5 turned down about the horizon, then the centre of sight will come to the point 8, where VS equals the distance of the eye.*~~

~~*To find the vanishing point of any line in a horizontal plane, we have to draw through S a line in the given direction and see where it euts the horizon. For instance to find the vanishing*~~

~~*points of the two horizontal direetions which make angles of 45° |*~~

~~*with the horizon, we draw through S lines SD and SD' making each an angle of 45° with the line DD'. by making VD and VD' each equal to the distance SV. points D, D' are therefore called the distance points.*~~

~~*§ 54. Let it now be required to find the perspective P of a point P, (figs. 21 and 22) inthe ground plane. We draw through P, two lines of which the*~~

~~projection can easily be found. The most con- venient lines are the perpendicular to the. base line, and a line making an angle of 45° with the picture plane. These lines in the~~

~~These points can also be found | The two |~~

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~~ground plan are P,Q, and P,R,. The first cuts the picture at Q, or at Q, and has the vanishing point V; hence QV is its perspeetive. The other cuts the picture in R,, orrather in R, and has the vanish- ing point D; its perspective is RD. These two lines meet at P, which is the point reqnired. It will be noticed that the line QR=Q,R,=Q,P, gives the distance of the point P behind the pic- ture plane. Hence if we know the point Q where a perpendicular from a point to the picture plane cuts the latter, and also the dis- tance of the point behind the picture plane, we can find its perspec- tive. We join Q to V, set off QR to the right equal to the distance of the point behind the picture plane, and join R to the distance point to the left; where RD cuts QV is the point P required. Or we set off QR' to the left equal to the distance and join R' to the dis- tance point D' to the right.~~

~~If the distance of the point from the picture should be very great, the point R might fall at too great a distance from Q to be on the drawing. In this case we might set off QW equal to the wth part of the distance and join it to a point E, so that VE equals the mth part of VD. Thus if QW=4QR and VE=3VD, then WE will again pass through P. It is thus possible to find for every point in the ground plane, or in fact in any horizontal plane, the perspective ; for the construction will not be altered if the ground plane be replaced by any other horizontal plane. We can in fact now jind the perspective of every point as soon as we know the foot of the per- pendicular drawn from tt to the picture plane, that ts, if we know its elevation on the picture plane, and its distance behind it. For this reason it is often convenient to draw in slight outlines the clevation of the figure on the picture plane.~~

~~Instead of drawing the elevation of the figure we may also proceed as follows. Suppose (fig. 23) A, to be the projection of the~~

~~*H*~~

~~*“1*~~

~~*2*~~

~~*Sgt*~~

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~~*es*~~

~~*R Fig. 23.*~~

~~*plan of a point A. Then the point A lies vertically above A, because vertical lines appear in the perspective as vertical lines*~~

~~*($51). If then the line VA, cuts the picture plane at Q, and we erect at Qa perpendicular in the picture plane to its base and set off on it QA, equal to the real height of the point A above the ground plane, then the point A, is the elevation of A and hence the line A,V will pass through the point A. The latter thus is deter- mined by the intersection of the vertical line through A, and the line A.V.*~~

~~*This process differs from the one mentioned before in this that the construction for finding the point is not made in the horizontal plane in which it lies, but that its plan is constructed in the ground plane. But this has a great advantage. The perspective of a hori- zontal plane from the picture to the line at infinity occupies in the picture the space between the line where the plane cuts the picture and the horizon, and this space is the greater the farther the plane is from the eye, that is, the farther its trace on the picture plane lies from the horizon. “~The horizontal plane through the eye is projected into a line, the horizon; hence no construction can be*~~

~~*erformed in it. The ground plane on the other hand is the lowest 1orizontal plane used. HIence it offers most space for constructions, which consequently will allow of greater accuracy.*~~

~~§ 55. The process is the same if we know the coordinates of the point, viz., we take in the base line a point O as origin, and we take the base line, the line OV, and the perpendicular OZ as axes of coordinates. If we then know the coordinates x, y, 2 measured in these directions, we make OQ=z, set off on QV a distance QA such that its real length QR=y, make QA,=z, and find A as before. This process might be simplified by setting off to begin with along'OQ and OZ scales in their true dimensions and along OV a scale obtained by projecting the scale on OQ from D to the line OF.~~

~~§ 56. The methods explained give the perspective of any point in space. If lines have to be found, we may determine the perspec- tive of two points in them and join these, and this is in many cases the most convenient process. Often, however, it will be advantageous to determine the projection of a line directly by finding its vanishing point. This is especially to be recommended when a number of parallel lines have to be drawn.~~

~~The perspective of any curve is in general a curve. jection of a conic is a conic, or in special cases a line.~~

~~The pro- The~~

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~~perspective of a circle may be any conic, not necessarily an ellipse. Similarly the perspective of the shadow of a circle on a plane is some conic. : bees~~

~~§ 57. A few words must be said about the determination of shadows in perspective. The theory of their construction 1s very simple. We have given, say, light. : J : the shadow and produce this line till it cuts the surface on which the shadow falls. These constructions must in many cases first be performed in plan and elevation, and then the point in the shadow has to be found in perspective. The constructions are different according as we take as the source of light a finite point (say, the flame of a lamp), or the sun, which we may suppose to be at an infinite distance. ;~~

~~If, for instance, in fig. 23, A is a source of light, EHGF a vertical wall, and C a point whose shadow has to be determined, then the shadow must le on~~

~~*the line joining A to C. To see where this ray meets the floor we draw through the source of light and the point C a vertical plane. This will cut the floor in a line which contains the feet A,, C, of the perpendiculars drawn from the points A, C to the floor, or the plans of these points. At C', where the line A,O, cuts AC, will be the shadow of C on the floor. If the wall EHGF prevents the shadow from falling on the floor, we determine the intersection K of the line A,C, with the base EF of the wall and draw a vertical through it, this gives the intersection of the wall with the vertical plane through A and C. Where it cuts AC is the shadow C" of C on the wall.*~~

~~*If the shadow of a screen CDD,C, has to be found we find the shadow D' of D which falls on the floor; then D,D' is the shadow of D,D and D'C' is the shadow on the floor of the line DC. The shadow of D,D, however, is intercepted by the wallat L. Here then the wall takes up the shadow, which must extend to D" as the shadow of a line on a plane is a line. Thus the shddow of the screen is found in the shaded part in the figure.*~~

~~*§ 58. If the shadows are due to the sun, we have to find first the perspective of the sun, thatis, the vanishing point of its rays. This will always be a point in the picture plane; but we have to distin- guish between the cases where the sun is in the front of the picture, and so behind the spectator, or behind the picture plane, and so in front of the spectator. In the second case only does the vanishing point of the rays of the sun actually represent the sun itself. It will be a point above the horizon. In the other case the vanishing point of the rays will lie below the horizon. It is the point where a ray of thesun through the centre of sight S cuts the picture plane, or it will be the shadow of the eye on the picture. In either case the ray of the sun through any point is the line joining the per- spective of that point to the vanishing point of the sun's rays. But in the one case the shadow falls away from the vanishing point, in the other it falls towards it. The direction of the sun's rays may be given by the plan and elevation of one ray.*~~

~~*For the construction of the shadow of points it is convenient first to draw a perpendicular from the point to the ground and to find its shadow on the ground. But the shadows of verticals from a point at infinity will be parallel; hence they have in perspective a vanishing point L, in the horizon. To find this point, we draw that vertical plane through the eye which*~~

~~contains a ray of the sun, This cuts the horizon in the required point L, and the picture plane in a vertical line which contains the vanishing point of the sun's rays themselves. Let then (fig. 24) L be the vanishing~~

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~~Fig. 24.~~

~~point of the sun's rays, L, be that of their projection in a horizon- tal plane, and let it be required to find the shadow of the vertical column AH. We draw AL, and EL; they meet at E', which is the shadow of E. Similarly we find the shadows of F, G, H. Then E'F'G'H' will be the shadow of the quadrilateral EFGH. For the shadow of the column itself we join E' to A,~~

~~*&c., but only mark the outlines; F'B, the shadow of BF, does not appear as such in the figure.*~~

~~*If the shadow of E has to be found when falling on any other surface we use the vertical plane through E, determine its inter-*~~

~~*PR O—*~~

~~*| slightly modified. The general principles will remain true.*~~

~~*a figure and a point L as source of |*~~

~~*We join the point L to any point of which we want to find | somewhat more complicated.*~~

~~*_ it would be necessary to have a representation in plan and eleva-*~~

~~*| enter.*~~

~~*PRO*~~

~~*section with the surface, and find the point where this intersection*~~

~~*/ is cut by the line EL. This will be the required shadow of E.*~~

~~*§ 59. If the picture is not to be drawn on a vertical but on an- other plane—say, the ceiling of a room—the rules given have to be But if the picture is to be on a curved surface the constructions beconie In the most general case conceivable*~~

~~*tion of the figure required and of the surface on which the pro- jection has to be made. A number of points might also be found by calculation, using coordinate geometry. But into this we do not Asan example we take the case of a panorama, where the surface is a vertical cylinder of revolution, the eye being in the axis. The ray projecting a point A cuts the cylinder in two points ou opposite sides of the eye, hence geometrically speaking every point has two projections ; of these only the one lying on the half ray from the eye to the point can be used in the picture. But the other has sometimes to be used in constructions, as the projection of a line has to pass through*~~

~~*both. Parallel lines have two vanish- ing points which are found by drawing a line of the given direction through the eye; it cuts the cylinder in the vanishing points reqnired. This operation may be performed by drawing on the ground the plan of the ray through the foot of the axis, and through the point where it cuts the cylinder a vertical, on which the point required must lie. Its height above is easily found by making a drawing of a vertical section on a reduced scale.*~~

~~*Parallel planes have in the same manner a vanishing curve. This will be for horizontal planes a horizontal circle of the height of the eye above the ground. For vertical planes it will be a pair of generators of the cylinder. For other planes the vanishing curves will be ellipses having their centre at the eye.*~~

~~*The projections of vertical lines will be vertical lines on the cylinder. Of all other lines they will be ellipses with the centre at the eye. If the cylinder be developed into a plane, then these ellipses will be changed into curves of sines. Parallel lines are thus represented by curves of sines which have two points in common. There is no difficulty in making all the constructions on a small scale on the drawing board and then transferring them to the cylinder.*~~

~~*§ 60. A variety of instruments have been proposed to facilitate perspective drawings. If the problem is to make a drawing from nature then a camera obscura or, better, Wollaston's camera lucida may be used. Other instruments are made for the construction of perspective drawings. It will often happen that the vanishing point of some direction which would be very useful in the construc- tion falls at a great distance off the paper, and various methods have been proposed of drawing lines through sucha point. For some of these see Stanley's Descriptive Treatise on Mathematical Drawing Instruments.*~~

~~*Literature.—Descriptive geometry dates from Monge, whose Géométrie Descrip- tive appeared in 1800. Before his time plans and elevations, especially of build- ings, had been in use, and rules had been developed to determine by construction from drawings the shapes of the stones required in bnildings, especially in vaults and arclies, These rules were reduced to a consistent method by Monge.*~~

~~*Perspective was investigated much earlier, as painters felt the need of it. Its beginnings date from the time of the Greek mathematicians, but its modern development from the time of the Renaissance, when the first books on the subject appeared in Italy. Albrecht Diirer also published a treatise on it and constructed amachine for making perspective drawings of objects. Of later writers we men- tion in the 17th century Desargues, and in the 18th Dr Brook Taylor, whose Linear Perspective appeared first in 1715 and New Principles of Linear Perspective in 1719. At present perspective is generally treated as a special case of projec- tion, and included in books on descriptive geometry.*~~

~~*For the literature of projection in general, we refer to the list of books given under GEOMETRY, vol. x. p. 407. For descriptive geometry and perspective. see Monge, Géometrie Descriptive; Leroy, Traité de Géometrie Descriptive ; Fiedler, Darstellende Geometrie, Gournerie, Traité de Perspective, Mannheim, Géométrie Descriptive (1880) and Eléments dela Géométrie Descriptive (1882); J. Woolley, Descriptive Geometry (1856), which is based on Leroy's work, and is the only scientific publication on the subject in England. A number of other publications with titles such as " Practical Geometry" and "Geometrical Drawing" contain more or less full explanations of the methods of descriptive geometry. These are based generally on Euclidian as opposed to projective geometry, and are there- fore in their theoretical part more or less unsatisfactory. We may mention Angel, Practical Plane Geometry and Projection. (O. H.)*~~

~~*PROJECTION OF THE SPHERE. See Grocrarny.*~~

~~*PROME, a district in Pegu division, British Burmah, India, between 18° 30' and 19° 15' N. lat., and 94° 40' and 96° E. long., containing an area of 2887 square miles. It occupies the whole breadth of the valley of the lrawadi, between Thayet district on the north and Hen- zada and Tharawadi districts on the south, and originally extended as far as the frontier of the province of Burmah, but in 1870 Thayet was formed into an independent juris- diction. There are two mountain ranges in Prome, which form respectively the eastern and western boundaries. The Arakan Yoma extends along the whole of the western side, and that portion of the district lying on the right bank of the Trawadi is broken up by thickly wooded spurs*~~

~~running in a south-easterly direction, the space for cultiva- tion being but limited and confined to the parts adjacent to the river. On the eastern side lies the Pegu Yoma, and north and north-east of the district its forest-covered spurs form numerous valleys and ravines, the torrents from which unite in one large stream called the Na-weng river. The most important of the plains lie in the south and south- west portions of Prome, and extend along the whole length of the railway that runs between the towns of Poungdé and Prome ; they are mostly under cultivation, and those in the south are watered bya series of streams forming the Myit- ma-kha or upper portion of the Hlaing. There are in addition large tracts of land covered by tree-jungle which are available for cultivation. The principal river is the Irawadi, which intersects the district from north to south ; next in importance are the Tha-ni and its tributaries and the Na-weng system of rivers. In the hills near the capital the soil is of Tertiary formation, and in the plains it is of alluvial deposit. The climate is much drier than other districts in British Burmah. The total rainfall in 1882 was 49°64 inches.~~

~~In 1881 the population was 322,342 (161,488 males and 160,909 females). Buddhists and Jains numbered 313,261, Mohammedans 1795, Hindus 978, Christians 336, Aborigines 5818, and Parsees 5. More than two-thirds of the population are agriculturists. The chief towns are Prome (see below), and Shwedoung and Poungdé, with 12,373 and 6727 inhabitants respectively. The chief products are rice, teak, eutch, silk, sugar cane, cotton, tobacco, and sesame oil; but the staple product is rice, which is cultivated mainly in the Poungdé and Shwe-doung townships. The total area under cultivation in 1882 was 234,222 acres. One of the most important manufactures is silk ; others are ornamental boxes, coarse brown sugar, and cutch. The gross revenue of the district in 1882 amounted to about £92,000, of which overa third was derived from the land.~~

~~The early history of the once flourishing kingdom of Prome, like that of the other states which now form portions of the province of British Burmah, is veiled in obscurity. Fact and fable are so interwoven that it is impossible to disentangle the true from the false. After the conquest of Pegu in 1758 by Aloung-bhura, the founder of the third and present dynasty of Ava kings,~~

~~*Prome remained a province of the Burman kingdom till the close of the second Burmese war in 1858, when the province of Pegu was annexed to British territory.*~~

~~*PROME, chief town of the above district, on the left bank. of the Irawadi, had a population in 1881 of 28,813 (males 14,982, females 13,831). To the south and south-east the town is closed in by low pagoda-topped hills, on one of which stands the conspicuous gilded Shwe Tsan-daw. The town was taken by the British in 1825 and again in 1852, on both occasions with hardly any opposition from the Burmese. In 1862 it was almost entirely destroyed by fire, and was afterwards relaid out in straight and broad streets. It was erected into a municipality in 1874, and since then great improvements have been made. Its principal manufactures are silk cloths and lacquer ware.*~~

~~*PROMETHEUS, son of the Titan Iapetus by the sea nymph Clymene, is the chief "culture hero," and, in some accounts, the Demiurge of Greek mythical legend. Asa culture-hero or inventor and teacher of the arts of life, he belongs to a wide and welltknown category of imaginary beings. Thus Qat, Quahteaht, Pundjel, Maui, Ioskeha, Cagn, Wainamoinen, and an endless array of others repre- sent the ideal and heroic first teachers of Melanesians, Ahts, Australians, Maoris, Algonquins, Bushmen, and Finns. Among the lowest races the culture-hero com- monly wears'a bestial guise, is a spider (Melanesia), an eagle hawk (Australia), a coyote (north-west America), a dog or raven (Thlinkeet), a mantis insect (Bushman), and so forth, yet is endowed with human or even superhuman qualities, and often shades off into a permanent and practically deathless god. Prometheus, on the other hand, is purely anthropomorphic. He is the friend and*~~

~~*benefactor of mankind. He defends them against Zeus, who, in accordance with a widely diffused mythical theory, desires to destroy the human race and supplant them with a new and better species, or who simply revenges a trick in which men get the better of him. The pedigree and early exploits of Prometheus are given by Hesiod (Zheog., 510-616). On a certain occasion gods and men met at Mecone. The business of the assembly was to decide what portions of slain animals the gods should receive in sacrifice. On one*~~

~~*side Prometheus arranged the best parts of the ox covered with offal, on the other the bones covered with fat. Zeus was invited to make his choice, chose the fat, and found only bones beneath. A similar fable of an original choice, in which the chooser is beguiled by appearances, recurs in Africa and North America. The native tribes adapt it to explain the different modes of life among themselves and white men. In wrath at this trick, according to Hesiod, or in other versions for the purpose of exterminating the remnants of people who escaped the deluge of Deucalion, Zeus never bestowed, or later withdrew, the gift of fire. In his "philanthropic fashion," Prometheus stole fire, concealed in a hollow fennel stalk (Hesiod, Op. et Di.), and a fennel stalk is still used in the Greek islands as a means of carrying a light (cf. Pliny, xiii. 22). According to some legends he gained the fire by holding a rod close to the sun. Pro- bably the hollow fennel stalk in which fire was carried got its place in myth from the very fact of its common use.*~~

~~*We thus find Prometheus in the position of the fire-bringer, or fire-stealer, and so connected with a very wide cycle of similar mythical benefactors. Among the Murri of Gippstand, to begin with a backward people, the fire-stealer was a man, but he became abird. Tow-e-ra, or fire, was in the possession of two women who hated the blacks. A man who loved men cajoled the women, stole fire when their backs were turned, and was metamorphosed into "a little bird with a red mark on its tail, which is the mark of fire." The fire-bringer in Brittany is the golden or fire-crested wren. Myths hike this kill two birds with one stone, and at onee account for the possession of fire by men and for the marking of certain animals regarded as fire-bringers.1_ In another Australian legend fire was stolen by the hawk from the bandicoot, and given to men. In yet another a man held his spear to the sun, and so got alight. A bird is fire-bringer in an Andaman island tale, and a ghost in another myth of the samc island.2_ In New Zealand, Maui stole fire from Mauika, the lord of fire. He used a bird's inter- vention. Among the Ahts, in North America,' fire was stolen by animals from the euttle-fish, Among the Thlinkeets, Yehl, the raven-god, was the fire-stealer. Among the Cahroes, the coyote steals fire from "two old women." Among the Aryans of India, Soma is stolen by birds, as water is among the Thlinkeets, and mead in the Edda.* Fire concealed himself, in the Veda, was dragged from his hiding place by Matarigvan, and was given to the priestly clan of Bhrigu. We also hear that Mataricvan " brought fire from afar" (R.*~~

~~*V., iii. 9, 5), and that Bhrigu found fire lurk- ing in the water (R. V., x. 46, 2).º*~~

~~*In considering the- whole question, one must beware of the hasty analogical method of reasoning too common among mythologists. For example, when a bird is spoken of as the fire-bringer we need not necessarily conclude that, in each case, the bird means lightning. On the other hand, the myth often exists to explain the cause of the mark- ings of certain actual species of birds. Again, because a hero is said to have stolen or brought fire, we need not regard that hero as the personification of fire, and explain all his myth as a fire-myth. The legend of Prometheus has too often been treated in this fashion, though he is really a culture hero, of whose exploits, such as making*~~

~~*1 For these see Brough Smith, Aborigines of Victoria; Kuhn, on bird fire-bringer in Isle of Man, Die Herabkunft des Feuers, p. 109.*~~

~~*2 Journ. Anthrop. Inst., Nov. 1884.*~~

~~*3 Sproat, Savage Life.*~~

- ~~*Bancroft, iii. 100;*~~

~~*> Compare Bergaighe, Za Religion Védique, i. 52-56, and Kuhn's Herabkunft ; and see the essays by Steinthal in appendix to English version of Goldziher's Mythology among the Hebrews.*~~

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~~*men of clay, fire-stealing is no more than a single example. This tendency to evolve the whole myth of Prometheus from a belief that he is personified fire, or the fire-god, has been intensified by Kuhn's ingenious and plausible etymo- logy of the name Ipopnfevs. The Greeks derived it from mpopnOys, '" provident," and connected it with such other words as mpouyféopar, mpop7ea. — They had also the proper name "Exiuybevs for the slow-witted brother of Prometheus who turned all the hero's wisdom to foolish- ness. Against these very natural etymologies the philo- logists support a theory that Prometheus 1s really a Greek form of pramantha (Skt.), the fire-stick of*~~

~~*the Hindus. The process of etymological change, as given by Steinthal, was this. The boring of the perpendicular in the horizontal fire-stick, whereby fire was kindled, was called manthana, from math, "I shake." The preposition pra was prefixed, and you get pramantha. But Matarig- van was feigned to have brought Agni, fire, and "the fetching of the god was designated by the same verb mathniémi as the proper earthly boring" of the firestick. "Now this verb, especially when compounded with the preposition pra, gained the signification to tear off, snatch to oneself, rob."! Steinthal goes on—'"' Thus the fetching of Agni became a robbery of the fire, and the pramdtha (fire-stick) a robber. The gods had intended, for some reason or other, to withhold fire from men; a benefactor of mankind stole it from the gods. This robbery was called pramdtha; pramdthyu-s is 'he who loves boring or robbery, a borer or robber.' From the latter words, according to the peculiarities of Greek phonology, is formed Ipopzyfev-s, Prometheus. He is therefore a fire- god," &c. Few things more ingenicus than this have ever been done by philologists. It will be observed that "forgetfulness of the meaning of words" is made to account for the Greek belief that fire was stolen from the gods. To recapitulate the doctrine more succinctly, men originally said, in Sanskrit (or some Aryan speech more ancient still), " fire is got by rubbing or boring ;" nothing could have been more scientific and straightforward. They also said, " fire is brought by Matarievan ;" nothing can be more in accordance with the mythopceic mode of thought. Then the word which means " fetched" is con- fused with the word which means "bored," and gains the sense of "robbed." Lastly, fire is said (owing to this confusion) to have been stolen, and the term which meant the common savage fire-stick is by a process of delusion conceived to represent, not a stick, but a person, Prometheus, who stole fire. Thus then, according to the philologists, arose the myth that fire was stolen, a myth which, we presume, would not otherwise have occurred to Greeks. Now we have not to decide whether the Greeks were right in thinking that Prometheus only meant "the fore-sighted wise man," or whether the Germans know better, and are correct when they say the name merely meant "fire-stick." But we may, at least, point out that the myth of the stealing of fire and of the fire-stealer is current among races who are not Aryan, and never heard the word pramantha. We have shown that Thlinkeets Ahts, Andaman Islanders, Australians, Maoris, South Sea Islanders, Cahrocs, and others all believe fire was origin- ally stolen. Is it credible that, in all their languages, the*~~

~~name of the fire-stick should have caused a confusion of thought which ultimately led to the belief that fire was obtained originally by larceny? If such a coincidence appears Incredible, we may doubt whether the belief that 18 common to Greeks and Cahroes and Ahts was pro- duced, in Greek minds by an etymological confusion, in Australia, America, and so forth by some other cause. What, then, is the origin of the widely-diffused myth that~~

- ~~Of. Kuhn, op. cit., pp. 16, 17.~~

~~fire was stolen? We offer a purely conjectural suggestion. No race is found without fire, but certain races? are said to have no means of artificially reproducing fire ; whether this be true or not, certainly even some civilized races have found the artificial reproduction of fire very tedious. Thus we read (Od., v. 488-493), " "As when a man hath hidden away a brand in the black embers at an upland farm, one that hath no neighbour nigh, and so saveth the seed of fire that he may not have to seek a light other- where, even so did Odysseus cover him with the leaves." If, in the Homeric age, men found it so hard to get the seed of fire, what must the difficulty have been in the earliest dawn of the art of fire-making? Suppose, then, that the human groups of early savages are hostile. One group lets its fire go out, the next thing to do would be to borrow a light from the neighbour, perhaps several miles off. But, if the neighbours are hostile, the unlucky group is cut off from fire, zgni interdicitur. The only way to get fire in such a case is to steal it. Men accustomed to such a precarious condition might readily believe that the first possessors of fire, wherever they were, set a high value on it, and refused to communicate it to others. Hence the belief that fire was originally stolen. This hypothesis at least explains all myths of fire-stealing by the natural needs, passions, and characters of men, "a jealous race," whereas the philological theory explains the Greek myth by an exceptional accident of changing language, and leaves the other widely diffused myths of fire-stealing in the dark. It would occupy too much space to discuss, in the ethnological method, the rest of the legend of Prometheus. Like the Australian Pundjel, and the Maori Tiki, he made men of clay. He it was who, when Zeus had changed his wife into a fly, and swallowed her, broke open the god's head and let out his daughter Athene. He aided Zeus in the~~

~~*struggle with the Titans. He was punished by him on some desolate hill (usually styled Cau- casus) for fire-stealing, and was finally released by Heracles.*~~

~~*His career may be studied in Hesiod, in the splendid Prometheus Vinctus of Aischylus, with the scholia, in Heyne's Apollodorus, in the excursus (1) of Schiizius to the Aischylean drama, and in the frequently quoted work of Kuhn. The essay of Steinthal may also be examined (Goldziher, Myth. Hebr., Engl. transl., p. 363-892), where the amused student will discover that "Moses is a Pra- manthas," with much else that is learned and convincing. See also Mr Tylor's Early History of Alan; Mr Nesfield in Calcutta Review, January, April, 1884; and above, art. Fig, vol. ix. p. 227 sq. cL Ie)*~~

~~*PRONGBUCK. See ANntTELoPE, vol. i. p. 102, and Plate I. fig. 6.*~~

~~*PRONY, Gasparp CLAIR Francois Mariz RIcHE DE (1755-1839), a celebrated French engineer, was born at Chamelet, in the department of the Rhone, 22d July 1755, and was educated at the Ecole des Ponts et Chaus- sées. His Mémoire sur la poussée des voiites published in 1783, in defence of the principles of bridge construction introduced by his master Peronnet, attracted special atten- tion. Under Peronnet he was engaged in restoring the fort of Dunkirk in 1785, and in erecting the bridge of Louis XVI. in 1787. The laborious enterprise of drawing up the famous Zables du Cadastre was entrusted to lis direction in 1792, and in 1798 he was appointed director at the Ecole des Ponts et Chaussées. He was employed by Napoleon to superintend the engineering operations both for protecting the province of Ferrara against the inundations of the Po and for draining and improving the Pontine Marshes. After the Restoration he was likewise engaged in regulating the course of the Rhone, and in several other important works. He was made a baron in 1828, and a peer in 1835. He was also a member of the principal academies and scientific societies of Europe. He died at Lyons 31st July 1839.*~~

~~*2 Tylor, Zarly History of Man.*~~

~~*PEGE GAN DA*~~

~~PROPAGANDA, or Sacred Congregation de Propaganda Fide, is the name given to a commission of cardinals appointed for the direction of the missions of the Roman Church. The idea of forming such an institution was conceived by Pope Gregory XIII. and other pontiffs, but it was Gregory XV. (1621-1623) who, after having sought counsel from cardinals and information con- cerning the state of religion in various countries from apostolic nuncios and superiors of religious erders, pub- lished, 22nd July 1622, the bull Jnscrutabile by which he founded the Congregation of Propaganda and provided means for its continuance. The cardinal vicar and the cardinal secretary of state were amongst its first members. Additional privileges were granted it by other bulls; and all the pontifical colleges founded up to that date as well as those which should afterwards be founded for the propagation of the faith were declared subject to the Propaganda. The deliberations of this body, embracing a great variety of important questions, when formulated in decrees and signed by the cardinal prefect and the secre- tary were declared by Urban VIII., in 1634, to have the force of apostolic constitutions, which should be inviolably observed. The cardinal prefect. is the head of the Con- gregation, and as such governs the Catholic missions of the world ; the secretary is assisted by five subalterns (minu- tanti), who act as heads of departments, and these again are assisted by inferior employees (scrittori). The more important acts of the Congregation, which are discussed in weekly meetings by the cardinal prefect and the officials, are submitted to the pope for his supreme decision. The archives of the institution were transferred, in 1660, from the Vatican to the Palazzo Ferrattini in the Piazza di Spagna, Rome, which is the seat of the Congregation. They form a valuable collection of historical, ethnographical, and geographical documents, embracing a period of two hundred and fifty years, and serve as a record of past events and of precedents to be followed in decisions on questions that may arise. The funds of the institution were supplied in the first instance by Gregory XV. and by private bequests. Cardinal Barberini, brother of Urban VIIL, provided for eighteen places in perpetuity for students, Mgr. Vives for ten. Pope Innocent XII. be- queathed to it 150,000 crowns in gold; Clement XII. gave it 70,000 crowns. In the second assembly of the Congregation it was proposed, and accepted as a rule, that prelates on being raised to the dignity of cardinal should pay for a ring offered them by the pope a sum which was at first fixed at 545 golden scudi, and which is now 600 Roman~~

~~*scudi. Large donations were made to the Propa- ganda by Catholics in England, Scotland, Ireland, the United States, Spain, and" Italy. The cardinal prefect administers the property of the institution in the name of the Congregation. To provide for the affairs of the Church of the Oriental Rite, Pius IX., in 1862, appointed a special Congregation with its own secretary, consultors, and officials.*~~

~~*The primary purpose of the Propaganda being to secure laborious and pious missionaries, colleges for their education and training were established. Chief amongst these is the Propaganda or Urban College in Rome, so named from Urban VIII. It is a general missionary seminary for the whole world. Here students are received from all foreign nations, and there are special foundations for Georgian, Persian, Chaldean, Syrian, Coptic, Brahman, Abyssinian, Armenian, Greek, and Chinese students, as well as for students from England, Ireland, America, and Australia, although thiese last have special colleges in Rome. After the age of fourteen each student takes an oath to serve the missions during his whole life in the ecclesiastical province or vicariate assigned to him by the Congregation, to which*~~

~~*he must send annually an account of himself and of his work. He is maintained and clothed free of expense. His studies embrace the full course of Greek, Latin, and Italian letters, some of the chief Oriental languages, as Hebrew, Syriac, Arabic, Armenian, and, when necessary, Chinese. There are also schools for the teaching of rational and natural philosophy, a complete course of theology, and the institutions of canon law. Besides this principal seminary, the Propaganda has colleges dependent on it both in Rome and in other countries, under the direction of regular and secular priests. From its begin- ning it had at its disposition national colleges,— such as the English, founded by Gregory XIII. ; the Irish, by Cardinal Ludovisi in 1628 ; the Scotch, by Clement VIII. in 1600 ;*~~

~~*the German and Hungarian; the American, of the United States, opened by Pius IX. in 1859; the Greek, founded by Gregory XIII; the Armenian, recently established by Leo XIIT.; and the Bohemian, opened 4th November 1884. The jurisdiction of the Propaganda extends over the English colleges*~~

~~*of Lisbon and Valladolid, the Irish college of Paris, and the American of Louvain. Until recently it had the Chinese college of Naples, transformed by the Italian Government, and the Illyrian college of Loreto, suppressed by the same Government ; and it still has the Albanian pontifical college of Scutari. Besides these, other colleges serve for the education of missionaries for the Pro- paganda, as the college of SS. Peter and Paul in Rome, founded by Pius IX., in Milan the seminary of St Calocero for all foreign missions, and at Genoa the College Brignole Sale for Italian emigrants to America. The institutions at Verona for central Africa are the support of the missions in the Soudan. Chief of all the seminaries is that of Paris which, for two centuries, has supplied missionaries for India and China. To these is committed the vast college of the island of Pulo Penang, where young men from China and neighbouring countries are trained to the priesthood. In Paris many missionaries are taken from the French seminary directed by the fathers of the Congregation of the Holy Ghost, who go to French colonies. At Lyons is the college for African imissions. In Belgium there are the colleges of F oreign Missions, of the Immaculate Conception, and of St Francis Xavier for Chinese missions. In Holland there was recently established the college of Stiel, whose students go to China. In All Hallows College, Ireland, the students are educated for the missions in Australia, Canada, and the Cape of Good Hope. In England a seminary has grown up within a few years at Mill Till, which has already supplied priests to the missions of Borneo and Madras. Previous to the late changes in Rome, the Propaganda had dependent upon it the college of Reformed Minors in 8. Pietro in Montorio,*~~

~~*the Carmelites in S- Pancrazio (suppressed), the Minor Observants of §. Bartolomeo all' Isola recently re- established, the Conventuals (suppressed), and the Irish Minor Franciscans of St Isidore. Outside of Rome there were also colleges of regulars for the missions, as Ocaila in Spain, Sernache in Portugal, and others. The Propaganda, in the establishment of vicariates or new episcopal sees, has always encouraged the formation, as soon as circum- stances would permit, of seminaries for the education of a native clergy, and frequently these have flourished, as the community of the "Houses of God" (case di Dio) in Tong- king, the seminaries of Sze-chuen, of Peking, and of Nanking. The first step taken in a new mission is the erection of a chapel, followed by the opening of a*~~

~~*school and an orphan- age. As numbers increase, and more priests come to the new mission, they are united under a superior invested with special powers by the Propaganda—in fact a prefect apostolic. As churches increase and the faith spreads, a vicar apostolic, who is a bishop 7m partibus, is appointed,*~~

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~~*and, if the progress made requires it, the mission is erected into an episcopal diocese. Such has been the method of proceeding in the American and Canadian missions ; such, in part, what has happened in India, China, and Africa. Through these, whether prefects or vicars apostolic or bishops, the orders of the Propaganda, which are those of the head of the church, are transmitted to the faithful, and they are the ordinary centres of its correspondence, although it does not disdain the reports furnished by the humblest members of the Christian flock. The prelates furnish exact reports to the Propaganda of the progress and circum- stances of the faith in their various missions.*~~

~~*The material means for the diffusion of the faith are supplied in the first place by special grants from the revenues of the Propaganda and from various associations in Europe. The greatest part is furnished by the society for the propagation of the faith of Paris and Lyons. This society is independent of the Propaganda, relying wholly on the energy of the two central councils of Paris and Lyons and on the charity of the faithful, though it attends to the sug- gestions of the Propaganda, which indicates to it the needs of new missions. Contributions are also furnished by other associations, as that of the Holy Infancy, or that for the education of Oriental nations. Similar societies, occupied with the support of special missions, exist in Bavaria, Ger- many, and Austria. The Propaganda likewise takes care that, as soon as a mission is established, pious foundations are constituted by native Christians, and become the local property of the church, and so supply it with a stable and enduring vitality. Subscriptions from Europe are given only to the poorer missions, which, however, are very numerous. One of the most powerful aids adopted by the Propaganda in the diffusion of the faith is the print- ing-press. The*~~

~~*missionaries are required to study the lan- guages of the countries to which they are sent and exhorted to publish books in these languages. Printing-presses are introduced into new missions. In China, what may be described as wooden stereotypes are employed for the printing of Catholic works in the Chinese language. Early in its career the Congregation of Propaganda estab- lished at its seat in Rome the celebrated Polyglott Print- ing Press, and gave it a character of universality. There people of all nations—the Copt, the Armenian, the Arab, the Hebrew, the Japanese, and the native of Malabar— may find books in their native tongue and in their special type. Although great progress has been made by other countries in polyglott printing, the Propaganda press still holds a high position.*~~

~~*The part of the world to which the cardinals of the Congregation of Propaganda first turned their attention was Asia. In no region of the globe has Christianity had greater difficulties to struggle against than in China. An ancient tradition exists, confirmed by documents, that in the early centuries of the Christian era Christianity had penetrated into and left traces in China. It was re- introduced in the 13th century by Franciscan fathers. It flourished at Peking for a time, but died out with the Mongolian dynasty, and China remained closed to Christian influences until 1555, when the Dominican father Gaspare della Croce introduced it into the province of Canton. After he was expelled came the Jesuits Rogeri and Ricci. They established a residence there in 1579, and were followed by Dominicans and Franciscans. These were succeeded a century later by the priests of the Paris seminary of foreign missions, in the last century by le and Lazarists, and in the present century ba : ee ae of the seminary of St Calocero of Milan.*~~

~~*shopties were created in 1688, one at Nanking, the*~~

~~*other at Peking, and the missi chuen ion e missions of Yun-nan and Sze-*~~

~~*At the beginning of the 18th century |*~~

~~*PROPAGANDA*~~

~~*the number of churches in the northern provinces reached 300, and of Christians 300,000. In 1803 a college for native clergy was opened in Sze-*~~

~~chuen, and the work of the Holy Infancy introduced. In 1837 the Portuguese patronage of Chinese missions was brought to an end, with the exception of that exercised over Macao, a Portu- guese colony.~~

~~In 1310 B. Odorico di Friuli, a Franciscan, entered Tibet and made many converts. In 1624 Father D'Andrada penetrated into the same country, but was not allowed to remain. Others followed, and were put to death. In 1847 the Propaganda entrusted to the seminary of foreign missions the task of entering Tibet, and in 1857 a vicariate apostolic was erected on the frontiers. In Mongolia, constituted a vicariate apostolic in 1840, many converts were made and several priests educated in the seminary of Siwang-se. This mission offers great hopes. It was divided into three vicariates in 1883, and is entrusted to the Belgian congregation of the Immaculate Heart of Mary. The Manchuria mission was made a vicariate in 1839; in 1854 a church, S. Maria ad Nives, was erected, and many other churches have since been built for the increasing mission. In 1592 an attempt was made to Christianize Corea; but repeated persecutions crushed out the germs of Christianity. Its first neophyte, its first native priest, its first bishops, and its first European missionaries were martyrs. From 1784 to 1789 4000 Coreans were converted, but their number was greatly reduced by persecution. In 1831 a vicariate was estab-~~

~~| lished ; in 1835 the number of Christians was 6280; in~~

~~1861 they reached 18,000 ; but in 1866 persecution began anew. Christianity was introduced into Japan in 1549 by S. Francis Xavier. In less than fifty years there were in Japan a bishopric, 380 churches, and 30,000 professing Christians. Persecution broke out in 1601, and in 1614 became so fierce that the priests were put to death and the people dispersed. In 1640 all Europeans, missionaries included, were banished from Japan, this proscription continuing for two centuries. Missionaries were admitted in 1843, but so jealously watched that little good was accomplished. In 1863 a treaty was concluded between the emperor of the French and the Japanese Government permitting the preaching of the gospel. The first church was built after a lapse of two centuries; the number of catechumens soon reached 10,000; other churches were constructed ; and the descendants of the old Christians, who had still preserved the faith, came forth from their~~

~~*concealment. A new persecution broke out in 1870; many Christians apostatized; a great number died of . hunger, and many were exiled. Peace was established in 1873. The vicariate apostolic was divided in 1876 into two—the northern and southern vicariates. By the treaty of Peking, concluded between the French and Chinese Governments, liberty of religion was granted in the Chinese empire and a new era opened. In 1873, in the eighteen provinces of the Chinese empire, the number of Catholics was 410,644, with 4054 centres, 1220 churches and public chapels, 294 bishops and missionaries, 252 native priests, 137 European female religious and 924 native, 104 orphanages with 6853 orphans, and 947 schools frequented by 10,624 pupils. In spite of popular tumults and per- secutions these numbers have increased in late years.*~~

~~*In the year of its foundation the Propaganda established a prefecture apostolic in Burmah. Italian Barnabites penetrated into the country in 1721, and two of them, Fathers Gallizio and Nerici, were put to death. The priests of the seminary of foreign missions continue the work, and three vicariates have been established. Malacca was visited by S. Francis Xavier, and was for a long time under the Portuguese jurisdiction ; but a vicariate was*~~

~~*established in 1841 and entrusted to the Paris seminary, which has a college in Penang for natives of China and neighbouring countries. Jesuits, Dominicans, and Fran- ciscans brought the Catholic faith to Siam in the 16th century. The first vicar apostolic was appointed in 1678. A terrible persecution of Christians, causing great loss, broke out in 1772, and it was not till 1821 that the missions were restored. The vicariate was divided into two in 1841. Inthe missions of the Anamite empire, comprising Tong-king and Cochin China, and the missions to Cambodia and to the Laos people, Christianity may be said to have had its birth and its growth in blood, so fierce and numerous have the persecutions been. In the 14th century the faith was introduced by Dominicans and Franciscans, and the first mission established in 1550 by Gaspare della Croce. The Jesuits came in 1615, and in 1665 the Propaganda established here the priests of the seminary of foreign missions. A few years later the number of Christians in the southern*~~

~~*provinces of Cochin China was 17,000, with 60 churches. Persecution followed persecution. The Dominican Father Francesco Gil, after nine years' imprisonment, was martyred in 1745. All foreigners were driven from the kingdom in 1825, and in 1826 an edict was issued against the Christians. What seemed a war of extermination was undertaken in 1833. Missionaries sought refuge in tombs and grottos, whence they issued by night to administer the sacraments.*~~

~~*his coadjutor, several Chinese priests, Mgr. Barie, vicar apostolic of Eastern Tong-king (about to be consecrated bishop), and an incredible number of lay persons of all ranks were put to death. beatification and sanctification of the Anamite martyrs was introduced by the Sacred Congregation of Rites. Perse- cution was renewed in 1844; the exiled missionaries and prelates returned, though a price was put upon their heads. Christianity was proscribed throughout all Anam in 1848 ; native priests were exiled, and European clergy cast into the sea or the nearest river. Nevertheless the vicariate of Cambodia was founded in 1850, and Eastern Cochin China was made a separate vicarlate. A new edict appeared in 1851, again enjoining that European priests should be cast into the sea, and natives, unless they trampled upon the cross, severed intwo. The missionaries Schaefiler and Bonnard were put to death; the vicars apostolic perished of hunger ; the mass of Christians were imprisoned or exiled. In 1856 and 1857 whole Christian villages were burned and their inhabitants dispersed. The edict of 1862 enjoined that Christians should be given in charge to pagans, that their villages should be burned and their property seized, and that on one cheek should be branded the words " false religion." In 1863 the number of martyrs had reached forty thousand, without reckoning those driven into the woods, where they perished. Never- theless, the Anamite church, steeped in blood, has in- creased, and is regarded as the brightest gem of the Propaganda missions,*~~

~~*India is one of the most extensive fields in which the mis- sionaries have laboured. Previous to the founding of the Propaganda the Jesuits had established several missions in India. The introduction of vicars apostolic consolidated the basis of Christianity, and now twenty-three vicariates apostolic and a delegate apostolic direct the spiritual affairs of this great country. In Africa, Catholic missionaries were the first travellers, two*~~

~~*centuries prior to Livingstone and Stanley. The earliest mission was that of Tunis (1624). The missions of the Cape of Good Hope were entrusted to the clergy of Mauritius; the Reformati and the Observants went to Egypt, the Carmelites to Mo-*~~

~~*| of the United States. | Philadelphia, Boston, and Bardstown (Louisville) were*~~

~~*Mgr. Delgado, vicar apostolic of Western Tong-king, Mgr. Henares |*~~

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~~*to Ethiopia and Abyssinia. The spiritual affairs of Africa are directed by one metropolitan and thirty-six bishops, vicars, and prefects apostolic. The progress of Catholicism in Australia is evident from the fact that two metro-politans, those of Melbourne and Sydney, with twelve suffragans direct its ecclesiastical affairs. While the missionary field of the Propaganda embraces Asia, Africa, Oceania, and both Americas, as well as England, Ireland, Scotland, Holland, Germany, Norway and Sweden, Iceland, Greenland, Switzerland, Albania, Macedonia, Greece,*~~

~~*| Turkey, &c., perhaps the most splendid results of its work*~~

~~*are to be met with in the United States and in Canada. In 1632 many Catholics settled with Lord Baltimore in Maryland. A century and a half later, in 1789, they had so increased that the Congregation of Propaganda withdrew them from the jurisdiction of the vicar apostolic of London and formed a new see in Baltimore, comprising the territory*~~

~~*In 1808 the sees of New York,*~~

~~*erected, and Baltimore was made the metropolitan diocese. At the end of 1884 there were twelve metropolitans and seventy-six bishops and vicars apostolic in the United States. In 1659 Mgr. Francois de Laval was the first vicar apostolic of Canada; shortly afterwards the episco- pal see of Quebec was established. Now Canada has four metropolitan and sixteen suffragan sees.*~~

~~*The Italian Government, in virtue of the laws relating to ecclesi- astical property of 1866, 1867, and 19th June 1878, sold the Villa Montalto, Frascati, belonging to the Propaganda, and placed the*~~

~~*| price in the Italian funds, paying interest to the Congregation. | Other property of the Congregation having been sold, a law-suit was | entered upon and decided in the Court of Cassation at Rome, 31st In 1842 the cause of the |*~~

~~*May 1881, in favour of the Propaganda. Appeal was made to the*~~

~~*tribunal of Ancona, where, 14th December 1881, decision was given*~~

~~*against the Propaganda. Appeal being again made, the Court of Cassation of Rome gave final judgment, 9th February 1884, against*~~

~~*the Propaganda. This sentence empowers the Italian Government*~~

~~*to sell the landed or immovable property of the Propaganda, place — the proceeds in the Italian funds, and pay the interest to the*~~

~~*Congregation. Protests against this act have been issued by Pope*~~

~~*Leo XIII., by Cardinal Jacobini, secretary of state to the pontiff,*~~

~~*by nearly all the Catholic bishops, and by innumerable thousands*~~

~~*of lay Catholics and many Protestants. (D. J.)*~~

~~*PROPERTIUS, Sextus, the greatest elegiac poet of Rome, was born of a good Umbrian family, who were con- siderable landed proprietors in the fair and fertile region between Perusia and the river Clitumnus. The seat of the Propertii was at Asisium or Assisi, the birthplace of the famous St Francis; and here also was Propertius born. The year of his birth is uncertain, and it has been vari- ously placed between 57 and 44 B.c. We learn from one passage of Ovid that Propertius was his senior, but also his friend and companion ; from another that he was third in the sequence of elegiac poets, following Gallus, who was born in 69 B.c., and Tibullus, whose birth has been assigned to 54 B.c., and immediately preceding Ovid*~~

~~himself, who, as he tells us elsewhere, was bornin 43 8.c. We shall not be far wrong in supposing he was born about 50 B.c., a date which also agrees well with the indications of the poenis themselves. HIs early life was full of misfortune. HIe buried his father before his time; and grief was closely followed by poverty. After the battle of Philippi and the return of Octavian to Rome the victorious legions had to be provided for; their clamorous need and cupidity could only be appeased by wholesale agrarian confiscation, and the north of Italy had to be surrendered. In common with his fellow poets Virgil and HIorace, Propertius was de- prived of his estate; but, unlike these, he had no patrons at court, and he was reduced from opulence to comparative in- digence. The widespread disaffection which these measures provoked was turned to account by Lucius Antonius, the brother of the triumvir, and his wife, the notorious Fulvia.~~

~~zambique and Madagascar, the Capuchins and Jesuits | The insurrection which is generally known as the bellwm~~

~~812~~

~~Perusinum from its only important incident, the fierce and |~~

~~fatal resistance of Perugia, deprived the poet of another of his relations, who was killed by brigands while making his escape from the lines of Octavian. The loss of his patri- mony, however, thanks no doubt to his mother's providence, did not prevent Propertius from receiving a superior educa- tion. After or, it may be, during its completion he and she left Umbria for Rome; and there, about the year 34)B.C., he assumed the garb of manly freedom. HIe was urged to take up a pleader's profession ; but the serious study went against the grain, and, like Ovid, he found in letters and gallantry a more congenial pursuit. Soon afterwards he made the acquaintance of Lycinna, about whom we know little beyond the fact that she subsequently excited the jealousy of Cynthia, and was subjected to all her powers of persecution (vexandi). This passing fancy was suc- ceeded by a serious attachment, the object of which was the famous "Cynthia." HIer real name was HIostia, and she was a native of Tibur. She was a courtezan of the superior class, somewhat older than Propertius, and seems to have been a woman of singular beauty and varied accom- plishments. HIer own predilections led her to literature ; and in her society Propertius found the~~

~~*intellectual sym- pathy and encouragement which were essential for the development of his powers. Her character, as depicted in the poems, is not an attractive one; but she seems to have entertained a genuine affection for her lover. The inti- macy began in 28 and lasted till 23 B.c. These six years must not, however, be supposed to have been a period of unbroken felicity. Apart from minor disagreements, an in- fidelity on Propertius's part excited the deepest resentment in Cynthia; and he was banished for a year. The quarrel was made up about the beginning of 25 B.c.; and soon after Propertius published his first book of poems and inscribed it with the name of his mistress. Its publication placed him in the first rank of contemporary poets, and amongst other things procured him admission to the literary circle of Mecenas. The intimacy was renewed; but the old enchantment was lost. Neither Cynthia nor Propertius was faithful to the other. The mutual ardour gradually cooled ; motives of prudence and decorum urged the dis- continuance of the connexion; and disillusion changed in- sensibly to disgust. Although this separation might have been expected to be final, it is not certain that it was so. It is true that Cynthia, whose health appears to have been weak, does not seem to have survived the separation long. But a careful study of the seventh poem of the last book, in which Propertius gives an account of a dream of her which he had after her death, leads us to the belief that they were once more reconciled, and that in her last illness Cynthia left to her former lover the duty of carrying out her wishes with regard to the disposal of her effects and the arrange- ments of her funeral. Almost nothing is known of the subsequent history of the poet. He was certainly alive in 16 B.c., as some of the allusions in the last book testify. And there are two passages in the letters of the younger Pliny in which he speaks of a descendant of the poet, one Passennus Paullus. Now in 18 3.c. Augustus carried the Leges Juliz, which offered inducements to marriage and Imposed disabilities upon the celibate. It would seem therefore at least a natural conclusion that Propertius was one of the first to comply with the provisions of the law, and that he married and had at least one child, from whom the contemporary of Pliny was descended.*~~

~~*Propertius appears to have had a large number of friends and acquaintances, chiefly literary, belonging to the circle of Mecenas, Amongst these may be mentioned Virgil, the epic poet Ponticus, Bassus (probably the*~~

~~*iambic poet of the name), and at a later period Ovid. He does not seem to have come across Tibullus ; and his relations with*~~

~~*Pe R«O"P Wh aa A*~~

~~*Horace were not particularly friendly. Horace may have regarded him'as an interloper in the favour of Mecenas, though there is nothing in the poems of Propertius to warrant the supposition. In person Propertius was pale and thin, as was to be expected in one of a delicate and even sickly constitution. He was very careful about his personal appearance, and paid an almost foppish attention to dress and gait. He was of a somewhat voluptuous and self-indulgent temperament, which shrank from danger and active exertion. He was anxiously sensitive about the opinion of others, eager for their sympathy and re- gard, and, in general, impressionable to their influence. His over-emotional nature passed rapidly from one phase of feeling to another; but the more melancholy moods predominated. A vein of sadness runs through his poems, sometimes breaking out into querulous exclamation, but more frequently venting itself in gloomy reflexions and prognostications. He had fits of superstition which in healthier moments he despised. It must be added that the native weakness of his character was no doubt con- siderably increased by his infirm and delicate constitution.*~~

~~*The poems of Propertius, as they have come down to us, consist of four books containing 4046 lines of elegiac verse. 'The unusual length of the second one (1402 lines) has led Lachmann and other critics to suppose that it originally consisted of two books, and they have placed the beginning of the third book at ii. 10, a poem addressed to Augustus. This theory, somewhat modified, has been powerfully advocated by Th. Birt (Das Antike Buchwesen, pp. 413-426). He divides the poems into two parts,—a single book (lib. 1.), published separately and called Cynthia Monobiblos, as in the MSS. and the lemma to Martial (xiv. 189), and a Yetraliblos Syntaxis, a collec- tion of four books, published together, consisting of the remainder of his poems. If this view is correct, the greater part of the first book of the Syntaxis must have been lost, as ii. 1-9 only contain 354 lines. The first book, or Cynthia, was published early in the poet's literary life, and may be assigned to 25 B.c. The date of the publication of the rest is uncertain, but none of them can have been published before 24 B.c., and the last, at any*~~

~~rate, was probably published posthumously. The subjects of the poems are threefold :—(1) amatory and personal, mostly regarding Cynthia—seventy-two (sixty Cynthia elegies), of which the last book contains three; (2) poli-. tical and social, on events of the day—thirteen, including three in the last book ; (3) historical and antiquarian—-six, of which five are in the last book.~~

~~The writings of Propertius are noted for their difficulty ; and this has undoubtedly prejudiced his reputation as a poet. His style seems to unite every element by which a reader could be deterred. Not to speak of the unequal quality of his workmanship, in which curtness alternates with redundance, and carelessness with elaboration, the indistinctness and discontinuousness of his thought is a serious strain upon the attention. An apparently desul- tory sequence of ideas, sudden and often arbitrary changes of subject, frequent vagueness and indirectness of expres- sion, a peculiar and abnormal Latinity, a constant tend- ency to exaggeration, and an excessive indulgence in learned and literary allusions,—all these are obstacles lying in the way of a study of Propertius. But those who have the will and the patience to surmount them will find their trouble well repaid. In power and compass of imagination, in freshness and vividness of conception, in truth and originality of presentation, few Roman poets can compare with him. If these qualities are seldom eminent for long together, if his flights are rarely steady and sustained, this is matter for regret rather than cavil or even astonishment. Propertius was essentially incapable~~

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~~of self-criticism, constitutionally intolerant of the slow labour of the file. His work is ever best' when done under the urgency of a supreme and rapid excitement, aud when, so to say, the discordant qualities of his genius are fused together by the electric spark of an immediate inspiration. Two of his merits seem to have impressed the ancients themselves. The first is most obvious in the scenes of quiet description and emotion in whose presenta- tion he particularly excels. Softness of outlire, warmth of colouring, a fine and almost voluptuous feeling for beauty of every kind, and a pleading and almost melan- choly tenderness—such were the elements of the spell which he threw round the sympathies of his reader, and which his compatriots~~

~~*expressed by the vague but expres- sive word blanditia. HIs facundia, or comniand of striking and appropriate language, is more noticeable still. Not only is his vocabulary very extensive, but his employ- ment of it extraordinarily bold and unconventional. New settings of use, idiom, and construction continually sur- prise us, and, in spite of occasional harshness, secure for his style an unusual freshness and freedom. HIs handling of the elegiac couplet, and especially of its second line, deserves especial recognition. It is vigorous, varied, and even picturesque. In the matter of the rhythms, ceesuras, and elisions which it allows, the metrical treatment is much more severe than that of Catullus, whose elegiacs are comparatively rude and barbarous; but it is not bound hand and foot, like that of the Ovidian distich, in a formal and conventional system. It only now remains to call attention to the elaborate symmetry of construction which is observable in many of his elegies. Often indeed the correspondence between different parts of his poem is so close that critics have endeavoured with more or less success to divide them into strophes.*~~

~~*Propertius's poems bear evident marks of the study of his predecessors both Greek and Latin, and of the influ- ence of his contemporaries. He tells us himself that Callimachus and Philetas were his masters, and that it was his ambition to be the Roman Callimachus, We can trace obligations to Theocritus, Apollonius Rhodius, and other Alexandrines, but above all to Meleager, and amongst earlier writers to Homer, Pindar, Auschylus, and others. Amongst Latin writers he had read with more or less care the works of Ennius, Lucretius, the dramatists, and Catullus. We find coincidences too close to be for- tuitous between his poems and those of Virgil, Horace, and Tibullus his contemporaries; but it is very possible the influence was reciprocal. Propertius's influence upon his successors was considerable. There is not a page of Ovid which does not show obligations to lis poems, while other writers made a more modest use of his stores. Among these may be mentioned Manilius, Juvenal, Martial, Statius, Claudian, Seneca, and Apuleius.*~~

~~*The works of Propertius have come down to us in a far from perfect condition. Some of the poems have been lost ; others are fragmentary ; and most are more or less disfigured by corruptions. The manuscripts on which we have to rely are late and im several cases interpolated ; and these circumstances, combined with the native diffi- culty of the poet's writing, make the task of his restora- tion and interpretation one of peculiar delicacy and diffi- culty.*~~

~~*Donatus (or Suetonius) in his life of Virgil, 30 (45), is the autho- rity for the full name of Propertius. " Aurelius" and " Nauta," which are added in the MSS., are due to confusion with Prudentius, and a corrupt reading of iii. 19, 22 (Miiller), (ii. 24, 22, Palmer). — On the Propertii, see Mommsen in Hermes, iv. p. 870; Haupt, Opusc., i. p. 282. Besides the Propertius Blesus (the Passennus Paullus of Pliny), we hear of a C. Propertius who was triumvir capitalis and proconsul in the time of Augustus, and a Propertius Celer, a poor senator under Tiberius. Inscriptions of the Propertii lave been found at Assisi, of Hertzberg, Prop., i. pp. 10-12.*~~

~~*Propertius tells us himself that his family was not “ noble,” iii. 32 (ii. 34), 55, 6, and iii. 19, 7.c.—Mevania (Bevagna) and Hispellum (Spello) have been put forward as the birth-place of Propertius, but the poet’s own expressions are decisive for Asisium. Apart from the question of reading in v. (iv.) 1, 125 (MSS. Asis.), the climbing walls of his town (scandentes arces, scandens murus, Vv. (iv.), 1, 65 and i.c.), its nearness to Perugia, and its position close above the plain (i. 22, 9, 10) are altogether unsuitable to Spello and Bevagna.—Ovid thus assigns Propertius his place :—successor fuit hic (Tibullus), tibi, Galle: Propertius ili (Tibullus): quartus ab his serie teimporis ipse fui (7’r., iv. 10, 58, 54) ; and again (2d., ii. 467), his (to Tibullus and Propertius) ego successi. For Ovid’s friendship with Propertius see below.—v. 1, 121 sq. is the chief authority for the earlier events of his life. For the premature death of his father and the loss of his property, see 127 sq. :—ossaque legisti non illa acetate legenda patris et in tenues ecogeris ipse Lares. nam tibi cum multi uersa- rent rura iuuenci abstulit excultas pertica tristis opes. _Else- where he says that he is non ita diues (iii. 19 (22), l.c.), aud that he had nulla domi fortuna relicta, iii. 32, 55, d.c. Indirect evi- dence, such as his living on the Esquiline, iv. (iii.), 23, 24, points to a competence. For the death of his kinsman, generally supposed to be the Gallus of i. 21, see i. 22, 5-8. Propertius’s mother is mentioned in ii. 8, 39; iii. 18, 15; and in very affeetionate terms in i. 11, 21. She was dead when iii. 18 (11) was written, @.c., six months after the publication of the first book. Yor the quality of Propertius’s education, the poems themselves are the only, but a sufficient, testimony.—For Lycinna see iv. 14 (iil. 15), 3-10, 43.— Cynthia, or Hostia (Apul., Apol., p. 415) of Tibur (v. (iv.), 7, 85), was the granddaughter (iv. 19 (iii. 20), 8) of L. Hostius, who wrote a poem on the Illyrian war of 178 z.c., of which some fragments arc preserved. She was much older than Propertius (ili, 10 (ii. 18), 20). hat she was a merctriz is clear from many indications—her accomplishments, her house in the Subura, the occurrence of scenes like those in i. 3, iii. 27 (ii. 29), the fact that Propertius could not. marry her, &c. For descriptions of her beauty see il. 2, 5 sq., and 8, 9 sq.; iii. 3 (ii. 18), 28, 24; her poetry, 1i. 8, 21; aud other accomplishments, i. 2, 27 sg., iv. 19 (20), 7, 8. In char- acter she was fickle (i. 15, ii. 6, &c.), greedy (iii. 8 (ii. 16), 11, 12, Cynthia non sequitur fasces, nec curat honores: semper aima- torum ponderat una sinus), and fond of finery (ii. 3, 15, 16); her temper was violent, iv. 7 (iii. 8), &c., and led her to slander those who had offended her (i. 4, 18 sg., &e).—*~~

~~*For the five years, see iv. (iii.) 25, 8, quinque tibi potui scruire fideliter annos ; and for the year of separation, iv. 15, 11 (iii. 16), 9, peccaram semel, ct totum sum pulsus in annum. The secoud separation is vouched for by the two last elegies of book iv. The evidence which v. (iv.) 7 furnishes in favour of a reconciliation is analysed by Postgate (Prop., Introd., p. xxv. sg.).—v. 6 commemorates the celebration of the Judi quinquennales, and v. 11, 66 alludes to the consulship of P. Scipio in 16 3.c. For Passennus Paullus (or as an Assisi inseription calls him C. Passennus Sergius Paullus Propertius Blesus), see Pliny (Hp., vi. 15), municeps Properti atque ctiam inter maiores Propertium numerat; (9, 22), in litteris uetcres aemulatur exprimit reddit: Propertium in primis a quo genus ducit, uera soboles eoque simillima ill in quo ille praecipuus, si elegos eius in manum sumpseris, leges opus tersum molle incundum et plane in Properti domo scriptuin.—ii. 1 and iv. (iii.) 9 are addressed to Mecenas, iii. 1 (ii. 10) to Augustus. Virgil is spoken of in the highest terms in iil. 32 (ii. 34), 61 sg. Other poems are addressed to Ponticus (i. 7, 9), Bassus (i. 4), Lyneeus a tragic poet (iii. 32, ii. 84). Volpi con- jectured (in his edition of Propertius, i. pp. xv. sg.) that the inquisitive fellow of Horace, Sad., i. 9; but the conjecture is generally rejected on grounds of chronology. It has recently been re-discussed and rejected by Prof. A. Palmer in his edition of Horace's Satires, i. 9 (notes), p. 219. In £p. ii. 87 sq., how- ever, Horace seems to make a direct attack on Propertius.—On Propertius's personal appearance, see i. 1, 22, 5, 21; palloremn nos- trum … cur sim toto corpore nullus ego. A Jikeness of him has possibly been preserved in a double Hermes in the Villa Albani and the Vatican, which representsa young beardless Roman, ofa nervous and somewhat sickly appearance, in combination with a Greek poet, possibly Callimachus or Philetas (Viseonti, Jconograph. Romana, plate 14, 8, 4; sce E. Brizio, Annal. dell' inst. arch., 1873, 105; C. Robert, Arch. Zeit., 88, 35, eited by Teuffel). Ill health is proved, as well by the specific allusion of i. 15 as by the frequent references to death and burial—i. 19; ii. 1, 71 sq. ; iii. 5, 1 (ii. 18,17) sq. For his care about dress and the like, sce il. 4, 15, 16, (5, 6), nequiquam perfusa meis unguenta eapillis ibat et expenso planta morata gradu. His character is mirrored in his poems. In particular it has had a great deal to do in moulding his vocabu- lary (Postgate, Introd., p. xxxvi. sg.). For want of courage and cnergy, especially, sce ii. 7, 14; iii. 12 (ii, 19), 17-24; and for superstitious leanings iii, 23 (ii. 27); ii. 4, 15, (25); v. (iv.) 5, 9, sg.—The numbering of the books is one of the most vexed questions of*~~

~~*Propertius ; but it is not unlikely that Birt's conclu- sions will be ultimately accepted. The dates of the several poems*~~

~~*are, Where known, some guide towards determining that, of the books: i. 8 seems to have been written about 27 B.c.; i. 6 not before 27 B.c.; ii. 1in 25 B.c.; i. 8 after 27 B.c. 3 iil. 1 (il. 10) in 24 B.c. ; 29, 31, end of 28; 32 not before 28 .c.; iv. (ili) 17 (18) in or after 23 B.c. ; so 8 (4), 4 (5), 11 (12), but 20 about 28 B.c.; v. (iv.) 6, 11 not before 16 B.c.; 3 in 23 Bc. For the evidence for believing book v. to-be posthumous see Postgate, pp. liv., lv.—It is beyond our limits to discuss the style and idiom of Propertius in fnll. For details see Hertzberg, Introduction, pp. 47, sq.; Postgate, Introduction, pp. lvii. sg. (literary style), Ixxxviii. sg. (grammar and vocabulary), cxxvi. sg. for metre and prosody; also L. Miiller's Introduction, pp. xlviii. sg. For ancient references to Propertius as a writer see Quint., x. 1, 93, where it is stated that some (not Quintilian) preferred him to Tibullus, Ov., A. A., ii. 383, Tr., ii1.465 (blandus P.), v. 1, 17 (blandus), Mart., xiv. 189 (facundus P.), viii. 78, Pliny, /.c. above, Stat., Silv., 1. 2, 253, Vibro Propertius antro.—Prop., iii. (iv.) 1, Callimachi Manes et Coi sacra Philetae, in uestrum, quaeso, ine sinite ire nemus ; v. (iv.) 1, 64, Vmbria Romani patria Callimachi. But, as is well pointed out by Teuffel in his History of Roman Literature, Pro- pertius's debt to Callimachus and Philetas is chiefly a formal one. Kven into his mythological learning he breathes a life to which those dry scholars were complete strangers.—For a summary ac- count of his relations to his predecessors and contemporaries see Postgate, Introd. ch. v. Coincidences with Horace are quoted in Teutfel (§ 246, 2); with Catullus, M. Magnus, Flecketsen's Jahr- biicher, 115, p. 418; with Tibullus, A. Zingerle, Ovid's Verhdliniss, &c., i. 55, 98, 101, &c. ; with Virgil, Nettleship, Ancient Lives of Vergil, p. 63, 64.*~~

~~*There is no existing MS. of Propertius older than the 14th century. Up till the publication of Bahrens's edition (1880), the Neapolitanus (N., now often called the Guelferbytanus) was regarded as the best. Buhrens, however, maintained its worthlessness as compared with the concurrence of four other MSS. of his own collating :—Vossianus, circa 1360 (A) ; Laurentianus, beginning of 15th century (F.); Ottoboniano-Vaticanus, end of 14th century (V.); Daventriensis, 1410-20 (D.). Béhrens's attack upon the Neapolitan was answered by H. Leo (RA. Mus., xxxi. 431), Ellis(Amer.*~~

~~*Journ. Phil., 1.389), Palmer (Hermathena, iv, 48-72). The contending merits of these MSS. have been examined by Solbisky (Comm. Phil. Jenenses, ii. 1883) with considerable care, and his conclusions as to the independ- ent value both of N. and the consensus of D. V. are likely to be accepted.*~~

~~*The editio princeps of Propertius is that of 1472, Venice. Among the chief editions may be mentioned the following, those with notes being marked with an asterisk :—*Scaliger (1577, &c.), *Broukhusius (2d ed., 1577), *Passeratius (1608), *Vulpius (1755, 2 vols.), *P. Burmann (and Santen) (1780), *Lachmann (1816; text only, 1829), "Jacob (1827), Hertzberg (1843-45, 2 vols.), *F. A. Paley (2d cd., 1872), L. Miiller (1870), Haupt-Vahlen (1879), Bahrens (1880), A. Palmer (1880); selec- tions, with introduction, Postgate (1881). Those of Miiller and Palmer are the editions cited throughout this article. 1t is impossible to cite the numerous pro- grains, dissertations, papers, &c., which have been published on subjects con- nected with Propertius. For fuller bibliographies it is sufficient to refer to Hertzberg, Prop., i. pp. 248-59; Engelmann's Bibliotheca Scriptorum Latinorum (ed. Preuss, 1882); J. E. B. Mayor's Bibliographical Clue to Latin Literature (1875); W. Teuffel, Geschichte d. Rom. Litteratur (2d ed., 1882; Eng. trans., 1873; sec. 246 gives an excellent account of Propertius); Pauly, Real-Encyclopéddie, ye ord ee) eer of recent Propertian literature are given in Bursian's*~~

~~*ahresberic pp. 7-54 (very meagre), and in the Trans. Camb. Philol. Soc., 1880 (i. 372-86), 1881-82 (ii. 226-36), a:*~~

~~*The following translations into English yerse are known:—G. F. Nott, Book i. (published anonymously, 1872); C.A. Elton, selections in his Specimens. of the Classic Poets, vol. ii. p. 215 sq. (1814, reprinted along with the preceding and a prose version by P. J. F. Gantillon, in Bohn's series, 1848, 1883); C. R. Moore (London, 1870); J. Cranstoun (Edinburgh, 1875); F.A, Paley, verse translations*~~

~~*from Book v. with notes (1866); also a few translations by Gray (th t) firs printed in Gosse's edition, vol. 1. (1884). ae es inom*~~

~~PROPHET (zpogyrys) is a word taken from the voca- bulary of ancient Greek religion, which passed into the language of Christianity, and so into the modern tongues of Europe, because it was adopted by the Hellenistic Jews as the rendering of the Hebrew x75 (nabi, pl. nébtim). The word therefore as we use it is meant to convey an idea which belongs to Hebrew and not to Hellenic belief — but when it first underwent this change of application the age of the nebiim was long past, and the Jews themselves had a very imperfect conception of what they had been and done. Hence in actual usage the idea conveyed by the word prophet has never quite corresponded with its his- torical prototype; the prophets of early Christendom, for example, are not by any means exact counterparts of the Old-Testament prophets, and in general very various ideas have prevailed as to what a prophet is or should be, because up to quite a recent date the work of the Hebrew prophets has been habitually approached not in~~

~~a purely historical spirit but under the influence of pre- conceived ideas.1~~

~~1 It does not appear that the origi i iati ; inal Hellenic associations of the Hee have had any sensible effect on 'these ideas. According to Plato e ae. Bae the name mpopfrns ought properly to be confined to erpreters employed to put an intelligible sense on the dreams,~~

~~PRO—P RO~~

~~In the present article no attempt will be made to follow those speculations about the nature of prophecy which belong to dogmatic theology rather than to history; but a brief sketch will be given (1) of the history of Hebrew prophecy (in supplement to what has been already said in the article ISRAEL or is to be found in the articles devoted to individual prophets), and (2) of prophecy in the early Christian Church. To speak of more recent religious phenomena within Christendom which have claimed to be prophetic would carry us too far; for them the reader is referred to such articles as MontanisM, ANABAPTISTS. The conception of prophecy on which the Mohammedan religion is built has been sufficiently explained in the life of Mohammed ; borrowed, somewhat unintelligently, from later Judaism, it is radically different from that of the Old Testament, and when narrowly looked at lends no countenance tothe statement often made, and at~~

~~*first sight plausible, that prophecy is a phenomenon characteristic of Semitic religion in general.*~~

~~*1. The Prophets of the Old Testament.—The author of 1 Sam. ix. 9 tells us that '"beforetime in Israel, when a man went to inquire of God, thus he spake, Come and let us go to the seer; for he that is now called a prophet (nab) was beforetime called a seer." This remark is introduced to explain how his contemporaries spoke of Samuel. He wasa "seer" (ver. 11), or, ashe is also called (ver. 6 sq.), a "man of God," that is one who stood in closer relations to God than ordinary men; "all that he: said was sure to come to pass," so that he could be consulted with advantage even in private matters like the loss of the asses of Kish. The narrative of 1 Sam. ix. is so vivid and exact that not many generations of oral tradition can have separated the writer from the events he records ; it shows us therefore, at least broadly, what the word prophet meant in the early times of the Hebrew kingdom, and it shows us that it had acquired that meaning after the age of Philistine oppression in which Samuel lived, and to which his younger contemporaries Saul and David put an end. That this is the sense of the author, and that we must not suppose that the word prophet had merely become more common in his time and supplanted an older synonym, appears beyond question a few verses further down, where we see that there were already in Samuel's time people known as nebéim, but that they were not seers. The seer, with his exceptional insight, is a man of prominent individuality and held in great respect : when Saul asks for the seer every one knows that there is only one person in the town whom he can mean. With the prophets it is quite otherwise ; they appear not individually but in bands; their prophesying is a united exercise accompanied by music, and seemingly dance-music ; it is marked by strong excitement, which sometimes acts contagiously, and may be so powerful that*~~

~~*visions, or enigmatic utterances of the frenzied udyris. Butin ordinary Greek usage the prophet of any god is in general any human instru- ment through whom the god declares himself; and the tendency was "to reserve the name for unconscious interpreters of the divine thought, and for the ministers of the oracles in general" (Bouché-Leclercq, ist. de la Divination [1880], ii. 11). This probably facilitated the adoption of the term by the Hellenists of Alexandria, for, when Philo distinguishes the prophet from the spurious*~~

~~*diviner by saying that the latter applies his own inferences to omens and the like while the true prophet, rapt in ecstasy, speaks nothing of his own, but simply repeats what is given to him by a revelation in which his reason has no part (ed. Mangey, ii. 321 sg., 843; comp. i. 510 sq.), he follows the preva- lent notion of the later Jews, at least in so far as he makes the function of the prophet that of purely mechanical reproduction; compare John xi. 51, and the whole view of revelation presupposed in the Apo- calyptic literature. But in any case the Greek language hardly offered another word for an organ of revelation so colourless as mpophrns, while the condition of etymology among the ancients made it possible to interpret it as having a special reference to prediction (so Eusebius, Dem. Zv., v., deriving it from mpopulve).*~~

~~*rnRor kh & T*~~

~~*he who is seized by it is unable to stand,! and, though this condition is regarded as produced by a divine afflatus, it is matter of ironical comment when a prominent man like Saul is found to be thus affected. Samuel in his later days appears presiding over the exercises of a group of nebiim at Ramah, where they seem to have had a sort of coenobium (Naioth), but he was not himself a na@bi—that name is never applied to him except in 1 Sam. iii. 21, where it is plainly used in the later sense for the idea which in Samuel's own time was expressed by '"'seer."? But again the nebitm seem to have been a new thing in Israel in the days of Samuel. Seers there had been of old as in other primitive nations; of the two Hebrew words literally corresponding to our seer, réeh and hézeh, the second is found also in Arabic, and seems to belong to the primitive Semitic vocabulary. But the enthusiastic bands of prophets are nowhere mentioned before the time of Samuel; and in the whole previous history the word prophet occurs very rarely, never in the very oldest nar- ratives, and always in that sense which we know to be later than the age of Samuel, so that the use of the term is due to writers of the age of the kings, who spoke of ancient things in the language of their own day. The appearance of the nebtim in the time of Samuel was, it would seem, as has been explained in the article IsraxEt, one manifestation of the deep pulse of suppressed indignant patriotism which began to beat in the hearts of the nation in the age of Philistine oppression, and this fact explains the influence of the movement on Saul*~~

~~*and the interest taken in it by Samuel. The ordinary life of ancient Israel gave little room for high-strung religious feeling, and the common acts of worship coincided with the annual harvest and vintage feasts or similar occasions of natural gladness, with which no strain of abnormal enthusiasm could well be*~~

~~*combined. It was perhaps only in time of war, when he*~~

~~*felt himself to be fighting the battles of Jehovah, that the Hebrew was stirred to the depths of his nature by emotions of a religious colour. Thus the deeper feelings of religion were embodied in warlike patriotism, and these feelings the Philistine oppression had raised to extreme tension among all who loved liberty, while yet the want of a captain to lead forth the armies of Jehovah against his foemen deprived them of their natural outlet. It was this tense suppressed excitement, to which the ordinary acts of worship gave no expression, which found vent in the enthusiastic services of the companies of prophets. In its external features the new phenomenon was exceedingly like what is still seen in the East in every zikr of dervishes—the enthusiasm of the prophets expressed itself in no artificial form, but in a way natural to the Oriental temperament. Processions with pipe and hand-drum, such as that described in 1 Sam. x., were indeed a customary part of ordinary religious feasts; but there they were an outlet for natural merriment, here they have changed their character to express an emotion more sombre and more intense, by which the prophets, and often mere chance spectators too, were so overpowered that they seemed to lose their old personality ane to be swayed by a super- natural influence. More than this hardly lies in the expression "a divine spirit" (ods nv), which is used not only of the prophetic afflatus but of the evil frenzy that afflicted Saul's later days. The Hebrews had a less narrow conception of the spiritual than we are apt to read into their records.*~~

~~*11 Sam. x. 5 sg., xix. 20 sg. In the latter passage read "they saw the fervour of the prophets as they prophesied, &c." (see Hoff- mann in Stade's Zeitschr., 1883, p. 89), after the Syriac.*~~

~~*2 On grounds of text-criticism indeed both this passage and 1 Sam. xxviii., where at ver. 6 prophets appear as revealers (seers), are held to be no part of the old stock of the history of Samuel.*~~

~~3 Hoffmann, ut supra, p. 92 sq.~~

~~815~~

~~To give a name to this new phemonenon the Israelites, it would seem, had to borrow a word from their Canaanite neighbours. At all events the word nai is neither part of the old Semitic vocabulary (in Arabic it is a late loan word), nor has it any etymology in Hebrew, the cognate words "to prophesy" and the like being derived from the noun in its technical sense. But we know that there were nebiim among the Canaanites; the " prophets" of Baal appear in the history of Elijah as men who sought to attract their god by wild orgiastic rites. In fact the presence of an orgiastic character is as marked a feature in Canaanite religion as the absence of it is in the oldest religion of Israel; but the new Hebrew enthusiasts had at least an external resemblance to the devotees of the Canaanite sanctuaries, and this would be enough to deter- mine the choice of a name which in the first instance seems hardly to have been a name of honour.* In admit- ting that the name was borrowed, we are not by any means shut up to suppose that the Hebrew nebiim simply copied their Canaanite neighbours. The phenomenon is perfectly intelligible without any such hypothesis. A wave of in- tense religious feeling passes over the land and finds its expression, according to the ordinary law of Oriental life, in the formation of a sort of enthusiastic religious order. The Nazarites and the Rechabites are parallel phenomena, though of vastly inferior historical tmportance.~~

~~The peculiar methods of the prophetic exercises de- scribed in 1 Samuel were of little consequence for the future development of prophecy. The heat of a first en- thusiasm necessarily cooled when the political conditions that produced it passed away ; and, if the prophetic asso- ciations had done no more than organize a new form of spiritual excitement, they wotld have only added one to the many mechanical types of hysterical religion which are found all over the East. Their real importance was that they embodied an intenser vein of feeling than was ex- pressed in the ordinary feasts and sacrifices, and that the greater intensity was not artificial, but due to a revival of national sentiment. The worship of the local sanctu- aries did nothing to promote the sense of the religious unity of Israel; Jehovah in the age of the Judges ran no small risk of being divided into a number of local~~

~~*Baals, givers of natural good things each to his own locality. The struggle for freedom called forth a deeper sense of the unity of the people of the one Jehovah, and in so doing raised religion to a loftier plane ; for a faith which unites a nation is necessarily a higher moral force than one which only unites a township or a clan. The local worships, which subsisted unchanged during the greater part of the Hebrew kingship, gave no expression to this rise in the religious consciousness of the nation; on the contrary we see from the prophetic books of the 8th century that they lagged more and more behind the pro- gress of religious thought. But the prophetic societies were in their origin one symptom of that upheaval of national life of which the institution of the human sove- reign reigning under the divine King was the chief fruit ; they preserved the traditions of that great movement ; they were, in however imperfect a way, an organ of national religious feeling, and could move forward with the movement of national life. And so, though we cannot follow the steps of the process, we are not surprised to*~~

~~*4 If this account of the origin of the nebiim is correct (comp.*~~

~~*Kuenen, Prophets, Eng. tr., p. 554 sq.), the etymological sense of the*~~

~~*word %3 is comparatively unimportant. The root seems to mean _ "to start up," "to rise into prominence," and so "to become audible" ;*~~

~~*but the range of possible explanations of the noun which remains open*~~

~~*is too great to give value to any conjecture. The leading views are*~~

~~*collected in several of the books cited at the close of this article, and*~~

~~*a fresh and interesting investigation is given in G. Hoffmann's article*~~

~~*quoted above.*~~

~~*learn that they soon had an established footing in Israel, and that the prophets came to be recognized as a standing sacred element in society.*~~

~~*What was their precise place in Hebrew life we hardly know, but they formed at least a religious class which in all its traditions represented the new national and not the old communal and particularistic life. One characteristic point which appears very early is that they felt themselves called upon to vindicate the laws of divine righteousness in national matters, and especially in the conduct of the kings, who were not answerable to human authority. The cases of Nathan and David in the matter of Uriah, of Elijah and Ahab after the judicial murder of Naboth, will occur to every one, and from the Hebrew standpoint the action of Gad in the matter of the census taken by David belongs to the same category. Such interventions with an Eastern king demanded great moral courage, for, though to some extent protected by their sacred character, the persons of the prophets were by no means legally inviolable (1 Kings xix. 2; xxii. 27; 2 Kings vi. 31). Another point of the first importance in the development of the class was the absorption into it of the old seers, which, as we have already seen, must have occurred comparatively early. The great prophecy of Nathan (2 Sam. vii.) is of too disputed a date to be cited in evidence, but already in David's time we find that Gad the abt is also the king's seer (2 Sam. xxiv. 11; comp. 1 Sam. xxii. 5), and by and by it comes to be clearly understood that the prophets are the appointed organ of Jehovah's communications with His people or His king. The rise of this function of the prophets is plainly parallel with the change which took place under the kings in the position of the priestly oracle; the Torah of the priests now dealt rather with permanent sacred ordinances than with the giving of new divine counsel for special occasions. Jehovah's ever-present kingship in Israel, which was the chief religious idea brought into promin- ence by the national revival, demanded a more continuous inanifestation of His revealing spirit than was given either by the priestly lot or by the rise of occasional seers ; and where could this be sought except among the prophets? It does not of course follow that every one who had shared in the divine afflatus of prophetic enthusiasm gave forth oracles; but the prophets as a class stood nearer than other men to the mysterious workings of Jehovah, and it was in their circle that revelation seemed to have its natural home.*~~

~~*PrOorHae*~~

~~*is not only prophet and priest but judge and ruler. But as the history goes on the prophet stands out more and more as the typical organ of revelation, the type of the man who is Jehovah's intimate, sharing His secrets (Amos ii. 7; Jer. xxiii. 22), and ministering to Israel the gracious guidance which distinguishes it from all other nations (Amos ii. 11; Hosea xii. 10, 13), and also the sentences of awful judgment by which Jehovah rebukes rebellion (Hos. vi. 5). The full development of this view seems to lie between the time of Elijah and that of Amos and Hosea,—under the dynasty of Jehu, when prophecy, as represented by Elisha and Jonah, stood in the fullest harmony with the patriotic efforts of the age. This growth in the conception of the prophetic function is reflected in parts of the Pentateuch which may be dated with probability as belonging to the period just named ; the name of nab? is extended to the patriarchs as Jehovah's intimates (Gen. xx. 7), and Moses begins to be chiefly looked at as the greatest of prophets (Num. xi. xi; Deut. xxxiv. 10), while Aaron and Miriam are also placed in the same class (Exod. xv. 20; Num. xii.) because they too are among the divinely favoured leaders of Israel (comp. Micah vi. 4).?*~~

~~*Elisha, the successor of Elijah, stood in much closer relations to the prophetic societies than his great master had done. As a man of practical aims he required a circle through which to work, and he found this among the prophets, or, as they are now called, the sons of the prophets. According to Semitic idiom "sons of the pro- phets" most naturally means "members of a prophetic corporation," ? which may imply that under the headship of Elisha and the favour of the dynasty of Jehu, which owed much to Elisha and his party, the prophetic societies took a more regular form than before. The accounts we have certainly point in this direction, and it is character- istic that in 2 Kings iv. 42 first fruits are paid to Elisha. But to an institution hike prophecy national recognition, royal favour, and fixed organization are dangerous gifts. It has always been the evil fate of the Hebrews to destroy their own highest ideals by attempting to translate them into set forms, and the ideal of a prophetic guidance of the nation of Jehovah could not have been more effectu- ally neutralized than by committing its realization to the kind of state church of professional prophets, 'eating bread" by their trade (Amos vii. 12),3 which claimed to inherit the traditions of Elijah and Elisha. The sons of the prophets appear to have been grouped round the lead- ing sanctuaries, Gilgal, Bethel, and the like (comp. Hos. ix. 8), and to have*~~

~~stood in pretty close relation to the priesthood (Hos. iv. 5), though this comes out more clearly~~

~~1 None of these passages belong to the very oldest thread of Penta- teuchal story, and similarly Deborah is called prophetess only in the later account (Jud. iv. 4), not in the song (Jud. v.). It is character- istic that in Num. xi. the elders who receive a share in Moses's task also receive a share of his prophetic spirit (comp. the parallel 2 Kings ii. 9 sg.). In the older account (Exod. xviii.) this is not so. Again Moses differs from all other prophets in that Jehovah speaks to him face to facc, and he sees the similitude of Jehovah. This is in fact the difference between him and Elijah (comp. Exod. xxxiii. 8-11 with 1 Kings xix. 13), but not between him and the great prophets of the 8th century (Isa. vi. 5). That prophecy was generally given in visions, dreams, and obscure sentences is truc only of an early period. Amos still has frequent visions of a more or less enigmatic character, as Micaiah had, but there is little trace of this in the-great prophets after him. On the psychological reasons for this see W. R. Smith, Prophets of Israel (1882), p. 221 sq.~~

~~2 See G. Hoffmann, Kirchenversammlung zu Ephesus (1878), p, 89.~~

~~3 Those who consulted the old seers were expected to make a pre- sent, 1 Sam. ix. 7 (Arabic holwanu-'l-kahin ; comp. Bokhari, iv. 219). Similar presents were brought to the older prophets (1 Kings xiv. 3), and first fruits were sometimes paid to a man of God; but the suc- cessors of Amos share his contempt for those who traded on their oracles (Mic. iii. 5 sq.).~~

~~PROPHET~~

~~for the southern kingdom, where, down to the last days of Hebrew independence, the official prophets of Jerusalem were connected with the temple and were under the authority of the chief priest (Jer. xxix. 26). Since the absorption of the aborigines in Israel Canaanite ideas had exercised great influence over the sanctuaries—so much so that the reforming prophets of the 8th century regarded the national religion as having become wholly heathenish ; and this influence the ordinary prophets, whom a man like Micah regards as mere diviners, had certainly not escaped. 'They too were, at the beginning of the Assyrian period, not much more different from~~

~~*prophets of Baal than the priests were from priests of Baal. Their God had another name, but it was almost forgotten that He had a different character.*~~

~~*The rise and progress of the new school of prophecy, beginning with Amos and continued in the succession of canonical prophets, which broke through this religious stagnation, has already been discussed in the article IsRAEL (vol. xiii. p. 410 sg.) ; for from Amos and still more from Isaiah downwards the prophets and their work make up the chief interest of Hebrew history. From this time, moreover, the prophets appear as authors ; and their books, preserved in the Old Testament, form the subject of special articles (Amos, Hosma, &c.).*~~

~~*lace. — Amos disclaimed all connexion with the mere profes- sional prophets, and in this he was followed by his suc- cessors. Formerly the prophets of Jehovah had been all on the same side; their opponents were the prophets of Baal. But henceforth there were two parties among the prophets of Jehovah themselves, the new prophets accus- ing the old of imposture and. disloyalty to Jehovah, and*~~

~~*these retaliating with a charge of disloyalty to Israel.*~~

~~*We have learned to call the prophets of the new school "true" prophets and their adversaries "false"; and this is perfectly just if we take the appellations to mean that the true prophets maintained a higher and therefore a truer view of Jehovah's character, purpose, and relation to His people. But the false prophets were by no means mere common impostors ; they were the accredited expon- ents of the common orthodoxy of their day — and even of a somewhat progressive orthodoxy, for the prophets who opposed Jeremiah took their stand on the ground of Josiah's reformation, and plainly regarded. themselves as conservators of the prophetic traditions of Isaiah, whose doctrine of the inviolability of Jehovah's seat on Zion was the starting point of their opposition to Jeremiah's pre- dictions of captivity. No doubt there were many con- scious hypocrites and impostors among the professional prophets, as: there always will be among the professional representatives of a religious standpoint which is intrin- sically untenable, and yet has on its side the prestige of tradition and popular acceptance. But on the whole the false prophets deserve that name, not for their conscious impostures, but because they were content to handle religious formulas*~~

~~*which they had learned by rote as if they were intuitive principles, the fruit of direct spiritual experience, to enforce a conventional morality, shutting their eyes to glaring national sins, after the manner of professional orthodoxy, and in brief to treat the religious status quo as if it could be accepted without question as fully embodying the unchanging principles of all religion. The popular faith was full of heathenish superstition strangely blended with the higher ideas which were the inheritance left to Israel by men like Moses and Elijah ; but the common prophets accepted all alike, and combined heathen arts of divination and practices of mere physical 'onthusiasm with a not altogether insincere pretension that*~~

~~*through their professional oracles the ideal was being maintained of a continuous divine guidance of the people of Jehovah.*~~

~~*Amos and his successors accepted the old ideal of pro- phecy if they disowned the class which pretended to em- body it. "The Lord Jehovah will do nothing, but He re- vealeth His secret to His servants the prophets." "By a prophet Jehovah brought Israel out of Egypt, and by a prophet" in each successive age Israel had been watched over and preserved. But in point of fact the function of the new prophecy was not to preserve but to destroy Israel, if Israel still meant the actual Hebrew nation with its traditional national life. 'Till Amos prophecy was optimist—even Elijah, if he dendunced the destruction of a dynasty and the annihilation of all who had bowed the knee to Baal, never doubted of the future of the nation when only the faithful remained ; but the new prophecy is pessimist—it knows that Israel is rotten to the core, and that the whole fabric of society must be dissolved before reconstruction is possible. And this it knows, not bya mere ethical judgment on the visible state of society, but because it has read Jehovah's secret written in the signs of the times and knows that He has condemned His people. 'To the mass these signs are unintelligible, be- cause they deem it impossible that Jehovah should utterly cast off His chosen nation; but to those who know His absolute righteousness, aud confront it with the people's sin, the impending approach of the Assyrian can have only one meaning and can point to only one issue, viz., the total ruin of the nation which has denied its divine head. It is sometimes*~~

~~*proposed to view the canonical prophets as simple preachers of righteousness ; their pre- dictions of woe, we are told, are conditional, and tell what Israel must suffer if it does not repent. But this is an incomplete view ; the peculiarity of their position is that they know that Israel as it exists is beyond repentance. Only, while they are hopeless about their nation they have absolute faith in Jehovah and HIs purpose. That cannot be frustrated, and, as it includes the choice of Israel as HIs people, it is certain that, though the present commonwealth must perish, a new and better Israel will rise from its grave. Not the reformation but the resur- rection of Israel is the goal of the prophets' hope (HOs. vi. 1 sq.).*~~

~~*This of course is only the broadest possible statement of a position which undergoes many modifications in the hands of individual seers, but on the whole governs all prophecy from Amos to Jeremiah. The position has, we see, two sides: on the one side the prophets are heralds of an inexorable judgment based on the demands of abso- lute righteousness ; on the other they represent an assured conviction of Jehovah's invincible and gracious love. The current theological formula for this two-sided position is that the prophets are at once preachers of the law and forerunners of the gospel ; and, as it is generally assumed that they found the law already written, their originality and real importance is made to lie wholly in their evan- gelical function. But in reality, as has been shown in IsraEL and PENTATEUCH, the prophets are older than the law, and the part of their work which was really epoch- making for Israel is just the part which is usually passed over as unimportant. By emphasizing the purely moral character of Jehovah's demands from Israel, by teaching that the mere payment of service and worship at Jehovah's shrines did not entitle Israel's sins to be treated one whit more lightly than the sins of other nations, and by en- forcing these doctrines through the conception that the approach of the all-destroying empire before which Israel must fall equally with all its neighbours was the proof of Jehovah's impartial righteousness, they gave for the first*~~

~~*time a really broad and fruitful conception of the moral government of the whole earth by the one true God."*~~

~~*It is impossible to read the books of the older prophets, and especially of their protagonist Amos, without seeing that the new thing which they are compelled to speak is not Jehovah's grace but His inexorable and righteous wrath. That that wrath must be followed by fresh mercies is not in itself a new thought, but only the neces- sary expression of the inherited conviction that Jehovah, whom they preach as the judge of all the earth, is never- theless, as past history has proved, the God who has chosen Israel as His people. That this is so appears most clearly in the fact that with Amos the prophecy of restora- tion appears only in a few verses at the end of his book, and in the still more instructive fact that neither he nor Hoséa attempts to explain how the restoration which they accept as a postulate of faith is to be historically realized." One point only in their picture of the great restoration appears to present the germ of an historical principle. The Israel of the future is to be one united nation as in the days of David. The Davidic kingdom is accepted by both prophets, and by Hosea even more explicitly than by Amos, as the type of the future kingdom of Jehovah. But one sees from the way in which this thought is handled that it is the idea of that kingdom as it was in days of old which is before the prophet's mind ; the actual state of Judah, which was not religiously better than the greater Israel, though it perhaps still possessed elements of greater political and social stability, was not such as to suggest the thought that when Samaria fell the continuity of Jehovah's relations with His people could be preserved at Jerusalem. It was in the great northern kingdom— still Israel par eacellence—not in the petty region that had remained loyal to David, that the drama of divine justice and mercy was to be acted. to ity end: to Hosea, at least in his later prophecies, the fate of Judah does not appear separable from that of the northern realm—when Israel and Ephraim fall by their iniquity Judah must fall with them (Hos. v. 5). Thus even on this side there is no real bridge over the chasm that separates the total ruin impending over the Israel of the present from the glorious restoration of the Israel of the future. There is a unity in the divine purpose, of which judgment and mercy are the two poles, but there is as yet no conception of an historical continuity in the execution of that purpose, and therefore no foundation laid for the maintenance of a con- tinuous community of faith in the impending fall of the nation.*~~

~~*From this we can see the enormous importance of the work of Isaiah as it has been exhibited in the article IsRaEL, vol. xiii. p. 413 sq.; his doctrine of the remnant, the holy seed, never lost to the nation in the worst times, never destroyed by the most fiery judgments, supplies the lacking element of continuity between the Israel of the present and of the future. Jehovah's kingdom cannot perish even for a time; nay, Isaiah argues that it must remain visible, and visible not merely in the circle of the like-minded whom he had gathered round him and who a ee*~~

~~*: 1 It must not be supposed that this conception necessarily came into force as soon as it was recognized that Jehovah was the creator of the universe. That the national or tribal god is the creator is an idea often found in very low religions. To us God's sovereignty over nature often seems the hardest thing to conceive ; but to primi- tive peoples who know nothing of laws of nature His moral sove- reignty is a much more difficult conception. In the older literature of the Hebrews the nearest approach to the thought of Amos and Hosea is Ber Gen. ii, ili., but Gen. xviii. 25.*~~

~~*Hosea ii. 14 sq., xi. 10 sq. are not solutions of this difficulty, as ap- pears from their metaphorical form. They tell us that Jehovah will call His people and that they will answer; but this is only putting in an-*~~

~~*other form the axiom that i ee at the gifts and calling of God are without*~~

~~*PROUPREBSG2*~~

~~*formed the first germ of the notion of the church, but in the political form of a kingdom also. Zion at least, the sacred hearth of Jehovah, the visible centre of his king- dom, must remain inviolable; it can never be delivered into the hands of the Assyrian. Thus, with Isaiah in the days of Sennacherib's invasion, the prophetic word became again, as it had been in the days of the Syrian wars, 'the chariots and horsemen of Israel," the stay and strength of all patriotic hope.*~~

~~*Yet even at this crisis the resemblance between Isaiah and Elisha, between the new prophecy and the old, is more apparent than real. Elisha still stands firmly planted on the old national conception of the religion of Jehovah ; his ideals are such as do not lie beyond the range of practical politics. In*~~

~~*doing battle against the Tyrian Baal he is content with a reformation for which the whole nation can be heartily won, because it makes no radical change in their inherited faith and practices of worship. And in stimulating resistance to Syria he is still the prophet of the old "God of the hosts of Israel"—a God who works deliverance by the thews and sinews of His earthly warriors. But Isaiah's ideal of religion was one which could never have been realized by a political move- ment; to root out all idols, all superstitions inconsistent with his lofty conception of the just King of Israel, who cares not for sacrifice and oblation, who can be acceptably approached through no religion of rote, whose sovereignty can receive practical recognition only by a thoroughgoing reformation of all parts of social life—this. was an ideal which could not be carried out by the mere education and concentration of any forces inherent in the nation. The true Israel of Isaiah is not an historical possibility ; it is a transcendental ideal for which he himself demands as a preliminary condition an outpouring of Jehovah's spirit on king (Isa. xi. 2) and people (Isa. xxxii. 15), working an entire moral regeneration. And so too it is not through the material organization of the Judean kingdom that Isaiah looks for deliverance from Assyria. He sees with absolute clearness the powerlessness of the little realm against that great empire: the Assyrian must fall, and fall before Jerusalem, that Jehovah alone may appear to all the earth as the one true God, while all the idols appear as vain to help their worshippers; but he falls by no earthly sword, but before the direct interposition of Jehovah Himself. These conceptions break through the old particularistic idea of Jehovah and His religion at every point. Zion is now not the centre of a mere national cult, but the centre of all true religion for the whole world ; and more than once the prophet indicates not obscurely that the necessary issue of the great conflict between Jehovah and the gods of the heathen must be the conversion of all nations, the disappearance of every other religion before the faith of the God of Israel. But this all-conquering religion is not the popular Jehovah wor- ship ; why then can the prophet still hold that the one true God is yet the God of Israel, and that the vindica- tion of His Godhead involves the preservation of Israel ? Not because His providence is confined to Israel—it embraces all nations; not because He shows any favour- itism to Israel—He judges all nations by the same strict rule. If Israel alone among nations can meet the Assyrian with the boast "with us is God," the reason is that in Zion the true God is known'—not*~~

~~*indeed to the mass, but to the prophet and to the "holy seed" which forms the salt of the nation. The interpretation which Isaiah puts*~~

~~*3 We should be apt to say "the true idea of God," but that is a way of putting it which does not correspond with prophetic thought. To the prophets knowledge of God is concrete knowledge of the*~~

~~*divine character as shown in acts—knowledge of a person, not of au idea.*~~

~~*PROPHET*~~

~~*on this fact depends on the circumstance that at that date religion had never been conceived asa relation between God and individuals, or as a relation between God and a purely spiritual society, but always asa relation between a deity and some natural social group—a stock, a tribe, a nation. It was therefore only as the God of Israel that the true God could be known within Israel ; and so on the one hand the little society of faith—which had not in reality the least tinge of political coherence—is thought of as yet forming the true kernel of the nation gua nation, while on the other hand the state of Judah profits by the prophetic religion inasmuch as the nation must be saved from destruction in order that the prophetic faith—which is still bound up with the idea of the nation—may not be dissolved. This connexion of ideas was not of course explicitly before the prophet's mind, for the distinctive features of a national religion could not be formulated so long as no other kind of religion had ever been heard of. When we put down in black and white the explicit details of what is involved in Isaiah's conclusion of faith we see that it has no absolute validity. True religion can exist without having a particular nation as its subject as soon as the idea of a spiritual community of, faith has been realized. But till this idea was realized Isaiah was right in teaching that the law of continuity demanded that the nation within which Jehovah had made Himself known to His spiritual prophets must be maintained as a nation for the sake of the glory of God and the preservation of the '"'"holy seed."*~~

~~*The catastrophe of Sennacherib's army, in which the doctrine of the inviolability of Zion received the most striking practical confirmation, was welcomed by Isaiah and his disciples as an earnest of the speedy inbringing of the new spiritual era. But these hopes were not fulfilled. The prophetic*~~

~~*teaching had indeed produced a profound effect ; to the party of reaction, as the persecution under Manasseh shows, it seemed to threaten to subvert all society ; and we can still measure the range and depth of its influence in the literary remains of the period from Isaiah to the captivity, which include Micah vi. 1-8, and that noble essay to build a complete national code on the principle of love to God, righteousness, and humanity— the legislation of Deuteronomy. Nay more, the reception of the book of Deuteronomy by king and people in the eighteenth year of Josiah shows what a hold the prophetic teaching had on the popular conscience; it was no small triumph that there was even a passing attempt to intro- duce such a code as the law of the land. But it was one thing to touch the conscience of the nation and another to change its heart and renew its whole life. That no code could do, and, as every practical government must adapt itself to actualities and not to a purely ideal standard, it must have appeared at once that the attempt to govern by prophetic ideas was only sewing a new piece on an old garment. The immediate result of Josiah's reformation was the complete dissolution of anything that could be called a political party of prophetic ideas; the priests and the ordinary prophets were satisfied with what had been accomplished ; the old abuses began again, but the nation had received a reformed constitution and there was nothing more to be said.*~~

~~*Thus it was that, though beyond question there had been a real advance in the average ethical and spiritual ideas of the people since the time of Isaiah, Jeremiah found himself more isolated than Isaiah had ever been. Even in that earliest part of his book which is mainly a recapitulation of his experiences and work in the reign of Josiah, his tone is one of absolute hopelessness as to the future of the nation. But we should quite misunderstand this pessimism if we held it to mean that Jeremiah saw*~~

~~*no signs of private morality and individual spiritual con- victions among his people. To him as a prophet the ques- tion was whether Israel as a nation could be saved. In Isaiah's days the answer had been affirmative; there appeared to be at least a potentiality of national regenera- tion in the holy seed when once it should be cleansed from the chaff by a work of judgment. But, now a cen- tury of respite had been granted, the Chaldeans were at the*~~

~~*gates, and there was no sign of valid national repent- ance. The harvest was past, the season of ripe fruits was over, and still Israel was not saved (Jer. viii. 20). The time of respite had been wasted, all attempts at national reformation had failed; how should Jehovah spare a nation which had shown no tokens of fitness to discharge the vocation of Jehovah's people? The question was not whether there was still a faithful remnant, but whether that remnant was able to save the state as a state, and this Jeremiah was forced todeny. Nay every attempt at genuine amendment was frustrated by the dead weight of a powerful opposition, and when the first captivity came it was precisely the best elements of Judah that went into captivity and were scattered among the nations (xxiv. 5 ; xxiil. 2 sq.). And so the prophet was compelled to teach that the immediate future of Israel was a blank, that the state asa state was doomed. HIe did not even dare to intercede for such a nation (vii. 16); though Moses and Samuel stood pleading for it before Jehovah, HIe could not but cast it out of HIis sight (xv. 1). It was the death-struggle of the idea of a national religion (vi. 8) ; the con- tinuity of true faith refused to be longer bound up with the continuity of the nation. Still indeed the New-Testa- ment idea of a purely spiritual kingdom of God, in this world but not of it, is beyond the prophet's horizon, and he can think of no other vindication of the divine purpose than that the true Israel shall be gathered again from its dispersion. But the condition of this restoration is now changed. To gather the dispersed implies a call of God to individuals, and in the restored Israel the covenant of Jehovah shall be not merely with the nation but with men one by one, and "they shall no more teach everyone his neighbour saying, Know the Lord, for all shall know Me from the least of them even to the greatest of them" (xxxi. 33 sg.). Ina word, when the nation is dissolved into its individual elements the continuity and ultimate victory of true faith depends on the relation of Jehovah to individual souls, out of which the new state shall be built up (Jer. ili. 14).*~~

~~*Thus, for the first time in the world's history, the ulti- mate problem of faith is based on the relation of God to the individual, believer; and this problem Jeremiah is com- pelled to face mainly in relation to his own personality, to assure himself that his own faith is a true possession and lifts him above all the calamities that assail him, in spite of the hopeless ruin of his nation. The struggle is a sore one; his very life is bitter to him; and yet he emerges victorious. To know that God is with him is enough though all else fail him.*~~

~~*Now as soon as the relation of God to a single soul has thus been set free from all earthly conditions the work of prophecy is really complete, for what God has done for one soul He can do for all, but only by speaking to each believer as directly as He does to Jeremiah. Henceforth revelation is not a word to the nation spoken through an individual, but a word spoken to one which is equally valid for every one who receives it with like faith. The New Testament joins on not to the post-exile prophets, who are only faint echoes of earlier seers, but to Jeremiah's great idea of the new covenant in which God's law is written on the individual heart, and the community of faith is the fellowship of all to whom He has thus spoken. The prophets of the restoration are*~~

~~*only the last waves beating on the shore after the storm which destroyed the old nation, but created in its room a fellowship of spiritual religion, had passed over ; they resemble the old prophets in the same imperfect way in which the restored community of Jerusalem resembled a real nation. It was only in so far as the community of faith still possessed certain external features of nationality that post-exile prophecy was possible at all, and very soon the care of the national or quasi-national aspects of religion passed altogether out of their hands into those of the scribes, of whom Ezekiel was the first father, and whose Torah was not the living word of prophecy but the Penta- teuchal code. From the time of Jeremiah downwards the perennial interest of Old-Testament thought lies in the working out of the problems of personal religion and of the idea of a spiritual fellowship of faith transcending all national limitation ; and these are the motives not only of the lyrics of the Psalter but of the greater theodiceas of Isa. xl.—lxvi. and of the book of Job. The theodicea of the prophets is national; they see Jehovah's righteousness working itself out with unmistakable clearness in the present, and know that all that He brings upon Israel is manifestly just; but from the days of Jeremiah! the fortunes of Israel as a nation are no longer the one thing which religion has to explain; the greater question arises of a theory of the divine purpose which shall justify the ways of God with individual men or with His "righteous servant "—that is, with the ideal community of true faith as distinct from the natural Israel. The discussion of these problems constitutes a quite distinct type of Old-*~~

~~*Testament literature beginning with the book of the Great Unknown, which is now appended to the writings of Isaiah; but this is an accident of arrangement that ought not to lead us to include among the prophetic writings proper a work so entirely different in origin and scope, and addressed not to an actual nation but to the ideal Israel, whose vocation is uo longer political but purely religious.*~~

~~*It will be evident even from this rapid sketch, neces- sarily confined to a few of the most cardinal points, that Hebrew prophecy is not a thing that can be defined and reduced to a formula, but was a living institution which can only be understood by studying its growth and observing its connexion with the historical movements with which its various manifestations were bound up. Throughout the great age of prophecy the most obvious formal character that distinguished it was that the pro- phet did not speak in his own name but in the name of Jehovah. But the claim to speak in the name of God is one which has often been made—and made sincerely—by others than the prophets of Israel, and which is suscep- tible of a great variety of meanings, according to the idea of God and His relation to man which is presupposed. Every early religion seeks to realize such an intercourse with the object of worship as shall be two-sided ; when the worshipper approaches the deity he desires to have an answer assuring him of acceptance and divine aid. The revelation thus looked for may be found in natural omens, in the priestly lot or some similar sacral oracle, or, finally, in the words of a seer who is held to be in closer contact with the deity than common men. Broadly speaking these methods of revelation are found in all ancient religions, but no other religion presents anything precisely analogous to prophecy. It is true that the prophets absorbed the old seers, and that the Israelites, as we see in the case of the asses of Kish, went to their seers on the same kind of occasions as sent heathen nations to seers or diviners. There is sufficient evidence that down to the last age of the J udeean monarchy practices not essentially different from divination were current in all classes of*~~

~~*One might say from the days of Habakkuk.*~~

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~~society, and were often in the hands of men who claimed to speak as prophets in the name of Jehovah. But the great prophets disallowed this claim, and the distinction which they draw between true prophecy and divination is recognized not only in the prophetical law of Deuteronomy but in earlier parts of the Pentateuch and historical books, "There is no augury in Jacob and no divination in Israel ; in due time it is told to Jacob and to Israel what God doth work" (Num. xxiii. 23). The seer, in the sense in which all antiquity believed in seers, is simply a man who sees what others cannot see, no matter- whether the thing seen be of public or of mere private interest; but the prophet is an organ of Jehovah's kingship over His people — he sees and tells so much of the secret purpose of Jehovah as is needful for His people to know. We have already seen how Amos and Hosea put this (supra, p. 817), and it does not appear that they were introducing a conception of prophecy formally novel—the new thing was their cou- ception of Jehovah's purpose. And so too with the fol- lowing great prophets ; the important thing in their work was not their moral earnestness and not their specific pre- dictions of future events, but the clearness of spiritual insight with which they read the spiritual significance of the signs of the time and interpreted the movements of history as proofs of Jehovah's actual moral sovereignty exercised over Israel. So long as the great problems of religion could be envisaged as problems of the relation of Jehovah to Israel as a nation the prophets continued to speak and to bring forth new truths; but the ultimate result was that it became apparent that the idea of moral government involved the destruction of Israel, and then the function of prophecy was gone because it-was essentially national in its objects. But meantime the relation of God to the prophet had acquired an independent significance ; the inner life of Isaiah during the lie years when his teaching seemed lost, or of Jeremiah through the whole course of his seemingly fruitless ministry, was rich in experiences of faith triumphing over temptations and trials, of personal converse with God sustaining the soul in the face of difficulties hopeless to the eye of sense, which formed the pattern of a new and higher stage of religion in which the relation of the individual soul to God should be set free from those limitations which had been imposed by the conception that the primary subject of religion is the nation. But the religion of the Old Testament did not become merely individualistic in becom- ing individual, and now the problem was to realize a new conception of the society of faith, the true Israel, the collective servant of~~

~~*Jehovah—in a word to form the idea of a spiritual commonwealth and to show how it was pos- sible for faith to hold fast, in spite of all seeming contra- diction, to the truth that Jehovah had chosen for Himself a spiritual people, every member of which was in truth the object of His saving and unfailing love, and which should ultimately in very deed inherit that glory of which the carnal Israel was unworthy. This is the post-prophetic problem which occupies the more profound of the later Old-Testament books, but first received its true solution in the gospel, when the last shreds of the old nationalism disappeared and the spiritual kingdom found its centre in the person of Christ.*~~

~~*Old-Testament prophecy therefore forms only one stage in a larger development, and its true significance and value can only be realized when it is looked at in this light. In this as in all other matters of transcendental truth "wisdom is justified of her children"; the conclusive vindication of the prophets as true messengers of God is that their work forms an integral part in the progress of spiritual religion, and there are many things in their teaching the profundity and importance of which are*~~

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~~*much clearer to us than they could possibly have been to their contemporaries, because they are mere flashes of spiritual insight lighting up for a moment some corner of a region on which the steady sun of the gospel had not yet risen.*~~

~~*A less complete but yet most powerful vindication of the spiritual prophets was furnished by the course and event of Israel's history. After the captivity it was no longer a question that the prophetic conception of Jehovah was the only possible one. Thenceforth the religion of Jehovah and the religion of the prophets are synonymous ; no other reading of Israel's past was possible, and in fact the whole history of the Hebrews in Canaan, as it was finally shaped in the exile, is written from this point of view, and has come down to us, along with the remains of actual prophetic books, under the collective title of "The Prophets."*~~

~~*To some extent this historical vindication of the pro- phetic insight went on during the activity of the prophets themselves. From the time of Amos*~~

~~*downwards the pro- phets spoke mainly at great historical crises, when events were moving fast and a few years were often sufficient to show that they were right and their opponents wrong in their reading of the signs of the times. And here the controversy did not turn on the exact fulfilment of de- tailed predictions; detailed prediction occupies a very secondary place in the writings of the prophets ; or rather indeed what seem to be predictions in detail are usually only free poetical illustrations of historical principles which neither received nor demanded exact fulfilment. Isaiah, for example, in the time of Ahaz sketches the fatal results of Assyrian intervention, and pictures the sufferings of Judah when it should become the battlefield of the rival empires of the Tigris and the Nile, in a way that was by no means realized in detail; but this does not affect the fact that he alone in Judah had correctly appreciated the historical situation, and that he did so not because he was a better statesman than his opponents, but because he had a different conception of the 'religious significance of the crisis. All through the prophetic period it was plain that the true prophets differed from the mere pro- fessional prophets and statesmen in their view of the political duties and prospects of the nation because they had a different idea, or, as they themselves would have said, a truer knowledge, of God, and so the prophets and their successors—notably Isa. xl.—-lxvi.—look on the event of Israel's history, not so much as proving that Isaiah or Jeremiah was a true prophet, but as proving that the Jehovah of the prophets is the true God, whose word cannot return to HIm void, but must surely accomplish that which HIe pleaseth (Isa. lv. 11).*~~

~~*The prophets themselves required no historical verifica- tion of their word to assure them that it was indeed the word of God, nor do they for a moment admit that their contemporaries are entitled to treat its authority as un- proved till such verification is offered. The word of God carries its own evidence with it in its searching force and fire: "Is not my word likes a fire, saith Jehovah, and like a hammer that breaketh the rock in pieces?" (Jer. xxiii. 29). Tio the prophet himself it comes with imperi- ous force: it constrains him to speak (Amos iii. 8), seizes him with a strong hand (Isa. viii. 11), burns like a fire within his bones till it finds utterance (Jer. xx. 9); and it is this force of moral conviction which ought also to com- mend it to the conscience of his hearers. The word is true because it is worthy of the true God. When Deut. Xviii. 21, 22 seeks the legal criterion of true*~~

~~*prophecy in the fulfilment of prediction, the writer is no doubt guided by the remembrance of the remarkable confirmation which the doctrines of spiritual prophecy bad received in history*~~

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~~*then recent, but his criterion would have appeared inade- quate to the prophets themselves, and indeed this passage is one of the most striking proofs that to formulate the principles of prophetic religion in a legal code was an impossible task.*~~

~~*The mass of the nation, of course, was always much more struck by the "signs" and predictions of the pro- phets than by their spiritual ideas; we see how the idea of supernatural insight and power in everyday matters dominates the popular couception of Elijah and Elisha in the books of Kings. Ata very early date the great pro- phets became a kind of saints or welzs, and the respect paid to the tombs of the prophets, which ultimately took in almost every particular the place of the old local shrines (Mat. xxiii. 29; Jerome, Lpit. Paulx, § 13; see OBADIAH), can be traced back to the time before the exile.'*~~

~~*After the extinction of the prophetic voice, an ever-increasing weight was not unnaturally laid on the predictive element in their writings. Their creative religious ideas had become the common property of religious-minded Jews, at least in the somewhat in- perfect shape in which they were enibodied in the law, and their work on this side was carried on by the great religious poets. But the restored community which was still making a sort of faint attempt to be a religious nation as well as a church felt very pain- fully the want of a direct message from God in critical times such as the prophets of old had been wont to bring. And in this need men began to look at the prophetic books, mainly in the hope that there might be found in them predictions which still awaited ful- filment, and might be taken as referring to the latter days of Persian or Greek oppression. By ignoring the free poetical form ofpro- phecy, and still more by ignoring the fact that the proplietic pictures of the ideal future of Israel could not be literally fulfilled after the fall of the ancient state had entirely changed the sphere in which the problems of true religion had to be worked out, it was possible to find a great mass of unfulfilled prophecy which might form the basis of*~~

~~*eschatological constructions. 'To use this material for the purpose in hand it was necessary to symbolize what was literal and to literalize what was figurative, to harmonize and to rearrange, above all to introduce some sort of prophetical chrono- logy of future events. But all this was quite in the vein of later Judaism, and so at length the unfulfilled predictions of the prophets served as the raw material for the elaborate eschatology of the apoca- lypses. See APocALypric LITERATURE and MeEssiau. In spite of superficial resemblances, mainly due to the unavoidable influence of current exegetical methods, the New-Testament conception of prophecy as fulfilled in Christ is fundamentally different from the Jewish apocalyptic view of unfulfilled prophecy. Not external details but the spiritual ideas of the prophets find their fulfilment in the new dispensation, and they do so under forms entirely diverse from those of the old national kingdom of Jehovah.*~~

~~*Literature.—In the ancient and medieval church and in the dogmatic period of Protestantism there was little of no attempt at historical study of prophecy, and the prophetical books were found instructive only through the application of allegorical or typical exegesis. For details the reader may refer to Diestel, Geschichte des Alten Testaments, Jena, 1869, and for the final form of orthodox Protestant views to Witsius, De Prophetis et Prophetia. The growing sense of the insufficiency of this treatment towards the close of the period of dogmatism showed itself in various ways. On the one hand we have the revival of apoca- lyptic exegesis by Cocceius and his school, which has continued to influence certain circles down to the present day, and has led to the most varied attempts to find in prophecy a history, written before the event, of all the chief vicissitudes of the Christian church down to the end of the world. On the other hand Lowth's Lectures on Hebrew Poetry, and the same author's Commentary on Isaiah (1778), show the beginnings of a tendency to look mainly at the esthetic aspects of the prophetical books, and to view the prophets as enlightened religious poets. This tendency culminates in Eichhorn, Die ebrdischen Propheten, 1816. Neither of these methods could do much for the historical understanding of the pheno- mena of prophecy as a whole, and the more liberal students of the Old Testament were long blinded by the moralizing unhistorical rationalism which succeeded the old orthodoxy. The first requisite of real progress, after dogmatic pretudices had been broken through, was to get a*~~

~~*living conception of the history in which the prophets moved; and this again called for a revision of all traditional notions as to the age of the various parts of Hebrew literature—criticism of the sources of the history, among which the prophetical books themselves take the first place. In recent times therefore advance in the understanding of the prophets has moved on pari passu with the higher criticism, especially the criticism of the Pentateuch, and with the general study of Hebrew history ; and most works on the subject prior to Ewald must be regarded as quite antiquated except for the light they cast on detailed points of exegesis. On the prophets and their works in general the best book is still Ewald's Propheten des Alten Bundes (1st ed. 1840-41, 2d ed. 1867-68, Eng. tr. 1876-77). The subject is treated in all works on Old Testament introduction (among which Kuenen's Onderzoek, vol. ii., claims the first placc), and on Old Testament theology (see especially Vatke, Religion des A, T., 1835). On the theology of the prophcts there is a separate work by Duhm, Bonn, 1875, and Knobel's Prophetismus der Hebréer, 1837, is a separate introduction to the prophetical books. Kuenen's Prophets and Prophecy in Israet*~~

~~*1 See 2 Kings xxiii. 21, and also Deut. xxxiv. 6. So too all the old national heroes and heroines ultimately became prophets ; in the case of Deborah there is even a fusion in local tradition between an old heroine and an historical seer.*~~

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~~*1875, Eng. tr. 1877) is in form mainly a criticism of the traditional view of nd Pe therefore be compared with his Onderzoek and Godsdienst van Israel. Most English books on the subject are more theological than historical, but a sketch of Hebrew prophecy in connexion with the history down to the close of the 8th century is given by W. R. Smith, The Prophets of Israel, Edin- burgh, 1882. A useful commentary on the prophetical books in general forms two volumes of Reuss, La Bible (Paris, 1876); the special literature is referred to in the articles on the several prophets. The literature of the theological questions connected with prophecy is much too copious to be cited here ; lists will be found in several of the books already refeired to. cw. BR. 8.)*~~

~~*2. Prophets in the Christian Church.—The appearance of prophets in the first Christian communities 1s one proof of the strength of faith and hope by which these bodies were animated. An old prophecy (Joel iii. 1) had foretold that in the Messianic age the spirit of God would be poured out on every member of the religious community, and in point of fact it was the universal conviction of those who believed in Christ that they all possessed the Spirit of God.*~~

~~*This Spirit, manifesting His presence in a variety of ways and through a variety of gifts, was to be the only ruling authority in the church. He raised up for Himself par- ticular individuals, into whose mouths He put the word of God, and these were at first regarded as the true leaders of the congregations. We find accordingly that there were prophets in the oldest church, that of Jerusalem (Acts xi. 27; xv. 32), and again that there were "prophets and teachers" in the church at Antioch (Acts xiii. 1). These were not office-bearers chosen by the congregation, but preachers raised up by the Spirit and conferred as gifts on the church. When Paul says (1 Cor. xii. 28; cf. Eph. iv.*~~

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~~*11), '"'God has set some in the church, first as apostles,—*~~

~~*second as prophets, third as teachers," he points to a state of things which in his time prevailed in all the churches both of Jewish and heathen origin. We here learn from Paul that the prophets occupied the second position in point of dignity ; and we see from another passage (1 Cor. xiv.) that they were distinguished from the teachers by their speaking under the influence of inspiration,—not, however, like the "speakers in tongues," in unintelligible ejaculations and disconnected words, but in articulate, rational, edifying speech. Until recently it was impossible to form any distinct idea of the Christian prophets in the post-apostolic age, not so much from want of materials as because what evidence existed was not sufficiently clear and connected. It was understood, indeed, that they had maintained their place in the churches till the end of the 2d century, and that the great conflict with what is known as Montanism had first proved fatal to them ; but a clear conception of their position and influence in the churches was not to be had. But the discovery, by Bryennios, of the ancient*~~

~~Christian work called Adayn Tov dddexa aroordAwv has immensely extended the range of our knowledge, and has at the same time thrown a clear light on many notices in other sources which for want of proper interpretation had been previously neglected or in- correctly understood.~~

~~The most important facts known at present about the manner of life, the influence, and the. history of the early Christian prophets are the following. (1) Down to the close of the 2d century the prophets (or prophetesses) were regarded as an essential element in a church possess- ing the Holy Ghost. Their existence was believed in, and they did actually exist, not only in the catholic congrega- tions—if the expression may be used—but also in the Marcionite church and the Gnostic societies. Not a few — prophets are known to us by name 3 as Agabus,~~

~~udas, and Silas in Jerusalem ; Barnabas, Simon Niger, &c., in Antioch; in Asia Minor, the daughters of Philip, Quadratus, Ammia, Polycarp, Melito, Montanus, Maximilla and Priscilla ; In Rome, Hermas; among the followers of Fa tog gm and Barkoph ; in the community of oe es, Philumene, &e. Lucian tells us that the impostor grinus Proteus, in the time of Antoninus Pius,~~

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~~figured as a prophet in the Christian churches of Syria. (2) Till the middle of the 2d century the prophets wero the regular preachers of the churches, without being attached to any particular congregation. While the "apostles" (¢.e., itinerating missionaries) were obliged to preach from place to place, the prophets were at liberty either, like the teachers, to settle in a certain church or to travel from one to another. (3) In the time of Paul the form of prophecy was reasoned exhortation in a state of inspiration; but very frequently the inspiration took the form of ecstasy—the prophet lost control of himself, so that he did not remember afterwards what he had said. In the Gentile-Christian churches, under the influence of pagan associations, ecstasy was therule. (4) With regard to the matter of prophecy, it might embrace anything that was necessary or for the edification of the church. The prophets not only consoled and exhorted by the recital of what God had done and predictions of the future, but they uttered extempore thanksgivings in the congregational assemblies, and delivered special~~

~~directions, which might extend to the most minute details, as, for example, the disposal of the church funds. (5) It was the duty of the prophets to follow in all respects the example of the Lord (€yew rots tpdrovs rod Kvupiov), and to put in practice what they preached. But an ascetic life was expected of them only when, like the apostles, they went about as missionaries, in which case the rules in Mat. x. applied to them. Whenever, on the contrary, they settled in a place they had a claim to a liberal maintenance at the hands of the congregation. The author of the A.dayy even compares them to the high priests of the Old Testament, and considers them entitled to the first- fruits of the Levitical law. In reality, they might justly be compared to the priests in so far as they were the mouthpieces of the congregation in public thanksgiving. (6) Since prophets were regarded asa gift of God and as moved by the Holy Spirit, the individual congregation had no right of control over them. When anyone was ap- proved as a prophet and exhibited the " conversation of the Lord," no one was permitted to put him to the test or to criticize him. The author of the A:dayy goes so far as to assert that whoever does this is guilty of the sin against the Holy Ghost. (7) This unique position of the prophets could only be maintained so long as the original enthu- siasm remained fresh and vigorous. rom three quarters primitive Christian prophecy was exposed to danger,— first, from the permanent officials of the congregation, who, in the interests of order, peace, and security could not but look with suspicion on the activity of excited prophets ; second, from the prophets themselves, in so far as an in- creasing number of dishonest characters was found amongst them, whose object was to levy contributions on the churches ;! third, from those prophets who were filled with the stern spirit of primitive Christianity and imposed on churches, now becoming assimilated to the world, obliga- tions which these were neither able nor willing tofulfil. It is from this point of view that we must seek to understand the so-called Montanistic crisis. Even the author of the A.daxy finds it necessary to defend the prophets who practised celibacy and strict asceticism against the depre- ciatory criticism of church members. In Asia Minor there was already in the year 160 a party, called by Epiphanius " Alogi," who rejected all Christian prophecy. On the other hand, it was also in Asia Minor that there appeared along with Montanus those energetic prophetesses who charged the churches and their bishops and deacons with becoming secularized, and endeavoured to prevent Chris-~~

~~1 See Lucian's story about Peregrinus, and that chapter of the~~

~~Aidax7 where the author labours to establish criteria for distinguish- ing false prophets from true.~~

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~~tianity from being naturalized in the world, and to bring the churches once more under the exclusive guidance of the Spirit and His charismata. The critical situation thus arising spread in the course of a few decades over most of the provincial churches. The necessity of resisting the inexorable demands of the prophets led to the introduction of new rules for distinguishing true and false prophets. No prophet, it was declared, could speak in ecstasy,—that was devilish; further, only false prophets accepted gifts. Both canons were innovations, designed to strike a fatal blow at prophecy and the church organization re-established by the prophets in Asia,—the bishops not being quite pre- pared to declare boldly that the church had no further need of prophets. But the prophets would not have been suppressed by their new methods of judging them alone. A much more important circumstance was the rise of a new theory, according to which all divine revelations were summed up in the apostles or in their writings. It was now taught that prophecy in general was a peculiarity of the Old Testament ("lex et prophetze usque ad Johannem"); that in the new covenant God had spoken only through apostles ; that the whole word of God so far as binding on the church was contained in the apostolic record—the New Testainent ;1 and that, consequently, the church neither required nor could acknowledge new revelations, or even instructions, through prophets. The revolution which this theory gradually brought about is shown in the trans- formation of the religious, enthusiastic organization of the church into a legal and political constitution. A great many things had to be sacrificed to this, and amongst others the old prophets. The strictly enforced episcopal constitution, the creation of a clerical order, and the for- mation of the New Testament canon accomplished the overthrow of the prophets. "God continually confers on the church apostles, prophets, and teachers," the word now was—"The church is founded in the (written) word of the prophets (z.c., the Old-Testa- ment prophets) and the apostles (vz, the twelve and Paul)." After the beginning of the 3d century there were still no~~

~~doubt men under the control of the hierarchy who experienced the prophetic ecstasy, or clerics like Cyprian who professed to have received special directions from God; but prophets by vocation no longer existed, and these sporadic utterances were in no sense placed on a level with the contents of the sacred Scriptures.~~

~~See Btickmann, "Ueber die Wunderkrifte bei den ersten Christen und ihr Erléschen," in the Ztschr. f. d. ges. luther. Theol. . Kirche, 1878, p. 216-255 (learned but utterly uncritical) ; Bonwetsch, "Dic Prophetie im apostol. und nachapostol. Zeitalter," in the Ztschr. f. kirchl. Wissensch. wu. kirchl. Leben, 1884, part 8, p. 408 sq., part 9, p. 460 sq¢.; Harnack, Die Lehre der zwilf Apostel, 1884, p. 93-137. (A. HA.)~~

~~PROSELYTE (zpooyAvros) is the term most frequently adopted by the Septuagint, especially in legal passages, to represent the Hebrew 33. The gér, or more fully gér wtdshab, is not any " stranger" but a stranger dwelling in a Hebrew community and enjoying a certain measure of protection. In old time at least the position of such a stranger was no doubt very insecure, for he had no strong kinsmen to take his part, and so, like the widow and orphan, with whom many passages of the Old Testament associate him, he was liable to oppression. The law as well as the prophets commend him ¢o the humane regard of his neighbours, but it would have been quite foreign to antique ideas to grant him equal rights (see Lev. xxv. 45; Deut. xxii. 20). Like the Arabic jar, therefore (whose name is at bottom the same), he must have gene- rally sought to attach himself as a client to some indi- vidual or community able to protect him, and so we must~~

~~1 The Apocalypse of John was received into it, not as the work of a prophet, but as that of an apostle.~~

~~Instead of the old formula, |~~

~~understand the metaphor in passages like Ps. xv. 1, imonx. 12.~~

~~In the old Hebrew kingdom the word gér had a civil not a religious significance, and it would almost seem that a poor Israelite without inheritance might sink to this position, which indeed is scarcely distinguishable from that of the Levite in Jud. xvii. 8, who went forth to~~

~~*sojourn (gur) where he might find a place. The exile and the restoration made a change in this as in all other aspects of Hebrew society. On the one hand Ezekiel xlvii. 22 and Isa. xiv. 1 contemplate that the restored nation shall be recruited by strangers who are received on equal terms; but, as the Jews returned not as an inde- pendent nation but as a distinct religious community, this implies especially that the sons of the stranger, by joining Israel, observing the Sabbath, and holding fast to Jehovah's covenant, may gain admission to all the privi- leges of the temple and its worship. So it is put in Isa. lvi. 6, 7 in marked contrast to the restrictions laid down in Deut. xxiii. 3, 7 sg. That the views of the prophets had practical issue cannot be doubted ; even the foreign Nethi- nim in the second temple were rapidly transformed not merely into good Israelites but into Levites. The condi- tion of admission to the full privileges of an Israelite, in particular to the passover, is, according to the Priestly Code (Exod. xii. 48; Numb. ix. 14), circumcision,—to which the later Jewish usage adds lustration by immer- sion in water (baptism, ?b7/d) and the presentation of a sacrifice (korban). The immersion, about which there has been a good deal of controversy, some maintaining that it came into use later than Christian baptism, was really a necessary act for one who had been previously unclean, and may be held to be involved in the general Pentateuchal law of ceremonial washings. The later technical name for a heathen who thus joined the theo- cracy was payn 13, '" proselyte of righteousness."*~~

~~*The free admission of foreigners to the Jewish church is a mark of the universalistic tendency which, in spite of all the narrownesses of Judaism under the law, accom- panied the break-up of the old national system. On the other hand the so-called Law of Holiness (later than Ezekiel but earlier than the Priestly Code), which is contained in Lev. xvii. sg., presents a different line of transition from the purely civil to the religious meaning of gér. In these laws, which proceed throughout on the principle that Israel, and all that has to do with Israel, must be regu- lated by regard to formal holiness, it is demanded that certain rules shall be enforced not only on Israelites proper but on strangers sojourning in their land. They are not to eat blood (xvii. 10), commit incest (xviii. 26), sacrifice to Moloch (xx. 2), or blaspheme Jehovah (xxiv. 16); and for murder and other ¢rimes they are to be answerable to the Hebrew authorities according to Hebrew law (xxiv. 22). These rules are in substance—the third being ex- tended to a*~~

prohibition of idolatry generally—the ‘“Noachic laws” to which in later usage a man or woman might pro- mise to conform and thereby, without becoming a regular member of the theocracy, be recognized as a ‘“‘ proselyte of the gate,” «ae, “within the gates of Israel.” What the Law of Holiness proposed to enforce became in fact—the theocracy not possessing political power over strangers— a voluntary obligation assumed by those “ who worshipped God” (ceBopevor Tov Oedv, Acts xiii. 50, xvi. 14, xvii. 4, 17, xviii. 7—in E.V. often rendered “devout ”).

The proselytizing zeal of the Jews is spoken of in Mat. . xxill. 15, and by many Greek and Latin writers. Up to the time of Hadrian it was facilitated by the favour gene- rally extended to the Jews by the Roman emperors ; and not only on Semitic soil, as at Damascus, where Josephus tells us that most of the women were proselytes, but

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throughout the Roman world many converts were made, especially among women. The most noted conversion was that of the royal house of Adiabene (Josephus, Ant., xx. 2), of which the splendid tomb of Queen Helena, a little way outside of Jerusalem, still remains a monument. PROSERPINE (Proserpina) is the Latin form of Prr- SEPHONE,! a Greek goddess, daughter of Zeus and the earth-goddess Demeter. In Greek mythology Demeter and Proserpine were closely associated, being known to- gether as the two goddesses, the venerable or august god- desses, sometimes as the great goddesses. herself was commonly known as the daughter (Core), sometimes as the first-born. As she was gathering flowers with her playmates in a meadow, the earth opened and Pluto, god of the dead, appeared and carried her off to be his queen in the world below. This legend was localized in various places, as at Eleusis, Lerna, and “‘ that fair field of Enna” in Sicily. Torch in hand, her sorrowing mother sought her through the wide world, and finding her not she forbade the earth to put forth its increase. So all that year not a blade of corn grew on the earth, and men would have died of hunger if Zeus had not persuaded Pluto to let Proserpine go. But before he let her go Pluto made her eat the seed of a pomegranate, and thus she could not stay away from him for ever.2. So it was arranged that she should spend two-thirds (according to later authors,

~~one-half) of every year with her mother and the heavenly gods, and should pass the rest of the year with Pluto beneath the earth. There can be little doubt that this is a mythological expression for the growth of vegetation in spring and its disappearance in autumn. According to Theopompus there was a Western people who actually called the spring Proserpine. As wife of Pluto, she sent spectres, ruled the ghosts, and carried into effect the curses of men. The lake of Avernus, as an entrance to the infernal regions, was sacred to her. From the head of a dying person Proserpine was supposed to cut a lock of hair which had been kept sacred and unshorn through life? She was sometimes identified with Hecate. On the other hand in her character of goddess of the spring~~

~~she was honoured with flower-festivals in Sicily and at i are oa ig veel Seals nk een~~

~~1 Some, however, regard Proserpina as a native Latin form, not borrowed from the Greek.~~

~~? The idea that persons who have made their way to the abode of the dead can return to the upper world if they have not tasted the food of the dead appears elsewhere, as in New Zealand (R. Taylor, New Zealand, pp. 238, 271).~~

~~3 Ain., iv. 698 sq. It appears to have been a Greek custom to cut a lock of hair from a dead man's head, and hang it outside of the house door, in token that there was a corpse in the house. At least this seems a fair inference from Eurip., Bee ti, HG, MON lock so cut may have been that which was kept sacred to the gods and unshorn (Htym. Mag., s.v., amrecxoAuumévos). For examples of hair dedicated to gods, see JJ., xxiii, 141 sq.; Plut., Phes., 5; Pans., vili. 20, 3. In Tibet a lama (priest) is called in to cut off some hairs from the head of a dying person, in order that his soul may escape through the top of his head, which is deemed an essential condition of a good transmigration (Horace de la Penna, in Bogle and Manning's Travels in Tibet). We can hardly doubt that the intention of the Greco-Roman custom was similar. In modern Greece the god of death, Charos, is supposed to draw the soul out of the body, and if a man resists the Arachobites believe that Charos slits open his breast (B. Schmidt, Volksleben der Neugriechen, p. 228). There are other instances of incisions made in the body of a dying~~

~~*person to allow his soul to escape (cp. Bastian, Mensch, ii. 342). The custom probably dates from the times when death in battle was the usual death. In the legend of Nisus and Scylla there is a trace of the custom which was still observed in classical times in the sacrifice of animals. The practice of cutting off the hair of the dead prevailed in India, though it does not appear in the Vedas (Monier Williams, Religious Thought and Life in India, p. 281). We are reminded of the practice of the Pawnees and other North American Indians, who shaved the head with the exception of one lock (the scalp-lock), which was removed by a victorious enemy (Catlin, North American Indians, vol. ii. p. 24). The Sandwich Islanders also cut a lock from a slain foe (Ellis, Pol. Res., vol. iv, p. 159)*~~

~~*Proserpine |*~~

~~*PRO—P RO*~~

~~*Hipponium in Italy. Sicily was a favourite haunt of the two goddesses, and ancient tradition affirmed that the whole island was sacred to them. The Sicilians claimed to be the first on whom Demeter had bestowed the gift of corn, and hence they honoured the two goddesses with many festivals. They celebrated the festival of Demeter when the corn began to shoot, and the descent of Proser- pine when it was ripe. At Cyare, a fountain near Syra-cuse which Pluto made to spring up when he carried off his bride, the Syracusians held an annual festival in the course of which bulls were sacrificed by being drowned in the water. At Cyzicus also, in Asia Minor, bulls were sacrificed to Proserpine. Demeter and Proserpine were worshipped together by the Athenians at the greater and less Eleusinian festivals, held in autumn and spring respectively. In the Eleusinian mysteries Proserpine no doubt played an important part (see Enzusinra and MystTErIEs). One Greek writer, Achemachus, identified Proserpine with the Egyptian Isis. At Rome Proserpine was associated with Ceres (the Roman representative of Demeter) in the festival of the Cerealia (April 12 to 19), she was represented as the wife of Dis Pater (the Roman Pluto), and was sometimes identified with the native Latin goddess Libera. The pomegranate was Proserpine's symbol, and the pigeon and cock were sacred to her. Her votaries abstained from the flesh of domestic fowls, fish, beans, pomegranates, and apples. In works of art she appears with a*~~

~~*cornucopia or with ears of corn and a cock. The regular form of her name in Greek was Per- sephone, but various other forms occur—Phersephone, Persephassa, Phersephassa, Pherrephatta, &c., to explain which different etymologies were invented. Correspond- ing to Proserpine as goddess of the dead is the old Norse goddess Hel (Gothic Halja), whom Saxo Grammaticus calls Proserpine. (J. G. FR.)*~~

~~*PROSKUROFF, a district town of the government of Podolia, Russia, situated on the railway from Odessa to Lemberg, 62 miles to the north-west of Schmerinka junction, and on the highway from Zhitomir to Kieff. It is poorly built, mostly of wood, on a low marshy plain surrounded by hills, at the junction of the Ploskaya with the Bug. Its old castle has been destroyed, the site being occupied by a Catholic church. The Orthodox cathedral (1839) contains a very ancient and highly venerated icon of the Virgin. The manufactures are insignificant ; but the Jewish merchants carry on an active export trade in corn and sugar, while the imports consist of salt and various manufactured wares. Agriculture and market-gardening are the chief occupations of its Little-Russian inhabitants. Of the population (11,750 in 1880) more than one-half are Jews.*~~

~~*PROSPER oF AquiTainz (AQUITANUS, or AQUITANICUS), a Christian prose and verse writer of the first half of the 5th century. Of his personal history almost nothing is known ; his surname seems to imply that he was a native of Aqui- tania, and there are various indications that he was edu- cated as a "rhetorician." While still comparatively young he gave himself to a religious and ascetic life, and at Marseilles soon made himself prominent as a champion of orthodoxy in the controversy with the Massilians or Semi- Pelagians. In this connexion he opened a correspondence with Augustine, along with his friend Hilarius (c. 429 A.D.), and about the same time (c. 430) he composed an hexameter poem of upwards of one thousand lines, Adversus Ingratos, a glowing polemic against the Pelagians. After Augustine's death he wrote Pro Augustino Re- sponsiones, and about 431 he visited Rome, still in the interests of Augustinianisin, eliciting from Pope Celestine his Lpistola ad Episcopos Gallorum against Cassianus. There are some indicatious that the latter years of his life*~~

~~were spent in Rome, and that he wrote his Chronicon there. The year of his death is unknown; the chronicle is brought down to 455.~~

~~Prosper's enthusiastic admiration for Augustine (to whom, how- ever, he was not personally known) led him to make an abridg- ment of that author's commentary on the Psalms, as well as a collection of sentences for his works,—probably the first dogmatic compilation of the class in which the Liber Sententiarwm is the best known example. Some of Augustine's theological dicta he also put into elegiac metre (one hundred and six epigrams). Prosper's~~

~~Chronicon is of value from the year 29 A.D. onwards, some of the.~~

~~sources which he used for that period being no longer extant. The best edition of the Opera is the Benedictine by Le Brun and Mangeant (Paris, 1711), reprinted in Migne's collection.~~

~~PROSSNITZ (Slavonic, Prostejov), the chief place in the fertile district of the Hanna, in Moravia, Austria, is situated on the small river Rumza, 11 miles south-west of Olmiitz. It carries on manufactures of sugar, cotton, and linen, and isan important centre for the sale of the barley and other produce of the Hanna. It is a town of ancient origin, and in the 16th century was one of the chief seats of the Moravian Brethren. Population in 1880,~~

~~16,751.~~

~~PROTAGORAS of Abdera, the first of the so-called Sophists,—who, about the middle of the 5th century B.c., asserted throughout Greece the claims of education or culture in opposition on the one hand to technical instruc- tion and on the other to physical research,—was an older contemporary of Socrates. At the age of seventy, having been accused and convicted of atheism, Protagoras fled from Athens, and on his way to Sicily was lost at sea. His birth has been plausibly assigned to 481 and his death to 411 B.c. Forty years of his life were spent in the exercise of his popular and lucrative profession in the principal cities of Greece and Sicily. According to Plato (Prot., 318 E), he endeavoured to communicate to his pupils "good counsel~~

~~or prudence (edSovAia), which should fit them to manage their households, and to take part by word and deed in civic affairs." In short, he professed not to "instruct" but to " educate." Further, the educa- tion which he provided was of a literary sort,—oratory, grammar, style, and the interpretation of the poets being among the subjects which he used as instruments. HIs formal lectures were supplemented by discussions amongst his pupils. HIe left behind him several treatises, of which only two or three sentences have survived. In 7'ruth, by way of justifying his rejection of philosophy or science, he maintained that "'man is the measure of all things— of what is, that it is, and of what is not, that it is not."} Besides 7'ruth, and the book Of the Gods which caused his condemnation at Athens, Diogenes Laertius attributes to him treatises on political, ethical, educational, and rhetorical~~

~~subjects.~~

~~On the significance of the Sophistical movement, and the part which Protagoras took in promoting it, as well as for bibliographi- cal information, see Sop1isTs.~~

~~PROTECTION. See Free Trade and PoliricaL Economy.~~

~~PROTESTANTENVEREIN is the name of a society in Germany the general objectrof which is to promote the union and the progress of the various established Pro- testant churches of the country in harmony with the advance of culture and on the basis of Christianity. It was founded at Frankfort-on-the-Main in 1863 by a number of distinguished clergymen and laymen of liberal tendencies, representing the freer parties of the Lutheran and Reformed churches of the various German states, amongst whom were the statesmen Bluntschli and Von Bennigsen and the professors Rothe, Ewald, Schenkel, HIlgenfeld, and HItzig. The more special objects of the~~

~~1 The exposition of this maxim contained in Plato's Theetetus, 152 C sq., is plainly not to be ascribed to Protagoras,~~

~~'circumstances of the church at the moment.~~

~~*association are the following :—the development of the churches on the basis of a representative parochial and synodal system of government in which the laity shall enjoy their full rights; the promotion of a federation of all the churches in one national church ; resistance to all hierarchical tendencies both within and without the Pro- testant churches; the promotion of Christian toleration and mutual respect amongst the various confessions ; the rousing and nurture of the Christian life and of all Christian works necessary for the moral strength and prosperity of the nation. These objects include opposition to the claims of Rome and to autocratic interference with the church on the part of either political or ecclesiastical authorities, efforts to induce the laity to claim and exercise their privileges as members of the church, the assertion of the right of the clergy, laity, and both lay and clerical professors to search for and proclaim freely the truth in independence of the creeds and the letter of Scripture. When the association was first formed the necessity for it was felt to be great. The separation between the Calvinistic and the Lutheran churches on the one hand, and between the churches of the various states on the other, even when the former separation had been bridged over by the Prussian Union ; the entire absence of any satisfactory system of church government, the autocratic authority of either the monarch or his ministers, or of the clergy, being supreme; the increasing encroachments of the papal power upon the rights of the individual and the state; the growing estrangement of the educated classes from the church on the one hand, with the manifestation of either ignorance of the fact or a determination to meet it with bitter denunciation on the part of the orthodox clergy on the other, were regarded as urgent calls to action by the liberals) Membership in the association is open to all Germans who are Protestants and declare their willingness to cooperate in promoting its objects. To facilitate its operations, the general association is broken up into a few groups or societies confined to certain geo- graphical areas. Every second year (at first every year) general meetings of the entire association are held at some convenient place. At first the governing committee had its permanent seat at Heidelberg, but in 1874 Berlin, as the new capital of the empire, was chosen. The means used to promote the objects aimed at are mainly (1) the formation of local branch associations throughout the country, the duty of which is by lectures, meetings, and the distribution of suitable literature to make known and advocate its principles, and (2) the holding of great annual or biennial meetings of the*~~

whole association, at which its objects and principles are expounded and applied to the The ‘“‘theses” accepted by the general meetings of the association as the result of the discussions on the papers read indicate the theological position of its members. The following may

serve as illustrations :—

The creeds of the Protestant church shut the doors on the past only, but open them for advance in the future; it is immoral and contrary to true Protestantism to require subscription to them. The limits of the freedom of teaching are not prescribed by the letter of Scripture, but a fundamental requirement of Protestautism is free inquiry in and about the Scriptures. The attempt to limit the freedom of theological inquiry and teaching in the universities is a violation of the vital principle of Protestantism. Only such con- ceptions of the person of Jesus can satisfy the religious necessities of this age as fully recognize the idea of his humanity and place in history. The higher reason only has unconditional authority, and the Bible must justify itself before its tribunal ; we find the history of divine revelation and its fulfilment in the Bible alone, and reason bids us regard the Bible as the only authority and canon in matters of religious belief.

The formation of the association at once provoked fierce and determined opposition on the part of the orthodox sections of the church, particularly in Berlin. Attempts

more or less successful have been made from the first to exclude clergymen and professors identified with it from the pulpits and chairs of Berlin and elsewhere, though mem- bership in it involves no legal disqualification for either. One of the objects of the association was to some extent obtained by the reorganization of the Prussian Churcli when Dr Falk was cultus minister, on the basis of parochial and synodal representation, which came into full operation in 1879. But the election for the general synod turned out very unfavourable to the liberal party, and the large orthodox majority endeavoured to use their power against the principles and the members of

~~*the association. The members of the association elected to the general synod were nine only, while the party of the decidedly orthodox numbered upwards of seventy. In 1882 the position of the association was rendered still more difficult by the agitation in Berlin of Dr Kalthoff and other members of it in favour of a "people's church" on purely dis- senting and extremely advanced theological principles. The turn of the political tide in the direction of conserva- tism in Berlin indicated by the retirement of the cultus minister Dr Falk increased the difficulties and the work of the association, far as Dr Falk was from sanctioning its theological principles. Moreover, it had sustained severe losses in its membership by death and other causes.*~~

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~~*At the end of the twelfth year of its existence (1877) the associa- tion had 7500 members, its annual income was nearly £350, and it had distributed in the same year 10,000 copies of its publications. In 1880 the number of members had risen to 26,000, and of loeal associations to 80.*~~

~~*See Schenkel, Der Deutsche Protestantenverein und seine Bedeutung fiir die Gegenwart (Wiesbaden, 1868, 2d ed. 1871); Der Deutsche Protestantenverein in seinen Statuten und den Thesen seiner Hauptversammilungen, 1865-82 (Berlin, 1883), and the annual reports in the Allgemeine Kirchliche Krontk, 1865-52, and Theological Review, July 1869, pp. 289-96.*~~

~~*PROTESTANTS is the generic term for members of the churches which owe their origin directly or indirectly to the RerormMaTIon (q.v.). The name is derived from the Protest of Spires in 1529 (see LurHer, vol. xv. p. 80). Certain small communities of Christians older than the Reformation, but agreeing with it in rejecting the author- ity of Rome, are generally and quite logically grouped as Protestants; and popularly the name is considered to include all Christians who do not belong to the Greek and Roman Catholic communions, though members of the Anglican Church, for example, frequently protest against such a classification as historically false and personally obnoxious. Protestantism has flourished best among the Teutonic*~~

~~*peoples of Northern Europe, and has always found it difficult to make its way among the Latin peoples of the South.*~~

~~*The following table shows approximately the number of Protestants in the world :—*~~

~~*Great Britain and Ireland (Anglicans, 18,800,000; Presbyterians, 3,900,000; Methodists, 3,500,000;*~~

~~*Independents, 1,200,000; Baptists, 1,000,000) .....ccasacaeccesjesocoeessecaditeceen sees stememenemenen die epameene 28,400,000 (estimate) German Empire (Lutherans, Reformed, and United, 28,318,280 ; Mennonites and other Baptists, 38,744) 28,357,024 (1880 Norway and Sweden (Norway, 1,805,076; Sweden, 4,561,759, mostly \ORRDNS HN) doponacdoaedmeosonacoso0nee 6,366,835 (1875 and 1880*~~

~~*Denmark and Iceland (Denmark, 1,960,844; Iceland, 72,000, mostly Lutheran) 9678; Lutherans, 73,696; Mennonites,*~~

~~*XO) 77) COBB tebcodonnccacddenceecmda sg onan occ eberace onsen dusbeonboseoooaoHOr Switzerland (mainly Reformed) ..... ee eaadiscAs sates satesins*~~

~~*Holland (Reformed, 2,346,568—including Remonstrants,*~~

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~~*9,472,680 (1879) 1,667,109 (1880)*~~

~~*(Making a total in countries of the Teutonic race of 69,296, 492.)*~~

~~*France (Reformed or Calvinists, 467,531; Lutherans, 80,117; others, 33,109) Belgium, Spain and Portugal, Luxemburg, and Monaco (respectively 15,000, 10,500, 968, and 626) ... el (Waldensians, Free Church of Italy, Methodists, Baptists, &c.)*~~

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~~580,757 (1872)~~

~~27,089 (various) 62,000 (estimate) 13,800 (estimate)~~

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~~(Total in countries of the Latin race, 683,646.)~~

~~Austria (Lutherans, 289,005; Reformed, 110,525; Unitarians, 169, &¢.).....:ccccccccerecrnceesee senses eenees Hungary (Lutherans, 1,180,150; Reformed, 2,043,280; Unitarians, 56,190) ..... - ssssesecccesrerreeeees Russia in Europe (Lutherans in Finland, 2,019,727)..... + Turkey, Greeee, Servia (respectively 10,200, 20,000, and 500) ..~~

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~~401,479 (1880) 3,229,620 (1880)~~

~~4,504,000 (partly estimate)~~

~~30,700 (estimate)~~

~~(Total in countries of Slavonic, non-Aryan, and mixed race, 8,165,799.) ——— - - ——— 78,145,937~~

~~IJ. AMERICA—~~

~~United States (Methodists, 3,686,114 church members; Baptists, 2,424,878; Lutherans, 950,868; Disciples of Christ, 591,821; Congregationalists,~~

~~381,697; Episeopalians, 347,781).....+++6+ 30,000,000 1~~

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~~West Indies~~

~~III, Astra and AusTRALASIA—~~

~~India (Anglicans, &c., 373,848; Baptists, Presbyterians, &c., 128,794 ; Lutherans, 29,577).....6~~

~~Dutch Possessions . Turkey in Asia (100,000) and Persia (5000)~~

~~South Australia (216,626) and West A : Nise. Weald ( ) an est Australia (20,613)~~

~~IV. Arrica—~~

~~Egypt and North Africa (10,000) and West Africa (110,000)...~~

~~Cape Colony, &c. East and Central Africa (2000) and Madagascar (300,000)~~

~~Total number of Protestants thus ascertained~~

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~~China and Corea (73,000), Japan (13,000), and Siam (2000)...~~

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~~New South Wales (516,512), Victoria (618,392), Queensland (139,380)..... :seeceessseeeeeeeeeneneetens~~

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~~Bc evhiciss ot 2,422,285 (1881)~~

~~160,500 (estimate) 180,000 (partly estimate)~~

~~32,762,785~~

~~532,219 (1881)~~

~~170,000 (partly estimate) 88,000 (estimate) 105,000 (estimate)~~

~~1,274,284 (1881) 237,239 (1881) 393,971 (1881)~~

~~284,000 (estimate)~~

~~3,084,713~~

~~120,000 (estimate) 400,000 (estimate) 302,000 (estimate)~~

~~822,000~~

114,815,435

This total of 115,000,000 is for obvious reasons considerably within the truth. Making allowance for increase of population since

$0 . p : me of the census returns, it will probably be not beyond the mark to state the Protestants of Europe at 81,000,000, of

America at

34,0 i : : ,000,000, of Asia and Australasia at 3,300,000, and of Africa at 850,000, and the total in round numbers at 120,000,000. As regards

Europe, compare Brachelli, Die Staaten Europa's, 1884.

Jurasehek in his edition of Otto Hiibner's Geograph.-statistische Tabellen,

1884, gi Totes : : » gives 123,000,000 Protestants, or 8°5 per cent. of the total population of the world, which he states at 1,485,000, 000.

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of 1880.

1 Thi . . : mer his estimate of the Protestant population is based on the details of church membership (partly given above) obtained at the census

occipital absent.

PRO-PRO

PROTEUS, a Greek sea-god, spoken of by Homer as the Old Man of the Sea. In the Odyssey he dwells in the sea near Pharos, an island said to be a day's sail from the mouth of the Nile; in Virgil his home is the Carpathian Sea between Crete and Rhodes. He knew all things past, present, and future, but was very loth to tell what he knew. Those who would consult him had first to surprise and bind him during his noon-day slumber ina cave by the sea, where he was wont to pass the heat of the day surrounded by his seals. Even when caught he would try to escape by assuming all sorts of shapes;

~~*now he was a lion, now a serpent, a leopard, a boar, a tree, fire, water. But if his captor held him fast, the god at last returned to his proper shape, gave the wished-for answer, and then plunged into the sea. He was subject to Poseidon, whose finny droves he shepherded under the billows. In post-Homeric times some thought that Proteus was a king of Egypt, at whose court the fair Helen tarried after she had been carried off by Paris, while the Greeks fondly deemed she was in Troy. This is the story followed, with varia- tions, by Herodotus, who got it from Egyptian priests, and by Euripides in his play of Helen.*~~

~~*The fairy tale of Proteus has been interpreted in various fanciful ways. Proteus's leading features—his knowledge of the future and his power of assuming any shape at pleasure—are characteristic of the "medicine-men" of savages in many parts of the world. As late as the beginning of our era there was a class of wizards at Rhodes who possessed two at least of the chief marks of " medicine- men "—the powers of transforming themselves and of making rain (Diod. Sie, v. 55). There were rain-makers also at Rome (Festus, s.v. "aquelicium," where see commentary).*~~

~~*PROTEUS ANGUINUS, a blind, newt-like perenni- branchiate Amphibian, about a foot long, found in the Adelsberg, Maddalena, and other limestone caverns of Carinthia and Carniola. The creature is white or flesh- coloured, and the transparent gills appear blood red; the skin passes uninterruptedly over the rudimentary eyes. The animal's body is cylindrical; the snout is long and blunt ; the fore-feet have three toes, and the hind (which are set very far back) two. There are three gill-arches and two gill-slits on each side. The absence of the fourth branchial arch is a feature that Proteus has in common with Afenobranchus and also with Spelerpes. The skull is of an elongated form, and presents several remarkable characters. The trabecule cranii are persistent, as in the snake. The membrane bones are singularly few, the maxille being rudimentary and the nasals and supra- In the lower jaw the splenial is said to be absent, but a mento-Meckelian cartilage element is present, as in Batrachia. The palatines have a row of teeth, and are ankylosed with the pterygoids; the premaxille, dentaries, and vomers carry teeth. The absence of a cartilage roof to the nasal cavity is one of the many characters in which Proteus agrees with Menobranchus, but differs from Siren and Menopoma. The suspensorium has only a simple pedicle, as*~~

~~in Batrachia, and the hyoid arch is remarkable for the enormous hyo-mandibular element, which is larger even than in many sharks. The notochord is scarcely constficted by the amphicccelous vertebree, and the intervertebral cartilages are at a minimum of development. There are twenty-nine trunk vertebree, one sacral, and twenty-eight caudal. The pectoral arch contains a long thin ossified scapula, a supra- scapula, and a long precoracoid separated by a deep notch from the main coracoid ; a fissure exists in the glenoid region. There is no sternum. The pectoral girdle is almost identical with that of Menobranchus. The pelvis has a narrow tapering ischial region, well-marked prepubes, and (?)a pointed epipubis; this girdle also is extremely like that of Jfenobranchus, but notably different from that of the Axolotl, which is only a pseudo-perennibranchiate,~~

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~~827~~

~~and whose real affinities are with Salamander and Triton. The bones of the fore-arm and leg are unankylosed, There are three unossified carpal and tarsal elements, which Gegenbaur identifies as a radiale, ulnare, and a fused distal row; such a carpus has no resemblance to either the em-bryonic or adult stage of any other amphibian. In the heart the auricular septum is incomplete; the truncus arteriosus bifurcates into two trunks: each divides into two, and the posterior of these again into two, thus forming the three aortic arches on each side. The pulmonary vein sends part only of its blood into the heart, and part into the systemic veins. The blood-corpuscles are the largest known among vertebrates, and are comparable to the exceedingly large corpuscles of the Dipnor. The brain is very small, straight, and embryonic in character. The gut is straight, and the stomach is a scarcely perceptible dilata- tion. The thyroid (alone among amphibians) is unpaired. The lungs are long simple sacs, expanded distally, as in Menobranchus ; the trachea is excessively short, and the two cartilages which bound the glottis are continued into long processes which pass to the base of the lungs. As in Siren, Siredon, and others, the lateral branch of the vagus nerve is connected with a series of sense-organs forming a "lateral line." These characters together indicate the exceedingly low position of Proteus among Amphibia ; it and its close~~

~~relative the American Jfenobranchus are the lowest of living Amphibia. The creature seems to be abundant within its limited habitat; it feeds on worms and small fishes, which in spite of its blindness it catches dexterously. It has bred in captivity, and lays round, isolated eggs, about a third of an inch in diameter. It changes colour slightly in the breeding season, and two rows of reddish spots make their appearance on the hinder~~

~~-part of the body. Such a change seems to indicate that~~

~~the creature has not always lived in the absolute darkness in which it now spends its life. Individuals differ in some minor characters, and Cope (Journ. Acad. Philadelphia, v. p. 103, 1866) has based four new species on Hyrtl's specimens (PP. zoisti, carrarx, xanthostichus, schreitersii). Merrem altered the name of the genus to Hypochthon (Gesch. der Amphibien, 1790-1820).~~

~~Authorities.—Proteus was first described by Laurenti in his Synopsis Reptilium (Vienna, 1768, p. 37); his locality, Lake Zirknitz, was erroneous. It was next mentioned by Scopoli (Annus V. Hist. Nat., 1772).~~

~~PROTOGENES, a Greek painter, born in Caunus on the coast of Caria, but resident in Rhodes during the latter half of the 4th century B.c., was celebrated for the minute and laborious finish which he bestowed on his pictures, both in drawing and in colour. Apelles, his great rival, standing astonished in presence of one of these works, could only console himself that he knew wheu to stop whereas Protogenes did not. So also Petronius (Satyr., 83) experienced a sensation of horror at the too vivid realization of nature in which Protogenes indulged. On one picture, the Ialysus, he spent seven years; on another, the Satyr, he worked continuously during the~~

~~siege of Rhodes by Demetrius Poliorcetes (305-4 B,C.) notwithstanding that the garden in which he painted was in the middle of the enemy's camp. Demetrius unsolicited took measures for his safety; more than that, when told that the Ialysus just mentioned was in a part of the town exposed to assault, Demetrius changed his plan of opera- tions. Possibly the slowness and laboriousness of the work of Protogenes was due partly to a want of~~

~~*training in his youth. He appears to have been self-taught ; some said that he had begun life as a ship-painter, and, though the painting of certain small figures of ships in a picture of his in Athens, however excellent it may have been, can hardly be held to confirm this account of his youth, it does not on the other hand render the account unreliable. It may have been due also to a want of early training that he found so much difficulty in rendering the foam at the mouth of a dog which occurred in the picture of Ialysus. Angry at his many failures, he dashed the sponge wet with the white colour which he had just wiped off at the mouth of the dog. The result was a perfectly successful foam. Ialysus was a local hero, the founder of the town of the same name in the island of Rhodes, and probably he was represented asa huntsman. The picture was still in Rhodes in the time of Cicero, but was afterwards removed to Rome, where it perished in the burning of the temple of Peace. On another occasion Protogenes seems to have used his sponge with a different effect. painted during the siege of Rhodes consisted of a satyr leaning idly against a pillar on which was a figure of a partridge so life-like that ordinary spectators saw nothing*~~

~~*but it. Enraged on this account, the painter wiped out the partridge. The Satyr must have been one of his last works. He would then be about seventy years of age, and*~~

~~*had enjoyed for about twenty years a reputation next only to that of Apelles, his friend and benefactor. Both were finished colourists so far as the fresco-painting of their day permitted, and both were laborious in the practice of draw- ing, doubtless with the view to obtaining bold effects of perspective as well as fineness of outline. It was an illus- tration of this practice when Apelles, finding in the house of Protogenes a large panel ready prepared for a picture, drew upon it with a brush a very fine line which he said would tell sufficiently who had called. Protogenes*~~

~~*on his return home took a brush with a different colour |*~~

~~*and drew a still finer line along that of Apelles dividing it in two. Apelles called again; and, thus challenged, drew with a third colour another line within that of Protogenes, who then admitted himself surpassed. This panel was seen by Pliny (V.H., xxxv. 83) in Rome, where it was much admired, and where it perished by fire. In the gallery of the Propylewa at Athens was to*~~

~~*be seen the panel by Protogenes in which occurred the figures of ships already mentioned. The subject consisted of two figures representing personifications of the coast of Attica, Paralus and Hammonias, to whom the presence of ships would be the more appropriate as the Athenians actually possessed two ships so named. For the council chamber at Athens he painted figures of the Thesmothete, but in what form or character is not known. Probably these works were executed in Athens, and it may have been then that he met Aristotle, who recommended him to take for subjects the deeds of Alexander the Great. In his Alexander and Pan he may have followed that advice in the idealizing spirit to which he was accustomed. To this spirit must be traced also his Cydippe and Tlepolemus, legendary personages of Rhodes, Among his portraits are mentioned those of the mother of Aristotle, Philiscus the tragic poet, and King Anti- gonus. But Protogenes was also a sculptor to some extent, and made several bronze statues of athletes, armed figures, huntsmen, and persons in the act of offering sacrifices.*~~

~~*The picture |*~~

~~*PRO—P RO*~~

~~*PROTOPLASM. In most of the biological articles already before the reader, whether concerned with general questions, as Brotocy, ANatomy, Borany, Empry- oLocy, Evotution, Histotocy, MorpHoiocy, PHysioLocy, &c., or even with special groups of living beings, as ANIMAL Kincpom, ForAMINIFERA, Funcus, Protozoa, &c., special reference has been made to protoplasm as the living matter from which all kinds of living beings are formed and developed, and to the properties of which all their functions are ultimately referred. Fundamentally important then as this substance is, whether we occupy the standpoint of morphology, physiology, or ztiology, an attempt must be made to outline the way in which our knowledge of it has been reached, to bring together by the aid of a short summary the statements of such preceding articles, and to supply means of extending the general idea thus obtained by reference to the original literature of the subject.*~~

~~*§ 1. Hestoryn—Among the varied and fruitful observa-. tions of the early microscopists, Résel v. Rosenhof's ex- cellent account (1755) of his*~~

~~*"Proteus animalcule" (the familiar Ameba) is especially noteworthy as the earliest description of the form and movements of what we now know as a mass of living protoplasm. Such discoveries as those of rotation in the cell of Chara (Corti, 1772), and of similar movements in other plant cells (Vallisneria, Meyen, 1827; Tradescantia, R. Brown, 1831), are also memorable,—imore so indeed in this relation than is the great contemporaneous movement in general histology, since this, though aided by the rapid improvement of the microscope, eagerly carried on by the united labours of. zoologists and botanists, headed by Johannes Miiller and Robert Brown, and culminating in the hands of Schleiden and Schwann (1838-39) in the fundamental morphologi- cal generalization of the cell theory (see MorpHoLocy), included views of the structure, origin, and function of the cell-substance alike erroneous and misleading. Know- ledge had in fact to start afresh from the level of the unappreciated discovery of Rosenhof ; and it is accordingly from the observations of Dujardin on Foraminifera (1835) that our modern knowledge of protoplasm dates. His main account is still worth reading in his own words. In proposing the term "sarcode," he says, "je propose de nommer ainsi ce que d'autres observateurs ont appelé une gelée vivante, cette substance glutineuse, diaphane, in- soluble dans leau, se contractant en masses globuleuses, sattachant aux aiguilles de dissection, et'se laissant étirer comme du mucus, enfin se trouvant dans tous les animaux inférieurs interposée aux autres éléments de structure." Though thus dissipating many errors, and placing the study of the lowest forms of life on its true basis, Dujardin unfortunately did not see the full bearing of his discovery. He recognized his sarcode, however, in the polyps, and noted that the ova of the slug exhibited similar move- ments. The next important step was not taken until 1846, when the botanist Hugo von Mohl, working on quite independent lines, reached a clearly defined conception of the vegetable cell, not only, as usual hitherto, distinguish- ing the cell wall and the nucleus from the cell contents (Zellsaft), but also the "tough, slimy, granular, semi- fluid" constituent from the watery cell-sap hitherto generally confused with it under the common name. For this substance (which Schleiden had already vaguely men- tioned as "Schleim") he proposed the term "protoplasma" (rpdros, first, rAdopa, formed substance). The discovery of the amoeboid movements of colourless blood-corpuscles dates from the same year, and the basis was thus prepared for Ecker's acute comparison (1849) of the "formed*~~

~~*contractile substance" of muscle with the "unformed contractile substance" of the lowest types of animal life. This*~~

~~*PROP?*~~

~~*speculation, so profoundly anticipatory of our present stand- point (see PuysioLocy), was greatly strengthened when Donders shortly afterwards succeeded in referring con- tractility from the cell-membrane to the cell-substance. Cohn's researches among microscopic plants and animals, and particularly his study of the transition, which at that time seemed so marvellous and so perplexing, from plant- like quiescence to animal-like activity, exhibited by the protoplasm of such an alga as Protococcus on escaping from its cell-wall, led him to suggest that vegetable protoplasm and animal sarcode, "if not identical, must be at any rate in the highest degree analogous substances." This speculation again ran too far in advance of current con- ceptions, dominated as these were by the errors which accompanied the cell-theory, and another decade of research was needed for its establishment. This was effected on several simultaneous and convergent lines. The botanical evidence culininated in De Bary's classical monograph of the Myxomycetes (1859) ; the study of the segmentation of the ovum, and the rapid advance of animal histology, both largely due to Kolliker, were of marked importance; while the clear identification of the vegetable " protoplasm " with the animal "sarcode," requiring, as it did, a mastery of all these lines and results of inquiry, was finally effected by M. ScHULTZE (¢.v.), whose researches on Foraminifera (1854), and subsequent admirable studies in animal histology, prepared him to accomplish the definite reform of the cell-theory. This he did by fully and finally replacing (1861-63) the early conception of the cell as an all-import- ant membrane enclosing a nucleus surrounded by fluid by that of a unit- mass of living matter or protoplasm (the nucleus alone being viewed as essential, the wall or mem- brane no longer so). Our present usage of the term proto- plasm for the living substance of the animal as well as of the plant dates from Schultze's paper ("' Ueber Muskelkor- perchen und das was man eine Zelle zu nennen habe," Arch. f. Anat. u. Physiol., 1861) ; and the term sarcode, notwith- standing Dujardin's priority, has since lapsed into disuse, save to some extent among French authors.*~~

~~This rejuvenescence of the cell theory, in a form point- ing to a far deeper unity of the forms and processes of organic nature than its founders had ventured to dream, marks the commencement of a new epoch of detailed inves- tigation of all the forms, aspects, conditions, and products of protoplasmic life; but in this movement the workers are too numerous for mention save in so far as may be inciden- tal in the following scanty reference to some of their main results (1).1~~

~~§ 2. Appearance and Properties of Protoplasm.—To ob- tain a notion of the appearance and physical properties of protoplasm; it is expedient as it were to repeat the process of discovery, and acquire concrete ideas by actual observa- tion as far as possible, or at least from good figures. The Amba (see Protozoa) and the FoRaMINIFERA (¢.v.) thus afford convenient and classical examples of the protoplasm of the lowest animal forms; the colourless corpuscles of blood should also be examined, and the structure of the higher tissues (see ANaTomY and HistoLoey) inquired into, and the segmentation of an ovum (see REPRODUC- TION) observed,—most conveniently perhaps in frog spawn. Vegetable examples are readily obtained from the cells of a growing shoot (see Botany, vol. iv. pp. 83 s¢., figs. 1 and 6); while the living cells of Chara (Botany, fig. 7) and other examples of protoplasmic movement should be observed. Thus, with the aid of the descriptive passages to be found in the articles referred to at the outset, a tolerably clear idea of a mass of protoplasm, with its con- tained granules of various kinds and its sap-vacuoles, will~~

~~1 These numbers refer to the bibliography at p. 830.~~

~~be obtained ; and its frequent differentiation into an outer layer or ectoplasm, clearer and denser, passing into an inner layer or endoplasm, usually more fluid and granular, will be noted. A finely reticulated structure of the protoplasm may also be made out in many cases; the nucleus (incon- Spicuous since equally refracting with the protoplasm dur- ing life, but brought out clearly after death by the process of internal digestion of the surrounding protoplasm, or by the application of dyes and other reagents), and its con- tained nucleolus, as well as the cell-wall when present, will be observed. Wide variations of consistency will thus be noted from the~~

~~*comparatively solid, almost brittle, state of the quiescent protoplasm of some seeds to its thin, syrupy, and largely vacuolated state in a growing vegetable tissue (cf. Botany, fig. 6). Such structural inquiries are now in active progress, especially in connection with the process of cell division (see HistoLocy, REPRODUCTION), and many questions of detail are more or less under active dispute, e.g., the relation of the nucleus to the protoplasm the existence or constancy of an internal network (the "'stroma") in both, the conditions of occurrence of that continuity of protoplasm lately shown to exist through the cell walls of many vegetable tissues, and so on (2).*~~

~~*§ 3. Manzfestations of Life (iunctions).—The vital pro- perties or "functions" exhibited by undifferentiated living protoplasm (e.g., Ameba) are usually enumerated as con- tractility, irritability and automatism, reception and assimi- lation of food, metabolism with secretion and excretion, respiration, and reproduction. Thus we have represented all those functions which in higher animals seem to be confined to special tissues—which we accordingly recognize as muscular or nervous, secretory or excretory, respiratory, reproductive, or the like. Yet in these organs, however apparently specialized to one function only, a residue of all or nearly all the other fundamental properties of pro- toplasm remains and may be redeveloped; and thus those functional changes (necessarily accompanying morpholo- gical evolution or change of environment) which we call 'adaptation" and those pathological disturbances which we term "disease" are alike provided for. See BloLoey, PATHOLOGY, SELECTION AND VARIATION, also (8).*~~

~~*§ 4. External Conditions of Iife—See Biouocy.*~~

~~*§ 5. Hxperimental Modification of the Conditions of Infe.—The behaviour of protoplasm under various modifications of physical conditions has been investigated by Schultze, Kihne, Strasburger, Engelmann, and others, while not a few researches are also extant as to the behaviour of living cells under various chemical stimuli, among which those of Darwin (see InsecTIVoRous PLants) and Frommann may be mentioned as especially suggestive. See also Scu1zo- MYCETES, NUTRITION, and (4).*~~

~~§ 6. Chemical Composition and Processes.—This aspect of protoplasm is of constantly increasing importance, since for the chemist all functions alike can only be viewed in terms of those specific anabolic or katabolic changes which to the physiologist, on the other hand, seem mere accom- paniments of them (see PuysioLocy, Nutrition, REprRo- puctTion). The determination of the chemical nature of protoplasm is thus the supreme problem of physiological chemistry; and, while, thanks to the labours of Reinke, E. Schultze, and others, there has been a rapidly increasing knowledge of its anastates, but more especially of its katastates, and of many cases of the unity of metabolic processes throughout nature, several daring general hypo- theses are already in the field. Of these that of Schiitzen- berger, who views proteid bodies as complex ureides, and that of Loew and Bokorny, who regard them as a complex mixture of aldehyde groups, are examples. See (9).~~

~~§ 7. Molecular Constituttion.—Many hypotheses as to the minute structure of protoplasm have been proposed ; thus~~

~~Spencer resolves protoplasm into " physiological units," Haeckel into "plastidules," while Darwin accounts for heredity by reference to the properties of supposed " gem- mules," Engelmann suggests the existence of "contractile units" (isotagmen), &c.; but those various hypotheses, framed mostly for special purposes, still await more general criticism. See (6).~~

~~§ 8. Origin of Protoplasm.—See ABIOGENESIS, BroLoey, REPRODUCTION, and (7).~~

~~Bibliography.—In addition to the articles above referred to, the reader may with advantage consult the following works, from which complete bibliographical details can be obtained. (1) For general history see Sachs, Geschichte d. Botanik; Carus, Ge- schichte d. Zoologie; Engelmann, " Physiol. d. Protoplasma u. Flimmerbewegung," in Hermann's Handb. d. Phystologie, 1., Leipsic, 1879 ; and for special history, Dujardin, = Recherches s. 1. organismes inférieurs," especially § lii., "S. 1. prétendus estomacs d. animales Infusoires ct s. u. subst. appelée Sarcode," Ann. d. Sci. Nat., 1835, p. 367; H. v. Mohl, "Ueb. d. Saftbewegung im Innern d.~~

~~*Zelle," Bot. Zeitung, 1846, p. 73; Max Schultze, Ueb. d. Organismus d. Polythalamien, Leipsic, 1854; Id., "Ueb. Mus- kelkérperchen," &c., Arch. f. Anat. u. Physiol., 1861, Id., D. Protoplasma d. Rhizopoden u. d. Pflanzenzellen, Leipsic, 1863 ;*~~

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~~*De Bary, "Die Mycetozoen," Zeitsch. f. wissensch. Zool., x., 1859 ; Haeckel, Generelle Morphologie, i., Berlin, 1866. (2) For general structure and properties sce Hofmeister, D. Lehre d. Pfl.-Zelle, Leipsic, 1867; Sachs, Lehrb. d. Botanik, or Engl. translation, Oxford, 1882; Sachs, Vorlesungen tib. Pflanzen-Physiol., Leipsic, 1882; and other text-books of vegetable physiology, especially those of Reinke and Pfeffer; Strasburger, D. Botan. Practicum, Leipsic, 1884; and Engelmann, op. cit. Among special works see Kiihne, Untersuch. ib. d. Protop. u. d. Contractilitét, Leipsic, 1864; Strasburger, "Studien iib. d. Protoplasma," Jena. Zettsch., x., 1876, also Ucb. Zellbildung wu. Zelitheilung, 2d ed., Jena, 1876. (3) Dohrn, Das Princip d. Funetionsweehsels, Leipsic, 1875; Foster, Handbook of Physiology, 4th ed., London, 1884. (4) For ex- perimental researches see Engelmann, Kiihne, and other authors cited under (2) passim; also Darwin, Jnsectivorous Plants, London, 1876; Frommann, "Ueb. Structur, Lebenserschein, &c., d. Thier. n. Pfi.Zellen," Jena. Zeitsch., xviii., 1884. (5) Gamgec, Physiol. Chem. of Anim. Body, London, 1880; Foster, Handbook of Physi ology ; Gautier, Chimie appliquée a4 la Physiologie; Schitzenberger, "¢ Recherches s. PAlbumine, &c.," Bull. d. l. Soc. Chimique, 1875 ; Leow and Bokorny, Biol. Central-Blatt, 1., No. 7; and Reinke, "Ueber d. Protoplasma," in Untersuch. a. d. bot. Lab. Univ. Gottingen, 1881.. (6) Spencer, Principles of Biology, vol. 1.; Haeckel, Gen. Morph.,i.; Darwin, Variation under Domestication; Engelmann, op. cit. (7) Engelmann, op. cit. (P. GE.)*~~

~~*PROTOZOA*~~

~~*ROTOZOA is the name applied to the lowest grade of the animal kingdom, and originated as a translation of the German term "Urthiere." Whilst at first used some forty years ago in a vague sense, without any strict*~~

~~*definition, so as to include on the one hand some simple organisms which are now regarded as plants and on the other some animals which are now assigned a higher place in the animal series, the term has within the last twenty years acquired a very clear signification.*~~

~~*The Protozoa are sharply and definitely distinguished from all the rest of the animal kingdom, which are known by the names ‘“Metazoa” or “ Enterozoa.” They are those animals which are structurally single “cells” or single corpuscles of protoplasm, whereas the Enterozoa consist of many such units arranged definitely (in the first instance) in two layers—an endoderm or enteric cell-layer and an ectoderm or deric cell-layer—around a central cavity, the enteron or common digestive cavity, which is in open communication with the exterior by a mouth.*~~

~~*The Protozoa are then essentially unicellular animals. The individual or person in this grade of the animal king- dom is a single cell ; and, although we find Protozoa which consist of aggregates of such cells, and are entitled to be called “multicellular,” yet an examination of the details of structure of these cell-aggregates and of their life- history establishes the fact that the cohesion of the cells in these instances is not an essential feature of the life of such multicellular Protozoa but a secondary and non-essen- tial arrangement. Like the budded “persons” forming, when coherent to one another, undifferentiated “ colonies” among the Polyps and Corals, the coherent cells of a com- pound Protozoon can be separated from one another and live independently ; their cohesion has no economic signifi- cance. Each cell is precisely the counterpart of its neigh- bour ; there is no common life, no distribution of function among special groups of the associated cells, and no cor- responding differentiation of structure. As a contrast to this we find even in the simplest Enterozoa that the cells are functionally and structurally distinguishable into two groups—those which line the enteron or digestive cavity and those which form the outer body wall. The cells of these two layers are not interchangeable ; they are funda- mentally different in properties and structure from one another. The individual Enterozoon is not a single cell ; it 1s an aggregate of a higher order consisting essentially of a digestive cavity around which two layers of cells are*~~

disposed. The individual Protozoon is a single cell; a number of .these individuals may, as the result of the pro- cess of fission (cell-division), remain in contact with one another, but the compound individual which they thus originate has not a strong character. The constituent cells are still the more important individualities; they never become differentiated and grouped in distinct layers differing from one another in properties and structure ; they never become subordinated to the individuality of the aggregate produced by their cohesion; hence we are justified in calling even these exceptional aggregated Protozoa unicellular.

By far the larger number of Protozoa are absolutely single isolated cells, which, whenever they duplicate them- selves by that process of division common to these units of structure (whether existing as isolated organisms or as constituents of the tissues of plants or of animals), separ- ate at once into two distinct individuals which move away from one another and are thenceforward strangers.

Whilst it is easy to draw the line between the Protozoa and the Enterozoa or Metazoa which lie above them, on account of the perfectly definite differentiation of the cells of the latter into two primary tissues, it is more difficult to separate the Protozoa from the parallel group of unicellular plants.

Theoretically there is no difficulty about this distinction. There is no doubt that organisms present themselves to us in two great series starting in both cases from simple unicellular forms. The one series, the plants, can take up the carbon, hydrogen, oxygen, and nitrogen necessary to build up their growing protoplasm from mineral com- pounds soluble in water, compounds which constitute the resting stage of those elements in the present physical conditions of our planet. Plants can take their nitrogen in the form of ammonia or in the form of nitrates and their carbon in the form of carbonic acid. Accordingly they require no mouths, no digestive apparatus; their food being soluble in water and diffusible, they absorb at all or many points of their surface. The spreading diffuse form of plants is definitely related to this fact. On the other hand the series of organisms which we distinguish as animals cannot take the nitrogen, necessary to build up their protoplasm, in a lower state of combination than it presents

~~*in the class of compounds known as albumens; nor can they take carbon in a lower state of combination than it presents when united with hydrogen or with*~~

~~*PREO@OPOAZOA*~~

~~*hydrogen and oxygen to form fat, sugar, and starch. Albumens and fats are not soluble in water and diffusible ; they have to be seized by the animal in the condition of more or less solid particles, and by chemical processes superinduced in the living protoplasm of the animal by the contact of these particles they are acted upon, chemic- ally modified, and rendered diffusible. Hence the animal is provided with a mouth and a digestive cavity, and with organs of locomotion and prehension by which it may search out and appropriate its scattered nutriment. Further the albumens, fats, sugars, and starch which are the necessary food of an animal are not found in nature excepting as the products of the life of plants or of animals ; accord- ingly all animals are in a certain sense parasitic upon either plants or other animals. It would therefore seem to be easy to draw the line between even the most minute unicellular plants and the similarly minute unicellular animals—assigning those which feed on the albumens, &c., of other organisms by means of a mouth and digestive apparatus to the animal series, and those which can appro- priate the elements of ammonia, nitrates, and carbonates to the plants.*~~

~~*Such absolute distinctions lending themselves to sharp definitions have, however, no place in the organic world ; and this is found to be equally true whether we attempt to categorically define smaller groups in the classification of plants and animals or to indicate the boundaries of the great primary division which those familiar names imply. Closely allied to plants which are highly and specially developed as plants, and feed exclusively upon ammonia, nitrates, and carbonates, we find exceptionally modified kinds which are known as "insectivorous plants" and are provided with digestive cavities (the pitchers of pitcher- plants, &c.), and actually feed by acting chemically upon the albumens of insects which they catch in these diges- tive receptacles. No one would entertain for a moment the notion that these insectivorous plants should be con- sidered as animals. The physiological definition separat- ing plant from animal breaks down in*~~

~~their case; but the consideration of the probable history of their evolution as indicated by their various details of structure suffices at once to convince the most sceptical observer that they actually belong to the vegetable line of descent or family tree, though they have lost the leading physiological char- acteristic which has dominated the structure of other plants. In this extreme case it is made very obvious that in grouping organisms as plants or as animals we are not called upon to apply a definition but to consider the multifarious evidences of historical evolution. And we find in the case of the Protozoa and the Protophyta that the same principle holds good, although, when dealing with extremely simple forms, it becomes much more diffi- cult to judge of the genetic relationship of an organism in proportion as the number of detailed points of possible agreement with and divergence from other forms to which it may be supposed to be related are few.~~

~~The feeding of plants upon carbonic acid is invariably accompanied by the presence df a peculiar green-colouring matter—chlorophyll. In virtue of some direct or indirect action of this chlorophyll the protoplasm of the plant is enabled to seize the carbon of the mineral world—the car- bon which has sunk to the lowest resting stage of combina- tion—and to raise it into combination with hydrogen and~~

~~oxygen and ultimately with nitrogen. There are plants which have no chlorophyll and are thus unable to feed upon carbonic acid. They are none the less plants since they agree closely with particular chlorophyll-bearing plants in details of form and structure, mode of growth and reproduction. A large series of these are termed Fungi. Though unable to feed on carbonic acid, they do |~~

~~not feed as do animals. They can take their carbon from acetates and tartrates, which animals cannot do, and their nitrogen from ammonia. Even when it is admitted that some of these colourless plants, such as the Bacteria (Schizomycetes), can act upon albumens so as to digest them and thus nourish themselves, it is not reasonable to place the Bacteria among animals, any more than it would be reasonable so to place Nepenthes, Sarracenia, and Drosera (insectivorous Phanerogams). For the structure and mode of growth of the Bacteria is like that of well- known~~

~~*chlorophylligerous minute Algze from which they undoubtedly differ only in having secondarily acquired this peculiar mode of nutrition, distinct from that which has dominated and determined the typical structure of plants.*~~

~~*So we find in a less striking series of instances amongst animals that here and there the nutritional arrangements which we have no hesitation in affirming to be the leading characteristic of animals, and to have directly and perhaps solely determined the great structural features of the animal line of descent, are largely modified or even alto- gether revolutionized. The green Hydra, the freshwater Sponge, and some Planarian worms produce chlorophyll corpuscles in the protoplasm of their tissues just as green plants do, and are able in consequence to do what animals usually cannot do—namely, feed upon carbonic acid. The possibilities of the protoplasm of the plant and of the animal are, we are thus reminded, the same. The fact that characteristically and typically plant protoplasm ex- hibits one mode of activity and animal protoplasm another does not prevent the protoplasm of even a highly developed plant from asserting itself in the animal direction, or of a thoroughly characterized animal, such as the green Hydra, from putting forth its chlorophylligenous powers as though it belonged to a plant.*~~

~~*Hence it is not surprising that we find among the Protozoa, notwithstanding that they are characterized by the animal method of nutrition and their forms determined by the exigencies of that method, occasional instances of partial vegetable nutrition such as is implied by the deve- lopment of chlorophyll in the protoplasm of a few members of the group. It would not be inconsistent with what is observed in other groups should we find that there are some unicellular organisms which must, on account of their structural resemblances to other organisms, be con- sidered as Protozoa and yet have absolutely given up alto- gether the animal mode of nutrition (by the ingestion of solid albumens) and have acquired the vegetable mode of absorbing ammonia, nitrates, and carbonic acid. Experi- ment in this matter is extremely difficult, but such " veget- able" or "holophytic nutrition" appears to obtain in the case of many of the green Flagellata, of the Dinoflagellata, and possibly of other Protozoa.*~~

~~*On the other hand there is no doubt that we may fall into an error in including in the animal line of descent all unicellular organisms which*~~

~~*nourish themselves by the inception of solid nutriment. It is conceivable that some of these are exceptional creophagous Protophytes parallel at a lower level of structure to the insectivorous Phanero- gams. In all cases we have to balance the whole of the evidence and to consider probabilities as indicated by a widely-reaching consideration of numerous facts.*~~

~~*The mere automatic motility of unicellular organisms was at one time considered sufficient indication that such organisms were animals rather than plants. We now know that not only are the male reproductive cells of ferns and similar plants propelled by vibratile protoplasm, but such locomotive particles are recognized as common products*~~

~~*" swarm-spores " and " zoospores") of the lowest plants.*~~

~~*The danger of dogmatizing erroneously in distinguish-*~~

~~*832*~~

~~*ing Protozoa from Protophyta, and the insuperable diffi- culty in really accomplishing the feat satisfactorily, has led at various times to the suggestion that the effort should be abandoned and a group constituted confessedly containing both unicellular plants and unicellular animals and those organisms which may be one or the other. Haeckel has proposed to call this group the Protista (1). On the whole, it is more satisfactory to make the attempt to dis- criminate those unicellular forms which belong to the animal line of descent from those belonging to the veget- able line. It is, after all, not a matter of much conse- quence if the botanist should mistakenly claim a few Protozoa as plants and the zoologist a few Protophyta as animals. 'The evil which we have to avoid is that some small group of unattractive character should be rejected both by botanist and zoologist and thus our knowledge of it should unduly lag. Bearing this in mind the zoologist should accord recognition as Protozoa to as wide a range of unicellular organisms as he can without doing violence to his conceptions of probability.*~~

~~*A very interesting and very difficult subject of speculation forces itself on our attention when we attempt to draw the line between the lowest plants*~~

and the lowest animals, and even comes again before us when we pass in review the different forms of Protozoa.

That subject is the nature of the first protoplasm which was evolved from not-living matter on the earth's surface. Was that first protoplasm more like animal or more like vegetable proto- plasm as we know it to-day? By what steps was it brought into existence ?

Briefly stated the present writer's view is that the carliest proto-

plasm did not possess chlorophyll and therefore did not possess the power of feeding on carbonic acid. A conceivable state of things

is that a vast amount of albuminoids and other such compounds |

had been brought into existence by those processes which cul- minated in the development of the first protoplasm, and it seems therefore likely enough that the first protoplasm fed upon these antecedent steps in its own evolution just as animals feed on organic compounds at the present day, more especially as the large creeping plasmodia of some Mycetozoa feed on vegetable refuse. It indeed seems not atall improbable that, apart from their elaborate fructification, the Mycetozoa represent more closely than any other living forms the original ancestors of the whole organic world. At subsequent stages in the history of this archaic living matter chlorophyll was evolved and the power of taking carbon from carbonic acid. he "' green" plants were rendered possible by the evolution of chlorophyll, but through what ancestral forms they took origin or whether more than once, i.e., by more than one branch, it is difficult even to guess. The green F lagellate Pro- tozoa (Volvocinez) certainly furnish a connecting point by which it is possible to link ou the pedigree of green plants to the primi- tive protoplasm ; it is noteworthy that they cannot be considered as very primitive and are indeed highly specialized forms as com- pared with the naked protoplasm of the Mycetozoou's plasmodium.

Thus then we are led to entertain the paradox that though the animal is dependent on the plant for its food yet the animal preceded the plaut in evolution, and we look among the lower Protozoa and not among the lower Protophyta for the nearest representatives of that first protoplasm which

~~*was the result of a long and gradual evolution of chemical structure and the starting point of the development of organic form.*~~

~~*The Protozoon Cell-Individual compared with the Typical Cell of Animal and Vegetable Tissues.*~~

~~*Morpnotocy.*~~

~~*The Protozoon individual is a single corpuscle of proto- plasm, varying in size when adult from less than the zoooth of an inch in diameter (some Sporozoa and Flagel- lata) up to a diameter of an inch (Nummulites), and even much larger size in the plasmodia of Mycetozoa. The sub- stance of the Protozoa exhibits the same general properties — irritability, movement, assimilation, growth, and division — — and the same irremediable chemical alteration as the result of exposure to a moderate heat, which are observed in the protoplasm constituting the corpuscles known as cells Which build up the tissues of the larger animals and*~~

~~*? These numbers refer to the bibliography at p. 866.*~~

~~*PROTOZOA*~~

~~*plants. There is therefore no longer any occasion to make use of the word "sarcode" which before this identity was established was very usefully applied by Dujardin (2) to the substance which mainly forms the bodies of the Protozoa. Like the protoplasm which constitutes the "cells" of the Enterozoa and of the higher plants, that of the Protozoon body is capable of producing, by chemical processes which take place in its substance (over and above those related merely to its nutrition), a variety of distinct chemical compounds, which may form a deposit in or beyond the superficial protoplasm of the corpuscle or may accumulate centrally. These products are therefore either ectoplastic or entoplastic. The chemical capacities of protoplasm thus exhibited are very diverse, ranging from the production of a denser variety of protoplasm, probably as the result of dehydration, such as we see in the nucleus and in the cortical substance of many cells, to the chemical separation and deposition of membranes of pure chitin or of cellulose or of shells of pure calcium carbonate or quasi-crystalline needles of silica.*~~

~~*Noctevus.—The nucleus is probably universally present in the Protozoon cell, although it may have a very simple struc- ture and be of very small size in some cases. The presence of a nucleus has recently been demonstrated by means of appropriate staining reagents in some Protozoa (shell- bearing Reticularia or Foraminifera and many Mycetozoa) where it had been supposed to be wanting, but we are not yet justified in concluding absolutely that there are not some few Protozoa in which this central differentiation of the protoplasm does not exist ; it is also a fact that in the young forms of some Protozoa which -result from the breaking up of the body of the parent into many small "spores" there is often no nucleus present.*~~

~~*In contrast to this it is the fact that the cells which build up the tissues of the Enterozoa are all derived from the division of a nucleated egg-cell and the repeated division of its macleated products, and are invariably nucleated. The same is true of tissue-forming plants,— though there are a few of the lowest plants, such as the Bacteria, the protoplasm of which presents no nucleus. In spite of recent statements (8) it cannot be asserted that the cells or protoplasmic corpuscles of the yeast-plant (Saccharomyces) and of the hyphz of many simple moulds contain a true nucleus. We are here brought to the question "What is a true nucleus?" The nucleus which is handed on from the egg-cell of higher plants and Enterozoa to the cells derived from it by fission has lately been shown to possess in a wide variety of instances such very striking characteristics that we may well question whether every more or less distinctly outlined mass or spherule of protoplasm which can be brought into view by colouring or other reagents, within the protoplasmic body of a Protozoon or a Protophyte, is necessarily to be con- sidered as quite the same thing as the nucleus of tissue- forming egg-cell- derived cells.*~~

~~*Researches, chiefly due to Flemming (4), have shown that the nucleus in very many tissues of higher plants and animals consists of a capsule containing a plasma of "achromatin" not deeply stained by reagents, ramifying in which is a reticulum of "chromatin" consisting of fibres which readily take a deep stain (Fig. I, A). Further it is demonstrated that, when the cell is about to divide into two, definite and very remarkable movements take place in the nucleus, resulting in the disappearance of the capsule and*~~

~~*in an arrangement of its fibres first in the form of a wreath (Fig. I, D) and subsequently (by the breaking of the loops formed by the fibres) in the form of a star (E). A further movement within the nucleus leads to an arrangement of the broken loops in two groups (F), the position of the open ends of the broken loops being reversed*~~

~~*PROTWZOA*~~

~~*as compared with what previously obtained. Now the _ two groups diverge, and in many cases a striated appear- ance of the achromatin substance between the two groups of loops of chromatin is observable (H). In some cases (especially egg-cells) this striated arrangement of the achromatin substance precedes the separation of the loops (G). The striated achromatin is then termed a " nucleus- spindle," and the group of chromatin loops (Fig. L, G, «)*~~

~~*)*~~

~~*Fie. I.—Karyokinesis of a typical tissue-eell (epithelium of Salamander) after Flemming and Klein. The series from A to 1 represent the suecessive stages in the movement of the chromatin fibres during division, exeepting G, whieh represents the "' nucleus-spindle" of anegg-eell. A, resting nucleus; D, wreath- form; E, single star, the loops of the wreath being broken; F, separation of the star into two groups of U-shaped fibres; H, diaster or double star; 1, comple- tion of the ecell-division and formation of two resting nnelei. In G the chromatin fibres are marked a, and correspond to the phase shown in F; they are in this case called the " equatorial plate"; 6, achromatin fibres forming the nucleus-spindle; c, granules of the eell-protoplasm forming a "polar star." Such a polar star is seen at eaeh end of the nueleus-spindle, and is not to be confused with the diaster H.*~~

~~*is known as "the equatorial plate." At each end of*~~

~~*the nucleus-spindle in these cases there is often seen a- star consisting of granules belonging to the general proto- |*~~

~~*plasin of the cell (G,c). These are known as " polar stars." After the separation of the two sets of loops (H) the protoplasm of the general*~~

~~*substance of the cell becomes constricted, and division occurs, so as to include a group of chromatin loops in each of the two fission products. of these then rearranges itself together with the associated achromatin into a nucleus such as was present in the mother-cell to commence with. This phenomenon is termed "karyokinesis," and has been observed, as stated above, in a large variety of cells constituting tissues in the higher animals and plants.*~~

~~*There is a tendency among histologists to assume that this process is carried ont in all its details in the division of all cells in the higher plants and animals, and accordingly to assume that the structural differentiation of achromatin plasma and chromatin nucleus-fibres exists in the normal nucleus of every such cell. If this be true, it is necessary*~~

~~*cell-individual by no means conforms universally to this model. As will be seen in the sequel, we find cases in*~~

~~*to this structure and to this definite series of movements during division (Fig. VIII. 3 to 12, and Fig. XXV.); and a knowledge of these phenomena has thrown light upon*~~

~~*some appearances (conjugation of the Ciliata) which were |*~~

~~*previously misinterpreted. But there are Protozoa with a*~~

~~*deeply-placed nucleus-like structure which does not pre- | sent the typical structure above described nor the typical |*~~

~~*changes during division, but in which on the contrary the*~~

~~*nucleus is a very simple homogeneous corpuscle or vesicle |*~~

~~*of more readily stainable protoplasm. The difficulties of observation in this matter are great,*~~

~~*and it is proportionately rash to generalize ; but it appears |*~~

~~*that we are justified at the present moment in asserting that not all the cells even of higher plants and animals*~~

~~_ which is paralleled in many Protozoa. Each |~~

~~exhibit in full detail the structure and movement of the typical cell-nucleus above figured and described ; and accord- ingly the fact that such structure and movement cannot always be detected in the Protozoon cell-nucleus must not be regarded as either an isolated phenomenon peculiar to such Protozoon cells, nor must it be concluded that we have only to improve our means of analysis and observation in order to detect this particular structure in all nuclei. It seems quite possible and even probable that nuclei may vary in these details and yet be true nuclei. Some nuclei which are observed in Protozoon cell-bodies may be regarded as being at a lower stage of differentiation and specializa- tion than are those of the epithelial and embryonic cells of higher animals which exhibit typical karyokinesis. Others on the contrary, such as the nuclei of some Radiolaria (vde infra), are probably to be regarded as more highly developed than any tissue cell-nuclei, and will~~

~~| be found by further study to present special phenomena~~

~~peculiar to themselves. In some of the highest Protozoa (the Ciliata) it has lately been shown that the nucleus may have no existence as such, but is actually dispersed throughout the protoplasm in the form of fine particles of chromatin-substance which stain on treatment with car- mine but are in life invisible (84). This diffuse condition of the nuclear matter has no parallel, at present known, in tissue-cells, and curiously enough occurs in certain genera of Ciliata whilst in others closely allied to them a solid single nucleus is found. The new results of histological research have uecessitated a careful study of the nucleus in its various stages of growth and division in the cell- bodies of Protozoa and a comparison of the features there observed with those established as "typical" in tissue-cells. Accordingly we have placed the figure and explanation of the typical cell-nucleus in the first place in this article for subsequent reference and comparison.~~

~~CorticaL Suspstance.—The superficial protoplasm of an embryonic cell of an Enterozoon in the course of its development into a muscular cell undergoes a change The cortical layer becomes dense and highly refringent~~

~~as compared with the more liquid and granular medullary substance. Probably this is essentially a change in the degree of hydration of the protoplasm itself, although it may be accompanied by the deposition of metamorphic products of the protoplasm which are not chemically to be regarded as protoplasm. The differentiation of this cortical substance (which is not a frequent or striking phenomenon in tissue-cells) may be regarded as an ectoplastic (2.e., peripheral) modification ofthe protoplasm, comparable to the entoplastic (central)~~

~~| modification which produces a nucleus.~~

~~The formation of "cortical substance" in the Protozoa~~

~~: furnishes the basis for the most important division into to note very distinctly that the nucleus of the Protozoon —~~

~~_ animals. (_ cortical substance ; their protoplasm is practically (except-which a close approach is made by the nucleus of Protozoa~~

~~lower and higher forms, in this assemblage of simplest A large number (the Gymnoniyxa) form no~~

~~ing the nucleus) of the same character throughout. A nearly equally large number (the Corticata) develop a complete cortical layer of denser protoplasm, which is distinct from the deeper medullary protoplasm. This layer is permanent, and gives to the body a definite shape and entails physiological consequences of great moment. The cortical protoplasm may exhibit further specialization of structure in connexion with contractile functions (muscular).~~

~~Ecropiastic PRODUCTS CHEMICALLY DISTINCT FROM ProTorLAsSM. —The protoplasm of all cells may throw down as a molecular precipitate distinct from itself chemical compounds, such as chitin and horny matter and other nitrogenized bodies, or again non-nitrogenous compounds, such as cellulose. Very usually these substances are~~

~~| deposited not external to but cm the superficial proto-~~

~~plasm. They are then spoken of as cell-cuticle if the cell bounds the free surface of a tissue, or as matrix or cell-wall in other cases. The Protozoon cell-body frequently forms such "cuticles," sometimes of the most delicate and evanescent character (as in some Ameebee), at other times thicker and more permanent. They may give indications (though proper chemical examination 1s difficult) of being allied in composition to chitin or gelatin, in other instances to cellulose, which is rare in animals and usual in plants. These cuticular deposits may be absent, or may form thin envelopes or in other cases jelly-like substance intimately mixed with the protoplasm (Radiolaria). They may take the form of hooks, tubercles, or long spines, in their older and more peripheral parts free from permeation by protoplasm, though deeply formed in and interpenetrated by it. Such pellicles and cuticles, the deeper layers (if not the whole) of which are permeated by protoplasm, lead insensibly to another category of ectoplastic products in which the material produced by the protoplasm is separated from it and can be detached from or deserted by the proto- plasm without any rupture of the latter. These are—~~

~~Shells and Cysts. —Such separable investments are formed by the cell-bodies of many Protozoa, a phenomenon not exhibited by tissue-cells. Even the cell-walls of the protoplasmic corpuscles of plant tissues are permeated by that protoplasm, and could not be stripped off without rupture of the protoplasm. The shell and the cyst of the Protozoon are, on the contrary, quite free from the cell- protoplasm. The shell may be of soft chitin-like sub-stance (Gromia, &c.), of cellulose (Labyrinthula, Dino- flagellata), of calcium carbonate (Globigerina, &c.), or of silica (Clathrulina, Codonella). The term "cyst" is ap- plied to completely closed investments ("shells" having one or more apertures), which are temporarily produced either as a protection against adverse external conditions or during the breaking up of the parent-cell into spores. Such cysts are usually horny.~~

~~Stalks,—By a localization of the products of ectoplastic activity the Protozoon cell can produce a fibre or stalk of ever-increasing length,~~

~~*comparable to the seta of a Cheetopod worm produced on the surface of a single cell.*~~

~~*ENTOPLASTIC PRODUCTS DISTINCT FROM PRoTOPLASM.— Without pausing here to discuss the nature of the finest granules which are embedded as a dust-cloud in the hyaline matrix of the purest protoplasm alike of Protozoa and of the cells of higher animals and plants, and leaving aside the discussion of the generalization that all protoplasm presents a reticular structure, denser trabecule of extreme*~~

~~*minuteness traversing more liquid material, it is intended |*~~

~~*here merely to point to some of the coarser features of structure and chemical differentiation, characteristic of the cell-body of Protozoa.*~~

~~*With regard to the ultimate reticular structure of protoplasm it will suffice to state that such structure has been shown to obtain in not a few instances (e.g., Lith- ameeba, Fig. V.), whilst in most Protozoa the methods of microscopy at present applied have not yielded evidence of it, although it is not improbable that a recticular differentiation of the general protoplasm similar to that of the nucleus may be found to exist in all cells.*~~

~~*Most vegetable cells and many cells of animal tissues exhibit vacuolation of the protoplasm ; 7.e., large spaces are*~~

~~*present in the protoplasm occupied by a liquid which is not |*~~

~~*protoplasm and is little more than water with diffusible salts in solution. Such vacuoles are common in Protozoa. They are either permanent, gastric, or contractile.*~~

~~*_ Permanent vacuoles containing a watery fluid are some- times so abundant as to give the protoplasm a '" bubbly " structure (Thalamophora, Radiolaria, &e.), or may merely give to1t a trabecular character (Trachelius, Fig. XXIV.*~~

~~*| but are confined to a few species.*~~

~~14, and Noctiluca, Fig. XXVI. 18). Such vacuoles may contain other matters than water, namely, special chemical secretions of the protoplasm. Of this nature are oil-drops, and from these we are led to those deposits within the cell-protoplasm which are of solid consistence (see below).~~

~~Gastric vacuoles occur in the protoplasm of most Proto- zoa in consequence of the taking in of a certain quantity of water with each solid particle of food, such ingestion of solid food-particles being a characteristic process bound up with their animal nature.~~

~~Contractile vacuoles are frequently but not universally observed in the protoplasm of Protozoa. They are not observed in the protoplasm of tissue-cells. The contrac- tile vacuole whilst under observation may be seen to~~

~~| burst, breaking the surface of the Protozoon and discharg-~~

~~ing its liquid contents to the exterior; its walls, formed of undifferentiated protoplasm, then collapse and fuse. After a short interval it re-forms by slow accumulation of liquid at the same or a neighbouring spot in the protoplasm. The liquid is separated at this point by an active process taking place in the protoplasm which probably is of an excretory nature, the separated water carrying with it nitrogenous waste-products. A similar active formation of vacuoles containing fluid is observed in a few instances (Arcella, some Amœbæ) where the protoplasm separates a gas instead of liquid, and the gas vacuole so produced ap- pears to serve a hydrostatic function.~~

~~Corpuscular and Amorphous Entoplastic Solids.—Con- cretions of undetermined nature are occasionally formed within the protoplasm of Protozoon cells, as are starch and nitrogenized concretions in tissue-cells (Lithamœba, Fig. V. conc.). But the most important corpuscular products after the nucleus, which we have already discussed, are chlorophyll corpuscles. These are (as in plants) concavo- convex or spherical corpuscles of dense protoplasm resem- bling that of the nucleus, which are impregnated superfi- cially with the green-coloured substance known as chloro- phyll. They multiply by fission, usually tetraschistic, independently~~

~~of the general protoplasm. They occur in representatives of many different groups of Protozoa (Pro- teomyxa, Heliozoa, Labyrinthulidea, Flagellata, Ciliata), Similar corpuscles or band-like structures coloured by other pigments are occa- sionally met with (Dinoflagellata).~~

~~Recently it has been maintained (Brandt, 5) that the chlorophyll corpuscles of Protozoa and other animals are parasitic Algz. But, though it is true that parasitic Algze occur in animal tissues, and that probably this is the nature of the yellow cells of Radiolaria, yet there seems to be no more justification for regarding the chlorophyll corpuscles of animal tissue-cells and of Protozoa as parasites than there is for so regarding the chlorophyll corpuscles of the leaves of an ordinary green plant.~~

~~Corpuscles of starch, paramylum, and other amyloid substances are commonly formed in the Flagellata, whose nutrition is to a large extent plant-like.~~

~~Entoplastic Fibres.—A fibrillation of the protoplasm of the Protozoon cell-body may be produced by differentia- tion of less and more dense tracts of the protoplasm itself. But as distinct from this we find horny fibres occasionally produced within the protoplasm (Heliozoa) having definite skeletal functions. The threads produced in little cavities in the superficial protoplasm of many Ciliate Protozoa, known as trichocysts, may be mentioned here.~~

~~Entoplastic Spicules. — Needle-like bodies consisting either of silica or of a horny substance (acanthin) are produced in the protoplasm of many Protozoa (Heliozoa, Radiolaria). These are known as spicules; they may be free or held together in groupsand arranged either radially or tangentially in reference to the more or less spherical~~

~~Re,~~

~~PRO TOA O &~~

~~A similar production of siliceous |~~

~~*body of the Protozoon. spicules is observed in thie tissue-cells of Sponges. Crys- tals of various chemical nature (silica, calcium carbonate, oxalate, &c.) are also frequently deposited in the protoplasm of the Protozoa, differing essentially from spicules in that their shape is due purely to crystallization.*~~

~~*GENERAL F'orRM OF THE Protozoon CELLt.—Those Proto- zoa Which have not a differentiated cortical substance, and are known as Gymnomyxa, present very generally an extreme irregularity of contour. Their protoplasm, being liquid rather than viscous, flows into the most irregular shapes. Their fundamental form when at rest is in many cases that of the sphere; others are discoidal or may be monaxial, that is to say, show a differentiation of one region or "end" of the body from the other. Frequently the protoplasm is drawn out into long threads or filaments which radiate uniformly from all parts of the spherical or discoidal cell-body or originate from one region to the exclusion of other parts of the surface.*~~

~~*These non-corticate Protozoa can take solid particles of food into their protoplasm, there to be digested in an extemporized "gastric vacuole," at any part or most parts of their superficies.*~~

~~*is everywhere freely exposed.*~~

~~*The corticate Protozoa have (with the exception of some parasites) one, and in the Acinetaria more than one, de- finite aperture in the cortical substance leading into the softer medullary protoplasm. This is the cell-mouth,—morphologically as distinct from the mouth of an Entero- zoon as is the hole in a drain pipe from the front door of a house, but physiologically subserving the same distinc- tively animal function as does the mouth of multicellular animals. The general form of the body is in these Proto- zoa oblong, with either monaxial symmetry, when the mouth is terminal, or bilateral symmetry, when the body is oblong and flattened and the mouth is towards one end of what becomes by its presence the " ventral" surface. Though the protoplasm is not nakedly exposed in irregular lobes and long filaments in these corticate Protozoa so as to pick up at all points such food-particles as may fall in its way, yet the protoplasm does in most Corticata project in one or more peculiarly modified fine hair-like processes from the otherwise smooth surface of the cell-body. These*~~

~~*processes are vibratile cilia, identical in character with the vibratile cilia of epithelial tissue-cells of Entero- zoa. They are essentially locomotor and current-produc- ing (therefore prehensile) organs, and, whilst unable to ingest solid food-particles themselves, serve to propel the organism in search of food and to bring food into the cell- mouth by the currents which they excite. Either a single vibratile filament is present, when it is called a flagellum, or a row or many rows of cilia are developed.*~~

~~*Constituent cells of the Enterozoa are well known which closely resemble some of the Gymnomyxa or non-corticate Protozoa in their general form. These are the colourless blood corpuscles or lymph corpyscles or phagocytes (Mecz- nikow, 6) which float freely in the blood and ingest solid particles at any part of their surface as do non-corticated Protozoa; they exhibit a similar irregularity and muta- bility of outline, and actually digest the particles which they take in. The endodermal digestive cells of some Enterozoa (Ccelentera and Planarians) are also naked proto- plasmic corpuscles and can take in solid food-particles.*~~

~~*No tissue-cells are known which present any close parallel to the mouth-bearing corticate Protozoa. The differentiation of the structure of a single cell has in these forms reached a very high degree, which it is not surpris- ing to find without parallel among the units which build up the individual of a higher order known as an Entero-*~~

~~*They have no permanent cell-mouth | leading into the soft protoplasm since that soft protoplasm | | ciliary movement are all exhibited by the protoplasm of*~~

~~*839*~~

~~*zoon. Cilia are developed on such cell-units (ciliated epithelium), but not used for the introduction of food- particles into the cell. In rare cases (the ciliated "' pots" of the vascular fluid of Sipunculus) they act so as to freely propel the ciliated cell through the liquid "blood" of the Enterozoon, as the cilia of a Protozoon propel it through water. An aperture in the cortical substance (or in the cuticular product) of a tissue-cell is sometimes to be observed, but is never (?) used for the ingestion of food. particles. Such an*~~

~~aperture occurs in unicellular glands, where it serves as the outlet of the secretion.~~

~~PHYSIOLOGY. Motion — As has just been hinted, the movement of~~

~~protoplasm, which in the tissue-cells of Enterozoa and~~

~~higher plants is combined and directed so as to produce effects in relation to the whole organism built up of countless cells, is seen in the Protozoa in a different relation, namely, as subserving the needs of the individual cell of which the moving protoplasm is the main sub- stance. The phenomena known in tissue-cells as "' stream- ing" (eg., in the cells of the hairs of Tradescantia), as local contraction and change of form (e «, in the corpuscles of the cornea), as muscular contraction, and as~~

~~the cell-body of Protozoa, with more or less constancy, and are intimately related to the processes of hunting, seizing, and ingesting food, and of the intercourse of the individuals of a species with one another and their evasion of hostile agencies. Granule streaming and the implied movement of currents in the protoplasm are seen in the filamentous protoplasm of the Heliozoa, Radiolaria, Reti- cularia, and Noctiluca, and in the cyclosis of the gastric vacuoles of Ciliata. Local contraction and change of form is seen best in the Amœbe and some Flagellata, where it results in locomotion. Definite muscular contraction is exhibited by the protoplasmic band in the stalk of Vorti- cella, by the leg-like processes of the Hypotrichous Ciliata, and by the cortical substance of some large Ciliata. Cili- ary movement ranging from the vibration of filaments of protoplasm temporarily evolved, up to the rhythmic beat of groups of specialized cilia, is observed in all groups of Protozoa in the young condition if not in the adult, and special varieties of ciliary movement and of cilia-like organs will be noted below. For an account of the con- ditions and character of protoplasmic movement generally which cannot be discussed in the present article the reader is referred to Engelmann (7).~~

~~The protoplasm of the cell-body of the Protozoa is drawn out into lobes and threads which are motile and are used as locomotive and prehensile organs. These processes are of two kinds, which are not present on the same cell and are not capable of transmutation, though there are excep- tions to both~~

~~of these statements. The one kind are termed “ pseudopodia,” and are either lobose or filamentous or branched and even reticular (Figs. 1V.and IX.). The Pro- tozoa which exhibit them are sometimes termed Myxopods. The other kind are cilia and flagella, and are simple threads which are alternately bent and straightened almost inces- santly during the life of the organism. These Protozoa are termed Mastigopods. Whilst the cilia and flagella are permanent organs, the pseudopodia vary greatly in char- acter; they are in some cases rapidly expanded and with- drawn in irregular form, and can hardly be said to be more than lobose protuberances of the flowing moving mass of protoplasm. In other cases they are comparatively per- manent stiff threads of protoplasm which can be contracted and can fuse with one another but rarely do so (Heliozoa, Radiolaria). Between these extreme forms of ‘“ pseudo- podia” there are numerous intermediate varieties, and the~~

~~836 rkO%s whole protoplasmic body of the Protozoon assume the form of a slowly changing network of threads of greater or less tenuity (Chlamydomyxa, Fig. V I). Nutrition.—Typically—that is to say, by determinate hereditary tendency—the Protozoa take solid food-particles into their protoplasm which form and occupy with the water surrounding them “gastric vacuoles i the protoplasm. The food-particle is digested in this vacuole, by what chemical processes is not ascertained. It has been shown~~

~~that the contents of the gastric vacuole give in some cases | LH1C1er | to point out that the range of chemical capacities is quite~~

~~as great as in the cells of the higher Enterozoa.~~

~~an acid reaction, and it is not improbable that free acid is secreted by the surrounding protoplasm. It is not known whether any ferment! is separated by the protoplasm, but it is probable from observations made on the digestive~~

~~may evel | appears, however, to be an excretory organ. | shown to rapidly excrete in a state of solution colouring matters (anilin blue) which have been administered with | food particles (8).~~

~~0OZ04~~

~~The contractile vacuole which exists in so many Protozoa It has been~~

~~No evidence has been adduced to show whether traces of nitrogenous waste-products are present in the water expelled by the contractile vacuole.~~

~~Chemical Metamorphosis.—The form which the various products of the activity of the Protozoon's protoplasm may assume has been noted above. It will be sufficient here~~

~~Chitin,~~

~~'cellulose, silicon, calcium carbonate, fats, pigments, and~~

~~process of Ccelentera (Actinize) that the ferment is not | separated, but that actual contact of the food-particle with |~~

~~the protoplasm is necessary for a "ferment influence" to be~~

~~exerted. The digestion of a food-particle by a Protozoon | is intra-cellular, and has been contrasted with the cavitary |~~

~~digestion of higher animals. In the latter, ferments and~~

~~acids are poured out by the cells bounding the enteric |~~

~~cavity into that space, and digestion is extra-cellular. In the lowest Enterozoa (many Coelentera and some Planarian worms) it has been shown that food-particles are actually taken up ina solid state by the soft protoplasm of the enteric cells and thus subjected to intra-cellular digestion. There appears to be a gradual transition from this process, in which close contact with living protoplasm is necessary that the solution of an albuminous food-particle may be effected, onwards to the perfectly free cavitary digestion by means of secretions accumulated in the enteron.~~

~~We have not yet any satisfactory observations on the chemistry of intra-cellular digestion either of Protozoa or of Ccelentera.~~

~~*Certain Protozoa which are parasitic do not take solid |*~~

~~*food particles; they (like higher parasites, such as the Tapeworms) live in the nutritious juices of other animals aud absorb these by their general surface in a liquid state. The Gregarine (Sporozoa), many Ciliata, &c., are in this case. Other Protozoa are known which are provided with chlorophyll corpuscles and do not take in solid food, but, apparently as a result of exceptional adaptation in which they differ from closely-allied forms, nourish themselves as do green plants. Such are the Volvocinean Flagellata and some of the Dinoflagellata. It has also been asserted that other Protozoa (viz., some Ciliata)—even some which possess a well-developed mouth—can (and experimentally have been made to) nourish themselves on nitrogenous compounds of a lower grade than albumens—such, for Instance, as ammonium tartrate. Any such assertions must be viewed with the keenest scepticism, since experi- mental demonstration of the absence of minute albuminous particles (eg., Bacteria) from a solution of ammonium tartrate in which Ciliate Protozoa are flourishing is a*~~

~~*Undigested food-remnants are expelled by the protoplasm*~~

~~*. a see cell either at any point of the surface or y the cell-mouth or by a special cell-a ili*~~

~~*coe Fig, XXLY. 29), y as} nus (some Ciliata,*~~

~~*Respiration and Excretion. —The protoplasm of the*~~

~~*Protozoa respires, that is, takes up oxygen and liberates |*~~

~~*carbonic acid, and can readily be shown experimentally to require a supply of oxygen for the manifestation of its activity. No special respiratory structures are developed in any Protozoa, and as a rule also the products of oxida- tion appear to be washed out and removed from the proto- plasm without the existence of any special apparatus.*~~

~~*1 The digestive ferment on*~~

~~*the plasmodium of the this subject Zopf (13),*~~

~~*pepsin has been detected by Krukenberg in ay raes Fuligo (flowers of tan). See on p. 88.*~~

~~*(| Spore-formation. matter of extreme difficulty and has not yet been effected. |*~~

~~*gases can be both deposited and. absorbed by it. Owing to the minuteness of the Protozoa, we are at present unable to recognize and do justice to the variety of chemical bodies*~~

~~*| which undoubtedly must play a part in their economy as*~~

~~*the result of the manufacturing activity of their pro- toplasm. See, however, Zopf (13), p. 71.*~~

~~*Growth and Reproduction.—The Protozoon cell follows the samie course as tissue-cells, in that by assimilation of*~~

~~*' nutriment its protoplasm increases in volume and reaches*~~

~~*a certain bulk, when its cohesion fails and the viscid droplet divides into two. The coefficient of cohesion varies in different genera and species, but sooner or later the disrupting forces lead to division, and thus to multi- plication of individuals or reproduction. The phenomena connected with the division of the nucleus (already alluded to) will be noticed in particular cases below.*~~

~~*Whilst simple binary division is almost without excep- tion a chief method of reproduction among the Protozoa, it is also very usual, and probably this would be found if our knowledge were complete to have few exceptions, that under given conditions the Protozoon breaks up rapidly into many (from ten to a hundred or more) little pieces, each of which leads an independent life and grows to the form and size of its parent. It will then multiply by binary division, some of the products of which division will in their turn divide into small fragments. The small fragments are called "spores." Usually the Protozoon before breaking up into spores forms a " cyst" (see above) around itself. Frequently, but not as a necessary rule, two (rarely three or more) Protozoon cell-individuals come together and fuse into one mass*~~

~~*before breaking up into spores. This process is known as "conjugation ;" and there can be no doubt that the physiological significance of the process is similar to that of sexual fertilization, namely, that the new spores are not merely fragments of an old individual but are something totally new inasmuch as they consist of a combination of the substance of indi- viduals who have had different life experiences.*~~

~~*Whilst spore-formation is not necessarily preceded by conjugation, conjugation is not necessarily followed by Among the Mycetozoa the young indi- viduals produced from spores conjugate at a very early period of growth in numbers and form " plasmodia," and after a considerable interval of feeding and growth the formation of spores takes place. Still more remarkable is*~~

~~*| the fact observed among the Ciliata where two individuals*~~

~~*conjugate and after a brief fusion and mixture of their respective protoplasm separate, neither individual (as far as certain genera at least are concerned) breaking up into spores, but simply resuming the process of growth and recurrent binary division with increased vigour.*~~

~~*There is certainly no marked line to be drawn between*~~

~~*_ reproduction by simple fission and reproduction by spore- | formation ; both are a more or less complete dividing of the parent protoplasm into separate masses; whether the*~~

~~*products of the first fission are allowed to nourish them- selves and grow before further fission is carried out or not*~~

~~*PRODROZO «A*~~

~~*does not constitute an essential difference. The fission of the Ciliate Protozoon, Opalina (see below Fig. XXIV. 4-8), is a step from the ordinary process of delayed binary divi- sion towards spore-formation. In some Protozoa spores are produced after encystation by a perfectly regular process of cleavage (comparable to the cleavage of the egg-cell of*~~

~~*Enterozoa) —first two, then four, then eight, sixteen, and thirty-two fission products being the result (see Fig. XX. 24, 25, &c.). :*~~

~~*But more usually there is a hastening of the process, and in these cases it is by no means clear what part the parent cell-nucleus takes. An encysted Gregarina (or two conjugated Gregarine) suddenly breaks up into a number of equal-sized spores, which do not increase in number by binary division and have not been formed by any such process. This multicentral segregation of the parent pro- toplasm is a marked development of the phenomenon of sporulation and remote from ordinary cell-division. How it is related to ordinary cell-division is not known, inas- much as the changes undergone by the nucleus in this rapid multicentral segregation of the parent protoplasm have not been determined. The spores of Protozoa may be naked or encased singly or in groups in little en- velopes, usually of a firm horny substance (see Fig. XX. 23 to 26, and Fig. XXIV. 15 to 18). Whenever the whole or a part of a Protozoon cell divides rapidly into a number of equal-sized pieces which are simultane- ously set free and are destined to reproduce the adult form, the term spore is applied to such pieces, but the details of their formation may vary and also those of their subsequent history. In typical cases each spore produced as the result of the fission of an encysted Protozoon (con- jugated or single) has its own protective envelope, as in the Mycetozoa (Fig. III.) and the Sporozoa (Fig. XVIIT.), from which the contained protoplasm escapes by " ger- mination " as a naked corpuscle either flagellate or ameebi- form. In some terminologies the word "spore" is limited to such a "coated" spore, but usually the naked proto- plasmic particles which issue from such "coated " spores, or are formed directly by the rapid fission of the parent Protozoon, are also called "spores." The former condition is distinguished as a "chlamydospore," whilst the latter are termed " gymnospores." Many Protozoa produce gymno- spores directly by the breaking up of their protoplasm, and these are either " flagellule" (swarm-spores) or '"' amce- bulz " (creeping spores). The production of coated spores is more usual among the lower plants than it is among Protozoa, but is nevertheless a characteristic feature of the Gregarin (Sporozoa) and of the Mycetozoa. The term "gemma" or "bud-spore" is applied to cases, few in number, where (as in Acinetaria, Fig. XXVL, Spiro- chona, Fig. XXIII. 10, and Reticularia, Fig. X. 8) the spores are gradually nipped off from the parent-cell one or*~~

~~more at a time. This process differs from ordinary cell-division only in the facts (1) that the products of division are of unequal size—the parent-cell being distin- guishable as the larger and more complete in structure, and (2) that usually the divi8ion is not binary, but more than one bud-spore is produced at a time.~~

~~Whilst in the binary cell-division of the Protozoa the two products are usually complete in structure at the period of separation, spores and spore-buds are not only of small size and therefore subject to growth before attaining the likeness of the parent, but they are also very often of simple and incomplete structure. The gap in this respect between the young spore and its parent necessarily varies according to the complexity of the parental form.~~

~~In the case of the Radiolaria, of the Gregarine, of Noctiluca, and of the Acinetaria, for instance, the spore has before it a considerable process of development in~~

~~structure and not merely of growth, before attaining the adult characters. Hence there is a possible embryology of the Protozoa, to the study of which the same prin- ciples are applicable as are recognized in the study of the embryology of Enterozoa. Embryonic forms of great sim- plicity of structure, often devoid of nucleus, and cousist- ing of simple elongate particles of protoplasm, are hatched from the spore-cases of the Gregarine (Fig. XVII. 13, 14)~~

~~These gradually acquire a differentiated cortical protoplasm and a nucleus. A very large number of Gymnomyxa pro- duce spores which are termed "monadiforni," that is, have a single or sometimes two filaments of vibratile protoplasm extended from their otherwise structureless bodies. By the lashing of these flagella the spores (swarm-spores or zoospores) are propelled through the water. 'The resem- blance of these nonadiform young (best called "flagel- lulee") to the adult forms known as Flagellata has led to the suggestion that we have in them a case of recapitula- tive development, and that the ancestors of the Gymno- myxa were Protozoa similar to the Flagellata. Again the Acinetaria produce spores which are~~

~~*uniformly clothed with numerous vibratile cilia (Fig. XXVI-), although the adults are entirely devoid of such structures; this is accounted for by the supposition that the Acinetaria have been developed from ancestors like the Ciliata, whose characters are thus perpetuated in their embryonic stages. There can be little doubt that these embryological sugges- tions are on the whole justified, and that the nucleated Protozoa are the descendants of non-nucleated forms simi- lar to the spores of Gymnomyxa and Sporozoa, whilst it seems also extremely probable that the ancestral Protozoa were neither exclusively amoeboid in the movement of their protoplasm nor provided with permanent vibratile filaments (flagella and cilia); they were neither Myxopods nor Mastigopods (to use the terms which have been intro- duced to express this difference in the character of the locomotor processes), but the same individuals were capable of throwing out their protoplasm sometimes in the form of flowing lobes and networks, sometimes in the form of vibratile flagella. A few such undifferentiated forms exist at the present day among the Proteomyxa and in a little more advanced condition among the lowest Flagellata, ¢.7., Ciliophrys.*~~

~~*Death.—It results from the constitution of the Proto- zoon body as a single cell and its method of multiplication by fission that death has no place as a natural recurrent phenomenon among these organisms. Among the Entero-zoa certain cells are separated from the rest of the consti- tuent units of the body as egg-cells and sperm-cells ; these conjugate and continue to live, whilst the remaining cells, the mere carriers as it were of the immortal reproductive cells, die and disintegrate. There being no carrying cells which surround, feed, and nurse the reproductive cells of Protozoa, but the reproductive cell being itself and alone the individual Protozoon, there is nothing to die, nothing to be cast off by the reproductive cell when entering on a new career of fission. 'The bodies of the higher animals which die may from this point of view be regarded as something temporary and non-essential, destined merely to carry for a time, to nurse, and to nourish the more import- ant and deathless fission-products of the unicellular egg. Some of these fission-products of the new individual de- veloped from an egg-cell—namely, the egg-cells and sperm- cells—are as immortal as the unicellular Protozoon, This method of comparing the unicellular and the multicellular organism is exceedingly suggestive, and the conception we*~~

thus gain of the individuality of the Enterozoon throws light upon the phenomena of reproduction and heredity in those higher organisms.

Experiment and observation in this matter are extremely

difficult ; but we have no reason to suppose that there is any inherent limit to the process of nutrition, growth, and fission, by which continuously the Protozoa are propagated. The act of conjugation from time to time confers upon the protoplasm of a given line of descent new properties, and apparently new vigour. Where it is not followed by a breaking up of the conjugated cells into spores, but by separation and renewed binary fission (Ciliata), the result is described simply as "rejuvenescence." The protoplasm originated by the successive division of substance traceable to one parent cell has become specialized, and in fact too closely adapted to one series of life-conditions ; a fusion of substance with another mass of protoplasm equally specialized, but by experience of a somewhat differing character, imparts to the resulting mixture a new com- bination of properties, and the conjugated individuals on separation start once more on their deathless career with renewed youth.

CLASSIFICATION OF THE PROTOZOA.

In attempting a scheme of classification it would be most in accordance with the accepted probabilities of the ancestral history of the Protozoa to separate altogether those forms devoid of a nucleus from those which possess one, and to regard them as a lower " grade" of evolution or differentiation of structure.

By some systematists, notably Biitschli (9), the presence or absence of a nucleus has not been admitted as a basis of classifica- tory distinction, whilst on the other hand both Haeckel (1) and Huxley (10) have insisted on its importance.

The fact is that during recent years many of those Protozoa which were at one time supposed to be devoid of nucleus even in a rudimentary form, and furnished therefore the tangible basis for a lowest group of " Protozoa

~~*Homogenea" or '"' Monera," have been shown by the application of improved methods of microscopic investigation to possess a nuclens, that is to say, a differentiated corpuscle of denser protoplasm lying within the general protoplasm, and capable when the organism is killed by alcohol or weak acids of taking up the colour of various dyes (such as carmine and heematoxylin) more readily and permanently than is the general protoplasm. In such cases the nucleus may be very small and exhibit none of the typical structure of larger nuclei. 'It is usually surrounded by a clear (z.e., non-granular) halo of the general protoplasm which assists the observer in its detection. Nuclei have been discovered in many Reticularia (Foraminifera), a group in which they were supposed to be wanting, by Schultze (11) and the Hertwigs (12) and more recently in the Mycetozoa and in Vampyrella and Protomonas (Zopf, 18), where so excellent an observer as Cienkowski had missed them.*~~

~~*It seems therefore not improbable that a nucleus is present though not observed in Protomyxa, Myxastrum, and other similar forms which have been by Haeckel and others classed as " Monera " or " Homogenea." The recently described (14) Archerina (Fig. II. 8, 11) certainly possesses no nucleus in the usual sense of that term, but it is possible that the chlorophyll-coloured corpuscles of that organism should be considered as actually representing the nucleus. Whilst then refraining from asserting that there are no existing Protozoa devoid of nucleus corresponding in this character with non-nucleate Protophyta, such as the Bacteria, we shall not in our scheme of classification institute a group of Homogenea, but shall leave the taking of that step until it has been shown after critical examination that those forms now regarded by some observers as Homogenea are really so.- In the meantime these forms will find their places alongside of the Nucleata most nearly allied to them in other characters,*~~

~~*The Protozoa with a definite permanent cortical substance of differentiated protoplasm are undoubtedly to be regarded as evolved from forms devoid of such differentiation of their substance, and we accordingly take this feature as the indication of a primary division of the Protozoa.! The lower grade, the Gymnomyxa, afford in other respects evidence of their being nearly related to the ancestral forms from which the Corticata (the higher grade)*~~

have developed. _.The Gymnomyxa all or nearly all, whilst exhibiting amceboid movement and the flowing of their protoplasm into "' pseudopodia " of very varied shapes, produce spores which swim by means of one or two flagella of vibratile protoplasm (monadiform young or flagellule). These flagellate young forms

1 The "exoplasm" and " by some authors are not dis tinuous substance— what wa ternal at another, them,

endoplasm" described in Ameebe, &e., tinct layers but one and the same con- $ internal at one moment becoming ex- no really structural difference existing between

PROTUAV:A

are closely related to the Flagellata, a group of the Corticata from which it seems probable that the Dinoflagellata, the Ciliata, and the Acinetaria have been derived. The Gymnomyxa themselves cannot, on account of the small number of structural features which they offer as indications of affinity and divergence in genetic relationships inter se, be classified with anything like confidence in a genealogical system. We are obliged frankly to abandon the attempt to associate some of the simpler forms with their nearest genetic allies and to content ourselves with a more or less artificial system, which is not, however, artificial in so far as its main groups are concerned. Thus the genetic solidarity of each of the large classes Heliozoa, Reticularia, Mycetozoa, and Radiolaria is not open to question. The Lobosa on the other hand appear to be a more artificial assemblage, and it is difficult to say that genetically there is any wide separation between them and the Mycetozoa or between the Mycetozoa and some of the simpler forms which we bring together under the class Proteomyxa.

The scheme of classification which we adopt is the following :—

PROTOZOA. GraDE A. GYMNOMYXA.

Class I. ProrEoMYXA. Ex. Vampyrella, Protomyxa, Archerina. Class II. M e ' ass I]. Mycerozoa. Ex. The Lu-mycetozoa of Zopf. \ Class I1I. Logosa. Ex. Ameba, Arcella, Pelomyxa. Class IV. LABYRINTHULIDEA. (Kx.

~~*Labyriuthula, Chlamydomyxa. | Class V. HEL10zZ0A. Filosa j Ex. Actinophrys, Raphidiophrys, Clathrulina. ee Class VI. ReticuLaRia. Ex. Gromia, Lituola, Astrorhiza, Globigerina. | ; Class VII. RapIoLaRiA. \ Ex. Thalassicolla, Eucyrtidium, Aecanthometra.*~~

~~*GRADE B. CORTICATA. (Class I. Sporozoa. Ex. Gregarina, Coccidium. (Class II. FLAGELLATA. | Ex. Monas, Salpingeca, Euglena, Volvor. Class II]. DINOFLAGELLATA. Ex. Prorocentrum, Ceratium. Class IV. RHYNCHOFLAGELLATA. Ex. Noctiluca. Class V. CILIATA. Ex. Vorticella, Paramecium, Stentor. ; Class VI. ACINETARIA. { Ex. Acineta, Dendrosoma. The genetic relationships which probably obtain among these groups may be indicated by the following diagram :—*~~

~~*Sections. Proteana. Plasmodiata. Lobosa.*~~

~~*Lipostoma.*~~

~~*Stomato- phora.*~~

~~*Class Acinetaria.*~~

~~*Class Rhyncho-dagellata.*~~

~~*Class Dino-flagellata.*~~

~~*a Class Ciliata.*~~

~~*< = &*~~

~~*oe*~~

~~*2)*~~

~~*o Class Sporozoe.*~~

~~*&*~~

~~*e Class Flagellata.*~~

~~*BE} oS*~~

~~*Class Class*~~

~~*‘ Mycetwzoa. Heliozoa. od Class Class ee Labyrinthulidea.\ Class Proteomyxa, Reticularia. = \ * 2) 2 Class Ss Lobosa. Radiolaria. a jes] CPs Gide*~~

~~*< WMW/Z*~~

~~*s (Protonucleata.)*~~

~~*:┤*~~

~~*4*~~

~~*mH*~~

~~*Homogenea.*~~

~~*Literature.—Certain works of an older date dealing with micro- Scople organisms, and therefore including many Protozoa, have historical interest. Among these we may cite O. F. Miiller, Animaleula Infusoria, 1786 ; Ehrenberg, Infusionsthierchen, 1838;*~~

~~*PROTEOMYXA.* |~~

~~*Dujardin, Histoire naturelle des Infusoires, 1841 ; Pritehard, Jn- JSusoria, 1857.*~~

~~*The general questions relating to protoplasm and to the consti- tution of the Protozoon body as a single cell are dealt with in the following more recent treatises:—Max Schultze, Ueber den Organ- ismus der Polythalamien, 1854, and Ueber das Protoplasma der Rhizopoden und Pflanzenzellen, 1863 , and Engelmann, article " Pro- toplasma" in Hermann's Handworterbuch der Physiologie, 1880.*~~

~~*Special works of recent date in which the whole or large groups of Protozoa are dealt with in a systematic manner with illustra- tions of the chief known forms are the following :—Biitschli, " Pro- tozoa," in Bronn's Classen und Ordnungen des Thierreichs, a comprehensivé and richly illustrated treatise now in course of publication, forming the most exhaustive account of the subject matter of the present article which has been attempted (the writer desires to express his obligation to this work, from the plates of which a large proportion of the woodcut figures here introduced have been selected); W. S. Kent, Manual of the Infusoria, 1882— an exhaustive treatise including figures and descriptions of all species of Flagellata, Dinoflagellata, Ciliata, aud Acinetaria ; Stein, Der Organismus der Infusionsthiere, 1867-1882; Haeckel, Die Radiolarien, 1862; Archer, '"' Résumé of recent contributions to our knowledge of freshwater Rhizopoda," Quart. Jour. of Micro- seopical Science, 1876-77; Zopf, " Pilztniere" (Mycetozoa), in Encyklopidie der Naturwissenschaften, Breslau, 1884.*~~

~~*We shall now proceed to consider the classes and orders of Protozoa in detail.*~~

~~*PROTOZOA.*~~

~~*Characters.—Organisms consisting of a single cell or of a group of cells not differentiated into two or more tissues ; incapable of assimilating nitrogen in its diffusible compounds (ammonia or nitrates) or carbon in the form of carbonates, except in special instanees which there is reason to regard as directly derived from allied forms not possessing this capacity.*~~

~~*The food of the Protozoa is in consequence as a rule taken in the form of particles into the protoplasm either by a specialized mouth or by any part of the naked cell-substance, there to be digested and rendered diffusible.*~~

~~*Grave A. GYMNOMYXA, Lankester, 1878 (64).*~~

~~*Characters. —Protozoa in which the cell-protoplasm is entirely or partially exposed to the surrounding medium, during the active vegetative phase of the life-history, as a naked undifferentiated slime or viscous fluid, which throws itself into processes or "nseudopodia" of various form either rapidly changing or relatively constant. Food can be taken into the protoplasm in the form of solid particles at any point of its surface or at any point of a large exposed area. The distinction into so-called "exoplasm" and "endoplasm" recognized by some authors, is zot founded on a permanent differentiation of substance corresponding to the cortical and medullary substance of Corticata, but is merely due to the centripetal aggregation of granules lying in a uniform undiffer- entiated protoplasm. 'The cell-individual exhibits itself under four phases of growth and development—(1) as a swarm-spore (monadiform young or flagellula) ; (2) as an ameeba form ; (8) as constituent of a plasmodium or eell-fusion or conjugation ; (4) as a eyst, which may be a flagellula(Schwdrme)-producing cyst, an amebula-producing cyst, a covered-spore(chlainydospore)-producing eyst (sporocyst sens. stric., Zopf), or a simple resting cyst which does not exhibit any fission of its contents (hypnoeyst). Any one of these phases may be greatly predominant and specialized whilst the others are relatively unimportant and rapidly passed through.*~~

~~*Onass I. PROTEOMYXA, Lankester.*~~

~~*Characters. -Gymnomyxa which exhibit in the ameba phase various forms of pseudopodia often-changing in the same individual, and do not produce elaborate spore eysts; hence they are not re- ferable to any one of the subsequent six classes. Mostly minute forms, with small inconspicuous nucleus (absent in some ?).*~~

~~*A division into orders and families is not desirable, the group being confessedly an assemblagesof negatively characterized or insnfliciently*~~

~~*known forms.*~~

~~*Genera.—Vampyrella, Cienkowski (15); Vampyrellidiwm, Zopf (18); Spirophora, Zopf (=Amaba radiosa, Perty) ; Haplococeus, Zopf ; Leptophrys, Hertwig and Lesser (16) ; Endyomena, Zopf ; Bursulla, Sorokin (17); Jfyxastrwm, Haeckel (1); Enteromyxa, Cienkowski (18); Colpodella, Cienkowski (19); Pseudospora, Cien- kowski (20); Protomonas, Cienkowski (15); Diplophysalis, Zopf (18); Gymnococcus, Zopf; Aphelidium, Zopf; Pseudosporidium, Zopf ; Protomyaa, Haeckel (1); Plasmodiophora, Woronin (21); Tetramyxa, Gobel (22); Gloidiwm, Sorokin (28) ; Gymnophrys, Cienkowski (24); Myzxodietywm, Hacckel (1); Boderia, Wright (25); Biomyxa, Leidy (92) ; Protogenes, Haeckel (1) ; Protameba, Haeckel (1); Nwelearia, Cienkowski (26); Afonobia, Aim. Schneider (27) ; Archerina, Lankester (14). e*~~

~~*The forms here brought together include several genera (the*~~

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~~*first nineteen) referred by Zopf to the Mycetozoa, some again (Vampyrella, Myxastrum, Nuclearia, Monobia) which are by Biitschli associated with the Heliozoa, others (Protamceba, Gloidium) referred by the same authority to the Lobosa (Amcebea) and others (Colpodella, Protomonas) which might be grouped with the lower Flagellata. By grouping them in the manner here adopted we are enabled to characterize those higher groups more satisfactorily and to give a jnst expression to our present want of that knowledge of the life-history both of these forms and of the higher Gymnomyxa which when it is obtained may enable us to disperse this hetero- geneous class of Proteomyxa. The gronp has the same function in relation to the other classes of Gymnomyxa which the group Vermes has been made to discharge in relation to the better defined phyla of the Metazoa ; it is a lumber-room in which obscure, lowly- developed, and insufficiently known forms may be kept until they can be otherwise dealt with.*~~

~~*It is true that, thanks to the researches of Continental botanists (especially Cienkowski and Zopf), we know the life-history of several of these organisms; but we are none the less unable to con- nect them by tangible characteristics with other Gymnomyxa.*~~

~~*Nearly all of the above-named genera are parasitic rather than "voracious," that is to say, they feed on the organized products of larger organisms both 'plants and animals (Haplococcus is parasitic in the muscles of the pig), into whose tissues they penetrate, and do not, except in a few eases (Protomyxa, Vampyrella), engulph whole organisms, such as Diatoms, &c., in their protoplasm. Many live upon and among the putrefying debris of other orgallisms (c.g., rotting vegetable stems and leaves, excrements of animals), and like the Mycetozoa exert a digestive action upon the substances with which they come in contact comparable to the putrefying and fermentative activity of the Schizomycetes (Bacteria).*~~

~~*Fig. II. illustrates four chief genera of Proteomyxa.*~~

~~*Protomyxa aurantiaca was described by Haeckel (1), who found it on shells of Spirnla on the coast of the Canary Islands, in the form of orange yellow flakes consisting of branching and reticular protoplasm nourishing itself by the ingestion of Diatoms and Peridinia. This condition is not a simple ameba phase but a "plasmodium" formed by the union of several young ameebe. The plasmodium under certain conditions draws itself together into a spherical form-and secretes a clear membranous cyst around itself, and then breaks up into some hundreds of flagellule or swarin- spores (Fig. 11. 2). The diameter of the cyst is "12 to '2 millimetre. The flagellule subsequently escape (Fig. II. 3) and swim by the*~~

~~*vibratile movement of one end which is drawn out in the form of a*~~

~~*coarse flagellum. phase (Fig. II. 4).*~~

~~*The swarm-spore now passes into the ameeba Several of the small ameebe creeping on the*~~

~~*surface of the spirula-shell then unite with one another and form a plasmodium which continues to nonrish itself by " voracious " inception of*~~

~~*Diatoms and other small organisms.*~~

~~*The plasmodia may attain a diameter of one millimetre and be visible by the naked eye.*~~

~~*A nucleus was not observed by Haeckel in the spores nor in the amœba phase, nor scattered nuclei in the plasmodium, but it is not improbable that they exist and escaped detection in the living con- dition, in consequence of their not being searched for by methods of staining, &c., which have since come into use. A contractile vacuole does not exist.*~~

~~*Vampyrella spirogyre, Cienkowski (Fig. II. 5, 6, 7), is one of several species assigned to the genus Vampyrella, all of which feed upon the living cells of plants. The nucleus previously stated to be absent has been detected by Zopf (18). There is no con- tractile vacuole. The amœba phase has an actinophryd character (i.e., exhibits fine radiating psendopodia resembling those of the sun-animalcule, Actinophrys, one of the Heliozoa). This species feeds exclusively upon the contents of the cells of Spirogyra, effect- ing an entrance through the cell-wall (Fig. IL. 5), sucking out the contents, and then creeping on to the next cell. In some species of Vampyrella as many as four amœba-individuals have been observed to fuse to forma small plasmodium. Cysts are formed which enclose in this species a single amœba-individual. The cyst often acqnires a second or third inner cyst menibrane by the shrinking of the protoplasmic body after the first encystment and the subsequent formation of a new membrane. The encysted pro- toplasm sometimes merely divides into four parts each of which creeps out of the cyst as an Actinophrys-like amœba (Fig. II. 'Ciel other instances it forms a dense spore, the product of which is not known.*~~

~~*Protogenes primordialis is the name given by Haeckel to a very simple form with radiating filamentous pseudopodia which he observed in sea-water. It appears to be the same organism as that deserihed and figured by Max Schultze as Amwba porrecta. Schultze's figure is copied in Fig. II. 12. No nucleus and no con- tractile vacuole is observed in this form. It feeds voraciously on smaller organisms. Its life-history has not been followed over even a few steps. Hence we must for the present doubt altogether as to its true affinities. Possibly it is only a detached portion of the protoplasm of a larger nucleate Gymnomyxon, The same kind of*~~

is justified i °s Pre imitiva, which doubt is justified in regard to Haeckel's Pi otameeba primitiva, 2 ba cried by hin "in pond water and differs from Protogenes n having lobose pseudopodia, whilst agreeing with it in absence of nuclei, contractile vacuoles, and other differentiation of structure.

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Fre. I1.—Various Proteomyxa 1. Protom f J 2 s yxa aurantiaca, Haeckel—modium phase. The naked protoplasm shows branched, reticulate ct Bo ——=. and numerous non-contractile vacuoles. It is in the act of en- = mt ing a Ceratium. Shells of engulphed Ciliata (Tintinnabula) are embedded

ean signs! tinea svete e,and " ech ee a. The onploms (though ‘ Y is drawing. . Cyst phase of Vampyrella. Th contents of the cyst have divided into four e 1 par i ‘ | visible. One is commencing to break its wa thi "i " ae Be bso: particles. 8. Archerina Boltoni Lenbesiar a ad bias en Mea protoplasm, and three groups of chloroph jheore a ae pAaace engulphing a Bacterium 7. 9. Cyst pbane Of kacherion hfs site ies ail; ee ; ee as : a. a, spinous cyst- :

puseles. 12. Prot rimordialis, Hi from Schultze's f seg primordialis, Haeckel (Ameba porrecta, M. Schultze),

The structureless protoplasmic network described by Haeckel

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[PROTEOMYXa.

from spirit-preserved specimens of Atlantic ooze and identified b him with Huxley's (28) Bathybius, as also the similar network described by Bessels (29) as Protobathybius, must be regarded for the present as insufficiently known. ;

~~*It is possible that these appearances observed in the ooze dredged from great depths in the Atlantic are really due to simple Protozoa. On the other hand it has been asserted by Sir Wyville Thomson, who at one time believed in the independent organic nature of Bathybius, that the substance taken for protoplasm by both Huxley and Haeckel is in reality a gelatinous precipitate of calcium sulphate thrown down by the action of alcohol upon sea-water. Other naturalists have pointed to the possibility of the protoplasmic network which Bessels studied in the living condition on board ship being detached portions of the protoplasm of Reticularia and Radiolaria. The matter is one which requires further investigation.*~~

~~*Archerina Boltoni is the name given by Lankester (14) to a very simple Gymnomyxon inhabiting freshwater ponds in company with Desmids and other simple green Alge (Fig. II. 8 to 11). Archerina exhibits an amceba phase in which the protoplasm is thrown into long stiff filaments (Fig. II. 11), surrounding a spherical central mass about z5;th inch in diameter (actinophryd form). A large vacuole (non-contractile) is present, or two or three small ones. No nucleus can be detected by careful use of reagents in this or other phases. The protoplasm has been seen to ingest solid food particles (Bacteria) and to assume a lobose form. 'The most striking characteristic of Archerina is the possession of chlorophyll corpuscles. In the actinophryd form two oval green-coloured bodies (2, b) are seen. As the protoplasm increases by nutrition the chlorophyll corpuscles multiply by quaternary division (Fig. Il. 10) and form groups of four or of four sets of four symmetrically arranged. The division of the chlorophyll corpuscles is not necessarily followed by that of the protoplasm, and accordingly specimens are found with many chlorophyll corpuscles embedded ina large growth of protoplasm (Fig. II. 8) ; the growth may increase to a considerable size, numbering some hundreds of chlorophyll corpuscles, and a proportionate development of protoplasm. Such a growth is not a plasmodium, that is to say, is not formed by fusion of independent amceba forms, but is due to continuous growth. When nutrition fails the individual chlorophyll corpuscles separate, each carrying with it an investment of protoplasm, and then each such amceba form forms a cyst around itself which is covered with short spines (Fig. II. 9). The cysts are not known to give rise to spores, but appear to be merely hypnocysts. ;*~~

~~*The domination of the protoplasm by the chlorophyll corpuscles is very remarkable and unlike anything known in any other organism. Possibly the chlorophyll corpuscles are to be regarded as nuclei, since it is known that there are distinct points of affinity between the dense protoplasm of ordinary nuclei and the similarly dense protoplasm of normal chlorophyll corpuscles.*~~

~~*Ciass II]. MYCETOZOA, De Bary.*~~

~~*Characeters.—Gymnomyxa which, as an exception to all other Protozoa, are not inhabitants of water but occur on damp surfaces exposed to the air. They are never parasitic, as are some of the Proteomyxa most nearly allied to them (Plasmodiophora, &c.), but feed on organic debris. They are structurally characterized by the fact that the ameeba forms, which develop either directly or through flagellnle from their spores, always form large, sometimes very large, i.e, of several square inches area, fusion plasmodia (or rarely aggregation plasmodia), and that the spores are always chlamydospores (¢.e., provided with a coat) and are formed either in naked groups of definite shape (sori) or on the surface of peculiar columns (conidiophors) or in large fruit-like cysts which enclose the whole or a part of the plasmodinm and develop besides the spores definite sustentacular structures (capillitium) holding the spores in a mesh-work. :*~~

~~*Three orders of Mycetozoa are distinguishable according to the arrangement of the spores in more or less complex spore-fruits.*~~

~~*OrpvER 1. SOROPHORA, Zopf.*~~

~~*Characters.—Mycetozoa which never exhibit a vibratile (monadi- form) swarmspore or flagellula phase, but hatch from the spore as ameebe. A true fusion plasmodium is not formed, but an aggrega- gation plasmodium by the contact without fusion of numerous amceba forms. The spore fruit is a naked aggregation of definitely arranged encysted amcebe called a sorus, not enclosed in a common capsule ; each encysted amceba has the value of a single spore and sets free on germination a singleamebula. They inhabit the dung of various animals.*~~

~~*Genera.—Copromyxa, Zopf; Cynthulina, Cienk. ; Déetyosteliwm, Brefeld ; Acrasis, Van Tieghem ; Polyspondylium, Brefeld.*~~

~~*OrDER 2. ENDOSPOREA, Zopf.*~~

~~*Characters.—Mycetozoa always passing through the flagellula phase and always forming true plasmodia by fusion of ameeba forms. The spore-fruit is in the form of a large cyst which encloses a quantity of the plasmodium ; the latter then breaks up into (a)*~~

~~*MYCETOZOA. |*~~

~~*spores (one corresponding to each nucleus of the enclosed_plas- | modium) each of which has a cellulose coat, and (0) a capillitium | of threads which hold the spores together. Each spore (chlamydo- | spore) liberates on germination a single nucleated flagellula, which develops into an amcebula, which in turn fuses with other aimceebule to form the plasmodium. The Endosporea are essentially dwellers on rotten wood and such vegetable refuse.*~~

~~*Fig. I11].—Mycetozoa (after De Bary). 1-6. Germination of spore (1) of Trichea varia, showing the emerging ‘“ flagellula” (4, 5), and its conversion into an “ameebula” (6). 7-18. Series leading from spore to plasmodium phase of Chondrioderma difforme:—7, spore; 10, flagellula; 12, amcebula; 14, apposi- tion of two amcebule ; 15-17, fusions; 18, plasmodium. 19, 20, Spore-fruit (cyst) of Physarum leucopheum, Fr. (Xx 25), the former from the surface, the latter in section with the spores removed to show the sustentaeular network or eapillitium. 21. Section of the spore-cyst of Didymium squamulosum, with the spores removed to show the radiating capillitium x and the stalk.*~~

~~*Sub-order 1. Prrirricura, Zopf. » 40]*~~

~~*Fam. 1. CLATHROPTYCHIACEA, Rostafinski.*~~

~~*Genera.—Clathroptychium, Rost. ; Enteridiwm, Ehr. Fam. 2. CRIBRARIACES.*~~

~~*Genera.—Dietydiwm, Pers. ; Cribraria, Pers.*~~

~~*Sub-order 2. EXNDOTRICHEA, Zopf.*~~

~~*Fam. 1. PHYSAREA.*~~

~~*Genera.—Physarwm, Pers.; Cratertwm, Trentepol; Badhamia, Berkeley; Zeoearpus, Link.; Tilmadoche, Fr.; Fuligo (4ithalium), Hall; dthaliopsis, Z.*~~

~~*Fam. 2. DipyMIACEs.*~~

~~*Genera.—Didymiwm; Lepidoderma, De Bary. Fam. 3. SPUMARIACE.*~~

~~*Genera.—Spumaria, Pers. ; Diaehea, Fries. Fam. 4. STEMONITEA.*~~

~~*Genera.—Stemonitis, Gleditsch ; Comatricha, Preuss ; Lam-*~~

~~*proderma, Rost.*~~

~~*Fam. 5. ENERTHENEMEA.*~~

~~*Genera.—Hnerthema, Bowman. Fam. 6. RETICULARIACEA, Zopf.*~~

~~*Genera.—Amaurochete, Rost. ; Reticularia, Bull. Fam. 7. TRICHINACES,*~~

~~*Genera.—Hemiareyria, Rost. ; Trichia, Hall. Fam. 8, ARCYRIACES.*~~

~~*Genera.—Areyria, Hall; Cornuvia, Rost.; Lyeogala, Ehr. Fam. 9. PERICHENACES.*~~

~~*Genera.—Periehana, Fries. ; Lachnobolus, Fries.*~~

~~*Fam. 10. Lickaera.*~~

~~*Genera.—JLieea, Schrader ; Fries. ; Z'ubulifera, Zopf.*~~

~~*ORDER 8. EXOSPOREA, Zopf.*~~

~~*Characters.—The ehlamydospore liberates an amcebula in the first instance, which develops into a flagellula. This subsequently returus to the amceba form, and by fusion with other amcebule it forms a true fusion plasmodium. The spores are not produced within a eyst but upon the surface of eolumn-like up-growths of the plasmodium, each spore (conidum) forming as a little spherical out- growth attached to the column (conidiophor) by a distinet pedicle.*~~

~~*Sole Genus.—Ceratium. [This name must be changed, since it was already applied to a genus of Dinoflagellata, when Famintzin and Woronin gave it to this Myeetozoon.]*~~

~~*Tubulina, Pers.; Lindbladia,*~~

~~*Further Remarks on Myeetozoa.—About two hundred species of Myeetozoa have been deseribed. Botanists, and especially those who oceupy themselves with Fungi, have accumulated the very large*~~

~~*PROT@ZO A*~~

~~*_ of eell-conjugation. | Proteomyxa; but among the other Gymnomyxa, excepting Myceto-*~~

~~*| undifferentiated protoplasm available for such study. | is referred to Zopf's admirable treatise (13) as to these matters, and*~~

~~*841*~~

~~*mass of facets now known in reference to®these organisms ; never- theless the most eminent botanist who has done more than any other to advance our knowledge of Myeetozoa, namely, De Bary, has expressed the view that they are to be regarded rather as animals than as plants. The fact is that, once the question is raised, it*~~

~~*' becomes as reasonable to relegate all the Gymnomyxa without*~~

~~*exception to the vegetable kingdom as to do so with the Myeetozoa.*~~

~~*| Whatever course we take with the latter, we must take also with*~~

~~*the Heliozoa, the Radiolaria, and the Reticularia.*~~

~~*The formation of plasmodia, for which the Mycetozoa are conspicu- ous, appears to be a particular instance of the general phenomenon Small plasmodia are formed by some of the*~~

~~*zoa, and among Corticate Protozoa, the fusion of two individuals (conjugation sensw strieto) is more usual than the fusion of several. Zopf (18) has attempted to distinguish arbitrarily between conjuga- tion and plasmodium formation by asserting that in the former the nuelei of the cells which fuse are also fused, whereas in the latter process the nuelei retain their independence. Both state- ments are questionable. What happens to the nucleus in suehi conjugations as those of the Gregarine has not yet been made out, whilst it is only quite recently that Strasburger (30) has shown that the plasmodia of Myeetozoa contain numerous scattered nuelei, and it is not known that fusion does not oecur between some of these. There is no doubt that the nuelei of plasmodia multiply by fission, though we have no detailed aceount of the process.*~~

~~*The Sorophora are exceptional in that the amcebe which unite to form a cell-colony in their ease do not actually fuse but only remain in close contact ; with this goes the fact that there are no large spore-cysts, but an identification of spore and spore-eyst. The aimcehee arrange themselves in stalked clusters (sori), and each be- eomes eneysted: one may, in this case, consider the eyst equally as a spore or as a spore-cyst which produces but a single spore. The amcebee described by various writers as inhabiting the alimentary canal and the dung of higher animals (including man) belong to this group. The form described by Cunningham in the Quart. Jour. Murer, Sei., 1881, as Protomyxomyees eoprinarius is appa- rently related to the Copromyxa (Guttulina) protea of Fayod (81).*~~

~~*The spore-fruits of the Endospores oceur in various degrees of elaboration. Usually they are (1) spherical or pear-shaped cysts with or without an obvious stalk (Fig. LI. 19, 20, 21), and often have a brilliant colour, and are of a size readily observed by the naked eye, the plasmodia which give rise to them being by no means microscopic. But they may present themselves (2) as irregular ridges growing up from the plasmodium, when they are termed serpula forms. Lastly, the cysts may be united side by side in larger*~~

*or smaller groups instead of forming at various sepa- rate points of the plasmodium. These composite bodies are termed "*fruit-cakes" or "eethalia," in view of the fact that the spore-eysts of Fuligo, also called Aithaliuni—the well-known "' flowers of tan " —form a cake of this description.*

The capillitium or network of threads which lies between the spores in the spore-cysts of Endosporez is a remarkable structure which exhibits special elaborations in detail in different genera, here not to be noticed for want of space. Although definite in form and structure, these threads are not built up by eells but are formed by a residual protoplasm (¢. Sporozoa) which is left in the cyst after the spores have been segregated and enclosed each in its special eoat. They are often impregnated by caleium carbonate, and exhibit erystalline masses of it, as does also the cyst-wall.

The spores of the Mycetozoa are as a rule about the ;4,th inch in diameter. They are produced by millions in the large fruit- cakes of such forms as Fuligo. Often the spore-coat is coloured; it always consists of a substance which gives the cellulose reaction with iodine and sulphuric aeid. This has been sometimes con- sidered an indication of the vegetable nature of the Mycetozoa, but cannot be so regarded. sinee many animals (especially the Tunicata and varions Protozoa) produee substances giving this same reaction.

*Dryness, low temperature, and want of nutriment lead to a.dor- miant condition of the protoplasm of the plasmodium of many Mycetozoa and to its enelosure in cyst-like growths known as '*selerotia," which do not give rise to spores, but from which the protoplasm creeps forth unaltered when temperature, nutrition, and moisture are again favourable. The sclerotia are similar in nature to the hypnoeysts of other Protozoa.*

The physiological properties—chemieal composition, digestive action, reaction to moisture, heat, light, and other physical influ- enees—of the plasmodia of Myeetozoa have been made the subject of important investigations; they furnish the largest masses of The reader

also for a detailed aceount of the genera and species.

~~*Cuass III. LOBOSA, Carpenter.*~~

~~*Characters. —Gymnomyxa in which (as in the succeeding four classes) the amceba-phase predominates over the others in perma- nence, size. attained, and physiological importance. The pseudo-*~~

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~~*odia are lobose, ranging in form from mere wave-like bulgings of the surface to blunt finger-like processes, but never having the character of filaments either simple, arborescent, or reticulate. Fusions of two individuals (conjugation) have been observed in a*~~

~~*Fic. IV.—Various Lobosa. 1, 2, 3. Dact J é - — ylosphzra (Ameba) pol:*~~

~~*ee in three. successive stages of division; he itp ahs 9 Pera ra — Lape sr Saree Buti ae vacuole (copied from . E. . uf. Mikrosk. Anat.). 4. Amceba princeps, Ehr. ome hyn a & Gorter nd b, 4; —_ (one or more wantreniiie: ihe*~~

~~*: -particles). 5. Pelomyxa palustris, G angel eee example with comparatively few teso-gorticies Gatanal a i in length). 6. Portion of a Pelomyxa more highly magni- See fee' ee zone of seh seta (so-called "'exoplasm"); 3,*~~

~~*» extre Imerous; c, lobose pseudopodium; d imi*~~

~~*Larch be nag ; é, nuclei ; f, refractive bodies " aniuedis Si eatcenl oom ac : e ee are seen numerous cylindrical crystals. vi oo ode ee fe hr. a,shell; 5, protoplasm within the shell; ¢, extended pe pag in the form of lobose pseudopodia; d, nuclei; ¢, contractile ; the dark bodies unlettered are gas vacuoles. 0 8.. Cochlio-*~~

~~*podium pellucidum, Hert. i alo sometimes mistaken ye ok claus, whilst the Waller teens*~~

~~*re Mi a, ucleus, whilst the latter is termed few cases, but not fusi indi ; sions of many individuals so as to form erie ; nevertheless the size attained by the naked protoplasm vy i : Shag 1S In Some cases considerable, forming masses readily y the naked eye (Pelomyxa). The presence of more than*~~

~~*one nucleus is a frequent character. A contractile vacuole may or may not be present. The formation of sporocysts and of chlamydo- spores (coated spores) has not been observed in any species, but naked spores (flagellule or ameebule) have been with more or less certainty observed as the product of the breaking up of some species (Ameeba? Pelomyxa). The cyst phase is not unusual, but the cyst appears usually to be a hypnocyst and not a sporocyst. In the best observed case of spore-production (Pelomyxa) the spores were apparently produced without the formation of acyst. Repro- duction is undoubtedly most freely effected by simple fission (Ameeba) and by a modified kind of bud-fission (Arcella). Fresh- water and marine. 'Two orders of the Lobosa are distinguished in accordance with the presence or absence of a shell.*~~

~~*OrpvER 1. NUDA.*~~

~~*Characters.—Lobosa devoid of a shell.*~~

~~*Genera.—Ameba, Auct. (Fig. IV. 4); Ourameba, Leidy (with a villous tuft at one end, Wallich's A. villosa); Coryeta, Duj. (low, ridge-like pseudopodia) ; Lithameba, Lankester (Fig. V.); Dina- meba, Leidy (92) (covered with short stiff processes); Hyalodiseus, H. and L.; Plakopus, F. E. Schultze; Dactylosphera, H. and L. (Fig. LV. 1, 2,8); Pelomyxa, Greeff (Fig. 1V. 5, 6) ; Amphizonella, Greeff (forms a gelatinous case which is broken through by the pseudopodia).*~~

~~*OrvER 2. TESTACEA.*~~

~~*Characters.—Lobosa which secrete a shell provided with an aperture from which the naked protoplasm can be protruded. The shell is either soft and membranous, or strengthened by the in- clusion of sand-particles, or is hard and firm.*~~

~~*Genera. —Cochliopodium (Fig. IV. 8), H. and L. ; Pyxidicula, Ehr. ; Areella, Ehr. (Fig. IV. 7); Hyalosphenia, Stein; Quad- rula, F. E. Schultze (shell membraneous, areolated) ; Difiugia, Leclerc (shell with adventitious particles).*~~

~~*Further remarks on the Lobosa.—The Lobosa do not form a very numerous nor a very natural assemblage. Undoubtedly some of the forms which have been described as species of Amba are ameeba forms of Mycetozoa ; this appears to be most probably the case in parasitic and stercoricolous forms. But when these are removed, as also those Proteomyxa which have pseudopodia of varying character, at one time lobose and at another filamentous, we have left a certain small number of independent lobose Gymnomyxa which it is most convenient to associate in a separate group. We know very little of the production of spores (whether it actually obtains or not) or of developmental phases among these Lobosa. The common Ameebe are referable to the species A. prineeps, A. lobosa, Daetylosphera polypodia, Ourameba villosa. Of none of these do we know certainly any reproductive phenomena excepting that of fission (see Fig. TV. 1, 2,3). Various statements have been made pointing to a peculiar change in the nucleus and a production of spores having the form of minute Amebx, arising from that body; but they cannot be considered as.established. Whilst the observed cases of supposed reproduc- tive phenomena are very few, it must be remembered that we have always to guard (as the history of the Ciliata has shown, see below) against the liability to mistake parasitic amebule and flagellulee for the young forms of organisms in which they are merely parasitic. The remarkable Pelomyxa palustris of Greeff (32) was seen by him to set free (without forming a cyst) a number of amcebulz which he considers as probably its young. Mr Weldon of St John's College, Cambridge, has observed the same pheno- menon in specimens of Pelomyxa which made their appearance in abundance in an aquarium in the Morphological Laboratory, Cambridge. It seems probable that the amcebulz in this case are not parasites but spore-like young, and this is the best observed case of such reproduction as yet recorded in the group.*~~

~~*Arcella is remarkable for the production of bud-spores, which may be considered as a process intermediate between simple fission and the complete breaking up of the parent body into spores. As many as nine*~~

~~*globular processes are simultaneously pinched off from the protoplasin extruded from the shell of the Arcella ; the nuclei (present in the parent Arcella to the number of two or three) have not been traced in connexion with this process. The buds then be- come nipped off, and acquire a shell and a contractile vacuole (33).*~~

~~*The presence of morc than one nucleus is not unusual in Lobosa, and is not due to a fusion of two or more uninuclear individuals, but to a multiplication of the original nucleus. This has been observed in some Amebe (A. princeps?) as well as Arcella. Pelomyxa (Fig. IV. 6) has a great number of nuclci like the Helio- zoon, Actinospherium (Fig. VIIL).*~~

~~*_Pelomyxa is the most highly differentiated of the Lobosa. The highly vacuolated character of its protoplasm is exhibited in a less degree by Lithameeba and resembles that of Heliozoa and Radiolaria. Besides the numerous nuclei there are scattered in the protoplasm strongly refringent bodies (Fig. IV. 6, /), the significance of which has not been ascertained. The superficial protoplasm is free from vacuoles, hyaline, and extremely mobile. Occasionally it is drawn*~~

~~*LABYRINTHULIDEA. |*~~

~~*out into very short fine filaments. Scattered in the protoplasm are a number of minute cylindrical crystals, of unascertained composi- tion. Pelomyxa is of very large size for a Protozoon, attaining a diameter of 7th of an inch. It takes into its substance a quantity*~~

~~*of foreign particles, both nutrient organic matter such as Rotifera | to*~~

~~*and Diatoms and sand particles. It occurs not uncommonly in old*~~

~~*Fig. V.—Lithameba discus, Lank. (after Lankester, 34). A, quiescent ; B, throwing out pseudopodia. .v., contractile vacuole, overlying whicli the vacuolated protoplasm is seen; conc, concretions insoluble in dilute HCl and dilute KHO, but soluble in strong HCl; ", nucleus.*~~

~~*muddy ponds (such as duck-ponds), creeping upon the bottom, and*~~

~~*has a white appearance to the naked eye. Lithameba (Fig. V.) is*~~

~~*distinguished by its large size, disk-like form, the disk-like shape of its pseudopodia, the presence of specific concretions, the vacuolation of its protoplasm, and the block-like form and peculiar tessellated appearance of its large nucleus, which has a very definite capsule. In Lithameba it is easy to recognize a distinct pellicle or temporary*~~

~~*cuticle which is formed upon the surface of the protoplasm, and |*~~

~~*bursts when a pseudopodium is formed. In fact it is the rupture of*~~

~~*this pellicle which appears to be the proximate cause of the outflow |*~~

~~*of protoplasm as a pseudopodium. Probably a still more delicate pellicle always forms on the surface of naked protoplasm, and in the way just indicated direction of the "flow" of protoplasm which is described as the "pro- trusion" of a pseudopodium,*~~

~~*The shells of Lobosa Testacea are not very complex. That of Arcella is remarkable for its hexagonal areolation, dark colour, and firm consistence; it consists of a substance, resembling chitin. That of Difflugia has a delicate membranous basis, but includes foreign particles, so as to resemble the built-up case of a Caddis worm.*~~

~~*Arcella is remarkable among all Protozoa for its power of secret-*~~

~~*ing gas-vacuoles (observed also in an Ameeba by Biitsehli), which |*~~

~~*serve a hydrostatic function, causing the Arcella to float. The gas can be rapidly absorbed by the protoplasm, when the vacuole neces- sarily disappears and the Arcella sinks.*~~

~~*Cuass IV. LABYRINTHIULIDEA.*~~

~~*Characters.—Gymnomyxa forming irregular heaps of ovoid nucleated cells, the protoplasm of which extends itself as a branching network or labyrinth of fine threads. The oval (spindle-shaped) corpuscles, consisting of well-marked nucleus (not observed in Chlamydomyxa), travel regu- larly*~~

~~*and continuously along the network of filaments. The oval corpuscles multiply by fission ; they also occasionally become encysted and divide into four spherical spores. The young forms*~~

~~*developed from these spores presumably develop into colonies, but |*~~

~~*have not been observed.*~~

~~*Genera.—Two genera only of Labyrinthulidea are known :—*~~

~~*Cienkowski; Chlamydomyxa, Archer.*~~

~~*Cienkowski (35) discovered Labyrinthula on green Alge growing on wooden piles in the harbour of Odessa (marine). It has an orange colour and forms patches visible to the naked eye. Chlamy- domyxa was discovered by Archer of Dublin (86) in the cells of Sphagnum and crawling on its 3 ey hence it is a freshwater form. Unlike Labyrinthula, the latter forms a laminated shell of cellulose (Fig. VI. 2, ¢), in which it is frequently completely enclosed, and indeed has rarely been seen in the expanded labyrinthine condition. The laminated cellulose shells are very freely secreted, the organism frequently deserting one and forming another within or adherent to that previously occupied. The network of Chlamydomyxa appears to consist of hyaline threads of streaming protoplasm, whilst that of Labyrinthula has a more horny consistence, and is not regarded by Cienkowski as protoplasm.*~~

~~*The spindle-shaped cells are much alike in form and size in the two genera; but no nucleus was detected by Archer in those of Chlamydomyxa. The encysting of the spindle-cells and their fission into spores has been seen only in Labyrinthula. Chlamy- domyxa is often of a brilliant green colour owing to the presence of chlorophyll corpuscles, and inay exhibit a red or mottled red and green appearance owing to the chemical change of the chlorophyll.*~~

~~*Labyrinthula,*~~

~~*determines by its rupture the form and the |*~~

~~*PROTOZOA*~~

1 It has been observed to take in solid nourishment, though Labyrin- thula has not.

The Labyrinthulidea present strong resemblances to the Myceto- zoa. The genus Dactylostelium (Sorophora) would come very close Labyrinthula were the amcebe of its ageregation plasmodium

dense protoplasm, and possessing each a |

Fia. Vi.—Labyrinthulidea. 1. A colony or "cell-heap" of Labyrinthu'a vitellina, Cieénk., crawling upon an Alga. 2. A colony or "cell-heap" of Chlamydomyxa labyrinthuloides, Archer, with fully expanded network of threads on which the oat-shaped corpuscles (cells) are moving. o is an ingested food particle; at ¢ a portion of the general protoplasm has detached itself and become encysted. 3. A portion of the network of Labyrinthula vitellina, Cienk., more highly magnified. », protoplasmic mass apparently produced by fusion of several filaments; p', fusion of several cells which have lost their definite spindle-shaped contour; s, corpuscles which have become spherical and are no longer moving (perhaps about to be eucysted). 4, Asingle spindle cell and threads of Laby- yinthula macrocystis, Cienk. n, nucleus. 5. A groupof encysted cells of L. macrocystis, embedded in a tough secretion. 6, 7. Encysted cells of L. macrocystis, with enclosed protoplasin divided into four spores. 8. 9, Transverse division of a non-encysted spindle-cell of L., macrocystis.

set upon a network of threads. Such a network, whether in the condition of soft protoplasm or hardened and horny, is represented in the higher Myectozoa by the capillitium of the sporocysts.

The most important difference between Archer's Chlamydomyxa and Cienkowski's Labyrinthula is that in the former the threads

Bal reo 7

| numerous isolated filamentous pseudopodia which exhibit very little

si ile protoplasm, whilst k appear to consist of contracti . : 25 he beg ao ae ee ae oti saad ae aol — s od i -cells. Neither form has bee -exal e eo at it is possible that this apparent difference will be removed by further study.

Fie. VII.—Heliozoa. 1. Actinophrys sol, Ehrb.; x 800. a. food-particle lying in a large food-vacuole ; b, deep-lying finely granular protoplasm ; c¢, axial filament of a pseudopodium extended inwards to the nucleus; d, the central nucleus; e, contractile vacuole; /, superficial much-vacuolated

protoplasm. 2. Clathrulina elegans, Cienk.; x 200. 3. Heter-

ophrys marina, H. and L. x 660. a, nucleus; b, clearer protoplasm surrounding the nucleus ; ¢, the peculiar felted envelope. 4. Raphi-diophrys pallida, F. E. Schultze; x 430. a, food-particle ; b, the nucleus ; ¢, contractile vacuole ; d, central granule in which all the axis-filaments of the pseudopodia meet.' The tangentially disposed spicules are seen arranged in masses on the surface. 5. Acanthocystis turfacea, Carter ;

x 240. a, probably the central nucleus ; b, clear protoplasm around the

nucleus ; ¢, more superficial protoplasm with vacuoles and chlorophyll

corpuscles ; d, coarser siliceous spicules ; e, finer forked siliceous spicules ;

J, finely granular layer of protoplasm. The long pseudopodia reaching beyond the spicules are not lettered. 6. Bi-flagellate "flagellula" of Acanthocystis aculeata, a, nucleus, 7.

Ditto of Clathrulina elegans, a, nucleus. 8. Astrodisculus ruber, Gre

central sphere (? nucleus) ; b, peripheral homogeneous envelope. Ciass V. HELIOZOA, Haeckel, 1866. Characters. —Gyinnomyxa in which the dominating ameba phase has the form of a spherical body from the surface of which radiate

eis 3× 8205 Va. red-coloured —

OZoOA | (HELIOZOA.

r change of form, except when engaged in the inception tions "The red loeb of the spherical body is richly vacuolated ; it may exlubit one or more contractile vacuoles and either a single central nucleus or many nuclei (Nuclearia, ss spherium). Skeletal products may or may not be present. F he — lule have been observed as the young forms of some species (one thocystis, Clathrulina), but very little has been as yet ee as to spore-formation or conjugation in this group, though isolatec facts of importance have been observed. Mostly freshwater forms.

13

Fic. VUI—Heliozoa. 1. Actinospherium Eichhornii, Ehr.; x 200. dt, nuclei ; b, iy veniueiden witht amnaiied vacuoles and numerous men : ¢, contractile vacuoles; d, peripheral protoplasm with larger vacuoles. 2. A portion of the same specimen more highly magnified and — o optical section. a@, nuclei; b, deeper protoplasni (so-called en Seg te d, peripheral protoplasm (so-called ectosare); €, pseudopodia oe vs grauular protoplasm streaming over the stiff axial filament; J, a : particle in a food-vacuole. 8, 4. Nuclei of Actinospherinm in : he resting condition. 5-18. Successive stages in the division a nucleus of Actinosphxrium, showing fibrillation, and in 7 and 8 forma = of an equatorial plate of chromatin substance (after Hertwig). Th ie Cyst-phase of Actinosphxrium Eichhornii, showing the pi otop! — divided into twelve chlamydospores, each of whicli has a siliceous coat ;

a, nucleus of the spore ; g, gelatinous wall of the cyst ; h, siliceous coat of the spore.

RETICULARIA. |

Orper 1. APHROTHORACA, Hertwig (56).

Characters. —Heliozoa devoid of a spieular or gelatinous envelope, excepting in some a temporary membranous cyst.

Genera. —Nuclearia, Cienk. (37) (many nuclei ; inany contractile |

vacuoles ; body not permanently spherical, but amceboid) ; Actin- ophrys, Khr. (Fig. VII. 1; body spherical ; pseudopodia with an axial skeletal

~~*filament; central nucleus; one large contractile vacuole; often forming colonies ; A. sol, the Sun-animaleule); Actinospherium, Stein (Fig. VIII; spherical body ; pseudopodia with axial filament ; nuclei very numerous ; contractile vaeuoles 2 to 14); Actinolophus, F. E. Schulze (stalked). :*~~

~~*OrvER 2. CHLAMYDOPHORA, Archer (57).*~~

~~*Characters.—Heliozoa with a soft jelly-like or felted fibrous envelope.*~~

~~*Genera.—Heterophrys, Areher (Fig. VII. 38); Sphenastrum, Greeff ; Astrodisculus, Greeff (Fig. VII. 8).*~~

~~*OrpvEr 8. CHALAROTHORACA, Hertw. and Lesser (58).*~~

~~*Characters.—Heliozoa with a loose envelope eonsisting of isolated siliceous spicules.*~~

~~*Genera.—Raphidiophrys, Areher (Fig. VII. 4; skeleton in the form of numerous slightly eurved spicules placed tangentially in the superficial protoplasm) ; Pompholyxophiys, Areher ; Pinacocystis H. and L. ; Pinaciophora, Greetf ; Acanthocystis, Carter (skeleton in the form of radially disposed siliceous needles ; encysted eon- dition observed, and flagellula young, Fig. VII. 6); Wagnerella, Mereseh.*~~

~~*OrprR 4. DESMOTHORACA, Hertw. and Less.*~~

~~*Characters.—Heliozoa with a skeletal envelope in the form of a spherieal or nearly spherical shell of siliea preforated by numerous large holes.*~~

~~*Genera.—Orbulinella, Entz (without a stalk); Clathrulina, Cienk. (with a stalk, Fig. VII. 2).*~~

~~*Further remarks on the Heliozoa.—The Sun-animaleules, Actino- phrys and Actinospherium, were the only known members of this group when Carter diseovered in 1863 Acanthocystis. Our further knowledge of them is chiefly due to Archer of Dublin, who dis- covered the most important forms, and figured them in the Quart. Jour. Micr. Sct. in 1867.*~~

~~*Some of the Proteomyxa (¢.g., Vampyrella) exhibit "heliozoon- | like" or "aetinophryd" forms, but are separated from the true |*~~

~~*Heliozoa by the fact that their radiant pseudopodia are not main- tained for long in the stiff isolated condition characteristic of this group. It is questionable whether Nuclearia should not be relegated to the Proteomyxa on account of the mobility of its body, which in all other Heliozoa has a constant spherical form.*~~

~~*Actinophrys sol is often seen to form groups or colonies (by fission), and so also is Raphidiophrys.*~~

~~*simple fission but by multiple fission, producing flagellate spores which may or may not be preceded by encystment.*~~

~~*been observed in the encysted state, and only the first two have been credited with the production of flagellated young. The two latter genera form covered spores within their cysts, those of Actino- spherium being remarkable for their siliceous coats (Fig. VIII. 14), but their further development has not been seen.*~~

~~*Crass VI. RETICULARIA, Carpenter, 1862.*~~

~~*(Foraminifera, Auct., Thalamophora, Hertwig).*~~

~~*Characters.—Gymnomyxa in which the dominating ameba- phase, often of great size (an inch in diameter), has an irregular*~~

~~*form, and a tendency to throw out great trunks of branching and |*~~

~~*often anastomosing filamentous pseudopodia, and an equally strong tendency to form a shell of secreted membrane or secreted lime or of agglutinated sand particles (only in one genus of secreted silex) into which the protoplasm (not in all?) can be drawn and out of and over which it usually streams in widely spreading lobes and branches. One nucleus is present, or there are many. A contrac- tile vacuole is sometimes, but not as a rule, present (or at any rate not described). Reproduction is by fission and (as in some other Protozoa) by the formation of peculiar bud-spores which*~~

~~*remain for a time after their formation embedded in the parental proto- plasm. No multiple breaking up into spores after or independent of the formation of a cyst is known. Marine and freshwater.*~~

~~*The Reticularia are divisible into several orders. The marked peculiarity of the shell structure in certain of these orders is only fitly emphasized by grouping them together as a sub-class Per- forata, in contrast to which the remaining orders stand as a sub-class Imperforata. The distinction, however, is not an ab- solute one, for a few of the Lituolidea are perforate, that is, are*~~

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~~*It is probable from the | little that is known that reproduction takes place not only by |*~~

~~*Only Clath- ! rulina, Acanthoeystis, Aetinospherium, and Aetinophrys have †*~~

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~~*Fic. 1X.—Gromiidea (Reticularia membranosa). Archeri, Barker. a, nucleus; 5, contractile vacuoles; c, the yellow oil-like body. Moor pools, Ireland. 2. Gromia oviformis, Duj. a, the numerous nuclei; near these the elongated bodies represent ingested Diatoms. Freshwater. 3. Shepheardella teniiformis, Siddall (Quart. Jour. Mier. Sci., 1880); x 30 diameters. Marine. The protoplasm is retracted at both ends into the tubular case. a, nucleus. 5. Shep- heardella txniiformis; x 15; with pseudopodia fully expanded. 6-10. Varying appearance of the nuclens as it is carried along in the streaming protoplasm within the tube. 11. Amphitrema Wrightianum, Archer, showing membranous shell encrusted with foreign particles. Moor pools, Ireland. 12. Diaphorophodon mobile, Archer. a, nucleus. Moor pools, Ireland.*~~

~~*1. Diplophrys*~~

~~*Sus-ciass A. Imperforata.*~~

~~*Characters.—Shell-substanee not perforated by numerous aper- tures through which the protoplasm ean issue, but provided with only one or two large apertures, or in branched forms with a few sueh apertures.*~~

~~*Orver 1. GROMIIDEA, Brady.*~~

~~*Characters.—Shell or test membranous, in the form of a simple sac with a pseudopodial aperture either at one extremity or at both.*~~

~~*sandy isomorphs of perforate genera such as Globigerina and — Rotalia.*~~

~~*Psendopodia thread-like, long, branching, reticulated. Marine and freshwater.*~~

~~*Fam. 1. Monosromrna, with a single aperture to the shell.*~~

~~*846 PROTOZOA / [RETICULARIA.*~~

~~*Genera.—Lieberkuhnia, Clap. and Lach. ; Gromia, Duj. (Fig.*~~

~~*: : : 5 : r | IX. 2); Mikrogromia, Hertw. ; Euglypha, Duj. (shell built up o | crea siliceous plates); Diaphorophodon, Archer (88) (many |*~~

~~*foreign particles cemented to form shell; small pseudopodia issue*~~

~~*i long ones from | between these, hence resembling Perforata, and large tong | extended from either aperture, Fig. IX. 5, and rapidly circulating*~~

~~*| within the tubular test during life, carrying with it the nucleus | which itself exhibits peculiar movements of rotation, Fig. IX. 6, 7, 1 869; a):*~~

~~*i*~~

~~*the proper mouth of the shell, Fig. IX. 12).*~~

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~~*Dees SONA Oe is ed*~~

~~*Fie. X.—_Imperforata, 1. Sptroloculina planulata, Lamarck, showing five*~~

~~*“coils”; porcellanous 2. Young ditto, with i ;*~~

~~; é ; : ; shell d protoplasm stained so as _to show the seven nuclei (eeTay Golene (Pans roplis); a sculptured imperfectly coiled shell; porcellanous. 4,~~

~~Vertebralina, a simple shell consisting of chambers succeedin \ ] 4 g onean — - rip og line; porcellanous. 5, 6. Thurammina papillata, mc age "5 "J orm. 45 is broken open so as to show an inner chamber; recent. ok s pte (Haplophragmium) canariensis, a sandy form; — * ucleated reproductive bodies (bud-spores) of Haliphysema. nici ina levis, M. Schultze; x 40; a simple porcellanous Greek 'a Ph Protoplasmic core removed after treatment with weak eal ci Pag the shell of Haliphysema Tumanovitzti, Bow. n — ae nuclei, stained With hematoxylin (after Lankester). ia = prhewes f umanovitett; x 25 diam.; living specimen, showing the : fag ass-shaped shell built up of sand-grains and sponge-spicules, and \ e mee protoplasm p, issuing from the mouth of the shell and pve Fate over its projecting constituents. 12. Shell of Astro- e. a timicola, Sand.; x 3; showing the branching of the test on some of rays usually broken away in preserved specimens (original). 13.~~

~~Secti ANE : ; oe of the shell of Marsipella, showing thick walls built of sand-~~

~~{~~

~~Fam. 2. AMPHISTOMINA, With an aperture at each end of the shell. Genera.—Diplophrys, Barker (Fig. 1X. 1); Détrema, Archer ; Amphitrema, Archer (Fig. IX. 11); Shepheardella, Siddall (39) (membranous shell very long and cylindrical so as to be actually tubular, narrowed to a spout at each end, Fig. 1X. 3; protoplasm~~

~~OrpER 2. ASTRORHIZIDEA, Brady.~~

~~Characters. —Test invariably consisting of foreign particles ; it is usually of large size and single-chambered, often branched or radiate with a pseudopodial aperture to each branch, the test often con- tinned on to the finer branches of the pseudopodia (Fig. X. 12) ; never symmetrical. Al] marine.~~

~~*Fam. 1. ASTRORHIZINA, Brady. Walls thick, composed of loose sand or mud very slightly cemented.*~~

~~*Genera.—Astrorhiza, Sandahl (Fig. X. 12, very little enlarged); Pelosina, Brady ; Storthosphera, Brady ; Dendrophrya, St. Wright ; Syringammina, Brady.*~~

~~*Fam. 2. PILuLININA. Test single-chambered ; walls thick, composed chiefly of felted sponge-spicules and fine sand, without calcareous or other cement.*~~

~~*Genera.—Pilulina, Carpenter; Technitella, Norman; Bathy- siphon, Sars.*~~

~~*Fam. 8. SACCAMMININA. Chambers nearly spherical ; walls thin,*~~

~~*| composed of firmly cemented sand grains.*~~

~~*Genera.—Psammosphera, Schultze; Sorosphera, Brady ; Saccam- mina, M. Sars.*~~

~~*Fam. 4. RHABDAMMININA. 'Test composed of firmly cemented sand – grains, often with sponge-spicules intermixed; tubular ; straight, radiate, branched or irregular; free or adherent; with one, two, or more apertures ; rarely segmented.*~~

~~*Genera.—Jaculella, Brady; Marsipella, Norman (Fig. X. 18) ; Rhabdammina, M. Sars;*~~

~~*OrpDER 3. MILIOLIDEA, Brady.*~~

~~*Characters.—Test imperforate ; normally calcareous and porcel- lanous, sometimes encrusted with sand; under starved conditions (e.g., in brackish water) becoming chitinous or chitino-arenaceous ; at abyssal depths occasionally consisting of a thin homogeneous,*~~

~~*| imperforate, siliceous film. The test has usually a chambered*~~

~~*structure, being divided by septa (each with a hole in it) into a series of loculi which may follow one another in a straight line (Fig. X. 4) or the series may be variously coiled (Fig. X. 1 and 38). The chambering of the*~~

~~*test does not express a corresponding cell- segmentation of the protoplasm; the latter, although growing in volume as the new shell-chambers are formed, remains one continuous cell-unit with many irregularly seattered nuclei (Fig. X. 2). The chambered and septate structure results in this group and in the other orders from the fact that the protoplasm, expanded beyond the*~~

~~*_ last-formed chamber, forms a new test upon itself whilst it lies and | rests upon the surface of the old test. The variations in such a*~~

~~*formation are shown in Fig. XII. 1, 2, 3, 4.*~~

~~*Fam. 1. NupecuLaRIna. Test free or adherent, taking various irregular asymmetrical forms, with variable aperture or apertures.*~~

~~*Genera.——Squammulina, Schultze (Fig. X. 9, showing the ex- panded pseudopodia) ; Nubeeularia, Defrance.*~~

~~*Fam. 2. Miriotina. Shell coiled on an elongated axis, either symmetrically or in a single plane or inequilaterally; two cham- bers in each convolution. Shell aperture alternately during growth (addition of new chambers) at either end of the shell.*~~

~~*Genera.—Biloculina, D'Orb. ; Fabularia, Defrance ; Spirolocu- lina, D'Orb. (Fig. X. 1, 2); Miliolina, Williamson (Fig. X1.).*~~

~~*Fam. 8. HAvErtninA. Shell dimorphous; chambers partly milioline, partly spiral or rectilinear.*~~

~~*Genera.—Articulina, D'Orb.; Vertebralina, D'Orb. (Fig X. 4); Ophthalmidium, Kubler; Hauerina, D'Orb.; Planispirina, Seguenza. _ Fam. 4. PENEROPLIDINA. Shell planospiral or cyclical, some- times erosier-shaped, bilaterally symmetrical.*~~

~~*Genera.—Cornuspira, Schultze ; Peneroplis, Montfort (Vig. X. 3) ;*~~

~~*RETICULARIA. |*~~

~~*Orbiculina, Lamarck ; Orbitolites, Lamarck (by a division of the chambers regularly into chamberlets, and a cyclical mode of growth which results in shells of the size of a shilling, a very elaborate- looking structure is produced which has been admirably analysed by Carpenter (40), to whose memoir the reader is specially referred).*~~

~~*Fic. XI.—Miliolina (Triloculina) tenera. Young living animal with ex- panded pseudopodia (after Max Schultze). A single nucleus is seen in the innermost chamber.*~~

~~*Fam. 5. ALVEOLININA. Shell spiral, elongated in the line of the axis of the convolution ; chambers divided into chamberlets. Genus.—Alveolina, D'Orb. Fam. 6. KERAMOSPHERINA. centric layers. Genus.—Keeramosphexra, Brady.*~~

~~*Orper 4. LITUOLIDEA, Brady.*~~

~~*Characters.—Test arenaceous, usually regular in contour ; septa- tion of the many-chambered forms often imperfect, the cavity being labyrinthic. 'lhis order consists of sandy isomorphs of the simpler Miliolidea, and also of the simpler Perforata (Lagena, Nodosaria, Cristellaria, Globigerina, Rotalia, Nonionina, &c.); it also contains some peculiar adherent species.*~~

~~*Fam. 1. Lirvotina. Test composed of coarse sand-grains, rough externally ; often labyrinthic.*~~

~~*Genera.—Reophax, Montfort; Haplophragmium, Reuss (Fig.*~~

~~*X. 7); Goskinolina, Stache; Placopsilina, D'Orb. ; Haplostiche,*~~

~~*Reuss; Litwola, Lamarck ; Bdelloidina, Carter.*~~

~~*Fam. 2. TROCHAMMININA. Test thin, composed of minute sand-grains incorporated with calcareous and other organic cement, or embedded in a chitinous membrane ; exterior smooth, often polished ; interior smooth or rarely reticulated ; never labyrinthic.*~~

~~*Genera.—Thurammina, Brady (test consisting typically of a single spherical chamber with several mammillate apertures, Fig. X. 5,6); Hippocrepina, Parker; Hormosina, Brady ; Ammo- discus, Reuss; Trochammina, Parker and Jones; Carterina, Brady; Webbina, D'Orb.*~~

~~*Fam. 3. Enpornyrina. 'Test more calcareous and less sandy than in the other groups of Lituolidea ; sometimes perforate ; septation distinct.*~~

~~*Genera.—Nodosinella, Brady ; Polyphragma, Reuss ; Involutina, Terg.; Endothyra, Phillips ; Bradyina, Moll.; Stacheia, Brady.*~~

~~*Fam. 4. Lorrusina. Test of relatively large size ; lenticular, spherical, or fusiform ; constructed either on a spiral plan or in concentric layers, the chamber cavities occupied to a large extent by the excessive development of the finely arenacecus cancellated walls.*~~

~~*Genera.—Cyclammina, Brady ; Loftusia, Brady ; Parkeria, Carpenter.*~~

~~*Sus-ciass Ps Perforata.*~~

~~*Characters.—Shell substance perforated by numerous minute apertures, through which as well as from the main aperture the protoplasm can issue.*~~

~~*Orper 5. TEXTULARIDEA, Brady.*~~

~~*Characters.—Tests of the larger species arenaceous, either with or without a perforate calcareous basis ; smaller forms hyaline and conspicuously perforated. Chambers arranged in two or more alternating series, or spiral or confused ; often dimorphous.*~~

~~*Fam. 1. TEXTULARINA. Typically bi- or tri-serial; often bi- rarely tri-morphous.*~~

~~*Genera.—Textularta Defrance ; Cuneolina, D'Orb. ; Verneiul- ina, D'Orb.; Tritaxia, Reuss; Chrysalidina, D'Orb.; Bigenerina, D'Orb.; Pavonina, D'Orb.; Spiroplecta, Ehr. ; Gaudryina, D'Orb. ; Valeulina, D'Orb.; Clavulina, D'Orb.*~~

~~*Shell spherical; chambers in con-*~~ |

~~Fam. 2. Buniminrna. Typically spiral ; weaker forms more or less regularly biserial; aperture oblique, comma-shiaped or some modification of that form.~~

~~Genera.—Bulimina, D'Orb.; Virgulina, D'Orb.; Bifarina, Parker and Jones; Bolivina, D'Orb.; Plewrostomelia, Reuss.~~

~~Fam. 3. CASsIDULINA. Test consisting of a Textularia-like series of alternating segments more or less coiled upon itself.~~

~~Genera.—Cassidulina, D'Orb.; Ehrenbergina, Reuss.~~

~~OrpER 6. CHILOSTOMELLIDEA, Brady.~~

~~Characters.—Test calcareous, finely perforate, many-chambered. Segments following each other from the same end of the long axis,~~

~~| or alternately at the two ends, or in cycles of three, more or less~~

~~embracing. Aperture a curved slit at the end or margin of the final segment.~~

~~Genera.—Ellipsoidina, Seguenza ; morphina, Reuss.~~

~~Orper 7. LAGENIDEA, Brady.~~

~~Characters.—Test calcareous, very finely perforated; either single-chambered, or consisting pf a number of chambers joined in a straight, curved, spiral, alternating, or (rarely) branching series. Aperture simple or radiate, terminal. No interseptal skeleton nor canal system.~~

~~Fam. 1. LAGENINA. Shell single-chambered.~~

~~Genera.—Lagena, Walker and Boys; Nodosaria, Lamk. ; Lin- gulina, D'Orb. ; Frondicularia, Defrance ; Rhabdogonium, Reuss ; Marginulina, D'Orb. ; Vaginulina, D'Orb. ; Rimulina, D'Orb. ; Cristellaria, Lamk. ;~~

~~*Amphicoryne, Schlumb. ; Lingulinopsis, Reuss ; Flabellina, D'Orb. ; Amphimorphina, Neugeb. ; Dentalinopsis, Reuss.*~~

~~*Fam. 2. PotyMorpHIINIva. Scgments arranged spirally or irregularly around the long axis; rarely biserial and alternate.*~~

~~*Genera.—Polymorphina, D'Orb. ; Dimorphina, D'Orb. ; Uviger- ina, D'Orb. ; Sagrina, P. and J.*~~

~~*Fam. 3. RAMULININA. Shell branching, composed of spherical or pyriform chambers connected by long stoloniferous tubes.*~~

~~*Genus.—Ramulina, Rupert Jones.*~~

~~*OrpEr 8. GLOBIGERINIDEA, Brady.*~~

~~*Characters.—Test free, calcareous, perforate ; chambers few, inflated, arranged spirally; aperture single or multiple, con- spicuous. No supplementary skeleton nor canal system. All the larger species pelagic in habit.*~~

~~*Genera.—Globigerina, D'Orb. (Fig. XII. 6): Orbulina, D'Orb (Fig. XII. 8); Hastigerina, Wy. Thomson (Fig. XII. 5); Pul-*~~

~~*Chilostomella, Reuss; Allo-*~~

~~*lenia, P. and J. ; Sphwxroidina, D'Orb. ; Candeina, D'Orb.*~~

~~*Orver 9. ROTALIDEA, Brady.*~~

~~*Characters.—Test calcareous, perforate ; free or adherent. Typi- cally spiral and "'rotaliform" (Fig. XII. 2), that is to say, coiled in such a manner that the whole of the segments are visible on the superior surface, those of the last convolution only on the inferior or apertural side, sometimes one face being more convex sometimes the other. Aberrant forms evolute, outspread, acervuline, or irregular. Some of the higher modifications with double chamber- walls, supplemental skeleton, and a system of canals. The nature of this supplemental skeleton is shown in Fig. XII. 2 and 10.*~~

~~*Fam. 1. Spirmuurnina. Test a complanate, planospiral, non- septate tube ; free or attached.*~~

~~*_ Genus. —Spirillina, Ehr.*~~

~~*Fam. 2. Roraurna. 'Test spiral, rotaliform, rarely evolute, very rarely irregular or acervuline.*~~

~~*Genera._—Patcellina, Williamson ; Cymbalopora, Hay ; Discorbina, P. and J.; Planorbulina, D'Orb. ; Truncatulina, D'Orb. ; Anomal- ina, P. and J.; Carpenteria, Gray (adherent); Rupertia, Wallick ; Pulvinulina, P. and J. ; Rotalia, Lamk. ; Calcwrina, D'Orb. [Shell rotaliform ; periphery furnished with radiating spines ; supplemental skeleton and canal system largely developed. This form is shown in a dissected condition in Fig. XII. 10. Outside and between the successive chambers with finely perforated walls a2, a3, at a secondary sheell-substance is deposited by the proto- plasm which has a different structure. Whilst the successive chambers with their finely perforate walls (resembling dentine in structure) are formed by the mass of protoplasm issuing from the mouth of the last-formed chamber, the secondary or supplemental- shell substance is formed by the protoplasm which issues through*~~

~~*the fine perforations of the primary shell substance ; it is not finely canaliculated, but is of denser substance than the primary shell and traversed by coarse canals (occupied by the protoplasm) which make their way to the surface of the test (c', c'). In Cal- carina a large bulk of this secondary shell-substance is deposited around each chamber and also forms the heavy club-like spines.]*~~

~~*Fam. 3. Trnoportna. Test consisting of irregularly heaped chambers with (or sometimes without) a more or less distinctly spiral primordial portion ; for the most part without any general | pseudopodial aperture.*~~

~~*848*~~

~~*Genera. —Tinoporus, Carpeuter ; Gypsina, Carter ; Aphrosint, Carter; Thalamopora, Roemer ; Polytrema, Risso. [Shell para- sitie, enerusting, or arboreseent ; surfaee areolated, eoloured pink or white, Fig. XII. 9. Interior*~~

~~partly oecupied by small chambers, arranged in more or less regular layers, and partly by non- segmented canal-like spaces, often crowded with sponge-spieules No true eanal system. This is one of the most important types as exhibiting the arborescent and enerusting form of growth. It is fairly abundant.]~~

~~Fic. XII.—Perforata, 1. Spiral arrangement of simp]~~

~~. x . 5 . € ¢ ; Reticularian shell, 2. Ditto, with pe septal eat ig peepee — shell-substance (shaded). 8. Diagram to show the mode in = — Successively-formed chambers may completely embrace their pre- bs 4, Diagram of a simple straight series of non-embracing~~

~~ers. 5. Hastigerina (Globigerina) Murrayi, Wyy. Thomson~~

~~calcareous matter, which are set on the shell, and have an axis of active~~

~~protoplasm. Pelagic: drawn in the livin igert } : ae 1 g state, 6. Glob poses onea D'Orb., showing the punctiform perforations of the anol sud aperture. 7. Fragment of the shell of Globigerina, seen~~

~~from within, and highly magni ions i agnified. a, fine perforations in the j song gh b, outer (secondary) shell substance. Two cptsag echo oe seen in section, and one lying among the smaller. 8. Or- universa, D'Orb. Pelagic example, with adherent radiating~~

~~PROTOZOA [RETICULARIA,~~

~~calcareous spines (hollow), and internally a small Globigerina shell. It is uncertain whether Orbulina is merely a developmental phase of Globi-~~

~~gerina. a, Orbulina shell; 6, Globigerina shell. 9. Polytrema miniu- _ceum, Lin.; x 12. Mediterranean, Example of a branched adherent cal- careous perforate Reticularian. 10. Calcarina Spenglert, Gmel.; x 10.~~

~~Tertiary, 'sicily. Shell dissected so as to show the spiral arrangement of the chambers, and the copious secondary shel! substance. a?, a3, a, chambers of three successive coils in section, showing the thin primary wall (finely~~

~~*tubulate) of each ; }, b, b, b, perforate surfaces of the primary wall of four titrs of chambers, from which the secondary shell substance has been cleared away; c', c', secondary or intermediate shell substance in section, showing coarse canals; d, section of secondary shell substance at right angles to c'; e, tubercles of secondary shell substance on the surface ; J, f, club-like processes of secondary shell substance.*~~

~~*Orper 10. NUMMULINIDEA, Brady.*~~

~~*Characters.—Test ealeareous and finely tubulated ; typically free, many-chambered, and symmetrically spiral. The higher modifications all possess a supplemental skeleton, and canal system of greater or less complexity.*~~

~~*Fam. 1. Fusuurnina. Shell bilaterally symmetrical ; chambers extending from pole to pole; each convolution completely enclosing the previous whorls. Shell-wall finely tubulated. Septa single or rarely double; no true interseptal eanals. Aperture a single elongated slit, or a row of small rounded pores, at the inner edge of the final segment.*~~

~~*Genera.—Fusulina, Fiseher ; Schwagerina, Moller.*~~

~~*Fam. 2. PoLYSTOMELLINA. Shell bilaterally synimetrieal, nauti- loid. Lower forms without supplemental skeleton or interseptal canals ; higher types with eanals opening at regular intervals along the external septal depressions.*~~

~~*Genera.—Nonionina, D'Orb. ; Polystomella, Lamarck.*~~

~~*Fam. 3. NUMMULITINA. Shell lentieular or complanate ; lower forms with thickened and finely tubulated shell-wall, but uo inter- mediate skeleton ; higher fornis with interseptal skeleton and eoin- plex canal system.*~~

~~*Genera.—Arehxodiscus, Brady ; Amphistegina, D'Orb.; Oper- eulina, D'Orb. ; Heterostegina, D'Orb. ; Nummutlites, Lamarck ; Asstlina, D'Orb.*~~

~~*Fam. 4. CyctociyPetna. Shell eomplanate, with thickened eentre, or lenticular ; consisting of a disk of chambers arranged in concentrie annuli, with more or less lateral thickening of lami- nated shell substanee, or*~~

~~*aeervuline layers of chamberlets, Septa donble and furnished with a system of interseptal eanals.*~~

~~*Genera.—Cycloelypeus, Carpenter ; Orbitoides, D'Orb.*~~

~~*Fam. 5. Eozoonina. Test forming irregular, adherent, aeervu- line masses.*~~

~~*Genus.—Lozoon, Dawson.*~~

~~*further remarks on the Reticularia.—The name Thalamophora, pointing to the peeuliar tendency which the larger members of the group have to form ehamber after clamber and so to build np a eomplex shell, has been proposed by Hertwig (56) and adopted by many writers. The old name Foraminifera (which did not refer to the fine perforations of the Perforata but to the large psendo- podial aperture leading from ehamber to ehamber) has also been extended by some so as to include the simpler Gromia-like forms. On the whole Carpenter's term Reticularia (62) seenis most suitable for the group, since they all present the character indicated. It has been objeeted that the Radiolaria are also retienlar in their pseudopodia, but if we except the pelagie forms of Reticularia (Globigerina, Orbulina, &e.), we find that the Radiolaria are really distinguishable by their stiffer, straighter, radiating pseudopodia. No doubt the Labyrinthulid Chlamydomyxa and the plasmodia of some Myeetozoa are as retienlar in their pseudopodia as the Reticularia, but they possess other distinctive features which serve, at any rate in an artificial system, to separate them.*~~

~~*The protoplasm of the majority of the Reticularia is unknown, or only very superficially observed ; henee we have made a point of introducing among our figures as many as possible which show this essential part of the organism. It is only recently (1876) that uuelei have been deteeted in the ealcareous-shelled members of the group, and they have only been seen in a few cases.*~~

~~*The protoplasm of the larger shell-making forms is known to be often strongly coloured, opaque, and creamy, but its minute strue- ture remains for future investigation. Referring the reader to the figures and their explanation, we would draw especial attention to the strueture of the protoplasmie body of Hastigerina (one of the Globigerinidea) as deteeted*~~

by the "Challenger" naturalists. It will be seen from Fig. X11. 5 that the protoplasm extends as a rela- tively enormous "bubbly" mass around the shell which is sunk within it ; from the surfaee of this " bubbly " (vacuolated or alveol- ated) mass the pseudopodia radiate.

The reader is requested to compare this with.Fig. XIII., repre- senting the " bubbly" protoplasmic body of Thalassieolla. It then beeomes obvious that the perforated central eapsule CK of the latter holds the same relation to the mass of the protoplasm as does the central perforated shell of Globigerina (Hastigerina). The extreme vacuolation of the protoplasm in both eases (the vacuoles being

filled with sea-water accumulated by endosmosis) and the stiff radiat- ing pseudopodia are directly correlated with the floating pelagic life of the two organisms. All the Radiolaria are pelagic, and many exhibit this vacuolation ; only a few of the Reticularia are so, and their strne- tural correlation to that habit has only lately been ascertained.

The Reticularia are almost exclusively known by their shells, which offer a most interesting field for stndy on acconnt of the very great complexity of form attained by some of them, notwithstand- ing the fact that the animal which produces them is a simple uni- cellular Protozoon. Space does not permit the exposition here of the results obtained by Carpenter in the study of the complex shells of Orbitolites, Operculina, Nummulites, &c.; it is essential that his work Introduction to the Study of the Foraminifera (Ray Society, 1862) should be consulted, and in reference to the sandy-shelled forms the monograph by Brady, in the Challenger Reports, vol. ix., 1883 ; and it must be sufficient here to point out the general prin- ciples of the shell-architecture of the Reticularia. Let us suppose that we have an ever-growing protoplasmic body which tends to produce a calcareous shell on its surface, leaving an aperture for the exit of its pseudopodia. 1t will grow too large for its shell and accumulate outside the shell. The accumulated

external mass may then secrete a second chamber, resting on the first as chamber 1 rests on chamber 0 in Fig. XII. 4. By further growth a new chamber is necessitated, and so is produced a series following one another in a straight line, each chamber commnnicating with the newer one in front of it by the narrow pseudopodial aperture (a, a}, a, a). Nowit is possible for these chambers to be very variously arranged instead of simply asin Fig. XII. 4. For instance, each new chamber may completely enclose the last, as in Fig. X11. 8, supposing the protoplasm to spread all over the outside of the old chamber before making a new deposit. Again the chambers

need not succeed one another in a straight line, but may be dis- |

posed in a spiral (Fig. XII. 1). And this spiral may be a flat coil, or it may be a helicine spiral with a rising axis ; further it may be close or open. All these forms in varions degrees of elaboration are exhibited by Miliolidea and various Perforata.

| But the Perforata in virtue of their perforate shell-walls introduce |

a new complication. The protoplasm issues not only from the mouth of the last-formed chamber, bnt from the numerons pores in the wall itself. This latter protoplasm exerts its lime-secreting functions ; it gathers itself into coarse branching threads which remain uncalcified, whilst all around a dense deposit of secondary

or supplemental shell-substance is thrown down, thus producing a | The thickness and amount of this |

coarsely eanalicnlar structure. secondary shell and the position it may occupy between and around the chambers of primitive shell-substance vary necessarily in dif- ferent genera according to the mode in which the primitive cham- bers are arranged and connected with one another. Calcarina is a fairly typical instance of an abundant secondary shell-deposit (Tig. XII. 10), and it is the existence of structure resembling the chambers of Calcarina with their surrounding primary and secondary shell- substances which has rendered it necessary toregard Eozoon (41) as the metamorphosed cnernsting shell of a pre-Cambrian Reticularian.

~~*The division of the Reticularia into Imperforata and Perforata which is here maintained has no longer the significance which was once attributed to it. It appears, according to the researches of Brady, that it is not possible to draw a sharp line between these snb-classes, since there are sandy forms which it-is diffienlt to separate from imperforate Lituolidea and are nevertheless perforate, in fact are "sandy isomorphs of Lagena, Nodosaria, Globigerina, and Rotalia." 1t does not appear to the present writer that there can be any insurmountable difficulty in separating the Lituolidea into two groups—those which are sandy isomorphs of the porcel- lanous Miliolidea, and those which are sandy isomorphs of the hyaline Perforata. The two groups of Lituolidea thus formed might be placed in their natural association respectively with the Imperforata and the Perforata.*~~

~~*The attempt to do this has not been made here, but the classifi- cation of Brady has been adopted. In Biitschli's large work on the Protozoa (9) the breaking up of the Lituolidea is carried out to a logical conclusion, and its members dispersed among the Miliolidea on theone hand and the various ordersof Perforata on the other hand.*~~

~~*The calcareous shell-substance of the Miliolidea being opaque and white has led to their being called " Porcellana," whilst the transparent calearcous shells of the smaller Perforata has gained for that group the synonym of " Hyalina."*~~

~~*The shells of the calcareous Reticularia and of some of the larger arenaccous forms are found in stratified rocks, from the Paleozoic strata onwards. The Chalk is in places largely com- posed of their shells, and the Eocene Numumulitic limestone is mainly a cemented mass of the shells of Nummulites often as large each as a shilling. The Atlantic ooze is a chalky deposit consisting largely of the shells of Globigerina, &c.*~~

~~*Cuass VII. RADIOLARIA, Haeckel, 1862 (63) (Polycystina, Ehr.).*~~

~~*Characters.—Gymnomyxa in which the protoplasmic body of the dominant amceba phase has the form of a sphere or cone from*~~

~~*PROTOZOA*~~

~~the surface of which radiate filamentous pseudopodia, occasionally anastomosing, and encloses a spherical (homaxonic) or cone-shaped (monaxonic) perforated shell of inembranous consistence known as the central capsule, and probably homologous with the perforated shell of a Globigerina. The protoplasm within the capsule (intra- capsnlar protoplasm) is continuons through the pores or apertures of the capsule with the outer protoplasm. Embedded in the former lies the large and specialized nucleus (one or more). Gelatinous substance is frequently formed peripherally by the extracapsular protoplasm, constituting a kind of soft mautle which is penetrated by the pseudopodia. A contractile vacuole is never present.~~

~~Usually an abundant skeleton, consisting of spicules of silica or of a peculiar substance called acanthin arranged radially or tangen- tially, loose or united into a basket-work, is present. Oil globules, pigment, and crystals are fonnd in greater or less abundance in the protoplasm.~~

~~In most but not all Radiolaria peculiar nucleated yellow cor- puscles are abundantly present, usually regarded as parasitic Alge. Reproduction by fission has been observed, and also in some few species a peculiar formation of swarm-spores (flagellule) within the central capsule, in which the nucleus takes an important part. All the Radiolaria are marine. The Radiolaria are divided into two sub-classes according to the chemical natnre of their spicular skeleton, and into orders according to the nature and the disposi- tion of the apertures in the wall of the central eapsule.~~

~~BS YA Se WA os = Q\ IWS on eae~~

~~IOS~~

~~TT ee~~

~~u~~

~~Ss~~

~~*Fic. XII.—Thalassicolla pelagica, Haeckel; x 25. CK, central capsule ; EP, extracapsular protoplasm ; «@é, alveoli, liquid-holding vacuoles in the protoplasm similar to those of Heliozoa, Pelomyxa, Hastigerina, &c.; ps, pseudopodia. The minute unlettered dots are the "yellow cells."*~~

~~*Sus-cLass 1]. Silico-Skeleta, Lankester.*~~

~~*Characters. —A more or less elaborate basket-work of tangential ant radial elements consisting of secreted silica is present ; in rare exceptions no skeleton is developed.*~~

~~*OrpeR 1. PERIPYLA, Hertwig.*~~

~~*Characters.—Silico-skeletal Radiolaria in which the central cap- sule is uniformly perforated all over by fine pore-canals ; its form is that of a sphere (homaxonic), and to this form the siliceous skeleton primarily conforms, though it may become discoid, rhabdoid, or irregular. 'Ihe nucleus is usually single, bnt numerous nuclei are present in each central capsule of the Polycyttaria.*~~

~~*Fam. 1. Spnaripa, Haeck. Spherical Peripylea with a spheri- cal basket-work skeleton, sometimes surrounded by a spongy outer skeleton, sometimes simple, sometimes composed of many concentric spheres (never discoid, flattened, or irregular). The central capsule sometimes encloses a part of the spherical skeleton, and often is penetrated by radiating elements.*~~

~~*Genera (selected).—Hthmosphera, Haeck. ; Xtphosphera, Haeck. ; Staurosphera, Haeck. ; Heliosphera, Haeck. (Fig. XIV. 14) ; As- tromma, Haeck. : Haliomma, Haeck. ; Actinomma, Haeck. (Fig. X1V. 17; note the sphere within sphere, the smallest lying in the nucleus, and the whole series of spherical shells connected by radial spines) ; Arachnosphera, Haeck. ; Pleymosphera, Haeck. ; Spongo- sphera, Haeck. (Fig. XVI. 8).*~~

~~*Fam. 2. Discrpa, Haeck. Discoid Peripylea; both skeleton and central capsule flattened.*~~

~~*Genera (selected).—Phawodiscus, Haeck. ; Heliodiscus, Haeck. ; Spongodiscus, Haeck. ; Spongurus, Haeck.*~~

~~Fam. 3. THALASSICOLLIDA. Peripylea devoid of a skeleton, or with a skeleton composed of loose siliceous spieules only. Nueleus single ; central eapsule and general protoplasm spherieal.~~

~~Genera (seleeted).— Thalassicolla, Huxley (Fig. XIIL, Fig. XIV. 1); Thalassosphera, Haeck. ; Physematiwm, Haeek.~~

~~Fam. 4. Ponycyrraria. Peripylea eonsisting of eolonies of many central eapsules united by their extracapsular protoplasm. Central capsules multiplying by fission. Nuclei in each central capsule numerous. Siliceous skeleton either absent, or of loose spieules, or having the form of a spherical fenestrated shell sur- rounding each eentral eapsule.~~

~~Genera (seleeted). —Collosphera, Miiller (with fenestrated globular skeleton); Sphxrozowm, Haeek. (skeleton of numerous loose spieules which are branched); Raphidozoum, Haeek. (spieules simple); Col- lozowm, Miiller (devoid of skeleton, Fig. XIV. 2, 3, 4, 5).~~

~~——~~

~~Fig. XIV.—Radi i — olaria, Huxley, in radial section. corpuscular structures of th~~

~~1. Central capsule of Thalassicoll ‘ a nucleata ie beaten ch wisn (Binnenblaschen); b, pails : psular protoplasm aini con- mia i ee aes! of the eapsule (membranous anid, iene ae ‘fas ini, — = Ms z nucleolar fibres (chromatin substance) of the pets ee eek en ogi tnerme, J. Miiller, two different forms of Collozoum feicntea ciefwing thi hee ‘eric eRe tee ts. Sing~~

~~eat ¢ , psular protopl~~

~~en up <4 & number of spores, the germs of smesutaporien i eciece: co a~~

[RADIOLARIA.

each encloses a crystalline rod. _c, yellow cells lying in the extracapsular protoplasm. 5. A small colony of Collozowm inerme, magnified 25 diameters. a, alveoli (vacnoles) of the extracapsular protoplasm; 0

central capsules, each containing besides protoplasm a large vil-globule. 6-13. Yellow cells of various Radiolaria:—6, normal yellow cell; 7, 8

division with formation of transverse septum; 9, a modified condition according to Brandt ; 10, division of a yellow cell into four ; 11, ameeboid condition of a yellow cell from the body of a dead Spheerozoon ; 12, a similar cell in process of division; 13, a yellow cell the protoplasm of which is creeping out of its cellulose envelope. 14. Heliosphxra inermis, Haeck., living example; x 400. a, nucleus; b, central capsule ; c, siliceous basket-work skeleton. 15. Two swarm-spores (tlagellule) of Collozoum inerme, set free from such a central capsule as that drawn in 4; each contains a crystal 6 and a nucleus a. 16. Two swarm-spores of Collozoum inerme, of the second kind, viz., devoid of crystals, and of two sizes, a macrospore and a microspore. They have been set free from central capsules with contents of a different appearance from that drawnin4. a, nucleus. 17. Aetinomma asteracanthion, Haeck ; x 260; one of the Peripylea. Entire animal in optical section. 4, nucleus : b,. wall of the central capsule ; '¢, innermost siliceous shell enclosed in the nucleus ; cl, middle shell lying within the central capsule; ¢e?, outer shell lying in the extracapsular protoplasm. Your radial siliceous spines, hold. ing the three spherical shells together are seen. The radial fibrillation of the protoplasm and the fine extracapsular pseudopodia are to be noted. 18. Amphilonche messanensis, Haeck; x 200; one of the Acanthometridea. Entire animal as seen living.

OrpER 2, MONOPYLAA, Hertwig.

Characters. —Silieo-skeletal Radiolaria in which the central cap- sule is uot spherieal but monaxonie (cone-shaped), with a single per- forate area (pore-plate) placed on the basal face of the eone ; the membrane of the capsule is simple, the nucleus single ; the skeleton is extracapsular, and forms a seaffold-like or bee-hive-like strueture of monaxonie form.

~~*Fie. XV.—Eueyrtidium cranioides, Haeck ; x150; one of the Monopylea. Entire animal as seen in the living condition. The central capsule is hidden by the bee-hive-shaped siliceous shell within which it is lodged. Fam. 1. Preetrpa, Haeck: Skeleton formed of siliceous spines*~~

~~*loosely conjoined.*~~

~~*Genera (seleeted).—Plagiacantha, Haeek. ; Plegmatium, Haeck.*~~

~~*Fam. 2. CyrtTrpA, Haeek. Skeleton a monaxonie or triradiate shell, or continuous piece (bee-hive-shaped).*~~

~~*Genera (selected). —Halicalyptra, Haeek. ; Eucyrtidium, Haeek. (Fig. XV.) ; Carpocanium, Haeek. (Fig. XVI. 3).*~~

~~*Fam. 3. Borripa, Haeek. Irregular forms; the shell composed of several chambers agglomerated without definite order ; a single eentral capsule.*~~

~~*Genera. —Botryocyrtis, Haeek. ; Lithobotrys, Haeek.*~~

~~*_ Fam. 4. SpyRipA, Haeek. Gemminate forms, with shell con- sisting of two eonjoined chambers ; a single eentral capsule.*~~

~~*_Fam. 5. STEPHIIDA, Haeek. Skeleton ericoid, forming a single siliceous ring or several conjoined rings.*~~

~~*Genera (seleeted).—Acanthodesmia, Haeek. ; Haeek. ; Lithocircus, Haeek. (Fig. XVI. 1).*~~

~~*OrpER 3. PHAODARIA, Haeek. (Tripylea, Hertwig). Characters.—Silieo-skeletal Radiolaria in which the central*~~

~~*Zygostephanus,*~~

-

—

~~*a*~~

1. Lithocircus annularis, Hertwig; one of the

Fie. XVE.—Radiolaria.. i ICU ? d Monopylea. Whole animal in the living state (optical section). a@, nucleus; b, wall of the central capsule; ¢, yellow cells; d, perforated area of the

central capsule (Monopyla). 2. Cystidium inerme, Hertwig ; one of the Monopylea. Living animal. An example of a Monopyleon destitute of skeleton. a@,nucieus; 0, capsule-wall; c, yellow cells in the extracapsular protoplasm. 3. Carpocanium diadema, Haeck. ; optical section of the bee-hive-shaped shell to show the form and position of the protoplasmic body, a, the tri-lobed nucleus; 0, the siliceou$ shell; ¢, oil-globules; d, the per-forate area (pore-plate) of the central capsule. 4, Celodendrum gracillimum, Haeck.; living animal, complete ; oneofthe Tripylea. a, the characteristic dark pigment (phzeodium) surrounding the central capsule b. The peculiar branched siliceous skeleton, consisting of hollow fibres, and the expanded pseudopodia are seen. 5. Central capsule of one of the Tripylea, isolated, showing a, the nncleus; 0,c, the inner and the outer laminze of the capsule-wall; d, the chief or polar aperture; ¢é,c, the two secondary apertures. 6,7. Acanthometra Claparedei, Haeck. 7 shows the animal in optical section, so as to exhibit the characteristic meeting of the spines at the central point as in all Acanthometridea; 6 shows the transition from the uninuclear to the multinuclear condition hy the breaking up of the large nucleus. «a, small nuclei; 0, large fragments of the single nucleus; ¢c, wall of the central capsnie; d, extraeapsular jelly (not protoplasm); é, peculiar intracapsular_yellow cells. 8. Spongo- sphera streptacantha, Haeck.; one of the Peripylxa. Siliceous skeleton not quite completely drawn on the right side. a@, the spherical extra- capsular shell (compare Fig. XIV. 17), supporting very large radial spines which are connected by a spongy network of siliceous fibres. 9. Aulosphxra elegantissima, Haeck.; one of the Phwodaria. Half of the spherical siliceous skeleton.

~~*capsule has a double membrane and more thau one perforate area, viz., one chief " polar aperture," and one, two, or more accessory apertures (Fig. XVI. 5). The nucleus is single. Around the central capsule is an abundant dark brown pigment (phodium of Haeckel). The siliceous skeleton exhibits various shapes regular and irregular, but is often remarkable for the fact that it is built up of hollow tubes.*~~

~~*Fam. 1. Pu#ocystipa, Haeck. The siliceous skeleton is either entirely absent or consists of hollow needles which arc disposed outside the central capsule, regularly or irregularly.*~~

~~*Genera (selected).—Aulacantha, Haeck.; Thalassoplancta, Haeck.*~~

~~*Fam. 2. PH#oGRoMiIpA, Haeck. The siliceous skeleton consists of a single fenestrated shell, which may be spherical, ovoid, or often dipleuric, but always has one or more large openings.*~~

~~*Genera (selected).—Challengeria, Wy. Thomson; Lithogromia, Haeck.*~~

~~*Fam. 8. PHmospHmRiDA. The siliceous skeleton consists of nunierous hollow tubes which are united in a peculiar way to form a large spherical or polyhedral basket-work.*~~

~~*Genera (selected). —Aulosphera, Haeck. (Fig. XVI. 9); Autlo- plegma, Haeck.; Cannacantha, Haeck.*~~

~~*Fam. 4. PHmoconcuipa. The siliceous skeleton consists of two separate fenestrated valves, similar to a mussel's shells; often there are attached to the valves simple or branched hollow tubes of silex.*~~

~~*Genera (selected).—Conchidium, Haeck. ; Celodendrum, Haeck. (Fig. XVI. 4).*~~

~~*Sus-cLAss II, Acanthometridea, Lankester (= Acanthino-skeleta).*~~

~~*Characters.—Radiolaria in which the skeleton is composed of a peculiar horny substance known as acanthin (rarely of silica). The central capsule is uniformly perforate (Peripylea type).*~~

~~*Fam. I. AcANTHONIDA, Haeck. Skeleton consisting of twenty spines of acanthin disposed in five parallel zones of four spines each, meeting one another at the central point of the organism ; never forming a fenestrated shell. :*~~

~~*Genera (selected).—Acanthometra, J. Miiller (Fig. XVI. 6, 7); Astrolonche, Haeck. ; Amphilonche, Haeck. (Fig. XIV. 18).*~~

~~*Fani. 2. DipLoconipa, Haeck. Skeleton a double cone.*~~

~~*Genus unicum.— Diploconus, Haeck.*~~

~~*Fam. 3. DorataspprpA, Haeck. The twenty acanthin spines of the skeleton form by transverse outgrowths a spherical fenestrated shell.*~~

~~*Genera (selected).—Stawraspis, Haeck. ; Dorataspis, Haeck.*~~

~~*Fam. 4. SpH#RocAPSIDA, Haeck. The twenty acanthin spines are joined together at their free apices by a simple perforate shell of acanthin.—*~~

~~*Genus unicum.—Spherocapsa.*~~

~~*Fam. 5. LirHonopHipa. Skeleton of many needles of acanthin radiating from a single point without definite number or order.*~~

~~*Genera.—Litholophus, Haeck: ; Astrolophus, Haeck.*~~

~~*Further remarks on the Radiolaria.—It has not been possible in the systematic summary above given to enumerate the immiense number of genera which have been distinguished by Haeckel (42) as the result of the study of the skeletons of thisgroup. The important differences in the structure of the central capsule of different Radio- laria were first shown by*~~

~~*Hertwig, who also discovered that the spines of the Acanthometridea consist not of silica but of an organic com- pound. In view of this latter fact and of the peculiar numerical and architectural features of the Acanthometrid skeleton, it seems proper to separate them altogether from the other Radiolaria. The Peripylea may be regarded as the starting point of the Radiolarian pedigree, and have given rise on the one hand to the Acantho- metridea, which retain the archaic structure of the central capsule whilst developing a peculiar skeleton, and on the other hand to the Monopylea and Pheodaria which have modified the capsule but retained the siliceous skeleton.*~~

~~*Pheodaria. Monopylea. Acanthometridea,*~~

~~*= * 4)*~~

~~*Peripylea. g. ay C Ss = * SS ie s*~~

~~*% =*~~

~~*oy Archi-peripylxa. RADIOLARIA,*~~

~~*The occasional total absence of any siliceous or acanthinous skeleton does not appear to be a matter of classificatory importance, since skelctal elements occur in close allies of those very few forms*~~

~~*852*~~

~~*which are totally devoid of skeleton. Similarly it docs not appear to be a matter of great significance that some forms (Polycyttaria) form colonies, instead of the central capsules separating from one another after fission has occurred. ; :*~~

~~*It is important to note that the skeleton of silex or acanthin does not correspond to the shell of other Gymnomyxa, which appears rather to be represented by the membranous central cap- snle. The skeleton does, however, appear to correspond to the spicules of Heliozoa, and there is an undeniable affinity between such a form as Clathrulina (Fig. VI. 2) and the Spherid Peripylea (such as Heliosphera, Fig. XIV. 14). The Radiolaria are,*~~

~~*however, a very strongly marked group, definitely separated from all, other Gymnomyxa by the membranous central capsule sunk:in their proto- plasm. Their differences inter se do not atiect their essential struc- ture. The variations in the chemical composition of the skeleton and in the perforation of the capsule do not appear superficially. The most obvious features in which they differ from one another relate to the form and complexity of the skeleton, a part of the organism so little characteristic of the group that it may be wanting altogether. It is not known how far the form-species and form-genera which have been distinguished in such profusion by Haeckel as the result of a study of the skeletons are permanent (i.e., relatively permanent) physiological species. There is no doubt that very many are local and conditional varieties of a single Protean species. The same remark applies to the species discriminated among the shell-bearing Reticularia. It must not be supposed, however, that less importance is to be attached to the distinguishing and record- ing of such forms because we arc not able to assert that they are permanent species.*~~

~~*The yellow cells (of spherical form, 005 to 0°15 of a millimetre in diameter) which occur very generally scattered in the extra- capsular protoplasm of Radiolaria were at one time regarded as essential components of the Radiolarian body. Their parasitic nature is now rendered probable by the observations of Cien- kowski (43), Brandt (44), and Geddes (45), who have established that each cell has a cellulose wall and a nucleus (Fig. XIV. 6 to 18), that the protoplasm is impregnated by chlorophyll which, as in Diatoms, is obscured by the yellow pigment, and that a starch- like substance is present (giving the violet reaction with iodine). Further, Cienkowski showed, not only that the yellow cells multiply by fission during the life of the Radiolarian, but that when isolated they continue to live; the cellulose envelope becomes softened ; the protoplasm exhibits amoeboid movements and escapes from the envelope altogether (Fig. XIV. 13) and multiplies by fission. Brandt has given the name Zooxanthella nutricola to the parasitic*~~

~~*unicellular Alga thus indicated. Hie and Geddes have shown that a |*~~

~~*similar organism infests the endoderm cells of Anthozoa and of some Siphonophora in enormous quantities, and the former has been led, it seems*~~

~~*erroneously, to regard the chlorophyll corpuscles of Hydra viridis, Spongilla, and Ciliata as also parasitic Alge, for which he has coined the name Zoochlorella. The same arguments which Brandt has used to justify this view as to animal chlorophyll would warrant the creation of a genns " Phytochlorella" for the hypothetical Alga which has hitherto been described as tlic '**chlorophyll corpuscles" of the cells of ordinary green plants.*~~

~~*Zooranthella nutricola does not, for some unknown reason, infest*~~

~~*the Acanthometridea, and it is by no means so universally present in the bodies of the Silico-skeleta as was supposed before its parasitic nature was recognized, _ The streaming of the granules of the protoplasm has heen observed in the psendopodia of Radiolaria as in those of Heliozoa and Reticularia ; it las also been seen in the deeper protoplasm ; and granules have been definitely seen to pass through the pores of the central capsule from the intracapsular to the extraeapsular pro- toplasm. A feeble vibrating movement of the pseudopodia has been occasionally noticed.*~~

~~*The production of swarm-spores has been observed only in Acanthometra and in the Polycyttaria aud Thalassicollide, and ouly in the two latter groups have any detailed observations been made. Two distinct processes of swarm-spore production have been observed by Cienkowski (48), confirmed by Hertwig (46)—dis- tinguished by the character of the resulting spores which are called crystalligerous " (Fig. XIV. 15) in the one ease, and ' di- morphous" in the other (Fig. X1V. 16). In both processes the nucleated protoplasm within the central capsule breaks up by a more or less regular cell-division into small pieces, the details of the process differing a little in the two cases. In those individuals which produce crystalligerous swarm- spores, each spore encloses a small crystal (Fig. XIV. 15). On the other hand, in those indi- viduals which produce dimorphous swarm-spores, the contents of the capsule (which in both instances are set free by its natural rupture) are seen to consist of individuals of two sizes " macro- ae and "'microspores, " neither of which contain crystals (ig. XIV. 16). The further development of the spores has not been observed in either case. Both processes have been observed ps the same species, and it is suggested*~~

~~*that there is an alternation oF sexual and asexual generations, the crystalligerous spores*~~

~~*PROTOZOA*~~

~~*| (cf. capillitium of Mycetozoa).*~~

~~*[RADIOLARIA.*~~

~~*developing directly into adults, which in their turn produce in their central capsules dimorphous swarm-spores (acrospores and microspores), which in a manner analagous to that observed in the Volvocinean Flagellata copulate (permanently fuse) with one another (the larger with the smaller) before proceeding to develop. The adults resulting from this process would, it is suggested, pro- duce in their turn crystalligerous swarm-spores. Unfortunately we liave no observations to support this hypothetical scheme of a life-history.*~~

~~*Fusion or conjugation of adult Radiolaria, whether preliminary to swarm-spore-production or independently of it, has not been observed—this affording a distinction between them and Heliozoa, and an agreement, though of a negative character, with the Reticu- laria.*~~

~~*Simple fission of the central capsule of adnlt individuals and subsequently of the whole protoplasmic mass has been observed in several instances, and is probably a general method of reproduction in the group.*~~

~~*The siliceous shells of the Radiolaria are found abundantly in certain rocks. They furnish, together with Diatoms and Sponge- spicules, the silica which has been segregated as flint in the Chalk formation. They are present in quantity (as much as 10 per cent.) in the Atlantic ooze, and in the celebrated "Barbados earth" (a Tertiary deposit) are the chief components.*~~

~~*Grave B. CORTICATA, Lankester, 1878 (64).*~~

~~*Characters. Protozoa in which the protoplasm of the cell-body, in its adult condition, is permanently ditlerentiated into two layers, an outer denser*~~

~~*cortical substance and an inner more fluid medul- lary substance (fot to be confused with the merely temporary distinction of exoplasm and endoplasm sometimes noted in Gymmnomyxa, which is not structural but due to the gravitation and self-attraction of the coarser granules often embedded in the uniformly fluid protoplasm).*~~

~~*Since the Corticata have devcloped from simple Gymnomyxa exhibiting both ameeboid and flagellate phases of form and activity, it results (1) that the forms of the body of many Corticata are traceable to modifications of these primitive forms; (2) that the young stages of the Corticata are in the lower classes of that group typical flagellule or amcebnle ; and (3) that there are certain archaic forms included in those lower classes whose position there is doubtful, and which might be with almost equal propriety assigned. to the Gymnomyxa, since they are transitional from that lower grade to the higher grade of Corticata.*~~

~~*Crass I. SPOROZOA, Leuckart (47); Syn. Gregarinida, Auct. Characters. —Corticata parasitic in almost all classes and orders of animals, imbibing nutriment from the diffusible albuminoids of*~~

~~*their hosts and therefore monthless. In typical cases there is hatched froma chlamydospore one or more modified nucleate or*~~

~~*‘ non-nucleate flagellula (falciform young, drepanidium phase).*~~

~~*The flagellula increases in size and differentiates cortical and medullary substance. Fission is common in the younger stages of growth. The movements now become neither vibratile nor ame- boid but definitely restrained, and are best described as “ “ eugle- noid” (cf. Flagellata, Fig. XX. 27, 28). The nucleus is single, large, and spherical, No contractile vacuole and rarely any vacuole is present. A size of ?yth inch may be attained in this phase, which may be definitely spoken of as the euglena phase corre- sponding to the amceba phase of Gymnomyxa. It is usually of oblong form, with sac-like contractile wall of cortical substance, but may be spherical (Coccidiidea) or even amceboid (Myxosporidia).*~~

~~*Conjugation, followed directly or after an interval by sporulation, may now ensue. The conjugated individuals (two), or sometinics a single individual,*~~

~~*become encysted. The contents of the cysts now rapidly divide (by a process the details of which are unknown) into minute ovoid nucleated (2) bodies ; sometimes a portion of the protoplasm is not converted into spores but may form sporoducts Each piece acquires a special chitin-like colourless coat, and is then a chlamydospore. Rarely one spore only is formed from the whole contents of a cyst. The spore-coat is usually thick, and remarkable for processes and other accessory developments. The included protoplasm of the chlamydo- spore frequently divides into several pieces before hatching. These usually, when set free from the spore-coat, have the form of modified nucleated flagellule, i.¢., flagellule in which the protoplasm is not drawn out into a thread-like flagellum but exhibits an elongate form, uniformly endowed with vibratile activity. With few (if any) excep- tions, the falciform young thus characterized penetrates a cell of some tissue of its host and there undergoes the first stages of its growth (hence called Cytozoa). In some forms the pre-cystic phase never escapes from its cell host. In other cases it remains connected with the hospitable cell long after it has by growth exceeded by many hundred times the bulk of its quondam entertainer; often it loses all connexion with its cell host and is carried away to some other part of the infested animal before completing its growth and eneysting,*~~

~~*SPOROZOA. |*~~

~~*The Sporozoa are divided into four sub-classes, differing from one another according to the form and development attained by the euglena phase. We shall place the most highly developed first, not only because our knowledge about it is most complete, but because it is possible that one at least: of the other sub-classes is derived by degeneration from it.*~~

~~*Sus-ciass I, Gregarinidea, Biitschli (9).*~~

~~*Characters. —Sporozoa in which the euglena phase is dominant, being relatively of large size, elongate in form, definitely shaped, having contractile but not viscid cortex, and exhibiting often active nutritional and locomotor phenomena. Though usually if not*~~

~~*invariably cell-parasites in early youth, they become free before attaining adult growth, and inhabit either the body-cavity or the Many spores are*~~

~~*produced in the encysted The spores have an oblong, sometimes caudate coat, and At present only*~~

~~*intestine of their hosts. phase. produce each one or several falciform young. known as parasites of Invertebrata.*~~

~~*st*~~

~~*Fig. X VII.—Sporozoa. . 1, 2. Monocystis agulis, Stem; x250; from the testis of the Earthworm. Two phases of movement—a ring-like contraction*~~

~~*NN)*~~

~~*passing along the body from one end to the other. 3. Individual of the sanie species which has penetrated in the young stage a sperm-cell of the Earthworm, aud is now clothed as it were with spermatoblasts. 4, Monocystis magna, A. Schmidt, from the testis of the Earthworm (Z. terres-*~~

~~*PROTOZOA*~~

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~~*tris, L.). Two individuals, which are implanted by one extremity at b in two epithelial cells of the rosette of the spermatic duct. a, uuclens of the Monocystis. 5. Tailed chlamydospores of Monocystis senuridis, Koll. 6. Two M. agilis encysted, spores forming on the surface of the*~~

~~*protoplasm. 7. A similar cyst further advanced in spore-formation (see Fig. XVITIT.). 8. Spore of af. agilis, now elongated but still naked. a,nucleus. x 1400. 9. The spore has now encased itselfin a navicula-*~~

~~*shaped coat. a, nucleus. 10. The spore protoplasm has now divided into several falciform swarm-spores, leaving a portion of the protoplasm unused. 06, Schneider's residual core. 11. Optical transverse section of a completed spore. b, Schneider's residual core. 12. Chlamydospor*~~

~~*of Klossia chitonis, nov. sp., from the liver of Chiton (original.) 13, 14. Chlamydospore of Monocystis nemertis, Koll., liberating falciform young. 0b, Schneider's residue. 15. Monocystis pellucida, Koll. (from Nereis) ; x*~~

~~150; to show the very thick cortical substance and its fibrilla- tion (after Lankester, 54). 16. Monocystis senuridis, K6ll., two indivi- duals adhering to one another (asyzygium). For spores see 5. 17. Mono- cystis aphrodite, Lankester (55); x 60; remarkable among Monocystids for its long proboscis resembling the epimerite of some Septata. 18. Klossia helicina, Aim. Schn., from the kidney of Helix hortensis. A single cell of the renal epithelium in which a full-grown Klossia is embedded. a, nucleus of the Klossia; a', nucleus of the renal cell. 19. Cyst of Klossia helicina, the contents broken up into spherical chlamydo- spores. 20. Single spore from the last, showing falciform young and a Schneider's residue b. 21. The contents of the same spore. 22, A small renal cell of Helix containing two of the youngest stage of Klossia. a Monocystis sagittata, Leuck., from the intestine of Capitella capitata ; x 100. 24 to 31. Coccidium oviforme, Leuck., from the liver of the Rabbit: —24, adult individual encysted; 25, the protoplasm contracted—a, nucleus ; 26, 27, division into four spores, as yet naked; 28, 29, the spores haveacquired a covering, 7.¢., are chlamydospores, and each contains a single falciform young; 30, 31, two views of a chlamydospore more highly magni- fied so as to show the single falciform young (from Leuckart). 32. Klossia octopiana, Aim. Schn., fron Cephalopoda. a, nucleus; b, cyst-membrane. Xx 200 diam. 33. Single spherical spore of the same; x 1400 diam; showing numerous falciform young, and }, Schneider's residue. 34. Myzidium Lieberkiihnii, Biitschli, one of the Myxosporidia, from the bladder of the Pike (Esox); creeping euglena phase, showing strongly lobed amoeboid character (pseudopodia and undifferentiated (?) cortex); x 60 diam. 35-39. Eimcria falciformis, Eimer sp., from the Mouse :— 35, an adult non-encysted individual inhabiting an epithelial cell of the intestine of the mouse; 36, encysted phase; 37, clear corpuscles appear in the encysted protoplasm; 38, the protoplasm now forms a single spore containing several falciform young; 6, Schneider's residue; 39, isolated spore showing falciform young, and 0, Schneider's residue. 40. Chlamydospore of Myzobolus Miilleri, Biitschli, one of the Myxo- sporidia from the gills of Cyprinoid Fishes. a, nucleus; b, refringent corpuscle; ¢, polar body or thread-capsule. 41. A similar chlamydo- spore which has ejected the filaments from its thread capsules. 42. Chlamydospore of a Myxosporidium infesting the kidney of Lota vulgaris. ¢, polar body (psorosperm of authors). 43, 44. Chlamydospores of a Myxosporidium from the gills of Perca (psorosperm of authors). Compare with the tailed chlamydospore of~~

~~*Monocystis senuridis, 5. 45 =47, Drepanidium ranarum, Lankester, the falciform young of an unascertained Coccidiide infesting the Frog (supposed by Gaule to be pro- duced by the blood corpuscles) :—45, specimen stained by iodine; 46, red- blood corpuscle of Frog, showing b, two contained Drepanidia, and a, the nucleus of the blood corpuscle ; 47, living Drepanidium. 48. Chlamy- dospore of Lieberkiihn's Voccidium of the Frog's kidney, perhaps belong- ing to the life-cycle of Drepanidium ranarum. The spore contains two falciform young (Drepanidia?) and a Schneider's residue. 49. Chlamydospore of Monocystis thalassemv, Lankester, containing nume- rous falciform young. 50, 51. Sarcocystis Miescheri, Lankester :—50, falciform young escaped from chlamydospores ; 51, adult euglena phase inhabiting a striated muscle fibre of the Pig.*~~

~~*Oxnper 1. HAPLOCYTA, Lankester.*~~

~~*Characters.—Gregarinidea in which there is never at any time a prtition of the medullary substance into two or more chambers. The euglenoid is always a single contractile sac with one mass of medullary substance in which floats the large vesicular transparent nucleus. Spores larger than in the next group, each producing several falciform young.*~~

~~*Genus unicum.—Monocystis, Stein, 1848. The various generic subdivisions proposed by Aim. Schneider (48), and accepted by Biitschh, appear to the present writer to have insufficient characters, and serve to complicate rather than to organize our knowledge of the subject. We do not yet know enough of the sporulation and subsequent development of the various monocystic Gregarinides to justify the erection of distimet genera.*~~

~~*Monocystis agilis, Stein, Fig. XVII. 1, 2, 3, 6, 7, 8, 9, 10, 11, and Fig. XVIII. is the type. The other species of Monocystis oveur chiefly (and very commonly) in marine Annelids, Platyhel- minthes, Gephyrea, and Tunicata; not in Arthropoda, Mollusca, nor Vertebrata. The only definite differences which they present of possibly more than specific worth, as compared with M. agilis, are in the form of the chlamydospores, which are sometimes tailed, as in M. senuridis (Fig. XVII. 5), and in Af. nemertis (Fig. XVII. 13) and M. sipunculi, and further also certain differences in the*~~

~~*eneral form, as for instance the anchor-like M. sagittata (Fig. XVII. 23), and the proboscidiferous If. aphroditz (Fig. XVII. 17). The fine parallel striation of the cuticule in some species (Jf, serpul#, &c.) might also be made the basis of a generic or sub- generic group.*~~

~~*On the whole it seems best to leave all the species for the present in the one genus Monocystis, pending further knowledge. It seems probable that more than one species (at least two, Mf. agilis and Jf. magna) infest the common Earthworm.*~~

~~*Orver 2. SEPTATA, Lankester.*~~

~~*Characters. —Gregarinidea in which in the adult the medullary substance is separated into two chambers—a smaller anterior (the*~~

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~~*protomerite) and a larger posterior (the deutomerite), in which lies the nucleus. 'There is frequently if not always present, either in early growth or more persistently, an anterior proboseis-like appen- dage (the epimerite) growing from the protomerite. The epimerite serves to attach the parasite to its host, and may for that purpose earry hooklets. It is always shed sooner or later. The phase in which it is present is called a " eephalont," the phase after it has broken off a "sporont" (see Fig. XIX. 22, 23). The spores are smaller than in the preceding group, often very minute, and some- times the eyst is complicated by the formation of sporoduets, and by a kind of "capillitium " of residual protoplasm (Fig. XIX. 2). Spores produeing each only a single (?) faleiform young.*~~

~~*Genera. —Gregarina, Dufour ; Hoplorhynchus, Von Carus.*~~

~~*[The numerous genera which have been proposed at different times by Hammersehmidt and others, and more recently by Aime Sehneider, appear to the present writer to be unservieeable, owing to the fact that our knowledge is as yet very incomplete. XIX. 2).*~~

~~*Another possible basis for generic division of the Septata may be found in the characters of the epimerite. This may be present or absent altogether. It*~~

~~may exist only in the young condition or persist until growth is completed. It may be simple, short, elongate, or provided with hooklets. The presence of hooklets on the epimerite is the only character which at present seems to serve conveniently for generic distinction. With regard to the other points mentioned we are not sufficiently informed, since we know the complete history of development from the young form set free from the spore in only one or two cases.]~~

~~The Septata are found exclusively in the alimentary canals of Arthropoda (Insects, Myriapods, Crustacea, not Arachnida). See Fig. XIX. for various examples of the group. ;~~

~~Fic. XVITI.—Cyst of Monocysti ili i ; | cystis agilis, the common Gregarini Earthworm ; X 750 diam. ; showing ripe chlamydospores vit toniles~~

~~absence of a] (aic. any residual protoplasm or other material in the cyst~~

~~Sus-cuass I]. Coccidiidea, Biitsehli (9).~~

~~Sporozoa in which the euglena phase remains of relati ae size, of spherical shape and tape egg-cell-like cee ¥ . not locomotive, but continues, until the cyst is formed to im abit a single cell of the host. Many, few, or one single chlamy- cee, are formed in the cyst. One or more falciform youn Tike Pe caeli spore, and exhibit active movements (flagellula- iike) leading to a penetration of a tissue-cell by the young form as in Gregarinidea. Many are parasites of Vertebrata. =~~

~~OxpER 1. MONOSPOREA, Aim. Schn.~~

~~Characters. — ers clers.—The whole content of the cyst forms but a single Genus unicum.—Fimeria (in the intestinal epithelium of Triton,~~

~~Frog, Sparr M ie irae : ‘ Fig XVI poy _ and the Myriapods Lithobius and Glomeris,~~

~~PROTOZOA~~

~~[SPOROZOA.~~

~~*Be*~~

~~*tas*~~

~~*se Ss Se*~~

~~*Fig. XIX.—Sporozoa (Septata). 1. Gregarina blattarwm, Siebold, from the intestine of Blatta orientalis; x 80. Asyzyginm of two individuals. Each animal consists of a small anterior chamber, the protomerite, and a large posterior chamber, the deutomerite, in which is the nucleus a. 2; Over-ripe cyst of Gregarina dlattarum, with thick gelatinous envelope e, and projecting sporoducts d. The spores have been nearly all discharged, but amass of them still lies in the centre of the cyst b. Thespecimen has been treated with dilute KHO, and the granular contents of the cyst dissolved. Around the central mass of spores is rendered visible the net- work of protoplasmic origin in which the ejected spores were embedded. This distinctly resembles in origin and function the capillitium of Mycetozoa (Fig. III.). a, the plasmatic channels leading to the everted sporoducts; b, the still remaining spores; ¢, the proper cyst-wall ; d, the everted sporoducts; ¢, the gelatinous envelope. 3. Aripe spore (chlamydo spore) of Gregarina blattarum, a long time after its escape from the cyst; x 1600 diam. 4, Commencing encystment of a syzy- gium of G. blattarum. a, protomerite of one individual ; b, gelatinous envelope ; ¢, protomerite of the second individual. 5. Three epithelial cells of the mid-gut of Blatta orientalis, into the end of each of which an extremely young Gregarina blattarwm has made its way. 6. Further development of the young Gregarina; only the epimerite a is now buried in the substance of the epithelial cell, and this will soon break off and set the Gregarina free. It is now a "'cephalont" ; it will then become a " sporont." 7. Basal part of an everted sporodnct of Gregarina blattarum. a, granu- lar-fibrous mass investing the base of the duct; b, commencement of the plasmatic channel in the interior of which the sporoduct was produced as an invaginated cuticular formation before its eversion. 8. Gregarina giyantea, E. Van Ben., from the intestine of the Lobster; x 150. a, nucleus.~~

~~*ee*~~

~~*SPOROZOA.*~~ |

~~*9. Anterior end of the same more highly magnified. a, protomerite ; 6, layer of circular fibrille lying below the cuticle ; ¢, cortical substance of the deutomerite; d, medullary substance of the deutomerite. 10. Two spores of Gregarina gigantea (after Butschli), showing the very thick coat of the spore. 11-15. Stages in the development of Gregarina gigantea :—11, recently escaped from the spore-coat, no nucleus; 12, still no nucleus, one vibratile and one motionless process; 138, the two processes have divided; one here drawn has developed a nucleus; 14, further growth ; 15, the deutomerite commences to develop. 16. Cysts of Gregarina gigantea, from the rectum of the Lobster. The donble contents are believed by Ed. Van Beneden to be due not to conjugation previous to encystment but to subsequent fission. 17,18. Gregarina longicollis, Stein, from the intestine of Blaps mortisaga :—17, cephalont phase, with a long proboscis-like epimerite a, attached to the protomerite 0}; 18, sporont phase, the epimerite having been cast preliminarily to syzygy and encystment. 19. Gregarina Maniert, Aim. Schneider, from the intestine of Timarcha knebricosa, to show the network of anastomosing fibres beneath the cuticle, similar to the annular fibrille of G. gigantea shown in 9. 20. Gregarina (Hoplorhynchus) obligacanthus, Stein, from the intestine of the larva of Agrion. Cephalont with spine-crowned epimerite a. 21. Spores of Gregarina oligacanthus. 22, 23. Grega- rina (Hoplorhynchus) Dujardini, Aim. Schneider, from the intestine of Lithobius forficatus :—22, specimen with epimerite a, therefore a “ cepha- lont”; 23, specimen losing its epimerite by rupture and becoming a*~~

~~*“*sporont.” OrpER 2. OLIGOSPOREA, Aim. Schn.~~

~~*Characters.——The cyst-content develops itself into a definite and constant but small number of spores.*~~

~~*Genus unicum.—Coccidiwm, Leuck. (in intestinal epithelium and liver of Mammals, and some Invertebrates, Figs. XVI. 24 to 31).*~~

~~*OrpER 3. POLYSPOREA.*~~

~~*Characters.—The cyst-content develops itself into a great num- ber of spores (sixty or more).*~~

~~*Genus unicum.—K/ossia, Aim. Schn. Three species of Klossia are found in Mollusca—viz., in Helix, in Cephalopods, and in Chiton. Schneider's genus, Adelea, from Lithobius, appears to belong here. Kloss (49) discovered the parasite of the renal cells of Helix hortensis represented in Fig. XVII. 18, 19, 20, 21, and 22; Schneider that of Cephalopods, Fig. XVII. 32, 33. In Chiton Dr Tovey has discovered a third species with very remarkable spores, which are here figured for the first time (Fig. XVII. 12).*~~

~~*The Drepanidium Ranarum (Fig. XVII. 45, 46, 47), discovered by Lankester (50) in the Frog's blood, is probably the falciform young of a Coccidium parasitic in the Frog's kidney, and discovered there by Lieberktihn (51). A spore of this Coccidium is shown in Fig. XVII. 48; whilst in 46 two Drepanidia which have penetrated a red-blood corpuscle of the Frog are represented.*~~

~~*The Polysporous Coccidiidea come very close to the Gregarinide genus Monocystis, from which they may be considered as being derived by an arrest of development. The spores and falciform young of the Coccidiidea are closely similar to those of Monocystis, and the young in both cases penetrate the tissue-cells of their host ; but in Monocystis this is only a temporary condition, and growth leads to the cessation of such "'cell-parasitism." On the other hand, growth is arrested in the Coccidiidea, and the organism is permanently a cell-parasite.*~~

~~*Since the parasitism is more developed in the case of a cell-para- site than in the case of a parasite which wanders in the body cavity, it seems probable that the Coccidiidea have been derived from the Gregarinidea rather than that the reverse process has taken place.*~~

~~*Sup-ciass III. Myxosporidia, Biitschli.*~~

~~*Characters.—Sporozoa in which the euglena-phase is a large multinucleate amceba-like organism (Fig. XVII. 34). The cysts are imperfectly known, but appear to be simple; some attain a diameter of two lines. The spores are highly characteristic, having each a thick coat which is usually provided with a bifurcate process or may have thread capsules (like nematocysts) in its substance (Fig. XVII. 40, 41, 42, 43, 44).*~~

~~*The spores contain a single nucleus, and are not known to produce falciform young, but in one case have been seen to liberate an ameebula. The further development is unknown. The Myxo- sporidia are parasitic beneath the epidermis of the gills and fins, and in the gall-bladder and urinary bladder of Fishes, both freshwater and marine. .*~~

~~*Genera.—Myzxidiwm, Biitschli (Pike, Fig. XVII. 34); Myzobolus, Biitschli (Cyprinoids) ; Lithocystis, Giard (the Lamellibranch Echino- cardium).*~~

~~*The Myxosporidia are very imperfectly known. They present very close affinities to the Mycetozoa, and are to be regarded as a connecting link between the lower Gymnomyxa and the typical Sporozoa. Possibly their large multinucleate amceba phase is a plasmodium formed by fusion of amcebule set free from spores, though it is possible that the many nuelei are the result of a division of an original single nucleus, preparatory to sporulation.*~~

~~*Their spores are more elaborate in structure than those of any other Protozoa, and are more nearly paralleled by those of some species of Monocystis than by those of Mycetozoa. The thread- capsules of the spores are identical in structure with those of Hydrozoa, and probably serve as organs of attachment, as do the furcate processes of the spore-case. It is not certain that a definite*~~

~~*cyst is always or ever formed, but as occurs rarely in some Gregari- nidea, the spores may be formed in a non encysted ameba form. Although pseudopodia, sometimes short and thread-like, have been observed in the ameeba phase, yet it is also stated that a distinction of cortical and medullary substance obtains. The " psorosperms" of J. Miiller arc the spores of Myxosporidia.*~~

~~*Sus-ciass IV. Sarcocystidia, Biitschli.*~~

~~(This division is formed by Biitschli for the reception of Sarco- cystis, parasitic in the muscular fibres of Mammals, and of Ameebi- dium, parasitic in Crustacea. Both are very insufficiently known, but have the form of tubular protoplasmic bodies in which numcer- ous ovoid spores are formed from which falciform young escape.)~~

~~Genera.—Sarcocystis, Lankester ; Amebidiwm, Cienkowski (52). Sarcocystis (Fig. X VIL. 50,51, S. Mieseheri, Lank.), was first observed by Miescher in the striated muscle-fibres of the Mouse ; then by Rainey in a similar position in the Pig, and taken by him for the youngest stage in the development of the cysts of Tania soliwm ; subsequently studied by Beale and others in connexion with the cattle-plague epidemic, and erroneously supposed to have a causal connexion with that disease. It is common in healthy butcher's meat. See Leuckart (47).~~

~~Further remarks on the Sporozoa.—The Sporozoa contrast strongly with the large classes of Gymnomyxa, the Heliozoa, Reticularia, and Radiolaria, as also with the Ciliate and Tentaculi- ferous Corticata, by their abundant and rapidly recurrent forma- tion of spores, and agree in this respect with some Proteomyxa, with Mycetozoa, and some Flagellata. Their spores are remark- able for the firm, chitin-like spore-coat and its varied shapes, contrasting with the cellulose spherical spore-coat of Mycetozoa and with the naked spores of Radiolaria and Flagellata.~~

~~The protoplasm of the more highly developed forms (Gregarini- dea) in the euglenoid phase exhibits considerable differentiation. Externally a distinct cuticle may be present, marked by parallel ruge (AMonocystis serpulx) or by fine tubercles (Aonoeystis sipun- euli). A circlet of hooks may be formed by the cuticle at one end of the body. Below the cuticle is sometimes developed a layer of fibrils running transversely to the long axis of the body (Fig. AIX. 9 and 19), which have been regarded as contractile, but are probably cuticular. The cortical layer of protoplasm below these cuticular structures is dense and refringent and sometimes fibril- lated (Monocystis pellucida, Fig. XVII. 15). It is the contractile substance of the organism, and encloses the finely granular more liquid medullary substance. The granules of the latter have been shown by Riitschli (9) to give a starch-like reaction with iodine, &c. Probably the protoplasm in which they lie is finely~~

~~*reticulate or vacuolar, and when the granules are few it is actually seen to be so. No contractile vacuole is ever present. In Myxosporidia the medullary protoplasm is coloured yellow by hematoidin derived from the blood of its host or by absorbed bile-pigment, and also contains small crystals.*~~

~~*The nucleus of the Gregarinidea is a large clear capsule, with a few or no nucleolar granules. It has never been seen in a state of division, and it is not known what becomes of it during sporula- tion, though sporulating Gregarinidea have been observed with many minute nuclei scattered in their protoplasm, presumably formed by a breaking up of the single nucleus.*~~

~~*The habit of attaching themselves in pairs which is common in Gregarinidea is perhaps a reminiscence of a more extensive forma- tion of aggregation plasmodia (compare Mycetozoa). The term '**syzygium"' is applied to such a conjunction of two Gregarinidea ; it is not accompanied by. fusion of substance. The formation of cysts is not connected with. this pairing, since the latter occurs in young individuals long before encystment. Also cysts are formed by single Gregarinidea, as is always the case in the non-motile Coccidiidea.*~~

~~*The encystment always leads to the formation of spores, but in rare cases sporulation has been observed in unencysted Gregarini- dea, and it occurs perhaps normally without true cyst-formation in the Myxosporidia.*~~

~~*The cell-parasitism of the young Sporozoa, and their flagellula- like (falciform) young and active vibratile movement, are points indicating affinity with the lower Gymnomyxa, and especially with those Proteomyxa, such as Vampyrella and Plasmodiophora, which are cell-parasites. Indeed it is probable that we have in this fact of cell-parasitism, and especially of parasitism in animal cells, a basis for the theoretical association of several unicellular organisms. The Haplococcus of Zopf (regarded by him as a Mycetozoon) is parasitic in the muscular cells of the Pig, and is probably related to Sarcocystis. Recently Von Lendenfeld (53) has described in Australia an amœba-like organism as parasitic in the skin of Sheep, which will probably be found to be either a Sporozoon or referable to those parasitic spore-producing Proteomyxa which are separated from Sporozoa*~~

~~only by their negative characters (see previous remarks on the negative characters of Proteomyxa).~~

~~The application of the name "Gregarines" has sometimes been~~

~~nothing in common with the Sporozoa. This was the case in regard to a fungoid growth in human hair—the so-called ni — Gregarine." The Silk-worm disease known as " pebrine" las also been attributed to a Gregarine. Itseems probable that the parasitic organism which eauses that disease is (as 1s also the distinct parasite causing the disease known as " flaecidezza" in the same animals) one of the Schizomyeetes (Bacteria). No disease is known at present as 'due to Sporozoa, although (eg., the Klossia chitonis) they may lead to atrophy of the organs of the animals which pe! infest, in consequenee of their enormous numbers. Coccidia an~~

~~Sarcoeystis are stated to oeeur in Man.~~

~~Ciass I. FLAGELLATA,! Ehrenberg.~~

~~Characters. —Corticata in which the dominant phase in the life- history is a eorticate flagellula, that is, a nueleated cell-body pro- vided with one or a few large processes of vibratile protoplasin. Very eommonly solid food particles are ingested through a distinct cell-mouth or aperture in the cortical protoplasm, thongh in some an imbibition of nutritive matter by the whole surface and a nutri- tional process ehemically resembling that of plants (holophytic), ehlorophyll being present, seems to oceur. ;~~

~~Conjugation followed by a breaking up into very numerous minute naked spores is frequent in some; as also a division into small individuals (mierogonidia), which is followed by their conjugation with one another or with big individuals (macrogonidia) and subse- quent normal growth and binary fission. ;~~

~~Many have a well-developed cuticle, which may form collar-like outgrowths or stalk-like processes. Many produce either gelatinous or ehitin-like shells (eups or ceenceeia), which are connected so as to form spherical or~~

~~*arborescent colonies ; in these colonies the proto- plasmic organisms themselves produce new individuals by fission, which separate entirely from one another but are held together by the continuity, with those already existing, of the new shells or jelly-houses or stalk-like supports produced by the new individuals. 'A single well-marked spherieal nucleus, and one or more contractile vacuoles, are always present in the full-grown form.*~~

~~*Often, besides ingested food-particles, the protoplasm contains starch granules (amylon nucleus), paramylum corpuscles, chromato- phors and ehlorophyll corpuseles, some of which may be so abundant as to obscure the nucleus. One or two pigment spots (stigmata or so-called eye-spots) are often present at the anterior end of the body.*~~

~~*Sus-exiass I. Lissoflagellata, Lankester.*~~

~~*Never provided with a collar-like outgrowth around the oral pole.*~~

~~*Orper 1. MONADIDEA, Biitschli.*~~

~~*Characters.— Lissoflagellata of small or very small size and simple structure; often naked and more or less amceboid, sometimes forming tests. Usually colourless, seldom with ehromatophors. With a single anterior large flagellum or sometimes with two additional paraflagella. A special month-area is often wanting, sometimes is present, but is never produced into a well-developed pharynx.*~~

~~*Fam. 1. Ruromasriciva, Butsehli. Simple mouthless forms with 1 to 2 flagella; either permanently exhibiting a Gymnomyxa- like development of pseudopodia or eapable of passing suddenly from a firm-walled into a Gymnomyxa-like condition, when the flagella may remain or be drawn in. Ingestion of food by aid of the pseudopodia.*~~

~~*Genera.—Mastigameba, F. E. Sehultze; Ciliophrys, Cienkowski (65); Dimorpha, Gruber; Actinomonas, Kent; Trypanosoma, Gruby (parasitic in the blood of Frogs and other Amphibia and Reptiles. Fig. XX. 21, 22). The Rhizomastigina might all be assigned to the Proteomyxa, with which they closely connect the group of Flagellata. The choice of the position to be assigned to such a form as Ciliophrys must be arbitrary.*~~

~~*Fam. 2, CERCOMONADINA, Kent. Minute oblong cell-body which posteriorly may exhibit amceboid changes. One large anterior flagellum. Mouth at the base of this organ. Reproduc- tion by longitudinal fission and by multiple fission producing spores in the eneysted resting state. j*~~

~~*_ Genera. —Cercomonas, Duj. (Fig. XX. 82, 33); Herpetomonas, S. Kent ; Oikomonas, Kent (=Monas, James Clark ; Pseudospora Cienkowski, Fig. XX. 29, 80, 81); Ancyromonas, 8. K.*~~

~~*Fam. By CopoNGcINA, Kent. Small colourless monads similar to Oikomonas in structure, which secrete a fixed gelatinous or membranous envelope or cup.*~~

~~*——— pee 24 Sse Clark; Platytheca, Stein.*~~

~~*. 4. Brkaerna, Stein. Distinguished fro ily by the fact that the monad is fixed in its pg na thread-like stalk ; eup usually raised on a delicate stalk.*~~

~~*Genera. —Bicoseca, J. Cl. ; Poteriodendron, Stein.*~~

~~*1 Butschili's work*~~

~~*groups of Flag (9) has been pretty closely followed in the diagnosis of the*~~

~~*ellata and the cnumeration of genera here given.*~~

~~*PROTOZOA*~~

~~*made erroneously to external parasitic organisms, which have*~~

~~*[FLAGELLATA.*~~

~~*Fic. XX.—Flagellata. 1. Chlamydomonas pulvisculus, Ehr. (=Zygoselmis, From.); one of the Phytomastigoda; free-swimming individual. a, nucleus; b, contractile vacuole; ¢, starch corpuscle; 4, cellulose investment; e, stigma (eye-spot). 2. Resting stage of the same, with fourfold division of the cell-contents. Letters as before. 3. Breaking up of the cell-contents into minute biflagellate swarm-spores, which escape, and whose history is not further known. 4. Synerypta volvox, Thr. ; one of the Phytomastigoda. A*~~

colony enclosed by a common gelatinous test c. a, stigma; 6b, vacuole (non-contractile). 5. Uroglena volvoz, Ehr.; one of the Monadidea. Half of a large colony, the flagellates embedded in a common jelly. 6. Chlorogonium euchlorum, Ehr. ; one of the Phytomastigoda. a, nucleus; 6, contractile vacuole; ¢, starch grain; d@, eye-spot. 7. Chlorogonium euchlorum, Ehr., one of the Phytomastigoda. Copulation of two liberated microgonidia. a, nucleus; b, contractile vacuole; d, eye-spot (so-called). 8. Colony of Dinobryon sertularia, Ehr. ; x 200; one of the Monadidea. 9. Hxemato-coccus palustris, Girod (= Chlamydococcus, Braun, Protococcus Cohn), one of the Phytomastigoda; ordinary individual with widely separated test. a, nucleus; b, contractile vacuole; c, amylon nucleus (pyrenoid). 10. Dividing resting stage of the same, with eight fission products in the common test e | 11. A microgonidium of the same. 12. Phalansterium consociatum, Cienk., one of the Choanoflagellata ; x 325. Disk-like colony. 13. Euglena viridis, Bhr.; x 300; one of the Euglenoidea. a, pigment spot (stigma); }, clear space ; ¢, paramyluml granules ; d, chromacophor (endochrome plate). 14. Gonium pectorale, O. F. Miiller; one of the Phytomastigoda. Colony seen from the flat side. x 300. a, nucleus; 6, contractile vacuole; ¢, amylon nucleus. 15. Dinobryon sertularia, Ehr.; one of the Monadidea. a, nucleus; 0, con-

FLAGELLATA. |

tractile vacuole: c, amylon-nucleus ; d, free colourless flagellates, probably not belonging to Dinobryon; e, stigma (eye-spot); Jf, chromatophors.

16. Peranema trichophorum, Ehr., (one of the Euglenoidea), creeping |

individual seen from the back; x 140. a, nucleus; 6, contractile vacuoles; c, pharynx ; d, month. Ehr., in profile. (eye-spot); ¢, paramylumi-body ; /, chlorophyll corpuscles. 18. Part of the surface of a colony of Volvox globator, L. (Phytomastigoda), showing the intercellnlar connective fibrils. a, nucleus; 6, contractile vacuole; c, amylum granule. 19. Two microgonidia of Volvox globator, L. a, nucleus; 06, contractile vacuole. 20. Ripe asexually produced daughter-individual of Volvox minor, Stein, still enclosed in the cyst of the partheno-gonidium. a, young partheno-gonidia. al Le OP, Trypanosoma sanguinis, Gruby; one of the Rhizomastigina, from the blood of Rana esculenta. a, nucleus. — x 500. 23-26. Repro- duction of

~~*Bodo caudatus, Duj. (one of the Heteromastigoda), after Dallin- ger and Drysdale :—23, fusion of several individuals (plasmodium); 24, encysted fusion-product dividing into four; 25, later into eight; 26, cyst filled with swarm-spores. 27. Astasia tenax, 0. F. Mill. (Proteus) ; one of the Euglenoidea; x 440. Individual with the two flagella, and strongly contracting hinder region of the body. a, nucleus ; 8, contractile vacuole, close to the pharynx. 98. The same devoid of flagella. a, nucleus; ¢, ¢, the two dark pigment spots (so-called eyes) near the mouth. ag). Oikomonas termo (Monas t-rmo) Ehr.; one of the Monadidea. a, nucleus; b, contractile vacuole ; ¢, food-ingesting vacuole ; d, food-particle. x 440. 30. The food-particle d has now been ingested by the vacnole. Sa Oikomonas mutabilis, Kent (Monadidea), with adherent stalk. a, nucleus; b, contractile vacuole ; ¢, food-particle in food vacuole. 82, 33. Cerco- monas crassicauda, Duj. (Monadidea), showing two conditions of the pseudopodium-protruding tail. a, nucleus ; b, contractile vacuoles ; c¢, mouth.*~~

~~*Fam. 5. Hererernonapina, Biitschli. Small colourless or green monads which possess, besides one chief flagellum, one or two smaller paraflagella attached near it, often forming colonies secreting a common stalk.*~~

~~*Genera.—Monas (Ehr.), Stein ; Dendromonas, Stein : Cephalo- thamnium, Stein ; Anthophysa, Bory d. Vine. (Fig. XXI. 12, 13); Dinobryon, Ehr. (Fig. XX. 8 and 15); Epipyzxis, Khr. ; Uroglena, Ehr. (Fig. XX. 5).*~~

~~*OrpER 2. EUGLENOIDEA, Biitschli.*~~

~~*Characters.—Generally somewhat large and highly developed monoflagellate forms, of monaxonic or slightly asymmetrical build. Cuticle present ; cortical substance firm, contractile, and elastic: some forms quite stiff, others capable of definite annular contraction and worm-like elongation. At the base of the flagellum a small or large mouth leading into a more or less distinct pharyngeal tube. Near this is always the contractile vacuole. Rarely a pair of flagella instead of one.*~~

~~*Fam. 1, Canomonapina. Colonred Euglenoidea, with numer-*~~

~~*ous small chlorophyll corpuscles or 1 to 2 large plate-like green or*~~

~~*brown chromatophors. Mouth and pharynx inconspicuous ; nutri- tion probably largely vegetal (holophytic).*~~

~~*Genera.—-Celomonas, Stein ; Gonyostomum, Dies. ; Vacuolaria, Cienk.; Aficroglena, Ehr. ; Chromalina, Cienk.; Cryptogicua, Ehr. Fam. 2. EugLenina, Stein. Body monaxonic, elongated, hinder end pointed. Spirally striated cuticle. A fine mouth-aperture leads into the well-developed tubular pharynx. Flagellum usually single, sometimes paired, often cast off. Near the pharynx is the '¢reservoir" of the contractile vacuoles and several of the latter. A single (sometimes two) stigma or colour-speck near the same spot. Chromatophors nearly always present, generally bright green. A large nucleus in the middle of the body. Multiplication by longitudinal fission. Encysted condition and atteudant fission imperfectly studied. Copulation doubtful.*~~

~~*Genera.—(a) With flexible cuticle :—Zuglena, Ehr. (Fig. XX. 18, 17; this is probably Priestley's "' green inatter," from which he obtained oxygen gas; though one of the very commonest of all Protozoa, its life-history has yet to be worked out); Colaciwm, Ehr.; Hutreptia, Perty.*~~

~~*(b) With stiff, shell-like cuticle :—Ascoglena, Stein ; Trachelo- monas, Ehr.; Lepocinelis, Perty; Phacus, Nitzsch.*~~

~~*Fam. 3. Mesorrna, Biitschli. Similar to the Euglenina, but devoid of chlorophyll, a deficiency connected with the saprophytic mode of life. Stigma always absent.*~~

~~*Genera.—(a) With flexible cuticle :—Astasiopsis, Biitschli ; Asta- siodes, Biitschli.*~~

~~*(b) With stiff cuticle and non-cgntractile body :—Monoidium, Perty ; Atractonema, Stein ; Rhabdomonas, Fresenius.*~~

~~*Fam. 4. Peranemina. Very contractile (metabolic) colourless Euglenoids. Mouth and pharynx large ; inception of solid nutri- ment certainly observed.*~~

~~*Genera.—Peranema, Duj. (Fig. XX. 16); Urceolus, Meresch.*~~

~~*Fam. 5. Peratomonapina. Colourless, non-metabolic forms. Mouth opening at the base of the single large flagellum.*~~

~~*Genera.—Petalomonas, Stein.*~~

~~*Fam. 6. ASTASINA. Colourless, metabolic, or stiff Euglenoids, differing from the rest in having a. sinall or large paraflagellum in addition to the chief one. Nutrition partly saprophytic partly animal.*~~

~~*Genera.—Astasia, Ehr. emend. Stein (Fig. XX. 27, 28); £Hetcro- noma, Duj.; Zygosclmis, Duj. ; Sphenomonas, Stein; Tropido- seynhus, Stein.*~~

~~*17. Anterior end of Euglena acus, |*~~

~~*a, mouth ; b, contractile vacuoles ; ¢, pharynx ; d, stigma | : | ; 5 A ; é roe ‘ function; the larger is directed backwards and trailcd, without*~~

~~*FPROADRAO s*~~

~~*857*~~

~~*Orver 3, HETEROMASTIGODA, Biitschli.*~~

~~*Characters. Small and large monads. Naked and even ameeboid or with stiff cuticle. Two flagella at the anterior end differing in size: the smaller directed forwards subserves the usual locomotor*~~

~~*movement. Sometimes two backwardly directed flagella are present. Always a mouth and animal nutrition. Always colourless.*~~

~~*Fain. 1. Bopontna, Btitschli. Size of the two flagella not very different.*~~

~~*Genera.—Bodo, Ehb. emend. Stein (Fig. XX. 23 to 26, and Fig. XXI. 10; the hooked monad and the springing monad of Dal- linger and Drysdale (66); Hetcromita of Dujardin and Kent); Phyllomitus, Stein ; Colponema, Stein; Dallingeria, Kent; Zri- mastix, Kent.*~~

~~*Fam. 2. ANISONEMINA, Kent. ence of the two flagella considerable. nutrition.*~~

~~*Genera.—Anisonema, Duj. ; Entostphon, Stein.*~~

~~*Large forms with cuticle ; differ- Mouth, pharynx, and animal*~~

~~*OrpER 4. ISOMASTIGODA, Biitschli.*~~

~~*Characters. —Small and middle-sized forms of monaxonic rarely bilateral shape. Fore-end with 2, 4, or seldom 5 equal-sized and similar flagella. Some are coloured, some colourless ; naked or with strong cuticle or secreting an envelope. Mouth and pharynx seldom observed ; nutrition generally holophytic (7.e., like a green plant), but in some cases, nevertheless, holozoic (2.¢., like a typical*~~

~~*animal). Fam. 1. AMPHIMONADINA. Small, colourless, biflagellate Iso-mastigoda.*~~

~~*Genera. —Amphimouas, Duj. (? Pseudospora, Cienk.).*~~

~~*Fam. 2, SPONGOMONADINA, Stein. Small colourless oval forms with two closely contiguous flagella. Chief character in the union of numerous individuals in a common jelly or in branched gelatinous tubes, the end of each of which is inhabited bya single and distinct individual.*~~

~~*Genera.—Spongomonas, Stein; Cladomonas, Stein; Rhipido- monas, Stein.*~~

~~*[Group Phytomastigoda, Biitschli. The following three families, viz., Chrysomonadina, Chlamydomonadina, and Volvocina, are so closely related to one another as to warrant their union as a sub- order. They are typical Isomastigoda, but have chlorophyll corpuscles and holophytic nutrition with correlated deficient mouth and pharynx. They are usually regarded by botanists as belonging to the unicellular Algz.]*~~

~~*Fam. 3. CHRYSOMONADINA, Bitschli. Single or colony-forming ; seldom an envelope. Spherical free-swimming colonies may be formed by grouping of numerous individuals around a centre. With two or rarely one brown or greenish brown chromatophor; a stigma (eye-speck) at the base of the flagella.*~~

~~*Genera.—Stylochrysalis, Stein; Chrysopyxis, Stem; Nephroscl- mis, Stein; Synura, Ehr. ; Syacrypta, Ehr. (Fig. XX. 4).*~~

~~*Fam. 4. CHLAMYDOMONADINA. Fore-end of the body with two or four (seldom five) flagella. Almost always green in consequence of the presence of a very large single chromatophor. Generally a delicate shell-like envelope of membranous consistence. 1 to 2 contractile vacnoles at the base of the flagella. Usually one eye- speck. Division of the protoplasm within the envelope may pro- duce four, eight, or more new individuals. This may occur in the swimming or in a resting stage. Also by more continuous fission microgonidia of varicus sizes are formed. Copulation is frequent.*~~

~~*Genera.—Hymenomonas, Stein; Chlorangium, Stein; Chloro- gonium, Er. (Fig. XX. 6, 7); Polytoma, Khr. ; Chlamydomonas, Ehr. (Fig. XX. 1, 2, 3); Hematococcus, Agardh (=Chlamydo- coccus, A. Braun, Stein ; Protococcus, Cohn, Huxley and Martin ; Chlamydomonas, Cienkowski) ; Carteria, Diesing ; Spondylomorum, Ehr. ; Coccomonas, Stein ; Phacotus, Perty.*~~

~~*Fam. 5. Vouvocina. Colony-building Phytomastigoda, the cell- individuals standing in structure between Chlamydomonas and Hematococcus, and always biflagellate. The number of individuals united to form a colony varies very much, as does the shape of the colony. Reproduction by the continuous division of all or of only certain individuals of the colony, resulting in the production ofa daughter colony (from each such individual). In some, probably in all, at certain times copulation of the individuals of distinct sexual colonies takes place, without or with a differentiation of the colonies and of the copulating cells as male and female. The result of the copulation is a resting zygospore (also called zygote cr o00-spermospore or fertilized egg-cell), which after a time develops itself into one or more new colonies.*~~

~~*Genera.—Gonium, O. F. Miiller (Fig. XX. 14) ; Stephanosphera, Cohn; Pandorina, Bory de Vine.; Eudorina, Ehr.; Volvox, Ehr. (Fig. XX. 18, 20).*~~

~~*[The sexual reproduction of the colonies of the Volvocina is one of the most important phenomena presented by the Protozoa. In some families of*~~

~~*Flagellata full-grown individuals become aineboid, fuse, encyst, and then break up into flagellate spores which develop*~~

~~*XIX. — 108*~~

~~*958 PROTOZOA*~~

~~*simply to the parental form (Fig. XX. 23 to 26). In the Chlamydomonadina a single adult individual by division produces small individuals, so-called ‘“‘microgonidia.” These copulate with one another or with similar microgonidia formed by other adults (as in Chlorogonium, Fig. 2.2.¢ 7) 3, 0r more rarely in certain genera a microgonidium copulates with an ordinary individual (macrogonidium). The result in either case 1s a “ zygote,” a cell formed by fusion of two which divides in the usual way to produce new individuals. The microgonidium in this case 1s the male element and equivalent to a spermatozoon , the macrogonidium is the female and equivalent to an egg-cell. The zygote isa fertilized egg-cell, or oo-spermospore. In the colony-building forms we find that only certain cells produce by division microgonidia ; and, regarding the colony as a multicellular individual, we may consider these cells as testis-cells and their microgonidia as spermatozoa. In some colony-building forms the microgonidia copulate with ordinary cells of the colony which, when thus fertilized, become encysted as zygotes, and subsequently separate and develop by division into new colonies. In Volvox the macrogonidia are also specially-formed cells (not merely any of the ordinary vegetative cells), so that in a sexually ripe colony we can distinguish egg- cells as well as sperm mother-cells. Not only so, but in some instances (Eudorina and some species of Volvox) the colonies which produce sexual cells can not merely be distinguished from the asexual colonies (which reproduce parthenogenetically), but can be distinguished also inter se into male colonies, which produce from certain of their constituent cell-units spermatozoa or microgonidia only, and female colonies which produce no male cells, but only macrogonidia or egg-cells which are destined to be fertilized by the microgonidia or spermatozoa of the male colonies.*~~

~~*The differentiation of the cell-units of the colony into neutral or merely carrying cells of the general body on the one hand and special sexual cells on the other is extremely important. It places these cell-colonies on a level*~~

~~with the Enterozoa (Metazoa) in regard to reproduction, and it cannot be doubted that the same process of specialization of the reproductive function, at first com- mon to all the cells of the cell-complex, has gone on in both eases. The perishable body which carries the reproductive cells is nevertheless essentially different in the two cases, in the Volvocina being composed of equipollent units, in the Enterozoa being com- posed of units distributed in two physiologically and morphologi- cally distinct layers or tissues, the ectoderm and the endoderm.~~

~~The sexual reproduction of the Vorticellidee may be instructively compared with that of the Phytomastigoda; see below.]~~

~~Fam. 6. TeTRAMITINA. Symmetrical, naked, colourless, some- what amceboid forms, with four flagella or three and an undulating membrane. Nutrition animal, but mouth rarely seen.~~

~~Genera.—Collodictyon, Carter; Tetramitus, Perty (Fig. XXI. 11, 14; calycine monad of Dallinger and Drysdale (66)) ; Monocerco- monas, Grassi; Trichomonas, Douné; Trichomastiz, Blochmann.~~

~~Fam. 7. Potymasticina. Small, colourless, symmetrical forms. Two flagella at the hinder end of the body and two or three on each ae in ee Nutrition animal or saprophytic.~~

~~enera.—Hexamitus, Duj. (Fig. XXI. 5); te Polymastix, Biitschli. tan aE aeete Pee)~~

~~Fam. 8. TREpoMONADINA, Kent. As Polymastigina, but the — shee flagella are placed far back on the sides.~~

~~Dallinger (67), epomonas, Duj., described recently without name by~~

~~Fam. 9. CryptomonaptNna. Coloured or colourless, laterally compressed, asymmetrical forms; with two very long anterior be gn placed a little on one side springing from a deep atrium-~~

~~@ groove or furrow (cf. Dinoflagellata and Noctiluca, to which these forms lead). , me eer From. ; Chilomonas, Ehr. ; Cryptomonas,~~

~~*Fam. 10. LopHomonapina. Atuftof numerousflagella anteriorly.*~~

~~*Genus.—Lophomonas, Stein (Fig. XXI. 9 lata with the Peritrichous Gilatay' ee ae*~~

~~*Sub-class II. Choanoflagellata, Saville Kent.*~~

~~*Flagellata provided with an u i i*~~

~~*pstanding collar surround —_— pole of the cell from which the ieee fecal ni hoi 2 entical in essential structure with the 'collared cells" of Sponges. ingle or colony-building. Individuals naked (Codosiga), or inhabit-*~~

~~*ing each a cup (Salpingeea), or embedded i i Fee oe ps aay embedded in a gelatinous common OrDER 1. NUDA, Lankester.*~~

~~*Characters.—Individuals nak i i i Pepsin aked, secreting neither a lorica (cup)*~~

~~*Genera.—Monosiga, 8. Kent (solit i*~~

~~*; , S. ary stalked or sessile) ; .*~~

~~*vga, ae Clark (united socially on a common Pre oie 1g. XXI. 3, 4); Astrosiga, S. Kent ; Desmarella, S. Kent.*~~

~~*Orper 2. LORICATA, Lankester.*~~

~~*Cha t ——— * . . . on hes Each individual collared-cell unit secretes a horny*~~

~~*[FLAGELLATA,*~~

~~*Fic. XXI.—Flagellata. 1. Salpingeea fusiformis, 8. Kent; one of the Choanoflagellata. The protoplasmic body is drawn together within the goblet-shaped shell, and divided into numerous spores. x 1500. 2. Hiscape of the spores of the same as monoflagellate and swarm-spores. 3. Codosiga umbellata, Tatem; one of the Choanoflagellata; adult colony formed by dichotomous growth; x 625. 4, A single zooid of the same ; x 1250. a, nucleus ; b, contractile vacuole ; ¢, the characteristic "collar" formed by*~~

~~*cuticle on the inner face of which is a most delicate network of naked streaming protoplasm. 5. Hexamita inflata, Duj. ; one of the Isomastigoda; x 650; normal adult; showinga, nucleus, and b, contrac- tile vacuole. _ 6,7. Salpingeca urceolata, 5. Kent ; one of the Choano- flagellata ;—6, with collar extended; 7, with collar retracted within the stalked cup. a, nucleus; 6, contractile vacuole. 8. Polytoma uvella, Miill. sp. ; one of the Phytomastigoda. a, nucleus; 6, contractile vacuole. x 800. 9. Lophomonas blattarum, Stein; one of the Isomastigoda, from the intestine of Blatta orientalis. a,nucleus. _ 10. Bodo lens, Miill. ; one of the Heteromastigoda; x 800. a, nucleus; 6, contractile vacuole; the wavy filament is a flagellum, the straight one is an immobile trailing thread. 11. Tetramitus sulcatus, Stein; one of the Isomastigoda ; x 430. a, nucleus; 6, contractile vacuole. 12. Anthophysa vegetans, O. F. Miiller; one of the Monadidea; x 300.*~~

~~*DINOFLAGELLATA. |*~~

~~*cells of a sponge-colony); d, similar zooid multiplying by transverse*~~

~~*fission ; e, normal zooids with their collars contracted ; 7, hyaline mucila-*~~

~~*ginous common test or zoothecium ; g, individual contracted and dividing*~~

~~*into minute flagellate spores (microgonidia) comparable to the spermato-*~~

~~*zoa of a Sponge.*~~

~~*Genera. —Salpingeca, Janies Clark (sedentary, Fig. XOSIL ©, TOE Lagenaca, 8. Kent (free swimming) ; Polyeca, S. Kent (cups united socially to form: a branching zocecium as in Dinobryon).*~~

~~*OrpER 3. GELATINIGERA, Lankester.*~~

~~*The cell-units secrete a copious gelatinous investment and form large colonies.*~~

~~*Genera. —Phalansteriwm, Cienk. (Fig. XX. 12); Proterospongia, Saville Kent (Fig. XX1. 15).*~~

~~[The Choanoflagellata were practically discovered by the Ameri- can naturalist James Clark (68), who also discovered that the ciliated chambers of Sponges are lined by collared cells of the same peculiar structure as the individual Choanoflagellata, and hence was led to regard the Sponges as colonies of Choanotlagellata. Saville Kent (69) has added much to our knowledge of the group, and by his discovery of Proterospongia (see Fig. XXI. 15, and description) has rendered the derivation of the Sponges from the Flagellata a tenable hypothesis.]~~

~~Further remarks on the Flagellata.—Increased attention has been directed of late years to the Flagellata in consequence of the researches of Cienkowski, Biitschli, James Clark, Saville Kent, and Stein. They present a very wide range of structure, froin the simple amceboid forms to the elaborate colonies of Volvox and Proterospongia. By some they are regarded as the parent-group of the whole of the Protozoa ; but, whilst not conceding to them this position, but removing to the Proteomyxa those Flagellata which would justify such a view, we hold it probable that they are the ancestral group of the mouth-bearing Corticata, and that the Ciliata and Dinoflagellata have been derived from them. One general topic of importance in relation to them may be touched on here, and that is the nature of the flagellum and its movements. Speaking roughly, a flagellum may be said to be an isolated filament of vibratile protoplasm, whilst a cilium is one of many associated filaments of the kind. The movement, however, of a flagellum is not the same as that of any cilium; and the movement of all flagella is not identical. A cilium is simply bent and straightened alternately, its substance probably containing, side by side, a con- tractile and an elastic fibril. A flagellum exhibits lashing move- ments to and fro, and is thrown into serpentine waves during these movements. But two totally distinct kinds of flagella are to be distinguished, viz., (@) the pulsellum, and (2) the tractellum. An example of the pulsellum is seen in the tail of a spermatozoon which drives the body in front of it, as does the tadpole's tail. Such a *pulsellum" is the cause of the movement of the Baeteria. It is never found in the Flagellata. So little attention has been paid to this fact that affinities are declared by recent writers to exist between Baeteria and Flagellata. The flagellum of the Flagellata is totally distinct from the pulsellum of the Bacteria. _ It is earrieo in front of the body and draws the body after it, being used as a man uses his arm and~~

~~*hand when swimming on his side. Hence it may be distinguished as a "tractellum." Its action may be best studied in some of the large Euglenoidea, such as Astasia. Here it is stiff at the base and is earried rigidly in front of the animal, but its terminal third is reflected and exhibits in this reflected condition swinging and undulatory movements tending to propel the reflected part of the flagellum forward, and so exerting a traction in that direction npon the whole animal. It is in this way (by reflexion of its extremity) that the flagellum or tractellum of the Flagellata also acts so as to impel food-particles against the base of the flagellum where the oral aperture is situated.*~~

~~*Many of the Flagellata are parasitic (some heematozoic, sce Lewis, 70); the majority live in the midst of putrefying organic matter in sea and fresh waters, but are not known to be aetive as putrefaction. Daliinger and Drysdale have shown that the spores of Bodo and others will survive ansexposure to a higher tempera- ture than do any known Schizomyeetes (Bacteria), viz., 250° to 300° Fahr., for ten minutes, although the adults are killed at 180°.*~~

~~*Cuass III. DINOFLAGELLATA, Bitschli.*~~

~~*Characters.—Corticate Protozoa of a bilaterally asymmetricalform, sometimes flattened from back to ventral surface (Diplopsalis, Glenodinium), sometimes from the front to the hinder region (Ceratium, Peridinium), sometimes from right to left (Dinophysis, Amphidinium, Prorocentrum)—the anterior region and ventral surface being determined by the presence of a longitudinal groove and a large flagellum projecting from it. In all except the genus Prorocentrum (Fig. XXII. 6) there is as well as a longitudinal groove a transverse groove (hence Dinifera) in which lies horizon- tally a second flagellum (Klebs and Biitschli), hitherto niistaken for a girdle of cilia. The transverse groove lies either at the anterior end of the body (Dinophysis, Fig. XXII. 3, 4; Amphidinium) or*~~

~~*PROT ®Z O &*~~

~~*within the common jelly or test (compared by 8. Kent to the mesoderm- | at the middle.*~~

~~agents of |~~

~~859~~

~~In Gymnodinium it takes a spiral course. In Polykrikos (a compound metameric form) there are eight indepen- dent transverse grooves.~~

~~The Dinoflagellata are either enclosed in a cuticular shell (Ceratium, Peridinium, Dinophysis, Diplopsalis, Glenodinium, Prorocentrum, &c.) or are naked (Gymnodinium and Polykrikos). 'he cuticular membrane (or shell) consists of cellulose or of a similar substance (cf. Labyrinthulidea) and not, as has been sup- posed, of silica, nor of chitin-like substance ; it is either a simple cyst or perforated by pores, and may be built up of separate plates (Fig. XXII. 10).~~

~~The cortical protoplasm contains trichocysts in Polykrikos.~~

~~The medullary protoplasm contains often chlorophyll and also diatomin and starch or other amyloid substance. In these cases (Ceratium, some species of Peridinium, Glenodinium, Prorocentrum, Dinophysis acuta) nutrition appears to be holophytic. But in others (Gymnodinium and Polykrikos) these substances are absent and food-particles are found in the medullary protoplasin which have been taken in from the exterior through a mouth ; in these nutrition is holozoic. In others which are devoid of chlorophyll and diatomin, &c., there is found a vesicle and an orifice connected with the exterior near the base of the flagellum (¢f. Flagellata) by which water and dissolved or minutely granular food-matter is introduced into the medullary protoplasm (Protoperidinium pellr- cidum, Pcridinium divergens, Diplopsalis lenticula, Dinophysis levis). It is important to note that these divergent methods of nutrition are exhibited by different species of one and the same genus, and possibly by individuals of one species in successive phases of growth (°).~~

~~No contractile vacuole has been observed in Dinoflagellata.~~

~~The nucleus is usually single and very large, and has a peculiar labyrinthine arrangement of chromatin substance.~~

~~*Transverse binary fission is the only reproductive process as yet ascertained. It occurs either in the free condition (Fig. XXII. 2) or in peculiar horned cysts (Fig. XXII. 8). Conjugation has been observed in some cases (by Stein in Gymnodinium).*~~

~~*Mostly marine, some freshwater. Many are phosphorescent.*~~

~~*The Dinoflagellata are divisible into two orders, according to the presence or absence of the transverse groove.*~~

~~*Orver 1. ADINIDA, Bergh.*~~

~~*Characters.—Body comyressed laterally ; both longitudinal and transverse flagellum placed at the anterior pole; a transverse groove is wanting ; a cuticular shell is present.*~~

~~*Genera.—Prorocentrum, Ehr. (Fig. XXII. 6, 7); Zxwviella, Cienk. (=Dinopyzis, Stein ; Cryptomonas, Ehr.).*~~

~~*OrpeR 2. DINIFERA, Bergh.*~~

~~*Characters.—A transverse groove is present and usually a longi- tudinal groove. The animalsare either naked or loricate.*~~

~~*Fam. 1. Drnopuyipa, Bergh. Body coinpressed ; the transverse groove at the anterior pole; the longitudinal groove present ; longitudinal flagellum directed backwards ; loricate.*~~

~~*Genera.—Dinophysis, Ehr. (Fig. XXI1. 3, 4); Amphidinium, Cl. & L.; Amphisolenia, Stein ; Histioncis, Stein ; Citharistes, Stein ; Ornithocercus, Stein.*~~

~~*Fam. 2. Peripinipa, Bergh. Body either globular or flattened ; transverse groove nearly equatorial ; longitudinal groove narrow or broad ; loricate.*~~

~~*Genera.—Protoperidinium, Bergh; Pertdinium (Ehr.), Stein (Fig. XXII]. 1, 2); Protoceratuum, Bergh; Ceratiwm, Sehrank (Fig. XXII. 15); Diplopsalis, Bergh ; Glenodinium, Ehr. ; Heterocapsa, Stein; Gonyaulax, Diesing ; Gontodoma, Stein ; Blepharocysta, Ehr.; Podolampas, Stein'; Amphidoma,*~~

Stein ; Oxytoxum, Stein ; Ptychodiscus, Stein ; Pyrophacus, Stein ; Ceratocorys, Stein.

Fam. 3. GyMNopInipa, Bergh. As Peridinida but no lorica

(cuticular shell). Genera.—Gymnodinium (Fig. XXII. 5), Stein; Hemidinium, Bergh.

Fam. 4. Potyprnipa, Biitschli, As Gymnodinida, but with several independent transverse grooves. Genus.—Polykrikos, Biitschli.

Further Remarks on the Dinoflagellata.—This small group is at the moment of the printing of the present article receiving a large amount of attention from Bergh (81), Klebs (83), and Biutschli (82), and has recently been greatly extended by the discoveries of Stein (80),—the last work of the great illustrator of the Ciliate Protozoa before his death. The constitution of the cell-wall or cuticle from cellulose, as well as the presence of chlorophyll and diatomin, and the holophytic nutrition of many forms recently demonstrated by Bergh, has led to the suggestion that the Dinoftlagellata are to be regarded as plants, and allied to the Diatomacez and Desmidiacez. Physiological grounds of this kind have, however, as has been pointed out above, little importance in determining the affinities of Protozoa, Biitschli (82) in a recent very important article has

| shown in confirmation of Klebs that the Dinoflagellata do not

possess ture mis

irdle of cilia as previously supposed, but that the struc- ekon for cilia is cS poad flagellum which lies horizontally

i ili llata is super- the transverse groove. Hence the name Cilioflage mad by Dinoflagellata (Gr. dinos, the round area where oxen tread

out on a threshing floor).

%,—

~~; nce, ;~~

~~Fic. XXII.—Dinoflagellata and Rhynchonagellata, : » N.B. In all tt figures the apparent girdle of cilia is, sevice to Klebs and "piitschii's recent discovery, to be interpreted as an encircling flagellum lying in the~~

~~transverse groove,~~

~~1. Peridinium uberrimum, Allman; x 300 (fresh-~~

~~Water ponds, Dublin) Probably (according to Biitschli) th a) g e proces the surface are not cilia nor flagellum. Both the fonpitutines mall: the~~

~~transverse groove are Well seen,~~

~~2. The same species in transverse~~

~~ssion. 3. Dinophysis ovata, Cl. and L; x350 (salt water, Norwegian~~

~~coast), Norwegian coast). trum micans, Ehr.; 300 (salt water).~~

~~4. Dinophysis acuminata, Cl. and L.: x350 (salt water 5. Gymnodinium, sp.; 600. 6. Prorocen- 7. Dorsal aspect of the~~

~~same species, 8, 9. Cysts of Peridinia; the contents of 8 divided~~

~~into eight minute Ceratium divergens. of its component plates. 11. The gs~~

~~naked Peridinia; 300, 10. Empty cuirass of Cl. and L.; x500; showing the form and disposition | ame species with the animal con-~~

~~aantod into a spherical form. The transverse groove well seen. 1~~

~~he same species in the normal stat really an undulating flagellum lying " th Sapeekent ins Waste, miliaris. (clal ridge of the adult); a, the big flagellum ; the 1s a flagellum which becomes the oral Poaiolhats of the adult.~~

~~e transverse groove.~~

~~*The apparent girdle of cilia is*~~

~~*13, 14,*~~

~~*n, nucleus; s, the so-called spine nlettered filament*~~

~~*15. Cera-*~~

~~*tium tripos, Mull. The transverse groove well seen. The cilia really are a single horizontal flagellum. 16, 17. Two stages in the transverse fission of Noctiluca miliaris, Suriray. n, nucleus; N, food-particles; t, the muscular flagellum. 18. Noctiluca miliaris, viewed from the aboral side (after Allman, Quart. Jour. Mic. Sct., 1872). a, the entrance to the atrium or flagellar fossa (=longitudinal groove of Dinoflagellata); ¢, the superficial ridge; d, the big flagellum (=the flagellum of the transverse groove of Dinoflagellata); h, the nucleus, 19. The animal acted upou by iodine solution, showing the protoplasm like the "primordial utricle" of a vegetable cell shrunk away from the structureless firm shell or cuirass. 20. Lateral view of Noctiluca, showing a, the entrance to the groove-like atrium or flagellar fossa in which 0 is placed; ¢, the superficial ridge; d, the big flagellum; e, the mouth and gullet, in which is seen Krohn's oral flagellum (=the chief flagellum or flagellum of the longitu- dinal groove of Dino-flagellata) ; 4, broad process of protoplasm extending from the superficial ridge ¢ to the central protoplasm; g, duplicature of the shell in connexion with the superficial ridge; A, nucleus.*~~

~~*Biitschli further suggests that the Dinoflagellata with their two flagella and their 1-shaped combination of longitudinal and transverse grooves may be derived from the Cryptomonadina (see p. 858). In the latter a groove-like recess is present in connexion with the origin of the two flagella. Biitschli thinks the large pro- boscis-like flagellum of Noctiluca (Rhynchoflagellata) represents the horizontal flagellum of Dinoflagellata, whilst the prominent longitudinal flagellum of the Dinoflagellata is represented in that*~~

~~*| animal by the small flagellum discovered by Krohn within the*~~

~~*gullet (see Fig. XXII. 20, c). The young form of Noctiluca (Fig. XXII. 14) has the longitudinal flagellum still of large size.*~~

~~*The phosphorescence of many Dinoflagellata is a further point of resemblance between them and Noctiluca.*~~

~~*Bergh has shown that there isa considerable range of form in various species of Dinoflagellata (Ceratium, &c.), and has also drawn attention to the curious fact that the mode of nutrition (whether holophytic or holozoic) differs in allied species. Possibly it may be found to differ according to the conditions of life in individuals of one and the same species.*~~

~~*The drawings in Fig. XXII. were engraved before the publication of Biitschli's confirmation of Klebs's discovery as to the non-existence of cilia in the transverse groove. The hair-like processes figured by Allman (91) external to the transverse groove in his Peridinium uberrimum (Fig. XXII. 1, 2) cannot, however, be explained as a flagellum. Biitschli inclines to the opinion that their nature was misinterpreted by Allman, although the latter especially calls attention to them as cilia, and as rendering his P. uberrimum unlike the Peridinium of Ehrenberg, in which the cilia (horizontal flagellum) are confined to the transverse groove.*~~

~~*Ciass IV. RHYNCHOFLAGELLATA, Lankester.*~~

~~*Characters.—Corticate Protozoa of large size (Ayth inch) and globular or lenticular form, with a firm cuticular membrane and highly vacuolated (reticular) protoplasm. In Noctiluca a deep groove is formed on one side of the spherical body, from the bottom of which springs the thick transversely striated proboscis or "big flagellum." Near this is the oral aperture and a cylin- drical pharynx in which is placed the second or smaller flagellum (corresponding to the longitudinal flagellum-of Dinoflagellata).*~~

~~*Nutrition is holozoic. No contractile vacuole is present ; granule- streaming is observed in the protoplasm. An alimentary tract and anus have been erroneously described. The nucleus is spherical and not proportionately large (see for details Fig. XXII. 18 to 20).*~~

~~*Reproduction by transverse fission occurs, also conjugation and, either subsequently to that process or independently of it, a forma- tion of spores (Cienkowski, 87), the protoplasm gathering itself, within the shell-like cuticular membrane, into a cake which divides rapidly into numerous*~~

~~*flagellated spores (flagellulx). These escape and gradually develop into the adult form (Fig. XXII. 13, 14).*~~

~~*The proboscis-like large flagellum is transversely striated, and exhibits energetic but not very rapid lashing movements.*~~

~~*Noctiluca is phosphorescent, the seat of phosphorescence being, as determined by Allman (86), the cortical layer of protoplasm underlying the cuticular shell or cell-wall as the primordial cuticle*~~

~~*_ of a vacuolated vegetable cell underlies the vegetable cell-wall.*~~

~~*Genera.—Only two genera (both marine) are known :—Woetiluca, Suriray (90) (Fig. XXII. 17-20) ; Leptodiscus, Hertwig (88).*~~

~~*Further Remarks on the Rhynchoflagellata.—The peculiar and characteristic feature of Noctiluca appears to be found in its large transversely-striated flagellum, which, according to Biitschli, is not the same as the longitudinal flagellum of the Dinoflagellata, but probably represents the horizontal flagellum of those organisms in a modified condition ; hence the name here proposed—Rhyncho- flagellata.*~~

~~*Noctiluca is further remarkable for its large size and cyst-like form, and the reticular arrangement of its protoplasm, like that of a vegetable cell. This is paralleled in Zrachelius ovum among the Ciliata (Fig. XXTV. 14), where the same stiffening of the cuticle allows the vacuolation of the subjacent protoplasm to take place. The remarkable Lepiodiseus medusoides of R. Hertwig (88) appears to be closely related to Noctiluca.*~~

~~*It would no doubt be not unreasonable to associate the Dino-*~~

~~*——wy*~~

~~*CILIATA.*~~ |

~~*flagellata and the Rhynchoflagellata with the true Flagellata in one*~~

~~*class. But the peculia*~~

~~rived from the Flagellata. to any other group, but they must be r branch of the family tree of Corticata.~~

~~luca to Peridinium was recently been put in a~~

~~atrial recess of Noctiluca (Fig.~~

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~~‘ rities of the organization of the two former groups is best emphasized by treating them as separate classes de-~~

~~Neither group leads on to the Ciliata or egarded as forming a lateral The relationship of Nocti-~~

~~first insisted upon by Allman, but has quite new light by Biitschli, who identifies the~~

~~furrow or groove of the Dinoflagellata, and the large and flagella of the former with the transverse and longitudinal flagella~~

~~respectively of the latter. appears to represent the continua~~

~~The phosphorescence~~

~~Meduse, Crustaceans, Annelids, in the phenomenon. Not unfrequently, escence on the British eoasts seems~~

~~which then occurs in m~~

~~Fic. XXII. Ciliata.—1. Spirostomum ambiguu~~

~~tricha; x 120. Observe trichous band of long cil 2. Stentor polymorphus,~~

~~XXIf. 20, 5) with the longitudinal~~

~~minute~~

~~The superficial ridge ¢ of Noctiluca tion of the longitudinal groove.~~

~~*of the sea, especially on northern coasts, is largely caused by Noctiluea, but by no means exclusively, since*~~

~~*illions in the littoral waters.*~~

~~*and various Protozoa often take part however, the phosphor- to be solely due to Noctiluca,*~~

~~*m, Ehr.; one of the Hetero-*~~

~~*on theright side the oral groove and special hetero- ia. a, moniliform nucleus ; b, contractile vacuole.*~~

~~*Miiller; one of the Heterotricha; x 50;*~~

~~*group of*~~

~~*individuals with the area fringed by the heterotrichous cilia expanded trumpet-wise. 3. Tintinnus lagenula, C. and L.; one of the Hetero- tricha; x 300. 4. Strombidium Claparedii, 8. K.; one of the Peritricha; x 200. 5. Empty shell of Codonella campanella, Haeck.; one of the Heterotricha; x 180. 6, 7. Terquatella typica, Lankester. p, the supra- oral lobe seen through the membranous collar. 8,9. View of the base and of the side of Trichodina pediculus, Ehr.; one of the Peritricha; x 300. a, nucleus; ¢, corneous collar; d, mouth. 10. Spirochona gemmipara, Stein; one of the Peritricha; x 350. a, uucleus; g, bud. 11. Vorticella citrina, Ehr.; x 150 (Peritricha). At d multiple fission of an individual cell to form "microgonidia." 12. Vorticella microstoma, Ehr. (Peritricha); x 300. At ¢ eight "microgonidia" formed by fission of a single normal individual. 13. Same species, binary fission. a, elongated nucleus. 14. Vorticella nebulifera, Ehr.; free-swimming zooid resulting from fission in the act of detaching itself and swimming away, possessing a posterior circlet of cilia. ¢, ciliated disk; J, pharynx. 15. Vorticella microstoma, Ehr.; normal zooid with two*~~

~~*microgonidia (or microzooids) c,d, in the act of conjugation. a, nucleus ; b, contractile vacuole; ¢, ciliated disk; f, pharynx. 16, Vorticella microstoma, Ehr., with stalk contracted and body enclosed ina cyst. 4, nucleus. 17. Vorticella nebulifera, Ehr. a, nucleus; 8, contractile vacnole ; c, muscular*~~

~~*region of the body continuous with the muscle of the stalk; d, pharynx (the basal continuation of the oral vestibule which receives at a higher point the foecal excreta and the ejected liquid from the contractile vacuole). 18. Carchesium spectabile, Ehr.; retractile colony; x 50. 19. Trichocysts of Epistylis flavicans, Ehr., as figured by Greeff. 20. Opercularia stenostoma, Stein; x 200; a small colony. Observe the ciliation of the oral vestibule and the upstanding ciliate disk (opercular-like). 21, 22. Pywxicola afinis, 8.K.; one of the stalked loricate Peritricha, in expanded and retracted states. 2, the true oper- culum. 23, 24. Gyrocoris oxyura, Stein; one of the free-swimming Peritricha, with spiral equatorial cilia-band; x 250. 6, contractile vacuole. 25, 26. Thuricola valvata, Str. Wright; one of the sessile tubicolous Peritricha. Two individuals are as a result of fission tempo- rarily occupying one tube; u, the valve attached to the tube, like the door of the trap-door spider's nest and the valve of the Gasteropod Clausilium.*~~

~~*Ciass V. CILIATA, Ehrenberg (Jnfusoria sensu stricto).*~~

~~*Characters. —Corticata of relatively large size, provided with either a single band of cilia surrounding the anteriorly placed oral aperture or with cilia disposed more numerously over the whole surface of the body. The cilia are distinguished from the flagella of Flagellata by their smaller size and simple movements of alternate flexion and erection ; they serve always at some period of growth as locomotor organs, and also very usually as organs for the introduction of food particles into the mouth. Besides one larger oblong nucleus a second (the paranucleus) is invariably (?) present' (Fig. XXV. 2), or the nucleus may be dispersed in small fragments. Conjugation of equal-sized individuals, not resulting in permanent fusion, is frequent. The conjugated animals separate and their uuclei and paranuclei undergo peculiar changes; but no formation of spores, either at this or other periods, has been de- eisively observed (Fig. XXV. 8 to 15). Multiplication by transverse fission is invariably observed in full-grown individuals (Fig. XXV. 16), and conjugation appears to take place merely as an interlude in the fissiparous process ; consequently young or small Ciliata are (with few exceptions) unknown. Possibly spore-formation may hereafter be found to occur at rare intervals more generally than is at present supposed (Fig. XXIV. 15, 18). A production of micro- gonidia by rapid fission occurs in some Peritricha (Fig. XXIII. 11, 12, 14, 15), the*~~

~~*liberated mierogonidia conjugating with the normal individuals, which also can conjugate with one another.*~~

~~*The Ciliata, with rare exceptions (parasites), possess one or more contractile vacuoles (Fig. XXV. 3). They always possess a delicate cuticle and a body-wall which, although constant, in form is elastic. They may be naked and free-swimming, or they may form horny (Fig. XXIII. 21, 25) or siliceous cup-like shells or gelatinous envelopes, and may be stalked and form colonies like those of Choanoflagellata, sometimes with organic connexion of the con- stituent units of the colony by a branching muscular cord (Vorti- cellide). Many are parasitic in higher animals, and of these some are mouthless. All are holozoic in their nutrition, though some are said to combine with this saprophytic and holophytic nutrition. The Ciliata are divisible into four orders according to the distribution and character of their cilia. The lowest group (the Peritricha) may possibly be connected through some of its members, such as Strombidium (Fig. XXIII. 4), with the Flagellata through such a form as Lophomonas (Fig. XXI. 9).*~~

~~*In the following synopsis, chiefly derived from Saville Kent's valuable treatise (71), the characters of the families and the names of genera are not given at length owing to the limitation of our space.*~~

~~*OrpErR 1. PERITRICHA, Stein (79).*~~

~~*Characters. —Ciliata with the cilia arranged in one anterior circlet or in two, an anterior and a posterior ; the general surface of the body is destitute of cilia.*~~

~~*Sub-order 1. NATANTIA (animals never attached).*~~

~~*Fam. 1. ToRQUATELLID&. a Genus. —Torquatella, Lankester, like Strombidium, but the cilia adherent so as to form a vibratile membranous collar (Fig. XXIII.*~~

~~*6, 7).*~~

~~*Fam. 2. Dicryocystipz. Animals loricate.*~~

~~*Fam. 3. ACTINOBOLID. Illoricate, with retractile tentacula.*~~

~~*862*~~

~~*Fam. 4. HALTERIIDZ. tri Oa Wwiesi< ra. — bidium, Cl. & L. (Fig. X: cM eee Dujard ae Soaalnrncn tats girdle of springing hairs; Didiniwm, Stein, (Fig. XXIV. 19). Fam. 5. GYROCORIDE, aie oemele patialiy — oris, Stein, with an equatorial ciliary g1 disnoned (Fig XXII 23, 24); Urocentrum, Nitzsch, girdle annular.*~~

~~*b> én Ali a i) ALN A\ -C hy, VAN*~~

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~~*Fie. XXIV. Ciliata.—1, Ophalinopsis sepiole, Foett. : trichous mouthless Ciliate from the liver of the § vacuoles (non-contractile), 2. A similar sp carmine, showing a remarkably branched and twist place of several nuclei. . Prichonympha agili in the intestine of the Termites (White Ants); granules (food 2). 4. Opalina ranarum, Purk mouthless Ciliate parasitic in the Frog's rectum ; a. numerous regnlarly dispersed nuclei, cess of binary fission. a, nuclei. now reduced the individuals to a relatively small size. produced fragment encysted, exp swallowed by Tadpoles. 8.*~~

~~*ree aA -; &@ mouthless Holotrichous Ciliate parasitic in the worm Nais; x 200. a, the large axial nucleus; b,*~~

~~*c 4 cuole 10. Anoplophrya prolifera, C. and L.; from the intestine of Clitellio, Remarkable for the adhesion in a metameric series*~~

~~*PROTOZOS*~~

~~*Fic. XXV. Ciliata (conjugation, &c.).*~~

~~*[CILIATA.*~~

~~*i ion-products. a, nuclens. 11. Aimphileptus gigas, e a oe of tlie Holotricha: x'100. b, contractile vacuoles; e, bi y 'ie (see Fig XXIII. 19); d, nucleus ; e, pharyux. 12, 13. Proro oe ao s, Ehr.; one of the Holotricha; x 75. a, nucleus; b, contractile zacaines A 'pharynx with horny ——— eed 12. The on ee i of isolated. 14. Zrachelius ovum, ; re fea) nn? sy oe the acyl i oye tg _ 1 tractile vacuoles; c,the cuticle-lined pha 3 , 16, eee Teinyophthirius multifilius, ' Fouquet ; one of the Holotricha; x'120.. Free individual and successive stages of division to form spores. a, nucleus; 2, contractile vacuoles. 19, Didinium nasutum, bay one of the 'Peritricha ; x 200. The pioune angen ⁎ — i d. a, nucleus; b, contractile vacuole; c,*~~

~~*0 3 5*~~

~~*ambulatory organs. 21. Euplotes harpa, Stein yp Sar ee q trichous processes (limbs). , 22 Nyctotherus pee 1 a polseoutihoes Ciliate Baringo ey ee eer ihe 5 4] . 1¢. . . Ns nucleus; 6, contractile vacuole; c, food pa e; d, 38, nti he Ia band of large cilia ; f, g, mouth; h, pharnyx; 7, small cilia.*~~

~~*Fam. 6. URCEOLARIID2.*~~

~~*Sg a fd*~~

~~*SSS*~~

~~*eee*~~

~~*iit HT) AH 44] IN WMH*~~

~~*a*~~

~~*ee*~~

~~*ee SS Sm nate cee*~~

~~*aeneee—apeee meee*~~

~~*1. Surface view of Holotrichous Ciliate, showing the disposition of the cilia in longitudinal rows. 2.*~~

~~*CILIATA.* |~~

~~*and paranucleus in each animal elongate and become fibrillated ; 10, two spherical paranuclei pn in each, two dividing or divided nuclei N+ ; 11, the spherical paranuclei have become fusiform; 12, there are now four paranuclei in each (pn4 and pn*), broken into four or- even more fragments ; 13, the two paranuclei marked pn* in 12 have united in each animal to form the new nucleus pn*; the nuclear fragments are still numerous; 14, after cessation of conjugation the nuclear fragments N and the two unfused paranuclear pieces pn are still present; 15, from a part or all of the fragments the new paranucleus is in process of formation, the new nucleus (pn* = N) is large and elongated. 16. Diagram of a Ciliate in process of trans- verse fission. 17. Condition of the nucleus N, and of the paranucleus pn in Paramecium aurelia after cessation of conjugation as observed by Biitschli. 18. Stylonichia mytilus (one of the Hypotricha), showing endoparasitic unicellular organisms b, formerly mistaken for spores ; a, nuclei (after conjugation and breaking up).*~~

~~*Fam. 7. OPHRYOSCOLECIDA,*~~

~~*Genera.—Astylozoon, Engelm. ; Ophryoscolex, Stein.*~~

~~*Sub-order 2. SEDENTARIA, animals always attached or sedentary during the chief part of the life-history.*~~

~~*Fam. 1. VorticeLtipa. Animals ovate, campanulate, or sub- cylindrical; oral aperture terminal, eccentric, associated with a spiral fringe of adoral cilia, the right limb of which descends into the oral aperture, the left limb encireling a more or less elevated protrusible and retractile ciliary disk.*~~

~~*Sub-family 1. Vorticelline: aniinalcules naked.*~~

~~*a.—Solitary forms.*~~

~~*Genera.—Gerda, Cl. and L. ; Scyphidia, Dujard.; Spirochona, Stein (sessile with peristome in the form of a spirally convolute mem- branous expansion, Fig. XXIII. 10); Pyzxidium, Kent (with a non-retractile stalk) ; Vorticella, Linn. (with a hollow stalk in which is a contractile muscular filament).*~~

~~*g.—Forming dendriform colonies.*~~

~~*Genera.—Carchesium, Ehr. (Fig. XXIII. 18, with contractile stalks); Zoothammium, Ehr. (contractile stalks) ; Epistylis, Ehr. (stalk rigid) ; Opercularia, Stein (stalk rigid, ciliated disk oblique ; an elongated peristomial collar, Fig. XXIII. 20).*~~

~~*Sub-family 2. Vaginicoline : animalcules secreting firm cup-like or tube-like membranous shells.*~~

~~*Genera.—Vaginicola, Lamarek (uo internal valve); Thuricola, Kent (with a door-like valve to the tube, Fig. XXIII. 25, 26) ; Cothurina, Ehr. (lorica or shell pedieulate ; no operculum); Pyxicola, Kent (lorica pedunculate, animal carrying dorsally a horny oper- culum, Fig. XXIII. 21, 22).*~~

~~*Sub-family 8. Ophrydina: animalcules secreting a soft gelatinous envelope.*~~

~~*Genera.—Ophionella, Kent ; Ophrydium, Ehr.*~~

~~*ORDER 2. HETEROTRICHA, Stein.*~~

~~*Characters. A band or spiral or cirelet of long cilia is developed in relation to the mouth (the heterotrichous band) corresponding to the adoral circlet of Peritricha; the rest of the body is uniformly beset with short cilia.*~~

~~*a,—Heterotrichal band circular.*~~

~~*Genera (selected).—Zintinnus, Schranck (Fig. XXIII. 3); Zri- chodinopsis, Cl. and L.; Codonella, Haeck. (with a peri-oral fringe of lappet-like processes) ; Calceolus, Diesing.*~~

~~*g.—Heterotrichal band spiral.*~~

~~*Genera (selected). —Stentor, Oken (Fig. XXIII. 2); Blepharisma, Perty (with an undulating membrane along the oral groove); Spirostomum, Ehr.. (oral groove linear and elongate, Fig. XXILI. 1); Leucophrys, Ehr. (oral groove very short).*~~

~~*y.—Heterotrichal band in the form of a simple straight or oblique adoral fringe of long cilia.*~~

~~*Genera (selected). —Bursaria, Miiller ; Nyctotherus, Leidy (with well-developed alimentary tract and anus, Fig. XX1V. 22); Balan- tidium, Cl. and L. (B. eolt parasitic in the human intestine).*~~

~~*OrpEr 3. HOLOTRICHA, Stein.*~~

~~*Characters.—There is no special adoral fringe of larger cilia, nor a band-like arrangement of cilia upon any part of the body ; short cilia of nearly equal size are uniformly disposed all over the surface. The adoral cilia sometimes a little longer than the rest.*~~

~~*a._With no membraniform expansion of the body wall.*~~

~~*Genera. Paramecium, Ehr. (Fig. XXV. 1, 2); Prorodon, Ebr.*~~

~~*BPRODO2O A*~~

~~*863*~~

~~*(Fig. XXIV. 13); Coleps, Ehr.; Enchelys, Uhr. ; Tracheloeerea, Khr. ; Trachelius, Ehr.; Amphileptus, Ehr.; Jethyophthirius, Fouquet (Fig. XXIV. 15).*~~

~~*g.—Body with a projecting membrane, often vibratile.*~~

~~*Genera.—Ophryoglena, Ehr.; Colpidiwm, Stein; Lembus, Cohn ; Trichonympha, Leidy (an exceptionally modified form, parasitic, Fig. XXIV. 3).*~~

~~*y.—Isolated parasitic forms, devoid of a mouth.*~~

~~*Genera.—Opalina, Purkinje (nuclei numerous, no contractile vacuole, Fig. XXIV. 4 to 8); Benedenia, Foett. ; Opalinopsis, Foett. (Fig. XXIV. 1, 2); Anoplophrya, Stein (large axial nucleus, numerous contractile vacuoles in two linear series, Fig. XXIV. 9 10); Haptophrya, Stein ; Hoplitophrya, Stein.*~~

~~*OrpER 4. HYPOTRICHA, Stein.*~~

~~*Characters.—Ciliata in which the body is flattened and the locomotive cilia are confined to the ventral surface, and are often modified and enlarged to the condition of musenlar appendages (sete so-called). Usually an adoral band of cilia, like that of Heterotricha. Dorsal surface smooth or provided with tactile hairs only. Mouth and anus conspicuously developed.*~~

~~*a.—Cilia of the ventral surface uniform, fine, and vibratile.*~~

~~*Genera.—Chilodon, Ehr. ; Loxodes, Ehr. ; Dysteria, Huxl. ; Huzleya, Cl. and L.*~~

~~*g.—Cilia of the ventral surface variously modified as sete (muscular appendages), styles, or uncini. ,*~~

~~*Genera.—Stylonichia, Khr. (Fig. OY, 1S) 2 Euplotes, Ehr. (Fig. XXIV. 20, 2M)*~~

~~*Oxytricha, Khr.;*~~

~~*Further remarks on the Ciliata.—The Ciliata have recently formed the subject of an exhaustive treatise by Mr Saville Kent (71) which is accessible to English readers. On the other hand Prof. Biitschli has not yet dealt with them in his admirable critical treatise on the Protozoa. Hence a large space has not been devoted in this article to the systematic classification and enumeration of their genera. See (79) and (98).*~~

~~*One of the most interesting features presented by the group is the presence in many of a cell anus as well as a cell mouth (Fig. XXIV. 22, d). In those devoid of an anus the undigested remnants of food are expelled either by a temporary aperture on the body-surface or by one opening into the base of*~~

~~*the pharynx. In many parasitic Ciliata, as in higher animal parasites, such as the Cestoid worms, a mouth is dispensed with, nutriment being taken by general imbibition and not in the solid form. Many Ciliata develop chlorophyll corpuscles of definite biconcave shape, and presumably have so far a capacity for vegetal nutrition. In Vorticella viridis the chlorophyll is uniformly diffused in the pro- toplasm and is not in the form of corpuscles (72).*~~

~~*The formation of tubes or shells and in connexion therewith of colonies is common among the Peritricha and Heterotricha. The cuticle may give rise to structures of some solidity in the form of hooks or tooth-like processes, or aS a lining to the pharynx (Fig. XXIV. 12).*~~

~~*The phenomena connected with conjugation and reproduction are very remarkable, and have given rise to numerous misconcep- tions. They are not yet sufficiently understood. It cannot be surely asserted that any Ciliate is at the present time known to break up, after encystment or otherwise, into a number of spores, although this was at one time supposed to be the rule. Icthyoph- thirius (Fig. XX1V. 15 to 18) and some Vorticelle (76) have been stated, even recently, to present this phenomenon ; but it is not impossible that the observations are defective. The only approach to a rapid breaking up into spores is the multiple formation (eight) of microgonidia or microzooids in Vorticellide (Fig. XXIII. 11, 12); otherwise the result of the most recent observations appears to be that the Ciliata multiply only by binary fission, which is very frequent among them (longitudinal in the Peritricha, transverse to the long axis in the others).*~~

~~*Several cases of supposed formation of spores within an adult Ciliate and of the production endogenously of numerous "* acineti- form young" have been shown to be cases of parasitism, minute unicellular parasites, ¢.g., parasitic Acinete (such as Spherophrya described and figured in Fig. XXVI.) being mistaken for the young.*~~

~~*The phenomenon of conjugation is frequent in the Ciliata, and is either temporary, followed by a separation of the fused individuals, as in most cases, or permanent, as in the case of the fertilization of normal individuals by the microgonidia of Vorticellide.*~~

~~*Since the process of conjugation or copulation is not followed by a formation of spores, it is supposed to have merely a fertilizing effect on the temporarily conjomed individuals, which nourish themselves and nultiply by binary fission more aetively after the process than before (hence termed " rejuvenescence)."*~~

~~*Remarkable changes have been from time to time observed in the nuclei of Ciliata during or subsequently to conjugation, and these were erroneously interpreted by Balbiani (73) as indicating the formation of spermatozoa and ova. The nuelei exhibit at one period great elongation and a distinct fibrillation, as in the dividing*~~

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~~*nuclei of tissue cells (compare Fig. I. and Fig. XXV. 9, 11, 17). The fibrille were supposed to be spermatozoids, and this erroneous view was confirmed by the observation of rod-like Bacteria (Schizomycetes) which in some instances infest the deeper proto- plasm of large Ciliata. : : é*~~

~~*The true history of the changes which oceur in the nuclei of conjugating Ciliata has been determined by Biitschli (74) in some typical instances, but the matter is by no means completely under- stood. The phenomena present very great obstacles to satis- factory examination on account of their not recurring very fre- quently and passing very rapidly from one phase to another. They have not been closely observed in a sufficiently varied number of genera to warrant a secure generalization. The follow- ing scheme of the changes passed through by the nuclei must be regarded as necessarily referring to only a few of the larger Heterotricha, Holotricha, and Hypotricha, and is only probably true in so far as details are concerned, even for them. It is at the same time certain that some such series of changes occurs in all Ciliata as the sequence of conjugation.*~~

~~*In most of the Ciliata by the side of the large oblong nucleus is a second smaller body (or even two such bodies) which has been very objectionably termed the nucleolus (Fig. XXV. 8), but is better ealled the " paranucleus" since it has nothing to do with the nucle- olus of a typical tissne-cell. When conjugation occurs and a "*syzygium"' is formed, both nucleus and paranucleus in each con- jugated animal elongate and show fibrillar*~~

~~*structure (Fig. XXV. 10). Each nucleus and paranucleus now divides into two, so that we get two nuclei and two paranuclei in each animal. . Elongation and fibrillation are then exhibited by each of these new elements and subsequently fission, so that we get four nuclei and four para- nuclei in each animal (11, 12). The fragments of the original nucleus (marked N in the figures) now become more dispersed and broken into further irregular fragments. Possibly some of them are ejected (so-called "cell excrement"); possibly some pass over from one animal to the other. Two of the pieces of the four-times- divided paranucleus now reunite (Fig. XXV. 13), and form a largish body which is the new nucleus. The remaining fragments of paranucleus and the broken down nucleus now gradually dis- appear, and probably as a remnant of them we get finally a few cor- puscles which unite to form the new paranucleus (14; 15). The conjugated animals which have separated from one another before the later stages of this process are thus reconstituted as normal Ciliata, each with its nuclens and paranucleus. They take food and divide by binary fission until a new period of conjugation arrives, when the same history is supposed to recur.*~~

~~*The significance of the phenomena is entirely obscure. It is not known why there should be a paranucleus or what it inay correspond to in other cells—whether it is to be regarded simply as a second nucleus or as a structurally and locally differentiated part of an erdinary cell-nuclens, the nucleus and the paranucleus together being the complete equivalent of such an ordinary nucleus. An attempt has been made to draw a parallel between this process and the essential features of the process of fertilization (fusion of the spermatic and ovicell nuclei) in higher animals; but it is the fact that concerning neither of the phenomena compared have we as yet sufficiently detailed knowledge to enable us to Judge conclusively as to how far any comparison is possible. Whilst there is no doubt as to the temporary fusion and admixture of the protoplasm of the conjugating Ciliata, it does not appear to be established that there 1s any transference of nuclear or paranuclear matter from one indi. vidual to the other in the form of solid formed particles.*~~

~~*_ Conjugation resulting merely in rejuvenescence and ordinary fis- sive activity is observed in many Flagellata as well as in the Ciliata. . _ A noteworthy variation of the process of binary fission occurring in the*~~

~~*parasite Opalina deserves distinct notice here, since it is inter- mediate in character between ordinary binary fission and that multiple fission which so commonly in Protozoa ig known as spore- formation. In Opalina (Fig. XXIV. 4) the nucleus divides as the animal grows; and we find a great number of regularly disposed Separate nuclei in its protoplasm. (The nuclei of many other Ciliata have recently been shown to exhibit extraordinary branched and even " fragmented " forms; compare Fig. XXIV. 2.) Ata certain stage of growth binary fission of the whole animal sets in, and growth ceases. Consequently the products of fission become smaller and smaller (Fig. XXIV. 6). At last the fragments contain each but two, three, or four nuclei. Each fragment now becomes encased in a spherical cyst (Fig. XXIV. 7). If this process had occurred rapidly, we should have had a uninucleate Opalina breaking up at once into fragments (as a Gregarina does), each fragment being a spore and enclosing itself in a Spore-case. The Opalina ranarum puma ake rectum of the Frog, and the encysted spores are in the early part of the year. They pass out into the water and undergo no change unless swallowed by a Tadpole, in the intestine of which they forthwith develop. From each spore- case escapes a uninucleate embryo (Fig. XXIV. 8), which absorbs nourishment and grows. As it grows its nucleus divides, and so the large multinucleate form from which we started is reattained.*~~

~~*PRO'TFOZOA*~~

~~*[CILIATA.*~~

~~*This history has important bearings, not only on the nature of sporulation, but also on the question of the significance of the multinucleate condition of cells. HIere it would seein that the formation of many nuclei is merely an anticipation of the retarded fissive process.*~~

~~*It is questionable how far we are justified in closely associating Opalina, in view of its peculiar nuclei, with the other Ciliata. It seems certain that the worin-parasites sometimes called Opaline, but more correctly Anaplophrya, &c., have no special affinity with the true Opalina. They not only differ from it in having one large nucleus, but in having numerous very active contractile vacuoles*~~

~~75).~~

~~es it has been shown, more especially by Gruber (84), that many Ciliata are multinucleate, and do not possess merely a single nucleus and a paranucleus. In Oxytricha the nuclei are large and numerous (about forty), scattered through the protoplasm, whilst in other cases the nucleus is so finely divided as to appear like a powder or dust diffnsed uniformly through the medullary proto- plasm (Trachelocerca, Choenia). Carmine staining, after treatment with absolute alcohol, has led to this remarkable discovery. The condition described by Foettinger (85) in his Opalinopsis (Fig. XXIV. 1, 2) isan example of this pulverization of the nucleus. The condition of pulverization had led in some cases to a total failure to detect any nucleus in the living animal, and it was only by the use of reagents that the actual state of the case was revealed. Curiously enough, the pulverized nucleus appears periodically to form itself by a union of the scattered particles into one solid nucleus just before binary fission of the animal takes place ; and on the completion of fission the nuclei in the two new individuals break up into little fragments as before. The significance of this observation in relation to the explanation of the proceedings of the nuclei during conjugation cannot be overlooked. It also leads to the suggestion that the animal cell may at one time in the history of evolution have possessed not a single solid nucleus but a finely molecular powder of chromatin-substance scattered uniformly through its protoplasm, as we find actually in the living Trachelo- cerca. 4 Some of the Ciliata (notably the common Vorticelle) have been observed to enclose themselves in cysts ; but it does not appear that these are anything more than " hypnocysts" from which the animal emerges unchanged after a period of drought or deficiency of food. At the same time there are observations which seem to indicate that in some instances a process of spore-formation may occur within such cysts (76).~~

~~The differentiation of the protoplasm into cortical and medul- lary substance is very strongly marked in the larger Ciliata. The food-particle is carried down the gullet by ciliary currents and is forced together with an adherent drop of water into the medullary protoplasm. Here a slow rotation of the successively formed food-vacuoles is observed (Fig. XXV. 2, 1, m, n, 0), the water being gradually removed as the vacuole advances in position. It was the presence of numerous successively formed vacuoles which led~~

~~*Ehrenberg to apply to the Ciliata the not altogether inappro- priate name "' Polygastrica." The chemistry of the digestive pro- cess has not heen successfully studied, but A. G. Bourne (8) has shown that, when particles stained with water-soluble anilin blue are introduced as food into a Vorticella, the colouring matter is rapidly excreted by the contractile vacuole in a somewhat concen- trated condition.*~~

~~*The differentiation of the protoplasm of Ciliata in some special cases as "muscular" fibre cannot be denied. The contractile filament in the stalk of Vorticella is a muscular fibre and not simple undifferentiated contractile protoplasm ; that is to say, its change ot dimensions is definite and recurrent, and is not rhythinie, as is the flexion of a cilium. (Perhaps in ultimate analysis it is impossible to draw a sharp line between the contraction of one side of a ciliam which causes its flexion and the rhythmical contraction of some muscular fibres.) The movements of the so-called "sete " of the Hypotricha are also entitled to be called " muscular," as are also the general contractile movements of the cortical substance of large Ciliata. Haeckel (77) has endeavoured to distinguish various layers in the cortical substance; but, whilst admitting that, as in the Gregarine, there is sometimes a distinct fibrillation of parts of this layer, we cannot assent to the general distinction of a *"myophane" layer as a component of the cortical substance.*~~

~~*Beneath the very delicate cuticle which, as a mere superficial pellicle of extreme tenuity, appears to exist in all Ciliata we freqnently find a layer of minute oval sacs which contain a spiral thread ; the threads are everted from the sacs when irritant reagents are applied to the animal (Fig. XXV. 2, g, h). These were discovered by Allman (78), and by him were termed " tricho- cysts." They appear to be identical in structure and mode of formation with the nematocysts of the Ccelentera and Platyhelmia. Similar trichocysts (two only in number) are found in the spores of the Myxosporidia (see ante, page 855).*~~

~~*The comparative forms of the nucleus and of the contractile vacuoles, as well as of the general body-form, &c., of Ciliata may*~~

~~*ACINETARIA.* |~~

~~be learnt from an examination of Figs. XXIII., XXIV., XXV., and the explanations appended to them. ;~~

~~Ciass VI. ACINETARIA, Lankester (Tentaculifera, Huxley).~~

~~Characters. —Wighly specialized Corticate Protozoa, probably derived from Ciliata, since their young forms are provided with a more or less complete investment of cilia. They are distinguished by having no vibratile processes on the surface of the body in the adult condition, whilst they have few or many delicate but firm~~

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~~Fig. XX VI.—Acinetaria.~~

~~1. Rhyneheta cyclopum, Zenker. 4, nucleus; b, contractile vacuole ; only a single tentacle, and that suctorial ; x 150. Parasitic on Cyclops. 2. Spherophrya urostylz, Maupas ; normal adult; x 200. a, nucleus; b, contractile vacuole. Parasitic in Urostyla. 3. The same dividing by transverse fission, the anterior moiety with tem- porarily developed cilia. a, nucleus ; b, contractile vacuole. 4, 5, 6. Spherophrya stentorea, Maupas; x 200. Parasitic in Stentor, and at one time mistaken for its young. 7. Trichophrya epistylidis, Cl. and L. ; x 150. a, nucleus; 6, contractile vacuole. 8. Hemiophrya gemmi- para, Hertwig; x 400. Example with six buds, into each of which a brauch of the nucleus a is extended. 9. The same species, showing the two kinds of tentacles (the suctorial and the pointed), and the con- tractile vacuoles }. 10, Ciliated embryo of Podophrya Steinit, Cl. and~~

~~Thy «800. ll. Acincta grandis, Saville Kent; x 100; showing pedun- culated lorica, and animal with two bunches of entirely suctorial tentacles. | a, nucleus. 12. Sphwerophrya magna, Maupas; xX 300. It has seized |~~

~~| fused individuals,~~

~~*with its tentacles, and is in the act of sucking out the juices of six examples of the ciliate Colpoda parvifrons. 13. Podophrya elongata, Cl, and L.; % 150. a, nucleus; 6, contractile vacuole. 14. Hemiophrya Benedenit, Fraip.; x 200; the suctorial tentacles retracted. 15. Dendrocometes paradoxus, Stein; x 350. Parasitic on Gammarus pulex. a, nucleus; b, contractile vacuole; ¢, captured prey. 16. A single tentacle of Podophrya; x 800. (Saville Kent.) 17-20. Dendrosoma radians, Ehr.: —17, free-swimming ciliated embryo, x 600 ; 18, earliest fixed condition of the embryo, x 600; 19, later stage, a single tentaculiferous process now developed, x 600; 20, adult colony; ¢, enclosed ciliated embryos; d, branching stolon; e, more minute reproductive (2) bodies. 21. Ophryo- dendron pedicellatum, Hincks; x 300. tentacle-like processes, which are either simply adhesive or tubular and suctorial. In the latter case they are provided at their ex- tremity with a sucker-disk and have contractile walls, whereas in the former case they have more or less pointed extremities. The Acinetaria are sedentary in habit, even if not, as is usual, per- manently fixed by a stalk. The nucleus is frequently arboriform. Reproduction is effected by simple binary fission, and by a modified fission (bud-fission) by which (as in Reticularia and Arcella) a number of small bud-like warts containing a portion of the branched parental nucleus are nipped off from the parent,. often simul- tancously (Fig. XXVI. 8). These do not become altogether dis- tinct, but are for a time enclosed by the parental cell each in a sort of vacuole or brood-chamber, where the young Acinetarian develops a coat or band of cilia and then escapes from the body of its parent (Fig. XXVI. 10,17). After a brief locomotive existence, it becomes sedentary, develops its tentacles, and loses its cilia. The Acinetaria have one or more contractile vacuoles. Their nutrition is holozoic. : The surface of the body in some cases is covered only by a delicate cuticle, but in other cases a definite membranous shell or cup (often stalked) is produced. Freshwater and marine. See Fraipont*~~

~~*(89).*~~

~~*OrpER 1. SUCTORIA, Kent.*~~

~~*A greater or less proportion or often all of the tentacles are suctorial and terminated with sucker-like expansions.*~~

~~*Genera.—Rhyncheta, Zenker (stalkless, naked, with only one tentacle ; epizoic on Cyclops; Fig. XXVI.1); Urnula, C. and L. ; Spherophrya, C. and L. (naked, spherical, with distinctly capitate tentacles only ; never with a pedicle; parasitic within Ciliata, supposed young ; Fig. XXVI. 2-6, 12); Trichophrya, C. and L. (as Spherophrya, but oblong and temporarily fixed without a pedicle); Podophrya, Ehr. (naked, solitary, globose, ovate or elongate, fixed by a pedicle; tentacles all suctorial, united in fascicles or distri- buted irregularly; Fig. XX V1. 10, 13, 16) ; Hemiophrya, 8. Kent (as Podophrya, but the tentacles are of the two kinds indicated in the definition of the group; Fig. XXVI. 8, 9, 14); Podocyathus, 8. Kent (secreting and inhabiting stalked membranous cups or lorice ; ten- tacles of the two kinds); Solenophrya, C. and L. (with a sessile lorica ; tentacles only suctorial) ; Acineta, Ehr. (as Solenophrya, but the lorica is supported on a pedicle; Fig. XXVI. 11); Dendro- cometes, Stein (cuticle indurated ; solitary, sessile, discoid ; tentacles peculiar, viz., not contractile, more or less branched, root-like, and perforated at the extremities and suctorial in function ; Fig. XXVI. 15). Dendrosoma, Ehr. (forming colonies of intimately with a basal adherent protoplasmic stolon and upstanding branches the termination of which bear numerous capi- tate suctorial tentacles only ; Fig. XX VI. 17-20).*~~

~~*OrvDER 2. NON-SUCTORIA, Lankester (= Actinaria, Kent).*~~

~~*Characters.—Tentacles filiform, prehensile, not provided with a sucker. :*~~
~~*Genera.—Ephelota, Str. Wright (solitary, naked, pedunculate,*~~

~~*| with many flexible inversible tentacles) ; Actinocyathus, 8S. Kent ;*~~

~~*Ophryodendron, C. and L. (sessile, with a long, extensile, anterior proboscis bearing numerous flexible tentacles at its distal extremity ; Fig. XXVI. 21); Acinetopsis, Robin (ovate, solitary, secreting a stalked lorica ; from the anterior extremity of the animal is deve- loped a proboscis-like organ which does not bear tentacles).*~~

~~*Further remarks on the Acinetaria.—The independence of the Acinetaria was threatened some years ago by the erroneous view of Stein (79) that they were phases in the life-history of Vorticellide. Small parasitic forms*~~

~~(Spherophrya) were also until recently regarded erroneously as the "acinetiform young" of Ciliata.~~

~~They now must be regarded as an extreme modification of the Protozoon series, in which the differentiation of organs in a unicellular animal reaches its highest point. The sucker-tentacles of the Suctoria are very elaborately constructed organs (see Fig. XXVI. 16). They are efficient means of seizing and extracting the juices of another Protozoon which serves as food to the Acinetarian. The structure of Dendrosoma is remarkable on account of its multicellular character and the elaborate differentiation of the reproductive bodies.~~

~~The ciliation of the embryos or young forms developed from the buds of Acinetaria is an indication of their ancestral connexion with the Ciliata. The cilia are differently disposed on the young of the various genera (see Fig. XXVI. 10, 17).~~

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~~PROUDHON, Pierre JosepH (1809-1865), a well- known revolutionary writer, was born in 1809 at Besancon, France, the native place also of the socialist Fourier. HIs origin was of the humblest, his father being a brewer's cooper; and the boy herded cows and followed other simple pursuits of a like nature. But he was not entirely self-educated ; at sixteen he entered the college of his native place, though his family was so poor that he could not procure the necessary books, and had to borrow them from his mates in order to copy the lessons. There isa story of the young~~

~~*Proudhon returning home laden with prizes, but to find that there was no dinner for him. At nineteen he became a working compositor; afterwards he rose to be a corrector for the press, reading proofs of ecclesiastical works, and thereby acquiring a very compet- ent knowledge of theology. In this way also he came to learn Hebrew, and to compare it with Greek, Latin, and French; and it was the first proof of his intellectual audacity that on the strength of this he wrote an " Essai*~~

~~*de grammaire générale." As Proudhon knew nothing |*~~

~~*whatever of the true principles of philology, his treatise was of no value. In 1838 he obtained the pension Suard, a bursary of 1500 franes a year for three years, for the encouragement of young men of promise, which was in the gift of the academy of Besangon. In 1839 he wrote a treatise "On the Utility of Keeping the Sunday," which contained the germs of his revolutionary ideas. About this time he went to Paris, where he lived a poor, ascetic, and studious life.—making acquaintance, however, With the socialistic ideas which were then fomenting in the capital. In 1840 he published his first work Qw est-ce que la Propriété? His famous answer to this question, "La propricté, c'est le vol," naturally did not please the academy of Besancon, and there was some talk of with- drawing his pension ; but he held it for the regular period.*~~

~~*For his third memoir on property, which took the shape of a letter to the Fourierist, M. Considérant, he was tried at Besangon but was acquitted. In 1846 he published his greatest work, the Systéme des Contradictions économi- ques ou Philosophie de la Misére. For some time Proud- hon carried on a small printing establishment at Besancon, but without success ; afterwards he became connected as a kind of manager with a commercial firm at Lyons. In 1847 he left this employment, and finally settled in Paris, Where he was uow becoming celebrated as a leader of innovation. He regretted the sudden outbreak of the*~~

~~*revolution of February (1848), becausc it found the social*~~

~~*reformers unprepared. But he threw himself with ardour into the conflict of opinion, and soon gained a national notoriety. He was the moving spirit of the Représentant du Peuple and other journals, in which the most advanced*~~

theories were advocated in the strongest language ; and as member of assembly for the Seine department he brought forward his celebrated proposal of exacting an impost of one-third on interest and rent, which of course was rejected. His attempt to found a bank which should operate by granting gratuitous credit was also a complete failure ; of the five million francs which he required only seventeen thousand were offered. The violence of his utterances led to an imprisonment at Paris for three years, during which he married a young working woman. As Proudhon aimed at economic rather than political innova-

_tion, he had no special quarrel with the second empire,

and he lived in comparative quiet under it till the publica- tion of his work, De la Justice dans la Révolution et dans ?kglise (1858), in which he attacked the church and other existing institutions with unusual fury. This time he fled to Brussels to escape imprisonment. On his return to France his health broke down, though he continued to write. He died at Passy in 1865.

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Personally Proudhon was one of the most remarkable figures of modern Franee. His life was marked by the severest simplicity and even Puritanism ; he was affectionate in his domestic relations, a most loyal friend, and strictly upright in conduct. He was strongly opposed to the prevailing I'rench socialism of his time because of its utopianism and immorality ; and, though he uttered all manner of wild paradox and vehement invective against the dominant ideas and institutions, he was remarkably free from feel- ings of personal hate. In all that he said and did he was the son of the people, who had not been broken to the usual social and academic diseipline; hence his roughness, his one-sidedness, and his exaggera- tions ; but he is always vigorous, and often brilliant and original.

It would of course be impossible to reduce the ideas of such an irregular thinker to systematic form. In later years Proudhon him- self confessed that "the great part of his publications formed

only a work of dissection and ventilation, so to speak, by means of |

~~which he slowly makes his way towards a superior conception of political and economic laws." is clear and firm ; no one could insist with greater emphasis on the~~

~~demonstrative character of economic principles as understood by |~~

~~himself. He strongly believed in the absolute truth of a few moral ideas, with which it was the aim of his teaching to mould and suffuse political economy. Of these fundamental ideas, justice, liberty, and equality were the chief. What he desiderated, for instance, in an ideal society was the most perfect equality of remuneration. It was his principle that service pays service, that a day's labour balances a day's labour—in other words, that the duration of labour is the just measure of value. He did not shrink from any of the consequences of this theory, for he would give the same remuneration to the worst mason as toa Phidias ; but he looks forward also to a period in human development when the present inequality in the talent and capacity of men would be reduced to an inappreciable minimum. equivalent of service is derived his axiom that property is the right of aubaine. The awbain was a stranger not naturalized ; and the~~

~~right of aubaine was the right in virtue of which the sovereign |~~

~~claimed the goods of such a stranger who had died in his territory. Property isa right of the same nature, with a like power of appro- priation in the form of rent, interest, &c. labour, consumes without producing, and enjoys without exertion.~~

~~Proudhon's aim, therefore, was to realize a science of society resting |~~

~~on principles of justice, liberty, and equality thus understood ; "a~~

~~science absolute, rigorous, based on the nature of man and of his |~~

~~faculties, and on their mutual relations ; a science which we have not to invent, but to discover." But he saw clearly that such ideas with their necessary accompaniments could only be realized through a long and laborious process of social transformation. As we have said, he strongly detested the prurient immorality of the schools of Saint-Simon and Fourier.~~

~~*He attacked them not less bitterly for thinking that society could be changed off-hand by a ready-made and complete scheme of reform. It was "the most accursed lie," he said, "that could be offered to mankind." In social change he distinguishes between the transition and the per- fection or achievement. With regard to the transition he advocated the progressive abolition of the right of awbaine, by reducing interest, rent, &c. For the goal he professed only to give the general principles; he had no ready-made scheme, no utopia. The positive organization of the new society in its details was a labour that would require fifty Montesquieus. The organization he desired was one on collective principles, a free association which would take account of the division of labour, and which would maintain the personality both of the man and the citizen. With his strong and fervid feeling for human dignity and liberty, Proudhon could not have tolerated any theory of social change that did not give full scope for the free development of man. Connected with this was his famous paradox of anarchy, as the goal of the free development of society, by which he meant that through the ethical progress of men government should become unnecessary. '"'Government of man by man in every form," he says, "is oppression. The highest perfection of society is found in the union of order and anarchy."*~~

~~*Proudhon's theory of property as the right of aubaine is substan- tially the same as the theory of capital held by Marx and most of the later socialists. Property and capital are defined and treated as the power of exploiting the labour of other men, of claiming the results of labour without giving an equivalent. Proudhon's famous paradox, "La propriété, c'est le vol," is merely a trenchant expression of this general principle. As slavery is assassination inasmuch as it destroys all that is valuable and desirable in human personality, so property is theft inasmuch as it appropriates the value produced by the labour of others in the form of rent, interest, or profit without rendering an equivalent. For property Prondhon would substitute individual possession, the right of occupation being equal for all men (see SOCIALISM).*~~

~~*The principal works of Proudhon have already been mentioned. A complete edition, including his posthumous writings, was published at Paris, 1875. See P. J. Proudhon, sa vie et sa correspondance, by Sainte-Beuve (Paris, 1875), an*~~

~~*admirable work, unhappily not completed; also Revue des Deux Mondes, Jan. 1866 and Feb. 1873, ins)*~~

~~*Yet the groundwork of his teaching |*~~

~~*From the great principle of service as the |*~~

~~*It reaps without |*~~

~~*867*~~

~~*PROUT, Samuet (1783-1852), water-colour painter, was born at Plymouth on September 17, 1783. His education in art was obtained by a patient and enthiusi- astic study of nature. He spent whole summer days, in company with the ill-fated Haydon, in drawing the quiet cottages, rustic bridges, and romantic water-mills of the beautiful valleys of Devon. He even made a journey through Cornwall, to try his hand in furnishing sketches for Britton's Beauties of England. On his removal in 1803 to London, which became his headquarters after 1812, a new scene of activity opened up before Prout. He now endeavoured to correct and improve his style by the study of the works of the rising school of land- scape. To gain a living he painted marine pieces for Palser the printseller, received pupils, aud published many drawing books for learners. He was likewise one of the first who turned to account in his profession the newly-invented art of lithography. In spite of all this industry, however, it was not until about 1818 that Prout discovered his proper sphere. Happening at that time to make his first visit to the Continent, and to study the quaint streets and market-places of Continental cities, he suddenly found himself in a new and enchanting province of art. All his faculties, having found their congenial element, sprung into unwonted power and activity. His eye readily caught the picturesque features of the architec- ture, and his hand recorded them with unsurpassed felicity and fine selection of line. The composition of his draw- ings was exquisitely natural; their colour exhibited "the truest and happiest association in sun and shade"; the picturesque remnants of ancient architecture were rendered with the happiest breadth and largeness, with the heartiest perception and enjoyment of their time-worn ruggedness ; and the solemnity of great cathedrals was brought out with striking effect. Encouraged by this success, Prout continued most enthusiastically to*~~

~~pursue that path upon which he had unexpectedly come. At the time of his death, 10th February 1852, there was scarcely a nook in France, Germany, Italy, and the Netherlands where his quiet, benevolent, observant face had not been seen search- ing for antique gables and sculptured pieces of stone. In Venice especially there was hardly a pillar which his eye had not lovingly studied and his pencil had not dexter-~~

~~ously copied.~~

~~See a memoir of Prout, by Johu Ruskin, in Aré Journal for 1849, and the same author's Notes on the Fine Art Soctety's Loan Col- lection of Drawings by Samuel Prout and William Hunt, 1879-80.~~

~~PROVENCAL LANGUAGE AND LITERATURE. I. Lancuacr.—Provengal is a name used to comprehend all the varieties of Romanic speecli formerly spoken and written, and still generally used by country people, in the south of France. The geographical limits of this infinitely varied idiom cannot be defined with precision, because it is conterminous on the north, south, and east with idioms of the same family, with which almost at every point it blends by insensible gradations. Roughly speaking, it may be said to be contained between the Atlantic on the west, the Pyrenees and Mediterranean on the south, and the Alps on the east,and to be bounded on the north by a line pro- ceeding from the Gironde to the Alps, and passing through the departments of Gironde, Dordogne, Haute Vienne, Creuse, Allier, Loire, Rhone, Istre, and Savoie. These limits are to some extent conventional. 'True, they are fixed in accordance with the mean of linguistic characters ; but it is self-evident that according to the importance attached to one character or another they may be deter- mined differently.~~

~~1. Different Names.—Though the name Provengal is generally adopted to designate the Romanic idiom of this | region, it must not be supposed that this name has been~~

~~imposed by general consensus, very firm historical basis. In the southern part of Gaul, Romanic developed itself, so to say, in the natural state of language. Contrary to what took place in other Romanic countries, no local~~

~~*variety here raised itself to the rank of the literary idiom par excellence. While in Italy the Florentine, in France the French dialect proper (that is to say, the dialect of the fle de France), succeeded little by little in monopolizing literary use, to the exclusion of the other dialects, we do not find that either the Mar- seillais or the Toulousain idiom was ever spoken or written outside of Marseilles or "oulouse. In consequence of this*~~

~~*circumstance, no name originally designating the language | ' TO | no doubt that to the Spaniards he joined more correctly*~~

~~*of a town or of a small district came to be employed to designate the language of the whole of southern France ; and on the other hand the geographical region described above, having never had any special name, was not able to give one to the idiom.*~~

~~*In the Middle Ages the idiom was spoken of under various appellations: Romans or lenga Romana was that most generally used. authors of the Leys d@Amors, a treatise on grammar,*~~

~~*poetry, and rhetoric, composed at Toulouse in the 14th | century. But this term, which is capable of being applied, ,*~~

~~*and which, in fact, has been applied, to each of the Romanic languages individually, is too general to be retained. It is, however, that which was revived in the beginning of the present century by Raynouard, the author of the Lexiqgue roman. It is now abandoned. In the 13th century a poet born in Catalonia, on the southern slope of the Pyrenees, Raimon Vidal of Besalu, introduced the name of Limousin language, probably on account of the great reputation of some Limousin troubadours, but he took care to define the expression, which he extended beyond its original meaning, by saying that in speaking of Inmousin he must be understood to include Saintonge,*~~

~~*This expression found favour in Spain, and especially in Catalonia, where the little treatise of Raimon Vidal was extensively read. The most ancient lyric poetry of the Catalans (13th and 14th centuries), composed on the model of the poetry of the troubadours, was often styled in Spain poesia*~~

~~lemosina, and in the same country lengua lemosina long designated at once the Provencal and the old literary Catalan.~~

~~The name Provengal as applied to language is hardly met with in the Middle Ages, except in the restricted sense of the language of Provence proper, i.¢., of the region lying south of Dauphiné on the eastern side of the Rhone. Raimon Feraut, who composed, about 1300, a versified life of St Honorat, uses it, but he was himself a native of Provence. We can also cite the title of a grammar, the Donatz Proensals, by Hugh Faidit (about 1250) ; but this work was composed in north Italy, and we may con- ceive that the Italians living next to Provence employed the name Provengal somewhat vaguely without inquiring into the geographical limits of the idiom so called. In fact the naine Provengal became traditional in Italy, and in the beginning of the 16th century Bembo could write, " Era per tutto il Ponente la favella Provenzale, ne tempi ne quali ella fiorf, in prezzo et in istima molta, et tra tutti gli altri idiomi di quelle parti, di gran lunga primiera. Conciosiacosa che ciascuno, o Francese, o Fiamingo, o Guascone, o Borgognone, o altramente di quelle nationi che egli si fosse, il quale bene scrivere e specialmente verseggiar volesse, quantunque egli Provenzale non fosse, lo faceva Provenzalmente" (Prose, ed. 1529, fol. vile)~~

~~PROVENOAL~~

~~or that it rests upon any | This passage, in which the primacy of the Provengal~~

~~[LANGUAGE.~~

~~tongue is manifestly exaggerated, is interesting as showing the name Provencal employed, though, with little pre- cision, in the sense in which we now apply it.~~

~~Another designation, which is supported by the great authority of Dante, is that of langued'oc. In his treatise De Vulgari Eloquo (bk i. chaps. viii. and ix.), the Floren- tine poet divides the languages of Latin origin into three idioms, which he characterizes by the affirmative par- ticles used in each, oc, o#l, st; 'nam alii oc, alii oil, alii st affirmando loquuntur, ut puta~~

~~*Hispani, Franci, et Latini." As is seen, he attributes the affirmation oc to the Spaniards, which is of course erroneous, but there is*~~

~~*the inhabitants of southern France, for in the Vita nuova, chap. xxv., he speaks of the /ingua d'oc as having been long celebrated for its poets, which can apply only to the lan- guage of the troubadours. The name langue d'oc occurs*~~

~~*| also as early as the end of the 13th century, in public _acts, but with a different sense, that of the province of It is notably that employed by the |*~~

~~*Languedoc, as constituted after the union of the county of Toulouse to the French king's dominion in 1271. In the royal acts of the end of the 13th and of the 14th century partes lingux occitane or pays de langue doc designates the union of the five seneschalates of Périgueux, Carcassone, Beaucaire, Toulouse, and Rhodez, that is to say, the province of Languedoc, such as it existed till 1790. Some scholars, following the example of Dante, still actually use the term langue d'oc in opposition to langue dour, but these names have the inconvenience that they take such a secondary fact as the form of the affirmative particle as an essential character. Moreover it can hardly help to dis- tinguish the other Romanic languages, as langue de st would cause a confusion between Italian and Spanish. Provengal, without being entirely satisfactory, since in*~~

~~*_ principle it applies solely to the language of Provence, is, Quercy, Auvergne, &c. (Fasos de trobar, ed. Stengel, p. 70). |*~~

~~*notwithstanding, the least objectionable name that can be adopted. In addition to its being in some sort conse- crated by the use made of it by the Italians, who were the first after the Renaissance to study the works of the troubadours, it must not be forgotten that, just as the Roman Provincia, in which the name originated, extended across the south of Gaul from the Alps to Toulouse and the Pyrenees, so still in the Middle Ages Provincia, Provinciales, were understood in a very wide sense to designate not only Provence strictly so called, zc. the*~~

~~*| present departments of Alpes Maritimes, Basses Alpes,*~~

~~*Var, Bouches du Rhéne, but also a very considerable part of Languedoc and the adjacent countries. Thus in the 12th century the chronicler Albert of Aix-la-Chapelle*~~

~~*| (Albertus Aquensis) places the town of Puy (Haute Loire) an Provincia.*~~

~~*2. General Characters of the Language in its Ancient State.—The Provencal language, within the limits above indicated, cannot be said to have any general characters really peculiar to it. Such of its characters as are found in all the varieties of the language are met with also in neighbouring idioms; such as are not found elsewhere are not general characters, that is to say, are manifested 'only In certain varieties of Provengal. In reality '" Provengal language" does not designate, properly speaking, a linguistic unity; 1t is merely a geographical expression.*~~

~~*Tonic or Accented Vowels.—Latin a is preserved in an open syllable amare, amar, amatum, amat, as well as in a closed syllable carnem, carn, This character is common also to the Romanic of Spain and Italy; but it is one of the best distin guish- ing marks between Provencal and French, for, to the north, this a, when in an open syllable, does not pass beyond a line which*~~

~~*Mv "The Provengal speech in the times in which it flourished was prized and held in great esteem all over the West, and among all the other idioms of that region was Ly far the foremost : so that every one,*~~

~~*whether Frenchman Fleming, Gascon, Burgundian, or of what nation Soever, who wished to write and versify well, although he was not a Provengal, did it in the Provengal language."*~~

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~~*would run approximately through Blaye, Coutras (Gironde), Riberae, Nontron (Dordogne), Bellac (Haute Vienne), Boussac (Creuse), Montlugon, Gannat (Allier), Montbrison (Loire). Start- ing eastward from Lyons or thereabouts, there appears a notable linguistic fact which is observable in varied proportions in the*~~

~~*departments of Ain, Isere, and Savoie, and in Romanic Switzer- |*~~

~~land. This is, that accented Latin a in an open syllable, when~~

~~preceded by a mouzllure or palatalization (whatever the origin |~~

~~of this), becomes ¢; on the contrary, when there is no mouwéllure, it remains a. Thus we find in the Meditations of Marguerite d'Oingt (Lyons, about 1300) ensennier, deleitier, as against desirrar, recontar, regardar. Of these two endings, the former, -ter, is that which is found regularly in French, the second that which is regular in Pr. Pure Pr. would have -ar in both cases (ensenhar, deleitar, desirrar, &c.); Fr. would have. -ier (enseignier, delitier) and -er (destrer). Prof. Ascoli has given the name of Franco-provencal (franco-provenzale) to the varieties of Romanie in which we find this duality of treatment of Latin a,~~

~~according as it was or was not preceded by a palatalized sound. |~~

~~Lat. 2 % become close ¢ (Ital., ¢ chiwso; Fr. é): habére aver, erédet eve, mé(n)sem mes, fidem fe, pilum pel. This character is not only common to Italian and Spanish, but also extends over the French domain on its western side as far as Britanny. Certain exceptions noticed in French do not occur in Pr.: thus mercédem, eéra, pr(eh)e(u)sum, venénum, which give in Fr. merei, etre, pris, venin, where we should have expected mereei, ceire, preis, venein, give regularly in Pr. meree, cera, pres, vere. Lat. &@ preserves, as in Italy, the sound of open ¢ (Ital., e aperto): pédem, pe, lévat, leva, lEporem, lebre. In certain determinate cases, this e from about the 13th century onwards may diphthongize to ze: égo, ew, then teu, héri, er, ter, férit, fer, fier. Lat. 7 is preserved, as in all the iomanic languages: amicum, amt, ripa, riba. Lat. 7% is treated lke z long when it precedes (with hiatus) another vowel : pium, pia, piu, pia, via, via, ligat, lia. Lat. 6, % result in one and the same sound, that of Italian w, Fr. ow (Eng. 00). The same phenomenon takes place in the north of Italy, and in the Romanic of Switzerland. 'This sound, which is styled by the Donat Proensal the o estrett (elose 0), is usually symbolized in the early texts by simple 0, and is thus confounded in spelling, though not in pronunciation, with the open o (0 lare of the Donatz Proensals) which comes from Lat. 8. Lat. @ becomes % (i.¢., Fr. 2), as all over France, and also in North Italy and Catalonia: Intirum, mur (=miir), dirum, dur (=diir). Lat. aw is rigorously preserved over the whole extent of the Pr. domain: aurum, aur, alauda, alauza, pauperem,~~

~~*paubre. At present the preservation of Lat, aw does not extend much outside the Prov. domain; it is, however, found in certain parts of the Ladino zone in Switzerland (upper Rhine valley), and in Friuli, and it is to be supposed to have been once general over the whole of that Zone. It is attested as late as the 16th century in the Vaudois valleys of Piedmont, and there are also examples of it in old Catalan. Elsewhere the diphthong has regularly become open o (aurum, It. and Sp. ovo, Fr. or, &c.).*~~

~~*Atonte Vowels.—The atonic vowels (7.e., vowels of the unac- cented syllables) which precede the accented syllable present no very characteristic phenomenon ; but it is otherwise with those that follow the accented syllable, the post-tonic vowels. The Pr. is one of the Romanic idioms which, like the French, but unlike the Castilian and the dialects of central and northern Italy, admit of only one syllable after the accent. But the rules are not quite the same as in French. In French the only vowel which can stand after the accented syllable is "e feminine," otherwise called "'e mute." In Prov. a and e are the most frequent vowels in this position, but 7 and o also occur. In French the first of the two post-tonic vowels of a Lat. proparoxytone always disappears ; in Prov. it tends to be preserved, when followed by one of the consonants », 7, J, d: te'rminum, te'rmen, ho'minem, o'men, angclum, angel, se'calem, se'guel, cre'scere, crei'sser, tespidum, te°bez. Finally, Prov. presents in certain words coming from Lat. pro- paraxytones the trace of forms which (like Ital.) admitted two atonic vowels after the accented sylHable: thus we have porte gue and po'rgue (po'rticum), Fabre'ga, a place name, and fa'rga (fa'brica), perte'ga and perga (pe*rtica), feme'na and fe-mna (fe'mina). We have also lagre*ma (la'eryma), but a form accented like Fr. Jarme does not exist. There seems to be no doubt that these forms in which a displacement of the Latin accent is observed were at an earlier period pronounced as proparaxytones (po'rtegue, fa'brega, pe rtega, fe'mena, la' grema).*~~

~~*Consonants.—The boundary usually recognized between Prov. and French is founded upon linguistic characters furnished by the vowels, especially a; if it had been determined by characters furnished by the consonants, the line of demarcation would have to be drawn farther south, becanse the consonantal system which is regarded as proper to French really extends in*~~

~~its main features over the northern zone of the Provencal region as defined above. As with the vowels, only a few of the salient facts cau here be~~

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~~indicated. C initial, or second consonant of a group, before a (caballum, mercatum), preserves its Lat. sound (=£) in the greater part of the Prov. region. But in the northern zone it takes the sound of teh (Eng. ef in chin) as in O. Fr., and this sound is still pretty well preserved, although there is here and there a tendency to the present sound of ch in Fr. (=sh Eng.). The place names Castellum, Castanétum, Casale, give Chastel, Chastanet, Chazal, in Dordogne, Haute Vienne, Corréze, Puy de~~

~~| Dome, Cantal, Haute Loire, the north of Lozére, of Ardéche, of~~

~~Drome, of Isere, and of Hantes Alpes, and Castel, Castanet, Cazal, farther to the south. Analogously, g initial, or second consonant of a group, followed by a, becomes j (i.¢., dzh=O. Fr. and Eng. j in jam) in the same zone; Garrica is Jarrija, Jarria in Dordogne, Corréze, Cantal, Haute Loire, Isére, and Garriga farther south. Between two vowels ¢ becomes d: edat, emperador, nadal, amada (etatem, imperatorem, natale, amata). This was also the case in O. Fr. until the course of the 11th century (honurede, emperedur, lavadures, &c., in the Life of St Alexis). But in the northern zone this d representing a Lat. ¢ fell away as~~

~~| early as in Fr.; in an 1lth-century text from the environs of'~~

~~Valence, we read mraor, coroaa (*muratorem, corrogita), Fr. corvée (P. Meyer, Recueil d'anevens textes, Provencal section, No. 40). In the south, d between two vowels was preserved almost everywhere until about the middle of the 12th century, when it became z (as in Fr. and Eng. zero): erwzel, azorar, auzir, vezer (crudélem, adorare, audire, vidére). In the 14th and 15th centuries this z, like every z or s soft of whatever origin, was ljable to become 7 (lingual, not uvular): aurir, veren (audire, videntem). In Béarn~~

~~and Gascony d remained; but in the northern zone Lat. d, instead of changing into z, r, disappeared as in Fr. and quite as early. The poem of Boetius, of which the MS. is of the 11th century, shows in this respect great hesitation: e.g., @ preserved in chaden, eredet, tradar, veder (cadentem, *eredé'dit, *tradare, vidére); d fallen away in ereessen, JSeeltat, traazo, veiit, fiar (*credessent, fidelitatem, *tra- datidnem, *viditum, p. ple. of vidére, fidare). One of the most general facts in Pr. is the habit of rejecting Lat. final 4, of which examples to any number are presented by the verbs. In Fr. this ¢ was formerly retained when it followed a vowel which remained, avmet, entret (amat, intrat), and still remains (in writing at least) when, in Latin, it follows a consonant, atmendt, Jou, vit (amant, facit, *fact, vivit, *vivt); but in Pr. the t is dropped in all cases, even in the most ancient texts: aman, fai, viu. Yet in the northern zone we find the ¢ retained in the 3d per. pl. of verbs, -ant, -ont (Lat. -ant, -unt). H has gone completely (or at least only appears through orthographic tradition, and very intermittently, (A)erba, (h)onor, (h)wmil, &c.), not only in words of Lat. origin, which is the case in O. Fr, but even in Teutonic words (anta, ardit, arene, ausbere, elm, Fr. honte, hardi, hareng, haubert, heawme, with h aspirated). By this feature, the~~

~~| northern limits of which are not yet well determined, the Pro-~~

~~vengal attaches itself to the Romanic of the southern countries. N final, or standing in Lat. between two vowels of which the second is to be dropped, disappears in the whole central part of the Pr. domain: gran gra, ben be, en e, ven-ve, fin fi, un u (granum, bene, in, venit, finem, unum). The forms with 2 belong to the eastern part (left of the Rhone), the western part (Gascony, but not Béarn), and the region of the Pyrenees. It is possible that this loss of 2 went along with a lengthening of final vowel; at least, in Béarnese when the x falls away the vowel is doubled: eaperaa, bestt, boo (capellanum, vicinum, bonum), &c. These are the most important characteristics of the consonants, in relation to the extent of space over which they prevail. Others, which appear only within a more limited area, are perhaps more curious ou account of their strangeness. It will suffice to mention a few which belong to the district bounded on the west and south by the Atlantic, the Basque provinces, and the Pyrenees, and which extends northward and eastward towards the Garonne and its affluents, as far as the Gironde. (This~~

~~*includes Béarn, Bigorre, and Gascony.) Here the sound v no longer exists, being replaced generally by 6; between two vowels, in Gascony, by « with the sound of Eng. w. Initial r assumes a prosthetic a: arram, arre, Arrobert (ramum, rem, Robertnm). JZ between two vowels becomes 7: aperar, eaperan, or (Béarn) caperaa, bera, era (apel- larc, capellanum, bella, ella). On the contrary, at the end of words (viz., in Romanic) 77 becomes g or ¢, d; the former*~~

~~*| change seems to belong rather to Hautes and Basses Pyrénées,*~~

~~*Landes, the latter to Gironde, Lot et Garonne, Gers: eg, ed, et (ille), arrasteg, -ed, -et (rastcellum), easteg, -ed, -et (castellum), eapdeg, -ed, -et (capitellum), whence Fr. cadet (in 16th century eapdet, originally a Gascon word). For further details upon the consonants in this region of south-west France, see Romania, iii. 435-38, v. 368-69.*~~

~~*Flexion.—Old Provengal has, like Old French, a declension con- sisting of two cases for each number, derived from the Latin nominative and accusative. In certain respects this declension is more in conformity with etymology in Provencal than in Old*~~

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~~*French, having been less influenced by analogy. 'he following are the types of this declension, taking them in the order of the Lat. declensions. 1. Words in a coming from Lat. Ist decl., increased by certain words coming from Lat. neuter plurals treated in Prov. as feminine singulars; one form only for each number ; sing. eausa, pl. eawsas. 2. Words of the Lat. 2d dee'., with a few from the 4th; two forms for each number: sing. subject cavals (caballus), object caval (caballum); pl. sub ject eaval (ca balli), object eavals(caballos). 38. Words of Lat. 3d decl. Here there are three Lat. types to be considered. The*~~

~~*first type preseuts the same theme and the same aceentuation in all |*~~

~~*the cases, ¢.g., eanis. The second presents the same accentuation in the nominative singular and in the other eases, but the theme ditfers: comes, cormitem. Inthe third type the acceutuation changes: pecca'tor,*~~

~~peccato‘rem. The first type is naturally confounded with nouns of the 2d decl.: sing., subj. cans or cas, obj. ean or ea. in their original variety; to co’mitem. Latin the theme of the nominative singular had been refashioned after the theme of the oblique cases. They said in the nom. sing. heredis, pareutis, principis, for heres, parens, prtinccps. Consequently the difference both of theme and of accentuation which existed in Lat. between nominative and accu- sative has disappeared in Pr. ‘This reconstruction of the nomina-~~

~~thus coms answers to co’mes, and eo’mte~~

~~tive singular after the theme of the other cases takes place in all |~~

~~Lat. words in -as (except abbas), in those in -7o, in the greater part of those in -o7, at least in all those which have an abstract meaning. Thus we obtain bontatz (bonitatis for bonitas) and bontat (bonitatem), eiutatz (civitatis for civitas) and ezutat (civitatem), anors (amoris foramor) and amor (amorem). All present participles in the subject case singular are formed in this way upon refashioned Latin nominatives : amans (amantis foramans) amant (amantem). It is to be remarked that in regard to feminine nouns Pr. is more etymological than Fr. In the latter feminine nouns have generally only one forni for each number; bonté for the subj. as well as for the obj. case, and not bontés and bonté; in Pr. on the contrary bontatz and bontat. Still, in a large number of nouns the original difference of accentuation between the nominative singular and the other cases has been maintained, whence there result two very distinct forms for the subj. and obj. cases. Of these words it is impossible to give a full list here; we confine ourselves to the exhibition of a few types, remarking that these words are above all sueh as designate persons: a‘bas abat, pa‘stre pasto’r, sor soro’r, eantai’re cantado’r (cantator, -Orem), emperarre envperado’r, bar baro’, compa nh conpanho’, lative lairo’ (latro,Onem). To this class belong various proper names: E’ble Eblo, Gui Guto:, Ue Ugo. A few have even come from the 2d decl., thus Peire Petro’, Pons Ponso’, Carle Carlo’, as if the Latin types had been Petro, -Onem, Ponso, -dnem, Carlo, dnem. We may mention also geogra phical adjectives, such as Bret Breto’, Bergo-nhz Bergonho’, Gase Gaseo’, &. The plural of the 3d decl. is like that of the second: subj. aba’t, soro’r, eantado’r, emperado’r, baro, companho, lairo’; obj. aba‘tz, soro’rs, eantado’rs, emperado’rs, baro’s, eonpanho’s, latvo’s, as if the Lat.~~

~~*nominative pl. had been abbati, sordri, cantatori, &c. It is barely possible that such forms actually existed in vulgar Latin; no trace of them, however, is found in the texts, save in the glosses of Cassel (8th c.), sapienti for sapientes, andina great many ancient charters parentorum, which implies a nominative parenti. The words of the 4th and 5th declensions present no points requiring mention here.*~~

~~*This declension of two cases is a notable character of the whole Romanic of Gaul, north as well as south, ¢.¢., French as well as Provengal. It must be noted, however, that in the south-west it existed only in a very restricted fashion. In the old texts of Gascony it is no longer general in the 13th century. In Béarn it appears to have been completely unknown, the nouns and adjs. having ouly one form, usually that of the obj. case. In Catalan poetry its application is often laid down in the 13th century, but as the charters and documents free from literary influence show no trace of it, its introduction into the poetry of this country may be assumed to be an artificial fact. In the region where it is best observed, “.@., in the centre and north of the Provencal territory, it tends to disappear from ordinary use already in the 13th century. The poet grammarian Raimon Vidal of Besalu, who flourished about the middle of the century, points out in various troubadours transgressions of the rules of declension, and recognizes that in conversation they are no longer observed. The general tendency was to retain only a single form, that of the obj. case. For certain words, however, it was the subj. form which survived. Thus in modern Pr. the words in the ending -ai-re (answering to Lat. -a tor) are as frequent as those in -adow’ (repr. -at or em). But there is a slight difference of meaning between these two suffixes.*~~

~~*Adjcetives, generally speaking, agree in flexion with the nouns. But there is one fact particular to adjectives and past participles which is observed with more or less regularity in certain 12th and*~~

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~~*The secoud and third types are sometimes followed |*~~

~~*But it has often happened that already m vulgar |*~~

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~~13th century texts. 'There is a tendency to mark more clearly than in the substantives the flexion of the subj. pl., chiefly when the adj. or participle is employed predicatively. 'This is marked by the addi- tion of an ¢, placed, according to the district, either after the final consonant, or else after the last vowel so as to form a diphthong with it. The following are examples from an ancient translation of the New Testament (MS. in library of the Palais Saint-Pierre, Lyons, end of 13th century):—'" Die a vos que no siatz consirost" (ne solliciti sitis, Mat. vi. 25); "que siatz visti d' els" (ut videamini ab eis, Mat. vi. 1); "e davaut los reis els princeps seretz menadi" (et ad presides et ad reges ducemini, Mat. x. 18). In charters of the 12th and 18th centuries we find in the subj. case pl., and especially in this predicative use, pagatg, certifiath, aecossatlhath,~~

~~| representing pagati, certificati, adconsiliati.~~

~~It is in the verbs that the individuality of the different Romanic idioms manifests itself most distinctly. At a very early date the etymological data were crossed, in various directions and divers manners according to the country, by analogical tendencies. The local varieties became little by little so numerous in the Romanic conjugation that it is not easy to discover any very characteristic features observed over a territory so vast as that of which the limits have been indicated at the commencement of this article. The following are, however, a few.~~

~~The infinitives are in -a7, -é, -re, -vr, corresponding to the Lat. -Gre, -ére, -ére, -ire, respectively; as in the whole Romanic domain, the conjugation in -ar is the most numerous. The table of verbs, which forms part of the Pr. grammar called the Donatz~~

~~| Proensals (18th century) contains 473 verbs in -a7, 101 in -ér and~~

~~-re, 115 in -iv. In the ar eonjugation we remark one verb from another conjugation : far (ef. It. fare) from faeere. The con jugations in -ér and -re encroach each upon the territory of the other. The three Lat. verbs cadére, capére, sapére have become -é7 verbs (eaze'r, eaber, saber) as in Fr. eheoir, -eevoir, savoir ; and several other verbs waver between the two: crede'r,~~

~~*creér, and eret‘re (cre ‘dére), quere‘rand querre(querére). This fluctuation is most frequent in the case of verbs which belonged originally to the -ée conjugation: arde‘r and a‘rdre, plaze’r and plai’re, taze’r and tat‘re (ardére, placére, tacére). Next to the -ar conjugation, that in -ir is the one which has preserved most formative power. As in the other Romanic languages, it has welcomed a large number of German verbs, and has attracted several verbs which etymologically ought to have belonged to the conjugations in -ér and -re : emplir (in plére), jauzir (gaudére), eosir (consuére), erebir (eripére), fugir (fugére), sequir (*sequére=seq wi). ;*~~

~~*Except in the -ar conjugation, the ending of the infinitive does not determine in a regular manner the mode of forming the different tenses. The present participles are divided into two series ; those in -a (obj. sing.) for the first conj., those in -e7 for the others. In this the Pr. distinguishes itself very clearly from the French, in which all present participles have ant. There is also in Pr. a participial form or verbal adjective which is not met with in any other Romanic language, except Romanian, where more over it is employed in a different sense; this is a form in -do’r, -doi‘ra, which supposes a Lat. type -torius, or-ttrius; the sense is that of a future participle, active for the intransitive verbs, passive for the transitive: endevenido’r, -doira, “that is to happen”; fazedo’r, -dot-ra, “that isto be done”; punido’, -doi’ra, ‘to be punished.” In conjugation properly so called, we may remark the almost eomplete disappearance of the Lat. preterite in -avi, of which traces are found only in texts written in the neighbourhood of the French-speaking region, and in Béarn. In return, a preterite which seems to have been suggested by the Latin dédi, has increased and become the type of the tense almost everywhere in the -a7 conjugation, and in many verbs in -ér and re: amet’, ame‘st, ame’t, ame’m, ame’tz, ame’ron. In Fr. there is a form like this, or at least having the same origin, only in a small number of verbs, none of which belong to the first con jugation, and in these only in the 8rd. pers. sing. and pl. (perdvé, perdierent ; entendié, entendierent, &c.) It is well known that re- duplicated preterites had greatly multiplied in vulgar Latin : there have been recovered such formsas ascendiderat,ostendedit, pandiderunt, adtendedit, incendiderat, &c. (see Schuchardt, Vokalismus des Vulgarlateins, i. 35, iii. 10; cf. Romania, ii. 477). But, in order to explain the Pr. form -et, -est, -et (with open é), we must suppose a termination not in -idi or -édi, but in*~~

~~-é°di. In the western region the 3d pers. sing. is generally in -ce, probably by analogy with preterites like bee, crec, dee, sec, formed after the Lat. type in ui. Another notable pecmli arity, of which Old Fr. shows only rare traces, in texts of a very remote period, is the preservation of a preterite in -ara or era, de rived from the Lat. pluperfect, ama'ra or ame'ra, 'I loved." The former comes directly from Lat. am &ram, the latter has been in- fluenced by the ordinary preterite in e'. This preterite is used with the sense of a simple past, not of a pluperfeet, and conse quently is an exaet doublet of the ordinary preterite, which explains how it was at length eliminated almost everywhere by the latter, of~~

~~LANGUAGE. |~~

~~which it was a mere synonym. But it remained in general use with the sense of a past conditional: ama'ra or ame'ra, "I should have loved," fora, " I should have been." .~~

~~3. Existing State of the Provencal_—In consequence of political circumstances (see notice of Provengal Literature below), the Provencal ceased to be used for administrative as well as literary purposes about the 15th century, in some places a little sooner, in others later (notably in Béarn, where it continued to be written as the language of ordinary use till the 17th century). The poems in local dialect composed and printed in the 16th century and on to our own day have no link with the literature of the preceding period. Reduced to the condition of a patois, or popular dialect simply, the idiom experienced somewhat rapid modifications. Any one who should compare the poems of Goudelin of Toulouse (1579-1649) with those of a Toulousain troubadour of the 13th century would be astonished at the changes which the language has under- gone. Yet this impression would probably be exaggerated. In order to make a rigorously accurate comparison of the language at the two epochs, it would have to be written in the two cases with the same orthographic system, which itis not. The first writers of Provengal, about the 10th or llth century, applied to the language the Latin ortho- graphy, preserving to each letter, as far as possible, the value given to it in the contemporary pronunciation of Latin. To express certain sounds which did not exist in Latin, or which were not there clearly enough noted, there were introduced little by little, and without regular~~

~~system, various conventional symbolizations such as Zh |~~

~~and nh to symbolize the sound of / and 2 mowillée. From this method of proceeding there resulted an orthographic system somewhat wanting in fixity, but which from its very instability lent itself fairly well to the variations which the pronunciation underwent in time and locality. But, the tradition having been interrupted about the 15th century, those who afterwards by way of pastime attempted composition in the patois formed, each for himself apart, an orthography of which many elements were borrowed from French usage. It is evident that differences already considerable must be exaggerated by the use of two very distinct orthographical systems. Nevertheless, even if we get quit of the illusion which makes us at first sight suppose differences of sound where there are merely different ways of spelling the same sound, we find that between the 14th and 16th century the language under- went everywhere, Béarn (for reasons already given) excepted, great modifications both in vocabulary and grammar. The Provengal literature having gradually died~~

~~out during the 14th century, the vocabulary lost immedi-~~

~~ately the greater part of the terms expressing general ideas or abstract conceptions. To supply the place of these, the authors who have written in the patois of the south during the last few centuries have been obliged to borrow from French, modifying at the same time their form, a multitude of vocables.which naturally have remained for the most part unintelligible to people who know only the patois. In this case the adoption of foreign words was excusable; but it did not stop here. Little by little, as primary instruction (now compulsory) was diffused, and introduced first in the towns and afterwards in the villages a certain knowledge of French, words purely French have been introduced into use in place of the corresponding dialect words. Thus, one hears constantly in Provence~~

~~pero, mero, fré-ro, forms adapted from French, instead of |~~

~~paire, maire, fraire; cacha (catsha' = Fr. cacher) instead~~

~~of escoundre, &c.~~

~~*In the phonology, the modifications are of the natural order, and so have nothing revolutionary. The language has developed locally tendencies which certainly already existed during the flourishing period, although the ancient orthography did not recognize them.*~~

~~*PROVENGCAL*~~

~~*in which they appeav.*~~

~~*871*~~

~~*Of the vowels, a@ tonic is generally preserved; an in an open syllable becomes 0 (open) in part of the departments of Aveyron, Lot, Dordogne, Corréze, Cantal, and south of Haute Loire: gro granum), mo(manum), po(panem). This nasalized a must have had a particular sound already in Old Pr., for it is qualified in the Donatz Proensals (ed. Stengel, p. 49) as a estreit (=close or narrow a). A feature almost general is the passage of post-tonic a into 0: terro, amavo, amado (terra, amabat, amata). In Var and the Maritime Alps examples of this change occur as early as the end of the 15th century. But even yet there are a few cantons, notably Montpellier and its neighbourhood, where the ancient post-tonic @ is preserved. 1t is remarkable that the Latin diphthong au, which had become simple o in almost all Romanic lands at the date of the most ancient texts, is to this day preserved with a very distinct diphthongal sound everywhere in the south of France.*~~

~~*In the morphology,the leading feature of modern Provengal is the ever greater simplification of grammatical forms. Not only have the two forms (nominative and objective) in each number, in nouns and adjectives, been reduced to one—this reduction manifested itself in ordinary use already in the 14th century—but in many places there no longer remains any distinction between the singular and the plural. In a great part of the south dew (ego) does duty as an objective, me or mi having disappeared. In part of Drome it is the other way, mi being substituted in the nomin- ative for iew, which it has completely displaced. It is perhaps in conjugation that the greatest changes from the older form of the language are seen. Analogy, basing itself upon one or another much used form, has acted with immense force, tending to make general in the whole conjugation, without any regard*~~

~~*to the original classes to which the various verbs belonged, certain terminations, chiefly those which were accented, and thus appeared to the popular instinct to have more significance. The result, if the tendency were carried the full length, would be the reduction of all the three coujugations to one. Perhaps before this point is reached the patois of the south will themselves have disappeared. As the endless modifications which the language undergoes, in vocabulary and grammar alike, develop themselves in different directions, and each over au area differently circumscribed, the general aspect of the language becomes more and more confused, without the possibility of gronping the endless varieties within dialectal divisions, there being no case in which a certain number of phonetic or morphological facts present themselves within the same geographical limits. The custom has been adopted of roughly designating these varieties by the name of the ancient provinces Limousin (divided into HIgh and Low Limousin), Alarchese, Auwvergnese, Gaseon, Béarnese, Rouergat, Languedocian, Provencal, &c.; but these divisions, though con- venient in use, correspond to no actualities. Nimes and Mont- pellier are in Languedoc, and Arles and Tarascon are in Provence ; nevertheless the dialect of Nimes resembles that of Arles and Tarascon more than that of Montpellier.*~~

~~*Texts.—For the history of the Provencal in all its varieties there are many more mate. ials than for any other Romanie language, not excepting even Italian or French. The literary texts go back to the 10th or lith century (see below). For phonetie purposes many of these texts are of secondary value, beeause the MSS. in which they have reached us, and several of which, especially for the poetry of the troubadours, are of Italian origin, have altered the original forms to an extent which it is not easy to determine; but we possess a countless number of eharters, coutumes, regulations, aceounts, registers of taxation, which are worthy of absolute confidence,—first, beeause these doenments are in most eases origin- als, and, seeondly, becausé, none of the dialectal varieties having raised itself to the rank of the literary language, as happened in France with the central (Parisian) variety and in Italy with the Florentine, writers never had the tempta- tion to abandon their own idiom for another, it is proper to add that Provencal possesses two ancient grammars of the 13th century (the earliest compiled for any Romanic idiom)—the Donatz Proensals and Razos de trobar (see p.*~~

~~$76). Although very short, especi:Jly the second, which is a eolleetion of detached ob- servations, they furnish valuable data. The 14th-century Leys d'Amors (see p. 876) presents the language in rather an artificialstate—the language which ought to be written rather than the langnage actually existing.~~

~~Bibliography.—l. Ancient Condition.—There docs not exist any comprehensive work upon the Provencal whenee to obtain a precise idea of the history of the language at its different epochs. Diez's Grammatik der romanischen Sprachen is stillthe groundwork. it gives, especially in the 3d ed. (1869-72), the last re- vised by the author, the results of extensive resexrches conveniently arranged. But Diez had only a slender knowledge of the language in its present state, and in his time phonology hed made little progress. The French translation of MM. G. Paiis, A. Brachet, and Morel-Fatio (Paris, 1573-76) was to be com- pleted by a supplementary volume, which was announeed at vol. ix. p. 636 of the present work, but this expedient has had to be abandoned, it having been reeognized that what was wanted was nota supplement but a gencral recast. The "Recherches plilologiqres si la langue romane," and " Résumé de la grammaire romanc," published by Raynouard at the beginning of vol. i. of his Lexique roman (1838), ave entirely out of date. The "Tableau sommaire des flexions provengales," published by M. Bartsch, in the Chrestomathie provencale (4th ed., 1880), is incomplete and often crroneous. , The actnal state of our know- ledge of ancient Provencal must be sought ina great number of scattered dis- sertations or monographs, which will be found especially in the Afémotres of the Société de Linguistique de Paris, 1868 (Phonétique provengale, 0, pp. 145-61), in the Romania (1872-85), and in the Rerue de la Société pour [étude des langues romanes, to which may be added some doctoral dissertations published in Ger- many, and the special studies upon the language of particular texts prefaeed to editions of these. As to dietionaries, the Lerique roman, ou Dictionnatre de la langue des Troubadours, by Raynouard (Paris, 6 vols. Svo, 1836-44), ean always be used with advantage, but the numerous speeial voeabularies appended by editors to texts published by them cannot be negleeted. These yield a considerable~~

~~r of words, either wanting or wrongly explained in the Lexique roman, 2 Modern Form.—The most sel grammatical works (all done with insufficient knowledge of phonology, and under the preconceived idea that there exist dialects with definite circumscription) are J. B. Andrews, Essai de grammatre du dialecte mentonais [Mentone] (Nice, 1878), see also his "Phonétique mentonaise," in Romania, xii. 394; Cantagrel, Votes sur Porthographie et la LOS langue- dociennes, prefixed to La Canson de la Lauseto, by A. Mir (Montpetlier, 1876); Chabanceau, Grammaire limousine (Paris, 1876), referring especially to the variety -of Nontron, in the north of Périgord (Dordogne) ; Constans, Essai sur V histoire du sous-dialecte du Rouergue (Montpellier and Paris, 1880) ; Lespy, Grammaire béarnaise (2d ed., Paris, 1880) ; A. Luchaire, Etudes sur les idiomes pyrénéens de la region francaise (Paris, 1879); Moutier, Grammaire dauphinoise, Dialecte dela vallée de la Dréme (Montelimar, 1882); Ruben, "Etude sur le patois du Haut Limousin," prefixed to Poems by J. Foucand, in the Limousin patois (Limoges, 1866). As to dictionaries we may mention, among others, Andrews, Vocabulaire Francais-mentonais (Nice, 1877); Azais, Dictionnaire des idiomes romans du midi de ia France (Montpellier, 1877, 3 vols. Svo), taking for its basis the dialect of Béziers; Chabrand and De Rochas d'Aiglun, Patots des Alpes Cottiennes et en particulier du Queyras (Grenoble and Paris, 1877) ; Couzini¢, Dictionnaire de la langue romano-castraise (Castres, 1850); Garcin, Nouveau dictionnatre provencal-francais (Draguignan, 1841, 2 vols.); Honnorat, Dictionnaire provencal-francais (Digne, 1846-7, 2 vols. 4to);=De Sauvages, Dictionnaire languedocien-frangais (new ed., Alais, 1820, 2 vols.); Vayssier, Dictionnaire patois-francais du departe- ment de l' Aveyron (Rodcz, 1879). From 1880 the Dictionnaire provencal-francais of Fr, Mistral. in 2 vols. 4to, has been in progress ; more than the half has ap- peared. This dictionary takes as its basis the variety of Maillane (in the north of Bouches-du-Rhéne), the author's native district, and gives in ascomplete a manner as possible all the forms used in the south of France. ltis by far the best of all the dictionaries of the southern dialects which have yet been published, and when finished it will almost enable the student to dispense with all the others.~~

~~If. ProvengaL Lirerature.—Provengal literature is much more easily defined than the language in which it is expressed. Starting in the 11th and 12th~~

~~*centuries in several centres, it thence gradually spread out, first over the greater portion, though not the whole, of southern France, and then into the north of Italy and Spain. It nowhere merged in the neighbouring literatures. At the time of its highest development (12th century) the art of composing in the vulgar tongue did not exist, or was only*~~

~~*beginning to exist, to the south of the Alps and the |*~~

~~*Pyrenees. In the north, in the country of French speech, vernacular poetry was in full bloom; but between the districts in which it had developed—Champagne, fle de France, Picardy, and Normandy—and the region in which Provengal literature had sprung up, there seems to have been an intermediate zone formed by Burgundy, Bourbon- nais, Berry, Touraine, and Anjou which, far on in the Middle Ages, appears to have remained barren of vernacular literature. In its rise Provencal literature stands com- pletely by itself, and in its development it long continued to be absolutely original. It presents at several points genuine analogies with the sister- literature of northern France ; but these analogies are due principally to certain primary elements common to both and only in a slight degree to mutual reaction.*~~

~~*It must be inquired, however, what amount of origin- ality could belong to any, even the most original, Romanic literature in the Middle Ages. In all Romanic countries compositions in the vernacular began to appear while the custom of writing in Latin was still preserved by unin- terrupted tradition. Even during the most barbarous periods, when intellectual life was at its lowest, it was in Latin that sermons, lives of saints more or less apocryphal, accounts of miracles designed to attract pilgrims to certain shrines, monastic annals, legal documents, and contracts of all kinds were composed. When learning began to re- vive, as was the case in northern and central France under the influence of Charlemagne and later in the 11th century, it was Latin literature which naturally received increased attention, and the Latin language was more than ever employed in writing. Slowly and gradually the Romanic languages, especially those of France, came to occupy part of the ground formerly occupied by Latin, but even after the Middle Ages had passed away the parent tongue retained no small portions of its original empire. Conse- quently Romanic literatures in*~~

~~*general (and this is especi- ally true of Provencal as it does not extend beyond the medizeval period) afford only an incomplete representation of the intellectual development of each country. Those literatures even which are most truly national, as*~~

~~*having been subjected to no external influence,*~~

~~*are only to a*~~

~~*PR OV EN ce*~~

~~*[LITERATURE,*~~

~~*limited extent capable of teaching us what the nation was. They were, in short, created in the interests of the illiterate part of the people, and to a considerable degree by those who were themselves illiterate. But that does not make them less interesting.*~~

~~*Origin.—It was in the 11th century, and at several places in the extensive territory whose limits have been described in the foregoing account of the Provengal language, that Provengal literature first made its appearance. It took poetic form ; and its oldest monuments show a relative perfection and a variety from which it may be concluded that poetry had already received a considerable develop- ment. The oldest poetic text, if the date and origin be correctly determined, is said to be a Provengal refrain attached to a Latin poem recently published (Zeitschrift fiir deutsche Philologie, 1881, p. 335) from a Vatican MS., written, it is asserted, in the 10th century. But it is use- less to linger over these few words, the text.of which seems corrupt, or at least has not yet been satisfactorily interpreted. The honour of being the oldest literary monument of the Provengal language must be assigned to a fragment of two hundred and fifty-seven decasyllabic verses preserved in an Orleans MS. and frequently edited and annotated since it was first printed by Raynouard in 1817 in his Choix des poésies originales des Troubadours. The writing of the MS. is of the first half of the 11th century. The peculiarities of the language point to the north of the Provencal region, probably Limousin or Marche. It is. the beginning of a poem in which the*~~

~~*– unknown author, taking Boetius's treatise De Consolatione*~~

~~*Philosophiz as the groundwork of his composition, adopts and develops its ideas and gives them a Christian cast of which there is no trace in the original. Thus from some verses in which Boetius contrasts his happy youth with his afflicted old age he draws a lengthy homily on the necessity of laying up from early years a treasure of good works. The poem is consequently a didactic. piece com- posed by a "clerk," knowing Latin. He doubtless preferred the poetic form to prose because his illiterate contempor- aries were accustomed to poetry in the vulgar tongue, and because this form was better adapted to recitation ; and thus his work, while a product of erudition in as far as it was an adaptation of a Latin treatise, shows that at the time when it was composed a vernacular poetry was in existence. A little later, at the close of the same century, we have the poems of William IX., count of Poitiers, duke of Guienne. They consist of eleven very diverse strophic pieces, and were consequently meant to be sung. Several are love songs; one relates a bonne fortune in very gross terms ; and the most important of all—the only one which can be approximately dated, being composed at the time when William was setting out for Spain to fight the Saracens—expresses in touching and often noble words the writer's regret for the frivolity of his past life and the apprehensions which oppressed him as he bade farewell, perhaps for ever, to his country and his young son. We also know from Ordericus Vitalis that William IX. had composed various poems on the incidents of his ill-fated expedition to the Holy Land in 1101. And it must further be mentioned that in one of his pieces (Ben voil que sapchon li plusor) he makes a very clear allusion to a kind of poetry which we. know only by specimens of later date, the partimen, or, as it is called in France, the jeu parti. William IX. was born in 1071 and died in 1127. There is no doubt that the most prolific period of his literary activity was his youth. On the other hand there is no reason to believe that he created the type of poetry of which he is to us the oldest representative. It is easy to understand how his high social rank saved some of his productions from oblivion whilst the poems of his pre-*~~

~~*decessors and contemporaries disappeared with the genera- tions who heard and sang them; and in the contrast in form and subject between the Boetius poem and the stanzas of William IX. we find evidence that by the*~~

~~*11th century Provengal poetry was being rapidly developed in various directions. Whence came this poetry? HIow and by whose work was it formed? 'That it has no connexion whatever with Latin poetry is generally admitted. There is absolutely nothing in common either in form or ideas between the last productions of classical Latinity, as they appear in Sidonius Apollinaris or Fortunatus, and the first poetic compositions in Romanic. The view which seems to meet with general acceptance, though it has not been distinctly formulated by any one, is that Romanic poetry sprang out of a popular poetry quietly holding its place from the Roman times, no specimen of which has survived,—just as the Romanic languages are only con- tinuations with local modifications of vulgar Latin. There are both truth and error in this opinion. The question is really a very complex one. First.as to the form: Romanic versification, as it appears in the Boetius poem and the verses of William IX., and a little farther north in the poem of the Passion and the Life of St Leger (10th or 11th century), has with all its variety some general and permanent characteristics ; it is rhymed, and it is composed of a definite number of syllables certain of which have the syllabic accent. This form has evident affinity with the rhythmic Latin versification, of which specimens exist from _the close of the Roman empire in ecclesiastical poetry. The exact type of Romanic verse is not found, however, in this ecclesiastical Latin poetry; the latter was not popular, and it may be assumed that there was a popular variety of rhythmic poetry from which Romanic verse is derived.*~~

~~*Again, as regards the substance, the poetic material, we find nothing in the earliest Provencal which is strictly popular. The extremely personal compositions of William IX. have nothing in common with folklore. They are subjective poetry addressed to a very limited and probably rather aristocratic audience. The same may be said of the Boetius poem, though it belongs to the quite different species of edifying literature; at any rate it is not popular poetry. Vernacular compositions seem to have been at first produced for the amusement, or in the case of religious poetry for the edification, of that part of lay society which had leisure and lands, and reckoned intellectual pastime among the good things of life. Gradually this class, intelligent, but with no Latin education, enlarged the circle ofitsideas. In the 12th century and still more in the 13th, historical works and popular treatises on contemporary science were composed for its use in the only*~~

~~*language it understood ; and vernacular literature continued gradually to develop partly on original lines and partly by borrow- ing from the literature of the "clerks." century vernacular poetry was still rather limited, and has hardly any higher object than the amusement and edifica- tion of the upper classes. An aristocratic poetry like the oldest Provengal cannot be the production of shepherds and husbandmen ; and there is no probability that it was invented or even very notably improved by William IX.*~~

~~*From what class of persons then did it proceed? Latin chroniclers of the Middle Ages mention as joculares, jocula- tores, men of a class not very highly esteemed whose pro- fession consisted in amusing their audience either by what we still call jugglers' tricks, by exhibiting performing animals, or by recitation and song. They are called joglars in Provengal, jouglers or jougleors in French. A certain Barnaldus, styled joglarius, appears as witness in 1058 to a charter of the chartulary of Saint Victor at Marseilles. In 1106 the act of foundation of a salva terra in Rouergue*~~

~~*PEO WN Cua L,*~~

~~*But in the 11th –*~~

~~*873*~~

~~*specifies that neither knight nor man-at-arms nor joculator is to reside in the village about to be created. These individuals—successors of the mimi and the thymelici of antiquity, who were professional amusers of the public — were the first authors of poetry in the vernacular both in the south and in the north of France. To the upper classes who welcomed them to their castles they supplied that sort of entertainment now sought at the theatre or in books of light literature. There were certain of them who, leaving buffoonery to the ruder and less intelligent members of the profession, devoted themselves to the composition of pieces intended for singing and conse- quently in verse. In the north, where manners were not so refined and where the taste for warlike adventure pre- vailed, the jongleurs produced chansons de geste full of tales of battle and combat. In the courts of the southern nobles, where wealth was more abundant and a life of ease and pleasure was consequently indulged in, they produced love songs.*~~

~~*There is probably a large amount of truth in the remark made by Dante in chapter xxv. of his Vita Nuova, that the first to compose in the vulgar tongue did so because he wished to be understood by a lady who would have found it difficult to follow Latin verses.1. And in fact there are love songs among the pieces by William of Poitiers; and the same type preponderates among the compositions of the troubadours who came immediately after him. But it is worthy of note that in all this vast body of love poetry there is no epithalamium nor any address to a marriageable lady. The social conditions of the south of France in the feudal period explain in great measure the powerful development of this kind of poetry, and also its peculiar characteristics—the profound respect, the extreme deference of the poet towards the lady whom he addresses. Rich heiresses were married young, often when hardly out of their girlhood, and most frequently without their fancy being consulted. But they seem after marriage to have enjoyed great liberty. Eager for plea- sure and greedy of praise, the fair ladies of the castle became the natural patronesses of the mesnie or household of men-at-arms and jongleurs whom their husbands main- tained in their castles. Songs of love addressed to them soon became an accepted and almost conventional form of literature ; and, as in social position the authors were generally far below those to whom they directed their amorous plaints, this kind of poetry was always distin- guished by great reserve and an essentially respectful style. From the beginning the sentiments, real or assumed, of the poets are expressed in such a refined and guarded style that some historians, overestimating the virtue of the ladies of that time, have been misled to the belief that the love of the troubadour for the mistress of his thoughts was generally platonic and conventional.*~~

~~*The conditions under which Romanic poetry arose in the south of France being thus determined as accurately as the scarcity of documents allows, we now proceed to give a survey of the various forms of Provencal literature, chronological order being followed in each instance. By this arrangement the wealth of each form will be better displayed ; and, as it is rare in the south of France for the same person to distinguish himself in more than one of them, there will be generally no occasion to introduce the same author in different sections.*~~

~~Poetry of the Troubadours.—Though he was certainly not the creator of the lyric poetry of southern France, William, count of Poitiers, by personally cultivating it gave it a position of honour, and indirectly contributed in a very powerful degree to insure its development and pre-~~

~~1 "Elo primo che comenciéd a dire sicome poeta volgare si mosse~~

~~peroche volle fare intendere le sue parole a donna alla quale era mala-gevole ad intendere i versi latini."' : XIX. — 110~~

~~servation. Shortly after him centres of poetic activity | father was a servant, Peire Vidal's a maker of furred~~

~~make their appearance in various places—first in Limousin and Gascony. In the former province lived a viscount of Ventadour, Eble, who during the second part of William of Poitiers's life seems to have been brought into relation with him, and according to a contemporary historian, Geffrei, prior of Vigeois, erat valde gratiosus in cantilens. We possess none of his compositions ; but under his influ- ence Bernart of Ventadour was trained to poetry, who, though only the son of one of the serving-men of the castle, managed to gain the love of the lady of Venta- dour, and, when on the discovery of their amour he had to depart elsewhere, received a gracious welcome from Eleanor of Guienne, consort (from 1152) of Henry II. of England. Of Bernart's compositions we possess about fifty songs of elegant simplicity, some of which may be taken as the most perfect specimens of love poetry Pro- vencal literature has ever produced. Bernart must therefore have been in repute before the middle of the 12th century ; and his poetic career extended well on towards its close. At the same period, or probably a little earlier, flourished Cercamon, a poet certainly inferior to Bernart, to judge by the few pieces he has left us, but nevertheless of genuine importance among the troubadours both because of his early date and because definite information regard- ing him has been preserved. He~~

~~was a Gascon, and composed, says his old biographer, " pastorals" according to the ancient custom (pastorelas a la wansa antiga). This is the record of the appearance in the south of France of a poetic form which ultimately acquired large develop- ment. 'The period at which Cercamon lived is determined by a piece where he alludes very clearly to the approaching marriage of the king of France, Louis VII., with Eleanor of Guienne (1137). Among the earliest troubadours may also be reckoned Marcabrun, a pupil of Cercamon's, from whose pen we have about forty pieces, those with dates ranging from 1135 to 1148 or thereabout. This poet has great originality of thought and style. HIs songs, several of which are historical, are free from the commonplaces of their class, and contain curious strictures on the corrup- tions of the time.~~

~~We cannot here do more than enumerate the leading troubadours and briefly indicate in what conditions their poetry was developed and through what circumstances it fell into decay and finally disappeared :—Peter of Auvergne (Peire d'Alvernha), who in certain respects must be classed with Marcabrun ; Arnaut Daniel, remarkable for his com- plicated versification, the inventor of the sestena, a poetic form for which Dante and Petrarch express an admiration difficult for us to understand ; Arnolt of Mareuil (Arnaut de Maroill), who, while less famous than Arnaut Daniel, certainly surpasses him in elegant siniplicity of form and delicacy of sentiment; Bertran de Born, now the most generally known of all the troubadours on account of the part he played both by his sword and his strventeses in the struggle between Henry IL. of England and his rebel sons; Peire Vidal of Toulouse, a poet of varied inspiration, who grew rich with gifts bestowed on him by the greatest nobles of his time; Guiraut de Borneil, lo maestre dels trobadors, and at any rate master in the art of the so-called~~

~~close" style (trobar clus), though he has also left us poems of charming simplicity; Gaucelm Faidit, from whom we have a touching lament (planh) on the death of Richard Coeur de Lion; Folquet of Marseilles, the most powerful thinker among the poets of the south, who from being a troubadour became first a monk, then an abbot, and finally bishop of Toulouse.~~

~~*It is not without interest to discover from what class of society the troubadours came. Many of them, there is no doubt, had a very humble origin. Bernart of Ventadour's*~~

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~~*garments, Perdigon's a fisher. Others belonged to the bourgeoisie: Peire d'Alvernha, for example, Peire Raimon of Toulouse, Elias Fonsalada. More rarely we see traders' sons becoming troubadours ; this was the case with Folquet of Marseilles and Aimeric de Pegulhan. A great many were clerics, or at least studied for the church,—for instance, Arnaut of Mareuil, Hugh of Saint Cireq (Uc de Saint Circ), Aimeric de Belenoi, Hugh Brunet, Peire Cardinal; some had even taken orders—the monk of Montaudon, the monk Gaubert of Puicibot. ecclesiastical authority did not always tolerate this breach of discipline. Gui d'Uissel, canon and troubadour, was obliged by the injunction of the pontifical legate to give up his song- making. One point is particularly striking—the number of nobles (usually poor knights whose incomes were in-*~~

~~*sufficient to support their rank) who became troubadours,*~~

~~*or even, by a greater descent, jongleurs—Raimon de Miraval, Pons de Capdoill, Guillem Azemar, Cadenet, Peirol, Raimbaut de Vacqueiras, and many more. There is no doubt they betook themselves to poetry not merely for their own pleasure, but for the sake of the gifts to be obtained from the nobles whose courts they frequented. A very different position was occupied by such important persons as William of Poitiers, Raimbaut of Orange, the viscount of Saint Antonin, William of Berga, and Blacatz, who made poetry for their own amusement, but contributed not a little, by thus becoming troubadours, to raise the profession.—*~~

~~*The profession itself was entirely dependent on the exist- ence and prosperity of the feudal courts. The troubadours could hardly expect to obtain a livelihood from any other quarter than the generosity of the great. It will conse- quently be well to mention the more important at least of those princes who are known to have been patrons and some of them practisers of the poetic art. They are arranged approximately in geographical order, and*~~

~~after each are inserted the names of those troubadours with whom they were connected.~~

~~France. —ELEANOR OF GUIENNE, Bernart of Ventadour (Venta- dorn); Henry CuRTMANTLE, son of Henry II. of England, Bertran de Born; Rictarp Caur pE Lion, Arnaut Daniel, Peire Vidal, Folquet of Marseilles, Gaucelm Faidit ; ERMENGAKDE OF NARBONNE (1143-1192), Bernart of Ventadour, Peire Rogier, Peire d'Alvernha ; Rarmon V., count of Toulouse (1148-1194), Bernart of Ventadour, Peire Rogier, Peire Raimon, Hugh Brunet, Peire Vidal, Folquet of Marseilles, Bernart of Durfort; Rarmon VI., count of Toulouse (1194-1222), Raimon de Miraval, Aimeric de Pegulhan, Aimeric de Belenoi, Ademar lo Negre; ALPHONSE II., count of Provence (1185- 1209), Elias de Barjols; Rarmon BERENGER IV., count of Provence~~

~~1209-1245), Sordel ; BARRAL, viscount of Marseilles (died c. 1192),~~

~~Peire Vidal, Folquet of Marseilles; Winniam VIIL., lord of Mont- pellier (1172-1204), Peire Raimon, Arnaut de Mareuil, Folquet of Marseilles, Guiraut de Calanson, AinericdeSarlat; RoBERT, dauphin of Auvergne (1169-1234), Pcirol, Perdigon, Pierre de Maensac, Gaucelm Faidit; GuizLAuME pu Baus, prince of Orange (1182- 1218), Raimbaut de Vacqueiras, Perdigon; SAVARIC DE MAvULrKON (1260-1230), Gaucelm de Puicibot, Hugh of Saint Cireq; Buacatz, a Provengal hoble (1200 ? -1236), Cadenet, Jean d'Aubusson, Sordel, Guillem Figueira; Henry I., count of Rodez (1208-1222), Hugh of Saint Cireq; perhaps Huen IV., count of Rodez (1222 1 1274), and Henry IL, count of Rodez (1274-1302), Guiraut Riquier, Folquet de Lunel, Serveri de Girone, Bertran Cartonel; Nunyo SANCHEZ, count of Roussillon (died in 1241), Aimeric de Belenoi ; Bernarp IV., count of Astarac (1249-1291), Guiraut Riquier, Amanieu de Sescas.~~

~~Spain. —A.PHonse II., king of Aragon (1162-1196), Peire Rogier, Peire Raimon, Peire Vidal, Cadenet, Guiraut de Cabreira, Elias de Barjols, the monk of Montaudon, Hugh Brunet; Persr IL, king of Aragon (1196-1213), Raimon de Miraval, Aimeric de Pegulhan, Perdigon, Ademar lo Negre, Hugh of Saint Cireq; Jamus I., king of Aragon (1213-1276), Peire Cardinal, Bernart Sicart de Maruejols, Guiraut Riquier, At de Mons; Prtser III., king of Aragon (1276-1285), Paulet of Marseilles, Guiraut Riquier, Serveri de~~

~~*Girone ; ALPHONSO IX., king of Leon (1188-1214), Peire Rogier, Guiraut de Borneil, Aimeric de Pegulhan, Hugh of Saint Cireq; Atrnonso X., king of Castile (1252-1284), Bertran de Lamanon,*~~

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~~*Bonifaci Calvo, Guiraut Riquier, Folquet de Lunel, Arnaut Plages, Bertran Carbonel.*~~

~~*Jtaly.—BontFack II., marquis of Montferrat (1192-1207), Peire Vidal, Raimbaut de Vaequeiras, Elias Cairel, Gaucelm Faidit (?) ; FREDERICK II., emperor (1215-1250), Jean d'Aubusson, Aimeric de Pegulhan, Guillem Figueira; Azzo VI., marquis of Este (1196— 1212), Aimeric de Pegulhan, Rambertin de Buvalel; Azzo VIII., marquis of Este (1215-1264), Aimeric de Pegulhan.*~~

~~*The first thing that strikes one in this list is that, while the troubadours find protectors in Spain and Italy, they do not seem to have been welcomed in French-speaking countries. This, however, must not be taken too absolutely. Provencal poetry was appreciated in the north of France. There is reason to believe that when Constance, daughter of one of the counts of Arles, was married in 998 to Robert, king of France, she brought along with her Provencal jongleurs. Poems by troubadours are quoted in the French romances of the beginning of the 13th century; some of them are transcribed in the old collections of French songs, and the preacher Robert de Sorbon informs us in a curious passage that one day a jongleur sang a poem by Folquet of Marseilles at the court of the king of France. But in any case it is easy to understand that, the countries of the langue dout having a full developed literature of their own suited to the taste of the people, the troubadours generally preferred to go to regions where they had less to fear in the way of competition.*~~

~~*The decline and fall of troubadour poetry was mainly due to political causes. When about the beginning of the 13th century the Albigensian war had ruined a large number of the nobles and reduced to lasting poverty a part of the south of France, the profession of troubadour ceased to be*~~

~~*lucrative. It was then that many of those poets went to spend their last days in the north of Spain and Italy, where Provengal poetry had for more than one generation been highly esteemed. Following their example, other poets who were not natives of the south of France began to compose in Provencal, and this fashion continued till, about the middle of the 13th century, they gradually abandoned the foreign tongue in northern Italy, and somewhat later in Catalonia, and took to singing the same airs in the local dialects. About the same time in the Provengal region the flame of poetry had died out save in a few places—Narbonne, Rodez, Foix, and Astarac—where it kept burn- ing feebly for a little longer. In the 14th century com- position in the language of the country was still practised ; but the productions of this period are mainly works for instruction and edification, translations from Latin or some- times even from French, with an occasional romance. As for the poetry of the troubadours, it was dead for ever.*~~

~~*Form.—Originally the poems of the troubadours were intended to be sung. The poet usually composed the music as well as the words ; and in several cases he owed his fame more to his musical than to his literary ability. Two manuscripts preserve specimens of the music of the troubadours ; but, as the subject has not as yet been investigated, we are stil] ignorant of one of the elements of their success. The following are the principal poetic forms which they employed. The oldest and most usual generic term is vers, by which is understood any composition intended to be sung, no matter what the subject. At the close of the 12th century it became customary to call all verse treating of love canso,—the name vers being then more generally reserved for poems on other themes. The sirventesc differs from the vers and the canso only by its subject, being for the most part devoted to moral and political topics. Peire Cardinal is celebrated for the sirventeses he composed against the clergy of his time. The political poems of Bertran de Born are sirventescs. There is reason to believe that originally this word meant simply a poem composed by a szrvent (Lat. serviens) or man-at- arms. The sirventesc is very frequently composed in the form, sometimes even with the rhymes, of a popu- lar song, so that it might be sung to the same air. The tenson is a debate between two interlocutors, each of whom has a stanza in turn. The partimen (Fr. jeu parti) is also a poetic debate, but it differs from the tenson in so far that the range of debate is limited. In the*~~

first stanza one of the partners proposes two alternatives ; the other partner chooses one of them and defends

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it, and the opposite side remains to be defended by the original pro- pounder. Often in a final couplet a judge or arbiter is appointed to decide between the parties. This poetic game is mentioned by William, count of Poitiers, at the end of the 11th century. The pastoreta, afterwards pastorela, is in general an account of the love adventures of a knight with a shepherdess. All these classes have one form capable of endless variations, five or more stanzas and one or two envois. The dansa and balada, intended to mark the time in dancing, are pieces with a refrain. The adba, which has also a refrain, is, as the name indicates, a waking or morning song at the dawning of the day. All those elasses are in stanzas. The descort is not thus divided, and consequently it must be set to music right through. Its name is derived from the fact that, its component parts not being equal, there is a kind of "discord" between them. It is generally reserved for themes of love. Other kinds of lyric poems, sometimes with nothing new about them except the name, were developed in the south of France ; but those here mentioned are the more important.

Narrative Poetry.—Although the strictly lyric poetry of the troubadours forms the most original part of Provengal literature, it must not be supposed that the remainder is of trifling import- ance. Narrative poetry, especially, received in the south of France a great development, and, thanks to recent discoveries, a consider- able body of it has already become known. Several classes must be distinguished :—the chanson de geste legendary or historic, the romance of adventure, and the novel. Northern France remains emphatically the native country of the chanson de geste; but, although in the south different social conditions, a more delicate taste, and a higher state of civilization prevented a similar pro- fusion of tales of war and heroic deeds, Provengal literature has some highly important specimens of this class. The first place belongs to Girart de Roussillon, a poem of ten thousand verses, which relates the struggles of Charles Martel with his powerful vassal the Burgundian Gerard of Roussillon. It is a

~~*literary production of rare excellence and of exceptional interest for the history of civiliza- tion in the 11th and 12th centuries. Gerard of Roussillon belongs only within certain limits to the literature of southern France. The recension which we possess appears to have been made on the borders of Limousin and Poitou ; but it is clearly no more than a recast of an older poem no longer extant, probably either of French or at least Burgundian origin. To Limousin also seems to belong the poem of Azgar and Maurin (12th century), of which we have unfortunately only a fragment so short that the subject cannot be clearly made out. Of less heroic character is the poem of Dawrel and Beton (end of the 12th or beginning of the 13th century), con- nected with the cycle of Charlemagne, but by the romantic character of the events more like a regular romance of adventure. We can- not, however, form a complete judgment in regard to it, as the only MS. in which it has been preserved is defective at the close, and that to an amount there is no means of ascertaining. Midway between legend and history may be classified the Provengal Chanson of Antioch, a fragment of which, 700 verses in extent, has been recently recovered in Madrid and published in Archives de 0 Orient Latin, vol. ii. To history proper belongs the chanson of the crusade against the Albigensians, which, in its present state, is composed of two poems one tacked to the other: the first, contain- ing the events from the beginning of the crusade till 1213, is the work of a certain William of Tudela, a moderate supporter of the crusaders ; the second, from 1213 to 1218, is by a veheinent opponent of the enterprise. The language and style of the two parts are no less different than the opinions. Finally, about 1280 a native of Toulouse named Guillaume Anelier composed, in the chanson de geste form, a poem on the war carried on in Navarre by the French in 1276 and 1277. It is an historieal work of little literary merit. All these poems are, as chansons de geste ought to be, in stanzas of indefinite length, with a single rhyme. Gerard of Roussillon, Aigar and Maurin, and Daurel and Beton are in verses of ten, the others in verses of twelve syllables. The peculiarity of the versi- fication in Gerard is that the pause in the line occurs after the sixth syllable, and not, as is usual, after the fourth. Like the chanson de geste, the romance of adventure is but slightly represented in the south ; but it is to be borne in mind that many works of this class must have perished, as is rendered evident by the mere fact that, with few exceptions, the narrative poems which have come down to us are each known by a single manuscript only. We possess but three Provengal*~~

~~*romances of adventute :—Jaz/ré (com- posed in the middle of the 13th century and dedicated to a king of Aragon, possibly James I.), Blandin of Cornwall, and Guillem de la Barra. The first two are connected with the Arthurian cycle: Jaufré is an elegant and ingenious work ; Blandin of Cornwall the dullest and most insipid one can well imagine. The romance of Guillem de la Barra tells an unlikely story also found in Boccaccio's Decameron (2d Day, viii.). It is rather a poor poem; but as a contribution to literary history it has the advantage of being dated. It was completed in 1318, and is dedicated toa noble of Languedoc called Sicart de Montaut. Connected with the romance of adven- ture is the novel (in Provencal novas, always in the plural), which*~~

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~~*is originally an account of an event "newly" happened. The novel must have been at first in the south what, as we sce by the Decameron, it was in Italy, a society pastime,—the wits in turn relating anecdotes, true or imaginary, which they think likely to amuse their auditors. But before long this kind of production was treated in verse, the form adopted being that of the romances of adventure—octosyllabie verses rhyming in pairs. Some of those novels which have come down to us may be ranked with the most graceful works in Provengal literature ; two are from the pen of the Catalan author Raimon Vidal de Besall. One, the Castia-gilos (the Chastisement of the Jealous Man), is a treatment, not easily matched for elegance, of a frequently-handled theme—the story of the husband who, in order to entrap his wife, takes the disguise of the lover whom she is expecting and receives with satisfaction blows intended, as he thinks, for him whose part he is playing ; the other, The Judgment of Love, is the reeital of a question of the law of love, departing eonsiderably from the subjects usually treated in the novels. Mention may also be made of the novel of The Parrot by Arnaut de Carcassonne, in which the principal character is a parrot of great, eloquence and ability, who succeeds marvellously in securing the success of the amorous enterprises of his master. Novels came to be extended to the proportions of a long romance. Flamenca, which belongs to the novel type, has still over eight thousand verses, though the only MS. of it has lost some leaves both at the beginning and at the end. This poem, composed in all probability in 1234, is the story of a lady who by very ingenious devices, not*~~

~~*unlike those employed in the Miles Gloriosus of Plautus, succeeds in eluding the vigilance of her jealous husband. No analysis can be given here of a work the action of which is so highly complicated ; suffice it to remark that there is no book in medieval literature which betokens so much quickness of intellect and is so instructive in regard to the manners and usages of polite society in the 13th century. We know that novels were in great favour in the south of France, although the specimens preserved are not very numerous. Statements made by Francesco de Bar- berino (early part of 14th century), and recently brought to light, give us a glimpse of several works of this class which have been lost. From the south of France the novel spread into Catalonia, where we find in the 14th century a number of novels in verse very similar to the Provengal ones, and into Italy, where in general the prose form has beeu adopted.*~~

~~*Didactic and Religious Poetry.—Compositions intended for instruction, correction, and edification were very numerous in the south of France as well as elsewhere, and, in spite of the enormous losses sustained by Provengal literature, much of this kind still remains. But it is seldom that such works have much originality or literary value. Originality was naturally absent, as the aim of the writers was mainly to bring the teachings contained in Latin works within the reach of lay hearers or readers. Literary value was not of eourse exeluded by the lack of originality, but by an unfortunate chance the greater part of those who sought to instruct or edify, and attempted to substitute moral works for secular pro- ductions in favour with the people, were persons of limited ability. It is needless to enumerate all the lives of saints, all the treatises of popular theology and morals, all the books of devotion, all the pious canticles, composed in Provengal during the Middle Ages. Enough to recall the Boetius poem (unfortunately a mere fragment) already mentioned as one of the oldest doeuments of the language, and really a remarkable work. From the multitude of saints' lives we may single out that of St Honorat of Lerins by Raimon Feraud (about 1300), which is distinguished by variety and elegance of versification, but is almost entirely a translation from Latin. Among poems strictly didactie one stands out by reason of its great extent (nearly thirty-five thousand verses) and the somewhat original conception of its' scheme—the Breviari @amor, a vast encyclopedia, on a theological*~~

~~basis, composed by the Minorite friar Matfre Krmengaut of Béziers between 1288 and 1300 or thereabout.~~

~~Drama.—Twenty years ago it might have been questioned whether dramatie representation was known in the south of France, but within that time several short dramatic pieces have been pub- lished or described ; and a eonsiderable number of actual theatrical representations have been found mentioned in the local records, Everything of this kind that we know of belongs to the religions drama, the oldest form in every medisval: literature. The period at which a purely secular theatre takes its rise in most quarters is the 15th eentury ; and by that time there was hardly any Provencal literature left. We possess in Provengal mysteries of Saint Agnes, of the Passion, of the Marriage of the Virgin, all belonging to the elose of the 13th eentury or the first half of the 14th. In the 15th eentury there is a fragment of a mystery of St James. Provence pigveny so-called, especially the eastern portion of it, seems to~~

~~ave been particularly fond of representations of this sort, to judge gilt in the local records. At the close of the 15th and ginning of the 16th eentury many mysteries were played in~~

~~that part of Dauphiné which corresponds to the present depart- ment of Hautes-Alpes. Five mysteries of this distriet, composed and played somewhere about 1500 (the mysteries of St Eustaee, of~~

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~~St Andrew, of St Pons, of Sts Peter and Paul, and of St Anthony of Vienne), have come down to us, and are now (1885) being edited. The influence of the contemporary French sacred drama may to some extent be traeed in them.~~

~~Prose—Prose composition in the south of France belongs to a comparatively late stage of literary development ; and the same remark applies to the other Romanie eountries, particularly to northern France, where prose hardly comes into fashion till the 13th eentury, the prose of the~~

~~*preceding century being little else than translations of the books of the Bible (especially the Psalter).*~~

~~*As early as the 12th century we find in the south sermons, whose importance is more linguistic than literary. To the 13th century belong certain lives of the troubadours intended to be prefixed to, and to explain, their poems. They were written before 1250, when the first anthologies of troubadour poetry were com- piled ; and some of them are the work of the troubadour Hugh of Saint Cireq. To the same period must be assigned Las Razos de trobar of the troubadour Raimon Vidal de Besalu (an elegant little treatise touching on various points of grammar and the poetic art), and also the Donatz Proensals of Hugh Faidit, a writer otherwise unknown, who drew up his purely grammatical work at the request of two natives of northern Italy. Of about the same date are two translations ofthe New Testament, one of which, preserved in MS. at Lyons, seems to have been made for Albigensians, A remark- able work, both in style and thought, is the Life of St Douceline, who lived at the elose of the 13th century near Marseilles, and founded an order of Beguines. In the 14th century compositions in prose grew more numerons. Some rare local chronicles may be mentioned, the most interesting being that of Mascaro, which eontains the annals of the town of Beéziers from 1338 to 1390. Theological treatises and pious legends translated from Latin and French also increase in number. The leading prose work of this period is the treatise on grammar, poetry, and rhetoric known by the namie of Leys d'Amors. It was composed in Toulouse, shortly before 1350, by a group of scholars, and was intended to fix the rules of the language with a view to the promotion of a poetical renaissance. Yor this purpose an academy was founded which awarded prizes in the shape of flowers to the best compositions in verse. We still possess the collection of the pieces crowned by this aeademy during the 14th eentury, and a large part of the 15th (Flors del gay saber). Unfortunately they are rather academic than poetic. The Leys d' Amors, which was to be the starting point and rule of the new poetry, is the best production of this abortive renaissance. The decay of Provencal literature arrived too soon to allow of a full development of prose. The 14th and 15th centuries were in no respect a prosperous period for literature in the south of Franee. In the 15th century people began to write French both in verse*~~

~~*and prose ; and from that time Provengal literature became a thing of the past.*~~

~~*Bibliography.—Fauriel, Histoire de la poésie provencale (Paris, 1846, 3 vols. 8vo), is quite antiquated. Not only are three-fourths of the works in Provengeal poetry ignored, but the very idea of the book is vitiated by the author's system (now abandoned), based on the supposition that in the south of France there was an immense epic literature. The articles on the troubadours in the Ziéstoire littéraire de la France, by Ginguené, E. David, &c., must be consulted with extreme caution. F. Diez's Die Poesie der Troubadours (Zwickau, 1827, 8vo; new ed. by Bartsch, 1883) and his Leben und Werke der Troubadours (Zwickau, 1829, 8vo; new ed. by Bartsch, 1882) are of great excellence for the time at which they appeared. For the history of Provengal literature in Spain, see Mila y Fontanals, De Jos trovadores en Espaiia (Barcelona, 1861, 8vo); for Italy, Cavedoni, Ricerche storiche intorno ai trovatori provenzali (Modena, 1844, 8vo) ; A. Thomas, Francesco Barberino et la littérature provencale en Italie (Paris, 1883, 8vo); O. Schultz, " Die Lebensverhdltnisse der italienischen Trobadors," in Zeits. Sir romanische Philologie (1833). For the bibliography consnlt especially Bartsch, Grundriss zur Geschichte der provenzalischen Literatur (Elberfeld, 1872, 8vo), For texts the reader may be referred to Raynouard, Choix de poésies originales des Troubadours (1816-21, 6 vols. 8vo), and Lexique roman, ou dict. de la langue des troubadours, of which vol. i. (1838) is entirely taken up with texts; and Rochegudc, Parnasse occitanien (Toulouse, 1819, Syo). All the pieces published by Raynouard and Rochegude have been reprinted without amendment by Mahn, Die Werke der Troubadours in provenz. Sprache (Berlin, 8vo, vol. i. 1846, ii. 1855-64, iii, 1880, iv., Containing an edition of the troubadour Guiraut Riquier, 1884). The same editor's Gedichte der Troubadours (Berlin, 1856-78) is a collection conspicuous for its want of order and of accuracy (see Romania, iii. 303). Among editions of individual troubadonrs may be mentioned—Petre Vidal's lieder, by Karl Bartsch (Berlin, 1857, 12mo); Les derniers troubadours de la Provence, by Paul Meyer (Paris, 1871, 8vo); Der Troubadour Jauyfre Rudel, sein Leben und seine Werke, by A. Stimming (Kiel, 1873, 8vo); Bertran de Born, sein Leben und seine Werke, by A. Stimming (Hallc, 1879, 8vo); Gutlhem Figueira, ein provenzalischer Troubadour, by E. Levy (Berlin, 1880, 8vo); Das Leben und die Lieder des*~~

~~*Troubadours Peire Rogier, by Carl Appel (Berlin, 1882, Svo); La vita e le opere del trovatore Arnaldo Daniello, by U. A. Canello (Halle, 1883, 8vo). Among editions of Provencal works of a miscellaneous kind are—Bartsch, Denkmdler der Provenzalischen Literatur (Stuttgart, 1856, 8vo); H. Suchier, Denkmdler der pro- venz. Literatur und Sprache (Halle, 1883-85, 2 vols, 8vo); Fr. Armitage, Sermons du XII stécle en vieux provencal (Heilbronn, 1884, 12mo); Paul Meyer, La Chanson de la Croisade contre les Albigeois, (Paris, 1875-79, 2 vols. 8vo); Id., Dauriel et Beton, Chanson de geste provencale (Paris, 1880, 8vo); Id., Le Roman de Flamenca (Paris, 1865, 8vo); E. Stengel, Die beiden diltesten provenzal. Gram- matiken, lo Donatz proensals und las Razos de trobar (Marburg, 1878, 8vo); Bartsch, Sancta Agnes, provenz. geistliches Schauspiel (Berlin, 1867, 8vo); Le Breviari @amor de Matfre Ermengaud, published by the Archeological Society of Béziers (Béziers, 1862-80, 2 vols, 8vo); A. L, Sardou, La Vida de Sant Honorat, légende en vers provenceaux par Raymond Feraud (Nice [1875], 8vo). Documents and dissertations on various points of Provengal literature will be found in almost all the volumes of Romania (Paris, in progress since 1872, Svo), and the Rerue des Langues romanes (Montpellier, in progress since 1870, 8vo0). Sce also the other jour- nals devoted in Germany and Italy to the Romanic languages, passim. (ESM)*~~

~~*Pa Ory*~~

~~*PROVENCE (Provincia), a province of France lying to the extreme south-east on the shores of the Mediterranean, bounded on the W. by Languedoc, on the N. by Ven- aissin and Dauphiné, and on the E. by Italy. It now forms the departments of Bouches-du-Rhéne, Var, and Basses- Alpes, with portions of Vaucluse and Alpes Maritimes. It was divided into Upper Provence, containing the four seneschalates of Forcalquier, Castellane, Sisteron Digne, and the Valley of Barcelonnette ; and Lower Provence, containing the eight seneschalates of Aix, Arles, Brignoles, Grasse, Marseilles, Draguignan, Hyéres, and Toulon. In ancient aS in modern times the most important city was Marseilles (Massilia), a chief seat of trade for the Greek merchants of the Mediterranean, who extended their power along the coast and founded Agde, Antibes, Grasse, and Nice. They afterwards called in the aid of the Romans (125 B.c.) against the Ligurian inhabitants of the surround- ing country, and the new-comers soon made tliemselves*~~

~~*masters of the territory which later formed the provinces of Languedoc, Dauphiné, and Provence. The new pro- vinec, of which the capital was Aquz Sextize (Aix), was called Provincia Gallica until the total conquest of Gaul, when the name of the district was changed to Gallia Narbonensis. In the 4th century of the Christian era, when the greater part of Languedoc, or Narbonensis Prima, had become subject to the Visigoths, and the Burgundians had spread to the Viennois, Provincia came to be applied only to the country lying between the Rhone, the Durance, and the Alps which was still held by the Romans. But they could not withstand for long the advancing tide of barbarian power. Although the Visi- gothic king Theodoric I. was defeated by Aetius before Arles in 425 A.p., and their united armies in turn defeated Attila in 451, yet Theodoric II. imposed the emperor Avitus on the Romans, and Euric by the capture of Arles (480) made the Visigoths masters of Provence. Their defeat at the battle of Bouglé in 507 by Clovis and Gundibald, king of the Burgundians, placed Provence at the mercy of the latter, who ceded it in 511 to Theodoric, king of the Ostrogoths, as guardian of the Visigothic king. The powers so gained were, however, resigned by his suc- cessor Witiges in 536 to Theodebert, king of the Franks, who had previously overthrown the Burgundian kingdom. On the death of Clotaire I. (561) Provence was divided between his sons Sigebert, king of Austrasia, and Gontran, king of Burgundy, Marseilles falling to the former and Arles to the latter. When Gontran died in 593 the pro- vince was united under his nephew Childebert, only to be divided again by his sons and reunited under Clotaire II. (613), until the sons of Dagobert, Sigebert II. and Clovis II. (633) parted it between them. In 719 the Saracens crossed the Pyrenees and made themselves masters of almost all Septimania, or Languedoc, and in 739 they joined with Maurontis, a Byzantine governor of Marseilles, in his attempt to drive out the Franks. Fortunately for Europe their forces were completely defeated by Charles Martel, who again united Provence to the Frankish kingdom. On the division of the Carlovingian empire in 843 Provence fell to Lothair, who left it with the title of king to his son Charles (855), at whose death without issue in 863 it was seized by Charles the Bald. In 879 his brother-in-law Boson, a son-in-law of the emperor Louis II., and governor of Vienne, was elected king by the synod of Mantale, when lis united provinces became known as Cisjuran Burgundy. HIs son, Louis the Blind, obtained the crown of Italy (900), but was deposed by HIugo, who, in his turn obtaining the*~~

~~*Italian kingdom, ceded Provence in 932 to Rudolph IL, king of Transjuran Burgundy. The two Burgundies thus united received the name of the Kingdom of Arles, which lasted in a phantom form until*~~

~~*HNCH 877*~~

~~*1032, but Provence was always governed by princes whose powers gradually increased, until the county was changed from a beneficiary to an hereditary fief. The line of bene- ficiary counts begins with Boson I. (926), who was rein- vested by Rudolph II. in 934. He was succeeded by Boson II. (948), whose son William I. (968) signalized his reign by driving out from the stronghold of Fraxinet the Moorish pirates who had seized it in 889, and thence ravaged the neighbouring country. His brother Rothbold, who held the fief until 1008, was followed by his nephew William IL, and, as the union of the kingdom of Arles with the German empire was by this time almost nominal, the counts of Provence claimed independence, and William's sons, Geoffrey-Bertrand I. and William IIL, divided the county in 1018 as an allodial fief. William III. died in 1053 and Geoffrey-Bertrand handed over to his nephews the northern part, or the county of Forcalquier, he himself retaining the main province to which his son Bertrand II. succeeded in 1063. At his death without issue in 1093 the county was ruled by his mother Etiennette, who was followed (1100) by her daughter Gerberge, wife of Gilbert, viscount of Milhaud and Gévaudan. Their daughter Douce was married to Raymond-Bérenger, count of Barcelona, of the house of Aragon, and Provence passed to him in 1112. But his succession was not undisputed. Raymond de 8. Gilles, count of Toulouse and Venaissin, a great-grandson of Rothbold, had about 1085 laid claim to the county of Forcalquier, and his pretensions were pro- bably partly admitted. The excitement of the crusades put a stop to further action, and in 1096, accompanied by Count Gilbert, he led the Provencal contingent, which was, however, more distinguished for foraging than fighting. On his death in 1105 his claims were revived by his son Alfonse Jourdain, who succeeded in obtaining from Raymond-Bérenger an extension of the county of Venaissin. Raymond-Bérenger I. died in 1130, and was succeeded by his son Bérenger-Raymond, whose rights were disputed by Raymond de Baux, husband of his mother's sister Etiennette. In the war which ensued the count was killed before Melgueil, leaving a young son, Raymond-Bérenger II.*~~

~~(1144), to the guardianship of his uncle, Raymond-Bérenger of Aragon. The claims of Raymond de Baux were renewed by his son HIugo, on whose defeat in 1162 the emperor Frederick I. gave his niece Richilda in marriage to the young count, and invested him with the fiefs of Provence and Forcalquier. HIs only daughter Douce had been betrothed to the count of Toulouse, who accordingly on the death of Raymond- Berenger II. (1166) claimed the county, but was defeated by Alphonso I. of Aragon, who invested his brother Raymond-Berenger III., on whose death in 1181 the fief reverted to Alphonso I. to pass to his son Alphonso II. (1196). This prince died in 1209, and was succeeded by his son Raymond-Bérenger IV., who, seeing that the great cities were nests of intrigue for rivals to the throne, set himself to destroy their independence. Through all changes of rulers the cities had kept their internal freedom and old Roman self-government. The election of the governing body had always remained in the hands of the citizens, but the office of chief magistrate, after ceasing to be filled by a nominee of the Byzantine emperor, had be- come vested either in certain families or in the bishops. In the 12th century measures of reform were imitated from the Italian republics, the chief characteristic of which was the election for life of a stranger as chief magistrate or podesta. The power of the podestas was too great to be broken at once, and, though the Albigenses in Avignon capitulated in 1226, and Nice, Grasse, Toulon, and Marseilles afterwards submitted to Raymond-Bérenger IV., it was left to his son-in-law, CHARLES oF ANJou (see~~

~~vol. v. pp. 422-23), to replace the podestas by governors of his own nomination (1246). Charles died in 1285, leav- ing the states of Anjou, Provence, and Naples to his son Charles II., under whose rule peace and prosperity to some extent revived. But the efforts of his son Robert (1309) in the cause of the Guelphs called for increased taxation, and he left a troubled heritage to his granddaughter Joan of Naples (1343). To avenge the murder of his brother Andrew, the husband of Joan, at whose instigation the crime had been committed, Louis of HIungary marched into Italy (1347), and made himself master of the kingdom of Naples. Joan fled to Provence, and by timely conces- sions to her people secured their favour in her efforts to regain the Neapolitan crown, But money was needed ; so Avignon, where~~

~~*the popes had resided since 1305, was sold to Pope Clement VI., and Joan won back Naples. An important part in the affair was played by the Pro- vencal estates, which consisted of the three houses of clergy, nobility, and commons, and were supreme in all financial matters, however absolute the counts might be in other branches of government. This power of the purse was jealously guarded, and the subsidies granted to the prince were never considered as other than dons gratuits, the name by which they were called even after the union with France, when they became an annual tri- bute. Owing to the right of répartition to definite objects of the sums raised by taxation, the Provengaux were not on the whole badly governed, for, though the estates had only the right of petition for legislation, yet when the need arose they could very effectually speak with the voice of the whole people. The representation of the bulk of the nation in the tiers-état was particularly good, for the deputies, who were paid, were returned not only by the twenty-five country electorates, or vigueries, but from thirty-seven communes as well. The English constitution may therefore be indebted to Provence for the important step which was taken by the younger Simon de Montfort in first summoning the representatives of cities and boroughs to the parliament of 1265. The earliest re- corded session of the estates was in 1146, and the meet- ings continued at intervals until 1639, when they ceased until 1787. The sessions not being annual, the powers of the estates in ordinary matters were delegated to a general assembly, composed of the archbishop of Aix, the pro- cureurs joints, who were representatives of each of the estates of the clergy and the nobility, and the whole of the tiers-état. This assembly gradually superseded the estates until in 1639 it replaced them altogether. To meet sudden emergencies there was a "great council," which consisted of the archbishop and three consuls of Aix as procureurs du pays, and the procureurs joints of the three estates, under the presidency of the grand seneschal. This officer was the representative of the counts in judicial affairs, and during their absence from the country in military matters also. HIs powers were not only adminis- trative, but to a great extent legislative, and they were therefore fated either to increase at the expense of the soverelgn or to be cut down by a firm ruler. Joan chose the latter course, and deprived the grand seneschal of his powers over the state domains, and his right to remove judges and pardon capital crimes. And she not only reduced. his power but appointed an Italian to the office, upon which the nation rose in revolt, and Louis of Anjou, selzing the opportunity to press*~~

~~his claims to the throne, led an army into Provence in 1368. The pretensions of Louis were met by Joan's offer to adopt him as her heir, and on her death in 1382 he succeeded to the county. The reign of Louis I. was passed in the unsuccessful pur- suit of his claims to the kingdom of N aples, and his son Louis II. (1384) and grandson Louis ITIL (1417) con-~~

~~tinued the same unprofitable contest. Reneé (1434), a brother of Louis III, was not less inclined to give up his rights, which had revived in force from his adoption by Joan II. of Naples, but, though fortune at first smiled on him, he was at last forced to resign his claim in favour of the house of Aragon. The count, or titular king, was an accomplished musician and a lover of literature and the arts; and, the latter part of his reign being on the whole peaceful, he was able to give free play to his inclinations. The artistic fame of his court has lasted to the present day, but it was the interest which he took in his subjects' material welfare, and his administration of wise laws, which caused his people to lament the death of René the Good. He died in 1480, and, leaving only a daughter Margaret, the ill-fated wife of Henry VI. of England, bequeathed the county to his nephew Charles of Maine. Charles ITI. died in the following year, making Louis XI. of France his heir, and in 1486 Charles VIII. by letters patent reunited the county to the kingdom of France.~~

~~The union was confirmed by the estates with the full approval of the people; but the emperor was not inclined to relinquish without a struggle his claims to overlordship, and he found a willing tool in the constable, Charles of Bourbon, who entered Provence at the head of the im. perialist army in 1524. His adventure met with failure, and the invasion by the emperor Charles V. himself in 1536 was equally unsuccessful. In 1501 Louis XIIL., with the view of strengthening his own authority, replaced the "conseil eminent," which in the time of the counts had been the highest court of justice, by a "parlement," consist- ing at first of the grand seneschal, a president, and eleven nominated councillors. The functions of the court were strictly judicial, but before its abolition in 1790 it had often assumed legislative rights, and consequently played a conspicuous part in the civil wars of the 16th and 17th centuries. The principles of the Reformation~~

~~*made what little progress they did in Provence from external rather than internal causes, and the people themselves never took kindly to doctrines which in many ways assumed an extremely bizarre and heretical form. The 13th century had witnessed Simon de Montfort's crusade against the Albigenses of Languedoc, and the ruin which heresy had brought on that province cannot have given the prosper- ous Provengaux any great love for new doctrines. The Waldenses of the 16th century were therefore chiefly con- fined to the mountainous districts, but the persecutions ordered by the parlement brought the horrors of civil war on the whole country. The extreme Catholics formed the Holy League against the Protestants, and the two parties were equally at enmity with Henry III, who tried to please both without satisfying either. In time the royal- ists and Protestants united under the name of Bigarrats, but it was not until Henry IV. had come to the throne, and Marseilles, the last stronghold of the League, had submitted, that the worn-out country was again at peace. Richelieu tried to increase the taxation of the people with- out their consent, but the disorders of the Cascaveous were the result, and a similar attempt by Mazarin in 1647 led to disturbances in connexion with the Fronde which lasted until 1652. In 1707, during the War of the Spanish Succession, the army of the allies under Prince Eugene invaded the province, and the horrors of war were followed by those of the plague of 1720, when 100,000 persons perished, Marseilles alone losing 50,000 out of a popula- tion of 90,000. The dispute between the Jesuits and Jansenists waxed warm about 1726, but the victory of the former only preceded their suppression by Pope Clement XIV. in 1773 in return for the cession of Avignon and the county of Venaissin, which had twice changed hands since their reunion with Provence in 1663. On the re-*~~

~~*convocation of the estates in 1787 the two upper houses refused to bear their share of taxation, and in 1789, in the states-general of the kingdom, Mirabeau with his col- leagues renounced the freedom and independence of the province. The division of Provence into departments in | 1790 finally obliterated all traces of the ancient con- | stitution, but the people still preserve in the soft tones of their Jangue d'oc an undying reminder of their former independence. (H. B. B.)*~~

~~*PROVERBS, Boox or. The title of the book of Pro- verbs is "The Proverbs of Solomon" (moby wn, mishlé shelomoh, or more shortly meshlé, for which Origen gives the feminine form misloth, Euseb., H. #., vi. 25). The | title in the LXX. is a literal rendering of the Hebrew, Tlapoiuiat Sartwpavros. In early times the book was frequently referred to both among Jews and Christians under the name of " Wisdom" or "The Wisdom that com- prises all Virtues" (4 wavaperos copia, Clem. Rom., ch. 57). This name, however, was employed somewhat indis- criminately, for not only Proverbs but also Ecclesiastes and the apocryphal books Ecclesiasticus and Wisdom were also designated by it, and sometimes apparently the whole third division of the canon (Lightfoot, Epp. of S. Clement, p. 164 sq.).*~~

~~*The book of Proverbs as it now lies before us consists of*~~

~~*a number of distinct parts. 1. We have, chap. i. 1-7 (or i. 1-6 as some think), a general heading and preface, giving the title of the*~~

~~*"The Proverbs of Solomon, the son of David, king of Israel. To know wisdom and instruction . . . to give subtlety to the simple, to the young man knowledge and discretion . . . to understand a proverb and a figure, the | words of the wise and their dark sayings." This is_ followed by the fundamental maxim of the Wisdom, " The fear of the Lord is the beginning of wisdom." The question to what parts of the book this preface extends is not easy to settle.*~~

~~*2. This general preface is followed by a lengthy pas- sage, i. 8-ix. 18, which consists, not of detached proverbs, though a number of such proverbs are scattered through it, but of connected discourses in praise of wisdom and the benefits which she confers on those who embrace her. The speaker is one of the wise, or a type of them, who ad- dresses his youthful pupil or friend as "my son," though at several points wisdom herself is introduced speaking, displaying her graces, offering herself to men, narrating her history, and magnifying the delights which they who follow her enjoy, as well as painting in dark colours the evils from which she preserves them. Attempts have been made to divide the passage into distinct sections, but without much success. Ewald counts three general divisions, Bertheau seven, Hooykaas eleven, and Delitzsch fifteen. The passage is in the main homogeneous, though containing at more places than one elements which*~~

~~at first sight might appear foreign (eg., vi. 1 sq.), and on the whole at least is the composition of a single author. Several of its characteristics, such as the style, and par- ticularly the personification of wisdom in chap. vill. and else- where, one of the most remarkable and beautiful things in Hebrew literature, indicate that the passage belongs to an advanced stage of the Hebrew wisdom.~~

~~3. Then follows the largest section in the book, x. 1- xxii. 16, with a new heading, "The Proverbs of Solomon." This division consists of a number of verses—three hundred and seventy-four, it is said—each of which contains a single proverb or maxim in two lines, the only exception being xix. 7, which has three lines, but this is probably due to one member of a second verse having fallen out. The kind of poetical parallelism most common in these verses is the |~~

~~antithetic, of the type "A wise son maketh a glad father, but a foolish son is the heaviness of his mother" (x. 1). This type of parallelism prevails almost exclusively in x.—xv., after which other types are more commonly introduced. The proverbs in this collection are of a very miscellaneous character, and are thrown together without any classifica- tion or regard to subject, though occasionally a few verses~~

~~| are found to follow one another having reference to a~~

~~common topic. 4, After this comes a small collection consisting of two parts which have been put together, xxii. 17—xxiv. 22 and~~

~~_ xxiv. 23-34. The author of the first collection informs his~~

~~son or disciple that what he addresses to him is " words of the wise" (xxii. 17) ; and the second small code is inscribed "These also are by the wise" (xxiv. 23). The proverbs in this collection sometimes make one verse, sometimes two or three, and even occasionally run out to a short proverbial discourse.~~

~~5. Then follows an important collection, xxv.—xxix., with the inscription, "These also are proverbs of Solomon, which the men of Hezekiah, king of Judah, copied out" (xxv. 1). The expression "copied out" (LXX. e&eypayav7o), lit. "transferred" or removed from one place to another,~~

~~| implies that the men of Hezekiah made use of written~~

~~sources in forming their collection. The notice is of great historical interest. Hezekiah, besides being a wise and reforming king, had probably literary tastes; he has the~~

~~reputation of having been a poet himself (Isa. xxxviii.) ; book and the purposes to be served by its contents :—|~~

~~| 2 Kings xviii. 37).~~

~~and his "men" were no doubt scholars and scribes about his court, who shared in his tastes and pursuits, and under his direction used their opportunities to rescue from oblivion the precious remains of the most ancient wisdom by transferring them from the small collections in which they lay hidden into a single and authorized code (cf. It may perhaps be considered some corroboration of the genuine historical character of the inscription that the collection begins with a number of proverbs relating to kings. The maxims in this code, particularly in xxv.—xxvii., approach much nearer to what we should imagine the early popular proverb to have been than many of those in the other large collection ; they are simple, usually contain a comparison, and have none of the abstractness which characterizes many of the maxims in x.-xxil. This may be regarded as a guarantee of their great antiquity.~~

~~6. Two small pieces then follow, evidently related to one another, xxx. and xxxi. 1-9,—the former with the inscription, "The words of Agur, the son of Jakeh," and the other with the heading, " The words of King Lemuel." The inscriptions to these two pieces are very obscure. In the former the A. V. can hardly be correct. More probably by a different division of words we should read —' The words of Agur the son of Jakeh of Massa. The man said, I have wearied myself, O God, I have wearied myself, O God, and am consumed ; for I am more brutish than any man," &. The words are those of one who~~

~~*has striven to comprehend God and found the task above him (Ps. lxxiii. 22). Possibly the above rendering re- quires a slight correction in the text, already made in the Veneto-Greek version, which renders "Jakeh the Massaite" (Gen. xxiv. 14%). Similarly the heading in xxxi. should probably read—" The words of Lemuel king of Massa, wherewith his mother instructed him." It is uncertain whether the names Agur and Lemuel be real or fictitious.*~~

~~*7. Finally the book is closed by an alphabetical poem, xxxi. 10-31, in praise of the virtuous (that is, the active, capable) woman.*~~

~~*The contents of these several sections are very various and not easy to classify. The proverbialists occupy them- selves with life in all its aspects. Sometimes they simply*~~

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~~*catch the expression of men good or bad, or photograph their actions and thoughts; more generally they pass a verdict upon them, and exhort or instruct men in regard tothem. The proverbs differ from the shrewd or humorous sayings which are so called in profane literature ; some of them have a certain flavour of humour, but they are mainly maxims touching practical life on its religious and moral side. Such maxims cannot be regarded as wholly or even in a very large degree the production of an individual mind. A number of them may well be by Solomon, and a greater number may belong to his age ; but, though the stream of wisdom began to flow in his day, its beginnings were then comparatively small ; as the centuries advanced it gathered volume. In the book which now exists we find gathered together the most precious fruits of the wisdom in Israel during many hundred years, and undoubtedly the later centuries were richer, or at all events fuller, in their contributions than the earlier. The tradition, however, which connects Solomon with the direction of mind known as the wisdom cannot reasonably be set aside. The renown for wisdom which this king enjoyed among his own people, and even, though in a distorted and fantastic form, among the other peoples of the East, must have rested on some real founda- tion. No doubt reputations grow, and veneration mag- nifies its hero sometimes in proportion to the indistinct- ness of its real knowledge of him; and objects seen in the broad light of day*~~

~~*are very insignificant compared with the bulk which they assume when seen between us and the light still lingering on the horizon of a day that has gone down. But, making allowance for the exaggerations of later times, we should leave history and tradition altogether unexplained if we disallowed the claim of Solomon to have exercised a creative influence upon the wisdom in Israel. At the same time it is probable that this influence did not lie in the application of new methods, much less in the creation of a new direction of thought. The supposition that Solomon was the inventor of the proverbial distich or mashal, particularly of the antithetical distich, or that he was the first to use this in his sententious sayings on men and life, and thus the father of didactic poetry among the Hebrews, is a mere conjecture. The distich was employed long before his day, and sententious maxims regarding life and men long preceded him. Moreover the conjecture is based on the very false assumption that the essence of the wisdom lay in the form of expression rather than in the matter, and that the curt, sharp, antithetical distich was its proper characteristic and belonged to it from the beginning. This assumption, made by Ewald, has been so usually accepted by writers after him that the polished pointed antithesis has been elevated into a criterion of the higher antiquity of those proverbs which possess it. Pro- bably the opposite conclusion would be nearer the truth. The form of these antithetical proverbs betrays art, long use of the literary methods of the wise, and an approach to technicality—things not to be expected in an early age. The early mashal was probably simple, containing a figure or comparison, as the name implies; some truth of the life of mankind thrown into an image from nature, without anything artificial or technical. Proverbs like "iron sharp- eneth iron," or such fine similes as these—"'a trampled fountain and a fouled spring is the righteous man who hath given way before the wicked," "a city that is broken down and hath no wall is the man whose spirit is without con- trol" (xxv. 26, 28)—are the kind of proverbs which we should look for in this earliest time. Solomon has a place of renown in the wisdom, not because he imposed any mannerism upon it, but because he threw a vigorous mind into it. He probably formed no class: the word "wise" did not, from being an adjective, become a noun in his*~~

~~*PROVERBS*~~

~~*days. The nature of his wisdom is best illustrated by the story of the two women with the living and the dead child (1 Kings iii. 16-28). He possessed a keen insight into the operations of human nature; he knew the world and men and life. Most likely also he possessed the power of giving pointed expression to his shrewd and ready judgments ; and, as it is said that he spoke of beasts and fishes and trees, he probably had an eye for the analogies between human life and the external world. From his character we should judge that his three thousand proverbs were not all religious ; neither were his thousand and one songs all hymns, or some of them would have been preserved to us besides the two more than doubtful poems in the Psalter (Ps. lxxii., cxxvii.). The theme of the wisdom was life, and its aims were practical; and, if the rise of the wisdom be connected with the age of Solomon, that is due to the fact that life in the civil sense began in this age, and its principles could be discovered. Then the tribes were con- solidated into one community, the state rose into existence, the channels of commerce were opened, men entered into various and complicated relations with one another, and the principles which rule such relations revealed themselves to the eye that was open to observe them.*~~

~~*It is not quite easy to form definite conceptions of those called the wise in Israel. They were certainly no heredi- tary caste like the priests; neither had they any distinct call to a vocation like the prophets, although in later times at least they were so well recognized that they could be ranked with these two classes as influential in forming men's opinions and guiding their actions (Jer. xviii. 18). They were probably men who might be named elders, not always because of their age, but because of their superior sagacity ; men who, having at heart the welfare of the state and particularly the moral soundness of the citizens, sought to gain the ear of the young and inculcate upon them the principles of right conduct. While the priests were the clergy and lawyers in Israel, and the prophets the statesmen, the wise were the moralists and educa- tionists, whose operations touched the individual in all his relations and duties. Their methods were probably simple to begin with, and natural, without anything strictly characteristic ; they were moral "reprovers," or ordinary "counsellors," and possibly at fi'st their ethical maxims were general, touching life as a whole. By and by they surveyed life with a keener scrutiny and subjected it to a sharper analysis, bringing their moral principles to bear on its shades and sides and aspects, and applying*~~

~~*these principles with greater inwardness so as to strike not merely at external conduct but at the disposition of the mind. And, finally, under the influence of the universalistic ideas of God and providence suggested to the minds of men in Israel by contact with the great empires of the world and observation of their destinies, when the Jewish state became involved in political movements as wide as the known world, the wise were enabled to gather together the manifold fragments into which they had analysed the moral life of man and the operation of the providence of God, and to perceive that they were all but elements in one great divine system embracing all things, both the world of nature and the destinies of men. 'To this great scheme, which was but God fulfilling himself in many ways, they gave the name of wisdom in the abstract; it was the counterpart of the divine mind, God's fellow and architect in framing the world. This was the divine wisdom; human wisdom consisted both in intellectual comprehension of it and in moral harmony with it, and the first could be reached only through the second: tke fear of the Lord is the beginning of wisdom. Illustrations of the wisdom in its earliest form may be seen in the collection XXV.—xxix., and in many proverbs in x.—xxii.*~~

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~~*(many examples of the period of most subtle analysis in the last-named collection), while the period of synthesis and what comes near to bea science of wisdom is represented in the passage i.—ix. Naturally along with this advance in thought there appeared a corresponding advance in the forms of expression in which the wisdom clothed itself: the wise acquired a method; a particular spirit began to animate their circles; their phraseology showed the impress of a particular mint, and ultimately assumed a form almost technical.*~~

~~*Perhaps some of the things which failed to attract the attention of the wise are more suggestive than those things with which they occupied themselves. Though sacrifice, for example, be once or twice alluded to, no importance is attached to the ritual system; the priest is not once mentioned, and the external exercises of worship appear to have little significance. But, what is more remarkable, the wise man differs as much froni the prophet as he does from the lawgiver. All those ideas around which prophecy revolves, such as*~~

~~*the idea of the kingdom of God, of a chosen people, of a Messiah or future king of the house of David, and the like, are entirely absent. The distinction between "Israel" and the "nations" has no place. The darling phraseology of the prophets—"Israel," "Jacob," "Zion," "my people," "the latter day"—and the whole terminology of particu- larism characteristic of prophecy and many even of the Psalms nowhere occurs. The conflict between the worship of Jehovah and that of false gods, with which the pages of prophetic writers are filled, does not receive even a pass- ing reference. Conclusions have been drawn from these peculiarities which, though not unnatural, are scarcely warranted. It has been inferred that the wise were men whose way of thinking placed them outside of their dis- pensation and in antagonism to the circle of beliefs cherished in Israel and represented by the prophets and other public teachers—in short, that they took up a humanistic or naturalistic position. A position to which the name naturalistic could be given is inconceivable in Israel. There were no doubt men called wise who pursued false directions (Jer. xviii. 18), as there were false prophets ; but there is nothing in the Proverbs to indicate any antagonism between their authors and either priest or pro- phet. On the contrary the passage iii. 9—a solitary one no doubt—"Honour the Lord with thy substance, and with the first fruits of all thine increase," shows their friendliness to the ritual. If they say on the other hand that the sacrifice of the wicked is an abomination to the Lord (xv. 8), and that by mercy and truth iniquity is atoned for (xvi. 6), this is nothing but what the prophets proclaim in a body, and means merely that obedience is better than sacrifice and the moral higher than the ritual. And even Sirach, a fervent supporter of priesthood and sacrifice (Ecclus. vii. 29 sq.), enunciates the same doctrine: "He that keepeth the law multiplieth offerings; he that taketh heed to the commandments sacrificeth a peace-offering. To depart from wickedness is a thing pleasing to the Lord, and to depart from unrighteousness is a pro- pitiation" (Ecclus. xxxv. 1 sg.). And that the wise men feel themselves within the circle of the revealed religion is evident from their use of the name Jehovah, their frequent references to the "law," that is, torah or revelation, the "commandment," the "word," and the like; and sucha sentence as this, "Where there is no vision (prophetic revelation, 1 Sam. iii. 1) the people cast off restraint" (xxix. 18), shows no unfriendliness to the prophets. The wise men had no quarrel with the institutions of Israel, nor with the public teachers and their operations ;*~~

~~they occupied themselves more, however, with the life of the individual than the community, and sought to distil from~~

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~~the particularistic thought in Israel principles which, both in morals and religion, should be universal and applicable wherever men lived.~~

~~Still this very universalism is a remarkable thing, and a different attempt has been made to explain it. It has been suggested that the wisdom, though some beginnings of it may have appeared during the prophetic period and while the autonomy of Israel as a state continued, must be in the main elements of its literature a thing posterior to the downfall of the state and the cessation of prophecy. Only in this way it is thought is it possible to explain the complete absence of all those ideas regarding Israel as a people, its relation to the heathen, and its future destiny, which fill the pages of the earlier literature. That inspira- tion and exaltation of mind which marked the prophetic age has disappeared and reflexion has taken its place. Enthusiasm for the state has died out because the state has perished, and is now represented by care for the individual. Prophecy has fulfilled its mission; it has lodged its principles in men's minds; it has seen itself fulfilled in the overthrow of the kingdom, but the hour of its triumph has been the hour of its death. Now follows the time of reflexion upon the prophetic truths, when the mind has accepted principles and risen through prophetic teaching to universal conceptions of God and the world, and an effort is made to apply them to the individual life. In short the age of the wisdom is the period of the return from exile, when Israel was no more a nation but a com- munity of people, when it had no king of its own but obeyed a foreign ruler, and when prophecy speedily became dumb, partly because its mission had been fulfilled and partly because the chief condition of its exercise, the exist- ence of the state, was awanting. In this condition of things the wise arose and exercised their functions; they do not allude to prophetic conceptions because, so far as these concerned the people in its nationality, they had in the meantime lost their meaning, and so far as they belonged to the general region of religious and ethical truth they had been accepted at least by the better minds among the people, and it is the aim of the wise to per- suade every individual in the community to receive them~~

~~*and live by them. The wise indeed are the successors of the prophets; they inculcate the same truths as they did, but the subject whose ear they seek to gain is the individual and no more the state.*~~

~~*Such a theory, should it come to be accepted, would carry its compensations with it. It would fill with the liveliest activity a period in the life of Israel where a silence almost of death seems at present to reign. The centuries after Malachi are a great blank ; if we could suppose them filled with the life and thought reflected in the charming literature of the wisdom, they would yield in interest to no period of the nation's history. And beyond doubt the wisdom continued to flourish in this age, for Ecclesiastes and later down the extra-canonical wisdom of Sirach are the fruits of it. If we consider Ecclesiastes, however, we find that it is the proper successor to the book of Job; it reflects the natural exhaustion of speculation on the great mysteries of God and providence which could not but follow the stormy conflict exhibited in Job. But in the two great collections of Solomonic proverbs such doubts regarding providence do not at all appear, and even in the other collections (except chap. xxx.) they are touched on lightly. The Proverbs appear to signalize the stage of Hebrew thought anterior to the book of Job. It may be said that Sirach does not debate such questions. This is true, but the reason is that he consciously declines to entertain them, "Seek not things that are too hard for thee"; " None shall say, what is this? wherefore is that?" (Ecclus, iii. 21, xxxix. 16), while to the proverbialists they*~~

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~~*do not occur. Again, it is doubtful if any period in the history of Israel was marked by an absence of those national aspirations and hopes so prominent in the pro- phets; and if the wise do not allude to them it is not because the hopes were dead but because another direction of thought absorbed them. They are equally indifferent to the claims of the law. But, at whatever time the Leviti- cal legislation arose or was codified, it is certain that at no period was it observed as it was after the restoration. And yet there is no allusion to it in the Proverbs; the "Jaw " referred to is not the ritual but the ethical law as in the prophets ; it is the law of one's mother, of the wise, of*~~

~~*divine revelation in general, but never specifically that of the priest. In Sirach on the contrary the wisdom her- self is identified with "the law which Moses commanded us for a heritage unto the assemblies of Jacob" (Ecclus. xxiv. 23). The truth is that the wisdom is a direction of thought differing from the main line of thought in Israel at any time, and yet a direction which we should expect and which we desiderate at all times. It is a force which was disrupting the particularism of the Jehovah religion from within just as the events of history shattered it from without, and bringing to view its inherent universalism. The prophets direct their attention mainly to the state, and they appear at irregular intervals. It is when the lion roars that they give the alarm (Amos iii. 8). Their voice is heard only when the tempest is rising, when some crisis in the people's history is approaching. We can hardly doubt that the intervals were filled up by the operations of men who pursued a calmer method, such as the wise, who were the "reprovers" and monitors fre- quently alluded to by the prophets themselves (Hos. iv. 4; Amos v. 10; Jer. xviii. 18). There is some danger of pushing the principle of development to an extreme so as under the influence of too ideal a conception of progress to divide the history and thought of Israel into sections by drawing straight lines across it, as.Ezekiel in his vision divided the holy land into rectangular belts. No people moves forward on one line or in a mass. Alongside of the main current of thought and progress there are always minor currents running. And finally, while there are many proverbs that from their nature can hardly be placed in the period of the restoration, there are really none that from their internal character require to be dated so low. The proverb already quoted, "Where no vision is the people cast off restraint " (xxix. 18), must be contempor- aneous with the prophetic period. The other, " My son, fear the Lord and the king" (xxiv. 21), would scarcely be spoken later than the monarchy (cf. 1 Kings xxi. 10). Many of the references to kings are no doubt general, though they are more natural under the native kingdom than at any other period (¢.g., xvi. 12, xx. 8); but such a saying as this, "A divine sentence is on the lips of the king, his mouth shall not transgress in judgment" (chap. xvi. 10), seems to take us back to the more ancient days in Israel.when the king actually judged causes in person. And undoubtedly the national tradition at the time of the composition of Job, as we see it reflected in the speeches of that book, was that the moral wisdom was so ancient as to be of immemorial antiquity.*~~

~~The questions regarding the age of the individnal collections contained in the present book and the age of the book as a whole are ele ae ?~~

~~1S an untortunate thing that the headings cannot be ely relied on. Such headings are often foillfticd on tradi- it arc merely suggestions of later editors or collectors. The oe ing of the collection XXV.—xxix., "These are also proverbs of pmo which the men of Hezekiah copied out," does not of course ? rom the men of Hezekiah, for the word "also" shows that itis ge ie nee who brought the collection into our present book, Th uch other proverbs of Solomon, viz., X.~xxii., already stood. vere 1s BO reason, however, to doubt the historical accuracy of the~~

~~| selves or by others.~~

~~' to another.~~

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~~inscription. This collection is at least as old as the end of the 8th century. At this period the proverbs contained in it were considered and called Solomonic. This of course does not guarantee that every proverb in the collection is by Solomon, though it guarantees the antiquity of the maxims, for the individual proverbs in a collection will always be older than the collection itself, and some of them may be of great antiquity. The term "copied out" implies that the men of Hezekiah confined themselves to written sources. We have little knowledge how the wise conducted their operations. Probably their instructions were in the main given orally. But small collections of their sayings were occasionally made by them- Several such collections were in existence in Hezekiah's days, and his scribes gathered them into one book. The usual extent of such small codes may be inferred from some of those embodied in our present book, e¢.g., xxii. 17—xxiv. 22, xxiv. 23-34, and xxx. There is no probability that the term 'copied out" implies that the men of Hezekiah proceeded critically and made a selection from a large mass of proverbs of such as they considered Solomonic, neither can their collection have been a gleaning made from _a number of small codes after the large code x.—xxii. had already been extracted from them. They can hardly have been acquainted with x.-xxii., otherwise their code would not lave contained so many duplicates of~~

~~maxims in that collection. It is certainly not improbable that Hezekiah's collection forms the oldest element in our book. Many of the proverbs contained in it have the stamp of antiquity. It comprises almost all the proverbs that we still use. Such sayings as "iron sharpeneth iron," "as face answereth to face in water," "the dog is returned to his vomit," "bray a fool in a mortar," phrases like 'heap coals of fire upon his head," "singing songs to a weary heart," "good news from a far country," "the curse causeless," "a whip for the horse, and a bridle for the ass, and a rod for the fool's back," are examples. Alinost all the proverbs in xxv.—xxvii. contain a comparison, and some are of great beauty, as for example, "an earthen vessel glazed with silver dross, so are fervent lips and a bad heart." The youngest elements in this collection are found in xxviii.xxix., which ap proach nearer the abstract and analytic manner of many of the proverbs in x.—xxii.~~

~~2. The passage i. 8-ix. is in all likelihood by one author, though some of the individual maxims contained in it may have been drawn from foreign sources (comp. vi. 9 sg. with xxiv. 30 sg.), and does not appear to be of very high antiquity. The general preface extends at least to xxii. 16; but, while its author says, "The pro- verbs of Solomon, son of David" (i. 1), a new inscription, "The proverbs of Solomon," heads x. This implies that i.-ix. were not considered Solomonic; the proverbs properly so-called commenced with the tenth chapter. Several things point towards a particular age as that to which the passage belongs. (1) The passage is pro- bably prior to the book of Job, for the personification of wisdom seems referred to in that book (xv. and xxvili., though xxviii. may be later than the main portions of the book). The age of Job is no doubt uncertain, but it can hardly be considered anterior to the exile, nor yet much later. (2) The descriptions given of wisdom taking her stand by the broadways and at the gates and addressing the throng- ing crowds of men (i., viii.), as well as the picture of the strange woman prowling in the streets at nightfall (vii.), suggest that the writer had the idea of a large and populous city present to his mind. This conld be no other than Jerusalem, and certainly Jerusalem before its destruction. The miserable city of the restoration could not until many generations after the return have afforded materials for the ideal before the author's eye, for nearly a century after the first exiles returned great part of it was still in ruins (Neh. vii. 4). Though the author warns the~~

~~youth of his day against disorderly and violent men, his references to life suggest a condition of general comfort and plenty. (3) On the other hand the personification of the wisdom marks the highest point to which Hebrew thought on the world rose, and cannot belong to an early age. It is scarcely conceivable except at a time when the operations of the wise had been long pursued. Wisdom, pausing in the work of expounding providence and the laws of human happiness, which she had long instinctively pursued with self-forgetful fascination in her task, becomes self-conscious, and turning her eyes upon herself displays her own graces and beauty before the sight of men. A philosophy of wisdom has now been reached. These facts together point to a time not very long anterior to the destruction of Jerusalem, possibly about a century after the men of Hezekiah made their collection. With this agrees the language of the piece, which, though generally good, has several marks of a somewhat late age, ¢.g., the frequent formation of abstracts in -wth.~~

~~3. It is more difficult to form an opinion regarding the large code, X.-xxli. It has generally been considered the oldest collection in our book ; and without doubt many of the proverbs contained in it may be old, as old as those in Hezekiah's collection, though others may be of more recent. origin. From the nature of such genera] maxims there is little about them to suggest one age in preference The grounds, however, on which these proverbs have been considercd the oldest in the book hardly support such~~

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~~a belief. These grounds are partly the form of the proverbs and partly the nature of their contents compared with the other collec- tions. In form the collection consists exclusively of distichs, and in large parts of antithetical distichs. But, though the distich may be the oldest form of proverb, the inference can hardly be drawn that all distichs are ancient; the distich continued the prevailing type at all times, being still largely used by Sirach, and all that we are entitled to say is that some distichs. are older than any proverbs that have another form. But many of the antitheti- cal distichs for which a high antiquity is claimed are probably comparatively modern. Their literary style is too finished and elaborate to possess a high antiquity. There is an abstractness in them, and an artificial balance of member~~

~~against member and word against word which suggests high literary culture and long use of the arts of the proverbialist. Further the extremely pro- miscuous nature of the collection, the repetitions in it, and the frequent occurrence of proverbs which are but modifications of others are proofs that it contains elements belonging to very different periods. The conjecture that Solomon himself put forth any collection of his proverbs has little to support it. At all events neither this whole collection nor any part of it in its present shape can have come from the hand of one who was the author of any great number of the proverbs contained in it. Nor can its present confusion be sufficiently explained by supposing with Ewald that an original ancient and orderly collection has suffered mutilation and fallen into disorder through repeated transcription and strong interpolation. That collections of pro- verbs were particularly liable to interpolation appears from the Septuagint, but the incoherence of our present code is such that it must have characterized it from the beginning. When we find one proverb repeated verbally (xiv. 12=xvi. 25), a nuinber of others having the first member identical but differing in the second, and again a number more differing in the first member but identical in the second, we are led to infer that many of the proverbs before coming into the collection had a long history of oral transmission and curreney, during which they underwent great changes, that like defaced coins they were thrown into the mint and came forth with a new image and superscription to circulate again among men, and that the code as a whole has been drawn largely from oral sources. While many of the maxims in such a code may be very ancient, the collection as a whole may be pretty late. Judged by contents, there is nothing in it that might not belong to the prophetic age or which would compel us to bring it in its present form below the exile. Some references in this collection, ¢.g., those to kings, when compared with similar allusions in Hezekiah's code, are thought to reflect an earlier and a happier time. The king is spoken of in a complimentary way, while in Hezekiah's collection the evils of corrupt government are bewailed and the misera contribuens plebs comes to the front. But the argument that proverbs in praise of a wise monarch must have originated under wise monarchs and conversely is not particularly strong ; if the men of Hezekiah had felt the force of it they would scarcely have set a number of equivocal references to kings at the head of a collec- tion formed under the auspices of that exemplary monarch. The history of the monarchy of Israel, both north and south, was~~

~~*sufii- ciently chequered to give the people experience of every kind of rule. Solomon himself was not a model prince, and neither in his nor his successor's days were the people unfamiliar with oppressive exactions. The references to rulers in all the collections are general reflexions from which historical conclusions cau hardly be drawn; in xix. 10 the rise of a slave to rule over princes is spoken of, a thing unknown in Israel; and similar general allusions to rulers occur both in Ecclesiastes and in Sirach (Ecclus. vii. 4 sq.).?*~~

~~*4, There is nothing in the contents of the small collections xxii. 17-xxiv. 34 to suggest a date lower than the exile (¢f xxiv. 21). On the other hand the despair of attaining to the knowledge of God expressed in ch, xxx. reminds us of Job xxviii. and Ecclesiastes, and the passage may belong to the post-exile period. The warning against adding to the words of God (xxx. 6) might also suggest the existence of canonical writings. The section is marked by peculi- arities of language and manner. If thenames Agur and Lemuel be real the passage might belong to a time when Israel and the tribes towards the south began to coalescc. The alphabetical poem with which the book is closed is probably not early, though there is little in it to suggest any precise age. Ezek. xxvii. 17 compared with xxxi. 16, 24 perhaps shows that in the time of this prophet Judah did not yet engage in the kind of manufactures mentioned in the poem.*~~

~~*The general heading i. 1-7 must be preface to at least i.—xxii. 16; it may extend to xxiv., or to xxix., or to the end of the book. Its relation to i. 8-ix. is of importance in reference to the date of the collection x.-xxii. On the one hand it is probable that the*~~

~~*1 The statement of Ewald that the article is rarer in this collection than in that of Hezekiah is not supported by the facts ; on the other hand the anticipative Aramean suffix, not found in xxv. sq., is com- mon to the two other large codes, i.-ix. and x.-xxii.*~~

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~~*preface comprises ver. 7, "The fear of the Lord is the beginning of wisdom." Some such general aphorism was necessary to clinch the statement regarding the uses of the proverbial literature. On the other hand the*~~

~~*passage i. 8-ix. could scarcely have begun abruptly, "My son, &c." The general aphorism both closes the preface and introduces what follows. If this be the case the author of the preface is also author of i. 8-ix., and undoubtedly the preface agrees in style with these chapters. He is certainly also the editor of x.xxii. It is possible that he was also the collector of the proverbs in this code. In any case this important collection would be anterior to the exile, though it is not likely that the collection was made long before the destruction of Jerusalem. The agree ment, however, between the style of the preface and that of the first nine chapters is supposed by others to be due to imitation on the part of the author of the preface. This is possible, though less natural. On such a supposition, however, the preface would be younger in date than i. 8-ix., and the conclusion as to the age of x.~xxii. would fall to the ground. This collection in that case might be later than i.—ix. and contain proverbs of the post-exile period. The preface refers to "the words of the wise," and it is probable that it extends to xxiv. Whether the author of the pre- face and editor of i.-xxiv. added also xxv.-xxix. is uncertain; the word "also" (xxv. 1) implies that this independent code was added when x.—xxii. had already received a place in the general collection.*~~

~~*The Septuagint version exhibits great variety of reading, and has many additions and also remarkable omissions. The additions are usually of little worth, though with exceptions, as the word " not" in v. 16. Critically the omissions are of more interest than the insertions. This version transfers xxx. 1-14 to a place after xxiv. 22; then follows the remainder of chap. xxiv. After this comes xxx. 15-xxxi. 9, then the code xxv.-xxix., and finally xxxi. 10-81. The objects of this transposition are not apparent; but the effect of the changes here and elsewhere has been to obliterate all traces of other than Solomonic authorship from the book, and possibly this was intended.*~~

~~*Literature.—Important commentaries are those of Schultens, M. Stuart, Ewald, Hitzig, Delitzsch, Bertheau (Exeg. Handb., lst cd.; 2d ed. by Nowack). Valuable on the text is Lagarde, Anmerkungen zur Griech. Uebersetzung der Proverbien ; also Deyserinck, Krit. Scholien (reprint from Theol. Tijds., 1883.) Works on the Wisdom are—Bruch, Weisheitslehre der Hebrder; Hooykaas, Geschiedents der*~~

~~*Beoefening van de Wijsheid onder de Hebreén; Oehler, Grundztige der Alttest. Weisheit. The literature is fully given in Lange's Comm., and the introductions;*~~

~~*sec especially the valuable section in Kuenen's Hist. Krit. Onderzoek. There is a special treatise on xxx.—xxxi. 9 by Miihlau. (A.B. DS*~~

~~*PROVIDENCE, a city of the United States, one of the capitals of the State of Rhode Island (the other being Newport), and the seat of justice of Providence county, is sitneted in 41° 49' 22" N. lat. and 71° 24' 48" W. long.,*~~

~~*Varragansets Bay*~~

~~*Plan of Providence. at the head of Narragansett Bay, on both banks of Providence River, and with Seekonk River on its eastern boundary. A nearly circular sheet of water known as the Cove lies in the heart of the city at the junction of river and estuaries. The total area of Providence is 14°76 square miles. On the east side the ground rises to a*~~

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~~*height of 204 feet, and on the west, where there is much more of level surface, to 75 feet ; but both the sides and summits of the hills are occupied by dwelling-houses. To the south lies the Roger Williams Park (102 acres), bequeathed to the city in 1871 by Betsy Willams, a descendant of the founder of Providence. The best known of all the public institutions is Brown University, whose spacious buildings (University Hall, Manning Hall, Hope College, Rhode Island Hall, Sayles Memorial Hall, Slater Hall, &c.) crown the heights on the east side of the river. Originally founded at Warren in 1764 as Rhode Island College, it was removed to Providence in 1770, but did not obtain its present name (bestowed in honour of Nicholas Brown, one of its principal benefactors) till 1804. By the terms of its charter 30 out of the 48 members of its board of fellows and board of trustees must be Baptists, but the management is unsectarian. In 1884 there were 20 professors and instructors, and 248 students. The library, kept in a fire-proof building, numbers 62,000 volumes. Besides the university, the city contains two high-schools, the Friends' Yearly-Meeting Boarding-School*~~

~~*(1819), the Roman Catholic Academy of the Sacred Heart of Jesus (1873), the Athenzeum (1836) with a library of over 43,000 volumes, the Providence Public Library with nearly 32,000 volumes, the Rhode Island Historical Society (1822, present building 1844), the Franklin Society (1823) for the furtherance of the natural sciences and mechanic arts, and many other educational institutions. The Butler Hospital for the insane (1844-47), which takes its name from Cyrus Butler, the principal subscriber, occupies several handsome buildings on the west bank of Seekonk river, capable of accommodating about 200 patients and possessing 140 acres of ground. Dexter Asylum (1827) for the poor, with 39 acres, the bequest of Mr Ebenezer Knight Dexter, receives about 125 inmates; and the Rhode Island Hospital (1863-68), erected at a cost of $450,000, has about 80 patients. Other institutions of a benevolent character are a home for aged men, a home for aged women, a Roman Catholic orphan asylum (1860), and dispensaries. The State prison and county jail used to stand on the north side of the Cove; but the State prison, the workhouse, the house of correction, the almshouse, and the State hospital for the insane are now clustered together at the State farm in Cranston, about 3 miles from the city line. The State house, which dates from 1762, is a plain brick building; but the city-hall, erected about 1878-79, at a cost of more than $1,000,000, is one of the finest buildings of its kind in New England. In front of it is a soldiers' and sailors' monument designed by Randolph Rogers and erected (1871) by the State in memory of 1741 citizens who fell in the civil war. Worthy of note also are the county court-house (1877), the Providence opera-house (1871), the Butler Exchange (1872), the arcade (1828), which runs 225 feet between Westminster and Wey bosset Street, with a width of 80 feet. Among the principal churches are a new cathedral (1878-85), St Stephen's Episcopal, the First Baptist, erected in 1775, and St Joseph's and St Mary's Roman Catholic. At one time Providence carried on a good trade with China and the East Indies ; but its shipping interests, though still considerable,! are now mainly absorbed by the coasting-trade, and altogether it has become rather a manufacturing than a commercial centre. In the production of gold jewellery it is one of the leading cities in the United States, and the Gorham silver factory alone employs 560 workmen. Cotton, wool, and iron are all worked up on the most extensive scale into a vast variety of forms—*~~

~~1 The merchandise imported into the district of Providence was valued at $537,800 in 1884, and the imports at $25,296; 59 vessels (10,864 tons) entered from foreign ports, and 41 (5012 tons) cleared.~~

~~PRO—P RO~~

~~yarn, calico, braids, laces, broad-cloth, worsteds, steam- engines, rifles, sewing machines, boilers, screws, hinges, dc. Among the larger companies are the Providence Tool Company (1500 workmen), the Corliss steam-engine works, the Providence Steam-engine Company, the Allen Fire Department Supply Company, Perry Davis's pain-killer manufactory, &c. Altogether there are about one hundred cotton mills and sixty wool mills. In 1880 the value of the cotton products was $2,250,273, of the wool products and worsted goods $7,139,947, and of the iron castings, machinery, &c., $4,757,401. The growth of the city in population is shown by the following figures :—~~

~~1708……1,446 1810……10,071 1850… 41,513 1730……8,916 1820……11,745 1860… 50,666~~

~~1774……4,321 1880……16886 Te70…… 68,904 1800……7,614 1840……23,172 — 1880……104,857~~

~~According to the registrar's returns the total for 1885 may be estimated at 121,000. From 1855 to 1883 in. clusive there has been an average of one birth in 36°37 of the population, one person married in 44-21, and one death in 50°89. 'The value of real estate in 1883 was $91,642,100; that of personal estate $30,854,400. The municipal revenue was $3,417,593, the expenditure $3,196,382, and the debt $8,142,223. .~~

~~Providence was founded and named by Roger Williams the religious reformer, who, having been expelled from Massachusetts in 1636, landed first at What Cheer Rock near the mouth of Seekonk river and settled some time after at the head of Providence river, where he obtained a grant of gronnd from the Sachem Canonicus. The town united with others in applying for and re- ceiving a charter from the Parliamentary Government in 1643-44. It was partially burned in King Philip's war in 1675. In 1788 De Warville describes it as decayed. A south-easterly storm in Sep- tember~~

~~*1815 raised the water in the harbour 12 feet above the usual spring-tide level and did great damage. The city charter dates from 1832. (W. E. F.)*~~

~~*PROVINCE (provincia, etymology uncertain), in the Roman sense, may be defined as the department or sphere of duty assigned to one of the higher magistrates (the con- suls and praetors).? But when, with the spread of the Roman arms, the government of conquered countries grew to be one of the most important duties of the higher magistrates, the term province, from designating the govern- ment of a conquered country as one particular duty of a Roman magistrate, came to be used generally as a designa- tion of the country itself. It is to province in the sense of a subject territory lying outside of Italy and governed by Roman magistrates that the following remarks will apply. As distinguished from Italy, the provinces paid tribute to Rome, for, at least from the time of the Gracchi, it was a recognized constitutional principle that the pro- vinces were the estates of the Roman people and were to be managed for its benefit. Under the republic the con- stitution of a province was drawn up by the victorious Roman general assisted by ten commissioners appointed by the senate from its own body, and the province was henceforth governed on the lines laid down in this con- stitution or charter (lex provinciz). For administrative purposes the province was divided into districts, each with its capital, the magistrates and council of which were responsible for the collection of the district taxes. For judicial purposes the province was divided into circuits (conventus), and in the chief town of each circuit the governor of the province regularly held assizes.*~~

~~*Cities taken by the sword were destroyed, and their lands were turned into Roman domains and were let out by the censors at Rome to private persons, who undertook to pay a certain proportion of the produce. Royal domains, such as those of Syracuse, Macedonia, Pergamum,*~~

- ~~*Only those magistrates who had imperium (military power) had a province. When the province of a questor is mentioned it refers to the province of the consul or pretor to whom the questor is subor- dinate. In familiar language any business was called a province,*~~

~~*PwOV IAC E*~~

~~*Bithynia, and Cyrene, were also confiscated. On the other hand communities which surrendered without offering an obstinate resistance were usually allowed to retain their personal freedom and private property, and their chief town was left in the enjoyment of its territory and civil rights, but all the lands were subjected to a tax, consisting either of a payment in kind (vectigal) or of a fixed sum of money (tributum, stipendium), and in some cases a custom-duty (portorium) was levied. It is to this latter class of com- munities (the civitates vectigales or stipendiariz) that the large majority of the provincial states belonged. In a better position were those states whose freedom was guaranteed by Rome on the ground of old alliances or special loyalty. Their freedom was recognized either by a treaty or by a decree of the Roman people or senate. As a decree of the people or senate could at any time be recalled, the position of the free states without a treaty was more precarious than that of the treaty states (civtates federatx). The latter, though not allowed to meddle in foreign politics, enjoyed a certain amount of internal freedom, retained their lands, paid no taxes, and were bound to render those services only which were expressly stipu- lated for in the original treaty, such as furnishing ships and troops, supplying corn at a certain price, and receiving Roman officials and soldiers en route. Amongst these treaty states were Massilia (Marseilles), Athens, Rhodes, and Tyre. The privileges of the free but not treaty states were somewhat similar, but, as stated, more precarious. All political distinctions, save that between slave and freeman, disappeared when Caracalla bestowed the Roman franchise on the whole empire.*~~

~~*Provincial Diets.—Apart from the government by Roman officials, every province appears to have had, at least under the empire, a provincial assembly or diet of its own (con- cilium or commune), and these diets are interesting as the first attempts at representative assemblies. The diet met annually, and was composed of deputies (legatz) from the provincial districts. It arranged for the celebration of religious rites and games, especially (under the empire) for the worship of the emperor, the neglect of which was severely punished. 'The actual celebration was under the conduct of the high priest of the province, a person of much dignity and importance, perhaps the forerunner of the Christian bishop. The diet also decreed the erection of statues and monuments; it passed votes of thanks to*~~

~~the outgoing governor, or forwarded complaints against him to Rome; and it had the right of sending embassies direct to the senate or the emperor.~~

~~The Provincial Governor.—The provinces were administered by governors sent direct from Rome, who held office for a year. From the formation of the first provinces in 227 3.c. down to the time of Sulla (82 B.c.) the governors were preetors (see PrR#Tor); from the time of Sulla to that of Augustus the preetors remained in Rome during their year of office, and at the end of it assumed the government ofa province with the title of propretor. This applies, however, only to provinces which were in a settled state and could consequently be administered without a large military force. A province which was the seat of war, or was at least in a disturbed state, was committed to the care either of one of the consuls for the year or of a commander specially appointed for the purpose with the title of proconsul, who might be one of the consuls of the pre- ceding or of a previous year, or else a former pretor, or even, in rare eases, a private individual who had held neither consulship nor pretorship. Thus the distinction between consular (or pro- consular) and pretorial (or propretorial) provinces varied from year to year with the military exigencies of different parts of the empire. At the close of the republic, however, we find even such a peaceful province as Asia administered by a proconsul. In the earlier period of the republic the senate either before or after the elections determined which provinces were to be governed by con- suls and which by pretors, and after their election the consuls arranged between themselves by lot or otherwise which of the provinces nominated by the senate each should have, and similarly with the pretors. But in order to guard against partiality the Sempronian law of 123 B.c. provided that the senate should yearly*

~~nominate the two consular provinces before the election of the consuls, and that the consuls should after their election but before their entry on office arrange between themselves which of the two provinces each should have. The Pompeian law of 53 B.c. enacted that no one should hold the governorship of a province till at least five years after his consulship or pretorship. This law was repealed by Cesar after the battle of Pharsalia, but was re-enacted under Augustus ; it severed the connexion which had~~

~~*previously existed between an urban magistracy and the governorship of a province, and turned the latter, from the mere prolongation of a Roman magistracy, into an independent office. Like magistracies at Rome a provincial governorship was regularly held for one year; but, unlike them, it could be prolonged, formerly by a vote of the people, later by a decree of the senate. The Julian law of Cesar (46 B.c.) enacted that the governorship of a consular province should be held for two, that of a pretorian province for one year. The necessary supplies of men and money were voted to the governor by the senate. His staff consisted of one or more lieu- tenants (legati), a questor, and numerous subordinates. The lieu- tenants were nominated by the senate from men of senatorial rank ; if they proved incompetent, the governor dismissed them ; if they showed ability, he entrusted them with military or judicial functions. As to the questor, see QumsTor. Besides these the governor took with him from Rome a number of young men of the upper classes to assist him in the government. These were known as the companions (comites) or suite of the governor, some- times, but incorrectly, as the preetorian cohort (see PRETORIANS). These members of his suite were chosen by the governor himself, who was responsible for them, but they were maintained at the expense of the state, and under the empire received regular pay. ln addition there was a crowd of beadles, clerks, couriers, criers, doctors, dragomans, &c., not to speak of freedmen and slaves for the personal service of the governor. Under the republic the governor was not allowed to take his wife with him to his province ; under the empire he might do so, but he was answerable for her conduct. Before setting out for his province the governor, clad in the purple military robe of his office, offered sacrifice on the Capitol ; then immediately after receiving the ¢mperium or military command he marched out of the city (for the ¢mperium could only be exercised outside of Rome and was forfeited by staying in the city), preceded by his sergeants (lictores), and accompanied by his suite. He was bound to travel direct to his province; the means of transport were supplied partly by the state, partly by the pro- vinces through which he travelled. His year of office began from the day he set foot in his province, but the time of arrival varied with the length and difficulty of the route. In the hands of the governor all powers military and civil were united. He commanded all the troops in the province, and had power to raise levies of Roman citizens as well as of provincials, and to make requisitions of war material. He possessed both*~~

~~criminal and civil jurisdiction ; as criminal judge he had the power of life and death, and from his sentence none but Roman citizens could appeal; as civil judge he was guided partly by the charter of the province (lex provincie), partly by the edict which it was customary for him to issue before his entrance on office (compare PRmToR), partly by the original laws of the country so far as their validity was acknowledged by the charter or by the governor's own edict. Under the empire Gaius wrote a commentary on the provincial edict, and it is usually supposed that this was a general edict drawn up for use in all the provinces and superseding all separate edicts for the different pro- vinces. Mommsen, however, is of opinion that Gaius only com- mented on the edict of a particular province.~~

~~Condition of the Provinces under the Republic.—Under the republic the Roman people regarded the provinces as so many estates from which they were to derive revenue. 'The weal or woe of the provincials was of no moment, but the development of the material resources of the provinces was of great moment. Hence agriculture and commerce were encouraged, settlements were made, roads and aqueducts were constructed ; in short, the Roman aimed at exploiting his empire by a system of prudent economy as far as possible removed from the blind rapacity which has turned the empire of the Turk from a garden into a wilderness. But the Roman governors were too apt to look on their provinces as their own peculiar prey ; they had usually bought their way to office at vast expense, and they now sought in the provinces the means of reimbursing themselves for the expenditure they had incurred at Rome. The annual change of governor was thus a frightful calamity to the provincials, for every year brought a repetition of the same extravagant demands to be met by the same or, as the province became exhausted, still heavier sacrifices. Redress was to be had originally by a complaint to the senate; after 149 B.c. there was a regular court established at Rome for thie trial of cases of oppression (repetunde) by provincial governors. But, even when after much trouble and expense the provincials had arraigned their oppressor, it was difficult to secure his condemnation at the hands of juries composed (as they usually were) of men who had a fellow-feeling for the offender because they had themselves com-~~

mitted or hoped for means of committing similar offences. Besides the governor, two classes of harpies joined in wringing the utter- most farthing from the unhappy provincials. These were the publicans or farmers of the taxes, and the money-lenders (negott- atores), who supplied a temporary accommodation at ruinous rates of interest. Both these classes were recruited from the ranks of the Roman knights, and, since from the legislation of Caius Gracchus (122 B.c.) the juries were drawn at first exclusively and after Sulla's time (81 B.c.) partially from the knightly order, the provincial governor could not check the excesses of those blood-suckers without risking a condemnation at the hands of their brethren. Accordingly he generally made common cause with them, backing their exactions when needful by military force.

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Augustus, in 27 B.c., divided the provinces into imperial and senatorial. Those which, from their proximity to the frontier or the turbulance of their population, required the presence of an army were placed under the direct control of the emperor; those which needed no troops were left to be administered by the senate. (1) The senatorial provinces were ruled by an annual governor as under the republic. Of these provinces Augustus ordained that Africa and Asia should be consular, the rest pretorian; but all the governors of the senatorial provinces were now called proconsuls. Their powers and dignities were much the same as they had been under the republic, except that they had how no troops, or only a handful to maintain order. (2) The imperial provinces were governed by imperial lieutenants (legatt Cxsaris), who were nominated by the emperor and held office at his

~~*pleasure; all of them had the power of the sword (jus gladii). For the administration of the finances these lieu- tenants had procurators under them, while the governors of the senatorial provinces continued to have questors as under the republic. Another class of imperial provinces consisted of those which from the physical nature of the country (as the Alpine districts) or the backward state of civilization (as Mauretania and Thrace) or the stubborn character of the people (as Judzea and igypt) were not adapted to receive a regular provincial constitu- tion. These were regarded as domains of the emperor, and were managed by a procurator (in the case of Egypt by a prefect, see PR&FECT) nominated by and responsible to the emperor.*~~

~~*Under the empire all provincial governors received a fixed salary. Complaints against them were brought before the senate, and the accusers were allowed a senator to act as their advocate. The lengthened periods during which the governors, at Icast in the imperial provinces, held office, together with the oversight exer- cised by the emperor, alleviated materially the position of the provincials under the empire. In order to keep himself well informed of what was passing in the empire, Augustus established a post whereby official despatches were forwarded by couriers and yofficial persons were conveyed by coaches. The post, however, was only for the use of the Government; no private person was allowed, unless by an exceptional concession, to avail himself of it. (J. G. FR.)*~~

~~*_PROVINS, a town of France, at the head of an arron- dissement of the department of Seine-et-Marne, at the junction of the Durtain with the Voulzie (an affluent of the Seine), 59 miles south-east of Paris by a branch rail-*~~

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~~*way which rejoins the main line from Paris to Belfort at Longueville (4 miles from Provins). While the town derives a certain reputation from its mineral waters (which contain iron, lime, and carbonic acid, and are used for bathing and drinking), and is also known from its trade in roses (incorrectly called Provence roses) for certain minor industries (such as the making of "conserves" and colouring bonbons), a far higher interest attaches to it as a place which during the Middle Ages enjoyed great pros-*~~

~~*perity and still preserves, in proof of its former import ance, a number of historical monuments. There still*~~

~~*tions, which makes a circuit of about 4 miles, encloses an area of about 300 acres, is strengthened at intervals by towers, generally round, and now, being bordered with fine trees, forms the principal promenade of the town. The large tower, situated within this line and variously known as the king's, Cesar's, or the prisoners' tower, is one of the most curious of the 12th-century keeps now extant.*~~

~~*|The base is surrounded by a thick mound of masonry added by the English in the 15th century when they were*~~

~~*masters of the town. The tower serves as steeple to the church of St Quiriace, which, dating its foundation from the 12th century, presents some exquisite features and preserves among its treasures the pontifical ornaments of St Edmund of Canterbury. The palace of the counts of Champagne, some fragments of which also belong to the 12th century, is occupied by the communal college. The old tithe-barn is a strange erection of the 13th century with noteworthy fireplaces, windows, and vaulting. Vari-ous portions of the church of St Ayoul date from the llth, 13th, 14th, and 16th centuries respectively ; but it is in a state of great dilapidation, and part of it is used as a fodder-store. Ste Croix belongs partially to the 13th century. On Mont Ste Catherine opposite Provins the general hospital occupies the site of an old convent of St Clare, of which there remains a cloister of the 13th century. The population of the town in 1881 was 6949.*~~

~~*Provins begins to figure in history in the 9th century. Passing from the counts of Vermandois to the counts of Champagne it rapidly attained a high degree of prosperity. Its fairs, attended by traders from all parts of Europe, were of as much account as those of Beaucaire. They were held twice a year, in spring and*~~

~~*| autumn, and fixed the price of provisions for the intervening months.*~~

~~*In the 18th century the population of the town is said to have reached 60,000 ; but the plague of 1848 and the famine of 1349 proved exceedingly disastrous. The War of the Hundred Years, during which Provins was*~~

~~*captured and recaptured, completed the ruin of thé unfortunate town. During tle religious wars it sided with the Catholic party and the League, and Henry IY. obtained possession of it in 1592 only after thirteen days' siege. See Felix Bourquelot, Wistoire de Provins, 2 vols., 1840.*~~

~~*PROVOST. See BorouciI and MunIcIPALity, also CATHIEDRAL and UNIVERSITIES, PROXY. See Proctor.*~~

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RUDENTIUS, Avretivs CLEMENS, a Christian verse- writer, apparently a native of Spain, who flourished during the latter half of the 4th century and in the begin- ning of the 5th. According to the meagre and vague auto-biographical notices given by himself in the preface to his poems he was born in the year 348, and, after receiving a liberal education, practised at the bar and subsequently held judicial office in two important cities. At the time of the publication of his poems in 405 he held from the emperor a high military appointment at court. Of his subsequent history nothing is known. ‘

His extant works, besides the preface already referred to and an epilogue, are the following :—(1) Cathemerinon Liber, a scries of twelve hymns (xaOnuepwav tuvGv) in various metres to be repeated or sung at particular periods of the day or seasons of the year ; (2) Apotheosis, a poem of 1085 hexameter verses on the divinity of Christ ; (3) Hamartigenia (967 hexameter verses) on the origin of evil and sin ; (4) Psyehomaehia, or the conflict between virtue and vice for the soul (915 hexameter verses) ; (5) Contra Synumachwn, two books, of 658 and 1131 hexameter verses respectively, directed against the petition of Symmachus to the emperor for the restora- tion of the altar and statue of Victory which Gratian had cast down ; (6) Peristephanon Liber, fourteen poems in various metres, in honour of certain saints who had won the crown of martyrdom (hence the name, repli orepdvwv),—these, which are often vigorous and graphic, are generally considered to show Prudentius at his best ; (7) Diptyehon or Dittoehxon, a scries of forty-nine hexameter tetrastichs on various events and characters mentioned in Scripture. The editio princeps appeared at Deventer in 1472; among modern editions may be named those of Faustus Arevalus (2 vols., Rome, 1788-89), Obbarius (Tiibingen, 1845), and Dressel (Leipsic, 1860).

PRUD’HON, Pierre (1758-1823), French painter, born at Cluny on the 4th of April 1758, was the third son of a mason. The monks of the abbey undertook his education. The paintings which decorated the monastery excited his emulation, and by the aid of Moreau, bishop of Macon, he was placed with Devosges, director of the art school at Dijon. In 1778 Prud’hon

went to Paris armed with a letter to Wille, the celebrated engraver, and three years later he obtained the triennial prize of the states of Burgundy, which enabled him to go to Rome, where he became intimate with Canova. He returned to Paris in 1787, and led for some time a precarious existence, paint- ing portraits and making designs for booksellers. The illustrations which he executed for the Daphnis and Chloe published by Didot brought him into notice, and his Teputation was extended by the success of his decorations

in the Hétel de Landry (now Rothschild), his ceiling paint- ing of Truth and Wisdom for Versailles (Louvre), and of Diana and Jupiter for the Gallery of Antiquities in the Louvre. In 1808 he exhibited Crime pursued by Venge- ance and Justice (Louvre, engraved by Royer), which had been commissioned for the assize courts, and Psyche carried off by Zephyrs (engraved by Massard). These two remark- able compositions brought Prud'hon the Legion of Honour; his merit was widely recognized ; he received innumerable orders, and in 1816 entered the Institute. Easy as to fortune, and consoled for the misery of his marriage by the devoted care of his excellent and charming pupil, Mademoiselle Mayer, Prud'hon's situation seemed enviable; but Mademoiselle Mayer's tragical suicide on 26th May 1821 brought ruin to his home, and two years later (16th February 1823) Prud'hon followed her to the grave. The classic revival which set in towards the close of the 18th century, and of which Louis David was the academic chief, found in Prud'hon an interpreter whose gifts of grace and naiveté tempered by seriousness atoned by the personal charm which they imparted to all he did for the want of severity and correctness in his execution. Mademoiselle Mayer (1778-1821) was his ablest pupil. Her Aban- doned Mother and Happy Mother are in the Louvre. Voiart, Notice historique de la vie et wwvres de P. Prud'hon; Areh. de Vart francais; Qu. de Quincy, Diseowrs prononcé sur la

tombe de Prud'hon, Fev. 1823 ; Eugene Delacroix, Rev. des Dewx Mondes, 1846 ; Charles Blanc, Hist. des peintres francais.

PRUSSIA (Ger., Preussen ; Lat., Borussia), a kingdom Plate J.

of northern Europe and by far the most important mem- ber of the German empire, occupies almost the whole of northern Germany, between 5° 52'

and 22° 53’ E. long. and 49° 7’ and 55° 53’ N. lat. It now forms a tolerably compact mass of territory, with its longest axis from south- west to north-east ; but within the limits just indicated lie the “enclaves” Oldenburg, Mecklenburg, Brunswick, and other small German states, while beyond them it possesses Hohenzollern, in the south of Wiirtemberg, and other “‘exclaves” of minor importance. On the N. Prussia is bounded by the North Sea, Denmark, and the Baltic; on the E. by Russia and Poland; on the 8. by Austrian Silesia, Moravia, Bohemia, Saxony, the Thuringian states, Bavaria, Hesse-Darmstadt, the Rhenish Palatinate, and Lorraine; and on the W. by Luxemburg, Belgium, and XX, — I

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the Netherlands. With the exception of the sea on the north and the mountain-barrier on the south-east, the frontiers are political rather than geographical, a fact that has always been characteristic of Prussia’s limits and that has had considerable influence in determining its history. The Prussian monarchy, with an area of 134,490 square miles, comprises nearly two-thirds of the entire extent of the German empire. Its kernel is the Mark of Branden- burg, round which the rest of the state has been built up gradually, not without costly and exhausting wars. The territory ruled over by the first Hohenzollern elector (1415-40) did not exceed 11,400 square miles, an area that had been quadrupled before the death of the first king in 1713. Frederick the Great left behind him a realm of 75,000 square miles, and the following two monarchs, by their Polish and Westphalian acquisitions, brought it to a size not far short of its present extent (122,000 square miles in 1803). After the disastrous war of 1806 Prussia shrank to something smaller than the kingdom of Frederick the Great (61,000 square miles), and the readjustment of Europe in 1815 still left it short by 14,000 square miles of its extent in 1803. Fully one-fifth of its present area is due to the war of 1866, which added Hanover, Hesse-Cassel, Hesse-Nassau, Schleswig-Holstein, and the city of Frankfort-on-the-Main to the Prussian dominions.

History.

The claims which Prussian history makes upon our attention are based neither upon venerable antiquity nor upon uniformity of origin. ‘The

territorial and political development of the country has taken place wholly within the last thousand years; and the materials out of which it has been built up—marquisates and duchies, ecclesiastical principalities and free imperial cities—are of the most heterogeneous description. The history of Prussia acquires its primary significance from the fact that this state was the instrument by which the political regeneration of Germany was ultimately effected from within, and the unity and coherence of the narrative are best observed when we consider it as a record of the training that fitted the country for this task. This rdle was forced upon Prussia rather by the exigencies of its geographical position than by its title to be racially the most representative German state. The people who have established the power of Germany cannot rank in purity of Teutonic blood with the inhabitants of the central, western, and southern parts of the empire. The conquest of the Slavonic regions that form so great a part of modern Prussia did not occur without a considerable intermingling of race, and Prussia may perhaps be added to the list of great nations that seem to owe their pre-eminence to the happy blending of their composite parts. It is perhaps also worthy of remark that this state, like its great rival, was developed from a marchland of the German empire,—Prussia arising from the North Mark erected against the Wends, and Austria from the East Mark erected against the Hungarians.

In tracing the early development of Prussia three main currents have to be noticed, even ina short sketch like the present, which do not completely unite until the beginning of the 17th century; indeed many writers begin the history of modern Prussia with the accession of the Great Elector in 1640. We have (1) the history of the Mark of Bran- denburg, the true political kernel of the modern state ; (2) the history of the district of Preussen or Prussia, which gave name and regal title to the monarchy; and (3) the history of the family of Hohenzollern, from which sprang the line of vigorous rulers who practically deter- mined the fortunes of the country.

Mark of Brandenburg.—Whether Teutons or Slavs were the earlier inhabitants of the district extending from the

Elbe on the west to the Oder and the Vistula on the east is a question mainly of antiquarian interest and one upon which authorities are not wholly agreed. In the open- ing centuries of the Christian era we find it occupied by Slavonic tribes, whose boundaries reach even to the west of the Elbe, and the conquest and absorption of these by the growing German power form the subject of the early history of Brandenburg. Hand in hand with the territorial extension of the Germans went the spread of Christianity, which, indeed, often preceded the arms of the conquering race. The Slavs to the east of the Elbe were left un- molested down to the foundation of the German monarchy, established by the successors of Charlemagne about the middle of the 9th century. Then ensued the period of formation of the German “marks” or marches, which served at once as bulwarks against the encroachments of external enemies and as nuclei of further conquest.

part of the present province of Saxony, to the west of the

year 930, and formed the beginning of the Prussian state. The same energetic monarch extended his career of con- quest considerably to the east of the Elbe, obtaining more or less firm possession of Priegnitz, Ruppin, and the district round the sources of the Havel, and even carried his arms to the banks of the Oder. His son Otho I. (936- 973) followed in his father’s footsteps and founded the bishoprics of Havelberg and Brandenburg, the latter taking its name from the important Wendish fortress of Bran- nibor. Towards the end of the 10th century, however, the Wendish flood again swept over the whole territory to the east of the Elbe, and the Germans were confined to the original limits of the North Mark. Christianity was rooted out and the bishop of Brandenburg reduced to an episcopus in partibus. The history of the next century and a half is simply a record of a series of desultory struggles between the margraves of the North Mark and the encom- passing Wends, in which the Germans did no more than hold their own on the left bank of the Elbe.

Things begin to grow a little clearer in 1134, when the Albert — emperor Lothair rewarded the services of Albert the the Bean

Bear, a member of the house of Anhalt and one of the most powerful princes of the empire, by investing him with the North Mark. Albert seems to have been a man of great vigour and considerable administrative talent,

and by a mixture of hard fighting and skilful policy he ex- tended his power over the long-lost territories of Priegnitz, Ruppin, the Havelland, and the Zauche. He also shifted the centre of power to the marshy district last-mentioned and changed his title to margrave of Brandenburg. The North Mark henceforth began to be known as the Altmark, or Old Mark, while the territory round Brandenburg was for a short time called the New Mark, but more per- manently the Mittelmark, or Middle Mark. The soil of Albert's new possessions was for the most part poor and unpromising, but he peopled it with industrious colonists from Holland and elsewhere, and began that system of painstaking husbandry and drainage which has gradually converted the sandy plains and marshes of Brandenburg into agricultural land of comparative fertility. The clergy were among his most able assistants in reclaiming waste land and spreading cultivation, and through them Christ- lanity was firmly established among the conquered and Germanized Slavs.

of their ancestral castle of Aschersleben, ruled in Branden- burg for nearly two hundred years ; but none of them seem to have been on a par with him in energy or ability. On the whole, however, they were able to continue in the course marked out by him, and, in spite of the pernicious practice

The North Estab-

Mark of Saxony, corresponding roughly to the northern oe C0} e

Elbe, was established by the emperor Henry I. about the y orth

Albert's descendants, generally known Ascaniai as the Ascanian line from the Latinized form of the name line.

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HISTORY. |

of dividing the territory among the various scions of the reigning house, the Mark grew steadily in size and import- ance. Before the end of the 12th century the margrave was created arch-chamberlain of the German empire, an office that eventually brought in its train the privilege of belong- ing to

the electoral college. Berlin became a fortified post of the margraves in 1240 and soon began to take the place

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ruler to checkmate any attempt on the part of the Polish- Lithuanian power, which had just overthrown the Teutonic Order (see p. 6), to push forward the Slavonic settlements to their old frontier on the Eibe. At first Frederick was merely appointed administrator of Brandenburg; but in 1415 he was declared the actual feudal superior of the land, and two years later formally installed as elector.

The Brandenburg to which Frederick succeeded was con- Internal siderably smaller than it had been in the best days of the con- Ascanians, consisting merely of the Altmark, Priegnitz, Mered the Mittelmark, part of the Ukermark, and the territory of jurg, Sternberg. Including his family possessions of Ansbach 11th to

and Baireuth, he ruled over a territory of about 11,400 14th cen-

of Brandenburg as the political centre of the margraviate. Under Waldemar, who succeeded in 1309, the scattered possessions of the house were again gathered into one hand. His sway extended over the Altmark ; Priegnitz, or the Vormark ; the Middle Mark, now extending to the Oder ;

the lands of Krossen and Sternberg beyond the Oder ; ae ry.

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the Ukermark, to the north ; Upper and Lower Lusatia ; and part of Pomerania, with a feudal superiority over the rest. No other German prince of the time had a more ex- tensive territory or one less exposed to imperial interference.

With Waldemar’s death in 1319 the Ascanian line be- came extinct and a period of anarchy began, which lasted for a century and brought the once flourishing country to the verge of annihilation. Its neighbours took advan- tage of its masterless condition to help themselves to the outlying portions of its territory, and its resources ‘were further wasted by intestine conflicts. In 1320 the emperor

I varian Louis the Bavarian took possession of the Mark as a lapsed

fief, and conferred it upon his son Louis, at that time a mere child. But this connexion with the imperial house proved more of a curse than of a blessing: the younger Louis turned out a very incompetent ruler, and Branden- burg became involved in the evils brought upon the Bavarian house by its conflict with the pope. To crown all, a pretender to the name of Waldemar appeared, whose claims to Brandenburg were supported by the new emperor, Charles IV. ; and in 1351 Louis, wearied of his profitless sovereignty, resigned the margraviate to his brothers, Louis the Roman and Otho. The first of these died in 1365, and Otho soon became embroiled with Charles IV. But he was no match for the astute emperor, who in- vaded the Mark, and finally compelled the margrave to resign his territory for a sum of ready money and the The ambition of Charles was directed towards the establishment of a great east German monarchy, embracing Bohemia, Moravia, Silesia, Lusatia, and Brandenburg, and he had the sagacity to recognize the commercial importance of the last-named as offering an outlet by the Baltic Sea. Charles, however, died in 1378, and with him perished his far-reaching plans. He was succeeded in the electorate of Brandenburg —for as such it had been formally recognized in the Golden Bull of 1356— by his second son Sigismund. This prince was too greatly hampered by his other schemes to bestow much attention on Brandenburg, and in 1388 his pecuniary embarrassments were so great that he gave the electorate in pawn to his cousin Jobst or Jodocus of Moravia. The unfortunate country seemed now to have reached the lowest point consistent with its further independent existence. Jobst looked upon it merely as a source of income and nade little or no attempt at government. Internal order completely disappeared, and the nobles made war on each other or plundered the more peaceful eitizens without let or hindrance. Powerful neighbours again took the op- portunity of appropriating such parts of Brandenburg as lay most convenient to their

own borders, and the final dissolution of the electorate seemed imminent. Jobst died in 1411; and Sigismund, who succeeded to the imperial throne mainly through the help of Frederick VI., burgrave of Nuremberg, conferred the electorate of Brandenburg on this stout supporter, partly in gratitude for services rendered and partly as a mortgage for money advanced. Sigismund also may possibly have recognized in Frederick the fitting

square miles in extent. The internal condition of Branden- burg had declined as much as its territorial extension had decreased. The central power had become weakened and the whole inner organization relaxed, while the electorate had also lost most of the advantages that once favourably distinguished it from other imperial fiefs. Under the first margraves the official side of their position had been pro- minent, and it was not forgotten that technically they were little more than the representatives of the emperor. In the 13th century this feeling began to disappear, and Brandenburg enjoyed an independent importance and carried out an independent policy in a way not paralleled in any other German mark. The emperor was still, of course, the suzerain of the country, but his relations with it had so little influence on the course of its development that they may be practically ignored. Within the Mark the power of the margraves was at first almost unlimited. This arose in part from the fact that few great nobles had followed Albert the Bear in his crusade against the Wends, and that consequently there were few large feudal manors or lordships with their crowds of dependent vassals. The great bulk of the knights, the towns, and the rural com- munes held their lands and derived their rights directly from the margraves, who thus stood in more or less im- mediate contact with all classes of their subjects. The towns and villages were generally laid out by contractors (locatores), not necessarily of noble birth, who were installed as hereditary chief magistrates of the community and re- ceived nunierous encouragements to reclaim waste lands. This mode of colonization was especially favourable to the peasantry, who seem in Brandenburg to have retained the disposal of their persons and property at a time when villainage or serfdom was the ordinary state of their class in feudal Europe. The dues paid by these contractors in return for their concessions formed the principal revenue of the margraves. As the expenses of the latter increased, chiefly in consequence of the calls of war, lavish

donations to the clergy, and the attempt to maintain court establish- ments for all the members of the reigning house, they were frequently driven to pawn these dues for sums of ready money. This gave the knights or barons an opportunity to buy out the village magistrates and replace them with creatures of their own; and the axe was laid at the root of the freedom of the peasants when Louis the Bavarian formally recognized the patrimonial or manorial juris- diction of the noblesse. Henceforth the power of the nobles steadily increased at the expense of the peasants, who were gradually reduced to a state of feudal servitude. Instead of communicating directly with the margrave through his burgraves and vogts (bailiffs), the village com- munities came to be represented solely by the knights who had obtained feudal possession of their lands. Many of the towns followed in their wake. Others were enabled to maintain their independence, and also made use of the pecuniary needs of the margraves, until many of. them practically became municipal republics. Their strength, however, was perhaps more usefully shown in their ability

The Hohen- zollerns.

Elector Freder- ick I.

Freder- ick II,

to resist the barons, which saved industry and commerce from extinction at a time of unbridled lawlessness, when the central power could do nothing for their aid. ; In the pecuniary embarrassments of the margraves also originated the power of the Stande, or estates, consisting of the noblesse, the clergy, and the towns. ‘The first recorded. instance of a diet co-operating with the ruler occurs in 1170, and in 1280 we find the margraves solemnly binding themselves not to raise a ‘‘bede” or special voluntary con- tribution (like the English “ benevolence”) without the consent of their estates. By 1355 the estates had secured the appointment of a permanent councillor, without whose concurrence the decrees of the margraves were invalid. In the century that followed the extinction of the Ascanians liberty degenerated into licence, and the land was given over to an almost total anarchy. Only the most powerful towns were able to maintain their

independence, and many of them and of the clergy paid regular black-mail to the nearest nobles. Thus rotten within, it is no wonder that the electorate completely lost its independent political importance.

The Hohenzollerns.—The new ruler who had to face this state of affairs was a member of an old Swabian family, which took its name of Hohenzollern from the ancestral castle in the Swabian Alb. Recent investigation has traced back the line to Hunfrid, duke of Rheetia and Istria at the beginning of the 9th century, a member of the widely-spread family of the Burkardingians, while it finds the actual progenitors of the Swabian branch of the family in two Alemannian dukes of the 10th century. Ata later period the Hohenzollerns were conspicuous for their loyal services to the Hohenstauffen emperors, under whom they acquired extensive possessions In Franconia and Moravia, and also the office of burgrave of Nuremberg (1191). They were ultimately recognized as among the most powerful princes of the empire, and, though they never attained to the electoral dignity, they frequently exercised considerable influence in the transference of the imperial crown. Rudolf of Hapsburg owed his succession in 1273 to the exertions of one Hohenzollern burgrave, and Louis the Bavarian owed the victory of Miihldorf (1322) to another. The two sons of the first burgrave, Conrad and Frederick, divided their inheritance between them, the former retaining the Franconian estates and the dignity of burgrave, the latter the ancestral possessions in Swabia. From the first of these descended the rulers of Prussia, while the other line also still exists in the person of the mediatized prince of Hohenzollern-Sigmaringen.

Frederick (1415-1440), who as elector of Brandenburg assumed the style of Frederick I., showed himself equal to the troublesome task before him, and would have been still more successful had his interests been limited to the elec- torate. By a prudent mixture of lenity and firmness, which did not shrink from actual fighting, he controlled the law- lessness of the Quitzows and other robber barons, restored a fair degree of internal order, and made his subjects feel that the central power was a fact that could not be ignored. While thus regulating the affairs of Brandenburg, Frederick was also a conspicuous figure in imperial politics, especially in the Hussite wars. His candidature for the imperial throne in 1438 may be regarded as the first occasion on which the houses of. Hohenzollern and Hapsburg came into

competition. Frederick was succeeded in Brandenburg by his son Frederick II. (1440-1470), and in his Franconian possessions by his son Albert. The former followed in his ae footsteps by taking energetic measures to consoli-

ate Als power and restore the electorate to its former extent. His chief struggle was with the large towns, which had cordially welcomed the Hohenzollerns as cham- pions against the freebooting barons, but were unwilling

to allow any intervention in their own affairs. Frederick subdued the resistance of Berlin, among other towns, and by a somewhat unwarrantable stretch of his prerogative erected a royal castle within its walls. He also regained possession of the Neumark, which had been given in pledge to the Teutonic Order in 1402, and would have added Lusatia and Pomerania to his domains if the emperor had not placed obstacles in his way. A long-standing feud with the archbishop of Magdeburg was also finally settled in this reign. Under his brother and successor

Albert (1470-1486), surnamed “ Achilles” from his chival- Albert rous valour and military talent, the Franconian lands were (Achilles)

again united with Brandenburg. Albert allowed his devo- tion to the emperor to interfere to some extent with his own interests, but he carried on successful wars with Mecklenburg and Pomerania, and effectually resisted the attempts of the Teutonic knights to repossess themselves of the Neumark. His name is best remeinbered by the Dispositio Achillea, a family ordinance providing for the future separation of Brandenburg and Ansbach-Baireuth, and establishing the custom of primogeniture in each. According to Hallam, this was the first instance of the legal establishment of primogeniture, and, when we con- sider the effect it had in keeping the Brandenburg posses- sions together, while those of Saxony (for instance) were frittered away among younger sons and their descendants, we shall not fail to discern its importance in determining

Prussia’s future. With the accession of John (1486-1499), John surnamed “Cicero” on account of his eloquence or of his (Cicero).

knowledge of Latin, begins a short period in which the rulers of Brandenburg take little share in imperial politics. At home John found his hands full in repressing the dis- orders that had arisen through Albert’s long absence from the electorate, and he acted with such vigour and address that he succeeded in obtaining from the towns an import- ant excise on beer, frequently refused to his father. The old claim to feudal supremacy over Pomerania, dating from the days of the Ascanians, was compromised in 1493 for an assurance of eventual succession on the extinction of the Pomeranian dukes.

the foundation of a university at Frankfort-on-the-Oder. He also effected an important internal reform by the intro- duction of Roman law, looking upon this as an easier way of securing uniformity of procedure than by a codification of the heterogeneous common law of his dominions. The inconvenience arising from the fact that the supreme court followed the sovereign from place to place was now re- moved in Brandenburg, asa short time before in England, by the establishment of a fixed and central court of final jurisdiction (Aammergericht). This court had its seat at Berlin, which had recently become the capital and resi- dence of the electors. In curbing the lawlessness of the nobles, who were yet far from being perfectly disciplined, Joachim showed as strong a hand as his predecessors. He adhered strenuously to his Roman Catholic belief in spite of the fact that Protestantism had been embraced by his own family and by most of his subjects, and he regarded with abhorrence the attitude of the Protestant princes towards the emperor. In violation of the family law, Joachim I. bequeathed the Neumark to his younger son

Jolin, and thus Joachim II. (1535-157 1) succeeded to only Joachim ; John seems to have I.

a part of the paternal possessions. been the more vigorous and decided of the two brothers, and led the way in announcing his transition to the Pro- testant faith, followed by Joachim in 1539. John also jomed the Schmalkald League, but was induced to retire from it by his brother, who succeeded in conjoining an adoption of the Reformation in his own dominions with

The next elector, Joachim I. Joachim (1499-1535), acquired the surname of “ Nestor” from his I. (Nes- encouragement of learning, which he showed inter alia by *°”

a careful avoidance of conflict with the emperor and Roman Catholic party. The church ordinance which he framed for Brandenburg was drawn up in such a way that the head of the state became likewise the head of the state church, and henceforth he regarded him- self, like Henry VIII. of England, as standing towards his own country in the place of the pope. The public introduction of the new faith was accomplished without difficulty, and the clergy witnessed the secularization of their property with much equanimity. ‘The funds thus acquired by Joachim, a prince of magnificent ideas and of lavish expenditure, were of great service to him ; but part of them he devoted to the encouragement of science and art. A compact of mutual right of eventual inheritance made in 1537 with the duke of Liegnitz and Brieg was of great ultimate importance as affording Frederick II. a pretext for his claims to Silesia. A still more useful arrangement of a similar kind was carried out by Joachim in 1569, when he secured the right of succession to the duchy of Prussia.

Between the accession of the Hohenzollern dynasty and the period at which we have now arrived the area of Brandenburg had been increased to nearly 15,000 square miles, and its material prosperity had grown in at least an equal ratio. It was still, however, far from being a com- pact or united state, nor had it as yet any pretension to an independent part on the European stage. Perhaps the most marked internal change was the increase in the power of the estates, resulting in great measure from the financial needs of the electors. Their gradual progress towards com- plete recognition as a co-ordinate branch of government may be said to have culminated in the formal declaration of Joachim II., that he would never undertake any action of importance affecting the welfare of his subjects without first consulting the estates. Yet alongside of this growth of the estates there were other causes at work paving the way for the future absolutism of the rulers. Thus the new ecclesiastical constitution brought the elector, as head of the church, into immediate relation with all classes of the people, and the

abolition of the distinction between mediate and immediate subjects in the religious sphere prepared the way for a similar position in secular matters. So too the introduction of Roman law accustomed the mind to dwell on the central authority and administration, and its very terminology promoted the conception of the elector as a “royal” ruler. A more important cause, however, than either of these was the gradual dccline of the power of the towns, with the accompanying revival of that of the nobles. The practical independence and com- parative wealth of the towns had been followed by intestine feuds, in which the patricians were arrayed against the guilds, and these not only weakened the towns directly, but also gave the electors frequent pretexts to interfere and curtail their privileges. At the end of the reign of Joachim II. the elector and the diet, the noblesse and the municipalities, were still in a state of comparative and promising equilibrium. But it was evident that the power of the diet was now almost wholly confined to its command of the purse, and that an elector who could make himself independent of its subsidies would be in a position to defy its claims ; while it was equally evident that the growing weakness of the towns was incapacitating them for any effectual resistance to an ambitious prince, who might utilize the congenial support of the noblesse as a stepping- stone to arbitrary power. The short-sighted and selfish neglect of general questions now making way among the separate sections of the diet, and their increasing tendency to appear at those sittings only in which their own peculiar interests were under discussion, also helped to free the hands of the electors. The condition of the peasantry

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had been steadily deteriorating, and their personal rights were already seriously encroached upon.

Under Joachim’s son, John George (1571-1598), who John permanently reunited the Neumark with Brandenburg, the George.

tendencies just noticed received emphatic expression. All vacant official positions were filled with members of the noblesse, who also received the right of exacting compul- sory service from the peasants and other similar privileges. The elector, who acquired the name of “ Oekonom” or steward from his admirable financial management, soon reduced the large debt left

by his father, and, leaning on the support he had earned from the barons, was able to act with great independence towards the other elements of the diet. During his undisturbed reign the material prosperity of Brandenburg advanced considerably, and the population was increased by numerous Protestant refugees from France and Holland.

testament of his father, which had assigned the Neumark to his younger brother, and in the Gera Bond executed a solemn ratification of the Dispositio Achillea. Ansbach and Baireuth were formally relinquished to the younger line, and have never since, except from 1791 to 1806, formed part of the Prussian dominions. ‘This reign is memorable for the establishment of a state council (Staatsrath), which served in sone degree as a ministerial cabinet, and may be characterized as the nucleus of the bureaucracy of modern Prussia.

reign is of great importance in the history of Brandenburg on account of the extensive territorial enlargement that fell to its lot. The contingency which had been contem- plated in the treaty with Prussia in 1569 was realized on the death of Duke Albert in 1618; and John Sigismund, whose title was strengthened by his marriage with the late duke’s daughter, inherited the duchy. His marriage also brought him a claim to the duchies of Cleves and Jiilich and other lands near the Rhine, but this title was disputed by the count palatine of Neuburg. The count was a Roman Catholic, and his contest with the elector soon became a mere incident in the great conflict that now broke out between the two religions. The disputed territories were occupied by Spanish and Dutch troops, and neither claimant derived much advantage from them till after the Thirty Years’ War. For a time, however, the outlying possessions of John Sigismund touched on both sides the limits of modern Prussia. In 1613 the elector, either from pure conviction or from a desire to conciliate the Reformed diet of Cleves, announced his adoption of the Reformed (Calvinistic) type of Protestantism, an action that gave great offence in his older dominions. He made, however, no attempt to induce his subjects to follow his example, and may be said to have inaugurated the policy of religious toleration that has since been characteristic of Prussian rulers. During his reign his territories were more than doubled in extent, covering at his death an area of 31,000 square miles;

but the elector of Brandenburg could not yet claim to rank above those of Bavaria and Saxony.

Duchy of Prussia.—The duchy of Prussia, thus ac- Duchy of quired by the elector, formed the eastern half of the ter- Prussia.

ritory bearing the name of Preussen, and stretched along the Baltic Sea from the Vistula to the Memel. It still remained a Polish fief, and was separated from the rest of the electoral dominions by West Prussia, which the Teutonic Order had been forced to resign to Poland a century and a half before. The native Prussians were of a race akin to the Letts and Lithuanians, and their name (Pruzi, Prutheni) was probably derived from a Lettish root meaning "'intelligence."! Towards the end of the 1 The traditionary counexion of the name with the proximity of

Joachim Frederick (1598- Joachim 1608) had the good sense and resolution to oppose the Frederick.

John Sigismund (1608-1619) does not seem to John have been a man of marked personal character, but his Sigis-

Teutonic Order.

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first century of the Christian era we find authentic accounts of the importation by the Romans of amber from the Baltic coast, but the first mention of the Pruzi by name occurs in a document of the 9th century. Their first appearance in German history is connected with the attempt made in 997 by Adalbert, bishop of Prague, to convert them to Christianity. But his efforts, as well as those of his successor Bruno, met with little success, and each of these pious missionaries found a martyr's grave on the shore of the Baltic. The obstinate adherence of the natives to their paganism was strengthened by their natural suspicion of a political aim under cover of missionary enterprise, and they felt that they were fighting for their land as well as for their religion. The next serious attempt at their conversion was made two hundred years later by a Cistercian nionk named Christian, who at the outset had some success and was appointed first bishop of Prussia.

The Prussians, however, soon expelled Christian and his supporters, and even invaded Polish territory, plundering and exacting tribute. In this extremity Christian and Conrad, duke of Masovia, applied for aid to the knights of the TEUToNIC ORDER (¢.v.), who gladly embarked on this new crusade. The Prussians made a desperate resistance; but the military discipline and strength of the Teutonic knights were not in the long run to be withstood, reinforced, as they were, by crowds of crusaders and adventurers anxious to share in the pious work, and assisted on two occasions by the troops of Ottocar of Bohemia. The knights entered Prussia in 1230, and after half a century of hard fighting found them- selves masters of the entire country. They had previously taken care to procure from the emperor and the pope a grant of all the lands they should conquer, as well as of those offered to them by Conrad of Masovia. At first the government of the Order, though arbitrary, was not un- favourable to the welfare of the land. The few native nobles who adopted Christianity were allowed to retain their privileged position, and the ranks of the noblesse were recruited by grants to German knights. Numerous towns and villages were built; the place of the greatly thinned Prussians was taken by industrious German colonists ; agriculture and commerce were carried on with energy and success; and all aggression from without was vigorously repelled. The general plan of colonization was similar to that in Brandenburg, except that the place of the margrave was taken by a class of privileged nobles, who divided the power of government among them. In 1309 Pomerelia, to the west of the Vistula, was subdued, and the headquarters of the Order were removed from Venice to the fortress of Marienburg on the Vistula; and before the end of the century: the “ Ordensland” of Prussia is said to have contained about fifty walled towns, still more numerous castles, and several hundred villages and hamlets, while it extended from Pomerania to the western frontier of Lithuania. The active trade which now flourished was carried on mainly with England and the Hanseatic towns. As time went on, however, the knights allowed their vows of temperance and chastity to sink into abeyance and became enervated by luxury and excess. Their old military skill declined, and they had sunk to such a state of weakness that the single battle of Tannenberg (1410), in which they were defeated by the Poles, shook their power to its foundations. Their arbitrary and exclusive rule now began to reap its reward : the Prussians took advantage of the weakness of the Order to claim a larger share in the government, and, as

their burdens continued to grow more oppressive, finally formed an alliance with its arch-enemy Poland. Attacked from

Russia seems unfounded, and the form Borussia or Porussia, which has been adopted as the Latin appellation of the country, is used for the first time by a chronicler of the fifteenth century.

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without and weakened by dissension within, the Order was at length compelled to succumb ; and a war begun in 1454 ended thirteen years later with the cession of West Prussia to Poland and an acknowledgment of the latter's feudal superiority over the remaining territories of the Order. The knights turned to Germany for help, and endeavoured to persuade powerful German princes to undertake the office of grand master. In 1511 their choice fell on Albert, a member of the Franconian branch of the Hohenzollerns, who undertook the task of reorganization with vigour and attempted to dispense with the oath of fealty to Poland. But, failing to receive any adequate support from the emperor, he at length, acting on the advice of Luther, determined to embrace Protestantism and convert the Ordensland into a secular and hereditary duchy. This momentous transformation was carried out in 1525 with- out interference from either the empire or Poland, and Albert continued to be a vassal of the latter state as duke of Prussia. The people of Prussia, many of whom had already gone over to the new faith, hailed the reform with great satisfaction, and most of the knights contentedly changed their life-rents for feudal holdings, married, and became hereditary nobles. When it passed into the hands of the elector of Brandenburg, Prussia thus consisted of a compact secular duchy, owing fealty to Poland, and pos- sessing the two well-defined estates of nobles and burghers, the first of which held the reins of power.

John Sigismund died in 1619, a year after his acquisi- George tion of Prussia, and left his territories to his son George William: |

William (1619-1640). This unfortunate prince may per- haps be described as the first utterly incompetent ruler of his ne, though due allowance must be made for the extreme difficulty of his position. Succeeding to power at the outbreak of the great struggle between Catholicism and Protestantism,

he neglected the opportunity of joining with Saxony in the formation of a strong league of German Protestant princes, and by his temporizing policy converted his electorate into the common battle-ground. In the language of Carlyle, "'where the Titans were bowling rocks at each other, George William hoped by dexterous skipping to escape share of the game." His own irresolu- tion was aided by the fact that his chancellor and chief adviser, Schwarzenberg, was a Roman Catholic and of strong imperialist sympathies, while the great bulk of his subjects dreaded an increase of the power of Calvinism almost more than that of Roman Catholicism. Branden- burg was overrun in turn by Mansfeld, Tilly, and Wallen- stein, and suffered as much as if it had taken an active part in the war. The Restitution Edict of 1628, however, gave the elector serious cause of alarm, and the appearance of Gustavus Adolphus before Berlin in 1631 confirmed his faltering decision and made him for a time throw in his lot with the Protestant cause. After the death of Gustavus, Brandenburg followed the example of Saxony in negotiating a separate peace with the emperor (1635), But this apostasy brought little relief, as the emperor gave no aid in expelling the Swedes from Brandenburg and Pomerania, which they continued to occupy for several years. In 1639 the elector removed his court to Kénigs- berg in Prussia, the only part of his realms in which he was sure of comparative tranquillity, and there he died in 1640, leaving a land devastated in great part by fire and sword and at the lowest ebb of dignity and power.

Frederick William (1640-1688), whom both his con- Great temporaries and after ages have agreed to dignify with Elector |

the title of the 'Great Elector," was only twenty years old when he succeeded to the throne, but he at once began to manifest a decided and vigorous character very different from that of his father. He emancipated himself without delay from the guidance of Schwarzenberg, and, in spite of

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rear in his war with the Turks. At his death, which took place in 1688, he was engaged in helping the prince of Orange to prepare for his descent on England.

The reign of the Great Elector forms one of the most Branden- signal instances in history of the conquest of adverse cir- burg cumstances by personal energy and merit; and it is with eee, reason that Prussian historians describe him as the second phector.

founder of the state. At his accession the greater part of

the emperor’s displeasure, concluded a peace with Sweden, which provided for the withdrawal of the Swedish troops from the electorate. During the following years of war Frederick William preserved a strict neutrality and utihzed the opportunity to restore the material resources of his country and reorganize and strengthen his army. The fruits of this line of action were seen at the peace of Westphalia (1648), when Frederick William, as lord of

an efficient army of 25,000 men, was able to secure a ready hearing for his claims to territorial extension. He established his right to the whole of Pomerania, but, as the Swedes refused to give up Western or Hither Pomerania (Vorpommern), he received as compensation the rich ecclesiastical principalities of Magdeburg, Halberstadt, and Minden, in central Germany. In the second Swedish and Polish war, which broke out in 1655, he used his inter- mediate position with great skill and unscrupulousness, allying himself first with one and then with the other of the belligerents, as seemed hkely to be most profitable. Thus the troops of Brandenburg took a prominent share in the defeat of the Poles at the three days’ battle of Warsaw (1656), in return for which service Sweden undertook to recognize the elector as independent sovereign of the duchy of Prussia. Scarcely, however, did the scale of victory begin to turn than the elector deserted his former ally, and in the treaty of Wehlau (1657) received his reward in the formal relinquishment by Poland of its feudal rights over Prussia. This important step, which added the electorate to the independent states of Europe and pre- pared the way for the growth of a great north German power, was ratified three years later at the general peace of Oliva. In 1666 the long-vexed question of the inheritance to the Rhenish duchies was settled by an amicable parti- tion, according to which Cleves, Mark, and Ravensberg fell to the share of Prussia. When Louis XIV. attacked Holland in 1672 Frederick William was at first the only German prince to

suspect danger in the anibitious designs of the French monarch. In spite of tempting offers from France, he concluded an alliance with Holland, and at the head of Austrian and Brandenburgian troops joined the Dutch in an ineffectual campaign on the Rhine. In 1673 he was forced, through lack of sufficient support from the emperor, to make peace with France; but he joined the triple alliance of Holland, Spain, and the empire in the following year and took part in an indecisive campaign in Alsace. There he received intelligence that the Swedes, at the instigation of France, had broken into Brandenburg. Hastening back to his own country without delay, he took the enemy by surprise, and at the head of about 6000 men gained a brilliant victory over twice that number of Swedish troops at Fehrbellin (1675), a small town to the north-west of Berlin. This success over the hitherto invincible Swedes lent great prestige to the elector's arms, and he followed it up by a series of vigorous campaigns, in which, with the aid of Denmark, he swept Branden- burg and Pomerania clear of the invaders, capturing Stettin in 1677 and Stralsund in 1678. The invasion of Prussia from Livonia, which formed the last effort of the Swedes, was also triumphantly repelled, the most memorable inci- dent of the short struggle being the elector's forced march over the frozen surface of the Frische Haff. At the peace of St Germain (1679), however, owing to the influence of France and the lukewarm support of the emperor, Frederick Wilham saw himself forced to restore Hither Pomerania to Sweden. The policy of the last years of the Great Elector may be described as an endeavour to hold the balance between France and the emperor. At first he jomed in a somewhat unnatural alliance with Louis XIV., but after the revocation of the Edict of Nantes (1685) he drew nearer to Austria and covered the emperor's

his territory was in the occupation of strangers and de- vastated by war, and in European politics Brandenburg was regarded as merely an appendage of the empire. Its army was of little value; its soil was poor; and its revenue was insignificant. To other sources of weakness were added the scattered nature of the electoral possessions, their mutual jealousies, and their separate interests. At Frederick Wilham's death the new north German state of Brandenburg-Prussia was a power that had to be reckoned with in all European combinations. Inferior to Austria alone among the states of the empire, it was regarded as the head and patron of German Protestantism ; while the fact that one-third of its territory lay outside the empire added to

its independent importance. Its area had been raised to 43,000 square miles ; its revenue had multiplied fivefold ; and its small army was nowhere surpassed in efficiency. The elector had overthrown Sweden and in- herited her position on the Baltic, and he had offered a steady and not ineffectual resistance to the ambition of France.

While thus winning for himself a position in the councils of Europe, the elector was not less active in strengthening the central authority within his dominions, and the trans- formation effected during his reign in the internal govern- ment of the state was not less striking than that in its external importance. Frederick William found Branden- burg a constitutional state, in which the legislative power was shared between the elector and the diet ; he left it to his successor as in substance an absolute monarchy. Many circunistances helped him in effecting this change, among the chief of which were the want of harmonious action on the part of the estates and the accelerated decline of the political power of the towns. The substitution of a perma- nent excise for the subsidies granted from time to time by the estates also tended to increase the elector's independ- ence, and the Government officials (Steuerrdthe) appointed to collect this tax in the towns gradually absorbed many of the adininistrative functions of the local authorities. The nobles and prelates generally preferred to raise their quota according to the old method of bede or "contri- bution," and this weakened the last bond of common interest between them and the estate of the burghers. In Brandenburg the elector met with little opposition in establishing his personal sovereignty, and after 1653 no general diet of Brandenburg was held. In Cleves and Mark he gained his end simply by an overwhelming display of force; but in Prussia, where the spirit of independence . was fostered by its history and by its distance from the seat of power, he found much greater difficulty. His emancipation from the suzerainty of Poland gave him a great advantage in the struggle, though the estates on their side averred that their relation with Poland was one that could not be dissolved except by common consent. It was not until the elector had occupied K6énigsberg with an armed force, and imprisoned the one (Burgomaster Roth) and executed the other (Baron Kalkstein) of the principal champions of independence, that he was able to bend the estates to his will, Arbitrary and unconstitu- tional as this conduct seems to us, we must not forget that Frederick William's idea of the functions of an absolute prince was very

superior to the unqualified egotism of the French monarchs, and that, while he insisted upon being

King Frederick Ie

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master in his own house, it was that he might at the same time be the first servant of the state. In his eyes an absolute government was the best guarantee of the common welfare, and was not sought merely for the sake of personal aggrandizement. It is not without significance in con- nexion with this that beyond his own territories he twice espoused the cause of the people against an absolute ruler, first in opposing Louis XIV., and again in aiding William of Orange. .

In matters of general administration Frederick William showed himself a prudent and careful ruler, and laid the foundation of the future greatness of Prussia in almost every department. The military and bureaucratic systems of the country both received their first important impulse in this reign. The wounds inflicted by the Thirty Years' War were in a great measure healed, and the finances and credit of the state were established on a firm basis. Agri- culture and commerce were improved and encouraged by a variety of useful measures, and education was not neglected. The elector even established Prussian colonies in Africa, and formed a small but efficient navy. In matters of religion Braudenburg stands out prominently as the only country of the time in which all Christian confessions were not only tolerated but placed upon an equal footing. The condition of the peasantry, however, reached almost its lowest ebb, and the "' recess" or charter of 1653 practically recognizes the existence of villainage. While the barons had been losing power on the one side as opposed to the elector, they had been increasing it on the other at the expense of the peasants. The Thirty Years' War afforded them frequent opportunities of replac- ing the village "Schulzen" with manorial courts; and the fact that their quota of taxation was wholly wrung from the holdings of the peasants made the burden of the latter four or five times as great as that of the towns. The state of public morals also still left much to be desired, while the clergy were too mucli occupied with squabbles over Lutheranism and Calvinism to be an effective instrument of reform.

The Great Elector's son Frederick I. (1688-1713) was an ostentatious and somewhat frivolous prince, who hazarded the acquisitions of his father by looking on his position as assured and by aiming rather at external tokens of his dignity than at a further consolidation of the basis on which it rested. The Brandenburg troops showed all their wonted prowess in the war of the second coalition against Louis XIV. and in that of the Spanish Succession ; but Frederick's interests were only mediately concerned, and neither the peace of Ryswick (1697) nor that of Utrecht (1713) brought him any very tangible advantage. Bran- denburg soldiers also helped the emperor in his wars with the Turks, and English readers should not forget that Frederick's action in covering the Dutch frontier with 6000 troops left William of Orange free scope in his expedition to England. The most notable incident in Frederick's reign was, however, his acquisition of the title of king of Prussia, which long formed the principal object of his policy, and which led him to make important con- cessions to all whose co-operation was necessary. The emperor's consent was finally purchased by the promise of a contingent of 8000 men to aid him in the War of the Spanish Succession, and on 18th J anuary 1701 Frederick crowned himself at Ké6nigsberg with accompanying cere- monies of somewhat inflated grandeur. Elector Frederick IIL. of Brandenburg became henceforth King Frederick I. of Prussia,! the title being taken from that part of his

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1 Strictly speaking, the title assumed was "king ix Prussia" (K6nig in Preussen), this apparently being meant to indicate that there was still a Prussia (West Prussia) of which he was not king, though it has also been otherwise explained.

territories in which he had no suzerain to acknowledge. Superficial as this incident may at first sight appear, it added considerably to the moral and political moment- um of the country, and its advantages were reaped by Frederick's two vigorous successors. About the same time (1697) the elector of Saxony also acquired the kingly dignity by his election to the throne of Poland, but in doing so he had to become a Roman Catholic, and thus left the Hohenzollerns without a rival among the Protest- ant dynasties

of Germany. Frederick was an extravagant ruler, who lavished large sums in maintaining his personal state ; but his expenditure was not wholly of this profitless nature, since he founded the university of Halle as a school of liberal theology, established academies of art and science at Berlin, and patronized men of literary eminence. In this he was perhaps mainly inspired by his talented wife Sophia Charlotte, a sister of George I. of England.

The court of Vienna had consoled itself for the growing power of Prussia under the Great Elector by the reflexion that it was probably of a temporary nature and due mainly to the vigorous individuality of that prince. The events of Frederick I.'s reign seemed to justify this view. At his accession Prussia might fairly claim to rank as the second state of Germany and possessed considerable influence as a European power of all but the first order. This, however, had been changed before the death of Frederick. Bavaria, Saxony, and Hanover had all raised themselves to at least a level with Prussia, which now sank back into the posi- tion of a merely German state and loyal supporter of the empire. Frederick's preoccupation in the western wars had allowed Sweden to reassert her pre-eminence in northern Europe, and it was Russia and not Prussia that now impeded her progress. The internal soundness of the country had also suffered: the finances were in a state of complete disorganization, and the burden of taxation was almost insupportable. If Frederick's successor had not been a man of vigorous character the downhill progress might have continued until it had removed Prussia alto- gether from the list of important states. Perhaps the general estimate of Frederick's character is unduly low owing to the fact that he was followed as well as preceded by a ruler of unusual capacity.

His son Frederick William I. (1713-1740) possessed Frederick administrative talents of no mean order and was singularly William painstaking, industrious, and determined in carrying out °

his plans. Though marked by no great external achieve- ments or exciting events, his reign is of the utmost im- portance in the Prussian annals from having checked the threatened downfall of Prussia and paved the way for Frederick the Great. By carefully husbanding his finances Frederick William filled his treasury and was able to keep on foot one of the largest and best disciplined armies in Europe, thereby securing for Prussia an

influence in Euro- pean councils altogether disproportionate to its size and population. In internal management he made Prussia the model state of Europe, though his administration was of a purely arbitrary type, in which the estates were never con- sulted and his ministers were merely clerks to register his decrees. The first act of the young king, who was as economical as his father was extravagant, was to institute a salutary reform in the expensive institutions of the court; and some idea of the drastic nature of this change may be gathered from the fact that the annual allowance for the salaries and pensions of the chief court officials and civil servants was at once reduced from 276,000 to 55,000 thalers. The peace of Utrecht (1713), which added Guelders to the Prussian territories, left Frederick William free to turn his attention to the northern war then raging between Sweden on the one side and Russia, Poland, and Denmark on the other. Though at first disposed to be

friendly to Sweden, he was forced by circumstances to take up arms against it. In September 1713 Stettin was captured by the allies and handed over to the custody of Frederick William, who paid the expenses of the siege and undertook to retain possession of the town until the end of the war. But Charles XII. refused to recognize this arrangement and returned from his exile in Turkey to demand the immediate restitution of the town. With this demand the Prussian monarch naturally declined to comply, unless the money he had advanced was reimbursed, and the upshot was the outbreak of the only war in which Frederick William ever engaged. The struggle was of short dura- tion and was practically ended in 1715 by the capture of Stralsund by the united Prussians, Saxons, and Danes under the command of the king of Prussia. The Swedes were driven from Pomerania, and at the peace of 1720 Frederick William received the greater part of Vorpom- mern, including the important seaport of Stettin. Sweden now disappeared from the ranks of the great powers, and Prussia was left without a rival in northern Germany.

A detailed history of Frederick William's reign would necessitate the recital of a long and tedious series of diplomatic proceedings, centring in the question of the succession to the duchies of Jiilich and Berg. In 1725 we find the king trusting for support to an alliance with England, while the queen has set her heart on a double marriage between her eldest son and daughter and an English princess and prince. The treaty of Wusterhausen between Austria and Prussia was concluded in the follow- ing year, and was confirmed with some modifications by the treaty of Berlin in 1728. Frederick William engaged to recognize the Pragmatic Sanction, while the emperor on his side undertook to support Prussia's claims to Jiilich and Berg. The policy of the latter, however, was far from straightforward, as he had already entered into a similar compact with the count palatine of Sulzbach, the rival claimant to the succession, who was a Roman Catholic and therefore a more sympathetic ally. Frederick William's intervention in the matter of the succession to the throne of Poland, rendered vacant by the death of Augustus IT. in 1733, proved barren of advantage to Prussia and failed to secure the hoped-for reversion of the duchy of Cour- land. A Prussian contingent took part none the less in the ensuing war between Austria and France, but Austria concluded peace in 1735 without consulting her ally. In 1737 the king was resolute enough to withstand the pressure brought to bear upon him by England, France, Holland, and Austria in order to induce him to submit to their settlement of the Jiilich-Berg question; and in 1739, convinced at last of the confirmed duplicity of the emperor, he turned to his hereditary enemy for help and concluded a defensive alliance with France. This action may be looked upon as marking the end of that phase in the rela- tions of the houses of Hapsburg and Hohenzollern in which the latter regarded the former with simple loyalty as its natural suzerain; the rivalry between Austria and Prussia had begun, and for the rest of the century formed the pivot on which the politics of Europe mainly turned. Frederick William died in 1740, conscious of his diplo- matic failures, but confident that his son would repair his errors.

If the external history of Frederick William's reign is not especially glorious, and if in diplomacy he was worsted by the emperor, the country at least enjoyed the benefits of a twenty-five years' peace and those of a well-meaning, though somewhat too patriarchal, government. During this reign the revenues of Prussia were doubled, and the king left at his death a well-

filled treasury and an army of 85,000 men. Though not ranking higher than twelfth among the European states in extent and population,

Prussia occupied the fourth place in point of military power. The king himself took the greatest interest in the management of his*army, in which the discipline was of the strictest ; and he carried the habits of the military martinet into all departments of the administration. His untiring industry occupied itself with the minutest details of government, and his downright blunt character showed there to greater advantage than in diplomatic circles. His chief innovation was the abolition of the distinction between the military and civil funds, and the assignment of the entire financial management of the country to a general directory of finance, war, and domains. Hitherto the proceeds of the excise and contribution had been paid into the military chest, while those of the royal monopolies and domains belonged to the civil service, deficiencies in one department being made good by the surplus of the other. Now, however, the directory was instructed to pay for everything out of a common fund, and so to regulate the expenditure that there should invariably be a surplus at the end of the year. As the army absorbed five-sevenths of the revenue, the civil administration had to be conducted with the greatest economy. The king himself set the example of the frugality which he expected from his officials, and contented himself with a civil list of 52,000 thalers (£7800). The domains were now managed so as to yield a greater income than ever before, and important reforms were made in the system of taxation. By the substitution of a payment in money for the obsolete military tenure the nobles were deprived of their practical exemption from taxation, and they were also required to pay taxes for all the peasant holdings they had absorbed. Attempts were made to better the condition of the peasants, and the worst features of villainage were abolished in the crown domains. The military system of cantonment, according to which each regiment was allotted a district in which to recruit, was of constitutional as well as military importance, since it brought the peasants into direct. contact with the royal officials. The collection of the taxes of the peasantry was removed from the hands of the

landowners. The duties of the state officials were laid down with great detail, and their performance was exacted with great severity. Official corruption was punished with extreme rigour. Justice seems to have been administered in an upright if somewhat Draconian manner, though the frequent and often arbitrary inflic- tion of the penalty of death by the king strikes us with astonishment. The agricultural and industrial interests of the country were fostered with great zeal. The most important industrial undertaking was the introduction of the manufacture of woollen cloth, the royal factory at Berlin supplying uniforms for the entire army. The com- mercial regulations, conceived in a spirit of rigid pro- tection, were less successful. In the ecclesiastical sphere the king was able to secure toleration for the Protestants in other parts of Germany by reprisals on his own Roman Catholic subjects, and he also gave welcome to numerous Protestant refugees, including 18,000 exiled peasants from Salzburg. For art, science, and the higher culture he had no respect, but he has the credit of founding the common- school system of Prussia and of making elementary educa- tion compulsory.

After the accession of Frederick the Great (1740-1786) Frederick

the external history of Prussia coincides to such an extent 1. with that of the German empire that it has already been treated with considerable detail in the article GERMANY (vol. x. pp. 503-4 ; see also FrepEricx II.). The outline of Frederick's foreign policy was probably determimed in some degree by the events of the later years of lis father's reign, and Austrian duplicity in the matter of Jiilich gave him a colourable pretext for his hostile attitude m reviving XX, — 2

Prussia under Frederick Te

the long dormant claims of Prussia to the Silesian duchies. Within a year of his accession he had embarked on the first Silesian War, and this was closely followed by the second, which ended in 1745, leaving Frederick in undis- puted possession of almost the whole of Silesia, with the frontier that still exists. East Friesland, the Prussian claim to which dated from the time of the Great Elector, was absorbed in 1744 on the death without issue of the

last duke. The two Silesian wars completely exhausted the stores left by Frederick William, both of grenadiers and thalers, and Frederick gladly welcomed the interval of peace to anlass new treasures and allow his subjects time to recover from their exertions. The measures he took were so successful that when the Seven Years' War broke out in 1756 he had an army of 150,000 men at his com- mand, representing about one-seventh of the available male population of his little kmgdom. He had also a fund of eleven million thalers in his treasury, though this would have gone but a small way in defraying the expenses of the protracted struggle had he not been assisted by the subsidies of England and able to make the fertile plains of Saxony his chief basis of supply. The succession of brilliant campaigns in which Frederick maintained himself against a coalition embracing nearly the whole of Europe has been narrated in the article AUSTRIA (vol. iii. p. 127 s¢.). As Macaulay points out in a somewhat highly-coloured passage, Frederick ruled over a population of less than five million souls, while his adversaries could draw their armies from a joint population of a hundred millions. The disproportion in wealth was at least as great. Nor was the small size of Frederick's land made up for by its strong patriotism and loyalty; on the contrary, the affections of his subjects had been partially alienated by the severity of his rule and the weight of taxation. Prussia had no strong natural bulwarks on its frontiers, but lay exposed to every foe. Yet Frederick's brilliant military genius was able to counteract all these dis- advantages and carry on the contest in spite of all odds. Though without gain in extent or population, Prussia emerged from the war as an undoubted power of the first rank, and henceforth completely eclipsed Saxony, Bavaria, and Hanover, while it was plain that Austria would no longer stand without a rival for the hegemony of the Ger- man empire. The glorious victories over the French and Russians also awakened a spirit of German patriotism that had hitherto been almost unknown. But the price paid for these results was enormous. Of the 850,000 soldiers who, as is estimated, perished during the war about 180,000 fell in the service of Prussia, and the gross popu- lation of the kingdom had decreased in seven years to the extent of half a million souls. The misery and poverty indirectly attendant on the war were incalculable, Numter- ous Prussian towns and villages were destroyed or made tenantless ; large tracts were left uncultivated for want of labourers ; and famine reigned to such an extent that even the seed-corn was converted into bread. The development of the country was thrown back for

many years, which were almost a repetition of the period succeeding the Thirty Years' War. But, while nearly a century elapsed before the traces of that struggle disappeared, Frederick, who showed himself great in peace as in war, repaired most of the ravages of the Seven Years' War in a tenth of the time, By great dexterity in the management of his finances he had kept clear of debt, and was soon able to advance large sums to the most impoverished districts. Foreign colonists were invited to repeople the deserted villages ; taxes were in several instances remitted for a& series of years ; the horses of the army were employed in farm labour ; and individual effort in every department was liberally supported by the Government. By 1770 nearly

all the ruined villages had been rebuilt; the ground was again under cultivation; order had been restored; the vacant offices had been filled ; and the debased currency had been called in. Throughout the kingdom agriculture was encouraged by the drainage of marshy districts; in- dustry was extended by the introduction of new manu- factures, by bounties, and by monopolies; and commerce was fostered by a series of well-meant, if economically unsound, measures of protection. Frederick's methods of administration did not greatly differ from those of his pre- decessor, though the unrelenting severity of Frederick William was relaxed and the peculiarities of his system toned down. Frederick's industry and activity were as great as those of his father, his insight keener, and his views more liberal. His rule was quite as personal and absolute, and the despotism was altered only in so far as the character of the despot was different. His own personal supervision extended to every department, and his idea of his position and duties made him his own first minister in the widest and most exacting sense of the term. He endeavoured to spare his subjects as far as was compatible with the immense army he maintained, and sought to raise the necessary revenues rather by improving the resources of the country than by additional taxation. He kept the charges of the civil administration down to the lowest point consistent with efficiency, and the court establishment was very economical, though it avoided the extreme of shabbi- ness witnessed under Frederick William. His efforts to improve the administration and the bureaucracy were un- ceasing, and he succeeded in

training a body of admirable public servants. One of his most sweeping reforms was in the department of law, where, with the able aid of Cocceji, he carried out a complete revolution both in procedure and personnel. The expenses of justice were greatly lightened, and no suit was allowed to drag on for more than a year. A complete divorce was effected between the departments of justice and provincial administration, a change that greatly strengthened the position of the private citizen in any contest with the officials of Government. One of the king's first acts was to abolish legal torture, and he rarely sanctioned capital punishment except in cases of murder. The application of the privilegium de non appellando (1746) freed Prussia from all relations with the imperial courts and paved the way for a codification of the common law of the land, which was begun under Frederick but not completed till the end of the century. In matters of religion Frederick not only exercised the greatest toleration, remarking that each of his subjects might go to heaven after his own fashion, but distinctly disclaimed the con- nexion of the state with any one confession, Equal liberty was granted in speaking and writing. Though his finances did not allow him to do much directly for education, his example and his patronage of men of letters exercised a most salutary effect. The old system of rigid social privi- lege was, however, still maintained, and unsurmountable barriers separated the noble from the citizen and the citizen from the peasant. The position of the last was very deplorable ; villainage still to a great extent existed, and the mental attitude of the rural population was servile in the extreme.!_ The paramount defect of Frederick's administration, as future events proved, was the neglect of any effort to encourage independence and power of self- government among the people. Every measure emanated from the king himself, and the country learned to rely on him alone for help in every emergency. Public opinion on political matters could not be said to exist ; and the

provincial diets met simply to receive the instructions of the royal agents.

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u One illustration of this is afforded by the fact that the private soldiers felt no resentment at being struck by their officers,

In 1772 Prussia and Austria, in order to prevent an overweening growth of Russia, joined in the first partition of Poland. Frederick's share consisted of West Prussia and the Netze district, a most welcome addition, filling up the gap between the great mass of his territories and the isolated district of East Prussia. It had also this advan- tage over later acquisitions at Poland's expense, that it was a thoroughly German land, having formed part of the colonizations of the Teutonic Order. In 1778 Prussia found herself once more in opposition to Austria on the question of the Bevarian succession, but the war that ensued was almost entirely nominal, and the difficulty was adjusted without much bloodshed. The same question elicited the last action of importance in which Frederick engaged,—the formation of a " Fiirstenbund," or league of German princes under Prussian supremacy, to resist the encroachments of Austria. The importance of this union was soon obscured by the momentous events of the French Revolution, but it was a significant foreshadowing of the duel of Austria and Prussia for the pre-eminence in Ger- many. Frederick died on 17th August 1786, having in-ereased his territories to an area of 75,000 square miles, with a population of five anda half millions. The revenue also had immensely increased and now amounted to about twenty million thalers annually, of which, however, thirteen were spent on the army. The treasury contained a fund of sixty million thalers, and the land was free of debt.

Frederick A continuation of the personal despotism under which

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William Prussia had now existed for seventy years, as well as of its

disproportionate influence in Europe, would have required a ruler with something of the iron will and ability of Frederick the Great. Unfortunately Frederick's nephew and suc- cessor, Frederick William II. (1786-1797), had neither the energy nor the insight that his position demanded. He was too undecided to grasp the opportunity of adding to Prussia's power by adhering to the vigorous external policy of his predecessor, nor did he on the other hand make any attempt to meet the growing discontent of his subjects under their heavy burdens by putting himself at the head of an internal movement of liberal reform. The rule of absolutism contintied, though the power now lay more in the hands of a "'camarilla" or cabinet

than in those of the monarch ; and the statesmen who now came to the front were singularly short-sighted and inefficient. The freedom of religion and the press left by Frederick the Great was abrogated in 1788 by royal ordinance. In 1787 the army engaged in an expensive and useless campaign against Holland. The abandonment of Frederick's policy was shown in a tendency to follow the lead of Austria, which culminated in an alliance with that power against revolu- tionary France. But in 1795 Prussia, suspicious of the Polish plans of Russia and Austria, concluded the separate peace of Basel, almost the only redeeming feature of which was the stipulation that all north German states beyond a certain line of demarcation should participate in its benefits. This practically divided Germany into two camps and inflicted a severe blow on the imperial system. The indifference with which Prussia relinquished to France German lands on the left bank of the Rhine, compared with her eagerness to increase her Slavonic terri- tories on the east, was certainly one of the great blunders of the reign. Prussia's share in the second and third partitions of Poland (1793 and 1795) nearly doubled her extent, but added little or nothing to her real power. The twelve years following the peace of Basel form one of the most sombre periods of the history of Prussia. Her prestige was lost by her persistent and ill-timed neutrality in the struggle with France; the old virtues of economy, order, and justice disappeared from the bureaucracy ; the army was gradually losing its excellence and was weakened

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rather than strengthened by the hordes of disaffected Polish recruits ; the treasury was exhausted and a large debt in- curred ; the newly-awakened feeling of German patriotism had died away, especially among the upper classes.

Frederick William III. (1797-1840) possessed many Frederick virtues that did him credit in his private capacity, but he William lacked the vigour that was at this juncture imperatively ~~

required from a ruler of Prussia, while he was unfortu- nately surrounded by counsellors who had as little concep- tion as himself of Prussia's proper réle. He continued to adhere closely to a policy of timid neutrality and seemed content to let Prussia slip back into the position of a second-rate

state, the attitude of which in the great Euro- pean struggle could be of no special importance. Not even the high-handed occupation of Hanover by the French in 1803 could arouse him; and the last shred of self-respect seemed to have been parted with in 1805 when Prussia consented to receive Hanover, the property of its ally England, from the hands of France. The formation of the Confederation of the Rhine in 1806 and the intelligence that France had agreed to restore Hanover to England at last convinced Frederick William of what he had to fear from Napoleon; while Napoleon on his side, being now free of his other antagonists, was only too glad of an opportunity to destroy his tool. Prussia declared war on 9th October 1806; and the short campaign that ensued showed that the army of Frederick the Great had lost its virtue, and that Prussia, single-handed, was no match for the great French commander. On 14th October the Prussian armies were overthrown at Jena and Auerstadt, and a total collapse set in. Disgraceful capitulations of troops and fortresses without a struggle followed one another in rapid succession; the court fled to East Prussia ; and Napoleon entered Berlin in triumph. At the peace of Tilsit (9th July 1807) Frederick William lost half his kingdom, including all that had been acquired at tlie second and third partitions of Poland and the whole of the territory to the west of the Elbe. An enormous war indemnity was also demanded, and the Prussian fortresses were occupied by the French until this should be paid. Prussia now paid heavily for its past remissness and drained the cup of humiliation to the dregs.

The next half-dozen years form a period of the greatest significance in the history of Prussia, embracing, as they do, the turning-point in the moral regeneration of the country. The disasters of 1806 elicited a strong spirit of devoted patriotism, which was fanned by the exertions of the ‘“ Tugendbund,” or League of Virtue, and by the writ- ings of men like Fichteand Arndt. This was accompanied by a wonderful revelation of vitality and recuperative power.

chancellor Hardenberg. The condition on which Stein based his acceptance of office was itself of immense import- ance ; he insisted that the system of governing through irresponsible cabinet councillors, which had gradually be- come customary, should cease, and that the responsible ministers of departments should be at once the confidential advisers and the executive

agents of the king. Stein's designs and wishes extended to the establishment of a regular system of parliamentary and local government like that of England, but he had not an opportunity to do much more than begin the work. His edict of 1807 abolished serfdom and obliterated the legal distinction of classes by establishing freedom of exchange in land and free choice of occupation.! The '"Stadteordnung " of 1808

1 Previous to this measure the distinction between '' noble,' "burgher," and "peasant" land and occupations was strictly observed, and no transition of property or employment from one class to another was possible.

The credit of the reformation belongs mainly te Stein's the great minister Stein, and in the second place to the reforms.

reformed the municipalities and granted them important rights of self-government. His administrative reforms amounted to a complete reconstruction of the ministerial departments and the machinery of provincial government, and practically established the system now In force. In 1810 Hardenberg, with a precipitancy which Stein would scarcely have approved, continued the reform in the con- dition of the peasants by making them absolute owners of part of their holdings, the landlords obtaining the rest as an indemnity for their lost dues.1 The revolution thus effected in Prussia has been aptly compared in its results to the great revolution in France ; but, while there the reforms were exacted by a people in arms, here they were rather forced upon the people by the crown. The army was also reorganized by Scharnhorst and Gneisenau, while the condition imposed by Napoleon that it should not exceed 42,000 men was practically evaded by replacing each body of men by another as soon as it was fairly versed in military exercises. The educational reforms of Wilham von Humboldt established the school system of Prussia on its present basis, and the university of Berlin was founded in 1809.

Frederick William hesitated to take part in the Austrian rising of 1809, but his opportunity came in 1813, when Napoleon fled from Russia, denuded of his troops. General York, commander of the corps that Prussia had been obliged to contribute to the French expedition, anticipated the formal

declaration of war by joining the Russians with his troops on his own responsibility (30th December 1812). On the outbreak of the war the people rose en masse and with the utmost enthusiasm. The regular army was sup- ported by hosts of “‘ Landwehr,” or militia, eager to share in the emancipation of their country. A treaty of alliance between Russia and Prussia was concluded at Kalisch, and Austria, after some hesitation, also joined the league against Napoleon. In the struggle that followed (see Austria, vol. 1. pp. 134-135) Prussia played one of the most prominent parts, and her general Bliicher ranks high among the heroes of the war. Between 1813 and the battle of Waterloo Prussia lost 140,000 men, and strained her financial resources to the utmost. As compensation she received at the congress of Vienna the northern half of Saxony, her old possessions to the west of the Elbe, Swedish Pomerania, the duchies of Berg and Jiilich, and other districts in Westphalia and on the Rhine. The acquisitions of the last partition of Poland, with the excep- tion of the grand-duchy of Posen, were resigned to Russia, Friesland went to Hanover, and Bavaria was allowed to retain Baireuth and Ansbach, which had come into her hands in 1806. This rearrangement of the map did not wholly restore Prussia to its former extent, as its area was now only 108,000 square miles compared with 122,000 square miles at the beginning of 1806, but the substitu- tion of German for Slavonic territory and the shifting of the centre of gravity towards the west more than made up for any slight loss In mere size. Hanover still formed a huge wedge splitting Prussia completely in two, and the western frontier was very ragged. Prussia’s position re- quired caution, but forced upon it a national German policy, and the situation of the new lands was vastly more effectual in determining the future leader of Germany than ae 8 aggrandizement in Italy. The work of incor- _ eae was accomplished with as little

F I 7 e, and the Prussian statesmen had the ce . re to leave the Rhenish districts in the full enjoy- : 8) the institutions they had been used to under the

rench régime. The remainder of Frederick William ITI.’s reign, though

2 The patrimonial jurisdiction of the 1 away till 1848, sine

was not taken

marked by much material and social progress, was in the political sphere a period of the most deplorable reaction. At first the king seemed disposed to fulfil his promise of 1815 and grant the country a constitution, but ultimately both le and his minister Hardenberg suffered themselves to be dragged in the wake of the retrogressive policy of Metternich. The only concession made to the popular demand was the utterly inadequate patent of 1823, appoint- ing triennial provincial diets with a merely consultative function. The king also allowed himself to be alarmed by the ultra-liberal movement at the universities, and joined in the notorious Carlsbad decrees (1819) and in the senseless prosecutions of demagogues that formed the sequel. Many of Prussia's noblest and most patriotic sons now suffered unmerited punishment, and the Government showed a total incapacity to understand the real state of affairs. Respect for the aged king, however, prevented an outburst during his reign. After 1830 Prussia began to shake herself clear of the Austrian leading-strings, and the establishment of the " Zollverein," or customs union of the German states under Prussian supremacy, was a decided step towards a policy of independence. In ecclesiastical matters this reign is memorable for the union forced by the crown upon the Lutherans and Calvinists, and for the preliminary symptoms of the '" Culturkampf."

Frederick William IV. (1840-1861), a man of character and intelligence, began his reign promisingly by an amnesty for political offenders and by well-meant concessions to the dissatisfied Ultramontanes; but it soon became evident that he held too exalted an idea of the divine right of kings willingly to grant such a constitution as was required. Then followed the contest between the crown and the people, the various steps of which have been chronicled in the article Germany. At last the king had to give way and grant a constitution based upon democratic principles, and substituting a representative parliament for the old Prussian system of estates. This constitution was pro- mulgated on 3lst January 1850, and Prussia therewith formally entered the ranks of modern and constitutional states. But in the following years the king maintained as reactionary a policy as was in any

way compatible with the constitution, receiving his chief support in this line of action from the Prussian “Junkerthum,” or squirearchy. In external politics the chief feature of the reign is Prussia’s neglect of the opportunity to take up a strong position as the political and military leader of northern and central Germany: the king refused the imperial crown offered to him by the Frankfort Parliament in 1849, and allowed Prussia to play a subordinate réle at Olmiitz in the fol- lowing year. Towards the close of his life the Prussian Government was distrusted at home and discredited abroad.

In 1858 William, prince of Prussia, became regent in consequence of the mental illness of his brother, and in 1861 he succeeded to the throne as William I. His acces- sion was hailed as likely to increase both the liberalism of Prussia’s internal institutions and the vigour of its external policy ; and the second at least of these expectations was not disappointed. But at an early period of his reign the king became involved in a constitutional dispute with the House of Representatives, which declined to grant the supplies necessary for an extensive system of military reorganization. Bismarck, who became prime minister in 1862, refused to allow the crown to be hampered by patrlia- mentary restrictions and raised the funds required in defi- ance of the attitude of the lower house. This internal conflict may have had its influence in forcing upon the ministry the necessity of a strong foreign policy, especially in its dealings with Austria, though the party of reform believed that the hegemony of Germany might have been secured by Prussia without war if she had simply placed

herself at the head of the liberal movement. Prussia’s neutral attitude in the Austro-Italian War was the first sign of the coming storm ; and then followed the Schileswig- Holstein episode, culminating in the war of 1866 (see Avsrria), the successful issue of which expelled Austria from Germany and left its rival in undisputed possession. The territorial acquisitions which Prussia now made, con- sisting of Hanover, Hesse-Cassel, Hesse-Nassau, Frankfort, and Schleswig- Holstein, increased its extent by about a fifth and

for the first time gave a satisfactory rounding-off toitsform. The Prussian landtag, carried away by success, granted Bismarck, by a large majority, the indemnity he had the grace to ask for in regard to his previous unconsti- tutional proceedings in the financial dispute.

The war of 1866 gave the deathblow to the Germanic Confederation of 1815, and in its place appeared the North German Confederation under the lead of Prussia. The transformation was completed five years later, after the successful war with France, when the south German states also joined the union and the king of Prussia became the German emperor. The united Germany that Frederick the Great had sought in the Fiirstenbund, that Frederick William III. had tried to organize in 1806 in opposition to the Confederation of the Rhine, that Frederick William IY. had hoped to achieve in 1850, was at length an accomplished fact. In entering this union Prussia may in a sense be said to have abdicated her position as a great power in favour of Germany, but her influence within the empire, practically comprising that of all the small north German states, is so overwhelming that her identity is not likely ever to be wholly lost. Any measure increasing the power of the empire at the expense of the individual states is tantamount to an increase of the power of Prussia.

Since the Franco-German War the history of Prussia has been for the outside world practically identical with that of Germany and has centred in the figure of Prince Bismarck. The policy of the imperial chancellor and Prussian premier is essentially autocratic in its nature, and seems to have for its keynote the necessity of main- taining at any price a strong central Government to cope with external emergencies. He identifies himself with no party, but generally manages by timely concessions to form such temporary parliamentary combinations as are necessary to carry the measures he has most at heart. On the other hand, he does not hesitate freely to call into requisition the royal veto on resolutions of parliament of which he does not approve. His reversion to a strong protectionist policy, which became marked in 1879, the date to which the history is brought down in the article GerMANY, has so far proved permanent, and numerous protective measures have been passed, though his favourite scheme of a Government monopoly of tobacco has been decisively rejected both by the imperial and the Prussian chambers. Asa pendant to these measures may be

men- tioned the laws intended to improve the position of the working classes, most of which are inspired by a spirit of state socialism. The alienation of the National Liberals, occasioned by the change in Bismarck's economic policy, has compelled him to seek his later majorities in a com- bination of Conservatives and Ultramontanes, the benefit of which has been mainly reaped by the latter. On the ac- cession of Pope Leo XIII. some conciliatory advances were made by Rome and Prussia; in 1881 diplomatic relations Were reopened with the Vatican, and several important concessions were made by a measure passed in 1883. The May laws have not been repealed, but they have latterly been put in force with much less stringency, and a great many of the vacant bishoprics and pastorates have been at least temporarily filled. The Ultramontanes continue to form one of the largest "fractions" both in the reichstag

and in the Prussian landtag. In spite of the continued existence of the special law passed against the socialists, which has been prolonged from time to time, their numbers have grown steadily, and in the autumnal election of 1884 they returned no fewer than twenty-four of their candidates to the reichstag, polling 550,000 votes, or about ten per cent. of the total number recorded. Their success was especially marked in Berlin, where they returned two members and polled 70,000 votes. The same election was also remarkable for the diminution of the German Liberal- ists (Deutsch-Ireisinnige), a party formed by the fusion of the Progressists and Secessionists.

Perhaps the most significant event in the recent history of Germany has been her entrance into the ranks of the colonial powers by the annexation in 1884 of several dis- tricts on the west coast of Africa, and among the islands of the Pacific Ocean. In this step Prince Bismarck has revived a policy that has slumbered since the time of the Great Elector (see p. 8), but there seems little reason to doubt that this new scheme of colonization will prove of more permanent importance than that of the 17th century.

CHRONOLOGICAL TABLE OF THE CHIEF EVENTS IN THE HIsTORY OF PRUSSIA.

930. Foundation of the North Mark, the nucleus of Brandenburg. 1134. Albert the Bear is invested with the North Mark, and founds the Ascanian line of margraves. 1230-83. Conquest of Preussen by the Teutonic Order. 1324-66. Margraves of the Bavarian line. 1356. Brandeuburg definitely recognized as an electorate. 1373-1413, Luxemburg line of electors. 1415. Frederick of Hohenzollern becomes elector of Brandenbnrg. 1539, Reforma- tion proclaimed by Joachim II. 1618. Duchy of Prussia inherited by Elector John Sigismund. 1640. Accession of Frederick William, the Great Elector. 1648. Brandenburg-Prussia receives Farther Pomerania, Magdeburg, Halber- stadt, and Minden at the peace of Westphalia. 1657. Independence of the duchy of Prussia recognized. 1675. Victory over the Swedes at Fehrbellin. 1701. Elector Frederick assumes the title of ‘‘ king of Prussia.” 1720. Acqnisition of Hither Pomerania. 1740. Accession of Frederick the Great. 1742. Acquisi- tion of Silesia at the close of the first Silesian War. 1744-45. Second Silesian War. 1756-63. Seven Years’ War; principal victories : Prague (6th May 1757), Rossbach (5th November 1757), Leuthen (5th December 1757), Liegnitz (idth August 1760), and Torgau (3d November 1760) ; principal defeats: Kolin (Sth June 1757), Hochkirch (14th October 1758), Kunersdorf (12th August 1759). 1772. First partition of Poland; acquisition of West Prussia, 1792. War with France. 1793. Second partition of Poland; acquisition of South Prussia. 1795. Third partition of Poland; acqnisition of New East Prussia; peace of Basel, providing for Prussia’s neutrality in the strnggle with France. 1806. War declared against Napoleon; defeats of Jena and Auerstaédt; Prussia conquered by the French. 1807. Peace of Tilsit and dismemberment of the kingdom. 1808, Beginning of Stein’s constitutional reforms. 1813. War of liberation; battle of Leipsic (16th to 19th October). 1814-15. Congress of Vienna; Prussia rehabilitated ; establishment of the Germanic Confederation. 1815. Battle of Waterloo. 1850. Promuigation of the Prussian constitution. 1864, War with Denmark. 1866. War with Austria; battle of Koniggratz (3d July); acquisition of Hanover, Schleswig-Holstein, and electoral Hesse; establishinent of North German Confederation. 1870-71. War with France. 1871. The king of Prussia proclaimed German emperor.

GEOGRAPHY AND STATISTICS.

Physical Features.._Fully three-fifths of Prussia belong to the Physical great north European plain and may be generally characterized as features.

lowlands. The plain is much wider on the east, where only the southern margin of Prnssia is mountainous, than on the west, where the Hanoverian hills approach to within less than 100 miles of the sea. A line drawn fron: Diisseldorf through Halle to Breslau would, roughly speaking, divide the flat part of the conntry from the hilly distriets. In the south-east Prussia is separated from Austria and Bohemia by the Sudetie chain, which begins at the valley of the Oder and extends thence towards the north-west. This chain includes the Riesen Gebirge, with the highest mountain in Prussia (Schneeckoppe, 5266 feet), and subsides gradually in the hills of Lnsatia. The Harz Mountains, however, beyond the Saxon plain, follow the same general direction and may be regarded asa detached continuation of the system. To the south of the Harz the Prussian frontier intersects the northern part of the Thuringian Forest, which is also prolonged towards the north-west by the Weser Hills and the Teutoburgian Forest. The south-west of Prussia is occupied by the plateau of the lower Rhine, including on the left bank the Hundsriiek and the Eifel, and on the right the Taunus, the Westerwald, and the Sanerland. Between the lower Rhenish and Thuringian systems are interposed the Vogelsberg, the Rhén, and other hills belonging to the Triassic system of the upper Rhine. The Silesian mountains are composed ehiefly of granite, gneiss, and schists, while the Harz and the lower Rhenish plateau are mainly of Devonian and Silurian formation. To the north of the Sauerland is the important Carboniferous system of the

1 The physical features of Prussia have been already so fully de- seribed under Germany that it has been deemed unnecessary to give here more than the briefest recapitulation. For other points which the reader may here miss he is also referred to that article.

Climate.

Soil.

Products,

Ruhr, and there are also extensive coal-fields in Silesia. With the exception of the Danube Prussia is traversed by all the chief Be of Germany, comprising almost the entire course of the Oder an the Weser. Nearly the whole of the Gerinan coast-line belongs to Prussia, and it possesses all the important seaports except the two most important of all, Hamburg and Bremen. ;

Climate.—The climate of Prussia is rendered more uniform than it would otherwise be by the fact that the average elevation in- ereases from north to south. The greatest extremes of temperature are found between the east and west, the mean annual warmth in the bleak and exposed provinces of the north-east being about 44 Fahr., while that of the sheltered valley of the Rhine is 6° higher. The difference is greatest in winter, when the respective means are 26° and 35°; in summer the difference is not above 2¢ to 4”. In Prussia as a whole the thermometer ranges from 100° to — 30°, but these extremes are rarely reached. The average annual rainfall is about 21 inches ; it is highest in the hilly district on the west (34 inches) and on the north-west coast (30 to 32 inches), and lowest (16 inches) in the inland parts of the eastern provinces.

Soil.— According to the most recent official returns, about 29 per cent. of the soil of Prussia consists of good loam or clay, 32 per cent. is mediocre or of loam and sand mixed, 31 per cent. is pre- dominantly sandy, and 6 per cent. is occupied by bogs and marshes. The north-eastern provinces eontain a high proportion of poor soil, and in the north-west oceur large traets of heath and moor. The reclaimed marshlands in both districts, as well as the soil in the immediate neighbourhood of the rivers, are usually very fertile,

and admirable traets of fruitful ground are found in the valleys of

the Rhine and its affluents and in the plain around Magdeburg. Patient and long-continued effort has, however, done much to equalize production, and large crops are now grown in some of the most unpromising parts of the kingdom. Prussia contains a greater proportion of tilled land than any of the countries of south Germany, while it is surpassed in this respect by Saxony, Hesse-Darmstadt, and the Thuringian states. The most fertile Prussian

province is Saxony, while the least productive are East and West Prussia. The following table shows the distribution of the cultivable area in the different provinees and in the country as a whole :—

| Meadow and F Arable Land, | Forests. Province. Area, – >| Pasture, 2 2 50 per cent. | 20°4 per cent. 23°3 per cent.

Sq. miles, Acres. Acres, Acres, BastyProsata…..... 14,280 4,709,295 2,127,317 1,681,057 West Pinssia…....| 9,850 3,455,000 1,124,885 1,349,392 Brandenburg …...| 15,410 4,586,360 1,487,872 3,205,635 Pomerania 11,620 4,152,002 1,408, 882 1,480,990 | Rosen 2 11,180 4,452, 360 934,450 1,464,449 SS eee eee ae 15,560 5,588,090 1,055,487 2,907,570 h GSANOMY: Meee… oe 9,750 3,836,192 826,352 1,269,920 Schleswig-Holstein .. 7,280 2,712,575 1,357,905 287,917 IFETION GT… sone e 14,840 3,126,182 4,365,115 1,512, 567 Westphalia…..... 7,800 2,121,745 1,262,530 1,411,085 Hesse-Nassau …... 6,060 1,561,552 623,872 1,572,492 Rhenish Prussia ….! 10,420 3,134,190 1,158,065 2,073,580 Hoheuzollern …., 440 130,967 50,212 94,652 Total 134,490 43,566,510 17,782,944 20,311,299

Prussia contains a greater proportion of woodland than any other large country in the south or west of Europe (France 17 per cent., Italy 12 per eent., Great Britain 3 per cent.), though not so large a proportion as Russia, Austria, and some of the minor German states. The most extensive forests are in East and West Prussia, Silesia, and Brandenburg, where coniferous trees prevail, and in the Rhenish and Hessian districts, where oaks and beeches are the most prominent growths. The north-vest is almost entirely desti- tute of timber, and peat is there used universally as fuel, The Government forests cover about 6,000,000 acres, or upwards of one- fourth of the whole, and are admirably managed, bringing in an annual revenue of 14 millions sterling. The state also controls the management of forests in private possession, and exerts itself to secure the planting of waste lands.

Products. —The principal crop in Prussia is rye, of which the ordinary bread of the country is made ; it grows in all parts of the kingdom, especially in the north and east, and oeeupies about one- fourth of the whole tilled surface. Oats occupy an area equal to about half that devoted to rye, and are also grown most extensively in the north-eastern district’, Wheat,

which is chiefly cultivated in the south and west, does not cover more than a fourth as much ground as rye. Barley is most largely grown in Saxony and Silesia. Other grain crops are spelt (chiefly on the Rhine), buekwheat (Hanover and Schleswig-Holstein), and millet; maize is grown for fodder in Some districts. The produce of grain scarcely covers the consumption and is supplemented by imports of rye and other cereals from Russia and Holland, Potatoes, used both as food aud for the distillation of spirits, are cultivated over nearly as large an area as rye and are especially predominant in the eastern provinces The common beet is extensively grown for the production of sugar in Saxony, Hanover, Silesia, Pomerania, and Brandenbure Flax and hemp oceupy considcrable areas in East Prussia, Silesia and

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[SOIL AND PRODUCTS.

r, while hops are raised chiefly in Posen and Saxony. The eas of ape el for oil has fallen off since the use of petro- leum has become general. The tobacco of Silesia, Brandenburg, Hanover, and the Rhine province is inferior to that of southern Germany ; the annual value of Prussian-grown tobacco is about £500,000, or one-fourth of the total produce of the empire. Only a comparatively sinall part of the Rhenish wine district falls within Prussia, which does not elaim more than a sixth (200,000,000 gallons, value £400,000) of the annual produce of Germany ; but this ineludes many of the choicest varieties, such as Steinberger, Johannisberger, and Riidesheimer. The best vineyards of the Moselle also belong to Prussia, and inferior kinds of wine are pro- duced in Saxony and Lower Silesia. Great quantities of apples, cherries, and plums are raised ou the Rhine, in Saxony, and other districts, while market-gardening on an extensive scale is practised near Erfurt and some other large towns. The hay-meadows of the eastern provinees are the largest, but those in the west bear lieavier erops. ‘The richest pasture is afforded by the marshlands along the North Sea and by the plain of the lower Rhine, while the Targe moors of Westphalia and Hanover are of comparatively little value in this respect. The accompanying table shows the yield in tons of the principal crops in 1883, in which year, however, the returns were rather below the average :-— ,

| Province. | Rye | Wheat. Barley. | Oats. | Potatoes.| Hay. East Prussia…./ 330,565| s8,585| 71,987! 911,139| 586,640 600,231 ‘West Prussia ../ 269,030 83,608} 69,600| 119,710] 838,953] 390,984 Brandenburg ..| 499,957, 55,963] 74,330, 140,382 | 2,555,660 699,751 Pomerania…... | 810,789 64,406 59,554 | 183,554 | 1,240,691! 578,290 | Posen ….....6- | 366,707 | 82,999 | 71,156) 98,670 | 1,377,857 | 435,534 | | Silesia…..... | 481,706 177,981} 174,671| 330,810} 1,929,859| 703,269 ‘Saxony …..... 377,259 197,293| 278,237] 224,808 | 1,744,984] 424.477 | Schleswig- | 181,793 75,049) 60,775] 196,731} 224,869] 375,469. Holstein ae | 459,780 | 130,488} 44,053| 177,401] 1,003,765] 715,734 Westphalia ….! 264,358 88,153 27,976 | 116,435 714,486 333,833 Hesse-Nassau ../ 117,938| 60,110] 28,156 96,642| 642:360| 386,781 Rhenish Prussia | 237,883} 151,309] 43,078 224,720 1,383,182] 4787575 , Hohenzollern ae ses 1,894 6,463 9,433 19,955 | 48,197 Total… .‘3,898,617 1,257,718 |1,010,036 (2,125,435 14,263,211 j8,101,125

| i { ee ee ee ee ee |

About one-half of the cultivable soil is in the possession of owners with properties exeeeding 180 acres in extent and averaging 860 acres, while one-half of the total number of owners occupy only one-fortieth of the entire area. The manner of distribution varies greatly in different parts of the kingdom, large propertics prevailing in the less fertile regions in the east and veasant-holdings in the west. In the district of Stralsund the average number of land- owners for each German square mile is 100, while in the district of Wiesbaden it is ten times as high. In Silesia and Posen Jati-fundia oceupy nearly half the total area, though this disproportion is gradually disappearing there as elsewhere. Asa general rule the best crops seem to be raised on the holdings of intermediate size,

Live Stock.—Aceording to an enumeration made in 1883, Prussia Live contains 2,417,641 horses, 8,737,367 cattle, 14,752,328 sheep, stoek. 5,819,136 pigs, and 1,680,686 goats. The province of Fast Prussia, with the principal Government stud of Trakehnen, is the head- quarters of horse-rearing, and contains the greatest number of horses both relatively (1 per 5 inhabitants) and absolutely (383,555). The horses bred there are generally suitable for the hghter kind of work only, and are in great request for

military purposes. Horses of a stouter type are bred in Schleswig-Holstein and on the Rhine, but heavy draught horses have to be imported from France, Holland, Belgium, and Denmark. The best cattle are reared in the maritime provinces, and the highest proportion (65 per 100 inhabitants) is found in Sehleswig-Holstein, whence, as well as from the marshy lowlands of Hanover, large numbers are exported to England. As a rule, however, the south German states are richer in cattle than Prussia. Prussia is one of the leading sheep-breeding countries of Europe, and much has been done to improve the race and increase the value of the flesh and wool. In Pomerania there are 170 sheep for every 100 inhabitants, and West Prussia and Posen also contain a high proportion. The total number of sheep in Prussia is, how- ever, diminishing owing to the spread of agriculture and the in- creased importation of wool; in 1861 it was nearly 21 millions. Swine abound in the central provinees, and hams and sausages are largely exported from Westphalia, Hanover, and Saxony. Huge flocks of geese are reared in Pomerania, and bee-keeping is a profit- able industry in Hanover, East and West Prussia, and the province of the Rhine.

Fisheries.—The fishery on thé Baltie Sea and its haffs employs about 15,000 men, and that on the North Sea about 2000 more. In the former the take consists mainly of herrings, flat fish, salmon, mackerel, and eels, while the chief objects of the latter are cod and oysters. Inland fishery has been encouraged by the foundation of numerous piscicultural establishments and by the enactment of close-time laws. Carp, perch, pike, and salmon, the latter especi- ally in the Rhine, are the principal varieties ; sturgeon are taken in the Elbe and Oder, and the lakes of East Prussia swarm with

Fisheries.’

ees at

Minerals,

INDUSTRIES. |

bream and lampreys. Game of various kinds abounds in different parts of Prussia, and the lakes are frequented by large flocks of water-fowl. .

Minerals.—Although it is obvious that the recent formations of the north German plain can boast of little or no mineral wealth, Prussia still takes rank among the great mining states. Its produce of coal and iron exceeds that of any country in Europe, except Great Britain ; in the production of zinc it is the foremost country in the world ; and its stores of salt are very considerable. In 1882 the total valuc of the mineral produce of Prussia was about 177 millions sterling. About 370,000 persons are employed in its mines, the larger part of whom are engaged in the production of coal. For purposes of administration and supervision the entire country is divided into five mining districts (Oberbergamtsbezirke), the head- quarters of which are Breslau, Halle, Klausthal (in the Harz), Dort- mund, and Bonn.

The two great deposits of coal are in the basin of the Ruhr on the west, where about 20 million tons are raised annually, and in Upper Silesia, where the beds are still more extensive but the coal of asomewhat inferior quality. The greater part of the smaller but valuable coal-field of the Saar also belongs to Prussia, and other important beds occur in Lower Silesia, near Halle, and near Aix-la- Chapelle. In 1882 Prussia produced upwards of 47 million tons of coal, equal to 90 per cent. of the total yield of Germany, and double the output of 1869. Nearly three-fourths of this amount came from the western coal-fields and upwards of one-fourth from the coal-measures of Silesia. The total value was £11,636, 250. Brown coal or lignite is found throughout the whole of Prussia, exeept in the extreme north-east and north-west, but occurs most plentifully in Saxony, Brandenburg, and north Silesia. In 1882 the produce was nearly 11 million tons, value 13 millions sterling. Peat is cut in large quantities in Hanover, where 15 per cent. of the surface consists of moorland. Iron is found in all parts of Prussia, occurring in the form of bog-iron ore even in the northern lowlands. The richest districts are those of Coblentz in the province of the Rhine, Arnsberg in Westphalia, Oppeln in Silesia, and Wiesbaden. A valuable bed of magnetic-iron ore occurs in the Harz. In 1882 fully 4,000,000 tons of iron ore were raised in Prussia, valued at £1,415,950 and forming 70 per cent. of the total yield of Germany. The quantity of pig-iron smelted from these and from imported ores was 2,467,500 tons and its value £7,490,000. Prussia produces nearly the whole of the zinc of Germany, and Silesia three-fourths of that of Prussia; in 1882 the amount was 113,300 tons, valued at £1,795,000. The produce of lead in the same

year was 88,300 tons, valued at £1,200,000 and found mainly in the valley of the Lahn near Coblentz, in Silesia, in the Harz, and in Hesse-Nassau. Copper was produced to the extent of 15,400 tons and the value of £1,025,000 ; five-sevenths were raised in Saxony, which includes some of the productive mines of the Harz. Silver and gold are extracted from the copper ore of Mansfeld in Saxony, and silver also from the lead ores of Silesia, Aix-la- Chapelle, Wiesbaden, and Arnsberg. In 1882 the value of the silver smelted out was £1,214,700, of gold only £9050. Salt also ranks high in importance among the mineral treasures of Prussia. In 1882 the total yield included 252,300 tons of boiled salt, 210,100 tons of rock-salt, and 85,400 tons of other salts, with a total value of £719,600. Brine springs occur throughout almost the whole kingdom, but by far the most productive provinces are Saxony and Hanover. Rock-salt is mined at Stassfurt in the province of Saxony, and in Posen. Chloride of potash and potassium salts arc also extensively found in Saxony. The other mineral products include manganese, nickel, pyrites, cobalt, quicksilver, alum, gypsum, and sulphuric acid. Good building-stone is common throughout the country, marble is found in Silesia, and roofing slates in the Devonian formations of the Rhine and the Harz. Chalk pits and cliffs abound in the Island of Rtigen. The amber of the Baltic coast is picked up on the beach after a storm, and is also found by digging and dredging. About 3000 persons are em- ployed in the search, and in favourable seasons 3000 to 4000 ewts. are collected. Mineral springs are numerous among the mountains of Silesia, the Taunus, and the Eifel. The most generally known are those in the district of Wiesbaden, including Wiesbaden itself, Ems, Homburg, Schlangenbad, and Schwalbach.

Industries. — Prussia now takes a high place among the manufac- turing states of Europe, though the foundation of its industrial im- portance cannot be dated farther back than the reign of the Great Elector (1640-88). As a general rule, apart from a few of the larger towns, the busiest manufacturing centres are found on the lower slopes and outskirts of the mountainous districts, such as the Rhenish valleys, Lusatia, and the vicinity of the Silesian coal- fields. About 35 per cent. of the population are supported by industrial pursuits. The district of Diisseldorf is the busiest in Prussia, and Berlin and Elberfeld-Barmen are among the chief hives of industry on the

Continent. The principal manufactured products are woollen, linen, cotton, silk, and iron goods.

The metallic industries, as might be expected, flourish chiefly in the neighbourhood of the coal-fields and have reached their highest

development in the district of the Ruhr. Steel is made most ex- tensively in the districts of Arnsberg (Westphalia) and Diisseldorf ; at Essen in the latter is Krupp's celebrated cannon-foundry, with 20,000 workmen. Small iron and steel goods also come chiefly from the Westphalian and Rhenish districts; and the cutlery of Solingen, the tools of Remscheid, and the needles of Aix-la- Chapelle enjoy a widespread reputation. Berlin is the chief seat of the manufacture of machinery and locomotives. Small arms are made at Suhl, Spandau, Potsdam, and Sommerda (Erfurt). Articles in bronze, brass, and electro-plate are largely made at and exported from Berlin, Frankfort-on-the-Main, Iserlohn, and Altena, while gold and silver goods are produced chiefly at Berlin and Hanau.

The textile industries of Prussia are also important, employing 400,000 workpeople, though they do not rank in extent with those of Great Britain. Until recently the chicf textile manufacture was linen, which was largely made by hand in Silesia, Westphalia, and Saxony. The domestic mode of manufacture has now to a great extent disappeared, but Westphalian and Silesian linens still maintain their reputation. The manufacture covers the home demand, but about one-third of the necessary flax and hemp has to be imported. Jute is made at Bielefeld and Bonn. The manu- facture of cotton has of late made great progress, though it is not so important in Prussia as in the kingdom of Saxony and in Alsace. The chief centres of this branch of industry are Diisscl- dorf, Miinster, Elberfeld-Barmen, Hanover, Breslau, and Licgnitz.. About 65 per cent. of the woollen yarn of Germany is made in Prussia, and woollen cloth of good quality is produced in the pro- vince of the Rhine, Silesia, Brandenburg, and Saxony. The spinning and weaving of worsted and woollen cloth are also still carried on throughout the country as domestic industries, but not to such an extent as formerly. Wool and

worsted yarn are imported from England and other countries, but the cloth manufactured is much in excess of the home demand and forms an important article of export. Carpets are made at Berlin and at Diiren in the Rhine province. Silk is manufactured at Crefeld, Elberfeld-Barmen, and other places near the Rhine. Though hardly reaching the high standard of that of Lyons, Rhenish silk commands a good price, and is exported to England, America, Russia, and Austria.

Tobacco and cigars are largely manufactured at Berlin and numerous other towns, aud to some extent wherever the tobacco plant is cultivated. The annual consumption of tobacco amounts to about 4 fb per head of population, or nearly thrice as much as in Great Britain ; but the revenue derived from the tobacco excise, owing to the small impost on home-made tobacco, is not more than 6d. a head as compared with 5s. per head in England. A com- paratively modern but very important branch of industry is the manufacture of sugar from the common beet. The great centre of this industry is the province of Saxony, which in 1882-83 contained nearly half the 280 sugar-works in the kingdom, the remainder being chiefly in Hanover and Silesia. Upwards of 600,000 tons of raw sugar and 160,000 tons of molasses are produced annually.! About 320 million gallons of beer are brewed in Prussia per annum and about 35 million more are imported from Bavaria and Bohemia ; the consumption per head, amounting from 65 to 70 quarts, is about half of the English and one-fourth of the Bavarian rate. Wine-making, as already mentioned, is an important industry on the Rhine, and large quantities of spirits are distilled from potatoes in Brandenburg and the eastcrn provinces. The remaining indus- trial products of Prussia include chemicals, chiefly made in Saxony, Silesia, and the Rhenish province ; dyes, at Elberfeld-Barmen and Crefeld ; paper, in the districts of Aix-la-Chapelle, Arnsberg, and Liegnitz ; glass (“ Bohemian glass”’), in Silesia ; pianos, at Berlin, Breslau, Cassel, and Erfurt ; and scientific instruments, at Berlin and Halle. The artistic furniture and porcelain of Berlin are char- acteristic specialities. In nearly every department there has been in recent years a steady advance both in quantity and quality.

Trade.—The commerce of Prussiais greatly facilitated by itscentral Trade.

position, which enables it to carry on a very extensive transit trade ; but, as the returns are not separated from those of the other members of the Zollvercin, it is impossible to do more than guess at its annual value. According to the Almanach de Gotha, the total value of the exports and imports of the German Customs Union in 1883 amounted to upwards of £330,000,000; and, to judge from the customs receipts, about three-fifths of this amount must be credited to Prussia. The chief imports are tea, coffee, sugar, and other colonial products, grain, wine, textile fabrics, fruit, petroleum, and manufactured articles of various kinds. Among the principal ex-

orts are grain, cattle, wine, potatoes, woollen and linen goods, Mics and leather, chemicals, iron and steel wares, lead, and zinc. The export of grain to France and England has fallen off greatly of recent years, owing to the increasing demand at home. The inland trade is fostered by numerous fairs, the most important of which take place at the two Frankforts, Breslau, and Magdeburg. The money-markets of Berlin and Frankfort-on-the-Main are among the most influential in Europe.

1 Over-production, stimulated by over-protection and the high bounty on exportation, produced a serious crisis in this industry in 1884.

Com- munica- tion.

Popula- tion.

In 1883 Prussia possessed upwards of three-fifths of the merchant ships of Germany, including 2586 sailing vessels and 229 steamers, manned by 17,315 men. Their burden, however, aiounting to 449,391 tons, was little more than one-third of the whole, and was exceeded by that of Bremen and Hamburg taken together. None of the Prussian seaports vies with either Hamburg or Bremen ; Lies largest is Stettin, whieh possesses a fleet of 40 steamers and 280 sailing ships. In 1881 the Prussian harbours were entered by 38,054 vessels of 3,483,545 tous burden, and cleared by 38,005 of 3,518,098 tons burden. The best seamen are furnished by the fishing population of Friesland or Frisia. ae

Communication.—With most internal means of communication Prussia is well provided. Almost none of its excellent highroads existed in the time of Frederick the Great, and many of them date from the Napoleonic era. The first Prussian railway was laid in 1838, but the railway system did not reeeive its full development until the events of 1866 removed the obstacles placed in the way by Hanover. Most of the lines were easy of construction, and absorbed comparatively little capital. The great majority were laid by private companies, and the Government confined itself to establishing lines in distriets not likely to attraet private capital. In 1879, however, a measure was passed authorizing the acquisi- tion by the state of the private railways, and in 1884 nine-teuths of the 13,800 miles of railway in Prussia were in the hands of Government. The proportion of railway mileage in Prussia (5 iniles per 10,000 inhabitants) is nearly as high as in Great Britain, but the traffic is mueh less. Thus in 1880-81 the Prussian rail- ways carried only 124 million passengers, while the British lines conveyed 622 millions. The expenses swallowed up 56 per cent. of the gross receipts, or 4 per cent. more than those of England in the sarne year; but in the matter of railway accidents the comparison is more favourable to the Prussian railways, on which only 235 persons lost their lives as compared with about four times as many in Great Britain. The passenger traffic has not increased in pro- portion to the extension of the railway system and the growth of population, but the goods traffic has steadily advanced. ‘The canal system of Prussia is little beyond its infancy, the total length of all the canals in the kingdom being only 1200 miles, a very small number as compared with either England or France. Among the most important are those uniting the Pregel with the Memel, and the Vistula with the Oder (via the Netze), and those bringing the Spree and Havel into commuuication with the Elbe on the one side and the Oder on the other. Canals uniting the Ems and the

Rhine, the Ems and the Weser, and the Weser and the Elbe are still desiderata. navigable rivers.

Population.—The last census of Prussia was taken in 1880, and the accompanying table summarizes the principal results then ascer- tained. The total population amounts to about 60 per cent. of that of the German empire.

On the other hand, Prussia has a large supply of

ail 2S} Roman | ther – Popula- |“) Protest- Chris- | Provinces. ae ae ants. | — tian | Jews: |Others. ag F Sects.

East Prussia ….| 1,938,986 | 135 | 1,654,510 | 250,462 | 7,483} 18,218 3,263 | West Prussia ….| 1,405,898} 142| 672,402| 693,719 |12,390 | 26,547, 840 Brandenburg ….| 3,389,155 | 220| 3,182,486 | 181,781] 6,087 | 66,245) 2,556 Pomerania …... 1,540,034 | 132 1,498,930 23,877 | 1,962} 13,886] 1,379 Posen ayes eon on 1,703,397 | 152 532,499 11,112,020 451} 56,609 | 1,818 Silesia 0.0.00… 4,007,925 | 257 | 1,867,470 |2,082,084 | 3,328 | 52,682) 2,361 Rpxony.a…..... 2,312,007 | 237 | 2,154,655 | 145,51S| 3,394] 6,700, 1,740 Schleswig-Hol- 1,127,149 | 154) 1,111,252) 8,903 | 1,687} 3,522/ 1,785

stein | Hawover’..... 2,120,168 | 142 1,842,186 | 258,824) 2,738) 14,790} 1,680 Westphalia …... 2,013,442 | 262, 949,644 |1,070,212| 2,614] 18,S10| 2.169 Hesse-Nassau_ ..| 1,554,376 | 256 | 1,087,901! 420,206 | 3,073 | 41,316| 1,880 Rhtineland ary 4,074,000 | 390 | 1,077,173 2,944,186 | 7,015} 43,694 | 1,932 ohenzollern…. 67,624 153 | 2,221! 64,491 3 771 138

27,279,111 | 202 |17,633,279 9,206,283 52,225 863,790 |23,534 |

The following table shows the growth of the population since the death of Frederick, the first king of Prussia. The first trustworthy census of Prussia was taken in 1816; the earlier figures are only uiore or less reasonable estimates.

Bate. Population. Area in square Average per niles, square mile.

1713 1,731,000 43,425

1740 2,486,000 45,900 3

1786 5,430,000 75,220 vs

1797 8,700,000 118,000 73

1816 10,349,031 108,100 93

1831 13,038,070 108,100 120

1864 19,254,649 108,430 Witt

1880 27,279,111 134,490 202°8

Between 1816 and 1831 the increase of the population i was about 30 per cent., and between 1831 ee T3864 it ae ae cent. Some districts have more than doubled their population since 1816, but the annual increment since 1866 has not exceeded 1 per cent., a fact due to the less rapid multiplication in the new pro-

vinces and the losses in the Franco-German War. The rate of increase in the latter part of the period 1867-84 has, however, been considerably more rapid than in the first half. The inerease is

cutirely due to the surplus of births over deaths, as emigration is-

very much in excess of nmmigration. With the exception of Saxony and some of the smallest states, Prussia is increasing more rapidly in population than any other member of the German empire. Its rate of increase is fully twice that of France aud about the same as that of the United Kingdom. The highest rate of increase i 1875-80 took place in Berlin (2°92 per annum) and Westphalia (1°39), the lowest in Hohenzollern (0°35) and East Prussia (0°82). The birth-rate, which for the entire country is 40 per 1000, is highest in West Prussia, Posen, and Westphalia and lowest in Schleswig-Holstein, Hanover, and Hesse-Nassau. The death-rate for the whole monarehy is about 27 per 1000, considerably higher than that of Great Britain, which is about 20 per 1000. Pomerania is remarkable for its low death-rate, West Prussia and Silesia for a high one. Both the birth-rate and the death-rate show a tendency todininish. Of the birtlis in 1882 8°11 per cent. were illegitimate, the proportion varying from 2°92 per cent. in Westphalia to 11 per eent. in Pomerania, and nearly 15 per cent. in Berlin. Between 1872 and 1880 the number of marriages diminished with ahnost unvarying steadiness; sinee 1880 it has risen again and uow amounts to about 8 per 1000 inhabitants. An interesting feature is the large proportion of mixed confessional marriages, amounting as a rule to about 7 per cent. of the whole. Between 1871 and 1881 the annual emigration from Prussia

amounted to 1°8 per 1000 inhabitants ; in 1882 no fewer than 129,894, and in 1883 104,167 emigrants left the country by the German ports and Antwerp. The highest proportion of emigrants comes from Pomerania (5°6) and Posen (4°3), the lowest from Silesia, the Rhineland, and Saxony.

A study of the figures in the table given above will show that as a rule the density of population increases from north to south and from east to west. As might be expected, the thickest population is found in the mining and manufacturing district of the Rhine, which is closely followed by the coal-regions of Silesia and parts of Saxony and Westphalia. The proportion for the whole kingdom is about 200 per square mile, but in the district of Diisseldorf this figure rises to 750 and in the nioorlands of Hanover it sinks to less than 50. According to the census of 1880, 57°4 per cent. of the popula- tion is rural, and 42°6 per cent. urban, 7.¢., lives in communities of more than 2000 inhabitants. The relative proportions vary greatly in the different provinces, as much as 62 per cent. of the population living in towns in the Rhineland, and as little as 23 or 24 per cent. in East Prussia and Posen. About 17 per cent. of the population is absorbed by towns each with 29,000 inhabitants aud upwards, while in Great Britain half the population is massed in the large towns and from 65 to 70 per cent. is urban. In Prussia also there is observable a strong movement towards concentration in towns, the annual rate of increase in the urban population being six times as great as that in the rural communities. In 1880 Prussia contained 24 towns each with upwards of 50,000 inhabit- ants, and 7 with upwards of 100,000 inhabitants, the correspond- ing numbers in Great Britain being 59 and 26. The following are the towns with upwards of 100,000 inhabitants each :—

SOMPRI cia terese sei stele svcreiee 1,122,330 IROMESDEUE, ia… te sector 140,909 GTOSIAMW os im scree Dees 272,912 Frankfort-on-the-Main ..136,819 18 C00) er 145,227 DEUSIC. 8. yon coe 108,551 Colm bade esa 144,772

Elberfeld and Barmen practically form one town with a popula- tion of 189,479 ; and Magdeburg, Diisseldorf, Stettin, and Altona are all above 90,000. The annual rate of suicides in Prussia is 18 to 20 per 100,000 inhabitants, a proportion seldom exceeded among European states. Divided

according to nationalities, the present (1885) population of Prussia consists roughly of 24,000,000 Germans, 2,800,000 Poles in the eastern provinces, 150,000 Lithu- anians in the north-cast, 180,000 Danes in Schleswig – Holstein, 90,000 Wends in Brandeuburg and Silesia, 60,000 Czechs in Silesia, and 12,000 Walloons near the Belgian frontier. In the rural dis- tricts of Posen and in parts of Silesia the Poles form the predominant element of the population.

In 1882 a census of occupations was taken in the German empire, the main results of which, so far as they relate to Prussia, are summarized in the following table. The figures include the wives, families, and other dependants of those actually engaged in the several occupations. The actual workers are about 11 millions in number and their dependants 16 millions.

tg | Ss

Percentage

Number of per- of total

Oc tions, cupations sons supported.

population. ee ee [cai ete 1. Agriculture, forestry, and fishing …..... 11,904,407 43 2 lndustrial PUrSWiLS |... oc.6 les. lee. leon. 9,393,750 35 Gk, JET 12 ne sees | Se eh Mn en 2,725,844 10 4. Domestic servants (and general labourers) 690,892 2-4 5. Official, military, and professional classes 1,305,657 5 6. Personsnot returned underany occupation 1,267,810 4°6

Religion.

Eduea- tion,

EDUCATION. |

Religious Statistics. —According to the census returns of 1880 (see table, p. 16), 64°64 per cent. of the population of Prussia were Pro- testants, 84 per cent. Roman Catholics, and 1°33 Jews. A glance at a confessional map of Prussia shows that the centre of the king- dom is solidly Protestant, the

proportion of Roman Catholics increas- ing as the eye travels east or west and reaching its maximum on the Rhine and in the Slavonic provinces. East Prussia, however, with the exception of Ermland, is Protestant. The Roman Catholics out- number the Protestants in the provinces of the Rhine (3 to 1), Posen, Silesia, and West Prussia. All religious bodies are granted freedom of worship, and civil rights are not conditional upon religious confession.

The Evangelical or Protestant State Church of Prussia consists as it now stands of a union of the Lutherans and Calvinists, effected under royal pressure in 1817. According to the king this was not a fusion of two faiths but an external union for mutual admission to the Eucharist and for the convenience of using the same liturgy, prepared under the royal superintendence. Those who were unable from conscientious scruples to join the union became Separatist or Old Lutherans and Old Calvinists, but their numbers were and are insignificant. The king is ‘‘summus episcopus,” or supreme pontiff of the ehurch, and is represented in the exercise of his ecclesiastical functions by the minister of public worship and instruction. The highest authority for the ordinary management of the church is the ‘‘Oberkirchenrath,” or supreme church council at Berlin, which acts through provincial consistories and superintendents appointed by the crown. Recent legislation has made an effort to encourage self-government and give a congregational eharacter to the church by the granting of a presbyterial constitution, with parish, diocesan, provincial, and general synods. The clergy, of whom there were 9146 in 1880, are appointed by the crown, by the consistories, by private or municipal patronage, or by congregational election.

The hierarchy of the Roman Catholic Church in Prussia consists of two archbishops (Cologne, Gnesen-Posen) and ten bishops. The prince-bishop of Breslau and the bishops of Ermland, Hildes- heim, and Osnabriick are directly under the pope, and the bishop- ries of Fulda and Limburg are in the archiepiscopal diocese of Freiburg in Baden. The higher ecclesiastics receive payment from the state, and the annual appropriation appearing in the budget for the Roman Catholic Church is as high as that made for the State Church. All the Roman Catholic religious orders in Prussia have been suppressed except those mainly or wholly occupied with attend- ance on the sick.

The relations of the state with the dissenting Christian sects, such as the Baptists, Mennonites, and Moravian Brethren, are prac- tically confined to granting them charters of incorporation which ensure them toleration. The Mennonites were formerly allowed to pay an extra tax in lieu of military service, which is inconsistent with their belief, but this privilege has been withdrawn. The Old Catholics number about 30,000, but do not scem to be increasing.

The Jews belong mainly to the urban population and form 20 to 30 per cent. of the inhabitants in some of the towns in the Slavonic provinces. They are especially prominent in commerce, finance, and on the stage, and also exercise great influence on the press. Perhaps the actual majority of newspaper editors and proprietors are of Jewish blood. The wave of social persecution to which they were subjected from 1876 onwards, especially in Berlin and Pomerania, has, to some extent at least, subsided.

Education.—In Prussia education is looked upon as the province

of the state, and the general level attained is very high. All schools, public and private, are under state supervision, and no one is allowed to exercise the profession of teacher until he has given satisfactory proof of his qualifications. At the head of the admi- nistration stands the minister of public instruction, to whoin the universities are directly subordinate. The sccondary schools are supervised by provincial ‘‘Schulcollegia,” or school-boards, ap- pointed by Government, while the management of the elementary and private schools falls within the jurisdiction of the ordinary “‘Regierungen,” or department officials. This they carry out through qualified school-inspectors, frequently chosen from among the clergy. All children must attend school from their sixth to their fourteenth year.

The expenses of the primary schools (Volksschulen) are borne by the communes (Gemeinden, see infra), aided when necessary by subsidies from the state. The subjects of instruction are theology, reading, writing, spelling, arithmetic, the elements of geometry, history, geography, and natural science, singing, drawing, sewing, and gymnastics. The fees are extremely small, amounting in the rural districts to about 1d. per week, and in Berlin and some other towns they have been entirely done away with. In 1882 Prussia contained 33,040 primary schools with 59,917 teachers and

4,339,729 pupils. This shows an average of 159 children attending school out of every 1000 inhabitants, the proportion varying from 120 to 130 in the north-eastern provinces to 175 to 180 in Westphalia and Rhenish Prussia. The number of illiterate recruits among those called upon cach year to serve in the arnvy affords a good test of the universality of elementary education. In 1882-83 the proportion of

“ Analphabeti,” or men unable to read or write, among the recruits levied was only 2 per cent., the rate varying from 9°75 per cent. in Posen to 0°03 in Schleswig-Holstein, where there was only one illiterate recruit among 3662. The teachers for the elementary schools are trained in normal seminaries or colleges estabHshed and supervised by the state, and much has been done of late years to improve their position. In most of the larger towns the ele- mentary schools are supplemented by middle schools (Biirgerschulen, Stadtschulen), which carry on the pupil to a somewhat more advanecd stage, and are partly intended to draw off thc unsuitable elements from the higher schools.

The secondary schools of Prussia may be roughly divided into classical and modern, though there are comparatively few in which Latin is quite omitted. The classical schools proper consist of Gymnasia and Progymnasia, the latter being simply gymnasia wanting the higher classes. In these boys are prepared for the universities and the learned professions, and the full course lasts for nine years. In the modern schools, which are divided in the same way into Realgymnasia and Realprogymnasia, and also have a nine years’ course, Latin is taught, but not Greek, and greater stress is laid upon modern languages, mathematics, and natural science. The three lower classes are practically identical with those of the gymnasia, while in the upper classes the thoroughness of training is assimilated as closely as possible to that of the classical schools, though the subjects are somewhat altered. Ranking with the realgymnasia are the Oberrealschulen, which differ only in the fact that Latin is entirely omitted, and the time thus gained de- voted to modern languages. The Héhere (or upper) Birgerschulen, in which the course is six years, rank with the middle schools above

mentioned, and are intended mainly for those boys who wish to enter business life immediately on leaving school. AJ] these secondary schools possess the right of granting certificates entitling the holders, who must have attained a certain standing in the school, to serve in the army as one-year voluntcers. The gymunasial ‘‘ certificate of ripencss ” (Maturitdtszeugniss), indicating that the holder has passed satisfactorily through the highest class, enables a student to enroll] himself in any faculty at the university, but that of the realgymnasium qualifies only for the general or “ nhilosophical”’ faculty, and docs not open the way to medicine, the church, or the bar. Considerable efforts are, however, now being made to have the realgymnasiuin certificate recognized as a sufficient qualification for the study of medicine at least. At any of these schools a thoroughly good edncation may be obtained at a cost seldom exceeding, in the highest classes, £5 per annum. The teachers are men of scholarship and ability, who have passed stringent Government examinations and been submitted to a year of probation. The great majority of the secondary schools have been established and endowed by municipal corporations. In 1881 Prussia contained 251 gymnasia, 64 progymunasia, 88realgymnasia, 15 oberrealschulen, 27 realschulen, 47 hohere bitrgerschulen, and 276 Hihere Tochterschulen, or higher schools for girls. Besides these there are, of course, numerous commercial, technical, indus- trial, and other special schools.

Prussia possesses ten of the twenty German universities, attended by 12,800 students, or at the rate of one student for 2125 inhabitants. The largest Prussian university is that of Berlin, attended by more than 4000 students, while Breslau, Bonn, Gottingen, and Halle have each npwards of 1000. The oldest is the university of Greifswald, founded in 1456. Like the schools the universities arc state insti- tutions, and the professors are appointed aid paid by Government, which also makes liberal annual grants for apparatus and equipment. The full obligatory course of study extends over three, and in the case of medicine four years. It is, however, not unusual for non- medical students also to spend four years at the university, and there is an agitation to make this compulsory. Students qualifying for a Prussian Government appointment are required to spend at least three terms or half-years (Semestc7’) at a Prussian university.

Ranking with the universities are the large polytcchnic colleges at Berlin, Hanover, and Aix-la-Chapelle, the mining academies of Berlin and Klansthal, and the academies of forestry at Eberswalde aud Minden. Departments for the study of agriculture are attached to many of the uiiiversities. Music is taught at several conservatoria, the best known of which are at Berlin and Frankfort-on-the-Main.

The science and art of Prussia find their most conspicuous ex- ternal expression in the academies of science and art at Berlin, both founded by Frederick I. ; and each town of any size throughout the kingdom has its antiquarian, artistic, and scientific societies. Recognized schools of painting exist at Berlin and Diisseldorf, and both these towns, as well as Cassel, contain excellent picture galleries. The scientific and archxological collections of Berlin are also of great importance. Besides the university collections, there are numerous large public libraries, the chief of which is the royal library at Berlin (1,000,000 vols.).

Constitution.— The present form of the government of Prussia, Consti- consisting of an hereditary monarchy with two houses of parlia- tution,

ment, is based upon a fundamental law promulgated in 1850, and subsequently somewhat modified by various enactinents, The

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constitution affirms the legal equality of all citizens in the eye of the law, provides for universal military service, and guarantees = personal liberty of the subject, the security of property, Immun} y. from domiciliary visits, the inviolability of letters, toleration ot religious sects, ee ae of ae Lae right of association an ic meetings, and liberty of migration. ;

Phe monarchy is herded in the male line of the house of Hohenzollern, and follows the custom of primogeniture. The king alone exercises the executive power, but shares the legislative power with his parliament. He appoints and discharges the ministers and other officials of the crown, summons and dissolves parliament, possesses the right of pardon and

mitigation of punishment, declar war and concludes peace, and grants orders and titles. He is hel

to be irresponsible for his public actions, and his decrees require the countersign of a minister, whose responsibility, however, is not very clearly defincd. The national tradition and feeling lend the crown considerable power not formulated in the constitution, and the king is permitted to bring his personal influence to bear upon parliament in a way quite at variance with the English con- ception of a constitutional monarch. The annual civil list of the king of Prussia amounts to £600,000. :

The legislative assembly consists of two chambers, which are convoked annually at the same time but meet separately. The right of proposing new measures belongs equally to the king and each of the chambers, but the consent of all three estates is neces- sary before a measure can pass into law. The chambers have con- trol of the finances and possess the right of voting or refusing taxes. Financial questions are first discussed in the lower house, and the upper house can accept or reject the annual budget only en bloc. All measures are passed by an absolute majority, but those affect- ing the constitution must be submitted to a second vote after an interval of at least twenty-one days. Members may not be called to account for their parliamentary utterances except by the chamber in which they sit. No one may at the same time be a meinber of both chambers. The ministers of the crown have access to both chambers and may speak at any time, but they do not vote unless they are actually members. The general scheme of govern- ment, though constitutional, is not cxactly “parliamentary” in the English sense of the word, as the ministers are independent of party and need not necessarily represent the opinions of the par- hamentary majority. The Herrenhaus, or house of peers, contains two classes of members, the hereditary and non-hereditary. The former consists of the adult princes of the house of Hohenzollern, the mediatized princes and counts of the old imperial nobility, and the heads of the great territorial nobility. The non-hereditary members comprise life peers chosen by the king from the ranks of the rich landowners, manufacturers, and men of general eminence, and representatives “presented” for the king’s approval by the landowners of the nine old provinces, by the larger towns, and by the universities. The Abycordnetenhaus, or chamber of deputies, consists of 433 members,

elected for periods of three ycars by indirect suffrage, exercised by all male citizens who have reached the age of twenty-five and have not forfeited their communal rights. The original electors are arranged in three classes, according to the rate of taxes paid by them, in such a way that the gross amount of taxation is equal in each class. The country is accordingly divided into electoral districts, with the electors grouped in three cate- gories, each of which selects a Wahlmann or electoral proxy, who exercises the direct suffrage. Members of the lower house must be thirty years old and in full possession of their civic rights. They receive a daily allowance (Didten) during the sitting of the house.

The king exercises his executive functions through an irrespons- ible Staatsrath, or privy council, revived in 1884 after thirty years of inactivity, and by a nominally responsible cabinet or council of ministers (Staats-Ministerium). The latter consists at present of the minister-president and of the ministers of foreign affairs, war, justice, finance, the interior, public worship and instruction, in- dustry and commerce, public works, agriculture, domains, and forests. Ministers conduct the affairs of thcir special departments independently, but meet in council for the discussion of general questions. They represent the executive in the houses of parlia- ment and introduce the measures proposed by the crown, but do not need to belong to either chamber. The affairs of the royal household and privy purse are entrusted to a special minister, who 1s not a inember of the cabinet.

_ The Prussian governmental system is somewhat complicated by its relation to that of the empire. The king of Prussia is at the same time German emperor, and his prime minister is also the imperial chancellor. The ministries of war and foreign affairs practically coincide with those of the empire, and the customs-dues and the postal and telegraph service have also been transferred to the imperial Government. Prussia has only seventeen votes in the federal council, or less than a third of the total number, but its influence is practically assured by the fact that the small northern states almost invariably vote with it. To the reichstag Prussia sends more than half the members. The double parliamentary

system works in some respects inconveniently, as the reichstag and Prussian landtag are often in_session at the same time and many persons are members of both. Where imperial and Prussian legisla- tion come into conflict the latter must give way. —

For administrative purposes Prussia 1s divided into Provinzen or provinces, Regicrungsbezirke or governmental departments, Kreise or circles, and Gemeinden or communes. The city of Berlin and the district of Hohenzollern are not included in any province, and the larger towns usually form at once a commune and a circle (Stadtkreis). Recent legislation has aimed at the encouragement of local government and the decentralization of administrative authority by admitting lay or popularly elected members to a share in the administration alongside of the Government officials. Certain branches of administration, such as the care of roads and the poor, have been handed over entirely to local authorities, while a share is allowed them in all. Asa general result it may be stated that the Prussian administrative system intervenes between the strongly centralized government of France and the liberty of local govern- ment enjoyed in England. In the province the Government is represented by the Oberprésident, whose jurisdiction extends over all matters affecting more than one department. He is assisted by a council (Provinzialrath), consisting, besides himself as chair- man, of one member appointed by Government and five members elected by the provincial committee (Provinzialausschuss), The latter forms the permanent executive of the provincial diet (Pro- vinzial-Landtag), which consists of deputies elected by the kreise or circles, and forms the chief provincial organ of local government. The regierungsbezirk is solely a Government division and is only indirectly represented in the scheme of local administration. The Government authorities are the Regierungs-Prdsident, who is at the head of the general internal administration of the department, and the Regierwng, or Government board, which supervises ecclesi- astical and educational affairs and exercises the function of the state in regard to the direct taxes and the domains and forests. The departmental president is also assisted by a Bezirksrath or district council, consisting of one official member and four others selected from inhabitants of the department by the provincial com- mittee. The governmental official in the kreis (county, circle) is the Landrath, an office which existed in the Mark of Brandenburg as early as the 16th century. He is aided by the Kreissausschuss, or

executive committee of the Kreistag (the diet of the circle), the members of which are elected by the rural and urban coinmunes. The kreis is the smallest state division; the communes, divided into urban and rural, are left almost entirely to local government, though the chief officials must obtain the sanction of the central authority. In the rural communes the head magistrate, called a Schulze or Dorfrichter, is elected for six years and is assisted by assessors called Schéffen. The regulations for the government of towns still rest in great measure on the liberal reforms effected by Stein at the beginning of the century. The chief power rests in the hands of the Stadtrath, which consists of Stadtverordneten, or town deputies elected by the citizens for six years. The practical executive is entrusted to the magistracy (Jagistrat), which usually consists of a burgomaster, a deputy burgomaster (both paid officials), several unpaid members, and, where necessary, a few other paid members. The unpaid members hold office for six years ; the paid members are elected for twelve years, and their election requires ratification from the state. The administrative system above described applies as yet in its full extent to about three-fourtlis of the provinces only, but is to be extended to the others in due course. Though in some respects rather cumbrous in its machinery, the system is on the whole found to work well and with economy.

In the seven eastern provinces, Westphalia, and part of the Rhenish province the common law of Prussia (Landrecht), codified in 1794, 1s in force, while the common law of the German empire, formed by an amalgamation of Roman, canon, and German law, prevails in the three new provinces and part of Pomerania. The Code Napoléon, however, still exists in the greater part of the Rhine district, and the commercial law has been consolidated in the German commercial code of 1861. A new penal code, promulgated in 1850, did away with the old patrimonial or seigniorial jurisdiction, and the administration of justice is now wholly in the hands of Government. The courts of lowest instance are the Amts- gerichte, in which sits a single judge, accompanied in penal cases by two Schéffen or lay assessors (a kind of jurymen, who vote with the judge). Cases of more importance are decided by the Land- gerichte or county courts, in which the usual number of judges is three, while in important criminal cases a jury of twelve persons is generally empanelled. From the landgerichte appeals may be made to the Oberlandesgerichte or provincial courts. The

oberlandesgericht at Berlin is named the Kammergericht and forms the final instance for summary convictions in Prussia, while all other cases may be taken to the supreme imperial court at Leipsic. The judges (ichter) are appointed and paid by the state, and hold office for

| life. After finishing his university career the student of law who

wishes to become a judge or to practise as qualified counsel (Reehtsan-walt, barrister and solicitor in one) passes a Government examina-

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_ Finances

FINANCES. |

tion and becomes a Referendarius. He then spends at least four years in the practical work of his profession, after which he passes a second examination, and, if he has chosen the bench instead of the bar, becomes an Assessor and is eligible for the position of judge. A lawyer who has passed the necessary examinations may at any time quit the bar for the bench, and a judge is also at liberty to resign his position and enter upon private practice. In all criminal cases the prosecution is undertaken by Government, which acts through Staatsanwailte, or directors of prosecutions, in the pay of the state.

Finances. —The finances of the: Prussian Government are well managed, and a deficit is now a rare occurrence. The expenditure has been considerably relieved by the transference of the cost of the army and navy to the imperial treasury, while on the other hand the customs-dues and several excise duties have been relinquished to the empire and an annual ‘‘ matricular” contribution paid towards its expenses. The budget is voted annually by the abgeordneten- haus ; the following table is an abstract of that for 1884-85 :—

Revenue | Expenditure. MiPCCTAKES 2..0c.s00s £7,296,286 | Expenses of collection and nclinect taxes' .....0-... 4,586,510 management …..... £28,234, 532 State lottery é AOI AOOM CLVAISE ie «,o.< «0.5.0 .0:s 01,0. 225,000 Marineinstitute and mint 128,225 Interest and management Domains and forests …. 3,805,857 | of public debt …..... 7,877,316 Mines and salt-works 5,120,752 | Houses of parliament…. 68,652 State railways …..... 28,798,867 | Apanages, annuities, and General financial adminis- IWCENNOES Be ONSaeo oe 3.262,017 tration 5,582, 368 | Matricular contribution Adininistrative revenues 1,160,253 to the German empire 2,038,460 Adininistrative expenditure 12,632,930 SUISHIGEE "face adearce ess 2,017,020 LOINTC THC) NBEO ee 1,644,670 IRENPION, sorec!. wee cs <3 596,333 Ministry of the interior 2,077,510 Occasional and _ extra- ordinary expenses 2,341,881 Total…. £56,680,818 | Total…. £56,680,818

Perhaps the only item requiring explanation in the above sum mary is the general financial administration under the head of revenue ; this includes advances from the surplus in the treasury, Prussia's proportion of the profits of the imperial customs and excises, repayments, interest, and other miscellaneous sources of revenue. 'he extraordinary expenses included upwards of £450,000 for railways and £750,000 for public works. The total expenditure is rather more than £2 per head of population, while in the United Kingdom it is about £2, 10s. Between 1821 and 1844 the rate in Prussia was 11s. 6d. per head, and even in 1858 it was only 21s. 8d. The incidence of direct taxation in Prussia is also less than in Great Britain, the respective figures being 5s. 3d. and 7s. per head. The principal direct imposts are the income-tax, which brings in 40 per cent. of the whole, the land-tax producing 37 per cent., and the house-tax producing 19 per cent. 'The proceeds of the income- tax amount to about 1s. 2d. per head, as compared with 6s. per head in Great Britain (in 1881). The comparative insignificance of the sum raised by indirect taxation is mainly due to the above- noted fact that the customs-dues and the most important excise duties have been made over to the imperial exchequer. In the preliminary estimates for 1885-86 the receipts and expenditure are balanced at £62, 886,250.

Local taxation in Prussia is often very high. The state income- tax is limited to 3 per cent. of the assessed income, but the com- munes and towns are allowed to make an arbitrary addition for local purposes, sometimes amounting to twice or thrice the sum paid to the state. This is chiefly owing to the fact that the state reserved for itself all taxation on real property, while imposing on the conm- munes the principal share in maintaining the expensive system of public schools. Incomes below £45 (900 marks) are not now taxed, but this exemption is of very recent origin. A few facts from the statistics of taxation and allied subjects may be of interest as affording some slight index to Prussia's growth in prosperity. Between 1864 and 1878 the entire capital subject to income-tax mereased from 24 to 48 marks per head of population, while the proportionate number of those liable to the tax had increased by about 75 per cent. It has also been computed that the average imcome per head increased between 1872 and 1881 by 15 marks, equivalent to a rise of 5 per cent. ; that of Great Britain increased In the same period by 88s., or 15 per cent. Of all the payers of meome-tax in 1872-81 only 0°10 per cent. had incomes of or above £1000, while 43 per cent. had not more than £25 and 52 per cent. between £25 and £100. Between 1867 and 1880 the proceeds of the house-tax increased by over 100 per cent. It now averages 1s. per head, varying from 6d. in country districts up to 5s. or 5s. 6d. in Berlin, Frankfort-on-the-Main, and Cologne. In 1875 the number of depositors in savings banks was 86 per 1000 inhabitants, and by 1880 the number had risen to 107. The sum deposited amounted to £79, 643, 400, equivalent to 58s. per head of population. At the same date Austria alone of European powers had a higher ees (67s.), while in Great Britain the sum was 44s. and in

rance 27s.

The public debt of Prussia in 1884 amounted to 3,345,097, 438

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marks, or £167,254,872. This is equivalent to about £6 per head of population, as compared with three and a half times as much in England. The annual charge for interest on the debt is 5s. 8d. per head in Prussia and

16s. 2d. in England. Between the end of the struggle with Napoleon and 1848 the debt was considerably reduced ; since 1848 it has steadily increased. It is, however, admirably secured, and a great part of it was incurred in the con- struction and acquisition of railways, the clear income from which covers the annual charges on the entire debt. The various branches of the debt are being gradually united in a consolidated fund, bearing interest at the rate of 4 per cent.

Army and Navy.—The Prussian army now forms about 75 per cent. of that of the German empire, of which it also furnished the model. (See Germany.) The first attempt at the foundation ofa Prussian navy was made by the Great Elector, who established a small fleet of eight or ten vessels. This, however, was completely neglected by his successors, and the present marine establishment is of quite recent origin. The present imperial navy is simply the Prussian navy under a different name. (See GERMANY.)

Bibliography.—The statistical facts in the foregoing article have been mainly drawn from the Jahrbuch fiir die amtliche Statistik des preussischen Staats, the Statistisches Jahrbuch. fiir das deutsche Reich, and other publications of the statistical offices of Prussia and Germany. Good general accounts of the natural, social, and political features of the country are given in Eiselen's Der preussische Staat (Berlin, 1862) and in Daniel's Handbuch der Geographie (5th ed., 1881 sq.). The Prussian constitution and administrative system are concisely described in the Handbuch der Verfassung und Verwaltung in Preussen, by Graf Hué de Grais, and are treated at length in Von Ronne's Staatsrecht der preussischen Monarchie (4th ed., 1881-84), For English readers the most interesting introduction to Prussian history is perhaps still to be found in the first part of Carlyle's Frederick the Great, the not invariably unprejudiced views of which may be corrected by Professor Tuttle's History of Prussia to the Accession of Frederick the Great (Boston, 1884). The latter admirable little work is, indeed, almost indispensable to every English student of Prussian constitutional history. Professor Seeley's Life of Stein (London, 1879) contains an excellent account of Prussia in the Napoleonic period, especially with regard to the important in- ternal reforms carried out at the beginning of the present century. Among the numerous German histories of Prussia two of the best are Droysen's Geschichte der preussischen Politik

and Ranke’s Zwolf Biicher preussischer Geschichte; the former is authoritative from the writer’s copious use of the Prussian archives, but the latter is less diffuse and more interesting. Other standard works arc those of Stenzel, Pauli, Riedel, and Lancizolle, while among shorter histories may be mentioned the manual of F. Voigt. Fix’s Territorial-Geschichte des brandenburgisch-preussischen Staates, with ten historical maps, is a convenient sketch of the territorial growth of Prussia. The period since the death of Frederick the Great is treated in Forster’s Neuere und neueste preussische Gesch- ichte and in Reimann’s Neuere Geschichte des preussischen Staats (1882 sq.). The history of the present century is perhaps most fully given in Treitschke’s Deutsche Geschichte im neunzehnten Jahrhundert (1879 sq.). Until recently the standard work on the history of Prussia proper was that of Johannes Voigt, but this is now being superseded by Lohmeyer’s Geschichte von Ost u. West Preussen (1881 sq.). The latter forms one of an admirable series of provincial histories in course of publication by Perthes of Gotha. The development of the Prussian bureaucracy is traced in Isaacsohn’s Geschichte des preussischen Beamienthums (1870-84). Several points are most satisfactorily handled in the humerous monographs on special periods, the lives of kings and statesmen, and the like. (J. FM.)

PRUSSIA, in the original and narrower sense of the word, is a district in the north-eastern corner of the modern kingdom of the same name, stretching along the Baltic coast for about 220 miles, and occupying an area of up-wards of 24,000 square miles. The eastern part of this territory formed the duchy of Prussia, which was acquired by the electors of Brandenburg in 1618, and furnished them with their regal title. The western part, which had been severed from the eastern half and assigned to Poland in 1466, was not annexed to Prussia until the partition of Poland in 1772, while the towns of Dantsic and Thorn remained Polish down to 1793. In spite of the contrast between the political and social conditions of the two districts, arising from the difference of their history, they were united in 1824 to forma single province. But, as might have been expected, the union did not work well, and it was dissolved in 1878, giving place to the modern provinces of East and West Prussia. The early history of the whole district is related under the kingdom of Prussia (above) and Teutonic Orper, while the former article also gives (p. 14) some statistics as to the produce

of the two provinces.}

East Prussia (Ostpreussen), the larger of the two provinces, has an area of 14,280 square miles, and is bounded by the Baltic Sea, Russia, and West Prussia. It shares in the general characteristics of the great north German plain, but, though low, its surface is by no means absolutely flat, as the southern half is traversed by a low ridge or plateau (comp. GERMANY), which attains a height of 1025 feet at a point ncar the western boundary of the province. This plateau, here named the Prussian Seenplatte, is thiekly sprinkled with small lakes, among which is the Spirding See, 46 square miles in extent and the largest inland lake in the Prussian monarchy.

1 Conipare Lohmeyer's Geschichte von Ost u. West Preussen (1881, sq.)

Army and navy.

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The coast is lined with low dunes or sandhills, in front of which lie the large littoral lakes or lagoons named the Frische Haff and the Kurische Haff. (See GerMANy.) The first of these receives the waters of the Nogat and the Pregel, and the other those of the Memel or Niemen. Fast Prussia is the coldest part of Germany, its mean annual temperature being about 44° Fahr., while the mcan January temperature of Tilsit is only 25°. The rainfall is 24 inches per annum. About half the province is under cultivation ; 18 per cent. is occupied by forests, and 23 per cent. by meadows and pastures. The most fertile soil is found in the valleys of the Pregel and the Memel, but the southern slopes of the Baltic plateau and the district to the north. of the Memel consist in great part of sterile moor, sand, and bog. The chief crops are rye, oats, and potatoes, while flax is cultivated in the district of Ermland, between the Passarge and the upper Alle. East Prussia is the headquarters of the horse-breeding of the country and contains the priucipal Government stud of Trakehnen ; numerous cattle are also fattened on the rich pasturcs of the river-valleys. The extensive woods in the south part of the province harbour a few wolves and lynxes, and the elk is still preserved in the forest of Ibenhorst, uear the Kurische Haff. The fisheries in the lakcs and hafis are of some importance ; but the only mincral product of note is amber, which is found in the peninsula of Samland in greater abundance

than in any other part of the world. Manufactures are almost confined to the principal towns, though linen-weaving is practised as a domestic industry. Commerce is facilitated by canals connecting the Memel and Pregel and also the principal lakes, but is somewhat hampered by the heavy dues exacted at the Russian frontier. A brisk foreign trade is carried on through the seaports of Konigsberg (140,909), the capital of the province, and Memel (19,660), the exports con- sisting mainly of timber aud grain. In 1880 the population of Kast Prussia was 1,933,936, including 1,654,510 Protestants, 250,462 Roman Catholics, and 18,218 Jews. The Roman Catholics are mainly confined to the district of Ermland, in which the ordinary proportions of the confessions are completely reversed. The bulk of the inhabitants are of German blood, but there are 400,000 Protestant Poles (Masurians or Masovians) in the south part of the province, and 150,000 Lithuanians in the north. As in other provinces where the Polish element is strong, East Prussia is below the general average of the kingdom in education ; in 1883 fully 54 per cent. of its recruits were unable to read or write. There is a university at Konigsberg.

West Prussia (IV estpreussen), with an area of 9850 square miles, is bounded by the Baltic, East Prussia, Poland, Posen, Brandenburg, and Pomerania. It resembles East Prussia in its physical character- istics, but its fertility is somewhat greater and its climate not quite so harsh. The Baltic plateau traverses the province from east to west, reaching its culminating point in the Thurmberg (1090 feet), near Dantsic. Near the middle of the province the range is in- terrupted by the valley of the Vistula, beyond which it trends to the north and approaches the coast. The lakes of West Prussia are nearly as numerous but not so large as those of the sister pro- vince. The natural products are similar, and the manufactures are also almost confined to the large towns. The cultivation of the common beet, for the production of sugar, has been introduced, and several sugar refineries have becn erected. The valley of the Vistula, particularly the rich lowlands (Werder) of the delta, are very fertile, producing good crops of wheat and pasturing large herds of horses, cattle, aud sheep. The population in 1880 was 1,405,898, consisting in almost equal proportions of Roman Catholics and Protestants ; there were 26,547 Jews and 490,000 Poles. The percentage of illiterate recruits in 1882 was still higher than in East Prussia (7°97), but not so high as in Posen (9°75). The capital and principal town is Dantsic

(108,551), while Elbing (35,842) and Thorn (20,617) also carry on a considerable trade.

PRUSSIA, RuenisH (German, Rheinpreussen, Rhein- provinz, Rheinland), the most westerly province of the kingdom of Prussia, is bounded on the N. by Holland, on the E. by Westphalia, Hesse-Nassau, and Hesse-Darmstadt, on the S.E. by the Rhenish Palatinate, on the S. and S.W. by Lorraine, and on the W. by Luxemburg, Belgium, and Holland. The small district of Wetzlar in the midst of the province of Hesse also belongs to Rhenish Prussia, which, on the other hand, surrounds the Oldenburg principality of Birkenfeld. The extent of the province is 10,420 square miles, or nearly twice that of the kingdom of Saxony ; its extreme length, from north to south, is nearly 200 miles and its greatest breadth is just under 90. It includes about 200 miles of the course of the Ihine, which forms the eastern frontier of the province

from Bingen to Coblentz and then flow oy s through north-westerly direction. gh itina

The southern and larger half of Rhenish Prussia, belong- ing geologically to the Devonian formations of the lower Rhine, is hilly. On the left bank are the elevated plateaus of the Hundsriick and the Eifel, separated from each other by the deep valley of the Moselle, while on the right bank are the spurs of the Westerwald and the Sauerland, the former reaching the river in the picturesque group known as the Seven Mountains. The highest hill in the province is the Walderbeskopf (2670 feet) in the Hochwald, and there are several other summits above 2000 feet on the left bank, while on the right there are few which attain a height of 1600 feet. Most of the hills are covered with trees, but the Eifel is a barren and bleak plateau, with numerous traces of volcanic agency, and is continued to- wards the north-west by the moorlands of the Hohe Venn. To the north of a line drawn from Aix-la-Chapelle to Bonn the province is flat, and marshy districts occur near the Dutch frontier. The climate varies considerably with the configuration of the surface. That of the northern lowlands and of the sheltered valleys is the mildest and most equable in Prussia, with a mean annual temperature of 50° Fahr., while on the hills of the Eifel the mean does not exceed 44°. The annual rainfall varies in the different districts

from 18 to 32 inches. Almost the whole province belongs to the basin of the Rhine, but a small district in the north-west is drained by affluents of the Meuse. Of the numerous tributaries which join the Rhine within the province, the most important are the Nahe, the Moselle, and the Ahr on the left bank, and the Sieg, the Wupper, the Ruhr, and the Lippe on the right. The only lake of any size is the Laacher See, the largest of the ‘‘ maare” or extinct crater lakes of the Eifel.

Of the total area of the Rhenish province about 46°5 per cent. is occupied by arable land, 17 per cent. by mea- dows and pastures, and 31 per cent. by forests. Little except oats and potatoes can be raised on the high-lying plateaus in the south of the province, but the river-valleys and the northern lowlands are extremely fertile. The great bulk of the soil is in the hands of small proprietors, and this is alleged to have had the effect of somewhat retarding the progress of scientific agriculture. The usual cereal crops are, however, all grown with success, and tobacco, hops, flax, rape, hemp, and beetroot (for sugar) are cultivated for commercial purposes. Large quantities of fruit are also produced. The vine-culture occupies a space of 30,000 acres, about half of which are in the valley of the Moselle, a third in that of the Rhine itself, and the rest mainly on the Nahe and the Ahr. The choicest varieties of Rhine wine, however, such as Johannisberger and Steinberger, are produced higher up the river, beyond the limits of the Rhenish province. In the hilly districts more than half the surface is sometimes occupied by forests, and large plantations of oak are formed for the use of the bark in tanning. Considerable herds of cattle are reared on the rich pastures of the lower Rhine, but the number of sheep in the province is comparatively small, and is, indeed, not greatly in excess of that of the goats. The wooded hills are well stocked with deer, and a stray wolf occasionally finds its way from the forests of the Ardennes into those of the Hundsriick. The salmon fishery of the Rhine is very productive and trout abound in the moun- tain streams. (Compare the agricultural tables under Prussia, p. 14 supra.)

The great mineral wealth of the Rhenish province probably furnishes its most substantial claim to the title of the ‘richest jewel in the crown of Prussia.” Besides parts of the Carboniferous measures of the Saar and the Ruhr, it also contains important deposits of coal near Aix-la-Chapelle. Iron

occurs abundantly near Coblentz, the Bleiberg in the Eifel possesses an apparently inex-

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haustible supply of lead, and zinc is found near Cologne and Aix-la-Chapelle. The mineral products of the district also include lignite, copper, manganese, vitriol, lime, gyp- sum, volcanic stones (used for mill-stones), and slates. In 1882 the total value of the minerals raised in the pro- vince was £5,460,000, or nearly one-third of the produce of Prussia; by far the most important item is coal, the output of which was upwards of 15,000,000 tons, valued at £4,400,000. Of the numerous mineral springs the best known are those of Aix-la-Chapelle and Kreuznach.

The mineral resources of Rhenish Prussia, coupled with its favourable situation and the facilities of transit afforded by its great waterway, have made it the most important manufacturing districtin Germany. The industry is mainly concentrated round two chief centres, Aix-la-Chapelle and Diisseldorf (with the valley of the Wupper), while there are naturally few manufactures in the hilly districts of the south or the marshy flats of the north. In the forefront stand the metallic industries, the total produce of which was valued in 1882 at £5,200,000. The foundries pro- duced upwards of a million tons of iron, besides zine, lead, copper, and other metals. The largest iron and steel works are at Essen (including Krupp’s cannon-foundry), Oberhausen; Duisburg, Diisseldorf, and Cologne, while cutlery and other small metallic wares are extensively made at Solingen, Remscheid, and Aix-la-Chapelle. The cloth of Aix-la-Chapelle and the silk of Crefeld form im- portant articles of export. The chief industries of Elber-feld-Barmen and the valley of the Wupper are cotton- weaving, calico-printing, and the manufacture of turkey red and other dyes. Linen is largely made at Gladbach, leather at Malmedy, glass in the Saar district, and beet-root sugar near Cologne. Though the Rhineland is par excellence the country of the vine, no less than 52,000,000 gallons of beer were brewed in the province in 1882-83, equivalent to an annual consumption of fifty-one quarts per head of population ; distilleries are also numerous, and large quantities of sparkling Moselle are made at Coblentz, chiefly for

exportation to England. Commerce is greatly aided by the navigable rivers, a very extensive network of railways, and the excellent roads constructed during the French régime. The imports consist mainly of raw material for working up in the factories of the dis- trict, while the principal exports are coal, fruit, wine, dyes, cloth, silk, and other manufactured articles of various descriptions.

The population of Rhenish Prussia in 1880 was 4,074,000, including 2,944,186 Roman Catholics, 1,077,173 Protest- ants, and 43,694 Jews. The Roman Catholics muster strongest on the left bank, while on the right bank about half the population is Protestant. The distribution of the confessions is, however, somewhat sporadic, owing to the varied histories of the constituent parts of the province. The great bulk of the population is of Teutonic stock, and about a quarter of a million are of Flemish blood. On the north-west frontier reside about 12,000 Walloons, who speak French or Walloon as their native tongue. The Rhine province is the most thickly populated part of Prussia, the general average being 390 persons per square inile, while in the government district of Diisseldorf the proportion rises to 754. The province contains a greater number of large towns than any other province in Prussia, and 62-5 of the population is returned as urban. Upwards of half the population are supported by industrial and commercial pursuits, and barely a quarter by agriculture. There is a university of good standing at Bonn, and the Success of the elementary education is borne witness to by the fact that in 1883 only 0°19 per cent. of the Rhenish recruits were unable to read and write. For purposes of administration the province is divided into the five districts

of Coblentz, Diisseldorf, Cologne, Aix-la-Chapelle, and Treves ; Coblentz is the official capital, though Cologne is the largest and most important town. In the greater part of the province the Code Napoléon, introduced under the French réginie, is still in force. Being a frontier province the Rhineland is strongly garrisoned, and the Rhine is guarded by the four strong fortresses of Cologne with Deutz, Coblentz with Ehrenbreitstein, Wesel, and Saar- louis. In the Prussian parliament the province of the Rhine is represented by twenty-seven members in the upper house and eighty-two in the lower.

History.—The present province of Rhenish Prussia was formed in 1815 out of the duchies of Cleves, Berg, Upper Guelders, and Jiilich, the ceclesiastical principalities of Treves and Cologne, the free cities of Aix-la-Chapelle and Cologne, and nearly a hundred small independent lordships, knightships, and abbeys. It is there- fore manifestly impracticable to give more than a broad general sketch of the historical development of a region of which the com- ponent parts have had so little of their past in common. At thie earliest historical period we find the territories between the Ardennes and the Rhine occupied by the Treviri, Eburones, and other Celtic tribes, who, however, were all more or less niodified and influenced by their Teutonic neighbours. On the right bank of the Rhine, between the Main and the Laln, were the scttlements of the Mattiaci, a branch of the Germanic Chatti, while farther to the north were the Usipetes and Tencteri. Julius Cesar conquered the tribes on the left bank and Augustus established numerous fortified posts on the Rhine, but the Romans never succeeded in gaining a firm footing on the right bank. Under the Romans the districts to the west of the Rhine, forming parts of the provinces of Belgica Prima, Germania Superior, and Germania Inferior, en- joyed great prosperity and reached a high degree of civilization. Several Roman cmperors resided and issued their edicts at Treves, the capital of Belgica Prima, and the important Roman remains in this city as well as in other parts of the province give an idea of the material benefits the territory derived from their dominion. As the powcr of the Roman empire declined the Franks pushed forward along both banks of the Rhine, and by the end of the 5th century had regained all the lands that had formerly been under Teutonic influence. The German conqucrors of the Rhenish dis- tricts were singularly little affected by the culture of the provincials they subdued, and all traces of Roman civilization were submerged in a new flood of paganism. By the 8th century the Frankish dominion was firmly established in central Germany and northern Gaul ; and under the Carlovingian monarchs the Rhineland, and especially Aix-la-Chapelle, plays a réle of considerable prominence. On the division of the Carlovingian realm the part of the Rhenish province to the cast of the river fell to the share of Germany, while that to the west remained with the evanescent middle kingdom of Lotharingia. By the time of Otho I. (936-973) both banks of the Rhine had become German, and the Rhenish territory was divided between the duchies of Upper and Lower Lorraine, the one on the Moselle and the other on the Meuse. Subsequently, as the central

power of the German sovereign became weakencd, the Rhineland followed the general tendency and split up into numerous small indcpendent principalities, each with its separate vicissitudes and special chronicles, The old Lotharingian divisions passed wholly ont of use, and the name of Lorraine became restricted to the dis- trict that still bears it. In spite of its dismembered condition, and the sufferings it underwent at the hands of its French neigh- bours in various periods of warfare, the Rhenish territory prospered greatly and stood in the foremost rank of German culture and pro- gress. Aix-la-Chapelle was fixed upon as the place of coronation of the German emperors, and the ecclesiastical principalities of the Rhine bulk largely in German history. Prussia first set foot on the Rhine in 1609, when it acquired the duchy of Cleves; and about a century later Upper Guelders and Mors also became Prussian. At the peace of Basel in 1795 the whole of the left bank of the Rhine was resigned to France, and in 1806 the Rhenish princes all joined the Confederation of the Rhine. The congress of Vienna assigned the whole of the lower Rhenish districts to Prussia, which had the tact to leave them in undisturbed possession of the liberal institu- tions they had become accustomed to under the republican rule of the French. (Compare RHINE.) CJ. He aie)

PRUSSIAN BLUE. See Prussic Acrp (p. 24 infra).

PRUSSIC ACID, the familiar name for a dangerously poisonous, though chemically feeble, acid, known scienti- fically as “‘ hydrocyanic acid,” or ‘cyanide of hydrogen,” is here taken as a convenient heading under which to treat of cyanides generally. This generic term (from xvavos, blue) is not meant to hint at any generic property; it is due simply to the fact that all cyanides, in an historical sense,

are derivatives of a blue pigment which was discovered accidentally by Diesbach, a Berlin colourmaker, about the beginning of the 18th century.

The foundations of our present knowledge of cyanides were laid by Scheele (1783), whose discoveries were subse- quently (from 1811) confirmed and supplemented, chiefly in the sense of quantitative determinations, by Gay-Lussac. Although we have no space for further historical notes, we must not

omit to state that Gay-Lussac, as one result of his work, conceived and introduced into chemistry the notion of the “compound radical,” having shown that prussic acid and its salts are related to the group NC in precisely the same way as chlorides are to chlorine, or sulphides to sulphur. This idea, in his own eyes and in those of his contemporaries, was greatly fortified by his success in even isolating his “ cyanogéne” as a substance.

In preparing cyanogen or cyanides in the laboratory the operator now always starts from prussiate of potash, with which, accordingly, we begin.

Prussiate of Potash, (NC)sFe.K,+3H,0 (syn. ferrocyanide of potassium ; Germ. Blutlaugensalz).—This salt is being produced industrially from animal refuse (hide and horn clippings, old shoes, blood solids, &c.), carbonate of potash, and iron filings or borings as raw materials. The carbonate of potash is fused at a red heat in an iron pear-shaped vessel suspended within a furnace, or on the cupel-shaped sole of a reverberatory furnace, and the animal matter, which should be as dry as possible, is then introduced in instal- ments along with the iron. The fusion is continued as long as inflammable gases are going off; then the still fluid mass is ladled out and allowed to cool, when it hardens into a black stone-like body known to the manufacturer as “metal.” When the broken- up inetal is digested with water in an iron vessel prussiate of potash passes into solution, while a black residue of charcoal, metallic iron, sulphide of iron, &c., remains. The clarified solution, after sufficient concentration in the heat, deposits on cooling part of its prussiate in lemon-yellow quadratic crystals (generally trun- cated octahedra), which are purified by recrystallization. The last mother-liqnors furnish an impure green salt, which is added to a fresh fuse and so utilized.

In former times it was believed that the prussiate was produced during the fusion process, and in the subsequent process of lixivia- tion simply passed into solution, until Liebig showed that this view was untenable. The fuse cannot contain ready-formed prussiate, because this salt at a red heat breaks up with formation of a residue of carbide of iron and cyanide of potassium. The metal in fact when treated with dilute alcohol gives up to it plain cyanide of potassium, and the fully exhausted residue yields no prussiate on treatment with water. The prussiate accordingly must be produced during

the process of lixiviation by the action of the cyanide of potassium on some ferrous compound in the metal. Liebig thought that it was partly the metallic iron, partly the sulphide of iron present in the metal, which effected the conversion. According to more recent researches a double sulphide, K,S+Fe,8,, which is always produced during the fusion (from the reagents proper and the sulphur of the organic matter and that of the sulphate of potash present in the carbonate as an impurity), plays this important part. The double sulphide by the action of water breaks up into alka- line sulphide, sulphide of iron (FeS), and sulphur. This sulphide of iron is of a peculiar kind ; it docs what ordinary FeS does not effect, readily at least : it converts the cyanide into prussiate, thus, 6NC.K+FeS=K,S+(NC),Fe.K,, while the eliminated sulphur of the original Fe,S, unites with another part of the cyanide of potassium into sulphocyanate, S+NCK=SNC.K, which latter salt is thus unavoidably produced as a (rather inconvenient) bye- product. Pure prussiate of potash has the specific gravity 1°83 ; it 1s permanent in the air. It loses its water, part at 60° C., the rest at 100° C., but very slowly. The anhydrous salt isa white powder. he crystals dissolve in four parts of cold and in two parts of boiling water. It is insoluble in, and not dehydrated by, alcohol.

Prussiate of potash has the composition of a double salt, te at ENG, but the idea that it contains these two binary

yanides 1s entirely at variance with its reactions. Cyanide of potassium is readily decomposed by even the feeblest acids, and to some extent even by water, with elimination of hydrocyanic acid, and on this account perhaps is intensely poisonous. A solu- tion of the prussiate remains absolutely unchanged on evaporation, ae the action on it even of strong acids in the cold results in the formation of the hydrogen salt, (NC), FeH,, which is decomposed, it 1s true, but only when the mixture is heated, with evolution of hydrocyanic acid. It is not poisonous. Its solution when mixed with nitrate of silver does not give a precipitate of cyanide of silver NC. Ag, and a solution of the two nitrates, but yields a unitary pre-

cipitate of the composition (NC)gFe.Agy which contains all the iron; only nitrate of potassium passes into solution. Other heavy metallic salts behave similarly. On the strength of these con- siderations chemists, following the

lead of Liebig, view prussiate as a binary compound of potassium, Ky, with a complex radical, N,CgFe, ‘‘ ferrocyanogen.” ; int

Hydrocyanic Acid, NC.H.—This acid is prepared most con- veniently from prussiate of potash. Wohler recommends the following method. Ten parts of powdered prussiate are placed in a retort, the neck of which is turned upwards, and a (cooled down) mixture of seven parts of oil of vitriol and fourteen parts of water is then added. If the aqueous acid is wanted, the exit-end of the retort is joined on direct to a Liebig’s condenser, which must be kept very cool by a current of cold water. If the anhydrous acid is desired, two wide-necked bottles (or two large U-tubes) charged with fused chloride of calcium and kept at 30° C. by immersion in a water bath of this temperature, must be inserted between the retort and condenser. In this case more particularly it is indispensable to provide for a most efficient condensation of the vapours; the exit- end of the condenser should be provided with an adapter going down to near the bottom of the receiver, which must be surrounded by a freezing mixture. The temperature of the latter, of course, must not be allowed to fall to the freezing-point of the distillate. The retort is heated by means of a sand bath and a brisk distilla- tion maintained until the residue begins to dry up. The result of the reaction is in accordance with the assumption that the dilute vitriol, in the first instance, converts the prussiate, one-half into (NC),Fe.H,, the other into (NC),Fe.K,H., and that through the effect of the heat these two bodies decompose each other into {(NC)gFe} K,Fe, which remains in the residue as a precipitate, and (NC);H,=6NCH, which distils over. Real NCH is a colour- less liquid of 0°6967 specific gravity at 18° C., which freezes at —15° C. (Gay-Lussac) into a white fibrous solid. According to Schulz the acid, if really pure, remains liquid at —- 37° C. It boils at 26°°5 C.; at 4°°5 its vapour-tension already amounts to half an atmosphere. The vapour is inflammable and burns into carbonic acid, water, and nitrogen. The acid mixes with water in all proportions, with contraction and yet absorption of heat. The solution beliaves on distillation like a mere mechanical mixture of its two components. Prussic acid has a very peculiar powerful smell ; more characteristic still is a kind of choking action which even the highly attenuated vapour exerts on the larynx. Prussic acid is fearfully poisonous; a few drops of even the ordinary pharmaceutical preparation (of 2 per cent.) are sufficient to kill a large dog. It acts with characteristic promptitude,

especially when inhaled asa vapour. Even a relatively large dose, if it has once found its way into the stomach without producing a fatal effect, is said to do relatively little harm there.}

Prussic acid is characteristically prone to suffer ‘‘ spontaneous decomposition.” Whether the pure anhydrous acid really is, in the strictest sense of the word, still requires to be found out; the ordinary preparation, when kept ina close bottle, soon turns brown and turbid from ‘‘azulmic” acid, a substance of complex constitu- tion. Other things are formed at the same time. The pure aqueous acid is liable to similar changes; in its case formiate of ammonia always forms the predominant product. This change is easily

understood— NC. H+2H,O=NH,+H. COOH. Ammonia. Formic acid.

A strong aqueous prussic acid, when mixed with fuming hydro. chloric acid, is soon converted into a magma of crystals of sal- ammoniac, with formation of formic acid, which remains dissolved. And yet, most singularly, the addition to the preparation of a small proportion of hydrochloric or sulphuric acid is the best means for preventing, or at least greatly retarding, its spontaneous change in the very same direction. Aqueous prussic acid acts only very feebly (if at all) on blue litmus ; it combines with aqueous caustic alkalis but does not decompose their carbonates; uor does it act upon the generality of insoluble basic metallic oxides or hydrates ; mercuric oxide and oxide of silver form noteworthy exceptions to this rule.

Cyanogen, (NC),.—When dry mercuric cyanide is heated it breaks up, .below redness, into mercury and cyanogen gas; part of the latter, however, always suffers polymerization into a solid called ‘“paracyanogen,” and presnmed to consist of molecules (NC)s. Cyanogen gas is colourless ; it has the specific gravity demanded by its formula. It possesses a peculiar odour and has a characteristic

} The British Pharmacopeia prescribes for the medicinal acid a strength of 2 per cent. of real NCH. The two medicinal prepara- tions known as agua amygdalarum amararum and as agua lawrocerast respectively contain prussic acid in combination with hydride of ben- zoyl, CgsH;.COH. In

neither case does the prussic acid pre-exist in the vegetable materials, but is produced during the mashing process which precedes the distillatiou, by a fermentative decomposition of the amygdalin which they contain. (See FERMENTATION, vol. ix. Ts Obs)

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irritating effect on the eyes and mucous membranes of the nose. It is poisonous. By strong pressure it is condensible into a liquid which freezes at —34°:4 C., and has the following vapour-tensions P at the temperatures ¢ stated —

i= — 20°°7 – 10° 0° = + 10° +20° C.

(Ps 1 1°85 27 3°8 5 atmos.

At ordinary temperatures water dissolves about 4°5 times, alcohol about 23 times its volume of the gas. The solutions are liable to (very complex) spoutaneous decomposition. The list of products includes oxalate of ammonia and urea. Cyanogen burns with a characteristically beautiful peach-blossom coloured flame into car-

~~ponic acid and nitrogen. This gas cyanogen, as already stated, is to cyanides what chlorine gas Cl, is to chlorides, but it is well to remember that the analogy, though perfect in regard to the corre~~ sponding formule, does not, as a rule, extend to the conditions of formation of the bodies represented. Thus cyanogen does not unite with hydrogen into prussic acid, nor does it combine with ordinary metals in the chlorine fashion. When passed over heated potas- sium, it is true, it combines with it into cyanide; and caustic potash-ley absorbs it with formation of cyanide and cyanate (NCO.K), just as chlorine yields chloride and hypochlorite KCIO ; but this is about the sum-total of the analogies in action. Yet metallic cyanides of all kinds can be produced indirectly.

Cyanide of Potassiwm, NC.K.—An aqueous mixture of the quan- tities NCH and KHO no doubt contains this salt, but it smells of the acid, and on evaporation behaves more like a mixture of the two congeners than in any other way. An exhaustive union can be brought about by passing NCH

vapour into an alcoholic solution of KHO; the salt NC.K then comes down as a crystalline precipi- tate, which must be washed with alcohol and dried, cold, over vitriol. A more convenient method is to dehydrate yellow prussi- ate and then decompose it by heating it to redness in an iron crucible. The Fe(NC), part of the salt breaks up into cyanogen and nitrogen, which go off, and a carboniferous finely-divided iron, which remains, with cyanide of potassium, which at that temperature isa thin fluid. Yet the iron sometimes refuses to settle with suffi- cient promptitude to enable one to decant off the bulk even of the fused cyanide. According to private information received by the writer a French manufacturer uses a certain kind of very porous fireclay as an efficient filtering medium.

The ordinary “cyanide of potassium” of trade is not strictly that at all, but at best a mixture of the real salt with cyanate. It is produced by fusing a mixture of eight parts of anhydrous prussiate and three parts of anhydrous carbonate of potash, allowing the reaction

‘yanate. to complete itself and the iron to settle, and decanting off the clear fuse. The product goes by the name of “ Liebig’s cyanide,” but the process was really invented by Rodgers.

Fused cyanide of potassium assumes on cooling the form of a milky white stone-like solid. It fuses readily at a red heat, and at a white heat volatilizes without decomposition, provided that it is under the influence of heat alone; in the presence of air it gradually passes into cyanate; when heated in steam it is converted into carbonate of potash with evolution of ammonia, carbonic oxide, and hydrogen. When heated to redness with any of the more easily reducible metallic oxides it reduces them to the metallic state, while it passes itself into cyanate. It also reduces the corresponding sulphides with formation of sulphocyanate ; for example, Pb(S or O)+ NCK=Pb+NC(O or S)K. Hence its fre- quent application in blowpipe analysis. When heated with chlor- ates or nitrates it reduces them with violent explosion. The aqueous solution of the salt has a strongly alkaline reaction ; it smells of hydrocyanic acid and is readily decomposed by even such feeble acids as acetic or carbonic. It readily dissolves precipitated chlor- ide, bromide, and iodide of silver ; this is the basis of its application in photography. Large quantitics of the salt are used in clectro- plating.

Other Binary Cyanidcs.—Of these only a few can be noticed here. (1) Cyanide of sodium is very similar to the potassium salt. The same remark, in a more limited sense, holds for the cyanides of barium, strontium, and calcium. (2) Cyanide of ammonium (NC.NH,) forms crystals volatile at 36° C. and smelling of ammonia and hydrocyanic acid. The solution in water decomposes spon- taneously, pretty much like that of the free acid. But the anhy- drous vapour by itself stands a high temperature, as is proved by the fact that it is produced largely when ammonia is passed over red-hot charcoal, C+ 2NH,;=H,+NCH.NH3. (3) Mercurie cyanide, Hg(NC).,, forms very readily when mercuric oxide is dissolved in aqueous prussic acid. The solution on evaporation and cooling deposits crystals soluble in eight parts of cold water. This salt is not at all decomposed, even when heated, by water, nor appreci- ably by dilute sulphuric or uitric acid; boiling hydrochloric acid eliminates the NC as hydrocyanic acid; sulphurettcd hydrogen acts similarly in the cold. It gives no precipitate with nitrate of silver. nor is it changed visibly by caustic alkalis. 1t readily

unites not only with other cyanides but also with a multitude of other salts into crystallizable double salts. Mercurous cyanide, Hg,(NC),, seems to have no existence. When it is attempted to produce it by double decompositions, the mixture Hg+(NC),Hg comes forth instead of the conipound Hg,(NC).. (4) Heavy metallic cyanides are mostly insoluble in water, and the general method for their preparation is to decompose a solution of the respective sulphate, chloride, &c., with one of cyanide of potassium. The most important general property of these bodies is that they readily dissolve in solution of cyanide of potassium with formation of double cyanides, which in their capacity as double salts all exhibit, in a higher or lower degree, those anomalies which were fully explained above (sce “ prussiate of potash”’). These “ metallo- cyanides,” as we will call them, being all, unlike plain cyanide of potassium, very stable in opposition to water and aqueous alkalis, are readily produced from almost any compound of the respective metallic radical—some from the metal itself—by treatment with solution of cyanide of potassium. In all we have said ‘‘potassium” may be taken as including sodium and in a limited sense am-

monium, but the potassium compounds are best known, and we accordingly in the following section confine ourselves to these.

Metallo-cyanides.—(1) Stlver.—Cyanide of silver, Ag. NC, is pro- duced as a precipitate by addition of hydrocyanic acid or cyanide of potassium to solution of nitrate of silver. The precipitate is similar in appearance to chloride of silver and, like it, insoluble in cold dilute mineral acids, but soluble in ammonia. At a red heat it is decom- posed with formation of a residue of carboniferous metallic silver. Precipitated cyanide of silver, though insoluble in hydrocyanic acid, dissolves readily in cyanide of potassium with formation of argento- cyanide, AgK.(NC)., which is easily obtained in crystals, perma- nent in the air and soluble in eight parts of cold water. Chloride of silver dissolves in cyanide of potassium solution as readily as the cyanide does and with formation of the same double salt— AgCl1+2KNC=KCl+AgK(NC),. This salt is used very largely in electro- plating. (2) Zcad.—From a solution of the acetate cyanide of lead is precipitated by addition of lydrocyanic acid or cyanide of potassium. The precipitate, Pb(NC)., has the exceptional pro- perty of being insoluble in cyanide of potassium. (3) Zine.— Cyanide of zinc, Zn(NC)., is obtained by addition of hydrocyanic acid to a solution of the acetate, as a white precipitate readily soluble in cyanide of potassium with formation of a double salt, ZnK,(NC),, which forms well-defined crystals. (4) Nickel.— The cyanide, Ni(NC),, is an apple-green precipitate, which is obtained by methods similar to those given under ‘‘zinc.” It readily dissolves in cyanide of potassium with formation of a crystallizable salt, Nik,(NC),+H,0, the solution of which is stable in air and not convertible into one of a nickelic (Ni’”) compound by chlorine (com- pare ‘‘cobalt” infra). The potassio- cyanides of silver, zinc, and nickel as solutions are not, changed visibly by caustic alkalis, but their heavy metals can be precipitated by sulphuretted hydrogen or sulphide of ammonium, as from solutions of, for instance, the chlorides. Aqueous mineral acids (in the heat at least) decompose them exhaustively with elimination of all the NC as NCH. (5) Copper.—When cyanide of potassium solution is added to one of sulphate of copper, a yellow precipitate of cupric cyanide, Cu(NC),, comes down; but on boiling this precipitate loses cyanogen and is converted into a white precipitate of the cuprous salt Cu(NC). This white precipitate dissolves in cyanide of potassium with for- mation chiefly of two crystalline double salts, viz.,

CuNC+6NCK, easily soluble in water, and CuNC+NCK. The latter is decom- posed by water with elimination of Cu.NC. The solution of the 6NC.K salt is not precipitated by sulphuretted hydrogen. Solu- tions of potassio-cyanides of cuprosum are used in electro-plating. (6) Gold.—Metallic gold dissolves in cyanide of potassium solution in the presence of air, thus—

Au+ 2KNC+40=3K,0 + Auk. (NC),.

This auro-cyanide of potassium is used largely for electro-gilding, for which purpose it is conveniently prepared as follows. Six parts of gold are dissolved in aqua regia and the solution is precipitated by anumonia, The precipitate (an explosive compound known as “fulminating gold ”) is dissolved in a solution of six parts of cyanide of potassium, when the double salt is formed with evolution of ammonia. The salt crystallizes in rhombic octahedra, soluble in seven parts of cold water.

In the following potassio-cyanides the heavy metals cannot be detected by means of their ordinary precipitants ; these salts all behave like the potassium salts of complex radicals composed of the heavy metal and all the cyanogen. (7) Cobalt.—Cyanide of potas- sium when added to a solution of a cobaltous salt (CoCl,, &c.) gives a precipitate soluble in excess of reagent. The solution presumably contains a cobalto-cyanide, Co(NC)..2KNC, but on exposure to air eagerly absorbs oxygen with formation of cobalti-cyanide, thus—

Co(NC),~~++4KNC +40=$3K,0 + Co””(NC),. 3K NC. Chlorine (Cl instead of 40) acts more promptly with a similar effect, If the alkaline solution is acidified and boiled, the same cobalti~~ cyanide is produced with evolution of hydrogen—

Co(NC), + 4KNC + HCl = KCl +43H,+Co’(NC);. 3K NC.

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Cobalti-cyanide of potassium, (NC),0o’”’.Ks, forms yellow crystals isomorphous with those of red prussiate (see infra). It is a re- markably stable salt. In its behaviour to reagents 1t exhibits none of the characters of

a cobalt salt or of a simple cyanide. Aque- ous inineral acids convert it into the hydrogen salt (NC),Co”Hs, which remains undecomposed on boiling. Heavy metallic salts pro- duce precipitates of cobalti-cyanides ; for example, (NC),Co”. Ag. (8) Ferrosum.—See ‘‘ prussiate of potash above. (9) Ferriewm.— Ferric hydrate and ferric compounds generally do not act upon cyanide of potassium in a manner analogous to that of ferrous com- pounds; but a ferri-cyanide analogous to the cobalti-salt referred to in (7) is readily produced by passing chlorine into a cold coumen of ordinary prussiate, (NC),Fe”. Ky + Cl= KC1+(NC)gfe”. Kg.* In preparing the salt an excess of chlorine and elevation of tempera- ture must be avoided, or else part of the salt is decomposed with formation of a green precipitate. The solution on evaporation and cooling yields splendid dark red crystals, soluble in 2°54 parts of water of 15°°6 C. (Wallace), forming a most intensely yellow solution. (Ordinary prussiate solution is only pale yellow even when saturated in the cold.) This salt (discovered by L. Gmelin in 1822) is now being manufactured industrially and is known in commerce as ‘‘red prussiate.” In its reactions it is analogous to ordinary yellow prussiate. The same group, (NC),Fe, which in the latter acts as a four-valent, in the red salt plays the part of a tri-valent radical, (NC),fe. But the radical thus modified has a great tendency to assume the four-valent form; hence an alkaline solution of red prussiate is a powerful oxidizing agent, (NC)¢fe.K, + KHO=(NC),Fe. K,+ HO. The HO goes to the reduc- ing agent. Like the yellowsalt, red prussiate is not poisonous, at least when pure.

Ferro- and Ferri-cyanides of Iron.—The two prussiates are con- stantly being used in the laboratory as very delicate reagents for the detection of iron salt, and for the discrimination of ferrous and ferric compounds in solutions,—(1) ferro-cyanide and ferrous salt, white precipitate ; (2) ferri-cyanide and ferric salt, intensely brown coloration; (38) ferro-cyanide and ferric salt, blue precipitate ; (4) ferri-cyanide and ferrous salt, blue precipitate. These blue precipitates are being produced industrially and used as pigments, under the names of “‘prussian blue” and ‘‘Turnbnll’s blue” for (8) and (4) respectively. The latter has been thus known for now half a century ; yet the constitution of the precipitates and the true rationale of their formation have been fully cleared up only during the last few years. The main results of the researches referred to are included in the following paragraphs.

(1) Ferro-eyanide of Hydrogen, (NC),Fe. H,, is obtained as a white crystalline precipitate when air-free concentrated solution of yellow precipitate is mixed with hydrochloric acid and ether. It is casily soluble in water and in alcohol. An aqueous solution of it is pre- pared for technical purposes by mixing a strong solution of yellow prussiate with enough tartaric acid to bring down the potassium as cream of tartar. When the solution of this ferro-hydrocyanic acid is boiled half the cyanogen goes off as NCH, while the other

remains as part of a white, rather unstable, precipitate, (NC),Fe ae

When the solution is exposed to the air, especially at higher temperatures, part of the cyanogen goes off as NCH, another part suffers oxidation into H,0+NC, and this latter combines with the Fe(NC), of the original compound into blue bodies similar in their general propertics to prussian blue. This latter change is utilized in calico-printing for producing patterns of, or dyeing with, prus- sian blue. The white precipitate (N Fe ine

as an acid of which ee iit! Tne Pe

(2) Everett’s Salt, (NC),Fe. Ke is the potash salt. This salt is

produced in the ordinary process for making prussic acid (see above). It is probably identical with the white precipitate produced when ferrous salt is decomposed by prussiate of potash. Everett’s salt when exposed to the air quickly absorbs oxygen and becomes blue ; the reaction, as Williamson showed, assumes a simple form when the precipitate is boiled with nitric acid. One-half of the potassium is then oxidized away, and a blue double ferri-cyanide of potassium and ferrosum takes the place of the original precipitate :—

(NC)¢Fe . K,Fe=4(K,0 as nitrate) + {(NC),fc} ““Fe’K’. sie ‘ ; Williamson’s blue. uis blue when boiled with ferro-cyanide of potassium is reconverted

into the original Everett’s salt wi rmati i eee salt with formation of a solution of red

(NO)efe. KFe* + K,*Ky . Fo(NC)p= (NO) gfe. Ky +Fe(NC),. FeK,

2 ; Red prussiate, Everett’s salt. the asterisked radicals changing places.

(3) Soluble Prussian Blue is isomerie Wi Pill; oe SStC with Williamson’s blue. It 1s produced by mixing a solution of ferric salt with exeess of yellow prussiate, which, however, is an old process ; what has been ascer-

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1 Here Wwe use the y ‘ ey i nat ng – s mbol ‘fe as desig i par ici — meani . i f aa 5 J s 56 parts of ferric iron, ce Fe

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tained lately is that the very same precipitate is produced by addi- tion to a ferrous salt of an excess of red prussiate. I. (NC), fe. K, + FeCl, =2KC1+ (NC)efe. KFe= B. Il. (NC),Fe. Ky + feCl; =3KC1+(NC)Fe. Kfe= B”. B’ and B” in the formule look different, but the difference is only apparent ; in either case the group (NC), is combined with 1Fe and lfe and 1K; the bodies are identical (Skraup; Reindel). The precipitate B, though insoluble in salt solutions, is soluble in pure water, forming an intensely blue solution ; hence the name. Now the potassium in soluble prussian blue can be displaced by iron in two ways, namely, by digestion with solutions of ferrous or ferric salts. In the former case (NC)gfeFeK becomes (NC)gfeFe gy OF

empirically (NC),.Fe;; this is Gmelin’s (‘‘Turnbull’s”) blue. In the latter case (NC), Fefelx becomes (NC),F efes, or empirically (NC),,Fe, ;

this is prussian blue as discovered by Diesbach. Contrasting this latter formula with that of Gmelin’s blue (NC),,.Fe,, we see that

the latter needs only lose }Fe to become prussian blue ; this sur- plus iron in fact can be withdrawn by means of nitrie acid.

In the manufacture of prussian blue the general process is to first precipitate ferrous sulphate with yellow prussiate and then to fully oxidize the precipitate by means of nitric acid or chlorine as far as the oxygen of the air does not doit. The following receipt is recommended amongst others. Six

parts each of green vitriol and yellow prussiate are dissolved separately, each in fifteen parts of water, and the solutions mixed. One part of concentrated sul- phuric acid and twenty-four parts of fuming muriatic acid are then added, and after standing some hours also a solution of bleaching powder in instalments until the blue colour is fully developed. “‘Turnbull’s”” blue is made by precipitating red prussiate of potash with excess of ferrous salt; but it is easily seen from what was said above that the use of this relatively expensive double cyanide might be dispensed with. The properties of the two pigments are pretty much the same. They are sold in the form of solid cakes or lumps, which, in addition to their blue colour, present a coppery lustre on fracture. They are stable against acids, but sensibly affected (bleached) on prolonged exposure to sunlight ; and, although they stand neutral soap fairly well, they are decomposed promptly by solutions of even the carbonates of the alkalis with formation of hydrated oxides ofiron. The cheaper commercial varieties are more or less largely diluted with clay, sulphate of baryta, &c. Pure prussian blue dissolves readily in a dilute solution of oxalic acid ; the intensely blue solution used to serve as a blue ink, but has come to be snperseded by the several more brilliant blues of the coal-tar series. These tar-blues have displaced prussian blue also in other applications, and as a commercial pigment it has besides to struggle against ultramarine. In short, it has gone very much out of use, and as a consequence the manufacture of yellow prussiate is no longer so remunerative as it used to be.

Analysis of Cyanides.—As hydrocyanic acid and cyanide of potassium are dangerously poisonous, and the latter at least is easily procured in commerce, the detection of cyanogen in this state of combination is one of the problems of forensic chemistry. To detect such cyanogen in, say, the contents of a stomach the first step is to distil the mass after acidification with tartaric acid, which decomposes cyanide of potassium but does not liberate prussic acid from prnssian blue (or even prussiate of potash?). If the dis- tillate gives no precipitate with nitrate of silver hydrocyanic acid is absent, if it does the precipitate may have been produced by hydrochloric acid, which may then be eliminated by redistillation with borax or sulphate of soda, neither of which affects NCH. But even in the presence of chlorides the following two tests give perfect certainty. (1) A solution of hydrocyanic acid, when alkalinized with caustic potash and then mixed

with, first ferroso-ferric salt and then excess of hydrochloric acid, gives a precipitate, or at least a green suspension, of prussian blue. (2) A solution of NCH, when mixed with ammonia and yellow sulphide of ammonium, is changed into onc of sulphocyanate of ammonium, which, after removal of the excess of reagents by evaporation at a gentle heat, strikes an intense aud very characteristic red colour with ferric salts, which colour does not vanish (as that of ferric acetate does) on even strong acidification with mineral acid (Liebig's test). The quantitative determination of cyanogen given as an aqneous solution of hydrocyanic acid or cyanide of potassium can (if haloids are absent) be effected by adding excess of nitrate of silver, then acidifying, if necessary, with nitric acid, filtering off, washing, drying, and weighing the cyanide of silver produced. AgNC=134 corresponds to NCH = 27 parts. A more ex- peditious method has been invented by Liebig. A known quantity of the given prussie acid is alkalinized strongly with caustic potash and then diluted freely with water. The caustic alkali usually contains plenty of chloride as an impurity, else a little alkaline chloride must be addcd. A standard solution of nitrate of silver (conveniently adjusted so as to contain 6°30 grammes of fused ni- trate per 1000 cubic centimétres, equivalent to 2 grammes of NCH) is now dropped in from a burette until the cloud of chloride of silver which appears locally from the first just fails to disappear on string, t.¢., until the reaction 2KNC + AgNO,=KAg.(NO), + KNO,

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has just been completed. One cub. cent. of silver solution used indicates 2 milligrammes of NCH. Liebig's method lends itself particularly well for the assaying of the medicinal acid and of cyanide of potassium. The two tests for hydrocyanic acid given above apply as they stand to solutions of the cyanides of alkali and alkaline-earth metals, but of to mercuric cyanide. In regard to all other eyanides we have only space to say that from a certain set (which includes the cobalti-cyanides and the platinum cyanides) cyanogen cannot be extracted at all as NCH (or AgNC) by any known methods. Such bodies must be identified by their own specific reactions or by elementary analysis. All cyanides are de- composed by hot concentrated sulphurie acid ; the carbon goes off as CO, the nitrogen remains as sulphate of ammonia

and the metals as sulphates, which brings them within the range of the routine methods of analysis.

Cyanates.—These were discovered by Wohler. The potassium salt NCO.K is produced by the oxidation of fused cyanide, for pre- parative purposes most conveniently by Wohler's method. An intimate mixture of two parts of absolutely anhydrous prussiate of potash and one part of equally dry binoxide of manganese is heated on an iron tray until the mass has become brownish black and just begun to fuse. It is now allowed to cool and exhausted by boiling 80 per cent. alcohol. The filtrate on cooling deposits crystals of the salt NCO.K. If only an aqueous solution of this salt is wanted for immediate use, the fuse may be extracted by cold water. From this solution the eyanate of silver, NCO.Ag, or lead, (NCO),Pb, can be prepared by precipitation with solutions of the respective nitrates or acetates. Hot water decomposes cyanate of potash promptly with formation of carbonates of potash and ammonia, KNCO 2H,0=NH, KHO+CO,. On addition of mineral acid to even the cold solution only a very little of the cyanic acid is liberated as such ; the bulk breaks up at once with effervescence, thus, NCO.H+2H,O=NH;+C0,+H,O. Very interesting is the action of the solution of cyanate of potash on sulphate of ammonia; its direct effect is the formation of cyanate of ammonia, NCO.NH,, but this salt almost immediately passes spontaneously into its isomer urea, which is not a cyanate at all but the amide of carbonic

Ng

acid, ie. CO(OH),-2(0H) +2NH,= CoN te,

2

discovered by Wohler, who thus for the first time produced an organic substance from inorganic materials, or virtually from its elements. Singularly, it is this pseudo-cyanate urea which serves as a material for making cyanic acid. When hydrochlorate of urea, HCl. CON.H,, is heated to 145°C. the latter behaves as if it were cyanate of ammonia: the ammonia unites with the hydrochloric acid into sal-ammoniac and the cyanic acid is set free, but imme- diately suffers polymerization into cyanuric acid, a solid tri-basie acid of the composition N,C,0,H;, which, being difficultly soluble,

can be freed from the sal-ammoniac by being washed with cold water. If perfectly anhydrous cyanuric acid be subjected to dry distillation it furnishes a distillate of (liquid) cyanic acid NCO. H, which must be condensed in a vessel surrounded by a freezing mixture.

Cyanic acid has a very appreciable vapour-tension even at ordi- hary temperatures, and the least trace of its vapour makes itself felt by a characteristically violent and dangerous action on the respira- tory organs. With dry animonia gas it unites into true cyanate of ammonia. We do not know much of its own properties, because as soon as it comes out of the freezing mixture it begins to suffer polymerization into ‘‘cyamelid” with great evolution of heat. This cyamelid is a porcelain-like mass, insoluble in all ordinary solvents and devoid of acid properties. Dry distillation reconverts it into cyanic acid.

Thiocyanates.—This term means bodies like cyanates, but containing sulphur instead of the oxygen of the latter. Thio- cyanates are better known, however, as sulphocyanates or sulpho- cyanides. (1) The potassium salt NCS.K is formed when cyanide of potassium is fused with sulphur or eertain metallie sulphides, €.g., PbS. The usual method of preparation is to fuse together forty-six parts of dehydrated yellow prussiate of potash, seventeen of dry carbonate of potash, and thirty-two of sulphur. The fuse is exhausted with boiling alcohol and thc filtered solution allowed to cool, when crystals of the salt separate out. The salt is very Soluble in water with characteristically large absorption of heat. (2) The ammonium salt NCS .NH, can’ be prepared by allowing a mixture of alcohol, strong aqueous ammonia, and bisulphide of carbon to stand for a time and then warming it. Thiocarbonate of ainmonium, CS,.(NH,),S, is produced first, but subsequently 1t gives up 2H,S to the ammonia and becomes NCS. NH,, which 1s easily obtained in crystals. The tar water obtained in the manufacture of coal-gas sometimes contains sufficient quantities of this salt to make it worth while to recover it. Both the potassium ald the ammonium salt are much used as reagents, and more especi- ally as precipitants for copper and silver. Solutions of eupric salt when mixed with sulphocyanate assume the dark-brown eolour of the cuprie salt Cu(NCS),, but on addition of sulphurous acid the colour disappears and a white precipitate of cuprous sulphocyanide,

This reaction was

Pa OY 25

NCS.Cu, comes down, which, if enough of reagent was used, con- tains all the copper. If sulphocyanate is added to nitrate of silver, all the silver is precipitated as Ag. NCS, similar in appearance to the chloride and, like it, insoluble in water and in nitric acid. Upon this and the fact that sulphocyanates strike a deep red colour with ferric salts Volhard has based an excellent titrimetric method for the determination of silver. (See SitveEr.)

Syntheses of Cyanogen Compounds.—Synuthetical organic chemistry dates from Wohler's discovery of the artificial formation of urea, and in the further development of this branch of the science cyano- gen has played a prominent part. (For illustrations we may refer to certain passages in the present article and in those on METHYL and on NirrocEN.) Hence it is worth while to enumerate briefly the synthetical method for the making of cyanogen itself. (1) Hydrocyanic acid is produced when a current of electric sparks is made to cross a mixture of acetylene, C,H,, and nitrogen. (2) Cyanide of ammonium is formed when ammonia is passed over red-hot charcoal (see supra). (3) Metallic cyanides are produced when dry nitrogen gas is passed over a dry mixture of carbonate of potash or baryta and charcoal at a white heat. A similar reaction goes on spontaneously in the iron-smelting furnaces and gives rise to the formation of vapour of cyanide of potassium. (4) Sulpho- eyanide of ammonium is produced from bisulphide of carbon and ammonia, as explained above. Gia 108)

PRYNNE, Wittiam (1600-1669), was born at Swains- wick near Bath in 1600. He was educated at Bath gramniar-school, and became a commoner of Oriel College, Oxford, in 1616, takmg his B.A. in 1621; he was ad- mitted a student of Lincoln's Inn in the same year, and in due time became a barrister. His studies Jed him deeply into legal and constitutional lore, and no less deeply into ecclesiastical antiquities. He was Puritan to the core, with a tenacious memory, a strength of will bordering upon obstinacy, and a want of sympathy with human nature in its manifold variety. His first book, The Per- petuity of a Regenerate Man's Estate, 1627, was devoted to a defence of one of the main Calvinistic positions, and The Unloveliness of Love-locks and Health's Sickness, 1628, were devoted to attacks upon

prevailing fashions, con- ducted without any sense of proportion, and treating follies on the same footing as scandalous vices.

After the dissolution of parliament in 1629 Prynne came forward as the assailant of Arminianism in doctrine and of ceremonialism in practice, and thus drew down upon himself the anger of Laud. Z/istrio-mastix, published in 1633, was a violent attack, not upon the special im- moralities of the stage of Prynne's day but upon stage- plays in general, in which the author laid himself open to the charge of assailing persons in high position, in the first place by pointing out that kings and emperors who had favoured the drama had been carried off by violent deaths, which assertion might easily be interpreted as a warning to the king, and in the second place by applying a dis- graceful epithet to actresses, which, as Henrietta Maria was taking part in the rehearsal of a ballet just as the sheet containing the offensive words was passing through the press, was supposed to apply to the queen. On 17th February 1634 Prynne was sentenced by the Star Chamber to be imprisoned and also to be fined £5000, expelled from Lincoln's Inn, rendered incapable of returning to his pro- fession, degraded from his degree in the university of Oxford, and set in the pillory, where he was to lose both his ears. On 7th May Prynne was placed in the pillory and lost his ears. The rest of the sentence, with the exception of the clause relating to the payment of the fine, was carried out. A sharp letter written by him to Laud criticizing his arguments at the trial was made the founda- tion of a fresh charge. Prynne, however, got the letter into his hands and tore it up. Though he was again brought before the Star Chamber, on 11th June, no addi tional penalty was inflicted on him. There is no reason to suppose that his punishment was unpopular. In 1637 he was once more in the Star Chamber, together with Bastwick and Burton. In A Divine Tragedy lately acted

he had attacked the Declaration of Sports, and in News from Ipswich he had attacked Wren and the bishops generally. On 30th June a fresh sentence, that had been delivered on the 14th, was executed. The stumps of Prynne's ears were shorn off in the pillory. When on 27th July he was sent to what

was intended to be perpetual imprisonment at Lancaster his journey was a triumphal progress,—the imposition of ship-money and the metro- political visitation having rendered the minds of English- men far more hostile. to the Government than they had been in 1634. Before long Prynne was removed to Mont Orgeuil Castle in Jersey, where it was hoped that he could be so entirely isolated that no word of his would reach the outer world again. ;

Immediately upon the meeting of the Long Parliament in 1640 Prynne was liberated. On 28th November he entered London in triumph, and on 2d March 1641 repara- tion was voted by the Commons, to be made to him at the expense of his persecutors. As might have been expected, Prynne after his release took the side of the Parliament strongly against the king, especially attacking in his writ- ings his old enemies the bishops, and accusing Charles of showing undue favour to the Roman Catholics. He com- mented on the words of Psalm cv., “Touch not mine anointed,” by arguing that they inhibited kings from injuring God’s servants who happened to be their subjects, and in a lengthy work entitled Zhe Sovereign Power of Parliaments and Kingdoms he maintained that the taking arins by parliament in a necessarily defensive war was no treason either in law or in conscience.

Prynne’s sufferings had not served to render him comn- passionate to others. In 1643 he took an active part in the proceedings against Nathaniel Fiennes for the surrender of Bristol. During this and the following year, however, his chief energies as a prosecutor were directed against Archbishop Laud. The cessation of hostilities with the Irish insurgents agreed to on 15th September 1643 brought Charles’s relations with the Catholics into increased dis- repute, and Prynne attacked Laud as the soul of a great Popish plot by publishing both before and after his execu- tion various collections of documents, one of which at least was garbled to render it more telling. Even before the execution of Laud Prynne found a new enemy in the In- dependents. In 1644 he published Z’welve Considerable Serious Questions touching Church Government, in which he upheld the right of the state to form a national church in accordance with the word of God, and reviled the Inde- pendents, partly as advocating an unscriptural discipline, partly as introducing heresy and division, and

maintaining that all religions ought to be tolerated. To the principle of individual liberty Prynne was from the beginning to the end irreconcilably hostile. For some time to come he poured forth pamphlet after pamphlet in vindication of his assertions. Flowing out of this controversy came another, beginning in 1645 with Four Short Questions, privately circulated, and followed by A Vindication of Four Serious Questions of Great Importance, in which he denied the right of the clergy to excommunicate or to suspend from the reception of the sacrament otherwise than by law. Prynne, in short, maintained the supremacy of the state over the church, whilst he argued that the state ought to protect the church from the rivalry of sectarian associations,

Early in 1648 Prynne broke new ground. The Levellers Levelled was directed against the dangerous opinion that the Lords should be brought down into the House of Com- mons, there to sit and vote. As usual, he argued his case on purely antiquarian and technical grounds, without any intellectual grasp of his subject.

On 7th November 1648 Prynne at last obtained a seat

in the House of Commons. He at once took part against those who called for the king's execution, and on 5th December delivered a speech of enormous length in favour of conciliating the king, who had inflicted the most griev- ous injuries upon him and whose misgovernment he had bitterly denounced. The result was his inclusion in Pride's " purge" on the morning of the 6th, when, having attempted resistance to military violence, he was subjected to imprisonment. A fresh protest, published on Ist January 1649 under the title of A Brief Memento to the Present Unparliamentary Junto, coupled with his contemptuous refusal to avow his authorship, brought about a fresh order of imprisonment on 10th January from the House of Commons itself, which, however, does not seem to have been carried out. After recovering his liberty Prynne retired to Swainswick. On 7th June 1649 he was assessed to the monthly contribution laid on the country by Parlia- ment. He not only refused to pay but published A Legal Vindication of the Liberties of England on the ground that no tax could be raised without the consent of the two Houses. In the same ycar he commenced a long histori- cal account of ancient parliaments, which was evidently

intended to reflect on the one in existence. In 1650 his labours were cut short by a warrant from President Brad- shaw, dated Ist July, and ordering his arrest. For the remainder of the year he was imprisoned in Dunster Castle, whence he was removed in January 1651 to Taunton, and in July to Pendennis Castle. On lst February 1652 the council of state ordered his discharge on giving a bond of £1000 to do nothing to the prejudice of the Common- wealth. On his resolute refusal to accept the condition an absolute order for his release was given on 18th Febru- ary. From his release till the death of Cromwell Prynne refrained from making any further assault on the existing Government. His strong conservatism, however, found expression in an argument in defence of advowsons and patronages and an attack on the Quakers, both published in the same year, as well as in an argument against the admission of the Jews to England issued in the beginning of 1655.

It was not until the restoration of the Rump Parliament by the army on 7th May 1659 that Prynne again came into prominent notice, though he had in the previous year issued A Plea for the Lords and House of Peersand A New Discovery, viz., that Quakers were Jesuits in disguise. On that day, in addition to the Rump, fourteen of the secluded members, with Prynne among them, claimed admittance. The claim was of course refused, but on a second attempt on the 9th, through the inadvertence of the doorkeepers, Prynne, Annesly, and Hungerford succeeded in taking their seats. When they were observed, however, no busi- ness was done, and the House purposely adjourned for dinner. At the return of members in the afternoon the doors were found guarded; the secluded members were not permitted to pass, and a vote was at once taken that they should not again be allowed to enter the House. Wrath- ful at the failure of his protest and at the continuance of the republican form of government, Prynne attacked his adversaries fiercely in print. In England’s Confusion, pub- lished 30th May 1659, in the Z’rue and Full Narrative, and in The Brief Necessary Vindication he gave long accounts of the attempt to enter the House and of his ejection, while in the Curtaine Drawne he held up the claims of the Rump to derision. In Mola Asinaria the ruling powers are described as ‘‘a new-fangled Government, compacted of Treason, Usurpation, Tyranny, Theft, and Murder.” Wood, however, denies that this was by Prynne. In Shufling, Cutting, and Dealing, 26th May, he rejoiced at the quarrels which

he sees arising, for “if you all complain I hope I shall win at last.” Concordia Discors pointed out

the absurdity of the constant tendency to multiply oaths, while “‘remonstrances,” ‘“ narratives,” “queries,” “ prescrip- tions,” “ vindications,” “declarations,” and “statements” were scattered broadcast. Upon the cry of the “good old cause” he is especially sarcastic and severe in The True Good Old Cause rightly stated and other pamphlets. Loyalty Banished explains itself. His activity and fear- lessness in attacking those in power during this eventful year were remarkable, and an ironical petition was circu- lated in Westminster Hall and the London streets com- plaining of his indefatigable scribbling. On 12th October the Rump was again expelled by Lambert, and on 24th December once more restored. On 26th December Prynne made another fruitless attempt to take his seat. In obedi- ence to the popular voice, however, the ejected members of 1648, with Prynne among them, wearing a basket-hilt sword, re-entered the House and resumed their old seats on 21st February 1660. He boldly declared that if Charles was to come back it were best done by the votes of those who had made war on his father, and was admonished for his language by Monk and the privy council. This parlia- ment recalled Charles and dissolved itself immediately,— Prynne bringing in the Bill for the dissolution on 24th February. On 13th March he appears as one of three appointed to carry out the resolution of the House expung- ing the Engagement.

The Convention Parliament, which met on 25th April 1660, contained a large number of Presbyterians. Prynne, who was returned for two places, Ludgershall and Bath, elected to sit for the latter, and on 16th June presented to the king an address from the corporation, evidently drawn up by himself, under the title of Bathonia Rediviwa. On lst May he was nominated on the committee appointed “to peruse the Journals and Records, and to examine what pre- tended Acts or orders have passed, inconsistent with the government by King, Lords, and Commons, and report them, with their opinion thereon, to this House,” and to secure the steady administration of the law, and the con- firmation of the legal judgments of

the past years. On 9th May he went to the Lords with various loyal votes of the Commons, and again on 18th May and on 9th June. On 3d June he “ fell upon” Ashley Cooper for putting his hand to the “instrument” to settle the Protector in power. On the 13th he moved that Colonel Fleetwood, Richard Crom- well, John Goodwin, Thorpe, and Whitelock should be excepted from the Act of general pardon and oblivion, the speedy passing of which he strongly urged upon the House. It is said that at the Restoration he applied to be made one of the barons of the exchequer, and that it was in default of this, and to keep so active a man in good temper, that he was appointed chief keeper of the records in the Tower with a salary of £500 a year by Charles, ‘of his owne meere motion for my services and sufferings for him under the late usurpers, and strenuous endeavours by printing and otherwise to restore His Majesty.” On 2d July he supported a proposal that all officers who had served during the Protectorate should now refund their salaries, and declared that he knew that those persons had received above £250,000 for their iniquitous doings and to keep out the king, a charge he had previously made on 12th May. In all the debates he was for severity upon any one who had held office under Cromwell. On 9th July he spoke “very honestly and passionately” from the Presby- terian point of view in the first great debate on religion, and on the 16th declared he “would not be for bishops unless they would derive their power from the king and not vaunt themselves to be jure divino.” In the debate of the 27th upon the Lords’ delay in passing the Act of Indemnity Prynne found an opportunity for expressing his hatred of priests and Jesuits ; and on the 30th, in the

debate on the Ministers’ Bill, he urged a settlement on the principle that the ministers should be compelled to take the oath, but that ‘all presentations should be good throughout, though not by the right patrons, in time of trouble.” On 17th August he spoke passionately against any leniency whatsoever being extended to any of the king’s judges. It is curious, however, to find that the House appointed him to carry the petition to the king in favour of Lambert or Vane. When the question of dis- banding came up, for the carrying out of which he was in October made one of the commissioners, Prynne moved that no arrears should be paid to those who had acted with Lambert and did not submit. On 7th November he supported

the Bill for the attainder of Cromwell and others who had participated in the king's execution, and were since dead, and particularly desired that the House would take the first and second reading at the same sitting, as was done in the case of the king's trial. At some time in this year (1660) he wrote a letter on the evil custom of drinking healths, a subject discussed in the House on 10th November. There was indeed scarcely any debate in which Prynne's voice was not heard; he spoke against laying the cost of the abolition of the court of wards upon the excise, having been in August appointed on the commission for appeals and regulating the excise, and in favour of Bills against the profanation of the Lord's Day (in which his knowledge of ecclesiastical con- troversy again appeared) and against swearing. He ap- pears at this time to have been officially connected with the Admiralty. He supported on 27th November the abortive attempt to turn the king's declaration concern- ing ecclesiastical affairs into a Bill, and moved against the payment of the debts of the attainted regicides. In December he wrote against the bishops to the king, thus "'blemishing his late services." During this year was pub- lished A Seasonable Vindication of the Supream Authority and Jurisdiction of Christian Kings, Lords, Parliaments, as well over the Possessions as Persons of Delinquents, Pre- lates, and Churchmen.

At the elections for the Pensionary Parliament, which met on 8th May 1661, Prynne was again returned as member for Bath in spite of the vehement efforts of the Royalists headed by Sir T. Bridge. This parliament was bent upon the humiliation of the Presbyterians, and Prynne appears in his familiar character of protester. On 30th May, when the members took the sacrament together at St Margaret's, 'Mr Prynne and some few others refused to take it kneel- ing. The parson with the bread passed on and refused to give it, but he with the wine, not noticing, gave the wine." With Secretary Morris Prynne opposed the motion that Dr Gunning should receive the thanks of the House and be desired to print hissermon. On the 18th of this. month he had moved that the Engagement, with the Solemn League and Covenant, should be burned by the hangman. On 13th July he was the subject of attack, as being in a way the representative of Presbyterianism ; the House in its vehement Anglicanism declared that his paper lately pub- lished, Sundry Reasons against the new intended Bill for governing and reforming Corporations, was illegal, false, scandalous, and

seditious. Prynne was censured, and so strong was the feeling that he deemed it best to express his sorrow, upon which the offence was remitted. The continued attacks upon the Presbyterians led him to pub- lish his Short, Sober, Pacific Examination of Hxuberances in the Common Prayer, as well as the Apology for Tender Consciences touching Not Bowing at the Name of Jesus. In 1662 there appeared also the Brevia Parliamentaria Rediviva, possibly a portion of the Register of Parlia- mentary Writs, of which the fourth and concluding volume was published in 1664. During 1663 he served constantly

on committees, and was chairman of the committee of supply in July, and again in April 1664.

In the third session Prynne was once more, 13th May 1664, censured for altering the draft of a Bill relating to public-houses after commitment, but the House again, upon his submission, while taking severe notice of an irregu- larity committed by “so ancient and knowing a member, remitted the offence, and he again appears on the com- inittee of privileges in November and afterwards. In 1665 and 1666 he published the second and first volumes respectively of the Exact Chronological Vindication and ‘ Historical Demonstration of the supreme ecclesiastical juris- diction exercised by the English kings from the original planting of Christianity to the death of Richard I. In the latter year especially he was very busy with his pen against the Jesuits. In January 1667 he was one of three appointed to manage the evidence at the hearing of the impeachment of Lord Mordaunt, and in November of the same year spoke in defence of Clarendon, so far as the sale of Dunkirk was concerned ; and this appears to have been the last time that he addressed the House. In 1668 was published his Aurum Regine or Records concerning Queen-gold, the Brief Animadversions on Coke’s Institutes in 1669, and the History of King John, Henry III., and Edward I., in which the power of the crown over ecclesi- astics was maintained, in 1670, The date of the Abridg- ment of the Records of the Tower of London is doubtful, though the preface is dated 1656/57. Prynne died in his lodgings at Lincoln’s Inn, 24th October 1669, and was buried in the walk under the chapel there, which stands upon pillars. His will, by which he

gave one portion of his books to Lincoln's Inn and another to Oriel College, is dated 11th August 1669. Prynne was never married.

The following curious account of his habits is given by Wood. '*His custom when he studied was to put on a long quilted cap which came an inch over his eyes, serving as an umbrella to defend them from too much light; and, seldom eating a dinner, would every three hours or more be munching a roll of bread, and now and then refresh his exhausted spirits with ale brought to him by his servant." There is a portrait of him in Oriel College, Oxford,

and Wood mentions one by Hollar, and an engraving by Stent, as the best extant. (S. R. G.—O, A.)

PRYTANIS (pl. prytancis) was the title of certain officials in Greek states. They appear.to have succeeded the kings at the time when the monarchical form of government was abolished throughout Greece. At Rhodes they continued to be the chief magistrates as late as the Ist century 8.c., but in other states their functions dwindled. Though they were not priests, they had the charge of certain public sacrifices. Their headquarters were in the "* pryta- neum" or town-hall, the central point of a Greek state, where a fire was kept perpetually burning on the public hearth. When a colony was founded the fire in the prytaneum of the new city was kindled from the fire in the prytaneum of the mother-city, and if this colonial fire ever happened to be extinguished it was rekindled from the same source. At Athens in classical times the prytaneis were those fifty members of the council of five hundred who presided at the council meetings as well as at the popular assemblies. They consisted of the fifty members who represented one of the ten tribes on the council. The office was held for a tenth of a year and passed in rotation to the representa- tives of each of the ten tribes, During their term of office the prytaneis were maintained at the public expense in the tholos or rotunda (not, as is sometimes stated, in the prytaneum). As the highest mark of honour, distinguished citizens and their descendants were sometimes maintained for life in the prytaneum. Here, too, ambassadors were entertained. There was further a court of justice at Athens called the "court in the prytaneum "; it tried murderers wlio were not to be found, and also lifeless instruments

which had been the cause of death,—an institution prob- ably existing from a very remote antiquity. >

PRZEMYSL, one of the principal towns of Galicia, Austria, and the seat of a Roman Catholic and of a Greek bishop, is picturesquely situated on the river San, about 140 miles to the east of Cracow. It contains several churches, of which the two cathedrals are the most inter- esting, and numerous convents, schools, and seminaries. Among its manufactures are wooden wares, linen, leather, and liqueur, and a brisk trade is carried on in these articles and in agricultural produce. hands of Jews, who form fully a third of the population. On the hill above the town are the ruins of an old castle, said to have been founded by Casimir the Great. Since 1874 Przemys] has been strongly fortified. The population of the town proper in 1880 was 9244, of the commune

20,040.

Przemysl, one of the oldest towns in Galicia, clairas to have been founded in the 8th century, and was at one time capital of a large independent principality. Casimir the Great and other Polish princes endowed it with privileges similar to those of Cracow, and it attained a high degree of prosperity. In the 17th century its im- portance was destroyed by inroads of Tatars, Cossacks, and Swedes.

PSALMANAZAR, George (c. 1679-1763), the assumed name of a pretended native of Formosa, who was in reality a Frenchman, and was born about 1679, probably in Languedoc. According to his own account he was sent in his seventh year to a free school taught by two Franciscan monks, after which he was educated in a Jesuit college “in an archiepiscopal city.” On leaving college he was recommended as tutor to a young gentleman, but soon fell into a lazy and idle life and became involved in pecuniary difficulties. This induced him to assume various personations in order to obtain a supply of ready money, his first being that of a pilgrim on the journey to Rome. Afterwards he travelled through Germany, Brabant, and Flanders in the character of a Japanese convert. At Liége he enlisted in the Dutch service, shortly after which he altered his character to that of an unconverted Japanese. At Sluys he made the acquaintance of a Scotch chaplain, by whom he was brought over to

England and introduced to the bishop of London. Having undergone conversion to Christianity, he was employed by the bishop to translate the church catechism into what was supposed to be the Formosan language. In 1704 he published a fictitious Historical and Geographical Description of Formosa, and was shortly afterwards sent to complete his studies at the university of Oxford. The work of course was founded on previous publications, but the compilation was done with great cleverness, in addition to which he printed a so-called Formosan alphabet, and specimens of the language accompanied with translations. In 1707 he published Dialogue between a Japanese and a Formosan. There also appeared without date An Inquiry into the Objections against George Psalmanazar of Formosa, with George Psalmanazar's Answer. To add to his income he also joined another person in promoting the sale of a sort of white japan, the art of paimting which he professed to have brought from Formosa. His pretensions were from the beginning doubted by many, and when exposure was inevitable he made a full confession of his guilt. Through- out the rest of his life he not only exhibited a seemingly conscientious regard for truth but according to Dr Samuel Johnson, as reported by Mrs Piozzi, "a piety, penitence, and virtue exceeding almost what we read as wonderful in the lives of the saints." Dr Johnson used to discuss theo- logical and literary matters with him in an alehouse in the city, and cherished so high an opinion of his character and talents that he asserted he would "as soon think of contradicting a bishop." Psalmanazar obtained a comfort- able living by writing for the booksellers. He published

The trade is mostly in the –

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PSA—PSA

Essays on Scriptural Subjects (1753), contributed various articles to the Ancient Universal History, and completed Palmer's History of Printing. He died in Ironmonger Row, Old Street, London, 3d May 1763. His memoirs appeared in 1764 under the title Memoirs of * * * commonly known by the Name of George Psalmanazar, but do not disclose his real name or the place of his birth.

PSALMS, Boox or, or Psaurer, the first book of the Hagiographa in the Hebrew Bible.

Title and Traditional Authorship.—The Hebrew title of the book is p*>an, téhillim, or pdm 7D, “the book of hymns” or rather “songs of praise.”! The singular nmbnn is properly the infinitive or nomen verbi of on, a verb employed in the technical language of the temple service for the execution of a jubilant song of praise to the accompaniment of music and the blare of the priestly trumpets (1 Chron. xvi. 4 sq., xxv. 3; 2 Chron. v. 12 sq.). The name is not therefore equally applicable to all psalms, and in the later Jewish ritual the synonym hadlel specially designates two series of psalms, cxiii.-cxvill. and exlv.~~cl., of which the former was sung at the three great feasts, the encenia, and the new moon, and the latter at the daily morning prayer. That the whole book is named “ praises ” is clearly due to the fact that it was the manual of the temple service of song, in which praise was the leading feature. But for an individual psalm the usual name is “WN (in the Bible only in titles of psalms), which is applic~~ able to any piece designed to be sung to a musical accom- paniment. Of this word Yadpos, “psalm,” is a translation, and in the Greek Bible the whole book is called Yadpoé or Yadrripiv.? The title Yadpoi or BuBrAdgs Yadav is used in the New Testament (Luke xx. 42, xxiv. 44; Acts i. 20), but in Heb. iv. 7 we find another title, namely “ David.” Hippolytus tells us that in his time most Christians said “the Psalms of David,” and believed the whole book to be his; but this title and belief are both of Jewish origin, for in 2 Mac. ii. 13 ra rod AaviS means the Psalter, and the title of the apocryphal “Psalter of Solomon” implies that the previously existing Psalter was ascribed to David. Jewish tradition does not make David the author of all the psalms; but as he was regarded as the founder and legislator of the temple psalmody (1 Chron., ut sup. ; Ezra li, 10; Neh. xii. 36, 45 sg.; Ecclus. xlvii. 8 sq.), 80 also he was held to have completed and arranged the whole book, though according to Talmudic tradition he incor- porated psalms by ten other authors, Adam, Melchizedck, Abraham, Moses, Heman, Jeduthun, Asaph, and the three sons of Korah. With this it agrees that the titles of the psalms name no one later than Solomon, and even he is not recognized as a psalmodist by the most ancient tradition, that of the LXX., which omits him from the title of Ps, cxxvil. and makes Ps, Ixxii. be written not by but of him. The details of the tradition of authorship show consider- able variation

; according to the Talmudic view Adam is author of the Sabbath psalm, xcii., and Melchizedek of Ps. cx., while Abraham is identified with Ethan the Ezrahite Os ixxxix.), But, according to older Jewish tradition attested by Origen, Ps. xcii. is by Moses, to whom are assigned Pss. xe,-c. inclusive, according to a general rule that all anonymous pieces are by the same hand with the nearest preceding psalm whose author is named ; and Ps, cx., which by its title is Davidic, seems to have been given to Melchizedek to avoid the dilemma of Matt. xxii. 41 sq.

1 Hippol., ed. Lag., p. 188; Enseb., W.E., vi. Za ea Epi he, MV et Pond., § 23; Jerome's preface to Psalt. juata Hebrxos. Similarly in the Syriac Bible the title is '' mazinoré." The passages are collected in Kimhi's preface to his commentary ihe Psalms, ed. Schiller-Szinessy, Cambridge, 1883. é Opp., ii. 514 sq., ed. Rue ; cp. Hippol., ut supra; Jerome, Ep. CXL. (ad Cypr.), and Pref. in Mal.

29

Origen's rule accounts for all the psalms except i. and ii., which were sometimes reckoned as one poem (Acts xiii. 33 in the Western text ; Origen; B. Berakhoth, f. 9b), and appear to have been ascribed to David (Acts iv. 25).

The opinion of Jerome (Pref. in Ps. Heb.) and other Christian writers that the collector of the Psalter was Ezra does not seem to rest on Jewish tradition.

Nature and Origin of the Collection.—Whatever may be the value of the titles to individual psalms, there can be no question that the tradition that the Psalter was col- lected by David is not historical ; for no one doubts that some of the psalms date from after the Babylonian exile. The truth that underlies the tradition is that the collection is essentially the hymn-book of the second temple, and it was therefore ascribed to David, because it was assumed, as we see clearly from Chronicles, that the order of worship in the second temple was the same as in the first, and had David as its father: as Moses completed the law of Israel for all time before the people entered Canaan, so David completed the theory and contents of the temple psalmody before the temple itself was built. When we thus under- stand its

origin, the tradition becomes really instructive, and may be translated into a statement which throws light on a number of points connected with the book, namely, that the Psalter was (finally, at least) collected with a liturgical purpose. Thus, though the Psalms represent a great range of individual religious experience, they avoid such situations and expressions as are too unique to be used in acts of public devotion. Many of the psalms are doxologies or the like, expressly written for the temple ; others are made up of extracts from older poems in a way perfectly natural in a hymn-book, but otherwise hardly in- telligible. Such ancient hymns as Exod. xv. 1 sq., Judges v., 1 Sam. ii. 1 sq., are not included in the collection, though motives borrowed from them are embodied in more modern psalms ; the interest of the collector, we see, was not his- torical but liturgical. Again, the temple, Zion, the solemn feasts, are constantly kept in the foreground. All these points go to show that the collection was not only used but actually formed for use in the temple.

The question now arises, Was the collection a single act or is the Psalter made up of several older collections And here we have first to observe that in the Hebrew text the Psalter is divided into five books, each of which closes with a doxology. The scheme of the whole is as follows :—

Book I., Pss. i.-xli.: all these are ascribed to David except 1., il., x. (which is really part of ix.), xxxiii. (ascribed to David in LXX.); doxology, xli. 13. Book 1I., Pss, xlii.-lxxii.: of these xlii.-xlix. are ascribed to the Korahites (xliii. being part of xlii.), 1. to Asaph, li.-lxxi, to David (except Ixvi., Ixvii., xxi. anonymous; in LXX. the last two bear David's name), lxxii. to Solomon ; dovology, 1xxii. 18, 19 followed by the subscription "The prayers of David the son of Jesse are ended." Book III., Pss. lxxiii.~~lxxxix.: here lxxiii.~~ Ixxxili, bear the name of Asaph, lxxxiv., lxxxv., lxxxvii., 1xxxviii. that of the Korahites, Ixxxvi. of David, Ixxxviii. of Heman, lxxxix. of Ethan ; doxology, 1xxxix. 52. Book IV., Pss. xc.-cvi.: all are anonymous except xc. (Moscs), ci., ciii. (David),—LXX. gives also civ. to David ; here the doxology is peculiar, ' Blessed be Jehovah God of Israel from everlasting and to everlasting. And let all the people say Amen, Hallelujah." Book Y., Pss. evii.-cl.: of these eVili.-cX., CXXli., CXxiv., cxxxi., cxxxili., exxxviii.-cxlv. are ascribed to David, and cxxvii. to Solomon, and cxx.-cxxxiv. are pilgrimage psalms; LXX. varies

considerably from the Hebrew as to the psalms to be ascribed to David; the book closes with a group of doxological psalms.

The division into five books was known to Hippolytus, but a closer examination of the doxologies shows that it does not represent the original scheme of the Psalter; for, while the doxologies to the first three books are no part of the psalms to which they are attached, but really mark the end of a book in a pious fashion not uncommon in Eastern litera- ture, that to book iv. with its rubric addressed to the people plainly belongs to the psalm, or rather to its liturgical exe- cution, and does not therefore really mark the close of a

collection once separate. In point of fact books iv. and v. have so many common characters that there 1s every reason to regard them as a single great group. | Again, the main part of books ii. and inl. (Pss. xlii.-lxxxiil.) is distinguished from the rest of the Psalter by habitually avoiding the name Jehovah (the Lord) and using Elohim (God) instead, even in cases like Ps. l. 7, where “I am Jehovah thy God” of Exod. xx. 2 is quoted but changed very awkwardly to “Tam God thy God.” This is not due to the authors of the individual psalms, but to an editor ; for Ps. liii. is only another recension of Ps. xiv., and Ps. lxx. repeats part of Ps. xl., and here Jehovah is six times changed to Elohim, while the opposite change happens but once. The Elohim psalms, then, have undergone a common editorial treatment distinguishing them from the rest of the Psalter. And they make up the mass of books ii. and ii1., the remaining psalms, Ixxxiv.~~lxxxix., appearing to be a sort of appendix. But when we look at the Elohim psalms more nearly we see that they contain two distinct elements, Davidic psalms and psalms ascribed to the Levitical choirs (sons of Korah, Asaph). The Davidic collection as we have it splits the Levitical psalms into two groups and actually divides the Asaphic Ps. 1. from the main Asaphic collection, lxxiil.~~ Ixxxiii. This order can hardly be original, especially as the Davidic Elohim psalms have a separate subscription (Ps. lxxii. 20). But if we remove them we get a continuous body of Levitical Elohim psalms, or rather two collections, the first Korahitic and the second Asaphic, to which there have been added by way of appendix by a non-Elohistic editor a supplementary

group of Korahite psalins and one psalm (certainly late) ascribed to David. The formation of books iv. and v. is certainly later than the Elohistic re- daction of books ii. and iii., for Ps. eviii. is made up of two Elohim psalms (vii. 7-11, lx. 5-12) in the Elohistic form, though the last two books of the Psalter are generally Jehovistic. We can thus distinguish the following steps in the redaction :—(«) the formation of a Davidic collection (book i.) with a closing doxology; (5) a second Davidic collection (li.-lxii.) with doxology and subscription ; (c) a twofold Levitical collection (xlii.-xlix. ; 1, Ixxiii.-lxxxiii.) ; (d) an Elohistic redaction and combination of (0) and © ; (e) the addition of a non-Elohistic supplement to (d) with a doxology ; (/) a collection later than (d), consisting of books iv., v. And finally the anonymous psalms i., ii., which as anonymous were hardly an original part of book 1. may have been prefixed after the whole Psalter was completed. We see too that it is only in the latest collec- tion (books iv., v.) that anonymity is the rule, and titles, especially titles with names, occur only sporadically. Else- where the titles run in series and correspond to the limits of older collections. ; Date of the Collection.—A process of collection which involves so many stages must plainly have taken a con- siderable time, and the question arises whether we can fix a limit for its beginning and end or even assign a date for any one stage of the process.. An inferior limit for the final collection is given by the Septuagint translation. But this translation itself was not written all at once, and its history is obscure ; we only know from the pro- logue to Ecclesiasticus that the Hagiographa, and doubt- less therefore the Psalter, were read in Greek in Egypt about 130 B.c. or somewhat later.1_ And the Greek Psalter, ae <_< one apocryphal psalm at the close, is y the same as the Hebrew; there is nothing to suggest that the Greek was first translated from a less complete Psalter and afterwards i extended to agree with ellen a a

1 The text of the passage is obscure and Latin “cum multum temporis ibi fuissem ” author’s meaning. A friend has suge ovyxpovicas we ought perhaps to read 7

in part corrupt, but the

probably expresses the ested to the writer that for auxvov éyxpovicas.

the extant Hebrew. It is therefore reasonable to hold that the Hebrew Psalter was completed and recognized as an authoritative collection long enough before 130 B.c. to allow of its passing to the Greek-speaking Jews in Alex- andria. Beyond this the external evidence for the com- pletion of the collection does not carry us. It appears indeed from 1 Chron. xvi., 2 Chron. vi. 41, 42, that various psalms belonging to books iv, and v. were current in the time of the Chronicler,—that is, towards the close of the Persian or more probably in the earlier part of the Greek period. But it is not certain that the psalms he quotes (xevi., ev., evi, cxxxii.) already existed in their place in our Psalter, or that Ps. cvi. even existed in its present form. Turning now to internal evidence, we find the surest start- ing-point in the Levitical psalms of the Elohistic collection. These, as we have seen, form two groups, referred to the sons of Korah and to Asaph. At the beginning of the Greek period or somewhat later Asaph was taken to be a. contemporary of David and chief of the singers of his time (Neh. xii. 46), or one of the three chief singers belonging to the three great Levitical houses (1 Chron. xxv. | sq.). But the older history knows nothing of an individual Asaph ; at the time of the return from Babylon the guild of singers as a whole was called Bné Asaph (Ezra ii. 41), and so apparently it was in the time of Nehemiah (Neh. xi. 22, Heb.).2 The singers or Asaphites are at this time still distinguished from the Levites; the oldest attempt to incorporate them with that tribe appears in Exod. vi. 24, where Abiasaph—that is, the eponym of the guild of Asaphites—is made one of the three sons of Korah. But when singers and Levites were fused the Asaphites ceased to be the only singers, and ultimately, as we see in Chron- icles, they were distinguished from the Korahites and reckoned to Gershom (1 Chron. vi.), while the head of the Korahites is Heman, as in the title of Ps. Ixxxvin, It is only in the appendix to the Elohistic psalm-book that we find Heman and Ethan side by side with Asaph, as in the Chronicles, but the body of the collection distinguishes between two guilds of singers, Korahites and Asaphites, and is therefore as a collection younger than Nehemiah, but presumably older than Chronicles with its three guilds. The contents of the Korahite and Asaphic psalms give no reason to doubt that they really were collected by or for these two guilds. Both groups are remarkable by the fact that they hardly contain any recognition of present sin on the part of the community of Jewish faith—though they do confess the sin of Israel in the past—but are exercised with the observation that prosperity does not follow righteousness either in the

case of the individual (xlix., xxiii.) or in that of the nation, which suffers not- withstanding its loyalty to God, or even on account thereof (xliv., Ixxix.). Now the rise of the problems of individual faith is the mark of the age that followed Jeremiah, while the confident assertion of national righteousness under misfortune is a characteristic mark of pious Judaism after Ezra, in the period of the law but not earlier. Malachi, Ezra, and Nehemiah, like Haggai and Zechariah, are still very far from: holding that the sin of Israel lies all in the past. Again, a considerable number of these psalms (xliv., Ixxiv., lxxix., lxxx.) point to an historical situation which can be very definitely realized. They are post-exile in their whole tone and belong to a time when prophecy had ceased and the synagogue worship was fully established (Ixxiv. 8, 9). But the Jews are no longer the obedient

2 The threefold division of the singers appears in the same list according to the Hebrew text of ver. 17, but the occurrence of Jedu- thun as a proper name instead of a musical note is suspicions, and makes the text of LXX. preferable. The first clear trace of the triple choir is therefore in Neh. xii. 24, ¢.e., not earlier than Alexander the Great, with whom Jaddua (ver. 22) was contemporary.

slaves of Persia; there has been a national rising and armies have gone forth to battle. Yet God has not gone forth with them: the heathen have been victorious, blood has flowed like water round Jerusalem, the temple has been defiled, and these disasters assume the character of a reli- gious persecution. These details would fit the time of re- ligious persecution under Antiochus Epiphanes, to which indeed Ps. Ixxiv. is referred (as a prophecy) in 1 Mac. vii, 16. But against this reference there is the objection that these psalms are written in a time of the deepest de- jection and yet are psalms of the temple choirs. Now when the temple was reopened for worship after its pro- fanation by Antiochus the Jews were victorious and a much more joyous tone was appropriate. Besides, if the psalms are of the Maccabee period, they can have been no original part of the Elohistic psalm-book, which certainly was not collected so late. But there is one and only one time in the Persian period to which they can be referred, viz., that of the great civil wars under Artaxerxes ITI. Ochus (middle of 4th century

8.c.). See Persts, vol. xviii. p. 580, and Puanicra, 7b. p. 809. The Jews were involved in these and were severely chastised, and we know from Josephus that the temple was defiled by the Persians and humiliating conditions attached to the worship there. It would appear that to the Jews the struggle took a theo- cratic aspect, and it is not impossible that the hopeful beginnings of a national movement, which proved in the issue so disastrous, are reflected in some of the other pieces of the collection.1 All this carries the collection of the Elohistic psalm-book down to quite the last years of the Persian period at the earliest, and with this it agrees—to name but one other point—that the view of Israel's past history taken in Ps. lxxviii., where the final rejection of the house of Joseph is co-ordinated with the fall of Shiloh and the rise of Zion and the Davidic kingdom, indi- cates a standpoint very near to that of Chronicles. The fusion of the separate Korahite and Asaphic psalm-books in a single collection along with the second group of Davidic psalms may very probably be connected with the remodelling of the singers in three choirs which Chronicles presupposes.

Now books iv. and v. are, as we have seen, later than the Elohistic redaction of books 11. and iii, so that the collection of the last part of the Psalter must, if our argu- ment up to this point is sound, be thrown into the Greek period, and probably not the earliest part thereof. And this conclusion is borne out by a variety of indications. First of all, the language of some of these psalms clearly points to a very late date indeed.2, The Jews had even in the time of Nehemiah (Neh. xiii. 24) been in danger of forgetting their own tongue and adopting a jargon com- pounded with neighbouring idioms; but the restorers of the law fought against this tendency with vigour and with so much success that very tolerable Hebrew was written for at least a century longer. But in such a psalm as cxxxix, the language is a real jargon, a mixture of Hebrew and Aramaic, which, in a hymn accepted for use in the temple, shows the Hebrew speech to have reached the last

1 Ps. Ixxxiii., in which Judah is threatened by the neighbouring States acting with the support rather than under the guidance of Asshur (the satrap of Syria?) is also much more easily understood under the loose rule of Persia than under the Greeks, and the associa- tion of Tyre with Philistia (as in lxxxvii. 4) agrees with Pseudo-Scylax (see vol. xviii. p. 809). If this psalm has a definite historical back- ground, which many critics doubt, it

must be later than the destruc- tion of Sidon by Ochus. That it is not of the Assyrian age is obvious from the mention of Arab tribes.

2 For details as to the linguistic phenomena of the Psalms, see especially Giesebrecht in Stade's Zeitschr., 1881, p. 276 sq. The objec- tions of Driver (Jowrn. of Phil., xi. 233) do not touch the argument

that such psalms as cxxxix. belong to the very latest stage of Biblical Hebrew,

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stage of decay. Again, though no part of the Psalter shows clearer marks of a liturgical purpose, we find that in books iv. and v. the musical titles have entirely disap- peared. The technical terms, that is, of the temple music which are still recognized by the Chronicler have gone out of use, presumably because they were already become un- intelligible, as they were when the Septuagint version was made. This implies a revolution in the national music which we can hardly explain in any other way than by the influence of that Hellenic culture which, from the time of the Macedonian conquest, began to work such changes on the whole civilization and art of the East. Once more the general tone of large parts of this collection is much more cheerful than that of the Elohistic psalm-book. It begins with a psalm (xc.) ascribed in the title to Moses, and seemingly designed to express feelings appropriate to a situation analogous to that of the Israelites when, after the weary march through the wilderness, they stood on the borders of the promised land. It looks back on a time of great trouble and forward to a brighter future. In some of the following psalms there are still references to deeds of oppression and violence, but more generally Israel ap- pears as happy under the law with such a happiness as it did enjoy under the Ptolemies during the 3d century B.c. The problems of divine justice are no longer burning ques- tions; the righteousness of God is seen in the peaceful felicity of the pious (xci., xcii., &c.). Israel, indeed, is still scattered and not triumphant over the heathen, but even in the dispersion the Jews are under a mild rule (cvi. 46), and the commercial activity of the nation has begun to develop beyond the seas (cvii. 26 sq.). The whole situation and vein of piety here are strikingly parallel to those shown in Ecclesiasticus, which dates from the close of the Ptolemaic sovereignty in

Palestine. But some of the psalms carry us beyond this peaceful period to a time of struggle and victory. In Ps. cxviii. Israel, led by the house of Aaron — this is a notable point—has emerged triumphant from a desperate conflict and celebrates at the temple a great day of rejoicing for the unhoped-for victory ; in Ps. exlix. the saints are pictured with the praises of God in their throat and a sharp sword in their hands to take vengeance on the heathen, to bind their kings and nobles, and exercise against them the judgment written in prophecy. Such an enthusiasm of militant piety, plainly based on actual successes of Israel and the house of Aaron, can only be referred to the first victories of the Maccabees, culminating in the purification of the temple in 165 B.c. This restora- tion of the worship of the national sanctuary under cir- cumstances that inspired religious feelings very different from those of any other generation since the return from Babylon might most naturally be followed by an extension of the temple psalmody ; it certainly was followed by some liturgical innovations, for the solemn service of dedication on the twenty-fifth day of Chisleu was made the pattern of a new annual feast (that mentioned in John x. 22). Now in 1 Mac. iv. 54 we learn that the dedication was celebrated with hymns and music. In later times the psalms for the encenia or feast of dedication embraced Ps. xxx. and the hallel Pss, cxiii.-cxvill. There is no reason to doubt that these were the very psalms sung in 165 B.c., for in the title of Ps. xxx. the words “the song for the dedication of the house,” which are a somewhat awkward insertion in the original title, are found also in the LXX., and therefore are probable evidence of the liturgical use of the psalm in the very first years of the feast. But no collection of old psalms could fully suffice for such an occasion, and there is every reason to think that the hallel, which especially in its closing part contains allusions that fit no other time so well, was first arranged for the same ceremony. The course of the subsequent history makes

it very intelligible that the Psalter was finally closed, as we have seen from the date of the Greek version that it must have been, within a few years at most after this great event.) From the time of Hyrcanus downwards the ideal of the princely high priests became more and more diver- gent from the ideal of the pious in Israel, and in the Psalter of Solomon we see

religious poetry turned against the lords of the temple and its worship. (See MEsSIAH.)

All this does not, of course, imply that there are not in books iv. and v. any pieces older than the completion of books ii. and iii, for the composition of a poem and its acceptance as part of the Levitical liturgy are not necessarily coincident in date, except in psalms written with a direct liturgical purpose. In the fifteen “songs of degrees” (Pss. cxx.-cxxxiv.) we have a case in point. According to the Mishna (Iiddoth, ii. 5) and other Jewish traditions, these psalms were ‘sung by the Levites at the Feast of Tabernacles on the fifteen steps or degrees that led from the women’s to the men’s court. But when we look at the psalms themselves we see that they must originally have been a hymn-book, not for the Levites, but for the laity who came up to Jerusalem at the great pilgrimage feasts ; and the title of this hymn-book (which can be restored from the titles derived from it that were prefixed to each song when they were taken into the Levitical connexion) was simply “Pilgrimage Songs.”? All these songs are plainly later than the exile ; but some of them cannot well be so late as the formation of the Elohistic psalm-book, and the simple reason why they are not included in it is that they were hymns of the laity, describing with much beauty and depth of feeling the emotions of the pilgrim when his feet stood within the gates of Jerusalem, when he looked forth on the encircling hills, when he felt how good it was to be camping side by side with his brethren on the slopes of Zion (cxxxili.), when a sense of Jehovah’s forgiving grace and the certainty of the redemption of Israel triumphed over all the evils of the present and filled his soul with humble and patient hope.

The titles which ascribe four of the pilgrimage songs to David and one to Solomon are lacking in the true LXX., and inconsistent with the contents of the psalms. Better attested, because found in the LX.X. as well as in the Hebrew, aud therefore probably as old as the collection itself, are the name of Moses in Ps. xc. and that of David in Pss. ci., cii., evlil.-cx., cxxxviii.-cxlv. But where did the last collectors of the Psalms find such very ancient pieces which had been passed by by all previous collectors, and what criterion was there to establish their genuineness? No canon of literary criticism can treat as valuable external evidence an attestation which first appears so many centuries after the supposed date of the poems, especially

when it is confronted by facts so conclusive as that Ps. eviii. is made up of extracts from Pss. lvii. and lx. and that Ps. exxxix. is marked by its language as one of the latest pieces in the book. The only possible question for the critic is whether the ascription of these psalms to David was due to the idea that he was the psalmist par excellence, to whom any poem of unknown origin was naturally ascribed, or whether we have In some at least of these titles an example of the habit so common in later Jewish literature of writing in the name of ancient worthies. In the case of Ps. xc. it can hardly be doubted that this is the real explanation, and the same account must be given of the title in Ps. ex. if, as seems probable, it is meant to cover the whole of the great hallel or tehilla (Ps. cxlv.-cl.), which must, from 2 a ee

1 Possibly under Simon : le sae on; compare the other allel (Ps. cxlv.-cl.)

2 nipyon pwr (Abyy as in Ezra vii. 9 ¢

plural like MINA N43). eems to be properly a

the allusions in Ps. exlix., as well as from its place, be almost if not quite the latest thing in the Psalter. Davidic Psalms.—For the later stages of the history of the Psalter we have, as has been seen, a fair amount of circumstantial evidence pointing to conclusions of a pretty definite kind. The approximate dates which their con- tents suggest for the collection of the Elohistic psalm- book and of books iv. and v. confirm one another and are in harmony with such indications as we obtain from external sources. But, in order to advance from the con- clusions already reached to a view of the history of the Psalter as a whole, we have still to consider the two great groups of psalms ascribed to David in books i. and i. Both these groups appear once to have formed separate collections and in their separate form to have been ascribed to David; for in book i. every psalm, except the introduc- tory poems i. and ii. and the late Ps. xxxiii., which may have been added as a liturgical sequel to Ps. xxxii., bears the title “of David,” and in like manner the group Pss. li.-lxxii., though it contains a few anonymous pieces and one psalm which is either “of” or rather according to the oldest tradition “for Solomon,” is essentially a Davidic hymn-book, which has been taken over as a whole into the Elohistic Psalter, even the subscription lxxil. 20 not being omitted. Moreover, the collectors of books i.~~1ii. knew of no Davidic psalms outside of these two collec~~ tions, for Ps. lxxxvi. in the

appendix to the Elohistic collection is merely a cento of quotations from Davidic pieces with a verse or two from Exodus and Jeremiah. These two groups, therefore, represented to the collectors the oldest tradition of Hebrew psalmody ; they are either really Davidic or they passed as such. This fact is im- portant ; but its weight may readily be over-estimated, for the Levitical psalms comprise poems of the last half-cen- tury of the Persian empire, and the final collection of books ii. and i. may fall a good deal later. Thus the tradition that David is the author of these two collections comes to us, not exactly from the time of the Chronicler, but certainly from the time when the view of Hebrew history which he expresses was in the course of forma- tion. And it is not too much to say that that view— which to some extent appears in the historical psalms of the Elohistic Psalter—implies absolute incapacity to under- stand the difference between old Israel and later Juda- ism and makes almost anything possible in the way of the ascription of comparatively modern pieces to ancient authors. Nor will it avail to say that this uncritical age did not ascribe the Psalms to David but accepted them on the ground of older titles, for it is hardly likely that each psalm in the Davidic collections had a title before it was transferred to the larger Psalter ; and in any case the titles are manifestly the product of the same uncritical spirit as we have just been speaking of, for not only are many of the titles certainly wrong but they are wrong in such a way as to prove that they date from an age to which David was merely the abstract psalmist, and which had no idea what- ever of the historical conditions of his age. For example, Pss, xx., XX1. are not spoken by a king but addressed to a king by his people; Pss. v., xxvii. allude to the temple (which did not exist in David’s time), and the author of the latter psalm desires to live there continually. Even in the older Davidic psalm-book there is a whole series of hymns in which the writer identifies himself with the poor and needy, the righteous people of God suffering in silence at the hands of the wicked, without other hope than patiently to wait for the interposition of Jehovah (Pss. xii., xxv., xxxvil., xxxvull., &c.). Nothing can be farther removed than this from any possible situation in the life of the David of the books of Samuel, and the case is still worse in the second Davidic collection, especially where we have in the titles

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definite notes as to the historical occasion on which the poems are supposed to have been written. To refer Ps. liii. to Doeg, Ps. liv. to the Ziphites, Ps. lix. to David when watched in his house by Saul, implies an absolute lack of the very elements of historical judgment. Even the bare names of the old history were no longer correctly known when Abimelech (the Philistine king in the stories of Abraham and Isaac) could be substituted in the title of Ps. xxxiv. for Achish, king of Gath. In a word, the ascrip- tion of these two collections to David has none of the characters of a genuine historical tradition.

At the same time it is clear that the two collections do not stand on quite the same footing. The Elohistic redac- tion—the change in the names of God—extends only to the second. Now the formation of the Elohistic Psalter must have been an official act directed to the consolidation of the liturgical material of the temple, and if it left one of the so-called Davidic collections untouched the reason must have been that this collection had already a fixed liturgical position. In other words, book i. is the oldest extant liturgy of the second temple, while there is no evidence that the Davidic psalms of book ii. had a fixed liturgical place till at least the close of the Persian period.

And now the question arises: May we suppose that the oldest liturgy of the second temple was also the liturgy of the temple of Solomon? We have it in evidence that music and song accompanied the worship of the great sanctuaries of northern Israel in the 8th century B.c. (Amos v. 23), but from the context it appears probable that the musicians were not officers of the temple but rather the worshippers at large (compare Amos vi. 5). So it cer- tainly was in the days of David (2 Sam. vi. 5) and even of Isaiah (xxx. 29); the same thing is implied in the song of Hezekiah (Isa. xxxvili. 20), and in Lam. ii. 7 the noise within the sanctuary on a feast-day which affords a simile for the shouts of the victorious Chaldeans suggests rather the untrained efforts of the congregation than the disci- plined music of atemple choir. The allusion to “chambers of singers” in Ezek. xl. 44 is not found in the Septuagint text, which is justified by the context, and the first certain allusion to a class of singers belonging to the sacred min- isters is at the return from Babylon (Hzra ii. 41). The way in which these singers, the sons

of Asaph, are spoken of may be taken as evidence that there was a guild of temple singers before the exile ; but they cannot have been very conspicuous or we should have heard more of them. The historical books, as edited in the captivity, are fond of varying the narrative by the insertion of lyrical pieces, and one or two of these—the "' passover song" (Exod. xv.) and perhaps the song from the book of Jashar ascribed to Solomon (see vol. xi. p. 598)—look as if they were sung in the first temple; but they are not found in the Psalter, and, conversely, no piece from the Psalter is used to illustrate the life of David except Ps. xviii., and it occurs in a section which can be shown to be an interpolation in the original form of 2 Samuel. These facts seem to indicate that even book i. of the Psalter did not exist when the editing of the historical books was completed, and that in music as in other matters the ritual of the second temple was com- pletely reconstructed. Indeed the radical change in the religious life of the nation caused by the captivity could not fail to influence the psalmody of the sanctuary more than any other part of the worship; the book of Lamenta- tions marks an era of profound importance in the religious poetry of Israel, and no collection formed before these dirges were first sung could have been an adequate hymn- book for the second temple. In point of fact the notes struck in the Lamentations and in Isa. xl.-lxvi. meet our ears again in not a few psalms of book i., e.g., Pss. xxii., xxv., where the closing prayer for the redemption of Israel in a

verse additional to the acrostic perhaps gives, as Lagarde suggests, the characteristic post-exile name Pedaiah as that of the author; Ps. xxxi., with many points of resem- blance to Jeremiah ; Pss. xxxiv., xxxv., where the "servant of Jehovah" is the same collective idea as in Deutero- Isaiah ; and Pss. xxxviii., xlii The key to many of these psalms is that the singer is not an individual but, as in Lam. ui., the true people of God represented as one per- son; and only in this way can we do justice to expressions. which have always been a stumbling-block to those who regard David as the author. But, at the same time, other psalms of the collection treat the problems of individual religion in the line of thought first opened by Jeremiah. Such a psalm is xxxix., and above all Ps. xvi. Other pieces, indeed, may well be earlier. When we compare Ps. viii. with Job vii. 17, 18, we can hardly doubt that. the psalm lay before the writer who gave its expressions so bitter a turn in the anguish of his soul, and Pss. xx., xxi. plainly belong to the old

kingdom. But on the whole it is not the pre-exilic pieces that give the tone to the collection ; whatever the date of this or that indivi- dual poem, the collection as a whole—whether by selec- tion or authorship—is adapted to express a religious life of which the exile is the presupposition. Only in this way can we understand the conflict and triumph of spirit- ual faith, habitually represented as the faith of a poor and struggling band living in the midst of oppressors and with no strength or help save the consciousness of loyalty to Jehovah, which is the fundamental note of the whole book.

Whether any of the older poems really are David's is a question more curious than important, as, at least, there is none which we can fit with certainty into any part of his life. If we were sure that 2 Sam. xxii. was in any sense part of the old tradition of David's life, there would be every reason to answer the question in the affirmative, as has been done by Ewald (see Davip); but the grave doubts that exist on this point throw the whole question into the region of mere conjecture.

The contents of book i. make it little probable that it was originally collected by the temple ministers, whose hymn-book it ultimately became. The singers and Levites were ill provided for, and consequently irregular in their attendance at the temple, till the time of Nehemiah, who made it his business to settle the revenues of the clergy in such a way as to make regular service possible. With regular service a regular liturgy would be required, and in the absence of direct evidence it may be conjectured that the adoption of the first part of the Psalter for this. purpose took place in connexion with the other far-reaching reforms of Ezra and Nehemiah, which first gave a stable character to the community of the second temple. In any case these psalms, full as they are of spiritual elements. which can never cease to be the model of true worship, are the necessary complement of the law as published by Ezra, and must be always taken along with it by those who would understand what Judaism in its early days really was, and how it prepared the way for the gospel.

The second Davidic collection, which begins with a psalm of the exile (Ps. li. ; see the last two verses), contains some. pieces which carry us down to a date decidedly later than that of Nehemiah. Thus Ps. lxviii. 27 represents the wor- shipping congregation as drawn partly from the neighbour- hood of

Jerusalem and partly from the colony of Galilee. In several psalms of this collection, as in the Levitical psalms with which it is coupled, we see that the Jews have again begun to feel themselves a nation and not a mere municipality, though they are still passing through bitter struggles; and side by side with this there is a de- velopment of Messianic hope, which in – lxxil. takes a

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wide sweep, based on the vision of Deutero-Isaiah. All these marks carry us down for this as for the other collec- tions of the Elohistic Psalter to the time when passive obedience to the Achemenians was interrupted. Several points indicate that the collection was not originally formed as part of the temple liturgy. The title, as preserved in the subscription to Ps. xxii, 20, was not “Psalms but “Prayers of David.” Again, while the Levitical psalms were sung in the name of righteous Israel, of which, according to the theory of the second temple, the priestly and Levitical circles were the special holy representatives, these Davidic psalms contain touching expressions of con- trition and confession (li., Ixv.). And, while there are direct references to the temple service, these are often made from the standpoint, not of the ministers of the temple, but of the laity who come up to join in the solemn feasts or appear before the altar to fulfil their vows (Pss. liv. 6, lv. 14, Ixiii., Ixvi. 13, &c.). Moreover, the didactic element so prominent in the Levitical psalms is not found here.

Such is the fragmentary and conjectural outline which it seems possible to supply of the history of the two Davidic collections, from which it appears that the name of David which they bear is at least so far appropriate as it marks the generally non-clerical origin of these poems. But the positive origin of this title must be sought in another direction and in connexion with book i. From the days of Amos, and in full accordance with the older history, the name of David had been connected with musical skill and even the invention of musical instruments (Amos vi. 5). In the days of Nehemiah, though we do not hear of psalms of David,! we do learn that instruments of the singers were designated as Davidic, and the epithet ‘man of God” (Neh. xii. 36) probably implies that agreeably with this David was already

regarded as having furnished psalms as well as instruments. But it was because the temple music was ascribed to him that the oldest liturgy came to be known in its totality as "'Psalms of David," and the same name was extended to the lay collection of "Prayers of David," while the psalms whose origin was known because they had always been temple psalms were simply named from the Levitical choirs, or at a later date had no title.

Musical Execution and Place of the Psalms in the Temple Service. ~The musical notes found in the titles of the psalms and occasion- ally also in the text (Selah, Higgaion) are so obscure that it seems unnecessary to center here upon the various conjectures that have been made about them. The clearest point is that a number of the psalms were set to melodies named after songs,? and that one of these songs, beginning novn-by (Al-taschith in E.V., Ps. lvii. sq.), may be probably identified with the vintage song, Isa. lxv. 8. The temple music was therefore apparently based on popular melodies. A good deal is said about the musical services of the Levites in Chronicles, both in the account given of David's ordi- nances and in the descriptions of particular festival occasions. But unfortunately it has not been found possible to get from these accounts any clear picture of the ritual or any certainty as to the

technical terms used. By the time of the Septuagint these terms were no longer understood ; it is not quite clear whether even the san understood them fully. e music of the temple attracted the attention of Theophrastus (ap. Porph., De Abst., 'ii. 26), who was perhaps the first of the Greeks to make observations on the Jews. His description of the temple ritual 1s not strietly accurate, but he speaks of the wor- anes as passing the night in gazing at the stars and calling on ' ao st prayer ; his words, if they do not exactly fit anything in e later ritual, are well fitted to illustrate the original liturgical use of Pss. vu, exxxiv. Some of the Jewish traditions as to the use of partieular psalms have been already cited ; it may be added that the Mishna (Témid) assigns to the service of the continual

1 Te, not in th i i Meek ee € parts of the book of Nehemiah which are by

2 Compare the similar way of eiting

'al kala, &e., in Syriac (Land, Aneecd, Lamy).

melodies with the prep. ‘al or » lv. ; Ephr. Syr., Zymni, ed.

purnt-offering the following weekly cycle of psalms, —(1) xxiv., (2) xlviii., (3) lxxxii., (4) xciv., (5) Ixxxi., (6) xciil., (Sabbath) xci.., asin the title. Many other details are given in the treatise Saférim, but these for the most part refer primarily to the synagogue service after the destruction of the temple. For details on the liturgical use of the Psalter in Christendom the reader may refer to Smith’s Diet. Chr. Ant., s.v. “ Psalmody.”

Ancient Versions.—A. The oldest version, the LXX., follows a text generally closely corresponding to the Massoretic Hebrew, the main variations being in the titles and in the addition (lacking in some MSS.) of an apocryphal psalm ascribed to David when he fought with Goliath. Pss. ix. and x. are rightly taken as one psalm, but conversely Ps. exlvii. is divided into two. The LXX. text has many “‘ daughters,” of which may be noticed (a) the Memphitic (ed. Lagarde, 1875); (b) the old Latin, which as revised by Jerome in 383 after the current Greek text forms the Psalterium Romanum, long read in the Roman Church and still used in St Peter’s ; (c) various Arabic versions, including that printed in the polyglotts of Le Jay and Walton, and two others of the four ex- hibited together in Lagarde’s Psalterium, Iob, Proverbia, Arabice, 1876; ou the relations and history of these versions, see G. Hoffmann, in Jenaer Literaturz., 1876, art. 589; the fourth of Lagarde’s versions is from the Peshito. The Hexaplar text of the LXX., as reduced by Origen into greater conformity with the Hebrew by the aid of subsequent Greek versions,? was further the mother (d) of the Psalterium Gallicanum,—that is, of Jerome’s second revision of the Psalter (385) by the aid of the Hexaplar text; this edition became current in Gaul and ultimately was taken into the Vulgate (e) of the Syro-Hexaplar ver- sion (published by Bugati, 1820, and in facsimile from the famous Ambrosian MS. by Ceriani, Milan, 1874). B. The Christian Aramaic version or Peshito (P’shitta) is largely influenced by the LXX.; compare Baethgen, Untersuchungen diber die Psalmen nach der Peschita, Kiel, 1878 (unfinished). This version has peculiar titles taken from Eusebius and Theodore of Mopsuestia (see Nestle, in Theol. Literaturz., 1876, p. 283). C. The Jewish Aramaic version or Targum is probably alate work. The most

convenient edition isin Lagarde, Hagiographa Chaldaice, 1873. D. The best of all the old versions is that made by Jerome after the Hebrew in 405. It did not, however, obtain ecclesiastical currency— the old versions holding their ground, just as English churchmen still read the Psalms in the version of the ‘‘ Great Bible” printed in their Prayer Book. This important version was first published in a good text by Lagarde, Psal- terium iuxta Hebreos Hieronymi, Leipsic, 1874.

Exegetical Works.—While some works of patristic writers are still of value for text criticism and for the history of early exegetical tradition, the treatment of the Psalms by ancient and medieval Christian writers is as a whole such as to throw light on the ideas of the commentators and their times rather than on the sense of a text which most of them knew only through translations. For the Psalms as for the other books of the Old Testament the scholars of the period of the revival of Hebrew studies about the time of the Reformation were mainly dependent on the ancient versions and on the Jewish scholars of the Middle Ages. In the latter class Kimhi stands pre-eminent ; to the editions of his commentary on the Psalms cnumerated in the artiele KimHI must now be added the admirable edition of Dr Schiller-Szinessy (Cambridge, 1883), con- taining unfortunately only the first book of his longer commentary. Among the works of older Christian scholars since the revival of letters, the commentary of Calvin (1557)—full of religious insight and sound thought—and the laborious work of M. Geier (1668, 1681 et s#pius) may still be consulted with advantage, but for most purposes Rosenmiiller’s Scholia in Pss. (2d ed., 1821-22) supersedes the necessity of frequent reference to the predecessors of that industrious com- piler. Of more recent works the freshest and most indispensable are Ewald’s, in the first two half volumes of his Dichter des alten Bundes (2d ed., Gottingen, 1866 ; Eng. tr., 1880), and Olshausen’s (1853). To these may be added (excluding general commentaries on the Old Testament) the two aeute but wayward com- mentaries of Hitzig (1836, 1863-65), that of Delitzsch (1859-60, then in shorter . form in several editions since 1867 ; Eng. tr., 1871), and that of Hupfeld (2d ed. by Riehm, 1867, 2 vols.). The last-named work, though lacking in original power and clearness of judgment, is extremely convenient and useful, and has had an influence perhaps disproportionate to its real exegetieal merits. The question of the text was first properly raised by Olshausen, and has since

received special attention from, among others, Lagarde (Prophetx# Chald., 1872, p. xlvi. sg.), Dyserinck (in the ‘‘scholia” to his Dutch translation of the Psalms, Theol. Tijdschr., 1878, p. 279 sq.), and Bickell (Carmina V. T. metrice, &c., Innsbruck, 1882), whose eritical services are not to be judged merely by the lueasure of assent which his metrical theories may command. 1n English we have, among others, the useful work of Perowne (5th ed., 1883), that of Lowe aud Jennings (2d ed., 1885), and the valuable translation of Cheyne (1884). The mass of literature on the Psalnis is so enormous that no full list even of recent commentaries can be here attempted, much less an enumeration of treatises on individual psalms and special critical questions. For the latter Kuenen’s Onderzoek, vol. iii., is, up to its date (1865), the most complete, and the new edition now in preparation will doubtless prove the standard work of reference. As regards the dates and historical interpretation of the Psalms, all older dis- eussions, even those of Ewald, are in great measure antiquated by recent pro- – gress in Pentateuch criticism and the history of the canon, and an entirely fresh treatment of the Psalter by a sober critical commentator is urgently needed. GY¥RSS)

PSALTERY. For the medieval instrument of this name (“sautrie” or ‘‘cembalo”), see PIANOFORTE (vol. xix. p. 65). The Hebrew 933, rendered YaAripior,* véBXa, Padpos (Ps. lxxi. 22), xebdpa (Ps. lxxxi, 2), dpyavov (Am. v. 23, vi. 5), in the LXX., and “psaltery” or “viol” in the A.V. (also “lute” in the Prayer-Book version of the Psalms), appears to have been a small stringed instrument, harp or lyre, the strings of which were touched with the player’s fingers. The statement of Josephus (Ant., vii. 12, 3), that the xuvépa (1123) had ten strings and was struck with the plectrum, while the v¢Bda had twelve and was played with the hand, is the earliest definition having any authority to be met with of these obscure instruments. The xwvtpa, if not a smaller lyre with tighter strings re-

3 See Field, Origenis Hexapla, where the fragments of these ver-

a are colleeted. That of Symmachus is esteemed the best. This word reappears in the PWAID! of Dan, iii. 5, &e.

quiring a plectrum, may, as some suppose, have been a kind of guitar, rather a tamboura, the most extensively known Eastern stringed instrument, which, in principle, is found represented in the oldest Egyptian monuments. The paucity of strings in the latter is, however, against this attribution. Nothing being more variable than the number of strings attached to the various stringed instru- ments at different times and in different places, eight, nine, or ten strings to the xevvpa, or ten (see Ps. xxxiil. 2, cxliv. 9, Heb.) or twelve to the vaGda, are probably immaterial variations. The musical instruments of the Bible are the most difficult subject in musical archeology, about which the translators of the A.V. or the Prayer-Book Psalms did not trouble themselves, but named the instruments from those in use around them.

PSAMMETICHUS. See Eeypt, vol. vii. p. 743.

PSELLUS, the name of several Byzantine writers, of whom the following were the most important.

1. Micuart PseLtvus the elder, a native of Andros and a pupil of Photius. He flourished in the second half of the 9th century, and strove to stem the rising tide of bar- barism by his devotion to letters and philosophy. His study of the Alexandrine theology, as well as of profane literature, brought him under the suspicions of the ortho- dox, and a former pupil of his, by name Constantine, accused him in an elegiac poem of having abandoned Christianity. In order to perfect his knowledge of Christ- ian doctrine, Psellus had recourse to the instructions of Photius, and then replied to his adversary in a long iambic poem, in which he maintained his orthodoxy. It has been conjectured by Allatius, Cave, and others that some of the books commonly attributed to the younger Psellus are the works of the elder, ¢.g., the Dialogue on Operations of Demons, and the short treatises On the Virtues of Stones and On Demons. Their reasons, however, resting on the inferiority of literary style and mode of treatment, are inconclusive,

2. MICHAEL CONSTANTINE PsELLUS the younger was born at Constantinople in 1020, of a consular and patrician family. He studied at Athens, and by his talents and vast industry made himself master of all the learning of the age, including theology, law, physics, mathematics, philosophy, and history. At Constantinople he taught philosophy, rhetoric,

and dialectic with the greatest suc- cess, and was honoured with the title of “Prince of Philosophers” by the emperors, who sometimes sought his advice and employed his services. But in 1078, when his pupil, the emperor Michael Ducas, was deposed, Psellus shared his downfall, being compelled by the new emperor, Nicephorus Botanias, to retire to a monastery. On his accession to the empire in 1081 Alexius Comnenus de-

prived Psellus of his title of “Prince of Philosophers” and

transferred it to his less talented rival John the Italian.

He appears to have been still alive in 1105 and perhaps mm 10,

Of his works, which are very numerous, many have not yet been printed. Even of those which have been printed there is no com- plete edition. Of his published works we nay mention—(1) his mathematical Opus in quatuor Mathematicas Disciplinas, Arith- meticam, Musicam, Geometriam, et Astronomiam, published at Venice in 1532, and several times reprinted, as at Basel in 1556 with the notes of Xylander; (2) a Paraphrase of Aristotle’s Tlepi eppnvelas, published in Greek by Aldus at Venice in 1503; (3) Synopsis legum, in iambic verse, edited with a Latin translation and notes by Franciscus Bosquetus, Paris, 1632; (4) De Vitits et Virtu- tibus, et Allegoriz, in iambic verse, published by Arsenius at Rome (no date), and reprinted at Basel, 1544 ; (5) Ilept évepyeias dardvav didoyos (De operatione demonum dialogus), translated into Latin by Petrus Morellus and published at Paris in 1577 ; (6) De lapidum virtutibus, published in Greek and Latin at Toulouse in 1615 (for 5 and 6 see MicuarL PsELLus above). :

PSEUDONYMOUS LITERATURE. GRAPHY, vol. ili. pp. 657-658,

See Brsuio-

PSKOFF, a government of the lake-region of north- west Russia, which extends from Lake Peipus to the source of the Dwina, having St Petersburg on the N., Novgorod, Tver, and Smolensk on the E., Vitebsk on the S., and Livonia on the W. It has an area of 16,678 square miles. In the south-east it extends partly over the Alaun heights —a broad ridge 800 to 1000 feet

above the sea, deeply in- dented with numerous valleys and ravines, thickly covered with forests, and dotted with small lakes and ponds. In the district of Toropets these heights take the name of Vorobiovy Hills ; extending westwards into Vitebsk, they send to the north a series of irregular ranges, separated by broad valleys, which occupy the north-western parts of Pskoff and give rise to the rivers flowing into Lakes Peipus and Ilmefi. A depression 120 miles long and 35 miles broad, watered by the Lovat and Polist, occupies the inter- val between the two hilly tracts ; it is covered throughout with forests and thickly studded with marshes overgrown with rank vegetation, the only tracts suitable for human occupation being narrow isolated strips of land on the banks of rivers, or between the marshes, and no communi- cation is possible except along the watercourses. These marshy tracts, which extend westwards into Vitebsk and north-eastwards towards St Petersburg, were even more impassable ten centuries ago, and, encircling the old Russian city of Pskoff, formed its best protection against the repeated attacks of its neighbours.

With the exception of the south-eastern corner, where Carboniferous rocks make their appearance, nearly the whole of the government consists of Devonian deposits of great thickness,—the Old Red Sandstone, with sub-ordinate layers of various sandstones, and clays containing brown iron ore; and the White Limestone, which contains ~ layers of dolomite, marls, clays with deposits of gypsum, and white sandstone, which is extensively quarried for building purposes. As regards the fauna the Devonian deposits of Pskoff are intermediate between those of Belgium, the Eifel, and Poland and those of middle Russia. The whole is covered with very thick sheets of boulder clay and bears unmistakable traces of glacial action ; the bottom moraine of the Scandinavian and Finnish ice-sheet formerly extended over the whole of this region, which often takes the shape of ridges (Lames or eskers), the upper parts consisting of Glacial sands and post-Glacial clays, sands, and peat-bogs. The soil is thus not only infertile on the whole, but also badly drained, on account of the impermeable nature of the boulder clay and the frequent occurrence of depressions having no distinct outlets to the rivers. Only those parts of the territory which are covered with thicker strata of post-Glacial deposits are suitable for agriculture.

The rivers are numerous and belong to three separate basins—to Lakes Peipus and Pskoff the rivers in the north- west, to Lake Ilmeii those in the middle, and to that of the Dwina the rivers in the south-east. A great number of small streams pour into Lake Pskoff, the chief being the Velikaya, which flows from south to north and receives numerous tributaries, which are used for floating rafts, a wide region being thus brought into communication with Lake Peipus and thence with the Narova. The Velikaya, which is now navigable for only 25 miles from Lake Pskoff, was formerly deeper. The Lovat and Sheloii, belong- ing to the basin of Lake I]meii, are both navigable, and a lively traffic is carried on on both; while the Dwina flows for 100 miles on the borders of the government or within it, and is used only for floating timber. There are no less than 850 lakes in Pskoff, with a total area of 391 square miles. The largest is Lake Pskoff, which is 50 miles long and 13 broad, and covers 312 square miles, having a depth of from 3 to 18 feet; it is connected by a channel, 40 miles

long and 3 to 10 wide, with Lake Peipus. Its islands, numbering nearly fifty, have an aggregate population of 2000 persons. The marshes on the banks of the Polist are nearly 1250 square miles in extent ; one in the neigh- bourhood of Lake Dviniye is 27 miles long and 17 broad, and another on the Toropa extends for 17 miles, while many elongated marshes, 15, 20, and 30 miles long and from 2 to 3 broad, run parallel to one another in the broad depression of the Lovat. Forests occupy nearly one-half (about 45 per cent.) of the entire area, and in some districts (Cholm, Toropets, Porkhoff) as much as two- thirds of the surface. Large pine forests are met with in the north; in other parts the birch and aspen prevail ; but almost one-quarter of the forest area is covered with low brushwood.

The climate is very moist and changeable. The average temper- ature is 41° Fahr. (17°°1 in January and 64°°8 in July).

The population of the government, which was 895,710 in 1881 (718,910 in 1863), consists almost exclusively of Great Russians, there being only 8000 Esthonians (in the district of Pskoff), about 500 Letts, and less than 1500 Jews. Many German traders live at Pskoff. The Russians and the greater part of. the Esthonians belong to the Greek Church, or are Nonconformists

(upwards of 12,000 in 1866, according to official figures). Of the total number of inhabitants only 58,900 live in towns, the remainder being distributed over no fewer than 15,000 small villages. ,

Notwithstanding the infertility of the soil the chief occupation is agriculture —rye, oats, barley, and potatoes being grown every- where ; but though corn is exported by the larger landowners to the average annual amount of nearly 1,600,000 bushels the amount imported is much greater (9,600,000 bushels). The annual export of flax is estimated at 530,000 ewts., Pskoff, Ostroff, Opotchka, Porkhoff, and Soltsy being important centres for the trade. The average annual crops during 1870-77 were 28,972,800 bushels of corn and 5,984,000 bushels of potatoes. The limited area of pasture lands is unfavourable for cattle- breeding, and in 1881 there were only 171,000 horses, 304,000 head of cattle, and 166,000 sheep ; mur- rains are very frequent. Fishing is a considerable source of wealth on the shores of the larger lakes, small salted or frozen fish (snyetk?) being annually exported to the value of £25,000 or £35,000. The timber trade is steadily increasing, the exports being estimated at present at nearly £50,000; wood for fuel is, however, at the same time imported from the government of St Petersburg. The popu- lation engage also in the preparation of lime, in stone-quarrying, in the transport of merchandise, and in some domestic trades. The manufactures are insignificant; their aggregate production in 1879 reached £518,800, and gave occupation to only 2350 persons. The total amount of merchandise loaded and discharged on the rivers within the government in 1880 was 1,761,000 ewts.

Pskoff is divided into eight districts, the chief towns of which are—Pskoff (21,170 inhabitants), Cholm (5550), Novorjeff (1915), Opotchka (4075), Ostroff (4200), Porkhoff (3925), Toropets (5760), Velikiya Luki (6600). Alexandrovskii Posad (2920) and Soltsy (5825, an important shipping place on the Shelofi river) have also

municipal institutions.

PSKOFF, capital of the above government, is pictur- esquely situated on both banks of the broad Velikaya river, 9 miles from Lake Pskoff and 171 miles by rail south-west of St Petersburg. The chief part of the town, with its kremlin on a hill and several suburbs, occupies the right bank of the

river, to which the ruins of its old walls descend; the Zapskovie, consisting of several suburbs, stretches along the same bank of the Velikaya below its confluence with the Pskova; and the Zavelitchie occupies the left bank of the Velikaya,—all three keeping their old historical names. The cathedral in the kremlin has been four times rebuilt since the 12th century and contains some very old shrines, as also the graves of the bishops of Pskoff and of several princes, including those of Dovmont and Vsevolod. The church of Dmitrii Solunskii also dates originally from the 12th century ; there are others belong- ing to the 14th and 15th. The Spaso-Mirojskii monastery, founded in 1156, has many remarkable antiquities. The ruins of numerous rich and populous monasteries in or near the town attest its former wealth and greatness. The present town is ill built, chiefly of wood, and shows traces of decay. Many of the inhabitants live by agriculture

or gardening ; the remainder are engaged in loading and unloading merchandise on the Velikaya and at the rail- way station, in combing flax, fishing, and domestic trades. The manufactures are unimportant. Since the completion of the St Petersburg and Warsaw railway the trade of Pskoff has increased. In 1880 the exports reached 99,000 ewts. on the Velikaya and 463,000 cwts. by rail; the imports were 125,700 ewts. on the Velikaya and 591,600 ewts. by rail. Pskoff has regular steam communication . with Dorpat. The population in 1882 was 21,170 (15,086 _ in 1866).

History.—Pskoff, formerly the sister republic of Novgorod, and one of the oldest cities of Russia, maintained its independence and its free institutions until the 16th century, being thus the last to be brought under the rule of Moscow. Its annals, unquestion- ably the fullest and liveliest of any in Russia, affirm that it already existed in the time of Rurik ; and Nestor mentions under the year 914 that Igor’s wife, Olga, was brought from Pleskoff (i.¢., Pskoff). It was quite natural that a Russian fortified town should rise at the entrance of the Velikaya valley within the earliest period of the Russian colonization of that region ; the river had from a remote antiquity been a channel for the trade of the south with the north Baltic coast. Pskoff being an important strategic point, its pos- session was obstinately disputed between the Russians and the Germans and

Lithuanians, and throughout the 11th and 12th centuries numerous battles were fought. At that time the place had its own independent institutions ; but, attacked as it was from the west, it became in the 12th century a "' prigorod" of the Nov- gorod republic,—that is (so far as can be judged from the incom- plete testimony of historical documents), a city having its own free institutions, but included in certain respects within the juris- diction of the metropolis, and compelled in time of war to march against the common cnemy. Pskoif had, however, its own prince (defensor municipii) ; and in the second half of the 13th century Prince (Timotheus) Dovmont fortified it so strongly, and was so successful in repelling its enemies, that the town acquired much importance and asserted its independence of Novgorod, with which in 1848 it concluded a treaty wherein the two republics were recog- nized as equals. The institutions of Pskoff resembled those of Novgorod ; it, in its turn, had several prigorods, and its rule ex- tended over the territory which now forms the districts of Pskoff, Ostroff, Opotchka, and Gdoff. Within this territory the ''vyetche " or ''forum"' of Pskoff was sovereign, the vyetches of the subordinate towns being supreme in their own municipal affairs. The city of Pskoff was divided into several sections or ''kontsy," according to the prevalent occupations of the inhabitants, and the kontsy were divided into ''ulitsy" (streets), which cnjoyed extensive powers of self-government. The vyetche was supreme in all affairs of general interest, as well as a supreme court of justice, and the princes were elected by it; these last had to defend the city and levied the taxes, which were assessed by twelve citizens, who com- bined to some extent the functions of judges with those of a jury. Pskoff differed widely, however, from Novgorod in the more demo- cratic character of its institutions; and, while the latter con- stantly showed a tendency to become an oligarchy of the wealthier merchants, the former figured as a republic where the influence of the poorer classes prevailed. Its trading associations, supported by those of the labourers, checked the influence of the wealthier merchants.

This struggle (of which the annals give a lively picture) con- tinued throughout the 14th and 15th centuries, resulting sometimes in armed riots. Notwithstanding these conflicts Pskoff was a very wealthy city. Its strong walls, whose ruins are still to be seen, its forty-two large and wealthy churches, built during this period, as also its humerous monasteries and its extensive trade, bear testimony to the wealth of the inhabitants, who then

numbered about 60,000. The ‘‘dyetinets ” or fort, enclosed by a stone wall erected by Dov- mont, stood on a hill between the Pskova and the Velikaya, having within its walls the cathedral of the Holy Trinity. Another stone wall enclosed the commercial part, the Kromy (kremlin) or middle town. In 1465 the suburb Polonische became so prosperous that it also was enclosed by a wall, and included within the circuit of the town proper. Even the Zapskovie was enclosed by a wooden palisade in the 15th century and later on by a stone wall; while the Zave- litchie was a busy centre of foreign trade. As early as the 13th century Pskoff had become an important station for the trade between Novgorod and Riga. A century later it entered the Hanseatie League. Its merchants and trading associations had factories at Narva, Revel, Riga, and exported fiax, corn, tallow, skins, tar, pitch, honey, and timber for shipbuilding, which were transported or shipped via Lake Peipus, the Narova, and the Embach to the ports on the Baltic and on the Gulf of Finland. Silks, woollen stuffs, and all kinds of manufactured wares were brought back in exchange and sold throughout northern Russia.

Internal and ex- ternal,

i Y —

Nevertheless, the continuous struggle between the “black” and ‘white’ people (the patricians and the plebeians) offered many opportunities to Moscow for interference in the internal affairs of Pskoff, especially with regard to the election of the princes, which was often the occasion of severe conflicts. In 1399 the prince of Moscow arrogated the privilege of confirming the elected prince of Pskoff in his rights ; and though, fifty years later, Pskoff and Noy- corod concluded several defensive treaties against Moscow the fall of both republics was inevitable, the poorer classes continuing to seek at Moscow a protection against the oppression of the richer citizens. After the fall of Novgorod (1475) Pskoff could no longer maintain its independence, and in 1510 it was taken by Vasilii Joannovitch. The vyetche was abolished and its bell taken away, and a waywode was nominated by Moscow to govern the city. Moscow merchants were settled at Pskoff, and put in possession of the fortunes of the former citizens. The conquered territory still maintained to some extent its self-government, especially with re-

gard to trade, but the struggle between rich and poor was aggravated by the intervention of foreigners. The “lutschiye ludi” (wealthier merchants) prohibited the ‘“‘malomotchnyie” (poorer merchants) from entering into direct trade relations with foreigners, and com- pelled them to sell their wares to themselves or to become their agents. These disputes furnished Moscow at the end of the 17th century with a pretext for abolishing the last vestiges of self-govern- ment at Pskoff, and for placiug all affairs of local administration in the hands of the Moscow waywodes. Thenceforward Pskoff fell into rapid decay. It became a stronghold of Russia against Poland and was besieged for seven months by Stephan Bathory during the Livonian War, and later on by Gustavus Adolphus. Under Peter I. it became a fortified camp, and its walls were protected by earth- works. But it never recovered its former importance, and is now one of the poorer cities of the empire. (e. &. K.)

PSYCHE. See Cupmp.

PSYCHOLOGY

The Standpoint of Psychology.

WN the several natural sciences the scope and subject- i matter of each are so evident that little preliminary discussion on this score is called for. It is easy to dis- tinguish the facts dealt with in a treatise on light from those that belong to one on sound; and even when the need arises to compare the results of two such sciences— as in the case, say, of light and electricity— there is still no difficulty,—apart, of course, from any which the im- perfect state of the sciences themselves may occasion. Theoretically, a standpoint is attainable from which this comparison can be made, in so far, say, as the facts of both sciences can be expressed in terms of matter and motion. But with psychology, however much it is freed from metaphysics, all this is different. It is indeed ordi- narily assumed that its subject-matter can be at once defined: “It is what you can perceive by consciousness or reflexion or the internal sense,” says one, “just as the subject-matter of optics is what you can perceive by sight.” Or, “psychology is the science of the phenomena of mind,” we are told again, “and is thus marked off from the

physical sciences, which treat only of the phenomena of matter.” But, whereas nothing is simpler than to dis- tinguish between seeing and hearing, or between the phenomena of heat and the phenomena of gravitation, a very little reflexion may convince us that we cannot in the same fashion distinguish internal from external sense, or make clear to ourselves what we mean by phenomena

of mind as distinct from phenomena of matter.

Let us begin with the supposed differentia of internal and ex- ternal; and first of all what are we to understand by an inner sense? To every sense there corresponds a sense-organ ; the several senses are distinct and independent, so that no one sense can add to or alter the materials of another ; and each is swt generis as regards quality,—the possession of five senses, ¢.9., furnishing no data as to the character of a possible sixth. Moreover, sense-im- pressions are passively reccived and occur in the first instance with- out regard to the feeling or volition of the recipient and without any manner of relation to the ‘‘ contents of consciousness ” at the moment. Now such a description will apply but very partially to the so-called ‘internal sense.” We can imagine consciousness without seclf-consciousness, still more without introspection, much as we can imagine sight without taste or smell. But this does not entitle ns to speak of self-conscionsness as a sense. For we do not by means of it passively receive impressions differing from all previous presentations, as the sensations of colour for one couched differ from all he has experienced before: the new facts consist rather in the recognition of certain relations among pre-existing presentations, z.¢., are due to our mental activity and not to a special mode of what has been called our sensitivity. For when we taste we cannot hear that we taste, when we see we cannot smell that we see ; but when we taste we may be conscious that we taste, when we hear we may be conscious that we hear. In this way all the objects of the external senses are recognized as having new relations by the miscalled ‘‘internal sense.’’ Moreover, the facts so ascertained are never independent of fecling and volition and of the contents of consciousness at the time, as true sensations are. Alsoif we consult the physiologist we learn that there is no evidence of any organ or “‘ centre” that could be regarded as the ‘‘ physical

basis” of this inner sense; and, if sclf-consciousness alone is tempo- rarily in abeyance and a man merely ‘‘beside himself,” such state of delirium has little analogy to the functional blindness or deafness that constitutes the temporary suspension of sight or hearing.

To the conception of an internal perception or observation the preceding objections do not necessarily apply,—that is to say, this conception may be so defined that they need not. But then in proportion as we escape the charge of assuming a special sense which furnishes the material for such perception or observation, in that same proportion are we compelled to seek for some other mode of distinguishing its subject-matter. For, so far as the mere mental activity of perceiving or observing is concerned, it is not easy to see any essential difference in the process whether what is observed be psychical or physical. It is quite true that the so-called psychological observation is more difficult, because the facts observed are often less definite aud less persistent, and admit less of actual isolation than physical facts do; but the process of recognizing similarities or differences, the dangers of mal-observa- tion or non-observation, are not materially altered on that account. It may be further allowed that there is one difficulty peculiarly felt in psychological observation, the one most inaccurately ex- pressed by saying that herg the observer and the observed are one. But this difficulty is surely in the first instance due to the very obvious fact that onr powers of attention are limited, so that we cannot alter the distribution of attention at any moment without altering the contents of cousciousness at that moment. Accord- ingly, where there are no other ways of surmounting this difficulty, the psychological observer must either trust to representations at a later time, or he must acquire the power of taking momentary glances at the psychological aspects of the phase of consciousness in question. And this one with any aptitude for such studies can do with so slight a diversion of attention as not to disturb very seriously either the given state or that which immediately succeeds it. But very similar difficulties have to be similarly met by physical observers in certain special cases, as, ¢.9., in observing and registering the phenomena of solar eclipse ; and similar apti- tudes in the distribution of attention have to be acquired, say, by extempore orators or skilful surgeons. Just as little, then, as there is anything that we can with propriety call an inner sense, just so little can we find in the process of inner perception any satis- factory

characteristic of the subject-matter of psychology. The question still is: What is it that 1s perceived or observed ? and the readiest answer of course is: Internal experience as distinguished from external, what takes place in the mind as distinct from what takes place without.

This answer, it must be at once allowed, is adequate for most purposes, and a great deal of excellent psychological work has been done without ever calling it in question. But the distinction be- tween internal and external experience is not one that can be drawn from the standpoint of psychology, at least not at the outset. From this standpoint it appears to be either (1) inaccurate or (2) not extra-psychological. As to (1), the boundary between the snternal and the external was, no doubt, originally the surface of the body, with which the subject or self was identified ; and in this sense the terms are of course correctly used. Fora thing may, in the same sense of the word, be in one space and therefore not in —i.e., ont of—another ; but we express no intelligible relation if we speak of two things as being one in a given room and the other in last week. Any one is at liberty to say if he choose that a certain thing is “in his mind”; but if in this way he distinguishes it from something else not in his mind, then to be intelligible this must imply one of two statements, —cither that the something else is actually or possibly in some other mind, or, his own mind being alone considered, that at the time the something else does not exist at all. Yet, evident as it seems that the correlatives in and not-in must both apply to the same category, whether space,

Mental and material.

Stand- point of psycho- logy.

time, presentation (or non-presentation) to a given subject, and so forth, we still find psychologists more or less consciously con- fused between “internal,” meaning “ presented” in the psychological sense, and “external,” meaning not “not-presented ” but corporeal or oftener extra-corporeal. But (2), when used to distinguish between presentations (some of which, or some relations of which with respect to others, are called “internal,” and others or other relations, “ external”), these terms are at all events accurate ;

only then they cease to mark off the psychological from the extra-psychological, inasmuch as psychology has to analyse this distinc- tion and to cxhibit the steps by which it has come about. But we have still to examine whether the distinction of phenomena of Matter and phenomena of Mind furnishes a better dividing line than the distinction of internal and external. — : ;

A phenomenon, as commonly understood, is what is manifest, sensible, evident, the implication being that there are eyes to see, cars to hear, and so forth,—in other words, that there is presenta- tion to a subject ; and wherever there is presentation to a subject it will be allowed that we are in the domain of psychology. But in talking of physical phenomena we, in a way, abstract from this fact of presentation. Though consciousness should cease, the physicist would consider the sum total of objects to remain the same: the orange would still be round, yellow, and fragrant as before. For the physicist—whether aware of it or not—has taken up a position which for the present may be described by saying that phenomenon with him means appearance or manifestation, or—as we had better say—object, not for a concrete individual, but rather for what Kant called Bewusstsein tiberhaupt, or, as some render it, the objective consciousness, 2.¢., for an imaginary subject freed from all the limitations of actual subjects save that of depending on “sensi- bility ” for the material of experience. However, this is not all, for,

as we shall see presently, the psychologist also occupies this posi- |

tion ; at least if he does not, his is not a true science. But further, the physicist leaves out of sight altogether the facts of attention, feeling, and so forth, all which actual presentation entails. From the psyehological point of view, on the other hand, the removal of the subject removes not only all such facts as attention and feeling, but all presentation or possibility of presentation whatcver. Surely, then, to call a certain object, when we abstract from its presentation, a material phenomenon, and to call the actual presentation of this object a mental phenomenon, is a clumsy and confusing way of representing the difference between the two points of view. For the terms “ material” and “mental” sgem to imply that the two so-called phenomena have nothing in common, whereas the same object is involved

in both, while the term “ phcnomenon” implies that the point of view is in each case the same, when in truth what is emphasized by the one the other ignores.

Paradoxical though it may be, we must then conclude that psychology cannot be defined by reference to a special subject-matter as such concrete sciences, for example, as mineralogy and botany can; and, since it deals in some sort with the whole of experience, it is obviously not an abstract science, in any ordinary sense of that term. To be characterized at all, therefore, apart from metaphysical assumptions, it must be characterized by the standpoint from which this experience is viewed, It is by way of expressing this that widely different schools of psychology define It as subjective, all other positive sciences distinguished as objective, than a first approximation

being But this seems scarcely more a fi to the truth, and, as we have seen incidentally, is apt to be misleading. The distinction rather is that the standpoint of psychology is what is some- times termed “ individualistic,” that of the so-called object- sciences being “‘universalistic,” both alike being objective in the sense of being true for all, consisting of what Kant would call judgments of experience. For psychology is not a biography in any sense, still less a biography deal ing with idiosyncrasies, and in an idiom having an interest and a meaning for one subject only, and incommunicable to any other. Locke, Berkeley, and Hume have been of late severely handled because they regarded the critical investigation of knowledge as a psychological problem and set to work to study the individual mind simply for the sake of this problem. But none the less their stand- point was the proper one for the science of psychology itself; and, however surely their philosophy was fore- doomed to a collapse, there is no denying a steady psycho- logical advance as we pass from Locke to Hume and his modern representatives, By “idea” Locke tells us he

means “whatsoever is the object of the understanding when a man thinks” (i.¢., is conscious), and having, as it were, shut himself within such a circle of ideas he finds himself powerless to explain his knowledge of a world that is independent of it; but he is able to give a very good account of some of

these ideas themselves. He cannot justify his belief in the world of things whence certain of his simple ideas ‘‘were conveyed” any more than Robinson Crusoe could have explored the continents whose products were drifted to his desert island, though he might perhaps survey the island itself well enough. Berkeley accord- ingly, as Professor Fraser happily puts it, abolished Locke’s hypothetical outer circle. Thereby he made the psycho- logical standpoint clearer than ever—hence the truth of Hume’s remark, that Berkeley’s arguments ‘‘admit of no answer”; at the same time the epistemological problem was as hopeless as before—hence again the truth of Hume’s remark that those arguments ‘produced no conviction.” Of all the facts with which he deals, the psychologist may truly say that their esse is percept, inasmuch as all his facts are facts of presentation, are ideas in Locke’s sense, or objects which imply a subject. Before we became con- scious there was no world for us; should our consciousness cease, the world for us ceases too; had we been born blind, the world would for us have had no colour; if deaf, it would have had no sounds; if idiotic, it would have had no meaning. Psychology, then, never transcends the limits of the individual; even the knowledge that there is a real world, as common-sense assumes, is, when psycho- logically regarded, an individual’s knowledge, which had a beginning and a growth, and can have an end. In fact, for the psychologist it is not ‘essentially knowledge, but presentations, partly possible, partly actual, in the mind of A, B, or C; just as this page is for the printer essentially “copy,” and only for the reader essentially “discourse.” But what the psychologist has to say about knowledge is, of course, itself knowledge, @.¢., assuming it to be correct ; the knowledge about which he knows is, however, for him not primarily knowledge, but “states of consciousness.”

But now, though this Berkeleyan standpoint is the standpoint of psychology —as we find it occupied, say, by J. 8. Mill and Dr Bain—psychology is not pledged to the method employed by Berkeley and by Locke. Psycho- logy may be individualistic without being confined ex- clusively to the introspective method. There is nothing to hinder the psychologist from employing materials fur- nished by his observations of other men, of infants, of the lower animals, or of the insane; nothing to hinder him taking counsel with the philologist or even the physiologist, provided always he can show the psychological bearings of those facts which are not directly psychological. N or, again, are we bound, because we take the

individualistic stand- point as psychologists, to accept the philosophical conclu- sions that have been reached from it, unless, indeed, we hold that it is the right point of view for philosophical speculation. A psychologist may be an idealist in Berkeley's sense or in Fichte's, but he need not ; he is just as free, if he see reason, to call himself, after Hamilton, a natural real- ist; only psychology will afford him no safe warrant for the realism part of it. The standpoint of psychology, then, is individualistic; by whatever methods, from whatever sources its facts are ascertained, they must—to have a psychological import—be regarded as having place in, or as being part of, some one's consciousness, In this sense, %€., aS presented to an individual, "the whole choir of heaven and furniture of earth" may belong to psychology, but otherwise they are psychological nonentities. The problem of psychology, in dealing with this complex sub- Ject-matter, is in general—first, to ascertain its constituent

Consti- tuent elements of mind.

Subject or Ego.

to ex- trude the Ego,

Attempts

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elements, and secondly, to ascertain and explain the laws

of their combination and interaction.

General Analysis of Mind ; its Ultimate Constituents.

As to the first, there is in the main substantial agree- ment: the elementary facts of mind cannot, it is held, be

expressed in less than three propositions,—I feel somehow,

I know something, I do something. But here at once there arises an important question, viz., What are we to understand by the subject of these

propositions? Nobody nowadays would understand it to imply that every psychi-

cal fact must be ascertained or verified by personal intro- spection ; perhaps no modern writer ever did understand this ; at any rate to do so is to confound the personal with the psychological. We are no more confined to our own immediate observations here than elsewhere ; but the point is that, whether seeking to analyse one's own consciousness or to infer that of a lobster, whether discussing the asso- ciation of ideas or the expression of emotions, there is always an individual mind or self or subject in question. It is not enough to talk of feelings or volitions: what we mean is that some individual, man or worm, feels, wills, acts—thus or thus. Obvious as this may seem, it has been frequently either forgotten or gainsaid. It has been for- gotten among details or through the assumption of a medley of faculties, each treated as an individual in turn, and among which the real individual was lost. Or it has been gainsaid, because to admit that all psychological facts per- tain to a psychological subject seemed to carry with it the admission that they pertained to a particular spiritual substance, which was simple, indestructible, and so forth : and it was manifestly desirable to exclude such assump- tions from psychology, 7.e., from a science which aims only at a scientific exposition of what can be known and verified by observation. But, however much assailed or disowned, the conception of a mind or conscious subject is to be found implicitly or explicitly in all psychological writers whatever,—not more in Berkeley, who accepts it as a fact, than in Hume, who accepts it asa fiction. This being so, we are far more likely to reach the truth eventually if we openly acknowledge this inexpugnable assumption, if such it prove, instead of resorting to all sorts of devious peri- phrases to hide it. Now wherever the word Subject, or its derivatives, occurs in psychology we might substitute the word Ego and analogous derivatives, did such exist. But Subject is almost always the preferable term 3 its im- personal form is an advantage, and it readily recalls its modern correlative Object. Moreover, Ego has two senses, distinguished by Kant as pure and empirical, the latter of which is, of course, an object, while the former is subject always. By pure Ego or Subject it is proposed to denote the simple fact that everything mental is referred to a Self. This psychological conception of a self or subject, then, is after all by no means identical with the metaphysical conceptions of a soul

or mind-atom, or of mind-stuff not atomic ; it may be kept as free from metaphysical implica- tions as the conception of the biological individual or organism with which it is so intimately connected.

The attempt, indeed, has frequently been made to resolve the former into the latter, and so to find in mind only such an indivi- duality as has an obvious counterpart in this individuality of the organism, 7.¢., what we may call an objective individuality. But such procedure owes all its plausibility to the fact that it leaves out of sight the difference between the biological and the psycho- logical standpoints. All that the biologist means by a dog is "the Sum of the phenomena which make up its corporcal existence." } And, inasmuch as its presentation to any one in particular is a point of no importance, the fact of presentation at all may be very well dropped out of account. Let us now turn to mind: Why should we not take this word or "'the word 'soul' simply as a name for the series of mental phenomena which make up an indi-

- Professor Huxley, Hume (English Men of Letters series), p. 171.

vidual mind?"2 Surely the moment we try distinctly to under- stand this question we realize that the cases are different. "Series of mental phenomena" for whom? For any passer-by such as might take stock of our biological dog? No, obviously only for that individual mind itself ; yet that is supposed to be made up of, to be nothing different from, the series of phenomena. Are we, then, (1) quoting J. S. Mill's words, 'to accept the paradox that something which ex hypothesi is but a series of feelings, can be aware of itself as a series?"3 Or (2) shall we say that the several parts of the series are mutually phenomenal, much as A may look at B, who was just now looking at A? Or (3) finally, shall we say that a large part of the so-called series, in fact every term but one, is phenomenal for the rest—for that one ?

As to the first alternative, paradox is too mild a word for it 8 even contradiction will hardly suffice. It is as impossible to express ''being aware of" by one term as it is to express an cquation or any other relation by one term: what knows can no more be iden- tical with what is known than a

weight with what it weighs. Ifa series of feelings is what is known or presented, then what knows, what it is presented to, cannot be that series of feelings, and this without regard to the point Mill mentions, viz., that the infinitely greater part of the series is either past or future. The question is not in the first instance one of time or substance at all, but simply turns upon the fact that knowledge or consciousness is unmeaning except as it implies something knowing or conscious of something. But it may be replied :—Granted that the formula for consciousness is something doing something, to put it generally ; still, if the two somethings are the same when I touch myself or when I see myself, why may not agent and patient be the same when the action is

| knowing or being aware of ; why may I not know myself—in fact,

do I not know myself? Certainly not ; agent and patient never are the same in the same act; the conceptions of self-caused, self- moved, self-knowun, et id genus omne, either connote the incompre- hensible or are abbreviated expressions—such, €é.g., as touching oneself when one's right hand touched one's left.

And so we come to the second alternative :—As one hand washes the other, may not different members of the series of feelings be sub- ject and object in tun? Compare, for example, the state of mind of a man succumbing to temptation (as he pictures himself enjoying the coveted good and impatiently repudiates scruples of conscience or dictates of prudence) with his state when, filled with remorse, he sides with conscience and condemns this 'former self,""— the "better self" having meanwhile become supreme. Here the cluster of presentations and their associated sentiments and motives, which together play the réle of self in the one field of consciousness, have —only momentarily it is true, but still have—for a time the place of not-self ; and under abnormal circumstances this partial alterna- tion may become complete alienation, as in what is called 'double consciousness." Or again, the development of self-consciousncss might be loosely described as taking the subject or self of onc stage as an object in the next,—self being, e.g., first identified with the body and afterwards distinguished from it. But all this, however true, is beside the mark ; and it is really a very scrious misnomer, ~—though the vagueness of our

psychological terminology seems to allow it—to do, as ¢.g., Mr Spencer does—represent the develop- ment of self-consciousness as a ‘differentiation of subject and object.” It is, if anything, a differentiation of object aud object, v.e., in plainer words, it is a differentiation among presentations— a differentiation every step of which implies just that relation to a subject which it is supposed to supersede.

There still remains an alternative, which, like the first, may be expressed in the words of J. S. Mill, viz., “the alternative of believ- ing that the Mind or Ego is something different from any series of feelings or possibilities of them.” To admit this, of course, is to admit the necessity of distinguishing between Mind or Ego, mean- ing the unity or continuity of consciousness as a complex of pre- sentations, and Mind or Ego as the subject to which this eomplex is presented. In dealing with the body from the ordinary biological standpoint no such necessity arises. “But, whereas there the indi- vidual organism is spoken of unequivocally, in psychology, on the other hand, the individual mind may mean either (i.) the series of feelings or ‘‘mental phenomena” above referred to; or (i) the subject of these feelings for whom they are phenomena; or (iii.) the subject of these feelings or phenomena + the series of feelings or phenomena themselves, the two being in that relation to each other in which alone the one is subject and the other a scries of feelings, phenomena, or objects. It is in this last sense that Mind is used in empirical psychology, its exclusive use in the first scnse being favoured only by those who shrink from the speculative associations connected with its exclusive use in the second. But psychology is not called upon to transcend the relation of subject to object or, as we may call it, the fact of presentation. On the other hand, as has been said, the attempt to ignore one term of the relation is hopeless ; and cqually hopeless, even futile, is the

2 Professor Huxley, op. cit., p. 172. 3 Examination of Sir W. Hamilton’s Philosophy, ch. xii. fin.

attempt, by means of phrases such as consciousness or the unity of

consciousness, to dispense with the recognition of a conscious subject.

We might now proceed to inquire more closely into the character and relations of the three states, modes, or acts! of this subject, which are

commonly held to be the invari- able constituents of psychical life and broadly distinguished as cognitions, feelings, and conations. But we should be at once confronted by a doctrine much in vogue at present, which, strictly taken, amounts almost to a denial of this tripartite classification of the facts of mind—the doctrine, viz., that feeling alone is primordial, and invariably present wherever there is consciousness at all. Every living crea- ture, it is said, feels, though it may never do any more ; only the higher animals, and these only after a time, learn to discriminate and identify and to act with a purpose. This doctrine, as might be expected, derives its plausibility partly from the vagueness of psychological terminology, and partly from the intimate connexion that undoubtedly exists between feeling and cognition on the one hand and feeling and volition on the other. As to the meaning of

the term, it is plain that further definition is requisite for a word that may mean (a) a touch, as feeling of roughness ; (6) an organic sensation, as feeling of hunger ; (¢) an emo- tion, as feeling of anger ; (d) feeling proper, as pleasure or pain. But, even taking feeling in the last, its strict sense, it has been maintained that all the more complex forms of consciousness are resolvable into, or at least have been developed from, feelings of pleasure and pain. The only proof of such position, since we cannot directly observe the beginnings of conscious life, must consist of considera- tions such as the following. ‘So far as we can judge, we find feeling everywhere ; but, as we work downwards from higher to lower forms of life, the possible variety and the definiteness of sense-impressions both steadily diminish. Moreover, we can directly observe in our own organic sensa- tions, which seem to come nearest to the whole content of infantile and molluscous experience, an almost entire absence of any assignable quale. Finally, in our sense-experience generally, we find the element of feeling at a maximum in the lower senses and the intellectual element ata maximum inthe higher. But the so-called intellectual senses are the most used, and use we know blunts feeling and favours intellection, as we see in chemists, who sort the most filthy mixtures by smell and taste without discomfort. Tf, then, feeling predominates more and more as we approach the beginning of consciousness, may we not say that it is the only sine qua non of consciousness? Considerations of this kind, however impressive when exhibited at length, are always liable to be overturned by some apparently

un- important fact which may easily be overlooked. Two lines, e.g., may get nearer and nearer and yet will never meet, if the rate of approach is simply proportional to the distance. A triangle may be diminished indefinitely and yet we can- not infer that it becomes eventually all angles, though the angles get no less and the sides do. Now, before we decide that pleasure or pain alone may constitute a complete state of mind, it may be well to inquire : What is the connexion between feelings of pleasure and pain and the two remain- ing possible constituents of consciousness, aS Wwe can observe them now? And this is an inquiry which will help us towards an answer to our main question, namely, that concerning the nature and connexions of what are commonly regarded as the three ultimate facts of mind. Relation Broadly speaking, in any state of mind that we can as feeling directly observe, what we find is (1) that we are aware of ocogni- 4 certain change in our sensations, thoughts, or circum-

Feeling.

tion and

conation. 1 Tt is useless at this point attempting to decide on the comparative

appropriateness of these and similar terms, such as “faculties,” “ capacities,” “functions,” &c.

stances, (2) that we are pleased or pained with the change, and (3) that we act accordingly. We never find that feeling directly alters—z.e., without the intervention of the action to which it prompts—either our sensations or situation, but that regularly these latter with remarkable promptness and certainty alter it. We have not first a change of feeling, and then a change in our sensations, perceptions, and ideas; but, these changing, change of feel- ing follows. In short, feeling appears frequently to be an effect, which therefore cannot exist without its cause, though in different circumstances the same cause may pro- duce a different amount or even a different state of feeling. Turning from what we may call the receptive phase of con- sciousness to the active or appetitive phase, we find in like manner that

feeling is certainly not, in such cases as We can clearly observe, the whole of consciousness at any moment. True, in common speech we talk of liking pleasure and disliking pain ; but this is either tautology, equivalent to saying, we are pleased when we are pleased and pained

when we are pained, or else it is an allowable abbrevia-

tion, and means that we like pleasurable objects and dislike painful objects, as when we say, we like feeling warm and dislike feeling hungry. And feeling warm or feeling hungry, we must remember, is not pure feeling in the strict sense of the word. Such states admit, if not of description, yet at least of identification and distinction as truly as colours and sounds do. Within the limits of our observation, then, we find that feeling accompanies some more or less definite presentation which for the sake of it becomes the object of appetite or aversion ; in other words, feeling implies a relation toa pleasurable or pain- ful presentation, that, as cause of feeling and end of the action to which feeling prompts, is doubly distinguished from it. Thus the very facts that lead us to distinguish feeling from cognition and conation make against the hypothesis that consciousness can ever be all feeling.

But, as already said, the plausibility of this hypothesis is in good part due to a laxity in the use of terms. Most psychologists before Kant, and English psychologists even to the present day, speak of pleasure and pain as sensa- tions. But it is plain that pleasure and pain are not simple ideas, as Locke called them, in the sense in which touches and tastes are,—that is to say, they are never like these localized or projected, nor elaborated in conjunction with other sensations and movements into percepts or intul- tions of the external. This confusion of feeling with sensa- tions is largely consequent on the use of one word pain for certain organic sensations and for the purely subjective state. But, to say nothing of the fact that such pains are always more or less definitely localized,—which of itself is so far cognition,—they are also distinguished as shooting, burning, gnawing, dc. &c., all which symptoms indicate a certain objective quality. Accordingly all the more recent psychologists have been driven by one means or another to recognize two ‘aspects ” (Bain), or “properties” (Wundt), in what they call a sensation, the one a “sensible or intellectual” or “qualitative,” the other an “affective” or “emotive,” aspect or property. The term “aspect hi is

figurative and obviously inaccurate ; even to describe pleasure and pain as properties of sensation is a matter open to much question. But the point which at present concerns us is simply that when feeling is said to be the primordial element in consciousness more is usually in- cluded under feeling than pure pleasure and pain, viz., some characteristic or quality by which one pleasurable or painful sensation is distinguishable from another. No doubt, as we go downwards in the chain of life the quali- tative or objective elements in the so-called sensations become less and less definite ; and at the same time organ- isms with well-developed sense-organs give place to others

Feeling and sensation distinct.

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without any clearly differentiated organs at all. But there is no ground for supposing even the amoeba itself to be affected in all respects the same whether by changes of temperature or of pressure or by changes in its internal fluids, albeit all of these changes will further or hinder its life and so presumably be in some sort pleasurable or pain- ful. On the whole, then, there are grounds for saying that the endeavour to represent all the various facts of consciousness as evolved out of feeling is due to a hasty

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and treacherous word “consciousness,” or committing our- selves to the position that ideas are modifications of a certain mental substance and identical with the subject to which they are presented, we may leave all this on one side, and say that ideas are objects, and the relation of objects to subjects—that whereby the one is object and the other subject—is presentation. And it is because only objects sustain this relation that they may be spoken of simply as presentations.

It will be convenient here to digress for a moment to take account Sensa- of an objection that is sure to be urged, viz., that sensations at all tious not events ought not to be called objects, that they are ‘“‘states of the psycho- subject” and that this is a deliverance of common sense, if anything logically is. Now if by this be meant (i.) that sensations are metaphysically

subject- subjective modifications in an idealistic sense, there is no need at ive.

striving after simplicity, and has been favoured by the ambiguity of the term feeling itself. If by feeling we mean a certain subjective state varying continuously in intensity and passing from time to time from its positive

Presenta- tion.

phase (pleasure) to its negative phase (pain), then this purely pathic state implies an agreeing or disagreeing something which psychologically determines it. If, on the other hand, we let feeling stand for both this state and the cause of it, then, perhaps, a succession of such " feelings " may make up a consciousness ; but then we are including two of our elementary facts under the name of one of them. The simplest form of psychical life, therefore, involves not only a subject feeling but a subject having qualitatively distinguish- able presentations which are the occasion of its feeling.

We may now try to ascertain what is meant by cogni- tion as an essential element in this life, or,. more ~~eaammmihy, what we are to understand by the term presentation. It was an important step onwards for psychology when Locke introduced that ."'new way of ideas" which Stillingfleet found alternately so amusing and so dangerous. By idea Locke tells us he meant true appearances in men's minds, or "whatsoever is the immiediate object of perception, thought, or understanding"; and it was so far a retro~~ grade step when Hume restricted the term to certain only of these appearances or objects, or rather to these appear- ances or objects in a certain state, viz., as reproduced ideas or images. And, indeed, the history of psychology seems to show that its most important advances have been made by those who have kept closely to this way of ideas; the establishment of the laws of association and their many fruitful applications and the whole Herbartian psychology may suffice as instances (see HERBART). The truth is that the use of such a term is itself a mark of an important generalization, one which helps to free us from the mytho- logy and verbiage of the "faculty-psychologists." All that variety of mental facts which we speak of as sensa- tions, perceptions, images, intuitions, concepts, notions, have two characteristics in common :—(1) they admit of being more or less attended

to, and (2) can be reproduced and associated together. It is here proposed to use the term presentation to connote such a mental fact, and as the best English equivalent for what Locke meant by idea and what Kant and Herbart called a Vorstellung.

A presentation has then a twofold relation,— first, directly to the subject, and secondly, to other presenta- tions. By the first is meant the fact that the presentation 1s attended to, that the subject is more or less conscious of it: itis “in his mind” or presented. As presented to a subject a presentation might with advantage be called an object, or perhaps a psychical object, to distinguish it from what are called objects apart from presentation, ¢.e., con- ceived as independent of any particular subject. Locke, as we have seen, did so call it; still, to avoid possible con- fusion, it may turn out best to dispense with the frequent use of object in this sense. But on one account, at least, it Is desirable not to lose sight altogether of this which 18 after all the stricter as well as the older signification of object, namely, because it enables us to express definitely, without implicating any ontological theory, what we have So far seen reason to think is the fundamental fact in psychology. Instead of depending mainly on that vague

this stage either to assert or deny that. But if the meaning be (ii.) that sensations are presented as modes of the subject, such a position is due toa confusion between the subject proper or pure Ego and that complex presentation or object, the empirical, or as we might call it the biotic, Ego. A self-conscious subject may not only havea sensation but may recognize it as its own,—recognize a certain con- nexion, that is to say, between the sensation and that presentation of the empirical self which self-consciousness implies. But such referenee only renders more obvious the objective nature of a sensa- tion, in the psychological sense of the term objective. Or, again, the meaning may be (iii.) that a subject whose presentations were all sensations would know nothing of the difference between subject and object. In this objection there is a lurking confusion between the standpoint of a given experience and the standpoint of its exposition. The true way, surely, to represent the bare fact of sensation is not to attempt to reproduce an experience as yet con- fined to sensations, but to describe such experience as a scientific psychologist would do if we could imagine him a spectator of it. The infant who is delighted by a bright

colour does not of course conceive himself as face to face with an object; but neither does he conceive the colour as a subjective affection. We are bound to describe his state of mind truthfully, but that is no reason for abandoning terms which have no counterpart in his consciousness, when these terms are only used to depict that consciousness to us. As to the objection (iv.) that, when all is said and done, sensations are conceived by common sense as modifications of self, whether so presented or not, it may be granted that it appears so at first blush, but not when common sense is more closely examined. The fact is we arc here upon what has been called ‘‘the margin of psycho- logy,” where our ordinary thinking brings into one vicw what science has to be at great pains to kecp distinct. Though it is scientifically a long way round from a fact of mind to the corre- sponding fact of body, yet it is only on careful reflexion that we can distinguish the two in those cases in which our practical interests have closely associated them. Such a case is that of sensation. The ordinary conception of a sensation coincides, no doubt, with the definition given by Hamilton and Mansel :— ‘*Sensation proper is the consciousness of certain affections of our body as an animated organism”; and it is because in ordinary thinking we reckon the body as part of self that we come to think of sensations as subjective modifications. But, when considerations of method compel us to eliminate physiological implications from the ordinary conception of a sensation, we are able here to dis- tinguish the conscious subject and the ‘‘ affections” of which it is conscious as clearly as we can distinguish subject and object in other cases of presentation. On the whole, then, we may conclude that there is nothing either in the facts or in our necessary conceptions of them to prevent us from representing whatever admits of psychical reproduction and association, no matter how simple it be, as an object presented to a subject.

As to the subjective relation of objects, the relation of Atten- presentation itself, we have merely to note that on the Hou.

side of the subject it implies what, for want of a better word, nay be called attention, extending the denotation of this term so as to include even what we ordinarily call inattention. Attention so used will thus cover part of what is meant by consciousness,—so much of it, that is, as answers to being mentally active, active enough at least to “receive impressions.” Attention

on the side of the subject implies intensity on the side of the object: we might indeed almost call intensity the matter of a pre- sentation, without which it is a nonentity.1 As to the connexion between these two, subjective attention and

1 Compare Kant's Principle of the Anticipations of Perception :— "Tn all phenomena the real which is the object of scusation has in- tensive magnitude."

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Con- tinuity of con- scious- ness.

objective intensity—in that higher form of attention called voluntary we are aware (1) that concentration of atten- tion increases or its abstraction diminishes the intensity of a presentation in circumstances where physically and physiologically there is nothing to prevent the intensity of the presentation from continuing uniform. Again, (2) in circumstances when psychologically we are aware of no previous change in the distribution of attention, we find the intensity of a presentation increased or diminished if certain physical concomitants of the presentation (¢g., stimulus, nervous process, é&c.) are increased or diminished. Thus, though this is a point we could hardly establish without the aid of psychophysics, we may conclude that the intensity of a presentation may be altered from two sides ; that it depends, in other words, partly upon what we may perhaps call its physical intensity and partly on the amount of attention it receives.

Some further exposition of the connexion between subjective attention and objective intensity is perhaps desirable here, where we are seeking to get a general view of the essential facts of mind and their relations, rather than later on, when we shall be more concerned with details. We are aware in ordinary life that the inteusity of any given sensation depends upon certain physical quantities, varying directly in some proportion as these vary. Hence, since our habitual standpoiut is the physical not the psy- chological,

we conceive sensory objects as having an intensity per se apart from the attention that their presentation secures. From the physical standpoint indeed it is manifest that no other conception is compatible with a scientific treatment of phenomena. Subjective ¢ «ees of variation are supposed to be eliminated: the general mind to which, according to the physicist's conception of a pheno- menon, that phenomenon is implicitly supposed to be presented is a mind in which there is no feeling to produce variations of atten- tion, or to favour sesthetic combinations of objects. Attention is thus assumed to be constant, and all variations in intensity to be objectively determined. But psychologically we cannot assume this. In any given presentation there is, it must be admitted, no immediate evidence that the intensity of the object is a function of two variables,—(1) what we have called its physical or absolute intensity and (2) the intensity of atteution. Still there are facts which justify this conclusion. That the intensity of the prescnta- tion varies with the absolute intensity of the object, attention remaining constant, is a proposition not likely to be challenged. What has to be shown is that the intensity of presentations varies with the attention, all else remaining constaut. Assuming that voluntary and non-voluntary attentiou are fundamentally the same, this amounts to showing (1) that concentration of attention upon some objects diminishes the intensity of presentation of others in the same ficld, whether the concentration be voluntary or non- voluntary, t.¢., due to a shock; and (2) that, even though only within narrow limits, increasing attention voluntarily has the same effect on the presentation as increasing the objective intensity from the physical side. The narrowness of these limits—practically an all-important fact—is theoretically no objection. It would not be difficult psychologically to account for our inability to concentrate attention indefinitely : that we can concentrate it at all is enough to show that there is a subjective as well as an objective factor in the intensity of a presentation. Any fuller consideration of the connexion between attention and presentations may be deferred.

The inter-objective relations of presentations, on which their second characteristic, that of revivability and asso- ciability depends, though of the first importance in them- selves, hardly call for examination in a general analysis like the present. But there is one point still more funda- mental that we cannot wholly pass by: it is—in part at any rate—what is commonly

termed the unity or con- tinuity of consciousness. From the physical standpoint and in ordinary life we can talk of objects that are isolated and independent and in all respects distinct individuals. The screech of the owl, for example, has physically nothing to do with the brightness of the moon: either may come or go without changing the order of thmgs to which the other belongs. But psychologically, for the individual percipient, they are parts of one whole: special attention to one diminishes the intensity of presentation of the other and the recurrence of the one will afterwards entail the re-presentation of the other also. Not only are they still parts of one whole, but such distinctness as they have

at present is the result of a gradual differentiation. It is quite impossible for us now to imagine the effects of years of experience removed, or to picture the character of our infantile presentations before our interests had led us habitually to concentrate attention on some, and to ignore others, whose intensity thus diminished as that of the former increased. In place of the many things which we can now see and hear, not merely would there then be a confused presentation of the whole field of vision and of a mass of undistinguished sounds, but even the difference between sights and sounds themselves would be without its present distinctness. Thus the further we go back the nearer we approach to a total presentation having the character of one general continwwm in which differences are latent. There is, then, in psychology, as in biology, what may be called a principle of “progressive differen- tiation or specialization” ; and this, as well as the facts of reproduction and association, forcibly suggests the con- ception of a certain objective continuum forming the background or basis to the several relatively distinct pre- sentations that are elaborated out of it—the equivalent, in fact, of that unity and continuity of consciousness which has been supposed to supersede the need for a conscious subject.

There is one class of objects of special interest even in a general survey, viz., movements or motor presentations. These, like sensory presentations, admit of association and reproduction, and seem to attain to such distinctness as they possess in adult human experience by a gradual differ- entiation out of an original diffused mobility which is little besides

emotional expression. Of this, however, more presently. It is primarily to such dependence upon feel- ing that movements owe their distinctive character, the possession, that is, under normal circumstances, of definite and assignable psychical antecedents, in contrast to sensory presentations, which enter the field of consciousness ex abrupto. We cannot psychologically explain the order in which particular sights and sounds occur; but the move- ments that follow them, on the other hand, can be ade- quately explained only by psychology. The twilight that sends the hens to roost sets the fox to prowl, and the lion's roar which gathers the jackals scatters the sheep. Such diversity in the movements, although the sensory presenta- tions are similar, is due, in fact, to what we might call the principle of " subjective or hedonic selection "—that, out of all the manifold changes of sensory presentation which a given individual experiences, only a few are the occasion of such decided feeling as to become objects of possible appetite (or aversion). The representation of what in- terests us comes to be associated with the representation of such movements as will secure its realization, so that— although no concentration of attention will secure the requisite intensity to a pleasurable object present only in idea—we can by what is strangely like a concentration of attention convert the idea of a movement into the fact, and by means of the movement attain the coveted reality. :

And this has brought us round naturally to what is per- haps the easiest way of approaching the question: What is a conation or action? In ordinary voluntary move- ment we have first- of all an idea or re-presentation of the movement, and last of all the actual movement itself,—a new presentation which may for the present be described as the filling out of the re- presentation,! which thereby attains that intensity, distinctness, and embodiment we call reality. How does this change come about? The attempt has often been made to explain it by a reference to the more uniform, and apparently simpler, case of reflex

1 On the connexion of presentations and re-presentations, see p. 59 below.

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Motor presenta- tions. Subject-

ive selec- tion.

Cona-

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action, including under this term what are called sensori-

motor and ideo-motor actions. In all these the movement

seems to be the result of a mere transference of intensity

from the associated sensation or idea that sets on the movement. But, when by some chance or mischance the same sensory presentation excites two alternative and con- flicting motor ideas, a temporary block, it is said, occurs ; and, when at length one of these nascent motor changes finally prevails and becomes real, then we have the state of mind called volition. But this assumption that sen- sory and motor ideas are associated before volition, and that the volition begins where automatic or reflex action ends, is due to that inveterate habit of confounding the psychical and the physical which is the bane of modern psychology. How did these particular sensory and motor presentations ever come to be associated? It is wholly beside the mark to answer that they are " organically de- termined psychical changes." In one respect all psychical changes alike are organically determined, inasmuch as all alike—so far, at least, as we at all know or surmise—have organic concomitants. In another respect no psychical changes are organically determined, inasmuch as physical events and psychical events have no common factors. Now the only psychological evidence we have of any very intimate connexion between sensory and motor representa- tions is that furnished by our acquired dexterities, 7.c., by such movements as Hartley styled secondary automatic. But then all these have been preceded by volition: as Mr Spencer says, "the child learning to walk wills each movement before walking it." Surely, then, a psycho- logist should take this as his typical case and prefer to assume that all automatic actions that come within his ken at all are in this sense secondarily automatic, Rie. 880 say

that either in the experience of the individual or of his ancestors volition, or something analogous to it, preceded habit.

But, if we are thus compelled by a sound method to regard sensori-motor actions as degraded or mechanical forms of voluntary actions, instead of regarding voluntary actions as gradually differentiated out of something physi- cal, we have not to ask: What happens when one of two alternative movements is executed? but the more general question: What happens when any movement is made in consequence of feeling? It is obvious that on this view the simplest definitely purposive movement must have been preceded by some movement simpler still. For any dis- tinct movement purposely made presupposes the ideal pre- sentation, before the actual realization, of the movement. But such ideal presentation, being a re-presentation, equally presupposes a previous actual movement of which it is the so-called mental residuum. There is then, it would seem, but one way left, viz., to regard those movements which are immediately expressive of pleasure or pain as prim- ordial, and to regard the so-called voluntary movements as elaborated out of these. The vague and diffusive char- acter of these primitive emotional manifestations is really a point in favour of this position. For such “ diffusion ” is evidence of an underlying continuity of motor presenta- tions parallel to that already discussed in connexion with Sensory presentations, a continuity which, in each case, becomes differentiated in the course of experience into comparatively distinct and discrete movements and sensa- tions respectively.?

1 Compare Spencer’s Principles of Psychology, i. 496.

? It may be well to call to mind here that Dr Bain also has regarded emotional expression as a possible commencement of action, but only to reject it in favour of his own peculiar doctrine of ‘* spontaneity,” which, however, is open to the objection that it makes movement Precede feeling instead of following it—an objection that would be

Serious even if the arguments advanced to support his hypothesis were a8 cogent as only Dr Bain takes them to be. Against the position

But, whereas we can only infer, and that in a very roundabout fashion, that our sensations are not absolutely distinct but are parts of one massive sensation, as it were, we are still liable under the influence of strong emotion directly to experience the corresponding continuity in the case of movement. Such motor-continuum we may sup- pose is the psychical counterpart of that permanent readi- ness to act, or rather that continual nascent acting, which among the older physiologists was spoken of as “tonic action”; and as this is now known to be intimately de- pendent on afferent excitations so is our motor conscious- ness on our sensory. Still, since we cannot imagine the beginning of life but only life begun, the simplest picture we can form of a concrete state of mind is not one in which there are movements before there are any sensations or sensations before there are any movements, but one in which change of sensation is followed by change of movement, the link between the two being a change of feeling.

Having thus simplified the question, we may now ask again: How is this change of movement through feeling brought about? The answer, as already hinted, appears to be: By a change of attention. We learn from such observations as psychologists describe under the head of fascination, imitation, hypnotism, &c., that the mere con- centration of attention upon a movement is often enough to bring the movement to pass. But, of course, in such cases there is neither emotional experience nor volition in question ; such facts are only cited to show the connexion between attention and movements. Everybody too has often observed how the execution of any but mechanical movements arrests attention to thoughts or sensations, and vice versa. Let us suppose, then, that we have at any given moment a certain distribution of attention between sensory and motor presentations; a change in that dis- tribution means a change in the intensity of some or all of these, and change of intensity in motor presentations means change of movement. Such changes are, however, quite minimal in amount so long as the given presentations are not conspicuously agreeable or disagreeable. As soon as they are, we find pleasure to lead at once to concentra- tion of attention on the pleasurable object ; so that pleasure is not at all so certainly followed by movement as we find pain to be, save of course when movements are themselves the pleasurable objects and are executed, as we say, for their own sakes. In fact, pleasure would seem rather to repress

movement, except so far as it is coincident either with a more economic distribution, or with a positive augmentation, of the available attention; and either of these, on the view supposed, would lead to increased but indefinite (7.¢., playful) movement. Pain, on the other hand, is much more closely connected with movement, and movement too which for obvious reasons much sooner acquires a purposive character. Instead of voluntary con- centration of attention upon a painful presentation we find attention to such an object always involuntary ; in other words, attention is, as it were, excentrated, dispersed, or withdrawn, If, therefore, the painful presentation is a movement, it is suspended ; if it is a sensation, movements are set up which further distract attention, and some of which may effect the removal of the physical source of the sensation.

ee eee maintained above he objects that ‘‘ the emotional wave almost invari- ably affects a whole group of movements,” and therefore does not furnish the ‘‘ isolated promptings that are desiderated in the case of the will” (Mental and Moral Science, p. 323). But to make this objection is to let heredity count for nothing. In fact, wherever a variety of isolated movements is physically possible, there also we always find corresponding instincts, ‘that untaught ability to perforn1 actions,” to use Dr Bain’s own language, which a minimum of prac- tice suffices to perfect.

Depend- ence of

action on

feeling.

Prim- ordial facts of mind.

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We are now at the end of our analysis, and the results may perhaps be most conveniently summarized by first throwing them into a tabular form and then dppending a few remarks by way of indicating the main purport of the table. Taking no account of the specific difference between one concrete state of mind and another, and supposing that we are dealing with

presentations in their simplest form, 1.¢., aS sensations and movements, we have :—

| (1) non-voluntarily at- >

= Presentation ‘

tending to changes of sensory

in the sensory-con- tinuum!; [Cognition]

(2) being, im conse- quence, either pleased or pained ;

A te [Feeling]

and (8) by voluntary attention or “inner- vation” producing changes in the motor- continuum.! [Conation] Of the three phases, thus logically distinguishable, the first and the third correspond in the main with the receptive and active states or powers of the older psychologists. The second phase, being more difficult to isolate, was long overlooked ; or, at all events, its essential characteristics were not distinctly marked: it was either confounded with (1), which is its cause, or with (3), its effect. But per- haps the most important of all psychological distinctions is that which traverses both the old bipartite and the prevailing tripartite classification, viz., that between the subject, on the one hand, as acting and feeling, and the objects of this activity on the other. Such distinction lurks indeed under such terms as faculty, power, conscious- ness, but they tend to keep it out of sight. With this distinction clearly before us—instead of crediting the sub- ject with an indefinite number of faculties or capacities, we must seek to explain not only reproduction, association, agreement, difference, d&c., but all varieties of thinking and acting by the laws pertaining to ideas or presentations, leaving to the subject only the one power of variously distributing that attention upon which the intensity of a presentation in part depends. Of this single subjective activity what we call activity in the narrower sense (as, é.g., purposive movement and intellection) is but a special case, although a very important one.

According to this view, then, presentatvons, attention, feeling, are not to be regarded as three co-ordinate genera, each a distinguishable “state of mind or consciousness,” i.e, as being all alike included under this one supreme category. There is, as Berkeley long ago urged, no resem- blance between activity and an idea; nor is it easy to see anything common to pure feeling and an idea, unless it be that both possess intensity. Classification seems, in fact, to be here out of place. Instead, therefore, of the one summum genus, state of mind or consciousness, with its three co-ordinate subdivisions—cognition, emotion, cona- tion—our analysis seems to lead us to recognize three dis- tinct and irreducible facts—attention, feeling, and objects or presentations—as together, in a certain connexion, con- stituting one concrete state of mind or psychosis. Of such concrete states of mind we may then say there are two forms, more or less distinet, corresponding to the two ways in which attention may be determined and the two classes of objects attended to in each, viz, (1) the sensory or

= Presentation of motor

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receptive state, when attention is non-voluntarily deter- mined, i.c., where feeling follows the act of attention ; and gua eS ee

1 To cover more complex cases, we might here add the words “or

trains of ideas.”

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(2) the motor or active state, where feeling precedes the act of attention, which is thus determined voluntarily.

To say that feeling and attention are not presentations will seem to many au extravagant paradox. If all knowledge consists of presentations, it will be said, how come we to know anything of feeling and attention if they are not presented? We know of them indirectly through their effects, not directly in themselves. This is, perhaps, but a more concrete statement of what philosophers have very widely acknowledged in a more abstract form since the days of Kant2—the impossibility of the subjective qua subjective being presented. It is in the main clearly put in the following passage from Hamilton, who, however, has not had the strength of his convictions in all cases :—‘‘The peculiarity of feeling, therefore, is that there is nothing but what is subjectively sub- jective ; there is no object different from self,—no objectification of any mod of self. We are, indeed, able to constitute our states of pain and pleasure into objects of reficxion, but, in so far as they are objects of reflexion, they are not feelings but only reflex cogni- tions of feelings.”* But this last sentence is not, perhaps, alto- gether satisfactory. The meaning seems to be that feeling ‘‘can only be studied through its reminiscence,” which is what Hamilton has said elsewhere of the ‘‘ phenomena of consciousness ” generally. But this is a position hard to reconcile with the other, viz., that feeling and cognition are generically distinct. How can that which was not originally a cognition become such by being reproduced ? The statements that feeling is ‘‘ subjectively subjective,” that in it ‘‘there is no object different from self,” are surely tantamount to saying that it is not presented ; and what is not presented cannot, of course, be re-presented. Instead, therefore, of the position that feeling and attention are known by being made objects of reflexion, it would seem we can only maintain that we know of them by their effects, by the changes, i.¢., which they produce in the character and succession of our presentations.4 We ought also to bear in mind that the effects of attention

and feeling cannot be known without attention and feeling: to whatever stage we advance, there- fore, we have always in any given ‘‘state of mind” attention and feeling on the one side, and on the other a presentation of objects. Attention and feeling seem thus to be ever present, and not to adinit of the continuous differentiation into parts which gives to presentations a certain individuality, and makes their association and reproduction possible.

Theory of Presentations.

Having now ascertained what seem to be the essential elements in any state of mind, we may next proceed to examine these several elements separately in more detail. It will be best to begin with that which is both the clearest in itself and helps us the most to understand the rest, viz., the objects of attention or consciousness, 1.¢., presentations. And this exposition will be simplified if we start With a supposition that will enable us to leave aside, at least for the present, the difficult question of heredity.

tion of a

there is more or less of progressive differentiation or ‘ psycho-

development ; we know too that the same holds broadly j\yo of a race; and it is believed to hold in like manner of the Fe evolution of the animal kingdom generally. It is believed vidual. that there has existed a series of sentient individuals beginning with the lowest form of life and advancing con- tinuously up to man. Some traces of the advance already made may be reproduced in the growth of each human being now, but for the most part such traces have been obliterated. What was experience in the past has become instinct in the present. The descendant has no conscious- ness of his ancestors’ failures when performing by “an

2 Compare “ Gefiihle der Lust und Unlust und der Wille. . . die gar nicht Erkenntnisse sind” (Krittk der reinen Vernunft, Harten- stein’s ed., p. 76).

3 Lectures on Metaphysics, ii. p. 432.

4 But, while we cannot say that we know what attention and feeling are, inasmuch as they are not presented, neither can we with any propriety

maintain that we are ignorant of them, inasmuch as they are by their very nature unpresentable. As Ferrier contends, ‘‘we can be ignorant only of what can possibly be known ; in other words, there can be ignorance only of that of which there can be knowledge” (Institutes of Metaphysics, § I1., Agnoiology, prop. iii. sqg.). The antithesis between the objective and the subjective factors in presenta- tion is wider than that between knowledge and ignorance, which is an antithesis pertaining to the objective side alone.

We know that in the course of each individual’s life Assump- |

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untaught ability” what they slowly and painfully found

out. But if we are to attempt to follow the genesis of mind from its earhest dawn it is the primary experience rather than the eventual instinct that we have first of all to keep in view. To this end, then, it is proposed to assume that we are dealing with one individual which has continuously advanced from the beginning of psychical hfe, and not with a series of individuals of which all save the first have inherited certain capacities from its pro- genitors. The life-history of such an imaginary indi- vidual, that is to say, would correspond with all that was new, all that could be called evolution or development, in a certain typical series of individuals each of whom advanced a certain stage in mental differentiation. On the other hand, from this history would be omitted that inherited reproduction of ancestral experience, or tendency to its reproduction, by which alone, under the actual con- ditions of existence, progress is possible.

If an assumption of this kind had been explicitly avowed by the psychologists who have discussed the growth of experience in accordance with the evolution hypothesis, not a few of the difficulties in the way of that hypothesis might have been removed. That individual minds make some advance in the complexity and distinct- ness of their presentations between birth and maturity is an obvious fact ; heredity, though a less obvious fact, is also beyond question. Using Locke’s analogy of a writing-tablet—or let us say an etching-tablet—by way

sent altogether. The worm is aware only of the difference between light and dark. The steel-worker sees half a dozen tints where others see only a uniform glow. To the child, it is said, all faces are alike; and throughout life we are apt to note the general, the points of resem- blance, before the special, the points of difference.1 But, even when most definite, what we call a presentation is still part of a larger whole. It is not separated from other presentations, whether simultaneous or successive, by some- thing which is not of the nature of presentation, as one island is separated from another by the intervening sea, or one note in a melody from the next by an interval of silence. In our search for a theory of presentations, then, it is from this " unity of consciousness" that we must take our start. Working backwards from this as we find it now, we are led alike by particular facts and general con- siderations to the conception of a totum objectivum or objective continuum which is gradually differentiated, thereby becoming what we call distinct presentations, just as with mental growth some particular presentation, clear as a whole, as Leibnitz would say, becomes a complex of distinguishable parts. Of the very beginning of this continuum we can say nothing: absolute beginnings are beyond the pale of science. Actual presentation consists in this continuum being differentiated; and every dif- ferentiation constitutes a new presentation. Hence the commonplace of psychologists :—We are only conscious as we are conscious of change.

of illustration, we may be sure that every individual started with some features of the picture completely pre- formed, however latent, others more or less clearly out- lined, and others again barely indicated, while of others there is as yet absolutely no trace. But the process of

But "change of consciousness" is too loose an expression Gradual to take the place of the unwieldy phrase differentiation differen- of a presentation-continuum, to which we have been driven. daha For not only does the term "consciousness" confuse what pea

exactness requires us to keep distinct, an activity and its tinvum.

reproducing the old might differ as widely from that of producing the new as electrotyping does from engraving. However, as psychologists we know nothing directly about it; neither can we distinguish precisely at any link in the chain of life what is old and inherited—original in the sense of Locke and Leibnitz—from what is new or acquired —original in the modern sense. But we are bound as a matter of method to suppose all complexity and differentia- tion among presentations to have been originated, i.e., experimentally acquired, at some time or other. So long, then, as we are concerned primarily with the progress of this differentiation we may disregard the fact that it has not actually been, as it were, the product of one hand dealing with one tabula rasa but of many hands, each of which, starting with a reproduction of what had been wrought on the preceding tabula'; put in more or fewer new touches before devising the whole to a successor who would proceed in like manner.

object, but also the term "change" fails to express the characteristics which distinguish presentations from other changes. Differentiation implies that the simple becomes complex or the complex more complex; it implies also that this increased complexity is due to the persistence of former changes ; we may even say such persistence is essen- tial to the very idea of development or growth. In trying, then, to conceive our psychological individual in the earliest stages of development we must not picture it as experienc- ing a succession of absolutely new sensations, which, com- ing out of nothingness, admit of being strung upon the "thread of consciousness" like beads picked up at random, or cemented into a mass like the bits of stick and sand with which the young caddis covers its nakedness. The notion, which Kant has done much to encourage, that psychical life begins with a confused manifold of sensa- tions not only without logical but without psychological unity is one that becomes more inconceivable the more

The pree What is implied in this process of differentiation or closely we consider it. An absolutely new presentation, — mental growth and what is it that grows or becomes | having no sort of connexion with former presentations till

tinuum,

differentiated 1—these are the questions to which we must nowattend. Psychologists have usually represented mental advance as consisting fundamentally in the combination and recombination of various elementary units, the so-called sensations and primitive movements, or, in other words, in a Species of “mental chemistry.” If we are to resort to physical analogies at all—a matter of very doubtful pro- priety—we shall find in the growth of a seed or an embryo far better illustrations of the unfolding of the contents of consciousness than in the building up of molecules: the Process seems much more a segmentation of what is origin- ally continuous than an aggregation of elements at first independent and distinct. Comparing higher minds or stages of mental development with lower—by what means such comparison is possible we need not now consider— we find in the higher conspicuous differences between pre- sentations which in the lower are indistinguishable or ab-

the subject has synthesized it with them, is a conception for which it would be hard to find a warrant either by direct observation, by inference from biology, or in con- siderations of an-a@ priori kind. At any given moment we have a certain whole of presentations, a ‘field of con- sciousness” psychologically one and continuous; at the next we have not an entirely new field but a partial change within this field. Many who would allow this in the case of representations, 7.e., where idea succeeds idea by the workings of association, would demur to it in the case of primary presentations or sensations. “For,” they would say, ‘‘may not silence be broken by a clap of thunder, and have not the blind been made to see?” To

1 This last statement is apt to mislead by implying an active com- parison of several objects ; but that absence or confusion of differences which hides the many is really very different from the detection of resemblances which makes the many one.

Diffusion and re- striction.

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urge such objections is to miss the drift of our discussion, and to answer them may serve to make it clearer. Where silence can be broken there are representations of preced- ing sounds and in all probability even subjective

pre- sentations of sound as well; silence as experienced by one who has heard is very different from the silence of Con- dillac's statue before it had ever heard. The question is rather whether such a conception as that of Condillac's is possible ; supposing a sound to be, qualitatively, entirely distinct from a smell, could a field of consciousness consist- ing of smells be followed at once by one in which sounds had part? And, as regards the blind coming to see, we must remember not only that the blind have eyes but that they are descended from ancestors who could see. What nascent presentations of sight are thus involved it would be hard to say; and the problem of heredity is one that we have for the present left aside.

The view here taken is (1) that at its first appearance in psychical life a new sensation or so-called elementary presentation is really a partial modification of some pre- existing presentation, which thereby becomes as a whole more complex than it was before ; and (2) that this com- plexity and differentiation of parts never become a plural- ity of discontinuous presentations, having a distinctness and individuality such as the atoms or elementary particles of the physical world are supposed to have. Beginners in psychology, and some who are not beginners, are apt to be led astray by expositions which begin with the sensa- tions of the special senses, as if these furnished us with the type of an elementary presentation. The fact is we never experience a mere sensation of colour, sound, touch, and the like; and what the young student mistakes for such is really a perception, a sensory presentation combined with various sensory and motor presentations and with representations—and having thus a definiteness and com- pleteness only possible to complex presentations. More- over, if we could attend to a pure sensation of sound or colour by itself, there is much to justify the suspicion that even this is complex and not simple, and owes to such complexity its clearly marked specific quality. In certain of our vaguest and most diffused organic sensa- tions, in which we can distinguish little besides variations in intensity and massiveness, there is probably a much nearer approach to the character of the really primitive presentations.

The importance of getting a firm grasp of this concep-

tion of a presentation-continuum as fundamental to the.

whole doctrine of presentations will justify us in ignoring a little longer the details of actual mental development and regarding it first from this more general point of view. In a given sensation, more particularly in our organic sensations, we can distinguish three variations, viz., variations of quality, of intensity, and of what Dr Bain has called massiveness, or, as we will say, extensity. This last characteristic, which everybody knows who knows the difference between the ache of a big bruise and the ache of a little one, between total and partial immersion in a bath, is, as we shall see later on, an essential element in our perception of space. But it is certainly not the whole of it, for in this experience of massive sensation alone it is impossible to find other elements which an analysis of spatial intuition unmistakably yields. Exten- sity and extension, then, are not to be confounded. Now we find, even at our level of mental evolution, that an increase in the intensity of a sensation is apt to entail an increase in its extensity too; this is still more apparent in the case of movements, and especially in the movements of the young. In like manner we observe a greater extent of movement in emotional expression when the intensity of the emotion increases. Even the higher region of ima-

gination is no exception, as is shown by the whirl and confusion of ideas incident to delirium, and, indeed, to all strong excitement. But this “diffusion” or “radiation,” as it has been called, diminishes as we pass from the class of organic sensations to the sensations of the five senses, from movements expressive of feeling to movements de- finitely purposive, and from the tumult of ideas excited by passion to the steadier sequences determined by efforts to think. Increased differentiation seems, then, to be inti- mately connectéd with increased “restriction.” The causal relations of the two must be largely matter of conjecture and cannot be fully discussed here. Probably there may be found certain initial differentiations which for psycho- logy are ultimate facts that it cannot explain. But, such differentiations being given, then it may be safely said that, in accordance with what we have called the principle of subjective selection (see p. 42), attention would be voluntarily concentrated upon some of them and voluntary movements specially connected with these. To such subjectively initiated modifications of the presentation- continuum, moreover, we may

reasonably suppose “re- striction” to be in large measure due. But increased restriction would render further differentiation of the given presentation possible and so the two processes might supplement each other. But, be their interaction what it may, these processes have now proceeded so far that at the level of human consciousness we find it hard to form any tolerably clear conception of a field of con- sciousness in which an intense sensation, no matter what, might diffuse over the whole. Colours, e.g., are with us so distinct from sounds that—except as regards the drain upon attention—there is nothing in the intensest colour to affect the simultaneous presentation of a sound. But at the beginning whatever we regard as the earliest differ- entiation of sound might have been incopresentable with the earliest differentiation of colour, if sufficiently diffused, just as now a field of sight all blue is incopresentable with one all red. Or, if the stimuli appropriate to both were active together, the resulting sensation might have been what we should describe as a blending of the two, as purple is a blending of red and violet. Now, on the other hand, colours and sounds are necessarily so far localized that we are directly aware that the eye is concerned with the one and the ear with the other. This brings to our Inco- notice a fact so ridiculously obvious that it has never been Present deemed worthy of mention, and yet it has undeniably im- abi | portant bearings—the fact, viz., that certain sensations or movements are an absolute bar to the simultaneous pre- sentation of other sensations or movements. We cannot see an orange as at once yellow and green, though we can feel it at once as both smooth and cold ; we cannot open and close the same hand at the same moment, but we can open one hand while closing the other. Such incopresent- ability or contrariety is thus more than mere difference, and occurs only between presentations belonging to the same sense or to the same group of movements. Strictly speaking, it does not always occur even then ; for red and yellow, hot and cold, are presentable together provided they have certain other differences which we shall meet again presently as differences of local sign.

In the preceding paragraphs we have had occasion to Reten- distinguish between the presentation-continuum or whole tenes field of consciousness, as we may for the present call it, and those several modifications within this field which are ordinarily spoken of as presentations, and to which—now that their true character as parts is clear—we too may confine the term. But

it will be well in the next place, before inquiring more closely into their characteristics, to consider for a moment that persistence of preceding modi- fications which the differentiation of the presentation-

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continuum implies. This persistence is best spoken of as retentiveness ; it is sometimes confounded with memory, though this is something much more complex and special. Retentiveness is both a biological and a psychological In memory there is necessarily some contrast of past and present, im rez tentiveness nothing but the persistence of the old. If psychologists have erred in regarding the presentations in consciousness together as a plurality of units, they have erred in like manner concerning the persisting residua of As we see a certain colour or a cer- tain object again and again, we do not go on accumulating images or representations of it, which are somewhere crowded together like shades on the banks of the Styx ; nor is such colour, or whatever it be, the same at the hundredth time of presentation as at tha first, as the There is no such constancy or uniformity in mind. Obvious as this must appear when we pause to think of it, yet the explanations of perception most in vogue seem wholly to

fact; memory is exclusively the latter.

such presentations.

hundredth impression of a seal on wax would be.

ignore it. Such explanations are far too mechanical and,

So to say, atomistic; but we must fall back upon the

unity and continuity of our presentation-continuum if we are to get a better. minutes we take half a dozen glances at a strange and curious flower. We have not as many complex presenta- tions which we might symbolize as ff,

Ly, J. But rather, at first only the general outline is noted, next the disposi- tion of petals, stamens, &c., then the attachment of the anthers, form of the ovary, and so on ; that is to say, symbolizing the whole flower as [p' (a b) 8' (c d) o' (fg) We first apprehend say [p'.. s'. . o'], then [p' (a 6) 8'. . 0/1, Oape@..)s' (c..)o' (Ff. .)], and so forth. It is because the earlier apprehensions persist that the later are an advance upon them and an addition to them. There is nothing in this process properly answering to the repro- duction and association of ideas: in the last and complete apprehension as much as in the first vague and inchoate one the flower is there as a primary presentation. There is a limit, of course, to such a procedure, but the instance taken, we may safely say, is not such as to exceed the bounds of a simultaneous field of consciousness. Now the question is: Ought we not to assume that such increase of differentiation through the persistence of preceding differentiations holds of the contents of consciousness as a whole? Here, again, we shall find limitations,— limitations too of great practical importance; for, if presentations did not pale as well as persist, and if the simpler presentations admitted of indefinite differentiation, mental advance— unless the field of consciousness, ¢.¢., the number of pre- Sentations to which we could attend together, increased without limit—would be impossible. But, allowing all this, it is still probably the more correct and fundamental view to suppose that, in those circumstances in which we now have a sensation of, say, red or sweet, there was in the primitive consciousness nothing but a vague modification, Which persisted; and that ona repetition of the circum- Stances this persisting modification was again further Inodified. The whole field of consciousness would thus, like a continually growing picture, increase indefinitely in complexity of pattern, the earlier presentations not disap- pearing, like the waves of yesterday in the calm of to-day, but rather lasting on, like old scars that show beneath new ones,

There is yet one more topic of a general kind calling for attention before we turn to the consideration of parti- cular presentations—the hypothesis of unconscious mental Modifications, as it has been unfortunately termed,— the hypothesis of subconsciousness, as we may style it to avoid this contradiction in terms. Tt is a fact easily

Suppose that in the course of a few

*verified, that we do not distinguish or attend separately to presentations of less than a certain assignable intensity. On attaining this intensity presentations are said to pass over the threshold of consciousness, to use Herbart's now classic phrase. What are we to say of them before they have attained it? * After they have attained it, any further increase in their intensity is certainly gradual; are we then to suppose that before this their intensity changed instantly from zero to a finite quantity, and not rather that there was also a subliminal Stage where too it only changed continuously? The latter alternative constitutes the hypothesis of subconsciousness. According to this hypothesis, a presentation does not cease to be so long as it has any intensity, no matter how little. We can directly observe that an increase in the intensity of many complex presentations brings to light details and differences before imperceptible ; since these details are themselves presenta- tions, they have been brought by this increase from the subconscious stage into the field' of consciousness. Simi- larly, presentations not separately distinguishable, because of too close a proximity in time, become distinguishable when the interval between them is such as to allow of a Separate concentration of attention upon each. Again, we find that presentations "revived" or re-presented after their disappearance from the field of consciousness appear fainter and less distinct the longer the time that has elapsed between their exits and their re-entrances. N obody hesi- tates to regard such obliviscence as a psychological fact ; why, then, should we hesitate to suppose that presenta- tions, even when no longer intense enough directly to influence attention, continue to be presented, though with ever lessening intensity ?*

On the whole we seein justified in assuming three grades of consciousness thus widely understood—(1) a centre or focus of consciousness within (2) a wider field, any part of which may at once become the focus, Just as in sight, surrounding the limited area of distinct vision on which the visual axes are directed, there is a wider region of indirect vision to any part of which those axes may be turned either voluntarily or by a reflex set up by the part itself, as happens, ¢.y., with moving objects quite on the margin of vision. But in describing (3) subconscious- ness as the third grade, this simile, due to Wundt, more or less forsakes us. Presentations in

subconsciousness have not the power to divert attention, nor can we voluntarily concentrate attention upon theni. Before either can happen the subconscious presentations must cross the threshold of consciousness, and so cease to be subconscious ; and this, of course, is far from being always possible. Now in the case of sight an object may fail to catch the eye, either because, though within the field of sight, it is too far away to make a distinct impression or because it is outside the field altogether. But we cannot conveniently interpret "threshold of consciousness" in keeping with the latter alternative; mere accretion from without is a conception as alien to psychology as it is to biology. We must make the best we can of a totum objectivum differen- tiated within itself, and so are confined to the first alternative. Our threshold must be compared to the sur- face of a lake and subconsciousness to the depths beneath it, and all the current terminology of presentations rising and sinking iniplies this or some similar figure,

This hypothesis of subconsciousness has been Strangely mis- understood, and it would be hard to say at whose hands it has suffered most, those of its exponents or those of its opponents. In the main it is nothing more than the application to the facts of presentation of the law of continuity, its introduction into psycho- logy being due to Leibnitz, who first formulated that law. © Half the difficulties in the way of its acceptance are due to the manifold ambiguities of the word consciousness. With Leibnitz consciousness was not coextensive with all psychical life, but only with certain

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higher phases! of it. Of late, however, the tendency has been to make consciousness cover all stages of mental devclopment and all grades of presentation, so that a prescntation of which there is no consciousness resolves itself into the manifest contradiction of an unpresented presentation—a contradiction not involved in Leibnitz's "unapperceived pereeption." Moreover, the active form of the word "eonscious" almost unavoidably suggests that an "uncon- scious mental modification" must be one in which that subjective activity, variously called consciousness, attention, or thinking, has no part. But such is not the meaning intended when it is said, for example, that a soldier in battle 1s often unconscious of

his wounds or a scholar uuconscious at any one time of most of the knowledge "hidden in the obscure recesses of his mind." There would be no point in saying a subject is not conscious of objects that are not presented at all; but to say that what is presented lacks the intensity requisite in the given distribution of attention to change that distribution appreciably is pertinent enough. Sub- eonscious presentations may tell on conscious life—as sunshine or mist tells on a landscape or the underlying writing on a palimpsest —although lacking either the differences of intensity or the indivi- dual distinctness requisite to make them definite features. Even if there were no facts to warrant this conception of a subliminal presentation of impressions and ideas it might still claiin an @ priort justification. For to assume that there ean be no presentations save such as pertain to the complete and perfect consciousness of a human being is as arbitrary and as improbable as it would be to suppose—in the absence of evidence to the contrary—that there was no vision or audition save such as is mediated by human cyes and ears. Psychological magnification is not more absurd than physical, although the processes in the two cases must be materially different ; but of course in no case is magnification possible with- out limit. 'The point is that, while we cannot fix the limit at which the subconscious becomes the absolutely unconscious, it is only reasonable to expect beforehand that this limit is not just where our powers of discrimination cease.

Over and above hindrances to its acceptance which may be set down to the paradoxical and inaccurate use of the word uncon- sciousness, there are two material difficulties which prevent this hypothesis from finding favour. First, the prevailingly objective implications of language are apt to make us assume that, asa tree remains the same thing whether it is in the foreground of a land- scape or is lost in the grey distance, so a presentation must be a something which is in itself the same whether above the threshold of consciousness or below, if it exist, that is, in this lower degree at all. But it must be remembercd that we are not now dealing with physical things but with presentations, and that to these the Berkeleyan dictum applies that their esse is peretpi, provided, of course, we give to percipi the wide meaning now assigned to consciousness. 'The qualitative differences of all presentations and the distinctness of structure of such as are complex both diminish with a diminution of intensity. In this sense much is latent or

“involved” in presentations lying below the threshold of con- sciousness that becomes patent or “evolved” as they rise above it. But, on the other hand, the hypothesis of subconsciousness does not cominit us to the assumption that all presentations are by their very nature imperishable: while many modifications of con- sciousness sink only into-obliviscence, many, we may well suppose, lapse into complete oblivion and from that there is no recall. Secondly, to any one addieted to the atomistic view of presenta- tions just now referred to it may well seem incredible that all the incidents of a long lifetime and all the items of knowledge of a well-stored mind that may possibly recur— the infinitely greater part of our spiritual treasures,” as Hamilton says—can be in any sense present continuously. The brunt of such an objection is effectually met by the fact that the same presentation may figure in very various connexions, as may the same letter, for example, in many words, the same word in many sentences. We cannot measure the literature of a language by its vocabulary, nor may we equate the extent of our spiritual treasures as suceessively pee with the psychical apparatus, so to say, into which they resolve.”*

The attempt has more than once been made to avoid the diffi- culties besetting subconsciousness by falling back on the concep- tions of faculties, capacities, or dispositions. Stored-up knowledge, says J. S. Mill, “‘is not a mental state but a capability of being put into a mental state” ; similarly of the cases which Hamilton records, “in whieh the extinct memory [2] of whole languages was suddenly restored,” he says, ‘it is not the mental impressions that are latent

1 The following brief passage from his Principes de la Nature et de la Grace (@ 4) shows his meaning :~~—“ I] est bon de faire distinction entre la Perception, qui est l’état intérieur de la Monade representant les choses externes, et lAp~~ perception, qui est la Conscience, ou la connoissance réflexive de cet état intérieur, laquelle n’est point donnée 4 toutes les Ames, nt toujours dla méme dme. Et c’est faute de cette distinction que les Cartésiens ont manqué, en comptant pour rien les perceptions dont on ne s’appercoit pas, comme le peuple compte pour rien les corps insensibles” (Op. Phil., Erdmann’s ed., ii. p. 715).

_ 2 Much light may be thrown on this matter and on many others by such inquiries as those undertaken by Mr Francis Galton, and described in his Inquiries into Human Faculty, pp. 182-203.

its unwonted glow reveals. all men, and in psychology of all subjects, should have supposed such merely formal conveniences as these conceptions of faculties and powers could ever dispense us from further inquiry. be urged in Mill's defence that he has investigated further and concludes that the only distinct meaning he can attach to uncon- scious mental modification is that of unconscious modification of the nerves—a modification of the nerves, that is to say, without any psychical accompaniment. But, while we can frequently under- stand a psychical fact better if we can understand its physical counterpart, a physiological explanation can never take the place of a psychological explanation. nervous modifications which have no psychical concomitants, then so far there is nothing psychological to explain ; but, if there really is anything calling for psychological explanation—and this Mill does not deny—then physical accompaniments must admit of psychical interpretation if they are to be of any avail, And in

but the power of reproducing them." But surely the capability of being put into a mental state is itself a mental state and something actual, and is, moreover, a different something when the state to be reproduced is different. E exerted? Even where the capability cannot be consciously exerted, must there not still! be something actual to justify the phrase latent

ower ? beaton but not for the contents of the " extinct memories " which

If not, how is such eapability ever

The "exaltation" of dclirium may account for the intensi-

It seems extraordinary that Mill of

It might

If all we have to deal with are

fact, although Mill professes to recognize only unconscious modi-

fications of nerves, he finds a psychological meaning for these by

means of his "mental chemistry,"—a doctrine which has done its

work and which we need not here discuss.

The exposition of subconseiousness given by Wundt is in the main an advance on that of Mill and calls for brief notice. Pre- sentations, says Wundt,? are not substances but functions, whose physiological counterparts in like manner are functional activities, viz., of certain arrangements of nerve-cells. Consciousness of the presentation and the nervous activity cease together, but the

latter leaves behind it a molecular modification of thc nervous –

structure which becomes more and more permanent with exercise, and is such as to facilitate the recurrence of the same functional activity. A more precise account of these after-effects of exercise is for the present unattainable; nevertheless Wundt regards it as obvious that they are no more to be compared to the activity to whieh they predispose than the molecular arrangement of chlorine and nitrogen in nitric chloride is to be compared to the explosive decomposition that ensues if the chloride is slightly disturbed. Mutatis mutandis, on the psychological side the only actual pre- sentations are those which we are conscious of as such; but pre-sentations that vanish out of consciousness leave behind psychical dispositions tending to renew them. 'The essential difference is that, whereas we may some day know the nature of the physical disposition, that of the psychical disposition must of necessity be for ever unknown, for the threshold of consciousness is also the limit of internal experience. The theory thus briefly summarized seems in some respects arbitrary, in some respects ambiguous. It is questionable, for instance, whether the extremely meagre in- formation that physiologists at present possess at all compels us to assume that the " physical disposition" of Wundt cannot con- sist in a continuous but much fainter discharge of function. At all events it is quite beside the mark to urge, as he does, that the effect of training a group of muscles is not shown in the persist- ence of slight movements during

intervals of apparent rest.4 The absence of molar motions is no evidence of the absence of molecular motions. And it is certain that psychologically we can be conscious of the idea of a movement without the movement actually ensuing, yet only in such wise that the idea is more apt to pass over into action the intenser it is, and often actually passes over in spite of us. Surely there must be some functional activity answering to this conscious presentation, and if this amount of activity is possible without movement why may not a much less amount be conceived possible too? Again, what meaning can possibly be attached to a psychical disposition which is the counterpart, not of physical changes, but of an arrangement of molecules? Compared with such an inconceivable unknown, the perfectly conceivable hypothesis of infinitesimal presentations so faint as to elude discrimination is every way preferable. In fact, if conceivability is to count for any- thing, we have, according to Wundt, no choice, for " we can never think of a presentation that has disappeared from consciousness except as retaining the properties it had when in consciousness." None the less he holds it to be an error 'to apply to presentations themselves a style of conception that has resulted from our being of necessity confined to consciousness." Verily, this is phenomenalism with a vengeance, as if presentations themselves were not also confined to consciousness !

3 Phystologische Psychologie, p. 203 sq.

4 J. S. Mill adopts substantially the same line of argument: "I have the power to walk across the room, though I am sitting in my chair ; but we should hardly call this power a latent act of walking" (Examination of Sir W.

Hamilton's Philosophy, 3d ed., p. 329).

Rela- tivity.

PSYCHOLOGY

This will be the most convenient place to take note of certain psychological doctrines which, though differing in some material respects, are usually included under the term Law of Relativity.

1. Hobbes's Ldem semper sentire et non sentire ad idem recidunt is often cited as one of the first formulations of this law ; and if we take it to apply to the whole field of con- sciousness it becomes at once true and trite: a field of consciousness unaltered either by change of impression or of ideas would certainly be a blank and a contradiction. Understood in this sense the Law of Relativity amounts to what Hamilton called the Law of Variety (Reid's Works, p. 932). But, though consciousness involves change, it is still possible that particular presentations in the field of consciousness may continue unchanged indefinitely. When it is said that "a constant impression is the same as a blank," what is meant turns out to be something not psychological at all, as, e.g., our insensibility to the motion of the earth or to the pressure of the air—cases in which there is obviously no presentation, nor even any evidence of nervous change. Or else this paradox proves to be but an awkward way of expressing what we may call accommodation, whether physiological or psychological. Thus the skin soon adapts itself to certain seasonal altera- tions of temperature, so that heat or cold ceases to be felt: the sensation ceases because the nervous change, its proximate physical counterpart, has ceased. Again, there is what James Mill calls "an acquired incapacity of atten- tion," such that a constant noise, for exainple, in which we have no interest is soon inaudible. As attention moves away from a presentation its intensity diminishes, and when the presentation is below the threshold of conscious- ness its intensity is then subliminal, whatever that of the physical stimulus may be. In such a case of psychological accommodation we should expect also to find on the phy- slological side some form of central reflexion or isolation more or less complete. Asa rule, no doubt, impressions do not continue constant for more than a very short time P still there are sad instances enough in the history of disease, bodily and mental, to show that such a thing can quite well happen, and that such constant impressions (and "fixed ideas," which are in effect tantamount to them), instead of becoming blanks, may dominate the entire consciousness, colouring or bewildering everything.

2. From the fact that the field of consciousness is con- tinually changing it has been supposed to follow, not only that a constant presentation is impossible, but as a further consequence that every presentation is essentially nothing but a transition or difference. "All feeling," says Dr Bain, the leading exponent of this view, "is two-sided. ... We may attend

more to one member of the couple than to the other. . . . We are more conscious of heat when passing to a higher temperature, and of cold when passing to a lower. The state we have passed to is our explocit con- sciousness, the state we have passed from is our umplocet consciousness." But the transition need not be from heat to cold, or vice versa: it can equally well take place from aneutral state, which is indeed the normal state, of neither heat nor cold ; a new-born mammal, e.g., must experience cold, having never experienced heat. Again, suppose a sailor becalmed, gazing for a whole morning upon a stretch of sea and sky, what sensations are implicit here? Shall Wwe say yellow as the greatest contrast to blue, or darkness as the contrary of light, or both? What, again, is the Impheit consciousness when the explicit is sweet; is it bitter or sour, and from what is the transition in such a case 4

It is difficult to avoid suspecting a certain confusion here between the transition of attention from one presentation to another and the qualitative differences among presenta-

tions themselves. It is strange that the psychologist who has laid such stress on neutral states of surprise as being akin to feeling, and so distinct from special presentations, should in any way confound the two. The mistake, if mistake indeed it be, is perhaps accounted for by the fact that Dr Bain, in common with the rest of his school, nowhere dis- tinguishes between attention and the presentations that are attended to. To be conscious or mentally alive we must have a succession of shocks or surprises, new objects calling off attention from old ones; but, over and above these movements of attention from presentation to presentation, do we find that each presentation is also itself but a transi- tion or difference? 'We do not know any one thing of itself but only the difference between it and another thing," says Dr Bain. But it is plain we cannot speak of con- trast or difference between two states or things as a contrast or difference if the states or things are not themselves presented, else the so-called contrast or difference would itself be a single presentation, and its supposed "relativity" but an inference. Difference is not more necessary to the presentation of two objects than two objects to the presenta- tion of

difference. And, what is more, a difference between presentations is not at all the same thing as the presenta- tion of that difference. The former must precede the latter ; the latter, which requires active comparison, need not follow. There is an ambiguity in the words " know," "knowledge," which Dr Bain seems not to have considered : "to know" may mean either to perceive or appreliend, or it may mean to understand or comprehend.! Knowledge in the first sense is only what we shall have presently to dis- cuss as the recognition or assimilation of an impression (see below, p. 53); knowledge in the latter sense is the result of intellectual comparison and is embodied in a proposition. Thus a blind man who cannot know light in the first sense can know about light in the second if he studies a treatise on optics. Now in simple perception or recognition we cannot with any exactness say that two things are per- ceived : straight is a thing, 7.c., a definite object presented ; not so not-straight, which may be qualitatively obscure or intensively feeble to any degree. Only when we rise to intellectual knowledge is it true to say, "No one could understand the meaning of a straight line without being shown a line not straight, a bent or crooked line."2 Two distinct presentations are necessary to the comparison that is here implied ; but we cannot begin with such definitional differentiation : we must first recognize our objects before we can compare them. We need, then, to distinguish be- tween the comparativity of intellectual knowledge, which we must admit—for it rests at bottom on a purely ana- lytical proposition—and the "differential theory of pre- sentations," which, however plausible at first sight, must be wrong somewhere since it commits us to absurdities. Thus, if we cannot have a presentation X but only the presentation of the difference between Y and Z, it would seem that in like manner we cannot have the presentation of Y or Z, nor therefore of their difference X, till we have had the presentation of A and B say, which differ by Y, and of C' and D, which we may suppose differ by Z. The lurking error in this doctrine, that all presentations are but differences, may perhaps emerge if we examine more closely what may be meant by difference. We may speak of (a) differences in intensity between sensations supposed

1 Other languages give more prominence to this distinction ; compare yravar and eidévar, noscere and scire, kennen and wissen, connattre and savoir. On this subject there are some acute remarks in a little- known book,

the Hxploratio Philosophica, of Professor J. Grote. Hobbes too was well awake to this difference, as, e.g., when he says, '"'There are two kinds of knowledge; the one, sense or knowledge original and remembrance of the same; the other, science or know- ledge of the truth of propositions, derived from understanding."

- *Bain, Logic, vol. i. p. 3.*

regards the qualities of sensations the outlook of the rela- tivists is, if anything, worse. In what is called Meyer's experiment, ¢.g. (described under Eyx, vol. vill. p. 825), what appears greenish on a red ground will appear of an orange tint on a ground of blue; but this contrast is only possible within certain very narrow limits. In fact, the phenomena of colour-contrast, so far from proving, dis- tinctly disprove that we apprehend the qualities of light only according to their mutual relation. In the case of tones it is very questionable whether such contrasts exist at all. Summing up on the particular doctrine of relativity of which Wundt is the most distinguished adherent, the truth seems to be that, in some cases where two presenta- tions whose difference is itself presentable occur in close connexion, this difference—as we indirectly learn—exerts a certain bias on the assimilation or identification of one or both of the presentations. There is no "unalterably fixed unit" certainly, but, on the other hand, "the mutual

to be qualitatively identical, or of (6) differences in quality in the same continuum or class of presentations, or of (¢) differences between sensations of different classes or con- tinua. Now, as regards (a) and (6), it will be found that the difference between two intensities of the same quality, or between two qualities of the same continuum, may be itself a distinct presentation. But nothing of this kind holds of ©.1 In passing from a load of 10 ib to one of 20 tb, or from the sound of a note to that of its octave, it is possible to make the change continuously, and to esti- mate it as one might the distance between two places on the same road. But in passing from the

scent of a rose to the sound of a gong or a sting from a bee we have no such means of bringing the two into relation—scarcely more than we might have of measuring the length of a journey made partly on the common earth and partly through the looking-glass. In ©, then, we have only a

change, a difference of presentation, but not a presentation of difference; and we only have more than this in (a) or (b) provided the selected presentations occur together. Tf red follows green we may be aware of a greater differ- ence than we could if red followed orange; and we should ordinarily call a 10-Ib load heavy after one of 5 ib and light after one of 20 tb. Facts like these it is which make the differential theory of presentations plausible.

3. On the strength of such facts Wundt has formulated a law of relativity, free, apparently, from the objections just urged against Dr Bain's doctrine, which runs thus: Our sensations afford no absolute but only a relative measure of external impressions. The intensities of stimuli, the pitch of tones, the qualities of light, we apprehend (empfinden) in general only according to their mutual rela- tion, not according to any unalterably fixed unit given along with or before the impression itself." ? We are not now concerned with so much of this statement as relates to the physical antecedents of sensation ; but that what is of psychological account in it requires very substantial qualification is evident at once from a single consideration, viz., that if true this law would make it quite immaterial what the impressions themselves were: provided the rela- tion continued the same, the sensation would be the same too, just as the ratio of 2 to 1 is the same whether our unit be miles or millimétres. In the case of intensities, e.g., there is a minimum sensibile and a maximum sensibile. The existence of such extremes is alone sufficient to turn the flank of the thoroughgoing relativists ; but there are instances enough of intermediate intensities that are directly recognized. A letter-sorter, for example, who identifies an ounce or two ounces with remarkable exact- ness identifies each for itself and not the first as half the second; of an ounce and a half or of three ounces he may have a comparatively vague idea. And so generally within certain limits of error, indirectly ascertained, we can identify intensities, each for itself, neither referring to a common standard nor to one that varies from time to time —to any intensity, that is to say, that chances to be simul-

taneously presented; just as an enlisting sergeant will recognize a man fit for the Guards without a yard measure and whether the man's comrades are tall or short. Of course such identification is only possible through the re- production of past inrpressions, but then such reproduction itself is only possible because the several impressions con- cerned have all along had a certain independence of related

As

impressions, and a certain identity among themselves.

1 Common language seems to recognize some connexion even here, or we should not speak of harsh tastes and harsh sounds, or of dull sounds and dull colours, and so forth. All this is, however, super- added to the sensation, probably on the ground of similarities in the accompanying organic sensations.

2 Physiologische Psychologie, Ist ed., p. 421; the doctrine re- appears in the 2d ed., but no equally general statement of it is given.

*relations of impressions" are not everything.**

Sensation and Movement. One of the first questions to arise concerning our simplest

presentations or sensations is to account for their differ- ences of quality. In some respects it may well seem an idle question, for at some stage or other we must acknow- ledge final or irresolvable differences. be frequently shown to be due to variety in the number,*

Still, differences can

arrangement, and intensity of parts severally the same,— these several parts being either simultaneously presented or succeeding each other with varying intervals. It is a sound scientific instinct which has led writers like G. H. Lewes and Mr Spencer to look out for evidence of some simple primordial presentation—the psychical counterpart, they supposed, of a

single nerve-shock or neural tremor— out of which by various grouping existing sensations have

‘arisen. It must, however, be admitted that but little of

such evidence is at present forthcoming ; and further, if we look at the question fora moment from the physiological standpoint which these writers are too apt to affect, what we find seems on the whole to make against this assump- tion. Protoplasm in its simplest state is readily irritated either by light, heat, electricity, or mechanical shock. ‘Detl the physiological characteristics of these various stimuli are better known, it is fruitless to speculate as to the nature of primitive sensation. But we have certainly no warrant for supposing that any existing class of sensations is entitled to rank as original. Touch, as we experience it now, is probably quite as complex as any of our special sensations. If a supposition must be ventured at all, it is perhaps most in keeping with what we know to suppose that the sensations answering to the five senses in their earliest form were only slightly differing variations of the more or less massive organic sensation which constituted the primitive presentation-continuum. We may suppose, in other words, that at the outset these sensations corre- sponded more completely with what we might call the general physiological action of light, heat, &c., as distinct from the action of these stimulants on specially differen- tiated end-organs. But, short of resolving such sensations into combinations of one primordial modification of con- sciousness, if we could conceive such, there are many interesting facts which point clearly to a complexity that we can seldom directly detect. Many of our supposed sensations of taste, e.g., are complicated with sensations of

8 Those who, like Helmholtz, explain the phenomena of contrast and the like as illusions of judgment, must class them as cases of comparativity ; those who, like Hering, explain them physiologically, would see in them nothing but physiological adaptation.

4 For a detailed account of the various sensations and perceptions pertaining to the several senses the reader is referred to the articles Eve, Ear, Toucu, Taste, SMELL, &c.

Quali- tative | differ- ences.

— Ln LQ,

Poe HO 1 0 G Y

touch and smell: thus the pungency of pepper and the dryness of wine are tactual sensations, and their spicy flavours are really smells. How largely smells mingle with what we ordinarily take to be simply tastes is best brought home to us by a severe cold in the head, as this temporarily prevents the access of exhalations to the olfac- tory surfaces. The difference between the smooth feel of a polished surface and the roughness of one that is unpolished, though to direct introspection an irresolvable difference of quality, is probably due to the fact that several nerve-terminations are excited in each case: where the sensation is one of smoothness all are stimulated equally ; where it is one of roughness the ridges compress the nerve-ends more, and the hollows compress them less, than the level parts do. The most striking instance in point, however, is furnished by musical timbre (see Ear, vol. vii. p. 593).

We find other evidence of the complexity of our existing sensations in the variations in quality that accompany variations in intensity, extensity, and duration. With the exception of spectral red all colours give place, sooner or later, to a mere colourless grey as the intensity of the light diminishes, and all in like manner become indis- tinguishably white after a certain increase of intensity. A longer time is also in most cases necessary to produce a sensation of colour than to produce a sensation merely of light or brightness: the solar spectrum seen for a moment appears not of seven colours but of two only— faintly red towards the left side and blue towards the right. Very small objects, again, such as coloured specks on a white ground, though still distinetly seen, appear as colour- less if of less than a certain size, the relation between their intensity and extensity being such that within certain limits the brighter they are the smaller they may be with- out losing colour, and the larger they are the fainter in like manner. Similar facts are observable in the case of other senses, so that generally we seem justified in regard- ing what we now distinguish as a sensation as probably com- plicated in several respects. In other words, if psychical magnification were possible, we might be directly aware that sensations which we now

suppose to be both single and simple were both compound and complex—that they

continuous variations in quality, as in looking at the rain- bow, for example. Still it is not to be supposed that colours or notes are necessarily presented as continua : that they are such is matter of after-observation.

The groups of sensations known as touches, smells, tastes, on the other hand, do not constitute continua : bitter tastes, for instance, will not shade off into acid or sweet tastes, except, of course, through a gradual diminution of inten- sity rendering the one quality subliminal followed by a gradual increase from zero in the intensity of the other. This want of continuity might be explained if there were grounds for regarding these groups as more complex than the rest,—in so far as tertiary colours or vowel-sounds, say, are complex and comparatively discontinuous. But it might equally well be argued that they are simpler than the rest and, as simple and different, are necessarily dis- parate, while the continuity of colours or tones is due to a gradual change of components.

Our motor presentations contrast with the sensory by their want of striking qualitative differences, We may divide them into two groups, (a) motor presentations proper and (6) auxilio-motor presentations. The former answer to our "feelings of muscular effort " or " feelings of innerva- tion." The latter are those presentations due to the strain- ing of tendons, stretching and flexing of the skin, and the like, by which the healthy man knows that his efforts to move are followed by movement, and so knows the position of his body and limbs. It is owing to the absence of these presentations that the anesthetic patient cannot directly tell whether his efforts are effectual or not, nor in what position his limbs have been placed by movements from without. Thus under normal circumstances motor pre- sentations are always accompanied by auxilio-motor ; but in disease and in passive movements they are separated and their distinctness thus made manifest, Originally we may suppose auxilio-motor objects to form one imper- fectly differentiated continuum, but now, as with sensa- tions, movements have become a collection of special continua, viz., the groups of movements possible to each limb and certain combinations of these.

Perception.

In treating apart of the differentiation of our sensory Mental and motor continua, as resulting merely in a number of synthesis distinguishable sensations and movements, we have been ° inte-

° : BRO eration. compelled by the exigencies of exposition to leave out of

consisted, that is, of two or more sensational elements or changes, alike or different in quality, of uniform or variable intensity, and occurring either simultaneously or in regular or irregular succession.

Quali- It is interesting to note that all possible sensations of sight another process which really advances part passu ee colour, of tone, and of temperature constitute as many | with this differentiation, viz., the integration or synthesis groups of qualitative continua. By continuum is here | of these proximately elementary presentations into those

_ tinuity,

meant a series of presentations changing gradually in quality, z.e., so that any two differ less the more they approximate in the series. We may represent this rela- tion among presentations spatially, so long as the differences do not exceed three. In this way our normal colour-sensa- tions have been compared to a sphere, in which (a) the maximum of luminosity is at one pole and the minimum at the other ; (b) the series of colours proper (red to violet and through purple back to red), constituting a closed line, are placed round the equator or in zones parallel to it, according to shade; and © the amount of saturation (or absence of white) for any given zone of illumination in- creases with distance from the axis. The several musical tones, again, have been compared to an ascending spiral, a given tone and its octaves lying in the same perpen- dicular. Temperatures similarly might be represented as Tanging in opposite directions, 2.¢., through heat or through cold, between a zero of no sensation and the organic sensa- Hons that accompany the destructive action of heat and cold alike. As we frequently experience a continuous Tange of intensity of varying amount, so we may experience

complex presentations which are called perceptions, in- tuitions, sensori-motor reactions, and the like. It is, of course, not to be supposed that in the evolution of mind any creature attained to such variety of distinct sensations and movements as a human being possesses without making even the first step towards building up this material into the most rudimentary knowledge and action. ‘ On the contrary, there is every reason to think, as has been said already incidentally, that further differentiation was helped by previous integration, that perception prepared the way for distincter sensations, and purposive action for more various movements. This process of synthesis, which ig in the truest sense a psychical process, deserves some general consideration before we proceed to the several complexes that result from it. Most complexes, certainly the most important, are consequences of that principle of subjective selection whereby interesting sensations lead through the intervention of feeling to movements ; and the movements that turn out to subserve such interest come to have a share in it. In this way—which we need not stay to examine more closely now—it happens that, in the

alternation of sensory and motor phases which is common to all psychical life, a certain sensation, comparatively in- tense, and a certain movement, definite enough to control that sensation, engage attention in immediate succession, to the more or less complete exclusion from attention of the other less intense sensations and more diffused movements that accompany them. Apart from this intervention of controlling movements, the presentation-continuum, how- ever much differentiated, would be for all purposes of know- ledge little better than the disconnected manifold for which Kant took it. At the same time it is to be remembered that the subject obtains command of particular movements out of all the mass involved in emotional expression only because such movements prove on occurrence adapted to control certain sensations. Before experience, and apart from heredity, there seems not only no scientific warrant for assuming any sort of practical prescience but also none for the hypothesis of a prior forms of

knowledge. Of a pre-established harmony between the active and passive phases of consciousness we need none, or—it may be safer to say—at least indefinitely little. A sentient creature moves first of all because it feels, not because it intends. A long process, in which natural selection probably played the chief part at the outset-—subjective selection becoming more prominent as the process advanced—must have been necessary to secure as much purposive movement as even a lobster displays. It seems impossible to except from this process the movements of the special sense-organs which are essential to our perception of external things. Here too subjective interest will explain, so far as psycho- logical explanation is possible, those syntheses of motor and sensory presentations which we call spatial perceptions and intuitions of material things. For example, some of the earliest lessons of this kind seem to be acquired, as we may presently see, in the process of exploring the body by means of the limbs,—a process for which grounds in sub- jective interest can obviously never be wanting.

The mere process of "association ""—Wwhereby we may suppose the synthesis of presentations to be effected so that presentations originally in no way connected tend to move in consciousness together—will confront us with its own problems later on. We need for the present only to bear in mind that the conjunction or continuity upon which the association primarily depends is one determined by the movements of attention, which movements in turn depend very largely upon the pleasure or pain that pre- sentations occasion. To some extent, however, there is no doubt that attention may pass non-voluntarily from one indifferent presentation to another, each being sufficiently intense to give what has been called a "shock of surprise," but not so intense as to awaken feeling to move for their de- tention or dismissal. But throughout the process of mental development, where we are concerned with what is new, the range of such indifference is probably small : indifferent presentations there will be, but that does not matter while there are others that are interesting to take the lead.

Perception as a psychological term has received various, though related, meanings for different writers. It is sometimes used for the recognition of a sensation or move- ment as distinct from its mere presentation, and thus is said to imply the more or less definite revival of certain residua or re-presentations of past experience which re- sembled the present. More

frequently it is used as the equivalent of what has been otherwise called the " localiza- tion and projection " of sensations,—that is to say, a sensa- tion presented either as an affection of some part of our own body regarded as extended or as a state of some foreign body beyond it. According to the former usage, strictly taken, there might be perception without any spatial pre- sentation at all: a sensation that had been attended to a

we had a precise name for each.

few times might be perceived as familiar. Such percept being a " presentative ~~*representative " complex, and wholly sensory, we might symbolize it, details apart, as S+s, using S for the present sensation, and s for a former S re*~~ *presented. According to the latter usage, an entirely new sensation, provided it were complicated with motor experi-*

ences in the way required for its localization or projection, would become a perception. Such a perception might be roughly symbolized as X + (Jf-+m), or as X+msimply, M standing for actual movements, as in ocular adjustment, which in some cases might be only former movements re- presented or m. probably invariably includes both cases : impressions which we recognize we also localize or project, and impressions which are localized or projected are never entirely new,— they are, at least, perceived as sounds or colours or aches, dc. It will, however, frequently happen that we are speci- ally concerned with only one side of the whole process, as is the case with a tea-taster or a colour-mixer on the one hand, or, on the other, with the patient who is perplexed to decide whether what he sees and hears is "' subjective," or whether it is "real." to discriminate the quality of an impression than to fix it spatially; indeed this latter process was taken for

But as a matter of fact actual perception

Usually we have more trouble

granted by most psychologists till recently. But, however little the two sides are actually separated, it is important to mark their logical distinctness, and it would be well if In any other science save psychology such names would be at once forthcoming ;

but it seems the fate of this science to be restricted in its

terminology to the ill-defined and well-worn currency of conimon speech, with which every psychologist feels at liberty to do what is right in his own eyes, at least within the wide range which a loose connotation allows. If there were any hope of their general acceptance we might pro- pose to call the first-mentioned process the assimilation or recognition of an impression, and might apply the term localization to its spatial fixation, without distinguishing between the body and space beyond,—a matter of the less importance as projection hardly enters into primitive spatial experience. But there is still a distinction called for: perception as we now know it involves not only localization, or 'spatial reference," as it is not very happily termed, but "objective reference" as well, We may perceive sound or light without any presentation of that which sounds or shines; but none the less we do not regard such sound or light as merely the object of our attention, as having only immanent existence, but as the quality or change or state of a thing, an object distinct not only from the subject attending but from all presentations whatever to which it attends. Here again the actual separation is impossible, because this factor in perception has been so intertwined throughout our mental develop- ment with the other two. Still a careful psychological ana- lysis will show that such "reification," as we might almost call it, has depended on special circumstances, which we can at any rate conceive absent. These special circumstances are briefly the constant conjunctions and successions of impressions, for which psychology can give no reason, and the constant movements to which they prompt. Thus we receive together, ¢.g., those impressions we' now recognize as severally the scent, colour, and "feel" of the rose we pluck and handle. We might call each a " percept," and the whole a "complex percept." But there is more in such a complex than a sum of partial percepts ; there is the apprehension or intuition of the rose asa thing having this scent, colour, and texture. We have, then, under perception to consider (i.) the assimilation and (ii.) the localization of impressions, and (iii.) the intuition of things.

The range of the terms assimilation or recognition of

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Assimi- impressions is wide: between the simplest mental process lation of they may be supposed to denote and the most complex unpre' there is a great difference. The penguin that watched "unmoved the first landing of man upon its lonely rock becomes as wild and wary as more civilized fowl after two or three visits from its molester: it then recognizes that featherless biped. His friends at home also recognize him though altered by years of peril and exposure. In the latter case some trick of his voice or manner, some " strik- ing" feature, calls up and sustains a crowd of memories of the traveller in the past,—events leading on to the present scene. The two recognitions are widely different, and it is from states of mind more like the latter than the former that psychologists have usually drawn their descrip- tion of perception. At the outset, they say, we have a primary presentation or impression P, and after sundry repetitions there remains a mass or a series of P residua, P\P2P3 + – - ; perception ensues when, sooner or later, P,, "calls up " and associates itself with these re-presentations or ideas. Much of our later perception, and especially when we are at all interested, awakens, no doubt, both distinct memories and distinct expectations; but, since these imply previous perceptions, it is obvious that the earliest form of recognition, or, as we might better call it, assimilation, must be free from such complications, can have nothing in it answering to the overt judgment, P,, is a P, Assimilation involves retentiveness and differentia- tion, as we have seen, and prepares the way for re-presenta- tion; but in itself there is no confronting the new with the old, no determination of likeness, and no subsequent classification. The pure sensation we may regard as a psychological myth ; and the simple image, or such sensa- tion revived, seems equally mythical, as we may see later on. The nth sensation is not like the first: it isa change in a presentation-continuum that has itself been changed by those preceding ; and it cannot with any propriety be said to reproduce these past sensations, for they never had the individuality which such reproduction implies. Nor does it associate with images like itself, since where there is association there must first have been distinctness, and what can be associated can also, for some good time at least, be dissociated. Localiza- 'To treat of the localization of impressions is really to give hie an account of the steps by which the psychological indi- ae ' vidual comes to a knowledge of space. At the outset of such an inquiry it seems

desirable first of all to make plain what lies within our purview, and what does not, lest we disturb the peace of those who, confounding philosophy and psychology, are ever eager to fight for or against the a prwrt character of this element of knowledge. That space is priort in the epistemological sense it is no concern of the psychologist either to assert or to deny. Psychologically priori or original in such sense that it has been either actually or potentially an element in all presentation from the very beginning it certainly is not. It will help to make this matter clearer if we distinguish what philosophers frequently confuse, viz., the concrete spatial experiences, constituting actual localization for the individual, and the abstract conception of space, generalized from what is found to be common in such experiences. A gannet's mind "possessed of" a philosopher, if such a conceit may be allowed, would certainly afford its tenant very different Spatial experiences from those he might share if he took up his quarters ina mole. So, any one who has revisited In after years a place from which he had been absent since childhood knows how largely a "personal equation," as it Were, enters into his spatial perceptions. Or the same truth may be brought home to him if, walking with a friend more athletic than himself, they come upon a ditch, which both know to be twelve feet wide, but which the one

feels he can clear by a jump and the other feels he cannot. In the concrete "up" is much more than a different direc- tion from "along." The hen-harrier, which cannot soar, 18 indifferent to a quarry a hundred feet above it—to which the peregrine, built for soaring, would at once give chase— but is on the alert as soon as it descries prey of the same apparent magnitude, but upon the ground. Similarly, in the concrete, the body is the origin or datum to which all posi- tions are referred, and such positions differ not merely quantitatively but qualitatively. Moreover, our various bodily movements and their combinations constitute a net- work of co-ordinates, qualitatively distinguishable but geo- netrically, so to put it, both redundant and incomplete. It is a long way from these facts of perception, which the brutes share with us, to that scientific conception of space as having three dimensions and no qualitative differences which we have elaborated by the aid of thought and lan- guage, and which reason may see to be the logical

presup- position of what in the order of mental development has chronologically preceded it. That the experience of space is not psychologically original seems obvious—quite apart from any successful explanation of its origin—from the mere consideration of its complexity. Thus we must have a plurality of objects—A out of B, B beside C, distant from D, and so on; and these relations of externality, juxtapo- sition, and size or distance imply further specialization : for with a mere plurality of objects we have not straight- way spatial differences. Juxtaposition, e.g., is only possible when the related objects form a continuum; but, again, not any continuity is extensive. Now how has this com- plexity come about ?

The first condition of spatial experience seems to lie Exten- in what has been noted above (p. 46) as the extensity of sity. sensation, This much we may allow is original; for the longer we reflect the more clearly we see that no combina- tion or association of sensations varying only in intensity and quality, not even if motor presentations are added, will account for the space-element in our perceptions. A series of touches a, b, c, d may be combined with a series of movements 7m, my, ms, m4; both series may be reversed ; and finally the touches may be presented simultaneously. In this way we can attain the knowledge of the coexistence of objects that have a certain quasi-distance between them, and such experience is an important element in our per- ception of space; but it is not the whole of it. For, as has been already remarked by critics of the associationist psychology, we have an experience very similar to this in singing and hearing musical notes or the chromatic scale. The most elaborate attempt to get extensity out of succes- sion and coexistence is that of Mr Herbert Spencer. He has done, perhaps, all that can be done, and only to make it the more plain that the entire procedure is a tutepov mpotepov. We do not first experience a succession of touches or of retinal excitations by means of movements, and then, when these impressions are simultaneously pre- sented, regard them as extensive, because they are asso- ciated with or symbolize the original series of movements ; but, before and apart from movenient altogether, we ex- perience that massiveness or extensity of impressions in which movements enable us to find positions, and also to measure. But it will be objected, perhaps not without

1 We are ever in danger of exaggerating the competence of a new discovery ; and the associationists seem to have fallen into this mistake, not only in the use they have made of the conception of asso- ciation in psychology in general, but in the stress they have laid upon the fact of movement when explaining our space-perceptions in particular. Indeed, both ideas have here conspired against them,— association in keeping up the notion that we have only to deal with a plurality of discrete impressions, and movement in keeping to the front the idea of sequence. Mill's Hxamination of Hamilton (3d ed., p. 266 sq.) surely ought to convince us that, unless we are prepared to

impatience, that this amounts to the monstrous absurdity of making the contents of consciousness extended. The edge of this objection will be best turned by rendering the conception of extensity more precise. Thus, suppose a postage stamp pasted on the back of the hand; we have in consequence a certain sensation. If another be added beside it, the new experience would not be adequately described by merely saying we have a greater quantity of sensation, for intensity involves quantity, and increased intensity isnot what is meant. For a sensation of a certain intensity, say a sensation of red, cannot be changed into one having two qualities, red and blue, leaving the inten- sity unchanged ; but with extensity this change is possible. For one of the postage stamps a piece of wet cloth of the same size might be substituted and the massiveness of the compound sensation remain very much the same. Inten- sity belongs to what may be called graded quantity: it admits of increment or decrement, but is not a sum of parts. Extensity, on the other hand, does imply plurality : we might call it latent or merged plurality or a " ground " of plurality, inasmuch as to say that a single presentation has massiveness is to say that a portion of the presentation- continuum at the moment undifferentiated is capable of differentiation. Attributing this property of extensity to the presentation-continuum as a whole, we may call the relation of any particular sensation to this larger whole its local sign, and can see that, so long as the extensity of a presentation admits of diminution without the pre- sentation becoming nil, such presentation has

two or more local signs,—its parts, taken separately, though identical in quality and intensity, having a different rela- tion to the whole. Such difference of relation must be regarded fundamentally as a ground or possibility of distinctness of sign—whether as being the ground or pos- sibility of different complexes or otherwise—rather than as being from the beginning such an overt difference as the term "local sign," when used by Lotze, is meant to imply. From this point of view we may say that more partial presentations are concerned in the sensation caused by two stamps than in that caused by one. The fact that these partial presentations, though identical in quality and intensity, on the one hand are not wholly identical, and on the other are presented only as a quantity and not as a plurality, is explained by the distinctness along with the continuity of their local signs. Assuming that to every distinguishable part of the body there corresponds a local sign, we may allow that at any moment only a certain portion of this continuum is definitely within the field of consciousness ; but no one will maintain that a part of one hand is ever felt as continuous with part of the other or with part of the face. This we can only represent by saying that the local signs have an invariable relation to each other: two continuous signs are not one day coin- cident and the next widely separate.2 This last fact is

say, a8 Mill seems to do, " that the idea of space is at bottom one of time" (p. 276), we must admit the inadequacy of our experience of movement to explain the origin of it.

1 To illustrate what is meant by different complexes it will be enough to refer to the psychological implications of the fact that scarcely two portions of the sensitive surface of the human body are anatomically alike. Not only in the distribution and character of the nerve-endings but in the variety of the underlying parts—in one place bone, in another fatty tissue, in others tendons or muscles variously arranged—we find ample ground for diversity in "the local colour- ing" of sensations. And comparative zoology helps us to see how such diversity has been developed as external impressions and the answering movements have gradually differentiated an organism origin- ally almost homogeneous and symmetrical. Between one point and another on the surface of a sphere there is no ground of difference; but this is no longer true if the sphere revolves round a fixed axis, still less if it also runs in one direction along its axis.

2 The improvements in the sensibility of our "spatial sense" con- sequent on its variations under practice, the action of drugs, &c. pane

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hardly perhaps implied in the mere massiveness of a sensa- tion, but it will be convenient to include it when speaking of the continuum of local signs as extensive. We have, then, a plurality of presentations constituting a continuum, presented simultaneously as impressions and having certain fixed and invariable relations to each other. Of such experience the typical case is that of passive touch, though the other senses exemplify it. It must be allowed that our conception of space in like manner involves a fixed continuity of positions ; but then it involves, further, the possibility of movement. Now in the continuum of local signs there is nothing whatever of this ; we might call this continuum an implicit plenum. It only becomes the pre- sentation of occupied space after its several local signs are complicated or "associated" in an orderly way with active touches, when in fact we have experienced the contrast of movements with contact and movements without, 2.c., in vacuo. It is quite true that we cannot now think of this plenum except as a space, because we cannot divest ourselves of these motor experiences by which we have explored it. We can, however, form some idea of the difference between the perception of space and this one element in the perception by contrasting massive internal sensations with massive superficial ones, or the general sensation of the body as "an animated organism" with our perception of it as extended.

It must seem strange, if this conception of extensity is essential to a psychological theory of space, that it has escaped notice so long. The reason may be that in investi- gations into the origin of our knowledge of space it was always the conception of space and not our concrete space perceptions that came up for examination. Now in space as we conceive it one position is distinguishable from another solely by its co-ordinates, z.c., by the magnitude and signs of certain lines and angles, as referred to a certain datum position, or origin; and these elements our motor experiences seem fully to explain. But on re- flexion we ought, surely, to be puzzled by the question, how these coexistent positions could be known before those movements were made which constitute them different positions, The link

we thus suspect to be missing is supplied by the more concrete experiences we obtain from our owu body, in which two positions have a qualitative difference or "local colour" independently of movement. True, such positions would not be known as spatial without move- ment; but neither would the movement be known as spatial had those positions no other difference than such as arises from movement.

We may now consider the part which movement plays Move- in elaborating the presentations of this dimensionless ™™™™

continuum into perceptions of space. In so doing we must bear in mind that this continuum implies the inco- presentability of two impressions having the same local sign, but allows not only of the presentation of impressions of varying massiveness but of several distinct impressions at the same time. As regards the motor element itself, the first point of importance is the incopresentability and invariability of a series of auxilio-motor presentations, P,P, PsP, P, cannot be presented along with P,, and from P, it is impossible to reach P, again save through P, and P,. Such a series, taken alone, could afford us, it is evident, nothing but the knowledge of an invariable sequence of impressions which it was in our own power to produce, Its psychological interest would lie solely in the fact that, whereas other impressions depend on an object- ive initiative, these depend ona subjective. But in the course of the movements necessary to the exploration of

obviously no real contradiction to this ; on the contrary, such facts are all in favonr of making extensity a distinct factor in our space experi- ence and one more fundamental than that of movement.

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the body—probably our earliest lesson in spatial perception —these auxilio-motor presentations receive a new signifi- cance from the active and passive touches that accompany them, just as they impart to these last a significance they could never have alone.

It is only in the resulting complex that we have the presentations of position and of spatial magnitude. For space, though conceived as a coexistent

continuum, excludes the notion of omnipresence or ubiquity ; two positions /, and /, must coexist, but they are not strictly distinct positions so long as we conceive ourselves present in the same sense in both. But, if F, and JF, are, eg., two impressions produced by compass-points touching two different spots as 7 and Z, on the hand or arm, and we place a finger upon J, and move it to /,, experiencing thereby the series P,,P,,P;,P,, this series constitutes J, and J, into positions and also invests /', and fF, with a relation not of mere distinctness but of definite distance. The resulting complex perhaps admits of symbolization as follows :—

Fa Fs Fe FaFeFelyFnFe….. SEG BY P) Po P3P4 Here the first line represents a portion of the tactual continuum, /', and /, being distinct "feels," if we may so say, or passive touches presented along with the fainter

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But in the evolution of our spatial experience impressions and positions are not thus presented apart. We can have, or at least Wwe Can suppose, an impression which is recognized without being localized ; but if it zs localized this means that a more complex presentation is formed by the addition of new elements, not that a second distinct object is presented and some indescribable connexion established between the impression and it, still less that the im- pression is referred to something not strictly presented at all. The truth is that the body as extended is from the psychological point of view not perceived at all apart from localized impressions. In like manner impressions projected (or the absence of impressions projected) constitute all that is perceived as the occupied (or un- occupied) space beyond. It is not till a much later stage, after many varying experiences of different impressions similarly local- ized or projected, that even the mere materials are present for the formation of such an abstract conception of space as "spatial reference" implies. Psychologists, being themselves at this later stage, are apt to commit the oversight of introducing it into the earlicr stage which they have to expound.

In a complex presentation, such as that of an orange or Intuition a piece of wax, may be distinguished the following points of things.

concerning which psychology may be expected to give an account :—(a) its reality, (6) its solidity or occupation of space, (c) its permanence, or rather its continuity in time, (d) its unity and complexity, and (e) its substantiality and the connexion of its attributes and powers. Though, in fact, these items are most intimately blended, our exposi- tion will be clearer if we consider each for a moment apart.

(a) The terms actuality and reality have each more Actual- than one meaning. Thus what is real, in the sense of ity or material, is opposed to what is mental; as the existent or 'elity:

sensations of the continuum as a whole; 7' stands for the active touch of the exploring finger and P, for the corre- sponding auxilio-motor object; the rest of the succession,

as not actually present at this stage but capable of re- vival from past explorations, is symbolized by the ¢¢¢ and P2P3P4. When the series of movements is accompanied by active touches without passive there arises the distinc- tion between one's own body and foreign bodies ; when the initial movement of a series is accompanied by both active and passive touches, the final movement by active touches only, and the intermediate movements are unaccompanied by either, we get the further presentation of empty space lying between us and them,—but only when by frequent experience of contacts along with those intermediate move- ments we have come to know all movement as not only succession but change of position. Thus active touches come at length to be projected, passive touches alone being localized in the stricter sense. But in actual fact, of course, the localization of one impression is not perfected before that of another is begun, and we must take care lest our necessarily meagre exposition give rise to the mistaken uotion that localizing an impression consists wholly and solely in performing or imaging the particular movements necessary to add active touches to a group of passive im- pressions. That this cannot suffice is evident merely from the consideration that a single position out of relation to all other positions is a contradiction. Localization, though it depends on many special experiences of the kind de- scribed, is not like an artificial product which is completed apart at a time, but is essentially a growth, its several constituent localizations advancing together in

definiteness and interconnexion. So far has this development advanced that we do not even imagine the special movements which the localization of an impression implies, that is to say, they are no longer distinctly represented as they would be if we definitely intended to make them: the past experiences are "retained," but too much blended in the mere perception to be appropriately spoken of as remembered or imaged. Apropos of this almost instinctive character of even our carliest spatial perceptions it will be appropriate to animadvert on a mis- leading implication in the current use of such terms as "localization," projection," " bodily reference," " spatial reference," and the like. The implication is that external space, or the body as extended, is im some sort presented or supposed apart from the localization, projection, or reference of impressions to such space. That it may

be possible to put a book in its place on a shelf there must be (1) the book, and (2), distinct and apart from it, the place on the shelf.

actual it is opposed to the non-existent ; and again, what is actual is distinguished from what is possible or necessary. But here both terms, with a certain shade of difference, in so far as actual is more appropriate to movements and events, are used, in antithesis to whatever is ideal or repre- sented, for what is sense-given or presented. This seems at least their primary psychological meaning; and it is the one most in vogue in English philosophy at any rate, over-tinged as that is with psychology.) Any examination of this characteristic will be best deferred till we come to deal with ideation generally (see p. 58 below). Meanwhile it may suffice to remark that reality or actuality is nota single distinct element added to the others which enter into the complex presentation we call a thing, as colour or solidity may be. Neither is it a special relation among these elements, like that of substance and attribute, for example. In these respects the real and the ideal, the actual and the possible, are alike; all the elements or qualities within the complex, and all the relations of those elements to each other, are the sae in the rose repre- sented as in the presented rose. The difference turns not upon what these elements are, regarded as qualities or relations presented or represented, but upon whatever it is that distinguishes the presentation from the representation of any given qualities or relations. Now this, as we shall see, turns partly upon the relation of

such complex pre- sentation to other presentations in consciousness with it, partly upon its relation as a presentation to the subject whose presentation it is. In this respect we find a differ- ence, not only between the simple qualities, such as cold, hard, red, and sweet in strawberry ice, eg., as presented and as represented, but also, though less conspicuously, in the spatial, and even the temporal, relations which enter into our intuition as distinct from our imagination of it. Where no such difference exists we have passed beyond ee eee ee

1 Thus Locke says, "Our simple ideas [t.e., presentations or im- pressions, as we should now say] are all real . . . and. not fictions at pleasure ; for the mind . . . can make to itself no simple idea inore than what it has received " (Essay, ii. 80, 2). And Berkeley says, "The

ideas imprinted on the senses by the Author of Nature are called real

things ; and those excited in the imagination, being less regular, vivid, and constant, are more properly termed ideas or images of things, which they copy or represent" (Prin. of Hum. Know., part i. § 38),

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plexity.

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the distinction of percept and image to the higher level of conception and thought. So, then, reality or actuality is not strictly an item by itself, but a characteristic of all the items that follow.

(b) Here our properly motor presentations or " feelings of effort or innervation" come specially into play. They are not entirely absent in those movements of exploration by which we attain a knowledge of space ; but it is when these movements are definitely resisted, or are only pos- sible by

increased effort, that we reach the full meaning of body as that which occupies space. Heat and cold, light and sound, the natural man regards as real, and by and by perhaps as due to the powers of things known or unknown, but not as themselves things. At the outset things are all corporeal like his own body, the first and archetypal thing, that is to say: things are intuited only when touch is accompanied by pressure; and, though at a later stage pass- ive touch without pressure may suffice, this is only because pressures depending on a subjective initiative, %.¢., on voluntary muscular exertion, have been previously experi- enced. It isof more than psychological interest to remark how the primordial factor in materiality is thus due to the projection of a subjectively determined reaction to that action of a not-self on which sense-impressions depend,— an action of the not-self which, of course, is not known as such till this projection of the subjective reaction has taken place. Still we must remember that accompany- ing sense-impressions are a condition of its projection : muscular effort without simultaneous sensations of contact would not yield the distinct presentation of the resistant occupying the space into which we have moved and would move again. Nay morc, it is in the highest degree an essential circumstance in this experience that muscular effort, though subjectively initiated, is still only possible when there is contact with something that, as it seems, 1s making an effort the counterpart of our own. But this something is so far no more than thing-stuff; without the elements next to be considered our psychological in- dividual would fall short of the complcte intuition of dis- tinct things.

(c) The remaining important factors in the psychologi- cal constitution of things might be described in general terms as the time-relations of their components. Such relations are themselves in no way psychologically deter- mined ; impressions recur with a certain order or want of order quite independently of the subject's interest or of any psychological principles of synthesis or association whatever. It is essential that impressions should recur, and recur as they have previously occurred, if knowledge is ever to begin; out of a continual chaos of sensation, all matter and no form, such as some philosophers describe, nothing but chaos could result. But a flux of impressions having this real or sense-given order will not suffice ; there must be also attention to and retention of the order, and these indispensable processes at least are psychological. Still they need not be further

emphasized here, nor would it have been necessary at this point to call them to mind at all had not British empirical philosophers brought psycho- logy into disrepute by overlooking them altogether.

But for its familiarity we should marvel at the fact that out of the variety of impressions simultaneously presented we do not instantly group together all the sounds and all the colours, all the touches and all the smells, but, dividing what is given together, single out a certain sound or smell as belonging with a certain colour and feel, similarly singled out from the rest, to what we call one thing. We might wonder, too—those at least who have made so much

of association by similarity ought to wonder—that, say, the white of snow calls up directly, not other shades of white or other colours, but the expectation of cold or of powdery soft-

ness. The first step in this process has been the simultane- ous projection into the same occupied space of the several impressions which we thus come to regard as the qualities of the body filling it. Yet such simultaneous and coincident projection would avail but little unless the constituent impressions were again and again repeated in like order so as to prompt anew the same grouping, and unless, further, this constancy in the one group was present along with changes in other groups and in the general field. There

is nothing in its first experience to tell the infant that the

song of the bird does not inhere in the hawthorn whence the notes proceed, but that the fragrance of the may-flower does. It is only where a group, as a whole, has been found to change its position relatively to other groups, and —apart from causal relations—to be independent of changes of position among them, that such complexes can become distinct unities and yield a world of things. Again, be- cause things are so often a world within themselves, their several parts or members not only having distinguishing qualities but moving and changing with more or less inde- pendence of the rest, it comes about that what is from one point of view one thing becomes from another point of view several,—like a tree with its separable branches

and fruits, for example. Wherein, then, more precisely, does the unity of a thing consist? This question, so far as it here admits of answer, carries us over to temporal continuity.

(d) Amidst all the change above described there is

thing comparatively fixed : our own body is both cohstant f é inuity.

as a group and a constant item in every field of groups ; and not only so, but it is beyond all other things an object of constant and peculiar interest, inasmuch as our earliest pleasures and pains depend solely upon it and what affects it. The body becomes, in fact, the earliest form of self, the first datum for our later conceptions of permanence and individuality. A continuity like that of self is then transferred to other bodies which resemble our own, so

far as our direct experience goes, in passing continuously

from place to place and undergoing only partial and gradual changes of form and quality. As we have ex- isted—or, more exactly, as the body has been continuously presented—during the interval between two encounters with some other recognized body, so this is regarded as having continuously existed during its absence from us. However permanent we suppose the conscious subject to be, it is hard to see how, without the continuous presenta- tion to it of such a group as the bodily self, we should ever be prompted to resolve the discontinuous presenta- tions of external things into a continuity of existence. It might be said: "Since the second presentation of a par- ticular group would, by the mere workings of psychical laws, coalesce or become identical with the image of the first, this coalescence suffices to ' generate' the conception of continued existence." But such assimilation is only the ground of an intellectual identification and furnishes no motive, one way or the other, for resolving two like things into the same thing: between a second presentation of A and the presentation at different times of two A's there is so far no difference. Real identity no more involves exact similarity than exact similarity involves sameness of things; on the contrary, we are wont to find the same thing alter with time, so that exact similarity after an interval, so far from suggesting one thing, is often the surest proof that there are two concerned. Of such real identity, then, it

would seem we must have direct experience ; and we have it in the continuous presentation of the bodily self; apart from this it could not be " generated" by association among changing presentations. Other bodies being in the first instance personified, that then is regarded as one thing— from whatever point of view we look at it, whether

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as part of a larger thing or as itself compounded of such But what is it that has thus a beginning and continues indefinitely ?

parts—which has had one beginning in time.

This leads to our last point.

(ec) So far we have been concerned only with the com- bination of seusory and motor presentations into groups and with the differentiation of group from group; the

relations to each other of the constituents of each group still for the most part remain. To these relations in the

main must be referred the correlative conceptions of sub- stance and attribute, the distinction in substances of

qualities and powers, of primary qualities aud secondary, and the like.?

Of all the constituents of things only one is universally present, that above described as physical solidity, which presents itself according to circumstances as impenetrability, resistance, or weight. Things differing in temperature, colour, taste, and smell agree in resisting compression, in filling space. Because of this quality we regard the wind as a thing, though it has neither shape nor colour, while a shadow, though it has both but not resistance, is the very type of nothingness. This constituent is invariable, while other qualities are either absent or change,—form altering, colour disappearing with ight, sound and smells intermitting. Many of the other qualities—colour, tem- perature, sound, smell—increase in intensity until we reach and touch a body occupying space; with the same move- ment too its visual magnitude varies. At the moment of contact an unvarying tactual magnitude is ascertained, while the other qualities and the visual magnitude reach a fixed maximum ; then first it becomes possible by effort to change or attempt to change the position and form of what we appreliend. This tangible plenum we thence- forth regard as the seat and source of all the qualities we project into it. In other words, that which occupies space is psychologically the substantial; the other real consti- tuents are but its properties or attributes, the marks or manifestations which lead us to expect its presence.

Imagination or Ideation.

Before the intuition of things has reached a stage so complete and definite as that just described, imagination or ideation as distinct from perception has well begun. In passing to the consideration of this higher form of mental life we have to note the distinction between im- pressions and images or ideas, to which Hume first gave general currency. Hume did not think it "necessary to employ many words in explaining this distinction. Every one of himself will readily perceive the difference . . .; though it is not impossible but in particular instances they may very nearly approach to each other. Thus in sleep, in a fever, in madness, or in any very violent emotions of soul, our ideas may approach to our impressions ; as, on the other hand, it sometimes happens our impressions are so faint and low that we cannot distinguish them from our ideas." In most cases, no doubt, the obvious differ- ence in intensity, or, as Hume puts it, "in the force or liveliness with which they strike upon the mind," is a sufficient

characteristic, but we must examine a good deal further and pay more attention to his uncertain cases if this important distinction is ever to be in any sense psychologically "explained."

To begin with, it is very questionable whether Hume was right in applying Locke's distinction of simple and complex to ideas in the narrower sense as well as to im- es eee eee

1 The distinction between the thing and its properties, like all the |

foregoing distinctions, is one that might be more fully treated under the head of " Thought and Conception." Still, inasmuch as the material Warrant for these concepts is contained more or less implicitly in our percepts, some consideration of it is in place here.

2 Treatise af Human Nature, book i. part i. § 1.

oe

pressions. 'That idea of red," says Hume, "which we form in the dark and that impression which strikes our eyes in the sunshine differ only in degree, not in nature."2 But what he seems to overlook is that, whereas there can be a mere sensation red—and such a presentation may for present purposes be regarded as simple—we can only have an image or representation of a red thing or a red form, 2.¢., of red in some way ideally projected or intuited. In other words, there are no ideas answering to simple or isolated impressions: what are revived in memory and imagination are percepts, not unlocalized sensations and movements. It is not only that we cannot now directly observe such representations,—because, for that matter, we can no longer directly observe even the original pre- sentations as merely elementary impressions; the point rather is that ideas as such are from the first complex, and do not begin to appear in consciousness apart from the impressions which they are said to reproduce till after these impressions have been frequently attended to together, and have been more or less firmly synthesized into percepts or intuitions.

The effects of even the earliest of these syntheses or "associations " of impressions must of course in some way persist, or progress in perception

would be impossible. On this account it has been usual to say that "perception" implies both 'memory " and 'imagina- tion"; but such a statement can be allowed only so long as these terms are vaguely used. The dog's mouth waters only at the sight of food, but the gourmand's mouth will also water at the thought of it. We recognize the smell of violets as certainly as we recog- nize the colour when the spring brings them round again ; but few persons, if any, can recall the scent when the flower has gone, so as to say with Shelley—

"Odours, when sweet violets sieken,

Live within the sense they quicken "— though most can recall the colour with tolerable clearness. In like manner everybody can perform innumerable complex voluntary movements which only a few can mentally rehearse or describe without the prompting of actual execution. And not only does such reproduction as suffices for perception fall short of that in- volved in reminiscence or memory in the narrower sense, but the manner in which the constituent elements in a perception are com- bined differs materially from: what is strictly to be called the asso- ciation of ideas. 'Io realize this difference we need only to observe first how the sight of a suit of polished armour, for cxample, instantly reinstates and steadily maintains all that we retain of former sensations of its hardness and smoothness and coldness, and then to observe how this same sight gradually calls up ideas now of tournaments, now of crusades, and so through all the changing imagery of romance. Though the percept is complex, it is but a single whole, and the act of perception is single too ; but, where, as is the case in memory and imagination, attention passes, whether voluntarily or non-voluntarily, from one repre- sentation to another, it is obvious that these several objects of attention are still distinct and that it is directed in turn to each. The term "association" seems only appropriate to the latter. To the connexion of the partial presentations in a complex, whether perception or idea, it would be better to apply the term "complica- tion," which was used in this sense by Herbart, and has been so used by many psychologists since. When we perceive an orange by sight we may say that its taste or feel is represcnted, when we perceive it by touch we may in like manner say that its colour is represented, symbolizing the whole complex in the first case sufficiently for our present purpose as C'tf, in the second as Pct. We might also symbolize

the idea of an orange as seen by ¢' tf and the idea of an orange as felt by /'c¢, using the accented Ictter to signify that different constituents are dominant in the two cases. What we have, then, to observe is briefly (1) that the processes by which the whole complex ¢' éf or f 'cé is bronglit into conscious- ness differ importantly from the process by which C or #' rein- states and maintains ¢f or ¢é, and (2) thate, ¢, and f never have that distinct existence as representations which they had as pre- sentations or impressions.

The mental synthesis which has taken place in the evolu- tion of the percept can only partially fail in the idea, and never so far as to leave us with a chaotic '"inanifold" of mere sensational remnants. On the contrary, we find that in 'constructive imagination " a new kind of effort is often requisite in order to dissociate these representational com-

3 Ibid. XX. — 8

Charac- teristics of ideas.

plexes as a preliminary to new combinations. But it is doubtful whether the results of such an analysis are ever the ultimate elements of the percept, that is, merely isolated impressions in a fainter form. We may now try to ascertain further the characteristic marks which distinguish what 1S imaged from what is perceived.

The most obvious, if not the most invariable, difference is that which, as we have seen, Hume calls the superior force or liveliness of primary presentations as compared with secondary presentations. But what exactly are we to understand by this somewhat figurative language? A simple difference of intensity cannot be all that is meant, for, though we may be momentarily confused, we can per- fectly well distinguish the faintest impression from an image, and yet can hardly suppose the faintest impression to be intenser than the most lively image. Moreover, we can reproduce such faintest impressions in idea, so that, if everything depended on intensity, we should be committed to the gratuitous supposition that secondary presentations can secure attention with a less intensity than is

required for primary presentations. The whole subject of the in- tensity of representations awaits investigation. Between moonlight and sunlight or between midday and dawn we could discriminate many grades of intensity ; but it does not appear that there is any corresponding variation of intensity between them when they are not seen but ima- gined. Many persons suppose they can imagine a waxing or a waning sound or the gradual abatement of an intense pain; but what really happens in such cases is probably not a rise and fall in the intensity of a single representa- tion, but a change in the complex represented. In the primary presentation there has been a change of quality along with change of intensity, and not only so, but most frequently a change in the muscular adaptations of the sense-organs too, to say nothing of organic sensations accompanying these changes. A representation of some or all of these attendants is perhaps what takes place when variations of intensity are supposed to be reproduced. Again, hallucinations are often described as abnormally intense images which simply, by reason of their intensity, are mistaken for percepts. But such statement, though supported by very high authority, is almost certainly false, and would probably never have been made if physiological and epistemological considerations had been excluded as they ought to have been. Hallucinations, when carefully examined, seem just as much as percepts to contain among their constituents some primary presentation—either a so- called subjective sensation of sight and hearing or some organic sensation due to deranged circulation or secretion. Now we have noticed already incidentally in a preced- ing paragraph that primary presentations reinstate and maintain the representational constituents of a percept ina manner very different from that in which what are unmis- takably ideas reproduce each other. The intensity and steadiness of the impressional elements are, as it were, shared by the ideational elements in a complex containing both. Intensity alone, then, will not suffice to discrimi- nate, neither will extremes of intensity alone lead us to confuse, impressions and images.

The superior steadiness just mentioned is perhaps a more constant and not less striking characteristic of per- cepts. Ideas are not only in a continual flux, but even when we attempt forcibly to detain one it varies continu- ally in clearness and completeness, reminding one of nothing so much as of the illuminated devices made of gas jets, common at fétes, when the wind

sweeps across them, momentarily obliterating one part and at the same time intensifying another. There is not this perpetual flow and flicker in what we perceive ; for this, unlike the train of ideas, has at the outset neither a logical nor a

psychological continuity. sciousness at any one moment are psychologically inde- pendent of each other; they are equally independent of the impressions and images presented the moment before independent, 2.e., as regards their order and character, not, of course, as regards the share of attention they secure. Attention to be concentrated in one direction must be withdrawn from another, and images may absorb it to the exclusion of impressions as readily as a first impression to the exclusion ofa second. But, when attention 2s secured, a faint impression has a fixity and definiteness lacking in the case of even vivid ideas. One ground for this definite- ness and independence lies in the localization or projec- tion which accompanies all perception. it might be asked, do we not confound percept and image when what we imagine is imagined as definitely localized and projected ? give the image the lie ; where this fails, as in dreams, or where, as in hallucination, the image obtains in other ways the fixity characteristic of impressions, such con- fusion does in fact result. have the whole presentation-continuum, as it were, occu- pied and in operation: we are distinctly conscious of being embodied and having our senses about us.

The impressions entering con-

But why, if so,

Because we have a contrary percept to

But in normal waking life we

This contrariety between impression and image suggests,

however, a deeper question: we may ask, not how it is

resolved, but how it is possible. With eyes wide open,

and while clearly aware of the actual field of sight and its filling, one can recall or imagine a wholly different scene :

lying warm in bed one can imagine oneself out walking in the cold. It is useless to say the terms are different, that what is perceived is present and what is imaged is past or future The images, it is true, have certain temporal marks—of which more presently—by which they may be referred to past or future; but as imaged they are present, and, as we have just observed, are regarded as both actual and present in the absence of correcting im- pressions. We cannot at once see the sky red and blue ; how is it we can imagine it the one while perceiving it to be the other? When we attempt to make the field of sight at once red and blue, as in looking through red glass with one eye and through blue glass with the other, either the colours merge and we see a purple sky or we see the sky first of the one colour and then of the other in irregular alternation. 'That this does not happen between impres- sion and image shows that, whatever their connexion, images altogether are distinct from the presentation-con- tinuum and cannot with strict propriety be spoken of as revived or reproduced impressions. This difference 1s manifest in another respect, viz., when we compare the effects of diffusion in the two cases. An increase in the intensity of a sensation of touch entails an increase in the extensity ; an increase of muscular innervation entails irradiation to adjacent muscles; but when a particular idea becomes clearer and more distinct there rises into consciousness an associated idea qualitatively related prob- ably to impressions of quite another class, as when the smell of tar calls up memories of the sea-beach and fish- ing-boats. Since images are thus distinct from impres- sions, and yet so far continuous with each other as to form a train in itself unbroken, we should be justified, if it were convenient, in speaking of images as changes in a repre- sentation- or memory-continuum ; and later on we may see that this is convenient.

Impressions, then, have no associates to whose presence their own is accommodated and on whose intensity their own depends. Each bids independently for attention, so

1 Moreover, as we shall see, the distinction between present and past or future psychologically presupposes the contrast of impression and image.

Con- nexion of impres- sions

and images.

rFeYrCcHotLoc Y

that often a state of distraction ensues, such as the train of ideas left to itself never occasions. The better to hear we listen; the better to see we look; to smell better we dilate the nostrils and sniff; and so with all the special senses: each sensory impression sets up nascent movements for its better reception.! In like manner there is also an adjustment for images which can be distinguished from sensory adjustments almost as readily as these are distin- guished from each other. We become most aware of this, as, mutatis mutandis, we do of them, when we voluntarily concentrate attention upon particular ideas instead of remaining mere passive spectators, as it were, of the general procession. To this ideational adjustment may be referred most of the strain and "head-splitting" connected with recollecting, reflecting, and all that people call head- work ; and the "absent look" of one intently thinking or absorbed in reverie seems directly due to the absence of sensory adjustment that accompanies the concentration of attention upon ideas.

But, distinct as they are, impressions and images are still closely connected. In the first place, there are two or three well-marked intermediate stages, so that, though we cannot observe it, we seem justified in assuming a steady transition from tlie one to the other. As the first of such intermediate stages, it is usual to reckon what are often, and—so far as psychology goes—inaccurately, styled after-images. They would be better described as after-sensations, except perhaps when the sense of sight is speci- ally in question, inasmuch as they are due either (1) to the persistence of the original peripheral excitation after the stimulus is withdrawn, or (2) to the effects of the exhaustion or the repair that immediately follows this excitation. In the former case they are qualitatively identical with the original sensation and are called "posi- tive," in the latter they are complementary to it and are called "negative" (see Ey, vol. viii. p. 823). These last, then, of which we have clear instances only in connexion with sight, are obviously in no sort re-presentations of the original impression, but a sequent presentation of dia- metrically opposite quality ; while positive after-sensations are, psychologically regarded, nothing but the original sensations in a state of evanescence. It is this continu- ance and gradual waning after the physical stimulus has completely ceased that give after-sensations their chief title to a place in the transition from impression to image. There is, however, another point of resemblance: after- sensations are less affected by

movement. If we turn away our eyes we cease to see the flame at which we have been looking, but the after-image remains and is projected upon the wall, and continues still localized in the dark field of sight even if we close our eyes altogether. But the fact that movement affects their localization, though it does not exclude them, and the fact also that we are dis- tinctly aware of our sense-organs being concerned in their presentation, both serve to mark them off as primary and not secondary presentations. The after-sensation is in reality more elementary than either the preceding percept or its image. In both these, in the case of sight, objects appear in space of three dimensions, ¢.e., with all the marks of solidity and perspective ;2 but the so-called after-image

1 Organic sensations, though distinguishable from images by their definite though often anatomically inaccurate localization, furnish no clear evidence of such adaptations. But in another respect they are

still more clearly marked off from images, viz., by the pleasure or pain they directly occasion,

- *The following scant quotation from Fechner, one of the best observers in this department, must suffice in illustration. " Lying awake in the early morning after daybreak, with my eyes motionless though open, there usually appears, when I chance to close them for @ moment, the black after-image of the white bed immediately before me and the white after-image of the black stove-pipe some distance away against the opposite wall. . . . Both [after-images] appear as*

lacks all these. Still further removed from normal sensa- tions (2.¢., sensations determined by the stimuli appropri- ate to the sense-organ) are the "recurrent sensations " often unnoticed but probably experienced more or less frequently by everybody—cases, that is, in which sights or sounds, usually such as at the time were engrossing and impressive, suddenly reappear several hours or even days after the phy- sical stimuli, as well as their effects on the terminal sense- organ, seem entirely to have ceased. Thus workers with the microscope often see objects which they have examined during the day stand out clearly before them in the dark i it was

indeed precisely such an experience that led the anatomist Henle first to call attention to these facts. But he and others have wrongly referred them to what he called a "sense-memory" ; all that we know is against the supposition that the eye or the ear has any power to retain and reproduce percepts. 'Recurrent sensations" have all the marks of percepts which after-images lack ; they only differ from what are more strictly called "hallu-cinations" in being, as regards form and quality, exact reproductions of the original impression and in being independent of all subjective suggestion determined by emotion or mental derangement.

In what Fechner has called the " memory-atter-image," or primary memory-image, as it is better termed, we have the ordinary image in its earliest form. As an instance of what is meant may be cited the familiar experience that a knock at the door, the hour struck on the clock, the face of a friend whom we have passed unnoticed, may sometimes be recognized a few moments later by means of the persist- ing image, although the actual impression was entirely disregarded. But the primary memory-image can always be obtained, and is obtained to most advantage, by looking intently at some object for an instant and then closing the eyes or turning them away. 'The object is then imaged for a moment very vividly and distinctly, and can be so recovered several times in succession by an effort of atten-tion. Such reinstatement is materially helped by rapidly opening and closing the eyes, or by suddenly moving them in any way. In this respect a primary memory-image re- sembles an after-sensation, which can be repeatedly revived in this manner when it would otherwise have disappeared. But in other respects the two are very different : the after-sensation is necessarily presented if the intensity and direction of the original excitation suffice for its production, and cannot be presented, however much we attend, if they donot. Moreover, the after-sensation is only for a moment positive, and then passes into the negative or complement- ary phase, when, so far from even contributing towards the continuance of the original percept, it directly hinders it. Primary memory-images, on the other hand, and indeed all images, depend mainly upon the attention given to the impression ; provided that was sufficient the faintest impression may be long retained, and without it very in- tense ones will soon leave no trace. The primary memory- image retains so much of its original definiteness and intensity as to make it possible with great

accuracy to compare two physical phenomena, one of which is in this way remembered while the other is really present; for the most part this is indeed a more accurate procedure than that of dealing with both together. But this is only possible for a very short time. From Weber's experiments with weights and lines? it would appear that even after

if they were in juxtaposition in the same plane; and, though—when my eyes are open—I seem to see the white bed in its entire length, the after-image—when my eyes are shut—presents instead only a narrow black stripe owing to the 'fact that the bed is seen considcrably fore- shortened. But the memory-image on the other hand completely reproduces the pictorial illusion as it appears when the eyes are open" (Elemente der Psychophysik, ii, p. 473). 3 Die Lehre vom Tastsinne, &c., p. 86 sq.

10 seconds a considerable waning has taken place, and after 100 seconds all that is distinctive of the primary image has probably ceased.

On the whole, then, it appears that the ordinary memory- image is a joint effect; it is not the mere residuum of changes in the presentation-continuum, but an effect of these only when there has been some concentration of attention upon them. It has the form of a percept, but is not constituted of "revived impressions," for the essential marks of impressions are absent ; there is no localization or projection, neither is there the motor adaptation, nor the tone of feeling, incident to the reception of impressions. Ideas do not reproduce the intensity of these original con- stituents, but only their quality and complication. What we call the vividness of an idea is of the nature of inten- sity, but it is an intensity very partially and indirectly determined by that of the original impression ; it depends much more upon the state of the memory-continuum and the attention the idea receives. The range of vividness in ideas is probably comparatively small; what are called variations in vividness are often really variations in dis- tinctness and completeness! Where we have great in- tensity, as in hallucinations, primary presentations may be reasonably supposed to enter into the complex.

It is manifest that the memory-continuum has been in some way formed out of or differentiated from the pre sentation-continuum by the movements of attention, but the precise connexion of the two continua is still very difficult to determine. We see perhaps the first distinct step of this evolution in the primary meniory-image : here there has been no cessation in presentation and yet the characteristic marks of the impression are gone, so much so, indeed, that superposition without "fusion" with an exactly similar impression is possible. In this manner we seem to have several primary images in the field of consciousness together, as when we count up the strokes of the clock after it has ceased striking. But, though the image thus first arises in the field of conscious- ness as a sort of drdppoa or emanation from the presenta- tion-continuum, its return (at which stage it first becomes a proper re-presentation) is never determined directly and solely by a second presentation like that which first gave it being. Its "revival" is not another birth. With a second impression exactly like the first we should have assimilation or simple recognition—an identity of the in- discernible which precludes the individual distinctness required in representation. But how, then, was this dis- tinctness in the first instance possible in the series of primary images just referred to as being due to the re- petition of the same presentation? Seemingly to differ- ences in the rest of that field of consciousness in which each in turn occurred and to some persistence of these differences. If the whole field which the second impres- sion entered had been just like the field of the first it is hard to see what ground for distinctness there would have been. When such second impression does not occur till after the primary memory-image has ceased, a representa- tion is still possible provided the new impression can reinstate sufficient of the mental framing of the old to give the image individual distinctness. This is really what happens in what is ordinarily called 'association by similarity," —-similarity, that is, in the midst of some diversity. Our inquiry into the connexion between pre- sentations and representations has thus brought us to the general consideration of mental association.

1 As we have seen that there is a steady transition from percept to image, so, if space allowed, the study of hallucinations might make clear an opposite and abnormal process—the passage, that is to say, of images into percepts, for such, to all intents and purposes, are hallucinations of perception, psychologically regarded.

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Mental Association and the Memory-continuum.

Only a very brief treatment of this important subject Associa. is permissible here, as it has already been handled at length tion by

under AssoctaTion or Ipzas (g.v.). Great confusion has

creased by a further laxity in the use of the term " associa- tion by similarity." In so far as the similarity amounts to identity, as in assimilation, we have a process which is more fundamental than association by contiguity, but then it is not a process of association. Yet, when the re- viving presentation is only partially similar to the pre- sentation revived, the nature of the association does not appear to differ from that operative when one "contiguous" presentation revives another. In the one case we have, say, aba recalling aby and in the other abc recalling def. Now anybody who will reflect must surely see that the similarity between aba and aby, as distinct from the identity of their partial constituent a 6, cannot be the means of recall; for this similarity is nothing but the state of mind—to be studied presently—-which results when a6 «# and ab y, having been recalled, are in con- sciousness together and then compared. But, if a 6, having concurred with y before and being now present in a ba, again revives y, the association, so far as that goes, is manifestly one of contiguity, albeit the state of mind im- mediately incident as soon as the revival is complete be what Dr Bain loves to style "the flash of similarity." So far as the mere revival itself goes, there is no more simi- larity in this case than there is when a 6 ¢ revives def. For the very a 6 c that now operates as the reviving pre- sentation was obviously never in time contiguous with the def that is revived; if all traces of previous experiences of a be were obliterated there would be no revival. In other words, the a 6c now present must be "automatically asso- ciated," or, as we prefer to say, must be assimilated to those residua of abc which were "contiguous" with d e/, before its representation can occur. And this, and nothing more than this, we have seen, is all the "similarity" that could be at work when a 6b x '"'brought up" a b y.

On the whole, then, we may assume that the only Couti-

principle of association we have to examine is the so-called

“association by contiguity,” which, as ordinarily formulated, (15.

runs :—Any presentations whatever, which are in conscious- ness together or in close succession, cohere in such a way that when one recurs it tends to revive the rest, such tendency increasing with the frequency of the conjunction. But such a statement is liable to all the objections already urged against what we may call atomistic psychology. Pre- sentations do not really crowd into Mansoul by the avenues of Eyegate, Eargate, &c., there to form bonds and unions as in Bunyan’s famous allegory. It has been often con- tended that any investigation into the nature of association must be fruitless.? But, if association is thus a first princi- ple, it ought at least to admit of such a statement as shall remove the necessity for inquiry. So long, however, as we are asked to conceive presentations originally distinct and isolated becoming eventually linked together, we shall naturally feel the need of some explanation of the process, for neither the isolation nor the links are clear,—not the isolation, for we can only conceive two presentations sepa- rated by other presentations intervening; nor the links, unless these are also presentations, and then the difficulty recurs. But, if for contiguity we substitute continuity and regard the associated presentations as parts of a new con- tinuum, the only important inquiry is how this new whole was first of all integrated.

2So Hume, Treatise of Human Nature, pt. i. § 4 (Green and Grose’s ed., p. 321); also Lotze, Afetaphystk, 1st ed., p. 526.

: oe ~ ity not been occasioned, as we have seen incidentally, by the lax fai

use of the term “association”; this confusion has been in- mental,

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To ascertain this point we must examine each of the two

leading divisions of contiguous association—that of simul-

merry” taneous presentations and that of presentations occurring

con-

tinuum.

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taken first.

in close succession. The last, being the clearer, may be In a series of associated presentations, A B C D &, such as the movements made in writing, the words of a poem learned by heart, or the simple letters of the alphabet themselves, we find that each member recalls its successor but not its predecessor. Familiar as this fact is, it is not perhaps easy to explain it satisfactorily. Since Cis associated both with B and D, and apparently as intimately with the one as with the other, why does it revive the later only and not the earlier? B recalls C; why does not C’ recall B? We havé seen that any reproduction at all of A or B or C depends primarily upon its having been the object of special attention so as to occupy at least momentarily the focus of consciousness. Now we can in the first instance only surmise that the order in which they are reproduced is determined by the order in which they were thus attended to when first presented. The next question is whether the association of objects simul- taneously presented can be resolved into an association of objects successively attended to. Whenever we try to recall a scene we saw but for a moment there are always a few traits that recur, the rest being blurred and vague, instead of the whole being revived in equal distinctness or indistinctness. On seeing the same scene a second time our attention is apt to be caught by something unnoticed before, as this has the advantage of novelty ; and so on, till we have “lived ourselves into” the whole, which may then admit of simultaneous recall. Dr Bain, who is rightly held to have given the best ex- position of the laws of association, admits something very like this in saying that “coexistence is an artificial growth formed from a certain peculiar class of mental successions.” But, while it is easy to think of instances in which the associated objects were attended to suc- cessively, and we are all perfectly

aware that the surest —not to say the only—way to fix the association of a number of objects is by thus concentrating attention on each in turn, it seems hardly possible to mention a case in which attention to the associated objects could not have been successive. In fact, an aggregate of objects on which attention could be focused at once would be already associated.

The only case, then, that now remains to be considered is that—to take it in its simplest form—of two primary presentations A and X, parts of different special continua or distinct—7.e., non-adjacent—parts of the same, and oecupying the focus of consciousness in immediate succes- sion. This constitutes their integration ; for the result of this occupation may be regarded as a new continuum in which A and X become adjacent parts. For it is characteristic of a continuum that an increase in the intensity of any part leads to the intenser presentation of adjacent parts; and in this sense A and X, which were hot originally continuous, have come to be so. We have here, then, some justification for the term secondary or memory-continuum when applied to this continuous series of representations to distinguish it from the primary or presentation-continuum from which its constituents are derived. The most important peculiarity of this con- tinuum, therefore, is that it is a series of representations Integrated by means of the movements of attention out of the differentiations of the primary or presentation-continuum, or rather out of so much of these differentia- tions as pertain to what we know as the primary memory- Image. These movements of attention, if the phrase may be allowed, come in the end to depend mainly upon in- terest, but at first appear to be determined entirely by

mere intensity.! To them it is proposed to look for that continuity which images lose in so far as they part with the local signs they had as impressions and cease to be either localized or projected. Inasmuch as it is assumed that these movements form the connexion between one re-presentation and another in the memory-train they may be called "temporal signs."? The evidence for their ex- istence can be more conveniently adduced presently ; it must suffice to remark here that it consists almost wholly of facts connected with voluntary attention and the volun- tary control of the flow of ideas, so that temporal signs, unlike local signs, are

fundamentally motor and not sensory. And, unlike impressions, representations can have each but a single sign,? the continuum of which, in contrast to that of local signs, is not rounded and com- plete but continuously advancing.

But in saying this we are assuming for a moment that the memory-continuum forms a perfectly single and un- broken train. If it ever actually became so, then, in the absence of any repetition of old impressions and apart from voluntary interference with the train, consciousness, till it ceased entirely, would consist of a fixed and mechanical round of images. Some approximation to such a state is often found in uncultured persons who lead uneventful lives, and still more in idiots, who ean scarcely think at all.

In actual fact, however, the memory-train is liable to Oblivis- change in two respects, which considerably modify its cence.

structure, viz., (1) through the evanescence of some parts, and (2) through the partial recurrence of like impressions, which produces reduplications of varying amount and extent in other parts. As regards the first, we may infer that the waning or sinking towards the threshold of con- sciousness which we can observe in the primary mental image continues in subconsciousness after the threshold is past. For the longer the time that elapses before their revival the fainter, the less distinct, and the less complete are the images when revived, and the more slowly they rise. All the elements of a complex are not equally revivable, as we have seen already : tastes, smells, and organic sensations, though powerful as impressions to revive other images, have little capacity for ideal repro- duction themselves, while muscular movements, though perhaps of all presentations the most readily revived, do not so readily revive other presentations. Idiosyncrasies are, however, frequent; thus we find one person has an exceptional memory for sounds, another for colours, another for forms. Stillit isin general true that the most intense, the most impressive, and the most interesting presentations persist the longest. But the evanescence, which is in all cases comparatively rapid at first, deepens sooner or later into real or apparent oblivion. In this manner it comes about that parts of the memory-continuum lose all distinct-

ness of feature and, being without recognizable content, a

} This connexion of association with continuous movements of atten- tion makes it easier to understand the difficulty above referred to, viz. that in a series 4 BCD... B revives C but not A, and so on—a diffi- culty that the analogy of adhesiveness or links leaves unaccountable. To ignore the part played by attention in association, to represent the Memory-continnum as due solely to the concurrence of presentations, is perhaps the chief defect of the associationist psychology, both Eng- lish and German. Mr Spencer's endeavour to show 'that psychical life is distinguished from physical life by consisting of successive changes only instead of successive and simultaneous changes " (Prin- ciples of Psychology, pt. iv. ch. ii., in particular pp. 403, 406) is really nothing but so much testimony to the work of attention in forming the memory -continuum, especially when, as there is good reason to do, we reject his assumption that this growing seriality is physically determined.

2 A term borrowed from Lotze (Metaphysik, 1st ed., p. 295), but the present writer is alone responsible for the sense here given to it and the hypothesis in which it is used.

% Apart, that is to say, of course, from the reduplications of the memory-train spoken of below,

Repeti- tion.

Generic images.

Train of ideas,

shrivel up to a dim and meagre representation of life that has lapsed—a representation that just suffices, for example, to show us that "our earliest recollections" are not of our first experiences, or to save them from being not only isolated but discontinuous. Such discontinuity can, of course, never be absolute ; we must have something repre- sented even to mark the gap. Oblivion and the absence of all representation are thus the same, and the absence of all representation cannot psychologically constitute a break. The terms "evolution" and "involution" have in this respect been happily

applied to the rising and falling of representations. When we recall a particular period of our past life or what has long ceased to be a familiar scene, events and features gradually unfold and, as it were, spread out as we keep on attending. A precisely opposite process may then be supposed to take place when they are left in undisturbed forgetfulness ; with loss of distinct- ness in the several members of a whole or series, there is a loss of individuality and of individual differences. And such loss is not a mere latency, as some psychologists, on metaphysical grounds! or from a mistaken use of physical analogies, have been led to suppose. There is no real resemblance between the action, or rather inaction, of a particle obedient to the first law of motion and the per- sistence of a presentation," which is not even the psychical equivalent of an atom.

More important changes are produced by the repetition of parts of the memory-train. The effect of this is not merely to prevent the evanescence of the particular image or series of images, but by partial and more or less frequent reduplications of the train upon itself to convert it into a partially new continuum, which we might perhaps call the "ideational continuum." The reduplicated por- tions of the train are strengthened, while at the points of divergence it becomes comparatively weakened, and this apart from the effects of obliviscence. One who had seen the queen but once would scarcely be likely to think of her without finding the attendant circumstances recur as well; this could not happen after seeing her in a hundred different scenes. The central representation of the whole complex would have become more distinct, whereas the several diverging lines would tend to dissipate attention and, by involving opposing representations, to neutralize each other, so that probably no definite background would be reinstated. Even this central representation would be more or less generalized. It has been often remarked that one's most familiar friends are apt to be mentally pictured less concretely and vividly than persons seen more seldom and then in similar attitudes and moods ; in the former case a " generic image" has grown out of such more specific representations as the latter affords. Still further removed from memory-images are the images that result from such familiar percepts as those of horses, houses, trees, &c.

Thus as the joint effect of obliviscence and reduplication we are provided with a flow of ideas distinct from the memory-train and thereby with the material, already more or less organized, for intellectual and volitional manipu- lation. We do not experience this flow—save very momentarily and occasionally—altogether undisturbed ; even in dreams and reverie it is continually interrupted and diverted. Nevertheless it is not difficult to ascertain that, so far as it is left to itself, it takes a very different course from that which we should have to retrace if bent on reminiscence and able to recollect perfectly. The readi- ness and steadiness of this flow are shown by the extremely small effort necessary in order to follow it. Nevertheless

a So, e.g., Hamilton (following H. Schmid), Lect. on AMet., ii. p.

SY. 2 Cf. Lotze, Metaphysik, p. 518.

from its very nature it is liable, though not to positive

breaches of continuity from its own working, yet to occasional blocks or impediments to the smooth succession of images at points where reduplications diverge, and either permanently or at the particular time neutralize each other.?

The flow of ideas is, however, exposed to positive interruptions Conflict from two distinct sides, —by the intrusion of new presentations and of pre-

by voluntary interference.

The only result of such interruptions senta-

which we need here consider is the conflict of presentations that may tions.

ensue. Hcrbart and his followers have gone so far as to elaborate a complete system of psychical statics and dynamics, based on the conception of presentations as forces and on certain more or less improbable assumptions as to the modes in which such forces interact. Since our power of attention is limited, it continually happens that attention is drawn off by

new presentations at the expense of old ones. But, even if we regard this non-voluntary redistribution of attention as implying a struggle between pre- sentations, still such conflict to secure a place in consciousness is very different from a conflict between presentations that are already there. Either may be experienced to any degree possible without the other appearing at all; as, absorbed in watching a starry sky, one might be unaware of the chilliness of the air, though recog- nizing at once, as soon as the cold is felt, that, so far from being incompatible, the clearness and the coldness are causally connected. This difference between a conflict of presentations to enter con- sciousness, if we allow for a moment the propricty of the expression, and that opposition or incompatibility of presentations which. is only possible when they are in consciousness has been strangely confused by the Herbartians. In the former the intensity of the presentation is primarily alone of account ; in the latter, on the contrary, quality and content are mainly concerned. Only the last requires any notice here, since such opposition arises when the ideational continuum is interrupted in the ways just mentioned, and apparently arises in no other way. Certainly there is no such opposition between primary presentations : there we have the law of incopresentability preventing the presentation of opposites with the same local sign; and their presentation with different local signs involves, on this level at all events, no conflict. But what has never been presented could hardly be represented, if the idea- tional process were undisturbed : even in our dreams white negroes or round squares, for instance, never appear. In fact, absurd and bizarre as dream-imagery is, it never at any moment cntails overt contradictions, though contradiction may be implicit.

But between ideas and percepts actual incompatibility is frequent. In the perplexity of Isaac, ¢.g.—“ The voice is J acoh’s voice, but the hands are the hands of Esau ”—we have such a case in a familiar form. ‘There is here not merely mental arrest but actual conflict : the voice perceived identifies Jacob, at the same time the hands identify Esau. The images of Esan and Jacob by themselves are different, but do not conflict ; neither is there any strain, quite the contrary, in recognizing a person partly like Jacob and partly like Esau. For there is no direct incompatibility between smooth and rough, so long as one pertains only to voice and the other only to hands, but the same hands and voice cannot be both smooth and rough. Similar incompatibilities may arise without the intrusion of percepts, as when, in

trying to guess a riddle or to solve a problem, or generally to eliminate intellectual differences, we have images which in themselves are only logically opposite, psychologically opposed, or in conflict, because each strives to enter the same com- plex. In all such conflicts alike we find, in fact, a relation of presentations the exact converse of that which constitutes similarity. In the latter we have two complete presentations, aba and aby, as similar, each including the common part a0; in the former we have two partial presentations, a and y, as contraries, each excluding the other from the incomplete aj—. And this ab, it is to be noted, is not more essential to the similarity than to the conflict. But in the one case it is a generic image (and cau logically be predicated of two subjects); in the other it ts a partially determined individual (and cannot be subject to opposing predicates). Except as thus supplementing ab, «and y do not conflict ; black and white are not incompatible save as attributes of the same thing. The possi- bility of most of these conflicts—of all, indeed, that have any logical interest—lies in that reduplication of the memory-continuum which gives rise to these new complexes, generic images, or general ideas.

Having thus attempted to ascertain the formation of the ideational continuum out of the memory-train, the

3 It is a mark of the looseness of much of our psychological termino- logy that facts of this kind are commonly described as cases of associa- tion. Dr Bain calls them "obstructive association," which is about on a par with "progress backwards"; Mr Sully's '"' divergent association " is better. But it is plain that what we really have is an arrest or inhibition consequent on association, and nothing that is either itself association or that leads to association.

question arises: How now are we to distinguish between imagining and remembering, and again, between imagining and expecting? It is plainly absurd to make the difference depend on the presence of belief in memory and expecta- tion and on its absence in mere imagination ; for the belief itself depends on the difference instead of constituting it. One real and

obvious distinction, however, which Hume pointed out as regards memory, is the fixed order and posi- tion of the ideas of what is remembered or expected as contrasted with "the liberty" of the imagination to trans- This order and position in the case of memory are, of course, normally those of the origial impressions, but it seems rather naive of Hume to tell us that memory "'is tied down to these without any power of variation," while imagination has liberty to transpose as it pleases, as if the originals sat to memory for their portraits, while to imagination they were but studies. Such correspondence being out of the question— as Hume takes care to state as soon as it suits him—all we have, so far, is this fixity and definiteness as contrasted In this

pose and change its ideas.

with the kaleidoscopic instability of ideation. respect what is remembered or expected resembles what is

perceived: the grouping not only does not change caprici-

ously and spontaneously, but resists any mental efforts to change it. But, provided these characteristics are there, we should be apt to believe that we are remembering, just as, mutatis mutandis, with like characteristics we might believe that we were perceiving: hallucination is possible in either case.

This fixity of order and position is, however, not suffi- cient to constitute a typical remembrance where the term is exactly used. But remembering is often regarded as equivalent to knowing and recognizing, as when on revisit- ing some once familiar place one remarks, '" How well I remember it!" What is meant is that the place is re- cognized, and that its recognition awakens memories. Memory includes recognition ; recognition as such does not include memory. In human consciousness, as we directly observe it, there is, perhaps, no pure recognition : here the new presentation is not only assimilated to the old, but the former framing of circumstance is reinstated, and so perforce distinguished from the present. It may be there is no warrant for supposing that such redinte- gration of a preceding field is ever absolutely nz, still we are justified in regarding it as extremely vague and meagre, both where mental evolution is but slightly advanced and

where frequent repetition in varying and irrelevant circumstances has produced a blurred and neutral zone. The last is the case with a great part of our knowledge ; the writer happens to know that bos is the Latin for "ox" and bufo the Latin for "toad," and may be said to remember both items of knowledge, if "remember" is only to be synonymous with "retain." But if he came across bos in reading he would think of an ox and nothing more; bufo would immediately call up not only "toad" but Virgil's Georgics, the only place in which he has seen the word, and which he never read but once. In the former there is so far nothing but re- cognition (which, however, of course rests upon retentive- ness) ; in the latter there is also remembrance of the time and circumstances in which that piece of knowledge was acquired. Of course in so far as we are aware that we Tecognize we also think that remembrance is at any rate possible, since what we know we must previously have learned,—recognition excluding novelty. But the point here urged is that there is an actual remembrance only When the recognition is accompanied by a reinstatement of Portions of the memory-train continuous with the previous Presentation of what is now recognized. Summarily stated, we may say that between knowing and remembering on

the one hand and imagining on the other the difference primarily turns on the fixity and completeness of the grouping in the former; in the latter there is a shifting play of images more or less "generic," reminding one of 'dissolving views." Hence the first two approximate in character to perception, and are rightly called recogni- tions. Between them, again, the difference turns primarily on the presence or absence of temporal signs. In what is remembered these are still intact enough to ensure a localization in the past of what is recognized ; in what is known merely such localization is prevented, either because of the obliviscence of temporal connexions or because the reduplications of the memory-train that have consolidated the central group have entailed their suppression. There is further the difference first mentioned, which is often only a difference of degree, viz., that remembrances have more circumstantiality, so to say, than mere recognitions have: more of the collateral constituents of the original concrete field of consciousness are reinstated. But of the two characteristics

of memory proper—(a) concreteness or circumstantiality, and (6) localization in the past—the latter is the more essential. It sometimes happens that we have the one with little or nothing of the other. For example, we may have but a faint and meagre representa- tion of a scene, yet if it falls into and retains a fixed

place in the memory-train we have no doubt that some

such experience was once actually ours. On the other hand, as in certain so-called illusions of memory, we may suddenly find ourselves reminded by what is happening at the moment of a preceding experience exactly like it—some even feel that they know from what is thus recalled what will happen next; and yet, because we are wholly unable to assign such representation a place in the past, instead of a belief that it happened, there arises a most distressing sense of bewilderment, as if one were haunted aud had lost one's personal bearings! It has been held by some psychologists? that memory proper includes the representation of one's past self as agent or patient in the event or situation recalled. And this is true as regards all but the earliest human experience, at any rate ; still, whereas it is easy to see that memory is essential to any development of self-conscicusness, the converse is not at all clear, and would involve us in a needless circle. Intimately connected with memory is expectation. We Expecta-

may as the result of reasoning conclude that a certain tion. event will happen ; we may also, in like manner, conclude that a certain other event has happened. But as we should not call the latter memory, so it is desirable to distinguish such indirect anticipation as the former fron that expectation which is directly due to the interaction of ideas. Any man knows that he will die, and may make a variety of arrangements in anticipation of death, but he cannot with propriety be said to be expecting it unless he has actually present to his mind a series of ideas ending in that of death, such series being due to previous associations, and unless, further, this series owes its re- presentation at this moment to the actual recurrence of some experience to which that series succeeded before. And as familiarity with an object or event in very various settings may be a bar to recollection, so it may be to expectation : the average Englishman, e¢.g., is continually surprised without his umbrella, though only too familiar with rain, since in his

climate one not specially attentive to the weather obtains no clear representation of its successive phases. But after a series of events ABCDE... has been once experienced we instinctively expect the recurrence

1 Any full discussion of these very interesting states of mind belongs to mental pathology.

2 As, eg., James Mill (Analysis of the Human Mind, ch. x.), who treats this difficult subject with great acuteness and thoroughness.

of BC… on the recurrence of A, 7.¢. provided the memory-train continues so far intact. Such expectation, at first perhaps sight—a mere tendency easily overborne— becomes strengthened by every repetition of the series in the old order, till eventually, if often fulfilled and never falsified, it becomes certain and, as we commonly say, irresistible. To have a clear case of expectation, then, it is not necessary that we should distinctly remember any previous experience like it, but only that we should have actually present some earlier member of a series which has been firmly associated by such previous experiences, the remaining members, or at least the next, if they continue serial, being revived through that which is once again realized. This expectation may be instantly checked by reflexion, just as it may of course be disappointed in fact ; but these are matters which do not concern the inquiry as to the nature of expectation while expectation lasts.

We shall continue this inquiry to most advantage by now widening it into an examination of the distinction of present, past, and future. To a being whose presenta- tions never passed through the transitions which ours undergo—first divested of the strength and vividness of impressions, again reinvested with them and brought back from the faint world of ideas—the sharp contrasts of "now" and "then," and all the manifold emotions they occasion, would be quite unknown. Even we, so far as we confine our activity and attention to ideas, are almost without them. Time-order, succession, antecedence and consequence, of course, there might be still, but in that sense of events as 'past and gone for ever," which is one of the

melancholy factors in our life; and in the obligation to wait and work in hope or dread of what is "still to come " there is much more than time-order. It is to presentations in their primary stage, to impressions, that we owe what real differ- ence we find between now and then, whether prospective or retrospective, as it is to them also that we directly owe our sense of the real, of what 7s and exists as opposed to the non-existent that is not. But the present alone and hfe in a succession of presents, or, in other words, continuous occupation with impressions, give us no knowledge of the present as present. This we first obtain when our present consciousness consists partly of memories or partly of ex- pectations as well. An event expected differs from a like event remembered chiefly in two ways—in its relation to present impressions and images and in the active attitude to which it leads. The diverse feelings that accompany our intuitions of time and contribute so largely to their colour- ing are mainly consequences of these differences. Let us take a series of simple and familiar events 4B CDE, re- presenting ideas by small letters and perceptions by capitals whenever it is necessary to distinguish them. Such series may be present in consciousness in such wise that abcd are imaged while Z is perceived anew, ¢.¢., the whole symbolized as proposed would be abcd £; such would be, e.g., the state of a dog which had just finished his daily meal. Again, there may be a fresh impression of A which revives bede; we should have then (1) 4bcde—the state of our dog when he next day gets sight of the dish in which his food is brought to him. A little later we may have (2) abC de. Here ab are either after-sensations or primary memory- images, or have at any rate the increased intensity due to recent impression; but this increased intensity will be rapidly on the wane even while C lasts, and ab will pale still further when C gives place to D, and we have (3) abcDe. But, returning to (2), we should find de to be in- creasing in intensity and definiteness, as compared with their state in (1), now that C, instead of .A, is the present impression. For, when A occupied this position, not only was ¢ raised less prominently above the threshold of con- sciousness by reason of its greater distance from A in the

memory-continuum, but, owing to the reduplications of this continuum, more lines of possible revival were opened up, to be successively negatived

as L succeeded to A and C to B; even dogs know that "there is many a slip 'twixt the cup and the ip." But, where 4 BC D # isa series of percepts such as we have here supposed—and a series of simpler states would hardly afford much ground for the distinctions of past, present, and future—there would be a varying amount of active adjustment of sense-organs and other movements supplementary to full sensation. In (2), the point at which we have a6 C de, for instance, such adjustments and movements as were appropriate to 6 would cease as B lapsed and be replaced by those appropriate to C. Again, as C succeeded to B, and d in consequence increased in intensity and definiteness, the movements adapted to the reception of D would become nascent, and so on. Thus, psychologically regarded, the distinction of past and future and what we might call the oneness of direction of time depend, as just described, (1) upon the continuous sinking of the primary memory-images on the one side, and the continuous rising of the ordinary images on the other side, of that member of a series of percepts then repeating which is actual at the moment ; and (2) on the prevenient adjustments of attention, to which such words as "expect," "await," "anticipate," all testify by their etymology. These conditions in turn will be found to depend upon all that is implied in the formation of the memory-train and upon that recurrence of lke series of impressions which we attribute to the "uniformity of nature." If we never had the same series of impressions twice, knowledge of time would be impossible, as indeed would knowledge of any sort.

This is perhaps the fittest pomt at which to inquire into Succes- the character and origin of our knowledge of succession Sion.

and duration, so far, that is, as such an inquiry belongs to psychology. We have not to ask how time itself comes to be; but, assuming it to be, we ask how the individual comes to know it. Time ig often figuratively represented as a line, and we may perhaps utilize this figure to make clear the relation of our intuition of time to what we call time itself. Time, then, we say, stretches backwards and forwards from the present moment. But the present, though a point of time, is still such that we can and do in that moment attend to a plurality of presentations to which we might otherwise have attended severally in suc- cessive moments. Granting this implication of simul- taneity and succession, we may, if we represent succession asa

line, represent simultaneity as a second line at right angles to the first; empty time—or time-length without time-breadth, we may say—is a mere abstraction. Now it is with the former line that we have to do in treating of time as it is, and with the latter in treating of our intuition of time, where, just as in a perspective repre- sentation of distance, we are confined to lines in a plane at right angles to the actual line of depth. Ina succession of events, say of sense-impressions, A BC DH… the presence of 4 means the absence of A and of C, but the presentation of this succession involves the simultaneous presence, in some mode or other, of two or more of the presentations A 5C' D. In presentation, as we have seen, all that corresponds to the differences of past, present,

and future is in consciousness simultaneously. This truism

—-or paradox—that all we know of succession is but an interpretation of what is really simultaneous or co- existent, we may then concisely express by saying that we are aware of time only through time-perspective, and experience shows that it isa long step from a succession of presentations to such presentation of succession. The first condition is that we should have represented together presentations that were in the first instance attended to

fPeye fH OL OG Y

successively, and this we have both in the persistence of primary memory-images and in the simultaneous reproduc- tion of longer or shorter portions of the memory-train. In a series thus secured there may be time-marks, though no time, and by these marks the series must be distin- guished from other simultaneous series. To ask which is first among a number of simultaneous presentations is unmeaning; one might be logically prior to another, but in time they are together and priority is excluded. Nevertheless after each distinct representation a, b, c, d there probably follows, as we have supposed, some trace of that movement of attention of which we are aware in passing from one presentation to another. In our present reminiscences we have, it must be allowed, little direct proof of this interposition, though there is strong indirect evidence of it in the tendency of the flow to follow the order in which the presentations were first attended to. With the movements: themselves we are familiar enough, though the residua of such movements are not ordinarily conspicuous, These residua,

then, are our temporal signs, and, together with the representations connected by them, constitute the memory-continuum. But temporal signs alone will not furnish all the pictorial exactness of the time-perspective. They give us only a fixed series; but the working of obliviscence, by insuring a progressive variation in intensity and distinctness as we pass from one member of the series to the other, yields the effect which we call time-distance. By theniselves such variations would leave us liable to confound more vivid repre- sentations in the distance with fainter ones nearer the present, but from this mistake the temporal signs save us; and, as a matter of fact, where the memory-train is imperfect such mistakes continually occur. On the other hand, where these variations are slight and imperceptible, though the memory-continuum preserves the order of events intact, we have still no such distinct appreciation of comparative distance in time as we have nearer the present where these perspective effects are considerable. When in retrospect we note that a particular presenta- tion X has had a place in the field of consciousness, while a series of objects A BC D . . . have succeeded each other, then we may be said in observing this relation of the two to perceive the duration of X. And it is in this way that we do subjectively estimate longer periods of time. But first, it is evident that we cannot apply this method to indefinitely short periods without passing beyond the region of distinct presentation; and, since the knowledge of duration implies a relation between distinguishable pre- sentations A BC D and X, the case is one in which the hypothesis of subconsciousness can hardly help any but those who confound the fact of time with the knowledge of it. Secondly, if we are to compare different durations at all, it is not enough that one of them should last out a series A BC D, and another a series L M NV 0; we also want some sort of common measure of those series. Locke was awake to this point, though he expresses himself vaguely (Hssay, ii. 14, §§ 9-12). He speaks of our ideas Succeeding each other "at certain distances not much unlike the images in the inside of a lantern turned round by the heat of a candle," and " guesses" that 'this appear- ance of theirs in train varies not very much ina waking man." Now what is this "distance" that separates A from B, B from C, and so on, and what means have we of knowing that it is tolerably constant in waking life? It is probably that the residuum of which we have called a temporal sign ; or, in other words, it is the movement of attention from A to B. But we must endeavour here to get a more exact notion of this movement. Everybody

knows what it is to be distracted by a rapid succession of varied impressions, and equally what it is to be wearied

by the slow and monotonous recurrence of the same im- pressions. Now these "feelings" of distraction and tedium owe their characteristic qualities to movements of atten- tion. In the first, attention is kept incessantly on the move : before it is accommodated to A, it is disturbed by the suddenness, intensity, or novelty of B; in the second, it is kept all but stationary by the repeated presentation of the same impression. Such excess and defect of sur- prises make one realize a fact which in ordinary life is so obscure as to escape notice. But recent experiments have set this fact in a more striking light, and made clear what Locke had dimly before his mind in talking of a certain distance between the presentations of a waking man. In estimating very short periods of time, of a second or less, indicated say by the beats of a metronome, it is found that there is a certain period for which the mean of a number of estimates is correct, while shorter periods are on the whole overestimated, and longer periods under- estimated. This we may perhaps take to be evidence of the time occupied in accommodating or fixing attention. Whether the "point of indifference" is determined by the rate of usual bodily movement, as Spencer asserts and Wundt conjectures, or conversely, is a question we need not discuss just now. But, though the fixation of atten- tion does of course really occupy time, it is probably not in the first instance perceived as time, ¢.¢., as continuous " protensity," to use a term of Hamilton's, but as intensity. Thus, if this supposition be true, there is an element in our concrete time-perceptions which has no place in our abstract conception of time. In time conceived as physical there is no trace of intensity; in time psychically experi- enced duration is primarily an intensive nagnitude, witness the comparison of times when we are "bored" with others when we are amused. It must have struck every one as strange who has reflected upon it that a period of time which seems long in retrospect—such as an eventful ex- cursion—should have appeared short in passing; while a period, on the contrary, which in memory has dwindled to a wretched span seemed everlasting till it was gone. But, if we consider that in retrospect length of time is repre- sented primarily and chiefly by impressions that have sur- vived, we have an explanation of one-half; and

in the intensity of the movements of attention we shall perhaps find an explanation of the other. What tells in retrospect is the series a b cd e, &c. ; what tells in the present is the intervening ¢,t,t,, &c., or rather the original acconimoda- tion of which these temporal signs are the residuum. For, as we have seen elsewhere, the intensity of a presentation does not persist, so that in memory the residuum of the most intense feeling of tedium may only be so many ?'s in &@ memory-continuum whose surviving members are few and uninteresting. But in the actual experience, say, of a wearisome sermon, when the expectation of release is continually balked and attention forced back upon a monotonous dribble of platitudes, the one impressive fact is the hearer's impatience. On the other hand, so long as we are entertained, attention is never involuntary, and there is no continually deferred expectation. Just as we are said to walk with least effort when our pace accords with the rate of swing of our legs regarded as pendulums, so in pastimes impressions succeed each other at the rate at which attention can be most easily accommodated, and are such that we attend willingly. We are absorbed in the present without being unwillingly confined to it; not only is there no motive for retrospect or expectation, but there is no feeling that the present endures, Each im- pression lasts as long as it is interesting, but does not con- tinue to monopolize the focus of consciousness till attention to it is fatiguing, because uninteresting. In suc: facts, then, we seem to have proof that our perception of duration rests XX. — 9

Is time discrete or con- tinuous?

66 PSs Yen wr oa y

ultimately upon quasi-motor objects of varying intensity, the duration of which we do not directly experience as duration at all. They do endure and their intensity is a function of their duration; but the intensity is all that we directly perceive. In other words, it is here contended that what Locke called an instant or moment—"the time of one idea in our minds without the succession of another, wherein therefore we perceive no succession at all"—is psychologically not "a part in duration" in that sense in which, as he says, "' we cannot conceive any duration with- out succession" (Essay, ii. 16, 12).

How do we know that the distance between our ideas cannot vary beyond certain bounds? This is not altogether a psychological question ; but we are perhaps entitled to note some interesting facts bearing upon it which may also serve to connect the perceptions of duration and suc- cession, If we make a Savart's wheel with a single tooth revolve slowly, say in three-quarters of a second, it will be found that in the long-run we estimate this interval correctly,—slight overestimates and slight underestimates occurring indifferently. If we next place a second tooth opposite the first, letting the wheel revolve as before, so as to divide the three-quarters of a second into two inter- vals, we shall on the average overestimate it, and must increase the whole period to reach a new point of indiffer- ence. With two other teeth at right angles to the first two, the three-quarters of a second will appear longer still, and the time of a revolution must be still more increased before we shall cease to overestimate it. Ifwe next employ, say, six teeth, 60° apart, the wheel revolving as at first, we shall detect ourselves attending to the alternate strokes, say to the first, third, and fifth, or perhaps to the third and the sixth; in this way, though we continue to over- estimate the total period, we can note the number and regularity of the subdivisions. If these, however, be yet further increased, we can no longer reproduce them, though still aware that the whole period is divided into parts. But by the time we have introduced about fifteen equi- distant teeth, although there is physically an alternation of noise and silence as before, we perceive only a continu- ous hum, which steadily changes in quality as the number of teeth is further increased. Facts like these not only show that we estimate duration primarily by the effects of attention, but also make it probable that such estimate is fairly constant, since it is always approximately the same physical interval that becomes blurred. Further, we see that, where the distance between successive presentations is too short for a separate fixation of attention upon each, we proceed to take them in groups. This procedure is facilitated by differences in the quality and intensity of the objects as well as by differences in the intervals be- tween them; hence among other things the zsthetie pro- perties of modulation and rhythm.

But, if our experience of time depends primarily upon acts of attention to a succession of distinct objects, it would seem that time, subjectively regarded, must be discrete and not continuous. This, which is the view

steadily maintained by the psychologists of Herbart's school, was implied if not stated by Locke, Berkeley, and Hume. Locke hopelessly confuses time as perceived and time as conceived, and can only save himself from pressing objections by the retort, 'It is very common to observe intelligible dis- courses spoiled by too much subtlety in nice divisions." But Ber- keley and Hume with the mathematical discoveries of Newton and Leibnitz before them could only protest that there was nothing answering to mathematical continuity in our experience. And, whereas Locke had tried to combine with his general psychological account the inconsistent position that "none of the distinct ideas we have of either [space or time] is without all manner of com- position," Berkeley declares, "For my own part, whenever I attempt to frame a simple idea of time, abstracted from the succession of ideas in my mind, which flows uniformly and is participated by all beings, I am lost and embrangled in inextricable difficulties. I

have no notion of it at all, only I hear others say it is infinitely divisible, and speak of it in such a manner as leads me to harbour

odd thoughts of my existence. . abstracted from the succession of ideas in our minds, it follows that the duration of any finite spirit must be estimated by the number of ideas or actions succeeding each other in that same spirit or mind"

. . Time therefore being nothing,

(Principles of Knowledge, 1. § 98). Hume, again, is at still greater

pains to show that "the ddea which we form of any finite quality is not infinitely divisible, but that by proper distinctions and separa- tions we may run this idea up to inferior ones, which will be perfectly

simple and indivisible . . . that the imagination reaches a mnt-

mum, and may raise up to itself an idea of whieh it cannot conceive any subdivision, and which cannot be diminished without a total annihilation" (Hwman Nature, pt. ii. § 1, Green's ed., p. 335).

‘At the first blush we are perhaps disposed to accept this account of our time-perception, as Wundt, ¢.g., does, and to regard the attri- bution of continuity as wholly the result of after-reflexion.! But

it may be doubted if this is really an exact analysis of the case.

Granted that the impressions to which we chiefly attend are dis-

tinet and discontinuous in their occupation of the focus of con-

sciousness, and that, so far, the most vivid element in our time-

experience is discrete; granted further that in recollection and expectation such objects are still distinct—all which seems to imply

that time is a mere plurality—yct there is more behind. Able

whole field of consciousness is not occupied by distinct objects,

neither are the changes in this field discontinuous. The experi-

mental facts above-mentioned illustrate the transition from a

succession the members of which are distinctly attended to to one in which they are indistinctly attended to, 7.¢., are not dis- continuous enough to be separately distinguished. Attention does

not move by hops from one definite spot to another, but, as Wundt himself allows, by alternate diffusion and concentration, like the foot of a snail, which never leaves the surface it is traversing. We have a clear presentation discerned as 4 or B when attention is gathered up; and, when attention spreads out, we have confused

presentations not admitting of recognition. But, though not

recognizable, such confused presentations are represented, and so

serve to bridge over the comparatively empty interval during which

attention is unfocused. 'Thus our perception of a period of time

is not comparable to so many terms ina series of finite units any more than it is to a series of infinitesimals. When attention is concentrated in expectation of some single impression, then, no doubt, it is brought to a very fine point ("zugespitzt," as Herbart would say); and a succession of such impressions would be repre- sented as relatively discrete compared with the representation of the scenery of a day-dream. But absolutely discrete it is not and cannot be. In this respect the truth is rather with Herbert Spencer, who, treating of this subject from another point of view, remarks, "When the facts are contemplated objectively, it becomes manifest that, though the changes constituting intelligence ap- proach to a single succession, they do not absolutely form one" (Psychology, i. § 180, p. 408).

On the whole, then, we may conclude that our concrete time-experiences are due to the simultaneous representa- tion of a series of definite presentations both accompanied and separated by more or fewer indefinite presentations more or less confused ; that, further, the definite presenta- tions have certain marks or temporal signs due to the movements of attention; that the rate of these movements or accommodations is approximately constant; and that each movement itself is primarily experienced as an intensity.

Feeling.

Such summary survey as these limits allow of the more elementary facts of cognition is here at an end ; so far the most conspicuous factors at work have been those of what might be termed our ideational mechanism. In the higher processes of thought we have to take more account of mental activity and of the part played by language. But it seems preferable, before entering upon this, to explore also the emotional and active constituents of mind in their more elementary phases. .

In our preliminary survey we have seen that psychical life consists in the main of a continuous alternation of receptive and reactive consciousness, 7.¢., in its earliest form, of alternations of sensation and movement. At a later stage we find that in the receptive phase ideation is added to sensation, and that in the active phase thought and fancy, or the voluntary

manipulation and control of the idea- tional trains, are added to the voluntary manipulation and control of the muscles. At this higher level also it is possible that either form of receptive consciousness may lead to either form of active: sensations may lead to thought rather than to action in the restricted

1 Comp. Wundt, Logik, vol. i. p. 482.

sense, and ideas apart from sensations may prompt to muscular exertion. There isa further complication still: not only may either sensations or ideas lead to either muscular or mental movements, but movements themselves, whether of mind or limb, may as merc presentations determine other movements of either kind. In this respect, however, movements and thoughts either in themselves or through their sensational and ideational accompaniments may be regarded as pertaining to the receptive side of consciousness. With these provisos, then, the broad generalization may hold that re- ceptive states lead through feeling to active states, and that presentations that give neither pleasure nor pain meet with no responsive action. But first the objection must be met that presenta- tions that are in themselves purely indifferent lead continually to very energetic action, often the promptest and most definite action. To this there are two answers. First, on the higher levels of psychical life presentations in themselves indifferent are often in- directly interesting as signs of, or as means to, other presentations that are more directly interesting. It is enough for the present, therefore, if it be admitted that all such indifferent presentations are without effect as often as they are not instrumental in furthering the realization of some desirable end. Sccondly, a large class of movements, such as those called sensori-motor and ideo-motor, are initiated by presentations that are frequently, it must be allowed, neither pleasurable nor painful. In all such cases, however, there is probably only an apparent exception to the principle of subjective selection. They may all be regarded as instances of another im- portant psychological principle which we have to deal with more fully by and by, viz., that voluntary actions, and especially those that either only avert pain or are merely subsidiary to pleasure- giving actions,

tend at length, as the effect of habit in the individual and of heredity in the race, to become "secondarily automatic," as it has been called. Such mechanical or instinctive dexterities make possible a more efficient use of present energies in securing pleasurable and interesting experiences, and, like the rings of former growths in a tree, afford a basis for further advance, as old interests pall and new ones present themselves. Here, again, it suffices for our present purpose if it be granted that there is a fair presumption in favour of supposing all such movements to have been originally initiated by feeling, as certainly very many of them were.

Of the feeling itself that intervenes between these sensory and motor presentations there is but little to be said. The chief points have been already insisted upon, viz., that it is not itself a presentation, but a purely sub- jective state, at once the effect of a change in receptive consciousness and the cause of a change in motor conscious- ness ; hence its continual confusion either with the move- ments, whether ideational or muscular, that are its expres- sion, or with the sensations or ideas that are its cause. For feeling as such is, so to put it, matter Of being rather than of direct knowledge ; and all that we know about it we

know from its antecedents or consequents in presentation.

stated, is too teleological to serve asa purely psychological principle, and, as generally formulated and illustrated, it takes account of matters quite outside the psychologist's ken. We are not now concerned to know why a bitter taste, eg., is painful or the gratification of an appetite pleasant, but what marks distinctive of all painful presenta- tions the one has and the other lacks. From a biological standpoint it may be true enough that the final cause of sexual and parental feelings is the perpetuation of the species; but this does not help us to ascertain what common character they have as actual sources of feeling for the individual. From the biological standpoint even the senile decadence and death of the individual may be shown to be advantageous to the race; but it would cer- tainly be odd to describe this as advantageous to the individual, so different are the two points of view. What we are in search of, although a generalization, has reference to something much more concrete than conceptions like race or

life, and does not require us to go beyond the con- sciousness of the moment to such ulterior facts as they imply.

Were it possible it would be quite unnecessary to examine in detail every variety of pleasurable and painful con- sciousness in connexion with a general inquiry of this sort. It will be best to enumerate at the outset the only cases that specially call for investigation. Feeling may arise mainly from (1) single sensations or movements, including in these what recent psychologists call their tone ; or it may be chiefly determined by (2) some combination or arrange- ment of these primary presentations,—hence what might be styled the lower esthetic feelings. We have thus among primary presentations a more material and a more formal cause or ground of feeling. The mere representa- tion of these sources of feeling involves nothing of moment: the idea of a bright colour or a bitter taste has not definite- ness or intensity enough to produce feeling ; and the ideal presentation of a harmonious arrangement of sounds or colours dees not in itself differ essentially as regards the feeling it occasions from the actual presentation. When we advance to the level at which there occur ideas more complex and more highly representative—or re-representa- tive, as Mr Spencer would say—than any we have yet con- sidered we can again distinguish between material and

| Causes Pure feeling, then, ranging solely between the opposite formal grounds of feeling. To the first we, might Ee 8 extremes of pleasure and pain, we are naturally led to in- | "7 (3) the se aan sympathetic, = religious feelings FeELINe. : this class will probably require but brief notice. The

quire whether there is any corresponding contrast in the causes of feeling on the one hand, and on the other in its manifestations and effects. To begin with the first ques- tion, which we may thus formulate: What, if any, are the invariable differences characteristic of the presentations or states of mind we respectively like and dislike; or, taking account of the diverse sources of feeling—sensuous, esthetic, intellectual, active—is there anything that we can predicate

second, consisting of (4) the intellectual and (5) the higher esthetic feelings, is more important. There is a special class of feelings, which might be distinguished from all the preceding as refler, since they arise from the

niemory or expectation of feelings; but in fact these are largely involved in all the higher feelings, and this brief reference to them will suffice ; of such hope, fear, regret, are examples.

1. The quality and intensity as well as the duration Sensa- and frequency of a sensation or movement all have to tions and do with determining to what feeling it gives rise. It Move

alike of all that are pleasurable and deny of all that are | painful, and vice versa? It isat once evident that at least

In presentations objectively regarded no such common ments,

characters will be found; if we find them anywhere it must be in some relation to the conscious subject, 7. in the fact of presentation itself. There is one important truth concerning pleasures and pains that may occur at once as an answer to our inquiry, and that is often ad- vanced as such, viz., that whatever is pleasurable tends to further and perfect life, and whatever is painful to disturb or destroy it. The many seeming exceptions to this law of self-conservation, as it has been called, probably all admit of explanation in conformity with it, so as to leave its substantial truth unimpeached.! But this law, however

i See Spencer, Data of Ethics, chaps. i.-iv.; G. H. Schneider, Freud und Leid des Mi enschengeschlechis, chap. i.

will be best to leave the last two out of account for a time. Apart from these, the pleasantness or painfulness of a movement appears to depend solely upon its intensity, that is to say, upon the amount of effort necessary to effect it, in such wise that a certain amount of exertion is agrec- able and any excess disagreeable. Some sensations also, such as light and sound, are agreeable if not too intense, their pleasantness increasing with their intensity up to a certain point, on nearing which the feeling rapidly changes and becomes disagreeable or even painful. Other sensa- tions, as bitter tastes, e.g., are naturally unpleasant, how- ever faint,—though we must allow the possibility of an acquired liking for moderately bitter or pungent flavours. But in every case such sensations produce unmistakable

manifestations of disgust, if at all intense. Sweet tastes, on the other hand, however intense, are pleasant to an unspoiled palate, though apt before long to become mawkish, like "sweetest honey, loathsome in lis own deliciousness," as confectioners' apprentices are said soon to find. The painfulness of all painful sensations or movements increases with their intensity without any assignable maximum being reached.

A comparison of examples of this kind, which it would be tedious to describe more fully and which are indeed too familiar to need much description, seems to show (1) that, so far as feeling is determined by the intensity of a pre- sentation, there is pleasure so long as attention can be adapted or accommodated to the presentation, and pain so soon as the intensity is too great for this; and (2) that, so far as feeling is determined by the quality of a presenta- tion, those that are pleasurable enlarge the field of con- sciousness and introduce or agreeably increase in intensity certain organic sensations, while those that are painful contract the field of consciousness and introduce or disagree- ably increase in intensity certain organic sensations. There are certain other hedonic effects due to quality the exa- mination of which we must for the present defer. Mean- while as to the first point it may be suggested, as at any rate a working hypothesis, that in itself any and every simple sensation or movement is pleasurable if there is attention forthcoming adequate to its intensity. In the earliest

and simplest phases of life, in which the presentation-

continuum is but little differentiated, it is reasonable to suppose that variation in the intensity of presentation preponderates over changes in the quality of presentation, and that to the same extent feeling is determined by the former and not by the latter. And, whereas this depend- ence on intensity is invariable, there is no ground for supposing the quality of any primary presentation, when not of excessive intensity, to be invariably disagreeable ; the changes above-mentioned in the hedonic effects of bitter tastes, sweet tastes, or the like tend rather to prove the contrary. This brings us to the second point, and it requires some elucidation. We need here to call to mind the con- tinuity of our presentations and especially the existence of a background of organic sensations or somatic conscious- ess, as it is

variously termed. By the time that qualita- tively distinct presentations have been differentiated from this common basis it becomes possible for any of these, without having the intensity requisite to affect feeling directly, to change it indirectly by means of the systemic sensations accompanying them, or, in other words, by their tone. The physiological concomitants of these changes of somatic tone are largely reflex movements or equivalents of movements, such as alterations in circulatory, respira- tory, and excretory processes. Such movements are psy- chologically movements no longer, and are rightly regarded as pertaining wholly to the sensory division of presenta- tions. But originally it may have been otherwise. To us now, these organic reflexes seem but part and parcel of the special sensation whose tone they form, and which they accompany even when that sensation, so far as its mere intensity goes, might be deemed indifferent. But perhaps at first the special qualities that are now through- out unpleasant may have been always presented with an excessive intensity that would be painful on this score alone, and the reflexes that at present pertain to them may then have been psychologically the expression of this pain.) At any rate it is manifestly unfair to refuse either

1 In the lowly organisms that absorb food directly through the skin such bitter juices as exist naturally might at once produce very violent effects, comparable, say, to scalding ; and the reflexes then established may have been continued by natural selection so as to save from

poisoning the higher organisms, whose absorbent surfaces are internal and only guarded in this way by the organ of taste. Some light is

,

to seek out the primitive effects of the sensations in ques- tion and allow for the workings of heredity, or to reckon this accompanying systemic feeling as part of them. The latter seems the readier and perhaps, too, the preferable course. A word will now suffice to explain what is meant by enlarging and contracting the field of consciousness and agreeably increasing or decreasing certain elements therein.

The difference in point is manifest on comparing the flow of spirits, buoyancy, and animation which result from a certain duration of pleasurable sensations with the lowness or depression of spirits, the gloom and heaviness of heart, apt to ensue from prolonged physical pain. Common language, in fact, leaves us no choice but to describe these contrasted states by figures which clearly imply that they differ in the range and variety of the presentations that make up consciousness, and in the quickness with which these succeed each other.? It is not merely that in hilarity as contrasted with dejection the train of ideas takes a wider sweep and shows greater liveliness, but as it were at the back of this, on the lower level of purely sensory ex- perience, certain organic sensations which are ordinarily indifferent acquire a gentle intensity, which seems by flow- ing over to quicken and expand the ideational stream, as we see, for instance, in the effects of mountain air and sunshine. Or, on the other hand, these sensations become so violently intense as to drain off and ingulf all available energy in one monotonous corroding care, an oppressive weight which leaves no place for free movement, no life or leisure to respond to what are wont to be pleasurable solicitations.®

As regards the duration and the frequency of presenta- tion, it is in general true that the hedonic effect soon attains its maximum, and then, if pleasant, rapidly de- clines, or even changes to its opposite. Pains in like manner decline, but more slowly, and without in the same sense changing to pleasures. The like holds of too frequent repe- tition. Physiological explanation of these facts, good as far as it goes, is, of course, at once forthcoming : sensibility is blunted, time is required for restoration, and so forth ; but at least we want the psychological equivalent of all this. In one respect we find nothing materially new; so far as continued presentation entails diminished intensity we have nothing but diminished feeling as a consequence ; so far as its continued presentation entails satiety the train of agreeable accompaninients ceases in which the pleasur- able tone consisted. But in another way long duration and frequent repetition produce indirectly certain charac-

thrown on questions of this kind by the very interesting experiments of Dr Romanes; for a general account of these see his Jelly-/fish, Star-fish, and Sea-urchins, chap. ix.

2 This is one among many cases in which the study of a vocabulary is full of instruction to the psychologist. The reader who will be at the trouble to compare the parallel columns under the heading "' Passive Affections," in Roget's Thesaurus of English Words and Phrases, will find ample proof both of this general statement and of what is said above in the text.

3 Observation and experiment show that the physical signs of pain in the higher animals consist in such changes as a lowered and weaker pulse, reduction of the surface temperature, quickened respiration, dilatation of the iris, and the like. And so far as can be ascertained these effects are not altogether the emotional reaction to pain but in large measure its actual accompaniments, the physical side of what we have called its fone. The following is a good description of these general characteristics of feeling :—" En méme temps, il se fait une série de mouvements gén¢raux de flexion, comme si l'animal voulait sc rendre plus petit, et offrir moins de surface 4 la douleur. II est intéressant de remarquer que, pour 'homme comme pour tous les animaux, on retrouve ces mémes mouvements généraux de flexion ct d'extension répondant aux sentiments différents de plaisir et de la douleur. Le plaisir répond 4 un mouvement d'épanouissement, de dilatation, d'extension. Au contraire, dans la douleur, on se rapetisse, on se referme sur soi; c'est un mouvement général de flexion" (C. Richet, L'Lomme et U' Intelligence: La Douleur, p. 9).

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teristic effects on feeling in consequence of habituation and accommodation. We may get used to a painful pre- sentation in such wise that we cease to be conscious of it as positively disagreeable, though its cessation is at once a source of pleasure ; in like manner we come to require things simply because it is painful to be without them, although their possession has long ceased to be a ground of positive enjoyment. This loss (or gain) consequent on accommodation! has a most important effect in changing the sources of feeling: it helps to transfer attention from mere sensations to what we may distinguish as interests. Combin- 2. Certain sensations or movements not separately un- ations of pleasant become so when presented together or in imme- sensa- diate succession ; and contrariwise, some combinations of tions aud : 2 of move- Sensations or of

movements may be such as to afford plea- ments. sure distinct from, and often greater than, any that they separately yield. Here again we find that in some cases the effect seems mainly to depend on intensity, in others mainly on quality. (i.) As instances of the former may be mentioned the pleasurableness of a rhythmic succession of sounds or movements, of syinmetrical forms and curved

painful combinations of different ungraduated colours. A comparison of these seems to justify the general statement that those colours yield good combinations that are far apart in the colour circle, while those near together are apt to be discordant. The explanation given, viz., that the one arrangement secures and the other prevents perfect retinal activity, seems on the whole satisfactory, —especially if we acknowledge the tendency of all recent investigations and distinguish sensibility to colour and sensibility to mere light as both psychologically and physiologically two separate facts. Thus, when red and green are juxtaposed, the red increases the saturation of the green and the green that of the red, so that both colours are heightened in brilliance. But such an effect is only pleasing to the child and the savage ; for civilized men the contrast is excessive, and colours less completely opposed, as red and blue, are preferred, each being a rest from the other, so that as the eye wanders to and fro over their border different elements are active by turns. Red and orange, again, are bad, in that both exhaust in a similar manner and leave the re- maining factors out of play.

outlines, of gentle crescendos and diminuendos in sound, and 3. The more or less spontaneous workings of imagina- Ideation of gradual variations of shade in colour, and the painfulness | tion, as well as that direct control of this working necessary 2nd in-

of flickering lights, “beats” in musical notes, false time, Ge false steps, false quantities, and the like. In all these, whenever the result is pleasurable, attention can be readily accommodated,—is, so to say, economically meted out ; and, whenever the result is painful, attention is surprised, balked, wasted, Thus we can make more movements and with less expenditure of energy when they are rhythmic than when they are not, as the performances of a ball- room or of troops marching to music amply testify. Of this economy we have also a striking proof in the ease with which

rhythmic language is retained. (ii.) As instances of the latter may be cited those arrangements of musical tones and of colours that are called harmonious or the opposite. Harmony, however, must be taken to have a different meaning in the two cases. When two or three tones harmonize there results, as is well known, a distinct pleasure over and above any pleasure due to the tones themselves. On the other hand, tones that are discordant are unpleasant in spite of any pleasantness they may have singly. Besides the negative condition of absence of beats, a musical interval to be pleasant must fulfil certain positive conditions, sufficiently expressed for our purpose by saying that two tones are pleasant when they give rise to few combination-tones, and when among these there are several that coimcide, and that they are unpleasant when they give rise to many combination-tones, and when among these there are few or none that coincide. 'Too many tones together prevent any from being distinct. But Where tones coincide the number of tones actually present 18 less than the number of possible tones, and there is a proportionate simplification, so to put it: more is com- manded and with less effort. A recent writer ? on harmony, m fact, compares the confusion of a discord to that of "trying to reckon up a sum in one's head and failing because the numbers are too high." A different explana- tion must be given of the so-called harmonies of colour. The pleasurable effect of graduations of colour or shade—to which, as Ruskin tells us, the rose owes its victorious beauty when compared with other flowers—has been already men- tioned : it is rather a quantitative than a qualitative effect. What we are now concerned with are the pleasurable or

1 It has been definitely formulated, but in physiological language, by Dr Bain as the Law of Novelty : "No second occurrence of any great shock or stimulus, whether pleasure, pain, or mere excitement, is ever fully equal to the first, notwithstanding that full time has been Siven for the nerves to recover from their exhaustion " (Afind and

Body, p. 51). Comp. also his Emotions and Will, 3d ed., p. 83. ~ Preyer, Akustische Untersuchungen, p. 59.

to thinking in the stricter sense, are always productive of pain or pleasure in varying degrees. Though the ex- position of the higher intellectual

processes has not yet been reached, there will be no inconvenience in at once taking account of their effects on feeling, since these are fairly obvious and largely independent of any analysis of the processes themselves. It will also be convenient to include under the one term "intellectual feelings," not only the feelings connected with certainty, doubt, per- plexity, comprehension, and so forth, but also what the Herbartian psychologists—whose work in this department of psychology is classical—have called par excellence the formal feelings,—that is to say, feelings which they regard as entirely determined by the form of the flow of ideas, and not by the ideas themselves. Thus, be the ideas what they may, when their onward movement is checked by divergent or obstructing lines of association, and especi- ally when in this manner we are hindered, say, from re- collecting a name or a quotation (as if, e.g., the names of Archimedes, Anaximenes, and Anaximander each arrested the clear revival of the other), we are conscious of a certain strain and oppressiveness, which give way to momentary relief when at length what is wanted rises into distinct consciousness and our ideas resume their flow. Here again, too, as in muscular movements, we have the con- trast of exertion and facility, when "thoughts refuse to flow" and we work 'invita Minerva," or when the appro- priate ideas seem to unfold and display themselves before us like a vision before one inspired. To be confronted with propositions we cannot reconcile—z.e., with what is or appears inconsistent, false, contradictory—is apt to be painful; the recognition of truth or logical coherence, on the other hand, is pleasurable. The feeling in either case is, no doubt, greater the greater our interest in the subject- matter ; but the mere conflict of ideas as such is in itself depressing, and the discernment of agreement, of the one in the many, in like manner a distinct satisfaction. Now in the one case we are conscious of futile efforts to com- prehend as one ideas which the more distinctly we appre- hend them for the purpose only prove to be the more completely and diametrically opposed ; we can only affirn and mentally envisage the one by denying and suppressing the representation of the other, and yet we have to strive to predicate both and to embody them together in the same mental image. Attention is like a house divided against itself: there is effort but it is not effective, for the field of consciousness is narrowed and the flow of ideas

Higher esthetic feelings.

arrested. When, on the other hand, we discern a common principle among diverse and apparently disconnected par- ticulars, instead of all the attention we can command being taxed in the separate apprehension of these "disjecta mem- bra," they become as one, and we seem at once to have at our disposal resources for the command of an enlarged field and the detection of new resemblances.

4, Closely related to these formal intellectual feelings are certain of the higher esthetic feelings. A reference to some of the commonplaces of esthetical writers may be sufficient briefly to exhibit the leading characteristics of these feelings. There is a wide agreement among men in general as to what is beautiful and what is not, and it is the business of a treatise on empirical zsthetics from an analysis of these matters of fact to generalize the principles of taste,—to do, in fact, for one source of pleasure and pain what we are here attempting in a meagre fashion for all. And these principles are the more important in their bearing upon the larger psychological question, be- cause among esthetic effects are reckoned only such as are pleasing or otherwise in themselves, apart from all recog- nition of utility, of possession, or of ulterior gratification of any kind whatever. Thus, if it should be objected that the intellectual satisfaction of consistency is really due to its utility, to the fact that what is incompatible and incom- prehensible is of no avail for practical guidance, at least this objection will not hold against the esthetic principle of wnity in variety. In accordance with this primary maxim of art criticism, at the one extreme art productions are con- demned for monotony, as incapable of sustaining interest because " empty," "bald," and "poor"; at the other ex- treme they are condemned as too incoherent and discon- nected to furnish a centre of interest. And those are held as so far praiseworthy in which a variety of elements, be they movements, forms, colours, or incidents, instead of conflicting, all unite to enhance each other and to form not merely amass but a whole. Another principle that serves to throw light on our inquiry is that which has been called the principle of economy,! viz., that an effect is pleasing in proportion as it is attained by little effort and simple means. The brothers Weber in their classic work on human locomotion discovered that those movements that are eesthetically beautiful are also physiologically correct ;

grace and ease, in fact, are wellnigh synonymous, as Herbert Spencer points out, and illustrates by apt instances of graceful attitudes, motions, and forms. The same writer,? again, in seeking for a more general law underlying the current maxims of writers on composition and rhetoric is led to a special formulation of this principle as applied to style, viz., that "economy of the recipient's attention is the secret of effect."

Perhaps of all esthetical principles the most wide- reaching, as well as practically the most important, is that which explains esthetic effects by association. Thus, to take one example where so many are possible, the croak- ing of frogs and the monotonous ditty of the cuckoo owe their pleasantness, not directly to what they are in them- selves, but entirely to their intimate association with spring-time and its gladness. At first it might seem, therefore, that there is nothing fresh in this principle relevant to our present inquiry, since a pleasure that is only due to association at once carries back the question to its sources, so that in asking why the spring, for ex- ample, is pleasant we should be returning to old ground. But this is not altogether true ; wxsthetic effects call up not

1 Compare Fechner, Vorschule der Aesthctik, ii. p. 263. Fechner's full style for it is " Princip der Skonomischen Verwendung der Mittel oder des kleinsten Kraftmasses."

2 Essays, Scientific, Political, and Speculative, vol. ii., Ess. I. and VIL.

merely ideas but ideals. A great work of art improves upon the real in two respects: it intensifies and it trans- figures. It is for art to gather into one focus, cleared from dross and commonplace, the genial memories of a lifetime, the instinctive memories of a race ; and, where theory can only classify and arrange what it receives, art— in a measure free from "the literal unities of time and place"—creates and glorifies. Still art eschews the abstract and speculative ; however plastic in its hands, the material wrought is always that of sense. We have already noticed more than once the power which primary presentations have to sustain vivid re- presentations, and the bearing of this on the esthetic effects of works of art must be straight- way obvious. The notes and colours, rhymes and rhythms,

forms and movements, which produce the lower esthetic feelings also serve as the means of bringing into view, and maintaining at a higher level of vividness, a wider range and flow of pleasing ideas than we can ordinarily command.

5. When we reach the level at which there is distinct Egoistic

self-consciousness (comp. p. 84), we have an important class of feelings determined by the relation of the presentation of self to the other contents of consciousness. the knowledge of other selves advances part passu with that of one's own self, so along with the egoistic feelings appear certain social or altruistic feelings. The two have much in common; in pride and shame, for example, account is taken of the estimate other persons form of us and of our regard for them; while, on the other hand, when we admire or despise, congratulate or pity another, we have always present to our mind a more or less definite conception of self in like circumstances. It will therefore amply serve all the ends of our present inquiry if we briefly survey the leading characteristics of some contrasted egoistic feelings, such as self-complacency and disappoint- ment. When a man is pleased with himself, his achieve- ments, possessions, or circumstances, such pleasure is the result of a comparison of his present position in this respect with some former position or with the position of some one else. Without descending to details, we may say that two prospects are before him, and the larger and fairer is recognized as his own. Under disappointment or reverse the same two pictures may be present to his mind, but accompanied by the certainty that the better is not his or is his no more. So far, then, it might be said that the contents of his consciousness are in each case the same, the whole difference lying in the different relationship to self. But this makes all the difference even to the contents of his consciousness, as we shall at once see if we consider its active side. Even the idlest and most thoughtless mind teems with intentions and expectations, and in its prosperity, like the fool in the parable, thinks to pull down its barns and build greater, to take its ease, eat, drink, and be merry. The support of all this pleasing show and these far-reaching ainis is, not the bare knowledge of what abundance will do, but the reflexion— These many goods are mine. In mind alone final causes have a place, and the end can produce the beginning ; the prospect of a

summer makes the pre- sent into spring. But action is paralysed or impossible when the means evade us—

- *Now drops at once the pride of awful state, The golden canopy, the glittering plate,"*

and a bleak and wintry barrenness is filled with the emptiness of despair. In so far as a man's life consists in the abundance of the things he possesseth, we see then why it dwindles with these. The like holds where self-complacency or displicency rests on a sense of personal worth or on the honour or affection of others.

And 5 feelings,

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We are now at the end of our survey of certain .typical

uaryand pleasurable and painful states. The answer to our in-

sult. quiry which it seems to suggest is that there is pleasure | tinuous pain to fall asleep, since in this state consciousness in proportion as a maximum of attention is effectively | is rapidly restricted both as to intensity and range. This exercised, and pain in proportion as such effective atten- | statement is entirely true as regards the intensity and tion is frustrated by distractions, shocks, or incomplete substantially true as regards the range, at least of the and faulty adaptations, or fails of exercise, owing to the | higher consciousness: certain massive and agreeable organic . narrowness of the field of consciousness and the slowness | sensations pertain to falling asleep, but the variety of . and smallness of its changes. Something must be said in | presentations at all events grows less. But then the explication of this formula, and certain objections that capacity to attend is also rapidly declining ; even a slight might be made to it must be considered. First of all, it intruding sensation entails an acute sense of strain in one i implies that feeling is determined partly by quantitative, | sense, in place of the massive pleasure of repose throughout; | or, as we might say, material,

conditions, and partly by | and any voluntary concentration either in order to move conditions that are formal or qualitative. As regards the | or to think involves a like organic conflict, futile effort, former, both the intensity or concentration of attention | and arrest of balmy ease. There is as regards the more and its diffusion or the extent of the field of consciousness | definite constituents of the field of consciousness a close have to be taken into account. Attention, whatever else | resemblance between natural sleepiness and the state of it is, is a limited quantity— monotonous humdrum we call tedium or ennui; and yet Pluribus intentus minor est ad singula sensus— the very same excitement that would relieve the one by to quote Hamilton's pet adage. Moreover, as we have | dissipating the weariness of inaction would disturb the seen, attention requires time. If, then, attention be dis- | other by renewing the weariness of action: the one is tributed over too wide a field, there isa corresponding loss | commensurate with the resources of the moment, the other | of intensity, and so of distinctness: we tend towards a | isnot. Thus the maximum of effective attention in question succession of indistinguishables—indistinguishable, there- | is, as Aristotle would say, 4 maximum "relative to us." fore, from no succession, We must not have more pre- | It is possible, therefore, that a change from a wider to sentations in the field of consciousness than will allow of | a narrower field of consciousness may be a pleasurable some concentration of attention: a maximum diffusion | change, if attention is more effectively engaged. Strictly will not do. A maximurh concentration, in like manner— | speaking, however, the so-called negative pleasures of rest even if there were no other objection to it—would seem | do not consist in a mere narrowing of the field of conscious- to conflict with the general conditions of consciousness, | Ness so much as in a change in the amount of concentration, inasmuch as a single simple presentation, however intense, | Massive organic sensations connected with restoration take would admit of no differentiation, and any complex pre- the place of the comparatively acute sensations of jaded sentation is in some sort a plurality. The most effective | powers forced to work, We have, then, in all cases to attention, then, as regards its quantitative conditions, | bear in mind this subjective relativity of all pleasurable must lie somewhere between the two zeros of complete | or painful states of consciousness. indifference and complete absorption. If there be an But there is still another and more serious difficulty to Do plea- excess of diffusion, effective attention will increase up

to | face. It has long been a burning question with theoretical sures a certain point as concentration increases, but beyond that | moralists whether pleasures differ only quantitatively or aan point will decrease if this intensification continues to in- | differ qualitatively as well, whether psychological analysis tively : crease ; and wce versa, if there be an excess of concentra- | Will justify the common distinction of higher and lower tion. But, inasmuch as these quantitative conditions | pleasures or force us to recognize nothing but differences involve a plurality of distinguishable presentations or | of degree, of duration, and so forth,—as expounded, e., changes in consciousness, the way is open for formal con- | by Bentham, whose cynical mot, "Pushpin is as good as ditions as well. Since different presentations consort | poetry provided it be as pleasant," was long a stumbling- differently when above the threshold of consciousness | block in the way of utilitarianism. The entire issue here together, one field may be wider and yet as intense as | is confused by an ambiguity in terms that has been already . another, or intenser and yet as wide, owing to a more | noticed: pleasure and pleasures have not the same conno- advantageous arrangement of its constituents,1 tation. By a pleasure or pleasures we mean some assign- gative The doctrine here developed, viz., that feeling depends | able presentation or presentations which are pleasant, —i.e.,

a- mes,

on efficiency, is in the main as old as Aristotle ; all that has been done-is to give it a more accurately psychological expression, and to free it from the implications of the faculty theory, in which form it was expounded by Hamil- ton, Of possible objections there are at least two that we must anticipate, and the consideration of which will

l As it is impossible to say that any distinguishable presentation is absolutely simple, the hypothesis of subconsciousness would leave us free to assume that any pleasantness or unpleasantness that cannot be explained on the score of intensity is due to some obscure harmony or discord, compatibility or incompatibility, of elements not separately discernible. But this, though tempting, is not really a very scientific procedure, If a particular presentation is pleasurable or painful in such wise as to lead to a redistribution of attention, it is reasonable to look for an explanation

primarily in its connexion with the rest of the field of consciousness. Moreover, it is obvious—since what takes Place in subconsciousness can only be explained in analogy with what takes place in consciousness—that, if we have an inexplicable in the one, We tnust have a corresponding inexplicable in the other. If the feeling produced by what comports itself as a simple presentation cannot be explained by what is in consciousness, we should be forced to admit that some presentations are unpleasant simply because they are un- Pleasant—an inexplicability which the hypothesis of subconsciousness might push farther back but would not remove,

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help to make the general view clearer, F irst, it may be urged that, according to this view, it ought to be one con-

afford pleasure ; by pleasure simply is meant this subject- ive state of feeling itself. The former, like other objects of knowledge, admit of classification and comparison: we may distinguish them as coarse or as noble, or, if we will, as cheap and wholesome. But, while the causes of feeling are manifold, the feeling itself is a subjective state, varying only in intensity and duration. The best evidence of this lies in the general character of the actions that ensue through feeling,—the matter which has next to engage us. Whatever be the variety in the sources of pleasure, what- ever be the moral or conventional estimate of their worthi- ness, if a given state of consciousness is pleasant we seek to retain it, if painful to be rid of it: we prefer greater pleasure before less, less pain before greater, This is, in fact, the whole meaning of preference as a psychological term. Wisdom and folly prefer each the course which the other rejects. Both courses cannot, indeed, be objectively preferable ; that, however, is not a matter for psychology. But, as soon as reflexion begins, exceptions to this primary principle of action seem to arise continually, even though we regard the individual as a law to himself. Such excep-

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tions, however, we may presently find to be apparent only. At any rate the principle is obviously true before reflexion begins,—true so long as we are dealing with actually present sources of feeling, and not with their re-

presenta- tions, But to admit this is psychologically to admit everything, at least if mind is to be genetically explained. Assuming, then, that we start with only quantitative variations of feeling, we have to attempt to explain the development of formal and qualitative differences In the grounds of feeling. But, if aversions and pursuits result from incommensurable states of pain and pleasure, there seems no other way of saving the unity and continuity of the subject except by a speculative assumption,—the doc- trine known as the freedom of the will. The one position involves the other, and the more scientific course 1s to avoid both as far as we can.

The question, then, is: How, if action depends in the last resort on a merely quantitative difference, could it ever come about that what we call the higher sources of feeling should supersede the lower? If it is only quantity that turns the scales, where does quality come in, for we cannot say, ¢.g., that the astronomer experiences a greater thrill of delight when a new planet rewards his search than the hungry savage in finding a clump of pig-nuts ? Tempora mutantur, nos et mutamur in illis contains the answer in brief. We shall understand this answer better if we look at a parallel case, or what is really our own from another point of view. We distinguish between higher and lower forms of life: we might say there is more life in a large oyster than in a small one, other things being equal, but we should regard a crab as possessing not necessarily more life—as measured by waste of tissue— but certainly as manifesting life in a higher form. How, in the evolution of the animal kingdom, do we suppose this advance to have been made? The tendency at any one moment is simply towards more life, simply growth ; but this process of self-preservation imperceptibly but steadily modifies the self that is preserved. The creature is bent only on filling its skin; but in doing this as easily as may be it gets a better skin to fill, and accordingly seeks to fill it differently. Though cabbage and honey are what they were before, they have changed relatively to the grub now it has become a butterfly. So, while we are all along preferring a more pleasurable state of consciousness before a less, the content of our conscious- ness is continually changing; the greater pleasure still outweighs the less, but the pleasures to be weighed are either wholly different, or at least are the same for us no more. What we require, then, is not that the higher pleasures shall always afford greater pleasure than the lower did, but that to advance to the level of life on which pleasure is

derived from higher objects shall on the whole be more pleasurable and less painful than to remain behind. And this condition seems provided in the fact of accommodation above referred to (p. 69) and in the important fact that attention can be more effect- ively expended by what we may therefore call improve- ments in the form of the field of consciousness. But when all is said and done a certain repugnance is apt to arise against any association of the differences between the higher and lower feelings with differences of quantity. Yet such repugnance is but another outcome of the com- mon mistake of supposing that the real is obtained by pulling to pieces rather than by building up.

- *Do not all charms fly At the mere touch of cold philosophy ?"*

But no logical analysis—nay, further, no logical synthesis —is adequate to the fulness of things. For the rest, such aversion is wholly emotional, and has no more an intel-

lectual element in it than has the disgust we feel on first witnessing anatomical dissections.'

Emotional and Conative Action.

We turn now from the causes of feeling to its manifesta- tions or effects, and have here in like manner to inquire whether there is in these also any contrast corresponding to the opposing extremes of pleasure and pain. We have already seen reasons for dismissing reflex movements or movements not determined by feeling as psychologically secondary, the effects of habit and heredity, and for re- garding those diffusive movements that are immediately expressive of feeling as primordial,—such movements as are strictly purposive being gradually selected or elaborated from them. But some distinction is called for among the various movements expressive of emotion; for there is more in these than the direct effect of feeling regarded as merely pleasure or pain. It has been usual with psycho- logists to confound emotions with feeling, because intense feeling is essential to emotion. But, strictly speaking, a state of emotion is a complete state of mind, a psychosis, and not a psychical element, if we may so say. Thus in

anger we have over and above pain a more or less definite object as its cause, and a certain characteristic reactive display —frowns, compressed lips, erect head, clenched fists, in a word, the combative attitude—as its effect, and similarly of other emotions ; so that generally in the par- ticular movements indicative of particular emotions the primary and primitive effects of feeling are overlaid by what Darwin has called serviceable associated habits. The purposive actions of an earlier stage of development become, though somewhat atrophied as it were, the emo- tive outlet of a later stage: in the circumstances in which our ancestors worried their enemies we only show our teeth. We must, therefore, leave aside the more complex emotional manifestations and look only to the simplest effects of pleasure and of pain, if we are to discover any fundamental contrast between them.?

Joy finds expression in dancing, clapping the hands, and meaningless laughter, and these actions are not only pleasurable in themselves but such as increase the existing pleasure. Attention is not drafted off or diverted; but rather the available resources seem reinforced, so that the old expenditure is supported as well as the new. To the pleasure on the receptive side is added pleasure on the active side. The violent contortions due to pain, on the other hand, are painful in themselves, though less intense than the pains from which they withdraw attention : they are but counter-irritants that arrest or inhibit still more painful thoughts or sensations. Thus, according to Darwin, "sailors who are going to be flogged sometimes take a piece of lead into their mouths in order to bite it with their utmost force, and thus to bear the pain." When in this way we take account of the immediate effects as well

1 "To look at anything in its elements makes it appear inferior to what it seems asa whole. Resolve the statue or the building into stone and the laws of proportion, and no worthy causes of the former beautiful result seem now left behind. So, also, resolve a virtuous act into the passions and some quantitative law, and it seems to be rather destroyed than analysed, though after all what was there else it could be resolved into?" Sir A. Grant, Avristotle's Ethics, Essay TV., "The Doctrine of the Mean," vol. i. p. 210 (2d ed.).

; 2 Of the three principles Darwin advances in explanation of emo- tional expression that which he places last—perhaps because it admits of less definite illustration—seems both psychologically and physio- logically more fundamental than the more striking principle of service- able associated habits which he places first ; indeed the following, which is his statement of it, implies as much: "Certain actions which we recognize as expressive of certain states of mind are the direct result of the constitution of the nervous system, and have been from the first independent of the will, and to a large extent of habit " (Hxpression of the Emotions, p. 66). It is in illustration of this principle too that

Darwin describes the movements expressive of joy and grief, emotions which in some form or other are surely the most primitive of any.

EFFECTS OF FEEL- ING.

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as of the causes of feeling, we find it still more strikingly true that only in pleasurable states is there an efficient expenditure of attention. It is needless now to dwell upon this point, although any earlier mention of it would hardly have been in place. But we should fail to realize the con- trast between the motor effects of pleasure and of pain if we merely regarded them as cases of diffusion. The in- tenser the feeling the intenser the reaction, no doubt, whether it be smiles or tears, jumping for joy, or writhing in agony ; but in the movements consequent on pleasure the diffusion is the result of mere exuberance, an overflow of good spirits, as we sometimes say, and these movements, as already remarked, are always comparatively purposeless or playful. Even the earliest expressions of pain, on the contrary, seem but so many efforts to escape from the cause of it; in them there is at least the blind purpose to flee from a definite ill, but in pleasure only the enjoyment of present fortune.

From Plato downwards psychologists and moralists have been fond of discussing the relation of pleasure and pain. It has been maintained that pain is the first and more fundamental fact, and pleasure nothing but relief from pain; and, again, on the other side, that pleasure is prior and positive, and pain only the negation of pleasure. So far as the mere change goes, it is obviously true that the diminution of pain is pro tanto pleasant, and the diminn- tion of pleasure pro tanto unpleasant ; and if relativity had the unlimited range sometimes assigned to it this would be all we could say. But we must sooner or later recognize the existence of a comparatively fixed neutral state, deviations from which, of comparatively short duration and of sufficient intensity, consti- tute distinct states of pleasure or pain. Such states, if not of liminal intensity, may then be further diminished without reversing their pleasurable or painful character, The turning- point here implied may, of course, gradually change too,—as a result, in fact, of the law of accommodation. Thus a long run of pleasure would raise "the hedonistic zero," while—to the small extent to which accommodation to pain is possible—a continuance of pain would lower it. But such admission makes no material difference where the actual feeling of the moment is alone concerned and retrospect out of the question. On the whole it seems, therefore, most reasonable to regard pleasure and pain as emerging out of a nentral state, which is prior to and distinct from both,—not a state of absolute indifference, but of simple coutentment, marked by no Special

active display. But it is by reference to such state of equi- librium or draGia that we see most clearly the superior volitional efficacy of pain upon which pessimists love to descant. Nobody," says Von Hartmann, "who had to choose between no taste at all for ten minutes or five minutes of a pleasant taste and then five minutes of an unpleasant taste, would prefer the last." Most men and all the lower animals are content "to let well alone."

To ascertain the origin and progress of purposive action it seems, then, that we must look to the effects of pain rather than to those of pleasure. Necessity is the mother of invention, and all things are full of labour. It is true that psychologists not unfrequently describe the earliest purposive movements as appetitive ; or at least they treat appetitive and aversive movements as co-ordinate and equally primitive, pleasures being supposed to lead to actions for their continuance as much as pains to actions for their removal. No doubt, as soon as the connexion between a pleasurable sensation and the appropriate action 1s completely established, as in the case of imbibing food, the whole process is then self ~~sustaining till satiety begins, But the point is that such facility was first acquired under the teaching of pain,—the pain of unsatisfied hunger. The term "appetite" is apt both by its etymology and its later associations to be misleading. What are properly called the "instinctive" appetites are—when regarded from their active side—movements determined by some existing un~~ easy Sensation. So far as their earliest manifestation in a particular individual is concerned, this urgency seems almost entirely of the nature of a vis a tergo; and the movements are only more definite than those simply ex- pressive of pain because of inherited pre-adaptation, on Which account, of course, they are called " instinctive." But what one inherits another must have acquired, and

we have agreed here to leave heredity on one side and consider only the original evolution.

But if none but psychological causes were at work this evolution would be very long and in its early stages very uncertain. At first, when only random movements ensue, we may fairly suppose both that the chance of at once making a happy lit would be small and that the number of chances, the

space for repentance, would also be small. Under such circumstances natural selection would hare to do almost everything and subjective selection almost nothing. So far as natural selection worked, we should have, not the individual subject making a series of tries and perfecting itself by practice, as in learning to dance or swim, but we should have those individuals whose stuff or structure happened to vary for the better surviving, increasing, and displacing the rest. How much natural selection, apparently unaided, can accomplish in the way of complicated adjustment we see in the adaptation of the form and colour of plants and animals to their environ- ment. Both factors, in reality, operate at once, aud it would be hard to fix a limit to either, though to our minds natural selection seems to lose in comparative im- portance as we advance towards the higher stages of life.

But psychologically we have primarily to consider sub- jective selection, 7.e., first of all, the association of parti- cular movements with particular sensations through the mediation of feeling. The sensations here concerned are mainly painful excitations from the environment, the re- curring pains of innutrition, weariness, &c., and pleasur- able sensations due to the satisfaction of these organic wants—pleasures which, although not a mere " filling up," as Plato at one time contended, are still preceded by pain, but imply over and above the removal of this a certain surplus of positive good. There seem only a few points to notice. (a) When the movements that ensue through pleasure are themselves pleasurable there is ordinarily no ground for singling out any one; such movements simply enhance the general enjoyment, which is complete in itself and so far cotitains no hint of anything beyond. (2) Should one of these spontaneous movements of pleasure chance to cause pain, no doubt such movement is speedily arrested. Probably the most immediate connexion possible between feeling and purposive action is that in which a painful movement leads through pain to its own suppres- sion. But such connexion is not very fruitful of conse- quences, inasmuch as it only secures what we may call internal training and does little to extend the relation of the individual to its environment. (c) Out of the irregular, often conflicting movements which indirectly relieve pain some one may chance to remove the cause of it altogether. Upon this movement, the last of a tentative series, attention, released from the pain, is concentrated ; and in this way the evil and the

reniedy become so far associated that on a recurrence of the former the many diffused movements become less, and the one purposive movement more, pronounced ; the one effectual way is at length established and the others, which were but pallia- tives, disappear. (d) When things have advanced so far that some one definite movement is definitely represented along with the painful sensation it remedies, it is not long before a still further advance is possible and we have pre- ventiwe movements, Thanks to the orderliness of things, dangers have their premonitions, After a time, therefore, the occurrence of some signal sensation revives the image of the harm that has previously followed in its wake, and a movement—either like the first, or another that has to be selected from the random tries of fear—occurs in time to avert the impending ill. (e) In like manner, provided the cravings of appetite are felt, any signs of the presence of pleasurable objects prompt to movements for their enjoy-

ment or appropriation. In these last cases we have action determined by perceptions. The cases in which the sub- ject is incited to action by ideas as distinet from percep- tions require a more detailed consideration ; such are the facts mainly covered by the term “ desire. ‘ ae

By the time that ideas are sufficiently self-sustaining to form trains that are not wholly shaped by the circum- stances of the present, entirely new possibilities of action are opened up. We can desire to live again through ex- periences of which there is nothing actually present to remind us, and we can desire a new experience which as yet we only imagine. We often, no doubt, apply the term to the simpler states mentioned under (e) in the last paragraph : the fox in the fable is said to have desired the grapes he vilified because out of his reach. Again, at the other extreme it is usual to speak of a desire for honour, or for wealth, and the like; but such are not so much single states of mind as inclinations or habitual desires. Moreover, abstractions of this kind belong to a more advanced stage of development than that at which desire begins, and of necessity imply more complicated

grounds of action than we can at present examine. The essential characteristics of desire will be more apparent if we suppose a case somewhere between these extremes, A busy man reads a novel at the close of the day, and finds himself led off by a reference to angling or tropical scenery to picture himself with his rods packed en rowte for Scot- land, or booked by the next steamer for the fairyland of the West Indies. Presently, while the ideas of Jamaica or fishing are at least as vividly imagined as before, the fancied preparations receive a rude shock as the thought of his work recurs. Some such case we may take as typical and attempt to analyse it.

First of all it is obviously true, at least of such more concrete desires, that what awakens desire at one time fails to do so at another, and that we are often so absorbed or content with the present as not to be amenable to (new) desires at all, A given X or Y cannot, then, be called desirable per se, it is only desirable by relation to the con- tents of consciousness at the moment. Of what nature is this relation? (1) At the level of psychical life that we have now reached very close and complete connexions have been formed between ideas and the movements necessary for their realization, so that when the idea is vividly present these movements are apt to be nascent. This association is the result of subjective selection—+.e., of feeling—but, being once established, it persists like other associations independently of it. (2) Those movements are especially apt to become nascent which have not been recently exe- cuted, which are therefore fresh and accompanied by the organic sensations of freshness, but also those which are frequently executed, and so from habit readily aroused. The latter fact, which chiefly concerns habitual desires, may be left aside fora time. (3) At times, then, when there is a lack of present interests, or when these have begun to wane, or when there is positive pain, attention is ready to fasten on any new suggestion that calls for more activity, requires a change of active attitude, or promises relief. Such spontaneous concentration of attention ensures greater vividness to the new idea, whatever it be, and to its be- longings. In some cases this greater vividness may suffice. This 1s most likely to happen when the new idea affords intellectual occupation, and this is at the time congenial, or with indolent and imaginative persons who prefer dreaming to doing. (4) But when the new idea does not lead off the pent-up stream of

action by opening out fresh channels, when, instead of this, it is one that keeps them nee upon itself in an attitude comparable to expectation,

hen we have desire. In such a state the intensity of the re-presentation 1s not adequate to the intensity of the

incipient actions it has aroused. This is most obvious when the latter are directed towards sensations or percepts, and the former remains only an idea. If it were possible by concentrating attention to convert ideas into percepts, there would be an end of most desires: "if wishes were horses beggars would ride." (5) But our voluntary power over movements is in general of this kind: here the fiat may become fact. When we cannot hear we can at least listen, and, though there be nothing to fill them, we can at least hold out our hands. It would seem, then, that the source of desire lies essentially in this excess of the active reaction above the intensity of the re-presentation (the one constituting the "impulse," the other the "object" of desire, or the desideratum), and that this disparity rests ultimately on the fact that movements have, and sensations have not, a subjective initiative. (6) The impulse or striving to act will, as already hinted, be stronger the greater the available energy, the fewer the present outlets, and, habits apart, the fresher the new opening for activity. (7) Finally, it is to be noted that, when such inchoate action can be at once consummated, desire ends where it begins: to constitute a definite state of desire there must be not only an obstacle to the realization of the desider- atum—if this were all we should rather call the state one of wishing—but an obstacle to its realization by means of the actions its representation has aroused.

However the desire may have been called forth, its intensity is primarily identical with the strength of this impulse to action, and has no definite or constant relation to the amount of pleasure that may result from its satisfac-tion. The feeling directly consequent on desire as a state of want and restraint is one of pain, and the reaction which this pain sets up may either suppress the desire or prompt to efforts to avoid or overcome the obstacles in its way. To inquire into these alternatives would lead us into the higher phases of voluntary action ; but we must first con- sider the relation of desire to feeling more closely.

Instances are by no means wanting of very imperious desires accompanied by the clear knowledge that their gratification will be positively distasteful! On the other hand it is possible to recollect or picture circumstances known or believed to be intensely pleasurable without any desire for them being awakened at all: we can regret or admire without desiring. Yet there are many psycho- logists who maintain that desire is excited only by the prospect of the pleasure that may arise through its grati- fication, and that the strength of the desire is propor- tional to the intensity of the pleasure thus anticipated. Quidquid petitur, petitur sub specie bont is their main formula. The plausibility of this doctrine rests partly upon a seemingly imperfect analysis of what strictly per- tains to desire and partly on the fact that it is substantially true both of what we may call ‘ presentation-prompted ” action, which belongs to an earlier stage than desire, and of the more or less rational action that comes later. In the very moment of enjoyment it may be fairly supposed that action is sustained solely by the pleasure received and is proportional to the intensity of that pleasure. But there is here no re-presentation and no seeking; the con- ditions essential to desire, therefore, do not apply. Again, in rational action, where both are present, it may be true —to quote the words of an able advocate of the view here controverted—that “our character as rational beings is to desire everything exactly according to its pleasure value.” ? But consider what such conceptions as the good, pleasure value, and rational action involve, Here we have foresight and calculation, regard for self as an object of permanent

1 As such an instance may: be cited Plato’s story of Leontius, the

*son of Agleon, in fep., iv. 489 fin. * Bain, Emotions and Will, 3d ed., p. 488.*

interest,—Butler’s cool self-love; but desire as such is blind, without either the present certainty of sense or the assured prevision of reason. Pleasure in the past, no doubt, has usually brought about the association between the

representation of the desired object and the movement for its realization; but neither the recollection of this pleasure nor its anticipation is necessary to desire, and

interest to ascertain the general mode of its elaboration : but as to this the reader must consult the article PHttotocy (vol. xviii. p. 766 sq.) Our space will only allow us to note in what way language, when it already exists, is instru- mental in the development as distinct from the communi cation of thought. But, first of all, what in general is thinking, of which language is the instrument 2

even when present they do not determine what urgency it will have. The best proof of this lies in certain habitual

In entering upon this inquiry we are really passing one of the Distinc- hardest and fastest lines of the old psychology,—that between sense tion be-

: Sane a ia and understanding. So long as it was the fashion to assume a tween desires. Pleasures are diminished by repetition, whilst multiplicity of faculties the need was less felt for a clear exposition sense

habits are strengthened by nit: ; if the intensity of desire, of their connexion. A man had senses and intellect much as he and un- therefore, were proportioned to the " pleasure value" of | had eyes and ears; the heterogeneity in the one case was no more derstand-

its gratification, the desire for renewed gratification should diminish as this pleasure grows less; but, if the present pain of restraint from action determines the intensity of desire, this should increase as the action becomes habitual. And observation seems to show that, unless prudence sug- gest the forcible suppression of belated desires or the active energies themselves fail, desires do in fact become more imperious, although less productive of positive pleasure, as time goes on.

In this there is, of course, no exception to the general principle that action is consequent on feeling,—a greater pleasure being preferred before a less, a less pain before a greater; for, though the feeling that follows upon its satisfaction be less or even change entirely, still the pain of the unsatisfied desire increases as the desire hardens into habit. It is also a point in favour of the position here taken that appetites, which may be compared to

inherited desires, certainly prompt to action by present pain rather than by prospective pleasure.

Intellection.

Desire naturally prompts to the search for the means to its satisfaction and frequently to a mental rehearsal of various possible courses of action, their advantages and disadvantages. Thus, by the time the ideational continu- um has become, mainly by the comparatively passive work- ing of association, sufficiently developed to furnish thinking material, motives are forthcoming for thinking to begin. It is obviously impossible to assign any precise time for this advance ; like all others, it is gradual. Fitfully, in strange circuinstances and under strong excitement, the lower animals give unmistakable signs that they can under- stand and reason. But thought as a permanent activity may be fairly said to originate in and even to depend upon the acquisition of speech. This indispensable instrument, which more than anything else enables our psychological individual to advance to the distinctly human or rational Stage, consists of gestures and vocal utterances, which were originally—and indeed are still to a large extent—emotional expressions! It is a question of the highest 0 a eae ee ee

1 It must here be noted that, though we still retain our psyehologieal standpoint, the higher development of the individual is only possible through intercourse with other individuals, that is to say, through society. Without language we should be mutually exelusivevand impenétrable, like so many physieal atoms ; with it each several mind may transcend

its own limits and share the minds of others. As a herd of individuals mankind would have a natural history as other animals have ; but

puzzling than in the other. But for psychologists who do not cut ing.

the knot in this fashion it is confessedly a hard matter to explain the relation of the two. The contrast of receptivity and activity hardly avails, for all presentation involves activity and esscntially the same activity, that of attention. Nor can we well maintain that the presentations attended to differ in kind, albeit such a view has been held from Plato downwards. N¢hdl est in intellectu quod non fuertt prius in sensu: the blind and deaf are

necessarily with- out some concepts that we possess. If pure being is pure nothing, pure thought is equally empty. Thought consists of a certain elaboration of sensory and motor presentations and has no content apart from thesc. We cannot even say that the forms of this ela- boration are psychologically a priort; on the contrary, what is epistemologically the most fundamental is the last to be psycho- logically realized. This is not only true as a fact ; it is also true of necessity, in so far as the formation of more concrete concepts is an essential preliminary to the formation of others more abstract, —those most abstract, like the Kantian categories, &c., being thus the last of all to be thought out or understood. And though this formative work is substantially voluntary, yet, if we enter upon it, the form at each step is determined by the so-called matter, and not by us; in this respect "the spontaneity of thought" is not really freer than the reccptivity of sense.2 "It is sometimes said that thought is synthetic, and this is true; but imagination is synthetic also; and the processes which yield the ideational train are the only processes at work in intellectual synthesis. Moreover, it would be arbitrary to say at what point the mere generic image ecases and the true concept begins,—so continuous are the two. No wonder, therefore, that English psychology has been prone to regard thought as only a special kind of perception—perceiving the agreement or disagreement of ideas—and the ideas themselves as mainly the products of association. Yet this is much like con- founding observation with experiment or invention,—the act of a cave-man in betaking himself toa drifting tree with that of Noah in building himself an ark. In reverie, and even in understanding the communications of others, we are comparatively passive spec- tators of ideational movements, non-yoluntarily determined. But in thinking or "intellection," as it has been conveniently termed, there is always a search for something more or less vaguely con- ceived, for a clue which will be known when it occurs by seeming to satisfy certain conditions. Thinking may be broadly described as solving a problem,—finding an AX that is B. In so doing we start from a comparatively fixed central idea or intuition and work along the several diverging lines of ideas associated with it,—hence far the aptest and in fact the oldest description of thought is that it is discursive. Emotional excitement—and at the outset the natural nian does not think much in cold blood—quickens the flow of ideas: what seems relevant is at once contemplated more closely, while what scenis irrelevant awakens little interest and receives little attention. At first the control

acquired is but very imperfect ; the actual course of thought of even a disciplined mind falls far short of the clearness, distinctness, and coherence of the logician's ideal. Familiar associations hurry attention away froin the proper topic, and thought becomes not only discursive but wandering ; in place of concepts of fixed and crystalline completeness, such as logie describes, we may find a congeries of ideas but unperfectly compacted into one generic idea, subject to continual transforma- tion and implicating much that is irrelevant and confusing.

Thus, while it is possible for thought to begin without Thought language, just as arts may begin without tools, yet language and lan- enables us to carry the same process enormously farther, 8%48°-

personality ean only emerge out of intercourse with persons, and of sueh intercourse language is the means, But, important as is this addition of a transparent and responsive world of minds to the dead

opaqueness of external things, the development of our psyehological individual still remains a purely individual development. The only new point is—and it is of the highest importance to keep it in sight-— that the materials of this development no longer consist of nothing but presentations elaborated by a single mind in aeeordance with psychieal laws. But that combination of individual experienees that converts subjective idiosyncrasy and isolation into the objeetivity and solidarity of Universal Mind only affects the individual in accordance with psyehieal laws, and we have no need therefore to overstep our proper domain in studying the advanee from the non-rational phase to the phase of reason.

In the first place it gives us an increased command of even such comparatively concrete generic images as can be

- *Locke, so often misrepresented, expressed this truth aceording to his lights in the following :—" The earth will not appear painted with flowers nor the fields covered with verdure whenever we have a mind to it… . Just thus is it with our understanding : all that is voluntary in our knowledge is the employing or withholding any of our faculties from this or that sort of objeets and a more or less accurate survey of them " (Hssay, iv. 18, 2).*

formed without it. The name of a thing or action becomes for one who knows the name as much an objective mark or attribute as any quality whatever can be. The form and colour of what we call an "orange" are perhaps even more intimately combined with the sound and utterance of this word than with the taste and fragrance which we regard as strictly essential to the thing. But, whereas its essential attributes often evade us, we can always com- mand its nominal attribute, in so far as this depends upon movements of articulation. By uttering the name (or hearing it uttered) we have secured to us, in a greater or less degree, that superior vividness and definiteness that pertain to images reinstated by impressions: our idea approximates to the fixity and independence of a percept (comp. p. 57 above). With young children and uncultured minds—who, by the way, commonly "think aloud "—the gain in this respect is probably more striking than those not confined to their mother-tongue or those used to an analytical handling of language at all realize' When things are thus made ours by receiving names from us and we can freely manipulate them in idea, it becomes easier mentally to bring together facts that logically belong together, and so to classify and generalize. For names set us free from the cumbersome tangibility and particu- larity of perception, which is confined to just what is pre- sented here and now. But as ideas increase in generality they diminish in definiteness and unity; they not only become less pictorial and more schematic, but they become vague and unsteady as well, because formed from a num- ber of concrete images only relatcd as regards one or two constituents, and not assimilated as the several images of the same thing may be. The mental picture answering to the word "horse" has, so to say, body enough to remain a steady object when under attention from time to time; but that answering to the word "animal" is perhaps scarcely twice alike. The relations of things could thus never be readily recalled or steadily controlled if the names of those relations, which as words always remain concrete, did not give us a definite hold upon them,— make them comprehensible. Once these 'airy nothings " have a name, we reap again the advantages a concrete constituent affords: by its means that which is relevant becomes more closely associated, and that which is irrele- vant—

abstracted from—falls off. When what answers to the logical connotation or meaning of a concept is in this way linked with the name, it is no longer necessary that such "matter or content" should be distinctly present in consciousness. It takes time for an image to raise its associates above the threshold; and, when all are there, there is more demand upon attention in proportion. There is thus a manifest economy in what Leibnitz happily styled "symbolic," in contrast to "intuitive" thinking. Our power of efficient attention is limited, and with words for counters we can, as Leibnitz remarks, readily perform operations involving very complex presentations, and wait till these operations are concluded before realizing and spreading out the net result in stcrling coin.

But this simile must not mislead us. In actual thinking there never is any complete separation between the symbol and the ideas symbolized: the movements of the one are never entirely suspended till those of the other are com- plete. "Thus," says Hume, "if, instead of saying, that in war the weaker have always recourse to negotiation, we should say, that they have always recourse to conquest, the custom which we have acquired of attributing certain relations to ideas still follows the words and makes us

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immediately perceive the absurdity of that proposition." ? How intimatcly the two are connected is shown by the surprises that give what point there is to puns, and by the small confusion that results from the existence of homo- nymous terms. The question thus arises—What are the properly ideational elements concerned in thought? Over this question psychologists long waged fight as either nominalists or conceptualists. The former maintain that what is imaged in connexion with a general concept, such as triangle, is some individual triangle "taken in a certain light,"> while the latter maintain that an "abstract idea" is formed embodying such constituents of the several par- ticulars as the concept connotes, but dissociated from the specific or accidental variations that distinguish one par- ticular from another. As often happens in such contro- versies, each party saw the weak point in the other. The nominalists easily showed that there was no distinct abstract idea representable apart from particulars; and the conccptualists

could as easily show that a particular presentation "considered in a certain light" is no longer merely a particular presentation nor yet a mere crowd of presentations. The very thing to ascertain is what this consideration ina certain light implies. Perhaps a speedier end might have been put to this controversy if either party had been driven to define more exactly what was to be understood by image or idea. Such ideas as are possible to us apart from abstraction are, as we have seen, revived percepts, not revived sensations, are complex total re-pre- sentations made up of partial rce-prescntations (comp. p. 57). Reproductive imagination is so far but a faint rehearsal of actual perceptions, and constructive imagina- tion but a faint anticipation of possible perceptions. In either case we are busied with elementary presentations complicated or synthesized to what are tantamount to intuitions, in so far as the forms of intuition remain in the idea, though the fact, as tested by movement, &c., is absent. The several partial re-presentations, however, which make up an idea might also be called ideas, not merely in the wide sense in which every nicntal object may be so called, but also in the narrower sense as second- ary presentations, 2.¢e., aS distinguished from primary pre- sentations or impressions. But sucli isolated images of an impression, even if possible, would no more be intuitions than the mere impression itself would be one: taken alone the one would be as free of space and time as is the other. Till it is settled, therefore, whether the ideational elements concerned in conception are intuitive complexes or some- thing answering to the ultimate elements of these, nothing further can be done.

In the case of what are specially called "concrete" as distinct from "abstract" conceptions—if this rough-and- ready, but unscientific, distinction may be allowed—the idea answering to the concept differs little from an intuition, and we have already remarked that the generic image (Gemeinbild of German psychologists) constitutes the con- necting link between imagination and conception. But even concerning these it is useless to ask what does one imagine in thinking, ¢g., of triangle or man or colour. We never—except for the sake of this very inquiry— attempt: to fix our minds in this manner upon some isolated conception ; in actual thinking ideas are not in conscious- ness alone and disjointedly but as part of a context. When the idea "man" is present, it is present in some proposition or question, as—Man is the paragon of animals; Jn man there

is nothing great but mind; and so on. It is quite clear that in understanding or mentally verifying such statements very different constituents out of the

- *Treatise of Human Nature, pt. i. § vii. (Green and Grose's ed.) p. 831. 3 So Hume, op. cit., p. 456.*

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whole complex "man" are prominent in cach. Further, what is present to consciousness when a general term is understood will differ, not only with a different context, but also the longer we dwell upon it: we may either analyse its connotation or muster its denotation, as the con- text or the cast of our minds may determine. Thus what is relevant is alone prominent, and the more summary the attention we bestow the less the full extent and intent of the concept are displayed. To the nominalist's objection, that it is impossible to imagine a man without imagining him as either tall or short, young or old, dark or light, and so forth, the conceptualist might reply that at all events percepts may be clear without being distinct, that we can recognize a tree without recognizing what kind of tree it is, and that, moreover, the objection proves too much : for, if our image is to answer exactly to fact, we must represent not only a tall or a short man but a man of definite nature,—one not merely either light or dark, but of a certain precise complexion. But the true answer rather is that in conceiving as such we do not necessarily imagine @ man or « tree at all, any more than—if such an illustration may serve—in writing the equation to the parabola we necessarily draw a parabola as well.

The individuality of a concept is thus not to be con-

founded with the sensible concreteness of an intuition |

either distinct or indistinct, and "the pains and skill" which Locke felt were required in order to frame what he called an abstract idea are not comparable to the pains and skill that may be necessary to discriminate or decipher what is faint or fleeting. The material "framed " consists no doubt of ideas, if by this is meant that in thinking we work ultimately with the ideational continuum, but what results is never a mere intuitive complex nor yet a mere Sroup of such. The concept or "abstract idea " only emerges when a certain intelligible relation is established among the members of such a group; and the very same intuition may furnish the material for different concepts as often as a different gerstiges Band is drawn between them. The stuff of this bond, as we have seen, is the word, and this brings into the foreground of consciousness when necessary those elements—whetlier they form an intuition or not—which are relevant to the concept. Con- ception, then, is not identical with imagination, although the two terms are still often, and were once generally, regarded as synonymous. The same ultimate materials occur in each ; but in the one they start with and retain a sensible form, in the other they are elaborated into the form which is called " intelligible."

The distinctive character of this intellectual synthesis

ee lies, we have seen, in the fact that it is determined entirely

by what is synthesized, whether that be the elementary constituents of intuitions or general relations of whatever Kind among these. It differs, therefore, in being selective from the synthesis of ideation, which rests upon contiguity and unites together whatever occurs together. It differs also from any synthesis, though equally voluntary in its uuitiation, which is determined by a purely subjective preference, in that intellection depends upon objective relations alone. . Owing to the influence of logic, which has long been in a much more forward state than psycho- logy, it has been usual to resolve intellection into compari- Son, abstraction, and classification, after this fashion : ABCM and ABCN are compared, their differences M and N left out of sight, and the class notion ABC formed Including both; the same process repeated with ABC and ABD yields a higher class notion AB; and so on. But Our ideational continuum is not a mere string of ideas of concrete things, least of all such concrete things as this View implies. Not

till our daily life resembles that of a Museum porter receiving specimens will our higher mental

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activity be comparable to that of the savant who sorts such specimens into cases and compartments. What we perceive is a world of things in continual motion, waxing, waning, the centres of manifold changes, affecting us and apparently affected by each other, amenable to our action and, as it seems, continually interacting among themselves, Liven the individual thing, as our brief analysis of percep- tion attempts to show (comp. pp. 55, 56), is not a mere sum of properties which can be taken to pieces aud distributed like type, but a whole combined of parts very variously related. To understand intellection we must look at its actual development under the impetus of practical needs, rather than to logical ideals of what it ought to be. Like other forms of purposive activity, thinking is primarily undertaken asa means to an end, and especially the end of economy. It is often easier and always quicker to manipulate ideas than to manipulate real things; to the common mind the thoughtful man is one who "uses his head to save his heels." In all the arts of life, in the growth of language and institutions, in scientific explana- tion, and even in the speculations of philosophy, we may remark a stcady simplification in the Steps to a given end or conclusion, or —what is for our present inquiry the same thing—the attainment of better results with the Same means. The earliest machines are the most cum- brous and clumsy, the earliest speculations the most fanci- ful and anthropomorphic. Gradually imitation yields to

| invention, the natural fallacy of post hoc, ergo propter hoc

to methodical induction, till what is essential and effective is realized and appreciated and what is accidental and inert is discarded and falls out of sight. In this way man advances in the construction of a complete mental clue or master-key to the intricacies of the real world, but this key is still the counterpart of the world it enables us to control and explain.

To describe the process by which such insight is attained as a mere matter of abstraction deserves the stigma of "soulless blunder" which Hegel applied to it. Of course if attention is concentrated on X it must pro tanto be

abstracted from Y, and such command of attention may require "some pains and skill." But to see in this invariable accompaniment of thinking its essential feature is inuch like the schoolboy's saying that engraving consists in cutting fine shavings out of a hard block. The great thing is to find out what are the light-bearing and fruit- bearing combinations. Moreover, thinking does not begin with a conscious abstraction of attention from recognized differences in the way logicians describe. The actual process of generalization, for the most part at all events, is much simpler. The same name is apphed to different things or events because only their more salient features are perceived at all. Their differences, so far from being consciously and with effort left out of account, often can- not be observed when attention is directed to them: to the inexperienced all is gold that. glitters, Thus, and as an instance of the principle of progressive differentiation already noted (p. 42), we find genera recognized before species, and the species obtained by adding on differences, not the genus by abstracting from them. Of course such vague and indefinite concepts are not at first logically general: they only become so when certain common ele- ments are consciously noted as pertaining to presentations in other respects qualitatively different, as well as numer- ically distinct. But actually thinking starts from such more potential generality as is secured by the association of a generic image with a name. So far the material of thought is always general,—is freed, that is, from the local and temporal and other defining marks of percepts.

The process of thinking itself is psychologically much better described as (1) an analysis and (2) a re-synthesis of

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this material already furnished by the ideational trains. The logical resolution of thought into hierarchies of con- cepts arranged like Porphyry's tree, into j udgments uniting such concepts by means of a logical

copula, «kc , 18 the out- come of later reflexion—mainly for technical purposes— upon thought as a completed product, and entirely pre- supposes all that psychology has to explain, The logical theory of the formation of concepts by generalization (or abstraction) and by determination (or concretion)—1.e., by the removal or addition of defining marks—assumes the previous existence of the very things to be formed, for these marks or attributes—X's and Y's, A's and B's—are themselves already concepts. Moreover, the act of gener- alizing or determining is really an act of judgment, so that the logician's account of conception presupposes judgment, while at the same time his account of judgment presup- poses conception. But this is no evil; for logic does not essay to exhibit the actual genesis of thought but only an ideal for future thinking. Psychologically—that is to say, chronologically—the judgment is first. The growing mind, we may suppose, passes beyond simple perception when some striking difference in whiat is at the moment perceived is the occasion of a conflict of presentations (comp. p. 62). The stalking hunter is not instantly recognized as the de- stroying biped, because he crawls on all fours; or the scare- crow looks like him, and yet not like him ; for, though it stands on two legs, it never moves. There is no immedi- ate assiinilation :; percept and idea remain distinct till, on being severally attended to and compared, what is there is known in spite of the differences. Recognition under such circumstances is in itself a judgment; but of more account is the further judgment involved in it or accom- panying it—that which connects the new fact with the old idea. Though actually complex, as the result of a combination of impressions, generic images are not neces- sarily known as complexes when they first enter into judgments; as the subjects of such judgments they are but starting-points for predication,—It crawls; It does not move; and the like. Such impersonal judgments, according to most philologists, are in fact the earliest ; and we may reasonably suppose that by means of them our generic images have been partially analysed, and have attained to something of the distinctness and constancy of logical concepts. But the analysis is rarely complete: a certain confused and fluctuating residuum remains behind. The psychological concept merges at sundry points into those cognate with it,—in other words, the continuity of the underlying memory-train still operates ; only the ideal concepts of logic are in all respects totus, teres, atque rotun- dus. Evidence of this, if it seem to any to require proof, is obtainable on all sides, and, if we could recover

the first vestiges of thinking, would be more abundant still. But, if we agree that it is through acts of judgment which suc- cessivcly resolve composite presentations into elements that con- eepts first arise, it is still very necessary to inquire more carefully what these elements are. On the one side we have seen logicians comparing them to so many letters, and on the other psychologists enumerating the several sensible propertics of gold or wax—their colour, weight, texture, &¢.—as instances of such elements. In this way formal logic and sensationalist psychology have been but blind leaders of the blind. Language, which has enabled thought to ad- vance to the level at which reflexion about thought can begin, is now an obstacle in the way of a thorough analysis of it. A child or savage would speak only of "red" and "hot," but we of "redness " and heat. They would probably say, 'Swallows come when the ys oe lengthening and snipe when they are shortening"; we on Sere are spring and snipe are winter migrants," In- oe he sun shines and plants grow,' we should say, "Sun- g e cause of vegetation." In short, there is a tendenc to resolve all concepts into substantive concepts ; and the rea 4 of this is not far to seek. Whether the subject or starting- oa of our discursive thinking be actually what we perceive as aie or whether it be a quality, an action, an effectuation (i.e, a transi- tive action), a concrete spatial or temporal relation, or finally, a

garded as its property or attribute. characteristic of every completed concept to bea fixed and inde- pendent whole, as it were,

of ideas. } \ t concepts must naturally be those of the things that live and move

about us; hence, then—to seek no deeper reason for the present— this natural tendency, which language by providing distinct names powerfully seconds, to reify or personify not only things but every clement and relation of things which we can single out, or, in other words, to concrete our abstracts.1 reached this stage that logic begins. mal, logic, which intends to concern itself not with thinking but only with the most general structure of thought, is debarred from recognizing any their relations as terms in a proposition.

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resemblance or difference in these or in other respects, it becomes

by the very : of t unity, and all that can be affirmed concerning it may so far be re-

fact of being the central object of thought pro tanto a

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crystallized out of the still-fluent matrix Moreover, the earliest objects of thought and the earliest

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difference between concepts that does not affect Asa consequence it drifts inevitably into that compartmental logic or logic of extension which knows nothing of categories or predicables, but only of the one relation of whole and part qualitatively considered. It thus pushes this reduction to a common denomination to the utmost: its terms, grammiatically regarded, are always names and symbolize classes or compartments of things. From this point of view all dis- parity among concepts, save that of contradictory exclusion, and all connexion, save that of partial coincidence, are at an end.

Of a piece with this are the logical formula for a simple judgment, X is Y, and the corresponding definitions of judgment as the com- parison of two concepts and the recognition of their agreement or disagreement.? It certainly is possible to represent every judg- ment as a comparison, although the term is strictly adequate to only one kind and is often a very artificial description of what actually happens. But fora logic mainly concerned with inference— i.c., with explicating what is implicated in any given statements concerning classes—there is nothing more to be done but to ascertain agreements or disagreements ; and the existence of these, if not necessarily, is at least most evidently represented by spatial rela- tions. Such representation obviously implies a single ground of comparison only and therefore leaves no room for differences of category. The resolution of all concepts into class concepts and that of all judgments into comparisons thus go together. On this view if a concept is complex it can only be so as a class combination ; and, if the mode of its synthesis could be taken account

of at all, this could only be by treating it as an element in the combination like the rest :—iron is a substance, &c., virtue a quality, &c., distance a relation, &c., and so on. There is much of direetly psychological interest in this thoroughgoing reduction of thought to a form which makes its consistency and logical concatenation conspicuously evi- dent. But of the so-called matter of thought it tells us nothing. And, as said, there are many forms in that matter of at least equal moment, both for psychology and for epistemology ; these formal logic has tended to keep out. of sight.

It has generally been under the bias of such a formal or com- putational logic that psychologists, and especially English psycho- logists, have entered upon the study of mind. They have brought with them an analytic scheme which affords a ready place for sensations or "simple ideas" as the elements of thought, but none for any differences in the combinations of these elements. Sensations being in their very nature concrete, all generality becomes an affair of names ; and, as Sigwart has acutely remarked, sensationalism and nominalisin always go together. History would have borne him out if he had added that a purely formal logic tends in like manner to be nominalistic (see Locic, vol. xiv. p. 791).

If we are still to speak of the elements of thought, we must extend this term so as to include not only the sensory elements we are said to receive but three distinct ways in which this pure matter is combined :—(1) the forms of intuition,2—Time and Space; (2) the real categories,— Substance, Attribute, State, Act, Effect, End or Purpose, &c,—the exact determination of whicl is not here in place; and (3) certain formal (logical and mathematical) categories, as Unity, Difference, Identity, Likeness. These can no more be obtained by such a process of abstraction and generalization as logicians and psychologists alike have

been wont to describe than the melody could be obtained

ie See Wundt, Logik, i. p. 107 sq., where this process is happily styled "die kategoriale Verschiebung der Begriffe."

two individual things, or a concept and an individual, compared to- gether, stand to each other"' (Lectures on Logic, i. p. 225).

3 As to these it must suffice to refer to what has been already said ; comp. pp. 53 and 64 sq.

2 Comp. Hamilton: "To judge (xplvew, judicare) is to recognize ~ the relation of congruence or of confliction in which two concepts,

Forms 0!) synthes!

Pe yc rR eme cy They are

by suppressing all the several notes in a tune. not primarily concepts more general than all others in the

sense in which animal is more general than nian, but rather

distinct methods of relating or synthesizing presentations. Kant, though he accepted almost unquestioned the logic and psychology current in his day, has yet been the occa- sion, in spite of himself, of materially advancing both, and chiefly by the distinction he was led to make between formal and transcendental logic. In his exposition of the latter he brings to light the difference between the "functions of the understanding " in synthesizing—or, as we might say, organizing—percepts into concepts and the merely analytic subsumption of abc and abd under ab,—a, b, c, and d being what they may. Unlike other concepts, categories as such do not in the first instance signify objects of thought how- ever general, but these functions of the understanding in constituting objects. In fine, they all imply some special process, and into these processes it is the business of psychology to inquire. But only the briefest attempt at such inquiry is here possible.

To begin with what are par excellence formal categories, and among these with that which is the most fundamental and formal of all—How do we come by the conception of unity? " Amongst all the ideas we have," says Locke, "as there is none suggested to the mind by more ways, so there is none more simple than that of unity, or one. It has no shadow of variety or composition in it ; every object our senses are employed about, every idea in our understand- ings, every thought of our minds, brings this idea along with it."! And the like with painful iteration has been said by almost all English psychologists since. Such con- sensus notwithstanding, to assign a

sensible origin ta unity is certainly a mistake,—one of a class of mistakes already more than once referred to, which consist in transferring to the data of sense all that is implied in the language necessarily used in speaking of them. The term "a sensa- tion" no doubt carries along with it the idea of unity, but the bare sensation as received brings along with it nothing but itself. And, if we consider sensory consciousness merely, we do not receive a sensation, and then another sensation, and so on seriatim ; but we have always a con- tinuous diversity of sensations even when these are quali- tatively sharply differentiated. Moreover, if unity were an impression of sense and passively received, it would, in common with other impressions, be unamenable to change. We cannot see red as blue, but we can resolve many (parts) into one (whole), and vice versa.2 Unity, then, is the result of an act the occasions for which, no doubt, are at first non-voluntarily determined ; but the act is still as distinct from them as is attention from the objects attended to. It is to that movement of attention already described in dealing with ideation (p. 61) that we must look as the source of this category. This same movement, in like manner, yields us temporal signs ; and the complex unity formed by a combination of these is what we call number. When there is little or no difference between the field and the focus of attention, unifying is an impossibility, whatever the impressions received may be. On the other hand, as voluntary acts of concentration become more fre- quent and distinct the variegated continuum of sense is shaped into intuitions of definite things and events. Also, aS soon as words facilitate the control of ideas, it becomes possible to single out special aspects and relations of

: Essay concerning Human Understanding, Il. xvi. § 1.

_ _ "Wir kénnen eines der hier gedruckten Worter als Eins ansehen, indem wir eine Mannigfaltigkeit von Buchstaben doch in einem ab- Schliessenden Acte zu einem Bilde vereinigen und es von den benach- barten Bildern trennen ; Wir konnen es als Vielhett ansehen, wenn wir auf den Uebergang von einem Buchstaben zum andern, jeden Schritt absetzend, achten " (Sigwart, Logik, ii. p. 41).

things as the subjects or starting-points of our dis- cursive thinking. Thus the forms of unity are manifold: every act of intuition or thought, whatever else it is, is an act of unifying.

It is obvious that the whole field of consciousness at any moment can never be actually embraced as one. What is unified becomes thereby the focus of consciousness and so leaves an outlying field ; so far unity may be held to imply plurality. But it cannot with propriety be said that in a simple act of attention the field of consciousness is analysed into two distinct parts, 2… two unities,—this (now attended to) and the other or the rest (abstracted from). For the not-this is but the rest of a continuum and not itself a whole ; it is left out but not determined, as the bounding space is left out when a figure is drawn. To know two unities we must connect both together; and herein comes to light the difference between the unity which is the form of the concept or subject of discourse and the unity of a Judgment. The latter is of necessity complex ; the former may or may not be. But in any case the complexity of the two is different. If the subject of thought is not only clear but distinct—z.e., not merely defined as a whole but having its constituents likewise more or less defined—such distinctness is due to previous judgments. At any future time these may of course' be repeated ; such are the ana- lytical or explicative judgments of logic. As the mere subject of discourse it is, however, a single unity simul- taneously apprehended ; the relation ascertained between it and its predicate constitutes the unity of judgment, a unity which is comprehended only when its parts are successively apprehended.

But, though a judgment is always a complex unity, the Law of extent of this complexity seems at first sight to vary as dicho- the form of synthesis varies. Formal logic, as we have iy. seen, by throwing the form of synthesis into the predicate ' has no difficulty in reducing every judgment to an § is P. But, if we at all regard the matter thought, it is certain, for example, that "It is an explosion" is less complex than "The enemy explodes the mine." The first answers one question ; the second answers three. But as regards the more complex judgment both the process of ascertaining the fact and the language in which it is expressed show that the three elements concerned in it are not synthesized at once. Suppose we start from the explosion,—and changes or movements are not only apt to attract attention first, but, when

recognized as events and not as abstracts per- sonified, they call for some supplementing beyond them- selves—then in this case we may search for the agent at work or for the object affected, but not for both at once. Moreover, if we find either, a complete judgment at once ensues: "' The enemy explodes," or "The mine is exploded." The original judgment is really due to a synthesis of these two. But, when the results of former judgments are in this manner taken up into a new judgment, a certain "condensation of thought" ensues. Of this condensation the grammatical structure of language is evidence, though logical manipulation—with great pains—obliterates it. Thus our more complex judgment would take the form — "The enemy is now mine-exploding" or "The mine is enemy-exploded," according as one or other of the simpler judgments was made first. An examination of other cases would in like manner tend to show that intellectual synthesis is always—in itself and apart from implications—a binary synthesis. Wundt, to whom belongs the merit of first explicitly stating this "law of dichotomy or duality"? as the cardinal principle of discursive thinking, contrasts it with synthesis by mere association. This, as running on continuously, he represents thus—A™B-C-D- . . . ; the

3 Wundt, Logik : eine Untersuchung der Principien der Erkenntniss, i, p. 53 sq.

Formal cate- gories.

Differ- ence and like- ness.

synthesis of thought, on the other hand, he symbolizes by forms such as the following :—

ae eS SC AmcsS ee.

In explanation of this law as a law of intellection it 1s hardly sufficient to rest it ultimately on the fact "that in a given moment of time only a single act of apperception is possible."! This applies to all syntheses alike. _ The point surely is that the one thing attended to in an intel- lective act is the synthesis of two things, and of two things only, because, as only one

movement of attention 1s possible at a time, only two things at a time can be synthesized. In that merely associative synthesis by which the memory-continuum is produced attention moves from A to Band thence to CO without any relation between A and B being attended to at all, although they must have relations, that of sequence, ¢.g., at least. The intellective synthesis which follows upon this first resolves the A~B into its elements, and then, if there be any ground for so doing, re-synthesizes them with a consciousness of what the syn- thesis means."

Passing now to the remaining formal categories—Differ- ence, Likeness, Identity—all of which come under the law of duality so far as they imply not a single presentation but some relation between two presentations, we have to seek out the characteristics of the states of mind in which these relations become objects of consciousness. The so- called fundamentum relationis, of course, can be nothing but the two presentations concerned. Just as certain, however, is it that the relation itself involves something more than these. Two equal triangles may be made to coincide, but are not necessarily coimcident: Dromio of Ephesus might be mistaken for Dronno of Syracuse, but at least they never mistook each other. And this brings us to the point. As Lotze puts it, "Two impressions « and 6 are never to be regarded as more than stdmuli which, by affecting the conscious subject—in its very nature in- dividual and sui generis—incite to reaction that activity by means of which there arise the new presentations, such as similarity, equality, contrast, &c."° The activity thus stimulated is what in other words we call the voluntary concentration of attention ; to ascertain, then, what these "'new presentations" of difference, likeness, and so forth are, we must analyse carefully what takes place when two impressions a and 6 are expressly compared.

"Difference," says Hume, "I consider rather as a nega- tion of relation than as anything real or positive. Differ- ence is of two kinds, as opposed either to identity [unity ? | or resemblance. The first is called a difference of number, the other of kind." The truth seems rather to be that difference in the sense of nunterical difference is so far an element in all relations as all imply distinct correlatives. To this extent even identity—or at least the recognition of it—rests on difference, that form of difference, viz., which is essential to plurality. But absolute difference of kind may be considered

*tantamount not, indeed, to the negation, but at least to the absence, of all formal relation. That this absolute difference—or disparateness, as we may call it—affords no ground for relations becomes evident when we consider (1) that, if we had only a plurality of absolutely different presentations, we should have no con- sciousness at all (comp. p. 45); and (2) that we never com- pare—although we distinguish, 7.c., recognize, numerical * SS ae ee ie that in every act of thought,*

abstract, ideas related have been previously con- nected by association. But certainly at the outset this is the case, in such wise that all the forms of intellectual synthesis are prefigured in

*the connexions of the ideational train or its reduplications. * Grundatige der Psychologie, p. 24.*

ES AB

PSY CU Oi orerh

difference—where presentations seem absolutely or totally different, as are, e.g., a thunderclap and the taste of sugar, or the notion of free trade and that of the Greek accusative. Allactual comparison of what is qualitatively different rests upon opposition or contrariety, 7.c., upon at least partial likeness (comp. p. 46). This being understood, it 1s note- worthy that the recognition of such unlikeness is, if any- thing, more "real or positive" than that of likeness, and is certainly the simpler of the two. In the comparison of sensible impressions—as of two colours, two sounds, the lengtlis or the directions of two lines, &c.—we find it easier in some cases to have the two impressions that are com- pared presented together, in others to have first one pre- sented and then the other. But either way the essential matter is to secure the most effective presentation of their difference, which in every case is something positive and, like any other impression, may vary in amount from bare perceptibility to the extremest distance that the continuum to which it belongs will admit. Where no difference or distance at all is perceptible, there we say there is likeness or equality. Is the only outcome, then, that when we pass from ab to ac there is a change in consciousness, and that when ab persists there is none? To say this is to take no account of the operations (we may symbolize them as ac — ab =cb,

ab —ab=0) by which the difference or the equality results. The change of presentation (6c) and absence of change (0) are not here what they are when merely passive occurrences, so to put it. This is evident from the fact that the former is but a single presentation and the latter no presentation at all. The relation of unlikeness, then, is distinguished from the mere "position" of change by (1) the voluntary concentration of attention upon ab and ac with a view to the detection of this change as their difference, and by (2) the act, relating them through it, in that they are judged unlike to that extent. The type of comparison is such superposition of geometrical lines or figures (as, e.g., in Euclid I. iv.) : if they coincide we have concrete equality ; if they do not their difference is a line or figure. All sensible comparisons conform essentially to this type. In comparing two shades we place them side by side, and passing from one to the other seek to determine not the absolute shade of the second but its shade relative to the first,—in other words, we look out for contrast. We do not say of one "It is dark," for in the scale of shades it may be light, but "It is darker"; or vice versa. Where there is no distance or contrast we simply have not two impressions, and, as said—if we consider the difference by itself—no impression at all. Two coincident triangles must be perceived as one. The distinction between the one triangle thus formed by two coinciding and the single triangle rests upon something extraneous to this bare pre- sentation of a triangle that is one and the same in both cases. The marks of this numerical distinctness may be various: they may be different temporal signs, as in re- duplications of the memory-continuum ; or they may be constituents peculiar to each, from which attention is for the moment abstracted, any one of which suffices to give the common or identical constituent a new setting. In general, it may be said (1) that the numerical distinctness of the related terms is secured in the absence of all qualita- tive difference solely by the intellectual act which has so unified each as to retain what may serve as an individual mark ; and (2) that they become related as "like" either in virtue of the active adjustment to a change of impres- sion which their partial assimilation defeats, or in virtue of an anticipated continuance of the impression which this assimilation confirms.

It is in keeping with this analysis that we say in common Ident

speech that two things in any respect similar are so far the same ; that, e.g7., the two Dromios—

Material identity.

Pe Can OL O 6 Y

“The one so like the other

As could not be distinguished but by names” — had the same complexion and the same stature just as we say they had the same mother. This ambjguity in the word “same,” whereby it means either individual identity or indistinguishable resemblance, has been often noticed, and from a logical or objective point of view justly com- plained of as “engendering fallacies in otherwise enlight- ened understandings.” But apparently no one has in- quired into its psychological basis, although more than one writer has admitted that the ambiguity is one “in itself not always to be avoided.”! It is not enough to trace the confusion to the existence of common names and to cite the forgotten controversies of scholastic realism. We are not now concerned with the conformity of thought to things or with logical analysis, but with the analysis of a psychological process. The tendency to treat presenta- tions as if they were copies of things—the objective bias, as we may call it—is the one grand obstacle to psycho- logical observation. Some only realize with an effort that the idea of extension is not extended ; no wonder, then, if it should seem “unnatural” to maintain that the idea of two like things does not consist of two like ideas. But, assum- ing that both meanings of identity have a psychological Justification, it will be well to distinguish them and to ex- amine their connexion. Perhaps we might term the one “material identity” and the other “ individual identity,’ — following the analogy of expressions such as “ different things but all made of the same stuff,” “the same person but entirely changed.” Thus there is unity and plurality concerned in both, and herein identity or sameness differs from singularity or mere oneness, which entails no relation, But the unity and the plurality are different in each, and each is in some sort the converse of the other. In the one, two different individuals partially coincide; in the other, one individual is partially different ; the unity in the one case is an individual presentation, in the other is the presentation of an individual.

In material identity the unity is that of a single pre- sentation, whether simple or complex, which enters as a common constituent into two or more others, It may be possible of course to individualize it, but as it emerges in a comparison it is a single presentation and nothing more, On account of this absence of individual marks this single presentation is what logicians call "abstract"; but this is not psychologically essential. It may bea generic image which has resulted from the neutralization of individual marks, but it may equally well be a simple presentation, like red, to which such marks never belonged. We come here from a new side upon a truth which has been already expounded at length, viz., that presentations are not given to us as individuals but as changes ina continuum. Time and space—the instruments, as it were, of individualiza- tion, which are presupposed in the objective sciences—are psychologically later than this mere differentiation.

The many vexed questions that arise concerning indi- vidual identity are metaphysical rather than psychological. But it will serve to bring out the difference between the two forms of identity to note that an identification cannot be established solely by qualitative comparison; an alibi or a breach of temporal continuity will turn the flank of the Strongest argument from resemblance, Moreover, resem- blance itself may be fatal to identification when the law of being is change. But, while temporal and spatial de- terminations are essential to individual identity, they have, strictly speaking, no individual identity of their own.

Vhen we speak of two impressions occurring at the same

1 Comp. J. 8. Mill, Logie, Hamilton, 34 ed., ch. xiv. p. 306, note; also Meinong, ""Hume-Studien " IL., Wiener Sitzungberichte (Phil. Hist. Cl.), vol. ci. p. 709.

unity of apperception."

bk. i. ch. iii, § 11, and ELeamination of

S1

time, or localize or project them into the same place, a careful analysis shows only that we detect no difference of temporal and local signs

respectively,—in other words, have only special cases of comparison.

As regards the real categories, it may be said generally Real that these owe their origin in large measure to the an- cate- thropomorphic or mythical tendency of human thought, — &°™es. TO dpowov TH dpoiw ywioKerOa, Into the formation of these conceptions two very distinct factors enter—(1) the facts of what in the stricter sense we call "self-conscious- hess," and (2) certain spatial and temporal relations among our presentations themselves. On the one hand, it has to be noted that these spatial and temporal relations are but the occasion or motive—and ultimately perhaps, we niay say, the warrant—for the analogical attribution to things of selfness, efficiency, and design, but are not directly the source of the forms of thought that thus arise. On the other hand, it is to be noted also that such forms, although they have an independent source, would never apart froi. suitable material come into actual existence. If the followers of Hume err in their exclusive reliance upon "associations naturally and even necessarily generated by the order of our sensations" (J. 8, Mill), the disciple of Kant errs also who relies exclusively on "the synthetic The truth is that we are on the verge of error in thus sharply distinguishing the two at

all ; if we do so momentarily for the purpose of exposition it behoves us here again to remember that mind grows and is not made. priori," "necessary," "formal," &c., without further quali- fication leads only too easily to the mistaken notion that all the mental facts so named are alike underived and original, independent not only of experience but of each other ; whereas but for the forms of intuition the forms of thought would be impossible,—that is to say, we should never have a self-consciousness at all if we had not pre- viously learnt to distinguish occupied and unoccupied space, past and present in time, and the like. equally true that, if we could not feel and move as well as receive impressions, and if experience did not repeat it- self, we should never attain even to this level of spatial and temporal intuition. Kant shows a very lame and halting recognition of this dependence of the higher forms on the lower both in his schematism of the categories, and again in correcting in his Analytic the opposition of sense and under- standing as respectively receptive and active with which he set out in his Aisthetic. the subjective and objective factors of real knowledge ad- vance together, the former is in a sense always a step ahead. We find

again without us the permanence, individuality, efficiency, and adaptation we have found Jirst of all within (comp. p. 56, b and d). of personality, though it facilitates a first understanding, soon proves itself faulty and begets the contradictions which have been one chief motive to philosophy. We smile at the savage who thinks a magnet must need food and is puzzled that the horses in a picture remain for ever still ; but few consider that underlying all common-sense thinking there lurks the same natural precipitancy. We attribute to extended things a unity which we know only as the unity of an unextended subject; we attribute to changes among these extended things what we know only when we act and suffer ourselves; and we attribute further

The use of terms like "innate," "a

But, again, it is

Still, although what are called

But such primitive imputation

both to them and their changes a striving for ends which we know only because we feel. In asking what they are, how they act, and why they are thus and thus, we assimi- late them to ourselves, in spite of the differences which lead us by and by to see a gulf between mind and matter. Such instinctive analogies have, like other analogies, to be confirmed, refuted, or modified by further knowledge, z.e.,

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Causal- ity.

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by the very insight into things which these analogies have themselves made possible. That in their first form they were mythical, and that they could never have been at all unless originated in this way, are considerations that make no difference to their validity, assuming, that is, that they admit, now or hereafter, of a logical transformation which renders them objectively

valid. This legitimation is of course the business of philosophy ; we are concerned only with the psychological analysis and origin of the conceptions themselves.

As it must here suffice to examine one of these categories, let us take that which is the most important and central of the three, viz., eausality or the relation of cause and effect, as that will necessarily throw some light upon the constitution of the others. To begin, we must distinguish three things, which, though very different, are very liable to be confused. (1) Perceiving im a de- finite case, ¢.g., that on the sun shining a stone becomes warm, we may say the sun makes the stone warm. 'This is a concrete Im- stance of predicating the cansal relation. In this there 1s, exphiitly at all events, no statement of a gencral law or axiom, sucli as we have when we say (2) "Every event must have a cause," —a statement commonly known as the principle of cansality. This again is dis- tinct from what is on all hands allowed to be an empirical general- ization, viz., (3) that such and such particular causes have invariably such and such particular effects. With these last psychology 1s not directly concerned at all: it has only to analyse and trace to its origin the bare conception of causation as expressed in (1) and involved in both these generalizations. Whether only some things have causes, as the notion of chance implies, whether all causes are uniform in their action or some capricious and arbitrary, as the unreflecting suppose, —all this is beside the qnestion for us.

One point in the analysis of the cansal relation Hume may be said to have settled once for all: it does not rest upon or contain any immediate intnition of a causal nexus. The two relations that Hume allowed to be perceived (or " presumed to exist'), viz., con- tiguity in space of the objects causally related and priority in time of the cause before the effect, are the only relations directly dis- cernible. We say indeed "The sun warms the stone"' as readily as we say "The sun rises and sets," as if both were matters of direct observation then and there. But that this is not so is evident from the fact that only in some cases when one change follows upon another do we regard it as following from the other: casual coin- cidence is at least as common as cansal connexion. Whence the difference, then, if not from perception ? Hume's answer,! repeated in the main by English psychologists since, is, as all the world knows, that the difference is the result of

association, that when a change 8 in an object B has been frequently observed to sncceed a change a in another object A, the freqnent repetition determincs the mind to a transition from the one to the other. It is this determination, which conld not be present at first, that constitutes 'the third relation betwixt these objects." This "internal im- pression" generated by association is then projected ; "for 'tis a common observation that the mind has a great propensity to spread itself ou external objects."

The subjective origin and the after-projection we must admit, put all else in Hume's famous doctrine seems glaringly at variance with facts. In one respect it proves too much, for all constant sequences are not regarded as causal, as according to his analysis they ought to be; again, in another respect it proves too little, for causal connexion is continually predicated on a first occurrence. The natural man has always distinguished between causes and signs or portents; bnt there is nothing to show that he produced an effect many times before regarding himself as the cause of it. J. 8. Mill has indeed obviated the first objection epistemologically by adding to constant conjunction the further characteristic of "uncon- ditionality." But this isa conception that cannot be psychologi- cally explained from Hume's premisses, unless perhaps by resolving it into the qualification that the invariability must be complete and not partial, whereupon the second objection applies. " Uncondi- tional" is a word for which we can find no meaning as long as we confine onr attention to temporal snccession. It will not do to say both that an invariable succession generates the idea, and that such invariable snecession must be not only invariable but also uncondi- tional in order to generate it. We may here turn the master against the disciple: "the same principle," says Hume, ' cannot be both the canse and the effect of another, and this is perhaps the only proposition concerning that relation which is either intni- tively or demonstratively certain" (op. cit., p. 891). Uncondition-

ality is then part of the causal relation and yet not the product of

invariable repetition. Perhaps the sonrce of this element in the relation will become clear if we examine more closely the internal impression of the

A : es : 5 Treatise of Human Nature, pt. tii., § xiv., "Of the idea of neeessary connexion.

mind which according to Hume constitutes the whole of onr idea of power or efficacy. To illustrate the nature of this impression Hume cites the instant passage of the imagination toa particnlar idea on hearing the word commonly annexed to it, when "'twill scarce be possible for the mind by its utmost efforts to prevent that transition" (op. cit., p. 398). It is this determination, then, which is felt internally, not perceived externally, that we mis- takenly transfer to objects and regard as an intelligible connexion between them. But, if Hume admits this, must he not admit more? Can it be pretended that it is through the workings of association among our ideas that we first feel a determination which our utmost efforts can scarce resist, or that we feel such determination under no other circumstances? If it be allowed that the natural man is irresistibly determined to imagine an apple when he hears its name or to expect thunder when he sees lightning, must it not also be allowed that he is irresistibly determined mnch earlier and in a much more impressive way when overmastered by the elements or by his enemies? Bnt further, such instaincesbring to light what Tinme's " determination" also implies, viz., its necessary correla- tive, effort or action. Even irresistible association can only be known as such by efforts to resist it. Hume allows this when he says that his principles of association 'are not infallible causes ; for one may fix his attention dnring some time on any one object without looking farther" (op. ctt., p. 898). But the fact is, we know both what it is to act and what it is to suffer, to go where we would and to be carried where we would not, quite apart from the work- ings of association. And, had Hume not confused the two differ- ent inquiries, that concerning the origin of the idea of causation and that concerning the ground of causal inference or law of causation, it could never have occurred to him to offer such an analysis of the former as he does.

Keeping to the former and simpler question, it would seem that when in ordinary thinking we say A causes this or that in B we project or analogically attribute to A what we experience in acting, and to B what we experience in being acted on ; and the structure of language shows that such projection was made long before it was suspected that what A once did and B once suffered must happen in like manner again. The occasions suitable for this projection are detemnined by the temporal and spatial

relations of the objects concerned, which relations are matter of intuition. These are of no very special interest from a psychological point of view, but the subjective elements we shall do well to consider further. First of all, we mnst note the distinction of immanent action and transitive action ; the former is what we call action simply, and implies only a single thing, the agent; the latter, which we might with advan- tage call effectuation, implies two things, z.¢e.,a patient distinct from the agent. In seientific language the agent in an intransitive act is called a causa immanens and so distinguished from the agent in effectuation or causa transiens, Common thought, however, does not regard mere action as caused at all; and we shall find it, in fact, impossible to resolve action into effectuation. But, since the things with which we ordinarily deal are complex, have many parts, pro- perties, members, phases, and in consequence of the analytic pro- cedure of thought, there ensues, indeed, a eontinual shifting of the point of view from which we regard any given thing, so that what is in one aspect one thing, is in another many (comp. p. 56 ¢). So it comes about that, when regarding himself as one, the natural man speaks of himself as walking, shouting, &c.; but, when dis- tinguishing between himself and his members, he speaks of raising his voice, moving his legs, and so forth. 'Thus no sooner do we re- solve any given action into an effectuation, by analytically dis- tinguishing within the original agent an agent and a patient, than a new action appears. Action is thus a simpler notion than causation and inexplicable by means of it. It is certainly no easy problem in philosophy to determine where the resolution of the complex is to cease, at what point we must stop, because in the presence of an individual thing and a simple activity. At any rate, we reach such a point psychologically in the conscious subject, and that energy in consciousness we call attention. If this be allowed, Hume's critique of the notion of efficacy is really wide of the mark. "Some," 2 he says, " have asserted that we feel an energy or power in our own mind; and that, having in this manner acquir'd the idea of power, we transfer that 'quality to matter, where we are not able immediately to discover it… . Bnt to convince us how fallacious this reasoning is, we need only consider that the will, being here consider'd as a cause, has no more a discoverable con- nexion with its effects than any material cause has with its proper effect. . . . The effect is there [too] distinguishable and separable from the cause, and cou'd not be foreseen without the experience of their constant conjunction" (op. cit.,p. 455). This is logical analysis, not psychological ; the point is that

the will is not considered as a cause and distinguished from its effects, nor in fact considered at

2 Hume here has Locke and Berkeley specially in view. Locke as a patient and acute inquirer was ineomparably better as a psychologist than a man addieted to literary foppery like Hume, for all his genius, could possibly be. On the partieular question, see Locke, it. 21, 3-5.

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Object- ivity of thought.

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It is not a case of sequence between two separable impressions ; for we cannot really make the indefinite regress that such logical distinctious as that between the conscious subject and its acts im- Moreover, our activity as such is not directly presented at and further than this psychological There are, as we have Seen, two ways in which this activity is manifested, the receptive or passive and the motor or active in the stricter sense—(comp. p. 44) aud our experience of But two halves do not make a whole ; so we have no complete experience of effectua-

all.

plies. i (all: we are, being active ; analysis will not go.

these we project in predicating the causal relation.

tion, for the simple reason that we cannot be two things at once.

We are guided in piecing it together by the temporal and spatial

relations of the things concerned. Hence, perhaps, some of the antinomies that beset this conception. In its earliest form, then, the so-called necessary connexion of cause and effect is perhaps nothing more than that of physical constraint. To this, no doubt, is added the strength of expectation—as Hume supposed—when the same effect has been found invariably to follow the same cause. Finally, when upon a basis of associated uniformities of

sequence a definite intellectual elaboration of such material ensues, the logical necessity of reason and consequent finds a place, and so far as deduc- tion is applicable cause and reason become interchangeable ideas. } The mention of logical necessity brings up a topic already inci- dentally noticed, viz., the objectivity of thought and cognition gen- erally (comp. pp. 55,77). The psychological treatment of this topic

is tantamount to an inquiry into the characteristics of the states of

mind we call certainty, doubt, belief—all of which centre round the one fact of evidence. Between the certainty that a proposition is true and the certainty that it is not there may intervene continu- ous grades of uncertainty. We may know that A is sometimes B, or sometimes not; or that some at least of the conditions of B are present or absent ; or the presentation of A may be too confused for distinct analysis. This is the tegion of probability, possibility, more or less obscurity. Leaving this aside, it will be enough to notice those cases in which certainty may be complete. With that certainty which is absolutely objective, é.¢., with knowledge, psycho- logy has no direct concern; it is for logic to furnish the criteria by which knowledge is ascertained,

Emotion and desire are frequent indirect causes of subjective certainty, in so far as they determine the constituents and the grouping of the field of consciousness at the monrent —" pack the Jury" or "'suborn the witnesses," as it were. certainty is in all cases some quality or some relation of these pre- sentations inter se. Ina sense, therefore, the ground of all certainty is objective—in the sense, that is, of being something at least directly and immediately determined for the subject and not by it. But, though objective, this ground is not itself—at least is not ultimately —au object or presentation. Where certainty is mediate, one judg- ment is often spoken of as the ground of another; but a syllogism is still psychologically a single, though not a simple, judgment, and the certainty of it as a whole is immediate. Between the judgment is B and the question Is A B? the difference is not one of content nor scarcely one of form: it is a difference which depends upon the effect of the proposition on the subject judging. (i.) We have this effect before us most clearly if we consider what is by common con- sent regarded as the type of certainty and evidence, the certainty of

present sense-impressions whence it is said, "Seeing is believing." The evident is here the actual, and the " feeling or consciousness " of certainty is in this case nothing but the sense of being taken fast hold of and forced to apprehend what is there. (ii.) The like 1s true of memory and expectation : in these also there is a sense of being tied down to what is given, whereas in mere imagination, however lively, this non-voluntary determination is absent (comp. p. 63). Hume saw this at times clearly enough, as, ¢.g., when he Says, "An idea assented to fecls different from a fictitious idea that the fancy alone presents to us." But unfortunately he not only made this difference a mere difference of intensity, but spoke of belief itself as "an operation of the mind" or 'manner of Conception that bestowed on our ideas this additional force or vivacity."® In short, Hume confounded one of the indirect causes of belief with the ground of it, and again, in describing this ground committed the terepop mporepov of making the mind determine the ideas instead of the ideas determine the mind. (iii.) In speaking of Intellection he is clearer: " The answer is easy with regard to Propositions that are prov'd by intuition or demonstration. In that case, the person who assents not only conccives the ideas according to the proposition, but is necessarily determin'd to con- celve them in that particular manner" (op, cit., p. 395). It has been often urged—as by J. S. Mill, for example—that belief is somcthing

"ultimate and primordial." No doubt it is; but so is the distinc. tion between activity and passivity, and it is not here maintained that certainty can be analysed into something simpler, but only that it is identical with what is of the nature of passivity—

' Comp. Wundt, Logik— Das Causal-Gesetz und Satz vom Grunde," Vol. i. p. 544,

- *Treatise of Human Nature, Green and Grose's ed, 21. p. 396.*

But the ground of

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objective determination. As Dr Bain puts it, "The leading fact in belief . . . is our primitive credulity. We begin by believing everything: whatever is is

true" (Emotions and Will, 3d ed., :p.

511). But the point is that in this primitive state there is no act answering to "believe" distinct from the hon-voluntary attention answering to "perceive," and no reflexion such as a modal term like "true" implies. With eyes open in the broad day no man says, "I am certain there is light": he simply sees. He may by and by come absolutely to disbelieve much that he sees—e.g., that things are nearer when viewed through a telescope—just as he will

cone to disbelieve his dreams, though while they last he is certain

in these too. The limits of this article forbid any attempt to deal

specially with the intellectual aspects of such conflicts of preseuta-

tions (comp. p. 62) or with their resolution and what is meant by

saying that reason turns out superior to sense. The consistency we fiud it possible to establish among certain of our ideas becomes

an ideal, to which we expect to find all our experience conform, – Still the intuitive evidence of logical and mathematical axioms is

psychologically but a new form of the actual ; We are only certain

that two and two make four and we are not less certain that we see

things nearer through a telescope.

Presentation of Self, Self-Consciousness, and Conduct.

The conception of self we have just seen underlying and to a great extent shaping the rest of our intellectual furni- ture; on this account it is at once desirable and difficult to analyse it and ascertain the conditions of its develop- ment. In attempting this we must carefully distinguish between the bare presentation of self and that reference of other presentations to it which is often called specially self-consciousness, "inner sense," or internal perception. Concerning all presentations whatever—that of self no*

less than the rest—it is possible to reflect, "This presentation is mine ; it is my object; I am the subject attending to it." Self, then, is one presentation among others, the result, like them, of the differentiation of the original continuum. But it is obvious that this presentation must be in existence first before other presentations can be re- lated to it. On the other hand, it is only in and by means of such relations that the conception of self is completed. We begin, therefore, with self simply as an object, and end with the conception of that object as the subject or "myself" that knows itself. Self has, in contradistinction from all other presentations, first of all (a) a unique in- terest and (1) a certain inwardness ; (c) it is an individual that (d) persists, (c) is active, and finally (f) knows itself. These several characteristics of self are intimately involved ; so far as they appear at all they advance in definiteness from the lowest level of mere sentience to those moments of highest self-consciousness in which conscience approves or condemns volition.

The earliest and to the last the most important element in self— Self and what we might perhaps term its root or material element—is that the body.

variously styled the organic sensations, vital sense, cceneesthesis, or somatic consciousness. This largely deterinines the tone of the

® See BELIEF, vol. iii, p, 532.

4 A large, though certainly diminishing, school of thinkers would entirely demur to such a proposal. " This personality," says one, "like all other simple and immediate presentations, is indefinable . . . it can be analysed into no simpler elements; for it is revealed to us in all the clearness of an original intuition " (Mansel, Metaphysies, p. 182). Such an objection arises from that confusion between psycho- logy and epistemology which we have met already several times before (as, ¢.g., in the case of space, p. 53, and of unity, p. 79). The fact is that a conception that is logically "' simple and immediate," in such wise as to be underivable from others, and therefore indefinable, may be—we might almost say will be—psychologically the result of a long process of development; for the more abstract a concept is, es, tae more fundamental in epistemological structure, the more thinking there has been to elaborate it. 'The most complex integrations of experience are needed to furnish the ideas of its ultimate elements, Such ideas when

reached have intelleetually all the clearmess of an original intuition, no doubt; but they are uot therefore to be con- founded with what is psychologically a simple and immediate presenta- tion. It was in this last sense that idealists like Berkeley and Kant denied any presentation of self as much as sceptics like Hume. Self is psychologically a product of thought, not a datum of sense ; hence, while Berkeley called it a "notion" and Kant an "'idea of the reason," Hume treated it as a philosophical fiction.

Inner self,

Self as a person.

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special sensations and enters, though little suspected, into all our higher feelings. If, as sometimes happens in serious nervous affections, the whole body or any part of it should lose common sensibility, the whole body or that part is at once regarded as strange and even as hostile. In some forms of hypochondria, in which this extreme somatic insensibility and absence of zest leave the intellect and memory unaffected, the individual doubts his own existence or denies it altogether. Ribot cites the case of such a patient who, declaring that he had been dead for two years, thus expressed his perplexity :—J'existe, mais en dehors de la vie réelle, matérielle, et, malgré moi, rien ne mayant donné la mort. Tout est mécanique chez moi et se fait inconsciemment, q It is not because they accompany physiological functions essential to the efficiency of the organism as an organism, but simply

because they are the most immediate and most constant sources of

feeling, that these massive but ill-defined organic sensations are from the first the objects of the directest and most _unrefiecting interest. Other objects have at the outset but a mediate interest through subjective selection in relation to these, and never become so instinctively and inseparably identified with self, never have the same inwardness. This brings us to a new point. As soon as definite perception begins, the body as an extended thing is dis- tinguished from other bodies, and such organic sensations as can be localized at all are localized within it. At the same time the actions of other bodies upon it are accompanied by pleasures and pains, while their

action upon each other is not. The body also is the only thing directly set in motion by the reactions of these feelings, the purpose of such movements being to bring near to it the things for which there is appetite and to remove from it those towards which there is aversion. 1t is thus not merely the type of occupied space and the centre from which all positions are reckoned, but it affords us an unfailing and ever-present intuition of the actu- ally felt and living self, to which all other things are external, more or less distant, and at times absent altogether. The body then first of all gives to self a certain measure of individuality, permanence, and inwardness.

But with the development of ideation there arises within this what we may call an inner zone of self, having still more unity and permanence. We have at this stage not only an intuition of the bodily self doing or suffering here and now, but also memories of what it has been and done under varied circumstances in the past. External impressions have by this time lost in novelty and become less absorbing, while the train of ideas, largely increased in number, distinctness, and mobility, diverts attention and often shuts out the things of sense altogether. In all such reminiscence or reverie a generic image of self is the centre, and every new image as it arises derives all its interest from relation to this; and so apart from bodily appetites new desires may be quickened and old emotions stirred again when all that is actually present is dull and unexciting. But desires and emotions, it must be remembered, though awakened by what is only imaginary, invariably entail actual organic perturbations, and with these the generic image of self comes to be intimately combined. ence arises a contrast between the inner self, which the natural man locates in his breast or ¢pyv, the chief seat of these emotional disturbances, and the whole visible and tangible body besides. Although from their nature they do not admit of much ideal representation, yet, when actually present, these organic sensations exert a powerful and often irresistible in- fluence over other ideas; they have each their appropriate train, and so heighten in the very complex and loosely compacted idea of self those traits they originally wrought into it, suppressing to an equal extent all the rest. Normally there is a certain equilibrium to which they return, and which, we may suppose, determines the so-called temperament, naturel, or disposition, thus securing some tolerable uniformity and continuity in the presentation of self. But even within the limits of sanity great and sudden changes of mood are

possible, as, ¢.g., in hysterical persons or those of a "mercurial temperament," or among the lower animals at the onset of parental or migratory instincts. Beyond those limits—as the concomitant apparently of serious visceral derangements or the altered nutrition of parts of the nervous system itself—complete

alienation" may ensue. A new self may arise, not only distinct from the old and devoid of all save the most elementary know- ledge and skill that the old possessed, but diametrically opposed to it in tastes and disposition, — obscenity, it may be, taking the place of modesty and cupidity or cowardice succeeding to generosity er courage. The most convincing illustrations of the psycho- oe Sales on structure of the presentation of self on the lower me ae bee ie furnished by these melancholy A ae hove ; but it is impossible to refer to them

Passing to the higher level of intellection, w o upon the concept which every intelligent oatne Seemann Tae tinctly forms of himself as a person, M. or N., having such and such a character, tastes, and eonvictions, such and such a history, and

1 'Bases affectives de la Personnalité," in Revue philosophique, xviii. p. 149.

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such and such an aim in life. The main instrument in the forma- tion of this concept, as of others, is language, and especially the social intercourse that language niakes possible. Up to this point the presentation of self has shaped that of not-self, that is to say, external things have been comprehended by the projection of its characteristics. But now the order isin a sense reversed : the indi-

vidual advances to a fuller self-knowledge by comparing the self within with what is first discernible in other persons without. So

far avant homme est la société ; it is through the "us" that we learn of the "me" (comp. p. 75 note 1), Collective action for common ends is of the essence of society, and in taking counsel together for the

good of his tribe each one learns also to take counsel with himself for his own good on the whole ; with the idea of the common weal

arises the idea of happiness as distinct from momentary gratification. The extra-regarding impulses are now confronted by a reasonable self-love, and in the deliberations that thus ensue activity attains to its highest forms, those of thought and volition. In the first we have a distinctly active manipulation of ideas as compared with the more passive spectacle of memory and imagination. Thereby emerges a contrast between the thinker and these objects

of his thought, including among them the mere generic image of

self, from which is now formed this conception of self as a person.

A similar, even sharper, contrast also accompanies the exercise of

what is very misleadingly termed "self-control," z.¢., control by this personal self of "the various natural affections," to use Butler's phrase, which often hinder it as external objects hindered them. It is doubtful whether the reasoning, regulating self is commonly regarded as definitely localized. The effort of thinking and concen- trating attention upon ideas is no doubt referred to the brain, but this is only comparable with the localization of other efforts in the limbs ; when we think we commonly feel also, and the emotional basis is of all the most subjective and inalienable. this latest phase of self as par eacellence "the inner self" such language is then mainly figurative, inasmuch as the contrasts just described are contrasts into which spatial relations do not enter.

The term "reflexion" or internal perception is applied to that state Self-con- of mind in which some particular presentation or group of presenta- Sclous- tions (x or y) is not simply in the field of consciousness but there as ness.

consciously related to self, which is also presented at the same time. Self here may be symbolized by M, to emphasize the fact that it is in like manner an object in the field of consciousness. The relation of the two is commonly expressed by saying, "This (# or y) is my (M's) percept, idea, or volition ; I (M) it is that perceive, think, will it.? Self-consciousness, in the narrowest

sense, as when we say, "I know myself, I am conscious that Iam," &c., is but a special, though

the most important, instance of this internal perception: here self

(M) is presented in relation to self (with a difference, M'); tlie subject itself —at least so we say—is or appears as its own object.

It has been often maintained that the difference between con- sciousness and reflexion is not a real difference, that to know and to know that you know are "the same thing considered in different aspects.'2 But different aspects of the same thing are not the same thing, for psychology at least. Not only is it not the same thing to feel and to know that you feel; but it might even be held to be a different thing still to know that you feel and to know that you know that you feel,—such being the difference perhaps between ordinary reflexion and psychological introspection.® The difficulty of apprehending these facts and keeping them distinct seems obvi- ously due to the necessary presence of the earlier along with the later ; that is to say, we ean never know that we feel without feel- ing. But the converse need not be true. How distinct the two states are is shown in one way by their notorions incompatibility, the direct consequence of the limitation of attention: whatever we have to do that is not altogether mechanical is ill done unless we lose ourselves in the doing of it. This mutual exclusiveness receives a further explanation from the fact so often used to dis- credit psychology, viz., that the so-called introspection and indeed all reflexion are really retrospective. It is not while we are angry or lost in reverie that we take note of such states, but afterwards, or by momentary side glances intercepting the main interest, if this be not too absorbing.

But we require an exacter analysis of the essential fact in this retrospect—the relation of the presentation x or y to that of self or M. What we have to deal with, it will be observed, is, implicitly at least, a judgment. First ofall, then, it is noteworthy that we are never prompted to such judgments by every-day occurrences or acts of routine, but only by matters of interest, and, as said, gener-

2 So—misled possibly by the confusions incident to a special faculty of reflexion, which they controvert—James Mill, Analysts, i. p. 22459.

(corrected, aes by both his editors, pp. 227 and 230), and also Hamilton, Lectaeme

3 It has been thought a fatal objection to this view that it implies the possibility of an indefinite regress ; but why should it not? We reach the limit of our experience in reflexion or at most in deliberate introspection, just as in space of three dimensions we reach the limit of our experience in another respect. But there is no absurdity in supposing a Consciousness more evolved and explicit than our self-consciousness and advancing on it as it advances on that of the unreflecting brutes.

If we speak of

Conduct.

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ally when these are over or have ceased to be all-engrossing. Now in such cases it will be found that some cffect of the preceding state

of objective absorption persists, like wounds reccived in battle un-

noticed till the fight is over,—such, ¢.g., as the weariness of muscular exertion or of long concentration of attention ; some pleasurable or

painful after-sensation passively experienced, or an emotional wave subsiding but not yet spent ; "the jar of interrupted expectation,"

or the relief of sudden attainment after arduous striving, making

prominent the contrast of contentment and want in that particular ; or, finally, the quiet retrospect and mental rumination in which we note what time has wrought upon us and either regret or approve what we were and did. All such presentations are of the class out of which, as we have seen, the presentation of self is built up, and so form in each case the concrete bond connecting the generic image of self with its object.1 In this way and in this respect each is a concrete instance of what we call a state, act, affection, &c., and the judgments in which such relations to the standing

presentation of self are recognized are the original and the type of all real pre- dications (comp. p. 81). The opportunities for reflexion are at first few, the materials being as it were thrust upon attention, and the resulting "percepts" are but vague. By the time, however, that a clear conception of self has been attained the exigencies of life

make it a frequent object of contemplation, and as the abstract of

a series of instances of such definite self-consciousness we reach the purely formal notion of a subject or pure ego. For empirical psychology this notion is ultimate ; its speculative treatment falls altogether—usually under the heading "rational psychology "'—to inetaphysics.

The growth of intellection and self-consciousness reacts power- fully upon the emotional and active side of mind. To describe the various sources of feeling and of desire that thus arise—es thetic, social and religious sentiments, pride, anibition, selfishness, sym- pathy, &c.—is beyond the scope of systematic psychology and certainly quite beyond the limits of an article like the present.? But at least a general réswmé of the characteristics of activity on this highest or rational level is indispensable. If we are to gain any oversight in a matter of such complexity it is of the first im- portance to keep steadily in view, as a fundamental principle, that as the causes of feeling become more complex, internal, and repre- sentative the consequent actions change in like manner. We have noted this connexion already in the case of the emergence of desires, and seen that desire in prompting to the search for means to its end is the primum movens of intellection (pp. 73-75). But intellect does much more than devise and contrive in unquestioning sub- servience to the impulse of the moment, like some demon of Eastern fable; even the brutes, whose cunning is on the whole of this sort, are not without traces of self-control. As motives conflict and the evils of hasty action recur to mind, deliberation succeeds to mere invention and design. In moments of leisure, the more imperious cravings being stilled, besides the rehearsal of failures or successes in the past, come longer and longer flights of imagination into the future. Both furnish material for intelectual rumination, and so we have at length (1) conceptions of general and distant ends, as wealth, power, knowledge, and —self-consciousness having arisen— the conception also of the happiness

or perfection of self, and (2) Maxims or practical generalizations as to the best means to these ends. Instead of actions determined by the vis a tergo of blind passion we have conduct shaped by what is literally prudence or foresight, the pursuit of ends that are not esteemed desirable till they are judged to be good. The good, it is truly urged, is not to be identified with the pleasant, for the one implies a standard and a judgment and the other nothing but a bare fact of feeling ; thus the good is often not pleasant and the pleasant not good ; in talk- ing of the good, in short, we are passing out of the region of nature into that of character. It is so, and yet this progress is itself so far natural as to admit of psychological explication. As already urged (p. 72), the causes of feeling change as the constituents of cou- Sclousness change and depend more upon the form of that conscious- hess as that increases in complexity. When we can deliberately vauge to and fro in time and circumstances, the good that is not directly pleasant may indeed be preferred to what is only pleasant while attention is confined to the seen and sensible ; but then the choice of such good is itself pleasant, — pleasanter than its rejection would have been. Freedom of will in the sense of absolute arbi- trariness or ' causeless volition," then, is at least without support from experience. The immediate affirmation of self-consciousness*

1 They have thus a certain analogy to the presentative element in external Perception, the re-presentative elements being furnished by the rest of the generic image of self. But, as this generic image is combined with and priin- arily sustained by a continuous stream of organic sensations, the analogy is not very exact.

2 The psychology of a century or so ago, like the biology of the same period, was largely of the ' natural history" type and was much occupied with such descriptions ; writers like Dugald Stewart, Brown, and Abercrombie, e.g., draw freely from biography (and even from fiction) illustrations of the popularly received mental faculties and affections. A very complete and competent handling of the various emotions and springs of action will be found in Bain,

he Emotions and the Will; Nahlowsky, Das Gefithisleben, 2d ed., 1884, is also good.

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that in the moment of action we are free must be admitted indeed, but it does not prove what it is supposed to prove—the existence of a liberum arbitrium indifferentie —but only that the relation of the end approved to the empirical self as then presented was the determining motive. This freedom of this empirical self is in all cases a relative freedom ; hence at a later time we often come to see that in some past act of choice we were not our true selves, not really free. Or perhaps we hold that we mere free and could have acted otherwise ; and this also is true if we suppose the place of the purely formal and abstract conception of self had been occupied by some other mood of that empitical self which is con- tinuously, but at no one moment completely, presented. It must, however, be admitted that psychological analysis in such cases is not only actually incomplete but in one respect must necessarily always remain so; and that for the simple reason that all we discern by reflexion must ever be less than all we are. That empirical self that the subject sces and even fashions is after all only its object and workmanship, not itself. If this be so, the indeterininist posi- tion, that particular acts are not fully determined by aught in con- sciousness, can neither be certainly established nor finally overthrown on scientific grounds ; but the presumption is againstit. Inanother sense, however, it may be allowed that freedom is possible, if not actual, viz., as synonymous with self-rule or autonomy. Freedom apples not to the ultimate source of an activity but to execution ; that man is free "externally" who can do what he pleases, and when we talk of internal freedom the same meaning holds.#

BrBuioGrapHy.—A. Historical.—There are few good works on the history of psychology ; the only one in English (R. Blakey, History of the Philosophy of Mind from the Earlicst Pertod to the Present Time, London, 1848) is said to be worthless, F. A. Carus's Geschichte der Psychologie (Leipsic, 1808) is at least useful for refer- ence. A work bearing the same title by H. Siebeck, of which only the first part has yet appeared (consisting of two divisions—(i.) Die Psychologie von Aristoteles, (il.) Die Psychologie von Aristotcles bus zu Thomas von Aquino, Gotha, 1880 and 1884) is thoroughly and carefully done. Die Philosophic in threr Geschichte (I, Psychologic), by the late Professor Harms (Berlin, 187), is also good. Ribot's La Psychologie Anglaise contemporaine (2d ed., Paris, 1875) and La Psychologie Allemande contemporaine (Paris, 1879) are lucid and

concise in style, though the latter work in places is superficial and inaccurate.

B. Positive.~~—The most useful and complete work as an intro~~ duction, and for the English reader, is Mr Sully's well-arranged and well-written Outlines of Psychology (2d ed., London, 1885). Of more advanced text-books the late Professor Volkmann's Lehr- buch der Psychologic (2 vols., 3d ed., K6then, 1885, edited by Cornelius) is a monument worthy the lifelong labours it entailed. Written in the main from a Herbartian standpoint, it is still the work of one who not only had read and thought over all that was worth reading by psychologists of every school but was unusually gifted with the qualities that make a good investigator and a good expositor. The importance of the Herbartian psychology to English students has been too long overlooked; while it has much in common with the English preference for empirical methods, it is in aim, if not in attainment, greatly in advance of English writers in exactness and system. Other excellent works of the same school are M. W. H. Drobisch's Empirische Psychologie (Leipsic, 1842), T. Waitz's Lehrbuch der Psychologic als Naturwissenschaft (Bruns-wick, 1849), and Steinthal's Einleitung in dic Psychologie und Sprachwissenschaft (Berlin, 1871). To the honoured name of Lotze belongs a distinguished place in any enumeration of recent produe- tions in philosophy ; his Afedicinische Psychologie (Gottingen, 1852) is still valuable ; but it is out of print and scarce.

PSYCHOPHYSICS. See Weper's Law.

3 See Eruics, to which these questions more fitly belong.

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tremity of the vertebra next in front of it. The eight or nine cervical vertebrae are always large, and are succeeded by about fourteen or sixteen which bear ribs. Probably there are no vertebra which can be called lumbar. The sacrum consists of from three to six vertebra. – The tail is short in some genera and very long in others. The sternum has a distinct median crest, and the scapula and coracoid are also much like those of carinate birds. The humerus has a strong ridge for the attachment of the pectoral muscle, and the radius and ulna are separate bones. There are four distinct

metacarpals ; passing from the inner or radial side, the first three of these bear respectively two, three, and four phalanges, the terminal ones having had

PTARMIGAN. See Grovss, vol. xi. p. 222.

PTERODACTYLE. The extinct flying reptiles known as "pterodactyles" are among the most aberrant forms of animals, either living or extinct. Since the beginning of this century, when Blumenbach and Cuvier first described the remains of these curious creatures, they have occupied the attention of naturalists, and various opinions have been expressed as to their natural affinities. The general pro- portions of their bodies (excepting the larger head and neck) and the modification of the forelimb, to support a mem- brane for flight, remind one strongly of the bats, but the resemblance is only superficial ; a closer inspection shows that their affinities are rather with reptiles and birds.

In all pterodactyles the head, neck, and forelimb are large in proportion to the other parts of the body (fig. 1). The skull is remarkably avian, and even the teeth, which

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Fia. 1.—Pterodactylus spectabilis, Von Meyer, natural size, from the lithographic slate. h, humerus ; ru, radius and ulna; mc, metacarpals ; pt, pteroid bone; 2, 3, 4, digits with claws; 5, elongated digit for support of wing membrane ;

pe sternum, crest not shown ; is, ischium; pp, prepubis. The teeth are not shown.

most of them possess, and which seem so unbird-like, are paralleled in the Cretaceous toothed birds of North America. Judging from the form of the skull, the brain was small, but rounded and more like that of a bird than that of a reptile. The position of the occipital condyle, beneath and not at the back of the skull, is another char- acter pointing in the same direction.

The nasal opening is not far in advance of the large orbit, and in some forms there is a lachrymo-nasal fossa between them. The pre- maxilla are large, while the maxille are slender. In certain species the extremities of the upper and lower jaws seem to have been covered with horn, and some forms at least had bony plates around the eye. The union of the post-frontal bone with the squamosal to form a supra-temporal fossa is a reptilian character. Both jaws are usually provided with long slender teeth, but they are not always present. The vertebral column may be divided into cervical, dorsal, sacral, and caudal regions. The centra of the vertebree are proccelous,—that is, the front of each centrum is cup-like and receives the ball-like hinder ex-

Fig. 2.—Rhamphorhynchus phyllurus, Marsh, from the Solenhofen slates, one- fourth natural size, with the greater part of the wing membranes preserved. x, caudal membrane; st, sternum; h, humerus; sc, scapula and coracoid ; wm, wing membrane.

claws. The phalanges of the outermost digit are much elongated, and except in one doubtful form are always four

digit, for the support of the patagium, which is the most characteristic feature of the pterodactyle's organization. A slender bone called the "pteroid" is sometimes seen extending from the carpal region in the direction of the upper part of the humerus. Some naturalists look upon the pteroid merely as an ossification of a tendon, corre- sponding with one which is found in this position in birds, while others are inclined to regard it rather as a rudiment- ary first digit, modified to support the édge of the patagium. The pelvis is small. In form the ilia'resemble rather the ornithic than the reptilian type ; but the other portions of the pelvis are more like those of the crocodiles. The hind

in number. It is the extreme elongation of this outer:

PTO—PTO

limb is small, and the fibula seems to have been feebly developed and fixed to the tibia. The hind foot has five digits in some forms, but only four in others. In the latter case the number of phalanges to each digit, counting

from the tibial side, is two, three, four, five respectively, The long bones and vertebrz, as well as some parts of the skull, contained large pneumatic cavities similar to those found in birds. There can be little doubt that the ptero- dactyles had the power of sustained flight. The large size of the sternal crest indicates a similar development of the pectoral nuscles and a corresponding strength in the arms. The form of the forelimb, especially its outer digit, indi- cates in no uncertain manner that it supported a flying membrane ; but within the last few years this has been more clearly demonstrated by the discovery of a specimen in the Solenhofen slates with the membrane preserved (fig. 2). The occurrence of pterodactyle remains in marine deposits would seem to indicate that they frequented the seashore ; and it is tolerably certain that those forms with long and slender teeth were, in part at least, fish-eaters. Seeing, however, that the armature of the jaws varies considerably in the different genera, it is most likely that

their diet varied accordingly.

Pterodaetyles present so many avian peculiarities that it has been proposed to place them ina special group, to be called Ornithosauria, which would hold a position intermediate between Aves and Reptilia. On the other hand, pterodactyles are thought by most authorities to have a closer relationship with the reptiles, and the different genera are placed in a separate order of the Reptilia called Ptero- swuria. The most important genera are five. (1) Pterodaetylus; these have the jaws pointed and toothed to their extremities, and the tail veryshort. (2) Rhamphorhynchus (fig. 2); this genus has the jaws provided with slender teeth, but the extremities of both mandible and upper jaw are produced into toothless beaks, which were prob- ably covered with horn ; the tail is extremely long. (3) Dimor- phodon ; in this form the anterior teeth in both upper and lower Jaws are long, but those at the hinder part of the jaws are short 2 the tail is extremely long. (4) Pteranodon ; similar in most respects to Pterodactylus, but the jaws are devoid of teeth. In these four genera the outer digit of the manus has fonr phalanges. (5) Ornt- thopterus; this form is said to have only two phalanges in the outer digit of the manus ; the genus, however, is very imperfectly known, and it has been suggested that it may perhaps be a true bird.

The Pterosauria are only known to have lived during the Meso- zoic period. They are first met with in the Lower Lias, the Dimor- phodon macronyx from Lyme Regis being perhaps the earliest known species. The Jurassic slatcs of Solenhofen have yielded a large number of beautifully preserved examples of Pterodactylus and Rhamphorhynchus, and remains of the same genera have been found in England in the Stonesfield slate. Bones of pterodactyles have also been obtained in some abundance from the Cretaccous phosphatic deposits near Cambridge ; and their remains have been met with occasionally in the Wealden and Chalk of Kent. The genus Peranodon is only known from the Upper Cretaceous rocks of North America, The Pterosauria were for the most part of moderate or small size (see fig. 1), but some attained to very con- siderable dimensions ; for instance, Rhamphorhynchus Bucklandi from the Stonesfield slate probably measured 7 feet between the wing-tips. But the largest forms existed apparently towards the elose of the Mesozoic period, the pterodactyles of the British Cretaceous rocks and the American Pieranodon being of still larger Size: some of them, it is calculated, must have had wings at least 20 feet in extent.

See Buckland, Bridgewater Treatise, 1836; Cuvier, Ossements fossiles, vol. v. pt. 2, p. 359 (1824) ; Huxley, "On Rhamphorhynchus Bucklandi," in Quart. Journ. Geol. Soc., vol. xv. p, 658 (1859), and Anatomy of Vertebrated Animals (1871), p. 266; Marsh, " Notice of New Sub-order of Pterosauria (Pteranodon)," Amer. Journ. Sei. and Art, vol. xi. p. 507 (1876), and on the " Wings of Pterodac- tyles," in Amer. Journ, Science, vol. xxiii. p. 251 (1882); Owen, Palaonto- graphical Society (1851, 1859, 1860); Seeley, Ornithosawria (1870); Von Meyer,

Reptilien aus dem lithograph. Schiefer [Fauna der Vorwelt] (1859), and Paleonto- graphica, vol. x. p. 1 (1861). (E. T. N.

PTOLEMIES, the Macedonian dynasty of sovereigns of Egypt. See Eoypr, vol. vil, pp. 745-748, and Mace. DONIAN Empire, vol. xv. p. 144.

PTOLEMY (Cravpivs PTOLEM&Us), celebrated as a mathematician, astronomer, and geographer. He was a native of Egypt, but there is an uncertainty as to the place of his birth ; some ancient manuscripts of his

works describe him as of Pelusium, but Theodorus Meliteniota, a Greek writer on astronomy of the 12th century, says that he was

born at Ptolemais Hermii, a Grecian city of the Thebaid. It is certain that he observed at Alexandria during the reigns of Hadrian and Antoninus Pius, and that he sur- vived Antoninus. Olympiodorus, a philosopher of the Neoplatonic school who lived in the reign of the emperor Justinian, relates in his scholia on the Phedo of Plato that Ptolemy devoted his life to astronomy and lived for forty years in the so-called IIrepa 70d KavéBov, probably elevated terraces of the temple of Serapis at Canopus near Alexandria, where they raised pillars with the results of his astronomical discoveries engraved upon them. This statement is probably correct ; we have indeed the direct evidence of Ptolemy himself that he made astronomical ob- servations during a long series of years; his first recorded observation was made in the eleventh year of Hadrian, 127 a.p.,! and his last in the fourteenth year of Antoninus, 151 a.p, Ptolemy, moreover, says, " We make our obser- vations in the parallel of Alexandria." St Isidore of Seville asserts that he was of the royal race of the Ptolemies, and even calls him king of Alexandria ; this assertion has been followed by others, but there is no ground for their opinion. Indeed Fabricius shows by numerous instances that the name Ptolemy was common in Egypt. Weidler, from whom this is taken, also tells us that according to Arabian tradition Ptolemy lived to the age of seventy-eight years ; from the same source some description of his personal appearance has been handed down, which is generally considered as not trustworthy, but which may be seen in Weidler, Historia Astronomiz, p. 177, or in the preface to Halma's edition of the Almagest, p. lxi. Ptolemy's work as a geographer is treated of below (p. 91 sg.), and an account of the discoveries in astronomy of Hipparchus and Ptolemy has been given in the article Astronomy. Their contribu- tions to pure mathematics have not yet been noticed in the present work. Of these the chief is the foundation of

trigonometry, plane and spherical, including the formation

of a table of chords, which served the same purpose as our table of sines. This branch of mathematics was created by Hipparchus for the use of

astronomers, and its exposi- tion was given by Ptolemy in a form so perfect that for 1400 years it was not surpassed. In this respect it may be compared with the doctrine as to the motion of the heavenly bodies so well known as the Ptolemaic system, which was paramount for about the same period of time. There is, however, this difference, that, whereas the Ptole- maic system was then overthrown, the theorems of Hip- parchus and Ptolemy, on the other hand, will be, as Delambre says, for ever the basis of trigonometry. The astronomical and trigonometrical systems are contained in the great work of Ptolemy 'H pa@npatixy otvragis, or, as Fabricius after Syncellus writes it, MeydAy otvrakis rips detpovopias; and in like manner Suidas says of7os [IroA.] eypaile Tov peyav dotpovopov rot cbvragw. The Syntacxis of Ptolemy was called 'O péyas dotpovdpos to distinguish it from another collection called 'O puxpds dotpovdpos, also highly esteemed by the Alexandrian school, which con- tained some works of Autolycus, Euclid, Aristarchus, Theo- dosius of Tripolis, Hypsicles, and Menelaus. To designate the great work of Ptolemy the Arabs used the superlative peyiorm, from which, the article al being prefixed, the hybrid name Almagest, by which it is now universally

known, is derived.

We proceed now to consider the trigonometrical work of Hippar- chus and Ptolemy. In the ninth chapter of the first book of the Almagest Ptolemy shows how to form a table of chords. He sup- poses the circumference divided into 360 equal parts (rujyara), and then bisects each of these parts. Further, he divides the diameter

1 Weidler and Halma give the ninth year; in the account of the eclipse of the moon in that year Ptolemy, however, does not say, as in other similar cases, he had observed, but it had been observed (Abmagest, iv. 9).

into 120 equal parts, and then for the subdivisions of these he em- ploys the sexagesimal method as most convenient in practice, ¢.2., he divides each of the sixty parts of the radius into sixty equal parts, and each of these parts he further subdivides into sixty equal parts. In the Latin translation these subdivisions become " partes minute prime" and " partes minute secund,"

whence our “minutes” and “seconds” have arisen. It must not be supposed, however, that these sexagesimal divisions are due to Ptolemy ; they must have been familiar to his predecessors, and were handed down from the Chal- deans. Nor did the formation of the table of chords originate with Ptolemy ; indeed, Theon of Alexandria, the father of Hypatia, who lived in the reign of Theodosius, in his commentary on the Almagest says expressly that Hipparchus had already given the doctrine of chords inscribed in a circle in twelve books, and that Menelaus had done the same in six books, but, he continues, every one must be astonished at the ease with which Ptolemy, by means of a few simple theorems, has found their values ; hence it is inferred that the method of calculation in the Almagest is Ptolemy’s own.

As starting-point the values of certain chords in terms of the diameter were already known, or could be easily found by means of the Elements of Euclid. Thus the side of the hexagon, or the chord of 60°, is equal to the radius, and thercfore contains sixty parts. The side of the decagon, or the chord of 36°, is the greater segment of the radius cut in extreme and mean ratio, and therefore contains approximately 37? 4’ 55” parts, of which the diameter contains 120 parts. Further, the square on the side of the regular pentagon is equal to the sum of the squares on the sides of the regular hexagon and of the regular decagon, all being inscribed in the same circle (Eucl. XIII. 10); the chord of 72° can therefore be calculated, and contains approximately 70° 32’ 3”, In like manner, the square on the chord of 90°, which is the side of the inscribed square, is twice the square on the radius ; and the square on the chord of 120707 the side of the equilateral triangle, 1s three times the square on the radius; these chords can thus be calculated approximately. Further, from the values of all these chords we can calculate at once the chords of the arcs which are their supplements.

This being laid down, we now proceed to give Ptolemy's exposition of the mode of obtaining his table of chords, which is a piece of geometry of great elegance, and is indeed, as De Morgan says, "one of the most beautiful in the Greek writers."

He takes as basis and sets forth as a lemma the well-known theorem, which is called after him, concerning a quadrilateral in- scribed in a circle: The rectangle under the diagonals is equal to the sum of the rectangles under the opposite sides. By means of this theorem the chord of the sum or of the difference of two arcs whose chords are given can be easily found, for we have only to dyaw a diameter from the common vertex of the two arcs the chord of whose sum or difference is required, and complete the quadri-lateral ; in one case a diagonal, in the other one of the sides is a diameter of the circle. The relations thus obtained are equivalent to the fundamental formule of our trigonometry —

sin (A+ B)=sin A cos B+cos A sin B, sin (A—B)=sin A cos B—cos A sin B, which can therefore be established in this simple way.

Ptolemy then gives a geometrical construction for finding the chord of half an are from the chord of the arc itself. By means of the foregoing theorems, since we know the chords of 72° and of 60°, we can find the chord of 12°; we can then find the chords of 6°, 3°, 14°, and three-fourths of 1°, and lastly, the chords of 44°, 74°, 9°, 104°, &c.,—all those ares, namely, as Ptolemy says, which being doubled are divisible by 3. Performing the calculations, he finds that the chord of 14° contains approximately 1" 34' 55", and the chord of three-fourths of 1° contains 0? 47' 8". A table of chords of ares increasing by 14° can thus be formed ; but this is not suffi-cient for Ptolemy's purpose, which was to frame a table of chords increasing by half a degree. This could be effected if he knew the chord of one-half of 1°; but, since this chord cannot be found geometrically from the chord of 14°, inasmuch as that would come to the triscction of an angle, he proceeds to seek in the first place the chord of 1°, which he finds approximately by means of alemma of great elegance, due probably to Apollonius. It is as follows: If two unequal chords be inscribed in a circle, the greater will be to the less in a less ratio than the arc described on the greater will be to the are described on the less. Having proved this theorem,

he proceeds to employ it in order to find approximately the chord of 1°, which he does in the following manner—

chord 60’ | 60 . 4 a

ame eo “chord 1 <3 chord 45’ ; again—

chord 90! _ 20

chord 60’ ~ 60’ For brevity we use modern notation. It has been shown that the chord of 45’ is OP 47’ 8” q.p., and the chord of 90’ is 1? 34’ 15” q.p. ; hence it follows that approximately

chord 1° <1» 2’ 50” 40” and > 1» 2’ 50”.

Since these values agree as far as the seconds, Ptolemy takes 1° 2’ 50"

be ae ”. chord Tee chord 90’.

as the approximate value of the chord of 1°. being thus known, he finds the chord of one-half of a degree, the approximate value of which is 0° 31’ 25”, and he is at once ina position to complete his table of chords for ares increasing by half a degree. Ptolemy then gives his table of chords, which is arranged in three columns ; in the first he has entered the arcs, increasing by half-degrees, from 0° to 180°; in the second he gives the values of the chords of these arcs in parts of which the diameter contains 120, the subdivisions being sexagesimal ; and in the third he has inserted the thirtieth parts of the differences of these chords for each half-degrec, in order that the chords of the intermediate arcs, which do not occur in the table, may be calculated, it being assumed that the increment of the chords of arcs within the table for each interval of 30’ is proportional to the increment of the arc.?

use of astronomers. applicable to astronomy, it is not surprising that its development was prior to that of plane trigonometry. of the eleventh chapter of the Almagest, whilst the solution of plane triangles is not treated separately in that work.

on a few simple and useful lemmas. known theorem of plane geometry concerning the segments of the sides of a triangle made by a transversal : The segments of any side are in a ratio compounded of the ratios of the segments of the other two sides. inscribed quadrilateral, was called after Ptolemy—naturally, indeed,

The chord of 1°

Trigonometry, we have seen, was created by Hipparchus for the Now, since spherical trigonometry is directly

It is the subject-matter

To resolve a plane triangle the Greeks supposed it to be inscribed

in a circle ; they must therefore have known the theorem—which is the basis of this branch of trigonometry—The sides of a triangle are proportional to the chords of the double arcs which measure the angles opposite to those sides. triangle this theorem, together with Eucl. I. 32 and 47, gives the complete solution. angled triangles by_drawing the perpendicular from a vertex on the opposite side. Halma) Ptolemy solves a triangle in which the three sides are given by finding the segments of a side made by the perpendicular on it from the opposite vertex. eleventh chapter of the first book of the Almagest contains inci- dentally some theorems and problems in plane trigonometry. The problems which are inet with correspond to the following: Divide a given are into two parts so that the chords of the doubles of those arcs shall have a given ratio; the same problem for external sec- tion. Lastly, it may be mentioned that Ptolemy (Alm., vi. 7; vol. 1.

ee, eee" p. 421, ed. Halma) takes 3° 8' 30", 22, 3 +45 +3600 =? 1416, as

the value of the ratio of the circumference to the diameter of a circle, and adds that, as had becn shown by Archimedes, it lies between 34 and 37%.

In the case of a right-angled Other triangles were resolved into right-

In one place (dlm., vi. c. 7; vol. i. p. 422, ed.

It should be noticed also that the

The foundation of spherical trigonometry is laid in chapter x1. The starting-point is the well-

This theorem, as well as that concerning the

since no reference to its source occurs in the Almagest. This error was corrected by Mersenne, who showed that it was known to Menelaus, an astronomer and geometer who lived in the reign of the emperor Trajan, The theorem now bears the name of Menelaus, though most probably it came down from Hipparchus ; Chasles, indeed, thinks that Hipparchus deduced the property of the spheri- cal triangle froin that of the plane triangle, but throws the origin of the latter further back and attributes it to Euclid, suggesting that it was given in his Portsms.? Carnot made this theorem the basis of his theory of transversals in his essay on that subject. It should be noticed that the theorem is not given in the Almagest in the general manner stated above ; Ptolemy considers two cases only of the theorem, and Theon, in his commentary on the Almagest, has added two more cases. 'The proofs, however, are general. Ptolemy then lays down two lemmas : If the chord of an arc of a circle be cut in any ratio and a diameter be drawn through the point of section, the diameter will cut the arc into two parts the chords of whose doubles are in the same ratio as the segments of the chord ; and a similar theorem in the case when the chord is cut externally in any ratio. By means of these two lemmas Ptolemy deduces in an ingenious manner—easy to follow, but difficult to discover-—from the theorem of Menelaus for a plane triangle the corresponding theorem for a spherical triangle: If the sides of a spherical triangle be cut by an arc of a great circle, the chords of the doubles of the segments of any one side will be to each other in a ratio compounded of the ratios of the chords of the doubles of the segments of the other two sides. Here, too, the theorem is not stated generally ; two cases only are considered, corresponding to the two cases given i plano. Theon has added two cases. The proofs are general. By means of this theorem four of Napier's for- mule for the solution of right-angled spherical triangles can be easily

1 Ideler has examined the degree of accuracy of the numbers in these tables and finds that they are correct to five places of decimals.

2 On the theorem of Menelaus and the rule of six quantities, see Chasles, uaa a istorique sur VOrigine et Développement des Méthodes en Géomeétrie, note vi. p. 291.

established. Ptolemy does not give them, but in each case when required applies the theorem of Menelaus for spheries directly. This greatly increases the length of his demonstrations, which the modern reader finds still more ecumbrous, inasmuch as in each case it was necessary to express the relation in terms of chords—the equivalents of sines—ouly, cosines and tangents being of later invention.

Such, then, was the trigonometry of the Greeks. Mathe- matics, indeed, has ever been, as it were, the handmaid of astronomy, and many important methods of the former arose from the needs of the latter. Moreover, by the found- ation of trigonometry, astronomy attained its final general constitution, in which calculations took the place of dia- grams, as these latter had been at an earlier period sub- stituted for mechanical apparatus in solving the ordinary problems. Further, we find in the application of trigon- ometry to astronomy frequent examples and even a sys- tematic use of the method of approximations,—the basis, in fact, of all application of mathematics to practical questions. There was a disinclination on the part of the Greek geometer to be satisfied with a mere approximation, were it ever so close; and the unscientific agrimensor shirked the labour involved in acquiring the knowledge which was indispensable for learning trigonometrical cal- culations. Thus the development of the calculus of approximations fell to the lot of the astronomer, who was both scientific and practical.?

We now proceed to notice briefly the contents of the Almagest. It is divided into thirteen books. The first book, which may be regarded as introductory to the whole work, opens with a short preface, in which Ptolemy, after some observations on the distinc- tion between theory and practice, gives Aristotle's division of the sciences and remarks on the certainty of mathematical knowledge, ""inasmuch as the demonstrations in it proceed

by the incontrovert- ible ways of arithmetic and geometry." He concludes his preface with the statement that he will make use of the discoveries of his predecessors, and relate briefly all that has been sufficiently explained by the ancients, but that he will treat with more care and develop- ment whatever has not been well understood or fully treated. Ptolemy unfortunately does not always bear this in mind, and it is sometimes difficult to distinguish what is due to him from that which he has borrowed from his predecessors.

Ptolemy then, in the first chapter, presupposing some preliminary notions on the part of the reader, announces that he will treat in order—what is the relation of the earth to the heavens, what is the position of the oblique circle (the ecliptic), and the situation of the inhabited parts of the carth ; that he will point out the differences of climates ; that he will then pass on to the consideration of the motion of the sun and moon, without which one cannot have a just theory of the stars ; lastly, that he will consider the sphere of the fixed stars and then the theory of the five stars called " planets." All these things—i.c., the phenomena of the heavenly bodies—he says he will endeavour to explain in taking for principle that which is evident, rcal, and certain, in resting everywhere on the surest observations and applying geometrical methods. He then enters on a summary exposition of the general principles on which his Syntaxis is bascd, and adduces arguments to show that the heaven is of a spherical form and that it moves after the manner of a sphere, that the earth also is of a form which is sensibly spherical, that the earth is in the centre of the heavens, that it is but a point im comparison with the distances of the stars, and that it has not any motion of translation. With respect to the revolution of the carth round its axis, which he says some have held, Ptolemy, while admitting that this supposition renders the explanation of the phenomena of the heavens much more simple, yet regards it as altogether ridiculous. Lastly, he lays down that there are two principal and different motions in the heavyens—one by which all the stars are carried from east to west uniformly about the poles of the equator; the other, which is peculiar to some of the stars, is in 4 contrary direction to the former motion and takes place round different poles. These preliminary notions, which are all older than Ptolemy, form the subjects of the second and following chapters. He next proceeds to the construction of his table of chords, of which we have given an account, and

which is indispensable to practical astronomy. The employment of this table presupposes the evaluation of the obliquity of the ecliptic, the knowledge of which is indeed the foundation of all astronomical science. Ptolemy in the next chapter indicates two means of determining this angle by observation, describes the instruments he employed for that purpose, and finds the same value which had already been found

; Comte, Systéme de Politique Positive, tii, 324. Cantor, Vorlesungen tiber Geschichte der Mathematik, p. 356.

by Eratosthenes and used by Hipparchus. This 'is followed by spherical geometry and trigonometry enough for the determination of the connexion betwecn the sun's right ascension, declination, and longitude, and for the formation of a table of declinations to each degree of longitude. Delambre says he found both this and the table of chords very exact." 3

In book ii., after some remarks on the situation of the habitable parts of the earth, Ptolemy proceeds to make deductions from the principles established in the preceding book, which he does by means of the theorem of Menelaus. The length of the longest day being given, he shows how to determine the ares of the horizon intercepted between the equator and the ecliptic—the amplitude of the eastern point of the ecliptic at the solstice—for different degrees of obliquity of the sphere ; hence he finds the height of the pole and reeiprocally. From the same data he shows how to find at what places and times the sun becomes vertieal and how to calculate the ratios of gnomons to their equinoctial and solstitial shadows at noon and conversely, pointing out, however, that the latter method is wanting in precision. All these matters he con- siders fully and works out in detail for the parallel of Rhodes. Theon gives us three reasons for the seleetion of that parallel by Ptolemy : the first is that the height of the pole at Rhodes is 36°, a whole number, whereas at Alexandria he believed it to be 30° Dom the second is that Hipparchus had made at Rhodes many observa- tions ; the third is that the climate of Rhodes holds the mean place of the seven climates subsequently described. Delambre suspects a fourth reason, which he thinks is the true one, that Ptolemy had taken his examples from the works of Hipparchus, who observed at Rhodes and had made these calculations for

the place where he lived. In chapter vi. Ptolemy gives an exposition of the most important properties of each parallel, commencing with the equator, whieh he considers as the southern limit of the habitable quarter of the earth. For each parallel or climate, which is determined by the length of the longest day, he gives the latitude, a principal place on the parallel, and the lengths of the shadows of the gnomon at the solstices and equinox. In the next chapter he enters into par- ticulars and inquires what are the arcs of the equator which cross the horizon at the same tine as given arcs of the ecliptic, or, which comes to the same thing, the time which a given are of the ecliptic takes to cross the horizon of a given place. He arrives at a formula for calculating ascensional differences and gives tables of asceusions arranged by 10° of longitude for the different climates from the equator to that where the longest day is seventeen hours. He then shows the use of these tables in the investigation of the length of the day for a given climate, of the manner of reducing temporal 4 to equinoctial hours and vice versa, and of the nonagesimal point and the point of orientation of the ecliptic. In the following chapters of this book he determines the angles formed by the inter- sections of the ecliptic—first with the meridian, then with the horizon, and lastly with the vertical circle—and coneludes by giving tables of the angles and ares formed by the intersection of these circles, for the seven climates, from the parallel of Meroe (thirteen hours) to that of the mouth of the Borysthenes (sixteen hours). These tables, lie adds, should be completed by the situation of the chief towns in all countries according to their latitudes and longi- tudes ; this he promises to do in a separate treatise and has in fact done in his Geography.

Book iii. treats of the motion of the sun and of the length of the year. In order to understand the difficulties of this question Ptolemy says one should read the books of the ancients, and especi- ally those of Hipparchus, whom he praises "as a lover of labour and a lover of truth" (dvdpi piAomdvy re duod Kal dihadnet). He begins by telling us how Hipparchus was led to discover the pre- cession of the equinoxes; he relates the observations which led Hipparchus to his second great discovery, that of the eccentricity of the solar orbit, and gives the hypothesis of the eccentric by which he explained the inequality of the sun's motion. Ptolemy concludes this book by giving a clear exposition of the circum- stances on which the equation of time depends. ll this the reader will find in the article Astronomy (vol. il. p.

750). Ptolemy, moreover, applies Apollonius's hypothesis of the epicycle to explain the inequality of the sun's motion, and shows that it leads to the same results as the hypothesis of the eccentric. He prefers the latter hypothesis as more simple, requiring only one and not two motions, and as equally fit to clear up the difficulties. In the second chapter there are some general remarks to which attention should be directed. We find the principle laid down that for the explanation of phenomena one should adopt the simplest hypothesis that it is possible to establish, provided that it is not contradicted by the observations in any important respect.> This fine principle,

3 De Morgan, in Smith's Dictionary of Greek and Roman Biography, s.v. "Ptolemaxus, Claudius."

4 Katpexal, temporal or variable. These hours varied in length with the seasons; they were used in aneient times and arose from the division of the natural day (from sunrise to sunset) into twelve parts.

5 Alm., ed. Halma, i. 159.

which is of universal application, may, we think—regard being paid to its place in the Almagest—be justly attributed to Hipparehus. It is the first law of the "philosophia prima" of Comte. We find in the same page another principle, or rather practical injunction, that in investigations founded on observations where great delicaey is required we should select those made at considerable intervals of time in order that the errors arising from the imperfection which is inherent in all observations, even in those made with the greatest care, may be lessened by being distributed over a large number of years. In the same chapter we find also the principle laid down that the object of mathematicians ought to be to represent all the celestial phenomena by uniform and circular motions. This prin- ciple is stated by Ptolemy in the manner which is unfortunately too common with him,—that is to say, he does not give the least indication whence he derived it. We know, however, from Sim- plieius, on the authority of Sosigenes,? that Plato

*is said to have proposed the following problem to astronomers : "What regular and determined motions being assumed would fully account for the phenomena of the motions of the planetary bodies?" We know, too, from the same source that Eudemus says in the second book of his History of Astronomy that " Eudoxus of Cnidus was the first of the Greeks to take in hand hypotheses of this kind," ® that he was in fact the first Greek astronomer who proposed a geometrical hypothesis for explaining the periodic motions of the planets—the famous system of concentric spheres. It thus appears that the principle laid down here by Ptolemy can be traced to Eudoxus and Plato ; and it is probable that they derived it from the same source, namely, Archytas and the Pythagoreans. We have indeed the direct testimony of Geminus of Rhodes that the Pythagoreans endeavoured to explain the phenomena of the heavens by uniform and circular motions.**

Books iv., v. arc devoted to the motions of the moon, which are very complicated ; the moon in fact, though the nearest to us of all the heavenly bodies, has always been the one which has given the greatest trouble to astronomers.' Book iv., in whieh Ptolemy follows Hipparchus, treats of the first and principal inequality of the moon, which quite corresponds to the inequality of the sun treated of in the third book. As to the observations which should be employed for the investigation of the motion of the moon, Ptolemy tells us that lunar eclipses should be preferred, inasmuch as they give the moon's place without any error on the score of parallax. The first thing to be determined is the time of the moon's revolution ; Hipparchus, by comparing the observations of the Chaldeans with his own, discovered that the shortest period in which the lunar eclipses return in the same order was 126,007 days and 1 hour. In this period he finds 4267 lunations, 45738 restitutions of anomaly, and 4612 tropical revolutions of the moon less 74° q.p. 3; this quantity (73°) is also wanting to complete the 345 revolutions which the sun makes in the same time with respect to the fixed stars. He concluded from this that the lunar month contains 29 days and 81' 50" 8'" 20" of a day, very nearly, or 29 days 12 hours 44' 3 20'". These results are of the highest import- ance. (See Astronomy.) In order to explain this equality, or the equation of the centre, Ptolemy makes use of the hypothesis of an epicycle, which he prefers to that of the eccentric. The fifth book commences with the description of the astrolabe of Hip- parchus, which Ptolemy made use of in following up the observa- tions of that astronomer,

and by means of which he made his most important discovery, that of the second inequality in the moon's motion, now known by the name of the "cvection." In order to explain this inequality he supposed the moon to move on an epicyele, which was carried by an eccentric whose centre turned about the earth in a direetion contrary to that of the motion of the epicycle. This is the first instance in which we find the two hypotheses of eccentric and epicycle combined. The fifth book treats also of the parallaxes of the sun and moon, and gives a description of an instrument—called later by Theon the "'parallactic rods'"—devised by Ptolemy for observing meridian altitudes with greater accuracy.

The subject of parallaxes is continued in the sixth book of the Almagest, and the method of calculating eclipses is there given. The author says nothing in it which was not known before ltis time.

Books vii., viii. treat of the fixed stars. Ptolemy verified the fixity of their relative positions and confirmed the observations of Hipparchus with regard to their motion in longitude, or the pre- cession of the equinoxes. (See Astronomy.) The seventh book concludes with the catalogue of the stars of the northern hemi- sphere, in which are entered their longitudes, latitudes, and magni-

1 Systeme de Politique Positive, iv. 173.

2 This Sosigenes, as Th. H. Martin has shown, was not the astronomer of that naine who was a contemporary of Julius Cesar, but a Peripatetic philosopher

who lived at the end of the 2d century a.D.

3 Brandis, Schol. in Aristot. edidit Acad. Reg. Borussica (Berlin, 1836), p. 498.

4 Hicaywy) eis Ta Paivdpueva, c. i. in Halma's edition of the works of Ptolemy, vol. iii. (Introduction aux Phénoménes Célestes, traduite du Gree de Geminus," p. 9), Paris, 1819.

5 This las been noticed by Pliny, who says, "' Multiformi hee (luna) ainbage torsit ingenia contemplantium, et proximum ignorari maxime sidus indignan- tium" (N, H., ii. 9).

book commences with what concerns them all in general. planets are much nearer to the earth than the fixed stars and more distant than the moon. then Jupiter and then Mars.

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tudes, arranged according to their constellations ; and the eighth book commences with a similar catalogue of the stars in the con- stellations of the southern hemisphere. the subject of keen controversy amongst modern astronomers. Some, as Flamsteed and Lalande, maintain that it was the same catalogue which Hipparchus had drawn up 265 years before Ptolemy, whereas others, of whom Laplace is'one, think that it is the work of Ptolemy himself. The probability is that in the main the catalogue is really that of Hipparchus altered to suit Ptolemy's own time, but that in making the changes which were necessary a wrong precession was assumed, This is Delambre's opinion ; he says, " Whoever may have been the true author, the catalogue is unique, and does not suit the age when Ptolemy lived ; by sub- tracting 2° 40' from all the longitudes it would suit the age of Hipparchus ; this is all that is certain."® It has been remarked that Ptolemy, living at Alexandria, at which city the altitude of the pole is 5° less than at Rhodes, where Hipparchus observed, could have seen stars which are not visible at Rhodes; none of these stars, however, are in Ptolemy's catalogue. contains, moreover, a description of the milky way and the manner of constructing a celestial globe ; it also treats of the configura- tion of the stars, first with regard to the sun, moon, and planets, and then with regard to the horizon, and likewise of the different aspects of the stars and of their rising, culmination, and setting simultaneously with the sun.

This catalogue has been

The eighth book

The ninth The

The remainder of the work is devoted to the planets.

Saturn is the most distant of all, These three planets are at a greater distance from the earth than the sun.? So far all astronomers are

agreed, This is not the case, he says, with respect to the two remaining planets, Mercury and Venus, which the old astronomers placed between the sun and earth, whereas more recent writers ® have placed them beyond the sun, because they were never seen on the sun.2 He shows that this reasoning is not sound, for they might be nearer to us than the sun and not in the same plane, and

consequently never seen on the sun. He decides in favour of the former opinion, which was indeed that of most mathematicians. The ground of the arrangement of the planets in order of distance

was the relative length of their periodic times; the greater the

circle, the greater, it was thought, would be the time required for its description, Hence we see the origin of the difficulty and the difference of opinion as to the arrangement of the sun, Mercury, and Venus, since the times in which, as seen from the earth, they appear to complete the circuit of the zodiac are nearly the same— a year. Delambre thinks it strange that Ptolemy did not see that these contrary opinions could be reconciled by supposing that the two planets moved in epicycles about the sun; this would be stranger still, he adds, if it is true that this idea, which is older than Ptolemy, since it is referred to by Cicero," had been that of the Egyptians.!? It may be added, as strangest of all, that this doetrine was held by Theon of Smyrna," who was a contemporary of Ptolemy or somewhat senior to him. From this system to that of Tycho Brahe there is, as Delambre observes, only a single step.

We have seen that the problem which presented itself to the astronomers of the Alexandrian epoch was the following: it was required to find such a system of equable circular motions as would represent the inequalities in the apparent motions of the sun, the moon, and the planets. Ptolemy now takes up this question for the planets; he says that "this perfection is of the essence of celestial things, which admit of neither disorder nor inequality,"

that this planetary theory is one of extreme difficulty, and that no one had yet completely succeeded in it. He adds that it was owing to these difficulties that Hipparchus—who loved truth above all things, and who, moreover, had not received from his prede- cessors observations either so numerous or so precise as those that he has left—had succeeded, as far as possible, in representing the motions of the sun and moon by circles, but had not even com- menced the theory of the five planets. He was content, Ptolemy

6 Delambre, Histoire de l Astronomie Ancienne, li. 264.

7 This is true of their mean distances ; but we know that Mars at opposition is nearer to us than the sun.

8 Hratosthenes, for example, as we learn from Theon of Smyrna.

9 Transits of Mercury and Venus over the sun's disk, therefore, had not been observed.

10 This was known to Eudoxus. Sir George Cornewall Lewis (An Historical Survey of the Astronomy of the Ancients, p. 155), confusing the geocentric revolu- tions assigned by Hudoxus to these two planets with the heliocentric revolu- tions in the Copernican system, which are of course quite different, says that " the error with respect to Mercury and Venus is considerable"; this, however, is an error not of Budoxus but of Cornewall Lewis, as Schiaparelli has remarked.

11 "Hune [solem] ut comites consequuntur Veneris alter, alter Mereurii cursus Ms (Somnium Scipionis, De Rep., vi. 17). This hypothesis is alluded to by Pliny, N. H., ii. 17, and is more explicitly stated by Vitruvius, Arch., ix. 4.

12 Macrobius, Commentarius ex Cicerone in Somnium Scipionis, i. 19.

13 Theon (Smyrneus Platonicus), Liber de Astronomia, ed.Th. H. Martin (Paris, 1849), pp. 174, 294, 296. Martin thinks that Theon, the mathematician, four of whose observations are used by Ptolemy (Alm., ii.

176, 193, 194, 195, 196, ed. Halma), is not the same as Theon of Smyrna, on the ground chiefly that the latter was not an observer.

in which the length of the longest day varies from 13} hours to 15} hours,—that is, from the latitude of Syene to that of the middle of the Euxine. This

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work has been printed by Petavius in his Uranologium, Paris, 1630, and by Halma in his edition of the works of Ptolemy, vol. iii., Paris, 1819. (2) 'Crobéces Tay TRavwpever 9 Tov ovpaviwy KiKNwy Kwicets, On the Planetary Hypothesis. This is a summary of a portion of the Almagest, and con- tains a brief statement of the principal hypotheses for the explanation of the motions of the heavenly bodies, It was first published (Gr., Lat.) by Bainbridge, the Savilian professor of astronomy at Oxford, with the Sphere of Proclus and the Kavav Baotdecv, London, 1620, and afterwards by Halma, vol. iv., Paris,

1820. (3) Kavav Baotdedv, A Table of Reigns. This is a chronological table of Assyrian, Persian, Greek, and Roman sovereigns, with the length of their reigns, from Nabonagar to Antoninus Pius. This table (comp. G. Synecellus, Chronogr., ed. Dind., i. 388 sg.) has been printed by Scaliger, Calvisius, Petavius, Bainbridge (as above noted), and by Halma, vol. iii., Paris, 1819. (4) "A pyovt- k@v BiBdia 7. This Treatise on Music was published in Greek and Latin by Wallis at Oxford, 1682. It was afterwards reprinted with Porphyry's com- mentary in the third volume of Wallis's works, Oxford, 1699. (5) Terpd Bi Bros otvrakis, Tetrabiblon or Quadripartitum. This work is astrological, as is also the small collection of aphorisms, called Kaprés or Centiloquiwm, by which it is followed. It is doubtful whether these works are genuine, but the doubt

merely arises from the feeling that they are unworthy of Ptolemy. They were both published in Greek and Latin by Camerarius, Nuremberg, 1535, and by Melanchthon, Basel, 1553. (6) De Analemmate, The original of this work of Ptolemy is lost. It was translated from the Arabic and published by Com- mandine, Rome, 1562. The Analemma is the description of the sphere on a

*plane. We find in it the sections of the different circles, as the diurnal parallels, and everything which can facilitate the intelligence of gnomonics. This de scription is made by perpendiculars let fall on the plane ; whence it has been called by the moderns 'orthographic projection." (7) Planispherium, The Planisphere. The Greek text of this work also is lost, and we have only a Latin translation of it from the Arabic. The '*planisphere " is a projection of the sphere on the equator, the eye being at the pole,—in fact what is now called "stereographie" projection. The best edition of this work is that of . Commandine, Venice, 1558. (8) Optics. This work is known to us only by imperfect manuscripts in Paris and Oxford, which are Latin translations from the Arabic ; some extracts from them have been recently published. The Opties consists of five books, of which the fifth presents most interest : it treats of the refraction of luminous rays in their passage through media of different densities, and also of astronomical refractions, on which subject the theory is more complete than that of any astronomer before the time of Cassini. De Morgan doubts whether this work is genuine on account of the absence of allusion to the Almagest or to the subject of refraction in the Almagest itself; but his chief reason for doubting its authenticity is that the author of the Optics was & poor gcometer. (G. J. A.)*

Geography.

Ptolemy is hardly less celebrated as a geographer than as an astronomer, and his great work on geography exer- cised as great an influence on the progress of that science as did his Almagest on that of astronomy. It became indeed the paramount authority on all geographical ques- tions for a period of many centuries, and was only gradu- ally superseded by the progress of maritime discovery in the 15th and 16th centuries. This exceptional position was due in a great measure to its scientific form, which rendered it very convenient and easy of reference 3 but; apart from this consideration, it was really the first attempt ever made to place the study of geography on a truly scientific basis, The great astronomer Hipparchus had indeed pointed out, three centuries before the time of Ptolemy, that the only way to construct a. really trust- worthy map of the Inhabited World would be by observa- tions of the latitude and longitude of all the principal points on its surface, and laying down a map in accordance with the positions thus determined. But

the materials for such a course of proceeding were almost wholly wanting, and, though Hipparchus made some approach to a correct division of the known world into zones of latitude, or "'climata," as he termed them, trustworthy observations even of this character were in his time very few in number, while the means of determining longitudes could hardly be said to exist. Hence probably it arose that no attempt was made by succeeding geographers to follow up the im- portant suggestion of Hipparchus. Marinus of Tyre, who lived shortly before the time of Ptolemy, and whose work is known to us only through that writer, appears to have been the first to resume the problem thus proposed, and lay down the map of the known world in accordance with the precepts of Hipparchus. His materials for the execu- tion of such a design were indeed miserably inadequate, and he was forced to content himself for the most part with determinations derived not from astronomical obser- vations but from the calculation of distances from itineraries and other rough methods, such as still continue to be em- ployed even by modern geographers where more accurate

continues, to arrange the observations which had been made on them in a methodic order and to show thence that the phenomena did not agree with the hypotheses of mathematicians at that time. He showed that in fact each planet had two inequalities, which are different for each, that the retrogradations are also different, whilst other astronomers admitted only a single inequality and the same retrogradation ; he showed further that their motions cannot be explained by eccentrics nor by epicycles carried along concentrics, but that it was necessary to combine both hypotheses. After these preliminary notions he gives from Hipparchus the periodic motions of the five planets, together with the shortest times of restitutions, in which, moreover, he has made some slight corrections. He then gives tables of the mean motions in longitude and of anomaly of each of the five planets,1 and shows how the motions in longitude of the planets can be represented in a general manner by means of the hypothesis of the eccentric combined with that of the epicycle. He next applies his theory to each planct and concludes the ninth book by the explanation of the various phenomena of the planet Mercury. In the tenth and eleventh books he treats, in like manner, of the various phenomena of the planets Venus, Mars, Jupiter, and Saturn.

Book xii. treats of the stationary and retrograde appearances of each of the planets and of the greatest elongations of Mercury and Venus. The author tells us that some mathematicians, and amongst them Apollonius of Perga, employed the hypothesis of the epicycle toexplain the stations and retrogradations of the planets. Ptolemy goes into this theory, but does uot change in the least the theorems of Apollonius ; he only promises simpler and clearer demonstra- tions of them. Delambre remarks that those of Apollonius must have been very obscure, since, in order to make the demonstrations in the Almagest intelligible, he (Delambre) was obliged to recast them. This statement of Ptolemy is important, as it shows that the mathematical theory of the planetary motions was in a toler- ably forward state long before his time. Finally, book xiii. treats of the motions of the planets in latitude, also of the inclinations of their orbits and of the magnitude of these inclinations.

Those who wish to go into details and learn the mathematical explanation of this celebrated system of "eccentrics" and "epicycles" are referred to the Almagest itself, which can be most conveniently studied in Halma's edition,2 to Delambre's Histoire del' Astronomie Ancienne, the second volume of which is for the most part devoted to the Almagest,3 or to Narrien's History of Astronomy,4 in which the subject is treated with great clearness.

Ptolemy concludes his great work by saying that he has ineluded in it every- thing of practical utility which in his judgment should find a place in a treatise on astronomy at the time it was written, with relation as well to dis-

A.D., and the Arabic translation was revised in the following century by Thabit ibn Korra. The emperor Frederick II. caused the Almagest to be trans- lated from the Arabic into Latin at N aples about 1230. In the 15th century it

graphical history, see Fabricius, Bibliotheca Greea, ed. Harles, vol. v. p. 280, and Halma's preface. An excellent summary of the bibliographical history is

qucrvations of the best meteorologists, as, for example, Meton, Democritus, ae 'igre Hipparchus, &c, Ptolemy, in order to make his Parapegma useful

all the Greeks scattered over the enlightened world of his time, gives the

mapeambre compares these mean motions with those of our modern tables af "- 8 them tolerably correct. By "motion in longitude" must be understood the motion of the centre of the epicycle about the eccentric, and by ee the motion of the star on its epicycle. " 7 this edition the Greek text and the French translation are given in the foycommns ; the latter, however, should not be read without reference to 3 Delambre begins his analysis of the Almagest thus—' L'Astronomie des recs est toute entidre dans la Syntaxe mathématique de Ptolémée."

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See Plate VII., vol. Sa%

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means of determination are not available. The greater part of the treatise of Marinus was occupied with the discussion of these authorities, and it is impossible for us, in the absence of the original work, to determine how far he had succeeded in giving a scientific form to the results of his labours ; but we are told by Ptolemy himself that he considered them, on the whole, so satisfactory that he had made the work of his predecessor the basis of his own in regard to all the countries bordering on the Mediterranean, a term which would comprise to the ancient geographer almost all those regions of which he had really any definite know- ledge. With respect to the more remote regions of the world, Ptolemy availed himself of the information imparted by Marinus, but not without reserve, and has himself ex- plained to us the reasons that induced him in some instances to depart from the conclusions of his predecessor. It is very unjust to term Ptolemy a plagiarist from Marinus, as

has been done by some modern authors, as he himself

acknowledges in the fullest manner his obligations to that writer, from whom he derived the whole mass of his materials, which he undertook to arrange and present to luis readers in a scientific form, It is this form and

ar- rangement that constitute the great merit of Ptolemy's work and that have stamped it with a character wholly distinct from all previous treatises on geography. But at the same time it possesses much interest, as showing the greatly increased knowledge of the more remote por- tions of Asia and Africa which had been acquired by geo- graphers since the time of Strabo and Pliny.

It' will be convenient to consider separately the two different branches of the subject,—(1) the mathematical portion, which constitutes his geographical system, properly so termed; and (2) his contributions to the progress of positive knowledge with respect to the Inhabited World.

1. Mathematical .Geography. —As a great astronomer, Ptolemy was of course infinitely better qualified to comprehend and explain the mathematical conditions of the earth and its relations to the celestial bodies that surround it than any preceding writers on the special subject of geography. But his general views, except on a few points, did not differ from those of his most emincnt precursors Eratosthcnes and Strabo. In common with them, he assumed that the earth was a globe, the surface of which was divided by certain great circles—the cquator and the tropics— parallel to one another, and dividing the earth into five great zones, the relations of which with astronomical phenomena were of course clear to his mind as a matter of theory, though in regard to the regions bordering on the equator, as well as to those ad- joining the polar circle, he could have had no confirmation of his conclusions from actual observation. He adopted also from Hip- parchus the division of the equator and other great circles into 360 parts or "degrees" (as they were subsequently called, though the word does not occur in this sense in Ptolemy), and supposed other circles to be drawn through these, from the equator to the pole, to which he gave the name of "meridians." He thus conceived the whole surface of the earth (as is done by modern geographers) to be covered with a complete network of "parallels of latitude" and "meridians of longitude," terms which he himself was the first ex- tant writer to employ in this technical sense. Within the network thus constructed it was the task of the scientific geographer to place the outline of the world, so far as it was then known by experience and observation.

Unfortunately at the very outset of his attempt to realize this conception he fell into an error which had the effect of vitiating all his subsequent conclusions. Eratosthenes was the first writer who had attempted in a scientific manner to determine the cir- eumference of the carth, and the result at which he arrived, that it amounted to 250,000 stadia or 25,000 geographical milcs, was gencrally adopted by subsequent geographers, including Strabo. Posidonius, however, who wrote about a century after Eratosthenes, had made an independent calculation, by which he rcdueed the eircumferenee of the globe to 180,000 stadia, or less than three- fourths of the result obtained by Eratosthenes, and this computa- tion, on what grounds we know not, was unfortunately adopted by Marinus Tyrius, and from him by Ptolemy. The consequence of this error was of course to make every degree of latitude or longi- tude (measured at the equator) equal to only 500 stadia (50 geo- graphical miles), instead of its true equivalent of 600 stadia. Its effects would indeed have been in some measure neutralized had there cxisted a sufficient number of points of which the position

was determined by actual observation ; but we learn from Ptolemy himself that this was not the case, and that such observations for latitude were very few in number, while the means of determining longitudes were almost wholly wanting.' Hence the positions laid down by him were really, with very few exceptions, the result of computations of distances from itineraries and the statements of travellers, estimates which were liable to much greater error in ancient times than at the present day, from the want of any accurate mode of observing bearings, or portable instruments for the measure- ment of time, while they had no means at all of determining dis- tances at sea, except by the rough estimate of the time employed in sailing from point to point. The use of the log, simple as it appears to us, was unknown to the ancients. But, great as would naturally be the errors resulting from such imperfect means of cal- culation, they were in most cases increased by the permanent error arising from the erroneous system of graduation adopted by Ptolemy in laying them down upon his map. Thus, if he had arrived at the conclusion from itineraries that two places were 5000 stadia from one another, he would place them at a distance of 10° apart, and thus in fact separate them by an interval of 6000 stadia.

Another source of permancnt crror (though one of much less im- portance) which affected all his longitudes arose from the errone- ous assumption of his prime meridian. In this respect also he followed Marinus, who, having arrived at the conclusion that the Fortunate Islands (the Canaries) were situated farther west than any part of the continent of Europe, had taken the meridian through the outermost of. this group as his prime meridian, from whence he calculated all his longitudes eastwards to the Indian Ocean. But, as both Marinus and Ptolemy were very imperfectly acquainted with the position and arrangements of thc islands in question, the line thus assumed was in reality a purely imaginary one, being drawn through the swpposed position of the outer island, which they placed 24° west of the Sacred Promontory (Cape St Vincent), which was regarded by Marinus and Ptolemy, as it had becn by all previous geographers, as the westernmost point of the continent of Europe,—while the real difference betwecn the two is not less than 9°20'. Hence ali Ptolemy's longitudes, reckoned east- wards from this assumed line, were in fact about 7° less than they would have been if really measured from the meridian of Ferro, which continued so long in use among gcographers in modern times. The error in this instance was the more unfortunate as the longitude could not of course be really measured, or even calculated, from this imaginary line, but was in reality calculated in both directions from Alexandria, westwards as well as eastwards (as Ptolemy himself has done in his eighth book) and aftcrwards 7e- versed, so as to suit the supposed method of coimputation.

It must be observed also that the equator was in like manner placed by Ptolemy at a considerable distance from its true geo- graphical position. The place of the equinoctial line on the sur- face of the globe was of course well known to him as a matter of theory, but as no observations could have been made in those remote regions he could only caleulate its place from that of the tropic, which he supposed to pass through Syene. And as he here, as elsewhere, reckoned a degree of latitude as equivaleut to 500 stadia, he inevitably madc the interval between the tropic and the equator too small by one-sixth; and the place of the former on the surface of the earth being fixed by observation he necessarily carried up the supposed place of the equator too high by more than 280 geographical miles. But as he had practically no geographical aequaintance with the equinoctial regions of the earth this error was of little importanee.

With Marinus and Ptolemy, as with all preceding Greek geo- graphers, the most important line on the surface of the globe for all practieal purposes was the parallel of 36° of latitude, which passes through the Straits of Gibraltar at one end of the Mediter- rancan, and through the Island of Rhodes and the Gulf of Issus at the other. It was thus regarded by Diceearchus and almost all his successors as dividing the regions around the inland sea into two portions, and as being continued in theory along the chain of Mount Taurus till it joined the great mountain range north of India; and from thence to the Eastern Ocean it was regarded as constituting the dividing line of the Inhabited World, along which its length must be measured. But it sufficiently shows how inaccurate were the observations and how imperfect the materials at his command, even in regard to the best known portions of the earth, that Ptolemy, following Marinus, describes this parallel as passing through Caralis in Sardinia and Lilybeum in Sicily, the one being really in 39° 12' lat., the other in 87° 50". It is still more strange that he places so important and well known a city as Carthage 1° 20' sowth of the dividing parallel, while it really lies nearly 1° to the north of it.

1 Hipparchus had indeed pointed out long before the mode of de- termining longitudes by observations of eelipses, but the instanee to which he referred of the eelebrated eclipse before the battle of Arbela, whieh was seen also at Carthage, was a mere matter of popular obser- vation, of no scientific value. no other,

Yet Ptolemy seems to have known of ,

Pe? Oo lh MY

The great problem that had attracted the attention and exercised the ingenuity of all geographers from the time of Diczarchus to that of Ptolemy was to determine the length and breadth of the Inhabited World, which they justly regarded as the chief subject of the geograplier's consideration. This question had been very fully diseussed by Matinus, who had arrived at conclusions widely dif- ferent from those of his predecessors. Towards the north indeed there was no great difference of opinion, the latitude of Thule being generally recognized as that of the highest northern land, and this was placed both by Marinus and Ptolemy in 63° lat., not very far beyond the true position of the Shetland Islands, which had come in their time to be

generally identified with the mysterious Thule of Pytheas. The western extremity, as already mentioned, had been in like manner determined by the prime meridian drawn through the supposed position of the Fortunate Islands. But towards the south and east Marinus gave an enormous extension to the con- tinents of Africa and Asia, beyond what had been known to or suspected by the earlier geographers, and, though Ptolemy greatly reduced his calculations, he still retained a very exaggerated esti- mate of their results.

The additions thus made to the estimated dimensions of the known world were indeed in both directions based upon a real exten- sion of knowledge, derived from recent information ; but unfortu- nately the original statemeuts were so perverted by misinterpretation in applying them to the construction of a map as to give results differing widely from the truth. The southern limit of the world as known to Eratosthenes, and even to Strabo (who had in this respect no further knowledge than his predecessor more than two eenturies before), had been fixed by them at the parallel which passed through the eastern extremity of Africa (Cape Guardafui), or the Land of Cinnamon as they termed it, and that of the Sembritz (corresponding to Sennaar) in the interior of the same continent. This parallel, which would correspond nearly to that of 10° of true latitude, they supposed to be situated at a distance of 3400 stadia (340 geographical miles) from that of Meroe (the position of which was accurately known), and 13,400 to the south of Alexandria ; while they conceived it as passing, when prolonged to the eastward, through the island of Taprobane (Ceylon), which was universally recognized as the southernmost land of Asia. Both these geo- graphevs were wholly ignorant of the vast extension of Africa to the south of this line and even of the equator, and conccived it as trending away to the west from the Land of Cinnamon and then to the north-west to the Straits of Gibraltar. Marinus had, how- ever, learned from itinerarics both by land and sea the fact of this great extension, of which he had indeed conceived so exaggerated an idea that even after Ptolemy had reduced it by more than a half it was still materially in excess of the truth. The castern coast of Africa was indeed tolerably well known, being frequented by Greek and Roman traders, as far as a place called Rhapta, opposite to Zanzibar, and this is placed by Ptolemy not far from its true posi- tion in 7° S. lat. But le added to this a bay of great extent as far as a promontory called Prasum

(perhaps Cape Delgado), which he placed in 153° 8. lat. At the same time he assumed the position in about the same parallel of a region called Agisymba, which was Supposed to have been discovered by a Roman general, whose itinerary was employed by Marinus. Taking, therefore, this parallel as the limit of knowledge to the south, while he retained that of Thule to the north, he assigned to the inhabited world a breadth of nearly 80°, instead of less than 60°, which it had occupied on the maps of Eratosthenes and Strabo.

It had been a fixed belief with all the Greek geographers from the earliest attempts at scientific geography not only that the length of the Inhabited World greatly exceeded its breadth, but that it was more than twice as great, —a wholly unfounded assump- tion, but to which their successors seem to have felt themselves bound to conform. Thus Marinus, while giving an undue extension to Africa towards the south, fell into a similar error, but to a far greater degree, in regard to the extension of Asia towards the'east. Here also he really possessed a great advance in knowledge over all his predecessors, the increased trade with China for silk having led to an acquaintance, though of course of a very vague and general kind, with the vast regions in Central Asia that lay to the east of the Pamir range, which had formed the limit of the Asiatic nations previously known to the Greeks. But Marinus had learned that traders proceeding eastward from the Stone Tower—a station at the foot of this range—to Sera, the capital city of the Seres, occupied Seven months on the journey, and from thence he arrived at the Chormous result that the distance between the two points was not less than 36,200 stadia, or 3620 geographical miles. Ptolemy, while he justly points out the absurdity of this conclusion and the errone- ous mode of computation on which it was founded, had uo means of Correcting it by any real authority, and hence reduced it summarily by one half. 'he effect of this was to place Sera, the easternmost point on his map of Asia, at a distance of 454° from the Stone Tower, which again he fixed, on the authority of itineraries cited by Marinus, at 24,000 stadia or 60° of longitude from the Euphrates,

reckoning in both cases a degree of longitude as equivalent to 400

stadia, in accordance with his uniform system of allowing 500 stadia to 1° of latitude. Both distanees were greatly in exeess of the truth, independently of the error arising from this mistaken system of graduation. The distances west of the Euphrates were of course comparatively well known, nor did Ptolemy's calculation of the length of the Mediterranean differ very materially from those of previous Greek geographers, though still greatly exceeding the truth, after allowing for the permanent error of graduation. The cffect of this last cause, it must be remembered, would unfortunately be cumulative, in consequence of the longitudes being computed from a fixed point in the west, instead of being reckoned east and west from Alexandria, which was undoubtedly the mode in which they were really calculated. The result of these combined causes of error was to lead him to assign no less than 180°, or 12 hours, of longitude to the interval between the meridian of the Fortunate Islands and that of Sera, which really amounts to about 130°.

But in thus estimating the length and breadth of the known world Ptolemy attached a very different sense to these terms from that which they had gencrally borne with preceding writers. All former Greek geographers, with the single exception of Hipparchus, had agreed in supposing the Inhabited World to be surrounded on

_all sides by sea, and to form in fact a vast island in the midst of

a eircumfluous ocean. This notion, which was probably derived originally from the Homeric fiction of an ocean stream, and was certainly not based upon direct observation, was nevertheless of course in accordance with the truth, great as was the misconception it involved of the extent and magnitude of the continents included within this assumed boundary. Hence it was unfortunate that Ptolemy should in this respect have gone back to the views of flipparchus, and have assumed that the land extended indefinitely to the north in the case of Europe and Scythia, to the east in that of Asia, and to the south in that of Africa. His boundary-line was in each of these cases an arbitrary limit, beyond which lay the Unknown Land, as he calls it. But in the last case he was not content with giving to Africa an indefinite extension to the south: he assumed tlie existence of a vast prolongation of the land to the east from its southernmost known point, so as to form a

connexion with the south-eastern extremity of Asia, of the extent and position of which he had a wholly erroneous idea.

In this last case Marinus had derived from the voyages of recent navigators in the Indian Seas a knowledge of the fact that there lay in that direction extensive lands which had bcen totally un- known to previous geographers, and Ptolemy had acquired still more extensive information in this quarter. But unfortunately he had formed a totally false conception of the bearings of the coasts thus made known, and consequently of the position of the lands to which they belonged, and, instead of carrying the line of coast northwards from the Golden Chersonese (the Malay Peninsula) to China or the land of the Sine, he brought it down again towards the south after forming a great bay, so that he placed Cattigara— the principal emporium in this part of Asia, and the farthest point known to him—on a supposed line of coast, of unknown extent, but with a direction from nortl to south. The hypothesis that this land was continuous with the most southern part of Africa, so that the two enclosed one vast gulf, though a mere assumption, is stated by him as definitely as if it was based upon positive in- formation ; and it was long received by medieval geographers as an unquestioned fact. This circumstance undoubtedly contributed to perpetuate the error of supposing that Africa could not be cir- cumnavigated, in opposition to the more correct views of Strabo and other earlier geographers. On the other hand, there can be no doubt that the undue extension of Asia towards the east, so as to diminish by 50° of longitude the interval between that continent and the western coasts of Europe, had a material influence in foster- ing the belief of Columbus and others that it was possible to reach the Land of Spices (as the East Indian islands were then called) by direct navigation towards the west.

It is not surprising that Ptolemy should have fallen into con- siderable errors respecting the more distant quarters of the world ; but even in regard to the Mediterranean and its dependencies, as well as the regions that surrounded them, with which he was in a certain sense well acquainted, the imperfection of his geographical knowledge is strikingly apparent. Here he had indeed some well-established data for his guidance, as far as latitudes were con- cerned, That of Massilia had been determined many years before by Pytheas within a few miles of its true position, and the latitude of Rome,

as might be expected, was known with approximate accuracy. Those of Alexandria and Rhodes also were well known, having been the place of observation of distinguished astronomers, and the fortunate accident that the Island of Rhodes lay on the same parallel of latitude with the Straits of Gibraltar at the other end of the sea enabled him to connect the two by drawing the parallel direct from the one to the other. The importance attached to this line (86° N. lat.) by all preceding geographers has been already mentioned. Unfortunately Ptolemy, like his predecessors, supposed its course to lie almost uniformly through the open sea, wholly ignoring the great projection of the African coast towards

the north from Carthage to the neighbourhood of the straits. The erroneous position assigned to the former city has been already adverted to, and, being supposed to rest upon astronomical observa- tion, doubtless determined that of all the north coast of Africa. The result was that he assigned to the width of the Mediterranean from Massilia to the opposite point of the African coast an extent of more than 11° of latitude, while it does not really exceed 64°.

At the same time he was still more at a loss in respect of longi- tudes, for which he had absolutely no trustworthy observations to guide him ; but he nevertheless managed to arrive at a result con- siderably nearer the truth than had been attained by previous geo- graphers, all of whom had greatly exaggerated the length of the Inland Sea. Their calculations, like those of Marinus and Ptolemy, could only be founded on the imperfect estimates of mariners ; but unfortunately Ptolemy, in translating the conclusions thus arrived at into a scientific form, vitiated all his results by his erroneous system of graduation, and, while the calculation of Marinus gave a distance of 24,800 stadia as the length of the Mediterranean from the straits to the Gulf of Issus, this was converted by Ptolemy in preparing his tables to an interval of 62°, or just about 20° beyond the truth. Even after correcting the error due to his erroneous computation of 500 stadia to a degree, there remains an excess of nearly 500 geographical miles, which was doubtless owing to the exaggerated estimates of distances almost always made by navi- gators who had no real means of measuring them.

Another unfortunate error which disfigured the eastern portion of his map of the Mediterranean was the position assigned to By- zantium, which Ptolemy (misled in this instance by the authority of Hipparchus) placed in the same latitude with Massilia (43° 5'), thus carrying it up more than 2° above its true position. This had the inevitable effect of transferring the whole of the Euxine Sea— with the general form and dimensions of which he was fairly well acquainted—too far to the north by the same amount ; but in addi- tion to this he enormously exaggerated the extent of the Palus Meotis (the Sea of Azoff), which he at the same time represented as having its direction from south to north, so that by the com- bined effect of these two errors he carried up its northern extremity (with the mouth of the Tanais and the city of that name) as high as 54° 30', or on the true parallel of the south shore of the Baltic. Yet, while he fell into this strange misconception with regard to the great river which was universally considered by the ancients as the boundary between Europe and Asia, he was the first writer of antiquity who showed a clear conception of the true relations be- tween the Tanais and the Rha or Volga, which he correctly described as flowing into the Caspian Sea. With respect to this last also he was the first geographer after the time of Alexander to return to the. correct view (already found in Herodotus) that it was an inland sea, without any communication with the Northern Ocean.

With regard to the north of Europe his views were still very vague and imperfect. He had indeed considerably more acquaint- ance with the British Islands than any previous geographer, and even showed a tolerably accurate knowledge of some portions of their shores. But his map was, in this instance, disfigured by two unfortunate errors,—the one, that he placed Ireland (which he calls Ivernia) altogether too far to the north, so that its southernmost portion was brought actually to a latitude beyond that of North Wales; the other, which was probably connected with it, that the whole of Scotland is twisted rownd, so as to bring its general exten- sion into a direction from west to east, instead of from south to north, and place the northern extremity of the island on the same parallel with the promontory of Galloway. He appears to have been embarrassed in this part of his map by his having adopted the conclusion of Marinus—based upon what arguments we know not—that Thule was situated in 63°, while at the same timc he regarded it, in conformity with the received view of all earlier

geographers, as the most northern of all known lands. In accord- ance with this same assumption Ptolemy supposed the northern coast of Germany, which he believed to be the southern shore of the Great Ocean, to have a general direction from west to east, while he placed it not very far from the true position of that of the Baltic, of the existence of which as an inland sea he was wholly ignorant, as well as of the vast peninsula of Scandinavia beyond it, and only inserted the name of Scandia as that of an island of inconsiderable dimensions. At the same time he supposed the coast of Sarmatia from the Vistula eastwards to trend away to the north as far as the parallel of Thule ; nor did he conceive this as an actual limit, but believed the Unknown Land to extend indefinitely in this direction, as also to the north of Asiatic Scythia.

The enormous extent assigned by him to the latter region has been already adverted to; but vague and erroneous as were his views concerning it, it is certain that they show a much greater approximation to the truth than those of earlier geographers, who possessed hardly a suspicion of the vast tracts in question, which stretch across Central Asia from the borders of Sarmatia to those of China. Ptolemy was also the first who had anything like a clear idea of the chain to which he gave the name of Imaus, and correctly regarded as having a direction across Scythia from south

to north, so as to divide that great region into two distinct portions which he termed Scythia intra Imaum and Scythia extra Imaum, corresponding in some degree with those recognized in modern inaps as Independent and Chinese Tartary. The Imaus of Ptolemy corresponds clearly to the range known in modern days as the Bolor or Pamir, which has only been fully explored in quite recent times. It was, however, enormously misplaced, being transferred to 140° E. long., or 80° east of Alexandria, the rea] interval between the two being little more than 40°.

It is in respect of the southern shores of Asia that Ptolemy's geography is especially faulty, and his errors are here the more unfortunate as they were associated with greatly increased know- ledge in a general way of the regions in question. For more than a century before his time, indeed, the commercial relations between Alexandria, as the great emporium of the

Roman empire, and India had assumed a far more important character than at any former period, and the natural consequence was a greatly increased geographical knowledge of the Indian peninsula. The little tract called the Periplus of the Erythrxean Sea, about 80 A.D., contains sailing directions for merchants to the western ports of that country, from the mouth of the Indus to the coast of Malabar, and correctly indicates that the coast from Barygaza southwards had a general direction from north to south as far as the extremity of the peninsula (Cape Comorin). We are utterly ignorant of the reasons which induced Marinus, followed in this instance as in so many others by Ptolemy, to depart from this correct view, ard, while giving to the coast of India, from the mouths of the Indus to those of the Ganges, an undue extension in longitude, to curtail its extension towards the south to such an amount as to place Cape Cory (the southernmost point of the peninsula) only 4° of latitude south of Barygaza, the real intervals being more than 800 geo- graphical miles, or, according to Ptolemy's system of graduation, 16° of latitude! This enormous error, which has the effect of dis- torting the whole appearance of the south coast of Asia, is associated with another equally extraordinary, but of an opposite tendency, in regard to the neighbouring island of Taprobane or Ceylon, the dimensions of which had been exaggerated by most of the earlier Greek geographers; but to such an extent was this carried by Ptolemy as to extend it through not less than 15° of latitude and 12° of longitude, so as to make it about fourteen times as large as the reality, and bring down its southern extremity more than 2° to the south of the equator.

We have much less reason to be surprised at finding similar distortions in respect to the regions beyond the Ganges, concern- ing which he is our only ancient authority. During the interval which elapsed between the date of the Periplus and that of Marinus it is certain that some adventurous Greek mariners had not only crossed the great Gangetic Gulf and visited the land on the opposite side, to which they gave the name of the Golden Chersonese, but they had pushed their explorations considerably farther to the east, as far as Cattigara. It was not to be expected that these commercial ventures should have brought back any accurate geographical information, and accordingly we find the con- ception entertained by Ptolemy of these newly discovered regions to be very different from the reality. Not only had the distances, as was usually the case with ancient

navigators in remote quarters, been greatly exaggerated, but the want of accurate observations of bearings was peculiarly unfortunate in a case where the real features of the coast and the adjoining islands were so intricate and exceptional. A glance at the map appended to the article Mar (vol. xv. Plate VII.) will at once show the entire discrepancy between the configuration of this part of Asia as conceived by Ptolemy and its true formation. Yet with the materials at his command we can hardly wonder at his not having arrived at a nearer approximation to the truth. The most Tatfertuimaee error was his idea that after passing the Great Gulf, which lay beyond the Golden Chersonese, the coast trended away to the south, instead of towards the north, and he thus placed Cattigara (which was probably one of the ports in the south of China) not less than 84° south of the equator. It is probable that in this instance he was misled by his own theoretical conclusions, and carried this remotest part of the Asiatic continent so far to the south with the view of connecting it with his assumed eastward pro- longation of that of Africa.

Notwithstanding this last theoretical assumption Ptolemy's map of Africa presents a marked improvement upon those of Erato- sthenes and Strabo. But his knowledge of the west coast, which he conceived as having its direction nearly on a meridional line from north to south, was very imperfect, and his latitudes utterly erroneous. Even in regard to the Fortunate Islands, the position of which was so important to his system in connexion with his prime meridian, he was entirely misinformed as to their character and arrangement, and extended the group through a space of more than 5° of latitude, so as to bring down the most southerly of them to the real parallel of the Cape de Verd Islands.

In regard to the mathematical construction, or, to use the modern phrase, the projection of his maps, not only was Ptolemy

greatly in advance of all his predecessors, but his theoretical skill was altogether beyond the nature of the materials to which he applied it. The

methods by which he obviated the difficnlty of transferring the delineation of different countries from the spherical

surface of the globe to the plane surface of an ordinary map differed °

indeed but little from those in use at the present day, and the errors arising from this cause (apart from those produced by his fundamental error of graduation) were really of little consequence compared with the-defective character of his information and the want of anything approaching to a survey of the countries deline- ated. He himself was well aware of his deficiencies in this respect, and, while giving full directions for the scientific construction of a general map, he contents himself for the special maps of different countries with the simple method employed by Marinus of drawing the parallels of latitude and meridians of longitude as straight lines, assuming in each case the proportion between the two, as it really stood with respect to some one parallel towards the middle of the map, and neglecting the inclination of the meridians to one another. Such a course, as he himself repeatedly affirms, will not make any material difference within the limits of each special map.

Ptolemy's geographical work was devoted almost exclusively to the mathematical branch of his subject, and its peculiar arrange- ment, in which his results are presented in a tabular form, instead of being at once embodied in a map, was undoubtedly designed to enable the geographical student to construct his maps for himself, instead of depending upon those constructed ready to his hand. This purpose it has abundantly served, and there is little doubt that we owe to the peculiar form thus given to his results their transmission in a comparatively perfect condition to the present day. Unfortunately the specious appearance of the results thus presented to us has led to a very erroneous estimate of their accu- racy, and it has been too often supposed that what was stated in so scientific a form must necessarily be based upon scientific observa- tions. Though Ptolemy himself has distinctly pointed out in his first book the defective nature of his materials and the true char- acter of the data furnished by his tables, few readers studied this portion of his work, and his statements were generally received with the same undoubting faith as was justly attached to his astronomical observations. It is only in quite recent times that his conclusions have been

estimated at their just value, and the apparently scientific character of his work shown to be in most cases a specious edifice resting upon no adequate foundations.

There can be no doubt that the work of Ptolemy was from the time of its regularly referred to in the eighth book. But how far those which are now extant represent the original series is a disputed point. In two of the most ancient MSS. it is expressly stated that the iuaps which accompany them are the work of one Agathodemon of Alexandria, who "drew them according to the eight books of Claudius Ptolemy." This expression might equally apply to the work of a contemporary draughtsman under the eyes of Ptolemy himself, or to that of 'a skilful geographer at a later period, and nothing is known from any other source concerning this Agatho- demon. The attempt to identify him with a grammarian of the same name who lived in the 5th century is wholly without founda- tion. But it appears, on the whole, most probable that the maps appended to the MSS. still extant have been transmitted by unin- terrupted tradition from the time of Ptolemy.

2. Progress of Geographical Knowledge.—The above examination of the methods pursued by Ptolemy in framing his general map of the world, or according to the phrase universally employed by the ancients, the Inhabited World (4 otkouyérn), has already drawn attention to the principal extensions of geographical knowledge since the time of Strabo.

While anything like an accurate acquaintance was still confined to the limits of the Roman empire and the regions that immediately adjoined it, with the addition of the portions of Asia that had been long known to the Greeks, the geographical horizon had been greatly widened towards the east by commercial enterprise, and towards the south by the same cause, combined with expeditions of a military character, but which would appear to have been dictated by a spirit of discovery. Two expeditions of this kind had been carried out by Roman generals before the time of Marinus, which, starting from Fezzan, had penetrated the heart of the African continent due south as far as a tract called Agisymba, " which Was inhabited by Ethiopians and swarmed with' rhinoccroses." These statements point clearly to the expeditions having traversed the great desert and arrived at the Soudan or Negroland. But the actual position of Agisymba cannot be

determined except by mere conjecture. The absurdly exaggerated view taken by Marinus has been already noticed ; but, even after his estimate had been reduced by Ptolemy by more than one-half, the position assigned by that author to Agisymba was doubtless far in excess towards the south. But, while this name was the only result that we know to have been derived from these memorable expeditions, Ptolemy found himself In possession of a considerable amount of information con- cerning the interior of northern Africa (from whence derived we

first publication accompanied with maps, which are:

know not), to which nothing similar is found in any earlier writer. Unfortunately this new information was of so crude and vague a character, and is presented to us in so embarrassing a form, as to perplex rather than assist the geographical student, and the state- ments of Ptolemy concerning the rivers Gir and Nigir, and the lakes and mountains with which they were connected, have exer- cised the ingenuity and baffled the sagacity of successive generations of geographers in modern times to interpret or explain them. It may safely be said that they present no resemblance to the real features of the country as known to us by modern explorations, and cannot be reconciled with them except by the most arbitrary conjectures,

It is otherwise in the case of the Nile. To discover the source of that river had been long an object of curiosity both among the Greeks and Romans, and an expedition sent out for that purpose by the emperor Nero had undoubtedly penetrated as far as the marshes of the White Nile ; but we are wholly ignorant of the sources from whence Ptolemy derived his information. But his statement that the mighty river derived its waters from the confluence of two streams, which took their rise in two lakes a little to the south of the equator, was undoubtedly a nearer approach to the truth than any of the theories concocted in modern times before the discovery in our own days of the two great lakes now known as the Victoria and Albert Nyanza. He at the same time notices the other arm of the river (the Blue Nile) under the name of the Astapus, which he correctly describes as rising in another lake. In connexion with this subject he introduces a range of mountains running from east to west, which he calls the Mountains of the

Moon, and which have proved a sad stumbling-block to geographers in modern times, but may now be safely affirmed to represent the real fact of the exist- ence of snow-covered mountains (Kilimanjaro and Kenia) in these equatorial regions,

Much the same remarks apply to Ptolemy's geography of Asia as to that of Africa. In this case also he had obtained, as we have already seen, a vague knowledge of extensive regions, wholly un- known to the earlier geographers, and resting to a certain extent on authentic information, though much exaggerated and misunder- stood. But, while these informants had really brought home some definite statements concerning Serica or the Land of Silk, and its capital of Sera, there lay a vast region towards the north of the line of route leading to this far eastern land (supposed by Ptolemy to be nearly coincident with the parallel of 40°) of which appa- rently he knew nothing, but which he vaguely assumed to extend indefinitely northwards as far as the limits of the Unknown Land. The Jaxartes, which ever since the time of Alexander had been the boundary of Greek geography in this direction, still con- tinued in that of Ptolemy to be the northern limit of all that was really known of Central Asia. Beyond that he places a mass of names of tribes, to which he could assign no definite locality, and mountain ranges which he could only place at haphazard. The character of his information concerning the south-east of Asia has been already adverted to. But, strangely as he misplaced Catti- gara and the metropolis of Sinz connected with it, there can be no doubt that we recognize in this name (variously written Thine and Sine) the now familiar name of China; and it is important to observe that he places the land of the Sine immediately south of that of the Seres, showing that he was aware of the connexion be- tween the two, though the one was known only by land explora- tions and the other by maritime voyages,

In regard to the better known regions of the world, and especially those bordering on the Mediterranean, Ptolemy according to his own account followed for the most part the guidance of Marinus. The latter seems to have relied to a great extent on the work of Timosthenes (who flourished more than two centuries before) in respect to the coasts and maritime distances, Ptolemy, however, introduced many changes, some of which he has pointed out to us, though there are doubtless many others which we

have no means of detecting. For the interior of the different countries the Roman roads and itineraries must have furnished him with a mass of valuable materials which had not been available to earlier geo- graphers. But neither Marinus nor Ptolemy seems to have taken advantage of this last resource to the extent that we should have expected, and the tables of the Alexandrian geographer abound with mistakes—even in countries so well known as Gaul and Spain— which might easily have been obviated by a more judicious use of such Roman authorities.

Great as are undoubtedly the merits of Ptolemy's geographical work, it cannot be regarded as having any claim to be a complete or satisfactory treatise upon this vast subject. It was the work of an astronomer rather than a geographer, in the highest sense of the term. Not only did its plan exclude all description of the countries with which it dealt, their climate, natural productions, inhabitants, and peculiar features, all of which are included in the domain of the modern geographer, but even its physical geography strictly so called.is treated in the most irregular and perfunctory manner. While Strabo was fully alive to the importance of the great rivers and mountain chains which (to use his own expressive

phrase) "geographize" a country, Ptolemy deals with this part of his subject in so careless a manner as to be often worse than useless. Even in the case of a country so well known as Gaul the few notices that he gives of the great rivers that play so important a part in its geography are disfigured by some astounding errors; while he does not notice any of the great tributaries of the Rhine, though mentioning an obscure streamlet, otherwise unknown, because it

happened to be the boundary between two Roman provinces.

The revival of the study of Ptolemy's work after the Middle Ages and the influence it exercised upon the progress of geography have been described in the article Map (vol. xv. p. 520). His Geographia was printed for the first time in a Latin translation, accompanied with maps, in 1478, and numerous other editions followed in the latter part of the 15th and earlier half of the 16th century, but the Greek text did not make its appearance till 1533, when

it was published at Basel in 4to, edited by the celebrated Erasmus. All these early editions, however, swarm with textual errors, and are wholly worthless for critical purposes. The same may be said of the edition of Bertius (Gr. and Lat., Leyden, 1618, typ. Elzevir), which was long the standard library edition of the work. lt contains a new set of maps drawn by Mercator, as well as a fresh series (not intended to illustrate Ptolemy) by Ortelius, the Roman ltiner- aries, including the Tabula Peutingeriana, and much othcr miscellaneous matter. The first attempt at a really critical edition was made by Wilberg and Grashof (4to, Essen, 1842), but this unfortunately was never completed. The edition of Nobbe (8 vols. 18mo, Leipsic, 1843) presents the best Greek text of the whole work as yet available and has a useful index. But by far the best edition, so far as completed, is that published in Didot's Bibliotheca Classicorum Grecorum (Paris, 1883), edited by Dr C. Miiller, with a Latin trans- lation and a copious commentary, geographical as well as critical. The first part, which is all that has yet appeared, coutains only the first three books, without the Prolegomena, which will be anxiously expected by all students of Ptolemy. (E. H.

PUBLIC HEALTH. State medicine as an organized department of administration is entirely of modern growth. By the common law of England the only remedy for any act or omission dangerous to health was an action for damages or an indictment for nuisance. (See NUISANCE.) At the same time the jurisdiction of the commissioners of sewers acted to a certain extent as a preventive means. Commissions of sewers were granted by the crown, at first in virtue of the general prerogative, afterwards under the provisions of numerous statutes, the earliest dating from 1427 (6 Hen. VI. c. 5). The powers of the com- missioners included the removal of obstructions in rivers, the making of fosses and drains, &c. Their jurisdiction, where still existing, is expressly preserved in the modern Public Health Acts. The indictment for nuisance still lies for many offences which are now punishable in a summary manner under the powers of recent legislation. But for a long time it was the only, not as nowa concurrent, remedy. Its obvious defect is that proceedings can only be taken after the mischief has been done. Old examples of nuisances dangerous to health and punishable at common law are the keeping of swine in a town, the dividing of a house in a town so that by reason of overcrowding it would be more dangerous in

time of sickness or plague, and the carrying on of offensive trades, such as the melting of tallow. The court leet seems to have had some jurisdic- tion in sanitary matters, confined to the prevention of nuisances and the determination of the quality of provi- sions within its local limits. At a comparatively early date statutes were passed dealing with matters for which the common law had provided too cuntbrous a remedy The attention of parliament, though but to a slight extent, was directed to the health of London as early as the Statute of the City of London in 1285 (18 Edw. I. st. 5). The earliest legislative enactment affecting the public health generally appears to be 12 Ric. I. c. 13, 1388, forbid- ding the deposit of offensive matter in rivers and other waters, as well in the city of London as in other cities. Acts of a similar character were from time to time passed to meet particular offences, such as 4 and 5 Hen. VII. c. 8, by which no butcher was to slaughter cattle in London or other walled towns. The plague called forth the Act of 1 Jac. I. c. 31, which made it a capital offence for an infected person to go abroad after bemg commanded by the proper authority to keep his house. The Act for the rebuilding of London after the great fire, 19 Car. II. c. 3, contained various provisions as to the height of houses, breadth of streets, construction of sewers, and pro- hibition of noisome trades. In 1832 the fear of cholera

led to 2 Will. IV. c. 10, empowering the privy council to take certain preventive measures against the spread of the disease. Numerous local Acts gave the authorities of the more important towns power over the public health. To this day London is governed by separate legislation. 'The Towns Improvement Act, 1847, contained provisions of a sanitary kind for incorporation in local Acts. But it was not until as recently as 1848 that a general Public Health Act, embracing the whole of England (except the metro- polis), was passed. The Public Health Act, 1848, created a general board of health as the supreme authority in sanitary matters. The Local Government Act, 1858, amended the Act of 1848, chiefly in the direction of greater local sanitary control. By an Act immediately preceding the Act of 1858 the general board of health was superseded partly by the home office, partly by the privy council, The Local Government Board, the present central authority, was created in 1871 by 34 and 35 Vict. ce. 70. The president of the Local Government Board is usually a member of the cabinet. Numerous other Acts dealing with public health were passed from

1849 to 1874. Finally in 1875 the existing law was digested into the Public Health Act, 1875 (38 and 39 Vict. c. 55).!

The tendency of sanitary legislation has been 'to place local sani- tary regulations in the hands of the local authorities, subject toa general superintendence by a Government departinent. The Act of 1875, which registers the results of this tendency, is a con- solidating not an amending Act, and did not materially alter the law. It is impossible in this place to do more than give a short notice of its comprehensive provisions. For the purposes of the Act England, except the metropolis, is divided into urban and rural sanitary districts, subject respectively to the jurisdiction of urban and rural sanitary authorities. The urban authority is either the corporation of a borough, improvement commissioners, or a local board, according to circumstancecs. QUARANTINE.) The jurisdiction ofa local authority is both preventive and remedial. The matters falling under this jurisdiction include (1) sewers, with certain exceptions, among which come sewers under the authority of commissioners of sewers, (2) scavenging and cleansing streets, (3) water-supply, (4) cellar-dwellings and lodging-houses, (5) nuisances," (6) offensive

1 For the history of sanitary legislation in England, see the /teport of the Royal Sanitary Comiission, 1869; M. D. Chalmers, Local Government, ch. vii.; Stephen, Commentaries, vol. iii. bk. iv. pt. iii. ch. ix. ; G. A. R. Fitzgerald, The Public Health Act, 1875, Introd.

2 The list of nuisances which may be dealt with summarily under the Act is as follows :—"(1) any premises in such a state as to bea nuisance or injurious to health; (2) any pool, ditch, gutter, water- course, privy, urinal, cesspool, drain, or ashpit so foul or in such a state as to be a nuisance or injurious to health ; (8) any animal so kept as to be a nuisance or injurious to health; (4) any accumulation or deposit which is a nuisance or injurious to health; (5) any house or part of a honse so overcrowded as to be dangerous or injurious to the health of the inmates, whether or not members of the same family ; (6) any factory, workshop, or bakeshop (not already under the opera- tion of any general Act for the regulation of factories or bakehouses) not kept in a cleanly state, or not ventilated in such a manner as to render harmless as far as practicable any gases,

vapours, dust, or other impurities generated in the course of the work carried on therein, that are a nuisance or injurious to health, or so overcrowded while work is carried on as to be dangerous or injurious to the health of those employed therein ; (7) any fireplace or furnace which does not, as far as practicable, consume the smoke arising from the combustibles used therein, and which is used for working engines by steam, or in any mill, factory, dyehouse, brewery, bakehouse, or gaswork, or in any manufacturing or trade process whatsoever ; (8) any chimney (not

being the chimney of a private dwelling-house) sending forth black

smoke in such qnantity as to be a nuisance." In relation to these statutory nuisances it is provided that no penalty is to be inflicted in respect of any accumulation or deposit if it is necessary for business purposes and if effectual means have been taken for preventing injury therefrom to the public health, or in respect of a nnisance from uncon-

enn street

trades, (7) unsound meat, (8) infections diseases and hospitals, (9) prevention of epidemic diseases, (10) mortuaries and (by the Public Health Act, 1879) cemeteries, (11) highways, (12) streets, (18) buildings, (14) lighting, (15) publie pleasure-grounds, (16) markets and slaughter-houses, (17) licensing of hackney carriages, horses, and boats. It is to be noticed that jurisdiction in some of these cases is confined to an urban authority. Contracts made by an urban authority, whereof the value or amount exceeds £50, must be in writing, and sealed with the common seal of the authority. Where the contract is of the value or amount of £100 or upwards tenders for its execution must be invited. A local authority has power, subject to the approval of the Local Government Board, to

+ make bye-laws and impose penalties for their breach. The authority

must appoint a medical officer and an inspector of nuisances ; if an urban authority, it must in addition appoint a surveyor, elerk, and treasurer. Officers may not contract with a local authority. An urban authority has

power tq levy a general district rate, a private improvement rate (an additional rate levied in return for some special advantage beyond that obtained by the inhabitants in general), and (in certain cases) a highway rate. The expenses of a rural authority are either general or special, the latter being chiefly the expenscs arising from sewerage and water-supply. General expenses are defrayed out of a common fund raised out of the poor rate. Special expenses are a charge upon the contributory places benefited. A local authority may, with the sanction of the Local Government Board, raise loans for the purposes of the Act. The loans are charged upon the general district rate. Legal procecd- ings under the Act are generally summary. Where proceedings are by action, one month's notice of action must be given where the cause of action is anything done, or intended to be done, or omitted to be done under the provisions of the Act. The action must be brought within six months after the accruing of the cause of action. The local authority and its officers are protected from personal liability for matters done in pursuance of the Act. An appeal from a court of summary jurisdiction lies to quarter sessions. In cases where the local authority decides a question as to liability to expenses, an appeal lies to the Local Government Board. The Local Government Board has power to alter areas and unite dis- tricts, to direct inquiries in relation to any matters concerning the public health in any place, to make provisional orders, and to enforce performance of duty by a defaulting local authority.

In addition to the Public Health Act, 1875, there are various Acts incorporated with that Act under the name of the "Sanitary Acts," dealing with similar subjects. These are the Bakehouse Regulation Act (1863), the Artisans and Labourers Dwellings Act (1868), the Baths and Washhouses Acts, the Labouring Classes Lodging- House Acts (1851, 1866, 1867). Since 1875 numerous Acts amending and extending the Public Health Act have been passed, dealing with (among other matters) river- pollution, water-supply, hospitals for infectious diseases, nuisance arising from alkali-works, and lodging of fruit- pickers. There is besides a mass of legislation which in fact, if not in name, has for its object the sanitary welfare of the people. It is sufficient to mention the Vaccination Acts, the Factory Acts, the Artisans and Labourers Dwell- ings Acts subsequent to 1868, the Merchant Shipping Acts (insuring the carrying of medicines and antiscorbutics on board ships, the provision of sleeping space for seamen, and the inspection

of seamen's lodging-houses), the Adul- teration Acts, and the numerous Burial Acts. In many local Acts notification of infectious disease by the medical man in attendance to the local authority is made com- pulsory, but the legislature has not as yet adopted any general provision of the kind.

The scientific aspect of public health does not fall within the Scope of the present article; it has been treated under the title Hycrenz. It is sufficient to say here that the effect of the attention which of late years has been given to the subject is seen in the reduction of the death-rate from 22°23 per thousand in the years 1841-51 to 21:27 for the years 1871-81.

London.—The metropolis is governed by a series of statutes, Some peculiar to itself, others general Acts, repealed as to the rest of England, but specially preserved as to the metropolis by the Publie Health Act, 1875. The limits of the metropolis for the SS ———EEE

sumed smoke if it be proved to the court that the smoke has been consumed as far as practicable and that the fire has been carefully attended to.

purposes of public health depend primarily upou the Metropolis Management Act, 1855 (18 and 19 Vict. c. 120, s. 250, schedules A and B). The local authorities are the metropolitan board of works, the vestries and district boards, and (in the eity of London) the commissioners of sewers. Asylums and hospitals are administered by the metropolitan asylums board. The water-supply is regulated by the Metropolis Water Acts, 1852 and 1871, gas by the Metro- politan Gas Act, 1860.

Scotland. —Sanitary legislation occurs as early as the reign of Alexander III. The Statwta Gilde, c. 19, forbade the deposit of dung or ashes in the street, market, or on the banks of the Tweed at Berwick under a penalty of eight shillings. At a later date the Act of 1540, c. 20, enacted that no flesh was to be slain in Edinburgh on the east side of the Leith Wynd ; that of 1621, e. 29, fixed the locality of fleshers and eandlemakers, The existing law of public health is contained in the Public Health (Scotland) Act, 1867 (30 and 31 Vict. e101). The local authority is the town council, the police commissioners or trustees, or the parochial board, accord- ing to circumstances. There is no distinction of urban and rural authority. The central authority is the board of supervision con- stituted by 8 and 9 Vict. e.

83. Proceedings by a local authority in cases of nuisance are by summary petition to a sheriff or a justice (in some cases only to a sheriff) upon requisition in writing under the hands of ten inhabitants. An appeal lies in cases of sufficient value from the sheriff-substitute to the sheriff and from the sheriff to the Court of Session. The list of nuisances in the Act differs, but not materially, from that in the English Act. The powers of local authorities in England and Scotland are very similar. There are no provisions as to contracts by local authorities corresponding to those in the English Act.

Ireland.—Several Acts of the Irish parliament dealt with specific nuisances, e.g., 5 Geo. III. c. 15, forbidding the laying of filth in the streets of cities or county towns, and making regulations as to sweeping and scavenging. 'There were also numerous private Acts dealing with water-supply and the obstruction of watercourses, In 1878 the existing legislation was consolidated by the Public Health (Ireland) Act, 1878 (41 and 42 Vict. e. 52), a close copy of the English Act of 1875. The list of statutory nuisances is the same in both Acts. The urban authority is the eorporation, the commissioners, the municipal commissioners, or the town com-

| missioners, according to circumstances. Ireland has its own local

government board.

United States.—After the Civil War boards of health were estab- lished in the chief cities. Public health is under the control of the local authorities to a greater extent than in England. By the Act of Congress of 25th February 1799 officers of the United States are bound to observe the health laws of the States. A national board of health was created by the Act of 8d March 1879, e. 202. Its main duties are to give advice to local authorities and to carry on investigations in sanitary matters. It has certain jurisdiction in quarantine and in epidemics of a peculiarly dangerous nature. (J. Wt.)

PUBLIC RECORDS. See Recorns, Pustic,

PUBLILIUS (less correctly written Pusuius) Syrus, a Latin writer of farces (mimi), flourished in the 1st cen- tury B.c. He was a native of Syria and was brought as a slave to Italy, but by his wit and talent he won the favour of his

master, who freed and educated him. His farces, in which he acted himself, had a great success in the provincial towns of Italy and at the games given by Cesar in 46 B.c. Publilius appeared on the stage at Rome and received from Czsar himself the prize for a histrionic con- test in which the actor vanquished all his competitors, including the celebrated Laberius. For the rest, we learn from Jerome that in 43 Publilius still enthralled the Roman playgoers. Cicero witnessed with pleasure the exhibition of his plays, and Seneca was a warm admirer of his wise and witty sayings. All that remains of his works is a collection of Sentences (sententix), a series of moral maxims in iambic and trochaic verse. This collection must have been made at a very early date, since it was known to Aulus Gellius in the 2d century a.p. Each maxim is comprised in a single verse, and the verses are arranged in alphabetical order according to their initial letters. In course of time the collection was interpolated with sentences drawn from other writers, especially from apocryphal writings of Seneca; the number of genuine verses is about 700. They include many pithy sayings, such as the famous "judex damnatur ubi nocens absolvitur." The best editions of the Sentences are those of E. Wélfflin (Teubner, 1869) and W. Meyer (Teubner, 1880).

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PUCKLER-MUSKAU, Hermann Lupwic HEINRICH, Prince or (1785-1871), a German author, was born at Muskau in Lusatia on 30th October 1785. He served for some time in the body-guard at Dresden, and afterwards travelled in France and Italy. In 1811, after the death of his father, he inherited the barony of Muskau and a considerable fortune. As an officer under the duke of Saxe-Weimar he distinguished himself in the war of liberation and was made military and civil governor of Bruges. After the war he retired from tue army and visited England, where he remained about a year. In 1822, in compensation for certain privileges which he re- signed, he was raised to the rank of prince by the king of Prussia. Some years earlier he had married the countess of Pappenheim, daughter of Prince Hardenberg ; but he separated from her in 1826. He again visited England and travelled in America and Asia Minor, living after his return at Muskau,

which he spent much time in cultivating and adorning. In 18465 he sold this estate, and, although he afterwards lived from time to time at various places in Germany and Italy, his principal residence was the castle of Branitz in the district of Kottbus, where he formed splendid gardens as he had already done at Muskau. In 1863 he was made an hereditary member of the Prussian Herrenhaus, and in 1866 he attended the Prussian general staff in the war with Austria. He died at Branitz on 4th February 1871, and, in accordance with instructions in his will, his body was burned. As a writer of books of travel he held a high position, his power of observation being keen and his style lucid and animated. His first work was Briefe eines Verstorbenen (1830-31), in which he ex- pressed many independent judgments about England and other countries he had visited and about prominent persons whom he had met. Among his later books of travel were Semilasso's vorletzter Weltgang (1835), Semalasso in Afrika (1836), Aus Mehemed-Ali's Reich (1844), and Die Riick- kehr (1846-48). He was also the author of Andeutungen tiber Landschaftsgdrtneret (1834).

See Piickler-Muskau's Briefwechsel und Tagebiicher ; Ludmilla Assing, First Hermann von Piiekler-Muskau ; and Petzold, First Hermann von Piekler-Muskau in seiner Bedeutung fiir die bildende Gartenkunst.

PUDSEY, a township of the West Riding of Yorkshire, is situated on an acclivity rising above the valley of the Aire and on the Great Northern Railway, 4 miles east of Bradford and 6 south-west of Leeds. The principal build- ings are the church of St Lawrence in the Gothic style, erected in 1821 and lately improved, and the mechanics' institute, a fine building, comprising class-rooms, a library, a public hall, and a lecture hall. The town has an import- ant woollen trade and possesses dyeing and fulling mills. Pudsey appears in Domesday as '" Podechesaie." It was sold by Edward II. to the Calverley family, from whom it passed to an ancestor of the Milners. By the Bradford Water and Improvement Act of 1881 part (37 acres) of the urban sanitary district of Pudsey was amalgamated with that of Bradford. The population of the diminished district (2409 acres) in 1871 was 12,173, and in 1881 it was 12,314.

PUEBLA, or in full La Purpia DE Los ANGELES, a city of Mexico, formerly capital of the province of Tlaxcala, now of the state of Puebla, lies

76 miles south-east of Mexico, in 19° N. lat. and 98° 2’ W. long., at a height of 7220 feet above the sea. It is admirably situated on a spacious and fertile plateau, which, while almost destitute of trees, is, especially in the neighbourhood of the city, clothed with gardens and fields. To the south-west rises the summit of Popocatepetl, and Orizaba and Iztaccihuatl are also within the horizon. By Humboldt Puebla was ranked as the most important city of Spanish America after Mexico, Guanajuato, and Havana, and in the matter

of population it still stands third among the state capitals, Its spacious streets run exactly east-west and north-south, and its houses, often of three stories, are solidly built of stone and in Spanish style. The cathedral, dedicated to the Immaculate Conception, was commenced in 1552 after the designs of Juan Gomez de Mora, but it was not completed until 1649, after Bishop Juan de Palafox y Mendoza had devoted eight years of strenuous effort to the enterprise. It is rather more than 320 feet long and

165 wide, and consists of a nave 80 feet high, with side.

aisles and a dome, the upper portion of which is con- structed of pumice-stone for the sake of lightness. The main front, like the columns of the interior, is in the Doric style, but its two side towers are Ionic. In one is a great bell cast in 1637 and weighing upwards of 8 tons. Apart from the cathedral Puebla was famous for the number, and more especially for the lavish decoration of its churches, monasteries, and colleges. Several of these (such as the church and convent of Santo Domingo and the church of S. Felipe Neri) are still of note, and the city also contains a museum, a theatre, &c. Puebla has long been one of the great trading and manufacturing centres of the country, and it has recently become an important point in the rapidly-developing railway system, having in 1884 lines to Apizaco on the railway from Vera Cruz to Mexico (28 miles), to Villa de Libres (58 miles), to San Martin (24 miles), to Matamoros Izucar (31 miles), and to San Juan de los Llanos. Cotton and woollen goods, leather, earthen- ware, soap, and glass are the leading manufactures. The population, which was about 80,000 in 1746 and 52,717 in 1793, and which greatly decreased during the revolu- tionary period, is now (1885) stated at 75,000.

Puebla was founded in 1533-34 by Sebastian Ramirez de Fuenleal, archbishop of Santo Domingo, and the Franciscan friar Toribio Motolinia. In 1550 it became the seat of the bishopric which had originally been founded in 1526 at Tlaxcala. The epithet 'de los Angeles," which is now practically dropped, was in the 17th and 18th centuries the chief part of the name, which often appears simply as Angeles. It is associated, with a popular belief that during the building of the cathedral two angels every night added as much to the height of the walls as the workmen had managed to add in the preceding day. In 1845 Santa Anna made an unsuccessful attempt to capture the city. On 18th March 1863 it was invested by the French under Forey, and on 17th May taken by storm.

See Buschman's history of the city and cathedral in Ztschr. f. allgem. Erdkunde, 1868, vol. xv. pp. 195-212, and xvi. pp. 338-345.

PUERPERAL FEVER. See SepricaMia.

PUERTO CABELLO, a town and seaport in the South American republic of Venezuela, in the province of Cara- bobo, used to rank next to Cartagena, and possesses one of the finest natural harbours in that part of the world. It is backed at the distance of about 5 miles by a range of mountains 3000 feet high, across which pass, at a height of 1800 feet, the road (36 miles) and the railway now (1885) in course of construction to Valencia, the capital of the province. The old town used to lie on an island (originally a coral bank) joined to the mainland by a bridge ; but since about 1850 the narrow channel between the town and the more extensive suburbs on shore has been filled up and covered with blocks of building, so that now Puerto Cabello occupies a kind of headland projecting into the bay. Formerly the lowness of its site and the mangrove swamps which fringed the whole coast rendered it appallingly unhealthy : at the time of Humboldt's visit, for example, the surgeon of the hospital reported that in seven years he had 8000 cases of yellow fever, and there were instances of the authorities having to take possession of vessels in the harbour because the entire crew had per- ished (Eastwick). But yellow fever has not been known at Puerto Cabello since about 1868, and the general death- rate of the place is quite normal. A good supply of water

is obtained from the Rio Esteban by means of an aqueduct –

3 miles long. The harbour, about 2 miles long and from one-fourth of a mile to a mile in breadth, is formed by a narrow spit of land or coral ledge running out for about 2 miles from the coast in a northerly and westerly direction. The entrance, about 90 feet deep, is so clear that no pilot is required ; and in the outer bay (100 to 800 feet deep) there is safe anchorage. On a high rock to the south- east of the town is the Mirador of Solano, or castle of Puerto Cabello, which has often proved an obstacle to enemies advancing from the interior. In 1883 the muni- cipality, with a population of 12,000, contained a tannery, a foundry and machine-shop, a coffee-mill, two soap and candle factories, and about fourteen wholesale warehouses. The exports consist of coffee, cocoa, hides, goat and deer skins, bark, woods, indigo, and cotton, but only the first in large quantities. Germany and the United States are the chief recipients. Within 6 miles of the town there are four villages of from 200 to 1500 inhabitants.

See Jiilfs and Balleer, Scchdfen der Erde, Oldenburg, 1878; and U.S. Consular Reports, Nos, 24, 26, 30, &c.

PUERTO DE SANTA MARIA, probably the " Mene-

sthei Portus" of Ptolemy, commonly called EL Puerto ("The Port"), a town of Spain, in the province of Cadiz, 7 miles to the north-east of that city (214 miles by rail ; see sketch map, vol. iv. p. 627), near the mouth and on the right bank of the Guadalete, which is here crossed by a suspension bridge. It is a pleasant and well-built though somewhat dull town, in a fertile country, and its houses resemble those of Cadiz, though they are often larger and profusely decorated with painting. Calle Larga, the principal street, is handsome and well-paved; there are several "alamedas" or public promenades, that of La Victoria being the finest. The place is famous for its bull-fights, that given here in honour of Wellington being the subject of the considerably idealized description in Byron's Childe Harold. Among the public buildings is a large Jesuit college, recently established. Puerto is chiefly important as a wine-exporting place; the "bodegas" " or wine-stores are large and lofty, but hardly equal to those of Xerez. The harbour is formed by the river ; its mouth is considerably obstructed by a bar. There is regular steam communication with Cadiz. Timber and iron are the chief

imports. The population of the munici- pality in December 1877 was 22,125.

PUERTO PRINCIPE, or now more correctly C1UDAD DEL PRrincipg, a city at the head of the central department of the island of Cuba. When first founded in the begin- ning of the 16th century by Velazquez, it was, as its more familiar name implies, on the sea-coast ; but it has been more than once shifted southward and inland, and is now nearly as far from the north as from the south side of the island. Though for some time after the surrender of San Domingo to France in 1800 Principe was the seat of the central government and supreme courts of the Spanish West Indies, it is no longer a place of much importance. The population is estimated at 31,000. Since 1840 the city has been connected by a railway with its port, which 18 sometimes called by its own name and sometimes by that of a smaller town on the bay about 11 miles from its entrance, San Fernando de Nuevitas. The harbour or bay s large, completely sheltered, and capable of admitting vessels of the largest draught ; but it is entered by a narrow crooked passage 6 miles long, which, though there are no hidden dangers, makes the assistance of a pilot desirable,

PUERTO RICO. See Porto RIco.

PUFENDORF, SAMUEL (1632-1694), was born at Chemnitz, Saxony, on the 8th of J. anuary 1632, the same year which also saw the birth of three other illustrious political and philosophical writers—Locke, Cumberland,

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and Spinoza. He belonged to an ecclesiastical family ; his father was a Lutheran pastor, and he himself was destined for the ministry. Having completed his pre- liminary studies at the celebrated school of Grimma, he was sent to study theology at the university of Leipsic, at that time the citadel of Lutheran orthodoxy. Its narrow and dogmatic teaching was profoundly repugnant to the liberal nature of the young student, who was not long in bidding adieu to the professors of theology and throwing himself passionately into the study of public law.

He soon went so far as to quit Leipsic altogether, and

betook himself to Jena, where he formed an intimate friendship with Erhard Weigel the mathematician, a man of great distinction. Weigel was imbued with the Cartesian philosophy ; and it was to his teaching and to the impetus he gave to the application of the mathematical method that Pufendorf owes the exact and ordered mind, and the precision, frequently approaching almost to dryness, which characterize his writings. It was also under Weigel's in- fluence that he developed that independence of character which never bent before other writers, however high their position, and which showed itself in his profound disdain for "ipsedixitism," to use the piquant phrase of Bentham.

Pufendorf was twenty-five years old when he quitted Jena. He hoped to find a career in some of the adminis- trative offices which were so frequently the refuge of the learned in the small states of ancient Germany ; but in this he was unsuccessful. In 1658, thanks to his eldest brother Isaiah, who had given up university teaching to enter the Swedish service, he went, in the capacity of tutor, into the family of Petrus Julius Coyet, one of the resident ministers of Charles Gustavus, king of Sweden, at Copen- hagen. At this time Charles Gustavus was endeavouring to impose upon Denmark a burdensome alliance, and in the middle of the negotiations he brutally opened hostilities. The anger of the Danes was turned against the envoys of the Swedish sovereign ; Coyet, it is true, succeeded in escaping, but the second minister, Steno Bjelke, and the whole suite were arrested and thrown into prison. Pufen- dorf shared this misfortune, and the future successor of Grotius was subjected to a strict captivity of eight months' duration. Like Grotius, he too had his Loevestein. The young tutor, deprived of books, occupied himself during his captivity in meditating upon what he had read in the works of Grotius and Hobbes. He mentally constructed a system of universal law; and, when, at the end of his captivity, he accompanied his pupils, the sons of Coyet, to the university of Leyden, he was enabled to publish the fruits of his reflexions under the title of Elementa Jurisprudentia wriversalis, libri duo. The work was de- dicated to Charles Louis, elector palatine, an enlightened prince and patron of science, who offered Pufendorf a chair of Roman law at Heidelberg, and when this was declined he created a new chair, that of the law of nature and nations, the first of the kind in the world. Pufen- dorf accepted it, and was thus in 1661, at the age of twenty-nine, placed in the most enviable of positions. He showed himself

equal to his task, and by his science and eloquence proved himself to be an honour and an orna- nent to the university.

The keenly sarcastic tract De statu imperii germanict, liber unus, dates from this period of his life. Smal] in bulk, it is great in significance, and is one of Pufen- dorf's most important works. Written with the assent of the elector palatine, but published under the cover of a pseudonym at Geneva in 1667, it was supposed to be addressed by a gentleman of Verona, Severinus de Mon- zambano, to his brother Lelius. The pamphlet made a great sensation. Its author arraigned directly the organi-

zation of the holy empire and exposed its feebleness, denounced in no measured terms the faults of the house of Austria, and attacked with remarkable vigour the politics of the ecclesiastical princes. But he did not thus describe the evil without at the same time suggesting the remedy. Thinking that Germany could not attain to a true monarchy without a great revolution, he proposed to call together a confederation, with a perpetual council representing all the members and occupying itself with external affairs. Before Pufendorf, Philipp Bogislaw von Chemnitz, publicist and soldier, had written, under the pseudonym of " Hippolytus a Lapide," De ratione status in amperio nostro Romano-Germanico. Inimical, like Pufen- dorf, to the house of Austria, Chemnitz had gone so far as to make an appeal to France and Sweden. Pufendorf, on the contrary, rejected all idea of foreign intervention. But in his plan, in which national initiative was all in all, were propounded the ideas of an army supported at the general expense, the secularization of the ecclesiastical principalities, the abolition of convents, and the expulsion of the Jesuits. His little book is pcrhaps the most im- portant that was produced in relation to the public law and politics of Germany, and it is noteworthy that he reveals himself as a consummate statesman, having a broad comprehension of the present and a clear insight into the future. Subsequent events proved the justice of his conclusions.

In 1670 Pufendorf was called to the university of Lund. The influence of his brother Isaiah, as also some disagree- ments which he had had with his colleagues at Heidelberg, influenced his decision to accept the call; but by

this acceptance he did not break with German culture, for in Scandinavia that culture was predominant. The sojourn at Lund was fruitful. In 1672 appeared the De jure nature et gentium, libri octo, and in 1675 a résumé of it under the title of De officio hominis et civis. The treatise De jure nature et gentiwm is the first systematic work on the subject. Grotius, whom. Pufendorf has been accused of having too servilely followed, had more especially treated of international relations ; and on the other hand Oldendorp, Hemming, and Winkler treated of the rudimentary part of the subject. Pufendorf took up in great measure the theories of Grotius and sought to complete them by means of the doctrines of Hobbes and of his own ideas. Judging of the work of Pufendorf as a whole, Mr Lorimer has felt justified in saying that "his conception was a magnificent one, and in the effort which he made to realize it he has left behind him a work which, notwithstanding the unpardonable amount of commonplace which it contains and its consequent dulness, is entitled to the respect of all future jurists. It was nothing less than an attempt to evolve from the study of human nature a system of jurisprudence which should be of universal and permanent applicability." The author derived law from reason, from the civil law, and from divine revelation, and established thus three " disciplines "—natural law, civil law, and moral theology. Natural law is all that is commanded to us by pure reason, and hence resulted the first important pcint in Pufendorf's theory, viz., that natural law does not extend beyond the limits of this life and that it confines itself to regulating external acts. Pufendorf combats Hobbes's conception of the state of nature, and concludes that the state of nature is not one of war but of peace. But this peace is feeble and insecure, and if something else does not come to its aid it can do very little for the preservation of mankind. As regards public law Pufen- dorf, while recognizing in the state (civitas) a moral person (persona moralis), teaches that the will of the state is but the sum of the individual wills that constitute it, and that this association explains the state. In this a priori con-

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ception, in which he scarcely gives proof of historical insight, he shows himself as one of the precursors of J. J. Rousseau and of the Contrat social. On the subject of international law, with which he occupies himself in-

cidentally, it is to be noted that Pufendorf belongs to the philosophical school, and also that he powerfully defends the idea that international law is not restricted to Christen- dom, but constitutes a common bond between all nations. because all nations form part of humanity. As was to be expected, the work made a sensation: it provoked enthusiastic admiration as well as anger and indignation ; the author was praised to the skies on the one hand, and accused of irreligion and atheism on the other. The universities of Lund and Leipsic, above all, furnished adversaries and critics. Being passionately attacked, he defended himself with passion, and he may be held to have come victorious out of these conflicts in which his combative and sarcastic soul delighted, for Pufendorf dearly loved a fray.

In 1677 he was called to Stockholm in the capacity of historiographer-royal. To this new period belong among others the work On the Spiritual Monarchy of the Pope, which was afterwards inserted in his fntroduction to the History of the principal States in Europe at the present Day, also the great Commentariorumi de rebus Suecacrs, libre XXVI., ab expeditione Gusta Adolphi regis in German- iam ad abdicationem usque Christine and a History of Charles Gustavus. In his historical works Pufendorf is hopelessly dry ; but he professes a great respect for truth and generally draws from archives. The treatise On the Spiritual Monarchy of the Pope alone recalls Severinus de Monzambano, There we find the same vigour and the same passion, and all through its pages we feel the indig- nation of the Prctestant who sees the noble cause of reli- gious liberty menaced by the papacy and by its two allies Louis XIV. and James IT. Of the same nature is another work of this period, De halitu religionis christiane ad vitam civilen, in which he undertakes to trace the limits between ecclesiastical and civil power, and where he expounds for the first time completely the theory known under the name of " Kollegial System" or " Kollegialismus," which was actually applied later in Prussia. This work is dated 1687. In 1688 Pufendorf was called to the service of Frederick William, elector of Brandenburg. He accepted the call; but he had no sooner arrived than the elector died. His son Frederick III. fulfilled the promises of his father, and Pufendorf, historiographer and privy coun- cillor, was instructed to write Zhe History of the Elector William the Great. The king of Sweden did not on this account cease to testify his goodwill towards Pufendorf, and in 1694 he created him a baron. In the same year, on the 26th of October, Pufendorf

died at Berlin and was buried in the church of St Nicholas, where an inscription to his memory is still to be seen.

The value of the man whose life has been thus briefly sketched was great ; he was at once philosopher, lawyer, economist, historian, we nay even add statesman. His influence also was considerable, and he has left a profound impression on thought, and not on that of Germany alone. Posterity has, however, done him scant justice, and has not acknowledged what it really owes to him. Much of the responsibility for this injustice rests with Leibnitz, who would never recognize the incontestable greatness of one who was con- stantly his adversary. Everybody knows the bitter criticism which he made ou Pufendorf, 'vir parum jurisconsultus et minime philo- sophus." This is only the condensed expression of a multitude of judgments passed by him on the author of the De jure nature et gentium. It was on the subject of the pamphlet of Severinus de Monzambano that the quarrel began. The conservative and timid Leibnitz was beaten on the battlefield of politics and public law, and the aggressive spirit of Pufendorf aggravated yet more the dis- pute, and so widened the division. From that time the two writers could never meet on a common subject without attacking each

other. The combat was almost always decided in favour of Pufen- dorf, but the irony of fate has ratified the words of his adversary,

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and the future has accepted an estimate dictated by anger and spite.

= H. von Treitschke, "Samuel von Pufendorf," Preussische Jahrbiicher, 1875, vol. xxxv. p. 614, and vol. xxxvi. p. 61; Bluntschli, Deutsches Staats-Worter- buch, vol. viii. p. 424, and Geschichte des allgemeinen Statsrcchts wnd der Politik, p. 108; Lorimer, The Institutes of the Law of Nations, vol. i. p. 74; Droysen, "Zur Kritik Pufendort's," in his Abhandlungen zur neueren Geschichte ; Roscher, Geschichte der National-Oekonomik in Deutschland, p. 304; Franklin, Das deutsche Reich nach Severinus von Monzambano. (Ee. NE

PUFF-ADDER. See Viprr.

PUFF-BIRD, the name first given, according to Swain- son (Zool. Illustrations, ser. 1, ii, text to pl. 99), by English residents in Brazil to a group of Birds known to ornithologists as forming the restricted Family Bucconide, but for a long time confounded, under the general name of Barbets, with the Cayntonide of modern systematists, who regard the two Families as differing very considerably from one another. Some authors have used the generic name Capito in a sense precisely opposite to that which is now usually accorded to it, and the natural result has been to produce one of the most complex of the many nomen- clatural puzzles that beset Ornithology. Fortunately there is no need here to enter upon this matter, for each group has formed the subject of an elaborate work—the Capi- tomde being treated by the Messrs Marshall,! and the Bucconide by Mr Sclater?—in each of which volumes the origin of the confusion has been explained, and to either of them the more curious reader may be confidently referred. The Bucconidx are zygodactylous Birds belonging to the large heterogeneous assemblage in the present work gener- ally looked upon as forming the "Order" Picarie# (see ORNITHOLOGY, vol. xviii. p. 41), and commonly considered nowadays to be most nearly allied to the Galbulide (JACAMAR, vol. xiii. p. 531), and like them confined to the Neotropical Region, in the middle parts of which, and especially in its Sub-Andean Sub-region, the Puff-birds are, as regards species, abundant; while only two seem to reach Guatemala and but one Paraguay. As with most South-American Birds, the habits and natural history of the Bucconide have been

but little studied, and of only one species, which happens to belong to a rather abnormal genus, has the nidification been described. This is the Chelidoptera tenebrosa, which is said to breed in holes in banks, and to lay white eggs much like those of the King- fisher and consequently those of the Jacamars. From his own observation Swainson writes (Joc. cit.) that Puff-birds are very grotesque in appearance. They will sit nearly motionless for hours on the dead bough of a tree, and while so sitting "the disproportionate size of the head is rendered more conspicuous by the bird raising its feathers so as to appear not unlike a puff ball. . . . When frightened their form is suddenly changed by the feathers lying quite flat." They are very confiding birds and will often station them- selves a few yards only from a window. The Bucconide almost without exception are very plainly-coloured, and the majority have a spotted or mottled plumage suggestive of immaturity. The first Puff-bird known to Europeans Seems to have been that described by Marcgrave under the name of " Tamatia," by which it is said to have been called in Brazil, and there is good reason to think that his description and figure—the last, comic as it is in outline and expression, having been copied by Willughby and many of the older authors —apply to the Bucco maculatus of modern Ornithology—a bird placed by Brisson (Orni- thologie, iv. p. 524) among the Kingfishers. But if so, Maregrave described and figured the same species twice, since lis " Matwtuc" is also Brisson's " Martin-pescheur tacheté du Brésil."

Mr Sclater in his Jonograph divides the Family into 7 A i Be eee

1 A Monograph of the Capitonide or Scansorial Barbets, by C. H. T. and G. f. L. Marshall, London, 1870-71, 4to:

a A Monograph of the Jacamars and Puff-birds, or Families Gal- bulide and Bucconide, by P. L. Sclater, London, 1879-82, 4to.

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genera, of which Bucco is the largest and contains 20 species. The others are Malacoptila and Monacha each with 7, Nonnula with 5, Chelidoptera with 2, and Micro- monacha and Hapaloptila with 1 species each. The most showy Puff-birds are those of the genus Monacha with an inky-black plumage, usually diversified by white about the head, and a red or yellow

bill. The rest call for no particular remark. (A. N.) PUFFIN, the common English name of a sea-bird, the Lratercula arctica of most ornithologists, known however on various parts of the British coasts as the Bottlenose, Coulterneb, Pope, Sea-Parrot, and Tammy-Norie, to say nothing of other still more local designations, some (as Marrott and Willock) shared also with allied species of Alcidx, to which Family it has, until very lately, been invariably deemed to belong. Of old time Puffins were a valuable commodity to the owners of their breeding- places, for the young were taken from the holes in which they were hatched, and 'being exceeding fat," as Carew wrote in 1602 (Survey of Cornwall, fol. 35), were "kept salted, and reputed for fish, as coming neerest thereto in their taste." In 1345, according to a document from which an extract is given in Heath's Islands of Scilly (p. 190), those islands were held of the crown at a yearly rent of 300 Puffins? or 6s. 8d., being one-sixth of their estimated annual value. A few years later (1484), either through the birds having grown scarcer or money cheaper, only 50 Puftins are said (op. cit., p. 196) to have been demanded. It is stated by both Gesner and Caius that they were allowed to be eaten in Lent. Ligon, who in 1673 published a Mistory of the Island of Barbadoes, speaks (p. 37) of the ill taste of Puffins "which we have from the isles of Scilly," and adds "this kind of food is only for servants." Puftins used to resort in vast numbers to certain stations on the coast, and are still plentiful on some, reaching them in spring with remarkable punctuality on a certain day, which naturally varies with the locality, and after passing the summer there, leaving their homes with similar precision. They differ from most other Alcidx in laying their single egg (which is white with a few grey markings when first produced, but speedily begrimed by the soil) in a shallow burrow, which they either dig for them- selves or appropriate from a rabbit, for on most of their haunts rabbits have been introduced. Their plumage is of a glossy black above—the cheeks grey, encircled by a black band—and pure white beneath ; their feet are of a bright reddish orange, but the most remarkable feature of these birds, and one that gives them a very comical ex- pression, is their huge bill. This is very deep and laterally flattened, so as indeed to resemble a coulter, as one of the bird's common names expresses ; but moreover it is parti- coloured—blue, yellow, and red —curiously grooved and still more curiously embossed in places, that is to say during the breeding-season, when the birds are most frequently seen. But it had long been known to some observers that such Puffins as

occasionally occur in winter (most often washed up on the shore and dead) presented a beak very different in shape and size, and to account for the difference was a standing puzzle. Many years ago Bingley (North Wales, i. p. 354) stated that Puffins "are said to change their bills annually." The remark seems.

3 There can not be much doubt that the name Puffin given to these young birds, salted and dried, was applied on account of their downy clothing, for an English informant of Gesner's described one to him (iTist. Avium, p. 110) as wanting trne feathers, and being covered only with a sort of woolly black plumage. It is right, however, to state that Caius expressly declares (Rarior. animal. libellus, fol. 21) that the name is derived "a naturali voce pnpin." Prof. Skeat states that the word is a diminutive, which favours the view that it was originally nsed as a name for these young birds. The parents were

_.-/-probably known by one or other of their many local appellations.

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to have been generally overlooked ; but it has proved to be very near the truth, for after investigations carefully pursued during some years by Dr Bureau of Nantes he was in 1877 enabled to shew (Bull. Soc. Zool. France, ii. pp. 377-399) that the Puffin's bill undergoes what may be called an annual moult, some of its most remarkable appendages, as well as certain horny outgrowths above and beneath the eyes, dropping off at the end of the breeding- season, and being reproduced the following year. Not long after the same naturalist announced (op. cit., iv. pp. 1-68) that he had followed the similar changes which he found to take place, not only in other species of Puffins, as the Fratercula corniculata and I'. cirrhata of the Northern Pacific, but in several birds of the kindred genera Cera- torhina and Simorhynchus inhabiting the same waters, and consequently proposed to regard all of them as forming a Family distinct from the Alcide—a view which has since found favour with Dr Dybowski (op. cit., vil. pp. 270-300 and viii. pp. 348-350), though there is apparently insufficient reason for accepting it.

The name Puffin has also been given in books to one of the Shearwaters, and its Latinized form Puffinus is still used in that sense in scientific nomenclature. This fact seems to have arisen from a mistake of Ray's, who, seeing in Tradescant's Museum and that of the Royal Society some young Shearwaters from the Isle of Man, prepared in like manner to young Puffins, thought they were the birds mentioned by Gesner (/oc. cit.), as the remarks inserted in Willughby's Ornithologia (p. 251) prove ; for the specimens described by Ray were as clearly Shearwaters as Gesner's were Puftins. (A. N.)

PUGET, Pierre (1622-1694), born at Marseilles on 31st October 1622, painter, sculptor, architect, and engineer, is a rare instance of precocious genius and mature power. At the age of fourteen he carved the ornaments of the galleys built in the port of his native city, and at sixteen the decoration and construction of a ship were entrusted to him. Soon after he went to Italy on foot, and was well received at Rome by Pietro di Cortona, who employed

him on the ceilings of the Barberini palace and on those.

of the Pitti at Florence. In 1643 he returned to Mar- seilles, where he painted portraits and carved the colossal figure-heads of men-of-war. After a second journey to Italy he painted also a great number of pictures for Aix, Toulon, Cuers, and La Ciotat, and sculptured a large marble group of the Virgin and Child for the church of Lorgues. A serious illness in 1665 brought Puget a pro- hibition from the doctors which caused him wholly to put aside the brush. He now sculptured the caryatides of the town-hall of Toulon (Louvre), went to Normandy, where he executed a statue of Hercules and a group of Janus and Cybele for the marquis of Vaudreuil, and visit- ing Paris made the acquaintance of Le Pautre and Fou- quet, who determined to eniploy him at Vaux and sent him to Italy to choose marbles for his work. The fall of Fouquet found Puget at Genoa, where he remained em- ployed by the nobles of the town. There he executed for Sublet des Noyers his French Hercules (Louvre), the statues of St Sebastian and of Alexandre Sauli in the church of Carignano, and much other work. The Doria family gave him a church to build; the senate proposed that he should paint their council-chamber. But Colbert bade Puget return to France, and in 1669 he

again took up his old work in the dockyards of Toulon. The arsenal which he had there undertaken to construct under the

1 A translated abstract of this paper—containing an account of what is perhaps the most interesting discovery of the kind made in ornithology for many years—is given in the Zoologist for 1878 (pp. 283-240) and another in the Bulletin of the Nuttall Ornithological Club for the same year (iii, pp. 87-91).

orders of the duke of Beaufort was destroyed by fire, and Puget, disheartened, took leave of Toulon. In 1685 he went back to Marseilles, where he continued the long series of works of sculpture on which he had been employed by Colbert. His statue of Milo (Louvre) had been completed in 1681, Perseus and Andromeda (Louvre) in 1683, and Alexander and Diogenes (bas-relief, Louvre) in 1685; but, in spite of the personal favour which he enjoyed, Puget, on coming to Paris in 1688 to push forward the execu- tion of an equestrian statue of Louis XIV., found court intrigues too much for him. He-was forced to abandon his project and retire to Marseilles, where he remained till his death in 1694. His last work, a bas-relief of the Plague of Milan, which remained unfinished, was placed in the council-chamber of the town-hall.

Puget was the. most vigorous representative of French sculpture in the 18th century ; in spite of his visits to Paris and Rome his work never lost its local character: his Hercules is fresh from the galleys of Toulon ; his saints and virgins are men and women who speak Provencal. His best work, the St Sebastian at Genoa, though a little heavy in parts, shows admirable energy and life, as well as great skill in contrasting the decorative accessories with the simple surface of the nude.

Cicognara, Storia della seultwra ; Lenoir, Afusée des Mon. Fran- pais; Lagrange, Vie de Pierre Puget; Barbet de Jouy, Sculptures mod. aw Lowvre.

PUGIN, Avcusrus Wetpy NorrumoreE (1812-1852), architect, was the son of Augustus Pugin, a native of France, who practised as an architect in London. He was born in Store Street, Bedford Square, on Ist March 1812. After completing the ordinary course of education at Christ's Hospital (blue-coat school), he entered his father's office, where he displayed a remarkable talent for drawing, When he had mastered the elements of his profession he devoted a large portion of his time to the sketching of public buildings ; he also accompanied his father on several professional tours in France. While still very young he was employed by his father to design furniture in the medieval style for Windsor Castle, and in 1831 he de- signed the scenery for the new opera of Aventlworth at Her Majesty's Theatre. Shortly afterwards he involved him- self deeply in money difficulties by an attenipt to establish a manufactory of stained glass, metal work, and furniture at Hart Street, Covent Garden. From the time, however, that he devoted himself steadily to his profession as an architect he never failed to find full employment. Shortly after his secession from the Church of England to that of Rome he published Contrasts ; or a Parallel between the Architecture of the 15th and 19th Centuries (1836), in which he severely criticized the architecture of Protestantism. His other principal works are Zrue Principles of Christian Architecture (1841), a Glossary of Ecclesiastical Ornament (1844), and a Z'reatise on Chancel Screens and Rood Lofts (1851). Pugin was the designer of a large number of im- portant Roman Catholic buildings, and also assisted Sir Charles Barry in the preparation of the designs for the new Houses of Parliament, Westminster. Early in 1852 he was attacked by insanity, which caused his death on 14th September of the same year.

Future historians who may write the architectural history of the 19th century will probably describe as its leading characteristic that enthusiastic revival of the Gothic style which took place in the second quarter of the century and continued with unabated vigour for more than thirty years. Among the many able archi- tects who during this period contributed to cover England with churches and other buildings, designed in a style which for three centuries had been rejected as barbarous, the name of Pugin deserves to be the most conspicuous. No man so thoroughly mastered the true principles of the Gothic style in its various stages, both in its leading

lines and in the minutest details of its mouldings and carved enrichments, and that too at a time when illustrated works on

Gothic architecture, such as have since been produced in enormous quantities,? had scarcely begun to exist; thus young Pugin had

2 These numerous illustrated works, with every detail shown toa workable seale, by doing away with the necessity for studying the

to learn the alphabet of his chosen style by careful and laborious study of the glorious examples of Gothic, both ecclesiastical and domestic, in which England was then (far more than now) so extra- ordinarily rich. His father was for many years engaged in prepar- ing a large series of works on the Gothic buildings of England, almost, if not quite, the first which were illustrated with accurate drawings of medieval buildings ; the early youth of A. W. Pugin was mostly occupied in making minute measured drawings for his father's books, and in this way his enthusiasm for Gothic art was first aroused. All through his life, both in England and during many visits to Germany and France, he continued to make, for his own instruction and pleasure, great numbers of drawings and sketches, especially in pen and ink, and with sepia monochrome. These are perhaps the most beautiful architectural sketches that have ever been produced, perfect in their delicacy and precision of touch, and masterpieces of skilful treatment of light and shade. They are mostly minute in scale, some almost microscopic in detail. Many of the Continental street scenes and interiors of cathedrals are of especial beauty from their contrasts of brilliant light and transparent shadow,! treated with Rembrandt-like vigour. At a very early age his wonderful mastery of Gothic detail was shown by the valuable aid he rendered to Sir Charles Barry in the con- struction of the new Houses of Parliament in 1836 and 1837.2 For some time he worked as a paid clerk to Barry, and to Pugin is mainly due the very remarkable excellence of all the details in this great building, execnted, it must be remembered, at a time when hitherto all examples of the revived Gothic were of the most ignor- ant and tasteless description. Pugin not only designed and even modelled a great part of the sculpture and other decorations of the building, but had

actually to train a school of masons and carvers to carry out his designs with spirit and accuracy.?

While still young Pugin became a Roman Catholic, and this, if possible, increased his intense zeal and enthusiasm for Gothic, or, as he preferred to call it, Christian architecture. His profession became to him a sort of religion, and his study of medieval build- ings was closely associated with his love for the mystic symbolism and the highly esthetic outward form of the old faith. 'he result of this was that he was almost wholly employed by adherents of the Catholic religion, In one way this was a fortunate circumstance, for it saved him from the temptation of assisting in that great wave of falsification and vulgarization which, under the name of "restor- ation," has devastated the principal medieval buildings of Great Britain and Ireland. In another way it was unfortunate, for his Catholic employers were mostly much pinched for money, and at the same time so devoid of all sympathy for the principles of which he was the chief exponent, that they almost always insisted on the greatest possible amount of display being made in the cheapest possible manner. On account of this it is unfair to judge of Pugin's genius from a critical examination of his executed works. In almost every case his design was seriously injured, both by cutting down its carefully considered proportions and by introducing shams (above all things hateful to Pugin), such as plaster groining and even cast-iron carving. The cathedral of St George at Southwark, and even the church of the Jesuits in Farm Street, Berkeley Square, London, are melancholy instances of this. Thus his life was one series of disappointments ; no pecuniary success compensated him for the destruction of his best designs, as in him the man of busi- ness was thoroughly subordinate to the artist. He himself used to Say that the only church he had ever executed with unalloyed Satisfaction was the one at Ramsgate, which he not only designed but paid for. Pugin was very broad in his love for the medixval styles, but on the whole preferred what is really the most suited to modern requirements, namely, the Perpendicular of the 15th century, and this he employed in its simpler domestic form with much success both in his own house at Ramsgate and in the stately Adare Hall in Iveland, built for Lord Dunraven. The cathedral of Killarney and the chapel of the Benedictine monastery of Dowtai Were perhaps the ecclesiastic buildings which were carried out with least deviation from Pugin's original conception,

He was a skilfnl etcher and produced a number of works illus- trated in this way by his own hand, and written with much elo-

buildings themselves, and being used simply like "'cribs" to an un- known language, are partly accountable for numberless recent build- Ings, which, while they are Gothie in form, are utterly devoid of the Tefinement, fitness, and true taste displayed in the buildings of the Middle Ages, _! Three volumes of photographs of these sketehes have been pub- lished in a square oetavo form, but have suffered from reduction in size,

ee A. comparison of the decorations of the Houses of Parliament with other contemporary and even later Gothie buildings shows in a very striking way the remarkable talent and industry displayed by Pugin in the work,

A few years ago very ill-judged attempts were made to elaim for Pugin the main eredit of Barry's design—claims whieh he himself Would have been the last to raise.

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quence, antiquarian knowledge, and even brilliant humour. This last gift is exemplified in a series of etched plates in his Contrasts : on one side is some noble structure of the Middle Ages, and on the other an example of the same building as erected in the 19th century. His works on Chaneel Sereens and on The True Prin- ciples of Christian Architecture are very ably written and exquisitely illustrated.*

Pugin's melancholy and premature end was to a great extent caused by the embittering influence of the constant frustration of his noblest artistic struggles and conceptions. oe Ben. Ferrey, Recollections of A. Welby Pugin and his Father, London,

PULCTI, Luter, Italian poet, was born at Florence on 3d December 1431 and died in 1487. The first edition of his Morgante Maggiore appeared at Venice in 1481. (See Iray, vol. xiii. p. 507 sq.)

PULGAR, Frernanpo pz, Spanish prose-writer of the latter part of the 15th century, born probably at Pulgar near Toledo, was brought up at the court

of John II. Henry IV. made him one of his secretaries, and under Isabella he became a councillor of state, was charged with at least one mission to France, and in 1482 was appointed historiographer-royal. His official Chronicle of the relgn of the Catholic sovereigns for the period previous to his appointment is loose and inaccurate; but in the later portion, where he had the advantage of personal know- ledge, he is always precise and often graphic. It is not brought down beyond the year 1492. It was first printed at Valladolid in 1565 under the name of Antonio de Lebrija. Pulgar's Claros Varones de Castilla, a series of sketches of forty-six of the most celebrated men of the reign and court of Henry IV., is of considerable interest both for its matter and for its style. He wrote, besides, a commentary on the ancient Coplas de Mingo Revulgo; and thirty-two of his Letters written to various persons of emi- nence, including some to the queen, are also extant. The first edition of the Cluros Varones was that of Seville (1500) ; some of the letters did not appear until 1528,

PULKOWA,. See OpsErvarory, vol. xvii. p. 714.

PULLEY. See MrcHanics and Brock MaAcuINERY.

PULTENEY, Witt1am, Earn or Baru (1684-1764), a politician elevated by a living historian > into the import- ant position in history of the first leader of the opposition, was descended from an ancient family with a pedigree duly recorded in Nichols's /istory of Leicestershire (iv. 320). His father, William Pulteney, died in 1715, and the future statesman was the offspring of his first wife, Mary Floyd, and was born in 1684. As his grandfather had been inti- mately connected with the city of Westminster, the boy was sent to Westminster school and from it proceeded to Christ Church, Oxford, acquiring in these institutions that deep classical knowledge which adorned his own speeches and enabled him to correct his great antagonist when he blun- dered in a quotation. On leaving Oxford he made the usual tour on the Continent. In 1705 he was brought into parliament by Henry Guy for the Yorkshire borough of Hedon, and at the death of that gentleman (a politician who had at one time held the office of secretary of the treasury) Pulteney inherited an estate of £500 a year and £40,000 in cash. This seat was held by him without a break until 1734, and though the family was then dispos- sessed for a time the supremacy was regained in the return of

another Pulteney in 1739. Throughout the reign of Queen Anne William Pulteney played a prominent part in the struggles of the Whigs, and on the prosecution of Sacheverell he exerted himself with great zeal against that violent divine. When the victorious Tories sent his friend

4 Pugin's sense of humour was keener than is altogether convenient for a man of business ; on one oeeasion when a eertain Catholie bishop wrote asking him to design a handsome ehureh, which was to eost an absurdly small sum of money, he replied, " My lord, say thirty shillings more and have a tower and spire."

> Justin M'Carthy, History of the Four Georges, vol. i. (1884).

Robert Walpole to the Tower in 1712, Pulteney championed his cause in the House of Commons and joined with the leading Whigs in visiting him in his prison-chamber. For these acts he was duly rewarded on the accession of George I. In the first ministry of the new king he held the post of secretary of war, a post which in the previous reign had been conferred upon St John, Walpole, and Granville suc- cessively, and when the committee of secrecy on the Utrecht treaty was formed the list included the name of William Pulteney. Two years later (6th July 1716) he becaine one of the privy council. Jn the following year the Whig ministry was rent in twain by internal dissension. On the proposition of the Government for granting a supply against Sweden the friends of Lord Townshend and Sir Robert Walpole voted against the administration, which only escaped defeat by a majority of four. Townshend was immediately dismissed from his post of lord-lieutenant of Ireland, and Walpole at once resigned his places, and amongst the Whigs who followed him in his retirement was Pulteney. Devotion like this merited some signal mark of favour on the return to power of the displaced ministers ; yet, when the crash of the South Sea Company restored Walpole to the highest position of authority, all that he offered to Pulteney was a peerage, a distinction which entailed the misfortune of banishment from the House where his faculties found their highest opportunities for display. The offer was rejected, but in 1723 Pulteney stooped to accept the lucrative but insignificant post of cofferer of the household. In this obscure position he was content for some time to

await the future; but when he found himself neglected he broke out into sarcasms on the civil list and in 1725 was dismissed from his sinecure. From the day of his dismissal to that of his ultimate tri- umph Pulteney remained in opposition, and, although Sir Robert Walpole attempted on his quarrel with Townshend to conciliate him, all his overtures were spurned. Pul- teney's resentment was not confined to his speeches in parliament. With Bolingbroke he set on foot the well- known periodical called The Craftsman, and in its pages the minister was incessantly denounced for many years. The war of pamphlets raged without ceasing. Lord Hervey published an attack on the Craftsman, and Pulteney, either openly or behind the person of Amhurst, defended its strict- ures of the minister. Whether the question at issue was the civil list, the excise, the income of the prince of Wales, or the state of domestic affairs Pulteney was ready with a pamphlet, and the minister or one of his friends came out with a reply. For one of these efforts he was challenged to a duel by Lord Hervey ; for another he was struck off the roll of privy councillors and dismissed from the com- mission of the peace in several counties. In print Pulteney was inferior to Bolingbroke alone among the antagonists of Walpole, but in parliament, from which St John was ex- cluded, he excelled all his comrades. When the sinking fund was appropriated his voice was the foremost in denunciation; when the excise scheme was stirring popular feeling to its lowest depths the passion of the multitude broke out in his oratory. Through Walpole's prudent withdrawal of the latter measure the fall of his ministry was averted, and dismay fell on the opposition leaders. Bolingbroke withdrew to France and Pulteney sought con- solation in foreign travel.

From the general election of 1734 until his elevation to the peerage Pulteney sat for Middlesex. For some years after this election the minister's assailants made little progress in their attack, but in 1738 the troubles with Spain supplied them with the opportunity which they desired. Walpole long argued for peace, but he was feebly supported in his own cabinet, and the frenzy of the people for war knew no bounds. In an evil moment for

his own reputation he consented to remain in office and to gratify popular passion with a war against Spain. His downfall was not long deferred. War was declared in 1739 ; a new parliament was summoned in the summer of 1741, and over the division on the election petitions the ministry of Walpole fell to pieces. The task of forming the new administration was after some delay entrusted to his principal antagonist, whereupon Pulteney offered the post of first lord of the treasury to that harmless poli- tician the earl of Wilmington, being content himself, as he had often declared his disdain for office, with a seat in the cabinet coupled with a peerage. At this act popular feeling broke out into open indignation. Exclamations that the country was betrayed were heard on all sides, and from the moment of his elevation to the Upper House Pulteney's influence dwindled to nothing. Horace Walpole asserts that when Pulteney wished to recall his desire for a peerage it was forced upon him through the ex-minister's advice by the king, and another chronicler of the times records that when victor and vanquished met in the House of Lords, the one as Lord Orford, the other as the earl of Bath, the remark was made by the exulting Orford: "'Here we are, my lord, the two most insignificant fellows in England." On 14th July 1742 Pulteney was created baron Pulteney of Hedon, county York, viscount Pulteney of Wrington, county Somerset, and earl of Bath, and a few months previously he had been restored to his rank in the privy council. On Wilmington's death in 1743 he made application to the king for the post of first lord of the treasury, only to find that it had been conferred on Henry Pelham. For two days in 1746 he was at the head of a ministry, but in "48 hours, three quarters, seven minutes, and eleven seconds" this short-lived ministry collapsed. An occasional pamphlet and an unfrequent speech were afterwards the sole fruits of Lord Bath's talents. His praises whilst in retirement have been sung by two prelates of the established church of England, Bishops Pearce and Newton. He died on 7th July 1764, and was buried on 17th July in his own vault in Islip chapel, Westminster Abbey.

Pultcney's eloquence was keen and incisive, sparkling with viva- city and with allusions drawn from the literature of his own country and of Rome. Of business he was never fond, and the loss in 1734 of his trusted friend John Merrill, who had supplied the qualities which he lacked, was feelingly lamented by him in a letter to Swift. His chief weakness was a passion for money, which was born with him and grew as he grew. As he left no

surviving issue! his vast fortune went to William Johnstone of Dumfries (the third son of Sir James Johnstone), who had married Frances, the daughter' and heiress of his cousin Daniel Pulteney, and had taken the name of Pulteney. Lord Bath has left no trace of the possession of prac- tical statesmanship, but for nearly twenty years he led the opposi- tion in the House of Commons to the greatest minister of the age, and had at last the triumph of driving his adversary from office. (W. Beh)

PULTOWA. See Porrava.

PUMA, a name, probably of native origin, introduced into European literature by the early Spanish writers on South America (as Garcilaso de la Vega and Hernandez) for one of the largest feline animals of the New World. It is generally called "'cougouar" by the French, "leon" by the Spanish Americans, and "panther" by the Anglo- American hunters of the United States. It is the Melis concolor of Linneeus and all subsequent systematic zoo- logical authors. In general and anatomical characters, teeth, &c., it is a typical member of the genus Felis, (See MAMMALIA, vol. xv. p. 434.) Though often spoken of as the American lion, chiefly on account of its colour, it rather resembles the leopard of the Old World in size and habits. Jt usually measures from nose to root of tail about 40

} His wife, Anna Maria Gumley, daughter of John Gumley of Isle- worth, usually styled "a wealthy glass manufacturer and army con- tractor," died on 14th September 1758, aged sixty-four. |

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inches, the tail being rather more than half that length. The head is rather small compared with that of other cats and has no mane. 'The ears are large and rounded. The tail is cylindrical, with some bushy elongation of the hairs near the end, but not forming a distinct tuft as in the lion. The general colour of all the upper parts and sides

Puma,

of the adult is a tawny yellowish brown, sometimes having a grey or silvery shade, but in some individuals dark or inclining to red. The lower parts of the body, inner sur-

face of the limbs, the throat, chin, and upper lip are dirty white ; the outside of the ears, particularly at their. base,

and a patch on each side of the muzzle black ; the end of

the tail dusky. The young, as is the case with the other plain-coloured Felidx, are, when born, spotted with dusky brown and the tail ringed. These markings gradually fade, and quite disappear before the animal becomes full-grown.

The puma has an exceedingly wide range of geographical distribution, extending over a hundred degrees of latitude, from Canada in the north to Patagonia in the south, and was formerly pretty generally diffused in suitable localities from the Atlantic to the Pacific Ocean, but the advances of civilization have in recent years considerably curtailed the extent of the districts which it inhabits. In Central America it is still common in the dense forests which clothe the mountain ranges as high as 8000 or 9000 feet above the sea-level, where the hideous sound of its howl- Ing is said to be almost continuously heard at night dur- Ing the breeding season, Though an expert climber, it is by no means confined to wooded districts, being frequently found in scrub and reeds along the banks of rivers, and even in the open pampas and prairies. Its habits much resemble those of the rest of the group to which it be- longs 3; and, like the leopard, when it happens to come Within reach of an abundant and easy prey, as the sheep or calves of an outlying farming station, it kills far more than it can eat, either for the sake of the blood only or to gratify its propensity for destruction. It rarely attacks man, and, when pursued, escapes if possible by ascending lofty trees. Several instances have occurred of pumas becoming tame in captivity. Edmund Kean, the celebrated actor, had one which followed him about like a dog. When caressed they express their pleasure by purring like a domestic cat,

PUMICE, a highly porous light mineral substance of Volcanic origin, resulting from the solidification of foam or scum formed by the escape of

steam or gas on the surface of molten lava, It is principally found of a whitish or clear

grey colour, more rarely of a slaty blue or reddish tint. In composition it is allied to the obsidians, containing in every 100 parts about 72 of silica, 17 of alumina, 2 of iron oxide, and 9 of soda and potash ; and under the blow-pipe it fuses to a whiteenamel. Its porosity renders it so exceedingly light that in the dry condition it floats readily on the surface of water, sinking only when thoroughly saturated. Owing to this property it is found very widely diffused over the ocean-bed, even at points far removed from volcanic vents, considerable blocks having been brought up in the dredgings of the "Challenger" at all the points of its sea-bottom exploration. It is obtained for industrial purposes in the regions of recent volcanoes—the Lipari Islands, Iceland, Auvergne, Teneriffe, &c.—and is highly valued as a smoothing and polishing material for the metals, marble, horn, wood, bone, ivory, and leather. For some purposes it is reduced to the condition of a fine powder, and used either direct or spread upon paper or linen, as glass or emery-paper. A toilet soap is prepared contain- ing a proportion of powdered pumice. An artificial pumice is made from a mixture of calcined and pulverized quartz and alumina baked in the form of a porous brick.

PUMP. Sce Mining, vol. xvi. pp. 458,459; Preumarics, vol. xix. p. 246; and HypromecuHanics, vol. xii. p. 533 sq.

PUMPKIN, See Gourp, vol. xi. p. 4, and Hort CULTURE, vol. xii, p. 283.

PUNCHINELLO (It. Policinella, Pulcinella), the most popular of the puppets, is of Italian origin, though its history is by no means free from obscurity. The earlier etymologists sought to trace the name to various mythical individuals, by whom, it was alleged, the type was first furnished. Galiani adopts the theory which derives it from the name of Puccio d'Aniello, a vintager of Acerra near Naples, who, having by his wit and grotesque appear- ance vanquished some strolling comedians in their own sphere, was induced to join the troop, and whose place, by reason of his popularity, was supplied after his death by a masked actor who imitated his

dress and manner. The claims of other individuals—Paolo Cinella, Polliceno, and Pulcinella, a Neapolitan dealer in fowls—have also found supporters, and the derivation of the name and character from some old mystery representing Pontius (O.E. Pownce ; Fr. Ponce) Pilate and Judas, or the J ews, was formerly popular. It has even been suggested that the title is a modification of roAd xuvéw as expressive of the restlessness which is characteristic of the puppet ; and the assumption that the character was invariably, of diminutive size has given rise to its reference to the word pollece, the thumb (cf. Ddumling, Tom Thumb). The most plausible theory, however, regards the name in its Italian form as a diminutive of pudcino, fem. pulcina, a chicken. It is sometimes stated that, in consequence of the habit of using the word "chicken" as a term of endearment, it came to mean "a, little child," and hence "a puppet" (Skeat), But this again involves the assumption that the application of the name to the char- acter was in some measure determined by the size of the puppets, whereas it would appear to have been trans- ferred from the comic stage to the puppet show, and the Pulcinella of the stage was not necessarily a dwarf. The choice, therefore, seems to lie between the theory of Quadrio, that it was applied on account of the resemblance of the hooked nose to a beak, and that of Baretti, which ascribes its employment to the nasal squeak and timorous impotence of the original character. With respect to the development of the modern type, it has been assumed that the whole family of Italian maschere (Arlecchino, Brighetta, and the like) are modified survivals of the principal Oscan characters of the Atellane, and that Punchinello is the representative of Maccus, the fool or clown. In proof of

this it is urged that Acerra, the supposed residence of Puccio d'Aniello and the traditional source of the char- acter, is in the neighbourhood of Aversa, the old Atella ; and reference is also made to a bronze statue of Maccus, discovered at Rome in 1727, an engraving of which has been preserved in Ficoroni's Le Maschere Sceniche e le Figure Comiche @Antichi Romani. But the resemblance of the statue to the puppet is scarcely to be termed a striking one, and the large nose and deformed figure are somewhat

hazardous ground on which to base a theory,— especially in view of the fact that such points of likeness as there are in it to the northern Punch are not to be found in the Neapolitan Pulcinella. It is possible that some relic of the old Ludi Oscz, transmitted through the Vice of the mystery plays, is to be found in the character ; but any direct descent from the Maccus of the Atellanz seems precluded by the fact that, while there are traces of the gradual development of the northern Punch from the Neapolitan Pulcinella, the latter with its grey hat, white smock and trousers, masked face, and undistorted body is widely different from its alleged prototype. It seems

necessary, therefore, to regard the Pulcinella as in large

part a distinct creation of comparatively modern date. Prior to the 17th century there is no indication in the Italian burlesque poets of the existence of Pulcinella, though Riccoboni places the creation of the part before

1600.

Andrea Perrucci (1699) and Gimma assert with some show of authority that Silvio Fiorillo, a comedian named after his principal part Captain Matamoros (the Italian Miles Gloriosus), invented the Neapolitan Pulcinella. It was afterwards improved by Andrea Calcese, surnamed Ciuccio, who died of the plague in 1656, and who, accord- ing to Gimma, imitated in the character the peasants of Acerra. This would place the origin of the Italian Pulcin- ella somewhere about the commencement of the 17th century, the original character appearing to have been that of a country clown, hook-nosed, shrill-voiced, cowardly, boastful, and often stupid, yet given at times to knavish tricks and shrewd sayings. In thorough accordance with this date, we find that the earliest known appearance of Polichinelle in France is at the commencement of the reign of Louis XIV., in the show of the puppet-playing dentist Jean Brioché. It might have been expected that the shrewder and wittier side of the character would most com- mend itself to the French mind, and there is good reason to believe that the Polichinelle of Brioché was neither a blunderer nor a fool. The puppet was almost immediately seized upon as the medium of political satire of the kind exemplified in the Letter of Polichinelle to Cardinal Mazarin (1649), and it is described in the Combat de Cyrano de Bergerac as a 'petit Ksope de bois, remuant, tournant, virant, dansant, riant, parlant,

petant" and as "cet hétéro- clite marmouset, disons mieux, ce drolifique bossu." In this there appear signs of transformation, whether the im- portation to France took place before or after the alleged improvements of Calcese. The hunchback had been long associated in France with wit and laughter, and there are, therefore, some grounds for Magnin's theory that the northern Punch is of French origin, a Gallic type under an Italian name, though there does not seem to be suffi- cient reason for adopting his suggestion that Polichinelle was a burlesque portrait of Béarnais. The date of its in- troduction into England has been disputed, Payne Collier being of opinion that Punch and King William came together, a second theory suggesting an earlier origin with the Huguenot refugees. In view of its popularity in France prior to the Restoration, however, it would be strange if its migration had been so long delayed, and it is more than probable that it crossed the Channel in the

wake of the Royalists. Apart from the general references by Pepys (1662) and by Evelyn (1667) to an Italian puppet-show at Covent Garden, the former makes men- tion (1669) of some poor people who called their fat child Punch, "that word being become a word of common use for all that is thick and short." An allusion to " Punch- inellos" is also to be found in Butler's satire on English imitation of the French, and Aubrey speaks of "a Punch- inello holding a dial" as one of the ornaments of Sir Samuel Lely's house at Whitehall. But, though the puppet did not travel in the train of William of Orange, allusions

_to it become far more frequent after the Revolution of 1688,

and the skill of the Dutch in their treatment of puppet mechanism may have enhanced its attractiveness. In 1703 it was introduced at Bartholomew Fair into a puppet play of the creation of the world; in 1709 (Yatler, No. 16) it was to be found in a representation of the Deluge, though in a different part from that of the Momus Polichinelle of Piron's Arlequin-Deucalion (1722); and in 1710 (Spectator, No. 14) it is mentioned as a leading figure in Powell's puppet-show at Covent Garden. The alleged satire on Robert Walpole, entitled A Second Tale of a Tub, or the History of Robert Powel, the Puppet-Showman (1715), furnishes some details of Punch

performances, and has an interesting frontispiece representing Powell with Punch and his wife. The Judy (or Joan, as she appears to have been sometimes called) is not of a specially grotesque order, but the Punch is easily recognizable in all but the features, which are of the normal puppet type. Other allusions are to be found in Gay's Shepherd's Week— Saturday (1714) and Swift's Dialogue between Mad Mulli- nix and Timothy (1728). The older Punchinello was far less restricted in his actions and circumstances than his modern successor. He fought with allegorical figures representing want and weariness as well as with his wife and with the police, was on intimate terms with the patriarchs and the seven champions of Christendom, sat on the lap of the queen of Sheba, had kings and dukes for his companions, and cheated the Inquisition as well as the common hangman. Powell seems to have introduced a trained pig which danced a minuet with Punch, and the French have occasionally employed a cat in place of the dog Toby, whose origin is somewhat uncertain. A typical version of the modern play, with illustrations, was published by Payne Collier and Cruikshank in 1828, (R. M. w.)

PUNCTUATION. See Patmocrapuy, vol. xviii. p.

163.

PUNJAB,! the most northern province of British India. Geographically the region called by this name is the tri- angular tract of country of which the Indus and the Sutlej (Satlaj) to their confluence form two of the sides, the third being the lower Himalaya hills between these two rivers. The British province now includes a large extent of country outside these boundaries, on all three sides—beyond the Indus to the range of hills running parallel to it on the west ; beyond the Sutlej eastward to the Jumna (Jamna) and southward to a distance of 60 miles below Delhi; within the hills, a large highland tract on the east and another on the west, with the Kashmir and Chamba terri- tories between. The British province stretches north and south from 35° 10' N. lat. at the head of the hill district of Hazara to 27° 40' at the south end of the Gurgaon dis- trict, and east and west from 69° 36' E. long. on the Dera Ghazi Khan and Sind frontier to 78° 55' on the Jumna. The length of the central line of communication across the province from Delhi to Peshawar by rail is 645 miles.

The name Punjab signifies "(country of] five rivers," Rivers ng ies ee

1 Panjab, according to received modern spelling ; but, as in other cases. of important and fanriliar names, the old form is commonly retained. :

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the five rivers being the great tributaries of the Inpus (q.v.), namely, the Jhelum, Chinab, Ravi, Bids, and Sutlej. These are all rivers of large volume, but, on account of the great width of sandy channel in their passage through the plains, their changing courses, and shifting shoals, they are of very moderate value for steam navigation, though they all support a considerable boat-traffic. The Indus has a course of about 550 miles through the Punjab. The Jhelum enters the plains a little above the town of Jhelum. Thence it flows south-west about 200 miles to join the Chinab. The Chinab (called Chandrabhaga in the hills, being formed by the union of the Chandra and the Bhaga, both from the Bara Lacha "ae aa Hills) enters the Punjab Sea about 15 miles north of Sialkét. About 200 miles lower down it receives the Jhelum on the right, and Saictoont about 60 miles farther the Na Ravi on the left. After a further course of about 120 miles it joins the Sut- lej. The Ravi, after reach- ing the plains, follows a very Winding course to its junction with the Chindb. | A deserted channel runs generally parallel to the present river through part of the district of Mont- gomery. The Bids enters the Punjab in the Gur- daspur district, and has a course in the plains of nearly 100 miles to its}, junction with the Sutlej near Hari-ki-Patan. The Sutlej flows nearly 500 miles through the plains before it unites with the Chinab, which is the junc- } tion of the five tributaries. |: Thence the united rivers (sometimes called Panj-nad or "the five streams ") flow in one channel about 50 miles to the Indus.

Whilst the general name Punjab is applied to the whole country of the five rivers, there are distinct names for each of the "doabs" (do, two ; db, water) or tracts between two

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‘ The name first given by the Aryans after their immigration was Sapia Sindhi, ‘(land of] seven rivers,” these being the five rivers of the modern Punjab with the addition of the Indus on the one side and of the Saraswati on the other. In the Vedic poems they are severally addressed as Sindhi, the Indus (the river) ; Vitasta, the Jhelum ; Asikni, Chinab; Atravati and Marudvridha, Ravi ; Vipdsa, Bids; Sutudri, Sutlej; and Saraswati, Sarsuti. It may be remarked that Sindhé itself means “river,” and Saraswati, “ having running water,” and that each is applied as an epithet to other great rivers. The Saraswati, alone of the seven, is not now great. It is represented by a channel or channels, occupying the position assigned to the ancient much-praised stream, but now nearly dry for a great part of the year; for, unlike the others, it comes ouly from the lower hills, not from perpetual snows. The large body of water which it carries for a time in the rainy season never reaches the Indus, towards which it directs Its course, but is lost in the desert lands of northern Rajputana and Bahawalpur. In writings of the 6th or 7th century B.C. the Saraswati is said to disappear and pass underground to join the Ganges and Jumna at Prig (Allahdb4d), which triple confluence received therefore the name Tribént. The Saraswati dropped out of the enumeration of the rivers of the early Aryan settlement; and, when in later days the Indus, which receives all the others, ceased to be reckoned along with them, the country took its name Panchanada, and afterwards, in Persian form, Panjab.

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adjoining rivers. The country between the Sutlej and the Bids is called the Jalandar Dob ; it includes the districts Jalandar and Hushidrpur. The long strip between the Bids-Sutlej and the Ravi, containing the greater part of the Gurdaspur, Amritsar, Lahore, Montgomery, and Multan districts, is called the Barf Doab. And Rechna Dodab is the tract between the Ravi and the Chinab, embracing the Sialkét and Gujranwala districts with the trans-Ravi portions of the districts of the Barf Dodb. Chaj or Jach is the dob

between the Chindb and the Jhelum (Gujrat and Shahpur districts and part of Jhang), and Sind Sagar (Indus Sea) is the name of the large dodb between the

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Map of Punjab. Jhelum and the Indus, including the Rawal Pindi, Jhelum, and Muzaffargarh districts, with parts of Shahpur, Bann, Déra Ismail Khan. The higher and drier parts of the dodbs are called "bar." They are waste but not barren, scantily covered with low shrubs, capable, when watered, of being well cultivated. The bar is the great camiel- grazing land. Large areas of the Muzaffargarh and Multan districts are "thal," barren tracts of shifting sand. The middle part of the Barf Dodb, in the Amritsar district, bears the distinctive name of Manjha (middle) as the centre and headquarters of the Sikh nation, containing their two sacred tanks of Amritsar and Taran Taran, and a dense and fine population of Jats, Rajputs, and Gujars. The Malwa Sikhs, again, are those of the cis-Sutlej country.

Besides the great rivers, the distinguishing feature of Minor the Punjab, there are some others deserving of notice. rivers.

The Cabul river joins the Indus above Attock after receiving, about 12 miles north-east of Peshawar, the Swat river, which enters British territory at Abazai. The Kunhar, from the Kashmir hills, flows down the Kaghan valley (the upper part of the Hazara district) and joins the Jhelum at Muzaffarabad. The Siran and the Dér in Hazara unite and near Torbéla run into the Indus, which

Area,

Physical features.

Mineral products.

Crops, &e.

below Attock also receives the Harro from Hazara. The Kurram, rising in Afghanistan and flowing through the Bannt district, falls into the Indus near Isa Khil, and the Sohan, from the lower hills of Kashmir, joins it above Kalabagh. The Bimbar, from the Kashmir Hills, below the Pir Panjal Pass, runs into the Chindb near Wazirdbad. The Dég, from the Jammu Hills, joins the Ravi near Gugaira. South of the Sutlej the Markanda, the Saras- wati, the Gaggar, and the Chitang, from the lower hills of Sirmur, which are violent torrents during the rainy season but nearly dry at other times, flow towards the Indus, but never reach it, being lost in the sands of the Bikanir and Bahawalpur desert.

The area of the Punjab proper, the triangular tract of country between the Indus and the Sutlej, is about 62,000 square miles; the whole area of the British province is 106,632, and of the feudatory states 35,817, making a total of 142,449 square miles. This area is for the most part a great alluvial plain. The north-east side of the province is a belt of hill-country, the outer margin of the Himalayas, on which are the valuable hill-stations of Murree, Dalhousie, Dharmsala, Kassauli, Sabéthi, Dagsliai, and Simla. In the Delhi and Gurgaon districts is the north end of the Aravali range. A part of the extremity of these hills became well known at the time of the siege of Delhi in 1857 under the name of the " Ridge," which was held by the British troops. Between the Jhelum and the Indus is the hilly region known by the general name of the Salt Range, containing the inexhaustible stores of rock-salt which have been worked for many centuries. The salt is dug from enormous caverns entered by narrow tunnels. The salt-hills are continued west of the Indus, where the salt is dug from open quarries. A double range of low hills runs south-westward from the Indus near the mouth of the Kurram. The part near the south end called Sheikh Budin (Sheikh Shahdéb-uddin) is a useful sana- torium, though of no great height or great extent. The western boundary of the province is the fine range of the Suliman Mountains, dividing the Punjab from Afghan- istan. The British possessions do not extend beyond the base of the hills, which are occupied by very independent tribes. It is only within a short time past that any exact knowledge has been obtained of the interior of these hills, beyond the parts visited in the course of the numerous frontier expeditions for the punishment

of inroads into British territory. A survey was made for the first time in 1883 of the fine mountain mass containing the snowy peak Takht-i-Suliman (Solomon's throne) and its sur- roundings.

Besides the rock-salt the mineral products of the Punjab are not many. Limestone, good for building, is obtained at Chanidt on the Chinab and at a few other places. There are extensive alum-beds at Kaélabagh on the Indus. A small quantity of coal is found in the Salt Range in disconnected beds, mostly at a considerable height above the plain, and not very accessible, the beds thinning out westwards from the Jhelum to the Indus. Petroleum is found in small quantities at a number of places in the Rawal Pind{, Kohat, and Bann districts, being gathered from the surface of pools or collected in shallow pits. It is used for making gas for the station of Rawal Pindi. In almost all parts of the Punjab there is '"kankar," rough nodular limestone, commonly found in thick beds, a few feet below the surface of the ground, used for road metalling and burned for lime.

As in other parts of India, there are commonly two har- vests in the year. The spring crops are wheat, barley, gram, various vegetables, oil-seeds, tobacco, and a little opium ; the autumn crops, rice, millets, maize, pulses, cotton, indigo, and sugar-cane. Tea is now extensively

cultivated in the Kangra district. Flax has been pro- duced successfully, but the cultivation has not been ex- tended. Hops have been grown experimentally, for the Murree brewery, on neighbouring hills; the cultivation in Kashmir has been more encouraging. Potatoes are grown extensively on cleared areas on the hills. The Punjab produces freely many of the Indian fruits, but none of special excellence except the peaches of Peshawar. Grapes are grown in many of the Himalayan valleys, where the rain is not excessive, also at Peshawar; but they are in- ferior to those brought from Cabul.

The forest area of the Punjab consists of 4694 square Forests, miles reserved, under the management of the forest depart- ment, and 13,000 square miles under the district officers.

The demarcation of protected and reserved forests is being extended. The wasteful destruction of trees is checked in the hill forests rented from native

states by the British Government. The principal reserved forests are the deodar (Cedrus Deodara) and chil (Pinus longifolia) tracts in the hills, the plantations of shisham (Dalbergia Sissu) and sal (Shorea robusta) in the plains, and the fuel rakhs or pre- serves (Acacia, Prosopis, &c.). The average nett surplus of forest income for the ten years 1875-85 was Rs.161,800. ;

The rainfall in the Punjab varies greatly in different Climate, | parts and from year to year. The maximum (126°55 | inches in the year) is at Dharmsala, on the face of the high north wall of the Kangra valley; the minimum (5:96) is in the Muzaffargarh district. In a country so open and so far from the sea there are extremes of heat and cold. A temperature of 128° Fahr. in the shade has been recorded, and a winter temperature of 25° at sunrise is not in- frequent. At Lahore, on the grass, the thermometer has | been known to fall to 17°. 1]

Of the whole area of British Punjab (106,632 square Cultiva- |

miles) 36,755 square miles are cultivated and 64,263 un- tion | cultivated, the remaining 5614 being reckoned uncultivable. | An area of 75,434 square miles (48,377,760 acres) is held by 33,020 village communities, formed of small proprietors | having joint interests and joint responsibility for the land | revenue, but cultivating each his own land. Among the Pathans of the trans-Indus districts the tribe and not the village community is in some cases the jointly responsible a body. There are 3406 estates of larger proprietors, with | a total area of 4,531,415 acres; and there are 10,216,872 acres of waste land, the property of the Government, of which less than one-half is capable of cultivation. The total area under wheat is seven millions of acres. There

is an increasing export of wheat, gram, rice, and oil- seeds.

Irrigation for large areas is from canals and from reser- Irriga- voirs, and for smaller areas from wells. The canals are of tion. two kinds, those carrying a permanent stream throughout the year, and those which fill only on the periodical rising of the rivers, the latter commonly known as " inundation canals," There are only a few parts of the country pre senting facilities for forming reservoirs, by closing the narrow outlets of smiall

valleys and storing the accumulated rainfall. The old canals made by the Mohammedan rulers, of which the principal are Firéz's Canal from the Jumna and the Hasli Canal from the Ravi, have been improved or reconstructed by the British Government. The principal new canals are the Sirhind, drawn from the Sutlej near Rupar, and irrigating parts of the native states of Patidla and Nabha as well as British territory ; the Barf Doéb Canal from the Ravi; the Swat Canal, drawn from the Swat river at Abazai; and inundation canals in the districts of Firéz pur, Shéhpur, Multén, and the Dérajat, from the Sutlej, the Jhelum, the Chindb, and the Indus. Water was admitted into the Sirhind Canal on 1st July 1882. Its branches are still under construction.

Popula- tion. |

| Adminis- curative "| livisions.

ative tates,

rwws AB

The population of the British province in 1881 numbered 18,850,437, of the feudatory states 3,861,683 ; total, 22,712,120, This total number consists of :—

British Native Territory. States. Total.

MOWAMMEMAMS ..5… cern ccnese 10,525,150 1,137,284 11,662,434 WS sacecougR nae 7,130,528 | 2,121,767 9,252,295 PEE ne ari ca ies ones «a0 1,121,004 595,110 1,716,114 IPP sh hiceentesaes esc 35,826 6,852 42,678 IPM SINANIS so. clslele's s0ise rt oaecce ee 33,420 279 33,699 PRUTISHS sci ccs e sees cs cesces 2,864 387 3,251 ISS S36 cocg0e BODE Co eee 462 3 465 'CAINE 9.0 Gree eae eee 1,183 1 1,184

18,850, 437 3,861,683 22,712,120

The Christians are thus distri-}—-—-———— |———___ —_____

buted :—

Huropean, British subjects …. 10,761 159 10,920 Other European and American 17,015 8 17,023 [ORCESI 9 leon enone e Conene 1,821 23 1,844 SUNG "Gqgggeoee eee 3,823 89 3,912 33,420 | 279 38,699

The Punjab has one-fourth of the Mohammedan inhabitants of India, one-twentieth of the Hindus, and eleven-twelfths of the Sikhs. Of the Hindus the classes most largely represented are Jats (4,432,720) and Rajputs (1,677,569). There are in the Punjab certain criminal tribes, always under surveillance, of which the population is at present 13,957.

The tribes of the western hill frontier are Mohammedans and Pathans in the north and Baluchis in the south (with one Pathan tribe among them). 'There are sixteen principal Pathan tribes, of which the most important are the Momand, Afridi, and Orakzai on the Peshawar border, and the Waziri adjoining Bannti and the Dérajat ; and seven Baluch tribes on the Déra Ghazi Khdn border, the chief of which are the Bézdar, Marri, and Bugti.

The British province is divided for administrative purposes into thirty-one districts, each under a deputy commissioner, grouped in

six divisions, each under a commissioner. Division.) District. | Area.| POP |! pivision.| District. | Area, | P: ae sq.m. sq. m. Delhi ..! Delhi…./ 1,276 | 643,515 || Rawal | Rawal – Gurgaon 1,938] 641,848|/ Pindi Pindi..) 4,861] 820,512 Rohtak ..'1,811 | 553,609 Jhelum ..| 3,910] 589,373 Hissar 1,./5,042 | 630,820 Shahpur 4,691} 421,508 Karnal ..'2,396 | 622,621 Gujrat ..| 1,973] 689,115 Ambala .. 2,570 |1,067,263 Gujran- Simla….! 18 42,945 wala ../ 2,587) 616,892 Jalandar| Ludidna 1,375 | 618,835 Sialkot ..) 1,958] 1,012,148 Firdzpur! 4,254 | 777,156 || Dérajat | Muzaffar- Jalandar 1,322] 789,555 garh ..| 8,139] 338,605 Hushiar- Dera ur…. 2,180] 901,381 Ghazi Kangra …9,069 | 730,845 Khan..| 4,517] 363,346 Lahore | Gurdas- Déra pur.. .(1,822 | 823,695 Ismail Airitsar 1,574 | 893,266 Khan..| 9,296] 441,649 Lahore ..:3,648| 924,106 Bannu ..! 3,868} 332,577 Jhang .. 5,702} 395,296 || Pesha- | Peshawar 2,504| 592,674 Mont- war Hazira ..) 3,039] 407,075 gomery 5,574] 426,529 Kohat . 2,838! 181,540 Multan …5,880| 551,964 Khyber ra 8,173 Pass —_———

106,632 18,850,437

The native states in feudal subordination to the British Govern- ment and in connexion with the Punjab are thirty-six in number, thirty-one Hindu and five Mohammedan. Of these many are very insignificant, the rulers being petty Rajput chiefs of old family and smal] means. The highest chief in rank and importance is the maharaja of Kashmir and Jammu, a Dogra Rajput (see vol. xiv. p. 12). The next is the maharaja of Patida (¢.v.). The Moham- medan state of Bahawalpur on the Sutlej is next, with a popula- tion under half a million and a revenue of about 20 lakhs. Next mM order are the rajas of Jind and NABHA (g.v.), cis-Sutlej states. They are Jats, like the mahardéja of Patidla, of the Phulkian clan (named from Phul, the founder of these three houses, in the middle of last century). Next comes the raja of KAPURTHALA (g.v.) in the fertile Jalandar Doab, of the Ahltwalia family. Of the rest the Most important in point of revenue are the states of Mandi in the hill country west of the Sutlej, and Sarmur in the hills east of that 'iver, under Rajput rulers, and Farfdkét and Malér Kotla in the plains, cis-Sutlej, the former Hindu, the latter Mohammedan.

Of the 22,700,000 people in the Punjab, in British territory and the native states, about 14,000,000 speak the provincial language, Panjabi, which varies in character in different parts of the pro-

vince, About 4,250,000 speak HinpusTani (q.v.), this number Including those whose ordinary vernacular is Hindi, but who 1 The

figures for the Hissir and Firdzpur districts are only approximate,

but the sum of the two together is correct. In the redistribution which is

_ROw (1885) being carried out the former district of Sirsa has been abolished ;

the eastern part is added to Hissar and the western to Firédzpur. In the above Statement half of the area and population has been assigned to each.

understand and are gradually adopting the more comprehensive Hindustani. These two languages are the most generally used. throughout

the province, but not equally in all parts. The other languages in use are more or less local. Jatki, spoken by about 1,500,000, belongs chiefly to the south-east districts. The language of the eastern hill country is a form of Hindi, spoken by about 1,500,000. Dégri is the language of the northern hills, and Kashmiri of a few large bodies of Kashmir workpeople at Ludiana, N urpuy, Amritsar, and some other places. The language of the Pathans of the northern part of the trans-Indus frontier is Pushtu (see vol. i. p. 238). Baluchi is spoken on the same frontier, farther south, ad- Jacent to Baluchistan, Sindi at the extreme south, next to Sind, and Bagri, a variety of Hindi, in the cis-Sutlej district bordering on Bikanir. There are also some minor local dialects, and a few people speaking langnages not of the Punjab,—Persian, Bengali, Mahrathi, Turki, Tibetan, Nipalese. Hindustani is the language of the law courts and of all ordinary official and other communica- tions with chiefs and people.

Many books, periodicals, and newspapers are published in some of these spoken languages, the greatest number in Hindustani, others in Hindi, Panjabi, Pushtu, and Persian, also some in Sanskrit and classical Arabic, which are not spoken. During the last quarter of which the details are published 360 books were registered, 161 Hindustani, 135 Hindi, 36 English, 16 Arabic, the rest bilingual. There are 7 English and 23 vernacular periodicals, monthly and fortnightly, and 28 vernacular hewspapers are published in the British province and 8 in native states.

The number of children under instruction in schools in the Pun- Educa- jab is 184,000 (9000 girls). There are 1559 primary schools for tion, boys, 206 middle schools, 25 high schools, and 3 industrial schools, also a training college and 4 normal schools. For girls there are 321 primary schools, 4 middle, 1 high, 1 industrial, and 4 normal schools. The higher and special educational institutions are the Lahore Government College, the Cambridge University Mission College at Delhi, the Oriental College of the Punjab University, the Medical School, and the Mayo School of Art, the last three at Lahore. A ward's school, for the orphans of Sikh chiefs, estab- lished at Ambala in 1867, is about to be extended to receive other upper- class students. The Government department of public in- struction was established in 1856. In 1868 the first proposal of a university for the Punjab was made, chiefly at the instance of the literary society called the Anjuman-

i-Punjab, with the support of the native chiefs. The institution took the form in 1870 of the Punjab University College, and it was raised in November 1882 to the status of a university. There are several other literary societies in the Punjab besides the Anjuman at Lahore.

The police force numbers 19,827 men, with 580 officers, 68 of whom are Europeans. There is in addition a special frontier police.

The military force in occupation of the Punjab consists of (1) Army. British troops (of which it has a larger proportion than any other province) ; (2) native troops of the regular Indian army ; (3) the Punjab frontier force, a local body of cavalry, infantry, and artillery, ordinarily employed only on the military duties of the western frontier ; and (4) the frontier militia, composed of men of the border tribes, both within and without British territory, employed as auxiliary to the regular troops, to garrison certain of the smaller fortified posts along the fronticr. There is also a volunteer rifle corps of Europeans at the large stations and on the lines of railway. The total military force, including police, of the native states in connexion with the Punjab is 21,500.

Most of the native manufactures of the Punjab are those common Manu- to other parts of India, such as the ordinary cotton fabrics, plain factures. woollen blankets, unglazed pottery, ropes and cord, grass matting, paper, leather-work, brass vessels, simple agricultural implements, and the tools used in trades.2 Other manufactures, not so general, yet not peculiar to the Punjab, are woollen fabrics, carpets and shawls, silk cloths and embroidery, jewellery and ornamental metal-work, wood and ivory carving, turned and lacquered wood- work, glazed pottery, arms and armour, and musical instruments. But some of these classes of manufacture are represented by work of special kinds or special excellence in particular parts of the Punjab, notably the silk fabrics of Multan and of Bahawalpur, the capital of the native state ; the carpets of Lahore, Peshawar, &c. ; the ‘“ “kashi” (see KasH1) or glazed tile-work (an ancient art still practised in a few places); “kéft-kari,” inlaid metal-work (gold wire on steel), chiefly made at Gujrat and Sialkét ; shawls and other fine woollen fabrics, made by Kashmiri workpeople at Ludiana and Nurpur, as well as in Kashinir ; ‘“lungis,” waist and turban scarfs, made at Peshawar, Bannu, &c. ; silk

embroidery for shawls, scarfs, and turbans, at Delhi, Lahore, and Multan ; embroidery on cloth for elephant-trappings, bed and table covers, &c., at Lahore and Multan ; enamelled ornaments, in Kangra and Miltdn ; quill embroidery on leather, in Kangra and Simla ; lacquered wood-

2 The India Museum at South Kensington has an excellent series of repre- sentations of native artisans and their mode of working, from the pencil of the present director of the Lahore School of Art, Mr J. L. Kipling, formerly of the School of Art at Bombay.

Finance.

Com- munica- tion.

History.

work, Pak Pattan. At Kohat there is a special manufactory of gun-barrels made of twisted iron straps. Thcre is much excellent carved wood-work on houses and on boats. Among the Punjab arts should be mentioned the artificial nose-making practised by a special class of surgeons at Kangra. Injury has been done to some of the native arts of the Punjab, as of other parts of India, by unwise copying of European patterns. The Lahore School of Art is expected to correct this and promote the study and execution of native forms and designs. The Lahore Museum contains illustra- tions of the arts and manufactures, as well as raw products, of the Punjab, and a large collection of the sculptures, mostly Buddhist, and many of Greek workmanship, found in the north-west of the province, chiefly trans-Indus. Upwards of 200 Greco – Buddhist sculptures were excavated in Yusufzai in 1883 and 1884. The number of visitors to the Lahore Museum during the year 1884 was upwards of 251,000. The value of the imports into the Punjab during the same year was £981,167, and of the exports £1,088,919. The chief lines of export and import traffic, apart from the trade with the immediately adjoining countries, are on the one side the railway to Delhi and the North-West Provinces, and on the other the Indus River and Indus Valley Railway to Sind and the sea. The Punjab exports wheat, tea, rock-salt, sugar, and other pro- ducts, and articles of local manufacture. English

piece-goods, cutlery and other metal-work, fruits (especially from Afghanistan and Kashmir), rice, drugs, and spices are among the chief inrports. The most important trade-centres are Delhi, Peshawar, Multan, and Amritsar. There is a large amount of both export and import trade with the countries on the north-west frontier. Efforts were made for some time by the Government to promote trade between the Punjab and Kashgar, but without much result. The endeavour is now being carried on by private enterprise. There are great difficulties in the hill country between, where the goods have to be carried on mules and ponies.

The revenue of the British province is £3,232,349. Of this sum £1,605,243 (consisting of land revenue £1,220,880, and minor items £384,363) goes to the iniperial treasury; £1,410,379 is provincial, raised and expended in the province in addition to an imperial grant ; and £216,727 is derived from local rates and mis- cellaneous income, and is locally expended.

The total length of railways in the province now (1885) open for trafic is 1205 miles. The main central line from Delhi to Pesha- war is 645 miles in length, of which 125 are east of the Jumna in the North-West Provinces, and 520 in the Punjab. Other lines now open are—Lahore to Multan 208 miles, and 10 to Shir-Shah, the port of Multan on the Chinab, Multan to Bahawalpur 63, Delhi to Riwari 52, Riwari to Hissar 89, Hissar to Firdzpur 130, Amritsar to Pathankot 67, Wazirabad to Sialkét 27, Lala Musa (near Gujrat) to Pind Dadan Khan and the Salt Mines 62, Rawal Pindi to Khushhalgarh 77. Other lines are under construction. There are 1467 miles of metalled road, 23,156 unmetalled, and 2676 miles of navigable river. In this country of great rivers, crossing lines of road, the value of boat-bridges is very great. During the five years following the construction of the bridge of boats over the Indus at Déra Ismail Khan the annual camel traffic between Afghanistan and the Punjab by the Gumal Pass, through the hills on the west, increased from 50,000 to 80,000, with corresponding increase of the " tirni" or grazing-tax paid by the Povinda camel- drivers. This trade-route and this class of carriers are of some im- portance. For a long time to come they are not likely to make way for other means of transport by road or railroad, though the trade will grow. The Povinda are a travelling tribe belonging to the Ghilzai country in Afghanistan. They make annual trade journeys into India by this route,

which is an easy and good one, capable of being turned to more account. The Sikhs imposed heavy duties on the goods they brought. The remission of these duties by the British Government greatly encouraged the trade, which is now further helped by the boat-bridge across the Indus. There are many passes through the hills between British India and Afghanistan, of which the principal are—the Khyber in the north, close to Peshawar, the nearest way to Cabul; the Bolan in the south, approached from Shikarpur and Jacobabad in Sind, the way to Quetta and Candahar; and between them three others looking towards Ghazni, namely, Gumal Pass, the valley of the united Gumal and Zhob rivers opposite Déra Ismail Khan, and the Kurram and Dawar routes opposite Bannu.

While the amount of railway and other traffic has been steadily increasing with the facilities afforded, the demands on the post- office and telegraph have likewise been growing rapidly. The annual number of letters and post-cards, now about twenty millions, has nearly doubled in ten years. The telegraph has had a fluctuat- ing increase in the number of messages, which during the year 1884 was upwards of 142,000.

History.—For the early history of the Punjab from the Aryan immigration to the rise of the Mogul dynasty the reader may consult the article Inp1a (vol. xii. p. 779 sqg.). It deserves, how- ever, to be specially noted here with reference to that period that from the time of Alexander onwards Greek settlers remained in

PUN? 2%

the Punjab, and that Greek artists gave their services for Buddhist work and introduced features of their own architecture in Indian as well as Grecian buildings. Besides the bases and capitals of large Greek columns at Shah-deri (Taxila) and elsewhere, numerous sculptures of Greek workmanship have been found at various places. These are single statues (probably portraits), also figures of Buddha, and representations of scenes in his legendary history, and other subjects. They are obtained from ruins of monasteries and other buildings, from mounds, and the remains of villages or monumcutal topes. Of Buddhist buildings now remaining the most conspicuous as well as distinctive in character are the topes (sthupa), in shape a plain hemisphere, raised on a platform of two or more stages, One

of the largest of these is at Manikyala, 14 miles east of Rawal Pindi. These Buddhist buildings and sculptures are all probably the work of the two centuries before and the three or four after the beginning of the Christian era. The character of the sculptures is now well known from the specimens in the India Museum, South Kensington, and both originals and casts of others in the Lahore Museum. Unfortunately they have no names or inscriptions, which give so much value to the sculptures of the Bharhut tope.

The several bodies of settlers in the Punjab from the earliest Tribes times have formed groups of families or clans (not identical with and Indian castes, but in many cases joining them), which have gener- clans,

ally preserved distinct characteristics and followed certain classcs of occupation in particular parts of the country. Some of the existing tribes in the Punjab are believed to be traceable to the early Aryan settlers, as the Bhatti tribe, whose special region is Bhattiana south of the Sutlej, and who have also in the village of Pindi Bhattian a record of their early occupation of a tract of country on the left bank of the Chinab, west of Lahore. The Dogra, another Aryan clan, belong to a tract of the lower hills between the Chinab and the Ravi. Others similarly have their special ancient localities. To the earlier settlers—the dark race (Dasyt) whom the Aryans found in the country, and who are commonly spoken of as aborigines—belonged, as is supposed, the old tribe called Takka, whose name is found in Taksha-sila or Taxila. And from the later foreigners again, the Indo-Scythians, are probably descended the great Jat tribe of cultivators, also the Gujars, a pastoral people and traders, and others. Some of the tribes or sections of them, having received the Hindu faith and the system of caste, have afterwards given large bodies of converts to Mohammedanism, so that there are now Hindus and Moham- medans of the same tribe continuing to bcar the same name, There are Mohammedan Rajputs, and there are both Hindu and Mohammedan Jats, and so with others.

It was during the events which brought Babar, the first of the Sikh Mogul dynasty, to the throne that the sect of the Sikhs arose. sect.

Nanak, the founder, derived his first ideas of the movement he was to lead from Kabir of Banaras, a Mohammedan by birth (it is

-believed), who joined himself to a sect of Hindus and strove to

give to their religion a new form and spirit free from idolatry. And the Sikh religion of the Punjab, founded on this model, was a reformed and monotheistic Hinduism. Nanak was born in 1469 at Talwandi on the Ravi, and lived to the age of seventy, leaving a large number of followers at his death. The name Sikh means "disciple," and the strength of the movement lay in the relation of the disciple to the "guri" or spiritual guide. In the time of Babar's successor, Humayiin (who was only in the Punjab during the tem- porary success of his rival, Shir Khan Sur), the Sikhs were under the direction of the second of their gurus, Angad (1539-1552), and of the third, Amar Das (1552-1574). During the long reign of Akbar (1556-1605) the Sikhs increased in number and power under the mild and liberal rule of a Mohammedan emperor who was nore than tolerant in all matters of religion. He himself sought diligently for knowledge of other faiths, and Amar Das, the Sikh guru, was one of those who had conferences with him. Rain Das, son-in-law of Amar Das, succeeded him in 1574. He received from Akbar a gift of a piece of land, on which he dug the large sqnare tank afterwards called Amritsar ("the pool of immortality"). In the last year of this guri's life the Punjab was visited, on Akbar's invitation, by several Jesuit fathers from Goa, who were received with great favour. To them the emperor gave a site for a church in the city of Lahore, and the church was built at his expense. In 1581 Ram Das was succeeded by his son Arjun Mal, a man of note. In the middle of his father's tank at Amritsar he built the temple, which was called at first Hari Mandar, and afterwards Darbar Sahib, the name by which it is now known. The town which began to rise round the tank and temple was made the headquarters of the Sikhs. Arjun gave further coherence to the body of his followers by levying a regular tax in place of the free and varied offerings they used to give; and he was the compiler of the sacred book called the Adi Granth, the materials for which he had received unarranged from his father. Akbar lived much in the Punjab. In 1586 he directed a campaign against the Afghans of the Peshawar valley, which was attended with no important results except the death of his able minister Bir Bal. In the next year he conquered Kashmir. On his visit to this new acquisition he was

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accompanied by one of the Portuguese Jesuits, Jerome Xavier (nephew of the celebrated Francis), who was a special friend of the emperor and was with him at the time of his death at Agra in 1605. Arjun's power and prosperity lasted only during Akbar's lifetime. Jahangir was equally favourable to the Christian mis- sionaries ; but the Sikh gurt incurred his displeasure. Believed to be a partisan of the emperor's rebellious son Khusru, Arjun was imprisoned in 1606 and died soon after. His successor, Har Govind, was only twelve years of age at the time of Arjun's death, and as he grew up his relation to the Sikhs became that of com- mander more than guri. The promulgation of the Granth for instruction of the people had made a way for this change in the character of the leadership. The work of the teacher was now in great measure transferred to the guardians of the sacred volume, who read it in the ears of the people. The guri thenceforth was the organizing head more than the religious guide. As a young man Har Govind accompanied the emperor to Kashmir. Jahangir, on his way back from this favourite summer resort, died at Rajaori in 1627, and was buried at Shah-dera on the Ravi, opposite Lahore. His widow, Nur Jahan, erected a beautiful monument over him, and was herself buried at the same place.

The reign of Shah Jahan (1627-1658) added much to the pros- perity of the Punjab. The emperor's large views found a fitting agent in Ali Mardin

Khan, his minister and director of works. Under his orders the canal from the Ravi near the foot of the hills to Lahore was made, and the Jumna Canal, which had been con- structed in the 14th century by Firéz Shah, was restored and im- proved. Ali Mardan Khan also built the magnificent "sardis" or rest-houses for travellers on the high road to Kashmir, and other works of utility in the Punjab. In the contests between the two sons of Shah Jahan the Punjab favoured the elder, Dara Shiké, whose intelligent interest in the welfare of the country, joined to literary tastes and liberal views, commended him to all classes of the people. His name is preserved in the town of Shiké-pira, 18 miles west of Lahore, Dara-nagar, and other places. The present military station of Lahore bears the name of Dara's religious in- structor, Mian Mir, near whose tomb, erected by his royal pupil, the British cantonment is built.

Har Govind, the sixth Sikh gurd, died in 1645. Har R4i, who succeeded him, gave his support to Dara Shiké. Dara was not successful in maintaining his rights against his younger brother Alamgir (called Aurangzib), who succeeded his father in 1658. Bernier, who was visiting India at this time, was a companion of the elder brother when in misfortune and of the younger when in power. Like his three predecessors, Aurangzib was fond of visiting Kashmir, and his journey through the Punjab on one of these occasions (1663-64) furnishes one of the most lively pictures of Bernier's Indian experiences. Har Rai died in 1661, and his successor, Har Kishan, a boy, held the nominal leadership of the Sikhs only three years, being followed in 1664 by Tegh Bahadur, a son of Har Govind. When, on his return to the Punjab from a visit to Bengal, he was thought to be exercising authority in- consistent with loyalty to the emperor, he was put to death by Aurangzib in 1675. This roused the Sikhs to greater zeal in the adoption of a military constitution. The next gurt, Govind Rai, son of Tegh Bahadur, after passing some years in retirement and study, came forth a vigorous and enthusiastic leader, with high aims. He set himself to the task of organizing the Sikhs of the Punjab, now becoming formidable from their number, their phy- sique, and their warlike propensities. The first adherents of Nanak, the founder of the sect, had been mostly Jats and Khattris. Many Were men of great stature and powerful frame. As Sikhs they acquired a distinctive appearance by giving up the Hindu prac- tice of shaving the head and face. They were forbidden the use of tobacco; and their discipline in other things

prepared them for being indeed the soldiers they looked. Govind Rédi adopted the designation " Singh" (lion), and this became the distinctive addition to the names of all Sikhs. He called the whole body the "khalsa" or free, and he devised a rite of initiation called the "pahal." He compiled a supplement to the Granth, containing instruction suited to the altered coudition of the Sikh people. After the death of Aurangzib in 1707 he accepted the invitation of Bahadur Shah to join him in a campaign against the Mahrattas. At Nadér, on the Godavari, he was murdered in 1708. His prin- cipal associate, Banda, led the Sikhs back to the Punjab and turned

18 arms against the Government. After a long series of fights with the Mogul's troops, during the reigns of Bahadur Shah and Farrukh Siyar, Banda was at length taken in 1716 and put to death.

Mohammed Shah was on the throne of Delhi, much occupied in contests with the Mahrattds, when Nadir Shah invaded India. Nadir's march through the Punjab in the beginning of 1739 met with no great opposition; but the Sikhs kept up a system of desultory plunder both of the invaders and of the people fleeing from them. Lahore submitted and was spared ; and it escaped again, on Nadir's return, after the defeat of Mohammed Shah at Karnal and the massacre at Delhi, by having a large sum of money teady to meet the expected demand. The Punjab offered no more

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effective resistance to the invasion in 1747 of Ahmad Shgh Abdali, who kept possession of Afghanistan after Nadir's death, He began by claiming the revenues of the parts of the Punjab and Sind which had been ceded to Nadir. On his third invasion (1752) he obtained possession of Lahore and Multan. The king of Delhi was now also an Ahmad Shah, and the invader was, for distinction, called in India Ahmad Khan Afghan. His son Timur, whom he made governor of Lahore, was driven out by the Mahrattas. Ahmad found frequent visits to the Punjab necessary, and only aftcr the total defeat of the Mahrattds at Panipat in 1761 did he retire finally to Cabul.

For a time the Sikhs seemed to have the prospect of holding the Period Punjab for themselves. Their number and power had greatly of inde-

increased. They had grouped themselves in associations and neighbourhood called " misls," with distinctive names, Power- ful menibers of certain of these clans, representing the aristocracy of the Sikh families, acquired the chiefship of large tracts of country on both sides of the Sutlej, some of which became nearly independ- ent states. Then there were certain members of the Sikh con- fedcration, not enrolling themselves in any clan nor owning any master, who assumed the réle of religious enthusiasts and warriors, and the name "Akali" or immortal. They were the ghazis of Sikhism. They dressed in blue and wore a high-pointed turban on which they carried several chakras of different sizes, their own special weapon. The chakr or chakra is a thin knife-edged ring of flat steel, a severe missile in skilled hands, but not much used. The Sikhs south of the Sutlej enlarged their possessions and made marauding excursions across the Jumna and the Ganges even as far as to Rohilkand. The capital was held by three leading Sikh chiefs, when, in 1797 and the following year, Zaman Shah, grand- son of Ahmad, brought an army with the view of recovering the Punjab, but was recalled both times by troubles at home. He secured Lahore without opposition, and on leaving in 1798 he niade it over to a young Sikh who had attracted his attention and done him good service. This was Ranjit Singh, son of Maha Singh, Ranjit a Jat Sikh who had risen to considerable power, and who died Singh. in 1792. The young ruler of Lahore was soon to make himself master of the whole Punjab, while heavy misfortune was awaiting Zaman Shah himself, who was to find shelter in the Punjab. The dethroned and blinded king was met in 1808 at RAwal Pind{ by Mountstuart Elphinstone when returning from his mission to Shah Shuja at Peshawar. When Ranjit Singh was beginning his career at Lahore the English adventurer George Thomas was trying, with the army he had raised, to carve out a little principality for himself in the Sikh states south of the Sutlej. Ranjit was a man of strong will and immense energy, of no education but of great acutcness in acquiring the knowledge that would be of use to him. He soon began to bring all the separate bodies of Sikhs under his control, and to acquire authority over others besides the Sikhs. When he endeavoured to include the Sikh states south of the Sutlej within his jurisdiction, the heads of these states—chiefs of Sirhind and Malwa, as they were called—sought and obtained in 1808 the protection of the British, whose territories had now extended to their neighbourhood. The English were at this time desirous of alliance with Lahore as well as with Cabul, for

protec- tion against supposed Freuch designs on India. A British envoy, Mr Charles Metcalfe, was received by Ranjit at Kasur in 1809 and the alliance was formed. Ranjit steadily strengthened himself and extended his dominions. In 1809 he obtained possession of Kangra, which the Nepalese were besieging. In 1813 he acquired the fort of Attock on the other side of the Punjab ; and the same year he obtained from Shah Shuja, now in his turn a refugee in Lahore, what he coveted as much as territory, the celebrated Koh-i-nir diamond, which had been carried off by Nadir Sh4h from Delhi. In 1818, after some failures in previous years, he captured Multan. Kashmir, which had successfully opposed him several times, was annexed the following year, and likewise the southern part of the country between the Indus and the hills. The Peshawar valley he succeeded in adding four years later, but he found it best to leave an Afghan governor in charge of that troublesome district. These trans-Indus and other outlying tracts were left very much to themselves, and only received a military visit when revenue was wanted. Peshawar was never really ruled till General Avitabile was sent there in later years. When he was gradually raising his large and powerful army Ranjit received into his service certain French and other officers, who drilled his troops and greatly improved his artillery. He valued these European officers highly, and exerted himself much to retain them. One of them, M. Allard, used to say that, if it was sometimes difficult to get into Ranjit's service, it was more difficult to get out of it. Whilst he relied on these foreigners for military and sometimes also for administrative services, he drew around him a body of native ministers of great ability, of whom the brothers Guldb Singh and Dhian Singh of Jammu were the most influential. (They had another brother, Suchét Singh, less prominent and less at court.) Ranjit maintained friendly relations with the English Government till his death. This was of much importance when, immediately

of kindred pendence.

Years of disorder.

First Sikh war.

Second Sikh war.

Under British rule.

after his death in 1839, the British were putting Shah Shuja back on the throne of Cabul. Ranjit was succeeded by his eldest son Kharrak Singh. He left two reputed sons, Shir Singh and Dhalip Singh, and two adopted sons, Kashmira Singh and Peshaura Singh, named from expeditions on which Ranjit was engaged at the time they were taken into his family. When Kharrak Singh nade Cheit Singh his chief minister in place of the Jamimi brothers, Dhian Singh killed the new minister. And now for a time the history of the Punjab became a history of intrigues and deeds of violence, and of contests for power which, when gained, could not be kept. Kharrak Singh's successor, Nau Nihal Singh, was killed by the fall of a beam from the Roshnai gateway of the Huzuri Bagh at Lahore as he was returning from the deceased king's funeral. Shir Singh succeeded, a man addicted, like Ranjit, to intemperance, and he was soon put out of the way by Ajit Singh Sindhanwala. His son Partab Singh was murdered by Lena Singh Majithia. Ranjit's adopted sons, Peshaura and Kashmara Singh, were also killed. Then caine the turn of the ex-minister Dhian Singh, who was slain by the same hand that had put Shir Singh to death, and which now placed the young Dhalip Singh on the throne. Other assassinations accompanied these chief ones. The leading Sindhanwalas were now all murdered, and with the accession of Dhalip Singh the friends of his mother, the rani, came into power, some of the wise old servants of Ranjit also continuing to hold important offices. Ranjit had left an army of 92,000 infantry, 31,800 cavalry, with 171 garrison guns and 384 field-pieces. It wasa force which could not be held in the feebler grasp of his successors. When one after another of those in nominal power had been assassinated and the treasury plundered, the army, unpaid and unmanageable, demanded to be led into British territory, and had their way. They crossed the Sutlej in December 1845. The battles of Mudki, Firdz-shahr, Baddiwal, and Aliwal were followed by the rout of the Sikh army at Sobraon on 10th February 1846, when they were driven back into the Sutlej with heavy loss, and the British army advanced to Lahore. Of the Sikh guns 256 fell into the hands of the British in these actions on the Sutlej. A treaty was made at Lahore on 9th March with the Sikh darbar, the chiefs and ministry who were to hold the government on behalf of the young maharaja, Dhalip Singh. By this treaty the Jalandar Doab and the hill district of Kangra were ceded to the British,

also the possessions of the maharaja on the left bank of the Sutlej. In addition the Britisli demanded a money payment of £1,500,000. The services of Gulab Singh, raja of Jamnui, to the Lahore state, in procuring the restora- tion of friendly relations with the British, were specially recognized. His independent sovereignty in such lands as might be made over to him was granted. The Sikh Government, unable to pay the whole of the money demand, further ceded, as equivalent for £1,000,000, the hill country between the Bias and the Indus, including Kashmir and Hazara. Gulab Singh was prepared to give the amount in place of which Kashmir was to have become British, and by a separate treaty with him, 16th March 1846, this was arranged. The pay- ment was seventy-five lakhs of Nanakshahi rupees, and Kashmir was added to Gulab Singh's territory. At the urgent request of the darbar a British force was left at Lahore for the protection of the mahdrdaja and the preservation of peace. To restore order and introduce a settled administration a British resident was appointed, who was to guide and control the council of regency, and assistants to the resident were stationed in different parts of the country. Peace was not long preserved. The governor of Multan, Diwan Mulraj, desired to resign. Two English officers sent by the resident to take over charge of the fort were murdered, 19th April 1848, and their escort went over to the diwan. Another of the assistants to the resident, Lieutenant Herbert Edwardes, then in the Dérajat, west of the Indus, hearing of the attack on the two officers, hastened to their assistance. On hearing of their fate he collected a force with which to attack the Multan army while the insurrection was yet local. This he did with signal success. But Multan could not fall before such means as he possessed. The movement spread, the operations widened, and the Sikh and English forces were in the field again. Multan was taken. The severe battle of Chilian- wala on 13th January 1849 left the Sikhs as persistent as after the two terrible days of Firdz-shahr in the previous campaign. And it needed the crushing defeat of Gujrat, 21st February 1849, like Sobraon in 1846, to bring the war to a conclusion, and this time to give the Punjab to England. It was annexed on 2d April 1849. For the government of the new province, including the Jalandar Doab, previously annexed, and the cis-Sutlej states, a board of administration was appointed consisting of three members. In place of this board a chief commissioner was appointed in 1853, aided by a judicial commissioner and a financial commissioner. British troops, European and native, of the regular army

were stationed at the chief cities and other places east of the Indus and at Peshawar. For the rest of the trans-Indus territory there was a special body of native troops called the Pnnjab frontier force, under the orders of the chief commissioner. During the Mutiny campaign of 1857 the Punjab, under Sir John Lawrence as chief cominissioner, was able to send important aid to the force engaged in

the siege of Delhi, while suppressing the disturbances which arose, and meeting the dangers which threatened, within the Punjab itself. In 1858 the Delhi territory, as it was called, west of the Jumna, was transferred from the North-West Provinces to the Punjab. The enlarged province was raised in rank, and on Ist January 1859 the chief commissioner became lieutenant-governor. In place of the judicial conimissioner a chief court was constituted in 1866, The number of judges, at first two, was increased to three in 1869. The number is now (1885) three permanent and two temporary. The form and manner of government are for the most part like those of other British provinces in India, except that the employment, as in the earlier days, of military officers as well as civilians in the civil administration is continued to the present time.

Soon after the annexation of the Punjab Christian missions were begun in the new province by the Church Missionary Society and the American Presbyterian Board. Inconnexion with the English society there are twenty-four ordained English missionaries, four medical and two lay missionaries, and ten native clergy. At Delhi there is a mission of the Society for the Propagation of the Gospel and the Cambridge University Mission, Also a large number of English ladies are engaged in teaching native ladies, who by the customs of the country are obliged to remain at home. The number of native Christians in the Punjab is nearly 4000. In 1879 a new diocese, that of Lahore, was constituted, embracing the provinces of Punjab and Sind.

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PUPPETS. See MaRioNnerres.

PURCELL, Henry (1658-1695), English musical com- poser, was born in 1658 in St Ann's Lane, Old Pye Street, Westminster. His father, Henry Purcell, was a gentle- man of the chapel-royal, and in that capacity sang at the coronation of Charles II. After his father's death in 1664 the boy was placed under the guardianship of his uncle, Thomas Purcell, a man of extraordinary probity and kindness. Through the interest of this affectionate guardian, who was himself a gentleman of His Majesty's chapel, Henry was admitted to the chapel-royal as a chorister, and studied first under Captain Henry Cooke, "master of the children," and afterwards under Pelham Humfrey. He is said to have composed well at nine years old; but the earliest work that can be certainly identified as his is an ode for the king's birthday, written in 1670. After Humfrey's early death in 1674 he con- tinued his studies under Dr Blow. In 1676 he was ap- pointed copyist at Westminster Abbey—not organist, as has sometimes been erroneously stated —and in the same year he composed the music to Dryden's Aurenge-Zebe, and Shadwell's Epsom Wells and The Libertine.' These were followed in 1677 by the music to Mrs Behn's tragedy, Abdelazor, and in 1678 by an overture and masque for Shadwell's new version of Shakespeare's Timon of Athens. The excellence of these compositions is proved by the fact that they contain songs and choruses which never fail to please, even at the present

day. The masque in Zimon of Athens is a masterpiece, and the chorus "In these delightful pleasant groves" in The Libertine is constantly sung with applause by English choral societies. In 1679 he wrote some songs for Playford's Choice Ayres, Songs, and Dvalogues, and also an anthem, the name of which is not known, for the chapel-royal. From a letter written by Thomas Purcell, and still extant, we learn that this anthem was composed for the exceptionally fine voice of the Rev. John Gostling, then at Canterbury, but after-

1 The Libertine was suggested by Tirso de Molina's tale, Zl Bur-

lador de Sevilla, afterwards dramatically treated by Moliére and chosen by Da Ponte as the foundation of Mozart's Don Giovanni.

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wards a gentleman of His Majesty's chapel. Purcell wrote several anthems at different times for this extraordinary voice, a basso profundo, the compass of which is known to have comprised at least two full octaves, from D below the stave to D above it. The dates of very few of these sacred compositions are known ; but one, "They that go down to the sea in ships," though certainly not written until some time after this period, will be best mentioned here. In thankfulness for a providential escape of the king from shipwreck Gostling, who had been of the royal party, put together some verses from the Psalms in the form of an anthem, and requested Purcell to set them to music. The work is a very fine one but very difficult, and contains a passage which traverses the full extent of Gostling's voice, beginning on the upper D and descending two octaves to the lower.

In 1680 Dr Blow, who had been appointed organist of Westminster Abbey in 1669, resigned his office in favour of his pupil; and Purcell, at the age of twenty-two, was placed in one of the most honourable positions an English artist could occupy. He now devoted himself almost entirely to the composition of sacred music, and for six years entirely severed his connexion with the theatre. But during the early part of the year, and in all prob- ability before entering upon the duties of his new office, he had produced two important works for the stage, the music for Lee's Theodosius and D'Urfey's Virtuous Wife. There is also strong evidence that it was in

1680—not, as has been generally represented, in 1675—that he com- posed his opera Dido and neas, a work of far greater significance in the development of art than has generally been supposed, since it forms a very important landmark in the history of English dramatic music. It was written, toa libretto furnished by Nahum Tate, at the request of Josiah Priest, a professor of dancing, who also kept a boarding-school for young gentlewomen, first in Leicester Fields and afterwards at Chelsea. At the time of its pro- duction} the condition of dramatic music in England was very rudimentary indeed,—so much so that the opera, properly so called, cannot fairly be said to have existed even in embryo, though it had long flourished brilliantly in Italy, and was beginning to take firm root in France. No English composer had as yet soared above the songs and choruses introduced into the masques, the comedies, and the tragedies of the period, for the purpose of enliven- ing the performance,—music always of a purely incidental character, and always quite unconnected with the pro- gressive action of the piece. Very different was tlie mixed form of entertainment thus produced from the true musical drama, the invention of which in Italy dated as far back as the closing years of the 16th century. At that period a number of literary and artistic savants—among them Vincenzo Galilei, the father of the astronomer, Jacopo Peri, Giulio Carcini, and the poet Rinuccini—were accustomed to meet in Florence for purposes of discussion at the house of Giovanni Bardi, count of Vernio. Deeply imbued with the principles of the Renaissance, these heated enthusiasts were determined to carry them from the domain of literature into that of music ; and their first dream was the revival of the method of recitation practised by the early Greeks in the tragedies of fEschylus and Sophocles. This, however, was, if only for technical reasons, absolutely impossible. The art was lost for ever; but in seeking to resuscitate it they invented something much more Precious-—dramatic recitative. With this at command the construction of the veritable "dramma per la musica " Was no difficult matter; and in fact Peri actually pro-

' The difficulty in fixing the exact date of its composition arises from a doubt as to whether or not it was performed in Leicester Fields before it was played in the new boarding-school at Chelsea,

duced a true opera, Furidice, which in 1600 was per- formed at Florence in honour of the marriage of Maria de' Medici with Henry IV. of France. Purcell, who had never been in Italy, confesses himself, in the preface to his sonatas, "unskilful in the Italian language," and could never by any chance have heard an Italian opera; but he knew very well what Italian music was, and had not neglected to study it deeply. Yet it is doubtful whether all Italy could at that moment have produced a work so full of inborn genius as Dido and dineas.2 It is a musical drama in the strictest sense of the term, a genuine opera, in which the action is entirely carried on in recitative, without a word of spoken dialogue from beginning to end; and the music is of the most genial character—a veritable inspiration, overflowing with spontaneous melody, and in every respect immensely in advance of its age. It never found its way to the theatre, though it appears to have been very popular among private circles. It is believed to have been extensively copied, but one song only was printed by Purcell's widow in Orpheus Britannicus, and the complete work remained in manuscript until 1840, when it was printed by the Musical Antiquarian Society, under the editorship of Sir George Macfarren. There is a tradition that the part of Anna (erroneously called Belinda), written for an alto voice, was sung by the composer himself.' Should this story be veri- fied, it will tell strongly in favour of the opinion that Purcell really did compose Dido and Eneus at the age of seventeen, 7.e., in 1675; for it is certain that at the corona- tion of James IT. he sang bass.

In 1682 Purcell was appointed organist of the chiayel- royal, vice Edmund Lowe deceased, an office which he was able to hold conjointly with his appointment at West- minster Abbey. For some years after this his pen was busily employed in the production of sacred music, odes addressed to the king and royal family, and other similar works. In 1685 he wrote two of his finest anthems, "T was glad" and 'My heart is inditing," for the coronation of James II. In 1687 he resumed his connexion with the theatre by furnishing the music for Dryden's tragedy Tyrannie Love. It is probable that the public were not at this time prepared for works of so advanced a character as Dido and Aineas ; for, though the young composer's pen was constantly employed in the production of incidental music, overtures, and act tunes for pieces of the period, we find him attempting no more operas based upon the true principles so cordially accepted on the Continent. In

this year also Purcell composed a march and quick-step, which became so popular that Lord Wharton adapted the latter to the fatal verses of Zilibulero; and in January 1688 he composed his anthem "Blessed are they that fear the Lord," by express command of the king. A few inonths later he wrote the music for D'Urfey's play, The Fool's Preferment. In 1690 he wrote the songs for Dryden's version of Shakespeare's Tempest, including "Full fathom five" and "Come unto these yellow sands," and the music for Betterton's Prophetess (afterwards called Dioclesian) and Dryden's Amphitryon; and in 1691 he produced his dramatic masterpiece, Aing Arthur, also written by Dryden, and first published by the Musical Antiquarian Society in

1843,

But Purcell's greatest work is undoubtedly his Te Deum and Jubilate, written for St Cecilia's Day, 1694, the first English Te Deum ever composed with orchestral accompaniments. In this he pressed forward so far in advance of the age that the work was annually performed at St Paul's Cathedral till 1712, after which it was per- formed alternately with Handel's Utrecht Te Deum and Jubilate until 1743, when it finally gave place to Handel's

2 Alessandro Scarlatti was one year younger than Purcell, and pro- duced his first opera, L'Onestd nell' amore, in 1680.

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Dettingen Te Deum. Purcell did not long survive the production of this great work. He died at his house in Dean's Yard, Westininster, on 21st November 1695, leaving a widow and three children, the former of whom soon after- wards published a number of his works, including the now famous collection called Orpheus Britannicus,

Besides the operas we have already mentioned, he wrote Don Quixote, Bonduea, The Indian Queen, The Fairy Queen, and others, a vast quantity

of sacred music, and numerous odes, cantatas, and other miscellaneous pieces. (W. 5. R.)

PURCHAS, Samvet (1577-1626), compiler of works on travel and discovery, was born at Thaxted, Essex, in 1577. He was educated at St John's College, Cambridge, where he graduated M.A. in 1600, and some time afterwards B.D., with which degree he was also admitted at Oxford in 1615. In 1604 he was presented by James I. to the vicarage of Eastwood, Essex, and in 1615 was collated to the rectory of St Martin's, Ludgate, London. He was also chaplain to Abbot, archbishop of Canterbury. Some years before his ecclesiastical duties called him to London Purchas had given over the care of his vicarage to his brother, and spent most of his time in the metropolis in the compilation of his geographical works. In 1613 he pub- lished Purchas, his Pilgrimage or Felations of the World, and the Religions observed in all Ages, which reached a fourth edition, much enlarged, in 1626; in 1619 Purchas, his Pilgrim or Microcosmus, or the Historie of Man , relat- ing the wonders of his Generation, varieties in his Degenera- tion, and necessity of his Regeneration ; and in 1625, in four volumes, Purchas, his Pulgrimes ; or Relation of the World in Sea Voyages and Lande Travels, by Englishmen and others. This last work was intended as a continuation of Hakluyt's Voyages, and was partly founded on MSS. left him by Hakluyt. The fourth edition of the Pilgrimage is usually catalogued as vol. v. of the Pilgrimes, but the two works are quite distinct, and essentially different in character, aS is indeed indicated in the names, the differ- ence being thus explained by Purchas himself: in the Pil- grimage he makes use of his own matter though borrowed, while in the Pilgrimes the authors themselves act their own parts in their own words. He was also the author of the King's Tower and Triumphal Arch of London, a sermon on 2 Sam. xxii. 51, published in 1623. He died in Sep- tember 1626, according to some in a debtor's prison, and although Anthony Wood affirms that he died in his own house there can be no doubt that the publication of his books had involved him in serious money difficulties.

PURGATORY (Purgatorium). The Roman Catholic Church has no more than two declarations of supreme authority on the subject of its distinctive doctrine of purgatory. The first is that of the council of Ferrara- Florence, in which it was defined, as regards the truly penitent who have departed this

life in the love of God before they have made satisfaction for their sins of com- mission and omission by fruits meet for repentance, that their souls are cleansed by purgatorial pains after death, and for their relief from these the suffrages of the living —the sacrifice of the mass, prayers, alms, and other offices of piety—are helpful. The second is that of the council of Trent, which runs as follows :—"Since the Catholic Church, instructed by the Holy Spirit from the sacred writings and the ancient tradition of the fathers, hath taught in holy councils, and lastly in this cecumenical council, that there is a purgatory, and that the souls detained there are assisted by the suffrages of the faithful, but especially by the most acceptable sacrifice of the mass, this holy council commands all bishops to have a diligent care that the sound doctrine of purgatory delivered to us by venerable fathers and sacred councils be believed, maintained, taught, and every- where preached." This decree is to be read in the light

of an earlier canon of the same council, by which it is con- demned as heretical to say that after the reception of the grace of justification the guilt of the penitent sinner is so remitted, and the penalty of eternal punishment so annulled, that no penalty of temporal punishment remains to be paid either in this world or in the future in purgatory before the kingdom of heaven can be opened. Thus the essential point of the doctrine is that Christian souls having any sin upon thein at the moment of death pass into a state of expiatory suffering, in which they can be helped by the prayers and other good works of living be- lievers. And this is all that modern Catholic theologians regard as being de fide. It is hardly necessary to say that the doctrine as popularly held and currently taught is generally much more detailed and explicit. In view of some of these developments, there is on all hands admitted to exist abundant room for the admonition of the council of Trent, when it proceeded to warn the clergy to exclude from popular addresses. all the more difficult and subtle questions relating to the subject, and such as do not tend to edification or make for piety. "They must not allow uncertainties or things which have the appearance of falsity to be given forth or handled, and they are to prohibit as scandalous and offensive such things as minister to curiosity or superstition or savour of filthy lucre. Let the bishops see to it that the prayers of the living—to wit,

the sacri- fices, prayers, alms, and other works of piety which have been wont to be rendered by believers for the departed—are done piously-and devoutly, according to the institutions of the church, and that those which are due by the wills of testators or otherwise be not rendered in a perfunctory manner but diligently and punctually, by priests and other ministers of the church who are bound to this service." Among the details of the doctrine, which have been the subject of much speculation among Catholics, may be specified the questions relating to the locality of purgatory and the nature and duration of its sufferings. On none of these points has anything authoritative been delivered. It is of course conceived of as having some position in space, and as being distinct from heaven, tlie place of eternal blessedness, on the one hand, and from hell, the place of eternal woe, on the other. But any theory as to its exact latitude and longitude (such, for example, as underlies Dante's description) must be regarded as the effort merely of the individual imagination. As regards the nature of its pains, there has been a constant disposition to interpret with strict literality the expressions of Scripture as to the cleansing efficacy of fire, but the possibility of interpreting them metaphorically has never been wholly lost sight of. With respect to their duration, it must be inferred from the whole praxis of indulgences as at present authorized by the church that the pains of purgatory are measurable by years and days; but here also everything is left vague. The thesis of all Protestants, as against the Roman Catholic doctrine of purgatory, is that "the souls of be- lievers are at their death made perfect in holiness and do immediately pass into glory." Scripture authority is claimed on both sides, but the argument, which is a some- what complicated one and depends mainly on the view arrived at as to the Scriptural doctrine of sin and satis- faction, cannot be entered upon here. When the two doctrines are compared in the light of ecclesiastical tra- dition it will be found that neither fully coincides with the opinions somewhat vaguely held by the early fathers, whose view of the intermediate state between death and the resurrection was largely affected by the pre-Christian doctrine of Hades or Sheol. On the one hand, Irenzus (Her., v. 31) regards as heretical the opinion that the souls of the departed do immediately pass into glory; he argues that, as Christ tarried for three days 'in the lower

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parts of the earth," so must the souls of His disciples also go away into the invisible place allotted them by God, and there remain until the resurrection, when, receiving their bodies and rising as their Lord arose, they shall come into heaven and into the presence of God. On the other hand, it is impossible to point out in any writing of the first four centuries any passage which describes the state of any of the faithful departed as one of acute suffer- ing, although Tertullian's belief that martyrs had the exceptional privilege of being taken to " paradise" at once clearly shows that for ordinary Christians the state after death was regarded rather as one of expectancy than of enjoyment. Still less would it be possible to show that the intermediate state was regarded by them as one in which satisfaction was made for sin. Origen's doctrine of Tip kaGépovov is intimately connected with his doctrine of apokatastasis ; in his view the application of purgatorial fire was not to take place until the last judgment, nor was its efficacy to be limited to those who had closed their life on earth as believers in Christ. In a different connexion Augustine, expounding 1] Cor. iii. 15 as referring more immediately to the purification of Christians by means of the trials of the present life, goes on to speak of it asa supposable thing that the process might be continued after death, but without committing himself to the belief ("incredibile non est, et utrum ita sit queri potest"). Gregory the Great was the first to formulate in express terms the doctrine which afterwards became that of the whole Roman obedience "de quibusdam levibus culpis esse ante judicium purgatorius ignis credendus est." Such utterances as this were never accepted by the Greek Church, which in its doctrine of the intermediate state still occupies as nearly as possible the standpoint of the ante-Nicene fathers.

PURI or Poorey, a district of British India in the Orissa division of the lieutenant-governorship of Bengal, lying between 19° 28' and 20° 16' N. lat. and 85° 0' and 86° 28' E. long., with an area of 2472 square miles. It is bounded on the N. by the native states of Banki and Athgarh, on the E. and N.E. by Cuttack district, on the S. by the Bay of Bengal, and on the W. by the Ganjam district of the Madras presidency and by the tributary state of Rampur. For the most part the country is flat, the only mountains being a low range which, rising in the west, runs south-east in an irregular line

towards the Chilka Lake, and forms a water-parting between the district and the valley of the Mahanadi. The middle and eastern divisions of the district, forming the south-western part of the Mahanadi delta, consist entirely of alluvial plains, watered by a network of channels through which the most southerly branch of that river, the Koyakhai, finds its way into the sea. The principal rivers in Puri are the Bhargavi, the Daya, and the N un, all of which flow into the Chilka Lake and are navigable by large boats during the rainy season, when the waters come down in tremendous floods, bursting the banks and carrying everything before them. The chief lakes are the Sar and the Chilka, the former, a backwater of the Bhargavi, being 4 miles long by 2 broad. The Chilka Lake is one of the largest in India; its length is 44 miles, and its breadth in some parts 20 miles. It is separated from the sea only by a narrow strip of sand. The lake is saline and everywhere very shallow, its mean depth ranging from 3 to 5 feet. Puri district is rich in historical remains, from the primitive rock-hewn caves of Buddhism—the earliest relics of Indian architecture—to the medieval sun temple at Kanarak and the world-renowned shrine of Jagannath. The chief roads in the district are the Cal- cutta and Madras trunk road and the pilgrim road from Cuttack to Puri. The climate of Puri is dry and healthy, and the average rainfall is 55-80 inches.

The census of 1881 returned the population of Puri district at 888,487 (446,609 males and 441,878 females). By religion 873,664 were returned as Hindus, 14,003 as Mohammedans, and 819 as Christians. The only town with a population excceding 5000 is Puri (g.v.). Puri is strictly a rice-growing tract, but pulses, jute, hemp, flax, and oil-seeds are also produced, while among its mis- ccllaneous crops are tobacco, cotton, sugar-cane, and turmeric. The principal manufactures are salt, earthenware, and brass and _bell- metal utensils and ornaments. In 1882-83 the total revenue of the district amounted to £79,498, towards which the land-tax contri- buted £60,255.

Puri first came under British administration in 1803. The only political cvents in its history since that date have been the rebel- lion of the maharaja of Khurda in 1804 and the rising of the paiks or peasant militia in

1817-18. Since then the country has been gradually restored to order and tranquillity.

PURI or Poorss, chief town of the above district, and commonly known as Jagannath, is situated on the Orissa coast in 19° 48’ N. lat. and 85° 51’ E. long. Its chief interest is centred in the sacred shrine of Jagannath, a temple which dates from the 12th century, and which lies at the southern extremity of the town. In 1881 the popu- lation of Puri was 22,095 (males 11,769, females 10,326), of whom 21,913 were Mohammedans.

PURIM (8), a feast of the later Jews, celebrated in honour of the deliverance of the nation from the schemes of Haman recorded in the book of Esther. The historical value of this record has been discussed in the article EstHER, where also mention is made of the now very prevalent opinion that the feast is an adaptation of a Persian festival. The derivation of the name “ Purim,” as well as the thing, from the Persian /urdigan (Pordigin, Pordiyan) has been raised above the level of a mere guess by Lagarde, who has shown that the readings ¢ovpyaa and dovpd.a in one of the Greek recensions of Esther point with great prob- ability to a form qovpdae (NTN) instead of Purim, exactly corresponding with the Persian word (Ges. Abd, p. 164; Armen, Stud., § 1339). The feast falls on the 14th and 15th of Adar, and is, in accordance with Esther ix. 22, of a joyous character, but quite secular in tone, with a great deal of hard drinking, the only quasi-religious features being the reading in the synagogue of the book of Esther and the section about Amalek, Exod. xvii. 8 sy. This cele- bration appears to have made its way among the Jews only gradually ; according to Josephus, however, it was generally observed in his day in all parts of the Jewish world. On the other hand, the preparatory fast on the 13th of Adar, which is based on Esther ix. 31, cannot have been observed in Palestine till a later date, for in the Megillath Ta‘anith (after the death of Trajan), Adar 13, ‘the day of Nicanor,” is still one of the days on which fasting is forbidden.

PURITANS. See Encianp, Cuurcn oF, vol. viii. p. 376 sg.; INDEPENDENTS, vol. xii. p. 726 sg.; and PRESBY- TERIANISM.

PURNIAH, a district of British India in the Bhagalpur division of the lieutenant-governorship of Bengal, occupy- ing an area of 4956 square

miles, is situated between 25° 15’ and 26° 37’ N. lat. and 87° and 88° 33’ E. long. On the N. it is bounded by the state of Nepal and the district of Darjiling, on the E. by the Jalpaiguri, Dinaj- pur, and Maldah districts, on the W. by Bhagalpur, and on the 8. by the Ganges, which separates it from the districts of Bhagalpur and the Santal Parganas. Purniah is a level depressed tract of country, but for the most part of a rich loamy soil of alluvial formation ; it is traversed by several streams, which flow from the Himalayas lying to the north and afford great advantages of irrigation and water carriage, and is well cultivated; but in the west the soil is thickly covered with sand deposited by the Kusi river, which rises in the Nepal mountains and flows southwards to the Ganges. ‘The country is destitute of anything that can be called forest, but much scrub jungle is found in the

neighbourhood of the more swampy tracts. Among other

rivers of the district is the Mahananda, which rises in the

mountains of Sikkim and flows through the east of Purniah into Maldah. Wild animals are not so numerous as in the neighbouring districts, but the tiger is found in all parts of Purniah, particularly along the banks and among the sandy islands of the Kusi, and also in the scrub jungle that runs along the north of the district. The climate of Purniah is of an intermediate character ; the average rain- fall is 67 inches, and the mean temperature is about 76°°8.

The staple product of Purniah is rice, but jute and tobacco are also cultivated to a considerable extent. Its manufactures include indigo, cottons, woollens, and silks, but the chief is that of indigo, which is mostly carried on in the south of the district. In 1882-83 the gross revenue amounted to £179,750, nearly two-thirds (£120,541) being derived from the land. By the census of 1881 the population numbered 1,848,687 (937,080 males, 911,607 females). The majority of the people are Hindus (1,076,589 in 1881) ; of Mohammedans in the same year there were 771,130, and of Christians only 327. PuRN1AH, the capital, is the only town in the district with a population exceeding 10,000.

This district was conquered by the Mohammedans in the 13th century, but it was not until four centuries later that its value was realized. During the 17th century the fronticr was considerably extended ; the country, however, remained in a state of anarchy until 1770, when it was governed by an English official with the title of "superintendent." Of late years the district has made considerable progress, and under all departments of loca] adminis- tration there has been stcady improvement.

PURNIAH, chief town and administrative headquarters of the above district, is situated on the east bank of the river Saura, in 25° 46' N. lat. and 87° 30' E. long. It contains a population, according to the census of 1881, of 15,016. The town is neat and well-built, but very un- healthy ; it is distant 283 miles north-west of Calcutta.

PURPLE (rop¢r'pa), the name given by the ancients to a dye derived from various species of Murex and Purpura. '(See Morzusea, vol. xvi. p. 648 sg. ; DyErne, vol. vii. p. 571; and Pua@nicta, vol. xviii. p. 804.) For the modern sources of the various shades of this colour, see DYEING, vol. vii. p. 579.

PURPURA, a disease characterized by the occurrence of purple-coloured spots upon the surface of the body, due to extravasations of blood in the skin, accompanied occasionally with hemorrhages from mucous membranes. Difference of opinion has prevailed among physicians as to whether these symptoms are to be regarded as con- stituting a disease per se, since they are frequently seen in connexion with various morbid conditions. Thus in persons suffering from such diseases as rheumatism, phthisis, heart disease, cancer, Bright's disease, jaundice, as well as from certain of the infectious fevers, extravasa- tions of the kind above-mentioned are not unfrequently present. But the term "purpura" is, strictly speaking, applicable only to those instances where the symptoms exist. apart from any antecedent disease. In such cases the complaint is usually ushered in by lassitude and feverishness. This is soon followed by the appearance on the surface of the body of the characteristic spots in the form of small red points scattered over the skin of the limbs and trunk. They are not raised above the surface, and they do not disappear on pressure. Their colour soon becomes deep purple or nearly black ; but after a few days they undergo the changes which are observed in the case of an

ordinary bruise, passing to a green and yellow hue and finally disappearing. When of minute size they are termed 'petechie" or "stigmata," when somewhat larger "vibices," and when in patches of considerable size '"'ecchymoses." They may come out in fresh crops over a lengthened period.

The form of the disease above described is that known as 'purpura simplex." A more serious form of the malady is that to which the term " purpura heemorrhagica " is applied.

PUR—PUS

Here, in addition to the phenomena already mentioned as affecting the skin, there is a tendency to the occurrence of hemorrhage from mucous surfaces, especially from the nose, but also from the mouth, lungs, stomach, bowels, kidneys, &c., sometimes in large and dangerous amount. Great physical prostration is apt to attend this form of the disease, and a fatal result sometimes follows the suc- cessive hemorrhages, or is suddenly precipitated by the occurrence of an extravasation of blood into the brain.

The causes of purpura are not well understood. The condition of the blood has been frequently investigated, but no alteration in its composition detected. The view most commonly held is that the disease depends on an abnormal fragility of the minute blood-vessels owing to their mal-nutrition. It would seem sometimes to arise in persons enjoying perfect health ; but in a large proportion of instances it shows itself among those who have been exposed to privation or insanitary conditions, or whose health has become lowered. Young persons suffer more frequently than adults, and repeated attacks may occur. Purpura has some points of resemblance to scurvy, but a clear distinction both as to causation and symptoms can be established between the two diseases.

The treatment will bear reference to any causes which may be discovered as associated with the onset of the disease, such as unfavourable hygienic conditions, and nutritive defects should be rectified by suitable diet. The various preparations of iron seem to be the best medicinal remedies in this ailment, while more direct astringents, such as gallic acid, ergot of rye,

turpentine, or acetate of lead, will in addition be called for in severe cases and especially when hemorrhage occurs.

PURSLANE, the vernacular equivalent of the botanical genus Portulaca. The species are fleshy annuals of small dimensions, with prostrate stems and entire leaves; the flowers are small and inconspicuous, or in some species brilliantly coloured, regular, with two sepals, five petals, seven to twenty stamens, an inferior ovary, with a style divided into from three to eight branches and ripening into a pod which opens by a transverse chink. J. oleracea is a native of India, which has been introduced into Europe as a salad plant, and in some countries has spread to such an extent as to become a noxious weed. This is the case in certain parts of the United States, where the evil qualities of "pussly" have become proverbial. Like many other: succulent plants, its juice is cooling and is used in tropical countries as a refrigerant in fever, while the bruised leaves are employed as an application in cases of local inflamma- tion. Some of the species, such as P. grandiflora and its varieties, are grown in gardens on rock-work owing to the great beauty and deep colouring of their flowers, the short duration of individual blossoms being compensated for by the abundance with which they are produced.

PUSEY, Epwarp BovuvertEe (1800-1882), originally Edward Bouverie, was born near Oxford in 1800. His family, which was of Huguenot origin, became through a marriage connexion lords of the manor of Pusey, a small Berkshire village near Oxford, and from it took their name a few years after Edward Bouverie's birth. In 1818 he became a commoner of Christ Church, Oxford, and after gaining high university distinctions was elected in 1824 to a fellowship at Oriel College. He thus became a member of a society which already contained some of the ablest of his contemporaries,—among them J. H. Newman and John Keble. But for several years his intercourse with them seems to have been slight. He divided his time between his country home and Germany, and occupied himself with the study of Oriental languages and of German theology. His first work, published in 1828, was a vindi- cation of the latter from a strong attack which had been

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made upon it by one of the leaders of the nascent High- Church party, H. J. Rose. His work, which is entitled

An Historical Enquiry into the probable Causes of the Rational Character lately predominant in the Theology of

Germany, is an impartial and clear summary of the history of German theology since the Reformation. In the same year (1828) the duke of Wellington appointed him to the

regius professorship of Hebrew with the attached canonry

of Christ Church, which he held for the rest of his life. Mr Rose's somewhat intemperate reply to him led to the

publication in 1830 of a second part of his Historical Enquiry, which is not less liberal in its tone than the pre-

vious part. But in the years which immediately followed

the current of his thoughts began to set in another direc-

tion. The revolt against individualism had begun, and he was attracted to its standard. By the end of 1833 "he showed a disposition to make common cause" with those who had already begun to issue the Zracts Jor the Times. "He was not, however, fully associated in the

movement till 1835 and 1836, when he published his

tract on baptism and started the Library of the Fathers" (Cardinal Newman's Apologia, p. 136). The real work of his life then began. He became a close student of the fathers and of that school of Anglican divines who had continued, or revived, in the 17th century the main tradi- tions of pre-Reformation teaching. In ten years after his first adhesion to the movement he had become, with his almost boundless capacity for accumulating information, saturated with patristic and " Anglo-Catholic " divinity ; and a sermon which he preached before the university in 1843, The Holy Eucharist a Comfort to the Penitent, so startled the authorities by

the re-statement of doctrines which, though well known to ecclesiastical antiquaries, had faded from the common view, that by the exercise of an authority which, however legitimate, was almost obsolete he was suspended for three years from the func- tion of preaching. The immediate effect of his suspension was the sale of 18,000 copies of the condemned sermon : its permanent effect was to make Pusey for the next quarter of a century the most influential person in the Church of England. The movement, in the origination of which he had had no share, came to bear his name eit was popularly known as Puseyism and its adherents as Puseyites. His activity, both public and private, as leader of the movement was enormous, He was not only on the stage but also behind the scenes of every important controversy, whether theological or academical. In the Gorham controversy of 1850, in the question of Oxford reform in 1854, in the prosecution of some of the writers of Essays and Reviews, especially of Professor Jowett, in 1863, in the question as to the reform of the marriage laws from 1849 to the end of his life, in the revived con- troversy as to the meaning of everlasting punishment in 1877, he was always busy with articles, letters, treatises, and sermons. The occasions on which, in his turn, he preached before his university were all memorable; and Some of the sermons were manifestoes which mark distinct stages in the history of the party of which he was the leader. The practice of confession in the Church of Eng- land practically dates from his two sermons on The Entire Absolution of the Penitent, in 1846, in which the revival of high sacramental doctrine is complemented by the advocacy of a revival of the penitential system which Medieval theologians had appended to it. The sermon on The Rule of Faith as maimtained by the Fathers and by the Church of England, in 1851, stemmed the current of Secessions to Rome after the Gorham judgment, which had Seemed to show that on an important point of doginatic theology the Church of England had no definite doctrine. The Sermon on Zhe Presence of Christ in the Hi oly Eucharist,

in 1853, first formulated the doctrine round' which almost all the subsequent theology of his followers has revolved, and which has revolutionized the current practices of Anglican worship. And the last university sermon which he composed, and which he was too ill to deliver

himself, Unscience, not Science, adverse to Faith, in 1878, rendered not only to his party but to religion in general the signal service of abandoning the old quarrel between theology and science, as to the manner in which the world was created, by admitting the possibility of evolution. Of his larger works the most important are his two books on the Eucharist—The Doctrine of the Real Presence (consisting of notes on his university sermon of 1853), published in 1855, and The Real Presence… the Doctrine of the English Church, published in 1857 ; Daniel the Prophet, in which he endeavours with great skill to maintain the traditional date of that book; The Minor Prophets, with Commentary, which forms his chief contribution to the study of which he was the professor; and the Eirenicon, in which he endeavoured to find, for those who accepted his premises, a basis of union between the Church of England and the Church of Rome. In 1836 he joined Newman, Keble, and Marriott in editing a series of translations from the fathers entitled A Library of Fathers of the Holy Catholic Church anterior to the Division of Hast and West, and contributed to it a revised translation of St Augustine's Confessions and several valuable prefaces ; the series was accompanied by a translation of the Catena Aurea of Thomas Aquinas, and was followed by an edition of some of the texts which had been translated. He also edited, with suitable omissions, several books of devotion by Roman Catholic writers, such as Avrillon and Scupoli.

In private life his habits were simple almost to austerity.

"He had few personal friends, and rarely mingled in gen-

eral society ; though bitter to opponents, he was gentle to those who knew him, and his munificent charities gave him a warm place in the hearts of many to whom he was personally unknown. In his domestic life he had some severe trials: his wife died, after eleven years of married life, in 1839 ; his only son, who was a scholar like-minded with himself, who had shared many of his literary labours, and who had edited an excellent edition of St Cyril's coin- mentary on the minor prophets, died in 1880, after many years of great bodily affliction. From that time Pusey was seen by only a few persons. His own bodily infirini- ties increased, and on 16th September 1882, after a short illness, he died a painless death. He was buried at Oxford in the cathedral of which he had been for fifty- four years a canon.

His friends devised for him after his death a singular memorial : they purchased his library, and bought for it a house in Oxford which they endowed with sufficient funds to maintain three librarians, who were charged with the duty of endeavouring to perpetuate in the university the memory of the principles which he taught.

His name will be chiefly remembered as the representative of a great religious movement which, whatever may be its ultimate issue, has carried with it no small part of the religious life of England in the latter half of the 19th century. His chief characteristic was an almost unbounded capacity for taking pains. His chief influence was that of a preacher and a spiritual adviser. His Parish Sermons reproduce the substance of patristic homilies in the massive style of the Caroline divines. His correspondence as a spiritual adviser was enornious ; his deserved reputation for piety and for solidity of character made him the chosen confessor to whom large numbers of men and women unburdened their doubts and their sins, But if he be estimated apart from his position as the head of a great party, it must be considered that he was more a theological antiquary than a theologian. He exhumed many forgotten theories and sup- ported them by a large number of quotations from ancient writers ; but the heterogencous inasses of information which he accumulated require a sifting which often leaves but a scanty residuum, and, however valuable to advanced scholars, cannot safely be commended,

to learners. Whatever he wrote was relative to the controversies of his time, and as a controversialist he holds a place which is unique among his contemporaries. He had an almost unrivalled power of massing his evidence, of selecting from an author just so much as was pertinent to the point under discussion, and of ignor- ing or depreciating statements which were at variance with the views which he advocated. Asa party leader he combined great enthusiasm with indefatigable energy and tenacity of purpose ; he chose his positions beforehand with great skill, and never after- wards abandoned them. But he does not seem to have had any great logical power: he builds elaborate arguments upon words of shifting connotation, such as “faith” and “church,” and slides unconsciously fron.

one meaning to another. Nor is there any evidence that he ever faced the historical difficulties which the position of the Church of England presents from the Catholic point of view, and which ultimately led to Newman's secession. He lived in Christian antiquity, and his arguments seldom touched any but sympathetic natures. Unlike Newman, who appealed to the cul- tured intellect of his time, he never caught the modern spirit. The result was that after Newman's departure the party of which Pusey was the head never made a single convert of mark. The intellect of Oxford and of England drifted away from it ; and, in spite of the eloquence of some of its advocates, " Puseyism" does not now number among its adherents any one who exercises an appreciable influence upon the intellectual life of England.

In fact Pusey survived the system which had borne his name. His followers went beyond him, or away from him, in two direc- tions. On the one hand, his revival of the medieval doctrine of the Real Presence, coinciding as it did with the revival of a taste for medieval art, naturally led to a revival of the medieval cere- inonial of worship. With this revival of ceremonial Pusey had little sympathy: he at first protested against it (in a university sermon in 1859); and, though he came to defend those who were accused of breaking the law in their practice of it, he did so on the express ground that their practice was alien to his own. But this revival of ceremonial in its various degrees is now the chief external characteristic of the movement of which he was the leader ; and "Ritualist " has thrust ' Puseyite" aside as the designation of those who hold the doctrines for which he mainly contended. On the other hand, the pivot of his teaching was the appeal to primitive antiquity. It was an appeal which had considerable force as against the vapid theology of the early part of the century, and as acriterion of the claims of Catholicism. But it lost its force, and his followers came to substitute for it an appeal to the prin- ciples of an @ priori philosophy, some of which were borrowed from Thomism and some, though at second hand, from Hegelian- ism. Nor is it probable that Puseyism will revive again. On the one hand, an appeal to primitive times which is divorced, as was Pusey's appeal, from the history of those times must necessarily fail in an age in which the spirit of historical inquiry is abroad ; on the other hand, however excellent the maxim may be which Pusey put in the forefront of his arguments, Qwod semper, quod ubique, quod ab omnibus, yet, when

limited, as Pusey limited it, to the statements of particular writers and the current beliefs of particular ages, it becomes a mere paradox and ccases to afford a logical basis for any system of doctrine. (E. HA.)

PUSHKIN. See PousHKy.

PUSHTU. See AFGHANISTAN, vol. 1. p. 238.

PUSTULE, MALIGNANT, a contagious disease com- municated to man from certain animals (especially cattle, sheep, and horses) suffering from splenic fever. This malady will be referred to under WooLsorTER's DISEASE, of which it forms a variety.

PUTEOLI. See Pozzvott.

PUTNEY, a suburb of London in the county of Surrey, is situated on the right bank of the Thames, about 8 miles above London Bridge by the river and 44 miles west of Hyde Park Corner by road. The picturesque old timber bridge connecting it with Fulham on the left bank of the river, and erected in 1729, is superseded by a structure of iron and granite. Putney is the headquarters of London rowing and the starting-point for most important boat-races. It consists chiefly of the old-fashioned High Street leading to Putney Common, and various streets of villas and houses inhabited by the middle classes. The church of St Mary near the bridge was rebuilt in 1836, with the exception of the picturesque old tower. Among the benevolent institutions are the almshouses of the Holy Trinity, founded by Sir Abraham Dawes in the reign of Charles II. ; the waterman's school, founded in 1684, for

the education of watermen's sons; and the royal hospital for incurables. To the south-west of the town is Putney Heath, 400 acres in extent, formerly a great resort of highwaymen and duellists. Putney is included within the metropolitan area. The population of the registration sub-district (area, 2235 acres) in 1871 was 9439, and in 1881 it was 13,235.

Putney occurs in Domesday as "Putelei," and subsequently appears as " Puttenheth" and " Pottenheth," gradually contracted into "Putney." The ferry was in early times of considerable importance. During the Parliamentary wars the heath was fre- quently occupied by troops, the headquarters of the generals being in the village. Putney was the birthplace of Thomas Cromwell, earl of Essex, and of Gibbon the historian.

oe . See FERMENTATION, vol. ix. pp. SU lsh

PUTTY is a kind of cement composed of fine powdered chalk intimately mixed with linseed oil, either boiled or raw, to the consistency of a tough dough. It is principally used by glaziers for bedding and fixing sheets of glass in windows and other frames, by joiners and painters for filling up nail-holes and other inequalities in the surface of wood-work, and by masons for bedding ashlar-work. The oxidation of the oil gradually hardens putty into a very dense adherent mass. When putty is required to dry quickly, boiled oil and sometimes litharge and other driers are used, " Putty powder" or "'polisher's putty " is oxide of tin in a state of fine division used for the polishing of glass, hard metals, granite, and similar substances.

PUY, Lz, or more precisely L—e Poy EN VEwAyY, chief town of the department of Haute-Loire, France, 352 miles from Paris by rail and 270 in a direct line, rises in the form of an amphitheatre at a height of 2050 feet above sea-level upon Mont Anis, the hill that divides the left bank of the Dolézon from the right bank of the Borne (a rapid stream which joins the Loire 3 miles below). From the new town, which lies east and west in the valley of the Dolézon, the traveller ascends the old feudal and ecclesiastical town through narrow steep streets, paved with slippery pebbles of lava, to the cathedral commanded by the fantastic pinnacle of Mont Corneille. Mont Cor- neille, which is 433 feet above the Place de Breuil (in the lower town), is a steep rock of volcanic breccia, sur- mounted by a colossal iron statue of the Virgin (53 feet high, standing on a pedestal 23 feet high), cast after a model by Bonassieux out of 213 guns taken at Sebastopol. The monument is composed of eighty parts fitted together and weighs 984 tons. Another statue, that of a bishop of Puy, also sculptured by Bonassieux, faces that of the Virgin. From the platform of Mont Corneille a mag- nificent panoramic view is obtained of the town, and of the volcanic mountains, which make this region one of the most interesting parts of France. The Romanesque cathedral (Notre Dame), dating from the 6th to the 12th century, has a particoloured facade of white sandstone and black volcanic breccia, which is reached by a flight of sixty steps, and consists of three tiers, the lowest composed of three high arcades opening into the porch beneath the nave of the church; above are three windows lighting the nave ; and these in turn are surmounted by three gables, two of which, those to the right and the left,

are of open work. Two side porches lead to the cathedral by the transept The bell-tower (184 feet), which rises behind the choir in

seven stories, is one of the most beautiful examples of the –

Romanesque transition period. The bays of the nave are covered in by octagonal cupolas ; the central cupola forms a lantern. The choir and transepts are barrel-vaulted. The cathedral has mural paintings of the 12th and 13th centuries, an open-work Romanesque screen surrounding the sanctuary, and a manuscript Bible belonging to the 9th century. The cloister, to the north of the choir, is striking

owing to its variously-coloured materials and elegant shafts ; Viollet le Duc considers one of its galleries to belong to the oldest known type of cathedral cloister (8th and 9th centuries). Connected with the cloister are remains of fortifications of the 13th century, by which it was sepa- rated from the rest of the city. Near the cathedral the baptistery of St John (4th century), built on the founda- tions of a Roman building, is surrounded by walls and numerous remains of the period, partly uncovered by recent excavations. The church of St Lawrence (14th century) contains the remains of Du Guesclin. Le Puy possesses fragmentary remains of its old line of fortifications, among them a machicolated tower, which has been restored, and a few curious old houses dating from the 12th to the 17th century. Of the modern monuments the statue of La Fayette and a fountain in the Place de Breuil, executed in marble, bronze, and syenite, may be specially mentioned. The museum, named after Crozatier, a native metal-worker to whose munificence it principally owes its existence, con- tains antiquities, engravings, a collection of lace, and ethno- graphical and natural history collections. Among the curiosities of Puy should be noted the church of St Michel d'Aiguille, beside the gate of the town, perched on an isolated rock like Mont Corneille, the top of which is reached by a staircase of 271 steps. The church dates from the end of the 10th century and its chancel is still older. 'The steeple is of the same type as that of the cathe- dral. Three miles from Puy are the ruins of the Chateau de Polignac, one of the most

important feudal strongholds of France. The population of Puy in 1881 was 18,567. The trade is chiefly in cattle, woollens, grains, and vege- tables. The principal manufacture is that of laces and blondes (in woollen, linen, cotton, silk, gold, and silver threads), which is carried on by 130,000 workwomen in the neighbourhood, the yearly turnover being £1,000,000. The town is connected by rail with St Etienne and Lyons, and also with Brioude on the line from Clermont-Ferrand to Nimes.

It isnot known whether Le Puy existed previously to the Roman invasion. Towards the end of the 4th or beginning of the 5th century it became the capital of the country of the Vellavi, at which period the bishopric, originally at Revession, now St Paulien, was transferred hither. Gregory of Tours speaks of it by the name of Anicium, because a chapel "ad Deum" had been built on the mountain, whence the name of Mont Adidon or Ani, which it still retains. In the 10th century it was called Podium Sancte Marie, whence Le Puy. In the Middle Ages there was a double enclosure, one for the cloister, the other for the town. The sanctuary of Notre Dame was much frequented by pilgrims, and the city grew famous and populous. Rivalries between the bishops (who held directly of the see of Rome) and the lords of Polignac, revolts of the town against the royal authority, and the encroachments of the feudal superiors on municipal prerogatives often disturbed the qniet of the town. The Saracens in the 8th century, the Routiers in the 12th, the English in the 14th, the Burgundians in the 15th, suc- cessively ravaged the neighbourhood. Le Puy sent the flower of its chivalry to the crusades in 1096, and Raymond d'Aiguille, called d'Agiles, one of its sons, was their historian. Many councils and various assemblies of the states of Languedoc met within its walls ; popes and sovereigns, among the latter Charlemagne and Francis I, visited its sanctuary. Pestilence and the religious wars put an end to its prosperity. Long occupied by the Leaguers, it did not submit to Henry JV. until many years after his accession.

PUY DE DOME, a department of central France, four- fifths of which belonged to Basse-Auvergne, one-sixth to Bourbonnais, and the remainder to Forez (Lyonnais), lies between 45° 17' and 46° 16' N. lat. and 2° 23' and 4° E, long. It is bounded on the N. by Allier, on the E. by Loire, on the S. by Haute-Loire and Cantal, and on the W. by Corréze and Creuse. The chief

town, Clermont- Ferrand, is 217 miles south of Paris in a direct line; and the department takes its name from a volcanic cone (4800 feet) which overlooks it. A meteorological observatory has stood on the summit, on the site of an old Roman temple, since 1876. The highest point of the department,

the Puy de Sancy (6188 feet), is also the most elevated peak of central France ; it commands the group of the vol- canic Monts Dore, so remarkable for their rocky corries, their erosion valleys, their trap dykes and orgues of basalt, their lakes sleeping in the depths of ancient craters or confined in the valleys by streams of lava, and their wide plains of pasture-land. The Puy de Sancy, forming part of the watershed, gives rise on its northern slope to the Dordogne, and on the east to the Couze, a sub-tributary of the Loire, through the Allier. The Monts Dore are joined to the mountains of Cantal by the non-volcanic group of the Cézallier, of which the highest peak, the Luguet (5101 feet), rises on the confines of Puy de Déme and Cantal. On the north the Monts Dore are continued by a plateau of the mean height of from 3000 to 3500 feet, upon which are seen sixty cones raised by volcanic outbursts in former times. These are the Monts Dome, which extend from south to north as far as Riom, the most remarkable being the Puy de Déme and the Puy de Pariou, the latter having a crater more than 300 feet in depth. To the east of the department, along the confines of Loire, are the Monts du Forez, rising to 5380 feet and still in part crowned with forests. Between these mountains and the Domes extends the fertile plain of Limagne. The drainage of Puy de Dome is divided between the Loire, by its affluents the Allier and the Cher, and the Gironde, by the Dordogne. The Allier traverses the department from south to north, receiving on its right the Dore, which falls into the Allier at the northern boundary and lowest level of the depart- ment (879 feet); on its left are the Alagnon from the Cantal, the two Couzes from the Luguet and the Monts Dore, and the Sioule, the most important of all, which drains the north-west slopes of the Monts Dore and Déme, and joins the Allier beyond the limits of the department. The Cher forms for a short space the boundary between the departments of Puy de Déme and Creuse, close to that of Allier. The Dordogne, while still scarcely formed, flows past Mont-Dore-les-Bains and

La Bourboule and is lost in a deep valley which divides this department from that of Corréze. None of these streams are navigable, but boats can be used on the Allier during floods. The climate of Puy de Déme is usually very severe, owing to its high level and its distance from the sea; the mildest air is found in the northern valleys, where the elevation is least. During summer the hills about Clermont-Ferrand, exposed to the sun, become all the hotter because their black volcanic soil absorbs its rays. On the mountains from 24 to 36 inches of rain fall in the year, but only half this amount (18 inches) in Limagne, around which the mountains arrest the clouds. Nevertheless the soil of this plain, consisting of alluvial deposits of voleanic origin, and watered by torrents and streams from the mountains, makes it one of the richest regions of France.

Of a total area of 1,964,685 acres 925,146 are arable, 266,226 meadow and grass land, 232,210 under wood, 78,006 under vines, while 397,663 are moorland or coarse pasturage. Out of a total of 566,064 inhabitants 392,177 are engaged in agriculture. Puy de Déme possesses 18,500 horses, 1600 mules, 4850 asses, 16,100 oxen or bulls, 174,000 cows or heifers, 60,500 calves, 309,900 sheep, 90,500 pigs, 22,550 goats, and 25,900 beehives, which in 1881 pro- duced 95 tons of honey aud 38 tons of wax. In 1882 there were produced 369,313 quarters of wheat, 493,134 of rye, 197,241 of barley, 320,138 of oats, 25,172 of buckwheat, 5,172,408 bushels of potatoes, and in 1881 234,504 bushels of dried vegetables, 1,986, 208 bushels of beetroot, 33 tons of tobacco, 1625 tons of hemp, 21 tons of flax, 26,176 bushels of rape-seed, a great quantity of colza oil, and 18,054,052 gallons of wine. The Limagne produces fruits of all kinds—apricots, cherries, pears, apples, and walnuts, and there are also plantations of mulberry trees. The department possesses numerous mineral treasures. The coal-mines, occupying a surface- area of 7660 acres, employ 1381 men, and in 1882 produced 188,234 tons. The most important, at Brassac on the Allier, on the borders of Haute-Loire, employ 1200 or 1500 men (in the two departments). Next come those of St Eloi near the department of Allier, and of

Bourg-Lastic and Messeix on the borders of Corréze. The depart- ment also works peat, asphalt, and bituminous schists. Mines of argentiferous lead employ 640 men and produce 33,695 tons of lead or silver, worth £45,600. The most important mines and foundries are at Pontgibaud on the Sioule. Copper, arsenic, iron, antimony, barium sulphate, alum, manganese, white lead, sulphur, sulphuretted zinc, loadstone, and (of precious stones) amethysts, jacinths, rubies, agates, chalcedonies, opals, are also found in the department. Quarries of porphyry and lava are worked (Volvic with 900 men), as well as marl, limestone, and gypsum. The hot springs of Mont Dore, known in the days of the Romans, contain a mixture of arsenic and iron bicarbonates, and are used especially for affections of the respiratory organs. The waters of La Bour- boule, containing sodium chlorides and bicarbonates, are particularly rich in arsenic, and efficacious against affections of the lymphatic glands, scrofula, diseases of the skin and air-passages, and rheuia- tism. The springs of St Nectaire, containing sodium and iron chlorides and bicarbonates, are efficacious in liver complaints, rheumatism, and gravel. Some of them are petrifying, as the spring of St Allyre at Clermont-Ferrand. The waters of Royat, in use in the time of the Romans, containing sodium and iron chlorides and bicarbonates, sparkling and rich in lithia, are used in cases of anemia, rheumatism, gout, diabetes, and gravel. The waters of Chateauneuf (on the Sioule), also known to the Romans, contain iron bicarbonates and are resorted to for skin diseases. Those of Chatelguyon, like the waters of Carlsbad and Marienbad, are used for disorders of the digestive organs, congestions of the liver, rheumatism, &c. The waters of Chateldon are used for the table. There are other chalybeate waters at St Martial, Beaulieu, Pontgibaud, St Myon, St Maurice, Arlanc, and many other mineral springs of varied character. Manufactures are for the most part grouped around Thiers, which produces a large amount of cheap cutlery, pasteboards (especially adapted for stamps or playing- cards), and leather; 20,000 workmen are thus employed, and the annual turn-over amounts to £1,200,000. The department con- tains important paper- mills, factories for lace and braid (in the mountains), for buntings, and camlets. Those for wool, cotton, and hemp contain 3500 spindles and morc than 400 looms. There are wool-carding works and factories for linens, cloths, and counter- panes,—also silk-mills, tanneries, manufactories for chamois and other leathers, for caoutchouc, important sugar-works, starch-works, manufactures of edible pastes with a reputation

as high as those of Italy, and manufactures of fruit-preserves. The saw-mills and the cheese industry in the mountains complete the list, which includes 201 establishments employing 75,553 persons. The department exports grain, fruits, cattle, wines, cheese, wood, and mineral waters. 'Traffic is carried on over 294 miles of Government roads, 9591 miles of other roads, and 178 miles of railway. The depart- ment is crossed from north to south by the railway from Paris to Nimes, and that of Vichy to Thiers; from west to east by that from Bordeaux to Lyons by Tulle, Clermont-Ferrand, and Thiers, with branches from Eygurande to Largnac and from Vertaison to Billom. Itis skirted on the north-west by the line from Montlucon to Gannat, with a branch line for goods to the mines of St Eloi. Twenty thousand inhabitants of the department, belonging chiefly to the district of Ambert, leave it during winter and find work clsewhere as navvies, chimney-sweeps, pit-sawyers, &c. The de- partment in 1881 contained 566,064 inhabitants and includes five arrondissements—CLERMONT-FERRAND (q.v.), Ambert (town, 3940 inhabitants), Issoire (6137), Riom (9590), Thiers (10,583)—50 can- tons, and 467 communes. It is attached to the bishopric of Cler- mont-Ferrand and to the 13th Army Corps in the same town ; the superior court is at Riom. (G. ME.)

PYAMIA. See Parnonoey (vol. xviii. p. 401) and SURGERY.

PYATIGORSK, a district town and watering-place of Caucasus, Russia, in the government of Terek, 124 miles by rail to the north-west of Vladikavkaz. It owes its origin to its mineral waters, which had long been known to the inhabitants of Caucasus, and even at the begin- ning of the present century attracted many Russians, who used to stay at the Konstantinogorsk fort, 2 miles off. The first buildings at the mineral springs were erected, however, in 1812, and in 1830 the name of Pyatigorsk ("town of the five mountains"), referring to the five summits of the Beshtau, was given to the new settlement. Its subsequent rapid increase was greatly stimulated by the completion of its railway connexion with Rostoff, and it has now nearly 14,000 inhabitants (13,670 in 1882). The town is charmingly situated on a small plateau on the south-western slopes of the Mashuka mountain, by which and the Beshtau it is protected on the north, The

snow-covered summits of the Elburz are seen on the south.

The sulphur springs, about fifteen in number, come from a great depth, from trachytic rocks, and vary in temperature from 72° to 115° Fahr. ; they are used both for drinking and for bathing. Before the opening of the railway the summer patients already numbered thousands and have become more numerous since; but defective accommodation and high prices tend to prevent their further in- crease, notwithstanding the very high esteem in whicli these mineral waters are held by medical authorities, both Russian and West European. The industries of Pyatigorsk are insignificant, but its trade has always had some importance, and it is still visited during its fairs by a few Persian merchants.

PYGMALION is the Greek form of a Phoenician name probably derived from the name of a god, oyp (C.1.5S., par. i. t. i. p. 133). Pygmalion or, as Josephus writes,

Phygmalion, brother of Dido (Elissa), has been spoken of |

in Pua@nicia (vol. xviii. p. 807). Another Pygmalion, son of Cilix and grandson of Agenor, king of Cyprus, is the subject of a famous story. He fell in love with an ivory statue he had made; Aphrodite granted life to the image, and Pygmalion married the miraculously born virgin (Ovid, Metam., x. 2438 sq.).

PYGMIES. The name "pygmy " (Greek rvypaios, from mvyp) means one whose height is measured by the distance between the elbow and the knuckles of an ordinary man, or rather less than an ell. The pygmies appear in Homer (11., iii. 6) as a tiny folk who dwelt by the streams of Ocean in the far southern land whither the cranes fly at the approach of our northern winter. The cranes made war on them and slaughtered them. 'These battles between the pygmies and the cranes are often mentioned by later writers and are frequently represented on vases. Philo- stratus describes a picture of the sleeping Hercules beset by swarms of pygmies, as Gulliver was by the Lilliputians, Aristotle held that the pygimies were a race of little men inhabiting the marshes out of which he supposed the Nile to flow. Other writers localized them in various parts of the world. Ctesias describes at some length a race of pygimies in the heart of India. They were black and

ugly; the tallest of them were only two ells high; their hair and beards were so long that they served them as garments ; they were excellent bowmen, and hunted hares and foxes with hawks, ravens, and eagles; their language and customs were those of the rest of the Indians, and they were very honest ; their cattle were small in proportion. Pygmies are also mentioned in Thrace (where they were called Catizi by the natives, according to Pliny) and in Caria.

_Eustathius speaks of pygmies in the far north, near Thule.

Strabo was inclined to regard them as fabulous ; no trust- worthy person, he says, had seen them. There is, how- ever, a story in Herodotus which would seem to show that the belief in the pygmies originated in well-founded reports of a race of undersized men in the heart of Africa. According to Herodotus (ii. 32), five men of the Nasamon- ians (a Libyan people near the Greater Syrtis) journeyed westward through the desert for many days till they came to a tribe of little black men of a strange speech, by whose city ran a great river flowing from west to east, and in it there were crocodiles ; moreover, there were fruit-bearing trees in that country and great marshes. This story is not improbable ; the river may have been the Niger (Joliba or Quorra) and the people niay have been allied to the Akka, an undersized race discovered within recent years near the equator by Schweinfurth, who thinks that they, as well as the Bushmen of South Africa, are remnants of an abori- ginal population of Africa now becoming extinct.

PYM, Joun (1584-1643), was born at Brymore in Somer- set in 1584. In 1599 he entered Broadgates Hall, now Pembroke College, Oxford, asa gentleman commoner. He is said by Clarendon to have held at a later date an office in the exchequer, in which he no doubt acquired that

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familiarity with financial business which afterwards dis- tinguished him. His wife, Anna Hooker, died in 1620, and in the following year he entered parliament for the first time as member for Calne, the statement that he sat in the Addled Parliament being now known to have been erroneous. To the patronage of the earl of Bedford no doubt Pym owed the position which he thus acquired. The use which he made of it was all hisown. He had none of the fire of Eliot's genius, but he early showed himself to be possessed of the two qualities which in combination make a leader of men, a thorough and honest sympathy with

the ideas of the time and a modcration in their applica-

There was more of measured force in him than His powers as a party leader were as

tion. there was in Eliot. yet unsuspected.

Pym's name was first prominently brought forward by his speech of 8th November 1621, directed against the Catholics. He strove to distinguish between an attempt "to punish them for believing and thinking" what they did and the disabling of them from doing "that which they think and believe they ought to do." His remedy was an oath of association to be taken by all loyal Protestants. Those who object to Pym's counsel as divisive must nevertheless acknowledge that there was a singular consistency in his advocacy of it. By organizing the resistance of the majority of Englishmen, he wished to baffle parties which might be dangerous by their organization or by the assist- ance which they might receive from abroad.

After the dissolution Pym was confined for three months in his house in London. In the following parliament he pleaded for the execution of the penal laws against recusants and for the restoration of the silenced Puritan clergy. In 1626 he was one of the managers of Bucking- ham's impeachment. In 1628 he was equally prominent in advocating the Petition of Right and in carrying on the impeachment of Mainwaring. The political question and the religious question were in Pym's mind fused into one. His intellect was intensely conservative, not easily admit- ting new ideas or projecting itself into the future to deal with growing changes in society, but seeking to rest on the conservatism of existing society rather than on the

maintenance of artificial forces. He looked for support to the nation itself, and he found it hard to believe that the national judgment could much differ from his own. In 1629 he found himself differing from those with whom he usually acted. Eliot carried the House with him in turn- ing the dispute with the king on the question of tonnage and poundage into one of parliamentary privilege, whilst Pym thought that the main question of the king's right to levy the duties without a parliamentary grant should be first attacked. He was beaten at the time, but his defeat was full of promise for the future. It is much in a man's favour that he is ready to look a difficulty fully in the face. It is characteristic of Pym that nothing is heard of him either during the riotous proceedings in which this parlia- ment closed or during the eleven years which passed with- out a parliament at all. He had neither the virtues nor the failings which accompany excitability of temperament.

With the Short Parliament Pym's three and a half years of authority begin. His speech of 17th April 1640 on grievances lasted for two hours, a length of time without precedent in the parliaments of those days. It was not eloquent in the sense in which Eliot's speeches were eloquent, but it summed up in a telling manner the griev- ances under which, in the opinion of the vast majority of thinking Englishmen, the commonwealth laboured. Before the session closed he showed his powers as a parliamentary tactician by proposing to bring forward the Scottish grievances and to make a peace with the Scots the condition of the grant of supplies. This proposal led

to a hasty dissolution of parliament, but it laid down the basis of a policy which afterwards stood Pym in good stead. That policy was precisely what had been fore- shadowed in his speech of 1621, the association of the majority who thought alike in civic union against official authority ; but that which in 1621 was to be a union of Englishmen alone in 1640 included Scots as well.

With the dissolution of the Short Parliament Pym once more sinks out of sight. There is, however, good reason to suppose that the summer months of 1640 were for him a time of unusual activity, and that he was a leading spirit in those negotiations with the Scots the exact nature of which cannot

now be traced. At all events in the end of August he was in close communication with the leaders of the opposition, and he then drew up, in co-operation with St John, the petition in which twelve peers demanded the redress of grievances and the summon- ing of parliament. The rout of Newburn gave emphasis to the language of the peers, and on 3d November 1640 the Long Parliament met.

Pym's leadership of the Commons rested on his sympathy with the feelings of the House combined with his skill in directing those feelings into a practical course. He expressed the general sentiment in the impeachment of Strafford and Laud, and in the passing of the Triennial Act, which was to make the long intermission of parlia- ments impossible for the future. In the trial of Strafford he showed himself resolute. Being determined to give to an act of state policy the character of a vindication of the law, Pym had to contend 'against the impatience of his followers and against the efforts of Charles, and still more of Henrietta Maria, to save Strafford by force. Over-whelmed for a moment by the impatience of the House, which converted the impeachment into a bill of attainder, he yet carried his point that the change should be no more than nominal, and that the legal arguments should proceed just as if the impeachment had been continued.

The struggle within the House itself was the least part of Pym's labours. In meeting the army plot and the other intrigues of the court he had to develop the powers of a commissioner of police, to be as ready in collecting and sifting information as he was prompt in counteracting the danger which he feared. In the protestation which was adopted by the Commons on 3d May he fell back on his old reinedy, banding together the majority in resistance to an unscrupulous minority. By the legislation which followed on the death of Strafford—the abolition of the special courts which had been erected to defend the Tudor monarchy, and the abandonment by the crown of its claim to levy customs without a parliamentary grant—he brought the king under the obligation to govern according to law. Much, however, remained to be done. Pym had to provide against the breach by force or fraud of the compact made, and also to provide for the harmonious working of the exe-cutive and legislative bodies. He proposed to attain these ends by demanding that the king's ministers should be responsible to parliament. To effect this it was necessary that parliament should be united, and to obtain

this end it was necessary to solve the religious difficulty. In the autumn of 1641 it appeared that a majority of the Peers and a large minority of the Commons wished to maintain the worship of the Prayer Book very nearly intact, whilst a minority of the Peers and a majority of the Commons wished to make very considerable alterations in it. To bind these two parties together against the king needed constructive statesmanship of the highest order, and this neither Pym nor any one else in the House showed signs of possessing. In the Grand Remonstrance, instead of in- dicating terms of compromise, he proposed to throw the regulation of the church on an assembly of divines to be

chosen by parliament,—that is to say, he combined the terrors of a vague threat of impending change with the entire absence of any security that those changes would be moderate. From that moment there were two parties in the state neither of which would give way to the other. Charles's attempt to arrest Pym and four other members on 4th January 1642 embittered but did not produce the conflict. For some months there was much fencing be- tween the two parties, and the Civil War was not begun till Charles raised his standard at Nottingham.

During the remaining months of Pym's life he was the most prominent leader of the war party in the House of Commons. Peace may be made in two ways, by one side capitulating to the other, or by the discovery of a com- promise which may give effect to the better aims of both sides. Pym was resolutely set against a capitulation, and he did not rise to the height of a mediator, His adver- saries of the peace party, led by Holles and Maynard, had as little idea of a compromise as he had, and they were foolish enough to suppose it possible to obtain the assent of Charles and his supporters to the establishment of a Puritan Church,

Pym's policy was at least coherent with itself. In 1621, on his first prominent appearance in political life, he had advocated the formation of an association against popery. The protestation of 1641 was an attempt to carry this plan into practice and to make it at the same time available

against Royalist intrigues. The Parliamentary covenant promulgated after the discovery of Waller's plot in June 1643 was an enlargement of the same project, and the Solemn League and Covenant in September 1643 embraced the three kingdoms. As long as he lived Pym was the soul of the Parliamentary resistance to the king, but it is in the covenants and associations which he brought into existence that his permanent contribution to English political development is to be found. Eliot hoped to rally parliament and the constituencies as a whole to the cause which he maintained to be just. Strafford hoped to rouse the devotion of the nation as a whole to the king whose crown was supported by his own masterful intellect. Pym was the founder of party government in England. He recognized from the first that there were differences of religious opinion amongst his fellow-countrymen, and he hoped to rally round a common purpose those who on the whole felt as he did himself, with such liberty of opinion as was possible under such conditions. If the enterprise failed it was partly because he was assailed by intrigue as well as by fair opposition, and in his fierce struggle against intrigue learned to cling to doctrines which were not sufficiently expansive for the government of a nation, partly because the limitations of government itself and the insufficiency of force to solve a complicated religious and political problem were in his time very im- perfectly understood. At least Pym prepared the way for the immediate victory of his party by summoning the Scots and by the financial measures which made the campaigns of 1644 and 1645 possible.

He did not, however, live to reap the harvest which was due to his efforts. Worn out by the strain of con- stant and agitating work, his health broke down, and on 8th December 1643 he died. His body was followed by both Houses when it was carried to be interred in West- minster Abbey. (Ss. RB. G.)

PYRAMID, This name fora class of buildings, though first taken from a part of the structure,! and mistakenly applied to the whole of it by the Greeks, has now so far

1 The vertical height was named by the Egyptians pir-em-us (see E. Revillout, Rev. g., 2d year, 305-309), hence the Greek form pyranis, pl.

pyramides (Herod.), used unaltered in the English of Sandys (1615), from which the singular pyramid was formed.

acquired a more definite meaning in its geometrical sense that it is desirable to employ it in that sense alone. A pyramid therefore should be understood as meaning a building bounded by a polygonal base and plane triangular sides which meet in an apex. Such a form of architecture is only known in Middle Egypt, and there only during the period from the [Vth to the AIIth Dynasty (before 2000 B.c.)—having square bases and angles of about 50°. In other countries various modifications of the tumulus, barrow, or burial-heap have arisen which have come near to this type; but these when formed of earth are usually circular, or, if square, have a flat top, and when built of stone are always in steps or terraces. The imitations of the true Egyptian pyramid at Abydos, Meroe, and else- where are puny hybrids, being merely chambers with a pyramidal] outside and porticos attached ; and the struc- tures found at Cenchrez, or the monument of Caius Sestius at Rome, are isolated and barren trials of a type which never could be revived: it had run its course in a country and a civilization to which alone it was suitable.

In the earliest monuments of Egypt there are three types, which were ruled by the external shape. For the temples (such as those of the kings of the [Vth Dynasty at Gizeh) varied in shape according to their arrangements; but the pyramid, the obelisk, and the mastaba? are designs whose importance was outward ; and these types, which started apparently at the same epoch (the earliest actually dated examples of each being all within the two reigns of Seneferu and Khufu), only lasted during the life of that archaic system to which they belonged. The pyramid type faded out in the middle kingdom (XIIth Dynasty) ; the obelisk was adapted in later times to a different purpose, as a member of bilateral temple decoration, instead of a solitary monument complete in itself and surrounded by an enclosure, as it was in the old kingdom ; and the mastaba gave way to the rock-hewn chapel or the bastard pyramid.

In considering the origin of the pyramid type there are three theories to be dealt with—(1) that it is merely a higher and refined form of the tumulus;

(2) that it was derived from the mastaba; (3) that it was a fresh idea, an invention de novo, The objection to the first view is that there is no graduated series of examples of lesser sizes before the large ones, possibly not any before the very largest, and that tumulus or mound burial is unknown in Egypt, ancient or modern; and to accept this view we must suppose that all the earlier stages were wrought in another land, and that the pyramid-builders migrated into Egypt when at the height of their architec- tural power. But their history does not agree to this, and in no other land can we find their training-ground. The second view is strongly suggested by the facts before us in Egypt. The only buildings that have been reasonably supposed to be earlier than the great pyramid are the two so-called pyramids of Sakkara and Medum. These struc- tures are not and never were true pyramids; they are mastabas added to by successive accretions at various tines, again and again finished off with a polished casing, only to be afresh enlarged by coats of rough masonry and another fine casing on the outside, until they have been extended upwards and around into a great stepped mass of masonry (Petrie, Pyramids, dc., p. 147), the successive faces of which rise at the characteristic mastaba angle of 75° (or 40n 1). These buildings then present the outline of a pyramidal pile, broken by successive steps, and it is but one stage further to build in one smooth slope from base to top; such a form would readily be designed when oice it was intended to build a large mass complete at

2 An oblong building with sloping sides and flat top, which con- tained usually the funeral chapel and place of offerings, and covered over the mouth of the sepulchral pit.

once on one uniform plan, as certainly was the case for the largest pyramids. The third view has some support in the absence of any datable pyramids before the largest and the second largest that ever existed, and in the steady deterioration of work that is known to have taken place. Remembering also what bold steps architecture has taken occasionally in later times (as in the Pantheon and St Sophia) without a series of graduated exainples, we should not condemn this view too readily by a priori reasoning. It is certain that the pyramids were each begun with a definite

design of their size and arrangement; at least this is plainly seen in the two largest, where continuous accretion (such as Lepsius and his followers propound) would be most likely to be met with. On looking at any section of these buildings it will be seen how impossible it would have been for the passages to have belonged to a smaller structure (Petrie, 165). The supposition that the designs were enlarged so long as the builder's life permitted was drawn from the compound imastabas of Sakkara and Medum ; these are, however, quite distinct architecturally from true pyramids, and appear to have been enlarged at

long intervals, being elaborately finished with fine casing

at the close of each addition.

Around many of the pyramids peribolus walls may be seen, and it is probable that some enclosure originally ex- isted around each of them. At the pyramids of Gizeh the temples attached to these mausolea may be still seen. As in the private tomb, the false door which represented the exit of the deceased person from this world, and to- wards which the offerings were made, was always on the west wall in the chamber, so the pyramid was placed on the west of the temple in which the deceased king was worshipped. The temple being entered from the east (as in the Jewish temples), the worshippers faced the west, looking toward the pyramid in which the king was buried. Priests of the various pyramids are continually mentioned during the old kingdom, and the religious endowments of many of the priesthoods of the early kings were revived under the Egyptian renaissance of the XXVIth Dynasty and continued during Ptolemaic times. A list of the hieroglyphic names of nineteen of the pyramids which have been found mentioned on monuments (mostly in tombs of the priests) is given in Lieblein's Chronology, p. 32, The pyramid was never a family monument, but be- longed—like all other Egyptian tombs—to one person, members of the royal family having sometimes lesser pyramids adjoining the king's (as at Khufu's) ; the essen- tial idea of the sole use of a tomb was so strong that the Inll of Gizeh is riddled with deep tomb-shafts for separate burials, often running side by side 60 or 80 feet deep with only a thin wall of rock between ; and in one place a previous shaft has been partially

blocked with masonry, So that a later shaft could be cut partly into it, macled with it like a twin-crystal.

Turning now to the architecture of -the buildings, their usual construction is a mass of masonry composed of horizontal layers of rough-hewn blocks, with a small amount of mortar; and this mass in the later forms became more and more rubbly, until in the VIth Dynasty it was merely a cellular system of retaining walls of rough Stones and mud, filled up with loose chips, and in the XIIth Dynasty the bulk was of mud bricks, Whatever was the hidden material, however, there was always on the outside a casing of fine stone, elaborately finished, and very well jointed ; and the inner chambers were of simi- larly good work. Indeed the construction was in all cases so far sound that, had it not been for the spite of enemies and the greed of later builders, it is probable that every pyramid would have been standing in good order at this day. The casings were not a mere "veneer" or niin,"

as they have been called, but were of massive blocks, usually greater in thickness than in height, and in some cases (as at South Dahshur) reminding the observer of horizontal leaves with sloping edges.

Inside of each pyramid, always low down, and usually below the ground level, was built a sepulchral chamber : this was reached in all cases by a passage from the north, sometimes beginning in the pyramid face, sometimes de- scending into the rock on which the pyramid was built in front of the north side. This chamber, if not cut in the rock altogether (as in Menkaura's), or a pit in the rock roofed with stone (as in Khafra's), was built between two immense walls which served for the east and west sides, and between which the north and south sides and roofing stood merely in contact, but unbonded. The gable roofing of the chambers was formed by great sloping cantilevers of stone, projecting from the north and south walls, on which they rested without pressing on each other along the central ridge; thus there was no thrust, nor were there any forces to disturb the building; and it was only after the most brutal treatment, by which these great masses of stone were cracked asunder, that the principle of thrust came into play, though it had been provided for in the sloping form of the

roof, so as to delay as long as possible the collapse of the chamber. This is best seen in the pyramid of Pepi (Petrie), opened from the top right through the roof. See also the Abusir pyramids (Howard Vyse) and the king's and queen's chambers of the great pyramid (Howard Vyse, Piazzi Smyth, Petrie). The roof- ing is sometimes, perhaps usually, of more than one layer ; in Pepi's pyramid it is of three layers of stone beams, each deeper than their breadth, resting one on another, the thirty stones weighing more than 30 tons each. In the king's chamber (Gizeh) successive horizontal roofs were in- terposed between the chamber and the final gable roof, and such may have been the case at Abu Roash (Howard Vyse).

The passages which led into the central chambers have usually some lesser chamber in their course, and aré blocked once or oftener with massive stone portcullises. In all cases some part, and generally the greater part, of the passages slopes downwards, usually at an angle of about 26°, or 1 on 2. These passages appear to have been closed externally with stone doors turning on a horizontal pivot, as may be seen at South Dahshur, and as is de scribed by Strabo and others (Petrie). This suggests that the interiors of the pyramids were accessible to the priests, probably for making offerings ; the fact of many of them having been forcibly entered otherwise does not show that no practicable entrance existed, but merely that it was unknown, as, for instance, in the pyramids of Khufu and Khafra, both of which were regularly entered in classical times, but were forced by the ignorant Arabs.

The pyramids of nearly all the kings of the IVth, Vth, and VIth Dynasties are mentioned in inscriptions, and also a few of later times. The first which can be definitely attributed is that of Khufu (or Cheops), called "the glorious," the great pyramid of Gizeh. Ratatef, who appears next to Khufu in the lists, is unknown in other mouuments ; he is perliaps the samc as Khnumu-Khufu, apparently a co-regent of Khufu, who may have becn buried in the so-called qucen's chamber of the great pyramid. Khafra rested in the great pyramid, now known as the second pyramid of Gizch. Menkaura's pyramid was called "the upper," being at the highest level on the hill of Gizeh. The lesser pyramids of Gizeh, near the great and third pyramids, belong respectively to the families of Khufu and Khafra (Howard Vyse). The pyramid of a Men(ka ?)ra at Abu Roash is probably also of this period. The pyramid of Aseskaf, called " the cool," is unknown, so also is that of Userkaf of the Vth

Dynasty, called the "holiest of buildings." Sahura's pyramid, the north one of Abusir, was named "the rising soul," much as Neferkara's (of unknown site) was namcd "of the soul." Raenuser's pyramid, "the firmest of buildings," is the middle pyra- mid of Abusir. The pyramid of Menkauhor, called "the most divine building," is somewhere at Sakkara. Assa's pyramid is unidentified ; it was "the beautiful." Unas not only built the

mastaba Farun, long supposed to be his pyramid, but had a pyra- mid called "the most beautiful of buildings" at Sakkara, which was opened in 1881 (see Recweil des Travaux, by M. Maspero, iii., for those opened at Sakkara). In the VIth Dynasty the "pyramid of souls," built by Ati (Rauserka), isunknown. That of Teta, "the most stable of buildings," was opened at Sakkara in 1881, as well as that of Pepi (Rameri), "the firm and beautiful." The pyramids of Rameren, "the beautiful rising,' and of Neferkara, "the firm life," are unknown. Haremsaf's pyramid was opened at Sakkara in 1881. Of the last two kings of the VIth Dynasty we know of no pyramids. In the VIIth or VIIIth Dynasty most probably the brick pyramids of Dahshur were erected. In the XIth Dynasty the pyramid, "the most glorious building," of Mentuhotep II. is mentioned, and the mud pyramid of one of the Antef kings is known at Thebes. In the XIIth Dynasty the pyramids, the "lofty and beautiful" of Amenemhat I. and "the bright" of Usertesen II. are known in inscriptions, while the brick pyramid at Howara may be most probably assigned to Amenemhat III., who appears to have built the adjoining temple.

Of the architectural peculiarities of some particular pyramids some notice must now be given. The great pyramid of Gizeh (Khufw's) is very different in its internal arrangements from any other known (see vol. ii. p. 385 sg. and vol. vii. p. 771 sq.). The greater number of passages and chambers, the high finish of parts of the work, and the accuracy of construction all distinguish it. The chamber which is most normal in its situation is the subter- ranean chamber; but this is quite unfinished, hardly more than begun. The upper chambers, called the "king's" and "queen's," were completely hidden, the ascending passage to them having been closed by plugging blocks, which concealed the point where it branched upwards out

of the roof of the long descending passage. Another passage, which in its turn branches from the ascending vassage to the queen's chamber, was also completely blocked up. The object of having two highly-finished chambers in the mass

may have been to receive the king and his co-regent (of whom

there is some historical evidence), and there is very credible testi- mony to a sarcophagus having existed in the queen's chamber, as well as in the king's chamber. On the details of construction in the great pyramid it is needless to enter here; but it may be stated that the accuracy of work is such that the four sides of the base have only a mean error of six-tenths of an inch in length and 12 seconds in angle from a perfect square.!

The second pyramid of Gizeh has two separate entrances (one in the side, the other in the pavement) and two chambers (one roofed with slabs, the other all rock-hewn) ; these chambers, however, do not run into the masonry, the whole bulk of which is solid so farasis known. This pyramid has a part of tle original casing on the top; and it is also interesting as having the workmen's barracks still remaining at a short distance on the west side, long chambers capable of housing about 4000 men. The great bulk of the rubbish from the work is laid on the south side, forming a flat terrace level with the base, and covering a steep rock escarpment which existed there. The waste heaps from the great pyramid were similarly tipped out over the cliff on its northern side. Thus the rubbish added to the broad platform which sct off the appear- ance of the pyramids; and it has remained undisturbed in all ages, as there was nothing to be got out of it. The third pyramid was cased around the base with red granite for the sixteen lowest courses. The design of it has been enlarged at one bound from a small pyramid (such as those of the family of Khufu) to one eight times the size, as it is at present; the passages necded therefore to be altered. But there is no sign of gradual steps of enlargement : the ehange was sudden, from a comparatively small design to a large one. The basalt sarcophagus of this pyramid was ornamented with the panel decoration found on early tombs, unlike the granite sarcophagi of the two previous pyramids, which are plain. Un- happily it was lost at sea in 1838.

Farther south are the pyramids of Abusir, the most complete account of which is in the work of Colonel Howard Vyse. Next come those of Sakkara. The construction of the step-pyramid or cumulative mastaba has bcen noticed above ; its passages are very peculiar and intricate, winding around the principal chamber, which is in the centre, cut in the rock, very high, and with a tomb- chamber built in the bottom of it, which is closed with a great plug of red granite, a circular stopper fitting into a neck in the chamber roof. A doorway faced with glazed tiles bearing a king's standard existed here ; the tiles were taken to Berlin by Lepsius. The other pyramids of Sakkara are of the VIth Dynasty, of Unas, Pepi, Haremsaf, &. They are distinguished by the introduction of very long religious texts, covering the whole inside of the chambers and passages; these are carefully carved in small hiero- glyphics, painted bright green, in the white limestone. Beyond

1 With respect to the construction of this and other pyramids, see Howard Vyse; on measurements of the inside of the great pyramid and descriptions, see Piazzi Smyth ; and on measurements in general, mechanical means, and theories, see Petrie.

these come the pyramids of Dahshur, which are in a simple and massive style, much like those of Gizeh. The north pyramid of Dahshur has chambers roofed like the gallery in the great pyramid by successive overlappings of stone, the roof rising to a great height with no less than eleven projections on each side. The south pyramid of Dahshur has still the greater part of its casing remaining, and is remarkable for being built at two different angles, the lower part being at the usual pyramid angle, while the upper part is but 48°. This pyramid is also remarkable for having a western passage to the chambers, which was carefully closed up. Beyond the Memphitic group are the scattered pyramids of Lisht, Illahun, and Howara, and the cumulative mastaba of Medum. Illahun is built with a framework of stone filled up with mud bricks, and Howara is built entirely of mud bricks, though doubtless cased with fine stone like the other pyramids.

Beyond these there are no true pyramids, but we will briefly notice those later forms derived from the pyramid. At Abydos a large cemetery is

covered with more than a hundred mud-brick chambers, the outsides of which are sloped to the form of an acute pyramid, and which have a door (or in later forms a large chamber) projecting on one side. These differ from true pyramids in (1) having an attachment more or less large on one face, (2) being always built on a square plinth, (3) having the principal face generally south, and but rarely to the north, (4) not being oriented, and (5) having the chainbers occupying the greater part of the structure. The sizes are about 18 feet wide and 24 high, with a chamber 11 feet wide and 13 high, and in the later and less acute forms 20 feet base and 21 in height (see Mariette, Abydos, Description des Fouitlles, ii. 48). At Thebes are also some similar structures belonging to the kings of the Xlth Dynasty; the tomb-chamber is, however, in the rock below. The size is not so insignificant, but is under 50 feet square. These, like those at Abydos, are not oriented, and have a horizontal entrance, quite unlike the narrow pipe-like passages sloping down into the regular pyramids (see Mariette, in B2b. Areh. Trans., iv. 193). In Ethiopia, at Gebel Barkal, are other so-called pyramids of a very late date. They nearly all have porches; their simplicity is lost amid very dubious decorations; and they are not oriented. They are all very acute, and have flat tops as if to support some ornament. The sizes are but small, varying from 238 to 88 feet square at Gebel Barkal and 17 to 63 feet square at Meroe. The interior is solid throughout, the windows which appear on the sides being useless architectural members (see Hoskin's Ethiopia, 148, &c.). The structures sometimes called pyramids at Bialimu in the Fayum seem to have no possible claim to such a name, though they are certainly of early work. Judging by the account of Herodotus (which seems intended to apply to them), by the present name (Pharaoh's thrones), and the actual remains, it appears that they were two great enclosed courts with sloping sides, in the centres of which were two seated statues raised on pedestals high enough to be seen over the walls of the courts. This form would appear like a pyramid with a statue on the top; and a rather similar case in early construction is shown on the sculptures of the old kingdom. Obelisks then were single monuments (not in pairs) and stood in the midst of a great courtyard with sides sloping like a mastaba ; such open courtyards on a small scale are found in the mastabas at Gizch, and are probably copied from the domestic architecture of the time.

On the vexed question of inscriptions on the pyramids it will suffice to say that not one fragment of early inscription is known on the casing of any pyramid, either i sitw or broken in pieces. Large quantities of travellers' "graffiti" doubtless existed, and some have been found on the casing of the great pyramid ; these probably gave rise to the accounts of inscriptions, which are expressly said to have been in many different languages.

The mechanical means employed by the pyramid-builders have been partly ascertained. The hard stones, granite, diorite, and basalt were in all fine work sawn into shape by bronze saws set with jewels (either corundum or diamond), hollows were made (as in sarcophagi) by tubular drilling with tools like our modern diamond rock-drills (which are but reinvented from ancient sources, see Engineering, xxxvii. 282), and small articles were turned in lathes fitted with mechanical tool-rests and jewel-pointcd tools. The details of the questions of transport and management of the large stones remain still to be explained.

Works referred to above.—Colonel Howard Vyse, Operations at the Pyramids,

1840; Professor C. Piazzi Smyth, Life and Work at the Great Pyramid, 1867 5 W. M. Flinders Petrie, Pyramids and Temples of Gizeh, 1883. (W. M. F. P.)

PYRENEES, a range of mountains stretching with a general trend 18° to the north of west between France and Spain, from Cape Creus, or more properly Cape Cerbera, on the Mediterranean to the Bay of Biscay. The length of the range is about 240 miles, the greatest breadth little more than 50 miles (exclusive of the lower parallel ranges on the Spanish side), and the area covered

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by it about 13,000 square miles. For the most part the crest of the main chain constitutes the Franco-Spanish frontier ; the principal exception to this rule is formed by the valley of Aran, which, belonging orographically to

France but politically to Spain, is closed at the head by a transverse ridge running north and south and connecting the eastern and western halves of the chain.

The whole range is remarkable for its regularity. The main chain is on the whole easy to trace; its continuity is unbroken, and the variations in its height are mostly confined within narrow limits. The same regularity is seen in the arrangement of the valleys. Except that of Aran, all the principal valleys are given off at right angles, or nearly so, like the pinnze of a fern-frond, on both sides of the chain, and they are again subdivided by similar minor valleys at right angles to them. In all these re- spects the Pyrenees contrast in a very marked manner with the Alps. They have none of the great longitudinal valleys so characteristic of the latter range, none of the great lakes by which such valleys are occupied, and but few passes like those which are found in plenty leading across the great chains of the Alps at a level much below that of the adjoining peaks. In this last particular, in-deed, the Pyrenees are conspicuously deficient. Between the two extremities of the range, where the principal highroads and the only railways run between France and Spain, there are only two passes practicable for carriages, — the Col de la Perche between the valley of the Tet and the valley of the Segre, and the Col de Somport or Port de Canfrane (where it is now proposed to pierce the range by a railway tunnel) on the old Roman road from Saragossa to Oloron.

This latter pass marks the western extremity of what are known as the Central Pyrenees, which extend east- wards to the valley of Aran and include the highest sum- mits of the whole range—Pic de Néthou or Maladetta (11,165 feet), Posets (11,047 feet), Mont Perdu (10,994 feet, Reclus; other authorities, 11,430 feet). In the Atlantic Pyrenees to the west of that pass the average height gradually, but steadily diminishes till we come to the Mediterranean, while in the Eastern Pyrenees, with the exception of one break at the eastern extremity of the Pyrénées Ariégeoises, the mean elevation is maintained with remarkable uniformity, till at last a rather sudden decline occurs in the portion of the chain known as the Albéres,

Narrow as the range is, the inclination of a straight line drawn from the base to the crest on the French side is not more than 3°, or a rise of about 6 in 100. On the Spanish side it is said to be somewhat steeper, but this has not been definitely ascertained. This fact, however, gives no idea of the general character of the Pyrenean slopes, The descent from the crest to the plains is marked

y a succession of terraces terminating in abrupt precipices. On the French side a long cliff marks the northern limit of the chain for the greater part of its length, and this feature is particularly well defined in the department of Aude, where a steep precipice marks the division between the true Pyrenees and the Corbiéres, a minor chain re- markable for the complexity of its geological structure, stretching in that department from south-west to north-east. _ Besides these longitudinal precipices marking the steps In the descent from the summit-line to the plains, the transverse valleys almost everywhere form profound Tavines, at the bottom of which brawl the innumerable Mountain-torrents (‘“gaves,” as. they are locally called) that form the principal feature in the hydrography of the range. Frequently they form lofty cascades, surpassed in Europe only by those of Scandinavia. The highest is that of Gavarnie at the head of the Gave de Pau, 1515

feet high. The wildness which thus in general marks the scenery of the Pyrenees is even greater on the Spanish than on the French side.

A peculiar and very striking feature in the Pyrenean valleys is the frequency with which their upper end assumes the form of a semicircle of precipitous cliffs. Such basins _ are called “ cirques,” and the most noted is that at the head of the valley just mentioned, the Cirque de Gavarnie. The origin of this form of valley is still a matter of discussion among geologists. Geologically the Pyrenees consist, like the Alps, of a core of granite overlaid by sedimentary strata of various age down to the Tertiary period. The granite is exposed chiefly in the east and centre, and appears in the west only in comparatively small isolated patches. Above the granitic core Cambro-Silurian rocks are very extensively developed, especially in the west, and it would appear that the first upheaval on the site of the present Pyrenees took place after the deposition of the rocks of this age, since those of the next epochs in geological history, the Old Red Sandstone, the

Carboniferous, and probably also the Permian, are almost entirely unrepresented. The Secondary rocks down to the Lower Cretaceous were de- posited perfectly conformably upon one another, probably against the slopes of a gentle ridge rising out of the water. Among these, Triassic rocks occupy a considerable area in the west on both slopes of the mountains; those of Jurassic age are likewise found on both slopes, but at different points; while the Lower Cretaceous form an almost continu- ous band on the north and one quite continuous on the south. After the deposition of the last-mentioned strata a second upheaval took place, and then another period of quiet deposition, during which the Upper Cretaceous and Kocene beds were laid down, was brought to a conclusion by the grand upheaval which elevated the Pyrenees into one of the great mountain-chains of Europe and imparted to them the general outline of their present relicf. The last deposits of the Eocene sea in this quarter, represented on the French side by the conglomerates of Palusson, have been raised by this upheaval up the slopes of the mountains, and are succeeded by the Miocene lacustrine molasse, which lies perfectly horizontally at their base. The next and last upheaval was one that did not affect the Pyrenees separately, but raised the whole area on which they stand, causing the emergence from beneath the sea of the region of the Landes and draining the lake that washed the foot of the Pyrenees on the east, thus establishing the present land connexion between France and the Iberian Peninsula.

The later rocks of the Pyrenees are to a large extent limestones, among which are conspicuous the characteristic hippuritic limestone of the southern Chalk and the nummu- litic limestone of the southern Eocene. For the most part the highest peaks belong to the granitic core of the moun- tains. But this is not always the case. In some instances limestone rocks have been carried up to the very crest of the mountains, as in Mont Perdu and in Marboré; the name of the latter, meaning "marble," indicates the nature of its constituent rock. Such limestone summits have a characteristic square massive form, very different from the sharp peaks of the granite and the schists. As in other limestone regions, caves are numerous in the Pyrenees, and several of these are of great interest to geologists and anthropologists on account of the traces of recent geological changes observable in them, and the remains of early man, both Paleolithic and Neolithic, which they have yielded.

The metallic ores of the Pyrenees are not in general of much importance, though there are considerable iron mines at Vic de Sos in Ariége and at the foot of Canigou in Pyrénées Orientales, Coal- deposits capable of being profitably worked are situated chiefly on the

Spanish slopes, but the French side has numerous beds of lignite. Mineral springs are abundant and very remarkable, and specially

noteworthy are the hot springs, in which the Alps, on the contrary, are very deficient. The latter, among which those of Bagnercs de Luchon and Eaux-Chaudes may be mentioned, are sulphurous and mostly situated high, near the coutact of the granite with the stratified rocks. The lower springs, such as those of Bagneéres de Bigorre (Hautes- Pyrénées), Rennes (Aude), and Campagne (Aude), are mostly selenitic and not very warm.

The amount of the precipitation, including rain and snow, is much greater in the Western than in the Eastern Pyrenees, which leads to a marked contrast between the two halves of the ehain in more than one respect. In the first place, the Eastern Pyrenees are without glaciers, the quantity of snow falling there being insufficient to lead to their development. 'he glaciers are confined to the northern slopes of the Central Pyrenees, and do not descend, like those of the Alps, far down in the valleys, but have their greatest length in the direction of the mountain-chain. They form in fact a narrow zonc near the crest of the highest mountains. Here, as in the other great mountain ranges of central Europe, there are evidences of a much wider extension of the glaciers dur- ing the Ice age. The case of the glacier in the valley of Argeles in the department of Hautes-Pyrénées is the best-known instance. The snow-line is stated to lie in different parts of the Pyrenees at from 8800 to 9200 feet above sea-level.

A still more marked effect of the preponderance of rainfall in the western half of the chain is seen in the aspect of the vegetation. The lower mountains in the extreme west are very well wooded, but the extent of forest declines as we go eastwards, and the Eastern Pyrenees are peculiarly wild and naked, all the more since it is in this part of the chain that granitic masses prevail. There isa change, moreover, in the composition of the flora

in passing from west to east. In the west the flora, at least in the north, resembles that of central Europe, while in the east, though the difference of latitude is only about 1°, on both sides of the chain from the centre whence the Corbiéres stretch north-eastwards towards the central plateau of France it is distinctly Mediterranean in character. The Pyrenees are relatively as rich in endemic species as the Alps, and among the most remarkable instances of that endemism is the occurrence of the sole European species of Dioscorea (yam), the D. pyrenwiea, on a single high station in the Central Pyrenees, and that of the monotypic genus Xatardia, only on a high alpine pass between the Val d'Eynes and Catalonia. The genus most abun- dantly represented in the range is that of the saxifrages, several species of which are here endemic.

In their fauna also the Pyrenees present some striking instances of endemism. There is a distinct species of ibex (Capra pyrenatea) con- fined to the range, while the Pyrenean desman or watcr-mole (Jfygale pyrenatea) is found only in some of the streams of the northern slopes of these mountains, the only other niember of this genus being con- fined to the rivers of southern Russia, Among the other peculiarities of the Pyrenean fauna are blind insects in the caverns of Ariége, the principal genera of which are Anophthalmus and Adelops.

See Murray's Handbook of France; A. Leymerie, Description géologique et paléontologique des Pyrénées dela Haute Garonne (to which a general account of the chain is prefixed), Toulouse, 1881 ; De Chausenque, Les Pyrénées, 1854; for the vegetation, Bentham, Catalogue des Plantes indigénes des Pyrénces et de Bas- Languedoc, Paris, 1826, and Grisebach, Vegetation der Erde, Leipsic, 1872; and for an account of the caverns, Geikie, Prehistoric Kwrope, and the authorities there cited. For the French side of the Pyrenees the best map is that of the Government survey on the seale of gy4an (about an inch to the mile). The first sheet of a map by Fr. Schrader of the Spanish slopes on the scale of yyroan has been published under the title Pyrénées Centrales avec les grands Massifs dw Versant espagnol; and a sketch map of the whole of the Spanish slopes based on the tracings of MM. Schrader, Wallon, and Saint-Sand was published in vol. vii. (1880) of the Annuaire du Club alpin francais, and also separately. See also the maps in Murray's Handbook. (G. G, C.)

PYRENEES, the name of three departments in the south of France.

1. Basses-PyReNEES, a department of south-western France, at the angle of the Bay of Biscay, was formed in 1790, two-thirds of it from Béarn and the rest from three districts of Gascony—Navarre, Soule, and Labourd — which together constitute the Basque region of France. The department lies between 42° 46’ and 43° 36’ N. lat. and between 0° 6’ E. and 1° 47’ W. long., and is bounded on the N. by Landes and Gers, on the E. by Hautes-Pyrénées (which has two enclaves, forming five communes, within this department), on the 8. by Spain, and on the W. by the ocean. The name is due to the fact that the peaks of the Pyrenees on its southern frontier are lower than in the neighbouring department. Their height increases gradually from west to east. The peak of the Rhune, to the south of St Jean de Luz, rises only to 2950 feet; and on the border of the Basque country, which occupies the western half of the department, the mean height of the summits is not much greater. The peak of

Orhy alone, in the south of the valley of Mauléon, reaches 6618 feet. But beyond that of Anie (8215 feet), on the meridian of Orthez, which marks the boundary of Béarn, much loftier elevations appear,—Mourrous (9760 feet), on the border of Hautes-Pyrénées, and the southern peak of Ossau (9465 feet), The frontier between France and Spain follows the crest-line of the main range, except in a few cases mentioned below. The general direction of the rivers of the department is towards the north-west, through a hilly country for the most part wooded or vine-clad, except on the higher slopes, which are grassy. The northern half of the department is covered with bracken or heath, indicating the proximity of the “landes.” The streams almost all meet in the Adour through the Gave de Pau, the Bidouze, and the Nive. In the north-east the two Luys flow directly to the Adour, which they join in Landes. In the south-west the Nivelle and the Bidassoa flow directly into the sea. The lower course of the Adour forms the boundary between Basses-Pyrénées and Landes; it enters the sea a short distance below Bayonne over a shifting bar, which has often altered the position of its mouth. The Gave de Pau, a larger stream than the Adour, passes Pau and Orthez, but its current is so swift that it is only navigable for a few miles

above its junction with the Adour. On the left it receives the Gave d'Oloron, formed by the Gave d'Ossau, descending from the Pic du Midi, and the Gave d'Aspe, which rises in Spain. The second iniportant affluent of the Gave de Pau, the Saison

or Gave de Mauléon, descends from the Pic d'Orhy.

From the Pic des Esealiers, which rises above the forest of Iraty, the Bidouze descends northwards; while the forest, though situated on the southern slope of the chain, forms a part of French territory. The Nive, a pretty river of the Basque country, takes its rise in Spain ; after flowing past St Jean Pied de Port, it joins the Adour at Bayonne. The Nivelle also belongs only partly to France and ends its course at St Jean de Luz. The Bidassoa, which is only important as forming part of the frontier, contains the [le des Faisans, where the treaty of the Pyrenees was concluded (1659), and debouches between Hendaye (France) and Fontarabia (Spain).

The climate of the department is essentially that of the Gironde in the valleys,—mild and damp. The spring is rainy ; the best seasons are summer and autumn, the heat of summer being inoderated by the sea. The winters are mild. The very calm air of Pau (see Pav) agrees with invalids and delicate constitutions. St Jean de Luz and Biarritz are much frequented by winter visitors.

The department is mainly agricultural, 287,719 of its inhabitants being dependent on this industry (Reclus). In 1881, of a total arca of 1,883,667 acres 129,132 were under wheat and produced 217,412 quarters ; the other figures were—barley, 4188 acres, 7197 quarters ; buckwheat, 455 acres, 761 quarters; oats, 12,800 acres, 22,327 quarters ; maizc, 161,786 acres, 354,055 quarters ; meslin, 2600 acres, 3987 ; ryc, 2308 acres, 3536; flax, 13,399 acres, 9348 quarters ; potatoes, 7067 acres, 158,592 bushels; vineyards, 63,511 acres, 4,019,466 gallons of wine (the most highly esteemed vintage being that of Jurancon). From 25,205 acres were produced 642,760 bushels of dried vegctables, and 18,781 acres of chestnut trees yielded 314,480 bushels of chestnuts. There are 163,613 acres of pastures and grazing-lands, 132,342 of permanent meadows and orchards, 28,595 under green crops, and 612,000 acres of waste lands. 'The live stock numbered 27,845 horses, 9110 mules, 15,409 asses, 189,818 horned cattle,

434,130 sheep (giving 300 tons of wool, worth £18,000), 78,310 pigs, 150,608 goats, and there were 16,000 hives of bees (producing 63 tons of honcy and 16 of wax). One-half of the 386,000 acres of forest belongs to private persons, the other almost wholly to the communes or the department, scarcely any woods belonging to the Government. Forest manage ment receives careful attention. The number of inhabitants cm- ployed in manufactures was 67,455. There are mines of antliracite, copper, iron, lead, zinc, silver, and kaolin in small quantity. The salt produced amounted to 9663 tons and is used partly for the famous Bayonne hams (so called, but really prepared in the neigli- bourhood of Orthez). The department has valuable mineral springs.

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Arreau and flows northwards through a beautiful valley as far as Labarthe, where it turns to the north-east > It as important as furnishing the plateau of Lannemezan with a feeding canal, the waters of which are partly used for irrigation and partly for supplying the streams that rise there and are dried up in summer,—the Gers and the Baise, affluents of the Garonne. This latter only touches the department. The climate of Hautes-Pyrénées, though very cold on the highlands, is warm and moist in the

The Eaux-Bonnes, hot and cold, containing sodium and sulphur, ave employed especially for disorders of the chest and respiratory organs. The Haux-Chaudes, of like composition, are efficacious in catarrh, rheumatism, and skin diseases. Those of Cambo on the Nive, some hot and sulphurous, some chalybeate and cold, are much frequented by the Basques on the eve of St John. The waters of St Christau, near Oloron, containing copper, are effica- cious in skin discases. The manufactures of the department in- elude woollen caps and sashes, the fez worn by the people of the district, nets, Béarn linen, cord slippers, chocolate, and there are also tanneries and flour-mulls. The only shipping port is Bayonne, which town is also the meeting-place of the roads to St Sebastian

and Pamplona in Spain.

Puyoo with St Palais, and Pau with Laruns (Eaux-Bonnes).

Oloron, Orthez (population of town, 4657), and Mauléon (2038), divided into 40 cantons and 558 communes.

(Bordeaux).

2, HAUTES-PYRENEES, a department of southern France, on the Spanish frontier, was formed in 1790, half of it being taken from Bigorre and the remainder from Armag- nac, Nébouzan, Astarac, and Quatre Vallées, districts which all belonged to the province of Gascony. It lies between 42° 40' and 43° 37' N. lat. and between 19' W. and 39'

E. long., and is bounded on the S. by Spain, on the W. by Basses-Pyrénées, on the N.W. by Landes, on the N.E. by Gers, and on the E. by Haute-Garonne. Except on the south its boundaries are conventional. Pyrenean peaks in this department reach or exceed the height of 10,000 feet, the Vignemale (10,820 feet) being the highest in French territory. The imposing corries, with their glaciers and waterfalls, and the pleasant valleys attract a large number of tourists, the most noted point being the famous Gavarnie. The northern portion of the department consists of plains, or rather fertile valleys, clothed with corn-fields, vineyards, and meadows. To the north-east, however, the cold and wind-swept plateau of Lannemezan (about 2000 feet), the watershed of the Streams that come down on the French side of the Pyre- nees, presents in its bleakness and barrenness a striking contrast to the plain that lies below. The department is drained by three principal streams, the Gave de Pau, the Adour, and the Neste, an affluent of the Garonne, The sources of the first and third lie close together in the Cirque of Gavarnie and on the slopes of Troumouse, whence they flow respectively to the north-west and north- east. An important spur of the Pyrenees, which carries the Pic de Néouvielle and the Pic du Midi de Bigorre, pro- jects to the northward between these two valleys. From the Pic du Midi the Adour descends, which, after watering the pleasant valley of Campan, leaves the mountains at Bagnéres and then divides into a multitude of channels, which irrigate the rich plain of Tarbes. Beyond Hautes- Pyrénées it receives on the right the Arros, which flows through the department from south to north-north-west : on the left it receives the Gave de Pau. This latter stream, rising in Gavarnie, is joined at Luz by the Gave de Bastan from Néouvielle,

and at Pierrefitte by the Gave de Cauterets, fed by streams from the Vignemale. The Gave de Pau, after passing Argelés and the grotto of Lourdes on its left and the chateau of Lourdes on its nght, leaves the mountains and turns sharply from north to north-north-west ; it has a greater volume of water than the Adour, but, being more of a mountain torrent, is regarded as a tributary of the Adour, which is navigable In the latter part of its course. The Neste d'Aure, de- Scending from the peaks of Néouvielle and Troumouse, re- celves the Neste de Louron from the pass of Clarabide at

Within the department there are 258 miles of Government roads and 7460 of departmental or parish roads. There are also 142 miles of railroad, connecting Bayonne with Toulouse, Dax with Puyoo (for Pau), Bayonne with Biarritz, The population in 1881 was 434,366 (57 per square kilométre), almost entirely Catholic. There are five arrondissements—Pau, Bayonne,

Basses – Pyrénées

constitutes the diocese of Bayonne, and is attached to the superior court of Pau and belongs to the district of the 18th Army Corps

Some of the

plains, where there are hot summers, fine autumns, mild winters, and rainy springs. The mean annual temperature is 68° Fahr. On the plateau of Lannemezan, while the summers are dry and scorching, the winters are very severe. A meteorological observatory has been built on the Pic du Midi.

Of the total area of 1,119,292 acres 259,334 are arable, 214,782 under wood, 160,624 pastures and grazing-lands, 76,015 permanent meadows and orchards, and 39,135 vineyards. The mountain slopes are covered with pasture to a height of more than 6600 fect. In 1881 the live stock included 114,900 horned cattle (the milch cows of Lourdes and the oxen of Tarbes being the most esteemed), 18,000 horses (mostly of the Tarbes breed crossed with Arab blood), 11,830 asses, 3200 mules (part of which are bred for Spain), 222,300 sheep, 74,800 pigs, and 8718 goats. The more important cercals are successively, as the elevation increases, maize, wheat,

and rye; in the mountain districts oats, barley, and buckwheat are grown. In 1882 the harvest yielded 158,620 quarters of wheat, 197,931 of maize, 70,690 of rye, 47,586 of oats, 15,069 of barley, 27,586 of buckwheat, 61,241 of meslin, and 1,793,104 bushels of potatoes. The formerly extensive forests have suffered considerably from the weather and other causes. Vines, trained npon trees as in Italy, yield on an average 2,464,000 gallons of wine annually. On the lower slopes chestimt trees and fruit trees take the place of the vines. There are various quarries of fine marbles, which are sawn and worked at Bagnéres, and numerous slate quarries. The mines of iron, nickel, lead, cobalt, manganese, and zinc are worked only irregularly. There is no coal, but a few hundred tons of peat are annually extracted. The mineral waters of Hautes-Pyrénées are numerous and much resorted to. The principal in the valley of the Gave de Pau are Cautercts (twenty-four hot springs containing sulphur and sodium), St Sauveur (two springs with sulphur and sodium), and Baréges (twelve hot springs with sulphur and sodium), and in the valley of the Adour Bagnéres (fifty-two hot or cold springs containing calcium sulphates, iron, and arsenic) and Capvern near Lannemczan (two springs containing calcium sul- phates). There are 2 paper-mills employing 101 workinen, 28 spin- ning or weaving factories employing 908 workmen (4000 spindles and 750 looms, of which 220 are power-looms). The light woollen materials known under the name of 'baréges" and the knitted work of the department are widely known beyond its limits. A company has been formed for establishing chcese- factories in the mountains, as in Switzerland. There are also saw-mills, flour-mills, tanneries, and at Tarbes very important artillery establishments and a bell-foundry.

The passes (ports) into Spain rise more than 6500 feet ; none of them are accessible to carriages, and only three—Gavarnie, Our- dissetou, and Plan —to beasts of burden. ' Within the department there are 222 miles of Government roads, 2837 miles of other roads, and 129 miles of railroad. It is traversed from west to east by the line from Bayonne to Toulouse, which has branches from Lourdes to Pierrefitte for Cauterets, from Tarbes to Bagnéres de Bigorre, and from Montrejeau to Bagnéres de Luchon. It is crossed also by lies from Tarbes to Bordeaux and from Tarbes to Agen, which separate at Vic de Bigorre. The population in 1881 was 236,474. There are three arrondissements, those of Tarbes (chief town), Argelés

(town, 1682 inhabitants), and Bagnéres de Bigorre (7634 inhabitants), 26 cantons, 480 communes. Hautes-Pyrénées con- stitutes the diocese of Tarbes, and is attached to the superior court of Pau and to the 18th Army Corps (Bordeaux).

3. PYRENEES-ORIENTALES, a department of southern ° France, bordering on the Mediterranean and the Spanish frontier, was formed in 1790 out of the old province of Roussillon and to some slight extent out of small portions of Languedoc. It lies between 42° 20' and 42° 56' N. lat. and 1° 43' and 3° 10' E. long., and is bounded on the N. by Ariége and Aude, on the E. by the Mediterranean, on the 8. by Catalonia, and on the W. by Ariége. Its boundaries are almost all natural and on the north follow the line of the Corbitres (from 2500 to 3000 feet high), on the north-west and south-west that of branches of the

Pyrenees (from 8000 to 10,000 feet), and on the south-cast that of the Albéres (from 4000 to 5000 feet), which end in the sea at Cape Cerbera. Deep and sheltered bays in this vicinity are succeeded farther north by flat sandy beaches, along which lie lagoons separated from the sea by belts of sand. The lagoon of St Nazaire is 5400 acres in extent, and that of Leucate on the borders of Aude is 20,000 acres. Mont Canigou (9137 feet), though not the highest mountain in the department, is the most remarkable, since it stands out to almost its full height above the plain, and exhibits with great distinctness the succession of zones of vegetation. From the base toa height of 1400 feet are found the orange, the aloe, the oleander, the pomegranate, and the olive; the vine grows to the height of 1800 feet ; next come the chestnut (2625 feet), the rhododendron (from 4330 to 8330 feet), pine (6400), and birch (6560) ; while stunted junipers grow quite to thesummit. The drainage of the department is shared by the Tet, Tech, and Agly, which flow direct into the Mediterranean. The Aude, the Ariége (an affluent of the Garonne), and the Segre (an afflu- ent of the Ebro) also take their rise within the department and include a small part of it in their respective basins. The Tet rises 9430 feet above the sea and descends rapidly into a very narrow valley before it debouches at Ile (between Prades and Perpignan) upon a large plain, where it flows over a wide pebbly bed and

supplies numerous canals for irrigation. It is nowhere navigable, and its supply of water varies much with the seasons, all the more that it is not fed by any glacier. The Agly, which passes Rivesaltes (famous for its wines), rises in the Corbiéres, and serves almost exclusively for irrigation, though admit- ting of navigation in the lower part of its course. The Tech, which after the Tet is the most important river of the department, flows through Vallespir (Vadlis aspera), which, notwithstanding its name, is a green valley, clothed with wood and alive with industry; in its course the river passes Prats de Mollo and Amélie-les-Bains, before reaching Arles and Céret. In the lowlands the climate is entirely that of the Mediterranean, and the productions are the same as those of Corsica or Sicily ; Amélie-les-Bains is much frequented on account of its mild climate and sheltered position. The thermometer ranges from 85° to 95° Fahr. in summer, and in winter only occasionally falls as low as 26° or 27°. The average number of rainy days in the year is 70; the mean amount of the rainfall is 27 inches on the coast, but increases towards the hills. The most common wind is the " tramontane" from north- north-west, as violent as the mistral of Provence and extremely parching. The "marinada" blows from the south-south-east.

Of a total area of 1,018,632 acres 211,960 are arable, 172,980 under vines, 167,740 under wood, 193,367 pasture-land, 27,305 meadow-land, and 148,270 barren moors (garrigues). In 1881 the live stock numbered 7287 horses, 6261 asses, 4873 mules, 17,768 horned cattle, 121,016 sheep (125 tons of wool in 1878), 12,864 goats, 28,838 pigs, and fowls and game in abundance ; there were also 6163 beehives, yielding 24 tous of wax and 19 tons of honey known as "miel de Narbonne." Thirty tons of cocoons (silk) were produced in the same year. The main source of wealth to the de- partment is its wine, of which 48,840,000 gallons were produced _in 1881; some kinds are strongly alcoholic and others are in request as liqueur wines (Rivesaltes, Banyuls). The harvest of 1881 yielded 26,551 quarters of wheat, 3793 of meslin, 87,9380 of rye, 6896 of barley, 3448 of buckwheat, 34,480 of oats, 55,172 of maize, 1,655,168 bushels of potatoes, 67,448 of dried vegetables, 22,640 of chestnuts, 110,336 of beetroot, 39 tons of henip, 39 of flax, and 23,000 of olives. Market-gardening (artichoke, asparagus, tomatoes, melons) and fruit culture (peaches, apricots, plums, pears, quinces, pomegran- ates, almonds, apples, cherries, walnuts, chestnuts) yield abundant returns. The woods produce timber for the cabinetmaker,

cork, and bark for tanning. In iron Pyrénées-Orientales is one of the richest departments in France. The greater part of the ore is transported to Aveyron, Gard, or Allier, but 25,000 tons arc smelted in blast-furnaces and 1800 in Catalonian forges witliin the depart-

ment. In 1881 12,100 tons of pig-iron were produced. The mineral resources of the department also include a bed of bismuth and mines of copper and silver, while both the Tet and the Tech are to some extent auriferous. A small amount of lignite is ob- tained (1639 tons), and various fine marbles are abundant. Granite, slate, gypsum, and limestone are quarried. The mineral waters are much resorted to. Amélie-les-Bains has twelve hot springs, chalybeate or sulphurous. In the arrondissement of Céret there are also the establishments of La-Preste-les-Bains, near Prats de Mollo, with hot sulphurous springs, aud of Boulou, the Vichy of the Pyrenees. Near Prades are the hot sulphurous springs of Molitz, and a little north of Mont Canigou are the hot springs of Vernet, containing sodium and sulphur. In the valley of the Tet

the sulphuros and alkaline springs of Olcette reach a temperature'

of 172° Fahr. The baths of Escaldas near Montlouis are hot, sulphurous, and alkaline. There are numerous tanneries, oil-works, distilleries, and saw-mills, and the manufactures of the department include the making of corks, cigarette-paper, barrels, bricks, woollen and other cloths, and "espadrilles"' (a kind of shoe made of coarse eloth with esparto soles). The ports of the department are Collioure, Port Vendres, and Banyuls, with 371 vessels and a total tonnage of 3638 in 1882. Port Vendres alone has any importance ; in 1882 the ships entered numbered 380 (104,572 tons), those which cleared 368 (95,931 tons). There are 67 miles of railway, consisting of a portion of the line from Narbonne to Barcelona (Spain) by Per- pignan, with its branches from Perpignan to Prades; there are 208 miles of Government roads and 2107 miles of other roads. The

chief routes across the Pyrenees are from Perpignan and Montlouis.

to Puycerda (Puigcerda) in the Spanish province of Gerona, through the pass of La Perche, skirting in the French department an enclave of Spanish territory. Three other roads run from Perpignan to Figueiras (Figueras) through the passes of Perthus, Banyuls, and Balistres. In 1881 the population of Pyrénées -Orientales amounted to 208,855, the majority of whom were Catalans in speech and the rest Provengal. The chief towns of the three arrondissements are PERPIGNAN (q.v.), Céret (8104 inhabitants), and Prades (3687) ; there are 17 cantons and 231 communes, The department constitutes the diocese of Perpignan and is attached to the superior court and army corps of Montpellier. (G. ME.)

PYRITES (from zp, fire), a name applied to the native

bisulphide of iron, which occurs as a yellow metallic ,

mineral, sufficiently hard to emit sparks when struck with either flint or steel. Nodules of pyrites are common in the lower beds of Chalk, and fragments of these nodules have occasionally been found on prehistoric sites under circumstances which suggest that the mineral was used as a fire-producing medium at a very early period of human culture. Even in late historic time it was often employed instead of flint, as in some of the old wheel-lock guns, whence it came to be known in France as " pierre d'arque- buse." It was afterwards found that pyrites might be made available as a source of sulphur, oil of vitriol, and other chemical products; and the mineral thus acquired such importance that in 1725 it was made the subject of a special treatise by Dr J. F. Henckel, of Freiberg in Saxony. In 1757 an English translation of this work appeared under the title of Pyritologia ; or a History of the Pyrites, the Principal Body in the Mineral Kingdom.

By modern mineralogists the term "pyrites" has been extended to a number of metallic sulphides, and it is there- fore now used rather as a group-name than as the specific designation of a mineral. Hence the typical pyrites is often distinguished as "iron pyrites," while other members of the group are known as "copper pyrites," " cobalt pyrites," "arsenical pyrites," &c. When, however, the term '"pyrites" is used without any qualifying prefix it invariably denotes the original iron pyrites, a mineral which is often known to miners as '"'mundic," and to mineralogists as "pyrite," the final letter

of the original word being omitted to bring the spelling into harmony with that of the names of many other minerals.

Iron pyrites, though containing nearly half its weight of iron, is of no importance as an ore of that metal; but the mineral is extensively worked for the sake of the sulphur which it contains, whence it is sometimes known as "sulphur ore." Large quantities of this ore have been worked in the vale of Avoca, in county Wicklow, Ireland. But by far the

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most important variety of the mineral is a "cupreous iron pyrites," which for many years past has been wrought on an enormous scale in Spain and Portugal. This ore seems to be an intimate mixture of iron pyrites with a small quantity of copper pyrites, the proportion of metallic copper being generally less than 3 per cent. Notwithstanding the poorness of the ore, the copper is profitably extracted by wet processes. There is also present a small quantity of silver (20 to 35 dwt. per ton), with a trace of gold. The deposits of this cupreous pyrites are of enormous magni- tude, and occur at the junction of porphyritic rocks with clay-slate of Devonian age. The principal Spanish mines are those of Rio Tinto, Tharsis, and Calaiias in the province of Huelva; whilst the most important of the Portuguese mines'is that of San Domingos in the province of Alemtejo. There is ample proof that some of these pyritic deposits were worked by the ancient Romans.

The quantity of cupreous and other iron pyrites imported into Great Britain during the year 1883——principally from Spain and Portugal, but partly from Norway and elsewhere —was 601,288 tons, of the declared value of £1,356,083. But this quantity had been exceeded in several previous years, notably in 1880 and 1877. The quantity of iron pyrites raised in the United Kingdom in 1883 amounted to 27,672 tons, of the value (at the mine) of £17,467.

See Iron, vol. xiii. pp. 280, 288 ; Coppsr, vol. vi. p. 847 ; Mar- CASITR, vol. xv. p. 582; and MINERALOGY, vol. xvi. pp. 390, 393. For details of the Rio Tinto pyrites, see 4 Treatise on Ore-Deposits, by J. Arthur Phillips, 1884. |

PYRMONT. See WaLpEcx.

PYROMETER, an instrument for measuring high temperatures. As long ago as 1701, in a paper ! published anonymously in the Philosophical Transactions, Newton gave the results of attempts to estimate the temperature of red-hot iron by noting the time it took to cool to an observed temperature, assuming what has since been called Newton's Law of Cooling. The numerical results are given in terms of the degrees of a linseed-oil thermometer constructed by Newton. Its zero was the temperature of melting ice and its second fixed point the normal temper- ature of the human body, denoted by 12°. About the same time Guillaume Amonton in Paris made somewhat similar attempts to determine the temperature of the red-hot end of an iron bar, using for reference a rudimentary air-thermo- meter—the first of its kind in which the variation of atmospheric pressure was allowed for. Since the middle of the last century the different methods and instruments Suggested for measuring high temperatures have been very numerous,—in fact the variation of alinost every physical property of substances which alter with change of temper- ature has been utilized for this purpose. Measurements of the increase of pressure produced in a quantity of gas while its volume remains constant or of the increase of volume at constant pressure, of the heat given out by a mass of metal in cooling to an observed temperature, of the expansion of a metal or graphite bar or of a mass of clay are those which have been most frequently employed ; but, besides these, the change in the electrical resistance of a wire, the saturation-pressure of the steam of various liquids, the pressure of gas dissociated from various solids, the electromotive force of a thermo-electric couple, the density of the vapour of a liquid, the change of shape of & compound spiral of different metals, have been used,— even the alteration in the wave-length of a note of given pitch has been suggested as capable of being made use of for pyrometric purposes. For reasons which will be Siven below, the numerical results obtained by one or other of the numerous forms of the gas-thermometer have " More definitely intelligible value. The gas-thermometer

1 “Scala Graduum Caloris,” in Phil. Trans., xxii, p. 824.

method and the calorimetric method were both employed by Pouillet for the accurate measurement of high temper- atures before 1836.

§ 2. The indications obtained by any of the numerous methods which have been suggested are, as a rule, expressed in terms of Centigrade or Fahrenheit degrees. This assign- ment of numbers presupposes not only a definition of tem- perature by which the size of the degree is determined but also a physical law which gives the relation between the measured interval of temperature and the standard degree. The various definitions of the standard degree that might be employed will be found in the article Hxaz, secs. 12, 24, 25, 30, 31, 32; and in sec. 35 of the same article the definition of the absolute thermodynamic scale of temper- atures is given. In the same article (sec. 38) it is shown that the “absolute temperature” of a liquid in thermal equilibrium with its own vapour under a pressure p may be obtained from the formula

‘ (1—o)dp

Jpk + t=t,¢ :

where p is the density of the vapour, po that of the liquid, « the latent heat per unit-mass of the vapour corresponding to the saturation-pressure p. The dynamical equivalent of heat is represented by J. We have therefore the com- plete theory of what may soon become a practical method of expressing temperatures in the thermodynamic scale. Sir W. Thomson, in the article mentioned (secs. 39-45), has described arrangements for measuring the pressure of the saturated vapours of various liquids which will give that measurement in a thoroughly satisfactory manner up to, at any rate, some 600° C. For the higher tempera- tures mercury is the liquid employed. There are, however, some experimental data still wanting before the formula quoted above can be applied to the numerical calculation of the temperature. These are (1) the density p of the saturated vapour corresponding to the series of pressures, and (2) the corresponding latent heat « of vaporization. These constants have not yet been actually observed.

Instruments such as those figured in the article cited can, however, be employed with convenience and accuracy as continuous intrinsic thermoscopes, whose indications can supply a numerical measure of temperature after an empirical graduation. When used thus they possess the enormous advantage that the pressure of the saturated vapour at a definite temperature is perfectly definite, so that a single observation of the pressure is all that is necessary to determine the temperature, and the instru- ment can be easily arranged, so that this observation is practically a very simple one. The pressure of mercury vapour has already been determined by Regnault for temperatures up to 550°. A thermoscopic method of pyrometry which is very similar to the above was sug- gested by Lamy.? He proposed to measure the pressure of carbonic-acid gas dissociated from calcium carbonate. There is experimental evidence to show that the pressure of the dissociated gas is definite at a definite tempera- ture. The recombination of the dissociated gas with the solid is, however, a slow process, and the method has been pronounced by Weinhold? to be practically unsatis- factory.

§ 3. Gas Pyrometry. Measurement of High Tempera- tures by the Expansion of Air and other Gases and Vapours. —Temperatures may be expressed in the absolute thermo- dynamic scale by the method of the gas-thermometer, which is available for practical purposes even at very high temperatures. It has been shown? that the indications

*2 Comptes Rendus, xix. p. 347. : 3 '*Pyrometrische Versuche," Pogg. Ann., cxlix. p. 186. 4 See Heat, secs. 46-67.*

of a nitrogen or hydrogen gas-thermometer, whether it is arranged to show the increase of pressure at constant volume or the increase of volume at constant pressure, give for the temperature numerical results which are practically identical with the corresponding numbers on the absolute scale. It follows, therefore, that any two gas-thermo- meters, if similarly graduated, would give identical indica- tions for the same temperature, no matter whether or not they are filled with the same kind of gas and whether

or not the quantities of the gases are such that the pressure in the two thermometers is the same at any one temperature. This important property of gas-thermometers has been experimentally verified by Regnault! by direct comparison up to 350° C. of instruments filled with different gases and at different pressures. For these reasons the readings of a properly arranged gas-thermometer have justly come to be regarded as furnishing the standard of temperature, at any rate outside the limits of the freezing and boiling points, and indeed may now be regarded as the tempera- ture standard for scientific purposes throughout the whole range. The Kew standards are calibrated mercury-in-glass thermometers whose fixed points are repeatedly redeter- mined. Such instruments will not agree exactly with the gas-thermometer except at the freezing-point and _ boiling- point. Comparisons have been made between various mercury-thermometers and air-thermometers by Regnault ? and many others. The results obtained by different ob- servers are not entirely concordant; but it is needless here to discuss them, for, whatever may be the divergence between the mercury and air thermometers in the freezing- point and boiling-point, the method of measuring higher temperatures by continuing the scale of a mercury-thermo- meter beyond those limits is altogether untrustworthy in consequence of the very wide divergence between different mercury-thermometers at the same temperature, amount- ing sometimes to 10° or more? at a temperature of 300°. The air-thermometer readings must therefore be regarded as the standard at any rate for temperatures beyond the boiling-point.

The general principle employed in the use of the gas- thermometer is as follows. Let p, be the pressure of a mass of gas at 0° C., 4) the pressure of the same mass of gas at 100° C., the volume being the same, p, the observed pressure of the same mass of gas at some unknown tem- perature ¢, the volume still remaining the same, then

Per Po. t (1) Pm-R loo :

*We require, therefore, three observations of the pressure, two * to graduate the instrument and the third to measure the temperature. If the thermometer has been filled with gas of a perfectly definite kind—e.g., properly dried and purified air, nitrogen, or hydrogen—and the containing vessel has been*

previously thoroughly dried, the value of Po) May be obtained from tables, since p49) =p)(1 + 100a), where a is the tabulated coefficient of expansion of the gas at constant volume. It is practically impossible to keep the volume of the gas constant in consequence of the expansion of the envelope. A correction must be applied on this account, the value of which is derived from inde- pendent observations of the expansion of the material of the envelope. If the pressure of the gas be maintained constant, and the volumes %, 99, % be observed for the three temperatures ¢°, 100°, 0°, we have—

Wy—V _ t V9 — Vy 100

1 "Dela Mesnre des Températures," Mém. de 'Inst., xxi. p. 168.

2 Mém. de UInst., xxi. p. 191. 3 See Hua, see. 26.

- *The two known temperatures at which the pressure is measured need not neeessarily be 0° and 100°, though these are often the most convenient. The formula requires only slight modification to make it applicable when any two other known temperatures are adopted.*

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In like manner 2) —v¥ may be taken from a table of the

coefficients of expansion of gases. The different methods which have been suggested for the employment of this property of gases to measure high temperatures are very numerous. We give details of a few of them.

(1) The Constant-Presswre Method.—The following is a very simple and practical plan of employing the method for obtaining a reading of the temperature. A glass or porcelain bulb, provided with a fine neck, is very carefully dried and filled with perfectly dry air ; it is then exposed to the source of the heat whose temper- ature is to be investigated in such a manner that the point of the neck just projects from the furnace. When the equilibrium of temperature is reached, the neck is hermetically sealed by a blow- pipe or oxy-hydrogen flame, and the bulb is withdrawn and allowed to cool, and weighed. The neck is then immersed in water or mercury and the point broken off. In consequence of the previous expansion of the air the

pressure in the interior is much léss than the atmospheric pressure, and the liquid consequently enters the bulb. When so much has entered that the pressure is the same inside and out (the difficulty of the comparative opacity of the porcelain is not insurmountable), the end is closed by a small piece of wax, and the bulb removed and weighed, with the liquid it contains. The bulb is then completely filled with the liquid, and weighed a third time. The difference between the third and first weighings gives a value % of formula (2), which only requires correction for the expansion of the envelope, while the difference between the second and first weighings gives a value of the volume from which v and V9 can be sharia, using the known co-efficient of expansion of air, and thus all the requisite data for the deter- mination of ¢ are obtained. This method was used by Regnault® to determine the coefficient of expansion of air, and has since been described as "a new pyrometer."

In the process just described the volume of the residual gas is measured ; its pressure, after cooling, may be measured instead, by an arrangement which was suggested by Regnault. The bulb is provided with a long fine neck, to the end of which a tap is fitted and so arranged that it can be easily connected with a manometer. The bulb is exposed to the high temperature, the tap being left open, and when the final temperature is reached the tap is closed and the bulb allowed to cool; it is then connected with the manometer, and, if the tap be a three- way tap, drilled as shown in fig. 1, it is easy to expel all the'! air from the bulb side of the manometer, between the mercury surface and the tap. The residual pressure is then measured by the manometer.

An instrument for observing the continuous variation of volume of a gas at constant pressure is figured and described by Sir W. Thomson in Hear (sec. 65). Arrangements have also been sug- gested by which the density ® of the gas at the high temperature can be directly measured. Regnault® has deseribed a hydrogen pyrometer based on this principle suitable for measuring the temperature ofa porcelain furnace. A wrought-iron tube of known capacity is permanently fixed in the furnace ; it is filled with pure dry hydrogen by passing a current of the gas through it for some time. The current of gas is then stopped, and after the gas has attained the

temperature of the furnace it is swept out by a current of dry air and passed over red-hot copper oxide. The water thus

5 Mém. de UInst., xxi.

TAC. h., mer (G06.

8 Throughout this article the term "density" is used whenever the mass of a unit of volume of a substance is referred to.

9 Ann. de Chim., [8], xiii. p. 39.

6 Comptes Rendus, xc. 727, 773.

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formed is collected in sulphuric acid tubes and its amount deter- mined by their increase in weight, and from this observation the density of the hydrogen in the wrought-iron tube is caleulated. An arrangement of taps makes the observation a very easy one when the apparatus is once set up. 'The formula (2) requires in this ease to be slightly modified. Thus let d;, dy, dy be the den- sities of the hydrogen at the temperatures ¢°, 100°, and 0° respect- ively, then for the same mass of gas 7 we have— Uz Ag=Vy99 Ay = Vp Uy =.

The formula therefore beeomes—

dy ~ Ae Ayo t (3)

dy— yp dy 100 ;

(2) The formula shows how the temperature of air in any experi- ment may be determined when its density at that temperature is observed. It is sometimes more convenient to determine instead the density of some vapour whieh at ordinary temperatures would be a solid or a liquid, and to deduce from that observation the density of air at the corresponding tenrperature. Thus, suppose that the density 6, (expressed in grammes per ee.) of the vapour of any given liquid or solid is observed, and that independent observa- tions show that the specifie gravity of the vapour, referred to air at

the same temperature and pressure, is o, then we have d= 6,/, and, since dy and dy can be taken from tables, all the necessary quantities in equation (3) are obtained. It will be noticed that the value of o, the specifie gravity of the vapour, is to be derived from independent observations. Apart from direct experimental evi- dence in any particular casc, there is the generally accepted theory, based on the law of Avogadro, that the specific gravity of a gas or vapour referred to hydrogen at the same temperature and pressure is represented by half the number expressing the molecular weight of the substance of which the vapour is composed. For elements, with few exceptions (of which mereury is one), the ratio of the atomic weights gives the specific gravity referred to hydrogen at the same temperature and pressure. At any rate, if there are suffi- eient data for us to regard « as known, we may evidently deduce the value of d;, and thus by formula (3) the temperature, from an observation of 6;.

Mercury Vapour.—Regnault! suggested the direet observation of the density of mercury vapour for the purpose of detennining the temperature. The process is as follows. A quantity of mereury is placed in a wrought-iron flask provided with a perforated lid as shown in fig. 2, No. 1. The flask is then exposed to the temper- ature to be measured, and when thermal equilibrium is attained the small lid is slid along so that the neck is closed. The flask is then taken out and allowed to cool, The mercury is collected and weighed ; the volume of the flask is determined and eorrected for the expansion of the iron ; and these two observations determine the den- sity of mercury (in grammes per ce.) at the { temperature in question. The specific gravity 2 of mereury vapour referred to air at the same temperature and pressure is known to be 6°92, Nol. Be & A porcelain flask with a ball stopper, shown in Fig. 2. fig. 2, No. 2, may be used instead of the iron flask.

Iodine Vapour. Deville and Troost's Pyrometer.—Some of the best-known determinations of very high boiling-points have been made by Deville and Troost,? who employed iodine in a manner similar to that in which Regnault employed mereury. Some iodine Was contained in a porcelain flask of about 300 ec. capacity, with a fine neek, which just protruded from the source of heat and was loosely elosed by means of a stopper ; when the temperature was reached and the iodine completely volatilized, the stopper was fused on to the nozzle by means of an oxy-hydrogen blowpipe. The

mass of the iodine remaining in the flask was determined by weigh- Ing, after it had cooled; the volume of the flask had been pre- viously determined ; thus the density of the iodine vapour eould be found. A correction of the volume of the flask was necessary in consequence of the expansion of the Bayeux poreelain of which it was composed. This was obtained from independent observa- tions of the linear elongation of a rod of poreelain for temperatures up to 1500° ; their results gave a coefficient of cubical expansion of 00000108 between 0° and the boiling-point of cadmium (856°), 0°0000108 between 0° and the melting-point of silver (1000°), from 0‘000016 to 0-000017 between 1000° and 1400°, reaching 000020 towards 1500°. The specific gravity of iodine vapour was taken to

8-716, referred to air at the same temperature and pressure ; this assumption was justified by additional observations with air and by using the number in a determination of the density of steam at the boiling-point of mereury.

(3) The Manometrie Gas-thermometer.—In the constant-pressure methods of measuring temperature which have just been described one experiment gives only a single observation of the temperature. =) ai eee

l Ann de Chimie, [8], 1xiii. p. 39.

: Mean of results of Von Meyer, Dumas, Mitscherlich, and Bineau. Ann. de Chimie, [3}, lviii. p. 257.

H Gea 7 SDLP LLY 1 17

allow for the expansion of the glass of the

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The continuous variation of temperature can be better observed by the econstant-volume method. This method as used for tem- peratures up to that at which glass softens (about 550° C.) was thoroughly investigated by Regnault, whose normal instrument is diseussed under HEAT, see. 24. The difference of pressure between the gas contained in the bulb and the atmosphere is measured by an open mercury-manometer. The barometrie

pressure must also be observed in order to obtain the values p,, 499, and py respectively of formula (1). Various forms have been given to the manometric apparatus in order that the mercury may be brought at each observation to the fiducial mark in the limb in connexion with the bulb. Balfour Stewart's> has a screw adjustment. An instru- ment deseribed by Codazza® is provided with an air-eompression manometer, and thus the neeessity of a separate observation of the barometrie height is dispensed with. Various other suggestions have been made for seeuring the same object.

The most convenient form of the instrument for general use is Jolly's (deseribed in Poggendorff's Jubelband, p. 82, 1874), and repre- sented in fig. 3. The two vertical tubes of the manometer are conneeted by an india-rubber tube properly strengthened by a cotton cover- ing, aud they can be made to slide vertically up aud down a wooden pillar which supports them ; they are provided with elamps for fixing them in any position and a tangent serew for fine adjustment. The connexion between the bulb and the manometer is made by means of the convenient three-way tap deseribed above. The seale of the instrument is engraved on the back of a strip of plane mirror before silvering, and the divisions are earried sufficiently far aeross the scale for the reflexions of the two surfaces of the mercury to be visible behind the seale. Parallax ean thus be avoided and an aecurate reading obtained without the ne- eessity of using a kathetometer. In order to

reservoir a weight-thermometer bulb is sup- plied with the instrument, made from another specimen of the same kind of glass, and the relative expansion of the mereury and the glass can thus be determined by the observer him- self. The volume of the air-bulb and that of the eapillary tube and the small portion of the manometer tube above the small beak of glass, the point of whieh serves as the fidueial mark, are determined by the instru- ment-makers, The formula of reduction is— _ #A-H v 1) ~ ally — 88H v° Hy' 1l+at'?'

where Z is the pressure at the high temperature ¢, H, the pressure at the temperature of the air ¢', v'/v the ratio of the volume of the connecting tube, &e., to the volume of the bulb, a the coefficient of expansion of the air, and 38 the coefficient of eubical expansion of the glass. A similar instrument

with a bulb which will resist higher temperatures may be used beyond the softening-point of glass. Pouillet in his elassical researeh on high temperatures" used a platinum bulb and connecting tube. He employed the eonstant- pressure method and measured in the manometer tube the variation of volume. Regnault® mentions a platinum air-pyrometer and gives instructions for drawing the platinum connecting tube; but no results of measurements obtained with it are given. E. Becquerel ® published an aecount of results obtained with a platinum reservoir air-thermometer, whieh were objected to by Deville and Troost on the ground that platinum becomes porous at high temperatures, and their objection is supported by an experiment described by them in the Répertoire de Chimie Appliquée, 1863, p. 237, and Fortsehritte der Physik, 1863, p. 84. Weinhold?° used a Jolly's thermometer fitted with a porcelain bulb and connecting tube, and Deville and Troost are of opinion that porcelain forms the only suitable material for gas-thermometer bulbs for very high tempera- tures.11_ For use at high temperatures the .gas-thermometer should be filled with gas at a low pressure, so that when heated there may be no great difference of pressure between the interior and the external air. It is perhaps unnecessary here to insist upon the necessity for the complete desiccation of the interior of the bulb and of the gas employed.

(4) The last modifieation of the gas-thermometer to which it is necessary to eall attention is that designed and used by Berthelot,!? intended for reading high temperatures rapidly to an aceuraey of within two or three degrees. It consists of a small eylindrical bulb

5 Phil. Trans., eliii. p. 425. 7 Comptes Rendus, iii. (1836), p. 782. § Ann. de Chimie, lxviii. p. 49.

4 Mém de U'Inst., xxi.

6 Dingler's Journal, ecx. p. 255.

8 Mém de l'Inst., xxi. p. 263.

10 Pogg. Ann., cxlix.

ll See Deville and Troost on glass and other envelopes for high-temperature instruments, Ann. de Chimie, [3], lviii. p. 265.

12 Ann. de Chimie, [4], xiii. p. 144.

of glass or silver of 4 cc. capacity connected with a vertical stem of thermometer tubing of 0°2 min. diameter. This stem terminates in an open vessel of mercury, and thus the pressure of the gas can be measured. Berthelot's instrument is graduated by refercnce to four fixed points, namely, the freezing-point and boiling- point of water, and the boiling-points of mercury and sulphur. In order that the mercury index may move easily in the tube, cxtreme care must be taken in drying the tube, and only perfectly pure mercury can be used.

§ 4. The results obtained by any of the air-pyrometric methods just described may be employed to express directly the temperature of the pyrometer in numbers agreeing closely with the thermodynamic scale. The other instru- ments to which we now turn our attention can only be regarded as intrinsic thermoscopes, whicli, in order to give intelligible numerical results, must be graduated by direct comparison with an air-thermometer. Some of them may indeed be used by extrapolation to give a numerical measure of temperatures outside the practical range of the air-thermometer, employing for that purpose a formula verified for temperatures within the range. A case in point is the determination of the temperature of fusion of platinum by the calorimetric method described below. These intrinsic thermoscopes are frequently much more convenient in practice than any of the modifications of the air-pyrometer.

§ 5. Discontinuous Intrinsic Thermoscopes.—The best ex- ample of the measurement of temperature by a discontinu- ous intrinsic thermoscope is that suggested by Prinsep.1 He formed a series of definite percentage alloys of silver and gold and of gold and platinum. The melting-points of these alloys give a series of fixed temperatures lying be- tween the melting-points of silver and gold and of gold and platinum respectively. An observation is taken by exposing in the furnace, upon a small cupel, a set of small

flattened specimens of the alloys, not necessarily larger than pin heads, and noticing which of them are fused.

The temperatures of fusion of these alloys have been determined by Erhard and Shertel?; their results are given in the following

table, taken from Landolt and Bornstein's Physikalisch-chemische Tabellen.

Table IL—The Fusing-Points of Prinsep's Alloys.

1, SitverR AND GOLD.

Remcent, Per cent. Fusing-

Per eent. Per cent. Fusing- of silver. of gold. point.3 of silver. of gold. point. 100 on 954° 40 60 1020° 80 20 975° 20 80 1045° 60 40 995° aa 100 1075°

2. GOLD AND PLATINUM,

Per cent. | Per cent. of Fusing-

Per cent. | Per cent, of | Fusing- of gold. platinum. point.3 of gold. platinum, point. 100 60 1075° 45 55 1420° 95 5 1100° 40 60 1460° 90 10 1130° 35 65 1495° 85 15 1160° 30 'i 1535° 80 20 1190° 25 75 1570° 75 25 1220° 20 80 1610° 70 30 1255° 15 85 1650° 65 85 1285° 10 90 1690° 60 40 1320° 5 95 1730° 55 45 1350° 66 100 1775° 50 50 1385°

It is said, however, that some difficulty is met with in the use of Prinsep's alloys in consequence of the property possessed by silver of taking up oxygen when melted and ejecting it on solidify- ing and of molecular changes in the alloys which make it unadvis- able to use the same specimen more than once. A similar method has recently been employed by Carnellcy and Carleton Williams, in which metallic salts with high fusing-points were employed instead of alloys, the fusing-points being initially determined by a calorimetric method. These methods recall an old empirical method sometimes employed in porcelain manufacture for estimating the*

1 Phil. Trans., 1828, p. 79.

2 Jahrb. fiir das Berg- wid Hiitten-Wesen in Sachsen, 1879.

3 Determinations of temperature by a porcelain air-thermometer. Errors in general less than 20°,

4 See Chem. Soc. Jowr., 1876, i. 489 ; 1877, i. 8365; 1878.

PYROME@E R

temperature of a furnace. Certain "pyrometrical beads" or "trials" —1.¢., small hoops or gallipots of clay—indicated the temperature by their tint much in the same way as the proper temperature is indicated by the colour of steel in tempering.

§ 6. The Calorimetric Method.—This is a very conveni- ent method and is often practically employed for measur- ing the temperature of furnaces. The observation consists in determining the amount of heat given out by a mass of platinum, copper, or wrought-iron on cooling in water from the high temperature. The theory is simple. Let m be the capacity for heat of the calorimeter and of the water contained in it, Jf the mass of metal, 7' the tem- perature required, ¢ the initial temperature of the water in the calorimeter, @ the final temperature of the water after the introduction of the metal, and x the mean specific heat of the metal between the temperatures 0 and 7'. Then

_m(6 -t) ae a

The value of «, the mean specific heat of the metal between the temperatures occurring in the experiment, must be determined by precisely sinilar calorimetric experiments, in which the high tem- perature 7' is determined by the application of one of the air-pyro- meter methods. The following table (II.) gives the best-known determinations of the mean specific heat of platinum for different ranges of temperature.

Table II,—Mean Specific Heat of Platinum.

Pouillet,5 by platinum ' Weinhold,§ by porcelain |; Violle,7 by porcelain re- reservoir air-thermo- | reservoir air – thermo- servoir air – thermo- meter.

|| meter. ineter.

Range of Mean | Range of Mean Range of Mean temp. spec. heat. temp. spec, heat. || temp. |Spec. heat, 0°- 100° 0°03350 10°°2 — 99°“1 | 003287 0°-100° 070323 » 200° 0°03392 | 16°°49-288°°5 0°03270 »» 300° | 0-03434 | 16°-9 -246°-4 | 0-03520 », 400° 0°03476 | 17°°2 -256°S | 0:03411 » 900° 0703518 | 23°°5 ~476° 003188 600° 0°03560 | 24°°6 -478° 003230 700° 0:03602 25°°4 -507° 0°03253 ° ° ‘ », 800° | O-03644 | 2077 ~705° | 003333 “784 00865 900° 0.03686 | 23°°6 -766° 0:03381 », 1000 0°03728 | 22°°3 ~934° 0:03396 0°-1000° 00377 y, 1100° 0°03770 i 17°°3 -952° 003338 e117 7° 0°0388 Violle’s results give, if ¢¢ be the mean specific heat between

0° and é°, ¢y¢=0°0817 +°000006¢. Assuming this formula to hold beyond the verified limits, he obtains by calorimetric observations 1779° C. as the temperature of the melting-point of platinum. The true specific heat of wrought-iron at temperature ¢ is accord- ing to Weinhold (J.c.) given by the formula ¢=cy + at + Bt?, where Cy =0‘105907, a=0‘00006538, B=0:000000066477, and the total heat obtained from unit-mass of wrought-iron cooling from ¢,° to t,°

is therefore Si Co +at+Bt?)dt, The specific heat of copper does not

appear to have been accurately determined for high temperatures. The determinations by Bede, quoted by Landolt and Bornstein (op. cit., p. 178) are— 15°-100° mean specific heat 0°09331 ; 72° 0°09483 ;

16°-17 ” ” ’ 17°-247° ” 19 0°09680.

There are two obvious sources of error of considerable amount in the use of the calorimeter for pyrometrical purposes, viz., (1) the liability of the metal to lose heat during its passage from the fur- nace to the calorimeter, and (2) the evaporation of water from the calorimeter. With the small mass of platinum generally used, the former source of error is likely to be very important, for the temperature of a mass of 50 grammes of mercury at 100° C. may fall a full degree in being carried to a calorimeter 3 feet away. It does not appear that any estimates of the amount of loss which may be so produced in calorimetric determinations have been published ; but in order

to reduce the loss Salleron® suggests the employment of a platinum or copper carrier in which to heat the mass of metal, and J. C. Hoadly® uses a graphite crucible for that purpose. The second source of loss is more easily disposed of. Weinhold (/.c.) uses a calorimeter closed by a lid and quite filled with water. This is provided with a broad tube passing nearly to the bottom of the calorimeter, and the latter is tilted while the platinum mass 1s being introduced ; whereas Violle!° gets over the same difficulty by the use of a calorimeter provided with a platinum " éprouvette, so that the heat is imparted more slowly to the water. In a calori- metric pyrometer for technical purposes, made by Messrs Siemens to. nea nna ont mh

® 0. &., ait. pe 786 (1836). 6 Pogg. Ann., exlix.

7 Phil. Mag., [5], iv. p. 318. 8 Chem. News, xxvii. 77. 9 Jour. of Franklin Inst., xciv. p. 252.

10" Pil. Mag., (5), iv. p. 318)

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PYROMETER

For

Brothers, the mass of metal employed is a copper cylinder. a sketch and description of the instrument, see Iron, vol. xiii. p. 304 (fig. 21).

§ 7. Continuous Intrinsic Thermoscopes.—The other pyro-

metric methods to which we have space to refer are those which depend on the continuous variation of some property of a body with variation of temperature. Each instru- ment of this kind requires graduation by direct or indirect comparison with an air-thermometer. The methods may be grouped under three heads,—(1) the expansion of a rod of metal or earthenware; (2) the variation of electrical resistance of a wire ; (3) the electromotive force of a thermo- electric junction,

(1) Expansion of Metals and Earthenware. —The necessity for the measurement of high temperatures has been most felt perhaps in pottery manufacture, and in consequence many attempts have been made by potters to establish a system of pyrometry based on the

ermanent contraction which clay undergoes when exposed to a high temperature. The action of Wedgwood's pyrometer described in the Phil. Trans., 1782, 1784, and 1786, depends on this property of clay. The linear contraction of a clay cylinder was measured by means of a metal groove with plane sides inclined to each other at a small angle, and the temperature was estimated numerically by comparing the contraction with that produced by a known dif- ference of temperature. The results were not very satisfactory, since the clay would contract the same amount by long-continued heating at a lower temperature as by a short exposure to a higher one. Wedgwood's estimate of the melting-point of cast iron was 20,577° Fahr.

The measurement of temperature by the expansion of a metal rod has been very frequently attempted. The first instrument to which the name of " pyrometer" was given was of this kind, and was devised by Muschenbroek,

and others were devised in the early part of the century by Des Aguliers, Ellicot, Graham, Smeaton, Ferguson, Brogniart, Laplace, and Lavoisier, and later by Pouillet. We may say here that the only acceurate methods of measuring the extremely minute elongations of metal rods are those in which the expansion is referred by some optical arrangement to a scale kept quite uninfluenced by the source of heat which causes the expansion. In this respect Pouillet's method of employing the expansion of a rod is superior to those previously employed.

The relative expansion of a metal in an earthenware socket was employed by Daniell in his well-known pyrometer. The relative expansion was indicated by an index of porcelain which was pushed forward when the bar expanded and left behind when it contracted, so that after the apparatus had cooled the expansion could be measured at leisure by the scale provided ; due allowarice was made for the expansion of the index itself. Quite recently the expansion of graphite has been employed for pyrometry by Steinle and Harting! As the result of his experience, however, Weinhold 2 states that it is not possible to obtain trustworthy measurements of temperature from an instrument depending on the relative expan- sion of solid bodies.

An ingenious application of the relative expansion of gold, silver, and platinum was introduced by Bréguet. Very narrow strips of the three metals are fastened together to form a compound ribbon- spiral, and to the end of the spiral is attached a needle, which, as the temperature changes, moves over a graduated circle. The in- strument, of course, requires empirical graduation. A modification of it is sometimes used to measure the temperature of the hot blast of an iron furnace.

(2) Variation of Electrical Resistance. —A pyrometric method founded on the variation of the electrical resistance of a platinum Wire has been practically carried out by Siemens, and was de- scribed by him in the Bakerian lecture (Proc. Roy. Soc., 1871). " Assuming a dynamical law, according to which the electrical re- sistance increases according to the velocity with which the atoms are moved by heat, a parabolic ratio of increase of resistance with Merease of temperature follows, and in adding to this the coeffi- cients (representing linear expansion and an ultimate

minimum resistancet the resistance r for any temperature is expressed by the general formula r=a7!87-y, which is found to agree very closely both with the experimental data at low temperatures sup- plied by Dr Matthiessen and with the experimental results varying up to 1000° OC." The details of the experimental verification are not given in the abstract of the lecture, nor are the numerical values of the constants for platinum. But Weinhold gives the information, obtained by letter from the lecturer, that 7 is the absolute temperature, and the numerical values of the constants— a=0°039369, B=0°00216407, y= —0°24127.

The experimental arrangement for practical purposes of the in-

*' See Beckert, Zeitschr. f. anal. Chem., xxi. p-. 248, 1882. * Pogg. Ann., cxlix. p. 206.*

strument as supplied by Messrs Siemens Brothers is exceedingly convenient. It is shown in fig. 4. P is the coil of platinum-wire wound on a cy- .

linder of fireclay, and connected by stout platinum wires, X,, X, 0 with three bind- ing screws at the end of a stout iron tube 6 feet long, and thereby with an arrange- ment for compar- ing its resistance with that of a standard coil X, by means of dif- ferential volta- meters V,V. A current from six Leclanché cells is divided into two parts, one going through the standard coil xX, the volta- meter V, and an additional pla- tinuim wire, also marked X, join- ing the other branch again at the end of the platinum coil, while the other branch includes the voltameter V, the connect- ing wire X, and the coil P. The wire OC is com- mon to both cir-

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- Fig. 4,

cuits, The amount of gas generated in the voltameters is inversely proportional to the resistances of the respective branch circuits. Thus, if V

and V' be the volumes of gas in the two voltameters respectively,

V _ Resistance of P and its connexions –

V'~ Resistance of X and its connexions

The leading wires from the screws of the iron tube to the com- mutator BLC are bound together in one cable, so that they have the same resistance ; thus the observed variation in the ratio of the resistances may be regarded as entirely due to the variation in the resistance of P. The height of the liquids in the two voltameters can be adjusted by the short glass tubes S, 8' sliding vertically on the wooden support to which the voltameters are attached. They are connected by means of india-rubber tubing with the voltameters. The commutator BBC is used to reverse the direction of the current every ten seconds during the observation, which lasts long enough to give a sufficient supply of gas in the voltameter tubes. By this artifice the error due to variation in the polarization of the electrodes is avoided.

The voltametric arrangement for comparing the resistances simplifies very greatly the apparatus required. In a laboratory the resistances may be, of course, more accurately compared by means of resistance-coils and a galvanometer. For technical purposes the temperatures up to 1400° are reduced from the observations by means of a very convenient slide rule. For temperatures beyond 1400° the calculation has to be gone through. The experimental data upon which the vertfication of the formula and the determination of the constants rest are not very numerous. Besides the measurements of Siemens referred to above, there is an experimental comparison by Weinhold of the results obtained from the instrument and those of an air-thermometer. For these observations the iron cover of the coil was removed. The results up to 500°, which in each case are the mean of from five to ten observations, show an agreement within 9°; those between 500° and 1000°, comprising one observa- tion at each of six temperatures, three of these between 531° and 553° and three between 933° and 992°, show differences of about + 26° at the lower limit and — 53° at the upper. The arrangement for comparing the resistances was found to be satisfactory and sufficiently sensitive. Specimens of this instrument were also sub- mitted to experiment by a committee of the British Association (Report, 1874), but their attention was confined to the resolution of the

question whether the platinum coil gave the same resist- ance after being repeatedly heated and cooled. It was found that

this was not the case unless the coil was carefully protected by a platinum sheath.

(8) Thermo-clectric Methods. —The measurement of high temper- atures by means of a thermo-electric junction has been attempted many times.

§ 8. The application of the variation in the wave-length of sound to the measurement of the density of air and con- sequent determination of the temperature has been sug- gested by Cagnard de Latour, Damon-Ferrand, Mayer, and Chautard. The method is liable to difficulties which need not be detailed here, but which are obviously sufficient to cause the experiments to be regarded rather as scientific curiosities than as pyrometric measurements.

§ 9. Hitherto we have confined our attention to the ques- tion whether any instrument described is capable of giving trustworthy indications of the temperature of the instru- ment itself; in order to be satisfied as to whether they fulfil their object, we have still to consider whether they can be easily made to take up the temperature of the body or enclosure under investigation. This is a very difficult question, and it seems doubtful whether with such an instrument as Siemens's electrical pyrometer, of which the coil is contained in a massive sheath of iron connected to about 6 feet of stout iron tube, thermal equilibrium between the coil and the enclosure is possible. We have not space to discuss the matter, but it sees not unlikely that the differences which still exist between the results of different observers may be due to the method of exposure of the pyrometer. In connexion with this the researches of Regnault® with reference to the determination of the boiling-point of mercury and sulphur are very important. He observed that his thermometers, when exposed directly to the steam, indicated too high a temperature, and that it was therefore necessary for the socket enclosing the ther- mometer to dip into the liquid to such an extent that the surface of the liquid was above the level of the top of the thermometer bulb. Whether or not this may account for some of the

differences between the results obtained for the boiling-point of zinc by Deville and Troost and by E. Becquerel and Violle it is difficult to say.

The following table (III.) will show the divergence among the best of the high-temperature measurements.

Lable III.—Determinations of the Boiling-Point of Zine.

Reference.

Pressure. Temp. Method. Observer. _ 759°54 mm. | 1039° Iodine vapour pyro- | Deville and Troost,| § 8, (2) meter 1859 761°2 ” 1040° ” ” ” ” ” 932° Platinum reservoir | E. Becquerel, 1863 | § 3, (3) air-thermometer 891° Porcelain reservoir os na air-thermometer 718‘9 4, | 1085° Porcelain reservoir Weinhold, 1873 ….| § 3, (3) air-thermometer 929°-954° | Air-thermometer ..’ Deville and Troost,} § 3, (1) | 1880 916°-925° | Hydrogen – thermo- 50 99 as meter 760 ” 930° Porcelain reservoir | Violle, 1882…....| § 8, (8) air-thermometer

§ 10. Perhaps the most important modern attempts at the development of pyrometry are those connected with the identification of the law connecting the temperature

of a body with the amount and nature of the energy which SS Se eee eee 1 Ann. de Chim., 1878. 2 Ann. de Chim., Ixviii. p. 49. 4 Mém. del’Inst., xxi. p. 241.

3 See ELECTRICITY. 5 Mém. de UInst., xxvi. p. 518.

it radiates. On such attempts depends the possibility of measuring the temperature of a hot body by means of the light it emits. This is evidently a most desirable object, since, if that were possible, one of the great difficulties of pyrometry—the bringing of the measuring instrument to the temperature of the body under investigation—would immediately disappear. At present, however, there is no general agreement among scientific men as to the form the relation takes. We cannot here do more than refer to the

“Report on Spectrum Analysis,” in the British Asso- ciation’s Reports for 1881 and 1884, for references to the literature of the subject. See RapIATION. (Ww. N. 8.) PYROTECHNY is the art of producing pleasing scenic effects by means of fire. It is not held to include the manufacture of inflammable and explosive substances for other purposes. The use of fireworks for purposes of display is not a modern invention, for it appears to have existed in China in very ancient times; but the secret of constructing them remained unknown in Europe till about the 13th century, when the knowledge of GuNPowWDER (q.v.) crept in from the East. In modern times the art has been gradually improved by the work of specialists, who have had the advantage of being guided by scientific knowledge. The value of such knowledge to the pyro- technist is extremely great; for he must be governed by the principles of chemistry in the selection of his materials, and his various contrivances for turning them to the best account are subject to the laws of mechanics. As in all such cases, however, science is useless without the aid of practical experience and acquired manual dexterity. Many substances have a strong tendency to combine with oxygen, and will do so, in certain circumstances, so energetically as to render the products of the combination (which may be solid matter or gas) intensely hot and luminous. This is the general cause of the phenomenon known as fire. Its special character depends chiefly on the nature of the substances burned and on the manner in which the oxygen is supplied to them. As is well known, our atmosphere contains oxygen gas diluted with about four times its volume of nitrogen; and it is this oxygen which supports the combustion of our coal and candles. But itis not often that the pyrotechnist depends wholly upon atmospheric oxygen for his purposes ; for the phenomena of combustion in it are too familiar, and too little capable of variation, to strike with wonder. Two cases, however, where he does so may be instanced, viz., the burning of magnesium powder and of lycopodium, both of which are used for the imitation of lightning in theatres. Nor does the pyrotechnist resort much to the use of pure oxygen, although very brilliant effects may be produced by burning various substances in glass jars filled with the gas. Indeed, the art could never have existed in anything like its present form had not certain solid substances become known which, containing oxygen in combination with other elements, are capable of being made to evolve large volumes of it at the moment it is required. The best examples of these solid oxidizing agents are nitrate of potash (nitre or

saltpetre) and chlor- ate of potash ; and these are of the first importance in the manufacture of fireworks. If a portion of one of these salts be thoroughly powdered and mixed with the correct quantity of some suitable combustible body, also reduced to powder, the resulting mixture is capable of burning with more or less energy without any aid from atmo- spheric oxygen, since each small piece of fuel is in close juxtaposition to an available and sufficient store of the gas. All that is required is that the liberation of the oxygen from the solid particles which contain it shall be started by the application of heat from without, and the action then goes on unaided. This, then, is the funda-

mental fact of pyrotechny,—that, with proper attention to the chemical nature of the substances employed, solid mixtures (compositions or fuses) may be prepared which contain within themselves all that is essential for the pro- duction of fire.

If nitre and chlorate of potash, with other salts of nitric and chloric acids and a few similar compounds, be grouped together as oxidizing agents, most of the other materials used in making firework compositions may be classed as oxidizable substances. Every composition must contain at least one sample of each class: usually there are present more than one oxidizable substance, and very often more than one oxidizing agent. In all cases the proportions by weight which the ingredients of a mixture bear to one another is a matter of much importance, for it greatly affects the manner and rate of combustion. The most important oxidizable substances employed are charcoal and sulphur. These two, it is well known, when properly mixed in certain proportions with the oxidizing agent nitre, constitute gunpowder ; and gunpowder plays an important part in the construction of most fireworks. It is sometimes employed alone, when a strong explosion is required ; but more commonly it is mixed with one or more of its own ingredients and with other matters. In addition to charcoal and sulphur, the following oxidizable substances are more or less employed :—many compounds of carbon, such as sugar, starch, resins, é&c.; certain metallic compounds of sulphur, such as the sulphides of arsenic and

antimony; a few of the metals themselves, such as iron, zinc, magnesium, antimony, copper. Of these metals iron (cast-iron and steel) is more used than any of the others. They are all employed in the form of powder or small filings. They do not contribute much to the burning power of the composition; but when it is ignited they become intensely heated and are discharged into the air, where they oxidize more or less completely and cause brilliant sparks and scintillations.

Sand, sulphate of potash, calomel, and some other sub- stances, which neither combine with oxygen nor supply it, are sometimes employed as ingredients of the compositions in order to influence the character of the fire. This may be modified in many ways. Thus the rate of combustion may be altered so as to give anything from an instantane- ous explosion to a slow fire lasting many minutes. The flame may be clear, smoky, or charged with glowing sparks. But the most important characteristic of a fire —one to which great attention is paid by pyrotechnists— is its colowr, which may be varied through the different shades and combinations of yellow, red, green, and blue. These colours are imparted to the flame by the presence in it of the heated vapours of certain metals, of which the following are the most important :—sodium, which gives a yellow colour ; calcium, red; strontium, crimson ; barium, green ; copper, green or blue, according to cir- cumstances. Suitable salts of these metals are much used as ingredients of fire mixtures ; and they are decom- posed and volatilized during the process of combustion. Very often the chlorates and nitrates are employed, as they serve the double purpose of supplying oxygen and of imparting colour to the flame.

The number of fire mixtures actually employed is very great ; for the requirements of each variety of firework, and of almost each size of each variety, are different. Moreover, every pyrotechnist has his own taste in the matter of compositions. They are capable, however, of being classified according to the nature of the work to which they are suited. Thus there are rocket-fuses, gerbe- fuses, squib-fuses, star-compositions, &e. ; and, in addition, there are a few which are essential in the coustruction of Most fireworks, whatever the main composition may be.

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Such are the starting-powder, which first catches the fire, the bursting-powder, which causes the final explosion, and the quick-match (cotton-wick, dried after being saturated with a paste of gunpowder and starch), employed for con- necting parts of the more complicated works and carrying the fire from one to another. Of the general nature of fuses an idea may be had from the following two examples, which are selected at hazard from among the numerous recipes for making, respectively, tourbillion fire and green stars :— Tourbillion. Meal gunpowder …... 24 parts. INIULCH eo rc reece On

Green Stars.

Chlorate of potash …16 parts. Nitrate of baryta …48 ,,

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Calomell er osssssecc: Bye

Sulphide of copper… 2 ,,

Although the making of compositions is of the first importance, it is not the only operation with which the pyrotechnist has to do; for the construction of the cases in which they are to be packed, and the actual processes of packing and finishing, require much care and dexterity. These cases are made of paper or pasteboard, and are generally of a cylindrical shape. In size they vary greatly, according to the effect which it is desired to produce. The relations of length to thickness, of internal to external diameter, and of these to the size of the openings for discharge, are matters of extreme importance, and must always be attended to with almost mathematical exactness and considered in connexion with the nature of the com- position which is to be used.

There is one very important property of fireworks that is due more to the mechanical structure of the cases and the manner in which they are filled

than to the precise chemical character of the composition, ¢.¢., their power of motion. Some are so constructed that the piece is kept at rest and the only motion possible is that of the flame and sparks which escape during combustion from the mouth of the case. Others, also fixed, contain, alternately with layers of some more ordinary composition, balls or blocks of a special mixture cemented by some kind of varnish ; and these stars, as they are called, shot into the air, one by one, like bullets from a gun, blaze and burst there with striking effect. But in many instances motion is imparted to the firework as a whole,—to the case as well as to its contents. This motion, various as it is in detail, is almost entirely one of two kinds, — rotatory motion round a fixed point, which may be the centre of gravity of a single piece or that of a whole system of pieces, and free ascending motion through the air. In all cases the cause of motion is the same, viz., that large quantities of gaseous matter are formed by the combus- tion, that these can escape only at certain apertures, and that a backward pressure is necessarily exerted at the point opposite to them. When a large gun is discharged, it recoils a few feet. Movable fireworks may be regarded as very light guns loaded with heavy charges; and in them the recoil is therefore so much greater as to be the most noticeable feature of the discharge; and it only requires proper contrivances to make the piece fly through the air like a sky-rocket or revolve round a central axis like a Catherine wheel. Beauty of motion is hardly less important in pyrotecliny than brilliancy of fire and variety of colour.

The following is a brief description of some of the forms of fire- work most employed :—

Fixed Fires.— Theatre fires consist of a slow composition which

may be heaped in a conical pile on a tile or a flagstone and lit at the apex. They require no cases. Usually the fire is coloured, —

green, red, or blue; and beautiful effects arc obtained by illumin-

ating buildings with it. It is also used on the stage ; but, in that

case, the composition must be such as to give no suffocating or poisonous fumes. Bengal lights are very similar, but are piled in saucers, covered with gummed paper, and lit by means of pieces of match. JAfarroons are small boxes wrapped round several times with lind cord and filled with a strong composition which explodes with a loud report. They are generally used in batteries, or in combination with some other form of firework. Sgwids are straight cylindrical cases about 6 inches long, firmly closed at one end, tightly packed with a strong composition, and capped with touch- paper. Usually a little bursting-powder is put in before the ordinary com- position, so that the fire is finished by an explosion. The character of the fire is, of course, susceptible of great variation in colour, &c. Crackers are characterized by the cases being doubled backwards and forwards several times, the folds being pressed close and secured by twine. One end is primed; and when this is lit the cracker burns with a hissing noise, and a loud report occurs every time the fire reaches a bend. If the cracker is placed on the ground, it will give a jump at each report ; so that it cannot quite fairly be classed among the fixed fireworks. Roman candles are straight cylindrical cases filled with layers of composition and stars alternately. These stars are simply balls of some special composition, usually containing metallie filings, made up with gum and spirits of wine, cut to the required size and shape, dusted with gunpowder, and dried. They are discharged like blazing bullets several feet into the air, and produce a beautiful effect, which may be enhanced by packing stars of differently coloured fire in one case. Gerbes are choked cases, not unlike Roman candles, but often of much larger size. Their fire spreads like a sheaf of wheat. They may be packed with vari- ously coloured stars, which will rise 30 feet or more. Lances are small straight cases charged with compositions like those used for making stars. They are mostly used in complex devices, for which purpose they are fixed with wires on suitable wooden frames. They are connected by leaders, t.e., by quick-match enclosed in paper tubes, so that they can be regulated to take fire all at the same time, singly, or in detachments, as may be desired. The de- vices constructed in this way are often of an extremely elaborate character ; and they include all the varieties of lettered designs, of Jixed suns, fountains, palm-trees, waterfalls, mosaic work, High- land tartan, &e.

Rotating Fireworks.—Pin or Catherine wheels are long paper cases filled with a composition by means of a funnel and packing- wire and afterwards wound round a disk of wood. This is fixed by a pin, sometimes vertically and sometimes horizontally ; and the outer primed end of the spiral is lit. As the fire escapes the recoil causes the wheel to revolve in an opposite direction and often with considerable velocity. Pastiles are very similar in principle and construction. Instead of the case being wound ina spiral and made to revolve round its own centre point, it may be used as the engine to drive a wheel or other form of framework round in a circle. Many varied effects are thus produced, of which the fire- wheel is the simplest. Straight cases, filled with some fire-com- position, are attached to the end of the spokes of a wheel or other mechanism capable of being rotated. They are all pointed in the same direction at an angle to the spokes, and they are connected together by leaders, so that each, as it burns out, fires the one next it. The pieces may be so chosen that brilliant effects of changing colour are produced ; or various fire-wheels of different colours may be combined, revolving in different planes and different directions —some fast and some slowly. Bisecting wheels, plural wheels, caprice wheels, spiral wheels, are all more or less coinplicated forms ; and it is possible to produce, by mechanism of this nature, a model in fire of the solar system.

Ascending Fireworks.— Tourbillions are fireworks so constructed as to ascend in the air and rotate at the same time, forming bcauti- ful spiral curves of fire. The straight cylindrical case is closed at the centre and at the two ends with plugs of plaster of Paris, the composition occupying the intermediate parts. The fire finds vent by six holes pierced in the case. Two of these are placed close to the ends, but at opposite sides, so that one end discharges to the right and the other to the left; and it is this which imparts the rotatory motion. The other holes are placed along the middle line of what is the under-surface of the case when it is laid horizon- tally on the ground; and these, discharging downwards, impart au upward motion to the whole. A cross picee of wood balances the tourbillion ; and the quick-match and touch-paper are so arranged that combustion begins at the two ends simultaneously and does not reach the holes of ascension till after the rotation is fairly begun. The sky-rocket is generally considered the most beautiful of all fireworks ; and it certainly is the one that requires most skill and science in its construction. It consists essentially of two parts, —the

body and the head. The body is a straight cylinder of strong pasted paper and is choked at the lower end, so as to pre- sent only a narrow opening for the escape of the fire. The com- position does not fill up the case entirely, for a central hollow conical bore extends from the choked mouth up the body for three quarters of its length. This is an essential feature of the rocket.

It allows of nearly the whole composition being fired at once; the |

result of which is that an enormous quantity of heated gases collects in the hollow bore and the gases, forcing their way downwards through the narrow opening, urge the rocket up through the air, The top of the case is closed by a plaster-of-Paris plug. A hole passes through this and is filled with a fuse, which serves to communicate the fire to the head after the body is burned out. This head, which is made separately and fastened on after the body is packed, consists of a short cylindrical paper chamber with a conical top. It serves the double purpose of cutting a way through the air and of holding the garniture of stars, sparks, crackers, serpents, gold and silver rain, &c., which are scattered by bursting fire as soon as the rocket reaches the highest point of its path. A great variety of beautiful effects may be obtained by the exercise of ingenuity in the choice and construction of this garniture. Many of the best results have been obtained by unpublished methods which must be regarded as the secrets of the trade. The stick of the sky-rocket serves the purpose of guiding and balancing it in its flight ; and its size must be accurately adapted to the dimensions of the case. In winged rockets the stick is replaced by cardboard wings, which act like the feathers of an arrow.

For a description of rockcts used in war, see AMMUNITION.

See Chertier, Sur les Feux d' Artifice (Paris, 1841; 2d ed. 1854); Mortimer, Manual of Pyrotechny (London, 1856); Tessier, Chimie pyrotechnique, ow Tratte pratique des Feux Colorés (Paris, 1858); Richardson and Watts, Chemical Tech- nology, sv. " Pyrotechny" (London, 1863-67); Thomas

Kentish, The Pyro- Hes is?s Treasury (London, 1878); Websky, Lufifeuerwerkkunst oon)”

PYRRHO. See Scerricism.

PYRRHUS. The name of Pyrrhus, king of Epirus, owes its chief fame in history to the fact that with his invasion of Italy in the early part of the 3d century B.c. Greece and Rome for the first time came definitely into contact. Born about the year 318, and claiming descent from Pyrrhus, the son of Achilles, connected also with the royal family of Macedonia through Olympias, the mother of Alexander the Great, he became when a mere stripling king of the wild mountain tribes of Epirus, and learned how to fight battles in the school of Demetrius Poliorcetes (the Besieger) and of his father Antigonus. He fought by their side in his seventeenth year at the memorable battle of Ipsus in Phrygia, in which they were decisively defeated by the combined armies of Seleucus and Lysi- machus. Soon afterwards he was sent to the court of Ptolemy of Egypt at Alexandria as a pledge for the faith- ful carrying out of a treaty of alliance between Ptolemy and Demetrius, as his sister Deidamia was the wife of the latter. Through Ptolemy, whose step-daughter Antigone he married, he was enabled to establish himself firmly on the throne of Epirus, and he became a formidable opponent to Demetrius, who was now king of Macedonia and the leading man in the Greek world. He won a victory over one of Demetrius’s generals in Atolia, invaded Macedonia, and forced Demetrius to conclude a truce with him. For a brief space of about seven months he had possession of a large part of Macedonia, Demetrius finding it convenient to make this surrender on condition that Pyrrhus did not meddle with the affairs of the Peloponnesus. But in 286 he was defeated by Lysimachus at Edessa, driven out of Macedonia, and compelled to fall back on his little king- dom of Epirus. In 280 came the great opportunity of his life, the embassy from the famous Greek city Taren- tum in southern Italy with a request for aid against Rome, whose hostility the Tarentines had recklessly pro- voked. Pyrrhus had a trusted friend and adviser in Cineas of Thessaly, a persuasive speaker and a clever diplomatist, and he at once sent him over with 3000 men to Tarentum with a view to prepare matters. He himself soon fol- lowed, after a disastrous passage across the Adriatic, witha miscellaneous force, furnished him partly by the assistance of

Ptolemy, of about 25,000 men, with some elephants, his best troops being some Macedonian infantry and Thessalian cavalry. He had counted on an army of Italian mercenaries, but the Tarentines and the Italian Greeks

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generally shrank from anything like serious effort and resented his calling upon them for men and money. Rome meantime raised a special war contribution, called on her subjects and allies for their full contingent of troops, and posted strong garrisons in all towns of doubtful fidelity. She was now quite the dominant power in Italy, but her position was critical, as in the north she had had trouble with the Etruscans and Gauls, while in the south the Lucanians and Bruttians were making common cause with Tarentum and the Greek cities. In fact there was the possibility of a most formidable coalition of the Italian peoples both in the north and in the south against Rome, and so Pyrrhus had a good deal on which to build his hopes of success. For the first time in history Greeks and Romans met in battle at Heraclea near the shores of the Gulf of Tarentum, and the cavalry and elephants of Pyrrhus secured for him a complete victory, though at so heavy a loss as to convince him of the great uncertainty of final success, Although he now had the Samnites as well as the Lucanians and Bruttians and all the Greek cities of southern Italy with him, he found every city closed against him as he advanced on Rome through Latium, and his dexterous minister Cineas utterly failed to negotiate a peace, the old blind Appius Claudius declaring in the senate that Rome never negotiated with a foreign enemy on Italian ground. In the second year of the war, 279, Pyrrhus again defeated a Roman army at Asculum (Ascoli) in Apulia, but he was no nearer decisive success, as Rome still had armies in the field and her Italian confederation was not broken up. For a while he quitted Italy for Sicily with the view of making himself the head of the Sicilian Greeks and driving the Cartha-ginians out of the island. In his military operations he was on the whole successful, and Rome and Carthage in face of the common danger concluded an offensive and defensive alliance against him. He passed three years in Sicily, but through want of political tact he gave offence to the Greek cities, which he treated rather too much in the fashion of a despot, not paying any respect to their local constitutions or sufficiently humouring their republican tastes and love of independence. He thus lost a good

opportunity of uniting both the Italian and Sicilian Greeks against Rome. On his return to Italy in 276 he had neither men nor money adequately supplied him, as Taren- tum and the other Greek cities had no confidence in him. It is said that he was thoroughly disheartened, and was haunted by mysterious dreams and forebodings which followed on an act which he imagined had involved him in the guilt of sacrilege. He made indeed one more effort, and engaged a Roman army at Beneventum in the Samnite country, but his arrangements for the battle miscarried, and he was defeated with the loss of his camp and the greater part of his army. He had made a fair trial of the strength of Rome and had been utterly baffled. N othing remained but to go back to his allies at Tarentum, He left a garrison in the city and returned the following year to his home in Epirus after a six years' absence, The brief remainder of his life was passed in camps and battles, without, however, any glorious result. He won a victory over Antigonus Gonatas, king of Macedonia, on Macedonian ground. In 273 he was invited into the Peloponnesus to settle at the sword's point a dispute about the royal succession at Sparta. He besieged the city, but was repulsed with great loss. Next he went to Argos at the Invitation of a political faction, and here in the con- fusion of a fight by night in the streets he met his death I his forty-sixth year from the hand of a woman, who hurled a ponderous roof-tile upon his head just at the Moment, it is said, when he was striking a blow at her son.

Pyrrhus was no doubt a brilliant and dashing soldier,

but he was aptly compared "to a gambler who made many good throws with the dice, but could not make the proper use of the game." There was something chivalrous about him which seems to have made him a general favourite. After his death Macedonia had for a time at least nothing to fear, and the liberty of Greece was quite at the mercy of that power.

For Pyrrhus, English readers will do well to consult Thirlwall, Greece, vols. vii., vill. ; Mommsen, History of Rome, ii. 7 ; Niebuhr, Lectures on Roman History, lects. 1., li. Plutarch's Life of Pyrrhus is the fullest of our original sources of information, and there is frequent mention of him in Polybius.

PYTHAGORAS anp PYTHAGOREANS. Pythagoras is one of those figures which have so impressed the imagina- tion of succeeding times that their historical lineaments are difficult to discern through the mythical haze that envelops them. Animated, as it would appear, not merely by the philosophic thirst for knowledge but also by the enthusiasm of an ethico-religious reformer, he became, centuries after his death, the ideal hero or saint of those who grafted a mystical religious asceticism on the doctrines of Plato. Writings were forged in his name. Lives of him were written which gather up in his person all the traits of the philosophic wise man, and surround him besides with the nimbus of the prophet and wonder-worker. He is described by his Neoplatonic biographers as the favourite and even the son of Apollo, from whom he received his doctrines by the mouth of the Delphic priestess. We read that he had a golden thigh, which he displayed to the assembled Greeks at Olympia, and that on another occasion he was seen in Crotona and Metapontum at one and the same time. He is said to have tamed wild beasts by a word and to have foretold the future, while many stories turn upon the knowledge he was reported to retain of his personality and deeds in former states of existence. Thus, as Zeller truly remarks, the information respecting Pythagoreanism and its founder grows fuller and fuller the farther removed in time it is from its subject. The authentic details of Pythagoras's career, on the other hand, are meagre enough and merely approximate in character. He was a native of Samos, and the first part of his life may therefore be said to belong to that Ionian seaboard which had already witnessed the first development of philosophic thought in Greece. The exact year of his birth has been variously placed between 586 and 569 B.C., but 582 may be taken as the most probable date. Some of the accounts make him the pupil of Anaximander ; but such an assertion lies so ready to hand in the circum- stances of time and place that we cannot build with any assurance upon the suggested connexion with the Ionic school. It is probable, however, that Pythagoras was aware of their speculations, seeing that he left behind him in Ionia the reputation of a learned and universally informed man. "Of all men Pythagoras, the son of Mnesarchus, was the most assiduous inquirer," says Hera- clitus, and then proceeds in his contemptuous fashion to brand his predecessor's wisdom as only eclectically compiled information or polymathy (xoAvpa@ia), This accumulated wisdom, as well as most of the tenets of the Pythagorean school, was attributed in antiquity to the extensive travels of Pythagoras,

which brought him in contact (so it was said) not only with the Egyptians, the Phoenicians, the Chaldeans, the Jews, and the Arabians, but also with the Druids of Gaul, the Persian Magi, and the Brahmans. But these tales are told of too many of the early philosophers to be received implicitly; they represent rather the tendency of a later age to connect the beginnings of Greek speculation with the hoary re- ligions and priesthoods of the East. There is no intrinsic improbability, however, in the statement that Pythagoras visited Egypt and other countries of the Mediterranean,

for travel was then one of the few ways of gathering knowledge. Some of the accounts represent Pythagoras as deriving much of his mathematical knowledge from an Egyptian source. Herodotus traces the doctrine of meteim- psychosis to Egypt, as well as the practice of burying the dead exclusively in linen garments, but he does not men- tion any visit of Pythagoras to that country. There is thus little more than conjecture to fill out the first half of the philosopher's life. The historically important part of his career begins with his emigration to Crotona, one of the Dorian colonies in the south of Italy. Nothing is known with certainty of the reasons that led to this step, which he appears to have taken about the year 529 ; perhaps the ethical temper which can be traced in the

Pythagorean school attracted the founder towards the –

sterner Dorian character. At Crotona Pythagoras speedily became the centre of a widespread and influential organiza- tion, which seems to have resembled a religious brother- hood or an association for the moral reformation of society much more than a philosophic school. Pythagoras appears, indeed, in all the accounts more as a moral reformer than as a speculative thinker or scientific teacher ; and it is noteworthy that the only one of the doctrines of the school which is definitely traceable to Pythagoras himself is the ethico-mystical doctrine of transmigration. The aim of the brotherhood was the moral education and purification of the community; and it seems to have been largely based upon a revival of the Dorian ideal of abstinence and hardi- hood along with certain other traits

of a more definitely religious character, which were probably due to the influ- ence of the mysteries. But many details of life and ritual, such as abstinence from animal food and from beans, celibacy, and even community of goods, have been fathered by the organized asceticism of a later period upon the original followers of Pythagoras. Ethics, according to the Greek and especially according to the Dorian conception, being inseparably bound up with the general health of the state, we are not surprised to find the Pythagoreans repre- sented as a political league ; nor is it wonderful that their following was among the aristocracy, and that they formed the staunchest supporters of the old Dorian constitutions. It is unfair, however, to speak of the league as primarily a political organization, wide though its political ramifica- tions must latterly have become. Its entanglement with politics was in the end fatal to its existence. The authori- ties differ hopelessly in chronology, but according to the balance of evidence the first reaction against the Pytha- goreans took place in the lifetime of Pythagoras himself after the victory gained by Crotona over Sybaris in the year 510, Dissensions seem to have arisen about the allotment of the conquered territory, and an adverse party was formed in Crotona under the leadership of Cylon. This was probably the cause of Pythagoras's withdrawal to Metapontum, which an almost unanimous tradition assigns as the place of his death in the end of the 6th or the beginning of the 5th century. The league appears to have continued powerful in Magna Grecia till the middle of the 5th century, when it was violently trampled out by the successful democrats. The meeting-houses of the Pythagoreans were everywhere sacked and burned ; men- tion is made in particular of "the house of Milo" in Crotona, where fifty or sixty of the leading Pythagoreans were surprised and slain. The persecution to which the brotherhood was subjected throughout Magna Greecia was the immediate cause of the spread of the Pythagorean philosophy in Greece proper. Philolaus, who resided at Thebes in the end of the 5th century (cf. Plato, Phedo, 61D), was the author of the first written exposition of the system. Lysis, the instructor of Epaminondas, was another of these refugees. This Theban Pythagoreanism

was not without an important influence upon Plato, and Philolaus had also disciples in the stricter sense. But as a philosophic school Pythagoreanism

became extinct in Greece about the middle of the 4th century. In Italy— where, after a temporary suppression, it attained a new importance in the person of Archytas, ruler of Tarentum— the school finally disappeared about the same time.

Pythagorean Philosophy.

The central thought of the Pythagorean philosophy is the idea of number, the recognition of the numerical and mathematical relations of things. In the naive speculation of an early age the abstract consideration of these relations was tantamount to assert- ing their essential existence as the causes of phenomena. Hence the Pythagorean thought crystallized into the formula that all things are number, or that number is the essence of everything, 'The Pythagoreans seem," says Aristotle, "to have looked mpon number as the principle and, so to speak, the matter of which existences cousist""; and again, "they supposed the elements of numbers to be the elements of existence, and pronounced the whole heaven to be harmony and number." ' Number," says Philolaus, 'is great and perfect and omnipotent, and the principle and guide of divine and human life." Fantastical as such a proposition sounds, we may still recognize the underlying truth that prompted it if we reflect that it is number or definite mathematical relation that separates one thing from another and so in a sense makes them things. Without number and the limitation which number brings there would be- only chaos and the illimitable, a thought abhorrent to the Greck mind. Number, then, is the principle of order, the principle by which a cosmos or ordered world subsists. So we may perhaps render the thought that is crudely and sensnously expressed in the ntterances of the school. They found the chief illustrations, or rather grounds, of their position in the regular movements of the heavenly bodies and in the harmony of musical sounds, the dependence of which on regular mathematical intervals they were apparently the first to discover. The famous theory of the harmony of the spheres combines both ideas: the seven planets are the seven golden chords of the heavenly heptachord.*

Immediately connected with their central doctrine is the theory of opposites held by the Pythagoreans. Numbers are divided into odd and even, and from the combination of odd and even the numbers themselves (and therefore all

things) seem to result. The odd number was identified with the limited, the even with the un- limited, because even numbers may be perpetually halved, whereas the odd numbers (at least the earlier ones), being without factors, seem to stand in solid singleness. All things, accordingly, were derived by the Pythagoreans from the combination of the limited and the unlimited ; and it is in harmony with the Greek spirit that the place of honour is accorded to the odd or the limited. Following out the same thought, they developed a list of ten funda- mental oppositions, which roughly resembles the tables of categories framed by later philosophers :—(1) limited and unlimited ; (2) odd and even; (8) one and many ; (4) right and left; (5) masculine and feminine ; (6) rest and motion ; (7) straight and crooked ; (8) light and darkness ; (9) good and evil; (10) square and oblong. The arbitrariness of the list and the mingling of mathematical, physical, and ethical contrasts are characteristic of the infancy of speculation. The union of opposites in which consists the exist- ence of things is harmony ; hence the expression already quoted that the whole heaven or the whole universe is harmony. But it is to be noted that interpretations of Pythagoreanism which repre- sent the whole system as founded on the opposition of nnity an duality, and suppose this to have been explicitly identified with the opposition of form and iatter, of divine activity and passive material, must be unhesitatingly rejected as betraying on the sur- face their post-Platonic origin. Still more is this the case when in Neoplatonic fashion they go on to derive this original opposition from the supreme Unity or God. The further speculations of the Pythagorcans on the subject of number rest mainly on analogies, which often become capricious and tend to lose themselves at last ina barren symbolism. The decade, as the basis of the numerical system, appeared to them to comprehend all other numbers m itself, and to it are applied, therefore, the epithets quoted above of number in general. Similar language is held of the number "four," because it is the first square number and is also the poten- tial decade (1+2+3+4=10) ; Pythagoras is cclebrated as the dis- coverer of the holy rerpaxrvs, "the fountain and root of ever-living nature." Seven" is called mapOévos and 'A@Avy, because within the decade it has neither factors nor product. "Five," on the other hand, signifies marriage, because it is the union of the first masculine with the first feminine number (8+2, unity being con- sidered asa number apart). The thought already becomes more fanciful when "one" is identified with reason, because it is m- changeable; "two" with opinion, because it is

unlimited and indeterminate ; “four” with justice, because it is the first square

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number, the product of equals. More legitimate is their application of number to geometry, according to whieh “one”’ was identified with the point, “two” with the line, “three” with the surface, and “four” with the eube. In the history of music the Pytha- gorean school is also of considerable importanee from the develop- ment which the theory of the octave owes to its members; according to some accounts the discovery of the harmonie system is due to Pythagoras himself.

As already mentioned, the movements of the heavenly hodies formed for the Pythagoreans an illustration on a grand scale of the truth of their theory. Thcir cosmologieal system is also interest- ing on aecount of peeuliarities which imark it out froin the current eonceptions of antiquity and bring it curiously near to the modern theory. Conceiving the universe, like many early thinkers, as a sphere, they placed in the heart of it the central fire, to which they gave the name of Hestia, the hearth or altar of the universe, the citadel or throne of Zeus. Around this move the ten heavenly bodies—farthest off the heaven of the fixed stars, then the five planets known to antiquity, then the sun, the moon, the earth, and lastly the counter-earth (dvrix@wv), which revolves between the earth and the central fire and thns completes the sacred decade. Revolving along with the earth, the last-mentioned body is always interposed asa shield between us and the direct rays of the central fire. Our light and heat eome to us indirectly by way of reflexion from the sun. When the earth is on the same side of the central fire as the sun, we have day ; when it is on the other side, night. This attribution of the ehanges of day and night to the earth’s own motion led up directly to the true theory, as soon as the machinery of the central fire and the counter-earth was dispensed with. The counter-earth became the western hemisphere, and the earth re- volved on its own axis instead of round animaginary centre. But, as appears from the above, the Pythagorean astronomy is also remarkable as having attributed a planetary motion to the earth instead of making our globe the centre of the universe. Long after-wards, when the church condemned the theory of Copernicus, the

indictment that lay against it was its heathen and “ Pythagorean ” character.

The doctrine which the memory of mankind associates most closely with Pythagoras’s name is that of the transmigration of souls—MEreMpsycHosis (g.v.). Though evidently of great import- ance for Pythagoras himself, it does not stand in any very obvious connexion with his philosophy proper. He seems to have adopted the idea from the Orphic Mysteries. The bodily life of the soul, according to this doctrine, is an imprisonment suffered for sins committed in a former state of existence. At death the soul reaps what it has sown in the present life. The reward of the best is to enter the cosmos, or the higher and purer regions of the universe, while the direst ¢rimes receive their punishment in Tartarns. But the general lot is to live afresh in a series of human or animal forms, the nature of the bodily prison being determined in each case by the deeds done in the life just ended. This is the saine doctrine of retribution and purificatory wandering which meets us in Plato’s mythieal descriptions of a future life. ‘They are borrowed by him in their substance from the Pythagoreans or from a common source in the Mysteries. In accordance with this religious view of life as a stage of probation were the cthical precepts of the sehool, inculcat- ing reverence towards the gods and to parents, justice, gentleness, temperance, purity of life, prayer, regular self-examination, and the observance of various ritual requirements.

Connecting its ethics in this way with religion and the idea of a future life, the Pythagorean societies had in them from the be- giuming a germ of asceticism and contemplative mysticism which it was left fora later age fully to develop. The Pythagorean life was destined to survive the peculiar doctrines of the Pythagorean philosophy and to be grafted on later philosophic ideas. The asceticism which characterized it appears in the 4th century B.c. in close connexion with the Orphic Mysteries ; and the ‘“ Pytha- goreans ” of that time are frequently the butts of the New Athenian Comedy. In the Alexandrian period the Pythagorean tradition struck deeper roots; in Alexandria and elsewhere schools of men

“wrose calling themselves Pythagoreans, but more accurately dis-

tinguished by modern eriticism as Neopythagoreans, seeing that their philosophical doctrines arc evidently derived in varying pro- portions from Plato, Aristotle, and the Stoics. In general it may be said that they develop the mystic side of the Platonie doctrine ; aud only so far as this is connected with the similar speculations of Pythagoras can they claim to be followers of the latter. Hence meu like Plutarch, who personally prefer to call themselves Platonists, may also be considered as within the scope of this Pythagorean revival. The link that really connects these Neo- pythagoreans with the Samian philosopher and distinguishes them from the other schools of their time is their aseetic ideal of life and their preoccupation with religion. In religious speculation they paved the way for the Neoplatonic conception of God as immeasur- ably transcending the world ; and in their thirst for prophecies, oracles, and signs they gave expression to the prevalent longing fora supernatural revelation of the divine nature and will. The

asceticism of the Jewish sect of the Essenes seems, as Zeller con- tends, to be due to a strong infusion of Neopythagorean elements. At a still later period Neopythagoreanisim set up Pythagoras and Apollonius of Tyana not only as ideals of the philosophie life but also as prophets and wonder-workers in immediate communication with another world, and in the details of their "lives" it is easy to read the desire to emulate the narrative of the Gospels. The Life of Apollonius by Philostratus, which is for the most part an historical romance, belongs to the 3d Christian century.

Zeller's discussion of Pythagoreanism, in his Philosophie d. Griechen, book 1., is very full; he also deals at considerable length in the last volume of the work with the Neopythagoreans, considered as the precursors of Neoplatonism and the probable origin of the Essenes. The numerous monographs dealing with speeial parts of the subject are there exainined and sifted. (A. SE.)

Pythagorean Geometry.

As the introduction of geometry into Greece is by common consent attributed to Thales, so all are agreed that to Pythagoras is due the honour

of having raised mathe- matics to the rank of a science. We know that the early Pythagoreans published nothing, and that, moreover, they referred all their discoveries back to their master. (See PuHILoLavs.) Hence it is not possible to separate his work from that of his early disciples, and we must therefore treat the geometry of the early Pythagorean school as a whole. We know that Pythagoras made numbers the basis of his philosophical system, as well physical as metaphysical, and that he united the study of geometry with that of arithmetic.

The following statements have been handed down to us. (a) Aristotle (MJet., i. 5, 985) says "the Pythagoreans first applied themselves to mathematics, a science which they improved ; and, penetrated with it, they fancied that the principles of mathematics were the principles of all things." (¢) Eudemus informs us that "Pythagoras changed geometry into the form of a liberal science, regarding its principles in a purely abstract manner, and investigated its theorems from the immaterial and intellectual point of view (advAws «al voepis)."1 (ce) Diogenes Laertius (viii. 11) relates that "it was Pythagoras who carried geometry to perfection, after Moeris? had first found out the prin- ciples of the elements of that science, as Anticlides tells us in the second book of his LHistory of Alexander; and the part of the science to which Pythagoras applied himself above all others was arithmetic." (d) According to Aris- toxenus, the musician, Pythagoras seems to have esteemed arithmetic above everything, and to have advanced it by diverting it from the service of commerce and by likening all things to numbers? (e) Diogenes Laertius (viii. 13) reports on the same authority that Pythagoras was the first person who introduced measures and weiglits among the Greeks. (jf) He discovered the numerical relations of the musical scale (Diog. Laert., viii. 11). (gy) Proclus4 says that "'the word 'mathematics' originated with the Pythagoreans." (h) We learn also from the same author- ity® that the Pythagoreans made a fourfold division of mathematical science, attributing one of its parts to the "how many" (ro wdcov) and the other to the "how much" (ro wnAtkov) ; and they assigned to each of these parts a twofold division. They said that discrete quantity or the "how many" is either absolute or relative, and that con- tinued quantity or the "how much" is either stable or in motion. Hence they laid down that arithmetic contem- plates that discrete quantity which subsists by itself, but

music that which is related to another; and that geometry considers continued quantity so far as it is immovable,

1 Proelus Diadoehus, In primum Huclidis Klemeatorum librum Commentarit, ed. Friedlein, p. 65.

2 Meris was a king of Egypt who, Herodotus tells us, lived 900 years before his visit to that country.

3 Aristox., Fragm., ap. Stob., Helog. Phys., i. 2, 6.

4 Proel., op. cit., p. 45.

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but that astronomy (7) oacpix7) contemplates continued quantity so far as it is of a self-motive nature. (z) Diogenes Laertius (viii. 25) states, on the authority of Favorinus, that Pythagoras "employed definitions in the mathema- tical subjects to which he applied himself."

The following notices of the geometrical work of Pytha- goras and the early Pythagoreans are also preserved. (1) The Pythagoreans define a point as 'unity having position" (Procl., op. cit., p. 95). (2) They considered a point as analogous to the monad, a line to the duad, a superficies to the triad, and a body to the tetrad (1b. p. 97). (38) They showed that the plane around a point is completely filled by six equilateral triangles, four squares, or three regular hexagons (2b., p. 305). (4) Eudemus ascribes to them the discovery of the theorem that the interior angles of a triangle are equal to two right angles, and gives their proof, which was substantially the same as that in Euclid I. 321 (a., p. 879). (5) Proclus informs us in his comment- ary on Euclid I. 44 that Eudemus says that the problems concerning the application of areas—-where the term "application" is not to be taken in its restricted sense (xapa8oA%), in which it is used in this proposition, but also in its wider signification, embracing tepBoA% and éAXevyus, in which it is used in Book VI. Props. 28, 29 —-are old, and inventions of the Pythagoreans? (ib., p. 419), (6) This is confirmed by Plutarch,? who says,

after Apollodorus, that Pythagoras sacrificed an ox on finding the geometrical diagram, either the one relating to the hypotenuse, namely, that the square on it is equal to the sum of the squares on the sides, or that relating to the problem concerning the application of an area. (7) Plutarch ® also ascribes to Pythagoras the solution of the problem, To construct a figure equal to one and similar to another given figure. (8) Eudemus states that Pythagoras discovered the construction of the regular solids (Procl., op. cit., p. 65). (9) Hippasus, the Pythagorean, is said to have perished in the sea on account of his impiety, inasmuch as he boasted that he first divulged the know- ledge of the sphere with the twelve pentagons (the in- scribed ordinate dodecahedron): Hippasus assumed the glory of the discovery to himself, whereas everything be- longed to Him—" for thus they designate Pythagoras, and do not call him by name."® (10) The triple interwoven triangle or pentagram—star-shaped regular pentagon— was used as a symbol or sign of recognition by the Pytha-*

1 We learn, however, from a fragment of Geminus, which has been handed down by Eutocius in his commentary on the Conics of Apol- lonius (Apoll., Conica, ed. Halleius, p. 9), that the ancient geometers observed two right angles in each species of triangle, in the equilateral first, then in the isosceles, and lastly in the scalene, whereas later writers proved the theorem generally thus— The three internal angles of every triangle are equal to two right angles."

2 The words of Proclus are interesting. " According to Eudemus the inventions respecting the application, excess, and defect of areas are ancient, and are due to the Pythagoreans. Moderns, borrowing these names, transferred them to the so-called conic lines, the parabola, the hyperbola, the ellipse, as the older school, in their nomenclature concerning the description of areas i plano on a finite right line, re- garded the terms thus :—An area is said to be applied (mapaBddXewv) to a given right line when an area equal in content to some given one is described thereon ; but when the base of the area is greater than the given line, then the area is said to be in excess (brepBdddew) 3 but when the base is less, so that some part of the given line lies without the described area, then the area is said to be in defect (€ANetweww). Euclid uses in this way in his

sixth book the terms excess and defect. . . . The term application (rapaBdddew), which we owe to the Pytha- goreans, has this signification."

3 Non posse suaviter vivi sec. Epicurum, c. xi.

4 Eire wpdBd\nua mwepl rod xwplov ris tapaBodjs. Some authors, rendering the last five words "concerning the area of the parabola," have ascribed to Pythagoras the quadrature of the parabola, which was one of the great discoveries of Archimedes.

5 Symp. viii., Quest. 2, c. 4.

6 Tamblichus, De Vit. Pyth., c. 18, s. 88.

goreans and was called by them "health" (wyseéa)." (11) The discovery of the law of the three squares (Euclid I. 47), commonly called the "theorem of Pythagoras," is attributed to him by many authorities, of whom the oldest is Vitruvius.® (12) One of the methods of finding right- angled triangles whose sides can be expressed in numbers (Pythagorean triangles)—that setting out from the odd numbers—is referred to Pythagoras by Heron of Alex. andria and Proclus.® (13) The discovery of irrational quantities is ascribed to Pythagoras by Eudemus (Procl., op. cit., p. 65). (14) The three proportions—arithmetical, geometrical, and harmonical—were known to Pythagoras," (15) Iamblichus " says, "' Formerly, in the time of Pytha- goras and the mathematicians under him, there were three means only—the arithmetical, the geometrical, and the third in order which was known by the name sub-contrary (vrevavria), but which Archytas and Hippasus designated the harmonical, since it appeared to include the ratios concerning harmony and melody." (16) The so-called most perfect or musical proportion, eg., 6:8::9:12, which comprehends in it all the former ratios, according to Iamblichus,!? is said to be an invention of the Baby- lonians and to have been first brought into Greece by Pythagoras. (17) Arithmetical progressions were treated by the Pythagoreans, and it appears from a passage in Lucian that Pythagoras himself had considered the special case of triangular numbers: Pythagoras asks some one, 'How do you count?" he replies, " One, two, three, four." Pythagoras, interrupting,

says, “Do you see? what you take to be four, that is ten and a perfect triangle and our oath.”!3 (18) The odd numbers were called by the Pytha- goreans “ gnomons,”?!4 and were regarded as generating, in-

7 Lucian, Pro Lapsu in Salut., s. 5; also schol. on Aristoph., Nwb., 611. That the Pythagoreans used such symbols we learn from Iamblichus (De Vit. Pyth., c. 38, ss. 237 and 238), This figure is referred to Pythagoras himself, and in the Middle Ages was called Pythagore figura ; even so late as Paracelsus it was regarded by him as a symbol of health, It is said to have obtained its special name from the letters v, y, t, (=e), a having been written at its prominent vertices.

8 De Arch., ix., Pref., 5, 6, 7. Amongst other authorities are Diogenes Laertius (viii. 11), Proclus (op. cié., p. 426), and Plutarch (ut sup., 6). Plutarch, however, attributes to the Egyptians the know- ledge of this theorem in the particular case where the sides are 3, 4, and 5 (De Is. et Osir., c. 56).

® Heron Alex., Geom. et Stereom. Rel., ed. F. Hultsch, pp. 56, 146; Procl., op. cit, p. 428. The method of Pythagoras is as follows :—he took an odd number as the lesser side; then, having squared this number and diminished the square by unity, he took half the remainder as the greater side, and by adding unity to this number he obtained the hypotenuse, e.g., 3, 4, 53 5, 12, 13.

10 Nicom. Ger., Introd. Ar., c. xxii,

In Nicomachi Arithmeticam, ed. 8, Tenuulius, p. 141,

2 Op. cit., p. 168. As an example of this proportion Nicomachus and, after him, Iamblichus give the numbers 6, 8, 9, 12, the harmonical and arithmetical means between two numbers forming a geometric proportion with the numbers themselves (a: ae ae, v).. Tam- blichus further relates (/.c.) that many Pythagoredins made use of this proportion, as Aristeus of Crotona, Timeus of Locri, Philolaus and Archytas of Tarentum, and many others, and after them Plato in his Timeus (see Nicom., Inst. Arithm., ed. Ast, p. 158, and Animad- versiones, pp. 327-329 ; and Iambl., op. cit., p. 172 sq.).

13 Biwy mpaots, 4, vol. i. p. 317, ed. C. Jacobitz.

14 Tvduwv means that by which anything is known, or“ criterion”; its oldest concrete signification seems to be the carpenter’s square (norma) by which a right angle is known. Hence it came to denote a per- pendicular, of which, indeed, it was the archaic name (Proclus, op. cit., p. 283). Gnomon is also an instrument for measuring altitudes, by means of which the meridian can be found; it denotes, further, the index or style of a sun-dial, the shadow of which points out the hours. In geometry it means the square or rectangle about the diagonal of a square or rectangle, together with the two complements, on account of the resemblance of the figure to a carpenter’s square; and then, more generally, the similar figure with regard to any parallelogram, as defined by Euclid II. Def. 2. Again, in a still more general signification, it means the figure which, being added to any figure, preserves the original form. See Heron, Dejinitiones (59). When

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asmuch as by the addition of successive gnomons—consist- ing each of an odd number of unit squares—to the original

square unit or monad the square form was preserved. (19)

In like manner, if the simplest oblong (érepdpyxes), consist-

ing of two unit squares or monads in juxtaposition, be taken and four unit squares be placed about it after the manner of a gnomon, and then in like manner six, eight . . . unit

squares be placed in succession, the oblong form will be

preserved. (20) Another of his doctrines was, that of all solid figures the sphere was the most beautiful, and of all plane figures the circle! (21) According to Jamblichus the Pythagoreans are said to have found the quadrature of the circle,”

On examining the purely geometrical work of Pythagoras and

his early disciples, as given in the preceding extracts, we observe that it is much concerned with the geometry of areas, and we are indeed struck with its Egyptian character. This appears in the theorem (3) concerning the filling up a plane with regular figures— for floors or walls covered with tiles of various colours were common in Egypt; in the construction of the regular solids (8), for some of them are found in Egyptian arehitecture ; in the problems con-

cerning the application of areas (5); and lastly, in the theorem of

Pythagoras (11), coupled with his rule for the construction of right- angled triangles in numbers (12). We learn from Plutarch that the Egyptians were aequainted with the geometrical fact that a triangle whose sides contain three, four, and five parts is right- angled, and that the square of the greatest side is equal to the squares of the sides containing the right angle. It is probable too that this theorem was known to them in the simple case where the right-angled triangle is isosceles, inasmuch as it would be at once suggested by the contemplation of a floor covered with square tiles — the square on the diagonal and the sum of the squares on the sides contain each four of the right-angled triangles into which one of the squares is divided by its diagonal. It is easy now to see how the problem to construct a square which shall be equal to the sum of two squares could, in some cases, be solved numerically. From the observation of a chequered board it would be perceived that the element in the successive formation of squares is the gnomon or carpenter's square. Hach gnomon consists of an odd number of squares, and the successive gnomons correspond to the successive odd numbers, and include, therefore, all odd squares, Suppose, now, two squares are given, one consisting of sixteen and the other of nine unit squares, and that it is proposed to form from them another square. It is evident that the square consisting of uine unit squares can take the form of the fourth gnomon, which, being placed round the former square, will generate a new square containing twenty-five unit squares. Similarly it may have been observed that the twelfth gnomon, consisting of twenty-five unit squares, could be transformed into a square each of whose sides contains five units, and thus it may have been seen conversely that the latter square, by taking the gnomonic or generating form with Tespect to the square ou twelve units as base, would produce the square of thirteen units, and so on.

This method required only to be generalized in order to enable Pythagoras to arrive at his rule for finding right-angled triangles whose sides ean be expressed iu numbers, which, we are told, sets out from the odd numbers. The nth square together with the nth gnomon forms the (2 +1)th syuare ; if the nth gnomon contains m? unit squares, m being an

mn? —

odd number, we have el, AS = i » which gives the

Tule of Pythagoras,

The general proof of Euclid I. 47 is attributed to Pythagoras, but we have the express statement of Proclus (op. cit., p. 426) that this theorem was not proved in the first instance as it is in the Elements. The following simple and natural way of arriving at the theorem is suggested by Bretschneider after Camerer.3 A square can be dissected into the sum of two squares and two equal rectangles, as in Euclid II. 4; these two rectangles can, by draw-Ing their diagonals, be decomposed into four equal right-angled triangles, the sum of the sides of each being equal to the side of the square ; again, these four right-angled triangles can be placed 80 that a vertex of each shall be in one of the corners of the square m such a way that a greater and less side are in continuation.

gsnomons are added successively in this manner to a square monad, the first gnomon may be regarded as that consisting of three square monads, and is indeed the constituent of a simple Greek fret; the Second of five Square monads, &c.; hence we have the guomonic numbers,

» Diog. Laert., De Vit, Pyth., viil. 19.

~ Sunplicius, In Aristotelis Paysicorum libros quattuor priores Com- pe etre, ed. H. Diels, p. 60.

, See Bretsch., Die Geom. vor Huklides, p. 82; Camerer, Ruclidis Lilem., vol. i. p. 444, and the references given thera,

The original square is thus dissected into the four triangles as before and the figure within, which is the square on the hypotenuse. This square, therefore, must be equal to the sum of the squares on the sides of the right-angled triangle.

It is well known that the Pythagoreans were much oceupied with the construction of regular polygons and solids, whieh in their cosmology played an essential part as the fundamental forms of the elements of the universe. We can trace the origin of these mathematical speculations in the theorem (8) that "the plane around a point is completely filled by six equilateral triangles, four squares, or three regular hexagons." Plato also makes the Pythagorean Timeus explain—" Each straight-lined figure consists of triangles, but all triangles can be dissected into rectangular ones which are either isosceles or scalene. Among the latter the most beautiful is that out of the doubling of which an equilateral arises, or in which the square of the greater perpendicular is three times that of the smaller, or in which the smaller perpendicular is half the hypotenuse. But two or four right-angled isosceles triangles, properly put together, form the square; two or six of the most beautiful scalene right-angled triangles form the equi-lateral triangle ; and out of these two figures arise the solids which correspond with the four elements of the real world, the tetra- hedron, octahedron, icosahedron, and the cube" 4 (Timeus, 58, 54, 55). The construction of the regular solids is distinctly ascribed to Pythagoras himself by Eudemus (8). Of these five solids three—the tetrahedron, the cube, and the octahedron—were kuown to the Egyptians and are to be found in their architecture. Let us now examine what is required for the construction of the other two solids-—the icosahedron and the dodecahedron. In the formation of the tetrahedron three, and in that of the octahedron four, equal equilateral triangles had been placed with a common vertex and adjacent sides coincident ; and it was known that if six such triangles were placed round a common vertex with their adjacent sides coincident, they would lie in a plane, and that, therefore, no solid could be formed in that manner from them. It remained, then, to try whether five such equilateral triangles could be placed at a common vertex in like manner; on trial it would be found that they could be so placed, and that their bases would form a regular pentagon. The existence of a regular pentagon would thus become known. It was also known from the formation of the cube that

three squares could be placed in a similar way with a common vertex; and that, further, if three equal and regular hexagons were placed round a point as common vertex with adjacent sides coincident, they would form a plane. It re- mained in this case too only to try whether three equal regular pentagons could be placed with a common vertex and in a similar way ; this on trial would be found possible and would lead to the construction of the regular dodecahedron, which was the regular solid last arrived at.

We see that the construction of the regular pentagon is required for the formation of each of these two regular solids, and that, therefore, it must have been a discovery of Pythagoras. If we examine now what knowledge of geometry was required for the solution of this problem, we shall see that it depends on Euclid IV. 10, which is reduced to Euclid II. 11, which problem is reduced to the following: To produce a given straight line so that the reet-angle under the whole line thus produced and the produced part shall be equal to the square on the given line, or, in the language of the ancients, To apply to a given straight line a rectangle which shall be equal to a given area—in this case the square on the given line—and which shall be cacessive by a square. Now it is to be observed that the problem is solved in this manner by Euclid (VI.- 30, Ist method), and that we know on the authority of Eudemus that the problems concerning the application of areas and their cxeess and defect are old, and inventions of the Pythagorcans (5). Hence the statements of Iamblichus concerning Hippasus (9)— that he divulged the sphere with the twelve pentagons—and of Lucian and the scholiast on Aristophanes (10)—that the penta- gram was uscd as a symbol of recognition amougst the Pythagoreans —become of greater importance.

Further, the discovery of irrational magnitudes is ascribed to Pythagoras by Eudemus (13), and this discovery has been ever regarded as one of the greatest of antiquity. It is commonly assumed that Pythagoras was led to this theory from the considera- tion of the isosceles right-angled triangle. It seems to the present writer, however, more probable that the discovery of incommen- surable magnitudes was rather owing to the problem: To cut a line in extreme and inean ratio. From the solution of this problem it follows at once that, if on the greater segment of a linc so cut a part be taken equal to the less, the greater segment, regarded as a new line, will be cut in a similar manner ; and this process can be continued without end. On the

other hand, if a similar method be adopted in the case of any two lines which can be re- presented numerically, the process would end. Hence would arise

4 The dodecahedron was assigned to the fifth element, quinta pars, ether, or, as some think, to the universe. (See PHILOLAUS.)

the distinction between commensurable and incommensurable quantities. A reference to Euclid X. 2 will show that the method above is the one used to prove that two magnitudes are inconmmen- surablc; and in Euclid X. 3 it will be scen that the greatest common measure of two commensurable magnitudes is found by this process of continued subtraction. It seems probable that Pythagoras, to whom is attributed one of the rules for representing the sides of right-angled triangles in numbers, tried to find the sides of an isosccles right-angled triangle numerically, and that, failing in the attempt, he suspected that the hypotenuse and a side had no common measure. He may have demonstrated the incommensurability of the side of a square and its diagonal. The nature of the old proof—which consisted of a reductio ad absurd- um, showing that, if the diagonal be commensurable with the side, it would follow that the same number would be odd and even 1—makes it nore probable, however, that this was accom- plished by his suceessors. The existence of the irrational as well as that of the regular dodecahedron appears to have been regarded by the school as one of their chief discoveries, and to have been preserved as a secret ; it is remarkable, too, that a story similar to that told by Iamblichus of Hippasus is narrated of the person who first published the idea of the irrational, namely, that he suffered shipwreck, &c.?

Eudemus ascribes the problems concerning the application of figures to the Pythagoreans. The simplest cascs of the problems, Euclid VI. 28, 29—those, namely, in which the given parallelogram is a square—correspond to the problem: To cut a given straight line internally or externally so that the rectangle under the segments shall be equal to a given rectilineal figure. The solution of this problem—in which the solution of a quadratic equation is implicitly contained—depends on the problem, Euclid Il. 14, and the theorems, Euclid II. 5 and 6, together with the theorem of Pythagoras. It is

probable that the finding of a mean proportional between two given lines, or the construction of a square which shall be equal toa given rectangle, is due to Pythagoras himself. The solution of the more gencral problem, Euclid VI. 25, is also attributed to him by Plutarch (7). The solution of this problem depends on that of the particular case and on the application of areas ; it requires, moreover, a knowledge of the theorems: Similar rectilineal figures are to each other as the squares on their homo- logous sides (Euclid VI. 20); and, If three lines are in geometrical proportion, the first is to the third as the square on the first is to the square on the second. Now Hippocrates of Chios, about 440 B.c., who was instructed in geometry by the Pythagoreans,

ossessed this knowledge. We are justified, therefore, in ascrib- ing the solution of the general problem, if not (with Plutarch) to Pythagoras, at least to his early successors.

The theorem that similar polygons are to each other in the duplicate ratio of their homologous sides involves a first sketch, at least, of the doctrine of proportion and the similarity of figures. ? That we owe the foundation and development of the doctrine of proportion to Pythagoras and his school is confirmed by the testi- mony of Nicomachus (14) and Jamblichus (15 and 16). From these passages it appears that the early Pythagoreans were acquainted, not only with the arithmetical and geometrical means between two magnitudes, but also with their harmonical mean, which was then called "subcontrary." The Pythagoreans were much occupied with the representation of numbers by geometrical figures. These speculations originated with Pythagoras, who was acquainted with the summation of the natural numbers, the odd numbers, and the even uumbers, all of which are capable of geometrical representa- tion. See the passage in Lucian (17) and the rule for finding Pythagorean triangles (12) and the observations thereon supra. On the other hand, there is no evidence to support the statement of Montucla that Pythagoras laid the foundation of the doctrine of isoperimetry, by proving that of all figures having the same peri- meter the circle is the greatest, and that of all solids having the

1 For this proof, see Euclid X. 117 ; see also Aristot., Analyt. Pr., i. c. 23 and c. 44.

2 Knoche, Untersuchungen tber die neu aufgefundenen Scholien

des Proklus Diadochus zu Euclid's Elementen, pp. 20 and 23, Herford,

1865.

3 It is agreed on all hands that these two theories were treated at length by Pythagoras and his school. It is almost certain, however, that the theorems arrived at were proved for commensurable magni- tudes only, and were assumed to hold good forall. The Pythagoreans themselves seem to have been aware that their proofs were not rigor- ous, and were open to serious objection; in this we may have the explanation of the secrecy which was attached by them to the idea of the incommensurable and to the pentagram which involved, and indeed represented, that idea. Now it is remarkable that the doctrine of proportion is ¢wice treated in the Elements of Euclid—first, in a general manner, so as to include incommensurables, in Book V., which tradition ascribes to Eudoxus, and then arithmetically in Book VII., which, as Hankel has supposed, contains the treatment of the subject by the olde: Pythagoreans.

same surface the sphere is the greatest. We must also deny to Pythagoras and his school a knowledge of the conic sections, and in particular of the quadrature of the parabola, attributed to him by some authors; and we have noticed the misconception which gave vise to this erroneous inference.

Let us now see what conclusions can be drawn from the foregoing examination of the mathematical work of Pythagoras and his school, and thus form an estimate of the state of geometry about 480 B.c. First, as to matter. It forms the bulk of the first two books of Euclid, and includes a sketch of the doctrine of proportion—which was probably limited to cominensurable magnitudes— together with some of the contents of the sixth book. It contains too the discovery of the irrational (4Aoyov) and the construction of the regular solids, the latter requiring the description of certain regular polygons—the founda- tion, in fact, of the fourth book of Euclid. Secondly, as to form. The Pythagoreans first severed geometry from the needs of practical life, and treated it as a liberal science, giving

definitions and introducing the manner of proof which has ever since been in use. Further, they distinguished between discrete and continuous quantities, and regarded geometry as a branch of mathematics, of which they made the fourfold division that lasted to the Middle Ages—the guadrivium (fourfold way to knowledge) of Boetius and the scholastic philosophy. And it may be observed that the name of "inathematics," as well as that of "philosophy," is ascribed to them. Thirdly, as to method, One chief characteristic of the mathematical work of Pythagoras was the combination of arithmetic with geometry. The notions of an equation and a propor- tion—which are common to both, and contain the first germ of algebra—were introduced among the Greeks by Thales. These notions, especially the latter, were elabo- rated by Pythagoras and his school, so that they reached the rank of a true scientific method in their theory of proportion. To Pythagoras, then, is due the honour of having supplied a method which is common to all branches of mathematics, and in this respect he is fully comparable to Descartes, to whom we owe the decisive combination of algebra with geometry.

Sce C. A. Bretschneider, Die Geometric wu. die Geometer vor Hu- klides (Leipsic, 1870); H. Hankel, Zur Geschichte der Mathematik (Leipsic, 1874); F. Hoefer, Histoire des Mathématiques (Panis, 1874); G. J. Allman, "Greek Geometry from Thales to Euclid," in Hermathena, Nos. v., vii., and x. (Dublin, 1877, 1881, and 1884); M. Cantor, Vorlesungen iiber Gesehichte der Mathematik (Leipsie, 1880). The recently published Short History of Greck Mathematics by James Gow (Cambridge, 1884) will be found a convenient compilation. (G. J. A.)

PYTHEAS of Massilia was a celebrated Greek navi- gator and geographer, to whom the Greeks appear to have been indebted for the earliest information they possessed, of at alla definite character, concerning the western regions of Europe, and especially the British Islands. The period at which he lived cannot be accurately determined ; but it is certain that he wrote, not only before Eratosthenes, who relied much upon his authority, but before Diczearchus, who was a pupil of Aristotle, and died about 285 B.C. Hence he may probably be regarded as about contem- porary with Alexander the Great. His work is now wholly lost, and appears to have been consulted in the original by comparatively few ancient writers, most of the

4 Proportion was not regarded by the ancients merely as a branch of arithmetic. We learn from Proclus that " Eratosthenes looked on proportion as the bond of mathematics" (op. cit., p. 43). We are also told in an anonymous scholium on the Elements of Euclid, which Knoche attributes to Proclus, that the fifth book, which treats of pro- portion, is common to geometry, arithmetic, music, and, in a word, to all mathematical science. And Kepler, who lived near enough to the ancients to reflect the spirit of their methods, says that one part of geometry is concerned with the comparison of figures and quantities, whence proportion arises. He also adds that arithmetie and geometry

_ afford mutual aid to each other, and that they eannot be separated.

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statements cited from it being confined to detached points, which may easily have been derived at second or even third hand. We are hence left almost wholly in the dark as to the form and character of the work itself, but the various titles under which it is cited by later writers point rather to a geographical treatise, in which he had embodied the results of his observations, than to a continuous narra- tive of his voyage like that of a modern navigator.

Some modern writers have supposed Pytheas to have been sent out at the public expense, in command of an expedition organized by the republic of Massilia; but there is no ancient authority for this, and the statement of Polybius, who had unquestionably seen the original work, is express, that he had undertaken the voyage in a private capacity and with limited means. All that we know concerning the voyage of Pytheas (apart from such detached notices as those already referred to) is contained in a brief passage of Polybius, cited by Strabo, in which he tells us that Pytheas, according to his own statement, had not only visited Britain but had personally explored a large part of it, and stated its circumference at more than 40,000 stadia (4000 geographical miles). To this he added the account of Thule (which he placed six days' voyage to the north of Britain) and the adjoining regions, in which there was no longer any distinction between the air and earth and sea, but a kind of mixture of all three, forming a substance resembling the gelatinous mollusc known as the Pulmo marinus,

which rendered all naviga- tio and progress in any other mode alike impossible. This substance he had himself seen, but the other state- ments he derived from hearsay. Returning from thence he visited the whole of the coasts of Europe bordering on the ocean as far as the Tanais (Polyb. ap. Strab., ii. p. 104). This last sentence has led some modern writers to suppose that he made two different voyages ; but this is highly improbtble, and the expressions of Polybius certainly imply that his explorations in both directions, first towards the north and afterwards towards the east, formed part of one and the same voyage.

The circumstance that the countries visited, and to a certain extent explored, by Pytheas were not only pre- viously unknown to the Greeks—except perhaps by vague hearsay accounts received through the Phcenicians—but Were not visited by any subsequent authority during a period of more than two centuries led some of the later Greek geographers altogether to disregard his statements, and even to treat the whole story of his voyage as a fiction,

‘ Eratosthenes, indeed, who wrote about a century after his

time, was disposed to attach great value to his authority, though doubting some of his statements ; but Polybius, about half a century later, involved the whole in one Sweeping condemnation, treating the work of Pytheas as & mere tissue of fables, like that of Euhemerus concerning Pancha ; and even Strabo, in whose time the western regions of Europe were comparatively well known, adopted to a great extent the same view with Polybius.

In modern times a more critical examination has arrived at a more favourable judgment, and, though Gossellin in his Recherches sur la Géographie des Anciens (vol. iv. pp. 168-180) and Sir G. C. Lewis in his Llistory of Ancient Astronomy (pp. 466-481) revived the sceptical view, the tendency of modern critics has been rather to exaggerate than to depreciate the value of what was really added by Pytheas to geographical knowledge. The fact is that our Information concerning him is so imperfect, and the scanty notices preserved to us from his work at once so meagre and discordant, that it is very difficult to arrive at anything like a sound conclusion. It may, however, be considered as fairly established that

Pytheas really made a voyage Tound the western coasts of Europe, proceeding from Gades,

the great Phoenician emporium, and probably the farthest point familiar to the Greeks, round Spain and Gaul to the British Islands, and that he followed the eastern coast of Britain for a considerable distance to the north, obtain- ing information as to its farther extension in that direction which led him greatly to exaggerate its size. At the same time he heard vaguely of the existence of a large island to the north of it—probably derived from the fact of the groups of the Orkneys and Shetlands being really found in that position—to which he gave the name of Thule. No ancient writer (except a late astronomer, who merely refers to it in a passing notice and obviously at second hand) asserts that Pytheas had hiniself visited Thule ; his account of the Sluggish Sea beyond it was, as stated by Polybius himself in the passage already cited, derived inerely from hearsay.

But the most important statement made by Pytheas in regard to this unknown land of Thule, and which has given rise to most controversy in modern times, was that connected with the astronomical phenomena affecting the duration of day and night in these remote arctic regions. Un- fortunately the reports transmitted to us at second hand in our existing authorities differ so widely that it is almost. impossible to determine what Pytheas himself really stated. It is, however, probable that the version given in one passage by Phny (#7.¥., iv. 16, 104) correctly represents his authority. According to this he reported as a fact that at the summer solstice the days were twenty-four hours in length, and conversely at the winter solstice the nights were of equal duration. Of course this would be strictly true had Thule really been situated under the arctic circle, which Pytheas evidently considered it to be, and his skill as an astronomer would thus lead him to accept. readily as a fact what he knew (as a voyager proceeded onwards towards the north) must be true at some point. But this statement certainly affords no evidence that he. had himself actually visited the mysterious land to which it refers. (See THULE.)

Still more difficult is it to determine the extent and character of Pytheas's explorations towards the east. The: statement of Polybius that he proceeded along the whole of the northern coasts of Europe as far as the Tanais is evidently based upon the supposition that this would be a simple and direct course along the coast of Germany and Scythia, —Polybius himself, in common with the other Greek geographers till a much later period, being wholly ignorant. of the vast projection of the Cimbric peninsula, and the long circumnavigation that it involved,—of all which no trace is found in the cxtant notices of Pytheas. Notwith- standing this, some modern writers have supposed him to have entered the Baltic and penetrated as far as the mouth of the Vistula, which he erroneously supposed to be the Tanais. The only foundation for this highly improbable as- sumption is to be found in the fact that in a passage cited by Pliny (4/.¥., xxxvii. 2, 35) Pytheas is represented as stating that amber was brought from an island called Abalus, distant a day's voyage from the land of the Guttones, a German nation who dwelt on an estuary of the ocean called Mentonomus, 6000 stadia in extent. It was a production thrown up by the waves of the sea, and was used by the inhabitants to burn instead of wood. It is not improbable that the "estuary" here mentioned really refers to the Baltic, the existence of which as a separate sea was un- known to all ancient geographers ; but the obscure nianner in which it is indicated, as well as the inaccuracy of the

statements concerning the place from whence the amber

was actually derived, both point to the sort of hearsay

accounts which Pytheas might readily have picked up on the shores of the German Ocean, without proceeding farther than the mouth of the Elbe, which is supposed by Ukert

to have been the limit of his voyage in this direction. It must be observed also that amber is found on the western coasts of Germany, as well as in the Baltic, though not in equal abundance.

It is a very singular fact that no mention is found in any ancient writer, in connexion with the voyage of Pytheas, of the Cassiterides or Tin Islands,

the exploration of which might naturally have been supposed to have been one of the chief objects of his voyage. It is indeed not im- possible that the statements on this subject preserved to us from Timeeus, who wrote less than a century after him, were derived from Pytheas, though there is no proof of this. The trade with those islands was probably at this period exclusively in the hands of the Phcenicians, but we know that at a later time a considerable portion of the supply was carried overland through Gaul to Massilia, Whether the voyage of Pytheas had any effect in contributing to bring about the diversion of this lucrative trade we have unfortunately no information.

Whatever uncertainty still hangs around all that has been trans- mitted to us concerning the actual explorations of Pytheas. it is certain that he had one merit which distinguished him from almost all his contemporaries: he was a good astronomer, and was one of the first who made observations for the determination of latitudes, among others that of his native place Massilia, which he fixed with remarkable accuracy, so that his result, which was within a few miles of the truth, was adopted by Ptolemy, and became the basis of liis map of the Western Mediterranean. Pytheas was also the first among the Greeks who arrived at any correct notion of the tides, and not only indicated their connexion with the moon but pointed out their periodical fluctuations in accordance with the phases of that luminary. Other observations concerning the manners and customs of the inhabitants of these remote regions are ascribed to him that are undoubtedly correct and tend strongly to prove that he had himself really visited them. Among these are the gradual disappearance of various kinds of grain as one advanced towards the north; the use of fermented liquors made from corn and honey ; and the habit of threshing out their corn in large covered barns, instead of on open threshing-floors as in Greece and Italy, on account of the want of sun and abundance of rain.

*The fragments of Pytheas have been collected by Arvedson (Upsala, 1824) and by Fuhr (De Pythea Massiliensi, Darmstadt, 1835). Of the numerous treatises and dissertations on the subject see for those of. earlier date Ukert's * Bemerkungen tiber Pytheas" (in vol. i. of his Geog. d. Griechen u. Romer, pp. 298-309), which contains an excellent summary of all that is known con- cerning the author and his work. The question has been also*

discussed by Sir G. C. Lewis, in his Historical Survey of the Astronomy of the Ancients (pp. 466-480, London, 1862), by Mr Bunbury, in his History of Ancient Geography (vol. i. chap. xv. sect. 2), and by Mr Elton, in his Origins of English History (London, 1882). A very elaborate but prolix and somewhat confused investiga- tion of the whole subject will be found in Miillenhoff's Dewtsche Alterthums- kunde (vol. i. pp. 211-497, Berlin, 1870). (E. H. B.)

PYTHON, a genus of gigantic snakes inhabiting the tropical parts of Africa and Asia, and known in some parts of the British possessions by the name of " rock-snakes." "On account of their general appearance, beautifully-marked skin, large size, and similarity of habits they are frequently confounded with the true boas of the New World and misnamed '"boa-constrictors." They differ from them, however, by having a double row of scutes under the tail, pits in the shields round the margins of the upper and lower jaws, and teeth in the intermaxillary bone.

Africa is inhabited by three species(Python sebx, P. regius, and P. natalensis), and Asia by two (Python molurus and P. reticulatus), the former of these two species being found on the continent of India and in Ceylon, the latter in the large islands of the Archipelago and in the Malayan Pen-insula. In Australasia and New Guinea similar snakes occur, but they are of much smaller size and differ in essential structural characters from the rock-snakes. These latter are among the largest of living reptiles ; although their dimensions and strength have been much exaggerated, specimens of 18 and 20 feet have been brought to Europe, and reliable statements of the occurrence of individuals which measured 30 feet are on record. Snakes of this size will easily overpower and kill one of the small species of deer or antelopes which abound in their native haunts, a sheep, or a good-sized dog; but the width of their mouth

PY TLPY &

would not permit them to swallow an animal larger than a half-grown sheep. The way in which they seize and kill their prey does not differ from that observed in num-

el yorted

yint

Python reticulatus (India).

erous other non-venomous snakes: after having seized their victim, they smother it by constriction, throwing several coils of the body over and round it. In swallowing they always commence with the head ; and, as they prey exclusively on mammals and birds, the hairs and feathers offer a considerable impediment to the passage through the narrow but distensible throat. The process of deglu- tition is therefore slow, although facilitated by the great quantity of saliva discharged over the body of the victim. During the time of digestion the snake is very lazy, and unwilling to move and to defend itself when attacked. At other times these animals are fierce enough, although always harmless to man if left unmolested. In captivity they seem to become used to those who attend upon them, but their apparent tameness is due rather to the depress- ing influence of a colder climate than to a change of their naturally excitable temper. Rock-snakes are mostly arbo- real, and prefer localities in the vicinity of water to which animals resort for the purpose of drinking. They move, climb, and swim with equal facility. It has now been well established by observations on specimens in a state of nature as well as in captivity that the female rock-snake incubates her eggs for about two months, at the end of which period the young are hatched, and probably remain under the protection of the mother for a few weeks longer. The snake collects the eggs into a conical heap, round which she coils herself, entirely covering them so that her head rests in the centre on the top of the cone. In this position the animal remains without food throughout the whole period of incubation, and an increase of the temperature between the coils of the snake has been ob- served in every case.

PYX. See Mint, vol. xvi. p. 483.

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Q

was written in Greek with the straight stroke verti-

cal, 9, as in the Phcenician alphabet from which it

was borrowed, and was called koppa, the equivalent of the Hebrew koph. It is found sparingly on some old inscrip- tions of Rhodes, of some of the A‘%gean islands, of Corinth and of Syracuse, and most frequently in the Chalcidian colonies of Sicily and Italy. But it was soon supplanted by kappa, and survived only in numeration as the repre- sentative of the number 90. It went to Rome with the

Chalcidian alphabet of Cumz, and was written at first

with the vertical line; but the stroke soon became slant, so that the symbol got the form it still retains (Q).

There is a slight but real distinction of sound between the so-called palatal and velar’. The first is the ordinary k, for which the back of the tongue iy raised against the back part of the hard palate. The second is produced by raising the tongue against the soft palate or velum palatt, that is, rather farther back in the mouth. This sound has a tendency to be accompanied by a slight rounding of the lips; this causes an equally slight w sound after the &. It is probable that the velar & with this parasitic w was in use for a time in Greece, and that it was represented by the koppa; the symbol would otherwise have been totally unnecessary ; also the koppa is generally followed by u or 0, which, on this view, is natural. We know that in Greece fw must have been an intermediate sound between kand p in words where x was labialized, such as érouat from root sak (see under K). sound was not retained in the language: either the w was dropped and the sound reverted to &, or p was produced by the assimilating force of the w; therefore all need for a symbol koppa ‘vanished. But in Latin the middle step remained, as in seguor; therefore the symbol was needed. But the parasitic sound became a complete w; and to denote this v was regularly written after the g. There- fore even in Latin the symbol was really otiose, for kv would have been quite sufficient, and did actually suffice for the Umbrian and Oscan, which never possessed the g. In old inscriptions we find qg alone when the following vowel is u, as in Mirgurios, pequnia. In later times, when o passed by weakening into uw, a preceding gu was written c; thus guom became cum, to avoid the double x of guwm. The gu of the Latin naturally passed on into the Romanic languages. It passed into the Teutonic

languages in borrowed words, such as quart, but made its way into Teutonic words also; thus, in English, cwén, cwellan are now spelt queen, quell.

QUADRILATERAL, a military term applied to any combination of four fortresses mutually supporting each other, but especially to that of the four fortified towns of Mantua, Peschiera, Verona, and Legnago, the two former of which are situated on the Mincio and the two latter on the Adige. The real value of the Quadrilateral, which gave Austria such a firm hold on Lombardy, lay in the extraordinary natural strength of Mantua and in the readiness with which troops and supplies could be poured into Verona from the north.

See "The Quadrilateral," in the Cornhill Magazine, 1862; and Professor Malfatti, J2 Quadrilatero, Milan, 1866.

~ QUADRUMANA. See Mammatta, vol. xv. p- 444, and Apr, vol. ii. p. 148.

QUESTOR was the title of a Roman magistrate whose functions, at least in the later times of the republic, were mainly financial. The origin of the questorship is some- what obscure, but on the whole it was probably instituted

But this intermediate

simultaneously with the consulship in 509 z.c.1 The number of the quzstors was originally two, but this was successively increased to four (in 421 B.c.), eight (in 267 or 241 z.c.), and by Sulla (in 81 B.c.) to twenty. Czesar raised the number to forty (in 45 3.c.), but Augustus reduced it again to twenty, which remained the regular number under the empire. When the number was raised from two to four in 421 3.c. the office was thrown open to the plebeians, and it was the first office that was so opened. It was the lowest of the great offices of state, and hence it was regularly the first sought by aspirants to a political career. Towards the close of the republic, if not earlier, the successful candidate was bound to have completed his thirtieth year before he entered on office, but Augustus lowered the age to twenty-five. Originally the questors seem to have been nominated by the consuls independently, but later, perhaps from the fall of the decemvirs (449 B.c.), they were elected by the people assembled in tribes (comitia tributa) and

pre- sided over by a consul or another of the higher magistrates. The queestors held office for one year, but, like the consuls and preetors, they were often continued in office with the title of proqueestor. Indeed it was a regular rule that the queestor attached to a higher magistrate should hold office as long as his superior; hence, when a consul regularly presided over the city for one year, and afterwards as proconsul governed a province for another year, his queestor also regularly held office for two years. Before the election of the queestors the senate decided the duties to be undertaken by them, and after election these duties were distributed amongst the new queestors either by lot or by the choice of the higher magistrates to whom a questor was assigned. A peculiar burden laid on the questors, not so much as an Official duty, but rather as a sort of fee exacted from all who entered on the political career, was the paving of the high roads, for which Claudius substituted the exhibition of gladiatorial games. Various classes of queestors may be distinguished according to the duties they had respectively to discharge. Up to 421 B.c. there were only two queestors, and when fresh ones were added the two original quzestors were distinguished by the appellation of urban questors (quexstores urbant), doubtless because they were bound to remain in Rome during thei» term of office.

1. The Urban Quexstors.—Originally the duties of the questors, like those of the eonsuls, were of a general and Tadefined: nature ; specialization of function had not yet arisen—the consuls were simply the superior, the questors simply the inferior magistratcs of the republie. From a very early time, however, the questors possessed criminal to the exelusion of eivil jurisdietion. Thc very name "questor" (from guexrere, "to seareh out") means " inves- tigator," "inquisitor." In the code of the Twelve Tables they are designated questores parricidit, "inquisitors of parrieide or murder" ;? and perhaps originally this was their full title, which was afterwards abbreviated into questors when their funetions as erim- inal judges fell into the background. In addition to parrieide or murder we ean hardly doubt that all other erimes fell within the jurisdiction of the questors ; political crimes only seem to have been exeepted. The criminal jurisdiction of the questors appears

1 Plutarch (Popl., 12) states that the office was instituted by the first consul. Tacitus, on the other hand (Ann., xi. 22), says that it dated from the time of

the kings, but his ground is merely that they were mentioned in the Lex Curiata of the consul Brutus, which Tacitus assumes to have been identical with that of the kings.

2 The etymology and original meaning of parricidiwm are doubtful. In the latter part of the word we have, of course, the same root as in exedere, "to kill," but whether or not the former part is from pater, "a father," or from the same root that we have in per-peram, per-jurium, is a moot point. Mommsen takes the latter view.

only to have terminated when towards the close of the republic trial by permanent courts (quaestiones perpetuw) was extcnded to criminal cases!

The questors had also charge of the public treasury (@rartwm) in the temple of Saturn, and this was in the later times of the republic their most important function. They kept the keys of the treasury and had charge of its contents, including not only coin and bullion but also the military standards and a large number of public documents, which in later times comprised all the laws as well as the decrees of the senate. Their functions as keepers of the treasury were withdrawn from the urban questors by Augustus and transferred to other magistrates, but the office itself continued to exist into the 8d century, though as to the nature of the duties attached to it we have little or no information.

2. The Military Questors.—These were instituted in 421 B.o., when two new questors were added to the original two, They never had a distinctive appellation like that of the urban questors, from whom, however, they were clearly distinguished by the fact that, while the urban questors did not stand in a special relation of subordination to any particular magistrate, a non-urban questor was regularly assigned as an indispensable assistant or adjutant to' every general in command, whose name or title the questor usually added to his own.? Originally they were the adjutants of the consuls only, afterwards of the provincial pretors, and still later of the proconsuls and propretors. military commanders had no questor, because a questor

woul have been a limitation to his powers. The governor of Sicily had two questors ; all other ae and commanders had but one. Between the questor and his superior a close personal relation, analogous to that. between a son and his father, existed, and was not severed when their official connexion ceased. , Not till the close of the republic do cases occur of a questor being sent toa province invested with preetorial and even consular powers ; in one case at least the questor so scnt had a second questor placed under him. The duties of the military questor, like those of the treasury questor, were primarily financial. Moneys due to a provincial governor from the state treasury were often, perhaps regularly, received and disbursed by the questor; the magazines seem to have been under his charge; he coined money, on which not unfrequently his name appears alone. The booty taken in war. was not necessarily under the control of the questor, but was dealt with, especially in later times, by inferior officers called prefecti fabrum. But, though his duties were primarily financial, . the questor was after all the chief assistant or adjutant of his superior in command, and as such he was invested with a certain degree of military power; under the republic his military rank | was superior to that of the legates, though under the empire this relation was reversed. When the general left his province before the arrival of his successor he usually committed it to the care of his questor, and, if he died or was incapacitated from naming his successor, the questor acted as his representative. Unlike the urban questor, the military questor possessed not a criminal but a civil jurisdiction corresponding to that of the ediles at Rome.

3. The Italian Questors.—The subjugation of Italy occasioned the institution (in 267 B.c.) of four new questors, who appear to have been called questores classici because they were originally intended to superintend the building of the fleet (cassis) ; their functions, however, are very imperfectly known. Though no doubt intended to assist the consuls, they were not subordinated (like the military questors) to a special consul. They were stationed at Ostia, at Cales in Campania, and in Gaul about the Padus (Po). The station of the fourth is not mentioned ; perhaps it was Lilybeeum in Sicily.

QUAGGA, or CovaGaa, an animal of the genus Zguus (see Horsz, vol. xii. p. 175), nearly allied to the zebra, which formerly was met with in vast

herds on the great plains of South Africa between the Cape Colony and the Vaal river, but now, in common with most of the larger wild animals of that region, becoming extremely scarce, owing to the encroachments of European civilization. In length of ears and character of tail it more resembles the horse than it does the ass, although it agrees with the latter in wanting the small bare callosity in the inner side of the hind leg, just below the hock, characteristic of the horse. The colour of the head, neck, and upper parts of

1 It is often supposed that the que&stores parricidti were an old magistraey quite distinet from the ordinary questors. For the identification of the two, see Mommsen, Rémisches Staatsrecht, ii., pe. L, p. 606.

2 Thus Cieero speaks of the provincia consularis of the queestor, and we find guestor Cn. Pompei, &e.

The dictator alone ane

QUA—QUA

the body is reddish-brown, irregularly banded and marked with dark brown stripes, stronger on the head and neck and gradually becoming fainter until lost behind the shoulder., There is a broad dark median. dorsal stripe. The under surface of the body, the legs, and tail are nearly white, without stripes. by a standing mane, banded alternately brown and white. Though never really domesticated, quaggas have occasion- ally been trained to harness, The accompanying figure is

Quagga.

reduced from a painting made from one of a pair which were driven in Hyde Park by Mr Sheriff Parkins in the early part of the present century. The name is an imita- tion of the shrill barking neigh of the animal, “ ouag-ga, ouag-ga,” the last syllable very much prolonged. It must pe remembered, however, in reading books of African travel that the same word is very commonly applied by hunters to another and more completely striped species, called by zoologists Burchell’s zebra. .

QUAIL (Old French Quazlle, Mod. French Caille, Italian Quaglia, Low Latin Quaguila, Dutch Kwakkel, and Kwartel, German Wachtel, Danish Vagtel), a very well- known bird throughout almost all countries of Europe, Asia, and Africa,—in modern ornithology the Coturm« communis or C. dactylisonans, This last epithet was given from the peculiar three-syllabled call-note of the cock, which has been grotesquely rendered in several European lan- guages, and in some parts of Great Britain the species is popularly known by the nickname of '" Wet-my-lips" or '"'Wet-my-feet." The Quail varies somewhat in colour, and the variation is rather individual than attributable to local causes; but generally the plumage may be described as reddish-brown above, almost each feather being trans- versely patched with dark brown interrupted by a longitu- dinal stripe of light buff; the head is dark brown-above, with three longitudinal streaks of ochreous-white ; the sides of the breast and flanks are reddish-brown, distinctly striped with ochreous-white ; the rest of the lower parts are pale buff, clouded with a darker shade, and passing into white on the belly. The cock, besides being generally brighter in tint, not unfrequently has the chin and a double-throat band of reddish or blackish-brown, which marks are want- ing in the hen, whose breast is usually spotted. Quails breed on the ground, as all gallinaceous birds commonly do, and lay from nine to fifteen eggs of a yellowish-white, blotched and spotted with dark brown. Though essenti- ally migratory by nature, not a few Quails pass the winter in the northern hemisphere and even in Britain, and many more in southern Europe. In March and April they cross the Mediterranean from the south on the way to their breed-

The crest is very high, surmounted —

ing homes in large bands, but these are said to be.as | fornia, Lophortyx californica, has also been tried in

nothing compared with the enormous flights that emigrate | Europe without success.

from Europe towards the end of September. During both migrations immense numbers are netted for the market, since they are almost universally esteemed as delicate meat. On capture they are placed in long narrow and low cages, darkened to prevent the prisoners from fighting, and, though they are often so much crowded as to be hardly able to stir, the loss by death that ensues is but trifling. Food, usually millet' or hempseed, and water are supplied in troughs hung in front, and thus these little birds are trans- ported by tens of thousands from the shores of the Mediterranean for consumption in the most opulent and populous cities of Europe. The flesh of Quails caught in spring commonly proves dry and indifferent, but that of those.taken in autumn, especially when they have been kept long enough to grow fat, as they quickly do, is excellent. In no part of the British Islands at present do Quails exist in sufficient numbers to be the especial object of sport, though there are many places in which a few, and in some seasons more than a few, yearly fall to the gun. When made to take wing, which is not always easily done, they rise with great speed, but on such occasions they seldom fly far, and no one seeing them only thus would be inclined to credit them with the power of extensive migra- tion that they possess, though this is often overtaxed, and the birds in their transmarine voyages frequently drop exhausted into the sea or on any vessel that may be in their way. In old days they were taken in England in a net, attracted thereto by means of a Quail-call,—a simple instrument,! the use of which is now wholly neglected,—on which their notes are easily imitated.

Five or six other species of the restricted genus Coturnix are now recognized ; but the subject of the preceding remarks is generally admitted to be that intended by the author of the book of Exodus (xvi. 13) as having supplied

-food to the Israelites in the wilderness, though a few ornithological writers have thought that bird to have been a SAND-GrovusE (¢.v.). In South Africa and India allied species, C'. delegorguii and 'C. coromandelica, the latter known as the Rain-Quail, respectively occur, as well as the commoner one, which in Australia and Tasmania is wholly replaced by C. pectoralis, the Stubble-Quail of the colonists. In New Zealand another species, C. nove-zelandix, was formerly very abundant in some districts, but is considered to have been nearly if not quite extirpated within the last twenty years by

bush-fires. Some fifteen or perhaps more Species of Quails, inhabiting the Indian and Australian Regions, have been separated, perhaps unnecessarily, to form the genera Synecus, Perdicula, Lxcalphatoria, and so forth ; but they call for no particular remark.

America has some fifty or sixty species of birds which are commonly deemed Quails, though by some authors placed in a distinct Family or Sub-family Odontophorine.2 The best known is the Virginian Quail, or Colin, as it is frequently called—that being, according to Hernandez, its old Mexican name. It is the Ortyx virginianus of modern ornithology, and has a wide distribution in North America, im some parts of which it is known as the " Partridge," as well as by the nickname of " Bob-White," aptly bestowed upon it from the call-note of the cock. Many attempts have been made to introduce this bird to England (as indeed similar trials have been made in the United States with Quails from Europe) ; but, though it has been turned out by hundreds, and has been frequently known to breed after liberation, its numbers rapidly diminish until it wholly disappears. The beautiful tufted Quail of Cali-

One is figured in Rowley's Ornithological Miscellany (ii. p. 363). They form the subject of a monograph in folio by Gould, published between 1844 and 1850.

All these American Quails or Colins seem to have the habit of perching on trees, which none of the Old-World forms possess.

Interesting from many points of view as is the group of Birds last mentioned, there is another which, containing a score of species (or perhaps more) often termed Quails or Button-Quails, is of still greater importance in the eyes of the systematist. This is that comprehended by the genus Turnix, or Hemipodius of some authors, the anatomical structure of which removes it far from the genera Coturniz, Ortyx, and their allies, and even from any of the normal Galline. Prof. Huxley, as already stated (ORNITHOLOGY, vol. xviii. p. 36), would regard it as the representative of a generalized stock from which the Charadriomorphe and Alectoromorphx, to say nothing of other groups, have sprung. Want of space prevents our here dwelling upon these curious birds. One species, 7. sylvatica, inhabits Barbary and southern Spain, and under the name of Andalucian Hemipode has been

included (though on evidence not wholly satisfactory) among British Birds as a reputed straggler. The rest are natives of various parts of the Ethiopian, Indian, and Australian Regions. It is characteristic of the genus Turnix to want the hind toe; but the African Ortyxelus and the Australian Pedionomus which have been referred to its neighbourhood have four toes on each foot, and, since nothing is known of the anatomy or: habits of the first and but little of those of the second,' their position must at present be considered doubtful. (A. N.)

QUAKERS. The Quakers, or, as they call themselves, the Society of Friends, are a body of Christians small in number but presenting several features of interest. To the student of ecclesiastical history they are curious as exhibiting a form of Christianity widely aberrant from the preva- lent types, and as a body of worshippers without a creed, a liturgy, a priesthood, or a sacrament; to the student of social science they are interesting as having given to women an almost equal place with men in their church organization, and as having attempted to eliminate war, oaths, and litigation from their midst. The student of English constitutional history will observe the success with which they have, by the mere force of passive resistance, obtained from the legislature and the courts indulgence for all their scruples and a recognition of the legal validity of their customs; whilst to the student of American history the Quakers will ever be remarkable for the pro- minent part they played in the colonization of New Jersey and Pennsylvania,

HMistory.—The history of Quakerism in England may conveniently be divided into four periods :—(1) from the first preaching of Fox in 1648 to the establishing of a church organization in 1666; (2) from that date to the Revolution of 1688; (3) from the Revolution to 1835; and (4) from 1835 to the present time.

1. George Fox (q.v.), the son of a weaver of Drayton in Leicestershire, was the founder of the Quakers. He began to preach in 1648, and in a few years gathered around him a great body of followers and a considerable number of itinerant preachers like himself, who zealously promul- gated his doctrines. Amongst these Edward Burrough was one of the most remarkable. In 1655 these preachers num- bered seventy-three. Fox and his

fellow-preachers spoke whenever opportunity offered — sometimes in churches,

3 Col. Legge's observations on the habits of Pedionomus in the Zoological Society's Proceedings (1869, pp. 286-238) would seem to shew a Limicoline affinity. Garrod in the same work (1873, p. 34) figured the skull as that of a Turnicine, in which view Forbes acquiesced (Jéis, 1882, pp. 389, 431); but against it Col. Legge im- mediately protested (tom. cit., p. 610).

sometimes in barns, sometimes at market-crosses. 'There is some evidence to show that the arrangement of this mis- sion, as it would now be called, rested mainly with Fox, and that the expenses of it and of the foreign missions were borne out of a common fund. Margaret Fell, the wife and afterwards the widow of Judge Fell—who sub- sequently married George Fox—opened her house at Swarthmore Hall, near Ulverston, to these preachers, and probably contributed largely to the common fund from which the expenses were paid. Fox's teaching was primarily a preaching of repentance; and he and his friends addressed vast congregations much as Wesley and Whitefield did at a later date. But his teaching had certain marked peculiarities—especially his insistence on the universality and sufficiency of the light of God's Spirit. He regarded the work in which he was engaged as in no wise the founding of a new sect or society, but, to use his own words, as 'the appearance of the Lord's everlasting truth, and breaking forth again in His eternal power in this our day and age in England." Such teaching and such views necessarily brought Fox and his friends into direct conflict with all the religious bodies of England, and they were continually engaged in strife with the Pres- byterian ministers who then filled the pulpits of English churches, with the Independents, with the Baptists, with the Episcopal Church, and with the wilder sectaries, like the Fifth Monarchy men, the Ranters, the Seekers, and the Muggletonians. This strife was conducted on both sides with a zeal and an acerbity of language not consonant with our present notions of decorum. The movement was accompanied, too, by most of those physical symptoms which usually go with vehement appeals to the conscience and the emotions of a rude multitude. The trembling amongst the listening crowd caused or confirmed the name of Quakers given to the body: men and women some- times fell down and lay grovelling on the earth and struggling as if for life. But the Quaker preachers seem not to have encouraged these manifestations, but rather to have sought to assuage them by such reasonable means as carrying the affected to bed or administering a cordial or medicine.

Some of the early Quakers indulged in eccentricities and extravagances of no measured kind. Some travelled and preached naked or barefoot or dressed in sackcloth ; others imitated the Hebrew prophets in the performance of symbolical acts of denunciation or warning; even the

women in some cases distinguished themselves by the impropriety and folly of their conduct. In some cases religious excitement seems to have produced or been attended by insanity, and the aberrations of Naylor and Ibbit can only be attributed to that cause. For, though not altogether free from acts of fanaticism, the Quaker leaders discouraged and disowned the grosser acts of enthusiasm.

The activity and zeal of the early Quakers were not con- fined to England ; they passed into Scotland and Ireland. Fox and others travelled to America and the West Indian Islands ; another reached Jerusalem, and testified against the superstition of the monks; Mary Fisher, "a religious maiden," visited Smyrna, the Morea, and the court of Mohammed IV. at Adrianople; others made their way to Rome; two women suffered imprisonment from the In- quisition in Malta; two men passed into Austria and Hungary ; and William Penn, George Fox, and others preached Quakerism in Holland and Germany.

As early as 1652 meetings of the followers of Fox, calling themselves at first the Children of Light, gathered together in various places in England, and were soon established in considerable numbers. The meetings at Bristol were often attended by from three to four thousand people.

QUAKERS

2. The second period in the history of Quakerism 1s marked by the introduction into the body, hitherto unor- ganized, of an organization and a discipline principally due to the mind and energy of Fox, by a more scholarly and learned air given to the Quaker productions by the writings of William Penn and Robert Barclay, and by the part which the Quakers played in the colonization of New Jersey and of Pennsylvania. It is not wonderful that the introduction of an organization and a discipline inet with great opposition amongst a people taught to believe that the inward light of each individual man was the only true guide for his conduct. The project met with some oppo- sition at the time, and at a later period (1683), from persons of considerable reputation in the body. Wilkin- son, Rogers, Story, and others raised a party against Fox as regards the management of the affairs of the society, and asserted that the meetings for discipline which had been established were useless, and that every man ought to be guided

by the Spirit of God in his own mind, and not to be governed by rules of man. They drew a consider- able following away with them, but the greater number adhered to their original leader.

Robert Barcuay (¢.v.), a Scotsman of family, who had received a polite education, principally in France, joined the Quakers about 1666, and William Penn (¢.v.) joined the body about two years later. The Quakers had always been active controversialists, and a great body of tracts and papers was issued by them; but hitherto they had not been of much account in a literary point of view. Now the writings of Barclay, especially his celebrated Apology for the True Christian Divinity (1675), published by him in Latin and English, and the works of William Penn (amongst which his Vo Cross no Crown was one of the best known) gave to the Quaker literature a more logical and a more scholarly aspect.

One peculiarity of the conduct of the Friends down to the Revolution of 1688, and more or less down to the present time, must not be overlooked. They were essenti- ally non-political. They opposed the most dogged per- sonal and individual resistance to what they thought wrong; but they never attempted by combination or otherwise to exert political influence. 'Keep out of the powers of the earth" was Fox's exhortation ; and, when in 1688 a discussion was introduced into the yearly gathering of the body on the choice of parliament men, Fox strenuously opposed the introduction of politics into the meetings of his followers.

During the whole time between the rise of the Quakers and the passing of the Toleration Act they were the objects of an almost continuous persecution, which they endured with extraordinary constancy and patience. In 1656 Fox computed that there were seldom less than a thousand in prison, and it has been asserted that between 1661 and 1697 13,562 Quakers were imprisoned, 152 were transported, and 338 died in prison or of their wounds. Having come into being after the death of Charles I., the Quakers first endured persecution under the Parliament and then under Cromwell. In 1645 an ordinance of the Parliament had made the directory of the Westminster divines obligatory ; and ordinances of the years 1646 and 1648 were passed for the preventing of blasphemies and heresies, which comprehended under these hard names some doctrines

afterwards promulgated by the Quakers, as that the two sacraments of baptism and the Lord's supper are not commanded by the word of God, and that the use of arms for defence, be the cause ever so just, is unlawful. Furthermore these or other ordinances of the Parliament placed the decision of questions as to tithes in the hands of the justices of the peace. The instrument of government under which Cromwell assumed power as the Lord Protector had held out a promise of protection in the exercise of their religion to '"'such as professed faith in God by Jesus Christ" (art. 87); and the Protector himself, in 2 speech addressed to Parliament on the 12th September 1654, had declared liberty of conscience to be a natural right; nevertheless the Quakers found that they were still the subjects of bitter per- secution. They were sometimes dealt with under the ordinances already referred to, sometimes as Sabbath-breakcrs because they

travelled to their mcetings for worship, sometimes as disturbers of the clergy in their office because they spoke in churches, sometimes as guilty of breaches of the peace because they preached in streets or markcts, sometimes for refusing to pay tithes, sometimes for refusing to take off their hats, sometimes for refusing to swear. So matters remained till the Restoration of Charles II., when the publication from Breda of his declaration for liberty of conscience again raised hopes of ease in the hearts of the Friends. But these hopes were again destined to disappointment. The laws under which the Quakers were persecuted during the revived Stuart period were (1) the common law, (2) the old legislation in ecclesi- astical matters which was revived on Charles's accession, (3) the special legislation of the period, and (4) the ecclesiastical laws as administered by the ecclesiastical courts. In the first class was the general law as to breakers of the peace; in the second class may be mentioned the statute of 6 Hen. VIII. by which im- prisonment was appointed as a punishment for non-payment of tithes, the statute of Klizabeth imposing the oath of supremacy, the Act of Uniformity passed in the first year of Elizabeth, the Acts of the 23rd and 29th years of the same queen which im- posed fines and penalties for non-attendance of church and the statute of the 385th year of Elizabeth by which an obstinate offender in that matter was made a felon without benefit of clergy, and, lastly, the statute of 3

James I. imposing the oath of alle- giance. (3) The special legislation during this period under which the Quakers suffered included (a) a statute 18 & 14 Car. II. c. 1, especially dirccted against them and punishing their refusal to take an oath, or the taking part in assemblies for worship, with fine, and a second conviction with an obligation to abjure the realm, or transportation to any of the king's plantations ; (b) the Act of Uniformity (13 & 14 Car. II. c. 4), more stringent than that of Elizabeth ; (c) the Five-Mile Act passed in 1665 (17 Car. II. c. 4); and, lastly, the Conventicle Act of 1670 (22 Car. II. c. 1). (4) The ecclesiastical courts, on the return of the Stuarts, were restored to thcir former vigour, and Quakers were continually proceeded against in them for non-payment of tithes, oblations, and other church claims, and also for non-attendance at the parish churches, and for contempt of the discipline and censures of the church. Many of their body were accordingly excommunicated, and under the writ de eacommunicato capiendo confined to prison.

The passing of the Conventicle Act gave fresh vigour to the persecution of Dissenters. But, on 15th March 1671-72, King Charles II. issued his declaration for suspending the penal laws in matters ecclesiastical, and shortly afterwards by pardon under the great seal released above four hundred Quakers from prison, remitted their fines, and released such of their estates as were forfeited by premunire. The dissatisfaction which this exercise of the royal prerogative created induced the king in the following year to recall his proclamation, and the suffer- ings of the Quakers revived ; and, notwithstanding repre- sentations and appeals to King Charles IT., the persecution continued throughout his reign. On the accession of James IT., the Quakers addressed him with some hope from his known friendship for William Penn, and pre- sented to him a list of the numbers of their members undergoing imprisonment in each county, amounting in all to fourteen hundred and sixty, King James not long afterwards directed a stay of proceedings in all matters pending in the Exchequer against Quakers on the ground of non-attendance on national worship. In 1687 came the king's celebrated declaration for liberty of conscience, and in the following year the Revolution, which put an end to all persecution of the Quakers, though they remained for many years liable to imprisonment for non-payment of tithes, and though they long laboured together with other Dissenters under

various disabilities—the gradual removal of which is part of the general history of England.

_ The Toleration Act was by no means the only legisla- tion of the reign of William and Mary which brought ease to the Quakers. The legislature early had regard to their refusal to take oaths; and from 1689 to a very recent date numerous enactments have respected the peculiar scruples of the Friends. This special legislation may be conveniently studied in Davis's Digest of Legislative Enact- ments relating to Friends (Bristol, 1820).

3. With the cessation of persecution in 1689 the

zeal of the Quaker body abated. Foreign missions had no existence except in the occasional travels of some wandering minister. The notion that the whole Christian church would be absorbed in Quakerism, and that the Quakers were in fact the church, passed away ; and in its place grew up the conception that they were "a peculiar people" to whom had been given a clearer insight into the truths of God than to the professing Christian world around them, and that this sacred deposit was to be guarded with jealous care. Hence the Quakerism of this period was mainly of a traditional kind: it dwelt with increasing emphasis on the peculiarities of dress and lan- guage which tended to shut Quakers off socially from their fellow-men; it rested much upon discipline, which developed and hardened into rigorous forms; and the correction or exclusion of its members was a larger part of the business of the body than the winning of converts either to Christi- anity or to Quakerism.

Excluded from political life by the constitution of the country, excluding themselves not only from the frivolous pursuits of pleasure but from music and art in general, with no high average of literary education (though they produced some men of eminence in medicine and science, as Dr Fothergill and Dr Dalton), the Quakers occupied themselves largely with trade, the business of their society, and the calls of philanthropy. In the middle and latter part of last century they founded several institutions for the more thorough education of their children, and entered upon many philanthropic labours.

During this period Quakerism was sketched from the outside by two very different men. Voltaire (Dictionnaire Philosophique, s.vv. Quaker," "Toleration") has described the body, which attracted his curiosity, his sympathy, and his sneers, with all his brilliance. Clarkson (Portraiture of Quakerism) has given an elaborate and sympathetic ac- count of the Quakers as he knew them when he travelled amongst them from house to house on his crusade against the slave trade.

4. It cannot be denied that the theology of Quakerism had become somewhat mystic and quietist during the long period we have just considered. About the year 1826 an American Quaker named Hicks (q.v.) openly denied the divinity of Christ, depreciated the value of the Scrip- tures, and recognized no other Saviour than the inward light. A large body of the American Quakers followed him, and still maintain a separate existence. Jt was this movement which led to a counter movement in England, known in the Quaker body as the Beacon controversy, from the name of a book published in 1835, advocating views more nearly akin to those known as evangelical than were held by many Quakers. A considerable discussion ensued, and a certain number of the Friends holding these more evangelical doctrines departed from the parent stock, leaving, however, behind them many influential members of the society who strove to give a more evangelical tone to the Quaker theology. Joseph John Gurney, by his various writings (some published before 1835), was the most prominent actor in this movement. This period has also been marked, especially within the last few years, by some revival of aggressive action, and Quakers have taken far more part in the teaching in Sunday schools, in the preaching of the gospel to the poor, and in the establish- ment of foreign missions than in the period immediately preceding. In 1847 an association was established to promote Sunday schools in the body; in 1859 a Friends' foreign mission was established; and the Quakers have now a few regular labourers in Madagascar, India, Syria, and Constantinople.

Other causes have been at work modifying the Quaker body. The repeal of the Test Act, the admission of

Quakers to parliament, the establishment of the university of London, and more recently still the opening to Dis- senters of Oxford and Cambridge, have all operated on the body. It has almost entirely abandoned its peculiarities of dress and language; the cultivation of music and the other arts is no longer discouraged except by a very few; and literary and scientific tastes have been cultivated all the more because their attention was not preoccupied with the love of field sports or of dancing. In fact a number of men either Quakers or of Quaker origin and proclivi- ties, large in proportion to the small body with which they are connected, occupy positions of influence in English society, and carry with them, not the full body of Quaker doctrine, but some leaven of Quaker habits and thoughts and feelings.

Doctrine.—It is not easy to state with certainty the doctrines of a body which has never adopted any creed, and whose views have undoubtedly undergone from time to time changes more or less definite. But the accepted writings of its members and the statements as to doctrine contained in the Book of Christian Discipline of the society furnish materials.

The most characteristic doctrine of Quakerism is un- doubtedly this—that there is an immediate revelation of the Spirit of God to each individual soul, that this light is universal and comes both to the heathen and the Chris- tian, and thereby the love and grace of God towards man- kind are universal. It is almost needless to call attention to the direct antithesis between this doctrine of the Quakers and the various doctrines of election held by the Puritans, so that, if Quakerism be called the climax of Puritanism, it is so only as the rebound is the climax of the wave. From the doctrine of the sufficiency of the inward light proceed several other of the peculiar views of Quakers. They have denied the necessity and abstained from the practice of the sacraments of baptism and the Lord's supper. The one baptism, says Barclay (12th pro- position), "is a pure and spiritual thing, to wit, the baptism of the spirit and fire….. of which the baptism of John was a figure which was commanded for a time, and not to continue for ever." "The communion of the body and blood of Christ," says the same author (13th proposi- tion), "is inward and spiritual, which is the participation of his flesh and blood by which the inward man is daily

nourished in the hearts of those in whom Christ dwells, of which things the breaking of bread by Christ with his disciples was a figure."

But not merely do the Quakers dispense with the sacra-

ments ; they exist without any priesthood or regular or.

ordained ministry; they allow the liberty of unlicensed preaching and prayer to every member of their society in their assemblies, and those in whom the body recognizes the true gifts are publicly acknowledged as ministers. But by this act they attain to no greater power in the society than they possessed before. By the strength and power of the light of God, says Barclay in his 10th pro- position, "every true minister of the gospel is ordained, prepared, and supplied in the work of the ministry ; and by the leading, moving, and drawing thereof ought every evangelist and Christian pastor to be led and ordered in his labour and work of the gospel both as to the place where, the persons to whom, and as to the times when he is to minister."

The Quakers not only have no stated ministry, but they hold that no form of worship is so good as a patient waiting upon God in silence "by such as find no outward ceremony, no observations, no words, yea not the best and purest words, even the words of Scripture, able to satisfy their weary and afflicted souls." Hence, although per- mitting addresses from their members, they sit frequently

silent both in family worship and in their meetings. Of late years, however, in some places passages from the Bible are read in their meetings for worship. Furthermore the Quakers maintain the equal right of women with men to preach and pray in their assemblies; and they cite the four daughters of Philip who prophesied, and other women who are mentioned in the New Testament as having laboured much in the Lord, as showing that their practice is in accord with that of the early church.

Refusing to acknowledge the ministry of the Estab- lished Church, and holding that they could thus best testify to " the spiritual reign and

government of Christ," the Quakers refused to pay all church rates, tithes, and other ecclesiastical demands. maintained the same objection against tithe-rent charge, and then abandoned it.

The Quakers deny the lawfulness for a Christian of all war, defensive or otherwise, and have always refused, often at the expense of much suffering, to take any part in military matters; they equally deny the lawfulness for a Christian man to take any oath, even in a court of justice, and the law of England has long recognized their affirmations as giving validity to their evidence; they have denied themselves the cultivation of music, attend- ance at the theatres, and hunting, shooting, and field sports generally as vain amusements inconsistent with the gravity and seriousness of Christian life; they have insisted on the duty of using language not only free from that profanity which was so common until lately but stripped of all flattery and purged of all dross of heathen- ism ; they enforced the duty of plainness of dress and of excluding from it, and from the modes of salutation and address, everything calculated to satisfy vanity.

The result of these doctrines on Quaker manners was notorious, and proved a continual source of objection to them on the part of their fellow-men, and frequently led to persecutions. They adopted the singular number in addressing a single individual, however exalted ; and the "thou" and "thee" used to a magistrate or a judge was often a cause of great irritation. They refused to say "good night," "good morrow," or 'good speed"; they adopted a numerical nomenclature for the months of the year and the days of the week. They refused to bow or to remove their hats, and for this they suffered much.1 They forbore the drinking of healths, not merely as a vanity, but as "a provocation to drink more than did people good." They adopted a remarkable simplicity in their marriages and their funerals. They used also great plain- ness in their houses and furniture and in their dress; and, by their tenaciously adhering to forms of attire which had fallen into disuse, their dress both for men and women became antique and peculiar, and Quakers were easily re- cognized as such by the garments they wore. Further- more they discarded the usual symbols of grief on the death of their relations.

One point of morality on which the Friends have long insisted deserves notice. They require their members who may have been released from their debts by bank- ruptcy or composition, when able to pay their debts in full, to do so notwithstanding their legal discharge.

In the great doctrines of Christianity embodied in the apostles' creed the Quakers are in accord with their fellow- Christians: they believe in the Father, Son, and Holy Spirit, in the atonement by Christ, and in sanctification by the Spirit ; they receive and believe the Scriptures as proceeding from the Spirit of God. A letter addressed by George Fox and others to the governor of Barbados in 1671 (Journal, Ist ed., p. 358), and the " General Advices"

1 See Thomas Ellwood's Journal for an account of his sufferings in this matter, at once pathetic and ludicrous.

To the year 1875 they

in the Book of Discipline, may usefully be consulted on this point.

Organization and Discipline—The duty of watching over one another for good was insisted on by the early Friends, and has been embodied in a system of discipline. Its objects embrace (a) exhortation and admonition to those who walk contrary to the standard of Quaker ethics, and the exclusion of obstinate or gross offenders from the body, and as incident to this the hearing of appeals from individuals or meetings considering them- selves aggrieved ; (6) the care and maintenance of the poorand provision for the Christian education of their

children, for which purpose the society has established

numerous boarding schools in different parts of the country ; (c) the amicable settlement of "all differences about outward things," either by the parties in contro- versy or by the submission of the dispute to arbitration, and the restraint of all proceedings at law between members except by leave ; (d) the recognition of ministers as such ; (¢) the cognizance of all steps

preceding marriage according to Quaker forms; (/) the registration of births, deaths, and marriages; (g) the issuing of certificates or letters of approval granted to ministers travelling away from their homes, or to members removing from one meeting to another; and (h) the management of the pro- perty belonging to the society. The present organization of the Quaker church is essentially democratic—it has not and never had any president or head; and in theory every person born of Quaker parents is a Quaker and entitled to take part in all the general assemblies of the body. The members are grouped together in a series of subordinated meetings which recall to the mind the Pres- byterian model. The unit is known as a "particular meeting"; next in order comes "the monthly meeting," usually embracing several particular meetings called to- gether, as its name indicates, monthly; then "the quarterly meeting," embracing several monthly meetings; and lastly "the yearly meeting," embracing the whole of Great Britain. Representatives are sent from each inferior to each superior meeting ; but all Quakers may attend and take part in any of these meetings. This system is double, each meeting of "men Friends" having its counterpart in a meeting of "women Friends"; and they usually meet at the same time, and join together in the devotional gatherings which take place before or after the meetings for discipline. The mode of conducting these meetings is noteworthy. There is no president, but only a secretary or clerk ; there are no formal resolutions; and there is no voting. The clerk ascertains what he con- siders to be the judgment of the assembly, and records it I a minute,

The offices known to the Quaker body are—(1) that of minister ; (2) of elder, whose duty it is "to encourage and help young ministers, and advise others as they in the wisdom of God see occasion"; and (3) overseers to whom is especially entrusted that duty of Christian care for and interest in one another which Quakers recognize as obligatory in all the members of a church. These officers hold from time to time meetings separate from the general assemblies of the members.

This present form both of organization and discipline has been reached only by a process of development. The quarterly or general meetings seem to have been the first union of separate congregations. In 1666 Fox established monthly meetings. In 1672 was held the first yearly meeting in

London. In 1675 certain "canons and institu- tions" were issued to the quarterly meetings. In 1727 elders were first appointed. In 1752 overseers were added ; and in 1737 the right of children of Quakers to be considered as Quakers was fully recognized, From

these dates it is obvious that the last century saw a vigor- ous development of the disciplinary element in Quaker- ism; it was probably the time of greatest rigour as regards external matters and of the greatest severity in punishing so-called delinquencies. In Aberdeen the meet- ing entered on their minutes an elaborate description of what was and what was not to be endured in the dress of men and women; and York quarterly meeting was so disturbed at the presence of young women in long cloaks and bonnets that they were ordered to take advice before coming to York, and one monthly meeting directed that those young women who intended to go to York were to appear before their own meeting "in their clothes that they intend to have on at York."

Of late years the stringency of the Quaker discipline has been relaxed: the peculiarities of dress and language have been abandoned; marriage with an outsider has ceased to be a certain ground for exclusion from the body ; and, above all, many of its members have come to "the conviction, which is not new, but old, that the virtues which can be rewarded and the vices which can be punished by external discipline are not as a rule the virtues and the vices that make or mar the soul" (Hatch, Bampton Lectures, 81).

The Quakers maintain that their system of church government and of discipline is in close. accordance with that of the early church. That it has some great differ- ences cannot be denied, especially when we think of baptism and the Lord's supper; that it has some import- ant points of likeness, especially in the care of each member for the others and in the maintenance of the poor, is equally certain. The portraiture of the early Christian church recently drawn by Dr Hatch in his Bampton Lectures is in many respects likely to recall the lineaments of Quakerism.

Philanthropic Interests—A genuine vein of philan- thropy has always existed in the Quaker body. In nothing has this been more conspicuous than in the matter of slavery. George Fox and William Penn laboured to secure the religious teaching of slaves. As early as 1676 the assembly of Barbados

passed "An Act to prevent the people called Quakers from bringing negroes to their meetings." John Woolman! laboured amongst the Quakers of America for the liberation of the slaves with the most winning tenderness. The Quakers were the first Christian body that purged themselves of the stain of dealing in slaves. As early as 1780 not a slave was owned by any Friend in England or America with the knowledge and consent of the society. In 1783 the first petition to the House of Commons for the abolition of the slave trade and slavery went up from the Quakers; and throughout the long agitations which ensued before that prayer was granted the society took an active and pro- minent part.

In 1798 Lancaster opened his first school for the educa- tion of the poor; and the cause of unsectarian religious education found in the Quakers steady support. They have taken also an active part in Sir Samuel Romilly's efforts to ameliorate the penal code; in prison reformation (1813), with which the name of Elizabeth Fry is especially connected ; in the efforts to ameliorate the condition of lunatics in England (the Friends' Retreat at York, founded in 1792, having been remarkable as an early example of kindly treatment of the insane); and in many other phil- anthropic movements.

One thing is noteworthy in Quaker efforts for the edu- cation of the poor and philanthropy in general: whilst

1 Woolman's Journal and Works are remarkable. He had a vision

of a political economy to be based not on selfishness but on love, not on desire but on self-denial,

they have always been Christian in character, they have not to any considerable extent been used as a means of bringing proselytes within the body.

Quakerism in Scotland.—Quakerism was preached in Scotland very soon after its rise in England; but in the north and south of Scotland there existed independently of and before this preaching groups of persons who were

dissatisfied with the national form of worship and met together in silence for devotion. They naturally fell into this society. In Aberdeen the Quakers took considerable hold, and were there joined by some persons of influence and position, especially Alexander Jaffray, some time pro- vost of Aberdeen, and Colonel David Barclay of Ury and his son Robert, the author of the Apology. Much light has been thrown on the history of the Quakers in Aber- deenshire by the discovery in 1826 at Ury of a MS. Diary of Jaffray, since published with elucidations (2nd ed., London, 1836).

Ireland.—The father of Quakerism in Ireland was William Edmondson ; his preachings began in 1653-54. The History of the Quakers in Ireland (from 1653 to 1752), by Wright and Rutty, may be consulted.

America.—tThe earliest appearance of Quakers in America isa remarkable one. In July 1656 two women Quakers, Mary Fisher and Ann Austin, arrived at Boston. Under the general law against heresy their books were burnt by the hangman, they were searched for signs of witchcraft, they were imprisoned for five weeks and then sent away. During the same year eight others were sent back to England.

In 1657 and 1658 laws were passed to prevent the introduction of Quakers into Massachusetts, and it was enacted that on the first conviction one ear should be cut off, on the second the remaining ear, and that on the third conviction the tongue should be bored with a hot iron. Fines were laid upon all who entertained Quakers or were present at their meetings. Thereupon the Quakers, who were perhaps not without the obstinacy of which Marcus Antoninus complained in the early Christians, rushed to Massachusetts as if invited, and the result was that the general court of the colony banished them on pain of death, and four Quakers, three men and one woman, were hanged for refusing to depart from the jurisdiction or obstinately returning within it. That the Quakers were irritating cannot be denied : some of them appear to have publicly mocked the institutions and the rulers of the colony and to have interrupted public worship ; and some of their men and women too acted with fanaticism and disorder. But even such conduct furnishes but a poor apology for inflicting stripes and death on men and women. The particulars of the proceedings of Governor Endicott and the magistrates of New England as given in Besse are startling to read. On the Restoration of

Charles II. a memorial was presented to him by the Quakers in England stating the persecutions which their fellow-members had undergone in New England. Even the careless Charles was moved to issue an order to the colony which effectually stopped the hanging of Quakers for their religion, though it by no means put an end to the persecution of the body in New England.

It is not wonderful that the Quakers, persecuted and oppressed at home and in New England, should turn their eyes to the unoccupied parts of America, and nourish the hope of founding amidst their woods some refuge from oppression and some likeness of a city of God upon- earth. In 1671-73 George Fox had visited the American planta- tions from Carolina to Rhode Island and had preached alike to Indians and to settlers; and in 1674 a moiety of New Jersey was sold by Lord Berkeley to John Fenwick in trust for Edward Byllinge. Both these men were

for the State and sailed for America.

QUAKERS

Quakers, and in 1678 Fenwick with a large company of his co-religionists crossed the Atlantic, sailed up the Dela- ware, and landed at a fertile spot which he called Salem. Byllinge, having become embarrassed in his circumstances, placed his interest in the State in the hands of Penn and others as trustees for his creditors, and they invited buyers, and companies of Quakers in Yorkshire and London were amongst the largest purchasers. In 1677-78 five vessels with eight hundred emigrants, chiefly Quakers, arrived in the colony (now separated from the rest of New Jersey under the name of West New Jersey), and the town of Burlington was established. In 1677 the fundamental laws of West New Jersey were published, and recognized in a most absolute form the principles of democratic equality and perfect freedom of conscience. Notwith- standing certain troubles from claims of the governor of New York and of the duke of York, the colony prospered, and in 1681 the first legislative assembly of the colony, consisting mainly of Quakers, was held. They agreed to raise an annual sum of £200 for the expenses of their commonwealth ; they assigned their governor a salary of £20; they prohibited the sale of ardent spirits to the Indians, and forbade imprisonment for debt. |

But beyond question the most interesting event in con- nexion with Quakerism in America is the foundation by William PEnw (q.v.) of the colony of Pennsylvania, where he hoped to carry into effect the principles of his sect—to found and govern a colony without armies or military power, to reduce the Indians by justice and kindness to civilization and Christianity, to administer justice without oaths, and to extend an equal toleration to all persons professing theism. Such was "the holy experiment," as Penn called it, which he tried, and which seemed as if it was destined to put Quakerism to practical proof. In 1681 he obtained a grant of the colony from Charles IL, and in the following year settled the frame of government Here he entered into his celebrated treaty of unity with the Indians, "le seul traité entre ces peuples et les Chrétiens qui n'est point été juré et qui n'est point été rompu." What was the result of this attempt to realize Quaker principles in a new country and on a virgin soil? The answer is in some respects indecisive. During the time that the Quaker influence was prédominant, and for seventy years after the founda- tion of Pennsylvania, the Indians are said never to have taken the life of a white man ; and once when five hundred Indians were assembled to concert a massacre they were turned from their purpose by six unarmed Friends. From England and Wales, from Scotland and Ireland, from the Low Countries and the banks of the Rhine, where Penn's missionary visit had made a deep impression, emigrants crowded to Pennsylvania; in two years Philadelphia had risen to be a town of six hundred houses, and in three years from its foundation that city had increased more than New York in fifty years; and the first century of the life of the colony exhibited in an unusual degree a scene of happiness and peace. But, on the other hand, little progress was made in winning the Indians to Christianity, and the annals of the infant State were full of petty quarrels and jealousies. Penn was a feudal sovereign, having over him a Stuart king as his lord paramount at home, and the absolute democracy which he had estab- lished as his immediate dependents beneath him. In such relations there were necessarily elements of difficulty, and soon dissensions broke out between the governor and the colonists ; a popular party was headed by members of the Quaker body and opposed the founder, and the influx of members of other religious persuasions led to dissensions in the assembly. The officials of the Court of Admiralty set up claims at variance with Penn's notions; differences

broke out between the province properly so-called and the territories which afterwards became the State of Delaware. Penn was engaged in protracted quarrels as to the bound- aries of his State; the English crown made requisitions on the colonists for men and money to support the war in America against France. Penn was during some years suspended by the crown from his rights as governor ; his son and one of the deputy governors whom he sent out disgraced themselves by their licentious conduct; the colony gradually passed away from under the influence of Quakerism; and Penn's "Civitas Dei" faded into an American republic. For many years large numbers of Quakers emigrated from England to America. The most noteworthy incidents in their history are the part which they have taken in that movement which has ended in the abolition of slavery in the United States and the interest which they have exhibited in the native Indians.

France.—The origin of the few Quaker congregations which exist in France is curious. It seems that amongst the Camisards were found a few who disapproved of the military operations by which their friends resisted the persecution of Louis XIV., who believed in a spiritual light, who met for silent worship, and in other respects were like Quakers. Certain it is that towards the end of last century a small body of persons holding these views and these practices existed at Congeniés and other villages at the foot of the Cevennes. During the war between England and France conse- quent ou the American struggle for independence a Quaker was part owner in two luggers, which, against his protests, were employed as privateers and captured two valuable prizes ; he took his share of the spoil, invested and accumulated it, and on the conclusion of peace in 1783 advertised in the Gazette de France for the owners of the captured ships. the little body at Congeniés, and hence a communication was estab- lished between the French and English Quakers, Probably about the same time certain American Quakcrs, on the invitation of the French Government, migrated from Nantucket to Dunkirk, for the purpose of extending the fisheries. A curious episode in Quaker history is the presentation, on 10th February 1791, to the National Assembly of a petition from these two bodies of French Quakers, and the reply of the president. The petition and answer were printed by Baudoin, printer to the Assembly.

Germany and Norway.—In both these countrics exist small bodies of persons who have adopted the views and practices of the Quakers. These bodies date from early in the present century.

Statistics of Quakerism.—The number of Quakers in England and Wales in 1680 was probably about 40,000, and in 1806 about 32,000. In 1883 the total number of members in England, Wales, and Scotland was returned as 15,219 (193 were in Scotland), an increase of 106 on the previous year, and the number of habitual attcnders of meetings of the body, not members, was 5880, an in- erease of 150. In Ireland there were, in 1883, 2812 Quakers. The Quakers in America number probably (including all bodies which claim to be Friends) from 50,000 to 60,000 or upwards. Besides these there are in Norway about 200, in France from 70 to 80, in Germany from 50 to 60, and in Australia and New Zealand from 500 to 600 Quakers.

Bibliography.—The writings of the early Quakers are numerous; the most noteworthy are the Journal of George Fox and the Life of Thomas Ellwood, both autobiographies, the Apology of Robert Barclay, and the works of Penn and Penington. The History of the Quakers by William Sewel, a Duteh Quaker, was translated into English, and has gone through several editions; a fistory of the Quakers by Gough may also be consulted. The Sufferings of the Quakers, by Besse (London, 1753), is the ehief authority as to the perseeutions they endured. The Peculiarities of the Society of Friends, and the other writings of Joseph John Gurney, exhibit the modern Evangelical Quakerism. Zhe Book of Discipline of the Society, in its successive editions from 1782 to 1883, is the only authoritative statement of the views of the Society on Christian practice and church govern- ment, and a comparison of the different editions would throw light on the ehanges of sentiment in the body. The Inner Life of the Religious Socteties of the Commonwealth (London, 1876), by Robert Barelay, a descendant of the apologist, contains much curious information about the Quakers. Smith's Descriptive Catalogue of Friends' Books (London, 1867) gives the information which its title Promises. Bancroft's History of the Colonization of the United States may be consulted for the American history of Quakers. The periodicals now issued by

members of the Quaker body in Great Britain are The Friend, The British Friend, Friends' Quarterly Examiner, and Friends' Review. (E. F.)

QUANTAMPOH, or Kunrampon, a town of the Gold Coast region of western Africa, situated about 80 miles north-east of Coomassie, in 7° 36' N. lat. and 1° 4' W. long. According to Captain Brandon Kirby, who was the first white man to reach the place, it had in 1881 a resident population of 15,000, and traders passed through it to the number of about 25,000. Formerly it was one of the great ivory-marts of this part of Africa, and it is still a centre of the cola-nut trade, the slave trade, &c.

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QUARANTINE (Fr. quarantaie, a period of forty days) is, in the original sense of the term, a thing of the past in the United Kingdom and in several of the other states of Europe, as well as in America. Its interest is therefore largely historical, and a sketch of the history will be given at the end of this article. But, in common usage, the same word is applied to the modern substitutes for quarantine, although these are a complete departure in principle or theory from the indiscriminate system of detention of ships and men, unlading of cargo in lazarets, fumigation of susceptible articles, and the like, which used to be carried to great lengths on account of the plague and in connexion with the Levantine trade.

Substitute for Quarantine in the United Kingdom.—The modern practice is to detain or refuse " pratique" to no ship unless there be a communicable form of sickness on board, or there had been such during the voyage. It is the duty of the officers of customs to question the captain as to the existence of any catching disease among the pas- sengers or ship's company; if there be any evidence or suspicion of communicable infection, the officers of cus- toms report the same to the port sanitary authorities, who have power to deal with the case under the Public Health Act, and according to an order of the Local Government Board first issued in 1873. The medical officer of health proceeds at once to make an inspection, detaining the ship and all on board only until such time as the inspection can be satisfactorily made, the sick removed to hospital, and disinfectants applied. This practice was

adopted with success in the casé of several arrivals from Baltic and North Sea ports with cholera on board in 1873, no exten- sion of the disease on shore ensuing, and again in 1884 in the case of a troopship arrived at Portsmouth direct from Bombay, and of at least two arrivals (at Liverpool and Cardiff) from Marseilles, with cholera on board. It is also adopted from time to time on account of small-pox cases, and of other catching importations at the discretion of the port sanitary authority.

The last importation of yellow fever into the United Kingdom was at Swansea in September 1865, by a wooden vessel with copper ore from St Jago de Cuba. There had been cases of yellow fever on board during the voyage ; but at Swansea (as in many other instances) the infection spread rather from the ship's hull and the unladed cargo than from the crew or their effects, and some fifteen deaths ensued. If such a case were to occur again, it would be dealt with, like any other communicable disease, by the port sanitary authority under the Public Health Act. The yellow-fever incident of 1865 at Swansea is the last oc- casion on which the sanction of the Quarantine Acts has been appealed to. The privy council merely directed the board of customs to warn the parties implicated of their liability to prosecution, although no prosecution would be instituted. The Quarantine Acts are still unrepealed, but they may be said to have become practically obsolete during the past twenty years.

Quarantine or tts Substitutes in other European Countries. —The principle of inspection, and of isolation of the sick, as stated above for the United Kingdom, was accepted with small reservation by the sanitary conference of Vienna in 1874, and it is now more or less consistently acted upon by all the larger European maritime states except Spain and Portugal. In times of cholera panic, quarantine of the original kind has been imposed against all arrivals from an "infected country" by ports of the Levant and Black Sea, and by several Mediterranean states besides Spain. But it is only in the ports of the Iberian Peninsula that the old quarantine traditions remain in force from year to year; and it is only for them that any special account need be given.

The principal occupation of the quarantine establish-

ment at Lisbon all the year round is with arrivals from Brazil, where yellow fever is endemic. The lazaretto of Lisbon, which is probably the largest and in ordinary times the busiest in the world, is situated on a hill opposite the Belem Tower, 4 miles below the city. The present establishment was erected by the Portuguese Government at a cost of over £200,000. It consists of seven perfectly distinct pavilions standing radially in a semicircle with the convexity to the river. It is managed by an inspector who is under the minister of the interior. Public tenders are invited every year, or every two years, for boarding and lodging the passengers according to their classes on board ship (Ist, 2d, and 3d), the contract being given to the lowest bidder. The present prices for board and lodging per diem are about 5s, 6d. Ist class, 3s. 2nd class, and Is. 6d. steerage. The establishment is carried on at a loss to the Government. Quarantine is imposed, as a matter of fact, on all ships, passengers, luggage, and cargo coming from the Brazils. The term varies from five days to seven days, according as the Brazilian port is considered infected or suspected. A bill of health is issued to the captain by the Portugese consul at the port of sailing, which usually bears on it that so many deaths from yellow fever had occurred during the previous eight or ten days. If clean bills of health were issued, the quarantine would be raised; and this has happened for short periods at rare intervals, During the winter months (December, January, February), when the cold makes a development of the yellow fever virus at Lisbon improbable, if not impossible, the baggage and cargo only are subject to quarantine, the passengers being allowed to go ashore at once with their hand baggage. Throughout the rest of the year all passengers from the Brazils have to go to the lazaretto and stay there the alloted time, their effects being aired, fumigated, or disinfected. "If Lisbon be the port of discharge, the cargo from an infected ship will be landed at the lazaret for purification if so directed. There is a schedule of "susceptible articles," which includes cotton, hair, hemp, letters, parcels, and other correspond- ence, hides, fresh meat, wool and linen, skin, feathers, and silk. These articles are fumigated with chlorine; the in- side of the ship is washed with chloride of lime or other disinfectant. In the case of a mail steamer on her way to England, the passengers and effects for Lisbon are landed at the quarantine grounds, and

the vessel proceeds to her destination (Liverpool or Southampton) "in quaran- tine," which means nothing as regards the English ports.

This rigorous routine is a concession to the popular recollection of the terrible epidemic of yellow fever in the hot summer of 1857, when there were 19,000 cases in and around Lisbon, with about 6000 deaths, a large proportion being among the well-to-do. The importation was traced to a tainted ship and cargo from Rio. For many years, no cases of yellow fever have developed among the suspected passengers landed ; and in only two or three instances have there been cases among the employés of the establishment who are occupied with the baggage and merchandise, The Lisbon chamber of commerce is now in favour of a modification of the quarantine law, and of regulations in conformity with the prominent facts of experience—namely, that the fever is not started on shore through personal contact, but solely by emanations from a ship's hull, ballast, cargo, or passengers' effects, and that high-class iron steamships are not, in the nature of things, under the same suspicion as old wooden sailing vessels.

The quarantine practices of Lisbon are copied faithfully at the Azores, Madeira, and the Cape Verd Islands.

For Spain there are two chief quarantine stations or "foul lazarets," one for the Atlantic seaboard at Vigo, and another for the Mediterranean coast at Port Mahon,

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Minorca. Vessels arriving at Spanish ports with foul bills of health (from Havana, é&c., in ordinary times, and from various ports in cholera times) must proceed to one or other of these appointed stations to perform their quaran- tine. A 'quarantine of observation," which is usually for six or three days, and is imposed on vessels with clean bills, may be performed at any port. Itis a routine maxim of the Madrid board of health that any country, such as the United Kingdom, which does not practise quarantine, is ipso facto suspected when a foreign epidemic is in any part of Europe to which its vessels trade; and all arrivals from its ports may be subjected to a quaran- tine of observation. This abstract doctrine, which can hardly be

approved by responsible medical authority, was acted on for a short time as recently as 1883 and 1884, when cholera was in Egypt and in Provence.

Next to Spain and Portugal, Turkey and Greece are the countries in Europe where the old quarantine traditions have most vitality, owing doubtless to their nearness to former seats of plague in the Levant. The lazarets at the Pireeus and in the Dardanelles are considerable establishments, mostly used now in times of cholera, Ships bound inwards for Turkish ports take health- guards on board in the Dardanelles. There are many other lazarets at Mediterranean, Adriatic, and Levantine ports, including Malta and Gibraltar, surviving from the days of the plague, whose machinery is furbished up from time to time when cholera breaks out.! For the whole of northern Europe, including the Atlantic seaboard of France, quarantine is now practically obsolete; by Holland it was never seriously practised even for the plague, aud by the states bordering on the Baltic it was given up about the same time as it fell into disuse in Great Britain.? In Norwegian ports subsequent to 1866 there were 3128 arrivals from countries infected with cholera, on board which 25 cases of cholera were found and 29 cases of cholerine ; but the malady obtained no footing on shore although quarantine was not enforced. In 1873, when cholera was prevalent in several ports of the Baltic and North Seas, there were 550 arrivals at Norwegian ports from infected countries, among which were 12 cases of cholera; but importation of the epidemic to the shore was prevented simply by inspection and isolation of the sick. In Italian ports, again, 800 vessels were quaran- tined in 1872, in not one of which was any case of cholera found. The immunity of the United Kingdom in 1873 and 1884, notwithstanding the arrival of ships with cholera on board, and even (in 1873) the unobserved land- ing of cholera cases, has been mentioned already.

Land Quarantine.—A land quarantine on a frontier is still enforced on account of cholera from time to time in southern Europe, ¢g., in 1884 by Italy against France at Ventimiglia and Modena and by Spain against France in the passes of the Pyrenees, and in 1885 by Portugal against Spain. The experiment occasionally succeeds. A "sanitary cordon" is the rigorous isolation (by troops) of a pestilence- stricken place from the

country around. It is a survival from the times of the plague, and is of no use in cholera.

Quarantine or its Substitutes in the Western Hemisphere. —Apart from the visitations of cholera now and then, the

1 Sir William Pym, the superintendent-general of quarantine, who visited most of them officially in 1844, narrates a case at Messina which itustrates the abuses that these establishments might be put to: "it is only very lately that the board of health at Messina placed a vessel (the 'Rapid') from England under quarantine, because a report had appeared in the papers of a fever having prevailed at Glasgow, and subjected her to a charge of about 8 per cent. upon the value of her cargo for quarantine fees" (Correspondence respecting the Quarantine Laws, Part. Paper, 1846, p. 16).

2 The lazaret for all the Baltic states was on the Swedish island of Kanso at the entrance of the Cattegat opposite Gothenburg.

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chief occasion of quarantine on the American continent and adjacent islands is the endemic existence of yellow fever in Brazilian and West Indian harbours, particularly Havana and Rio de Janeiro (and, since 1853, in Callao and other Peruvian ports). During the yellow-fever season from April to November, the ports of the United States are on the outlook, under the quarantine laws of each State, to de- tain vessels with yellow fever on board arriving from Gulf ports or from the West Indies and Brazil. In like manner the ports of the River Plate would protect themselves against foul arrivals from Brazil ; and some of the Mexican Gulf and West Indian harbours will even practise quaran- tine against each other according as the fever happens to be epidemic here or there. The practice at New York, Boston, Philadelphia, Baltimore, and other United States ports is to detain only the sick, or those who are reasonably suspected, the lazaret (usually on an island in the harbour) being practically a hospital for sailors, immigrants, and other newly-arrived persons suffering from communicable disease. In some years the cases of yellow fever arriving at New York have been numerous, and an epidemic has now and again arisen among the

residents near the lazaret. Experience has shown that the ship's hull, foul ballast, and the like have been the real sources of infection, cases occurring at New York every year among the labourers on infected ships. It is only occasionally that the unlading of the cargo of a yellow-fever ship into the quarantine barges has been insisted on. The classification of ships according as they carry clean or foul bills of health has been found to be practically unworkable in the United States, a foul bill being a rare thing. The severity of the quarantine is left, accordingly, very much to the discretion of the medical officer of the port. According to the de- finition of the National Board of Health, quarantine is "the administration employed to determine the presence or absence of the causes of contagious or infectious diseases, and to secure the removal or destruction of such causes ;" and it does not imply detention for any specified time, nor for more time than is necessary for the above purposes. Notwithstanding the creation of a National Board of Health for the Federal Union, quarantine is still an affair of the States acting independently. The detection and isolation of small-pox cases is one of the chief occupations of the quarantine officers at United States ports.

As regards the introduction of cholera into the United States, Billings says :—' The present quarantine systems of the United States are now probably unable to prevent the introduction of this disease, as they have been heretofore, Unless the disease had actually occurred on board ship, very little precaution would be taken, and very few of our ports have the necessary facilities for properly dealing with a large passenger ship having cholera on board, in such a Manner as to obtain a reasonable amount of security without causing unreasonable delay, involving unnecessary suffering and danger on the part of those not actually sick " (Zrans. Internat. Med. Congress, London, 1881, iv. 416).

In several instances, when cholera has broken out among emigrants in a transatlantic steamship, the vessel has put into Halifax, N. 8., where there are facilities for quarantining passengers ; and more than once the epidemic, although of the most threatening kind, has gone no farther. New Orleans has proved itself a more likely port of entry for cholera than any of the Atlantic ports,

In the ports of South America and the West Indies the quarantine practice is variable and empirical. Sometimes an absolute cordon has been established, as in the instance of Dominica against Guadeloupe in 1865-66 during the cholera. The smaller and healthier the community the more severe is the quarantine likely to be. In the West Indies, the Bermudas, é&c., the very remarkable disease of

dengue (probably a modern hybrid form) is considered to be an importable infection which quarantine can keep out.

Quarantine in the Red Sea and at Suez.—Cholera having come to Europe in 1865 by a new route, by the pilgrim traffic to Mecca, the conference of Constantinople in 1866 took into consideration the question of a quarantine at the Straits of Bab-el-Mandeb. Since that time such a quaran- tine has been instituted for pilgrim ships at the island of Xamaran on the Arabian side of the Red Sea, some 200 miles within the straits. Since the severe outbreak of cholera at Mecca in the end of 1881, the quarantine for pilgrim ships at Xamaran has become more stringent. The slight outbreak at Mecca in 1882 is said, without good reason, to have arisen owing to three English steam- ships with pilgrims having evaded that quarantine. All pilgrim ships whatsoever are required to stop at Xamaran,! and the pilgrims from cholera-stricken countries in the East are disembarked and kept under observation in the lazarets on the island for ten or fifteen days.?

On the dispersal of the hajj at Mecca, another quaran- tine is performed by the pilgrims returning by way of Suez, who are usually only a small fraction of the whole assemblage. They are disembarked either at Wejh on the Arabian coast half way between Jeddah and Suez, or at Tor on the Sinaitic side of the Gulf of Suez, sometimes even at both places. After the epidemic at Mecca from September to December 1881, it was not until the 19th February 1882 that the last company of pilgrims was allowed to re-embark at Wejh for Suez, by the authority of an inspecting sanitary commission from Egypt. If no suspicious cases occur, the detention is for fourteen days; but a single case subjects the whole group in which it had appeared to a further term of quarantine. Pilgrims bound for Smyrna, Beyrout, or other ports in the Levant are subjected to another term of quarantine in the

lazaret of the port of arrival. Those proceeding landwards to Damascus undergo a quarantine at Moses' Wells.

The usefulness of this control over the movements of the Mecca pilgrims has been much debated. Regarding the ad- vantages of the quarantine after the breaking up of the hajj there has been a good deal of positive evidence since 1865 ; but the detention at Xamaran is a much more questionable affair. Ina great assemblage at Mecca, such as that of 1881, there are all the conditions for the fresh breeding of a choleraic form of sickness, which shall be communicable to others, just as there have often been (in the common-

1 The working of the quarantine at Xamaran will be best understood from a particular instance. The steamship "Hesperia" sailed in July 1882 from Bombay for Jeddah with 498 pilgrims, who had been inspected under the Native Passengers Act. She arrived on the 26th July at Aden, where she was quarantined for ten days owing to the death of one of the firemen from cholera, Xamaran was reached on the 8th of August, and the pilgrims landed for a ten days' quarantine. Deaths having occurred among the pilgrims on shore, a second quaran- tine of ten days was imposed ; and towards the expiry of that time the health officer again placed the ship in quarantine for ten days owing to more deaths on shore. On September 8, when the vessel was still in quarantine, it became necessary to proceed to Aden for coals, steam having been kept up continually owing to the dangerous nature of the quarantine moorings. In leaving Xamaran the ship broke her quaran- tine, and only escaped the threatened fire of the Turkish gunboat by her speed. She returned from Aden on the 19th September, and re- embarked her passengers for Jeddah on the 23d, two of them dying in the boats during the embarkation. The drinking-water of the quaran- tine camp at Xamaran was credibly stated to be in a fetid condition, causing vomiting and purging, and the food insufficient and inferior. Each pilgrim had to pay 10 rupees, and the ship 12,000 piastres of sani- tary dues. After landing her passengers at Jeddah, the " Hesperia" proceeded on her voyage to Liverpool, undergoing a twenty-four hours' quarantine of observation at Suez.— Brit. Med. Journ. , 1882, ii. 952.

2 The international sanitary conference of Rome (1885) has pro- posed a relaxation of the rule: each ship with more than thirty pilgrims to carry a doctor, and no ship to be detained more than 24 hours, nor the pilgrims disembarked, unless there be or has been cholera on board.

Plague.

Small- pox.

Typhus.

sense view) the elements of its de novo origin under pre- cisely similar circumstances among a multitude of Hindus at Hurdwar, or other religious places of resort in India; and the excessive pains taken to exclude hypothetical cases of the communicable disease coming from India, Java, or other endemic centre are disproportionate so long as there is no assurance that the soil of Mecca is not itself about to become a breeding-place of the poison de novo. On the other hand the dispersal from Mecea is obviously an occa- sion for sanitary precautions.

For the general traffic from the East a quarantine of observation of twenty-four hours is imposed on arrivals at Suez from time to time when cholera is formally declared to be epidemic in Bombay or other Eastern port. Under such circumstances, ships pass through the canal in quarantine, having their canal pilots either on board the ship "in quarantine," or, under an older and more cum- brous arrangement, navigating the vessel from a steam- launch. In like manner, the coaling at Port Said is done in quarantine, and the mails and passengers landed at Brindisi under the same restrictions and formalities. The question of a more searching quarantine at Suez for the general Eastern traffic has been much discussed in the French Academy of Medicine, and has been taken up more recently at Berlin; but the weight of opinion (led by M. de Lesseps) is against any such inter- ference with the quick despatch of vessels, as at once futile and impracticable.t During all the years that the canal has been open, cholera has become epidemic in Europe only once owing to direct importation from the East, namely in 1884, when the vehicle was a transport returned from

Saigon ; and the circumstances in that case were such that a quarantine at Suez, unless it had included the ship's hull and the personal effects on board, would have made no real difference. On the other hand, transports with recognized cholera on board have on two or three pre- vious occasions been passed through the canal with all despatch, and no harm done on shore either in the isthmus of Suez or at the port of arrival (Portsmouth, Toulon).

PRINCIPLES OF QUARANTINE. —Plague, yellow fever, and Asiatic cholera are the three great spreading diseases which have been successively the subject of quarantine restrictions.

For many years plague has ceased to have any practical interest in this connexion ; the last occasion of alarm in the Mediterranean ports was the outbreak of 1859, at Benghazi, in Tripoli; and at the present date the sole concern is about the land quarantine along the Turko-Persian and Russo-Persian frontiers. It is for yellow fever and Asiatic cholera, therefore, that the principles of quarantine have chiefly to be discussed, the epidemiological prin- ciples being somewhat different in the two cases. But one or two remarks have to be made about the theory of preventing the intro- duction of other communicable diseases.

In the draft of an international bill of health which was adopted by the international sanitary congress at Washington in 1881 small-pox and typhus are scheduled along with plague, yellow fever, and cholera. Although there are few countries where smaJJ- pox has not obtained a footing, yet every seaport finds it advisable to prevent the free entrance of fresh cases. Thus Denmark, in 1884, took precautions against the importation of small-pox from the Thames. It is mostly in Australia, New Zealand, the Cape, and other colonies that quarantine against small-pox is rigorously carried out. Except fora limited outbreak in Sydney in 1884, that disease has been absolutely excluded from the Australasian colonies, thanks to their admirable quarantine establishments. The case is very different at the Cape, owing to the existence of a virulent native centre of variolous disease at no great distancc in the interior.

As regards typhus, the principles of prevention are entircly different from those that apply to small-pox. When the Irish emigration by sailing ships

was brisk forty years ago, typhus often came with the new arrivals to New York, Boston, Philadelphia, Quebec, and Montreal ; and a similar state of things now goes on in

1 A large majority of the medical delegates to the conference of Rome (1885) voted in favour of detaining at Suez for at least five days such vessels as might be judged by an officer of the International Sanitary Commission to be suspect,—the passengers to be disembarked and isolated in groups.

.and Basse Terre (Guadeloupe) were poisonous to the crews of the

connexion with the Italian and other European emigration to Brazil and the River Plate. Filth, overcrowding, and want are the causes of such outbreaks ; and it is only where those conditions obtain on shore that the imported disease spreads. A period of detention amidst clean and wholesome surroundings after landing has much to recommend it, the best argument for such general precaution being the fact that the disease in some instances had not occurred during the voyage, but only after the emigrants had Janded in the new country. Another illustration of the need of quite special rules for typhus, and of the need of freedom from dogmatic bias about pre-existing disease germs, is the remarkable outbreak at Liverpool in 1859. The epidemic was clearly traced to an Egyptian frigate with four hundred souls on board, many of them convicts in chains. The vessel arrived in the Mersey from Alexandria in an indescrib- able state of filth ; about one hundred of the crew and others were on the sick list from diarrhoea, dysentery, and the like; but none of the cases were typhus, nor was there a single case of that disease among the ship's company from first to last. The typhus occurred in the pilot and others who went on board in the river, among the attendants at a bath to which the filthy crew were sent to be washed, and among the patients of the Southern Hospital, into which some of the Arabs and Nubians were admitted for common complaints. To make quarantine effective against typhus, it is necessary to keep in mind that the specific fever may be vicarious to a common condition of filth and general misery. It is a modified form of the same principle of vicarious infection that, in the his- torical retrospect, gives us the key to the much

more important problem of yellow fever, a disease which is to be regarded as a special form of typhus.

Principles of Quarantine against Yellow WFever.—The first Yellow requirement in the quarantine doctrine of yellow fever is to know fever. where the disease is endemic, that is to say, where its poison exists 5 in such a form that it may rise in exhalations from the harbour mud, alluvial foreshores, or wharves and shipping quarters in

eneral, or may enter the bilges of ships with the water. There is a natural reluctance on the part of seafaring communities in the western hemisphere to admit that they harbour the seeds of yellow fever; but some of the endemic foci of the disease are beyond dispute. The principal are Havana and Rio de Janeiro. But if we take the whole historical period of yellow fever into our view, from 1640 onwards, we shall find that there is hardly a single great slave port in the New World that has uot been at one time or another a native seat and source of the miasmatic virus of yellow fever. Some of these have long since got rid of the poisonous exhalations, such as Philadelphia and Baltimore ; others, such as Norfolk, Charleston, and Savannah, have in all probability seen the worst days of the fever, and are now practically free froin the taint in their harbours and their soil ; but there are other United States ports, such as New Orleans, for which the like assurance cannot as yet be given. In the West Indies the ports of the Spanish An- tilles are the worst primary breeding-places of the poison at the present day ; although in the 17th and 18th centuries Bridgetown (Barbados), English Harbour (Antigua), Fort Royal (Martinique),

stationary men-of-war to an almost incredible extent. On the main- land, Georgetown, Demerara, isin the same rank ; and the Brazilian ports (particularly Rio) have been so since 1849. Besides these harbours, all of them among the principal slave-ports at one time or another, there are others, such as Vera Cruz, Tampico, Chagres, and Porto Bello, which would seem to have lurking in their soil or shore-mud the specifically noxious thing that produces yellow fever ; but it is a question whether these have not got the virus at second-hand from other centres in the Gulf. Again, it is probable that the occasional outbreaks at Monte Video had been caused by material quantities of the specifically noxious filth carried thither in trading

bottoms. The great epidemics in the ports of Spain in the first quarter of this century were certainly due either to reship- ment of the virus from the West Indies in the bilges of merchant- men, or to an original deposition of it from contraband slave-ships making the return voyage to Europe with cargoes of produce (see an article by the writer in the North American Review, Oct. 1884). The rare outbreaks in Europe within the last fifty years have been due to foul arrivals from slave-ports like Havana and Rio. Wherever the line be drawn between endemic and non-endemic ports of yellow fever, it is only the latter that can in reason seek to impose quarantine against the disease. Of such are now the ports on the Atlantic seaboard of the United States, the ports of the River Plate, and the whole European seaboard; for these the history is full of instances of true importations traceable to particular vessels, and from such instances the principles of an efficacious quarantine may be deduced. It is not a passenger steamship arriving at New York or Lisbon with a case or cases of VW yellow fever on board that calls for quarantine (as distinguished from isolation and care of the sick); no real epidemic can be shown to have ever arisen from purely personal importation of that kind. The great epidemics in Spain and Portugal, and the more recent and smaller outbreaks in New York and in some ports of northern

_ Cholera.

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Europe, have been traced to other sources than the persons of the sick. Even a ship with a fevcr-stricken crew is dangerous, not so much because of the fever among the crew, but on account of those lurking causes of yellow fever in the ship through which the crew themselves were infected. There is an overwhelming mass of testi- mony that the real risk of importing the yellow-fever virus is always in the foul bilges of wooden ships, which had been lying in one of the endemic yellow-fever harbours. The poison is sucked in through the ship's seams ; it ferments or multiplies in her bilges, rises as miasmata to infect the hold or 'tween decks, sometimes clinging to cargo, and perhaps making no sign uutil the cargo is all out. Again, in temperate latitudes, the virus may be imported and do no harm, unless it meet with a tract of exceptionally hot weather, such as happened at

Swansea in 1865. According to this principle, all iron ships, which have little or no bilge-water, and all clean ships whatsoever, are practically free from the risk of importing an epidemic of yellow fever, even although one or more of their passengers or crew may have developed the malady on the voyage, having come on board in the stage of its incubation. The only question of practical consequence in the case of iron steam- ships arises in connexion with the modern practice of carrying water-ballast in tanks or compartments of the ship's bottom. On the other hand a wooden ship from a yellow-fever port, espe- cially if she have open seams and had lain long in the harbour or "careenage," is not above suspicion on arriving during hot weather, even if no cascs of yellow fever had occurred on board during the voyage. Such vessels have often carried the yellow-fever poison in their bilges ; in some cases they had not been suspected until it was too late, and in other cases of mysterious outbreaks they have never been suspected at all because they had no actual cases on board. The grand lesson of experience in yellow fever is that the ship's hull is infinitely more dangerous than the persons of yellow- fever patients ; and a ship's hull is dangerous only because there isa material quantity of specifically poisonous filth fermenting in the recesses of the hold. All high-class iron ships, and clean ships in general, are, for common-sense purposes, above suspicion. The persons of the sick are little likely to introduce the fever ; but foul linen, bedding, and clothes are a source of danger, especially if they have been in a box or bundle for some time (witness the slight outbreak at Madrid in 1878 on the unpacking of soldiers' baggage brought via Santander from Cuba).

Principles of Quarantine against Cholera.—The peculiar dangers of cholera diffusion arise from the vomited and purged matters which are characteristic of the common type of the malady. Under certain circumstances the discharges of the sick are infective; they are probably not infective as they come from the body; but even minute quantities of the choleraic matters, if they have fermented in the ground, or in boxes and bundles of foul linen, bedding, or clothes, may exhale a virus which is often suddenly prostrating in its action. Thus every person with cholera, or even with choleraic diarrhoea in times of epidemic, is a source whence many more may be poisoned. When the choleraic matters percolate into wells or reservoirs the poisoning may be on a great scale. Cholera with such

infective properties is an exotic to the soil of Europe and probably of all countries except south-eastern Asia; and, if the in- fective discharges of cholera patients from the East were kept out of Western soil, no choleraic disease would be likely to become epideinic on the latter. Such exclusion has been more or less the endeavour of all Western states from the time of the first invasion through Central Asia in 1881. The only question is whether, by attempting too much, they have not lost the opportunity of con- trolling the spread of the disease by less drastic means. The instances where cholera has been kept out by a rigid cordon, or the strictest form of quarantine, are few: it is probable that Spain owed her immunity in 1849, when all the rest of Europe suffered, to her policy of exclusion; there was a strikingly successful instance of the same in the case of Dominica in 1865, during a frightful cholera mortality in Guadeloupe, only 22 miles distant; and it has happened more than once for Portugal to keep out the epidemic and for Sicily to protect herself for a time against the mainland of Italy. Butin the great majority of instances the quarantines against cholera have becn "elaborate illustrations of leakiness." Island communities have the best chances of succeeding; but in the case of the British Islands the attempt has been abandoned as impracticable. The British policy of attempting a good deal less was justified by success in 1873, when the Baltic and North Sea trade went on uninterruptedly, notwithstanding the presence of cholera at various ports across the water. In 1874 the inter- national sanitary conference of Vienna adopted an abstract resolution by a large majority approximately in favour of the British practicc, though the conference of Rome in 1885 was slightly reactionary. According to this practice a case of cholera isreceived into the country with much the same sort of assurance as a case of typhoid fever would be. There is much reason to believe that in both cases the agency of the soil or other tertiwm quid is necded to give potency to the poison, and that the diffusion of both diseases can be limited by disposing of the discharges of the sick in

such a way that they shall neither taint the soil or the water, nor ferment on unwashed linen or bedding. Wherever a filth- sodden soil receives the choleraic matters, poisonous miasmata will rise from it; and such miasmata will also arise even in houses or on board ship, or from bundles and boxcs

of effects, if cleanliness be thoroughly overpowered by the stress of events. In India such cholera-soils exist from year to year, or are capable of being made on occasion, as at great religious fairs; and in that respect some Indian soils are to cholera what certain of the harbours and fore- shores of the western hemisphere arc to yellow fever. Both dis- eases in their native seats are primarily caused by specific miasmata from the tainted soil. Butin Europe the spreading power of cholera is infinitely greater than that of yellow fever because the choleraic matters are more copious, and more likely to ferment under all circumstances of climate, locality (coast and interior), states of weather, and differences of race. But there is still a reasonable prospect of finding a good substitute for quarantine against cholera in the fact that its power of spreading is certainly made subject to conditions. The maxim for cholera is—Take care of the conditions, and the disease will take care of itself. Cholera is what Pettenkofer calls an "exogenous" infection: the infective mattcr acquires its virulence, not in or upon the body, as in a case of small-pox, but outside the body, amidst filth or other sanitary neglect. The reason why cholera is more difficult to manage than typhoid fever is that it is peculiarly a disease of the poor; " poverty has always been the true quartermaster of cholera." The virus is transported (in the West at least) from place to place largely by emigrants, religious pilgrims (as in Russia), fugitives, tramps, or others hard pressed by circumstances ; one of the most remarkable instances of that kind is its alleged transmission, in 1833, from Kansas across the Rocky Mountains to the Pacific by parties of Indians successively infected. The danger from the wandering poor is all the greatcr that they would be naturally unwilling under any circumstances to sacrifice their small belongings of clothes, bedding, and the like, which are often the real media of infection. It is not to be denied that the old-fashioned detention for a week or more in a lazaret has still something to recommend it for such poor classes of travellers ; but the detention will be more likely to give vitality to any lurk- ing virus of the discase than to extinguish it, unless the lazaret be particularly well found in all the conveniences of living.

HisTory OF QUARANTINE. —The first lazarets in Europe were con- structed for the plague; and that disease was the only one for which quarantine was practised (uot to mention the earlier isolation of lepers, and the attempts to check the invasion of syphilis in northern Europe about

1490) down to the advent of yellow fever in Spain at the beginning of the 19th century, and the arrival of Asiatic cholera in 1831. Venice took the lead in measures to check the spread of plague, having appointed three guardians of the public health in the first years of the Black Death (1348). The next record of preventive measures comes from Reggio in Modena in 1874. The first lazarct was founded by Venice in 1403, on a small island adjoining the city; in 1467 Genoa followed the example of Venice; and in 1476 the old leper hospital of Marseilles was converted into a plague hospital, the great lazaret of that city, perhaps the most complete of its kind, having been founded in 1526 on the island of Pomégue.

The practice at all the Mediterranean lazarets was not different from tise English procedure in the Levantine and North-African trade, to which the rest of this sketch will be confined. On the approach of cholera in 1831 some new lazarets were set up at Western ports, notably a very extensive establishment near Bordeaux, afterwards turned to another use.

The plague had disappeared from England, never to return, for more than thirty years before the practice of quarantine against it was definitely established by an Act of Parliament of Queen Anne's reign (1710). The first Act was called for, owing to an alarm lest plague should be imported from Poland and the Baltic; the second Act of 1721 was due to the disastrous prevalence of plague at Marseilles and other places in Provence; it was rencwed in 1788 owing to a fresh outbreak of the malady on the Continent, and again in 1743 owing to the disastrous epidemic at Messina, In 1752 a rigorous quarantine clause was introduced into an Act regulating the Levantine trade ; and various arbitrary orders were issued during the next twenty years to meet the supposed danger of infection from the Baltic. Although no plague cases ever came to England all those years, the restrictions on traffic became more and more stringent (following the movements of medical dogma), and in 1788 a very oppressive Quarantine Act was passed, with provisions affecting cargoes in particular. The first year of this century marks the turning point in quarantine legislation ; a parliamentary committee sat on the practice, and a more reasonable Act arose on their report. In 1805 there was another new Act, and in 1828-24 again an elaborate inquiry followed by an Act mak- ing the quarantine only at discretion of the privy council, and at the same time recognizing yellow

fever "or other highly infectious disorder" as calling for quarantine measures along with plague. The steady approach of cholera in 1831 was the last occasion in

England of a thorough-going resort to quarantine restrictions. The pestilence invaded cvery country of Europe despite all efforts to keep it out. In England the experiment of hermetically sealing the ports was not seriously tried when cholera returned in 1849, 1853, and 1865-66. In 1847 the Privy Council ordered all arrivals with clcan bills from the Black Sea and the Levant to be admitted to free pratique, provided there had bcen no case of plague during the voyage; and therewith the last remnant of the once formidable quarantine practice against plague may be said to have disappeared. The quarantine establishment fell gradually into disuse, and is now represented by a hulk at the Motherbank (Portsmouth), which is kept up solely for formal reasons.

For a number of years after the passing of the first Quarantine Act (1710) the protective practices were of the most haphazard and arbitrary kind. In 1721 two vessels laden with cotton goods, &c., from Cyprus, then a seat of plague, were ordered to be burned with their cargoes, the owners receiving £23,935 as indemnity. By the clause in the Levant Trade Act of 1752 vessels for the United Kingdom with a foul bill (¢.¢., coming froma country where plague existed) had to repair to the lazaretto of Malta, Venice, Messina, Leghorn, Genoa, or Marseilles, to perform their quarantine or to have their cargoes " sufficiently opened and aired." Since 1741 Stangate Creek (on the Medway) had been made the quarantine station at home; but it would appear froin the above clause that it was available only for vessels with clean bills. In 1755 lazarets in the form of floating hulks were established in England for the first time, the cleansing of cargo (particularly by exposure to dews) having becn done previously on the ship's deck. There was no medical inspection employed, but the whole routine left to the officers of customs and quarantine. In 1780, when plague was in Poland, even vessels with grain from the Baltic had to lie forty days in quarantine, and unpack and air the sacks; but owing to remonstrances, which came chiefly from Edinburgh and Leith, grain was from that date declared to be a "non-

susceptible article." About 1788 an order of council required every ship liable to quar- antine, in case of meeting any vessel at sea, or within four leagues of the coast of Great Britain or Ireland, to hoist a yellow flag in the day time and show a light at the maintopmast head at ight, under a penalty of £200. After 1800 ships from plague-countries (or with foul bills) were enabled to perform their quarantine on arrival in the Medway instead of taking a Mediterranean port on the way for that purpose ; and about the same time an extensive lazaret was built on Chetney Hill near Chatham at an expense of £170,000, which was almost at once condemned owing to its marshy foundations, and the materials sold for £15,000. The use of float- ing hulks as lazarets continued as before. In 1800 two ships with hides from Mogador (Morocco) were ordered to be sunk with. their cargoes at the Nore, the owners receiving £15,000. About this period it was merchandise that was chiefly suspected: there was a long schedule of "susceptible articles," and these were first exposed on the ship's deck for twenty-one days or less (six days for each instalment of the cargo), and then transported to the lazaret, where they were opened and aired forty days more. The whole detention of the vessel was from sixty to sixty-five days, including the time for reshipment of her cargo. Pilots had to pass fifteen days on board a "convalescent ship." The expenses may be esti- mated from one or two examples. In 1820 the " Asia," 763 tons, arrived in the Medway with a foul bill from Alexandria, laden with linseed; her freight was £1475 and her quarantine dues £610. The same year the "Pilato," 495 tons, making the same voyage, paid £200 quarantine dues on a freight of £1060. In 1823 the "William Parker" from Alexandria paid £188, or 54 per cent. on the value of her cargo. In 1823 the expenses of the quarantine service (at various ports) were £26,090, and the dues paid by shipping (nearly all with clean bills) £22,000; in 1824 the figures were respectively £23,704 and £14,419. A parliamentary return moved for by Mr Forster showed the expenses of the quaran- tine establishments at Rochester, Portsmouth, Bristol, Milford, Liverpool, and Bo'ness for the year ending 6th J anuary 1846 to be £15,590. A return for the United Kingdom and colonies moved for by Mr Joseph Hume in 1849 showed, among other details, that the expenses of the lazaret at Malta for ten years from 1839 to 1848 had been £53,553. Under the direction of Sir W. Pym, the superintendent-general of quarantine, the home establishments were gradually reduced from 1846 onwards; and the reports of the Board of

Health (signed by Chadwick, South- wood Smith, and others) in 1849 and 1852, which argued against quarantine, although not always on sound epidemiological prin- ciples, gave a further impetus in the same direction. The most recent appeal to the quarantine law (at Swansea in 1865) has been referred to above.

Literature—The most considerable treatise on quarantine is the article (pp. 166) by Léon Colin in the Dict. Encyl, des Sc, Med., 34 section, vol. i., Paris, 1874 (with a bibliography). There is also a general article by Reincke in Eulenburg's Handbuch des Gesundheitswesen. A quarantine committee of the Social Science Association collected, in 1860-61, valuable consular returns on the practice of quarantine in all parts of the world; these were edited by Milroy and ordered to

be printed (with the report and Summary) as three parliamentary papers com- municated to the board of trade, The third paper (6th August 1861, No. 544)

contains, in an appendix, an Jistortcal Sketch of Quarantine Legislation and Practice in Great Britain, by Dr Milroy, from which the above historical notes have been largely taken. See also Sherston Baker, Law of Quarantine, Lond., 1878. Russell's Treatise of the Plague (4to, London, 1791) contains "remarks on quarantines, lazarcttoes, &c.," and an account of the mode of "shutting up" practised by households in Aleppo on the outbreak of plague in the town. On plague-quarantines, sce also Hirsch, in the Vierteljahrsschrfir Oeffentl. Gesundheitspflege, 1880, xii. 6. The inexpediency of quarantine in the United Kingdom is discussed by John Simon in the eighth Report of the Medical Officer of the Privy Council for 1865, p. 35. The fifth fteport (new series), 1875, contains an abstract by Seaton of Proceedings of the International Santtary Con- Jerence at Vienna, 1874. (C. C.)

QUARANTINE, Carriz, The importation of foreign cattle into England was forbidden at a comparatively early period. Thus 18 Car. IL. c. 2 made such importa- tion a common nuisance. In 1869 previous legislation was consolidated by the Contagious Diseases (Animals) Act, 1869, which applied to the United Kingdom. In 1878 this Act was repealed and new provisions made by the Contagious Diseases (Animals) Act, 1878, amended

by two Acts passed in 1884. By this Act the privy council is empowered to make from time to time such general or special orders as they think fit for prohibiting the landing of animals brought from a foreign country. Foreign animals can be landed only at certain ports named by the privy council, and must be slaughtered on landing, unless they are intended for exhibition or other exceptional purposes, in which case they are subject to the quarantine rules given in the fifth schedule of the Act. In the United States the importation of neat cattle is forbidden by the Act of 1883, c. 121, except as allowed by the secretary of the treasury. The appropriation Acts since 1881 have made annual grants of sums of $50,000 to enable the secretary of the treasury to cooperate with State and municipal authorities in making regulations for the establishment of cattle quarantine stations. The cattle quarantine system of Canada is said to be one of the most perfect existing. In 1876 a quarantine of eight days was established, raised to ninety days in 1879. The chief Canadian Act is 42 Vict. c. 23. The effect of the Canadian precautions has been that English orders in council have allowed Canadian cattle to be imported into the United Kingdom for breeding and exhibition purposes.

QUARANTINE, Winow's, is the right of a widow to remain in the principal house belonging to her husband for forty days after his death. It is specially recognized in Magna Carta and in some of the State laws in the United States.

QUARE IMPEDIT, in English law, is a form of action by which the right of presentation to a benefice is tried. It is so called from the words of the writ formerly in use which directed the sheriff to command the person disturbing the possession to permit the plaintiff to present a fit person, or to show cause "why he hinders" the plaintiff in his right. The action is one of the few surviving real actions preserved by 3 & 4 Will. IV. c. 27. As a real action it could before the Judicature Acts have been brought only in the Court of Common Pleas, The effect of recent legislation has been to assimilate proceedings in quare impedit as far as possible to those in an ordinary action. It is now usually brought against a bishop to try the legality of his refusal to institute a particular clerk. The bishop must fully state upon the pleadings the grounds on which he refuses. Quare impedit is peculiarly the remedy of the patron; the remedy of the clerk is the

proceeding called duplex querela in the ecclesiastical court. At common law no damages or costs were recoverable in quare impedit ; 13 Edw. I. st. 1, ¢. 5, provided for damages up to two years' value of the benefice, and 4 & 5 Will. IV. c. 39 for costs, The action is not barred till the expira- tion of sixty years, or of three successive incumbencies adverse to the plaintiff's right, whichever period be the longer (3 & 4 Will. IV. ¢. 27, § 29). Where the patron of a benefice is a Roman Catholic, one of the universities

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presents in his place (1 Will. and Mary, sess. I, c. 26). By 13 Anne c. 13 during the pendency of a quare impedit to which either of the universities is a party in right of the patron being a Roman Catholic the court has power toadminister an oath for the discovery of any secret trust, and to order the cestw: que trust to repeat and subscribe a declaration against transubstantiation.

QUARLES, Francis (1592-1644), asacred poet of the 17th century, enjoyed considerable celebrity in his own day, and some of his works" have shared in the recent revival of interest in our older literature. The work by which he is best known, his #mblemes, was originally pub- lished in 1635, with grotesque illustrations, engraved by Marshall, and borrowed from the Pia Desideria of Hermann Hugo. The poems, which are diffuse medita- tions upon Scriptural texts, seem, in modern phrase, to have been "written up" to the illustrations, and are quite in keeping with their quaint mixture of sublime and familiar thoughts. An edition of the Hmblems, with new illustrations by C. H. Bennett, was published in Edinburgh in 1857, and these illustrations are reproduced in Mr Grosart's complete edition in the Chertsey Worthies Library. The incongruous oddities of Quarles's verse are more obvious than the higher qualities that recent admirers claim for him. The following stanza, in a paraphrase of Job xiv. 13, has often been referred to as the supreme example of his occasional sublimity of thought :—

"Tis vain to fice ; till gentle Mercy show Her better eye, the farther off we go The swing of Justice deals the mightier blow."

Quarles would seem to have been a man of good family, and he boasts of his "long-lived genealogy." He was born at Romford in Essex in 1592, and, after a regular education at school, Christ's College, Cambridge, and Lincoln's Inn, had influence enough at court to get the office of cup- bearer to the queen of Bohemia. He was afterwards (about 1621) appointed secretary to Ussher, the primate of Ireland, and later on, returning at an uncertain date to England, obtained (in 1639) the post of city chronologer, which had been held before him by Middleton and Ben Jonson. Upon the outbreak of the Civil War he wrote on the Royalist side, and died in 1644, in consequence, his widow suggests, of his harsh treatment by the king's enemies, Quarles's first publication, with the suggestive title of The Feast of Wormes, appeared in 1620, and from that date till his death he was a busy and prolific writer of verse and prose. His Divine Poems, collected in 1630, were published separately at intervals in the course of the preceding ten years. Divine Fancies followed in 1632 ; then the Emblems, which might well come under that general designation. The earlier poem of Argalus and Parthenia (1622) was in a different vein: the substance Was imitated from Sidney's Arcadia, and the verse from Marlowe's Hero and Leander. The speeches are spun out to a most tedious length, but the poem contains more fine lines and fewer incongruous fancies than any other of the author's productions. Quarles also published many Elegies, In the fashion of memorial verses of which Milton's Lycadas was the contemporary masterpiece. His Llieroglyphics, In the same vein as his Emblems, appeared first in 1638. His principal prose work was the Lnchyridion (1640), a collection of four "centuries" of miscellaneous aphorisms. This was followed two years later by more 'observations " of the same kind " concerning princes and states." Lovers of commonplace wisdom dressed in a garb always studi- ously quaint and sometimes happily epigrammatic, may turn to Quarles with every prospect of enjoyment.

QUARTER SESSIONS (in full, GeneRAL QuaRTER

ESSIONS OF THE Pxacs) is the name given to a local court with civil and criminal jurisdiction. In England the

court consists in counties of two or more justices of the peace, one of whom must be of the quorum (see Justicz OF THE PEACE), in cities and boroughs of the recorder alone. The quarter sessions are a court of record. The records in a county are nominally in the custody of the custos rotulorum, the highest civil officer in the county, practically in that of the clerk of the peace, who is nomin- ated by the custos and removable by the quarter sessions. In a city or borough he is appointed by the council and removable by the recorder. The original jurisdiction of quarter sessions seems to have been confined to cognizance of breaches of the peace. By a series of statutes passed in the reign of Edward III. the time of the holding of the sessions was fixed, and their jurisdiction extended to the trial of felonies and trespasses. The jurisdiction now depends upon a mass of legislation reaching from 1344 to the present time. The dates at which the county sessions must meet are fixed, by 2 Geo. IV. and 1 Will. IV. c. 70, to be the first weeks after the 11th of October, the 28th of December, the 3lst of March, and the 24th of June. Quarter sessions in a city or borough depend upon the Municipal Corporations Act, 1882, 45 & 46 Vict., c. 50. A grant of quarter sessions to a city or borough is made by the crown in council on petition of the town council. The main points in which borough differ from county quarter sessions are these :—(1) the recorder, a barrister of five years' standing, is sole judge in place of a body of laymen ; (2) the recorder has a discretion to fix his own dates for the holding ofa court, as long as he holds it once every quarter of a year; it may be held more frequently if the recorder think fit or a secretary of state so direct ; (3) the recorder has no power to levy a borough rate or to grant a licence for the sale of exciseable liquors by retail. In some few boroughs the recorder is judge of the borough civil court. Quarter sessions in the counties of Middlesex, Kent, and Lancaster, as also in London and the Cinque Ports, are governed by special legislation.

The jurisdiction of quarter sessions is either original or appellate.

Original Jurisdiction.—Civil.—This includes the levying of a county rate and its application, the appointment of a county licensing committee, and of public officers, such as the county treasurer, the public analyst, and the inspectors of weights and measures, the confirmation of bye-laws made by local authoritics, the increase or alteration of polling places and petty

sessional divisions, the regulation of police, and powers under various Acts of Parliament, such as the Highway Acts, and the Contagious Diseases (Animals) Act. The quarter sessions of the metropolitan counties have by 25 Geo. II. c. 36 the power of licensing music-halls, &c., within 20 miles of London.

Criminal.—Apart from statute, the commissions of justices of the peace ovine that they shall reserve the graver felonies for trial at assizes. They are now forbidden by several Acts of Parlia- ment to try a prisoner for treason or murder, or for any felony punishable without a previous conviction by penal servitude for life (such as burglary and rape), or for any of the offences cnumerated in 5 & 6 Vict. c. 88, the most practically important of which are perjury, forgery, bigamy, abduction, conccalment of birth, libel, bribery, and conspiracy. The procedure is by indictment, as at assizes, and the trial of offences by jury. In the case of incorrigible rogues and of sureties of the peace the quarter sessions exercise a quasi-criminal jurisdiction without a jury. They may also estreat recognizances entered into for appearance in a court of summary jurisdiction, but this part of their jurisdiction may be considered practically obsolete, as the Summary Jurisdiction Act, 1879, gives the court of summary jurisdiction power to estreat the recognizances Lope Jurisdiction.—Civil, —The principal cases in which this jurisdiction is exercised are in appeals from orders of a court of summary jurisdietion as to the assessment of the poor-rate and the removal and settlement of paupers, and orders made under the Highway, Liccnsing, and Bastardy Acts.

Criminal.—An appeal lies to quarter sessions from a court of summary jurisdiction only where such an appcal is expressly given bystatute. The appellate jurisdiction has been considcrably increased by the Summary Jurisdiction Act, 1879 (42 & 48 Vict. c, 49), which allows an appeal (with certain exccptions) from every conviction or order of a court of summary jurisdiction inflicting imprisonment without the option of a fine. The appeal may be

brought in accordance with either the Act giving the appeal or the Summary Jurisdiction Act.

There is no appeal from quarter sessions on the facts, but their decision may be reviewed by the High Court of Justice by means of certiorart, mandamus, prohibition, or a case stated under 12 & 18 Vict. c. 45, § 11. A case may be stated for the opinion of the court of criminal appeal under 11 & 12 Vict. c. 78, § 1.

Ireland.—In Ireland the chairman of quarter sessions is a salaried professional lawyer, and has important civil jurisdiction corresponding very much to that of a county court judge in Eng- land. His jurisdiction depends chiefly upon 14 & 15 Vict. c. 57. The recorders of Dublin and Cork are judges of the civil bill courts in those cities.

Scotland.—In Scotland quarter sessions were established by the Act 1661, c. 338, under which justices were to meet on the first Tuesday of March, May, and August, and the last Tuesday of October to "administrate justice to the people in things that are within their jurisdiction and punish the guilty for faults and crimes done and committed in the preceding quarter." The jurisdiction of quarter sessions in Scotland is more limited than in England, much of what would be quarter-sessions work in Eng- land being done by the sheriff or the commissioners of supply. Quarter sessions have appellate jurisdiction in poaching, revenue, and licensing cases, and under the Pawnbrokers and other Acts. All appeals from proccedings under the Summary Jurisdiction Acts are taken to the High Court of Justiciary at Edinburgh or on circuit (44 & 45 Vict. c. 33). The original jurisdiction of quarter sessions is very limited, and almost entirely civil. Thus they have power to divide a county and to make rules for carrying into effect the provisions of the Small Debts Act, 6 Geo. IV. c. 48. The decision of quarter sessions may be reviewed by advocation, suspension, or appeal.

United States.—In the United States courts of quarter sessions exist in many of the States; their jurisdiction is determined by State legislation, and extends as a rule only to the less grave crimes, They are in some States constituted of professional judges.

QUARTZ, the name of a mineralogical species which includes nearly all the native forms of silica. It thus embraces a great number of distinct minerals, several of which are cut as ornamental stones or otherwise used in the arts. For a general description of the species, see MINERALOGY, vol. xvi. p.

389 ; and for its chief varieties, see AGATE, vol. i. p. 277; Ameruyst, vol. i. p. 736; Furnt, vol. ix. p. 325; and Jaspmr, vol, xiii, p. 596. The crystallography of quartz has been fully investigated by Des Cloizeaux in his classical Afémoire sur la cristal- lisation et la structure intériewre du Quartz, Paris, 1855.

QUASSIA, the generic name given by Linneus to a small tree of Surinam in honour of the negro Quassi or Coissi, who employed the intensely bitter bark of the tree as a remedy for fever. This bark was introduced into European medicine about the middle of the last century, and was officially recognized in the London Pharmacopoia of 1788. In 1809 it was replaced by the bitter wood or bitter ash of Jamaica, Picrena excelsa, Lind]., which was found to possess similar properties and could be obtained in pieces of much larger size. Since that date this wood has continued in use in Britain under the name of quassia to the exclusion of the Surinam quassia, which, however, is still employed in France and Germany. Picrena ex- celsa, Lindl. (Quassia excelsa, Swartz) is a tree 50 to 60 feet in height, and resembles the common ash in appear- ance. It has imparipinnate leaves composed of four or five pairs of short-stalked, oblong, blunt, leathery leaflets, and inconspicuous green flowers. The fruit consists of shining drupes about the size of a pea. It is found also in Antigua and St Vincent. Quassia amara, L., is a shrub or small tree belonging to the same natural order as Picrena, viz., Simarubacexr, but is readily distinguished by its large handsome red flowers arranged in terminal clusters. It is a native of Panama, Venezuela, Guiana, and northern Brazil. Jamaica quassia is imported into England in logs several feet in length and often nearly one foot in thickness, consisting of pieces of the trunk and larger branches. The thin greyish bark is usually removed. The wood is nearly white, or of a yellowish tint, but sometimes exhibits blackish markings due to the

mycelium of a fungus. The wood has a pure bitter taste, and is without odour or aroma. It is usually to be met with in the form of turnings or raspings, the former being obtained in the manufacture of the “bitter cups” which are made of this wood. The medicinal properties are due to the presence of quassiin (first obtained by Winckler in 1835), which exists in

the wood to the extent of ;',th per cent. It isa neutral crystalline substance, soluble in hot dilute alcohol and chloroform and in 200 parts of water. It is also readily soluble in alkalies, and is reprecipitated by acids. It is almost insoluble in ether, and forms an insoluble compound with tannin.

Quassia is used in medicine in the form of infusion and tincture as a pure bitter tonic and febrifuge, and in consequence of contain- ing no tannin is often prescribed in combination with iron. An infusion of the wood sweetened with sugar is also uscd as a fly poison, and forms an effectual injection for destroying thread worms. Quassia also forms a principal ingredient of several " hop substitutes," for which use it was employed as long ago as 1791, when John Lindsay, a medical practitioner in Jamaica, wrote that the bark was exported to England "in considerable quantities for the purposes of brewers of ale and porter."

QUATERNIONS. The word quaternion properly means "a set of four." In employing such a word to denote a new mathematical method, Sir W. R. Hamiitron (g.v.) was probably influenced by the recollection of its Greek equivalent, the Pythagorean Tetractys, the mystic source of all things.

Quaternions (as a mathematical method) is an exten- sion, or improvement, of Cartesian geometry, in which the artifices of coordinate axes, &c., are got rid of, all directions in space being treated on precisely the same terms. It is therefore, except in some of its degraded forms, possessed of the perfect isotropy of Euclidian space.

From the purely geometrical point of view, a quater- nion may be regarded as the quotient of two directed lines "an space—or, What comes to the same thing, as the factor, or operator, which changes one directed line into another. Its analytical definition cannot be given for the moment; it will appear in the course of the article.

History of the Method.—The evolution of quaternions belongs in part to each of two weighty branches of mathe- matical history—the interpretation of the imaginary (or impossible) quantity of common algebra, and the Cartesian application of algebra to geometry. Sir W. R. Hamilton was led to his great invention by keeping geometrical applications constantly before him while he endeavoured to give a real significance to ,/-—1. We will

therefore confine ourselves, so far as his predecessors are concerned, to attempts at interpretation which had geometrical appli- cations in view.

One geometrical interpretation of the negative sign of algebra was early seen to be mere reversal of direction along a line. Thus, when an image is formed by a plane mirror, the distance of any point in it from the mirror is simply the negative of that of the corresponding point of the object. Or if motion in one direction along a line be treated as positive, motion in the opposite direction along the same line is negative. In the case of time, measured from the Christian era, this distinction is at once given by the letters A.D. or B.c., prefixed to the date. And to find the position, in time, of one event relatively to another, we have only to subtract the date of the second (taking account of its sign) from that of the first. Thus to find the interval between the battles of Marathon (490 B.c.) and Waterloo (1815 a.p.) we have

+1815 — (—490)=2305 years. And it is obvious that the same process applies in all cases in which we deal with quantities which may be regarded as of one directed dimension only, such as dis- tances along a line, rotations about an axis, &c. But it

is essential to notice that this is by no- means necessarily true of operators. To turn a line through a certain angle in a given plane, a certain operator is required ; but when we wish to turn it through an equal negative angle we must not, in general, employ the negative of the former operator. For the negative of the operator which turns a line through a given angle in a given plane will in all cases produce the negative of the original result, which is not the result of the reverse operator, unless the angle involved be an odd multiple of a right angle. This is, of course, on the usual assumption that the sign of a product is changed when that of any one of its factors is changed, —which merely means that —1 is commutative with all other quantities.

The celebrated Wallis seems to have been the first to push this idea further. In his Z'reatise of Algebra (1685) he distinctly proposes to construct the imaginary roots of a quadratic equation by going out of the line on which the roots, if real, would have been constructed.

In 1804 the Abbé Buée,! apparently without any know- ledge of Wallis's work, developed this idea so far as to make it useful in geometrical applications. He gave, in fact, the theory of what in Hamilton's system is called Composition of Vectors in one plane—i.e., the combination, by + and —, of complanar directed lines. His construc- tions are based on the idea that the imaginaries +,/—1 represent a unit line, and its reverse, perpendicular to the line on which the real units +1 are measured. In this sense the imaginary expression a+6,/—1 is constructed by measuring a length a along the fundamental line (for real quantities), and from its extremity a line of length 6 in some direction perpendicular to the fundamental line. But he did not attack the question of the representation of products or quotients of directed lines. The step he took is really nothing more than the kinematical principle of the composition of linear velocities, but expressed in terms of the algebraic imaginary.

In 1806 (the year of publication of Buée's paper) Argand published a pamphlet? in which precisely the same ideas are developed, but to a considerably greater extent. For an interpretation is assigned to the product of two directed lines in one plane, when each is expressed as the sum of a real and an imaginary part. This product is interpreted as another directed line, forming the fourth term of a proportion, of which the first term is the real (positive) unit-line, and the other two are the factor-lines. Argand's work remained unnoticed until the question was again raised in Gergonne's Annales, 1813, by Francais. This writer stated that he had found the germ of his remarks among the papers of his deceased brother, and that they had come from Legendre, who had himself received them from some one unnamed, This led to a letter from Argand, in which he stated his communica- tions with Legendre, and gave a résumé of the contents of his pamphlet. In a further communication to the Annales, Argand pushed on the applications of his theory. He has given by means of it a simple proof of the exist- ence of x roots, and no more, in every rational algebraic equation of the mth order with real coefficients. About 1828 Warren in England, and Mourey in France, inde- pendently of one another and of Argand, reinvented these modes of interpretation ; and still later, in the writings of

= Stil a rs

‘ Phil. Trans., 1806.

? Essai sur une maniére de représenier les Quantités Imaginaires dans les Constructions Géométriques. A second edition was published by Hoiiel (Paris, 1874). There is added an important Appendix, Consisting of the papers from Gergonne’s Annales which are referred

to in the text above. Almost nothing can, it seems, be learned of Argand’s private life, except that in all probability he was born at

Geneva in 1768,

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Cauchy, Gauss, and others, the properties of the expression

a+6,/—1 were developed into the immense and most important subject now called the theory of complex numbers (see Numpers, TuEory oF). From the more purely sym- bolical view it was developed by Peacock, De Morgan, &e., as double algebra.

Argand’s method may be put, for reference, in the following form. The direeted line whose length is a, aud whieh makes an angle @ with the real (positive) unit line, is expressed by

a(cos6+isiné), where ¢ is regarded as +4/-—1. The sum of two sueh lines (formed by adding together the real and the imaginary parts of two such expressions) ean, of course, be expressed as a third direeted line— the diagonal of the parallelogram of which they are conterminous sides, The product, P, of two such lines is, as we have seen, given by 1: a(cos6+7ésin@) :: a(cosé+7sin 6’) : P, or P=aa’{cos(0+6’)+isin(6’)}. Its length is, therefore, the produet of the lengths of the factors, and its inclination to the real unit is the sum of those of the factors. If we write the expressions for the two lines in the form A Bi, A’+B%, the produet is AA’—BB’+7(AB’+ BA’); and the faet that the length of the product line is the product of those of the factors is seen in the form

(A2+ B)(A'2+B)=(AA!— BB')? +(AB'+BA'?. In the modern theory of eomplex numbers this is expressed by saying that the Norm of a produet is equal to the product of the norms of the factors.

Argand's attempts to extend his method to space gene- rally were fruitless. The reasons will be obvious later ; but we mention them just now because they called forth from Servois (Gergonne's Annales, 1813) a very remark- able comment, in which was contained the only yet discovered trace of an anticipation of the method of Hamilton. Argand had been led to deny that such an expression as 2' could be expressed in the form A + Bi,— although, as is well known, Euler showed that one of its values is a real quantity, the exponential function of — 7/2. Servois says, with reference to the general representation of a directed line in space :—

"Tanalogie semblerait exiger que le trindme fit de la forme peosat+geosB+rcosy; a, B, y étant les angles d'une droite avec trois axes rectangulaires; et qu'on etit

*(pcosa+qcosB+rcosy)(p'eosa+q'eos B+7'e08y) =cos*a+cos*B+cos*y=1. Les valeurs de p, g, 7, p', 7, 7 qui satisferaient & eette condition seraicnt abswrdes; mais seraient-elles imaginaires, reductibles 4 la forme générale A+Ba/-—1?% Voila une question d'analyse fort singuliére que je soumets a vos lumiéres. La simple proposition que je vous en fais suffit pour vous faire voir que je ne crois point que toute fonetion analytique non réelle soit*

vraiment reductible & la forme A+ Ba/-1."

As will be seen later, the fundamental 2, 7, & of quater- nions, with their reciprocals, furnish a set of six quantities which satisfy the conditions imposed by Servois. And it is quite certain that they cannot be represented by ordin- ary imaginaries,

Something far more closely analogous to quaternions than anything in Argand's work ought to have been suggested by De Moivre's theorem (1730). Instead of regarding, as Buée and Argand had done, the expression a (cos 6+72sin 6) as a directed line, let us suppose it to represent the operator which, when applied to any line in the plane in which @ is

measured, turns it in that plane through the angle 0, and at the same time increases its length in the ratioa: 1. From the new point of view we see at once, as it were, why it is true that

(cos 6 +7sin 6)” =cosmé + isin mé.

For this equation merely states that m turnings of a line through successive equal angles, in one plane, give the same result as a single turning through m times the common angle. To make this process applicable to any plane in space, it is clear that we must have a special value of i for each such plane. In other words, a unit line, drawn in any direction whatever, must have —1 for itssquare, In such XX. — 21

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a system there will be no line in space specially distin- guished as the real unit line: all will be alike imaginary, or rather alike real. We may state, in passing, that every quaternion can be represented as a(cos6 +. wsin@),— where ais areal number, 6 a real angle, and # a directed unit line whose square is—1. Hamilton took this grand step, but, as we have already said, without any help from the previous work of De Moivre. The course of his investiga- tions is minutely described in the preface to his first great work! on the subject. Hamilton, like most of the many inquirers who endeavoured to give a real interpretation to the imaginary of common algebra, found that at least two kinds, orders, or ranks of quantities were necessary for the purpose. But, instead of dealing with points on a line, and then wandering out at right angles to it, as Buée and Argand had done, he chose to look on algebra as the science of pure time,2 and to investigate the properties of “sets” of time-steps. In its essential nature a set is a linear function of any number of distinct units of the same species. Hence the simplest form of a set is a couple; and it was to the possible laws of combination of couples that Hamilton first directed his attention. It is obvious that the way in which the two separate time-steps are involved in the couple will determine these laws of combination. But Hamilton’s special object required that these laws should be such as to lead to certain assumed results; and he therefore commenced by assuming these, and from the assumption determined how the separate time-steps must be involved in the couple. If we use Roman letters for mere numbers, capitals for instants of time, Greek letters for

time-steps, and a parenthesis to denote a couple, the laws assumed by Hamilton as the basis of a system were as follows :— (B,, B,)-(Ay, Ag)=(B,- Ay, Bzy- Ag)=(a, 8); (a, b)(a, B)=(aa— bp, ba+ap).3 To show how we give, by such assumptions, a real inter- pretation to the ordinary algebraic imaginary, take the simple casea=0, b=1, and the second of the above for- mule gives (0, 1)(a, B)=(-B, a). Multiply once more by the number-couple (0,1), and we have (0, 1)(0, 1)(a, B)=(0, 1)(-B, a)=(—a,—8) =(-1, 0)(a, B)= -(a, B). Thus the number-couple (0,1), when twice applied to a step-couple, simply changes its sign. That we have here a perfectly real and intelligible interpretation of the ordin- ary algebraic imaginary is easily seen by an illustration, even if it be a somewhat extravagant one. Some Eastern potentate, possessed of absolute power, covets the vast possessions of his vizier and of his barber. He determines to rob them both (an operation which may be very satis- factorily expressed by —1); but, being a wag, he chooses his own way of doing it. He degrades his vizier to the office of barber, taking all his goods in the process ; and makes the barber his vizier. Next day he repeats the opera- tion. Each of the victims has been restored to his former rank, but the operator —1 has been applied to both. Hamilton, still keeping prominently before him as his great object the invention of a method applicable to space of three dimensions, proceeded to study the properties of triplets of the form 2+7y+Jjz, by which he proposed to represent the directed line in space whose projections on

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1 Lectures on Quaternions, Dublin, 1853.

2 Theory of Conjugate Functions, or Algebraic Couples, with a Pre- liminary and Elementary Essay on Algebra as the Science of Pure Time, read in 18388 and 1835, and published in Trans. R. I. A., xvii. ii. (1835).

3 Compare these with the long-subsequent ideas of Grassmann, presently to be described. i

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QUATEHERNIONS

the coordinate axes are x, y, 2 The composition of two such lines by the algebraic addition of their several pro- jections agreed with the assumption of Buée and Argand for the case of coplanar lines. But, assuming the dis- tributive principle, the product of two lines appeared to give the expression

ace! — yy! — 22! + tye! + acy') + J (xa! + 2a!) + ij(yz +2y'). For the square of j, like that of 7, was assumed to be negative unity. But the interpretation of y presented a difficulty,—in fact the main difficulty of the whole investi- gation, —and it is specially interesting to see how Hamilton attacked it. He saw that he could get a hint from the simpler case, already thoroughly discussed, provided the two factor lines were in one plane through the real unit line. This requires merely that

yresry'se2's or yz —2zy=0;

but then the product should be of the same form as the separate factors, Thus, in this special case, the term in vj ought to vanish. But the numerical factor appears to be yz' +2y', while it is the quantity yz' — zy' which really vanishes. Hence Hamilton was at first inclined to think that 77 must be treated as nil. But he soon saw that "a less harsh supposition" would suit the simple case. For his speculations on sets had already familiarized him with the idea that multiplication might in certain cases not be commutative; so that, as the last term in the above pro- duct is made up of the two separate terms ¢yyz' and jizy/, the term would vanish of itself when the factor-lines are coplanar provided 7j= —jz, for it would then assume the form ij (yz —zy'). He had now the following expression for the product of any two directed lines

wvat! — yy' — ae + U(yoo! + xy") + j(acd! + xt!) + if(y2 — zy'). But his result had to be submitted to another test, the Law of the Norms. As soon as he found, by trial, that this law was satisfied, he took the final step. "This led me," he says, "to conceive that perhaps, instead of seeking to confine ourselves to triplets,. .... we ought to regard these as only imperfect forms of Quaternions, and that thus my old conception of sets might receive a new and useful application." In a very short time he settled his fundamental assumptions. He had now three distinct space-units 7, 7, 4; and the following conditions regulated their combination by multiplication :—

QaPak=——-1, j= -ji—k, jk— -kj=i, ki= —tkaj4 And now the product of two quaternions could be at

once expressed as a third quaternion, thus—

(a+ib+je+kd)(a’ + ib! +jc’+kd’)=A+iB+JC+kD, where

© 6 © ‘o: Ramee

A=aa’ — bb’ – cc’ — dd’,

B=ab’ + ba’+cd’ — de’,

C=ac’ +ca”+db’ — bd’,

D=ad’ + da’ + be’ — cb’. Hamilton at once found that the Law of the Norms holds,— not being aware that Euler had long before decomposed the product of two sums of four squares into this very set of four squares. And now a directed line in space came to be represented as iv+jy+kz, while the product of two lines is the quaternion

— (aa! + yy! +22”) + i(ye! —2y’) +5 (20! — x2!) +k(ay! — yx’).

To any one acquainted, even to a slight extent, with the elements of Cartesian geometry of three dimensions, 4 glance at the extremely suggestive constituents of this

| expression shows how justly Hamilton was entitled to say

—‘ When the conception . . . . had been so far unfolded and fixed in my mind, I felt that the new instrument for applying calculation to geometry, for which I had so long

4 It will be easy to see that, instead of the last three of these, we may write the single one 7k= — 1.

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sought, was now, at least in part, attained.” this memorable discovery is October 16, 1843.

We can devote but a few lines to the consideration of Suppose, for simplicity, the factor- lines to be each of unit length. Then a, y, z, x’, y’, 2’ express Also, if @ be the angle between

the expression above.

their direction-cosines. them, and x”, y’, 2” the direction-cosines of a line perpendi- cular to each of them, we have «a + yy’ +22’ =cos6, ye — 2 =x sin 6, &e., so that the product of two unit lines is now expressed as — cos@ + (ca + jy” +kz’)sin6. Thus, when the factors are parallel, or 6=0, the product, which is now the square of any (unit) line, is—1. And when the two factor lines are at right angles to one another, or 6=7/2, the product is simply tx” +jy”+kz’, the unit line perpendicular to both. Hence, and in this lies

the main element of the symmetry and simplicity of the quaternion calculus, all systems of three mutually rectangular unit lines in space have the same properties as

the fundamental system 1, j, k. In other words, if the system (considered as rigid) be made to turn about till the jirst factor coincides with 7 and the second with j, the product will coincide with & This fundamental system, therefore, becomes unnecessary ; and the quater- nion method, in every case, takes its reference lines solely from the problem to which it is applied. It has therefore, as it were, a unique internal character of its own.

Hamilton, having gone thus far, proceeded to evolve these results from a train of a priori or metaphysical reasoning, which is so interesting in itself, and so char- acteristic of the man, that we briefly sketch its nature.

Let it be supposed that the product of two directed lines is something which has quantity ; .¢., it may be halved, or doubled, for instance. Also let us assume (a) space to have the same properties in all directions, and make the convention (6) that to change the sign of any one factor changes the sign of a product. Then the product of two lines which have the same direction cannot be, even in part, a directed quantity. For, if the directed part have the same direction as the factors, (b) shows that it will be reversed by reversing either, and therefore will recover its original direction when both are reversed. But this would obviously be inconsistent with (a). If it be perpendicular to the factor lines, (a) shows that it must have simultaneously every such direction. Hence it musé be a mere nuniber.

Again, the product of two lines at right angles to one another cannot, even in part, be a number. For the reversal of either factor must, by (6), change its sign. But, if we look at the two factors in their new position by the light of (a), we see that the sign must not change. But there is nothing to prevent its being represented by a directed line if, as farther applications of (a) and (6) show we must do, we take it perpendicular to each of the factor lines. Hamilton seems never to have been quite satisfied with the apparent heterogeneity of a quaternion, depending as it does on a numerical and a directed part. He indulged in a great deal of speculation as to the exist- ence of an extra-spatial unit, which was to furnish the raison d'étre of the numerical part, and render the quater- nion homogeneous as well as linear. But, for this, we must refer to his own works.

Hamilton was not the only worker at the theory of sets. The year after the first publication of the quaternion niethod, there appeared a work of great originality, by Grassmann,! in which results closely analogous to some of those of Hamilton were given,

In particular two species of multiplication ("inner" and "outer ") of directed lines in one plane were given. The results of these two

Die Ausdehnungslehre, Leipsic, 1844 ; 2d ed., "vollstandig und strenger Form bearbeitet," Berlin, 1862. Sce also the collected works of Mébius, and those of Clifford, for a general explanation of Grassmann's method.

kinds of multiplication correspond respectively to the numerical and the directed parts of Hamilton's quaternion product. But Grassmann distinctly states in his preface that he had not had leisure to extend his method to anglesin space. Hamilton and Grass- mann, while their-earlier work had much in common, had very dif- ferent objects in view. Hamilton, as we have seen, had geometrical application as his main object; when he realized the quaternion system, he felt that his object was gained, and thenceforth con- fined himself to the development of his method. Grassmann's object seems to have becn, all along, of a much more ambitious character, viz., to discover, if possible, a system or systems in which every conceivable mode of dealing with sets should be included, That he made very great advances towards the attain- ment of this object all will allow; that his method, even as com- pleted in 1862, fully attains it is not so certain. But his claims, however great they may be, can in no way conflict with those of Hamilton, whose mode of multiplying couples (in which the "inuer" and "outer" multiplication are essentially involved) was produced in 1833, and whose quaternion system was completed and published before Grassmann had elaborated for press even the rudimentary portions of his own system, in which the veritable diffi- culty of the whole subject, the application to angles in space, had not even been attacked. Grassmann made in 1854 a somewhat savage onslaught on Cauchy and De St Venant, the former of whom had invented, while the latter had exemplified in application, tlic system of "cles algébriques," which is almost precisely that of Grassmann, But it is to be observed that Grassmann, though he virtually accused Cauchy of plagiarism, does not appear to have preferred any such charge against Hamilton. He does not allude to Hamilton in the second edition of his work. But in 1877, in the Mathematische Annalen, xii., he gave a paper "On the Place of Quaternions in the Awsdehnungslehre," in which he condemns, as far as he can, the nomenclature and methods of Hamilton. There are many othcr systems, based ou various principles, which have been given for application to geometry of directed lines, but those which deal with products of lines are all of such complexity as to be practically useless in application. Others, such as the Bary- centrische Calctl of Mobius, and the Jléthode des Equipollences of Bellavitis, give elegant modes of treating space problems, so long as we confine ourselves to projective geometry al matters of that order; but they are limited in their field, and therefore nced not be discussed here. More general systems,

having close analogies to quaternions, have been given since Hamilton's discovery was pub- lished. As instances we may take Goodwin's and O'Brien's papers in the Cambridge Philosophical Transactions for 1849.

Relations to other Branches of Science.-—Even the above brief narrative shows how close is the connexion between quaternions and the ordinary Cartesian space-geometry. Were this all, the gain by their introduction would consist mainly in a clearer insight into the mechanism of coordin- ate systems, rectangular or not—a very important addition to theory, but little advance so far as practical applica- tion is concerned. But we have now to consider that, as yet, we have not taken advantage of the perfect symmetry of the method. When that is done, the full value of Hamilton's grand step becomes evident, and the gain is quite as extensive from the practical as from the theoreti- cal point of view. Hamilton, in fact, remarks,? "I regard it as an inelegance and imperfection in this calculus, or rather in the state to which it has hitherto been unfolded, whenever it becomes, or seems to become, necessary to have recourse …... to the resources of ordinary algebra, for the solution of equations in quaternions." This refers to the use of the x, y, 2 coordinates,—associated, of course, with 2, 7, &. But when, instead of the highly arti- ficial expression ix+jy+kz, to denote a finite directed line, we employ a single letter, a (Hamilton uses the Greek alphabet for this purpose), and find that we are permitted to deal with it exactly as we should have dealt with the more complex expression, the immense gain is at least in part obvious. Any quaternion may now be expressed in numerous simple forms. Thus we may regard it as the sum of a number and a line, a+a, or as the product, By, or the quotient, de", of two directed lines, &c., while, in many cases, we may represent it, so far as it is required, by a single letter such as gq, 7, ce.

2 Lectures on Quaternions, § 513.

Perhaps to the student there is no part of elementary mathematics so repulsive as is spherical trigonometry. Also, everything relating to change of systems of axes, as for instance in the kinematics of a rigid system, where we have constantly to consider one set of rotations with regard to axes fixed in space, and another set with re- gard to axes fixed in the system, is a

matter of trouble- some complexity by the usual methods. But every quaternion formula is a proposition in spherical (some- times degrading to plane) trigonometry, and has the full advantage of the symmetry of the method. And one of Hamilton's earliest advances in the study of his system (an advance independently made, only a few months later, by Cayley) was the interpretation of the singular operator a( )q7}, where qisa quaternion. Applied to any directed line, this operator at once turns it, conically, through a definite angle, about a definite axis. Thus rotation is now expressed in symbols at least as simply as it can be exhibited by mcans of a model. Had quaternions effected nothing more than this, they would still have inaugurated one of the most necessary, and apparently impracticable, of reforms.

The physical properties of a heterogeneous body (pro- vided they vary continuously from point to point) are known to depend, in the neighbourhood of any one point of the body, on a quadric function of the coordinates with reference to that point. The same is true of physical quantities such as potential, temperature, &c., throughout small regions in which their variations are continuous ; and also, without restriction of dimensions, of moments of inertia, d&c. Hence, in addition to its geometrical applications to surfaces of the second order, the theory of quadric functions of position is of fundamental importance in physics. Here the symmetry points at once to the

selection of the three principal axes as the directions for 1, .

j, &; and it would appear at first sight as if quaternions could not simplify, though they might improve in ele- gance, the solution of questions of this kind. But it is not so. Even in Hamilton's earlier work it was shown that all such questions were reducible to the solution of linear equations in quaternions ; and he proved that this, in turn, depended on the determination of a certain operator, which could be represented for purposes of calculation by a single symbol. The method is essentially the same as that developed, under the name of "matrices" by Cayley in 1858 ; but it has the peculiar advantage of the simplicity which is the natural consequence of entire freedom from conventional reference lines.

Sufficient has already been said to show the close con- nexion between quaternions and the theory of numbers. But one most important connexion with modern physics must be pointed out, as it is probably destined to be of great service in the immediate future. In the theory of surfaces, in hydrokinetics, heat-conduction, potentials, &c., we constantly meet with what is called Laplace's operator,

0 ee tee V1Z., Pa apt ae : i.e,, it is independent of the particular directions chosen for the rectangular coordinate axes. Here, then, is a case

specially adapted to the isotropy of the quaternion system , d

and Hamilton easily saw that the expression in j ath could be, like ia +jy +kz, effectively expressed by a single letter. He chose for this purpose y. And we now see that the square of vy is the negative of Laplace's operator ; while v itself, when applied to any numerical quantity conceived as having a definite value at each point of space, gives the direction and the rate of most rapid change of that quantity. Thus, applied to a potential, it gives the direc- tion and magnitude of the force; to a distribution of

We know that this is an mvariant ;

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temperature in a conducting solid, it gives (when mul- tiplied by the conductivity) the flux of heat, &e. No better testimony to the value of the quaternion method could be desired than the constant use made of its notation by mathematicians like Clifford (in his Kinematic) and by physicists like Clerk-Maxwell (in his Electricity and Mag- netism). Neither of these men professed to employ the calculus itself, but they recognized fully the extraordinary clearness of insight which is gained even by merely trans- lating the unwieldy Cartesian expressions met with in hydrokinetics and in electrodynamics into the pregnant language of quaternions.

Works on the Subject.—Of course the great works on this sub- ject are the two immense treatises by Hamilton himself. Of these the second (Elements of Quaternions, London, 1866) was posthumous—incomplete in one short part of the original plan only, but that a most important part, the theory and applications of vy. These two works, along with Hamilton's other papers on quaternions (in the Dublin Proceedings and Transactions, the Philo- sophical Magazine, &c.), are storehouses of information, of which but a small portion has yet been extracted. A German translation of Hamilton's Elements has recently been published by Glan.

Other works on the subject, in order of date, are Allegret, Essai sur le Caleul des Quaternions (Paris, 1862); Tait, dn Elementary Treatise on Quaternions. (Oxford 1867, 2d ed. 1873; German translation by v. Scherff,

1880, and French by Plarr, 1882-84); Kelland and Tait, Zntroduction to Quaternions (London, 1878, 2d ed. 1882); Hoiiel, Hléments de la Théorie des Quaternions (Paris, 1874); Unverzagt, Theorie der Quaternionen (Wiesbaden, 1876); Laisant, Introduction & la Méthode des Quaternions (Paris, 1881) ; Graefe, Vorlesungen tiber die Theorie der Quaternionen (Leipsic,

1884).

An excellent article on the " Principles" of the science, by Dillner, will be found in the Mathematische Annalen, vol. xi., 1877. And a very valuable article on the general question, Linear Associated Algebra, by the late Prof. Peirce, was unfortunately lithographed for private circulation only. Sylvester and others have recently pub- lished extensive contributions to the subject, including quaternions under the general class matrix, and have developed niuch farther than Hamilton lived to do the solution of equations in quaternions, Several of the works named above are little more than compilations, and some of the French ones are painfully disfigured by an attempt to introduce an improvement of Hamilton's notation ; but the mere fact that so many have alrcady appeared shows the sure progress which the method is now making. (PiGe DD)

QUATREMERE, Errenne Marc (1782-1857), one of the most learned of modern Orientalists, came of an eminent family of Parisian merchants. His father was a victim of the Revolution, his mother a pious woman devoted to works of charity and venerated after her death almost as a saint. The son retained much of what was best in the old spirit of the Parisian bowrgeoisie —its industry, sobriety, and independence of character, along with a certain narrowness of view. He was sincerely religious, with strong Jansenist and Gallican tendencies, a touch of rationalism, and a great dislike of modern growths of Catholicism. His whole life was spent alone among his books, and his works always display the most extensive and accurate erudition—in which indeed, and not in criticism or original ideas, his strength lay. Employed in 1807 in the manuscript department of the imperial library, he passed to the chair of Greek in Rouen in 1809, entered the academy of inscriptions in 1815, taught Hebrew and Aramaic in the Collége de France

from 1819, and finally in 1827 became professor of Persian in the School of Living Oriental Languages.

Quatremére's first work was Recherches sur la langue et la littera- ture de v Egypte (1808), showing that the language of ancicnt Egypt must be sought in Coptic. His Mlém. sur les Nabatéens (1835) has been mentioned under NapaTmAns, and his translation of Maxnizt's history of the Mameluke sultans in the article on that author. The valuable notes to the latter book show his erudition at the best. He published also among other works a translation of Rashid al-Din's Hist. des Mongols de la Perse (1836); Mém. géog- et hist, sur U Egypte (1810); the text of Ibn Khaldtin's Prolegomena ; and a vast number of useful memoirs in the Jour. As. His numerous reviews in the Jour. des Savants should also be men- tioucd. Quatremére made great lexicographic collections in Ort ental languages, fragments of which appear in the notes to his

Plate II.

Moun- tains.

Rivers,

QU E—

various works. His MS. material for Syriac has been utilized in Payne Smith's Thesaurus ; of the slips he collected for a projected Arabic, Persian, and Turkish lexicon some account is given in the preface to Dozy, Supp. aux Diett. Arabes. They are now in the Munich library. :

QUEBEC, a province of Canada in British North America, lying between 52° 30' and 45° N. lat., and be- tween 57° 7' and 79° 33' 20" W. long., and bounded on the N. by Labrador and Hudson's Bay, on the E. by Labrador and the Gulf of St Lawrence, on the S. by the Bay of Chaleurs, New Brunswick, and the States of Maine, New Hampshire, Vermont, and New York, and on the S.W. and W. by the river Ottawa and the province of Ontario. Its length, from Lake Temiscamingue to Anse au Sablon in the Straits of Belle Isle, is nearly 1000 miles on a due east and west course, and from Lake Temiscamingue to Cape Gaspé it is 700 miles; its breadth is 300

miles, and the area 188,694 square miles (120,764,651 acres). The sur- face of the country is exceedingly varied and picturesque, embracing several ridges of mountains and lofty hills, diversified by numerous rivers, lakes, and forests. There are many islands of great fertility and beauty, cascades and falls of considerable height, and extensive tracts of cultivable land, rendering the scenery everywhere bold and striking. Mountain ranges extend from south-west to north-east and run parallel to each other. The Notre Dame or Green Mountains, which are a continuation of the Appalachian range, extend along nearly the whole of the south side of the St Lawrence, terminating at the gulf of the same name, between the Bay of Chaleurs and Gaspé Point, where they form an elevated table-land 1500 feet high. Their chief summits are Mount Logan and Mount Murray, very nearly 4000 feet high. In the eastern townships the mountains of this range are capable of cultivation. The Laurentian range(called by Garneau the Laurentides) skirts the northern bank of the St Lawrence, forming undulat- ing ridges of 1000 feet in elevation, and extending from Labrador to the vicinity of Quebec, where it leaves the river. Keeping nearly parallel with it until within 30 miles west of Montreal, it rounds the Ottawa for 100 miles, crosses it, and curves in the direction of Kingston, From this point the range extends north- westward to the shores of Lakes Huron and Superior. The Mealy Mountains, stretching from 75° W. lat. to Sandwich Bay, are always covered with snow, and are about 1500 feet high. There are many rocky masses connected with the mountain chains lining the St Lawrence which form precipitous cliffs, often rising to a considerable height. Some of the hills of the Laurentian range are 1300 feet high, and below the city of Quebec their altitude is 3000 feet. They enclose numberless small lakes, many of which are still unexplored.

The whole country is exceptionally well watered, and abounds in numerous large rivers, bays, and lakes. The principal river is the Sr Lawrence (q.v.), which flows through the entire length of the province. A short dis- tance above Montreal it receives from the north-west the Ottawa, an interesting and beautiful stream over 600 miles in length, with its tributaries the Gatineau, the Liévre, and the Rouge. The St Lawrence is navigable for ships of the line as far as Quebec, and for steamships of over 9000 tons to Montreal. Between Montreal and Lake Ontario the navigation is interrupted

by rapids, the most important of which are the Cedar and Lachine Rapids, the latter about 9 miles above Montreal. The total elevation

between tide water and Lake Ontario is about 230 feet.

This is overcome by eight canals, varying from ? mile to 114 miles in length, in the aggregate only 41 miles of canals, with locks 200 feet long between the gates, and 45 feet wide. The St Maurice, rising in Lake Oskelaneo near the Hudson's Bay Territory, and flowing into the St

pretty falls and rapids.

QUE 165

Lawrence at Three Rivers, is over 400 miles long. It has many tributaries, and drains an area of 21,000 square miles. Twenty-four miles above Three Rivers is the fall of Shawenegan, 150 feet high. The Batiscan river enters the St Lawrence at Batiscan. Jacques Cartier, Ste Anne, and Montmorency are all on the northern side of the St Lawrence. The Montmorency is famous for its falls— situated about 8 miles from Quebec city, 250 feet high —and the natural steps on its rocky bank, 14 miles above the cataract. Near the falls is Haldimand House, once the residence of the duke of Kent, father of Queen Victoria. The Saguenay, sometimes called the River of Death, is one of the most remarkable bodies of water in the world.} It rises in Lake St John, and discharges into the St Law- rence at Tadousac, after a course of 100 miles. At its mouth the Saguenay is 2} miles wide, and the depth ex- ceeds 100 fathoms. The depth in other parts varies from 100 to 1000 feet. Inthe upper part of the river are many The Saguenay is navigable for large vessels as far as Chicoutimi, 98 miles from the mouth of the river. Fifteen miles south of Chicoutimi there re- cedes from the Saguenay Ha Ha Bay, at the head of which is the village of St Alphonse. On the south side of the St Lawrence is the Richelieu river, which drains Lake Cham- plain, and enters Lake St Peter at Sorel, and flows in a northerly direction for 75 miles. Champlain sailed up this river in 1609. Other important streams are the St Francis, rising in Lake Memphremagog ; the Chaudiére, the outlet of Lake Megantic, with its beautiful falls, 125 feet high, and situated 10 miles above Quebec; the Chateau- guay, Yamaska, Etchemin, Loup, Assumption, Becancour, and North. All these rivers are navigable, and contain fish.

Besides the rapids mentioned, there are situated a short distance above Rigaud on the Ottawa the Carillon Falls, a series 12 miles in length. Near Ottawa city are the Chaudiére Falls, or " boiling pot," less than 40 feet in height, and extending over 6 miles. Les Chats, a series of rapids 30 miles further up the Ottawa, are striking and grand. At Calumet there is another rapid. The Falls of Ste Anne are on the north shore of the St Lawrence, 22 miles below Quebec ; the Falls of St Fereol, the Long Sault, Cedars, and Lachine Rapids by no means complete the list.

The principal lakes are Lake St John, which possesses Lakes.

an area of 360 square miles, Lake Temiscamingue, 126 miles, St Peter, Metapedia, Kempt, Megantic, Memphrema- gog, Pipmuakan, the northern part of Lake Champlain, Manouan, Grand Wayagamack, Asturagamicook, Piscaton- que, Kakebonga, Mijizowaja, Keepawa, Papimonagace, Edward, Matawin, St Louis, Massawipi, Pamouscachiou, Graves, Grand, St Francis, and hundreds of others of lesser note, and all stocked with fish. The chief bays along thie coasts are Chaleurs (in part), with its bold and precipitous cliffs, Malbaie, Mille Vaches, Ha Ha, &c. Quebec's prin- cipal islands are Anticosti, sterile and almost uninhabited, Bonaventure, an important fishing station to the east of Gaspé, and the Magdalen Islands, situated in the Gulf of St Lawrence, about 50 miles north of Prince Edward Island. This group is inhabited by about 3200 persons, mostly French fishermen. Other islands are the island of Montreal, St Helen's, Jesus, the island of Orleans, 22 miles long, below Quebec, Grosse Isle, Isle aux Coudres, Hare, Bic Island,—all in the St Lawrence ; and the islands of Calumet and Allumette in the Ottawa river.

1 Bayard Taylor says it is "not properly a river. It is a tremen- dous chasm, like that of the Jordan Valley and the Dead Sea, cleft for 60 miles through the heart of a mountainous wilderness. Hvery- thing is hard, naked, stern, silent. Dark grey cliffs of granite gneiss rise from the pitch-black water; firs of gloomy-green are rooted in their crevices and fringe their suminits; loftier ranges of a dull! indigo hue show themselves in the background; and over all bends a pale, cold, northern sky."

Geology and minerals.

Beginning with the oldest rocks, the more northern part of the province of Quebec is based on the Laurentian system of Sir William Logan. This includes both the Laurentian proper and an overlying formation largely com- posed of Labrador and anorthite felspars, to which Sir William Logan gave the name Upper Laurentian, though it is now more usually known by the name Norian, applied to similar rocks in Scandinavia. This Upper Laurentian formation occupies but limited areas, one of which is near Lake St John, and another to the east of St Jerome, not far from Montreal. The Lower Laurentian of Logan, on the other hand, including the Ottawa or Trembling Mountain group and the Grenville series, extends from the Straits of Belle Isle to the Ottawa river in a continuous belt. It consists largely of gneiss and crystalline schists, and holds thick beds of limestone and beds of iron ore and veins of apatite. It is the chief seat of the iron and phosphate mining industries, and contains also the principal deposits of graphite or plumbago. It is on this formation that the remarkable forms, discovered by Dr Dawson (now Sir William), known as Hozoon canadense, and supposed to be the earliest form of animal life, occur.

The Laurentian formation is succeeded in the western part of the province by the Potsdam sandstone, a probable equivalent in age of the Upper Cambrian of Britain. On this rests a dolomitic limestone—the Calciferous formation, —and on this the great and richly fossiliferous limestones of the Lower Silurian (Ordovician) age known as the Chazy and Trenton groups. These limestones afford the best building-stone of the province, while the Potsdam sand- stone also affords a good stone of construction. Above the Trenton is the Utica shale, a dark-coloured argilla- ceous deposit, rich in graptolites and trilobites, and on this is the Hudson River group, consisting largely of sandstones and calcareous beds.

To the south-west of these rocks lie Upper Silurian and Devonian beds, the latter holding fossil plants and fishes, and at the extreme south-eastern part of the province, on the Bay of Chaleurs, is the outlier of the Lower Carboni- ferous area of New Brunswick, It is not likely that any true coal occurs in the province, though veins of hardened bitumen are found locally in the beds next to be noticed.

From Quebec eastward along the St Lawrence occurs a great series of argillaceous and arenaceous beds, the equivalents of the Upper Cambrian and Lower Silurian of the interior districts, but deposited under different con- ditions, and abounding in some peculiar forms of trilobites and graptolites, In their extension to the southward they pass into the United States. Near the boundary they begin to be associated with various crystalline rocks. These were regarded by Sir William Logan as altered Silurian beds of the Quebec group; but later observers (MacFarlane, Selwyn, and Hunt) have maintained that they are, in part at least, of greater age. They contain several important economic minerals—gold, copper, and iron ores, chrysolite used as asbestos, chromic iron, and serpentine ; marble and roofing slates are found in asso- ciated beds believed to be of Silurian age.

A large part of the country, more especially on the lower levels, is covered with Pleistocene deposits of the so- called Glacial age. The lower part of these beds consists of tile or boulder-clay with local and Laurentian boulders, and in some places a few marine shells of northern species. On this rests a finer blue clay, in some places rich in fossil shells, and known as the Leda clay. It affords a good material for the manufacture of bricks and tiles. Above the Leda clay are sands and gravels, often with travelled boulders, and named the Saxicava sand, from a shell found very abundantly in some portions of their lower part. These superficial deposits appear to imply submergence

and driftage of thick ice-fields with local glaciers descend- ing from the mountains. The prevalent directions of glacial striations is north-east and south-west or parallel to the course of the St Lawrence valley.

In certain alluvial deposits in the vicinity of the St Maurice river there occur workable deposits of bog iron ore, which have been worked for many years.

The climate of Quebec is variable. is generally steady, and the atmosphere is clear and bracing, The thermometer often registers 20°. below zero. Snow lies on the ground from the end of November until the middle of April,

affording good sleighing for five months of the year. The inhabitants enjoy with zest and spirit all the out-door sports common to the country, such as skating, curling, tobogganing, snow-shoeing, coasting, and sliding. In Montreal winter carnivals are held which attract from all parts of Canada and the United States thousands of spec- tators. Snow falls to a very great depth, and though the winds are often sharp they are not often raw or damp, nor is there any fog. The summer is warm and pleasant, and the extreme heat is indicated at 90°. The finest season of the year is the autumn, which lasts about six or eight weeks.

Vegetation develops rapidly in Quebec.

being rich and loamy, and well suited for the growth of cereals, hay, and fruit crops, all of which ripen perfectly, Wheat, barley, oats, rye, flax, pulse, buckwheat, maize, potatoes, turnips, carrots, beets, parsnips, celery, and the various roots thrive well. The principal fruits are plums, apples, melons, grapes, strawberries, raspberries, blueberries, gooseberries, cranberries, currants, and cherries. Hay has always been considered a leading crop, and much of it is exported to the United States, where it finds a ready market. Farming is carried on extensively in the eastern townships, and in all parts of the country agriculture is prosecuted with more or less activity.

The amount of land under crops in 1881 was 4,147,984 acres, and in pasture, 2,207,422 acres. The crops raised were—spring wheat, 1,999,815 bushels; winter wheat, 19,189; barlcy, 1,751,539 ; oats, 19,990,205; rye, 430,242; pease and beans, 4,170,456; buck- wheat, 2,041,670; maize, 888,169; potatoes, 14,878,287 ; turnips, 1,572,476 ; other roots, 2,050,904 bushels; hay, 1,614,906 tons; grass and clover seeds, 119,306 bushels. The number of horses in 1881 was 273,852; of working oxen, 49,287; of milch cows, 490,977 ; of other cattle, 490,119; of sheep, 889,833; of swine, 329,199. In 1881 2,730,546 tb of wool and 559,024 tb of honcy were produced.

Dense forests cover enormous tracts of territory, and afford a Forests.

principal means of revenue to the province, as well as a source of industry for the people. The chief trees are white and red pine, spruce, ash, elm, beech, birch, maple, butternut, black walnut, fir, poplar, cedar, oak, cherry,

hickory, basswood, &c. Upwards of fourteen hundred varieties of plants may be found, of which two hundred possess medicinal virtues. Lumbering is extensively carried on, and large quantities of dressed lumber and square timber are annually shipped to England.

The total value of the forest products exported in 1882-83 was Exports $11,050,002 ; of the fisheries, $719,799 ; of the mines, $516,837 ; of and im animals and their produce, $11,714,674 ; of agricultural products, ports.

$7,795,427 ; of manufactures, $1,437,254. The grand total value of the exports was $41,591,939, whereof produce of the province, $33,339,549. Of late years an active trade has sprung up in the exportation of beef and cattle to England. The imports in the same year amounted to $42,166,729 dutiable goods, and $18, 743, 142 free goods; total $55,909,871.

Shipbuilding, once a leading industry of the province, has Indus- fallen off considerably, steamships and iron vessels having supcr- tries.

seded wooden ships in the carrying trade. The number of vesscls built in Quebce during 1883 was 42, tonnage 6594. On the 31st of December 1883, the vessels registered in the province, and remaining on the registry books of the several ports, were 1738, tonnage 216,577. There were engaged in the coasting trade, including steamers and sailing vessels, 6948 craft, representing @ tonnage of 1,648,550. The number of saw and grist mills in the province in 1881 was 1729, employing 12,461 hands. There were also 419 tanneries, employing 2968 hands. Othcr industries arc shingle-making, manufactures of wool and cloth, cheese and butter making, iron-working, sash, door, and blind factories, sugar-

In winter the cold Climate.

Much of the Agricul- country is well adapted for agricultural purposes, the soil ture.

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Fish- eries.

Mineral “pro- 7 duce.

Com- munica- tion,

‘Popula- ‘lon,

-dminis. ‘ation,

QUEBEC

refining, boat-building, brewing and distilling, and the manufac- ture of edge tools, india-rubber goods, and boots and shoes. In 1871 the amount invested in industries in the province was $28,071,868 ; in 1881 it reached $59,216,992, when 85,673 men, women, and children were employed in the various industries,

$18,333,162 were paid out in wagcs, raw material to the value of

$62,563,967 was consumed, and the value of the articles produced was $104,662, 258.

Quebec derives grcat importance from its fisheries, which are ex- tensive and valuable, particularly those of the St Lawrence, which consist principally of cod, haddock, holibut, salmon, mackerel, shad, white fish, herrings, lobsters, and seals. In the lakes and rivers there are salmon, trout, and bass, and the sporting streams are among the best in the world. The right of fishing in inland waters belongs to the owners of the lands in front of or through which such waters flow. The provincial government holds a large number of uugranted lands bordering on rivers and lakes, and derives an income from the leasing of fishing privileges. A fish- breeding establishment is maintained by the Dominion Govern- ment at Tadousac, from which there are encouraging results. In 1881 there were 110 vesscls and 801 men and 4779 boats and 6929 men engaged in the fisheries. The product netted in 1882 was $1,976,515 ; in 1883 it was $2,138,997.

Game is plentiful in Quebec (wild duck, teal, wild geese, part- tridges, woodcocks, snipe, pigeons, plover, &c.), About 295 dif- ferent birds exist. Of wild animals the principal are bears, wolves, cariboo, deer, lynxes, foxes, musk rats, minks, martens, squirrels, beavers, and hares.

Gold, iron, and copper ores abound in notable quantities. The former is found chiefly on the banks of the Chaudiére in the county of Beauce. In 1881 the quantity produced was 3411 oz.; in 1883 the product was 7902 oz., realizing $140,262. Copper is obtained in the eastern townships, and iron of superior quality abounds

almost everywhere throughout the province. In 1881 the yield of

this ore was 11,326 tons; of iron, 92,001 ; pyrites, 2300; peat, 14,597 ; plumbago, 270 ; mica, 4000 tons ; building stone for dress- ing, 1,674,362 cubic feet ; roofing slate, 4593 squares. In some sections smal] quantities of lead are found.

Good waggon roads intersect the province wherever there is a settlement. In 1883 the amount expended on colonization roads by the local government was $71,392. Telegraphic lines are established throughout the province, each line of railway, besides the great roads, having special wires. The postal facilities are excellent, and regular mails penetrate every part. Railway com- munication is ample and extensive, the chief lines being the Grand Trunk, the Canadian Pacific, and the Intercolonial. In 1884 Quebec had 1942 miles of railways in operation, while other lines are under construction and projected. The canal system is very complete, and commerce is greatly helped by the several water- Ways in operation. These are the Lachine Canal extending from Montreal to Lake St Louis ; the Beauharnois Canal, uniting Lakes St Francis and St Louis ; the Chambly Canal uniting Lake Cham- a with the Richelieu river; and the Carillon and Grenville

anal.

The province is divided into sixty-three counties, with a total area of 120,764,651 acres. Up to the 30th of June 1883 the total superficies of disposable lands surveyed and subdivided into farm lots was 6,539,160

acres, The population was 1,191,516 in 1871; in 1881 it was 1,359,027 (678,175 males and 680,852 females), The prevailing religion is that of the Roman Catholic Church, of which there are seven dioceses, viz., the archdiocese of Quebec, and the dioceses of Montreal, Three Rivers, St Hyacinthe, Sherbrooke, Rimouski, and Chicoutimi. The Protestant dioceses are two in number—Quebec and Montreal. According to the census of 1881 the religious denominations in the province were as follows :—

Church of Rome…....cssccesses MTOM SH PAV ONtIOtGl… nss-.scsceesasscceeees 4,210 Church Cig AgIANG..,.....10600, 68,797 | Other denominations…..... 5,647 BEROYCCTIANIB:.<.+s0c-cecsansesnsees 50,287 | Of MOTELIBION.....0000recee0ee 432 Methodists… 39,220 | No creed stated …....c.cseoseceess 2,609 aptists… SIBDO MMC WStscsscestssrseecrsesscrescersessecs 989 Congregationalist 5,244 nee

1,359,027

The greater portion of the population is composed of French- Speaking people, natives of the soil. There are also a good many Scotch, English, and Irish, and their descendants. The Indians, mostly of the Algonquin, Iroquois, Huron, Abenakis, and Micmac tribes, number 7515, scattered in various parts of the province on Teservations which they cultivate with more or less assiduity. They are peaceably disposed, and live in harmony.

The affairs of the province are administered by a lieutenant- §overnor and an executive council composed of six members with portfolios, assisted by a legislative assembly of sixty-five members, and a legislative council of twenty-four councillors. The latter hold their appointments for life, and the former are elected by the people every five years. The lieutenant-governor is appointed by the Severnor-general in council. Quebec returns to the Dominion House of Commons sixty-five representatives, and twenty-four appointees to the Dominion Senate.

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The public revenue in 1883 amounted to $4,655,757, and the Finance, expenditure was $3,962,015. The principal source of revenue is the annual

subsidy granted to the province, under the terms of the B,N.A. Act of 1867, by the Dominion Government. This subsidy in 1883 amounted to $959,252, and interest on trust funds in the hands of the Dominion Government, $55,459. The remainder of the revenue is derived from the crown domain and timber limits, licences, stamps on law and registration documents, and other mis- cellaneous receipts. The administration of justice cost in 1883 the sum of $372,400.

The judiciary consists of a Court of Queen's Bench, with a chief justice and five assistants ; a superior court, with a chicf justice and twenty-eight assistants ; a court of review, with three judges forming a quorum ; a court of vice-admiralty ; courts of quarter sessions ; and courts for the summary trial of petty causes. The provincial legislature meets at Quebec.

The militia (military districts Nos. 5, 6, and 7, operating under Militia. the Canada Militia Act of 1883) consists of an active force by arms of the following :—cavalry, officers and men, 448; field artillery, 321 ; garrison artillery, 598 ; engineers, 87 ; infantry, 9885 ; rifles, 924 ; total, 12,258. The number of active militia men authorized for annual drill during 1888 was 7965. Schools of cavalry and gunnery, situated at Quebec, and one of infantry at St J olin's, have been established for the purpose of training officers and non-com- missioned officers of the militia.

Education in Quebec is under the control of a superintendent Eduea- and a council of public instruction appointed by the Government. tion. The council is divided into two sections, called Roman Catholic and Protestant committees, who act independently, and, through the superintendent, control the Roman Catholic and Protestant institu- tions respectively. The province is divided into school municipali- ties containing from one to twenty-five schools each, under five commissioners elected by the people. As the school system includes religious instruction, the religious minority (Catholic or Protestant) in any municipality may separate from the majority, and organize schools of their own, under three trustees, and receive their proper share of the Government grant. Every citizen pays a tax which is levied on his property for the support of primary schools. In Montreal, Quebec, and Sherbrooke the Roman Catholics and Pro- testants are entirely separate for educational purposes. Thirty-six inspectors visit

the schools twice a year, and report to the Govern- ment, by whom they are appointed and paid. In 1883 there were in the province 1071 municipalities, including 4404 elementary schools, 383 model schools, 246 academies, 31 colleges, 18 special schools, 3 normal schools, and 3 universities, making a total of 5038 institutions, attended by 245,225 pupils, under 6871 teachers. In support of these schools, the local contributions amounted to $2,809,739, and the Government grant to $352,677. The two Pro- testant universities are M'Gill University at Montreal, founded in 1821, and Bishops College at Lennoxville, founded in 1843. The Roman Catholic university (Laval) was founded by the Quebec seminary in 1852. It has a succursale at, Montreal.

The public charitable institutions receiving aid from the Govern- Charities. ment are Beauport, St Ferdinand de Halifax, and St Jean de Dieu lunatic asylums. Grants are annually made to about ninety other institutions, including industrial schools and reformatories, the total amount reaching in 1883 $301,121.

The capital is QuEBEC (q.v.). The largest and most important Towns. city is MONTREAL (g.v.). Other chief towns are Three Rivers, population 8670, so-called from the St Maurice, which here joins the St Lawrence by three mouths (it is one of the oldest cities, and the seat of a large lumber and iron trade); St Hyacinthe, 5321; Levis, 7597, where the quarantine for cattle is situated ; Sorel, 5791; St John's, 4814; St Francois, Beauce, 4181; Sher- brooke, 7227; Valley Field, 3906; Malbaie, 3014; Baie St Paul, 3794 ; St Henri, 6415; Hull, 6890; St Jean Baptiste, 5874. ;

The quarantine station is at Grosse Isle, an island in the river St Lawrence, 314 miles below Quebec. It is 24 miles long by 1 mile in width.

History. —Quebec was first visited by the French, under Jacques Cartier, in 1535, and a second time in 15386, though it is said that Sebastian Cabot discovered the country in 1497. The regular settlement of the province, however, was not made until 1608, when Samuel de Champlain landed at the site now occupied by Quebec city. Here he established military and trading posts, and it was not long before the new possession became the seat of the Récollet and Jesuit missions, which were zealously carried on under the most trying circumstances for nearly a century and a half, The early settlers endured countless hardships from the incursions of the

Indians, and the frequent wars in which they were forced to engage with the English and Dutch. In 1759 the marquis of Montcalm was defeated at Quebec by an English army under General Wolfe. A year later the French surrendered all their important ports, and the colony passed under English rule. In 1763 the treaty of Paris was signed, by the terms of which, and the conditions laid down a few years later in the memorable Quebec Act of 1774, the French were guaranteed by England their

laws, language, and religion. In 1791 the province was divided into Upper and Lower Canada, but in 1841, after a series of internal dissensions, ineluding the rebellion of 1837, and several politieal quarrels, the country was again united. In 1867 the provinees of old Canada, under the names of Ontario and Quebee, were erected with New Brunswick and Nova Seotia into the Dominion of Canada. (G. ST.) QUEBEC, the ancient capital of Canada, and present capital of the province of Quebec, is situated on the north- west bank of the river St Lawrence at its junction with the St Charles, about 300 miles from the Gulf of St Lawrence and 180 miles below Montreal, in 46° 49’ 6” N. lat. and 71° 13’ 45” W. long. It is the most picturesque and most strongly fortified city on the continent. Quebec is built on the northern extremity of an elevated table-land which forms the left bank of the St Lawrence for a distance of 8 miles. The highest part of the headland is Cape Diamond, 333 feet above the level of the water, and crowned by the citadel, which covers an area of forty acres, and presents a bold and precipitous front on the south-east side, while towards the north and west the declivity is more sloping and gradual. The harbour of Quebec is spacious and capable of accommodating ships of the largest tonnage, and its docks and tidal basin, when completed, will rank among the most perfect works of the kind in the world. They are constructed of lime- stone and iron, and, including the graving dock on the Levis side of the river, will cost very nearly three millions of dollars. The harbour is protected towards the north-east by the island of Orleans, on either side of which there is an approach. The spring tides rise and fall about 18 feet. Quebec is divided into upper and lower town,— access to the former being obtained by a steep and winding street, several flights of narrow steps, and an elevator. In the lower town are situated the principal banks, merchants’ offices, and wholesale

and retail storos. The streets, with one or two exceptions, are narrow and irregular. In the upper town, where the streets-are wider and well-paved, are the better class of dwelling houses, the public buildings, most of the churches, the public walks and gardens, retail stores and small shops. To the west are the suburbs of St John, St Louis, and St Roche. The latter occupies the lower plain, and is rapidly becoming a place of commercial importance. The other two suburbs are on the same level with the upper town. South-west of St John stretch the historic Plains of Abraham. On this battle-ground a column 40 feet high has been erected to mark the spot where General Wolfe in 1759 died victorious. In the governor's garden, which overlooks the St Lawrence, is a stately monument 65 feet in height, which is dedicated to the memory of Wolfe and Montcalm. An iron pillar surmounted by a bronze statue, the gift of Prince Napoleon Bonaparte, stands on St Foye road, and commemorates the achievements of the British and French troops in 1760. Four martello towers occupy commanding positions. A point of interest in the upper town is Dufferin Terrace, a magnificent promenade 1400 feet long and 200 feet above the level of the river. Part of this terrace occupies the site of the old Chateau St Louis, which was destroyed by fire in 1834. The view from the platform is very striking and beautiful. The Grand Battery also affords a fine prospect. Quebec was once the walled city of the north, but several of its ancient fortifications have been dismantled, and the old gates

taken down. There are three gates now, instead of five as in former years, viz., St Louis, Kent, and St John's, each of — which is very handsome and massive. Among the principal edifices are the parliamentary and departmental buildings, —a stately pile situated on Grande Allée,—the new court house now building, the post office, custom-house, city hall, masonic hall, the Basilica, or Roman Catholic cathedral (an. irregular cut-stone building 216 feet long by 180 feet wide, and containing many fine oil paintings), the archi- episcopal palace, the Anglican cathedral (a plain structure in the Roman style), the skating rink, and the hall of the Young Men's Christian Association ; four large markets — supply the people with

meat and country produce. There are eight Roman Catholic churches, five Church of England, two Presbyterian, one Methodist, one Baptist, one Lutheran, one Congregational, one Scandinavian, one French Pro- testant, and a Jewish synagogue, which is situated in the

Plan of Quebec.

Masonic Hall. Laval University, which derives ifs name from the first bishop of Quebec, who founded in 1663 the seminary for the training of priests, is the principal educational establishment of the Roman Catholics. It was instituted in 1852 by a royal charter from Queen Victoria and a charter from Pope Pius IX. The building is large and spacious, and the university, which is held in high esteem, is well equipped with apparatus, a library of over 85,000 volumes, a museum, geological specimens, and a picture gallery, Laval has a strong staff of professors, lay and clerical, and the faculties are theology, law, medicine, and arts. In connexion with this institution are the grand seminary founded in 1663, where theology is taught, and the minor seminary for literature and philosophy. Laval Normal and Model School, the Ursuline Convent,—a very large establishment for the education of young ladies, founded in 1641,—the Convent of the Good Shepherd, and several nunneries complete the list of

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Roman Catholic educational institutions. Morrin College (Presbyterian) was founded by Dr Morrin, and is affiliated with M'Gill University. Other Protestant schools are the boys' high school, the girls' high school, a number of academies, and public and private schools, all in a state of efficiency. In 1881 the number of children attending the various schools in Quebec was 9889, of whom half were girls. There is no free public library in the city, but the Literary and Historical Society,—the oldest chartered institution of the kind in Canada, founded by Lord Dalhousie in 1824,—the Canadian Institute, the Geo- graphical Society, the Young Men's Christian Association, the Advocates' Library, and the Parliamentary Library have valuable collections of books. The principal benevolent institutions are the marine hospital, the Hétel Dieu, founded in 1639 by the duchess of Aiguillon, the general hospital (1693), the Finlay Asylum, the Jeffrey Hale Hospital, the Church of England Female Orphans' Asylum, the Ladies'

Protestant Home, St Bridget's Asylum, Grey Nunnery, and the lunatic asylum at Beauport. Nine daily newspapers are published at Quebec, six of which are in the French language. A good supply of water is afforded from Lake St Charles, but the city has suffered so severely from devastating fires in the past that in 1883 the common council ordered an additional pipe to be laid at a cost of half a million of dollars. Quebec is well lighted with gas and the electric light. Connexion is had with all parts of Canada and the United States by several railway lines, and the city is at the head of ocean steam- ship navigation to Europe. There are two lines of street cars. The head offices of three banks are situated in Quebec, viz., the Quebec Bank, the Union Bank of Lower Canada, and La Banque Nationale. Besides these there are two savings banks, the Post Office Savings Bank, and the agencies of the Bank of Montreal, the Bank of British North America, and the Merchants' Bank. The population of the city in 1871 was 59,699 ; in 1881, 62,446 (28,923 males and 33,523 females),—6200 being Protestants.

Shipbuilding was formerly one of the chief industries of Quebec, but of late years very few wooden ships have been built. In 1883 the number was twenty-five, representing a total tonnage of 4596 tons. Manufacturing is carried on to some extent, the principal manufactures being iron castings, machinery, cutlery, nails, leather, Musical instruments, boots and shoes, paper, india-rubber goods, ropes, tobacco, steel, &c.

Quebec's staple export is timber, the greater portion of the ship- ments reaching town from the Ottawa and St Maurice districts. The rafts floating down the river are collected in the coves, and fastened by booms are moored along the banks. These coves extend along the river for upwards of 6 miles above the city. On the right bank of the stream, not far from Quebec, are extensive sawmills. The port is one of the leading emporiums of the export trade between Canada and Great Britain. The number, tonnage, and crews of the vessels entered and cleared at Quebec for several years is as follows :—

Entered.

Cleared.

No. Tons. Crews. No. Tons, Crews. 1880 657 675,634 A221 611 572,562 14,587

1881 783 802,186 19,888 851 847,615 20,225 1882 642 676,327 17,675 680 681,235 17,162 1883 682 737,059 18,687 653 631,213 15,652 1884 693 767,395 19,351 698 686,790 16,408

_ Large quantities of timber—especially white pine (10, 427,000 feet in 1883), oak, and red pine—are exported from Quebec. The total value of exports in 1883 was $9,268,983 ; of imports $4,976,713, and of import duty received $823,213°63. The value of the real estate is set down at $24,000,000.

The city returns three members to the Canadian House of Cominons, and three to the provincial House of Assembly. It is governed by a mayor, eight aldermen, and sixteen councillors, who hold their offices for two years. Quebec is the seat of the Roman Catholic archbishop, and the see of the bishop of the Church of England. _ Quebec was first visited by the French navigator Jacques Cartier in 1535, when it consisted of a sparsely-settled Indian village called

Stadacona. In July 1608 the city was founded by Champlain, who bestowed on it its present name. Its growth was slow, and the humerous wars with the Indians and the English rendered the work of colonization and scttlement precarious and difficult. In 1629 the English captured it, but three years later it was restored to the French. In 1663 the colony was created a royal govern- ment, and Quebec became the capital. In 1690 Sir William Phips with a numerous fleet attempted to reconquer it, but the French governor, Count de Frontenac, destroyed many of his vessels and forced the English to fly. The French held possession until 17 59, when it fell into the hands of the British under Wolfe, and it was finally ceded to Britain by the treaty of Paris in 1763. In 1775 General Montgomery with an American force attacked the city, but he perished before its walls and his troops were dispersed. Since then its capture has not been again attempted. (G. ST.)

QUEDAH or Kepau. See Manay Pxznisuta, vol. RV. p. a22t

QUEDLINBURG, an ancient town of Prussian Saxony, in the district of Magdeburg, is pleasantly situated on the Bode, near the north-west base of the Harz Mountains. It is still partly surrounded by a turreted wall. On the west it is commanded by the old chateau of the imperial abbesses of Quedlinburg, with the interesting abbey church, the body of which was erected in the 11th century. In the crypt, dating from the 10th century, are interred Henry the Fowler and his wife Matilda. The Late Gothic town-house, with additions of the 18th century, contains a good collection of local antiquities. The town also pos- sesses several other churches and numerous schools and charitable foundations. Quedlinburg is famous for its nurseries and market-gardens, and exports vegetable and flower seeds to all parts of Europe and America. It sup- plies most of the seed used for the cultivation of beet- root for sugar in Silesia, Austria, and Poland. It also carries on manufactures of cloth, iron, and chemicals, and a trade in grain and cattle. The poet Klopstock was a native of Quedlinburg. The population in 1880 was 18,437, almost all Protestants.

The town of Quedlinburg, which was founded by Henry the Fowler about the year 930, on the site of the old village of Quit- lingen, became a favourite residence of the Saxon emperors, and was the scene of several diets and assemblies of pas It after- wards joined the Hanseatic League, and attained its greatest pro- sperity in the 13th or 14th century. The convent was established a few years after the town, and was also richly endowed with lands and privileges. The abbesses, who were frequently members of the imperial house, ranked among the independent princes of the German empire and had no ecclesiastical superior except the pope. The town at first strove zealously to maintain its independence against the abbess, and to this end called in the aid of the bishops of Halberstadt. In 1477, however, the abbess Hedwig, aided by her brothers Ernest and Albert of Saxony, forecd the bishops to renounce their claims; and for the next two centuries both town aud abbey remained under the protection of the electors of Saxony. In 1539 the Reformation was embraced, and the nuniery was couverted into a Protestant sisterhood. In 1697 the elector of Saxony sold his rights over Quedlinburg to the elector of Branden- burg, whose troops forthwith entered the town. The abbesses retained their right of private jurisdiction, aud the disputes between them and the Prussian Government were not finally scttled till the secularization of the abbey in

1803. The last two abbesses were tlie Princess Anna Amelia (1755-1787), sister of Frederick the Great, and the Princess Sophia Albertina, daughter of King Adolphus Frederick of Sweden.

QUEEN ANNE'S BOUNTY is the name applied to a perpetual fund of first-fruits and tenths granted by a charter of Queen Anne, and confirmed by statute in 1703 (2 & 3 Anne, c. 11), for the augmentation of the livings of the poorer Anglican clergy. First-fruits (annates) and tenths (decimex) formed originally part of the revenue paid by the clergy to the papal exchequer. The former consist of the first whole year's profit of all spiritual preferments, the latter of one-tenth of their annual profits after the first year. Benefices under the annual value of £50 are now exempt from the tax. The income derived from first-fruits and tenths was annexed to the revenue of the crown in 1535 (26 Hen. VIII. c. 3), and so continued

until 1703. Since that date there has been a large mass of legislation dealing with Queen Anne's Bounty, the effect of which it is impossible to deal with fully in this place. The governors consist of the archbishops and _ bishops, some of the principal officers of the Government, and the chief legal and judicial authorities) The augmentation proceeds on the principle of assisting the smallest benefices first. All the cures not exceeding £10 per annum must have received £200 before the governors can proceed to assist those not exceeding £20 per annum. In order to encourage benefactions, the governors may give £200 to cures not exceeding £45 a year, where any person will give the same or a greater sum. The average income from first-fruits and tenths isa little more than £14,000 a year. In 1883 the trust funds in the hands of the governors amounted to £4,806,717. The grants in 1883 amounted to £15,400, the benefactions to £20,195. The accounts are laid annually before the queen in council and the Houses of Parliament. The duties of the governors are not confined to the augmentation of benefices. They may in addition lend money for the repair and rebuilding of residences and for the execution of works required by the Ecclesiastical Dilapidations Acts, and may receive and apply compensation money in respect of the enfranchise- ment of copyholds on any benefice. The governors are unpaid ;

the treasurer and secretary receives a salary of £1000 a year. He is appointed by patent under the great seal, and holds office during the pleasure of the crown.

QUEEN CHARLOTTE ISLANDS, a group of islands lying off the west coast of British Columbia, to which they belong. They were so called by Captain Dixon, who visited them in the "Queen Charlotte" in 1787, and spent more than a month on their coasts. They are com- posed of two chief islands, Graham Island to the north and Moresby Island to the south, separated by a very narrow channel; but around these, especially in the south, are innumerable smaller islands. The whole group has the form of a wedge with the point towards the south. The extreme length is about 180 miles, and the greatest breadth 60 miles. The total area cannot be determined, as the longitude of the west coast has not yet been definitely ascertained. See vol. iv. Pl. XXXV.

The islands are mountainous, and appear to be a parti- ally submerged continuation of the mountain-chain tra- versing Vancouver's Island, which lies to the south, separ- ated from the group by Queen Charlotte Sound. The mountains are situated more particularly in the southern island, which is little more than a skeleton of mountains washed at their base by the waters of numerous inlets. Many summits here rise above 5000 feet in height. The larger island to the north, which has a length of about 77 miles and a breadth equal to the maximum breadth of the group, is in general lower, though here also there are hills rising to between 2000 and 3000 feet. Both the mountains and lowlands are well wooded, but in general the timber is not found in accessible spots in sufficient quantity to encourage attempts to develop the lumber trade. At present the principal commercial resources of the islands are derived from the fish that frequent these shores. Immense shoals of dog-fish visit the north and north-east, and they are utilized for their oil by a com- pany established on Skidegate Inlet on the east side of Moresby Island. Holibut, herring, salmon, cod, and coal- fish or "skil" (this last also rich in oil and a valuable food-fish) are likewise abundant. The climate is extremely moist, especially on the west side of the watershed.

Geologically the group appears to be composed mainly of Triassic, Cretaceous, and Tertiary strata, with intrusive masses here and there of

granite and other igneous rocks. The Triassic deposits occupy almost the whole of the

‘which he spent some time in foreign travel.

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southern part of the group, and it is uncertain whether some Paleozoic rocks may not be exposed at certain points, as they are in corresponding situations on the mainland of British Columbia. The Cretaceous deposits lie uncon- formably on those of Triassic age on both sides of Skide- gate Inlet and Channel (in the south of Graham Island and north-east of Moresby Island), and are interesting geologically from containing a bed of anthracitic coal. These deposits are again unconformably overlaid by those of Tertiary age extending over the greater part of Graham Island ; and the unconformity in this case is accompanied by evidence of great disturbance, indicating that this was the chief period of mountain-making in the group.

The islands are inhabited by an interesting race of Indians called the Haidas, who are chiefly found on the coasts, where they support themselves by fishing, partly also by the cultivation of the potato, which was probably introduced among them by some of the early voyagers. They tattoo their bodies, sometimes paint their faces, and have many singular customs; but their greatest peculi- arity consists in their habit of erecting great numbers of carved posts as ornaments in front of their dwellings. Their number is rapidly decreasing, and in the last official report on the exploration of this group (Victoria, 1884), it is estimated at only eight hundred.

The fullest account of the Queen Charlotte Islands and their inhabitants is to be found in the report of George M. Dawson in the Report of Progress for 1878-79 of the Geological Survey of Canada.

QUEENSBERRY, James Dovcias, sECOND DUKE oF (1662-1711), was the eldest son of William, third earl and first duke, high treasurer of Scotland, and Isabel Douglas, sixth daughter of William, first marquis of Douglas. He was born at Sanquhar Castle 18th Decem- ber 1662, and educated at the university of Glasgow, after He sided with the prince of Orange at the Revolution, and was appointed a privy councillor, and

colonel of the Scotch troop of horse guards. On the death of his father in 1695 he succeeded him as extraordinary lord of session, and was also appointed keeper of the privy seal. In 1702 and 1703 he was appointed by Queen Anne secretary of state, and commissioner to the parliament of Scotland. In the latter year he was deprived of his offices, but he was again restored in 1705, and in the following year was constituted high commissioner on the part of Scotland for carrying out the Treaty of Union between the two king- doms, which, chiefly owing to his influence and skill, was completed in 1707. In recognition of his services he received a pension of £3000 per annum, and on the 26th May 1708 was created a British peer by the title of duke of Dover. On 9th February 1709 he was appointed third secretary of state. He died 6th July 1711.

QUEEN'S COUNTY, an inland county in the province of Leinster, Ireland, is bounded N.W. and N. by King's County, E. by Kildare and a detached portion of King's County, 8. by Carlow and Kilkenny, and W. by Tipperary. Its greatest length from east to west is about 35 miles, and its greatest breadth from north to south about 30 miles. The area is 424,854 acres, or about 663 square miles. The surface is for the most part level or gently undulating, but in the north-west rises into the elevations of the Slieve Bloom Mountains, the highest summit being Ardern, 1733 feet. Like the level country, they belong to the limestone formation, but are wrapped round with folds of Old Red Sandstone. In the central part of the county there is a large extent of bog. The south-east portion is included in the Leinster coal-field. Iron ore, copper, and manganese are found in small quantities. Potter's clay is plentiful; and slate, sandstone, and marble are quarried in some places. Nearly the whole of the

Plate III,

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county is drained either by the Barrow, which has its source in the Slieve Bloom Mountains, and forms at various points the boundary with King's County, Kildare, and Carlow, or by the Nore, which enters the county from Tipperary near Borris-in-Ossory, and flows east and then south till it reaches Kilkenny. The lakes are few and small, the largest being Lough Anaghmore on the north- western boundary. The Grand Canal enters the

county at Portarlington, and runs southwards to the Barrow in Kildare, a branch passing westwards 12 miles to Mount- mellick.

Agricultwre.—The climate is dry and salubrious. Originally a great extent of the surface was occupied with bog, but by draining much of it has been converted into good land. For the most part it is very fertile except in the hilly districts towards the north, aud there is some remarkably rich land in the south-east. The total extent under crops in 1884 was 129,617 acres, of which 73,536 acres were under tillage and 56,081 acres under incadow and clover, Of the 42,755 acres under corn crops 639 acres were under wheat, 24,467 acres under oats and 17,639 acres under barley. Of the 30,601 acres under green crops, 15,888 were under potatoes, and 12,077 under turnips. Dairy farming is extensively carried on. The total number of cattle in 18883 was 78,496, of which 20,421 were mileh cows. There were 70,530 shcep, 33,834 pigs, 5433 goats, and 249,619 poultry. Horses and mules numbered 14,494, and asses 5742,

Agriculture forms the chicf occupation, but the manufacture of woollen and cotton goods is carried on to a small extent.

Railways. —The Great Southern and Western Railway crosses the country from north-east to south-west with stations at Portarling- ton, Maryborough, Mountrath, and Ballybrophy. At Portarlington a branch passes westward to Mountmellick ; there is also a branch passing southward from Maryborough, and another passing west- ward from Ballybrophy.

Adminstration.—The county is divided into cleven baronies, and contains 53 parishes and 1156 townlands, Ecclesiastically it is in the dioceses of Leighlin and Ossory, with portions in those of Kil- dare, Killaloe, and Dublin. Judicially itis in the home circuit, Assizes are held at Maryborough, the county town, and quarter sessions at Abbeyleix, Borris-in-Ossory, Carlow-Graigue, Mary- borough, Mountmellick, and Stradbally. There are fifteen petty sessions districts. The poor-law unions of Abbeyleix and Donagh- more are wholly within the county, and portions of those of Athy, Carlow, Mountmellick, and Roscrea. The county is included in the Dublin military district, and there is a barrack station at Maryborough.

Population.—Within the last forty years the population has diminished by more than one-half, Jn 1841 it numbered 153,930, which in 1871 had diminished to 79,765, and in 1881 to omleile The following were the largest towns :—Mountmellick(3126), Mary- borough (2872), Portarlington (partly in King's County) (2357), and Mountrath (1865).

History.—Anciently the territory now included in Queen's County was divided between the districts of Leix, Offaly, Clamnaliere, and Ossory. In the reign of Philip and Mary, it was made shire ground under the name of Queen's County, in honour of the sovercign, the place chosen for the county town being named Maryborough. 'Threc miles south of Stradbally is Dun of Clopook, an ancient dun or fort occupying the whole extent of the hill, and there is another large fort at Lugacurren, Aghaboe, where there are the ruins of the abbey, was formerly the seat of the bishopric of Ossory. There are no remains of the Abbey of Timahoe founded by St Mochua in the 6th century, but in the neighbourhood of the site there is a fine round tower. Among the principal old castles are the fortress of the O'Moores in ruins occupying the precipitous tock of Dunamase, three miles east of Maryborough, Borris-in- Ossory on the Nore, and Lea castle on the Barrow, 2 miles below Portarlington, erected by the F itzgeralds in 1260, burnt by Edward Bruce in 1315, again rebuilt, and in 1650 laid in ruins by the soldiers of Cromwell.

QUEENSLAND, a British colony, the north-eastern portion of Australia, is situated between New South Wales and Torres Strait, and between the Pacific Ocean and the Northern Territory of South Australia. Its southern boundary is about 29° S. lat.; its western is 141° E, long. from 29° to 26° S. lat., and 138° E. thence to the Gulf of Carpentaria; its northern is about 9° °S. including the Torres Straits islands. In extreme length it is 1400 miles; in breadth, 1000. Its area is 669,520 square miles, or about 5} times that of the United Kingdom. The popula- tion is under 300,000.

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With a seaboard of over 2500 miles, it is well favoured with ports on the Pacific side. Moreton Bay receives the Brisbane river, on whose banks Brisbane, the capital, stands. Maryborough port is on the Mary, which flows into Wide Bay; Bundaberg, on the Burnett ; Gladstone, on Port

Curtis; Rockhampton, up the Fitzroy (Keppel Bay) ; Mackay, on the Pioneer ; Bowen, on Port Denison : Townsville, on Cleveland Bay. Cairns and Port Douglas are near Trinity Bay ; Cardwell is on Rockingham Bay; Cooktown, on the Endeavour; Thursday Island port, near Cape York; and Normanton, near the Gulf of Car- pentaria. The new gulf port is at Point Parker. The quiet Inner Passage, between the shore and the Great Barrier Reef, 1200 miles long, favours the north-eastern Queensland ports. Ipswich, Toowoomba, Oxley, Been- leigh, Maryborough, and Mackay are farming centres ; Warwick, Roma, Clermont, Blackall, Aramac, Hughenden, and Mitchell are pastoral ones. Gympie, Charters Towers, Ravenswood, and Palmerville are gold-niining towns ; while Stanthorpe and Herberton have tin mines. Town- ships are laid out by Government as occasion requires, There are fifteen large districts, viz., Moreton, Darling Downs, Wide Bay, Burnett, Maranoa, Warrego, and South Gregory, southward; Port Curtis, Leichhardt, South Kennedy, Mitchell, and North Gregory, central ; North Kennedy, Burke, and Cook, northward. Cape York Peninsula is the northern limit. A few persons were sent to the Brisbane in 1826; but the Moreton Bay dis- trict of New South Wales was thrown open to coloniza- tion in 1842. Jt was named " Queensland " on its separa- tion from the mother colony in 1859. A natural but unfounded prejudice against its supposed warmer position retarded its progress, or confined its few inhabitants to pastoral pursuits. The discovery of abundant wealth in minerals and sugar-lands, with the growing conviction of its singular salubrity, greatly advanced the immigration prospects of the colony. A broad plateau, of from 2000 to 5000 feet in height, extends from north to south, at from 20 to 100 miles from the coast, forming the Main Range. This region is the seat of mining, and will be of agriculture. The Coast Range is less elevated. A plateau goes westward from the Great Dividing Range, throwing most of its waters northward to the gulf. The Main Range sends numerous but short streams to the Pacific, and a few long ones south-westward, lost in earth or shallow lakes, unless feeding the river Darling. Going northward, the leading rivers, in order, are the Logan, Brisbane, Mary, Burnett, Fitzroy, Burdekin, Herbert, Johnstone, and Endeavour. The Fitzroy receives the Mackenzie and Dawson ; the Burdekin is supplied by the Cape, Belyando, and Suttor. The chief gulf streams are the Mitchell, Flinders, Leichhardt, and Albert. The great dry western plains have the Barcoo, Diamantina, Georgina, Warrego, Maranoa, and Condamine. There are few lakes. A succession of

elevated and nearly treeless downs of remarkable fertility contrasts with the heavily timbered country favoured by the rains. Cape York Peninsula is an – epitome of Queensland. There is good land alternating with bad. The hills are rich in gold, silver, copper, tin, and coal. The forests are valuable, and the scrub is dense. Flats near the mouths of the many streams are admirable for sugar-cane and rice, while rising slopes suit coffee trees. West of the range dividing the gulf waters froin the Pacific is a sandy grassless region where the only vegetation is a poisonous pea. Suddenly the traveller passes from this desert to the glorious downs around Hughenden, a garden-land beside the Flinders. Farther north-west is the charming Leichhardt river district, and the marvellous mineral Cloncurry highland. Southward of 'that again is the country of the Diamantina and

Georgina, with little rain, but having vast tracts of good black soil threaded by slight ridges of barren sandstone. Droughts are there followed by floods from thunder showers. The south-western portion is inferior to all, having heavy sand-rises between the grassy belts. Still the pastoral settlers are taking up areas there. All that dry warm west is remarkably healthy for man and beast. The productive and better-watered part between the Main Range and the Pacific has the principal population.

Climate.—The coast-lands, with an annual rainfall of from 40 to 130 inches, are favoured by the south-east trade-winds and the summer north-west monsoons. Dur- ing 1882 there fell at Johnstone river, 17° 8., nearly 160 inches on one hundred and ninety-seven days. Northern Queensland, up to the ranges, is well watered. Central and southern districts are not so aided by the monsoons. The highlands have on their eastern side from 30 to 70 inches, but on their western only from 15 to 30. The gulf region has from 30 to 60. The southern hills have far less rain than the northern ones. The arid western area depends on occasional thunderstorms, though nature provides a grass that long resists the drought. The low south-west basin, trending to the depressed lake region of South Australia, has repeatedly seasons of intense dryness. In temperature, Brisbane has a mean of 69°—between 34° and 105°. The hilly districts, even in the tropics, have slight frosts in winter, but a high barometer in the dry warm weather. North

Queensland has less heat than its latitude would seem to threaten. Tropical ports show a lower summer thermometer than may sometimes be seen in Sydney, Adelaide, and Melbourne. The western heat is stimulating in its dryness and electrical condition. The oppression on the northern coast is felt during the rainy season, though the showers cool the air. The prevalence of south-east winds off the sea mitigates the trials of summer. The dreaded "hot wind," brought southward by the usual course from central Australian deserts, descends upon the southern colonies, avoiding Queensland. Still the ordinary western breeze, passing over so great an expanse of land, while posftively cold on winter nights, is sufficiently hot during the summer.

In a recent year the colonial registrar-general gave the death-rate of Brisbane municipality at 13 in the thousand, Toowoomba 17, and Rockhampton 15. In tlie tropics it was 12 at Charters Towers and Cooktown, 15 at Towns- ville; but 29 at Mackay, where the sickly Polynesians abound. The prevalent diseases are rather from disordered liver and bowels than lungs and throat. Low fevers, seldom fatal, continue for a time in all newly 'opened-up country throughout Australia, as in America. Female mortality, even in the tropical ports, is considerably less than that of males. Infants, as a rule, thrive better in the colony, according to numbers, than in England. Cooktown, in lat. 16° S., is regarded by some as the sana- torium of the future. Queensland can give invalids any climate they may desire—moist and equable, dry and exhilarating, warm days and cool nights, soft coast airs for bronchial affections, and more bracing ones for other consumptives.

Geology.—Queensland is geologically connected with New South Wales and Victoria by the great chain of hills continued through the eastern portion of Australia, from Cape York to Bass's Strait. That immense range consists largely of Paleeozoic formations with igneous rocks. The granites, porphyries, and basalts have greatly tilted and metamorphosed the sedimentary deposits of Silurian, Devonian, Carboniferous, and Oolitic ages. The width of this elevated and mineral part of the colony varies from 50 to 400 miles. Ancient formations, however, rise in the broad western plains, and everywhere indicate metallic

treasures. Nearer the eastern coast granite and porphy- ritic rocks appear in greater force than .in the Dividing Range, and the voyager rarely loses sight of them all the way from Moreton Bay to Cape York. They add much to the attractiveness of the scenery, especially in Whit- sunday Passage. The old sedimentary strata consist of sandstones, limestones, conglomerates, and slates of vari- ous kinds. The Carboniferous beds are of great extent, occupying thousands of square miles (perhaps as many as 100,000), on the highlands, and on both sides of the Main Chain. It is in north and central Queensland that the mineral is found of the true Paleozoic character, bearing the distinctive floral features of the English and New South Wales Newcastle formation, The Jurassic and Liassic rocks of the southern hilly districts are rich in cannel coal. The Wollumbilla beds are similar to the Upper Wiannamatta ones of New South Wales. The Mesozoic or Secondary formations prevail largely to the westward. Ammonites, belemnites, and ichthyosauri de- clare the same condition of things as once existed in the English midlands. The Cretaceous and Oolitic series on the western plains occupy nearly a third of Queensland, and their grassy surface is being rapidly covered with flocks of sheep.

pials. A monster bird, like the New Zealand moa, twice as large as the existing emu, once strode over Queensland plains. An ichthyosaurus, computed nearly thirty feet in length, was found on the surface of the Flinders river downs. The Secondary fossils have less resemblance than those of Western Australia to the European species. Near the Condamine a fossil monitor twenty feet long was unearthed. The northern coal-fields display the Glos- sopteris, Sygillaria, and Lepidodendron. The northern beds exhibit the mesozoic Thinnfeldia odontopterodes, Aletho- pteris australis, and Podozomites distans.. Some existing Queensland fish, as the ceratodus, are allied to those of the Carboniferous age in Great Britain.

Minerals.—Gold is. found in alluvial deposits and in quartz veins. The most important, of the former werc ncar the northern Palmer river, but auriferous quartz now almost monopolizes the digger's attention. The recognized gold workings are over 7000 square niles. While there were

3454 Europeans, early in 1883, engaged in quartz mining, only 280 were on alluvial ground; in the same year 2046 Chinese worked alluvial claims. Charters Towers in the north and Gympie in the south arc the chief gold centres ; but Mount Morgan, south of Rockhampton, is the richest mine yet discovered. The gold export realized £1,498,433 in 1875, but only £829,655 in 1882. 'The decrease is owing to the greater dependence of the miners on blasting rock.

Gold is often found mixed with silver, copper, or lead. Onc lode had to the ton 75 to 120 ounces of silver and from 4 oz. to 43,02. of gold. Silver ore is being worked to great advantage now near Ravenswood, Star river, and Sellheim river. Copper has been long so low-priced in England that its extraction in the colony, with high-rated labour, has been seriously checked. The cupriferous area is very large there. Mount Perry, Peak Downs, Herberton, and Cloncurry are the leading copper sites. The " Aus- tralian" mine of Cloncurry, 200 miles south of the gulf, is very rich, In one place a lode, 80 to 120 feet wide, showed 30 per cent. of bismuth and 40 of copper to the ton. Tin streams were first opened at Stanthorpe, near the southern border. Tin lodes of astonishing richness exist in the Wild river district about 19° S, lat. There are single claims of tin stream, or on tin lodes, besides tin land leases, at Tate river, Wild river, and other localities. The Tinaroo yield in the five years has been £388,350. Called the Cornwall of Australia, this tin district shows gold, silver, copper, and antimony. The tin export of the colony during 1883 was £298,845, Iron ores abound, but with no present prospect of being utilized. Bismuth, graphite, antimony, ee cinnabar, and other netals are known. Precious stones are gathered from gold and tin workings. Building stones are plentiful in variety, and good in quality, Granite, porphyry, basalt, sandstone, and marbles are wrought. The coal is, after all, the most important and useful of the mincrals. Already steamers, foundries, and railways are being supplied from Qucensland pits. Several beds are known near Moreton Bay. Abont Ipswich and Darling Downs the coal is clean to the touch. Some specimens cake, others do not. All are good for gas and steam purposes. The Darling Downs beds are in an ancient lake, and are valuable for fuel and oil. On 100 tb of that coal being burnt, 529 tb of water were evaporated to 505 from Newcastle coal, leaving 16 tb of ash to 7 for the other. Thatcannel is of Lias age. Much rests under the Eolian sandstone and basalt of the west. The Burrum mineral,

between Maryborough and Bundaberg, is true coal, yielding, at the first opening, 3000 tons a month. One seam would give 5,000,000 tons. The Dawson, Bowen, and Mackenzie river basins, of vast extent, are Paleozoic, as in the Drummond range, and westward over the main chain. Coal is found in the York peninsula. On the coal of Queensland the distinguished Australian geologist, the Rev. J. Tenison Woods, expresses himself thus : —"'The fact that the coal formations cover so vast an extent of the territory, and so many valuable coal-fields having been discovered, makes me con- fident in predicting that its resources in coal are enormous, are equal, if not superior, to any other colony, and will raise her Shores to be in the end the grand céal emporium of the southern hemisphere."

Agriculture.—Until the last few ycars little cultivation was to be seen, and only 180,000 acres yet reccive such attention, Labour Was supposed to pay better in other employments. Still there can be grown in Queensland corn of all varieties, hay, English vege-

' As an illustration of success the Day Dawn mine of Charters Towers may be cited. Some Germans long struggled in vain, and with difficulty got enough gold to supply them with food, Suddenly they struck a rich reef, After considerable gains they formed a company to work the ground. Upon a paid-up capital of £12,000, the share- holders' dividends in four years came to £138,399. Gympie affords evel more remarkable instances of good fortune,

tables, sweet potatoes, mclons, cassava, cocoa, indigo, arrowroot, ginger, coffee, ricc, tobacco, cotton, spices, cinchona, cocoa-nnt, bread-fruit, and sugar-cane, with the frnits of England, India, and China. Lucerne is much grown for stud stock, where winter food is needed. Bananas, oranges, grapes, pine-apples, mangoes, guavas, tamarinds, and dates thrive well. Coffee is being extensively pro- duced. Many Ceylon planters have recently settled in the colony. Cotton pods, tended mostly in Moreton district, are now a paying crop. 'The mulberry success is paving the way for silk culture. The Roma grapes and oranges are much esteemed. Bananas grow on any coast-lands. Arrowroot and tobacco are profitable. Swect potatoes are extcnsively used. Rice will be a crop of the future. Farmers in the southern hills raise corn and English fruits. Dairy farming belongs more to a cooler

latitude. Wheat can be success- fully produced, when labour is cheaper, over an area of 60,000 square miles. Stanthorpe wheat gave 67 Ib to the bushel. Maize is a more certain crop. But sugar-cane is now the Queensland farmer's chief resource. From the southern border up to Cape York, if near the coast, it can be raised. All round Moreton Bay, and in the Maryborough and Bundaberg neighbourhood, it does well; but in the more northern parts, as at the Mackay, Cairns, Burdekin, Johnstone, and Herbert ficlds, the yield is greater, and the plant comes earlier to maturity. In the Mackay sugar district, during 1884, there were 22,000 acres in canc. Coast Queensland has not only warmth, and rich alluvial or scrub soil, but abundance of rain when growth requires it, with fine weather at cane ripening for manufacturing sugar. Some plantcrs have their own appliances for the extraction of juice and the manufacture of sugar, but the small farmers combine to have machinery in their district, or else dispose of cane or juice for cash to the neighbouring sugar-maker, Polynesians or Kanakas have been used for the sugar-house, though Europeans do all the work of growth and manufacture in South Queensland, Chinese merchants are establishing cane grounds, worked by their own countrymen ; and Germans and Scandinavians have extensively embarked in this industry.

Pastoral farming is still the leading industry of the colony, and is rapidly extending over all districts. An occasional check to its prosperity comes by drought in the dry western interior. But a few good seasons, in that healthy wilderness, cnable the shcepmaster to recoup himself, especially as, in the remoter parts, le has a securer tenure and a very small rental. In "settled districts," and within 30 miles of the coast, a "run " is subject to resumption by the state, at six months' notice, should any part be required to be cut up for farms, In the more distant "unsettled district" a lease of twenty- one years is fairly secure. The rent advances every seven years of the term from about half a farthing to a penny an acre. In the dry parts, where grass is insufficient, cattle and sheep thrive well on the salt bush and other shrubs. The only really unavailable pas- tora] region is that portion of the north-western slope of the Main Range already referred to. The spear-grass sometimes sends its barbed tufts into the flesh of sheep. Wild dogs, floods, and droughts have to be encountered, though the animals to be tended are unaffected by ailments plaguing flocks and herds in Britain. The western plains, dry but fertile, are best for sheep ; the hills and moist coast-

lands for cattle and horses. The merino sheep yields excellent wool on tropical pastures, contrary to formcr expectations. The sheep had increased from 3,000,000 to 12,000,000 between 1860 and 1883; and cattle, from 430,000 to 4,320,000. To meet future droughts, subterranean streams have been found by artesian wells in the most, arid wastes, and the storage of water after floods will furnish a supply in dry weather.

Flora.—The Queensland flora comprehends most of the forms

eculiar to Australia, with the addition of about five hundred species belong to the Indian and Malayan regions. The eastern por- tion of New Holland may have a vegetation of a somewhat different type from that of the western, but both have older representatives than those found in the central zone from the gulf to the Southern Ocean. The palms in the north-east of Queensland include the Cycas and the screw or Pandanus. The pines take an important position in the colony,—as the Morcton Bay pine (Araucaria Cunninghamit), the Burnett bunya bunya (Araucaria Bidwelli), the kauri or dundathu (Dammara robusta), and the she pine (Podocarpus elata). The Callitris or cypress family like poor soil. The cedar forests are buricd in scrub towards the mouths of eastern rivers. Coast-lands are crowded with trccs, though brigalow-scrub, with the silver-leaved tops, prevails far inland. There are trees rising above 300 feet. One monster, near the Johnstone river, was seen 88 feet in girth at 55 feet from the ground, and 150 at the base. The Moreton Bay fig-tree has immense wall-like abutments. The bottle or gouty stem tree of the north, Delabechia Gregori, is allied to the African baobab. Flowers are numcrous, yielding often a powerful fragrance, though most commonly exhibited on shrubs. Queensland is notably a timber region, having both hard and soft woods. Above three hundred useful woods, many taking a fine polish, were sent to a recent exhibition. An active export of some, particularly cedar and pine, is conducted at Maryborough and Port Curtis. Woods there are in use for building purposes,

furniture, dyeing, shipbuilding, coachbuilding, hoops and staves, turnery, gunstocks, veneering, &c. Among the Hucalypti are those known as Moreton Bay ash, mahogany, yellow box, blaekbutt, ironbark, turpentine,

bloodwood, messmate, with the blue, red, grey, forest, swamp, scented, and spotted gum trees. The ironwood, brigalow, and myall are of the Acacia genera. Among the Casu- aring are the he, she, swamp, forest, and river oaks. Names are found oddly given by colonists. Their red cedar is the Cedrela Goona ; white cedar, the Melia composita ; pencil cedar, the Dysoxy- lon Muelleri; white wood, the Alstonia; light yellow wood, the Flindersia orleyana; dark yellow wood, the hus; beech, the Gmelina Leichhardtti ; coachwood, the Ceratopetalum ; ebony, the Malba; musk, the Marlea ; Leichhardt's tree, the Sarcocephalus cordatus ; mahogany, the T'ristania; tulip, the Stenocarpus sinuatus ; honeysuckle, the Banksia; pea-tree, the Melaleuca ; bottlebrush, the Callistemon lanceolatus ; beefwood, the Banksia; satinwood, the Xanthoxylum brachyaeanthum ; coral tree, the Erythrina ; apple, the Angophora subvelutina; teak, the Dissilaria balo-ghioides; feverbark, the

Fauna.—The Queensland fauna is much like that described under New Soutn Wass. But forms are now living there whose allies are elsewhere recognized as Tertiary Fossils. The marsupials consti- tute a prominent family. The platypus or water mole is duck-billed and web-footed. The dingo is a howling, nocturnal dog. Queens- land birds are very beautiful. One is something like the New Guinea bird of paradise. Other species of the feathered order are kindred to some in the Asiatic islands. Bower birds have a satin plumage, and indulge in play-bowers, adorned with shells and stones, The regent bird and rifle bird are peculiarly attractive in colours. Mound builders lay their eggs in sand heaps. The wild turkey and other game may be easily obtained. North Queensland has a fine cassowary. Reptiles consist of alligators, lizards, and snakes ; few of the last, particularly of larger species, are hurtful to man.

Fisherics.—The sperm whale has become rare of late in North Australian seas. Deep-sea fishing is unknown in Queensland. About the coasts are the usual edible Australian forms, as whiting, rock cod, bream, flathead, schnapper, guardfish, &c. Sharks and alligators are there. The shell-grinder, Cestracion, is similar to a shark found as fossil in Europe. Sword fish grow to a great size. Some Queensland fish resemble varieties in Indian seas. The Chinese are the best fishermen in Australian waters. The huge dugong, or sea cow, feeding on bay grasses, has a delicate flesh, of the

flavour of veal, and furnishes an oil with the qualities of cod- liver oil, The fishery of the trepang, béche-de-mer, or sea slug employs a considerable number of boats about the coral reefs,

QUEENBSBLAYN D

Boiled, smoke-dried, and packed in bags, the trepang sells for exportation to China, though its agreeable and most nourishing soup is relished by Australian invalids. At Cooktown and Port Douglas more than £100 per ton may be had for the produce. The pearl fishery is a prosperous and progressive one in or near Torres Straits. A licence is paid, and the traffic is under Government supervision. Thursday Island is the chief seat of this industry. The shells are procured by diving, and fetch from £120 to £200 a

'ton. Mother-of-pearl and tortoiseshell constitute important exports

of the colony, capable of great expansion. Oysters are as fine fla- voured as they are abundant. Turtles are caught to the northward.

Commerce.—So extensive a coast-line, and so much of that pro- tected by the Barrier Reef, cannot but be favourable to commerce. The Torres Strait mail service has opened up increased opportunities for trade with China, India, Java, &c. Contiguity to New Cale- donia and the Pacific lsles will conduce to mercantile relations. There are several lines of coasting steamers. The great develop- ment of the mining, pastoral, and sugar industries, the rapid growth of railways, an easy tariff, and the settlements of York Peninsula are giving a great impetus to commerce. The exports for 1882 were £3,534,452; of which wool brought £1,329,019 ; gold £829,655 ; tin £269,904; stock £280,466; sugar £153,188; tallow £129,549 ; preserved meats £119,348 ; pearls £105,869; hides £88,359 ; béche-de-mer £25,082. The imports for that year were £6,318,463. Among these imports some items may be cited: —for manufactured cotton, silk, and woollen goods £889,352, un- manufactured £194,489 ; for metal goods and hardware £910,029 ; flour and grain, £453,307; oilman's stores, £376,987; spirits, wines, and beer, £320,925 ; books and stationcry, £118,798; tea, £109,286. Few of these articles are yet re-exported. The cx- ports for 1883 advanced to £4,652,880, to which wool contributed £2,277,878, and sugar £538,785. The shipping exceeds 1,500,000 tons. Dock conveniences, ships, and

colonial-made steam dredgers exercise the state care. The development of coal mines is aiding both shipping and railway extension. With the establishment of British rule in New Guinca, a serious danger to Queensland interests will be averted, and a happy opportunity offered for the enlarge- ment of its commerce.

Manufactures.—The colony is too young, its population too scattered, its resources in raw material too extensive, for any great advance at present in the industrial stage. Yet already large foundries are established, in which agricultural instruments, mining machinery, sugar appliances, steam engines, and locomotives are constructed. Tanneries, breweries, sugar-mills, distilleries, tobacco- factories, cotton-ginning, woollen factories, wine-making, meat- preserving, boot-factories, &c., are being carried on. The sawmills near Maryborough arc, perhaps, equal to anything in the southern hemisphere, relays of men working at night by electric light.

Roads and Ratlways.—Nearly ninety divisional boards, through- out the colony, raise means by rates for highway improvements, Government supplementing their revenue, as in the ease of muni- cipalities, by special grantsin aid. Coaches travel inland 700 miles from the capital. At the end of 1884, besides several hundreds of niiles of railway in process of construction, the lines opened to traffic were 1201 miles. The western line is from Brisbane, over Darling Downs, through Roma. The south-west will be reached by Cun- namnulla. From Rockhampton westward the railway has gone 350 miles on towards the downs of the Barcoo. The line from Townsville, parallel to the last, after passing Charters Towers, will go on to Hughenden and the Flinders river region. The three great lines will be hereafter eonnected, and the Cloncurry and gulf country united with the western ports. Maryborough is thus eon- neeted with Gympie and Burrum, Bundaberg with Mount Perry, Brisbane with Warwick, and Brisbane with several suburbs. The heavy loans of the colony are mainly devoted to the construction of railways.

Administration.—The governor is appointed by the Queen. The executive council has 8 members, the legislative council 38, and the assembly 55. The term of parliament is five years. There were in January 1884 42 electorates, 18 municipalities, 4 boroughs, 85 divisional boards, 49 police districts.

Excepting very occasional difficulties with blacks in remote and scrubby districts, order is thoroughly observed. Numerous religious and temperance organizations are of assistance in securing respect for law. Among official departments are those of the colonial secretary, treasurer, auditor-general, public works and mines, public lands, customs, administration of justice, post office, police, immigration, and medical board.

Revenue.—Of a revenue of £2,102,095 in 1881-2, £806,719 came from taxation. For the year ending June 30, 1884, the total was £2,566,358. Of this, the customs gave £866,475 ; excise, £34,441 ; land sales, £365,536 ; pastoral rents, £246,108 ; railways, £581,642 ; post and telegraph, £155,996. The expenditure was £2,317,674. In the settled districts, during 1883, 304 runs had an area of 11,162 square miles, at a rental of £21,419. In the unsettled districts 8939 runs had 475,601 square miles, paying £216,638, averaging less than a farthing anacre. Expired and renewed leases realize in-

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ereasing rates. The absolute public debt in 1884 was £16,570,850. Of that amount the outlay on railways was about 12 millions ; immigration, 2; harbours, 1}. Roads and telegraph lines took other sums.

Education.—Queensland led the way among the Australian colo- nies, in the establishment of a system of public instruction free, unsectarian, and compulsory. At the same time, however, the parliament declined to grant further state aid to the clergy and religious edifices of Protestant Episcopalians, Presbyterians, Wes- leyans, and Roman Catholics, formerly drawing from the treasury. State or provisional schools are formed wherever there is a sufti- cient gathering of children. The annual public cost was £2, 17s. per scholar. There are, however, self-supporting private schools. Masters and mistresses of state schools are paid by the Government according to their own educational status, the number of cliildren, and the proficiency of instruction. Excellent training schools for teachers are established. Five superior grammar schools are partly supported by the state; the municipal councils have voluntarily aided those

institutions, and offered scholarships to their pupils. The Government gives frec education in grammar schools to suc- cessful scholars in state schools, besides thrce years' exhibitions to universities to a certain number passing a high examination. State aid is also rendered to schools of art, schools of design, free libraries, and technical schools.

Population.—The estimated population in January 1884 was 290,000, of whom three-fifths were males, Polynesian labourers, imported for three years, are about 8000. The Chinese, now re- stricted by a heavy poll tax, may be 18,000. The Aborigines, very fast dying out, mainly by contact with civilization, may be from 10,000 to 12,000.

History.—The Portuguese may have known the northern shore nearly a century before Torres, in 1605, sailed through the strait since called after him, or before the Dutch landed in the Gulf of Carpentaria. Captain Cook passed along the eastern coast in 1770, taking possession of the country as New South Wales. Flinders visited Moreton Bay in 1802, Oxley was on the Brisbane in 1828, and Allan Cunningham on Darling Downs in 1827. Sir T. L, Mitchell in 1846-7 made known the Maranoa, Warrego, and Barcoo districts. Leichhardt in 1845-47 traversed the coast country, going round the gulf to Port Essington, but was lost in his third great journey. Kennedy followed down the Barcoo, but was killed by the blacks while exploring York Peninsula. Burke and Wills crossed western Queensland in 1860. Landesborough, Walker, M'Kinlay, Hann, Jack, Hodgkinson, and Favence continued the researches. Squatters and miners have opened new regions. Before its separa- tion in 1859 the country was known as the Moreton Bay district of New South Wales. A desire to form fresh penal depéts led to the discovery of Brisbane river in December 1823, and the proclamation of a penal settlement there in August 1826. The convict popula- tion was gradually withdrawn again to Sydney, and the place was declared open to free persons only in 1842, The first land sale in Brisbane was on August 9, 1843. An attempt was made in 1846, under the ministry of Sir James Graham and Mr Gladstone, to establish at Gladstone on Port Curtis the colony of North Australia for ticket-of-leave men from Britain and Van Diemen's Land. Earl Grey's Government under strong colonial appeals arrested this policy, and broke up the convict settlement. In 1841 there were 176 males and 24 females; in 1844, 540 in all; in 1846, 1867. In 1834 the

governor and the English rulers thought it necessary to abandon Moreton Bay altogether, but the order was withheld. The first stock belonged wholly to the colonial Government, but flocks and herds of settlers came on the Darling Downs in 1841. In 1844 there were 17 squatting stations round Moreton Bay and 26 in Darling Downs, having 13,295 cattle and 184,651 sheep. In 1849 there were 2812 horses, 72,096 cattle, and 1,077,983 sheep. But there were few persons in Brisbane and Ipswich. The Rev. Dr Lang then began his agitation in England on behalf of this northern district. Some settlers, who sought a separation from New South Wales, offered to accept British couvicts if the ministry granted independence. In answer to their memorial a shipload of ticket-of-leave men was sent in 1850. In spite of the objection of Sydney, the Moreton Bay district was proclaimed the colony of Queensland on December 10, 1859. The population was then about 20,000, and the revenue £6475, Little trade, no manu- factures, wretched roads, defective wharfage, struggling townships, aud poor schools marked that epoch. Political liberty occasioned a general advance. The first parliament, with the ministry of Mr (now Sir R. G. W.) Herbert, organized a good school system, carried an effective land bill, and established real religious equality. While the pastoral interest rapidly grew, the agricultural and trad- ing classes got firm footing. The revelation of gold and. copper treasures increased the prosperity. But a reaction followed ; wool prices fell, cotton- growing ceased, early sugar-cane efforts failed, and trouble succeeded excessive speculation in land and mines. A steady application to legitimate pursuits, however, soon restored confidence ; and the colony, as its resources have gradually de- veloped, has continued to advance and prosper. (J, BO.)

QUEENSTOWN, formerly Covz or Cork, a market town and seaport in the county of Cork, Ireland, is pieturesquely situated, 13 miles east-south-east of Cork, on the south side of Great Island, on the slope of an eminence rising somewhat abruptly above the inner Cork harbour. It consists chiefly of terraces, rising above each other, and inhabited by the wealthier classes. On account of the mildness of the climate it is much frequented by valetudinarians in winter. Previous to the American War the Cove of Cork was a very small fishing village, but within the last fifty years it has rapidly increased. It received its present name on the occasion of the visit of Queen Victoria in 1849. The harbour, which is 4 miles long by 2 broad, and is

defended by the Carlisle and Camden Forts at its entrance, and by Fort Westmoreland on Spike Island, can afford shelter to a very large fleet of vessels. The port is the calling station for the American mail steamers. Among the principal buildings are the new Catholic cathedral for the diocese of Cloyne, and the Pro- testant Episcopal church for the united parishes of Clonmel and Temple Robin. A fine promenade, over a mile in length, connects Queenstown with Rushbrook, a favourite watering-place. The population of Queenstown in 1871 was 10,334, and in 1881 it was 9755.

QUERCITRON is a yellow dye-stuff obtained from the bark of the quercitron oak, Quercus tinctoria (see vol. xvii. p. 693). The tree isa native of the United States, but is now also cultivated in France and South Germany. The dye-stuff is prepared by grinding the bark in mills after it has been freed from its black epidermal layer, and sifting the product to separate the fibrous matter, the fine yellow powder which remains forming the quercitron of commerce. The ruddy-orange decoction of quercitron contains quercitannic acid (vol. xvii. p. 692) and an active dyeing principle, quercitrin, C,,H,,O,, The latter sub- stance is a glucoside, and in aqueous solution under the influence of sulphuric acid it splits up into a rich tinctorial principle, quercetin, C,,H,,0,,, and a variety of sugar called isodulcite, C;H,,Og The reaction may be thus formu- lated

CzgH yyy + HO = Cn7Hy,0y. + CsHy 40g. Quercetin precipitates in the form of a crystalline powder of a brilliant citron yellow colour, entirely insoluble in cold and dissolving only sparingly in hot water, but quite soluble in aleohol. Either by itself or in some form of its glucoside quercitrin, quercetin is found in several vegetable substances, among others in cutch, in Persian berries (Zhamnus catharticus), buckwheat leaves (Poly- gonum Fagopyrum), Zante fustic wood (Rhus Cotinus), and in rose petals, &c. Quercitron was first introduced asa yellow dye in 1775. For many years it has been used principally in the form of FLavin (g.v.). Flavin is pre- pared by boiling quercitron in water and precipitating the tinctorial principle by sulphuric acid. By one method soda crystals are added in preparing the solution. The yellow precipitate is washed to free it from acid, pressed, and dried. From 100 parts of quercitron about 85 of flavin are obtained, having a tinctorial power more than twice that of the original

bark. Quercitron and its in- dustrial derivatives are principally employed in calico- printing. With alumina (red liquor mordant) they yield a bright canary colour, with tin salt a fine clear yellow, with iron liquor grey, olive, or black according to the strength of the mordant, and with mixed alumina and iron liquor an orange tint.

QUERETARO, a city of Mexico, capital of the state of the same name, lies on a plateau 5900 feet above the sea, 1524 miles north-west of Mexico by the Central Mexican Railway. It isa well-built place with a beautiful tree-planted alameda, a cathedral, and several handsome

churches and convents (Santa Clara, worthy of special note), a hospital, and other public buildings ; and it is sup- plied with excellent water from the mountains by a great stone aqueduct erected at the expense of the Marquis de Villar del Aquila whose statue adorns one of the squares. In manufactures it occupies a high place, producing cotton and woollen goods, leather, soap, and wood-carv- ings. The great Hercules cotton-factory, about 2 miles by rail from the town, is enclosed by a high loop-holed wall and defended by a small company of soldiers; in this way the proprietors have maintained their position since 1840 in spite of all the revolutions that have swept over the country. About 1400 operatives (all Mexicans) are employed, and work is carried on both day and night. Unbleached cotton is the staple product. The population of the city was stated at 38,000 in 1882.

Querétaro was captured by the Spaniards in 1536, and made a city in 1655. In 1848 it was the seat of a congress by which peace between Mexico and the United States was ratified, and in 1867 the emperor Maximilian, unable to hold it against the republicans

under Escobedo, was made prisoner and shot on the Cerro de las Campanas to the north of the town.

QUERN. See Frovr, vol. ix. p, 343-4.

QUESNAY, Francois (1694-1774), was one of the most eminent economists of the 18th century. He was born at Mérey, near the village of Montfort

/Amaury, about 28 miles from Paris, on the 4th of June, 1694, a year memor- able also for the birth of Voltaire. He was the son of a worthy advocate, who had the reputation of ruining his own practice by reconciling the parties who came to consult him about their suits. The modest resources of the family were derived principally from the cultivation of a small landed estate, Quesnay's mother in particular busying herself much with the details of its management, which she thoroughly understood. His boyish years were thus spent amidst country scenes and the occupations of the farm, and he retained to the end a strong predilection for rural life and a special interest in the welfare of the agricultural population. Little attention was given to his early literary instruction; it is said that he could not read till he was eleven years of age, when he was taught partly by the family gardener, who used as the text book the Maison Rustique of Jean Licbault, a work "wherein" (to quote the words of its old English translator, Richard Surflet, 1606) "is conteined whatever can be required for the building or good ordering of a husbandman's house or countrey farme." This book Quesnay is said to have studied with such assiduity as to have almost known it by heart. He learned Greek and Latin and the elements of several sciences with scarcely any aid from masters. He was possessed with an ardent and untiring desire for know- ledge, and we are told that more than once he walked to Paris for a book, which he read on his way back the same day, thus travelling twenty leagues on foot.

At the age of sixteen he became apprentice to a surgeon in the neighbourhood of Mérey, who was not able to teach him much, and he soon went to Paris to continue his professional education. He there devoted himself with great ardour for five or six years to the study of medicine and surgery, diligently attending the hospitals, and following the courses of anatomy, chemistry, and botany ; he also learned drawing and engraving, in which he acquired considerable skill, and gave some attention to metaphysics, to which he had been attracted by the reading of Malebranche's Recherche de la Vérité. About 1718 he established himself at Mantes, and soon obtained a distinguished clientéle. He became known to the Maréchal de Noailles, who conceived a high esteem for him, and persuaded the queen, whenever she came to Maintenon, which was not very far from Mantes, to consult. no physician but Quesnay. A celebrated practi-

tioner of the time, named Silva, having published a treatise on bleeding, which, though of little merit, was loudly applauded by his friends, Quesnay wrote a refuta- tion of it, founded on the principles of hydrostatics, which brought his name much into notice. When La Peyronnie had procured about 1730 the foundation of an academy of surgery with the view of elevating that profession, he selected Quesnay for the post of perpetual secretary. Coming to Paris to fill it, he obtained through La Pey- ronnie's influence the office of surgeon in ordinary to the king. He was the author of the remarkable preface which was prefixed to the first volume of the Mémovres of the academy. He was for a long time much occupied with the controversies between the faculty of medicine and the college of surgery concerning the respective limits of the two professions, and wrote most of the pieces in which the claims of the latter were asserted. [Finding that frequent attacks of the gout were rendering him incapable of performing manual operations, he procured in 1744 the degree of doctor of medicine from the university of Pont- '-Mousson ; but, though thus changing the nature of his practice, he continued to defend the rights of the surgical profession. He soon after purchased the reversion to the office of physician in ordinary to the king, and afterwards became his first consulting physician; in this capacity he was installed in the palace of Versailles, occupying apart- ments near those of Madame de Pompadour. Louis XV. esteemed Quesnay much, and used to call him his thinker ; when he ennobled him, he gave him for arms three flowers of the pansy (pensée), with the motto Propter excogitationem mentis.

He now devoted himself principally to economic studies, taking no part in the court intrigues which were perpetu- ally going on around him. About the year 1750 he became acquainted with M. de Gournay, who was also an earnest inquirer in the economic field; and round these two distinguished men was gradually formed the philo- sophie sect of the Heonomistes, or, as for distinction's sake they were afterwards called, the Physiocrates. The most remarkable men in this group of disciples were the elder Mirabeau (author of L'Ami des Hommes, 1756-60, and Philosophie Rurale, 1763), the Abbé Baudeau (Introduction a la Philosophie Economique, 1771), Le Trosne (De Ordre Social, 1777), Morellet (best known by his controversy

with Galiani on the freedom of the corn trade), Mercier Lariviére, and Dupont de Nemours. Of the writings of the last two, as well as of the general doctrine of the physio- crats, some account has been given in the article PoxrricaL Economy (see vol. xix. pp. 359 sq.). The principal econo- mic work of Quesnay himself was the 7'ableau Economique, which Laharpe called /'Alcoran des Economistes. A small éditeon de luxe of this work, with other pieces, was printed in 1758 in the palace of Versailles under the king's immediate supervision, some of the sheets, it is said, having been pulled by the royal hand. Already in 1767 the book had disappeared from circulation, and no copy of it is now procurable ; but the substance of it is has been preserved in the Ami des Hommes of Mirabeau, and the Physiocratie of Dupont de Nemours. In Quesnay's Mawimes Générales du Gouvernement Economique d'un Royaume Agricole, which was put forward as an Extrait des Economies Royales de Sully, and was printed along with the Zableau in 1758, besides stating his economic doctrines, he expresses his opinion in favour of a legal despotism as the best form of government. " Let the sovereign authority be single, and superior to all the individuals of society and all the unjust enterprises of private interest. The system of counter- forces in a government is a harmful one, which produces only discord among the great and the oppression of the weak." He had contributed to the Encyclopédie in

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1756 the articles "'Fermiers" and "Grains," which con- tained the earliest announcement of his principles through the press; and he published 'a number of minor pieces in the Journal de ? Agriculture, du Commerce, et des Finances, and in the Hphémérides du Citoyen. His Droit Naturel, which was included in the Phystocratie of Dupont de Nemours, is especially noteworthy as showing the philo- sophic foundation of his economic system in the theory of the jus nature.

Interesting notices of Quesnay's character and habits have been preserved to usin the Mémovres of Marmontel and those of Mme. du Hausset, femme de chambre to Mme. de Pompadour.! His probity and disinterested zeal for the public good did not suffer from the atmosphere of the court; he never

abused his credit with the sovereign or the favourite for any selfish end. To raise the national agriculture from the decay into which it had fallen and to improve the condition of the working population were the great aims he kept steadily in view. His conversation was piquant, humorous, and suggestive, often taking the form of moral and political apologues. Some of his weighty sayings are quoted by contemporary writers. Here is one of them. Having met in Madame de Pompadour's salon an official person who, in recommend- ing violent measures for the purpose of terminating the vexatious disputes between the clergy and the parliament, used the words, "C'est la hallebarde qui méne un royaume," Quesnay replied, " Et qu'est ce qui meéne la hallebarde?" adding, after a pause, "C'est l'opinion ; cest donc sur Vopinion qu'il faut travailler." Diderot, D'Alembert, Duclos, Helvetius, Buffon, Turgot, Marmontel, used to meet in his rooms in the palace, and also several of the physiocrats above named; and Madame de Pom- padour, who affected the patronage of philosophy and science, sometimes came to join them and converse with them. Amongst them, when they were alone, subjects were sometimes discussed in a tone which would not have pleased the royal ear. Thus, one day, Mirabeau having said, "The nation is in a deplorable state," Lariviére replied in prophetic words, "It can only be regenerated by a conquest like that of China, or by some great internal convulsion ; but woe to those who live to see that! The French people do not do things by halves!" Adam Smith, during his stay on the Continent with the young duke of Buccleuch in 1764-66, spent some time in Paris, where he made the acquaintance of Quesnay and some of his followers ; he paid a high tribute to their scientific services in his Wealth of Nations, and would have dedicated that work to Quesnay, had the latter been alive at the time of its publication.

At. the age of seventy Quesnay went back to the study of mathematics. He thought, we are told, that he had discovered the quadrature of the circle, and was not pre- vented by the remonstrances of his friends from printing his supposed solution of the problem. He died in 1774, having lived long enough to see his great pupil, Turgot, in office as minister of finance. Quesnay had married in 1718, and had a son and a daughter ; his grandson by the former was a member of the first Legislative Assembly.

The cconomic writings of Quesnay are collected in the 2d vol. of the Principaux Economistes, published by Guillaumin, with preface and notes by Eugéne Daire. His writings on medicine and surgery have now only an historic interest. They were as follows :— 1. Observations sur les effets de la saignée, 1730 and 1750; 2. Essai

physique sur Véconomie animale avec Vart de quérir par la saigneée, 1786 and 1747 ; 3. Recherches critiques ct historiques sur Corigine,

1 These Afémoires were first printed by Quintin Craufurd in his Mélanges d' Histotre et de Littérature, 1806, and again in 1817 ; they have since been published in the Collection des Mémoires relatifs a la Révolution Francaise, 1824, and also in the Bibliotheque des Mémoires relatifs aU Histoire de France pendant le 18" Siécle.

les divers états, ct les progrés de la chirurgie cn France (said to have been the joint work of Quesnay and Louis), 1744, and, with slightly altered title, 1749; 4. Traité de la suppuration, 1749 ; 5. Traité de la gangrene, 1749; 6. Traité des fievres continues, 1753 ; 7. Obser- vations sur la conservation de la vie (said to have been printed at Versailles along with the Tableau Economique), 1758. His other writings were the article "Hvidence" in the Encyclopédie, and Recherches sur Vévidence des verités géométriques, with a Projet de nouveaux éléments de géométrie, 1773. Quesnay's loge was pro- nounced in the Academy of Sciences by Grandjean de Fouchy (see the Recueil of that Academy, 1774, p. 134). There is a good por- trait of him, engraved by J. Ch. Francois, which is reproduced in the Dictionnaire d'Economie Politique of Coquelin and Guillau- min. (Cee Gan i)

QUESNEL, Pasquier (1634-1719), Roman Catholic theologian, was born in Paris on July 14, 1634, and, after graduating in the Sorbonne with distinction in 1653, joined the Congregation of the Fathers of the Oratory in 1657, receiving priest's orders in 1659. In 1675 he pub- lished an edition of the works of Leo the Great, in the notes to which the Gallican liberties were defended. The work was consequently put upon the Jndex in the follow- ing year, and Quesnel's relations with his ecclesiastical superiors became so strained that in 1681 he had to retire to Orleans. Four years later, finding himself unable to sign a document imposed on all members of the Oratory in condemnation of Jansenism, he fled to Brussels, where he

was intimately associated with Arnauld, and where, encouraged by him, he published in 1694-95 a complete edition of the Réfleaions Morales sur le Nouveau Testa- ment, a work of edification on which he had first begun to engage himself shortly after joining the Oratory, and a part of which had appeared as early as about 1671. The nature of its contents, and still more the known sympa- thies of its author, made the book an object of unwearying Jesuit hostility ; Quesnel was imprisoned for a short time in the palace of the archbishop of Mechlin in 1703, but happily succeeded in escaping into Holland; his papers, however (compromising, it is said, to many persons), fell into the hands of the enemy, and long were to the Pére La Chaise his "pot au noir" (as he calied it) by means of which he was able to darken the prospects of his adver- saries as he chose. The bull Unigenitus, in which no fewer than 101 sentences from the Wéflexions Morales were condemned as heretical, was obtained from Clement IX. in September 8, 1713 (see vol. xiii. p. 567). Quesnel died at Amsterdam on December 2, 1719, A complete list of his works is given by Moreri.

QUETELET, Lampert ADoLpHE JACQUES (1796-1874), astronomer, meteorologist, and statistician, was born at Ghent, February 22, 1796, and educated at the lyceum of that town. In 1819 he was appointed professor of mathe- matics at the athenzeum of Brussels; in 1828 he became lecturer at the newly created museum of science and literature, and he continued to hold that post until the museum was absorbed in the free university in 1834. In 1828 he was appointed director of the new royal observa- tory which it had been decided to found, chiefly at his instigation. The building was finished in 1832, and the instruments were ready for work in 1835, from which date the observations were published in 4to volumes (Annales de VObservatoire Royal de Brumelles), but Quetelet chiefly devoted himself to meteorology and statistics. From 1834 he was perpetual secretary of the Brussels Academy, and published a vast number of articles in its Bulleten, as also in his journal Correspondance Mathématique et Phys- ique (11 vols., 1825-39). He died on February 17, 1874.?

Quetelet's astronomical papers refer chiefly to shooting stars and similar phenomena. He organized extensive magnetical and

2 His son ERNEST QUETELET (1825-78) was from 1856 attached to the observatory and made a great number of observations of stars with proper motion, from which a large catalogue of stars is now (1885) being published.

meteorological observations, and in 1839 he started regular observa- tions of the periodical phenomena of vegetation, especially the flowering of plants. The results are given in various memoirs published by the Brussels Academy and in his works Sur le Climat de la Belgique and Sur la Physique du Globe (the latter forms vol. xiii. of the Annales, 1861). He is, however, chiefly known by the statistical investigations which occupied him from 1823 onward. In 1835 he published his principal work, Sur l'Homme et le Développe- ment de ses Fueultés, ow Essai de Physique Sociale (2d ed. 1869), containing a résumé of his statistical researches on the develop- ment of the physical and intellectual qualities of man, and on the 'faverage man," both physically and intellectually considered. In 1846 he brought out his Lettres a 8S. A. R. le Due régnant de Saxe- Coburg et Gotha sur la théorie des probabilités appliquée awx sciences morales et politiques (of which Sir J. Herschel wrote a full account in the Ldinburgh Review), and in 1848 Du Systéme Social et des Lois qui le régissent (dedicated to the prince consort). In these works he shows how the numbers representing the individual qualities of man are grouped round the numbers referring to the "average man" in a manner exactly corresponding to that in which single results of observation are grouped round the mean result, so that the principles of the theory of probabilities may be applied to statistical researches on the subjects. These ideas are further developed in various papers in the Bulletin and in his L' Anthropo- métrie, ow Mesure des différentes Facultés del' Homme (1871), in which he lays great stress on the universal applicability of the binomial law, —according to which the number of cases in which, for instance, a certain height occurs among a large number of individuals is repre- sented by an ordinate of a curve (the binomial). symmetrically situated with regard to the ordinate representing the mean result (average height).

A detailed Essat sur la Vie et les Travaux de L. A.J. Quetelet, by his pupil and assistant E. Mailly, was published at Brussels in 1875,

QUETTA, a valley in Baluchistan, and the most northern district in the province. It embraces an area of about 90 square miles, and is situated near the Afghan frontier between 30° 2' and 30° 14' N. lat. and between 66° 55' and 67° E. long. 'The general aspect of the country is hilly, rocky, and sterile, particularly towards the north ; but in many parts the soil is rich and good, yielding wheat, rice, madder, tobacco, and lucerne, besides numerous grasses. The district has abundant orchards, furnishing grapes, apples, pears, pomegranates, figs, dec. ; melons and all kinds of English vegetables are also largely cultivated. The valley is watered by the Lora stream. Wild sheep, goats, and hogs abound in the hills of the district. The climate appears to be healthy and the tem- perature moderate, ranging from 30° Fahr. in the winter to about 80° in the summer. Since 1876 Quetta has been the seat of a British political officer. Its occupation secures the Pishin valley, holds in check border tribes, and keeps open the roads of the Kojak and Gwaja passes over the Khwaja Amran range leading to Kandahar. During the Afghan compaigns of 1878-80 Quetta formed the base of operations of the southern column. In 1879 a railway was commenced to Quetta, with a view to its being pushed on to Kandahar. The line starts from the Sind railway system at Sukkur and runs wa Jacobabad to Sibi, and is now in course of construction to Quetta; it is to be termed the Sind-Pishin railway. Quetta (or Shal, meaning " the fort" or "kot"), the capital, is situated at the northern extremity of the valley, near the head of the Bolan Pass and close to the Pishin valley, at an elevation of 5900 fect above the level of the sea. The town is surrounded by a mud wall; in its centre, on an artificial mound, is a fort which commands a very fine and extensive view of the neighbouring valley.

QUEVEDO VILLEGAS, Francrsco (1580-1645), the greatest satiric writer of Spain, was born in 1580 at Madrid, where his father, who came from the mountains of Burgos, was secretary to Anne of Austria, fourth wife of Philip IT. Karly left an orphan and without other protection than that of his guardian, D. Agustin de Villanueva, protonotary of Aragon, the young man educated himself and chose his own career. Full of zeal to conquer all knowledge, he betook himself to Alcala, the nearest university to Madrid,

where in a few years he covered a vast field of study, acquiring a knowledge of classical and modern tongues—of Italian and French, Hebrew and Arabic, of philosophy (or what passed by that name), theology, civil law, and economics. His masters were astounded at his erudition, and his fame reached beyond Spain; at twenty-one he was in correspondence with Justus Lipsius on questions of Greek and Latin literature, and the great scholar loaded him with praises and treated him as an equal. These years of study left a great and permanent influence on Quevedo's style; to them are due the pedantic traits and mania for quotations which strike and offend us in most of his works.

The licentiate of Alcala next betook himself to the court and mingled with the corrupt society that surrounded Philip III., or rather the duke of Lerma, then the real ruler of Spain. The cynical greed of the ministers, the meanness of their flatterers, the corruption of all the royal officers, the financial scandals, the shamelessness of the women, brutalized by the low place given to them in family life and by the practices of a purely formalist religion, formed a spectacle which soon awoke in Quevedo his talent as a painter of manners. At Madrid or at Valladolid, where the court resided from 1601 to 1605, he mingled freely with these intrigues and disorders, and soon lost the purity of his morals, but not his independence, his uprightness and integrity. From this period date his first Dreams (Suefios), satirical fantasies in which the spirit and manner of Lucian and Dante are combined. '" Dream of Skulls," "The Possessed Alguazil," "The Stables of Pluto," "The Madhouse of Love," such are the titles of these earliest writings composed in 1607-8, which in some degree recall the "Dances of Death" of the later Middle Ages ; the author is transported in sleep to hell, where he assists at the long and lamentable procession of men of all conditions, professions, and trades who move toward their punishment, clad in their most characteristic vices and absurdities. The series was continued from 1612 to 1622 by "The World as it is" and the " Review of Witticisms." With the Dreams may be associated certain works of similar scope and tone, e.g., To every one according to his Works, and Fortune made Reasonable, where Jupiter in concert with Fortune, whom he has caused to stop her wheel, orders all kinds of men instantly to resume their true nature

and the condition they deserve: thus the physician becomes a hangman, the accused a judge, the painted lady a duenna and witch, and so forth.

In 1609 Quevedo entered into relations with the famous D. Pedro Tellez Giron, duke of Osuna, with whom his fortunes were linked for more than ten years. The duke, celebrated for his bold enterprises of war against the Queen of the Adriatic, for his share in the conspiracy of Venice in 1618, for the luxurious splendour of his viceregal rule in Sicily and Naples, and finally for his terrible dis- grace, recognized Quevedo's unusual merits and made him his secretary. Thus between 1611 and 1620 he learned politics,—the one science which he had perhaps till then neglected,—initiated himself into the questions that divided Europe, and penetrated the designs and ambitions of the neighbours of Spain as well as the secret history of the guilty intriguers protected by the favour of Philip ITI. The result was that he wrote several political works, particularly a lengthy treatise, The Policy of God and the Government of Christ, in which he lays down the duties of kings by displaying to them how Christ has governed His church. The disgrace of the duke of Osuna (1620) reached Quevedo, who was arrested and exiled to La Torre de Juan Abad in New Castile, where he possessed lands and of which he afterwards became seignior. ; Quevedo, though involved in the process against the

duke, remained faithful to him in his misfortunes, and bore exile and prison with resignation. On the death of Philip ITI. (31st March 1621), he recommended himself to the first minister of the new king by celebrating his accession to power and saluting him as the vindicator of public morality in an elegant epistle, in the style of Juvenal, on The Present Habits of the Spaniards. Olivares recalled him from his exile and gave him a charge in the palace, and from this time Quevedo resided almost con- stantly at court, where he acquired a position of great weight, only comparable to that of Voltaire in the France of last century. Like Voltaire, he became a sort of oracle, and exercised in Spain a kind of political and literary jurisdic- tion due to his varied relations and knowledge, but especi- ally to his biting and unbridled wit, which had no respect of persons and laid bare every sore. General politics, social economy, war, finance, literary and religious

questions, all fell under his dissecting knife, and he had a dissertation, a pamphlet, or a song for everything. One day he is de- fending St James, the sole patron of Spain, against a powerful coterie that wished to associate St Teresa with him, and meeting these antagonists with the vehemence of a warm patriot and the learning of a professional theo- logian ; next day he is writing against the duke of Savoy, the hidden enemy of Spain, or against the measures taken to change the value of the currency ; or once more he is engaged with the literary school of Gongora, whose affecta- tions and designed obscurity of style seem to him to sin against the genius of the Castilian tongue. And in the midst of this incessant controversy on every possible subject he finds time to compose a comic romance, Don Pablo of Segovia (1626),—a masterpiece of sparkling verve and fun, which admirably continues the series of Lazarillo de Tormes and Guzman de Alfarache,—to pen a dissertation on The Constancy and Patience of Job (1631), to translate St Francis de Sales and Seneca, to compose thousands of verses, and to correspond with Spanish and foreign scholars,

But Quevedo was not to maintain unscathed the high position won by his knowledge, talent, and biting wit. The government of Olivares, which he had welcomed as the dawn of a political and social regeneration, made things worse instead of better, committed fault upon fault, and led the country to ruin. Quevedo saw this and could not hold his peace. An anonymous petition in verse enumerat- ing to the king in strong terms the grievances of his sub- jects was found in the early part of December 1639 under the very napkin of Philip IV. It was shown to Olivares, who exclaimed, "I am ruined"; but before his fall he sought vengeance on the libeller. His suspicions fell on Quevedo, who had enemies glad to confirm them. Quevedo was arrested on December 7, and carried under a strong escort to the neighbouring convent of Leon, where he was kept in rigorous confinement till the fall of the minister (23d January 1643) restored him to light and freedom, but not to the health which he had lost in his dungeon. He had little more than two years to live, and these were spent in inactive retreat, first at La Torre de Juan Abad, and then at the neighbouring Villanueva de los Infantes, where he died September 8, 1645.

Quevedo was of middle height, with black, somewhat crisp hair, a very fair complexion, a broad forehead, and very sharp eyes always furnished with

spectacles. The upper part of his body was well built but the lower part deformed: he limped, and his fect turned inwards. Though of very dissolute manners, he loved stndy most, and lived surrounded by books. He had a table on whecls for reading in bed and a stand that enabled him to read at table. His conversation, as one might guess from his books, was sparkling, full of unexpected turns and slyness, and many bon-mots are ascribed to him.

As a satirist and humorist Quevedo stands in the first rank of Spanish writers ; his other literary work docs not count for much. I. I. Chifflet, in a letter of February 2, 1629, calls him "a very learned man to be a Spaniard," and indeed his erudition was of a solid kind, but he merits attention not as a humanist, philosopher, and moralist, but as the keen polemic writer, the pitiless mocker, the profound observer of all that is wicked and absurd in human nature, and at the same time as a finished master of style and of all the secrets of the Spanish tongue. His style indeed is not absolutely pure, and already belongs to the period of decadence. Quevedo, who ridiculed so well the bad taste of "cultism," fell him- self into another fault and created the style called "conecptism," which hunts after ambiguous expressions and "double entendrcs." But, though involved and overcharged with ideas, his style is of singular force and originality ; after Cervantes he is the greatcst Spanish writer of the 17th century.

There is an exeellent collected edition of Quevedo's prose works with a good life of the author by D. Aureliano Fernandez-Guerra (Bibl. Ribadeneyra, vols. xxiii. and xlviii.) ; his poetieal works in vol. xix of the same colleetion are badly edited by D. Florenzio Ianer. (A, M.-F.)

QUEZAL, or QuEsat, the Spanish-American name for one of the most beautiful of birds, abbreviated from the Aztec or Maya Quwetzal-tototl, the last part of the com- pound word meaning fowl, and the first, also written Cuetzal, the long feathers of rich green with which it is adorned! The Quezal is one of the Trocons (¢.v.), and was originally described by Hernandez (Historia, p. 13), whose account was faithfully copied by Willughby. Yet the bird remained practically unknown to ornithologists until figured in 1825, from a specimen belonging to Leadbeater,? by Temminck (P/. col., 372) who, however, mistakenly thought it was the same as the

Z'rogon pavoninus, a con- generic but quite distinct species from Brazil, that had just been described by Spix. The scientific determination of the Quetzal-bird of Central America seems to have been first made by Bonaparte in 1826, as Trogon paradiseus, according to his statement in the Zoological Society's Pro- ceedings for 1837 (p. 101); but it is not known whether the fact was ever published. In 1832 the egustro Trimestre, a literary and scientific journal printed at Mexico, of which few copies can exist in Europe, contained a communication by Dr Pablo de la Llave, describing this species (with which he first became acquainted prior to 1810, from examining more than a dozen specimens obtained by the natural-history expedition to New Spain and kept in the palace of the Retiro near Madrid) under the name by which it is now commonly known, Pharomacrus mocino.? These facts, however, being almost unknown to the rest of the world, Gould, in the Zoological Proceedings for 1835 (p. 29), while pointing out Temminck's error, gave the species the name of Trogon resplendens, which it bore for some time. Yet little or nothing was generally known about the bird until Delattre sent an account of his meeting with it to the Echo du Monde Savant for 1843, which was reprinted in the Revue Zoologique for that year (pp. 163-165). In 1860 the nidification of the species, about which strange stories had been told to the naturalist last named, was deter- mined, and its eggs, of a pale bluish-green, were procured

1 The Mexican deity Quetzal-coatl had his name, generally trans- lated " Feathered Snake," from the quetzal, feather or bird, and coatl, snake, as also certain kings or chiefs, and many places, e.g., Quetzal- apan, Quetzaltepec, and Quezaltenango, though perhaps some of the last were named directly from the personages (cf. Bancroft, Native Races of the Pacific States, vol. v., Index). Qunetzal-itzli is said to be the emerald.

2 This specimen had been given to Mr Canning (a tribute, perhaps, to the statesman who boasted that he had "called a New World into existence to redress the balance of the Old") by Mr Schenley, a diplo- matist, and was then thought to be unique in Europe ; but, apart from those which had reached Spain, where they lay neglected and unde- scribed, James Wilson says (Zllustr. Zoology, pl. vi., text) that others were brought with it, and that one of them was given to the Edinburgh Museum. On the 21st day of the

sale of Bullock's Museum in 1819, Lot 38 is entered in the Catalogue as "The Tail Feather of a magni- ficent undescribed Trogon " and probably belonged to this species.

3 De la Lliave's very rare and interesting memoir was reprinted by M. Sallé in the Revue et Magazin de Zoologie for 1861 (pp. 23-388).

by Mr Robert Owen (P. 7. S., 1860, p. 374; bis, 1861,

66, pl. ii. fig. 1); while further and fuller details of its –

habits (of which want of space forbids even an abstract here) were made known by Mr Salvin (Jbis, 1861, pp. 138-149) from his own observation of this very local and remarkable species. Its chief home is in the mountains near Coban in Vera Paz, but it also inhabits forests in other parts of Guatemala at an elevation of from 6000 to 9000 feet.

The Quezal is hardly so big as a Turtle-Dove. The

Quezal, male and female.

cock has a fine yellow bill and a head bearing a rounded crest of filamentous feathers; lanceolate scapulars over- hang the wings, and from

the rump spring the long flowing plumes which are so characteristic of the species, and were so highly prized by the natives prior to the Spanish conquest that no one was allowed to kill the bird when taken, but only to divest it of its feathers, which were to be worn by the chiefs alone. These plumes, the middle and longest of which may measure from three feet to three feet and a

half, with the upper surface, the throat, and chest, are of a resplendent golden-green,! while the lower parts are of a vivid scarlet. The middle feathers of the tail, ordinarily concealed, as are those of the Peacock, by the uropygials, are black, and the outer white with a black base. In the hen the bill is black, the crest more round and not fila- mentous, the uropygials scarcely elongated, and the vent only scarlet. The eyes are of a yellowish-brown. Southern examples from Costa Rica and Veragua have the tail-coverts much narrower, and have been needlessly considered to form a distinct species under the name of P. costaricensis, There are, however, some good congeneric species, P. anti- stanus, P. fulgidus, P. auriceps, and P. pavoninus, from various parts of South America, and, though all are beauti- ful birds, none possess the wonderful singularity of the Quezal. (A. N.)

QUEZALTENANGO, a city of Guatemala, capital of the province of its own name, lies on the Siguila in a fertile district about 25 or 30 miles to the west of Lake Atitlan, on the high road between the city of Guatemala and the Mexican province of Chiapas. It has a cathedral and other public buildings, carries on the manufacture of cotton and wool, and contains from 20,000 to 30,000 inhabitants, mostly Indians. In the days of the Quiché power Quezaltenango, or, as it was then called, Xelahuh, was one of the largest and most flourishing cities in the country. The Spanish city was founded by Alvarado in

1524.

QUIETISM, a peculiar form of Mysticism (¢.v.) within the modern Catholic Church, mainly associated with the names of Madame Guyon and Micugr pe Motinos (99.v.).

See also FuneEton,

QUILIMANE, or Kitimane (the former being the Portuguese spelling), a Portuguese town on the east coast of Africa, at the head of a district of the province of Mozambique, lies 12 miles inland from the mouth of the river Quilimane or Qua Qua, which, an independent stream during the rest of the year, during the rainy season becomes a deltaic branch of the Zambesi, with which it is connected by Mutu, a cross channel or ditch. The town lies on the north bank of the river at a point where it is still about a mile broad, and as many as fifty coasting vessels may be seen at a time in the harbour. Large steamers are obliged to lie off the river mouth till high tide. Almost all the European merchants live in one long acacia-shaded street or boulevard skirting the river, while the Indian merchants or Banyans occupy another street run- ning at right angles. The natives have their hut-clusters hid among the tropical vegetation which begins at the very end of the street and rapidly passes off into the uninvaded swamlp-forest. The whole site is low and unhealthy, and the Portuguese have done next to nothing to improve it, The total population is between 6000 and 7000. Quili- mane, at one time the capital of the Arab kingdom of Angoza, was seized by the Portuguese in the 16th century, and became in the 18th and the early part of the 19th the chief slave mart on the east coast of Africa. In modern times it has been the starting point of several exploring expeditions—notably of Livingstone's up the Zambesi to Lake Nyassa in 1861.

QUILL. See Featruers and Pen.

QUILLOTA, a town of Chili, at the head of a district in the province of Valparaiso, lies 30 miles by rail north- east of Valparaiso, on the south or left bank of the Aconcagua, about 20 miles from its mouth. It is one of the oldest towns in the country, and since the opening of the railway in 1863 it has grown so that in population

1 Preserved specimens, if exposed to the light, lose much of their

beauty in a few years, the original glorious colour becoming a dingy greenish-blue.

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(11,369 in 1875) it is exceeded only by the capital and six other towns. It is famous for the quality of its chiri- moyas (Anona Cherimolia) and lucumas ; and in the neigh- bourhood there are rich copper mines. In 1822 and 1851 it suffered from earthquakes.

QUILON, a seaport town in Quilon district, Travancore state, Madras presidency, India, between the towns of Trevandrum and Aleppi, in 8° 54' N. lat. and 76° 37' E. long. It is a healthy town, and contained in 1881 a popu- lation of 13,588. It enjoys great facilities of water com- inunication, and has an active export trade in timber, cocoa-nuts, ginger, pepper, &c. The outer point of the town (Tangacheri) is slightly elevated above the adjoining ground, and contains high cocoa-nut trees. Besides being a very projecting point, Quilon is rendered still more unsafe to approach by the bank of hard ground called the Tangacheri reef which extends some distance to the south- west and west of the point and along the coast to the northward. 'There is, however, good anchorage in a bight about 3 miles from the fort. Quilon is one of the oldest towns on the Malabar coast, and continued to be a place of considerable importance down to the beginning of the 16th century. It was garrisoned by a strong British force from 1803 to 1830; but the subsidiary force has since been reduced to one native regiment, whose cantonments lie to the east of the town. The town is 385 miles south-west of Madras.

QUIMPER, or QuimPER-CoRENTIN, a town of France, formerly the capital of the county of Cornouailles, and now the chief town of the department of Finistére, is situ- ated 158 miles north-west of Nantes and 68 miles south- east of Brest on the railway between those towns. The delightful valley in which it lies is surrounded by high hills and traversed by the Steir and the Odet, which, meeting above the town, form a navigable channel for vessels of 150 tons during the rest of their journey to the sea (11 miles). With its communal population of 15,288, Quimper ranks in Finistére next to Brest and Morlaix. The only articles in which it has any consider-

able trade are fish and marine manures ; and in 1882 the total movement of the port was 31 vessels (2976 tons) entering and 36 vessels (3352 tons) clearing. The real interest of the town lies in its old churches and its historic associations. Of the old town-walls a few portions are still preserved in the terrace of the episcopal palace and in the neighbourhood of the college. Quimper is the seat of a bishop belonging to the province of Rennes. The cathedral, dedicated to the patron saint St Corentin and erected between 1239 and 1515, has a fine fagade, the pediment of which is crowned by an equestrian statue of King Grallon, and adorned (like several other external parts of the building) with heraldic devices cut in granite. Two lateral towers with modern spires (1854-56) and turrets reach a hetght of 247 feet. The total length of the build- ing is 303 feet and its width 52, the length of the transept 118 feet and the height 66. The nave and the transept are in the style of the 15th century, and the central boss bears the arms of Anne of Brittany (1476-1514). The terminal chapel of the apse dates from the 13th century. In the side chapels are the tombs of several early bishops. The high altar, tabernacle, and ciborium are costly works of contemporary art. The pulpit panels represent episodes in the life of St Corentin. Of the other churches may be mentioned St Matthieu, rebuilt at the beginning of the 16th century, with a fine belfry ; the church of Locmaria, dating from the 11th century; and the college chapel, in the "Jesuit" style. The old seminary is now used as a poorhouse, and there is also a lunatic asylum in the town. The public library in the town-hall possesses 25,000 volumes. The museum built in 1869-70 contains archee-

ological collections and about 1300 paintings and draw- ings. In 1868 a bronze statue of Laennec the inventor of the stethoscope (born at Quimper in 1781) was erected in Place St Corentin.

Quimper, or at least its suburb Locmaria (which lies below the town on the left bank of the Odet), was occupied in the time of the Romans, and numerous traces of the ancient foundations still exist. At a later period Quimpcr became the capital of Cornouailles and the residence of its kings or hereditary counts. It is said to have been Grallon Meur (i.¢., the Great) who brought the name of Cornouailles from Great Britain and founded the bishopric, which was first held by St Corentin about 495. Ho el, count of Cornouailles, marrying the sister and heiress of Duke Conan in 1066, united the countship with the duchy of Brittany. Quimper was surrounded by walls in the course of the 138th century. It suffered greatly in the local wars of succession. In 1344 it was savagely sacked by Charles of Blois. Monfort did not succeed in his attempt to take the town by storm on August 11, 1845, but it opened its gates to his son John IV. in 1364 after the victory at Auray. At a later period it sided with the Leaguc. Besides Lacunec, already mentioned, it has given birth to Kerguélen the navigator, Fréron the critic, Hardouin the anti- quary, and Count Louis de Carne. Doubtless on account of its dis- tance from the capital, Quimpcr, like Carpentras and Landerneau, has undeservedly been made a frequent butt of French popular wit.

QUINAULT, Puitipre (1635-1688), a dramatist of merit, and the only European writer who has made the opera libretto a work of literature (so much so that the popularity of opera may be said to be not a little due to him), was born at Paris on June 3, 1635. He was educated by the liberality of Tristan, the author of Marianne. His first play was produced at the Hotel de Bourgogne in 1653 when Quinault was only eighteen. It is said that it was the occasion of an important innova- tion in dramatic history. Tristan had offered it and it had been accepted as his own at the price of a hundred crowns, which, though little enough, was twice the regular price of a few years before. When Tristan told the actors that it was the work of a novice they wished to throw up their bargain and only held to it on the terms of a ninth part of the receipts. The piece succeeded and Quinault followed it up,

but he also read for the bar ; and in 1660, when he married a widow with money, he bought himself a place in the Cour des Comptes. Then he tried tragedies (Agrippa, &c.) with more success than desert. He re- ceived one of the literary pensions then recently established, and was elected to the Academy in 1670.

Up to this time he had written some sixteen or seven- teen comedies, tragedies, and tragi-comedies, of which the tragedies were mostly of very small value and the tragi- comedies not of much more. But his comedies—especially his first piece Les Rivales, L' Amant Indiscret (1654) (which has some likeness to Molitre's Htourdi, and was with it used to make up Newcastle's and Dryden's Sir Martin Mar-all), Le Fant6me Amoureux (1659), and La Mere Coquette (1665), perhaps the best—are much better. None of these styles, however, made Quinault worthy of a place here. In 1671 he contributed to the singular miscellany of Psyche, in which Corneille and Moliére also had a hand, and which was set to the music of Lulli. Here he showed a remarkable faculty for lyrical drama, and from this time till just before his death he confined himself to composing libretti for Lulli's work. This was not only very profitable (for he is said to have received four thousand livres for each, which was much more than was usually paid even for tragedy), but it established Quinault's reputation as the master of a new style,—so much so that even Boileau, who had previously attacked and satirized his dramatic work, was converted, less to the opera, which he did not like, than to Quinault's remarkably ingenious and artist-like work in it. His libretti are among the very few which are readable without the music, and which are yet carefully adapted to it. They certainly do not contain very exalted poetry or very perfect drama.

But they are quite free from the ludicrous doggerel which (not merely in English) has made the name libretto a by- word, and at the same time they have quite enough dra- matic merit to carry the reader, much more the spectator, along with them. It is not an exaggeration to say that Quinault, coming at the exact time when opera became fashionable out of Italy, had very much to do with estab- lishing it as a permanent European genre. His first piece after Psyche was a kind of classical masque, The Feast of Love

and Bacchus (1672). Then came Cadmus (1674), then in the same year and the three following Alceste, Thésée, Atys (one of his best-liked pieces), and Jsis. All these, it may be observed, were classical in subject, and so was Proserpine (1680), which was superior to any of them. The Triumph of Love (1681) is a mere ballet, but in Persée and Phaeton Quinault returned to the classical opera. Then he finally deserted it for romantic subjects, in which he was even more successful. Amadis (1684), Roland (1685), and Armide (1686) are his masterpieces, the last being the most famous and the best of all. It should perhaps be observed that the very artificiality of the French lyric of the later 17th century and its resemblance to alexandrines cut into lengths were aids to Quinault in arranging lyrical dialogue. Lulli died in 1687, and Quinault, his occupation gone (for the two had now worked together for more than fifteen years, and it would probably have been difficult to find another composer equally well suited to his librettist), became devout, began a poem called the '" Destruction of Heresy," and died on November 26, 1688. The best edition of his works is that of 1739 (Paris, 5 vols.). QUINCE. Among botanists there is a difference of opinion whether or not the quince is entitled to take rank as a distinct genus or as a section of the genus Pyrite At is not a matter of much importance whether we call the quince Pyrus Cydonia or Cydonia vulgaris. For practical purposes it is perhaps better to consider it as distinct from Pyrus, differing from that genus in the twisted manner in which the petals are arranged in the bud, and in the many-celled ovary, in which the numerous ovules are disposed horizontally, not vertically as in the pears.

The quinces are much-branched shrubs or small trees with

entire leaves, small stipules, large solitary white or pink flowers like those of a pear or apple, but with leafy calyx- lobes, and a many-celled ovary, in each cell of which are numerous horizontal ovules. The common quince is a native of Persia and Anatolia, and perhaps also of Greece and the Crimea, but in these latter localities it is doubtful whether or not the plant is not a relic of former cultivation, By Franchet and Savatier P. Cydonia is given as a native of Japan with the native name of "maroumerou." It is certain that the Greeks knew a common variety upon which they engrafted scions of a better variety which they called xvdeviov, from Cydon in Crete, whence it was obtained, and from which the names Cydonia, Codogno (Italian),

Coudougner and Coing (French), Quitte (German), and Quince have been derived. Pliny (1. N., xv. 11.) men- tions that the fruit of the quince, Malum cotoneum, warded off the influence of the evil eye ; and other legends connect it with ancient Greek mythology, as exemplified by statues in which the fruit is represented, as well as by represent- ations on the walls of Pompeii. The fragrance and astringency of the fruit of the quince are well known, and the seeds are used medicinally for the sake of the mucilage they yield when soaked in water, a peculiarity which is not met with in pears. This mucilage is analogous to, and has the same properties as, that which is formed from the seeds of linseed. In English gardens three varieties are cultivated—the apple-shaped quince, the pear-shaped quince, and the Portugal quince; the last-named has larger

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fruits than the other two (4 inches in length, 3-3} in

width), of a rich yellow colour when ripe and with less

astringency, hence it is better suited for culinary and con-

fectionary purposes than the other two, but is said to be somewhat more tender. The common quince and _ its varieties are very largely used as "dwarfing " stocks on which choice pears are engrafted. The effect is to restrain the growth of the pear, increase and hasten its fruitful- ness, and enabie it to withstand the effects of cold (see Horvicutturg, vol. xii. p. 213). The common Japan quince, Pyrus or Cydonia japonica, is grown in gardens for the sake of its flowers, which vary in colour from creamy white to rich red, and are produced during the winter and early spring months. CO. Maule, a recently introduced shrub from Japan, bears a profusion of equally beautiful orange-red flowers, which are followed by fruit of a yellow colour and agreeable fragrance, so that, when cooked with sugar, it forms an agreeable conserve, as in the case of the ordinary quince. The fruit of the ordinary Japan quince is quite uneatable.

QUINCY, a city of the United States, the county seat of Adams county, Illinois, occupies a limestone bluff 125 feet above low-water mark on the east bank of the Missis- sippi at the extreme western point of the State. The

river is crossed here by the great bridge of the Hannibal and St Joseph Railroad. Quincy Bay, an arm of the river, is the finest natural harbour for steamboats on the upper Mississippi. By water Quincy is 160 miles above St Louis, and by rail 263 miles south-west of Chicago via Galesburg. Commanding an extensive view, being well built, having excellent waterworks, and forming an important centre in the railway system of the region, Quincy is both an attrac- tive and a prosperous place, with very miscellaneous in- dustries. Among the public buildings are the court-houses, St John's cathedral (1877), a medical college (1873), a city library, and several hospitals and asylums. The population in 1860 was 13,718 ; in 1870, 24,052 (1073 coloured) ; and in 1880, 27,268 (1508 coloured). Laid out in 1825 or about three years after the arrival of the first white settler, Quincy was made a town in 1834, and a city in

QUINCY, a township and seaport of the United States, in Norfolk county, Massachusetts, on a small bay of its own name in the south of Massachusetts Bay and 7 miles south-south-east of Boston by rail. It is best known for its great granite quarries, in connexion with which was constructed in 1827 the first (horse) railway in the United

States, and as the birthplace of Governor John Hancock.

and Presidents John Adams and John Quincy Adams. Among the principal buildings—chiefly situated in the village, which lies on an elevated plain near the centre of the township—are the granite town-house, the so-called Adams Temple (a church erected in 1828), beneath the portico of which are the tombs of the two Presidents Adams, the Adams Academy, a home for infirm sailors, a public library, and the mansions of the Quincy and Adams families, whose estates occupied the greater portion of the township. Quincy, which till 1792 formed part of Braintree, had 5017 inhabitants in 1850, 6779 in 1860, 7442 in 1870 and 10,570 in 1880.

QUINCY, Jostan, Jr. (1744-1775), born in Boston, Mass., 1744, is the most eminent of a well-known family whose founder emigrated to New England in 1633, At the time of his death, at the age of thirty-one, he had won distinction as a lawyer, and his place was secured in history as among the most eloquent, the most clear-sighted, and the most devoted of the men who led the American colo- nists in the measures preliminary to the revolution

In 1767 he entered upon the public discussion of political questions, maintaining with great ability and courage the

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duty of his countrymen to resist any encroachments upon their right to self-government. In 1770 he wrote An Address of the Merchants, Traders, and Freeholders of Boston in favour of a non-importation Act, asserting, about the same time, in a newspaper article that Americans would “know, resume, assert, and defend their rights” by the “arts of war” if “the arts of policy” should fail. In December 1773 he took an active and leading part in the town-meeting which virtually ordered the destruction of the cargoes of the tea-ships in Boston harbour. The appeal to the other towns for help to sustain Boston against the enforcement of the consequent Acts of Parliament was written by him ; and soon after there appeared under his own name Observations on the Boston Port Bull, with Thoughts on Cwil Society and Standing Armies, his lougest and most important political paper, which made him a marked man both in England and America. He sailed a few months afterwards for England with the approval of the leading revolutionists, to present, though unofficially, to the ministry and other public men the grievances and the determination of the colonists. After six months failing health—he had long been threatened with consumption—compelled him to return home, and he died on shipboard as the vessel was entering the harbour of Gloucester, Massachusetts, April 26, 1775.

A memoir written by his only son, Jostau Quincy (1772-1864), containing his life, correspondence, and the Observations on the Boston Port Bill, was published in 1825 (2d ed. 1874). This only son of Josiah Quincy, jun., born in Boston in February 1772, lived to be three times the age of his father, and filled public stations for more years than his father lived ; he was a member of Congress during the eventful period from 1805 to 1813 ; as the second mayor of Boston his sagacity and energy insurcd the future prosperity of that city ; in Congress he maintained at the head of the

Federal party the struggle with the disastrous foreign policy of the administrations of Jefferson and Madison, and the dangcrous growth of the slave-power, which he never ceased to qppose ; as president of Har- vard College for sixteen years (1829-45) he increased the usefulness and added to the influence of that seat of learning. He wrote a history of the college for two hundred ycars, which was also largely a history of Massachusctts. He died in June 1864 in the ninety- third year of his age. A lifc of hin, by his youngest son Edmund Quincy, an accomplished seholar and well-known author, was pub- lished in 1867.

QUINET, Epcar (1803-1875), was born at Bourg-en- Bresse, in the department of the Ain, France, on February 17, 1803. His father, Jerome Quinet, had been a com- missary in the army, but being a strong republican and disgusted with Napoleon's usurpation, he gave up his post and resided either at Bourg or at a country house which he possessed in the neighbourhood, devoting himself to scien- tific and mathematical study. Edgar, who was an only child, was much alone, but his mother (whose name was Eugénie Rozat Lagis, and who was a person of education and strong though somewhat unorthodox religious views) exercised great influence over him. He was sent to school first at Bourg and then at Lyons, where he took no part in a celebrated barring out which led to the expulsion of his schoolfellow Jules Janin. On leaving school his father wished him to go into the army and then suggested busi- ness. But Quinet was determined upon literature, and after a time got his way. His first publication, the Zab-lettes du Juif Errant, appeared in 1823. Being struck with Herder's Philosophie der Geschichte, he undertook to translate it, learnt German for the purpose, published his work in 1827, and obtained by it considerable credit. At this time he was introduced to Cousin and made the acquaintance of Michelet. He had visited Germany and England before the appearance of his book. Cousin pro- cured him a post on a Government mission to the Morea in 1829, and on his return he published in 1830 a book on La Giréce Moderne. Some hopes of employment which

by the reputation of speculative republicanism which he had acquired. But he joined the staff of the Revue des . Deux Mondes, and for some years

contributed to it numer- ous essays, the most remarkable of which was that on "Les Epopées Francaises du XIIéme Siécle," an early though not by any means the earliest appreciation of the long-neglected chansons de geste. Ahasvérus, his first ori- ginal work of consequence, appeared in 1833. This is a singular prose poem in language sometimes rather bom- bastic but often beautiful. ~~Shortly afterwards he married Minna Moré, a German girl with whom he had fallen in love some years before. Then he visited Italy, and, besides writing many essays, produced two poems, Vapoléon and Promethée (1833), which being written in verse (of which he was not a master) are inferior to Ahasvérus. In 1838 he published a vigorous reply to Strauss's Life of Jesus, and in that year he received the Legion of Honour. In 1839 he was appointed professor of foreign literature at Lyons, where he began the brilliant course of lectures afterwards embodied in the Génie des Religions. Two years later he was transferred to the Collége de France and the Génie des Religions itself appeared (1842). Quinet's Parisian professorship was more notorious than fortunate, owing, it must be said, to his own fault. His chair was one of Southern Literature, but, neglecting his proper subject, he chose, in conjunction with Michelet, to engage in a violent polemic with the Jesuits and with Ultramontanism. Two books bearing exactly these titles appeared in 1843 and 1844, and contained, as was usual with Quinet, the substance of his lectures. These excited so much disturbance and the author so obstinately refused to confine himself to literature proper that in 1846 the Government put an end to them—a course which was not disapproved by the majority of his colleagues. By this time Quinet was a pronounced republican and something of a revolutionist. He appeared in arms during the dis~~ turbances which overthrew Louis Philippe, and was elected by the department of the Ain to the Constituent and then to the Legislative Assembly, where he figured among the extreme Radical party. He had published in 1848 Les févolutions d Italie, one of his principal though not one of his best works. He wrote numerous pamphlets dur- ing the short-lived second republic, attacked the Roman expedition with all his strength, and was from the first an uncompromising opponent of Prince Louis Napoleon. He was banished from France after the coup d'état, and estab- lished himself at Brussels. His wife had died some time previously, and he now married Mademoiselle Assaki, the daughter of a Roumanian poet. At Brussels he lived for some seven years, during which he published Les Hsclaves

| (1853), a dramatic poem, Marnix de Ste Aldégonde (1854),

a study of that Reformer in which he very greatly exagger- ates Sainte Aldegonde's literary merit, and some other books. He then moved to Veytaux on the shore of the Lake of Geneva, where he continued to reside till the fall of the empire. Here his pen was busier than ever. In 1860 appeared a singular book somewhat after the fashion of Akhasvérus entitled Merlin VEnchanteur, in 1862 a Histoire de la Campagne de 1815, in 1865 an elaborate book on the French Revolution, in which the author, republican as he was, blained the acts of the revolutionists unsparingly, and by that means drew down on himself much wrath from more thoroughgoing partisans. Many pamphlets date from this period, as does La Création (1870), a third book of the class of Ahasvérus and Merlin, but even vaguer, dealing not with history, legend, or philosophy, but with physical science for the most part. Quinet had refused to return to France to join the Liberal opposition against Napoleon III., but immediately

he had after the revolution of February were frustrated | after Sedan he returned. He was then restored to his pro-

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fessorship, and during the siege wrote vehemently against the Germans. He was elected deputy by the department of the Seine in 1871, and was one of the most obstinate opponents of the terms of peace between France and Germany. He continued to write till his death, which occurred at Versailles on the 27th March 1875. Le Stége de Paris et la Défense Nationale appeared in 1871, La République in 1872, Le Lnvre de VExilé in the year of its author's death and after it. This has been followed by three volumes of letters and some other work. Quinet had already in 1858 published a semi-biographic book called _ LTistoire de mes Idées. The whole of his very numerous works, the chief of which have been already named, have appeared in a uniform edition of which some thirty volumes are now published. His second wife, in 1870, published certain Mémoires @ Exil. There is in English an elaborate Early Life and Writings of Edgar Quinet, by R. Heath (London, 1881), but it does not go beyond the year 1842.

Quinet's character was extremely amiable, and his letters to his mother, his aeconnts of his early life, and so forth are likely always to make him interesting. He was also a man of great moral con- scientiousness, and as far as intention went perfectly disinterested, though it may perhaps be questioned whether the disappointment which he met with for years after the revolution of February had not an insensible influence in determining his republicanism. But he never temporized, and, as has been said above, hesitated not to criticize his own party as severely as his opponents. He had, how- ever, as a writer, a thinker, and a politician, drawbacks which pre- vented him from taking the first rank, and which will probably make his works, except those which are purely personal, less and less read in the future. As a writer his chief fault is want of concentration, asa thinker and politician vagueness and want of practical deter- mination. His work is very extensive and abounds in passages of great beauty. But no single book of his can be called a master- piece, and none is of sueha kind that the reader fecls the subject to have been thoroughly treated in accordance with a definite and eonsistent principle or series of principles. Of verse he had but little command, and his abundance in a certain kind of effusive prose wants chastisement and criticism. The singular rhapsodies,

of which in the threc books Ahasvérus, Merlin, and La Création he.

has left great store, are too diffuse, too inorganic, and too devoid of coherent and positive intention to rank very high. They are more like recorded dreams than anything else. His historical and philo- sophical works on the other hand, though showing much reading, fertile thought, abundant facility of expression, and occasionally, where prejudice does not come in, acute judgment, are rather (as not a few of them were in fact) reported lectures than formal treatiscs. His rhetorical power was altogether superior to his logical power, and the natural consequence is that his work is full of contradictions. These contradictions were,.moreover, due not merely to an incapacity or an unwillingness to argue strictly, but also to the presence in his mind of a large number of inconsistent tastes and prejudices which he either could not or would not co- ordinate into an intelligible creed. Thus he has the strongest attraction for the picturesque side of medievalism and catholicity, the strongest repulsion for the restrictions which medieval and Catholic institutions imposed on individual liberty. Hc

refused to submit himself to any form of positive orthodoxy, yet when a man like Strauss pushed unorthodoxy to its extreme limits Quinet revolted, As a politician he acted with the extreme Radicals, yet universal suffrage, the cardinal doctrine of Radicalism, disgusted him as unreasonable in its principle and dangerous in its results. His pervading characteristic, therefore, is that of an eloquent vagueness, very stimulating and touching at times, but as deficient in coereive force of matter as it is in lastiug precision and elegance of form. He is less inaccurate in fact than Michelet, but he is also much less one-ideaed, and the result is that he seldom attains to the vivid representation of which Michelet was a master. (G. SA.)

QUININE, the most important of the active principles contained in cinchona bark (see CrncHona, vol. v. p. 780). Although the value of this bark in the treatment of intermittent fevers became widely known in 1638 through the cure of the countess of Chinchon, it was not until 1810 that any attempt was made to determine definitely the active principles to which its properties were due. In that year Gomez of Lisbon obtained a mixture of alkaloids by treating an alcoholic extract of the bark with water and then adding a solution of caustic potash. To this he gave the name of cinchonino. In 1820 two French

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chemists, Pelletier and Caventou, proved that the cin- chonino of Gomez contained two alkaloids which they named quinine and cinchonine. Some years afterwards quinidine and cinchonidine were discovered, and subse- quently several other alkaloids, but in smaller quantity, in different varieties of the bark.

Chemistry.—The alkaloids appear to exist in cinchona bark chiefly in combination with cinchotannic and quinic acids, since solvents of the alkaloids in the free state do not dissolve out any from the powdered bark. The cinchotannic acid apparently becomes altered by atmo- spheric oxidation into a red-colouring matter, known as cinchono-fulvic acid or cinchona red, which is very abundant in some species, as in C'. succirubra. For this reason those barks which, like C. Calisaya, C. officinalis, and C. Ledgeriana, contain but little colouring matter are preferred by manufacturers, the quinine being more easily extracted from them in a

colourless form. The value of cinchona bark for the manufacture of quinine depends on the amount of quinine sulphate that can be prepared from it in the crystalline form. The exact mode of extraction adopted by manufacturers is kept a profound secret. That hitherto adopted by the Indian Government for the preparation of the cinchona febrifuge (see below) has the merit of simplicity, but the whole of the alkaloid present in the bark is not obtained by it. This method is to exhaust the powdered bark as far as possible by means of water acidulated with hydrochloric acid and then to pre- cipitate the mixed alkaloids by caustic soda. Another method which is said to give better results consists in mixing the powdered bark with milk of lime, drying the mass slowly with frequent stirring, exhausting the powder with boiling alcohol, removing the excess of alcohol by distillation, adding sufficient dilute sulphuric acid to dis- solve the alkaloid and throw down colouring matter and traces of lime, c&c., filtering, and allowing the neutralized liquid to deposit crystals. The sulphates of the alkaloids thus obtained are not equally soluble in water, and the sulphate of quinine can consequently be separated by fractional crystallization, since, being less soluble in water than the other sulphates, it crystallizes out first.

The quinine of commerce is the neutral sulphate, containing 74 molecules of water of crystallization, and having the formula (C,,H,,N,O,).. H,SO,+1°H,O. When crystallized from alcohol, or when dried over sulphuric acid, it contains only 2 molecules. Cownley has shown that the salt containing 2 molecules of water is the most per- manent one, for when the commercial sulphate containing 7% molecules is dried at 100° C. it becomes anhydrous, and when subsequently exposed freely to the air it rapidly absorbs 2 molecules of water; and that the commercial salt, if exposed to the air, effloresces until only 2 mole- cules of water are retained.!

Two other sulphates are known. The one contains a single equivalent of acid, and in commerce bears the name of acid sulphate or soluble sulphate of quinine; it is soluble in 11 parts of water, but with considerable diffi- culty in absolute alcohol. The other sulphate contains 2 equivalents of sulphuric acid, is very soluble in cold water, but quite insoluble in ether; it is not an article of commerce. Both these sulphates crystallize with 7 molecules of water.

The neutral sulphate of quinine occurs in commerce in the form of slender white acicular crystals, which are very light and bulky. It is soluble in about 740 parts of cold water, but in 30 of boiling water, 60 of rectified spirits of wine (sp. gr. 0°85), and 40 of glycerin. Its solubility in water is lessened by the presence of sodium or magnesium sulphate, but is increased by nitrate of potassium,

' Pharm. Jour., [8], vol. vii p. 189.

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chloride of ammonium, and most acids. It is not

soluble in fixed oils or in ether, although the pure alkaloid is soluble in both. It becomes phosphorescent

on trituration. When prescribed it is generally rendered more soluble in water by the addition of dilute sulphuric

acid or of citric acid, one drop of the former or $ths of a grain of the latter being used for each grain of the sulphate of quinine.

When a solution of quinine is exposed to sunlight it assumes a yellowish or brown colour due to the formation of " quiniretin," a body which is isomeric with quinine but has mot an alkaline reaction, is not precipitated by tannin, and has an aromatic as well as a bitter taste. Quinine is precipitated from its solution by alkalies and their carbonates. It is very soluble in solution of ammonia, and also slightly soluble in lime water.

The acid solution of sulphate of quinine is fluorescent, especially when dilute; it is levogyrate; and when a solution of chlorine is first added and then ammonia an emerald green colour, due to the formation of thalleoquin, is developed. This test answers with a solution contain- ing only 1 part of quinine in 5000, or in a solution containing not more than 55 Zo part if bromine be used instead of chlorine. The fluorescence is visible in an acid solution containing one part in 200,000 of water.

Quinine forms with sulphuric acid and iodine a com- pound known as herapathite, 4C,,H,,N,O,.3S0,H,. 61 +3H,O, which possesses optical properties similar to those of tourmaline; it is soluble in 1000 parts of boiling water; and its sparing solubility in cold alcohol has been utilized for estimating quinine quantitatively. The other alkaloids are distinguished from quinine thus:—quinidine resembles quinine, but is dextrogyrate, and the iodide is very in- soluble in water; the solution of cinchonidine, which is levogyrate, does not give the thalleoquin test, nor fluor- escence; cinchonine resembles cinchonidine in these respects, but is dextrogyrate.

Commercial sulphate of quinine frequently contains from 1 to 10 per cent. of the sulphate of cinchonidine owing to the use of barks containing it. The sulphate of cinchonidine is more soluble than that of quinine; and, when 1 part of quinine sulphate suspected to contain it is nearly dissolved in 24 parts of boiling water, the sulphate of quinine crystallizes out on cooling, and the cinchonidine is found in the clear mother liquor, from which it can be precipitated by a solution of tartrate of potassium and sodium, Samples of quinine in which cinchonidine is present usually contain, according to Hesse, a smaller per- centage of water than the pure sulphate, the cinchonidine salt exercising a reducing influence on the quinine salt in this respect. Traces of quinidine are also sometimes, though rarely, found in commercial quinine, but, since quinidine is even more valuable as a medicine than quinine, its presence does not detract in a medicinal point of view from the value of the latter.

Owing to its voluminous character, as much as 18 per cent. of water may remain present in apparently dry samples of sulphate of quinine. If it loses more than

14°6 per cent. of water when dried at 100° C. it contains

an excessive amount of moisture. Owing to its variability in this respect the hydrochlorate of quinine has been recommended as a more constant salt; it also possesses advantages from a therapeutical point of view.

Sulphate of quinine manufactured from cuprea bark (Remyjia pedunculata) is liable to contain from ‘10 to ‘90 per cent. of sulphate of homoquinine, which almost coincides in solubility with sulphate of quinine. Homo-

quinine has been shown by Paul and Cownley to be decomposed on treatment with caustic soda into quinine and a new alkaloid, cupreine, in the proportion of 2 to 3.

They have also shown that cupreine is soluble in a solu- tion of caustic soda (differing in this respect from quinine), and that therefore it is easy to prepare sulphate of quinine perfectly free from either homoquinine or cupreine. So far as the medicinal properties of cupreine and homo- quinine are at present known they appear to be of no practical importance.}

In consequence of the high price of the alkaloid an attempt was made a few years since by the Government of India to manufacture from cinchona bark a cheap febrifuge which should represent the alkaloids contained in the bark and form a substitute for quinine. This enterprise met with such success that in 1884 as much as 8714 Ib of the febrifuge were prepared; and during the previous year 9144 Ib were distributed, of which 4880 ib were supplied to the Government institutions at a cost of little more than a rupee per ounce.

This mixture is known as cinchona febrifuge, and is prepared chiefly from C. succtrubra, which succeeds better in India than the other species in cultivation, and grows at a lower elevation, being consequently procurable in large quantities at a comparatively low price. A mixture of the cinchona alkaloids, consisting principally of cinchoni- dine sulphate, with smaller quantities of the sulphates of quinine and cinchonine, is sold under the name of " quine- tum" at a cheaper rate than quinine.

In 1870 the Indian Government purchased no less than 81,600 ounces of sulphate of quinine, besides 8832 ounces of the sulphates of cinchonine, cinchonidine, and quinidine ; but at the present date it is able to meet the require- ments of its establishments almost entirely by the cinchona febrifuge prepared at the Government plantations in India.

Although quinine is manufactured in the United States, a large quantity has been imported from Europe since the high duty levied on its manufacture has been removed. There is considerable difficulty in obtaining trustworthy statistics as to the extent of the manufacture of quinine. The largest sale that has taken place in America appears to have been in 1883, when 14 tons

were put up to auction, and in the same year 16,000 ounces were sold in London and a similar quantity at Berlin.

Phystological Action.—Quinine arrests the movements of the white corpuscles of the blood, rendering them round and darkly granulate, and, by.preventing them from making their exit from the blood-vessels, diminishes or arrests the formation of pus in inflammation and causes contrac- tion of the spleen when that organ is enlarged. It acts upon the cerebro-spinal nervous system, giving rise to headache and a sense of tension in the brain; these symptoms may be removed by the addition of hydrobromic acid or prevented by the use of the hydrobromide of quinine. It acts through the sympathetic nervous system on the heart, and is thus capable of restraining all the animal processes which develop heat, organic changes, or muscular action. It is antagonistic to atropine in its physiological action.

The use of quinine in medicine dates from its discovery in 1820. Its chief value is as an antiperiodic, especially in intermittent fevers, but also in other diseases when they assume a periodic character, such as neuralgia, asthma, hooping cough, &c. In blood poisoning, whether arising from natural or traumatic causes, it has been found of great utility. Its curative powers in sunstroke have been repeatedly proved in the East Indies, and a dose of quinine will often cut short an attack of catarrh if taken in the early stage. In malarial districts persons have

1 Pharm. Jour, and Trans., [8], vol. xii. p. 497, and vol. xv. p.

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been exposed to miasmatic influence without danger after taking a dose or two of five grains of quinine once or twice a day. In the smallest medicinal doses it is purely tonic, in larger ones stimulant ; but it differs from other medicines of the same class in the stimulant action being longer sus- tained. In large doses it acts as a sedative, and in exces- sive doses it is poisonous.

In some individuals it pro- duces an erythematous eruption, and it is also known to act as an oxytocic. Large doses also sometimes produce deafness, and act injuriously in all inflammatory states of the mucous membrane.

The other alkaloids of cinchona bark—quinidine, cincho- nidine, and cinchonine—also possess similar properties, quinidine being even more effectual than quinine ; but cinchonine appears to produce nausea and gastric disturb- ance. This is also the case with the cinchona febrifuge prepared from C. succirubra.

Until the year 1867 English manufacturers of quininc were eutirely dependent upon South America for their supplies of cinchona bark, which were obtained exclusively from uncultivated trees, growing chiefly in Bolivia, Peru, and Ecuador, the prin- cipal species which were used for the purpose being Cinchona Calisaya, Wedd. ; C. officinalis, Hook. ; C. macrocalyz, var. Palton, How. ; C. Pitayensis, Wedd. ; C. micrantha, R. and P.; and C. lanctfolia, Mutis. Since the cultivation of cinchona trees was com- meuced in Java, India, Ceylon, and Jamaica, several other species, as well as varieties and hybrids cultivated in those countries, have been used.! Recently C. lanctfolia, var. Calisaya, Wedd., known as the calisaya of Sauta Fé, has been strongly recommended for cultivation, because the shoots of felled trees afford bark containing a considerable amount of quinine ; C. Pitaycnsis has also been lately introduced into the Indian plantations on account of yielding the valuable alkaloid quinidine, as well as quinine, but the last two species have not as yet been grown in sufficient quantities to afford marketable bark.

The first importation from India took place in 1867, since which time the cultivated bark has arrived in Europe in constantly increasing quantities, London being the chief market for the Indian barks and Amsterdam for those of Java. The principal sales take place in May. In 1876, when Indian calisaya bark first came into the European market, the imports into London were the following :—Cinchona succirubra, 45,000 tb; C. officinalis, 20,000 Ib; C. Calisaya, 1000 tb. During the last few years Cinchona Cali- saya has also been eultivated extensively in Bolivia and in Tolima, United States of Colombia, and this bark, which had almost dis- appeared from

commerce, is likely in a few years to again become an available source of quinine.

In order to obtain the cultivated bark as economically as possible, experiments were made some years ago by M‘lvor and others which resulted in the discovery that, if the bark were removed from the trunks in alternate strips soas not to injure the cambium, or actively growing zone, a new layer of bark was formed in one year which was richer in quinine than the original bark and equal in thickness to that of two or three years’ ordinary growth. This is known in commerce as renewed bark. The process has been found to be most conveniently practised when the trees are eight years old, at which age the bark separates most easily. The yield of quinine has been ascertained to increase annually until the eleventh year, at which it seems to reach its maximum. The portion of the trunk from which the bark has been removed is sometimes pro- tected by moss, and the new bark which forms is then distin- guished by the name of mossed bark. The species which yield the largest ainount of quinine are by uo means the easiest to cultivate, and experiments have consequently been made in cross-fertilization and grafting with the view of giving vigour of growth to delicate trees yielding a large amount of alkaloid or of increasing the yield

1Tn Java, C. Calisaya, vars. anglica, javanica, Hasskarliana, and Ledgeriana; C. officinalis, var. angustifolia; C. lancifolia; C. caloptera, Mig.; C. micrantha and C. succirubra, How. In India, C. succirubra, C. officinalis, vars. angustifolia, crispa, Uritusinga, and Bonplandiana, and to a lesser extent C. Calisaya, vars. Boliviana and microcarpa; C. micrantha, C. Peruviana, How., and C. nitida, R. and P., form only a small proportion of the plantations. Sinee Mr J. E. Howard, the eminent quinologist, pointed out that C. Pahu- diana, How., and C. Calisaya, vars. javanica, Hasskarliana, and anglica, were likely to lead to disappointment as quinine-yielding speeies, these have been replaced in the plantations as rapidly as possible by the more valuable speeies, of which C. Ledgeriana, yield- ing from 5 to 10 per eent. or even more of quinine, C. officinalis, and a hybrid between C. officinalis and C. succirubra which has been named C. robusta, Trimen, are the most important.

in strong growing trees affording but little quinine. Grafting, how- ever, has not been found to answer the purpose, since the stock and the graft have been found to retain their respective alkaloids in the natural proportion just as if growing separately. Hybridization also is very uncertain, and is very difficult to carry out effectually; hence the method of propagating the best varieties by cuttings has been adopted except in the case of those which do not strike readily, as in C. Ledgcriana, in which the plants are grown from the shoots of felled trees.

A few years ago it was discovered that a bark imported from the United States of Colombia under the name of cuprea bark, and derived from Remijia pedunculata, Triana, and other species, con- tained quinine to the extent of 4 to 25 per cent., and in 1881 this bark was exported in enormous quantities from Santander, exceed- ing in amount the united importations of all the other cinchona barks; and by reason of its cheapness this has since that date been largely used for the manufacture of quinine.

The imports of cinchona bark into London in 1884, including cuprea bark, arc stated to have been 59,287 bales, into France 9271 bales, and into New York 8150 bales.

Cinchona bark as imported is never uniform in quality. The South-American kinds contain a variable admixture of inferior barks, and the cultivated Indian barks comprise, under the respec- tive names of yellow, pale, and red barks, a number of varieties of unequal value. For this reason a sample from every bale is analysed before the importations are offered for sale.

The alkaloids arc contained, according to Howard, ehiefly in the cellular tissue next to the liber. No definite knowledge has as yet been attained of the exact steps by which quinine is formed in nature in the tissues of the bark, nor have the numerous cndeavonrs that have been made to build up quinine artificially or to obtain some idea of its constitution by splitting it up into its component parts been more successful. Nearly all that is known at present has resulted from analyses of the leaves, bark, and root. From these it appears that quinine is present only in small quantities in the leaves, in larger quantity in the stem bark, and inereasing in proportion as it approaches the root, where quinine appears to decrease and cinchonine to increase in amount, although the root bark is generally richer in alkaloids

thau that of the stem. The altitude at which the trces are grown seems to affect the production of quinine, since it has been proved that the yield of quinine in C. officinalis is less when the trees are grown below 6000 feet than above that elevation, and that cinchonidine, quinidine, and resin are at the same time increased in amount. It has also been shown by Broughton that C. perwviana, which yields cinchonine but no quinine at a height of 6000 feet, when grown at 7800 feet gives uearly as much crystallized sulphate of quinine, and almost as readily, as C. officinalis. Karsten also ascertained by experiments made at Bogota on C. lancifolia that the barks of one district were sometimes devoid of quinine, while those of the same spccies from a neighbouring locality yielded 34 to 44 per cent. of the sulphate , moreover, Dr De Vrij found that the bark of C. officinalis cultivated at Utakamand varied in the yield of quinine from 1 to 9 per cent. In these cases the variation may have been due to altitude. Free access of air to the tissues also seems to increase the yield of quinine, for the renewed bark is found to contain more quinine than the original bark.

See Pharmacographia, 2d ed., pp. 859-3870; Howard, Quinology of the East Indian Plantations; Hesse in Pharm. Jour. and Trans., ser. 3, vol. iv. pp. 649- 750, 795; Bartholow, Materia Medica and Therapeutics ; King, Manual of Cin- chona Cultivation. (E, M. H.)

QUINSY. See Tonst1itis.

QUINTANA, Manvet Joss (1772-1857), Spanish poet and man of letters, was born at Madrid on April 11, 1772, and after completing his studies at Salamanca was called to the bar. In 1801 he produced an unsuccessful tragedy El Duque de Viseo; his Pelayo (1805), appeal- ing as it did to the spirit of resistance to foreign oppression, was much more successful. The first volume of his some- what rhetorical and superficial Vidas de Espafioles Célebres, in 1807, containing lives of Spaniards who had success- fully opposed the enemies of their country, was similar in motive, and at the outbreak of the revolution of 1808 Quintana, as journalist (Variedades, and Semanarvo patriotico), as secretary to the cortes and the regency, and also as "the Spanish Tyrteus" (Odas @ Espaiia hobre, 1808), rendered important services to the patriotic cause. On the return of Ferdinand VII. in 1814 he shared the fate of other "liberals " or "

constitutionalists," and had to endure six years' imprisonment in Pamplona, obtaining his release only in 1820, when he was named president of the department of public instruction under the new Govern-

ment. The counter-revolution of 1823 again drove him from office, to which he was once more restored after the death of the king in 1833. In 1835 he was made a senator and peer ; and in 1855, at a meeting of the cortes, a laurel crown was placed on his head by Queen Isabella II., whose " governor" he had been during her minority. He died at Madrid on March 11, 1857.

The works of Quintana form the 19th volume in Ribadaneyra's Biblioteca de Autores Espafioles (1852). The third and last volume of the Vidas appeared in 1833. The biographies of Nufiez de Bilboa, Pizarro, The Cid, Guzman el Bueno, Gonsalvo de Cordova, and one or two others have been translated into English.

QUINTILIAN (M. Fasrvus QuINnTILIANUS) was born in the obscure Spanish town of Calagurris (Calahorra), on the Ebro, in the country of the Vascones, not later than 35 a.p. Concerning his family and his life but few facts remain. His father taught rhetoric, with no great success, at Rome, and Quintilian must have come there at an early age to reside, and must have there grown up to manhood. The years from 61 to 68 he spent in Spain, probably attached In some capacity to the retinue of the future emperor Galba, with whom he returned to the capital. Quintilian must have brought back with him a considerable reputation as arhetorician. For at least twenty years after the acces- sion of. Galba he was at the head of the foremost school of oratory in Rome, and may fairly be called the Isocrates of his time. He also gained some but not a great repute as a pleader in the courts. His greatest speech appears to have been a defence of the queen Berenice, on what charge is not known. For a member of a learned profession his circumstances were easy ; but the question of Juvenal, " How is it that Quintilian owns so many estates?" ought perhaps not to be accepted as evidence of great wealth. Vespasian created for him a professorial chair of rhetoric, liberally endowed with public money, and from this time he was unquestionably, as Martial calls him, "the supreme

controller of the restless youth." About the year 88 Quintilian retired from teach- ing and from pleading, to compose his great work on the training of the orator (Institutio Oratoria). After two years' retirement he was entrusted by Domitian with the education of two grand-nephews, whom he destined as suc- eessors to his throne. Quintilian gained the titular rank of consul, and probably died not long before the accession of Nerva (96 a.p.). A good many years earlier his wife had died at the age of nineteen, leaving him two sons, one of whom died when seven years old, the other in his "eae year, while the father was engaged upon his great work.

Such is the scanty record that remains of Quintilian's uneventful life. But it is possible to determine with some accuracy his relation to the literature and culture of his time, which he powerfully influenced. His career brings home to us the vast change which in a few generations had passed over Roman taste, feeling, and society. In the days of Cicero rhetorical teaching had been entirely in the hands of the Greeks. Even Cicero, when he wrote his rhetorical works, was driven to plead that it could not be disgraceful to teach what it was not disgraceful to learn. The Greek language, too, was in the main the vehicle of instruction in rhetoric. The first attempt to open a Latin rhetorical school, in 94 B.c., was crushed by authority, and not until the time of Augustus was there any professor of the art who had been born to the full privileges of a Roman citizen. The appointment of Quintilian as professor by the chief of the state marks the last stage in the emancipation of rhetorical teaching from the old Roman prejudices.

During the hundred years or more which elapsed between the death of Cicero and the birth of Quintilian education all over the Roman empire had spread enor-

mously, and the education of the time found its end and climax in rhetoric. Mental culture was for the most part acquired, not for its own sake, but as a discipline to develop skill in speaking, the paramount qualification for a public career. Rome, Italy, and the provinces alike resounded with rhetorical exercitations, which were pro- moted on all sides by professorships, first of Greek, later also of Latin rhetoric, endowed from municipal funds. The mock contests of the future orators roused a vast

amount of popular interest. In Gaul, Spain, and Africa these pursuits were carried on with even greater energy than at Rome. The seeds of the existing culture, such as it was, bore richer fruit on the fresh soil of the Western provinces than in the exhausted lands of Italy and the Kast. While Quintilian lived, men born in Spain domin- ated the Latin schools and the Latin literature, and he died just too soon to see the first provincial, also of Spanish origin, ascend the imperial throne.

As an orator, a teacher, and an author, Quintilian set himself to stem the current of popular taste which found its expression in what we are wont to call silver Latin. In his youth the influence of the younger Seneca was dominant. But the teacher of Quintilian was a man of another type, one whom he ventures to class with the old orators of Rome. This was Domitius Afer, a rhetorician of Nimes, who rose to the consulship. Quintilian, however, owed more to the dead than to the living. His great model was Cicero, of whom he speaks at all times with unbounded eulogy, and whose faults he could scarce bring himself to mention; nor could he well tolerate to hear them mentioned by others. The reaction against the Ciceronian oratory which had begun in Cicero's own lifetime had acquired overwhelming strength after his death. Quintilian failed to check it, as another teacher of rhetoric, equally an admirer of Cicero, had failed—the historian Livy. Seneca the elder, a clear-sighted man who could see in Cidéero much to praise, and was not blind to the faults of his own age, condemned the old style as lacking in power, while Tacitus, in his Dialogue on Orators, includes Cicero among the men of rude and "unkempt" antiquity. The great movement for the poetization of Latin prose which was begun by Sallust ran its course till it culminated in the monstrous style of Fronto. In the courts judges, juries, and audiences alike demanded what was startling, quaint, or epigrammatic, and the speakers practised a thousand tricks to satisfy the demand. Oratory became above all things an art whose last thought was to conceal itself. It is not surprising that Quintilian's forensic efforts won for him no great reputation.

The Jnstitutio Oratoria is one long protest against the tastes of the age. Starting with the maxim of Cato the Censor that the orator is 'the good man who is skilled in speaking," Quintilian takes his future orator at birth and shows how this goodness of character and skill in speaking may be best

produced. No detail of training in infancy, boyhood, or youth is too petty for his attention. The parts of the work which relate to general education are of great interest and importance. Quintilian postulates the widest culture ; there is no form of knowledge from which something may not be extracted for his purpose; and he is fully alive to the importance of method in education. He ridicules the fashion of the day, which hurried over preliminary cultivation, and allowed men to grow grey while declaiming in the schools, where nature and reality were forgotten. Yet he develops all the technicalities of rhetoric with a fulness to which we find no parallel in ancient literature. ven in this portion of the work the illustrations are so apposite and the style so dignified and yet sweet that the modern reader, whose initial interest in rhetoric is of necessity faint, is carried along with much

less fatigue than is necessary to master most parts of the rhetorical writings of Aristotle and Cicero. At all times the student feels that he is in the company of a high-toned gentleman who, so far as he could do so without ceasing to be a Roman, has taken up into his nature the best results of ancient culture in allitsforms. His literary sympathies are extraordinarily wide. When obliged to condemn, as in the case of Seneca, he bestows generous and even extravagant praise on such merit as he can find. He can cordially admire even Sallust, the true fountain-head of the style which he combats, while he will not suffer Lucilius to lie under the aspersions of Horace. The passages in which Quintilian reviews the literature of Greece and Rome are justly celebrated. The judgments which he passes may be in many instances traditional, but, looking to all the circumstances of the time, it seems remarkable that there should then have lived at Rome a single man who could make them his own and give them expression. The form in which these judgments are rendered is admirable. The gentle justness of the sentiments is accompanied by a curious felicity of phrase. Who can forget "the immortal swiftness of Sallust," or "the milky richness of Livy," or how " Horace soars now and then, and is full of sweetness and grace, and in his varied forms and phrases is most fortunately bold"? Ancient literary criticism perhaps touched its highest point in the hands of Quintilian.

To comprehensive sympathy and clear intellectual vision Quintilian added refined tenderness and freedom from self-assertion. 'Taking him all in all, we may say that his personality must have been the most attractive of his time—more winning and at the same time more lofty than that of the younger Pliny, his pupil, into whom no small portion of the master's spirit, and even some tincture of the master's literary taste, was instilled. It does not surprise us to hear that Quintilian attributed any success he won as a pleader to his command of pathos, a quality in which his great guide Cicero excelled. In spite of some extravagances of phrase, Quintilian's lament (in his sixth book) for his girl-wife and his boy of great promise is the most pathetic of all the lamentations for bereavement in which Latin literature is so rich. In his precepts about early education Quintilian continually shows his shrinking from cruelty and "oppression. The educational method of ' Orbilius, abounding in blows," has never been more earnestly rebuked.

Quintilian for the most part avoids passing opinions on the problems of philosophy, religion, and politics. The professed philosopher he disliked almost as much as did Isocrates. He deemed that ethics formed the only valuable part of philosophy and that ethical teaching ought to be in the hands of the rhetoricians. In the divine govern- ment of the universe he seems to have had a more than ornamental faith, though he doubted the immortality of the soul. As to politics Quintilian, like others of his time, felt free to eulogize the great anti-Ceesarean leaders of the dying republic, but only because the assumption was universal that the system they had championed was gone for ever. But Quintilian did not trouble himself, as Statius did, to fling stones at the emperors Caligula and Nero, who had missed their deification. He makes no remark, laudatory or otherwise, on the government of any emperor before Domitian. No character figured more largely in the rhetorical controversies of the schools than the ideal despot, but no word ever betrayed a conscious- ness that the actual occupant of the Palatine might exemplify the themes. Quintilian has often been re- proached with his flattery of Domitian. No doubt it was fulsome. But it is confined to two or three passages, not thrust continually upon the reader, as by Statius and

Martial. To refuse the charge of Domitian's expected successors would have been perilous, and equally perilous would it have been to omit from the Lnstitutio Oratorva all mention of the emperor. And there was at the time only one dialect in which a man of letters could speak who set any value on his personal safety. There was a choice between extinction and the writing of a few sentences in the loathsome court language, which might serve as an official test of loyalty. So Quintilian, man of honour though he was, swallowed the test as best he might, even as two generations ago in England unbelievers took the sacrament to avoid exclusion from municipal affairs.

The Latin of Quintilian is not always free from the faults of style which he condemns in others. It also exhibits many of the usages and constructions which are characteristic of the silver Latin. But no writer of the decadence departs less widely from the best models of the late republican period. The language is on the whole clear and simple, and varied without resort to rhetorical devices and poetical conceits. Besides the Jnstitutio Oratoria, there have come down to us under Quintilian's name 19 longer and 145 shorter Declamationes, or school exercitations on themes like those in the Controversiw of Seneca. The longer pieces are certainly not Quintilian's. The shorter were probably published, if not by himself, at least from notes taken at his lessons. It is strange that they could ever have been supposed to belong to a later century ; the style proclaims them to be of Quintilian's school and time. The works of Quintilian have often been edited. Of the editions of the whole works the chief is that by Burmann (1720) ; of the Jnstitutio Oratoria that by Spalding, completed by Zumpt and Bonnell (1798-1834, the last volume containing a lexicon), and that by Halm (1868). The tenth book of the Jnséi- tutio Oratoria has often been separately edited, as by Krueger, Bonnell, Mayor (unfinished), and others. There is a critical edition of the 145 Declamationes by C. Ritter (1885). (J. S. RB.)

QUINTUS SMYRNAEUS, a late epic poet of Greece, sometimes called Quintus Calaber because his poem was discovered at Otranto in Calabria. Next to nothing is known of him. He appears to have lived in the latter part of the 4th century, shortly before Nonnus. He speaks of himself as having tended sheep in his youth at Smyrna (bk. xii. 308 sqg.). His epic in fourteen

books, known as 7a ped' "Ounpov or the Posthomerica, takes up the tale of Troy at the point where Homer's Iliad breaks off, 2.¢., after the death of Hector, and carries it down to the capture of the city by the Greeks. It describes the doughty deeds and deaths of Penthesilea the Amazon (bk. i.), Memnon, son of the Morning (bk. ii.), and Achilles (bk. iti.); the funeral games in honour of Achilles (bk. iv.); the contest for the arms of Achilles and the death of Ajax (bk. v.); the exploits of Neoptolemus and Deiphobus, the deaths of Paris and Cinone, the capture of Troy by means of the wooden horse, the sacrifice of Polyxena at the grave of Achilles, the departure of the Greeks, and their dispersal by the storm (bks. vi—xiv.). The poet has no originality ; in conception and style his work is closely modelled on Homer. His materials are borrowed from the cyclic poems from which Virgil also drew, in particular the Athiopis of Arctinus and the Little Iliad of Lesches. The style is clear, but the poem is flat and tedious, in spite of the abundance of similes with which the poet seeks to relieve its dulness.

The first edition of Quintus Smyrneus was published by Aldus Manutius in 1504 or 1505 ; in this century there have been editions by Tychsen, 1807, Lehrs in the Didot edition of Hesiod, &c., 1841, and two editions by Kochley in 1850 (Weidmann) and 1853 (Teubner). Sainte-Beuve has an essay on him.

QUITO, the capital of the republic of Ecuador, South America, an archbishopric, and the chief town of a depart- ment, lies 14' of latitude south of the equator, and in 79° 45' W. long., at a height of 9520 feet above the sea. In ancient times it was connected with Cuzco by a paved highway, portions of which still exist; but under Spanish rule it was allowed to relapse almost into the natural isolation of its position. Since 1870, however,

two carriage roads have been constructed from Quito to Milagro on the Guayaquil river and to the province of Manabi respectively. The railway projected between the city of Guayaquil and Quito has as yet advanced inland only to Chimbo bridge at the foot of the Andes, so that the really difficult part of the enterprise remains un- touched ; a telegraph line, however, has been opened. The distance between these two leading cities of

the republic is 200 miles by road, and the transit of goods takes fourteen days and costs from 10 to 14 dollars per cargo of 250 bb. Though built on the eastern skirts of the magnificent volcano of Pichincha (15,827 feet) and within 5 miles of its crater, Quito is not within sight of the sumniit, a secondary eminence known to the Incas as Yavira, and now as Panecillo, rising between. The site is an irregular plain traversed by two ravines running down from the mountain, one of which is arched over so as not to inter- fere with the alignment of the streets. Though the streams flow east at first, they really belong to the system of the Perucho which discharges into the Pacific near Esmeraldas. The houses, mostly of sun-dried brick, are usually low and squat, and not a chimney is to be seen. The public buildings are also of a massive and heavy- looking Spanish type. In the principal square are the cathedral, with a fine marble porch, the Government house, with a colonnade running the whole length of the facade, and the palace of the nuncio. But the finest building in Quito is the college of the Jesuits, part of which is occupied by the university, an institution long rendered interesting to Englishmen by the presence of the venerable botanist Dr William Jameson. There is a public library in the city of 20,000 volumes, and a polytechnic school was instituted in 1872. The local manufactures are confined to coarse cotton and woollen stuffs, thread, lace, hosiery, silk, and a certain amount of jewellery. About 1870 the population was estimated by Dr Jameson at between 30,000 and 40,000 ; the Almanach de Gotha for 1885 states it as 80,000.

Quito (the city of the Quitus, a race akin to the Quichuas of Peru) was peacefully conquered by the Spanish captain Sebastian Benalcazar in 1533. It received' the rank of a Spanish city in 1541 from Charles V., and became the capital of the province of Quito in the viceroyalty of New Granada. More than once it has suffered severely from earthquakes : in 1797, for example, 40,000 of its inhabitants were thus destroyed ; and in March 22, 1859, property was damaged to the value of $3,000,000.

QUOITS. This pastime resembles the ancient discus- throwing which formed one of the five games of the Greek pentathlon (see Discus, vol. vii. p. 258). The modern quoit, however, is a far lighter missile, and consists of a circular iron ring to be thrown or pitched in play at a fixed object. This ring is flattened, having a thick inner edge and thin outer one. 'he latter is

slightly indented at a Siven spot to receive the tip of the player's forefinger with- out cutting it. There is no limit to the weight of a quoit, but this should be specified before commencing a match. The diameter is restricted to 8 inches over all. Two iron Pins, called "hobs," are driven into the ground at a certain distance apart, generally 19 yards. There may be one or more players a side, and each has two quoits. These he may throw successively ; or else each player throws one Only at a time and a second round follows in the same order, as may have been agreed on. The throwing takes place the reverse way after each round. A player grasps the quoit with his forefinger along the outer edge and the tip in the dent, holding the two surfaces between the thumb and the other fingers. In pitching, a slight rotary Motion is imparted by the wrist, in order that the quoit may pass smoothly and horizontally through the air, and alight flat. Fach player attempts to make his quoit pitch on the hob or pin so that the head of the latter passes

oy

through the circular opening in the centre of the missile, Such a success is termed a " ringer," and two is scored. Quoits of opposite sides alighting equidistant from the pin do not score at all. Ifa player has both his quoits nearer the pin than any of his opponents he scores two ; while if only one be nearer he is entitled to count one to his credit. The game is popular in many country towns and villages of England and in the mining districts of the Midlands and Lancashire. The rules were drawn up as follows in 1869 :—

1. That the distance from pin to pin be 19 yards, and that the player stand level with the pin, and deliver his quoit with the first step. 2. That no quoit be allowed which measures more than 8 inches external diameter, but the weight may be unlimited. 3. That the pins be 1 inch above the clay. 4, That all measurements be taken from any visible part of the pin to the uearest visible part of the quoit. No clay or quoit to be disturbed. 5. That no quoit count unless fairly delivercd in the clay free from the outer rim, and that no quoit on its back count unless it holds clay or is knocked out by another quoit. That no quoit rolling on the clay count unless it first strikes another quoit or the pin. 6. That each player deliver his quoits in succession, his opponent then following. ?. That an umpire be appointed, and in all cases of dispute his decision be final.

QUO WARRANTO, in English law, is the name given to an ancient prerogative writ calling upon any person usurping any office, franchise, liberty, or privilege belonging to the crown to show "by what warrant" he maintained his claim. It lay also for non-user or misuser of an office, &e. If the crown succeeded, judgment of forfeiture or ouster was given against the defendant. The procedure was regulated by statute as early as 1278 (the statute of Quo Warranto, 6 Edw. I.c. 1). After atime the cumbrous- ness and inconvenience of the ancient practice led to its being superseded by the modern form of an information in the nature of a guo warranto, exhibited in the Queen's Bench Division either by the attorney general ex officio or by the queen's coroner and attorney at the instance of a private person called the relator. The information will not be issued except by leave of the court on proper cause being shown. It does not lie where there has been no user or where the office has determined. Nor does it lie for the usurpation of every kind of office. But it lies where the office is of a public nature and created by statute, even though it is not an encroachment upon the prerogative of the crown. Where the usurpation is of a municipal office the information is regulated by 9 Anne c. 20, under which the defendant may be fined and judgment of ouster given against him, and costs may be granted for or against the relator. Such an information must, in the case of boroughs within the Municipal Corporations Act, 1882, be brought within twelve months after disqualifi- cation (45 & 46 Vict. c. 50, § 225); in the case of other boroughs, within six years after the defendant first took upon himself the office (32 Geo. III. c. 58, § 2). The information in the nature of a quo warranto, though nomin- ally a criminal, has long been really a civil proceeding, and has recently been expressly declared to be so (47 & 48 Viet. c. 61, § 15). In cases not falling within 9 Anne c. 20, judgment of ouster is not usually given. The most famous historical instance of guo warranto was the action taken against the corporation of London by Charles II. in 1684. The Queen's Bench adjudged the charter and franchises of the city of London to be forfeited to the crown (State Trials, vol. viii, 1039). This judgment was reversed by 2 Will. & Mary, sess. 1, c. 8; and it was further enacted, in limitation of the prerogative, that the franchises of the city should never be seized or forejudged on pretence of any forfeiture or misdemeanor.

In the United States the right to a public office is tried by quo warranto or analogous procedure, regulated by the State laws. Proceedings by quo warranto lie in a United States court for the removal of persons holding office contrary to Art. xiv. § 3 of the Amendments to the Constitution, Act of May 31, 1870, c. 14.

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R

was written in Greek originally as P, following the

Phcenician form; sometimes, however, a triangle takes the place of the semicircle ; not unfrequently also a short stroke appears where we have the lower limb on the right hand ; the reason of this addition is not plain: it can hardly have been a diacritical mark to distinguish R from P (as G from C at Rome) because the latter symbol in Greece always kept its two vertical lines ([), the curved line (P) appearing first in the Roman alphabet.

The sounds denoted by the same symbol r differ con- siderably. First, there is the true consonantal r—our English r in reed, é&c.—produced by raising the tip only of the tongue towards the front palate; the voice escapes by this aperture, the side passages between the tongue and the palate being closed ; the mechanism, therefore, is just the opposite to that which produces / (see letter L). Secondly, there is the vowel 7; this is due to the space between the tip of the tongue and the palate being suffi- ciently great to allow the voice to escape without any friction ; the difference between this and consonantal 7 is parallel to that between w and w, or between 2 and y. This vowel-sound, though not heard regularly in any modern language, is not unfrequent in several in certain combina- tions; for example, it is quite possible to articulate "father" as "fath-r," where the r alone forms a syllable and is there- fore vocalic. This vowel-sound was a regular sound in Sans- krit, and was probably also heard in the parent language ; but in the derived languages (except Sanskrit) it became consonantal 7 with an independent vowel preceding or following; thus a presumed original "krd" (= heart), where 7 denotes the vocalic 7, gave in Sanskrit "hrd," in Greek xpad-(y, in Latin "cor(d)." Thirdly, r may denote a trill,—that is to say, a sound produced by the vibration of the tongue when laid loosely against the palate

and set in motion by a strong current of breath or voice. When the point of the tongue is laid loosely in this way against the palate just behind the gums and made to trill as voice passes over it, we hear the Scotch and- the French 7, each of which is a trill, not a consonantal 7. The same sound, but unvoiced, is heard in the French "théatre," &c., and is also the Welsh rh. A similar trill at the back part of the palate gives the Northumbrian " burr."

RAAB (Hungarian Gyér), the capital of a Hungarian province of the same name, lies at the influx of the Raab into a branch of the Danube, 70 miles to the south-east of Vienna. It is a well-built town, with a pleasant pro- menade laid out on the site of the old fortifications, and is the seat of a Roman Catholic bishop. The cathe- dral dates from the 12th century, but has recently been modernized ; the bishop's palace is an imposing castellated edifice, with dungeons constructed by the Turks. The town possesses several other churches, two of which belong to the Protestants and one to the Greek Church, besides convents, schools, and an academy of jurisprudence. The theatre, on an island formed by the Danube and the Raab, is also a handsome building. The inhabitants, who num- bered 20,980 in 1880, manufacture cloth and tobacco and carry on a considerable trade in grain and horses.

Raab occupies the site of the Roman Arabona, aud by the 10th cen- tury had become a place of some importance. In 1594 it fell into the hands of the Turks, who, however, retained possession of it for four years only. In 1809 the forces of the insurgent Hunga- rian noblesse were easily defeated here by Napoleon's veterans; and the attempts made to maintain the town against the Austrians in

1848-49 were also fruitless. About 10 miles to the south-east of Raab is St Martinsberg, the oldest and wealthiest abbey in Hungary.

Jewish titles of honour.

RAB, RABBI, RABBAN, RABBONI, RABBENU, Rab (2), "lord," '" master," "teacher," is the title prefixed to the name of such a Baby-

lonian teacher of the Law or expounder of the Mishnah as, though authorized to "judge" and to decide other religious questions, has not been

ordained, or fully ordained, in Palestine! Rabbi (In, paBPei, Matt. xxiii. 7, &c.), "my teacher," is the title of a teacher fully ordained in Pales- tine.

Rabban, "our teacher" or "our lord," but also "their," z.¢. all Israel's, teacher (]37, later form of D3),

was the title of the prince (president of the synedrium) from the time of Gamliel I. (the Gamaliel of St Paul) and

onward. Ifa prince-president sprang from any other house than Hillel's, who was a descendant of David through the female line (as, for example, R. El'azar b. 'Azaryah), he was not called by this highest title of honour. The only ex- ception to this rule was Rabban Yohanan b. Zakkai, to whom Jewish traditional lore owes so much,—nay, its very existence. For he not merely had a distinguished circle of pupils of his own (Aboth, ii. 8, 9), but he saved the lives of the members of the synedrium and secured its free activity. Vespasian, who knew him to have been friendly to the cause of Rome, granted him " Yamnia and its sages" at his request (T. B., Gittin, 56b). In Babylonia, again, Rabbana (Rab- bono) was the title of the Résh Galutha, or "head of the captivity." He who bore it was always the reigning de- scendant of the house of David in the male line. The only person on whom this title was bestowed, though he was not Résh Galutha, was Rab Ashe (T. B., Kethuboth, 22a), the principal editor of the Babylonian Talmud, who is reported to have united in his person riches, learning, and virtues such as no man had possessed since the time of '" Rabbi," the principal editor of the Mishnah (T. B., Gittin, 59a).

Raz, when the title is not followed by an individual name, denotes par excellence Abba Arékha (Arikha), so called either from the place Arékha in Babylonia, or be- cause of his high stature, or his eminence as a man and scholar. Abba Arékha was the most successful teacher of the Law and interpreter of the Mishnah in Babylonia, having brought the latter with him from Palestine, where he had received it orally and directly from Rabbi Yehudah Hannasi; he taught it to more than 1200 pupils, whom he is related to have housed, fed, and clothed (T. B., Kethuboth, 106a). He introduced many religious and moral reforms, notably in connexion with marriage, which are law among the Jews of all countries to this day. His Hebrew prose approaches the sublimity of the Old Testa- ment poetry, as may be

seen from the tripartite ‘addi- tional service” recited by all Rabbinic Jews on the two days of the “ New Year.” He is also in Babylonia the sole representative of the sublime Palestinian Agadoth, which so closely resemble the words of the Founder of Christianity. In patience with others, and especially with his shrewish wife, he surpassed Job himself. He died as the first head of the academy of Sira (somewhat later identified with Matha Mehasya) in 247 a.p., more than eighty years old.

RaBsi, when the title is not followed by a proper name, denotes par excellence Rabbi Yehudah Hannasi, the prin- cipal editor of the Mishnah (see vol. xvi. p. 504).

*Sdebeees Seeger ee gieemneeren ened Nigga See * aaa Sir 1 An old pronunciation of this title is Rib, as in Biribbi (2 2),*

of which the only true explanation is “son of the greatest doctor of the age,” applied to R. Yose b. Halaphta (T. B., Pesahim, 100a), R. Shime‘on, son of the editor of the Mishnah (Baba Bathra, 16b), and others. Hence the Talmudic explanation of Exod. xxiii. 2, “thou shalt not gainsay a scholar greater than thyself” (T. B., Synhedrin, 18b).

RA B—RAB

The Hellenistic RaBBont (6aBBovvet, John xx. 16) is the Aramaic rzbbonz used by a slave of his master, a son of his father, a wife of her husband, a worshipper of his God. (Com- pare the similar variation of the vowel in pisho = rdcya.)

RABBENU signifies “our teacher” par excellence, and means in Palestine R. Yehudah Hannasi, and in Baby- lonia Rab (¢.e., Abba Arékha).

Rabbah (7.39), also Rubbo and Rubboh, a title plaeed in the

Palestinian Talmud and Midrashim after the names of certain teachers (T. Y., Berakhoth, i. 1; Kilayim, ix. 8, and elsewhere),

corresponds to the Hebrew Sua in the same connexion in the Babylonian Talmud (Berakhoth, 6a, and elsewhere), and does not, as has hitherto been

supposed, mean "'the great" but simply "the elder." Thus many questionable Talmudie magnitudes disappear. (S. M. §.-S.)

RABA (Rds6)—ic., Ras Apa 8. YosrrH 3, HAmA (Homo)—was, like his teacher Rabbah and his fellow-pupil Abayye, a scion of the house of Eli, on whom rested the double curse of poverty and that none of them should reach old age (1 Sam. ii. 31-36). According to T. B., Rosh Hasshanah, 18a,1 he sought to remove this curse, if not by sacrifices and offering then by the study of the Law, while Abayye also practised works of charity. Raba was rabbi and judge of the congregation and head of the school (methibta) of Mahiiza. He lived in the middle of the 4th Christian century, and became on the death of his fellow-pupil Abayye head of the famous academy of Pum-baditha, which was only closed in 1040. He was noted, like his predecessor, for his genius; and the discussions between them (and similar ones of others) are known in the Babylonian Talmud as the Havayoth de-Abayye ve-Raba (Sukkah, 28a). Raba was also noted for the liberality of his religious decisions (T. B., Berakhoth, 22b; Pesahim, 30a, and elsewhere). Being a man of considerable wealth, he showed, in accordance with Scriptural truth (Prov. xviii. 23), his independence in every way. Thus he hesi- tated not to include the exquisites of the congregation of Mahiiza, who were noted for their luxurious style of living, among the candidates for Gehenna, whose faces would one day become as dark as the sides and the bottom of a sauce-pan (T. B., Rosh Hasshanah, 17a), whilst he most ungal- lantly applied to their idle wives the passage of Amos iv. 1 (T. B., Shabbath, 32b). Raba was in fact the Abraham a Sancta Clara of his day, minus the cloister life of the latter. He was married to one of the beautiful, accomplished, and amiable daughters of his teacher, R. Hisda, whom he so dearly loved that he was ready to forgive Bar Hadya (an interpreter of dreams who had much vexed him by his adverse interpretations) everything except the interpreta- tion of a dream foreboding her death. Raba, relying on Gen. xli. 12, 13, believed that the fulfilment of dreams within certain limits was influenced by the interpretation given to them (T. B., Berakhoth, 55b). (S, M. S.-S.)

RABAD (7185). Under this abbreviation five Jewish scholars are known, all of whom, singularly enough, lived during the 12th century.

I. Ras AB-Beru-Drn, zc, the ehief rabbi par excellence. His real name was R. Abraham b. Yishak of Narbonne. He was the teacher of the most distinguished rabbis of Provenee, ineluding his famous son-in-law (Rabad III.) and Rabbenu Zerahyah Hallevi, the author of the Maor. It has always been known that a great deal of literature on the Talmud belonging to him is mixed up with the works of others, notably with those of Rabad (see III. below). CL MN ee Ne Me

1 See Rashi, catchword NIM "ON ; Hullin, 133a, eatchwords

p pra and smont 'at. «The Zosaphoth and printed editions (.cc.) put Rappan (q.v.) for Raba; but Rashi's traditional reading (NYY 15) must be right. For, in the first place, it would have been on the part of the Talmud superfluous to state that Rabbah and Abayye were of the house of Eli, seeing that the latter was the son of the brother of the former. And secondly, the story goes (Rosh Hasshanah, 1. c.) that he who only studied the Law died at the age of forty (Abayye living to sixty), whereas the synchronisms of Rabbah's life show that he must have lived to a much greater age.

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In 1867-69, however, Dr B. H. Auerbach, rabbi of Halberstadt, edited for the first time Rabad's chief work, The Eshkol, in three parts, 4to.

_II. R. ABRAHAM B. Davin (Daid, 3)8) HALLEVI of Toledo, the historiographer, who suffered martyrdom in 1180. His ehief work has been printed innumerable times, and repeatedly with historieal additions from earlier sources. Some of the parts of this "Tradi- tion" and of these additions have been translated into Latin,

English, and German. (1) His historical work, MS3PM 70D, is a chroniele down to 1161, preceded by Seder 'Olam and Megillath Ta'anith (Mantua, 1518, 4to); eheap editions are to be got in Poland. (2) His philosophieo-theological work (composed in Arabie, translated into Hebrew by R. Shelomoh Ibn Labi—14th century— and into German by Weil) came out at Frankfort in 1852, 8vo.

III. R. ABRAHAM B, Davip, disciple and son-in-law of Rabad I. This is the " great Rabbi of Posquiéres," the only opponent whom Maimonides thought a mateh for himself. He died in 1198. His works are :—(1) Commentary on the Mishnie treatise 'Eduyyoth (see MIsHNAH, vol. xvi. p. 506), which accompanies some early and all later editions of the Babylonian Talmud (that on amid, as- eribed to him, is not his). (2) Commentary on Siphro (see vol. xvi. p. 507). (8) Mueh of Zemim De'im, part of the collection Lummath Yesharim, on various Rabbinic matters, Venice, 1622, fol. (4) Ba'ale Hannephesh, on laws relating to women (first inde- pendent edition, Prague, 1811, 4to). (5) Hassagoth, or Strictures on the Mishneh Torah of Marmontpxs (q.v.). These accompany most early and all later editions of the Mishneh Torah.

IV. R. Aprauam B. Davin, author of the commentary on the Sepher Yesirah.? His eommentary has been printed innumerable times with the work itself, the editio princeps at Mantua in 1562, 4to. Part of its preface was done in Latin by Rittangelius (Am- sterdam, 1642, 4to).

V. R. ABRAHAM B. Davip. He wrote Strictures (Hassagoth) on Rashi on the Pentateuch. This little and most interesting book was either written by a Sepharadi or Provencal, and lies in MS. (Add., 377, 8, 1) in the Cambridge University Library. No other eopy is known. a (S. M. S.-S.)

RABAN (j'ax1)—2.e., RaBBENU Exr'ezer B. Nain of Mainz—was one of the most famous Halakhic teachers of the 12th century. He lived at Mainz and corresponded with Rashi's son-in-law, Rabbenu Meir b. Shemuel, and his three distinguished sons, RasuBam (q.v.), Ribam (R. Yishak b. Meir, who died young and left seven orphans), and Rabbenu Tham (R. Ya'akob). His great Halakhic work, M3yb NIDY, or WYN jay, is commonly called by the combination of the author's initials which heads this article, the Book of Raban, and was printed at Prague in 1610 fol.2 Other Halakhic literature by him is to be found in Kol Bo, § 123 (without place or date, but probably Naples, towards the end of the 15th century), and its reprints. More lies in MS. in libraries; thus the ben Iaroshah, of which no other copy is known, is preserved in the Cambridge University Library (Add., 498). R. Eliezer was also a fine liturgical poet, vying both in senti- ment and elegance with the poets of the Sepharadic school, as appears, for example, from the Ophan

and other pieces designed for a Sabbath when there is a circumcision. Rabbenu Eli‘ezer died in the 12th century. The date 5007 (=1247) which appears in the formulas of a bill of divorcement and a deed of manumission of a slave is most assuredly due to a scribe of the 13th century, who in transcribing Raban’s book conformed the date to his own time—a practice often to be met with.

Dr A. Jellinek of Vienna has published a History of the First Crusade (VINN NI DIP, Leipsic, 1854, 8vo)—a little book interesting in more than one way—whieh bears the name of Raban. It cannot, however, be by the subject of this article, as one ean see by comparing with his genuine work the questionable poetie stuff whieh forms part of the Konferes. The author is no doubt Raban

of Cologne. Nor does the commentary on ponds by (for Pentecost

eve) under the title of Saun WON, whieh has been often printed, and of whieh the Cambridge Library has an old MS. (Add., 493, 1),

2 The idea that R. Yoseph Arukh—Maxpés (a Greek) or Longus (a Roman) —was the author of this commentary must be given up. On the other hand, it is not quite impossible that this eommentator and the writer of the Strictures on Rashi are one and the same person.

3 The thanks of the writer of these lines are due to the eurators and librarian of the Bodleian for the loan of this book.

belong to this Rabin, though it has been ascribed to him for 600 years. Its writer was undoubtedly a Provengal. (8. M. 8.-8.)

RABANUS MAURUS. See Hrapanus Mavrus.

RABAT (Rrs4z), Rzdt, or ARBAT, also known as NEw SALLEE, a city of Morocco, on the coast of the Atlantic, 130 miles south of Cape Spartel at the mouth of the Bu Rakrak, which separates it from Sallee proper on the northern bank. It is a commercial town of about 26,000 to 30,000

inhabitants, occupying a rocky plateau and sur- rounded by massive but dilapidated walls, strengthened by three forts on the seaward side. The old citadel, over- hanging the mouth of the river, is still, though partially in ruins, an imposing building, with huge arched gateways, square towers, and masses of rich red-brown masonry ; and to the south of the town lies a modern palace defended by earthworks after the European fashion. The conspicuous feature in the view from the sea is the Hasan tower, a beautiful square-built minaret 180 feet high, which stands at an elevation of about 65 feet above the sea to the west of the walled town, and in the midst of gardens and or- chards whose vegetation partly hides the ruined columns of the ancient mosque to which it was attached. It is constructed of soft reddish-brown stone, and each side is adorned with a different design. At one time the Bu Rakrak afforded a much better harbour than it does now: the roadstead is quite unprotected, and there is a danger- ous bar at the mouth of the river. Rabat trades with Fez and the interior of Morocco, with the neighbouring coast- towns and Gibraltar, and with Marseilles, Manchester, and London. The principal articles of export are wool, hides, and wax, and the products of that local manu- facture of leather, carpets, mats, woollen and cotton stuffs, pottery, and circular brass trays which makes Rabat the greatest industrial centre in Morocco. Cotton goods and loaf-sugar are first among the imports. The average value of the exports in the ten years 1872 to 1881 was £47,236, and of the imports £73,945. In 1883 the figures were £39,596 and £50,222 respectively.

Sallee (Sal4), on the north side of the river, is also enclosed with walls. Much of the interior, however, is vacant and the houses are mean; and, unlike their neigh- bours of Rabat, the inhabitants (about 30,000) down to quite recent times distinguished themselves by particular hostility to Christians, who were thus prevented from entering their gates. To the north a ruined aqueduct extends for miles.

Rabat was founded by Yak‘tb al-Mansur (ob. 1306); but Sallee was then an ancient city, and on the scarped hills to the west of Rabat stand the ruins of Sala, a Roman colony. Shella, as the

pe: is now called, was the seat of the mausoleum of the Beni- {erin dynasty.

RABBA, a town of Nupi or Nufi, on the bank of the Kworra (Niger), opposite the island of Zagozhi, in 9° 6' N. lat., and 200 miles above the confluence of the Kworra and the Binue. At the time of Lander's visit in 1830 it was a place of 40,000 inhabitants and one of the most important markets in the country. In 1851 Dr Barth reported it "in ruins," and in 1867 Rohlfs found it with only 500 inhabitants. A mission station, established there in 1857 by the Church Missionary Society, was afterwards withdrawn. The town has latterly somewhat recovered its position.

RABBAH—z.¢, RaB ABBAH BAR NAHMANI—was of the house of Eli, on whom the curse rested that none of them should reach a high age (1 Sam. ii. 33). Like Raba, he tried to remove this curse (T. B., Rosh Has- shanah, 18a; see Rapa). He was twenty-two years head of the academy of Pumbaditha, from which he fled in the year 330, pursued by a troop of the Persian king (Shapur IL), and perished miserably in a jungle (T. B., Bobo Mets'io, leaf 86a).

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Rabbah, owing to his great dialectic powers, to which no diffi- culty seemed difficult, was called 'Oker Harim, "uprooter of mountains."! This title was applied to him when the selection as "head" lay between him and his friend, fellow-pupil, and suc- cessor, Rab Yoseph, "the Blind," to whom is commonly, but by mistake, ascribed the authorship of certain Targumim. This latter doctor was, owing to his vast but mere reproductive powers, called Sinai, the mountain from which the letter of the Law was given (T. B., Berakhoth, 64a). (8. M. S.-8.)

RABBI See Ras.

RABBIT. This animal, one of the best known and most frequently seen of all wild British mammals, is, with the hare, a member of the Rodent genus Zepus, which contains about twenty-five other species spread over the greater part of the world, and whose more important characters have already been referred to (see Harz, vol. xi. p. 476, and Mamma tia, vol. xv. p. 421).

The rabbit (Lepus cuniculus), speaking for the present of the wild race only, is distinguished from the hare externally by its smaller size, shorter ears and feet, by the absence or reduction of the black patch at the tip of the ears so characteristic of the hare, and by its greyer colour. The skull is very similar to that of the hare (see Mammattia, fig. 99), but is smaller and lighter, and has a slenderer muzzle and a longer and narrower palate. Besides these characters, however, the rabbit is sharply

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separated from the hare by the fact that it brings forth its young naked, blind, and helpless; to compensate for this, it digs a deep burrow in the earth in which they are born and reared, while the young of the hare are born fully clothed with fur, and able to take care of themselves in the mere shallow depression or "form" in which they are born. The weight of the rabbit is from 24 to 3 hb, although individuals perfectly wild have been recorded up to more than 5. Its general habits are too well known to need a detailed description here. It breeds from four to eight times a year, bringing forth each time from three to eight young. Its period of gestation is about thirty days, and it is able to bear when six months old. It attains to an age of about seven or eight years.

The geographical distribution of the rabbit presents many most interesting peculiarities. It is believed to be originally a native of the western half of the Mediter- ranean basin only, and still abounds in Spain, Sardinia, southern Italy and Sicily, Greece, Tunis, and Algeria ; and many of the islands adjoining these countries are quite overrun with it. Thence it has spread, partly by man's agency, northwards throughout temperate western Europe, increasing rapidly wherever it gains a footing; and this extension is still going on, as is shown by the

1 See for a similar expression Matt. xvii. 20.

case of Scotland, in which sixty years ago rabbits were little known, while they are now found in all suitable localities up to the extreme north. It has also gained admittance into Ireland, and now abounds there as much as in England. Out of Europe the same extension of range has been going on. In New Zealand and Australia rabbits, introduced either for profit or sport, have increased to such an extent as to form one of the most serious pests that the farmers have to contend against, as the climate and soil seem to suit them perfectly and their natural enemies are too few and too lowly organized to keep their numbers within reasonable bounds. In other cases rabbits introduced into islands have become or remained more or less distinct from their parent stock; thus the rabbits both of the Falkland Islands and of Jamaica still show traces of their descent from domesticated varieties, and have never reverted to the ordinary brownish-grey type. And again, as was pointed out by Mr Darwin,} the rabbits in the island of Porto Santo, near Madeira, whose ancestors were introduced from Spain in 1418 or 1419, have formed quite a distinct diminutive race, barely half the bulk or weight of English rabbits, and differing in certain slight details of colour and habits.

The rabbit has been domesticated by man from a very early period. No doubt exists amongst naturalists that all the varieties of the domestic animal are descended from the Lepus euniculus. The variations which have been perpetuated and intensified by artificial selection are, with the exception of those of the dog, greater than have been induced in any other species of mammal. For not only has the weight been more than qnadrupled in some of the larger breeds, and the structure of the skull and other parts of the skeleton greatly altered, but the proportionate size of the brain has been considerably reduccd and the colour and texture of the fur altered in the most remarkable manner. The establish- ment of these extreme variations is dependent on the highly arti- ficial conditions under which the animals are kept, their great pro- lificacy, and the rapidity with which the generations succeed each other, which enable the process of artificial selection by the preserva- tion of those most suited to the purposes of the breeder to be carried into effect with facility.

The Lop-cared breed is the oldest English fancy variety ; it has been cultivated carefully for about a century, the aim of the breeder being chiefly

directed to the development of the size of the ears, and with such success that they sometimes measure more than 23 inches from tip to tip and exceed 6 inches in width. This development, which is accompanied by great changes in the structure of the skull, that have been carefully described by Darwin in his Variation of Animals, &c., depends on breeding the animals in warm damp hutches, without which the best developed parents fail to produce the desired offspring. In colour the lop-eared rabbits vary greatly.

The Belgian hare is a large variety of a hardy and prolific char- acter, which closely resembles the common hare in colour, and is not unlike itin form. Some few years since many of these animals were sold as leporides or hybrids, produced by the union of the hare and the rabbit; but the most careful experimenters have failed to obtain any such hybrid, and the naked immature condition in which young rabbits are born as compared with the clothed and highly developed young hares renders it exceedingly unlikely that hybrids could he produced. Nor does the flesh of the Belgian rabbit resemble that of the hare in colour or flavour. A closely allied variety, though of even larger size, is known by the absurd name of Patagonian rabbit ; it has no relation to the country after which it is called.

The Angora rabbit is characterized by the extreme elongation and fineness of the fur, which in good 'specimens reaches 6 or 7 inches in length, requiring great care and frequent eombing to prevent it from becoming matted. The Angoras most valued are albinos, with pure white fur and pink eyes; in some parts of the Continent they are kept by the peasants and clipped regularly.

Amongst the breeds which are valued for the distribution of colour on the fur are the H imalayan and the Dutch. The former 1s white, but the whole of the extremities—viz., the nose, the ears, tail, and feet—are black or very dark in colour. This very pretty breed has no connexion with the mountain chain from whence it has taken its name, but is a variety produced by careful breeding and selection as fully described by Darwin (op. cit.). Though but recently produced by crossing, it now generally breeds true to colour, at times throwing back, however, to the silver greys from which it was derived. The rabbits known in Great Britain as Dutch are of small size, and are valued for the disposition of the colour and

‘ Variation of Animals and Plants, 2d ed., i. p. 119.

markings. The entire body behind the shoulder-blades is uniformly coloured, with the exception of the feet ; the anterior part of the body, including the fore legs, neck, and jaws, is white, the cheeks and ears being coloured. In some strains the coloured portion extends in front of the fore legs, leaving only a ring of white round the neck. The more accurately the coloured portion is defined the higher is the animal esteemed.

The Silver grey is a uniform coloured variety, the fur of which is arich chinchilla grey, varying in depth of colour in the different strains. From the greater valuc of the fur silver greys have been frequently employed to stock warrens, as they breed true to colour in the open if the ordinary wild rabbits are rigorously excluded. Other colours known, as Silver cream and Silver brown, are closely allied varicties.

As an article of food the domesticated rabbit is of considerable importance. From 100 to 200 tons are imported into London from Ostend every week during the colder months of the year, having been reared in hutches by the Belgian peasants. ‘hey are for- warded without their skins, which are half the value of the flesh. A plan has been recently devised by Major Morant, which is known as “hutch-farming in the open.” The animals are kept in large hutches with projecting roofs, floored with coarse galvanized iron netting, through which the grass projects to be eaten by the rabbits. The hutches are shifted twice or thrice a day, so that the animals are constantly on clean ground and have fresh food. The young, when old enongh to leave the mother, are reared in somewhat larger hntches of a similar description and killed for market under three months of age.

RABELAIS, Francors (c. 1490-1553), the greatest of French humourists and one of the few great humourists of the world, was born at Chinon on the Vienne in the pro- vince of Touraine. The date of his birth is wholly uncer- tain: it has been put by tradition and by authorities long subsequent to his death as 1483, 1490, and 1495. There is nothing in the positive facts of his life which would not suit tolerably well with any of these dates; most 17th-century authorities give the earliest, and this also accords best with

the age of the eldest of the Du Bellay brothers, with whom Rabelais was at school. In favour of the latest it is urged that if Rabelais was born in 1483 he must have been forty- seven when he entered at Montpellier, and proportionately and unexpectedly old at other known periods of his life. In favour of the middle date, which has, as far as recent authorities are concerned, the weight of consent in its favour, the testimony of Guy Patin, a witness of some merit and not too far removed in point of time, is invoked, though perhaps the fact of its being a via media has really had most to do with the adoption. The only contribution which need be made here to the controversy is to point out that if Rabelais was born in 1483 he must have been an old man when he died, and that scarcely even tradition speaks of him as such. And since this tradition is men- tioned it may as well be observed at once that all the anecdotes of Rabelais without exception, and most of the accounts of the facts of his life, date from a period long posterior to his death and are utterly unworthy of cre- dence. Colletet nearly a hundred years later, Antoine Leroy a full hundred, and Bernier nearly a hundred and fifty collected or invented stories which, as far as any actual authority goes, must be regarded as worthless. Bishop Huet's researches were made nearly as late as Bernier's. Throughout this article, therefore, when tradition or any similar word is used without further precision it will be understood that the statements have in themselves only conjectural validity.

With regard to his birth, parentage, youth, and educa- tion everything depends upon tradition, and it is not until he was according to one extreme hypothesis thirty- six, according to the other extreme twenty-four, that we have solid testimony respecting him. In the year 1519, on the 5th of April, the Francois Rabelais of history emerges. The monks of Fontenay le Comte bought some property (half an inn in the town), and among their signatures to the deed of purchase is that of Francois Rabelais. Before this all is cloudland. It is said that he had four brothers

and no sisters, that his father had a country property called La Deviniére, and was either an apothecary or a tavern-keeper. Half a century after his

death De Thou mentions that the house in which he was born had become a tavern. It still stands at the corner of a street called the Rue de la Lamproie, and the tradition may be correct. An indistinct allusion of his own has been taken to mean that he was tonsured in childhood at seven or nine years old; and tradition says that he was sent to the convent of Seuilly, though of course he could then have taken no definite vows, and there is no evidence whatever that the passage in question, which simply condemns the practice referred to, has any personal reference. From Seuilly at an unknown date tradition takes him either to the univer- sity of Angers or to the convent school of La Baumette or La Basmette, founded by good King René in the neighbourhood of the Angevin capital. Here he is sup- posed to have been at school with the brothers Du Bellay, with Geoffroy d'Estissac and others. The next stage in this (as far as evidence goes, purely imaginary) career is the monastery of Fontenay le Comte, where, as has been seen, he is certainly found in 1519 holding a position sufficiently senior to sign deeds for the community, where he, as will be seen, certainly, though at an unknown date, took priest's orders, and where he also pursued, again cer- tainly, the study of letters, and especially of Greek, with ardour. From this date, therefore, he becomes historically visible. The next certain intelligence which we have of Rabelais is somewhat more directly biographical than this bare entry of his name. The letters of the well-known Greek scholar Budzeus, two of which are addressed to Rabelais himself and several more to his friend and fellow- monk Pierre Amy, together with some notices by André Tiraqueau, a learned jurist, to whom Rabelais rather than his own learning has secured immortality, show beyond doubt what manner of life the future author of Gargantua led in his convent. These letters are partly written in Greek and partly in Latin. In Tiraqueau's book De Legibus Connubialibus, which excited a controversy with another jurist of the west, Bouchard, also a friend of Rabelais, the latter is described as "a man most learned in both languages and all kinds of scholarship above his age, and beyond the wont and, if J may say so, the excessive scrupulousness of his order." The excessive scrupulousness of the order showed itself before long in reference to Amy and Rabelais, the latter of whom had, as this sentence of Tiraqueau's also informs us, translated the first book of Herodotus. The letters of Budzeus show that an attempt was made by the heads of the convent or the order to check the studious ardour of these Franciscans; but it failed, and there is no positive evidence of anything like actual

persecution, the phrases in the letters of Budzeus being merely the usual exaggerated Ciceronianism of the Renaissance. Some books and papers were seized as sus- picious, then given back as innocent; but Rabelais was in all probability disgusted with the cloister,—indeed his great work shows this beyond doubt. In 1524, the year of the publication of Tiraqueau's book above cited, his friend Geoffroy d'Estissac procured from Clement VII. an indult, licensing a change of order and of abode for Rabelais. From a Franciscan he became a Benedictine, and from Fontenay he moved to Maillezais, of which Geoffroy d'Estissac was bishop. He seems indeed to have been constantly in the company of the bishop and to have made many new literary acquaintances, notably Jean Bouchet, the poet. To him he wrote an epistle in French verse, still extant, which proves that Rabelais, much more truly than Swift, never could have been a poet. The title of this epistle is, however, noteworthy, inasmuch as the author is described in the original (a collection of Bouchet's works

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published in 1545) as a man of great literary knowledge in Greek and Latin, and as a great. orator in Greek, Latin, and French. But even this learned and hospitable retreat did not apparently satisfy Rabelais. In or before 1530 he left Maillezais, abandoned his Benedictine garb for that of a secular priest, and, as he himself puts it in his subsequent Supplicatio pro Apostasia to Pope Paul IIL., "ner seculum diu vagatus fuit." He ismet at Montpellier in the year just mentioned. He entered the faculty of medicine there on the 16th of September and became bachelor on the Ist of November, a remarkably short in- terval, which shows what was thought of his acquirements. Early in 1531 he lectured publicly on Galen and Hippo- crates, while his more serious pursuits seem to have been chequered by acting in a morale comédie, then a very fre- quent university amusement. Visits to the Iles d'Hiéres, and the composition of a fish sauce in imitation of the ancient garum, which he sent to his friend Dolet, are associated, not very certainly, with his stay at Montpellier, which, lasting rather more than a year at first, was renewed at intervals for several years.

In 1532, however, and probably rather early than late in that year, he had moved from Montpellier to Lyons. Here he plunged into manifold work,

literary and professional. He was appointed before the beginning of November phy- sician to the hétel dieu, with a salary of forty livres per annum. He edited for Sebastian Gryphius, in the single year 1532, the medical Epistles of Giovanni Manardi, the Aphorisms of Hippocrates, with the Ars Parva of Galen, and an edition of two supposed Latin documents, which, however, happened unluckily to be forgeries. These three works were dedicated in order to his three chief friends of Touraine and Poitou, André Tiraqueau, the bishop of Maillezais, and Bouchard. We also have a Latin letter written on lst December 1532 to a certain Bernard de Salignac, otherwise unknown.

It is certain that at this time Lyons was the centre and to a great extent the headquarters of an unusually enlightened society, and indirectly it is clear that Rabelais became intiniate with this society. A manuscript distich, which was found in the Toulouse library, on the death of an infant named Theodule, whose country was Lyons and his father Rabelais, would seem to show that he here entered into other connexions than those of friendship. Absolutely nothing, however, is known about the child and its mother; it is enough to say that the existence of the former would have been by the manners and morals of the time very easily condoned. But what makes the Lyons sojourn of the greatest real importance is that at this time probably appeared the beginnings of the work which was to make Rabelais immortal. It is necessary to say "probably," because the strange uncertainty which rests on so much of his life and writings exists here also. There is no doubt that both Gargantua and Pantagruel were popular names of giants in the Middle Ages, though, curiously enough, no mention of the former in French hterature much before Rabelais's time has been traced. In 1526, however, Charles de Bordigné, in a satiric work of no great merit, entitled Za Légende de Pierre Pacfeu, has the name Gargantua with an allusion, and in 1532 (if not earlier) there appeared at Lyons Les Grandes et Inestimables Chroniques du Grand et Enorme Géant Gargantua. This is a short book on the plan of the later burlesques and romances of the Round Table. Arthur and Merlin appear with Grantgosier, as he is here spelt, Galemelle (Gargalelle), Gargantua himself, and the terrible mare. But there is no trace of the action or other characters of Gargantua that was to be, nor is the manner of the piece in the least worthy of Rabelais. No one supposes that he wrote 1t, though it has been supposed that he edited it and that in

reality it is older than 1532, and may be the direct subject of Bordigné's allusion six years earlier. What does, how- ever, seem probable is that the first book of Pantagruel (the second of the whole work) was composed with a definite view to this chap book and not to the existing first book of Gargantua, which was written afterwards when Rabelais discovered the popularity of his work and felt that it ought to have some worthier starting-point than the Grandes Chroniques. The earliest known and dated edition of Puntagruel is of 1533, of Gargantua 1535, though this would not be of itself conclusive, especially as we actually possess editions of both which, though un- dated, seem to be earlier. But the definite description of Gargantua in the title as "Pere de Pantagruel," the omis- sion of the words "second livre" in the title of the first book of Pantagruel while the second and third are duly entitled "tiers" and "quart," the remarkable fact that one of the most important personages, Friar John, is absent from book ii., the first of Pantagruel, though he appears in book i. (Gargantua), and many other proofs show the order of publication clearly enough. There is also in existence a letter of Calvin, dated 1533, in which he speaks of Pantagruel, but not of Gargantua, as having been condemned as an obscene book. Besides this, 1533 saw the publication of an almanac, the first of a long series which exists only in titles and fragments, and of the amusing Prognostication Pantagrueline (still, be it observed, Panta- grueline, not Gargantuine). Both this and Pantagruel itself were published under the anagrammatic pseudonym of "Alcofribas Nasier," shortened to the first word only in the case of the Prognostication.

This busy and interesting period of Rabelais's life was brought to a close apparently by his introduction or rein- troduction to Jean du Bellay. They had been, it has been said, schoolfellows, but Bellay does not appear among the list of Rabelais's friends in the first years of his emancipa- tion. From 1534, however, he and the other members of his family appear as Rabelais's chief and constant patrons during the remainder of his life. It was just before Christ- mas that Jean du Bellay, passing through Lyons on an embassy to Rome, engaged Rabelais as physician. The visit did not last very long, but it left literary results in an edition of a description of Rome

by Marliani, which Rabelais published in September 1534. It is also thought that the first edition of Gargantua may have appeared this year.

In the spring of 1535 the authorities of the Lyons hospital, considering that Rabelais had twice absented himself without leave, elected Pierre de Castel in his room; but the documents which exist do not seem to infer that any blame was thought due to him, and the appointment of his successor was once definitely postponed in case he should return. An epigram of Dolet shows that at least once and probably about this time he per- formed a public dissection. At the end of 1535 Rabelais once more accompanied Jean du Bellay, now a cardinal, to Rome and stayed there till April in the next year. This stay furnishes some biographical documents of importance in the shape of letters to Geoffroy d'Estissac, of the already- mentioned Supplicatio pro Apostasia, and o& the bull of absolution which was the reply to it. This bull not only freed Rabelais from ecclesiastical censure but gave him the right to return to the order of St Benedict when he chose, and to practise medicine. He took advantage of this bull and became a canon of St Maur. The monastery having but recently become collegiate, there seems to have been some technical difficulty which necessitated a new suppli- cation. In the next year (1537) we find Rabelais present at a dinner where the friends of Etienne Dolet met to congratulate him on his pardon for the homicide of

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Compaing. The luckless printer has left a poem on the occasion, and two other writers, Salmon Macrin and Nicholas Bourbon, have also left poems of this date ex- pressing the regard in which Rabelais was generally held. Now, too, he took his doctor's degree at Montpellier, lectured on the Greek text of Hippocrates, and next year made a public anatomical demonstration. During these two years he seems to have resided either at Montpellier or at Lyons. But in 1539 he entered the service of Guillaume du Bellay-Langey, elder brother of Jean, and would appear to have been with him (he was governor of Piedmont) till his death on 9th January 1543. Rabelais wrote a panegyrical memoir of Guillaume, which is lost, and the year before saw the publication of an edition of Gargantua and Pantagruel, book i., together (both had been repeatedly reprinted separately), in which

some dangerous expressions were cut away. Nothing at all is known of his life, whereabouts, or occupations till the publication of the third book, which appeared in 1546, ‘“Cavec privilége du roi,” which had been given in Septem- ber 1545.

Up to this time Rabelais, despite the condemnation of the Sorbonne referred to above, had experienced nothing like persecution or difficulty. Even the spiteful or treacher- ous act of Dolet, who in 1542 reprinted the earlier form of the books which Rabelais had just slightly modified, seems to have done him noharm. But the storm of persecu- tion which towards the end of the reign of Francis I. was

| fatal to Dolet himself and to Despériers, while it exiled

and virtually killed Marot, did not leave Rabelais scatheless. There is no positive evidence of any measures taken or threatened against him; but it is certain that he passed nearly the whole of 1546 and part of 1547 at Metz in Lorraine as physician to the town at the salary of 120 livres, that Sturm speaks of him as having been ‘“‘cast out of France by the times” (with the exclamation ed Tov xpovwy) in a contemporary letter, and that he himself in a letter, also contemporary, though it is not clear whether it is of 1546 or the next year, gives a doleful account of his pecuniary affairs and asks for assistance. At Francis’s death on 31st March 1547 Du Bellay went to Rome, and at some time not certain Rabelais joined him. He was certainly there in February 1549, when he dates from Du Bellay’s palace a little account of the festivals given at Rome to celebrate the birth of the second son of Henry II. and Catherine de’ Medici. This account, the Scvomachie as it is called, is extant. In the same year a monk of Fontevrault, Gabriel du Puits-Herbault, made in a book called Teotimus the first of the many attacks on Rabelais. It is, however, as vague as it is violent, and it does not seem to have had any effect. Rabelais had indeed again made for himself protectors whom no clerical or Sorbonist jealousy could touch. The Sciomachie was written to the cardinal of Guise, whose family were all-powerful at court, and Rabelais dedicated his next book to Odet de Chatillon, afterwards cardinal,a man of great influence. Thus Rabelais was able to return to France, and was presented to the livings of Meudon and St Christophe de Jambet. It may, however, surprise those who have been accustomed to hear

him spoken of as "curé de Meudon" and who have read lives of him founded on legend to find that there is very little ground for believing that he ever officiated or resided there. He certainly held the living but two years, resign- ing it in January 1552 along with his other benefice, and it is noteworthy that at the episcopal visitation of 1551 he was not present. To this supposed residence at Meudon and to the previous stay at Rome, however, are attached two of the most mischievous items of the legend, though fortunately two of the most easily refutable. It is said that Rabelais met and quarrelled with Joachim du Bellay the

poet at Rome, and with Ronsard at Meudon and elsewhere, that this caused a breach between him and the Pléiade, that he satirized its classicizing tendencies in the episode of the Limousin scholar, and that Ronsard after his death avenged himself by a libellous epitaph. The facts are these. Nothing is heard of the quarrel with Du Bellay or of any meeting with him, nothing of the meetings and bickerings with Ronsard, till 1699, when Bernier tells the story without any authority. The supposed allusions to the Pléiade date from a time when Ronsard was a small boy, and are mainly borrowed from an earlier writer still, Geoffroy Tory. Lastly, the epitaph read impartially is not libellous at all but simply takes up the vein of the opening scenes of Gargantua in reference to Gargantua's author. There is indeed no reason to suppose that either Ronsard or Du Bellay was a fervent admirer of Rabelais, for they belonged to a very different literary school; but there is absolutely no evidence of any enmity between them or even of any acquaintanceship which could have given rise to enmity.

Some chapters of Rabelais's fourth book had been pub- lished in 1548, but the whole did not appear till 1552. The Sorbonne censured it and the parliament suspended the sale, taking advantage of the king's absence from Paris. 3ut it was soon relieved of the suspension. This is the last fact we know about Rabelais. It is supposed that he died in 1553, but actual history is quite silent, and the legends about his deathbed utterances—" La farce est jouée," "Je vais chercher un grand peut-étre," &¢c.—are altogether apocryphal. The same may be said of the numerous silly stories told of his

life, such as that of his procuring a free passage to Paris by inscribing packets "Poison for the king," and so forth.

Ten years after the publication of the fourth book and nine after the supposed date of the author's death there appeared at Lyons sixteen chapters entitled Z'fle Sonnante par Maistre Francois Rabelais, and two years later the entire fifth book was printed as such. In 1567 it took place with the others, and has ever since appeared with them. But from the beginning of the 17th century there have never been wanting disbelievers in its authenticity. The controversy is one of some intricacy, but as it is also one of capital importance in literary history the heads of it at least must be given here. The opponents of the book rely (1) on the testimony of a certain Louis Guyon, who in 1604 declared that the fifth book was made long after Rabelais's death by an author whom he knew, and who was not a doctor, and on the assertion of the bibliographer Du Verdier, about the same time, that it was written by an "écolier de Valence"; (2) on the fact that the anti-monastic and even anti-Catholic polemic is much more accentuated in it; (3) that parts are apparently replicas or rough drafts of passages already appearing in the four earlier books; (4) that some allusions are manifestly posterior to even the farthest date which can be assigned for the reputed author's decease. On the other hand, it is urged that, though Guyon and Du Verdier were ina sense contemporaries, they wrote long after the events, and that the testimony of the former is vitiated, not merely by its extreme vagueness but by the fact that it occurs in a plaidoyer, tending to exculpate physicians from the charge of unorthodoxy; that Du Verdier in another place assigns the Pantagrueline Prognostication to this same unknown student of Valence, and had therefore probably confused and hearsay notions on the subject ; that the rasher and fiercer tone, as well as the apparent repetitions, are sufficiently accounted for on the supposi- tion that Rabelais never finally revised the book, which indeed dates show that he could not have done, as the fourth was not finally settled till just before his death ;

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and that it is perfectly probable, and indeed almost certain, that it was prepared from his papers by another hand, which is responsible for the

anachronous allusions above referred to. But the strongest argument, and one which has never been attacked by authorities really competent to judge, is that the "griffe de Yaigle" is on the book, and that no known author of the time except Rabelais was capable of writing the passage about the Chats fourrés, the better part of the history of Queen Whims (La Quinte) and her court, and the conclusion giving the Oracle of the Bottle. To this argument we believe that the more com- petent a critic is, both by general faculty of appreciation and by acquaintance with contemporary French literature, the more positive will be the assent that he yields.

Gargantua and Pantagruel, notwithstanding their high literary standing and the frequency with which certain passages from them are cited, are, owing partly to their archaism of language and partly to the extreme licence which their author has allowed himself, so little read that no notice of them or of him could be complete without some sketch of their contents. The first book, Gargantua, describes the birth of that hero (a giant and the son of gigantic parents), whose nativity is ushered in by the account of a tremendous feast. In this the burlesque exaggeration of the pleasures of eating and drinking, which is one of the chief exterior notes of the whole work, is pushed to an extreme,—an extreme which has attracted natural but perhaps undue attention. Very carly, however, the » author becomes serious in contrasting the early education of his hero—a satire on the degraded schools of the Middle Ages—with its subsequent and reformed stage, in the account of which all the best and noblest ideas of the humanist Renaissance in reference to pedagogy are put with exceptional force. Gargantua is recalled from Paris, whither he had been sent to finish his education, owing to a war between his father, Grandcosier, and the neighbouring king; Picrochole. This war is described at great length, the chief hero of it being the monk, Friar John, a very unclerical cleric, in whom Rabelais greatly delights. Picrochole defeated and peace made, Gargantua establishes the abbey of Thelema in another of Rabelais's most elaborate literary passages, where all the points most obnoxious to him in monastic life are indicated by the assignment of their exact opposites to this model convent. The second book, which introduces the principal hero of the whole, Pantagruel, Gargantua's son, is, on any other hypothesis but that already suggested of its prior composition, very difficult to explain, but in itself it is intelli- gible enough. Pantagruel goes through something like a second edition (really a

first) of the educational experiences of his father. Like him, he goes to Paris, and there meets with Panurge, the principal triumph of Rabelaisian character-drawing, and the most original as well as puzzling figure of the book. Panurge has almost all intellectual accomplishments, but is totally devoid of morality : he is a coward, a drunkard, a lecher, a spiteful trickster, a spend- thrift, but all the while infinitely amusing. This book, like the other, has a war in its latter part; Gargantua scarcely appears in it and Friar John not at all. It is not till the opening of the third book that the most important action begins. 'This arises from Panurge's determination to marry —a determination, however, which is very half-hearted, and which leads him to consult a vast number of authorities, each giving occasion for satire of a more or less complicated kind. At last it is determined that Pantagruel and his followers (Friar John has reappeared in the suite of the prince) shall set sail to consult the Oracle of the Dive Bouteille. The book ends with the obscurest passage of the whole, an elaborate eulogy of the " herb pantagruelion," which appears to be, if it is anything, hemp. Only two probable explanations of this have been offered, the one seeing in it an anticipation of Joseph de Maistre's glorification of the executioner, the other a eulogy of work, hemp being on the whole the most serviceable of vegetable products for that purpose. The fourth and fifth books are entirely taken up with a description of the voyage. Many strange places with stranger names are visited, some of them offering obvious satire on human institutions, others, except by the most far-fetched explanations, resolvable into nothing but sheer extravaganza. At last the Land of Lanterns, borrowed from Lucian, is reached, and the Oracle of the Bottle is consulted. This yields the single word "Tring," which the attendant priestess declares to be the most gracious and intelligible she has ever heard from it. Panurge takes this as a sanction of his marriage and the book ends abruptly. This singular romance is diversified by or, to speak more properly, it is the vehicle of the most bewildering abundance of digression, burlesque amplification, covert satire on things political, social, and religious, miscellaneous erudition of the literary and scientific kind. Everywhere the author lays stress on the excellence of '"Pantagruelism," and the reader who is himself a Pantagruelist (it is perfectly idle for any other to attempt the book) soon discovers

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what this means. Itis, in plain English, humour. The definition of humour is a generally acknowledged crux, and till it is defined the definition of Pantagruelism will be in the same position. But that it consists in the extension of a wide sympathy to all human affairs together with a comprehension of their vanity may be said as safely as anything else. Moroseness and dogmatism are as far from the Pantagruelism of Rabelais as maudlin sentimentality or dilettantism. Perhaps the chief things lacking in his attitude are, in the first place, reverénce, of which, however, froma few passages, it is elear he was by no nieans totally devoid, and an appreciation of passion and poetry. Here and there there are touches of the latter, as in the portrait of Quintessence, but passion is everywhere absent—an absence for which the comic structure and plan of the book does not by any means supply a complete explanation.

For a general estimate of Rabelais's litcrary character and influ- ence the reader may be referred to the article FRANCE (vol. ix. p- 652). But some detailed remarks must be given here. The life and works of Rabelais, despite the considerable number of publica- tions of which they have been the subject, have hitherto been less fully and satisfactorily treated than the life and works of any author who oceupics an equally important plaee. As will have been seen from the foregoing attempt to give the actual facts, a whole legend has grown up round the scanty details recorded of him, and many, if not all, of the particulars of that legend can be shown to be false. But no one hitherto has undertaken in a satisfactory fashion the construction of a rigorously critical life. In the same way there are many questions in referenee to his main work which have never been thoroughly and finally sifted by a critical intelligence equal to the task. Limits of space, to say no more, prevent any such attempt being made here ; but there are three questions with- out the discussion of which this notice of one of the foremost writers of the world would not be worthy of its present place. These are — What is the general drift and purpose of Gargantua and Panta- gruel, supposing there to be any? What defence can be offered, if any defence is needed, for the extraordinary licence of language and imagery which the author has permitted himself? What was his attitude towards the great questions of religion, philosophy, and politics? These questions succeed each other in the order of reason, and the answer to each assists the resolution of the next.

There have been few more remarkable instances of the lues com- mentatoria than the work of the editors of Rabelais. Almost every one appears to have started with a Rabelais ready made in his head, and to have, so to speak, read that Rabelais into the book. Those who have not done this, like Le Duchat, Motteux, and Esmangart, have generally committed the error of tormenting themselves and their author to find individual explanations of personages and events. The extravagance of the last-named commentator takes the form of seeing elaborate allegories ; that of some others devotes itself chiefly to identifying the characters of the romance with more or less famous historical persons. But the first blunder, that of forming a general hypothetical conception of Rabelais and then adjusting interpretation of the work to it, is the commoner. This conception, however, has singularly varied. According to some expositors, among whom the latest and not the least respectable is M. Fleury, Rabelais is a sober reformer, an apostle of earnest work, of sound education, of rational if not dogmatic religion, who wraps up his morals in a farcical envelope partly to make them go down with the vulgar and partly to shield himself from the consequences of his reforming zeal. According to others, of whom we have had in England a distinguished example in Mr Besant, Rabclais is all this but with a difference. He is not religious at all; he is more or less anti-religious ; and his book is more or less of a general pro- test against any attempt to explain supernaturally the riddle of the earth. According to a third class, the most distinguished re- cent representative of which was M. Paul Lacroix, the Rabelaisian legend does not so much err in principle as it invents in fact. Rabelais is the incarnation of the 'esprit Gaulois," a jovial careless soul, not destitute of common sense or even acute intellectual power, but first of all a good fellow, rather preferring a broad jest to a fine-pointed one, and rollicking through life like a good-natured undergraduate. Of all these views it may be said that those who hold them are obliged to shut their eyes to many things in the book and to see in it many which are not there. The religious part of the matter will be dealt with presently ; but it is impossible to think that any unbiassed judge reading Rabelais can hold the grave philosopher view or the reckless good fellow view without modifications and allowances which practically deprive either of any value asa sufficient explanation of the book and its writer. Those who, as it has been happily put, identify Rabelais with Pantagruel, strive in vain on any view intellectually consistent or morally respectable to account for the vast

ocean of pure or impure laughter and foolery which surrounds the few solid islets of sense and reason and devotion. Those who in the same way identify Rabelais with Panurge can never explain the education scheme, the solemn apparition of Gargantua among the farcical and fantastic Variations on Panurge's wedding, and many other passages ; while, on the other hand, those who insist on a definite propaganda of

any kind must justify themselves by their own power of seeing things invisible to plain men.. But these vagaries are not only un- justifiable ; they are entirely unnecessary. No one reading Rabelais without part? pris, but with a good knowledge of the history and literature of his own times and the times which preceded him, can have much difficulty in appreciating his book. He had evidently during his long and studious sojourn in the cloister (a sojourn which was certainly not less than five-and-twenty years, while it may have been five-and-thirty, and of which the studiousness rests not on legend but on documentary evidence) acquired a vast stock of learning. He was, it is clear, thoroughly penetrated with the instincts, the hopes, and the ideas of the Renaissance in the form whieh it took in France, in England, and in Germany,—a form, that is to say, not merely humanist but full of aspirations for social and political improvement, and above all for a joyous, varied, and non-ascetic life. He had thoroughly convinced himself of the abuscs to which monachism lent itself. Lastly, he had the spirit of lively satire and of willingness desipere in loco which frequently goes with the love of books. It is in the highest degree improbable that in beginning his great work he had any definite purpose or intention. The habit of burlesquing the romans d'aventwres was no new one, and the form lent itself easily to the two literary exercises to which he was most disposed,—apt and quaint citation from and variation on the classics and satirical criticism of the life he saw around him. The immense popularity of the first two parts induced him to eon- tinue them, and by degrees (the genuineness of the fifth book at any rate in substanee is here assumed) the possibility of giving the whole something like a consistent form and a regular conclusion presented itself to him. The voyage in particular allowed the widest licence of satirical allusion, and he availed himself of that licence in the widest sense. Here and there persons are glanced at, while the whole scenery of his

birthplace and its neighbourhood is curiously worked in; but for the most part the satire is typical rather than individual, and it is on the whole a rather negative satire. In only two points can Rabelais be said to be definitely polemic. He certainly hated the monkish system in the debased form in which it existed in his time; he as certainly hated the brutish ignorance into which the earlier systems of education had suffered too many of their teaehers and scholars to drop. At these two things he was never tired of striking, but elsewhere, even in the grim satire of the Chats fourrés, he is the satirist proper rather than the reformer. It is in the very absence of any cramping or limiting purpose that the great merit aud value of the book consist. It holds up an almost perfectly level and spotless mirror to the temper of the earlier Renaissance. The author has no universal medicine of his own (except Pantagruelism) to offer, nor has he anybody else's universal medicine to attack. He ranges freely about the world, touching the laughable sides of things with kindly laughter, and every now and then dropping the ristbile and taking to the rationale. It is not indeed possible to deny that in the Oracle of the Bottle, besides its mercly jocular and fantastic sense, there is a certain "echo," as it has been called, "of the conclusion of the preacher," a certain acknowledgment of the vanity of things. But in sucli a book such a note could hardly be wanting unless the writer had been a fanatic, which he was not, or a mcre voluptuary, whieh he was not, or a dullard, which he was least of all. It is, after all, little more than a suggestion, and is certainly not strengthened by anything in the body of the work. Rabclais is, in short, if he be read without prejudice, a humourist pure and simple, feeling often in earnest, thinking almost always in jest. He is distinguished from the two men who alone can be com1pared to him in character of work and force of genius combined—Lucian and Swift—by very marked characteristics. He is much less of a mere mocker than Lucian, and he is entirely destitute, even when he deals with monks or pedants, of the ferocity of Swift. He neither sneers nor rages; the rire ¢tmmense which distinguishes him is altogether good-natured ; but he is nearer to Lucian than to Swift, and Lucian is perhaps the author whom it is most neccs- sary to know in order to understand him rightly. ,

If this general view is correct (and it may at least claim to be founded on nothing but the reading of Rabelais himself without prejudice and with a tolerable apparatus) it will probably condition to some extent the answer to

be given to the two minor questions stated above. The first is connected with the great blemish of Gargantua and Pantagruel,—their extreme coarseness of language and imagery. It is somewhat curious that some of those who claim Rabelais as an enemy of the supernatural in general have been the loudest to condemn this blemish, and that some of them have made the exceedingly lame excuse for him that it was a means of wrapping up his propaganda and keeping it and himself safe froin the notice of the powers that were. This is not complimentary to Rabelais, and, except in some very small degree, it is not likely to be true. For as a matter of fact obscenity no less than impiety was charged against him by his ultra-orthodox enemies, and the obseenity no less than the supposed impiety gave them a handle against him before such bodies as the Sorbonne and the parliaments. As for the extreme theory of the anti-Rabclaisians, that Rabelais

was a "dirty old blackguard" who liked filth and wallowed in it from choice, that hardly needs comment. His errors in this way are of course, looked at from an absolute standard, unpardonable. But judged relatively there are several, we shall not say excuses, but explanations of them. In the first place, the comparative indecency of Rabelais has been much exaggerated by persons un- familiar with carly French literature. The form of his book was above all things popular, and the popular French literature of the Middle Ages as distinguished from the courtly and hterary litera- ture, which was singularly pure, can hardly be exceeded in point of coarseness. The fabliaux, the carly burlesque romances of the Audigier class, the farces of the 15th century, cqual (the grotesyue iteration and amplification which is the uote of Gargantua and Pantagruel being allowed for, and sometimes without that allow- ance) the coarsest passages of Rabelais. His coarseness, moreover, disgusting as it is, has nothing of the corruption of refined voluptu- ousness about it, and nothing of the sniggering indecency which disgraces men like Pope, like Voltaire, and like Sterne. It shows in its author a want of reverence, a want of decency in the proper sense, a too great readiness to condescend to the easiest kind of ludicrous ideas and the kind inost acceptable at that time to the common run of mankind. The general taste having been consider- ably refined since, Rabelais has in parts become nearly unreadable, —the worst and most

appropriate punishment for his faults. As for those who have tried to make his indecency an argumcut for his laxity in religious principle, that arguinent, like another men- tioned previously, hardly needs discussion. It is notoriously false as a matter of experience. Rabelais could not have written as he has written in this respect and in others if he had been an earnestly pious person, taking heed to every act and word, and studious equally not to offend and not to cause offence. But no onc in his senses would dream of claiming any such character for him.

This brings us to the last point—what his religious opinions were. He has been claimed as a freethinker of all shades, from undogmatic theism to athcism, and as a concealed Protestant. The last of these claims has now bcen very generally given up, and indeed Erasmus might quite as reasonably be claimed for the Reformation as Rabelais. Both disliked and attacked the more erying abuses of their church, and both at the time and since have been disliked and attacked by the more imprudent partisans of that church. But Rabelais, in his own way, held off from the Reformation even more distinctly than Erasmus did. The accusa- tion of freethinking, if not of directly anti-Christian thinking, has always been more common and has recently found mucli favour. It is, however, remarkable that those who hold this opinion never give chapter and verse for it, and it may be said confidently that chapter and verse cannot be given. The sayings attributed to Rabelais whieh colour the idea (such as the famous '"'Je vais chercher un grand peut-étre," said to have been uttered on his death-bed) are, as has been said, purely apocryphal. In the book itsclf nothing of the kind is to be found. Perhaps the nearest approach to it is a jest at the Sorbonne couched in the Pauline phrase about " the evidence of things not seen," which the author removed from the later editions. But irreverences of this kind, as well as the frequent burlesque citations of the Bible, whether commendable or not, had been, were, have since been, and are common in writers whose orthodoxy is unquestioned ; and it must be remembered that the later Middle Age, which in many respects Rabelais represents almost more than he does the Renaissance, was, with all its unquestioning faith, singularly reckless and, to our fancy, irreverent in its use of the sacred words and images, which were to it the most familiar of all images and words. On the other hand, there are in the book, in the description of Gargantua's and Pantagruel's education, in the sketch of the abbey of Thelema, in several

passages relating to Pantagruel, expressions which either signify a sincere and unfeigned piety of a simple kind or else are inventions of the most detestable hypocrisy. For these passages are not, like many to be found from the Renaissance to the end of the 18th century, obvious flags of truce to cover attacks, —mere bowings in the house of Rimmon to prevent evil consequences. There is absolutely no sign of the tongue in the cheek. They are always written in the author's highest style, a style perfectly elo- quent and unaffected ; they can only be interpreted (on the free- thinking hypothesis) as allegorical with the greatest difficulty and obscurity, and it is pretty certain that no one reading the book without a thesis to prove would dream of taking them in a non- natural sense. It is not, indeed, to be contended that Rabelais was a man with whom religion was in detail a constant thought, that he had a very tender conscience or a very scrupulous orthodoxy. His form of religious sentiment was not evangelical or mystical, any more than it was ascetic or eeremonial or dogmatic. As regards one of the accepted doctrines of his own church, the excellence of the celibate life, of poverty, and of elaborate obedience to a rule, he no doubt was a strong dissident ; but the evidence that, as a Christian, he was unorthodox, that he was even an heretical or latitudinarian thinker in regard to those doctrines which the various Christian churches have in common, is not merely weak, it is

practically non-existent. The counter testimony is, indeed, not very strong and still less detailed. But that is not the point. It is sufficient to say that there is absolutely nothing within the covers of Rabelais's works incompatible with an orthodoxy which would be recognized as sufficient by Christendom at large, leaving out of the question those points of doctrine and practice on which Christians differ. Beyond this no wise man will go, and short of it hardly any unprejudiced man will stop.

The dates of the original editions of Rabelais's works have been given where possible already. The earlier books were repeatedly reissued during the author's life, and always with some correction. What may be called the first complete edition appeared in 1567 at Lyons, published by Jean Martin.

It is computed that no less than sixty editions were printed before the close of the 16th century. A very considerable time, however, elapsed before the works were, properly speaking, edited. Huet devoted much pains to them, but his results were not made public. The first edition which calls for notice, except in a complete bibliography, is that of Le Duchat (Amsterdam, 1711). Le Duchat was a very careful student, and on the whole a very efficient editor, being perhaps, of the group of students of old French at the beginning of the 18th century, which included La Monnoye and others, the most sober, critical, and accomplished. But at that time the knowledge of the period was scarcely far enough advanced. The next important date in the bibliography of Rabelais is 1823, in which year appeared the most elaborate edition of his work yet published, that of Esmangart and Johanneau (9 vols.), including for the first time the "Songes Drolatiques," a spurious but carly and not uninteresting collection of grotesque figure-drawings illustrating Gargantua and Pantagruel, and the second edition of M. de lAulnaye, containing a bad text but a useful glossary. From this time the editions have been very numerous. Among them may be mentioned those illustrated by Gustave Doré, first on a small scale (1854), afterwards more elabo- rately (1870); that of the Collection Didot by Burgaud des Marets and Rathery (1859, second edition 1870); the Bibliothéque Elzévir- iene edition by MM. Lacour and A. de Montaiglon; that of the Nouvelle Collection Jannet (seven small volumes, 1867-74), com- pleted by M. Moland ; and lastly, the edition of M. Marty-Laveaux in the Collection Lemerre (1868-81), which is unfortunately not se completed, but which when finished will undoubtedly be the – n1andsomest, the most accurate, and the most complete in the scholarly sense yet published. At present the most really useful edition which combines a handsome form with cheapness is that of the Nouvelle Collection Jannet, though that of MM. Burgaud des Marets and Rathery is not to be despised. Commentaries on Rabelais, independent of editions, have been especially numerous of late years; the work of MM. Reville, Noel, Mayrargues, and Gebhart may be mentioned. But the best recent book on the sub- ject in French is that of M. J. Fleury (2 vols., Paris, 1876), whicli, though deficient in exactitude as to many points of detail, aud sacrificing something to a desire of presenting Rabelais as a great social philosopher, is, on the whole, very sensible and complete.

tabelais was very early popular in England. There are possible allusions to him in Shakespeare, and the current clerical notion of him is very unjustly adopted by Marston in the words "wicked Rabelais"; but Bacon described him better as the great jester of France, and a Scot, Sir Thomas Urquhart, translated the earlier books in 1653. This was not worthily completed till the luckless Motteux, or, as his compatriots call him, Le Motteux, finished it with an extensive commentary. Criticism of a scattered kind on Rabelais in English is abundant, that of Coleridge being the most important, while the constant evidence of his influence in Southey's Doetor is also noteworthy. But he was hardly treated as a whole before Mr Besant's book on the subject in the Foreign Classics for English Readers (1879), which the author has since followed up with Readings from Rabelais (1883). Myr Besant has too readily adopted (probably from Michelet) the apocryphal scandals as to the difference between Rabelais and the poets of the Pléiade, and is committed (it is not quite clear why) to a view of Rabelais as a non-Christian thinker and preacher for which it is impossible to discover solid justification. But otherwise his books form the best introduction possible for a modern English reader to this great author. (G. SA.)

RABENER, Gorriies Winuetm (1714-1771), German satirist, was born in 1714 near Leipsic, and after studying law at that city entered the civil service, in which he continued for many years. He died on 22d March 1771. The papers which he published in the Bremer Beitrdge were subsequently collected into a Sammlung satirischer Schriften (2 vols., 1751), to which two volumes were after- wards added. The work passed through numerous edi- tions. Rabener's Freundschaftliche Briefe were published posthumously by C. F. Weisse with a biography. (See GERMANY, vol. x. p. 533.)

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RABIES, a virulent disease, developed primarily in and peculiar to the canine species. Its occurrence in the same manner in other carnivorous animals, as the fox, wolf, hyzena, jackal, raccoon, badger, and skunk, has been asserted ; but there is every probability that it is originally a disease of the dog. It is communicated by inoculation to nearly all, if not all, warin-blooded creatures. The trans- mission from one animal to another only certainly takes place through inoculation with viruliferous matters. The

malady is generally characterized at a certain stage by an irrepressible desire in the animal to act offensively with its natural weapons,—dogs and other carnivora attacking with their teeth, herbivora with their hoofs or horns, and birds with their beaks, when excited ever so slightly. In the absence of excitement the malady may run its course without any fit of fury or madness. Transmission of the disease to man produces HypRopHopia (q.v.) or dread of water, but in animals this symptom is rarely, if ever, observed. Rabies has been known from the very earliest times, and serious outbreaks have been recorded as occur- ring among dogs, wolves, and foxes in different parts of the world, particularly in western Europe and in North and South America. It is very frequent in Europe and appears to be on the increase. France, Germany, upper Italy, and Holland evidently suffer more than other Con- tinental countries. England is becoming more frequently visited than before, though Scotland and Ireland are much less troubled than England. Spain is also sometimes severely scourged by it; but it is rare in Portugal. On the American continent it is well known, though on the eastern side of the Andes it is rarely if ever seen; and it has never been heard of in Quito. In the West Indies —in Hispaniola, Jamaica, Domingo, Havana, Guadaloupe, and Hayti—as well as in Ceylon, it is frequently wit- nessed, and in 1813 it was introduced into Mauritius. It exists in North and South China, and has been reported in Cochin China and the kingdom of Anam. It is fre- quent and fatal in India; and it is by no means rare in Syria, Palestine, and Turkey. It has been observed in the Hij4z in Arabia, and in North Africa and Egypt. Hydrophobia has been reported in Algeria; but Rohlfs asserts that it is unknown in Morocco. Gibraltar and Malta have been seriously invaded at times, and in Sweden, Denmark, Norway, Russia, and Lapland it has been fre- quently seen in an epizootic form; but it is not yet positively decided whether it exists in the Arctic regions. Steller and Erman assert that it is unknown in Kam- chatka and Greenland; but Hayes (Zhe Open Polar Sea) gives us the particulars of an outbreak of disease in South Greenland, which persisted for several years, caused him the loss of his sledge-dogs in 1870, and in 1872 extended from Smith's Sound to Jakobshavn, threatening the utter extinction of the species, and with it the dis- appearance of the Eskimo. In most of its features it appeared to be rabies. The scourge is unknown, accord- ing to reliable evidence, in Australia and New Zealand, Tasmania, the Azores, and St Helena, as well

as the island of Madeira ; it has not been seen at Sumatra, nor in East, South, and West Africa, nor in the island of Réunion.

Rabies (hydrophobia) is almost invariably fatal in man, and in the dog it nearly always terminates in death, though instances of recovery are recorded ; and it is extremely probable that in those cases in which people have been bitten by dogs and subsequently perished from hydro- phobia, without the animals themselves offering any marked Indications of illness either at the time or afterwards, these have been suffering from a mild form of the disease. It 18 also fatal to horses, cows, pigs, goats, and cats, but not to fowls, many of these recovering from accidental or experimental inoculation. Indeed rabies varies consider-

ably in intensity and in the character of its symptoms in different species of creatures. Pasteur has shown that, if it is transmitted from the diseased dog to the monkey and ultimately from monkey to monkey, at each trans- mission it becomes more attenuated in virulence, and remains so attenuated when passed again to the dog, rabbit, or guinea-pig, nor will it any longer produce the disease in dogs by hypodermic inoculations. Even inocu- lation by trepanning the cranium, which is so infallible in conveying rabies, may produce no result, the dog thence- forward being protected, and no longer capable of receiving the disease. On the other hand, the rabific virus is in- tensified when passed from rabbit to rabbit, or from guinea-pig to guinea- pig; and after several transmissions through the bodies of these animals it regains the maxi- mum virulence which it possessed before it was enfeebled by being passed through the monkey. And the same thing holds with respect to the virulence of the ordinary rabid dog: when virus which is far from having reached its maximum intensity is conveyed to the rabbit, it requires to be passed through several of these animals before it reaches its maximum. It may be mentioned that the disease is not readily conveyed from man to animals, either accidentally or experimentally. The virus appears to exist in greatest intensity in the salivary glands and their secretion, in the brain and spinal cord, and perhaps to a lesser degree in the blood ; doubtless it exists also in other fluids and tissues of the diseased animal. The priucipal alterations found in the bodies of rabid animals after

death are located in the spinal cord, especially its upper portion, the medulla oblongata, certain parts of the brain, and the salivary glands, more particularly the submaxillary and sublingual,—less in the parotid. The stomach, kidneys, and other organs also present altera- tions which are more or less significant, especially the former, in which foreign bodies, as hair, wood, stones, earth, pieces of cloth, &c., are very frequently found. But the nature of the lesions, as well as the symptomato- logy, shows that the action of the poison is more especially exerted on the brain or spinal cord, though the eighth pair of nerves, and branches of the fifth and seventh pairs, are not involved in animals, as in man.

The period in which the symptoms of the disease become manifest, especially after accidental inoculations, as bites, varies extremely ; indeed there is no disease in which the period of latency or incubation is more variable or pro- tracted, this being sometimes limited to a few days or weeks and extending in rare cases to more than twelve months. In experimental inoculations the period is greatly shortened and the results more certain,—all the more so if the virus is introduced into the cranial cavity by trepan- ning, or into the blood-stream by intravenous inoculation. In accidental inoculations, as in wounds from rabid dogs, a certain but varying percentage escape. This immunity may be due to natural non-receptivity, to the wound not having been inflicted in a very vascular part, or to the saliva having been expended from frequent bites on other animals, or intercepted by clothing, hair, wool, &c.

Symptoms.—The discase has been divided into three stages or periods, and has also been described as appearing in at least two forms, according to the peculiarities of the symptoms. But, asa rule, one period of the disease does not pass suddenly into another, the transition being almost imperceptible ; and the forms do not differ essentially from each other, but appear merely to constitute varieties of the same disease, due to the natural disposition of the animal, or other modifying circumstances. These forms have been designated true or furious rabies (Fr. rage vrai; Germ. rasende Wuth) and dumb rabies (Fr. rage mue ; Germ. stille Wath).

The malady does not commence with fury and madness, but in a strange and anomalous change in the habits of the dog: it becomes dull, gloomy,

and taciturn, and seeks to isolate itself in out-of-the- way places, retiring beneath chairs and to odd corners. But in its retirement it cannot rest: it is uneasy and fidgety, and no

sooner has it lain down than suddenly it jumps up in an agitated manner, walks backwards and forwards several times, again lies down and assumes a sleeping attitude, but has only maintained it for a few minutes when it is once more moving about. Again it retires to its corner, to the farthest recess it can find, and huddles itself up into a heap, with its head concealed beneath its chest and fore-paws. This state of continual agitation and inquietude is in striking contrast with its ordinary habits, and should therefore receive attention. Not unfrequently there are a few moments when the creature appears more lively than usual, and displays an extra- ordinary amount of affection. Sometimes there is a disposition to gather up straw, thread, bits of wood, &c., which are industriously carried away; a tendency to lick anything cold, as iron, stoncs, &c., is also observed in many instances; and there is also a desire evinced to lick other animals. Sexual excitement is also frequently an early symptom. At this period no disposition to bite is observed ; the animal is docile with its master and obeys his voice, though not so readily as before, nor with the same pleased countenance. There is something strange in the expression of its face, and the voice of its owner is scarcely able to make it change from a sudden gloominess to its usual animated aspect. These symptoms gradu- ally become more marked : the restlessness and agitation increase. If on straw the dog scatters and pulls it about with its paws, and if in a room it scratches and tumbles the cushions or rugs on which it usually lies. It is incessantly on the move, rambling about, scratching the ground, sniffing in corners and at the doors, as if on the scent or seeking for something. It indulges in strange movenients, as if affected by some mental influences, or a prey to hallucinations. When not excited by any external influence it will remain for a brief period perfectly still and attentive, as if watching something, or following the movements of some creature on the wall; then it will suddenly dart forward and snap at the vacant air, as if pursuing an annoying object, or endeavouring to seize a fly. At another time it throws itself, yelling and furions, against the wall, as if it heard threatening voices

on the other side, or was bent on attacking anenemy. Nevertheless, the animal is still docile and submissive, for its master's voice will bring it out of its frenzy. But the saliva is already virulent, and the excess- ive affection which it evinces at intervals, by licking the hands or face of those it loves, renders the danger very great should there be a wound or abrasion. Until a late period in the disease the inaster's voice has a powerful influence over the animal. When it has escaped from all control and wanders erratically abroad, ferocious and restless, and haunted by horrid phantoms, the familiar voiee yet exerts its influence, and it is rare indeed that it attacks its master.

There is no dread of water in the rabid dog; the animal is gener- ally thirsty, and if water be offered will lap it with avidity, and swallow it at the commencement of the disease. And, when, at a later period, the constriction about the throat—symptomatic of the disease—renders swallowing difficult, the dog will none the less endeavour to drink, and the lappings are as frequent and pro- longed when deglutition becomes impossible. So little dread has the rabid dog of water that it will ford. streams and swim rivers ; and when in the ferocious stage it will even do this in order to attack other creatures on the opposite side. The evidence on this head is overwhelming.

At the commencement of the discase the dog does not usually refuse to eat, and some animals are voracious to an unusual degree. But in a short time it becomes fastidious, only eating what it usually has a special predilection for. Soon, however, this gives place to a most characteristic symptom—either the taste becomes extremely depraved or the dog has a fatal and imperious desire to bite and ingest everything. The litter of its kennel, wool from cushions, carpets, stockings, slippers, wood, grass, earth, stones, glass, horse-dung, even its own feces and urine, or whatever else may come in its way, are devoured. On examination of the body of a dog which has died of rabies it is so common to find in the stomach a quantity of dissimilar and strange matters on which the teeth have been exercised that, if there was nothing known of the animal's history, there would be strong evidence of its having been affected with the disease. When a dog, then, is observed to gnaw and eat suchlike matters, though it exhibits no tendency to bite, it should be suspected.

The mad dog does not usually foam at the mouth to any great extent at first. The mucus of the mouth is not much increased in quantity, but it soon becomes thicker, viscid, and glutinous, and adheres to the angles of the mouth, fauces, and teeth. It is at this period that the thirst is most ardent, and the dog sometimes furiously attempts to detach the saliva with its paws; and, if after a while it loses its balance in these attempts and tumbles over, there can no longer be any doubt as to the nature of the malady. There is another symptom connected with the mouth in that form of the disease named '"'dumb madness" which has frequently proved deceptive. The lower jaw drops in consequence of paralysis of its muscles, and the mouth remains open. The interior is dry from the air passing continually over it, and assumes a deep red

tint, somewhat masked by patches of dust or earth, which more especially adhere to the upper surface of the tongue and to the lips. The strange alteration produced in the dog's physiognomy by its constantly open mouth and the dark colour of the interior is rendered still more characteristic by the dull, sad, or dead ex- pression of the animal's eyes. In this condition the creature is not very dangerous, because generally it could not bite if it tried, — indeed there does not appear to be much desire to bite in dumb inadness ; but the saliva is none the less virulent, and accidental inoculations with it, through imprudent handling, will prove as fatal as in the furious form. The mouth should not be touched, —numerous deaths having occurred through people thinking the dog had some foreign substance lodged in its throat, and thrusting their fingers down to remove it. The sensation of tightness which seems to exist at the throat causes the dog to act as if a bone were fixed between its teeth or towards the back of its mouth, and to employ its fore-paws as if to dislodge it. This is a very deceptive symptom, and may prove cqually dangerous if caution be not ob- served. Vomiting of blood or a chocolate-coloured fluid is witnessed in some cases, and has been supposed to be due to the foreign sub- stances in the stomach, which abrade the lining membrane ; this, however, is not correct, as it has been observed in man,

The voice of the rabid dog is very peculiar, and so characteristic that to those acquainted with it nothing more is needed to prove the presence of the disease. Those who have heard it once or twice never forget its signification. Owing to the alterations taking place in the larynx the voiee becomes hoarse, cracked, and stridulous, like that of a child affected with croup,—the "voix du coq," as the French have it. A preliminary bark is made in a somewhat elevated tone and with open mouth; this is immediately succeeded by five, six, or eight decreasing howls, cmitted when the animal is sitting or standing, and always with the nose elevated, which seem to come from the depths of the throat, the jaws not coming together and closing the mouth during such emission, as in the healthy bark. This alteration in the voice is frequently the first observable indica- tion of the malady, and should at once attract attention. In dumb madness the voice is frequently lost from the very commencement, —hence the designation.

The sensibility of the mad dog appears to be considerably dimi- nished, and the animal appcars to have lost the faculty of expressing the sensations it experiences: it is mute under the infliction of pain, though there can be no doubt that it still has peripheral sensation to some extent. Burning, beating, and wounding produee much less effect than in health, and the animal will even mutilate itself with its teeth. Suspicion, therefore, should always strongly attach to a dog which does not manifest a certain susceptibility to painful impressions and receives punishment without any cry or complaint. There is also reason for apprehension when a dog bites itself persistently in any part of its body. A rabid dog is usually stirred to fury at the sight of one of its own species; this test has been resorted to by Bouley to dissipate doubts as to the existence of the disease when the diagnosis is otherwise unccrtain. As soon as the suspected animal, if it is really rabid, finds itself in the presence of another of its species it at once assumes the aggress- ive, and, if allowed, will bite furiously. All rabid animals indeed become excited, exasperated, and furious at the sight of a dog, and attack it with their natural weapons, even the timid sheep when rabid butts furiously at the enemy before which in health it would have fled in terror. This inversion of sentiment is sometimes valu- able in diagnosing the malady ; it is so common that it may be said to be present in every case of rabies. When, therefore, a dog, contrary to its habits and natural inclination, becomes suddenly aggressive to other dogs, it is time to take precautions.

In the large majority of instances the dog is inoffensive in the early period of the disease to those to whom it is familiar, It then flies from its home and either dies, is killed as "mad," or returns in a miserable plight, and in an advanced stage of the malady, when the desire to bite is irresistible. It is in the carly stage that sequestra- tion and suppressive measures are most valuable. The dogs which propagate the disease are usually those that have escaped from their owners, After two or three days, frequently in about twelve hours, more serious and alarming symptoms appear, ferocious in- stincts are developed, and the desire to do injury is irrepressible. The animal has an indcfinable expression of sombre melancholy and cruelty. The eyes have their pupils dilated, and entit flashes of light when they are not dull and heavy; they always appear so fierce as to produce terror in the beholder; they are red and their sensibility to light is increased; and wrinkles, which sometimes appear on the forehead, add to the repulsive aspect of the animal. If caged it flies at the spectator, emitting its characteristic howl or bark, and seizing the iron bars with its teeth, and if a stick be thrust before it this is grasped and gnawed. This fury is soon suc- ceeded by lassitude, when the animal remains insensible to every excitement. Then all at once it rouses up again, and another paroxysm of fury commences. The first paroxysm is usually the most intense, and the fits vary in duration from some hours to a day, and even longer; they are ordinarily briefer in trained and

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pet dogs than in those which are less domesticated, but in all the remission is so complete after the first paroxysm that the animals appear to be almost well, if not in perfect health. During the paroxysms respiration is hurried and laboured, but tranquil during the remissions. There is an increase of temperature and the pulse is quick and hard. When the animal is kept in a dark place and not excited, the fits of fury are not observed. Sometimes it is agitated and restless in the manner already described. It never becomes really furious or aggressive unless excited by external objects,—the most potent of these, as has been said, being another dog, which, however, if it be admitted to its cage, it may not at onee attack. The attacked animal rarely retaliates, but usually responds to the bites by acute yells, which contrast strangely with the silent auger of the aggressor, and tries to hide its head with its paws or beneath the straw. These repeated paroxysms hurry the course of the discase. The secretion and flowing of a large quantity of saliva from the mouth are usually only witnessed in cases in which swallowing has become impossible, the mouth being gencrally dry. At times the tongue, nose, and whole head appear swollen. Other dogs frequently shun one which is rabid, as if aware of their danger.

The rabid dog, if lodged in a room or kept in a house, is continually endeavouring to escape; and when it makes its escape it goes freely forward, as if impelled by some irresistible force. It travels con- siderable distances in a short time, perhaps attacking every living creature it meets, —preferring dogs, however, to other animals, and these to mankind ; cats, sheep, cattle, and horses are particularly liable to be injured. It attacks in silence, and never utters a snarl or a cry of anger; should it chance to be hurt in return it emits no cry or howl of pain. The degree of ferocity appears to be related to natural disposition and training. Soine dogs, for instance, will only snap or give a slight bite in passing, while others will bite furiously, tearing the objects presented to them, or which they meet in their way, and sometimes with such violence as to injure their mouth and break their teeth, or even their jaws. If chained, they will in some cases gnaw the chain until their teeth are worn away and the bones laid bare. The rabid dog does not continue its progress Very long. Exhausted by fatigue and the paroxysms of madness excited in it by the objects it meets, as well as by hunger, thirst, and also, no doubt, by the malady, its limbs soon become

feeble ; the rate of travelling is lessened and the walk is unsteady, while its drooping tail, head inclined towards the ground, open mouth, and protruded tongue (of a leaden colour or covered with dust) give the distressed creature a very striking and characteristic physiognomy. In this condition, however, it is much less to be dreaded than in its early fits of fury, since it is no longer capable or desirous of altering its course or going out of its way to attack an animal or a man not immediately in the path. It is very probable that its fast-failing vision, deadened scent, and generally diminished perception prevent its being so readily impressed or excited by surrounding objects as it previously was. To each paroxysm, which is always of short avin, there succeeds a degree of exhaustion as great as the fits have been violent and oft repeated. This compels the animal to stop; then it shelters itself in obscure places—frequently in ditches by the roadsidc—and lies there in a somnolescent state for perhaps hours. There is great danger, nevertheless, in disturbing the dog at this period; for when roused from its torpor it has sometimes sufficient strength to in- flict a bite. This period, which may be termed the second stage, i$ as variable in its duration as the first, but it rarely exceeds three or four days. The above-described phenomena gradually merge into those of the third or last period, when symptoms of paralysis appear, which are speedily followed by death. During the remission in the paroxysms these paralytic symptoms are more particularly manifested in the hind limbs, which appear as if un- able to support the animal's weight, and cause it to stagger about ; or the lower jaw becomes more or less drooping, leaving the parched mouth partially open. Emaciation rapidly sets in, and the paroxysms diminish' in intensity, while the remissions become less marked. The physiognomy assumes a still more sinister and repulsive aspect; the hair is dull and ercct; the flanks are re- tracted ; the eyes lose their lustre and are buried in the orbits, the pupil being dilated, and the cornea dull and semi-opaque ; very often, even at an early period, the eyes squint, and this adds still more to the terrifying appearance of the poor dog. The voice, if at all heard, is husky, the breathing laborious, and the pulse hurried and irregular. Gradually the paralysis increascs, and the posterior extremities are dragged as if the animal's back were broken, until at length it becomes general; it is then the prelude to death. Or the dog remains lying in a state of stupor, and can only raise itself With difficulty on the fore-limbs when greatly excited. In this condition it may yet endeavour to bite at objects within its reach. At times

convulsions of a tetanic character appear in certain muscles ; at other times these are general. A comatose condition ensues, and the rabid dog, if permitted to die naturally, perishes, in the great majority of cascs, from paralysis and asphyxia.

In dumb madness there is paralysis of the lower jaw, which im-

parts a curious and very characteristic physiognomy to the dog ; the voice is also lost, and the animal can neither eat nor drink. In this condition the creature remains with its jaw pendent and the mouth consequently wide open, showing the flaccid or swollen tongue covered with brownish matter, and a stringy gelatinous- looking saliva lying between it and the lower lip and coating the fauces, which sometimes appear to be inflamed. Though the animal is unable to swallow fluids, the desire to drink is neverthe- less intense ; for the creature will thrust its face into the vessel of water in futile attempts to obtain relief, even until the approach of death. Water may be poured down its throat without inducing a paroxysm. The general physiognomy and demeanour of the poor creature inspire the beholder with pity rather than fear. The symptoms due to cerebral excitement are less marked than in the furious form of the disease ; the agitation is not so considerable, and the restlessness, tendency to run away, and desire to bite are nearly absent ; generally the animal is quite passive. Not unfre- quently one or both eyes squint, and it is only when very much excited that the dog may contrive to close its mouth. Sometimes there is swelling about the pharynx and the neck; when the tonguc shares in this complication it hangs out of the mouth. In certain cases there is a catarrhal condition of the membrane lining the nasal cavities, larynx, and bronchi; sometimes the animal testifies to the existence of abdominal pain, and the feces are then soft or fluid. The other symptoms—such as the rapid exhaustion and emaciation, paralysis of the posterior limbs towards the ter- mination of the disease, as well as the rapidity with which it runs its course—are the same as in the furious form.

The simultaneous occurrence of furious and dumb madness is frequently observed in packs of fox-hounds. Dumb madness differs, then, from the fnrious type in the paralysis of the lower jaw, which hinders the dog from

biting, save in very exceptional circumstances ; the ferocious instincts are also in abeyance ; and there is no tendency to aggression. It has been calculated that from 15 to 20 per cent. of rabid dogs have this particular form of the disease. Puppies and young dogs chiefly have furious rabies.

These are the symptoms of rabies in the dog; but it is not likely, nor is it necessary, that they will all be present in every case. In other species the symptoms differ more or less from those mani- fested by the dog, but they are generally marked by a change in the manner and habits of the creatures affected, with strong indi- cations of nervous disturbance, in the majority of species amounting to ferociousness and a desire to injure, timid creatures becoming bold and aggressive, (See Fleming, Rabies and Hydrophobia.)

In order to prevent injury from this disease in countries in which it is prevalent owners of dogs should be well acquainted with its symptoms, especially the premonitory ones ; of these a change in the demeanour and habits of the animal—unusual irritability, depraved appetite, rest- lessness, and a tendency to wander from home—are the most marked. One of the chief police measures is dimi- nution in the number of useless dogs. This is best enforced by the imposition of a dog-tax or licence, which may be large or small in proportion to the number of dogs or the urgency of the case. On the licence-paper the chief symptoms of the malady should be described so as to warn dog-owners. Every dog should wear a collar with a brass plate, on which are inscribed the name and address of the owner as well as a police register-number stamped thereon, or some particular mark affixed by the police or inland revenue authorities, for purposes of identi- fication ; all stray dogs without a collar of this description ought to be captured, and sold or destroyed after three or more days if not claimed. Blunting the canine and incisor teeth of dogs has also been proposed as a precautionary measure. All dogs suspected of rabies should be captured and, when the existence of the disease is confirmed, de- stroyed. Rabid dogs should be destroyed at once. It is also well as a precautionary measure to kill dogs or cats which have been bitten or " worried" by rabid animals. During an outbreak of rabies all dogs should be securely muzzled and if possible led. It is a great mistake to de- stroy immediately suspected dogs which have bitten people ; they should be kept until their condition is ascertained, as, if they are found to be healthy, this will greatly relieve the mind of those who have

been bitten. Suspected dogs should be carefully kept under observation and frequently inspected by a veterinary surgeon or other competent per-

son. All wounds inflicted by strange or suspected dogs should be immediately attended to and treated by suction, washing, and expression, until proper surgical treatment can be adopted. In those countries in which the disease has not yet appeared, in order to prevent its admission, the importation of dogs should be forbidden or an extended period of quarantine imposed.

We may here allude to the results of Pasteur's experi- ments in rabies. By passing modified virus into the bodies of dogs he has discovered that they are protected from an attack of the disease—are, in fact, rendered refractory to rabies. For instance, rabific virus is obtained from a rabbit which has died after inoculation by tre- panning, and after a period of incubation longer by some days than the shortest period in these animals, which is invariably between seven and eight days subsequent to inoculation with the most active virus. The virus of the rabbit in the period of long incubation is inoculated by trepanning into a second rabbit, the virus of this into a third; and on each occasion the virus, which becomes more and more potent, is inoculated into a dog. The latter at last becomes capable of supporting what would be to other dogs a deadly virus, and is entirely proof against rabies either by intravenous inoculation, by tre- panning, or by the virus of a rabid animal. By using the blood of rabid animals in certain determinate conditions Pasteur has been able to greatly simplify the operations of inoculation, and to render dogs most decidedly refrac- tory to the malady. There is great importance attached to the suggestion that now, and until rabies has been ex- tinguished altogether by inoculation, it may be possible to prevent development of the disease after bites from rabid dogs, owing to the long duration of the incubative period. Admitting that rabies is produced by the bite of rabid animals only, and that Pasteur's inoculations are really protective, it is suggested that a law compelling all dogs to be so protected would in the end extirpate the disease. But certain important

points have yet to be decided before any definite conclusion can be arrived at. (G. FL.

RABUTIN, Roger pz, Comre pr Bussy (1618-1693), commonly known as Bussy-RasuTin (and for shortness Bussy), is perhaps the most characteristic figure among the lesser noblesse of France in the 17th century, as La Rochefoucauld is among the greater. Bussy, however, except in point of gallantry and literary power, chiefly illustrated the evil sides of the character. He represented a family of distinction and age in Burgundy (see S&vIGN#, Madame de), and his father was Léonor de Rabutin, a soldier of merit and a man of position, holding the lieu- tenant-generalship of the province of Nivernais. Bussy- Rabutin (it is perhaps advisable to add the family name to distinguish him from the hardly less famous Bussy d'Amboise) was born in 1618. He was the third son, but by the death of his elder brothers becanie the representative of the family. He entered the army when he was only sixteen and fought through several campaigns, succeeding his father in the office of "'mestre de camp." But he very early distinguished himself in other ways than that of military service, and in 1641 was sent to the Bastille by Richelieu for some months as a punishment for neglect of his duties in running after his ladyloves. In 1643 he married a cousin, Gabrielle de Toulongeon, who seems to have been fond of him, and for a short time he left the army. But in 1644 he again bought a commission and for some years was closely connected with the great Condé. His wife died, and he became more famous, or at least more notorious, than ever by an attempt to abduct Madame de Miramion, a rich widow. This affair was with some diffi- culty made up and Bussy afterwards married Louise de

Rouville. When the Fronde broke out he, like others, went from party to party, but finally passed to the royal side. He fought with some distinction both in the civil war and on foreign service, and in 1655 he went to serve under Turenne in Flanders. He served there for several cam- paigns and distinguished himself at the battle of the Dunes and elsewhere; but he did not get on well with his general, and his quarrelsome disposition, his overweening vanity, and his habit of composing libellous chansons by degrees made him the enemy of most persons of position both in the army

and at court. In the year 1659 he fell into disgrace for having taken part in an orgy or series of orgies at Roissy near Paris during Holy Week, which caused great scandal, and shortly afterwards he began to compose for the amusement of his mistress, Madame de Montglas, his famous Histoire Amoureuse des Gaules. This book—a series of sketches of the chief ladies of the court, not without wit, but much less remarkable for wit than for ill nature and licence—circulated freely in manuscript and had numerous spurious sequels. One of these stung the king, and Bussy was in 1665 sent to the Bastille, where he remained for more than a year, and from which he was only liberated on condition of retiring to his estates. Here he abode in what was then called exile for seventeen years. He was then restored toa modified degree of royal favour, but never received any great mark of it, and died in 1693.

Although a man of considerable abilities, Bussy had very little in his character that was either amiable or estimable. Despite his extravagant pride of birth and rank, there is much reason for acquiescing in the verdict pronounced on him (by an anonymons contemporary apparently), that he was "a coxcomb, who never, either at court or in camp, lost the taste for bad company and the air of a rustic"; his bravery was undoubted, but he seems to have much overrated his own military ability. He libelled friends and foes alike, and any toleration which might be extended to his innumerable gallantries is lessened by his incorrigible habit of telling tales and his spiteful scandal-mongering against women who had left him or whom he had left. He was, however, possessed of much literary power. The Histoire Amowreuse is in its most striking passages merely adapted from Petronius, and, except in a few portraits, its attractions are chiefly those of the scandalous chronicle. But his Alémoires, published after his death, are ex- tremely lively and characteristic, and his voluminous correspond- ence yields in variety and interest to few collections of the kind, except Madame de Sévigné's, who indeed is represented in it to a great extent, and whose letters first appeared in it. The literary and historical student, therefore, owes Bussy some thanks. But it is impossible not to see that he united some of the worst charae- teristics of an aristocracy on the way to decadence-—relaxed morals, a glaring indifference to duty and to all motives but self-interest, insolence in prosperity, servility in adverse circumstances, jealousy of others more favoured than himself.

The best edition of the Histoire Amoureuse des Gaules is that of Boiteau and Livet in the Bibliotheque Elzevirienne (4 vols., Paris, 1856-76), of the Mémoires and Correspondance that of Lalanne (8 vols., Paris, 1857-59). Bussy wrote other

things, of which the inost important, his Genealogy of the Rabutin Family, re- mained in MS. till 1867.

RACCOON. This name,! familiar to all readers of works on American natural history, is borne by a small carnivore belonging to that section of the order which contains the bears, weasels, badgers, &c. (see MaMMALIA, vol. xv. p. 440). The raccoon resembles in many respects a diminutive bear, both in its general build and in the pro- portions of its skull and teeth, which last are broad, blunt, and rounded, and more suited for a semi-vegetarian than for an exclusively animal diet. Its other more important zoological characters, with an account of its systematic position, have been already noted in the article just re- ferred to. The common North-American raccoon (Procyon lotor) is a clumsy thickly-built animal about the size of a badger, with a coat of long coarse greyish brown hairs, short ears, and a bushy black and white ringed tail. Its

1 A corruption of the North-American Indian "arrathkune" or "aratheone." The Freneh raton or raton laveur, German Waschbir, and other European names are derived from a eurions habit the raccoon has of dipping or washing its food in water before eating it.

range extends over the whole of the United States, and stretches on the west northwards to Alaska and southwards

Raccoon.

well into Central America, where it attains its maximum size. The following notes on the habits of the raccoon are extracted from Dr C. Hart Merriam's charming work on the mammals of the Adirondacks (N. E. New York).

“Raccoons are omnivorous beasts and feed upon mice, small birds, birds’ eggs, turtles and their eggs, frogs, fish, crayfish, molluscs, insects, nuts, fruits, maize, and sometimes poultry. Excepting alone the bats and flying-squirrels, they are the most strictly nocturnal of all our mammals, and yet I have several times seen them abroad on cloudy days. They haunt the banks of ponds and streams, and find much of their food in these places, such as crayfish, mussels, and fish, although they are unable to dive and pursue the latter under water, like the otter and mink. They are good swimmers and do not hesitate to cross rivers that lie in their path. . . . The raccoon hibernates during the severest part of the winter, retiring to its nest rather carly, and appearing again in February or March, according to the earliness or lateness of the season. It makes its home high up in the hollow of some large tree, preferring a dead limb to the trunk itself. It does little in the way of constructing a nest, and from four to six young are commonly born at a time, generally carly in April in this region. The young remain with the mother about a year.”

The South-American species, Procyon cancrivorus, the crab-eating raccoon, is very similar to P. lotor, but differs by its much shorter fur, larger size, proportionally more powerful teeth, and other minor characters. It extends over the whole of South America, as far south as the Rio Negro, and is very common in all suitable localities. Its habits are similar to those of the North-American species,

RACHEL (1820 or 1821-1858), the stage name of a French actress, whose true name was ExizaBerH Fixrx, and who was the daughter of Jacob Félix and Esther Haya, Alsatian Jews, who travelled on foot through France as pedlars. She was born according to one account on 24th March 1820, according to another on 28th February of the following year, in a small inn in Mumpf in the canton of Aargau, Switzerland. At Rheims she and her eldest sister Sophia, afterwards known as Sarah, joined a troupe of Italian children who made their living by singing in the cafés, Sarah taking part in the singing and Elizabeth, then only four years of age, collecting the coppers. In 1830 they came to Paris, where they sang in the streets, Rachel giving such patriotic songs as the Parisienne and the Marseillaise with a rude but precocious energy which evoked special admiration and an abundant shower of coppers. Choron, a famous teacher of singing, was so

im- pressed with the talents of the two sisters that he under- took to give them gratuitous instruction, and after his death in 1833 they were received into the Conservatoire.

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Sophia gained a medal for singing, but Rachel at an early period gave her chief attention to elocution and acting. Her voice, though deep and powerful, was at first hard and inflexible ; and her thin and meagre appearance con- veyed an impression of insignificance, which her plain features and generally impassive manner tended to confirm. It was only her remarkable intelligence that encouraged her instructors to persevere ; but even they did not recognize her talents as exceptional. She made her first appearance at the Gymnase in the Vendéenne in 1837 with only medi- ocre success. On 12th June of the following year she succeeded, after great difficulty, in making a début at the Théatre Frangais, appearing as Camille in Les Horaces, when, attention having been directed to her remarkable genius by Jules Janin in the Débats and Madame de Girardin in the Presse, it at once received universal recognition. Her range of characters was limited, but within this range she was unsurpassable. It was especially in the tragedies of Racine and Corneille that she excelled, and more particularly in the impersonation of evil or malignant passion. By care- ful training her originally hard and harsh voice had become flexible and melodious, and its low and muffled notes under the influence of passion possessed a thrilling and penetrat- ing quality that was irresistible. When excited her plain features became transfigured by the glow of genius, and in her impersonations of evil and malignant emotions there was a majesty and dignity which fascinated whilst it re- pelled. Her facial elocution was unsurpassable in variety and expressiveness, whilst the grace of her gestures and the marvellous skill with which she varied her tones with every shade of thought and emotion were completely beyond criti- It was, however, the predominance of intellect and will rather than the perfection of her art that most specially characterized her impersonations and conferred on them their unique excellence. She appeared successively as Emilie in Cinna, Hermione in Andromaque, Eriphile in Iphigénie, Monime in

Mithridate, and Aménaide in Z'ancréde ; but it was in Phédre, which she first played on 21st January 1843, that her peculiar gifts were most strikingly mani- fested. In modern plays she created the characters of Judith and Cleopatra in the tragedies of Madame de Gir- ardin, but her most successful appearance was in 1849 in Adrienne Lecouvreur. In 1840 she visited London, where her interpretations of Corneille and Racine were the sen- sation of the season. She also played successively in the principal capitals of Europe. In 1855 she made a tour in the United States with comparatively small success, This was, however, after her powers through continued ill-health had begun to deteriorate. She died of consumption at Cannet, near Cannes, on 4th January 1858.

RACINE, a city of the United States, the county seat of Racine county, Wisconsin, lies 23 miles by rail south of Milwaukee, and occupies a plateau projecting for about 6 miles into Lake Michigan, 40 feet above its level. The town is the seat of extensive manufacturing industries— producing carriages, waggons, ploughs, threshing-machines, portable steam-engines, fanning-mills, leather, blinds and sashes, school furniture, wire, linseed oil, baskets, &c.— is engaged in the lumber trade and general commerce, and contains two city hospitals, an orphan asylum, Racine (Episcopalian) college founded in 1852, and a Roman Catholic academy. The harbour is open to vessels drawing 15 feet. Racine, first settled in 1834, was incorporated in 1848, four years after the first steamer had entered the

ort. The population was 7822 in 1860, 9880 in 1870, and 16,031 in 1880.

RACINE, JEAN (1639-1699), the most equal and accom- plished, if not the greatest, tragic dramatist of France, was born at La Ferté Milon in the old duchy of Valois in the month of December 1639. The 20th and the two follow-

ing days of the month are variously given as his birthday ; all that is certain is that he was christened on the 22d. The ceremony was at that time often, though not invariably, performed on the day of birth. Racine belonged to a family of the upper bourgeoisie, which had indeed been technically ennobled some generations earlier and bore the punning arms of a rat and

a swan (rat, cygne). The poet himself subsequently dropped the rat. His family were connected with others of the same or a slightly higher station in La Ferté and its neighbourhood,—the Des Moulins, the Sconins, the Vitarts, all of whom appear in Racine's life. His mother was Jeanne Sconin. His father, of the same name as himself, was only four-and- twenty at the time of the poet's birth. He seems to have been a solicitor (procureur) by profession, and held, as his father, the grandfather of the dramatist, had done, the office of controleur au grener a sel. Racine was the eldest child of his parents. Little more than a year afterwards his sister Marie was born and his mother died. Jean Racine the elder married again, but three months later he himself died and the stepmother is never heard of in connexion with the poet or his sister. They were left 'without any provision, but their grandparents, Jean Racine the eldest and Marie des Moulins, were still lving, and took charge of them. These grandparents had a daughter, Agnes, who figures in Racine's history. She was a nun of Port Royal under the style of Mere de Sainte Thécle, and the whole family had strong Jansenist leanings. Jean Racine the eldest died in 1649, and, apparently as a consequence of this, the poet was sent to the Collége de Beauvais. This (which was the grammar-school of the town of that name, and not the famous Collége de Beauvais at Paris) was intimately connected with Port Royal, and to this latter place Racine was transferred in November 1655. His special masters there were Nicole and Le Maitre. The latter, in an extant letter written to his pupil during one of the gusts of persecution which Port Royal constantly suffered, speaks of himself as 'votre papa"; the manner in which Racine repaid this affection will be seen shortly. It is evident from documents that he was a very diligent student both at Beauvais and Port Royal. He wrote verse both in Latin and French, and his Port Royal odes, which it has been the fashion with the more fanatical admirers of his later poetry to ridicule, are far from despicable. They show the somewhat garrulous nature-worship of the Pléiade tempered by the example of the earlier school of Malherbe. He seems also to have made at least a first draft of his version of the breviary hymns; some, if not most, of a considerable mass of translations from the classics and annotations on them must also date from this time. Racine stayed at Port Royal for three years, and left it, aged nearly nineteen, in October 1658. He was then entered at the Collége dHarcourt and boarded with his second cousin, Nicolas Vitart, steward of the duke of Luynes. Later, if not at first, he lived in the Hétel de Luynes

itself. It is to be observed that his Jansenist surroundings continued with him here, for the duke of Luynes was a severe Port Royalist. It is, however, clear from Racine's correspondence, which as we have it begins in 1660 and is for some years very abundant and interesting, that he was not at all of an austere disposition at this time. His chief correspondent is a certain young abbé Le Vasseur, who seems to have been by no means seriously given, The letters are full of verse-making and of other diversions; a certain Made- moiselle Lucréce, who seems to have been both amiable and literary, is very frequently mentioned, neither is she the only one of her sex who, appears. Occasionally the liveliness of the letters passes the bounds of strict de- cency, though there is nothing very shocking in them.

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Those to Madame (or, as the habit of the time called her, Mademoiselle) Vitart are free from anything of this kind, while they are very lively and pleasant. It does not appear that Racine read much philosophy, as he should have done, but he occasionally did some business in super- intending building operations at Chevreuse, the duke's country house. He would seem, however, to have been already given up irrevocably to literature. This by no means suited the views of his devout relations at Port Royal, and he complains in one of his letters that an unlucky sonnet on Mazarin had brought down on him '"'excommunications sur excommunications." But he had much more important works in hand than sonnets. The marriage of Louis XIV. was the occasion of an ambitious ode, "La Nymphe de la Seine," which was submitted before publication to Chapelain, the too famous author of the Pucelle. Chapelain's fault was not ill-nature, and he made many suggestions (including the very pertinent one that Tritons were not usually found in rivers), which Racine duly adopted. Nor did the ode bound his ambitions, for he finished one piece, Amaste, and undertook another, Les Amours d@'Ovide, for the theatre. The first, however, was rejected by the actors of the Marais, and it is not certain that the other was ever finished or offered to those of the Hotel de Bourgogne. Racine's letters show that he was intimate with more than one actress at this time; he also made acquaintance with La Fontaine, and the foundations at any rate of the legendary "society of four" (Boileau, La Fontaine, Moliére, and Racine) were thus laid.

His relations were pretty certainly alarmed by this very pardonable worldliness, though a severe expostulation with him for keeping company with the abominable actors is perhaps later in date. Allusions in a letter to his sister leave little doubt of this. Racine was accordingly disturbed in his easy-going life at Paris. In November 1661 he went to Uzes in Languedoc to live with his uncle the Pére Sconin, vicar-general of that diocese, where it was hoped that Sconin would be able to secure a benefice for his nephew. It is certain that he was not slack in endeavour- ing to do this, but his attempts were in vain, and perhaps the church did not lose as much as the stage gained. Racine was at Uzes for an uncertain time. All that is known is that he was back in Paris before the end of 1663. His letters from Uzés to La Fontaine, to Le Vas- seur, and others are in much the same strain as before, but there is here and there a marked tone of cynicism in them. One passage in particular, in which he tells how he was disenchanted with a damsel of Uzés, has an un- pleasantly Swiftian touch about it. Once back in Paris, he gave himself up entirely to letters with a little courtier- ship. An ode on the recovery of Louis XIV. from a slight illness probably secured him the promise of a pension, of which he speaks to his sister in the summer of 1664, and on 22d August he actually received it. It is uncertain whether this pension is identical with " gratifications" which we know that Racine for some years received and which were sometimes eight and sometimes six hundred livres. It would seem not, as one of these gratifications had been allotted to him the year before he so wrote to his sister. All this shows that he had already acquired some repute as a promising novice in letters, though he had as yet. done nothing substantive. The ode in which he thanked the king for his presents, "La Renommée," is said to have introduced him to Boileau, to whose censor- ship there is no doubt that he owed much, if not every- thing; and from this date, November 1663, the familiarity of "the four" undoubtedly existed in full force. Racine was at the time the least distinguished, but he rapidly equalled, if not the merit, the reputation of his friends. Unfortunately it is precisely at this date that his corre-

spondence ceases, and it is not renewed till after the close of his brief but brilliant career as a dramatist (Esther and Athalie excepted). This is the

more to be regretted in that the most disputable events of Racine's life as well as the greater part of his literary work fall within this silent period. His strange behaviour to Moliére, his virulent attack on his masters and friends of Port Royal, and the sudden change by which, after the failure of Phédre and for no clearly expressed cause, a man of pleasure and an active literary worker became a sober domestic character of almost ostentatiously religious habits, and abstained from almost all but official work, are unillumined by any words of his own. From this time forward the gossip of the period and the Life by his son Louis are the chief sources of information. Unfortunately Louis Racine, though a man of some ability and of unimpeached charac- ter, was only six years old when his father died, and had no direct knowledge. Still his account represents family papers and traditions and seems to have been carefully, as it is certainly in the main impartially, written. From other sources—notably Boileau, Brossette, and Valincourt— a good deal of pretty certainly authentic information is obtainable, and there exists a considerable body of corre- spondence between Boileau and the poet during the last ten years of Racine's life.

The first but the least characteristic of the dramas by which Racine is known, La Thébaide, was finished by the end of 1663, and on Friday 20th June 1664 it was played by Moliére's company at the Palais Royal theatre. editors assert that Moliére himself acted in it, but the earliest account of the cast we have, and that is sixty years after date, omits his name, though those of Madeleine Béjard and Mademoiselle de Brie occur. There is a tradition, supported by very little evidence, that Moliére suggested the subject ; on the other hand, Louis Racine distinctly says that his father wrote most of the play at Uzés before he knew Moliére. Racine's own letters, which cover the period of composition, though not that of representation, give little help in deciding this not very important ques- tion, except that it appears from them that the play was designed for the rival theatre, and that "La Déhanchée," Racine's familiar name for Mademoiselle de Beauchateau, with whom he was intimate, was to play Antigone. The play itself is by far the weakest of Racine's works. He has borrowed much from Euripides and not a little from Rotrou; and in his general style and plan he has as yet struck out no great variation from Corneille. We have very little intelligence about the reception of the piece. It was acted twelve times

during the first month, which was for the period a very fair success, and was occasion- ally revived during the year following.

This is apparently the date of the pleasant picture of the four friends which La Fontaine draws in his Psyche, Racine figuring as Acante, "qui aimait extrémement les jardins, les fleurs, les ombrages." Various stories, more or less mythical, also belong to this period; the best authenticated of them contributes to the documents for Racine's unamiable temper. He had absolutely no reason to complain of Chapelain, who had helped him with eriticism, obtained royal gifts for him, and, in a fashion, Started him in the literary career, yet he helped in com- posing the lampoon of Chapelain décoiffé. The sin would not be unpardonable if it stood alone, but unluckily a much graver one followed.

We have no definite details as to Racine's doings during the year 1664, but in February 1665 he read at the Hétel de Nevers before La Rochefoucauld, Madame de la Fayette, Madame de Sévigné, and other scarcely less redoubtable judges the greater part of his second acted play, Alexandre le Grand, or, as Pomponne (who tells the fact) calls it, Porus,

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This was a frequent kind of preliminary advertisement at the time, and it seems, as we find from the rhymed gazettes, to have been successful. It was anxiously expected by the public, and Moliére's company played it on 4th Decem- ber,—Monsieur, his wife Henrietta of England, and many other distinguished persons being present. The gazetteer Subligny vouches for its success, and the still more certain testimony of the accounts of the theatre shows that the receipts were good and, what is more, steady. But a fort- night afterwards Alexandre was played, "de complot avec M. Racine," says La Grange, by the rival actors (who had four days before performed it in private) at the Hotel de Bourgogne. A vast amount of ink has been spilt on this question, but no one has produced any valid justification for Racine. That the piece failed at the Palais Royal is demonstrably false, and as this is stated in the earliest attempt to excuse Racine, and the only one made in his lifetime, it is pretty clear that his case was very weak. His son simply

says that he was ‘ mécontent des acteurs,” which indeed is self-evident. It is certain that Moliére and he ceased to be friends in consequence of this proceeding ; and that Moliére was in fault no one who has studied the character of the two men, no one even who considers the probabilities of the case, will easily believe. If, however, Alexandre was the occasion of showing the defects of Racine’s character as a man, it raised him vastly in public estimation as a poet. He was now for the first time pro- posed as a serious rival to Corneille. There is a story, which a credible witness vouches for as Racine’s own, that he read the piece to the author of the Cid and asked his verdict. Corneille praised the piece highly, but not asa drama, “J1 Vassurait qu’il n’était pas propre a la poésie dramatique.” There is no reason for disbelieving this, for the character of Alexander could not fail to shock Corneille, and he was notorious for not mincing his words. Nor can it be denied that Racine might have been justly hurt, though with a man of nore amiable temper the slight would hardly have caused the settled antagonism to Corneille which he displayed. The contrast between the two even at this early period was accurately apprehended and put by Saint Evremond in his masterly Dissertation sur I’ Alex- andre, but this was not published for a year or two. To this day it is the best criticism of the faults of Racine, though not, it may be, of the merits, which had not yet been fully seen. It may be added that in the preface of the printed play the poet showed the extreme sensitiveness to criticism which perhaps excuses, and which certainly often accompanies, a tendency to criticize others. These defects of character showed themselves still more fully in another matter. The Port Royalists, as has been said, detested the theatre, and in January 1666 Nicole, their chief writer, spoke in one of his Lettres sur Visionnaires of dramatic poets as “‘empoisonneurs publics.” There was absolutely no reason why Racine should fit this cap on his own head ; but he did so, and published immediately a letter to the author. It is very smartly written, and if Racine had con- tented himself with protesting against the absurd exaggera- tion of the decriers of the stage there would have been little harm done. But he filled the piece with personalities, telling an absurd story of Mere Angelique Arnauld’s supposed intolerance, drawing a ridiculous picture of Le Maitre (a dead man and his own special teacher and friend), and sneering savagely at Nicole himself. The latter made no reply, but two lay adherents of Port Royal took up the quarrel with more zeal than discretion or ability. Racine wrote a second pamphlet as bitter and personal

as the first, but less amusing, and was about to publish it when fortu- nately Boileau, who had been absent from Paris, returned and protested against the publication. It remained accord- ingly unprinted till after the author's death, as well as a

preface to both which he had prepared with a view to publishing them together. In this respect Boileau was certainly Racine's good angel, for no one has ventured to excuse the tone of these letters. The best excuse for them is that they represent the accumulated resentment arising from a long course of "excommunications."

After this disagreeable episode Racine's life for ten years and more becomes simply the history of his plays, if we except his liaisons with the actresses Mademoiselle du Pare and Mademoiselle de Champmeslé (which are undoubted, though there is not much to be said about them) and his election to the Academy on 17th July 1673. Mademoiselle du Pare (Marquise de Gorla) was no very great actress, but wag very beautiful, and she had previously captivated Moliére. Racine induced her to leave the Palais Royal company and join the Hétel. She died in 1668, and long afterwards the infamous Voisin accused Racine of having poisoned her. Mademoiselle de Champmeslé was plain and stupid, but an admirable actress and apparently very at- tractive in some way, for not merely Racine but Charles de Sévigné and many others adored her. She was cruel to none, but for five years before his marriage Racine seems to have been her amant en titre. Long after- wards, just before his own death, he heard of her mortal illness and speaks of her to his son without a flash of tenderness.

The series of his dramatic triumphs began with Andro- maque, and this play may perhaps dispute with LPhédre and Athalie the title of his masterpiece. It is much more uniformly good than Phédre, and the character of Hermione is the most personally interesting on the French tragic stage. It is said that the first representation of Andro- maque was on 10th November 1667, in public and by the actors of the Hétel de Bourgogne, but the first con- temporary mention of it by the gazettes, prose and verse, is on the 17th, as performed in the queen's apartment. Perrault, by no means a friendly critic as far as Racine is concerned, says that it made as much

noise as the Crd, and so it ought to have done. Whatever may be thought of the tragédie pathétique (a less favourable criticism might call it the "sentimental tragedy"), it could hardly be better exemplified than in this admirable play. A ferocious epigram of Racine's own (an epigram not unworthy of Martial, and as difficult to comment on to modern ears polite as some of Martial's own) tells us that some critics thought Pyrrhus too fond of his mistress, and Andromache too fond of her husband, which is not likely to be the present verdict. In the contemporary depreciations is to be found the avowal of its real merit. The interest was too varied, the pathos too close to human nature to content Boileau, and the partisans of Corneille still found Racine unequal to the heroic height of their master's grandeur. A just criticism will probably hold that these two objections neutralize each other. Both parties agreed in saying that much of the success was due to the actors, another censure which is equivalent to praise. It so happens, too, that, though the four main parts were played by accomplished artists, two at least of them were such as to try those artists severely. Pyrrhus was taken by Floridor, the best tragic actor by common consent of his time, and Orestes by Montfleury, also an accomplished player. But Made- moiselle du Pare, who played Andromachie, had generally been thought below, not above, her parts, and Mademoiselle des Oeillets, who played the difficult réle of Hermione, was old and had few physical advantages. No one who reads Andromaque without prejudice is likely to mistake the secret of its success, which is, in few words, the application of the most delicate art to the conception of really tragic passion. Before leaving the play it may be mentioned that it is said to have been in the part of Hermione, three

years later, that Mademoiselle de Champmieslé captivated the author. Andromaque was succeeded, at the distance of not more than a year, by a play which, taken in con- junction with his others, is perhaps the best proof of the theatrical talent of Racine,—the charming comedietta of Les Plaideurs. We do not know exactly when it was played, but it was printed on 5th December 1668, and it had succeeded so badly that doubtless no long time passed between its appearance on the stage and in print. For the printing at that time both in France and England made the play publica materies, and therefore in the case of very successful pieces it was put off as

long as possible. Many anecdotes are told about the origin and composition of Les Plaideurs. The Wasps of Aristophanes and the known fact that Racine originally destined it, not for a French company, but for the Italian troupe which was then playing the Commedia dell' Arte in Paris dispense us from enumerating them. The result is a piece admirably dramatic, but sufficiently literary to shock the profanum vulgus, which too frequently gives the tone at theatres. It failed completely, the chief favouring voice being, accord- ing to a story sufficiently well attested and worthy of belief even without attestation, that of the man who was best qualified to praise and who might have been most tempted to blame of any man then living. Moliére, says Valincourt, the special friend of Racine, said in leaving the house, "Que ceux qui se moquoient de cette pitce meritoient qu'on se moquoient d'eux." But the piece was suddenly played at court a month later ; the king laughed, and its fortunes were restored. The truth probably was that the legal profession, which was very powerful in the city of Paris, did not fancy the most severe satire on its ways which had been made public since the or ¢a of the fifth book of Rabelais. It need only be added that, if Louis XIV. admired Les Plaideurs, Napoleon did not, and excluded it from his travelling library. It was followed by a very different work, Britannicus, which appeared on 13th December 1669. It was much less successful than Andromaque, and, whether or not the cabals, of which Racine constantly complains, and which he certainly did nothing to disarm, had anything to do with this, it seems to have held its own but a very few nights. Afterwards it became very popular, and even from the first the ex- quisite versification was not denied. But there is no doubt that in Britannicus the defects of Racine, which in his first two plays were excusable on the score of apprentice- ship, and in the next two hardly appeared at all, display themselves pretty clearly to any competent critic. The complete nullity of Britannicus and Junie and the insuffi- cient attempt to display the complex and dangerous char acter of Nero are not redeemed by Agrippina, who is really good, and Burrhus, who is solidly painted as a secondary character. Voltaire calls it "la piéce des connaisseurs," and the description is—not quite in the sense in which the critic meant it—a very pregnant one. Britannicus is eminently the piece in which persons of a dilettante turn are seduced by the beauties which do exist to discover those which do not. The next play of Racine has, except Phédre, the most curious history of all. " Bérénice," says Fontenelle succinctly, "fut un duel," and he acknowledges

that his uncle was not the conqueror. Henrietta of Orleans proposed (it is said without letting them know the double commission) the subject to Corneille and Racine at the same time, and rumour gives no very creditable reasons for her choice of the subject. Her death, famous for its disputed causes and for Bossuet's sermon, preceded the performance of the two plays, both of which, but especially Racine's, were successful. There is no doubt that it is the better of the two, but Chapelle's not unfriendly criti- cism in quoting the two lines of an old song—

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RACINE

" Marion pleure, Marion crie, Marion veut qu'on la marie "'— is said to have annoyed Racine very much, and it has a most malicious appropriateness. Bajazet, which was first played on 4th January 1672 (for Racine punctually pro- duced his piece a year), is perhaps better. As a play, technically speaking, it has great merit, but the reproach commonly brought against its author was urged specially and with great force against this by Corneille. It is im- possible to imagine anything less Oriental than the atmo- sphere of Bajazet ; the whole thing is not only French but ephemerally French—French of the day and hour ; and its ingenious scenario and admirable style scarcely save it. This charge is equally applicable with the same reservations to Mithridate, which appears to have been produced on 13th January 1673, the day after the author's reception at the Academy. It was extremely popular and, as far as style and perfection in a disputable kind go, Racine could hardly have lodged a more triumphant diploma piece. His next attempt, Jphigénie, was a long step back- wards and upwards in the direction of Andromaque. It

is not that the characters are eminently Greek, but that

Greek tragedy gave Racine examples which prevented him from flying in the face of the propriety of character as he had done in Bérénice, Bajazet, and Mithridate, and that he here called in, as in Andromaque, other passions to the aid of the mere sighing and crying which form the sole appeal of these three tragedies. Achilles is a rather pitiful per- sonage, and the grand story of the sacrifice is softened very tamely to suit French tastes; but the

parental agonies of Clytemnestra and Agamemnon are truly drawn, and the whole play is full of pathos. It succeeded brilliantly and deservedly, but, oddly enough, the date of its appear- ance is very uncertain. It was assuredly acted at court in the late summer of 1674, but it does not seem to have been given to the public till the early spring of 1675, the usual time at which Racine produced his work,

The last and finest of the series of tragedies proper was the most unlucky. Phédre was represented for the first time on New-Year's Day 1677 at the Hétel de Bourgogne. Within a week the opposition company or "troupe du roi" launched an opposition Phédre by Pradon. This singular competition, which had momentous results for Racine, and in which he to some extent paid the penalty of the lex talioms for his own rivalry with Corneille, had long been foreseen. It has been hinted that Racine had from the first been bitterly opposed by a clique, whom his great success irritated, while his personal character did nothing to conciliate them. His enemies at this time had the powerful support of the duchess of Bouillon, one of Mazarin's nieces, a woman of considerable talents and imperious temper, to- gether with her brother the duke of Nevers and divers other personages of high position. These persons of quality, guided, it is said, by Madame Deshouliéres, a poetess of merit whom Boileau unjustly depreciated, selected Pradon, a dramatist of little talent but of much facility, to compose a Phédre in competition with that which it was known that Racine had been elaborating with unusual care. Pradon, perhaps assisted, was equal to the occasion, and it Is said that the partisans on both sides did not neglect means for correcting fortune. On her side the duchess of Bouillon is accused of having bought up the front places in both theatres for the first six nights ; on his part Racine 1s said to have repeated an old trick of his and prevailed on the best actresses of the company that played Pradon's Piece to refuse the title part. There is even some ground for believing that Racine endeavoured to prevent the op- position play from being played at all, and that an express order from the king had to be obtained for it. It was of

no value, but the measures of the cabal had been so well taken that the finest tragedy of the French classical school was all but driven from the

stage, while Pradon's was a positive success. A war of sonnets and epigrams followed, during which it is said that the duke of Nevers menaced Racine and Boileau with the same treatment which Dryden and Voltaire actually received, and was only deterred by the protection which Condé extended to them.

The unjust cabal against his piece and the various annoyances to which it gave rise no doubt made a deep impression on Racine. But in the absence of accurate contemporary information it is impossible to decide exactly how much influence they had on the subsequent change in his life. For thirteen years he had been constantly em- ployed on a series of brilliant dramas. He now broke off his dramatic work entirely and in the remaining twenty years of his life wrote but two more plays, and those under special circumstances and of quite a different kind. He had been during his early manhood a libertine in morals and religion; he now married, became irreproachably domestic, and almost ostentatiously devout. No authentic account of this change exists; for that of Louis Racine, which attributes the whole to a sudden religious impulse, is manifestly little more than the theory of a son pious in both senses of the word. Probably all the motives which friends and foes have attributed—weariness of dissipated life, jealousy of his numerous rivals in Mademoiselle de Champmeslé's favour, pique at Pradon's success, fear of los- ing still further the position of greatest tragic poet which after Corneille's Surena was indisputably his, religious sen- timent, and so forth —entered more or less into his action. At any rate what is certain is that he reconciled himself with Arnauld and Port Royal generally, and on lst June married Catherine de Romanet and definitely settled down to a quiet domestic life, alternated with the duties of a courtier. For his repentance was by no means a repentance in sackcloth and ashes. The drama was not then very profitable to dramatists, but Louis Racine tells us that his father had been able to furnish a house, collect a library of some value, and save 6000 livres. His wife had money, and he had possessed for some time (it is not certain how long) the honourable and valuable post of treasurer of France at Moulins. His annual "gratification" had been increased from 800 to 1500 livres, then to 2000, and in the October of the year of his marriage he and Boileau were made historiographers-royal with a salary of 2000 crowns. Besides all this he had, though a layman, one or two benefices. It would have been pleasanter if Louis Racine had not told us

that his father regarded His Majesty's choice as "'an act of the grace of God to detach him entirely from poetry." Even after allowing for Louis Racine's religiosity and the conventional language of all times, there is a flavour of hypocrisy about this which is disagreeable, and has shocked even Racine's most uncom- promising admirers. For the historiographer of Louis XIV. was simply his chief flatterer. Before going further it may be observed that very little came of this historio- graphy. The joint incumbents of the office made some campaigns with the king, sketched plans of histories, and left a certain number of materials and memoirs ; but they executed no substantive work. Racine, whether this be set down to his credit or not, was certainly a fortunate and apparently an adroit courtier. His very relapse into Jansenism coincided with his rise at court, where Jansen- ism was in no favour, and the fact that he had been in the good graces of Madame de Montespan did not deprive him of those of Madame de Maintenon. Neither in Hsther did he hesitate to reflect upon his former patroness. But a reported sneer of the king, who was sharp-eyed enough, "'Cavoie avec Racine se croit bel esprit; Racine avec Cavoie

se croit courtisan," makes it appear that his comparatively low birth was not forgotten at Versailles.

Racine's first campaign was at the siege of Ypres in 1678, where some practical jokes are said to have been played on the two civilians who acted this early and peculiar variety of the part of special correspondent. Again in 1683, in 1687, and in each year from 1691 to 1693 Racine accompanied the king on similar expeditions. The literary results of these have been spoken of. His labours brought him, in addition to his other gains, frequent special presents from the king, one of which was as much as 1000 pistoles. In 1690 he further received the office of " ventilhomme ordinaire du roi," which afterwards passed to his son. Thus during the later years of his life he was more prosperous than is usual with poets. His domestic life appears to have been a happy one. Louis Racine tells us that his mother "did not know what a verse was," but Racine certainly knew enough about verses for both. They had seven children. The eldest, Jean Baptiste, was born in 1678; the youngest, Louis, in 1692. It has been said that he was thus too

young to have many personal memories of his father, but he tells one or two stories which show Racine to have been at any rate a man of strong family affection, as, moreover, his letters prove. Between the two sons came five daughters, Marie, Anne, Elizabeth, Francoise, and Madeleine. The eldest, after showing " vocation," married in 1699, Anne and Elizabeth took the veil, the youngest two remained single but did not enter the cloister. To complete the notice of family matters—much of Racine's later correspondence is addressed to his sister Marie, Madame Riviére. :

The almost complete silence in the literary sphere which Racine imposed on himself after the comparative failure, shameful not for himself but for his adversaries, of Phédre was broken once or twice even before the appearance of the two exquisite tragedies in which under singular circum- stances he took leave of the stage. The most honourable of these was the reception of Thomas Corneille on 2d January 1685 at the Academy in the room of his brother. The discourse which Racine then pronounced turned almost entirely on his great rival, of whom he spoke even more than becomingly. But it was an odd conjunction of the two reigning passions of the latter part of his life—devoutness and obsequiousness to the court—which made him once more a dramatist. Madame de Maintenon had established an institution, first called the Maison Saint Louis, and afterwards (from the place to which it was transferred) the Maison de Saint Cyr, for the education of poor girls of noble family. The tradition of including acting in edu- cation was not obsolete. At first the governess, Madame de Grinon, composed pieces for representation, but, says Madame de Caylus, a witness at first hand and a good judge, they were "detestable." Then recourse was had to chosen plays of Corneille and Racine, but here there were obvious objections. The favourite herself wrote to Racine that "nos petites filles" had played Andromaque "a great deal too well." Sheasked the poet for a new play suited to the circumstances, and, though Boileau advised him against it, it is not wonderful that he yielded. The result was the masterpiece of Hsther, with music by Moreau, the court composer and organist of Saint Cyr. Although played by schoolgirls and in a dormitory, it had an enormous success, in which it may be charitably hoped that the transparent comparison of the patroness to the heroine had not too much to do. Printed shortly afterwards, it had to suffer a certain reaction, or perhaps a certain vengeance, from those who had not been

admitted to the private stage. But no competent judge could hesitate. Racine probably had read and to some extent followed the Aman of Montchrestien, but he made of it only the use

which a proved master in literature has a perfect right to make of his forerunners. The beauty of the chorus, which Racine had restored more probably from a study of the Pléiade tragedy than from classical suggestions, the per- fection of the characters, and the wonderful art of the whole piece need no praise. Almost immediately the poet was at work on another and a still finer piece of the game kind, and he had probably finished Athale before the end of 1690. The fate of the play, however, was very different from that of Esther. Some fuss had been made about the worldliness of great court fétes at Saint Cyr, and the new play, with settings as before by Moreau, was acted both at Versailles and at Saint Cyr with much less pomp and ceremony than Hsther. It was printed in March 1691 and the public cared very little for it. The truth is that the last five-and-twenty years of the reign of Louis XIV. were marked by one of the lowest tides of literary accom- plishment and appreciation in the history of France. The just judgment of posterity has ranked Athalie, if not as Racine's best work (and there are good grounds for consider- ing it to be this), at any rate as equal to his best. Thence- forward Racine was practically silent, except for four can- tiques spirituelles, in the style and with much of the merit of the choruses of Lsther and Athalze. The general literary sentiment led by Fontenelle (who inherited the wrongs of Corneille, his uncle, and whom Racine had taken care to estrange further) was against the arrogant critic and the irritable poet, and they made their case worse by espousing the cause of La Bruyére, whose personalities in his Carac- teres had made him one of the best hated men in France, and by engaging in the ancient and modern battle with Perrault. Racine, moreover, was a constant and spiteful epigrammatist, and the unlucky habit of preferring his joke to his friend stuck by him to the last. A savage epigram on the Sesostrvs of Longepierre, who had done him no harm and was his familiar acquaintance, dates as late as 1695. Still the king maintained him in favour, and so long as this continued he could afford to laugh at Grub Street and the successors of the Hétel de Rambouillet alike. At last, however, there seems (for the matter is

not too clear) to have come a change. Some say that he disobliged Madame de Maintenon, some (and this would be much to his honour, but not exactly in accord with anything else known of him) that, like Vauban and Fénelon, he urged the growing misery of the people. But there seems to be little doubt of the fact of the royal displeasure, and it is even probable that it had some effect on his health. Disease of the liver appears to have been the immediate cause of his death, which took place on 12th April 1699. The king seems to have, at any rate, forgiven him after his death, and he gave the family a pension of 2000 livres. Racine was buried at Port Royal, but even this transaction was not the last of his relations with that famous home of religion and learning. After the destruction of the abbey in 1711 his body was exhumed and transferred to Saint Etienne du Mont, his gravestone being left behind and only restored to his ashes a hundred years later, in 1818. His eldest son was never married ; his eldest daughter and Louis Racine have left descendants to the present day.

A critical biography of Racine is, in more ways than one, an ex- ceptionally difficult undertaking, —not in regard to the facts, which, as will have been seen, are fairly abundant, but as to the construc- tion to be placed on them. The admirers of Racine's literary genius have made it a kind of rcligion to defend his character ; and strict- ures on his character, it seems to be thought, imply a desire to depreciate his literary worth. The reader of the above sketch of his life must judge for himself whether Racine is or is net to be ranked with those great men of letters, fortunately the greater number, whose personality is attractive and their foibles at worst excusable. There is no doubt that the general impression given,

not merely by the flying anecdotes of the time, but by ascertained facts, is somewhat unfavourable. Racine's affection for his family

and his unbroken friendship for Boileau are the sole points of his life which are entirely creditable to him. His conduct to Moliére and to Nicole cannot be excused ; his attitude towards his critics and his rivals was querulous and spitcful ; his relation to Corneille contrasts strikingly with the graceful position which young men of letters, sometimes by no means lis inferiors, have often taken up towards the surviving glories of a past generation ; his

“ conver- sion,” though there is no just cause for branding it as hypocritical, appears to have been a singularly accommodating one, enabling him to tolerate adultery, to libel his friends in secret, and to flatter greatness unhesitatingly. None of these things perhaps are very heinous crimes, but they are all of the class of misdoing which, fairly or unfairly, mankind are apt to regard with greater dislike than positive misdeeds of a more glaring but less unheroic character.

The personality of an author is, however, by all the laws of the saner criticism, entirely independent of the rank to be assigned to his work, and, as in other cases, the strongest dislike for the char- acter of Racine as a man is compatible with the most unbounded admiration of his powers as a writer. But here again his injudicious admirers have interposed a difficulty. There is a theory common in France, and sometimes adopted out of it, that only a Frenchman, and not every Frenchman, can properly appreciate Racine. The charm of his verse and of his dramatic presentation is so esoteric and delicate that foreigners cannot hope to taste it. This is of course absurd, and if it were true it would be fatal to Racine’s claims as a poet of the highest rank. Such poets, such writers, are not paro- chial or provincial, and even the greatest nations are but provinces or parishes in the realm of literature. Homer, Shakespeare, Dante, even Moliere, Rabelais, Goethe, are not afraid to challenge the approval of the whole world, and the whole world is not found com petent or unwilling to give it. Nor need Racine in reality avail fimeel? of this unwise pretension. Judged by the common tests of literature he isa consuminate artist, but he is scarcely a great poet, for his art, though unsurpassed in its kind, is narrow in range and his poetry is neither of the highest nor of the most genuine.

He may be considered from two very different points of view,— (1) as a playwright and poetical artificer, and (2) as a dramatist andapoct. From the first point of view there is hardly any praise too high for him. He did not invent the form he practised, and those who, from want of attention to the historical facts, assume that he did are unskilful as well as ignorant. When he came upon the scene the form of French plays was settled, partly by the energetic efforts of the Pléiade and their successors, partly by the reluctant acquiescence of Corneille. It is barely possible that the latter might, if he had chosen, have altered the course of French tragedy ; itis nearly certain

that Racine could not. But Corneille, though he was himself more responsible than any one else for the acceptance of the single-situation tragedy, never frankly gave himself up to it, and the inequality of his work is due to this. His heart was, though not to his knowledge, elsewhere, and with Shake- speare. Racine, in whom the craftsman dominated the man of genius, worked with a will and without any misgivings. Every advantage which the Senecan tragedy adapted to modern times was capable of he gave it. He perfected its versification ; he subordi- nated its scheme entirely to the one motive which could have free play in it,—the display of a conventionally intense passion ; he set himself to produce in verse a kind of Ciceronian correctness. The grammar criticisms of Vaugelas and the taste criticisms of Boileau produced in him no feeling of revolt, but only a determination to play the game according to these new rules with triumphant accuracy. And he did so play it. He had supremely the same faculty which enabled the rhétoriqueurs of the 15th century to execute apparently impossible tours de force in ballades couronnées, and similar tricks. He had besides a real and saving vein of truth to nature, which preserved him from tricks pure and simple. He would be and he was as much a poet as prevalent taste would let him be. The result is that such plays as Phédre and Andromaque are supreme in their own way. If the critic will only abstain from thrusting in tierce, when according to the particular rules he ought to thrust in quart, Racine is sure to beat him.

But there is a higher game of criticism than this, and this game Racine does not attempt to play. He does not even attempt the highest poetry at all. His greatest achievements in pure passion— the foiled desires of Hermione and the jealous frenzy of Phédre —are cold, not merely beside the crossed love of Ophelia and the remorse of Lady Macbeth, but beside the sincerer if less perfectly expressed passion of Corneille's Cléopaitre and Camille. In men's parts he fails still more completely. As the decency of his stage would not allow him to make his heroes frankly heroic, so it would not allow him to make them utterly passionate. He had, moreover, cut away from himself by the adoption of the Senecan model all the opportunities which would have been offered to his remarkably varied talent on a freer stage. It is indeed tolerably certain that he never could have achieved the purely poetical comedy of 4s You Like It or the Vida cs Sueno, but the admirable success of

Les Plaidewrs makes it at least probable that he might have done some- thing in a lower and a more conventional style. From all this,

however, he deliberately cut himself off. Of the whole world which is subject to the poet he took only a narrow artificial and conven- tional fraction. Within these narrow bounds he did work which no admirer of literary craftsmanship can regard without admiration. But at the same time no one speaking with competence can deny that the bounds are narrow. It would be unnecessary to contrast his performances with his limitations so sharply if those limitations had not been denied. But they have been and are still denied by persons whose sentence carries weight, and therefore it is still neces- sary to point out the fact of their existence.

Nearly all Racine's works are mentioned in the above notice. There is here no room for a bibliographical aceount of their separate appearances. The first eolleeted edition was in 1675-76, and contained the nine tragedies which had then appeared. The last and most complete whieh appeared in the poet's life- time (1697) was revised by him, and contains the dramas and a few miscellane- ous works. Like the editio princeps, it is in 2 vols. 12mo. The posthumous editions are innumerable and gradually beeame more and more eomplete. The most noteworthy are the Amsterdam edition of 1722; that by Abbé @ Olivet, also at Amsterdam, 1743; the Paris quarto of 1760; the edition of Luneau de Boisjermain, Paris and London, 1768; the magnificent illustrated folios of 1805 (Paris); the edition of Germain Garnier with La Harpe's commentary, 1807 ; Geoffroy's of the next year; Aimé Martin's of 1820; and lastly, the grands écrivains edition of Paul Mesnard (Paris, 1865-73). This last contains almost all that is necessary for the study of the poet, and has been chiefly used in preparing the above notice. Louis Racine's Life was first published in 1747, Translations and imitations of Racine are innumerable. In English the Dis- tressed Mother of Philips and the Phaedra and Hippolytus of Smith, both composed more or less under Addison's influenee, are the most noteworthy. (G. SA.)

RACKETS. Like tennis, this game of ball is of French origin, and its name is derived from "'raquette," the French term for the bat used in the pastime. In the United Kingdom it is not so universally pursued as cricket

and football, and is essentially an indoor game, which is played only in prepared and covered courts. Such buildings have been erected at many of the large public schools, at the universities, and in garrison towns, where will be found the chief exponents of rackets, a game which requires active running powers, quick eyesight, and dexterity of hand.

The old "open" courts, which merely consisted of a plain wall without any side walls, are now almost obsolete and need not be further mentioned. The usual dimen- sions of a "close" court are 80 feet by 40 feet for four- handed matches, whilst 60 feet by 30 feet are sufticient for a single match. Sometimes courts are built of an in- termediate size so as to be available for either single or double matches. The front wall of a court should be 40 feet high, the back one 14 feet, the space over the latter being utilized by a gallery for specta- tors, umpire, and marker.

FRONT 40 Feet

<= 48 Feet >

62 Feet

RIGHT SERVICE SPACE

LEFT SERVICE SPACE

SERVICE LINE

LEFT BACK COURT2| RIGHT BACK COURT The side 3

walls are 40 feet high throughout, in order to support the

roof. This must be well lit with sky- lights carried on light iron girders and protected inside with wire-work in order to ward off damage from the balls. Bricks make the best walls, which must be plastered inside with Roman cement or plaster of Paris, set to a perfectly level surface in order that the balls may rebound evenly. In the military officers' courts in India this plaster is painted white for the sake of XX, — 27

DOOR

coolness, and black balls are in vogue. In England black paint and white balls are used. In cool climates asphalt makes the best flooring. In the tropics stone paving, perfectly evenly set, or some similar material, must be used. Gutta-percha soles to the shoes of the players are indis- pensable, to prevent slipping and to preserve the evenness of the flooring. The narrow entrance door, made of very hard wood, is situated in the centre of the back wall and must be perfectly flush with the same on the inside. The bottom of the front wall is covered with hollow deal sound- ing boarding up to a height of 2 feet 2 inches, where is the "line." The sound betrays a ball striking the board- ing below the line, which throws it out of play. At 7 feet 9 inches above the level of the floor comes another white line across the front wall, termed the "cut line," because the in-player, when serving, must first make the ball re- bound from the front wall above this line. Across the floor, varying in position according to the length of the court, is the "short line," so called because an out-player is not bound to take any ball served which falls between it and the front wall. The space between here and the back wall is divided into two equal-sized parallelograms by a line drawn down to the doorway. As the front wall is faced, these are called "right" and "left" courts. An in-player serving from one side must make the ball fall in the other court after rebounding from the front wall. The "service spaces," in which an in-player stands when serving, are 8 feet 6 inches deep 'from the short line and 6 feet 6 inches wide from each side wall.

The game is played with no other implements but bats and balls. The striking portion of the former is oval- shaped and strung tightly across with catgut. The handle is of pliant ash covered with leather in order to give the hand a tight grip. The balls are about 1} inches in diameter, and very hard in order to rebound evenly and quickly.

In a four-handed game we will suppose A and B to be playing against C and D and that the former couple have won the choice of first innings. A accordingly commences serving from the right service space into the left court, that being the most difficult one to return the ball from. B stands behind A to return any balls for his side in the back portion of the court. C

stands where he likes ready to take the ball about to be served by A, whilst C's partner, D, places himsclf between A and B to take the fore court play for his side. For A's service to be good his ball must first strike the front wall above the cut line, and secondly rebound from the floor of the left-hand court, though whether it strike the side or back walls or not after rebounding from the front wall is immaterial. If these rules are complied with, C is bound to return the ball, at its first bound off the floor, on to the front wall above the sounding- board. Ifhe does not succeed A and B score one ace in their favour. If C achieves his purpose the game is continued by one of either side returning the ball alternately, till a player either strikes the sound- ing board, skies it into the roof or gallery, or strikes it later than the first bound off the floor. If A or B makes the first failure A is out. If it is C or D, the in-side scores an ace, and A continues serving alternately from each service space. The out-playcr may take a faulty service at his own option. If he does, the ace is played out in the usual way. When A is put out C goes in, then D, and lastly A's partner B, and so on in the same rotation. B is not allowed to follow

1. The game to be 15 up. At 13 all, the out-players may set it to 5, and at 14 all, to 8, provided this be done before another ball is struck.

RAD—RAD

2. The going in first, whether odds be given or not, to be deeided by lot; but one hand only then is to be taken.

3, The ball to be served alternately from right and left, beginning whichever side the server pleases.

4, In serving, the server must have one foot in the space marked off for that purpose. The out-player to whom he serves may stand where he pleases, but his partner and the server's partner must both stand behind the server till the ball is served.

5, The ball must be served above, and not touching the line on the front wall, and it mnst strike the floor, before it bounds, within and not touehing the lines enelosing the eourt on the side opposite to that in whieh the server stands.

6. A ball served below the line, or to the wrong side, is a fault, but it may be taken, and then the aee must be played out, and eounts.

7. In serving, if the ball strikes anywhere before it reaches the front wall, it is a hand out.

8. In serving, if a ball touehes the server or his partner before it has bounded twiee it is a hand out, whether it was properly served or not.

9. Itis a fault—

a. If the server is not in his proper place.

b. If the ball is not served over the line.

c. If it does not fall in the proper eourt.

d. If it touches the roof.

e. If it touehes the gallery-netting, posts, or eushions.

The out-player may take a fault if he pleases, but ifhe fails in putting the ball up it eounts against him.

10. Two eonsecutive faults put a hand out.

11. An out-player may not take a ball served to his partner.

12. The out-players may ehange their courts onee only in eaeh game.

13, If a player designedly stops a ball before the second bound it counts against him.

14, If a ball hits the striker's adversary above or on the knee, it is a let; if below the knee, or if it hits the striker's partner or himself, it eounts against the striker.

15. Till a ball has been touehed, or has bounded twiee, the player or his partner may strike it as often as they please.

16. Every player should get out of the way as muchas possible. Ifhe eannot, the marker is to deeide whether it is a let or not.

17. After the serviee, a ball going out of the eourt or hitting the roof is an aee; a ball hitting the gallery-netting, posts, or eushions, in returning from the front wall, is a let; but if it hits the roof before reaehing the front wall it

eounts against the striker. 18. The marker's decision is final. If he has any doubt, he should ask

adviee; and, if he eannot dteide positively, the ace is to be or ones again. . FW.

RADAUTZ, a town in the Austrian duchy of Bukowina, is situated on the Suczava, about 15 miles from the frontier of Moldavia. It was formerly the seat of a Greek bishopric, removed to Czernowitz in 1786, and possesses a cathedral with the tombs of several Moldavian princes. It contains a Government stud, and manufactures paper, glass, machinery, beer, and brandy. In 1880 Radautz had 11,162 inhabitants.

RADBERTUS, head of the Benedictine abbey of Corbie, near Amiens, from 844 to 851, and one of the most pro- minent theological writers of his age, was born at or near Soissons towards the close of the 8th century, and became a monk of Corbie in 814, when he assumed the cloister name of Pascuastus. He soon gained recognition as a learned and successful teacher, and Adalhard, St Anskar the apostle of Sweden, Odo bishop of Beauvais, and Warinus abbot of Corvey in Saxony may be mentioned among the more distinguished of his pupils. In 844 he was chosen abbot, but as a disciplinarian he was more energetic than successful, and in 867 he resigned the office. In his official capacity he took part in the synod of Chiersy which condemned Gottschalk. Of the closing period of his life nothing is known, except that it was one of great literary activity.

His works include an Expositio in Mattheum, in twelve books, a favourable specimen of the exegesis of that period, and the Liber de Corpore et Sanguine Christi, a pious and popularly written treatise, designed to prove that the elements in the sacrament are completely changed. The latter work, originally composed in 881, elicited a reply by Ratramnus, a brother monk

of Corbie, who maintained that the body and blood of Christ were present in the Eucharist only "spiritualiter et secundum potentiam." The De Partw Virginis of Radbertus (845) was also taken exception to by Ratramnus for its Docetic teaching as to the manner of Christ's birth " utero clauso."

RADCLIFFE, a town of Lancashire, is situated on the river Irwell, crossed by a bridge of two arches, and on the Lancashire and Yorkshire Railway, 7 miles north-west of Manchester and 2 south-west of Bury. The church of St Bartholomew dates from the time of Henry IV. ; some of the Norman portions of the building still remain. The tower was rebuilt in 1665, the north transept added in 1846, and the whole building restored in 1870-73. It possesses some good windows and several ancient monu:

ments. Radcliffe Tower, dating from the 13th century, and formerly an extensive manorial residence, is now a complete ruin. Cotton-weaving, calico-printing, and bleaching are the principal industries, and there are extensive collieries in the neighbourhood. The town is governed by a local board of health established in 1866. The area of the urban sanitary district is 2453 acres, with a population in 1871 of 11,446, and in 1881 of 16,267. Radcliffe is so called from a cliff of red rock on the south side of the Irwell opposite the town. The manor was held by Edward the Confessor, and was conferred on Roger de Poictou, but was forfeited by him soon after the Domesday survey. In the reign of Stephen it was granted to Ranulph de Gernons, earl of Chester.

RADCLIFFE, Ann Warp (1764-1823), novelist, was born in London on 9th July 1764. She was the author of three novels unsurpassed of their kind in English litera- ture, The Romance of the Forest (1791), The Mysteries of Udolpho (1794), The Italian (1797). The interval of three years between the successive publications is noticeable ; works so elaborate, intricate, and closely interwoven could not be written in a hurry. The second of the three novels is the one commonly associated with Mrs Radcliffe's name, but the preference is probably due to the title ; each is an improvement on its predecessor, and the last is considerably the best on the whole in style as well as in plot and char- acter. She wrote two other novels before any of these, the Castles of Athlin and Dunbayne (1789) and the Sicilian Romance

(1790), but they attracted no special attention and deserve none, although in them she works with the same romantic materials—dreadful castles, wild adventures, terrible characters. One other was written after the famous three, but not published till 1826, three years after her death—Gaston de Blondeville, interesting as an elaborate study of costume and scenery, and valuable as a monument of her accurate archeological learning, but comparatively tedious as a story, though not without passages in her best style. The circumstances that turned Mrs Radcliffe to literature are not recorded in the meagre memoir published under her husband's direction. Her maiden name was Ward, and her parents, who are described as "persons of great respectability, though engaged in trade," in London, had literary relations. Her husband was an Oxford gradu- ate and proprietor and editor of the Hnglish Chronicle. After The Italian she gave up writing for publication, and was reported to have been driven mad by the horrors of her own creations. This was purely mythical. It appears that she never saw the Italian scenery which she depicts with such minuteness, and never left England but once, in the summer of 1794, after the completion of her Udolpho. A record of the tour was published in the following year, along with descriptions of a visit to the English Lakes, the beauties of which she was one of the first to celebrate. Of scenery, as might be judged from her novels, where the descriptions are often felt as a tedious impediment, Mrs Radcliffe was an enthusiastic amateur, and made driving tours with her husband every other summer through the English counties. She died in February 1823.

_ Asa novelist Mrs Radcliffe deserves a much higher place than 1s accorded to her in general estimation. Critics familiar with her works, from Sir Walter Scott downwards, have shown themselves fully alive to the difference; but the general public confound her with puerile and extravagant imitators, who have vulgarized her favourite " properties" of rambling and ruinous old castles, dark, desperate, and cadaverous villains, secret passages, vaults, trapdoors, evidences of deeds of monstrous crime, sights and sounds of mys- terious horror. She deserves at least the credit of originality, but apart from this there are three respects in which none of her numer- ous imitators approach her,—ingenuity of plot, fertility of incident, and skill in devising apparently supernatural occurrences capable of explanation by human agency and natural coincidence. Except in her last

and posthumously published work she never introduces the really supernatural, and, whether or not we agree with Sir Walter Scott that this limitation was a mistake in art, it must at least be acknowledged to impose a heavier burden on the author's

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ingenuity. Her imitators found it easier to follow Horace Walpole in this point. Some of the tragic situations in The Italian are worked ont with a vivid power of imagination which it would be hard to parallel in English literature outside the range of the Eliza- bethan draina, with the minor celebrities of which Mrs Radcliffe may fairly challenge comparison.

RADETZKY, Jowann J. W. A. F. C., Count or RaveETz (1766-1858), field-marshal of Austria, was born at Trzebnitz in Bohemia in 1766, to the nobility of which province his family belonged. He entered a cavalry regi- ment in 1784 and served under Joseph II. and Laudon against the Turks in 1788 and 1789. In 1793 his regiment was sent to the lower Rhine, and from this time onwards Radetzky was engaged in the wars which were continued (with intermission) between Austria and France for the next twenty years. In 1796 he was adjutant to General Beaulieu, over whom Bonaparte won his first victories in Italy. In 1799, when the Austrians with Suwaroff's help reconquered Northern Italy, he distinguished himself at the battles of Novi and the Trebbia, displaying, accord- ing to the despatches of General Mélas, great presence of mind in the midst of extreme danger. After the defeat of Marengo he was removed from Italy to Germany, and there took part in the still more disastrous engagement of Hohenlinden. In 1805 Radetzky, now major-general, was back in Italy, serving under the archduke Charles in the successful campaign of Caldiero, the fruits of which were lost by Mack's capitulation at Ulm and the fall of Vienna. In 1809+he fought at Wagram. In 1813, when all the great powers of Europe combined against Napoleon, Radetzky was chief of the staff under Schwarzenberg, the Austrian commander-in-chief of the allied forces, and he now gained a reputation outside his own country. The plan of the battle of Leipsic is said to have been in great part Radetzky's work, and in this engagement he was wounded. He entered Paris with the allied sovereigns in March 1814, and returned with them to the congress of Vienna, where he appears to have

acted as an inter- mediary between Metternich and the czar Alexander, when these great personages were not on speaking terms. During the succeeding years of peace he disappeared from the public view and narrowly escaped being pensioned off in 1829, The insurrection of the Papal Legations in 1831 brought him, however, into active service again ; and on the retirement of General Frimont he was placed in command of all the Austrian forces in Italy, receiving in 1836 the dignity of field-marshal. Radetzky was now seventy years old, but twelve more years were to pass before the really historical part of his career opened. When he was eighty-two the revolution of 1848 broke out. Milan rose in insurrection against its Austrian rulers, and after a struggle of five days Radetzky was forced to eva- cuate the city. Unable to retain any hold on Lombardy, he concentrated his troops at Verona, the fortifications of which were toa great extent his own creation. Charles Albert, king of Sardinia, now declared war upon Austria, occupied Milan, and laid siege to Peschiera. Radetzky, after the arrival of reinforcements, moved southwards to Mantua, and attempted from that point to turn the Sar- dinian flank; he was, however, defeated on the Mincio, and Peschiera fell into the enemy's hands. Radetzky, nevertheless, was secure in the possession of Verona and Mantua; and, after being still further reinforced, he re- sumed the offensive in July, defeated the Sardinians at Cus- tozza and in several other encounters, and advanced victori- ously upon Milan, where, on 6th August, an armistice was concluded, the Sardinian army retiring behind the Ticino. During the succeeding months, while Vienna and the central provinces of the Austrian empire appeared likely to fall into anarchy, Radetzky's army remained firm in its loyalty to the old order of things, and declined to enter

into relations with the democratic leaders. It was in fact at this time the mainstay of the house of Hapsburg, while everything around the central government tottered ; and, when the restoration of authority began, and the young emperor Francis Joseph ascended the throne that had been vacated by his imbecile predecessor, Radetzky gave to the new monarch the prestige of a crushing victory over his Italian enemies. The armistice was denounced by Charles Albert on the 12th of March 1849. On the 20th Radetzky crossed the Ticino at Pavia, and on the 23d he annihilated the Italian army at

Novara. Peace followed this brief and decisive campaign, and for the next eight years Radetzky governed upper Italy. He retired from service in 1857, and died at the age of ninety-two in the following year. Radetzky was idolized by the Austrian army, but his reputation as a general has not survived him.

RADHANPUR, a petty state of India, within the group of states under the supervision of the political superintend- ent of Palanpur ; it is situated in the north-western corner of Gujarat, close to the Runn of Cutch, Bombay presidency, and lies between 23° 26' and 23° 58' N. lat. and between 71° 28' and 72° 3' E. long. The country is an open plain without hills and with few trees, square in shape, and about 35 miles across. Including the pergunnahs of Munjpur and Sami, it contains an area of 1150 square miles with a popu- lation (1881) of 98,129 (males 50,903, females 47,226), the majority being Hindus. Though subject to very great extremes of heat and cold, the climate is healthy. The estimated yearly revenue of the state is from £50,000 to £60,000. Its chief products are cotton, wheat, and all the common varieties of grain; the only manufacture of any importance is the preparation of a fine description of salt- petre. Radhanpur came under British protection in 1819, when the nawab applied for aid to check the raids of mar- auders. No tribute is exacted and its domestic relations are left entirely free.

RADHANPUR, chief town of the state and the seat of the nawab, had a population of 14,722 in 1881. The nearest railway station is at Kharagoda, 40 miles distant.

RADIATA. This term was introduced by Cuvier in 1812 to denote the lowest of his four great animal groups or "embranchements." He defined them as possessing radial instead of bilateral symmetry, and as apparently destitute of nervous system and sense organs, as having the circulatory system rudimentary or absent, and the respira- tory organs on or coextensive with the surface of the body; he included under this title and definition five classes,—Hchinodermata, Acalepha, Entozoa, Polypi, and Infusoria, Lamarck (Hist. nat. d. Anim. s. Vertébres) also used the term, as when he spoke of the Medusez as radiata medusaria et anomala; but he preferred the term Radiaria, under which he included Echinodermata and Meduse.

Cuvier's term in its wide extension, how- ever, passed into general use; but, as the anatomy of the different forms became more fully known, the difficulty of including them under the common designation made itself increasingly obvious. Milne-Edwards removed the Poly- zoa; the group was soon further thinned by the exclu- sion of the Protozoa on the one hand and the Entozoa on the other; while in 1848 Leuckart and Frey clearly distinguished the Coelenterata from the Echinodermata as a separate sub-kingdom, thus condemning the usage by which the term still continued to be applied to these two groups at least. In 1855, however, Owen included under Lamarck's term Radiaria the Echinodermata, Anthozoa, Acalepha, and Hydrozoa, while Agassiz also clung to the term Radiata as including Echinodermata, Acalepha, and Polypi, regarding their separation into Ccelenterata and Echinodermata as "an exaggeration of their anatomical differences" (Hssay on Classification, London, 1859).

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These attempts, however, to perpetuate the usage were finally discredited by Huxley's important Lectures on Com- parative Anatomy (1864), in which the term was finally abolished, and the "radiate mob " finally distributed among the Echinodermata, Polyzoa, Vermes (Platyhelminthes), Coelenterata, and Protozoa. On radiate symmetry, see MorpHotocy. Compare also Cuvier, ANIMAL Kinepom, ECHINODERMATA, CoRALS, &e.

RADIATION anp CONVECTION. 1. When a red- hot cannon ball is taken out of a furnace and suspended in the air it is observed to cool, z.e., to part with heat, and it continues to do so at a gradually diminishing rate till it finally reaches the temperature of the room. But the pro- cess by which this effect is produced is a very complex one. If the hand be held at a distance of a few inches from the hot ball on either side of it or below it, the feeling of warmth experienced is considerable; but it becomes intolerable when the hand is held at the same distance above the ball. Even this rude form of experiment is sufficient to show that two processes of cooling are simul- taneously at work,—one which apparently leads to tle loss of heat in all directions indifferently, another which leads to a special loss in a vertical direction upwards. If the ex- periment is made in a dark room, into which a

ray of sun- light is admitted so as to throw a shadow of the ball on a screen, we see that the column of air above the ball also casts a distinct shadow. It is, in fact, a column of air very irregularly heated by contact with the ball, and rising, in obedience to hydrostatic laws, in the colder and denser air around it. This conveyance of heat by the motion of the heated body itself is called convection ; the process by which heat is lost indifferently in all directions is called radiation, These two processes are entirely different in their nature, laws, and mechanism ; but we have to treat of both in the present article.

2. To illustrate how the third method by which heat can be transferred, viz., conduction (see Heat, vol. xi. p. 577), is involved in this process, let the cannon ball (which for this purpose should be a large one) be again heated and at once immersed in water until it just ceases to be luminous in the dark, and then be immediately hung up in the air. After.a short period it again becomes red-hot all over, and the phenomenon then proceeds precisely as before, except that the surface of the ball does not become so hot as it was before being plunged in the water. This form of experiment, which requires that the interior shall be very considerably cooled before the surface ceases to be self- luminous, does not succeed nearly so well with a copper ball as with an iron one, on account of the comparatively high conductivity of copper. In fact, even when its surface is covered with lamp-black, to make the loss by radia- tion as great as possible, the difference of temperature between the centre and the surface of a very hot copper ball—which is only an inch or two in diameter—is in- considerable.

3. In conduction there is passage of heat from hotter to colder parts of the same body; in convection an irregularly heated fluid becomes hydrostatically unstable, and each part carries its heat with it to its new position. In both processes heat is conveyed from place to place. But it is quite otherwise with radiation. That a body cools in con- sequence of radiation is certain; that other bodies which absorb the radiation are thereby heated is also certain ; but it does not at all follow that what passes in the radiant form is heat. To return for a moment to the red-hot cannon ball. If, while the hand is held below it, a thick but dry plate of rock-salt is interposed between the ball and the hand there is no perceptible diminution

of warmth, and the temperature of the salt is not perceptibly raised by the radiation which passes through it. When a piece

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of clear ice is cut into the form of a large burning-glass it can be employed to inflame tinder by concentrating the sun's rays, and the lens does the work nearly as rapidly as if it had been made of glass. It is certainly not what we ordinarily call "heat" which can be transmitted under conditions like these. Radiation is undoubtedly a trans- ference of energy, which was in the form commonly called heat in the radiating body, and becomes heat in a body which absorbs it; but it is transformed as it leaves the first body, and retransformed when it is absorbed by the second. Until the comparatively recent full recognition of the con- servation and transformation of energy it was almost im- possible to form precise ideas on matters like this; and, consequently, we find in the writings even of men like Prévost and Sir J. Leslie notions of the wildest character as to the mechanism of radiation. Leslie, strangely, re- garded it as a species of "pulsation" in the air, in some respects analogous to sound, and propagated with the same speed as sound. Prévost, on the other hand, says, "Le calorique est un fluide discret; chaque élément de calo- rique suit constamment la méme ligne droite, tant qu'aucun obstacle ne l'arréte. Dans un espace chaud, chaque point est traversé sans cesse en tout sens var des filets de calorique."

4, The more intensely the cannon ball is heated the more luminous does it become, and also the more nearly white is the light which it gives out. So well is this known that in almost all forms of civilized speech there are terms corresponding to our "red-hot," " white-hot," ce. As another instance, suppose a powerful electric current is made to pass through a stout iron wire. The wire becomes gradually hotter, up to a certain point, at which the loss by radiation and convection just balances the gain of heat by electric resistance. And as it becomes hotter the amount of its radiation increases, till at a definite temperature it becomes just visible in the dark by red rays of low refrangibility. As it becomes still hotter the whole radiation

increases ; the red rays formerly given off become more luminous, and are joined by others of higher refrangibility. This process goes on, the whole amount of radiation still increasing, each kind of visible light becoming more intense, and new rays of light of higher refrangibility coming in, until the whole becomes white, 7.e., gives off all the more efficient kinds of visible light in much the same relative proportion as that in which they exist in sunlight. When the circuit is broken, exactly the same phenomena occur in the reverse order, the various kinds of light disappearing later as their refrangibility is less. But the radiation continues, grow- ing weaker every instant, even after the whole is dark. This simple observation irresistibly points to the con- clusion that the so-called "radiant heat" is precisely the same phenomenon as "light," only the invisible rays are still less refrangible than the lowest red, and that our Sense of sight is confined to rays of a certain definite range of refrangibility, while the sense of touch comes in where sight fails us. Sir W. Herschel in 1798, by placing the bulb of a thermometer in the solar spectrum formed by a flint-glass prism, found that the highest temperature was in the dark region outside the lowest visible red,—a result amply verified at the time by others, though warmly contested by Leslie.

5 This striking conclusion is not without close ana- logies in connexion with the other senses, especially that of hearing. Thus it has long been known that the "range of hearing" differs considerably in different individuals, some, for instance, being painfully affected by the chirp of a cricket, which is inaudible to others whose general hearing is quite as good. Extremely low notes, on the other hand, of whose existence we have ample dynamical

evidence, are not heard by any one; when perceived at all they are felt.

6. We may now rapidly run over the principal facts characteristic of the behaviour of visible rays (see Liaw), and point out how far each has been found to characterize that of so-called "radiant heat" under similar conditions,

(a) Rectilinear propagation : an opaque screen which is placed so as to intercept the sun's light intercepts its heat also, whether it be close to the

observer, at a few miles from him (as a cloud or a mountain), or 240,000 miles off (as the moon in a total eclipse). (b) Speed of propagation: this must be of the same order of magni- tude, at least, for both phenomena, 7.e., 186,000 miles or so per second ; for the sun's heat ceases to be percep. tible the moment an eclipse becomes total, and is perceived again the instant the edge of the sun's disk is visible. (c) Reflexion: the law must be exactly the same, for the heat-producing rays from a star are concentrated by Lord Rosse's great reflector along with its light. (d) Refraction: when a lens is not achromatic its principal focus for red rays is farther off than that for blue rays ; that for dark heat is still farther off. Herschel's deter- mination of the warmest region of the spectrum (§ 4 above) is another case in point. (¢)-Oblique radiation ; an illumi- nated or a self-luminous surface appears equally bright however it is inclined to the line of sight. The radiation of heat from a hot blackened surface (through an aperture which it appears to fill) is sensibly the same however it be inclined (Leslie, Fourier, Melloni). (/) Intensity : when there is no absorption by the way the intensity of the light received from a luminous point-source is inversely as the square of the distance. The same is true of dark heat. But this is not a new analogy; it is a mere consequence of (a) rectilinear propagation. (g) Selective absorption : light which has been sifted by passing through one plate of blue glass passes in much greater percentage through a second plate of the same glass, and in still greater percentage through a third. The same is true of radiant heat, even when the experiment is made with uncoloured glass ; for clear glass absorbs certain colours of dark heat more than others (De Laroche, Melloni). (2) Interference bands, whether produced by two mirrors or by gratings, characterize dark heat as well as light ; only they indicate longer waves (Fizeau and Foucault). (7) Polarization and double refraction: with special apparatus, such as plates of mica split by heat into numerous parallel films, the polarization of dark heat is easily established. When two of these bundles are so placed as to intercept the heat, an unsplit film of mica interposed between them allows the heat to pass, or arrests it, as it is made to rotate in its own plane (Forbes). (/) By proper chemical adjustments photographs of a region of the solar spectrum beyond the visible red have been obtained (Abney). We might mention more, but those given above, when considered together, are conclusive. In fact (b) or (2) alone would almost settle the question.

7. But there is a superior as well as an inferior limit of visible rays. Light whose period of vibration is too small to produce any impression on the optic nerve can be degraded by fluorescence (see Licur) into visible rays, and can also be detected by its energetic action on various photographic chemicals. In fact photographic portraits can be taken in a room which appears absolutely dark to the keenest eyesight. By one or other of these processes the solar spectrum with its dark lines and the electric arc with its bright lines have been delineated to many times the length of their visible ranges. The electric arc especially gives (in either of these ways) a spectrum of extraordinary length ; for we can examine it, as we can not examine sunlight, before it has suffered any sensible absorption.

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8. Thus radiation is one phenomenon, and (as we shall find) the spectrum of a black body (a conception roughly realized in the carbon poles of an electric lamp) is continu- ous from the longest possible wave-length to the shortest which it is hot enough to emit. These various groups of rays, however, are perceived by us in very different ways, whether by direct impressions of sense or by the different modes in which they effect physical changes or transforma- tions. The only way as yet known to us of treating them all alike is to convert their energy into the heat-form and measure it as such. This we can do in a satisfactory manner by the thermo-electric pile and galvanometer.

9. Of the history of the gradual development of the theory of radiation we can give only the main features. The apparent concentration of cold by a concave mirror, which had been long before observed by Porta, was redis- covered by Pictet, and led to the extremely important enunciation of the Law of Exchanges by Prévost in 1791. As we have already seen, Prévost's idea of the nature of radiation was a corpuscular one, no doubt greatly influenced in this direction by the speculations of Lesage (see ATom). But the value of his theory as a concise statement of facts and a mode of co- ordinating them is not thereby materially lessened. We give his own statements in the following close paraphrase, in which the italics are re- tained, from sect. ix. of his Du Calorique Rayonnant (Geneva, 1809).

“1, Free caloric is a radiant fluid. And because caloric becomes free at the surfaces of bodies every point of the surface of a body is a centre, towards and from which filaments (filets) of caloric move in all direetions.

“2. Heat equilibrium between two neighbouring free spaces consists in equality of cachange.

‘¢3, When equilibrium is interfered with it is re-established by inequalities of exchange. And, in a medium of constant temper- ature, a hotter or a colder body reaches this temperature according to the law that difference of temperature diminishes in geometrical progression in successive equal intervals of time.

“4, Ifintoa locality at uniform temperature a reflecting or refract- ing surface is introduced, it has no effect in the way of changing the temperature at any point in that locality.

*“*5, Ifinto a locality otherwise at uniform temperature there 7s introduced a warmer or a colder body, and next a reflecting or refract- ing surface, the points on which the rays emanating from the body are thrown by these surfaces will be affected, in the sense of being warmed if the body is warmer, and cooled if it is colder.*

“6, A reflecting body, heated or cooled in its interior, will acquire the surrounding temperature more slowly than would a non-reflector.

“7, A reflecting body, heated or cooled in its interior, will less affect (in the way of heating or cooling it) another body placed at a little distance than would a non-reflecting body under the same circumstances.

“ All these consequences have been verified by experiment, except that which regards the refraction of cold. This experiment remains to be made, and I confidently predict the result, at least if the refraction of cold can be accurately observed. This result is indi- cated in the fourth and fifth consequences [above], and they might thus be subjected to a new test. It is scarcely necessary to point out here the precautions requisite to guard against illusory results of all kinds in this matter.”

10. There the matter rested, so far as theory is con- cerned, for more than half a century. Leslie and, after him, many others added fact by fact, up to the time of De la Provostaye and Desains, whose experiments pointed to a real improvement of the theory in the form of specializa- tion. But, though such experiments indicated, on the whole, a proportionality between the radiating and absorb- ing powers of bodies and a diminution of both in the case of highly reflecting surfaces, the anomalies frequently met with (depending on the then unrecognized colour-differences of various radiations) prevented any grand generalization. The first real step of the general theory, in advance of what Prévost had achieved, and it was one of immense import, was made by Balfour Stewart in 1858. Before we take it up, however, we may briefly consider Prévost's state- ments, putting aside his erroneous views as to the nature

of heat ; and we must also introduce some results of the splendid investigations of Sadi Carnot (1824), which cast an entirely new light on the whole subject of heat.

11. Prévost's leading idea was that all bodies, whether cold or hot, are constantly radiating heat. This of itself was a very great step. It is distinctly enunciated in the term "'exchange" which he employs. And from the way in which he introduces it it is obvious that he means (though he does not expressly say so) that the radiation from a body depends on its own nature and temperature alone, and is independent altogether of the nature and temperature of any adjacent body. This also was a step in advance, and of the utmost value. It will be seen later that Prévost was altogether wrong in his assumption of the geometrical rate of adjustment of differences of temperature,—a statement originally made by Newton, but true only approximately, and even so for very small temperature differences alone. Newton in the Queries to the third book of his Optics distinctly recognizes the pro- pagation of heat from a hot body to a cold one by the vibrations of an intervening medium. But he says no- thing as to bodies of the same temperature.

12. To Carnot we owe the proposition that the thermal motivity of a system cannot be increased by internal actions. A system in which all the parts are

at the same tempera- ture has no thermal motivity, for bodies at different temperatures are required in order to work a heat-engine, so as to convert part of their heat into work. Hence, if the contents of an enclosure which is impervious to heat are at any instant at one and the same temperature, no changes of temperature can take place among them. This is certainly true so far as our modes of measurement are

concerned, because the particles of matter (those of a

gas, for instance) are excessively small in comparison with the dimensions of any of our forms of apparatus for mea- suring temperatures. Something akin to this statement has often been assumed as a direct result of experiment : a number of bodies (of any kinds) within the same imper- vious enclosure, which contains no source of heat, will ultr- mately acquire the same temperature. This form is more general than that above, inasmuch as it involves con- siderations of dissipation of energy. Either of them, were it strictly true, would suffice for our present purpose. But neither statement can be considered as rigorously true. We may employ them, however, in our reasoning as truc in the statistical sense ; but we must not be surprised if we should find that the assumption of their rigorous truth may in some special cases lead us to theoretical results which are inconsistent with experimental facts,—z.e., if we should find that deviations from an average, which are on far too minute a scale to be directly detected by any of our most delicate instruments, may be seized upon and converted into observable phenomena by some of the almost incomparably more delicate systems which we call individual particles of matter.

13. The next great advance was made by Balfour Stewart.1 The grand novelty which he introduced, and from which all his varied results follow almost intuitively, is the idea of the absolute uniformity (qualitative as well as quantitative) of the radiation at all points, and in all direc- tions, within an enclosure impervious to heat, when thermal equilibrium has once been arrived at. (So strongly does he insist on this point that he even states that, whatever be the nature of the bodies in the enclosure, the radiation there will, when equilibrium is established, be that of a black body at the same temperature. He does not expressly say that the proposition will still be true

even if the bodies can radiate, and therefore absorb, one definite wave-length only; but this is a legitimate deduction from his state

1 Trans. R. 8. E., 1858; see also Phil. Mag., 1863, i. p. 354.

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ments. To this we will recur.) His desire to escape the difficulties of surface-reflexion led him to consider the radia- tion inside an imperfectly transparent body in the enclo- sure above spoken of. He thus arrived at an immediate proof of the existence of internal radiation, which recruits the stream of radiant heat in any direction step by step precisely to the amount by which it has been weakened by absorption. Thus the radiation and absorption rigorously compensate one another, not merely in quantity but in quality also, so that a body which is specially absorptive of one particular ray is in the same proportion specially radiative of the same ray, its temperature being the same in both cases. To complete the statement, all that is necessary is to show how one ray may differ from another, viz., in intensity, wave-length, and polarization.

14. The illustrations which Stewart brought forward in support of his theory are of the two following kinds. (1) He experimentally verified the existence of internal radiation, to which his theory had led him. This he did by show-ing that a thick plate of rock-salt (chosen on account of its comparative transparency to heat-radiations) radiates more than a thin one at the same temperature,—surrounding bodies being in this case of course at a lower temperature, so that the effect should not be masked by transmission. The same was found true of mica and of glass. (2) He showed that each of these bodies is more opaque to radia- tions from a portion of its own substance than to radiation in general. Then comes his conclusion, based, it will be observed, on his fundamental assumption as to the nature of the equilibrium radiation in an enclosure. It is merely a detailed explanation that, once

equilibrium has been arrived at, the consequent uniformity of radiation throughout the interior of a body requires the step-by-step compensation already mentioned. And thus he finally arrives at the state- ment that at any temperature a body's radiation is exactly the same both as to quality and quantity as that of its absorption from the radiation of a black body at the same temperature. In symbolical language Stewart's proposi- tion (extended in virtue of a principle always assumed) amounts to this:—at any one temperature let R be the radiation of a black body, and ef (where e is never greater than 1) that of any other substance, both for the same definite wave-length; then the substance will, while at that temperature, absorb the fraction e of radiation of that wave-length, whatever be the source from which it comes. The last clause contains the plausible assumption already referred to. Stewart proceeds to show, in a very original and ingenious way, that his result is compatible with the known facts of reflexion, refraction, &c., and arrives at the conclusion that for internal radiation parallel to a plane the amount is (in isotropic bodies) proportional to the refractive index. Of course, when the restriction of parallelism to a plane is removed the internal radiation is found to be proportional to the square of the refractive index. This obvious completion of the statement was first given by Stewart himself at a somewhat later date.

15. So far Stewart had restricted his work to "dark heat," as it was then called; and he says that he did so expressly in order to confine himself to rays "which were universally acknowledged to produce heat by their absorp- tion." But he soon proceeded to apply himself to luminous radiations. And here he brought forward the extremely important fact that 'coloured glasses invariably lose their colour in the fire" when exactly at the temperature of the coals behind them, z.e., they compensate exactly for their absorption by their radiation. But a red glass when colder than the coals behind appears red, while if it be hotter than they are it appears green. He also showed that a piece of china or earthenware with a dark pattern on a light ground appears to have a light pattern on a

dark ground when it is taken out of the fire and examined in a dark room. Hence he concluded that his extension of Prévost's theory was true for

luminous rays also.

16. In this part of the subject he had been anticipated, for Fraunhofer had long ago shown that the flame of a candle when examined by a prism gives bright lines (i.e., maxima of intensity of radiation) in the position of the constituents of a remarkable double dark line (7.e., minima of radiation) in the solar spectrum, which he called D. Hallows Miller had afterwards more rigorously verified the exact coincidence of these bright and dark lines. But Foucault! went very much farther, and proved that the electric arc, which shows these lines bright in its spectrum, not only intensifies their blackness in the spectrum of sun- hght transmitted through it, but produces them as dark lines in the otherwise continuous spectrum of the light from one of the carbon points, when that light is made by reflexion to pass through the arc. Stokes about 1850 pointed out the true nature of the connexion of these phenomena, and illustrated it by a dynamical analogy drawn from sound, He stated his conclusions to Sir W. Thomson,? who (from 1852 at least) gave them regularly in his public lectures, always pointing out that one con- stituent of the solar atmosphere is certainly sodium, and that others are to be discovered by the coincidences of solar dark lines with bright lines given by terrestrial sub- stances rendered incandescent in the state of vapour. Stokes's analogy is based on the fact of synchronism (long ago discussed by Hooke and others), viz., that a musical string is set in vibration when the note to which it is tuned is sounded in its neighbourhood. Hence we have only to imagine a space containing a great number of such strings, all tuned to the same note, Such an arrangement would form, as it were, a medium which, when agitated, would give that note, but which would be set in vibration by, and therefore diminish the intensity of, that particular note in any mixed sound which passed through it.

17. Late in 1859 appeared Kirchhoft's first paper on the subject. He supplied one important omission in Stewart's development of the theory by showing why it is necessary to use as an absorbing body one colder than the source in order to produce reversal of spectral lines. This we will presently consider. Kirchhoff's proof of the equality of radiating and absorbing powers is an elaborate but unnecessary piece of mathematics, called for in con- sequence of his mode of attacking the question. He chose to limit his reasoning to special wave-lengths by introduc- ing the complex

mechanism of the colours of thin plates (Licut, vol. xiv. p. 608), and a consequent appeal to Fourier's theorem (Harmonic ANALysIs, vol. xi. p. 481), instead of to the obviously permissible assumption of a sub- stance imperfectly transparent for one special wave-length, but perfectly transparent for all others; and he did not, as Stewart had done, carry his reasoning into the interior of the body. With all its elaboration, his mode of attack- ing the question leads us no farther than could Stewart's. Both are ultimately based on the final equilibrium of tem- perature in an enclosure required by Carnot's principle, and both are, as a consequence, equally inapplicable to exceptional cases, such as the behaviour of fluorescent or phosphorescent substances. In fact (see THERMODYNAMICS) Carnot's principle is established only on a statistical basis of averages, and ts not necessarily true when we are deal- ing with portions of space, which, though of essentially finite dimensions, are extremely small in comparison with the sentient part of even the tiniest instrument for measur- ing temperature.

1 L' Institut, 7th February 1849 ; see Phil. Mag., 1860, i. p. 193.

2 Brit, Assoc., President's address, 1871. 3 Pogg. Ann., or Phil. Mag., 1860.

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18. Kirchhoff's addition to Stewart's result may be given as follows. Let radiation 7, of the same particular wave- length as that spoken of in § 14, fall on the substance ; er of it will be absorbed, and (1 —¢)r transmitted. This will be recruited by the radiation of the substance itself, so that the whole amount for that particular wave-length becomes (1 — e)r+eR, or r— e(r—), Thus the radiation is weakened only when &SPECTROSCOPY).

19. From the extension of Prévost's theory, obtained in either of the ways just explained, we see at once how the constancy of the radiation in an enclosure is maintained. In the neighbourhood of and perpendicular to the surfaces of a black body it is wholly due to radiation, near a transparent body wholly to transmission. A body which reflects must to the same extent be deficient in its radia- tion and transmission ; thus a perfect reflector can neither radiate nor transmit. And a body which polarizes by reflexion must supply by radiation what is requisite to render the whole radiation

unpolarized. A body, such as a plate of tourmaline, which polarizes transmitted light, must radiate light polarized in the same plane as that which it absorbs. Kirchhoff and Stewart independently gave this beautiful application.

20. Empirical formulz representing more or less closely the law of cooling of bodies, whether by radiation alone or by simultaneous radiation and convection, have at least an historic interest. What is called Newton's Law of Cool- ing was employed by Fourier in his Théorie Analytique dela Chaleur. Here the rate of surface-loss was taken as proportional to the excess of temperature over surrounding bodies. For small differences of temperature it is accurate enough in its applications, such as to the corrections for loss of heat in experimental determinations of specific heat, &c., but it was soon found to give results much below the truth, even when the excess of temperature was only 10° C.

21. Dulong and Petit, by carefully noting the rate of cooling of the bulb of a large thermometer enclosed in a metallic vessel with blackened-walls, from which the air had been as far as possible extracted and which was main- tained at a constant temperature, were led to propound the exponential formula Aa'+B to represent the radia- tion from a black surface at temperature ¢. As this is an exponential formula, we may take ¢ as representing absolute temperature, for the only result will be a definite change of value of the constant A. Hence if ¢, be the temper- ature of the enclosure, the rate of loss of heat should be A(a' ~ a), or Aa'(ai-%—1), The quantity A was found by them to depend on the nature of the radiating surface, but a was found to have the constant value 1:0077. As the approximate accuracy of this expression was verified by the experiments of De la Provostaye and Desains for temperature differences up to 200° C., it may be well to point out two of its consequences. (1) For a given differ- ence of temperatures the radiation is an exponential func- tion of the lower (or of the higher) temperature. (2) For a given temperature of the enclosure the radiation is as (1:0077)9-1, or 6(1+0:00380+ ...), where @ is the temperature excess of the cooling body. Thus the New- tonian law gives 4 per cent. too little at 10° C. of difference.

22. Dulong and Petit have also given an empirical formula for the rate of loss by simultaneous radiation and convection. This is of a highly artificial character, the part due to radiation being as in the last section, while that due to convection is independent of it, and also of the

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nature of the surface of the cooling body. It is found to be proportional to a power of the pressure of the surrounding gas (the power depending on the nature of the gas), and also to a definite power of the temperature excess. The reader must be referred to French treatises, especially that of Desains, for further information.

23. Our knowledge of the numerical rate of surface- emission is as yet scanty, but the following data, due to Nicol,! may be useful in approximate calculations. Loss in heat units (1 ib water raised 1° C. in temperature) per square foot per minute, from

Brightreoppere ..csansiicuterd 1:09 0°51 0°42 Blackenedicopper…...—.-0 2°03 1°46 ileal:

The temperatures of body and enclosure were 58° C. and 8° C., and the pressure of contained air in the three columns was about 30, 4, and 0-4 inches of mercury respectively. The enclosure was blackened.

24. Scanty as is our knowledge of radiation, it is not at all surprising that that of convection should be almost ni, except as regards some of its practical applications. Here we have to deal with a problem of hydrokinetics of a character, even in common cases, of far higher difficulty than many hydrokinetic problems of which not even ap- proximate solutions have been obtained.

25. What is called Déppler's Principle (Licut, vol. xiv. p. 614) has more recently? led Stewart to some curious speculations, which a simple example will easily explain. Suppose two parallel plates of the same substance, per- fectly transparent except to one definite wave-length, to be moving towards or from one another. Each, we pre- sume, will radiate as before, and on that account cool; but the radiation which reaches either is no longer of the kind

which alone it can absorb, whether it come directly from the other, or is part of its own or of the other's radiation reflected from the enclosure. Hence it would appear that relative motion is incompatible with temperature equilibrium in an enclosure, and thus that there must be some effect analogous to resistance to the motion. We may get over this difficulty if we adopt the former speculation of Stewart, referred to in brackets in § 18 above. For this would lead to the result that, as soon as either of the bodies has cooled, ever so slightly, the radia- tion in the enclosure should become that belonging to a black body of a slightly higher temperature than before, and thus the plates would be furnished with radiation which they could at once absorb, and be gradually heated to their former temperature.

26. A very recent speculation, founded by Boltzmann? upon some ideas due to Bartoli, is closely connected in principle with that just mentioned, This speculation is highly interesting, because it leads to an expression for the amount of the whole radiation from a black body in terms of its absolute temperature. Boltzmann's investigation may be put, as follows, in an exceedingly simple form. It was pointed out by Clerk Maxwell, as a result of his electro-magnetic theory of light, that radiation falling on the surface of a body must produce a certain pressure. It is easy to see (most simply by the analogy of the 'virial equation, MECHANICS, vol. xv. p. 719) that the measure of the pressure per square unit on the surface of an impervi- ous enclosure, in which there is thermal equilibrium, must be one-third of the whole energy of radiation per cubic unit of the enclosed space. We may now consider a re- versible engine conveying heat from one black body to another at a different temperature, by operations alternately of the isothermal and the adiabatic character (THERMO- DYNAMICS), which consist in altering the volume of the en-

1 Prog, ROS. E,, Vii. 1870, p. 206. 2 Brit. Assoc. Report, 1871. 3 Wiedemann's Ann., 1884, xxii.

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closure, with or without one of the bodies present in it. For one of the fundamental equations gives

dE ‘ Cp

ae ae” where ¢ is the absolute temperature. If / be the pressure on unit surface, 3f is the energy per unit of volume, and this equation becomes

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Hence it follows at once that, if the fundamental assump- tions be granted, the energy of radiation of a black body per unit volume of the enclosure is proportional to the fourth power of the absolute temperature. It is not a little remarkable that Stefan! had some years previously shown that this very expression agrees more closely with the experimental determinations of Dulong and Petit than does their own empirical formula.

27. It would appear from this expression that, if an impervious enclosure containing only one black body in thermal equilibrium is separated into two parts by an impervious partition, any alteration of volume of the part not containing the black body will produce a corresponding alteration of the radiation in its interior. It will now correspond to that of a second black body, whose tempera- ture is to that of the first in the inverse ratio of the fourth roots of the volumes of the detached part of the enclosure.

28. Lecher? has endeavoured to show that the distri- bution of energy among the constituents of the radiation from a black body does not alter with temperature. Such a result, though apparently inconsistent with many well- known facts, appears to be consistent with and to harmonize many others. It accords perfectly with the notion of the absolute uniformity (statistical) of the energy in an en- closure, and its being exactly that of a black body, even if the contents (as in § 25) consist of a body which can radiate one particular quality of light alone. And if this be the case it will also follow that the intensity of radiation of any one wave-length by any one body in a given state depends on the temperature in exactly the same way as does the whole radiation from a black body. Unfor- tunately this last deduction does not accord with Melloni’s results ; at least the discrepance from them would appear to be somewhat beyond what could fairly be set down to error of experiment. But it is in thorough accordance with the

common assumption (§ 14) that the percentage absorption of any particular radiation does not depend on the temperature of the source. The facts of fluorescence and phosphorescence, involving the radiation of visible rays at temperatures where even a black body is invisible, have not yet been dealt with under any general theory of radiation ; though Stokes has pointed out a dynamical explanation of a thoroughly satisfactory character, they remain outside the domain of Carnot's principle. (Pp. G. T.)

RADIOMETER. See Pyeumarics, vol. xix. p. 249.

RADISH. See Horticutturg, vol. xii. pp. 286, 287.

RADNOR, an inland county of South Wales, is situated between 52° 5' and 52° 25' N. lat. and between 2° 57' and 3° 25' W. long., and is bounded E. by Hereford and Shropshire, N. by Montgomery, W. by Cardigan, and §. by Brecknock. Its greatest length from north to south is about 30 miles, and its greatest breadth from east to west a 33 miles. The area is 276,552 acres, or 432 square miles,

The greater part of the surface of the county is hilly, and the centre is occupied by a mountainous tract called Radnor Forest, running nearly east and west, its highest summit reaching 2163 feet. Towards the south and south-east the hills are much less elevated and the valleys

1 Sitzungsber. d. k. Ak. in Wien, 1879.

- *Wiedemann's Ann., 1882, xvii.*

widen out into considerable plains, abounding with small rivulets. The hills for the most part present smooth and rounded. outlines, but the valley of the Wye is famed for its beauty. The higher ranges are covered with heath, but there is good pasturage on the lower slopes. The smaller elevations are frequently clothed with wood. The prevailing strata are the Lower Silurian rocks; but in the east there is a considerable area occupied by Old Red Sand- stone, and throughout the county felspathic ash and green- stone are found, while near Old Radnor there is a large patch of Silurian limestone.

Lead and copper are said to exist, but not in quantities sufficient to pay the working. There are saline, sulphurous, and chalybeate wells at Llan-drindod. The Wye enters the county in the north-west, 18 miles from its source in Plinlimmon, and flowing in a south-easterly direction divides it from Brecknock, until it bends north-east and reaches Hay, after which it for some distance forms the boundary with Hereford. Its prin- cipal tributary is the Ithon, which flows south-west and joins it 7 miles above Builth. The Teme, flowing south- east, forms the northern boundary of the county with Shropshire, The Llugw, rising in the northern part of the county, flows south-east into Hereford, a little below Presteigne.

Agriculture.—The climate is somewhat damp, and in the spring cold and ungenial. The greater part of the county is suitable only for pasturage, but there is some good arable land in the valleys in the southern and south-eastern districts, which produces excellent crops of turnips, oats, and Welsh barley, the soil being chiefly open shaly clay, although in the east there is an admixture of red sandstone soils. In 1884 there were 156,628 acres, or about five- ninths of the total area, under cultivation, and of these 114,242 acres, or about four-fifths, were in permanent pasture. Of the 21,356 acres under eorn crops 12,245 acres, or more than half, were under oats, whilst wheat oeeupied 5200 aeres and barley 3853. Green crops occupied only 7100 acres, of which 1107 were under potatoes and 5682 under turnips. Horses numbered 9249 (3755 used solely for agricultural purposes), cattle 30,917 (10,223 cows and heifers in milk or in ealf), and sheep as many as 244,771. The inhabitants are dependent almost solely on agriculture, the manufactures being confined ehiefly to coarse cloth, stockings, and flannel for home use.

Railways. —The eounty is intersected by several lines: the Central Wales Railway ruus south-west from Knighton to Llan- dovery ; another line runs south-eastwards by Rhayaderand Builth and joins the Hereford line, which passes by Hay and Talgarth ; while another branch line passes by Kineton to New Radnor,

Administration and Population.— Radnor eomprises six hun- dreds, ~~but contains no municipal borough. It has one court of quarter sessions and is divided into six petty and special sessional divisions. The aucient borough~~

~~of Radnor (population 2005) is governed by the provisions of an old charter, and has a commission of the peaee. The connty contains sixty civil parishes with part of one other, and is partly in the diocese of St David's and partly in that of Hereford. It returns one member to the House of Com~~ mons. The population in 1871 was 25,430 and in 1881 it was 23,528, of whom 11,939 were males and 11,589 females. The number of inhabited houses was 4775. The average number of persons to an acre was 0°09 and of aeres to a person 11°75.

History and Antiquities.—During the Roman occupation the district was included in the province of Siluria. The Roman road from Chester to Caermarthen entered the northern extremity of the county near Newtown and, following the valley of the Ithon, crossed the Wye and entered Brecknockshire near the town of Builth. There are remains of a Roman station at Cym near Llan- drindod, and at Wapley Hill near Presteigne there is a very good example of a British camp. The district was afterwards included ehiefly in Powis, but partly in Gwent and partly in Feryllwge. It was made a county by Henry VIII. Anciently it was called Maesy- fedd. The name Radnor is also of very great antiquity, and occurs in the Cambrian annals as early as 1196. There are no ancient castles elaiming special notice, and the only ecclesiastical ruin of importance is that of the abbey of Cwm-Hir, founded for the Cis- tercians in 1143, and occupying a romantic situation in the vale of Clywedog. A considerable portion of the ancient building has bcen used as materials for the adjoining modern mansion.

RADOM, a government of Poland, occupying a trian- gular space between the Vistula and the Pilica and bounded on the N. by Warsaw and Siedlce, on the E. by Lublin, on the 8. by Austrian Galicia and Kielce, and on the W.

by Piotrkéw. The area is 4765 square miles. Its southern part stretches over the hilly plateau of Poland, which consists of short ridges of hills from 800 to 2000 feet in height, intersected by deep valleys, and is known as the Sandomir Heights. These heights are thickly wooded ; the valleys, running west and east and watered by several tributaries of the Vistula, are

excellently adapted for agri- culture. Farther north in its central portion the contour of the government is level, the soil fertile, and the surface, which is diversified here and there with wood, is further broken up by occasional spurs, 800 feet in height, of the Lysa Géra Mountains. The northern districts, where the Pilica joins the Vistula, consist of low flat tracts with undefined valleys, exposed to frequent floods and covered over large areas with marshes; the basin of the Pilica, notorious for its unhealthiness, is throughout a low marshy plain. Devonian, Carboniferous, Permian, and Triassic deposits appear in the southern plateau, Chalk and Jurassic in the middle, and Tertiary in the north. Wide tracts are covered with Glacial deposits, —the Scandinavian erratics reaching as far south as Ilza; these last in their turn are covered with widely spreading post-Glacial lacus- trine deposits. The Vistula skirts the government on the south and east and is an important means of com- munication, several hundreds of light boats (galary) descending the river every year, while steamers ply as far up as Sedomierz. The Sedomierz district is occasionally exposed to disastrous inundations of the river. The tribu- taries of the Vistula (Radomka, Kamienna, and several others) are but short and small, while those of the Pilica are mere streams sluggishly flowing amidst marshes.

The population (644,830 in 1882) is Polish for the most part, one- seventh being Jews. According to creed the proportious are— Roman Catholic 84:0 per cent., Jewish 14°6, Protestant 1:3, aud Greek 0°1 per cent. The chief occupation of the inhabitants is agriculture, the principal crops being wheat, oats, rye, potatoes, and beetroot (for sugar). Corn is exported and potatoes largely used for distillation. In 1879 there were 148 manufacturing estab- lishments (197 in 1883), employing 1708 hands, with an aggregate jap egos of 2,121,000 roubles (£212,000), the more important being tanneries, flour-mills, sugar-works, and several machinery and iron-works. These last are suffering, however, from want of wood-fuel, and many of them have recently been closed. Trade is not very extensive, the only channel of commerce being the Vistula. There is no lack of philanthropic institutions within the govern- ment (most of them founded early in this century), but never- theless the sanitary condition of tlre people is deplorable. Plica polonica, which is endemic in the government of Radom as well as in that of Kielee, is widely diffused, no fewer than 15,000 per-

sons suffering from it, and cognate maladies, such as goitre, scabies, and tinea capitis, are also widely prevalent.

The educational institutions include two lycées or gymnasia and two progymnasia (all at Radoin), with 813 male and 287 female pupils, a normal school, a theological seminary at Sandomir, and 170 primary schools (112 in villages), with 8465 scholars.

The government is divided into eight districts, the chief towns of which are —Radom, Iza (2750), Konsk (6275), Kozienice (5690), Opatow (5200), Opoczno (5585), and Sedomierz or Sandomir (6265, or 14,710 including suburbs). Zavihvost (8700) is an important custom-house. Ostrowiec (5290), Staszow (6910), Przedborz (6345), and Szidlowiec (5290) have municipal institutions.

RADOM, capital of the above government, situated on the Mleczna, a tributary of the Radomka, 65 miles south from Warsaw, is one of the best-built provincial towns of Poland. Lublin Street has a number of fine shops, and there are two well-kept public gardens. The permanent population in 1882 was 12,970, half of whom were Jews, and the town is rapidly growing towards the south-east. Though an old town, Radom has no interesting antiquities. The church of St Wlaclaw, contemporary with the founda- tion of the town, was transformed by the Austrians into a storehouse, and subsequently by the Russian Government into a military prison. The old castle is in ruins, and the old Bernardine monastery is now used as barracks. The manufactures are unimportant, but trade has been lately increasing.

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Radom, which is mentioned in historical documents of the year 1216, at that time occupied the site of what is now Old Radom. New Radom was founded in 1340 by Casimir the Great. Here Jadwiga was elected queen of Poland in 1382, and here too in 1401 the first act relating to the union of Poland with Lithuania was signed ; the "seim"' of 1505, where the organic law of Poland was sworn by the king, was also held at Radom. Several great fires, and still more the Swedish War, were the ruin of the old city. After the third partition of Poland it fell under Austrian rule ; later on, in

1809, it became capital of the Radom department of the grand-duchy of Warsaw. In 1815 it was annexed to Russia and became chief town of the province of Sandomir.

RAEBURN, Sir Henry (1756-1823), portrait-painter, was born at Stockbridge, a suburb of Edinburgh, on the 4th of March 1756, the son of a manufacturer of the city. He was early left an orphan. Being placed in Heriot's Hospital, he received there the elements of a sound education, and at the age of fifteen was apprenticed to a goldsinith in Edinburgh. Here he had some little oppor- tunity for the practice of the humbler kinds of art, and various pieces of jewellery, mourning rings and the like, adorned with minute drawings on ivory by his hand, are still extant. Soon he took to the production of care- fully finished miniatures; and, meeting with success and patronage, he extended his practice to oil-painting, being all the while quite self-taught. The worthy goldsmith his master watched the progress of his pupil with interest, gave him every encouragement, and introduced him to David Martin, who had been the favourite assistant of Allan Ramsay junior, and was now the leading portrait- painter in Edinburgh. Raeburn received considerable assistance from Martin, and was especially aided by the loan of portraits to copy. Soon the young painter had gained sufficient skill to render it advisable that he should devote himself exclusively to art. When in his twenty-second year he was asked to paint the portrait of a young lady whom he had previously observed and admired when he was sketching from nature in the fields. She was the daughter of Peter Edgar of Bridgelands and widow of Count Leslie. The lady was speedily fascinated by the handsome and intellectual young artist, and in a month she became his wife, bringing him an ample fortune. After the approved fashion of artists of the time, it was resolved that Raeburn should visit Italy, and he accord- ingly started with his wife. In London he was kindly received by Sir Joshua Reynolds, who gave him excellent advice as to his study in Rome, especially recommending to his attention the works of Michelangelo. He also offered him more substantial pecuniary aid, which was declined as unneeded; but Raeburn carried with him to Italy many valuable introductions from the president of the Academy. In Rome he made the acquaintance of Gavin Hamilton, of Batoni, and of Byers. For the advice of the last-named he used to acknowledge himself greatly indebted, and particularly for the recommendation that "he should never copy an object from memory, but,

from the principal figure to the minutest accessory, have it placed before him." After two years of study in Italy he returned to Edinburgh in 1787, where he began a most successful career as a portrait-painter. In that year he executed an admirable seated portrait of the second Lord President Dundas,

Of his earlier portraiture we have interesting examples in the bust-likeness of Mrs Johnstone of Baldovie and in the three-quarter-length of Dr James Hutton, works which, if they are somewhat timid and tentative in handling and wanting in the trenchant brush-work and assured mastery of subsequent productions, are full of delicacy and char- acter. The portraits of John Clerk, Lord Eldin, and of Principal Hill of St Andrews belong to a somewhat later period. Raeburn was fortunate in the time in which he practised portraiture. Sir Walter Scott, Blair, Mackenzie,

Woodhouselee, Robertson, Home, Ferguson, and Dugald Stewart were resident in Edinburgh, and they were all, along with a host of others less celebrated, immortalized on the painter's canvas. Of his fully matured manner we could have no finer examples than his own portrait and that of the Rev. Sir Henry Moncreiff Wellwood, the bust of Dr Wardrop of Torbane Hill, the two full-lengths of Adam Rolland of Gask and that of William Macdonald of St Martin's. It was commonly believed that Raeburn was less successful in his female than in his male portraits, but the exquisite full-length of his wife, the smaller like- ness of Mrs R. Scott Moncrieff in the Scottish National Gallery, and that of Mrs Robert Bell are sufficient to prove that he could on occasion portray all the grace and beauty of the gentler sex.

Raeburn spent his life in Edinburgh, rarely visiting the metropolis, and then only for brief periods, thus preserving his own sturdy individuality, if he missed the opportunity of engrafting on it some of the fuller refinement and delicacy of the London portraitists. His leisure was em- ployed in athletic sports, in his garden, and in architectural and mechanical pursuits, and so varied were the interests that filled his life that his sitters used to say of him, "You would never take him for a painter till he seizes the brush and palette." Professional honours fell thick upon him. In 1812 he was elected

president of the Society of Artists in Edinburgh, in 1814 associate, and in the following year full member of the Royal Academy. In 1822 he was knighted by George IV. and appointed His Majesty's limner for Scotland. He died at Edinburgh on the 8th of July 1823.

In his own day the portraits of Raeburn were' excellently and voluminously engraved, especially by the last members of the great school of English mezzotint. In 1876 a collection of over 300 of his works was brought together in the Royal Scottish Academy galleries ; in the following year a series of twelve of his finest portraits was included in the winter exhibition of the Royal Academy, London ; and a volume of photographs from his paintings has been edited by Dr John Brown.

Raeburn possessed all the necessary requirements of a popular and successful portrait-painter. He had the power of produeing a telling and forcible likeness; his productions are distinguished by breadth of effect, by admirable force of handling, by execution of the swiftest and most resolute sort. Wilkie has recorded that, while travelling in Spain and studying the works of Velazquez, the brush-work of that master reminded him constantly of the "square touch" of Raeburn. But the portraits of Velazquez are unsurpassable examples of tone as well as of handling, and it is in the former quality that Raeburn is distinctly wanting. The colour of his portraits is sometimes crnde and out of relation, inclining to the use of positive and definite local igments, and too little perceptive of the changeful subtilties a modifications of atmospheric effect. His draperies frequently consist of little more than two colours—the local hue of the fabric and the blaek whieh, more or less graduated, expresses its shadows and modelling. In his flesh, too, he wants—in all but his very best productions— the delicate refinements of colouring which distinguish the works of the great English portrait-painters. His faces, with all their excellent truth of form and splendid vigour of handling, are often hard and bricky in hue.

RAFF, Josepx Joacim (1822-1882), composer and orchestral conductor, was born near Zurich on 27th May 1822 and educated chiefly at Schwyz. Here, under the care of the Jesuit fathers, he soon became an excellent classical and mathematical scholar, but received scarcely any instruction in his favourite art, in which, nevertheless, he made extraordinary progress

through sheer force of natural genius, developed by persevering study which no external obstacles could induce him to discontinue. So successful were his unaided efforts that, when in 1843 he sent some MSS. to Mendelssohn, that warm encourager of youthful talent felt justified in at once recommending him to Breitkopf & Hirtel of Leipsic, who published a large selection of his early works. Soon after this he became acquainted with Liszt, who gave him much generous

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encouragement. He first became personally acquainted with Mendelssohn at Cologne in 1846, and gave up all his other engagements for the purpose of following him to Leipsic, but his intention was frustrated by the great composer's death in 1847. After this cruel disappoint- ment he remained for some time at Cologne, where his attention was alternately devoted to composition and to the preparation of critiques for the well-known periodical Cacilia. Thus far he must be regarded as, in every sense of the word, a self-taught artist; but he felt 'the need of systematic instruction so deeply that, retiring for a time from public life, he entered at Stuttgart upon a long course of severe and uninterrupted study, and with so great success that in 1850 he appeared before the world in the character of an accomplished and highly-cultivated musician. Raff now settled for a time in Weimar in order to be near Liszt. Hans von Bitlow had already brought him into notice by playing his Concertstiick for pianoforte and orchestra in public, and the favour with which this fine work was everywhere received encouraged him to attempt a greater one. During his stay in Stutt- gart he had begun the composition of an opera entitled Konig Alfred, and had good hope of securing its perform- ance at Dresden; but the political troubles with which Germany was then overwhelmed rendered its production in the Saxon capital impossible. At Weimar he was more fortunate. In due time Kinig Aljred was produced there under Liszt's able direction with complete success; it is still frequently performed at the court theatre, as is also his second opera, Dame Kobold, written for the same theatre in 1870. His third opera, Samson, has not yet, we believe, been publicly represented.

Raff remained at Weimar until 1856, when he obtained a large clentéle at Wiesbaden as a teacher of the pianoforte. In 1859 he married Doris Genast,

an actress of high repute, and thenceforward devoted himself with renewed energy to the work of composition, displaying an inexhaustible fertility of invention tempered by an amount of technical skill which stamped even his lightest works with the dignity to which the union of natural talent with high artistic cultivation can alone give birth. He resided chiefly at Wiesbaden till 1877, when he was appointed director of the Hoch-Conservatorium at Frankfort, an office which he retained until his death, 25th June 1882.

Raff's compositions are almost innumerable. More than 200 have been published, ineluding ten symphonies—undoubtedly his finest works—quartets, concertos, sonatas, songs, and examples of nearly every known variety of style; yet he never repeats himself. Notwithstanding his strong love for the romantic school, he is never guilty of extravagance, and, if in his minor works he is sometimes a little commonplace, he never descends to vulgarity. His symphonies Lenore and Jn IValde are truly wonderful examples of musical painting, and replete with poetry in every bar.

RAFFLES, Str Tuomas Sramrorp (1781-1826), the son of a captain in the West India trade, was born at sea off the coast of Jamaica on 5th July 1781. Returning with his mother to England, he was placed in a boarding- school at Hammersmith, where he remained till the age of fourteen, when he entered the East India Honse as an extra clerk. While employed there he occupied his leisure hours in particularly studying languages, for which he possessed great facility. In 1805 the directors of the India House having resolved to found a new trading settlement at Penang, Raffles was appointed assistant- secretary, and on his voyage out he acquired the Malay language. Owing to the illness of the chief secretary, he soon had to undertake the entire adniinistrative labour of the new government. In 1808 he had to visit Malacca to recruit his shattered strength ; here he enjoyed large opportunity of mingling with a very varied population, and, in conlpany with the two Orientalists Marsden and

Leyden, he began his elaborate researches into the history, laws, and literature of the Hindu and Malay races. In zoology he took special interest, and on his return to England became founder and first president of the Zoolo- gical Society. While in Calcutta in 1809, Raffles sug- gested to Lord Minto, then governor-general of India, the desirableness of wresting Java from the French. The governor-general took up the idea with vigour ; a fleet of ninety ships dropped anchor before Batavia in August 1811, and ina short time the conquest of the island was effected. Raffles was made lieutenant-general of the new territory, and resolved to give to the island a pure and upright administration, There were three sources of abuse to eradicate—the revenue system, the system of police and public justice, and the slave trade. Ina period of only five years Raftles had almost cffocted his design ; his popularity was secured, and the revenue was eight times larger than it had been under the Dutch. The policy of some of his measures being, however, considered doubtful by the home authorities, he was recalled in 1816, but his conduct was approved. He published a valuable and well-illustrated History of Java, in 2 vols. 4to, 1817.

Having received knighthood, Sir Stamford Raffles set out for Suniatra as lieutenant-governor of Bencoolen, arriving in March 1818, and immediately recommenced the work of reform. Jn 1819 he induced the marquis of Hastings to annex Singapore. He again visited Singapore, his 'political child," in 1822, and occupied himself for nearly a year in laying out the new city, and in estab- lishing its constitution as a free port. Java had been given up to the Dutch shortly after Sir Stamford left it, and now Bencoolen was granted to them in exchange for Malacca. On setting sail for England from Sumatra in February 1824 the ship took fire and the crew and pass- engers were with difficulty saved. The loss to Sir Stam- ford was beyond all repair. The whole of his drawings, all his collections in botany and zoology, all his multi- tudinous papers and manuscripts, fell a prey to the flames, his pecuniary loss amounting to more than £20,000. During one of his excursions into the interior of Sumatra, in company with Dr Arnold, he came upon the largest and most extraordinary of known flowers, the Raflesia Arnoldi (see Parasitism, vol. xviii. p. 265). In 1820 he sent home a

large collection of preserved animals, now in the museum of the London Zoological Society, described in the Zransactions of the Linnean Society. He died of apoplexy at his house near London on 5th July 1826.

RAFN, Carn Curistian (1795-1864), Danish arche- ologist, was born in Brahesborg, Fiinen, on 16th January 1795 and died at Copenhagen on 20th October 1864. He is chiefly known in connexion with the controversy as to the question of the discovery of America by the Norsemen. (See AmERIcA, vol. i. p. 706.)

RAGATZ, or RaGaz, a watering-place in Switzerland, in the canton of St Gall, with a station on the railway to Coire, 64 miles south-east of Zurich, stands 1700 feet above the sea at the mouth of the magnificent gorge through which the impetuous Tamina forces its way to the Rhine; its baths are supplied with mineral water from the hot springs of Pfaffers, which issue from the right side of the ravine 24 miles higher up. As the tourist centre for one of the most picturesque districts of Switzer- land, Ragatz has greatly increased since the middle of the century. It had then only 650 inhabitants; in 1870 there were 1825, and in 1880 1996, while the annual number of visitors is about 50,000. In the churchyard is the grave of Schelling, who died at Ragatz in 1854. Ragatz originally belonged to the abbots of the Benedictine monastery of Pfaffers (713-1838); their residence became in 1840 the "Hof Ragatz" hotel, and in 1868 the whole

property, which had been seized by the state in 1838, passed into private hands. The Swiss defeated the Austrians at Ragatz in 1446.

RAGLAN, Fitzroy James Henry Somerset, Baron (1788-1855), English general, was the eighth and youngest son of the fifth duke of Beaufort by Elizabeth, daughter of Admiral the Hon. Edward Boscawen, and was born on 30th September 1788. He entered the army in 1804. In 1807 he was attached to the Hon. Sir Arthur Paget's embassy to Turkey, and the same year he was selected to serve on the staff of Sir Arthur Wellesley in the expedi- tion to Copenhagen. In the following year he accom- panied the same general in a like capacity to Portugal, and during the whole of the Peninsular War was at his right hand, first as aide-de-camp and then as

military secretary. He specially distinguished himself at the storm- ing of Badajoz, being the first to mount the breach, and it was to him that the governor delivered up his sword. During the short period of the Bourbon rule in 1814 and 1815 he was secretary to the English embassy at Paris. On the renewal of the war he again became aide-de-camp and military secretary to the duke of Wellington. At Waterloo he lost his right arm by a shot, but he quickly gained the facility of writing with his left hand, and on the conclusion of the war resumed his duties as secretary to the embassy at Paris. From 1818 to 1826 he sat in the House of Commons as member for Truro. In 1819 he was appointed secretary to the duke of Wellington as master- general of the ordnance, and from 1827 till the death of the duke in 1852 was military secretary to him as com- mander-in-chief. He was then appointed master-general of the ordnance, and shortly afterwards was raised to the House of Lords as Baron Raglan. In 1854 he was appointed to the command of the English troops sent to the Crimea. Here the advantage of his training under the duke of Wellington was seen in the soundness of his military tactics, but the trying winter campaign in the Crimea also brought into prominence defects perhaps traceable to his long connexion with the formalities and uniform regulations of military offices in peace time. At the same time the hampering influence of a divided com- mand must be taken into account, and it ought not to be forgotten that, if his advice had been adopted by the French at the beginning, Sebastopol would very probably have fallen in a few weeks after the landing of the allies. His suggestion was to march straight upon the north side of Sebastopol, but after the battle of Alma on 20th September the plan was abandoned, and the south side was reached by the desperate expedient of a perilous flank march. For the hardships and sufferings of the English soldiers in the terrible Crimean winter owing to a failure in the commissariat, both as regards food and clothing, Lord Raglan and his staff were at the time severely cen- sured by the press and the Government ; but, while Lord Raglan was possibly to blame in representing matters in a too sanguine light, it afterwards appeared that the chief neglect rested with the home authorities. The monotony of the siege was broken by the battles of Balaclava on 26th October and of Inkermann on 5th November, in which the accurate and rapid decision of Lord Raglan changed impending disasters into brilliant victories. During the trying winter of 1854-55 the suffering he was compelled to witness, the censures, in great part unjust,

which he had to endure, and all the manifold anxieties of the siege seriously undermined his health, and he died of dysentery on 28th June 1855,

See Kinglake's History of the Invasion of the Crimea.

RAGMAN ROLLS, the name given to the collection of instruments by which. the nobility and gentry of Scotland were compelled to subscribe allegiance to Edward IJ. of

England between the conference of Norham in May 1291 and the final award in favour of Baliol in November 1292, and again in 1296. Of the former of these records two copies were preserved in the chapter-house at Westminster (now in the Record Office, London), and it has been printed by Rymer (/edera, ii. 542). Another copy, preserved originally in the Tower of London, is now also in the Record Office. The latter record, containing the various acts of homage and fealty extorted by Edward from Baliol and others in the course of his progress through Scotland in the summer of 1296 and in August at the parliament of Berwick, was published by Prynne from the copy in the Tower and now in the Record Office. Both records were printed by the Bannatyne Club in 1834, The derivation of the word " ragman " has never been satisfactorily explained, but various guesses as to its meaning and a list of examples of its use for legal instruments both in England and Scot- land will be found in the preface to the Bannatyne Club's volume, and in Jamieson's Dictionary, s.v. "Ragman." The name of " Ragman" has been sometimes confined to the record of 1296, of which an account is given in Calendar of Documents relating to Scotland preserved in the Public Record Office, London (1884), vol. ii, Introd., p. xxiv. ; and as to the seals see p. lili. and appendix.

RAGUSA (Slavonic Dubrounik, Turkish Paprovnik), a city on the east coast of the Adriatic, for many centuries an independent republic, now at the head of a district in the province of Dalmatia in Austria-Hungary. It is built close to the sea at the foot of the bare limestone mass of Monte Sergio, on which stands an unfinished Fort Impérial erected by the French. In front lies the island of Lacroma, the traditional landing-place of Cceur-de-Lion. Several ancient stone-built forts—San Lorenzo (11th cen- tury), Leverono

(16th), &c.—defend the harbour, and the city is fenced in with lofty walls. The main street runs in a narrow valley between the mountain and a seaward ridge ; the valley was up till the 13th century a channel of the sea, and the seaward ridge was the rocky island of Lavve or Ragusa proper, opposite which lay among its pine trees the Slavonic settlement of Dubrovnik. Though still a fine street, this corso is not so imposing as before its palatial mansions were overthrown by the earthquake of 1667. It contains a 15th-century cistern, a church (Del Redentore) erected after the earthquake of 1536 to avert similar catastrophes, and a Franciscan monastery ; and in the piazza off its southern extremity are the Palazzo Rettorale, or residence of the "rectors" of the republic (1435-52), the old custom-house and mint, completed in 1520, and the Torre del Orologio, with its curious clock. The "palace" is a marvellous specimen of late Romanesque influence, especially famous for the six columns of its fagade and the alchemist group with which one of the capitals is decorated ; and the custom-house has also a fine Roman- esque element in its style. The cathedral (dedicated to the Virgin Mary, though the patron saint of the city is St Blasius, whose effigy perpetually occurs on its coins, fortifications, and churches) is a building in the Italian taste of the 18th century. Ragusa can never have been a large city. In the 16th century it is said to have contained 30,000 or 40,000 inhabitants ; in 1881 it had only 7245, and its commune, with its fifteen additional villages, 10,936. The harbour, once one of the great ports of southern Europe, is altogether too small for modern requirements, in spite of the new breakwater constructed in 1873 to protect it from the south-west winds. From 400 to 600 vessels (mostly under 50 tons burden) enter yearly. The neighbouring harbour of Gravosa (Slav Grwuz; population 677) is the real port of Ragusa as far as steam- boat traffic is concerned. The staple trade is that of oil ; but the whole supply is sent to the Trieste market.

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Ragusan Malmsey, once famous, has disappeared before the vine-disease since 1852.

The history of Ragusa has been thus summarized by Mr Free- man :—" Those hills, the slopes of whieh begin in the streets of the eity, once feneed

in a ledge of Hellenie land from the native barbarians of Illyrieum. Then they feneed in a ledge of Roman land from the Slavonie invader. Lastly they still fence in a ledge of Christian land from the dominion of the infidel." The eity was founded on a roeky island by Roman Christian refugees from Epidaurus (now Ragusa Vecchia, 675 inhabitants), in the middle, say some, of the 3d century after Christ ; and in the middle of the 7th century it was strengthened by other refugees from Salona, destroyed by the Slavs. In course of time a Slavic settlement was ineorporated within its walls; and thus by language and sympathies it became a link between two great eivilizations. Ragusa! maintained its independence against all comers partly by war but more by diplomaey. In the 9th eentury it more than onee repulsed the Saracens, and in the 10th defended itself against Venice, the pirates of the Narenta, Samuel (ezar of the Bulgarians), and the emperor Otho; in the 11th century it was drawn by its alliance with Robert Guiseard into a war with Byzantium and Veniee, and in the 12th eentury fought with the ban of Bosnia and with Stephen Nemanya of Servia, who twice invested the eity. But its policy was generally peaceful. To refugees of all nations, even to those who had been its own bitter foes, it afforded asylum ; and by means of treaty and tribute it gradually worked its way to a position of mereantile power which Europe eould hardly parallel. A eompact which it made with the Turkish ruler at Broussa in 1370 was renewed by Bajazet in the 15th eentury and saved the little state from the fate of her most powerful neighbours, Byzantium and Servia. By that time Ragusa had stations at Serai, Bucharest, Tirgovisee, Widdin, Rustehuk, Sophia, and Adrianople ; and her vessels were known not only in Italy, Sicily, Spain, Greece, and the Levant, but in the more northern parts of Europe. Our own language retains in the word "argosy" a relic of the carraeks of Ragusa, then known to Englishmen as Argouse, Argusa, or Aragosa. As the world widened the Ragusan merchants went farther,—to India, even, and America. But the finest vessels of their fleet were compelled to join the Spanish Armada and shared its fate ; and the eity, which had felt shocks of earthquake in 1520, 1521, 1536, and 1639, was in April 1667 laid utterly in ruins and lost a fifth of its inhabitants. "The reetor of the republie, five-sixths of the nobles, nine-tenths of the clergy, a Duteh ambassador with his suite of thirty-three on his way to Constantinople, and 6000 citizens were buried." Ragusa never quite recovered its prosperity, though it was again a busy trading town of 15,000 inhabitants when Napoleon seized it in 1806. In 1808 it was deprived of its

independence ; and by the eongress of Vienna in 1814 it was assigned to Austria. This is not the place to deseribe the remarkable literary development, Latin, Italian, and Slavonic, of whieh Ragusa was the centre in the 15th, 16th, and 17th centuries, and to whieh so many of its patricians contributed ; a detailed account will be found in Pypin and Spasovieh's History of Slavic Literatures (German edition, 1880). Gondulic (Gondola) the poet and Boseovich the mathematician are leading names.

See Engel, Geschichte von Ragusa (Vienna, 1807); Makusheff, Investigations into the Historical Documents of Ragusa (in Russian, St Petersburg, 1867); Monu- menta hist. Slavorum meridionalium (Warsaw, 1864); Appendini, Notizie storico- crit. sulle antichita, &c., dei Ragusei (Ragusa, 1802-3); Sir Gardner Wilkinson, Dalmatia; A. A. Paton, The Danube and Adriatic; J. A. Evans, Thro' Bosnia and the Herzegovina, 1876; E. A. Freeman, Subject and Neighbour Lands of Venice, 1881.

RAGUSA, a city of Italy in the province of Syracuse (Sicily), 16 miles east of Vittoria and 10 north-north- west of Modica, lies on the right side of the valley of the Ragusa or Erminio (Herminius). It consists of an upper town with 24,183 inhabitants and a lower town with 6260 (1881), the two communes having a total popula- tion of 30,720. The church of Santa Maria della Scala is in part modern, but in part of considerable antiquity and interest ; and San Giorgio contains the tomb of Bernardo Caprera (ob. 1423), who tried to seize the crown of Sicily. Ragusa possesses a large cotton-factory. Stone impreg- nated with petroleum is quarried in the Grotta Oleosa in the neighbourhood, and after the oil is burned out becomes an article of export under the name of pietra nera. The city, which was destroyed by earthquake in 1693, is of con- siderable antiquity, as is proved by the numerous ancient tombs existing in the district; but whether it is to be identified with Hybla Herzea is matter of opinion.

1 The name, of unknown origin, appears as Rhaugia, Rhaugium, Rhausium, Ragusium, Lavusa, Labuda, Labusedum, &c,

RAHEL. See VARNHAGEN VON ENSE. ;

RAHWAY, a city of the United States in Union county New Jersey, 19 miles by rail south-west of New York, lies on Rahway river at the head of schooner navigation, about 4 miles above its mouth in Staten Island Sound. It is best known for its carriage-factories, but has also a wool- mill, a printing-press manufactory, a printing-house, a shirt-factory, a hunting-goods factory, &c. The popula- tion was 6258 in 1870 and 6455 in 1880. First settled in 1720 and named after Rahwack, the Indian owner of the site, Rahway was incorporated as a city in 1858.

RAI BARELI or Roy Bareitry, a district of British India, in the Rai Bareli division! of Oudh, under the jurisdiction of the leutenant-governor of the North- Western Provinces, has an area of 1738 square miles. It lies between 25° 49' and 26° 35' N. lat. and between 80° 45' and 81° 40' E. long., and is bounded on the N. by the districts of Lucknow and Bara Banki, on the E. by Sultanpur, on the 8. by Partabgarh and the Ganges, and on the W. by Unao. The general aspect of the district is slightly undulating, and the country is beauti- fully wooded ; in fact, the beauty of the country is not to be surpassed by any part of the real plain of Hindustan. The soil is remarkably fertile, and the cultivation of a high class. The principal rivers of the district are the Ganges and the Sai: the former skirts it for 54 miles and is everywhere navigable for boats of 40 tons; the latter traverses it from north-west to south-east, a dis- tance of 55 miles. Other rivers are the Basha, the Loni, and the Naiya. The indigenous products of Rai Bareli consist of several magnificent and useful timber trees, numerous kinds of grazing and thatching grasses, and a variety of rice known as "pasahi," which grows wild in many tanks and marshes ; its jungle products are lac and silk cocoons. Herds of wild cattle are to be found in the south of the district, near the Sai river, and do much harm to the crops ; nylghau are common near the Ganges, and wolves are occasionally met with in the jungles.

According to the census of 1881 Rai Bareli district contains a population of 951,905 (imales 466,906, females 484,999). By religion 874,180 are Hindus, 77,424 Mohammedans, and 123 Christians. The most numerous castes are the Ahirs (114,869), the Brahmans (113,212), and the Rajputs (70,757). Compared withother Oudh districts, the proportion of high castes is large, which is accounted for by the fact that Rai Bareli was for centuries

the seat of Hindu authority and but little controlled by the Mohammedan kings. The population is almost entirely rural, there being only three towns with a population exceeding 5000, viz., Rai Bareli (see below), Jais (11,044), and Dalmau (5367). The principal occupa- tion of the people is agriculture. Of the total area 892 square miles were in 1882 returned as cultivated, 432 as cultivable, and 414 square miles as uncultivable. The greater portion of the cultivated area is two-crop land. The principal crops are rice, wheat, gram, arhar, and pease. In years of scarcity Rai Bareli is worse off than other districts, having no railway and only some 56 miles of water communication along its border. On the other hand, its masonry wells afford it a greater assurance against famine ; its drainage is superior to that of other districts ; it suffers comparatively less from floods; and its area of artificial irrigation is so large that absolute famine ought to be almost unknown. The average rainfall of the district is 37 inches; the rainfall is, however, very capricious and often deficient in the very months when it is most necded for agricultural purposes. Although possessing no railway communication, the district is well opened up by roads. Its gross revenue in 1882 was £153,072, of which £129,841 was derived from the land-tax. There are little trade and few manufactures, except cloth-weaving for local use, the making of brass and copper utensils, and glass ware.

_ RAI BARELI or Roy Barerty, town and administra- tive headquarters of the above district, is situated on the

Rai Bareli division comprises the three districts of Rai Bareli, Sultanpur, and Partabgarh, and contains an area of 4882 square miles, with a population (1881) of 2,756,864 (males 1,362,761, females 1,394,103). The great majority of the people are Hindus, of whom there are 2,493,536; the Mohammedans number 262,892 and the Christians 226,

banks of the Sai in 26° 14’ N. lat. and 81° 17’ E. long. It was founded by the Bhars, who called it Bharauli, but it was subsequently corrupted into Bareli. The prefix “Rai” is either derived from Rahi, a village near the town, or from the fact of its having been long in the possession of a Kayasth family bearing the name of Rai. The population of the town (1881) is 11,781 (males 5970, females 5811). It possesses many architectural features, chief

of which is a spacious and strong fort erected in 1403, and constructed of bricks 2 feet long by 1 foot thick and 14 wide. Among its ancient buildings are the magnificent palace and tomb of Nawab Jahan Khan, the governor in the time of Aurangzeb, and four fine mosques.

RAIKES, Roserr (1735-1811), the founder of Sunday schools, was the son of Robert Raikes, a printer in Gloucester and proprietor of the Gloucester Journal, and was born on 14th September 1735. On the death of his father in 1757 he succeeded him in the business, which he continued to conduct till 1802. Along with some others he started a Sunday school at Gloucester in 1780, and on his giving publicity to the enterprise in the columns of his journal the notice was copied into the London papers and awakened considerable attention. For nearly thirty years he continued actively engaged in the promotion of his undertaking, and he lived to witness its wide extension throughout England. He died on 5th April 1811. Among various accounts of the life and work of Raikes mention may be made of that by P. M. Eastman, 1880.

RAIL (German Ralle, French Rale, Low Latin Rallus), originally the English name of two birds, distinguished from one another by a prefix as Land-Rail and Water-Rail, but latterly applied in a much wider sense to all the species which are included in the Family Rallidx of Ornithology.

The Lanp-Rar, also very commonly known as the Corn-Crake, and sometimes as the Daker-Hen, is the Rallus crex of Linneus and Cres pratensis of recent authors. Its monotonous grating cry, which has given it its common name in several languages, is a familiar sound throughout the summer nights in many parts of the British Islands ; but the bird at that season very seldom shews itself, except when the mower lays bare its nest, the owner of which, if it escape beheading by the scythe, may be seen for an instant before it disappears into the friendly covert of the still standing grass. In early autumn the partridge-shooter not unfrequently flushes it from a clover- field or tangled hedgerow ; and, as it rises with apparent labour and slowly flies away to drop into the next place of concealment, if it fall not to his gun, he wonders how so weak-winged a creature can ever make its way to the shores if not to the interior of Africa, whither it is almost certainly bound ; for, with comparatively few individual exceptions,

the Land-Rail is essentially migratory —nay more than that, it is the Ortygometra of classical authors ——supposed by them to lead the Quam (supra, p. 146) on its voyages—and in the course of its wanderings has now been known to reach the coast of Greenland, and several times that of North America, to say nothing of Bermuda, in every instance we may believe asa straggler from Europe or Barbary. The Land-Rail needs but a brief description. It looks about as big as a Partridge, but on examination its appearance is found to be very deceptive, and it will hardly ever weigh more than half as much. The plum- age above is of a tawny brown, the feathers being longi- tudinally streaked with blackish brown; beneath it is of a yellowish white ; but the flanks are of a light chestnut. The species is very locally distributed, and in a way for which there is at present no accounting. In some dry upland and corn-growing districts it is plentiful; in others, of apparently the same character, it but rarely occurs ; and

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Early wooden tram- ways,

RAI—RATI

the same may be said in regard to low-lying marshy meadows, in most of which it is in season always to be heard, while in others having a close resemblance to them itis never met with. ‘ The nest is on the ground, generally in long grass, and therein from nine to eleven eggs are commonly laid. ‘These are of a cream-colour, spotted and blotched with light red and grey. The young when hatched are thickly clothed with black down, as is the case in nearly all species of the Family.

The WaATER-RaIL, locally known as the Skiddy or Bill- cock, is the Kallus aquaticus of Ornithology, and seems to be less abundant than the preceding, though that is in some measure due to its frequenting places into which from their swampy nature men do not often intrude. Having a general resemblance to the Land-Rail,! it can be in a moment distinguished by its partly red and much longer bill, and the darker coloration of its plumage—the upper parts being of an olive brown with black streaks, the breast and belly of a sooty grey, and the flanks dull black barred with white. Its geographical distribution is very wide, extending from Iceland (where it is

said to preserve its existence during winter by resorting to the hot springs) to China; and though it inhabits Northern India, Lower Egypt, and Barbary, it seems not to pass beyond the tropical line. It never affects upland districts as does the Land- Rail, but always haunts wet marshes or the close vicinity of water. Its love-note is a loud and harsh cry, not continually repeated as is that of the Land-Rail, but uttered at considerable intervals and so suddenly as to have been termed "explosive." Besides this, which is peculiar to the cock-bird, it has a croaking call that is frog-like. The eggs resemble those of the preceding, but are more brightly and delicately tinted.

The various speeies of Rails, whether allied to the former or latter of those just mentioned, are far too numerous to be here noticed. Hardly any part of the world is without a representative of the genera Orex or Rallus, and every considerable country has one or

perhaps more of each—though it has been the habit of systematists to_refer them to many other genera, the characters of which are with difficulty found. Thus in Europe alone three other species allied to Crex pratensis oceur more or less abundantly ; but one of them, the Spotted Rail or Crake, has been made the type of a so- ealled genus Porzana, and the other two, little birds not mueh bigger than Larks, are eonsidered to form a genus Zapornia. The first of these, which used not to be uneommon in the eastern part of England, has a very near representative in the Carolina Rail or Sora, Crex carolina, of North America, often there miscalled the Ortolan, just as its European analogue, C. porzana, is in England often termed the Dotterel. But, passing over these as. well as some belonging to genera that can be much better defined, and other still more interesting forms of the Family, as Aphanapteryx (Brrps, vol. iii. p. 733), Coor (vol. vi. p. 341), Moor-HEN (vol. Xvi. p. 808), and OcypRoME (vol. xvii. p. 722), a few words must be said of the more distant group formed by the South-Ameriean Heliornis, and the Afriean and Indian Podica, comprising four or five species, to which the name "Finfoots" has been applied — from the lobes or flaps of skin that fringe their toes. Though for a long while placed among the Podieipedide (GruBE, vol. xi. p. 79), their osteology no less than their

habits appear to indicate their allianee with the Rails, if they be not members of the Family Rallide ; but they seem to shew the extreme modification of that type in adaptation to aquatic life. Then again the curious genus Mesites of Madagasear, whose systematic place has been so long in doubt, has been referred by Prof. Alph. Yictne- Raveards (Ann. Se. Naturelle, ser. 6, vii. art. 2) to the neighbourhood of the Rails, though offering some points of resemblance to the Herons. On the other hand the Jacanas (vol. xiii. p. 531) or Parridx, which from their long toes were onee thought to belong to the Rails, are now generally admitted to be Limicoline, while the genus Aramus —the Courlan or Limpkin of the Southern United States—still oceupies a very nndetermined position, On the whole the Rallidx eonstitute a group of birds whieh, particularly as regards their relations to some other remarkable forms, of which the Sun-Bittern, Eurypyga, and Kagu, Rhinochetus, may especially be named, well deserve greater attention from the systematist, and any ornitho- logist in want of a subject could hardly find one more likely to reward his labours if he were only to carry them out in a judicious way. Based on the safe ground of anatomy, but due regard being also had to the external characters, habits, and other peculiarities of this multifarious group, amonograph might be produced of sur- passing interest, and one that in its bearings on the doetrine of evolution would be likely to prove a telling record. (A. N.)

RAILWAY

AILWAYS had their origin in the tramways which were laid more than two hundred years ago in the mineral districts of England for the conveyance of coal to the sea. In those days, before Macadam, roads bearing heavy traffic were with difficulty kept in repair. This led to the plan of laying planks or timbers at the bottom of the ruts as a better contrivance than filling in with stones, and then to laying rails of timber on the level surface. In 1676 tramways consisted of rails of timber laid "from the colliery to the river, exactly straight and parallel, and bulky carts were made with four rollers fitting the rails, whereby the carriage was so easy that one horse would draw down four or five chaldron of coals." The rails originally were formed of scantlings of good sound oak, and were con- nected by sills or cross timbers of the same material pinned together with oak trenails. By and by an additional or wearing rail, which could be easily renewed when worn,

was placed above the supporting rail, and it was then possible to cover the cross pieces or sleepers with earth to protect them from the horses' feet. These ways, laid by permis- sion of local proprietors, were called "way-leaves." It became a common practice to nail down bars of wrought iron on the surfaces of the ascending inclines of the road. These bars or rails were about 2 inches wide and half an inch thick, and were fastened to the wood rails by counter- sunk spikes. But the iron bars, not being stiff enough,

1 Formerly it seems to have been a popular belief in England that the Land-Rail in autumn transformed itself into a Water-Rail, resuming its own characters in spring. The writer has met with several persons who had serious doubts on the subject !

were considerably bent when the trucks were loaded, and the resistance was reduced but slightly below that of a well-constructed double wooden tramway.? Nevertheless, while the regular load of coals for one horse on the common road was but 17 cwt., on the tramway the horse could regularly take a load of 42 cwt. Cast-iron was first tried incidentally as a material for rails in 1767 by the Coal- brookdale Iron Company. The iron rails were cast in lengths of 5 feet, 4 inches – wide, and 1} inches thick, — formed with three holes, through which they were fastened to the oak rails. The tramway was developed into the railway by the em-

ployment of cast-iron flange ~

rails (fig. 1) to replace the \ WK wooden rails; the continuous Fic, 1.—The tram-road, flange or ledge on their inner EPO-aeO

edge kept the wheels on the track. The roads were then called tram-roads, probably as an abbreviation of

trammel-roads, the flanges of the rails being in reality trammels to gauge the road and confine the wheels to

2 The earliest system of way on the Baltimore and Ohio Railroad and other railroads in the United States was a simple reproduction of this compound of wood and iron. As the ends of the bars beeame loose and turned upwards

they were known as “ snakes’ heads.” Oceasion- ally they pierced the floors of the earriages and injured passengers,

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BSS S BYZZAS Ss

Tron rails

on tram- roads,

Stockton and Dar- lington

Railway,

224

the track. The leading objection to this system was that the rail was liable to be covered with dust. J essop therefore in 1789 laid down at Loughborough cast-iron “edge rails,” raised above the ground so as to allow a flanged cast-iron wheel to run on them (fig. 2), This appears to have been the first system of rails laid on cast-iron chairs and on sleepers. The rails were pinned or bolted into the chairs.. A wrought-iron rail was patented by Birkenshaw in 1820, as the “fish-belly ” rail, similar in form and mode of support to Jessop’s rail, but rolled in

Fic, 2,—The edge rail, 1789. This form of rail grew into favour. It weighed 33 Ib per yard, and was laid in cast-iron chairs, spiked down to square stone blocks at 3-feet bearings (see

under side.

fig. 3). The edge rail and the flanged wheel consti- tute the basis of the whole system of a railway. The rails forming a line of way were placed to a gauge or dis- tance apart of 4 feet 84 inches, and two parallel lines of way were spaced with 6 feet between the inner rails of the ways. This interspace is popularly known as the “ six-foot.”

The benefits derived from the use of the tramway or railway for the transport of coal suggested to reflective persons the employment of it for the conveyance of general merchandise and of passengers. For the conveyance of heavy merchandise inland the canals little more than sixty years ago furnished the principal means. Though there were three such water-routes between Liverpool and Man- chester, they were sometimes so crowded that cotton took a month to pass from the seaport to the manufacturing towns in the interior; yet the whole of the merchandise passing between Liverpool and Manchester did not average more than 1200 tonsa day. The average rate of carriage was 18s. per ton, and the average time of transit on the 50 miles of canal was thirty-six hours, The conveyance of passengers by the improved coach-roads was comparatively rapid, but it was very costly. The first great movement to mend this state of things was the passing of the Act in 1821 for the construction of the Stockton and Darlington Railway. Colliery railways were in evidence to prove the benefits of railway communication by steam-power. The Hetton Railway, for instance, in the neighbourhood of N ewcastle, from the colliery to the river Wear, was 7 miles long, and trains of 60 tons net weight were taken over the line at a speed of 4$ miles per hour. On the Killingworth Rail- way an engine and tender weighing 10 tons drew a load of 40 tons at a speed of 6 miles per hour, consuming 50 ib of coal per mile run. Whilst animal-power only was at first relied on for working the Stockton and Darlington

Fria. 3.—The fish-belly rail, 1820-30.

RAILWAY

Railway, the Act provided for working with men and horses or " otherwise." By another Act applied for at the request of George Stephenson, who became engineer to the line, the company was empowered to work the railway with locomotive engines. The line, with three branches, was over 38 miles in length, and was at first laid as a single line, with passing places at intervals of a quarter of a mile, the way being constructed with wrought-iron fish- belly rails, weighing 28 tb per yard. It was opened in September 1825 by a train of thirty-four vehicles, making a gross load of about 90 tons, drawn by one engine driven by Stephenson, with a signalman on horseback in advance. The train moved off at the rate of from 10 to 12

miles an hour, and attained a speed of 15 miles per hour on favour- able parts of the line. A train weighing 92 tons could be drawn by one engine at the rate of 5 miles per hour, The principal business of the new railway was the conveyance of minerals and goods, but from the first passengers in- sisted upon being carried, and in October 1825 the com- pany began to run a daily coach, called the ' Experiment," to carry six inside, and from fifteen to twenty outside, making the journey from Darlington to Stockton and back in two hours. The fare was ls., and each passenger was allowed to take baggage not exceeding 14 tb weight. The rate for carriage of merchandise was reduced from 5d. to one-fifth of a penny per ton per mile, and that of minerals from 7d. to 14d. per tor per mile. The price of coals at Darlington fell from 18s, to 8s. 6d. per ton.*

The Monklands Railway in Scotland, opened in 1826, Earliest was the first to follow the example of the Stockton and lines.

Darlington line, and several other small lines—including the Canterbury and Whitstable, worked partly by fixed engines and partly by locomotives—quickly adopted steam- traction. But the inauguration of the Liverpool and Manchester Railway, opened in 1829, made the first great impression on the national mind that a revolution in the modes of travelling had really taken place. In 1838 a line was opened between London and Birmingham, and the first train accomplished the whole distance—112} miles—at an average speed of over 20 miles per hour. The London and Greenwich, the London and Southamp- ton, the Great Western, Birmingham and Derby, Bristol and Exeter, Eastern Counties, Manchester and Leeds, Grand Junction, Midland Counties, North Midland, South- Eastern, London and Brighton, Manchester and Birming- ham, and Edinburgh and Glasgow, together with many small Bills, were all passed within four years from the time of the passing of the London and Birmingham Bill. Thus in the course of four or five years the foundations were laid of most of the existing trunk lines of railway in Great Britain. The original Liverpool and Manchester line, 304 miles in length, now forms part of a network of lines, the property of one company, nearly 1800 miles in extent, representing a capital invested in railway works and plant of £100,000,000.

Meantime the construction of the way was the subject Kinds of of much consideration. The fish-belly form of wrought- “il

iron rail was troublesome to roll, and so the flat-bottom or flat-foot rail (fig. 4) was designed, combining a solid head with a flange base. This rail, with holes through the flange to hold the spikes, was used to some extent, and was laid on longi- tudinal timber sleepers, and also on transverse sleepers. The disadvantage was want of vertical stiffness of the system; and, if the rail was made higher, it was liable to rock on the sleeper and work loose on the spikes. This rail, known as the Vignoles rail, has been much improved in form and proportions and is extensively used. The bridge rail (fig. 5)—so called

Fia. 4.—The flat- bottomed rail.

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RATLWAY

because it was first laid on bridges—vwas that first used on the Great Western Railway, and i is of a shallow section, but wide, and possessed of lateral stiff- NK ness. The first line was a series of beech WY KX piles, 12 inches square, driven into the Fic. 5.—The teldae ground, to which were bolted at the sur- rail. face level cross balks of timber, one on each side of the pilehead on which they were shouldered. Longitudinal balks, 15 feet long, were laid on the cross balks. The longi- tudinals were covered with oak or elm planking screwed down to the surface. When the ballast was packed under the longitudinal balks, the surface of the oak planks was planed level, and the bridge rails screwed down on them, with felt between. It was supposed that there would: be no yielding whatever, but a very short time demonstrated that the piles formed a series of solid resistances, while the balks between sprang, and it was found necessary to cut away the piles.

Transoms were then framed into the longitudinals and secured by strap-bolts, and the whole resembled a long ladder laid on the ground. Eight different sections of rails were tried in succession ; one section measured 14 inches in height by 7 inches in width, weighing 44 tb per "yard 5 aud the last section 22 inches high by 6 inches wide, 'weighing 62 tb per yard. The screws which held down the rails were counter-sunk be- neath the wheel-flanges, and nut-headed on the other side (see fig. 6). In consequence of the want of depth in the rails, they bent longitudinally under the wheels, and the horizontal flanges curled up at the sides, while the holes Fig. 6.—Bridge rail on through them bent into angles. One Great Western Railway. remedy tried was to cross-board the longitudinal timbers on the surface, and thus the fibre was made less yielding.

The double-headed rail (fig. 7) was originated a: J oe Locke, and was first laid on the Grand Junction Railway. It also weighed 62 Ib per yard. The two tables were equal; the rail was more easily rolled than others, and, being reversible, it was in fact two rails in one. But as it was laid in cast-iron chairs the lower table was exposed to Fic. 7 —The damage under the hammering of the traffic; and double- many engineers were led to make the lower ee table of smaller size, as in fig. 8, merely as a , support, not as a surface to be used by the wheels. This rail, which acquired the title of " bull-headed," was, like the flat-foot and bridge rails, used as a prop supported on its base. There was a waste of metal in these early rails, both flat-foot and double-headed, owing to the excessive thickness of the vertical web, which has been corrected in recent designs. It was found, naturally, that rails would not rest in their chairs at the joints, but were loosened and bruised at the ends by the blows of the traffic. The fish-joint re ere was therefore devised in 1847 by Mr W. 4, pos 'rah (Bridges Adams, the intention being by "fishing " the joints to convert the rails into continuous beams. In the original design two chairs were placed, one under each rail, a few inches apart, as in fig. 9. The joint was thus suspended between the two chairs, and two keys of iron, called "fishes," fitting the side channels of the rails, were driven in on each side between the chairs and the rails. In subsequent modifications the fishes were, and they continue to be, bolted to and through the rails, the sleepers being placed further apart, and the joint sus- pended between them.

In the employment of steam-power for traction on rail-

‘Ways rapid progress was made in response to the demand

for power. The year 1829 is famous in the annals of rail- ways not only for the opening of the Liverpool and Man-

Fic. 9.—The original fish-joint, i W. Bridges Adams.

chester line but for the invention and construction of the first high-speed locomotive of the standard modern type. Robert Stephenson’s engine, the “Rocket,” was made under competition for the Liverpool and Manchester Rail- way, and it gained the prize for lightness, power, and speed awarded by the directors. The two steam-cylinders of the “Rocket” were 8 inches in diameter, with 164 inches of stroke, and the driving-wheels were 4 feet 84 inches in diameter. The engine weighed 4 tons 5 ewt., “the tender following it 3 tons 4 ewt., and two loaded carriages drawn by it on the trial 9 tons 11 ewt.: thus the weight drawn was 12 tons 15 cwt., and the gross total 17 tons. The pressure of steam in the boiler was 50 tb per square inch. An average speed of 14 miles per hour was attained, the greatest velocity being 29 miles per hour; and the boiler evaporated 18} cubic feet, or 114 gallons, of water per hour. The “ Rocket” possessed the three elements of effi- ciency of the modern locomotive,—the internal water- surrounded fire-box and the multitubular flue in the boiler, or a number of small tubes in place of one large tube; the blast-pipe, by which the waste steam of the engine was exhausted up the chimney; and the direct connexion of the two steam- cylinders, one on each side of the engine, with the driving or propelling wheels, on one axle. The subdivision of the single large flue, up to that time in general use in locomotives, into a number of small tubes greatly accelerated the generation of steam without adding to the size or weight of the boiler. But the evaporating tubes would have been of little avail practically had they not been supplemented by the blast-pipe, which, by ejecting the steam from the engine after it had done its work in the cylinder straight up the chimney, excited a strong draught through the boiler and caused a brisk and rapid combustion of fuel and generation of heat. The heat was absorbed with proportional rapidity through the newly applied

heat- ing-tubes. The blast-pipe, thus applied, in conjunction with the multitubular flue, vastly improved the capacity and usefulness of the locomotive. And, taking into account the direct connexion of the steam-cylinder with one axle and pair of wheels, the improvements were tantamount to a new and original machine. The " Rocket" subsequently drew an average gross load of 40 tons behind the tender at a speed of 13°3 miles per hour. The old Killingworth engine, one of the earlier type of locomotives constructed by George Stephenson, weighing with its tender 10 tons, could only work at a maximum of 6 miles per hour with 50 tons.

For many years engines belonged to two general classes. In one class there were six wheels, of which one pair was placed behind the boiler, typified in the engines of the day made by Robert Stephenson ; in the other class there were but four wheels, placed under the barrel of the boiler, leaving the fire-box overhung, typified in the engines made by Bury for the London and Birmingham Railway. Ex- perience demonstrated the disadvantage of an overhanging mass, with a very limited wheel-base, in the four-wheeled engine running at high speed; and now it is the general

practice to apply six wheels at least to all ordinary loco- motive stock. The earliest four-wheeled locomotive con- structed by Robert Stephenson and Co. as an article of regular manufacture weighed 9 tons in working order. The six-wheeled engines which followed weighed 11} tons. In the course of business locomotives of greater power and greater weight were constructed ; and there are loco- motives of the present time which weigh 474 tons in working order, and with the tender full of water and coal about 80 tons gross. There are other engines of special design with twelve wheels which weigh in working order, with fuel and water, 72 tons. The contrast is emphasized in the history of the old Garnkirk and Glasgow Railway, which was opened about the year 1829. The first engines of that line weighed from 8 to 9 tons. They had steam-cylinders 11 inches in diameter, and 4-feet wheels of cast-iron, with a working pressure in the boiler of 50 ib per

square inch. The "Garnkirk" engine used to take a train of three carriages, together weighing 7 tons gross, at the average speed of 16 miles per hour between Glasgow and Gartsherrie. When the old line, 8 miles in length, was merged in the Caledonian Railway, now comprising a system of nearly 1000 miles in length, the power of the engines was greatly increased, and at this day (1885) there are express passenger engines working over the same ground having large cylinders of 17 or 18 inches in diameter, and wheels of 7 and 8 feet in diameter, weighing from 35 to 45 tons. These engines, with steam of 120 ib pressure per square inch, take a gross load of 90 tons at a speed of from 40 to 50 miles per hour.

STATISTICS,

Length of Railways in the United Kingdom.—The length of rail- ways open for traffic at the end of the year 1854, twenty-five years after the opening of the Liverpool and Manchester Railway, was 8053 miles (of which nearly one-fourth was single line of way), cost- ing about £35,500 per mile. In 1874 that mileage was doubled (16,449 miles, nearly one-half being only single line), costing about £37,000 per mile. According to the latest published return the length of railways open for traffic at the end of 1883 amounted to 18,681 miles, and the proportion of single line had decreased, being under 46 per cent. Whilst the mileage open was increased at the rate of 420 miles a year during the earlier period (1854-74), it was only increased by 248 miles a year during the later period (1874-83). But many miles of way in multiple have been laid for

'the working of traffic concentrated on main lines,—127 miles of

triple line and 285 of quadruple. The largest share of multiple way belongs to the London and North-Western Railway Company, which owns 28 miles of triple way and no less than 114 of quad- ruple. The principal section of this railway, 80 miles in length, between London and Rugby, is entirely in quadruple,—two lines for goods and two for passenger traffic. Table I. shows the dis- tribution of the 18,681 miles of railway open at the end of 1883 :—

Double Line or wild)

Country. mane Single Line.

Miles. Per cent.| Miles. Per cent.) Miles.

England and Wales …..... 8,380 or 63°5 4,835 or 36°5 | 13,215

COMIBRE Sais cc macasss cor nis cate 1147 5, 39 LS1f 4,. BL 2,964 POMRG he os oc diedinnn sdece cise 5 ,, 28 1,924 ,, 77 23502 | Total

companies (206

The railways here represented were owned by 281 3 ut

in England and Wales, 31 in Scotland, and 44 in Ireland). the whole property is worked by 123 companies.? :

The longest mileage of railway worked by one eompany is that of the Great Western Railway, which at the end of 1883 was 2268 miles. Next to this ranks the London and North-Western (1793), then the North-Eastern (1534), the Midland (1381), the North- British (1006), and the Caledonian (877). The three longest mile- ages in Ireland owned each by one company are those of the Great Northern (503), the Great Southern and Western (478), and the Midland Great Western (425). The four largest English com- panies, taken together, work nearly 7000 miles of railway,—more

~ than half of the whole length of railways in England and Wales.

The two leading lines in Scotland, taken together, work nearly 1900, or two-thirds of the whole length of railways in Scotland. In

1 It would appear that less progress has been made in Ireland than in Great Britain in amalgamation and concentration of management.

RAILWAT

Ireland the three leading lines, taken together, work 1400,—more than half of the whole length of railways in Ireland.

Capital Invested, Expenditure per Mile, &c.—The capital raised Capital for the eonstruction of railways at the end of the year 1883 invested.

amounted to about £785,000,000, representing an expenditure of £42,000 per mile open. Some small portion of this eost belongs to lines in course of construction. The money has been raised in the following proportions :—

Ordinary share capital paid up ….£293,437,106 or 37°4 per cent.
Guaranteed stock 94,672,823 ,, 12°1 a

Preferential, SHOOK j.;<0 oie /ecereidis, eaxele 200,888,198 ,, 25°6 Bs AB GAINED) 28. [sfc ale xsayuyasdisiane ens oie Stok 36 ato 15,323,505 ,, 1:9 5 Webenture:stOeK occ. cocc eases 180,599,680 ,, 23°0 S

Total (say £785,000,000).... £784,921,312 ,, 100-0 a

In 1857 the ordinary stock was 57 per cent., as against 37°4 per cent. in 1883; and the guaranteed and preferential stock together were but one-third of the ordinary share capital, while in 1883 they equalled it. The English railway system, so far as capital is eon- cerned, has become adjusted to the rule of having rather less than 40 per cent. of the capital in "open stock." In 1845-46 the divi- dends of railways appear to have reached a maximum. The pre- cipitate influx of new lines during the four years from 1846 to 1850, contests before parliament, competition in various forms, and other causes then came in to depress dividends, and reduced the average proportion of net receipts in 1849 to 2°83 per cent. of the total capital and loans raised at that time. In 1857 the percentage of net receipts had risen again to 4°06 per cent. of the total capital and loans; and notwithstanding the accumulation of preference capital and loans, both taking precedence of ordinary capital, the available dividend on the latter increased from 1°88 per cent. to 3°6 per cent. Since that time the average dividend paid on ordinary capital has maintained its levcl at least, and it amounted for 1883 to 4°68 per cent. The average eost per mile open at the end of 1883, calculated on the amount of eapital raised, with that for 1857 added for comparison, was as follows (Table IJ.) :—

Per Mile | Per Mile |

1883. 1857.

England and Wales …..... 13,215 650,945,834 | £49,260 | £39,270
RCORAMA. A eercreysalcccactae me 2,964 98,531,315 33,240 28,230
MELB Feo. s-leeicins ok estes 2,502 35,444,163 14,170 15,660

18,681 784,921,312 42,020 34,950

The marked increase in capital expenditure per mile is due to per- Cost per manent improvements, station accommodation, reconstruction, and mile.

multiplication of lines. Of the great cost of English railways, independently of the permanent improvements already noticed, part has been incurred in parliamentary warfare, while much of it is due to great and costly termini, and to the character of the earlicr works of construction in England, where great expenditure was incurred for the sake of securing long levels and very easy gradi- ents, until Joseph Locke made a new departure, and constructed the Grand Junction Railway on economic principles by following in great part the contour of the surface. For this line and the London and Birmingham line, for which Robert Stephenson was the engineer, Acts were passed in the same year (1833). The latter line was expensively laid out with tunnels, viaducts, and heavy cuttings and-embankments, and cost in round numbers £53,600 per mile, as against £23,200 per mile for Locke's line. The cheaper line abounded in inclines of from 1 in 85 to 1 in 265, whilst the more expensive line was ruled by gradients not steeper than 1 in 330. Locke reckoned upon the sufficiency of the engine-power to take the trains up the inclines, and the famous Crewe engine was the outgrowth of the situation. The London and South-Western Rail- way, which cost £26,800 per mile, was laid out by Locke to a ruling gradient of 1 in 250. There are other instances of econo- mical construction by the same engineer in the original Caledonian and Scottish Central Railways—now amalgamated—the former of which was made with long gradients of 1 in 75, 1 in 80, 1 in 100, and other steep slopes. Besides these there are other cheaply made railways in Scotland ; but there is only one Scottish railway of the monumental class,—the Edinburgh and Glasgow, nearly dead level, with enormously expensive works. On the Metro- politan Railway system, 22 miles in length, upwards of £11,000,000 have been paid up, or about £500,000 per mile. The enormous cost of this line, as well as of

the Metropolitan District system (18 miles long, costing £374,000 per mile) and the North London system (12 miles long, costing £325,000 per mile), is sufficiently explained by the place and conditions. The original London and Blackwall Railway, built, like the North London, for the most part on arches, eost £311,912 per mile. The original Birkenhead, Cheshire, and, Lancashire Junction Railway, now vested in the neighbouring railway companies, cost upwards of £75,000 per mile, owing partly to the protracted eontests in which it had been involved with the neighbouring railways, and partly to the costly works of construction joining the railway to the docks at Birken- head. Of railways in England, the original Carlisle and Silloth

Railway, 13 miles long, has the honour of standing at the foot of the list, having cost £6474 per mile. Of the Scottish lines the Caledonian system stands at the head of the list, costing £45,500 per mile. The North British system cost £33,000 per mile. At the foot of the list stood the original East of Fife line, 7 miles

proportions of rolling stock for twenty-one leading British railways (31st December 1883) are exhibited in detail in Table IV., arranged in the order of the numerical proportions which the carrying stock for traffic bears to the locomotive stock :—

1

> Fa} te 2 : | e long, with a cost of £4351 per mile. But the cheapest lines of a Miles! 3 2 | ae Cd Carriage and considerable length are the Forth and Clyde line, costing £5525 HINA open.} SS) ES #8 | Waggon Stocks. per mile, and the Peebles line, costing £5545 per mile. Both E | oF = these lines have been taken into the North British system. In | |- = Ireland the Dublin and Kingstown Railway, 8 miles long, a suburban Miles,| En- Vehi- Vehi- | Vehi- a | eS railway, cost £53,000 per mile. The original Limerick and Foynes ENGLAND AND WALES. | 'gines.| cles. | cles. | cles. gine. open line, costing £5282 per mile, is probably the cheapest piece of | Metropelitem, edi… | 221 60] 241 59} 300; 5:0, 13°6 railway in the United Kingdom. Metropolitan District …..... 18 | 42 | 296 19) 315] 7-0)17-5 The

proportions of expenditure on capital account cannot in the | _ Tee as Sedscver | ies | eae 4 ph gan os absence of data be exactly determined. The following may be London and South-Western _..| 721 | 471 | 2467 | 6964| 9,431/ 20-0 | 13-1 accepted as an approximate analysis of the average cost of the rail- | |South-Hastern…..... | 370 | 325 | 2047 | 4,798] 6,845 | 21-1 | 18:5 ways, as it stood in 1871 :— London and North-Western .. 1793 | 2451 | 6092 | 47,518 | 53,610| 21-9 29-9 Z ae en | London, Brighton, and South aie ert & coat Oe 403 | 410 | 2817 | 7,078} 9,895] 24-1 | 24:5 é ; ae MED IDE S030 eonnonocooano ods 1049 | 615 | 2960 | 11,957 | 14,917 | 24:3 | 14-2 Land and compensations = 2000000000000007075 92008 oF BE | Great Wentern 22220000 sj, 2208 | 1807 | 4508 84,704 | 39,902] 249, 17°3 Works of construction and stations complete …..... 18,000 ,, 50. | sip ear Sheffield, and Lin-| . Locomotive and carrying stock …....0cccceessee 3,000 ,, 8 Te tN ett on oa no CoaBbabooods | 314 7 505 | (781 | 12,434 | 13,215 | 26:2 42°1 Interest on stock, discounts, bonuses, dividends from Tane ahi a Foe 168 | 733 | 2086 | 17,384 | 19,450 | 26-5 | 25°3 capital, contingencies, &. oo… eee ccc cece. 6,000 ily Bee CUO NOESSHEG.---| 404 | E840) aes 20,223 | 22,718 | 27°3 200 i 2 z 2 Gee Lil@leviGl SEER cee wen ae 1381 | 1629 | 3856 | 61,532 | 65,388 | 40:1 | 47-3 36,000 100 North-Eastern …..../ 1534 | 1462 | 2739 | 76,369 | 79,108 | 54°1 | 51°6 From this estimate it would appear that the net cost of construc- Reoreenn: | c tion and equipment was £21,000 per mile, or about 58 per cent. ea oe een "| aCe 290 ioe haoieee rr 2 ae Cost of of the entire cost. The capital cost of the working stock is given | | Caledonian eee Oe) ae oe 1030 43,253 | 44,883 Pree working by the London and North-Western Railway Company. Excluding aes stock. a considerable number of engines and carrying stock which had sidan ee dos igual aidan | ee he ' 5 & 11a) Teal WeSbEIN 2.2… , 7 z been constructed as duplicate stock charged to revenue, no doubt | | Great Southern wor western .., 478 | 160 | 344 | 3,345| 3689] 23-1) 7-9 —at 3lst December 1884 the quantities and costs were as follows :— Great Northern …..... , 503 | 127 | 468 | 2,807] 3,275 25-8 | 6°5

2 Sad LOCOMOLIMESE te steed eee einer 2 = ye I Gar sbeIndlersureesrerer erin =n eee j £3,574,284 (£1538 per engine).

3,463 passenger carriages…..... 2,116 horse-boxes, guards' vans, &¢.....

Here the number of vehicles varies from 5 per engine on the Metro-

; 1,496,212 (£268 per vehicle). politan Railway, 7 on the District Railway, and 11:7 on the North

51,817 waggon stock ….....s..0 000, 3,320,322(£64 ,,), London Railway — all of these specially ‘passenger lines of dense a traffic—to 54 per engine on the North-Eastern Railway, 59 on the Total …..... 00.00.00. £8,390,818 North British Railway, and 65 on the Caledonian Railway—all

It is to be explained with reference to these low rates of cost that the original cost of the early working stock stands unaltered in the books of the company, whilst the whole of the original working stock has been replaced at the charge of revenue by engines and vehicles of modern design and larger capacity. Divided by

these being specially lines of mineral traffic.

Train Miles Run, 1883.—The number of miles run by passenger Train and goods and mineral trains, and the number run by mixed trains, miles are as follows (Table V.) :— run,

a eeSSSSSSSSSSSSSSSSSSSSSSeSeEeee

the number of miles (1793) open at 31st December 1884, the total Passenger, Goode ae0 Mixed. | Total. charge for working stock is at the rate of £4680 per mile open. S| ee For new working stock manufactured by the same company dur- Country. Per Per Per Per ing the eighteen months ending 3lst December 1884 the following Train AYE! Train VE grain PVE] train | aver 5 “ 3 age | z age age 3 age average sums were charged ‘to capital :— Miles. [imile| Miles. | nile} Miles. | 2)]_| Miles. mile 31 locomotives with tenders or tank-engines ….... £1100 each. open open open! open 22opvcliicles carriaserstoek ….....08hele ocsccte css oeks. 385 ,, SL | ae | el 2Vo2wehicles, Wageon StOCK s… – sec. sonst cees cote sce cns 59 «Cy, a 7 : :

‘ : : ee ; < and Wales|117,406,242/ 8940 108,446,732] 8258) 498,415] 38 226,351,389 17,236 Rolling Working or Rolling Stock. —The working or

rolling stock of | jgtayar 18,243,827 4486| 15,933,637| 5397 |1,632,851| 553 | 30,810,315 10.436 stock. railways consists of locomotives with their tenders, passenger | reland .. 7,526,871 3030) 3,602,884) 1450| 605,777] 246 | 11,735,532, 4,726*

carriages, horse-boxes, carriage trucks, travelling post-oflices with Total …./138,176,940 7442 127,983, 253| 6893 |2,737,043| 147 208,897,236 14,482 their tenders and vans, goods waggons, covered goods waggons, | |Total, per cattle trucks, coke and coal waggons, timber trucks, ballast waggons, Cente) .. | 51-4 a 47°6 a 1:0 an 100 |

and goods brake vans. Table III. (below) shows that in England and Wales there is nearly one locomotive per mile of line open, or for the United Kingdom three engines for every 4 miles. The greatest waggon stock per mile open is to be found in Scotland—nearly thirty-one per mile. The proportions of vehicles for traffic of all classes for each locomotive averaged at the end of the year 1883 :— England and Wales…..... 31‘1 vehicles per engine.

The mixcd-train miles constitute just 1 per cent. of the total number, and the mileages run by passenger and goods trains are nearly equal. On an average each mile of way was traversed forty times a day. Taking the means of the numbers of engines for the end of 1882 and the end of 1883 as the average number during the year, the train miles run per locomotive are as follows (Table VI. yi

OO laa ee tts ess… <,c.ccrveia tee lye 7 35 1 5 " nooo cane Geesuedoon cnet poasoo ed” Average Nuinber | Train Miles per oe > 8 ae of Engines, Engine. (2 Lapere rere ence aeeRReen: 33°9 ra ie

: io ’ : i Yo England and Wales….....0… 11,996 18,863 The excessive proportion of fifty-two vehicles per engine in Scot- (2 _ ca ai rn 1,678 18,361 iand corresponds to the comparatively excessive number of train | | Ireland “1.12.2272777 7707720000000 626 18,747 miles with goods and minerals, which are 20 per cent. more than 5 Nie a Sg ee 14,300 : 18,805

the passenger-train miles, whilst in England they are 8 per cent.

less, and in Ireland more than 50 per cent. less. The various | An engine when actually on duty may accomplish 120 train miles

Taste II].—Summary of the Quantities of We orking Stock at the end of the Year 1883.

. Waggons and Total No. of

: Passenger ee Total Pass- ati for Live a su = e ne ae Other Vehicles, | Vehicles for

Locomotives. Caines res ed to enger-Train | Stock, Miner- } © Tl Maneeal: as Ballast Passengers, ges. assenger rene als, and Mer- | AUC "aveta' | wWaggons, &c. |Goods, Ballast Trains. Jnandi Train Stock. on d

Country. chandise. |

+ IRE ~ = Per @ Per Per = Per Per Per

*a mile as mnile ee mile os tnile = mile Nae mile Nugts nile ie mile : open. * | open. : open. * | open. * {open. * | open. ° open. * Jopen, England and Wales …...../ 12,144 92 | 27,274 | 2-06 | 10,133 '77 =| 37,407} 2°83 | 329,622 | 24-94 | 367,029 | 27-77 10,609 80 =| 377,638 | 28°57 COGAN 4. ov cnc ccc cces 1,693 '57 3,001} 1:21 1,269 *43 4,860] 1°64 91,444 | 30°85 | 96,304 | 32-49 1,166 *39 97,470 | 32°88 Hiroe UMM evs regi se0sisics o éeiciee ae 632 "25 1,439 cong 622 oorey 2,061 "$2 13,195 | 5:27! 15,256] 6-09 297 "12 15,553 | 6°21 Flip Gall Pertne Ses oaks 14,469 '77 =| 32,304) 1°73 | 12,024} -64 | 44,398] 2:37 434,261 | 23°24 478,589 | 25°61 | 12,072] +65 | 490,661 | 26-26*

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per day, which would make upwards of 40,000 per annum. But at any moment half the engines may be taken as in reserve or under repair, which reduces the average performance per engine of the whole stock to some 20,000 miles per year, and the circum- stances of many lines do not admit of such high averages of mileage run. Taking the twenty-one leading lines in detail, following the selection already made to show the quantities of

working stock, the number of train miles run on the different lines in 1883 is shown in Table V1I. as follows :—

ae ro z Dw . oe 3 3) Train Miles run. ae z Railway. Sa |5 EE | Goods and & ASP ite az Passeuger. | Winners Total. = 3 ENGLAND AND WALES.

Metropolitan …. 22 58 1,443,401 8,794; 1,447,195 | 24,950

Metropolitan Dis-

LIC tReet «<< 16 39 1,191,966 | 5,719 | 1,197,685 | 30,710 North London ..| 12 87 | 1,705,749} 285,085} 1,990,834 | 22,880 London,Chatham,

aud Dover …./ 160 168 | 8,152,677 678,173 | 3,830,850 | 22,800 London and South-

Western …... 721 456 8,001,548} 3,045,365 11,046,913 | 24,220 South-Eastern 370 322 4,930,330 | 1,416,949| 6,347,279 | 19,710 LondonandNorth-

Western …... 1784 2424 | 18,931,111 | 19,395,461 | 38,326,572 | 15,810 London and

Brighton …... 130 404 6,521,451 | 1,427,306) 7,948,757 | 19,680 Great Eastern ..| 1032 608 8,486,358 | 5,334,027 | 13,820,385 | 22,730 | Great Western 2254 1565 | 14,298,157 | 16,047,939 | 30,346,096 | 19,390 Manchester, Shef-

field, and Lin-:

colnshire …... 314 496 4,507,290 | 5,065,879 | 9,573,169 | 19,300 Great Northern..| 770 726 | 8,091,256 8,238,177 | 16,329,433 | 22,490 Lancashire and :

Yorkshire 493 815 7,602,008 | 5,467,541 | 13,069,549 | 16,040 Modlandy 3 o.cecn 1378 1605 | 13,105,400 | 19,981, 855 | 33,087,255 | 20,620 North-Eastern ..} 1521 1462 9,681,906 | 14,763,232 | 24,445,138 | 16,720

ScoTLAND.

Glasgow and

South-Western 331 285 2,230,838 | 2,294,680 | 4,525,518 | 15,880 North British….| 1002 563 | 5,032,790 | 6,428,496 | 11,461,286 | 20,360 Caledonian …... 872 690 5,232,096 | 6,617,610 | 11,849,703 | 17,170

TRELAND. Midland Great

Western …... 425 100 1,104,971 682,651 | 1,787,622 | 17,880 Great Southern |

and Western ..| 478 160 1,678,691 | 1,164,993 | 2,843,684 | 17,7S0 Great Northern ..| 503 127 1,851,768 783,148 | 2,634,916 | 20,750

TABLE VIIT.—Duties performed by Engines of Manchester, Sheffield, and Lineolashire Railway.

RALLW Aw

small goods-train mileage, is partly explained by the fact that this eompany had 141 duplicate locomotives in 1883. Engines run many miles unavoidably "empty,"—that is, without a train, the proportion of the empty or unprofitable mileage depending on the traffic and the nature of the line. A Hine with locally heavy gradients must have "assistant" or " pilot" engines in readiness to assist the trains up the inclines, and such engines usually have to return empty to the depét ; and in cases of special trains empty engines are run to or from the train, as the case may happen, Engines, especially assistant engines, may have to stand 'in steam" or with the steam up and the fire in good order, in readi- ness to act when required. Some railway companies register the whole time the engines are in steam, also the assistant, ballasting, and empty mileage run, besides the time on active duty and the train milesrnn, The nature of the duty of goods engines, which is various, is also distinguished, so as, in short, to make a complete record of the work done. Thus for the Manchester, Shefficld, and Lincolnshire Railway Table VIII. (see above) gives the duties performed by the engines during the second half-years of 1857 and 1883. The times of engines assisting and running empty are included in the hours in steam with trains,—passenger and goods respectively. There were about 170 engines

employed in shunting and marshalling trains. The relative percentages of the hours the engines were in steam and of miles run on different duties in the second half-year of 1883 are given in Table IX. :—

‘ Service. | Hours in Steam. ‘Miles run.

Per cent. Per cent. RassSeneery (Ramis gu enicmyslan c.c6’s «ses hos eee 14°6 36°4

| Goods and mineral trains …..... 22°4 40°6

| Passenger, goods, and mineral trains…... 87-0 770 IB OUIASHRULAUES 6s accxcvsies etee arene ile? i15a SUUMGIN Gs note meters eitereaiaise Sertom ete eee 36°8 17°4

D.Ae included in pass- ,

| porting eee a oe cea ee if peg ana “Q

| IY coo ooecehounoe coescoonaSGOG tev eses mineral trains

MS tenner cers cose tern eared ow iar eerie 25°0 20

Total ee ccecce ee wei cs 100°0 100°0

The proportion of extra cngine mileage to the work done in hauling goods, minerals, and passengers varies very much on dif- ferent systems, according to the nature of the traffic, for by far the greater part of it arises in connexion with goods and minerals, which itself is a very varying quantity. The train mile, therefore, —that is, the revenue-produeing train mile— though it is the simplest and handiest unit of performance, is not an absolute measure of work done. The shunting or marshalling of trains is an item not indicated by train mileage, and yet it is hard work and occupies as many hours in steam as the train mileage. Again, the fuel consumed, reckoncd only on the train mileage run, amounts to

ete s P : 5 Half-year ending Half-year ending) | 5316 per mile run ; but, reckoned on the total mileage run by engines, | Bist Dec. 1857. | 31st Dec. 1883. | | in which the extra mileage, whether ballasting, shunting, or assist-

MO COMMOLIVES << vee cicae Stevens Saree 115 505 ing, is hard work, it amounts only to 41 Ib per mile Lp DOOR cc. nM se ae scenes a : 431 On the London and North-Western Railway in 1874 the total Bs of ow ih steam — oaaiie shunting time was 613,472 hours of one engine—about the same With Patan. en ree 95.397 J] 376.576 as on the Sheffield line in 1883—and on this work 171 engines With ballast trains 1112772217770) 19,746 were constantly employed, marshalling and classifying the trains SUCU UL CREE Santee mene reas oa 49,093 621,000 in the sidings. A like number, so employed on the Sheffield line, Standing... .. se. .seeeeeeceeeee eens 28,842 421,430 amount to-one-third of the total locomotive stock. _ __,. Total hours in steam ..... 173,272 1,685,426 Trafie.—Before the establishment of the railway from twenty Pass- Es miles run by engines— " 6 Sanees to thirty coaches ran daily between Manchester and Liverpool, enger ee ent yen nO bedicin CODEC pe pee whereas the railway carried 700,000 passengers during its first traffic. CCUUS oc co gg opeedonaeestandoconiee 360,243 eighteen months. Wherever railways were made the carriage of Cattle .....406. te seeee been e ees 8,772 passengers was found to be one of the most remunerative sources MIXER 5). s.c.5s atetelslohetsiotele/cieterelsisieieteisiiels 87,244 dete : : i i emcee aes. ac eit 947189 ae of traffic. Nearly fifty years ago Porter, in his Progress of the LONG)... enc caceen Ber eerie an csc: 162 : Nation (1836), estimated that in Great Britain 82,000 persons daily, Roel Scodwead wee... 550,610 2,614,546 or 30,000,000 per annum, travelled ~~by coach an average distance i of about 12 miles each, at an average cost of 5s. for each passenger, Total train miles …..... doce 1,244,531 4,958,235 or 5d. per mile, whereas in 1881 upwards of 600,000,000 pass~~ Ballast (8 niles per hour)..... eae 1,045 73,292 : : : 1 Shangins GmmleemeeWean. eal 11237249 engers travelled by railway at a cost, taking averages, of 103d. ASSISHINE oo). 5.05.0.0 ee Rocsuetor 84,250 83,304 cach, which at the average rate of say 14d. per mile travelled would BIOpWe t roar ceteanesene Ao Ouomceo oe 81,327 253,794 represent an average length of 84 miles, at one-fourth of the cost Total onetime tiles | aaee-uu. 4,361,153 6,441,867 and in one-third of the time required by coach. ; i ; ; Table X. shows the total number of passengers of each class Difference of engine miles and train conveyed in 1883 :— Bless ee ee a 116,622 1,483,682 y : Difference per cent. of train miles…. 9°37 29°9 Fuel consumed— Second | Third Class CRED nc acaeiea steer sean te eae .s..| 12,076°8 tons = Country. First Class.| "Cjasg

| and Parlia-} Total. Come coer etic. 1. Tee Ae 11,484°0 _,, 117,679 tons ‘ mentary. JEUNE WAI TON. Gone onocenuod ee nk: 42:4 ib 53°4 tb eS os | Sa a », engine milerun …..... eee 83°8 ib 40:9 tb England and Wales ….| 29,897,866 59,083,508 | 523,420,384 | 612,401,758 », hourin steam …..... Giiier.,’ 804°5 ib 156°5 Ib COUMEMGL «5. 5.s,0,s.s:cenaieiere 4,790,982 2,835,687 | 44,404,858 D2 0312 it Cost for fuel per train mile, at 6s. 5°42d. Merge caRNGL se ors etievolatatelicvareen ets 1,692,029 4,177,589 | 13,408,234 19,284,852 DOTALOUL in. serene). «eee : ia ae Pen ann Gn Gn = Ge ator Tel a eae an faba. tek | 86,887,877 | 66,006,784 | 581,233,476 | 683,718,137”) ra per hour in steam …..... 540d.

aa

In general the lines of preponderating passenger-train miles run the greater number of miles per engine. The small mileage per engine of the London and North-Western line, with a relatively

The proportions of passengers, independent of season-ticket holders, were as follows (Table XI.) :—

eee ee ee eo ee eee 1 Season-ticket holders in addition :—England and Wales, 570,686; Scotland, 37,924 ; Ireland, 23,440; total, 682,050.

RALL WAY

First Second Third Country. Class. Class. Class. | Totals. Per cent. | Per cent. Per cent. England and Wales…..... 4: 9° 85°4 100 SGOHMBUE 5.5 cece esse cous 252 5-4 85-4 100 NVGIORE cc nccietie tae cece 8-8 21°6 69°6 100 Ete eter ee rerci cic aasios 5:3 9°7 85°0 100

The number of passengers conveyed in the year 1883 per mile of the mean length of railway open during the year was, in England 46,340, in Scotland 17,550, and in Ireland 7710,

The receipts from passenger traffic in 1883 are given in Table XII. (see below). The decided preponderance of third-class traffic shown in this table is the outcome of the work of years. In 1854 npwards of 111 million passengers travelled by railway, of whom 13 per cent. travelled by first, 34

by second, and 53 by third class and _parlia- mentary carriages. In 1873, the year before the Midland Railway Company ceased to carry second-class passengers, upwards of 455 million passengers travelled by railway, of whom only 8} per cent. travelled by first, 15 by second, and 763 by third class carriages, In 1881 upwards of 623 million passengers travelled by railway, nearly six times as many as in 1854, Of these only 6 per cent. were first and 104 sccond class passengers, whilst the third-class and parliamentary passengers rose to 833. Finally, in 1883 (as already statcd_in Table XTI.), 85 per cent. of the passengers were third class. The same movement is exemplified in the receipts, the mass of receipts gravitating towards third class, as shown by the following abstract per mile open for the years already men- tioned (Table XIII.) :—

First Second Third

Year. Class. | Class. Class. 1854 £349 £416 £382

1873 274 250 737 1881 209 190 846 1883 178 913

These figures show that in 1854 first and second together made up two-thirds of the whole receipts but that they steadily declined in succeeding proportionally but absolutely, —th trary, exhibiting a rapid increase, they were exactly one-third of th amounted to more than two-thirds engers. The reaction in first-class able because the number of first- millions—was nearly trebled in 1 exactly the same as in 1881,—about 38 millions ; whilst in 1883 there were nearly 364 millions. The explanation is probably to be sought partly in the fact that first-class fares have been reduced in many cases and cxpress fares have been almost entirely abolished, and partly to the increased habit of taking third class for long journeys, so that first-class journeys, bei have become less remunerative to t third class is by far the most remu traffic of railways ; pursued by railway companies in France, of discouraging third- class traffic. On

class receipts from passengers, years, not only e third-class receipts, on the con- insomuch that, whereas in 1854 e whole receipts, in 1883 they of the whole receipts from pass- reccipts is all the more remark- class passengers in 1854—143 873; that of 1873 was almost

or third-class carriages are deterrently uncom- vel who travel by necessity, On the contrary, low fares and ; they may almost be said to een recognized by the more in- The high speed of express trains —from 45 to 50 miles and upwards per hour—is, of course, an On ccrtain lines there are only d third. The Caledonian Raii- opt, about thirty-five years ago,

TABLE XII.—Receipts Jrom Passenger Traffic in 1883.

| class carriages, at the same time readjusting and lowering the fares, —the revised rates being 14d. and ‘1d, respeetively per mile for first and third class. The result was that in 1875 272 inillion passengers travelled on this railway,—nearly 5 millions more than in 1873, before the change was made ; whilst in 1881 there were 29 million travellers, of whom 27 millions were third and only 2 millions first class passengers; and in 1883 upwards of 31 million passengers were carried, of whom 29% millions were of the third and a little over 1¢ millions of the first class. The gross receipts for passenger traffic on the Midland Railway were, in round num- bers, £1,660,000 in 1878, £1,787,000 in 1881, and £1,904,000 in 1883, whilst the percentage of working expenditure remained the same. On the whole, it appears from the results of this grand experiment that the change has succeeded financially, whilst there is no doubt that it has stimulated the provision for and develop- ment of third-elass travelling on other railways. The gravitation of traffic to the lowest level is unquestionable ; and it is aided by the fact that third-class carriages have been (1885) for some years run with nearly all trains, fast as well as slow, and that the largeness of the number of third-class passengers has forced upon the management of the companies improvements in the popular class of carriage. As the downward movement of the classes con- tinues the outcome will most likely be a general reduction of the number of classes to two,—nominally first and third, practically first and second. On 1st May 1885 seeond-class carriages were abolished on the branch lines of the Great Northern Railway ; and, if the experiment answers expectations, second-class carriages will be abolished on the entire Great Northern system.

close analysis of goods traffic. goods or general merchandise co (Table XIV.) :—

Lanner

nveyed in 1883 were as follows

Total A General Mer- per aver- Country. Minerals, clinnilise Total. age mile open. ee a Tons. Tons. Tons. Tons. England and Wales …... 160,522,029 | 65,387,354 | 295, 909,383 | 17,100 Seotland'...7… 27,767,095 8,692,433 36,459,528 | 12,300 Ireland yess ae ce 1,196,458 2,817,569 4,014,057 1,600 Serer | 189,485,612 | 76,897,356 | 266,382,968 | 14,260

The receipts from mineral and goods traflic in 1883 are given in

Table XV. :— Mer- Live ; Country. lage: aeneie Minerals. Total. England and Wales …... £18,028,587 | £787,642 | £14,057,188 | £32,873,417 Scoflandme semen ss. Us 2,267,685 175,996 | 2,062,223! 4,530,691 NTGIANGEEE So ccs cote ccna. 952,215 208,808 136,010 1,297,033 NOt ac. oo £21,248,487 | £1,172,446 | £16,255,421 | £38,701,3191 Total per mile open £1137 £63 £870 £2070 Proportion per cent. of Gib rere hci ose 55°0 3°0 42°0 100

These statistics of merchandise and mineral traffie show that upwards of 266 million tons were conveyed in 1883 in the United Kingdom, seven-tenths of which were minerals, In 1857 71 million tons were conveyed, of which only two-thirds consisted of minerals ; whence it appears that a more rapid development of mineral traffic than of general merchandise took place in the interval.

The whole of the receipts directly earned on the railwa 1883, with the miscellaneous reccipts derived from rents, tolls, navigation, steamboats, &c., are brought together in Table XVI. (see below). The receipts per train mile from passengers and from goods and mineral traffic are reckoned exclusive of the receipts on railways working mixed trains; but all the receipts per train mile for passengers and goods together are divided by the total mileage run by all trains. In the last column the gross receipts, including miscellaneous receipts, are divided by the total train mileage.

1 Including £24,965 from goods-traffic receipts not classified.

Receipts from Passengers. Soh oS Countr, Pero te ountry. — Eo 28 4 é Mails. Gross Total. ; Second , Season Bo amo First Class. Cia Third Class. | tickets. Total. a SoS Heladtend Wales' 5 .56.240-/-00 see.) ee £2,998,905 | £2,859,017 £14,702,697 | £1,498,554 | £22,059,173 £2,562,166 | £483,542 £25,104, 881 2 A050 Seno CO eR EIRENE bb See ocbco een aacc. 450,010 147,085 1,661,281 146,038 2,404,414 336,742 144,021 2,885,177 eM ees na ssineceesa. Soe 221,138 323,642 686,086 47,999 1,278,865 126,447 113,363 1,518,675 SlSitea Me aeraeteiAs cscs cies ata oe eee eee eee £3,670,053 £3,329,744 | £17,050,064 | £1,692,591 £25,742,452 | £3,025,355 £740,926 £29,508, 733 exverage DEN MUSOPEN 2… 0c s— +2ce

87°2

The returns to the Board of Trade do not supply material for Goods The quantities of minerals and traffic.

ys in Receipts.

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RATLWAYT

TABLE XVI.—Statistics of Receipts earned in 1883.

: Merchandise and Passengers, Merchan- Mis- Total Receipts from Country. Passengers. Minerals. dise, and Minerals. cellaneous. all sources. Per train | 'Per train Per train Per train mile. mile. mile. | mile. £1 s. d. £1 | ies ide £ Se 3d £ £& Fes Bngland and WAlES oy sec cs asses eocccee aise «s| 29, LOE SSE 4 83°3 | 32,873,417 6 0°6 57,978,298 5 15 | 2,543,240 (60,521,538 5 42 BGOGIBNG Polis ses tecernnenianes's Hoar apoacG Gohoo ee | 2,885,177 4 00 4,530,869 5 58 7,416,046 4 9°8 269,447 7,685,493 4 11°9 PERCE occas. ale ees sa 5.0070 te Sea) go's ae 6 os waleel ahs 1,518,675 a 10:3 1,297,083 | 6 11°2 2,815,708 4 9°6 39,531 2,855,239 4 1074 Wer… A ohe.. se cececeess.| 29,508,733 | 4 27 |38,701,319 | 6 0-1 [68,210,052 | 5 0-9 | 2,852,218 [71,062,270 | 5 3°4 POtal per Maile OPEN:

Of the total receipts for passengers and goods, goods brought 56°8 per cent. and passengers 43°2. In 1857 the proportions were nearly the same,— 56 and 44 per cent. respectively. Vor the three king- doms separately the percentages for 1883 were (Table XVII.) :—

| : Minerals and | Passengers. Merchandise. Per cent. Per cent. Boglind and. Wales «csSEC. 2) 1 ie ee Sees ee ote sacacn cam mare o | 39°0 61°0 IRE a1, Re ICO Ue Gian oie nea ee ae ee | 54-2 45°8 TOtall .., .1iwt teh we ss eee | 43°2 56°8

The average traffic receipts per mile open in 1883 were distributed between the three kingdoms as shown in Table XVIII. :—

Per average Per Mile Mile open. per Week. Hnpland aed "Wales… 2. cccds. ccattoonnus £4415 £84°9 PCO UMMC etercyeisis ete sisicioe o octor-tsin- Ae tage 2509 48°2 IFEIIUO LS choice ere sc shieiee cise nes oe ae tpt 1134 21°8 Pleo IOs > fstogaliautisteveastsuctereeeaete £367 £70°6 DGtal, VEST criccescinessateme ys £2715 £52

These quantities for 1883 are proportionally for the three kingdoms as 4, 2}, 1. For the year 1857 the corresponding amounts were as 3, 2, 1, so that the growth of traffic in the interval has been greater in England than in Scotland, and greater in Scotland than in Ireland.

of expenditure of different kinds per mile open and per train mile run, and, in addition, the proportional expenditure of the different kinds in parts of the total working expenditure. The heads of expenditure are classified in this table in order to separate direct or really working expenditure from what may be called contingent or incidental expenditure not essential to the working of a railway, as rates, duty, compensation, &c. The direct or essential working ex- penditure is thus upwards of 32 millions sterling, or 86 per cent. of the whole sxpanelibare, The amount and proportion of the net receipts are shown by deducting the total working expenditure from the total receipts, as under :—

Per train mile.

Total receipts ….....£71,062,270, or 5s. 3°4d. or 100 per cent. Gross working expenditure…. 37,369,562 ,, 2s. 94d. ,, 526 i Net receipts …..... £33,692,708 ,, 28.6d. ,, 47-4

The net receipts available for payment of dividend are equal to

4°29 per cent. on the paid-up capital, and they were disposed for 1883 in the following fashion :—

On-ordinary capital …..... £13,725,933, equivalent to 4°68 per cent. On guaranteed and preferential CADMAD od ae eran Nelntiaya Banca 12,601,797 > 35 4:26 3 On bonus and debenture stock .. 8,254,643 BS 5 4°21 #4 Total payments …..... £34, 582,373 % 3 4-41 i Net available receipts …. £33,692,708 a ae 4°29

bed

The total distribution, it appears, exceeded the available net

receipts for the year by nearly £1,000,000. In explanation of the

TABLE X1X.—Statistics of Expenditure for the United Kingdom for 1883.

**

Table XIX. (below) contains a summary of the expenditure of the Working | railways of the United Kingdom for the year 1883, with the rate expenses,

8 ead Ba $ = – a 4 Contingent Working Expenditure. Ei eg o | oe) 24 a &® | ee = z = gg ne = O30! 6 : =| bar © a. .«|Ae ze | as "A nm, = 5 2 | a8 |oae/Ss2| & | 2 | 282) 2 |g |SesiS8elee| ase | 28] B45] £2 Country, | By | gS |S88|ES8| & | 5 | see] 22 | 2s ee /285 (282) Beh) ge | ene | az & Oo: B cn av ak ag be = So =SB= £2 | gs |#2p\ea=| g | & | S25 | $4 | 54 |AaE|EES G58] 858 32) See| 22 sv | ae | eee as | g | 8 | PA | & |B [bse eg isee| fae) se | gh) 2A 2 os a& | ge = 5 oS OSs Ses) & LED bell gl England Miles. £ £ | £ 2 i £ a I £ £ £ and Wales..| 13,133 [5,545,784 8,013,274 2,705,031, 9,705,382 1,384,598 /27,354,069 1,598,490 681,560 172,335|171, 237 314,13911,239, 878 338, 875 4,516,514 31,819,248 Scotland .,..| 2,952 | 774,038) 929,352*

471,806 1,096,011| 158,644) 3,429,851 181,047, 57,696 63,167) 19,883 45,657| 74,068 103,427| 544.945 3,974,796 Treland…. .| 2,484 ee 391,721, 130,909, 411,675} 80,595 1,439,876, 81,312 11,530) 6,821, 13,389} 11,010) 11,580 135,642) 1,575,518 Total ….1 18,569 16,743,798/9,334,347 3,307,746,11,213,068 1,623, 837|32,223, 796 1,860,849.739,256|247,032‘197,941 373,18511,324,956 453,882 5,197,101\37, 369,562 Working Expenditure per Mile open per Year. SE EE eee ee eee England Miles. | £ £ £ £ £ £ £ £ and Wales..) 13,133 422 610 206 739 105 2082 i 337 2423 Scotland ….| 2,952 262 314 160 371 54 1161 184 1345, Treland…...| 2,484 171 158 53 166 32 580 54 634 Total ….| 18,569 363 503 178 604 87 1735 my fl : | 280 2013

Total.

100 100 100

100

England / d. d. d. d. d. s. d. d, and Wales. ./226,351,389| 5°88 8°49 2-87 10°29 1:47 25 43 Scotland ….| 30,810,315] 6°03 7:24 3°68 8°54 1:24 2 28 44 Treland …... 11,735,532| 8-67 8-01 2°68 8-42 1°65 2 54 23 Total ….|268,897,236, 602 | 833 | 295 | 10°01 | 145 | 2 43 | ; 43 % Proportions of Working Expenses in parts of the Total Expenses. England per cent. per cent.|per cent.| per cent. Iper cent. | per cent. per cent. and Wales.. 17°4 25°2 8°5 30°5 44 860 : 14:0 Scotland …. 19°5 23°4 11-9 27°5 | 40 86°3 : 13-7 Ireland …... 26°9 24°9 8°3 26°2 5-1 91:4 8°6 Total …. 180 | 25-0 89 | 30-0 4°3 86-1 | | 13°9

1 Exclusive of receipts on railways in cases where the traffic is conveyed by mixed trains, 2 Exclusive of £51,335 received by the North London Company for working other lines.

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apparent discrepancy it may be stated that some companies had invested a portion of thcir capital in the stocks and shares of other companies ; that interest is occasionally paid on the capital of com- panies whose lines are not open for traffic; and that interest on loan capital is not always paid out

of net earnings. The appropria- tion of the gross receipts to working expenditure and dividends, according to the tabulated statement of expenditure, is summarily as follows, in parts of the gross reccipts :—

Per cent. Maintenance of way, works, &. ..... 9°5 MEGEOMO MVE PAWEL 55. acs s eee scare 13°1 Maintenance of carriages and waggons …..... 4°6 pUTUMOTOMPENSES Me. ceo 2os +5. eens nec nee 15°8 General chances v4.0. sion. cen ee 223 Direct expenditure on working …..... 45°3 Contingent expenditure on working …... 73 Total working expenditure…..... 52°6 Payments of interest and dividends…..... 47°4 GYOSSIRECCUPES ns .5:0:6 04 sisvare ccisvenie vicisiow ve oles 100

tribution In 1842 the total receipts amounted to upwards of £4,250,000. In of traffic. 1852 they were nearly £16,000,000, and during the thirty-one years

following they are given at intervals as in Table XX. :—

- Ben #23 | PECs Average ‘ Receipts | S2 |3aee Year Miles open. | Total Receipts. per Mile. sae BBs me id S a ee | | =I Miles Per cent. 1853 7,488 £18,035,879 £2408 £46 ay

1856 8,523 23,165,493 2718 52

1859 9,772 25,743,502 2635 51 a

1862 11,208 29,128,558 2599 50 49 1865 13,039 35, 890,113 2752 54 48

1868 14,438 Ye oaks oad ae

1871 15,457 48,892,780 8162 61 47 1874 16,266 59,255,715 3643 70 55 1877 16,975 62,973,328 3709 71 54 1880 17,815 65,491,625 3677 71 51

1883 18,569 71,062,270 3804 1e 53

Thus the receipts were quadrupled during the thirty years from 1853 to 1883, whilst the mileage of railway open was increased by two and a half times. The receipts per mile increased notwith- standing their continual dilution by the accession of new lines. These results, taken together, indicate

the inherent elasticity of the railway and its seemingly inexhaustible resources.

Of the main trunk-lines, which constitute the foundation of the Tailway system, those which converge towards and terminate in London—the metropolitan lines—are more important than the provincial lines. London is the great heart of the country and is the chief centre of commerce ; moreover, the metropolitan railways, taken together, possess a greater variety of traffic than others ; hence they are selected for discussion illustrative of the growing magnitude and distribution of traffic. On the nine metropolitan railways, including the London and Blackwall and the North London, in operation in 1854-57, Table XXI. shows the receipts for these four years; and the receipts for the year 1883 derived from the twelve metropolitan companies then' in operation are added for comparison :—

— ee

: Receipts Average ° Receipts ot Year. Miles open. Total Receipts. per Mile, as | 1854 2579 £9, 354,425 £3627 £70 1855 2664 9,920,609 3724 iil

1856 2778 10,559,658 3801 73 1857 2834 10,743,118 3790 73 1883 8649 43,389,062 5017 96

In the early years—1856, for instance—the metropolitan rail- way mileage open constituted one-third of the total mileage open, whilst it produced nearly one-half of the total traffic receipts of the United Kingdom, insomuch that the receipts per metropolitan mile were two-fifths more than the average total reccipts per mile. Recently—in 1883—though the metropolitan mileage open was less than one-half of the total mileage open of the United Kingdom, it earned six-tenths of the total receipts; and the receipts per metropolitan mile were one-third more than the average total on the whole mileage of the country. Lastly, the increase of receipts of the metropolitan lines is greater than that of the entire system. Whether, therefore, the increase of receipts be compared with the total receipts or with the mileage open, the traffic of the metro- politan railways increases the most rapidly, and it is also of the greatest absolute magnitude. But, to bring out clearly the relative importance and progress of the traffic of different districts, let us separate what may be distinguished as the coast

lines to the south and east of the metropolis—the Great Eastern, and the railways south of the Thames—from the interior lines to the north and west,

the Great Northern, Midland, North-Western, Great Western, and the three local lines, the North London, Metropolitan, and District. The receipts may be correspondingly classified and compared with the reccipts in other parts of the United Kingdom (Table XXII.):— a ae ae

Year 1857, Year 1883. ange average | Recspts || average | Receipt Miles open. ip = Miles open.| Per Mule per Week. per Week. | Miles. Miles. | Metropolitan interior lines 1515 £86°5 6236 £95°9 Metropolitan coast lines .. 1319 56°5 2413 98°0 | Other English lines not in- cluded in the above 3616 51°5 4484 73°5 | Seottish railways …..... 1183 40°5 2952 50°1 | Wirish wanliwwaiyst 22) cence oe 1044 – 21°0 2484 22:1) This comparative statement shows some strong contrasts. In 1857

the densest traffic in England, averaging £86, 10s., over 1515 miles lay to the north and west of the metropolis ; the railway traffic of the country was very partially distributed ; and, taking London as the great focus, the traffic radiated and converged in all directions, with decreasing intensity as the distance from the centre increased. In the year 1883, on the contrary, whilst the metropolitan traffic continued to be the densest, the. traffic of the metropolitan coast lines per mile open had advanced so rapidly as even to surpass that of the interior metropolitan lines,—the receipts being £98 pcr mile per week against £96. The rapid development of the southern lines passenger traffic is, as will be shown, the cause of the great advance in receipts. Further insight into the comparative conditions of intcrior and coast lines may be got by taking four great inland lines (Great Northern, Great Western, Midland, and London and North-Western), which are lines of prepondcrating goods and mineral] traffic, and contrasting them with four great coast lines of preponderating passenger traffic (South-Eastern ; London, Brighton, and South Coast; London, Chatham, and Dover; and South- Western). In the annexed table (XXIIL) for 1883 the average fare per passenger is calculated on the assumption that the fares formed 80 per cent. of the whole receipts for passenger trains, and the average length of a

passenger's journey is got by taking 85 per cent. of the passengers as third class at 1d. a mile and 15 per cent. as first and second class at 12d. a mile.

OF SSS

*| Four Metropolitan | Four Metropolitan ' Interior Railways. Coast Railways. Per mile Per mile | open. open. | Average miles open …..... GASGn ie 1,381 a Passenger train milesrun ….} 54,425,924 | 8,799 22,606,006 | 16,370 Goods and mineral train miles MUU Feito ns cusseiuayeiere ce aereisiexs oe 63,663,432 10,291 6,567,793 4,756 Total train milesrun …..... 118,089,356 19,090 | 29,178,799} 21,126 | Number of passengers …..... 159,686,870 | 25,814 | 131,002,266 | 94,860 |Tons of goods and minerals CONVEVCU Mr. cia… tee ose 94,870,258 | 15,340} 10,365,093 7,505 | Receipts from passenger traffic | £11,234,047 | £1,816 | £5,755,000 | £4,167 | Proportion of total receipts | 386 per cent. oe 72°3 per cent ba Receipts per train mile….| 4s. 3-07d._ | 5s. 1°09d. Average receipt per passenger 1s. 4°88d. 10°05d. VASERAR CRTANG)ci mre ch cay. oie. Is. 1°50d. 811d, | Approximate average length of passenger journeys …... 12 miles eis 74 miles 56 , Receipts from goods, &c¢..... £17,831,467 | £2,882 | £2,202,137 | £1,595 Proportion of total receipts | 61°4 per cent. an 27-7 per cent 54 Receipts per train mile….| 5s. 7-21d. | 6s. 8°46d, Average receipt per ton …... 3s. 9°09d. a4 4s. 3°00d. oe otal Teeeiptsy.. cs… cee ee £29,065,514 | £4,698 | £7,957,137 | £5,762 Der urainprmniles ey… ete cab TIGNES |) NR 5s. 5°45d. 25 Direct working expenditure ..| £13,461,020 | £2,176 £3,621,907 | £2,623 | ECAR JT (eRe a Rees o 2s, 3°36d. ae 2s. 5°80d. Ba i Special net receipts …..... £15,604,494 | £2,522 | £4,335,230 | £3,139 | Per cent. of total receipts… 53°60 a 54°48 30 Receipts per train mile….] 2s. 7°70d. a 2s. 11°66d. es Gapital raised ….....6.0. £275,582,620 £44,550 | £94,983,202 | £68,776 | Net receipts per cent. of capital 5°66 * 4°56 re*

The coast lines, being freer from competition, gct higher rates both for goods and passengers; but the inland lines have the advantage in direct working expenditure per train mile, and a still greater advantage in the much smaller capital raised per mile of line open, so that, in spite of compctition and low rates, they earn 5% per cent. on their capital as against a little over 44 earned by the coast lincs. The greater capital outlay

on the coast railways seems to be due to the costliness of stations and carriage stock for a preponderating passenger traffic; and as this more than outwcighs the gains from higher rates the statistics support the generally accepted opinion that goods and mineral traftic on railways is profitable and should be encouraged and developed. Mr R. Price Williams, an accepted authority on railway statistics, supports this conclusion. Mr F. R. Conder, on the contrary, who has deeply studied the question, maintains that the heavy mineral traffic of railways should be rclegated to the canals, which, though slow, are low in their charges.

Limployés.—In 1856 Robert Stephenson estimated that 1 per Em- cent. of the population of the United Kingdom was maintained ployés.

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by the railways then in operation, independently of the consider- able amount of labour employed on railways in course of construc- tion. On 31st March 1884 railway employés numbered in all 367,793 persons, or 19°69 per mile open, showing an increase of more than 50 per cent. on the proportion per mile in 1857, which was only 12°63. Table XXIV. gives details :—

| | Per Persons. Mile. |

Secretary s departmetile fo… 0. «cme: os owes or eee ne 4,199 “23 | General manager’s departments …..... 781 04 | Superintendent’s departments — Superintendents and assistant superintendents. . 143 Station-masters and clerks …....- ee Sensl aus 16,178 TEC ONG rj s aceciera Staessen 1 ‘cMseteale State ee 1,389 Guaads. 2.5.4 Saas «2 ae tas oe oe RR ely. 5,902 Signalmen and pointsmen …....:-..e0-2— 0: 19,012 WAGH CRC OME IORD an.ere Stevcareyarevsiny aes eres exenavet Siausseusieyaraitee 2,060 ea Shunters, porters, messengers, &c. .....25- 29,493 ays sie. | Goods manager’s departments— 74,177 | 3°97 | Goods and assistant managers …..... 113 ai ARCRUN ANGNCHET RS wit cf ciccte se selse sos oe wre es 17,058 IMBPEELOTO. ccs alas Becncs Hemeuaes ae acer oe 963 Guards and: PrAKeCSOON. gcse, 3% oiccereniare cre teres 0 Se 7,410 Shunters, porters, messengers, &c. ..... 44,169 mS ae Locomotive and carriage departments— 69,713 | 3°73

*Engineers and assistant engineers …..... 125 * ge AEDS 5.2758: 1092 16-79 veiele oeinede aauatsle io Pode 248 STV Spee gnden 60 paodnn ds cacse geo doo0us comidoe 2,013 Foremen, mechanics, and artisans …..... 47,130 Drivers and firemen 2.2. Jel. serdtmcres oO eens = 25,669 EEO RET 5 n;: siclavelal pis. $ eustsoigs 6 CPS slave ote Yemres Bic 43,141 |... =a Engineer's departments— 118,326 | 6°33 Engineers and assistant engineers …..... 201 be DP ramenbsmien Valen ace wee ss.cce sc Giamls as mores' aie 585 bo Clerics! Schrier. Sree ees toes is eee nalts Spo ee 782 $e MSOC ONE. rose mere Pate clahoe Clans slat cialis alae ©.ossuaua eta: 1,166 ae 58 POTOMIEN GWG (GABE o.oo oc ccrcyoinue'e 5 6s vin eserssees 8,020 a0 a0 Artisans and, MIGCHAMIER . ..ccccie ce cess cece cee: 10,539 oe "Fc Plate-layers, labourers, &c. ..... 59,316 s Ae 80,609 | 4:32 Storekeeper's departments …....000-0-eee- 2,820 15 Piles Geparrmaer es 5155.55.08 Ways sce ereracese whaisiecessiele «s 1,781 10 OAT OF. Seis elk Se Sse Dad eB ca ctuck daktae the esc 222 01 PELSOTA AN ad se oss iseee doe eels Seep es Fautlawtne 3,754 20 Canals, steamboats, docks, and piers …..... 8,004 43 Hotels, refreshment-rooms, and sundries…..... te 3,407 18 EB teal ate sae tager re weet Maa pors ete | 367,793 | 19-69*

From this table it may be estimated that there are now two drivers and two firemen for every 3 miles of line open. In 1857 there were only two drivers and two firemen for every 5 miles; and, though the train service has increased faster than the train mileage, the work of the drivers has sensibly diminished, each man on an average doing 20,950 miles as against 23,420 in 1857.

RAILWAY CONSTRUCTION.

The selection of lines of railway is mainly governed by the same principles as hold good for roads, but the cost of the rails renders it of greater importance to shorten the length of the route than to make slight savings in embankments and cuttings. The first step in the survey is to ascertain the positions of the watercourse and

watershed lines of the district to be passed through. The general | ©

direction having been selected by the help of an ordnance map, a sketeh-map, or a special reconnaissance survey, the river-crossings are to be examined and decided upon, and the points determined at which the watersheds are to be crossed and the approaches to bridges set out. Trial lines should be run between the points thus fixed, and the country should be carefully examined on each side of these before the route is finally decided on. Sharp curves and steep gradients are in themselves evils, involving special cost for maintenance and for working, although original outlay may be economized by the adoption of them. A straight and horizontal surface is assumed as the standard of perfection ; and the proper business of the engineer in laying out a railway is to harmonize the engineering and the financial conditions of the problem so as to yield the highest practicable return on the money expended, and to see that, whilst the railway may be neither quite straight nor quite level, it shall not be unduly costly in construction from ex- cessive cutting, tunnelling, and making of embankments, in order to obviate severe curves and gradients, nor excessively cheap from following the surface of the ground too closely and incurring heavy gradients and severe curves, and as a consequence heavy working expenditure.

Cuttings and Embankments.—Engineers endeavour so to plan the works of a railway that the quantity of earth to be excavated shall be equal to the quantity that goes to form the embankments. The earthwork is the foundation and support of the superstructure, and as such it must be uniformly firm, of hberal width, easy slopes, thorough drainage. Figs. 10 and 11 are type-sections of cuttings and embankments for a double line of way on the national gauge, showing the "formation" surface and the ballast on which the permanent way is supported, with the slopes, the side drains, and the feneing. Fig. 12 is a type-section of the permanent way on the national gauge, settled by Mr John Fowler for the South Wales Railway. Upon the formation level the ballast is deposited, 2 feet

in depth at the centre, dressed level, for about 22 feet in width for a double line of way. The sleepers and chairs are buried in tle

Fic. 10.—Type section of a cutting. ballast, and the rails partially also, these standing 2 or 3 inehes above the ballast. The intermediate space between the two lines of way is, as before stated, 6 feet, and, taking the lengths of the

Level of Rails

Fic. 11.—Type section of an embankment, sleepers at 9 feet, the total width for two lines of way over the

sleepers is 6 feet + 4 feet 84 inches + 24 inches x 2 (width of the rails) + 9 feet = 20 feet 14 inches; and it is seen that, as the

Fic. 12.—Type section of permanent way.

ballast is 22 feet wide at the upper surface, it extends to nearly 1 foot beyond the ends of the sleeper at each side and about 34 feet beyond the outer rails at each side.

The slopes of cuttings vary aecording to stratification, soil, direc- Cuttings.

tion of the vein, moisture. In gravel, sand, or common earth the slopes rise 1 foot for 1 to 14 or 2 feet of base'; in solid rock the slopes are nearly vertical. Cuttings are as deep as from 50 to 100 feet below the surface, and embankments as high above. The London and Birmingham Railway had upwards of 12 million enbic yards of excavation, and 104 millions of excavation in the original estimates, or above 100,000 cubic yards of earthwork per mile. The heaviest cutting on the line is at Tring, 24 miles long, averag- ing 40 feet deep, the greatest depth being 60. In the case of the great Blisworth cutting the strata were unequal in consistency. About halfway up the face of the eutting a stratum of limestone rock, 25 feet in thickness, was found, with loose strata below and above it, and it was necessary to prevent the lower stratum, con- sisting of wet clay, from being forced out under the superincum- bent mass by undersetting. A rubble wall, averaging 20 feet in

height, was built on each side underneath the rock, strengthened by buttresses at intervals of 20 feet, resting on inverted arches carried across

underneath the line.

A puddle-drain was formed

Fic. 13.—Blisworth cutting ; west end.

behind each wall, with a small drain through the wall to let off the water from behind. Fig. 13 is an elevation of the west end of the cutting where it is | _ about 40 feet deep, show- =. =

ing clearly the method = Ba of undersetting, and fig. ashe. 14 is a cross section of x= oe ae the side walls at the ~~ er, same place, where the ~ a – left-hand shows a sec- |=s- SSeS goss =. tion of the wall in the ~SS3== ita >”

i ies a ge Fic. 14.—Section of the same cutting. through a buttress, together with the invert and drains. One of

the walls is shown in front elevation in fig. 15. The New Cross cutting through the London clay, on the South-Eastern Railway, is 2 miles long, = 2c and is for some Z distance from= 80 to nearly 100 feet in depth. This cutting affords an example of the tendency of some soils to slip. The slopes of the cutting were finished at 2 horizontal to 1 vertical; and they remained as thus finished for

ee r n mi

Fia. 15.—Wall of the same cutting.

Tunnels.

RAILWAY

about two years, when, after continued bad weather, the slopes commenced slipping to such an extent that the line was rendered impassable for some weeks, and parts of the slopes were reduced to an inclination of 4 to 1, The Winchburgh cutting, on the Edin- burgh and Glasgow Railway, is 4 miles long and from 25 to 60 feet deep, through solid rock. It is succeeded by an embankment 13 miles long and 60 feet high, followed in immediate

succession by a stone viaduct half a mile long and 80 feet high. The Olive Mount eutting of the Liverpool and Manchester Railway is 2 miles long and at some places 100 feet deep.

Perhaps the most interesting case of embankment and cutting in combination is that of the crossing of Chat Moss, on the Liverpool and Manchester Railway. The moss was 44 miles across, and it varied in depth from 10 to 30 feet. Its general character was such that cattle could not stand on it, and a piece of iron would sink in it. The subsoil was composed principally of elay and sand, and the railway had to be carried over the moss on the level, requiring cutting and embanking for upwards of 4 miles. In forming 277,000 cubic yards of embankment 670,000 yards of raw peat were con- sumed, the difference being occasioned by the squeezing out of the water. Large quantities of embanking were sunk in the moss, and, when the engineer, Stephenson, after a month's vigorous operations, had made up his estimates, the apparent work done was sometimes less than at the beginning of the month. The railway ultimately was made to float on the bog. Where em- bankment was required drains about 5 yards apart were cut, and when the moss between them was dry it was used to form the embankment, Where the way was formed on the level drains were cut on each side of the intended line, and were intersected here and there by cross drains, by which the upper part of the moss became dry and firm. On this surface hurdles were placed, 4 feet broad and 9 long, covered with heath, upon which the ballast was laid.

Tunnels. —The relative costs of rock-cuttings and cuttings in clay do not greatly differ; for, not only does the vertical rock-

entting require less excavation than the wide yawning earth- eutting of the same depth, with extended slopes, but, when it is executed, the rock-cutting is not liable to the expensive slips which sometimes overtake the other, usually cheaper to tunnel. The tunnel (see fig. 16) under Callander ridge near Falkirk station, | on the Edinburgh and Glasgow Railway,

is a fair representation of

=

lway.

tunnels as usually constructed. It is lined with brick 18 inches thick, founded on stone footings of greater breadth, in order to throw the load securely upon the subsoil, as shown in the trans. verse section. The sides and roof of the tunnel are curved from footing to footing, so as effectually to resist the inevitable external pressure of the earth, to a span of 26 feet in width and a height of 22. The sectional view shows also the centering or timber framing employed in the building of the tunnel, which was braced diagonally and transversely to resist the unavoidable inequalities of pressure without alteration of form whilst the arch was in course of construction. Externally the entrances are built of stone, and the flank walls are 3 feet in thickness, with counterforts at inter- vals, This tunnel is not straight, but is formed on a curve of 1 mile radius, and is 830 yards, or nearly half a mile in length.

The Kilsby tunnel, on the London and Birmingham Railway, was rendered necessary by the opposition raised to the line passing through Northampton. It is driven 160 feet below the surface and is 2398 yards in length, 30 feet in width, and 30 feet high, constructed with two wide air-shafts 60 feet in diameter, not only to give air and ventilation but to admit light enough to enable the enginc-driver in passing through it with a train to see the rails

For depths excceding 60 feet it is |

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from end toend. The construction of the tunnel was let for the sum of £99,000, but, owing chiefly to the existence of unseen quicksands, the tunnel is stated to have actually cost nearly £300,000, or £125 per lineal yard.

The Box tunnel, on the Great Western Railway, between Bath and Chippenham, was another difficult and expensive work. It is about 70 feet below the surface, and is 3123 yards in length, or rather more than 12 miles ; the width is 30 and the height 25 feet. Where bricked, the sides are

constructed of seven and the arch of six rings of brick, and there is an invert of four rings. There are cleven air-shafts to this tunnel, generally 25 feet in diameter.

The tunnel under the Mound at Edinburgh (see fig. 17), on the Edinburgh and Glasgow Railway, of tunnels formed with inverts,— that is to say, inverted arches built under the rails. The figure is a transverse section, showing the truly circular arch of the tunnel, 28 feet in diameter and 20 high above the rails, built of brick 3 feet thick, stiffened with counterforts ex-

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at Edinburgh.

Mound was a mass of loose earth and rubbish on a boggy soil, hence the necessity for the invert arch, on which the tunnel may be conceived to float.

The Shakespeare tunnel, or, more correctly, double tunnel, driven through the Shakespeare Cliff near Dover, on the South-Eastern Railway, is in fact two narrow tunnels, carrying each one line of rails (see fig. 18), 12 feet wide and 30 in extreme height, through

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Fig. 18.—The Shakespeare tunnel, on the South-Eastern Railway.

the chalk, separated by a solid pier or wall of chalk 10 feet thick. The chalk is of variable quality, and the greater part of the tunnel is lined with brick, strengthened by counterforts at 12 feet intervals, which carry the weight of doubtful beds of chalk. The tunnel is 1430 yards, or upwards of three-

quarters of a mile in length, rising westward with an inclination of 1 in 264. The tunnd being within a short distance of the face of the cliff, the material excavated was discharged through galleries about 400 feet long, driven in from the face of the cliff, into the sea, —the first operation being to run a bench or roadway along the face of the cliff. There are seven vertical shafts from the surface, averaging 180 feet deep.

There were in 1857 about 70 miles of railway tunnelling in Great Britain, or 1 mile of tunnel for 130 miles of railway. There are now (1885) probably at least 100 miles of tunnelling. The cost of tunnelling has averaged £102 per mile. The longest tunnel is the Woodhead, at the summit of the Manchester, Shefficld, and Lincolnshire Railway, being 3 miles and 60 feet long. The tun- nelling on the Metropolitan Railway is noticed below, p. 239,

Bridges and Viaducts.—There are very few level crossings on Bridges.

English railways—that is, the crossing of one railway with another, or with a common road, at the same level—the chances of accidents having demanded, in general, the construction of bridges over or under the railway. The general appearance of an ordinary stone or brick bridge is represented by fig. 19, showing in elevation a bridge over or under the railway. The minimum height of a bridge over the railway is ruled by the elevation necessary to clear the top of the chimney of the locomotive. An excellent method of carrying roads over railways, where the height is limited and the span is moderate, consists in erecting flat-arched cast-iron beams over the railway, and throwing brick arches of small span between the beams upon their lower flanges, to carry the roadway. Thus the vertical depth from the soffit or crown of the main arch to the roadway above may but very little exceed the depth of the beam, which is apparent in the sectional view. This method of construction is, moreover, well adapted for skew-bridges, Cast-iron

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Viaducts.

Forth Bridge.

has, however, as a material for railway structures, been very gen- erally superseded by wrought-iron, forming plate girder bridges. Timber is now almost unheard of for railway bridges on account

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E E => Fic. 19.—Ordinary bridge over or under a railway. The left-hand side is for a cutting, and a bridge over the railway ; the right-hand side is for an embank- ment and a bridge under the railway ; the difference is in the foundations. of its want of durability and stiffness ; and such bridges as have formerly been built of timber in Great Britain are being rebuilt of stone, brick, or plate-iron. The longest viaduct in England is perhaps the Congleton, on the

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Manchester and Birmingham Railway ; it is of stone, 1026 yards or more than half a mile in length and 106 feet high, and it cost £113,000, or £113 per yard run. The Dane viaduct, on the same line, is of brick, 572 yards long and 88 feet high, and it cost £54,000, or £96 per yard run, having 238 arches of 68 feet span. The Avon viaduct, on the Midland Railway, is of brick, 240 yards in length and 51 feet high, with 11 arches of 50 feet span ; it cost £14,000, or £60 per yard run. For comparison it may be stated that the Britannia Tubular Bridge across the Menai Straits, 616 yards long and 104 feet high, cost £600,000, or £974 per yard run. On the different lines entering London there are several miles of brick viaducts in the approaches to termini, and also at Manchester and other large cities and towns. Many interesting details might

be given as to bridges and viaducts of the larger kind, but we must- here confine ourselves to some account of the Forth Bridge, now in course of

construction at Queensferry, referring the reader for other examples to the article BrIDGEs.

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Fic. 20.—The Forth Bridge.

The Forth Bridge, designed by Mr John Fowler and Mr Benjamin Baker, is the largest and most remarkable railway bridge in the world. One of its spans is shown in elevation and plan in fig. 20. The bridge consists of 2 spans of 1700 feet each, 2 of 675 each, 15 of 168 each, and 5 of 25 each. Including the width of the piers, there is almost exactly 1 mile of main spans and half a mile of approaches by viaducts, making together about 14 miles of total length. 'The clear headway under the centre of the bridge is 150 feet above the level of high water, and the highest part of the bridge is 361 above the same level. Each of the three main piers consists of a group of four cylindrical piers of masonry and concrete, 49 feet in diameter at the top and from 60 to 70 in diameter at the bottom. The deepest pier is about 70 fect below low water, and the rise of the tide is 18 feet at ordinary spring tides. In the piers there are about 120,000 cubic yards of masonry and in the superstructure 44,500 tons of steel. The contract was let for the sum of £1,600,000, being at the rate of £645 per lineal yard. An impression of the magnitude of the bridge is derived from a comparison with the largest railway bridge in England, the Britannia Bridge, which has a span of 465 feet, the ratio of which to that of the Forth Bridge—1700 feet—is as 1 to 3°65. The site of the Forth Bridge is at Queensferry. At this place the Firth of Forth is divided by the island of Inchgarvie into two channels, which, being as much as 200 feet in depth, precluded the construction of intermediate piers. Hence the adoption of two large spans of 1700 feet each, between which the central pier is founded on the island midway across. The bridge is composed of three double lattice-work canti- levers, like scale-beams, 1360 feet in length, poised on three sub- structures, and connected at their extremities by ordinary girders 350 feet long, which complete the main spans. The bridge is taper in plan, varying from a width

of 120 feet—the distance apart of the lower members of the cantilevers at the piers—to a minimum of 314 at the ends, in order to confer a degree of stiffness laterally, for resisting irregular stresses, wind- pressure in particular. The columns above the piers, forming the basis of the cantilevers, are 12 feet in diameter. The lower booms, as well as the struts of the cantilevers, being the members in compression, are circular in cross section, this form of section having been selected as the most effective for resisting compressive stress. The lower boom is at the piers 12 feet in diameter, constructed of plates 1} inches in thickness. The size is gradually reduced towards the ends, where the diameter is 5 feet, made of plates three-eighths of an inch in thickness. Correspondingly the upper member of each cantilever is a tapering box-lattice girder, rectangular in section, 12 feet deep by 10 wide at the piers, and 5 feet by 3 at the ends. The central girders are 32 feet apart. The wind-pressure is assumed for calcu- lation at a maximum of 56 fb per superficial foot. It is calculated that the maximum possible stress on any member of the bridge is at the rate of 74 tons per square inch of section. The required ultimate strength of steel under compression is from 34 to 37 tons per square inch, and under tension from 30 to 33 tons. Between the two main girders the double line of way is to be carried on an

internal viaduct (see smaller figure in fig. 20), supported by trestles and cross girders. The way will consist of heavy bridge rails, Brunel section, laid on longitudinal sleepers bedded in four steel troughs, into which the wheels will drop in case of derailment, and then run on the sleepers.

Railway Stations.—Railway stations are either "' terminal" or Stations.

"intermediate." A terminal station embraces (1) the passenger station ; (2) the goods station ; (3) the locomotive, carriage, and waggon depéts, where the engines and the carrying stock are kept, cleaned, examined, and repaired. At many intermediate stations the same arrangements, on a smaller scale, are made ; in all of them there is at least accommodation for the passenger and the goods traffic. The stations for passengers and goods are generally in different and sometimes in distant positions, the place selected for each being that which is most convenient for the traffic. The passenger station abuts on the main line, or, at termini, forms the natural

terminus, at a place as near as can conveniently be obtained to the centre of the population which constitutes the passenger traffic. The goods station is approached by a siding or fork set off from the main line at a point short of the passenger station. Terminal branches of the railways—where, for example, there is a sharp incline—are sometimes worked by stationary engines and ropes to the point where the locomotive joins the tram. The loco- motive station is placed wherever the ground may most conveni- ently be obtained, at or near to the terminus; in some cases it is found at a distance of 3 or 4 miles. An abundant supply of good water and ample means of drainage are important at stations. There should be ample area of land to adinit of the greatest possible extension of accommodation, and the erection of buildings on land adjacent to the station grounds should be discouraged. Companies have been compelled to repurchase at greatly advanced cost land originally disposed of by them as "surplus," and generally with a view to building operations. When this course is adopted prudent managers should take care to secure in the conveyance power to repurchase the freehold at original prices, with allowance for out- lay in building or otherwise, by valuation.

In laying out the approaches and station-yard of passenger Arrange- stations ample width and space should be provided, with well- ment of defined means of ingress and egress to facilitate the circulation of termini.

vehicles, and the setting-down pavement should be as long as possible, to admit of several carriages discharging passengers and luggage at the same time. The pavement should be wide and sheltered from the weather by a roof, overhanging beyond the kerb, or spanning the roadway, but in all cases free from columns. The position of the main buildings relative to the direction of the lines of rails is the distinguishing feature in terminal stations. When space permits, the usual course is to place them on the departure side parallel to the platform, but they are frequently placed at the end of the station at right angles to the rails and platforms. Or these two systems are combined in a third arrangement, in which the offices are placed in a fork, between two or more series of lines and platforms. Of the metropolitan termini, the Great Northern

Plat- forms.

Roofs,

RAILWAY

passenger station, the Great Western, and the South-Western sta- tions are examples of the first class; the London Bridge, Cannon Street, Charing Cross, and Victoria stations (comprising the South- Eastern and the Brighton lines), and the Great Eastern and the Fenchurch Street stations (comprising the North London, Black- wall, North Woolwich, and Tilbury lines), are examples of the second class; and the London and North-Western station is an example of the third class. The first and usual class of stations commands the greatest length of setting-down pavement, ample space for booking and other offices, waiting-rooms, &e., and the shortest average distance for passengers and luggage from the offices to the outgoing trains. Nevertheless, where the traffic is various, involving the despatch of numerous trains to different 'points in quick succession, and necessarily with perfect regularity, the second system is the best. But where the frontage is limited, and where trains start at some distance from the entrance, there is inconvenience in the movement of luggage over a crowded platform. The third plan is probably the least commodious of the three ; but it has the advantage of affording two arrival platforms, with car- riage-roads alongside, the others having but one so situated. In all the classes, it may be observed, transverse lines are inserted with turn-tables, to place all the lines in compact communication for turning on or off spare carriages, loaded horse-boxes, or carriage- trucks. Independently of the turn-tables, the lines of rail are con- nected by switches or points converging towards the two main lines of rail, outgoing and incoming ; and thus the assortment and marshalling of trains may be effected by horse or engine power independently of the turn-tables. Each plan of station comprises one or more large turn-tables for reversing the engine with its tender together.

The correct arrangement and appropriation of the several lines of

railway in a terminal station materially affect the economical and efficient working of the traffic. It is essential that every traffic line, both in and out, should be provided with one or more spare sidings, in addition to those set apart for the break-vans, horse-boxes, and carriage-trucks, and for the locomotive department. All these lines should communicate with each other

by means of points and crossings, to allow of shunting with engine-power, and to reduce to the lowest limits the number of turn-tables or their substitutes. Curves ouglit never to have a radius of less than 800 feet.

The practice with regard to the height of platforms above the rails has varied cousiderably, the tendency being to raise them much higher than was usual at first ; 3 feet may be stated as the limit in this respect. Too much attention cannot be given to the necessity for obtaining the greatest possible width of platform. Where the platform is used on one side only, the width ought never to be less than 20 feet; and when both sides are required 30, or even 40, should be allowed. The best mode of constructing the platform is undoubtedly with stone slabs laid hollow upon longitudinal walls, so as to admit of carrying beneath it the water and gas pipes, telegraph or signal wires, and the general drainage, with free access to each. Cutting out for turn-tables and openings for cross lines of rails are frequently inevitable difficulties, which have given rise to various ingenious contrivances, as shifting-stages, drawbridges, &. By far the best substitute for the turn-table yet introduced is the traverser. If well made and carefully worked and attended to, the shifting of carriages from line to line can be per- formed without extra manual labour or interference cither with the rails or the platforms. The other objection is best met by the use of easy inclines, with crossings on the rail-level. Where the plat- forms do not exceed 2 feet in height and the surface is smooth, gradients of 1 in 10 are not too steep for luggage-barrows, nor are they dangerous in a crowd.

The carlier terminal railway stations were designed either with intermediate columns supporting the roof or with brick walls, vary- ing in number of spans from two to five or six. It often happens that in the course of a few years such stations have to be remodelled to meet the constantly increasing traffic ; and great difficulties are occasionally met with in the rearrangement of platforms which are wasted where lines of rails have been laid, whilst rails are wasted where platforms are placed, and where columns interfere. To allow engines and carriages to pass from one line of rails to another at the shortest possible intervals it becomes necessary to have diagonal crossings from one part of the station to another in many directions, while at the same time the free movements of pass- engers and luggage on the platforms must not be impeded. Thus there arose a system,

originated, it is believed, in the great Con- tinental termini, of constructing roofs in two spans, one covering the up lines of rails and the other the down lines. King's Cross passenger station is an example of this kind. The principle of wide spans for the roofs of railway stations, clear of intermediate walls or columns, was adopted in England probably for the first time in 1848-49, in covering Lime Street station, Liverpool, on the London and North-Western Railway, by one span of 153% feet. The extreme length of the roof was 374 feet. The new Lime Street station, it may be added, is covered by a roof of one span of 212 feet. Tythebarti Street station, Liverpool, on the Lancashire and

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Yorkshire Railway, is covered by a roof in one span of 136 feet; there, as the traffic increased, the lines and platforms were changed so as to admit of treble the quantity of traffic being conducted, which would have been impossible if the roof had been built with sectional spans and columns. pany has been repaid the excessive cost of the single-span roof many times over in economy of working. The next single-span roof on a large scale appears to have been that of 212 feet covering the New Street station, Birmingham, in which five lines of way, belonging to different companies—the London and North-Western and others—meet and concentrate passenger and goods traffic of every description. The roof was 840 feet in length, with trusses or principals placed at intervals of 24 feet. of one arched plate-iron girder 15 inches deep, having a rise of 454 feet at the centre. bar 4 inches in diameter, from which the arch is strutted at inter- vals. This issaid to cover the largest area of any station in England. The Cannon Street station of the Charing Cross Railway is the Caunoa terminus of the City extension of that line, giving direct access to Street the City of London for the South-Eastern Railway, and linking the station.

It is averred that the railway com-

The principal consists

The ends of the arch are tied by a round tie-

Charing Cross station at the west end with the City. During the

year 1867—the first year the extension was open for traffic—about

8 million passengers used the Cannon Street station, of which nearly one-half were local passengers booked between Cannon Street and Charing Cross. The length of ground between the river Thames and Cannon Street is 855 feet, of which the fore-court occupies 90, the booking-offices 85, and the shed or covered portion of the station reaching to the river 680. The station is 201 feet 8 inches wide outside the walls and 187 feet inside. The whole of the station is built on a substructure of brick piers and arches, ex-cepting the booking-oftices and the part which is over Upper Thames Street. 'The ordinary piers are 5 feet thick with footings 8 feet wide, resting on a bed of concrete 10 feet in thickness, and the whole of the under structure is made available for storage and other purposes. The rails and platforms are carried across Upper Thames Street on wrought-iron girders 24 feet deep to 87 feet of span. The floor of this bridge is of creasoted Baltic planking 8 inches thick. The walls of the station are of brick-work, 45 feet high above the level of the platform. They are built in piers 6 feet 44 inches thick and panels 2 feet 74 inches thick. The roof is of one clear span of 190 feet 43 inches circular, having a rise or versed sine of 60 feet at the centre, composed of ribs constructed of plate- iron and angle-iron, and, like ordinary girders, 21 inches deep, each foot of each rib being ticd by a tie-bar of round wrought-iron 5y's_inches in diameter. The tie-bar rises 30 feet and the depth of the truss at the centre is 30 feet. One end or foot of the rib is fixed to the supporting wall and the other end is placed on rollers, by the aid of which the principal or truss is free to expand or to contract according to the variations of temperature. The trusses are placed at from 33} to 35 feet apart. The bookiug-offices, wait- ing-rooms, &c., are at the end of the station on the ground floor of the building, which above and below them forms the City Terminus Hotel. Parcels offices, stores, cellarage, &c., are provided in the basement, with hydraulic lifts worked by direct pressure from tanks in the towers at the south end. The used water is discharged into tanks about 9 feet above the level of the platform, whence it is again utilized for the general purposes of the station. There are nine lines of way in the station, of which eight run alongside five platforms, and one line is space for stock and for standing-room. The two outer platforms are employed for the short traffic to Greenwich and Mid-Kent and to Charing Cross, 184 feet wide by 522 and 486 feet long respectively. The general departure platform

is 665 fect long and 19 wide; and the two general arrival platforms, one on each side of the cab road, are 721 fect long by 124 wide. On this system there are two lines of rail to each platform, reckon- ing the general arrival platforms as one; accommodation is thus found for 4788 lineal feet of trains. These nine lines of way con- verge and merge in five lines of way over the bridge for a length of about 600 feet, constituting the station-yard. The first line, on the western or up-stream side, is exclusively for trains proceeding from Cannon Street to Charing Cross ; the second line is for trains approaching Cannon Street, whether from London Bridge, the country, or Charing Cross; the centre line is exclusively for trains from London Bridge or the country ; the fourth is the main down line ; the fifth, or east line, is for engines going to or from the engine depét at the far end of the bridge, or for engines wait- ing for their trains. The movements of the trains are regulated from the signal-bridge, which crosses the converged lines of way at a distance of about 140 feet from the south end of the station, by means of about forty pairs of points, with twenty-four sema- phore arms, eight of which are for trains outward and sixteen for trains inward. The signal-box on the bridge is 42 feet long and 9 wide, and contains sixty-seven levers, by thirty-seven of which signals on Saxby and Farmer's system are worked, and by thirty the points are worked. Several of the point-levers work the switches at both ends of cross-over lines. The signals lock the points and each other, so that no contradictory signals can be

given ; nor can ingress to or egress from a platform be given until the points are set accordingly. There are in the locking frame thirty-two slides and about a thousand locks, and an idea of the duty that falls on this apparatus may be formed from the fact

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The goods and mineral station at King's Cross may be selected as King's an example of such stations. It comprises coal depots and wharves, Cross potato-stores, engine-sheds, repairing sheds, stores, stables, and all goods the necessary offices, buildings, and appliances required for the station,

St Pan- eras.

that 775 trains have passed under the signal-bridge in a single working day (Whit-Monday), and that, each train being reversed here, a fresh engine has to be attached to it, the superseded engine being passed into a siding. In the course of thirty-five minutes one morning thirty-five trains were signalled and passed in or out of the station. The duty of signalling is performed by two men.

The cost of the works of the Cannon Street station, with the cost for Charing Cross station for comparison, is shown in Table XXV. (below). The substructure is reckoned to the forimation- level, inclusive of the public footway under Charing Cross station and the public roadway under Cannon Street station, but exclusive of the river abutment of the bridge. The superstructure includes the fore-court, booking-offices, fittings, towers, roof, gas and water mains, &c., excluding the permanent way.

The total cost of the works of the whole Charing Cross Railway, from London Bridge station to Cannon Street and Charing Cross, with the terminal stations, was £1,160,118. The cost of the land for the whole railway, after deducting the value of surplus land, Hungerford Bridge, pier tolls, &c., was £1,900,000, making a total for land and works of over £3,000,000. For this sum there are 44 miles of railway for double line, the cost being at the rate of £680,000 per mile. The works include two large bridges over the river Thames, a number of expensive bridges over streets, viaducts, and two large metropolitan termini. The cost for land at Cannon Street station was at the rate of £3, 15s. 7d. per square foot, and that at Charing Cross station was £2, 18s. 5d.

St Pancras passenger station of the Midland Railway is the most recently constructed metropolitan terminus. The approach to the land on which the station is built was crossed by the Regent's Canal, and in order to secure good gradients and suitable levels for metropolitan suburban stations the main passenger line is carried over the canal ; and, as a result, the level of St Pancras station is from 12 to 17 feet higher than that of the adjoining roads. The St Pancras branch, on the contrary, for effecting a junction with the Metropolitan Railway, leaving the main line some distance from the terminus, descends through a tunnel beneath the Regent's Canal and the

passenger station, as well as under a considerable length of the main line. The height of the rails above the ground- level admitted of the construction of a lower floor with direct access to the streets, built and arranged for Burton beer traffic. The floor of the station is supported on girders and columns extending from side to side and acting as a tie for the roof girders, which start from the ground-level and form the roof as a single arch. The ribs or girders forming the roof are laid to a clear span of 240 feet ; the walls built between the ribs are 2454 feet apart. The clear height of the ribs above the level of the platforms is 96 feet at the centre. The length of the station is 689 feet 4 inches. The lower floor contains 720 cast-iron columns set on brick piers, and 49 rows of principal girders across the station, with 15 rows longitudinally. Upon these intermediate girders are carried, and the whole is covered in with Mallett's buckled plates. The cost of the ironwork of the floor was £57,000, being at the rate of £3, 0s. 6d. per square yard. The roof girders, twenty-five in number, are placed at intervals of 29 feet 4 inches, except at the outer end, where the last two girders are only 14 feet 8 inches apart. The cost of the roof, including covering, with two gables and screens, amounted to £69,365, being at the rate of £40, 18s. per square of 100 square feet or 10 fcet square. If there had not been any floor-girders to act as roof-ties, the extra cost for ties at the level of the floor would have been about £1 per square.

Table XXVI. gives the spans and areas covered by the roofs of some of the principal London passenger termini :—

goods and mineral traffic of the company. Twelve lines of rail run into the goods-shed, with a platform at each side for the receipt and despatch of goods. On the outer side of the rails, within the building, space is reserved for the vans engaged in collecting and distributing the goods. The outer line of rails at the east side of the platform is used for unloading the waggons with the inward goods, and that on the west side for loading the outward goods. The inner lines nearest to these are used for the arrival of goods trains, for empty waggons, and for making up trains for departure. The waggons, after being unloaded, are taken by means of turn- tables and cross-roads to the departure side of the station, where the business of loading and despatching them is carried on. The platforms have each two rows of hydraulic cranes, of 1 and 2 tons lifting power alternately. The

receiving offices are on the plat- forms, but the general offices are adjacent to the main building.

| | Cannon Street. Charing Cross. The stables are under the platform ; the granary is at the south "Area, exclusive of fore-court ….| 152,632 square feet | 103,672square feet | | end of the goods-shed, through which it is approached by two lines Substructure… 6… cee ee ee | £74,962 fe £41,422 i) running through the middle of the shed,—two other lincs, one on

» per square foot…./ _.. 9s. 10d. 8s. each side of them, being reserved for full waggons. When emptied, oan eaeige | HE 208. 7a bee os sites the waggons are removed by two lines which run one on each outer

*. : —— es __*_| | side of the goods-shed. The shed and the granary are supplied*

Total ….....-.-0+- 2232, 224 vo £153,026 oy with water communication through tunnels under the roads to a

2 PO ee aca 29s. 7d. | | basin on the south, and thence to the Regent's Canal ; and lighters

can receive or discharge their freights directly under the buildings. On the west of the goods-shed are the coal depéts and staiths. The coal arriving at the station is discharged in some cases directly from the waggons into carts alongside ; in other cases it is dis- charged through hoppers on to weighing machines at a lower level, and thence filled into sacks. For this operation there is a frontage of 343 yards; and there is in addition a coal depét in Cambridge Street, adjoining the goods-yard, with a frontage of 196 yards. There is a coal and stone dock or basin connected with the Regent's Canal, where barges are loaded directly from the coal-waggons, either through doorways in the bottom of the waggons or by dis- charging the coal from the sides of the waggons into hoppers. There is also a hopper at the Cambridge Street depdt for the pur- pose of loading barges on the canal. Adjoining the canal basin there are numerous private wharves for bricks and other merchan- dise. To the north are the locomotive and carriage sheds for repair- ing the stock, also two engine-running sheds, one round and the other rectangular. The goods, mineral, and locomotive stations

cover an area of about 70 acres, and the total area covered by the goods and passenger stations and the running lines to Copenhagen tunnel is upwards of 90 acres. The principal goods-shed and granary is 300 feet long and 175 wide, and the area occupied by the goods-warehouses, potato-market, coal-offices, and other buildings amounts to 8? acres. In addition, 1 acre is covered by open sheds and 14 acres by the stables and the engineers' shops. The engine- sheds can hold eighty-four engines and tenders, and they, with the workshops, tanks, carriage-repairing shops, and sundry premises, cover 24 acres.! There are in the goods, mineral, and engine yards 284 miles of single line of way and more than 250 sets of switches, 200 turn-tables for waggons, and one for engines and tenders; of that length of line 11} miles of sidings are used for coal-waggons.

It is unnecessary to dwell at length on the arrangement of small terminal stations for branch lines. Where the line is single a single platform suffices, the trains being light and moving only in one direction at one time.

In fixing intermediate stations the first step should be to get a Inter- good map of all the places within the scope of the railway, and to mediate mark upon it the population of each place from the last parlia- stations.

meutary.census. The greater the number of stations, the more the travelling increases ; for quick and cheap transit creates traffic. Stations, especially important ones, should be on the surface rather than on an embankment or a viaduct or in a cutting. Facilities of access in all directions from the surrounding districts, with good roads in the case of passenger traffic, and good water and railway communication for goods depéts, are obviously indispensable. For safety and regularity there should be an uninterrupted view along the line of railway—no sharp curves or complication of over-bridges —in the vicinity of a large station. Intermediate and junction stations should be situated on dead levels, since, when a good

; ; Span |aoyereq| Cost per | Additional} | length of level can be had, with gradients falling from it both

Railway and Station. aol | Area. a Ms ey one ways, there is the greatest possible facility for working the traffic.

= Sa | sae) | Falling gradients towards a station are objectionable, but cannot

Feet. [Sq. yds.| £ s. d.| £5. a. in all cases be avoided. When the station is situated midway

London and North-Western, Euston, .. | 23,144 tees sees between towns of such extent as to cause an equal flow of traffic in

imation Te Ge ie Ae each direction, offices may be requisite on both sides of the line ; eat Northern, King's Cross …... Hs Or 22,808 sau bom v 5 5 di

Midland, St Pancras …..... +0… | g40 | 18,822] s11i°0 | 4°70 || but, where the bulk of the traffic teuds one way only, it will be

South-Eastern, Chanting (Crosse eee 166 hes 3400/60 0 desirable to concentrate it on that side which involves the larger

*annon Street…... 190 3,875 | 43 10 0 6 0 0 Py raiti eect ivcions, peta * | 98'807 tee = number of passengers and the greater extent of waiting space. Victoria Station, Great Western side| 120 ae 27:18 4 | with gable 1 The headquarters of the locomotive and carriage department are at Don-*

caster station.

Junction stations.

Midland building works,

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This rule, again, will be modified by the position of the town or the district whence the traffic is to be derived, especially if the railway lies on the natural surface and adjoins a public road, whether crossing on the level or otherwise. his last condition is the most frequent one ; and, as some portion at least of the traffic must be expected to depart from the platform opposite to the offices, provision must be made for crossing with the least amount of danger to the public. When the passengers are numerous in both directions, over-bridges, as before stated, are objectionable ; and in a surface-station

an archway under the line is frequently imprac- ticable. Some good authorities have adopted the plan of making the trains take up and set. down the passengers at one platform only, when the platform may be made rather more than double the length of a single train, having crossings in the centre to com- municate with both lines of rails, thus placing the trains when standing on the platform upon a loop-siding distinct from those lines. This system offers great convenience to the public when there is much first-class traffic and a large quantity of baggage ; and it is especially applicable when the station partakes of the character of a terminus, or is used asa receiver from branch or neighbouring lines, offering, as it does, great facilities for making up and receiving trains which may run over a portion only of the main lines, as well as for attaching and detaching the carriages intended or used for branch traffic.

The buildings and yards in junction stations may be placed in the fork between the two double lines of railway forming the junction, or beyond the point of jynction.

Locomotive stations comprise two departments,—the running and the constructing and repairing of engines and tenders. The chicf locomotive station of the Midland Railway at Derby may be taken as an example. It is contiguous to the passenger station, and is in communication with the main line by a number of sidings branching off at the north end of that station, near the bridge over the Derby Canal. The arca of ground enclosed is about 80 acres, of which 12 are covered by buildings. The walls of the erecting shops are 284 feet high ; those of the fitting and other shops are 20. The tools are 693 in number. The number of locomotives housed at Derby station (1885) is 289. There is room in the erecting shops for seventy-one locomotives. The workshops are capable of turning out 120 engines per year—say, thirty new engines with tenders, and ninety engines with new boilers, cylinders, and other working parts.

The carriage and waggon works of the Midland Railway at Derby are situated about half a mile south of the passenger station, with which they are connected by a double line of way branching out from the south end of the station. The works were built in 1875-76, on an enclosed piece of land 67 acres in extent, of which 193 are covered by buildings. There are 154

miles of single way within the enclosure. The workshops are built in blocks, separated by open spaces of at least 70 feet in width. They consist principally of seven large shops, of red brick, the walls being of a uniform height of 21 feet; four on the west side are devoted to the preparation of timber and the building and painting of carriages and waggons, and three on the east side to the manipulation of various metals, comprising the foundry and iron stores, the smithy and the machine and fitting shop. Each block of building is entirely surrounded by a 7-inch water-main continually charged with water at a pressure sufficient to throw a jet over the ridge of the roof of any of these buildings. Vehicular communication is carried on between the shops on the east and the west side of the works by means of traversing tables, the rails for which are laid the entire distance across the shops from north to south, and intersect the nine principal lines of sidings flanking the shops. Both steam-power and horse-power are used for moying the traversers.

The saw-mill is 320 feet long and 200 wide. In the cellar underneath all the main shafting, pulleys, and belting are placed. About a hundred loads of oak logs are converted into plank or scantling weekly. There are in all about a hundred machines for sawing and working wood. Outside the saw-mill are large cross- cutting saw-benches, with circular saws 6 feet in diameter, by which logs of deal are cut to the required length before being taken into the mill. The waggon-shop is 320 feet long and 200 wide. The carriage building and finishing shop is 384 by 200 feet wide. In the panel-shed fitted with louvre ventilators, mahogany panel boards, maple boards, &c., are stored for about two years, to be thoroughly dried and seasoned before being used in vehicles. The painting and trimming shop is 384 by 300 feet. It has seventeen lines of rails, each capable of holding ten ordinary vehicles. From the commencement to the finish, twenty-five distinct operations— pruning, filling up, rubbing down, painting, varnishing—are per- formed on a passenger carriage. Young girls and women—the children and widows of the company's servants who have lost their lives by accident in the service—are employed on the light work of sewing, stuffing of cushions and backs of carriages, french-polishing, washing and dyeing, cleaning and lacquering light brass-work and gilding.

The foundries, iron and brass, are 200 feet long by 90 wide. Two thousand tons of iron castings are turned out annually. There are the bar-iron stores 200 by 45 feet, the general stores 150 by 90 feet, and the mess-room 45 by 70 feet, providing accommodation for 500 workmen ; also two smiths' shops, one of them 225 by 200 feet, the other 140 by 200 feet ; the machine and fitting shop, 400 by 225 feet ; and the coal-waggon repairing shop, 350 by 300 feet. The carriage and waggon works just noticed are capable of turning out seven new carriages and eighty new waggons weekly. All the building of railway carriages for the Midland Railway is done at their works, and 80 per cent. of the new waggons are built here. Eighty per cent. of the carriages and 20 per cent. of the waggons are repaired here. The machinery of all kinds laid down for calry- ing on the business of the carriage and waggon works comprises 500 machine tools, 9 steam-engines, 1 gas-engine, 15 stationary boilers, 4 warming boilers, 8 steam traversers, 2 steam cranes, 2 steam travelling cranes, with a number of hydraulic cranes and overhead cranes.

One of the engine houses or sheds for engines on duty, at Gorton Engine-station, on the Manchester, Sheffield, and Lincolnshire railway, is sheds.

shown in fig. 21. It is a rotunda of 150 feet in diameter inside,

Fic. 21.—Rotunda at Gorton locomotive station, to house the working engines,

and is capable of holding seventcen engines with their tenders, leaving the entrance and exit lines clear. The advantage of this atrangement over the ordinary polygonal engine-house is in the absence of pillars for supporting the roof, of which there are twelve for a twelve-sided polygon; in this building there is but one column, at the centre. To the left of the entrance is a furnace for holding live fuel, from which the engines are lighted ; and there are two lines of rail across the central turn-table, on one of which the engines enter and on the other depart. Between the rails of each radiating line a pit is constructed to afford access below the engines for inspection. The roof is of wrought-iron, surmounted by a louvre for ventilation, which is glazed to admit light freely. In the engine-shed of the North-Eastern Railway at Newcastle five ordi- nary engine-house rotundas have been replaced by a single rect- angular building 450 by 280 feet with five turn-

tables. This shed has berths for ninety engines, and the extra space enclosed by the rectangular building as against separate rotundas is used for executing minor repairs.

Station Fittings.—The use of switches and crossings is to form Switches.

a link of communication between one line of rails and another. They are either constructed with ordinary rails or with rails specially rolled, and are carried in cast-iron chairs spiked down to sleepers. The switch-rails are movable, and when worked inde- pendently are moved by rods to which heavy weights are attached, —the function of the weights being to retain the points in one position, and to act as a self-acting adjustment in restoring them to their normal position after they have been shifted for the passage of a vehicle or a train. When only one of the terminal rails is movable it is called a single switch and is used only on sidings or branch lines of rail. The double switches, being more perfect in

Faeing- points.

Turn- tables.

Traver- sers.

‘Water- eranes.

Signals.

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action, are adopted on the main line; and, as a general rule, switches ou the main line are ordered to be laid with the points in the direction of the traffic, so that passing trains may run out of the points, and not into them. “ Facing-points,” as they are termed, are such as are laid on the main line, facing or pointing towards the regular advancing trains. Many accidents have been caused to trains by facing-points, improperly set or out of order, turning the train unexpectedly into a siding, when it was impossible to pull up in time to prevent a collision, or throwing the train off the rails altogether. So dangerous are facing-points felt to be, particularly on high-

speed lines, that on some railways they are absolutely forbidden at all except ct terminal stations and at intermediate stations where every train is ordered to stop. In some situations this rule can only be followed by sacrificing simplicity and increas- ing the number of backing-points ; but it no doubt diminishes the risk of accident.

Turn-tables are of two classes,—for turning carriages and waggons, aud for turning engines and tenders together. Those ordinarily used are of cast-iron, and carry two transverse lines of rails. They re- volve upon a central pivotand conical rollers near the circum- ference, which are upheld by and turn upon a cast-iron base bedded in ce- ment, or on a built foundation (see fig, 22). For turning engines and tenders to- gether turn- tables about 40 feet long are re- quired. A com- mon plan of table consists of two _ longitu- dinal balks of timber, to carry a line of rails, framed together with cast-iron |e beams in such aZZ way that the

Fic, 22.—Carriage turn-table for stations,

centre is supported on a pivot and the extremities on rollers. table revolves, in a pit about 4 feet deep, on a large circular race of cast-iron bedded on a firm foundation to carry the rollers, and

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the motive force is applied by means of gearing. In situations where there is much traffic it is needful to extend the deck of the table laterally, like wings, to complete the circle, and so cover in the pit.

Traversers are a convenient substitute for turn-tables, particularly for working a number of parallel lines of rails. A traverser is-simply a low rectangular frame, made with two overhanging rails, to reccive carriages or waggons, and movable on rollers aeross the lines of rail, so as to receive the carriage from any one line of rail and deposit it on any other.

Water-cranes for delivering water to locomotives are too familiar to every one to need deseription.

Railway Signals.—The earliest passenger railways were opened without any fixed signals. Flags and disks, elevated on posts and pillars, were first employed, in various forms, and were worked on various codes. Sir Charles Hutton Gregory, about the year 1841, designed and erected at New Cross station, on the Croydon Rail- way, the semaphore signal, an adaptation of the old form of sema- phore used for telegraphing over short distances. This was the most important step ever taken in the development of railway signalling. The semaphore has been almost universally adopted for fixed signalling on railways. There are two arms, to the mght and to the left, to command trains arriving in either direction. The arm is turned out horizontally, in a position perpendicular to the post, to signal danger ; diagonally downwards at an angle of about 45° as a signal of caution; aud it is turned home, disappearing within the post, when the line is right for the approach of a train. But the general practice now (1885) is to work the semaphore in two positions only,—at danger and at caution. It is thus always in sight, and its position can be identified without hesitation. To make the signal system safe there must be clear definition and strict enforcement of the duties of the attendant ; good men must be seleeted at adequate pay, and they must have convenient, warm, well- fitted lodges, with ample window-space, within which they may keep a constant watch over the line without exposure to weather. At junctions and other important signal-stations the

lodges should be raised some height above the surface, to give perfect supervision in every direction and prevent distraction. At night the place of semaphores or disks is supplied by large and powerful lamps with reflectors, capable of showing lights of three colours,—a white light, a blue or green light, and a red light, signi- fying respectively safety, caution, danger ; or, as in general practice, two lights only are shown,—red and green.

Signalling has been a subject of much controversy, and has been divided into two main systems. In "negative" signalling the normal position is that of caution, or that of safety, as the praetice may be, and the signal is only turned on to danger when specially required for the protection of the station

on the line. On the other hand, the " positive" system presupposes the normal state of the signal to be that of danger, so that, if the signalman neglect his duty to lower the semaphore when the station is clear for the passage of an approaching train, the train is bound to stop. The positive system has long been in suceessful operation at all large and important junctions. In such a situation the use of a stringent code is manifestly conducive to the greatest degree of safety, as by the unavoidable intersections of the lines of rails there are many chances of collision. The positive system has been merged in

what is known as the block system of signalling,—that is to say, Bloek the positive system has been on most railways extended to every system,

station on the lines in combination with telegraphic signalling. The best, perhaps the only, safeguard against error on the part of the persons in charge of trains is to be found in the adoption of the absolute block system, and of means for enabling engine-drivers to observe signals well in advance. The absolute block system con- sists in dividing the line of railway into intervals of convenient lengths, and by means of telegraphic and fixed signals allowing only one train at a time on any single length of single way. The signalman at station A does not send a second train to station B until he receives a signal from station B that the first train has arrived there ; meantime the signal at A stands at danger until the man at B signals the arrival of the train at B. Under the " per- missive block" system it is simply permitted to signalman B to block signalman A in the event of anything occurring at station B that may render that course advisable. But, supposing that a train has just left station A, then the message from B comes too late to enable signalman A to prevent the train from running into the obstruction at B. The permissive system has been well tried on the principal railways, and is preferred on some lines because it admits of trains being passed on one after another with greater rapidity than on the absolute block system. But it does not afford much protection, and it is now generally preferred to work on the absolute block system, and, for the purpose of doing so effectually, to erect intermediate stations on lines of constant traffic, so as to taal shorter intervals for blockings and obviate the delay inci- ental to unduly long intervals. The average distance apart of passenger stations is, say, 3 miles, but the distance of signal-sta- tions,

whilst it seldom exceeds 4 niles, is frequently only a quarter of a mile, and the average interval may be taken as 14 miles. Dis- tant signals—that is, signals placed at a distance in advance of points of danger and worked by wire communication from the signal-box—were, it is believed, first introduced on the North British Railway at Meadowbank station near Edinburgh in 1846, after the opening of the Hawick branch. In 1852 the Great Northern Railway was completely fitted with distant signals of the semaphore type. Distant siguals are occasionally fixed at 1500 yards' distance ; but beyond 800 yards their action is uncertain, and it is checked by a repeater—electric or mechanical—by which, by way of confirmation, the signal is returned to the signalman. As railway junctions were multiplied it became apparent, not only that distant signals were to be provided for distinct lines, but that concerted action should be established between signals and switches. They are said to be connected when they are simply

coupled together and are moved simultaneously. They are said Inter- to be interlocked when the necessary movement of the switches is locking completed before that of the signal to safety is commenced ; and, system.

conversely, the movement of the signal to danger is completed before the movement of the switches can be commenced. This is the fundamental principle of the interlocking system of signalling now generally practised. By the combination of the absolute block system and the interlocking system the greatest possible number of trains are enabled to travel over one pair of rails in a given time. At Cannon Street station, at the busiest time of the day, eighteen trains arrive and eighteen depart within an hour; 108 operations of shifting switches and signals, by means of sixty-seven levers or handles, have to be performed in that time. On the North London Railway, at Liverpool Street station, 250 trains pass over the same rails in a day of nineteen hours, averaging only four minutes between trains ; frequently only two minutes elapse. The number of trains daily using Moorgate Street station on the Metro- politan Railway is more than 770, involving twice as many move- ments of engines—1540 movements—on four lines of way in nine- teen hours, and every movement is separately signalled. This, of course, could not be performed without the aid of electric instru-

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ments, to enable the signalmen to communicate with each other,

and to have a constant record on the faces of the instruments to show what is being done.

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The side walls are three bricks backs of the walls are carried The arch was ordinarily built making 224 inches of thickness; but the reased occasionally to eight, nine, or ten The haunches of the arch are backed with concrete. The footings of the walls rest on concrete foundations 30 inches in thickness. A drain-pipe 18 inches in diameter is laid longitudinally along the middle of the tunnel. The whole of the tunnelling of the District Railway, of which Mr Fowler was the engineer, was put in with open cuttings. Two trenches 6 feet wide were sunk to receive the side walls, which were built up to a level 4 feet above the springing of the arch. As the construction of the walls pro-

ceeded the timbering was removed and replaced by concrete backing behind the walls. The earth in the middle, called the " dumpling "

or core, was excavated to such a level as to admit of the centering being put into position for the turning of the arch. When the arch was built and the centering removed, the dumpling, which had been utilized for transport, was excavated down to the floor-level from the ends, whence the stuff was conveyed away. By this economical method of procedure the only earth and gravel that required to be lifted was that which was excavated in forming the trenches for the side walls. It was raised by means of steam- cranes travelling on temporary rails laid by the sides of the the centering for the arch was supported on

mple and less costly than ordinary centering.

s shown in section in fig. 23. Inverts, or in-

were laid in across the bottom, between the footings. alls, where, from the nature of the soil or from excessive

high above the level of the rails.

or 27 inches in thickness, and the down vertically to the foundation. with five rings of bricks, number of rings was inc rings.

METROPOLITAN RAILWAYS.

Railways designed for the local service of large cities are neces-

sarily either sunk below or raised above the level of the streets. The late Mr Charles Pearson, solicitor to the City of London, was the originator of the system of intra-metropolitan railways. He

worked at the subject from the year 1837. 'The Metropolitan and

the Metropolitan District Railways in and around London are ex-

amples of the underground system. In 1854 the first Act of Parlia-

ment was passed; the works were commenced in 1860; the first

section of the line—Paddington to Farringdon Street—was opened

in January 1863, Mr John Fowler being the engineer. Several con-

secutive extensions into the City and towards Westminster and the

London Mansion House were made at different times, until the "inner inner _cirele" was completed in October 1884, thirty years after the passing arele. of the first Act, and twenty-four years after the commencement of the work of construction. The inner circle of railways as con- structed is the direct outcome of the recommendation of the Lords' Committee of 1863, that they should abut upon, if they did not actually join, nearly all the principal railway termini in the metro-

polis, completing the circle by a line on the north side of the Thames. The total length of the inner circle is 13 miles and 176

yards. About 2 miles of this length are laid with four lines of rails, and there are twenty-seven stations on the cirele at an average distance of half a mile apart. The combined length of the two systems, including the extensions beyond the inner circle, amounted in Deeember 18838 to 40 miles.

The cost of the Metropolitan Railway system, 22 miles in length,

in December 1883 has already been stated as £500,000 per mile,

and that of the Metropolitan District Railway system, 18 miles in length, as £374,000 per mile. In 1871, when the works had been completed and opened from Moorgate Street to Mansion House station, the capital expenditure by the District Railway Company for works and equipment of 74 miles of double-line railway was officially stated to be £5,147,000 ; and by the Metropolitan Railway Company £5, 856,000 on 104 miles, —subject to deduction in respeet

of surplus lands. The combined cost for 174 miles was at the rate

of £630,000 per mile—the greater cost per mile being, no doubt, due to the greater proportion of underground work. 'he cost of the 14 miles recently opened between Mansion House and Aldgate stations was about £450,000, or about £400,000 per mile. The longer axis of the inner circle is about 54 miles in length, east and west, and the shorter about 2 miles long at the widest part, north and south. The line runs at very various levels, traversing the sloping ground that stretches from the river Thames towards the heights of Hampstead and Highgate. Several natural sewers, formerly clear brooks or tidal channels, now covered, are traversed by the railway. They occasioned many difficulties and great out- lay, as they required to be conveyed across the line in specially con- structed conduits. The Ranelagh sewer, for instance, is carried under the Metropolitan Railway at Gloucester Terrace in a brick- built channel 9 feet wide by 8 high ; and over the District Railway at Sloane Square station im a cast-iron tube 9 feet in diameter, supported on wrought-iron girders of 70 feet span.~~. The Fleet Ditch had to be crossed five times. The average level of the rails of the~~

~~District Railway, which traverses the old bed of the river and the swamps of Pimlico and Bridge Creek, is 13 feet below Thames high~~ water mark ; whilst that of the northern part, on the Metropolitan Railway, is 60 feet above that datum, making 73 feet of difference of level, and giving rise to heavy works and steep gradients at the west and east ends of the circle, Cuttings 42 feet deep and a tunnel 421 yards in length are found at Campden Hill on the west; and cuttings 33 feet deep and a tunnel 728 yards in length at Clerken- well on the east, on gradients of 1 in 75 and 1 in 100 respectively. The works of construction consist of covered ways, tunnels, and open cuttings with retaining walls. The cost of property precluded the use of ordinary open cuttings with slopes. The covered ways were formed by making open cuttings in the first place and then building "open" or artificial tunnels, and covering them in, so as to restore the surface. The sides of the cuttings were made vertieal or nearly vertical, and they were supported by timber framing or poling boards till the masonry of the tunnel was completed. The line from Paddington to Moorgate was made in this way with a mixed gauge—that is, the 7 feet gauge and the 4 feet 84 inch gauge in combination—to take the traffic of the Great Western Railway as well as that of national gauge lines. The covered way was therefore made 284 fect wide and 17 high for the mixed gauge, and the arch is elliptical, built of seven "rings" or courses of brick, with side walls three bricks or 27 inches thick, on footings 4 feet wide. At the junction of a branch with the main line a " belt- mouth" or expanding arch was coustructed in which the span was gradually enlarged to 60 feet. The covered way on the extension, where the national gauge alone was laid, was 25 feet wide. The normal or standard type of arched covered way is 15 feet 9 inches

excavations. Again, the core, and was si The complete arch i verted arches, of the w

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Fig. 24. Fic. 23.—Metropolitan District Railway. Type section of covered way; brick h

arch. Fic. 24.—Metropolitan District Railway. Type section of covered way.

lateral pressure, the floor was thought likely to rise. When there was not sufficient depth for a brick arched way the side walls were made, as shown in fig. 24, of briek and concrete, in bays 8 feet wide, of piers and recesses, spanned by cast-iron girders from 18 to 30 inches in depth, carrying jack-arches between them. The average cost of the arch-covered ways, 25 feet wide, was about £40 per lineal yard, as against £52 per yard for the girder-covered way.

On the inner circle there are three tunnels,—the Clerkenwell Inner tunnel, 728 yards long, of which the level of the rails was from eircle. 29 to 59 feet below the surface of the ground; the "widening " tunnel, 733 yards long, parallel to the Clerkenwell tunnel; and the tunnel under Campden Hill, 421 yards in length. Even when the utmost precantions y are taken, tunnelling through a town is a risky operation. Settle- ments may occur years | after the completion of the works ; water mains may be broken in the streets and in the houses ; stone staircases may fall down; and other un- pleasant symptoms of instability may show themselves. The cost of the tunnel of 25 feet in width was at the rate of £63 per lineal yard. Open cuttings are 284 feet in clear width on the original line of mixed gauge and 25 feet wide on the extensions. The

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Covered ways, tunnels, &e.

Metropolitan District Railway. Type brick and concrete, in section of open cutting.

11 feet bays, consisting of piers 3 feet wide on the face, and recesses

between the piers 8 feet wide. They are inclined backwards with a batter of 14 inches to 1 foot. The foundations are 5 feet below the level of the rails,

and the thickness of the walls at the base is 40 per cent., or two-fifths of the height. Occasionally, where the depth is considerable, the thickness is less, and one or two rows of

cast-iron struts, according to the depth, are placed between the walls at the upper part to take the thrust. A section of open cutting with two rows of struts is shown in fig. 25. The cost of open cuttings 25 feet wide and 25 deep was, say, £67 per lineal yard, or with one row of cast-iron struts £55 per yard. With two rows of struts for a depth of 42 feet, the cost was £108 per lineal yard. It was the intention originally to make the stations as well as the railway strictly "underground," and those at Baker Street, Portland Road, and Gower Street were so constructed. At Baker Street a segmental arch of 45 fect span and 10 feet 4 inches of rise extends over the entire length of 300 feet of platform. The cost of such a station, including booking-offices, restorations, and other contingencies, amounted to £18,000. On the extensions the stations were, when the conditions admitted it, placed in open cuttings, roofed over, 300 feet long, with platforms 15 fect wide. The average cost exceeded that of the same length of ordinary covered way by from £14,000 to £22,000. Not only sewers but gas mains and water mains occasionally demanded very expensive diversions. In passing Broad Sanctuary 2000 feet of gas mains, ranging from 14 to 30 inches in diameter, were diverted ; and in simply crossing High Street, Kensington, 600 feet of pipes of from 3 to 30 inches bore were diverted. In passing a sound building on a good foundation the work was executed in short lengths, with carefully timbered trenches quickly followed up by the con- crete and brickwork of the retaining walls or covered way. Under the houses of Pembridge Square the side walls of the railway were constructed in short lengths, and to form the roof of the covered way main girders of 25 feet span were slipped between the walls of the houses at convenient places, between which jack-arches were built. At Park Crescent only a floor of old ship timber separates the kitchens from the railway. The permanent way originally consisted of wrought-iron flange rails with longitudinal sleepers and then of steel flange rails; but these have been gradually re-

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Glasgow City and District

Railway.

New York elevated railroad.

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Fig. 26.

placed by double-headed rails in chairs, Fig. 26 shows a section of the covered way under Queen Victoria Street, with the main sewer underneath and the galleries for pipes, &c., at the sides.

The Glasgow City and District Railway will supply important links of communication between the railways on the north side of the river Clyde. The line extends from College station, High Street, by George Street and Regent Street, crossing Dumbarton Road to the existing Stobcross line, over a length of nearly 25 miles, almost wholly underground. Of this length 1700 yards, or nearly 1 mile, are tunnelled and 1000 yards are covered way. The tunnels are arched with four rings of brick in cement, toa clear height of 183 feet at the crown and 27 feet in width, for two lines of way. The covered way is arched over with brick.

We may take the "clevated railroads" of New York as an instance of metropolitan railways for local service above ground. In 1867 the first attempt was made to improve existing means of transit between the residential and the business quarters of the city by the construction of an elevated railroad worked by a wire rope and astationary engine. The railroad passed into other hands in 1872, and the New York Elevated Railroad Company was formed. The lines of this and of the Metropolitan Elevated Railroad Company are now worked together by the Manhattan

Railway Company. From the southern terminus of the former railway at South Ferry diverge the lines by which the eastern and western sides of the city are traversed. ‘Junctions are made with the Grand Central Depét of the New York Central and other railroads, and with the New York City and Northern Railroad. In the beginning of 1880 the elevated system was worked over 344 miles of line; 165,000 passengers on an average were carried per day,—the largest number carried in one day being 274,000. The trains run every two minutes in the morning and evening, when the fares are 5 cents or 24d. for any distance ; and in the quieter hours of the day every four or five minutes for a general fare of 10 cents or 5d. The working charges

RALLWAT

amount to about 63 per cent. of the gross earnings. On the New York Elevated Railroad the railway is supported on square wrought- iron lattice-work columns let into cast-iron base blocks founded on brickwork and concrete, at distances of from 37 to 44 feet apart. Where the street traffic is crowded a N.¢ a, §

single row of ¢olumns is planted in Gazz a

the line of each curb, on om upper es ends of which a pair of longitudinal |

girders are fixed to carry a line of Za bit way, 224 feet high above the street level, as shown in fig. 27, at each side of the street. In other situations the two lines of way are supported at a height of 21 feet on longitudinal girders in the middle of the street, fixed to transverse girders, which span the street and are carried on columns at the curbs. A third ar- rangement is adopted where the columns are planted in the street at a distance transversely of 234 feet, as in fig. 28, each carrying a line of rails at a height of 18 feet, and con- nected at intervals by arched bracing to steady the structure. In this il- yn lustration the street is occupied by a double line of tramway. 'The rails are of the Vignoles pattern, of Bes- semer steel, weighing 50 tb per yard, spiked to cross timber sleepers, and guarded by two longitudinal timbers, one on each side of each rail. The sharpest curve on the main line has 90 feet of radius. The gradients con- form, for the most part, to those of the streets, and the steepest gradient is 1 in 50 for a length of 800 yards. The traffic is worked with outside cylinder, four- coupled wheel, bogie-truck locomotives, weighing in working order 194 tons. The driving-wheels are 34 feet in diameter, and the

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Fic. 27,—New York Elevated Rail- road, Square lattice-work column.

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Fia. 28.—New York Elevated Railroad. Section.

cylinders 12 inches in diameter with a stroke of 16 inches, The cars are of the usual American type, entered from each end, 45 feet long and 8 wide,

with seats for forty-two passengers. They are placed on two bogie trucks, and weigh 12 tons. The trains are provided with continuous air-brakes. The stations are about one- third of a mile apart ; the platforms are 200 feet long and 13 wide. aa cost per mile of double way is given by Mr R. E. Johnston as ollows :—

Foundations, columns, girders, superstructure, and permanent way .. £57,696

ule SF We pee One ome mrigede gear dao Cl Onnnr rae Docaae Tan aa ares 12,

PIMC MMIC OR OEIN OS 71) cpcaiar ale sNoxeranarateiayes eeeloerelofs Gis mica svelaveGhesiesioikdlotaiesl« Bye 4,

AGRON CARS 5 5 dievs.sisvbte 6 Galan R40 Grater are ane eee: «ge a ahah «oun alee 1 Beals 7,680 AR OGAL ei WINS 5 A, oka tge = 4 @ satauacacaislons lata. +, gbialale, Seta yale espace £81,376

No payment has been made for way-leave along the streets, nor for compensation to frontagers, though it is known that in the residen- tial quarters traversed by the railroads rents have in many instances, at least, been depreciated to the extent of 50 per cent.

PERMANENT WAY.

The permanent way consists of rails, chairs, spikes, keys, and sleepers laid in a bed of ballast deposited on the formation. The sleepers or substructure should be bedded on broken stones, cinders, or gravel, at least 12 inches in depth under the sleepers, without

rat nw 2 OY

any clay or other material in it that might interfere with the

24]

Steel rails are now very generally used instead of iron ; and indeed Steel it may be affirmed that but for the introduction of that material rails.

Gauge. Gauge.—The measure of the standard or British national gauge | for rails and also for the wheel tires of locomotives the railway of railways is 4 feet 8} inches of width between the rails forming a | system would have broken down under the enormous growth of line of rails or a way. There are many other gauges in existence | traffic. Rails of wrought-iron on the early railways lasted about in different parts of the world. In England the gauge of 7 feet, | twenty-five years; those of later date have been worn out in from originally adopted on the Great Western Railway, was known as | five to ten years and in certain situations in twelve months, mainly the "'broad gauge" in contradistinction to the ordinary gauge of | owing to increased traffic, heavier loads on the engine-wheels, in- 4 feet 8} inches, which was for a long time known as the " narrow | creased speed, quicker stopping and quicker starting. Steel has gauge."' But the 7 fcet gauge has been to a great extent replaced |. come to the rescue both in the engine-wheels and in the rails. by the 4 feet 84 inch or national gauge, and it is being gradually | Loads of from 15 to 18 tons are now placed with impunity on the replaced altogether. The lengths of line now (1885) laid on the two | single wheels of engines as well as on coupled wheels, while it gauges on the Great Western Railway are as follows :— appears from the investigations of Mr R. Price Williams, a leading

Vittes. Yards. authority on permanent way, that a fully proportioned bull-headed Vee ot adc ete 6.006, 2 en al. 6 5 CN aes, 183 924 rail of steel outlasts fifteen or eighteen iron rails. Steel rails are PR ROC SACO o 3.0… 2's s7e. sieicieayeieisierem oeeteomiee prec ees oasis 243 1034 not merely stronger or harder but, owing to their texture, are worn 4 feet $3 inch we bed? thosieuiagh wenetaiok Be ges 594 away only by simple abrasion, whereas iron rails separate out into the Great Western mie. 84 946 strands as soon as the outer coating that binds them together is : — — worn off. Mr Alfred A. Langley laid down in 1874 samples of Total length of line …..... 0. sess eee teaser eens 2300 1738 permanent way near Stepney station on the Loudon and Blackwall The name of "narrow gauge" has now ceased to be applicable to | Railway, where upwards of 300 trains a day passed over a single line the standard gange, and is reserved for gauges of much less width, — of way. The weight of each train was on an average about 150 tons, the metre gauge and others of from 2 to 8 or 34 feet wide. Why a making a total of about 45,000 tons daily over one line of rails, fractional

measure of gauge should have been selected is a question | The rails are both of steel and of iron, weighing 80 Ib per lineal which has puzzled many people. The fact seems to be that the yard and keyed in cast-iron chairs on cross rectangular sleepers. track of the original carts or trains—5 feet wide outside the wheels— | The greater number of the wrought-iron rails had to be turned was takcn as a standard for the gauge of rails, which was measured | @fter one year and three-quarters, during which period they had outside also. The width of the single rail at the top being originally | Worn down about one-eighth of an inch ; but the necessity for re- 14 inches, the width for the two rails together is 34 inches, which | V€TSINg did not arise from the wear itself, but because they gave leaves 4 feet 8} inches for the inside measure or true gauge. There | Way in places, either bulging or splitting. The steel rails had are in the United Kingdom a few railways of gauge narrower than | Worn about one-sixteenth of an inch in the same period. About the standard gauge, of which instances occur in the following | 27,000,000 tons had passed over the line. lines :—Festiniog, 1 foot 114 inches; Talyllyn, 2 feet 6 inches; The rails generally, indeed almost universally, used for the way Kinds of Dinas and Snowdon, Southwold, Isle of Man, Manx Northern, | of railways are the double-headed, the bull-headed, and the flange rails, Ravenglass and Eskdale, Ballymena and Larne, each 3 feet. The | Ot Vignoles rails (in the United States, Germany, Canada, and following statement (Table XXVIL.) comprises the gauges of the | Mexico), the double-headed and the bull-headed rails being keyed principal railway systems in the world :— into cast-iron chairs spiked to sleepers, the flanged being laid upon : and fastened direct to the sleepers. The principal advantage of ane ft.in.| | the flange rail is the facility with which it can be attached to the Great Britain standard gauge| 4 84! Erowailinmeaeages {4 8}| | Sleeper with fastenings of a simple description. The disadvantages Ireland, standard gauge ….| 5 38 ; ita 4 91 | are that it cannot be turned or reversed when the head is worn, as Pena Pearess ErOVOlne 4 8} Unies rittsssss | 8 01) the double-headed rail may be, and that the rigid attachinent of Russia, standard gauge ….] 5 0 eee oe 3 0|| the rail to the sleeper causes a greater degree of disturbance of > re FA BSe NURS canesaneses 2 0] | the way and involves more labour for maintenance than in the case Se ieee 3 6 5 6 | | of the double-headed rail. The double-headed rail is made heavier a pel, etpertand , { 4 g}| | for the same class of traffic than the flange rail; but it is also Antwerp and Ghent

…..... ee | ee 4 2) | stronger and is easily bent to curves, although owing to the mode India, prevailing gauge ….| 5 6 3 6| | of attachment to the chairs by wooden keys there is a lability ” moe ee caer ot Ai ede (ee se 3 || to a slight longitudinal movement of the rails, known as ‘ creep- ” reonum and Conje- 5 6 ae pe cs Ih fediwsil the Ramana P te doabl veram Railway …. 7. re { 5 3|| ing.” The bull-headed rail possesses the a vantages of the double- “a 36/2 3 6| | headed rail, except that, like the flange rail, it is not reversible. EgyPt….0…seeece esse eee 4 8} oon ae lanes : &,| | The bull-headed rail is laid on most of the railway lines of England a ($ §| Fez South Wales’s] 4&4 | and Scofland ; the double-headed rail is also in use. In Ireland (3 61] ow Zealand c 3 | | the bull-headed and the flange rails are used. Double-headed and a a. a 3 6 || bull-headed rails in English practice are rolled toa weight of from ae 82 to 86 Ib per yard; the heads are made from 2% to 23 inches wide ; the webs are from five-eighths to thirteen-sixteenths of an The relative advantages of broad gauges and narrow gauges were | inch in thickness ; and the height of the rail varies from 5% to exhaustively discussed at the Institution of Civil Engineers (in | 5 inches. The rails are now made of steel, in bars for the most 1873), on the reading of Mr W. T. Thornton’s paper on ‘The | part 30 feet in length, with the advantage in comparison with Relative Advantages of the 5 feet 6 inch Gauge and of the Metre | shorter lengths of a more solid road, fewer joints, and less cost for Gauge for the State Railways of India.” The fallacy pervading the | maintenance. They are fixed into massive cast-iron chairs, weigh- Chairs. arguments for narrow gauges is that they take the width between | ing from 31 to 55 Ib each, by means of hard wood keys—oak. the rails as the basic unit of the system; whereas that is really | They are canted inwards in their seats at an angle usually of 1 in little more than an incident, and the dimensions of the railway | 20, the bettcr to resist lateral blows from wheels. The chairs are must in point of fact be governed by the size and weight of the | made of considerable width on the more heavily worked lines— vehicles which the traffic requires. Speaking generally, the | from 7 to 8 inches, against a minimum of 43 inches on other lines. national gauge of 4 feet 8} inches is at least as good as any | On some lines the seats of the chairs on which the rails rest are other for the purposes of general traffic. If the width of gauge | slightly rounded in the direction of the rail; this forms a com- were still an open question, it might be maintained that a gauge | pensation for slight deviations from thc level in the sleepers, but is*

of 5 feet would be rather more convenient in view of the increasing | mainly useful in preventing indentation of the rails by the con- size of the more powerful locomotives. cussions to which they are subject—a matter of importance with Rails. fails.—‘ The experience of the last twenty-five years,” said Mr | double-headed rails which are by and by to be reversed. In such*

drainage of water through the ballast to the formation.

George Parker Bidder, speaking in 1861, ‘“‘has shown that one system has been adopted almost universally—the double-headed rails, upon chairs with cross sleepers, a plan which has been materially improved by fishing the joints.” On the continent of Europe and in America, however, engineers have almost universally laid the flat-foot or flange rail ; and in France double-headed rails, keyed in chairs, have been replaced by flange rails. On the Metro- politan and Metropolitan District Railways, on the contrary, the flange rails have been taken up and replaced by double-headed rails in chairs. The case may be briefly stated in the following terms. The double-headed rail system with chairs is the best where sup- plies of material and labour for maintenance and repair are always ready and available. The single-headed flange rail system is the best when the main thing to attain is simplicity in construction.

cases Mr T. E. Harrison places cushions of hard wood in the chair to support the rails, which are thus effectually protected from indentation ; and, in addition, the trains run more smoothly.

The oak keys by which the rails are fastened in the chairs are Keys,

generally applied at the outer side of the rail, as the jar caused by the lateral percussion of the flangcs of wheels is then less than when the key is placed inside ; but on the Manchester, Sheffield, and Lincolnshire Railway the key is put at the inner side of the rail, and there is this to be said in favour of the practice, that the rails are kept firmly to gauge and the key is less likely to shift. On some railways contrivances are employed to prevent the keys from shifting or creeping out of their proper position in the chair ; these will be noticed in their places. The rails are laid end to end, one-eighth or thrce-sixtecnths of an inch apart at ordinary

XX. — 31

Fish- plates.

Sleepers.

Double- headed rails.

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temperatures, to allow for expansion in hot weather. The joints of the rails are united or fished with parallel stcel plates lodged within the side channels of the rails and fastened with four bolts and nuts passed through the web of the rails, and, in order that the fish-plates may take a solid and steady bearing, the entering faces of the upper and lower members of the rails are in most in- stances formed straight and steep,—at an angle of about 2 to 1. For the same purpose the fish-plates are hollow at their inner faces, so as not to be in contact with the vertical members or web of the rails, and are slightly elastic in consequence. Vertical stiffness, also, is of prime importance in fish-plates, which act as beams fixed at the ends and uniformly loaded, being required to sustain the loads of trains passing over the joints. On some lines, accordingly, the fish-plates are made of greater depth, extending downwards along the lower table of the rail, and are even turned under it, whence they are called clip fish-plates. The chairs are laid on transverse timber sleepers, ordinarily cut from Baltic redwood to a scantling of 10 inches wide and 5 deep, and 9 feet in length,— speaking precisely, only 8 feet 11 inches in length, to secure the timber from import duty. They are most commonly submitted to a preserving process by the injection of about 24 gallons of creasote into each sleeper. The chairs are fixed to the sleepers by iron spikes or oak trenails, or both, varying in number from two on the lines of lighter traffic to three or four on lines of heavier traffic. On the London and South-Western Railway and on the South-Eastern Railway a compound fastener is used,—a spike driven into a hollow trenail, after the latter is driven iuto the sleeper. There are usually eleven cross sleepers to each length of rails of 30 feet, making the average distance between the sleepers about 2 feet 9 inches from centre to centre. It is usual to space them apart more widely in the middle portion of the rail-bars (up to 3 feet) and more closely about the joints, with a view to

equalizing the vertical resistance of the rails to rolling loads, by supplying a greater degree of support from the sleepers near the joints.

The standard models of permanent way on the double-headed rail and chair system adopted by Mr John Fowler for the New South Wales railways have been already noticed. The rails are shown in section in figs. 29 and 85. The sleepers are of colonial hard woods, chiefly iron-bark timber. They are laid 2 feet 6 inches apart between centres at the joints of the rails, and 3 feet 1 inch apart elsewhere. The upper and lower tables of the rails are curved or rounded in section to a radius of 5} inches, the height of the rail. The entering or overhanging faces of the rail are inclined at

| Fig. 29.

Fic. 29.--- Double-headed rail ; New South Wales Railway. Fia. 30.— Chair; New South Wales Railway.

Fig. 30.

a slope of about 1 in 2, forming straight and equally inclined bearings to receive the fish-plates. The rails, while in course of manufacture, are tested by selecting a few rails of each day's make, from which a portion 4} feet in length is cut off and placed on iron supports 3} feet apart, and is subjected to three blows from a weight of 1 ton falling 12 feet each time. The rails are to deflect not less than 64 inches and not more than 73 under this test without showing any signs of fracture. The fish-bolts, as well as the spikes for fastening the chairs to the sleepers, are made of the finest quality of close fibrous iron. Fifty per cent. of the rails were ordered 24 feet in length, 40 per cent. 21, and 10 per cent. 18. The chairs (fig. 80) are 134 inches long at the sole, 41 wide, and 14 thick at the seat of the rail. Test bars of the metal used for the chairs are cast to a scantling of 2 inches by 1 inch and 84 feet long. They are placed on edge, on supports 3 fect apart, and are required to sustain a dead load of 30 cwt. suspended from the centre of the bar without fracture. The spikes are seven-eighths of an inch in diameter, tapered at the head to

fifteen-sixteenths, with hemispherical or cup-heads forged from the solid bar. The above-described way, as laid in New South Wales, is bedded in bal- last consisting of broken stone 12 inches in depth below the sleepers, broken to a gauge of 8 inches, boxed up with broken stone of a smaller size to a gauge of 2 inches for a depth of 8 inches. The total depth of the ballast from the crown of the formation is 22 inches. The surface of the formation below the ballast is rounded in cross-section, in order to drain off such water as penetrates through the bal- last. Grips or furrows are cut and drains laid in where necessary, so that no water is allowed to remain on the line or under the ballast.

The South-Eastern double-headed rail (fig. 31) is keyed into chairs 44 inches wide and 132 long at the sole. They are fixed to the seis by two spikes driven into two hollow oak trenails. The slecpers at the joints are laid 2 feet 4 inches ware ahwest centres, og ae The following are the quantities of material Railway. for 1 mile of way, single line :—

tons.

Steel rails, 82 fb per yard…... 8521 yards 128 17 3 14 Fis-plates: wns. .2 ee ces … 505 pairs 5 0 1 8 Fish bolts and nuts . -2020 ik 2 2 5 CCL ee een ac amtoriciich 4022 56 ll 0 21 COSTE SPIRES) og ie.g seis: jase 6 acer 8044 2 ary i) 8 (SG. aie cae aoe eaobid of ae 4022 Sleepers, creasoted …..... 2011 ARTEMIS occ theyciatats Mctae pie lsieiakesaselel 8044

These quantities are considerably less than those of the Midland Railway (which are stated below), as may naturally be the case for a line chiefly of passenger traffic in comparison with one of heavy goods and mineral traflic. The double-headed rails of the North- Eastern Railway, 82 tb per yard, are bedded on blocks or cushions of oak placed in the bottom of the chairs, the advantages of which have already been noticed.

The type section of way of the Midland Railway is shown in fig. Bull- The formation is inclined each way from the centre, making headed The ballast is of strong gravel rails.

‘ 1

two straight slopes for drainage.

i ‘ | ‘ i j i ‘ ;

pana jaca fs cj ‘ se

L i ~,

Fia. 32.—Type section of way of Midland Railway.

broken stone, and ashes or clinker,—chiefly gravel. It covers a width of 264 feet for two lines of way. It is laid to a depth of 16 inches at the middle of the six-foot, and is formed level with the upper sides of the sleepers between the rails in the four-foot, with a medium depth of 16 inches, or 11 inches beneath the slcepers. At the outer sides of the rails the ballast is heaped level with the tops of the chairs, or, more precisely, the tops of the keys, and is sloped down to the formation at each outer side. The upper and lower surfaces of the rail (see fig. 33) are curved to a radius equal to the height of it, and the planks are flat,—adapted for taking up lateral blows and mitigating wear. The chairs are remarkable for large dimensions, being 74 inches wide and 154 long at the sole, which is 1{ inches thick under the rail, and for their weight, 50 tb each. The cost of relaying 1 mile of single way on the Midland system just described, based on bogs s prices in 1884, amounts to £1572, 8s. 5d. Deduct- P

ing credit for old material to the amount Sa: Mita bene of £714, 8s. 3d., the net cost of relaying A

is £858, Os. 2d. The particulars of quantities, cost, and credit are given in the following statement, prepared by Mr Alfred A. Lang- ley, the enginecr of the railway :— i

Cost to relay 1 mile of Single Line with 30-feet Bull-headed Steel Rails, weighing 85 1b. per yard ; eleven Sleepers to each 30 feet length,

aE

Steel rails, 3520 yards at 85 ib=1834 tons, ab £5 …..... £667 10 9 Chairs, 3872 at 50 ib=86} tons, at £3 …....- 0c eee cree 259 110 0 Fish-plates (steel clip), 352 pairs at 40 ib=6} tons, at £8…. 50 0 0 Bolts and nuts, 1408 at 14 th=1 ton, at £9, 10s. ..... 910 0 Spikes, 7744, at 1} Ib=4} tons, at £7, 108…....----000— 3117 6 Trenails (solid oak), 7744, at £2, 10s. per thousand …..... 19 7 2 Keys (oak), 3872, at £4 per thousand…....~~..sseeeeeee 15 9 9 Sleepers (creasoted), 1936, at 45. ....~~. ses eee e eee e eee eeee 387 4 0 Labour, 1760 yards, at 1s. 6d. 1.1… cece eee eee ee eee eens 122 0 ©

Total cost of laying …....ccccesesessceceeeeees £1572 8 5

RAILWAY

Credits :—

Steel rails, 3520 yards at 80 ib=1252 tons, at £3, 15s. ..... 471 11-3 Chae, S812, a642 Th 72 tOnS, at £2 cecccialer ts secs ele eee 145 0 0 Fish-plates (clip), 352 pairs at 35 Ilb=5}3 tons, at £3, 10s….. is 5 © Wrought-iron serap, 2 tons, Ab BE .c.0. 564 «ce swcis crs oe vows 6 0 0 Sleepers, LOS; wb) OU. GAM oo 3.5. .o:c.c.6 ois cetereis oie en nsiineesciareaue 7212 ©

TE SUM CLOOMIS: & ccaavscctem sates Ate aseilale Aaa s aero s warcietey LT14 8 -8

INGE CORE OL VOIAV INE «5 over5:< axsseye cisis Closes ie cieped sore 8 £858 0 2

Not included in the above :—Ballast for 1 mile of single line, 4000 cubic yards, at 2s.=£400; ballast for 1 mile of double line, 7000 cubic yards, at 2s.= £700; ballast for a lift of about 3 inches, in relaying 1 mile of single line, 520 cubic yards, at 2s.=£52; engine hire, wages of ballast guards, use of waggons, &c., in relaying 1 mile of single line, £50. The lift of 3 inches signi- fies the wear and tear of ballast and the quantity required to be replaced.

The standard rail on the London and North-Western Railway is, like that of the Midland, bull-headed, but less high and wider at the head and the foot

and thicker in the web. The chairs have the peculiarity of being ribbed horizontally on the inner face against which the oak key is driven, in order to grip the key. The sleepers at the joints are placed 2 feet 3 inches apart between centres. The Great Northern Company's standard rail contrasts with the two immediately preceding rails in being less high than either, and having a thinner web and a larger head than the others. There are peculiarities in the disposition of the way. The first is that the joints of the rails are supported in a chair directly under each joint, to which the fishes are bolted; the second is that the two rails forming a line of way break joint with each other, the joints alternating from side to side, and that, as a consequence, all the sleepers are placed equally apart. On this system, it is argued, the way is of as nearly uniform strength as it is possible to make it. The keys for fixing the rails are of compressed fir.

The Great Western, the Metropolitan, and the Lancashire and Yorkshire rails are the heaviest of the bull-headed rails noticed in Table XXVIII. (see below),— weighing 86 tb per yard, having comparatively thin webs and great development of head (see fig. 34). In the Great Western chair the inner face of the jaw that holds the key is formed with an indenta- tion, to aid in keeping the key in place,—the key being likely to expand into the vacancy. In the Metropolitan way the chairs are fast- ened to the sleepers by two through bolts and nuts to each chair. The rails of the Fie. 34.—Bull-headed Manchester, Sheffield, and Lincolnshire Rail- dd Na a ' – y- way are placed in chairs of great length, 16} inches ; and, contrary to usual practice, the oak keys for securing the rails in the chairs are fixed on the inner side of the rail, the rail taking its bearing directly upon the jaw of the chair. Thus the lateral strokes of the wheels on the rails are resisted directly

by the jaw of the chair, and not through the medium of the key. There are twelve sleepers to each length of rail, averaging 2 feet 6 inches apart between centres, as against the usual number on other lines, eleven per rail-length of 30 feet. The sleepers, of Baltic redwood, are not creasoted nor preserved by any other pro- cess, except in one or two places where sand ballast is used.

The leading particulars of standard double-headed and bull- headed rails, with chairs and sleepers, are given in Table XXVIII. (see below).

Specimen standard flange rails are illustrated in figs. 35 and 36 Flange Leading particulars of flange rails are given in rails.

in cross section. Table XXIX. below.

In the case of the flange rail of the New South Wales Railway (fig. 35) the inward cant of the rails is provided for by planing out by machinery the beds of the rails at the upper sides of the slcepers to the angle 1 in 20; and that the rails may be kept in gauge the beds are notched into the surface by as much as the thickness of the flange of the rail. No holes of any kind, either punched or drilled, are made in the flanges of the rails; these are fastened to the sleepers by screws and spikes alternately, having projecting heads, by which the flange is clipped aud held down. In order to check the tendency to creeping of the rails as well as of the fish-plates, it is intended to flange the fish-plates and to cut a notch at each end of them, in each of which a dog-spike is to be

JIC A.

Fig. 35. Fig. 36. Fig. 37. Fic. 35.—Flange rail ; New South Wales Railway.

Fia. 36.—Flange rail; Midland Great Western Railway. Fic. 37.—Bridge rail; Great Western Railway.

driven into the sleepers. The Great Northern of Ireland rail is similar to Mr Fowler's on the New South Wales Railway, but heavier. The Midland Great Western rail (fig. 36) is peculiarly formed, with a web of taper section, being nine-sixteenths of an inch thick at the head, and thickened to 1 inch at the flange. The bridge rail of the Great Western Railway (fig. 37) is laid on the model originally adopted by Mr Brunel. The rails are only 3 inches high, and are aided in resisting vertical stress by the con- tinuous longitudinal sleepers of large scantling, 14 inches wide and 7 deep, on which they are laid, with pine packing 8 inches wide and 1 thick. The rails are laid so as to break joint with the

‘sleepers, which are in lengths of 25 feet, whilst the rails are from

18 to 32 feet inlength. The rails are fastened down by fang-bolts,

TABLE XXVIII.—Standard Double-headed and Bull-headed Rails, with Chairs and Sleepers.

*Dimensions of Rail. Chairs. Number of Sleepers. ree * | Fish- Or” li) aa a Railway. ail per Wid Thick- | | a | Sole fla . ‘ th of Length | plates ‘ Width of ‘ Tre- P Distance Yard. |Height.) “7 ness of i Weight. or Spikes. : Total.| Section. ; Head. Web of Bars, Sole. pitied. nails, apart. ee state as) ee. aes || Ee – Double-headed rails— tb. Inches., Inches. | Inch. | Feet. th. Inches. in.x in. | ft. in. New South Wales … 76 5 2h § | 21,24 | plain} 26 44 | flat 2 2 10 × 5 s) dl South-Eastern …..... 82 5 25 # 24 plain 814 44 flat aa 2 2 10 × 5 2 § Londonand §. -Western 82 5} 24 4 30 clip 40 64 | flat spiked trenails 3 10× 5 2 16 North-Hastern…..... 82 53 24 t 30 plain 40 8 | cushion 4 50 4 10× 5 2 9 Great N. of Scotland .. 72 4} 24 30 plain 35 5g | flat 3 3 10 × 44 2 98*

Bull-headed rails—

PU AE ores fora. a rapety ase 85 5g 28 3 30 clip 50 ves rounded 2 2 4 10× 5 3.0

London and N.-Western 84 5 2 qe 30 clip 45 (fs rounded 2 2 4 10 × 5 Sf

Great Northern …... 82 5 y’s 28 tt | 30 plain 40 |joints 7,7} flat or 3 3 10× 5 2. 8%

Great Western…..... 86 52s 23 +4 | 26, 29,32) plain be (f3 | rounded 2 33 2 12 × 6 2 9 Metropolitan …..... 86 55 24 te 24 clip 39 6 | flat bolts and nuts 2 12× 6 pa

Manchester, Sheffield,

and Lincolnshire 80 53 23 g 380 plain | 40, 51 6 flat 3 3 10×5 {2 6(as.) Lancashire and York-

(fe eenee BE GEO GOL 86 5} 28 full bare) 30 | Plain 55 7% flat 2 2 4 10× 5 2 % Great N. of Scotland .. 80 5 25 ¢ 30 ~~ plain 35 58 | flat 3 5 3 10 × 43 2 9 Great N. of Ireland .. 7 5} 25 H 26 clip te 64 flat 3 3 10× 5 3 0

TABLE XXIX.—Specimen Standard Flange Rails ; in Cross Section. Weight Dimensions of Rail. Sleepers. Railway. Rail. | of Rail Wi A ; Fish-plates. ‘ . idth | Width of | Thickness | Length F Distance per 7: | Meigne. of Sal Flange. | of Web. | of Bars. Gatton, apart. tb. | Inches. | Inches. | Inches. Inch. Feet. : Inches x inches.} Feet in,

Dr iNietw SOMBM WALGS) 5.10… 4 crise cle sieee sieiefols sis flange 714 43 24 43 Ee 24 plain 10 × 5 SF il Great Northern of Ireland ….....0000 % 79 43 2k 5 eet 26 plain flanged 10 × 5 8 0 Midlnna Great Westen . 2.00 sclimemleinseleieeie’s ” 79 4h8 2g 5 vs tol 23, 26% flanged 10 × 5 Great Southern and Western ….....6 000008. a 7 49, 23 5 ts. 24 As { r 7 4,

CBE NM as oF end to s6sccpnkauni iacd ener eislaxoie eraseieralo bridge 68 $ 23 64 2 webs, = 18 to “| joint-plate l Re at i continuous

Metallic perma- nent way.

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which pass through their flanges and the sleeper together. At the joints they are fortified by square iron plates laid under the joints, through which fang-bolts are passed. The longitudinals are con- nected and kept to gauge by transoms or cross-ties at intervals.

The minimum weight of ordinary flange rails is about 45 tb per lineal yard. If the weight is less than this for main lines the upper bearing surface is objectionably narrow, and it is scarcely high enough above the sleepers. The maximum weight of flange rails is about 80 tb per lineal yard. Flange rails, like headed rails, are laid on transverse sleepers, to which thcy are fixed, most com- monly by means of screws, spikes, or flange bolts and nuts. In all cases it is preferable to effect the fastening of steel rails without piercing them in the flange, as they are materially weakened by such perforations.

*In the United States (also very largely in Germany, Canada, and Mexico) the Vignoles rail is universally used for railways, varying in weight from 67 or 70 Ib per yard on a few leading lines to 30 ib on narrow-gauge railways. No railroads with any considerable traffic are now laid down with rails of less weight than 60 Ib per yard. The Pennsylvania Railroad, laid to a gauge of 4 feet 9 inches, is constructed of flange rails of two sections, one of 60 Ib per yard 41 inches high, the other of 67 tb 44 inches high, in lengths of 30 feet. The fishes or splices are 2 feet in length, held by four bolts and nuts. The outer splice is formed with a horizontal flange or **tongue," which overhangs the flange of the rail and is spiked to the sleeper. Allowance for expansion when the rails are laid in winter is provided by laying the rails five-sixteenths of an inch apart, endwise ; in summer a space of only one-sixteenth of an inch in width is allowed. The cross sleepers are 8 inches wide by 7 deep, and are 8% feet in length ; they arc laid so closely that the maximum distance apart between centres does not exceed 2 feet. There are sixteen sleepers for each length of 30 feet, and the sleepers at the joints are laid with a clearance of over 10 inches between them. The rails are fastened by spikes to the sleepers at the inside and the outside. The width for the double line of way at the formation level is 81 feet 4 inches in cuttings; and on embankments the width of the formation is 24 feet 3 inches, sloping from the centre at the rate of 1 in 20. The ballast is laid to a depth of not less than 12 inches under the sleepers, and is filled in to the level of the upper surface of the sleepers. Where stone ballast is used it is broken uniformly to a gauge of 24 inches in diameter. For double lines of way large stones are placed in the bottom, at the centre, between the lines to provide for drainage ; but the stones are not placed under the ends of the sleepers; thus water is drained off rapidly.*

*Metallic Permanent Way.—Metallic permanent way, in which the sleepers are of iron, has been much employed in tropical countries, and is = now to some ex- tent adopted in France and in Ger- many. The oldest and most widely <4 used system of me- = tallic way is that of « Mr H. Greaves, who in 1846 introduced a spherical or bowl sleeper of cast-iron, having the chair for the rail cast on its summit (see fig. 38). Every second pair of sleepers are * = connected and held Fic. 38.—Greaves's cast-iron sleepers. to gauge by transverse tie-bars, which pass through and are bolted to them. 'The form of the sleeper is strong, it holds well in the ground, the chair is*

not liable to be detached, the whole bearing surface is directly beneath the road, the ballast is kept dry and elastic, and there is a simple means of packing the sleeper through holes in the top, with a pointed rammer from the surface, so that the sleeper and the rail can be forced upwards without dis- turbing the general bed of ballast. They may also be lowered by taking out a portion of ballast from the interior. Another system, Mr W. Bridges Adams's "suspended girder rail," is shown

in fig. 39. The rail . N is 7 inches deep, qe weighing 65 ib per "

lineal yard, and is Fie. 39.—Suspended girder,rail.

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suspended by continuous angle-wires, or side wings bolted to it, and bedded in the ballast; and, as the bearing surface on the ballast was approximated to the bearing surface of the rail, a great degree of stability was anticipated. Wrought-iron trans- verse sleepers were first tried in Belgium in 1862, then in France and in Portugal, and afterwards in Germany. There are various systems, most of which were unsatisfactory, but the Vautherin sleeper, first tried in 1864 on the Lyons railway, has

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been successful. It is hollow in section, of the form

LocoMOTIVE POWER.

Locomotives may broadly be reduced to two classes, according Types of In the first class these engine.

to the situation of the working cylinders. are within the framing, under the boiler, with the main driving axle cranked at two points to receive the power from the two cylinders ; in the second class they are outside the framing, and connected, not to the axle, which is straight, but to crank-pins fixed between the spokes of the wheels, in connexion with the nave. From these distinguishing features the two types of engines are known respectively as "inside cylinder locomotives" and " out- side cylinder locomotives." In the

latter the general contour of the cylinders is usually visible at the fore-end of the machine. The tenders have six or four wheels, according to the taste of the designer, and they are supplied with powerful brakes, worked by screws, with blocks of wood placed against each wheel. A water- tank forms the upper part of the tender, namely, the two sides and the back, usually in the form of a horse-shoe, holding from 1000 to 3000 gallons ; and in the hollow of the shoe the fuel is deposited, of which a full charge may weigh from 30 ewt. to 34 tons. The engine and the tender are sustained on springs placed over the axle-bearings. Again, there is the general classification of locomotives into passenger engines and goods and mineral engines. As the power of the engine is brought into action through the grip of the driving wheels upon the rails, it is necessary, for the exertion of maximun1 pk in goods engines, to make two or more pairs of the wheels of one size, and transmit the driving force from the central pair of wheels to the front and back pairs by means of coupling-rods attached to crank-pins at the naves of the wheels. Such engines are called "six-coupled," and for them the most convenient combination is with inside cylinders. "When the cylinders are outside it is usual to couple only the hind pair of wheels to the driving wheels, making a "four-coupled" engine, the leading or front wheels being of smaller diameter than the driving-wheels, and so leaving room for the convenient placement of the cylinders. The six-coupled engine can take the heaviest train on a good straight railway,—that is, one free for the most part from curves ; but four-coupled engines work more economic- ally on lines with frequent curves, and may be made so as to take, in average practice, as great a load as six-coupled engines. Pass- enger locomotives have usually been constructed with a single pair of driving-wheels, for free running at high speeds; but as traffic became heavier four-coupled-wheel passenger engines came into vogue ; and express trains are now for the most part worked with four-coupled engines. In recent years the forepart of engines has in many cases been placed on a four-wheeled truck connected

Speed and

eugine power.

Express pass- enger locomo- tives,

RAILWAY

by a central bolt or pivot to the frame of the engine, so that the fore-wheels can swing to the curves of the line. On the Metro- politan, Metropolitan District, and North London Railways entirely, and on many large railway systems partially, where sharp curves are frequent, bogie-engines are employed, and with great advan- tage in facilitating traction. Another device for the same purpose is the use of radial axles,—that is, axles either at the forepart or the back of the engine, which by their axle-boxes slide laterally between circularly formed guides on entering and on leaving curved parts of the way, and so maintain a radial position at right angles to the line of rails.

American practice, many years since, arrived at two leading types of locomotive for passenger and for goods traffic. The passenger locomotive has eight wheels, of which four in front are framed in a bogie, and the four wheels behind are coupled drivers. This is the type to which English practice has been approximating. The tender is carried on eight wheels, disposed under two trucks or bogies, fore and aft. Goods locomotives are made with eight wheels and with ten wheels, of which, in each case, the leading pair of wheels are conuected with a swing bolster and radius bar, to conform laterally and radially to curves.

As the speed increases a more than proportional increase in the engine-power is necessary to draw a given train. Thus, if an engine and tender, weighing together 40 tons and exerting a given tractive force, takes, say, forty loaded carriages, weighing 360 tons, at 20 miles per hour on a level, the loads which it could take if it a the same tractive power at higher speeds would be only as ollows :—

At 20 miles per hour, <= carriages, weighing 360 tons,

” ” ” 3 ” ” 200 ” ” ” ” 21 ” ”? 144 » oF 50 ” ” 15 ” ” 106 ” ” 60 ” ” il ” bP 75 ”

The influence of gradients also is very important. If an engine and tender, weighing together 40 tons, is capable of drawing a maximum train of, say, forty-two loaded carriages, weighing 420 tons, at 20 miles per hour on a level, it would only draw the following loads at the same speed on the following inclines :—

Level 0… 2: 42 carriages, weighing 420 tons.

Incline 1 in 600, 34 9 a 340 ,, ” ” 3800, 27 ? ” 270 ” » 9 150,20 ,, ” 200 ,; ” ” 100, 15 ” ” 150 ” ? ”? 75, 12 ” te 120 ” ” ” 50, ” ” 90 ” ” ” 40, ” ” 65 2 ” ” 30, 5 ” ” 45 ” ” ” 20, 3 ” ” 24 ”

10, nil sy, o nil

This is the reason why the older railways were made nearly level at an enormous cost,—the elder Stephenson’s policy being to incur a large expenditure in construction in order to avoid otherwise heavy inclines and heavy expenses. The ruling gradient of the Liverpool and Manchester Railway was fixed at 1 in 900, excepting, of course, the inevitable inclines at Rainhill summit, for working which special provision was made ; that of the next great line, the London and Birmingham, was fixed at 1 in 330; on the Great Western Railway, one of the earliest made lines, the ruling inclina- tion is 1 in 1320 for the greater part of the way. Locke, as already explained, initiated the system of cheaply constructed railways, as the facilities for increasing the power of locomotives became better understood ; he constructed lines with long steep gradients, some of them 1 in 70, 1 in 75, 1 in 80. The Great Northern Railway, of comparatively recent origin, was constructed on a ruling gradient of 1 in 200; and, in general, the more recently made lines have the steepest gradients. Steep railways are generally also lines of frequent curves, which is another cause of loss of locomotive power. Moreover, the ruling speeds, as they may be called, have in the course of years increased. Thus in every way more powerful engines are now needed than in the early days of railways.

The fundamental characteristics of English practice are fairly represented by a few types of locomotives. ‘Take first an express passenger locomotive, which stands on a whecl base—the distance apart of the centres of the extreme axles—of 15 feet 4 inches. The cylinders are inside and are 16 inches in diameter, with a slide of 22 inches. The driving-wheels are 7 feet in diameter. The fire- grate has an area of 18 square feet, and the heating surface of the fire-box and flue-tubes taken together is 1339 square feet. The total weight of the engine in working order is 28 tons 6 cwt., of which nearly 12 tons are driving weight,—the weight at the driving- wheels. The

tender stands on three pairs of wheels and weighs about 16 tons, with, in addition, 1780 gallons or 8 tons of water when filled, and 3 tons of coal.

The " Lady of the Lake" is an express passenger locomotive, one of a class which was designed by Mr John Ramsbottom with special regard to the running of express trains on the northern division of the London and North-Western Railway. The cylinders are "outside" ; they are 16 inches in diameter, with 24 inches of stroke, and the driving-wheels are 7 fect 7 inches in diameter. The fire-grate has an area of 15 square feet, and there is over 1000 square

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feet of heating surface. The engine weighs 27 tons in working order and the tender 174, together 444 tons. The tender is fitte with Mr Ramsbottom's apparatus for picking up feed-water whilst running: a scoop is let down from the bottom of the tender and dips into water contained in a long open trough laid between the rails, from which it is scooped up into the tanks. The minimum speed at which this operation can-be effected is 22 miles per hour. By the aid of the water-lifter this express engine has been enabled to run the whole distance from Holyhead to London—264 miles— in one continuous run, at an average speed of 42 miles per hour, taking a train of eight or nine carriages, and consuming 27 tb of coal as fuel per mile run.

An express passenger locomotive having 18-inch cylinders and four-coupled driving-wheels, 7 feet in diameter, with a four-wheel bogie in front under the smoke-box, was designed by Mr T. W. Johnson for the traffic of the Midland Railway. The engine stands on eight wheels, forming a base 214 fect long. It weighs about 42 tons in working order, and with the tender, including coal and water, about 68 tons. The average load taken by engines of this class is fourteen carriages at the time-bill speed of 50 miles per hour, over gradients of from 1 in 120 to 1 in 130, with a consump- tion of 28 Ib of coal per mile run. The engine can take as a maxi- mum load seventeen carriages between Manchester and Derby, over ruling gradients of 1 in 90 and 1 in 100 for 10 miles, at a speed up the inclines of 35 miles per hour, and on levels and falling gradients at 50 miles per hour. The carriages

weigh, with passengers, 11 tons each, making up a train of the gross weight of 187 tons.

The express passenger engines on the Great Northern Railway (fig. 40), designed by Mr Patrick Stirling, have outside cylinders, 18

Fic. 40.—Express locomotive ; Great Northern Railway.

inches in diameter, and a single pair of 8-feet driving-wheels. It is one of the most recent developments of the single-wheel engine. It is placed on eight wheels, of which the first four are framed in a bogie, or truck, pivoted on a centre under the smoke-box. The cylinders are placed outside, and between the wheels of the bogie at each side. They are 18 inches in diameter, with a stroke of 28 inches,—dimensions which, taken together, exceed in magni- tude those of any other engine for English passenger-traffic. The driving-wheels are 8 feet 1 inch in diameter and the bogie-wheels 3 feet 11 inches. The engine weighs 38 tons in working order, the distribution of the weight being as follows :—

Leading bogie-wheels 7 tons Hin a fe AS GOMS: cteene ont bis {2 re Morini ge wheels Nas. ssi. seed okt aocicln ooacemaaad 15 35 RIA MENON she SENS « Ss alwaniae ticle dealers adore e roe 8 “ss Total weight in working order ……..... 38 (yy

The pivot of the bogie is 6 inches nearer the hind than the front axle,—these being 64 feet apart. By this disposition the bogie appears to lead better than if the pivot were, as usual, equidistant between the axles. The working pressure in the boiler is 140 tb per square inch. There are 217 brass flue-tubes, 1,%, inches in diameter, presenting a heating surface for evaporation of upwards of 1000 square fect. There is in all 1165 square feet of surface, and there is 17°6 square feet of grate surface. Mr Stirling, on the question of single- wheel versus coupled wheels for passenger locomotives, states that he constructed two classes of engines,—one class with four 63-feet wheels coupled, the other with a single pair of 7-feet driving-wheels, The boilers of the two classes were alike ; also the cylinders, which were 17 inches in diameter, with 24 inches of stroke. The pressure in the boilers was 140 tb. With like trains the single-wheel engine had the better of it; in fact, it generally beat the ‘coupled engine in time, running from King’s Cross to

Potter's Bar, a distance of nearly 13 miles, nearly all uphill, the gradients varying from 1 in 105 for 2 miles to 1 in 200. + of the class of the 8-feet-wheel engine travel between King's Cross and Leeds or York. The steepest gradients on the route are met with on leaving Leeds, ascending 1 in 50, besides the gradient 1 in 105 leaving King's Cross. Trains of from sixteen to twenty- two carriages are taken from King's Cross station with ease; and on several occasions twenty-eight carriages have been taken, and time has been kept. On one occasion a distance of 15 miles in

twelve minutes was accomplished with a train of sixteen carriages, making a speed of 75 miles per hour. The engine has taken a train of thirty-three carriages full of passengers from Doncaster to Scarborough and back at an average speed of 45 miles per hour. It is capable of moving a gross weight, including engine, tender, and train, of 856 tons on a level ata speed of 45 miles per hour. The average results of the regular performance of seven engines of this class between Doncaster, Peterborough, and London for the third quarter of 1884 show that a train of twelve six-wheeled carriages weighing 13 tons each was taken at a speed of from 50 to 53 miles per hour, for a consumption of 254 Ib of eoal per mile run and five pints of oil per 100 miles run.

Four-coupled locomotives, having the cylinders inside, and four wheels coupled "in front," with a pair of hind or trailing wheels, are known as "mixed engines,"—that is to say, engines adapted for either passenger traffic or goods traffic,—a generally useful type. In one example the cylinders are 16 inches in diameter, with a stroke of 22 inches; the coupled wheels are 5 feet in diameter. The weight of the engine is 24} tons, of which 20 tons are driving weight.

The next engine to be noticed is a generally useful engine, four- coupled "behind," for passenger traffic, such, for instance, as that with inclined fire-grate and sloping fire-box designed by Mr J. J. Cudworth for service on the South-Eastern Railway. On a wheel- base of 15 feet the weight of the engine—304 tons—is so distributed that 104 tons fall at each pair of

driving-wheels and 94 tons at the leading wheels. The cylinders are inside, 16 inches in diameter, with 24 inches of stroke and 6-feet driving-wheels.

Another express passenger locomotive, having inside cylinders and four-coupled wheels behind, for service on the London and North-Western Railway, has cylinders 17 inches in diameter, with 24 inches of stroke, and 6 feet 7 inch driving wheels. The engine weighs 294 tons, of which 11 are at the middle wheels, 8? at the hind wheels, and 94 at the front; thus the driving weight amounts to two-thirds of the total weight. This engine can move a gross weight of 293 tons, comprising engine, tender, and train, on a level at a speed of 45 miles per hour, with a working pressure of 120 tb per square inch in the boiler. 'With trains averaging ten carriages the consumption of coal is 26} Ib per mile run.

A tank locomotive is an engine which carries its supply of fuel and water with it on its own frame, dispensing with the tender. Such engines are much used for short traffic, as well as for shunting and marshalling trains.

The four-coupled tank engine (fig. 41) used for the passenger

Fra. 41.—Tank locomotive ; Metropolitan Railway.

traffic of the Metropolitan Railway has four wheels coupled.behind and a bogie in front. This engine weighs in working order 454 tous, of which about 35 tons are utilized as driving weight, making 174 tons for one pair of wheels,—about the greatest load on one pair of wheels anywhere. The regular duty of this engine is to take a train of six carriages capable of holding in all 432 passengers, and weighing in themselves 13 tons each, at an average specd, including stoppages, of 18 miles per hour, consuming 37 Ib of Welsh coal per train mile run. Whilst passing through the tunnels or covered ways the exhaust steam from the engine is condensed in large tanks carried on the engine, filled with cold water. The quantity of condensing water consumed is 900 gallons for half the journey, or every 63 miles; it is raised to 200° Fahr. temperature.

The eight-wheeled tank engine (fig. 42) has been designed by Mr

Fic. 42,—Tank locomotive ; Great Eastern Railway.

T. W. Worsdell to work the heavy suburban metropolitan traffic of the Great Eastern Railway,—the ordinary trains in this service being composed of fifteen or twenty close-coupled carriages, taken over steep gradients and sharp curves. For this purpose the fore and

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hind axles are radially mounted, as before explained, to take the

curves with facility, the engine running either end first. The engine weighs 52 tons in working order, and of these 30 tons are driving weight placed on the two pairs of coupled driving-wheels. With large cylinders 18 inches in diameter, and driving – wheels only 5 feet 4 inches in diameter, the engine is adapted for starting promptly, which it is required to do in order to keep time between closely placed stations. Every stop is made by the Westinghouse brake, with which the engine is fitted.

Locomotives for drawing heavy goods trains, though not heavier than the most powerful passenger locomotives, can take goods trains of great weight. Six-coupled goods engines, with 17-inch

cylinders and driving-wheels 5 feet in diameter, weighing 32 tons

in working order, can take a train weighing 360 tons on a level at

a speed of 25 miles per hour, consuming from 40 to 45 tb of eoal

per mile run with trains. The Fairlie engine (fig. 43) is placed on ESS 2s.

Fic. 43.—The Fairlie locomotive.

two bogies or swivelling trucks, the foremost of which carries the cylinders and propelling gear and the hindmost the tank and coal- boxes.

The longest distance run without stopping, eombined with the Rates of highest speed, is performed on the Great Northern Railway, between speed.

Grantham and King's Cross, 1054 miles, in 1 hour 58 minutes, at the rate of 534 miles per hour. The Great Western Company run from Paddington to

Swindon—77} miles—in 1 hour 27 minutes, being at the rate of 534 miles per hour, On the London and North-Western Railway the distance—77} miles—from Willesden to Rugby is run in 1 hour 28 minutes, at the rate of 523 miles per hour. 'The average rate of express and mail passenger trains on this line is 40 miles per hour or more. Parliamentary trains, call- ing at all stations, run at an average speed of from 19 to 28 miles per hour. Express goods trains attain a speed of from 20 to 25 miles per hour. The speed of coal trains is limited, as far as possible, to 15 miles per hour.

The coal trains on the London and North-Western, Midland, and Great Northern Railways generally consist of from thirty to thirty-five waggons, weighing from 5 to 54 tons each, and carry- ing a load of 8 tons of coal. At this rate the total load of coal for thirty-five waggons weighs 280 tons, and, adding the weight of the brake-van at the end of the train, 10 tons 17 cwt., the maximum gross weight of train is 483 tons 7 cwt., as on the Great Northern Railway. This train is taken by a goods engine with six-coupled wheels 5} feet in diameter, having two steam eylinders 174 inches in diameter, with a stroke of 26 inches, and a pressure of 140 Ib per square inch in the boiler. The loco- motive weighs in working order 36 tons 18 cwt., and the tender with fuel and water 30 tons 17 cwt., making together 67 tons 15 ewt. for the locomotive and tender. The gross weights are as

follows :— : ; . Tons. cwts. Train, thirty-five vehicles (waggons, load, and brake-van) ..483 7 Engine and tender, in full working order …….+2+ee00- 67 15 BupiMe, Tender, ANd TAM 2.6. tees es secs aces cteneese 551 2

These large coal trains are taken at a speed of 18 miles per hour, on ascending inclines of 1 in 178 at 10 miles per hour. The con- sumption of coal as fuel in the engine is at the rate of 45 Ib per mile run, including the coal consumed in getting up steam. Mr Patrick Stirling, the locomotive engineer of the Great Northern Railway, has also designed and constructed still more powerful engines, having six-coupled 5-feet wheels, with cylinders 19 inches in diameter and of 28 inches stroke. These engines are capable of taking a train of forty-nine loaded coal-waggons, weighing with brake-van 6724 tons. Including the weight of the engine and tender the total gross load is, say, 740 tons, taken with a consump- tion of 50 Ib of coal per

mile run. This is probably the most extraordinary example of a dead pull on an ascending incline of 1 in 178. It is equivalent to a gross weight of 1816 tons on a level. It was found that this train was too long for some of the sidings, besides fouling both the level crossings in the city of Lincoln ; hence the train was reduced in number to forty-five waggons. Six-coupled goods-engines of the usual proportions, working at full power, exert a tractive force of from 5 to 6 tons in the direction of the rails, equal to the movement of. a gross weight of engine, tender, and train of from 1240 to 1500 tons on a level straight line at a speed of 15 miles per hour, or to from 386 to 463 tons on a level

Coal trains,

net hw AY 247

straight line at a speed of 60 miles per hour. A tractive force of 10 or 12 Tb is capable of drawing 1 ton on a level at 10 miles per hour. At 60 miles per hour the required tractive force is about 45 ib for 1 ton of gross weight.

The long double-bogie passenger-car universally in use in the United United States, originally introduced by Ross Winans on the Balti- States more and Ohio Railroad, is distinguished essentially from the cars. carriages on British railways by the longitudinal passage in the centre of the body, reaching from end to end of the car, with seats at each side, and admitting of the free passage of the conductor throughout the train. The absence of doors at the sides permits of the enlargement of the body laterally. These cars are also dis- tinguished by the use of two four-wheeled bogies or trucks on which the body is carried, and to which it is pivoted, allowing the car to pass with facility over quick curves. There is generally but one class of travellers ; yet for the long journeys Pullman and other slecp- ing cars have come into use, at extra fares. From the Atlantic cities to the West there is a special "immigrant" class, as also over the Pacific railroads; and between the chief Western cities and the sea- board of late years a second-class system has been begun: passcngers are usually carried in smoking cars at rates but little lower than first- class fares, which on these lines are about 1d. per mile. Refresh- ment cars are also attached to trains. Ordinary passenger cars are 93 to 10 feet wide and 444 in length of body, or 49 feet over the extreme platforms. They are about 73 feet high

at the sides, inside the body, and nearly 10 feet high at the centre. The car is entered by steps at the ends. The middle passage is about 2 feet wide. On each side there are fourteen seats, placed transversely, each 38 inches wide and holding two persons. The backs of the seats, which do not rise more than 34 inches above the floor, are mounted on swivels, by which the seat is made reversible. A window is placed next each seat, having a movable glass and a venetian blind. The cars are heated by stoves or steam heaters, burning coal, and are lighted by oil-lamps or candles, on some lines by compressed coal-gas._ Each car is provided with a water-closet and a supply of iced water, and a vendor of books, papers, and cigars patrols the cars. There is a cord of communication with the engine-driver. The car, complete, weighs from 17 to 20 tons, and sleeping cars about one-half more.

The form of goods truck generally used for some years after the Goods opening of the Liverpool and Manchester Railway in 1829 was trucks, simply a platform about 10 feet long, on four wheels, with sides varying from 4 to 10 inches in height, weighing from 24 to 34 tons. Many such waggons were employed for transporting heavy rough goods of 2 tons weight. The general unfitness of this style of waggon led to the adoption of portable sides and ends, which consisted of open crib-rails dropped into staples; and to thesc was added the costly tarpauling or sheet to cover the goods and bind them down. The waggon thus appointed, 18 or 14 feet in length and weighing about 34 tons, was fit to carry 4 or 5 tons of ordinary goods. But loose or removable parts of waggons are liable to be lost or get out of order, and are costly to maintain, while a new tarpauling may be spoiled on the first day of using it by injury from projecting angles of goods under cover. Crib-rails and tarpaulings, therefore, have been to some extent superseded by built covered waggons from 14 to 16 feet long and 74 feet wide, with sliding or hinged doors and roofs, so that with the crane- chairs a bale of goods, however heavy, can be deposited at or moved from any part of the interior of the waggon, and the goods may be perfectly enclosed and protected from damage by fire, wind, or rain. Covered waggons weigh from 4 to 6% tons, and they can carry, according to their dimensions, from 6 to 8 tons of goods. The cost of maintenance of ordinary open waggons is said to amount to from 7 to 10 per cent of the first cost, whilst that of covered waggons is said to be only 4 per cent. It may be stated generally that

waggons if properly made will carry 60 per cent. more than their own weight of goods, but that ill- designed badly-made waggons will carry no more than their own weight of goods. The great demand for weight in waggons arose, as much as from anything else, from the absence of spring-buffers at the ends, which exposed them daily to rude and trying collisions, By and by buffing-springs were introduced at one' end of the waggon, the other being left "dead," and at length, cheap and convenient buffers having been devised, springs came to be placed at both ends of new stock. Waggons, as formerly made, were in long trains likewise subjected to violent shocks in starting into motion, and therefore the draw-bars also were placed upon springs. Some companies have gone further and placed the guard or side chains upon springs. 'Thus the waggon has come to be defended by springs at all points, and there is no doubt that the extra cost so incurred has been amply covered by savings on repairs and diminished breakages of goods. Spiral springs for buffing and drawing, made of round or of oval steel, fixed externally to the ends of waggons, have been much employed ; but laminated springs, placed under the floor, are taking their place. Broad-gauge (7-feet gauge) waggons have been constructed sufficiently strong to carry 20 tons of load on six wheels; but they were not generally made to carry more than 10 tons. Even 10 tons is considered in some quarters to be exccssive as a maximum waggon-load on the ordinary or 4 feet 83 inch gauge. On the Midland Railway, for instance, the standard coal-waggon is constructed to carry 8 tons, The

CARRIAGES AND WAGGONS.

Varieties The common varieties of vehicle employed in railway traffic are ofrail- as follows :—(1) Passenger-train stock : first-class carriage, second-way class carriage, third-class carriage, composite carriage, luggage vehicle. brake-van, horse-box, carriage-truck. To thcse may be added the mail-carriage or travelling post-office. (2) Goods-train stock: platform-waggon, open or box waggon, high-sided round-end wag- gon, covered goods-waggon, cattle-waggon, sheep-waggon, coal- waggon, coke-waggon, brake-van. Besides these there are other waggons specially designed for special traffic, as gunpowder, salt, and lime, also ballast-waggons, for the private use of the engineer's department. Carriages are usually made of the same external length, width, and height. The under works of the stock may

thus be identical in construction, and an economical uniformity of working and wearing parts is secured. Uniformity of waggons is still more important than in the case of carriages, as their total number and cost are much greater, and the supervision with which they are favoured is less minute ; besides, the cost of maintenance is less than where many varieties of waggon exist on the same line. But, whatever may be the upper works, the under works of the whole of the waggon stock should be entirely uniform. One of the greatest evils of railway engineering has been want of uniformity in stock, partly due to different companies not arranging to have stock suitable for joint use on each other's lines and partly to inevitable changes of plan to meet the growing wants of traffic. Another source of mischief was the separation of the duties of engine and of carriage and waggon superintendence. The carriage superintendent, aiming at the utmost economy of maintenance in his department, continually added to the quantity and weight of material employed in the construction of the carrying stock, as the remedy for the observed failure of weak parts ; and thus the stock, particularly waggons, was increased in strength rather by adding to the mass of matter than by studying to throw the same weight of timber and iron into superior combinations. Meantime the heavy trains, handed over to the locomotive department, led to the construction of heavier and more powerful locomotives, when the maximum was quickly reached, and strongly evinced by the damage done to the permanent way. It was found, moreover, that the older carriages suffered most in cases of collision ; hence there was an additional inducement to add to the size and weight of carriages. But this line of development has been mainly deter- – mined by the demands of the public for greater convenience, speed, and safety, and from the growth of traffic, involving greater length and weight of trains. Passen- The early first-class carriages weighed 3} tons, the bodies or ger car- upper parts being 15 feet long, 64 feet wide, and 4 feet 9 inches Tiages. high, divided into three compartments, to hold six passengers each, or eighteen in all. They now weigh from 8 to 13 tons each, and are from 20 to 30 feet in length and from 8 to 84 fcet wide. Carriages have until recent years been placed almost all on four wheels ; but six wheels on three axles are now generally in use. A modern first-class carriage, 28 to 80 feet long with four compart- ments, gives 7 to 74 feet of total length for each compartment, as against 5 feet in the early carriages. Second and third class carriages, in length from 28 to 81 feet, are divided into five com-

partments, each from 5 feet 7 inches to 6 feet 2 inches long. Saloon carriages are occasionally used, so called because two or more of the ordinary compartments are merged in one. Second- class carriages originally were destitute of cushioning, hard and square, on the nearly obsolete policy of making them uncomfort- able in the hope of inducing passengers to travel first class. The London, Brighton, and South Coast Railway Company in 1857-58 were the first to supply comfortably padded seats in their second- class carriages, and the receipts of that company were in~1858 materially augmented in consequence. Third-class carriages have been improved, under the stimulating example of the Midland Railway Company, who abandoned their second-class carriages, and raised their third-class stock to an equality with the second- class vehicles of other lincs. But there are yct lines of railway on which the third-class carriages are little better than obsolete first and second class carriages converted into third-class. Passenger luggage brake-vans are made open (for the most part) inside for passengers' luggage. They are fitted with a dog-box or small enclosure from side to side with doors at both ends, and with projecting sides, glazed, to accommodate the guard and afford a view of the train from end to end. A pair of doors are placed in each side for luggage. In some designs a separate compartment is partitioned off for the guard, in other cases a compartment of a passenger carriage is allotted for luggage and for the guard. The luggage van is fitted with a powerful brake; it should be fitted with three pairs of wheels. Horse-boxes are constructed to carry three horses.

Recent carriage stock.

Lighting.

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heavier the load for which mineral vehicles are constructed, the greater is the tear and wear of the stock, insomuch that the waggons on that line which stood to their work best were the old 6-ton waggons.

Railway carriages are composed of two distinct parts, —the under- frame or substructure, and the body or superstructure. The under- frame has to carry the body and to resist the stress of work. It should be on axles placed

well apart, and should be firmly framed together, of hard wood, with iron tie-rods, brackets, knees, straps, bolts, and nuts. Powerful laminated springs are lodged within the frame to take the pull of the train through the central draw- bars and to intercept and absorb the thrusts of the buffers at the ends through the buffing-rods. On the Midland Railway four-

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wheeled carriages are (1885) being gradually superseded by six- wheeled and long bogie carriages. Four varieties of bogie carriage and three varieties of six-wheeled carriage are constructed for the service. First-class compartments are constructed to seat six persons, three on each side; third-class compartments seat ten persons, five on each side. A uniform width of 8 feet outside, or 74 inside, is adopted for all carriages; and, as a rule, first-class compartments are 73 feet long between the partitions, and third-class compartments 6 feet loug. The roof is 7 feet 4 inches above the floor at the centre, and the clear height of the doorway is 6 fect. The wheels are 3 feet 74 inches in diameter. Leading par-

ticulars of the several kinds of carriage now constructed on tlic Midland Railway are given in Table XXX. as follows :—

Carriage. of Bey. Compartments. pnd Weight. Price Feet. Tons. cwt

6-wheeled bogie composite ….....eeeeeeeeeee 54 8 first class, 4 third class, 1 luggage=8 58 £1097 4-wheeled bogie composite ….....0..eeeceee 45 3 0 3 oA i 48 18 10 768 4-wheeled bogie third class ….....see+e-+-ee- 43 7 third class 70 1715 620 4-wheeled bogie composite ….....ese-eeeeee 40 2 first class, 3 third class, 1 luggage=6 42 17 5 654 G-wheeled finsivelass "22..6. oo. s ccc crc memecass as 30 4 first class 24 10.) «(138 516 Gawheeled: COMPOSIC . ce c oe creisie1ecrsisiicis comeisre sles 31 2 first class, 2 third class, 1 luggage=5 32 1 Ao 450 Gawihee lousy Meno Classics cterstes sloetesisieiect teeters 31 5 third class 50 10 7 390

Each of these carriages is fitted with a vacuum brake. In the beginning of 1885 there were 837 bogie carriages at work on the Midland Railway, inclusive of 34 Pullman cars. The bogie cars, in virtue of their ability to swing their bogies to the curves on the line, run more freely than ordinary

carriages, which have parallel axles. Six-wheeled carriages are enabled to run the more freely by an allowance of lateral play for the axle-boxes of the middle axle between the axle-guards, whereby the wheels adapt themselves freely to the rails on curves. The Pullman cars in use on the Midland Railway were sent from America. They are of two kinds, —the drawing-room for day service and the sleeping-car. The body of the cars is 514 feet in length externally and 8 feet 9 inches wide. Inside the body is 8 feet 2 inches wide, and 8 feet 64 inches high above the floor. The total length, including the gangways at the ends, is 58 feet. Each car is mounted on two four-wheeled bogies, There are seats for twenty-seven persons in the drawing- room car, with lavatories and heating apparatus, and twenty-two beds are made up in each sleeping-car. The cars weigh 214 tons and their cost is £2700 each.

The carriage stock of the Metropolitan Railway was designed to carry large numbers. The bodies of the carriages are 39} feet in length and 84 feet wide outside, running on eight wheels, of which the extreme axles radiate, or are movable laterally to suit the curves of the way. The first-class carriages are divided into six compartments, providing seats for forty-eight passengers. The second and third class carriages have eight compartments, hold- ing altogether eighty passengers in each. These carriages weigh 18 tons each.

The waggon stock of the Midland Railway is of several classes. All the standard goods and mineral waggons, as well as cattle- waggons, are constructed to carry 8 tons. Leading dimensions, weights, and prices are given below in Table XXXI. :—

External Di- mensions over | Internal Dimensions. Corner Pillars. Load | Weight N00) 0 fe ——— ee to jof Wag- | Price. Height |carry.| gon. Length.| Width.| Length.| Width.) above Floor. ft. in.| ft. in.| ft. in.| ft. in.| ft. in.} tons. jtns,cwt.| £ Covered goods ….{14 ll] 7 5 14 2 610 | 5 103) 8 5 3 72 High – sided for goods or (onlin cone 12 1h 5 le Gere OF} 2 10 S 25. 92 68 Low-sided..| 14 11] 7 5 | 14 6;7 0/1 9 8 4 14 61 Cattle wag- BONS. care 1 6 | 840 17 9 7 4 7 03) 8 6 0 86

The covered goods waggons are made with a doorway at each side, 5 feet wide and 5 high, and a sliding door to each door- way. The high-sided waggons are made with a doorway and hinged door in each side, and two

trap-doors in the bottom. In the low-sided waggons each side is a door for its whole length. The cattle-waggons are made with doorways in each side, to each of which there are two doors hinged to each doorpost, and a letting-down door hinged to the lower side-rail. All the waggons are fitted with transverse buffing and draw springs.

Lighting of Carriages. —The North London Railway Company, it is believed, were the first to use gas instead of oil for lighting carriage stock. Thirty gas-lights in a train are supplied from two reservoirs or gasholders in the brake-vans, which hold 200 cubic feet of ordinary coal-gas, supplied from the mains,—enough to serve the train for from two hours to two and a half hours. The gas is conducted by pipes over the roofs of the carriages, with a branch

to each compartment. Ordinary coal-gas has also been used on the metropolitan railways. Pintsch's system of lighting carriages by compressed oil-gas is extensively in use on Continental railways, where it has been in operation for upwards of ten years. In 1876-77 the system was tried successfully on the Metropolitan Railway, when it appeared that 1000 cubic feet of the compressed gas could do the work of 6500 cubic feet of coal-gas, at a cost of scarcely one farthing per burner per hour, against one-third of a penny for coal-gas lamps, and from $d. to #d. for oil-lamps. The gas is distilled from cheap oils, as the waste-products from the manufacture of paraffin, soft lignite, or shale. The gas is pumped from the gasholder into reservoirs, in which it is compressed to about one-tenth of its ordinary volume. From these it is drawn off into a reservoir stowed under each carriage at a pressure of six atmospheres, or 90 tb per square inch. The Pintsch system is in use on railways in England and Scotland on nearly 3000 vehicles, and is being extended to other stock ; the number of vehicles thus lighted in all the railways of Europe is about 18,000. Besides, the system is employed for the head-lights of locomotives.

Intercommunication signals for railway trains are provided Inter- between driver and guard, driver and passengers, or passengers coni- and guard. Electric means of communication have been proposed munica- and tried, but mechanical appliances are most commonly employed. tion There is the ordinary guard's cord, extending along the train out- signals.

side, placed so as to be accessible from the window; then there are the same cord, with an attachment coming inside the window, the English cord, connected with a bell in the driving cab, a line inside the carriage connected with the steam-whistle, and so on. The acoustic signals appear to belong to the last type; but none of these systems is comparable with the through middle passage of the American cars already noticed.

Continuous Brakes.—No department of railway practice has in Con- recent years received closer attention and more minute study than tinuons that of continuous brakes,—brakes applied to the several vehicles brakes.

in a train. With the amount of brake-power that had for many years been supplied to passenger trains—hand-brakes on tenders and guards' vans—a train running at from 45 to 50 miles per hour on a straight level line could not be pulled up within from 800 to 1200 yards ; and even that inadequate amount of brake-power was in the hands of several men. It was clear that the problem of arresting a train in the shortest distance could only be solved by bringing a power to bear on every part of the train in the shortest possible time. But the difficulty consisted in establishing con- tinuity of action, so that the engine-driver or the guard should be enabled to apply the brake-blocks on a series of vehicles in one operation. Mechanical means were first tried, in the systems of Fay and Newall, in which the brakes are worked by a continuous rod passed under the vehicles. These systems were found to be available only on sections of not more than four or five vehicles, and were not worked by the driver but by the guard. In September 1858 a circular was issued by the Board of Trade to the railway companies, calling attention to the advantages to be derived from having their trains controlled by a sufficient amount of brake-power. Subsequently many inventions were tried,—brakes worked by fluid pressure, others worked by chains ; but no practical solution of the problem appears to have been arrived at until Mr Westinghouse of Pittsburgh, U.S.A., invented a really continuous brake worked by compressed air, which was quickly adopted in the United States, and was tried a few years later on several railways in England. It is still (1885) employed exclusively on the Metropolitan District Railway.

Although the Westinghouse brake was greatly in advance of previously existing systems and answered ordinary requirements

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remarkably well, it became evident that for the worst types of acci- dents something more was wanted. The brake as first produced was non-automatic, being worked from the engine only, not by the guard. And, since the power had to travel from the engine along the whole length of the train, there was a loss of valuable seconds of time whilst the brake-blocks were being applied. Mr Westing- house therefore designed a system by which each vehicle was supplied with a complete brake apparatus, carrying its own store of power in the form of an auxiliary reservoir of compressed air, in addition to the brake cylinder already there. By the action of the "triple valve "—a later introduction—which is fitted to each smaller re- servoir on the branch by which it is connected to the main or brake- pipe, the brakes can be instantly applied. A store of compressed air is maintained throughout the train in the continuous pipe and auxiliary reservoirs ; and so long as the pressure in these is main- tained the brakes are kept off. By a reduction of the pressure in the pipe the triple valve is brought into action, and the com- pressed air in the reservoir flows into the brake-cylinder and applies the brake. The brake can be at once released by restoring the pressure in the brake-pipe, when the compressed air in the cylinder escapes into the atmosphere. In the event of a train being parted and the brake-pipe severed, the escape of air reduces the pressure in the pipe, and the brakes are instantly self-applied. They have thus become known as "automatic" brakes. The com- pressed air by the agency of which the Westinghouse automatic

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Fic. 44,—E, the brake-pipe, extends the whole length of the train, connected between the vehicles by a coupling E', with flexible pipes e', e; F, the triple valve at the end of the reservoir G@; H, the brake-cylinder, with pistons and rods connected with the brake-levers and the blocks suspended on frames; h, a branch pipe from the brake-pipe or main to the triple valve and reservoir 3 h', a branch pipe from the reservoir and triple valve to the brake-cylinder.

brake is worked is stored in a main reservoir on the engine, as well as in the local reservoirs under the carriages, at a pressure of from 70 to 80 tb per square inch. The air is compressed by means of a steam-pump attached to the engine and worked by steam from the boiler. The compressed air is supplied through the brake-pipe, which passes through the whole length of the train to the second- ary reservoirs. A brake-cylinder is fixed near each secondary re- servoir, and the charge enters the cylinder at the middle of its length between the pistons, which are driven apart, one towards each end of the cylinder, and act, through piston-rods and levers, upon the brake-blocks which are applied to the wheels. The pistons are maintained in their central positions in the brake-cylinder, when out of action, by spiral springs which abut on the ends of the cylinders ; and so the brake-blocks are kept clear of the wheels, The general arrangement of the brake-apparatus applied to a car- riage is shown in fig. 44; and the reservoir and brake-cylinder, with their connexions to each other and to the main pipe, and the intermediary triple valve in section, are shown on a larger scale in fig. 45. The triple valve, by means of which instant automatic ac- tion throughout the train is produced, consists of a piston in a short cylinder, carrying a slide valve,—the piston and the valve moving together. A vehicle out of order can be cut out of the system by turning a tap, and brakes which have been applied by the parting of a train can be released by opening a valve on the cylinder.

In 1874 a royal commission on railway accidents was appointed, and in June 1875 brake trials were made at Newark. On a level road a train, weighing 208°6 tons, running at a speed of 514 miles per hour, and fitted with the Westinghouse automatic pressure-

brake—there tested for the first time on an English railway—was brought to a stand in a distance of 825 fect in the course of 18 seconds,—the equivalent distance for an initial speed of 50 miles per hour being 777 feet. In trials on the North-Eastern Railway

i

Fig. 45.

in July 1879, a train, fitted with the Westinghouse brake, weighing 208 tons, and running at a speed of 51 miles per hour, was stopped in a distance of 621 feet in 142 seconds, —the equivalent distance

for a speed of 50 miles per hour being 594 feet. In August 1877 the Board of Trade urged the railway companies to united and harmonious action, and stated the requirements which in their opinion were essential in a good coutinuous brake: it should be— efficient in stopping trains; instantaneous in action and easily applied by engine-drivers or guards ; in case of accident instant- aneously self-acting ; capable of being put on or taken off with facility, on the engine, tender, and every vehicle of a train ; regu- larly used in daily working; and the materials employed easily maintained and kept in order. That a brake should be instant- aneous in action is evident on considering that at a speed of 50 miles per hour a train advances through 734 feet in a second of time. A striking example of the value of seconds under such cir- cumstances is quoted in the Report, contrasting the working of the Westinghouse compressed-air brake and the Westinghouse vacuum-brake. The rates of speed were nearly the same,—about 52 miles per hour, or 76 feet per second. The train with the former brake ran 825 feet, whilst that with the latter ran 1533 feet. Now, it took 7# seconds to put on the vacuum-brakes and 14 seconds to put on the pressure-brakes. The difference, 64 seconds, at 76 fect per second, makes a space of 475 feet traversed by the train before the brake came into action. In consequence of these steps taken by the Board of Trade all the large railway companics have now (1885) adopted continuous brakes, though some of these do not comply with the conditions of the Board of Trade. The principal question is not now that of automatic versus non-automatic, but of automatic pressure-brakes versus automatic vacuum-brakes. In the latter, as the name indicates, the work is done by the atmo- spheric pressure against the pressure of a comparative vacuum. At 31st December 1878 only 21 per cent. of the total carriage stock was fitted with brakes of some form, of which 12°8 per cent. were auto- matic ; whilst at 30th June 1884 of the total carriage stock 76 per cent. was fitted with continuous brakes, of which 58 per cent. were automatic. It appears that there are in the United Kingdom considerably more Westinghouse automatic brakes in operation than any other single system. The same brake is very largely used in America and on

the Continent, and at the end of 1884 it had been adopted to the extent of upwards of 15,000 sets for locomotives and 78,000 for carriages.

ELECTRICITY.

The employment of electricity in the working of railways has Signal- already been referred to in the application of block-signalling to ling.

the direction of the traffic, in the working of junctions, the protec- tion of stations and sidings, and the repetition of signals.

The first attempt to apply electric power for propulsion on rail- Propul- ways was made by Mr R. Davidson, who in September 1842 tried sion.

on the Edinburgh and Glasgow Railway an electro-magnetic loco- motive, running on four wheels and weighing 5 tons. A speed of 4 miles per hour was attained. Electric power was applied in 1881 by Messrs Siemens and Halske of Berlin on an electric railway, the Lichterfelde line, near Berlin; and since then they have con- structed an electric line 1} miles long, from Charlottenburg to the Spandauer Bock, and a short line in Costverloren Park near Am- sterdam. They also applied the system to a railway in the mines at Zankerode in Saxony. At the International Electric Exhibition in Paris (1881) an electric line was worked by Messrs Siemens Brothers which carried an average of over 13,000 passengers per week ; and in September 1883 a railway of 3 feet gauge, 6 miles in length, was opened between Portrush and Bushmills in the

Lighting.

Acci- dents.

north of Ireland. The gradients are very heavy, having a slope of 1 in 35 at many parts. The curves are very quick, following the line of the road. The conductor employed consists of a third rail, weighing 19 Tb to the yard, and

laid close to the fence. Elec- tricity is transmitted through the conductor, by means of steel brushes, to the Siemens motors by which the car is propelled. The dynamo-machines by which the electricity is generated are driven by the power of a natural waterfall of 26 feet in the river Bush. Two turbines are driven by the fall of water at a speed of 225 revolu- tions per minute ; each is capable of yielding 50 horse-power. The electric car can run on the level at the rate of 12 miles per hour.

Several large metropolitan and other stations are lighted by electricity. At the Waterloo station of the London and South- Western Railway, for example, the new main line suburban pass- enger station, about 13 acres in area, has been lighted by the Anglo-American Brush Light system since February 1881, sixteen arc- lamps of 2000 candle-power each being employed. The Windsor line station at the same terminus, about 14 acres in area, has been lighted by the Edison Company's system since January 1883 with 200 glow-lamps of 16 candle-power each. The large goods-yard on the same railway, about 18 acres in extent, at Nine Elms, has been lighted since January 1883 by fourteen arc-lamps of 4000 candle-power each. The lighting of railway trains by elec- tricity has been successfully effected on the Great Eastern Railway since October 1884. The power is derived from a dynamo-machine driven by a compact rotary engine, placed together in a small case on the top of the locomotive, and worked by steam from the boiler. Sixty electric lights are generated, each of them sufficient to light thoroughly a compartment of a carriage, and supply light for a train of at least twelve vehicles. Trains on other lines also are lighted by electricity.

ACCIDENTS.

Accidents on railways arise from three causes,—inattention of servants, defective material either in the works or the rolling stock, and excessive speed. But the adoption of the absolute block system, with the use of interlocked points and signals and continuous brakes, has led to an absolute diminution of the number of accidents, whilst the amount of traffic has been greatly increased. In 1883 the total number of train accidents on railways in the United Kingdom, reported on to the Board of Trade, was 94 on 18,681 miles open, against 241 accidents ten years earlier on 16,082

miles open. The increased efficiency of management is strikingly brought out by Table XXXII. :-—

Number of Class of Accident to Engines and Trains. Accidents.

1873. 1883.

1. Meeting with or leaving the rails in consequence of obstruction, or from defects in the way or works….| 24 12 2. Failure of boilers, axles, wheels, tires, &c….....4+ 23 it 8. Entering stations at too great speed …....-..~~eeee 5 2 4. Collisions between trains following on the same line of rails, except at junctions, stations, or sidings …... 18 3 5. Collisions at JUNCtiONS …....0..cccccccccnessssseseces 20 8 6. Collisions within fixed signals at stations or sidings 98 44 7. Collisions between engines or trains meeting in oppo~~ Saray Gbbieonles Np ge pdoomenondpe Sabodon) csonoauGaboouT 3 8. Collisions at level crossings of two railways …..... 3 9. Derailment of engines or trains wrongly run or turned; ~ into sidings, or otherwise through facing points …. 36 6 10. On inclines,—want of Control] .....eeeee ce eeee cece ll 2 Totaliot train 'accidents… ccc: : sss cece cence 241 94 11. Miscellaneous,—not train accidents …....- 6 7 UR) Sop do poaceaseD pNopacaAoauoUsdUneadodon 247 101

During the period 1873-1883 there was therefore a material improvement not only in the character of the way and works but also in that of the rolling stock. Accidents from entering statious at too great a speed have been augmented in number,—a result naturally arising from the greater speeds and volumes of traffic. Ten of these (for 1873 and 1883) were due to want of control of the trains, and seven others to want of continuous brakes. Collisions have been diminished to a marked extent ; and nearly all of those in 1883 took place at junctions, stations, and sidings, mostly within fixed signals. Many of these collisions could have been obviated if proper interlocking and block working had been in use, together with continuous brakes on the trains. Of the 94 investigated train accidents 75 took place on the lines of fifteen companies, working in the aggregate 12,850 miles, and having run upwards of 216 millions of miles with trains,—showing that one accident happened for every 171 miles of railway, or for every 3 millions nearly of miles run. One person in every 625 employed in the traffic—locomotive, carriage, engineers', and stores departments— in 1883 was

killed in the service. The employés who stand at the extremes of the scale of fatality are guards: of brakesmen and goods-guards 1 in 97 lost their lives, and of passenger-guards only 1 in 5902. Pointsmen and signalmen occupy a medium position in the scale, 1 in 800 losing their lives ; of engine-drivers 1 in 643 was killed, and of firemen 1 in 5383. Of persons other than pass-

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engers or servants of railway companies who suffered in accidents, trespassers, including suicides, as usual form the largest number, —354 killed and 165 injured. Of passengers 125 were killed and 1416 were injured—together, 1541 persons, or 1 in about 444,000 of the total number of passengers in 1883.

Rai~way Law.

Parliament soon began to exercise control over railways by means Legisla- of standing orders; and in 1832 a passenger duty of 4d. per mile tive mea. for every four passengers carried was levied on railway companies. sures,

In 1842 a Government department was instituted whereby the Board of Trade was empowered to appoint inspectors of railways, to postpone the opening of railways, to disallow bye-laws, and to institute legal proceedings against companies for infringing the law. The Board of Trade was further empowered to direct cornpanies to make returns of accidents, of traflic, and of tolls levied. The passenger duty was fixed at 5 per cent. of the gross receipts from passengers. In 1846 the Commissioners of Railways, five in number, were appointed, to whom the jurisdiction of the Board of Trade was transferred, but in 1851 it was re-transferred to the Board of Trade. The Railway and Canal Traffic Act, 1854, requires railway companies to provide " reasonable facilities" for receiving, forward- ing, and delivering their own traffic and the traffic of other com- panies, and to abstain from "unreasonable" preference. It appears to have been of small practical utility until 1873. The Regulation of Railways Act, 1878, establishes a new tribunal, "The Railway Commissioners," not more than three in number, one to be of ex- perience in the law and one of experience in railway business. The principal duty of the commissioners is to enforce the

observance of the “reasonable facilities ” section of the Act of 1854. The com- missioners have power to enjoin the forwarding of through traffic at through rates, the power being set in motion by the companies only. The commissioners are empowered whenever there is a dis- pute between two companies that can be referred to arbitration to decide such dispute. The Employers’ Liability Act, 1880, provides that where personal injury is caused to a workman by reason of the negligence of any person in the service of the employer, who has the charge or control of any signal, points, locomotive engine, or train upon a railway, he or his representatives shall have the same right of compensation or remedy against the employer as if the workman had not been in the service of the employer nor engaged in his work. The amount of compensation is not to exceed three years’ earnings of the workman. (D. e7C3)

FoREIGN AND CONTINENTAL.

Europe.—A few unimportant tramways were opened in France in France,

1826-32. In 1833 the Government began a comprehensive system of surveys, and laid down the general plan of railway development for the whole country; and in 1842 Thiers devised a scheme by which the state was to furnish half the cost (about £10,000 per mile), while private companies were to lay the lincs at their own expense and equip and work them fora term of years. In 1857 six great companies were working their lines with profit ; but the state found it necessary (1859) to guarantee them the interest on the additional lines which were needed. By subsequent legislation the construction of local railways on a cheaper scale was encouraged, and in 1875-76 unsuccessful efforts were made by speculators to unite these local lines into systems which should compete with the old companies and break their monopoly. Since that date some have been absorbed by the great companies ; others have passed into the hands of the state. After more than one scheme for a comprehensive system of state railways had been formed by leading statesmen and then for one reason or another abandoned, in 1884 agreements were made by which some 7000 miles of railway were to be constructed in addition to the 17,000 miles then in operation, the money to be supplied by the six great companies and ultimately repaid by the state, which meanwhile guaranteed the

shareholders of each company a dividend equal to the average of recent years (in no case so low as 7 per cent.). The profitable system of monopoly has not been favourable to the development of enterprise in railway nianagement in France. Scarcely any of the so-called express trains run at as high a speed as 40 miles an hour. The time allowed for the despatch of goods is very long. The average rates (0°78d. per passenger-mile, 0°82d. per ton-mile) are somewhat higher than those of Germany. The long-distance traffic especially has received but little encouragement. On the other hand, many of the technical arrangements of the French lines are excellent. Although the state owns so few railroads, it has reserved extensive rights of regulation, both in matters of business and in cngineering ; there is a body of Government engineers organized with almost military precision.

Soon after 1830 plans were laid for a Belgian system to be owned Belgium.

and managed by the state, and work was actively begun in 1833. The Government lines were arranged in the form of a cross, the point of intersection being at Malines. By this means the Govern- ment was able to develop the traffic of Belgium itself, and at the same time to secure a large share of the transit trade between Ger-

Holland.

Germany.

Austria- Hungary.

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many and England which had formerly gone wia Holland. Having obtained control of the main lines with a length of about 300 miles the Government left the rest to private enterprise. Between 1850 and 1870 the private lines had increased from less than 200 to 1400 miles and competition between the state and private railways soon became active, and for ten years after 1856 rates were in con- sequence reduced to the lowest possible point. The state railways, however, had certain advantages: they had been well laid out and economically constructed ; their organization was admirable and

the very keenness of private competition was sufficient to guard agaiust serious abuses. Nevertheless about 1870 the Government decided to purchase most of the competing lines, and by 1874 it owned more than half the railways of the country. It now (1885) owns three-quartcrs ; there is only one large private system which could by any possibility compete, and with this there is a joint- purse agreement. The charges in general have uot been raised as a result of the new policy, and they are still the lowest in Europe.

The first lines in Holland were constructed by private companies in 1840-56. In 1860 a state system was begun, which included at one time nearly two-thirds of the mileage of the kingdom. It was not, however, managed by the state directly, but leased to a private company. But the financial results were not satisfactory to either party, and the commission of 1881-82 reported strongly against the arrangement. The absence of connexions or of mutual accommoda- tion between the different systems elicited severe criticism.

The first German line was opened in 1835. While most of the states were too small to have a comprehensive policy, Prussia from the very outset encouraged railway development, giving pecuniary assistance, and in return reserving important rights of state con- trol. About 1848 the Government began to construct railways of its own, at the same time purchasing shares of stock in private companies. After 1870 the same policy, which had been for a time suspended, was again pushed forward in the direction of creating a German imperial system; but the jealousy of the smaller states

roved fatal to its success. The Prussian Government, however,

egan to extend its own system ona large scale. In 1878 it owned only 3000 miles of railroad and managed 2000 more, while 6000 were in the hands of private companies. Now (1885) there are 13,000 miles of state railways and only about 1000 in private hands, The prices paid by the Government were, as a rule, high (in one instance the sellers secured an income of more than 16 per cent.), but the lines are nevertheless managed with reasonable profit to the state. The passenger-train service is prompt and comfortable. The speed attained is greater than elsewhere in Continental Europe, the

maximum being about 45 miles. The passenger rates are low, averaging not quite 0°7d. per mile for all passengers carried. There are Oa aa et few accidents. The freight service is rather slow, and the charges are not relatively so low as those for pass- engers, On the other hand, they have for the most part avoided preferential rates ; something very like a system of equal mileage rates prevails, though not always quite consistently carried out. In addition to this rate there is a fixed terminal or "Grundsatz"; but it is put, almost purposely, too low, so as uot to interfere with the very short-distance traftic. The result is that the mileage rate is relatively too high, and for the long-distance traffic it reaches a very high figure. Down to 1880 this result was evaded by a system of special tariffs for export, import, or transit traffic, but during the last five years a strong effort has been made to do away with them. It has not been altogether successful, owing to the competition of water-routes.

In Austria a tramway line for general traffic was chartered in 1824 and opened in 1828. But until 1838 the Government positively discouraged the introduction of railways. The policy then adopted, however, guaranteed to each railway a monopoly in its own district during the (comparatively short) period for which its charter was to run. At the same time the state made lines of its own on a large scale. The revolution of 1848 led to financial straits; and in the years following most of the state railways, at least in Austria itself, were sold to private companies for about one-half their real value. But in Hungary the reality of a state railway system was more steadily maintained. The growth of the Austrian system was slow until after the war of 1866; then it began to develop rapidly. The railway speculation which ended in the crisis of 1873, being perhaps more recklessly carried on in Austria than any- where else in the world, resulted in very severe distress. Since 1876 there have been consistent efforts to increase the importance of the state railway system both by the purchase of old lines and the construction of new ones. At present there are in Austria 2000 miles of state-managed railroad, and not quite 6000 managed by private companies; while in Hungary there are 2000 miles of state railroad and 3000 in private hands. The policy of the state management has been to reduce rates, especially for passengers ; but they are still higher than in Germany. In 1883 the average receipt per mile for each passenger was 0°84d. ; while the average receipt per ton of freight was 109d. Per train-

mile the receipts were about 9s. ; but the traffic was so light in many parts of the country that the average profit on the investment was only 4% per cent.

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The Austrian railways belong to the German Verein, and are like the German lines in most of their methods and principles of ad- ministration. They have carried the system of traffic agreements, even between the state and private companies, into the same de- tail; but they have not adopted the system of equal mileage rates in their tariffs ; on the contrary, they have (like Belgium) adopted a sliding scale, diminishing for longer distances. Probably no other country is so situated that it has to deal with such perplex- ing problems of railway tariff policy as Austria. Nearly all the Austrian railways are of standard gauge; but the problem of the economical construction and management of local lines has received most careful attention from the authorities ; and the law specially encourages the construction of cheap railways in mountainous dis- tricts or for purely local traffic. About fifty such railways were chartered between 1880 and 1883.

The first lines in Switzerland were merely local, and the summer Switzer: It was not until land.

passenger traffic formed a main source of income. Austria had completed two routes across the Alps and France one that the first Swiss route, the St Gotthard, was projected. It is, however, the greatest work of them all, the main tunnel being over 93 miles in length. In spite of the character of the country, the Swiss railways are nearly all of standard gauge. They are entirely owned by private companies, though many of them have received aid from the cantons. The rates for freight are somewhat high. There are now about 2000 miles in all.

After 1860 the railways of Italy developed rapidly. There were Italy.

four main systems—the upper Italian, the Roman, the Calabrian, and the southern system (along the Adriatic). Although this last had in many respects the least promising field, it was the most enterprising and the most successful. The other systems had been arranged more in accordance with the old political divisions than in accordance with the wants of trade. In spite of liberal subsidies from the Government they did not prosper. The lines of Calabria (and Sicily) were the most unfortunate ; and the Government in 1870 was compelled to take the railways of this section into its own hands. The gross receipts have been constantly less than the working expenses. In 1873 the Government contracted to purchase the Roman railways for the same general reasons. The financial difficultics were such that the contract was not carried out till 1880-82. Meantime similar contracts, though for very different reasons, had been made for the purchase of the other two systems. But a special commission, which thoroughly studied the question during 1878-81, reported that the Italian Government had better not undertake to work its lines, even though it virtually owned them. Eventually they were leased for a term of sixty years to two main companies, each controlling about 3000 miles of line, with a third, much smaller, in Sicily. The state is to receive about 274 per cent. of the gross receipts, the companies 62} per cent. ; the remainder is to be divided in a somewhat complicated system of reserve funds. On the whole, the railways of Italy leave much to be desired both in construction and equipment. The rates are reasonable, particularly for local traftic; but the service is always slow, and often quite inadequate to the wants of trade.

The first railway line in Spain was opened in 1848, and the period Spain.

of most rapid development was from 1855 to 1865. The Govern- ment encouraged railways by most liberal subsidics, which had the effect of bringing forward a number of purely speculative under- takings. The indirect results were bad; and for this, as well as other reasons, the years 1869-75 formed a time of most serious depression. Since then matters have improved greatly, on account both of changes in legislation made about 1870 and of the improve- ment in the country itself. There are now about 5000 miles of railway. One-fourth of the money spent has been advanced by

the Government ; and of late years the financial results have been reasonably good. The ratio of working expenses to gross earnings is about 45 per cent. The charges for passengers are rather low ; but those for freight are extremely high. The gauge is 54 feet.

The first Portuguese line was constructed by the state in 1853 Portugal.

or 1854. The Government now owns about half the roads of the country,—one system in the north and another in the south, each somewhat less than 200 miles long. The central lines are owned by a company, chartered in 1859, which has been for many years managed by a body of French directors, from whose control it has but recently been freed. The financial results have been far from satisfactory. The railways are built on a 5% feet gauge.

In Denmark and in Norway railway development has been slow. Scandi-
The greater part of the lines are owned and managed by Govern- navia.

ment. Most of the Norwegian lines are laid on a gauge of 34 feet. The running is slow and the traffic very light. Sweden possesses something over 4000 miles in all, of which the state owns about one-third. The capital averages less than £7000 per mile,—lower than in almost any other country of the world. The railways are in the hands of a number of local companies, which control on an average hardly 30 miles each.

In Russia a short railway—little more than an experiment—was Russia.

constructed in the neighbourhood of St Petersburg in 1835-37, The first line of any length was opened in 1851 between St Peters-

Turkey.

Canada.

Mexico..

Col- ombia.

Guate-

mala.

Brazil.

Chili.

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burg and Moscow. This was built by the state, but afterwards sold toa private company. After the close of the Crimean War railway construction was more rapid. The lines were laid down by the Government surveyors, but were constructed and managed by private companies, receiving, however, much help from the Government. Of the 15,000 miles in operation hardly a tenth part belongs to the state, even including the 700 miles of state railway in Finland. Yet about half the capital employed in rail- way construction has been furnished by the state. Since 1880 the construction of railways in European Russia has moved slowly. Of greater importance has been the development of the Asiatic lines. The first of these, in the Caucasus, was opened in 1872 to a length of nearly 200 miles. The Trans-Caspian military railway was begun in 1880; the connexion between the Caspian and the Black Sea was completed in 1883. The Siberian railway is being pushed forward as rapidly as the finances of the empire will allow. The administration is in most respects modelled upon that adopted by Germany and Austria, The plan of the Russian railways has been dictated by military rather than industrial considerations. The gauge is 5 feet.

Isolated lines were constructed in Turkey in 1860 and 1866. The first general plan for a system of importance dates from 1869, and was modified in 1872. Foreign companies furnished the capital and received a subsidy from the Government. In return they were to make certain annual payments; but the clauses providing for this were so carelessly drawn that the companies seem to have had an interest in delaying the completion of the work. Some of the lines were lost in the cession of territory which followed the war of 1878. There are now open for traffic about 1000 miles of railway in European Turkey, and 200 more in Asia Minor.

There is a fairly developed system of railways (1000 miles or more) in Roumania, owned by the state; and there are a few lines in Servia.

Arrangements seem to be completed by which through communica- tion in these countries will soon be established on a large scale, if the authorities in Turkey and Bulgaria do not fail in their duty. The Government of Greece is also engaged in extending its railway system, which has hitherto amounted to nothing. (ASrE:)

America.—In the Dominion of Canada 9118 miles of railway and 6735 of tramway, together 15,848, were open in the end of 1888. The accounts show that the total outlay for construction amounted to about 73 millions sterling, being at the rate of £4610 per mile. The gross earnings for the year 1883 amounted to up- wards of 6 millions sterling, of which 72°3 per cent. was absorbed as working expenses, leaving £1,693,000 net earnings, which amounted to only 2°3 per cent. on the capital cost. The earlier railways were laid to gauges of 54 and 34 feet, but the inconveniences of break of gauge with the railways of the United States led to the relaying of all the lines to the standard gauge, except those of Newfoundland and Prince Edward's Island, which remain on the 33 feet gauge. The principal system is the Grand Trunk Railway, comprising the original Grand Trunk and the Great Western, which were consolid- ated in 1882, making a total length of 2358 miles of line. The first section of the system—Portland to Montreal—was opened in 18538, the first line opened in Canada. In June 1884 of the (esti- mated) 2899 miles of the Canadian Pacific Railway, connecting the Pacific with the Atlantic, 2105 miles were open and in operation.

In Mexico the first railway constructed and opened was the Mexi- can Railway, between Mexico city and Vera Cruz, 264 miles, with a branch 29 miles, the first section from Vera Cruz to Paso del Macho being opened in 1865. This railway, with one or more others in Mexico, was constructed to the 4 feet 84 inch gauge, but others, including the Mexican National Railway, 910 miles long, are laid to the 3 feet gauge. The Mexican Central Railroad, 1224 miles long, was completed in 1884.

The Panama Railroad, Colombia, between Aspinwall and Panama, 473 miles in length, was opened in January 1855. The rails are laid toa gauge of 5 feet. Railways were in progress in 1883-84 in scveral of the other states of Colombia, all of them to a gauge of 3 feet.

In Guatemala the first line of railway from San Jose to Esquintla, 13 miles in length, laid to a gauge of 3 feet, was opened in June 1880. A line from Champerico to Ritalhulca, 30 miles long, was opened in December 1883 ; and another from San José to the capi- tal, 69 miles long, is now finished.

In the empire of Brazil the Mana Railway was the first line opened, early in the decade 1850-60. It isa short line of single way, 11 miles long, between the head of the bay of Rio de Janeiro and the foot of the serra. It was laid toa gauge of 54 feet ; but other lines in Brazil are laid to a gauge of 5 feet 3 inches. The empire possessed in January 1884 railways of a total length of 3500 miles open for traffic, besides 1500 miles in course of construction. The state owns nine lines, having 1300 miles open, the principal of which is the Dom Pedro II., intended to connect the eastern and western provinces of the empire.

Chili was one of the first states in South America to initiate the construction of railways. The Copiapo Railway, laid to the 4 feet 84 inch gauge, was opened about 1850; and an Act was passed in 1852 authorizing the construction of a line to connect Santiago

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with Valparaiso, 114 miles distant. In 1855 the first 8 miles were opened for traffic, and in 1863 the line was opened throughout. It was constructed to a gauge of 54 feet. In 1883 the total length of lines open for traffic was 1378 miles.

In Peru a system of railways has been in course of construction Peru, since 1852, chiefly at the expense of the state. In 1878 there were open for traffic, or in course of construction, twenty-two lines belonging to the state and to private individuals, 2030 miles in length, representing a cost of about 36 millions sterling.

Africa.—The railways of Lower Egypt have been laid out pri- Egypt. marily to connect Alexandria, Cairo, and Suez, with branches to Mansurah and elsewhere in the Delta. The line first laid out, between Alexandria and Cairo, 130 miles long, was opened in January 1856. The junction line from Bennah to Suez is 101% miles in length ; the total length of railways open

for traffic in Egypt at the end of 1883 was 941 miles, laid to the 4 feet 84 inch gauge.

There are three systems of railway at the Cape of Good Hope,— Cape the Western from Cape Town, the Midland from Port Elizabeth, Colony, and the Eastern from East London. In January 1884 there were 1213 miles open for traffic.

In the colony of Natal there were at the end of 1883 105 miles Natal. of railway open, and 120 were then in course of construction.

In the Island of Mauritius there are two lines of railway laid Mau- to the 4 feet 83 inch gauge, with two branches, of a total length of ritius. 94 miles. The North line, starting from Port Louis, is 31 miles long, and was opened in 1864; the Midland line, passing through the centre of the island, is 35 miles long, and was opened iu 1865.

Asia.—In 1845 the East Indian and the Great Indian Peninsula India. Railway Companies were formed. Four years later the Government entered into arrangements with these two companies for the con- struction of railways in the presidencies of Bengal and Bombay, guaranteeing for ninety-nine years a dividend of from 44 to 5 per cent. upon the estimated cost of these and succeeding railways. They adopted one uniform gauge of 5 feet 6 inchcs. Down to 1869 this policy of guarantee and: uniform gauge was adhered to. But in 1869, under the rule of Lord Lawrence, the Government altered the standard gauge for new lines to one metre, or 3 feet 33 inches, and used the lightest rails and rolling-stock compatible with the requirements of Indian traffic. There are now five different railway gauges in India, namely, the 54 feet, the 3 feet 33 inch, the 4 feet, the 24 feet, and the 2 feet. The first piece of railway opened in India was a section of the Great Indian Peninsula Railway, 203 miles long, from Bombay to Tannah, in 1853. At the end of March 1884 there were 1288 miles of that railway open for traffic.

The East Indian Railway was opened for a length of 38 miles in 1854; there are now 1509 miles open. In 1869 this railway was transferred to Government, though it is still worked by the com- pany. Of the Madras Railway 65 miles were opened in 1856 ; there are now 861 open. The first

of the imperial state railways was opened (114 miles) in 1873. At the end of March 1884 the number of miles of line open for traffic was as follows (Table XX XIII.) :—

Miles open, | Cost per Mile, March 1884. | December 1883. West UNG RAM WANs «ccc cc ccseeice cecese 1,509 £22,400 Guaranteed Ta WAYS . 20. cece cave ccwecece 4,641 15,000 Darjiling- Assisted companies …....-..e00. 256 Himalayan

4,700

State railways—Imperial ….....000 2,649 10,200 PRO NAIC TD crepe siatalelstais) sieters 1,273 6,800 Native States…..... 504 5,600 Total for all railways …..... 10,832 £13,700

The number of passengers carried increased from 24,280,459 in 1874 to 65,098,953 in 1883.

In Ceylon the railways have been constructed by the Govern- Ceylon. ment. The main line, from Colombo to Kandy, 743 miles long, was opened for traffic in 1867; and the branch to Navalapitiya,

17 miles long, was opened in 1874. The Kalutara Railway, 273 niles long, was finally opened in 1879. There were 164 miles open at the end of 1884, and 16 in course of construction.

The only railway ever laid in China ran along a strip of land, China. about 9 miles long, between Shanghai and Woosung, opened in 1876. In October 1877 the line was removed and the traffic came to an end in consequence of official jealousy, although the railway was very popular with the natives.

The first railway that was opened in Japan was the Tokio-Yoko- Japan. hama line, 18 miles in length, commenced in 1869 and opened for traffic in 1872, laid to a gauge of 34 feet. At June 1884 there were open for traffic 236 miles of railway. .

Australia.—The four leading colonies of Australia have their capitals connected by railways, and each has its own gauge.

The railways of New South Wales are divided into three systems, New all of which take their departure from Sydney, the capital,—the South northern, the western, and the southern system. The first piece of Wales. line, 15 miles in length, was opened in 1855; and at the end of 1883 there were 1320 miles open for traffic, and 597 in course of

Victoria.

Queens- land.

South Aus- tralia.

Western Aus- tralia,

New Zea- land.

Con- struc- tion.

RATLWAY

construction. inches.

Victoria has a uniform gauge of 5 feet 8 inches. The railways all belong to the state. There were 1562 miles of railway open at the end of 1883, besides which 180 were in progress.

In Queensland a system of light substantial railways has been laid out on the 34 feet gauge, mainly from motives of economy and to moderate the difficulties of carrying the line over the main range to the tableland of the Darling Downs. The first section of the Southern and Western Railway was opened in 1867. At the end of 1883 there were 1038 miles of railway open for traffic, and 454 were in course of construction.

In South Australia a gauge of 5 feet 3 inches was at first adopted. The Adelaide and Port Adelaide Railway, 74 miles long, was opened in 1856, and the Adelaide and Kapunda Railway, connecting the capital with the chief copper mines, 503 miles long, was opened in 1857. At the same time railways on a 34 feet gauge were also con- structed ; the first of these, between Port Wakefield and Blyth, was partly opened in May 1867. The

Port Augusta and Port Darwin Railway, destined to connect the Indian Ocean with the Southern Ocean, will, when completed, be about 2000 miles in length. The colony had 991 miles of railway open for traffic at the end of 1888, with 225 in course of construction. In view of the inconveniences of a break of gauge, the progress of the broader gauge lines was stayed northwards, after the junctions had been effected, and new main lines into the interior are constructed on the 34 feet gauge.

In Western Australia there were only 55 miles of railway open for traffic at the end of 1883 and 68 in course of construction.

At the end of 1883 Tasmania had 167 miles of railway completed, and in 1884 207 miles in course of construction.

New Zealand.—The first railways in New Zealand were con- structed in the province of Canterbury: the Lyttelton and Christ- church Railway, connecting the port town with the capital of the province, 6 miles long, was commenced in 1860, and opened in 1867, laid to a gauge of 5 feet 3 inches. The Great Southern Rail- way, a portion of the trunk line to the south, of the same gauge, was opened, also in 1867, to the river Selwyn, distant 23 miles from Christchurch. A comprehensive system of railways connecting the chief towns of the colony was commenced at the expense of the Government in 1872, for which the 34 feet gauge was adopted as the standard. The first lines so constructed were the Wellington and Woodville Railway and the Napier and Manawatu Railway. At the end of 1883 there were 469 miles open for traffic in the North Island and 926 in the South Island, besides 91 of private lines, making in all 1486 miles. @i eC)

The lines are laid to a uniform gauge of 4 feet 84

United States.

Construction.—The low cost of American railways has been due largely to a close adaptation of the alignment to the natural surface by the use of grades and curves. The importance of saving in materials, labour, and cost has been very much greater than in Europe, because labour and nearly all materials but timber were much costlier, and especially because tlie interest on money was very much higher, —until about 1875, on the average

probably 9 or 10 percent. The use of the " truck " or " bogie " under locomotives and cars made it possible for the Baltimore and Ohio Railroad, the first long line in a mountainous country, to be constructed with curves of 600 feet radius, and on temporary lines on the same rail- way with curves of 300 and 278 feet radius. Curves of 955 and even 716 feet radius are common through difficult country ; curves of 573 feet radius occur on some important lines; and 410 to 388 feet radii are not uncommon in mountainous regions. On the United States military railroads in 1864 an immense traffic passed safely over temporary lines with a curve of 50 feet radius. Early experi- ments as to the real power of the locomotive to surmount gradients led to the adoption of 110 and 116 feet per mile for ascents 17 miles long, and to the successful use on a temporary track over a tunnel (in 1852) of gradients of 1 in 10, over which a locomotive weighing 25 tons hauled regularly one-car trains weighing 584 tons, including its own weight. A gradient of 1 in 124, 7 miles long, in a mining branch in Colorado is now regularly worked. In the construction proper a noticeable peculiarity has been the frce use of open trestle- work of timber, to save both masonry and earth or rock excavation. Some of these timber structures have been of enormous proportions, as the Portage Viaduct (sce vol. iv. p. 328) over the Genesee River, 284 feet high and 800 feet long, in 50 feet spans, built in eighteen months (1858), at a cost of only $140,000, and containing 125,000 cubic feet of timber and 80 tons of bolts. Structures of timber exceeding 100 feet in height have been rare, but of all dimensions below that exccedingly common, the usual intent and practice hav- ing been to replace them as they became unserviccable with masonry embankments. Although their use has not unfrequently been abused by permitting them to become unsafe from decay, they have in the main been thoroughly solid and substantial. For bridge spans of 30 to 250 feet the wooden " Howe truss" bridge, a type peculiar to America, was early invented and almost universally

used where wrought-iron trusscs would be now used both in Europe and America. The piers and abutments for such trusses were usually of stone, but not unfrequently of timber also. These wooden trusses are now being rapidly replaced with iron, the lead- ing types being the Whipple, Post,

Fink, and Bollman trusses (see BrIpGEs, vol. iv. p. 822 sqg.). The sleepers (in America called ties or cross-ties) are usually of hard wood (white oak), hewn on top and bottom, with the natural surface of the tree on the sides. The usual dimeusions are 6 (sometimes 7) inches thick, 8 (sometimes 84 or 9) feet long, and 8 to 10 or even 12 inches face. The usual rule is to place them 2 feet or less apart, and 2640 to 2700 to the mile. The large bearing surface thus afforded has especially favoured the use of the flat-based or Vignoles rail, and it is in exclusive use throughout North and forthe most part South America. The rails now most largely rolled weigh from 56 to 65 Tb per yard. On the light-traffic lines of the south and west there are still many 50 Ib rails, and in the north and east rails of 70, 72, 75, and 80 Ib sections are in limited but increasing use. An average for the whole United States would now be somewhat under 60 Ib. The close propinquity of the sleepers gives much greater stiffness to the rail than com- parative weights alone would indicate, a 60 ib rail being fully equivalent in stiffness and strength to an 80 fb rail supported on chairs 3 feet between centres. The ballast and drainage of American railroads have often been very defective, with the view to effecting a large saving in first cost. Improvements in this as in other respects have taken place in recent years, and many thousand miles are now maintained at a high standard of excellence. Right of way, usually in a continuous strip 100 feet wide (wider where necessary, but never narrower), has been largely given, or purchased at very low rates. The widths of road-bed (almost always first graded for a single track) are usually 18 to 20 feet in excavation and 14 feet on embankments, with 14 to 1 slopes. Side slopes of 1 to 1 have been largely used in regions not exposed to frost. Parallel tracks are placed 13 feet between centres.

Railway development in the United States has had to adapt Develop- itself to the needs of a new and rapidly growing country, a large ment.

part of which was first made available for settlement by railways. Three locomotives were imported from England in 1829, and the first trial in America took place on 8th August 1829 at Honesdale, Pennsylvania. The first railway constructed to be worked by loco- motives was the South Carolina Railroad (1828-30), though trials of an experimental locomotive had been made before on the Balti- more and Ohio Railroad, which continued to be worked by horse power until 1832. The milcage of railway

construction about kept pace with that of the United Kingdom until 1850 ; at the beginning of 1885 it amounted to 125,379 miles. The mileage completed amounted to 40 miles at the end of 1830, to 3361 miles in 1841, and to 5206 miles in 1847, of which 1340 miles had been opened within six years. Then there was a sudden and great increase, the yearly additions for seven years being 1056 miles in 1848, 1048 in 1849, 1261 in 1850, 1274 in 1851, 2288 in 1852, 2170 in 1858, 3442 ntiles in 1854. The Civil War checked railway construction, only 3257 miles being opened during the five years ending with 1865, when the aggregate amounted to 32,996 miles. But during the seven years ae with 1872 the mileage of the country was nearly doubled, the yearly additions being 1403 miles in 1866, 2541 in 1867, 2468 in 1868, 4103 in 1869, 5658 in 1870, 6660 in 1871, 7439 in 1872, a total of 30,272 miles in seven years. At the close of this period of construction there was a mile of railway to every 666 inhabitants. It was followed by great financial disasters and in- dustrial stagnation, and by a period of comparative inactivity in railway extension, only 5217 miles being opened in 1873, and only 14,057 in the five years ending with 1878 (2428 in the last-named year). During the five years ending with 1883 40,000 miles were opened, of which 11,568 fell to 1882. At the end of 1884 the population per mile of railway was 458. There was no railway west of the Mississippi until 1853, and then only 38 miles; in 1860 there were 1930 miles (24,990 on the east), and in 1865 3007 miles (29,988 on the east). Since 1865 46,600 miles have been built west of the Mississippi. About one-half of the population of the United States isin the territory lying north of the Potomac and Ohio and east of the Mississippi, including sixteen States with an aggregate area of 418,495 square miles, 29,000,000 inhabitants, and 55,725 miles of railway. France and Germany together have nearly the same area (416,205 square miles), 83,000,000 inhabitants, and 40,682 miles of railway. The United States has one mile of railway to 7°5 square miles of territory and 520 inhabitants, and Europe 1 mile of railway to 10°2 square miles and 2040 inhabit- ants. The two States of New York and Pennsylvania, whose area is abont equal to that of Great Britain, have onc mile of railway to 6°2 square miles, against one to 5°9 in Great Britain; and Massa- chusetts and New Jersey, with one-third more area than Belgium (which has more railway in proportion to area than any other European country), have 4 square miles of area per mile of railway, while Belgium has 4°2. In the Southern States

the railways are much less numerous and have lighter traffic and earnings. The prevailing course of traffic in America is east and west, or rather

Cost. The railways having at first to serve a thinly peopled but rapidly | fluctuations in these rates, the figures being the number of cents growing country, American engineers devised methods of construc- | per 100 Ib of first-class (the highest class) freight :— tion and working which produced a line at very small cost, lacking : = very many of the appliances considered necessary in Europe, but 1869. | 1870. | 1871. | 1875. | 1882. | 1884. capable of being extended and developed as the country itself be- | | Fichest rate…...| 188 180 | 150 10 | %% 7 caine more settled and prosperous. At first many lines cost only | | Lowest rate …...| 25 50 | 30 30 30 40 £2000 per mile, and much better lines are now being built for |? —J—-aA__2AJ Be £3000 per mile or less. Even when fully developed they are still The rates which the railways have endeavoured to maintain on usually very much less costly than European railways. Some of | this traffic since 1877 have been, with but slight changes, 75 cents the large systems have cost, on the average, only from £7000 to | for first-class freight, 60 for second, 45 for third, 35 for fourth, £8000 per mile. The average reported cost in 1884 of the 125,000 | and 25 cents for fifth. The highest of these is at the rate of 1°644 miles of railway in the United States was £11,400 per mile ; but | cents per Amcrican ton per mile (=0-92d. per English ton per mile); the actual average cost is probably much less. the lowest is 0°548 cent (=0°307d.) The "basis rate" is that on Traftic. In the United States coal for fuel and timber for building and | grain and flour from Chicago to New York,—grain, flour, and meats other purposes are carried by railway 1500 miles or more from the | forming about four-fifths of the whole traffic eastwards. Twenty place of production. Cattle are carried 2000 miles and more, and | cents (=0°492 cent or 0°275d. per ton per mile) is considered a wheat and other grains worth but half as much per ton, in immense | remunerative rate. Another "basis rate" is that from Chicago quantities, 1500 to 1800 miles. 'This is possible only by rates | south-west to Kansas City, which governs rates from places about which in most countries would be thought ruinously low. But in | 500 miles from Chicago west and south-west. This rate is usually recently settled parts of the United States the population are often | nearly the same as that from Chicago north-west to St Paul, 400 dependent upon the railway for almost everything they consume ;

| miles, governing a large amount of traffic in that direction. Between and almost everything they produce, except their bread and meat, | the Missouri river and the Pacific coast is another territory with has to be carried by the same means. Thus the traffic per inhabit- | another basis ; and in the south, rates from the Atlantic ports to ant is very much larger than in most old countries. Hence too | inland towns are governed by one general rule, as also those from manufactured goods can often be carried 1000 or 1500 miles at a | places in the upper Mississippi valley (like St Louis, Chicago, cost very little more than that at the place of manufacture or | Cincinnati, and Louisville) to the same or other interior towns of importation. In one year the five eastern trunk lines received at | the south. 'Traffic is facilitated on the longer routes by organiza- their western termini (about 450 miles from New York) for trans- | tions known as " fast freight lines," whose cars run over several portation eastwards 8,200,000 tons of goods, equal to more than | connecting railways. When first established these lines were in- 26,000 tons daily. This has greatly promoted the formation of | dependent corporations, owning their cars, collecting the charges for large railway systems and the construction of branches and exten- | transportation, and paying dividends out of their profits. Now all sions by railway companies near unsettled districts. A company | but a few are simply co-operative agencies of the several associated with a line 500 miles long is induced to make extensions not only | railway companies, which contribute cars in certain agreed pro- by the profit to be made on the new line, which in a new country | portions, and share the expenses of the joint agencies, each com- may be almost nothing for several years, but also by the profit | pany receiving the earnings for the freight passing over its railway made by carrying the traffic of the new line over the 500 miles of | precisely as for any through freight. old railway. Comparing the traffic per inhabitant in the United The laws governing the formation of railway corporations and Corpor- States, Germany, and Austria-Hungary in 1883, we get (Table | authorizing railway construction differ in different States, but in ation XXXIV.) :— most it is open to any association of men with the necessary capital maage- – - to form a company and construct a railway anywhere. Generally ment. ce | Gemkay, | or the laws relating to raising and extending capital and the disposi- sey: _| | tion of income are very lax, and under them great abuses have Passenger-miles……..seee000- 158 99 39 occurred. All but a very small number of the railways have been De ee eee

eee ee 772 212 112 projected and constructed by private enterprise; but many com- panies have received aid from towns, cities, counties, or States, and Thus each American travels three-fifths more and has 34 times as | the Federal Government and the State of Texas (the only State much goods transportation done for him as the average German. owning the public land within its borders) have subsidized many Rates. The railways of America have enjoyed great liberty in fixing their | railways, mostly west of the Mississippi, by immense grants of

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to and from the north-eastern Atlantic States north of the Potomac. The eastern " trunk lines," as they are called, extending from the west to the north-eastern seaports (and also to Canada), have a heavier goods traffic than any other lines of considerable length in the world. The companies owning these lines also own or con- trol in some way extensive systems reaching as far west as Chicago, and in several cases to the Mississippi at St Louis. T'wo great systems centre on the Pacific coast. Chicago is the chief traffic centre of the interior.

rates, which, however, have been somewhat restricted by new legisla- tion in several States since 1870, notably one limiting the New York Central to 2 cents (1d.) per mile for all classes of passengers. The average rates for goods have been reduced very much since the Civil War and even since 1875. Passenger rates have also been

reduced, but not nearly so much. Table XXXYV. shows, in pence, the average goods rates per ton on a few important railways :—

RAT LWAY

The classification of passengers is but little developed in America. For local journeys there are usually but one class and one rate of fare ; but on several important lines additional charges are made for certain special kinds of accommodation. Railway " wars" often bring down the through fares to a ridiculously low figure: for instance, the first-class fare for 960 miles, New York to Chicago, has been £2 or less, and the immigrant fare during the spring and summer of 1884 was 4s. The rates on goods are

innumerable and are often changed. Table XXXVII. gives examples of the great

public lands, in the aggregate amounting to 200,000,000 acres. The Federal Government also lent its bonds to the amount of £13,000,000 to aid in the construction of a few lines between the Missouri and the Pacific coast. Between 1830 and 1840 several States undertook to construct railways on their own account ; but most of these attempts ended in disaster, and the railways were completed by companies, if completed at all. There remain, how- ever, two State railways, one 138 miles long owned by Georgia,

Lake Shore | Chicago F hich it leases t tion f rorki New York Senn: 2 Sh g inion which it leases to a corporation for working, and the other b Year Central. | sylvania. —— — Pacific. | Massachusetts, mostly in the long Hoosac tunnel. Owing to tho pa | Se ee el oe — of raising capital for railway construction from 1867 1°540 0°167 ai 1°948 the sale of bonds, secured only by the property bought by the aes — — ane ah er proceeds, before the end of 1874 108 railway companies were in- 1880 0°490 0-491 0°423 0-831 1-055 solvent, and interest was unpaid on more than £100,000,000 1884 0-464 0-413 0-388 0°664 0°781 ($497,807,660) of mortgage bonds which they had issued. Indeed,

From the whole country the averages in 1884 were—rate per mile, 0°629d. ; per ton of goods, 0°502d. ; per passenger, 1°178d. This on the average goods rate from 1880 to 1884 was a reduction of 13 per cent., amounting to more than £13,000,000 on the traffic of 1884. The passenger rates of the above-named railways have been in pence per mile (Table XXXVI.) :—

Lake Shore

Chicago

of the total nominal railway capital of the United States very nearly one-half is represented by bonds. One great compan

which has paid dividends for many years has £9,500,000 of Stock to £20,000,000 of debt. The management of railway companies in the United States is often autocratic to the last degree. When once directors have been

elected by the vote of the majority of the shareholders, they take the most important steps without ever con- sulting the shareholders, and in their annual reports they give only

New Yor ~~— 2 Sh Grou such information as they please, subject to no examination by in~~

soe Central. agheat. para gg to org Pacific dependent auditors. This state of dics naturally leads to pare

S| | — | —_—_| | _____| | abuses, to directoral mismanagement and dishonest speculation in

1870 1-045 1-245 1-306 1°645 bonds and shares. In some cases, however, the authority of the

ld rie ee ie pt ca directors is limited by the charter or constitution of the company. 1984 0-970 1-214 1-085 1-190 1-485 There are very few, if any, lines which have trains whose speed Speed.

equals that of the fast English trains, the fastest being between

Work. ing,

RAI—RATI

New York and Philadelphia, 90 miles in 112 minutes. ‘The 440 miles from New York to Buffalo are run in 102 hours, and the 960 miles from New York to Chicago in 25 hours. A great obstacle to fast runuing is the original vice of construction with level highway and railway crossings. Only few lines are provided with the block signals and interlocking apparatus required with numerous fast trains ; but the use of continuous air-brakes is general. There has been more success in designing appliances to mitigate the effect of accidents than in inventions for avoiding them altogether. Acci- dents are very numerous, the casualties being more frequent in proportion to traffic than in the principal Europcan countries. The number of accidents to passengers, however, is insignificant when compared with that of accidents

to employés and persons walking over crossing-lines. In 1880 the numbers killed and injured were (Table XX XVIII.) :—

Pass- Em- Un- engers. ployés. Others. known.| Total. PESTO aie, ciciere se tiviy ye eiete 143 923 1472 3 2541 Digi decree wacsciesncte cre 544 3617 1451 62 5674 Montel. cise ee 687 4540 2923 65 8215

This gives one passenger killed for every 43,280,000 miles travelled, and one injured to every 11,375,000. In the United Kingdom there were one passenger killed for every 960,000 miles run by passenger trains, and one injured for every 254,000 miles.

Though American railways have steeper grades and sharper curves than in Europe, the loads carried in freight trains are some- times exceptionally large: trains of 45 or 50 eight-wheeled cars each loaded with nearly 18 tons are common. The average load on the principal lines has been doubled since 1870, largely by the adoption of heavier and more powerful locomotives and by the better management of trains, and to some extent by a better condition of permanent way. This has had much to do with the great reduction in the rates charged. The cost of working American railways is usually a larger proportion of the earnings than in Europe. An American railway which spends 60, 66%, or 75 per cent. of its earn- ings for working expenses would in England be called costly to work. The expense per ton per mile on several railways in recent years has been, in cents per ton of 2000 tb (Table XX XIX.) :—

Penn- Lake

New York A 1 wy, Illinois AN U.S. Central. Erie. sylvania. | Shore. | Wabash. | Central. 0:76 0°600 0°529 | 0-473 0-418 | 0-694 0-639

The expense per passenger mile, which is larger than in Europe,

is shown, in cents, in Table

ae the traffic is nearly all first-class, L. :—

New York : Penn- Lake | Illinois ANLU.S. Central. Erie sylvania. {| Shore. Wabash. Central. 1‘710 1°159 1372 1°733 1°166 1°804 1°075 Se ee eee eee ee

American railways also contrive to do their work with a very small number of men. In 1880 86,781 miles of railway were worked with a force of 418,957 men, or 4°7 men per mile, against 367,793 in the United Kingdom on 18,681 miles, or 19°7 per mile, and 316,570 in Germany, or 14°3 per mile. The greater thinness of traffic on American lines accounts for but part of this, for the number of train-miles per year per man employed in different countries is 929 in the United States, 350 in the United Kingdom, 476 in Germany, 395 in Austria-Hungary.

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work done per man is the number of passenger and ton miles for each man employed (which cannot be given for the United Kingdom) ; this is shown in Table XLI. :—

Per Employé. United States. Germany. a Passenger-miles …..... 14,860 14,883 IVE TO DL TOnsmiles! oe cansecve css os 70,587 31,050 Sa ey,

Ee eS ee | The principal statistics of the railways of the United States in recent years are shown in Table XLII. :—

1884, 1883. 1882. 1880.

Miles of railway…... 125,152 120,552 114,461 87,801 Rolling Stock— No. of locoinotives . 24,587 23,823 22,114 17,412 No. of passenger car-| 17,993 16,889 15,551 12,330 riages Luggage, mail, and ex- 5,911 5,948 5,366 4,475 press cars Freight cars …..... 798,399 738,660 710,451 455,450 Trafic per mile of railway Train-miles—Passenger 1,825 1,757 1,728 1,575 Goods 2,958 3,274 3,186 2,860 Total .. 4,783 5,081 4,914 4,435 Passenger-miles…... 77,568 79,872 78,105 65,392 DONEMUES wee cos ccs 352,845 367,904 366,480 329,027 ; £ £ £ | £ CHITTY, 68 SoBe re 1,535, 279,811/1,495,578,156|1,403, 350,022 1,085,144, 512 Clit aga ee aie 1,384,910, 888|1,336, 951, 209|1,207,018, 029 1,036,489,161 Earnings from— g £ £ £ Passengers .. -+| 41,358,140 | 41,367,451 | 37,627,492)

28,820,342 Goods …..... -+| 100,573,982 | 108,901,966 | 97,155,664 | 83,229,152 Other Sources…....) 10,729,200 11,158,139 | 10,814,306, 4,040,625 Total …...../ 152,661,322 | 161,422,556 | 145,597,462 116,090,119 Working expenses se eeas 99,359,540 | 103,105,038 | 92,633,708; 70,560,024 Per cent. of earnings 65°21 63°78 63°61 60°78 Net earnings …...0.. 53,302,782 | 58,317,518 | 52,963,754 45,530,095 Perpassengertrain-mile—| 5 gq s. d. s. d. s. d. Gross earnings …... 4 2 4 7 4 9 4 11} HIKDENSES!- ciclo «cece ec 3 22 3 4 8 5} 3 2 Net earnings …..... 0 11} 1 3} 1 3} 1 94 Per goods train-mile— s. d. ala s. a. s. d, Gross earnings …... 6 3 6 6 6 7h 6 10} EXpenS@s .. 020i 2.000. 4 2} 4 4 4 54 4 1 Net earnings …..... 2 02 Pj me} | oD) 2 9} Per passenger mile— d. d. d. d. BECODUS | cree esas 1178 1-211 15257, 1°165 Expenditure …..... 0°912 0°881 0°914 0°839 PLORtmEr tyes e/< ow sreleer 0°266 0°330 0°343 0326 Per ton-mile— d. d. d. d. MRECEN DES, vciciesieciec a 0°629 0°692 0°692 0°722 Expenditure …..... 0°425 0°413 0°441 0°426 EOMUMME ey tf iarsie oeginae 0°204 0:279 0°251 0°296 Averuge No. of miles travelled— Passengers. .... +0040 26 274 253 23 (Coa aauesonsesns 1143 109 2

(A.M. W.—D. W. D.)

RAIMBACH, Azsrauam (177 6-1843), line-engraver, a Swiss by descent, was born in London in 1776. Educated at Archbishop Tenison's Library School, he was an appren- tice to J. Hall the engraver from 1789 to 1796. For nine years part of his working-time was devoted to the study of drawing in the Royal Academy and to executing occasional engravings for the booksellers, whilst his leisure hours were employed in painting portraits in miniature. Having formed an intimacy with Sir David Wilkie, Raim- bach in 1812 began to engrave some of that master's best pictures. The Village Politicians, the Rent-Day, the Cut Finger, Blind-Man's Buff, the Errand-Boy, Distraining for Rent, the Parish Beadle, and the Spanish Mother and Child raised him in the estimation of connoisseurs, the French especially holding him in great honour. It is said that he never employed any assistants, but executed the whole of his plates with his own hand. At his death, in 1843, he held a gold medal awarded to him for his Village Poli-

ticians at the Paris Exhibition of 1814. He was elected corresponding member of the Institute of France in 1835.

RAIMONDI, Marcantonio. See MARCANTONIO.

RAIN. See Merrzoronoey, vol. xvi. pp. 128, 150-4, 180, and Gxonoey, vol. x. p. 267 sq.

RAINBAND. Every transparent substance is perfectly opaque to some particular kinds of light. A certain shade of orange light is absorbed by the vapour of water, and, when sunlight which has traversed a stratum containing this vapour is decomposed in a spectroscope, the blank caused by the missing rays appears as a black band or group of fine lines. This is called the rainband, because from its intensity the amount of moisture in the atmo- sphere may be guessed at, and the occurrence of rain predicted with considerable certainty. It has long been known that the spectrum of sunlight shows lines of telluric as well as of solar origin. The former constitute

| the absorption-spectrum of the atmosphere (see SpEcTRO-

SCOPY); some are produced by the permanent gases, others by aqueous vapour, which is always present, though in variable amount. The absorption-spectrum of water- vapour has been minutely studied and carefully mapped by Janssen and by Cornu. In Angstrém's table of normal solar spectra there are numerous groups of lines which appeared most conspicuous when the sun was close to the horizon, and many of these are coincident with the absorp- tion-lines of water-vapour. They are found principally in the red and yellow, and the main group is seen a little to the red side of the D line. In small spectroscopes the water-vapour lines appear fused together into a band on the red side of D, or even as a mere widening of that line. There are several variable bands in the spectrum which come to a maximum of intensity when the sun is on the horizon. These are due to absorption by the permanent gases; the one which in a small instrument appears to separate the yellow from the green is frequently mistaken for the water-vapour band, and this is the cause of many incorrect '"'rainband predictions." In 1872 Professor Piazzi Smyth noticed a change in the water-vapour lines before and after a sirocco in Palermo, and the same phenomenon was brought before him very strikingly in France before great

rains in 1875 (Edin, Ast. Obs., vol. xiv.), when he named the main group of water-vapour lines the “ rainband.”

The rainband may be observed with any spectroscope, but direct- vision instruments of medium size are most convenient. It is im- portant that the spectroscope should have as great dispersion as possible and good definition, especially at the red end. To make au observation the slit, which must be kept perfectly clean, should be narrowed down uritil the spectral lines are sharp and clear. The instrument should be carefully focused to get the maximum absorp- tion effect; but all observers lay stress on noting whether the intensity of the band decreases rapidly or gradually as the altitude is increased. When a dark band is observed at the horizon and at the zenith, heavy rain is almost certain to follow immediately. It is of little importance whether the sky be clear or covered with high clouds at the point of observation ; low clouds or haze make the result untrustworthy by shortening the line of sight, thus reducing the strength of the band and equalizing it in all directions. The utility of the spectroscope in meteorology depends on its power of investigating the hygrometrical conditions of the whole slice of atmosphere looked through, and it affords a means of asccrtaining the difference of humidity in differeut directions. The hygrometer only indicates the state, as regards moisture, of the few yards of air surrounding it. The great difficulty in the way of obtainin accurate results with the rainband spectroscope has been the menta scale of comparison employed by most observers. Although some have found it easy to estimate the intensity of the band from 0 to 20, it is beyond the power of many to describe it in figures even from 0 to 5. Professor Piazzi Smyth noted its strength relatively to that of the dry-air band between the green and yellow. The fixed solar lines £, b, and F have been used as a closer approxi- mation to a scale in instruments not powerful enough to separate the rainband from the D line. This compound line appears to vary from something less intense than £ in very dry weather to something considerably darker than # when rain is imminent. Seven degrees can be discerned, and these may be represented by using the sign=to mean ‘of equal intensity with,” > to mean “darker than,” and < ‘less dark than,” as, H<), =0b,>bF. When the thin solar lines in the green are seen very distinctly there is less probability of rain falling than when they are indistinct or invisible.

The following table gives an idea of the intensities corresponding to rain-probabilities at Edinburgh.

Intensity of rainband with D. Temperature. Prediction. ***b< F (thin lines distinct). Below 60° Fahr. oe '5 >bobF, a9 Much rain.***

It appears that the average percentage of fulfilments of predictions of "rain" and "no rain," made for a period of twelve hours after one observation in the morning, which may be expected in Scotland is about 75. In less variable climates, such as those of the south of Europe and parts of the United States, a much higher degree of accuracy has been attained. The precise strength of rainband

RAI—RAL

which corresponds to the probability of a fall of rain within a definite time depends on the temperature and also on the place of observation ; in every case it must be determined by the observer for himself. Very dark rainbands are found to precede rain in more than 95 per cent. of the cases everywhere ; entire, or almost entire, absence of the band presages a dry day with equal prob- ability. With a spectroscope powerful enough to split D a mental numerical scale must be used in default of a suitable micrometer, aud by practice the observer will be able to draw up a table for its conversion into probabilities of rain.

The production of an artificial absorption-line the intensity of which could be varied by known degrees suggested itself to more than one observer as the principle for a rainband-micrometer.

The spectroscopic history of a thunderstorm observed on 9th June 1884 by Professor Cook is extremely interesting. During its approach the water-vapour line observed at 10° north of the zenith towards the storm was darker by ten degrees of the scale than that observed .10° south of the zenith, although to the eye the clouds presented exactly the same appearance at both places. On this occasion the strength of the line varied as follows :—

Hour. | At zenith.! At 30°. | At 20°. | At 10°. | – At horizon. S8a.m… 1183 21 32 43 45

2 14 23 34 44 46

10) 53 14 25 36 45 47

ie 15 27 37 46 48

11.45 a.m. 50 he Rain commenced 11.20.

12 noon 32 tas fea Boe feemeza Rain ceased 12.10.

12.45 p.m. £0a We oul exe » recommenced 12.20. CSUN 5 15 Rain ceasedatl. Totalrain-

fall, 1°6 inches in 14 hours.

Some relation has been traced between the variations of the rain- band and the appearance of aurore, but this matter is not yet fully investigated. (H. R. M.)

RAINBOW. See Licut, vol. xiv. p. 595 sq.

RAINGAUGE (PiuviomeTerR, HyrTomerer, UDpo- METER). 'The value of the measurement of rainfall (see Mergoroocy) has long been understood, although it is only within the last hundred years that trustworthy results have been obtained. Marriotte is claimed as the originator of the raingauge in 1677. The simplest form is an open vessel of uniform diameter exposed to the rain, in which the depth of water collected during any interval of time may be measured. In order to reduce evaporation the mouth of the gauge is usually a funnel of the same diameter as the vessel ; and some means, such as an external narrow glass tube graduated in inches and parts to show the | height of the water inside, or a float bearing a graduated rod, or, in more delicate forms, a movable scale which may be set by a vernier to the surface of the water, is adopted to facilitate measurement. Raingauges on this plan can- not be very accurate ; their one advantage is that the area of the collecting

surface does not require to be known. The disadvantages are that so much water is required to wet the sides of the vessel as to make the instrument read too low when a side tube is used, and the tube is liable to

*be broken in frost; when a float and rod are employed, the rod projecting above the funnel catches rain and the resulting reading is too high. Almost all raingauges now used have a circular funnel of known diameter, which con- ducts the rain-water to a receiver, from which it may be poured into a special narrow measuring-glass so graduated that what would cover a space of the area of the funnel to the depth of 1 inch fills a portion of the glass large enough to be easily graduated into 100 parts. The funnel may have any diameter from 3 to 24 inches without introduc- ing a greater discrepancy than 1 or 2 per cent. of the amount of rain collected, but 5 and 8 inches are the dia- meters usually employed, and the measuring-glasses are graduated accordingly. Advantage is sometimes taken of the fact that for a funnel 4°697 inches in diameter 1 fluid ounce of water collected represents one-tenth of an inch of rain, since the area is 17°33 square inches, and a fluid ounce at 60° Fahr. contains 1-733 cubic inches of water. The best form of instrument, Glaisher's rain and snow gauge recommended by the Royal Meteoro- logical Society, is a cylindrical copper vessel 8 inches in diameter and 18 inches high, in which the funnel is laced about halfway down (see fig. 1). he Scottish Meteorological Society largely employ Howard's raingauge,a | *. plain glass bottle holding about half |: a gallon and provided with a long é 5-inch copper funnel, which has a collar fitting over the neck of the bottle to prevent rain from being blown in laterally by the wind. In some forms the funnel leads to a long glass tube divided into inches, tenths, and hundredths of rainfall. Mr Symon's storm raingauge on this prin- ciple is intended to be read from a distance, and is only graduated into cee of an inch. The water = ected by a raingauge may be weighed S instead Of so at but the oes Fra. 2.—Graduated measuring process being much more simple is glass. always adopted, at a slight expense of accuracy, however, as the variation of volume with temperature is not taken into account. Precipitation and evaporation being complementary phenomena, an atmometer or evaporation-gauge ought, strictly speaking, to ac- company*

each raingauge. But none of the instruments yet devised ean be regarded as satisfactory, accordingly a number of devices have been introduced to calculate or to minimize the evaporation from raingauges. Dr Garnett in 1795 proposed to use two gauges of unequal size, and recently Prof. Michie Smith has introduced a simplification by making the area of one gauge exactly double that of the other. If the evaporation is the same from each, the difference between the readings of the two gauges gives the true rainfall in the smaller. If 4 be the area of the funnel in the smaller, 24 that of the funnel iu the larger, V a certain volume of water placed in each gauge, H the evaporation, and & the inches of rainfall, then V+ 2AR-H-(V+AR-E)=AR, however V and E may vary. The simplest and best method is to use a funnel terminating in a long straight tube, which reaches almost to the bottom of the receiving vessel. Gauges have been constructed for experimental purposes always to face the wind, and with openings capable of being fixed at any angle. For use at sea they may be swung on gimbals; but when so employed the record must be sup- plemented by the readings of a hydrometer so as to detect and allow for any admixture with sea-spray. Self-registering and self- recording raingauges, as frequently used in meteorological observa- tories, are constructed on two leading types. In Hermann's "hyetometrograph," 1789, a fixed funnel conducts the rain into one of twelve glasses placed on the circumference of a horizontal wheel, which is turned by clockwork so that each glass remains under the funnel for one hour. In Stutter's more recent instru- ment the receiving funnel delivers into a smaller funnel, which has a sloping tube and is carried round by clockwork so as to remain for one hour over each of twenty-four fixed glasses arranged in a circle. The second kind of self-registering instrument produces a continuous record of rainfall, indicating the hour of commencement and close of each shower, the amount of rain that has fallen, and the rate at which it fell. In Beckley's "pluviograph" a pencil, attached to a vessel which sinks as it receives the rain, describes a curve on a sheet of paper fixed round a rotating cylinder; when full the receiver empties itself by means of a siphon and the pencil is carried rapidly upwards, describing a straight vertieal line.

Fig. 1. Fig. 2. Fria. 1.—Glaisher's rain and snow gauge.

The higher a raingauge is placed above the ground, or rather above a broad flat surface, the smaller is the rainfall registered, as the following figures indicate :—

Height of funnel above ground in feet.. 0 1 10 20 40 200 Rain registered (average) ..... 1:07 1°00 0°93 0°90 0°70 0°58

When the mouth of the gauge is on or within a few inches of the ground the orm inte rg of raindrops increases the amount of water. Minute rain-spherules, which usually float in horizontal or oblique planes, are most numerous near the ground, where consequently they coalesce to form regular drops which fall into the funnel. The raindrops also increase slightly in size by condensing moisture as they fall. But the greatest effect is probably produced by wind, which forms eddies round high and isolated objects, thus more or less interfering with the fall of rain into the gauge. It is obvious that all raingauges intended for comparison should be fixed at the same height, and in Great Britain the standard distance of the mouth of the funnel from the ground or from a broad flat surface is one foot. The situation of a raingauge should be perfectly open, especially in the direction of the prevailing rainbringing winds. In measuring rain it is essential to see that the funnel is not indented or deformed in any way, and that the collecting vessel is inaccessible to air or rain except through the funnel. The temper- ature of rain as it falls should be observed whenever it is possible todo so. The amount of solid matter collected in the raingauge should be ascertained and recorded as bearing on Mr Aitken's theory of rain (see EVAPORATION), and it should be examined micro- scopically for volcanic and cosmic dust. (H. R, M.)

RAIPUR, a district of India, in the Chhatisgarh division of the Central Provinces, lying between 19° 48' and 21° 45' N. lat. and 80° 28' and 82° 38' E. long., with an area of 11,855 square miles. It is bounded on the N. by Bilaspur, on the E. by Sambalpur and Patna, on the W. by Balaghat, Bhandara, and Chanda, and on the 8. by Bastar and Jeypur. 'The district spreads out in a vast plateau closed in by ranges of hills branching from the great Vindhyan chain. It is drained by the Seonath and the Karun rivers, which subsequently unite and form the Mahanadi. Geologically

the country consists in the hilly tracts of gneiss and quartzite ; the sandstone rocks in the west are intersected with trap dykes. Iron ore is abun- dant, and red ochre of high repute is found. In the interior the principal strata are a soft sandstone slate (covered generally by a layer of laterite gravel) and blue limestone, which crops out in numerous places on the surface and is invariably found in the beds of the rivers. Throughout the plains the soil is generally fertile. The climate is generally good; the mean temperature is 78° and the average rainfall about 49 inches.

The population of Raipur in 1881 was 1,405,171 (males 696,242, females 708,929). By religion 856,492 were Hindus, 14,991 Moham- medans, and 821 Christians, The only town with a population exceeding 10,000 is Raipur (see below). Attached to the district are four feudatory states, viz., Chhuikhadan (with 32,979 inha- bitants), Kanker (63,610), Khairagarh (166,138), and Nandgaon (164,339). Their combined area is 2658 square miles.

Of the total area under British administration only 3636 square miles are cultivated, and of the portion lying waste 4337 acres are returned as cultivable. The staple crop is rice; other crops are ~ wheat, food-grains, oil-seeds, and cotton. The commerce of Raipur is of quite recent creation, for under the Mahrattas the transit dues that were levied prevented its development. The exports consist mainly of grain, cotton, and lac, while metals constitute the chief import. The gross revenue of the district for 1883-84 amounted to about £89,829, of which the land yielded £64,871.

Raipur was governed by the Haihai-Bansi dynasty of Ratanpur for many centuries until their deposition by the Mahrattas in 1741. The country was then already in a condition of decay, and soon afterwards it relapsed into absolute anarchy. In 1818 it was taken under British superintendence and made rapid progress. It fell with the rest of the Nagpur dominions to the British Government in 1854. Raipur suffered but little during the mutiny.

RAIPUR, chief town of the above district and head- quarters of the Chhatisgarh division of the Central Pro- vinces, is situated in 21° 15’ N. lat. and 81° 41’ E. long., on a plateau 950 feet above sea-level. In 1881 its

population amounted to 24,948 (12,447 males and 12,501 females). The modern town dates from 1830, and carries on a flour- ishing trade in grain, lac, cotton, é&c.

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RAIS, Ratz, or Retz, Gintus pr (d. 1440), marshal of France, seigneur of Hautpart and of many other lordships, who was hanged and burned at Nantes in 1440, has left a name connected directly with one of the most horrible stories in history, and indirectly with other curious matter. Not much is known of Rais before the trial which made his name infamous. He was of the noblest blood of the marches of Brittany, being on the father's side of the Laval branch of the ducal family of Montfort, and being connected through his mother and by marriage with the houses of Craon, Thouars, and others. His possessions in the district from which he took his name, and which borders the estuary of the Loire on the south, as well as along the river, were great, and his chief seat was at Champtocé. He had served in the English wars with the credit of a brave knight, had a rather special reputa- tion for devotion, had been marshal since 1429, and had held the alms-dish at the coronation of Charles VII. Suddenly he was arrested, tried, and, as above stated, executed on the evidence of accomplices and his own con- fession. The crimes with which he was charged extended over some fourteen years. During that period it was alleged that he had, through different agents, especially a woman called La Meffraie, kidnapped or enticed to his various abodes large numbers (Monstrelet says 160, others 140) of children. These children, after being sub- jected to every outrage of lust and cruelty, were sacrificed to the devil, their blood used for magical ceremonies, their bodies burned, and their bones buried in the precincts of Rais's castles. The ultimate purpose of this devil- worship was asserted to be the acquisition by Rais (who was assisted by divers sorcerers, especially an Italian im- ported for the purpose) of power and honours in the state. The depositions were very full and still exist, and on them and his confession Rais was executed. It is, however, somewhat suspicious that the bishop of Nantes, who pro- moted, and the duke of Brittany, who sanctioned the pro- ceedings, were

both bitter personal enemies of Rais, while the king, who was also concerned, had for a main part of his policy the putting down of feudal barons who, like Rais, held posts of vantage in the country. The two chief contemporary authors who mention the case, Monstrelet and Chastellain, speak of it with somewhat less horror than might, even allowing for possible political sympathies, have been expected. Monstrelet (who says that Rais was charged with the murder of pregnant women also) says that 'many ladies and damsels" begged his body of the duke, and that great part of the nobles of Brittany, not only his relations, had great sorrow and sadness for his death. Chastellain introduces the ghost of Rais in rather striking fashion in his Temple de Bocace as "followed by a multitude of little children crying 'Vengeance.'" The ~~*affair affected public imagination as much because of the rarity of a criminal of such rank being brought to justice as of the heinousness of the crimes attributed to him. Locally it took a very strong hold of the popu*~~ *lar mind, and a tradition not easy to trace connects it with the Bluebeard legend, which finally took shape in the hands of Perrault. This connexion, however, hardly bears examination. In the first place, there is no evidence that Rais ever was called Bluebeard, thongh a contemporary English adventurer who is mentioned by Holinshed was so called, and may have left a bad reputation in France. In the second, it is impossible to trace even the most superficial resemblance between the stories. In Bluebeard there are no children concerned, no unnatural crimes, no sorcery; it is merely one of the numerous stories of "punished curiosity" so fre- quent in folk-lore. As it stands the Rais story is too horrible to make much of a figure in literature; but it*

has attracted some students of causes célébres, notably Dumas jils in his Tristan le Roux.

For authorities besides the passages of Monstrelet and Chastellain above quoted, Michelet, Histoire de France, tnd Vallet de Viriville, Histoire de Charles VII., may be consulted. Meézeray's account, usually followed in books of reference, is loose ; he had evidently not seen the records, nor

even Monstrelet. But his assignment of a state crime against the duke as the real cause of death is very probable, though not formally correct.

RAISINS are the dried fruits of certain varieties of the grape vine, Vitis wnifera, which grow principally in the warm climate of the Mediterranean coasts and are com- paratively rich in sugar. The use of dried grapes or raisins as food is of great antiquity (Numb. vi. 3; 1 Sam. xxv. 18, xxx. 12). In medizval times raisins imported from Spain were a prized luxury in England, and to the pre- sent day Great Britain continues to be the best customer of the raisin-producing regions. 'Raisins of the sun" are obtained by letting the fruit continue on the vines after it has come to maturity, where there is sufficient sunshine and heat in the autumn, till the clusters dry on the stocks. Another plan is partially to sever the stalk before the grapes are quite ripe, thus stopping the flow of the sap, and in that condition to leave them on the vines till they are sufficiently dry. The more usual process, however, is to cut off the fully ripe clusters and expose them, spread out, for several days to the rays of the sun, taking care that they are not injured by rain. In unfavourable weather they may be dried in a heated chamber, but are then inferior in quality. In some parts of Spain and France it is common to dip the gathered clusters in boiling water, or In a strong potash lye, a practice which softens the skin, favours drying, and gives the raisins a clear glossy appearance. Again, in Asia Minor the fruit is dipped into hot water on the surface of which swims a layer of olive oil, which communicates a bright lustre and softness to the skin. Some superior varieties are treated with very great care, retained on their stalks, and sent into the market as clusters for table use; but the greater part are separated from the stalks in the process of drying and the stalks winnowed out of the fruit. Raisins come from numerous Mediterranean localities, and present at least three distinct varieties,—(1) ordinary or large raisins, (2) sultana seedless raisins, and (3) currants or Corinthian raisins (see vol. vi. p. 715). The greater proportion of the common large raisins of English commerce comes from the provinces of Malaga, Valencia, and Alicante in Spain ; these are known by the common name of Malaga raisins. Those of the finest quality, called Malaga clusters, are prepared from a variety of muscatel grape, and preserved on the stalks for table use. This variety, as well as Malaga layers, so called from the manner of packing, are

exclusively used as dessert fruit. Raisins of a somewhat inferior quality, known as '"lexias," from the same pro- vinces, are used for cooking and baking purposes. Smyrna raisins also come to some extent into the English market. The best quality, known as Elemé, is a large fruit, having a reddish yellow skin with a sweet pleasant flavour. Large-seeded dark-coloured raisins are produced in some of the islands of the Greek Archipelago and in Crete, but they are little seen in the British markets. In Italy the finest raisins are produced in Calabria, inferior qualities in central Italy and in Sicily. From the Lipari Islands a certain quantity of cluster raisins of good quality is sent to England. In the south of France raisins of high excellence—Provence raisins in clusters—are obtained at Roquevaire, Lunel, and Frontignan. Sultana seedless raisins are the produce of a small variety of yellow grape, cultivated exclusively in the neighbourhood of Smyrna. The vines are grown on a soil of decomposed hippurite limestone, on sloping ground rising to a height of 400 feet

above the sea, and all attempts to cultivate sultanas in other raisin-growing localities have failed, the grapes quickly reverting to a seed-bearing character. The dried frnit has a fine golden-yellow colour, with a thin, delicate, translucent skin and a sweet aromatic flavour. A very fine seedless oblong raisin of the sultana type with a brownish skin is cultivated in the neighbourhood of Damascus, but it is rarely seen in the Western markets.

Raisins are chiefly valuable on account of the large proportion of grape sugar and cream of tartar which they contain. In old dry raisins these substances are found in hard nodular masses. The seeds contain from 15 to 18 per cent. of a bland fixed oil and about 5 per cent. of tannin. The imports into the United Kingdom average in value about £1,000,000 yearly, the quantity imported in 1883 having been 588,309 cwt., valued at £1,057,934.

RAJA (English form Razan), Sanskrit nom. sing. of the stem rdjan (in modern Indian vernaculars rdjd, rdjah, rdja, rdjan, rdzu, irdsen, also the forms rdi, rdo, rdnd are trace- able to the sae stem) = king, prince, chief, from the root rdéj, to be resplendent. In the oldest times the headman of

any petty tribe was called raja from the fact of his being conspicuous for the number of golden ornaments with which he was decked out. Then raj4 became the com- mon designation for a king, whether of a small tribe or of a large state. The constitution of all states was monarch- ical, mostly hereditary, occasionally also electoral, but in no case absolute, for the people had a voice in the govern- ment. On the other-hand, the king was greatly hampered in his action by his duties towards the priestly caste. Even in that later stage of Indian civilization which we find portrayed in the code of Manu the king appears as subordinate to the priest, though his prerogative is in all other respects paramount, especially in the matter of revenue. Theoretically this system has been continued ever since; but practically the rdjé's powers have been gradually extended, some of them being distributed by him at his pleasure among various officials, who were rewarded, not by regular salaries, but by grants and the profits of oppression.! It thus appears that the title is, strictly speaking, only applicable to Hindu potentates, but in practice it is not unfrequently used to indicate a ruling chief irrespective of his nationality or creed.

The rights and privileges assigned to rdéjds by treaty and usage are manifold and varied. But all rajas are precluded from waging war against an external foe save with the permission of the British Government, and so none can be said to be independent in the fullest sense of the word. At the same time there are several princes in India who titularly hold that status, in so far, that is, as they possess the right to administer their kingdom according to their own notions of justice and equity ; but even in these instances, and they are few, British residents are attached to the various courts, charged to advise in the interests of good government and righteous dealing. Such officers seldom fail to secure a powerful influence, and it is not often that their counsel is disregarded or their representations pass unheeded. More than this, when flagrant injustice occurs the British Government is occasionally compelled to interfere, and instances are not wanting when a raja has been deposed, notwithstanding a clause in his treaty forbidding the intervention of the British Government in the affairs of his state. Such cases, which are not frequent, are justified by political necessity. In many instances native chiefs are allowed by treaty to maintain a military force, but at the present

time the troops principally serve to gratify the cravings of Eastern potentates for the outward and visible signs of power.

Rajas of lesser note retain a semblance of power so far

1 See for the Vedic period, H. Zimmer, Altindisches Leben, Berlin, 1879, p. 162 sq. ; for later times, M. Duncker, Geschichte des Alter- thums, iii. 152 sg., and Tod's Antiquities of Rajasthan, passim.

as concerns questions of minor importance, but in grave cases involving issues of life and death the officer attached to the court reviews and, should it be necessary, modifies or reverses the decrees which may be passed. Chieftains in this category do not even enjoy the appearance of inde- pendence, though in many instances they are allowed to keep a body of military retainers.

Other rajds are inerely large and wealthy landholders with no sovereign rights or privileges, resembling in many respects the territorial magnates of Great Britain; while in some instances the term is simply a title of distinction unconnected with the possession of land or power.

Scarcely less complex and varied are the conditions which regulate succession to the rajships of India: in some instances adoption is admitted, in other cases col- lateral succession is accepted, while again there are occa- sions when the customs of the family are a potent factor in the choice of an heir. It might have been supposed perhaps that the salute could be fairly taken as indicative of the status of the chief to whom it is assigned ; but in reality such an assumption would be most misleading, for not unfrequently the number of guns was fixed in bygone years, and the lapse of time has made numerous and essential changes in the status of the various chieftains. So much is this the case that it: has never been settled authoritatively what chiefs are entitled to claim the Western prefix of "highness."

RAJAMAHENDRI (Rajamahendravaram, Rajahmun- dry), a town of India, in the Godavari district, Madras presidency, situated on high

ground on the left bank of the Godavari river in 17° N. lat. and 81° 49’ E. long., and 365 miles north-east of Madras. Its population in 1881 numbered 24,555 (males 12,290, females 12,265). Rajamahendri was formerly the headquarters of a separate district of the same name, but is now incorporated with Godavari.

Tradition divides the merit of founding this city betwcen the Orissa and Chalukya princes. There appears little doubt that the city of the Vengi kings was identical with the site of the present town, and that this also was the seat of the Orissa power in the south. In 1471 Rajamahendri was wrested from Orissa by the Mohammedans, but early in the 16th century it was retaken by Krishna Raja and restored to Orissa. It continued under Hindu rule till 1572, when it yielded to the Moslems of the Deccan under Rafat Khan. For the next century and a half it was the scene of perpetual fighting, and at last fell to Golconda, and became one of the four nawabships of that government. Rajamahendri passed into the possession of the French in 1753, but they were driven out by the British under Colonel Forde in 1758. The French, however, recaptured it, but, finding that the treasure had been removed, they evacuated it almost immediately.

RAJPUTANA, an immense tract of country in India, consisting of twenty states, having each its own autonomy and separate chief, besides the small British division of Ajmere, which is situated almost in the centre of the province, These territories lie between 23° and 30° N. lat. and between 69 30’ and 78° 15’ E. long., and their combined area is approximately estimated at 130,000 square miles. Rajputéna extends from the province of Sind on the west to the North-Western Provinces on the east, skirting the Bombay presidency on the south, and stretching to the Punjab on the north. It is traversed from south-west to north-east by the Rajputana State Railway, and from the south to that railway at Ajmere by the Malwa Railway from Khandwa on the Great Indian Peninsula line through Indore. The country is divided by the Aravalli Mountains into two unequal parts (of which the north-western is much the larger), and consists to a great extent of sandy, arid, and unproductive wastes, but it improves gradually to comparatively habitable and fertile tracts towards the north-east. This division includes the Thur or great sandy desert of

northern India, covered everywhere by long parallel dunes, varying from 50 to 100

feet high, with few wells and streams, and almost destitute of vegetation. The south-eastern division is considerably more elevated and fertile, is diversified in character, and contains extensive hill-ranges and long stretches of rocky wold and woodland ; it is watered by the drainage of the Vindhyas, carried north-east by the Chambal and Banas rivers. In many parts there are wide vales, fertile plateaus, and great stretches of excellent soil, with forests and arti- ficial lakes ; but even in this division the surface, for the most part, is stony, rugged, under jungle, and infertile, except close to the river banks.

The chief rivers of Rajputana are the Loni, the Chainbal, and the Banas. The first of these, the only river of any consequence in the north-western division, flows for 200 miles from the Pukar valley, close to Ajmere, to the Runn of Cutch. In the south- eastern division the river system is important. The Chambal is by far the largest river in Rajputana, through which it flows for about one-third of its course, while it forms its boundary for another third. The source of the river is in the highlands of the Vindhyas, upwards of 2000 feet above the sea; it enters the province at Chaurasgarh in Mewar and soon becomes a considcrable stream, collecting in its course the waters of other rivers, and finally dis- charging itself into the Jumna after a course of 560 miles. Next in importance ranks the Banas, which riscs in the south-west near Kankraoli in Mewar. It collects nearly all the drainage of the Mewar plateau with that of the eastern slopes and hill-tracts of the Aravallis, and joins the Chambal a little beyond the north- eastern extremity of the Bundi state, after a course of about 300 miles, Other rivers are the W. Banas and the Sabarmati, which rise among the south-west hills of Mewar and take a south-westerly course. The river Mahi, which passes through the states of Partab- garh and Banswara, receiving the Som, drains the south-west corner of Rajputana through Gujrat into the gulfs of Cutch and Cambay. Rajputana possesses no natural freshwater lakes, but there are several important artificial lakes, all of which have been constructed with the

object of storing water. The only basin of any extent is the Sambhar salt lake, of about 50 miles in circuit.

Geologically considered the country may be divided into three regions,—a central, and the largest, Ss ee the whole width of the Aravalli system, formed of very old sub-metamorphie and gneissic rocks ; an eastern region, with sharply defined boundary, along which the most ancient formations are abruptly replaced by the great basin of the Vindhyan strata, or are overlaid by the still more extensive spread of the Deccan trap, forming the plateau of Malwa; and a western region, of very ill-defined margin, in which, besides some rocks of undetermined age, it is more or less known or suspected that Tertiary and Secondary strata stretch across from Sind, beneath the sands of the desert, towards the flanks of the Aravallis. Rajputana produces a variety of metals. Ore of cobalt is obtained in no other locality in India, and although zine blend has been found elsewhere it is known to have been extracted only in this province. Copper and lead are found in several parts of the Avavalli range and of the minor ridges in Ulwur and Shekha- wati, and iron ores abound in several states. Alum and blue vitriol (sulphate of copper) are manufactured from decomposed schists at Khetri in Shekhawati. Good building materials are obtained from many of the rocks of the country, amongst which the Raialo limestone (a fine-grained crystalline marble) and the Jaisalmir (Jeysulmere) limestone stand pre-eminent.

Rajpntana is of great archezologie interest, and possesses some fine religious buildings in ruins and others in excellent preserva- tion. Amongst the latter are the mosque at Ajmere and the temples on Abu. But the finest and most characteristic features of architecture in the country are shown in the forts and palaces of the chiefs and in their cenotaphs.

Herds of camels, horses, and sheep are found wherever there is pasturage, and in the desert and in the southern part of the country wild asses, nylghau, and antelopes, besides lions, leopards, tigers, wolves, hyznas, jackals, and foxes, are met with.

The climate throughout Rajputana is very dry and hot during summer ; while in the winter it is much colder in the north than in the lower districts, with hard frost and ice on the Bikanir borders. The rainfall is

very unequally distributed : in the western part, which comes near to the limits of the rainless region of Asia, it is very scanty, and scarcely averages more than 5 inches ; in the south-west the fall is more copious, sometimes exceeding 100 inches at Abu ; but, except in the south-west highlands of the Aravallis, rain is most abundant in the south-east. Notwith- standing all its drawbacks, Rajputana is reckoncd one of the healthiest countries in India, at least for the native inhabitants.

Population. —The census of 1881, which was the first general enumeration of population in Rajputana since England's connexion with India, gave a total number (including Ajmere division) of 10,729,114. Of these 166,343 were Bhils; but no accurate census

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could be taken of these people owing to their repugnance to be counted. Exclusive of Bhils, the population numbered 10,562,771 (5,710,337 males, 4,852,434 females). The following statement gives the area and population of the several statcs and of the British division of Ajmere :—

| Area in } Area in States. square o "tg States. square | Popula- miles. Es | miles. – Hon.

Ajmere-Mhair- | Kishengurh …. 724 112,633 | "wara (British) | 2,711] 460,722 || Kotah……... 8,797 | 517,275 Banswara …...| 1,500 152,045 || Lawa ……... 18 2,682

Bhurtpar' ..... 1,974 645,540 | Marwar or Jodh- Ish! een oases 22,340 509,021 | PROG Hole 37,000 | 1,750,408 BUDA 56515 cr0518 5 2,300 254,701 | MewarorUdaipur| 12,670] 1,494,220 WON Pies es os 1,200 249,657 | Partabgarh 1,460 79,568 Dungarpur 1,000 153,381 | Shahpura …... 400 51,750 airnur es. 14,465 | 2,534,357 || Sirohi……... 8,020] 142,908 Jaisalmir (Jey- BRO sp terete 2,509 338,029 sulmere) ..... 16,447 108,143 || Ulwur(Alwar)..| 3,024 682,926 | Jhalawar …... 2,694 340,488 |) an eee 2 Karauli …..... | 1,208) 148,670 | Total…) 132,461 | 10,729,114

The great mass of the people are Hindus, numbering in 1881 (excluding Bhils) 9,215,272, as against 919,556 Mohammedans and 3519 Christians.

Among the Hindus the paucity of Rajputs is remarkable. It is commonly supposed that, because nearly the whole country is ruled by Rajputs, therefore the population consists mainly of Rajput tribes ; but these are merely the dominant race, and the territory is called Rajputana because it is politically pos- sessed by Rajputs. The whole number of this race is roughly estimated at 700,000, and nowhere do they form a majority of the whole population in a state; but they are strongest, numerically, in the northern states and in Mewar. By rigid precedence the Brahmans occupy the first rank ; they are numerous and influential, and with them may be classed the pecnliar and important caste of Charans or Bhats, the keepers of secular tradition and of the genealogies. Next come the mercantile castes, mostly belonging to the Jaina sect of Hinduism ; these are followed by the powerful cultivating tribes, such as the Jats and Gujars, and then come the non-Hindu or so-called aboriginal tribes, chief of whom are the Minas, Bhils, and Mhairs.

The mass of the people are occupied in agriculture. In the large towns banking and commerce flourish to a degree beyond what would be expected for so backward a country. In the north the staple products for export are salt, grain, wool, and cotton, in the south opium and cotton ; while the imports consist of sugar, hard- ware, and piece goods. Rajputana is very poor in industrial pro- duction. 'The principal manufactures are salt, cotton, and woollen goods, carvings in ivory, and working in metals, &c., all of which handicrafts are chiefly carried on in the eastern states. The system of agriculture is very simple ; in the country west of the Aravallis only one crop is raised in the year, while in other parts south and east of the Aravallis two crops are raised annually, and various kinds of cereals, pulses, and fibres are grown.

History.—Only faint outlines can be traced of the condition of Rajputana previous to the invasion of Upper India by the Mohain- medans, and these indicate that the country was subject for the most part to two or three very powerful tribal dynasties. Chief of these were the Rahtors, who ruled at Kanauj; the Chauhans of Ajmere; the Solankhyas of Anhilwara, in Gujrat; the Gehlots with the Sesodia sept, still in Mewar or Udaipur; and the Kachwaha clan, still in Jaipur. These tribal dynasties of Rajputs were gradually supplanted by the Moslem invaders of the 11th century

and weakened by internal feuds. At the beginning of the 16th century the Rajput power began to revive, but only to be overthrown by Baber at Fatehpur Sikri in 1527. The clans were finally either conquered, overawed, or conciliated by Akbar—all except the distant Scsodia clan, which, however, submitted to Jahangir in 1616. From Akbar's accession to Aurangzeb's death, a period of 151 years, the mogul was India's master. Aurangzeb's death and the invasion of Nadir Shah led to a triple alliance among the three leading chiefs, which internal jealousy so weakened that the Mahrattas, having been called in by the Rahtors to aid them, took possession of Ajmere about 1756; thenceforward Rajputana became involved in the general disorganization of India. By 1803 nearly the whole of Rajputana had been virtually subdued by the Mahrattas. The victories of Generals Wellesley and Lake, how- ever, saved the Rajputs ; but on Wellington's departure from India the floodgates of anarchy were reopened for ten years. On the out- break of the Pindari War in 1817 the British Government offered its protection. The Pindaris were put down, Amir Khan sub- mitting and signing a treaty which constituted him the first ruler of the existing state of Tonk. By the end of 1818 similar treaties had been executed by the other Rajput states with the paramount power. Sindhia gave up the district of Ajmere to the British, and the pressure of the great Mahratta powers upon Rajputana was permanently withdrawn. Since then the political history of Rajputana has been comparatively uneventful. The great storm of the mutinies of 1857, though dangerous while it lasted, was

short. The capture of the town of Kotah, which had been held by the mutineers of that state, in March 1858, marked the extinction of armed rebellion in the province. (On 2, 18.)

RAJSHAHE! or Raseswaye, a district of India, in the lieutenant-governorship of Bengal, forming the south- western corner of the Rajshéhi with Kuch Behar division. It lies between 24° 3' and 24° 59' N. lat. and between 88° 21' and 89° 24' E. long., and is bounded on the N. by the districts of Dindjpur and Bogra, on the E. by Bogra and Pabna, on the S. by the Ganges and Nuddea district, and on the W. by Maldah and

Murshidabad. The area of 2359 square miles is one alluvial plain seamed with old river-beds and studded with marshes. The Ganges and the Mahananda are its principal rivers; the former con- stitutes a great natural boundary-line to the south and south-west, and the latter, which rises in the Himalayas, borders the district on the west for a few miles before joining the Ganges. Other rivers are the Narad and Baral, important offshoots of the Ganges; the Atrai, a channel of the Tista; and the Jamuna, a tributary of the Atrai. Both the Atrai and the Jamuna belong to the Brahmaputra system and are navigable throughout the year for small cargo boats. The drainage of Rajshahi is not carried off by means of its rivers, but through the chains of marshes and swamps, the most important of which is the Chalan "bil" or lake, which discharges itself into the Brahmaputra. The climate of Rajshahi does not differ from that of other districts of Lower Bengal ; its average rainfall for the five years ending 1882/83 equalled 68 inches. The Northern Bengal State Railway intersects the district from north to south.

Population.—The census of 1881 gave a population, almost en- tirely rural, of 1,338,688 (males 660,226, females 678,412). Of this number 288,749 were returned as Hindus, 1,049,700 as Moham- medans, and only 121 as Christians. The only town with over 10,000 inhabitants was Rampur Beauleah (19,228), which is the chief town and administrative headquarters of the district. This town is situated on the north bank of the Ganges in 24° 22' N. lat. and 88° 39' E. long. ; it is of modern growth and is built for the most part on river alluvia. It was formerly the seat of the Dutch and East India Company's factories, and is still a centre of the silk and indigo trade.

Rice is the staple crop of the district ; other cereal crops are wheat, barley, and Indian corn, which are grown to a small extent ; among miscellaneous crops are indigo, sugar-cane, mulberry, and tobacco. Ganja is also grown in a small tract to the north of the district. Silk spinning and weaving and the preparation of indigo are the chicf manufactures, but these are now both declining. The total revenue of Rajshaht in 1883-84 amounted to £123,098, towards which the land-tax contributed £88,584.

History.—When the East India Company took over the adminis- tration of Bengal in 1765 Rajshahi was one of the largest and most important districts in the province. It appears to have extended from Bhagulpur on the west to Dacca on the east, and to have in- cluded an important subdivision called Nij-Chakla Rajshahi on the south of the Ganges, which extended over a great portion of what now lies within the districts of Murshidabad, Nuddea, Jessore, Birbhum, and Burdwan. 'The total arca was estimated at 12,909 square miles, or more than five times the sizc of the present district. Having been found much too large to be effectually administered by one central authority, Rajshahi was stripped by Government in 1793 of a considerable portion of its outlying territory, and a natural boundary-line was drawn to the west, south, and east along the Ganges and Brahmaputra. Its north-western limits were reduced in 1813, when the present district of Maldah was constituted. The erection of Bogra into a separate jurisdiction in 1821 still further reduced jis area ; and in 1832 the limits of Rajshahi were finally fixed very much at their present lines by the constitution of Pabna into an independent jurisdiction.

RAKOCZY, the name of an old and wealthy family of upper Hungary. SicismuND was on 11th February 1607 elected prince of Transylvania, but in the following year abdicated in favour of Gabriel Bathori, to whom succeeded

1 The Rajshahi with Kuch Behar division comprises the seven dis- tricts of Dinajpur, Rajshaéhi, Rangpur, Bogra, Pabna, Darjiling, Jal- pdiguri, and the native state of Kuch Behar. Its total area is 18,735 square miles, and its population (1881) 8,336,399 (males 4,237,388, females 4,099,011).

Bethlen Gabor. Bethlen died in 1629, and Grorce I. (1591-1648), son of Sigismund, born in 1591, was, after the demission of Gabor's widow, Catherine of Brandenburg, 26th November 1631, elected prince of Transylvania by the estates. In 1645 he joined the Swedes in an attempt to deliver Hungary from the yoke of Austria and secure religious liberty to the Protestants, but when the emperor Ferdinand showed a disposition to enter into a treaty with him he became oblivious of the cause of which he

had been the professed champion. By the treaty of Linz he was formally recognized as prince of Transylvania. He died on 24th October 1648. GrorcE IT. (1615-1660), son of the preceding, was chosen by the estates to succeed him as prince of Transylvania. Having been disappointed in his hopes of the crown of Poland on the death of Casimir V., he entered into an alliance with John Casimir and invaded the country, but was completely defeated on 16th July 1657. His procedure against Poland provoked the hos- tility of the Turks, with whom he was engaged in continual war until his death at Grosswardein on 26th June 1660, from wounds received at the battle of Klausenburg. Francis I, (1642-1676), son of the preceding, did not succeed his father as prince of Transylvania. Having become connected with a plot for the overthrow of the Austrian Government, his life was only saved through the intervention of his mother, who was a Catholic, and he had to pay a fine of 400,000 florins. He edited a volume of prayers, which had an extensive circulation in Hungary. He died on 8th July 1676. Francis LEopotp (1676- 1735), son of the preceding, was at the age of twelve along with his mother made prisoner by the Austrians, and by them was educated in a Jesuit college in Bohemia. After his marriage with a princess of Hesse he returned to Hungary, where the greater portion of his estates was restored to him. On account of his connexion with a conspiracy of the malcontent party he was in 1701 arrested and brought to Vienna, but making his escape he went to Poland, where he spent several years in exile. In 1703 he headed a new insurrection, which had achieved consider- able success before the death of the emperor Leopold in the end of 1705. Owing to the milder attitude of Joseph I., matters for a time assumed a more peaceful appearance. In 1707 Rakéczy was elected prince of Transylvania, and on 3lst May of this year the independence of Hungary was proclaimed. From this time, however, the fortunes of the Hungarian cause began to decline, and Rakéczy finally in despair, having refused an amnesty and offers of pardon, retired to the frontiers of Poland, after which, on lst May 1711, peace was concluded at Szatmar. Rakdczy refused to own it, and retired to France and subsequently to Turkey, where he died at Rodosto on 8th April 1735. (See Huy- GARY, vol. xii. pp. 369-370.)

RALEIGH, a city of the United States, the capital of North Carolina and the seat of justice of Wake county, is situated in 35° 47’ N. lat. and 78° 48’

W. long., a little to the north-east of the geographical centre of the State, and occupies a kind of high ground in the upper valley of the Neuse, a river flowing south-east towards Pamlico Sound. It is the meeting-place of three railways—the Raleigh and Gaston, the Raleigh and Augusta, and the Richmond and Danville lines—and its railway distance from Portsmouth is 177 miles and from Washington 230. Raleigh is laid out round a park of 10 acres called Union Square and divided into four sections by four broad streets which strike out symmetrically from this centre; the fine old trees which were spared by the original settlers give it the sobriquet of "City of Oaks." Besides the State house or capitol (a substantial granite structure in Union Square), the public buildings coniprise the county court- house, the governor's mansion, the United States court-

house and post-office (1875), the State geological museum, a State insane asylum, institutions for the blind and the deaf and dumb, the penitentiary, and the Shaw institute for the higher education of coloured pupils. There are a normal school and a graded school system for both white and coloured pupils. Raleigh is a centre of the cotton and tobacco trades, has railway machine and car shops, and manufactures steam-engines, shuttle blocks and bob- bins, ice, cotton-seed oil, fertilizers, hosiery, clothing, agri- cultural implements, carriages, carpentry, cigars, marble wares, &c. The population was 4780 in 1860, 7790 (4094 coloured) in 1870, and 9265 (4354 coloured) in 1880. Raleigh was selected as the seat of government in 1788, was laid out in 1792, and made a city in 1794.

RALEIGH, Sm Watrter (1552-1618), admiral and courtier, was born at Hayes in Devonshire in 1552. After a short residence at Oriel College, Oxford, he took service in the autumn of 1569 with a body of volunteers serving in the French Huguenot army, and he probably did not return to England till 1576. During the course of these years he appears to have made himself master of seaman- ship, though no evidence of this is obtainable. In 1579 he was stopped by the council from taking part in a voyage planned by his half-brother Sir Humphrey Gilbert, and in 1580 he commanded an English company in Munster (Ireland). On 10th

November he took part in the massacre at Smerwick. He remained in Ireland till December 1581, distinguished for his vigour and ability as well as for his readiness to treat Irish rebels as mere wild beasts, who were to be pitilessly exterminated, and whose leaders might be smitten down if necessary by assassina- tion. In one way or another Raleigh's conduct gained the favourable notice of Elizabeth, especially as he had chosen to seek for the support of Leicester, in whose suite he is found at Antwerp in February 1582. For some years Raleigh shone as a courtier, receiving from time to time licences to export woollen cloths and to sell wine, after the system by which Elizabeth rewarded her favourites with- out expense to herself. In 1585 he became lord warden of the Stannaries, soon afterwards he was vice-admiral of Devon and Cornwall, and in 1587 was captain of the guard. But he was one of those who were dissatisfied unless they could pursue some public object in connexion with their chase after a private fortune. In 1583 he risked £2000 in the expedition in which Sir Humphrey Gilbert perished. In 1584 he obtained a charter of colonization, and sent Amadas and Barlow to examine the country which he named Virginia. In 1585 he despatched a fleet laden with colonists. They were, however, soon discouraged and were brought back to England by Drake in the following year. Shortly afterwards fifteen fresh colonists were landed, and another party in 1587. All these, however, perished, and, though Raleigh did all that was possible to succour them, the permanent colonizing of Virginia passed into other hands.

In 1584 Raleigh obtained a grant of an enormous tract of land in Munster, in one corner of which he introduced the cultivation of the potato. To people that land with English colonists was but the counterpart of the attempt to exterminate its original possessors. This view of the policy of England in Ireland was not confined to Raleigh, but it found in him its most eminent supporter. In his haste to be wealthy, his love of adventure, his practical in- sight into the difficulties of the world, and his unscrupulous- ness in dealing with peoples of different habits and beliefs from his own, Raleigh was a representative Elizabethan Englishman. He did his best, so far as a usually absentee landlord could do, to make his colonists prosperous and successful; but he underestimated the extraordinary vitality of the Irish race, and the resistance which was

awakened by the harsh system of whicli he was the con- stant adviser at Elizabeth's court. Elizabeth, too, was unable to support him with the necessary force, and his whole attempt ended in failure. Raleigh's efforts were at least made on behalf of a race whose own civilization and national independence were at stake. The Elizabethan men were driven to take large views of their difficulties, and it was impossible for Raleigh to separate the question whether English forms of life should prevail in Munster from the question whether they should be maintained in England. Two conceptions of politics and religion stood face to face from the Atlantic to the Carpathians, and every one of vigour took aside. The balancing intellects were silenced, or, like Elizabeth's, were drawn in the wake of the cham- pions of one party or the other. Wherever the strife was hottest Raleigh was sure to be found. If he could not succeed in Ireland he would fight it out with Spain. In 1588 he took an active part against the Armada, and is even supposed by some to have been the adviser of the successful tactics which avoided any attempt to board the Spanish galleons. In 1589 he shared in the unsuccessful expedition commanded by Drake and Norris, and for some time vessels fitted out by him were actively employed in making reprisals upon Spain.

Raleigh was a courtier as well as a soldier and a mariner, and as early as 1589 he was brought into collision with the young earl of Essex, who challenged him, though the duel was prevented. Some passing anger of the queen drove him in this year to visit Ireland, where he renewed his friendship with Spenser, and, as is told in poetic lan- guage in Colin Clout's come Home again, took the poet back with him to England, introduced him to Elizabeth, and persuaded him to proceed to the immediate publication of a portion of the Maerie Queen. If Raleigh could plead for a poet, he could also plead for a Puritan, and in 1591 he joined Essex in begging for mercy for Udall. In the end of 1591 or the beginning of 1592 Raleigh seduced and subsequently married Elizabeth Throckmorton, and was consequently thrown into the Tower by Elizabeth, who could not endure that the fantastic love-making to herself which she exacted from her courtiers should pass into real affection for a younger woman. Previously to his imprisonment Raleigh had been forbidden to

sail in command of a fleet of which a great part had been fitted out at his own cost for service against Spain. The ships, how- ever, sailed, and succeeded in capturing a prize of extra- ordinary value known at the time as the " Great Carrack." No one but Raleigh was capable of presiding over the work of securing the spoils. He was sent to Plymouth, still in the name of a prisoner, where his capacity for business and his power of winning the enthusiastic affection of his sub- ordinates were alike put to the test. The queen at last consented to restore him to complete liberty, though she tried to cheat him of his fair share of the booty.

Raleigh resolved to use his regained liberty on an en- terprise more romantic than the capture of a carrack. The fable of the existence of El Dorado was at that time fully believed in Spain, and in 1594 Raleigh sent out Captain Wheddon to acquire information about the lands near the Orinoco. In 1595 he sailed in person with five ships for Trinidad. On his arrival he found that the Spaniards, who had occupied a place called San Thomé at the junction of the Orinoco and the Caroni, had been obliged to abandon it. Raleigh ascended the river to the spot, heard more about El Dorado from the Indians, brought away some stones containing fragments of gold, and returned to England to prepare a more powerful ex- pedition for the following year. When he came back he published an account of his voyage. The hope of enrich- ing himself, and of giving to his country a source of wealth

which would strike the balance in its favour in the struggle with Spain, exercised a strong fascination over the imagi- native character of Raleigh. In the next year, 1596, how- ever, he was wanted nearer home, and was compelled to content himself with sending one of his followers, Captain Keymis, to extend his knowledge of Guiana. He was himself called on to take the command of a squadron in the expedition sent against Spain under Lord Howard of Effingham and the earl of Essex. It was Raleigh who, on the arrival of the fleet off Cadiz, persuaded Howard and Essex to begin by an attack on the Spanish fleet, and who himself led the van in sailing into the harbour. Before long the Spanish fleet was thoroughly beaten, and all of it, except two vessels which were captured, was

destroyed by the Spaniards themselves. Raleigh was wounded in the action, and the subsequent capture of Cadiz was carried out by others. In May 1597 Elizabeth, who was growing somewhat tired of the petulance of Essex, readmitted Raleigh to court. It was arranged that he should go as rear-admiral of a fleet, under the command of Essex, intended to cripple yet further the maritime power of Spain. The "island voyage," as it was called, was on the whole a failure, the only notable achievement being the capture of Fayal (Azores) by Raleigh in the absence of Essex. The generous nature of Essex was overmastered by vanity, and, falling under the sway of meaner men, he grew to regard Raleigh as a personal rival. He did not even mention the capture of Fayal in his official account of the voyage.

In 1598 Elizabeth, who was always ready to reward her courtiers at the expense of others, completed a bargain in Raleigh's favour. In 1591 he had obtained, through the queen's intervention, a lease for ninety-nine years of the manor of Sherborne from the bishop of Salisbury. In 1598 the see was vacant. Aspirants to the mitre were informed that only by converting the lease into a perpetual estate in Raleigh's favour could the object of their wishes be obtained. On these terms Dr Cotton became bishop of Salisbury and Raleigh possessor of Sherborne in full ownership. In 1600 Raleigh added to his other offices that of governor of Jersey. A temporary reconciliation between Raleigh and Essex was followed by a permanent estrangement when Essex was appointed to the govern- ment of Ireland, the personal feeling on both sides being probably strengthened by the divergence between their Irish policies,—Raleigh wishing to use force alone, whilst Essex wished to come to terms with Tyrone. When Essex rushed into his final act of rebellion he gave out as one of his reasons his fear of being murdered by Raleigh and Lord Cobham, who at this time were allied.

After the death of Essex the question of the succession assumed a pressing importance with the imminence of the close of Elizabeth's reign. Cecil, allying himself with the intriguing Lord Henry Howard, assured himself of James's favour, and poisoned his ear against Raleigh and Cobham. Into Raleigh's feelings at this time it is impossible to penetrate with certainty, but it can hardly be doubted that, though he professed

himself ready to support James's claim, he did not throw his whole heart into the cause of the Scottish king. Raleigh was the man of the struggle against Spain, self-reliant and unrelenting, eager to push on the reprisals on Spain till the Spanish monarchy was utterly beaten down. James was a lover of peace, anxious to live on good terms with all his neighbours, and under the belief that by fair dealing the Catholic powers and the pope himself might be brought to accept loyally the hand which he was ready to hold out. Raleigh, in short, wished to emphasize the differences which divided Christendom ; James wished to treat them as hardly existing at all. When James came to the throne, therefore, he was certain

to come into conflict with Raleigh, and not being able to see the advantage of keeping about him men of different tempers he dismissed him from the captaincy of the guard, compelled him to surrender the wardenship of the Stan- naries, suspended his patent of wine licences as a monopoly, and took from him the governorship of Jersey, though for this he gave him a pension to compensate for his loss. That which followed it is impossible to fathom to the bottom. Raleigh must have been very angry, and it is quite possible that he may have used violent language and have even spoken of a Spanish invasion as preferable to the rule of James, or have declared his preference of the title of Arabella Stuart to that of the existing sovereign. The main witness against him was Cobham, and Cobham made and retracted his charges with such levity that it is im- possible to trust to his evidence. Raleigh, however, was imprisoned, and, after attempting to commit suicide, was brought to trial at Winchester in November 1603, when he was condemned to death. The king, however, commuted his sentence upon the scaffold to one of imprisonment.

During his imprisonment in the Tower Raleigh devoted himself to chemical experiments and to literary work. It was here that he composed so much of the History of the World as was ever finished, and that he also issued pam- phlets on questions of passing politics. Here too he learned that misfortune continued to follow him, and that there was a flaw in the conveyance by which he had made over Sherborne to trustees to save it from the usual consequences of attainder, and that James had seized it for

his favourite Carr, though he gave in compensation £8000 and a pension of £400 a year for the lives of Lady Raleigh and her eldest son. ;

Raleigh's thoughts had often turned to Guiana. An offer made by him in 1612 to send Keymis to the gold mine which he believed to exist near the Orinoco was rejected, but in 1616 he was himself released at the intercession of Villiers, on the understanding that he was to go in person to Guiana, and was to visit the gold mine. As a security that he would not encroach upon the territory of Spain, he was to remain unpardoned, so that his life might be at the king's mercy if he broke his promise. It is probably not doing injustice to Raleigh to suppose that he had no intention of keeping it if it proved inconvenient. As far as was then known, indeed, the spot where the mine was supposed to be might be reached without passing a Spanish settlement, though he was aware that the Spaniards claimed the whole country as their own. To seize Spanish territory and to fight the Spaniards in every possible way was, however, regarded by him as altogether righteous as well as politic, and he had no respect for James's scruples, which arose partly from weakness, but partly also from a respect for international obligations, which in the case of Spain was foreign to Raleigh's mind. Most likely Raleigh thought that all would be well if he brought home sufficient evidence that the mine was worth possessing. Before he sailed he suggested to James that he should be allowed to attack Genoa, a city in dependence on Spain, and when this plan was rejected he entered into com- munication with the French ambassador and sent to the admiral of France to ask permission to bring into a French harbour all that he might gain on his voyage. The expedition turned out badly. His sailors would not ascend the Orinoco unless he remained at the mouth to keep off the Spaniards. Those who ascended found a Spanish village in the way, and after a sharp fight drove the Spaniards out and burned the place. The mine, if it really existed, they never reached, and Raleigh had to return to England with failure on his head. He was soon arrested and lodged in the Tower.

Whether James would have pardoned Raleigh if he had

brought home large quantities of gold cannot now be said. Coming home as he did, he had to bear the blame of the attack on the Spanish village, which he had done nothing to avert in his orders to the party going up the river. He was brought before a commission of the privy council. Notes taken of the proceedings have only partially been preserved, but it appears that there was strong evidence that after his failure he had attempted to induce his captains to seize Spanish prizes, or, in other words, to commit what James held to be an act of piracy, though Raleigh, with his views of the rightfulness of fighting Spain in America whatever the Governments in Europe might do, would doubtless have qualified it by another name. At last the commission decided against him, and he was sent to execution formally on his old sentence at Winchester, in reality for having allowed his men to shed Spanish blood after engaging that he would not do so. He was executed on 29th October 1618. His attitude against Spain gave him popularity at a time when the attempt of James to draw closer the bonds between Spain and England was repudiated by the great majority of the nation. (Ss. BR. G.)

RAMAH., See SaMvEL.

RAMAYANA. See Sanskrit LITERATURE.

RAMBAN. R. Mosuru Ben Nayman, or NACHMAN- IDES, was born before 1200 at Gerona, where he was rabbi and physician, and died between 1268 and 1270 in Pales- tine, probably at Acre. Although a Sepharadi in the later and larger sense of the word, he was the disciple of the greatest Provencal rabbis, and became the most celebrated Talmudist and cabbalist of his age in his own country.

1. Of his extant commentaries on the Bible that on the Penta- teuch is the most valuable. Three editions may be named. (1) Ed. prin., s. 1. e a., but certainly before 1480. According to oral tradition the compositors set the type in a waggon whilst travel- ling in Italy from place to place for the purpose of selling printed books. (2) Lisbon, 1489. (8) Naples, 1490. This book has been translated at least twice into Latin (Schiller-Szinessy, Catal., i. pp. 174-177). The authorship of the commentary on Job, ascribed to Nachmanides, has been questioned, but without good grounds

(op. cit,, pp. 211-213). The commentaries, however, generally ascribed to him on Canticles and Ruth are certainly not his.

2. Of his many works on Rabbinic literature we mention only : (1) MIWA, Strietures on MAIMONIDES'S (q.v.) Sepher Hammisvoth (Constantinople, 1510, 4to; Venice, 1550, folio,—the latter in Giustiniani's edition of Maimonides's Mishneh Torah. A cheap

edition came out at Warsaw in 1888). (2) 'N mindy, 4.0. Remarks against Rabbenu Zerahyah's Maor (both printed now with the Riph) and Hassaba (both in Temim De'im, §§ 225, 226). (3) NDI ADD, vindication of Al-Phasi against RABAD (q.v.—the third)

(Vienna, 1805). (4) mba, DVT, mpd, Deeisions, Novellxz, and Colleetanea ; these are spread over almost the whole Talmud. The Responsa ascribed to him are by his disciple Rashba. (5) MW, a sermon on the superiority of the Mosaic Law (best edition by Jellinek, Vienna, 1872, 8vo). (6) Letters (a) on the Maimonidean controversy (cheapest edition, Vilna, 1821, 8vo); (0) to his son, on conduct (Lisbon ed. of the Pent. com.) ; (c) Iggereth Hakkodesh, on the ethics of matrimony (latest edition, Berlin, 1793, 8vo) ; MSS. le in almost every public library in Europe, ¢.g., Cambridge. (7) DINA MN, on Sickness, Death, &e. (Constantinople, 1518, folio),—partly ascetic and contemplative, partly Rabbinic ordi-

nances ; its last chapter separately under the title of Syoan ley (Naples, 1490, 4to, and reprints). (8) His anti-Christian contro- versies are chiefly contained in his MD}, a Disputation with the convert Pablo Christiani, the teacher of Raymundus Martini, held before Jayme I., king of Aragon ; it is translated into Latin, and will be found, with a mutilated and otherwise corrupt text, in Wag- enseil's Tela ignea Satan (Altdorf, 1681, 4to), the best and cheapest edition of the text and of the explanation of Isa. lii. 18 to liii. 12 being that of Dr Steinschneider (Berlin, 1860, 8vo). (9) Cabbal- istic matter is contained in all Ramban's works (notably, however, in the Pentateuch ! and Job); he has also a commentary on the Sepher Yesirah (Mantua, 1562, 4to, and reprints). (10) Nachmanides was

1 Nachmanides's acuteness and honesty are a sufficient guarantee that the Bahir (Midrash, 15; Eney. Brit., xvi. p. 287), so often quoted in his

Pentateuch commentary as a bona fide old book, cannot be a composition of his own time, as some have of late asserted.

also a liturgical writer of eminence. There are extant by him a prose prayer for one going on a sea voyage (Yephe Noph, Venice, 1575, 4to), and a piece of religious poetry (Melo Chofnajim, Berlin, 1840, 8vo, pp. 39-41) for the Malkhiyyoth (first part of the additional service of New Year) ; the latter is a mostajab and betrays a perfect master both in kabbalah and poetry. For a specimen of Aramaic poetry see his introductory poem to AftIhamoth Adonai. (8. M. §.-8.)

RAMBOUILLET, chief town of an arrondissement in the department of Seine-et-Oise, France, 30 miles south- west of Paris on the line to Brest, is a small place of 5186 inhabitants, and derives its whole interest from the associa- tions connected with the ancient chdteau, which stands surrounded by a beautiful park of 2965 acres and a wide forest dating from the 14th century. A great machicolated tower and some apartments with good woodwork still remain. The gardens, partly in French, partly in English

style, are picturesque, and have an avenue of Louisiana

cypress unique in Europe. The park contains the national sheep-farm, where the first flock of merino sheep in France was raised last century. The school of sheep-farming is of recent foundation. Here, too, is the first military school erected for soldiers' children.

Originally a royal domain, the lands of Rambonillet passed in the 14th century to the D'Angennes family, who held them for 300 years and built the chateau. Francis I. died there in 1547 ; and Charles [X. and Catherine de' Medici found a refuge in the chateau in the wars of religion, as Henry III. did after them. The famous marquise de Rambouillet is separately noticed below. Created a duchy and peerage in favour of the duke of Toulouse, son of Louis XIV., Rambouillet was subsequently bought and em- bellished by Louis XVI., who erected a model farm, sheep establish- ment, and other buildings. The place was a hunting-seat of Napoleon I. and Charles X., and it was here that in 1830 the latter signed his abdication.

RAMBOUILLET, CatHErinE DE VivonnE, MARQUISE DE (1588-1665), a lady famous in the literary history of France, was born in 1588. She was the daughter and heiress of Jean de Vivonne, marquis of Pisani, and her mother Giulia was of the noble Roman family of Savelli. She was married at twelve years old to Charles d'Angennes, vidame of Le Mans, and afterwards marquis of Rambouillet. Her celebrity is due to the salon or literary meeting-place which she established as early as 1608 in the Hétel de Rambouillet,—or, to give it its proper name, the Hétel Pisani, for M. de Rambouillet had shortly before his marriage sold his family mansion. Madame de Ram- bouillet not merely endeavoured to refine the manners of her guests and gave special attention to literary conversa- tion, but also seems to have taken great trouble to arrange her house for purposes of reception, and is said to have been the first to devise suites of rooms through which visitors could move easily. The hétel was open for more than fifty years, and almost all the more remarkable person- ages in French society and French literature frequented it, especially during the second quarter of the century, when it was at the height of its reputation. The incidents con- nected with the salon of the "incomparable Arthénice" (an anagram for Catherine which is said to have taken two poets of renown, Malherbe and Racan, a whole afternoon to devise) are innumerable, and it would be impossible to recount them in any space here available. Among the more noteworthy are the sonnet war between the Uranistes and the Jobistes—partisans of two famous sonnets by Voiture and Benserade—and the composition by all the famous poets of the day of the Guirlande de Julie, a collec- tion of poems on different flowers, addressed to Julie d'Angennes, Madame de Rambouillet's eldest daughter. Even more important is the rise of the Précieuses, who owed their existence to Madame de Rambouillet's salon and influence. These ladies—who are usually represented in the memory of posterity by Moliére's avowed caricatures and by Mademoiselle de Scudéry, but whose name, it must be remembered, Madame de Sévigné herself was proud to

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bear—insisted on a ceremonious gallantry from their suitors | and friends (though it seems from Tallemant's account that practical jokes of a mild kind were by no means excluded from the Hétel de Rambouillet), and especially favoured an elaborate and quintessenced kind of colloquial and literary expression, such as at the end of the 16th and in the earlier part of the 17th century was fashionable throughout Europe. The immortal Précieuses Ridicules was no doubt directly levelled not at the Hétel de Ram- bouillet itself but at the numerous coteries which in the course of years (for the salon had been open for more than a generation when Moliére's piece, which was patronized by the real Précieuses themselves, appeared) had sprung up in imitation of it. But the satire did in truth touch the originators as well as the imitators,—the former more closely perhaps than they perceived. The Hétel de Ram- bouillet continued open till the death of its mistress, 27th December 1665, but latterly it lost its peculiar position. It had no doubt a very considerable influence in bringing about the classicizing of French during the 17th century, though the literary work with which it is chiefly identified was of an older school than that of the age of Louis XIV. proper.

The chief original authorities respecting Madame de Rambouillet and her set are Tallemant des Réaux in his Historicttes and Somaize in his Dictionnaire des Précicuses. Many recent writers have treated the subject, among whom MM. Cousin, Livet, and De Barthélemy deserve special mention.

RAMEAU, Jean Puiuipre! (1683-1764), musical theorist and composer, was born at Dijon, 25th September 1683. His musical education, partly in consequence of his father's desire to prepare him for the magistracy, still more through his own wayward disposition, was of a very desultory character; but his talent manifested itself at a very early age. In 1701 his father sent him to Milan to break off a foolish love-match. But he learned little in Italy, and soon returned, in company with a wandering theatrical manager, for whom he played the second violin. He next settled in Paris, where he published his Premier Livre de Piéces de Clavecin, in 1706. In 1717 he made an attempt to obtain the appointment of organist at the church of St Paul. Deeply annoyed at his unexpected failure, he retired for a time to Lille, whence, however, he soon removed to Clermont-

Ferrand, where he succeeded his brother as organist at the cathedral, and here it was that his true art-life began.

Burning with desire to remedy the imperfection of his early education, Rameau now diligently studied the writ- ings of Zarlino, Descartes, Mersenne, F. Kircher, and certain other well-known authors. He not only mastered their several theories but succeeded in demonstrating their weak points and substituting for them a system of his own, which, notwithstanding its manifest imperfection, was based upon firm natural principles, and ultimately led to discoveries of the utmost possible value to musical science. His keen insight into the constitution of certain chords, which in early life he had studied only by ear, enabled him to propound a series of hypotheses, many of which are now accepted as established facts; and, if, in his desire to carry out his system to a logical conclusion, he was sometimes tempted into palpable and dangerous error, it was only in obedience to the law which invariably renders the inventor of a new theory blind to the stubborn facts which militate against its universal application. His theory was based upon an instinctive anticipation of the discoveries of modern science. While the older con- trapuntists were perfectly satisfied with the laws which regulated the melodious involutions of their vocal and instrumental parts, Rameau demonstrated the possibility of building up a natural harmony upon a fundamental bass,

1 Not Jean Baptiste, as erroneously stated by Gerber.

and of using that harmony as an authority for the enact- ment of whatever laws might be considered necessary for the guidance either of the contrapuntist or the less ambi- tious general composer. And in this he first explained the distinction between two styles, which, in deference to the views expressed by a popular critic of the present day, have been called the "horizontal and vertical systems," the "horizontal system" being that by which the older contrapuntists regulated the onward motion of their several parts, and the "vertical system" that which constructs an entire passage out of a single harmony. From fundamental harmonies he passed to inverted chords, to which he was the first to call attention; and

the value of this discovery fully compensates for his erroneous theory concerning the chords of the eleventh and the great (Angl. “added ”) sixth.? Rameau first set forth his new theory in his Z’raité de ? Harmonie (Paris, 1722), and followed it up in his Vouveau Systeme (1726), Génération Harmonique (1737), Démonstra- tion (1750), and Nouvelles Réflexions (1752). But it was not only as a theorist that he became famous. Returning to Paris in 1722, he first attracted attention by composing some light dramatic pieces, and then showed his real powers in his first great opera, Zippolyte et Aricie, founded on Racine’s Phédre, and produced at the Académie in 1733. Though this work was violently opposed by the admirers of Lully, whose party spirit eventually stirred up the famous “ guerre des bouffons,” Rameau’s genius wag too brilliant to be trampled under foot by an ephemeral faction, and his ultimate triumph was assured. He afterwards produced more than twenty operas, the most successful of which were Dardanus, Castor et Pollux, Les Indes Gal- antes, and La Princesse de Navarre. Honours were now showered upon him. He was appointed conductor at the Opéra Comique, and the directors of the opera granted him a pension. King Louis XV. appointed him composer to the court in 1745, and in 1764 honoured him with a patent of nobility and the order of Saint Michael. But these last privileges were granted only on the eve of his death, which took place in Paris on 12th September 1764. RAMESES (Gen. xlvii. 11 ; Exod. xii. 37; Num. xxxiii. 3), or, with a slight change in the vowel points, RAAMsES (Exod. i. 11), the name of a district and town in Lower Egypt, is notable as affording the mainstay of the current theory that King Rameses II. was the pharaoh of the oppression and his successor Menptah the pharaoh of the exodus. The actual facts, however, hardly justify so large an inference. The first three passages cited above are all by the priestly (post-exile) author and go together. Jacob is settled by his son Joseph in the land of Rameses and from the same Rameses the exodus naturally takes_ place. The older narrative speaks not of the land of Rameses but of the land of Goshen; it seems probable, therefore, that the later author interprets an obsolete term by one current in his own day, just as the Septuagint in Gen. xlvi. 28 names instead of Goshen Heroopolis and the land of Rameses. Heroopolis lay on the canal connecting the Nile and the Red Sea, and not far from the head of the latter, so that the land of Rameses must be sought in Wady Tumilat near the line of the modern

freshwater canal. In Exod. i. 11, again, the store-cities or arsenals which the Hebrews built for Pharaoh are specified as Pithom and Raamses, to which LXX. adds Heliopolis. Pithom (the city of the god Tum) is probably the Patumus of Herod. ii. 158, which also lay on the canal, so here again Wady Tumilat is the district to which we are referred. But did the Israelites maintain a continuous recollection of the names of the cities on which they were forced to build, or were these names rather added by a writer who knew what fortified places were in his own time to be seen in Wady 2 For further information on this subject, see vol. xvii. p. 92.

Tumilat? The latter is far the more likely case, when we consider that the old form of the story of the Hebrews in Egypt is throughout deficient in precise geographical data, as might be expected in a history not committed to writing till the Israelites had resided for centuries in another and distant land. The post-exile or priestly author indeed gives a detailed route for the exodus (which is lacking in the older story), but he, we know, was a student of geo- graphy and might supplement tradition by what he could gather from traders as to the caravan routes.1_ And at all events to argue that, because the Hebrews worked at a city named after Rameses, they did so in the reign of the founder, is false reasoning, for the Hebrew expression might equally be used of repairs or new works of any kind.

It appears, however, from remains and inscriptions that Rameses Il. did build in Wady Tumilat, especially at Tell Maskhuta, which Lepsius therefore identified with the Raamses of Exodus. This identification is commemorated in the name of the adjacent rail- way station. But recent excavations on the spot have brought to light further inscriptions, on the ground of which Naville makes the ruins those of Pithom and further identifies Pithom with the later Heroopolis. The identity of Pithom and Heroopolis is also favoured by comparison of the LXX. and the Coptic of Gen. xlvi. 28. See E. Naville, The Store-city of Pithom and the Route of the Exodus, London, 1885.

RAMESWARAM, a small island situated between Ceylon and India, at the entrance of Palk Strait in the Gulf of Manaar, in 9° 18’ N. lat. and 79° 22’ E. long. It is about 14 miles long by 5 wide, is lowand sandy, and for the most part uncultivated. The estimated population of the island is about 14,000. It contains one of the most venerated Hindu shrines, founded, according to tradition, by Rama himself, which for centuries has been the resort of thousands of pilgrims from all parts of India. To the south of this great temple there is a freshwater lake about 3 miles in circumference. At the western extremity of the island is the small but busy port of Pambam, which gives its name to the channel between India and Ceylon.

Rameswaram island is the first link in the chain of islets and rocks forming Adam’s Bridge. Geological evidence shows that this gap was once bridged by a continuous isthmus, which, accord- ing to the temple records, was breached by a violent storm in 1480. Operations for removing the obstacles in the channel, and for deepening and widening it, were begun in 1838. The main channel has a minimum depth of 14 feet; its length is 4232 feet and its breadth 80 feet. A second channel to the south, called the Kilkarai oo 2100 feet long, 150 feet wide, and is dredged to a depth (e) 2 feet.

RAMMOHUN ROY. See Roy.

RAMPUR, a native state of India, in the Rohilkhand division of the North-Western Provinces, lying between 28° 26' and 29°10' N. lat. and between 78°54' and 79°33' E. long. It is bounded on the N. and W. by the British district of Murddabaéd, and on the N.E. and S.E. by the district of Bareli. The country is level and generally fertile ; it is well watered in the north by the rivers Kosila and Nahul and in the south by the Ramgangé. It adjoins the Tarai on the north, at the foot of the Himé- layas, and is exceedingly unhealthy. The total area of the state is 945 square miles, with a population (1881) of 541,914 (males 282,359, females 259,555), of whom 302,989 were Hindus and 238,925 Mohammedans.

The revenue of Rampur in 1883-84 was £167,031 and the ordinary annual expenditure £160,134. Rice, sugar, hides, and a kind of damask are the principal exports, and the imports comprise elephants, English cloth, and groceries and salt. During the mutiny of 1857 the nawab of Rampur rendered important services to the British, for which he received a grant of land assessed at £12,852 in perpetuity, besides other honours.

RAMPUR, capital of the above state, stands on the left bank of the Kosila in 28° 48' N. lat. and 79° 4' E. long. ; it is surrounded by a belt of bamboo trees and

1 From the position of the words it is even not unlikely that '¢Pithom and Raamses" may be the addition of a redactor, and that the first author of Exod. i. 11 only spoke generally of store-cities.

brushwood, with a low ruined parapet, and is the resi. dence of the nawab, who represents the Rohilla chieftains of Rohilkhand.

RAMPUR BEULEAH. See RAssHAui, supra, p. 261,

RAMSAY, Attan (1686-1758), author of the Gentle Shepherd, a pastoral drama in the Lowland Scotch dialect, was born in Lanarkshire in 1686.

An Edinburgh barber set agoing the literary movement in Scotland that cul- minated in the poetry of Burns. This peasant-poetry is often spoken of as if it were a spontaneous indigenous product, but the harvest that ripened towards the close of the 18th century had its seed-time earlier, and the seeds were imported from England. Allan Ramsay was a peasant by birth (although he claimed kinship with the noble family of Dalhousie) —the son of a manager of lead- mines in Lanarkshire ; but the country-bred lad was trans- planted to a town, being apprenticed at the age of fifteen to a barber in Edinburgh. In this calling he somehow made the acquaintance of a band of Jacobite young gentle- men of literary tastes, was admitted to the convivialities of their " Easy Club," and formally adjudged "a gentle- man." The basis of the club seems to have been literary, the members taking fancy names of celebrities, —Buchanan, Boece, Bickerstaff, and so forth. Ramsay's name was Bickerstaff, and the fact is of some importance as showing how he was brought into contact with the discussion of the theory of pastoral poetry among the London wits of the time. Ramsay's connexion with the Easy Club lay between 1712 and 1715, and in the course of that period occurred the dispute about pastoral poetry occasioned by the great publication of Pope's Windsor Forest (see Porx). The Guardian for 7th April 1713 (No. 23) contained a descrip- tion of a true pastoral poem, which was afterwards realized by Ramsay in the Gentle Shepherd with such scrupulous fidelity in every detail that the criticism might fairly be described as the recipe from which the poem was made. There is not a clearer case in literary history of the influ- ence of criticism on creation; Ramsay's great pastoral — and it well deserves the epithet—was the main outcome of the prolonged discussion of that kind of poetry by the Queen Anne wits. 'Paint the manners of actual rustic life," said the Guardian critic to the poet, 'not the manners of artificial shepherds and shepherdesses in a fictitious golden age; use actual rustic dialect ; instead of satyrs and fauns and nymphs introduce the supernatural creatures of modern superstition." These precepts Ramsay diligently observed, and the result was that his Gentle Shepherd not only attracted attention among the learned students of poetry as a literary curiosity, the first genuine pastoral after Theo- critus, but at once became a favourite and a living force among the peasantry in whose dialect it was written and for whose characters it furnished ideal models. 'There was hardly a farmhouse in

Scotland in which a copy of the poem was not to be found, and the moral force of the ideal exhibited in the hero Patie may be traced in the character of Burns and many another Scottish peasant-bard in whom ostentatious libertinism is not redeemed by the same genius. From a moral point of view a better exemplar than Ram- say's ideal hero might well have been desired. The poet- laureate of the Easy Club took his moral tone from the poets of the Restoration, with whom his Jacobite boon com- panions were in full sympathy; and thus through the genial, convivial, quick-witted, and slily humorous barber the spirit of the Restoration passed into the homes of the Scotch peasantry to do battle with the austere spirit of the kirk.

RAM—RAM

The Gentle Shepherd is the only production of Ramsay's that has much claim to remembrance. His lyrics for the most part are poor artificial imitations, adorned here and there with pretty fancies, but devoid of sincerity of feeling. He is happier in his humorous descriptions of character and occasional personal poems; "renowned Allan, canty callan," as his admirers loved to call him, had a quick sense of the ridiculous and a firm touch in the exhibition of what amused him. Once he had established a character as a poet he abandoned the trade of wig-making, set up as a bookseller, and was the first to start a circulating library in Scotland. From his shop in High Street opposite Niddry Street he issued his incidental poems in broadsheets, and made a volume of them in 1721, and another in 1728. The nucleus of the Gentle Shepherd was laid in separately issued pastoral dialogues ; round these the complete drama was built and published as a whole in 1725. As a col- lector, editor, imitator, and publisher of old Scottish poetry Ramsay gave an impetus to vernacular literature at least as great as that given by his principal original poem. His Tea-Table Miscellany, published in 1724, for which English as well as Scottish poets and moderns as well as ancients were laid under contribution, was extremely popular ; and his Evergreen (1724), a collection of poems written prior to 1600, was the precursor of Bishop Percy's Reliques in a similar field. A collection of ables, published complete in 1730, part original, part translated from La Motte and La Fontaine, was Ramsay's last literary work, but he lived to an advanced

age, dying in 1758, the year before the birth of Burns. One of the speculations of the enlightened and enterprising man of business was a theatre, which was opened in 1736, but soon shut up by the magistrates.

; eerie edition of Ramsay's poems was issued by A. Gardner m .

RAMSAY, Attan (1713-1784), portrait-painter, the eldest son of the author of The Gentle Shepherd, was born at Edinburgh about 1713.1 Ramsay manifested an aptitude for art from an early period, and at the age of twenty we find him in London studying under the Swedish painter Hans Huyssing, and at the St Martin's Lane Academy ; and in 1736 he left for Rome, where he worked for three years under Solimena and Imperiali (Fernandi). On his return he settled in Edinburgh ; and, having attracted attention by his head of Forbes of Culloden and his full-length of the duke of Argyll, he removed to London, where he was patronized by the duke of Bridgewater. His pleasant manners and varied culture, not less than his artistic skill, contributed to render him popular. In 1767 the Scotsman was appointed to succeed Shakelton as principal painter to His Majesty; and so fully employed was he on the royal portraits which the king was in the habit of presenting to ambassadors and colonial governors that he was forced to take advantage of the services of a host of assistants—of whom David Martin and Philip Reinagle are the best known—upon the minor portions of his works, and sometimes on the faces themselves. His life in London was varied by frequent visits to Italy, where he occupied himself more in literary and antiquarian research than with art. But at length this prosperous career came to an end. The painter's health was shattered by an accident, a dislocation of the right arm. With an unflinching pertinacity, which we can understand when we see the firm-set resolute mouth of his own portrait, he struggled till he had com- pleted a likeness of the king upon which he was engaged at the time, and then started for his beloved Italy, leaving ~ 1 There seems to be some dubiety as to the exact date: the brothers Redgrave, in their Century of Painters, give the date as 1709, while Samuel Redgrave, in his Dictionary of Painters of the English School states it as 1713, a year—probably the correct one—assumed by Cunningham in his Lives.

behind him a series of fifty royal portraits to be completed by his assistant Reinagle. For several years he lingered in the south, his constitution finally broken. He died at Dover on the 10th of August 1784.

In his art Ramsay paid the penalty of popularity: the quality of the work which bears his name suffered from his unremitting assiduity as a court-painter and from his unsparing employment of assistants. Among his most satisfactory productions are some of his earlier ones, such as the full-length of the duke of Argyll, and the numerous bust-portraits of Scottish gentlemen and their ladies which he executed before scttling in London. They are full of both grace and individuality ; the features show excellent draughtsmanship ; and the flesh- painting is firm and sound in method, though frequently tending a little to hardness and opacity. His full-length of Lady Mary Cokc is an especially elegant female portrait, remarkable for the skill and delicacy with which the white satin drapery is managed ; while in the portrait of his brown-eyed wife, the eldest daughter of Sir Alexander Lindsay of Evelick, in the Scottish National Gallery, we have a sweetncss and tenderness which shows the painter at his highest. This last-named work shows the influence of French art, an influence which helped greatly to form the practice of Ramsay, and which is even more elcarly visible in the large collection of his sketches in the pos- session of the Royal Scottish Academy and the Board of Trustees, Edinburgh.

RAMSAY, Anprew Micwart (1686-1743), commonly called the 'Chevalier Ramsay," who was born at Ayr, Scotland, on 9th January 1686, is noteworthy as having been among the few writers not of French birth who are admitted by French criticism to have written in French with purity and scholarship. Ramsay visited France com- paratively early and came under the influence of Fénelon, which made hin a convert to Roman Catholicism. He held several important tutorships in his adopted country, the chief of which was the charge of Prince Charles Edward and the future cardinal of York. His biographers mention with surprise the conferring of an honorary degree upon him by the university of Oxford. The claim was nominally his discipleship to Fénelon, but in reality beyond doubt his connexion with the Jacobite party. He died at St Germain-en-Laye (Seine-et-Oise) on 6th May 1743.

Ramsay's principal work was the J'ravels of Cyrus (London and Paris, 1727), a book composed in avowed imitation of T'élémaque. He also edited T'élémaque itself with an introduction, and wrote an Essai de Politique on the principles of his master and a Histoire de la Vie et des Ouvrages de Fénelon, besides a partial biography of Turenne, some poems in English, and other miscellaneous works.

RAMSAY, Davin (1749-1815), American physician and historian, was the son of an Irish emigrant, and was born in Lancaster county, Pennsylvania, on 2d April 1749. After graduating M.D. at Princeton College in 1765 he settled as a physician at Charleston, where he obtained an extensive practice. During the revolutionary war he served as a field-surgeon, and in 1776 he became a mem- ber of the South Carolina legislature. Having acted as one of the "council of safety" at Charleston, he was on the capture of that city on 27th August 1780 seized by the British as a hostage, and for nearly a year was kept in confinement at St Augustine. From 1782 to 1786 he was a member of Congress. His interest in the revolutionary struggle led him to devote his leisure to the preparation of several historical works on the subject, and in 1785 he published in two volumes LHistory of the Revolution in South Carolina, in 1789 in two volumes Z/tstory of the American Revolution, in 1801 a Life of Washington, and in 1809 in two volumes a History of South Carolina. He was also the author of several minor works. He died at Charleston on 8th May 1815 from a wound inflicted by a lunatic. His //istory of the United States in 3 vols. was published posthumously in 1816, and forms the first three volumes of his Universal History Americanized, published in 12 vols. in 1819.

RAMSDEN, Jesse (1735-1800), astronomical instru- ment maker, was born at Salterhebble near Halifax, York- shire, in 1735. He went to London in 1755, and was

shortly afterwards bound apprentice to a mathematical instrument maker. He afterwards started business on his own account and acquired great celebrity as an artist. He died on 5th November 1800.

Ramsden's speciality was divided circles, which began to super- sede the quadrants in observatories towards the end of the 18th century. His most celebrated work was a 5-feet vertical circle, which was finished in 1789 and was used by Piazzi at Palermo in constructing his well-known catalogue of stars. He was the first to carry out in practice a method of reading off angles (first suggested in 1768 by the duke of Chaulnes) by measuring the distance of the index from the nearest division line by means of a micrometer screw which mioves one or two fine threads placed in the focus of a micro- scope. Ramsden's transit instruments were the first which were illuminated through the hollow axis; the idea was suggested to him by Professor Ussher in Dublin.

RAMSGATE, a seaport and watering-place of England, in the Isle of Thanet, Kent, and a "vill" of the old Cinque Port of Sandwich, is finely situated between chalk cliffs at the northern extremity of Pegwell Bay, on the London, Chatham, and Dover Railway, 79 miles east-south-east of London. It possesses a fine stretch of sand, and is much frequented as a watering-place. It first rose into import- ance in the beginning of the 18th century through its trade with Russia. In 1749 it was selected as a harbour of refuge for the Downs, and the erection of a pier under the direc- tion of Smeaton was begun in 1787. The harbour has been improved at various periods, and now (1885) covers an area of 51 acres, enclosed by two piers, one about 1200 and the other about 1500 feet in length, accommodation being afforded for as many as 400 sail. The limits of the port were extended in 1882. A considerable shipping trade in coal and provisions is carried on, and there is also a fleet of 150 vessels engaged in the North Sea fishery. A fine promenade pier was erected in 1881. The town possesses a town-hall (1839), assembly rooms, and exten- sive bathing establishments. The church of St George was built in 1826. There is a small Roman Catholic cathedral, built by Welby Pugin. The neighbouring Peg- well Bay, famed for its shrimps, is supposed to have been the scene of the landing of Hengist and Horsa, and at Cliffs End (Ebbs Fleet) a monolithic cross marks the landing-place of St Augustine in 596. On the summit of Osengal Hill, about a mile to the west of the town, a graveyard of the early Saxon settlers was discovered during the cutting of the railway. Ramsgate was incorporated as a borough in 1884.

The population of the urban sanitary district (area 2278 acres) in 1871 was 19,640, and in 1881 22,683, or, including 638 fishermen at sea,

23,321.

RAMUS, Perer, or PrERRE DE LA Ramis (1515-1572), logician, was born at the village of Cuth in Picardy in the year 1515. He was descended from a noble family, which had fallen, however, into such poverty that his father earned his livelihood as a field-labourer. The early death of his father increased Ramus's difficulties in obtain- ing the education for which he thirsted. But at last his perseverance was rewarded by admission, in a menial capacity, to the college of Navarre. He worked with his hands by day and carried on his studies at night. The reaction against scholasticism was still in full tide; it was the transition time between the old and the new, when the eager and forward-looking spirits had first of all to do battle with scholastic Aristotelianism. In the domain of logic men like Laurentius Valla, Rudolphus Agricola, and Ludovicus Vives, imbued with the spirit of the Renais- sance, had already invoked Cicero against the barbarous Latinity of the scholastic compends ; and, following the same prototype, they had proposed various innovations which tended to assimilate logic to rhetoric. Ramus out- did his predecessors in the impetuosity of his revolt. He signalized himself on the occasion of taking his degree

(1536) by victoriously defending the daring thesis—Every- thing that Aristotle taught is false. This tour de force was followed up by the publication in 1543 of Aristotelice Animadversiones and Dialectice Partitiones, the former a criticism on the old logic and the latter a new text-book of the science. What are substantially fresh editions of the Partitiones appeared in 1547 as Institutiones Dialectice, and in 1548 as Scholx Dialectice ; his Dialectique, a French version of his system, is the earliest work on the subject in the French language. Meanwhile Ramus, as graduate of the university, had opened courses of lectures; but his audacities drew upon him the determined hostility of the conservative party in philosophy and theology. He was accused of undermining the foundations of philosophy and religion, and the matter was brought

before the parlement of Paris, and finally before the king. By him it was re- ferred to a commission of five, who found Ramus guilty of having "acted rashly, arrogantly, and impudently," and interdicted his lectures (1544). He withdrew from Paris, but soon afterwards returned, the decree against him being cancelled through the influence of the cardinal of Lorraine. In 1551 Henry IL. appointed him professor of philosophy and eloquence at the Collége de France, where for a considerable time he enjoyed free scope for his energies. His incessant literary activity is proved by the fifty works which he published in his lifetime, to which must be added nine that appeared after his death. In 1561, however, the slumbering enmity against Ramus was suddenly fanned into flame by his adoption of Protestant- ism. He had to flee from Paris for his life; and, though he found an asylum in the palace of Fontainebleau, his house was pillaged and his library burned in his absence. He resumed his chair after this for a time, but in 1568 the position of affairs was again so threatening that he found it advisable to ask permission to travel. He travelled mainly in Switzerland and Germany, residing some time in Basel, Heidelberg, Geneva, and Lausanne, and meeting everywhere with the most flattering reception. Returning to France, Ramus at last fell a victim to the inveterate hate of his opponents: he perished by the hands of hired assassins in the massacre of St Bartholomew (1572).

The logic of Ramus enjoyed a great celebrity for a time, and there existed a school of Ramists boasting numerous adherents in France, Germany, and Holland. As late as 1626 Burgersdyck divides the logicians of his day into the Aristotelians, the Ramists, and the Semi-Ramists, who endeavoured, like Goclenius of Mar- burg, to mediate between the contending parties. Ramus's works appear among the logical text-books of the Scottish universities, and he was not without his followers in England in the 17th cen- tury. There is even a little treatise from the hand of Milton, published two years before his death, called Artis Logice Plenior Institutio ad Petri Rami Methodum concinnata. It cannot be said, however, that Ramus's innovations mark any epoch in the history of logic ; and, though some of his additions have maintained their ground, he has made no contribution of fundamental importance to the science. His rhetorical leaning is seen in the definition of logic as the "ars disserendi" ; he maintains that the rules of logic may be bettcr learned from

observation of the way in which Ciccro persuaded his hearers than from a study of the Organon. The dis- tinction between natural and artificial logic, i.¢., between the im- plicit logic of daily speech and the same logic made explicit in a system, passed over into the logical handbooks. Logic falls, accord- ing to Ramus, into two parts—invention (treating of the notion and definition) and judgment (comprising the judgment proper, syllogism, and method). This division gave rise to the jocular designation of judgment or mother-wit as the "secunda Petri." He is, perhaps, most suggestive in his emendations of the syllogism. He admits only the first three figures, as in the original Aristotelian scheme, and in his later works he also attacks the validity of the third figure, following in this the precedent of Laurentius Valla. Ramus also set the modern fashion of deducing the figures from the position of the middle term in the premises, instead of basing them, as Aristotle does, upon the different relation of the middle to the so-called major and minor term. On the whole, however, though Ramus may be allowed to have advanced logical study by the wholesome fermentation of thought which he caused, we are

at a loss to see the grounds for his pretentious claim to supersede Aristotle by a new and independent system.

See Waddington-Kastus, De Petri Rami vita, scriptis, philosophia, Paris, 1848 ; Charles Desmaze, Petrus Ramus, professeur au Collége de France, sa vie, ses écrits, sa mort, Paris, 1864.

RAMUSIO. The noble family of Ramusio—the spelling adopted in the publication of the Vavigationz, though it is also written Ramnusio, Rhamnusio, Rannusio, &c.— was one of note for literary and official ability during at least four generations. Its original home was in Rimini, and the municipality of that city has within the last few years set up a tablet on the town-hall bearing an inscription which may be thus rendered: 'The municipality of Rimini here records the claim of their city to the family of the Ramusios, adorned during the 15th and 16th centuries by the illustrious jurist and man of letters Paolo the elder, who rendered the work of Valturius, our fellow-citizen, into the vernacular; by the physician Girolamo, a most successful student of Oriental tongues, and

the first to present Europe with a translation of Avicenna; and by Giovanni Battista, cosmographer to the Venetian republic and secretary to the Council of Ten, who bequeathed to the world that famous collection of voyages and travels, re- garded in his own day as a marvellous work, and still full of authority among all civilized nations."

PaoLo THE ELDER (c, 1443-1506), the first of those thus commemorated, migrated in 1458 from Rimini to Venice, where he obtained full citizenship, studied law, and became a member of the magistracy, filling the offices of vcario, of judicial assessor, and of criminal judge under various administrators of the Venetian provinces on the continent. He continued, however, to maintain relations with the Mala- testa princes of his native city, and in 1503 negotiated with them the cession of Rimini to the republic. The wife of Paolo, bearing the singular name of Tomyris Macachio, bore him three sons and four daughters. Paolo died at Bergamo on 19th August 1506 at the age of sixty-three, and was buried in 8. Agostino at Padua. Paolo was the author of a variety of legal treatises and the like, and also published at Verona in 1483 both a corrected edition and an Italian translation of a once famous book, Valturius, De re militar, dedicating both to Pandolfo Malatesta of Rimini.!

GrroLamo (1450-1486), younger brother of Paolo, had a notable history. After he had studied medicine at Padua public suspicion was roused against him in connexion with the death of a lady with whom he had had some love passages, and this ran so high that he was fain, by help of his brother Paolo, to whom he transferred his property, to make his escape (about 1481-83) to Syria and to take up his abode at Damascus. In 1486 he removed to Beyrout, and died the same year, killed, as the family chronicler re- lates, by a surfeit of "certain fruit that we call armellini and albicocche, but which in that country are known as mazza- Franchi," a title which English sailors in southern regions still give to apricots in the vernacular paraphrase of sill- johns. During his stay in Syria Girolamo studied Arabic and made a new translation of Avicenna, or rather, we may assume, of some part of that author's medical works (the Canon'). It was, however, by no means the first such trans- lation, as 1s erroneously alleged in the Rimini inscription, for the Canon had been

translated by Gerard of Cremona (d. 1187), and this version was frequently issued from the early press. Girolamo's translation was never printed, but was used by editors of versions published at Venice in 1579 and 1606. Other works of this questionable member of the house of Ramusio consisted of medical and philosophical tracts and Latin poems, some of which last were included in a collection published at Paris in 1791.?

1 Both works are in the British Museum. 2 "Ramusii Ariminensis Carmina," in Quingue Illustrium Poetarum . . Lusus in Venerem. Girolamo's are grossly erotic.

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Gian Barista (1485-1557), the eldest son of Paolo Ramusio and Tomyris Macachio, was born at Treviso in 1485 (20th June). Having been educated at Venice and at Padua, at an early age he entered the public service (1505), becoming in 1515 secretary of the senate and in 1533 secretary of the Council of Ten. He also served the republic in various missions to foreign states, ¢.g., to Rome, to Switzerland, and to France, travelling over much of the latter country by special desire of the king, Louis XII. He also on several occasions filled the office of cancellier grande. In 1524 he married Franceschina, daughter of Francesco Navagero, a noble,—a papal dispensation being required on account of her being cousin to his mother Tomyris. By this lady he had one son, Paolo. In his old age Ramusio resigned the secretaryship and retired to the Villa Ramusia, a property on the river Masanga, in the province of Padua, which had been bestowed on his father in 1504 in recognition of his services in the acquisi- tion of Rimini the year before. The delights of this retreat are celebrated in the poems and letters of several of Gian Battista's friends. He also possessed a house at Padua in the Strada del Patriarcato, a mansion noted for its paintings and for its collection of ancient sculpture and inscriptions. These, too, are commemorated by various writers. A few days before his death Ramusio removed to this house in Padua, and there died, 10th July 1557, at the age of seventy-two. He was, by his own desire, buried at Venice, in the tomb which he had made for his mother, in Santa Maria dell' Orto. His wife's death had

occurred in 1536. In the work called Museum Mazzuchellianum (Venice, 1761, vol. i. pl. xiv. No. 6) there is represented a 16th-century medal of Ramusio, which looks a genuine likeness, and a bronze example of which, without the reverse,' is preserved in St Mark's Library. There was a portrait of him, represented as in conversation with Andrea Gradenigo, in the Sala del Maggior Consiglio, but in 1577 this perished in a fire, as did also a portrait of his father, Paolo. A professed portrait of Gian Battista by Francesco Grisellini, in the Sala dello Scudo, appears to be, like the companion portrait of Marco Polo, a work of fancy. A public nautical school at Rimini has within the last three years received from the Government the title of the Isti- tuto Ramusio.

Ramusio was evidently a general favourite, as he was free from pushing ambition, modest, and ingenuous, and, if it be safe to judge from some of the dissertations in his

Vavigatroni, must have been a delightful companion; both his friend Giunti and the historian Giustiniani speak of him with the strongest affection. He had also a great reputation for learning. Before he was thirty Aldus Manutius the elder dedicated to him his edition of Quin- tilian (1514); a few years later (1519) Francesco Ardano inscribed to him an edition of Livy, and in 1528 Bernardino Donati did the like with his edition of Macrobius and Censorinus. To Greek and Latin and the modern lan- guages of southern Europe he is said to have added a knowledge of " Oriental tongues," but there is no evidence how far this went, unless we accept as such a statement that he was selected in 1530 on account of this accom- plishment to investigate the case of one David, a Hebrew, who, claiming to be of the royal house of Judah, wished to establish himself at Venice outside of the Ghetto.5 But*

3 The reverse is an amorphous map. The book is.in the British Museum.

4 Rerum Venetarum .. . Historia, bk. xiv.

> Ramusio's report on this Hebrew is preserved in the diaries of Marcus Sanudo, and is printed by Cigogna. It is curious. David represented himself as a prince of the Bedouin Jews who haunt the caravan-road between Damascus and Medina; he claimed to be not only a great warrior

covered with wounds but great also in the law and in the cabala, and to have been inspired by God to conduct the

Ramusio had witnessed from his boyhood the unrolling of that great series of discoveries by Portugal and Spain in East and West, and the love of geography thus kindled in him made that branch of knowledge through life his chief study and delight. He is said, with the assistance of friends touched by the same flame, to have opened a school for geography in his house at Venice. And it appears from a letter addressed to him by his friend Andrea Navagero, that as early as 1523 the preparation of material for his great work had already begun. The task had been suggested and encouraged, as Ramusio him- self states in a dedicatory epistle to the famous Girolamo Fracastoro, by that scholar, his lifelong friend ; an address to the same personage indeed introduced each of the three volumes, and in the first the writer speaks of his desire to bequeath to posterity, along with his labours, "a testimony to the long and holy friendship that had existed between the two." They were contemporaries in the strictest sense (Ramusio 1485-1557, Fracastorius 1483-1553). His corre- spondence, which was often devoted to the collection of new material for his work, was immense, and embraced many distinguished men. Among those whose names have still an odour of celebrity were Fracastoro, just men- tioned, Cardinal Bembo, Damiano de Goez, and Sebastian Cabot; among lesser lights, Vettor Fausto, Daniel Barbaro, Paolo Manuzio, Andrea Navagero, the cardinals Gasparo Contarini and Gregorio Cortese, and the printer Tommaso Giunti, editor after Ramusio's death of the Navigation. Before speaking more particularly of this work we may conclude the history of the family.

Paoto (GrroLAMO GaspaRE)! (1532-1600) was the only child of Gian Battista, and was born on 4th July 1532. Like his father, he maintained a large correspondence with many persons of learning and note. In 1541 Francesco Contarini, procurator of St Mark's, brought from Brussels a MS. of Villehardouin's History of the Conquest of Con- stantinople, which he presented to the Councilof Ten. In 1556 they publicly ordered its translation into Latin, and gave the commission to Paolo Rannusio. His

father also seems to have taken much interest in the work, for a MS. vernacular translation by him exists in the Marciana. . Paolo's book was not completed till 1573, many years after the father's death, and was in fact a paraphrase enlarged from other sources, thus, according to Cigogna's questionable judgment, 'converting the dry story of Ville- hardouin into an elegant (fiortta) historical work." It was not published till 1609, nine years after Paolo's death ; nor was it ever really reprinted, though it became the subject of a singular and unintelligible forgery. For Jacopo Gaffarelli, who was sent to Venice to buy books for Richelieu, having apparently procured the "remainder " copies, removed the title and preliminary pages and sub- stituted a fresh title with the date 1634, and a dedication to his master the cardinal.?

GrroLaMo GIUSEPPE (1555-1611), the son of Paolo, was born at Venice in 1555. He entered the public service in 1577, and was employed in connexion with various foreign missions. In 1601 he published at Lyons the French text of Villehardouin ; and, besides an Italian translation of this old historian (who seems thus to have furnished occupation for three generations of Ramusios), he left behind him a Storia o Cronaca di Casa Ramusia, a folio

dispersed tribes to the Holy Land and to rebuild the temple. In this view he had visited Prester John and the Jews in his kingdom, and then various European countries. David was dark in complexion, "like an Abyssinian," lean, dry, and Arab-like, well dressed and well attended, full of pretensions to supernatural cabalistic knowledge, and with enthusiastic ideas about his mission, whilst the Jews regarded him as a veritable Messiah.

1 This person and his son affected the spelling Rannusio.

2 Tn the British Museum.

RAMUSLO

MS. still in St Mark's Library. He died at Padua in 1611, and his posterity did nothing to continue the reputa- tion of the family, official or literary.

We revert to the Navigationi e Viaggi. 'Two volumes only were published during the life of Gian Battista, vol. i. in 1550, vol. iii, in 1556; vol. ii. did not appear till 1559, two years after his death, delayed, as his friend and printer T. Giunti explains, not only by that event but by a fire in the printing-office (November 1557), which destroyed a part of the material which had been prepared. It had been Ramusio's intention to publish a fourth volume, containing, as he mentions himself, documents relating to the Andes, and, as appears from one of the prefaces of Giunti, others relating to explorations towards the Antarctic.2 Rainusio's collection was by no means the first of the kind, though it was, and we may say ou the whole continues to be, the best. Even before the invention of the press such collections were known, of which that made by a certain Long John of Ypres, abbot of St Bertin, in the latter half of the 14th century was most meritorious, and afforded in its transcription a splendid field for embellishment by the miniaturists, which was not disregarded. The best of the printed collections before Ramusio's was the Novus Orbis, edited at Bascl by Simon Gryneus in 1532, and reissued in 1537 and 1555. This, however, can boast of no disquisitions nor of much editorial judgment. Ramusio's collection is in these respects far superior, as well as in the variety and fulness of its matter. He spared no pains in ransacking Italy and the Spanish peninsula for coutributions, and in translating them when needful into the racy Italian of his day. Several of the pieces are very rare in any other shape than that exhibited in Ramusio's collection ; several besides of importance—e.g., the invaluable travels of Barbosa and Pigafetta's account of Magellan's voyage—were not publicly known in any complete form till the present century. Of two important articles at least the originals have never been otherwise printed or dis- covered ; one of these is the Summary of all the Kingdoms, Cities, and Nations from the Red Sea to China, a work translated from the Portuguese, and dating apparently from about 1535; the other, the remarkable Ramusian redaction of Marco Poto (q.v.). The Prefatione, Espositione, and Dichiarazione, which precede this ver- sion of Marco Polo's book, are the best and amplest examples of Ramusio's own style as an editor. They are full of good sense and of interesting remarks derived from his large reading and experi- ence, and few pictures in words were ever touched more delightfully than that in which he sketches the return of the Polo

family to their native city, as he had received it in the tradition of the Venetian elders.

There were several editions of the Navigationi e Viaggi, and as additions continued to be made to the several volumes a good deal of bibliographical interest attaches to these various modifications.4 The two volumes (i. and iii.) published in Ramusio's lifetime do not bear his name on the title-page, nor does it appear in the addresses to his friend Fracastorius with which these volumes begin (as does also the second and posthumous volume). The editions of vol. i. are as follows—1550, 1554, 1563, 1588, 1606, 1613.5 The edition of 1554 contains the following articles which are not in that of 1550,—(1) copious index ; (2) "Narr. di un Compagno di Barbosa" ; (3) "Informationi del Giapan"; (4) "Alli Lettori di Giov. de Barros"; (5) "Capitoli estratti da di Barros." The edition of 1563 adds to these a preliminary leaf concerning Ramusio, "'Tom- maso Giunti alli Lettori." After 1563 there is no change in the contents of this volume, only in the title-page. It should be added that in the edition of 1554 there are three double-page woodcut maps (Africa, India, and India extra Gangem), which do not exist in the edition of 1550, and which are replaced by copper- plate niaps in subsequent editions. These maps are often missing. The editions of vol. ii. are as follows—1559, 1574, 1583, 1606. There are important additions in the 1574 copy, and still further addi- tions in that of 1583. The additions made in 1574 were—(1) " Herberstein, Della Moscovia e della Russia"; (2) " Viaggio in Persia di Caterino Zeno" ; (3) "Scoprimento dell' Isola Frislanda, &c., per due fratelli Zeni" ; (4) "Viaggi in Tartaria per alcuni frati Minori" ; (5) " Viaggio del Beato Odorico" (two versions). Further additions made in 1583 were—(1) " Navigatione di Seb. Cabota"; (2) at the end 90 ff. with fresh pagination, containing ten articles on "Sarmatia, Polonia, Lithuania, Prussia, Livonia, Moscovia, and the Tartars by Aless. Guagnino and Matteo di Michcovo." The two latest "editions" of vol. ii. are identical, 7.e., from the same type, with a change of title-page only, and a reprint of the last leaf of the preface and of the last leaf of the book. But the last cir- cumstance does not apply to all copies. In one now before the

3 See in vol. iii. the end of Ramusio's Discorso on the conquest of Peru, and Giunti's " Alli Lettori"' in the 3d edition of the first volume.

4 Brunet's statements on the subject are borrowed, and not quite accurate. The detail in Cigogna seems to be accurate, but it is vague as to the deficiencies of the earlier editions.

5 All of these are in the British Museum.

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writer, whilst the title bears 1606, the colophon bears " Appresso i Giunti, 1583." Vol. iii. editions are of 1556, 1565, and 1606.1 There is no practical difference between the first two, but that of 1606 has forty-five pages of important new matter, which embraces the Travels of Cesare Fedrici or Federici in India, one of the most valuable narratives of the 16th century, and Three Voyages of the Hollanders and Zealanders to Nova Zembla and Groenland. Vol. iii. also contains (omitting maps and figures inserted in the text, or with type on the reverse) a two-page topographical view of Cuzco, a folding map of Terra Nova and Labrador, a two-page map of Brazil, a two-page map of Guinea, &c., a two-page map of Sumatra, a two-page pictorial plan of the town of Hochelaga in New France, and a general map of the New World in a hemisphere. Brunet's statement mentions issues of vol. ii. in 1564, and of vol. iii, in 1613; but these seem to have no existence. It would thus appear that a set of Ramusio, to be as complete as possible, should embrace—for vol. i., 1563 or any subsequent edition ; for vol. ii., 1588 or 1606; for vol. iii., 1606.

Besides the circumstances to be gathered from the Navigationi regarding the Ramusio family see the Iscrizioni Venete of Emanuele Cigogna. There is also in the British Museum Monografia letta il 14 Marzo 1883. . . by Guglielmo Carradori, Rimini, 1883 ; but hardly anything has been found in this except the inscription quoted at the beginning of this article. (08h

See

RANCE, ArmManp JEAN LE BoUTHILLIER DE. TRAPPISTS.

RANDERS, a town of Denmark, at the head of an amt in the province of North Jutland (Nérrejylland), on the Gudenaa, about 8 miles above its junction with Randers Fjord, an inlet of the Cattegat. It is situated on the railway that runs south by Aarhuus to Fredericia, and has a branch line (1875) to Grenaa on the coast. Though a place of considerable antiquity —being mentioned in 1086 as the meeting-place of insurgents against Knud, the saint —Randers has few remains of old buildings and bears the stamp of a compact modern manufacturing town that owes its importance to its distilleries, dye-works, carriage ~~fac~~ tories, salt-works, weaving-factories, tan-works, &c. St Morten's church dates from the 14th century, but has been frequently altered and enlarged down to 1869-70. Other buildings are the town-house (1778, restored 1858), the court-house (1860-62), the infirmary (1870), the alms- house (1868), the Jewish synagogue (1858), and the high school (1858 ; the institution founded by Christian ITI.). The population was 11,354 in 1870 and 13,457 in 1880.

Randers is best known in history as the scene of the assassina- tion of Count Geerts by Niels Ebbesoén in 1340. In the Middle Ages it had six churches and four monastic establishments—the oldest a Benedictine nunnery (1170). The Grey Friars' building was turned into a castle (Dronningborg) after the Reformation ; its church was burned down in 1698.

RANDOLPH, Joun (1773-1833), of Roanoke, American statesman, was descended from an influential and wealthy Virginian family, and was the third and youngest son of John Randolph of Cawsons, Chesterfield county, where he was born on 2d June 1773. His father having died in his infancy, his early years were passed under the care of his stepfather. He attended schools at Williamsburg and Princeton and for a short time studied at Columbia College, New York, but, although well read in modern works bear- ing on politics and philosophy, his own statement, "I am an ignorant man, sir," was in other respects not inaccurate. Both his religious and his political views were radical and extreme. At an early period he imbibed deistical opinions, which he promulgated with extreme eagerness. He was also so strongly opposed to the new constitution of the United States that he could not bear to hear Wash- ington take the oath to support it. In order to assist in asserting the right of resistance to national

laws, and to withstand the '"'encroachments of the administration upon the indisputable rights" of Virginia, he was in 1799 elected as a democrat to Congress, where he sat, with the exception of two terms, till 1825. After the election of Jefferson as president in 1801 Randolph was elected chair- man of the committee of ways and means. He took an active part in agitating for the reform of the judiciary, and

1 All of these are in the British Museum.

in 1804 moved the impeachment of Judge Chase. The part he took in this matter tended to widen his breach with Jefferson, from whom he finally separated in 1806. Pos- sessing considerable wit, great readiness, and a showy if somewhat bombastic eloquence, he would undoubtedly have risen to high influence but for his strong vein of eccentricity and his bitter and ungovernable temper. The championship of State rights was carried by him to an extreme utterly quixotic, inasmuch as he not only asserted the constitutional right of Virginia to interpose her protest against the usurpation of power at Washington but claimed that the protest should be supported by force. On account of his opposition to the war with England in 1812 he was not returned to Congress in 1813, but he was re-elected in 1815. In 1825 he was elected to the United States Senate, where he continued to sit till 1827. In 1830 he was for a short time minister to Russia. He was elected to Congress in 1832, but died of consumption at Philadelphia before he took his seat, 24th May 1833, His last will was disputed in the law courts, and the jury returned a verdict that in the later years of his life he was not of sane mind.

Among several biographies of Randolph mention may be made of that by Hugh A. Garland, New York, 1850 (11th ed., 1857), and that by Henry Adams, forming vol. i. of the series of American

» Statesmen, edited by J. T. Morse, junior, Boston, 1883.

RANDOLPH, Tuomas (1605-1634), an English poet, was born in Northamptonshire in 1605. He was educated at Westminster and Cambridge, and soon gave promise as a writer of comedy. Ben Jonson,

not an easily satisfied critic, adopted him as one of his "sons." The ease and melody of his verse and the quickness of his wit and fancy justify the favour with which the youth was received by the magnates of literature. Unhappily he died under thirty in 1634, before his powers had reached their matur- ity. His principal works are—Zhe Muses' Looking-Glass, a Comedy; Amyntas, or the Impossible Dowry, a pastoral acted before the king and queen ; Aristippus, or the Jovial Philosopher ; The Conceited Pedlar ; The Jealous Lovers, a Comedy; Hey for Honesty, down with Knavery, a Comedy; and several other poems. TIlis works have recently been edited by W. Carew Hazlitt.

RANGOON TOWN, a district in the Pegu division of the province of British Burmah, situated in 16° 47' N. lat. and 96° 13' E. long., on the left bank of the Hlaing or Rangoon river at its junction with the Pegu and Pu-zwon-doung streams, 21 miles from the sea. In 1880 the town was detached from the surrounding area of the old district of Rangoon and constituted a separate district, the remainder of the country being formed into a distinct jurisdiction under the title of Hanthawady. The soil of Rangoon in the mountains and elevated tracts is grey sandy clay, and in the plains it is mostly alluvial mixed with earth of reddish colour, well suited for the growth of rice, vegetables, and fruit trees.. The Rangoon river flows from the junction of the Panlaing and Hlaing rivers to the sea; from the sea to Rangoon it is navigable during the monsoons by vessels of the largest draught, and in the dry season by vessels of 1000 tons. Pu-zwon- doung creek empties itself into the Rangoon river at Battery Point. It is navigable during the spring tides of the south- west monsoon for cargo boats of 100 tons; near its junction with the Rangoon river is a small rock, dangerous to large vessels. The only lake of any importance is the Kandaugyi or Royal Lake within the Dalhousie Park. The chief products of the district are grains and pulses (principally rice), cotton, timber, and cutch (catechu) and gambier. Rangoon comprises an area of 22 square miles, with a population in 1881 of 134,176 (males 91,504, females 42,672); Hindus numbered 35,871, Mohammedans 21,169, Christians 9741, and Buddhists 67,131.

The town was first built in 1753 by Aloung-bhoora, the founder of the Burmese monarchy. On the outbreak of the first Burmese War, in 1824, it was taken by the British, but subsequently restored to the native power. It was eaptured a second time in 1852 and passed along with the province of Pegu into the hands of the British. The town was destroyed by fire in 1850, and serious conflagrations oceurred again in 1853 and 1855. Since the last devastation Rangoon has undergone eonsiderable improvements ; among the latest may be mentioned the construction of steam tramways in the prineipal thoroughfares and the establishment of a volunteer fire brigade.

RANGPUR, a district of British India, in the lieu- tenant-governorship of Bengal, lying between 25° 3' and 26° 19' N. lat. and 88° 47' and 89° 56' E. long., is bounded on the N. by Jalpdiguri district and Kuch Behar state, on the E. by the Brahmaputra, separating it from Goalpara and Maimansinh, on the 8. by Bogra, and on the W. by Dindjpur and Jalpaiguri. The district is one vast plain ; the greater part of it, particularly towards the east, is in- undated during the rains, and the remainder is traversed by a network of streams which frequently break through their sandy banks and plough for themselves new channels over the fields. Agricultural industry has taken full advantage of the natural fertility of the soil, which is composed of asandy loam. The river system is constituted by the Brahmaputra and its tributaries, chief of which are the Tista, Dharla, Sankos, and Dudhkumar. There are no embankmeuts or artificial canals in the district, nor does the alluvial soil produce any minerals. The climate of Rangpur is generally malarious owing to the numerous stagnant swamps and marshes filled with decaying vege- table matter. The average annual rainfall is 86°14 inches. The Northern Bengal State Railway cuts through the western half of the district from north to south, with a branch to Rangpur town.

In 1881 the population was 2,097,964 (males 1,067,701, females 1,030,263) ; Hindus numbered 816,532, Mohammedans 1,279,605, and Christians 86. The population is for the most part rural ; the only towns containing upwards of 10,000 inhabitants are RANGPUR, the eapital (q.v.), Barakhatta (11,393), Bhogdabari (10,892), and Dimlah (10,503). The distriet contains an area of 3486 square miles, about three-fourths

being under continuous cultivation. The staple crops are riee, wheat, and other grains, oil-seeds, and jute ; among the miseellaneous crops are indigo, sugar-cane, betel-leaf, betel-nut, and mulberry for silkworms. Spare land capable of eultivation can hardly be said to exist,—even the patches of waste land yield a valuable tribute of reeds and cane. Of industries the chief is the manufaeture of paper from jute fibre ; other produets are striped cotton earpets, silk cloth woven from the cocoon of a worm fed on the castor-oil plant, baskets and mats, brass-ware, and ornaments earved in ivory and buffalo horn. In 1883-84 the

gross revenue of Rangpur disttict was £165,165, of which the land- '

tax eontributed £102,248.

The traet eomprised within the district of Rangpur was formerly the western outpost of the ancient Hindu kingdom of Kamrup. The realm appears to have attained its greatest power and prosperity under Raja Nilambhar, who was treaeherously overthrown by Husain Shah, king of Bengal, at the close of the 15th century. On the conquest of the kingdom of Bengal about 1542 by the renowned Afghan Sher Shah, subsequently emperor of Delhi, Rangpur appears to have become incorporated with the empire. During the turbulent period which followed the death of Sher Shah it threw off allegiance to Delhi, but the country was re-annexed by Akbar in 1584, though it was not completely subjugated till the time of Aurangzeb, about 1661. Rangpur passed to the East India Company in 1765 under the firman of the emperor Shah Alam. Numerous changes have since taken place in the jurisdiction, in consequence of which the district area has been much diminished.

RANGPUR, principal town and administrative head- quarters of the above district, is situated on the north bank of the Ghaghat river in 25° 44' N. lat. and 89° 17' E. long., and contains a population (1881) of 13,320.

RANJIT SINGH (Rungeer SrncH). See Ponsa, above, p. 111.

RANKINE, Witt1am Jonn Macquorn (1820-1872), a descendant of old Scottish families, the Rankines of Carrick and the Cochranes of

Dundonald by the father's side, and the Grahames of Dougalston by the mother's,

RAN—RAWN

was born at Edinburgh in 1820, and completed his educa- tion in its university. He was trained as an engineer under Sir J. Macneill, working chiefly on surveys, harbours, and railroads, and was appointed in 1855 to the chair of civil engineering in Glasgow, vacant by the resignation of Lewis Gordon, whose work he had undertaken during the previous session.

He was a voluminous writer on subjects directly con- nected with his chair, and, besides contributing almost weekly to the technical journals, such as the Engineer, brought out a series of standard text-books on Civil Engineering, The Steam-Engine and other Prime Movers, Machinery and Millwork, and Applied Mechanics. These have passed through many editions, have done more for the advancement of their subjects than any works of modern date, and are still in the very highest rank of educational works. To these must be added his elaborate treatise on Shipbuilding, Theoretical and Practical. This, however, corresponded to but one phase of Rankine's immense energy and many-sided character. He was an enthusiastic and most useful leader of the volunteer move- ment from its commencement, and a writer, composer, and singer of humorous and patriotic songs, some of which, as "The Three Foot Rule" and "They never shall have Gibraltar," became well known far beyond the circle of his acquaintance. Rankine was the earliest of the three founders of the modern science of THERMODYNAMICS (q.v.) on the bases laid by Sadi Carnot and Joule respectively, and the author of the first formal treatise on the subject. His contributions to the theories of Elasticity and of Waves rank high among modern developments of mathematical physics, although they are mere units among the 150 scientific papers attached to his name in the Royal Society's Cata- logue. The more important of these have been collected and reprinted in a handsome volume (Rankine's Scientific Papers, London, 1881), which contains a memoir of the author, written by Professor Tait. Rankine died in 1872.

RANPUR, a native state of India, in the province of Orissa in the lieutenant-governorship of Bengal, situated on the western boundary of the British district of Puri, in about 20° N, lat. and 85° 20' E. long. The south- west part of the state is a region of hills, forest clad, and almost entirely uninhabited, which wall in its whole western side, except at a single point, where a pass leads into the adjoining state of Nayagarh. Its population in 1881 was 36,539 (18,382 males, 18,157 females). The only town is the raja's place of residence, which consists of one long and wide street.

RANUNCULUS. Familiarly known as " buttercups," the species of this genus form the type of the order Lanunculacee. The plants are herbs, sometimes with fleshy root-fibres, or with the base of the stem dilated into a kind of tuber (Z. bulbosus), They have tufted or alternate leaves, dilated into a sheath at the base and verv generally, but not universally, deeply divided above. The Jowers are solitary, or in loose cymes, and are remarkable for the num- ber and distinctness (freedom from union) of their parts. Thus there are five sepals, as many petals arranged in whorls, numcrous stamens, and numerous carpels arranged in spires. The petals have a little pit or gland at the base, which is interesting as foreshadowing the more fully developed tubular petals of the nearly allied genera Aconi-tum and Helleborus. The presence of all the floral organs in a free condition induced A. P. de Candolle to place Ranunculus at the head of the vegetable kingdom, but at the present time the reverse opinion holds good, and Ranunculus with its numerous separate parts is supposed to occupy a lower status than a flower in which a greater amount of consolidation and differentiation takes place. The genus is large as to number of species, which occur in

most temperate countries in the northern and southern hemispheres, and, while they extend into arctic and ant- arctic regions, they show little or no tendency to inhabit tropical countries except on the higher mountains. Several are natives of Great Britain, occurring in pastures, while the water-buttercups, denizens of pools and streams, vary greatly in the character of the foliage according as it is submersed, floating, or aerial,

and when submersed varying in accordance with the depth and strength of the current. The ranunculus of the florist is a cultivated form of 2. asiaticus, remarkable for the range of colour of the flowers (yellow to purplish black) and for the regularity with which the stamens and pistils are replaced by petals. The common or lesser celandine is the &. Ficaria of the botanist, remarkable for its tuberous root-fibres. The species are all more or less acrid.

RAOUL ROCHETTE, Déstr&t (1783-1854), French archeologist, was born in 1783 at St Amand in the depart- ment of Cher, and received his education at Bourges. In 1813 he was called to the chair of history in the Collége de Louis-le-Grand at Paris. About four years afterwards he was translated to the similar chair in the Sorbonne. The first result of his labours, published in 1815 under the title of Histoire Critique del' Etablissement des Colonies G'recques, in 4 vols. 8vo, was favourably received by the public. In 1819 he was appointed superintendent of antiquities in the Bibliothéque at Paris, an office which he held till 1848. To this was added in 1826 the pro- fessorship of archeology at the Bibliothéque, a result of which may be seen in his excellent Cours d'Archéologie (1828). In the following year (1829) appeared his Monu- ments Inédits, and if this great work is now less frequently referred to than in former years it is because the path which it indicated has been steadily followed out by others, and with more complete results than was possible in his day. A still valuable and interesting work is his Peintures Inédites (1836). So also his Peintures de Pompé (1844) remains a splendid monument of the enterprise with which he sought to render attractive the study of archeology. He was a frequent contributor to the Annali of the Roman Institute, the Journal des Savants, and the Académie des Inscriptions, and often engaged in disputes with his con- temporaries in matters on which time has for the most part proved him to have been right. At his death in 1854 Raoul Rochette was perpetual secretary of the Academy of Fine Arts and a corresponding member of most of the learned societies in Europe.

RAOUX, Jean, French painter, was born at Montpellier in 1677 and died at Paris in 1734. After the usual course of training he became a member of the Academy in 1717 as an historical painter. His reputation had been

previ- ously established by the credit of decorations executed during his three years in Italy on the palace of Giustiniani Solini at Venice, and by some. easel paintings, the Four Ages of Man (National Gallery), commissioned by the grand prior of Vendéme. To this latter class of subject Raoux devoted himself, nor did he even paint portraits except in character. The list of his works is a long series of sets of the Seasons, of the Hours, of the Elements, or of those scenes of amusement and gallantry in the representation of which he was immeasurably surpassed by his younger rival Watteau. After his stay in England (1720) he lived much in the Temple, where he decorated several rooms. His best pupils were Chevalier and Mont- didier. His works, of which there is a poor specimen in the Louvre, were much engraved by Poilly, Moyreau, Dupuis, «&e.

See Mariette, Abecedario Arch. del Art Francais ; Dussieux, Les Artistes Francais & 0 Etranger ; Soulié, Musée de Versailles; De Chennevitres, Peintres provinciaux.

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RAPANUI, or Easter Isuann (Paascheylandt, Oster- insel, [le de Paques, &e.), the Warnu or Tart of Cook, an island in the eastern part of the South Pacific, lying in 27° 8' S. lat. and 109° 25' W. long., 1000 miles east of Pitcairn. It is rudely triangular in shape, with its hypo- tenuse 12 miles long running north-east and south-west, and its three angles marked by three volcanic peaks. The coasts have no natural harbours of any importance, and landing is difficult. There is no lack of fertile soil, and the climate is moist enough to make up for the absence of running water. At one time the island would appear to have been wooded, but it now presents only a few bushes (Edwardsia, Broussonetia, &c.), ferns, grasses, sedges, &c. The natives keep a few goats and a large stock of domestic fowls, and the French house which now owns a large part of the island feeds about 10,000 sheep.

It is doubtful whether Rapanui (7.¢., Great Rapa) was discovered by Davis in 1686, though it is sometimes marked Davis Island on our maps. Admiral Roggeveen reached it on 6th April 1722; in 1744 Captain Cook discovered it anew, and it has sinec been visited by La Pérouse (1776),

Kotzebue (1816), Beasby (1826), &c. At the time of Roggeveen's discovery the island probably contained from 1500 to 2000 inhabitants of Polynesian raee, who, according to their own tradition, came from Rapa Iti (Little Rapa) or Oparo, one of the Tibuai or Austral group.

The remarkable colossal statues which give a unique archexo- logical interest to Rapanui have been described under Potynesta, vol. xix. p. 428 ; figures of them will be found in Pinart's valuable paper in the Tour du Monde (1878, No. 927).

RAPE OIL. This important fatty oil, known also as "sweet oil," is obtained from seeds of cultivated varieties of the cruciferous genus Brassica, the parent form of the whole apparently being the wild navew, B. campestris (Lin.), the B. precor of De Candolle. From the same stock, it is generally assumed, have sprung the Swedish turnip and the common turnip; but the oil-yielding plants have developed in a special direction and are exclusively culti- vated for the oil they yield. Under the general name "rape oil" is included the produce of several plants having distinct and fairly constant characters, and one of these oils —COoLZzA (¢.v.)— is a very well-known commercial variety. In Germany, where the production of rape oil centres, three principal oil-seeds—colza (Kohlsaat), rape, and riibse: —are well recognized. Colza is the produce of the parent stock B. campestris and is the form principally cultivated in France and Germany. Rape seed, the variety produced by B. campestris, var. napus, and riibsen seed, yielded by 2. campestris, var. rapa, are extensively cultivated in the valley of the Danube and eastwards through Persia into India. These plants are principally distinguished from each other by the colour of their radicle leaves and the form of inflorescence, but also by the size and appear- ance of the small ovoid seeds. The seed of the colza is ruddy brown, rape is blue-black, and riibsen is almost black in colour. It has been found that 1000 seeds of colza weigh 29°3 grains, the same number of riibsen weighing 34:5 grains and of rape 71°75 grains. Each of these plants has summer and winter, or annual and biennial, varieties ; and as there are numerous intermediate forms in cultivation the varieties merge into each other.

The oil yielded by these seeds is, in physical and chemi- cal properties, practically the same, the range of fluctua- tions not being greater than would be found in the oil of any specific seed under similar varying conditions of pro- duction. Colza seed is, in general, the richest in oil, and the winter varieties of all the seeds are more productive than the summer varieties. In summer rape and riibsen the proportion of oil averages from 30 to 35 per cent., the winter seeds have from 35 to 40, and winter colza contains from 40 to 45 per cent. Newly pressed rape oil has a dark sherry colour with, at first, scarcely any perceptible smell; but after resting a short time the oil deposits an XX. —35

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abundant mucilaginous slime, and by taking up oxygen it acquires a peculiar disagreeable odour and an acrid taste. Refined by the ordinary processes (see OrLs, vol. xvi. p. 743), the oil assumes a clear golden yellow colour. In specific gravity it ranges between 0°9112 and 0°9117 in the raw state, and from 0°9127 to 0°9136 when refined ; the solidifying point is from —2° to —10°C. Rape oil consists of a mixture of three simple fats or glycerides of fatty acids—the glyceride of oleic acid (olein), of stearic acid (stearin), and of brassic acid, the latter being a fat found hitherto only in oils from the Crucifere and from grape seeds. The olein of rape oil differs from ordinary olein in not yielding sebacylic acid on destructive distillation.

The principal uses of rape oil are for lubrication and lighting ; but since the introduction of mineral oils for both these purposes the importance of rape has considerably decreased. It is but little employed in soap-making, as it sapouifies with difficulty and yields only an indifferent product. In Germany it is very considerably used as a salad oil under the name of Schmalzél, being for that purpose frecd from its biting taste by being mixed with starch, heated till the starch is carbonized, and filtered after the oil has cooled. The offensive taste of rape oil may also be removed by treatment with a small proportion of sweet spirit of nitre (nitrous cther). In the East Indies rape oil and its equivalents, known under various names, are the most important of oils for native use. They are largely

consumed as food instead of ghi under the name of "mectah " or sweet oil, but for all other purposes the same sub- stance is known as " kurwah" or bitter oil. Most natives prefer it for the preparation of their curries and other hot dishes. Rape oil is the subject of extensive adulteration, principally with the cheaper hemp oil, rosin oil, and mineral oils. These sophistications can be most conveniently detected, first by taste and next by saponifica- tion, rosin oil and mineral oil remaining unsaponified, hemp oil giving a greenish soap, while rape oil yields a soap with a yellow tinge. With concentrated sulphuric acid, fuming nitric acid,

nitrous acid, and other reagents rape oil gives also characteristic colorations ; but these are modified according to the degree of purity of the oil itself. 'The presence of sulphur in rape and other cruciferous oils also affords a ready means for their identification. Lead plaster (emplastrwm lithargyrt) boiled in rape oil dissolves, and, sulphide of lead being formed, the oil becomes brown or black. Other lead compounds give the same black coloration from the formation of sulphide.

RAPHAEL (5×5, "God heals") first appears in litera- ture in the book of Tobit, where in human disguise and under the name of Azarias ("God helps") he accompanies Tobias in his adventurous journey and conquers the demon Asmodeus. He is said to be "one of the seven angels [archangels] who present the prayers of the saints and enter into the presence of the glory of the Holy One." In the book of Enoch Raphael is the angel of the spirits of man, and it is his business to gather the souls of the dead in the place where they are reserved till the day of judg- ment,—a conception which seems to imply a derivation from OND), "ghosts." In later Midrash Raphael appears as the angel commissioned to put down the evil spirits that vexed the sons of Noah with plagues and sicknesses after the flood, and he it was who taught men the use of simples and furnished materials for the 'Book of Noah," the earliest treatise on materia medica (Ronsch, Buch der Jubilden, p. 385 sq.).

RAPHAEL (1483-1520). RapHaet Sanzio was the son of Giovanni Santi, a painter of some repute in the ducal city of Urbino, situated among the Apennines on the borders of Tuscany and Umbria.! For many years both before and after the birth of Raphael the city of Urbino was one of the

chief centres in Italy of intellectual and artistic activity, thanks to its highly cultured rulers, Duke Federigo If. of Montefeltro and his son Guidobaldo, who succeeded him in 1482,2 the year before Raphael was born. The ducal

1 See Pungileoni, Elogio Storico di Raffaello, Urbino, 1829; for a valuable account of Raphael's family and his early life, see also Id., Vita di Giov. Santi, Urbino, 1822, and Campori, Notizie e Documenti per la Vita di Giov. Santi e di Raffaello, Modena, 1870. 2 See an interesting account of the court of Urbino by Delaborde, Etudes sur les B. Arts. . . en Italie, Paris, 1864, vol. i. p. 145.

residence of Urbino, built by Federigo II., even now one of the most magnificent palaces in Italy, was lavishly adorned with works of art of every class—frescos, panel- pictures, tapestries, tarsia-work, stucco-reliefs, and _sculp- ture—executed for the duke by some of the chief Italian artists of his time, and contained a collection of oil-paintings by the Van Eycks and other celebrated Flemish painters. Giovanni Santi was a welcome guest at this miniature but splendid court, and the rich treasures which the palace contained, familiar to Raphael from his earliest years, were a very important item among the various influences which formed and fostered his early love for art. It may not perhaps be purely fanciful to trace Raphael's boyish admiration of the oil-paintings of Jan Van Eyck and Justus of Ghent in the miniature-like care and delicacy with which some of his earliest works, such as the Knight's Dream, were executed.

Though Raphael lost his father at the age of eleven, yet to him he certainly owed a great part of that early training which enabled him to produce paintings of appa- rently mature beauty when he was scarcely twenty years of age. From his father, too, Raphael learned much of the religious sentiment and grace of motive which are specially conspicuous in his earlier paintings. The altar-piece painted by Giovanni for the church of Gradara, and a fresco, now preserved in the Santi house? at Urbino, are clearly prototypes of some of Raphael's most graceful paintings of the Madonna and Child. On the death of his father in 1494

young Raphael was left in the care of his stepmother (his own mother, Magia Ciarla, having died in 1491) and of his uncle, a priest called Bartolomeo.‘

First or Perugian Pertod.—In what year Raphael was apprenticed to Perugino and how the interval before that was spent are matters of doubt. Vasari’s statement that he was sent to Perugia during his father’s lifetime is cer- tainly a mistake. On the whole it appears most probable that he did not enter Perugino’s studio till the end of 1499, as during the four or five years before that Perugino was mostly absent from his native city.° As was the case with every one with whom Raphael came in contact, the Perugian master was fascinated by the charm of his manner and delighted by his precocious ability, and seems to have devoted special pains to his artistic education. The so-called Sketch Book of Raphael in the academy of Venice contains studies apparently from the cartoons of some of Perugino’s Sistine frescos, possibly done as practice in drawing.

This celebrated collection of thirty drawings, now framed or preserved in portfolios, bears signs of having once formed a bound book, and has been supposed to be a sketch-book filled by Raphacl during his Perugian apprenticeship. Many points, however, make this tempting hypothesis very improbable ; the fact that the draw- ings were not all originally on leaves of the same size, and the miscellaneous character of the sketches—varying much both in style and merit of execution—seem to show that it is a collection of studies by different hands, made and bound together by some

subsequent owner, aud may contain but very few drawings by Raphael himself. ®

Before long Raphael appears to have been admitted to take a share in the execution of paintings by his master ;

3 The house of Giovanni Santi, where Raphael was born, still exists at Urbino in the Contrada del Monte, and, being the property of the municipality, is now safe from destruction.

4 The administration of Giovanni Santi's will occasioned many painful family disputes and even appeals to law ; see Pungileoni, 47. Stor. di Raffaello.

5 Crowe and Cavalcaselle (Life of Raphael, vol. i., London, 1882) adopt the notion that Raphael went to Perugia in 1495, but the reasons with which they support this view appear insufficient.

6 See an excellent critical examination of the Sketch Book by Morelli, Italian Masters in German Galleries, translated by Mrs Richter, London, 1882; according to this able critic, only two draw- ings are by Raphael. See also Schmarsow, '¢Raphael's Skizzenbuch in Venedig," in Preussische Jahrbiicher, x\viti. pp. 122-149, Berlin, 1881, who takes the opposite view. Kahl, Das venezianische Skizzen- buch, Leipsic, 1882, follows Morelli's opinion.

and his touch can with more or less certainty be traced in some of Perugino's panels which were executed about 1502. Many of those who, like Messrs Crowe and Cavalcaselle, adopt the earlier date of Raphael's apprenticeship believe that his hand is visible in the execution of the beautiful series of frescos by Perugino in the Sala-del Cambio, dated 1500; as does also M. Miintz in his excellent Raphaél, sa Vie, Paris, 1881, in spite of his accepting the end of 1499 as the period of Raphael's first entering Perugino's studio, two statements almost impossible to reconcile. Considering that Raphael was barely seventeen when these frescos were painted, it is hardly reasonable to attribute the finest heads to his hand; nor did he at an early age master the difficulties of fresco buono. The Resurrection of Christ in the Vatican and the Diotalevi Madonna in the Berlin Museum are the principal pictures by Perugino in parts of which the touch of Raphael appears to be visible, though any real certainty on this point is unattainable.

About 1502 Raphael began to execute independent works; four pictures for churches at Citta di Castello were probably the earliest of these, and appear to have been painted in the years 1502-4. The first is a guild-banner painted on one side with the Trinity, and below, kneeling figures

of §. Sebastian and S. Rocco; on the reverse is a Creation of Eve, very like Perugino in style, but possessing more grace and breadth of treatment. These are still in the church of 8. Trinita.2 Also for Citta di Castello were the coronation of S. Niccolo Tolentino, now destroyed, though studies for it exist at Oxford and Lille (Gaz. d. B. Arts, 1878, i. p. 48), and the Crucifixion, now in the Dudley collection, painted for the church of S. Domenico, and signed RAPHAEL VRBINAS P. It is a panel 8 feet 6 inches high by 5 feet 5 inches wide, and contains noble figures of the Virgin, St John, St Jerome, and St Mary Magdalene. The fourth painting executed for this town, for the church of S. Francesco, is the exquisitely beautiful and highly finished Sposalizio, now in the Brera at Milan, signed and dated RAPHAEL VRBINAS MDI. This is closely copied both in com- position and detail from Perugino's painting of the same subject now at Caen, but is far superior to it in sweetness of expression and grace of attitude. The Temple of Jerusalem, a domed octagon with outer ambulatory in Perugino's picture, is reproduced with slight alterations by Raphael, and the attitudes and grouping of the figures are almost exactly the same in both. The Connestabile Madonna is one of Raphael's finest works, painted during his Perugian period ; it is a round panel; the motive, the Virgin reading a book of hours, is a favourite one with him, as it was with his father Giovanni. This lovely picture was lost to Perugia in 1871, when Count Connes- tabile sold it to the emperor of Russia for £13,200.

Second or Mlorentine Period, 1504-1508.—From 1504 to 1508 Raphael's life was very stirring and active. In the first half of 1504 he visited Urbino, where he painted two small panels for Duke Guidobaldo, the St George and the St Michael of the Louvre. His first and for him mo- mentous visit to Florence was made towards the end of 1504, when he presented himself with a warm letter of recommendation? from his patroness Joanna della Rovere

1 Parts of Perugino's beautiful triptych of the Madonna, with the archangels Raphael and Michael, painted for the Certosa near Pavia and now in the National Gallery of London, have been attributed to Raphael, but with little reason. Perugino's grand altar-piece at Florence of the Assumption of the Virgin shows that he was quite capable of painting

figures equal in beauty and delicacy to the St Michael of the Certosa triptych. See Frizzoni, LZ' Arte Italiana nella Gal. Nat. di Londra, Florence, 1880.

? For an account of processional banners painted by distinguished artists, see Mariotti, Lettere pittoriche Perugine, p. 76 sq.

3 This letter, which still exists, was sold in Paris in 1856, and is now in private hands.

to the gonfaloniere Pier Soderini. In Florence Raphael was kindly received, and, in spite of his youth (being barely of age), was welcomed as an equal by the majority of those great artists who at that time had raised Florence to a pitch of artistic celebrity far above all other cities of the world. At the time of his arrival the whole of artistic Italy was being excited to enthusiasm by the cartoons of the battle of Anghiari and the war with Pisa, on which Da Vinci and Michelangelo were then devoting their utmost energies (see LEoNARDO and MICHELANGELO). 'To describe the various influences under which Raphael came and the many sources from which he drank in stores of artistic knowledge would be to give a complete history of Florentine art in the 15th century. With astonishing rapidity he shook off the mannerisms of Perugino, and put one great artist after another under contribution for some special power of drawing, beauty of colour, or grace of composition in which each happened to excel. Nor was it from painters only that Raphael acquired his enlarged field of knowledge and rapidly growing powers. Sculptors like Ghiberti and Donatello must be numbered among those whose works helped to develop his new-born style. The Carmine frescos of Masaccio and Masolino taught this eager student long-remembered lessons of methods of dramatic expression.? Among his contemporaries it was especially Signorelli and Michelangelo who taught him the importance of precision of line and the necessity of a thorough knowledge of the human form.' From Da Vinci he learned subtleties of modelling and soft beauty of expression,' from Fra Bartolomeo nobility of composi- tion and skilful treatment of drapery in dignified folds.9 The friendship between Raphael and the last of these was very close and lasted for many years. The architect Baccio d'Agnolo was another of his special friends, at whose

house the young painter enjoyed social intercourse with a large circle of the chief artists of Florence, and probably learned from him much that was afterwards use- ful in his practice as an architect.

The transition in Raphael's style from his first or Perugian to his second or Florentine manner is well shown in the large picture of the Coronation of the Virgin painted for Maddalena degli Oddi, now in the Vatican, one of the most beautiful that he ever produced, and especially re- markable for its strong religious sentiment,—in this respect a great contrast to the paintings of his last or Roman manner which hang near it. The exquisite grace of the angel musicians and the beauty of the faces show signs of his short visit to Florence, while the general formality of the composition and certain details, such as the flutter- ing ribbands of the angels, recall peculiarities of Perugino and of Pinturicchio, with whose fine picture of the same subject hung close by it is interesting to compare it. Raphael's painting, though by far the more beautiful of the two, is yet inferior to that of Pinturicchio in the composition of the whole; an awkward horizontal line divides the upper group of the Coronation from that below, the apostles standing round the Virgin's tomb, filled with roses and lilies (Dante, Par., xxiii. 73), while the older Perugian has skilfully united the two groups by a less formal arrangement of the figures. The predella of this masterpiece of Raphael is also in the Vatican; some of

- *See Minghetti, "I Maestri di Raffaello," in the Nuova Antologia, 1st August 1881.*

® See his sketch of St George and the Dragén in the Uffizi, largely taken from Donatello's pedestal relief outside Or San Michele.

§ See his cartoon of St Paul preaching at Athens (South Kensington Museum).

7 See many of his life-studies, especially the one he sent to Albert Diirer, now at Vienna.

8 See the portrait of Maddalena Doni in the Pitti.

® See the Madonna del Baldacchino in the Pitti.

*its small paintings, especially that of the Annunciation to the Virgin, are interesting as showing his careful study of the rules of per- spective. Several preparatory sketches for this picture exist: fig. 1 shows a study, now at Lille, for the two principal figures, Christ setting the crown on Hismother's head (see fig. 2). It is drawn from two youths in the ordi- nary dress of the time; and it is in- teresting to compare it with his later studies from the nude, many of which *! are for figures which*

in the future picture

were to be draped,

made at a time when his developed style required a more careful rendering of the human form than was necessary for the simpler and more religious manner of Perugia. It was at Florence, as Vasari says, that Raphael began

G. 1.—Silver-point study for the main figures in the Coronation of the Virgin

(Vatican). In the Lille museum. Illus- trating Raphael's use of draped models during his early period.

Fig. 2.—The group for which fig. 1 is a study.

serious life studies, not only from nude models but also by making careful anatomical drawings from dissected corpses and from skeletons.

His first visit to Florence lasted only a few months; in 1505 he was again in Perugia painting his first fresco, the Trinity and Saints for the Camaldoli monks of San Severo, now a mere wreck from injury and restorations. The date MDV and the signature were added later, prob- ably in 1521. Part of this work was left incomplete by the painter, and the fresco was finished in 1521 (after his

: While at Florence he is said to have taught the science of per- spective to his friend Fra Bartolomeo, who certainly gave his young instructor valuable lessons on composition in return.

RAPHAEHESLS

death) by his old master Perugino.2 It was probably earlier than this that Raphael visited Siena and assisted Pinturicchio with sketches for his Piccolomini frescos.® The Madonna of §. Antonio was also finished in 1505, but was probably begun before the Florentine visit. A record of his visit to Siena exists in a sketch of the antique marble group of the Three Graces, then in the cathedral library, from which, not long afterwards, he painted the small panel of the same subject now in Lord Dudley's collection.*

In 1506 Raphael was again in Urbino, where he painted for the duke another picture of St George, which was sent to England asa present to Henry VII. The bearer of this and other gifts was Guidobaldo's ambassador, the accom- plished Baldassare CasTIGLIONE (q.v.), a friend of Raphael's, whose noble portrait of him is in the Louvre. At the

_ court of Duke Guidobaldo the painter's ideas appear to

have been led into a more secular direction, and to this stay in Urbino probably belong the Dudley Graces, the miniature Knight's Dream of Duty and Pleasure in the National Gallery (London),' and also the Apollo and

'Marsyas, sold in 1882 by Mr Morris Moore to the Louvre

for £10,000, a most lovely little panel, painted with almost Flemish minuteness, rich in colour, and graceful in arrangement.®

Towards the end of 1506 Raphael returned to Florence, and there (before 1508) produced a large number of his finest works, carefully finished, and for the most part wholly the work of his own hand. Several of these are signed and dated, but the date is frequently very doubtful, owing to his custom of using Roman numerals, introduced among the sham Arabic

embroidered on the borders of dresses, so that the I's after the V are not always dis- tinguishable from the straight lines of the ornament. The following is a list of some of ltis chief paintings of this period :—the Madonna del Gran Duca (Pitti); Madonna del Giardino, 1506 (Vienna); Holy Family with the Lamb, 1506 or 1507 (Madrid); the Ansidei Madonna, 1506 or 1507 (National Gallery); the Borghese Entombment, 1507 ; Lord Cowper's Madonna at Panshanger, 1508; La bella Giardiniera, 1508 (Louvre) ; the Eszterhazy Madonna, prob- ably the same year; as well as the Madonna del Cardellino (Uffizi), the Tempi Madonna (Munich), the Colonna Madonna (Berlin), the Bridgewater Madonna (Bridgewater House), and the Orleans Madonna (Duc d'Aumale's col- lection). The Ansidei Madonna was bought in 1884 for the National Gallery from the duke of Marlborough for. £70,000, more than three times the highest price ever before given for a picture." It was painted for the Ansidei

2 The fresco of the Last Supper, dated 1505, in the refectory of S. Onofrio at Florence is uot now claimed as a work of Raphael's, in spite of a signature partly introduced by the restorer.

3 Raphael probably had no hand in the actual execution of the paintings; see Schmarsow, Raphael und Pinturicchio in Siena, Stutt- gart, 1880, and Milanesi, in his edition of Vasari, iii. p. 515 sg., appendix to life of Pinturicchio.

4 This fine altar-piece, with many large figures, is now the property of the heirs of the duke of Ripalta, and is stored in the basement of the National Gallery, London.

5 This missal-like painting is about 7 inches square ; it was bought in 1847 for 1000 guineas. The National Gallery also possesses its cartoon, in brown ink, pricked for transference.

6 In spite of some adverse opinions, frequently expressed with ex treme virulence, the genuineness of this little gem can hardly be doubted by any one who carefully studies it without bias. Sketches for it at Venice and in the Uffizi also appear to bear the impress of Raphael's manner. See Delaborde, Etudes sur les B. Arts… en Italie, i. p. 236; Gruyer, Raphaél et

l' Antiquité, ii. p. 421; Hitelberger, Rafael's Apollo und Marsyas, Vienna, 1860; Batté, Le Raphaél de M. Moore, Paris, 1859 ; and also various pamphlets on it by its former owner, Mr Morris Moore.

7 It is engraved at p. 538, vol. ii., of Dohme, Kunst und Kiinstler des Mitielalters, Leipsic, 1878, a work which has many good reproductions of Raphael's paintings and sketches.

family of Perugia as an altar-piece in the church of 8. 'Fiorenzo, and is a work of the highest beauty in colour, well preserved, and very large in scale. The Virgin with veiled head is seated on a throne, supporting the Infant with one hand and holding a book in the other. Below stands 8. Niccolo da Tolentino, for whose altar it was painted; he holds a book and a crozier, and is clad in jewelled mitre and green cope, under which appear the alb and cassock. On the other side is the Baptist, in red mantle and camel's-hair tunic, holding a crystal cross. The rich jewellery in this picture is painted with Flemish- like minuteness. On the border of the Virgin's robe is a date, formerly read as MDV by Passavant and others; it really is MDVI or MDVIL If the later date is the true one, the picture was probably begun a year or two before. A favourite method of grouping his Holy Families is that seen in the Madonna del Cardellino and the Bella Giar- diniera, in which the main lines form a pyramid. This arrangement is also used in the Madonna del Giardino and in the larger group, including St Joseph and St Elizabeth, known as the Canigiani Holy Family, now at Munich, one of the least graceful of all Raphael's compositions. The Entombment of Christ, now in the Palazzo Borghese in Rome, was painted during a visit to Perugia in 1507 for Lady Atalanta Baglioni, in memory of the death of her brave and handsome but treacherous son Grifonetto, who was killed in 1500 by his enemies the Oddi party.1 The many studies and preliminary sketches? for this import- ant picture which exist in various collections show that it cost Raphael an unusual amount of thought and labour in its composition, and yet it is quite one of his least suc- cessful paintings, especially in colour. It is, however, much injured by scraping and repainting, and appears not to be wholly by his hand. The Madonna del Baldacchino, one of the finest

compositions of the Florentine period, owing much to Fra Bartolomeo, is also unsatisfactory in execution ; being left unfinished by Raphael, it was com- pleted by Ridolfo Ghirlandajo, by whom the ungraceful angels of the upper part and the canapy were wholly exe- cuted, and even designed. It was painted for the Dei family as an altar-piece for their chapel in 8. Spirito, Florence. The St Catherine of the National Gallery was probably painted in 1507; its cartoon, pricked for transference, isin the Louvre. In colouring it much resembles parts of the Borghese Entombment, being quiet and grey in tone. 'fo the Florentine period belong some of his finest portraits, .and it is especially in these that Da Vinci's influence appears. The portraits of Angelo Doni and his wife Maddalena (Pitti) are vivid and carefully executed paint- ings, and the unknown lady with hard features (now in the Uffizi) is a masterpiece of noble realism and conscien- tious finish. The Czartoriski portrait, a graceful effemi- nate-looking youth with long hair and tapering hands, now moved to Cracow, is probably a work of this period ; though worthy to rank with Raphael's finest portraits, its authenticity has been doubted. Very similar in style is the Herrenhausen portrait, once attributed to Giovanni Bellini, but an undoubted work of Raphael, in his second manner ; it also represents a young man with long hair, close shaven chin, a wide cloth hat and black dress, painted in half length. The so-called Portrait of Raphael by him- self at Hampton Court is a very beautiful work, glowing with hight and colour, which may possibly be a genuine picture of about 1506. It- represents a pleasant-looking

1 See Symonds, Sketches in Italy, the chapter on Perugia, mainly taken from the contemporary chronicle of Matarazzo.

2 These show that Raphael at first intended to paint a Deposition from the Cross, and afterwards altered his scheme into the Entomb- ment; an excess. of study and elaboration partly account for the shortcomings of this picture.

youth with turned-up nose, not bearing the remotest resemblance to Raphael, except the long hair and black cap common to nearly all the portraits of this time? A fine but much-restored portrait of Raphael by

himself, painted at Florence, exists in the Uffizi; it represents him at a very early age, and was probably painted during the early part of his stay in Florence.

Third or Roman Period, 1508-20.—In 1508 Raphael was painting several important pictures in Florence; in September of that year we find him settled in Rome, from a letter addressed in the warmest terms of affectionate admiration to Francia, to whom he sent a sketch for his Adoration of the Shepherds, and promised to send his own portrait in return for that which Francia had given him.' Raphael was invited to Rome by his fellow-citizen (not relation, as Vasari says) Bramante, who was then occupied in the erection of the new church of St Peter's, the founda- tion-stone of which had been laid by Julius II. on 18th April 1506. At this time the love of the popes for art had already attracted to Rome a number of the chief artists of Tuscany, Umbria, and North Italy, among whom were Michelangelo, Signorelli, Perugino, Pinturicchio, Lorenzo Lotto, Peruzzi, Sodoma, and many others, and it was among this brilliant assembly that Raphael, almost at once, took a leading positions Thanks to Bramante's friendly intervention, Julius II. (Della Rovere) soon became Raphael's most zealous patron and friend, as did also the rich bankers Agostino Chigi (the Rothschild of his time) and Bindo Altoviti, whose portrait, at the age of twenty, now at Munich, is one of the most beautiful that Raphael ever produced.

A series of rooms in the Vatican, over the Appartamenti Borgia, were already decorated with frescos by Bonfigli, Perugino, Piero della Francesca, Andrea del Castagno, Signorelli, and Sodoma; but so rapidly had the taste of the time changed that Julius II. decided to sweep them

COURT OF THE SISTINE

Fic. 3.—Plan showing position of Raphael's frescos in the stanze.

A. Stanza della Segnatura (1509-11): 1, Disputa; 2, School of Athens; 8, Justinian giving his code to Trebonian ; 4, Gregory IX. giving decretals to a jurist ; 5 (over the window), Three Virtues ; 6 (over the other window), Apollo and a group of poets on Mount Parnassus; vault with medallions of Poetry, Theology, Science, and Justice, and other paintings. B. Stanza

d'Eliodoro (1511-14): 7, Expulsion of Heliodorus from the Temple; 8, Mass of Bolsena 3 9, St Peter freed from prison; 10, Attila repulsed by Leo I. ; vault with scenes from Old Testament, by pupils. C. Stanza dell' Incendio (1517), nearly all painted by pupils: 11, Burning of the Borgo ; 12, Victory of Leo IV. over the Saracens at Ostia; 13, Coronation of Charlemagne by Leo III. in St Peter's ; 14, Oath of Leo III. before Charlemagne. D. Sala di Costantino, painted by pupils (1520-24): 15 and 16, oil-paintings of Comitas and Justitia attributed to Raphael; 17, 17, great fresco of the Defeat of Maxentius. KE EH. Part of Raphael's loggia, by his pupils. F. Chapel of Nicholas V., painted by Fra Angelico. G, Cortile of Bramante.

all away and re-cover the walls with paintings in the more developed but less truly decorative style of Raphael. It was not without regret that Raphael saw the destruction of this noble series of frescos. One vault, that of the

3 To judge of the authorship of a portrait from internal evidence is especially difficult, as in so many cases the strong individuality of the person represented obscures that of the painter.

4 Malvasia, Felsina pittrice, Bologna, 1678, was the first to publish this letter ; sce also Miintz, Raphaél, sa Vie, &c., p. 315, Paris, 1881. Minghetti (Wuova

5 Miintz, '" Michel-Ange et Raphaél 4 la cour de Rome," Gaz. des B. Arts, March and April 1882, and Les Arts a la cour des Papes, vol. lii., Paris, 1884.

Stanza dell' Incendio, painted by his master Perugino, he saved from obliteration ; it still exists, well preserved, a most skilful piece of decorative work ; and he also set his pupils to copy a number of portrait-heads in the frescos of Piero della Francesca before they were destroyed.} Fig. 3 shows the positions of Raphael's frescos in the stanze, which, both from their size and method of lighting, are very unsuited for the reception

of these large pictures. The two most important rooms (A and B) are small, and have an awkward cross light from opposite windows."

Stanza della Segnatura (papal signature room), painted in 1509-11 (A on fig. 3). The first painting executed by Raphael in the stanze was the so-called Disputa, finished in 1509. It is very unlike the later ones in style, showing the commencement of transition from his Florentine to his "Roman manner"; as a decorative work it is very superior to the other frescos ; the figures are much smaller in scale, as was suited to the very moderate size of the room, and the whole is arranged mainly on one plane, without those strong effects of perspective which are so unsuited to the decorative treat- ment of a wall-surface. In its religious sentiment too it far excels any of the later stanze paintings, retaining much of the sacred charac- ter of earlier Florentine and Umbrian art. As a scheme of decoration it appears to have been suggested by some of the early apsidal mosaics. Fig. 4 shows the disposition of its main masses, which seem to indicate the curved recess of an apse. Gold is largely used, with much richness of effect, while the later purely pictorial frescos have little or none. The subject of this magnificent paint- ing is the hierarchy of the church on earth and its glory in heaven. The angels in the upper tier and the nude cherubs who carry the books of the Gospels are among the most beautiful figures that Raphael ever painted.*

The painting on the vault of this room is the next in date, and shows further transition towards the "Roman manner." In his treatment of the whole Raphael has, with much advantage, been partly guided by the painting of Perugino's vault in the next room (C). Though not without faults, it is a very skilful piece of de- coration ; the pictures are kept subordinate to the lines of the vault, and their small scale adds greatly to the apparent size of the whole. A great part of the ground is gilt, marked with mosaic- like squares, a conimon practice with decorative painters,— not intended to deceive the eye, but simply to give a softer texture to the gilt surface by breaking up its otherwise monotonous glare. The principal medallions in each cell of this quadripartite vault are very graceful female figures, representing Theology, Science, Justice, and Poetry. Smaller subjects, some almost miniature-like in scale, are arranged in the intermediate spaces, and each has some special meaning in reference to

the medallion it adjoins ; some of these are painted in warm monochrome to suggest bas-reliefs. The fine painting of the Flaying of Marsyas is interesting as show- ing Raphael's study of antique sculpture: the figure of Marsyas is a copy of a Roman statue, of which several replicas exist. The very beautiful little picture of the Temptation of Eve recalls Albert Diirer's treatment of that subject, though only vaguely. Much mutual admiration existed between Raphael and Diirer: in 1515 Raphael sent the German artist a most masterly life study of two nude male figures (now at Vienna); on it is written in Albert Diirer's beautiful hand the date and a record of its being a gift from Raphael. It is executed in red chalk, and was a study for two figures in the Battle of Ostia (see below).

On the wall opposite the Disputa is the so-called School of Athens. In this and the succeeding frescos all notion of decora- tive treatment is thrown aside, and Raphael has simply painted a magnificent series of paintings, treated as easel pictures might have been, with but little reference to their architectural surround- ings. The subject of this noble fresco, in contrast to that opposite,*

1 How fine these portrait-heads probably were may be guessed from Piero's magnificent frescos at Arezzo, in the retro-choir of 8. Francesco.

2 See Brunn, Die Composition der Wandgemdlde Raphaels im Vatican, Berlin, and Gruyer, Les Fresques de Raphaél au Vatican, Paris, 1859.

3 It need hardly be said that the name Disputa is a misnomer ; there could be no dispute among the saints and doctors of the church about so well estab- lished a dogmia as the real presence: the monstrance with the Host below and the figure of Christ above indicate His double presence both on earth and in

heaven. Dr Braun, Springer, and Hagen have published monographs in Ger- ian on this painting.

4 See Trendelenburg, Ueber Rafael's Schule von Athen, Berlin, 1843, and Richter (same title), Heidelberg, 1882; the title "School of Athens" is com- paratively modern,

_ 5 He has shown great skill in the way in which he has fitted his end frescos into the awkward spaces cut into by the windows, but they are none the less treated in a purely pictorial manner.

Fic. 4.— Diagram to show main lines of the Disputa, suggest- ing an apse, with mosaic de- coration.

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is Earthly Knowledge, represented by an assembly of those great philosophers, poets, and men of science of ancient Greece who were admitted by the church to have been not wholly without inspira- tion from Heaven, and by their labours to have prepared the way for the clearer light of Christianity. The central figures are Plato and Aristotle, while below and on each side are groups arranged with the most consummate skill, including the whole '" filosofica famiglia" of Dante (Jnfer., iv. 133-144), and a number of other leaders of thought, selected in a way that shows no slight acquaint- ance with the history of philosophy and science among the ancient Greeks. In this selection we may fairly suppose that Raphael was aided by Bembo, Ariosto,® Castiglione, Bibbiena, or others of the crowd of scholars who at this time thronged the papal court. Many interesting portraits are introduced—Bramante as the aged Archimedes, stooping over a geometrical diagram ; a beautiful fair- haired youth on the left is Francesco Maria della Rovere, duke of Urbino; and on the extreme right figures of Raphael himself and Perugino are introduced (see fig. 5, below). The stately building in which these groups are arranged is taken with modifications from Bramante's first design for St Peter's.

Over the window (No. 6 on fig. 3) isa group of poets and musicians on Mount Parnassus, round a central figure of Apollo ; it contains many heads of great beauty and fine portraits of Dante and Petrarch. The former, as a theologian, appears also in the Disputa. Over the opposite window (No. 5) are graceful figures of the three chief Virtues, and at one side (No. 4) Gregory IX. (a portrait of Julius II.) presenting his volume of decretals to a jurist ; beside him is a splendid portrait of Cardinal de' Medici (afterwards Leo X.) be- fore his face was spoiled by getting too stont. This painting shows the influence of Mclozzo da Forli.? On the

other side Justinian presents his code to Trebonianus (No. 8); this is inferior in exe- cution and appears to have been chiefly painted by pupils.

' The next room (B), called La Stanza @'Eliodoro, was painted in 1511-14 ;8 it is so called from the fresco (No. 7 in fig. 3) represent- ing the expulsion of Heliodorus from the Temple (2 Mace. iii.), an allusion to the struggles between Louis XII. of France and Julius II. The whole spirit of the subjects in this room is less broad and tolerant than in the first: no pagan ideas are admitted, and its chief motive is the glorification of the pontificate, with insistence on the temporal power. The main incident of this picture is the least successful part of it: the angel visitant on the horse is want- ing in dignity, and the animal is poorly drawn, as is also the case with the horses of Attila's army in the fresco opposite. The group of women and children on the left is, however, very beautiful, an

the figures of Julius II. and his attendants are most nobly designed and painted with great vigour. The tall standing figure of Mare Antonio Raimondi, as one of the pope's bearers, is a marvellous piece of portrait painting, as is also the next figure who bears his name on a scroll—IO . PETRO. DE. FOLIARIIS . CREMONEN. Behind, Giulio Romano is represented as another papal attendant. This picture was completed in 1512. Over the window (No. 8) is the scene of the Miracle at Bolsena of 1264, when the real presence was proved to a doubting priest by the appearance of blood-stains on the Corporal (see Orviero). Julius II. is introduced kneeling behind the altar; and the lower spaces on each side of the windows are filled with two groups, that on the left with women, that on the right with officers of the papal guard. The last group is one of the most masterly of all throughout the stanze: each face, a careful portrait, is a marvel of expression and power, and the technical skill with which the whole is painted to the utmost degree of finish, almost. without any tempera touches, is most wonderful. The next fresco in date (No. 10) is that of the Repul- sion of Attila from the walls of Rome by Leo I., miraculously aided by the apparitions of St Peter and St Paul; it contains another allusion to the papal quarrels with France. It was begun in the lifetime of Julius II., but was only half finished at the time of his death in 1513; thus it happens that the portrait of his successor, the Medici pope Leo X., appears twice over, first as a cardinal riding behind the pope,

painted before the death of Julius II., and again in the character of 8. Leo, instead of the portrait of Julius which Raphael was about to paint.¥ Attila with his savage-looking army is not the most successful part of the fresco: the horses are very wooden in appearance, and the tight-fitting scale armour, put on in some impossible way without any joints, gives a very unreal and theatrical look to the picture. Part is the work of pupils. In 1514 he painted the Deliverance of St Peter from Prison, with

6 Anosto visited Rome twice about this time, as ambassador from the duke of Ferrara to Julius II.,—the first time in 1509.

7 Compare his fresco of Sixtus IV., now in the picture-gallery of the Vatican.

8 The vault of this room is painted with scenes from the Old Testament on a harsh blue ground, much restored; they are probably the work of Giulio Romano, and in a decorative way are very unsuccessful,—a striking contrast to the beautiful vaults of Perugino and Raphael in rooms Cand A. The deep blue grounds so much used by Raphael's school are very liable to injury from damp, and in most cases have been coarsely restored. Those in the Villa Madama are untouched, and in parts the damp has changed the ultra- marine into emerald green.

9 A pen sketch in the Louvre by Raphael shows Julius II. in the place afterwards occupied by Leo X. ; another difference in this sketch is that the pope is borne in a chair, not on horseback as in the fresco.

a further political allusion (No. 9). It is very skilfully arranged to fit in the awkward space round the window, and is remarkable for an attempt, not much suited for fresco-painting, to combine and contrast the three different qualities of light coming from the moon, the glory round the angel, and the torches of the sentinels.

For rooin C Raphael designed and partly painted the Incendio del Borgo (No. 11), a fire in the Borgo or Leonine City, which was miraculously stopped by Leo IV. appearing and making the sign of the cross at a

window in the Vatican. In the background is shown the fagade of the old basilica of St Peter, not yet destroyed when this fresco was painted. Oue group on the left, in the fore- ground, is remarkable for its vigour and powerful drawing; the motive is taken from the burning of Troy; a fine nude figure of Afneas issues from the burning houses bearing on his back the old Anchises and leading the boy Ascanius by the hand. Some of the female figures are designed with much grace and dramatic power. Many studies for this picture exist. This is the last of the stanze frescos on which Raphael himself worked. Others designed by him and painted by Giulio Romano, Gianfrancesco Penni, and other pupils were the Battle of Ostia (No. 12), a very nobly composed picture, and the Oath of Leo III. before Charlemagne (No. 14). The other great picture in this room (No. 18), the Coronation of Charlemagne (a portrait of Francis I. of France), is so very inferior in composition that it is difficult to believe that Raphael even made a sketeh for it. The enormous fresco of the Defeat of Maxentius by Constantine (room D, No. 17) was painted by Giulio Romano, soon after Raphael's death, from a sketch by the latter ; it is even more harsh and disagreeable in colour than most of Giulio Romano's early frescos.1_ Among the other very inferior frescos in this great hall are two female figures (Nos. 15 and 16) representing Comitas and Justitia, painted on the wall in oil eolours, very harmonious and rich in tone; they are usually, though wrongly, attributed to Raphael himself.

made many studies, both nude and draped, for single figures and

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Fic. 5.—Heads of Raphael and Perugino from the School of Athens, showing incised lines and " fresco edges."

groups, the painter made a small drawing of the whole composi- tion, which was enlarged by his pupils with the help of numbered squares, drawn all over it, to the full size required, on paper or canvas. Holes were then pricked along the outlines of the cartoon, and the design pounced through on to an undercoat of dry stucco on the wall, with pounded charcoal and a stiff brush. Over this,

1 See Montagnani, Sala di Costantino, Rome, 1834. Though he was hever a good colourist, the great frescos by Giulio Romano in the Palazzo del Té, Mantua, show some improvement as compared with his Roman work.

2 These three stages were usually distinguished as study, sketch, and cartoon.

early in the morning, a patch of wet stucco was laid, about enough to serve for the day's painting ; this of course obliterated the out- line on the wall, and the part covered by the patch was again sketched in by frechand, with a point on the wet stuceo, so as to be a guide for the outline traced with the brush and the subsequent painting. A line impressed on the wet stucco was easily smoothed out, but a touch of the brush full of pigment sank deeply into the moist stucco, and could not easily be efiaced. It will thus be seen that in fresco painting the only use of pouncing the whole design on to the wall was to keep the general positions of the figures right, and was no guide as to the drawing of each separate part. Fig. 5 shows the portrait-heads of himself and Perugino, at the extreme left of the School of Athens; on this are visible many of the impressed sketch-lines, and also part of the "fresco edge" of the ee on which this part is painted. The heads in this figure are ess than one day's work. It will be seen that there is no attempt at any accuracy of drawing in the impressed lines. Raphael, especi- ally in his later frescos, worked with wonderful rapidity: three life-sized busts, or half a full-length figure, more than life-size, was a not unusual day's work. In some of the frescos the edges of each day's patch of stucco can easily be traced, especially in the Incendio del Borgo, which has a strong side light. In the Disputa much use was made of tempera in the final touches, but less was used in the subsequent frescos, owing to his increasing mastery of the difficulties of the process.

The paintings in the stanze were only a small part of Raphael's work between 1509 and 1513. To this period belong the Madonna of Foligno (Vatican), painted in 1511 for Sigismondo Conti; it is one of his most beautiful compositions, full of the utmost grace and sweetness of expression, and appears to be wholly the work of his hand. It has suffered much from repainting. Of about the same date are the gem-like Garvagh

Madonna (National Gallery, bought for £9000; once in the possession of the Aldo- brandini family), the Diademed Virgin of the Louvre, and the Madonna del Pesce at Madrid. The last is a very

noble picture, but the design is more pleasing than the _ colour, which, like other paintings of Raphael's at Madrid,

suggests the inferior touch of a pupil; it was executed in 1513 for 8. Domenico in Naples. In addition to other easel pictures a number of his finest portraits belong to this period—that of Julius II. (Uffizi), of which a good replica or contemporary copy exists in the National Gallery, the so-called Fornarina in the Palazzo Barberini, the Bal- dassare Castiglione of the Louvre, and the unfinished por- trait of Federigo Gonzaga of Mantua.

When Giovanni de' Medici, at the age of thirty-eight, became pope as Leo X., a period of the most glowing splendour and reckless magnificence succeeded the sterner rule of Julius II. Agostino Chigi, the Sienese financier, was the chief of those whose lavish expenditure contributed to enrich Rome with countless works of art. For him Raphael painted, in 1513-14, the very beautiful fresco of the Triumph of Galatea in his new palace by the Tiber bank, the Villa Farnesina, and also made a large series of magnificent designs from Apuleius's romance of Cupid and Psyche, which were carried out by a number of his pupils. These cover the vault and lunettes of a large loggia (now closed in for protection) ; in colouring they are mostly harsh and gaudy,° as is usually the case with the works of his pupils, a great contrast to the fresco of the Galatea, the greater part of which is certainly the master's own work.® For the same patron he painted

3 A very fine ancient copy of this portrait is in the Pitti Palace ; certain peculiarities in its execution show it to be by some Venetian painter, as was pointed out to the present writer by Mr Fairfax Murray.

4 Chiefly by Giulio Romano, Gianfrancesco Penni, and Giovanni da Udine ; much injury has been done to these frescos by repainting, especially in the coarse blue of the ground.

5 These and other frescos by his pupils are much disfigured by the disagreeable hot tone of the flesh, very unlike the pearly tone of the flesh of Galatea.

§ Dorigny, Psychis et Amoris fabula a Raphaele, &e., Rome, 1698 ; and Gruner, Fresco Decorations in Italy, London, 1854, pls. 16-18. The group of the Triton and Nymph on the left of the composition was probably executed by Giulio Romano,

(also in 1513) his celebrated Sibyls in S. Maria della Pace, —figures of exquisite grace, arranged with perfect skill in an awkward space. It is not without reason that Vasari gives these the highest position among his fresco- paintings.! Agostino Chigi also employed Raphael to build for him a private chapel in 8. Maria del Popolo, and to make a series of cartoons to be executed in mosaic on the inner dome.? The central medallion has a figure of

God among clouds and angel boys, such as Raphael drew with unrivalled grace (fig. 6), and around are the eight

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Fig. 6.—Mosaic of God creating the stars, from the Chigi chapel, in.

centre of dome, designed by Raphael. planets, each with its pagan deity and directing angel.' He has not hampered himself by any of the usual rules which should apply to the designing of mosaic; they are simply treated as pictures, with almost deceptive effects of perspective. The execution of these brilliant mosaics was carried out by the Venetian Luigi della Pace, whose signature is introduced on the torch of Cupid in the panel representing the star Venus (Ludovico della [~ , y Pace Veneziano fecit, 1516). These mosaics DP are still as perfect and brilliant as if they V were the work of yesterday. Probably in F 1516 the early years of Leo X.'s reign were painted the Madonna della Seggiola (Pitti), the 8. Cecilia at Bologna (not _com- pleted till 1516), the miniature Vision of Ezekiel (Pitti), and three important pictures at Madrid. The latest of these, known

as Lo Spasimo, from the church at Palermo, for which it was painted, is one of Raphael's finest com- positions, representing Christ bearing His Cross. It bears signs of Giulio Romano's hand in its heavy colouring with unpleasant purple tones. The Madonna called Della Perla has much changed from the darkening of the pigments ; in design it recalls Leonardo da Vinci.t The small Madonna della Rosa is the most perfect in colour of all the master's pictures in the Madrid Gallery, and is usually rather undervalued ; it is a most graceful little picture. The portrait of Leo X. with Cardinals de' Rossi and de' Medici, in the Pitti, is one of his finest portrait-pictures, especially as regards the figure of the pope. Little is

1 Thanks to Michelangelo's generous intervention, Raphael was paid the large sum for that time of 900 gold ducats for this fresco.

2 Gruner, Mosaici in S. Maria del Popolo, Rome, 1839.

3 Tn accordance with Dante's scheme in the Paradiso.

4 La Perla, "the pearl" of the Spanish royal collection, was origin- ally painted for Bishop Louis of Canossa ; it was sold by Cromwell with the greater part of Charles I.'s collection at Hampton Court. The com- position, though not the execution, of this picture belongs to Raphael's early years in Rome ; it is very remarkable for its delicacy of touch and high finish. ;

5 The magnificent portrait-heads of the Venetian scholars Navagero and Beazzano, now in the Doria Gallery in Rome, are worthy of Raphael

at his best, and have for long been attributed to him. There are good contemporary copies at Madrid,

known about the Madonna di S. Sisto, the glory of the Dresden Gallery; no studies or sketches for it exist. In style it much resembles the Madonna di Foligno; it is less injured by restoration than the latter.

Among the latest works of Raphael are the large St Michael and the Devil, in the Louvre, signed " Raphael Urbinas pingebat, MDxviml.," and the very beautiful por- trait of the Violin-player, in the Sciarra-Colonna

Palace in Rome, also dated 1518; this last bears much resemblance to the painter himself. The British Museum possesses one of Raphael's finest portraits, though only a chalk drawing, that of his friend the painter Timoteo della Vite, a masterpiece of expression and vigour; it is executed in black and red, and is but little inferior in chromatic effect to an oil-painting; it is life-size, and is executed with wonderful skill and evident keen interest in the subject.

The tapestry cartoons, seven of which are in the South Kensington Museum, were painted by pupils from Raphael's designs. They are part of a set of ten, with scenes from the Acts of the Apostles, intended, when copied in tapestry, to adorn the lower part of the walls of the Sistine chapel. The tapestries themselves, worked at Brussels, are now, after many vicissitudes, hung in a gallery in the Vatican ; the set is complete, thus preserving the design of the three lost cartoons. The existing seven, after being cut up into strips for use on the looms, were bought by Rubens for Charles 1.6 The tapestry copies are executed with wonder- ful skill, in spite of Raphael's having treated the subjects in a purely pictorial way, with little regard to the exi- gencies of textile work. The designs are reversed, and the colours far more brilliant than those of the cartoons, much gold and silver being introduced. The noble figure of Christ in the Delivery of the Keys to St Peter is in the tapestry much disfigured by the addition of a number oi large gold stars all over the drapery, which spoil the simple dignity of the folds. The rich framework round each pic- ture, designed by Raphael's pupils, probably by Penni and Giovanni da Udine, exists in the tapestries and adds greatly to their decorative effect. The cartoons were executed in 1515 and 1516, and the finished tapestries were first exhi- bited in their place in the Sistine chapel on 26th December 1519,—a very short time for the weaving of such large and elaborate pictures. The three of which the cartoons are lost represent the Martyrdom of St Stephen, the Con- version of St Paul, and St Paul in Prison at Philippi. Probably no pictures are better known or have been more often engraved and copied than these seven cartoons.'

The Transfiguration.-—In 1519 Cardinal Giuliano de' Medici (afterwards Clement VII.), as bishop of Narbonne, ordered two altar-pieces for his cathedral,—the one by Raphael, the other by Raphael's

Venetian rival Sebastiano del Piombo (see SzBasTIANO). That by the latter painter is the noble Resurrection of Lazarus, now in the National Gallery, in the drawing of which the Venetian received important aid from Michelangelo. Several studies for Raphael's picture exist, showing that he at first intended to paint a Resurrection of Christ as a pendant to Sebas- tiano's subject, but soon altered his scheme into the Trans- figuration. The eight or nine existing studies are scattered through the Oxford, Lille, Windsor, and some private

6 Fortunately they were not sold with the bulk of Charles's collec- tion, and remained at Hampton Court till a few yearsago. See Koch, Rafael's Tapeten im Vatican, Vienna, 1878, and Miintz, Hist. de la tapisserie Italienne, Paris, 1880.

7 The name "arazzi" given by Italians to these tapestries is derived from Arras, where they were erroneously thought to have been woven ; they were made at Brussels. It is much to be regretted that visitors to the Vatican are no longer allowed to see these priceless examples of textile work.

8 See Morgenstern, Ueber Rafael's Verklirung, Leipsic, 1822, and Justi, Die Verklérung Christi, Leipsic, 1870.

collections. A great part of the lower group was un- finished at the time of the painter's sudden death in 1520, and a good deal of the heavy colouring of Giulio Romano is visible in it. On the death of Raphael the picture be- came too precious to send out of Rome, and Cardinal de' Medici contented himself with sending the Resurrection of Lazarus to Narbonne. The Transfiguration was bequeathed by him to the monks of 8. Pietro in Montorio, in whose church it remained till it was stolen by Napoleon I. It

now hangs in the Vatican Gallery.

Architectural Work.1—Though he designed but few buildings, Raphael's great repute even in this branch of art is shown by the fact that Bramante, before his death in March 1514, specially requested that Raphael should be made his successor as chief archi- tect of St Peter's. To this most important post he was appointed by a brief of Leo X., dated 1st August 1514. The progress of St Peter's was, however, too slow for him to leave much mark on its design. Another work of Bramante's, completed by Raphael, was the graceful Cortile di S. Damaso in the Vatican, including the loggie, which were decorated with stucco-reliefs and paintings of sacred subjects by his pupils under his own supervision, but only very partially from his designs.? The Palazzo dell' Aquila, built for Giovanni Battista Branconio, and destroyed in the 17th century during the extension of St Peter's, was one of Raphael's chief works as an architect. He also designed the little cross church, domed at the intersection like a miniature St Peter's, called S. Eligio degli Orefici, which still exists near the Tiber, almost opposite the Farnesina gardens, a work of but little merit. According to M. Geymniiiller, whose valuable work, Raffaello come Architetto, Milan, 1883, has done so much to increase our knowledge of this subject, the Villa Farnesina of Agostino Chigi, usually attributed to Peruzzi, was, as well as its palace-like stables, designed by Raphael; but internal evidence makes this very difficult to believe. It has too much of the delicate and refined character of the 15th century for Raphael, whose taste seems to have been strongly inclined to the more developed classic style, of which Palladio afterwards became the chief exponent. The Palazzo Vidoni, near S. Andrea della Valle, also in Rome, is usually attributed to Raphael, but an original sketch for this in Pernzzi's own hand has recently been identified among the collection of drawings at Siena; this, how- ever, is not a certain proof that the design was not Raphael's. M. Geymiiller has, however, shown that the Villa Madama, on the slopes of Monte Mario above Rome, was really designed by him, though its actual carrying out, and the unrivalled stucco-reliefs which make its interior one of the most magnificent palaces in the world, are due to Ginlio Romano and Giovanni da Udine, as men- tioned in Vasari's life of the latter. The original design for this villa made by Raphael himself has been discovered by M. Gey- miiller. Another architectural work was the little Chigi chapel in S. Maria del Popolo, built in 1516, for the dome of which the above-mentioned mosaics were

designed (see fig. 6). At the time of his death he was preparing to build himself a handsome palace near the church of S. Eligio ; the deed for the purchase of its site was signed by him only a few days before his last short illness. Though not completed till 1530, the Palazzo Pandolfini at Florence was also designed by him ; it is a dull scholastic building without any special beauty either in proportion or treatment of the mass ; it is illustrated by Montigny and Famin, Architecture Toscane, Paris, 1815, pls. 33-36.

A sober criticism of Raphael's architectural works must force one to refuse him a high position in this branch of art. In the church of S. Eligio and the Chigi chapel he is merely a copyist of Bramante, and his more original works show but little power of invention or even mastery of the first principles of architectural design. His details are, however, often delicate and refined (especially in the Palazzo Pandolfini), and he was supremely successful in the decora- tive treatment of richly ornamented interiors when he did not, as in some of the Vatican stanze, sacrifice the room to the frescos on its walls.

Sculptwre.—That Vasari is right in attributing to him the model for the beautiful statue of Jonah in the Chigi chapel (fig. 7) is borne witness to by two important documents, which show that his almost universal talents led him to attempt with success the

1 See Ojetti, Discorso su Raffaello Architetto, Rome, 1883, but more especially Geymiiller's work mentioned below, and his Projets Primitifs pour la Bas. de S. Pierre, Paris, 1875-80.

2 See Mariani, La Bibbia nelle Loggie del Vaticano, Rome; Anon., Dipinti nelle Loggie del Vaticano, Rome, 1841; and Gruner, Fresco Decorations, London,

1854, pls. 1-5. Too great a share in the decoration of the loggie is usually given.

to Raphael; not only the harsh colour but also the feebleness of much of the drawing shows that he can have had but little to do with it.

3 See Gruner, Fresco Decorations, &c., London, 1854, pls. 6-12, and Raffaelle Santi, Ornati della Villa Madama, &c., Rome, 1875. Two other little known but very beautiful architectural works, executed under Raphael's influence by his pupils, are the bath-room of Cardinal Bibbiena in the Vatican and the bath-room of Clement VII. in the castle of S. Angelo, both richly decorated with delicate stucco-reliefs and paintings, treated after a classical model.

preliminary part of the sculptor's art, though there is no evidence to show that he ever worked on marble.4 One of these is a letter written to Michelangelo to warn him that Raphael had been in- vading his province as a sculptor by modelling a boy, which had been executed in marble by a pupil, and was a work of much beauty. Again, after his death his friend Baldassare Castiglione, in a letter dated 8th May 1528, asks his steward in Rome "if Giulio Romano still possesses a certain boy in marble by Raphael aud what lis lowest price for it would be," —"s'egli [Giulio Romano] ha pid quel puttino di marmo di mano di Raffaello e per quanto si daria all' ultimo." A group in marble of a Dead Boy on his Dolphin Playfellow, now in the St Petersburg Hermitage, has been erroneously supposed to be Raphael's "put- tino," which has also been identified with a statuette of a child till recently at Flor- ence in the possession of Signor Molini.é The statue of Jonah was executed in marble by Loren- zetto, a Florentine sculptor ; and it re- inained in his studio for many years after Raphael's death. The South Kensington Museum possesses a small clay sketch for this beautiful group, slightly different from the marble; it is probably the ori- ginal design by the master's own hand. The whole feeling of the group—a beauti- . ful youth seated on

a sea ~~monster — is purely classical, and the motive is prob~~

abl taken fr pint sihtoris ata Fic. 7.—Statue of Jonah in the Chigi chapel,

representing Arion designed by Raphael, sculptured by Loren- or Taras on a dol- Zetto; heroic size.

phin.® Being intended for a church it was necessary to give the figure a sacred name, and hence the very incongruous title that it received, There is no trace of Raphael's hand in the design of the other statue, an Elijah by Lorenzetto, though it also is ascribed to him by Vasari.

Lesser Arts practised by Raphael.—Like other great artists, Raphael did not disdain to practise the lesser branches of art: a design for a silver perfume-burner with female caryatids is preserved in an engraving by Marco da Ravenna; and he also designed two liandsome repoussé salvers for Agostino Chigi, drawings for which are now at Dresden. In designs for tarsia- work and wood ~~carv~~ ing he was especially skilful ; witness the magnificent doors and shutters of the stanze executed by his pupil Giovanni Barile of Siena.' The majolica designs attributed to him were by a name- sake and relation called Raffaello di Ciarla;® and, thongh many fine dishes and ewers of Urbino and other majolica are decorated with Raphael's designs, they are all taken from pictures or engrav- ings, not specially done by him for ceramic purposes. With the frivolity of his age Leo X. occasionally wasted Raphael's skill .on unworthy objects, such as the scenery of a temporary theatre ; and in 1516 the pope set him to paint in fresco the portrait life-size of a large dealans; the gift of the king of Portugal, after the

4 See note on p. 369, vol. iv., of Milanesi's edition of Vasari, Florence, 1879. To one branch of the sculptor's art, practised under Raphael's supervision, belong the elaborate and delicately executed stucco-reliefs of the loggie and elsewhere. Among these occur many panels with figare-oi tions, large in scale and important in composition; those executed during his lifetime arc free from the too pictorial character which is an obvious fault in the very magnificent reliefs of the Villa Madama.

5 See Appendix, p. 406, vol. iv., of Milanesi's edition of Vasari; Rembadi, Del putto . . . di Raffaello, Florence, 1872; Gennarelli, Sopra una

Scultwra di Raffaello, Florence, 1873. The evidence which would attribute this piece of sculpture to Raphael is almost worthless. See on the St Petersburg group, Guédéonoff, Ueber die dem Raphael zugeschr. Marmorgruppe, St Petersburg, 1872.

6 Compare this latter subject on reverses of the beautiful didrachms of Tarentum, c. 300 B.c.

7 The very beautiful and elaborate choir-stalls of the church of 8S. Pietro de' Casinensi at Perugia, with panels carved in relief, executed in 1535 by Stefano da Bergamo, are mainly adapted from Raphael's designs.

8 Campori, Notizie Stor, d. Maiolica di Ferrara, 3d ed., Pesaro, 1879, pp.

182-133.

animal was dead.!. This elephant is also introduced among the stucco reliefs of the Vatican loggie, with the poetaster Barrabal sitting in mock triumph on its back.

Though Raphacl himself does not appear to have practised the art of engraving, yet this formed one of the many branches of art which were carried on under his supervision. A large number of his designs were engraved by his pupils Marcantonio Raimondi (see vol. xv. p. 530) and Agostino Veneziano. These valuable engrav- ings are from Raphael's sketches, not from his finished pictures, and in some cases they show important alterations made in the execution of the picture. Raimondi's engraving of the 8. Cecilia of Bologna in design is very inferior to that of the actual painting. Several of Raphael's most important compositions are known to us only by these early engravings, ¢.g., the Massacre of the Innocents (engraved by Raimondi), which is one of his finest works, both for skilful composition and for masterly drawing of the nude. Another magnificent design is the Judgment of Paris, containing a large number of figures ; the nude figure of Minerva is a work of especial force and

beanty. A standing figure of Lucretia? about to stab herself is also one of his most lovely figures. Many of Raphacl's studies for Marcantonio's engravings still exist.

Archxology.—As an antiquary Raphacl deserves to take the highest rank. His report? to Leo X. in 1518 is an eloquent plea for the preservation of ancient buildings. In 1515 he had been appointed by Leo X. inspector of all excavations in Rome and within 10 miles round. His careful stndy of the antique, both statues and modes of decoration, is clearly shown in many of his frescos, and especially in the graceful stucco reliefs and painted grotteschi, of which he and his pupils made such skilful use in the decorations of the Vatican loggie, the Villa Madama, and elsewhere.4

Raphael's Fame.—When we consider the immense field over which his labours were spread and the strong personal individuality which appears in all these varied branches of art, together with the almost incredible number of paint- ings that issued from his studio, it will be seen that he must have laboured with an amount of unflagging industry which has perhaps never been surpassed, and that too in a time and in a city of which the social habits and luxurious splendour certainly threw every possible temptation in the way of steady application and regular work.

Among all the painters of the world none has been so universally popular as Raphael, or has so steadily main- tained his pre-eminent reputation throughout the many changes in taste which have taken place in the last three and a half centuries. Apart from his combined merits as a draughtsman, colourist, and master of graceful composi- tion, he owes the constancy of admiration which has been felt for him partly to the wide range of his subjects, but still more to the wonderful varieties of his style. If the authorship of his paintings were unknown, who would guess that the Sposalizio of the Brera, the Madonna del Baldacchino of the Pitti, and the Transfiguration could possibly be the work of one painter? In his earliest pic- tures he touches the highly spiritual and sacred art of the Perugian Fiorenzo di Lorenz. while in his latest Roman work he is fully embarked in che pagan spirit of the last development of the Renaissance, already on the brink of the most rapid decline. In the seventeen or eighteen years which composed his short working life he passed through

stages of development for which a century would not have seemed too long, while other painters lived through the same changeful time with but little alteration in their manner of work. Perugino, who outlived his wonderful pupil, completed in 1521 Raphael's San Severo fresco in a style differing but little from his paintings executed in the previous century.

In versatility of power Raphael (as a painter) remains almost without a rival; whether painting an altar-piece

1 Under it was inscribed—'" Raphael Urbinas quod natura abstu- lerat arte restituit."

2 On a pedestal is inscribed in Greek—" Better to die than live pasely."

3 Published by Visconti, Lettera di Raffaello a Leone X., Rome, 1840; see also Miintz, " Raphaél Archéologue," &c., Gaz. des B. Arts, October and November 1880.

4 See Gruyer, Raphaél et l Antiquité, Paris, 1864.

for a church, a large historical fresco, a portrait, or decor- ative scenes from classical mythology, he seems to excel equally in each; and the widely different methods of painting in tempera, oil, or fresco are employed by him with apparently equal facility. His range of scale is no less remarkable, varying from a miniature, finished like an illuminated MS., to colossal figures in fresco dashed in with inimitable breadth and vigour.

An additional glory is thrown round his memory by the personal beauty, charm of manner, and deep kindliness of heart which endeared him to all who knew him.' His sincere modesty was not diminished by his admission as an equal by the princes of the church, the distinguished scholars, and the world-famed nien of every class who formed the courts of Julius II. and Leo X. In accordance with the spirit of the age he lived with considerable dis- play and luxury, and was approached with the utmost deference by the ambassadors of foreign princes, whether their master desired a picture, or, as the duke of Ferrara did, sent to consult him on the best cure for smoky chimneys. To his pupils he was as a father, and

they were all, as Vasari says, “vinti dalla sua cortesia”; they formed round him a sort of royal retinue, numbering about fifty youths, each talented in some branch of the arts.® Giulio Romano and Gianfrancesco Penni, his two favourite pupils, lived with him in the Palazzo di Bramante, a house near St Peter’s, where he resided during the greater part of his life in Rome. This fine palace, designed by Bra- mante, was destroyed in the 17th century at the same time as Raphael’s Palazzo dell’ Aquila.

It is difficult to realize the furor of grief and enthusiasm excited by the master’s death on Good Friday 1520, at the age of thirty-seven exactly, after an attack of fever which lasted only ten days. His body was laid out in state in his studio, by the side of the unfinished Transfiguration, and all Rome flocked to the place for a last sight of the “divino pittore.” His property amounted to about £30,000; his drawings and MSS. he left to Giulio Romano and Gianfrancesco Penni; his newly bought land to Cardinal Bibbiena, the uncle of the lady to whom he had been betrothed; there were liberal bequests to his servants; and the rest was mostly divided among his relatives at Urbino. He desired to be buried in the Pan- theon, under the noble dome which he and Bramante had dreamed of rivalling. His body is laid beside an altar, which he endowed with an annual chantry, and on the wall over it is a plain slab, with an inscription written by his friend Cardinal Bembo. Happily his grave has as yet escaped the disfigurement of a pretentious monument such as those erected to Michelangelo, Dante, and other great Italians ; it has not, however, remained undisturbed: in 1833 it was opened and the bones examined.” In March

1883 a festival was held at Urbino, on the occasion of the’

4th centenary of his birth, and on this occasion many interesting articles on Raphael were published, especially one by Geymiiller, “Le IV™ Centenaire de la Naissance de Raphaél,” 1483-1883, in the Gaz. de Lausanne, March*

1883,

Literature.—Comolli, Vita inedita di Raffaello, 1790 ; Duppa, Life of Raphaci, London, 1816; Braun, Raphael . . . Leben und IVerke,

Wiesbaden, 1819; Fea, Raffaello. . . ed aleane di Ini Opere, Rome, 1822; Rehberg, Rafael Sanzio aus Urbino, Munich, 1824 ; Quatremere de Quincy, Vita ed Opere di Raffaello, trans. by Longhena, Milan, 1829 (a work marred by many inaccuracies) ; Rumohr, Ueber Raphacl und sein Verhédliniss, Berlin, 1831; Rio, Michelange et Raphaél, Paris, 1863 ; Gruyer, Raphaél et ? Antiquité

5 See the eloquent eulogy of his character at the end of Vasari's Life.

§ See Minghetti, "Gli Scolari di Raffaello," Nuova Antologia, June

1880.

7 See "Ritrovamento delle ossa di Raffaello," Soe. Virtuosi al Pan- teone, Rone, 1833 ; other pamphlets on this were published in the same year by Fea, Falconieri, and Odescalchi.

(Paris, 1864), Les Vierges de Raphaél (Paris, 1878), and Raphaél, Peintre de Portraits (Paris, 1880) ; Grimm, Das Leben Raphaels von Urbino, Berlin, 1872 (intended spccially to point out the crrors of Vasari and Passavant, and not written in a very fair spirit) ; Gher- ardi, Della Vita di Raffaello, Urbino, 1874; Springer, Rafael und Michelangelo, Leipsic, 1878 ; Perkins, Raphael and Michelangelo, Boston, 1878 ; Dohme, Kunst wad Kiinstler des Mittelalters, Leipsic, 1878 (vol. ii. of this valuable work, with many illustrations, is devoted entirely to Raphael and Michelangelo) ; Alippi, 17 Raffaello, Urbino, 1880 ; Clément, Michelange ct Raphaél, 5th ed. (improved), Paris, 1881; Kug. Miintz, Raphaél, sa Vie, sun Guvre, &e., Paris, 1881 (this is on the whole the best single work on Raphael, both from its text and its numerous well-chosen illustrations) ; Passavant, Rafael und sein Vater, Leipsic, 1839-58 (a valuable book, especially for its list of Raphael's works ; a uew edition translated by Guasti into Italian was published at Florence in 1882, but, though printed so recently, this edition is in no way superior to the French one of Lacroix, Paris, 1860, which, however, is a great advance on the original German text) ; Crowe and Cavalcaselle, Life and Works of Raphael, London, 1882-85; Eug. Miintz, Les Historiens et les Cri- tiques de Raphaél, Paris, 1883 (contains

a good bibliography of the subject). The student of Raphael owes a special debt of gratitude for the recent labours of MM. Miintz, Gruyer, and Geymiiller.

Teproductions of Raphael's Works.—From the time of Raimondi downwards no painter's works have been so frequently engraved. The Calcografia Camerale (now called Regia) of Rome possesses an enormous number of copper-plates of his pictures by a great many good (and bad) engravers of this and the last century. Elec- trotypes of the old coppers are still worked, and are published by the Stamperia at very moderate prices ; in the catalogue Nos. 736 to 894 are the works of Raphael, including several books of engrav- ings containing whole scts, such as the Vatican loggic, &c. A very complete collection of photographs from these and other en- gravings is published by Gutbier and Liibke, Léafael's Werke, simmt- liche Tafelbildcr und Fresken, Dresden, 1881-82, in three large volumes, divided into classes,—pictures of the Madonna, frescos, stanze of the Vatican, tapestry cartoons, &c. The descriptive text and life of Raphael are by Litbke. The Malcolm, Oxford, British Museum, Lille, Louvre, Dresden, and other collections of Raphael's drawings have mostly been published in photographic facsimile, and an enormous number of illustrated monographs on single pictures exists. Braun's autotypes of the stanze and Farncsina frescos are especially good. (J. H. M.) °

RAPIN, Pav pz (1661-1725), sieur of Thoyras, French historian, was the son of Jacques de Rapin, avocat at Castres (Tarn), where he was born on 25th March 1661. He was educated at the Protestant academy of Saumur, and in 1679 he became an advocate, but soon afterwards entered the army. The revocation of the Edict of Nantes in 1685 and the death of his father, which happened two months afterwards, led him to come to England; but, unable to find employment there, he crossed to Holland and enlisted in the company of French volun- teers at Utrecht commanded by Daniel de Rapin, his cousin-german. He accompanied the prince of Orange to England in 1688, and the following year Lord Kingston made him ensign in his regiment, with which he proceeded to Ireland. He took part in the siege of Carrickfergus and the battle of the Boyne, and was shot through the shoulder at the battle of Limerick. Soon

afterwards he was promoted captain ; but in 1693 he resigned in order to become tutor to the earl of Portland's son. His next change was to return to his family, which he had settled at The Hague, and there he continued some years. But, as he found his family increase, he resolved to retire to a more economical residence, and accordingly removed in 1707 to Wesel, where he commenced his great work P'Histowe @ Angleterre. Though he was of a strong con- stitution, the seventeen years' application entirely ruined his health. He died in 1725,

Rapin was also the author of a Dissertation sur les Whigs et les Torys, 1717. L' Histoire d Angleterre, embracing the period from the invasion of the Romans to the death of Charles I., was printed at The Hague in 1724 in 8 vols. It was translated into English, and improved with notes, by Tindal, in 2 vols. folio, 1725-31. Although the work of a foreigner, it is deservedly estecmed as one of the fullest and most impartial collections of English political transactions extant.

RASGRAD or Hesarcrap, a town of Bulgaria, with a station about 2 miles distant on the Varna and Rustchuk

Railway, is situated on the Byaly Lom, 970 feet above sea-level. It has increased in population during the last fifty years from 3000 to 10,000 inhabitants. In 1810 it was the scene of the defeat of the Turks by the Russians.

RASHBA (8'2¥) stands for three rabbins of various ages and various countries.

1. R. Sure'on Ben Ex'azar was a Mishnic teacher of the 2d century. ©

2, Rappenu SumtsHon Ben Asranam of Sens wrote commentaries on various Mishnic treatises (see MisNau, vol. xvi. p. 506).

3. R. SHeLomon Ben Azsranam (or Ben [Ibn] Add- ereth) was a disciple of Nachmanides, upon whom his master's mantle had fallen (see Rampan). He became chief rabbi of Barcelona. Here so many disciples from the neighbouring provinces flocked to him as to excite emulation among the Jews in the capital of Castile, who thereupon appointed the

German Rabbi Asher b. Yehiel (Rosh). At the same time religious questions poured in upon him from all Israel, so that it is a marvel how he could go through his mere clerical work.

His works extend over the whole Talmud, although not all of them are printed. But thousands of his Responsa have been printed, while many others lie in MS. at Cambridge (Add. 500). Of his other works, the enumeration of which would occupy columns, mention can be made only of his explanations of the Agadoth of the Babylonian Talmud, containing polemic against both Christians and Moslems (MS., Univ. Camb., Add. 1567, 1). On his part in the Maimonidcan controversy sce Schiller-Szinessy, Catalogue, i. 187 sq. (S. M. 8.-8.)

RASHBAM. Rassenv Suemven Ben Metr, commonly called, from his title and the initials of his own and his father's names, Rashbam, was born at Rameru (Ramerupt near Troyes, in France) about 1080. He was almost the greatest Talmudist of his time, the only two excelling him till 1105 being Rashi and later on his own younger brother, Rabbenu Ya'akob, better known as Rabbenu Tham. In Bible criticism and exegesis, however, he excelled all the men of the 11th and 12th centuries, even if we include R. Menahem b. Helbo, R. Yoseph Bekhor Shor, and R. Yoseph Kara of the Franco-Ashkenazic school, and Abraham Ibn 'Ezra of the Sepharadic school. Rashbam was the son of Yokhebed, second daughter of Rasur (g.v.); and of Rabbenu Meir of Rameru (b. Shemuel). He suc- ceeded his grandfather Rashi as head of the Rabbinical college, and probably also of the congregation, of Troyes. Later, however, we meet him at other places, ¢.g., Caen, Loudun. He died about 1160.

Of his works the following are known. (1) Commentaries on the Bible: («) his commentary on the Pentateuch, uncritically edited several times (ed. princeps, Berlin, 1705), and critically and most ably for the first time by Rosin of Breslau (1881, 8vo); (d) commentaries on most of the other books of the Bible, the greater part of which are now lost, but the existence of which is in early times fully testified to. Those on Ecclesiastes and Canticles} were published by Dr Jellinek at Leipsic (1855, 8vo); specimens of both books havc been translated into English by Dr Ginsburg (Song of Songs, London, 1857, and Coheleth, London, 1861).

(2) Com- mentaries on the Babylonian Talmud ; of these we now possess only his supplements on Pesahim (leaves 99b-121b), Baba Bathra (leaves 29a-176b), and Makkoth (leaves 19b sq.; sce the so-called

Ttashi on the Riph, in the Mishnah, iii. 5, catchword jptn Spy). Commentaries on five other treatises are distinctly referred to by old authorities,? but Rashi's commentaries so thoroughly eclipsed all those written before and after him that none of them hada chance of surviving, except in the shape of a supplement. (3) Additamenta or Tosaphoth ; sce Rabbinovicz (varia lectiones), i1.,

1 The present writer cannot share the opinion of those who, because of the Agadic explanations with which that commentary abounds, call Rashbam's authorship in question, Ibn 'Ezra himself, who was sober thinker enough, is compelled in Canticles to resort to the Rabbinic explanation, —a proceeding and a method in which every modern com- mentator must take refuge, unless he wishes to explain the book as a merely profane one.

2 See Berliner Magazin, &c., vii. 186, and Or Zaru'a, in several places (comp. Magazin, ii. p. 100).

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Preface, p. 18, and Steinschneider, Hebr. Handsehr. in der kon. Bib. Berlin, p. 8. (4) Responsa ; see, for example, Raban (Prague, 1610, folio), leaves 143, col. 2, to 146b, col. 1, and elsewhere. (5) Of his controversies with Christians nothing is left except what is occasionally to be found in his commentary on the Pentateuch. (6) On his book on the calendar calculations sec Berliner Magazin, vil. p. 185. (7) On the true author of the commentary on Aboth, ascribed to Rashbam, see Taylor, Catal., No. 20. (8) Although the attack on his hemero-nyction theory (commentary on Gen. i. 4, 5) was made by Ibn 'Ezra (Jggereth Hasshabbath ; see Kerem Hemed, iv. pp. 159-178, and Mibhar Hammaamarim by Nathan b. Shemuel, printed at Leghorn in 1840, leaves 58a-66a) in Rash- bam's lifetime he scems not to have answercd it. (S. M.S.-S.) RASHI ('v), that is, RABBENU SHELOMOH YISHAKI (Solomon, son of Isaac), whence by Christian writers he is also called Isacides! (1040-1105), was the*

greatest rabbi of the Middle Ages. He is equally important for Biblical and Talmudic study, and in the former connexion as inter- esting to Christians as to Jews from the influence of is exegesis on Luther's Bible (through De Lyra; see vol. xi. p. 601) and on the English version of the Old Testament (mainly through Ibn 'Ezra, and still more through Kimhi). Rashi is the most eminent of the "sages" or '"' great men of Lothaire"? (39m, i.e, Lorraine) in whom culminated that movement of Jewish scholarship to which Charlemagne had given the first impulse. From the Jew Isaac, first in- terpreter and then ambassador in his famous mission to Harun ar-Rashid, Charlemagne had doubtless learned how superior in literary attainments the Jews of the East were to those of the West, and therefore he gave great privileges to the accomplished Makhirites ® who were introduced into the south of France, and spread Jewish culture and litera- ture there.t Later on he brought from Rome to Mainz the Kalonymites, a family of distinguished Talmudists, poets, &c., of Lucca;> and soon Spires, Worms, and Mainz (spoken of as Shum, 0'%v') became famous seats of Jewish learning ; their ordinances (Takkanoth Shum) were of norm- ative authority for centuries, and the study of the Hebrew Bible and the Babylonian Talmud steadily spread from southern Germany to northern France. Though Spires, Worms, and Mainz by the partition treaty of Verdun in 843 belonged to East Frankland, yet in Jewish literature Lothaire includes these cities; and all the greatest doctors of Jewish lore in the south of Germany or north of France belong to the " great men" or "'sages of Lothaire."® Rashi was born, in the year in which the last nominal gaon of Pumbaditha died, at Troyes, where his father Yishak was no doubt rabbi. R. Yishak was probably a disciple of R. Gershom ; certainly he was an eminent Talmudist.' His wife, Rashi's mother, was a sister of R. Shime'on hazzaken.® 1 The interpretation of the » of "W as meaning Yarchi (Jarchi), a.e., of Lunel, is not to be charged on Buxtorf, nor on Seb. Miinster, being already found in the text of the Pugio Fidei of Raymundus

Martini, written in the second half of the 13th century. 2 Lothaire never means Lhuitre (Luistre), as appears from the phrase

*smd mob, "realm of Lothaire." Instead of 77ND 7*Y in Rashi's*

so-called Siddur, ii. leaf 33a, must be read smd "TY, as will be easily seen from the context.

3 See Yohasin Hasshalem (London and Edinburgh, 1857, 8vo), p. 84.

4 Possibly also, like some princes of the 10th century, Charlemagne encouraged Jewish literature in order to keep at home the considerable sums which the Jews had been wont to send to the Babylonian geonim.

5 See 'Emek Habbakha, ed. Lettcris (Vienna, 1852, 12mo), p. 18, and Wiener's German translation (Leipsic, 1858, 8vo), p. 8. Reshal's Responsa, § xxix., is unfortunately corrupt in many places.

6 See Brit. Mus. MS. Add. 27200, leaf 24a.

7 This appears from an explanation quoted from him by his son

on a passage of 'Abodah Zarah (f. 75a, catchword pba by), This treatise was at that time scarcely studied, even by eminent rabbis, and the explanation is markedly superior to one which Rashi also gives from R. Ya'akob b. Yakar, hitherto regarded as the most eminent of his teachers.

8 Not to be confounded with his older contemporary, the poet and Halakhist, Shime'on b. Yishak haggadol. The epithets "hazzaken" and "haggadol" both mean "the elder," but the epithet is varicd to distinguish the persons.

at the age of eighteen.

RAS—RAS

Her name is unknown, as is also that of the wife whom

Rashi, according to Mishnic precept (Aboth, v. 21), married Soon after his marriage, and with his wife's consent, he left her to prosecute his studies in Germany, returning home only from time to time.® She bore him no sons, but three daughters.!®

Rashi had at least six teachers,—(1) his father ; (2) R. Ya‘akob b. Yakar (chief rabbi at Worms) for Bible and Talmud (Rashi on T. B., Pesahim, 111a), a disciple of R. Gershom (Rashbam, zbid., and Siddur, ii. leaf 10a) and friend of R. Eli‘ezer haggadol; (3) his successor, RK. Yishak Segan Leviyyah (T.B., Besah, 24b), a pupil of R. Eliezer haggadol ; (4) his mother's brother, already named (T.B., Shabbath, 85b); (5) R. Yishak b. Yehudah, also a pupil of R. Elitezer, and head of the community at Mainz (Pardes, xxi.); (6) R. Elyakim, head of the community at Spires (dbed., clix., clxxxi., cexc., cccvi.). Besides the oral instruction of his teachers, Rashi had and used copies of, and commentaries on, sundry parts of the Talmud written by these scholars themselves or by their teachers or disciples (T. B., Berakhoth, 39a, 57b; Shabbath, 10b; R. Hasshanah, 28a; Sukkah, 45b; Siddur, ii. leaf 10a). He had also before him all the Jewish literature existing and known at his time, as the Bible, part of the Apo crypha, all the Targums, sundry cabbalistic works (Sepher Yestrah, Hekhaloth, &c.), both Talmuds, the Midrashim, Sheeltoth, Halakhoth Gedoloth, Teshuboth Haggeonim, the works of R. Mosheh Haddarshan, the lexicographical works of Menahem b. Seruk and Donash b. Labrat, and, last but not least, the commentaries of R. Gershom, which he used largely, but mostly silently.!2 He also used the works of his own contemporaries, such as the ‘Arukh.!8 His studies completed, Rashi returned to his native town and opened a school for Bible and Talmud. His fame quickly rose ; disciples gathered round him from the whole north of France and south of Germany, and men in office, who had grown grey in study, addressed to him "religious ques- tions," his "answers" to which give us insight into his character, piety, and ability. He died on 13th (not 26th) July 1105,15 having already seen two of his grandsons " in-*

® See Hophes Matinonim, ed. Goldberg, p. 2 CNWINW INNS ann

pm2nd).

10 They married three of their father's disciples. The husband of the eldest was, according to Schiller-Szinessy (Camb. Cat., ii. 88 sq., note 1), R. Simhah of Vitry-le-Frangais (ob. 1105), reputed author of the Mahzor Vitri, which, if the other MSS. so called have no better title to the name

than that in the British Museum, Add. 27200-1, must now be regarded as lost (Taylor, Catal. MSS. of Aboth, &c., No. 20; Schiller-Szinessy, op. cit., ii. 61 sg.). The issue of this marriage was (1) R. Shema'‘yah of Soissons (see MIsHNAH, vol. xvi. p. 506); (2) R. Shemuel, who married his cousin, Rashbam's only sister. Rashi's second daughter, Yokhebed, married R. Meir of Raineru (b. Shemuel), a brother of R. Simhah. He was father of four sons,—(1) Ribam (R. Yishak b. Meir), whe died in his father's lifetime; (2) RasHBam (g.v.) ; (3) R. Tham or Rath; (4) R. Shelomoh (Br. Mus., Add. 27200, leaf 158b). The third daughter, Miryam, married R. Yehudah b, Nathan, who sup- plemented his father-in-law's commentary on Afakkoth, and wrote the commentary that goes by Rashi's name on T.B., Vazir, &c. Their son's name was R. Yom Tob (Sepher Hayyashar, Vienna, 1810, § 599).

ll See Rashi, T. B., Berakhoth, 51a; Hagigah, 13a; Sukkah, 45a ; and many other places. See also Siddur, ii. leaf 22b, col. 2 (on the reading of the Shema' in bed). Such passages as Kiddushin, 71a, do not, when rightly understood, testify to the contrary. Rashi's "they " refers not to his contemporary teachers, but to those of the Talmud who 'had not explained to us the Holy Names of the Twelve and Forty-two." It is therefore quite untrue that Rashi "knew nothing of kabbalah."

12 R. Gershom, "the light of the Diaspora" (see vol. xvi. p. 506), died in the year in which Rashi was born, and was the immediate teacher of his teachers. One of his commentaries is printed in the Shittah Mekubbeseth on Karethoth, Vienna, 1878, folio.

® See T.B., Shabbath, 13b, catchword D3INN.

14 See Hophes Matmonim, p. 8.

15 See MS. De-Rossi (Roy. Libr., Parma) 175 (Catal., p. 116), and MS. Luzzatto (Literaturbl. d. Orients, vii. p. 418). This precious MS., which subsequently belonged to Halberstam of Bielitz, is now the property of the master of St John's College, Cambridge.

RAS—RAS

terpreting' in his presence, and the budding intelligence of a third, who became the greatest Talmudist of his age.

Rashi, though not the originator of all that he teaches in his commentary on the Talmud, had so digested the whole literature bearing on that stupendous work that his teaching, even when it appears to be imitative, is really creative. In his Biblical com- mentaries he has not, of course, grammatical and_ philological knowledge of the modern type, but he had a very fine sense for linguistic points, which was not equalled, much less surpassed, by the greatest rabbis who followed him. He gave satisfaction, if not to all, at least to the best of his time, and, as the great German poet says, "he who has given satisfaction to the best of his time lives for all ages."

*Rasui's Works.—A. Bible Commentary (WND).—Rashi com- mented on the whole of the Hebrew Bible except Job, chaps. xl. 21 to the end, and the books of Chronicles.1. Kimhi's is the only Rabbinical commentary which can be said to have successfully approached this great work in its influence on Jewish scholarship ; and on the Pentateuch Rashi had no rival. For centuries too his was the text-book in boys' schools throughout the Jewish world—and in some countries it is so still, its depth and subtilty being com- bined with simplicity of exposition. Its currency is attested by more than a hundred supcrcommentaries, translations, extracts, and the like, of which there are about fifty in print. An eminent rabbi declares that Rashi may be substituted for the Targum "in the reading of the weekly pericope" (Reshal, Yam shel Shelomoh on Kiddushin, ii. $14). Rashi's influence on Christian scholars has already been alluded to. N. de Lyra copied him so closely as to be called his "ape."**

Translations.—The whole commentary was reudered into Latin by PELLICANUS (q.v.), but never printed, and again by Breithaupt (3 vols. 4to0, Gotha, 1710-14). This version includes the spurious commentary on Chronicles and is accompanied by notes. Of separate parts there are printed versions of Gen. i.-vi. (Scherzer, 1663), Gen. vi.-xi. (Abicht, 1705), Gen. xlix. (Loscani, 1710), Hosea (Mercier, 1621), Joel, Jonah (Leusden, 1656), Joel (Genebrard, 1563), Jonah, Zephaniah, Obadiah (Pontac,

1556), Obadiah (Crocius, 1673), Malachi (S. de Muis, 1618), Ps. xix. (Id., 1620), Proverbs (Giggeus, 1620), Canticles (Genebrard, 1570), Ruth (Carpzov, 1703), Esther (Aquinas, 1622). The Pentatcuch was translated into German by L. Dukes (Prague, 1833-38, 8vo); Genesis was done by L. Haymann (Bonn, 1833, 8vo). Editions, especially of the Pentateuch, are very numer- ous. Only some of the chief can here be named,—(a) on the whole Bible, with the sacred text—Venice, 1545, 1595, 1607 (all three in 4to) ; Cracow, 1610, 4to; Basel, 1618, folio; (b) Pentateuch with text (all sm. folio) —Bologna, 1482; Ixar, 1490; Lisbon and Naples, 1491; (e) Pentateuch without text—Reggio, 1475, folio (the first Hebrew book printed with date); s./. et a., but before 1480, 4to; Soncino, 1487, folio. MSS. of Rashi on the whole Bible are very rare, and even those which are supposed to be such turn out, on examination, to be either incomplete or defective, or both. There lies a precious MS. in Leyden (1 Scal.) ; but it is a trifle defective in Exodus. St John's College, Cambridge, possesses a still more ancient and precious MS. (A. 8; dated 1239) ; but it lacks the Penta- teuch and Kzra(-Nehemiah), and is defective in the end (though, it is true, only in Chronicles, which is not Rashi's, as mentioned before). But MSS. of Rashion the Pentateuch, both old and good, abound. There are few libraries in Kurope that have not one or two of this commentary. It is to be hoped, therefore, that Dr A. Berliner, who has already edited critically Rashi on the Pentateuch (Berlin, 1866, 8vo), although not on the faith of a sufficient number of MSS., will soon issue a second and superior edition.

B. Commentary on the Babylonian Talmud, D13\p.3— Rashi had not been dead a hundred ycars when it was felt in the learned world that no such master in the Talmud had ever existed before him, and that without his aid and especially his corrections of the text (then only embodied in his commentary), the sca of the Baby- lonian Talmud could not safely be sailed on. He became now the teacher even of the Jews in the East. He commented on the whole of the Talmud to which Gemara is attached (see Misunan), except on Nedarim from leaf 22b to the end, Nazir and Tamid from begin- ning to end, Baba Bathra from 29a to the end, and Makkoth from leaf 19b to the end. In commenting on the two last-named*

1 The supplement to the former is generally ascribed to R. Ya‘akob Nazir ; its relation to the author of the MS. commentary on Job (Camb. Univ. Lib., Dd. 8. 53) has still to be worked out. The commentary on Chronicles in which Rashi is three times cited by name (2 Chron. iii. 15, xxii. 11, and xxiii. 14) is the work of a German rabbi residing in Provence.

2 See J. H. Maius, Vita Reuehlini, 1687, Pref. The thanks of the present writer are due to the curators and librarian of the Bodleian for the loan of this book.

3 On this word see Schiller-Szinessy, Catalogue, i. p. 181, note.

4 His disciple, son-in-law, and continuator Rabbenu Yehudah b. Nathan writes: “ At the word ‘tahor’ (pure) the soul of our teacher went out in purity.”

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massekhtoth death surprised him. Rashi on the Talmud has never been printed apart from the text, and so the first complete edition is that contained in the editio princeps of the Babylonian Talmud (Venice, 1520-23, folio). Portions had eome out before with parts of the Talmud (Soncino, 1483, and elsewhere later). There are MSS. containing Rashi on isolated Talmudic treatises in various libraries : the Cambridge University Library and British Muscum have six each, the Bodleian twelve, the Paris National Library seven.

C. The Leligiows Deeisions (DYPDD) given by Rashi are to be found in various works, principally in the so-called Siddur (i. and ii.) and Happardes (Warsaw, 1870, folio)—called Happardes Haggadol to distinguish it from the abridgment by R. Shemuel of Bamberg (138th century) called Likkute Happardes (Venice, 1519, 4to)—a work of which Rashi himsclf seems to have laid the foundation, though other literature on other subjects is now mixed up with it. Of the same nature are Haorah and WN) WON, MSS. of which lie at Munich (kindly lent to the writer by Merzbacher) and Oxford. Various halakhoth, &c., are also to be found in various malizorim (¢.g., the Cambridge MS. Add. 667, leaves 153-156,

and elsewhere), the Shibbole Halleket, ii. (by R. Sidkiyyahu b. Abraham Harophe, Cambridge MS. Add. 653).

D. Poems (D°O1D).—Rashi was no poet by profession and much less by genius; but he had a tenderly feeling heart, and saw the horrors of the first crusade; and he wrote Selihoth (propitiatory and penitential prayers), whicl are by no means without their value. One is cmbodicd in the additional service of the day of atonement and begins " Tannoth Saroth" (Reshal's Hesponsa, § Xxix.), and several more, which form the acrostic Shelomoh bar Yishak, are found in the collection of the Selihoth of the Ash- kenazic rite. It is not improbable also that the Aramaic Reshuth iv. to the Haphtarah in Targum (introduction to the prophetic portion as given in Yonathan b. 'Uzz'iel's Aramaic paraphrase), which is to be found in the Renchliuian Codex (De Lagarde, Prophet# echaldaice, Leipsic, 1872, 8vo, leaf 492), is his. It is much his style, and the acrostic is Shelomoh (and not fynw). It is also very probable that Reshuth v. is his. If so, he must have composed it when very young, as several expressions in it testify.

E. Le'azim co"ryS),—In his commentaries Rashi, like R. Gershom before him and others after him, often introduces French words (chiefly verbs and nouns) to give precision to his explanations. Of these Le'azim there are certainly more than 3000, and they are most valuable to the student of old French. Unfortunately copyists, notably in Italy, and printers subsequently, have often substituted their own vernacular for the original French; there are now even Russian words to be found in Rashi. Four hundred years ago explanations of some of these Le'azim and of those of Kimhi were offered by the author of Makre Dardeke (Naples, 1488). Other contributions have followed intermittingly down to the present time (Brothers Bondi in Or Esther, Dessau, 1812; Dormitzer and Landau in Marpe Lashon, Odessa, 1865, 12mo). The labours of M. Arséne Darmstetcr promise to be exhaustive, and are based on ex- tensive collations, see Romania, April 1872, p. 146 sq.

There is no satisfactory life of Rashi; most recent accounts rest on a Life by Zunz (1822), which has not been reprinted in his collected works. (S. M. 8.-S.)

RASHT (also Rascht, Rescht, Rashd, and Resht), a town in northern Persia, situated in 37° 18' N. lat. and 49° 37' E. long., capital of the richly wooded maritime pro- vince of Gilan, contains from 15,000 to 20,000 inhabitants. Eastwick, who was there in 1861, accepts the former estimate, but states that the place was four times as popu- lous before the plague of 1831. The distance from Enzelli, on the southern shores of the Caspian, the actual port of dis- embarkation for passengers and goods from Russia, is about 16 miles, of which 12 (to Pari Bazaar) are accomplished in an open boat, the last part by river, but for the most part over a widespread brackish lake or lagoon (murddb), abounding in wild fowl, surrounded by reeds, and separated from the sea by a narrow belt of sand. From Pari Bazaar to Rasht the road, piercing through forest and swamp, had for many long years been memorable only for its puddles and pools, its ruts and ruggedness, but it has more recently undergone great improvement. As for the town itself, the tiled houses in the streets, and the lanes, lined with hedge and cottage, in the environs, impart a cheer- fulness to the locality little in unison with the sickly and fever-stricken faces and forms of the inhabitants. Yet the beauty and hazel eyes of the children, with their "true English pink and white complexions" noticed by Eastwick, are not significant of inherited enervation.

Rasht is the residence of a Russian and an English

consul, and the seat of a local governor nominated by the shah. It is the centre of the silk trade, which once flourished so greatly in Persia as to show an annual export of nearly a million and a half pounds in weight, valued at £700,000. In 1882, however, the prevalence of disease among the silkworms caused many of the peasants of Gilan to abandon the culture of silk in favour of rice, which became largely exported to Russia. But the geographical position of Rasht gives it a world-wide reputation irre- spective of trade. If the roads by Trebizond, Erzeroum, and Tabriz on the one hand and by Poti, Tiflis, and Tabriz on the other can still be considered the two 'commercial highways" from Europe to Persia, the line of land and water communication by Astrakhan and the south-eastern shores of the Caspian has a good claim to be called. the true

modern highway for travellers and diplomatists moving in the same direction.

Rasht was visited in 1739 by "two English gentlemen from Petersburg," whose narrative, published three years later, contains much interesting information on the existing relations of Gilan with Russia. It is noteworthy, but not astonishing, to find that in those days the shah (Nadir Kuli) was himself 'in a manner the sole merchant or trader in all Persia." In 1744 Jonas Hanway came there also ; but no fuller account of tle capital of Gilan has perhaps ever been recorded than that of Samuel Gmelin in 1771, when Hidaiyat Khan ruled the province, and Karim Khan Zend was sovereign of Persia. Gmelin was reccived with extraordinary honours, as an imperial officcr of Russia, and every opportunity was afforded him of observing the country, its features and produce, and of acquainting himself with the manners and customs of the inhabitants. In 1882 a concession for the construction of a railway from Rasht to Teheran, via Kazvin, was granted to a M. Boital. It is probable that no more practical effect will be given to this scheme than to that of Baron de Reuter some ten years before.

See A Journey through Russia into Persia (London, 1742); Histoire des Décou- vertes, vol. ii. (Lausanne, 1784); Eastwick, Three Years' Residence in Persia (1864); Telegraph and Travel (1874); and published official Reports (182).

RASK, Rasmus Curist1aAN (1787-1832), an eminent scholar and philologist, was born at Bréndekilde in the Island of Fiinen or Fyen in Denmark in 1787. He studied at the university of Copenhagen, and early dis- tinguished himself by singular talent for the acquisition of languages. In the year 1808 he was appointed assistant keeper of the university library, and some years after wards made professor of literary history. In 1811 he published, in Danish, his Introduction to the Grammar of the Icelandic and other Ancient Northern Languages, from printed and MS. materials which had been accumulated by his predecessors in the same field of research. The reputation which Rask thus acquired recommended him to the Arna-Magnzan Institution, by which he was employed

as editor of the Icelandic Lexicon (1814) of Bjérn Haldor-_

son, which had long remained in manuscript. About the same time Rask paid a visit to Iceland, where he remained from 1813 to 1815, and made himself completely master of the language and familiarized himself with the litera- ture, manners, and customs of the natives. To the interest with which they inspired him may probably be attributed the establishment at Copenhagen, early in 1816, of the Icelandic Literary Society, which was mainly instituted by his exertions, and of which he was the first president. In October 1816 Rask left Denmark on a literary expedition, at the cost of the king, to prosecute inquiries into the languages of the East, and collect manuscripts for the university library at Copenhagen. He proceeded first to Sweden, where he remained two years, in the course of which he niade an excursion into Finland, for the purpose of studying the language of that country. Here he published, in Swedish, his Anglo-Saxon Grammar in 1817. In 1818 there appeared at Copenhagen, in Danish, an Essay on the Origin of the Ancient Scandi- navian or Icelandic Tongue, in which he traced the affinity of that idiom to the other European languages, particu- larly to the Latin and the Greek. In the same year he

brought out the first complete editions of Snorro's Hdda and Sezemund's #dda, in the original text, along with Swedish translations of both Hddas, the originals and the versions occupying each two volumes. From Stockholm he went in 1819 to St Petersburg, where he wrote, in German, a paper on "The Languages and Literature of Norway, Iceland, Sweden, and Finland," which was pub- lished in the sixth number of the Vienna Jahrbiicher. From Russia he proceeded through Tartary into Persia, and resided for some time at Tabriz, Teheran, Persepolis, and Shiraz. In about six weeks he made himself suffi- ciently master of the Persian to be able to converse freely in that language with the natives. In 1820 he embarked at Bushire for Bombay; and during his residence in the latter city he wrote, in English, " A Dissertation on the Authenticity of the Zend Language" (Trans. Lit. Soc. of Bombay, vol. iii., reprinted with corrections and addi- tions in Z'rans. R. As. Soc.). From Bombay he proceeded through India to Ceylon, where he arrived in 1822, and soon afterwards wrote, in English, " A Dissertation respect- ing the best Method of expressing the Sounds of the Indian Languages in European Characters," which was printed in the Z'ransactions of the Interary and Agricultural Society of Colombo. Rask returned to Copenhagen in May

1823, bringing with him a considerable nuniber of Oriental manuscripts, Persian, Zend, Pali, Singalese, and others, which now enrich the collections of the Danish capital. He died at Copenhagen on 14th November 1832.

During the period betwecn his return from the East and his death Rask published in his native language a Spanish Grammar (1824), a Frisie Grammar (1825), an Essay on Danish Orthography (1826), a T'reatise respecting the Ancient Egyptian Chronology and an Italian Grammar (1827), and the Ancient Jewish Chronology previous to Moses (1828). He likewise cdited an edition of Schneider's Danish Grammar for the use of Englishmen (1830), and super- intended the English translation of his valuable Anglo-Saxon Grammar by Thorpe (1830). Rask's services to comparative philology were very great. He was the first to point out the con- nexion between the ancient Northern and Gothic on the one hand, and of the Lithuanian, Sclavonic, Greek, and Latin on the other, and he also has the credit of being the real discoverer of the so- called "Grimm's Law" for the transmutation of consonants in the transition from the old Indo-European languages to Teutonic, although he only compared Teutonic and Greek, Sanskrit being at the time unknown to him. Rask's facility in the acquisition of languages was extraordinary ; in 1822 he was master of no less than twenty-five languages and dialects, and is stated to have studied twice as many. His numerous philological manuscripts were transferred to the king's library at Copenhagen. Rask's Anglo-Saxon, Danish, and Icelandic Grammars have been given to the English public by Thorpe, Repp, and Dasent respectively.

RASKOLNIKS. See Russia.

RASPBERRY. See Horticutturg, vol. xii. p. 276.

RASTATT, or Rastapt, a small town in Baden, is situated on the Murg, 4 miles above its junction with the Rhine and 12 miles south-west of Carlsruhe. It is a fortress of great strength, commanding the passage through the Black Forest. The only notable building is the old palace of the margraves of Baden, a large Renais- sance edifice in red sandstone, now partly used for military purposes and containing a collection of pictures, antiquities, and trophies from the Turkish wars. The industry of

Xastatt is almost confined to local needs, and the town may be said to live on the garrison, which forms nearly half of its population (1880) of 12,356. Two-thirds of the inhabitants are Roman Catholics. .

Previous to the close of the 17th century Rastatt was a place of no importance, but after its destruction by the French in 1689 it was rebuilt on a larger scale by Margrave Lewis, the well-known imperial general in the Turkish wars, and became the residence of the margraves of Baden down to 1771. In 1714 the preliminary articles of the peace between Austria and France, ending the War of the Spanish Succession, were signed here. The congress of Rastatt in 1797-99 had for its object the re-arrangement of the

map of Germany by providing compensation for those princes who had relinquished to France territory on the left bank of the Rhine.

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RAS—RAT

It dispersed, however, without result, war having again broken out between France and Austria. As the French plenipotentiaries were leaving the town they were waylaid and assassinated by Hungarian hussars. The object and instigators of this deed have remained shrouded in mystery, but the balance of evidence seems to indicate that the Austrian authorities had ordered a violent seizure of the ambassadors' papers, to avoid damaging disclosures with regard to Austrian designs on Bavaria, and that the soldiers had simply exceeded their instructions. The Baden revolution of 1849 began at Rastatt with a military mutiny and ended here a few months later with the capture of the town by the Prussians. Rastatt is now a fortress of the German empire.

RASTELL, the name of two early English printers.

I, Jonn Rastett or RastTaLy, printer and author, was born at London towards the end of the 15th century. He was educated at Oxford, and married Elizabeth, the sister of Sir Thomas More. He was a man of considerable learning and, although not bred to the law like his son,

showed his devotion to legal studies by his writings. He went into the printing business about the year 1514, and produced Liber assisarum, with a preface by himself, His first dated publication was Abbreviamentum librorum legum Anglorum (1517). He also printed The Wydow Edyth (1525), A Dyaloge of Syr Thomas More (1529), and a number of other books. The last dated piece from his press was labyl's Ghoste (1533), a poem. He lived "at the sygne of the meremayd at Powlysgate." John Rastell, the Jesuit, who has been frequently confounded with him, was no relation. By his will, dated 20th April 1536, he appointed Henry VIII. one of his executors ; administra- tion was granted on the renunciation of the executorship by the king on 18th July 1536. It is a curious document, and contains a long account of the testator's religious belief. Rastell was occupied upon a concordance at the time of his death ; its publication was provided for by the will (see Arber's Registers of Comp. of Stationers, ii. 8, 9). He died at London, leaving two sons,—William, printer and judge (see below), and John, a justice of the peace.

Rastell's chief writings are the following. The Pastyme of People ; the Chronyeles of dywers Realmys and most speeyally of the Realme of Englonde (1529), now of extreme rarity ; a note in the catalogue of the British Museum says, "the only perfect copy known." It ranges from the earliest times to Richard III., and was edited by Dibdin in 1811 for the quarto series of English chronicles, A new Boke of Purgatory, 1530, being dialogues on the subject between "Comyngo au Almayne a Christen Man, and one Gyngemyn a Turke." This was answered by John Frith, pro- dueing Rastell's Apology against John Fryth, also answered by the latter. The controversy is said to have ended in Rastell's con- version to the Reformed religion. xposttioncs terminorum legum anglorum (in French, also translated into English, 1527 ; reprinted as recently as 1812 as Les Termes de la Ley). The Abbreviacion of Statutis (1520), the first abridgment of the statutes in English, with an interesting preface by Rastell, giving reasons for the in- novation ; down to 1625 fifteen editions appeared.

TI. Wi1iam Rasretz (c. 1508-1565), printer and judge, son of the above, was born in London about 1508. At the age of seventeen he went to the

university of Oxford, but did not take a degree, being probably called home to superintend his father's business. The first work which bears his own imprint was A Dyaloge of Sir Thomas More (1531), a reprint of the edition published by his father in 1529. He also brought out a few law books, some poetry, an edition of Fabyan's Cronycle (1533), and The Apologye (1533) and The Supplycacyon of Soulys of his uncle Sir Thomas More. His office was "in Fletestrete in saynt Brydys chyrche yarde." He became a student at Lincoln's Inn on 12th September 1532, and gave up the printing business two years later. In 1547 he was appointed reader. On account of his religion he left England for Louvain ; but upon the accession of Mary he returned, and was made sergeant-at-law in October 1555. He was one of the seven sergeants who gave the famous feast that year in the Inner Temple Hall (see Dugdale's Orig. Jurid., 1680, p. 128). His patent as judge of the Queen's Bench

was granted on 27th October 1558. One of his pre- decessors, John Boteler, had also been printer and judge. Rastell continued on the bench until 1562, when he retired to Louvain without the queen's licence. By virtue of a special commission issued by the barons of the Exchequer on the occasion an inventory of his goods and chattels was taken. It furnishes an excellent idea of the modest nature of the law library (consisting of twenty-four works) and of the chambers of an Elizabethan judge (see Law Magazine, February 1844). He died at Louvain on 27th August 1565.

It is difficult to distinguish between the books written by him and those by his father. The following are believed to be his: 4 Colleceion of all the Statutes (1557), A Table collected of the Yeares of the Kynges of Englande (1561), both frequently reprinted with con- tinuations, and A Colleecion of Entrees, of Declaracions, &c. (1566), also frequently reprinted. The entries are not of Rastell's own drawing, but have been selected from printed and MS. collections ; their "pointed brevity and precision" are commended by Story. He supplied tables or indexes to several law books, and edited La novel natura brevium de Monsiewr Anton. Fitzherbert and

The Workes of Sir T. More in the English Tonge (1557). He is also stated to have written a life of Sir T. More, but it has not come down to us.

See Bale, Scriptores maioris Brytannia, 1557-59; Pits, Relationes hist. de rebus Angl., 1619; Tanner, Bibliotheca, 1748; Ames, Typogr. Antig., by Dibdin, 1816, iii. pp. 81, 8370; Wood, Athens Oxonienses, 1813, i. pp. 100, 343; Dodd, Church History, 1739, ii. p. 149; Foss, Biographia Juridica, 1870; Reeves, History of the Engl. Law, 1869, iii. p. 482; Marvin, Legal Bibliography, 1847 ; Clarke, Biblio- theca Legum, 1819; Bridgman, Legal Bibliography, 1807; Catalogue of Books in the British Museum before 1640, 1884.

RASTRICK, an urban sanitary district in the West Riding of Yorkshire, is situated on an acclivity near the Calder, and on the Lancashire and Yorkshire Railway 5 miles south-east of Halifax and 34 north of Huddersfield. It possesses woollen and silk manufactures, and there are stone quarries in the neighbourhood. The ancient chapel of St Matthew was replaced in 1798 by a church in the Grecian style, which was restored in 1879, A school was founded in 1701 by Mrs Mary Law, who also endowed a charity for poor widows. The population of the urban sanitary district (area, 1371 acres) in 1871 was 5896, and in 1881 it was 8039.

RAT. Under the article Mouse (vol. xvii. p. 5) an account has been already given of the relationships and chief allies of the animals known as rats, and the present article is confined to the two species to which the name rat is most strictly applicable. These are the so-called old English black rat, Mus rattus, and the common brown or Norway rat, Jf. decumanus. The first of these is a com- paratively small 2 — and lightly built 2S animal, seldom 5 exceeding about © 7 inchesin length, with a slender head, large ears = = a (see fig., A), and 4 a long thin scaly , tail about 8 or 9 inches in length. Its colour is, at least in all tem- perate climates, a peculiar shining

bluish black,

rather lighter on

the belly, the B.

ears, feet, and A. Black Rat (Mus rattus).

tail being also B. Brown Rat (M. decumanus).

black ; but in tropical regions it is represented by a grey or rufous-backed and white-bellied race to which the name of Alexandrian rat (Jf. alexandrinus) has been applied, owing to its having been first discovered at Alexandria, but which cannot be considered to be really specifically distinct from the true black rat. Its disposi-

tion is milder and more tamable than that of M. decu- manus, and it is therefore the species to which the tame white and pied rats kept as pets commonly belong. It is said that in some parts of Germany ©. rattus has been lately reasserting itself and increasing at the expense of M. decumanus, but this seems very unlikely from the pre- vious history of the two animals (compare Movss, vol. xvil. p. 5).

The brown or Norway rat, Jf. decumanus, is a heavily built animal, growing to 8 or 9 inches in length, with a bluff rounded head, small ears (see fig., B), and a com- paratively short tail,—always shorter than the head and body combined, and generally not longer than the body alone. Its colour is a uniform greyish brown above, and white below, the ears, feet, and tail being flesh-coloured ; melanistic varieties are by no means rare, and these are often mistaken for true black rats, but the differences in size and proportions form a ready means of distinguishing the two. The brown rat is believed to be a native of western China, where a wild race has been recently dis- covered so like it as to be practically indistinguishable. The two species agree fully in their predaceous habits, omnivorous diet, and great fecundity. They bear four or five times in the year from four to ten blind and naked young, which are in their turn able to breed at an age of about six months. The time of gestation is about twenty days. (0. T.)

RATAFTIA is a term applied to a flavouring essence, the basis of which is the essential oil of bitter almonds. Peach kernels are properly the source of ratafia, but any of the other substances yielding bitter almond oil is

used. The name “ratafia” is also applied in France to a variety of liquors, and from Dantzic a special liqueur is sent out under the name of “ratafia” (see vol. xiv. p. 686).

RATEL. The animals known as Ratels or Honey- badgers are small clumsy-looking creatures of about the size and appearance of the true badgers, and belong to the same natural group of the Carnivora, namely, the subfamily Meline of the large family Mustelide, which contains the otters, badgers, stoats, weasels, &c. (see MAMMALIA, vol. xv. p. 440). Of the ratels two species are generally recognized, viz., the Indian Ratel (Mellivora indica), a

African Ratel (Mellivora ratel).

native of all the peninsula of India, and the African (JZ. ratel), which ranges over the whole of the African continent —although by some authors the West African race is con- sidered to represent a third distinct species, which has

been named WM. leuconota. All the ratels are of very much the same colour, namely, iron-grey on the upper parts of the head, body, and tail, and black below, a style of colora- tion rather rare among mammals, as the upper side of the body is in the great majority darker than the lower. Their body is stout and thickly built; the legs are short and strong, and armed, especially on the anterior pair, with long curved fossorial claws; the tail is short; and the ear-conches are reduced to mere rudiments. These modi- fications are all in relation to a burrowing mode of life, for which the ratels are among the best adapted of all carnivores. The skull is conical, stout, and heavy, and the teeth, although sharper and less rounded than those of their allies the badgers, are yet far less suited to a purely carnivorous diet than those of such typical Mustelidz as the stoats, weasels, and martens. The two species of ratel may be distinguished by the fact that the African has a distinct white line round the body at the junction of the grey of the upper side with the black of the lower, while in the Indian this line is absent; the teeth also of the former are on the whole decidedly larger, rounder, and heavier than those of the latter. In spite of

these dif- ferences, however, the two ratels are so nearly allied that they might almost be considered to be merely geographical races of a single widely spread species.

The following account of the Indian ratel is extracted from Dr Judson's Mammals of India:—"The Indian badger is found throughout the whole of India, from the extreme south to the foot of the Himalayas, chiefly in hilly districts, where it has greater facilities for constructing the holes and dens in which it lives ; but also in the north of India in alluvial plains, where the banks of large rivers afford equally suitable localities wherein to make its lair, It is stated to live usually in pairs, and to eat rats, birds, frogs, white ants, and varions insects, and in the north of India it is accused of digging out dead bodies, and is popularly known as the grave-digger. It doubtless also, like its Cape congener, occa- sionally partakes of honey. It is often very destructive to poultry, and I have known of several having been trapped and killed whilst committing such depredations in Central India and in the northern Circars. In confinement the Indian badger is quiet and will par- take of vegetable food, fruits, rice, &c." O;

RATHENOW, a small town of Prussia in the province of Brandenburg, lies on the right bank of the Havel, 44 miles to the west of Berlin. It is known for its " Rathenow stones," 7.¢., bricks made of the clay of the Havel, and for its spectacles and optical instruments, which are exported to various parts of the world. It contains no buildings of note. The population in 1880 was 11,394, including 174 Roman Catholics and 68 Jews.

Rathenow has enjoyed the apne of a town since 1217. In 1394 it was taken and partly destroyed by the archbishop of Magdeburg. During the Thirty Years' War it was repeatedly occupied by the opposing troops, and in 1675 it was cleverly snatched from the Swedish garrison by the Great Elector.

RATIBOR (Polish Raciborz), a town of Prussian Silesia in the department of Oppeln, is pleasantly situated on the left bank of the Oder at the point where the river becomes navigable, about 12 miles from the Austrian frontier. The most prominent buildings are the handsome court- house by Schinkel and the Modern Gothic church ; on the right bank of the Oder is

the old chateau of the dukes of Ratibor. The town is the seat of a diversified industry, the chief products of which are machinery and railway gear, iron wares, tobacco and cigars, paper, sugar, furni- ture, and glass. Trade is carried on in these articles and in agricultural produce, and hemp and vegetables are largely grown in the environs. The population in 1880 was 18,373, or, including the immediately adjacent villages, 27,100, five-sixths of whom are Roman Catholics. In the town itself, where there are only about 2500 Poles, German is chiefly spoken, but Polish and Czechish dialects are predominant in the neighbourhood.

Ratibor, which received municipal privileges at the close of the 13th century, was formerly the capital of an independent duchy,

380 square miles in extent, which existed as such from 1288 to 1532 and afterwards passed successively into the hands of Austria and Prussia (1742). In 1815 a small mediate principality was formed out of the old lordship of Ratibor and certain ecclesiastical domains, and was conferred upon the landgrave Amadeus of Hessen- Rothenburg as compensation for Rhenish territory absorbed by Prussia. The title of "duke of Ratibor" was revived for his suc- cessor in 1840.

RATIONALISM. In modern usage the term " rational- ism" is employed almost exclusively to denote a theological tendency, method, or system, and is then applied in a narrower and a wider sense. In its wider sense, which is most common in English theological literature, it is the name of that mode of thought generally which finds the final test of religious truth in the human understanding, conscience, or reason, and particularly in the understanding. In its narrower sense, which is almost the only sense it bears in Germany, it denotes a definite school, or rather phase of theological thought, and a phase of thought which has now been outlived. It is with rationalism in this limited sense and as a tendency of German theological thought that this article deals. Rationalism had as its antitheses on the one hand supernaturalism, and on the other naturalism or simple deism, The matter of the contention between the rationalists and these two classes of opponents was supernatural revelation—its necessity, its existence, its possibility. The naturalists denied revela- tion altogether ;

the supernaturalists maintained the fact of a supernatural revelation, possessing an authority above "reason," though capable of being proved by "reason." The rationalists did not deny the fact of a revelation, though in the end they ignored it and claimed the right to submit every supposed revelation to the judgment of the "reason" or the moral sense. The rationalists themselves are, however, divided by some German writers into two classes—relative and absolute—those who hold that the matter of revelation is identical with the truths of reason, but admit that of necessity, or as a matter of fact, re- velation anticipated reason, and those who really call in question the fact of a revelation, without going quite the length of the naturalists in the rejection of Christianity. Kant drew a distinction between the "rationalist" and the "pure rationalist," defining the former as one who maintains that natural religion alone is essential, and the latter as one who admits the fact of a supernatural revelation but denies that it is a part of religion to know and accept it.

German rationalism was a specific theological form of the general intellectual movement of the last century known as "illuminism" or Aufkldrung; but, while the illu- minati generally ended in rejecting Christianity, the ration- alists retained and defended it in a form approved by the logical understanding or the moral sense. While ration- alism, as a child of the general intellectual movement of the age in which it appeared, owed much to the philosophy, science, and humanism of the intellectual life of Europe, as a specially theological tendency it was powerfully influ- enced by English deistical writings. Both Lechler and Ritschl assign to these writings a great immediate effect on the development of German rationalism. Of German thinkers it was especially the philosopher Wolff—who threw into a compact and systematic form, suited for Ger- man students, the philosophy of Leibnitz —who initiated German theologians into the rationalistic habit and method, though Wolff himself was a supernaturalist. The condition of the German church and the state of theology also con- tributed to the creation of rationalism, The hard intellect- ual orthodoxy of Lutheranism had already done its part towards producing the pietistic movement, and, while pietism helped to free men's minds from bondage to the Lutheran creeds and once more directed attention to the

Bible, the cold intellectual habit of orthodoxy nurtured the same habit of rationalism while it failed to satisfy it, and so created a reaction against itself. Thus both orthodoxy and pietism were agents in calling forth rationalism, which was to prove the most dangerous opponent to both. More than one of the foremost rationalists had passed through the school of pietism.

Regarding rationalism as the opponent of supernatural- ism and naturalism, and as an opponent which appealed in the conflict almost exclusively to either the logical under- standing or the moral sense as the criterion of religious truth, it may be said to have existed in Germany for nearly a century (c. 1740-1836), and to have flourished about half that length of time (c. 1760-1810),—that is, it took its rise simultaneously with the publication of Wolff's writ- ings (1736-50) and the translation into German of the works of the English deists (Tindal's Christianity as Old as the Creation was translated in 1741), displayed its greatest strength in Semler's critical works (1760-73) and in Kant's philosophy (1781-93), began then to decline gradually under the influence of the works of Herder, Jacobi, Fichte (in his later period), and Hegel, and at last died out when Schleiermacher especially, in the department of theology proper, and Baur and Strauss, amongst others, in the de- partment of Biblical criticism, had given currency to ideas and issues which rendered its main contentions objectless and its criteria of religious truth invalid.

The English deists, the German illuminati, and the French philosophers had before the middle of the last century, with a vast array of argument, called in question the idea of a supernatural revelation, and had seriously attacked the supernatural origin of the Hebrew and Chris- tian Scriptures. Christian Wolff undertook the defence, and claimed to have demonstrated the supernatural reve- lation of the Bible. He made the old distinction between natural and revealed religion of fundamental importance, and maintained that demonstrable truths alone can be re- garded as part of natural religion. Revealed religion he drew solely from the Scriptures, and sought to prove by a chain of reasoning and historical evidence their divine ori- gin. Thus in reality the intellect alone was

constituted the faculty for ultimately determining the truth of revelation as well as for constructing a natural religion. The general adoption of the distinction between natural and revealed religion, of the appeal to logical and historical evidence and argument for proof of the truths of both, and of the supposition that the truths of natural religion could be demonstrated while those of revealed religion were above, if not contrary to reason, and rested solely on the authority of Scripture, naturally divided theologians into two hostile camps, and proved, contrary to Wolff's expectations, more favourable to the naturalists and rationalists than to the supernaturalists. If it was admitted by all that the appeal in the contention was to be to the understanding, and the religious nature and higher reason were left out of account, and if, moreover, the truths of natural religion —God, duty, immortality—were supposed by all to be demonstrable, supernatural revelation was certain in that age to be put to great disadvantage. The result of Wolff's philosophy was a natural theology, a utilitarian system of morals, without any religious fervour or Christian pro- fundity. Wolff's philosophy thus inaugurated in Germany a theological period corresponding, in its way, with the period in England between 1688 and 1750, when "Chris- tianity appeared to be made for nothing but to be 'proved,'" and the only test to be applied was "reason," which was simply the philosophy in vogue. In both cases religion was regarded as substantially a set of doctrines, revelation as the publication of them, and God as teaching them after the most anthropomorphic manner. No profound concep-

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tion had been formed of either religion or revelation, and none at all of their relation to each other, while the idea of God was simply that of the deists.

It was in the application of its principles and method (thus brought into vogue) to Biblical studies that rational- ism won its greatest triumphs, and really accomplished its greatest measure of good work. Johann Salomo Semler (1725-1791), the father of modern Biblical criticism, as the Germans call him, was the greatest representative of the school in this

department. A pietist by education, with something of Gottfried Arnold's liking for heretics and all his dislike of ecclesiasticism, but with none of Arnold's mysticism, a man of immense learning, without any clear and systematic management of it, he was the first German to apply the strict principles of historical criticism, in conjunction with the rationalistic truths and errors of his day, to the study of the Scriptures and ecclesi-astical history, particularly the history of doctrines. He assailed with all the wealth of his learning the traditional view of the limits and authority of the Biblical canon especially, and having, as he held, demonstrated its human origin and fallibility, he proceeded to deal freely with the books composing it, as sharing the failings common to everything human. He found the Scriptures pervaded with "local ideas," and his Christianity was really limited to the "natural religion" of the deists and the moral truths taught by Christ. Asa man who had been under a pietistic training, he was, it is true, unwilling to refer to the understanding alone for evidence of the truths of Christianity, but his enlargement of the test is confined to the admission of an appeal to the measure of virtue and happiness produced. By this extended test he tries the matter of the Scriptures, assigning to his category of local ideas " whatever is not adapted to make men wise unto their true advantage." The supernatural origin of the Scriptures as writings and most of the miracles recorded in them he rejected; but, on the other hand, he was a vigorous opponent of the adversaries of Christianity and of the naturalists who denied revelation altogether, —Reim-

arus, for instance, the author of the Wolfenbiittel /rag-

mente, Other decided rationalists contemporaneous with Semler were Teller (1734-1804), Eberhard (1739-1809), and Steinbart (1738-1809), who all agreed in confounding religion with morality, and in reducing Christianity to a popularization of utilitarian morals.

Meanwhile the profounder spirits of the nation—Lessing, Herder, Hamann, and others—were conceiving truer ideas of the nature of religion, of the human conditions of revela- tion, and of the character of the Bible and the mission of Christianity. It was, however, Kant who produced the greatest immediate effect on the history of rationalism.

Himself a rationalist, regarding religion only as a form of morality, and revelation as at most a possible aid to the earlier propagation of moral principles, he nevertheless started doubts and ideas which sealed the doom of rational- ism in its first shallow form. There was an end of the demonstrable natural religion of Wolff when once Kant's criticism of the proofs of the existence of God and of the immortality of the soul met with even partial acceptance. The breath of lofty mysticism which inspired his grand ethical system was also fatal to the cold shallow reasoning and commonplace utilitarianism of previous rationalists. Yet, though Kant proclaimed principles which compelled rationalism to assume other positions, and which really contained within them the seeds of its destruction, he re- mained himself a rationalist, for the reason especially that he never advanced to a profound conception of the nature of either religion or revelation and the conditions and relations of both. His fruitful idea of the relation of revelation to a community rather than to an individual

he was unable to apply properly to the revelation contained in the Bible. Though his morality was something infinitely beyond 18th-century utilitarianism, it still constituted for him religion, and the only test he applied to a professed revelation was that it must contain the purest moral teach- ing. Fichte, accepting Kant's ethical principles, taught that a revelation—that is, proclamation of God as the moral lawgiver of the world—might be a necessity in the case of a degeneration of mankind to such an extent that the idea of goodness should be lost. On the other hand, Fries and Jacobi took up the position of Kant regarding the limitations of human knowledge of religious truth, and still further prepared for the advance beyond rationalism by claiming for man a special religious faculty, under the names of fazth, feeling, or a sense of the infinite. Fichte, in his later period, made an advance in the same direction, abandoning the abstract ethical position of Kant by an appeal to love as the supreme principle in God and man. He thus reached a position more suited for the apprelien- sion of the nature of religion, and he recognized in the workings of genius—with its incomprehensible light and movements—manifestations analogous to the phenomena of

revelation. Meantime, the rationalists amongst theo- logians continued their work of reducing the Bible, with its history, miracles, and doctrines, by one means or another, into harmony with their notions of a rational and useful moral revelation, though for the most part they did not acknowledge the claims of the Old Testament to be considered a revelation at all, or at most a revelation for the childhood of the race. The accounts of miracles in the Bible were either denied or explained away as natural occurrences, or as poetical and Oriental phraseology, while the doctrines of the Bible and the creeds were diluted into religious or moral commonplaces. As representative Bibli- cal scholars of this class J. G. Eichhorn (1752-1827) and H. E. G. Paulus may be mentioned, as representative theologians Henke (1752-1809), Wegscheider (1771-1849), and Rohr (1752-1848).

But early in the new century the triumph of a profounder philosophy of religion and of a worthier treatment of re- ligious systems and the records of revelation began rapidly to make itself felt. Schleiermacher once more carried religion from the confined and frigid regions of the under- standing and the distant heights of abstract morals into the vaster and yet nearer, warmer and yet clearer, world of feeling. Following Herder, he annihilated the rational- istic distinction between natural and revealed religion by claiming revelation for all religion and religions, and he mediated in the fruitless contention of rationalism versus supernaturalism by vindicating a supernatural element for the religious life and Christianity, while at the same time he justified rationalism in its rejection of any infraction of the laws of nature. He put an end to the conception of revelation as the communication of doctrine by sub- stituting for it the, at all events, profounder and truer view that it consists in a fundamental affection of the whole religious nature, giving it a new and special direction, the organs of it being historical personalities endowed with supreme religious genius. Hegel and Schelling contributed in other ways, particularly by substituting another idea of God and nature, to the decay of rationalism. Amongst Biblical critics De Wette, under the influence of Herder's poetic insight into early literatures and of Fries's religious philosophy, contributed largely to a truer appreciation of the Bible as literature and the record of revelation than such scholars as Eichhorn and Paulus had attained to. In the year 1828 Dr Pusey could inform

English theolo- gians that the school had had its day, and early in the third decade of the century Hase was able to sum up the work of the school, which was then practically defunct,

though some of its ablest representatives continued for some years to defend its positions. Hase's summary is, that rationalism failed to recognize the historical forces that condition all religious life and progress; that it necessarily issued in a barren religion of the intellect ; that in the last instance it drew its decisions, not from the depths of the soul, but from a shallow popular philosophy which overlooked the rights of religious feeling ; that on that account it kept its God of the outward universe as far removed from men's hearts and lives as possible ; but that, nevertheless, it was through it especially that a breach between modern culture and the church was avoided and the banner of free inquiry was kept waving. Even men as far removed from rationalism as Tholuck, Dorner, Ritschl, and Alexander Schweizer acknowledge that it was a means, however imperfect, of effectually upholding in the church the great principle that religious truth has an intimate affinity to man's nature and must be freely examined and intelligently appropriated. Tholuck pro- nounces it not an outward skin disease in the history of Protestantism, but an integral part of that history and a phase of its development, in some respects abnormal, in others normal and natural.

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the Histories of Protestant theology by Frank, Dorner, and Gass. (J. F. 8.)

RATISBON (German Regensburg), an ancient city of Bavaria, the seat of a bishop, and the capital of the Upper Palatinate, is pleasantly situated on the right bank of the Danube, opposite the influx of the Regen, from which it derives its German name. It lies almost exactly in the centre of the kingdom, about 65 miles to the north-east of Munich and 53 miles to the south-east of Nuremberg. On the other side of the river is the small town of Stadt-am- Hof, connected with Ratisbon by a long stone bridge of the 12th century, above and below which are the islands of the Obere and Untere Worth. In external appearance Ratisbon is quaint and romantic, presenting almost as faithful a picture of a town of the early Middle Ages as Nuremberg does of the later. Most of the streets are narrow and irregular, but spacious promenades have been laid out on the site of the old fortifications. One of the most characteristic features in its architecture is the number of strong loopholed towers attached to the more ancient dwellings, recalling a day when civic broils were of frequent recurrence. The interesting "street of the ambassadors" is so called because it contained the resi- dences of most of the ambassadors to the German diet, whose coats-of-arms may still be seen on many of the houses.

The cathedral of Ratisbon, though small in size, is a very interesting example of pure German Gothic, diverg- ing in several points from the type elaborated in France. It was founded in 1275 and completed in 1634, with the exception of the towers, which were added during a recent restoration. The details are very harmonious and pleasing, and the interior contains numerous interesting monuments, including one of Peter Vischer's masterpieces. Adjoining the cloisters are two chapels of earlier date than the cathe- dral itself, one of which, known as the "old cathedral," goes back perhaps to the 8th century. The Schotten-

kirche, a plain Romanesque basilica of the 12th century, derives its name from the monastery of Irish Benedictines ("'Scoti") to which it was attached; the principal door- way is covered with very singular grotesque

carvings, the meaning of which remains a mystery. The old parish church of St Ulrich is a good example of the Transition

Ratisbon.

1. Cathedral.

2. Schottenkirche. style of the 13th century. Other specimens of the Romanesque basilica style are the church of Obermiinster, dating from 1010, and the abbey church of St Emmeran, built in the 13th century and remarkable as one of the few German churches with a detached belfry. The beau- tiful cloisters of the ancient abbey, one of the oldest in Germany, are still in fair preservation. In 1809 the conventual buildings were converted into a palace for the prince of Thurn and Taxis, hereditary postmaster-general of the old German empire. The town-house, a somewhat gloomy pile, dating in part from the 14th century, contains the rooms occupied by the imperial diet of Germany from 1663 to 1806. An historical interest also attaches to the Golden Cross Inn, where Charles V. made the acquaintance of the fair Barbara Blumberger, the mother of Don John of Austria (b. 1547). The promenade is adorned with a bust of Kepler, who died at Ratisbon in 1630. Perhaps the most pleasing modern building in the city is the Gothic villa of the king of Bavaria on the bank of the Danube. Among the chief manufactures of Ratisbon are iron and steel wares, pottery, parquet flooring, and lead pencils. Boat-building is also prosecuted, and a brisk transit trade is carried on in salt, grain, and timber. In 1880 the town contained 34,516 inhabitants, of whom 27,844 were Roman Catholics, 5995 Protestants, and 675 Jews. Stadt-am- Hof, which practically forms a suburb of Ratisbon, con- tained 3392 inhabitants.

Near Ratisbon are two very handsome classical buildings erected by Louis I. of Bavaria, with the aid of the architect Klenze, as national monuments of German patriotism and greatness. The more imposing of the two is the Walhalla, a costly reproduction of the Parthenon, erected as a Teutonic ge of fame on a hill rising from the Danube at Donaustauf, 6 miles to the east. The massive substructions of the temple somewhat dwarf the building itself when seen from a distance, and the choice of a classic model for a German Pantheon seems somewhat incongruous, but after

these deductions are made it still remains a magnificent and imposing structure. The interior, which is as rich as coloured marbles, gilding, and sculptures can make it, contains the busts of more than a hundred German worthies. The second of King Louis's buildings is the Befreiungshalle at Kelheim, 14 miles above Ratisbon, a large circular building, which has for its aim the glorification of the heroes of the war of liberation in 1813.

8. St Emmeran's Church. 4. Thurn and Taxis Palace.

5. Town-house. 6. Golden Cross Inn.

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The early Celtic settlement of Radespona was chosen by the Romans, who named it Castra Regina, as the centre of their power on the upper Danube, and it soon attained considerable importance. It afterwards became the seat of the dukes of Bavaria and one of the main bulwarks of the East Frankish monarchy ; and it was also the focus from whieh Christianity spread over southern Germany. St Emmeran founded an abbey here in the middle of the 7th century, and St Boniface established the bishop- ric abont a hundred years later. Ratisbon acquired the freedom of the empire in the 13th century and was for a time the most flourishing city in southern Germany. It became the chief seat of the trade with India and the Levant, and the boatmen of Ratisbon are frequently heard of as expediting the journeys of the crusaders. The city was loyally Ghibelline in its sympathies and was a favourite residence of the German emperors. Numerous diets were held here from time to time, and after 1663 it became the regular place of meeting of the German diet. The Reforma- tion found only temporary acceptance at Ratisbon and was met by a counter-reformation inspired by the Jesuits. Before this period the city had almost wholly lost its commercial importance, owing to the changes in the great highways of trade. Ratisbon had its due share in the Thirty Years' and other wars, and is said to have suffered in all no fewer than seventeen sieges. In 1807 the town and bishopric were assigned to the prince primate Dalberg and in 1810 they were ceded to Bavaria. After the battle of Eggmiih] (1809) the Austrians retired upon Ratisbon, and

the pursuing French defeated them again beneath its walls and reduced great part of the city to ashes.

RATLAM or Rurzam, a native state of India, in the Western Malwa Agency (Central India Agency), lying be- tween 23° 2' and 23° 36' N. lat. and_74° 42' and 75° 17' E. long., with an area of 729 square miles, and a popula- tion (1881) of 87,314 (males 45,779, females 41,535),— Hindus numbering 54,034, Mohammedans 9913, Jains 6038, Christians 19, and aboriginals 17,297. Its revenue from all sources in 1881-82 was estimated at £130,000. The Nimach State Railway connecting Indore with Nimach and Nasirabad passes by Ratlam town. This town, which is one of the principal seats of the opium trade of Malwa, is superior to most cities in Indore, and has good bazaars. Its population in 1881 amounted to 31,066 (16,544 males and 14,522 females).

Ratlam state is held as tributary to Sindhia; but in 1819 an arrangement was made by which the raja agreed to pay an annual tribute amounting to about £6600, while Sindhia engaged never to send any troops into the country or to interfere with the in- ternal administration. This tribute was assigned by the treaty of 1844 between the British Government and Sindhia in part

payment of the Gwalior contingent. It is now paid to the British Government.

RATNAGIRI or Rurnacuerry, a British district of India, in the Konkan division of the Bombay presidency, with an area of 3922 square miles. It lies between 15° 40' and 18° 5'N. lat. and 73° 5' and 73° 55' E. long., and is bounded on the N. by the Savitri river, separating it from the Janjira Agency, and by Kolaba district ; on the E. by the Western Ghats, dividing it from the districts of Satara and Belgaum and the native state of Kolhapur ; on the §., where it is reduced to a strip of sea-coast not more than 4 miles wide, by the Portuguese possessions of Goa; and on the W. by the Arabian Sea. The district forms a belt between the Ghats and the sea, and its general character is rocky and rugged; nearly all the fertile land lies on the banks of the streams which intersect the country. 'The coast, about 150 miles in length, is almost uniformly rocky and dangerous. At intervals of about 10 miles a river or bay opens, sufficiently

large to form a secure harbour for native craft, and the promontories at the river-mouths are almost invariably crowned with the ruins of an old fort. The rivers and creeks are generally navigable for about 20 miles, and afford great facilities for a coasting trade. The denudation of the forests has apparently tended to promote deposits of silt; but active measures have of late been taken to preserve and extend the forest area. 'Tigers, leopards, bears, bison, wild boar, sambhar deer, and hyenas are found in the forests on the

slopes and near the foot of the Sahyadri Hills. At the beginning of British rule there were no roads, and traffic was confined to places where there was water carriage; but a network of roads has now been made, and the open- ing of the Ghat roads to cart traffic has revolutionized the trade and concentrated it at Chiplun, Rajapur, and Vengurla, which form the gates of a considerable traffic to and from the Deccan. The exports are salt fish, shell- lime, and cocoa-nuts, and the imports comprise food grains, molasses, tobacco, chillies, ground nuts, turmeric, ghi, blankets, piece goods, and iron. The mean temper- ature, as registered at Ratnagiri station, is 78°°6, and the average annual rainfall is 103°58 inches.

In 1881 the population of Ratnagiri distriet was 997,090 (473,058 males and 524,037 females),—Hindus numbering 921,046, Moham- medaus 71,051, and Christians 3275. The district contains three towns with a population exceeding 10,000,—RATNAGIRI (see be- low), Malwan (15,565), and Chiplnn (12,065). Since it came under British rule the number of inhabitants has increased threefold ; all the land is occupied, and the population is greater than the land can feed. Food has in consequence to be imported, and the condition of the people would be deplorable were it not their custom to move in large numbers to Bombay in search of employment, where they earn good wages and return to spend it in their homes. The chief crops are grain and rice. The extent of arable land is small, but on the whole cultivation is good. Of 1,117,686 acres under actual cultivation in 1883-84, of which 38,865 were twice cropped, cereals occupied 1,020,583 and pulses 41,733 acres. There are no manufactures of any importance ; but the school of industry at

Ratnagiri possesses steam saw-mills, and undertakes wood and iron work ofall descriptions. The revenue of the district in 1883-84 amounted to £126,596, of which the land-tax contributed £91,429.

Ratnagiri formed part of the dominions of the peshwa, and was annexed by the British Government in 1818 on the overthrow of Baji Rao.

RATNAGIRI or RurnacuHerry, chief town of the above district, is situated on the Konkan coast in 16° 59' N. lat. and 73° 19' E. long., 136 miles south by east of Bombay. A leading industry connected with the town is the sardine fishery, which usually takes place in January and February, and engages fleets of canoes. A single net-caster will fill his canoe in the course of a morning. The lighthouse was erected in 1867; its light, visible 18 miles distant, is 250 feet above high water. The population of the town in 1881 numbered 12,616 (males 6418, females 6198).

RATRAMNUS, a theological controversialist of some mark, who flourished in the 9th century, was a monk of the Benedictine abbey of Corbie near Amiens, but beyond this fact almost nothing of his personal history has been preserved. He is now best known by his treatise on the Eucharist (De corpore et sanguine Domini liber), in which he controverted the doctrine of transubstantiation as taught ina similar work by his contemporary Radbertus Paschasius (see above, p. 210). In the controversy about election, when appealed to by Charles the Bald, he wrote two books De predestinatione Dei, in which he maintained the doctrine of a twofold predestination, nor did the fate of Gottschalk deter him from supporting the view of that un- fortunate theologian against Hincmar as to the orthodoxy of the expression "trina Deitas." Ratramnus perhaps won most glory in his own day by his Contra Grecorum opposita, in four books (868), a much valued contribution to the controversy between the Eastern and Western Churches which had been raised by the publication of the encyclical letter of Photius in 867.

RATTAN. See Caner and Pam.

RATTAZZI, Urpano (1808-1873), Italian statesman, was born on 29th June 1808 at Alessandria, and from 1838 practised with great success at the bar. In 1848 he was sent to the chamber of deputies in Turin as

representative of his native town. By his debating powers he contributed to the defeat of the Balbo ministry, and for a short time held the portfolio of minister of public instruction ; after-

wards, under Gioberti, he became minister of the interior, and on the retirement of the last-named in 1849 he be- came practically the head of the Government. The defeat at Novara compelled the resignation of Rattazzi in March 1849. His election as president of the chamber in 1852 was one of the earliest results of the so-called " connubio " with Cavour, and having become minister of justice in 1853 he in that and the next following years was able to carry a number of measures of reform of considerable importance, including that for the suppression of certain of the monastic orders. During a momentary reaction of public opinion he resigned office in 1858, but again entered the cabinet under La Marmora in 1859 as minister of the interior. In consequence of the cession of Nice and Savoy he again retired in January 1860. He was entrusted with the formation of a new ministry in March 1862, but in consequence of his policy of repression towards Garibaldi was driven from office in the following December. He was again prime minister in 1867, from April to October. His death took place at Frosinone on 5th June 1873. (See Iraty, vol. xiii. p. 488 sg.

RATTLESNAKE. Rattlesnakes are a small group of the family of Pit-vipers (Crotalidx), characterized by a tail which terminates in a chain of horny, loosely con- nected rings, the so-called "rattle." The "pit" by which the family is distinguished from the ordinary vipers is a deep depression in the integument of the sides of the snout, between the nostrils and the eye; its physiological function is unknown. The rattle is a complicated and highly specialized organ, developed from the simple conical seale or epidermal spine, which in the majority of snakes forms the termination of the general integument of the tail. The bone by which the root of the rattle is supported consists of the last caudal vertebrae, from three to eight in number, which are enlarged, dilated, compressed, and coalesced (fig. 1, a). This bone is covered with thick and

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Rattle of Rattlesnake (after Czermak).

Fig. 1.—Caudal vertebre, the last coalesced ina single bone a. Fig. 2.—End of tail (rattle removed); a, cuticular matrix covering terminal bone. Fig. 8.—Side view of a rattle; cand d the oldest, aand 6 the youngest joints. Fig. 4.—A rattle with joints disconnected ; « fits into b and is covered by it; 2 into d in like manner.

vascular cutis, transversely divided by two constrictions into three portions, of which the proximal is larger than the median, and the median much larger than the distal (fig. 2, a). This cuticular portion constitutes the matrix of a horny epidermoid covering which closely fits the shape of the underlying soft part and which is the first commencement of the rattle, as it appears in very young rattlesnakes before they have shed their skin for the first time. When the period of a renewal of the skin approaches anew covering of the extremity of the tail is formed below the old one, but the latter, instead of being cast off with the remainder of the epidermis, is retained by the posterior swelling of the end of the tail, forming now the first loose joint of the rattle. This process is repeated on succeeding

exuviations,—the new joints being always larger than the old ones as long as the snake grows (fig. 3). Perfect rattles therefore taper towards the point, but generally the oldest (terminal) joints wear away in time and are lost. As rattlesnakes shed their skins more than once every year, the number of joints of the rattle does not indicate the age of the animal but the number of exuvia- tions which it has undergone. The largest rattle in the British Museum has twenty-one joints. The rattle (fig. 4) consists thus of a variable number of dry, hard, horny cup-shaped joints, each of which loosely grasps a portion of the preceding, and all of which are capable of being shaken against each other. If the interspaces between the joints are filled with water, as often happens in wet weather, no noise can be

produced. The motor power lies in the lateral muscles of the tail, by which a vibratory motion is communicated to the rattle, the noise produced being similar to that of a weak child's rattle and percep- tible at a distance of from 10 to 20 yards.

The habit of violently and rapidly agitating the tail is by no means peculiar to the rattlesnake, but has been observed in other venomous as well as innocuous snakes with the ordinary termination of the tail, when under the influence of fear or anger. The special object for which the rattle has been developed in these snakes is unknown.

Rattlesnakes are entirely confined to the New World. North-American authors distinguish now a great number of different kinds, the most recent, Garman (/eptiles and Batrachians of North America, 1883, 4to), enumerating twelve distinct species and thirteen additional varieties ; but all these species or varieties fall into two groups, viz., one which has the upper side of the head covered with the ordinary nine dermal shields, and the other in which the shields between and behind the eyes are broken up or replaced by small scales. The former group consists of two species only, of comparatively small size, both North American, Crotalus miliarius being the more generally known. The second group comprises the more formidable kinds of South as well as North America, which are gener- ally described under the names of C. horridus and C. durissus. In the older standard works the former name was applied to the southern form, which extends from Paraguay and Chili through Brazil into Mexico, and the latter to the common North-American rattlesnake; in modern American works this nomenclature is reversed. C. horridus and C. durissus belong to the most danger- ous of poisonous snakes. If a person bitten by an adult rattlesnake escapes with life, protracted illness and the loss of or injury to the wounded limb are frequently the consequence. They inhabit localities to which the sun has free access, prairies, rough stony ground, &c. Specimens of 5 feet in length are not rare. Formerly common in the eastern parts of the United States, and still so in thinly inhabited districts of the western States, rattlesnakes, like the vipers of Europe, have gradually succumbed to the unceasing persecution of man. They vary much in colour : a common type of coloration is a brownish ground gpiour, sometimes yellowish, sometimes blackish. Series of large

dark spots, frequently edged with yellow, and of very variable shape, run along the back and sides. The head and neck are ornamented with dark or black longitudinal bands, or are marked by an almost uniform coloration.

RAU, Karu Hernricu (1792-1870), German political economist, was born at Erlangen on 23d November 1792. He pursued his studies, devoting himself principally to the (so-called) cameralistic sciences, from 1808 to 1812 at the university of his native place, where he afterwards remained as a privat-docent. In 1814 he obtained the prize offered by the academy of Gottingen for the best treatment

of the question, How the disadvantages arising from the abolition of trade guilds might be removed. His memoir, greatly enlarged, was published in 1816 under the title Ceber das Zunftwesen und die Folgen seiner Aufhebung. He was then favourable to the continued existence of trade corporations on a reformed basis, but afterwards abandoned this view. In the same year appeared his Prime linex histori politices. In 1818 he became professor at Erlan- gen. Hecompeted successfully in 1820 for a prize offered by the academy of Haarlem for the best essay on the causes of poverty ; and in the same year he published a transla- tion, characterized by Roscher as "free, but very good," of Storch's Cours d'Economie Politique, with notes and addi- tions of his own. In 1822 he was called to the chair of political economy at Heidelberg, where the rest of his life was spent, in the main, in teaching and research. He took some part, however, in public affairs: in 1837 he was nominated a member of the first chamber of the duchy of Baden, and did good service in that capacity ; and in 1851 he was one of the commissioners sent to England on the part of the Zollverein to study the Industrial Exhibition. A result of this mission was his account of the agricultural implements exhibited at London (Die landwirthschaftlichen Gertthe der Londoner Ausstellung, 1853). He was elected a corresponding member of the French Institute in 1856. After a useful and honourable career he died at Heidel- berg on 18th March 1870.

His principal work is the Lehrbuch der politisehen Ockonomie (1826-37), an encyclopedia of the economic knowledge of his time, written with a special view to the guidance of practical men. The doctrines are, in the main, those of Smith and Say; but they are treated in an independent manner, and the conclusions of his predecessors are modified, especially by. giving larger scope to the action of the state. The three volumes are respectively occupied with (1) political economy, properly so called, or the theory of wealth, (2) administrative science (Volkswirthschaftspolitik), and (3) finance. The two last he recognizes as necessarily admitting of variations in accordance with the special circumstances of different countries, whilst the first is more akin to the exact sciences, and is in many respects capable of being treated, or at least illustrated, mathematically. This threefold division marks his close relation to the older German cameralistic writers, with whose works he was familiarly acquainted. It isa consequence in part of his conformity to their method and his attention to administrative applications that his treatise was found peculiarly adapted for the use of the official class, and long maintained its position as their special text- book. He was the economic teacher, says Roscher, of the well- governed middle states of Germany from 1815 to 1848. The book has passed through many editions ; in that of 1870 by Adolf Wagner it was transformed into a new book.

In the earlier part of his scientific life Rau tended strongly towards the relative point of view and an historical method in economics. But, though in his great work he kept clear of the exaggeratcd abstraction of the Ricardians and rejected some of

their a priort assumptions, he never joined the historical school. –

To the end he occupied a somewhat indeterminate position with respect to that school ; on the whole, however, he more and more subordinated historical investigation to immediate practical in- terests, and in his economic politics moved in the direction of limiting rather than extending the sphere of state action. His general merits are thoroughness of treatment, accuracy of state- ment, and balance of judgment ; he shows much industry in the collection and skill in the utilization of statistical

facts; and his exposition is orderly and clear. Roscher finds in his earlier works a spirituel charm which disappears in the later.

Besides the publications already mentioned, he was author of the following :—Ueber den Luxus, 1817 ; Ansichten der Staatswirth- schaft mit besonderer Beziehung auf Deutschland, 1820; Malthus und Say tiber die Ursachen der jetzigen Handelsstockung, 1821 ; Grundriss der Kameralwissenschaft oder Wirthsehaftslehre, 1823 ; Ueber die Kameralwissensehaft, Eniwiekelung thres Wesens wnd threr Thetle, 1825; Ueber die Landwirthsehaft der Rheinpfalz, 1830; an academic oration De vi nature in rempublicam, 1831; and Gresehichte des Pfluges, 1845.

Rau founded in 1834 the Arehiv der politisehen Oekonomie wnd Polizetwissenschaft, in which he wrote a number of articles, after- wards issued in separate form: amongst them may be named those on the debt of Baden, on the accession of Baden to the Zollverein, on the crisis of the Zollverein in the summer of 1852, on the American banks, on the new English poor law, on List's national

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system of political economy, and on the minimum size of a peasant property. This enumeration will give an idea of the extent and variety of his researches.

RAUCH, Curistian Dantet (1777-1857), one of the most celebrated sculptors of modern times, was born at Arolsen in the principality of Waldeck on the 2d of January 1777. The opening career of the young artist was attended with considerable difficulty, his parents being poor and unable to place him under efficient masters. His first instructor taught him little else than the art of sculpturing grave-stones, and Professor Ruhl of Cassel could not give him much more. A wider field of improve- ment opened up before him when he removed to Berlin in 1797 ; but poverty still hampered all his efforts. He was obliged to earn a livelihood by becoming a royal lackey, and to reserve the prosecution of

his favourite art for his spare hours. The genius of Rauch, however, soon forced itself into notice and recommended him to several persons of influence who were able to give him assistance. Queen Louisa, surprising him one day in the act of modelling her features in wax, sent him to study at the Academy of Art. Not long afterwards, in 1804, Count Sandrecky gave him the means to complete his education at Rome, where William von Huniboldt, Canova, and Thorwaldsen be- friended him. Under such patronage the young sculptor made rapid progress. Among other works, he executed bas-reliefs of Hippolytus and Pheedra, Mars and Venus wounded by Diomede, and a Child praying. In 1811 Rauch entered upon the eminent part of his career, when he was commissioned to execute a monument for Queen Louisa of Prussia. The statue, representing the queen in a sleeping posture, was placed in a mausoleum in the grounds of Charlottenburg, and procured great fame for the artist. Commissions for portraits came pouring in upon him. The consummate tact with which he seized individual characteristics and the artistic manner in which he treated them at once established his reputation. The erection of nearly all public statues came to be entrusted to him. He began to execute that long series of representa- tions of great Germans in which his genius is exhibited to full advantage. In course of time almost every important town throughout the country possessed a bust of some eminent statesman, patriot, or man of genius from his chisel. There were, among others, Bliicher at Breslau, Maximilian at Munich, Francke at Halle, Diirer at Nurem- berg, Luther at Wittenberg, and the grand-duke Paul Frederick at Schwerin. At length, in 1830, he com- menced, along with Schinkel the architect, the models for a colossal monument at Berlin to Frederick the Great. This work was inaugurated with great pomp in May 1851, and has ever since been regarded as one of the masterpieces of modern sculpture. On a granite pedestal 25 feet in height stands the colossal equestrian statue of the king. His plain pinched features and his grotesque costume are given with historical exactness without impairing the artistic effect. An air of resistless majesty ennobles the mean countenance, and a bold and skilful treatment hides the absurdity of the garb. The excellence of his master- piece was recognized throughout the world. Princes de- corated him with honours. The academies of Europe enrolled him among their members. Especially did his own sovereign and countrymen regard him with proud affection and respect. A statue of Kant for Konigsberg

and a statue of Thaer for Berlin occupied his attention during some of his last years; and he had just finished a model of Moses praying between Aaron and Hur when he was attacked by his last illness. He died.on 3d December

1357.

RAUMER, Friepricu Lupwic Grore von (1781-1873), German historian, was born at Worlitz in Anhalt on 14th

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May 1781. His father (who died in 1822) was much esteemed in Anhalt, where, as "kammerdirector," he did excellent service to agriculture. Raumer was educated at the Joachimsthal Gymnasium,, Berlin, and at the universi- ties of Halle and Gottingen. In 1801 he began to practise as a lawyer in the Brandenburg chamber, and in the follow- ing year he was made assessor. From 1806 to 1808 he was connected with a department of the crown lands chamber at Wusterhausen near Berlin. Having been made a coun- cillor in 1809, he was called in 1810 to a post in the office for the national debt, and soon afterwards received an appointment in the bureau of the chancellor, Hardenberg. He was made a professor at the university of Breslau in 1811, and in 1819 he became professor of political science and history at Berlin. In 1815 he had carried on histori- cal investigations in Venice, and in the two following years he had travelled much in Germany, Switzerland, and Italy. At Berlin he was for some time a member of the Upper Board of Censors and secretary of the Academy of Sciences. The former office he resigned in 1831, the latter in 1847. His professorship at the Berlin university he did not give up until 1853, and even then he did not altogether cease to lecture. In 1848 he was elected a member of the national assembly at Frankfort, where he associated him- self with the right centre; and from Frankfort he was sent on a mission to Paris, At a later period he was a member of the first chamber of the Prussian parliament. He died at Berlin on 14th June 1873. Raumer made many contributions to history, in all of which he embodied the results of independent research and gave evidence of a sound and penetrating judgment. His style is direct, lucid, and vigorous,

and his best books have been as warmly appreciated by ordinary readers as by scholars.

His first work, published anonymously in 1806, was entitled Sechs Dialoge tiber Kricg und Handel. This was followed by Das britische Bestewerungssystem (1810), Handbueh merkwiirdiger Stellen aus den lateinisechen Gesehichtschreibern des AMMittelulters (1818), Herbstreise nach Venedig (1816), and other books. His most famous works are Geschichte der Hohenstaufen und threr Zeit (1823-25) and Gesehichte Europas seit dem Ende des 15ten Jahrhunderts (1832-50). In 1831 appeared Briefe aus Paris und Frankreich im Jahre 1830 and Briefe aus Paris zur Erléuterung der Geschichte des 16ten und 17ten Jahrhunderts. He went to England in 1835, to Italy in 18389, and to America in 1848, and these visits led to the publication of various works—England in 1835 (1836), Bettrdge zur neuern Gre- sehiechte aus dem Britischen Museum und Reichsarchive (1836-39), Italien, Beitrdége zur Kenntniss dieses Landes (1840), Die Vereinigten Staaten von Nordamerika (1845). Among his later books may be men- tioned Antiquarisehe Briefe (1851), Historisch-politische Briefe tiber die geselligen Verhdltnisse der Menschen (1860), Lebenserinnerungen und Briefweehsel (1861), and Handbuch zur Geschichte der Literatur (1864-66). In 1830 Raumer began the Historisehes Taschenbueh published by Brockhaus, which from 1871 was continued by Riehl.

RAUPACH, Ernst BensamMin Satomo (1784-1852), German dramatic writer, was born on the 21st of April 1784 at Straupitz, a village near Liegnitz in Silesia. He attended the gymnasium at Liegnitz and afterwards studied theology at Halle. He spent a good many years in Russia as a teacher, and in 1816 was made a professor in the university of St Petersburg. In 1822 he left Russia, and after travelling for some time in Italy settled as a writer for the stage in Berlin, where he remained during the rest of his life. He died at Berlin on the 18th of March 1852.

Raupach was not a man of imaginative genius, but he had re- markable skill in the invention of effective dramatic situations, and was master of a vigorous rhetorieal style. These qualities secured for hima prominent place among the most popular dramatic writers of his day. Ie wrote both

tragedies and comedies, and was the author of a series of dramas represcnting the great events of the

age of the Hohenstaufen. See P. Raupach, Raupach, eine biographische Skizze (1853).

RAVAILLAGC, Francois (1578-1610), the assassin of Henry IV. of France, was born near Angouléme in 1578. He was of humble origin, and began life as a valet de

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teacher of a school. He was not able, however, to keep clear of debt, and after having been imprisoned for some time by his creditors he sought admission to the recently founded order of Feuillants, but after a short probation was dis- missed as a visionary. An application for admission to the Society of Jesus was equally unsuccessful in 1606. His various disappointments tended to foster a violently fanatical temperament, and widely-spread rumours that the king was intending to make war upon the pope sug- gested to him the idea of assassination, which he deliber- ately and successfully carried out on 14th May 1610. In the course of his trial he was frequently put to the torture, but persistently (and it is now believed truly) denied that he had been prompted by any one or had any accomplices. Sentence of death was carried out with revolting barbarity on 27th May.

RAVEN (Anglo-Saxon Hrafn, Icelandic Hrafn, Danish Ravn, Dutch Raaf, German abe), the largest of the Birds of the Order Pusseves; and, as already shewn (OrnI- THOLOGY, vol, xviii. p. 49), probably the most highly developed of all Birds.

Quick-sighted, sagacious, and bold, it must have followed the prehistoric fisher and hunter, and generally without niolestation from them, to prey on the refuse of their spoils, just as it now waits, with the same intent, on the movements of their successors ; while it must have likewise attended the earliest herdsmen, who could not have regarded it with equal indifference, since its now notorious eharacter for attacking and putting to death a weakly animal was doubtless in those days manifested. Yet the

Raven is no mere dependant upon man, being always able to get a living for itself ; and moreover a sentiment of veneration or superstition has from very remote ages and among many races of men attached to it—a sentiment so strong as often to overcome the feeling of distrust not to say of hatred which its deeds inspired, and, though rapidly decreas- ing, even to survive in some places until the present day. There is no need to dwell on the association of this bird with well-known characters of history sacred or profane—Noah or Elijah, Odin or Flokki, the last of whom by its means diseovered Iceland. The Raven is even said to have played its part in the mythology of the Red Indian ; and none can wonder that all this should be so, since, wherever it occurs and more especially wherever it is numerous, as in ancient times and in thinly peopled countries it must have been, its size, appearance, and fearless habits would be sure to attract especial attention. Nor has this attention wholly ceased with the advance of enlightenment, for both in prose and verse, from the time of Shakespeare to that of Poe and Dickens, the Raven has often figured, and generally without the amount of misrepresenta- tion which is the fate of most animals which celebrated writers condescend to notice. Notwithstanding all this, however, the Raven has now fallen upon evil days. The superstitious reverence with which it was once regarded has all but vanished and has been very generally succeeded by persecution, which in many districts has produced actual extirpation, so that it is threatened with ex- tinction, save in the wildest and most unpeopled districts.!

The Raven breeds very early in the year, in England resorting to its nest, which is usually an ancient 1f not an ancestral structure, about the middle or towards the end of January. Therein are laid from five to seven eggs of the common Corvine coloration (see Crow, vol. vi. pp. 617, 618), and the young are hatched before the end of February. In more northern countries the breeding-season is naturally delayed, but everywhere this species is almost if not quite the earliest of birds to enter upon the business

1 That all lovers of nature should take what steps they ean to arrest this sad fate is a belief whieh the present writer fully holds. With- out attempting to deny the loss which in some eases is inflicted upon the

rearers of eattle by Ravens, it is an enormous mistake to suppose that the neighbourhood of a pair of these birds is invariably detri- mental. On this point he ean speak from experienee. For many years he had an intimate knowledge of a pair oceupying an inland locality surrounded by valuable floeks of sheep, and abounding in rabbits and game, and had ample opportunities, whieh he never negleeted, of repeatedly examining the pellets of bones and exuvie that these, like all other earnivorous birds, east up. He thus found that this pair of Ravens fed almost exelusively on moles. Soon after he moved from the neighbourhood in whieh they lived the unreasoning zeal of a gamekeeper (against, it is believed, the orders of his master) put an end to this interesting eouple—the last of their species which

chambre, but afterwards became a petty solicitor and also | mhabited the eounty.

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of perpetuating its kind. The Raven measures about 26 inches in length, and has an expanse of wing considerably exceeding a yard. Its bill and feet are black, and the same may be said of its whole plumage, but the feathers of the upper parts as well as of the breast are very glossy, re- flecting a bright purple or steel-blue.! The species inhabits the whole of Europe, and the northern if not the central parts of Asia; but in the latter continent its southern range is not well determined. In America? it is, or used to be, found from the shores of the Polar Sea to Guatemala if not to Honduras, but is said hardly to be found of late years in the eastern part of the United States. In Africa its place is taken by three allied but well- differentiated species, two of which (Corvus umbrinus, readily distin- guished by its brown neck, and C. affinis,3 having its superior nasal bristles upturned vertically) also occur in South-Western Asia, while the third (C. leptonyx or C. tingitanus, a smaller species characterized by several slight differences) inhabits Barbary and the Atlantic Islands. Further to the southward in the Ethiopian Region three more species appear, whose plumage is varied with white —C. scapulatus, C. albicollis, and C. crassirostris—the first two of small size, but the last rivalling the real Raven in that respect. (A. N.)

RAVENNA, chief city of an Italian province of the same name, contained 18,571 inhabitants according to the census of 1881. It is situated in the north-east of Italy, in 44° 25’ N, lat. and 12° 12’ E. long., about 4 miles from the Adriatic, with which it is now connected by the Cor- sini Canal, the two small rivers Ronco and Montone no longer serving as means of communication between the city and the sea. A railway, 26 miles long, unites Ravenna with Castel Bolognese on the line from Bologna to Rimini.

Ravenna owes both its great historic importance in the past and its comparative dulness and obscurity in the present to the same cause,—its position in an alluvial plain, formed and continually extended by the deposits brought down by a number of small and rapid streams from the neighbouring Apennines. Any one who glances at a map of the north-western corner of the Adriatic will see at once the general character of the coast,—broad lagunes sometimes stretching far inland; flat alluvial plains intersected by endless dykes; numerous rivers (of which the Po is by far the largest and makes the most conspicuous delta) descending from the Apennines or the Alps; and, outside of all, a barrier of islands which have a continual tendency to become adherent to the shore through the new deposits which are brought down, and thus to be turned from islands into low hills. This de- scription suits Venice nearly as well as it suits Ravenna, and the chief difference between these two great historic cities is that the lagunes of Ravenna are about twenty centuries older than those of Venice.

The one transcendent interest of Ravenna to & modern traveller consists in its churches. No other city in the world offers so many and such striking examples of the ecclesiastical architecture of the centuries from the 4th to the 8th. The style is commonly called Byzantine, and no doubt from the close connexion of Ravenna with Constan- tinople considerable influence was exerted by the latter city on the former ; but some of the most striking features of the churches of Ravenna—the colonnades, the mosaics,

1 Pied examples are not at all uncommon in some localities and wholly white varieties are said to have been seen.

- *American birds have been described as forming a distinct species under the name of Corvus carnivorus or C. cacolotl.*

3 Mr Sharpe (Cat. B. Brit. Museum, iii. p. 45) separates C. affinis as forming a distinct genus Rhinocorax; but it is a hard task on any

reasonable ground to break up the genus Corvus as long accepted by systematists,

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perhaps the cupolas—are not so much Byzantine as repre- sentative of early Christian art generally. It is truly said by Mr Freeman :

"The outside of a Ravennese basilica is an unadorned and un- attractive pile of brick. If it has any architectural grouping or outline about it, it owes it to the campanile which a later age has added. But if the churches of Ravenna are thus unattractive without, they are emphatically all glorious within. The eye dwells with genuine artistic delight on the long unbroken rows of pillars and arches, their marble shafts, their floriated capitals, sometimes the work of the Christian craftsman, sometimes the spoils of heathen- dom pressed into the service of the sanctuary. . . . The whole plan of these buildings allows a great field for void spaces ; but the void spaces thus left are filled up by these wonderful mosaic paint- ings which look down upon usas fresh as they were thirteen hundred years back."

Every traveller to Ravenna is impressed by the vivid- ness of these decorations, which were older when Giotto painted his first fresco than Giotto's frescos are now ; but we can here only allude to the subject, referring the reader to the article Mosaic (vol. xvi. p. 852 sq.).

The following are the most important churches of Ravenna, arranged in the order of the dates generally attributed to them :—

Church. | Builder. Date. } 1. Metropolitan Church, or Ecclesia Ur- USS UGE. coupeenos 370-390 (2) siana, and baptistery adjoining | 2. 8. Giovanni Evangelista …..... Galla Placidia …..... 495 Bete AGN Mme b

iy a see ens sees cc oe (NGeMROMUS |... ces cere cs about 430 4. §. Pier Crysologo (chapel) ..... '§. Peter Chrysologus..| about 450 5, S.Giovanni| Battista, 2.0… ..cc0ses | BadWaris …. cede sso a3 6. SS. Nazario e Celso ….....0…8! Galla Placidia …..... 5 7. S. Pier Maggiore (now S. Francesco)..| Bishop Neon ©) sees about 458 8. 8. Teodoro (now Santo Spirito)—A. ..) Theodoric(?).....| 493-526 9. S. Maria in Cosmodin (Arian bap- Wir A Mose sce " tistery)—A. 10. S. Martino in Coelo Aureo (now S. s 5 Apollinare Nuoyo)}—A. | La SVIGNG Ter… a HecINes sia cima wccecmienr es Julianus Argentarius..} about 530 | 12. S. MarlayWagcione . oc… cece es coun Bishop Ecclesius …. '5 13. 8. Apollinare in Classe…..... Julianus Argentarius..| about 535 (The churches marked A. were originally erected for the Arian worshi p-)

The cathedral (No. 1) has been so much modernized as to have lost its interest; but the baptistery adjoining it, decorated by Bishops Neon and Maximian in the 5th and 6th centuries, an octagonal building with mosaics of the apostles on the roof, is still unspoiled. SS. Nazario e Celso (No. 6) is a little building in the form of a Latin cross, and is better known as the mausoleum of Galla Placidia, whose tomb and those of three emperors, her hus- band, brother, and son, are deposited here. It is surmounted with a cupola surrounded with four semi-domes, on which are depicted figures of the Good Shepherd with His sheep, of evangelists, prophets, &c., and two stags drinking at a fountain. §S. Apollinare Nuovo (No. 10) has above the arches of the nave what is perhaps the greatest triumph of mosaic art, two processions of virgins and of martyrs marching, the former from the city of Classis, the latter from the palace of Theodoric, to the Saviour. In the former group Christ sits upon the lap of His mother, and the Magi are interposed between Him and the procession of virgins. In the latter He is en- throned in glory and guarded by four ministrant angels. S. Vitale (No. 11) is doubly interesting as having furnished the model after which Charles the Great built his impcrial minster at Aix-la-Chapelle and as containing full-length contemporary portraits in mosaic of Justinian and Theodora, surrounded by ecclesiastics, courtiers, and soldiers of the guard. It is surmounted bya dome, is circular in form, and has eight apsidal chapels all round it, ono of which, correspond- ing to the choir in an ordinary church, is prolonged to about four times the length of the other apses.

Unfortunately, only in this choir have the mosaics been preserved, but they are of the highest possible interest. §. Apollinare in Classe (No. 18), once the centre of a busy population of sailors, shopkeepers, and dock-labourers, now stands absolutely alone in a wide and desolate expanse 2 milcs from the sea. The decorations of the church have suffered from damp —thcre are frequently some inches of water on the pavement— but the twenty-four stately marble columns with Corinthian capitals form a magnificent prelude to an apse covered with mosaics, among which is conspicuous a te jewelled cross, symbolizing the Saviour on the Mount of Transfiguration ; Moses and Elias lean forth from the clouds on either side, and in the valley below the apostles wait, represented symbolically as sheep. Many mosaic portraits of bishops of Ravenna are on the walls of the church, and a mosaic picture, representing Constantine Pogonatus and his brothers be- stowing a privilegium on Bishop Reparatus about the year 670.

History.—Strabo mentions a tradition that Ravenna was founded by Thessalians, who afterwards, finding themselves pressed on by

the Etrurians, called in their Umbrian neighbours and eventually departed, leaving the city to their allies. Throughout the valley of the Po the Gauls took the place of the Etrurians as a conquer- ing power; but Ravenna may possibly have retained its Umbrian character until, about the year 191 B.c., by the conquest of the Boii the whole of this region passed definitely under the dominion of Rome. Either as a colonia or a municipium, Ravenna remained for more than two centuries an inconsiderable city of Gallia Cis- alpina, chiefly noticeable as the place to which Cesar during his ten years' cominand in Gaul frequently resorted in order to confer with his friends from Rome. At length under Augustus it suddenly rose into importance, when that emperor selected it as the station for his fieet on "the upper sea." Two hundred and fifty ships, said Dion (in a lost passage quoted by Jordanes), could ride at anchor in its harbour. Strabo, writing probably a few years after Ravenna had been thus selected as a naval arsenal, gives us-a description of its appearance which certainly corresponds more closely with modern Venice than with modern Ravenna. "It is the largest of all the cities built in the lagunes, but entirely com- posed of wooden houses, penetrated in all directions by canals, wherefore bridges and boats are needed for the wayfarer. At the flow of the tide a large part of the sea comes sweeping into it, and thus, while all the muddy deposit of the rivers is swept away, the malaria is at the sane time removed, and by this means the city cnjoys so good a sanitary reputation that the Government has fixed on it as a place for the reception and training of gladiators." On the other hand, good water was proverbially difficult to obtain at Ravenna,—dearer than wine, says Martial, who has two epigrams onthe subject. And Sidonius, writing in the 5th century, com- plains bitterly of the "feculent gruel " (cloacalis puls) which filled the canals of the city, and which gave forth fetid odours when stirred by the poles of the bargemen. The port of Ravenna, situated about 3 miles from the city, was named Classis. A long line of houses called Cesarea connected it with Ravenna, and in process of time there was such a continuous series of buildings that the three towns seemed like one.

The great historical importance of Ravenna begins early in the 5th century, when Honorius, alarmed by the progress of Alaric in the north of Italy, transferred his court to the city in the lagunes. From this date (¢. 402) to the fall of the Western empire in 476 Ravenna was, though not the exclusive, the chief residence of the Roman emperors and the centre of the elaborate machinery of the state. Here Stilicho was slain; here Honorius and his sister Placidia caressed and quarrelled ; here Valentinian III. spent the greater part of his useless life; here Majorian was proclaimed ; here the Little Romulus donned his purple robe ; here in the pine- wood! outside the city his uncle Paulus received his decisive defeat from Odoacer. Through all these changes Ravenna maintained its character as an impregnable "city in the sea," not easily to be attacked even by a naval power on account of the shallowness and devious nature of the channels by which it had to be approached. On becoming supreme ruler of Italy Odoacer, like the emperors who had gone before him, made Ravenna his chief place of residence, and here after thirteen years of kingship he shut himself up when Theodorie the Ostrogoth had invaded Italy and defeated him in two battles. Theodoric's siege of Ravenna lasted for three years (489-492) and was marked by one bloody encounter in the pine-wood on the east of it. The Ostrogoth collected a fleet and established a severe blockade, which at length caused Odoacer to surrender the city. The terms, arranged through the intervention of John, archbishop of Ravenna, were not observed by Theodoric, who, ten days after his entry into the city, slew his rival at a banquet in the palace of the Laurel Grove (15th March 493). tavenna was Theodoric's ehief place of residence, and the thirty- three years of the reign of the great Ostrogoth (493-526) may prob- ably be considered the time of its greatest splendour. 'In the eastern part of the city he built for himsclf a large palace, which probably occupied about a sixth of the space now enclosed within the city walls, or nearly the whole of the rectangle enclosed by Strada di Porta Alberoni on the south, Strada Nuova di Porta Serrata on the west, and the line of the city walls on the north and east. There still remains elose to the first-named street and fronting the Corso Garibaldi a high wall built of square Roman bricks, with pillars and arched recesses in the upper portion, which goes by the name of Palazzo di Teodorico. Freeman, on account of the Romanesque character of the architecture, thinks it probable that it really belongs to the time of the Lombard kings; but at

1 The great pine-wood to the east of the city, which, though injured by an unusually severe winter and threatened by a projected railway, is still one of the great glories of Ravenna, must therefore have been in existence already in the 5th century. Byron's description,

[The] immemorial wood Rooted where once the Adrian wave flowed o'er," is probably true ; but there is no evidence that it was in historic time that this change took place. Our conjecture is that the Pineta grew on a large peninsula somewhat resembling the Lido of Venice.

any rate it is of the very early medieval period, and it marks the spot where part of the Ostrogothie palace once stood. A more memorable and clearly authentic monument of Theodoric is fur- nished by his tomb, a massive mausoleum in the style of the tomb of Hadrian at Rome, which stands still perfect outside the walls near the north-east corner of the city. It is of circular shape and surmounted by an enormous monolith, brought from the quarries of Istria and weighing more than 300 tons. In this mausoleum Theodoric was buried, but his body was cast forth from it, perhaps during the troublous times of the siege of Ravenna by the imperial troops, and the Rotunda (as it is now generally called) was con- verted into a church dedicated to the Virgin.

Nine years after the death of Theodoric Justinian sent an army to Italy, nominally in order to avenge the mnrder of Theodoric's daughter Amalasuntha, but in fact to destroy the Gothic monarchy and restore Italy to the empire. Long after the Goths had lost Rome they still clung to Ravenna, till at length, weary of the feebleness and ill-success of their own king, Vitiges, and struck with admiration of their heroie eonqueror, they offered to transfer their allegiance to Belisarius on eondition of his assuming the diadem of the Western empire. Belisarius dallied with the pro- posal until he had obtained an entrance for himself and his troops within the walls of the eapital, and then threw off the mask and proclaimed his inviolable fidelity to Justinian. Thus in the year 540 was Ravenna re-united to the Roman empire. Its connexion with that empire —or, in other words, its dependence upon Con- stantinople—lasted for more than 200 years, during which period, under the rule of Narses and

his successors the exarchs, Ravenna was the seat of Byzantine dominion in Italy. In 728 the Lombard king Luitprand took the suburb Classis; about 752 the eity itself fell into the hands of his successor Aistulf, from whom a few years after it was wrested by Pippin, king of the Franks. By this time the former splendour of the city had probably in great measure departed ; the alteration of the coast-line and the filling up of the Jagunes which make it now practically an inland city had probably commenced, and no historical importance attaches to its subsequent fortunes. It formed part of the Frankish king's donation to the pope in the middle of the 8th century. It was an independent republic, generally taking the Guelf side in the 13th century, subject to rulers of the house of Polentani in the 14th, Venetian in the 15th (1441), and papal again in the 16th,—Pope Julius II. having succeeded in wresting it from the hands of the Venetians. From this time (1509) down to our own days, except for the inter- ruptions caused by the wars of the Freneh Revolution, Ravenna continued subject to the papal see and was governed by a eardinal legate. In 1859 it was one of the first cities to give its vote in favour of Italian unity, and it has since then formed a part of the kingdom of Italy.

At the beginning of the period thus rapidly sketched Charles the Great visited the city and carried off the brazen statue of Theodorie and the marble columns of his palace to his own new palace at Aix- la-Chapelle. More than five centuries later (1820) Dante became the guest of Guido Novello di Polenta, lord of Ravenna, and here he died on the 14th September of the following year. The marble urn eontaining the body of the poet still rests at Ravenna, where what Byron calls "a little cupola more neat than solemn" has been erected over it. In 1512 the French army under Gaston de Foix fought a fieree battle with the Spanish, Venetian, and papal troops on the banks of the Ronco about 2 miles from Ravenna. The French were victorious, but Gaston fell in the act of pursuing the enemy. His death is commemorated by the Colonna dei Francesi erccted on the spot where he fell. Lord Byron resided at Ravenna for eighteen months in 1820-21, attracted by the charms of the countess Guiccioli.

Literature.—The most important authority for the history of Ravenna is Bishop Aguellus, who wrote about 840, in very bad Latin, the Liber

Pontificalis Ecclesie Ravennatis. It is printed in vol. ii. of Muratori's Rer. Ital. Scriptores, but much tlic best edition is that by Holder-Egger in the Monumenta Germania Historica (1878). Rubeus (Hist. Ravennatwm Libri Decem, Venice, 1599) seems to have had access to some authorities besides Agnellus which are now lost. Ciampini (Vetera Monumenta, 1690-99, and Synopsis Historica, 1693) gives some fair representations of the mosaics, and Quast's Ravenna (Berlin, 1842) is a careful and well-illustrated monograph. Dr Ricci, in a popular guide, Ra- venna et swot Dintorni (1878), has included some of the results of a very careful study of the antiquities of his native city. Professor Freeman's essay The Goths at Ravenna is the best account in English of the city in its historical connexion, and Mr J. A. Symonds in his Sketches in Italy and Greece has gyace- fully touched on its picturesque qualities and literary associations. (T. H.)

RAVENSBURG, an industrial town of Wiirtemberg, is pleasantly situated amid vine-clad hills on the small river Schussen, 12 miles to the north of Friedrichshafen on the Lake of Constance. Its aspect is quaint and medieval, and above its houses rise nine picturesque towers, the most prominent of which, dating from the 15th century, is known as the '" Mehlsack" or sack of flour. The town-house is also a 15th-century building. The industrial products of Ravensburg are varied, includ-

ing linen, cotton, embroidered muslins, pottery, glass, and playing-cards. The fruit market is of considerable im- portance, and trade is also carried on in cattle, grain, and wood. The population in 1880 was 10,550, of whom 2620 were Protestants.

Ravensburg was founded in the 11th century by the Guelfs, one of whose ancestral castles lay on the Veitsberg, to the south of the town. In 1180 the town passed into the hands of the Hohenstaufens, and a century later it became a free town of the empire. Annexcd to Bavaria from 1803 to 1810, it was ceded to Wiirtemberg in the latter year.

RAWAL PINDf or Rawvt Prnves, a district of British India, in the division of the same name,! under the juris- diction of the lieutenant-governor of the Punjab, lying between 33° and 34° N. lat. and 71° 46' and 73° 41' E. long. It is situated on the southern slopes of the north- western extremities of the Himdlayas, and contains large mountain tracts, with rich valleys traversed by many moun- tain torrents. Its area is 4861 square miles; it is bounded on the N. by Hazara district, on the E. by the river Jhelum, on the 8. by Jhelum district, and on the W. by the Indus. From its north-eastern extremity to its western limits the district is traversed by hills more or less linked together, causing those peculiarities of surface and of climate by which it is distinguished. The eastern range, known locally as the Murree (Marri) Hills, from the sana- torium erected at the north-eastern extremity of the dis- trict, is a continuation of the great Himalayan system ; it descends in a southerly and westerly direction, and is clothed with magnificent forest trees and a rich under- growth of brushwood. Southward these hills follow the course of the Jhelum, decreasing in height, but gaining in picturesqueness what they lose in sublimity, until they subside into a comparatively level country. The mountains in the western half of the district belong to the trans-Indus system; the chief range, known as the Chitta Pahar or White Hills, is composed chiefly of nummulitic limestone. To the north lies the fertile valley of Chach, one of the rare oases which relieve the wildness of this savage waste. The Indus and the Jhelum are the chief rivers of Rawal Pindi. The former bounds the district along its whole western edge, where it is very picturesque, and in parts navigable for steamers; the latter, forming the eastern frontier, is equally picturesque though less important for navigation. Other chief rivers are the Sohan and the Haroh, both tributaries of the Indus. The climate of Rawal Pindi is noted for its salubrity; the mean annual temperature is 69°°4, and the average annual rainfall 33°15 inches. The Punjab Northern State Railway runs through its whole length, with a branch from Golra junction, north of the town of Rawal Pind{, to Khusalgari on the western frontier.

The population in 1881 was 820,512 (males 449,287, females 371,225), Hindus numbering 86,162, Mohammedans 711,546, Sikhs 17,780, Christian$S 3822, and "others" 202. The only town with a population exceeding 10,000 is the capital (sce below). The inhabitants are mostly

scattered in small hamlets over the surface of the country. The staple product is wheat in the spring and bajra in the autumn. Inferior grains are giving place to more valuable cereals, and to cotton and potatoes. Of the total area 1517 square miles are cultivated and 379 cultivable. Owing to the rugged nature of the country there is very little commerce, and that little is concentrated principally at the headquarters town. Imports consist of sugar, spices, cotton goods, and salt; while exports are confined to the raw materials of agriculture. The only manufacture of any importance is cotton-weaving. The total revenue of the district in 1882-83 was £105,316, of which the land- tax yielded £68,715.

Rawal Pindi with the rest of the Sikh dominions passed to the British in 1849, under whose administration it enjoyed compara- tive peace until the mutiny in 1857. The events of that year

1 Rawal Pindi division comprises the four districts of Rawal Pindi, Jhelum, Gujrat, and Shahpur, with a total area of 15,485 square

miles and a total population (1881) of 2,520,508 (males 1,346,578, females 1,173,985).

afforded an outlet for the smouldering passions engendered by ancestral feuds, and the Murree Hills became the scene of an attempted insurrection. The authorities, however, having been warned of this by a faithful native, took steps for defence, so that when the enemy arrived they were compelled to withdraw in dis- order, and they shortly afterwards disbanded themselves. Since then the district has remained comparatively tranquil. Among recent events is the great durbar held by the viceroy of India (Earl Dufferin) on 8th April 1885 in honour of the amir of Afghanistan (Abdur Rahman). The district abounds in objects of great anti- quarian interest, chief of which are those of Dehri Shahan (or Shah Dheri), a village situated in 33° 17’ N. lat.and 72° 49’ E. long. Dehri Shahan has been identified with the site of the ancient city of Taxila or Takshasila, which in the time of Alexander was ‘‘a large and wealthy city, the most populous between the Indus and Hydaspes” (Jhelum). The ruins of Taxila consist of several dis- tinct portions, and rank as the most

interesting, extensive, and best preserved memorials of antiquity in the Punjab province.

RAWAL PINDf or Rawvt Prxpes, principal town and administrative headquarters of the above district, lies in 33° 37’ N. lat. and 73° 6’ E. long. The present town is of modern origin ; it is well built and has an air of con- siderable prosperity ; its streets are broad and handsome, and several fine buildings add to its appearance. It is chiefly a grain mart. The population of the town in 1881 was 52,975 (35,985 males and 16,990 females).

RAWANDIS. See Monammepantsm, vol. xvi. p. 579.

RAWITSCH (Polish favicz), a small manufacturing town of Prussia in the province of Posen, lies near the Silesian frontier, 37 miles to the north of Breslau. It is regularly built and contains a handsome Protestant church and a substantial town-hall. The principal industry is the manufacture of snuff and cigars, for the first of which in particular it enjoys a considerable reputation. Trade is carried on in grain, wool, cattle, hides, and timber. The population in 1880 was 12,260, made up of 7587 Protestants, 3539 Roman Catholics, and 1123 Jews. Rawitsch is of comparatively modern origin, having been founded by Protestant refugees from Silesia during the Thirty Years’ War.

RAWMARSH, a large village and urban sanitary dis- trict in the West Riding of Yorkshire, is situated on the ridge of a hill above the valley of the Don and on the Midland Railway, 2 miles north of Rotherham and 12 south-west of Doncaster. It possesses extensive iron-works and steel rolling-mills, and there are collieries in the neighbourhood. The church of St Lawrence was rebuilt in 1839 with the exception of the old Norman tower. There are several almshouses and other charities. At the

time of the Conquest the manor was granted to Walter

d’Eincourt, and in the 12th century it was divided among the three daughters of his subinfeudatory Paganus, who is supposed to have been the founder of the church. The population of the urban sanitary district (area, 2578 acres) in 1871 was 6869, and in 1881 it was 10,179.

RAWTENSTALL, a town of east Lancashire, is situ- ated on the Lancashire and Yorkshire Railway, 8 miles north of Bury and 12 south-east of Blackburn. At the beginning of the century it contained only a few houses, but since the rise of the manufacturing industry it has steadily increased, till it is now a considerable town. The cotton and woollen mills are very extensive, and in the neighbourhood there are stone quarries. The church of St Mary, in the Gothic style, erected in 1837, has lately been restored ; and several of the denominational chapels are large and handsome buildings. The town has also good schools. There is a public cemetery, 15 acres in extent. Near the town is the Haslingden Union workhouse, erected in 1869. The population of the urban sanitary district (area, 1667 acres) in 1871 was estimated at 11,307, and in 1881 it was 12,571. Now (1885) by the incorporation of Newchurch, Goodshaw, and Crawshaw Booth the popu- lation is over 30,000.

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RAY. The Rays (Batoide') together with the Sharks (Selachorder) form the suborder Plagiostomata of Cartila- ginous fishes, and are divided into six families, as already noticed in IcHTHYOLOGY, vol. xii. pp. 685, 686.

The first family contains only the Saw-fishes (Pristis), of which five species are known, from tropical and subtropical seas. Although saw-fishes possess all the essential characteristics of the rays proper, they retain the elongate form of the body of sharks, the tail being excessively muscular and the sole organ of locomotion. The "saw" (fig. 1) is a flat = protruding intestines. The and enormously devel- teeth proper, with which the oped prolongation of the '\;_ mouth is armed, are ex- snout, with an endo- += tremcly small and obtuse, skeleton which consists = and unsuitable for inflicting of from three to five carti- == wounds or seizing animals. laginous tubes; these are, © Saw-fishes are abundant in in fact, merely the rostral | thetropics; in their stomach processes of the cranial pieces of intestines and frag- cartilage and are found ments of cuttle-fish have in all rays, though they been found. They grow to are commonly much a large size, specimens with shorter. The integument saws 6 feet long and 1 foot of the saw is hard, covered broad at the base being of with shagreen; and a common. occurrence. series of strong teeth, sharp in

front, and flat behind, are embedded in it, in alveolar sockets, on each side. The saw isa most formidable weapon of offence, by means of which the fish tears pieces of flesh off the body of its victim, or rips open its abdomen to feed on the

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. family, Rhinobatide, bear a strong resemblance to the saw-fishes, but lack the saw. Their teeth are con- sequently more developed, flat, obtuse, and adapted for crushing hard-shelled mar- ine animals. There are about sixteen species, from . tropical seas.

Fig. 1.—Pristis perrotteti.

The third family, Torpedinidz, includes the Electric Rays. The peculiar organ (fig. 2) by which the electricity is produced has been described in vol. xii p. 650. The fish uses this power voluntarily either to defend itself or to stun or kill the smaller animals on which it feeds. To receive the shock the object must complete the galvanic circuit by communicating with the fish at two distinct a. either directly or through the medium of some conducting

ody. The electric currents created in these fishes exercise all the other known powers of electricity : they render the needle mag- netic, decompose chemical compounds, aud emit the spark. The dorsal surface of the electrie organ is positive, the ventral negative. Shocks accidentally given to persons are severely felt, and, if pro- ceeding from a large healthy fish, will temporarily paralyse the arms of a strong man. The species of the genus Torpedo, six or seven in number, are distributed over the coasts of the Atlantic and Indian Ocean, and two reach northwards to the coasts of Great Britain (7. marmorata and T. hebctans). They are said to attain to a weight of from 80 to 100 Ib, but fortunately such gigantic specimens are scarce, and prefer sandy ground at some distance from the shore, where they are not disturbed by the violent agita-

tion of the surface-water. Other genera, comprising species of smaller size, inhabit different parts of the tropical and subtropical

Fig. 2.—TZorpedo narce (Mediterranean). A portion of the skin on the left side has been removed to show the electric organ.

seas. All the rays of this family have, like electric fishes generally, a smooth and naked body.

The fourth family, Raiidex, comprises the Skates and Rays proper, or Raia. More than thirty species are known, chiefly from the temperate seas of both hemispheres, but much more numerously from the northern than the southern. A few species descend to a depth of nearly 600 fathoms, without, however, essentially differing from their surface congeners. Rays, as is sufficiently indicated by the shape of their body, are bottom-fishes, living on flat sandy ground, generally at no great distance from the coast or the surface. They lead a sedentary life, progressing, like the flat-fishes, by an undulatory motion of the greatly extended pectoral fins, the thin slender tail having entirely lost the function of an organ of locomotion, and acting merely as a rudder. They are carnivorous and feed exclusively on molluscs, crustaceans, and fishes. Some of the species possess a much larger and more pointed snout than the others, and are popularly distinguished as "skates." The follow- ing are known as inhabitants of the British seas :—(a) Short- snouted species : (1) the Thornback (&. elavata), (2) the Homelyn Ray (&. maculata), (3) the Starry Ray (R. radiata), (4) the Sandy Ray (&. circularis) ; (b) Long-snouted species, or Skates: (5) the Common Skate (2. batis), (6) the Flapper Skate (R. macrorhynchus), (7) the Burton Skate (2. marginata), (8) and (9) the Shagreen Skates (R. vomer and R. fullonica). A deep-sea species (R. hyper- borea) has recently been discovered near the Faroe Islands at 600 fathoms. Most of the skates and rays are eaten, except durin the breeding season ; and even the young of the former are esteeme as food. The skates attain to a much larger size than the rays, viz., to a width of 6 feet and a weight of 400 and 500 Ib.

The members of the fifth family, Trygonidx or Sting-rays, are distinguished from the rays proper by having the vertical fins replaced by a strong spine attached to the upper side of the tail. Some forty species are

known, which inhabit tropical more than temperate seas. The spine is barbed on the sides and is a most effective weapon of defence ; by lashing the tail in every direction the sting-rays can inflict dangerous or at least extremely painful wounds. The danger arises from the lacerated nature of the wound as well as from the poisonous property of the mucus inoculated. Generally only one or two spines are developed. Sting-rays attain to about the same size as the' skates and are eaten on the coasts of the Mediterranean and elsewhere. One species (7'rygon pastinaca) is not rarely found in the North Atlantic and extends northwards to the coasts of Ireland, England, and Norway.

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The rays of the sixth and last family, M/yliobatidx, are popularly known under various names, such as " Devil-fishes," " Sea-devils,"' and "Eagle-rays." In them the dilatation of the body, or rather the development of the pectoral fins, is carried to an extreme, whilst the tail is very thin and sometimes long like a whip-cord (fig. 8), Caudal spines are generally present and similar to those

Fic, 8.—Aetobatis narinari (Indo-Pacific Ocean).

of the sting-rays ; but in the pectoral fin a portion is detached and forms a "'cephalic" lobe or pair of lobes in front of the snout. The dentition consists of perfectly flat molars, adapted for crushing hard substances. In some of the cagle-rays the molars are large and tessellated (fig. 4), in others extremely small. Of the twenty

Fic. 4.—Jaws of an Eagle-Ray, Myliobatis aquila.

species which are known, from tropical and temperate seas, the majority attain to a very large and some to an enormous size: one mentioned by Risso, which was taken at Messina, weighed 1250 fb. A fcetus taken from the uterus of the mother (all eagle-rays are viviparous), captured at Jamaica and prescrved in the British Museum, is 5 feet broad and weighed 20 Ib. The mother measured 15 fect in width and as many in length, and was between 3 and 4 feet thick. At Jamaica, where these rays are well known under the name of " devil-fishes," they are frequently

attacked for sport's sake, but their capture is uncertain and sometimes attended with danger. The eagle-ray of the Mediterranean (Afyliobatis aquila) has strayed as far northwards as the south coast of England. (A. C. G.) RAY or Wray (as he wrote his name till 1670), Jonn (1628-1705), sometimes called the father of English natural history, was the son of the blacksmith of Black Notley near Braintree in Essex. There he was born on 29th November 1628, or, according to other authorities, sonie months earlier. From Braintree school he was sent at the age of sixteen to Catherine Hall, Cambridge, whence he removed to Trinity College after about one year and three- quarters. His tutor at Trinity was Dr Duport, regius pro- fessor of Greek, and his intimate friend and fellow-pupil the celebrated Isaac Barrow. Ray was chosen minor fellow of Trinity in 1649, and in due course became a major fellow on proceeding to the master's degree. He held

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many college offices, becoming successively lecturer in Greek (1651), mathematics (1653), and humanity (1655), preelec- tor (1657), junior dean (1657), and college steward (1659 and 1660); and according to the habit of the time he was

accustomed to preach in his college chapel and also at

Great St Mary's before the university, long before he took holy orders. Among his sermons preached before his ordination, which was not till 23d December 1660, were the famous discourses on The Wisdom of God in the Crea- tion, and on the Chaos, Deluge, and Dissolution of the World. Ray's reputation was high also as a tutor; he communicated his own passion for natural history to several pupils, of whom Francis Willughby is by far the most famous.

Ray's quiet college life came to an abrupt close when he found himself unable to subscribe to the Act of Uni- formity of 1661, and was accordingly obliged to give up his fellowship in 1662, the year after Isaac Newton had entered the college. We are told by Dr Derham in his Infe of Ray that the reason of his refusal "was not (as some have imagined) his having taken the 'Solemn League and Covenant,' for that he never did,

and often declared that he ever thought it an unlawful oath; but he said he could not declare for those that had taken the oath that no obligation lay upon them, but feared there might." From this time onwards he seems to have depended chiefly on the bounty of his pupil Willughby, who made Ray his constant companion while he lived, and at his death left him £60 a year, with the charge of educating his two sons.

In the spring of 1663 Ray started together with Willughby and two other of his pupils on a Continental tour, from which he returned in March 1666, parting from Willughby at Montpellier, whence the latter continued his journey into Spain. He had previously in three different journeys (1658, 1661, 1662) travelled through the greater part of Great Britain, and selections from his private notes of these journeys were edited by George Scott in 1760, under the title of Mr Ray's Itineraries. Ray himself published an account of his foreign travel in 1673, entitled Observations topographical, moral, and physiological, made on a Journey through part of the Low Countries, Germany, Italy, and France. From this tour Ray and Willughby returned laden with collections, on which they meant to base complete systematic descriptions of the animal and vegetable kingdoms. Willughby under- took the former part, but, dying in 1672, left only an ornithology and ichthyology, in themselves vast, for Ray to edit ; while the latter used the botanical collections for the groundwork of his Methodus plantarum nova (1682), and his great Historia generalis plantarum (1685). The plants gathered on his British tours had already been described in his Catalogus plantarum Angle (1670), which work is the basis of all later English floras.

In 1667 Ray was elected a fellow of the Royal Society, and in 1669 he published in conjunction with Willughby his first paper in the Philosophical Transactions on '" Ex- periments concerning the Motion of Sap in Trees." They demonstrated the ascent of the sap through the wood of the tree, and supposed the sap to "precipitate a kind of white coagulum or jelly, which may be well conceived to be the part which every year between bark and tree turns to wood, and of which the leaves and fruits are made." Immediately after his admission into the Royal Society he was induced by Bishop Wilkins to translate his Real Character into Latin, and it seems he actually completed a translation, which, however, remained in

manuscript ; his Methodus plantarum nova was in fact undertaken as a part of Wilkins's great classificatory scheme.

In 1673 Ray married Margaret Oakley of Launton (Oxford); in 1676 he went to Sutton Coldfield, and in 1677

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to Falborne Hall in Essex. Finally, in 1679, he removed to Black Notley, where he afterwards remained. His life there was quiet and uneventful, but embittered by bodily weakness and chronic sores. He occupied himself in writ- ing books and in keeping up a very wide scientific corre- spondence, and lived, in spite of his infirmities, to the age of seventy-six, dying on 17th January 1705.

Ray's first book, the Catalogus plantarum cirea Cantabrigiam nascentiwm (1660, followed by appendices in 1663 and 1685), was written in conjunction with his " amicissimus et individuus comes," John Nid. The plants, 626 in number, are enumerated alphabetic- ally, but a system of elassification differing little from Caspar Bauhin's is sketched at the end of the book ; and the notes contain many curious references to other parts of uatural history. The stations of the plants are minutely described ; and Cambridge students still gather some of their rarer plants in the eopses or chalk-pits where he found them. The book shows signs of his indebtedness to Joachim Jung of Hamburg, who had died in 1657 leaving his writings unpublished ; but a MS. copy of some of then was sent to Ray by Hartlieb in 1660. Jung invented or gave precision to many technical terms that Ray and others at once made use of in their descriptions, and that are now classical ; and his notions of what constitutes a specifie distinction and what eliaracters are valueless as such seem to have been adopted with little change by Ray. The first two editions of the Catalogus plantarum Angliz (1670, 1677) were likewise arranged alphabetic- ally; but in the Synopsis stirpiwm Britannicarum (1690, 1696, also re-edited by Dillenius 1724, and by Hill 1760) Ray applied the scheme of elassification which he had by that time elaborated in the Methodus and the Historia plantarum. The Methodus plan- tarum nova (1682) was largely based on the works of Cesalpini and Jung, and still more on that of Morison of Oxford. The greatest merit of this book is the use of the number of

cotyledons as a basis of classification ; though it must be remembered that the difference between the monocotyledonous and dicotyledonous embryo was detected by Grew. After dividing plants into flowerless and flowering, Ray says, " Floriferas dividemus in Dicotyledones, quarum semina sata binis foliis anomalis, seminalibns dictis, que cotyledonorum usuin prestant, e terra exeunt, vel in binos saltem lobos dividuntur, quamvis eos supra terram foliorum specie non effernnt ; et Monocotyledones, que nec folia bina seminalia efferunt nee lobos binos condunt. Hee divisio ad arbores etiam extendi potest ; siquidem Palme et congeneres hoe respectu codem modo a reliquis arboribus differunt quo Monocotyledones a reliquis herbis." But a serious blemish was his persistent separation of trees from herbs, a distinction whose falsity had been exposed by Jung and others, but to which Ray tried to give scientific founda- tion by denying the existence of buds in the latter. At this time he based his classification, like Cesalpini, chiefly upon the fruit, and he distinguished several natural groups, such as the grasses, Labiate, Umbellifere, and Papilionacex. The elassification of the Methodus was extended and improved in the Historia plantarum, but was disfigured by a large class of Anomalz, to include forms that the other orders did not easily admit, and by the separation of the cereals from other grasses. The first volume of this vast book was published in 1685, the second in the next year, and the third in 1704 ; it enumerates and describes all the plants known to the author or described by his predecessors, to the number, according to Adanson, of 18,625 species. In the first volume a chapter "De plantis in genere" contains an account of all the anatomical and physiological knowledge of the time regarding plants, with the recent speculations and discoveries of Czsalpini, Grew, Malpighi, and Jung. And Cuvier and Dupetit Thouars, declaring that it was this chapter which gave acceptance and authority to these authors' works, say that " the best monument that could be erected to the memory of Ray would be the republica- tion of this part of his work separately." The Stirpiwm Europex- arum extra Britannias nascentinm Sylloge (1694) isa much amplified edition of the catalogue of plants colleeted on his own Continental tour. In the preface to this book he first elearly admitted the doctrine of the sexuality of plants, which, however, he had no share in establishing. Here also begins his long controversy with Rivinus, which chiefly turned upon Ray's indefensible separation of ligneons from

herbaceous plants, and also upon what he con- eeived to be the misleading reliance that Rivinus placed on the characters of the corolla. But in the second edition of his Afethodus (1703) he followed Rivinus and Tournefort in taking the flower instead of the fruit as his basis of classification: he was no longer a fructicist but a corollist.

Besides editing his friend Willughby's books, Ray wrote several zoological works of his own, including Synopses of Quadrupeds (1693), that is to say, both mammals and reptiles, of Birds, and of Fishes (1718) ; the last two were published posthumously, as was also the more important {Zistoria fnseetorwm (1710). – The History of Insects embodied a great mass of Willughby's notes, and the

Synopses of Birds and Fishes were mere abridgments of the " Ornithology " and " Ichthyology."

Most of Ray's minor works were the outcome of his faculty for laborious compiling and eataloguing ; for instance, his Collection of English Proverbs (1670), his Collection of out-of-the-way English Words (1674), his Collection of Curious Travels and Voyages (1693), and his Dietionariolum trilingue, or Nomenelator classieus (1675). The last was written for the use of Willughby's sons, his pupils ; it passed through many editions, and is still useful for its careful identifications of plants and animals mentioned by Greek and Latin writers. But Ray's permanent influence and reputation have probably depended most of all upon his two books entitled The Wisdom of God manifested in the Works of the Creation (1691), and Afiscellaneows Discourses concerning the Dissolution and Changes of the World (1692). The latter includes three essays, on "The Primitive Chaos and Creation of the World," "«The General Deluge, its Causes and Effects,' and "The Dissolu- tion of the World and Future Conflagrations." The germ of these works was contained in sermons preached long before in Cambridge. Both books obtained immediate popnlarity ; the former, at least, was translated into several languages ; and to this day their influ- ence is apparent. For, as Sir J. Smith says in his biography of Ray, "this book [The Wisdom of God, &c.] is the basis of all the labours of following divines, who have made the

book of nature a commentary on the Book of Revelation." In it Ray recites in- numerable examples of the perfection of organic mechanism, the multitude and variety of living ereatures, the minuteness and usefulness of their parts. Many, if not most, of the familiar proofs of purposive adaptation aud design in nature were suggested by Ray. The structure of the eye, the hollowness of the bones, the eamel's stomach, the hedgehog's armour, are anlong the thou- sand instances cited by him of immediate ereative interpositions. But, though his application of natural history to apologetic theo- logy has made his reputation peculiarly wide, it must be acknow- ledged that none of this scientific discoveries at all equal in value those of the physiological botanists who immediately preceded him, and that even in classificatory insight he was surpassed by several of his contemporaries.

Authorities.—Select Remains, Itineraries, and Life, by Dr Derham, edited by George Scott, 1740; notice by Sir J. E. Sinith in Ree's Cyclopedia; notice by Cuvier and A. Dupetit Thouars in the Biographie Universelle; all these were collected under the title Memorials of Ray, and edited (with the addition of a complete catalogue of his works) by Dr Edwin Lankester, 8vo (Ray Society), 1846 ; Correspondence (with Willughby, Martin Lister, Dr Robinson, Petiver, Derham, Sir Hans Sloane, and others), edited by Dr Derham, 1718; Selections, with additions, edited by Lankester Ray Society), 1848, For accounts of Ray's system of classification, see Cuvier, Legons Hist. s. Sci. Nat., p. 488; Sprengel, Gesch. d. Botanik, ii. p. 40; also Whewell, Hist. Ind. Sct., iil. p. 332 (ed. 1847), and Wood, art. " Classification" in Ree's Cyclopedia, (D. W. T.)

RAYMOND LULLY. See Lutty.

RAYMOND or Sasunpe: (Sebonde, Sebeyde, &c.) appears to have been born at Barcelona towards the end of the 14th century. He combined the training of a phy- sician and a theologian, and was professor of theology at Toulouse, seemingly from the year 1430 onwards. He published there in 1436 his chief work, Zheologia Naturalis, sive liber creaturarum. This book was reprinted pretty frequently during the next two centuries, and has recently been republished at Sulzbach (1852), but without the intro- duction, which, for some not very intelligible reason, was placed upon the

Jndex by the council of Trent. It was translated into French by Montaigne at the command of his father (see Montaigne, Hssazs, ii. 12). The six Dialogi de natura hominis are an extract from the larger work made by Raymond himself. Raymond is a scholastic of the period of decline. The chief thought of the Theologia Naturalis is the parallelism between the book of nature and the book of revelation. The second of these two books is more sacred on account of its supernatural character, but a foundation must be laid by the study of the first. Nature culminates in man, who alone of the creatures possesses all the four properties which mark off the different grades of existence (esse, vivere, sentire, intelligere). But man himself points forward to a self-existent unity in which individual differences disappear. Everything that we find in the creatures is present in God without lhmitation or negation, so that God's being is the universal being of all things. Hence it is true that God created the world out of nothing. Raymond endeavours to deduce the principal dogmas of the church by the natural light in a similar fashion. Man's own advantage and the glory of God are

the ultimate rules of conduct, and the coincidence of the iwo is maintained on the ground of the joys of knowledge. Knowledge has its natural consummation in the knowledge cf God; man's knowledge of God is at the same time the love and gratitude which he, as representative of the creatures and mediator between them and God, continually offers to the divine majesty. The fact that self-love and the love of God are at present often in conflict is traced by Raymond to the fall of the first human pair; and this gives him occasion to deduce the doctrine of the incarna- tion, almost in the words of Anselm's Cur Deus homo. RAYNAL, GuinLauMe THomas Francois (1713-1796), was born on 12th April 1713 in the province of Rouergue, and was educated at Pézenas by the Jesuits. He took orders, and, going to Paris, did parish work ; but he left the priesthood (being indeed deprived for misconduct) and betaking himself to literature soon became one of the minor members of the phalosophe coterie. He did not a little journalism and bookmaking of divers kinds; but his name would be entirely forgotten were it not for the Histoire philosophique et politique des Etablissements et du Commerce des

Européens dans les Deux Indes. This book is not, and indeed was not in its own day, of any substan- tive value as a book of reference on its nominal subject ; but it exercised considerable influence : it was exceedingly characteristic of the period and society which produced it, and passages of it are still worth reading. The secret of its merits and its faults is to be found in the manner of its composition. Raynal himself wrote but a small part of it, and he took not the slightest pains to make it a homo- geneous work. But he borrowed from books and he begged from his own friends all manner of diatribes against super- stition and tyranny, often illustrated by lively anecdotes and eloquent tirades. Grimm assigns a full third of the book to Diderot, which is probably an exaggeration, but that Diderot had a great hand in it no judge of style can doubt. It was published in 1772, and brought the author many compliments, even from men like Gibbon, who should have known better. A new edition in 1780 was even bolder. It was condemned and burned (29th May 1781), and the author had to fly the country. He returned just before the Revolution, but having apparently a natural tendency to opposition he became a strong Royalist. He died on 6th March 1796. No other work of Raynal's deserves notice here. The best account

in English of the Histoire des Indes will be found in Mr John Morley's Diderot, vol. ii. chap. xv.

RAZORBILL or Razor-BinteED AUK, known also on many parts of the British coasts as the Marrot, Murre, Scout, Tinker, or Willock—names which it, however, shares with the GuILLEMoT (vol. xi. p. 262), and to some extent with the PUFFIN (see above, p. 101)—a common sea-bird of the Northern Atlantic,' resorting in vast numbers to certain stations on rocky cliffs for the purpose of breeding, and, its object being accomplished, returning to deeper waters for the rest of the year. It is the Alca torda of Linneeus ? and most modern authors, congeneric with the GARE-FowWL (vol. x. p. 78), if not with the true Guillemots, between which two forms it is intermediate—differing from the former in its small size and retaining the power of flight,

1 Schlegel (Aus. des Pays-Bas, Urinatores, p. 14) records an example from Japan ; but this must be in error.

2 The word Alca is simply the Latinized form of this bird's common Teutonic name, Alk, of which Auk is the English modification. It must therefore be held to be the type of the Linnean genus Alca, though some systematists on indefensible grounds have removed it thence, making it the sole member of a genus named by Leach, after Aldrovandus (Ornithologia, bk. xix. chap. xlix.), Utamania—an ex- traordinary word, that seems to have originated in some mistake from the no less extraordinary Vuttamaria, given by Belon (Observations, i. c, xi.) as the Cretan name of some diving bird, which certainly could not have been the present species.

which that presumably extinct species has lost, and from the latter in its peculiarly-shaped bill, which is vertically enlarged, compressed, and deeply furrowed, as well as in its elongated, wedge-shaped tail. A fine white line, run- ning on each side from the base of the culmen to the eye, is in the adult bird in breeding-apparel (with a few very rare exceptions) a further obvious characteristic. Other- wise the appearance of all these birds may be briefly described in the same words—bhead, breast, and upper parts generally of a deep glossy black, and the lower parts and tip of the secondaries of a pure white, while the various changes of plumage dependent on age or season are alike in all. In habits the Razorbill closely agrees with the true Guillemots, laying its single egg (which is not, however, subject to the same amazing variety of coloration that is pre-eminently the Guillemot's own) on the ledges of the cliffs to which it repairs in the brecding- season, but it is said then as a rule to occupy higher eleva- tions, and when not breeding to keep further out to sea. On the east side of the Atlantic the Razorbill has its stations on convenient parts of the coast from the North Cape to Britanny, besides several in the Baltic, while in winter it passes much further to the southward, and is sometimes numerous in the Bay of Gibraltar, occasionally entering the Mediterranean but apparently never extending to the eastward of Sicily or Malta. On the west side of the Atlantic it breeds from 70° N. lat. on the eastern shore of Baffin's Bay to Cape Farewell, and again on the coast of America from Labrador and Newfoundland to the Bay of Fundy, while in winter it reaches Long Island. (4. N.)

RAZZI, GIANANTONIO. See SoDDoMA.

RE, Isue or, a long, low island 3 miles off the coast of the French department of Charente Inférieure, runs south-east and north-west with a breadth of about 3 miles and a length of 184 miles. The north-west point (Pointe des Baleines) has a lighthouse of the first class. The Pertuis Breton separates the island from the coast of La Vendée to the north, and the Pertuis d'Antioche from the Isle of Oléron to the south. With a surface of 18,259 acres, the Isle of Ré has 15,370 inhabitants, whose chief source of income is the salt marshes, producing annually 31,500 tons of salt. The island has also a vineyard and corn lands, and boasts of the excellence of its figs, pears, and cream. Apart from the orchards it is now woodless, though once covered with forests. Oysters are success- fully cultivated, the annual supply of these molluscs being 35,000,000. The coast facing the Atlantic is rocky and inhospitable, but there are numerous harbours on the land- ward side. The island seems once to have been united to the continent, with which it is still connected by a line of sunken rocks; its existence is not mentioned before the 8th century. Tradition says that the city of Antioche on the west coast was destroyed by the Atlantic storms, which still constantly threaten to cut the island in two at the isthmus (only 230 feet wide) formed by the gulf called Fier d'Ars. There are two cantons—St Martin and Ars-en-Ré—in the arrondissement of La Rochelle. St Martin, with a secure harbour, was fortified by Vauban, and is the depét for convicts on their way to New Caledonia.

READE, Cuarzezs (1814-1884), holds a high and dis- tinctive place among the English novelists of the third quarter of the 19th century. The son of an Oxfordshire squire, he was born at Ipsden in 1814, and was educated for the bar. He entered Magdalen College, Oxford, pro- ceeded B.A. in 1835, with a third class in classics, was elected Vinerian Reader in 1842, and was called to the bar (Lincoln's Inn) in 1843. It was comparatively late in his life that he made his first appearance as an author, but he showed at once that he had subjected himself to a laborious apprenticeship to the study of life and literature.

He began as a dramatist, and this his first ambition shaped and coloured his work to the end. It was his own wish that the word "dramatist" should stand first in the de- seription of his occupations on his tombstone. He was dramatist first and novelist afterwards, not merely chrono- logically but in his aims as an author, always having an eye to stage-effect in scene and situation as well as in dialogue. Grol, his first play (1850), was but a moderate success. He did not achieve popularity till 1856, when he produced Jt's Mever Too Late to Mend, a novel written with the purpose of reforming abuses in prison discipline and the treatment of criminals. The prosecution of his moral purpose carried him too far for most of his readers ; he described prison life with a minuteness and fidelity— the result of laborious studies of blue-books and newspapers and personal inquiries—which become at times tedious and revolting ; but the power of the descriptions was undeni- able, and the interest of the story, in spite of all over- elaboration of painful details, was profound and thrilling. The truth of some of his details was challenged, and the novelist showed himself a pungent controversialist. From first to last he defended himself with vigour and great strength of language against all attempts to rebut his con- tentions or damage his literary property. J¢'s Never Too Late to Mend was his first great success, but before this he had gained the respect of critics with two shorter novels, Pey Wofington (1852), a close study of life and character behind the scenes, and Christie Johnstone (1853), an equally close study of Scotch fisher folk, an extraordi- nary tour de force for the son of an English squire, whether we consider the dialect or the skill with which he enters into alien habits of thought. He had also established his position as a dramatist by writing (in combination with Mr Tom Taylor) a stage version of Pey Woffington under the title of Masks and Faces (1854), the most successful and the most frequently reproduced of his plays, besides three that were less successful, Zhe Courier of Lyons (a powerful melodrama), 7%vo Loves and a Life, and The King's Rivals (1854), From 1856 onwards he kept his position in the foremost rank of contemporary novelists. Five minor novels followed in quick succession, —The Course of True Love never did Run Smooth (1857), Jack of all Trades (1858), The Autobiography of a Thief (1858), Love Me Little, Love Me Long (1859), The Double Marriage, or White Lies (1860). Then appeared, in 1861, what most critics regard as his masterpiece, The Cloister and the Hearth. He had dealt with the subject two years before in

a short story in Once a Week, but, seeing its capabilities, he returned to it and expanded it into its present form. As a picture of manners it is broad and full; yet amply as the novelist illustrates the times he very rarely becomes tedious or allows the thrilling interest of the story to lapse. Returning from the 15th century to modern English life, he next produced another startling novel with a purpose, Hard Cash (1863), in which he strove to direct attention to the abuses of private lunatic asylums. Three more such novels, in two of which at least the moral purpose, though fully kept in view, was not allowed to obstruct the rapid flow of thrilling incident, were afterwards undertaken,— Foul Play (1869), in which he exposed the iniquities of ship-knackers, and paved the way for the labours of Mr Plimsoll ; Put Yourself in his Place (1870), in which he grappled with the tyrannous outrages of trades-unions ; and A Woman-Hater (1877), in which he gave a helping hand to the advocates of woman's rights. The Wandering Heir (1875), of which he also wrote a version for the stage, was suggested by the Tichborne trial. Outside the line of these moral and occasional works Reade produced three that might be classified as psychological, inasmuch as they were elaborate studies of character,—Grifith Gaunt (1866),

A Terrible Temptation (1871), A Simpleton (1873). Thea first of these was in his own opinion the best of his novels, and his own opinion was probably right. He was wrong, however, in his own conception of his powers as a dramatist. At intervals throughout his literary career he sought to gratify his dramatic ambition, hiring a theatre and en- gaging a company for the representation of his own plays. An example of his persistency was seen in the case of Foul Play. He wrote this in 1869 in combination with Mr Dion Boucicault with a view to stage adaptation. The play was more or less a failure; but he produced another ver- sion alone in 1877, under the title of A Scuttled Ship, and the failure was pronounced. His greatest success as a dramatist attended his last attempt —Drink—an adapta- tion of Zola's L'Assommoir, produced in 1879. At his death in 1884 (11th April) Reade left behind him a com- pleted novel, A Perilous Secret, which showed no falling off in the art of weaving a complicated plot and devising thrilling situations.

It was characteristic of Reade's open and combative nature that he admitted the public freely to the secrets of his method of com- Basen He spoke about his method in his prefaces ; he intro-

uced himself into one of his novels—"Dr Rolfe" in A Terrible Temptation ; and by his will he left his workshop and his ac: umu- lation of materials open for inspection for two years after his death. It appears that he had collected an enormous mass of materials for his study of human nature, from personal observation, from news- papers, books of travel, blue-books of commissions of inquiry, from miscellaneous reading. This vast collection of notes, cuttings, extracts, gathered together week by week and year by ycar, is classified and arranged in huge ledgers and note-books duly paged and indexed. He had planned a great work on " the wisdom and folly of nations," dealing with social, political, and domestic details, and it was c'uefly for this that his collection was destined, but in passing '.2 found the materials very uscful as a store of incidents and suggestions. A collector of the kind was bound to be systematic, otherwise his collection would have fallen into inextricable confusion, and Reade's collection contains many re- markable curiosities in classification and tabulation. On the value of this method for his art there has been much discussion, the prevalent opinion being that his imagination was overwhelmed and stifled by it. He himself strenuously maintaincd the contrary ; and it must be admitted that a priori critics have not rightly understood the use that he made of his laboriously collected facts. He did not merely shovel the contents of his note- books into his novels ; they served rather as an atmosphere of reality in which he worked, so that his novels were like pictures painted in the open air. His imagination worked freely among them and was quick- cned rather than impeded by their suggestions of things suited to the purpose in hand ; and it is probably to his close and constant contact with facts, acting on an imagination naturally fertile, that we owe his marvellous and unmatchable abundance of incident. Even in his novels of character there is no meditative and analytic stagnation ; the development of character is shown through a rapid unceasing progression of significant facts. This rapidity of move- ment was perhaps partly the result of his dramatic studies ; it was probably in writing for the stage that he learned the value of keep- ing the attention of his readers incessantly on the alert. The hankering after stage

effect, while it saved him from dulness, often betrayed him into rough exaggeration, especially in his comic scenes. But the gravest defect in his work is a defect of temper. His view of human life, especially of the life of women, is harsh, almost brutal ; his knowledge of frailtics and vices is obtruded with repel- lent force ; and he cannot, with all his skill and power as a story- teller, be numbered among the great artists who warm the heart and help to improve the conduct. But as a moral satirist and castigator, which was the function he professed over and above that of a story-teller, he undoubtedly did good service, both indirectly in his novels and directly in his own name. (W. M.)

READING, a market-town and ancient borough of Berk- shire, is pleasantly situated on slightly elevated ground on the banks of the Kennet, a short distance above its junc- tion with the Thames, and on branches of the Great Western, South-Eastern, and South-Western Railways, 28 miles south-south-east of Oxford and 354 west of London by rail. Besides the facilities on the Thames there is water communication by the Kennet to Newbury, and by the Kennet and Avon Canal to the Severn. The Thames is crossed by one bridge and the Kennet by three. The

town is well built, with wide and regular streets and many good villas in the suburbs. Of the magnificent Benedictine abbey founded in 1121 by King Henry L, originally one of the three wealthiest in England, all that now remains is a mass of ruins (with the exception of the gateway, which was restored in 1861 and is now carefully preserved), a portion of the great hall (in which several parliaments have been held), and the foundation of the Norman apsidal chapel. Henry I., who died at Rouen, was buried within its precincts; but his monument was destroyed in the time of Edward VI.; and John of Gaunt was married there to Blanche of Lancaster in 1359. By Henry VIII. it was converted into a palace, which formed the occasional residence of subsequent sovereigns until its destruction during the Cromwellian wars. Of other old ecclesiastical buildings of special interest the principal are Greyfriars' church, completed about 1311, formerly the church of Greyfriars' monastery, but after the dissolution used successively as a town-hall, a workhouse, and a

jail, until it was restored to its original use in 1864; St Mary's church, rebuilt, according to Camden, in 1551 from the ruins of a nunnery founded by Elfrida to expiate the murder of her stepson (Edward the Martyr); the church of St Lawrence, originally Norman, but rebuilt in the 15th century in the Early English style, containing some ~ interesting brasses; and the church of St Giles, of mixed architecture, which was severely damaged during the Cromwellian wars. At the free grammar-school, founded in 1445, Archbishop Laud received his education, and he afterwards became a generous benefactor to it. The school was removed in 1871 to new buildings surrounded by 12 acres of ground. Other educational foundations are the Kendrick schools (1624), the blue-coat school (1656), and the green-coat school for girls (1779). The various almshouses were consolidated into one building in 1865. Among the modern structures are the municipal buildings (in the Renaissance style, erected in 1875 and enlarged in 1882, containing a large concert-room, a free library, schools for science and art, and a museum), the corn exchange, the assize courts, the athenzeum, the royal Albert hall, the masonic hall, the workhouse, and the royal Berk- shire hospital. The town has a large trade in corn and agri- cultural produce ; and, in addition to an extensive biscuit manufactory which employs over 3000 hands, it possesses iron-works, iron-foundries, engine- works, and breweries. Adjoining the town are extensive seed nurseries covering about 10,000 acres. The population of the borough (area, 2186 acres) in 1871 was 32,324, and in 1881] it was 42,054.

The origin of the town is doubtful ; but Reading must have been aplace of some importance when the Danes in 871 brought their war-ships up the Thames as far as the Kennet and made the town for some time their headquarters. It was burned by Sweyn in 1006. In Domesday the name occurs as Radynges. A new and strong castle was erected here by Stephen, which was destroyed by Henry II. In 1209 the professors and students of Oxford made a temporary retreat to Reading, owing to a quarrel with King John. From the 138th to the 16th century parhaments were frequently held in the town, and in the Michaelmas term of 1625 the law courts were transferred to it on account of the prevalence of the plague in London. In 1643 it surrendered to the Parliamentary forces under the earl of Essex, and subsequently was more than once occupied

by the rival armies. It isa borough by prescription and received charters and grants from Henry III. and subsequent sovereigns. It has returned members to parhament from the 23d of Edward I. ; the number was reduced from two to one in 1885. By the Municipal Act of 1836 it was divided into three wards governed by a mayor, six alderinen, and eighteen councillors.

READING, a city of the United States, capital of Berks county, Pennsylvania, on the east bank of the Schuylkill river, and on the Schuylkill and Union Canals, 58 miles north-west of Philadelphia at the intersection of some fourteen railway lines, representing eight different companies. It occupies an elevated and healthy position

on a plain that gradually rises towards an amphitheatre of hills, including Penn's Mount on the east and Neversink Mountain on the south. The plan is extremely regular and the principal streets cross at Penn Square, the business centre of the city. An abundant supply of excellent water helps to keep the whole place sweet and clean. Conspicuous buildings are —the court-house, the city-hall, Trinity Church (Lutheran), Christ Church (Episcopal), the opera-house, Mishler's academy of music, and the railway station. Besides a very extensive and varied manufacture of iron and iron wares from steam-boilers down to nails, Reading carries on distilling, tanning, cotton-weaving, cigar-rolling, paper-making, and many other industries, and is the seat of extensive machine-shops of the Phil- adelphia and Reading Railroad. The population—2385 in 1800, 15,743 in 1850, 33,930 in 1870, and 43,278 in 1880—is largely of German origin ; and in 1883 one out of its five daily newspapers and six out of its eleven weeklies were in German.

Laid out in 1748 by Thomas and Richard Penn, Reading received incorporation as a borough in 1788, and was made a city in 1847.

REALEJO, a town and harbour on the Pacific coast of Nicaragua, situated in the neighbourhocd of 12° 28' N. lat. The harbour is spacious and well sheltered, and altogether the best which Nicaragua possesses on that coast ; it is protected by a peninsula and two considerable islands,

Cardon and Asserradores or Corinto. The town lies 9 miles inland, and as a port is now superseded by the new town of Corinto, founded about 1849, and since 1881 connected with Leon and the interior by a railway. Realejo was the terniinus adopted by Bedford Pim for his scheme of an interoceanic canal; but the route actually sanctioned reaches the coast of the Pacific at Brito, some distance to the south.

REAL ESTATE. The land law of England and of countries whose law is based upon that of England stands in a peculiar position, which can be understood only by an outline of its history.

History.—Such terms as "fee" or "homage" carry us far back into feudal times. Rights of common and dis- tress are based upon still older institutions, forming the very basis of primitive law. The conception of tenure is the most fundamental ground of distinction between real and personal estate, the former only being strictly en- titled to the name of estate (see EstatE). The division into real and personal is coincident to a great extent with that. into immovable and movable, generally used by systems of law founded on the Roman (see PERSONAL EstaTE), That it is not entirely coincident is due to the influence of the Roman law itself. The Greeks and the Romans of the republic were essentially nations of citizens; the Teutons were essentially a nation of land- folk; the Roman empire bridged the gulf between the two. It is probable that the English land law was produced by the action of the policy adopted in the lower empire, finally developed into feudalism, upon the previously ex- isting course of Teutonic custom (see FEUDALISM). It is sufficient to say here that the distinguishing features of the Teutonic system were enjoyment in common and the absence of private ownership, except to a limited extent, The history of the development of the old English land law before the Conquest will be found under ENGLAND and Lanp. Its principal features, stated as shortly as possible, were (1) liberty of alienation, either by will or inter vivos, of such land as could be alienated, chiefly, if not entirely, bocland, subject always to the limits fixed by the boc; (2) publicity of transfer by enrolment in the shire-book or church-book ; (3) equal partition of the estate of a deceased among the sons, and failing sons among the daughters ; (4) cultivation to a great extent by persons in various

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degrees of serfdom, owing money or labour rents; (5) variety of custom, tending to become uniform, through the application of the same principles in the local courts ; (6) subjection of land to the trinoda necessitas, a burden imposed for the purpose of defence of the realm. The rudiments of the conceptions of tenure and of the crown as lord paramount were found in the old English system, and lenland was an anticipation of the limited interests which afterwards became of such importance.! The con- nexion of political privileges with the ownership of land is not peculiar to the pre-Conquest or any other period. It runs through the whole of English history. Originally all freeholders seem to have voted in the county court. Finally the Reform Acts of this century, however they may have lowered the qualification, still require (except in the case of the university vote) the vote to be derived from an interest in land. No amount of consols will give a vote at a parliamentary election. A qualification from land is also necessary in the case of sheriff, justices of the peace, and other public officials.

The elements of feudalism so far existed in England under the Anglo-Saxon and Danish kings as to make it easy to introduce it in full at the Norman Conquest. Feudalism was not so much a distinct and separate creation, developed at once in its maturity, as a collection of institu- tions whose origin was to be found in unconnected sources. What the Norman Conquest did was not to change all at once allodial into feudal tenure, but to complete the association of territorial with personal dependence in a state of society already prepared for it.2 "'Nulle terre sans seigneur" was one of the fundamental axioms of feudalism. There might be any number of infeudations and subin- feudations to mesne lords, but the chain of seigniory was complete, depending in the last resort upon the king as lord paramount. Land was not owned by free owners owing only necessary militia duties to the state, but was held of the king by military service of a far more onerous nature. he folkland became the king's land ; the soldier was a landowner instead of the landowner being a soldier. Free owners tended to become tenants of the lord, the township to be lost in the manor.? The common land became in law the waste of the manor, its enjoyment rest- ing upon a presumed grant by the lord. On the other

hand, the whole of England did not become manorial ; the conflict between the township and the manor resulted in a compromise, the result of which affects English tenure to this day. But it was a compromise much to the advantage of the privileged class, for in England more than in any other country the land law is the law of the nobility and not of the people. One reason of this is that, as England was never so completely feudalized as were some of the Continental states, the burden of feudalism was not so severely felt, and has led to less agitation for reform.

The land forfeited to the Conqueror was regranted by him to be held by military service due to the king, not to the mesne lord as in Continental feudalism. In 1086 at the council of Salisbury all the landholders swore fealty to the crown. In the full vigour of feudalism the inhabit- ants of England were either free or not free. The free inhabitants held their lands either by free tenure (Jiberum tenementum, franktenement) or by a tenure which was originally that of a non-free inhabitant, but attached to land in the possession of a free man. Franktenement was ; 1 The name has not remained as in Germany and Denmark. A fief is still Lehen in Germany, Lehn in Denmark.

2 "The relation of vassalage, originally personal, became annexed to the tenure of land" (Palgrave, Rise and Progress of the English Commonwealth, vol. i. p. 505).

It is a disputed point whether the manor organization existed

before the Conquest ; but its full development seems to have been later than that event.

either military tenure, called also tenure in knight service or chivalry (including barony, the highest tenure known to the law, grand serjeanty and the special forms of escuage, castle-guard, cornage, and others), or socage (including burgage and petit serjeanty), or frankalmoign (/ibera elee- mosyna) or divine service, by which ecclesiastical corpora- tions generally held their land.t The non-free inhabitants were in Domesday Book servi, cotarti, or bordarii, later nativi or villani, the last name being

applied to both free men and serfs. All these were in a more or less dependent condition. The free tenures all exist at the present day, though, as will appear later, the military tenures have shrunk into the unimportant and exceptional tenure of grand serjeanty. The non-free tenures are to a certain extent represented by CopyrHoxp (q¢.v.). The most im- portant difference between the military and socage tenures was the mode of descent. Whether or not a feudal benefice was originally hereditary, it had certainly become so at the time of the Conquest, and it descended to the eldest son. This applied at once in England to land held by military service as far as regarded the capital fief. The descent of socage lands or lands other than the capital fief for some time followed the old pre-Conquest rule of descent. Thus in the so-called " Laws of Henry I." the lands other than the capital fief, and in Glanvill, who wrote in the time of Henry II., socage lands, if anciently partible (antiquitus divisum), were divided among all the sons equally. But by the time of Bracton (Henry III.) the course of descent of lands held by military service had so far prevailed that, though it was a question of fact whether the land was partible or not, if there was no evidence either way descent to the eldest son was pre- sumed. Relics of the old custom still remain in the case of gavelkind (see below). The military tenant was sub- ject to the feudal incidents, from which the tenant in socage was exempt. These incidents, especially wardship and marriage, were often of a very oppressive nature. Alienation of lands by will, except in a few favoured districts, became impossible; alienation inter wivos was restrained in one direction in the interests of the heir, in another in the interests of the lord. At the time of Glan- vill a tenant had a greater power. of alienation over land which he had purchased (terra acqutetata) than over land which he had inherited. But by the time of Bracton the heir had ceased to have any interest in either kind of land. The lords were more successful. It was enacted by Magna Charta that a free man should not give or sell so much of his land as to leave an amount insufficient to perform his services to his lord. In spite of this provision, the rights of the lords were continually diminished by subinfeudation until the passing of the Statute of Quia Emptores. Aliena- tion by a tenant in chief of the crown without licence was a ground of forfeiture until 1 Edw. ITI. st. 2, c. 12, by which a fine was substituted. The modes of con- veyance at this time were only two, feoffment with livery of seisin for corporeal hereditaments, grant for

incorporeal hereditaments. Livery of seisin, though public, was not officially recorded like the old English transfer of property. The influence of local custom upon the land law must have become weakened after the circuits of the judges of the King's Court were established by Henry II. Jurisdiction over litigation touching the freehold was taken away from the lords' courts by 15 Ric. IT. c. 12.

The common law as far as it dealt with real estate had in the main assumed its present aspect by the reign of Henry III. The changes which have been made since that date have been chiefly due to the action of equity

4 Frankalmoign was not always regarded as a distinct tenure. Thus Littleton (§ 118) says that all that is not tenure in chivalry is tenure

in socage. XX. — 39

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and legislation, the latter sometimes interpreted by the courts in a manner very different from the intention of parliament. The most important influence of equity has been exercised in MorT@acs (q.v.) and trusts (see TRUST), in the doctrine of specific performance of contracts concerning real estate, and in relief from forfeiture for breach of covenant. As to legislation, it is impossible in this place to do more than direct attention to the main provisions of the principal statutes among the mass of those which from Magna Charta downwards have dealt with real estate. History of Real Estate Legislation.—The reign of Edward J. is notable for three leading statutes which are still law, all passed in the interests of the superior lords. The Statute of Mortmain (7 Edw. I. st. 2, c. 13) is the first of a long series directed against the acquisition of land by religious and charitable corporations (see CHARITIES). The statute De Donis Conditionalibus (13 Edw. I. c. 1) forbade the alienation of estates granted to a man and the heirs of his body, which before the statute became on the birth of an heir at once alienable (except in the case of gifts in frankmarriage), and so the lord lost his escheat. For the mode in which the statute was practically defeated and estates tail in their modern form created see ENTAIL. The statute Quia Hmptores (18 Edw. I. c. 1)

preserved those rights of the lords which were up to that time sub- ject to be defeated by subinfeudation, by enacting that in any alienation of lands the alienee should hold them of the same lord of the fee as the alienor.! Since 1290 it has been impossible to create an estate in fee-simple to be held of a mesne lord, or to reserve a rent upon a grant of an estate in fee (unless in the form of a rent-charge), or to create a new manor. The statute, however, does not bind the crown. The practical effect of the statute was to make the transfer of land thenceforward more of a commercial and less of a feudal transaction. The writ of elegit was introduced by the Statute of Westminster IT. in 1285 as a creditor's remedy over real estate. It has, however, been considerably modified by subsequent legislation. From 1290 to the reign of Henry VIII. there is no statute of the first importance dealing with real estate. The reign of Henry VIIL, like the reign of Edward L,, is signalized by three Acts, the effects of which continue to this day. The one which has had the most lasting influence in law is the Statute of Uses, 27 Hen. VIII. c. 10 (see Convey- ANCING, Trust). The Statute of Uses was intended to provide against secrecy of sales of land, and as a necessary sequel to it an Act of the same year (27 Hen. VIII. c. 16) enacted that all bargains and sales of land should be duly enrolled (see Sate). Bargain and sale was a form of equi- table transfer which had for some purposes superseded the common law feoffment. It applied only to estates of inheritance and not to terms of years. The unforeseen effect of 27 Hen. VIII. c. 16 was to establish as the ordinary form of conveyance until 1841 the conveyance by lease and release? Uses having become legal estate by the Statute of Uses, and therefore no longer devis- able, 32 Hen. VIII. c. 1 (explained by 34 and 35 Hen. VIII. c. 5) was passed to remedy this inconvenience. It is still law as to wills made before 1838 (see WILL). In the reign of Elizabeth the Acts of 13 Eliz. c. 5 and 27 Eliz. c. 4 avoided fraudulent conveyances as against all parties and voluntary conveyances as against subse- quent purchasers for valuable consideration. arly in the reign of Charles II. the Act of 1661 (12 Car. II. c. 24) turned all the feudal tenures (with the exception

. / Tenants in chief of the crown were liable to a fine on alienation until 12 Car. II. c. 24.

2 From the reign of Edward IV. at latest up to the Fines and Re- coveries Act of 1833 fines and recoveries were also recognized as a means of conveyance. They are so regarded in the Statute of Uses.

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of frankalmoign and grand serjeanty) into tenure by free and common socage and abolished the feudal incidents. The Statute of Frauds (29 Car. II. c. 3) contained pro- visions that certain leases and assignments, and that all agreements and trusts relating to land, should be in writing (see Fravp). The land registries of Middlesex and York- shire date from the reign of Anne (see REGISTRATION). Devises of land for charitable purposes were forbidden by the Mortmain Act (9 Geo. II c. 36). In the next reign the first general Inclosure Act was passed, 41 Geo. IIL c. 109 (see Commons). In the reign of William IV. were passed the Prescription, Limitation, and Tithe Commuta- tion Acts (see Prescription, Limiration, TrrHss) ; fines

and recoveries were abolished and simpler modes of con-

veyance substituted by 3 and 4 Will. IV. c. 74; and the laws of inheritance and dower were amended by 3 and 4 Will, IV. ce. 105, 106 (see INHERITANCE, HUSBAND AND Wire). In the reign of Victoria there has been a vast mass of legislation dealing with real estate in almost every conceivable aspect. At the immediate beginning of the reign stands the Wills Act (see Witt). The transfer of real estate has been simplified by 8 and 9 Vict. c. 106 and by the Conveyancing Acts of 1881 and 1882 (see below). Additional powers of dealing with settled estates were given by the Settled Estates Act, 1856, later by the Settled Estates Act, 1877, and the Settled Land Act, 1882 (see SETTLEMENT). Succession duty was levied for the first time on freeholds in 1853. The strictness of the Mortmain Act has been relaxed in favour of gifts and sales to public institutions of various kinds, such as schools, parks, and museums. The period of limitation has been shortened for most purposes from twenty to twelve years by the Real Property Limitation Act, 1874 (see Limiration). Several Acts have been passed dealing with the enfranchisement and commutation of copyholds: and the preservation of commons and open spaces (see Com- MONS, CopYHoLD). The Naturalization Act, 1870 (33

and 34 Vict. c. 14), enables aliens to hold and transfer land in England. The Felony Act, 1870 (33 and 34 Vict. c. 23), abolished forfeiture of real estate on conviction for felony. The Agricultural Holdings Act, 1883 (46 and 47 Vict. ¢. 61), gives the tenant of a tenancy within the Act a general right to compensation for improvements, substitutes a year's notice to quit for the six months' notice previously necessary, enlarges the tenant's right to fixtures, and limits distress to a year's rent. By 47 and 48 Vict. c. 71 the law of escheat is extended to incorporeal hereditaments and equitable estates. Among other subjects which have been dealt with by recent legislation may be mentioned Rz- GISTRATION, MoRTGAGE, PARTITION, EXCAMBION, FIXTURES (qq.vv.), taking of land in execution, declaration of title, and apportionment. Not a year passes in which the land law is not altered to a greater or less degree. Bills have been introduced within recent years, but hitherto unsuccess- fully, for amending the law by the assimilation of the suc- cession to real and personal estate, and for the compulsory enfranchisement of leaseholds.

Real estate at the present day is either legal or equitable, a differ- ence resting mainly upon historical grounds (see Equiry, Trust). The following observations apply in general to both kinds of estate. The usual classification of interests in real estate regards either the extent, the time, or the mode of enjoyment. The division accord- ing to the extent is in the first instance Into corporeal and incorporeal hereditaments, a division based upon the Roman law division of res into corporates and incorporales, and open to the same objection, that it is unscientific as co-ordinating subjects of rights with the rights themsclves. Corporeal hereditaments, says Blackstone, 'consist of such as affect the senses, such as may be sceu and*

handled by the body ; incorporeal are not the objects of scnsation, can neither be secn nor handled, are creatures of the mind, and

3 In spite of this objection the division is adopted by the legislature ; see, for instance, 47 and 48 Vict. c. 71.

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exist only in contemplation." Corporeal hereditaments are all necessarily freehold ;! an interest in land less than freehold, such as a term of years, is personalty only. There was no room for such an interest in the feudal gradation of teunre ; it was regarded as a mere personal contract and was incapable of the incidents of tenure. By the Conveyancing Act, 1881 (44 and 45 Vict. c. 41, s. 65), the residue of a long term of years may in certain cases be enlarged into the fee-simple. A copyhold is in strict law only a tenancy at the will of the lord (see CopyHoLp). Estates of freehold are either estates for life or in fee (called also estates of inheritance), the latter being in fee-tail or in fee-simple. An estate for life may be either for the life of the tenant or for the life of another person, the latter called an estate pwr autre vie. The former kind of estate includes estates of dower and curtesy (see HusBAND AND WIFE). An estate in fee is called a fee simply, an obvious sign of its feudal origin. Estates tail are either general or special, the latter being in tail male or (rarely) in tail female. There may also be a quasi-entail of an estate pwr awtre vie (see ENTAIL). An estate. in fee-simple is the largest estate known to English law. Its ordinary incidents are an oath of fealty (never exacted), EscueratT (q.v.), and (in a manor) suit of the court baron, and occasionally a small quit-rent and relief. All these are obviously relics of the once important feudal incidents. Incorporeal heredita- ments consist chiefly, if not wholly, of rights in alieno solo. They are divided by Mr Joshua Willianis (Real Property, pt. ii.) into (1) reversions, remainders, and executory interests, (2) hereditaments purely incorporeal, the last being either appendant, appurtenant, or in gross. Examples are profits a prendre (such as rights of common), easements (such as rights of way),? seigniories, advowsons, rents, tithes, titles of honour, offices, franchises. Before 1845 corporeal hereditaments were said to lie in livery, incorporeal in grant. But by 8 and 9 Vict. c. 106, s. 2, all corporeal hereditaments are, as regards the conveyance of the immediate freehold thereof, to be deemed to lie in grant as well as in livery. With regard to the time of cnjoyment, estates are either in possession or in expectancy, —that is, in reversion or remainder or executory interests (see REMAINDER). With regard to the mode of enjoyment, estates are either joint, in common, in coparcenary, or in severalty. Lxecptional Tenures.—It has been already stated that there are still to be found survivals of the old pre-Conquest customary law. They are found both in the tenure and in the conveyance of land. The only

customs of which judicial notice is taken are GAVELKIND (g.v.) and BoroucH-ENGLISH (q.v.). Any other local customs, as in manors, must be proved by evidence. The tenures of frankalmoign and grand serjeanty were specially preserved by 12 Car. II. c. 24. Tenure in frankalmoign is the nearest approach in English law to absolute ownership. An estate in frankalmoign has no incidents, as it is held simply by divine service and is not subject to escheat. All tenures in frankalmoign must (except where created by the crown) be older than Quia Emptores. The tenure of grand serjeanty

is the holding of lands by doing a personal service to the king, as .

carrying his banner or sword. Petit serjeanty consists in the pay- ment to the king yearly of a bow, sword, dagger, or such other small things belonging to war (Littleton, §159). Itisin effect socage.

Title—This is the name given to the mode of acquisition of rights over real estate. Title may arise either by alienation, voluntary or involuntary, or by succession. Voluntary alienation is either ¢nter vivos or by will. The former branch is practically synonymous with conveyance, whether by way of sale, settlement, mortgage, or otherwise. As a general rule alicnation of real estate inter vivos must be by deed since 8 and 9 Vict. c. 106. Since that Act a deed of grant has superseded the old forms of feoffment and lease and release. Considerable alterations in the direction of shortness and simplicity have been madc in the law of transfer of real estate by the Conveyancing Acts, 1881, 1882 (44 and 45 Vict. ce. 41, 45 and 46 Vict. c. 39). The word "grant" is no longer necessary for a conveyance, nor are the old words of limitation "heirs" and "heirs of the body." It is sufficient to use the words "in fee-simple," "in tail," 'in tail male," "in tail female." Many provisions usually inserted in deeds, such as covenants for title by a beneficial owner and powers of appointment of new trustees, obtain statutory sanction. Forms of mortgage, conveyance, and settlement are appended to the Act. The Solicitors' Remuneration Act, 1881 (44 and 45 Vict. c. 44), was passed as a necessary sequel to the Conveyancing Act, and tlie remuneration of solicitors now stands upon a different and more satisfactory basis. For acquisi- tion by will and succession, see WILL, INHERITANCE. Involuntary alienation is by

BANKRUPTCY (g.v.) and by other means of enforcing the rights of creditors over land, such as distress or execution. It may also arise by the exercise by the state of its right of eminent domain for public purposes, as under the Lands Clauses and other Acts.2 In sales of real estate title is generally traced in an abstract delivered by the vendor (see SALE).

1 In the category of corporeal hereditaments are also included certain acces- sories to corporeal hereditaments proper, such as growing crops, fixtures, title- deeds, &e.

2 It should be noticed that an easement in gross cannot exist.

3 The right of the state to contribution from land for revenue purposes and

Restraints on Alienation.—The alienation of real estate may be

subject to almost any conditions, provided that such conditions do not contravene the law. Asa general rule there can be no restric- tions upon the alienation of an estate in fee-simple ; the two ideas are incompatible. In the case, however, of a married woman a restraint on anticipation is allowed within certain limits. The power of imposing such a restraint is preserved by the Married Women's Property Act, 1882 (45 and 46 Vict. c. 75, s. 19), subject to the right of the court to bind the interest of the marricd woman where it would be for her benefit to do so (44 and 45 Vict. c. 41, s. 39). In another direction the imposition of a course of devolution upon property is forbidden by the law against perpetuities, under which no executory interest can be made to commence unless within the period of any fixed number of existing lives, and an additional period of twenty-one years (with a few months added, if necessary, for the period of gestation). Accumulation of income is forbidden (with a few exceptions) by the Thelusson Act (39 and 40 Geo. ITI. c. 98) for any longer term than the life of the grantor or settlor, or twenty-one years from his death, or during a pcriod of minority. Certain persons are by the general policy of the law disabled from exercising full proprietary rights, such as marricd women (see above), convicts, infants, and lunatics. Estates tail are in

general alicnable under the Fines and Recoveries Act (see ENTAIL). But in a few cases estates tail are settled inalienably by Act of Parliament, generally as a reward for public services. Estates are thus settled to go with the titles of Marlborough, Wellington, Abergavenny, and Shrewsbury.

*Exceptional Modes of Alicnation.—In some of these cases, like those of the exceptional tenures, the influence of the old customary law is to be traced. The transfer of copyholds especially depends to a great extent upon the custom of particular manors, but, subject to that, it usually takes place by surrender and admittance (see CopyHoLp). Gavelkind lands may be conveyed by feoffment by any infant above the age of fifteen. For mines in the Forest of Dean a peculiar mode of transfer is provided by 1 and 2 Vict. c. 43. In the Isle of Portland there seems to be a distinct survival of the pre-feudal conveyance. The vendor and purchascr meet in the parish church, where a deed is signed by the parties in the presence of two houscholders of the island. These deeds are called *‘church gifts.”*

Procedure.—In some cases rights attaching to real estate are pro- tected by peculiar remedies. At an early period it became more convenient to try the right to the possession of, rather than the right to the property in, real estate. Possessory tended to super- sede proprietary remedies, from their great simplicity and elasticity. The general mode of trying the right to both property and posses- sion was from the time of Henry II. the real action, the form called “writ of right” (after Magna Charta gradually confined to the Court of Common Pleas) being used to determine the property, that called “‘assise of novel disseisin” being the general means by which the possession was tried. About the reign of Elizabeth the action of ejectment became the ordinary form of possessory remedy. Real actions existed until 3 and 4 Will. IV. c. 27, by which they were finally abolished, with the exception of writ of right of dower, writ of dower unde nihil habet, quare tmpedit, and ejectment. Of these QUARE IMPEDIT (q.v.) appears to be the only one now in use. The assise of novel disseisin, the action of ejectment in both its original and its reformed stage (see EJECTMENT), and finally the action for the recovery of land in use since the Judicature Acts are all historic- ally connected as gradual developments of the possessory action (see Possrsston). The action for the

recovery of land is still sub- ject to special provisions and is not quite in the same position as an ordinary action (see Rules of the Supreme Court, 1888, Ord. xii, rr. 25-29, Ord. xviii. r. 2, &c.). There are certain matters affecting real estate over which the Court of Chancery formerly had exclusive jurisdiction, in most cases because the principles on which the court acted had been the creation of equity. The Judicature Act, 1873 (86 and 87 Vict. c. 66, s. 34), assigns to the Chancery Division of the High Court of Justice all causes and matters for (inter alia) the redemption or foreclosure of mortgages, the raising of portions or other charges on land, the sale and distribution of the proceeds of property subject to any lien or charge, the specifie performance of contracts between vendors and purchasers of real estates, including contracts for leases, the partition or sale of real estates, and the wardship of infants and the care of infants' cstates.

In the case of rent a summary mode of remedy by act of the

creditor still exists (see DISTRESS, RENT).

For the economical aspect of the English law, see LAND. Fora list of the main points of difference between real and personal estate, see PERSONAL ESTATE.

Authorities.—Those cited at the end of Lanp, and in addition Digby, History of the Law of Real Property ; Elton, Tenures of Kent; Goodeve, Modern Law of Real Property ; Pollock, Land Laws; Stephen, Commentaries, vol. i. ; Seebohin, English Village Community ; Williams, teal Property; Wolstenholine and Turner, Conveyancing Acts. ' . '

Ireland.—The law of real estate in Ireland is the English law,

to stamp duties on deeds perhaps falls under this head. These iniposts are really involuntary alienations of part of the profit of the land.

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which finally superseded the native law in James I.'s reign, as modified by subsequent legislation. 'The main difference is in the law of

LaNpLoRD AND TENANT (q.v.) and the operation of the Landed Estates Court, merged in the High Court of Justice in Ire- land by the Supreme Court of Judicature (Ireland) Act, 1877.

United States.—The law of real estate in the United States is the law of England modified to suit a different state of cireumstances. The main point of difference is that in the United States the occupiers of land are generally wholly or in part owners, not tenants, as in England. This is to a great extent the effect of the home- stead laws (see HomestEap). The traces of the feudal origin of the law are, as might be expected, considerably less prominent than in England. Thus estates tail are practically obsolete ; in some States they are specially forbidden by the State constitutions. The law of descent is the same in real and personal estate (see INHERIT- ANCE). Manors do not exist, except in the State of New York, where they were created by the crown in colonial days (Bouvier, Law Diet., Manor"). Registration of deeds is general (see REGISTRATION). In some States forms of deed are prescribed by statute. Conveyancing is for the most part simpler than in Eng- land. The holding of real estate by religious or eharitable corpora- tions is generally restricted by the Act ereating them rather than by anything like the English law of mortmain. In Pennsylvania such a eorporation cannot hold land without an Act of the legisla- ture, and in Territories of the United States it cannot hold real estate of a greater value than $50,000 (Act of Congress of ist July 1862, c. 126). Perpetuities are forbidden in most States. The right of eminent domain is at once acknowledged and limited by the constitution of the United States. By art. 5 of the Amendments private property is not to-be taken for public use without just com- pensation. A similar provision is found in many of the State con- stitutions. By an Act of Congress of 9th April 1866, e. 31, all citizens of the United States have the same right in every State and Territory as is enjoyed by white citizens thereof to inherit, purchase, lease, sell, hold, and convey real and personal property. In most States aliens may hold land; but in some States they cannot do so without becoming naturalized or at least filing in the specified manner a declaration of intention to become naturalized. For the State laws affecting the capacity of aliens to hold land, see Wash- burn, Real Property, vol. i. p. 64.

International Law.—The law of the place where real estate is situated (lex loet rei site) governs its tenure and transfer. The laws of England and of the United States are more strict on this point than the laws of most other countries. They require that the for- malities of the locus ret site must be observed, even if not necessary to be observed in the place where the contract was made. The lex loei rei site determines what is to be eonsidered real estate.

REALISM. See ScHoLAsricism.

REAUMUR, Rent Antone FercHautt DE (1683- 1757), the eldest son of a French nobleman, was born on 28th February 1683 at La Rochelle and received his early education there. He was taught philosophy in the Jesuits' college at Poitiers, and in 1699, when "hardly seventeen, but already possessed of the prudence of a grown man," went to Bourges to study civil law and mathematics under the charge of an uncle, canon of La Sainte Chapelle. In 1703 he came to Paris, where he continued the study of mathematics and physics. He soon made his presence felt in the highest circles, and in 1708, at the remarkably early age of twenty-four, was elected a member of the Académie des Sciences. From this time onwards for nearly half a century hardly a year passed in which the Mémozres de l' Académie did not contain at least one paper by Réaumur. At first his attention was occupied by mathematical studies, especially in geometry. In 1710 he was appointed to the charge of a great Government work—the official descrip- tion of the useful arts and manufactures—which led him to many practical researches that resulted in the establish-

ment of manufactures new to France and the revival of neglected industries. For discoveries regarding iron and steel the regent Orleans awarded him a pension of 12,000 livres ; but, being content with his ample private income, he requested that the money should be secured to the Académie des Sciences for the furtherance of experiments on improved industrial processes. In 1731 he became greatly interested in meteorology, and invented the thermo- meter which bears his name. In 1735 family arrange- ments obliged him to accept the post of commander and intendant of the royal and military order of Saint Louis ; he

discharged his duties in connexion with it with scru- pulous attention, but declined to receive any of the emoluments. Whatever his other occupations were, he always found time for the systematic study of natural history, in which he took great delight. He was a born naturalist, gifted with rare powers of observation and de- scription,—indeed his friends often called him the Pliny of the 18th century. He loved retirement and lived much at his country residences, at one of which, La Bermondiére (Maine), he met with an accident, a fall from horseback, the effects of which proved fatal on 17th October 1757. He bequeathed his manuscripts, which filled 138 port- folios, and his natural history collections to the Académie des Sciences.

Réaumur was a man of wide attainments and great industry. His writings, sometimes on trivial topics, were frequently diffuse, yet always interesting. His mind was original and intensely practical. As a rule he avoided theoretical questions, but when he took them up his manner of treatment was remarkably clear, chiefly on account of an ingenious use of metaphor, often expanding into allegory. His memory was retentive, his information immense, and his kindliness of disposition such that his knowledge and wealth seemed to be amassed only for the benefit of his friends. He always bore a high character, was a great favourite in society, and associated on terms of intimacy with the principal great men of the time in Europe.

Réaumur's scientific papers are too numerous to be recapitulated ; they deal with nearly all branches of science. His first paper, in 1708, was on a general problem in geomctry, his last, in 1756, on the forms of birds' nests. He proved experimentally the fact, afterwards demonstrated theoretically by Du Hamel, that the strength of a rope is less than the sum of the strengths of its separate strands. He examined and reported on the auriferous rivers, the turquoise mines, the forests, and the fossil beds of France. He devised the method of tinning iron that is still employed, and investigated the differences between iron and steel, correctly showing that the amount of combustible matter (sulphur in the language of the old chemistry) is greatest in cast iron, less in steel, and least in wrought iron. His book on this subject (1722) was translated into English and German. The thermo- meter by which he is now best remembered was constructed

on the principle of taking the freezing-point of water as 0°, and graduating the tube into degrees each of which was one-thousandth of the volume contained by the bulb and tube up to the zero mark. It was purely an accident dependent on the dilatability of the parti- cular quality of alcohol employed which made the boiling-point of water 80°; and mercurial thermometers the stems of which are graduated into eighty equal parts between the freezing and boiling points of water are not Réaumur thermometers in anything but name.

Réaumur wrote much on natural history. Early in life he described the locomotor system of the Echinodermata, and showed that the supposed vulgar error of Crustaceans replacing their lost limbs was an actual fact. In 1710 he wrote a paper on the possi- bility of spiders being used to produce silk, which was so celebrated at the time that the Chinese emperor Kang-he caused a translation of it to be made. He treated also of botanical and agricultural matters, and devised processes for preserving birds and eggs. He elaborated a system of artificial incubation, and made important observations on the digestion of carnivorous and graminivorous birds ; but his greatest work is the M/émotres pour servir a 0 Histoire des Inseetes, 6 vols., with 267 plates, Amsterdam, 1734-49. It describes the appearance, habits, and locality of all the known insects except the beetles, and is a marvel of patient and accurate observation. Amongst other important facts stated in this work are the experiments which enabled Réaumur to prove the correct- ness of Peyssonel's hypothesis, that corals were animals and not plants, as was previously supposed.

REBUS, an enigmatical representation of some name or thing, by using figures or pictures instead of words or

parts of words. Camden mentions an instance of this kind of wit in a gallant who expressed his love to a woman named Rose Hill by painting in the border of his gown a rose, a hill, an eye, a loaf, and a well; this, in the style of the rebus, reads " Rose Hill I love well." This kind of wit was long practised by the great, who took the pains to find devices for their names. It was, however, happily ridiculed by Ben Jonson in the humorous

description of Abel Drugger's device in the Alchenust and by the Spectator in the device of Jack of Newberry. The name is also applied to arrangements of words in which the position of the several vocables is to be taken into account in divining the meaning. Thus 'I understand you undertake to over- throw my undertaking" makes the rebus

stand take to I you throw

taking my ;

or in French

venir

pir vent Wun

un Vient

may be read "un soupir vient souvent d'un souvenir."

The original use of the word, which comes to us from.

France, was, however, wider: any equivoque or satirical pleasantry might be so named, and the origin of the term is ascribed by Ménage to the clerks of Picardy, who at carnival time used to put out satirical squibs called "De rebus que geruntur." ' Rebus," in heraldry, is a coat of arms which bears an allusion to the name of the person,— as three castles for Castleton, three cups for Butler, three conies for Coningsby.

RECAMIER, Mapame (whose maiden name was J EANNE Francoise JuLtie ADELAIDE BERNARD), was born on 4th December 1777 at Lyons, and died at Paris on 11th May 1849. She was married at fifteen to the banker Récamier, who was more than old enough to be her father. Beautiful, accomplished, with a real love for literature, she possessed at the same time a temperament which protected her from scandal, and from the early days of the consulate to almost the end of the July monarchy her salon was one of the chief resorts of literary and political society that pretended to fashion. For some time she was much under the in- fluence

of Madame de Staél, and it was partly through her that Madame Récamier became acquainted with Benjamin Constant, whose singular political tergiversations during the last days of the empire and the first of the restoration have been attributed to Madame Récamier. There is no doubt that she succeeded in inspiring a real and almost desperate passion in the heart of Constant, whose letters to her have had a singular fate, having been twice published in part, and twice interfered with by judicial proceedings on the part of the representatives of the parties concerned. In Madame Récamier's later days she lost most of the for- tune which, when she was the wife of a rich banker, had given her part of her consequence ; but she continued to receive visitors at the Abbaye-aux-Bois. Here Chateau- briand was a constant visitor, and in a manner master of the house; but Madame Récamier never even in old age, ill-health, and reduced circumstances lost her attraction. After her death Souvenirs et Correspondances tirés des Papiers de Madame Récameer were published. To compile, however, a real account of her would necessitate the ransack of all the memoirs, correspondence, and anecdotage con- cerning French political and literary life for the first half of this century.

RECANATI, a city of Italy, in the province of Macerata, 174 miles from Loreto, on the highway between Ancona and Rome, is built ona hill 910 feet above the sea, and still retains portions of its 15th-century walls and gateways. It is now perhaps best known as the birthplace of the poet Leopardi, whose monument adorns the principal piazza and whose family has collected in the town a very interesting

museum of Leopardiana; but it also contains fine old mansions of the Leopardi, Mazzagalli, Massucci, and Car- radori in the main street, a palazzo communale with a bronze representation of the removal of the Holy House to Loreto, and a Gothic cathedral, built towards the close of the 14th century and dedicated to St Flavianus, patriarch of Constantinople. The population in 1881 was 8864 in the town and port (3040) and 19,524 in the commune. 'Recanati appears as a strong castle in the 10th century or earlier. Round this gathered a community whose petty wars with Osimo (Auximum) called for the interference of Innocent

III. in 1198. From Frederick II. it obtained the right of having a port on the Adriatic ; and by Gregory IX. it was made a city and the seat of the bishopric transferred from Osimo. This oscillation between Guclf and Ghibelline continued characteristic of Recanati. Urban IV. abolished the "city"' and bishopric ; Nicholas IV. restored them. John XXII. again, in 1320, removed the bishopric and placed the city under interdict. The interdict was withdrawn in 1328 on payment of a heavy fine, but the bishopric remained in abeyance till 1357. Gregory XII., who on his deposition by the council of Constance was made papal legate of the sees of Macerata and Recanati, died in this city in 1417. The assistance rendered by Recanati to the popes in their struggles with the Sforza seems to have cxhausted its resources, and it began to decline. Considerable damage was done by the earthquake of 1741; and the French, who were twice in possession of the city in 1797, pillaged it in 1799.

RECHABITES, or Sons or RecHaB, in ancient Israel formed a sort of religious order in some respects analogous to the Nazarites, with whom they shared the rule of abstinence from wine. They went farther than the latter, however, in eschewing the luxuries and pursuits of settled life, living in tents and refusing to sow grain as well as to plant vineyards. Their origin must have been in northern Israel, for their "father" or founder, to whom they referred their rule of life, was that Jehonadab or Jonadab, son of Rechab, who lent his countenance to Jehu in the abolition of Tyrian Baal-worship (2 Kings x.). The order founded by Jehonadab must from its constitution have soon become a sort of hereditary clan, and as such the "house of Rechab" appears in Jer. xxxv., from which we learn that they had survived in Judah after the fall of the northern kingdom and continued to observe the ordi- nance of Jehonadab till the approach of Nebuchadnezzar drove them for protection into Jerusalem. Jeremiah pro- mised them as a reward of their obedience that they should never lack a man to represent them (as a priest) before Jehovah. This perhaps is the origin of the later Jewish tradition that the Rechabites intermarried with the Levites and so entered the temple service! Hegesippus in his account of the death of James the Just even speaks of Rechabite priests and makes one of them protest against the crime (Eus., H.Z., ii. 23).

RECIFE. See PERNAMBUCO.

RECOGNIZANCE, in law, is, in the words of Black- stone, "'an obligation of record, entered into before some court or magistrate duly authorized, whereby the party bound acknowledges that he owes to the king or a private plaintiff (as the case may be) a certain sum of money, with condition to be void if he shall do some particular act,— as if he shall appear at the assizes, keep the peace, pay a certain debt, or the like." The term itself means that the person bound recognizes the existence of a debt. Recog- nizance was at one time used as a security for money lent, something in the nature of a mortgage. In this sense it is practically obsolete, though it is alluded to in modern Acts of Parliament, ¢.g., 27 and 28 Vict. c. 112, by which a recognizance entered into after 29th July 1864 does not bind the land until actual delivery in execution. The principal use of recognizances at the present day is in chancery and criminal procedure. In chancery recogniz- ances are entered into as a form of security by certain

1 From the obscure passage 1 Chron. ii. 55 it would seem that in later times the Rechabites were regarded as Kenites.

persons appointed to positions of trust, such as guardians or receivers. In criminal practice they affect either suspected or accused persons, or witnesses. As early as 1360 the Act of 34 Edw. III. c. 1 empowered justices to take of all them that were not of good fame sufficient surety and mainprize of their good behaviour. The wide terms of this provision are not acted upon at the present day. The only recognizances of this kind practically enforced are those entered into as security for keeping the peace. Such recognizances are forfeited by any act tending to a breach of the peace. The Criminal Law Consolidation Acts of 1861 provide that any court may on the conviction of a person for an offence under any of the Acts require him in addition to or in lieu of other punishment to enter into his own recognizances for keeping the peace and being of good behaviour. The power to bind witnesses by recog- nizance was originally conferred by an Act of 1554, 1 Ph. and M. c. 13. Recognizances are now the usual means by which a court of summary jurisdiction or a coroner

binds over a prosecutor and his witnesses or an accused person and his witnesses to appear at the trial. The pro- cedure principally depends upon 7 Geo. IV. c. 64, 11 and 12 Vict. c. 42 (one of Jervis's Acts), 30 and 31 Vict. c. 35 (Russell Gurney's Act), 42 and 43 Vict. c. 49, s. 31 (the Summary Jurisdiction Act, 1879). In proceedings in error and in appeals from courts of summary jurisdiction to quarter sessions the prosecution of the appeal by the appellant is secured by recognizance. In certain cases police authorities have by recent statutes a limited authority to take the recognizance of accused persons. Failure to comply with the conditions of recognizances leads to their forfeiture. Additional facilities for the enforcing of re- cognizances were given by the Summary Jurisdiction Act, 1879 (see QUARTER Sesstons). When recognizances are forfeited they are estreated (i.e., extracted) from the records of the court to be enforced against the defaulter. An appeal against an order of a court of summary jurisdic- tion forfeiting recognizances lies to quarter sessions (3 Geo. IV.c. 46). By 28 and 29 Vict. c. 104 a recognizance does not bind the land in the hands of a bona fide purchaser for valuable consideration or a mortgagee unless actual execu- tion has issued and been registered in the name of the debtor at the central office of the Supreme Court of Judi- cature. Registered recognizances are among the encum- brances for which search is made on a purchase of land. By 45 and 46 Vict. c. 39 an official negative of the exist- ence of registered recognizances may be given by the proper officer on application. A discharge in bankruptcy does not release the debtor from a debt on a recognizance unless the Treasury certify in writing their consent to his discharge (46 and 47 Vict. c. 52, s. 30). Forgery of recog- nizances is a felony punishable by five years' penal servi- tude (24 and 25 Vict. c. 98, s. 32).

In Scotland the place of recognizances is filled by cautions ; a caution in law-burrows corresponds very nearly to a recognizance to keep the peace.

In the United States recognizances are used for much the same purposes as in England.

RECORDE, Ropert (c. 1500-1558), a physician and eminent mathematician, was descended from a respectable family at Tenby in Wales and was born about 1500. He was entered of the university of

Oxford about 1525, and was elected fellow of All Souls College in 1531. As he made physic his profession, he went to Cambridge, where he took the degree of M.D. in 1545. He afterwards re- turned to Oxford, where he publicly taught arithmetic and mathematics, as he had done prior to his going to Cam- bridge. It appears that he afterwards went to London, and acted as physician to Edward VI. and to Queen Mary, to whom some of his books are dedicated. He died in the

King's Bench prison, Southwark, where he was confined for debt, in 1558.

Recorde published several works upon mathematical subjects, chiefly in the form of dialogue between master and scholar, viz. :— The Grounde of Artes, teachinge the Worke and Practise of Arith- meticke, both in whole numbers and fractions, 1540, 8vo; The Path- way to Knowledge, containing the First Principles of Geometry . . . bothe for the usc of Instrumentes Geometricall and Astronomicall, and also for Projection of Plattcs, London, 1551, 4to; The Castle of Knowledge, containing the Explication of the Sphere both Celestiall and Materiall, &c., London, 1556, folio; The Whetstone of Witte, which is the second part of Arithmetike, containing the Extraction of Rootes, the Cossike Practice, with the Rules of Equation, and the Woorkes of Surde Numbers, London, 1557, 4to. This was the first English book on algebra. He wrote also a medical work, The Urinal of Physic, 1548, frequently reprinted. Sherburne states that Recorde also published Cosmographiz Isagoge, and that he wrote a book De Arte faciendt Horologiwm and another De Usu Globorum et de Statu Temporum. Recorde's chief contributions to the progress of algebra were in the way of systematizing its notation. He is said to have been the first to use the sign of equality (=) having the two parallel lines, as he says himself, because no two things could be more equal. The adaptation of the rule for extracting the square root of an integral number to the extrac- tion of the square root of an integral algebraical function is also said to be due to him.

RECORDER. See Courr and QUARTER SESSIONS.

RECORDS, Pustic. According to the definition of the Record Commissioners appointed at the commencement of this century to report upon the nature of the archives, the national muniments of England constitute four great classes. The first class consists of independent documents relating to various subjects, persons, and places, but making altogether one whole, such as, for instance, Domesday Book, or the Valor Ecclesiasticus of Henry VIII. The second class consists of the series of enrolments, including within one roll great varieties of distinct and separate entries classed according to their formal character, as, for instance, the close rolls and patent rolls, or classed according to their subject-matter, as are the Liberate and the Norman rolls. The third class embraces those records which contain entries of judicial proceedings and those where each subject has a distinct roll; whilst the last class comprises all separate documents, such as letters, inquisitions, privy seals, com-missions, and other various descriptions of formal instru- ments. Sir Edward Coke has given in his signification of the term "record" a briefer and less involved definition ; but according to his rendering many important documents would have to be excluded from the list of the national archives. Hence it was decreed, on the passing of the Public Records Act (1 and 2 Vict. c. 94), which created the master of the rolls the keeper of the archives, that the word "records" should be taken to mean "all rolls, records, writs, books, proceedings, decrees, bills, warrants, accounts, papers, and documents whatsoever, of a public nature belonging to Her Majesty."

The documents of the once styled Courts of Chancery, Queen's Bench, Exchequer, and Comnion Pleas contain the very essence of England's antiquarian wealth: they constitute most of its bulk, much of its legal importance, and nearly all its historical interest. 'The custom of recording documents on rolls of parchment," writes Sir Thomas Hardy, the late deputy-keeper of the public records, "though of very ancient date, commenced nevertheless at a period subsequent to the Conquest; for no vestige can be traced of such a system during the Anglo-Saxon dynasty. 'Apud Anglo-Saxones,' says Hickes, 'etiam mos erat leges regum latas in codicibus monasteriorum tanquam in tabulas publicas referendi.' It may be assumed that, had such a plan been then in operation, the same would have been adopted by the Conqueror to perpetuate the survey of the

kingdom which he caused to be made, and for the preserva- tion of which he evinced so mucli zeal and anxiety." As to the precise time when the use of rolls for the entry of

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matters of business first began there is still considerable doubt. That no rolls of a date antecedent to that of the 3lst Henry I. are now in existence is certain. It may therefore be presumed that the practice of enrolling com- menced shortly after the Conquest.

Court of Chancery.—Owing to the vast quantity of documents of this court, only the salient points of the principal series of rolls can be dealt with. Among the most important enrolments belonging to this court is the extensive series of documents known as the close rolls or Rotuli Litterarum Clausarum. Upon their well-preserved parchment membranes the historian scans entries relating —to the privileges of peers and commoners in times gone by ; to measures employed for the raising of armies and the equipment of fleets; to orders for the observance of treaties, and for the fortification of castles; and to laws innumerable touching the power of the bench, the authority of the church, the extent of the civil jurisdiction, and the prerogatives of the crown. By the help of these rolls the lawyer and antiquary can learn how the coinage of the realm was regulated, how aids and imposts, toll- ages and subsidies, were raised, how riots and tumults were suppressed, how state prisoners were pardoned, how the writs ran for the summoning of parliaments, what deeds were enrolled between party and party, what facts were deemed worthy of record upon the birth, marriage, and death of royal and noble families; in short, there is little that concerns the naval and military, the civil and ecclesiastical, the legal and diplomatic affairs of the king- dom, which is not to be found upon the yards and yards of parchment which constitute the collection of the close rolls, The origin of the name "close" is due to the fact that the documents composing the series, being of a private nature, were despatched closed or sealed up, and were addressed to one or two persons only. The close rolls begin with the reign of John and continue without in- terruption to the present time. Since the days of Henry VIII. the entries on these rolls are mostly confined to the

enrolments of deeds of bargain and sale, wills of papists, recognizances, specifications of new inventions, and other instruments enrolled for safe custody by warrant from the lord chancellor or master of the rolls. Next in importance, and scarcely second in historical interest, is the series of muniments, dating also from King John to the present day, called the patent rolls. Nota subject connected with the history and government of the country but receives illustration from this magnificent collection. Is a castle besieged by the king, a papal interdict removed by royal supplication, a safe-conduct granted to an unpopular pre- late, credence allowed to some court witness, grace shown to a rebellious subject, church lands bestowed on begging clergy, negotiations entered into with foreign princes, powers of ambassadors regulated, lands, offices, and ward- ships granted to public bodies or private persons, titles of nobility created, charters confirmed, proclamations drawn up, licences to hold, sell, and marry, commands to do fealty and homage,—all, whether relating to political, social, ecclesiastical, or commercial life, are to be found recorded on the membranes of the "'litterz patentes." With the exception of a few gaps in the reigns of John and Henry III. the letters-patent extend without break or flaw from the year 1200 to our own day. Unlike the close rolls, they are unsealed and exposed to view, hence their name. 'The third great class of records belonging to the Court of Chancery consists of the " parliament rolls" ; these, however, are far from being a perfect collec- tion, as many of the documents containing the proceedings of various parliaments are hopelessly lost. The series begins with the 6th Edward I. and extends, though with frequent breaks, to Henry VIII. As the journals of the

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House of Lords do not commence till the reign of Henry VIII, it is only from the parliament rolls that proof can be obtained of a peer having sat in parliament previous to that period ; such proof is always requisite in claims to an ancient barony by writ. When complete these rolls contain entries of the various transactions which took place from the opening to the close of each parliament. Unfortunately many of the lost rolls belong to those parliaments which are of the greatest importance for the history of the con- stitution. The enrolments of Acts of Parliament, however, are

of considerable help in the investigation of English parliamentary history and constitute a most important sup- plement to the parliament rolls. They begin with Richard IMI. and continue to 1849, when enrolments ceased and Acts printed on vellum were substituted. Space forbids us to enter into details respecting the other important collections belonging to the Chancery records. We only allude briefly to the charter rolls, which consist of grants of privileges to religious houses and bodies corporate, and which extend from John to Henry VIIL., in which reign grants from the crown were entered on the patent rolls ; the coronation rolls, which contain the commissions and proceedings of the commissioners appointed to hear and determine claims of service to be performed at coronations, as well as the oaths taken by the king or queen when crowned,—this collection, with the exception of the coro- nation rolls of Charles I. and George III, which are wanting, is perfect from James I. to Victoria; the fine rolls, consisting of accounts of fines paid to the king for licences to alienate lands, for freedom from knight service, for pardons, wardships, and the like, which also begin with John and go down to Charles I. ; the French and Nor- man rolls, which relate to transactions in France whilst the English held part of that country; the oblata rolls, con- sisting of accounts of the offerings and free gifts to the sovereign from his subjects; and the valuable inquisitions post-mortem, frequently but erroneously referred to as escheat rolls, taken on the death of every tenant of the crown. 'Then in addition to these there are the hundred rolls, the decree rolls, the royal letters, the carte antique, the privy seals and signet bills, the subsidy rolls, the Irish, Scotch, and Welsh rolls, the Almain rolls, and numerous other classes of document which it is impossible to cata- logue or describe within the limits of a general review of the English archives. Suffice it to say that every class of records is carefully arranged for public inspection and that full and clear indices render research a matter of little difficulty.

Court of Queen's Bench.—As this court takes cognizance of both civil and criminal causes, the former on the crown side and the latter on the plea side of the court, the re- cords are arranged in the two sections, crown side and plea side. Of these records the most important are the judgment or plea rolls. From the time of Richard I. to the year 1702 they were united with the crown rolls, but at that date they were separated. The

plea rolls contain the general proceedings in causes, but the modern rolls are very defective owing to the neglect of attorneys in bringing the records in, The crown rolls are composed of indictments, informations, and other similar proceedings to which parties have pleaded. Another division of the judgment rolls contains the controlment rolls, which com- prise minutes of all the principal proceedings in crown causes, with numerical references to the judgment rolls, where the proceedings are entered at length. Apart from the plea rolls the remaining records of this court are of little general interest. Among their number we imay notice the attorney's oath roll, containing the oaths re- quired to be subscribed by attorneys on their admission, the '"'baga de secretis," containing proceedings on attainders

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(of great interest to the historian), the contents of which have becn admirably reported upon by Sir Francis Palgrave, the enrolment of bails, proceedings in outlawry, the jail delivery rolls, and a mass of indictments, recognizances, and other similar documents. The prayer book known as the sealed copy of the "Book of Common Prayer" pursuant to statute 14 Charles IL. is also among the re- cords of the Court of Queen's Bench.

Court of Common Pleas.—This court contains a far richer collection than the Court of Queen's Bench, and from the nature of its jurisdiction the documents possess great interest for the genealogist and topographer. Foremost among them is the valuable collection of "feet of fines or final concords," which date from Henry II. to the year 1834, when fines and recoveries were abolished and "more simple modes of assurance substituted." "The utility of these records," says the Report of the House of Commons' committee on the state of the public records, "to all persons desirous of tracing property and pedigree is unquestionable." Fines contain the proceedings which have been adopted to convey estates and to free them from their entail to issue and from the dower of wives. Thus we are able to learn the name of the freeholder levying the fine, and if he was married the name of his wife and often of his children, the position and value of his estate, and not unfrequently something about his ancestors. Yet perhaps the chief value of this class of records is that they prove

marriages and their issue at a time when parochial registers were not in existence. Few documents show so unbroken a succession from so early a date as these " pedes finium." The king's Silver Office books are the chief in- dexes to the fines, but they suffered greatly from the fire at the king's Silver Office in the Temple in March 1838. The recovery rolls (since 1834 continued under the name of "disentailing assurances" on the close rolls) also con- stitute another important supplement to the study of the pedes finium. Next to the collection of fines may be classed the judgment rolls of this court, or, as they are more commonly designated, the "de banco" rolls. They formerly consisted of two parts, the "communia placita" or personal plea rolls, and the " placita terre" or pleas of lands and deeds enrolled ; but after the reign of Elizabeth the latter became distinct rolls, containing the king's silver and fines, assizes, deeds enrolled, and all real actions. The judgment rolls pass through three stages—first, they are plea rolls; then, when the parties join issue, issue rolls ; and lastly, when judgments are entered upon them, judg- ment rolls. The recording of the judgments has, however, been very much neglected, for many of the judgments, instead of being entered on the plea or issue rolls, have been entered on separate pieces of parchment, and thus have given rise to certain distinct bundles called "riders," in which such entries are contained.

Court of Exchequer.—This collection contains next to that of the Court of Chancery the most interesting and valu- able series of documents among the English public records. The most important and most prominent series is that of the great rolls of the Exchequer, otherwise called the pipe rolls.! As with the close and patent rolls, so with the rolls of the pipe, it is difficult to state what is and what is not entered upon their membranes. Everything which in former times went to swell the revenues of the crown — rents of various kinds, fines, amercements, profits of lands and tenements, and the like—is to be found enrolled upon them. The accounts of the ancient revenue of the crown, digested under the heads of the several counties and annually written out in order to the charging and dis-

1 In 1883 was founded the Pipe Roll Society, which has for its

object the printing of the entire series of pipe rolls from the reign of Henry I.

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charging of the sheriffs and other accountants, are also to be seen upon their membranes. Ifa great man was outlawed, his goods seized, his daughter married or made a ward, the account thereof can be read in the pipe rolls. To the pedigree-hunter these records are particularly use- ful, since they contain the names of most men of property ; while to the county historian they are invaluable. Few of the English national archives boast a more uninterrupted succession than the great rolls of the Exchequer. Begin- ning in the second year of Henry II., they continue to the present time with but two gaps—the rolls of the first year of Henry III. and of the seventh year of Henry IV. Of the latter of these missing rolls the antigraph or roll made by the chancellor's scribe is still in existence and supplies the place of the lost roll. At the beginning of this series there is a roll which was long looked upon as that of the first year of Henry II., or by some antiquaries as belonging to the fifth year of Stephen; but recent criticism seems to establish the fact that it is a roll of the 31st year of Henry I.,—the earliest national document, save Domesday, of any extent that now exists. Another im- portant class of documents belonging to the Court of Ex- chequer and stored with a variety of information upon secular and religious matters is the memoranda rolls, which extend from Henry III. to the middle of the present century. These rolls contain enrolments of all the weighty business done in the offices of the queen's and lord trea- surer's remembrancer. Upon their membranes the in- quirer will read how writs ran for the recovery of debts due to the crown, how commissions were appointed to seize estates attainted or forfeited to the crown, how goods were seized in the various ports of England for the non- payment of customs, how the accounts of sheriffs and escheators were settled with the Exchequer, how cities and boroughs made claim to special privileges, and how the numerous proceedings in equity on English informations and bills were conducted. The "brevia regia" endorsed on the memoranda rolls are the most ancient writs of that description in the kingdom; in the earlier periods they assume the shape of letters and contain various wishes of the sovereigns. To the antiquary

and historian the collec- tion of archives called "originalia rolls," which extend from Henry III. to William IV., is of great service. They not only throw considerable light upon the manners and customs in vogue in the 13th and 14th centuries, but also record the descent of lands, questions relating to crown revenues and feudal tenures, the appointment of various commissions for different purposes of investigation, and other similar entries. The importance of the originalia rolls is also increased from the fact that they contain numer- ous extracts from early rolls now no longer in existence. Among the documents of the ancient Exchequer there is much to interest the purely ecclesiastical historian in the collection of ministers' accounts of the issues and profits of monastic lands in the hands of the crown; in the pensions granted to abbots and others upon the dis- solution of the monasteries, now enrolled among the records of the Augmentation Office ; in the accounts of monasteries contained in the chartularies, the account books of first- fruits and tenths; in the taxation rolls which regulated the taxes as well to the kings as to the popes until the survey of Henry VIII.; in the Valor Ecclesiasticus of Henry VIII., which contains surveys of archbishoprics, bishoprics, abbeys, monasteries, and the like throughout the kingdom ; in the visitations of religious houses ; and in the Wolsey books. To the antiquary pure and simple the collection in the Exchequer which records the history of knights' service is perhaps the most interesting. The number of knights' fees throughout the kingdom was 60,215, of which the clergy had 28,015 ; but, as in process

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of time it became a doubtful question whether lands were held by knight's service or by some other tenure, inquisi- tions were held and each baron had to return to the king an account of what he held. Such accounts comprise the early history of landed property, with the names of the owners and the extent of the estates. For information on this subject the three great authorities are the Black and Red Books of the Exchequer, the scutage rolls, and the subsidy rolls; the Liber Niger Scaccarii, or Liber Niger Parvus as it is sometimes called, compiled by Gervase of Tilbury, nephew to Henry IT., in the twenty-second year of that king's reign, is the most ancient of these. It contains a list of knights' fees of the time of

Henry IL. and in many of the returns there appear family names and par- ticulars of the parents, children, wives, and occupiers of the land as well as of tenants im capite. In this book there are also various treaties of the same king, four bulls of Pope Alexander IIL, and the constitution of the royal household during the reign of Henry II. The Red Book is somewhat similar to the Liber Niger, and contains among other entries the oaths of the different officers of the Court of Exchequer; the Dialogus de Scaccario (for- merly ascribed to Gervase of Tilbury, but clearly proved by Madox to have been written by Richard FitzNigel, at one time treasurer of the Exchequer, who held the see of London from 1189 to 1198); numerous short memoranda, &c., for the instruction and use of the officials ; and collec- tions of knights' fees and serjeanties of the reigns of Henry IL, Richard L., John, and Henry III. Many of its entries are also in the Black Book. The scutage rolls, which begin in the reign of Edward I., contain the pecuniary satisfaction paid by each knight in lieu of the personal attendance upon his sovereign that was required of him. This satis- faction was called "'scutagium" or "servitium scuti" (service of the shield), and in Norman-French " escuage," from écz, a shield. The assessment was, however, so arbitrary that it was decreed by Magna Charta that no scutage should be imposed without consent of parliament. The subsidy rolls record the fifteenths and tenths, &c., granted by parliament to the crown. In addition to the above are the marshals' rolls, which contain an account of the military service due from great tenants to the king on the eve of a war, the "testa de Nevil," and the solitary roll called the constable's roll. Among the more important documents belonging to the ancient Exchequer collection, concerning which space forbids us to particularize, are the records of the Augmenta- tion Court, full of valuable matter to the church historian, the court rolls of manors possessed by the crown, the volu- minous series of bills and answers, the collection of special commissions, the golden bull of Clement VII. conferring the title of "Defender of the Faith" upon Henry VIIL, hearth-money accounts, the Jews' rolls, the vast collection of crown leases, the recusant rolls, and the very curious wardrobe accounts.

Obsolete Courts.—In addition to the various records which have been alluded to belonging to the Courts of Chancery, Queen's Bench, Common Pleas, and Exchequer, there is a large class of documents which

appertain to obsolete courts, and many of which are of great historical value. The most important of this class are the archives belonging to the Star Chamber, the Court of Chivalry, the Court of Requests, the Court of Wards and Liveries, and the Marshals Court. The muniments of the duchy of Lancaster and also those of the abolished courts of the palatinate of Durham are now among the archives of the Record Office. An account of Domesday Book has already been given (see Domzespay Book). The amal- gamation of the State Paper Office in 1854 with the Record Office has been the means of rendering the series of the English national archives an almost complete collection.

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With the exception of certain manuscripts in the British Museum and in a few public libraries, most of the public muniments of the realm are now placed in one repository and under the supervision of the master of the rolls.

Upon the subject of the public records Sir Francis. Palgrave, under whose auspices as deputy keeper the public muniments were brought together under one roof, writes as follows :—

"Whether we consider them in relation to antiquity, to con- tinuity, to variety, to extent, or to amplitude of facts and details they have uo equals in the civilized world. For the archives of France, the most perfect and complete in Continental Europe, do. not ascend higher than the reign of St Louis, and compared with ours are stinted and jejune ; whereas in England, taking up our title (so to speak) from Domesday, the documents placed under the custody of the master of the rolls contain the whole of the materials for the history of this country in every branch and under every aspect, civil, religious, political, social, moral, or material from the Norman Conquest to the present day."

History.—In consequence of the neglect and indifference from which the national arehives suffered before being housed in their: present quarters, it is as much a matter for wonder as for congra- tulation that any of them are still in existence. In the earlier periods the records of the courts were preserved in the palace of' the king ; but, when the law courts became

stationary and were held within the precincts of the royal palace, instead of following the sovereign from place to place, all legal documents remained in the custody of their respective courts. On the busiuess of the country increasing, the records began to assume such vast propor- tions that further accommodation had to be obtained. Gradually three warehouses for the custody of public documents came into: existence. The records of the King's Bench and Common Pleas were removed to the palace at Westminster, to the old chapter- house, and to the cloister of the abbey of Westminster, and thus laid the foundation of the well-known "chapter-house repository." Towards the end of the reign of Richard I. the Court of Chancery becoming separated from that of the Exchequer, the wardrobe in the Tower of London was used as the chief place of deposit for all Chancery documents, and thus the Record Office in the Tower sprang up. It had been the custom of the earlier masters of the rolls to keep the records of their courts in their private houses; but after the reign of Edward IV. these documents. were lodged in what is now styled the "chapel of the rolls," but which was then known as the "domus conversorum Judzorum," or the house for converted Jews and infidels, which had been annexed to the office of the master of the rolls in the reign of Edward IIL. ;, an office was subsequently attached to the chapel, and thus arose the record depository known as the "rolls chapel office." For many years these three places of deposit—the chaptcr-house, the Tower, and the rolls chapel office—constituted the chief repositories for: public records ; but, as the accommodation that these buildings offercd was limited, rooms in private houses, vacant vaults, and even stables had to be taken by the ministers of the day for the storing of the ever-increasing archives. Little care was, how- ever, paid to the preservation of the parchments. They were put into houses and forgotten ; their various removals were most care- lessly superintended ; and they were often left a prey to the pilfer- ings of the curious. Now and again a sovereign or a secretary of state turned his attention to the disgraceful condition in which the muniments of the kingdom were preserved and a sweeping reforni was announced ; but more important matters always appcar to: have shelved the subject. In 1567 Queen Elizabeth was informed of the confused and perilous state of the records of her parliament and her chancery, and orders were given for rooms to be prepared in the Tower for the reception of these parchments, Her Majesty declaring that "it was

not meet that the records of her chancery, which were accounted as a principal measure of the treasure belong- ing to herself and to her crown and realm, should remain in private: houses and places for doubt of such danger and spoil as theretofore had happened to the like records in the time of Richard II. and Henry VI." This order was, however, never executed. Ou the accession of Charles II., William Prynne, then keeper of the records in the Tower, implored the king "to preserve these ancient records not only from fire and sword, but watcr, moths, canker, dust, cob-webs, for your own and your kingdom's honour and service, they being such sacred reliques, such peerless jewels that your noble ancestors have estimated no places so fit to preserve them in as. consecrated chapels or royal treasuries and wardrobes where they lay up their sacred crowns, jewels, robes ; and that upon very good grounds, they being the principal evidences by which they held, supported, defended their crowns, kingdoms, revenucs, prerogatives, and their subjects, their respective lands, lives, liberties, properties, franchises, rights, laws." This earnest appeal was not urged before it was required. On his appointment to office Prynne made an inspection of the records under his custody. He found them

"buried together in one confused chaos, dust, and filth in the dark corners of Cesar's chapel in the White Tower." He employed soldiers and women to remove and cleanse them, " who soon grow- ing weary of this noisome work left them as foul, dusty, and nasty as they found them." He then begged the aid of the clerks of his department, but these officials, " being unwilling to touch the records for fear of fouling their fingers, spoiling their clothes, endangering their eyesight and healths by their cankerous dust and evil scent," declined the task. To the energetic Prynne the labour of methodizing the papers in his charge seemed hopeless ; he saw them in confused heaps hidden here and scattered there and destitute of anything approaching to an index. He lamented that it would require "Briareus his hundred hands, Argus his hundred eyes, and Nestor's centuries of years to marshal them into distinct files and make exact

alphabetical tables of the several things, names, places, comprised in them." Still nothing was done to remedy the evils complained of. Addresses were presented to parliament upon the subject; reports were drawn up and committecs frequently sat; but it was not until the beginning of this century that a com- plete and satisfactory investigation of the public records was entered 'nto. In the summer of 1800 a very able report upon the state of the archives was drawn up; and a commission was appointed " to methodize, regulate, and digest the records." But the commission directed its attention exclusively to the printing of antiquarian matter, and nothing was attempted for the better preservation of the archives. Dissatisfaction arose, and a select committee of the House of Commons was appointed to inquire into the working of the Record Commission. 'The result of its sittings was the passing of a special Act of Parliament, which placed the public records in the custody and under the superintendence of the master of the rolls for the time being, and directed the treasury forthwith to provide a suitable building. In 1851 the foundations of the present Record Repository were laid, and seven years afterwards the public records were removed from their different places of deposit and housed in their new quarters, where they are now most carefully preserved. The history of the custody of the state papers which run from Henry VIII. to the present time is but a repetition of the neglect -and ill-treatment which the public records had to endure. When they first began to be preserved they were locked up in chests, then confined in the larder of the privy scal, then lodged in the tower over the gateway of Whitehall Palace, then transferred to the upper floor of the lord chamberlain's lodgings, then despatched to an old house in Scotland Yard ; and it was not till 1833 that the State Paper Office in St James's Park was specially erected for their accommodation. Twenty years later it was deemed advisable by the Government of the day to amalgamate the state papers with the public records; the State Paper Office was therefore pulled down and its contents transferred to the repository in Fetter Lane. On making a careful examination of the state of the documents, it was found that many of them had " greatly suffered from vermin and wet," and that the list of those which had been stolen or had strayed from the collection was no small one. Theft and destruction for private ends appear to have becn the two chief agents of mis- chief. During the reign of Henry VIII. many of the despatches were appropriated by Lord St Albans and

Lord Cherbury, to whom they were entrusted. In the reign of Queen Elizabeth most of the private business papers of Her Majesty, especially her letters on matters of secret importance, came into the hands of the earl of Leicester and finally into the possession of his secretary and his descendants; and, "though they were ultimately recovered, a great part had perished by time and the distraction of the wars, &c. ; being left in England during the Rebellion, many had been abused to the meanest purposes." Upon the outbreak of the Civil War the king's papers from the time he was in the north till the surrender of Oxford were designedly burned ; whilst "a fair cabinet of the king's, full of papers of a very secret nature, which had been left by the king upon his retirement to the Scots, amongst which were thought to be all the queen's letters to the king and things of a very mystcrious nature," was also de- stroyed. In the turbulent days of the Commonwealth Bradshaw, in his capacity as president of the council, managed to obtain possession "of divers books, treaties, papers, and records of state," somne of which, in spite of all the efforts of Charles II., were not regained. At the Restoration 'all the papers of state during the time of the usurpation remained in Thurloe's hands, and Sir Samuel Morland advised a great minister to have them seized, being then privately in four great deal desks ; but for reasons left to be judged, that minister delayed to order it, and Thurloe had time to burn them that would have hanged a great many, and he certainly did burn them exeept some principal ones culled out by himself." During the reign of Charles II. various papers were sent out of the country to The Hague and Sweden for the convenience of ~~*ambassadors, many of which were never returned. Indeed so care*~~ *lessly did ministers watch their own documents that a treaty con- cluded with Holland in 1654 was bought at an auction, and the original treaty with Portugal in the same year was found on a stall in the street. Within almost a comparatively recent date there*

were instances of documents sent out of the State Paper Office which were never returned,—a fact which may account for many of the purely official papers to be found in the manuscript collec- tions of private individuals.

In spite, however, of past thefts and negligence, the state papers, like the public records, are a most wealthy and valuable collection. Their contents were considered so important that at one time it was a matter of the greatest difficulty for any outsider to obtain access to them. The keeper of the state papers was bound by oath "to let no man see anything in the office of His Majesty's papers without a warrant from the king." He was also "ticd by a strict oath and by His Majesty's commands to deliver nothing out of the office unless to the lords and others of the council." During the whole history of the State Paper Office the keepcr never had power to grant on his own authority leave to consult the papers; such permission could only be obtained from the sceretary of state, to whose office the docunients belonged. Among the persons fortunate enough to have this favour accorded them, we find that in 1670 Evelyn was lent several documents which related to Holland ; that in 1679 Dr Gilbert Burnet was permitted by warrant "from time to time to have the sight and use of such papers and books as he shall think may give him information and help in finishing his history of the Reformation of the Church of England"; and that in the same year Prince Rupert made a personal request to the king on behalf of Roger L'Estrange, who was writing a history of the Civil War in England. In later times permission was more freely given, though the "'library of MSS." was still most vigilantly guarded, and applications were more often refused than granted. As an instance of the strictness with which the state papers were preserved, we find that as late as 1775 Lord North, though he was then prime minister, had to beg the king's permission to have free access to all correspondence in the Paper Office; and that in 1780 it was necessary for the Ordnance Office to have permission to search the Paper Office for any documents that regarded their depart- ment. These restrictions have now been entirely removed, thanks to the late Lord Romilly ; when he was master of the rolls, the public records were thrown open to the public free of all the charges that were formerly demanded for investigation, whilst the saine liberal course has been pursued with regard to the state papers down to the year 1760. After that date special permission has to be obtained. Calendars and indexes of the public records are annually published in the appendices to the reports of the deputy- keeper of the public records. Large volumes—entitled Calendars of State Papers—consisting of condensations of the documents in the Public Record Office and

elsewhere from the days of Henry VIII. to the 18th century are now in course of publication.

See Sir T. D. Hardy, Introduction to the Close and Patent Rolls; Fine Rolls, ed. C. Roberts; Feet of Fincs, ed. Joseph Hunter; Thomas Madox, History and Antiquities of the Exchequer; Great Roll of the Pipe, ed, Joseph Hunter ; the Record Report of 1800; Noel Sainsbury, ‘“‘The State Paper Office,” in. the deputy-keeper’s Thirtieth Report (Appendix); A. C. Ewald, Our Public Records, (A. C. BL)

REDBREAST, the name of a bird which from its manners, no less familiar than engaging, has for a long while been so great a favourite among all classes in Great Britain as to have gained an almost sacred character. The pleasing colour of its plumage—-one striking feature of which is expressed by its ancient name—its sprightly air, full dark eye, enquiring and sagacious demeanour, added to the trust in man it often exhibits, but, above all, the cheerful sweetness of its song, even “when winter chills the day” and scarce another bird is heard—combine to produce the effects just mentioned, so that among many European nations it has earned some endearing name, though there is no country in which “ Robin Redbreast ” is held so highly in regard as England.! Well known as is its appearance and voice throughout the whole year in the British Islands, there are not many birds which to the attentive observer betray more unmistakably the influence of the migratory impulse ; but somewhat close scrutiny is needed to reveal this fact. In the months of July and August the hedgerows of the southern counties of Eng- land may be seen to be beset with Redbreasts, not in flocks as is the case with so many other species, but each indi-

1 English colonists in far distant lands have gladly applied the common nickname of the Redbreast to other birds that are not im- mediately allied to it. The ordinary “ Robin” of North America is a Thrush, Turdus migratorius (see FIELDFARE, vol. ix. p. 142), and one of the Bluebirds of the same continent, the Sialia sialis of most orni- thologists, is in ordinary speech the Blue “ Robin” ; while the same familiar name is given in the various communities of Australasia to several species of the genus Petraca, though some have no red breast.

vidual keeping its own distance from the next 1—all, how- ever, pressing forward on their way to cross the Channel. On the European continent the migration is still more marked, and the Redbreast on its autumnal and vernal passages is the object of hosts of bird-catchers, since its value as a delicacy for the table has long been recognized.? But even those Redbreasts which stay in Britain during the winter are subject to a migratory movement easily per- ceived by any one that will look out for it. Occupying during autumn their usual haunts in outlying woods or hedges, the first sharp frost at once makes them change their habitation, and a heavy fall of snow drives them towards the homesteads for such food as they may find there, while, should severe weather continue long and sustenance become more scarce, even these stranger birds disappear —most of them possibly to perish—leaving only the few that have already become almost domiciled among men. On the approach of spring the accustomed spots are revisited, but among the innumerable returning deni- zens Redbreasts are apt to be neglected, for their song not being powerful is drowned or lost, as Gilbert White well remarked, in the general chorus.

From its abundance, or from innumerable figures, the Redbreast is too well known to need description, yet there are very few representations of it which give a notion of its characteristic appearance or gestures—all so suggestive of intelligence. Its olive-brown back and reddish-orange breast, or their equivalents in black and white, may be easily imitated by the draughtsman; but the faculty of tracing a truthful outline or fixing the peculiar expression of this favourite bird has proved to be beyond the skill of almost every artist who has attempted its portraiture. The Redbreast exhibits a curious uncertainty of tempera- ment in regard to its nesting habits. At times it will place the utmost confidence in man, and again at times shew the greatest jealousy. The nest, though generally pretty, can seldom be called a work of art, and is usually built of moss and dead leaves, with a moderate lining of hair. In this are laid from five to seven white eggs, sprinkled or blotched with light red.

Besides the British Islands, the Redbreast (which is the JJota- cilla rubccula of Linneus and the Erithacus rubccula of modern authors) is generally dispersed over the continent of Europe, and is in winter found in the oases of the Sahara. Its eastern limits are not well determined. In Northern Persia it is replaced by a very nearly allied form, Erithacus hyrcanus, distinguishable by its more ruddy hues, while in Northern China and Japan another species, H. akahige, is found of which the sexes differ somewhat in plumage—the cock having a blackish band below his red breast, and greyish-black flanks, while the hen closcly resembles the familiar British species—but both cock and hen have the tail of chestnut-red. A beautiful bird supposed to inhabit Corea, the Sylvia komadori of Temminck, of which specimens are very scarce in collections, is placed by some writers in the genus Erithacus, but whether it has any very close affinity to the Redbreasts does not yet seem to be proved. It is of a bright orange-red above, and white beneath, the male, however, having the throat and breast black. (A. N.)

REDDITCH, a town of Worcestershire, is situated on an eminence near the Warwickshire border, 16 miles south- west of Birmingham by the Midland Railway. The church of St Stephen, a handsome building in the Decorated style, erected in 1854-55, contains some good stained-glass windows. A public cemetery was formed in 1854. Among the public buildings are the county court, where special sessions are held, and the literary and scientific institute. In the neighbourhood are the remains of Bordesley Abbey, founded by the Cistercians in 1138. The town is an important seat of the needle manufacture. The urban

1 Tt is a very old saying that Unum arbustum non alit duos Lirithacos—one bush does not harbour two Redbreasts.

? Of late years an additional impulse has been given to the capture of this species by the absurd fashion of using its skin for the trimming of ladies' dresses and " Christmas ecards."

sanitary district (area about 926 acres) had a population of about 7871 in 1871, and of 9961 in 1881.

REDEMPTORISTS or Lievortans. See Licvort, vol. xiv. p. 635.

RED RIVER. Three at least of the many Red Rivers of the world deserve to be mentioned,—(1) the Red River or Fleuve Rouge, the Songeoi or Thao of the Anamese, the Hoang-Kiang of the Chinese, which flows through the heart of Tonc-K1nG (¢.v.) ; (2) the Red River which rises in the Stake Plain in Texas (U.S.), passes through a magnificent caiion 100 miles long, and from 200 to 1000 feet deep, and furnishes a navigable channel of 1200 miles before it reaches the Mississippi (q.v.); (3) the Red River of the North, a somewhat smaller stream, which, rising in Elbow Lake (so called from its shape) in Minnesota (U.S.), not far from the sources of the Mississippi, crosses into Canada at Pembina, and falls into Lake Winnipeg, after a course of 565 miles (110 in Canada). The Red River of the Mississippi presents the physical geographer with a phenomenon nowhere reproduced on the same scale, —a great raft of timber and driftwood, which, in spite of the labours of Captain Shreve (1835-39) and General Williamson and Captain Linnard (1841-45), had by 1871 increased so as to block the channel for 45 miles between Spring Creek and Caroline Bluff. The Red River of the North is equally famous as the scene of some of the leading events in the history of the North-West.

Rep River SETTLEMENT.—In 1811 the fifth earl of Selkirk (1771-1820), who had devoted special attention to emigration as a means of providing for the surplus population of the Scottish Highlands, obtained from the Hudson's Bay Company a grant of land in what was then called the district of Ossiniboia (Assiniboia). In 1813 a settlement was founded by his agent, Mr Miles Macdonell, on the banks of the Red River, the first fort (Fort Daer) being at Pembina. By 1814 the settlers numbered 200. The North-West Fur-Traders of Manchester (a company which was the bitterest rival of the Hudson's Bay Company till the two amalgamated in 1821) did all they could by force and fraud to break up the colony, which, by 1816, had taken up its headquarters at Fort Douglas, on the site of the present town of Winnipeg. The French-Indian half-breeds (Bois-Brfilés) were incited agaiust it, and its mills and houses were burned. The earl of Selkirk, arriving on the scene, sueceeded in reorganizing the community, to which the name of Kildonan was now given, after Kildonan in

Helmsdale, Sutherland- shire. He found himself personally involved in a very network of hostile intrigue ; but the colony was saved, and after his prema- ture death it continued to be more or less supported by his heirs till 1824. In 1835 Lord Selkirk's territorial claims were trans- ferred to the Hudson's Bay Company, who undertook to pay the expenses ineurred by the family. At that date the population of the settlement consisted of about 5000 Highlanders, Bois-Britilés, English half-breeds, and retired company officials. At the transfer of territorial jurisdiction to the Canadian Government in 1869 the Bois-Brfilés, under a certain Louis Riel (son of a Frenchman who had built the first mill on the Red river), revolted and declared an independent republic. Colonel (now Lord) Wolseley was de- spateched with a foree of 1400 men, and without bloodshed took possession of Fort Garry on 24th August 1870. The only striking feature of the expedition was the remarkable energy with which the difficulties of transport were overcome. Riel in 1885 became the leader of another unsuccessful insurrection of half-breeds in the same region.

See Halkett, Statement respecting the Earl of Selkirk's Settlement wpon the Red River, London, 1817; G. Bryce, Manitoba, 1882 (which contains previously unpublished docunients); " Narrative of the Red River Expedition," in Black- wood's Magazine, vols. cviii. and cix. (1871).

REDRUTH, a market town of Cornwall, is pleasantly situated on the West Cornwall Railway, about 9 miles west of Truro. It is almost the centre of the mining district of West Cornwall, and, though many of the rich copper mines are now abandoned, others have proved rich in tin at greater depths, and new mines have also been opened, sufficient to render Redruth one of the most busy and important towns of the county. Within the last few years a post-office, a mining exchange, and a school of science and art have been built, as well as a new church. At the foot of Carn Brea, the unique Druidical hill, sur- mounted by masses of granite, with an ancient castle and

See Plate

V., vol. ii,

monument to Lord de Dunstanville, is the parish church dedicated to St Uny, with a fine old 15th-century tower and peal of bells. The industries include brewing, tin- smelting, making of safety fuses, and iron-founding. Be- sides the market-house, there are a granite town-hall, a masonic hall, and the public rooms with Druids' Hall. At the west end of the town is the West Cornwall Miners' Hospital (thirty beds), erected by Lord Robartes in 1863 and since added to by the same nobleman. The popula- tion of the urban sanitary district (area 4006 acres) in 1871 was 10,685, and in 1881 it was 9335.

RED SEA. The Red Sea runs north-north-west from the Gulf of Aden in the Indian Ocean for about 1200 miles, extending from 12° 40' to 30° N. lat. The Strait of Bab-el-Mandeb at the entrance to the Gulf of Aden is 13} miles across, and is divided by Perim Island into two channels, the north-eastern narrow and shallow, the south-western 10 miles wide, and deep. The sea widens rapidly to 140 miles in 16° N. lat., and more gradually to 205 miles off Kunfuda in 19° N. lat.; from this point it narrows to 115 miles in 24° N. lat., a breadth which is maintained up to 27° 45' N. lat., where the sea divides into two gulfs, those of Suez and 'Akaba. The Gulf of Suez continues in the north-north-west direction for 170 miles, with an average width of 30 miles; that of 'Akaba is narrower, and runs north-north-east for 97 miles. The Sinaitic peninsula between the two gulfs bounds the Red Sea to the north; on the east the Arabian coast and on the west the coasts of Egypt, Nubia, and Abyssinia form the boundaries.

The Arabian coast (see AraBra) is generally a narrow sandy plain backed by ranges of barren mountains abrupt in outline and of moderate height. Enormous coral reefs run along the coast in broken lines, parallel to the shore but not connected with it. They usually rise out of deep water to within a few feet of the surface ; and a navigable channel of from 2 to 3 miles in width, in which the water is always calm, extends between them and the land. The Farisan Archipelago in 17° N. lat. is the largest and most important of the island groups of the eastern reef. It is entirely of organic formation. The most important har- bours of Arabia on the Red

Sea are Mokha in 13° 30’ N. lat. (now nearly deserted for those of Aden and Hodeida, the port of San‘a), Lokeyyah about 200 miles farther north, Jiddah in 21° 20’ N. lat. (the only well protected harbour), and Yenbo in 24° N. lat. The western coast is flat and desert in the north, but gives place farther south to high tablelands rising at some distance from the shore, and then to the lofty Abyssinian mountains (see ABYSSINIA, Arrica, Ecypr). The parallel system of coral reefs is not so extensive as on the east coast, and being nearer the land the inshore channel is narrower. ‘The large and curiously shaped coral-rock island of Dahlak, lying off Annesley Bay, is the most important on the reef. There are seven or eight harbours, of which the best known are Massowah, a little to the north of Annesley Bay (the largest inlet on the sea), and the port of disembarkation of the British troops in the Abyssinian War of 1868, Khor Nowarat, which, though small, is the best bay in the Red Sea, and Sawakin (Suakim) in 19° 30’ N. lat., the chief port of the Soudan trade.*

The only islands of importance not already mentioned are those of the volcanic group in 14° N. lat., one of which, Jebel Zugur, 10 miles long and 7 wide, rises in a series of bare hills to the altitude of 2074 feet, and the islet Jebel Teir in 15° 30’ N. lat., on which a volcano has only recently become inactive. A dangerous reef named the Dedalus in 24° 26’ N. lat. lies right in the way of steamships traversing the sea; it is covered with a few feet of water or uncovered, according to the season, and, like most of the

reefs and islands on the usual track of vessels, is furnished with a lighthouse.

The Red Sea area is in a state of gradual upheaval, the former seaport of Adulis on Annesley Bay is now 4 miles from the shore, and at Suez the former limits of the sea can be traced for several miles northwards ; whereas the north coast of Egypt is undergoing gradual subsidence.

Tides.—The tides are imperceptible at many places on the Red Sea, and where observable they are extremely uncertain, varying both as to time and to amount of rise with the direction and force of the wind. At Suez,

where they are most regular, the rise varies from 7 feet at spring to 4 feet at neap tides. The surface-currents of the sea are also variable and perplexing ; they are chiefly pro- duced by the wind, and change in velocity and direction accordingly.

Trafic.—From the decline of the old_ Indian trade with Egypt till the formation of the Peninsular and Oriental Steam Navigation Company and the overland route to India in 1840, traffic m the Red Sea was almost entirely confined to small native vessels trading with grain and fruit between Egypt and Arabia, and carrying pil- grims to Jiddah, the port of Mecca. Since 1840 passenger traffic, and since the opening of the Suez Canal in 1869 trade of all kinds in European vessels, have greatly increased. A telegraphic cable was laid from Bombay to Suez in 1859.

Meteorology.—The climate of the Red Sea region is one of the hottest in the world. The altitude of the sun, the almost con- tinually cloudless skies, the arid rainless character of the shores, and the complete absence of rivers combine to make the mean temperature high. That of the air usually ranges from 70° to 94° Fahr., though it has been frequently observed as high as 105° in the shade on board ship, and in the northern part of the sea the clearness of the nights promotes radiation, so that by morning the thermometer may fall to the freezing-point on shore. 'The atmo- sphere over the land is very dry ; the ieence between the read- ings of the wet and dry bulb thermometers is frequently as much as 25°, and sometimes, during the prevalence of the desert wind, it rises to 40°. The evaporation from the Red Sea is naturally excess- ive; the humidity of the air over the water is always great in summer, and when the wind blows off the sea the atmosphere is frequently saturated on shore. From the direction of the prevail- ing winds, precipitation takes place chiefly on the mountains of Abyssinia. North-north-west winds prevail on shore all the year round with very slight exception; but in the middle of the sea they are only universal from June to September, and are confined to the northern half from October to May. During the latter season south-south-east winds prevail in the southern part of the sea, while a belt of calms and light variable breezes occupies a changing position near the centre. The southerly winds are often accompanied with rain squalls, and in September there are frequently calms and hazy weather. Hurricanes

and heavy storms seldom occur in the sea, but moderate gales are common and sandstorms not unusual. From the admiralty temperature charts it appears that the mean temper- ature of the surface-water at the four typical seasons of the year, taking all available data into account, is as follows :—

Gulf of About South Adjacent Suez. 20° N. lat. End. Indian Ocean. le OYlleiaviersctelelelelteloreratere 65° ior 78° ° IBGMG6 nooobenaproosn dS 76° 80° 87° 85° WAGs GE Peters eiciolsie.vleisie'= figs 85° eee 79° INGhGONE Gonaaboouane 76° 86° 82° 82°

The temperature of the water at the south end of the sea is usually in excess of that of the air, and it is on record that on four consecu- tive days the temperature of the surface-water was 100°, 106°, 100°, and 96°, while at the same time that of the air was 80°, 82°, 83°, and 82°. The surface-temperature varies from 70° to 90°, according to the position and the season. The winter mean of the northern part is about 71°, and this temperature continues to the bottom at that season. When the temperature on the surface is higher than 71° it gradually falls as the depth increases, uutil at about 200 fathoms it becomes uniform in all parts of the sea as 71°, a temperature which is maintaincd from that depth to the bottom all the year round. This is in consonance with all observations made on enclosed seas, the water below the point to which the barrier reaches being of uniform temperature. According to some authori- ties this is the isocheimal or mean winter temperature of the sur- face ; but the researches of the " Challenger" seem to indicate that the temperature of the external ocean at the summit of the barrier is that which extends to the bottom of the enclosed sea.

Physical Conditions—The greatest depth, which occurs in 21° N. lat., is about 1200 fathoms, and from this point the sea shoals toeach end. The general conformation of the bottom is that of a series of gradually sloping rounded elevations with rounded basins between them. 'The water is shallow in the Gulf of Suez and also at the Strait of Bab-el-Mandeb, where the depth in the centre of the large channel is a little under 200 fathoms. The Red Sea basin is cut off from the general oceanic circulation by a barrier rising

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to within 200 fathoms of the surface in a channel that has a much smaller average depth and is only 134 miles wide. As no rivers discharge into it and little rain falls, it must be viewed as a purely evaporational arca, and as such it is of extreme scientific interest. It reproduces and exaggerates all the special physical conditions of the Mediterranean ; but on account of the extremely trying nature of the climate it has not been so thoroughly investigated. The average amount of evaporation at Aden is variously estimated at from 0°25 to 0°75 inch per day, or from 8 to 23 feet per year; in the Red Sea generally it nust be at least equal to the smaller figure, and probably exceeds it. As the level of the Red Sea is not sub- ject. to any permanent change it is evident that water must flow in through the Strait of Bab-el-Mandeb—the slight current through the Suez Canal need not be eonsidered—to replace loss by evapora- tion. If there were no return eurrent it is estimated that the Red Sea would become a mass of solid salt in one or two thousand years. Although the salinity of the water is higher than that of the water of the ocean it does not appear to be on the increase. The density of Red Sea water at 60° Fahr. is about 1°030, corre- sponding to 4°0 per cent. of total salts, while that of average ocean water is 1°026, which corresponds to 3°5 per cent. of salts. In order to account for the constancy of salinity in the Red Sea it is necessary to assume the existence of strong undercurrents of salt water passing out of the sea, beneath the opposite entering current of fresher water. These undercurrents have not yet been ob- served, but there are indirect proofs of their existence. During the hottest months (July to September), when there is most eva- poration, the prevalence of northerly winds drives the water out of the Red Sea as a rapid surface-drift ; the south-west monsoon is blowing in the Indian Ocean at the same time, and the general level in the Red Sea is from 2 to 3 feet higher than during the cooler months, when evaporation is less, and when the north-east monsoon forces water into the funnel-shaped Gulf of Aden, and thence through the Strait of Bab-el-Mandeb. This is held by Dr W. B. Carpenter to be a proof of the existence of an undercurrent, for the north-east wind forms a head of water at the strait, which to equalize pressure over the area produces an under-return-current, and this greatly accelerates the flow of the regular undercurrent of the Red Sea, and so lowers the

general level. In summer the outflow of dense salt water is slower, and this more than neutralizes the effect of the outward surface-drift, which to some extent reduces the volume of the entering fresher water at that season. In the Red Sea there is a constant and regular sub-surface circulation of water due solely to evaporation ; the surface-drifts caused by wind, although they form rapid currents and render navigation dangerous at times, are minor agents in the system and modify it only toa slight extent. The Red Sea and the Persian Gulf serve as concen- tration areas for maintaining the salinity of the deep water in the Indian Ocean, in opposition to the currents of comparatively fresh water flowing northwards from the Antarctic Occan.

Deposits.—In a sea so nearly landlocked and so narrow the deposits which cover the bottom are naturally of the order classed as terrigenous. The large quantity of sand blown into the sea, the immense abundance of corals and other ealcareous organisms in the water, and the entire absence of rivers with their suspended sediments produce deposits more nearly resembling in some of their characteristics those of the open ocean than those of inland seas. But the sand and ooze from the bottom of the Red Sea have not yet been thoroughly examined.

Fawna.—Animal life in all its forms is extremely abundant in the Red Sea, which, however, cannot be said to have been any more completely surveyed from a biological than from a physical point of view, although sevcral eminent zoologists have studied special types. Great numbers of new species have been discovered by each investigator, and it has been ascertained that the Red Sea fauna differs considerably from that of the Mediterranean, not more than twenty species being common, it is stated, to both, thus indicating that the separation of the two seas must have taken place at a remote epoch, which appears from geological evi- dence to be the Eocene period. It exhibits affinities with the fauna of the Pacific, particularly with that of the eoast of Japan. Corals are more plentiful and more active in the Red Sea than in almost any other piece of water of its size, a result probably due equally to the high temperature, the great salinity of the water, and the abundance of food. (Gab a8 Jl)

REDSHANK, the usual name of a bird—the Scolopax calidris of Linnzus and Totanus calidris of modern authors —so called in English from the colour of the bare part of its legs, which, being also long, are conspicuous as it flies over its marshy haunts or runs nimbly beside the waters it affects. In suitable localities it is abundant throughout the greater part of Europe and Asia, from Iceland to China, mostly retiring to the southward for the winter, though a considerable number remain during that season

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along the coasts and estuaries of some of the more northern countries. Before the great changes effected by drainage in England it was a common species in many districts, but at the present day there are very few to which it can resort for the purpose of reproduction. In such of them as remain, its lively actions, both on the ground and in the air, as well as its loud notes render the Redshank, during the breeding-season, one of the most observable inhabitants of what without its presence would often be a desolate spot, and invest it with a charm for the lover of wild nature. At other times the cries of this bird may be thought too shrill, but in spring the love-notes of the male form what may fairly be called a song, the constantly repeated refrain of which—leero, leero, leero (for so it may be syllabled)— rings musically around, as with many gesticulations he hovers in attendance on the flight of his mate; or, with a slight change to a different key, engages with a rival; or again, half angrily and half piteously complains of a human intruder on his chosen ground. The body of the Redshank is almost as big as a Snipe's, but its longer neck, wings, and legs make it appear a much larger bird. Above, the general colour is greyish-drab, freckled with black, except the lower part of the back and a conspicuous band on each wing, which are white, while the flight-quills are black, thus producing a very harmonious effect. In the breeding-season the back and breast are mottled with dark brown, but in winter the latter is white. The nest is generally concealed in a tuft of rushes or grass, a little removed from the wettest parts of the swamp whence the bird gets its sustenance, and contains four eggs, usually of a rather warmly tinted brown with blackish spots or blotches ; but no brief description can be given that would point out their differences from the eggs of other birds,

more or less akin, among which, those of the Lapwrne (vol. xiv. p. 308) especially, they are taken and find a ready sale.

The name Redshank, prefixed by some epithet as Black, Dusky, or Spotted, has also been applied to a larger but allied species— the T'otanus fuscus of ornithologists. This is a much less common bird, and in Great Britain as well as the greater part of Europe it only occurs on its passage to or from its breeding-grounds, which are usually found south of the Arctic Circle, and differ much from those of its congeners—the spot chosen for the nest being nearly always in the midst of forests and, though not in the thickest part of them, often with trees on all sides, generally where a fire has cleared the undergrowth, and mostly at some distance from water. This peculiar habit was first ascertained by Wolley in Lapland in 1858 and the following year. The breeding-dress this bird assumes is also very remarkable, and seems (as is suggested) to have some correlation with the burnt and blackened surface interspersed with white stones or tufts of lichen on which its nest is made—for the head, neck, shoulders, and lower parts are of a deep black, con- trasting vividly with the pure white of the back and rump, while the legs become of an intense crimson. At other times of the year the plumage is very similar to that of the common Redshank, and. the legs are of the same light orange-red. (A. N.)

REDSTART, a bird well known in Great Britain, in many parts of which it is called Firetail—a name of ~~al~~ most the same meaning, since "start" is from the Auglo- Saxon steort, a tail! This beautiful bird, the Luticidla pheenicurus of most ornithologists, returns to England about the middle or towards the end of April, and at once takes up its abode in gardens, orchards, and about old buildings, when its curious habit of flirting at nearly every change of position its brightly-coloured tail, together with the pure white forehead, the black throat, and bright bay breast of the cock, renders him conspicuous, even if attention be not drawn by his lively and pleasing though short and intermittent song. The hen is much more plainly attired ; but the characteristic colouring and action of the tail per-

1 On this point the articles "Stark-naked" and 'Start' in Prof. Skeat's Etymological Dictionary may be usefully consulted ; but the eonnexion between these words would be still more evident had this bird's habit of quickly moving its tail been known to the learned author.

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tain to her equally as to her mate. The nest is almost always placed in a hole, whether of a tree or of a more or less ruined building, and contains from five to seven eggs of a delicate greenish-blue, occasionally sprinkled with faint red spots. The young on assuming their feathers present a great resemblance to those of the REDBREAST (supra, p. 314) at the same age; but the red tail, though of duller hue than in the adult, forms even at this early age an easy means of distinguishing them. The Redstart breeds regularly in all the counties of England and Wales; but, except in such localities as have been already named, it is seldom plentiful. It also reaches the extreme north of Scotland ; but in Ireland it is of very rare occurrence. It appears throughout the whole of Europe in summer, and is known to winter in the interior of Africa. To the east- ward its limits cannot yet be exactly defined, as several very nearly allied forms occur in Asia; and one, 2. aurorea, represents it in Japan.

A congeneric species which has received the name of Black Redstart,! Ruticilla titys,? is very common throughout the greater part of the Continent, where, from its partiality for gardens in towns and villages, it is often better known than the preceding species. It yearly occurs in certain parts of England, chiefly along or near the south coast, and curiously enough during the autumn and winter, since it is in central Europe only a summer visitor, and it has by no means the high northern range of 2. phenicurus. The males of the Black Redstart seem to be more than one year in acquiring their full plumage (a rare thing in Passerine birds), and since they have been known to breed in the intermediate stage this fact has led to such birds being accounted a distinct species under the name of &. cazrit, thereby perplexing ornithologists for a long while, though now almost all authorities agree that these birds are, in one sense, immature.

More than a dozen species of the genus Ruticilla have been described, and the greater number of them seem to belong to the Himalayan Sub-region or its confines. One very pretty and interesting form is the 2. moussieri of Barbary, which no doubt allies the Redstart to the SToNE-Cuats (9.v.), Pratincola, and of late some authors have included it in that genus. In an opposite direction the Bluethroats, apparently nearer to the Redstarts than to any other type, are by some authorities placed in the genus Ruticilla, by others considered to form a distinct genus Cyanecula, and by at least one recent writer referred to the genus Hrithacus (see REDBREAST). If we look upon them as constituting a separate genus we find it to contain two or three distinguishable forms :—(1) C. swecica, with a bright bay spot in the middle of its clear blue throat, breeding in Scandinavia, Northern Russia, and Siberia, and wintering in Abyssinia and India, though rarely appearing in the intermediate countries, to the wonder of all who have studied the mystery of the migration of birds; next there is (2) C. leucocyanea, with a white instead of a red gular spot, a more Western form, ranging from Barbary to Germany and Holland; and lastly (3) C. wolji, thought by some authorities (and not without reason) to be but an accidental variety of the preceding (2), with its throat wholly blue,—a form of comparatively rare occurrence. The first of these is a not unfrequent, though very irregular visitant to England, while the second has appeared there but seldom, and the third never, so far asis known. By

1 The author of a popular work on British birds has suggested for this species the name of " Blackstart,'"' thereby recording his ignorance of the meaning of the second syllable of the compound name as already explained, for the Black Redstart has a tail as red as that of the com-moner English bird.

2 The orthography of the specific term would seem to be titis (Ann. Nat. History, ser. 4, x. p. 227), a word possibly cognate with the first syllable of Titlark and Titmouse.

the ornithologist of tolerably wide views the Redstarts and Bluethroats must be regarded as forming with the Nieur- INGALE (vol. xvii. p. 498), Redbreast, Hedge-Sparrow, Wheatear, and Chats a single group of the

“Family” Sylviide, which has been usually called Savicoline, and is that which is most nearly allied to the Thrushes (see THRUSH).

In America the name Redstart has been not unfittingly bestowed upon a bird which has some curious outward resemblance, both in looks and manners, to that of the Old Country, though the two are in the opinion of some systematists nearly as widely separated from each other as truly Passerine birds well can be. The American Redstart is the Setophaga ruticilla of authors, belonging to the purely New-World family Mniotiltide, and to a genus which con- tains about a dozen species, ranging from Canada (in summer) to Bolivia. The wonderful likeness, coupled of course with many sharp distinctions, upon which it would be here impossible to dwell, between the birds of these two genera of perfectly distinct origin, is a matter that must compel every evolutionist to admit that we are as yet very far from penetrating the action of Creative Power, and that especially we are wholly ignorant of the causes which in some instances produce analogy. A. N.)

REDWING, Swedish Ridvinge, Danish Réddrossel, Ger- man Lothdrossel, Dutch Koperwiek, a species of THRUSH (q.v.), the Zurdus iliacus of authors, which is an abundant winter visitor to the British Islands, arriving in autumn generally about the same time as the FIELpraRE (vol. ix. p. 142) does. This bird has its common English name 3 from the sides of its body, its inner wing-coverts, and axil- laries being of a bright reddish-orange, of which colour, however, there 1s no appearance on the wing itself while the bird is at rest, and not much is ordinarily seen while it is in flight. In other respects it is very like a Song-Thrush, and indeed in France and some other countries it bears the name Mauvis or Mavis, often given to that species in some parts of Britain; but its coloration is much more vividly contrasted, and a conspicuous white, instead of a light brown, streak over the eye at once affords a ready diagnosis. The Redwing breeds in Iceland, in the sub- alpine and arctic districts of Norway, Sweden, and Finland, and thence across Northern Russia and Siberia, becoming scarce to the eastward of the Yenissei, and not extending beyond Lake Baikal. In winter it visits the whole of Europe and North Africa, occasionally reaching Madeira, while to the eastward it is found at that season in the north-western Himalayas and Kohat. Many

writers have praised the song of this bird, comparing it with that of the NIGHTINGALE (vol. xvii. p. 498); but herein they seem to have been as much mistaken-as in older times was Linneus, who, according to Nilsson (Orn. Svecica, i. p. 177, note), failed to distinguish in life this species from its commoner congener 7'. musicus. The notes of the Redwing are indeed pleasing in places where no better songster exists; but the present writer, who has many times heard them under very favourable circumstances, cannot but suppose that those who have called the Redwing the '" Nightingale" of Nor- way or of Sweden have attributed to it the credit that properly belongs to the Song-Thrush ; for to him it seems that the vocal utterances of the Redwing do not place it even in the second rank of feathered musicians. Its nest _

3 Many old writers assert that this bird used to be known in England as the "Swinepipe "; but, except in books, this name does not seem to survive to the present day. There is no reason, however, to doubt that it was once in vogue, and the only question is how it may have arisen. If it has not been corrupted from the German Weindrossel or some other similar name, it may refer to the soft inward whistle which the bird often utters, resembling the sound of the pipe used by the swineherds of old when collecting the animals under their charge, whether in the wide stubbles or the thick beech-woods ; but another form of the word (which may, however, be erroneous) is " Windpipe,"' and this might lead to a conclusion very different, if indeed to any conclusion at all, ' Whindle" and '" Wheenerd" have also been given as two other old English names of this bird (Harl. Miscellany, Ist ed., ii. p. 558), and these may be referred to the local German Weindrustle and Winsel.

and eggs a good deal resemble those of the Blackbird, and have none of the especial characters which distinguish those of the Song-Thrush. ALN.

RED WING, a city of the United States, capital of Goodhue county, Minnesota, occupies a commanding site on a plateau encircled by high bluffs (nearly 300 feet high), on the west bank of the Mississippi, 41 miles south of St Paul on the La Crosse division of the Chicago and St Paul Railroad ; it is also the eastern terminus of the Cannon Valley branch of

the same railway. Red Wing has an opera-house and a music-hall ; it trades in lumber, manufactures earthenware, waggons and carriages, furni- ture, flour, leather, and boots and shoes, and exports large quantities of wheat. The population was 4260 in 1870 and 5876 in 1880; in 1885 it was estimated at 8000, including 1050 employés in manufactories.

REDWOOD. See Sequoia.

REED, a term applied to several distinct species of large, water-loving grasses. The common or water reed, Phragmites communis, Trin. (Arundo phragmites, L.), oc- curs along the margins of lakes, fens, marshes, and placid streams, not only throughout Britain but over the Pale- arctic and Nearctic regions, and even in South Australia. Another very important species is Psamma arenaria, R. and S. (Ammophila or Arundo arundinacea, Host.), the sea-reed or marram grass, a native of the sandy shores of Europe and North Africa. Both species have been of notable geological importance, the former binding the soil and so impeding denudation, and actually converting swamp into dry land, largely by the aid of its tall (5 to 10 feet) close set stems, which not only break the currents of water around them, and so cause deposition of their sediment,

but furnish in themselves an important annual contribution

to the incipient soil. The latter species, of which the branching rootstocks may be traced 30 or even 40 feet, is of still greater importance in holding sand-dunes against the encroachments of the sea, and for this purpose has not only been long protected by law but has been extensively planted on the coasts of Norfolk, Holland, Gascony, &c. Other reeds are Calamagrostis (various species), Gynerium argenteum (pampas grass), Deyeuxia, &e., also Arundo Donax, the largest European grass (6 to 12 feet high), which is abundant in southern Europe. Reeds have been extensively used from the earliest times in thatching and in other branches of construction, and also for arrows,

the. pipes of musical instruments, &c. Reed pens are still used in the East (see PEN). Plants belonging to other orders occasionally share the name, especially the bur-reed (Sparganium) and the reed-mace (Z'ypha), both belonging to the natural order 7'yphacex. The bulrushes (Scirpus), belonging to the natural order Cyperacex, are also to be distinguished. See Grasses; also Sowerby's British Grasses, &e.

REED, in music. See Oxos, vol. xvii. p. 705; Har- MONIUM, vol. xi. p. 483 ; and OrGAN, vol. xvii. p. 828 sq.

REEVE, Criara (1725-1803), one of the imitators of Horace Walpole in Gothic romance, was born at Ipswich in 1725. She was an industrious woman of letters, and produced many works in prose and verse, including an interesting sketch of the Progress of Romance; but her only eminent success was the romance of Zhe Old English Baron (1777). In her theory about the use of the super- natural, as in chronological position, she stands midway between Walpole and Mrs Radcliffe. Though she owned Walpole as a master, she declined to follow as far as he went in supernatural incident; she admits a castle and a haunted wing and the ghost of a murdered man, but draws the line before statues dropping blood, pictures that groan and walk out of their frames, and suchlike improb- abilities. She was the daughter of a Suffolk clergyman, and died at Ipswich in 1803.

REFEREE, in law, is a person to whom a matter is delegated by a superior for report or decision. The prin- cipal use of the word occurs in the practice of the House of Commons and of the High Court of Justice. The Court of Referees is a court to which the House of Commons commits the decision of all questions of locus standt,—that is, the right of petitioners to be heard in opposition to private Bills. A referee is also associated with members of the House as a member of every committee on an opposed Bill, but may not vote. Under the Judicature Act, 1873, cases are submitted to either official or special referees for inquiry and report, or for trial. Inquiry and report may be directed in any case,—trial only by consent of the parties, or in any matter requiring any prolonged examination of documents or accounts, or any scientific or local

investiga- tion which cannot be tried in the ordinary way (36 and 37 Vict. c. 66, ss. 56, 57; Rules of the Supreme Court, 1883, Ord. xxxvi.).

REFLEXION. See Lieut, vol. xiv. p. 586 sq.

REFORMATION

a lee period occupied by the great movement known

as the Protestant Reformation stands identified, for the most part, with the period which marks the transition from the medizval to the modern era in European history. Taken within its narrowest limits, it may be looked upon as commencing with the year 1517 and as finding a certain consummation with the year 1545. In the former year Luther's theses, published at Wittenberg,! represent the commencement of that direct and open renunciation of medizval doctrine which he initiated ; in the latter year the assembling of the council of Trent marks the renewed sanction and promulgation of that doctrine whereby an insuperable barrier was erected between the communion of Rome and the churches of Protestantism. From that time each communion possessed its distinctive organiza- tion and formulary of faith, and the struggles which subsequently took place between Romanism and Pro-

testantism represent, not attempts to bring about or to

1 Most of the details of the main facts connected with the German Reformation during Luther's lifetime are given under LUTHER.

resist reform (whether of discipline or of doctrine), but endeavours on the part of both communions to bring about, if possible, the extinction of the opposed form of faith.

But, although the contest which Luther initiated had, long before his death, resulted in complete and irreparable rupture between the contending parties, it is certain that in order to understand the true nature and origin of that contest we must go back to events long anterior to 1517 ; while in order fully to estimate its effects we must follow the history of events long after 1545. In Germany, for example, the Reformation can

hardly be regarded as find- ing even a formal consummation before the peace of Augs- burg (1555) ; in Switzerland the movement went on with iunportant modifications down to the death of Calvin in 1564 ; in France the onward progress was not materially checked before the massacre on the eve of St Bartholomew (1572); in Bohemia its independent and peculiar fortunes found a final solution only with the battle of the White Hill in 1620; while in England and in Scotland, in the Netherlands, in Scandinavia, in Italy and in Spain, the

Its three phases.

movement assumed so much variety of character, and was decided by circumstances of time and place of so different a kind, that its essential features often become merged and almost lost in their combination with other and altogether extraneous elements.

Nor are the considerations arising out of diversities of race, divergencies of political interests, and varied issues the only difficulties which attach to any attempt to treat the movement as a whole. We must also bear in mind the very different conceptions of the end to be attained which at successive stages of its history have modified its teaching and its organization, and eventually in a great measure determined its geographical limits. These conceptions may be distinguished as those involving (1) a reform of discipline, (2) a reform of doctrine, (3) a modifica- tion of the current dogmatic teaching. Of these three dis- tinet conceptions the first, taking its rise in the generally admitted corrupt practice of the Roman Church, aimed at little more than a restoration of discipline,—a reform of morals, that is to say, among the clergy and the mon- astic orders, and the abolition of those various abuses which had grown up under the lax administration and baneful examples of successive popes and of the Curia; the second, although demanding a reform of doctrine as well as of discipline, sought simply to restore what was believed to be the teaching of the primitive as opposed to the medizval church; while the third, guided in the first instance rather by an only half-conscious instinct than by any avowed standard of belief, sought eventually to establish the right of private judgment, to the almost entire

repudiation of authority, whether as expressed in the decrees of councils, in the confessions of the Reformed churches, or in the creed of Trent. And it is from this last point of view that the Reformation has gradually come to be regarded as a new commencement rather than as a restoration of belief,—as a point of departure towards a higher and more enlightened faith rather than as a return to an ancient, imperfectly ascertained, and possibly obsolete standard.

But, by whichever of these aims the movement in favour of reformation was guided, the dominant conception has not unfrequently operated quite independently of the other two. Demands for reform of discipline not unfrequently resulted in disunion where disagreement with respect to doctrine did not exist. The further definition of already accepted doctrine, again, even when made in connexion with some minor article of belief and involving but an almost imperceptible divergence of interpretation, often proved productive of a serious schism where in questions of discipline there was perfect unanimity. The right of private judgment, when urged in contravention of any of the newly formulated standards of discipline or belief, in- volved an equally decisive rupture with those who recog- nized only the traditional sources of doctrine. It is evident, therefore, that the Reformation, when regarded from a fairly comprehensive point of view, must appear as a highly complex movement carrying in itself the ele- ments of further controversy and conflict. Even the theory which would seem to afford the most satisfactory solution of its varied phenomena—that which teaches us to look upon it as a Teutonic revolt, intellectual no less than re- ligious, against the traditions which the Latin Church in the course of centuries had invented and imposed on the faith and habits of thought of Western Christendom— often fails us as a clue to its widely different manifesta- tions, and other disturbing causes seem to forbid the effort to refer them to any general principle. The character and policy of the reigning Roman pontiff, the jealousies and divergent interests of the several European states and the special aims of their several rulers, the spell which imperial

institutions and traditions long continued to exercise over the minds of all but the most advanced and independent thinkers, are all important factors in the movement. If, however, we endeavour to assign the causes which pre- vented the Reformation from being carried even to but partial success long prior to the 16th century, we can have no difficulty in deciding that foremost among them must be placed the manner in which the medieval mind was fettered by a servile regard for precedent. To the men of the Middle Ages, whether educated or uneducated, no measure of reform seemed defensible which appeared in the light of an innovation. Precedent was the standard whereby every authority, lay or clerical, was held to be bound ; and to this rule the only exceptions were a general council and the supreme pontiff. Even Gregory IX. or Clement V., when he assumed to promulgate additions to the existing code of the Universal Church, was understood to do so simply in his capacity of infallible expounder of essential and unalterable doctrine ; while no reform, how- ever seemingly expedient or however recommended by its abstract merits, was held to be justifiable if it could be shown to be in conflict with ancient and authoritative tradition. The Reformers themselves always maintained that the doctrines which they enforced rested on Scriptural precedent and primitive example. Their assertion was frequently challenged by their antagonists; and it 'may reasonably be doubted whether even Luther or Calvin could have commanded any considerable following had not their doctrinal teaching been combined with a demand for a reformation of discipline which rested on undeniable precedent, and to which the circumstances of the time imparted new and irresistible force,—a force, however, which had been long accumulating and had been derived in no small measure from the blind obstinacy of the Roman see in times long antecedent.

The existence long before the 16th century of a strong Desire desire to bring about a reformation of discipline within the for re-

church itself is attested by evidence which it will suffice

form of disci-

to pass by with little more than an allusion. Among the pline.

most notable instances are those afforded by the rise of the Dominican and Franciscan orders in the 13th century and of the Brethren of St Jerome (or the Brethren of the Common Life) in the 14th century,—efforts based upon general conviction, which resulted in spontaneous combina- tions. Similar in origin, though more strictly ecclesi- astical in character, were the designs of the great councils which successively assembled at Pisa (1409), at Constance (1414), and at Basel (1431). Among those who were dis- tinguished in these assemblies by their strenuous advocacy of reform, Pierre d'Ailly and his pupil Jean Charlier de Gerson, both successively chancellor of the university of Paris, and Nicholas de Clémenges, archdeacon of Bayeux, were especially conspicuous. Lach alike upheld in the plainest language the superiority of a general council to the pope, and the obligation that rested on such a body to address itself to the task of church reform whenever the necessity might arise, and the supreme pontiff himself be found either incapable of such a labour or unwilling to initiate it. Of the widespread necessity for such reform, as shown by the condition of the clergy and the monas- teries, the remarkable treatise by Nicholas de Clémenges,! De Corrupto Ecclesiz Statu, affords alone sufficient evidence. By Michelet? this powerful tractate has been compared, for its vigour and the effect which it produced, to the De Captivitate Ecclesie Babylonica of Luther; and it is a striking proof of the deep-rooted corruption of the whole church that such flagrant abuses should have continued to exist for another century with little or no abatement.

1 Or by Dietrich of Niem ; the authorship is disputed. 2 Hist. de France, bk. viii. c. 3.

Task of Re- formers.

REFORMATION

Clémenges deplores in the strongest terms the state of the church in his day,—a condition of appalling degeneracy, which he ascribes mainly to the increase in wealth and luxury that had followed upon the development of a worldly spirit in its midst. His strictures leave no order or degree of either the ecclesiastical or the monastic life untouched,—the overwhelming ostentation of the Curia ; the pride and rapacity of the

cardinals, their immorality and addiction to simony ; the prevalence of the same vices among the episcopal order, filled with beardless youths, who, scarcely liberated from the dread of the school- inaster's ferule, hastened to assume the pastoral office ; the lower clergy in general so sunk in vice and sloth that scarcely one in a thousand (" vix inter mille unus ") was to be found living a godly and sober life; the nunneries, which he declares were brothels rather than sanctuaries ("non dico Dei sanctuaria, sed Veneris execranda prostibula"). We can feel no surprise at finding that in the 16th century Clement VII. thought it necessary to place this burning diatribe by a great doctor of the church in the Index Ex-purgatorius. A few years later we find the evils to which Clémenges called attention emphasized by one of the most eminent ecclesiastics of the age, —the cardinal Julian Cesarini, when he was endeavouring to dissuade Pope Eugenius IV. from his design of dissolving the council of Basél (see Poprpon, vol. xix. p. 502). In this letter he affirms that so strongly is popular feeling stirred against the clergy by their neglect of their duties and scandalously immoral lives that there is reason to fear that, if some remedy be not devised, the whole fabric of the Roman Church may be overturned.!

The complete failure of these successive efforts to bring about any comprehensive measure of church reform is a familiar fact in European history. And not only were the evils which it was sought to abolish suffered to continue with but little abatement, but dissent even from the recog- nized discipline of the church was placed under a ban, and made, in common with dissent from doctrine, an offence punishable with the severest penalties. The medieval theory of the Roman hierarchy had indeed been reaffirmed by Eugenius IV. and his successors with a success which seemed almost to preclude the possibility of its ever being again challenged. But the main point here to be noted 1s that in none of these several efforts in the direction of reform, whether resulting from conciliar or popular action, was the doctrine of the church once called in question. The fate that overtook John Huss and Jerome of Prague appears to have been very generally regarded as a neces- sary example of just rigour in the suppression of heresy. We find, accordingly, that, when in the following century it was sought to associate the efforts of the reformers in the direction of doctrinal change with the efforts of a party within the

church itself in the direction of disciplinary reform, the defenders of the traditional Catholic faith challenged the assumed precedent and altogether denied the parallel. "It is," wrote Bossuet in the 17th century, "an obvious illusion; for among all the passages which they adduce there is not one in which those teachers have ever dreamed of changing the belief of the church, of amending its worship, which consisted chiefly in the sacrifice of the mass, or of overthrowing the authority of her prelates and especially that of the pope, all which was the primary design of this new reformation of which Luther was the architect."2 It is not easy to gainsay the reasonableness of Bossuet's criticism. It was the fundamental theory of the Reformation that it involved the setting aside of the

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1 " Dissolutio cleri Alemannie, ex qua laici supra modum irritantur adversus statum ecclesiasticum .. . inclinatus est arbor ut cadat, nec potest diutius persistere." See Ain. Sylvius, Opera (ed. 1551), pp. 66, 70. 2 (fuvres (1865), ii. 303.

development given in medizval times to the doctrines and teaching of the early church, and proposed to substitute for these a totally different interpretation, which rejected the successive decisions of councils and popes as arbitrary and erroneous. Such a theory, however, necessarily im- posed on the Reformers the task of proving the validity of their own position, by showing that their repudiation of a practice and of precedents which had been accepted for so many centuries was justified by an appeal to yet more ancient and unquestionable authority. If indeed they failed in so doing, they must look forward to sinking in the estimation of Christendom to the level of heretics, and be prepared to stand before posterity in the same category as the Arians, the Albigenses, the Lollards, and the Hussites, and those other sects which, by their un- warranted assertion of the right of private interpretation, had provoked and incurred the formal condemnation of the church. It is not within the scope of this article to attempt to estimate the justice of the theological argu- ments by which the Reformers sought to vindicate their position ; but there is good reason for concluding that the argumentative powers and personal

influence of Luther and Calvin would have failed, just as the efforts of pre- ceding reformers had failed, in effecting the desired result, had not the conditions and circumstances of the age been such as to lend new force to the arguments which they urged in favour of a fundamental change in the standpoint of religious faith.

The most notable feature in connexion with traditional belief which challenges our attention at the commence- ment of the 16th century is the manner in which the popedom was becoming less and less in harmony with the spirit of the age, and with those new forces which were now developing in the midst of Teutonism. The intoler- ance of the church in the repression of heresy had become more pronounced and was pressing with increasing rigour on free thought, when, owing to the influences of the New Learning, that thought was everywhere on the point of seeking to break through the traditional trammels ; the corruption of the Curia and of both the regular and the secular clergy, the extension of the temporal power of the pontiffs in Italy, and the extortion of their emissaries in other countries had reached a climax just as, owing to the more independent spirit generated by the consolidation of the nationalities, the ruler and the people in each kingdom or principality were becoming increasingly impatient of the existence of such abuses. A brief consideration of these several features becomes, accordingly, quite indis- pensable, if we wish rightly to comprehend the forces at work in Europe at the time when the Reformers arose to combine them and give them more definite direction.

Not a few, and some very memorable, efforts had been Efforts

made before the 16th century to bring about a reformation of doctrine, but these had almost invariably been promptly visited with the censure of the church. Long after the " heresies" of the 4th century had died away and after the controversies of the turbulent 9th century—such as those on the Eucharist between Paschasius Radbertus and Ratramnus, and on predestination between John Scotus Erigena and Gottschalk—had been silenced by the decisions of the pontiffs, we find movements arising, which, how- ever much they differ in other characteristics, all attest the existence of a widespread desire among large sections of the community

to revert to a simpler form of religious belief and practice. The Paulicians (or Manichzans of the East), the Albigenses (or Manichzans of the West), the Waldenses, the Cathari, and the Leonists (or Poor Men of Lyons)— sects which made their appearance mainly in the 12th and 13th centuries, and for the most part in Switzerland, Languedoc, and northern France— the XX. — 4I

Lollards in England and the Hussites in Bohemia, may be looked upon as the ancestors in faith of the Huguenots and the Puritans of after-times, and were all more or less characterized by an aversion to the Roman ritual, to splendid churches, to crosses and crucifixes, combined with a more definite denial of such doctrines as that of baptismal regeneration, of transubstantiation, of masses for the dead, and of the obligation to observe Lent. The ultimate fate of these different sects was singularly similar. Of their earlier history, indeed, we have but few memo- rials, for their records, if any existed, have mostly perished ; and, as with their prototypes in the earlier Christian centuries, it became almost necessarily their policy to avoid all external demonstrations which would be likely to arrest the attention of the world. An inquisitor of the 13th century, when describing the Leonists (c. 1250), whom he speaks of as both the most ancient and the most widely spread of the sects then existing, represents them as by no means guilty, to all external appearance, of practices which could fairly be stigmatized as blasphemous, but as wearing a great semblance of piety, as being of good repute among their neighbours, and chiefly blamable as given to speaking against the Roman Church and its clergy and thus gaining, only too easily, the ears of the laity at large.!_ To such characteristics, however, the Albi- genses in the 12th century had presented a remarkable exception. At the commencement of the pontificate of Innocent III. (1198) his legates had found nearly the whole of the rich and prosperous territory extending from Carcassonne to Bordeaux dominated by this powerful heresy,—a form of doctrine associated, moreover, not with austerity but with voluptuousness of life, with a profound contempt for the priestly profession, and with a warm

admiration for the conceptions of chivalry and the poetry

Influence of poli- tical motives.

of the troubadour,—a heresy enriched by the devotion of its adherents to an extent which made it far wealthier than the church itself in those regions, and before which the representatives of the Roman orthodoxy seemed threatened almost with extinction. The suppression of this heresy by Simon de Montfort is a well-known episode, and would seem to have formed the point of departure for a new and more rigorous policy on the part of the church in its dealings with like manifestations of dis- obedience. In the year 1229 the statutes of the council of Toulouse formulated, as it were, the code of persecution, and, aided by the Inquisition, which probably took its rise about the same time, supplied a new machinery for the detection and suppression of heresy. To the terrorism thus established, after the sword of De Montfort had done its work, we may fairly refer the changed characteristics of the adherents of the heresies in France, as above de- scribed, in the middle of the 13th century.

But, the suspicions of the church having once been thoroughly roused and the secular power incited and guided to its task, external conformity and inoffensive life, the mountain hamlet and the secluded valley, proved alike unavailing to avert the cruelty of the persecutor. The Cathari in Italy did not long survive the fall of the Hohen- staufens, from whom they had received effective protection and support ; and it added not a little to the offence of the doctrines proclaimed by the Spiritual Franciscans, whose tenets were condemned by the council of Vienne in 1311, that, while the order had taken its rise in a spirit of protest against the corruptions of the Curia, its members were known to be ready to favour and aid by all the means in their power the restoration of the imperial ascendency in Italy. The Spiritual Franciscans were the forerunners of the Apostolic Brethren, one of the most widely spread of the new sects, and must also be looked

- *Max. Bibl. Patrum (1676), vol. xxv. p. 264.*

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upon as the precursors of the Lollards. The intimate con- nexion between theological doctrine and political Opinion that existed among the latter sect is well known. We find, accordingly, that heresy, long before Reformation times, was regarded by the papal power as associated with hostile political interests, and that a new incentive to its rigorous suppression was thus supplied.

On the other hand, the popedom itself, during the long sojourn of the pontiffs at Avignon (1309-7 8), became involved in a political alliance, whereby it alienated the sympathies of Europe at large to an extent which it was never afterwards able to regain. During that long and humiliating episode in its history the office was filled almost exclusively by Frenchmen, whose policy was con- ceived in complete subservience to that of the reigning French monarch ; and the pontiff at Avignon thus came to be regarded both by the empire and in England as the pliant ally of a hostile power. During the following century it recovered much of its influence in Germany, where its pretensions were sometimes regarded not un- favourably by the electors as an equipoise to the too despotic sway of the emperor. Somewhat later we find it receiving the most efficient support from Spain. But it could never again command the same universal defer- ence in Western Christendom; and the apparently genuine devotion to its interests which may from time to time be discerned manifesting itself, now in one nation and now in another, was largely inspired by olitical considerations, and often dearly purchased at the expense of a corre- sponding hostility provoked among another people.

To the manner in which theological tenets, often purely speculative in their origin and innocuous in their bearing upon practice, thus came to be regarded as identified with secular questions of grave import and pressing for an immediate solution, we must partly attribute the jealousy with which the first symptoms of heresy were now watched for by Rome. Early in the 14th century the Fraticelli and the Apostolic Brethren, with other heretical sects, were anathematized. In the year 1324 Pope John XXII. demanded of the emperor the suppression of the Waldenses,? who had reappeared in Lombardy ; and, ably as Marsilius of Padua assailed the pretensions of the papacy, his pro- test seemed ineffectual amid the supreme humiliation of his patron, Louis of Bavaria. Driven alike from

Italy and from France, the persecuted sect took refuge in Savoy and in Switzerland, and in the year 1489 the 'papal legate reported that their numbers were not less than 50,000. Lollardism was suppressed with unsparing hand in England ; and John Sawtrey, the first of Wikliffe's followers to suffer martyrdom, was burnt to death in 1401, for refusing to worship the cross and for denial of the doctrine of transubstantiation. Fifteen years later John Huss and Jerome of Prague suffered the same fate at Constance, and the indignation excited among their fellow-countrymen, intensified as this feeling was by differences of race, gave rise to a memorable resistance, which eventually won religious freedom for the land. At the diet of Kutna Hora (Kuttenberg) in 1485 a truce was made between the Utraquists and the Catholics for thirty-two years, and the complete religious equality then established was made permanent at the diet of 1512. In England, on the other hand, the Lollard movement was almost completely extinguished. The political doctrines with which it had become associated made it the object of suspicion alike to the ecclesiastical and to the civil power; and Sir John

® They were not, however, known under this name; in the 15th and at the commencement of the 16th century they never so styled them- selves, and were rarely so styled by others. The name by which they were known among themselves was that of "The Brethren." See Ludwig Keller, Die Reformation und die dlteren Reformparteien (1885), p. 296.

'The New Learning,

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Oldcastle, its chief leader, although he suffered martyrdom, altogether failed to win the popularity or the reverence which waited on the memories of the two Hussite leadcrs. The religious tenets of his followers were not, indeed, alto- gether suppressed, and continued to command a certain fol- lowing down to the 16th century. Asa tradition, however, they would seem to have survived in connexion with the early English Puritanism rather than with the Reformation ; while between the Hussite movement and the Reformation the connexion is unquestionable and was recognized by Luther himself.

During the very time that the Roman pontiffs were wielding thus effectually the weapons of bigotry and per- secution against all manifestations of independent religious thought, their influence and patronage were largely given to the fostering of other influences, which ultimately proved highly favourable to that very freedom of judgment and of philosophic speculation which the Roman see has invariably sought to suppress. The relations in which the "New Learning," as it was then called, is to be found successively standing to the representatives of orthodox belief constitute an interesting and instructive study. At one time Greek had been held in reverence as the official language of the Roman Church; but, from the period when the popes were first enabled to shake off the yoke of the Eastern emperor in Italy, the use of the Greek language had been discontinued, its literature placed under a ban, and the study of both systematically discouraged in Western Chris- tendom. Then came the Renaissance; and under the patronage of pontiffs like Nicholas V. (1447-1455), and cardinals like Julian and Bessarion, Greek became as much in favour at the Curia as it had before been discredited. At first it seemed not improbable that this literary re- volution might prove a powerful aid not only in promot- ing Christian culture but in diffusing a more genuinely Christian and catholic spirit. While eminent ecclesiastics sought to bring about the reconciliation of the churches of the East and West, original thinkers like Pius IT. and Maffeus Vegius put forth views on the whole subject of education which involved a decisive rupture with the traditions of medizevalism. It is unnecessary to describe the manner in which this promising future became over- clouded ; how learning in Italy became associated at once with scepticism and immorality ; and how men of letters like Politian and Poggio and Bembo and Beccadelli, under the favour of pontiffs like Leo X., at once scandalized the devout and amused the fancy of the polite scholar. "This fable of Christ has been to us a source of great gain," a cardinal at the Vatican was overheard to observe. Such a tone of feeling, however, was not consonant with the spirit of the persecutor, and if the religious spirit was shocked by profanity it was less disgraced by bigotry. Earnestness of conviction was derided and disbelieved in ; and the prevalent sentiments at the Curia at the outbreak of the Reformation were those of idle and careless security. Signs, however, were not wanting to prove to a later generation how little that false security was justifiable. Foremost among those who advocated

reform and a policy of reconciliation in the first half of the 15th century was Nicolas de Cusa, who, though German by birth, embraced with ardour the schemes projected for the regeneration of Italy and of the church at large. Neither Pius II. nor Nicholas V., who alike promoted him and honoured him, appears to have discerned the dangerous element that lurked in his bold spirit of inquiry. From Cusa, however, Laurentius Valla derived the guidance which led him on to his memorable attack on the fiction of the Donation of Constantine, and to that more general investigation of the claims of the popedom which marks the commencement of the historical scepticism which now began to develop

with such startling results. To Valla succeeded Gregory of Heimburg, who exposed the papal pretensions with equal vigour, and made it for the first time apparent how formidable a weapon the New Learning might prove in the defence of those imperial and popular rights in Germany which Rome at that time contemptuously ig- nored. The conflict between Heimburg and Eugenius TV. foreshadowed, indeed, the greater contest between the Teutonic and the Latin power, and Heimburg has more than once been designated the prototype of Ulrich von Hutten.

In the whole history of the Reformation, and of the Political period by which it was immediately preceded, the political aims of relations of the popedom to the other European powers }°

and more especially to Germany, constitute, in fact, elements of primary importance. In the latter part of the 15th century those relations were still further em- bittered by the personal character and aims of the reigning pontiffs. At the very time when the existence of the popedom as a temporal power was menaced by the rising spirit of innovation, the reverence and sympathy of Europe were still further alienated by the spectacle of the career of Alexander VI. and of his end,—the result, it was commonly reported, of the poison which he had designed for the de- struction of another. The character of lis successor, Julius II. (1503-1513), might well seem virtuous by comparison ; but at no period in the history of the pontificate does its religious character seem more completely lost sight of in purely secular interests. It had long before (see Poprpom) been the aim

of each more ambitious pope to become a great territorial prince and thus to lay the foundation of the private fortunes of his house. But Julius aimed at something more than this,—at the assertion of political supremacy throughout Italy and of the right to rank with the great powers of Europe as wielding at once material resources but little inferior to theirs, and as commanding a widespread organization to the like of which not one of them could aspire. Such were the objects to which his untiring energies were systematically directed. Within four years of his accession he had added Perugia and Bologna to the possessions of the church, and fron Piacenza to Terracina his sway extended over all the great strongholds and the most fertile territory ; even the great powers of France and Spain, notwithstanding their newly consolidated strength, could not but regard with jealousy and apprehension his genius and his policy. "Before," wrote Machiavelli, "there was no baron so petty as not to look with contempt on that popedom which now even a king of France regards with respect." The means by which this remarkable change was effected involved, however, a recourse to fiscal expedients which eventually proved eminently detrimental to the Roman see ;! while for nearly a quarter of a century we find the policy of the great powers in relation to Rome almost entirely determined by purely political considerations and Italy itself becoming the arena of their contending ambi- tions. In the year 1494 Charles VIII. of France effected his memorable passage of the Alps to grasp the crown of Naples. It was currently believed that he had been incited to the enterprise by Alexander VI. himself,—a cir- cumstance which alone suffices to explain the failure which attended that pontiff's efforts when he subsequently sought to prevail upon the invader to submit his claims to the arbitration of the holy see. In the year 1508 the invasion

1 Syb quibus" (de. Alexander VI. and Julius II.) "etiam in negotiatione prebendaria multe nove techn repertz sunt ad pecunias undique corradendas, et ab illis recepte sunt approbataque, magts fisci quam Christi rem agentibus." See the remarkable letter of Eubulus Cordatius to Montesius, prefixed to the reprints of the Treatises of Nicolas de Clémenges, ed. 1519.

Rela- tions of popedom with France ;

with Castile and Aragon ;

by the emperor Maximilian I. took place, with the object of re-establishing the imperial supremacy in Italy,—an expedition which was in some respects the counterpart of that of Charles, and to which Julius II. opposed a vacillat- ing policy not unlike that of his predecessor. To the expedition of Maximilian succeeded the league of Cambray, designed to humble the republic of Venice, and warmly supported by Julius II. as a means whereby to gratify his resentment at the resistance offered by that powerful state to the encroachments of the popedom. No sooner was Venice sufficiently humiliated than Julius proceeded to concert measures for carrying out the great object of his ambition,—the expulsion of the foreigner from Italy. Never before had the aims of the papacy seemed so completely in conflict with those of every European power.

In France, Louis XII., on appealing to the representa- tives of the Gallican Church (council of Tours, September 1510), soon found that national feeling entirely prevailed over Ultramontane sympathies, and that he might count on their effectual support. Notwithstanding, therefore, the remonstrances of his devout consort, Anne of Brittany, he resolved upon a vigorous anti-papal policy. In concert with the emperor Maximilian, he revived the long-dormant demand for a general council; and a mimic assembly, consisting of four cardinals, twenty Gallican prelates, cer- tain abbots and other dignitaries, was actually convened at Pisa in 1511. In this extremity Julius exhibited his usual fertility of resource by organizing the Holy League, and thus inducing Ferdinand of Aragon and the Venetians to combine with him in opposing the designs of schismatic France. The council, transferred to Milan, issued from thence in April 1512 an edict suspending Julius from all pontifical functions as a "notorious disturber of the council, the author of schism, contumacious, incorrigible, hardened" (Raynaldus, sub ann.). The pontiff thereupon excommunicated Louis XII., who rejoined by a formal protest and by causing coins to be struck and circulated bearing the arms of France and the ominous inscription Perdam Babylonis nomen. In the meantime the fifth Lateran council, the rival council convened by Julius, commenced

its sittings (May 1512), and forthwith de- clared the acts of the assembly held at Milan to be those of a schismatical body, while it proceeded to confirm the papal censure on the king of France. The expulsion of the French from Italy, after the fall of their heroic leader, Gaston de Foix, seemed to threaten only a further widening of the schism, when the death of Julius in 1513 opened the door for negotiation—an opportunity of which Louis eagerly availed himself—while the pliant disposition of the new pontiff, Leo X. (1513-1521), afforded additional facilities for arriving at an agreement. The French monarch now disavowed the proceedings of the council which he had before supported, and acknowledged the validity of the acts of the council at the Lateran. Other points were still under discussion when Louis died and was succeeded by Francis I., January 1515.

In the following year the» Catholic king Ferdinand of Aragon died. The relations of Spain to the papacy during his reign and before that time had been very far from representing a policy of complete subserviency. By a concordat made in the year 1482 Pope Sixtus IV. had conceded to the sovereigns of Castile and Aragon the right of nominating to the higher ecclesiastical offices, although he had reserved to himself a corresponding power in con- nexion with the inferior benefices,—a privilege which soon resulted in the customary abuses and rendered the papal supremacy for a time scarcely more popular in Spain than in Germany. At nearly the same time the institution of the Inquisition in the former country is generally supposed

to have first taken place (see InquisitTIon),—an event which must not, however, be construed into a proof of the ascendency of papal influence. In its earlier stage the Inquisition was quite as much a civil as an ecclesiastical tribunal, being especially directed against the exclusive privileges and immunities claimed by the hereditary nobility ; and, although under Cardinal Ximenes the re- pression of heresy became one of its chief functions, it was long regarded with no friendly feelings by Rome. The Roman doctrine and discipline were rigorously im- posed on the Spanish population, but Ferdinand himself showed little disposition to

submit to the dictation of the Roman pontiff. In the year 1508 he sharply rebuked his viceroy, the count of Rivarzoga, for allowing a papal bull to be promulgated in the provinces without having previously obtained his sanction, and declared that if the bull were not forthwith withdrawn he would withdraw the two crowns from the obedience of the holy see. Five years later Cardinal Ximenes, in a like spirit, openly denounced the abuses that accompanied the traffic in indulgences.

The tone that Germany at this period was able to with The several states and princi- Ger- palities, feebly protected by the imperial authority, which ™"Y-

assume was very different.

could no longer be asserted as of yore, yielded an easy prey to the extortion of the papal emissaries. The national clergy, perhaps more corrupt than in any other Teutonic country, showed themselves completely subservient to the worst malpractices of Rome. It was from the laity at large that the first warning came that either reform or revolution must before long ensue. In the year 1511 a notable document, purporting to emanate from the German people at large, was laid before the emperor. Drawn up in the form of a petition, it enumerated and described the various abuses associated with the prevailing ecclesiastical practice and suggested the remedies. Fore- most among the specified grievances it placed the utter want of good faith shown by successive pontiffs in the manner in which they were accustomed altogether to dis- regard (often at the instance of most unworthy favourites) the privileges and immunities solemnly granted by their predecessors. It complained of the frequent nullifying of the elections of prelates canonically elected by their respect- ive chapters, of a like disregard for such elections even in cases where large sums had been paid to the Curia by the chapters in order to secure the ratification of their choice, of the manner in which all the richest benefices were reserved for cardinals and proto-notaries, of the fre- quent anticipation of reversions (expectative gratie) and of the concentration of numerous benefices in the hands of single individuals, of the incessant lawsuits generated by these malpractices and the consequent waste of con- siderable sunis both on the lawsuits themselves and on the obtaining

of bulls which eventually proved inoperative, —"'so that," said the petitioners, 'it has become a common saying that, on obtaining a reversion from Rome, one ought to lay by one or two hundred gold pieces where- with to defend the actions to which the maintenance of one's rights will infallibly give rise." Other matters of complaint were the frequency with which annates were demanded; the bestowal of livings on those utterly in- competent for the discharge of their duties,—" fitter," in fact, "to be muleteers than to be the instructors of their fellow-men"; the frequent issuing of new indulgences and revocation of the old, notwithstanding the repeated re- monstrances of the laity ; the levying of tenths under pre- text of an expedition against the Turks when no such expedition was designed ; and the petition closed with the complaint, which had been rife almost ever since the days of Hilary of Arles, of the continual summoning of suits

to Rome which could be as satisfactorily and far more promptly decided before the national tribunals.1

Attitude While the popular feeling in Germany was being thus

of Ger- effectually alienated from the papal see, the learning of

eiiting. Germany was also pursuing that ominous track, first delineated by Gregory of Heimburg, which marks its com- plete divergence from the Italian humanism, The names of Johann von Goch (d. 1475), Johann Wessel (d. 1489), Johann Reuchlin (d. 1522), and Erasmus stand associated, although in different ways, with a great movement which, by attacking at once the doctrine and the discipline of the church, opened up the way for Luther. Goch and Wessel were among the first to give systematic form to the opposi- tion to the existing ecclesiastical system, and their criticism included both popes and councils as ultimate authorities in matters of faith. They inveighed with especial force against the doctrines of indulgences, veneration of saints, and purgatory, and they denied that confession, the Lord's Supper, and extreme unction were to be regarded as sacraments of divine institution. During the years 1511 to 1516 Reuchlin carried on a memorable struggle against the monks of

Cologne in defence of the New Learning and of improved canons of textual criticism. In the year 1516 Erasmus put forth the first edition of his Novum Instrumentum. Side by side with these more elaborate efforts there was going on another literary movement which in its influence on the popular mind was not less consider- able. Ever since the days of the early Lollards satire had been found a not altogether ineffectual weapon in assailing those abuses in the church which argument and remon- strance seemed powerless to reform. The Prazse of Molly, from the pen of Erasmus, which appeared in 1511, seconded the graver efforts of Reuchlin, and successfully held up to ridicule those monastic orders of whose greed and dull obstructive activity Germany was already so weary. But even this brilliant effort paled in its effects when compared with the Epistole Obscurorum Virorum, which appeared in 1515-16. These letters, of which Ulrich von Hutten and his friend Crotus Rubianus were the principal authors, were a series of broadly humorous fabrications, purporting to be written by members of the obscurantist party them- selves. A more skilful mode of exposing the ignorance and imbecility of thought which characterized the average intelligence 6f the monks'of those days could hardly have been devised; and the success of the artifice appeared complete when it became known that certain stolid monks had been led to approve the volume and even aid in its circulation as a genuine and valid defence of the views which they upheld.

These effective demonstrations, it is to be noted, were not merely the outcome of that widespread discontent above described, but resemble rather a series of sparks elicited by immediate contact between the German mind and Rome; and it is of no little interest to mark the effect produced on three of the most eminent representa- tives of the new movement by their visit, within a few years of each other, to the capital and by the contempla- tion of the splendour of the Curia and the moral degrada-

Visit to tion of its members. Of these three observers the first a was Erasmus, who visited the capital in 1506. His lively }gense of the incongruous was not a little excited by the spectacle of the warlike pontiff, Julius II., whom, in his Praise of Folly, written a few years later, he describes as

1 See "Gravamina Germanice Nationis cum Remediis et Avisa- mentis ad Cxsarem Maximilianum," in Freherus, Germanicarum Rerum Scriptores, ii. 318. The existence of such grievances and their non-redress may serve partly to explain the obduracy with which the subjects of the empire received the simultaneous proposals of Maxi- inilian in the direction of state-reform. See Janssen, Gesch. d.

deutschen Volkes, i. 557-561. Janssen, it may be observed, makes no reference to the document above cited.

subverting alike the laws, peace, and religion. But Erasmus himself does not appear to have been greatly scandalized. He affects, indeed, to be somewhat uncertain whether it is Germany that has copied Rome or whether Rome has not rather copied a certain class of German prelates, who seem to look upon the battlefield as the fitting place where to render up their souls to God. Somewhat later, writing in a graver mood, he declares that nothing will ever efface his more pleasing recollections of the great city,—its freedom of discourse, its intellectual illumination, its works of art, its libraries, and its scholars. Four years after Erasmus came an Augustinian monk from Erfurt, full of reverence for the traditions, the grandeur, and the sanctity of Rome. Martin Luther appears to have been less struck than was Erasmus by the unpriestly character of Julius II., who, as he admits, maintained order and watched over the sanitary condition of the Sacred City. But he was shocked beyond measure by the corruption, the profanity, and the immoral lives of the Roman clergy. The fond illusion of his monastic life was at an end ; and he returned to Germany not only prepared to counsel resistance to papal extortion but shaken in his whole allegiance to the holy see. A few months after Luther came Ulrich von Hutten. It would be difficult to select a better representative of the temper and feeling of the higher classes in Germany at that time. To pride o birth: and devotion to the New Learning he united a love of adventure which no physical suffering or misfortune seemed able to subdue, and a chivalrous spirit which could but impatiently brook the assertion of even legitimate authority. Already burning with resentment at the sys- tematic extortion to which his countrymen were subjected, his feelings were still further intensified as he listened to the contemptuous language and observed the supercilious

demeanour which marked the Roman estimate of those who bore the German name. He heard from an eye-wit- ness a description of Julius II. as that pontiff had presented himself to the world at the siege of Mirandola, with "wild eye, brazen front, and threatening mien." On his return to his fatherland Hutten condensed into epigrammatic Latin verse, beside the suppressed fury of which the polished satire of Erasmus seems to pale, a description of what he had seen and heard, and denounced with terrible effect the whole system of bulls, indulgences, and other devices whereby an avaricious prelate was wringing dis- honest gains from a long-suffering nation. Few literary assailants have ever possessed a greater power of irritating an antagonist than did Ulrich von Hutten, and considera- tions of generosity or expediency rarely deterred him. It was generally expected when Leo X. ascended the pontifical throne that he would be anxious to sheathe the sword which his predecessor had wielded so vigorously, and his countrymen already hailed him as the " restorer of peace." By that epithet Hutten too vouchsafed to address him, but it was in a dedication to the pontiff of a reprint of Laurentius Valla's Treatise on the Donation of Constantine, and the seeming act of homage was thus artfully appended to pages exceptionally calculated to wound the papal susceptibilities.

It nist, however, be admitted that the character of the German episcopate at this time was such that it scarcely appeared to advantage even when compared with that of the ecclesiastics of the Roman Curia. Its members were generally scions of princely houses, caring little for the spiritual interests of their dioceses, but delighting in field sports and martial exercises, given to building palaces for their own residence rather than to the erection of churches, and often without the slightest tincture of learning. Their primate at this time was Albert, brother of the elector of Brandenburg, archbishop of Mainz and Magde-

of Luther ;

of Ulrich von

Hutten. f

Char- acter of German episco- pate.

burg, a young and ambitious voluptuary, caring for little but pleasure and display. On the great prelates the ex- tortion of Rome sometimes fell not less heavily than on

of Ingoldstadt drew attention to the resemblance between Luther's the doctrines put forth in the theses and those of the relations Hussites, and at the mention of that undoubted heresy not With the

Tetzel's cam- paign.

the laity; and the archbishop, before he could receive his pallium, was called upon to pay the sum of 30,000 gulden into the papal exchequer. Leo X. was at that time intent on carrying out the great design of his predecessor, the rebuilding of St Peter's. It has been observed by Palla- vicino that the millions devoted to the erection of the material church were acquired at the cost of many more millions to the spiritual church. Leo proclaimed a fresh issue of indulgences, and the archbishop Albert was appointed his commissioner to carry out the sale in a large portion of Germany. He seized the occasion to prevail upon the pope to allow him to appropriate one half of the money collected for the indulgences in order to pay for his pallium. As his chief agent in the sale he imprudently selected one Tetzel, a Dominican friar, whose unscrupulous- ness in such work was so notorious that the papal collector at Mainz refused to employ him. In the course of his progress Tetzel came to Jiiterbogk, near Wittenberg, and his superstitious traffic and the impudent devices which he employed to cajole the people were thus brought directly under the notice of Luther. The young professor seized the opportunity of directing the attention of the university, where le was already highly popular, to the abuses associated with the sale of indulgences. He did not as yet impugn the doctrine of indulgences itself, and he expressed his conviction that their good father the pope must be altogether unaware of the extent to which such abuses were allowed to prevail. His celebrated theses were forwarded by himself to the archbishop, as well as to the elector of Saxony, his patron, and also the muni- ficent founder of the university.

The elector, who had seen with no slight dissatisfaction the manner in which his provinces were being plundered in order to pay for the extravagance of a neighbouring prelate, extended his protection to the courageous polemic, and Luther thus gained the all-precious interval of freedom from molesta- tion which enabled him to compose the memorable treatises whereby he produced such an immense effect on the minds and consciences of his countrymen. The nailing of his theses to the door of the chureh at Wittenberg, it is to be noted, was a very common method of procedure on the part of a university disputant ; and nearly a year passed away before the events which so deeply agitated Witten- berg were recognized in their full importance by the world at large. Luther himself, indeed, in his notable letter to Leo X., written in 1518, tells us} that, contrary to has wishes, his theses were translated into German, and circulated throughout the nation, and that his antagonists declared that he had set the world in flames, But in this language there is evidently something of exaggeration. Some two months after the appearance of Luther's theses Tetzel, by way of rejoinder, published at the university of Frankfort-on-the-Oder a hundred and six anti-theses, and these were subsequently burnt by the students of Wittenberg in the market-place. To Leo, however, the vague reports that reached Rome conveyed only the im- pression of a dispute between the two monastic orders of which Luther and Tetzel were respectively the representa- tives. He declared that Luther was a man of genius, and refused to interfere. Even Ulrich von Hutten, at that time residing not far from Wittenberg, seems to have shared in this misapprehension, and, writing to his patron, he expresses the hope that the two contending parties may eventually tear each other to pieces.

But in the course of a few months the importance of the struggle began to be more clearly apprehended. John Eck

1 Werke, ed. 1883, i. 528.

a few of Luther's supporters recoiled. His conduct was certainly not wanting in astuteness, however genuine his enthusiasm. In 1518 he republished his theses, with addi- tions and explanations, under the title of Solutions. Like Hutten, he selected the supreme pontiff himself as the person to whom he dedicated the treatise. In the letter of dedication (the

letter above referred to) he professes to make his unqualified submission to him whom he addresses, and at the same time endeavours to exculpate himself for thus republishing the theses. N otwithstanding the popular form, the vernacular language, in which they had already appeared, they were still so encumbered with the techni- calities of the schools that he could not conceive how they could be intelligible to the laity at large ("sic edite ut

mihi incredibile sit eas ab omnibus intelligi "). He was –

therefore anxious, with the pontiff's sanction and approval, to republish them in a form less liable to misinterpretation. If, however, that sanction were withheld, he could only bow to Leo's decision as to that of God's vicegerent on earth ("vocem tuam vocem Christi in te prasidentis et loquentis agnoscam"). While Luther was thus labouring under mis- apprehension, affected or real, with respect to the kind of doctrinal teaching that was likely to find favour in Rome, it would seem that Leo himself was very imperfectly in- formed regarding the state of feeling in Germany. The conditions which moulded his political action and his personal sympathies alike tended to distract his attention from the events which had recently been occurring in Saxony. The representative of a princely house, well versed in European affairs and in questions of statecraft, gifted with more than an ordinary share of Italian subtlety and powers of dissimulation, he was well qualified to cope with the difficulties by which he found himself surrounded. But his aims, chief among which was his desire to establish lis brother Julian on the throne of Naples, were directed more to family aggrandizement than to national unity. They ran strongly counter to the growth of Spanish influ- ence, while with that stern policy which guided. the rule of Ximenes, dictated by the desire to restore medieval doctrine and discipline and to suppress heresy, he had no sympathy. The ecclesiastic was almost lost in the patron of the arts, the urbane and polished scholar and voluptuary, the admirer of wit and epigram. In politics it was his main purpose to trim the balance between France and Spain ; in church matters it was chiefly to stifle contro- versy. So indifferent was he to German affairs, and so little cognizant of the state of feeling among the people, that at the very moment when irritation at the extortion of his emissaries was at its height, and the fraudulent

nature of that extortion had been thus ably exposed by Luther, he conceived it to be a suitable time for levying a contribution throughout the empire under pretext of an expedition against the Turks. The proposal roused a spirit of opposition even among the clergy themselves ; and one of their number, a prebendary at Wiirzburg, issued a mani- festo, in the form of a pampliet, in which he roundly de- clared that the true Turks were to be found in Italy. This pamphlet fell into Luther's hands, and with the instinct of genius he recognized the opportunity afforded by such a state of feeling for an appeal to a wider audience than he had hitherto addressed. He now took his stand as the de- nouncer both of abuses in the matter of discipline and of the extortion and oppression under which his countrymen laboured. And from that day to the day of his death he filled a place in their affection and esteem to which no other of their leaders could make pretence. The turning- point in his public career is marked by his appearance at

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Augsburg before the papal legate Cajetan and his subse- quent flight from the city. In the disputation at Leipsic he could go so far as to repudiate the divine institution of the papacy and even pronounce against the infallibility of councils. He was still further confirmed in his doctrinal divergence by the influence of Melanchthon, who now began to call in question the doctrine of transubstantiation ; and Valla's Treatise on the Donation of Constantine, with which he first became acquainted in February 1520, would seem to have dispelled the last vestige of doubt in his mind with respect to the essential falsity of the claims of the papacy to temporal power. The contrast now presented by the tone and language of his writings to that of his letter to Leo, written two years before, is startling. In the month of April 1520 appeared his discourse De Libertute Chris- tiena, inveighing against the abuses of the Curia and re- ferring to Leo himself in terms of open irony. To this succeeded in the following August his appeal, written in the vernacular German, "To the Christian nobility of the German nation," wherein he frankly confesses that his reliance is upon none of the ecclesiastical orders, but upon the newly-

elected young emperor and the nobles; and he reiterates his demand for a general council,—one that shall be really free, bound by no arbitrary canons, and holding its deliberations free from papal control, This again was succeeded in the ensuing October by his treatise on The Babylonian Captinty of the Church, wherein he examines, and for the most part repudiates, the sacramental theories of the medizeval church. The cause which he advocated now began to assume genuinely European proportions. From Nuremberg came an effective tribute from the youth- ful meistersinger Hans Sachs to the " Wittenberg Night- ingale," one of the earliest efforts of his genius. Ulrich von Hutten, at length perceiving the true character of the contest, followed up the address to the German nobility by translating into the vernacular his own treatise Z'o Germans of every Class, and owing to lis persuasions the powerful and chivalrous free knight Franz von Sickingen hastened to declare himself an uncompromising supporter of the Lutheran movement. 'Together they already dis- cussed plans which included nothing less than the estab- lishment of a national church altogether independent of Rome, with the archbishop of Mainz as its primate. The danger that menaced the Roman see could now no longer be disguised ; and in June 1520 Leo fulminated his bull of excommunication against Luther. On the 8th of the following July he addressed a letter to Frederick of Saxony in which he deplores that he can no longer speak of Luther asason. He feels certain that the elector will prove loyal to the church, although he does not disguise the fact that he has heard of his friendship for the heretical leader and that the latter relies on his support. He has ordered the bull to be circulated among the nobility of Saxony, and he feels equally assured that he may reckon on their assistance in extinguishing this "incendiary conflagration." As for Luther himself, he denounces him as one who is seeking to revive the heresies of the Waldenses, the Hussites, and the Bohemians, and who, by the manner in which he has con- demned the burning of heretics, has clearly shown that he sympathizes with the Turks and aims at the destruction of the true church.!

The bull of excommunication, along with numerous volumes of the decretals, was burnt by Luther himself at Wittenberg in the following December,—a proceeding by

1 Balan, Monumenta Reformationis Lutherane (1884), pp. 1-3. This letter, published for the first time in this collection, differs entirely from that given in the Jena edition of Luther's works; and Cardinal Balan in his preface (pp. 5-10) adduces satisfactory reasons for con- cluding that the letter which he prints from an original in the archives

of the Vatican is the true letter, and that the other, if not a forgery, is a reproduction from some untrustworthy source.

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which he formally intimated his repudiation of the decrees and canons of the church. Such a measure necessarily roused the opposition of those learned bodies by whom the canon law was taught and elaborated, and on 21st April 1521 the university of Paris condemned as "heretical, schismatical, impious, and blasphemous" more than a hun- dred propositions extracted from Luther's writings; while, skilfully following up the line of attack indicated by the supreme pontiff, they enlarged upon the view that Luther- anism was little more than a specious reproduction of errors long ago proscribed and exploded. The university at the same time decreed that Luther's writings should be burnt ; and the sentence was subsequently carried into effect in most of the capitals of Europe. In London the ceremony was performed at Paul's Cross on the 12th May, and Bishop Fisher in his sermon on the occasion declared that Luther by burning the decretals had made it clear that he would not lave hesitated to burn the pope himself had the latter been in his power.

The Reformation in England had, however, already com- Reforma- menced, and its origin must be looked upon as in a great tion in

measure independent of the Lutheran movement; as in Germany, it had been preceded by a kindred movement, an endeavour to bring about a reform of discipline. The nation was not compelled, as in Italy, to witness the cor- ruptions of the papal court, nor were the laity equally oppressed with the people of Germany by imposts and exactions of every kind. But the unsparing extortion practised by Wolsey's agents after his appointment as legatus a latere was severely resented, and appeared all the more grievous when contrasted with that immunity from arbitrary

taxation which it was the Englishman's special boast to inherit as his birthright ; and the arbitrary pro- cedure of the ecclesiastical courts and the licentious lives of the clergy were the subjects of loud and continual com- plaint. In the ycar 1514 the notable case of Richard Hunne roused popular indignation to the highest pitch. He had been so bold as to resist what he regarded as an unjust exaction of mortuary fees, by pleading in the eccle- siastical court that the action brought against him was un- lawful by the Statute of Preemunire,—a plea which virtually raised the whole question of benefit of clergy. Hunne was committed to the Lollards' Tower and was shortly after found dead,—murdered, as it was popularly believed, by the contrivance of the chaucellor of the bishop of London. The case gave rise to a fierce legal controversy, in which the authority of an Act of Parliament was opposed by the precedents established by a decretal of the church. It was followed by the memorable trial of Dr Standish (1515), by which the question of the royal supremacy was dis- tinctly raised, and Henry himself not improbably led to conceive that theory of his legitimate authority in matters ecclesiastical which was afterwards attended with such important results. The state of discipline among the clergy at large was but little, if any, better than in Ger- many, and their addiction to secular pursuits and plea- sures, their covetousness, ambition, and licentiousness are attested not only by satirists like Roy and Skelton, but by grave and temperate censors such as Dean Colet, Arch- bishop Warham, Bishop Fisher, and Sir Thomas More, and form the subject of their earnest remonstrance and appeals for reform. Wolsey himself, than whom no states- man more clearly discerned the tendencies of the age, was especially anxious to raise the reputation of the whole body for learning and exemplary lives, and it was with this view that he founded Cardinal College (afterwards Christ Church) at Oxford, and invited some of the most promising young scholars at Cambridge to become instruc- tors within its walls.

It is also in connexion with the two universities that

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The death of Leo X. in 1521 was coincident with an im- Eventsin portant crisis in Italian history. Milan had been wrested Italy,

we meet with the first indications of a reformation of doctrine. During the years 1511-14 Erasmus had filled

1521-26.

the post of Lady Margaret professor of divinity at Cam- bridge, and the publication of his Novum Instrumentum in 1516 was directly the outcome of his labours during that period. Thomas Bilney, the martyr, a member of Trinity Hall and one of the most eminent of the Reformers, expressly attributes his conversion to the influence of Erasmus's Vew Testament. Around Bilney there gathered a little band of Cambridge scholars,— Shaxton, Crome, Skip, Rogers, Lambert, Heynes, Taverner, Parker, and others. It was their custom to meet together at an inn known by the sign of the " White Horse." In the first instance, their attention was chiefly given to the Scriptures themselves, but subsequently to the writings of Luther. The inn then began to be styled "Germany " by their enemies ; and such would appear to be the first cominencement of the Reformation in England. That commencement was illustrated by an incident which not a little resembles the better-known incident associated with the career of Luther. On the appearance of the papal proclamation of indulgences in 1517 a copy had been affixed to the gate of the common schools in the university. The same night a young Norman student, of the name of Peter de Valence, wrote over the proclamation a few Latin words denouncing the theory of indulgences as a supersti- tion. He was forthwith summoned to appear before the vice-chancellor in order to account for his conduct, and on failing to do so was formally excommunicated.

and Charles V. in his nineteenth. The English monarch, at this time both zealous and devout, was eager to give some proof of his loyalty to the Catholic Church, and had he occupied the place of Charles the career of Luther would probably have been soon arrested. The great Reformer owed his safety at this critical period mainly to the armed chivalry of Germany, which rallied ominously to his support. On no occasion was its presence more sensibly felt than at the diet of Worms (May 1521). The memorable edict (see LuTHER), signed on the same day as that on which the pope and the young emperor concluded their compact for the

reconquest of Milan from the French, marks the crown- ing triumph of the policy of Leo and Alexander. But Charles, who looked upon Luther as a means of bringing pressure to bear upon the pontiff which might prove useful in a future emergency, was determined not to surrender the bold. professor, for the present, to his enemies. To Henry, who was influenced by no such secular considera- tions, Luther's contumacy appeared to call for authorita- tive rebuke in every land; and in July 1521 he produced, in reply to the treatise on The Babylonian Captivity, his Defence of the Sacraments. The book passed rapidly through several editions, was translated into German, and, to quote the expression of Cochleus, " filled the whole Christian world with joy and admiration." Such an effort from such a quarter called for distinguished recognition. Francis was already styled the eldest son of the church. The imperial dignity presupposed a not less conspicuous fidelity. The titles of " Most Christian " or ' Most Catho- lic" could not accordingly be vouchsafed to the English monarch, He was therefore rewarded with the newly- coined title of "' Defender of the Faith." Sir Thomas More and Bishop Fisher both imitated their royal master's example by also compiling a tractate in reply to Luther; but the Reformer, in his rejoinder to the royal polemic, called its author a fool and designated him the "Pharaoh of England."

from the French by the allied papal and imperial forces, and the realization of that scheme of national unity and independence for which he and his predecessor had laboured seemed no longer a dream of the future.' In the midst of his exultation—partly, it is said, as the result of it —Leo died, and seldom in the annals of the papacy had an elec- tion to the office been attended with equal interest and excitement. Wolsey eventually was out-manceuvred by the imperial party, and the emperor's former preceptor, the irreproachable, austere, and rigidly devout Adrian (VI.) of Utrecht (1522-1523) succeeded to'the papal chair. After a few months' tenure of the office he too gave place to another, and the house of Medici was again represented in the person of Clement VIT. (1523-1534). In this election Wolsey was again a candidate, and a second time he had reason to believe that he owed his defeat to the emperor, an injury which he never forgave. In not a few respects Clement was admirably qualified to cope with the diff- culties by which he found himself surrounded. He had been at once the most trusted and the ablest of Leo's

advisers ; his attainments and experience were such as in every way corresponded to the requirements of his office, for, while well versed in philosophy and theology, he had also mastered the political and ecclesiastical questions of the day, and his clear perception enabled him to grasp the essential features of his policy with remarkable skill and promptitude. His position, however, was one of extreme

Henry In the month of January 1519 the enrperor Maximilian I. | perplexity, alike in its diplomatic and its theological rela- VIll., died, and the imperial dignity, declined by Frederick of | tions. To no power had he and his house rendered greater Se Saxony, descended to Charles V. Of the three monarchs | services than to Spain; ever since, indeed, the pontificate Charles Who had aspired to this supreme honour Henry VIII. was | of Alexander VL, the papacy had, often without designing V. now in his twenty-ninth year, Francis I. in his twenty-sixth, | it, been the instrument of imperial aggrandizement. With

the accession of Clement, however, these relations are to be seen assuming a new phase. The election of Charles V. as emperor awoke in the proud representative of the great house of the Medici the sense of a new danger ; and the prospect of Milan, Naples, and the empire being concentrated in a single hand was one which no Italian potentate could be expected to contemplate with equa- nimity. The retreat of Bourbon from Italy, on the other hand, had caused the Curia to look with altered sentiments on the policy of France ; and if Clement's advice and good wishes could have availed aught the great disaster at Pavia would have been averted. The emperor was far from unaware how little he had throughout been indebted to Clement's good offices, and before he led his army into Italy had been heard to avow his intention of avenging himself 'on that poltroon the pope." "Some day or other," he added, "perhaps Martin Luther may become aman of worth." The battle of Pavia (February 1525) followed, and its results seemed to threaten the overthrow of that balance of power which it was the aim of the chief leaders of the new nationalities to maintain ; both Wolsey and Clement VII. alike now regarded with dismay the proportions which the power of Spain was assuming. "It is no trivial question, no single state, that is concerned in the coming contest," exclaimed Clement's minister; "this

war will decide the freedom or the eternal slavery of Italy." In July 1526 the papal troops had already entered Lombardy.

Such were the circumstances under which the Clement- ine League (22d May 1526) was formed, with the general assent of the Italian states, but with the usual disregard of the state of opinion north of the Alps. But it was hardly reasonable to expect that Ferdinand of Austria would be solicitous to uphold the papal interests in Germany when the imperial interests were being thus vigorously assailed in Italy. Three months before, the sanction of the

Charles V.'s in- vasion of Italy.

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emperor had been given to the publication of certain ' pro- visions" in matters of faith which had filled the Lutheran party with alarm. At Gotha and again at Torgau the Protestant leaders began to concert measures for actively repelling the policy of coercion which they anticipated would shortly be commenced. When, however, the diet assembled at Spires in June they found their apprehen- sions dispelled in an unexpected manner by the newly- aroused animosity towards the Roman pontiff and his policy. Never had the electors shown themselves more unanimous in counsel or submitted with better grace to the- contributions imposed upon them. It was even pro- posed that the recently issued provisions should be publicly burnt and the Bible adopted as the only rule of faith. However, it was finally resolved that the respective states should be declared to be at full liberty, in relation to all questions of belief raised by the edict of Worms (see Louruer), 'to conduct themselves as each should here- after be ready to answer for towards God and the emperor," —terms which virtually implied permission to proceed ac- cording to their own discretion. "Such an enactment," ob- serves Ranke, '"' containing as it does no mention whatever of the supreme pontiff, may be looked upon as the com- mencement of the Reformation properly so called, involving, in fact, the institution of a new church in Germany."

The effects of the concurrent action of religious and national sentiment thus brought about were soon to receive a memorable illustration in Italy.

The soldiers who made their way under the leadership of Frondsberg, Ferdinand's lieutenant, across the Alps, in the snows of November 1526, into the plains of Lombardy, and afterwards mingled with the Spanish forces which Bourbon led on to the assault on Rome, were almost entirely avowed supporters of Luther's cause and full of fierce hatred of popery. Fronds- berg himself loudly declared that as soon as he had taken Rome he would hang the pope. The Spaniards, notwith- standing their unshaken devotion to Catholicism, entered the city burning with the spirit of national antipathy, and eager to revenge the long series of wrongs and exactions which their countrymen had suffered at the hands of Italian ecclesiastics. Among the horrors which followed upon the capture of the capital (May 1527) nothing more completely shocked the sense of Latin Christendom than the savage contempt manifested by the German soldiery for everything that symbolized the Roman faith, their wanton destruction of relics and images, mock religious services, and especial brutality in the treatment of priests. Even their Spanish confederates, though equally merciless in their excesses, looked on with indignation as they saw them disguising themselves as cardinals and holding a mock consistory under the windows of St Angelo for the purpose of elect- ing Luther as pope. But even the impressions thus pro- duced were evanescent when compared with the constantly renewed and unavailing regret which filled the breast of the scholar and the churchman in after years, as he realized the irreparable losses inflicted upon art and learning, the destruction of unique manuscripts and ancient records. Nor can it be a matter of surprise that a sentiment of deep revenge should have arisen in Rome against the Lutheran destroyer, and that even the Swabian and the Spanish invader alike should have afterwards been solicit- ous in a manner to disguise their own responsibility, by professing to look upon the blow thus struck at the sanctity and inviolability of the sacred city as a direct judgment of God. For a time, though only for a few months, it was believed, even by politicians so shrewd and well informed as Wolsey, that the emperor himself was designing to aid the Reformation. The approach of the Turks, who had overrun Hungary, and the hostility of France demon- strated the urgent necessity of maintaining concord among

his subjects in the empire ; and it is possible that he may really have contemplated placing himself at the head of the Lutheran movement and keeping Clement VII. per- manently a prisoner at Gaeta. But his Spanish blood, his education under Adrian of Utrecht, and the traditions of the imperial dignity proved too powerful a counterpoise, and Charles eventually not only deigned to lay before the courts of Europe a partial explanation and apology for the tragedy at Rome, but in a treaty (26th November 1527) with the pontiff he entered upon an agreement for the adoption of a distinct anti-Reformation policy. It has been asserted that Clement also undertook on this occasion not to declare the marriage of Henry VIII. and Catherine illegal, but no such stipulation appears in the existing treaty.

In pursuance of his anti-imperial policy Wolsey did Wolsey's not fail to seek to turn to the best account the sensation Policy.

caused by the triumph of the imperial arms. He enjoined the observance of a three days' fast and the offering up of prayers in every church in England for the captive pontiff's deliverance. He could not, however, but be conscious that his policy was regarded with but little favour by the nation at large. The young emperor was highly popular among the citizens of London, and the ancient amicable relations with the house of Burgundy and the actual important commercial relations with Flan- ders combined to render Spain in the eyes of Englishmen their natural ally, while France they still regarded as their hereditary foe. An expedient to which he had recourse about this time only-served still further to fan this feeling. He had sought to render France, instead of the Low Countries, the main channel of the commerce between England and the Continent by making Calais the chief port for merchandise. The merchants of the Hanse towns took alarm; and, as it was in their vessels that Luther's writings, which were now eagerly purchased in England, even at exorbitant prices, chiefly found their way across the Channel, the preachers of the Reformation found no difficulty in representing to their countrymen that an Anglo-French alliance could not fail to prove inimical to the gospel. On the other hand, the Catholic party both in England and in Germany, as soon as the project of the divorce became noised abroad, could not but recognize in Catherine the representative of

the interests of the true church, while they looked upon the emperor as her champion, and upon Wolsey as a traitor to the cause of truth and justice. During the last five years the cardinal's efforts to reform the clergy and repress the Reformation in England had been strenuous and constant. In the year 1521 he had enjoined all the bishops "to take order that any books, written or printed, of Martin Luther's heresies and errors should be brought in to the bishop of each diocese."1 The movement at Cambridge continued, however, to progress, and in 1523 some of the bishops suggested the appointment of a visita- tion to the university "for trying who were the fautors of heresy there." This proposition was not acted upon by Wolsey, who probably in his heart sympathized with the genuine spirit of learning developing in the university, and the matter was subsequently made the ground of an accusation against him by his enemies.2_ We find, accord- ingly, George Stafford, a member of Pembroke Hall, venturing in the following year to adopt the example set by Luther, of taking the Scriptures themselves, instead of the Sentences of Peter Lombard (the theological text- book of the universities), as the 'basis of a course of divinity lectures. In the following year William Tyndal published at Antwerp the first edition of his translation 1 Strype, Memorials, i. 56. 2 Burnet, Hist. of the Reform., ed. Pocock, i. 70. XX. — 42

of the New Testament, and in 1526 we hear of its intro- duction into Oxford by Thomas Garret, and of the volume being burnt at Paul's Cross. On 27th November 1527 Bilney and Arthur were examined at the Chapter House at Westminster before Wolsey and other ecclesiastics, as to whether they had preached or taught to the people the opinions of Luther or any others condemned by the church. seaports and commercial towns of the eastern counties, such as Yarmouth, Harwich, and Norwich, the university would appear to have become familiarized with the Lutheran doctrines much sooner than Oxford. From 3d July to 20th September 1527 Wolsey was in France, intent on bringing about the marriage of

Princess Mary with the duke of Orleans, and on gaining the support of Francis in the matter of the royal divorce.

Henry himself had at this time fully resolved to carry the latter project into effect, and the doubts raised with respect to the validity of his marriage and the legitimacy of Mary cannot be regarded as anything more than official formalities, designed to give a veil of decency to his real purpose. While in France Wolsey learned from Flanders that the emperor had become apprised of Henry's real intentions, and he himself now proceeded (to quote his own words) to employ "all possible ways and practices for the obtaining of the pope's consent." Unfortunately for the success of his efforts, Henry at this juncture con- ceived the design of sending another agent to Rome, to act altogether independently of Wolsey, and charged to procure, not only the appointment of a commission em- powered to dissolve the marriage with Catherine, but also a dispensation removing all obstacles to the king's second marriage with Anne Boleyn. Clement was still a prisoner in the castle of St Angelo, but on the evening of the 9th December 1527, disguised in a blouse and carrying a basket and an empty sack on his back, he effected his escape, and with the assistance of a guide arrived the next morning at Orvieto. From that day his resolve was probably definitively taken, and, notwithstanding his previous promises and his subsequent apparent conces- sions, he would seem to have been firmly resolved not to grant his consent to a measure deeply humiliating to him- self and certain to expose him to the full brunt of the emperor's resentment. But at Orvieto Henry's delegate, Knight, although untrained and ill qualified for the task of a diplomatist, obtained both a commission and a dispensa- tion, which, however, on his reaching England, were both found to be worthless, owing to designed non- observance of the necessary technicalities. In the following year Foxe and Gardiner were despatched on a like errand. The latter was far better suited for the work than Knight; and he did not scruple to threaten the trembling pontiff with the complete withdrawal of Henry's support, and to predict as the inevitable consequence the collapse of the already tottering apostolic see,—a result which, he de- clared, "' would be attended by the applause and satisfac- tion of the whole world." By such menaces Clement was eventually induced again to grant a commission and a dispensation. A decretal bull, formally annulling Henry's first marriage,

was handed to Campeggio, which he was instructed to show to the king and then to destroy. But in the meantime the celebrated brief executed by Julius IT., in which the dispensation for Henry's first marriage was re-enacted in more precise and unqualified terms, was discovered in the Spanish archives. It was sought to show that the brief was a forgery, but to this view of the matter Clement altogether refused to assent. At length, however, in May 1529 the legate proceeded to open his court at Westminster. The courageous conduct of Catherine put honourable men to shame; and no

Owing to the proximity of Cambridge to the-

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slight impression was produced by Bishop Fisher's heroic declaration of his willingness to stake his life that her marriage with the king was perfectly valid. Campeggio, under various pretexts, still hesitated and delayed. In July the news of the peace of Cambray arrived, and it was known that the influence of the emperor would hence- forth be paramount in Italy, while it was believed that the projected marriage between the French monarch and the sister of the emperor augured a durable peace between the empire and France. Then the legate adjourned the court and the pontiff revoked the cause to Rome. All around Wolsey saw the plans which he had laid with so much toil and skill breaking up, and on him the royal displeasure vented itself. He died 30th November 1530, a victim to the wanton caprice of one whom he had served only too faithfully, and with him the ablest supporter of papal influence and the most formidable opponent of Reformation principles in England disappeared.

Henry would not condescend to appear before a Roman court, and as a last expedient it was proposed that the question of the legality of his first marriage should be submitted to the learned bodies, the universities and emi- nent canonists of Europe. This scheme had already been recommended by the episcopal bench, but to Cranmer's ingenuity is attributed the further suggestion that the opinion thus obtained should be carried into effect by a court convened in England. Commissioners, among whom Richard Croke appears as the most conspicuous and in-

defatigable, were accordingly despatched on the proposed errand. The means to which they had recourse in order to obtain opinions such as their royal employer desired are plainly described by a contemporary writer, who says that 'there was inestimable sums of money given to the famous clerks to choke them, and in especial to such as had the governance and custody of their universities' seals."1 The evidence more recently brought to light enables us to accept this statement as substantially correct.? The unpopularity of the divorce among the nation at large was especially shown at the two universities, where the junior members made demonstrations of the greatest dis- satisfaction, while their seniors were mostly bribed or in- timidated into acquiescence by the royal agents ; nor could the authorities at either Oxford or Cambridge disguise the fact that they found themselves at variance with the feeling of the country at large.

It is at this juncture that Cranmer assumes a foremost Cranmer.

place as a leader of the English Reformation. He had written in defence of the divorce, and had taken a part in embassies sent by Henry to treat on the question with the emperor and the pope; and Clement had shown his sense of the value of his influence by appointing him to the lucrative post of grand penitentiary for England, in the hope of winning him over to the papal interests. Cranmer's whole policy, however, had been directly opposed to that of Wolsey. He had used his best efforts to con- firm the commercial relations with the Netherlands, and had superintended the negotiation of a commercial treaty between that country and England. He had resided for some months in Germany, and while there had married Margaret, the daughter of Andrew Osiander, a distin- guished preacher and leader of the Lutheran party at Nuremberg. From Germany he was now summoned back to England to become the successor of Warham, the pri- mate, who had died in August 1532. As there had as yet been no formal rupture with the see of Rome, it became necessary for him to apply to Clement for the customary bull of consecration, and also for his pallium as metro-

1 Cavendish, Life of Wolsey, ed. Singer, p. 206. 2 See Croke's and other letters in Records of the Reformation, ed. Pocock, Nos. xcix.-cxxvi.,

exxviii.~~cxlvi., clvii.~~ eciii,

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politan, and on receiving these it was also requisite that he should take the oaths of canonical obedience and sub- jection to the Roman pontiff. His conduct in this dilemma has been generally regarded as indefensible. In order to

ool While such was the progress of events in England and in Political Germany there had been going on in Switzerland a corre- condi-

sponding movement, second only in importance to that tion of

initiated by Luther. 'The political relations of the Swiss py"

show that he disclaimed the right of the pontiff to nomi- nate to ecclesiastical offices in England, he surrendered the several bulls, eleven in number, into Henry's hands ; and, having done this, he took the usual oath of obedience to the see of Rome.! Before doing so, however, he made a protestation to the effect that he did not intend thereby to bind himself to do anything contrary to the laws of God, the king's prerogative, or the commonwealth and statutes of the kingdom. On 23d May 1533 he proceeded, as archbishop and legate of the apostolic see, to pronounce the king's marriage with Catherine of Aragon null and void ab initio, as contrary to the divine law; and five days later he gave judicial confirmation to the royal marriage with Anne Boleyn. In the following year (23d Mareli 1534) Clement rejoined by a manifesto declaring the validity of the first marriage, and calling upon Henry to take back his first wife and to observe "a perpetual silence" in relation to the question for the future.2 This decisive step was mainly the result of the parliamentary action that had in the meantime been going on. The parliament of 1529 had in various ways limited the privi- leges of the. clergy, and by the Act 21 Hen. VIII. c. 13 had deprived them of the power of holding pluralities by virtue of licences obtained from Rome for money. Fisher, from his place in the House of Lords, vainly sought to combat these reforms by declaring that Lutheranism was spreading in the nation and by reminding his audience of Germany and Bohemia and the miseries that had already

befallen those countries. The allusion to the Lutheran inovement appears to have been, indeed, singularly inju- dicious, and there can be no doubt that at this period it was the aim not only of the king but of the bishops to dissociate the Reformation movement in England from the movement that was in progress in Germany. As yet the repudiation of the papal supremacy and a reform in matters of discipline were all that was contemplated either hy the crown or the parliament. In 1531 appeared a pro- clamation making it penal to introduce bulls from Rome, and this was shortly followed by an Act visiting with severe penalties all who should be found going about the country for the purpose of carrying on the sale of indul- gences ; while under the famous Statute of Premunire the whole body of the clergy were convicted of having recog- nized the validity of Wolsey's acts as papal legate, and thereby placed both their liberties and their possessions at the mercy of the king. In April 1533 there followed the Act providing that all causes should henceforth be tried in the courts of the kingdom, and forbidding appeals to Rome under any circumstances whatever,—the body "now being usually called the English Church" being held "sufficient and meet of itself to declare and deter- mine all such doubts and duties as to their rooms [7.e., offices] spiritual doth appertain." These successive enact- nents had already paved the way for Henry's final rejoinder to Clement's demands,—the Act of Supremacy (November 1534), whereby the king was not only declared to be supreme head of the Church of England, but was at the same time invested with full power "to repress and amend all such errors and heresies as, by any manner of spiritual jurisdiction, might and ought to be lawfully reformed."

1 It should, however, be noted that Cranmer's oath as metropolitan contained the clause "salvo ordine meo," and this clause might prob- ably, in the judgment of canonists, render his subsequent reservation more defensible. See Sarum Pontifical in Camb. Univ. Lib. (Mm. iii. 21); Maskell, Afonumenta Ritualia, ii. 817; Strype, Memorials of Cranmer, App. No. VI.

2 Records of the Reformation, ii. 532.

confederation at this period exercised a very appreciable influence over the whole course of the Reformation. With the commencement of the century the cantons had already reached the nuinber of thirteen; and the confederates, in combination with the Leaguers, represented Italian as well as German interests. In great crises they were not incapable of presenting a combined front to the common foe; but more generally they were divided by political jealousies and differences, while the majority of the men in each canton were mere military adventurers, ready to serve under the banner of the empire, France, the pope, or the duke of Milan, according as the one or the other power seemed likely best to reward their services. An important change in the ecclesiastical relations of the cantons had recently brought them into closer connexion with Rome. 'The six bishoprics into which Switzerland was divided—Lausanne, Sion (Sitten), Como, Basel, Chur, and Constance—had formerly been severally subject to the metropolitan jurisdiction of Mainz, Besancon, and Milan. But this jurisdiction had been superseded by the creation of the nunciatures, whereby each bishopric was brought into direct connexion with the papal see. The nuncios often exercised a potent influence on the political relations of the confederates. They negotiated with large bodies of Switzers the conditions of military service under the pope; they directed the traffic in indulgences; and they watched with especial jealousy the first appearance of schism. 'The experience, however, of those of the confederates who accepted military service in Italy did not serve to increase their reverence for the Curia and its aims. They carried back with them to their homes a contempt for the whole administration of the Roman see and its dependencies which communicated itself to their country- men, and at no centres were opinions adverse to Catho- licism now spreading more rapidly than at Zurich, Bern, and Basel.

Born in the same year as his brother Reformer, Ulrich Zwingli.

Zwingli was scarcely less distinguished by commanding powers, devotion to study, and a yet more notable devo- tion to truth; but in the enlightened tolerance which marked his whole career we recognize the contrast between his early associations and those which nurtured the somewhat narrow though fervid patriotism of Luther. The latter, in the retirement of his monastic cell, had pondered over the profound speculations of

Augustine, the imaginative subtleties of De Lyra, and the mysticism of Tauler. The other, at the universities of Vienna and Basel, had become familiarized with classic models, and his genius had gained a brighter inspiration from converse with the masterpieces of antiquity. It was in connexion with the church at Glarus that Zwingli first assumed the discharge of pastoral duties. It was characteristic of his true and discerning patriotic feeling that he strongly dis- approved of the acceptance of mercenary service by lus countrymen, and more especially of the service of France, and his outspoken sentiments on the subject eventually rendered it necessary for him to quit Glarus for Einsiedeln. Here he was for a short time in receipt of a pension from the pope and was generally regarded as a supporter of Catholic institutions. In conjunction with the abbot of Einsiedeln he aimed, however, at the development of a less superstitious spirit among both the clergy and the laity, who resorted in great numbers to the monastery (a noted centre for pilgrimages). It was here that he formed the acquaintance of one of the most eminent of the Re- formers, Oswald Geisshiusler (better known as Myconius),

BBY and through his friend's influence received in 1518 an invitation to settle in Zurich as the parish priest of the cathedral in that city. Here he at once began to discard the traditional mode of exposition which limited the preacher to certain prescribed sections of the Bible, and commenced instead a connected series of lectures on the New Testament. In the course of four years he thus completed a course of sermons on the whole of that portion of the Bible. This innovation, peculiar to the Reformed Church, was never adopted by Luther, although followed by most of the theologians of Switzerland and the upper Rhineland. It was in the year 1519 that Zwingli first became acquainted with Luther's carly treatises ; but his own views appear to have been formed quite independently of these. Shortly after his arrival in Zurich the Fran- ciscan Bernardin Samson visited the city on a like mis- sion to that of Tetzel and encountered in Zwingli another Luther. The grossness of the system of indulgences was so ably exposed by Zwingli that he carried nearly all who heard him with him, and Samson was obliged to return to Italy before his mission was fully accomplished. Even Faber, afterwards the opponent of Zwingli, could not but express to the latter his satisfaction at the result.

Gradu- ally the voice of the Reformer was heard uplifted against other medieval superstitions and especially against Mari- olatry ; his fame as a preacher rapidly spread, and he became known as one of the chief leaders of opinion in Zurich. The state of morality in the city was, however, exceedingly low, and he not only had to encounter con- siderable opposition but was repeatedly exposed to charges of heresy. Nevertheless the conviction which he produced among the more influential citizens of the truth of the tenets which he advocated was such that in the year 1520 an order was issued by the city council to the effect that all ministers should in future ground their discourses on the New Testament, "and prove their doctrine from the Bible alone, discarding all innovations and human inven- tions." While meeting with opposition in one direction, he was compelled himself to oppose the zeal of fanaticism in another. As at Wittenberg, an iconoclastic spirit had begun to manifest itself, and the question of the lawfulness of images in churches was warmly debated. In the months of January and October 1523 two conferences of the clergy and laity assembled in Zurich, in the course of which Zwingli put forth sixty-seven propositions, involving con- clusions adverse to the teaching and practice of the medi- eval church. Among those who took part in the discus- sions were Faber, Meyer of Bern, Hofmeister, and Conrad Schmidt of Kiissnacht, Knight Commander of the Order of St John, a man of eminent character and ability. Schmidt endeavoured, although in a temperate and rational manner, to defend the custom of placing images in the churches, but after a warm discussion Zwingli ultimately decided for their abolition. In the yet more important discussion that followed, with respect to the true nature and significance of the mass, whether it was to be regarded as of the nature of a sacrifice or simply as a commemorative ordinance, he expressed himself in favour of the latter interpretation. The issues raised by the sixty-seven propositions extended considerably in their scope beyond all that Luther had as yet advanced ; and, as at Leipsic, it was soon discovered that the two contending parties were divided by an insuper- able difference with respect to the authority 'which they were disposed to accept as final,—the one party grounding their arguments solely on the Scriptures, the other on the councils and the fathers. It may be noted, as an illustra- tion of the extremely low status of the inferior clergy of the country at this period, that, in replying to

Zwingli's demand for an intelligent and systematic study of the Scriptures by all pastors, it was urged as an objection that

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many pastors might be unable to afford to purchase a copy

of the Bible for their own use! Another notable theory supported by Zwingli was that known at a later period as Erastianism, according to which the authorities of thechurch

were to be held to be ultimately amenable to the jurisdic-

tion of the civil power. At his instance the church at Zurich next proceeded to repudiate the control both of the bishop of Constance and of the papal nuncio, constituting itself (1524) a separate ecclesiastical body, the supreine authority over which was vested in the magistrates of the

city. In the public services the Latin liturgy and the Gregorian chant were set aside for a German prayer-book

and German singing. The rite of baptism was made more simple,—the ceremony of exorcism on which the Lutheran Church continued long after to insist being altogether dis- carded. In the year 1525 Zwingli published a more sys- tematic exposition of his tenets in his best-known work,

his Commentary on True and False Religion, which he dedicated to Francis I. His conception of the sacraments

and of original sin as here unfolded separates him still further from the doctrine of the medieval church, while

in his remarkable catholicity of belief in regard to salva-

tion he much resembles some of the early Greek fathers.

Like Clement and Origen, he believed in the final happi-

ness of the good and wise, including the good and wise of pagan antiquity; nor did he hesitate to express his con- viction that Socrates was a better and wiser man than any Dominican or Franciscan of his own day. On the other hand, he upheld the doctrine of predestination in its most

rigid form, that afterwards known as "supralapsarian"

(see PREDESTINATION).

In no country was the Reformation so closely associated Reforma- with political feeling as in Switzerland ; and its upholders, tion amid surrounding despotisms, were advocates of republican Sa institutions. Zwingli and his followers looked on with ~~ shame and sorrow as they saw their countrymen hastening

to cross the Alps to become the mercenaries of the pope. With no less sense of humiliation did they regard the venal spirit of their public officials stooping to become the pensioners of the French court. The progress of these

new opinions was, as is usually the case, much more rapid

in the large towns than in the more rural and moun- tainous regions. At Bern they were ably upheld by Anshelm, the historiographer of the city, and by Sebastian Meyer, and Haller; in the free city of Basel he had for

his followers Cicolampadius and William Farel; and already in 1527 Conrad Pellicanus, afterwards his zealous follower, had conceived that admiration of his character

and tenets which was attended by such important results. Wyttenbach, Zwingli's former preceptor, sustained his teaching in Biel, Joachim von Watt in St Gall, Biirgh, Blasius, and Dorfmann among the Grisons. In the cantons

of Schwyz, Uri, Unterwalden, Lucerne, and Zug, on the other hand, the new doctrines found strenuous opposition ;

and the simple mountaineers listened with unfeigned sorrow and indignation when they heard that it was pro- posed to abolish pilgrimages, such as those to the field of Morgarten and the chapel of Tell, and to dispense with those priestly virtues of celibacy and fasting which so greatly enhanced their filial reverence for their village pastor. Another and yet more serious obstacle, which Contro- threatened to place the whole movement in peril, was that versies presented by the differences of belief which now began to : rise among the Protestants themselves. Foremost among j these points of difference was that respecting the Eucharist, —the theory which Zwingli maintained being assailed with peculiar acrimony and vehemence by Luther. Political feeling added not a little to the animosity of that attack. Difficult as it may seem to associate the efforts of one who

did so much for intellectual freedom with tyranny and

coercion, it is certain that Luther's influence after the year 1523 was not favourable to the political liberties of his countrymen. In that year both Sickingen and Hutten were removed by death, the victims of a policy to which Luther was always strenuously opposed,—the endeavour to enforce the redress of political and ecclesiastical griev- ances by recourse to arms. The iconoclastic ardour of Karlstadt and the fanaticism of Miinzer alarmed him be- yond measure, and he regarded with the most genuine distrust the spread of their influence among the peasantry. The sequel justified his alarm. Ground between the exac- tions of the agents of the church on the one hand and the oppression of the nobles on the other, the peasants rose at last in fierce rebellion. No such insurrection, so wide-spread, so sanguinary, and so ruthless in its vengeance, had ever before disquieted Germany as that which marked the close of the year 1524. The part played by Luther in relation to that gloomy episode will always be a matter for dispute among critics of different schools. To some he appears as lending his great influence to crush the efforts of down-trodden classes driven to desperation by in- tolerable oppression, to others as the champion of law and order against lawless miscreants intent on revolutionizing both church and state. Luther himself considered that

loyalty to the emperor and to the civil authority was a primary duty, and that questions of religious reform should never be suffered to affect the citizen's fidelity to his politi- cal obligations. He probably held that his views were justified by the sequel ; but they were not shared by Ulrich von Hutten nor by Zwingli, who both maintained that the popedom and the empire were too closely associated to make it possible to attack the one without: also attacking the other.!_ The sacramental controversy runs parallel with the history of the Peasants' War, and it unfortunately hap- pened that the theory of the Eucharist maintained by Zwingli was the same as that upheld by Karlstadt, whose iconoclastic successes at Wittenberg .had made him an object of especial dislike to Luther. It was in vain, therefore, that G&colampadius and Martin Bucer sought to mediate between the two parties. Luther, to whose view the republican doctrines and the sacramental theory advocated by Zwingli appeared closely associated, believed he saw in the latter only a second Karlstadt ; and he was thus led to assail him and his followers with an amount of coarse ridicule altogether unbecoming both the subject and the occasion. Zwingli replied in much more temperate fashion, but he did not hesitate to assert that the doctrine which Luther maintained was identical with that taught by the Church of Rome.? To this Luther rephed in his tractate entitled Bekenntniss vom Abendmahl Christi (1528). This pamphlet warfare only served, however, to embitter the relations of the two parties ; and, although the reaction- ary sentiments evinced by several of the princes at the second diet of Spires (15th March 1529) gave significant warning of the necessity for union and concord among the whole body of the Reformers, it was distinctly foreseen that the conference convened at Marburg a month later was not likely to lead to any healing of the schism (LUTHER). The excellent intentions of the landgrave of Hesse in con- vening the conference were altogether frustrated. The moral effect was, however, distinctly favourable to Zwingli. His demeanour towards his opponent had throughout been conciliatory and fraternal, while that of Luther had been of a different character. Although fourteen articles, em- bracing the most important tenets of the Christian faith, had been agreed upon almost without discussion, he could not regard as a brother the man who differed from him on the obscure and doubtful doctrine embodied in the fifteenth 1 See Ranke's Deutsche Geschichte, iv. 107. 2 Deutsche Schriften, iii. 16.

article. This intolerance, a sinister omen for the future of the Reformation movement, produced an unfavourable impression on the iminds of not a few with respect to Luther's moderation, and caused them subsequently to espouse the side of Zwingli, among their number being the landgrave Philip and Francis Lambert. The former, indeed, did not altogether despair of yet bringing about an alliance between the two parties, and was especially desirous of prevailing upon the Evangelical party (as the Lutherans now began to be called) to adinit the congrega- tions at Ulm and Strasburg into their communion. With this design he caused the congress of Schmalkald to be convened on the 29th of November, an earlier date than that originally intended. His friendly purpose was, how- ever, again frustrated ; and it soon became evident that the elements of difference between Luther 4nd Zwingli— the reluctance of the former to engage in any line of action which might involve an appeal to arnis, and the patriotic spirit of the other, which led him to look upon the assertion of political freedom as itself a Christian duty. which it would be moral cowardice to evade—were such as it was hopeless to compose.

Such were the circumstances under which the einperor, Imperial temporarily freed from graver political anxieties by the policy.

treaty of Cambray, convened the diet of Augsburg; and on the 25th June 1530 the able and generally temperate ex- position of the Protestant faith drawn up by Melanchthon, known as the Confession of Augsburg, was read before the assembly and the people. The Catholic reply, composed by Eck and other theologians, was then presented, and finally the Reformers were called upon to renounce their distinctive tenets and return to their ancient faith. They were at the same time required to arrive at a formal decision within a stated period; and on the 13th of August the Evangelical princes notified to the emperor their inability

to comply with his command. On the 29th of the follow- League

ing March, at a third congress, convened at Schmalkald, they formed themselves into the memorable League, where- by each party to the compact pledged himself to the following agreement: 'As soon as any one

of them should be attacked for the gospel's sake, or on account of any matter resulting from adherence to the gospel, all should at once proceed to the rescue of the party thus assailed, and aid him to the utmost of their ability." It was like- wise resolved steadfastly to oppose the assembling of any council which was uot summoned independently of the pope or was not in its composition fairly representative of the whole church. In the meantime the efforts made further to define doctrine had been attended with the usual, it might be said the inevitable, results. The tenth article of the Augsburg Confession had been rigorously formulated so as not merely to exclude the Zwinglian theory of the Lord's Supper but also to involve in censure any interpretation that deviated, however slightly, from that laid down by Luther himself. A certain section of the Evangelicals declined, accordingly, to sign the Con- fession, and the four cities of Strasburg, Constance, Mem- mingen, and Lindau shortly after drew up and submitted to the diet another confession, known as the Confessio Tetrapolitana,—the coniposition mainly of Bucer and Hedio. In this the influence of the Zwinglian party so far prevailed that the adoration of images, a point on which the Augsburg Confession had been silent, was specifically condemned. The four cities were, however, admitted to the League of Schmalkald in 1531. Other circumstances temporarily strengthened the hands of the Leaguers. The emperor had formed the design of raising his brother Ferdinand, king of Bohemia and Hungary, to the dignity of "king of the Romans"; but the project roused the jealousy of the house of Bavaria, and the

Contest in Swit- zerland.

Progress in Ger- many.

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reigning duke entered into a treaty with the Protestant League. 'Treaties were about the same time made with France and Denmark, and it was evident that the new confederation would be able to oppose a resistance which even the resources of the empire might not be able to overcome. At this juncture another circumstance formed an appreciable element in the imperial calculations. All attempts at arriving at an understanding with the Turks had proved without result, and Solyman's invasion of Hungary

was imminent. At the advice of his brother, Charles accordingly condescended to treat with the mem- bers of the League, and in July 1532 the religious peace of Nuremberg afforded a temporary compromise, which it was provided should remain in force until a general council, of the character demanded by the Lutherans, was con- vened, or until the assembling of a new diet of the states of the empire. In the meantime the Lutherans were to be free from molestation and to be permitted to preach and publish the doctrines of the Confession of Augsburg. They were also to be left in possession of such church property as they still retained, and the jurisdiction of the courts of the empire in ecclesiastical questions was to be suspended. In return for these concessions the Leaguers pledged themselves to be loyal to the emperor, and to render aid both with money and men in the event of an invasion by the Turks. They likewise undertook not to afford protection either to the Anabaptists or to the followers of Zwingli.

The great leader of the Reformation in Switzerland was at this time no more. In the year 1531 the feud between the Catholic and Protestant cantons had reached a climax; in the former the more bigoted section, aided by Ferdinand of Austria, had commenced an active persecution, and some of the Protestant preachers had been put to death. In order to repel these aggressions a league was formed between Zurich, Strasburg, and the landgrave of Hesse, and Zwingli strongly advised that a combined attack should forthwith be made on their opponents in Lucerne and Schwyz, and freedom of conscience obtained by an armed denionstration. Divided counsels, however, pre- vailed ; and eventually Zurich was left to bear the brunt of the contest almost entirely alone. At the battle of Cappel (11th October 1531) Zwingli fell, and his followers sustained a defeat which, although they carried on a war of fierce retaliation, they were unable to retrieve, and a decided reaction in favour of Catholicism now set in. The death of CEcolampadius took place soon after the battle of Cappel, and was followed in 1535 by that of Francis Kolb, the Bernese Reformer. The heroic end of AZwingli was a matter of exultation not only to his Catho- lic antagonists but even to Luther, who was ungenerous enough to class his brother Reformer with lawless fanatics like Miinzer,! and in a letter written in the following year even went so far as to warn

Duke Albert of Prussia not to tolerate the followers of Zwingli within his territories.?

In Germany, on the other hand, the Reformation con- tinued to progress. In 1533 Philip of Hesse, who was subsidized by France, inflicted a severe defeat on Ferdi- nand, and was able shortly after to reinstate Ulrich, duke of Wiirtemberg, in his dominions, The emperor at the peace of Kadan (29th June 1534) undertook to abstain from further interference in the ecclesiastical affairs of the duchy, and the understanding arrived at on that occasion is regarded by Ranke as marking the second important stage in the history of the Reformation in Germany. The Reformed faith was forthwith established throughout Wiirt- emberg, and soon after was introduced into Holstein, Pomerania, the Mark of Brandenburg, Upper Saxony,

1 De Wette, Letters, iv. Nos. 1429, 1430. 2 7b., No. 1445,

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Brunswick, and the Palatinate. The League of Schmal- kald was thus strengthened by numerous and powerful accessions ; among the number was King Francis himself, who, although he was repressing the Reformation move- ment with severity in his own dominions, saw his advan- tage in siding with the Protestant princes against lis chief enemy, the emperor. Henry VIII. declared himself also a supporter of the League. The city of Basel had already in 1534 put forth, independently, a new confession of faith, and this was followed in 1536 by a second, which received the approval of Luther and became known as the "first Helvetic confession." In order, however, still further to unite the Protestant party, with a view to a general council, Luther, in conjunction with other theologians from Saxony, Swabia, and Hesse, drew up and transmitted to the Lutheran representatives at Schmalkald in February 1537 another confession. In this the doctrines contained in the Confession of Augsburg were reiterated, but in a far more uncompromising form. Luther denounced the pope as Antichrist and the mass as an abomination. Melanchthon declared himself unable to concur in this language, and in an additional article expressed his readi- ness to yield submission to the

bishop of Rome as the highest dignitary in the church so soon as the latter should sanction really scriptural teaching.

As elsewhere, the history of the Reformation in France

Reforma-

is that of a twofold struggle,—an endeavour to bring about tion in

*a reform of discipline, and a contest which pointed in the direction of doctrinal change. The abuses that prevailed in the Gallican Church at this period were scarcely less glaring than those in Germany. The appointments to the higher benefices were dictated solely by the most sordid motives,—political ambition, court favouritism, and family interest. Pluralism largely prevailed ; and both bishoprics and abbeys were granted in commendam to such an extent that residence was almost unknown. Preferments were often bestowed upon laymen, and even upon females and children. Pierre de l'Estoile, writing of the middle of the 16th century, states that the majority of the benefices in France were then held by persons who were by the canon law disqualified for their office. But in no country was the movement, that aimed at the correction of abuses such as these, more completely dissociated from the religious revolution contemplated by the Protestant leaders. In the first instance, the doctrines of Luther*were favourably regarded by many of the nobility and of the episcopal order. The leader of the party which represented those doctrines was Lefévre d'Etaples, whose translation of the New Testament into French appeared in the year 1522. In the year 1521, having been singled out by the Sorbonne for special attack asa teacher of the tenets which the university had just so emphatically condemned, he deemed it prudent, notwithstanding the encouragement he received from Francis, to retire to Meaux. Here, under the pro- tection of Brigonnet, the eminent bishop of that diocese, he became the guiding genius of a movement which at one time seemed likely to transform Meaux into a second Wittenberg. This activity, however, was very early checked by the terrors of a commission. Lefévre and his disciple Farel fled to Strasburg, the latter subsequently to Geneva, where his efforts founded the famous school of theology associated with the name of Calvin (see CALVIN) ; Brigonnet, alarmed at the prospect of a schism which threatened to prove permanent, reverted to*

Catholicism, and even acquiesced in a policy of persecution in his own diocese. Both Francis I. and his sister Margaret, queen of Navarre, were at this time disposed to support the Reformation. When the Sorbonne condemned the Col- loqumes of Erasmus (May 1526) Francis gave orders that 24,000 copies should be printed and circulated throughout

France.

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the country ; he accepted with expressions of favour the dedication to himself by Zwingli of the latter's treatise On True and False Religion. His sister corresponded with Melanchthon and was openly assailed by the Sorbonne as a favourer of heresy, while, as the mother of Jeanne d'Albret, her memory was always cherished with peculiar regard by the great Huguenot party. But the loss of prestige which Francis incurred by his defeat at Pavia and his subsequent captivity inspired the Ultramontane party with greater confidence, and, in spite of his efforts, Louis de Berquin, a leader of the Reformers and one of the most eminent scholars in France, perished at the stake in 1529. The policy of Francis was indeed mainly dic- tated by one dominant motive—that of personal hostility to the emperor—and the apparent caprice with which he treated the Reformers was the result to no small extent of this feeling. It now became his aim to conciliate Pope Clement as an ally against his great rival, and with this view he took advantage of certain excesses committed by a few fanatics, after the example of Miinzer, to light the fires of persecution. At the same time, therefore, that he was supporting the League of Schmalkald he was burning heretics in his own dominions. On the death of Clement (September 1534), when he found the hopes which he had founded on an alliance with the Medici extinguished, since Paul III. proved less amenable to his plans, he again changed his tactics: he invited Melanchthon to come and take up his residence in France, and he set at liberty those who had been imprisoned for holding the Reformed doctrines. At the peace of Crespy (1544), again, he once more changed his policy, and sought to arrive at an agree- ment with Charles for the suppression of heresy and the restoration of discipline in the church.

At the period at which we have now arrived the main influences which guided the later history of the Reforma- tion may be discerned in full activity. Largely political almost from the commencement of the movement, they continued more and more to partake of that character or became mingled with elements not less secular. Foremost among these latter must be placed the appeal made to

_ baser motives both in Germany and in England, by the

Efforts at

manner in which the nobility of both countries were bribed to acquiesce in the suppression of the religious orders, by being allowed to become large sharers in the property and revenues of the monastic and conventual foundations. Among the lower classes, on the other hand, who were often painfully reminded of the loss they had sustained in the withdrawal of that charity which, amid all the de- generacy of the monasteries, had still been one of their recognized functions, a certain genuine sympathy with Catholicism and traditional regard for its institutions long continued to survive. But even among these classes men could not but be conscious that a higher standard of belief and practice had been introduced by the Reformation, while the superior ability shown by those who preached its doc- trines, in adapting their discourse to the comprehension and spiritual needs of the poor, invested them with a highly effective influence.

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Dissatisfied with such a result, Charles next endeavoured to bring about an understanding by a series of conferences ; and Paul III. was induced to send his legate to attend a diet in Ratisbon (29th July 1541), where a project for reunion, known as the Ratisbon Interim, was brought under formal discussion. 'It resulted," says Gieseler, "as before at Augsburg: they quickly came together on merely specu- lative formulas ; but as soon as they touched upon the ex- ternal constitution and ordinances relating to the authority of the church the division remained." It was the last, perhaps the only occasion, on which an influential section on both sides (the party that followed Paul JII. and the party that followed

Melanchthon) was animated by a genu- ine desire for reconciliation. Their design was defeated by the ignoble political aims of Francis on the one hand, and by the theological illiberality of Luther and the elector of Saxony on the other. In the nieantime Protestantisni continued to advance: Hermann von Wied, elector of Cologne, became a supporter of its doctrines ; and Pomer- ania, Anhalt, Mecklenburg, and the imperial cities were added to the territories in which it became the dominant faith. It was at this juncture, when the Reformation in Germany may be considered to have advanced to its high- est point, that Paul ILI. brought forward a proposal for assembling a general council,—a proposition to which it was decided by the Protestant party at the diet of Worms (March 1545) not to accede, inasmuch as it would be a council convened by the pope. In the following December, however, the council (see TRENT, CoUNCIL oF) asseinbled, —the publication, in the meantime, of Luther's pamphlet Against the Popedom at Rome, founded by the Devil, having further contributed to foster theological rancour. The deliberations of this famous assembly resulted, as is well known, in the enactment of a series of canons condemna- tory of Protestant doctrine; and in this manner the hopes which down to this time had been cherished of bringing about a compromise with respect to those articles of faith on which agreement had before seemed not un- attainable were finally extinguished.

Two months after the first assembling of the council of Trent Luther died. His latter days had been embittered by the defection (as he regarded it) of Melanchthon to a hostile camp, in the espousal by the latter of the tenets maintained by Cicolampadius and Bucer. The doctrine of the church having now been once more defined by the Tridentine decisions, the emperor, in the confident belief that theological divergence might be expected soon to cease, next turned his attention to the removal of those abuses in matters of discipline which he held to be the chief obstacle to the return of Protestants to the church. With this view he brought about the acceptance of the Augsburg Interim (15th May 1548) by the diet, a com- promise which, while it roused the susceptibilitics of the pope, altogether failed to meet the conscientious scruples of the Protestant party. In its place Melanchthon and Duke Maurice of Saxony put forth the Leipsic Interim, a singular admixture of Lutheran doctrine and Roman ritual, which subsequently gave rise to the controversy with the

In Germany the policy of the emperor, nearly always | Adiaphorists. The imperial design, of thus bringing about compro- ambiguous, became complicated with new difficulties. | the extinction of Protestantism either by coercion or by i… ™ Charles himself, from political motives, appears at this | conciliatory measures, may be held to have been finally many, time to have been really desirous of bringing about a | defeated at the diet of Augsburg (1555), when it was

termination of the prevailing religious controversies, but his vice-chancellor, Held, on whom it devolved to carry out his intentions, pursued a singularly infelicitous line of action, which ultimately led to the formation of the League

decided not only that every ruler of a separate state should henceforth be at liberty to adopt either the Augsburg Confession (see supra) or the Catholic faith as his personal creed, but that his subjects should also be called upon to

conform to the profession of their temporal head. The Pro-

effects of this arrangement cannot be held to have been testant beneficial. Wherever, as was not seldom the case, the a ruler of one principality embraced a different doctrine ;

of Nuremberg (10th June 1538), whereby Ferdinand, the duke of Bavaria, Henry of Brunswick, Albert of Branden- burg, and George of Saxony entered into a combination for the purpose of opposing the League of Schmalkald.

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from that professed by a neighbouring potentate, the carrying out of such a law could scarcely fail to generate or intensify feelings of aversion and enmity between their respective subjects, while its complete failure as a

means of bringing about unanimity is shown in the rise of those numerous controversies which afterwards enabled the ad- herents of Romanism to launch so effective a taunt against the principles of Protestantism. Among these controversies were those of the Majorists (1551-1562), whose founder, Georg Major of Wittenberg, maintained the doctrine of the necessity of good works to salvation; of the Syner- gists (1555-1567), who held that men could not be saved unless the operations of the divine grace were seconded by the spiritual efforts of the individual soul; of the fol- lowers of Osiander (1549-1567), who supported a modified theory of the doctrine of justification; of the Crypto- Calvinists (1552-1574), who, led by Peucerus, the son-in- law of Melanchthon, maintained against Flacius Illyricus a theory of predestination differing from the Lutheran doctrine. In this last instance the feelings of enmity engendered by the controversy rose to such a pitch that the elector of Saxony was induced to send the leading Philippists to prison, while Flacius and his party celebrated the victory which they held to be theirs by a solemn service of thanksgiving and a commemorative medal. In the year 1580 an endeavour was made to bring about a reconciliation of the various contending parties by drawing up the celebrated Formula of Concord, but the design was attended with but little success. In the midst of this theological ferment, however, the divines of the university of Helmstidt, in the earlier part of the 17th century, were honourably distinguished by their systematic endeavours to allay the strife; and the career of Georg Calixtus, while affording a remarkable illustration of a gloomy chap- ter in the history of Protestantism, may be cited as a proof that a faithful adherence to the principles of the Reforma- tion was not incompatible with a regard for the right of private judgment and intellectual freedom.

In the Scandinavian kingdoms the Reformation was materially assisted by political motives ; the introduction of Lutheranism into Denmark by King Christian II. in 1520 was to a great extent the result of his desire to raise the lower classes with a view to the corresponding depression of the nobility and the more powerful eccle- siastics of the realm. He sanctioned the marriage of the clergy and caused the New Testament to be translated into Danish. These measures, however, owing in no slight degree to the motives by which they were held to be inspired, involved him in a struggle

with his subjects which eventually led to his deposition and to his passing the rest of his life in exile. But the new doctrines con- tinued to be effectively preached by John Tausen, who had been among Luther's pupils at Wittenberg; and the principles of the Reformation spread rapidly in Schleswig and Holstein. On the accession of Christian's successor, Christian III. (his cousin), the movement acquired fresh strength. The new monarch had been a witness of Luther's heroic conduct at Worms and had conceived the warmest admiration for the character of the great Reformer, and through his efforts the tenets of the Reformation were adopted in 1536, at a diet held at Copenhagen, as the religion of the state. In the following year the move- ment extended to Norway and shortly after that to Ice- land. In Sweden the Reformation was established concur- rently with the political revolution which placed Gustavus Vasa on the throne. It was, however, only too apparent that the patriot king was largely influenced by the expect- ation of replenishing his exhausted exchequer from the revenues of the church, and, as in Germany and in Eng- land, the assent of the nobility was gained by their

admission toa considerable share in the confiscated pro- perty. Among the powerful cities which represented the great Hanseatic confederacy, again, the acceptance of Lutheran doctrine turned largely on the keen commercial rivalry that then existed between that confederacy and Holland, and on the contests between the privileged and the unprivileged classes in the towns. In the prosecution of the former struggle the burghers of Liibeck appealed for assistance to Denmark, and, failing to gain the aid they sought, proceeded to organize an alliance with the object of restoring Christian II. to his throne ; at the same time, with the view of outbidding their opponents in popularity, they unwisely proclaimed revolutionary principles scarcely less subversive than those of Miinzer. In the civil war that ensued Christian III. ultimately triumphed over his enemies, and Wullenwever, the leader of the fanatical party, suffered death upon the scaffold. The Reformation was now firmly established, but in conjunction with the mon- archy reinforced by the power of the nobility, while the ecclesiastical constitution was remodelled ; and in the year 1539, at the diet of Odense, the new faith was proclaimed ; as the religion of the land. ;

In Bohemia the Hussite movement (see Huss and Bohemia. Hussirus) must be held to have become almost absorbed in the broader current of Lutheranism, although the Calix- tines (or moderate Utraquists) and the Taborites (or ex- treme party) long continued to“differ on questions of disci- pline. In the earlier part of the 17th century, however, the trained activity and energy of the Jesuits led to the almost entire expulsion of both parties, and Protestantism as a professed creed nearly ceased to survive.

In Poland Protestantism prevailed before the first Poland.

quarter of the 16th century closed. In Dantzic, Elbing, and Thorn it was established by overwhelming majorities. By the Pax Dissidentiwm, however, with a view to averting contests such as those that disturbed the peace of other lands, the principle of universal toleration was enunciated ; and the duke of Anjou (afterwards Henry III. of France), on being elected to the vacant throne of Poland in 1573, notwithstanding his own attachment to Catholicism, found himself compelled to swear that he would strictly protect the adherents of the opposed faith from persecution and aggression. But here again the influence of the Jesuits ultimately proved victorious. The nobles were gained over by their arts, and Catholicism reasserted its ascendency.

In the Netherlands, where the free spirit of the great The mercantile communities was in singular harmony with the Nether- movement, the progress was still more rapid. The details “ a of the heroic struggle waged against Charles V. and Philip II. must be regarded as belonging rather to secular than to theological history ; but it is to be noted, alike to the honour of the people and of the house of Orange, that the enact- ment of the principle of religious toleration followed upon the fierce and intolerant persecution to which the country had so long been exposed. Although the majority of the inhabitants professed the tenets of Calvinism, the Arminian party succeeded in bringing about a union of church and state, which, however, left the other communions almost entirely unrestricted in their religious freedom. The fol- lowers of Gomarus, indeed, early in the 17th century, seemed at one time likely to place this freedom in danger, not only by their assertion of more rigid Calvinistic doctrine, but also by their demand that the church should be

con- stituted independent of the state. But eventually (see Motley, Hust. of the United Netherlands, c. lii.) the party that favoured religious toleration triumphed; and the Dutch republic long continued to be an asylum for those whom the ascendency of the contrary principle in other lands drove into exile. The church organization was modelled on the political organization of the provinces, each province

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Scotland.

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being subdivided into classes, while the mode of government was nearly identical with that known as Presbyterian.

In England the reformation of doctrine made but little progress during the reign of Henry VIIL., for, although by the Ten Articles (1536) the royal assent was given to the adoption of the doctrine of justification by faith and to the recognition of the Bible and the three ancient creeds as the standard of belief, a marked reaction in favour of Catholic doctrine took place in the enactment of the Six Articles in 1539. For a brief period heresy became a statutable offence and death was inflicted under the new provisions. The anomalous position of the English Church became a scandal to Europe; for, while some men were burnt for denying the doctrine of transubstantiation or for refusing to admit the royal supremacy, others, as Barnes and Gerard, suffered at the stake for their profes- sion of Lutheran opinions, and even Cromwell must be regarded as in some measure a victim of his attachment to German Protestantism. During the reign of Edward VI. Somerset in conjunction with Cranmer pressed on the work of the Reformation apace. Chantries and hospitals were everywhere suppressed and their endowments confis- cated. The bishops were 'compelled to acknowledge their direct subordination to the crown by being required to take out licences for the exercise of their jurisdiction. In 1549 the first Book of Common Prayer was published, and the Act of Uniformity prescribed its use, while that of all other forms of devotion was forbidden under heavy penalties. The canon law was revised by a body of com- missioners specially appointed for the purpose, and the new code was completed for future use, although it never received the young king's signature. By these and other similar reforms, carried out in a great measure under Cranmer's direction, it was sought to make the Reforma- tion in England a complete rejoinder to the proceedings of the council assembled at Trent.

In Scotland the Reformation assumed a different char- acter from that of the movement in England. It was inspired directly and solely by Germany,

and may be regarded as commencing from the martyrdom of Patrick Hamilton in the year 1528, there being no evidence of any prior spontaneous efforts in the direction of doctrinal reform on the part of the people. Hamilton's designs were looked upon with the greatest disfavour by the clergy at large; and, as James V. was especially anxious to secure the support of that body in his conflict with his insub- ordinate nobility, he was altogether opposed to the adop- tion of the Lutheran tenets. He even aspired to succeed

to the title, which Henry had forfeited, of 'Defender of |

the Faith," and was encouraged to hope that he might succeed to the English crown. After his death (1542), however, under the regency of the earl of Arran, the Nteformed doctrines began to be regarded with greater favour at court, while the merciless policy of Cardinal Beaton and the cruel fate of Wishart gave rise to an out- burst of popular indignation against the bishops to which 3eaton himself fell a victim (1546). The country was now divided into two parties,—the bishops, the clergy at large, and the powerful-influence of France (as represented by the Guises) being on the side of Catholicism, while many of the chief nobles and the laity at large were inclined to favour Protestantism. The English influence, which, wisely exerted, might have operated powerfully on the same side, was, however, sacrificed by the injudicious policy of Somerset, who by his endeavour to enforce the marriage of Mary Stuart with the youthful Edward roused the national spirit. The sense of humiliation and resent- ment which followed upon the battle of Pinkie (1547), where the English were greeted by the Scottish soldiery With the cry of "heretics," produced a reaction in favour

of Catholicism which was not arrested until the return of John Knox in 1555 from the Continent (see Knox).

In Ireland the circumstances which favoured the intro- Ireland.

duction of Protestantism in England were altogether wanting. The Roman ritual was in harmony with the genius of the people, whereas the

aversion naturally inspired by a creed imposed at the dictation of the conqueror was in itself a formidable obstacle. The harsh and essentially un-Christian policy pursued by the constituted ecclesiastical authorities presented further difficulties. The Bible was not translated into the vernacular, and that idiom was equally ignored in the church services, where the choice lay between the Latin, hallowed in the minds of the people by immemorial usage, and the language of the oppressor. Notwithstanding, if the native population failed to attend the English Church services they were fined. Other abuses similar to those which had contributed so power- fully to render Germany Protestant,—non-residence on the part of the clergy, the bestowal of benefices on needy aliens, often altogether wanting in religious earnestness, and sometimes indifferent to the observance of ordinary morality,—still further intensified the feeling of alienation. Protestantism became odious in the eyes of the Irish people; and, when, after long years of oppression and neglect, it was sought to inaugurate a juster policy and to render the established church in some degree really national, the obstacles thus created could not be overcoine.

Authorities.—The. sources already named under Porrpom, Brza, CALVIN, ERAsmMus, Huss, Jesuits, Knox, LuruEr may be con- sulted. The Lchrbuch der Kirchengeschichtc of Gieseler (vol. iii. 2 pts.) gives a condensed and impartial summary of the main features of the movement throughout Europe, together with a valuable compendium of authorities. A translation has appeared in Clark's Foreign Theological Library, and has been republished in a revised form by Prof. Henry B. Sinith (New York, 1868), but in its latter form the valuable citations contained in the German work from the original authorities are not given in full. Other standard works are—Baur, Gesch. d. christlichen Kirche (18638); Guericke, Handbuch der Kirchengesch., vol. ii. (Leipsic, 1866), which treats the subject from the Lutheran standpoint ; Hagenbach, J7ist. of Lef. in Ger- many and Switecrland (Clark's For. Theol. Lib., 2 vols., 1879), written in sympathy with the Zwinglian movement; Déllinger, Die Reformation, 8 vols. (1851), treating solely of the Lutheran movement; Ranke, Deutsche Gesch. im Zeitalter d. Ref., 5 vols.; Maurenbrecher, Gesch. d.:kath. Ref., vol. i. (1517-84), 1880. The Annales Ecclesiasticti of Raynaldus, the continuator of Baronius, contains original documents.

See also Hausser's Gesch. d. Zeitalters der Ref. (1547-1648), 2d ed., by Oncken, 1879, in which the poli- tical relations of the movement are succinctly brought out (Eng. trans. by Mrs Sturge, 1878) ; Monwmenta Lcformationis Luthcrane, a selection from documents at the Vatican by Cardinal Balan (1883- 84); and Keller's Die Reformation und dic dltcren Licformpartcien (Leipsic, 1885). For the confessions successively adopted by the different Evangelical and Reformed churches consult Schaff's History of the Crecds (1878), chaps. v., vi., and vii. The series. known as Leben und ausgewihlite Schriften der Vater und Begriindcr der Lutherischen Kirchen, ed. Nitzsch, 8 vols. (1861-75), gives full biographies of the most eminent Evangelical teachers. The corre- sponding work for the Reformed Church is the Leben und ausgew. Schriften d. Véter u. Begr. d. ref. Kirchen, ed. Hagenbach, 10 vols. (1857-62). Other biographies of special interest are—Geiger, Johann Reuchlin, sein Leben u. seine Werke (Leipsic, 1871), and that of Ulrich von Hutten, by Strauss (trans. by Mrs Sturge, 1874). Hutten's Works (ed. EK. Bocking, 7 vols., Leipsic, 1871) and Das Chronikon dcs Konrad Pellican (ed. Riggenbach, Basel, 1877) may also be consulted. For the history of the subject in England, see Foxe's Acts and Monuments, ed. Cattley, 8 vols. (1841); Jer. Collier's Ecclesiastical History of Great Britain, ed. Barham, 9 vols. (1840-41); Burnet's History of the Reformation in England, ed. Pocock, 7 vols. (1865); and the criticisms contained in vol. iil. of S. R. Maitland's 7'racts (1842), and also his Essays on Subjects con- nected with the Reformation in England. The Records of the Rcforma- tion, by Pocock, 2 vols. (1870), contains important original docu- ments; to this work may be added Strype's Annals, 6 vols. (1822), and Memorials, 7 vols. (1824); the works of the Reformers published by the Parker Society (Cambridge, 1841-54), and the Ziirich Letters, 8 vols. (same society); J. H. Blunt's Reformation of the Church of England (1514-47), 2 vols., 1869-80; and Dixon's History of the Church of England from the Abolition of the Roman Jurisdiction (1529-48), 2 vols., 1877-80. (J. B. M.)

There exist two classes of schools for the reformation and industrial training of children in Great Britain and Ireland, both under state control when duly certified. Reformatory schools are for the better training of juvenile convicted offenders ; industrial schools, in which industrial training is provided, are chiefly for vagrant and neglected children and children not convicted of theft. These schools are of modern but gradual growth, the result in part of humane endeavours to rescue children from evil courses already embarked on or likely to be their lot, in part of the con- viction that, as a matter of social economy, the expendi- ture incurred in early restraint is less costly than the punishment of matured crime.

England and Scotland.—The Acts of Parliament relating to reformatory and industrial schools in Great Britain were consolidated and amended in 1866; and these Acts (29 and 30 Vict. cc. 117, 118), with local legislation and some ex- tension and amendment, govern the two classes of schools at the present time. Both reformatory and industrial schools are certified by the home secretary upon the appli- cation of the managers, and upon a satisfactory inspection and report, and subject to a yearly visit by inspectors. In both classes industrial training is an essential feature, so as to engender industrious habits in the inmates and give them the means of earning an honest livelihood. Not only local circumstances but reasonable individual inclina- tions are taken into consideration. In rural districts the cultivation of the soil and in urban districts local trades are obvious sources of employment ; the duties of a sailor are taught in training ships near the coast. Occupations that create a distaste for labour or that do not provide a permanent source of profitable labour for adults are avoided. The managers (often a committee of magistrates) make all necessary rules for the management and discipline of the schools, subject to the provisions of the legislature and the intervention of the secretary of state. They have the appointment of officers. Conformity to the rules and residence in the schools may be enforced by imprisonment, the application and limits of which vary somewhat in reformatory and industrial schools, ¢.g., such imprisonment for school offences is confined in industrial schools to children above ten, an age almost always exceeded in the inmates of reformatories. Attention is paid in both classes to religious convictions, and as far as possible a selection is made of a

school conducted in accordance with the creed professed by the child or its responsible guardians. Children after eighteen months' detention may be placed out on licence with trustworthy persons and with their own consent. The managers of a reformatory or of an in- dustrial school may decline to receive the youthful offender in the one case and in the other the child proposed to be sent; but the reception of a child operates as an under- taking by the managers to educate, clothe, lodge, and feed him (or her) until he (or she) can be legally discharged or is removed. Reformatory and industrial schools are, however, essentially distinct in character and governed by distinct Acts of Parliament: a school cannot at the same time be both a certified industrial school and a certified reformatory school, The Middlesex Industrial School for juvenile offenders, established under local Acts, and in part a certified industrial school, is, however, somewhat exceptional in blending the treatment of both classes.

Any offender under sixteen, convicted of an offence punishable with penal servitude or imprisonment and sentenced to be imprisoned for ten days or a longer term, may be sent to a certified reformatory school for not less than two and not more than five years. A youthful offender under ten cannot be sent to a reformatory school unless he has been previously charged with some crime

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or offence punishable with penal servitude or imprisonment, or is sentenced in England by a judge of assize or court of general or quarter sessions or in Scotland by a circuit court of justiciary or a sheriff. Youthful offenders receiving a conditional pardon may now be sent to a certified reforma- tory school. Certified industrial schools receive any child apparently under fourteen who is brought by any person before justices as answering to any of the following de- scriptions :—if found begging or receiving alms (whether actually or under the pretext of selling or offering for sale anything) or being in any street or public place for these purposes ; if found wandering and not having any home or settled place of abode, or proper guardianship, or visible means of subsistence; if found destitute, either being an orphan or having a

surviving parent who is undergoing penal servitude or imprisonment ; if it frequents the com- pany of reputed thieves ; if lodging, living, or residing with common or reputed prostitutes, or in a house resided in or frequented by prostitutes for the purpose of prostitution ; if it frequents the company of prostitutes (43 and 44 Vict. c. 15); where a parent 'or step-parent represents to the magistrates that he is unable to control a child and that he desires that the child be sent to an industrial school; where the guardians of the poor represent that a child maintained in a workhouse or pauper school or poor- house is refractory or the child of a parent convicted of a crime or offence punishable with penal servitude or im- prisonment, and that it is desirable that he be sent to an industrial school. To the above cases have to be added a child apparently under twelve who is charged with an offence punishable by imprisonment or a less punishment but has not been in England convicted of felony or in Scotland for theft; and the children of any woman con- victed of a crime after a previous conviction, and under her care and control at the time of conviction for the last of such crimes, who have no visible means of subsistence or who are without proper guardianship (Prevention of Crimes Act, 1871).

A prison authority (a term as regards industrial schools calculated to mislead, as the authority is in general the court of quarter sessions or school boards, and in Scotland commissioners of supply, magistrates of burghs, or county boards) may, with the approval of the secretary of state, establish or contribute towards the establisliment, building (including borrowing money), or management (and in England may not only contribute to but undertake these matters) of reformatory or industrial schools, or towards the support of the inmates, and such authority may con- tract with the managers for the reception and maintenance of offenders or children. The treasury contributes towards the custody and maintenance of offenders in reformatory _ and of children in industrial schools on the recommendation of the secretary of state, the sum being limited as regards children in industrial schools, on the application of their parents or guardians, to 2s. per head per week. The guard- ians of the poor or the board of management of district pauper schools or parochial boards of a parish or com- bination may, with the consent in England of the local government, and in Scotland of the board of

management, contribute towards the maintenance of children detained in industrial schools. A prison authority in England may contribute towards the ultimate disposal of an inmate of a certified industrial school. The parent or other person legally liable to maintain a youthful offender or child in a school is required (if able) to contribute not more than 5s. per week, recoverable summarily. The alleged want of diligent enforcement of this liability is a great source of complaint.

The introduction of a system of compulsory elementary educa- tion rendered it necessary to extend industrial schools. Under

various Acts passed since 1870 school boards have power, with the consent of the secretary of state, to contribute to or wholly to undertake the establishment, building, and maintenance of in- dustrial schools, and a power exists to transfer industrial schools from other authorities to school boards, but such schools are sub- ject to the jurisdiction of the secretary of state in the same manner as other certified industrial schools. The machinery for bringing children, the subjects of certified industrial schools, before the proper tribunal for making orders has been and is a vexed question. Legis- lative powers given to "any one" are apt to fall into abeyance or into the hands of the police. School boards have a discretionary power to appoint officers to bring children before justices to be sent to industrial schools (83 and 84 Vict. c. 75, s. 86). A school board or school attendance committee (as the local authority) is required, after due warning to the parents, to complain to a court of summary jurisdiction of the non-attendance of a child coming within the elementary education Acts, aud must so complain at the instance of any person. The court may then make an attend- ance order for the child at some certified efficient school, and, in case of non-compliance, may order the child to be sent to a certified day or other industrial school. The expenses of industrial schools, established by or contributed to by school boards, form part of the general expenses of the school fund. As in the case of other in- dustrial schools, parents are liable to contribution, and where a child is ordered upon complaint made by a school attendance com- mittee to be sent to a certified industrial school the council, guard-

lans, or sanitary authority appointing such committee have, on the recommendation of the committee, the same power of contri- buting towards the maintenance as if they were a school board (42 and 48 Vict. c. 48, s. 4).

In 1876 a fresh class of industrial schools was introduced called 'certified day industrial schools," in relation to which prison authorities and school boards have the same powers as in the case of industrial schools ; and towards the custody, industrial training, elementary education, and meals of children attending these schools parliament may contribute a sum limited to 1s. per head per week, on conditions recommended by the secretary of state, with a limited power over the contribution of parents. In certain cases of non- compliance with an attendance order the child is sent to a day industrial school rather than to an industrial school of the class described above (39 and 40 Vict. c. 79, s. 16). In large eities day industrial schools are calculated to be of great service in dealing with the class of poor neglected children. The children are found to be managed without much difficulty, and to respond to any efforts made on their behalf; they compare favourably with children kept for years in close confinement, and are often their superiors in spirit and intelligence (27th Report of inspector). Another de- scription of certified schools has sprung up in connexion with school boards,— truant schools." The few which at present are established in London and some large towns are on the whole doing a good work. The necessary adaptation of certified industrial schools to the school-board system must necessitate the placing of all reformatory and industrial schools on a clcarcr system of classi- fication. Crime must be distinguished from pauperism. However crime may arise from neglect of parents, it is neither desirable nor fair to compel as the price of poverty children unconvicted of crime to associate with juvenile delinquents even after the punishment of crime has ceased. On the other hand, the actual incarceration of boys and girls in a jail should be avoided as far as possible.*

The total number of schools under Government inspection at the close of 1883 was 200, viz., 61 reformatory and 139 industrial schiools, of which last 7 were specially certified as truant and 12 as day industrial schools. The number of children under detention ~ in 1883 in reformatory schools

in Great Britain was 6657, at a total school expenditure of £126,122, of which £85,635 was paid by the treasury, £6140 by parents, £23,183 by rates, and £4943 by sub- scriptions and lcgacies. In industrial schools the number was 18,780 and the expenditure £359,821, of which £176,733 was paid by the treasury, £17,596 by parents, £40,052 by rates, £65,542 by school boards, and £42,129 by subscriptions. The total admissious (excluding transfers) to reformatory schools to the end of 1883 ainounted to 42,669, viz., 34,640 boys and 8029 girls. The total discharges (excluding transfers) were 36,111, viz., 29,235 boys and

6876 girls. They were disposed of as follows :— | Boys. Girls. Total. Employment or service ……. 9,962 3814 13,776 Placed out through relatives ……... 9,663 > Ws) 11,778 HEEL C OW ro occiscy sieis «ove sis siensretelurerettes 2,317 148 2,465 pS ER OMS OG ae ayes acc. .a.a aise oa \e ain, o's cle oer 2 Aot) a 4,291 pT enCIMO BME ois sitio sieln Qaec as avs eres 693 a 693 Discharged from disease oh 374 181 555 | Diseharged as incorrigible … 213 91 304 Died sean eee 781 299 1,080 Absconded, and not recovered …..... 941 228 1,169 29,235 | 6876 36,111

The total admissions to industrial schools (excluding transfers)

to the end of 1883 were 61,260, viz., 48,959 boys and 12,301 girls,

The total discharges (excluding transfers) were 42,412, viz., 33,877 boys and 8535 girls. They were disposed of as follows :—

Loys Girls. Total. Employment or service ……. 12,513 5248 17,761 MINOT Rees xc -72.cisyste eter oie sveveie aiaiasa ce are chere 10,212 1995 12,207 SEAT PUA Gyr isrels jars a.c's\ 5 s.4s0.8 view aieie ele Be 737 130 86 MGRUALOUSO Barta «icici sievsisneetereisv alee cicteate aie 5,325 f 5,325 BETS GG Cltetetese rc clot .cssucictettels cele sve v.6ltle oversee 921 921 | Diseharged as diseased, or on special TOMAS eter e's s.0, 5 ausietsisis.e%0 4 .0;0/aieie\tiesg.e o.« 8 859 281 1,140 Comunitted to reformatories ……... 885 153 1,038 FSO ee ects ss sucyeniccs oc vclatete ea cercee 1,405 557 1,962 Absconded, and not recovered …..... 1,020 171 1,191

33,877 8535 42,412

Ireland.—Reformatory schools were established in Ireland in 1858, and ten years afterwards were placed mainly on their present footing (Irish Reformatory Schools Act, 1868); whilst the cstab- lishment and regulation of industrial schools were provided for by the Industrial Schools Act (Ireland), 1868, extending to Ireland, with certain modifications, the English Act of 1866. The differ- ences between the Acts applicable in Ireland and Great Britain relate chiefly to minor matters. The rule requiring a young offender ora child to be sent to a school under the same religions manage- ment is much more rigid in Ireland than in Great Britain, and the Irish Act does not limit the power of sending a child under ten toa reformatory school where the child has not been previously charged with an offenee punishable with penal servitude or im- prisonment. The power to contract with managers for the recep- tion and maintenance of young offenders is in general vested in grand jurics and in some town councils. The number of reforma- tory schools in Ireland at the close of 1883 was 9, viz., 5 for boys and 4 for girls, with 907 boys and 192 girls. Of industrial schools there were 62, viz., 17 for boys, 44 for girls, and 1 for young boys and girls, with a total of 2409 boys and 3759 girls. The disposal on discharge follows the lines given in the tables for Great Britain. Much the larger proportion of girls in industrial schools in Ireland, as might be anticipated, find their subsequent career in cmployment or service, or are placed out through friends. Emigra- tion also is absolutely far larger (and has been from the establish- ment of industrial schools) in the case of girls than of boys. The reported results of the training of girls discharged from reformatory schools are very satisfactory, and amoug the 1526 girls discharged during the three years 1880-82 there was only one conviction for crime during 1883. The total receipts for the maintenance of reformatory schools in 1888 were £28,116, of which £17,555 was contributed by the treasury vote and £7920 from local rates. The average cost per head for maintenance (including rent and dis- peau') was £23, 9s. for boys and £27, 2s, 2d. for girls. For in- dustrial schools the reeeipts in 1888 were £126,820, of which the treasury contributed £77,259 and rates £27,960. Parental con- tributions to reformatory and industrial schools were £1018.

United States.—The institutions in the United States and of other civilized countries, having for their object or effort the reclamation of the young,

are too closely connected with the educa- tion of poor and destitute children generally to allow of examination here, or of useful comparison with the reformatory and industrial schools of Great Britain under state control.

In 1882 a royal commission was issued to inquire into the management generally of all certified reformatories and industrial schools in the United Kingdom, The commission, in the following year, suggested a simplification of the law and the removal of some anomalies and defects, including the vexed question as to the treatment of boys and girls in relation to imprisonment, and the distinctions already ad- verted to. The commissioners expressed their opinion that these schools were having a salutary effect in reducing the amount both of juvenile and of adult crime. The memor- anda of the earl of Dalhousie and Lord Norton attached to the Leport are worthy of special attention. (J. B. D.)

REFORMED CHURCHES, the designation of those Protestant bodies who adopted the tenets of Zwingli (and later of Calvin), as distinguished from those of the Lutheran or Evangelical divines. Compare PRESBYTERIANISM, RE-

FORMATION, and GERMANY, vol. x. p. 469.

REFORMED CHURCH IN AMERICA (Dvrtcn), formerly the Reformed Protestant Dutch Church, a reli- gious denomination which arose in Holland in the 16th century. See PresBYTERIANISM, vol, xix. p. 698 sq.

REFRACTION. See Ligut and Oprics.

REFRIGERATION. See Ick and Preservep Foon.

REGALIA, insignia of royalty used at the coronation of the sovereign and other great state ceremonials. The regalia of England were in very early times deposited for security in some religious house dependent on the crown, | most generally in the treasury of the Temple. The first | mention of their being deposited in the Tower of London | is in the reign of Henry

IIJ., who on his return from France in 1230 commanded the bishop of Carlisle to replace the jewels in the Tower as they had been before. From his time down to the present the regalia (with the exception of the ancient crown of Edward the Confessor, long retained in Westminster Abbey) have been generally in the Tower under the care of a keeper, but both Henry III. and several of his successors, when in money difficulties, had recourse to the expedient of pawning the crown jewels toraisea loan. Originally the keeper was appointed | by letters patent at a stated salary of £50 per annum, which was so largely increased by perquisites that in the time of Henry VIII. it amounted to about £1500. The office had attached to it important privileges, and was frequently held by persons of distinction. At the Restora- tion many of the perquisites were abolished, and since that period the duties have been merged in those of the lord chamberlain, who appoints a person to have charge of the regalia in the Tower. To make up for the decrease in the perquisites of the office, the regalia were first in the reign of Charles II. allowed to be exhibited in public, the profits accruing being given to the person appointed by the lord chamberlain to have charge of the regalia. They were originally kept in a small building in the south side of the White Tower, till the reign of Charles I., when they were transferred to a strong chamber in the Martin Tower, afterwards called the Jewel Tower. During the Civil War they were nearly all carried off by the Puritans and destroyed, and in 1671 an attempt made to steal the new regalia by Colonel Bioop (q.v.) was nearly successful. During the fire of 1841 they were removed for safety to the house of the governor, and afterwards a new room within the Wakefield Tower was constructed for their reception. 'The regalia now contained in this room include St Edward's crown, made for the coronation of Charles II. to replace the one broken up and sold during the Civil War; the new state crown made for the coronation of Queen Victoria ; the prince of Wales's crown ; the queen consort's crown ; the queen's diadem or circlet of gold made for the coronation of Marie d'Este, consort of James IL. ; St Edward's staff of beaten gold; the royal sceptre or sceptre with the cross; the rod of equity or sceptre with the dove; the queen's sceptre with the cross; the queen's ivory sceptre, made for Marie d'Este ; an ancient sceptre supposed to have been made for Queen Mary, consort of William III.; the orb; the queen's orb; the Koh-i-Noor diamond ; the sword of mercy or curtana ; the sword of justice ; the armille or coronation

bracelets ; the royal spurs ; the ampulla for the holy oil; the gold coronation spoon (supposed to be the only relic of the ancient regalia now remaining) ; the golden salt cellar; the baptismal font ; and the silver wine fountain presented to Charles II. by the corporation of Plymouth.

The regalia of Scotland, of which there is a very complete account in Papers relative to the Regalia of Scotland published by the Bannatyne Club (1829), consist of the crown, the sceptre, and the sword of state. The ancient regalia were carried off or destroyed by Edward I. of England in 1296, and Robert Bruce was crowned at Scone with a temporary crownlet, which also shortly afterwards fell into the hands of the English. The present crown, from the character of a portion of its workmanship, is supposed to be that made by the orders of Robert Bruce and first used at the coronation of David II. in 1329. Two concentric circles were added to it in the reign of James V., surmounted at the point of intersection with a mound of gold enamelled and a large cross patée, upon which are the characters J. R. V. The sceptre was made in the reign of |

James V., and the sword of state was presented to King James IV. in 1507 by Pope Julius 1I. When Cromwell invaded Scotland the regalia were removed for greater security by the earl marischal

| from the crown room in Edinburgh Castle to his castle of Dunnottar,

one of the strongest fortresses in Scotland. During its siege by Cromwell they were carried from it by a stratagem devised by the wife of the governor and the wife of the minister of Kinneff, and buried under the flagstones in Kinneff church, where they remained till the Restoration. From the Restoration till the Union they were deposited in the crown room of Edinburgh Castle. After the Union they lay locked in a chest until 1818, when they were first publicly exhibited. See also the articles Coronation, CRowN, and SCEPTRE.

REGENSBURG. See Ratisson.

REGENT. The position of a regent as an administrator of the realm during the minority or incapacity of the king is one unknown tothe common law. “In judgment of law the king, as king, cannot be said to be

a minor, for when the royal body politic of the king doth meet with the natural capacity in one person the whole body shall have the quality of the royal politic, which is the greater and more worthy and wherein is no minority. For omne majus continet in se minus" (Coke upon Littleton, 43a). For reasons of necessity a regency, however anomalous it may be in strict law, has frequently been constituted both in England and Scotland. There are fifteen instances in English history, the earliest of which is the appointment of the earl of Pembroke with the assent of the loyal barons on the accession of Henry JJJ. Whether or not the sanction of parliament is necessary for the appointment is a question which has been much discussed. Lord Coke recommends that the office should depend on the will of parliament (Znst., vol. iv. p. 58), and it is certain that in modern times provision for a regency has always been made by Act of Parliament. In Scotland the appointment of regents was always either by the assent of a council or of parliament. Thus in 1315 the earl of Moray was appointed regent by Robert I. in a council. At a later period appointment by statute was the universal form. Thus by 1542 c. 1 the earl of Arran was declared regent during the minority of Mary. By 1567 c. 1 the appointment by Mary of the earl of Moray as regent was confirmed. As late as 1704 c. 3 provision was made for a regency after the death of Anne. The earliest regency in England resting upon an express statute was that created by 28 Hen. VIII. c. 17, under which the king appointed his executors to exercise the authority of the crown till the successor to the crown should attain the age of eighteen if a male or sixteen if a female. They delegated their rights to the protector Somerset, with the assent of the lords spiritual and temporal. No other example of a statutory provi- sion for a regency occurs till 1751. In that year the Act of 24 Geo. IL c. 24 constituted the princess dowager of Wales regent of the kingdom in case the crown should descend to any of her children before such child attained the age of eighteen. A council called the council of regency was appointed to assist the princess. A prescribed oath was to be taken by the regent and members of the council. Their consent was necessary for the marriage of a successor to the crown during minority. It was declared to be unlawful for the regent to make war or peace, or ratify any treaty with any foreign power, or prorogue, adjourn, or dissolve any parliament without the consent of the majority of the council of regency, or give her assent to any bill for repealing or varying the Act of Settlement, the Act of Uniformity,

or the Act of the Scottish parlia- ment for securing the Protestant religion and Presbyterian church government in Scotland (1707 c. 6). The last is an invariable provision, and occurs in all subsequent Regency Acts. The reign of George III. affords examples of provision for a regency during both the infancy and incapacity of a king. The Act of 5 Geo. HI.c. 27 vested

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in the king power to appoint a regent under the sign manual, such regent to be one of certain named members of the royal family. The remaining provisions closely followed those of the Act of George II. In 1788 the insanity of the king led to the introduction of a Regency Bill. In the course of the debate in the House of Lords the duke of York disclaimed on behalf of the prince of Wales any right to assume the regency without the consent of parliament. The necessity for the authority of parlia- ment in the particular circumstances was much discussed, as a reference to the parliamentary history of the time will show. Owing to the king's recovery the bill ultimately dropped. Ona return of the malady in 1810 the Act of 51 Geo. III. c. 1 was passed, appointing the prince of Wales regent during the king's incapacity. The royal assent was given by commission authorized by resolution of both Houses. By this Act no council of regency was appointed. There was no restriction on the regent's authority over treaties, peace and war, or parliament, as in the previous Acts, but his power of granting peerages, offices, and pensions was limited. At the accession of William IV. the duchess of Kent was, by 1 Will. IV. c. 2, appointed regent, if necessary, until the Princess Victoria should attain the age of eighteen. No council of regency was appointed. By 1 Vict. c. 72 lords justices were nomin- ated as a kind of regency council without a regent in case the successor to the crown should be out of the realm at the queen's death. They were restricted from granting peerages, and from dissolving parliament without directions from the successor. The last Regency Act was passed after the marriage of the queen. By 3 & 4 Vict. c. 52 Prince Albert was appointed regent in case any of the queen's children should succeed to the crown under the age of eighteen. The only restraint

on his authority was the usual prohibition to assent to any bill repealing the Act of Settlement, &c. By 10 Geo. IV. c. 7 the office of regent of the United Kingdom cannot be held by a Roman Catholic. A similar disability is imposed in niost, if not all, Regency Acts.

REGGIO DI CALABRIA, a city of Italy, in the pro- vince of its own name, formerly Calabria Ulteriore Prima, is admirably situated on the Strait of Messina some miles farther south than the city of Messina on the other side. It is the terminus of the railway round the south-east coast from Bari; a scheme for a line along the west coast to Naples received legislative sanction in 1879. The luxuriant gardens and orchards of Reggio have been cele- brated for centuries, and the climate is so warm that even the date-palm occasionally ripens its fruit. The old city was in great part destroyed by the earthquake of 1783, and it is now built on a regular plan, with broad streets run- ning north and south and cross streets climbing the hill from the seaside. Besides the cathedral (rebuilt since thie earthquake), the principal edifices are the chamber of com- merce, the new comizio agrario, the castle on the height, the Renaissance Palazzo Musitano Guerrera, and the Gothic Villa Leo. Local manufactures are essences, scented waters, silks, and byssus gloves, caps, and shoes. Extensive improvements have since 1870 been made on the port of Reggio both by the niunicipality and the Government ; in 1883 787 vessels (209,717 tons) entered and 713 (207,179) cleared. Oil, lemons, and similar fruits, essences, silk, and grain are the staple exports. The population of Reggio was, in 1881, 23,853 in the city, or including the various suburban villages—Sbarre (3622), Santa Catarina (1147), &c.— 35,437, and in the commune

39,296.

A colony, mainly of Chaleidians, partly of Messenians from the

Peloponnesus, settled at Rhegium (Regium) in the 8th century B.c. About 494 B.c. Anaxilas, a member of the Messenian party, made

himself inaster both of Regium and Zancle (Messina). In 427 it joined the Athenians against Syracuse, but in 415 it remained neutral. An attack which it made on Dionysins of Syracuse in 399 was the beginning of a great struggle which in 387 re- sulted in its complete destruction and the dispersion of its in- habitants as slaves. Restored by the younger Dionysius under the name of Pheebids, the eolony soon recovered its prosperity and resumed its original designation. In 280, when Pyrrhus in- vaded Italy, the Regines admitted within their walls a Roman garrison of Campanian troops; these mercenaries revolted, massacred the male eitizens, and held possession of the city till in 270 they were besieged and destroyed by the Roman eonsul Genucius. Though one of the cities promised by the triumvirs to the veterans, Regium escaped through the favour of Octavius (hence Regium Julium). Alaric (410 a.p.), Totila (549), and Robert Guiscard (1060) all occupied the city. It was at Reggio that Joseph Bonaparte received the title of king of the Two Sicilies. In 1860 the Bourbon garrison surrendered to the Garibaldians. REGGIO NELL' EMILIA, a city and episcopal see of Italy, in the province of Reggio nell' Emilia (up till 1859 part of the duchy of Modena), is situated on the line of the old Via AEmilia, 17 miles by rail south-east of Parma. It is a large, well-built, and flourishing place with a population in 1881 of 18,634 (commune 56,031) within the circuit of its walls. Among the points of principal interest are the Piazza Maggiore, with the statue of the river Crostolo ; the cathedral, which was founded in 857 a.p. but dates mainly from the 15th century ; the co- cathedral basilica of San Prospero, with its six old Lom- bard lions in front; the public library, which contains the published and unpublished works of Spallanzani; the museum, in which are preserved the same uaturalist's collections ; the large municipal theatre, famous for its operas throughout Italy ; and the municipal " palace," with the statue of Cecilius Metellus. In the neighbourhood of the city there is an extensive model lunatic asylum as well as a large poorhouse. The house in which Ariosto was born in the Corso della Ghiara is now municipal property. Horse-races are held at Reggio every year. Regium Lepidi or Regium Lepidium was probably founded by Amilius Lepidus at the time of the eonstruction of the milian Way. It was during the Roman period a flourishing municipium, but never beeame a colony ; and, though the name is frequently mentioned in the course of the eivil war, it is associated with no event more interesting than the

assassination of M. Brutus, the father of Ceesar's friend and foe. The bishoprie dates from 450 A.D. Under the Lombards the town was the seat of dukes and counts ; in the 12th and 13th centuries it formed a flourishing republie, busied in surrounding itself with walls (1209), controlling the Crostolo and constructing navigable canals to the Po, coining money of its own, and establishing prosperous schools. About 1290 it first passed into the hands of Obizzo d'Este, and the authority of the same family was after many vieissitudes more formally reeognized in 1409. In the contest for liberty which began in 1796 and elosed with annexation to Piedmont in 1859 Reggio took vigorous part. Besides Ariosto, the city has given birth to Secchi the astronomer and Prospero Clementi the sculptor; and the poet Boiardo was governor of Reggio for many years before his death in 1494. REGIOMONTANUS (1436-1476). The real name of this astronomer was JoHANN MU.ier, but from his birth- place, Kénigsberg, a small town in Franconia, he called himself Jou. pe Monterecio. The name Regiomontanus occur for the first time on the title page of his Scripta, pub- lished in 1544, but he has since become best known by it. He was born in June 1436 and became the pupil of Purbach at the university of Vienna, and jointly with him endea- voured, with such imperfect instruments as they could construct, to test the accuracy of the Alphonsine tables of the motions of the planets. After Purbach's death Regiomontanus finished and_ published his Epitome in Ptolemei Almagestum, but, having in the meantime become

acquainted with Cardinal Bessarion, who was anxious to

spread the knowledge of the Greek literature among the Western nations, he proceeded with him to Italy in 1462, and for the following eight years devoted a great deal of time to the study of the Greek language and to collecting

Greek manuscripts. He returned from Italy in 1471 and settled at Nuremberg, at that time one of the chief centres of German industry and literary life. Here he became associated with Bernhard Walther (1430-1504), a wealthy patrician and an enthusiastic astronomer. An observatory was erected, and the finest instruments the skilful artisans of

Nuremberg could make were regularly used by the two friends for observing the heavens. Clocks driven by weights were here used for the first time for scientific purposes, the influence of refraction in altering the apparent places of the stars better appreciated, Venus substituted for the moon as a connecting link between observations of the sun and of stars, and other improve- ments introduced in practical astronomy. Regiomontanus also published a number of calendars and ephemerides, which induced Pope Sixtus IV. to summon him to Rome to assist in reforming the confused calendar. He died very shortly after his arrival in Rome, July 6, 1476.

In 1464 Regiomontanus finished a work on trigonometry, which science had made considerable progress among the Arabians but had to be reinvented in Europe. 'The work was, however, never printed till 1533 (De Triangulis libri quinque), probably because the author, aftcr introducing the use of tangents, had wished to re-write his book, but was prevented from doing so by his early death. In his Tabule Directionwm (Nuremberg, 1475) there is a table of tangents (tabula fecunda). His instruments and obser- vations at Nuremberg are described in a posthumous work, — Seripta clarissimt mathematici Joh. Regiomontant (Nuremberg, 1544). The ephemerides and calendars were published partly in German (Magister Johann von Kunsperk's teutscher Kalender), partly in Latin (Ephemerides Astronomiew, Nuremberg, 1473 or 1475, for the years 1475-1506 ; Kalendarium Novum, Nuremberg 1474, re- issued many times and translated into German and Italian). The German geographer Martin Behem made these calendars known among the Spanish and Portuguese navigators, and they became of the greatest importance in guiding Columbus, Diaz, Vasco da Gama, and many others over the trackless ocean. The life of Regiomontanus was written by Gassendi (The Hague, 1654) ; among modern works see Regiomontanus, ein geistiger Vorliufer des Copernicus, by Zeigler (Dresden, 1874), Die Vorgeschichte der Gregorianisehen Kalenderreform, by Kaltenbrunner (Vienna, 1876), and Rudolph Wolf's Geschichte der Astronomie (Munich, 1877).

REGISTRATION. In all systems of law the registra- tion of certain legal facts has been regarded as necessary, chiefly for the purpose of ensuring publicity and simplify- ing evidence. Registers, when made in

performance of a public duty, are as a general rule admissible in evidence merely on the production from the proper custody of the registers themselves or (in most cases) of examined or cer- tified copies. The extent to which registration is carried varies very much in different countries. For obvious reasons judicial decisions are registered in all countries alike. In other matters no general rule can be laid down, except perhaps that on the whole registration is not as fully enforced in the United Kingdom and the United States as in Continental states. The most important uses of registration occur in the case of judicial proceedings, land, ships, bills of sale, births, marriages, and deaths, companies, friendly and other societies, newspapers, copy- rights, patents, designs, trade marks, and professions and occupations. The registration of qualified voters in par- liamentary elections in the United Kingdom is treated in a separate section below.

Judicial Proceedings.—In England registrars are attached to the privy council, the Supreme Court, and the county courts. In the Queen's Bench Division (except in its bankruptcy jurisdiction) the duty of registrars is performed by the masters. Besides exercising limited judicial authority, registrars are responsible for the drawing up and recording of various stages of the. proceedings from the

petition, writ, or plaint to the final decision.' With them are filed affidavits, depositions, pleadings, &c., when such filing is

1 The antiquity of registration of this kind is proved by the age of the Registrum Brevium, or register of writs, called by Lord Coke "a most ancient book of the Common Law" (Coke upon Littleton, 159a).

necessary. The difference between filing and registration is that the documents filed are filed without alteration, while only an epitome is usually registered. The Judicature Act, 1878, created district registries in the chief towns, the district registrar having an authority similar to that of a registrar of the Supreme Court. In the Admiralty Division cases of account are usually referred to the registrar and merchants. The registration in the central office of the supreine court of judgments affecting lands, writs of exccution, recognizances, and lites pendentes in England, and the registration in Scotland of abbreyiates of adjudications

and of inhibitions, are governed by special legislation. All these are among the incumn- brances for which search is made on investigating a title. Their satisfaction and discharge is also registered. The Conveyancing Act, 1882, provides for a certificate by the proper officer of the existence or non-existence of entries of judgments, deeds, and other matters or documents made in the central office: The certificate is conclusive in favour of a purchaser. Decisions of criminal courts are said to be recorded, not registered, except in the case of courts of summary jurisdiction, in which, by the Summary Jurisdiction Act, 1879, a register of convictions is kept. Probates of wills and letters of administration, which are really judicial decisions, are registered in the principal or district registries of the Probate Division. In Scotland registration is used for giving a summary remedy on obligations without action by means of the fiction ofa judicial decision having been given establishing the obligation. A clause of registration is introduced in deeds importing obliga- tion. The various registers available for this kind of registraton will be found in Watson, Law Diet., s.v. " Registration."

Land. —Registration in its relation to land is either of title or of assurances. A register of title bears on the face of it the name and description of a plot of land with more or less particularity, the name of the owner, and the charges and easements to which the land is subject. Noone can go behind the entry except in case of fraud. A register of assurances or deeds contains only a copy of documents affecting title, or a memorial or other epitome of such documents, without any authentication of the title as such. Thus a register of title would show that A was owner subject to a mortgage to B, and the purchaser would purchase such a title. A register of assurances would show in the same circumstances that a conveyance had been made to A, and that subsequently A had mortgaged to B, but the purchaser would have to make sure for himself that A and B had the right to convey and mortgage. It will be obvious that the object of registration of deeds is quite different from that of registration of title. The former aims at facilitating the search for incumbrances, the latter at abolishing search by making it unnecessary. The requisites of a registry of title are thus stated by Sir H. Maine (Zarly Law and Custom, 353) :—

“The land registries which have the highest commendation from judicial writers are those of ecrtain small Teutonic communities, e.g., the state of Hesse- Darmstadt and the Swiss eanton of Zurieh. JI ean here give but a brief deserip- tion of the mechanism. The land of the community is divided into a number of eireumseriptions of no greatarea. For each of these a central office is established, with a staff of functionaries who are to some extent experts, and at each office a register is opened in whieh separate portions or groups of pages are appropriated to separate masses of land… When the register hus onee been opened, the legal history of every pareel of every area is thenecforward recorded in it, and every transfer or mortgage must be registered in it, under pain of invalidity. Whether a person wishing to sell or mortgage has the right to do so, it is the business of the staff of experts to asecrtain, It is absolutely essential to the system that the register should be easily accessible, and the formalities of registration simple and cheap.”

It will appear on referring to Reau Estrare that before the Conquest publicity of transfer was secured by a system of record in the shire-book or church-book. After the Conquest this pub- licity, continued for a time in the Domesday survey, from various causes gradually gave way to that secrecy of transfer which is now one of the peculiar features of English law. Publicity was to a certain extent sccurcd by the court rolls in the case of copyhold lands, by the local statutes mentioned below, and by the Act enforcing the registration of rent charges and annuities charged on land (18 Vict. c. 15). There was a tendency in the same direction in those statutes which made the enrolment of deeds necessary for their validity. Such are the Statute of Enrolments, 27 Henry VIII. c. 16, the Mortmain Act, 9 Geo. II. ¢. 36, the Fines and Recoveries Act, 8& 4 Will. IV. ¢. 74, under which an estate tail may be barred by an enrolled deed, and Acts affecting Queen Anne’s Bounty, 1 Geo. I., st. 2, c. 10, and the Charity Commissioners, 18 & 19 Vict. e.124. No general registry has as yet been established in England, though many attempts have been made in that direction. The question was debated as far back as the Long Parliament. General Ludlow mentions the characteristic incident “that upon the debate of ‘registering deeds in each county for want of which, within a certain time fixed after the sale, such sales should be void, and, being so regarded, that lands should not be subject to any incuin- brance,’ this

word incumbrance was so managed that it took up three months' time before it could be ascertained by the com- mittee" (Afemoirs, i. 486). In the reign of Charles II. a registry of deeds was established for the Bedford Level by 15 Car. II. c. 17. In the reign of Anne registries of deeds and wills were established

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for the county of Middlesex (7 Anne e. 20), for the West Riding of Yorkshire (2 & 3 Anne c. 4), and for the East Riding and Kingston-upon-Hull (6 Anne c. 35). Similar provisions were not applied to the North Riding until 8 Geo. II. c. 6. The Yorkshire Acts were cousolidated and amended by the Yorkshire Registries Act, 1884. "Under these Acts, all deeds are to be adjudged fraudulent and void against any subsequent purchaser or mort- gagee for valuable consideration, unless a memorial of such deeds be duly registered before the registering of the memorial of the deed under which such subsequent purchaser or mortgagee shall claim" (Williams, Real Property, pt. i. ch. x.). Priority thus depends upon the date of registration. The Acts do not extend to copyholds, to leaseholds for a term not excecding twenty-one years, or to chambers in an Inn of Court. The full operation of the Registry Acts has been to a certain extent affected by the doctrines of equity that an equitable mortgage by deposit of deeds is valid without registration, and that notice of a prior unregistered deed is within limits equivalent to registration. "It shall only be in cases where the notice is so clearly proved as to make it fraudu- leut in the purchaser to take and register a conveyance in pre- judice to the known title of another that we will suffer the registered deed to be affected" (Sir William Grant in Wyatt v. Barwell, 19 Vesey's Reports, 438). On this subject the Yorkshire Registries Act, 1884, provides by § 14 that "all priorities given by this Act shall have full effect in all cases except in cases of actual fraud, and all persons claiming thereunder any legal or equitable interests shall be entitled to corresponding priorities, and no such person shall lose any such priority merely in consequence of his having been affected with actual or constructive notice, except in cases of actual fraud." The Act provides for an official search of the same nature as that introduced by the Conveyancing Act, 1882, and for the entry of a caveat against registration by any person interested. Passing to general

registration, a general registry of deeds was recommended by the real property commissioners in 1830. The royal commission of 1854 reported in 1857 in favour of general registration of title. In pursuance of this report the Land Registry Act, 1862 (“Lord Westbury’s Act”), was passed. It provided for the optional registration of such titles to freeholds and leaseholds in freeholds as a court of equity should hold to be marketable. It was of little importance in practice on account of its making a marketable title (7.¢., such a title as the court would compel an unwilling purchaser to accept) and a definition of boundaries necessary, and of its not giving an indefeasible title in effect, though it does so in name, until there had been dealing with the land for valuable consideration subsequent to registration. The Act is still law as to titles registered under it and not re- registered under the Act of 1875, On the same day as the Laud Registry Act was passed the Declaration of Title Act, 1862, under which power is given to any person entitled to apply for the registration of an indefeasible title under the Land Registry Act to apply to the Court of Chancery for a declaration of title, and the court, on proof of a marketable title, is to issue a certificate of title under the seal of the court. The Land Registry Act was con- demned by the report of a royal commission in 1870. In 1875 some of the recommendations of the commission were adopted in the Land Transfer Act, 1875 (“Lord Cairns’s Act”), the latest general enactment on the subject. The Act of 1875 allows the optional registration of a title less than marketable, and the land certificate delivered to the proprietor is to state whether his title be absolute, qualified, or possessory. T’wo or more persons may be registered as joint proprietors. No notice of any trust is to appear on the register. To be registered land must be either freehold or leasehold for an unexpired term of at least twenty-one years. Land in Middlesex or Yorkshire registered under the Act ceases to be within the jurisdiction of the local registries. A caution against registration may be lodged by any person interested. The Act established an office of land registry under a registrar appointed by the lord chancellor. registries, if necessary. The Act, like its predecessor, has becn very little used. A compulsory system of registration of title in England has been so universally recognized as expedient that its adoption cau only be a question of time. The chief difficulties in the way ofa reform are the objection of the landowners to pub- licity of transactions in land, the expense, greater than in other

countries or in the colonies, arising from the complexity of the English law of real property, and, not least, the conservative instincts of the legal profession. One effect of registration will be to much diminish the importance of the legal doctrines of Possession and LimiraTion (q.v.). "It is a grave question whether the establishment of titles by long possession is consistent with a complete and efficient system of registration. In Scotland, where there is such a system, there is nothing answering to our Statute of Limitations as regards land" (Pollock, Zand Laws, 169).1

1 § 21 of the Aet of 1875 in fact provides that "a title to any land adverse to or in derogation of the title of the registered proprietor shall not be aequired by any length of possession," with an exception in favour of an adverse claim where the registered title is possessory only.

There was also a power of creating district.

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Another effect will be the recurrence to the primitive legal con- ception of the transfer of land as a matter of public notoriety. In Ireland a registry of assurances was established by 6 Anne ec. 2 (Ir.). 28 & 29 Vict. e. 88 constitutes a limited registry of title in the record of title to land which has been the subject of conveyance or declaration by the Landed Estates Court. In Scotland the present system of registration of assurances has existed since the reign of James VI. The Act 1617 c. 16 created a pnblic register for registering within three-score days instruments of sasine as well as reversions and other writs affecting heritable property. The Act established a general register of sasines at Edinburgh and local registers, The latter were abolished by 31 & 32 Vict. c. 64. Modern Acts commencing in 1845 and consolidated in 1868 by 31 & 32 Vict. c. 101 dispense with sasinc and the instrument of sasine. The recording of a conveyance with a warrant of registration indorsed now constitutes infeftment. Either the whole or part of a deed inay be registered. Probative leases of thirty-one or more years may be registered under 20 & 21 Vict. ce. 26. As to entails see Enrain. Writs affecting land held in burgage before 1874 must be registered in the burgh register of sasines

(37 & 38 Vict. c. 94, § 25). The lord clerk register's duties under the Act of 1617 were transferred to the deputy clerk register by 42 & 43 Vict. c. 44 (see Watson, Law Dict., s.vv. "Deeds," " Registration"). In most of the British colonies land registration of some kind exists. The Indian Registration Act, 1866, steers a niiddle course between compulsory and optional registration. The registration of some assurances is compulsory, of others optional. In Australia a system of compulsory registration of title was introduced by Sir R. R. Torrens, and, after having been first adopted by the legislature of South Australia in 1858, has been generally applied by the other Australian colonies since that time. Under the South Australian Act a certificate of title is cancelled and regranted on transfer. Instrumentsare not effectual until registra- tion and indorsement according to statutory forms. Mortgages have priority according to the date of registration, irrespective of notice. The registrar nay demand the deposit of a map. In the United States registration of assurances is universal, but registration cf title is not so generally adopted. At the date of writing, a bill for the compulsory registration of title is before the New York legislature. For the purpose of dealing with public lands of the United States a register of the land office is appointed in each land district. Returns from each land office are made to the general land office.

Ships.—The registration of ships in the British empire (other than fishing boats, the registration of which is governed by special legislation) now depends upon the Merchant Shipping Acts. The register is open only to British ships, and not more than sixty-four persons can be registered as owners of any ship. One registered owner may, however, represent the beneficial title of any number of persons. No notice of a trust can be entered on the register. Mortgages must be registered in the statutory form in order to be good against registered transferees and mortgagees. The registrar is generally in the United Kingdom the principal officer of customs for any port, abroad such person as may be nanied by order in council. The Merchant Shipping Act, 1854, established a " general register and record of seamen " under a registrar-general of seamen. The Merchant Shipping Act, 1872, extended both the name and authority of this officer. Since that Act he has been called the registrar-general of shipping and seamen. Returns of shipping and seamen are transmitted to

him by the local registrars. In the United States the registration of ships depends upon a series of Acts of Congress beginning in 1792. See Hevised Statutes, § 4131. A register of seamen is kept by the shipping commissioner (Act of 7th June 1872, c. 322).

Bills of Sale.—By the Bills of Sale Acts, 1878 and 1882, every bill of sale is to be registered within seven clear days after the execution thereof, or, if it is executed in any place out of England, then within seven clear days after the time at which it would in the ordinary course of post arrive in England if posted immediately after execution. A bill must be re-registered every five years, if still existing. An affidavit of the time of its execution, of its due execution and attestation, and containing a description of the residence and occupation of the person making the bill and of every attesting witness, must be filed with the registrar within seven days. A transfer or assignment of a registered bill of sale need not be registered. The duties of registrar are performed by a master of the Supreme Court attached to the Queen's Bench Division of the High Court of Justice. Provision is made for the trausmis- sion of bills of sale made by persons or affecting goods outside the London bankruptcy district to the registrars of the proper county courts. The register may be searched by any person on payment of a fee of one shilling. Similar provisions are contained in the Irish Acts of 1879 and 18838. Bills of sale are unknown in Scotland.

Births, Baptisms, Marriages, Deaths, Burials.—The registration of baptisms, marriages, and burials is said to have been first intro- duced by Thomas Cromwell when vicar-gencral in 1522, but it is

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only in comparatively modern times that the registration lias been fully carried out. The registration of births, &c., in the United Kingdom depends upon a large body of statutory law. Baptisms, mazriages, and burials are usually registered at the time of their occurrence, births and deaths within a certain time afterwards. The English Act 35 & 36 Vict. c. 36 forbids the charging of any fee for registration of baptism. The law of registration of births and deaths is consolidated for England by 37 & 38 Vict. c. 88, for Ireland by 43 & 44 Vict. c. 13. In Scotland it depends upon

17 & 18 Vict. c. 80, as amended by later Acts. The registration of marriages in England depends chiefly 'upon 4 Geo. IV. ¢. 76, and 6 & 7 Will. IV. c. 85; in Ireland upon 7 & 8 Vict. c. 81 (as to Protestants), 26 & 27 Vict. c. 90 (as to Roman Catholics); in Scotland upon 17 & 18 Vict. c. 80. The chief official charged with the administration of the Acts is the registrar-general of births, deaths, and marriages; in Scotland the office is held by the deputy clerk-registcr. In the United States the registration of births, marriages, and deaths is, with a few exceptions such as births and deaths at sea and marriages abroad, the subject of State and not United States legislation. Burials are regulated in England by the Burial Acts, especially the Registration of Burials Act, 1864, in Scotland by 18 & 19 Vict. c. 68. Chapels belonging to nonconformist bodies may be certified to the registrar-general (see NoNconFormitTy). There are few enactments dealing with the subject of this paragraph which extend to the United Kingdom. Those which do so are of a special nature, such as Acts aflecting friendly societies and officers and soldiers abroad. A Registration Act embracing the United Kingdom is much needed.

Companics.—Under the Companies Act, 1862, and subsequent Companies Acts {inost of which apply to the United Kingdom), commercial companies as distinguished from associations of other kinds must be registered. Any company requiring to be registered and not registered is an illegal association, and its members cannot take advantage of the limitation of liability and other benefits conferred by the Acts. The register is under the charge of the registrar-general of joint stock companies or such other registrar as the Board of Trade may appoint. The register must contain (1) the emorandum of association, including the name and objects of the proposed company and the place where its registered office is situate ; (2) the articles of association ; (3) a list of members and shareholders (or directors where there are no shareholders), and a statement of the amount held by each shareholder, and other particulars ; (4) any order of court confirming the reduction of the capital of a company ; (5) any contract duly made in writing by which a share is issued otherwise than for cash ; (6) proceedings in winding up. No trust is to appear on the register in the case of companies registered in England or Ireland. Every company must keep at its registered office a register of its members, and, if a company not divided into shares, a

register of its directors or managers, and, in addition, if a limited company, a register of mortgages and charges affecting the property of the company.

Fricndly Socicties. —A friendly society consisting of seven members at least may be registered under the Friendly Societies Act, 1875. The name of the society and of its secretary, and of every trustee or other officer authorized to sue or to be sued in the name of the society, and also a copy of its rules, are entered on the register. There is a chief registrar of friendly societies with assist- ant registrars for Scotland and Ireland. Every registered society is to have a registered office. In the same registry are now registercd building societies, industrial and provident societies, aud trade unions.

Newspapers.—By the Newspapers Libel and Registration Act, 1881, the registrar of joint stock companies is to kcep a register of the titles of newspapers and the names of their proprietors (sce Newspapers, Press Laws).

Copyrights, Patents, Designs, Trade Marks.—See Copyntcnt, –

PATENTS, TRADE MARK.

Professions and Occupations. —The effect of recent legislation has been that solicitors, medical men, dentists, veterinary surgeons, chemists and druggists, seamen, lodging-house keepers, cow keepers, milk retailers, aud others must be registered in accordance with various statutory provisions. Unless duly registered they cannot as a rule recover for their services. In certain other cases registra-

tion is not in name necessary, but it is practically enforced by the |

law regarding the entry in certain official books and documents as prima facie evidence of qualification. Thus the roll of the House of Lords is evidence that a person appearing upon it is a peer, the army list that a name contained in it is that of an officer.

Among other matters of less importance which are registered are crown debts, acknowledgnients by married women, colonial stock under 40 & 41 Vict. ec. 59, schemes under the Regulation of Railways Act, 1867, hospitals where lunatics are received, and (in Scotland) lunatics confined in asylums. In this place may be mentioned the peculiar privilege enjoyed by the Channel Islands : orders in council or Acts of Parliament in which they are not named do not become law in those islands until after registration in the royal courts. (J. Wt.)

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PARLIAMENTARY REGISTRATION. England. —Prior to 1832 the right of parliamentary electors was

| determined at the moment of the tender of the vote at the election,

or, in the event of a petition against the return, by a scrutiny, a committee of the House of Commous striking otf those whose qualification was held to be insufficient, and, on the other hand, adding those who, having tendcred their votes at the poll, with a good title to do so, were rejected at the time. A conspicuous feature of the Reform Act of that year was the introduction of a new mode of ascertaining the rights of electors by means of an entirely new system of published lists, subject to claims and objections, and after due inquiry and revision forming a register of voters. In forming a register the services of overseers, already existing in every parish, were called into requisition. As regards clectors in counties, principally freeholders and long-lease-holders and £50 tenant farmers, under the Chandos clause, overseers have no official knowledge of the persons qualified to vote. Their duty towards providing a register of county electors consisted in giving public notice, receiving claims and objections, and making out lists of them and forwarding them to the clerk of the peace. In boroughs their primary duty was to make out lists, their rate Looks as overseers giving tllem the knowledge of persons entitled under the Reform Act to vote as £10 rated occupiers, to which subsequent claims were added or objections made. In old boroughs where freemen were entitled, independently of the then new occupation franchise, tlle town clerk prepared the lists. Barristers were appointed to revise the lists,

which eventually formed the register of voters for the ensuing year for counties and boroughs.

This procedure still forms the basis of registration, but subject to important alterations since made. Although the Act of 1832 was most carefully drawn, its provisions minutely indicating every step to be taken for the formation of a register, accompanied by precise forms, it was found insufficient in practice ; and accord- ingly a Registration Act was passed in 1848 (6 & 7 Vict. c. 15), by which forms of precept were issued by clerks of the peace and town clerks to overseers, telling them in a compendious form what they were to do, and providing them with the necessary forms for all cases. The Representation of the People Act in 1867 introduced very important changes in the franchise,—in counties by introduc- ing an occupation qualification distinct from any previous descrip- tion of franchise either in county or borough, but having somewhat closer affinity to the £10 occupation in boroughs under the Reform Act of 1882 than to the £50 tenant occupation in counties under that Act. This county franchise was an occupation as owner or tenant of lands or tenements of the rateable value of £12, with the concomitants of rating to the poor rates and payment of rates; but the £12 occupation practically merged within it a large proportion of £50 tenaut occupiers. The alterations effected by the Act of 1867 in the borough franchise were much more extensive. In the

first place, the franchise was given to every inhabitant occupier as-

owner or tenaut of any dwelling house within the borough; but rating and payment of poor rates were made essential conditions of this franchise : part of a house occupied as a separate dwelling, if separately rated, was a sufficient dwelling house to confer the franchise. Notwithstanding the apparent effect of the general enfranchisement of inhabitant occupiers, a very considerable body still depended on the former £10 franchise in consequence of the distinction between residence and inhabitancy. Secondly, the Act gave the franchise to occupiers of lodgings of a yearly value (irre- spective of furniture) of £10. A Registration Act of the following year was in several important respects defective. With respect to two of the three new classes enfranchised in 1867 many doubts were

indeed removed by it. The overseers were required to make out a list of £12 occupiers in counties; on the other hand lodgers in boroughs were required under the Act of 1867 to claim to be registered. But with respect to the third class, the most numerous of all—the inhabitant occupiers in boroughs—the Act contained no direction. Notwithstanding attempts to meet these and various other defects, several years elapsed without any alteration being effected. In the meantime important electoral changes occurred. The alterations effected by the Act of 1867, besides those of qualifi- cation, the redistribution of seats, and the representation of minorities, followed by the Ballot Act of 1872, were succeeded by the innovation of mixing up regulations for the exercise of parlia- mentary with the municipal franchise, and led up to the fusion of the registration of the two franchises and the Parliamentary and Municipal Registration Act of 1878, introducing important changes both as regards the definition of the franchise in boroughs and the procedure in relation to registration. As regards the latter the changes recognized the combination of borough registration for the double purpose of parliamentary and municipal registration, and also the more ready preparation of accurate registers irrespective of the combination.

The legislation of 1884 and 1885 in relation to registration next requires noticc. The Representation of the Pcople Act, 1884,

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enacted that a uniform household franchise and a uniform lodger franchise at elections shall be established in all counties and boroughs throughout the United Kingdom, aud every man pos- sessed of a household qualification or a lodger qualification shall, if the qualifying premises be situated in a county in England or Scot- land, be entitled to be registered as a voter, and, when registered, to vote at an election for such county, and, if the qualifying pre- mises be situated in a county or borough in Ireland, be entitled to be registercd as a voter and, when registered, to vote at an election for such county or borough.

A wain practical effect of the Act of 1884 was to extend to eounties the franchise previously confined to boroughs in respect of inhabitant occupiers of dwelling houses, and in respect of the occupation of

lodgings. At the same time the franchise in respect of occupation of lands and tenements (other than a household franchise) was assimilated in boroughs and counties and fixed at £10 a year. Independently of this extension to counties and assimilation of the household and lodger franchise, provision was made for extending the franchise to many cases of the inhabitancy of houses by persons who, in consequence of filling offices or serving others or of the tenure of the house, were deprived of the franchise, not being in law occupiers. This is commonly spoken of as the service franchise. On the other hand restrictions were placed on faggot votes in respect of rent charges. Moreover, a man is not entitled by virtue of the Act to be registered as a county voter in respect of the occupation of any dwelling house, land, or tenement situate in a borough. This Act was shortly followed by the Registration Act, 1885, assimilating the registration law applicable to the borough and county occupation franchises.

The procedure for the formation of the register, as well in counties as in boroughs, is still very complicated. In counties there are two classes of persons entitled to be registered—the one ownership voters, the other occupation voters. General but detailed instructions are sent by the clerk of the peace to overseers, accompanied by forms and copies of the existing register. On or before the 20th June the overseers publish the ownership portion of the then existing register for the parish, at the same time giving

notice in a prescribed form that all persons entitled to be registered |

in counties in respect of the ownership of property within the parish and not upon the register, or whose qualification or address has changed, who are desirous of having their names inserted in the register, must give notice to the overseers in a prescribed published form by the 20th July. A list of such ownership claimants is pub- lished by the end of July. The occupation voters now entitled in counties to be on the register comprise a £10 occupation qualifica- tion and principally a household qualification, and also a lodger qualification. 'The occupation list other than that of lodgers is made out and published by the overseers. They are required to get the information, and as this information cannot be gathered in many vases from the rate books, they may require rated persons to supply them

with the names of all inhabitaut occupiers of their dwelling houses so that such persons (including chiefly the ser- vice franchise already mentioned) may be entered in a separate column of the rate book. The lodger list is made out by the overseers from an existing list, if there be one (for in counties there can be no existing list before 1886), and by claims. In cities and boroughs the franchises (where there are no freemen) are chiefly occupation franchises, and the same general system of registration prevails as in counties in relation to the registration or occupation franchises.

With the exception of the provisions relating to the so-called service franchise already noticed, registration procedure has not been much changed by the legislation of 1884 and 1885, and in counties as well as in boroughs it mainly rests still on the Regis- tration Act of 1848. Overseers receive their precepts in boroughs from the town clerk, as they do in counties from the clerks of the peace, and the town clerk deals with the lists of freemen where that description of franchise exists. As the household occupation and lodger franchises were introduced into boroughs in 1867, the pre- paration and publication of lists as to occupation franchises rests principally on the same procedure in counties and boroughs.

Ample facilities are given for fresh and amended claims and for objections made (by any one on the register) to the overseers by the 20th August and published by them in lists; and, where payment of poor rates is essential, not necessarily by the voter, but by some one (as in some occupation franchises it is), a list of persons dis- qualified is-made out and open to inspection. While the actual exercise of the franchise is governed by the duration of the register (which in the absence of special legislation, as adopted for 1868 and for 1885, is in force for the ordinary year, viz., from 1st January), every period of qualification is computed by reference to the 15th July; the qualification must be complete on that day, whether or not it comprises a possession or occupation for a previous definite fixed period. When payment of poor rates is part of a qualification, payment before the 15th July of rates payable to the 15th January is sufficient. Disqualifications generally refcr to their existence at

months of the 15th July disqualifies. Even with regard to dis-qualification by office, which may be transitory and disconnected with the qualifying franchise, the existence of the disqualification on the 15th July isa bar to registration. Where a man is registered by virtue of one qualification he cannot be also registered to vote by reason of another in respect of the same property, and a qualification franchise under the Representation of the People Act, 1884, gene- rally overrides another description of qualification ; but fine distinc- tions sometimes exist between inhabitancy and residence in relation to different qualifications affecting the right to be on the register in respect of one description of occupation franchise rather than another. Ina borough divided under the Redistribution of Scats

. Act, 1885, a person cannot be registered in more than one division.

The duties of overseers in reference to registration extend froin spring toautumn. By the 25th of August the lists are delivered by them to the clerk of the peace in counties, and in boroughs to the town clerk. Barristers are appointed to revise the lists and hold courts for that purpose (and also for revising the municipal franchise) between the 15th September and 31st October, giving notice to the clerks of the peace in counties and town clerks of boroughs, who publish notice of the sittings appointed and attend and deliver the lists, the overseers also attending. They hold open courts (the localities including all polling places in counties) on appointed 'days, with evening sittings in populous places, with general powers of adjournment. Aright of appeal exists from a revising barrister's decision on the points of law, by a claimant or objector, to judges of the High Court of Justice. Whether the right of appeal is exercised or not, the lists, as settled and signed by the barrister, are transmitted by him to the clerk of the peace or town clerk as the case may be. The lists are copied and printed in such manner and form that the list of voters for every parish appeais separately and with reference to polling places. By the end of December the printed lists signed by the clerk of the peace are delivered to the sheriff of the county, and signed borough lists are delivered by the town clerk to the returning officer. The

register is thus completed, and the book constitutes the register of persons entitled to vote for the county or borough to which it relates at any election which takes place during the year commenc- ing on the Ist January next after such register is made.

For some years after the passing of the Reform Act, 1832, an elector was allowed, previous to voting, to be interrogated as to the possession of the qualification for which his name was inserted on the register; but since 1843 no inquiry is permitted at the time of polling as to the right of any person to vote, except as to his identity with the name appearing on the register and as to his having already voted ; he may be required to give his answers on oath, but without an oath a false answer wilfully made is an indictable misdemeanour. With this exception it is unlawful to require any voter to take an oath in proof of his qualification or right to vote, or to reject any vote tendered by any person whose name is upon the register ; and no scrutiny is allowed by or before any returning officer with regard to any vote given or tendered at an election. A great effort, partially successful, was made in 1885 to transfer the cost of forming the register from local to imperial funds. A part of the cost is now borne by the state. The remuneration of revising barristers is paid by the treasury.

Scotland.—In Scotland as in England a system of registration was established in 1832 (2 & 3 Will. IV. c. 65), and, passing over amendments on the extension and assimilation of county and burgh franchises by the Representation of the People Act, 1884, establishing a general household qualification in the United Kingdom, the principles of registration adopted in England by the Registration Act, 1885, were applied with some modifications to Scotland by the Registration Amendment (Scotland) Act, 1885. An annual revision of the register (founded on the valuation roll) is made by appointed officers, with the publication of lists and of names of parties interested making claims and objections. Instead, however, of the duties of publication and primary correction being in the hands of the parish officers, as in England, those duties devolve as before on assessors (aided in burghs by the town clerks), who make up the register. The duties of final revision: devolve on the sheriff, who authenticates the register, and it is delivered to the sheriff clerk with the names duly arranged. The

principal expenses of registration are provided from local or county sources, with a contribution from imperial funds.

Treland.—In Ireland also the registration of voters was a feature of the reform in parliament effected in 1832, and the same general features as to the formation and amendment of the register prevail as in England. The extension and assimilation of the franchise by the Representation of the People Act, 1884, is carried out by the Parliamentary Registration (Ireland) Act, 1885, on the same lines as before, only adapted to peculiar exigencies. Clerks of poor-law unions have still many of the dutics of parochial officers in England. Prominent among recent divergencies is the proviso that temporary eviction for non-payment of rent followed by

the same date. As regards parochial relief, any relief within twelve | reinstalment does not disqualify a claim to occupation franchise.

Revision is made at spécial sessions before assistant barristcrs, or, in counties, before the chairman. The register, when com- pleted, is placed in the hands of the sheriff in countics and of the returning officer in boroughs. The expenses of registration a —o from local sources, with a contribution from imperial unds.

Universities. —The Reform Act of 1832 made no change in the university representation. Special provisions affect the electoral roll of universities returning members of parliament.

London Freemen.—There are also special provisions as to the registration of freemen in the City of London. (J. E. D.)

REGNARD, Jean Francois (1656-1709), who in general estimation ranks next to Moliére among French comic dramatists, was born at Paris in 1656, and during at least the earlier part of his life had a singularly adven- turous career considering his time, station, and couutry. His father was a rich shopkeeper, who educated his son carefully, and died

when he was about twenty, leaving Regnard master of what was for the time a considerable fortune. Regnard, who was apparently beyond his day in affection for travelling, set off at once for Italy and there gambled perseveringly. A young tradesman's son in such circumstances ought, according to precedent and poetical justice, to have been fleeced to his last penny; but Regnard, according to the story, increased his fortune by ten thousand crowns. In Italy (on his second visit accord- ing to some authorities) he met and fell in love witha young married lady of Provengal birth. With her and her husband (it is difficult not to believe that biographers have taken the facts of a short autobiographical romance which Regnard wrote, under the title of La Provencale, rather literally) he set out for France on board an English frigate. This was attacked by two Algerian rovers; the captain and the crew were cut to pieces, and the passengers taken to Algiers and sold. Regnard, who, being skilful in cookery, was a valuable slave, is said to have been taken by his master to Constantinople, but after about two years' cap- tivity he was ransomed with his lady love for twelve thousand livres. The husband was supposed to be dead, and Regnard was preparing to marry the widow when a proper time of mourning had elapsed, but the husband reappeared and the lover was disappointed. The disappointment set him once more on a roving life, and he journeyed by Holland, Denmark, and Sweden to Lapland, and thence by Poland, Turkey, Hungary, and Germany back to France, having commemorated what was then the somewhat extra- ordinary feat of visiting the head of the Gulf of Bothnia by a Latin inscription on the rocks, which was visible thirty years later. He returned to Parisat the end of 1683. He now appears to have entirely exhausted his roving inclina- tions, and for the second half of his life (for this date of December 1683 nearly bisects it) his existence, if not exactly sedentary, was divided between luxury and letters. He bought the place of treasurer of France in the Paris district; he had a house at Paris in the Rue Richelieu; and he acquired the small estate of Grillon near Dourdan (about equidistant between Rambouillet and Fontainebleau), where he hunted, feasted, and wrote comedies. This latter amusement he began in 1688 with a piece called Le Divorce, which was performed at the Thédtre Italien, and followed it up with many other small pieces, which are not, however, his titles to fame. He gained access to the Théatre Frangais in 1694 with a slight piece called Attendez- mot sous Orme, and two years

later produced there the masterly comedy of Le Joueur, in reference to which his ally Dufresny attempted to make out a charge of plagiar- ism. Le Distrait (1697), Le Retour Imprévu (1700), Les Folies Amoureuses (1704), Les Menéchmes (1705), a clever following of Plautus, and, lastly, his masterpiece, Le Légataire Universel (1708), with one or two less meritorious pieces, were also produced at the Frangais.

Regnard's death, after a quarter of a century of quiet

living, renews the doubtful and romantic circumstances of his earlier life. Some hint at poison; there is a wild and wonderful story of his having deliberately made up a pre- scription of horse medicine for himself and taken it with fatal consequences ; while other more prosaic accounts give as the cause of death his having gone out hunting while under an ordinary course of treatment, and on his return, when much heated, having swallowed a large quantity of iced water. At any rate he died on the 4th September 1702. z

Besides the plays noticed above and others, Regnard wrote a cer- tain number of miscellaneous poems, the above-mentioned novel of La Provencale, and several short accounts in prose of his travels. He quarrelled with Boileau and was reconciled with him, owing to which fact the expressions of that critic concerning Regnard's literary merit were not wholly consistent, The saying, however, which is attributed to him when some one, thinking to curry favour, remarked that Regnard was only a mediocre poet, "Il n'est pas médiocrement gai," is both true and very appropriate. Regnard's verse is not particularly good (in his non-dramatic work it is some- times positively bad), and his French style, especially in his purely prose works, is not considered faultless. He is often unoriginal in his plots, and, whether Dufresny was or was not justified in his com- plaint about Le Joueur, it seems likely that Regnard owed not a little to him and to others; but he had a thorough grasp of comic situation and incident and a most amusing faculty of dialogue. He is often not far from the verge of farce, but he certainly might plead Moliére's cxainple in this respect. There is no trace in him of Moliére's ethical value, and he is seldom a serious critic of society and life, while in point of refinement of

incident and language his drama is a distinct relapse from his master's. But there are few things in artificial comedy more amusing and more dexterously managed than the series of devices whereby the miserly uncle of Le Légataire Universel is brought to make his nephew rich and happy.

The first edition of Regnard's complete works was published in 1731 (6 vols., Paris), one of the last in 1854 (2 vols.). There is a good selection of almost every- thing important in the Colleetion Didot.

REGNAULT, Henri (1843-1871), French painter, born at Paris on the 3lst October 1843, was the son of Henri Victor Regnault (noticed below). On leaving school he successively entered the studios of Montfort, Lamothe, and Cabanel, was beaten for the Great Prize (1863) by Layraud and Montchablon, and in 1864 exhibited two portraits in no wise remarkable at the Salon. Nothing, in short, produced by Regnault up to 1866 led men to suspect the brilliancy of his endowments, but in that year he made a mark, carrying off the Great Prize with a work of unusual force and distinction—Thetis bringing the Arms forged by Vulcan to Achilles (School of the Fine Arts). The past and the works of the past in Italy did not touch him, but his illustrations to Wey's Rome show how observant he was of actual life and manners; even his Automedon (School of Fine Arts), executed in obedience to Academical regulations, was but a lively recollection of a carnival horse race. At Rome, moreover, Regnault came into contact with the modern Hispano-Italian school, a school highly materialistic in its aims and tendencies, and inclined to regard even the human subject only as one amongst many sources whence to obtain amusement for the eye. The vital, if narrow, energy of this school told on Regnault with ever-increasing force during the few remaining years of his life. In 1868 he had sent to the Salon a life-size portrait of a lady in which he had made one of the first attempts to render the actual character of fashionable modern life, and, on his return from a visit to the exhibition, he seized the opportunity of making a tour in Spain. There he saw Prim pass at the head of his troops, and received that lively image of a military demagogue which he afterwards put on canvas somewhat to the displeasure of his subject. But this work made an appeal to the imagination of the public, whilst all the later productions of Regnault were addressed exclusively to the eye. After a further flight to

Africa, abridged by the necessities of his position as a pensioner of the school of Rome, he painted Judith, then (1870) Salome, and, as

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a work due from the Roman school, despatched from Tangiers the large canvas, Execution without Hearing under the Moorish Kings, in which the painter had played with the blood of the victim as were he a jeweller toying with rubies. The war arose, and found Regnault foremost in the devoted ranks of Buzenval, where he fell on January Bo, 1871.

See Correspondance de H. Regnault; Dupare, H. Regnault, sa vie et son euvre; Cazalis, H. Regnault, 1843-1871; Bailliere, Les artistes

de mon temps; ©. Blanc, H. Regnault; P. Mantz, Gazetie du Beaux Arts, 1872.

REGNAULT, Henri Victor (1811-1878), was born on July 21, 1811, at Aix-la-Chapelle. His early life was a struggle with poverty. When a boy he went to Paris, and after a time succeeded in obtaining a situation in a large drapery establishment, where he remained, occupying every spare hour in study, until he was in his twentieth year. 'Then he entered the Ecole Polytechnique, and, after making the best use of his increased opportunities, passed in 1832 to the Hcole des Mines, where he developed an aptitude for experimental chemistry.

A few years later he was appointed to a professorship of chemistry at Lyons, and devoted himself to research amongst organic compounds. He paid little attention to theories and cared only for facts; but, by his unequivocal proof of the substitution of chlorine for hydrogen in hydro-carbons, he greatly assisted his countrymen Laurent and Dumas in establishing the type-theory of organic com- pounds. Regnault's most important chemical work was a series of researches, commenced in 1835, on the haloid and other derivatives of unsaturated hydrocarbons. This made him the discoverer of the vinyl group of compounds, car- bon tetrachloride (CCl,), and of perchlorether (C,Cl,,0). He studied many of the natural alkaloids and organic acids, introduced a classification of the metals according to the facility with which they or their sulphides are

oxidized by steam at high temperatures, and effected a comparison of the chemical composition of atmospheric air from all parts of the world. .

In 1840 Regnault was recalled to Paris by his appoint- ment to the chair of chemistry in the Ecole Polytechnique ; at the same time he was elected a member of the Academie des Sciences, in the chemical section, in room of M. Robiquet ; and in the following year he became professor of physics in the Collége de France, there succeeding Dulong, his old master, and in many respects his model. From this time Regnault devoted almost all his attention to practical physics ; but in 1847 he published a four-volume treatise on Chemistry which was highly esteemed and has been translated into many languages.

Regnault is perhaps best known by his careful redeter- mination of the specific heats of all the elements obtainable, and of many compounds—solids, liquids, and gases—by which he was enabled to correct the values obtained by Dulong and Petit, and to reduce the number of exceptions to their law that the specific heat of an element varies inversely as its atomic weight, and of a compound as tts molecular weight. He investigated the expansibility of gases by heat, determined the coefficient for air as 003663, and showed that, contrary to previous opinion, no two gases had precisely the same rate of expansion. By numerous delicate experiments he proved Boyle's law that the volume of a gas ts inversely as the pressure it supports to be only approximately true, and that those gases which are most readily liquefied diverge most widely from obedience to the law. Regnault studied the whole subject of thermometry critically; he introduced the use of an accurate air-ther- mometer, and compared its indications with those of a mercurial thermometer, determining the absolute dilatation of mercury by heat as a step in the process. He also paid

attention to hygrometry and devised a hygrometer in which a cooled metal surface is used for the deposition of moisture.

In 1854 he was appointed to succeed Ebelnian as director of the celebrated porcelain manufactory at Sévres. He carried on the great

research on the expansion of gases in the laboratory at Sévres, but all the results of his latest work were destroyed during the Franco-German War, in which also his son Henri (noticed above) was killed. Regnault never recovered the double blow, and, although he lived until January 19, 1878, his scientific labours ended in 1872. He wrote more than eighty papers on scientific subjects, and he made fine researches, many of them of importance, in conjunction with other workers. His greatest work, bearing on the practical treatment of steam-engines, forms vol. xxi. of the Mémotres de Académie des Sciences.

Regnault was great as a laborious worker ; in all his researches he overeame every difficulty by his determined perseverance, his un- usual natural ingenuity in devising apparatus, and his rare power of manipulation. Although few discoveries are associated with his name, the mass of physical constants which he determined with the utmost aceuracy constitutes a powerful instrument of further advance, and the thorough training which he gave his students has provided many painstaking and exact workers in the field of physics.

REGNAULT, Jean Baptiste, French painter, was born at Paris on 9th October 1754, and died in the same city on November 12, 1829. He began life at sea in a mer- chant vessel, but at the age of fifteen his talent attracted attention and he was sent to Italy by M. de Monval under the care of Bardin. After his return to Paris, Regnault, in 1776, obtained the Great Prize, and in 1783 he was elected Academician. His diploma picture, the Education of Achilles by Chiron, is now in the Louvre, as also the Christ taken down from the Cross, originally executed for the royal chapel at Fontainebleau, and two minor works— the Origin of Painting and Pygmalion praying Venus to give Life to his Statue. Besides various small pictures and allegorical subjects, Regnault was also the author of many large historical paintings; and his school, which reckoned amongst its chief attendants Guérin, Crepin, Lafitte, Blondel, Robert Lefevre, and Menjaud, was for a long while the rival in influence of that of David.

REGNIER, Matuorin (1573-1613), the greatest satirist of France, was born at Chartres on the 21st December 1573. His father, Jacques Regnier, was a bourgeois of good means and position; his mother, Simonne

Desportes, was the sister of the poetical Abbé Desportes, one of the most distinguished of the disciples of Ronsard. Desportes, who was richly beneficed and in great favour at court, seems to have been regarded at once as Mathurin Regnier's natural protector and patron, and the boy himself, with a view to his following in his uncle's steps, was tonsured at nine years old. It appears that Jacques Regnier, at any rate for a time, encouraged his son to imitate his uncle in poetry also, though he afterwards changed his views. The boy was somewhat early introduced to general society of the jovial kind, for his father built a tennis court at the end of his garden which became semi- public and was much frequented. The poet's enemies said that his father had been a common gaming-house keeper, and that the court was built with the ruins of some church property ; but this seems to be mere scandal. Little is known of his youth, and it is chiefly conjecture which fixes the date of his visit to Italy in the suite of the Cardinal de Joyeuse in 1586. Others give 1583 and 1593, but the former date is certainly too early, and the latter pro- bably too late. Indeed the greatest uncertainty exists as to the dates and incidents of Regnier's short life, and his biographers hitherto have chiefly busied themselves in

upsetting each others' facts without supplying fresh details of an authentic character. It is commonly said that the poet, finding Joyeuse an inactive or unwilling patron, trans- ferred his services to Philippe de Bethune, Sully's brother, who went as ambassador to Rome in 1601; but this seems doubtful, for one of the very few positive documents con- cerning Regnier speaks of him as still in Joyeuse's service a year later. What is generally certain is that during the greater part of his youth he lived partly in Paris and partly in Italy, after a somewhat idle and very dissipated fashion. He early began the practice of satirical writing, and the enmity which existed between his uncle Desportes and the poet Malherbe gave him occasion to attack the latter in some of his very best verses. It has been generally said that Regnier obtained full possession of a canonry at Chartres, to the reversion of which he had been appointed when a child, in 1604, and a singular legend is told of the immediate circumstances ; but the formal registry of admission signed by himself is

extant, and is dated 1609, a further instance of the uncertainty which prevails respecting him. In 1606 Desportes died, leaving nothing to Regnier, though they seem to have been on excellent terms to the last. The poet was even disappointed of the succession to Desportes's abbacies, but he obtained a pension (the amount as usual variously stated at 2000 and 6000 livres) chargeable upon one of them, by the influence of the Marquis de Coeuvres, afterwards Maréchal d'Estrées, the brother of Henry IV.'s Gabrielle. He also became a great favourite with his bishop, Philippe Hurault, at whose abbacy of Royaumont Regnier spent much time in the later years of his life. On the other hand the death of Henry IV. deprived him

of his last hope of great preferments, and appears to have |

considerably soured his temper. He did not long survive the king. His life had always been one of dissipation, or, to speak frankly, debauchery, and in the autumn of 1613 he went to Rouen to put himself under the care of a quack doctor. An apparent cure was followed by a feast at which the patient drank his physician's health too freely in strong Spanish wine, and died of pleurisy or fever at his hotel, the Ecu d'Orléans, on the 13th October. His body was disembowelled and the entrails deposited in the parish church, that of St Marie Mineure, the other remains being carried to Royaumont and buried there.

Such is the meagre amount of positive knowledge respecting one of the greatest poets of France. Nor can it be said that Regnicr's literary history is quite aecurately ascertained, though it is less dubious than his personal. The period immediatcly preceding and following his dcath was a period of numerous collections of licentious and satirical poems, some published, some still remaining in manuscript. Gathered from these therc has been a floating mass of epigrams, &c., attributed to Regnier, few of which are certainly authentic, and most of which do no particular credit to his memory. On these editors of his works have cxercised freely the right of acceptance or rejection, so that it is very rare to find two editions of Regnier which exactly agree in contents. His acknowledged or undoubted work, however, is that on which his fame rests, and it falls into three classes :—regular satires in alexandrine couplets, serious poems in

various metres, and satirical or jocular epigrams and light pieces, which oftcn, if not always, exhibit considerable licence of language. This latter class is, however, much the least important in every way. The real greatness of Regnier consists in

the vigour and polish of his satires, contrasted and heightened as | that vigour is with the exquisite feeling and melancholy music of | In the latter Regnier is a disciple of |

some of his minor poems. Ronsard (whom he defended brilliantly against Malherbe), without the occasional pedautry, the affectation, or the undue fluency of the Pléiade, but in the satires he had hardly any master (Vauquelin de la Fresnaye and Agrippa d'Aubigné, who preceded him in point of composition, did not publish their satires until later) except the ancients. He has sometimes followed Horace closely, but always in an entirely original spirit. His vocabulary is varied and picturesque, but is not marred by the maladroit classicism of somc of the Ronsardists. His verse is extraordinarily forcible and nervous, but what distinguishes him especially from most satirists is the way in which he gets the bettcr of what may be called the commonplaces of satire, and to a great extent at any

rate avoids the tendency of all French poetry to run into types. His keen and accurate knowledge of human nature and even his purely literary qualities extorted the admiration of Boileau— usually the severest of critics iu regard to all poets of the preeeding age except Malherbe. Rcgnier, moreover, in respect of Malherbe has himself displayed remarkable independence and acuteness of literary criticism, and the famous passage in which he satirizcs the poet of Caen contains the best denunciation of the merely " correct" theory of poetry that has ever been written. Lastly, Regnier had a most unusual descriptive faculty, and the vividness of what may be called his narrative satires was not approaclicd in France for at least two centuries after his death. All his merits are displayed in the masterpiece entitled Macetie ow Ul Hypocrisic déconcertée, but hardly any one of the sixteen satires which he has left falls below even a very high standard. In general it may be said that

Regnier is the last poet who shows the poetic faculties of the French tongue before the classical reforms of the 17th century had cramped and curtailed them, and that he shows these faculties in something like perfection.

The first edition of Regnier's satires appeared in 1608 published by Gabriel Buon. There was another in 1609, and another in 1612. The author had also eontributed to two collections—Les Muses Gaillardes in 1609 and Le Temple @'Apolion in 1611. In the year of his death (1613) a eompleter collection appeared, and another in 1616. The chief editions of the 18th eentury are that of Brossette (1729), which supplies the standard eommentary on Regnier, and that of Lenglet Dufresnoy (1733). Recently the poet has been frequently and carefully reprinted. The editions of Prosper Poitevin in 1860, of M. de Barthélemy in 1862, and of M. Courbet in 1875 may be specially mentioned. The last, printed after the originals in italie type, and well edited, is perhaps the best, as M. de Barthélemy's is the fullest, of recent eopies.

REGULUS, Marcus Atitius, was consul for the second time in the ninth year of the First Punic War (256 3.c.), and so was one of the commanders in the great naval expedi- tion which shattered the Carthaginian fleet and success- fully landed an army on Carthaginian territory at Clupea. At first the invaders had such success that half the army and the other consul Manlius could be recalled to Rome, and yet leave good hope that Regulus with the insurgent Numidian subjects of the Phcenicians would finish the war in the second canipaign. But Carthage, which had found an able general in the Spartan Xanthippus, used the winter to such good account that in the spring of 255 Regulus was decidedly inferior in strength, and, hazarding a pitched battle on ground favourable to the enemy, had his army cut to pieces and was himself taken captive. Regulus perished in captivity, and was supposed at Rome to have been done to death : according to the common story he was sent to Rome on parole to negotiate a peace or ex- change of prisoners, but on his arrival strongly urged the senate to refuse both proposals, and returning to Carthage was slain with horrid tortures. This is the story so elo- quently told by Horace (Carm. iii. 5), and which made Regulus to the later Romans the type of

heroic endurance in misfortune ; but most critical historians regard it as insufficiently attested, Polybius being silent.

REICHA, Anton JosepH (1770-1836), musical theorist and teacher of composition, was born at Prague, February 27, 1770, and educated chiefly by his uncle, Joseph Reicha (1746-1795), a clever violoncellist, who first received him into his house at Wallerstein in Bohemia, and afterwards carried him to Bonn. He studied hard, and began to compose at a very early age,— producing, during the course of a long and active life, a vast quantity of church music, five operas, a number of symphonies, oratorios, and many miscellaneous works. Though clever and ingenious, his compositions are more remarkable for their novelty than for the beauty of the ideas upon which they are based, and display but little of the divine fire which alone can render works of art immortal. His fame is, indeed, more securely based upon his didactic works than upon the results of his theories as exemplified in his own productions. His Traité de Mélodie (Paris, 1814), Cours de Composition Musicale (Paris, 1818), Traité de Haute Composition Musicale (Paris, 1824— 1826), and Art du Compositeur Dramatique (Paris, 1833) are valuable and instructive essays, containing much that is new and interesting ; and, though many of the theories they

set forth are now condemned as erroneous, they can scarcely be read without profit to the student.

Reicha first visited Paris in 1799. In 1802 he removed to Vienna, where he spent some happy years in close intercourse with Beethoven, and the veteran Haydn. His permanent settlement at Paris took place in 1808. In 1817 he succeeded Méhul as professor of counterpoint at the Conservatoire. In 1831 he was made a knight of the Legion of Honour; and in 1835 he was admitted as a member of the Institute in the place of Boieldieu. He died at Paris, May 28, 1836.

REICHENAU, a picturesque island in the Untersee or western arm of the lake of Constance, is 3 miles in length by 1 in breadth, and is connected with the east bank by a causeway three quarters of a mile long. It belongs to the duchy of Baden, and comprises the three parishes of Ober- zell, Mittelzell, and Unterzell, with a joint population of 1463 in 1880. The soil is very fertile, and excellent wine is produced in sufficient quantity for exportation. The Benedictine abbey of Reichenau, founded in 724, was long celebrated for its wealth and for the services rendered by its monks to the cause of learning. In 1538 the abbey, which had previously been independent, was subordinated to the see of Constance, and in 1799 it was secularized. The abbey church, dating in part from the 9th century, contains the tomb of Charles the Fat, who retired to this island in 887, after losing the empire of Charlemagne. It now serves as the parish church of Mittelzell, and the churches of Oberzell and Unterzell are also interesting buildings of the Carlovingian era.

REICHENBACH, a manufacturing town of Saxony, in the province of Zwickau, lies in the hilly district known as the Voigtland, 50 miles to the south of Leipsic. The chief industrial products are woollen cloth, merino, cashmere, flannel, and shawls. Its importance is of recent origin, and the population, amounting to 16,509 in 1880, has trebled itself within the last fifty years. The earliest notice of the town occurs in a document of 1212, and it acquired municipal rights in 1367.

REICHENBACH, a cotton-manufacturing town of Prus- sian Silesia, with 7225 inhabitants (1880) and an old castle, lies 30 miles to the south-south-west of Breslau, and demands mention chiefly from its connexion with several important historical events. In 1762 Frederick the Great gained a victory here over the Austrians ; by the Reichen- bach convention of 1790 England and the other powers guaranteed the subsistence of the Turkish empire; and in 1813 a treaty, afterwards ratified at Prague, was con- cluded here between Austria and the allies.

REICHENBACH, Grore von (1772-1826), astrono- mical instrument maker, was born at Durlach in Baden on August 24, 1772. He first served as an officer of artillery, and afterwards held several civil appointments in Bavaria, Already from 1796 he was occupied with the construction of a

dividing engine; in 1804 he founded, with Liebherr and Utzschneider, an instrument- making business in Munich; and in 1809 he established, with Fraunhofer and Utzschneider, equally important optical works at Benedictbeuern, which were moved to Munich in 1823. He withdrew from both enterprises in 1814, and founded with Ertel a new optical business, from which also he retired in 1820. He died at Munich on May 21, 1826.

Reichenbach's principal merit is his having introduced into observatories the meridian or transit eircle, eombining the transit instrument and the mural circle into one instrument. This had already been done by Roemer about 1704, but the idea had not been adopted by any one else, the only exception being the transit circle constructed by Troughton for Groombridge in 1806. The trausit eirele in the form given it by Reichenbaeh had one finely- divided eirele attached to one end of the horizontal axis and read

by four verniers on an " Alhidade Circle," the unaltered position of which was tested bya spirit level. The instrument came almost at once into universal use on the Continent (the first one was made for Bessel in 1819), but in England the mural eircle and transit instrument were not superseded for many years.

REICHENBERG (Bohem. Zzberec), a town of Bohemia, with an independent jurisdiction, lies on the Neisse, about 50 miles to the north-east of Prague and not far from the Saxon and Prussian frontiers. It is the centre of the important cloth manufacture of northern Bohemia, and is the third town of Bohemia in size and the second in industrial importance. Its cloth factories employ about 7000 workpeople and produce goods to the annual value of upwards of a million sterling, while weaving is also extensively prosecuted as a domestic industry. Other important manufactures are cotton, yarn, machinery, and liqueur. 'Trade is carried on in the raw materials and finished products of the various industries. The most prominent buildings are the town-house, of 1601; the chateau of Count Clam Gallas; the Dekanalkirche, of the 16th century; the Protestant church, a handsome modern Romanesque edifice

; the hall of the cloth-workers ; the new law courts; the new theatre; and the weaving school. The population in 1880 was 28,090.

Reichenberg is first mentioned in a document of 1348, and from 1622 to 1634 was among the possessions of the great Wallenstein, since whose death it has belonged to the Gallas and Clam Gallas families. The woollen industry was introduced about the middle of the 16th century. In 1866 Reichenberg was the headquarters of Prinee Charles Frederick of Prussia.

REICHENHALL, a small town and watering-place of Upper Bavaria, is finely situated in an amphitheatre of lofty mountains, on the river Saale or Saalach, 1570 feet above the level of the sea and 9 miles to the south-west of Salzburg. As indicated by its name, in which the syllable hall corresponds, according to a well-known linguistic law, to the Latin sal, Reichenhall possesses several copious saline springs, producing upwards of 11,500 tons of salt per annum. The water of some of the springs, the sources of which are 50 feet below the surface of the soil, is so strongly saturated with salt (up to 24 per cent.) that it is at once conducted to the boiling houses, while that of the others is first submitted to a process of evaporation. Reichenhall is the centre of the four chief Bavarian salt-works, which are connected with each other by brine con- duits having an aggregate length of 60 miles. The surplus brine of Berchtesgaden is conducted to Reichenhall, and thence, in increased volume, to Traunstein and Rosenheim, which possess larger supplies of timber for use as fuel in the process of boiling. Since 1846 Reichenhall has become one of the most fashionable spas in Germany, and it is now visited annually by about five thousand patients, besides many thousand passing tourists. The resident population in 1880 was 3271, almost all Roman Catholics. The saline springs are used both for drinking and bathing, and are said to be efficacious in scrofula and incipient tuberculosis. In addition to numerous large hotels, the most' prominent edifices are the Romanesque church, recently restored, and the handsome and extensive build- ings of the salt-works.

The brine springs of Reichenhall are mentioned in a document of the 8th century, and were perhaps known to the Romans ; but almost all trace of

the antiquity of the town was destroyed by a conflagration in 1834. The brine conduit to Traunstein dates

from 1618. The environs abound in numerous eharming Alpine exeursions.

REICHSTADT, Duke or. See Napoteon II. (vol. xvii. p. 226). The title is derived from the little town of Reichstadt in northern Bohemia.

REID, Mayne (1818-1883), captain in the United States army, was in his generation one of the most popular of writers of stories of adventure. His own early life was

as adventurous as any boy reader of his novels could desire. He was a native of Ulster, born in 1818, and was educated for the church, but, disliking the prospect of a regular pro- fession, went to America at the age of twenty in search of excitement and fortune. Among other experiences he made trading excursions on the Red River, and studied the ways of the retiring red man and the white pioneer on the spot. He made acquaintance with the Missouri in the same prac- tical manner, and roved about through all the States of the Union. When the war with Mexico broke out in 1845 he obtained a commission, was present at the siege and capture of Vera Cruz, and leda forlorn hope at Chapultepec. In one of his novels he says that he believed theoretically in the military value of untrained troops, and that he had found his theories confirmed in actual warfare. But, though he saw a good deal of service in America, he was disappointed in his plans for taking part in a conflict with the regular troops of a European country. An enthusiastic republican, he offered his services to the Hungarian insurgents in 1849, raised a body of volunteers, and sailed for Europe, but arrived too late. Thereafter he settled in England, and began his career of a novelist in 1849 with the Rifle Rangers. This was followed next year by the Scalp Hunters. He never surpassed his first productions, except perhaps in Zhe White Chief (1855) and The Quadroon (1856); but he continued to produce tales of self-reliant enterprise and exciting adventure with great fertility. Simplicity of plot and easy variety of exciting incident are among the merits that

contribute to his popularity with boys. His reflexions are not profound, but are frequently more sensible than might be presumed at first sight from his aggressive manner of expressing them. He died in London, October 22, 1883.

REID, Tuomas (1710-1796), the chief founder of what is generally designated the Scottish school of philo- sophy, was born at Strachan in Kincardineshire, about 20 miles from Aberdeen, on the 26th April 1710. His father was minister of the place for fifty years, and traced his descent from a long line of Presbyterian ministers on Deeside. His mother belonged to the brilliant family of the Gregorys, which gave so many representatives to literature and science in Scotland last century. After two years at the parish school of Kincardine, Thomas Reid entered Marischal College, Aberdeen, in 1722. He was instructed in philosophy by Dr George Turnbull, in his day a voluminous and versatile writer, but now almost entirely forgotten. Turnbull's teaching would appear, from the account given of it by M'Cosh, to have antici- pated and suggested certain characteristics of Reid's sub- sequent theory. Reid graduated in 1726 at the early age of sixteen, but remained in Aberdeen as librarian to the university for ten years longer. This may be looked upon as his real student-time, and it seems to have been largely devoted to mathematical reading. In 1737 he was pre- sented to the living of Newmachar near Aberdeen. The parishioners, being violently excited at the time about the law of patronage, received Reid with open hostility ; and tradition asserts that, during the preaching of his first sermon, an uncle who lived near defended him on the pulpit stair with a drawn sword. But before he left the parish he was completely successful in winning the affections of his people. He was, however, nowise dis- tinguished as a preacher, being accustomed "from a dis- trust in his own powers," as Stewart puts it, "to preach the sermons of Dr Tillotson and of Dr Evans." The greater part of his time was given to study; and, insti- gated by the publication of Hume's treatise, he now turned his chief attention to philosophy, and in particular to the theory of external perception. His first publica- tion, however, which dealt with a question of philosophical

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method suggested by the reading of Hutcheson, was more nearly allied to his mathematical studies. The '" Essay on Quantity, occasioned by reading a Treatise in which Simple and Compound Ratios are applied to Virtue and Merit," denies that a mathematical treatment of moral subjects is possible. The essay appeared in the 7'ransac- tions of the Royal Society for the year 1748. Before this, in 1740, Reid had married a cousin of his own, the daughter of a London physician. In 1752 the professors of King's College, Aberdeen, elected him to the chair of philosophy, which he held for the next twelve years. The foundation of the Aberdeen Philosophical Society, which numbered among its members Canipbell, Beattie, Gerard, and Dr John Gregory, was mainly owing to the exertions of Reid, who was secretary for the first year (1758). Many of the subjects of discussion were drawn from Hume's speculations ; and during the last years of his stay in Aberdeen Reid propounded his new point of view in several papers read before the society. Thus we find from the minutes that on the 13th and 26th of July 1758 Mr Reid "handled" the following questions :— "Are the objects of the human mind properly divided into impressions and ideas? And must every idea be a copy of a preceding impression?" The reply to Hume which these titles foreshadow was embodied by Reid in his Enguiry into the Human Mind on the Principles of Common Sense, published in 1764. The Enquiry does not go beyond an analysis of sense perception, and is therefore more limited in its scope than the later Essays; but if the latter are sometimes more mature, there is more freshness about the earlier work. The same year saw Reid's removal from Aberdeen to the professorship of moral philosophy in the university of Glasgow, where he succeeded Adam Smith. This position he continued to hold till 1781, when he resigned his chair in order to give his undivided energies to completing a systematic exposition of his philosophy. As a public teacher, Reid did not possess the eloquence and charm of manner which afterwards characterized both Stewart and Brown. Stewart's account of his lecturing, which may be pre- sumed to be favourable, mentions only the "silent and respectful attention" which was accorded to "the sim- plicity and perspicuity of his style" and "the gravity and authority of his character." Reid's philosophical influence was mainly exerted through his writings, and, at second hand, through the eloquent treatment which his doctrines received at the hands of Dugald Stewart, and the learning which Hamilton subsequently devoted to their

elucidation. The Essays on the Intellectual Powers of Man appeared in 1785, and their ethical complement, the Lssays on the Active Powers of the Human Mind, in 1788. These, with an account of Aristotle's Logic appended to Lord Kames's Sketches of the History of Man (1774), conclude the list of works published in Reid's life- time. Hamilton's edition of Reid also contains an account of the university of Glasgow and a selection of Reid's letters, chiefly addressed to his Aberdeen friends the Skenes, to Lord Kames, and to Dr James Gregory. .With the two last-named he discusses the materialism of Priestley and the theory of necessitarianism. He reverted in his old age to the mathematical pursuits of his earlier years, and his ardour for knowledge of every kind remained fresh to the last. But in 1792 the serenity which marked the concluding years of his life was clouded by the death of his wife. All the children of their marriage except one daughter had died many years before. In other respects Reid's life pursued its equable and uneventful course till within a few weeks of his death, which took place on the 7th October 1796.

The key to Reid's whole philosophy is to be found in

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his revulsion from the sceptical conclusions of Hume. In several passages of his writings he expressly dates his philosophical awakening from the appearance of the Treatise of Human Nature. "1 acknowledge," he says in the dedication of the Znquiry, "that I never thought of calling in question the principles commonly received with regard to the human understanding until the Treatise of Human Nature was published in the year 1739. The ingenious author of that treatise upon the principles of Locke—who was no sceptic—hath built a system of scepticism which leaves no ground to believe any one thing rather than its contrary. His reasoning appeared to me to be just; there was, therefore, a necessity to call in question the principles upon which it was founded, or to admit the conclusion." Reid thus takes Hume's scepticism as, on its own showing, a reductio ad impossibile of accepted philosophical principles, and refuses, accordingly, to separate Hume from his intellec- tual progenitors. From its origin in Descartes and onwards through Locke and Berkeley, modern philosophy carried with it, Reid contends, the germ of scepticism. That

scepticism, “inlaid in it and reared along with it,” Hume did but bring to light. Embracing the whole philosophic movement under the name of “ the Cartesian system,” Reid detects its mp@rov Weddos in the unproved assumption shared by these thinkers “that all the objects of my knowledge are ideas in my own mind.” ‘This doctrine or hypothesis he usually speaks of as “the ideal system 2 or “the theory of ideas”; and to it he opposes his own analysis of the act of perception. In view of the results of this analysis, Reid’s theory (and the theory of Scottish philosophy generally) has been dubbed natural realism or natural dualism in contrast to theories like subjective idealism and materialism or to the cosmothetic idealism or hypothetical dualism of the majority of philosophers. But this is unduly to narrow the scope of Scottish philosophy, which does not exhaust itself, as it is sometimes supposed to do, in uncritically reasserting the independent existence of matter and its immediate presence to mind. The real significance of Reid’s doctrine lies in its attack upon the principles which Hume explicitly lays down as the alpha and the omega of his system, viz., the principles that all our perceptions are distinct existences, and that the mind never perceives any real connexion among distinct exist- ences (cf. Appendix to the third volume of the Treatise, 1740). It is here that the danger of “the ideal system 4 really lies—in its reduction of reality to “particular perceptions,” momentary or “ perishing ” existences essen- tially unconnected with each other. If the ultimate elements of experience are unrelated units or sense- atoms, called impressions, then it only remains to be shown, as Hume attempts to show, how the «dlusion of supposed necessary connexion arises. But Reid meets this scepticism by combating the principle on which it is based. In logical language, he denies the actuality of the abstract particular: unrelated impressionsand ideasnowhere exist. The unit of knowledge is not an isolated impression but a judgment; and in such a judgment is contained, even initially, the reference both to a permanent subject and to a permanent world of thought, and, implied in these, such judgments, for example, as those of existence, substance, cause and effect. Such principles are not derived from sensation, but are “suggested ” on occasion of sensation, in such a way as to constitute the necessary conditions of our having perceptive experience at all. Thus we do not start with “ideas,” and afterwards refer them to objects; we are never restricted to our own minds, but are from the first immediately

related to a permanent world. Reid has a variety of names for the principles which, by their presence, lift us out of subjec-

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tivity into perception. He calls them "natural judgments," "natural suggestions," "judgments of nature," "judg- ments immediately inspired by our constitution," " prin- ciples of our nature," "first principles," "principles of common sense." The last designation, which became the current one, was undoubtedly unfortunate, and hasconveyed to many a false impression of Scottish philosophy. It has been understood as if Reid had merely appealed from the reasoned conclusions of philosophers to the unreasoned beliefs of common life. The tirades of men like Beattie and Oswald, and many unguarded utterances of Reid himself, lent countenance to this notion. But Reid's actions are better than his words; his real mode of procedure is to redargue Hume's conclusions by a refutation of the premises inherited by him from his predecessors. For the rest, as regards the question of nomenclature, Reid everywhere unites common sense and reason, making the former "only another name for one branch or degree of reason." Reason, as judging of things self-evident, is called common-sense to distinguish it from ratiocination or reasoning. And in regard to Reid's favourite proof of the principles in question by reference to "the consent of ages and nations, of the learned and unlearned," it is only fair to observe that this argument assumes a much more scientific form in the Hssays, where it is almost identified with an appeal to "the structure and grammar of all languages." "The structure of all languages," he says, "is grounded upon common sense." To take but one example, "the distinction between sen- sible qualities and the substance to which they belong, and between thought and the mind that thinks, is not the invention of philosophers ; it is found in the structure of all languages, and therefore must be common to all men who speak with understanding " (Hamilton's feid, pp. 229 and

454).

The principles which Reid insists upon as everywhere present in experience evidently correspond pretty closely to the Kantian categories and the unity of apperception. Similarly, Reid's assertion of the essential

distinction between space or extension and feeling or any succession of feelings may be compared with Kant's doctrine in the Zisthetic. Space," he says, "whether tangible or visible, is not so properly an object [Kant's "matter"] as a neces- sary concomitant of the objects both of sight and touch," Like Kant, too, Reid finds in space the source of a necessity which sense, as sense, cannot give (Hamilton's Reid, 323). In the substance of their answer to Hume, the two philosophers have therefore much in common. But Reid lacked the art to give due impressiveness to the important advance which his positions really contain. Although at times he states his principles with a wonder- ful degree of breadth and insight, he mars the total effect by frequent looseness of statement, and by the amount of irrelevant psychological matter with which they are overlaid. And, if Kant was overridden by a love of formal completeness and symmetry, Reid's extreme indifference to form and system is an even more danger- ous defect in a phildsopher. It has also to be admitted that the principles frequently appear in Reid more as matter of assertion than as demonstrated necessities for the constitution of experience. The transcendental deduc- tion, or proof from the possibility of experience in general, which forms the vital centre of the Kantian schenie, is wanting in Reid; or, at all events, if the spirit of the proof is occasionally present, it is nowhere adequately stated andemphasized. But, when these defects are acknowledged, Reid's insistence on judgment as the unit of knowledge and his sharp distinction between sensation and perception must still be recognized as philosophical results of the highest importance. They embody the only possible answer to

Hume's sceptical dissolution of knowledge. Reid's theory of sensation, indeed, deserves more attention than has been generally bestowed upon it. According to this theory, sensations are not the objects of our perception, not even, as Kant maintained, the "matter" of our perceptions on which the "form" is superinduced ; they are merely the "signs" which introduce us to the knowledge of real objects. The latter "are presented to the mind" by means of, or on occasion of, certain corresponding sensa- tions ; but the sensation and the perception "appear upon accurate reflexion not only to be different things, but as unlike as pain is to the point of a sword"

(Hamilton's Reid, 122). Sensation, it might be expressed, is the condition of perception, but there is no sort of community between the two. They are distinct in kind, and therefore the possibility of deriving the one from the other— of melting down the real world into subjective sensations —is once for all shut out. Reid's position here enables him to escape also from the phenomenalism of the Kantian theory. Inasmuch as the permanent objects presented to us in perception are not in any sense a manipulation of

subjective sensations, there is not even an apparent |

warrant for branding them as "merely" phenomenal. They are real in the full sense of the word; we know the world as it really exists.

The relativism or phenomenalism which Hamilton afterwards adopted from Kant and sought to engraft upon Scottish philosophy is thus wholly absent from the original Scottish doctrine. One or two passages may certainly be quoted from Reid in which he asserts that we know only properties of things and are ignorant of their essence. But the exact meaning which he attaches to such expressions is not quite clear; and they occur, moreover, only incidentally and with the air of current phrases mechanically repeated. In Dugald Stewart, however, the merely qualitative nature of our knowledge is consciously emphasized, and made the foundation of philosophical arguments ; so that Stewart in this respect paves the way for the more thoroughgoing philosophy of nescience elaborated by Hamilton. But since Hamilton's time the most typical Scottish thinkers have repudiated his relativistic doctrine, and returned to the original tradition of the school.

Authorities.—For the life, the Memoir by Dugald Stewart, prefixcd to Hamilton's edition of Reid's works, may be consulted, along with the account given by Dr M'Cosh in his Scottish Philo- sophy (1875). The complete edition of the works by Sir William Hamilton, published in two volumes with notes and supplement- ary dissertations by the editor (6th ed. 1863), has superseded all others. (A. SE.)

REID, Sir Witti1am (1797-1858), administrator and man of science, was born in 1797 at the manse of Kin- glassie, Fifeshire, Scotland, and

entered the army in 1809 as a lieutenant of royal engineers. He saw active service in the Peninsula under Wellington, and afterwards took part in the bombardment of Algiers in 1816. It was while governor of Bermuda that in 1838 he published the work by which he is now known, Zhe Law of Storms, which obtained a wide popularity and did good service in furthering the progress of this department of meteorology. In 1851 he was chairman of the executive committee of the Great Exhibition; on the completion of the work he was made a K.C.B. and appointed governor of Malta. He died in October 1858, shortly after his return to England.

REIGATE, a market town and municipal borough of Surrey, is situated at the head of the long valley of Holms- dale Hollow, on three railway lines, 23 miles south of London. It consists principally of one long street, with surrounding houses and villas inhabited chiefly by persons having their occupations in London. Of the old castle, supposed to have been built before the Conquest, to com-

mand the pass through the valley, there only remains the entrance to a cave beneath, 150 feet long and from 10 to 12 feet high, excavated in the sand, which the barons used as a guardroom. The grounds have been laid out as a public garden. Near the market house is the site of an ancient chapel dedicated to Thomas & Becket. In the chancel of the parish church of St Mary, a building rang- ing from Transition Norman to Perpendicular, which dates from the beginning of the reign of Henry VIL., were buried Archbishop Ussher and Lord Howard, the commander of the English navy against the Spanish Armada. Above the vestry there is a library containing some choice manu- scripts and rare books. The grammar school was founded in 1675. Among the other public buildings are the town- hall, the public hall, the market-hall, and the working nien's institute. The town has some agricultural trade, and in the neighbourhood are quarries for freestone, hearth- stone, and white sand. The area of the municipal borough is 6015 acres, with a population in 1871 of 15,916, and in 1881 of 18,662.

In Domesday the town was called " Churchfelle," or '' the church in the field," and afterwards it was called Churchfield in Reigate, the earlier

reading of the latter name being " Ridgegate." The castle was taken by Louis the Dauphin in the reign of John. In the time of the Confessor the manor belonged to his queen Edith. A market was granted by Edward III. The town returned two members to parliament from the reign of Edward I. to the reign of William IV., and one from 1832 to 1867, when it was disfranchised for corrupt practices.

REIMARUS, Hermann Samuer (1694-1768), known to history chiefly as the author of the Wolfenbiittel Fragments, was born at Hamburg, December 22, 1694. His father, the son of a clergyman and married into a patrician family of that city, was one of the masters in the Johanneum college, a good scholar and excellent teacher. Until his twelfth year the son received his education almost entirely from his father. He passed from his father's tuition into the class of the famous scholar Johann Albrecht Fabricius, whose son-in-law he subsequently became. In his twentieth year he entered the university of Jena, where he studied theology, ancient languages, and philosophy. After making a tour in Holland and England (1720), he became privat-docent in the university of Wittenberg ; and in 1723 he accepted the post of rector of the high. school at Wismar in Mecklen- burg, which he exchanged four years afterwards for that of professor of Hebrew and Oriental languages in the high school of his native city. This post he held till his death, though offers of more lucrative and distinguished positions were at various times made to him. His professional duties were but light, and he employed his ample leisure in the study of philology, mathematics, philosophy, history, political economy, natural science, and natural history, for which he made expensive collections. Philo- sophy and theology, however, became with his advancing years the chief subjects of pursuit. From 1744 to 1768 he had in hand the theological work from which Lessing published the notorious Fragments in1774-78. Reimarus was held by his contemporaries in the highest esteem as a scholar, a thinker, an author, and a man. His house was the centre of the highest culture of Hamburg, and a monument of his influence in that city still remains in the Haus der patriotischen Gesellschaft, where the learned and artistic societies partly founded by him still meet. His wife bore him seven children, three only of whom lived to grow up, namely his only surviving son—the distinguished physician Johann Albrecht Heinrich—and two daughters, one of them

being Elise, Lessing's friend and correspondent. Ten days before his death he invited a select number of friends to dine with him, and, with his wonted cheerfulness and amiability, declared to them solemnly that this was his

farewell meal with them. 'Three days after he was taken seriously ill, and died March 1, 1768.

Reimarus's reputation as a classical and historical scholar rests on the valuable edition of Dio Cassius (1750-52) which he prepared from the materials collected by his father-in-law, J. A. Fabricius. In the department of philosophy he published a work on logic (Vernunftlehre als Anweisung zum richtigen Gebrauche der Vernunft, 1756, fifth edition 1790), and two very popular books bearing on the great religious questions of the day. The first of these works was a collection of essays on the principal truths of natural religion (Abhandlungen von den vornehmst- en Wahrheiten der natiirlichen Religion, 1754, 6th ed. 1791); the second (Betrachtungen tiber die Kunsttriebe der There, 1762, 4th ed. 1798) dealt with one particular branch of the same subject. In these works he appears as a powerful opponent of French materialism and Spinoza's pantheism, a zealous teleologist and able wielder of the argument from design. His philosophical position is essentially that of Christian Wolff. But it is the work (carefully kept back during his lifetime, strangely enough) fron which Lessing published certain chapters after the author's death with which his name is most widely asso- ciated. Lessing's relation to this work has been stated in the article Lzssinc. Its title in the MS. is Apologie oder Schuteschrift fiir die verniinftigen Verehrer Gottes. The original MS. isin the Hamburg town library; a copy was made for the university library of Gottingen, 1814, and other copies are known to exist. In addition to the seven fragments published by Lessing, a second portion of the work was issued in 1787 by C. A. E. Schmidt (a pseudo- nym), under the title Uebrige noch ungedruckte Werke des Wolfenbiittelschen Fragmentisten, and a further portion by D. W. Klose in Mtedner's Zeitschrift fiir historische Theo- logie, 1850-52. Two of the five books of the first part and the whole of the second part, as well as appendices on

the canon, remain still, and will probably always remain, unprinted. But D. F. Strauss has given an exhaustive analysis of the whole work in his book on Reimarus.

The standpoint of Reimarus in his Apologie is that of pure natu- ralistic deism. Miracles and mysteries are denied, and natural religion is put forward as the absolute contradiction of revealed. The essential truths of the former are the existence of a wise aud good Creator and the doctrine of the immortality of the soul. These truths are discoverable by reason, and are such as can constitute the basis of a universal and rational religion. A revealed religion could never obtain universality, as it could never be made intelligible and credible to all men. Even supposing its possibility, the Bible does not present such a revelation. It abounds in error as to matters of fact, contradicts human experience, reason, and morals, and is one tissue of folly, deceit, enthusiasm, selfishness, and crime. Moreover, it is not a doctrinal compendium, or catechism, which a revelation would have tobe. What the Old Testament says of the worship of God is little, and that little worthless, while its writers are unacquainted with the second fundamental truth of religion, the immortality of the soul. The design of the writers of the New Testament, as well as that of Jesus, was not to teach true rational religion, but to serve their own selfish ambitions, in pro- moting which Reimarus makes them exhibit an inconceivable combination of conscious frand and enthusiasm. With all his acuteness as a rationalistic critic, and the destructive force of his attack upon the old orthodox conception of the nature of the Bible and revelation, Reimarus must be regarded simply as the classical representative of rationalism in its absolute inability to form any remotely just conception of God, religion, revelation, the Bible, and Christianity. His Apologie is the historical monument to the in- capacity of rationalism with regard to philosophy, religion, and true historical and literary criticism. By the higher and profounder ideas and historical insight of Lessing, Herder, Semler, Kant, and Schleiermacher, his entire position was rendered antiquated, and the permanently valid portions of his criticism of the Bible are of value ouly as destructive of a theory, now outlived, of it and religion. But as a learned, acute, and logical assailant of that theory he

must be honoured with a place amougst the pioneers of truer views of both.

See the " Fragments" as published by Lessing, reprinted in vol. xv. of Les- sing's Werke, Hempel's edition; D. F. Strauss, Hermann Samuel Reimarus und seine Schutzschrift fiir die verniinftigen Verehrer Gottes, 1861, 2d. ed. 1877; Rev.

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Charles Voysey, Fragments from Iietmarus, London, 1879 (a translation of the life of Reimarus by Strauss, with the second part of the seventh fragment, on the " Object of Jesus and his Disciples"); the Zives of Lessing by Danzel and G. E. Guhrauer, Sime, and Zimmern ; Kuno Fischer, Geschichte der neuern Philosophie, vol. ii. pp. 759-772, 2d ed. 1867; Zeller, Geschichte der deutschen Philosophie, 2d ed. 1875, pp. 243-6.

REIMS. See RHErms.

REINAUD, JosErx Toussaint (1795-1867), a distin- guished French Orientalist, was born in 1795 at Lambese, Bouches du Rhéne, and began to study for the church, but, being drawn towards Eastern learning, he came to Paris in 1815 and became a pupil of Silvestrede Sacy. In 1818 and the following year he was at Rome as an attaché to the French minister, and studied under the Maronites of the Propaganda, but gave special attention to Mohammedan coins. In 1824 he entered the department of Oriental MSS. in the Royal Library at Paris, and in 1838, on the death of De Sacy, he succeeded to his chair in the school of living Oriental languages. In 1847 he became presi- dent of the Société Asiatique, and in 1858 conservator of Oriental MSS. in the Imperial Library. In all these func- tions Reinaud maintained the great reputation of the French Oriental school, and he also did good service with his pen. His first important work was his classical descrip- tion of the collections of the Duc de Blacas (1828). To history he contributed an essay on the Arab invasions of France, Savoy, Piedmont, and Switzerland (1836), and various collections for the period of the crusades; he edited (1840) and in part translated (1848) the geography of Abulfeda; to him too is due a

useful edition of the very curious records of early Arabic intercourse with China of which Renaudot had given but an imperfect translation (Relation des Voyages, &c., 1845) and various other essays illustrating the ancient and medieval geography of the East. His chief quality was indefatigable industry.

REINDEER. See DEER.

REINEKE VOS. See German LITERATURE, vol. x. pp. 522, 527, and RoMANCE.

REINHOLD, Kart Leronwarp (1758-1823), who played a considerable part in the early spread and develop- ment of the Kantian philosophy, was born at Vienna in 1758. At the age of fourteen he entered the Jesuit College of St Anna with the intention of becoming a priest of the order. The order was dissolved by the pope in the following year; but young Reinhold, being full of Catholic and monastic zeal, joined a similar college of the order of St Barnabas in 1774. There he remained nine years, before the end of which his scientific and philosophic studies had completely estranged him from the life and aims of the cloister. In 1783 he fled to North Germany, and settled in Weimar, where he became Wieland's col- laborateur on the German Mercury, and eventually his son-in-law. In the German Mercury he published, in the years 1786-87, his Briefe tiber die Kantische Philosophie, which, by their clear and eloquent exposition were most important in making Kant known to a wider circle of readers. Reinhold himself had read the Critique five times without a single ray of light; in the end it was the ethical side of the system by which he found him- self attracted and convinced. As a result of the Letters, Reinhold at once received a call to the neighbouring university of Jena, where he taught from 1787 to 1794, and largely contributed to make Jena, after Kénigsberg, the second home of the Kantian philosophy. In 1789 he published his chief work, the Versuch einer neuen Theorie des menschlichen Vorstellungsvermigens, in which he attempted to simplify the Kantian theory and make it more of a unity. In 1794 he accepted a call to Kiel, but his departure from Jena marks the zenith of his reputa- tion. He taught at Kiel till his death in 1823, but his independent activity was at an end. His essentially

receptive and impressible nature yielded first to the XX. —- 45

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powerful impulse of Fichte, and then gravitated, on grounds of religious feeling, towards Jacobi, whom he in turn deserted for the so-called "rational idealism" of Bardili.

Reinhold's historical importance belongs entirely to his earlier activity. The development of the Kantian standpoint contained in the New Theory of the Human Faculty of Ideas (1789), and in the Fundament des philosophischen Wissens (1791), was called by its author "Elemeutarphilosophie." Endeavouring to build up the system out of simpler elements, Reinhold starts from the mere fact of consciousness of the existence of mental states (" Vorstel- lungen" or ideas). Every idea carries with it the reference to a subject, whose idea it is, and to an object, of which it is the idca. This double reference explains why every idea consists, as Kant inaintained, of "form" and "matter." In its "form" lies the reference to the subject, in its "inatter" the reference to an object. Hence, too, we see why the thing-in-itself, though neces- sarily existent, is at the same time necessarily unknowable, seeing that all knowledge implies a subject-derived element. 'The rest of Reinhold's emendations to Kant are little more than suggested improvements in terminology.

REISKE, Jonann Jacop (1716-1774), scholar and physician, was born 25th December 1716, in the little town of Zérbig in Electoral Saxony. From the Waisen- haus at Halle he passed in 1733 to the university of Leipsic, and there spent five years. He lived alone with- out teacher or friend, heard no lectures, but studied con- tinually without order or aim. He tried to find his own way in Greek literature, to which Gernian schools then gave little attention; but, as he had not mastered the grammar, he soon found this a sore task and took up Arabic. He was very poor, having almost nothing beyond his allowance, which for the five years was only two hundred thalers. But everything of which he could cheat his appetite was spent on Arabic books, and when he had read all that was then printed he thirsted for manuscripts, and in March 1738 started on foot for Hamburg, joyous though totally unprovided, on his way to Leyden and the treasures of the Warnerianum. At Hamburg he got

some money and letters of recommendation from the Hebraist Wolf, and took ship to Amsterdam. Here D'Orville, to whom he had an introduction, proposed to retain him as his amanuensis at a salary of six hundred guilders. Reiske refused, though he thought the offer very generous ; he did not want money, he wanted manuscripts. But when he reached Leyden (6th June 1738) he found that the lectures were over for the term and that the MSS. were not open to him. His money too was gone, and he passed a miserable summer. By and by things mended: D'Orville and A. Schultens helped him to private teaching and reading for the press, by which he was able to live, and his great power of work enabled him still to find time enough for his own studies. He heard the lectures of A. Schultens, and practised himself in Arabic with his son J. J. Schultens. Through Schultens too he got at Arabic MSS., and was even allowed sub rosa to take them home with him. Ultimately he seems to have got free access to the collec- tion, which he recatalogued—the work of almost a whole summer, for which the curators rewarded him with nine guilders.

In spite of his hardships Reiske's first years in Leyden were not unhappy, till he got into serious trouble by intro- ducing divers emendations of his own into the second edition of Burmann's Petronius, which he had to see through the press. His patrons withdrew from him, and his chance of perhaps becoming professor was gone. D'Orville indeed soon came round, for he could not do without Reiske, who did work of which his patron, after dressing it up in his own style, took the credit. But A. Schultens was never the same as before to him; Reiske indeed was too independent, and hurt him by his open criticisms of his master's way of making Arabic mainly a handinaid of Hebrew. Reiske, however, himself admits that

Schultens, though he had reason to complain of his scholar's want of respect towards him, always behaved honourably to him. In 1742 by Schultens's advice Reiske took up medicine as a study by which he might hope to live if he could not do so by philology, and at medicine he worked hard for four years, still continuing the tasks that brought him bread as well as his Greek and Arabic studies. In 1746 he graduated as M.D., the

fees being remitted at Schultens's intercession. It was Schultens too who con- quered the difficulties opposed to his graduation at the last moment by the faculty of theology on the ground that some of his theses had a materialistic ring. On June 10, 1746, he left Holland and settled in Leipsic, where he hoped to get medical practice.

But his shy proud nature was not fitted to gain patients, and the Leipsic doctors would not recommend one who was not a Leipsic graduate. In 1747 an Arabic dedication to the electoral prince of Saxony got him the title of professor, but did not better his circumstances. Neither the faculty of arts nor that of medicine was willing to admit him among them, and he never delivered a course of lectures. He had still to go on doing literary task-work, but his labour was much worse paid in Leipsic than in Leyden. Still he could have lived and sent his old mother, as his custom was, a yearly present of a piece of leather to be sold in retail if he had been a better manager. But, carc- less for the morrow, he was always printing at his own cost great books which found no buyers. And so for many years he lived in such misery that he often did not know where to find bread to still his hunger. His academical colleagues were hostile; and Ernesti, under a show of friend- ship, secretly hindered his promotion. His slashing and unsparing reviews made bad blood with the pillars of the university.

At length in 1758 the magistrates of Leipsic rescued him from his misery by giving him the rectorate of St Nicolai, and, though he still made no way with the leading men of the university and suffered from the hostility of men like Ruhnken and J. D. Michaelis, he was compensated for this by the esteem of Frederick the Great, of Lessing, Karsten Niebuhr, and many foreign scholars. The last decade of his life was made cheerful by his marriage with Ernestine Miller, who shared all his interests and learned Greek to help him with collations. In proof of his gratitude her portrait stands beside his in the first volume of the Oratores Grect. Reiske died August 14, 1774, and his MS. remains passed, through Lessing's mediation, to the Danish minister Suhm, and are now in the Copen- hagen library.

Reiske certainly surpassed all his predecessors in the range and quality of his knowledge of Arabic literature. It was the history, the realia of the literature, that always interested him ; he did not care for Arabic poetry as such, and the then much praised Hariri seemed to him a grammatical pedant. He read the poets for their bearing on history, and cared less for their verses than for such scholia as supplied historical notices. Thus for example the scholia on Jarir furnished him with a remarkable notice of the prevalence of Buddhist doctrine and asceticism in 'Irak under the Omayyads. In the Adnotationes Historice to his Abulfeda (Abulf. Annales Moslemici, 5 vols., Copenhagen, 1789-91) he collected a veritable treasure of sound and original research ; he knew the Byzantine writers as thoroughly as the Arabic authors, and was alike at home in modern works of travel in all languages and in ancient and medieval authorities. He was interested too in numismatics, and his letters on Arabic coinage (in Eichhorn's Nepertorium, vols. ix.—xi.) form, according to De Sacy, the basis of that branch of study. To comprehensive knowledge and very wide reading he added a sound historical judgment. He was not, like Schultens, deceived by the pretended antiquity of the Yemenite Kasidas.1_ Errors no doubt he inade, as in the attempt to ascertain the date of the breach of the dam of Marib.

Though Abulfeda as a late epitomator did not afford a starting-

1 « Animadvers. erities in Hamze hist. regni Joctanidarum," in Eichhorn's Afon. Ant. Hist. Ar., 1775.

point for methodical study of the sources, Reiske's edition with his version and notes certainly laid the foundation for research in Arabie history. The foundation of Arabie philology, however, was laid not by him but by De Saey. Reiske's linguistic knowledge was great, but he used it only to understand his authors ; he had no feeling for form, for language as language, or for metre. He was diligent in lexieographie eolleetions, but cared nothing for etymology or for any speculations that transeended the historical data before him. This narrowness of interest was the eounterpart of his hatred for pedantry and strong love of reality. His

greed for historieal facets made his studies a sort of vast foray in Arabic literature, but with this he is not to be reproached.

In Leipsie Reiske worked mainly at Greek, though he continued to draw on his Arabie stores accumulated in Leyden. Yet his merit as an Arabist was sooner recognized than the value of his Greek work, partly perhaps beeause his talents were really at their best in dealing with a literature whieh suffers little injustice through laek of interest in its form, but mainly because his eon- temporaries in Greek learning were narrow and had not the judg- ment to appreeiate him. Reiske the Greek seholar has been rightly valued only in reeent years, and it is now reeognized that he was the first German sinee Sylburg who had a living knowledge of the Greek tongue. His reputation does not rest on his uumer- ous editions, often hasty or even made to booksellers' orders. The text was never his main eoneern, and he often let received readings stand against his own judgment. The valuable matter lies in his remarks, especially his eonjectures. He himself designates the Animadversationes in Seriptores Greecos as flos ingenit swt, and in truth these thin booklets outweigh his big editions. Closely following the author's thought he removes obstaeles whenever he meets them, but he is so steeped in the language and thinks so truly like a Greek that the diffieulties he feels often seem to us to lie in mere points of style. His eritieism is empirical and uumethodie, based on immense and careful reading, and applied only when he feels a diffieulty ; and he is most sueeessful when he has a large mass of tolerably homogeneous literature to lean on, whilst on isolated points he is often at a loss. Phoneties, dialeets, orthography were indifferent to him; metre he did not understand. His eorreetions are often hasty and false, but a surprisingly large proportion of them have sinee received eonfirmation from MSS. And, though his merits as a Greeian lie mainly in his eonjeetures, his realism is felt in this sphere also; his German translations especially show more freedom and practical insight, more feeling for aetual life, than is eommon with the seholars of that age.}

Reiske was essentially a pioneer, who neither left any eomplete performanee behind him nor marked out for others a sharply defined niethod of researeh. This was partly due to his unhappy eireumstanees, but mainly to his passionate interest in all history and all letters, whieh

never allowed him to linger in any one field. The son of the Zérbig tanner, driven by a natural instinet to Arabic lore, devoured by eager desire to view the unknown treasures of distant ages and lands, is an attraetive figure amidst the pedants of learned Germany as it then was. Reiske was not amiable, but he was a real character—a eharaeter, too, sustained by genuine piety when the deep waters threatened to close over his head.

For a list of Reiske's writings see Meusel, xi. 192 sg. His chief Arabie works (all posthumous) have been mentioned above. In Greek letters his chief works are Constantint Porphyrogeniti libri II. de ceremoniis aule Byzant., vols. i. i1., Leipsic, 1751-66, vol. iii., Bunn, 1829; Animadv. ad Grexcos auctores,5 vols., Leipsie, 1751-66 (the rest lies unprinted at Copenhagen); Oratorum Gree, que supersunt, 8 vols., Leipsic, 1770-73; App. crit. ad Demosthenem, 3 vols., tb., 1774-75; Maximus Tyr., ib., 1774; Plutarchus,11 vols, ib., 1774-79; Dionys Italic., 6 vols., tb., 1774-77; Libanius, 4 vols., Altenburg, 1784-97. Various reviews in the Acta Eruditorum and Zuverl. Nachrichten are characteristic and worth reading.

Compare D. Johann Jacob Reiskens von thm selbst aufgesetzte Lebensbeschreibung, Leipsic, 1783. (J. WE.)

RELAND, Aprian, a meritorious Dutch Orientalist, was born at Ryp, July 17, 1676, studied at Utrecht and Leyden and successively professed Oriental languages with great success at Harderwijk (1699) and Utrecht (1701). In the latter chair, from which he also lectured on sacred antiquities, he remained till he died of small-pox February oy 17 ie:

Reland's most important work is Palestina ex veteribus monu- mentis tllustrata, Utreeht, 1714, an admirable eolleetion whieh is still the most valuable book on the historieal geography of the Holy Land. His Antiquitates saere veterum Hebreorum, learned, elear, and eompact, is also a most useful book; and his other writings and eolleetions—for he reprinted many eurious and useful traets of other seholars on Biblieal and Rabbinieal topics—all show judg- ment as well as knowledge. His works are enumerated by Burman, Traj. Erud., p. 296 sq.

RELICS. Relics, in what may be called their merely human and historic aspect, appeal to many of the most

1 For this estimate of Reiske as a Greek seholar the writer is indebted to Prof. U. v. Wilamowitz-Moellendorff.

obvious and most deeply seated principles of human nature —to that power of connexion with the past which has been justly called one of the divinest elements of our being, to the law of association, and to that love of something like ocular testimony which so notoriously affects the mind more forcibly than "the hearing of the ear." The Russian general Suwaroff, "albeit unused to the melting mood," is reported to have been deeply touched by the relics of departed greatness laid bare by the discovery of a palace in the Crimea which had been built by Mithradates. Many of those who were present at the opening of the tomb of Robert the Bruce at Dunfermline were quite unmanned at the sight of the skull that had toiled for Scot- land's weal, and the arm that had struck down Sir Henry de Bohun on the eve of the battle of Bannockburn ; and at the funeral of the duke of Wellington, in 1852, the pathetic part of the processional ceremonial was found to lie in the riderless charger, bearing relics of the deceased warrior. In 1802 Napoleon Bonaparte, while making his preparations at Boulogne for the invasion of England, pro- fessed to have found a coin of Julius Ceesar and a weapon which had belonged to one of the soldiers of William the Conqueror. Napoleon had a profound belief in the power of the imagination. It is needless to dwell upon his object in ostentatiously announcing these discoveries.

It is obvious, however, that, apart from designs such as that of Napoleon, pretended relics, sometimes associated with real sometimes with legendary events, would be sure to spring from human credulity, from love of the marvel- lous, and from hopes of gain. Perhaps all settled Govern- nients exhibit relics, such as regalia and the like, of which many are perfectly authentic, while: some would not bear close examination. The same may be said of family treasures. We read of ancient Romans exhibiting curiosi- ties, such as fragments of the ship "Argo." Again, relics are apt to gather round a great name. The town of Lutterworth possessed an

ancient chair and a piece of a cope. Each became, despite of want of evidence, and indeed against evidence, associated with the name of Wickliffe.

It would be strange indeed if religion (which, alike in its good features and in its abuses, penetrates more deeply than anything else into the human heart) were found to be dissociated from relics. Probably all the more widely spread creeds claim some such material links with the past. Let it suffice to mention here the Ka'ba at Mecca, and the tooth of Buddha exhibited in Ceylon.

We turn to the pre-Christian and Christian dispensa- tions. The Old Testament contains allusions to relics too numerous to mention. We may refer to the language of the epistle to the Hebrews, which speaks of the holy of holies as containing the golden censer, and the ark of the covenant, wherein were the golden pot that had manna and Aaron's rod that budded and the tables of the covenant (Heb. ix. 4, 9; Exod. xxv. 10, 16; Num. xvii. 10). These were believed to have been lost at the destruction of the temple by Nebuchadnezzar. We also read of the sword of Goliath being preserved as something sacred (1 Sam. xxi. 9).

Certainly, however, in one respect, perhaps in two (though of seemingly opposite tendencies), Judaism stands in this matter distinguished from contemporary religions. Nowhere else should we read of a valued and most interest- ing relic being destroyed by a devout ruler because it was found to have been abused and to have led to idolatry, as was done to the brazen serpent by Hezekiah (2 Kings xviu. 4). But it may also be questioned whether the records of any other people contain an account of a miracle wrought by the relics of a deceased prophet. We may indeed read of a miracle wrqught in heathendom for the defence of

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innocence unjustly accused, and we also find the possession of the bones of a departed hero made the condition of a successful war.! But the second book of Kings relates the revival of a dead man by the bones of Elisha,—a narrative rendered the more remarkable by the fact that, as a

rule, the contact with a corpse, a bone, or a grave made a man unclean for seven days (Num. xix. 11-22).

The New Testament does not relate any case precisely similar to that of Elisha. The remains of the protomartyr Stephen are simply committed to the tomb, with much lamentation by devout men (Acts viii. 2); and of the funeral of the first martyred apostle, James, we have no record. It is not, however, to be denied that the book of Acts tells of miracles of healing resembling that of her who was cured by the touch of our Lord's garment (Matt. ix. 20-22). Even the shadow of Peter, it is implied, may have healed the sick; and handkerchiefs or aprons which had been worn by Paul relieved not only the diseased but the possessed (Acts v. 15; xix. 12).

To a great extent the homage paid to the tombs and the remains of patriot, sage, or bard was transferred, at an early period in the history of the Christian church, to those of its own heroes, more especially to those of martyrs. Sucha result was natural, and almost inevitable. The intercession of the departed on behalf of the living was everywhere recognized, and that of martyrs naturally believed to be especially powerful. But it was further inferred from the instance of Elisha and from the passages of the book of Acts already cited that it might please the Alinighty to repeat similar manifestations of miraculous power. Whether the fathers who maintain this view would have written so freely if they could have foreseen the abuses which were to arise may perhaps be doubted.? 3ut three or four features in the history of early Christen- dom conspired to spread the cultus of relics. These were the heathen persecutions, the rise of Gnosticism, the strong and exaggerated feeling about possession and witchcraft, -———to which may probably be added the sense of a sort of education connected with visible and tangible links of connexion with the past.

The way in which these elements of the case would operate is tolerably obvious. If, as at Lyons and Vienne, pagan persecutors burnt the ashes of the martyrs, and threw them into the Rhone, exulting in the idea that they were disproving one of the most important articles of the Christian creed, the resurrection of the body, with still more fervid zeal would the faithful seize every opportunity of honouring those remains which their opponents

sought to vilify. Then, again, the other great foe of early Christen- dom, the heresy of Gnosticism (often denounced as a more subtle and dangerous evil than the open hostility of heathendom), amidst all its varied forms was consistent in representing matter as something essentially evil. The counter teaching, implied in the central doctrine of the

1 We allude to the miracle claimed by two poets, Ovid (Fast., iv. 310) and Propertius (Hleg., iv. 14, 51), as also by Livy, Cicero, and Pliny, to have been wrought by Cybele on behalf of the Vestal Claudia, and to the oracular injunction from Delphi to the Spartans to find and carry with them the bones of Orestes as a condition of success against the men of Tegea (Herodotus, i. 67-68).

2 A set of passages is given by Petavius (De Dogmatibus Theologicis, "De Incarnatione," xiv. 11). It certainly includes most of the leading post-Nicene patristic names,—such as Eusebius and many fathers commonly honoured with the prefix of saint, as Gregory of Nazianzus, Gregory of Nyssa, Chrysostom, both the Cyrils, Ambrose, Jerome, and others. Of these St Jerome is the most extreme and vehement ; but this is accounted for, not only by the author's temperament, but by the fact of his writing against an opponent whom he specially dis- liked on personal as well as theological grounds (Contra Vigilantium liber unus). Later writers on the same side with Vigilantius are Claudius of Turin and Agobard of Lyons, but our limits forbid us to diseuss their views. Some sectaries (e.g., the Novatianists) appear to have been as anxious as their opponents to collect relics.

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Christian faith, the mystery of the incarnation, and in the sacraments, might seem to gain some aid from the venera- tion shown to what was regarded as another form of hallowed matter, the bodies of the saints or the material instruments of Christ's passion. And, thirdly, the dread of possession found some alleviation in the check to satanic malice which relics were believed to effect.

It is also conceivable that the interest created by such memorials might have its share in that education of the earlier Middle Ages which was so powerfully assisted by pilgrimages and by biographies. Guizot, in a well-known chapter of his Civilisation en France has dwelt largely on the value of even the legends of this period. He main- tains that, in a world full of violence, disorder, and oppression, the legends of the saints found food for some of the most powerful instincts and invincible needs of the human mind—that exaggeration of details, or even failure in material truth, did not prevent them from being a moral relief and a protest on behalf of many of the rights of man. Material memorials, or even supposed memorials, would certainly help to impress such stories upon the mind, as is the case with the facts and the legends of secular history. Leibnitz, among the large concessions in his Systema Theo- logicum to the Roman Catholic view of these questions, in some degree anticipates the language of Guizot concerning pious legends.

In any case, alike for good and for evil,—and it will be necessary to speak presently of the sadder aspects of the question,—relics from the 4th to the 16th century occupied a large space in the mind of Christendom. The word relics (reliquix, deiiyava) became almost restricted, in theological language, to the bodies (or parts of the bodies) of saints, or, as has been intimated, to memorials of Christ's passion, or instruments which had been used in the torture and execution of martyrs. Inquiries con- nected with their genuineness are, as is well known to students of ecclesiastical history, conspicuous in the life of the mother of Constantine, St Helena, who claimed to have discovered the true cross on which our Lord suffered, and in the career of St Ambrose at Milan. Once at least a really glorious series of campaigns, those of the emperor Heraclius against the

barbarian Avars and the Persians (622-628), is connected with a successful en- deavour to regain the cross (see Persia, vol. xviii. pp. 614-615). It is remarkable that the Persians are reported to have kept the cross in its case with the seals unbroken.

Thus far relics have been regarded as evidencing two marks of a very powerful element of life, namely, the capacity of evoking enthusiasm and of influencing even bystanders or opponents. But it is time to turn to the more painful features of their history in connexion with Christian thought and practice. It must not be supposed that the recognition of such phases is by any means a purely Protestant sentiment, although it is no doubt a pro- minent feature in the Reformation of the 16th century. Thus, for example, one of the most credulous biographies of a saint of the 4th century, that of St Martin by Sulpicius Severus, mentions (chap. viii.) an instance where the supernatural insight of Martin was exerted in the way of repression of such homage. The country people were exhibiting veneration at the tomb of a supposed saint, but it was revealed to the bishop of Tours that it was that of a robber executed for his crimes. St Augustine, in his severe and satiric tractate against certain unworthy monks who made their profession a mere cloak for idleness, clearly insinuates the sale of questionable relics as one of their faults. "Alii membra martyrum, si tamen martyrum, venditant." The traffic in relics became part of the recog- nized commerce of Christendom and was countenanced by sovereigns of undoubted excellence. Thus Athelstan was

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a great donor of relics to the monastery at Exeter. A list occupying more than three columns is given in the Leofric inissal. It includes fragments of the candle which the angel of the Lord lit in the tomb of Christ, of the burning bush whence Jehovah spoke to Moses, and of one of the stones which slew the protomartyr Stephen. Edward the Confessor and Louis IX. of France may be named among the saintly patrons of a commerce which they at least con- sidered meritorious.

The mention of this last name involves a reference to an event which, above all others of the Middle Ages, spread, fostered, and ultimately injured the veneration of relics. The crusades created a profound

excitement in this matter. Pilgrims had already thought it a default to return from Palestine without some such evidence that they had actually visited the Holy Land. Relics, at first probably bought and sold in good faith, became multi- plied ; and rival possessions of most sacred memorials (as, for instance, the crown of thorns, exhibited both by the abbey of St Denys and by St Louis) were by no means uncommon. Even the crime of theft seems to have been condoned when a relic was in question, and mutilation of a saint's body to have been hardly thought irreverent. To swear by these relics became the most binding of oaths, as will be remembered by those who have read the life of King Robert IL of France, and the ruse practised on Harold by William, duke of Normandy. Marauding campaigns between monastery and monastery were by no means uncommon ; but these sink into insignificance com- pared with the spoliation exercised by the crusaders from the West who captured and sacked Constantinople in 1203-4. The shameful behaviour of the conquering army is admitted by the Latins themselves ; but the condemna- tion freely uttered against licence, brutality, and profane irreverence seems generally (though not quite universally) hushed when the spoliation concerns treasure in the way of relics. The fact of their abundance shows an agree- ment on this point, amidst their differences, between the Latin and Greek Churches ; but Constantinople must have been greatly impoverished by the immense supply of relics "that were scattered by this revolution over the churches of Europe."?

The next two centuries saw no diminution of such zeal, and there grew up, it can hardly be doubted, an increase of lower motives and of fraud. By the time of the Reformation the condition of matters was such as in many respects to offer a mark for all assailants of the existing state of things, and a practical admission on the part of those in authority that it was to a large extent simply indefensible. Erasmus, on this as on so many other kindred subjects, is found leading the van of satirists. One of his Colloquia, entitled Peregrinatio Religioms Ergo, contains within some thirty pages a mass of sarcasm against the abuses of the age. The discharge of vows through an agent, the localism of particular favours, the earthly (and sometimes evil) character of the petitions offered to saints and specially to the Virgin Mother, the strange character of the relics, one of the most common and abundant being the "celeste lac beats Virginis,"

the enormous amount of wealth lying idle at the shrine of St Thomas & Becket—these and similar topics are treated in this author's caustic and elegant Latinity. The Colloquia were published in 1522, and from this date a mass of similar literature in the vernacular tongue of various countries, of a coarser kind and more adapted to the popular taste, seems to have been circulated freely throughout Europe.

1 Gibbon, Decline and Fall, chap. 1x. sub jin.; comp. Milman, Latin Christianity, bk. ix. chap. vii. Milman quotes from Gunther's words concerning the abbot Martin, one of the spoilers: " Indignum ducens sacrilegium, nisi in re sacra, committere."

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The reaction against the homage paid to relics was immense. A practice which has not only been extensively abused, but which appears from its very nature to involve a fatal facility of abuse, can never stand quite where it did after such an exposure as that to which reference has been made. Yet it seems doubtful whether the Reformers in all cases intended to do more than check the prominent abuses connected with relics. Those who claimed Holy Scripture as the sole authority could not deny that it might please the Almighty to convey blessings through the instrumentality of such material things, as in the cases already referred to in the second book of Kings and the Acts of the Apostles. Even Luther seems rather to denounce mistakes concerning particular relics than the respect paid to recognized ones. In like manner the English Church, while using severe and contemptuous language in the Homelies with reference to such practices as those satirized by Erasmus, has preserved in its calendar, among minor festivals, the days respect- ively chosen by the earlier medizeval church for the discovery of the cross by St Helena (May 3rd) and its recovery by Heraclius (September 14th). Mosheim and other learned foreign Protestants also speak gently on such themes. Thus the devout Lutheran Neander, while mentioning in his Church History some cases of deliberate fraud, and holding that the superstition concerning saints and relics bordered nearly on paganism, is yet unable to approve of the extreme reaction which in some quarters arose out of it.

As regards the Church of Rome, although in theory the events of the 16th century may have left its teaching untouched, yet it can hardly be questioned but that this is one of the many departments of religious life in which that great commotion, as De Maistre calls it, has in his words, even among Roman Catholics, operé une révolution trés sensible. The council of Trent, which must be regarded as, from its own point of view, a reforming council, treated the subject of relics in its twenty-fifth session, held in December 1563. It expressed its earnest desire for the removal of abuses, for the abolition of unworthy gain in the veneration of relics, and of revelry on oscasion of their visitation. It forbade the acceptance by any church of new relics, without the approbation of the bishop, given after consultation with theologians and other devout men, and referred grave and difficult questions concerning the extirpation of abuses to the judgment of local councils, of metropolitans, and ulti- mately to the Roman see itself.

By these steps a great change has been effected. We hear nothing more of the sale of relics (which had indeed been forbidden by the fourth Lateran council in 1215), of theft or of war in connexion with them. Some of those most strange memorials to which a passing allusion has been made above have seemingly disappeared from history. And, although leading writers of the Roman obedience in France and Italy do not often make concessions, the Freiburg Encyclopxdia admits the non-authenticity of num- bers of relics brought home from the crusades and from the conquest of Constantinople; and Addis and Arnold (Roman Catholic Dictionary, 1884) say that "abuses no doubt have occurred in all ages with regard to relics." No shock less great than that caused by the Reformation would probably have effected so much as has been done.

Still, however, the Church of Rome stands alone, we believe, in considering the possession of relics an indis- pensable condition of the performance of the highest acts of public Christian worship. Every altar used for the celebration of mass must, according to Roman Catholic rule, contain some authorized relics. These are inserted | into a cavity prepared for their reception, called "the tomb,"

by the bishop of the diocese, and sealed up with the epis- copal seal.

A uthorities.—Many of the leading authorities have already been named. Tothesemay be added on the Roman Catholic side Perrone, Prelectiones Theologice, vol. ii. "De Cultu Sanctorum," cap. iv. (ed. Paris, 1863), and Martigny, Dictionnaire des Antiquités Chre- tiennes (s. v. "Reliques"). On the other side the followers of Calvin (on this as on so many other topics) are usually more fiercely anti-Roman than those of Luther. Among Anglican divines those who have published treatises on the Thirty-nine Articles are necessarily brought across the subject. The work of the bishop of Winchester (Dr Harold Browne) will here be found the fullest and most able as well as the most candid and temperate. Compare also Bp. Pearson, Minor Works, vol. ii. (J. G. C.)

RELIEF. See Scurrrurs.

RELIGIONS. Religions, by which are meant the modes of divine worship proper to different tribes, nations, or communities, and based on the belief held in common by the members of them severally, were not before the present century the subject of original scientific research and comparative study. With the exception of a few good books containing useful information on some ancient religions and on the religious customs of uncivilized nations, nothing written on this subject in former cen- turies can be said to possess any scientific value. It is not that the old books are antiquated, as all works of learning must become with the lapse of time: they were worth nothing even when published. There were huge collec- tions, containing descriptions of all the religions in the world, so far as they were known, laboriously compiled, but without any critical acumen, and without the least suspicion that unbiblical religions are not mere curiosities. There was a philosophy of religion, but it was all but purely speculative, and it could not be otherwise, as then it had but scanty means to work with, and was obliged to draw the facts it required from very troubled and insuffi- cient sources. Attempts were made to explain the mytho- logies of the Greeks and the Romans, and even of some Oriental nations, but for the same reason they could not but fail. Then there was the theological bias, which caused all religions except one to be regarded as utterly false ; the philosophical bias, which caused all

religions, except the arbitrary abstraction then called natural religion, to be decried as mere superstitions, invented by shrewd priests and tyrants for selfish ends; and, finally, the total lack of a sound method in historical investigation, which was one of the prominent characteristics of the 18th century. It was only after the brilliant discoveries which marked the end of that century and the first half of this, and after the not less brilliant researches to which they gave rise; after the sacred writings of the Chinese, the Indians, the Persians, and some other ancient nations could be studied in the original ; after the finding of the key to the Egyptian hieroglyphics and the Assyrian and Babylonian cuneiform writing had lifted the veil which for many centuries had covered the history of these most ancient civilizations—it was then only that a history of religion could be thought of and that something like a science of religion could be aimed at, if not yet founded.

The comparative historical study of religions is one of the means indispensable to the solution of the difficult problem What is religion?—the other being a psychological study of man. It is one of the pillars on which not a merely speculative and fantastic, and therefore worth- less, but a sound scientific philosophy of religion should test. Still, like every department of study, it has its aim in itself. This aim is not to satisfy a vain curiosity, but to understand and explain one of the mightiest motors in the history of mankind, which formed as well as tore asunder nations, united as well as divided empires, which

sanctioned the most atrocious and barbarous deeds, the most cruel and libidinous customs, and inspired the most admirable acts of heroism, self-renunciation, and devotion, which occasioned the most sanguinary wars, rebellions, and persecutions, as well as brought about the freedom, happiness, and peace of nations—at one time a partisan of tyranny, at another breaking its chains, now calling into existence and fostering a new and brilliant civilization, then the deadly foe to progress, science, and art. Religions, like living organisms, have a history, and therefore this is to be studied first, so far as it can be known,—how they rise and spread, grow and fade away ; how far they are the creations of individual genius,

and how far of the genius of nations and communities 3 by what laws, if it is possible to discover them, their development is ruled; what are their relations to philosophy, science, and art, to the state, to society, and above all to ethics 3 what is their mutual historical relation, that is, if one of them sprang from another, or if a whole group are to be derived from a common parent, or if they only borrowed from one another and were subject to one another's influence ; lastly, what place is to be assigned to each of those groups or single religions in the universal history of religion. The first result of this historical inquiry must be an attempt at a genealogical classification of religions, in which they are grouped after their proved or probable descent and affinity. However, like every genuine scientific study, historical investigations, if they are to bear fruit, must be compara- tive. Not only has every religion as a whole, and every religious group, to be compared with others, that we may know in what particular qualities it agrees with or — differs from them, and that we may ~~*determine its special characteristics, but, before this can be done, compara*~~ *tive study on a much larger scale must precede. Every religion has two prominent constituent elements, the one theoretical, the other practical—religious ideas and religious acts, The ideas may be vague conceptions, concrete myths, precise dogmas, either handed over by tradition or recorded in sacred books, combined or not into systems of mythology and dogmatics, summarized or not in a creed or symbol, but there is no living religion without some- thing like a doctrine. On the other hand, a doctrine, however elaborate, does not constitute a religion. Scarcely less than by its leading ideas a religion is characterized by its rites and institutions, including in the higher phases of development moral precepts, in the highest phases ethical principles. It happens but very seldom, if ever, that those two elements balance each other. In different religions they are commonly found in very different proportions, some faiths being pre-eminently doctrinal or dogmatic, others pre-eminently ritualistic or ethical but where one of them is wanting entirely religion no longer exists. Not that dogma and ritual are religion ; they are only its necessary manifestations, the embodi- ment of what must be considered as its very life and essence, of that which as an inner conviction must be dis- tinguished from a doctrine or creed—a belief. But we cannot get a knowledge of the belief which lies at the base of a particular doctrine and which prompts peculiar rites and acts, without*

studying the mythical and dogmatical conceptions and the ritual or ethical institutions in which it takes its shape, and without comparing these with others. This then is the task of what is called compara- tive theology in its widest sense, of which comparative mythology is only a branch, and in which more space and attention should be given to the hitherto much neglected comparative study of religious worship and of ethics in their relation to religion. It is then only that we can proceed to characterize and mutually compare religions themselves, regarded as a whole, and that we may come

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to what must be the final result of this historical as well | primitive Ozp-Arvaw! religion.

as comparative study, a morphological classification of religions. Here the study of religions reaches its goal, and the task of the philosophy of religion, the other main branch of the so-called science of religion or general theology, begins.

It need scarcely be said that the basis of the compara- tive historical study of religions must be a patient and critical examination of the sources from which the know- ledge of the various religions of the world is to be drawn, viz., written documents and traditions, monunients and works of art, sacred writings and heretical books, and, when we wish to inquire into the religions of the uncivi- lized tribes that have no history at all, an impartial weighing of the evidence brought by travellers and settlers from different parts of the globe,—in short, an unbiassed ascertaining of facts.

Genealogical Classification.—There is no difficulty in determining the descent and relationship of religions which have taken rise in historical times, such as Con-

fucianism, Buddhism, Judaism, Christianity, Mohamme- |

danism, and some others of minor importance. But the great majority of ancient religions had their origin in pre- historic times, of which neither documents nor trustworthy traditions are extant. In that case their mutual relation has to be established by reasoning from the myths, ideas,

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That the same name of the highest heaven-god, Dyaus, Zeus, Ju(piter), Zio ('T'y), is met with among Indians, Greeks, Italiotes, Germans, and Norsemen, however great the difference of the attri- butes and dignity ascribed by each of them to the god thus named may be, is a fact now generally known. Where this name has been lost, as is the case with the Persians, the Slavs, and the Celts, there are otlier divine names which they have in common with their kindred nations. Still more important is the fact that most Aryans show a tendency to call their supreme god "father," as is proved by the very common forms Dyaus pitar, Zeds warnp, Jupiter, Diespiter, Marspiter, Alfsdr. The supreme god in the Avesta, Aluramazda, is often called father. Moreover many divine names used by different Aryan nations, though varying in form, are derived from the same root,—which proves the original unity of their conception. Take as examples the root di (div), '"'to shine," and its derivatives Dyaus, Deva, and their family, Diti, Aditi, Dione, Pandion, Dionysos, Diovis, Dianus (Janus), Diana, Juno ; or the root man, "to think" (perhaps equally signifying originally "to shine"), and its

derivatives Manu, Minos, Minerva, (Juno) Moneta ; or the | roots sur (svar), sar, mar, vas.

Especially startling is the

'use of the same general word for "god" aniong several

rites, and characteristics common to them. Professor Max |

Miiller (Lectures on the Science of Religion, pp. 154 sq.) suggests that, whatever classification has been found most useful in the science of language ought to prove equally useful in the science of religion. Now it may be true in general, at least for the most ancient times, that where the

languages of a group of nations are proved to belong to one family their religions too most probably "hold together by the same relationship." But this hypothesis requires proof, and that proof is not to be obtained otherwise than by the comparative study of the religions themselves. Only when the religions of two independent nations agree in doctrine and mode of wor- ship, above all in the notion of the relation between God and man, between the divine and the human, to such a

be accounted for by the universal aspirations and wants of

Aryan nations, viz., Skr. deva, Iran. daeva, Lat. deus, Litth. déwas (deiwys), Old Norse tivar (plur.), to which

_belong perhaps also Greek eds, Irish dia, Cymr. dew.

| be original.

Daeva and deiwys are used in a bad sense, but this cannot So too the word asura (ahura), which, though it too was used by the Indians in relatively modern times in a bad sense, was the name which the East-Aryans gave to their highest gods, and the Norse asa, pl. exsir (orig. ans), are both to be derived from the root as, anh. If we add to this the remarkable conformity of the myths and customs in all Aryan religions,—if, above all, by com- paring them with those of other races, especially of the Semites, we find that the leading idea embodied in these Aryan myths and rites is everywhere the same, however different the peculiar character of each religion may be,

namely, the close relation between God and man, the real degree and in such a manner that this agreement cannot

human nature, then only may we feel sure that the one of |

these religions is the parent of the other, or that both have come from a common stock. If not only two but several religions agree in like manner, or nearly so, we get a family of religions. At present we can go no farther. The mutual relations of the different families cannot be determined yet; the probleni is too difficult and too com- plicated to be solved in the

present state of science. That religions belonging to different families have borrowed myths and customs from one another and have been sub- jected to one another's influence may easily be proved. But whether the families themselves are branches of one and the same old tree is an open question to which a satisfactory answer cannot be given now.

It would be equally premature to venture on drawing up acomplete genealogical table of religions. For some families of religions such a classification may be sketched with tolerable certainty; the genealogy of by far the greater number of them can be given in mere outlines only, leaving the fixing of details for further inquiry. We start from what may be held the most certain.

Aryan or Indo-Germanie Family.—Comparative mytho- logy and the history of religion leave no doubt that all the religions of the Aryan or Indo-Germanic nations, viz., Eastern Aryans (or Indians, Persians, and Phrygians) and Western Aryans (or Greeks, Romans, Germans, Norsemen, Letto-Slavs, and Celts), are the common offspring of one

unity between the divine and the human economy,' so that we may call them the "theanthropic" religions,—if we remember this, there can be no doubt that all of them

have sprung from one primitive Ozp-Aryaw religion.

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However, the degree in which the Aryan religions are mutually related is not always the same. None of them came directly from the Ozp-Arvyawreligion. They consist of five pairs, each of which must have been first a unity :— the Indo-Persian, the Graeco-Roman, the Letto-Slavic, the Norse-Teutonic, and the Gaelo-Cymric. The fact that the members of those pairs are more closely allied with one another than with the other members of the family obliges us to assume five prehistoric Aryan religions :—the Ozp EAsT-ARVAN, the OtD PELASGIC,3 the OLp Winpic, the Oxtp German, and the Ozp Czxrric religions, forming so many links between those historical religions and the common parent of all,—the primeval Arya worship.

Space forbids us to give the complete proof of this con- clusion. We only mention that the Indian and Iranian religions have many gods incommon, unknown tothe Western Aryans, and therefore probably such as arose after the eastern and western branch of the family had separated, ¢.g., Mitra—Mithra, Aryaman—Airyaman, Bhaga—Bagha— Baga (comp. also Aramati—Armaiti, Sarasvati— Hara-

1 This special type indicates prehistoric religions.

2 This is why they call the Godhead " father," or even " brother, friend, companion." Compare the names Mitra—Mithra, " friend," Aryaman—Airyaman, "companion," &c.

3 The name is not exact. It is only chosen as the most convenient,

Genealogical Table of the Aryan Religions.

; PAMAVATIE. © |. s.i.ccsscseaecsseseecasteace covsensveteeeeee eae Buddhism | Makovane. | |

*: a Cvetimbara 3 '2 : E = | Jainism: { Digambara. (BE ' lag f.2 r= Anke SIS cere ree tanener entcrerecnercecoccorerarn codenacr reson = of) (E | £ (Vishnuitic(Krishnaitic)) ; > = iierien (a5 J sects: | Modern a 6 5 ro 2 | Re "4 re | Civaistic sects. i sects, | BO g * { So ee \ Brahmanism……. { Purva Mima;nsa. | 3 \Brahmanic sects (?). Gree 3 = J (ee eee J 3 a eae |be8 il "1 2 2s Aa | bh eee s&s io | asks lars q t mos fa | eS ee EE : Song 2|\3\238e S228) (Zendiks. os B/E ata ges S254! 5 oa Ug Nc Fer | EE Da : ae. ogs a 3 a Ss (Miia BASSI ec. at =) a, eee Modern Parsism in Kirman and India,) 7 | te B 2 RED aS} is s oy ae 4 = @ .20 o [ees ; So 2 (2 B 8 | Ci nceereee J a taat =| { Manicheism (mixed with Christian and Buddhistic 2 o \ the Achemenides be | eee). Phrygian religion (?). Mithra and Anéahita worship spread to the West. o) # (& (Grecian religions of) Hellenic rel., mixed (Homeric rel. : a Ales | Asia Minorand Crete. with Phry ygian, ; Hesiodic rel. teoonnowsanaed : iS = | &) Achean rel, Lycian, and Phos} Aplin (Delphic) rel. : | © | Pelasgic rel. nician elements. (Athenian rel. : <3 faa 3 = a*

= 2/5 : :

*z—|—& 4 * : <4 2 | 3 " be Hn | id feu} |. (Latin = pu 2 cn et Becca —Old Roman rel.——Roman rel. as reformed by the a a lal fe= Sanniitt ‘ Tarquinii and more and nore |- SPREAD OF BUDDHISM. 5 2 s LE Etrurian (?)—* mixed with Greek rites. eee ee i) rg Southern Buddhism. Northern Buddhism. 2 Ceylon. Indian Peninsula in Arvakan. the Middle Ages, 5 ‘ Burmah. now driven out. a Siam. Kashmir. _88 { Cymric branch (Welsh, Gauls). of Nepal. a 3 Gadhelic branch (Irish, Scotch). 8 Bactria. ae China—Japan, &p = a a Tibet. a Mongols. 3 Tartar tribes and Si- be ith $ eria. a Es = | Kamboja. Leal 3d ao | . . oss 3) | Indian Archipelago. I (Ze oe Odhin, Thor. > me | ° 4 \ Vanir: Njordh, Frey, Freya. ae io) PA “a 3 = a 3 es me cas z a By ies t=] o l2 q (High German branch: Tio highest, Wuotan. oa oe? z = a Low Germans: Woden, Goden. * £2 \ Low German branch < Frisians: Wéda*

Anglo-Saxon : Vuoden (?)

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**OLD WINDIC RELIGION.*

(Religion of the Baltic Slavs or Wends proper. a) < | Old-Russian or Eastern branch (Svarog, Dajbog, Ogonii). B & { Religion of the Poles and Czechs, all but unknown. 7) B | ation of the Servians and their nearest relations, not much better known.

1 Prehistoric religions are marked with an asterisk (*),

Semitic.

RELIGIONS

qaiti, &c.), and that the Soma—Haoma sacrifice, equally unknown in Europe, at least in that form, was the prin- cipal sacrifice as well in India as in Iran. The close relation of the Teutonic and Norse religions, and of the mythology and rites of the Greeks and Romans, even if we carefully except all that the latter took from the former in historical times, is

sufficiently proved. It is not so evident, but still highly probable, that the religions of the north-western and the south-eastern Celts, though differing from one another in historical times, are daughters of one ancient Czz7ic religion. When we presuppose such a common parent, an ancient Wywpc religion, for the Letto-Slavic religions, we do so by way of an hypothesis, based on the analogy with the other branches of the family. What we know about these and about the Celtic forms of worship is so defective that we cannot speak more positively. As for the Phrygian religion, it seems to belong to the Iranian stock, and to form the transition from the Persian to the Greek or Pelasgic worship.

There may have been some other intermediate stages,

besides those which we have been compelled by the facts

to assume, between the historical Aryan religions and the prehistoric Ozp-Arvyaw. Thus, ¢.g., the Vedic religion as well as the Zarathustric cannot be considered as having sprung directly from the Zas7-Aryay. The Rig-Veda appears to be far less primitive than has been generally thought until now. It contains ancient elements, but it is itself the product of relatively modern speculations, and belongs to a period in which a complicated and mystical sacrificial theory was upheld by priests of various func- tions and ranks. On the other hand it cannot be denied that the Zarathustric dogmas are pure old Aryan myths in a new shape—this is what M. Jas. Darmesteter has proved —but it was doubtless a reformer, or, if Zarathustra was no historical person, a body of reformers, who called the Zarathustric religion into existence. Therefore, between the Vedic and Zarathustric religions and their common ancestor the Las7-ArYAN, there must have existed an Oxp Ivvraw and an OLp-/RANIAN religion.

This may suffice to justify the genealogical table of the Aryan religions given on last page.

Semitic Feligions—Though there is so much wanting in our knowledge of the Semitic religions, especially as regards those of the pre-Christian Arameans, of the pre- Islamic Arabs, and of the old Hebrews, all we know about them tends to prove that they too must have descended

from a common source. When we find that the same divinities were worshipped by several North-Semitic nations it might be contended that they were borrowed from one of them, as trade and conquest had brought them from ancient times into close contact with one another. But no such relation existed till the very last centuries of the Assyrian empire between the Northern Semites and the various tribes of the Arabian desert. Therefore gods and religious ideas and customs prevailing alike among the northern and the southern or Arabic branch of the race may be safely regarded as the primeval property of the whole family. Such are the general name for the godhead, Tlu, El, [ah (in Allah), and the gods Serakh or Sherag (3¢paxos, Assyr., Arab., Cypr.), Keivan (Kaivanu, Babyl., Assyr., Arab., ¢f. Amos v. 26), Al-Lat, the moon-goddess (Babyl., Assyr., Arab.), as one of three different forms, of which another, the Al-'Uzza of the Arabs, is met with as "Uza or 'Aza in Phoenician inscriptions, while the corresponding male god Aziz is found among the Arameans, and the third, Manat, corresponds to Meni, the "minor Fortune," the planet Venus of the Hebrews, perhaps also with the Babylonian Manu. The myth of the dying and reviving Thammuz, Dumuzi, common to all Northern Semites, seems not to have been current among the ancient Arabs, though some scholars (Krehl, "Lenor- mant) think there are traces of it left in their traditions and rites. Tree worship and stone worship have been pretty general in prehistoric times, and not a few remains of both have survived in all ancient faiths and modern superstitions ; but the latter was particularly developed among both Northern and pee Semites, which is proved by the use of Betyles (°8"N'2), by the black stone in the Ka'ba, the stone at Bethel, that in the temple of the great goddess of Cyprus at Paphos, at Edessa, and elsewhere, by the seven black stones representing the planet-gods at Erech (Uruk) in Chaldxa, &c. Holy mountains too are very frequent among the Semites, alike in Arabia (Kaci, Dhu-l-shera, Horeb, Sinai—the two last-named still worshipped by the Saracens in the 6th century of our era) and in Canaan (Hermon, Tabor, comp. the Tabyrios and Zeus Atabyrios in Cyprus, Karmél, Peniél, Sion, Moriah, ¢.¢, Gerizim), in Syria (Lebanon, Anti-Libanus, Amanus; comp. the istirdt, the heights of modern Syria), and in Mesopotamia, where the zigurrats or terrace towers represent the holy

mountains as the abodes of the gods. Finally, all Semitic religions without a single

*Genealogical Table of the Semitic Religions. *OLD 06h RELIGION. ae ee? ee*

*Southern Branch. *OLD ARABIC RELIGION.*

eee ee Religions of the Sabean or Him-

Northern Branch.

~——) Eastern Branch, Babylonian rel.,

Western Branch.

North of yaritic rel., per- Hebrew religion. i) a2) Q os) > probably mixed Arabia. haps not free 5 5 8 3 with foreign from — ota- Old- Israelitic z= = =e B Bs B elements. mian elements. rel, S =o a. = - g a Oe gE a ae I Mosaic reform, = o etree tecaae gy OB. &. Assyrian rel, 2 - Se £ £ a ¢ Beoe £ & & Rel. of Rel. of 2 A. eB. g e a Israel. Judah 68 ; Pees i i —-—-— B a =o S Reform of the 8 it an & = Prophets & SB SF F phets. a : 5 @e: 8 Se eres eri eee et Judaism. &. So & [og. tert Preaching 8 OW Mohammed See CRD eee e eens ee ere ere tee eee eaecer res ose tesecs ses of the # E 8 5 Islam, gospel. Ss Primitive a ee Christianity. PoP

1 Prehistoric religions are marked with an asterisk (*).

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exception understand the relation between God and man as one between the supreme lord and king (El the mighty, Ba‘al, Bel, Adon, Malik, Sar) and his subject or slave (‘Abd, ‘Obed, Bod), his client or protected one (Jar, Gér). They are eminently theocratic, and show a marked tendency to

monotheism, which, both in Israel and in Arabia, is the last word of their religious development,

It is not so easy to determine the grade of relationship between the different Semitic religions as it is to show that they all descend from a common parent. Moreover the question is complicated by another problem—Whether the Babylonians and Assyrians borrowed the greater part of their religious conceptions and institutions from a foreign, non-Semitic people, the primitive inhabitants of their country, and if this be the case what they then have of their own and what is due to the influence of that ancient civilization. Whatever may be the final solution of this question, we shall not go far wrong if we distin- guish the Semitic religions into two principal groups—the one comprising the southern or Arabic, with perhaps the most ancient Hebrew, the other all the Northern Semitic religions from the Tigris to the Mediterranean,—leaving it undecided whether the undeniable relationship between the north-eastern and the north-western Semitic religions be that of parent and children or that of sisters—in other words, whether it be due to the influence of the superior culture of the former or to the fact that they all have radiated from a common centre. This only is beyond doubt, that the Assyrian religion is a daughter of the Babylonian, and that the Canaanitic and Pheenician modes of worship are closely allied.

What we give on last page is no more than a rough genealogical table of the Semitic religions.

A detailed and accurate genealogical classification of the religions which do not belong to either of those two principal families is out of the question. Their mutual relation can be fixed only in a general way.

African Feligions.—The first problem to be solved is the classification of the Egyptian religion. It is neither Semitic and theocratic nor Aryan and theanthropic. But it has many elements that belong to the former, and also a few elements that belong to the latter category, which might lead to the supposition that it represents a stage in the development of the great Mediterranean, commonly called the Caucasian, race, anterior to the separation of the Aryan family from the Semitic. But this is no more than a supposition, as the existence of such a Mediterranean race, embracing

the so-called Hamites, Semites, and Japhetites or Aryans, is itself a pure hypothesis. All we know is that the Egyptians themselves mention a people called Punt (the Phut of the Bible), with whom they had commercial rela- tions and whose religion was akin to their own, so much so that they called the country of Punt, on the western Arabian and on the opposite African coast, the Holy Land (ta neter). The same may be said of the Cushites, the southern neighbours of Egypt, the ancient pre-Semitic Ethiopians ; and a pre-Semitic population also may have lived in Canaan, allied to the Egyptians and ethnologically or genealogically combined with them, with Cush, and with Phut in the tenth chapter of Genesis. But, as we know next to nothing about their religions, a Hamitic family of religions, including these four, is still purely hypothetical.

That the primitive religion of southern Mesopotamia, commonly called Accadian or Sumerian, was related to the Egyptian, is also a mere conjecture, which does not seem to be favoured by the newly discovered facts. Finally, the scanty remains of the pre-Islamic religion of the Imoshagh or Berbers, the ancestors of the Libyans (in Egyptian Ribu), the Geetulians, the Mauretanians, and the Numidians resemble in some degree Egyptian customs

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and notions; but, whether they point to genealogical relationship or are due to early Egyptian influence, it is hard to say.

This, however, cannot be denied, that there are to be found in the Egyptian religion a great many magical rites and animistic customs, closely resembling those which prevail throughout the whole African continent. If then, as is generally supposed,! the dominant race sprang from Asiatic settlers and conquerors, who long before the dawn of history invaded the country, subjugated the dark- coloured inhabitants, and mixed with them, and if it is to these foreigners that the more elevated elements in the Egyptian religion are due, the basis of this religion is of a purely Nigritian character.

All we can say about the other original religions of the dark continent is that they resemble one another in many respects. We may distinguish four

principal groups :—(1) the Cushite, inhabiting the north-eastern coast region south of Egypt; (2) the Nigritian proper, including all the Negro tribes of inner Africa and the west coast ; (3) the Bantu or Kaffrarian (Kafir) ; and (4) the Khoi-Khoin or Hottentot, including the Bushmen, in South Africa. Before we can come to decision with regard to the first-named group, we must receive better and more certain information than we now possess. The prominent char- acteristic of the second group of religions, those of the Negroes proper, is their unlimited fetichism, combined as usual with tree worship, animal worship, especially that of serpents, with a strong belief in sorcery and with the most abject superstitions, which even Islim and Chris- tianity are not able to overcome. They have next to no mythology, at all events a very poor one, which may be one of the causes of what is called euphemistically their ten- dency to monotheism. A theistic tendency, as Dr Tylor calls it, cannot be denied to them. Almost all tribes believe in some supreme god, without always worshipping him, generally a heaven- and rain-god, sometimes, as among the Cameroons and in Dahomey, a sun-god. But the most widely spread worship among Negroes and Negroids, from west to north-east and south to Loango, is that of the moon, combined with a great veneration for the cow.

Among the Abantu or Kafirarians (Ama-Khosa, Ama- Zulu, Be-Chuana, Ova-Herero), which form the third group, fetichism is not so exuberant. Their religion is rather a religion of spirits. The spirits they worship, not sharply distinguished from the souls of the departed ancestors (Imi-shologu, Barimi), are conjured up by a caste of sorcerers and magicians, Isintonga (Isinyanga, Nyaka), and are all subordinate to a ruling spirit, re- garded as the ancestor of the race, the highest lawgiver who taught them their religious rites, but who seems to have been originally a moon-god as the lord of heaven. The four tribes give him different names—the Ghost (Mu- kuro), the very High (Mo-limo), the Great-great (Unku-lunkulu) or grandfather ; but that the Bantu religions are four branches of one and the same faith cannot be doubted. They agree in many respects with those of the Negroes, but differ from them in others, especially in the cardinal characteristic of the latter, their fetichism. Possibly the difference is for the greater part due to the influence of the Hottentots, to whom the country now inhabited by the Abantu formerly belonged, and

who seem to have been at the time of the invasion more civilized than the latter.

The Khoi-Khoin or Hottentots, who are not black but brown, and who now live in and near the Cape Colony,

1 Even Rob. Hartmann, Die Nigritier, Berlin, 1876, pp. 192 sz., who denies the existence of a Hamitic race, and considers the Egyptians as Nubian Cushites, separated from the others in early times, ascribes their higher civilization to their intercourse with Semitic settlers.

Mon- golian,

KELIGIONS

also have a supreme deity, called Tsui- or Tsuni-Koab (the | wounded knee) by the colonial Hottentots, Heitsi-eibib (wooden face) by the Namaqua. He, too, like the highest god of the Bantu, is the ancestor of the race and the chief of souls and spirits. But the primitive myth current about him shows that he was originally a moon-god, con- tending with the spirit of darkness. 'The altars intended for sacrifices to this god are now called his graves, and the | Bantu, who do not use them, call them chiefs' graves. The great ditference between the religions of the Khoi- Khoin and the other Nigritians is the total absence of animal worship and of fetichism by which it is character- ized. Even sorcery and magic are still very primitive among them. 'Therefore they must be considered as a distinct family among the African tribes, only allied to the so-called Bushmen (Ba-tua, Ba-roa, or Soaqua, Sonqua),

who seem to be a degraded race, sunk to the lowest degree of savagery, but who likewise worship a highest god and by whom likewise fetichism is not practised.

The Chinese Religions, and their Relation to the Mongolic and Ural-Altaic.—This is perhaps the most knotty point in the genealogical classification of religions. There are ethnologists (as Oscar Peschel) who bring not only the Chinese, with their nearest relatives the Japanese and Coreans,—all Ural-Altaic or Turanian nations,—but also the whole

Malay race, including the Polynesians and Micronesians, and even the aboriginal Americans, from the Eskimo to the Patagonians and Fuegians, under one and the same vast Mongoloid family. There is indeed some similarity in the religious customs of the Americans and of the so-called Turanians ; and even in the Polynesian religions some points of contact with those of the former might be discovered. Still, such conformities are but few and not very important, and do not justify our going so far! Other ethnologists, like Friedrich Miiller, do not admit the Americans, including the Hyperboreans of North America and the north-west of Asia, nor the Malayans and the Polynesians as members of the Mongol- ian race. 'This, according to them, only comprises the Chinese and their relatives in Tibet and the Transgangetic

peninsula, the Japanese and Coreans, and the Ural-Altaic or Turanian nations. Now Prof. Max Miiller? tries to show that the religions of all those groups of nations—let us say, of this Mongolian race—are also bound together by a close relationship, because not only their character is fundamentally the same, but even the same name of the highest god, Tien, Tengre, Tangara, &c., is met with among most of them. Putting aside the argument taken from the common name of the supreme deity, which is all but general among the members of this ethnical family and seems to have come from the Chinese to some of the Mongolians,? we cannot deny the fact that not only in the Ural-Altaic and Japanese but also in the highly-developed Chinese religions the relation between the divine powers and man is purely patriarchal. Just as the chief of the horde—nay, even the son of heaven, the Chinese emperor— is regarded as the father of all his subjects, whom they are bound to obey and to venerate, so are the gods to their worshippers. The only difference is that the Chinese heaven-god Tien is an emperor like his earthly representa- tive, ruling over the other spirits of heaven and earth as does the latter over the dukes of the empire and their subjects, while the Ural-Altaic heaven-god is indeed the most powerful being, invoked in the greatest difficulties, when he only is able to save, but no supreme ruler,—not

1 They are enumerated by Waitz, Anthropologie der Naturvilker, lii., 56 sq. 2 Lectures on the Science of Religion, 190 sq.

3 The resemblance of the Mongolian Tengre, Tangara, to the Sumerian or Accadian Dingira appears to be equally fortuitous as that of the Polynesian Tangaroa (Taaroa) to the Melanesian Ndengei.

anything more than a primus inter pares, every other god being absolute lord and master in his own domain. Now this difference is not one of character but of progress, and answers fully to the difference of the political institutions of which it. is the reflex.

The high veneration for the spirits of the deceased fathers, which are devoutly worshipped among all the members of this religious family, is a necessary conse- quence of its patriarchal type. But this feature is not less predominant among nations belonging to wholly different races. Another striking characteristic of the Mongolic religions is their extensive magic and sorcery (Shamanism). One might say that even the gods and the heroes of epic poetry are sorcerers, and that what their worshippers value above all are the magical powers they possess. Shamans are most highly honoured. One of the Chinese religions, and in fact that which contains the most ancient elements, we mean Taoism, involves the most implicit belief in sorcery, and even Buddhism, as it was adopted by the Mongols and the Chinese, has degenerated to all but pure Shamanism.

We are thus fully justified in assuming a Mongolian or patriarchal family of religions, of which the following are the principal subdivisions :—

1. Chinese Religions, being (a) the Awcrznr NATIONAL Chinese.

religion, now superseded partly by (6) Confucianism and (c) Taoism, partly, though only several centuries later, by Chinese Buddhism. What the ancient national religion was can only be gathered from its survivals in the still existing faiths. Confucianism claims to be a restoration of the old and pure institutions of the fathers, though it may just as well be said to be a thorough reform, and Taoism is, according to some European scholars, the original Chinese religion in its latest development—we should say, in its most miserable degradation. At all events, in some form or another, it is much older than Lao-tsze (6th century B.c., see Lao-

rszE), though it has availed itself of his mystical treatise Z'ao-té-King as a sacred buok. There may be some truth in both these conflicting assertions. Without venturing to speculate on the origin of the Chinese nationality, which according to some is a mixture of autochthons with more civilized foreign invaders (the Hundred Families), nor on the possibility that this ethnic dualism may be the source of the two streanis of religious development in China, we have some ground to hold Con- fucius's reform as the renewal of a much older reform (Chowkung's or even earlier), limited to the learned and the greater part of the upper classes,—Taoism on the con- trary being a revival of the ancient popular Chinese religion, to which the 7'ao-té-King had to give the appear- ance of a philosophical basis. Chinese Buddhism does not differ much from the latter, and is now equally despised.

2. Japanese Religions, where we have again the same Japanese.

triad, nearly parallel to the Chinese: (a) the old national religion Kami- no-madsu (the way, 7.e., the worship, of the gods), called frequently Sin- to (Chinese Shin-tao, the way or worship of the spirits), with the mikado as its spiritual head, just as Chinese Taoism had its popes; (0) Confucianism, imported from China in the 7th century; and © Buddhism, imported from Corea and nearly ex- terminated in the 6th century, but reviving, and at last, in the beginning of the 7th century, triumphant.

3. The /%nnic branch of the Ural-Altaic religions, all recog- Finnic.

nizing the same heaven-god Num, Yum, Yummal, Yubmel, Yumala, as supreme. The primitive unity of this sub- division has been demonstrated by Castrén, the highest authority upon it. By far the best known of this family are its North-European members, the religions of the Lapps, the Esthonians, and the Finns, but the two last named are not pure specimens of Ural-Altaic worship, as

Eskimo.

Other

Ameri- can re- ligions,

they borrowed much from the Germanic, especially from the Scandinavian, mythology.

It is highly probable that the other branches of the same ethnic family, the Mongolian and the Turkish, and the other members of the same branch, e.g., the Magyars, originally did not differ much from the Finnic in religious ideas and customs. Unfortunately we are here able to judge only by analogy, partly because we are but imper- fectly informed, partly because most of these nations have long been converted to Buddhism, Mohammedanism, and Christianity. Nor do we know in how far the Tibetans, Burmese, Siamese, and other peoples nearly related to the Chinese had originally a similar worship, as all of them are now faithful Buddhists.

The question whether the religion of the primitive inhabitants of Mesopotamia (Sumér-Akkad) has any genea- logical relation to that of the Chinese and the Ural-Altaic family, as some scholars now try to prove, is not yet ripe for solution.

The Aboriginal Religions of America.—The religions of the Eskimo (Esquimantsic, Ashkimeg, as their Redskin neighbours call them) or Innuyt (7. "men," as they call themselves) should be clearly distinguished from those of the other American nations. Though some of their cus- toms and notions resemble those of the latter, there are others, and it would seem the most important, which are of the same character as those prevailing among the Ural- Altaians and Mongols. Now, as they belong ethnically to the Hyperborzean or Arctic nations, who inhabit not only the extreme north of America from east to west, but also the islands between the two continents and besides a part of the east of Siberia, and as these Hyperborzans are physically akin to the Mongolian race, we might suppose that the American elements in the Eskimo religion have been borrowed, and that it must be considered to have been originally a member of the Ural-Altaic family. Their division of the world of spirits into those of the sea, the fire, the mountains, and the winds, with Torngarsuk (chief of spirits), the heaven-god, as the highest, and their belief in the magical power of their sorcerers, the Angekoks, do not differ

from those which characterize the Ural-Altaic religions. At any rate the religion of the Eskimo is the connecting link between the latter and those of the American aborigines.

That all the other religions of North and South America are most closely allied is generally admitted, and is indeed beyond doubt. Several myths, like those of the sun-hero, of the moon-goddess, of the four brothers (the winds),! are found in their characteristic American form among the most distant tribes of both continents. Some religious customs, scarcely less characteristic, such as the sweating bath, intended to cause a state of ecstasy, the ball-play, a kind of ordeal, the sorcery by means of the rattle, are all but generally practised. Fetichism and idolatry are much less developed among the Americans than among other uncivilized and semi-civilized races, but a marked tendency to gloomy rites and bloody self-torture is common to all.

subordinate ; also the hero myth which has sprung from that belief, and the so-called totemism, 7.¢., the adoption of a special tutelar genius, usually in animal form, for every individual family. (2) Those of the Aztec race, comprising the Aztecs, Toltecs, and Nahuas, who are spread from Vancouver's Island to Nicaragua. To this branch belongs that strange mixture of more elevated religious ideas and barbarous rites which was the state worship of the Mexican empire, but which for its purer elements was indebted to the conquered race, the Mayas (see Mexico). (3) Those of the original inhabitants of the Antilles, to whom the Mayas in Yucatan and the Natchez between the Red River and the Mississippi seem to be nearly related. They are one of the most gifted nations of the American race, with an interesting mythology and highly-developed religious ideas, but perhaps weakened by civilization and therefore unable to withstand the more warlike barbarous tribes, by whom they were finally sub-jugated. (4) That of the Muyscas (Chibchas) in South. America. Originally they seem to have had the same worship as the Nicaraguans. At least the Nicaraguan god Fomagazdad, the creator of mankind and the consort of the moon-goddess, acts a part in the principal myth of the Muyscas, under the name of Fomagata. But-after the latter had reached a

higher stage of civilization they adored the god Bochika as its principal founder, and Fomagata became a dethroned tyrant, while the moon. goddess, now an evil deity, tried to spoil the beneficent works of Bochika. There is some likeness between their hierarchical political institutions and those of Peru, but they were never subjected to the power of the Incas, and it is not proved that they borrowed their culture from them. (5) Those of the Quichua, Aymara, and their rela- tives, which culminated in the sun worship of the Incas in Peru, spread by them throughout all the countries they conquered, and even reformed by some of them to a toler- ably pure and elevated theism (not monotheism, as Dr Brinton contends). This most interesting religion ranks highest among all the faiths of the two American con- tinents, those of Central America not excepted. This remarkable progress is not to be derived from the influence of foreign settlers, come from Asia or Europe, but is here, _ as well as in Central America, the product of natural growth favoured by happy circumstances. (6) Those of the warlike Caribs and Arowaks, extending along the whole of the north coast of South America, who subjugated the peaceful inhabitants of the Antilles to their rule.

The Brazilian aborigines (Tupi-guaranos, Indios mansos), who form a distinct group, and the south-eastern and southern tribes (Abipones, Pampas Indians, Puelches, Pata- gonians or Tehuelches, Fuegians) have religious notions and customs quite in accordance with the low degree of their civilization. Only the Araucanians, though ethnic- ally the nearest relations of the Fuegians and perhaps of the Pampas Indians, have a somewhat advanced sun wor- ship, but seem to have been influenced by the ascendency of Peruvian culture.

The American family of religions may be divided into the following principal groups. (1) Those of the Redskins of North America, from Canada to the Gulf of Mexico, all

Lastly we come to the Malayo-Polynesian family of Malayo- religions. The primitive ethnic unity of this widely Poly- scattered race, which, including the Micronesians and 2°S!4™

of whom have in common the worship of the great spirit (Kitche Manitoo, Michabo, Wahcon[da], Anduagni, Oki) who is the ghost of heaven, the

highest wind-god, to whom all other spirits, even those of the sun and the moon, are

1 The myth of the four brothers is met with, ¢g., among the Algonkins, the Mayas in Yucatan, the Tzendal branch of the Maya race, the Tarascos in Michoacan near Mexico, the Aztecs, by whom it is combined with that of Quetzalcoatl, all through North America, ae os in Peru. See Brinton, Hero Myths, pp. 44, 162, 216, 208,

3, 179.

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Melanesians, inhabits the islands in the Great Pacific from Easter Island to the Pelew Archipelago, the East Indian Archipelago, and the Malay Peninsula, and to which belong the Hovas of Madagascar, has been established on sufficient evidence. As to their primitive religious unity we cannot be equally positive. The original religions of the Malay archipelago have given place first to Brahmanism and Buddhism, afterwards to Mohammedanism, lastly, though only sporadically, to Christianity. But, so far as we can

judge from what has still survived of the aboriginal

Classi- fication of re-

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worship and from what is known of the religious customs of the Malagasy, especially the Hovas, the ancient Malay religions did not differ more from the Polynesian and the Melanesian than do the languages. There is one institu- tion especially which, though in principle and to a certain degree common to all ancient religions, has nowhere acquired that importance and that peculiar development which it has grown to in the Polynesian and the Melane- sian religions, the institution of the taboo, a kind of interdict laid on objects and persons, by which they are

made sacred and inviolable. Now this taboo, which more than anything else characterizes these religions, was equally important in Madagascar before Radama's reforms, and exists also among the Malays, who call it Pamali, nay, even among the Australians, who call it Kuinyunda. There are some other customs common to all these nations, as the particular worship of the ghosts of the deceased, some ordeals, &c., but this is of minor importance. The general observance of such a peculiar custom as the taboo by all the peoples belonging to this ethnic family, a custom which rules their whole religion, gives us the right to speak of a Malayo-Polynesian family of religions.

One distinct branch of this family is the Polynesian, which has everywhere the same myths with only local varieties, and the same supreme god Taaroa or Tangaroa. The Micronesian branch is only a subdivision of it. The Melanesian branch differs more widely, but agrees in the main, and the supreme god Ndengei, whether original or borrowed, is evidently the same as Tangaroa. That the Malay branch had its marked subdivisions is very pro- bable; but the settlement of this difficult question must be left to further research. According to ethnologists the Australians and the now extinct Tasmanians do not belong to the Malayo-Polynesian race. But, as their religion shows the same prominent characteristic as the Polynesian, and, moreover, agrees with it in other respects, they must be in some way related.

These are the rough outlines of a genealogical classifica- tion of religions. It embraces nearly all of them. Only afew have been purposely left out, such as those of the Dravidas, the Munda tribes, and the Sinhalese in India, partly for want of trustworthy information, partly because it is not yet certain what belongs to them originally and what is due to Hindu influence. At any rate we cannot consider their religions as allied to the Ural-Altaic. We have also omitted the religions of the Basque or Euscal- dunac, of which nothing particular is known, and for obvious reasons the Etrurian. Even if the intricate pro- blem with regard to their language could be solved, the Etrurians borrowed so much from the Greek mythology that it would be next to impossible to state what kind of religion they originally had as their own.

Morphological Classification of Religions.—In his Lec- tures on the Science of Religion, pp. 123-143, Prof. Max Miller, who has done so much to raise the comparative study of religions to the rank of a science, criticizes the most usual modes of classification applied to religions, viz., (1) that into true and false, (2) that into revealed and natural, (3) that into national and individual, (4) that into polytheistic, dualistic, and monotheistic, and dis- misses each and all of them as useless and impracticable. In this we cannot but acquiesce in his opinion and hold his judgment as decisive. The only exception we should like to take refers to the classification under (3), which, as we shall presently show, contains more truth than he is dis- posed to admit. And when he winds up his argument with the assertion that "the only scientific and truly genetic classification of religions is the same as the classi- fication of languages" we must dissent from him. Even

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run parallel with that of languages. Prof. Max Miiller says that, " particularly in the early history of the human intellect, there exists the most intimate relationship between language, religion, and nationality." This may be generally true; we do not deny it. But the farther history advances the more does religion become inde- pendent of both language and nationality. And that the stage of development a religion has attained to—the one thing to be considered for a morphological classification—has nothing to do with the language of its adherents is obvious. Now for a really scientific study of religions such a morphological classification is absolutely necessary, and therefore we are bound by our subject to give our opinion with regard to the truly scientific principle on which it ought to be based.

First let us see what has already been done to this effect by one of the best authorities. Prof. W. D. Whitney, in an interesting article "On the so-called Science of Religion," declares for the well-known classifica- tion of religions into national and individual. To quote his own words, "There is no more marked distinction among religions than the one we are called upon to make between a race religion—which, like a language, is the collective product of the wisdom of a community, the unconscious growth

of generations—and a religion pro- ceeding from an individual founder, who, as leading repre- sentative of the better insight and feeling of his time (for otherwise he would meet with no success), makes head against formality and superstition, and recalls his fellow- men to sincere and intelligent faith in a new body of doctrines, of specially moral aspect, to which he himself gives shape and coherence. Of this origin are Zoroas- trianism, Mohammedanism, Buddhism; and, from the point of view of the general historian of religions, what- ever difference of character and authority he may recognize in its founder, Christianity belongs in the same class with them, as being an individual and universal religion, grow- ing out of one that was limited to a race." We hardly think that this reasoning can be unconditionally assented to. At any rate we must put it in another way. Before the American scholar's essay was published, it had already been judiciously observed by Prof. Max Miiller that, though neither a Brahman, nor a Greek, nor a Roman could name the name of the founder of his religion, we discover even there the influence of individual minds or schools or climates. So he thinks that this classification is useful for certain purposes, but fails as soon as we attempt to apply it in a more scientific spirit. This is partially true. What is the wisdom of a community but the wisdom of its more enlightened members, that is, of individuals? Religions of which the origin and history lies in the dark may be called the unconscious growth of generations, but in a figurative sense only. If they have a mythology and a ritual of their own, it may be the result of something like natural selection ; but every myth meant to explain natural phenomena, every rite meant to still the wrath or to win the favour of the higher powers and accepted as an integral part of their faith and worship, perhaps first by some more advanced members of a tribe or nation or community only, afterwards by all of them, was originally the creation of one single human mind. On the other hand, if founders of higher religions are themselves "the leading representatives of the better insight and feeling of their time," then here too there is only growth ; they are at the head of their contemporaries, because the better insight and feeling of the latter culmin- ate in them, and because they are able to lend them a shape which makes the more advanced ideas and senti- ments agreeable to the minds and hearts of the many ;

the genealogical classification of religions does not always | but they meet with success only when that which they

preach lies hidden and lives unspoken in the minds and | gods, but even subordinated to them. If some individuals—

hearts of their generation. It is clear then, that on both sides of the line of demarcation between the two categories of religions there are individuals at work, and that on both sides there is growth. The only remaining difference is, that on this side there is consciousness, on that side there is not. But this too cannot serve us. Much in the growth of the so-called race religions was unconscious and therefore anonymous and forgotten; much, however, was not so. We know of many changes for better or worse in national religions, either reforms or reactions, made with full consciousness, because intentionally ; and we know the names of the kings or tyrants or other individuals who made them. Who knows if the same was not the case when these religions were born—if what now seems to be the collective product of the wisdom of the community was not simply the product of a tyrant's, a mighty chief- tain's bon plaisir, or of a renowned magician's influence ? Finally, if by "founder of a religion" is meant he whom the professors of that religion revere as a heaven-born messenger of the truth or as the greatest of prophets, or adore as the son of God, the incarnation of the highest, —then what Prof, Whitney says they all did, namely, " give shape and coherence to a body of doctrines of specially moral aspect," does not apply to the most of them. The new body of doctrines in its coherence was never shaped by them, but by the leaders of the community to which their preaching gave rise. We call them founders of a new religion, not because they always intended to found one, but because, perhaps involuntarily, they laid the foundations of it in the new and pregnant principles they revealed to the world by their word and life.

Still, whatever we may have to criticize in Prof. Whitney's proposition, there is indeed no more marked distinction among religions than the one

he makes between what he calls race religions and religions proceeding from an individual founder, and no other than this should be the basis of a morphological classification. For between those two great categories or orders to one or other of ‘ ° oo. oe

which all known religions belong and every religion must belong there is a difference not only of degree but of an essential kind, a difference of principle, the one great all- important difference. The principle of the one category is nature, that of the other ethics.

In the nature religions the supreme gods are the mighty powers of nature, be they demons, spirits, or man-like beings, and ever so highly exalted. There are great mutual differences between these religions, though they belong to the same order,—eg., a great difference between the Finnic Ukko and the Norse Odin, between the thunder- god of the Brazilian aborigines and the Vedic Indra or the Olympian Zeus, but it is only a difference of degree; fundamentally they are the same. Nobody denies that one nature religion stands on a much higher level than another. Not only are they either uncon- sciously and by the drift of public opinion or consciously and intentionally altered, enriched, combined with foreign modes of worship, but in some of them a constant and remarkable progress is also to be noticed. Gods are more and more anthropomorphized, rites humanized. For they are not by any means inaccessible to the influence of moral progress. Frem an early period moral ideas are com- bined with religious doctrines, and the old mythology is modified by them. Ethical attributes are ascribed to the gods, especially to the highest. Nay, ethical as well as intellectual abstractions are personified and worshipped as divine beings. But as arule this happens only in the most advanced stages of nature worship; and, moreover, these ethical personifications are simply incorporated in the old system, and not only not distinguished from the nature

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philosophers, sages, prophets—have risen to the conscious- ness that the moral ought to have predominance over the natural, yet nature religion, though strongly mixed with ethical elements, does not recognize this, and those who are called to represent and defend it abhor such inde- pendent

thinkers and persecute them as dangerous enenties to the faith of the fathers. Nature religions cannot do otherwise, at least if they do not choose to die at once. They can for a long time bear the introduction—let us say, infiltration—of moral, as well as esthetic, scientific, and philosophical notions into their mythology; they suffer from it, indeed, and this is instinctively felt by the headstrong defenders of the pure old tradition; but they are unable to shut them out, and if they did so they would be left behind and lose their hold on the minds and the hearts of the leading classes amoung more civilized nations. So they are obliged to let them in, were it only for self-preservation. But the reform must not exceed certain limits. If the ethical elements acquire the upper hand, so that they become the predominating principle, then the old forms break in twain by the too heavy burden of new ideas, and the old rites become obsolete as being useless. If the majority has at last outgrown the traditional worship and mythology—if it comes to the conclusion, which was already the conviction of philosophers, that the old nwmina are only nomina, Zeus, Hera, Hestia only names for the sky, the ether, the fire,! to which moral attributes can be ascribed only in a tropical sense—then nature religion inevitably dies of inanition. No political power, no mighty priesthood, no poetry, no mysticism like that of the Neo-Platonists, no romanticism like that of Julian, not even an attempt to imitate the organization and the rites of an ethical religion, can save it any longer from utter decay.

When this culminating point has been reached, the way is prepared for the preaching of an ethical religious doctrine. Ethical religions do not exclude the old naturistic elements altogether, but subordinate them to the ethical principle and lend them something of an ethical tinge, that they may be more in accordance with the now prevailing system. The old nature-gods, at least the most important among them, survive, and, though first neglected and thrown into the background by the new ideal or abstract divine beings, come again to the front, but only as serving spirits, ministers, angels (dyyeAo., yazatas, &c), or even saints, as all nature now stands under the control of one supernatural ruler in whom the supremacy of moral law is personified. Now the prominent characteristics of ethical religions are just the reverse of that which characterizes the naturistic. Nature religions are polyde- monistic or

polytheistic ; under favourable circumstances they may rise at best to monolatry. Ethical religions, on the other hand, though not all of them strictly monotheistic or pantheistic, all tend to monotheism and are at least monarchic. In nature religions, though they are not exempt from the control of individuals, and even have in part received from them their particular shape or been reformed by them, the ethical or national aspect prevails over the individual, spontaneous growth over conscious speculation, imagination over reflexion. Ethical religions on the contrary are communities brought together, not by the common belief in national traditions, but by the common belief in a doctrine of salvation, and organized

1 This conclusion as such is utterly false. The gods are no mere nomina. They are not the natural phenomena themselves, but spirits, lords, ruling them. The fact is that their worshippers at last become conscious of the naturistic basis of their religion and then reject it.

practising that doctrine. So they are founded by indi- viduals—founded, not instituted or organized, for that as a rule is done by the generation which follows that of the founder—and not always by one single person, but in some cases by a body of priests or teachers. This funda- mental doctrine and the system based on it are considered by the adherents to be a divine revelation, and he who first revealed it, or is thought to have revealed it, is con- sidered as an inspired prophet or a son of God. Nay, even if the primitive teaching had an atheistic tendency, as in the case of Buddhism, it is this real or mythical teacher whom they not only revere, but worship as their supreme deity.

We now come to the subdivisions of each of the two principal categories. And here we cannot silently pass by the classification of the least advanced religions proposed by Prof. Pfleiderer (Religionsphilosophie auf geschichtlicher Grundlage, 2d ed. 1884, vol. ii.), which supersedes the complete classification of religions given by him in an earlier work (Dre Religion, thr Wesen und ihre Geschichte). The latter was based on his conception of religion as the fusion of dependence and liberty, but has now been aban- doned by the author.

According to Pfleiderer the original religion must have been a kind of indistinct, chaotic naturism, being an adoration of the natural phenomena as living powers ; and, as primitive man cannot have had consciousness of his superiority over the animals, nor of his personality and his spiritual nature, he could not conceive these divine powers as personal, or spiritual, or anthropomorphic, but only as living beings.

Then from this primitive naturism sprang :—(1) anthro- pomorphic polytheism, which is decidedly an advance on mythopceic naturism, as it brings the personal gods into relation with the moral life of man, but at the same time has its drawback since it attributes all human passions, faults, and sins to the gods; (2) spiritism (animism), combined with a primitive idolatry, fetichism, each of them not an advance but rather a depravation of religion, caused by the decadence of civilization, which inevitably followed the dispersion and isolation of tribes previously united; (3) henotheism, not the henotheism of Max Miller, or of Hartmann, or of Asmus, but a practical henotheism, 7.¢., the adoration of one God above others as the specific tribal god or as the lord over a particular people, a national or relative monotheism, like that of the ancient Israelites, the worship of an absolute sovereign who exacts passive obedience. This practical monotheism is totally different from the theoretical monotheism, to which the Aryans, with their monistic speculative idea of the godhead, are much nearer.

Passing by the primitive naturism, which is only a matter of speculation, we are bound to admit the real exist- ence of the other three classes specified by Pfleiderer. Only the order in which they are arranged must be changed. For, if spiritism or animism sprang from a primitive not yet animistic naturism, at the same time with, though under different circumstances from, anthropomorphic poly- theism and henotheism, how then shall we explain so many traces and remains of a previous animistic belief in each of the latter religious developments? They too must have gone through an animistic stage. And, on the other hand, some traces even of anthropomorphic mythology are not totally wanting in the animistic religions of uncivilized tribes and barbarous nations,—though, of course, in this mythology manlike beings still stand on the same level as, if not much lower than, those having the shape of animals,

The different stages of religious development have been characterized by C. P. Tiele (Outlines of the History of

Religion, § 3) as follows :—(a) a period in which animism generally prevailed, still represented by the so-called nature religions (in the narrower sense), or rather by the polydex- monistic magical tribal religions ; (6) polytheistic national religions resting on a traditional doctrine; (c) nomistic (or, as Prof. Carlo Puini proposes to call them, nomothetic) religions, or religious communities founded on a law or sacred writing and subduing polytheism more or less com- pletely by pantheism or monotheism; (d) universal or world-religions, which start from principles and maxims. Though in general maintaining this division, at least for practical use, if we wish to draw up a morphological classi- fication of religions, we shall have to modify and to com- plete it, and to arrange the different stages under the two principal categories of nature religions and ethical religions.

Nature Religions.—1. To the philosophy of religion we Nature leave the solution of the difficult problem,—What may religions.

have been the state of religion before the oldest religion known to us sprang into being, and even before that animistic stage of development which we know only by its survivals in the higher and its ruins in the still existing lower religions? Certain it is that the oldest religions must have contained the germs of all the later growth, and, though perhaps more thoroughly naturistic than the most naturistic now known, must have shown some faint traces at least of awakening moral feelings. Man, we think, in that primitive stage, must have regarded the natural phenomena on which his life and welfare depend as living beings, endowed with superhuman magical power; and his imagination, as yet uncontrolled by observation and reasoning, must frequently have given them the shape of frightful animals, monsters, portentous mythical beings, some of which still survive in the later mythologies. Perhaps the best name for this first stage of religious development might be the “ polyzoic” stage.

2. The following naturistic stages are to be classified under three distinct heads :—(a) polydemonistic magical religions under the influence of animism; (0) purified magical religions, in which animistic ideas still play a prominent part, but which have grown up to a therian- thropic polytheism ; (c) religions in which the powers of nature are worshipped as manlike though superhuman and semi-ethical beings, or anthropomorphic polytheism.

3. Animism, which exercises a prominent influence on Animism

the religions of the first stage (a) mentioned above, is a system by which man, having become conscious of the superiority of the spirit over the body and of its relative independence, tries to account for the phenomena of nature, which he, not having the slightest scientific knowledge either of nature or of mind, is unable to explain otherwise. It is not itself a religion, but a sort of primitive philosophy, which not only controls religion, but rules the whole life of man in the childhood of the world. All things living and moving, or startling him by something strange and extraordinary, and of which he does not know the natural causes, he ascribes to the working of mighty spirits, moving freely through earth and air, and, now of their own accord now under com- pulsion, taking up their abode either temporarily or permanently in some living or some lifeless object. Only the powerful among these spirits, "those on which man feels himself dependent, and before which he stands in awe, acquire the rank of divine beings," and either as invisible or as embodied spirits become objects of worship (spiritism and fetichism). As the principal characteristics of those religions we have to consider—(1) a confused and indeterminate polydzemonistic mythology, though some spirits, especially those directing heavenly pheno- mena, are held to be more powerful than the others, and the supreme spirit of heaven is generally the mightiest of

all; (2) an implicit belief in the power of magic, which | returning phenomena, but, in accordance with the manlike

accounts for the high veneration in which sorcerers and fetich-priests are held ; (3) the predomination of fear over all other feelings, and the performance of religious acts mostly for selfish ends. For a somewhat more copious exposition of the character and the development of religions under the control of animism we must refer to Outlines of the History of Religion, S§ 7-17, and the works there cited. Theri- 4, Purified magical religions (6) are the connecting link anthropic between the polydemonistic magic religions (a) and the cl anthropomorphic polytheistic ©, and ought to be distin- "guished from each. The gods, though sometimes repre- sented in a human form, more frequently in that of an animal, are really spiritual beings, embodying themselves in all kinds of things, but principally in animals. Most images of the gods are either human bodies with heads of animals or the bodies of animals with human heads. It is therefore we call these religions therianthropic. The worship of animals is one of the principal characteristics of most of them. Ina subsequent stage, though surviving sporadically, it is much more restricted. The same may be said of the widespread worship paid to the souls of the departed, which is one of the most important constituent elements of the religions in this stage of development, though it survives in the next stage as well. It is frequently combined, as, ¢.g., in Egypt, with an elaborate eschatology. Magic and sorcery, though forbidden and even entailing prosecution if exercised by private sorcerers, are still held in high esteem when in the hands of the lawful priests. They are now organized as a traditional ritual and gradually developed into a boundless mysticism. Some of the ancient nature myths have already become legends and supposed primeval history. As might be expected, some of the religions belonging to the therian- thropic stage stand nearer to the primitive animism, whilst others draw very nigh to the anthropomorphic stage; and so it would seem that we ought to make a distinction between such therianthropic religions as belong to federations and such as belong to united empires—let us say, the unorganized and the organized. In the latter there is a strong tendency to monotheism anda kind of theocracy, the king being regarded as the living representa- tive of the supreme deity, both of which characteristics are not so prominent in the former.

5. In the anthropomorphic polytheism of the highest nature religions © there are, as in all subsequent stages, many survivals of what was

common in the preceding, but so far as this could be done they have been adapted to the new system and disguised under new names or by means of new explanations. We call this polytheism anthropomorphic because the gods are now all of them superhuman but manlike beings, lords over the powers of nature and reigning over its departments, workers of good and of evil. As manlike beings they show more ethical tendencies and attributes than those of the – previous periods. But, being indeed the old nature gods themselves, only remodelled and humanized, and their myths being originally fantastic and even animistic descriptions of natural phenomena, represented as wars and wooings, quarrels and revelries, robberies and tricks of the giant powers of nature, their mythology is full of disgusting narratives, and they are frequently represented as indulging the lowest passions and performing the most degrading acts. Pious poets and grave philosophers felt shocked by such myths, and either tried to mend them or boldly denied them; but they constituted nevertheless the faith of the majority till the fall of nature religion. Only, though essentially nature myths and still felt to be so, they are now no longer considered as an explanation of ever-

Anthro- pomor- phic poly- theism.

character of the gods, as a kind of divine history, nay, are worked out into what may be called an imposing epic, beginning with the origin of life and ending only with the fall of the present cosmic econonly. The gods them- selves are no longer represented as animals or trees or stones; these have now become their symbols and attributes, and are only looked upon as being sacred to them. Of the power they possessed, in their old quality of spirits, to assume all shapes at will the myths of their metamorphoses still bear witness, myths now told by elegant poets for the amusement of their readers, but despised by serious philo- sophers. The real therianthropic beings of the old mytho- logy, monsters like centaurs, harpies, fauns, satyrs, and others which could not be banished from ancient lore, now represent a lower order and are suffered to act only as followers or ministers or even as enemies of the gods. Not one of the religions in the polytheistic stage was able to elevate itself to the purely ethical standpoint ; but, as moral consciousness went on increasing, deeper and more ethical religious ideas gathered round the persons of the

most humane gods, the beloved son or daughter of the supreme deity, and gave rise to purer modes of worship which seemed to be forebodings of a time to come.

Ethical Religions.—1. With regard to the ethical religions Ethical the question has been mooted—and a rather puzzling religions. question it is —What right have we to divide them into nomistic or nomothetic communities, founded on a law or Holy Scripture, and universal or world religions, which start from principles and maxims, the latter being only three—Buddhism, Christianity, and Mohammedanism ? The division has been adopted, among others by Prof. Kuenen, in his Hibbert Lectures, though with the import- ant restriction that Islam, as being essentially par- ticularistic, ought to be excluded from the class of univer- salistic religions. In an interesting paper (in the Leyden Theol. Tijdschrift, 1885, No. 1) Prof. Rauwenhoff rejects the whole class and particularly disapproves of the term "world religions," for which he substitutes that of "world churches." The question deserves to be discussed thoroughly, but for that this is not the place. Here we can only state the results to which a conscientious review of our own opinion and an impartial consideration of our opponents' arguments have led us.

2. We now think that the term " world religions " must be sacrificed, though indeed " world churches" would do no better, perhaps even worse. Without serving longer to determine the character of certain religions, the term " world religions" might still be retained for practical use, to distinguish the three religions which have found their way to different races and peoples and all of which profess the intention to conquer the world, from such communities as are generally limited to a single race or nation, and, where they have extended farther, have done so only in the train of, and in connexion with, a superior civilization. Strictly speaking, there can be no more than one universal or world religion, and if one of the existing religions is so potentially it has not yet reached its goal. This is a matter of belief which lies beyond the limits of scientific classification.

3. Still there is a real difference between two at least of the three above named, which are still contending with one another for supremacy over

the nations of the globe, and the other religious communities which no longer try to make proselytes—between Buddhism and Christianity on the one hand, and Confucianism, Brahmanism, Jainism, Mazdaism, and Judaism on the other. And this difference, which ought to be maintained, is indeed one of principle, not of fact only. If the latter, after having been adopted by a nation, have remained stationary for centuries and

even are continuously fading away, while the former now embrace many millions of adherents belonging to various nations and races, and ever go on increasing more or less rapidly, this cannot be due to some fortuitous or external circumstances only, but must have its principal cause in the very nature of each sort of religions.

4. When we call the one particularistic the others universalistic (not universal), the one national the other human, when we describe the one as bound to special doctrines and rites, the others, though equally embodying themselves in doctrines and rites wherever they were organized into churches or state religions, as nevertheless really free from them and starting from principles and maxims, we possibly use words apt to be misunderstood and perhaps wanting some qualification, but the meaning of them on the whole is sufficiently clear. In calling nomistic religions, like Judaism and Mazdaism, particular- istic or national, we do not mean to say that they are exclusive in character and that they have not tried to spread beyond the boundaries of the race and the nation to which they belonged originally. They have done so indeed ; they hoped to extend their dominion, but they succeeded only where they could impose the nationality or the civilization with which they had grown together, like the Chinese in Corea and Japan, or the Brahmans in several parts of India ; and it is known that the proselytes of Judaism always ranked below the born sons of Abraham.

Now Buddhism, Islam, and Christianity were neither national nor particularistic. All of them were the repre- sentatives of ideas surpassing so to say the national horizon ; all of them had in view, not the special religious wants of the nation, but more general aspirations of the human heart and mind. Two of them, therefore, were rejected, after a shorter or

longer struggle, by the peoples to which their founders belonged by birth; and it isa well-known fact that Mohammedanism, though founded by an Arab, took its fundamental ideas from Judaism and Christianity, and that not the Arabs, but foreign nations, especially the Persians, raised it to the high position which it would not have occupied in the world without them. The national form of the Buddhistic idea was Jainism, that of the Christian idea Ebionitism, and perhaps the Wahhabites may be considered as the national reformers of Mohammedanism ; and it is only natural that none of these sects found adherents except among the peoples in the midst of which they arose. Nor were Buddhism, Islim, and Christianity particularistic. Bud- dhism "looks for the man ; the miseries of existence beset all alike, and its law is a law of grace for all."—So too in its way does Islim; in the beginning it spreads by con- quest, but the faithful of every nationality, whether converted by the force of arms or by the preaching of missionaries, acquire the same rights and dignity as the Arabs. The universalism of Christianity needs no proof. Here, however, the difference begins. We class these three religions under one head, because they reseinble one another in so many respects, and because they differ from the other religious communities founded by individuals precisely in that in which they are mutually alike. But we are far from placing them on the same level. Isldm, é.g., 18 not original, not a ripe fruit, but rather a wild offshoot of Judaism and Christianity. Buddhism, though the most widely spread, has never been victorious except where it had to contend with religions standing on no very high degree of development. For a short time it had a footing in Persian countries, but there its influence was neither deep nor durable, and in China it was not even able to overcome Confucianism and Taoism ; it seems to have been driven from India by Brahmanism, without being actually persecuted. Both Islam and Buddhism, if

not national, are only relatively universalistic, and show the one-sidedness, the one of the Semitic, the other of the Aryan race. The former represents an important religious idea—the absolute sovereignty of the one God, towards whom man, being nothing himself, has only one duty, that of tacit obedience; it exalts the divine, not com- bining it with, but

opposing it to, the human, which it despises, and therefore neglects the development of ethics. Buddhism on the contrary neglects the divine, preaches the final salvation of man from the miseries of existence through the power of his own self-renunciation; and therefore, as it is atheistic in its origin, it very soon becomes infected by the most fantastic mythology and the most childish superstitions. If religion really is the synthesis of dependence and liberty, we might say that Islam represents the former, Buddhism the latter element only, while Christianity does full justice to both of them. Christianity, the pure and unalloyed at least, has fused dependence and liberty, the divine and the human, religion and ethics into an indivisible unity.

5. There are still some other points of difference. Thus, to mention one point only, Mohammedanism in its external features is little better than an extended Judaism. Spread over many countries, adopted by various nations differing in culture, speech, and race, nevertheless it has its holy language, its unvarying rites, its central sanctuary round which the pilgrims from every part of the Mohammedan world assemble every year. Not so with Buddhism and Christianity. If Christian crusaders tried to reconquer their Holy Land from the infidels, and in fact possessed it for a time, if medizeval Buddhist pilgrims desired to see, and some Christian pilgrims even now visit, the places where the cradle of their faiths once stood, all this makes no longer an integral part of their worship, which is not necessarily bound to place or time. The divisions of Buddhism and Christianity are mutually much more in- dependent than those of Mohammedanism. Still, though in this respect Buddhism comes nearer to Christianity, this alone preaches a worship in spirit and in truth; and in that which Rothe called its greatest excellence, in its variety, its changeableness, its power of adapting itself to the religious wants of various generations, peoples, and individuals, in a word, in its elasticity, which is the natural result of its purely spiritual character, Christianity ranks incommensurably high above both its rivals! But we cannot pursue this matter any further.

We now give the following sketch of a morphological classification of religions :—

I. NaruRE RELIGIONS. (a) Polydemonistic Magical Religions under the coutrol of Animism.

To this class belong the religions of the so-called savages or uncivilized peoples, but they are only degraded renimants of what they once must have been.

(b) Purified or organized Magical Religions. Therianthropic Polytheism. 1. Unorganized. 2. Organized. — Japanese Kami-no-madsu. The semi-civilized religions of

The non-Aryan (Dravidian) reli-| America: Maya, Natchez, gions of India, principally in| Toltecs-Aztecs, Muyscas, Incas the Deccan. in Peru.

The ancient religion of the

Religion of the Finns and Ehsts. : Chinese cmpire.

The old Arabic religions. : Old Pelasgic religion. Ancient Babylonian (Chaldean) Old Italiote religions. religion. Etruscan religion before its ad-| Religion of Egypt.

mixture with Greek elements (?) The old Slavonic religions.

1 To prevent misconstruction, it is perhaps not superfluous to state that we are giving here neither a confession of faith nor an apology, but that we have here to treat Christianity simply as a subject of comparative study, from a scientific, not from a religious point of

view. XX. — 47

History

and.

spread of « religions,

d70

(c) Worship of manlike but superhuman and scmi-ethical Lcings. Anthropomorphic Polytheism.

The ancient Vaidic religion (India).

The pre-Zarathustrian Iranic religion (Bactria, Media, Persia).

The younger Babylouian and Assyrian religion.

The religions of the other civilized Semites (Phcenicia, Canaan, Arama, Sabseans in South Arabia).

The Celtic, Germanic, Hellenic, and Greco-Roman religions.

II. Ernicat RELIGIONS. (a) National Nomistic (Nomothetic) religious communitics. Taoism and Confucianism in China. Brahinanism, with its various ancient and modern sects. Jainism and primitive Buddhism. Mazdaism (Zarathustrianism), with its sects. Mosaism. Judaism. (6) Universalistic religious communities. Islam, Buddhism, Christianity.

We conclude with a few remarks on the history and spread of religions. Between the history of religions and that of religion in general there is no real difference. A history of religions must be something other and more than a collection of the histories of the principal religions, arranged after a chronological or an ethnological scheme. The connecting links and historical relations between them must be kept in view. It ought to be shown how every religion coming to the front on the stage of history is

rooted in the past, has been fostered so to speak by one |

or more of its predecessors, and cannot be maintained without taking up and assimilating the still living elements of the old faith. Special attention must be paid to the spread and intermixture of religions and systems, myths and rites, the cause of so many changes, of thorough reforms as well as of corruption and decay. Thus, even undesignedly the history of religions exhibits the progress of the religious idea in the history of mankind.

The oldest historical documents, contemporaneous with the facts they record, are undoubtedly those of ancient Egypt and Babylonia; perhaps the latter may in the end prove the more ancient of the two. Be this as it may, documentary history begins in western Asia and north- eastern Africa. And it is remarkable that even in that remote past we find the religions both of ancient Babylonia and of Egypt in anything but a primitive state—remark- able, but only natural, as civilization must have reached a rather elevated standpoint to produce such written docu- ments and works of art. Many centuries, at all events a long period, of religious evolution must have preceded the dawn of religious history. Even then and there, just as elsewhere, that which lies behind can only be conjectured, but conjecture may be raised to a high degree of probability by comparing the myths and rites surviving in the historical religions, though they really belong to a former state of development, with those still prevailing among uncivilized tribes. For several centuries these two religions, whatever may have been their genealogical relation, were developed independently, and the task of the historian is, by studying the most ancient records, to give a notion of their earliest state and to point out the faint traces of their internal changes which are still extant. There are some vague allusions to an early Babylonian conquest of western Asia, which might account for the agreement of some ancient modes of worship in the Western countries with those of Babylonia; but before the XVIIIth Dynasty of Egypt (15th or 16th century B.c.) the empires on the banks of the Euphrates and Tigris and that on the banks of the Nile seem not yet to have come into contact. From that time, at least during the rule of the XIXth Dynasty, not a few Semitic deities were admitted into the Egyptian pantheon. In a well-known

Semitic Ba‘al as well as to the national god Mentu. On the other hand, but much later, some Egyptian religious emblems find their way into Assyria, and several Egyptian gods with Egyptian modes of worship into Pheenicia, Assyrian religion, being an early offshoot of the Babylonian, and with the lapse of time more and more imbued with younger Babylonian elements, spreads westwards with the extension of the Assyrian empire, penetrates into Asia Minor and Syria, and finds

followers even among the kings of Judah. But there the prophets, true to their national god Jahveh, and reforming his worship on purely ethical principles, wrestle with unbending perseverance against those foreign idolatrous customs and lay the foundations of that monotheistic community which sur- vives the Babylonian exile, and, having been organized as Judaism, becomes the cradle of Christianity.

Did space permit we would fain pursue the rapid historical sketch, which tends to show how even in ancient times there was a continuous interchange of ideas and rites between the leading religions, those even which are commonly considered as being purely national—that is, so entirely fused with the social and political life of a nation that they seem unfit for adoption by peoples widely different. But a general survey of the history of religions cannot be given here. All that can be done is to indicate in a few words its further course, not without hinting that the same interchange as we have observed in western Asia and Egypt is to be found everywhere.

In eastern Asia the dominating religions are those of China and of India. They too have been developed inde- pendently, each radiating from its centre, China proper and Hindustan, so far as either the vast Chinese empire or the Aryan dominion over the Indian peninsula extended. The Chinese civilization seems to be much older than the Indian. But the sources from which a knowledge of the ancient Chinese religion might be drawn have come down to us thoroughly revised and expurgated either by Con- fucius himself or by some of his followers. The ancient religious literature of India is very extensive, and in it three or four stages of religious thought may without difficulty be found ; but the real ancient history of Indian religion is not to be gathered from it. Neither Chinese nor Indian religions have exercised any influence on the pro- gress of religion in the west of Asia or in Europe. They form a world apart. The Chinese religion was adopted by some Mongolian tribes and was introduced into Corea and Japan ; Indian settlers, Vaishnavas, Qaivas, or Bauddhas, carried Indian thought and Indian worship with them to some parts of Further India and of the Indian archipelago, but this happened in relatively recent times. For ages and ages they lived quite isolated and self-sufficient—the Chinese either with Lao-tsze seeking the veritable Tao

in the highest ideal of absolute isolation, or with Confucius amiably moralizing on the duties of "the perfect man"; the Indian dreaming his monotonous and fantastic dreams and longing for absorption in the eternal Brahm; neither of them suspecting that without them, among what they would have called Western barbarians if they had known of their existence, the world's history was going on as a mighty stream of which they did not even hear the distant roar. It was not until Darius the son of Hystaspes, but chiefly Alexander the Great, had opened the gates of India to Western civilization that an Indian sovereign, converted to Buddhism, could think of benefiting foreign nations by

-the message of salvation from the miseries of existence,

and that Buddhist missionaries went out to nearly every part of Asia.

Meanwhile Medo-Persian supremacy had supplanted the Assyrian and Neo-Babylonian, and with it the Zarathus-

hymn the victorious Egyptian king is compared to the | trian religion (Mazdaism) had come in contact with those

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of western Asia. This too had its distinct place in the general history of religion. For though it seems not to have spread much farther than the Iranian languages, and the attempts of Mazdayacnan missionaries to convert certain Tartar or Mongolish tribes were not crowned with extraordinary success, its tenets deeply influenced the post-exilian angelology and demonology of the Jews, and through it the belief on these subjects current among medizval Christians. Moreover, not indeed the whole system, but still some of its semi-spurious offshoots, remnants of the Ozp Lasr Aryan mythology, neglected by the Zarathustrian reformers, but afterwards revived and mixed up with Semitic elements, the worship of Mithra and Anahita, wandered from Asia Minor through Greece and Italy to Germany and found adherents everywhere.

The final and, if we except that of Mosaism, the most interesting chapter of the ancient history of religions is that which narrates the growth, the

transformations and vicissitudes, the decline and corruption of the worship belonging to Greece and Rome. Its importance to general history needs no exposition. But its real purport is in the main not realized, or at least misunderstood. It is indeed the history of the spread of that rich and composite mythological system which is called Hellenic religion over the whole civilized world of Europe and part of Asia and Africa, and of the total transformation of the ancient Roman religion by its influence. But, studied in the true historical, that is, genetic and comparative, spirit— not with the jealous narrow-mindedness of the old classi- cal school, whose idol, the self-sufficient and self-educated Greek, has already been broken to pieces, nor with the one-sidedness of some comparative mythologists, who have substituted the self-sufficient Aryan for that imaginary Greek— Hellenic religion appears to be rooted, not only in the old national worship, but also, and even deeper, in the religions of some Eastern peoples, as is the case with Hellenic art and all the other branches of that splendid civilization. It would never have risen so high above the level of old Pelasgic faith and worship, never have spread over so wide an area, never have reigned with ever increasing authority in Etruria and in Rome, had not the deeper religious ideas of Semitic and other Eastern nations, which prevailed in the Phcenician colonies on the islands and coasts of the Mediterranean, and above all in that focus of all kinds of worship, Asia Minor, become assimi- lated with it, and—for this too must be acknowledged— had it not after all impressed those ideas with the stamp of Aryan fancy and Hellenic taste, the stamp of its own genius. The great stream of religious development which had its sources in Egypt, in Babylon, and in Iran, and many less important affluents, finishes its course in the Greco-Roman religion. With this the old world dies away. But then the preaching of the gospel had already laid the foundations of a newand higher world of religious life, which no more belongs to ancient history.

Modern history of religions is chiefly the history of Buddhism, Christianity, and Islam, and of their wrestling with the ancient faiths and primitive modes of worship, which slowly fade away before their encroachments, and which, where they still survive in some parts of the world and do not reform themselves after the model of the dominant religion, draw nearer and nearer to extinction.

But the subject is too vast to be treated of in detail here. It has been our object only to show, even for the ancient history of religions, the continuity and coherence which nobody will deny with regard to the modern. In both ancient and modern times, religions spread (1) by the influence of superior civilization, (2) by conquest, (3) by colonization or commerce, (4) by missions. Examples are too numerous and too well known to require mention here.

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Literature.—The numerous monographs on special religions, as well as treatises on the philosophy of religion, on mythology, on comparative mythology even, must be excluded from this notice. Only the most important collections of historical monographs, and those philosephical works which are not purely or principally speculative, but are based on the conrparative study of the religions themselves, will be mentioned.

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preparation). The history of the principal religions of the world is described in the series of monographs published at Haarlem entitled De Voornaamste Godsdiensten (Islamism, by Dozy, 1863; Pdrsism, by Tiele, 1864; Buddhism, by Kern, 1883-84; Greek Religion, by Van Oordt, 1864; Norse Religion, by Meyboom, 1868; Isracl, 2 vols., by Kuenen, 1869-70; Roman Catholicism, by Pierson, 4 vols., 1868-74 ; Protestantism, by Rauwenhoff, 2 vols., 1865-71). See, too, C. P. Tiele, Hist. comparée des religions de l Egypte et des peuples Sémitiques, trans. by G. Collins, Paris, 1882; A. Réville, Lcs religions des peuples non-civilisés, Paris, 1888 ; Id., Les religions du Mexique, de l Amér. centrale, et du Pérou, Paris, 1885 (compare the Hibbert Lectures for 1884). Of another series, under the title Oricntal Religions and their relation to Universal Religion, by Samuel Johnson, three volumes only are published (Jndia, 2d ed., London, 1873; China, Boston, 1877; Persia, 1885). P. D. Chantepie de la Saussaye published four popular sketches of the religions of Confucius, Lao-tsze, Zarathustra, and Buddha, but with copious notes and references, Utrecht, 1883. Equally popular is G. Rawlinson's Religions of the Ancient World, London, s.a.

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The views of the present writer on various subjects relating to the science of religion have been expounded iu several volumes of the Theol. Tijdschrift and De Gids. Only a few of these papers have been translated into German or French. See, ¢.g., Revuc politique et littéraire, 12th August 1876 and 12th January 1878. In the Theol. Tijdschrift are to be found some articles on cognate sub- jects by Profs. Kuenen and Rauwenhoff and by Dr A. Bruining. Valuable contributions to the history of religions are given by the Revue de I' Histoire des Religions, edited by Vernes, 1880-84, and by Jean Réville, 1885. Prof. Max Miiller is rendering an im- portant service to the comparative study of religions by his col- lection of translations entitled Sacred Books of the East, of which some twenty-four volumes have appeared, and which is still in course of publication. (Om Te, HN)

d72 REMAINDER, REVERSION. In the view of English

law a remainder or reversion is classed either as an incorporeal hereditament or, with greater correctness, as an estate in expectancy (see Ruan Estate). That is to say, it is a present interest subject to an existing estate in possession called the particular estate, which must determine before the estate in expectancy can become an estate in possession. A remainder or reversion is in strictness confined to real estate, whether legal or equitable, though a similar interest may exist in personalty. The particular estate and the remainder or reversion together make up the whole estate over which the granter has power of disposition.1 Accordingly a remainder or reversion limited on an estate in fee simple is void. The difference between a remainder and a reversion, stated as simply as possible, is that the latter is that undisposed-of part of the estate which after the determination of the particular estate will fall into the possession of the original grantor or his representative, while a remainder

is that part of the estate which under the same circumstances will fall into the possession of a person other than the original grantor or his representative. A reversion in fact is a special instance of a remainder, distinguishable from it in two important respects :—(1) a reversion arises by opera- tion of law on every grant of an estate where the whole interest is not parted with, whereas a remainder is created by express words ; (2) tenure exists between the reversioner and the tenant of the particular estate, but not between the latter and the remainderman. Accordingly rent service is said to be an incident of a reversion but not of a remainder, and a reversioner could distrain for it at common law (see Rent). A reversion may be limited upon any number of remainders, each of them as it falls into possession becoming itself a particular estate. Thus A may grant an estate for life or for years to B, with remainder to OC, with remainder to D, with a reversion or ultimate remainder to himself. A remainder or reversion may be alienated either by deed or by will. A conveyance by the tenant of a particular estate to the remainderman or reversioner is called a surrender ; a conveyance by the remainderman or reversioner to the tenant is a release. Remainder.—Remainders are cither vested or contingent. "An estate is vested in interest when there is a present fixed right of future enjoyment. An estate is contingent when a right of enjoy- ment is to accrue on an event which is dubious and uncertain.

' Compare the life-rent and fee of Seotch law. : 2 A eontingent remainder amounting to a freehold cannot be limited on a partieular estate less than a freehold.

REMAINDER

determination had not happened. The case of determination by any other means is met by 40 & 41 Vict. c. 38. The Act provides that a contingent remainder which would have been valid as a springing or shifting use or executory devise or other liniitation had it not had a sufficient estate to support it as a contingent remaindcr is, in the event of the particular estate determining before the contingent remainder vests, to be capable of taking effect as though the contingent remainder had originally been created as a springing or shifting use or executory devise or othcr executory limitation. It will accordingly only be good if the springing use,

&c. (for which see TRUST), would be good. If the springing use be void as a breach of the rule against perpetuities (see REAL Esrars), the remainder will likewise be void. It may be noticed that, apart from this Act, there is some uncertainty as to the applieation . of the rule against perpetuities to remainders. The better opinion is that it applies to equitable remainders and to legal remainders expectant upon an cstate for life limited to an unborn person. In the latter case the rule as applied to contingent remiainders is somewhat different from that affecting exeeutory interests. The period is different, the remainder allowing the tying up of property for a longer time than the executory interest. There is also the further difference that the rule does not affect a contingent remainder if it become vested before the determination of the particular estate. An executory interest is void if it may trans- gress the rule, even though it do not actually do so. The subject of remainders would not be complete without a reference to the fainous rule in "Shelley's Case" (1 Coke's Reports, 93 b). The rule is that when the ancestor by any gift or conveyance takes an estate of freehold, and in the same gift or conveyance an estate is limited, either mediately or inimediately, to his heirs or the heirs of his body, in such a case the word "heirs" is a word of limitation and not of purchase ; that is to say, the estate of the ancestor is not a life or other freehold estate with remainder to the heirs or heirs of the body, but an estate in fee or an estate tail according to circum- stances. The rule isa highly technical one, and has led to niuch

'litigation and in many cases without a doubt to the defeat of a

testator's intentions. It is said to have had its origin in the wish of the law to preserve to the lords their right of wardship, whieh would have been ousted by the heir taking as purchaser and not as successor.

The State laws of the United States affecting remainders will be found in Washburn, Real Property, vol. ii. bk. ii. ch. iv. § 7. As a general rule contingent remainders have been rendered of little practical importance by enactments that they shall take effect as executory devises or shall not determine on determination of the particular estate. The rule in "Shelley's Case" is the common law where it is not repealed by statute. The prevailing spirit of legislation in the States is unfavourable to its continuance.

Reversion.—Unlike remainders, all reversions are present or vested estates. The law of reversion, like that of remainder, has been considerably modified by statute. It was formerly considered that on the grant of the reversion the tenant should have the opportunity of objecting to the substitution of a new landlord. It was therefore necessary that he should attorn tenant to the purchaser. Without such attornment the grant was void, unless indeed attornment were compelled by levying a fine. The neces- sity of attornment was abolished by 4&5 Annec, 16. Its only use at present seems to be in the case of mortgage. A mortgagor in possession sometimes attorns tenant to the mortgagee in order that the latter may treat him as his tenant and distrain for his interest as rent. The legal view that rent was incident to the reversion led at common law to a destruction of the rent by de- struction of the reversion. This would of course chiefly happen in the case of an under-tenant and his immediate reversioner, if the intermediate became merged in the superior reversion. To obviate this difficulty it was provided by 8 & 9 Vict. c. 106, § 9, that, on surrender or merger of a reversion expectant on a lease, the rights under it should subsist to the reversion conferring the next vested right. The question as to what covenants run with the reversion is one of the most difficult in law. The rule of common law seems to have been that covenants ran with the land but not with the reversion, that is to say, the benefit of them survived to a new tenant but not to a new landlord. The effect of the Act of 32 Hen. VIII. c. 34, and of the Conveyancing Act, 1881 (44 & 45 Vict. c. 41, §$ 10, 11, 58), has been to annex to the reversion as a general rule the benefit of the rent and the lessee's covenants and the burden of the lessor's covenants. Merely collateral covenants, however, do not run with the reversion, but are regarded as per- sonal contracts between lessor and

lessee. At common law on the severance of a reversion a grantce of part of the reversion could not take advantage of any eondition for re-entry, on the ground that the condition was entire and not sevcrable. This doctrine was abolished by one of Lord St Leonard's Acts in 1859. The Con- veyancing Act, 1881, § 12, now provides in wider terms than those of the Aet of 1859 that on severance of the reversion every eon- dition capable of apportionment is to be apportioned. In order to guard against fraudulent concealment of the death of a cestui que

vie, or person for whose life any lands are held by another, it was provided by 6 Anne c. 18 that on application to the Court of Chancery by the person entitled in remainder, reversion, or expect- ancy, the cestui que vie should be produced to the court or its com- missioners, or in default should be taken to be dead. The purchase of a reversionary interest might formerly have been set aside in a court of equity on the ground of inadequacy of price. This rule of equity no longer exists. It was enacted by 31 Vict. c. 4 (which extends to the United Kingdom) that no purchase made bona fide of a reversionary interest in real or personal estate shall be set aside merely on the ground of under-valne. The Act does not affect those cases in which the courts relicve against such purchases on the ground of fraud or duress—the cases, for instance, of exorbit- -ant bargains made by money-lenders with expectant heirs. In Scotland reversion is generally used in a sense approaching that of the equity of redemption of English law. REGISTRATION).

In the United States the Act of 82 Hen. VIII. c. 384 "is held to be in force in Massachusetts, Pennsylvania, Illinois, and Con- necticut, but was never in force in New York till re-enacted " (Washburn, Real Property, vol. i. 482). (J. Wt.)

REMBRANDT (1607-1669). RemBpranpt HaRMENS van Run, the chief of the Dutch school of painting and one of the greatest painters the world has seen, was born in Leyden on the 15th July 1607.! It is only within the past thirty years that we have come to know anything of the real history of the man. Up to that time we had but a tissue of fables connected with his name and representing him as ignorant, boorish, and avaricious. These

fictions, resting on the loose assertions of Houbraken (De Groote Schouburgh, 1718), have been cleared away by the untiring researches of Scheltema and other Dutchmen, notably by C. Vosmaer, whose elaborate work (Hembrandt, sa Vie et ses Guvres, 1868, 2d ed. 1877) will remain as the basis of our knowledge of the man and of the chronological development of the artist.2, Rembrandt's high position in European art rests on the originality of his mind, the power of his imagination, his profound sympathy with his subjects, the boldness of his system of light and shade, the thorough- ness of his modelling, his subtle colour, and above all on the intense humanity of the man. He was great in con- ception and in execution, a poet as well as a painter, an idealist and alsoa realist; and this rare union is the secret of his power. From his dramatic action and mastery of expression Rembrandt has been well called "the Shakespeare of Holland." To understand aright his position in art, we must consider rapidly his sur- roundings and note the influences which affected him ; we shall thus find what he had in common with his time and understand better how far he was really a new power, an original genius.

It must be borne in mind that in the beginning of the 17th century Holland had risen to great power. Though not yet formally free from the Spanish yoke, she had broken the fetters by the heroic efforts of the former generation, and had entered on her grand career of national enterprise. Science and literature flourished in her universities, poetry and the stage were favoured by her citizens, and art found a home not only in the capital but in the provincial towns. It was a time also of new ideas. Old conventional forms in religion, philosophy, and art had fallen away, and liberty was inspiring new conceptions. It is with those of art that we have to deal. Here there were no church influences at work to fetter the painter in the choice and treatment of his subject, no academies to prescribe rules.

1 This is now generally accepted as the year of his birth, though soine hold it should be 1606 or 1608.

- *Vosmaer's first volume, on the precursors and apprenticeship of Rembrandt, was published in 1863. New light has since been thrown*

on important points by Dr Bode (Lolliéndische Malerei, 1888), De Roever, De Vries, and others.

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Left to himself, therefore, the artist painted the life of the people among whom he lived and the subjects which interested them. It was thus a living history that he painted,—scenes from the everyday life and amusements of the people, often mean and vulgar it must be confessed, the civic rulers, the regents of the hospitals and the heads of the guilds, and the civic guards who defended their towns. So also with the religious pictures which were produced under the influence of these environments. The dogmas and legends of the Church of Rome were no longer of interest to such a nation; but the Bible was read and studied with avidity, and from its page the artist drew directly the scenes of the simple narrative. The Old and New Testaments and the Apocrypha were the sources from which, without any interference of Jesuit inquisitors, he drew his inspiration. This change had been coming on steadily since the Reformation, a change that implied a growing freedom from trammels and a larger and more human view of the subjects treated. Perhaps the earliest trace of this new aspect of Bible story is to be found in the pictures painted in Rome about the beginning of the 17th century by Adam Elsheimer of Frankfort, who had undoubtedly a great influence on the Dutch painters studying in Italy. These in their turn carried back to Holland the simplicity and the picturesque effect which they found in Elsheimer's work. Among these, the precursors of Rembrandt, may be mentioned Moeyaert, Ravesteyn, Lastman, Pinas, Honthorst, and Bramer. Influenced doubt- less by these painters, Rembrandt determined to work out his own ideas of art on Dutch soil, resisting apparently every inducement to visit Italy. Though an admirer of the great Italian masters, he yet maintained his own individuality in the most marked manner. It is strange that we have no evidence that he ever met his greatest Dutch rival, the brillant Frans Hals, his senior by some fifteen years.

Rembrandt was born in the house No. 3 Weddesteg, on the rampart at Leyden overlooking the Rhine. The house belonged to his father Gerrit Harmen van Rijn, a well-to-do miller, and still exists, but the windmill is

no more. He was the fourth son, and, as the older boys had been sent to trade, his parents resolved that he should enter a learned profession, With this view he was sent to the High School at Leyden; but the boy soon mani- fested his dislike of the prospect and determined to be a painter. Accordingly he was placed for three years under Swanenburch, a connexion of the Van Rijn family. This master was a painter of no great merit, but he enjoyed some reputation from his having studied in Italy. His next master was Lastman of Amsterdam, a painter of very considerable power. In Lastman's works we can trace the germs of the colour and sentiment of his greater pupil, though his direct influence cannot have been great, as it is said by Orlers that Rembrandt remained with him only six months, after which time he returned to Leyden, about 1623, During the early years of his life at Leyden Rembrandt seems to have devoted himself entirely to studies, painting and etching the people around him, the beggars and cripples, every picturesque face and form he could get hold of. Life, character, and above all light were the aims of these studies. His mother was a fre- quent model, and we can trace in her features the strong likeness to her son, especially in the portraits of himself at an advanced age. So far as we know there is no likeness of his father, who died about 1632. The last portrait of his mother is that of the Belvidere Gallery of Vienna, painted the year before her death in 1640. One of his sisters also frequently sat to him, and Bode suggests that she must have accompanied him to Amsterdam and kept house for him till he married. This conjecture rests

on the number of portraits of the same young woman painted in the early years of his stay in Amsterdam and before he met his bride. Then, again, in the many portraits of himself painted in his early life we can see with what zeal he set himself to master every form of expression, now grave now gay, at one time with a smile at another with a frown,—how thoroughly he learned to model the human face not from the outside but from the inner man. Careful in detail and thorough in work, these studies were the foundation of his later triumphs. Dr Bode gives fifty as the number of the portraits of himself, most of them painted in youth and in old age, the times when he had leisure for such work.

Rembrandt's earliest pictures were painted in the last four years of his stay at Leyden, from 1627 to 1631. Bode mentions about nine pictures as known to belong to these years, chiefly paintings of single figures, as St Paul in Prison and St Jerome ; but now and then compositions of several, as Samson in Prison and Presentations in the Temple. The prevailing tone of all these pictures is a greenish-grey, the effect being somewhat cold and heavy. The gallery at Cassel gives usa typical example of his studies of the heads of old men, firm and hard in workmanship and full of detail, the effects of light and shade being carefully thought ont. His work was now attracting the attention of the lovers of art in the great city of Amster-dam ; and, urged by their calls, he removed about 1631 to live and die there. His life has few incidents and these only personal, for he lived among the simple burgher citizens, moving in an excellent circle of men of science, divines, poets, artists, and friends of art. At one bound he leaped into the position of the first portrait painter of the city, and received numerous commissions. During the early years of his residence there are at least forty known portraits from his hand, firm and solid in manner and staid in expression. It has been remarked that the fantasy in which he indulged through life was reserved only for the portraits of himself and his immediate connexions. The excellent painter Thomas De Keyser was then in the height of his power, and his influence is to be traced in some of Rembrandt's smaller portraits. Pupils also now flocked to his house in the Bloemgracht, among them Gerard Douw, who was nearly of his ownage. The first important work executed by Rembrandt in Amsterdam is Simeon in the Temple, of the Hague Museum, a fine early example of his treatment of light and shade and of his subtle colour. The concentrated light falls on the principal figure, his favourite way of arresting attention, while the background is full of mystery. The surface is sooth and enamelled, and all the details are carefully wrought out, while the action of light on the mantle of Simeon shows how soon he had felt the magical effect of the play of colour. Between the small Simeon of 1631 and the life-sized Lesson in Anatomy of 1632 there isa great difference. In the latter we have the first of the great portrait subjects, —Tulp the anatomist, the early friend of Rembrandt, dis- coursing to his seven associates, who are ranged with eager heads round the foreshortened body. The subject was not new, for it had been treated in former years by the Mierevelds, A. Pietersen, and others, for the Hall of the Surgeons. But

it was reserved for Rembrandt to make it a great picture by the grouping of the expressive portraits and by the completeness of the conception. The colour is quiet and the handling of the brush timid and pre- cise, while the light and shade are somewhat harsh and abrupt. But it isa marvellous picture for a young man of twenty-five, and it is generally accepted as the first milestone in the career of the painter, and as marking a new departure.

In the forty long years of Rembrandt's incessant activity

as an artist about seven hundred pictures are known to have come from his own hand. It is therefore clearly impossible within the space at our disposal to notice more than the prominent works in their order. Besides the Pellicorne family portraits of 1632, we have the caligra- phist Coppenol of the Cassel Gallery, interesting in the first place as an early example of Rembrandt's method of giving permanent interest to a portrait by converting it into a picture. He invests it with a sense of life by a momen- tary expression as Coppenol raises his head towards the spectator while he is mending a quill. The same motive is to be found in the Shipbuilder, 1633 (of Buckingham Palace), who looks up from his work with a sense of interruption at the approach of his wife. But the worthy Coppenol, "the Phcenix of the Pen," has another charm for us ; he was one of Rembrandt's earliest friends in his new abode and remained true to the end, being painted thrice and etched twice by the artist, the last of whose portrait etchings (1661) was the Coppenol of large size. The two small pictures of the Philosopher of the Louvre date from 1633, delicate in execution and full of mysterious effect. The year 1634 is especially remarkable as that of his marriage with Saskia van Ulenburgh, a beautiful, fair-haired Frisian maiden of good connexions. 'Till her death in 1642 she was the centre of his life and art, and lives for us in many a canvas as well as in her own portraits. On her the painter lavished his magical power, painting her as the Queen Artemisia or Bathsheba, and as the wife of Samson,—always proud of her long fair locks, and covering her with pearls and gold as precious in their play of colour as those of the Indies. A joyous pair as we see them in the Dresden Gallery,

Saskia sitting on his knee while he laughs gaily, or promenading together in a fine picture of 1636, or putting the last touches of ornament to her toilette, for thus Bode interprets the so-called Burgo- master Pancras and his Wife. These were his happy days when he painted himself in his exuberant fantasy, and adorned himself, at least in his portraits, in scarfs and feathers and gold chains. Saskia brought him a marriage portion of forty thousand guilders, a large sum for those times, and she brought him also a large circle of good friends in Amsterdam. She bore him four children, Rum- bartus and two girls successively named Cornelia after his beloved mother, all.of whom died in infancy, and Titus, nanied after Titia a sister of Saskia. We have several noble portraits of Saskia, a good type of the beauty of Holland, all painted with the utmost love and care, at Cassel (1633), at Dresden (1641), and a posthumous one (1643) at Berlin. But the greatest in workmanship and most pathetic in expression seems to us, though it is decried by Bode, that of Antwerp (1641), in which it is impossible not to trace declining health and to find a melancholy pre-sage of her death, which took place in 1642. Then truly went out the light of Rembrandt's life.

Returning to Rembrandt's work, we find one of the greatest portraits of 1634 to be the superb full length portrait of Martin Daey, which with that of Madame Daey, painted according to Vosmaer some years later, formed one of the ornaments of the Van Loon collection at Amsterdam. Both now belong to Baron Gustave de Rothschild. From the firm detailed execution of this portrait one turns with wonder to the broader handling of the Old Woman, aged eighty-three, in the National Gallery, of the same year, remarkable for the effect of reflected light and still more for the sympathetic rendering of character.

The life of Samson supplied many subjects in these early days. The so-called Count of Gueldres Threatening his Father-in-law of the Berlin Gallery has been restored to its proper signification by M. Kolloff, who finds it to be Samson. It is forced and violent in its action. But the

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greatest of this series, and one of the prominent pictures of Rembrandt's work, is the Marriage of Samson of the Dresden Gallery, painted in 1638.

Here Rembrandt gives the rein to his imagination and makes the scene live before us. Except the bride (Saskia), who sits calm and grand on a dais in the centre of the feast, with the full light again playing on her flowing locks and wealth of jewels, all is animated and full of bustle. Samson, evidently a Rembrandt of fantasy, leans over a chair pro-pounding his riddle to the Philistine lords. In execution it is a great advance on former subject pictures; it is bolder in manner, and we have here signs of his ap- proaching love of warmer tones of red and yellow. It is also a fine example of his magic play of colour.

The story of Susannah also occupied him in these early years, and he returned to the subject in 1641 and 1653. The Bather of the National Gallery may also be another interpretation of the same theme. In all of these pictures the woman is coarse in type and lumpy in form, though the modelling is soft and round, the effect which Rembrandt always strove to gain. Beauty of form was outside his art. But the so-called Danae (1636) at St Petersburg is a sufficient reply to those who decry his nude female forms. As flesh painting it glows with colour and life, and the blood seems to pulsate under the warm skin. In the picturesque story of Tobit Rembrandt found much to interest him, as we see in the beautiful small picture of the Arenberg collection at Brussels. Sight is being restored to the aged Tobias, while with infinite tenderness his wife holds the old man's hand caressingly. The momentary action is complete, and the picture goes straight to the heart. In the Berlin Gallery he paints the anxiety of the parents as they wait the return of their son. In 1637 he painted the fine picture now in the Louvre of the Flight of the Angel; and the same subject is grandly treated by him, apparently about 1645, in the picture exhibited in the winter exhibition at Burlington House in 1885. Reverence and awe are shown in every attitude of the Tobit family. A similar lofty treatment is to be found in the Christ as the Gardener appearing to Mary of 1638 (Buckingham Palace).

We have now arrived at the year 1640, the threshold of his second manner, which extended to 1654, the middle age of Rembrandt. During the latter part of the previous decade we find the shadows more transparent and the blending of light and shade more perfect. There is a growing power in every part of his art. The coldness of his first manner

had disappeared, and the tones were gradually changing into golden-brown. He had _ passed through what Bode calls his "Sturm-und-Drang" period of exaggerated expression, as in the Berlin Samson, and had attained to a truer, calmer form of dramatic expression, of which the Manoah of Dresden is a good example (1641). Whether it was that he was getting tired of painting commissioned portraits, that he was independent of them, or that he aimed at higher flights, it is certain that these portraits painted "to order" became more rare about this time, and that those which we have are chiefly friends of his circle, such as the Mennonite Preacher (C. C. Ansloo) and the Gilder (Le Doreur), a fine example of his golden tone, formerly in the Morny collection and now in America. His own splendid portrait (1640) in the National Gallery illustrates the change in his work. It describes the man well,—strong and robust, with powerful head, firm and compressed lips and determined chin, with heavy eye-brows, separated by a deep vertical furrow, and with eyes of keen penetrating glance,—altogether a self- reliant man that would carry out his own ideas, careless whether his popularity waxed or waned. The fantastic

rendering of himself has disappeared; he seems more |

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conscious of his dignity and position. He has now many friends and pupils, and numerous commissions, even fron the stadtholder; he has bought a large house in the Breedstraat, in which during the next sixteen years of his life he gathered his large collection of paintings, engravings, armour, and costume which figure afterwards in his inventory. His taste was wide and his purchases large, for he was joint owner with picture dealers of paintings by Giorgione and Palma Vecchio, while for a high-priced Marc- antonio Raimondi print he gave in exchange a fine impression of his Christ Healing the Sick, which has since been known as the Hundred Guilder Print. The stadt- holder was not a prompt payer, and an interesting corre- spondence took place between Rembrandt and Constantin Huygens, the poet and secretary of the prince. The Rembrandt letters which have come down to us are few, and these are therefore of importance. Rembrandt puts a high value on the picture, which he says

had been painted "with much care and zeal," but he is willing to take what the prince thinks proper; while to Huygens he sends a large picture as a present for his trouble in carrying through the business. There is here no sign of the grasping greed with which he has been charged, while his unselfish conduct is seen in the settlement of the family affairs at the death of his mother in 1640.

The year 1642 is remarkable for the great picture formerly known as the Night Watch, but now more correctly as the Sortie of the Banning Cock Company, another of the landmarks of Rembrandt's career, in which twenty-nine life-sized civic guards are introduced issuing pell-mell from their club house. Such guilds of arque- busiers had been painted admirably before by Ravesteyn and notably by Frans Hals, but Rembrandt determined to throw life and animation into the scene, which is full of bustle and movement. One can almost hear the beating of the drum and the barking of the dog. The dominant colour is the citron yellow uniform of the lieutenant, wearing a blue sash, while a Titian-like red dress of a musketeer, the black velvet dress of the captain, and the varied green of the girl and drummer, all produce arich and harmonious effect. The background has become dark and heavy by accident or neglect, and the scutcheon on which the names are painted is scarcely to be seen.

But this year of great achievement was also the year of his great loss, for Saskia died in 1642, leaving Rembrandt her sole trustee for her son Titus, but with full use of the money till he should marry again or till the marriage of Titus. The words of the will express her love for her husband and her confidence in him. With her death his life was changed. Bode has remarked that there is a pathetic sadness in his pictures of the Holy Family,—a favourite subject at this period of his life. All of these he treats with the naive simplicity of Reformed Holland, giving us the real carpenter's shop and the mother watching over the Infant reverently and lovingly, with a fine union of realism and idealism. It is true indeed that the circumstances of his time and country made it impos- sible for him to attempt to realize the ancient forms of Hebrew life, or to revive the bye-past race of Judea. He was content, as the old Italians were, with the types around him. The street in which he lived swarmed with Dutch and

Portuguese Jews, and many a Jewish rabbi sat to him. He accepted their turbans and local dress as character- istic of the people. But in his religious pictures it is not the costume we look at; what strikes us is the pro- found perception of the sentiment of the story, making them true to all time and independent of local circum- stance. A notable example of this feeling is to be found in the Woman Taken in Adultery of the National Gallery, painted in 1644 in the manner of the Simeon of the Hague.

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Beyond the ordinary claims of art, it commands our atten- tion from the grand conception of the painter who here as in other pictures and etchings has invested Christ with a majestic dignity which recalls Leonardo and no other. A similar lofty ideal is to be found in his various renderings of the Pilgrims at Emmaus, notably in the Louvre picture of 1648, in which, as Mrs Jameson says, "'he returns to those first spiritual principles which were always the dowry of ancient art. Here we have before us a countenance pale and tender, meek and lowly of heart, adorned only with holiness and a glorified life." From the same year we have the Good Samaritan of the Louvre, the story being told with intense pathos. The helpless suffering of the wounded man, the curiosity of the boy on tiptoe, the excited faces at the upper window, are all conveyed with masterly skill. In these two last pictures we find a broader touch and freer handling, while the tones pass into a dull yellow and brown with a marked predilection for deep rich red. Whether it was that this scheme of colour found no favour with the Amsterdamers, who, as Hoogstraten tells us, could not understand the Sortie, it seems certain that Rembrandt was not invited to take any leading part in the celebration of the congress of Westphalia of this year (1648), a year famous in Dutch history for the European declaration of the independence of Holland, and in Dutch art as the subject of Terburg's picture in the National Gallery and of Van der Helst's famous Banquet of the Civic Guard at Amsterdam.

Rembrandt touched no side of art without setting his mark on it, whether in still life, as in his dead birds or the Slaughtered Ox of the Louvre, or in his drawings of elephants and lions, all of which are instinct with life. But

at this period of his career we come upon a branch of his art on which he left, both in etching and in painting, the stamp of his genius, viz., landscape. Roeland Roghman, but ten years his senior, evidently influenced his style, for the resemblance between their works is so great that, as at Cassel, there has been confusion of authorship. Hercules Seghers also was much appreciated by Rembrandt, for at his sale eight pictures by this master figure in the inven- tory, and Vosmaer discovered that Rembrandt had worked on a plate by Seghers and had added figures to an etched Flight into Egypt. The earliest pure landscape known to us from Rembrandt's hand is the Winter Scene of Cassel (1646), silvery and delicate. As a rule in his painted landscape he aims at grandeur and poetical effect, as in the Repose of the Holy Family of 1647 (till recently called the Gipsies), a moonlight effect, clear even in the shadows. The Canal of Lord Lansdowne, and the Mountain Landscape with the Approaching Storm, the sun shining out behind the heavy clouds, are both conceived and executed in this spirit. A similar poetical vein runs through the Castle on the Hill of Cassel, in which the beams of the setting sun strike on the castle while the valley is sunk in the shades of approaching night. More powerful still is the weird effect of Lord Lansdowne's Windmill, with its glow of light and darkening shadows. In all these pictures light with its magical influences is the theme of the poet-painter. From the number of landscapes by himself in the inventory of his sale, it would appear that these grand works were not appreciated by his contemporaries. The last of the landscape series dates from 1655 or 1656, the close of the middle age or manhood of Rembrandt, a period of splendid power. In the Joseph Accused by Potiphar's Wife of 1654 we have great dramatic vigour and perfect mastery of expression, while the brilliant colour and glowing effect of light and shade attest his strength. To this period also belongs the great portrait of himself in the Fitzwilliam Museum at Cambridge.

But evil days were at hand. The long-continued wars

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and civil troubles had worn out the country. Trade and commerce languished, and in Amsterdam hundreds of houses were empty.

Rembrandt's brothers had suffered, and money was scarce. His own and doubtless Saskia's means were tied up in his house and in his large collection of valuable pictures, and we find Rembrandt borrowing considerable sums of money on the security of his house to keep things going. Perhaps, as Bode suggests, this was the reason of his extraordinary activity at this time. Then, unfortunately, in this year of 1654, we find Rembrandt involved in the scandal of having a child by his servant Hendrickie Jaghers or Stoffels, as appears by the books of the Reformed Church at Amsterdam. He recognized the child and gave it the name of Cornelia after his much- loved mother, but there is no proof that he married the mother, and the probability is against such a marriage, as the provisions of Saskia's will would in that case have come into force, and her fortune would have passed at once to her son Titus. Hendrickie seems to have continued to live with him, for we find her claiming a chest as her property at his sale in 1658. Doubtless she is the peasant girl of Rasdorf to whom Houbraken says Rembrandt was married. Sad as the story is, Hendrickie has an interest for us. Bode asserts that in his art there was always a woman in close relationship to Rembrandt and appearing in his work—his mother, his sister, and then Saskia. Are there any traces of Hendrickie? Whatif the little servant maid of ten years, painted about 1645 (Dulwich Gallery), and again in the Demidoff picture of the same year, in which the girl is painted in the red dress of a Dutch orphan, in both cases smiling and leaning over a window, were the maidservant of his house in 1654? The ages would correspond. Bode suggests that the beautiful por- trait of the Lady in the Salon Carré of the Louvre and the Amor and Cupid of the same gallery may represent Hendrickie and her child. Both pictures belong to this date, and by their treatment are removed from the category of Rembrandt's usual portraits. But if this is conjecture, we get nearer to fact when we look at the picture exhibited at Burlington House in 1883 to which tradition has attached the name of " Rembrandt's Mistress." At a glance one can see that it is not the mere head of a model, as she lies in bed raising herself to put aside a curtain as if she heard a well-known footstep. It is clearly a woman in whom Rembrandt had a_ personal interest. The date is clearly 165 , the fourth figure being illegible ; but the brilliant carnations and masterly touch connect it with the Potiphar's Wife of 1654 and the Jaghers period. It is painful to turn from this attempt to trace the life of Rembrandt in his

work to the sadder side of the story. In 1656 his financial affairs became more involved, and the Orphans' Chamber transferred the house and ground to Titus, though Rembrandt was still allowed to take charge of Saskia's estate. Nothing, how- ever, could avert the ruin of the painter, who was declared bankrupt in July 1656, an inventory of all his property being ordered by the Insolvency Chamber. The first sale took place in 1657 in the Keizerskroon hotel, Thomas Jacobz Haring, a well-known name in connexion with Rembrandt's art, being auctioneer; and the second, at which the larger part of the etchings and drawings were disposed of, in 1658—" collected by Rembrandt himself with much love and care," says the catalogue. The sum realized, under 5000 guilders, was but a fraction of their value. The time was unfavourable over the whole of Europe for such sales, the renowned collection of Charles I. of England having brought but a comparatively small sum in 1653. Driven thus from his house, stripped of everything he possessed even to his table linen, Rembrandt took a modest lodging in the same Keizerskroon hostelry

(the amounts of his bills are in record), apparently without friends and thrown entirely on himself. But there was no failure here, for this dark year of 1656 stands out pro- minently as one in which some of his greatest works were produced, as, for example, John the Baptist Preaching in the Wilderness, belonging to Lord Dudley, and Jacob Blessing the Sons of Joseph, of the Cassel Gallery. It is impossible not to respect the man who, amid the utter ruin of his affairs, could calmly conceive and carry out such noble work. Yet even in his art one can see that the tone of his mind was sombre. Instead of the brilliancy of 1654 we have for two or three years a preference for dull yellows, reds, and greys, with a certain measure of uniformity of tone. The handling is broad and rapid, as if to give utterance to the ideas which crowded on his mind. There is less caressing of colour for its own sake, even less straining after vigorous effect of light and shade. Still the two pictures just named are among the greatest works of the master. To the same year belongs the Lesson in Anatomy of Johann Deyman, another of the many men of science with whom Rembrandt was closely associated. The subject is similar to the great Tulp of 1632, but his manner and power of colour had advanced so

much that Sir Joshua Reynolds, in his visit to Holland in 1781, was reminded by it of Michelangelo and Titian.1 Vosmaer ascribes to the same year, though Bode places it later, the famous portrait of Jan Six, the future burgo- master, consummate in its ease and character, as Six descends the steps of his house drawing on his glove. The connexion between Rembrandt and the great family of Six was long and close, and is honourable to both. Jan married a daughter of Tulp the anatomist, one of Rembrandt's earliest friends. In 1641 the mother of Six, Anna Wymer, had been painted with consummate skill by Rembrandt, who also executed in 1647 the beautiful etching of Six standing by a window reading his tragedy of " Medea," afterwards illustrated by his friend. Now he paints his portrait in the prime of manhood, and in the same year of gloom paints for him the masterly John the Baptist. Six, if he could not avert the disaster of Rembrandt's life, at least stood by him in the darkest hour, when certainly the creative energy of Rembrandt was in full play. The same period gives us the Master of the Vineyard, and the Adoration of the Magi of Bucking- ham Palace.

After the sale of the house in the Breedstraat Rembrandt retired to the Rosengracht, an obscure quarter at the west end of the city. Vosmaer thinks he has traced the very house, but some doubts have been thrown on this dis- covery by De Roever. We are now drawing to the splendid close of his career in his third manner, in which his touch became broader, his impasto more solid, and his knowledge more complete. Hastening on by quicker steps, we may mention the Old Man with the Grey Beard of the National Gallery (1657), and the Bruyningh, the Secretary of the Insolvents' Chamber, of Cassel (1658), both leading up to the great portraits of the Syndics of the Cloth Hall of 1661. Nearly thirty years separate us from the Lesson in Anatomy, years of long-continued observation and labour. The knowledge thus gathered, the problems solved, the mastery attained, are shown here in abundance. Rembrandt returns to the simplest gamut of colour, but shows his skill in the use of it, leaving on the spectator an

1 This picture has had a strange history. It had suffered by fire and was sold to a Mr Chaplin of London in 1841, was exhibited in Leeds in 1868, and again disappeared, ultimately to be found in the magazines of the

South Kensington Museum as a doubtful Rembrandt. The patriotism of some Dutch lovers of art restored it to its native country ; and it now hangs, a magnificent fragment, in the Museum of Amsterdam.

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impression of absolute enjoyment of the result, unconscious of the means, The plain burghers dealing with the simple concerns of their guild arrest our attention as if they were the makers of history. They live for ever.

In his old age Rembrandt continued to paint his own portrait as assiduously as in his youthful and happy days. About twenty of these portraits are known, a typical one being found in the National Gallery. All show the same self reliant expression, though broken down indeed by age and the cares of a hard life. There isin Stockholm a large and unfinished picture which, if painted by Rembrandt, belongs to the late years of his life (etched by Waltner, Gaz. des Beaux-Arts, Nov. 1874). It is catalogued as the Oath of John Ziska, certainly a strange subject for Rem- brandt. Bode accepts the more natural interpretation of Prof. Anton Springer, viz., the Feast of Judas Maccabzeus, and ascribes the picture to an earlier date than that given by Vosmaer. Havard, however, after careful examination, attributes the work to Carel Fabritius.

About the year 1663 Rembrandt painted the (so-called) Jewish Bride of the Van der Hoop Gallery and the Family Group of Brunswick, the last and perhaps the most brilliant works of his life, bold and rapid in execution and marvel- lous in the subtle mixture and play of colours in which he seems to revel. The woman and children are painted with such love that the impression is conveyed that they repre- sent a fancy family group of the painter in his old age. This idea received some confirmation from the supposed dis- covery that he left a widow Catherine Van Wyck and two children, but this theory falls to the ground, for De Roever has shown (Oud Holland, 1883) that Catherine was the widow of a marine painter Theunisz Blanckerhoff, who died about the same time as Rembrandt. The mistake arose from a miscopying of the register. The subject of these pictures is thus more mysterious than ever.

In 1668 Titus, the only son of Rembrandt, died, leaving one child, and on 8th October 1669 the great painter him- self passed away, leaving two children, and was buried in the Wester Kerk. He had outlived his popularity, for his manner of painting, as we know from contemporaries, was no longer in favour with a people who preferred the smooth trivialities of Van der Werff and the younger Mieris, the leaders of an expiring school.

We must give but a short notice of Rembrandt's achievements in etching. Here he stands out by universal confession as first, excelling all by his unrivalled technical skill, his mastery of expression, and the lofty conceptions of many of his great pieces, as in the Death of the Virgin, the Christ Preaching, the Christ Healing the Sick (the Hundred Guilder Print), the Presentation to the People, the Crucifixion, and others. So great is his skill simply as an etcher that one is apt to overlook the nobleness of the etcher's ideas and the depth of his nature, and this tendency has been doubtless confirmed by the enormous difference in money value between "states" of the same plate, rarity giving in many cases a fictitious worth in the eyes of collectors. The points of difference between these states arise from the additions aie changes made by Rembrandt on the plate ; and the prints taken off by him have been subjected to the closest inspection by Bartsch, Gersaint, Wilson, Daulby, De Claussin, C. Blanc, Willshire, Seymour Haden, Middleton, and others, who have described them at great length and to whoimn the reader is referred. The classification of Rembrandt's etchings adopted till lately was the artificial one of treating them according to the subject, as Biblical, portrait, landscape, and so on; and to Vosmaer must be ascribed the credit of being the first to view Rembrandt's etched work, as he has done his work in painting, in the more scientific and interesting line of chronology. This method has been developed by Mr Seymour Haden and Mr Middleton, and is now universally accepted. But even so recently as 1873 M. C. Blanc, in his fine work L'Giwvre complet de Rembrandt, still adheres to the older and less intelligent arrangement, resting his preference on the frequent absence of dates on the etchings and more strangely still on the equality of the work. Mr Scymour Haden's reply is conclusive, "that the more important etchings which may be taken as types arc dated, and that, the style of the etchings at different periods of

Rembrandt's carecr being fully as marked as that of his paintings, no more difficulty attends the classification

of one than of the other." Indced M. Vosmaer points out in his life of Rembrandt that there is a marked parallelism between Rembrandt's painted and etched work, his early work in both cases being timid and tentative, while he gradually gains strength and character both with the brush and the graver's tools. M. Vosmaer's scheme of chronological order has doubtless been challenged in some respects, but it gave the deathblow to the older system. Mr Seymour Haden has started the theory that many of the etchings ascribed to Rembrandt up to 1640 were the work of his pupils, and seems to make out his case, though it may be carried too far. He argues (in his monograph on the Hitched Work of Rembrandt, 1877) that Rembrandt's real work in etching began after Saskia's death, when he assumes that Rembrandt betook him- self to Elsbroek, the country house of his "powerful friend" Jan Six. But it must be remembered that the future burgomaster was then but a young student of twenty-four, a member of a great family it is true, but unmarried and taking as yet no share in public life. That Rembrandt was a frequent visitor at Elsbroek, and that the Three Trees and other etchings may have been pro- duced there, may be admitted without requiring us to believe that he had left Amsterdam as his place of abode. The great period of

his etching lies between 1639 and 1661, after which the old painter |

seems to have renounced the needle. In these twenty years were produced his greatest works in portraiture, landscape, and Bible story. They bear the impress of the genius of the man.

In addition to the authors named, the reader is referred to W. Biirger (the nom de plume of Th. Thoré), Musées de la Hollande, 1858-1860; E. Fromentin, Maitres dautrefois; H. Havard, L'Ecole Hollandaise; Scheltema, Rembrand, Discours sur sa Vie, 1866; Ath. Cocquerel fils, Rembrandt, son individualisme dans Tart, Paris, 1869.—Since the

foregoing was put in type, anew and valuable work on Rembrandt, chiefly as the etcher, has appeared from the penof M. Eugene Dutuit (Z'@uvre complet de Rembrandt, Paris, 1885). M. Dutuit rejects the classification of M. C. Blane as dubious and unwarranted, dismisses the chrono- logical arrangement proposed by M. Vosmaer and adopted by Mr Seymour Haden ani Mr Middleton as open to discussion and lacking in possibility of proof, and reverts to the order established by Gersaint, ranging his materials under twelve heads:—Portraits (real and supposed), Old Testament and New

Testament subjects, histories, landscapes, &c. (J. F. W.)

REMIGIUS (or Remepivus, as the name is spelt in Fredegarius and elsewhere), or REm1, was born of noble parents and, according to a later tradition, in the district of Laon. In one of his own letters, written apparently about 512 a.p., Remigius speaks of himself as having been a bishop for fifty-three years. This throws back his election to about 459; and, as all his earlier biographers agree in making him twenty-one years of age on his appointment to this office, the date of his birth may be fixed at somewhere about the year 438. The bishop- ric was forced upon the young recluse by the townspeople of Rheims, who in this century had not yet lost the right of electing their own pastor. For the next thirty-seven years of Remigius's life we have no clue excepting one, or at most two, allusions in the letters of Sidonius Apollin- aris (Ep, viii. 14 ; ix. 7,8),—both of which epistles M. Baret has assigned to from 472 to 474. It is true that Fredegarius (Du Chesne, i. 728), writing about 658, and the later biographers associate the name of Remigius with that of Clovis in the story of the famous vase of Sois- sons. But the earlier account of Gregory (c. 590) lends no sanction to this association; and it is not till 496 that Remigius figures definitely in history. On the Christmas day of this year he baptized Clovis at Rheims with the greatest pomp. "Bow thy head meekly, O Sicambrian," were his words to the royal convert ; "adore what thou hast burnt and burn what thou hast adored." Two of the king's sisters were baptized about the same time ; and on the death of one of these, Albofledis, Remi- gius wrote Clovis a letter of consolation that is still pre- served (Dom. Boug. iv. 51). The traditions and perhaps the documents of Hincmar's time enumerated the immense possessions

conferred by Clovis upon his favourite pre- late. Remigius, in his turn, does not seem to have been slack in urging the orthodox king to undertake the deliverance of his fellow believers who in southern Gaul reluctantly submitted to the yoke of the Aryan Burgun- dians and Visigoths. His intrigues with the discontented bishops of Burgundy are said to have paved the way for Clovis's invasion (500). Hinemar has preserved the tradition that Remigius blessed Clovis before he set out

on his war against the Visigoths (507); and we still have the letter in which he recommends the king to be merciful in his new conquests (Bouquet, iv. 52; see, however, Junghans's remarks on the probable date of this letter).

It is not, however, solely as a statesman or as the mentor of a barbarian king that Remigius claims atten- tion. In Hincmar's time he was recognized as the second founder of the church of Rheims, to whose influence that see owed the greater part of its possessions; and in such a matter the popular tradition can hardly have been entirely wrong. One of his few remaining letters is directed in the most vigorous terms against the encroach- ments of a neighbouring bishop, Falco of Maestricht (Bougq., iv. 53). Heis said to have established a bishopric at Laon, his native place. So great was his fame that it reached the ears of Alaric and his Gothic counsellors at Toulouse, and that, at last, Pope Hormisdas or one of his immediate predecessors appointed him his vicar throughout the Frankish domains. Of Remigius's writ- ings only a few verses and the letters alluded to above have been preserved; but his credit for learning and eloquence is amply attested by Sidonius Apollinaris and Gregory of Tours. The former, writing to Remigius (c. 472), declares him to be unsurpassed by any living orator.

Gregory has also preserved the tradition that Remigius was bishop of Rheims for more than seventy years (De Gloria Conf., 89), a fact which inclines us to lay some confidence on the more detailed statement of Hincmar that he died on January 13, in the ninety-sixth year of his age, after an episcopate of seventy-four years. Hence we may fix upon 533 as the date of his decease, more especially as this conclusion coincides well

enough with the little that is known as to the chronology of his two immediate successors (Ste Marthe, ix. 10-13). In 882, when the Northmen were threatening a descent upon the un- walled city of Rheims, Hincmar had the body of St Remi removed from its first resting-place in the little church of St Christopher to Epernay. Next year it was brought back to Rheims, but it was not restored to its original home till some years later. We learn from Gregory of Tours that, even so early as the reign of Childebert II. (575-596) the first of October was held sacred to the memory of the saint. During the Carlovingian times this day became one of the great feasts of the year, its observance being sanctioned by the council of Mainz in 813 and a capitulary of Louis le Debonnaire in 821 (Dessailly). In 1049 Pope Leo IX. assisted at the removal of the relics and issued a decree for the observation of the féte.

The authorities for the life of St Remi are very meagre. An almost contemporary Vita Remigii, written in the popular Latin of the period (cothurno Gallicano), and known to Gregory of Tours, was, according to Hinemar, almost entirely destroyed in the troubled times of Charles Martel, but not before it had been abbreviated and stripped of nearly all historic value by Fortunatus between the years 565 and 590. This abridgment, which still exists, formed the basis of the Vita Remigit written by Hincmar, archbishop of Rheims from 845 to 882, who, however, professes to incorporate with his work some fragments of the orginal Vita and other ancient documents, as he has most certainly incorporated the living traditions of his own age. In the course of the next century Flodoard, a canon of Rheims (0d. 966), compiled his account of St Remi, by making a very free use of his predecessors' labours, with, however, some traditional information of hisown. The above works are all in Migne's Patrologia, vols. 1xxxviii., exxv., &c. See also Fredegarius and Gregory of Tours, whose authority is only second to that of Fortunatus. The scattered documents of the Merovingian period are to be found in the great collections of A. Du Chesne, Bouquet, and Labbé. Le Cointe's Annales Ecelesiastici, vol. i.; Mabillon's Annales Ordinis Bened., vol. i.; Ste Marthe's Gallia Christiana, vol. ix.; and the Acta Sanctorum (October 1), which contains the best modern life of St Remi, may be consulted with advantage. Of French lives see that by the

prior Armand. The so-called Testamentuwm Remigit, which has been preserved in a longer and shorter form by Flodoard and

Hincmar, has lately found an able champion of its authenticity in the Abbé Dessailly. For Remigius's connexion with Vedastus (who assisted in the conversion of Clovis), St Medard, St Eleutherius, &c., see the Bollandist Vita Remigti alluded to above and the Acta Sanctorum for Feburary 6, June 8, and February 20.

REMIREMONT, the chief town of an arrondissement of the department of the Vosges, France, 17 miles south- south-east of Epinal by rail, on the banks of the Moselle where it is joined by the Moselotte. It is a pretty and well-built town picturesquely surrounded by forest-clad mountains, and commanded by Fort Parmont, one of the line of defensive works along the Moselle. Besides a great cotton spinning-mill (30,000 spindles) brought from Miilhausen after the war of 1870, it possesses tanneries, weaving-factories, and saw-mills; and it trades in timber, cattle, cheese, coopers' wares, &c. The more interesting buildings belong to the ancient abbey, to which the town owes most of its fame. The abbey church was consecrated to Pope Leo IX. in person in 1051. The abbatial resi- dence (which now contains the mairie, the court-house, and the public library) has been twice rebuilt in modern times (in 1750, and again after the fire of 1871), but the original plan and style have been preserved in the imposing front, the vestibule, and the grand staircase. The popula- tion of the town was 6212 in 1871, and 7857 in 1881; that of the commune 6510 and 8126.

Remiremont has its name from St Romaric, one of the com- panions of St Columban of Luxeuil, who founded a monastery and a convent on the hills above the site where the town now stands. On the destruction of these establishments by the Hungarians in 910 a.D. the nuns took refuge at Remiremont, and their new convent became famous under an abbess who " carried not a crosier but a sceptre." Enriched by dukes of Lorraine, kings of France, and emperors of Gcrmany, the ladies of Remiremont ultimately attained to great power. The abbess was a princess of the empire, and received consecration at the hands of the pope at Rome. The canoncsses (fifty in number) were selected only from those

who could give proof of noble descent. Their property comprised fifty- two signiories and twenty-two petty lordships. On Whitsun Mon- day the neighbouring parishes paid homage to the chapter in a ceremony called the " Kyrioles"; and on their accession dukes of Lorraine had to come to Remiremont with great pomp to swear to continue their protection. The " War of the Scutcheons" (Panon- ceaux) in 1566 between the duke and the abbess ended in favour of the duke ; and the abbess never recovered her former position. The townsfolk took advantage of this and similar contests to extend their municipal privileges. In the 17th century the ladics of Remiremont fell away so much from the original monastic rule as to take the title of countesses, renounce their vows, and marry. The town was attacked by the French in 1638, and ruined by the earthquake of 1682. With the rest of Lorraine it was joined to France in 1766. The monastery on the hill (Mont de Romeric or Saint Mont) and the nunnery in the town were both suppressed in the Revolution.

REMONSTRANTS meant originally those Dutch Pro- testants who, after the death of ARMINIUS (g.v.), continued to maintain the views associated with his name, and in 1610 presented to the states of Holland and Friesland a "remonstrance " in five articles formulating their points of departure from stricter Calvinism. Their adversaries met them with a "counter remonstrance," and so were known as the Counter Remonstrants. The conflict continued to rage till 1618-19, when the synod of Dort (see Dort, Synop oF) established the victory of the stricter school. The judgment of the synod was enforced by the deposition and in some cases the banishment of Remonstrant ministers; but the Government soon became convinced that their party was not dangerous to the state, and in 1630 they were formally allowed liberty to reside in all parts of Holland and build churches and schools. In 1621 they had also received liberty to make a settlement in Schleswig, where they built themselves the town of Friedrichstadt. This colony still exists. embodied in 1621 in a confessio written by Episcopius (q.v.), their great theologian, while Wytenbogaert gave them a catechism and regulated their churchly order. The

The doctrine of the Remonstrayts was |

Remonstrants adopted a simple synodical constitution ; but their importance was henceforth more theological than ecclesiastical. Their seminary in Amsterdam has boasted of many distinguished names—Curcelleus, Limborch, Wetstein, Le Clerc; and their liberal school of theology, which naturally grew more liberal and even rationalistic, reacted powerfully on the state church. The Remon- strants are now a small body (see HoLLann, vol. xii. p. 66), but respected for their traditions of scholarship and liberal thought.

REMSCHEID, a manufacturing town of Rhenish Prussia, in the district of Diisseldorf, sometimes dignified with the title of the " Rhenish Sheffield," is situated about 20 miles to the north-east of Cologne, at a height of 1120 feet above the sea. It is the centre of the German hard-ware industry, and large quantities of tools, scythes, skates, and other small articles in iron, steel, and brass are annually made here for exportation to all parts of Europe, the East, and North and South America. In 1880 the commune contained 30,029 inhabitants (26,844 Pro- testants), of whom 11,000 belonged to Remscheid proper and the rest to the manufacturing villages with which it is grouped. The name of Remscheid occurs in a document of 1132, and the town received the first impulse to its industrial importance through the immigration of Pro-testant refugees from France and Holland.

REMUSAT, Aset (1788-1832), a distinguished Chinese scholar, was born at Paris, 5th September 1788. His father, a surgeon, superintended his early education in person and designed him for the medical profession. Jean Pierre Abel Rémusat graduated with distinction as M.D. in 1813, and for a short time held a hospital appointment, but his heart had long been in other studies. A Chinese herbal in the collection of the Abbé Tersan had attracted his attention when he was still a lad; he taught himself to read by great perseverance and with very imperfect helps, and at the end of five years' study he produced in 1811 an Essai sur la langue et la littérature Chinoises, and a paper on foreign languages among the Chinese, which procured him the patronage of De Sacy. In 1814 a chair of Chinese was founded at the Collége de France, and Rémusat was placed in it. From this time he gave himself wholly to the languages of the Extreme East, and published a long series of useful works, among which

his contributions from Chinese sources to the history of the Tartar nations claim special notice. Rémusat became an editor of the Journal de Savants in 1818, and founder and first secretary of the Paris Asiatic Society in 1822; he held also in the course of his life various honourable and lucrative Government appointments. He married in 1830, but had no children. He died at Paris, 4th June 1832, and his éloge was written by De Sacy.

REMUSAT, Cyartes Frangors Marin, ComTe DE (1797-1875), French politician and man of letters, was born at Paris on the 13th March 1797. His father, also Comte de Rémusat, of a good though not very distinguished family in the district of Toulouse, was a man of considerable literary taste, of much administrative ability, and of moderate Liberal views in politics. He was chamberlain to Napoleon, but disapproved of the emperor's absolutist government and aggressive policy, and after the restoration became prefect first of the Haute Garonne and then of the Nord. His wife (mother of Charles) was a still more remarkable person, whose full abilities have only recently been made known. Her maiden name was Claire Elisabeth Jeanne Gravier de Vergennes. She was born in 1780, and was early introduced to the salons, which reopened after the cessation of the Terror. She married the Comte de Rémusat when she was very young, and was long attached to the service of Josephine, to whom she was

finally dame du palais. Talleyrand was a particular admirer of hers, and she was generally recognized as a woman of great intellectual capacity as well as of much personal grace and charm. After her death (1824) an Essai sur VEducation des Femmes was published and received an academic couronne. But it was not till 1879, when her grandson M. Paul de Rémusat published her memoirs, which have since been followed by some correspondence with her son, that justice could be generally done to her literary talent. The light thrown on the Napoleonic court by this remarkable book was great, and Madame de Rémusat appeared as hardly the inferior of the best memoir and letter writers of the previous century.

The same documents contained much information on the youth and education of her son Charles. He very early developed political views more decidedly Liberal than those of his parents, and, being bred to the bar, published in 1820 a short pamphlet on jury trial. He was also an active journalist, showing in philosophy and literature the special influence of Cousin. He was, however, at the same time a thorough man of the world, and is said to have furnished to no small extent the original of Balzac's brilliant egoist Henri de Marsay. He took no active part in politics till the revolution of July, when he signed the journalists' protest against the Ordinances, and in the following October was elected deputy for Toulouse. He then ranked himself with the "doctrinaires," and supported (being a speaker of no small power) most of those measures of restriction on popular liberty which rapidly made the July monarchy unpopular with French Radicals. In 1836 he became under-secretary of state for the interior, but did not hold the post long. He then became an ally of Thiers, and in 1840 held the ministry of the interior for a short time. In the same year he became an Academician.

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For the rest of Louis Philippe's reign he was in opposition till he joined Thiers in his brief and hopeless attempt at a ministry in the spring of 1848. During this time Rémusat constantly spoke in the chamber, but was still more active in literature, especially on philosophical subjects,—the most remarkable of his works being his book on Abélard (1845), In 1848 he was elected, and in 1849 re-elected, for the department of Haute Garonne and sat on the Conservative side. But he would not support Louis Napoleon, and had to leave France after the coup d'état ; nor did he re-enter political life at all during the second empire, though his son M. Paul de Rémusat stood for the Haute Garonne, and was very nearly elected, in 1869. Nor would he at first accept the advances made him after the establishment of the third republic. In 1871 he was appointed minister of foreign affairs and accepted the post. Although minister he was not a deputy, and on standing for Paris in September 1873 he was beaten by M. Barodet. A month later he was elected (having already resigned with Thiers) for the Haute Garonne by a very great majority. He died at Paris on the 6th April 1875.

During his long abstention from political life Rémusat continued to write on his favourite subjects of philosophical history and especially English philosophical history. Saint Ansclme de Cantor- béry appeared in 1854; L' Angleterre aw XVILIeme siecle in 1856 (2d ed. enlarged, 1865); Bacon, sa vie, son temps, dc., in 1858; Channing, sa vie ct ses wuvres, in 1862; John Wesley in 1870; Lord Herbert of Cherbury in 1874; Histoire de la philosophie cn Angleterre depuis Bacon jusqu'a Locke, in 1875; besides other and minor works. The impression derived from these and from the political records of his life is that he was on the whole one of those men whose performances are unequal to their powers. He wrote well, was a forcible speaker, and au acute critic ; but his adoption of the indeterminate eclecticism of Cousin in philosophy and of the somewhat similarly indeterminate liberalism of Thiers in politics probably had a bad effect on him, though both no doubt accorded with his critical and unenthusiastic turn of mind.

RENAISSANCE

oe AISSANCE is a term which has recently come into use to indicate a well-known but indefinite space

sance and Of time and a certain phase in the development of the

Revival

European races. On the onc hand it denotes the transi-

of Learn- tion from that period of history which we call the Middle

ing,

Ages to that which we call Modern. On the other hand it implies those changes in the intellectual and moral attitude of the Western nations by which the transition was characterized. If we insist upon the literal meaning of the word, the Renaissance was a re-birth; and it is needful to inquire of what it was the re-birth. The metaphor of Renaissance may signify the entrance of the European nations upon a fresh stage of vital energy in general, implying a fuller consciousness and a freer exercise of

faculties than had belonged to the medieval period. Or it may mean the resuscitation of simply intellectual activi- ties, stimulated by the revival of antique learning and its application to the arts and literatures of modern peoples. Upon our choice between these two interpretations of the word depend important differences in any treatment of the subject. The former has the disadvantage of making it difficult to separate the Renaissance from other historical phases—the Reformation, for example—with which it ought not to be confounded. 'The latter has the merit of assign- ing a specific name to a limited series of events and group of facts, which can be distinguished for the purpose of analysis from other events and facts with which they are intimately but not indissolubly connected. In other words, the one definition of Renaissance makes it denote the whole change which came over Europe at the close of the Middle Ages. The other confines it to what was known by our ancestors as the Revival of Learning. Yet,

when we concentrate attention on the recovery of antique culture, we become aware that this was only one pheno- menon or symptom of a far wider and more comprehen- sive alteration in the conditions of the European races. We find it needful to retain both terms, Renaissance and Nevival of Learning, and to show the relations between the series of events and facts which they severally imply. The Revival of Learning must be regarded as a function of that vital energy, an organ of that mental evolution, which brought the modern world, with its new conceptions of philosophy and religion, its re-awakened arts and sciences, its firmer grasp on the realities of human nature and the world, its manifold inventions and discoveries, its altered political systems, its expansive and progressive forces, into being. Important as the Revival of Learning undoubtedly was, there are essential factors in the com- plex called the Renaissance with which it can but remotely be connected. When we analyse the whole group of pheno- mena which have to be considered, we perceive that some of the most essential have nothing or little to do with the recovery of the classics. These are, briefly speaking, the decay of those great fabrics, church and empire, which ruled the Middle Ages both as ideas and as realities; the appearance of full-formed nationalities and languages ; the enfeeblement of the feudal system throughout Europe ; the invention and application of paper, the mariner's compass,

gunpowder, and printing; the exploration of continents beyond the ocean ; and the substitution of the Copernican for the Ptolemaic system of astronomy. Europe in fact had been prepared for a thorough-going metamorphosis before that uew ideal of human life and culture which the Revival of Learning brought to light had been made

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manifest, It had recovered from the confusion conse- quent upon the dissolution of the ancient Roman empire. The Teutonic tribes had been Christianized, civilized, and assimilated to the previously Latinized races over whom they exercised the authority of conquerors. Compara- tive tranquillity and material comfort had succeeded to discord and rough living. Modern nationalities, defined as separate factors in a common system, were ready to cooperate upon the basis of European federation. The ideas of universal monarchy and of indivisible Christendom, incorporated in the Holy Roman Empire and the Roman

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the history of Europe in the 16th century of our era came to be written with the brevity with which we write the history of Europe in the 6th century B.c., it would be difficult at the distance of time implied by that supposition to dis- tinguish the Italian movement of the Renaissance in its origin from the German movement of the Reformation. Both would be seen to have a common starting-point in the reaction against long dominant ideas which were becoming obsolete, and also in the excitation of faculties which had during the same period been accumulating energy.

The Renaissance, if we try to regard it as a period, Chrono- was essentially the transition from one historical stage to logical another. It cannot therefore be confined within strict limits.

Church, had so far lost their hold that scope was offered for the introduction of new theories both of state and church

Method of treat- ment.

which would have seemed visionary or impious to the medizval mind, It is therefore obvious that some term, wider than Revival of Learning, descriptive of the change which began to pass over Europe in the 14th and 15th centuries, has to be adopted. That of Renaissance, Ninascimento, or Renascence is sufficient for the purpose, though we have to guard against the tyranny of what is after all a metaphor. We must not suffer it to lead us into rhetoric about the deadness and the darkness of the Middle Ages, or hamper our inquiry with preconceived assumptions that the re-birth in question was in any true sense a return to the irrecoverable pagan past. Nor must we imagine that there was any abrupt break with the Middle Ages. On the contrary, the Renaissance was rather the last stage of the Middle Ages, emerging from ecclesiastical and feudal despotism, developing what was original in medizeval ideas by the light of classic arts and letters, holding in itself the promise of the modern world. It was therefore a period and a process of transition, fusion, preparation, tentative endeavour. And just at this point the real importance of the revival of learning may be indicated. That rediscovery of the classic past restored the confidence in their own faculties to men striving after spiritual freedom ; revealed the continuity of history and the identity of human nature in spite of diverse creeds and different customs; held up for emula- tion master-works of literature, philosophy, and art; provoked inquiry; encouraged criticism; shattered the narrow mental barriers imposed by medizval orthodoxy. Humanism, a word which will often recur in the ensuing paragraphs, denotes a specific bias which the forces liberated in the Renaissance took from contact with the ancient world,—the particular form assumed by human self-esteem at that epoch,—the ideal of life and civilization evolved by the modern nations. It indicates the endeavour of man to reconstitute himself as a free being, not as the thrall of theological despotism, and the peculiar assistance he derived in this effort from Greek and Roman literature, the littere humaniores, letters leaning rather to the side of man than of divinity.

It is now apparent in what sense the Renaissance has to be treated in this article. It will be considered as implying a comprehensive movement of the European intellect and will toward self-emancipation, toward re-

assertion of the natural rights of the reason and the senses, toward the conquest of this planet as a place of human occupation, and toward the formation of regula- tive theories both for states and individuals differing from those of medizeval times. The revival of learning will be treated as a decisive factor in this process of evolution on anew plan. To exclude the Reformation and the Counter- Reformation wholly from the survey is impossible, as will appear inore plainly in the sequel. These terms indicate moments in the whole process of modern history which were opposed, each to the other, and both to the Renais- sance ; and it is needful to bear in mind that they have, scientifically speaking, a quite separate existence.

Yet if | of cosmopolitan importance.

chronological limits. This indecision inherent in the nature of a process which involved neither a political revolution nor the promulgation of a new religious creed, but was a gradual metamorphosis of the intellectual and moral state of Europe, is further augmented by the different epochs at which the several nations were prepared to bear their share in it. England, for example, was still feudal and medieval when Italy had socially and mentally entered on the modern stadium. A brother of the Black Prince banqueted with Petrarch in the palace of Galeazzo Visconti. Thatis to say, the founder of Italian humanism, the representative of Italian despotic state-craft, and the companion of Froissart's heroes met together at a marriage feast. The memories which these names evoke prove how impossible it is to fix boundaries in time for a movement which in 1368 had reached nearly the same point in Italy as it afterwards attained at the close of the 16th century in England. The Renaissance must indeed be viewed mainly as an internal process whereby spiritual energies latent in the Middle Ages were developed into actuality and formed a mental habit for the modern world. The pro- cess began in Italy, and gradually extended to the utmost bounds of Europe, producing similar results in every nation, and establishing a common civilization.

There is one date, however, which may be remembered The date with advantage as the starting-point in time of the 1453.

Renaissance, after the departure from the Middle Ages had been definitely and consciously made by the Italians. This is the year 1453,

when Constantinople, chosen for his capital by the first Christian emperor of Rome, fell into the hands of the Turk. One of the survivals of the old world, the shadow of what had been the Eastern empire, now passed suddenly away. Almost at the same date that visionary revival of the Western empire, which had imposed for six centuries upon the imagination of medieval Europe, hampering Italy and impeding the consolidation of Germany, ceased to reckon among political actualities ; while its more robust rival, the Roman Church, seemed likely to sink into the rank of a petty Italian principality. Three lights of medizval Christendom, the Eastern empire, the Holy Roman empire, and the papacy, at this point of time severally suffered extinction, mortal enfeeblement, and profound internal transformation. It was demonstrated by the destruction of the Eastern and the dotage of the Western empire, and by the new papal policy which Nicholas V. inaugurated, that the old order of society was about to be superseded. Nothing remained to check those centrifugal forces in state and church which substituted a confederation of rival European powers for the earlier ideal of universal monarchy, and separate religious constitutions for the previous Catholic unity. At the same time the new learning introduced by the earlier humanists awakened free thought, encouraged curiosity, and prepared the best minds of Europe for speculative audacities from which the schoolmen would have shrunk, and which soon expressed themselves in acts The new learning had been

Dates If we look a little forward to the years 1492-1500, we | of imitating the Augusti also in the sphere of letters. He 1492- obtain a second date of great importance. In these years | caused a scheme of humanistic education to be formulated, 1500 the expedition of Charles VIII. to Naples opened Italy to | and gave employment at his court to rhetoricians, of whom side French, Spanish, and German interference. The leading | Alcuin was the most considerable. But very little came of nations of Europe began to compete for the prize of the | the revival of learning which Charles is supposed to have peninsula, and learned meanwhile that culture which the | encouraged ; and the empire he restored was accepted by Italians had perfected. In these years the secularization | the medieval intellect in a crudely theological and vaguely of the papacy was carried to its final point by Alexander | mystical spirit. We should, however, here

remember VL, and the Reformation became inevitable. The same | that the study of Roman law, which was one important period was marked by the discovery of America, the | precursory symptom of the Renaissance, owed much to exploration of the Indian seas, and the consolidation of | medizval respect for the empire as a divine institution. the Spanish nationality. It also witnessed the application | This, together with the municipal Italian intolerance of of printing to the diffusion of knowledge, the revolution | the Lombard and Frankish codes, kept alive the practice effected in military operations by the use of gunpowder, | and revived the science of Latin jurisprudence at an early and the revolution in cosmology which resulted from the | period. Copernican discovery. Thus, speaking roughly, the half Philosophy attempted to free itself from the trammels Specula- century between 1450 and 1500 may be termed the | of theological orthodoxy in the hardy speculations of tion and culminating point of the Renaissance. The transition | some schoolmen, notably of Scotus Erigena and Abelard. ae from the medizval to the modern order was now secured | These innovators found, however, small support, and were Ages. if not accomplished, and a Rubicon had been crossed | defeated by opponents who used the same logical weapons from which no retrogression to the past was possible. | with authority to back them. Nor were the rationalistic Looking yet a little farther, to the years 1527 and 1530, a opinions of the Averroists without their value, though the third decisive date is reached. In the first of these years | church condemned these deviators from her discipline as happened the sack of Rome, in the second the pacification | heretics. Such medieval materialists, moreover, had of Italy by Charles V. under a Spanish hegemony. The | but feeble hold upon the substance of real knowledge. age of the Renaissance was now closed for the land which Imperfect acquaintance with authors whom they studied gave it birth. The Reformation had taken firm hold on | in Latin translations made by Jews from Arabic com- northern Europe. The Counter-Reformation was already | mentaries on Qreck texts, together with almost total imminent. ignorance of natural laws, condemned them to sterility. Piseur- It must not be imagined that so great a change as that | Like the other schiomachists of their epoch, they fought sors of implied by the Renaissance was accomplished without pre- | with phantoms in a visionary realm. A_ similar judg- the Re- monitory symptoms and previous endeavours. In the | ment may be passed upon

those Paulician, Albigensian, maussance- main we mean by it the recovery of freedom for the human Paterine, and Epicurean dissenters from the Catholic spirit after a long period of bondage to oppressive ecclesias- | creed who opposed the phalanxes of orthodoxy with frail tical and political orthodoxy,—a return to the liberal and imaginative weapons, and alarmed established orders in practical conceptions of the world which the nations of

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received gladly. Its vast significance was hardly under- stood. Both secular and spiritual potentates delighted in the beauty and fascination of those eloquent words which scholars, poets, and critics uttered— words indeed, but words which drew armed hosts behind them !"*

antiquity had enjoyed, but upon a new and enlarged plat- form. This being so, it was inevitable that the finally suc- cessful efforts after self-emancipation should have been anticipated from time to time by strivings within the ages that are known as dark and medieval. It is therefore part of the present inquiry to pass in review some of the claim- ants to be considered precursors of the Renaissance. First of all must be named the Frank in whose lifetime the dual conception of universal empireand universal church, divinely appointed, sacred, and inviolable, began to control the order of European society. Charles the Great lent his forces to the plan of resuscitating the Roman empire at a moment when his own power made him the arbiter of western Europe, when the papacy needed his alliance, and when the Eastern empire had passed under the usurped regency of a female. He modelled a spurious Roman empire, which was surnamed "Holy," in consequence of the diplomatic contract struck by him with the bishop of Rome, and in obedience to the prevailing theological beliefs of Latin Christianity. The Holy so-called Roman but essentially Teutonic empire owed such substance as the fabric possessed to Frankish armies and the sinews of the German people. As a struc- ture composed of divers ill-connected parts it fell to pieces at its builder's death, leaving little but the incubus of a memory, the fascination of a mighty name, to dominate the mind of medieval Europe. As an idea, the empire grew in visionary power, and remained one of the chief obstacles

in the way of both Italian and German national coherence. Real force was not in it, but rather in that

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counterpart to its unlimited pretensions, the church, which had evolved it from barbarian night, and which used her own more vital energies for undermining the rival of her creation. Charles the Great, having proclaimed himself successor of the Czesars, was obscurely ambitious

the state by the audacity of their communistic opinions. Physical science struggled into feeble life in the cells of Gerbert and Roger Bacon. But these men were accounted magicians by the vulgar; and, while the one eventually assumed the tiara, the other was incarcerated in a dungeon. The schools meanwhile resounded still to the interminable dispute upon abstractions. Are only universals real, or has each name a corresponding entity? From the midst of the Franciscans who had persecuted Roger Bacon because he presumed to know more than was consistent with human humility arose John of Parma, adopting and popularizing the mystic prophecy of Joachim of Flora. The reign of the Father is past; the reign of the Son is passing ; the reign of the Spirit is at hand. Such was the formula of the Eternal Gospel, which, as an unconscious forecast of the Renaissance, has attracted retrospective students by its felicity of adaptation to their historical method. Yet we must remember that this bold intuition of the abbot Joachim indicated a monastic reaction against the tyrannies and corruptions of the church, rather than a fertile philosophical conception. The Fraticelli spiritualists, and similar sects who fed their imagination with his doctrine, expired in the flames to which Fra Dolcino, Longino, and Margharita were consigned. To what extent the accusations of profligate morals brought against these reforming sectarians were justified remains doubtful; and the same uncertainty rests upon the alleged iniquities of the Templars. It is only certain that at this epoch the fabric of Catholic faith was threatened with various forms of prophetic and Oriental

Natural- ism in medixval life and literature.

Goliardic poetry,

mysticism, symptomatic of a widespread desire to grasp at something simpler, purer, and less rigid than Latin theology afforded. Devoid of criticism, devoid of sound learning, devoid of a firm hold on the realities of life, these heresies passed away without solid results and were forgotten.

We are too apt to take for granted that the men of the Middle Ages were immersed in meditations on the other world, and that their intellectual exercises were confined to abstractions of the schools, hallucinations of the fancy, allegories, visions. This assumption applies indeed in a broad sense to that period which was dominated by intolerant theology and deprived of positive knowledge. Yet there are abundant signs that the native human instincts, the natural human appetites, remained unaltered and alive beneath the crust of orthodoxy. In the person of a pope like Boniface VIII. those ineradicable forces of the natural man assumed, if we may trust the depositions of ecclesiastics well acquainted with his life, a form of brutal atheistic cynicism. In the person of an emperor, Frederick IL, they emerged under the more agreeable garb of liberal culture and Epicurean scepticism. Frederick dreamed of remodelling society upon a mundane type, which anticipated the large toleration and cosmopolitan enlightenment of the actual Renaissance. But his efforts were defeated by the unrelenting hostility of the church, and by the incapacity of his contemporaries to understand his aims. After being forced in his lifetime to submit to authority, he was consigned by Dante to hell. Frederick's ideal of civilization was derived in a large measure from Provence, where a beautiful culture had prematurely bloomed, filling southern Europe with the perfume of poetry and gentle living. Here, if anywhere, it seemed as though the ecclesiastical and feudal fetters of the Middle Ages might be broken, and humanity might enter on a new stage of joyous unimpeded evolution. This was, however, not to be. The church preached Simon de Montfort's crusade, and organized Dominic's Inquisition; what Quinet calls the '"' Renaissance sociale par V Amour " was extirpated by sword, fire, famine, and pesti- lence. Meanwhile the Provengal poets had developed their modern language with incomparable richness and dexterity, creating forms of verse and modes of emotional

expression which determined the latest medizval phase of literature in Europe. The naturalism of which we have been speaking found free utterance now in the fabliaux of jongleurs, lyrics of minnesingers, tales of trouvéres, romances of Arthur and his knights,—compositions varied in type and tone, but in all of which sincere passion and real enjoyment of life pierce through the thin veil of chivalrous mysticism or of allegory with which they were sometimes conventionally draped. The tales of Lancelot and Tristram, the lives of the troubadours and the Wachtlieder of the minnesingers, sufficiently prove with what sensual freedom a knight loved the lady whom custom and art made him profess to worship as a saint. We do not need to be reminded that Beatrice's adorer had a wife and children, or that Laura's poet owned a son and daughter by a concubine, in order to perceive that the mystic passion of chivalry was compatible in the Middle Ages with commonplace matrimony or vulgar illegitimate connexions. But perhaps the most con- vincing testimony to the presence of this ineradicable naturalism is afforded by the Latin songs of wandering students, known as Carmina Burana, written by the self-styled Goliardi. In these compositions, remarkable for their facile handling of medizval Latin rhymes and rhythins, the allegorizing mysticism which envelops chival- rous poetry is discarded. Love is treated from a frankly carnal point of view. Bacchus and Venus go hand in

hand, as in the ancient ante-Christian age. The open- air enjoyments of the wood, the field, the dance upon the village green, are sung with juvenile lightheartedness. No grave note, warning us that the pleasures of this earth are fleeting, that the visible world is but a symbol of the invisible, that human life is a probation for the life beyond, interrupts the tinkling music as of castanets and tripping feet which gives a novel charm to these unique relics of the 13th century. Goliardic poetry is further curious as showing how the classics even at that early period were a fountainhead of pagan inspiration. In the taverns and low places of amusement haunted by those lettered songsters, on the open road and in the forests trodden by their vagrant feet, the deities of Greece and Rome were not in exile, but at home within the hearts of living men. Thus, while Christendom was still preoccupied with the crusades, two main forces of

the Renaissance, naturalism and enthusiasm for antique modes of feeling, already brought their latent potency to light, prematurely indeed and precociously, yet with a promise that was destined to be kept.

When due regard is paid to these miscellaneous evi- Medizval dences of intellectual and sensual freedom during the attitude

Middle Ages, it will be seen that there were by no means lacking elements of native vigour ready to burst forth. What was wanting was not vitality and licence, not audacity of speculation, not lawless instinct or rebellious impulse. It was rather the right touch on life, the right feeling for human independence, the right way of approach- ing the materials of philosophy, religion, scholarship, and literature, that failed. The courage that is born of knowledge, the calm strength begotten by a positive attitude of mind, face to face with the dominant over- shadowing Sphinx of theology, were lacking. We may fairly say that natural and untaught people had more of the just intuition that was needed than learned folk trained in the schools. But these people were rendered licentious in revolt or impotent for salutary action by ignorance, by terror, by uneasy dread of the doom declared for heretics and rebels. The massive vengeance of the church hung over them, like a heavy sword suspended in the cloudy air. Superstition and stupidity hedged them in on every side, so that sorcery and magic seemed the only means of winning power over nature or insight into mysteries surrounding human life. The path from dark- ness to light was lost; thought was involved in alle- gory; the study of nature had been perverted into an inept system of grotesque and pious parable-mongering ; the pursuit of truth had become a game of wordy dialectics. The other world with its imagined heaven and hell haunted the conscience like a nightmare. How- ever sweet this world seemed, however fair the flesh, both world and flesh were theoretically given over to the devil. It was not worth while to master and economize the resources of this earth, to utilize the goods and ameliorate the evils of this life, while every one agreed, in theory at any rate, that the present was but a bad prelude to an infinitely worse or infinitely better future. To escape from these preoccupations and prejudices except upon the path of conscious and deliberate sin was impossible for all but minds of rarest quality and courage; and these were too often reduced to the recantation of their

supposed errors no less by some secret clinging sense of guilt than by the church's iron hand. Man and the actual universe kept on reasserting their rights and claims, announcing their goodliness and delightfulness, in one way or another ; but they were always being thrust back again into Cimmerian regions of abstractions, fictions, visions, spectral hopes and fears, in the midst of which the intellect somnambulistically moved upon an unknown way.

Ttaly— It is just at this point that the Revival of Learning inter- thought, and conscience in the future. This conviction

me re vened to determine the course of the Renaissance. Medi- | made young men leave their loves and pleasures, grave men

ee zeval students possessed a considerable portion of the Latin quit their counting-houses, churchmen desert their missals, g.

classics, though Greek had become in the fullest sense of the phrase a dead language. But what they retained of

ancient literature they could not comprehend in the right

spirit. Between them and the text of poet or historian hung a veil of mysticism, a vapour of misapprehension. The odour of unsanctity clung around those relics of the pagan past. Men bred in the cloister and the lecture- room of the logicians, trained in scholastic disputations, versed in allegorical interpretations of the plainest words and most apparent facts, could not find the key which might unlock those stores of wisdom and of beauty. Petrarch first opened a new method in scholarship, and re- vealed what we denote as humanism. In his teaching lay the twofold discovery of man and of the world. For human- ism, which was the vitalelement in the Revival of Learning, consists mainly of a just perception of the dignity of man as a rational, volitional, and sentient being, born upon this earth with a right to use it and enjoy it. Humanism implied the rejection of

those visions of a future and imagined state of souls as the only absolute reality, which had fascinated the imagination of the Middle Ages. It involved a vivid recognition of the goodliness of man and nature, displayed in the great monuments of human power recovered from the past. It stimulated the curiosity of latent sensibilities, provoked fresh inquisition into the groundwork of existence, and strengthened man's self- esteem by knowledge of what men had thought and felt and done in ages when Christianity was not. It roused a desire to reappropriate the whole abandoned provinces of mundane energy, and a hope to emulate antiquity in works of living loveliness and vigour. The Italians of the 14th century, more precocious than the other European races, were ripe for this emancipation of enslaved intelligence. In the classics they found the food which was required to nourish the new spirit; and a variety of circum- stances, among which must be reckoned the pride of a nation boasting of its descent from the Populus Romanus, rendered them apt to fling aside the obstacles that had impeded the free action of the mind through many cen- turies. Petrarch not only set his countrymen upon the

divined the importance of recovering a knowledge of Greek literature. he was followed by numerous Italian enthusiasts, who visited Byzantium before its fall as the sacred city of a new revelation. The next step was to collect MSS., to hunt

To this task Boccaccio addressed himself; and |

to crowd the lecture rooms of philologers and rhetoricians. When Greek had been acquired, MSS. accumulated, libraries and museums formed, came the age of printers and expositors. Aldus Manutius in Italy, Froben in Basel, the Etiennes in Paris, committed to the press what the investigators had recovered. Nor were there wanting at the same time men who dedicated their powers to Hebrew and Oriental erudition, laying, together with the Grecians, a basis for those Biblical studies which advanced the Reformation. Meanwhile the languages of Greece and Rome had been so thoroughly appropriated that a final race of scholars, headed by Politian, Pontano, Valla, handled once again in verse and prose both antique dialects, and thrilled the ears of Europe with new-made pagan melodies. The church itself at this epoch lent its influence to

the prevalent enthusiasm. Nicholas V. and Leo X., not to mention intervening popes who showed themselves tolerant of humanistic culture, were heroes of the classical revival. Scholarship became the surest path of advancement to ecclesiastical and political honours. Italy was one great school of the new learning at the moment when the Ger- man, French, and Spanish nations were invited to her feast.

It will be well to describe briefly, but in detail, what Nature of this meeting of the modern with the ancient mind effected Italian

over the whole field of intellectual interests. In doing so, we must be careful to remember that the study of the classics did but give a special impulse to pent-up energies which were bound in one way or another to assert their independence. Without the Revival of Learning the direc- tion of those forces would have been different ; but that novel intuition into the nature of the world and man which constitutes what we describe as Renaissance must have emerged. As the facts, however, stand before us, it is impossible to dissociate the rejection of the other world as the sole reality, the joyous acceptance of this world as a place to live and act in, the conviction that "the proper study of mankind is man," from humanism. Humanism, as it actually appeared in Italy, was positive in its con-

| ception of the problems to be solved, pagan in its con- right method of studying the Latin classics, but he also |

tempt for medizval mysticism, invigorated for sensuous enjoyment by contact with antiquity, yet holding in itself the germ of new religious aspirations, profounder science, and sterner probings of the mysteries of life than had been attempted even by the ancients. The operation of this humanistic spirit has now to be traced.

human- sm.

ism

out, copy, and preserve the precious relics of the past. In this work of accumulation Guarino and Filelfo, Aurispa and Poggio, took the chief

part, aided by the wealth of Italian patricians, merchant-princes, and despots, who were inspired by the sacred thirst for learning. Learning was then no mere pursuit of a special and recluse class. It was fashionable and it was passionate, pervading all society

It is obvious that Italian literature owed little at the Relation outset to the revival of learning. The Divine Comedy, of Dante, the Canzoniere, and the Decameron were works of monu- pea mental art, deriving neither form nor inspiration imme- sna diately from the classics, but applying the originality of Villani to Italian genius to matter drawn from previous medieval the

; : : : . rival of sources. Dante showed both in his epic poem and in his se earning.

with the fervour of romance. For a generation nursed in decadent scholasticism and stereotyped theological formule it was the fountain of renascent youth, beauty, and freedom, the shape in which the Helen of art and poetry appeared to the ravished eyes of medizeval Faustus. It was the resurrection of the mightiest spirits of the past. "I go," said Cyriac of Ancona, the indefatigable though uncritical explorer of antiquities, "I go to awake the dead!" This was the enthusiasm, this the vitalizing faith, which made the work of scholarship in the 15th century so highly strung and ardent. The men who followed it knew that they were restoring humanity to its birthright after the expatriation of ten centuries. They were instinc- tively aware that the effort was for liberty of action,

lyrics that he had not abandoned the sphere of contem- porary thought. Allegory and theology, the vision and the symbol, still determine the form of masterpieces which for perfection of workmanship and for emancipated force of in- tellect rank among the highest products of the human mind. Yet they are not medizval in the same sense as the song of Roland or the Arthurian cycle. They proved that, though Italy came late into the realm of literature, her action was destined to be decisive and alterative by the introduction of a new spirit, a firmer and more positive grasp on life and art. These qualities she owed to her material prosperity, to her freedom from feudalism, to her secularized church, her

commercial nobility, her political independence in a federation of small states. Petrarch

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and Boccaccio, though they both held the medizval doctrine that literature should teach some abstruse truth beneath a veil of fiction, differed from Dante in this that their poetry and prose in the vernacular abandoned both alle- gory and symbol. In their practice they ignored their theory. Petrarch's lyrics continue the Provengal tradition as it had been reformed in Tuscany, with a subtler and more modern analysis of emotion, a purer and more chastened style, than his masters could boast. Boccaccio's tales, in like manner, continue the tradition of the fabliaux, raising that literary species to the rank of finished art, enriching it with humour, and strengthening its substance by keen insight into all varieties of character. The Canzomere and the Decameron distinguish themselves from medizval literature, not by any return to classical precedents, but by free self-conscious handling of human nature. So much had to be premised in order to make it clear in what relation humanism stood to the Renais-sance, since the Italian work of Dante, Petrarch, and Boccaccio is sufficient to indicate the re-birth of the spirit after ages of apparent deadness. Had the Revival of Learning not intervened it is probable that the vigorous efforts of these writers alone would have inaugurated a new age of European culture. Yet, while noting this reserva- tion of judgment, it must also be remarked that all three felt themselves under some peculiar obligation to the classics. Dante, mediseval as his temper seems to us, chose Virgil for his guide, and ascribed his mastery of style to the study of Virgilian poetry. Petrarch and Boccaccio were, as we have seen, the pioneers of the new learning. They held their writings in the vernacular cheap, and initiated that contempt for the mother tongue which was a note of the earlier Renaissance. It may further be observed that Hiovanni Villani, the first chronicler who used Italian for the

compilation of a methodical history, tells us how he was impelled to write by musing on the ruins of Rome and thinking of the vanished greatness of the Latin race. We have therefore to recognize this fact that the four greatest writers of the 14th century, while the Revival of Learning was yet in its cradle, each after his own fashion acknowledged the vivifying touch upon their spirit of the antique genius. They seem to have been conscious that they could not give the desired impulse to modern literature and art without contact with the classics; and, in spite of the splendour of their achievements in Italian, they found no immediate followers upon that path.

The fascination of pure study was so powerful, the Italians at that epoch were so eager to recover the past, that during the 15th century we have before our eyes

ship ana the spectacle of this great nation deviating from the course

litera- ture ;

of development begun in poetry by Dante and Petrarch, in prose by Boccaccio and Villani, into the channels of scholar- ship and antiquarian research. The language of the Canzoniere and Decameron was abandoned for revived Latin and discovered Greek. Acquisition supplanted invention ; imitation of classical authors suppressed originality of style. The energies of the Italian people were devoted to transcribing codices, settling texts, translating Greek books into Latin, compiling grammars, commentaries, encyclopeedias, dictionaries, epitomes, and ephemerides. During this century the best histories—Bruno's and Poggio's annals of Florence, for example—were composed in Latin after the manner of Livy. The best dissertations, Landino's Camaldunenses, Valla's De Voluptate, were laboured imitations of Cicero's Z'usculans. The best verses,

Pontano's elegies, Politian's hexameters, were in like manner |

Latin; public orations upon ceremonial occasions were delivered in the Latin tongue ; correspondence, official and familiar, was carried on in

the same language; even the fabliaux received, in Poggio's acetix, a dress of elegant

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Latinity. The noticeable barrenness of Italian literature at this period is referable to the fact that men of genius and talent devoted themselves to erudition and struggled to express their thoughts and feelings in a speech which was not natural. Yet they were engaged ina work of incalculable importance. At the close of the century the knowledge of Greece and Rome had been reappro- priated and placed beyond the possibility of destruction ; the chasm between the old and new world had been bridged ; medizeval modes of thinking and discussing had been superseded ; the staple of education, the common culture which has brought all Europe into intellectual agreement, was already in existence. Humanism was now an actuality. Owing to the uncritical veneration for

antiquity which then prevailed, it had received a strong tincture of pedantry. Its professors, in their revolt against the Middle Ages, made light of Christianity and paraded paganism. What was even worse from an artistic point of view, they had contracted puerilities of style, vanities of rhetoric, stupidities of wearisome citation. Still, at the opening of the 16th century, it became manifest what fruits of noble quality the Revival of Letters was about to bring forth for modern literature. Two great scholars, Lorenzo de' Medici and Politian, had already returned to the practice of Italian poetry. Their work is the first absolutely inodern work, —modern in the sense of having absorbed the stores of classic learning and reproduced those treasures in forms of simple, natural, native beauty. Boiardo occupies a similar position by the fusion of classic mythology with chivalrous romance in his Orlando Innamorato. But the victor's laurels were reserved for Ariosto, whose Orlando Furioso is the purest and most perfect extant example of Renaissance poetry. It was not merely in what they had acquired and assimilated from the classics that these poets showed the transformation effected in the field of literature by humanism. The whole method and spirit of medizeval art had been abandoned. That of the Cinque Cento is positive, defined, mundane. The deity, if deity there be, that rules in it, is beauty. Interest is confined to the

actions, passions, sufferings, and joys of human life, to its pathetic, tragic, humorous, and sentimental incidents. Of the state of souls beyond the grave we hear and are supposed to care nothing. In the drama the pedantry of the Revival, which had not injured romantic literature, made itself perniciously felt. Rules were collected from Horace and Aristotle. Seneca was chosen as the model of tragedy; Plautus and Terence supplied the groundwork of comedy. Thus in the plays of Rucellai, Trissino, Sperone, and other tragic poets, the nobler elements of humanism, considered as a revelation of the world and man, obtained no free development. Even the comedies of the best authors are too observant of Latin

| precedents, although some pieces of Machiavelli, Ariosto, Aretino, Cecchi, and Gelli are admirable for vivid delinea-

tion of contemporary manners.

poetry. Cimabue started with work which owed nothing directly to antiquity. At about the same time Niccola Pisano studied the style of sculpture in fragments of Greeco- Roman marbles. His manner influenced Giotto, who set painting on a forward path. Fortunately for the unim- peded expansion of Italian art, little was brought to light of antique workmanship during the 14th and 15th centuries. The classical stimulus came to painters, sculptors, and architects chiefly through literature. There- fore there was narrow scope for imitation, and the right spirit of humanism displayed itself in a passionate study of perspective, nature, and the nude. Yet we find in the

| writings of Ghiberti and Alberti, we notice in the master- XX. – 49

The relation of the plastic arts to the revival of learning to the is similar to that which has been sketched in the case of fine arts ;

to science and philo- sophy ;

pieces of these men and their compeers Bruncllesch i and Donatello, how even in the 15th century the minds of artists were fascinated by what survived of classic grace and science. Gradually, as the race became penetrated

with antique thought, the earlier Christian motives of the |

arts yielded to pagan subjects. Gothic architecture, which had always flourished feebly on Italian soil, was supplanted by a hybrid Roman style. The study of Vitruvius gave strong support to that pseudo-classic manner which, when it had reached its final point in Palladio's work, overspread the whole of Europe and dominated taste during two centuries. But the perfect plastic art of Italy, the pure art of the Cinque Cento, the painting of Raphael, Da Vinci, Titian, and Correggio, the sculpture of Donatello, Michelaugelo, and Sansovino, the architecture of Bra- mante, Omodeo, and the Venetian Lombardi, however much imbued with the spirit of the classical revival, takes rank beside the poetry of Ariosto as a free intelligent product of the Renaissance. That is to say, it is not so much an outcome of studies in antiquity as an exhibition of emancipated modern genius fired and illuminated by the masterpieces of the past. It indicates a separation from the Middle Ages, inasmucli as it is permanently natural. Its religion is joyous, sensuous, dramatic, terrible, but in each and all of its many-sided manifestations strictly human. Its tauch on classical mythology is original, rarely imitative or pedantic. The art of the Renaissance was an apocalypse of the beauty of the world and man in unaffected spontaneity, without side thoughts for piety or erudition, inspired by pure delight in loveliness and harmony for their own sakes.

In the fields of science and philosophy humanism wrought similar important changes. Petrarch began by waging re- lentless war against the logicians and materialists of his own day. With the advance made in Greek studies scholastic methods of thinking fell into contemptuous oblivion. The newly aroused curiosity for nature encouraged men like Alberti, Da Vinci, Toscanelli, and Da Porta to make prac- tical experiments, penetrate the working of physical forces, and invent scientific instruments. Anatomy began to be

studied, and the time was not far distant when Titian:

should lend his pencil to the epoch-making treatise of Vesalius. The Middle Ages had been satisfied with absurd and visionary notions about the world around them, while the body of man was regarded with too much suspicion to be studied. Now the right method of interrogating nature with patience and loving admiration was instituted. At the same time the texts of ancient authors supplied hints which led to discoveries so far-reaching in their results as those of Copernicus, Columbus, and Galileo. In philosophy, properly so-called, the humanistic scorn for medieval dulness and obscurity swept away theological metaphysics as valueless. But at first little beyond empty rhetoric and clumsy compilation was substituted. The ethical treatises of the scholars are deficient in substance, while Ficino's attempt to revive Platonism betrays an uncritical conception of his master's drift. It was some- thing, however, to have shaken off the shackles of ecclesi- astical authority ; and, even if a new authority, that of the ancicnts, was accepted in its stead, still progress was being made toward sounder methods of analysis. This is notice-

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proving that the emancipation of the will had been accom- plished. It must be added that their writings, like every other product of the Renaissance, except its purest poetry

and art, exhibit a hybrid between medizeval and modern ten-

dencies. Childish ineptitudes are mingled with intuitions of maturest wisdom, and seeds of future thought germinate in the decaying refuse of past systems.

Humanism in its earliest stages was uncritical. absorbed the relics of antiquity with omnivorous appetite, and with very imperfect sense of the distinction between worse and better work. Yet it led in process of time to criticism. The critique of literature began in the lccture room of Politian, in the printing-house of Aldus, and in the school of Vittorino. The critique of Roman law started, under Politian's auspices, upon a more liberal course than that which had beeu followed by the powerful but narrow- sighted glossators of Bologna. Finally, in the court of Naples arose that most formidable of all critical engines, the critique of

established ecclesiastical traditions and spurious historical documents. Valla by one vigorous effort destroyed the False Decretals and exposed the Dona- tion of Constantine to ridicule, paving the way for the polemic carried on against the dubious pretensions of the papal throne by scholars of the Reformation. A similar criticism, conducted less on lines of erudition than of persiflage and irony, ransacked the moral abuses of the church and played around the very foundations of Chris- tianity. This was tolerated with approval by men who repeated Leo X.'s witty epigram: "What profit has not that fable of Christ brought us!" The same critical and philosophic spirit working on the materials of history produced a new science, the honours of which belong to Machiavelli. He showed, on the one side, how the history of a people can be written with a recognition of fixed prin- ciples, and at the same time with an artistic feeling for personal and dramatic episodes. On the other side, he addressed himself to the analysis of man considered as a political being, to the anatomy of constitutions and the classification of governments, to the study of motives under- lying public action, the secrets of success and the causes of failure in the conduct of affairs. The unscrupulous rigour with which he applied his scientific method, and the

| sinister deductions he thought himself justified in drawing

able in Pomponazzo's system of materialism, based on the |

interpretation of Aristotle, but revealing a virile spirit of disinterested and unprejudiced research. The thinkers of southern Italy, Telesio, Bruno, and Campanella, at last opened the two clief lines on which modern speculation has since moved. 'Telesio and Campanella may be termed the predecessors of Bacon. Bruno was the precursor of the idealistic schools. All three alike strove to discngage their minds from classical as well as ecclesiastieal authority,

from the results it yielded, excited terror and repulsion. Nevertheless, a department had been added to the intellec- tual empire of mankind, in which fellow-workers, like Guicciardini at Florence, and subsequently Sarpi at Venice, were not slow to follow the path traced by Machiavelli. The object of the foregoing paragraphs has bcen to show in what way the positive, inquisitive, secular, explor- atory spirit of the Renaissance, when

toned and controlled by humanism, penetrated the regions of literature, art, philosophy, and science. It becomes at this point of much moment to consider how social manners in Italy were modified by the same causes, since the type developed there was in large measure communicated together with the new culture to the rest of Europe. The first subject to be noticed under this heading is education. What has come to be called a classical education was the immediate product of the Italian Renaissance. The universities of Bologna, Padua, and Salerno had been famous through the Middle Ages for the study of law, physics, and medicine ;

and during the 15th and 16th centuries the two first still

enjoyed celebrity in those faculties. But at this period no

_ lecture-rooms were so crowded as those in which professors _ of antique literature and language read passages from the

_no defined place for the new learning of the Revival, which

poets and orators, taught Greek, and cominented upon the systenis of philosophers. The medieval curriculum offered

had indeed no recognized name. Chairs had therefore to

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be founded under the title of rhetoric, from which men like Chrysoloras and Guarino, Filelfo and Politian, expounded orally to hundreds of eager students from every town of Italy and every nation in Europe their accumu- lated knowledge of antiquity. One mass of Greek and Roman erudition, including history and metaphysics, law and science, civic

institutions and the art of war, mythology and magistracies, metrical systems and oratory, agriculture and astronomy, domestic manners and religious rites, grammar and philology, biography and numismatics, formed the miscellaneous subject matter of this so-styled rhetoric. Notes taken at these lectures supplied young scholars with hints for further exploration ; and a certain tradition of treating antique authors for the display of general learning, as well as for the elucidation of their

archeology, taking for his models of conduct the great men of antiquity rather than the saints of the church. He was also expected to prove himself an adept in physica] exercises and in the courteous observances which survived from chivalry. The type is set before us by Castiglione in that book upon the courtier which went the round of Europe in the 16th century. It is further einphasized in a famous passage of the Orlando Innamorato where Boiardo compares the Italian ideal of an accomplished gentleman with the coarser type admired by nations of the north. To this point the awakened intelligence of the Renaissance, instructed by humanism, polished by the fine arts, expanding in genial conditions of diffused wealth, had brought the Italians at a period when the rest of Europe was comparatively barbarous.

texts, came into vogue, which has determined the method of scholarship for the last three centuries in Europe. The lack of printed books in the first period of the Revival, and

This picture has undoubtedly a darker side. Human- The moral ism, in its revolt against the Middle Ages, was, as we defects of have seen already, mundane, pagan, irreligious, positive. the Italian

the comparative rarity of Greek erudition among students, combined with the intense enthusiasm aroused for the new gospel of the classics, gave special value to the personal teaching of these professors. They journeyed from city to city, attracted by promises of higher pay, and allured by ever-growing laurels of popular fame. Each large town established its public study, academy, or university, similar institutions under varying designations, for the exposition of the littere humaniores. The humanists,

or professors of that branch of kuowledge, became a class of the highest dignity. They were found in the chanceries of the republics, in the papal curia, in the council chambers of princes, at the headquarters of condottieri, wherever business had to be transacted, speeches to be made, and the work of secretaries to be performed. Furthermore, they undertook the charge of private education, opening schools which displaced the medizval system of instruction, and taking engagements as tutors in the families of despots, noblemen, and wealthy merchants. The academy established by Vittorino da Feltre at Mantua under the protection of Gian Francesco Gonzaga for the training of pupils of both sexes, might be chosen as the type of this Italian method. His scholars, who were lodged in appro- priate buildings, met daily to hear the master read and comment on the classics. They learned portions of the best authors by heart, exercised themselves in translation from one language to another, and practised composition in prose and verse. It was Vittorino's care to see that, while their memories were duly stored with words and facts, their judgment should be formed by critical analysis, attention to style, and comparison of the authors of a decadent age with those who were acknowledged classics. During the hours of recreation suitable physical exercises, as fencing, riding, and gymnastics, were conducted under qualified trainers. From this sketch it will be seen how closely the educational system which came into England during the reigns of the Tudors, and which has prevailed until the present time, was modelled upon the Italian type. English youths who spend their time at Eton between athletic sports and Latin verses, and who take an Ireland with a first class in "Greats" at Oxford, are pursuing the same course of physical and mental discipline as the princes of Gonzaga or Montefeltro in the 15th century.

The Renaissance can, after all, be regarded only as a period of transition, in which much of the good of the past was sacrificed while some of the evil was retained, and neither the bad nor the good of the future was brought clearly into fact. Beneath the surface of brilliant social culture lurked gross appetites and savage passions, unrestrained by medieval piety, untutored by modern experience. Italian society exhibited an almost unex- ampled spectacle of literary, artistic, and courtly refinement crossed by brutalities of lust, treasons, poisonings, assas- sinations, violence. A

succession of worldly pontifis brought the church into flagrant discord with the principles of Christianity. Steeped in pagan learning, emulous of imitating the manners of the ancients, used to think and feel in harmony with Ovid and Theocritus, and at the same time rendered cynical by the corruption of papal Rome, the educated classes lost their grasp upon morality. Political honesty ceased almost to have a name in Italy. The Christian virtues were scorned by the foremost actors and the ablest thinkers of the time, while the antique virtues were themes for rhetoric rather than moving- springs of conduct. This is apparent to all students of Machiavelli and Guicciardini, the profoundest analysts of their age, the bitterest satirists of its vices, but themselves infected with its incapacity for moral goodness. Not only were the Italians vitiated ; but they had also become impotent for action and resistance. At the height of the Renaissance the five great powers in the peninsula formed a confederation of independent but mutually attractive and repellent states. Equilibrium was maintained by diplomacy, in which the humanists played a foremost part, casting a network of intrigue over the nation which helped in no small measure to stimulate intelligence and create a common medium of culture, but which accustomed statesmen to believe that everything could be achieved by wire-pulling. Wars were conducted on a showy system by means of mercenaries, who played a safe game in the field and developed a system of bloodless campaigns. Meanwhile the people grew up unused to arms. When Italy between the years 1494 and 1530 became the battle- field of French, German, and Spanish forces, it was seen to what a point of helplessness the political, moral, and social conditions of the Renaissance had brought the nation.

Renais- sance,

Tt was needful to study at some length the main pheno- Diffusion mena of the Renaissance in Italy, because the history of of the that phase of evolution in the other Western races turns ae

. . . . . earning almost entirely upon points in which they either adhered 4), to or diverged from the type established there. Speaking Italy broadly, what France, Germany, Spain, and England through- assimilated from

Italy at this epoch was in the first place + the new learning, as it was then called. This implied the

tosocial' The humanists effected a deeply penetrating change manners. jn social manners. Through their influence as tutors, professors, orators, and courtiers, society was permeated by a fresh ideal of culture. To bea gentleman in Italy meant at this epoch to be a man acquainted with the rudiments at least of scholarship, refined in diction, capable of corresponding or of speaking in choice phrases,

open to the beauty of the arts, intelligently interested in Europe.

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new conception of human life, the new interest in the material universe, the new method of education, and the new manners, which we have seen to be inseparable from Italian humanism. Under these forms of intellectual enlightenment and polite culture the renascence of the human spirit had appeared in Italy, where it was more than elsewhere connected with the study of classical antiquity. But that audacious exploratory energy which formed the motive force of the Renaissance as distinguished from the Revival of Learning took, as we shall see, very different directions in the several nations who now were sending the flower of their youth to study at the feet of Italian rhetoricians.

The Renaissance ran its course in Italy with strange indifference to consequences. The five great powers, held in equilibrium by Lorenzo de' Medici, dreamed that the peninsula could be maintained in statu quo by diplomacy. The church saw no danger in encouraging a pseudo- pagan ideal of life, violating its own principle of existence by assuming the policy of an aggrandizing secular state, and outraging Christendom openly by its acts and utterances. Society at large was hardly aware that an intellectual force of stupendous magnitude and incalculable explosive power had been created by the new learning. Why should not established institutions proceed upon the customary and convenient methods of routine, while the delights of existence were augmented, manners polished, arts developed, and a golden age of epicurean ease made decent by a state religion which no one cared to break with because no one was

left to regard it seriously? This was the attitude of the Italians when the Renaissance, which they had initiated as a thing of beauty, began to operate as a thing of power beyond the Alps.

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| fication of Gothic architecture by pseudo-Roman elements

of style was incomplete. What Germany aftcrwards took of the Palladian manner was destined to reach it on a circuitous route from France. In like manner the new learning failed to penetrate all classes of society with the rapidity of its expansion in Italy, nor was the new ideal of life and customs so easily substituted for the medieval. The German aristocracy, as Aineas Sylvius had noticed, remained for the most part barbarous, addicted to gross pleasures, contemptuous of culture. The German dialects were too rough to receive that artistic elabora- tion under antique influences which had been so facile in Tuscany. The doctors of the universities were too wedded to their antiquated manuals and methods, too satisfied with dulness, too proud of titles and diplomas, too anxious to preserve ecclesiastical discipline and to repress mental activity, for a genial spirit of human- ism to spread freely. Not in Cologne or Tiibingen but in Padua and Florence did the German pioneers of the Renaissance acquire their sense of liberal studies. And when they returned home they found themselves encumbered with stupidities, jealousies, and rancours. Moreover, the temper of these more enlightened men was itself opposed to Italian indifference and immor- ality; it was pugnacious and polemical, eager to beat down the arrogance of monks and theologians rather than to pursue an ideal of esthetical self-culture. Toa student of the origins of German humanism it is clear that something very different from the Renaissance of Lorenzo de' Medici and Leo X. was in preparation from the first upon Teutonic soil. Far less plastic and form- loving than the Italian, the German intelligence was more penetrative, earnest, disputative, occupicd with sub-

Revival Germany was already provided with universities, seven | stantial problems. Starting with theological criticism, of Learn- of which had been founded between 1348 and 1409. | proceeding to the stage of solid studies

in the three Gegiaty In these haunts of learning the new studies took root | learned languages, German humanism occupied the atten-

after the year 1440, chiefly through the influence of tra- velling professors, Peter Luder and Samuel Karoch. Gerinan scholars made their way to Lombard and Tuscan lecture-rooms, bringing back the methods of the humanists. Greek, Latin, and Hebrew erudition soon found itself at home on Teutonic soil. Like Italian men of letters,

tion of a widely scattered sect of erudite scholars; but it did not arouse the interest of the whole nation until it was forced into a violently militant attitude by Pfefferkorn's attack on Reuchlin. That attempt to extinguish honest thought prepared the Reformation; and humanism after 1518 was absorbed in politico-religious warfare.

*The point of contact between humanism and the Reforma- Relation tion in Germany has to be insisted on; for it is just here humanism that the relation of the Reformation to the Renaissance in *? the*

5 : German general makes itself apparent. As the Renaissance had potorma- its precursory movements in the medieval period, so the tion.

these pioneers of humanism gave a classic turn to their patronymics; unfaniiliar names, Crotus Rubeanus and Pierius Grecus, Capnion and Lupambulus Ganymedes, C&colampadius and Melanchthon, resounded on the Rhine. A few of the German princes, among whom Maximilian,

the prince cardinal Albert of Mainz, Frederick the Wise of Saxony, and Eberhard of Wiirtemberg deserve mention, exercised a not insignificant influence on letters by the foundation of new universities and the patronage of learned men. The cities of Strasburg, Nuremberg, Augs- burg, Basel, became centres of learned coteries, which gathered round scholars like Wimpheling, Brant, Peutinger, Schedel, and Pirckheimer, artists like Diirer and Holbein, printers of the eminence of Froben. Academies in imitation of Italian institutions came into existence, the two most conspicuous, named after the Rhine and Danube, holding their headquarters respectively at Heidelberg and Vienna. Crowned poets, of whom the most eminent was Conrad Celtes Protucius (Pickel!), emulated

the fame of Politian and Pontano. Yet, though the Renaissance was thus widely communicated to the centres of German intelligence, it displayed a different character from that which it assumed in Italy. Gothic art, which was indi- genous in Germany, yielded but little to southern influ- ences. Such work as that of Diirer, Vischer, Cranach, Schéngauer, Holbein, consummate as it was in technical excellence, did not assume Italian forms of loveliness, did not display the paganism of the Latin races. The modi-

German Reformation was preceded by Wickliffe and Huss, by the discontents of the Great Schism, and by the councils of Constance and Basel. These two main streams of modern progress had been proceeding upon different tracks to diverse issues, but they touched in the studies stimulated by the Revival, and they had a common origin in the struggle of the spirit after self-emancipation. Johann Reuchlin, who entered the lecture-room of Argyro- poulos at Rome in 1482, Erasmus of Rotterdam, who once dwelt at Venice as the house guest of the Aldi, applied their critical knowledge of Hebrew and of Greek to the elucidation and diffusion of the Bible. To the Germans, as to all nations of that epoch, the Bible came as a new book, because they now read it for the first time with eyes opened by humanism. The touch of the new spirit which had evolved literature, art, and culture in Italy sufficed in Germany to recreate Christianity. This new spirit in Italy emancipated human intelligence by the classics ; in Germany it emancipated the human conscience by the Bible. The indignation excited by Leo X.'s sale of indulgences, the moral rage stirred in Northern hearts by papal abominations in Rome, were external causes which precipitated the schism between Teutonic and

The Catholic revival in Italy.

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Latin Christianity. The Reformation, inspired by the same energy of resuscitated life as the Renaissance, assisted by the same engines of the printing-press and paper, using the same apparatus of scholarship, criticism, literary skill, being in truth another manifestation of the same world-movement under a diverse form, now posed itself as an irreconcilable antagonist to Renaissance Italy. It would be difficult to

draw any comparison between German and Italian humanists to the disparagement of the former. Reuchlin was no less learned than Pico; Melanchthon no less humane than Ficino ; Erasmus no less witty, and far more trenchant, than Petrarch; Ulrich von Hutten no less humorous than Folengo; Paracelsus no less fantastically learned than Cardano. But the cause in which German intellect and will were enlisted was so different that it is difficult not to make a formal separation between that movement which evolved culture in Italy and that which restored religion in Germany, establishing the freedom of intelligence in the one sphere and the freedom of the conscience in the other. The truth is that the Reformation was the Teutonic Renaissance. It was the emancipation of the reason on a line neglected by the Italians, more important indeed in its political consequences, more weighty in its bearing on rationalistic developments than the Italian Renaissance, but none the less an outcome of the same ground-influences. We have already in this century reached a point at which, in spite of stubborn Protestant dogmatism and bitter Catholic reaction, we can perceive how the ultimate affranchisement of man will be the work of both.

The German Reformation was incapable of propagating itself in Italy, chiefly for the reason that the intellectual forces which it represented and employed had already found specific outlet in that country. It was not in the nature of the Italians, sceptical and paganized by the Revival, to be keenly interested about questions which seemed to revive the scholastic disputes of the Middle Ages. It was not in their external conditions, suffering as they were from invasions, enthralled by despots, to use the Reformation as a lever for political revolution. Yet when a tumultuary army of so-called Lutherans sacked Rome in 1527 no sober thinker doubted that a new agent had appeared in Europe which would alter the destinies of the peninsula. The Renaissance was virtually closed, so far as it concerned Italy, when Clement VII. and Charles V. struck their compact at Bologna in 1530. This compact proclaimed the principle of monarchical absolutism, sup- ported by papal authority, itself monarchically absolute, which influenced Europe until the outbreak of the Revolu- tion. A reaction immediately set in both against the Renaissance and the Reformation. The council of Trent, opened in 1545 and closed in 1563, decreed a formal pur- gation of the church, affirmed

the fundamental doctrines of Catholicism, strengthened the papal supremacy, and inaugurated that movement of resistance which is known as the Counter-Reformation. The complex onward effort of the modern nations, expressing itself in Italy as Renais- sance, in Germany as Reformation, had aroused the forces of conservatism. The four main instruments of the reac- tion were the papacy, which had done so much by its sym- pathy with the revival to promote the humanistic spirit it now dreaded, the strength of Spain, and two Spanish institutions planted on Roman soil—the Inquisition and the Order of Jesus. The principle contended for and estab- lished by this reaction was absolutism as opposed to freedom—monarchical absolutism, papal absolutism, the suppression of energies liberated by the Renaissance and Reformation. The partial triumph of this principle was secure, inasmuch as the majority of established powers in

opinions afloat in Europe. Renaissance and Reformation were, moreover, already at strife. Both too were spiritual and elastic tendencies toward progress, ideals rather than solid organisins.

The part played by Spain in this period of history was Spain in the Re- . naissance

determined in large measure by external circumstance The Spaniards became one nation by the conquest o

Granada and the union of the crowns of Castile and apts ana The war of national aggrandizement, being in letters.

Aragon. its nature a crusade, inflamed the religious enthusiasm of the people. It was followed by the expulsion of Jews and Moors, and by the establishment of the Inquisition on a solid basis, with powers formidable to the freedom of all Spaniards from the peasant to the throne. These facts explain the decisive action of the Spanish nation on the side of Catholic conservatism, and help us to understand why their brilliant achievements in the field of culture during the 16th century were speedily followed by stag- nation. It will be well, in dealing with the Renaissance

in Spain, to touch first upon the arts and literature, and then to consider those qualities of character in action whereby the nation most distinguished itself from the rest of Europe. Architecture in Spain, emerging from the Gothic stage, developed an Early Renaissance style of bewildering richness by adopting elements of Arabic and Moorish decoration. Sculpture exhibited realistic vigour of indubitably native stamp; and the minor plastic crafts were cultivated with success on lines of striking originality. Painting grew from a homely stock, until the work of Velazquez showed that Spanish masters in this branch were fully abreast of their Italian compeers and contemporaries. To dwell here upon the Italianizing versifiers, moralists, and pastoral romancers who attempted to refine the vernacular of the Romancero would be superfluous. They are mainly noticeable as proving that certain coteries in Spain were willing to accept the Italian Renaissance. But the real force of the people was not in this courtly literary style. It expressed itself at last in the monumental work of Don Quixote, which places Cervantes beside Rabelais, Ariosto, and Shakespeare as one of the four supreme exponents of the Renaissance. The affectations of decadent chivalry disappeared before its humour; the lineaments of a noble nation, animated by the youth of modern Europe emerging from the Middle Ages, were portrayed in its enduring pic- tures of human experience. The Spanish drama, mean- while, untrammelled by those false canons of pseudo- classic taste which fettered the theatre in Italy and afterwards in France, rose to an eminence in the hands of Lope de Vega and Calderon which only the English, and the English only in the masterpieces of three or four play-wrights, can rival. Camoens, in the Zusiad, if we may here group Portugal with Spain, was the first modern poet to compose an epic on a purely modern theme, vying with Virgil, but not bending to pedantic rules, and breathing the spirit of the age of heroic adventures and almost fabu-lous discoveries into his melodious numbers. What has chiefly to be noted regarding the achievements of the Spanish race in arts and letters at this epoch is their potent national originality. The revival of learning pro-duced in Spain no slavish imitation as it did in Italy, no formal humanism, and, it may be added, very little of fruitful scholarship. The Renaissance here, as in England, displayed essential qualities of intellectual freedom, delight in life, exultation over rediscovered earth and man. The note of Renaissance work in Germany was still Gothic.

This we feel in the penetrative earnestness of Diirer, in the homeliness of Hans Sachs, in the grotesque humour of Hulenspregel and the Narrenschif, the sombre pregnancy of the Faust legend, the almost stolid mastery of Holbein.

church and state felt threatened bv the revolutionary | It lay not in the German genius to escape from the pre-

occupations and the limitations of the Middle Ages, for this reason mainly that what we call medizval was to a very large extent Teutonic. But on the Spanish peninsula, in the masterpieces of Velazquez, Cervantes, Camoens, Calderon, we emerge into an atmosphere of art, definitely national, distinctly modern, where solid natural forms stand before us realistically modelled, with light and shadow on their rounded outlines, and where the airiest creatures of the fancy take shape aud weave a dance of rhythmic, light, incomparable intricacy. The Spanish Renaissance would in itself suftice, if other witnesses were wanting, to prove how inaccurate is the thcory that limits this movement to the revival of learning. Touched by Italian influences, enriched and fortified by the new learning, Spanish genius walked firmly forward en its own path. It was only crushed by forces generated in thie nation that produced it, by the Inquisition and by despotic Catholic absolutism.

In the history of the Renaissance, Spain and Portugal represent the exploration of the ocean and the colonization of the other hemisphere. The voyages of Columbus and Vespucci to America, the rounding of the Cape by Diaz and the discovery of the sea road to India by Vasco da Gama, Cortes's conquest of Mexico and Pizarro's conquest of Peru, marked a new era for the human race and inaugurated the modern age more decisively than any other series of events has done. It has recently been maintained that modern Kuropean history is chiefly an affair of competition between confederated states for the possession of lands revealed by Columbus and Da Gama. Without challenging or adopt- ing this speculation, it may be safely affirmed that nothing

Explora- tion of the ocean,

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so pregnant of results has happened as this exploration of |

the globe. in politics and commerce, substituting the ocean for the Mediterranean, dethroning Italy from her seat of central

To say that it displaced the centre of gravity | | Verona back with him to France, and founded a school of architee-

importance in traffic, depressing the eastern and elevating | the western powers of Europe, opening a path for Anglo- |

Saxon expansiveness, forcing philosophers and statesmen to regard the Occidental nations as a single group in counter- poise to other groups of nations, the European community as one unit correlated to other units of humanity upon this planet, is truth enough to vindicate the vast signi- ficance of these discoveries. The Renaissance, far from being the re-birth of antiquity with its civilization confined to the Mediterranean, with its Hercules' Pillars beyond which lay Cimmerian darkness, was thus effectively the entrance upon a quite incalculably wider stage of life, in which mankind at large has since enacted one great drama. Dogmatic While Spanish navies were exploring the ocean, and Catholi- Spanish paladins were overturning empires, Charles V. cism. headed the reaction of Catholicism against reform. Stronger as king of Spain than as emperor, for the empire was little but a name, he lent the weight of his authority to that system of coercion and repression which enslaved Italy, desolated Germany with war, and drowned the Low Countries in blood. Philip II., with full approval of the Spanish nation, pursued the same policy in an even stricter spirit. He was powerfully assisted by two institu- tions, in which the national character of Spain expressed itself, the Inquisition and the Society of Jesus. Of the former it is not needful to speak here. But we have to observe that the last great phenomenon of the Spanish Renaissance was Ignatius Loyola, who organized the militia by means of which the church worked her Counter-Reformation. His motto, Perinde ac cadaver, expressed that recognition of absolutism which papacy and monarchy demanded for their consolidation. The logical order of an essay which attempts to show how Renaissance was correlated

to Reformation and Counter-Reformation has necessitated the treatment of

_ business, captains, and artists.

| that externally they remained ruder and less polished.

Italy, Germany, and Spain iu succession ; for these three France in nations were the three main agents in the triple process to the Re- be analysed. It was due to their specific qualities, and to — the diverse circumstances of their external development," =~ that the re-birth of Europe took this form of duplex action

on the lines of intellectual and moral progress, followed by reaction against mental freedom. We have now to speak

of France, which earliest absorbed the influence of the Italian revival, and of England, which received it latest.

The Renaissance may be said to have begun in France

with Charles VITI.'s expedition to Naples, and to have con- tinued until the extinction of the house of Valois. Louis

XII. and Francis I. spent a considerable portion of their reigns in the attempt to secure possession of the Italian provinces they claimed. Henry II.'s queen was Catherine

of the Medicean family ; and her children, Charles IX. and Henry IIL, were Italianated Frenchmen. Thus the con- nexion between France and Italy during the period 1494—

1589 was continuous. The French passed to and fro across the Alps on military and peaceful expeditions. Italians came to France as courtiers, ambassadors, men of French society assumed

a strong Italian colouring, nor were the manners of the court very different from those of an Italian city, except

The relation between the crown and its great feudatories, the military bias of the aristocracy, and the marked distinction between classes which survived from the Middle Ages, rendered France in many vital points unlike Italy. Yet the annals of that age, and the anecdotes retailed by Brantéme, prove that the royalty and nobility of France had been largely Italianized. It is said that Louis XII. brought Fra Giocondo of French

*architects. But we need not have recourse to this legend '**

for the explanation of such Italian influences as were already noticeable in the Renaissance buildings on the Loire. Without determining the French style, Italian intercourse helped to stimulate its formation and development. There are students of the 15th century in France who resent this intrusion of the Italian Renaissance. But they forget that France was bound by inexorable laws of human evolution to obey the impulse which communicated itself to every form of art in Europe. In the school of Fontainebleau, uuder the patronage of Francis I., that Italian influence } made itself distinctly felt ; yet a true French manner had been already formed, which, when it was subsequently applied at Paris, preserved a marked national quality. The characteristic of the style developed by Bullant, De VYOrme, and Lescot, in the royal or princely palaces of Chenonceaux, Chambord, Anet, Ecouen, Fontainebleau, the Louvre, and elsewhere, is a blending of capricious fancy and inventive richness of decoration with purity of outline and a large sense of the beauty of extended masses. Beginning with the older castles of Touraiue, and passing onward to the Tuileries, we trace the passage from the medieval fortress to the modern pleasure house, and note how architecture obeyed the special demands of that new phenomenon of Renaissance civilization, the court. In the general distribution of parts these monumental buildings express the peculiar conditions which French society assumed under the influence of Francis I. and Diane de Poitiers. In details of execution and harmonic combina- tions they illustrate the precision, logic, lucidity, and cheerful spirit of the national genius. Here, as in Lombardy, a feeling for serene beauty derived from study of the antique has not interrupted the evolution of a style indigenous to France and eminently characteristic of the French temperament.

During the reign of Francis I. several Italian painters

French painting and sculpture,

French literature.

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of eminence visited France. Among these Del Rosso, Primaticcio, Del Sarto, and Da Vinci are the most famous. But their example was not productive of a really great school of French painting. It was left for the Poussins and Claude Lorraine in the next century, acting under mingled Italian and Flemish infiuences, to embody the still active spirit of the classical revival. These three masters were the contemporaries of Corneille, and do not belong to the Renaissance period. Sculpture, on the contrary, in which art, as in architecture, the medieval French had been surpassed by no other people of Europe, was practised with originality and power in the reigns of Henry II. and Francis I. Ponzio and Cellini. who quitted Italy for France, found themselves outrivalled in their own sphere by Jean Goujon, Cousin, and Pilon. The decorative sculpture of this epoch, whether combined with architec- ture or isolated in monumental statuary, ranks for grace and suavity with the best of Sansovino's. At the same time it is unmistakably inspired by a sense of beauty dif- ferent from the Italian—more piquant and pointed, less languorous, more mannered perhaps, but with less of empty rhythmical effect. All this while, the minor arts of enamelling, miniature, glass-painting, goldsmith's work, jewellery, engraving, tapestry, wood-carving, pottery, &c., were cultivated with a spontaneity and freedom which proved that France, in the middle point between Flanders and Italy, was able to use both influences without a sacrifice of native taste. It may indeed be said in general that what is true of France is likewise true of all countries which felt the artistic impulses of the Renaissance. Whether we regard Spain, the Netherlands, or Germany at this epoch, we find a national impress stamped upon the products of the plastic and the decorative arts, notwith- standing the prevalence of certain forms derived from the antique and Italy. It was only at a later period that the formalism of pseudo-classic pedantry reduced natural and national originality to a dead unanimity.

French literature was quick to respond to Renaissance influences. De Comines, the historian of Charles VIII.'s expedition to Naples, differs from the earlier French chroniclers in his way of regarding the world of men and affairs. He has the perspicuity and analytical penetration of a Venetian ambassador. Villon, his contemporary, may rather be ranked, so far as artistic form and use of knowledge are concerned, with poets of the Middle Ages, and in particular with the Goliardi. But he is essentially modern in the vividness of his self-portraiture, and in what we are wont to call realism. Both De Comines and Villon indicate the entrance of a new quality into litera- ture. The Rhetoriqueurs, while protracting medieval traditions by their use of allegory and complicated metrical systems, sought to improve the French language by introducing Latinisms. Thus the Revival of Learning began to affect the vernacular in the last years of the 15th century. Marot and his school reacted against this pedantry. The Renaissance displayed itself in their effort to purify the form and diction of poetry. But the decisive revolution was effected by Ronsard and his comrades of the Pléiade. It was their professed object to raise French to a level with the classics, and to acclimatize Italian species of verse. The humanistic movement led these learned writers to engraft the graces of the antique upon their native literature, and to refine it by emulating the lucidity of Petrarch. The result of their endeavour was immediately apparent in the new force added to French rhythm, the new pomp, richness, colouring, and polish con- ferred upon poetic diction. French style gradually attained to fixity, and the alexandrine came to be recognized as the standard line in poetry. D'Aubigneé's invective and Regnier's satire, at the close of the 16th century, are as

modern as Voltaire's. Meanwhile the drama was emerging from the medieval mysteries; and the classical type, niade popular by Garnier's genius, was elaborated, as in Italy, upon the model of Seneca and the canons of the three unities. The tradition thus formed was continued and fortified by the illustrious playwrights of the 17th century. Translation from Greek and Latin into French progressed rapidly at the commencement of this period. It was a marked characteristic of the Renaissance in France to appropriate the spoils of Greece and Rome for the profit of the mother tongue. Amyot's Plutarch and his Daphnis and Chloe rank among the most exquisite examples of beautiful French prose.

Prose had now the charm of simplicity combined with grace. To mention Brantéme is to mention the most entertaining of gossips. To speak of Montaigne is to speak of the best as well as the first of essayists. In all the literary work which has been mentioned, the originality and freshness of the French genius are no less conspicuous than its saturation with the new learning and with Italian studies. But the greatest name of the epoch, the name which is synonymous with the Renaissance in France, has yet to be uttered. That, of course, is Rabelais. His incommensurable and indescrib- able masterpiece of mingled humour, wisdom, satire, erudi- tion, indecency, profundity, levity, imagination, realism, reflects the whole age in its mirror of hyper-Aristophanic farce. What Ariosto is for Italy, Cervantes for Spain, Erasmus for Holland, Luther for Germany, Shakespeare for England, that is Rabelais for France. The Renaissance cannot be comprehended in its true character without familiarity with these six representatives of its manifold and many-sided inspiration.

The French Renaissance, so rich on the side of arts and French letters, was hardly less rich on the side of classical studies, scholar- The revival of learning has a noble muster-roll of names ae in France: Turntbe, the patriarch of Hellenistic studies ; sha. the Etiennes of Paris, equalling in numbers, industry, and tion in learning their Venetian rivals ; the two Scaligers ; impas- France. sioned Dolet; eloquent Muret; learned Cujas; terrible Calvin; Ramus, the intrepid antagonist of Aristotle ; De Thou and De Béze; ponderous Casaubon; brilliant young Saumaise. The distinguishing characteristics of French humanism are vivid intelligence, critical audacity and polemical acumen, perspicuity of exposition, learning directed in its applications by logical sense rather than by artistic ideals of taste. Some of tlie names just mentioned remind us that in France, as in Germany and Holland, the Reformation was closely connected with the revival of learning. Humanism has never been in the narrow sense of that term Protestant; still less has it been strictly Catholic. In Italy it fostered a temper of mind decidedly averse to theological speculation and religious earnestness. In Holland and Germany, with Erasmus, Reuchlin, and Melanchthon, it developed types of character, urbane, reflective, pointedly or gently critical, which, left to themselves, would not have plunged the north of Europe into the whirlpool of belligerent reform. Yet none the less was the new learning,

through the open spirit of inquiry it nourished, its vindication of the private reason, its enthusiasm for republican antiquity, and its proud assertion of the rights of human independence, linked by a strong and subtle chain to that turbid revolt of the individual consciousness against spiritual despotism draped in fallacies and throned upon abuses. To this rebellion we give the name of Reformation. But, while the necessities of antagonism to papal Rome made it assume at first the form of narrow and sectarian opposition, it marked in fact a vital struggle of the intellect towards truth and freedom, involving future results of scepticism and rationalistic audacity from which its earlier champions

would have shrunk. It marked, moreover, in the con- dition of armed resistance against established authority which was forced upon it by the Counter-Reformation, a firm resolve to assert political liberty, leading in the course of time to a revolution with which the rebellious spirit of the Revival was sympathetic. This being the rela- tion of humanism in general to reform, French learning in particular displayed such innovating boldness as threw many of its most conspicuous professors into the camp at war with Rome. Calvin, a French student of Picard origin, created the type of Protestantism to which the majority of French Huguenots adhered. This too was a moment at which philosophical seclusion was hardly possible. In a nation so tumultuously agitated one side or the other had to be adopted. Those of the French humanists who did not proclaim Huguenot opinions, found themselves obliged with Muretus to lend their talents to the Counter-Reforma- tion, or to suffer persecution for heterodoxy, like Dolet. The church, terrified and infuriated by the progress of reform, suspected learning on its own account. To be an eminent scholar was to be accused of immorality, heresy, and atheism in a single indictment; and the defence of weaker minds lay in joining the Jesuits, as Heinsius was fain to do. France had already absorbed the earlier Re- naissance in an Italianizing spirit before the Reformation made itself felt as a political actuality. This fact, together

with the strong Italian bias of the Valois, serves to explain in some degree the reason why the Counter-Reformation entailed those fierce entangled civil wars, massacres of St Bartholomew, murders of the Guises, regicides, treasons, and empoisonments that terminated with the compromise of Henry IV. It is no part of the present subject to analyse the political, religious, and social interests of that struggle. The upshot was the triumph of the Counter-Reformation, and the establishment of its principle, absolutism, as the basis of French government. It was a French king who, when the nation had been reduced to order, uttered the famous word of absolutism, " L'Etat, c'est moi."

The Renaissance in the Low Countries, as elsewhere, had its brilliant age of arts and letters. During the Middle Ages the wealthy free towns of Flanders flourished under conditions not dissimilar to those of the Italian republics.

They raised miracles of architectural beauty, which were |

modified in the 15th and 16th centuries by characteristic elements of the new style. The Van Eycks, followed by Memling, Metsys, Mabuse, Lucas van Leyden, struck out a new path in the revival of painting and taught Europe the secret of oil-colouring. But it was reserved for the 17th century to witness the flower and fruit time of this powerful art in the work of Porbus, Rubens, and Vandyck, in the Dutch schools of landscape and home-life, and in the unique masterpieces of Rembrandt. We have a right to connect this later period with the Renaissance, because

the distracted state of the Netherlands during the 16th |

century suspended, while it could not extinguish, their wsthetic development. century, moreover, are animated with the Renaissance spirit no less surely than the Florentine school of the 15th or the Venetian of the 16th. The animal vigour and

carnal enjoyment of Rubens, the refined Italianizing |

beauty of Vandyck, the mystery of light and gloom on Rembrandt's panels, the love of nature in Ruysdael, Cuyp, and Van Hooghe, with their

luminously misty skies, silvery daylight, and broad expanse of landscape, the interest in common life displayed by Terburg, Van Steen, Douw, Ostade, and Teniers, the instinct for the beauty of animals in Potter, the vast sea spaces of Vanderveldt, the grasp on reality, the acute intuition into character in portraits, the scientific study of the world and man, the robust sympathy with natural appetites, which distinguish

The various schools of the 17th |

REWAds &A WC

the whole art of the Low Countries, are a direct emanation from the Renaissance. .

The vernacular in the Netherlands profited at first but little by the impulse which raised Italian, Spanish, French, and English to the rank of classic languages. But humanism, first of all in its protagonist Erasmus, afterwards in the long list of critical scholars and editors, Lipsius, Heinsius, and Grotius, in the printers Elzevir and Plantin, developed itself from the centre of the Leyden university with massive energy, and proved that it was still a motive force of intellectual progress. In the fields of classical learning the students of the Low Countries broke new ground chiefly by methodical collection, classi- fication, and comprehensive criticism of previously accumu- lated stores. Their works were solid and substantial edifices, forming the substratum for future scholarship. In addition to this they brought philosophy and scientific thoroughness to bear on studies which had been pursued in amore literary spirit. It would, however, be uncritical to pursue this subject further ; for the encyclopedic labours of the Dutch philologers belong to a period when the Re- naissance was overpast. For the same reason it is inadmis- sible to do more than mention the name of Spinoza here.

The Netherlands became the battlefield of Reformation and Counter-Reformation in even a stricter sense than France. Here the antagonistic principles were

posed in the course of a struggle against foreign despotism. | The conflict ended in the assertion of political independence as opposed to absolute

dominion. Europe in large measure owes the modern ideal of political liberty to that spirit of stubborn resistance which broke the power of Spain. Recent history, and in particular the history of democracy, claims for its province the several stages whereby this principle was developed in England and America, and its outburst in the frenzy of the French Revolution. It is enough here to have alluded to the part played by the Low Countries in the genesis of a motive force which may be described as the last manifestation of the Renaissance striving after self-emancipation.

The insular position of England, combined with the nature of the English people, has allowed us to feel the vibration of European movements later and with less of shock than any of the Continental nations. Before a wave of progress has reached our shores we have had the opportunity of watching it as spectators, and of consider- ing how we shall receive it. Revolutions have passed from the tumultuous stages of their origin into some settled and recognizable state before we have been called upon to cope with them. It was thus that England took the influences of the Renaissance and Reformation simul- taneously, and almost at the same time found herself engaged in that struggle with the Counter-Reformation which, crowned by the defeat of the Spanish Armada, stimulated the sense of nationality and developed the naval forces of the race. Both Renaissance and Reforma- tion had been anticipated by at least a century in England. Chaucer's poetry, which owed so much to Italian examples, gave an early foretaste of the former. Wickliffe's teaching was a vital moment in the latter. But the French wars, the Wars of the Roses, and the persecution of the Lollards deferred the coming of the new age; and the year 1536, when Henry VIII. passed the Act of Supremacy through | Parliament, may be fixed as the date when England entered definitively upon a career of intellectual develop- ment abreast with the foremost nations of the Continent. The circumstances just now insisted on explain the specific character of the English Renaissance. The Reformation had been adopted by consent of the king, lords, and

commons ; and this change in the state religion, though it | Was not confirmed without reaction, agitation, and blood-

Flemish and Dutch scholar- ship.

Dutch

wars of

independ-

1

plainly ¢ nee

England in the Renais- sance

Combined influences of Renais- sance and Reforma- tion.

Arts,

letters, and the drama.

RENAISSANCE

shed, cost the nation comparatively little disturbance. | Humanism, before it affected the bulk of the 'English

people, had already permeated Italian and French litera- ture. Classical erudition had been adapted to the needs of modern thought. The hard work of collecting, print- ing, annotating, and translating Greek and Latin authors had been accomplished. The masterpieces of antiquity had been interpreted and made intelligible. Much of the learning popularized by our poets and dramatists was | derived at second hand from modern literature. This | does not mean that England was deficient in ripe and | sound scholars. More, Colet, Ascham, Cheke, Camden | were men whose familiarity with the classics was both. intimate and easy. Public schools and universities con- | formed to the modern methods of study ; nor were there wanting opportunities for youths of humble origin to obtain an education which placed them on a level with Italian scholars. The single case of Ben Jonson suff- ciently proves this. Yet learning did not at this epoch | become a marked speciality in England. There was no class corresponding to the humanists. It should also be | remembered that the best works of Italian literature were introduced into Great Britain

together with the classics. Phaer's Virgil, Chapman's Homer, Ilarrington's Orlando, Marlowe's Hero and Leander, Fairfax's Jerusalem Delivered, North's Plutarch, Hoby's Courtier—to mention only a few | examples—placed English readers simultaneously in pos- session of the most eminent and representative works of Greece, Rome, and Italy. At the same time Spanish | influences reached them through the imitators of Guevara and the dramatists; French influences in the versions of romances ; German influences in popular translations of | the Faust legend, FZulenspiegel, and similar productions. | The authorized version of the Bible had also been recently

given to the people,—so that almost at the same period of

time England obtained in the vernacular an extensive

library of ancient and modern authors. This was a privi-

lege enjoyed in like measure by no other nation. It suffi. | ciently accounts for the richness and variety of Elizabethan literature, and for the enthusiasm with which the English language was cultivated.

Speaking strictly, England borrowed little in the region | of the arts from other nations, and developed still less that was original. What is called Jacobean architecture marks | indeed an interesting stage in the transition from the Gothic style. But, compared with Italian, French, Spanish, German, and Flemish work of a like period, it is both | timid and dry. Sculpture was represented in London for a brief space by Torrigiani ; painting by Holbein and Antonio More; music by Italians and Frenchmen of the Chapel Royal. But no Englishmen rose to European eminence in these departments. With literature the case was very different. Wyat and Surrey began by engrafting | the forms and graces of Italian poetry upon the native | stock. They introduced the sonnet and blank verse. Sidney followed with the sestine and terza rima and with | various experiments in classic metres, none of which took root on English soil. The translators handled the octave stanza. Marlowe gave new vigour to the couplet. The first period of the English Renaissance was one of imita- tion and assimilation. Academies after the Italian type were founded. Tragedies in the style of Seneca, rivalling Italian and French

dramas of the epoch, were produced, Attempts to Latinize ancestral rhythms, similar to those which had failed in Italy and France, were made. Tenta-_ tive essays in criticism and dissertations on the art of : poetry abounded. It seemed as though the Renaissance ran a risk of being throttled in its cradle by superfluity of | foreign and pedantic nutriment. But the natural vigour |

of the English genius resisted influences alien to itself, |

_and Spain, the mysteries

indefinite period of time. – possible upon the lines laid down at the outset, where it was explained why the term Renaissance cannot now be sance.

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and showed a robust capacity for digesting the varied diet offered to it. As there was nothing despotic in the temper of the ruling classes, nothing oppressive in English culture, the literature of that age evolved itself freely from the people. It was under these conditions that Spenser gave his romantic-epic to the world, a poem which derived its allegory from the Middle Ages, its decorative richness from the Italian Renaissance, its sweetness, purity, har- mony, and imaginative splendour from the most poetic nation of the modern world. Under the same conditions the Elizabethan drama, which in its totality is the real exponent of the English Renaissance, came into existence. This drama very early freed itself from the pseudo-classic mannerism which imposed on taste in Italy arid France. Depicting feudalism in the vivid colours of an age at war with feudal institutions, breathing into antique histories the breath of actual life, embracing the romance of Italy of German legend, the fictions of poetic fancy and the facts of daily life, humours of the moment and abstractions of philosophical speculation, in one homogeneous amalgam instinct with intense vitality, this extraordinary birth of time, with Shakespeare for the master of all ages, left a monument of the Renaissance unrivalled for pure creative power by any other product of that epoch. To complete the sketch, we must set Bacon, the expositor of modern scientific method, beside Spenser and Shakespeare, as the third

representative of the Renaissance in England. Nor should Raleigh, Drake, Hawkins, the semi-buccaneer explorers of the ocean, be

omitted. They, following the lead of Portuguese and English Spaniards, combating the Counter-Reformation on the seas, Teaction

opened for England her career of colonization and planta-

tion. All this while the political policy of Tudors and cism, Stewarts tended towards monarchical absolutism, while monarch- the Reformation in England, modified by contact with ical ab- the Low Countries during their struggles, was narrowing eaten, Puritanism indicated Renais. a revolt of the religious conscience of the nation against sance the arts and manners of the Renaissance, against the culture.

into strict reactionary intolerance.

encroachments of belligerent Catholicism, against the corrupt and Italianated court of James I. against the absolutist pretensions of his son Charles. In its final manifestation during the Commonwealth, Puritanism won a transient victory over the mundane forces of both Reformation and Renaissance, as these had taken shape in England. It also secured the eventual triumph of con- stitutional independence. Milton, the greatest humanistic poet of the English race, lent his pen and moral energies during the best years of his life to securing that principle on which modern political systems at present rest. Thus the geographical isolation of England, and the comparatively

_ late adoption by the English of matured Italian and Cer-

man influences, give peculiar complexity to the phenomena of Reformation and Renaissance simultaneously developed on our island. The period of our history between 1536 and 1642 shows how difficult it is to separate these two factors

| in the re-birth of Europe, both of which contributed so

powerfully to the formation of modern English nationality.

It has been impossible to avoid an air of superficiality, New and the repetition of facts known to every schoolboy, in political this sketch of so complicated a subject as the Renaissance,— Télations

embracing many nations, a great variety of topics, and an Yet no other treatment was

confined to the Revival of Learning and the effect of antique

studies upon literary and artistic ideals. The purpose of

this article has been to show that, while the Renaissance

implied a new way of regarding the material world and

human nature, a new conception of man's destiny and XX. — 50

duties on this planet, a new culture and new intellectual perceptions penetrating every sphere of thought and energy, it also involved new reciprocal relations between the mem- bers of the European group of nations. The Renaissance closed the Middle Ages and opened the modern era,—not merely because the mental and moral ideas which then sprang into activity and owed their force in large measure to the revival of classical learning were opposed to medizval modes of thinking and feeling, but also because the politi-

cal and international relations specific to it as an age |

were at variance with fundamental theories of the past. Instead of empire and church, the sun and moon of the medizeval system, a federation of peoples, separate in type and divergent in interests, yet bound together by common tendencies, common culture, and common efforts, caine into existence. For obedience to central authority was substituted balance of power. Henceforth the hegemony of Europe attached to no crown imperial or papal, but to the nation which was capable of winning it, in

the spiritual region by mental ascendency, and in the temporal by force. Conservae That this is the right way of regarding the subject

eae. appears from the events of the first two decades of the S- sive

parties attained its highest point in Italy. Luther published his in modern theses in 1517, sixty-four years after the fall of Constanti- Europe. nople, twenty-three years after the expedition of Charles VIII. to Naples, ten years before the sack of Rome, at a moment when France, Spain, and England had only felt the influences of Italian culture but feebly. From that date forward two parties wrestled for supremacy in Europe, to which may be given the familiar names of Liberalism and Conservatism, the party of progress and the party of established institutions. The triumph of the former was most signal among the Teutonic peoples. The Latin races, championed by Spain and supported by the Papacy, fought the battle of the latter, and succeeded for a time in rolling

16th century, those years in which the humanistic revival |

back the tide of revolutionary conquest. Meanwhile that liberal culture which had been created for Europe by the Italians before the contest of the Reformation began con- tinued to spread, although it was stifled in Italy and Spain, retarded in France and the Low Countries, well nigh extir- pated by wars in Germany, and diverted from its course in England by the counter-movement of Puritanism. The auto da fés of Seville and Madrid, the flames to which Bruno, Dolet, and Paleario were flung, the dungeon of Campanella and the seclusion of Galileo, the massacre of St Bartholomew and the faggots of Smithfield, the desolated — plains of Germany and the cruelties of Alva in the Nether- lands, disillusioned Europe of those golden dreams which had arisen in the earlier days of humanism, and which had been so pleasantly indulged by Rabelais. In truth the Re- naissance was ruled by no Astrea redux, but rather by a severe spirit which brought not peace but a sword, remind- ing men of sternest duties, testing what of moral force and tenacity was in them, compelling them to strike for the old order or the new, suffering no lukewarm halting between two opinions. 'That, in spite of retardation and retro- gression, the old order of ideas should have yielded to the new all over Europe,—that science should have won firm standing-ground, and

political liberty should have struggled through those birth-throes of its origin,—was in the nature of things. Had this not been, the Renaissance or re-birth of Europe would be a term without a meaning.

Literature.—The special articles on the several arts and the | literatures of modern Europe, and on the biographies of great men mentioned in this essay, will give details of necessity here omitted. | It may be useful to indicate a few works upon the Renaissance in ‘ general, Burekhardt’s Die Cultur der Renaissanee in Italien, | Michelet’s ‘Renaissance ” (7th vol. of Histoire de Franee), Voigt’s Wiederbelebung des Classisechen Alterthums ; Symonds’s Renaissance in Italy, Mare Monnier’s Renaissanee de Dante & Luther, Miintz’s Précurseurs de la Renaissaneeand Renaissance en Italie et en Franee, and Geiger’s Humanismus und Renaissanee in Italien und Deutseh- land are among the most comprchensive. (otk. 82)

RENAIX, a manufacturing town of Belgium, in the province of East Flanders, eight miles by rail south of Oudenarde, with a communal population of 14,089 in 1876. It contains the ruins of a castle built in 1638 by Count John of Nassau-Siegen, and a church with the tomb of St Hermes, to whom it is dedicated.

RENAUDOT, Evskpe (1646-1720), theologian and

Orientalist, was born in Paris in 1646, and was educated |

for the church. Notwithstanding his taste for theology and his title of abbé, he never took orders, and much of his life was spent at the French court, where he attracted the notice of Colbert and was often employed in con- fidential affairs. The unusual learning in Eastern tongues which he had acquired in his youth and continued to maintain amidst the distractions of court life did not bear fruit till he was sixty-two years old. His best-known books, which are still valuable, are the Historia Patri- archarum Alexandrinorum (Paris, 1713), and the collection of Eastern liturgies (2 vols., 1715-16). The latter work was designed to supply proofs of the “perpetuity of the faith” of the church on the subject of the sacraments, the topic about which most of his theological writings turned, and which was then, in consequence of the controversies attaching to Arnauld’s Perpétuité de la Foi, a burning one between French Catholics

and Protestants. Rénaudot was not a very fair controversialist, but his learning and industry are unquestionable, and his piety shone the more

brightly that it did not withdraw itself from contact with |

the world. Hc died in 1720. RENDSBURG, a town of Prussia, in the province of

sandy district, 20 miles to the west of Kiel. It consists of three parts:—the crowded Altstadt, on an island in the Eider ; the Neuwerk, on the south bank of the river; and the Kronwerk, on the north bank. Rendsburg is the chief _ place in the basin of the Hider, and when in the possession of Denmark was maintained as a strong fortress, guarding the approach to the Cimbric peninsula. Its present import- ance, however, rests on the commercial facilities afforded by its connexion with the North Sea and the Baltic through the Eider and the Eider Canal, by which a brisk transit trade is carried on in grain, timber, Swedish iron, and coals. The principal industries are cotton-weaving, tanning, and the manufacture of artificial manures; and there isa large iron foundry in the immediate neighbourhood. 'The popu- lation in 1880 was 12,776, including a strong garrison.

The town of Rendsburg came into existenee under the shelter of a castle founded by the Danes about the year 1100 on an island of the Eider, and was at first an object of dispute between the Danish kings and the counts of Holstein. In 1252 it was finally adjudged to the latter, and it has since shared their fortunes. The town was surrounded with ramparts in 1539, but the important fortifications of the Kronwerk were not constructed till the end of the 17th century. During the Thirty Years' War Rendsburg was taken both by the Imperialists and the Swedes, but_in 1645 it suecessfully resisted a seeond siege by the latter. The war of 1848-50 began with the capture of Rendsburg by the Holsteiners by a coup de main, and it formed the centre of the German opera- tions. On the departure of the German troops in 1852 the Danes at ouce set to work to demolish the fortifications.

RENE I. (1409-1480), duke of Anjou, count of Provence, and titular king of Naples, was the second son of Louis II. of Aragon, king of Naples, and

Yolande,

Schleswig-Holstein, is situated on the Eider, in a flat and | daughter of John L of Aragon, and was born 16th

REN—REN

Although his father was crowned king of | the county, and follows a general north-easterly course to its junc-

January 1409. Naples at Avignon by Pope Clement VII. in 1384, he was unable to make good his claims. After his death Louis III., the elder son, assumed the title, and in 1423 was adopted by Johanna II. of Naples, and obtained possession of the throne. Dying 15th November 1434, he left his claims'to his brother René, who was also appointed heir by Johanna II. at her death in the following year. Meantime René had been imprisoned by the count of Vaudemont for contesting his claims to the dukedom of Lorraine, and therefore appointed his wife Isabella regent in his stead. In 1437 he procured his freedom and the acknowledgment of his right to Lorraine for 400,000 florins, and in the following year landed at Naples and rejoined Isabella. Finding, however, that the task of conquering the kingdom from Alphonso of Aragon was beyond his power, he returned in 1442 to Lorraine, which he afterwards gave over to his son John, titular duke of Calabria. In 1444 he took part at Tours in the peace negotiations between England and France; and, to cement the alliance, Henry VI. espoused his daughter Margaret of Anjou. Subsequently he ceased to concern himself with politics, and devoted his chief attention to literature. He also took a special interest in painting and sculpture, although there appears to have been no foundation for the statement that he practised either of these arts. His closing years were spent in the company of his daughter the exiled queen. He died 10th July 1480.

His @uvres Completes, with a biography and notes by the count of Quatrebarbes, were published at Paris, 4 vols., 1844-46. See also De Villencuve-Bargemont, Histoire de René d' Anjou, 8 vols., Paris, 1825 ; Renouvier, Les peintres et les enlumineurs du rot René, 1851; and Lecoy de la Marche, Le roi René, 2 vols., Paris, 1875.

RENFREW, a county of Scotland, skirting the Firth of Clyde, lies between 55° 40’ 34” and 55° 57’ 45” N. lat, and between 4° 13’ and 4° 54’ W. long., and is bounded N. by the Clyde, N.E. by Dumbarton and by Lanark, E. by Lanark, 8. by Ayr, and W. by the Firth of Clyde. Its greatest length from west-north-west to east-south-east is 304 miles, and its greatest breadth at right angles to this 13} miles. The area is 253°793 square miles or 162,427°958 acres, of which 2021:179 acres are foreshore and 3621°342 are water. Except a small portion opposite the burgh of Renfrew, the whole county lies to the south of the Clyde. Twenty-seventh among the Scottish counties as regards extent, it is fifth in point of population, and Midlothian alone is as densely populated, the number of inhabitants to the square mile in 1881 having been 1075 in both. For local purposes the county is divided into an upper and a lower ward, the former embracing the two-thirds lying to the east, and having its district centre at Paisley, while the latter contains the parishes of Innerkip, Greenock, Port Glasgow, and Kilmalcolm, and has its dis- trict centre at Greenock. The southern border and western part of the county are hilly, but none of the heights rise very much above sea-level, the highest points being Misty Law (1663), East Girt Hill (1673), Hill of Stake (1711), and Burnt Hill (1572), all along the border of Ayrshire. The central part is undulating and, as much of the higher portion of it is well wooded, the scenery is in some places picturesque. Along the greater part of the northern border is a flat tract of clayey carse-land known locally as the “laich lands,” and very fertile in favourable seasons.

The principal river is the Clyde, which forms a considerable portion of the northern boundary ; and the other chief streams are the White Cart, Black Cart, and Gryfe. The first has its chief sources in the extreme south-east of the county, and flows north- ward—forming for most of the way the boundary with Lanarkshire— to Catheart, south of Glasgow, whence it has a westerly course to Paisley, and then again a northerly course till it joins the Clyde a

mile north-west of the burgh of Renfrew. The Black Cart issues from Castle Semple Loch near the centre of the southern border of

tion with the White Cart at Inchinnan church a mile west of the burgh of Renfrew. Its most important headwater is the river Calder, which, with smaller streams flowing to it, drains a con- siderable portion of the southern border and flows into Castle Semple Loch at Lochwinnoch. The Gryfe, which, with a large number of streams flowing to it, drains nearly all the western half of the county, risesat Gryfe Reservoir, 24 miles south of Greenock, and has a winding easterly course to its junction with the Black Cart at Walkinshaw, 2 miles north-west of Paisley. A number of smaller streams flow direct to the Clyde, the most important being the Kip and the Kelly Burn in the west of the county. The principal lochs are Loch Thom and Gryfe Reservoir, 24 miles south of Greenock; Castle Semple Loch, near the centre of the southern border ; Loug Loch and Loch Goin, farther east near the same border; and Balgray and Glen Reservoirs, connected with the Glasgow water supply near the centre of the eastern part of the county. The Glasgow, Paisley, and Johnstone Canal, which for- merly united these three towns, has since 1882 been laid dry along ine greater part of its course and the bed converted into a railway ine.

The rocks throughout the county are Carbonifcrous, and almost the whole of the Lower Carboniferous or Calciferous Sandstone series is here represented by a thick set of volcanic deposits. The oldest beds are the red sandstones, cornstones, and conglomerates which oceupy the extreme west corner between Innerkip and Loch Thom. Overlying these is the upper portion of the Lower Car- boniferous—the cement-stone group—which runs from the hills behind Greenock on the west, south-eastward by the high ground south of Paisley, and so on to the south-east corner of the county and thence into Lanarkshire. The cement-stones form the under- lying deposits over nearly two-thirds of the county to the south. west and west ; but, though the base of this subdivision here con- sists of the usual white sandstones and cement-stones, yet the great mass of the rocks are contemporancous lava-flows—basalts, mela- phyres, and porphyrites—with interbedded tuffs and volcanic agglomerates which have all issued from a line of vents the posi- tions of which may still be traced by the volcanic necks which remain at several points. In the south-east there are intercalated beds of sandstone, shale, and impure limestone. In some places this series of beds passes conformably up into

the overlying Car- boniferous Limestone series, which occupies a basin covering nearly one-third of the county to the north-east ; but the two subdivisions are oftener brought into contact by faults, a double line of which along the valley of the Black Cart brings a narrow tract of the limestones right across the volcanic beds just described. The base of the Carboniferous Limestone subdivision cousists of limestones, the middle portion of a series of valuable scams of coal and iron- stone, which are extensively worked, and the upper part of lime- stones. Masses of intrusive voleanie rocks occur to the south of Johnstone and the north-east of Paisley, and to the north of John- stone and north-west of Paisley are oil-producing shales, which are worked at Clippens and Walkinshaw. Near Pollokshields, at Thornliebank, and to the east of Barrhead there are small outliers of millstone grit consisting of yellow sandstones ; and along the extreme north-east corner of the county to the south of Glasgow the true Coal Measures of the great Lanarkshire and Stirlingshire basin are brought in by a fault which throws them down against the Carboniferous Limestone series. Volcanic dykes of Tertiary age run across the older rocks at various points, some very well marked examples occurring near the centre of the southern border. The Glacial deposits are well marked and interesting, the clays at Jordanhill to the north of the Clyde and near Paisley having yielded numerous species of Foraminifera and arctic shells. The beds of economic value are all extensively worked. In 1882 the eighteen collieries within the county produced 114,324 tons of coal out of a total of 20,515,134 tons for all Scotland, 164,523 tons of ironstone out of a total of 2,404,177 tons, 90,804 tons of cil-shale out of a total of 994,487 tons, and 22,554 tons of fireclay out of a total of 435,457 tons. Limestones are also quarricd in large quantities for smelting purposes and for the manufacture of lime, — one thin but valuable Dee at Orchard, 4 miles south of Glasgow, producing a cement that "sets" under water. Copperas is obtained from the iron pyrites got in the shale, and at one time alum-shale was worked at Hurlet in the north-east and copper in the voleanic rocks about Lochwinnoch. ;

Farming operations do not differ in detail from those carried _on in the adjoining middle and lower wards of Lanarkshire. The climate is very variable ; and, as the prevailing west and south-west winds come in from the Atlantic warm and full of moisture, con- tact with the colder land

causes very heavy rains, and the western part of Renfrewshire is one of the wettest districts in Scotland, the mean annual rainfall amounting to over 60 inehes. The mean annual temperature is about 48°. The hilly district has a good deal of moss and moorland, but the soil, which is a light earth, is also over considerable areas deep enough to produce good pasture. In the undulating middle district the soilis generally deeper and

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better, particularly along the streams, where there are tracts of good |

haughland, but it is also in many places thin and poor. There is a considerable amount of pasture, and the principal crops are oats and barley. On the flat lands adjoining the Clyde the soil is a

rich alluvium which, except when soured by excessive rain, pro-—

| 60 Azresand under.} 50 to 100 Acres. | | No. Acres.

299 329

No, Acres.

300 326

No. Acres.

1875 1880

45,298

23,094 50,830

25,078

688 581

10,633 8,904

According to the agricultural returns for 1884 the total area under crops was 95,353, a percentage of 60°8 (57°3 in 1874). The area under corn crops in 1884 was 17,502 acres; under green crops, 6,683 acres; under rotation of grasses, 22,997 acres ; under permanent pasture, 47,880 acres; orchards and market-gardens, 158 acres ; and woodland, 5424. Of the corn land more than four-fifths was under oats, which occupied 14,182 acres, while 2229 were under wheat, and only 178 under barley. Potatoes were grown on 4351 acres, and turnips and swedes on 2332; while under beans, rye, vetches, &c., there are about 1300 acres annually. The total number of horses in 1884 was 3331; the number of cattle to every 100 acres under cultivation was 28°8, the average for Scotland being 23°6. The large towns in the county and neighbourhood account for a great number of cattle being kept for dairy and feeding purposes. The number of sheep to every 100 acres under cultivation was 33°1, the average for Scotland being 145°1. The number of pigs was 1952. According to the Miscellaneous Statistics of the United Kingdom (1879) 5735 proprietors owned 155,321 acres with an estimated gross rental of £990,898. Sir M. R. Shaw Stewart possessed 24,951 acres, Allan Gilmour of Eaglesham 16,516, A, A. Spiers of Elderslie 11,259, H. Lee Harvey of Castlesemple 6500, Sir W. Stirling Maxwell 4778, Lord Blantyre 4449, Duncan Darroch of Gourock 4248, and W. Mure of Caldwell 3624.

Besides the coal, iron, and oil industries already mentioned, the county has extensive, varied, and valuable manufactures, of which the chicf are noticed in the separate articles on Greenock and Paisley. Elsewhere there are chemical works, engineering works, foundries, and bleaching, dyeing, and weaving works. 'here are throughout the shire a large tt ar of excellent roads; and numer- ous lines and branches of the Caledonian and the Glasgowand South- Western systems afford ample railway communication along the centre, north, and west fdr both general traffic and minerals. The population has risen from 78,501 in 1801 to 216,947 in 1871 and to 263,374 in 1881 (126,743 males, 136,631 females), more than 100,000 of the inercase having taken place between 1851 and 1881. Of the whole number 49,681 men Enel 21,734 women were engaged in industrial handicrafts or dealt in manufactured substances, and of these 7741 men and 15,547 women were connected with the making of textile

fabrics, while 7986 men and 172 women were connected with the working of mineral substanccs.

The Redistribution Act passed in 1885 extended the parliament- ary representation of the county from one totwo members, The only royal burgh is Renfrew, which is separately noticed, ag are also the parliamentary burghs of Greenock and Paisley. The county also contains part of the south side of Glasgow and its suburbs, the ptt SE burgh of Port Glasgow, the police burghs of Pollokshaws, Gourock, and Johnstone, and a number of small towns and villages.

Historically Renfrewshire first appears as part of the territory of the Damnonii, and thcreafter it was part of the British kingdom of Strathclyde. The western part, then known as Strathgryfe, was granted by David I. to Walter, the first high steward of Scotland, and the Stewarts had long a local connexion with it. Somerled, Lord of the Isles, was defeated and slain in the neighbourhood of the burgh of Renfrew in 1164 ; and Marjory Bruce is said to have been killed by a fall from her horse at Knock Hill between Paisley and Renfrew in 1316. In 1404 the county, which had previously formed part of Lanark, was erected into a separate jurisdiction by Robert III., who created his son James baron of Renfrew, a title still held by the eldest son of the reigning sovereign. In the end of the 17th century the district was famous for its witches ; and in 1685, after the failure of the earl of Argyll's ill-conducted enter- et the carl himself was taken prisoner on the bank of the

White Cart opposite Inchinnan church, at the spot marked by the " Argyll Stone," now within the policics of Blythswood House.

Sce Crawfurd, Description of the Shire of Renfrew (17 10); Hamilton of Wishaw, Description of the Sheriffdom of Lanark and Renfrew (Maitland Club, 1831); Hector, Selections from the Judicial Records of Renfrewshire (1876-78); and A History of the Witches of Renfrewshire (Paisley, 1809 and 1877).

RENFREW, a royal and parliamentary burgh and the county town of the above county, is situated in the north- east near the south bank of the

Clyde, connected with which isa small harbour. The main part of the town is gathered round four streets branching out from an open

RE N—

100 to 300 Acres. | 300 to 500 Acres.

hE a

duces very heavy crops, a large extent being unde: wheat. Although mincral workings have injured agriculture in several localities, the

large towns in the connty and neighbourhood have stimulated im-

provements, and the arable area has steadily increased. The follow-

ing table gives a classification of holdings in 1875 and 1880 :—

500 to 1000 Acres. Total,

Above 1000 Acres.

Acres. No.

anc, © 1311

1031 1254

Space called the cross. The town-hall, erected in 1871-73, and restored after partial destruction by fire in 1878, has a massive square tower rising to a height of 105 feet. The railway station is 6 miles west of Glasgow. The industries are connected with two shipbuilding yards, a chemical work, a forge, a dyework, and weaving. Popula- tion in 1881, 5115.

The town, which is spoken of as a burgh in 1160, scems to have been in the 16th and carly in the 17th century the principal port on the Clyde, one branch of whicli ran in a channel, now silted up, close behind the houses on the north side of High Street. The original castle of the Stewards seems to have stood on the island called " The King's Inch," between the

two channels of the river. Renfrew is one of the Kilmarnock group of parliamentary burghs,

RENI, Gurpo (1575-1642), a prime master in the Bolognese school of painting, and one of the most admired artists of the period of incipient decadence in Italy, was born at Calvenzano near Bologna on 4th November 1575. He is most usually named Guido. His father was a musician of repute, a player on the flageolet; he wished to bring the lad up to perform on the harpsichord. Ata very childish age, however, Guido displayed a determined bent towards the art of form, scribbling some attempt at a drawing here, there, and everywhere. He was only nine years of age when Denis Calvart took notice of him, received him into his academy of design by the father's permission, and rapidly brought him forward, so that by the age of thirteen Guido had already attained marked proficiency. Albani and Domenichino became soon after- wards pupils in the same academy. With Albani Guido was very intimate up to the earlier period of manhood, but they afterwards became rivals, both as painters and as heads of ateliers, with a good deal of asperity on Albani's part ; Domenichino was also pitted against Reni by the policy of Annibale Caracci. Guido was still in the academy of Calvart when he began frequenting the opposi- tion school kept by Lodovico Caracci, whose style, far in advance of that of the Flemish painter, he dallied with. This exasperated Calvart. Him Guido, not yet twenty years of age, cheerfully quitted, transferring himself openly to the Caracci academy, in which he soon became prominent, being equally skilful and ambitious. He had not been a year with the Caracci when a work of his excited the wonder of Agostino and the jealousy of Annibale. Lodovico cherished him, and frequently painted him as an angel, for the youthful Reni was extremely handsome. After a while, however, Lodovico also felt himself nettled, and he patronized the competing talents of Guercino, On one occasion Guido had made a copy of Annibale's Descent from the Cross; Annibale was asked to retouch it, and, finding nothing to do, exclaimed pettishly, "He knows more than enough" ("Costui ne sa troppo"). On another occasion Lodovico, consulted as umpire, lowered a price which Reni asked for an early picture. This slight determined the young man to bea pupil no more. He left the Caracci, and started on his own account as a competitor in the

race for patronage and fame. A renowned work, the story of Callisto and Diana, had been completed before he left.

Guido was faithful to the eclectic principle of the Bolognese school of painting. He had appropriated some-

thing from Calvart, much more from Lodovico Caracci ; he studied with much zest after Albert Diirer ; he adopted the massive, sombre, and partly uncouth manner of Caravaggio. One day Annibale Caracci made the remark that a style might be formed reversing that of Caravaggio in such matters as the ponderous shadows and the gross common forms; this observation germinated in Guido's mind, and he endeavoured after some such style, aiming constantly at suavity. Towards 1602 he went to Rome with Albani, and Rome remained his headquarters for twenty years. Here, in the pontificate of Paul V. (Borghese), he was greatly noted and distinguished. In the garden-house of the Rospigliosi Palace he painted the vast fresco which is justly regarded as his masterpiece— Pheebus and the Hours preceded by Aurora. This exhibits his second manner, in which he had deviated far indeed from the promptings of Caravaggio. He founded now chiefly upon the antique, more especially the Niobe group and the Venus de' Medici, modified by suggestions from Raphael, Correggio, Parmigiano, and Paul Veronese. Of this last painter, although on the whole he did not get much from him, Guido was a particular admirer; he used to say that he would rather have been Paul Veronese than any other master—Paul was more nature than art. The Aurora is beyond doubt a work of pre-eminent beauty and attainment; it is stamped with pleasurable dignity, and, without being effeminate, has a more uniform aim after graceful selectness than can readily be traced in previous painters, greatly superior though some of them had been in impulse and personal fervour of genius. The pontifical chapel of Montecavallo was assigned to Reni to paint ; but, being straitened in payments by the ministers, the artist made off to Bologna. He was fetched back by Paul V. with ceremonious éclat, and lodging, living, and equipage were supplied to him. At another time he migrated from Rome to Naples, having received a commis- sion to paint the chapel of S. Gennaro. The

notorious cabal of three painters resident in Naples—-Corenzio, Caracciolo, and Ribera—offered, however, as stiff an opposition to Guido as to some other interlopers who preceded and succeeded him. They gave his servant a beating by the hands of two unknown bullies, and sent by him a message to his master to depart or prepare for death ; Guido waited for no second warning, and departed. He now returned to Rome; but he finally left that city abruptly, in the pontificate of Urban VIII., in consequence of an offensive reprimand administered to him by Cardinal Spinola. He had received an advance of 400 scudi on account of an altarpiece for St Peter's, but after some lapse of years had made no beginning with the work. A broad reminder from the cardinal put Reni on his mettle; he re- turned the 400 scudi, quitted Rome within a few days, and steadily resisted all attempts at recall. He now resettled in Bologna. He had taught as well as painted in Rome, and he left pupils behind him; but on the whole he did not stamp any great mark upon the Roman school of painting, apart from his own numerous works in the papal city.

In Bologna Guido lived in great splendour, and estab- lished a celebrated school, numbering more than two hundred scholars. He himself drew in it, even down to his latest years. On first returning to this city, he charged about £21 for a full-length figure (mere portraits are not here in question), half this sum for a half-length, and £5 for a head. These prices must be regarded as handsome, when we consider that Domenichino about the same time received only £10, 10s. for his very large and celebrated picture, the Last Communion of St Jerome. But Guido's reputation was still on the increase, and in process of time he quintupled his prices. He now left Bologna hardly at all; in one instance, however, he went

off to Ravenna, and, along with three pupils, he painted the chapel in the cathedral with his admired picture of the Israelites Gathering Manna. His shining prosperity was not to last till the end. Guido was dissipated, generously but indiscriminately profuse, and an inveterate gambler. The gambling propensity had been his from youth, but until he became elderly it did not noticeably damage his fortunes. It grew upon him, and in a

couple of evenings he lost the enormous sum of 14,400 scudi. The vice told still more ruinously on his art than on his character. In his decline he sold his time at so much per hour to certain picture dealers; one of them, the Shylock of his craft, would stand by, watch in hand, and see him work. Half-heartedness, half-performance, blighted his product : self-repetition and mere mannerism, with affecta- tion for sentiment and vapidity for beauty, became the art of Guido. Some of these trade-works, heads or half- figures, were turned out in three hours or even less. It is said that, tardily wise, Reni left off gambling for nearly two years ; at last he relapsed, and his relapse was followed not long afterwards by his death, caused by malignant fever. This event took place in Bologna on 18th August 1642 ; he died in debt, but was buried with great pomp in the church of 8. Domenico,

Guido was personally modest, although he valued himself on his position in the art, and would tolerate no slight in that relation ; he was extremely upright, temperate in diet, niece in his person and his dress. He was fond of stately houses, but could feel also the eharm of solitude. In his temper there was a large amount of suspiciousness; and the jealousy which his abilities and his sueeesses exeited, now from the Caraeci, now from Albani, now from the monopolizing league of Neapolitan painters, may naturally have kept this feeling in aetive exercise. Of his numerous scholars, Simone Contarini, named I] Pesarese, counts as the most distin-guished ; he pas an admirable head of Reni, now in the Bolognese Gallery. The portrait inthe Uffizi Gallery of Florence is from Reni's own hand. Two other good seholars were Giacomo Semenza and Francesco Gessi.

The eharacter of Guido's art is so well known as hardly to call for detailed analysis, beyond what we have already intimated. His most eharaeteristie style exhibits a prepense ideal, of form rather than character, with a slight mode of handling, and silvery, some- what'cold, colour. In working from the nude he aimed at perfec- tion of form, especially marked in the hands and feet. But he was far from always going to choice nature for his model; he trans- muted ad libitwm, and painted, it is averred, a Magdalene of demonstrative eharms from a vulgar-looking colour-grinder. His best works have beauty, great amenity,

artistie feeling, and high aecomplishment of manner, all alloyed hy a eertain core of eommon- plaee ; in the worst pietures the eommonplace swamps everything, and Guido has flooded European galleries with trashy and empty pretentiousness, all the more noxious in that its apparent grace of sentiment and form misleads the unwary into approval, and the dilettante dabbler into eheap raptures. Both in Rome and where-ever else he worked he introdueed inereased softness of style, which was then designated as the modern method. His pictures are mostly Seriptural or mythologie in subjeet, and between two and three hundred of them are to be found in various European eolleetions—more than a hundred of these containing life-sized figures. The portraits which he executed are few, —those of Sixtus V., Cardinal Spada, and the so-ealled Beatriee Cenei being among the most noticeable. The identity of the last-named portrait is very dubious; it certainly cannot have been painted direet from Beatrice, who had been exeeuted in Rome before Guido ever resided there. Many etehings are attributed to him—some from his own works, and some after other masters ; they are spirited, but rather negligent. .

Of other works not already noticed, the following should be named :—in Rome (the Vatiean), the Crucifixion of St Peter, an example of the painter's earlier manner ; in Forli, the Coneeption; in Bologna, the Alms of St Roch (early), the Massacre of the Innoeents, and the Pieta, or Lament over the Body of Christ (in the chureh of the Mendicanti), whieh is by many regarded as Guido's prime exeeutive work; in the Dresden Gallery, an Eece Homo ; in Milan (Brera Gallery), Saints Peter and Paul ; in Genoa (chureh of S. Ambrogio), the Assumption of the Virgin; in the Berlin Gallery, St Paul the Hermit and St Anthony in the Wilderness. The celebrated picture of Fortune (in the Capitol) is one of Reni's finest treatments of female form; as a speciinen of male form, the Samson Drinking from the Jawbone of an Ass (Turin Gallery) might be named beside it. One of his latest works of mark is the

Ariadne, which used to be in the Gallery of the Capitol. The Louvre contains twenty of his pictures, the National Gallery of London seven, and others were once there, now removed to other public collections. The

most interesting of the seven is the small Coronation of the Virgin, painted on copper, an elegantly finished work, more pretty than beautiful. It was probably painted before the master quitted Bologna for Rome.

Vor the life and works of Reni, see Passeri, Vite de' Pitiori, and Malvasia, Felsina Pittrice ; also Lanzi, Storia Pittorica. CW. M. R

RENNELL, James (1742-1830), probably the most celebrated of English geographers, was born on 3d Decem- ber 1742, near Chudleigh in Devonshire, where his father John Rennell, a man apparently of gentle blood, was the owner of a small farm called Waddon.! The register of Chudleigh records the baptism of James Rennell on 21st December. John Rennell, who had married Ann Clark in 1738, seems to have fallen into embarrassed circumstances, and to have taken service in the artillery, with which he served in the duke of Cumberland's campaign in Flanders of 1747-48. The date of his death is uncertain, but he appears never to have rejoined his family. Asa boy the son James found a valuable friend in the then vicar of Chudleigh, Gilbert Burrington, by whose advice and assistance he entered the navy in the beginning of 1756. Throughout his Indian career Rennell kept up a regular correspondence with Mr Burrington, and always regarded him with affection and gratitude.

The earliest of Rennell's existing letters show him, in March 1758, as an acting midshipman on board the " Bril- liant," 36, Captain Parker, afterwards the famous Admiral Sir Hyde Parker, the elder of two of that name. When attached to the "Brilliant" James Rennell was present at several of those desultory expeditions against the French coast and shipping on which so much strength was squan- dered in the wars with France. Among these was a landing directed against the works and ships at Cherbourg (August 1758), and two other expeditions to the vicinity of St Malo, which were more futile, and the last of which ended somewhat disastrously. A MS. plan of the Bay of St Cast, where the re-embarkation took place (September 11, 1758), executed by James Rennell at the age of sixteen, and probably his first attempt at topographical work, is now before us. It bears the inscription " Plan of St Cas Bay, J. Rennel fect. 1758. To the Rt. Honble. Lord Howe this plan is dedicated by his obedient humble servant, J. Rennel."?

In 1760 Captain Parker, leaving the " Brilliant," took the "Norfolk" to India, and Rennell was to have gone with him, but through some accident misséd his ship and went out in the "America," 50, Captain Haldane. On reaching India he rejoined Captain Parker, now in com- mand of the "Grafton," 58, with the fleet engaged in the blockade of Pondicherry, which Coote was besieging on the landward side.

The Annual Register for 1830, ina sketch of Rennell's career, gives an anecdote for which we cannot vouch, finding no allusion to it in his letters. It is to the effect

1 There were several branches of the family round Chudleigh, and the name occurs on several monuments in Chudleigh church. Four generations of Thomas Rennells, clergymen of some note, were reckoned as relations by James Rennell :—(1) T. Rennell, fellow of Exeter College, Oxford, M.A. of 1699, rector of Bishop's Leighton ; (2) T. R., rector of Barnack, called "a very profound scholar… with a rich library ;" (8) T. R., of King's College, Cambridge, master of the Temple, and dean of Winchester; (4) T. R., editor of the British Critic, Christian advocate at Cambridge, vicar of Kensington. As Rennell calls the second his cousin, the first was probably his grandfather's brother ; he eould hardly have been his father's brother on account of the dates,

2 He writes the name indifferently Rennel and Rennell till February 2, 1760, when he says to Mr Burrington :—'"' You desired that in future I would write my name with a double Z. I shall in the future, but am inclined to think it will be of little use to me."' There is,

we believe, here some reference to the clerical relations, whom he at that time thought neglectful.

that, some sloops of war belonging to the enemy being moored in shallow water, Rennell asked the use of a boat. Accompanied by one sailor he reconnoitred the sloops, and ascertained what he had surmised to be true, viz. that owing to an unusually high tide it was possible to reach those vessels. This information was acted on with com- plete success. Whatever

amount of truth there may be in this anecdote, we know, at least, from his letters that he took part in the cutting out of the "Baleine" and "Hermione," the former a 40-gun frigate, the latter an armed Indiaman, both at anchor before Pondicherry, within a half musket-shot of the place, and that he was a volunteer in one of the boat divisions which attacked the "Baleine." This vessel had no sails bent, and the captors, being exposed for an hour to a very heavy fire from the ramparts, lost severely.

We do not know what good guidance had first turned the lad's attention to surveying, but his letters show that he went to India provided with useful books and instru- ments, and they contain from time to time notices of various surveys executed by him, eg., of the harbour of Trinconomalé (or Trincomalee, as we now call it), and of the bay and roads of Diego Rayes,? whither the East Indian fleet had gone as the rendezvous of an intended attack on Mauritius, which did not come off.

Captain Parker appears to have been friendly to Rennell, but had little hope of obtaining promotion in the navy for him, and counselled him to try his fortune in the Company's service. Rennell acquiesced, and in the summer of 1762 went, apparently as a surveyor, on board a Company's vessel which was despatched on a reconnais- sance to Manila and the neighbouring islands. The only trace we have been able to find of this voyage consists in sundry charts and coast-views published by Alexander Dalrymple, a friend of Rennell's in after days. Such are the Bay of Camorta in the Nicobar Islands, 1762; View of Quedah; Chart of Sambeelan Islands in the Straits of Malacca, 1763 ; View of Malacca, July, 1762; Chart of Abai Harbour, on north-west of Borneo, 1762.

Of the expedition we have no particulars, but we gather that Rennell looked back on his treatment and service on board with dissatisfaction, though his performance of the duties assigned him recommended him as a man of merit to the authorities at Fort St George. He had missed a great chance in the navy, for during his absence orders came for the expedition against Manila, which ended in the capture of that place in 1762,—an expedition in which Captain Parkcr took the "Santissima Trinidad," a prize of enormous value. Rennell, however, made many friends at

Madras, and had several offers of employment, though he did not think himself at liberty to accept any till the return of Captain Parker and his final discharge from the "Grafton's" books (July 1763). ° He now obtained the command of a vessel in the Government service, but whilst she lay off Madras, shortly afterwards, a cyclone destroyed every ship save one in the roads, and Rennell's among them. Fortunately he was on shore when the gale came on; but he lost everything.

The city of Madura was then being besieged by a British force in combination with one sent by the naw4b of the Carnatic ; and Mr Palk, governor of Fort St George, employed Rennell to superintend the landing of troops and stores for that operation. For his conduct of this service he received the thanks of the Government and a handsome present. Apparently about this time*

3 From Rennell's notice of its size and position this is evidently the island now called Rodriguez, about 350 miles north-east of Mauritius.

*4 This siege of Madura belongs to an obseure passage of Indian history, an account of which must be sought in Nelson's Afanual of Madura (Madras, 1868), and Bishop Caldwell's History of Tinneveily (Madras, 1881). Mohammed Yusuf Khan, a man of great ability, who had been *' commander of all the Company's sepoys" (at Madras), and afterwards governor of Madura for the nawab and the Company, threw off his allegiance in the beginning of 1768. A joint expedition was sent against him, and for a long time had indifferent sueeess. Eventually Marehand, the chief of a French contingent in Yusuf's service, betrayed him to the English commandant, and in the latter part of 1764 it is said that he was hanged, whether by order of the Fort St George Government or of the nawab is doubtful.*

RENNELL

also he made surveys of the coast about Cape Calymere, and of the Paumben Passage. Shortly afterwards, having gone to Calcutta, he found in Captain Tinker, the officer eommanding the king's squadron there, a gentleman with whom he had been slightly acquainted in the navy. There was evidently something very eugaging in Rennell's manner, aspect, and

character, for others as well as Captain Tinker immediately endeavoured to interest in his fortunes the governor of the presidency. This was Heury Vansittart, the successor of Clive, and father of Nicolas Vansittart, who was so long chaneellor of the exehequer (1812- 1823), and died Lord Bexley. The result was the appointment of Rennell as surveyor of the E. I. Company's dominions in Bengal, '"before," as he writes, "I was scarcely apprised of the matter." A few days later he received a commission "for practitioner engineer in the citadel erecting at Caleutta near Fort William '— the fortress, in fact, now so well known by the latter name,

Rennell, in a letter announcing his appointment, calls it that of "surveyor-general," but this term is not used in the official record, dated April 9, 1764.1! The date of his commission in the eorps of engineers, as ensign (or "' practitioner engincer," as the junior rank was termed), is the same. The eorps of Bengal Engineers, which after a ereditable existence of just about a eentury was amalgamated with the Royal Engineers in 1862, was then in its infaney. Only four officers appcar as having had commissions earlier than James Rennell, though the subsequent introduction of several officers with higher rank eventually placed more than this number over his head.

Practically, though he was sometimes engaged in works of con- struction or demolition,? Rennell's-work as a surveyor oecupied the whole of his Indian service, which extended to thirteen years only. In the eourse of this employment he reduced to order and substantial accuracy the map of Bengal, and accumulated a great part of the material which he afterwards utilized in the determina- tion of all the important points embraced in the first approxi- mately correct map of India. His merits were highly appreciated, and his rise was rapid. In January 1767 his position was raised to that of surveyor-general, and at the same time he was promoted to captain.

In their letter to the court of directors, reporting this promotion, the council at Fort William say :—

"We have appointed Captain Rennell, a young man of distinguished merit in this branch, surveyor-general, and directed him to form one general chart from those alrcady made, and such as are now on hand, as they can

be collected in. This, though attended with great labour, does not prevent his prosecuting his own surveys, the fatigue of which, with the desperate wounds he has lately received in one of them, have already left him but a shattered constitution.“3

This passage refers to a memorable passage in Rennell’s career, which had nearly proved its tragical termination. Bengal proper was in those early days of the Compauy’s administration very far from being the tranquil country that we have known it for so many years (except indced during its partial share in the agitations of 1857, from the mutiny of several regiments within its bound- arics). And it was about a year before the promotion just mentioned that Rennell, on one of his surveying campaigns in northern Bengal, met with the adventure in question.

The distriets in that quarter (Purniah, Dinajpur, Rangpur, &e.) were at that time habitually ravaged by bodies of marauders, who had their headquarters in the forest-tracts at the foot of the Himalayas, and beyond British jurisdiction. From these forests they used to issue annually in large bands, plundering and levying exactions far and wide, and returning to their jungle-asylum when threatened with pursuit. A few ycars before (1763) a large body of them had plundered the city of Daeca. They professed to belong to a religious fraternity and were commonly known as the Sanydsis, a name under which they are frequently mentioned in the corre- spondence of Warren Hastings, sometimes as Fakirs, The affair took place in the semi-independent state of Kuch Behar, near the border of Bhutan. Hearing that a party of native soldiers had been sent to put down one of those bands, which had just taken and plundered the capital of the state, Rennell hastened to join the detachment with his own small eseort, and came up with it just after the banditti had received a beating. The next day (21st February 1766) was spent in pursuit of the enemy, and in the afternoon Rennell and two other officers, who had gone forward to reconnoitre, found themselves in presence of a large body of the Sanyasis. Their small escort of native horse rode off, and the officers were surrounded. Rennell’s Armenian assistant was killed, his engineer subaltern fought his way clear with a slight wound,

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1 Extract from Bengal Public Consultations of that date (Records in India Office). "Mr Hugh Cameron, who was employed on this establishment as surveyor of the new lands, being deceased 16th ultimo, it is agreed to appoint Mr James Renall (séc) in his room, who is recommended to us as a capable person, and by specimens of some surveys made by him which the President now lays before the Board, promises to be a very useful servant."

2 One of his exceptional employments (July 1768) was the demolition of for- tifications round Chandernagore, which the Freneh had commenced "expressly contrary to the treaty of Paris."

be Printed in Long's Hxtracts from the Fort William Records, p. 487 (Caleutta,

1869).

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Rennell himself retreated fighting to the detachment, and was put in a palankin, eovered with sabre-wounds. One blow had cut into his right shoulder blade and through several ribs; his left arm was severely cut in three places, and he had other wounds besides. or surgical help he had to be sent to Dacca, 300 miles off, in an open boat, which he had to direct himself, as he lay on his face, whilst the natives applied onions as a cataplasm to his shoulder. He was long given up, but, under the tender care of his friend Dr Russell, he reeovered, though his health was long affected by the loss of blood and severity of the injuries.

Ou two later oceasions Rennell's letters spcak of his being attacked or waylaid whilst on survey, in one case by irregulars in the employment of the "jemitdars," i.¢., "zemindars," in districts remote from Calcutta, and on another occasion by the " Bootcse,"' or Bhutias, as we now call them. Ina letter dated 30th October 1770 he says in his brief way :-—

*“*T must not forget to tell you that about a month ago a large leopard jumped at me, and I was fortunate enough to kill him by thrusting my bayonet down his throat. Five of my men were wounded by him, four of them very danger- ously. You sce J am a lucky fellow at all times.”*

We gather from this passage that it was common in those days for officers to earry bayoncts,—a circumstance which is also set forth in one of the best known portraits of General Wolfe.

Shortly aftcr this last adventure Rennell was allowed to carry out, with a force under his command, a project that he had formed for the suppression of the banditti in the north. Writing on the 3d March 1771, he speaks of having returned successful from this expedition, after marching 320 miles in fifteen days, which he justly observes was “pretty good travelling in that climate, especially for soldiers.” ‘This did not, however, put au end to the Sanyasis, for they are spoken of by Hastings as still a pest in 1773 and 1774.

Rennell’s usual residence was at Dacca, though his visits to Calcutta were atleast annual. On one of thesc he married (October 15, 1772) Miss Jane Thackeray, one of the sixteen children of Archdeacon Thackeray, who had been headmaster of Harrow from 1746 to his death in 1760, and who has been called by Dr Butler the “seeond founder” of the school.4 Among Dr Thackeray’s descendants are to be counted many distinguished Anglo-Indians ; and William Makepeace Thackeray of the Civil Service, the grandfather of the great writer who has made that combination of names familiar and illustrious, was a friend of Renncll’s and the brother of his wife.

Indian careers were not in those days generally prolonged. Fortunes were reaped more rapidly than in later years, and death likewise mowed with swifter strokcs. In the list of Bengal engineers there are thirteen, including Rennell, who received eom- missions prior to 1770, the earliest in 1761. Of these thirteen, before 1780, six were dead, four had resigned, one had been dis- missed, and two only in the year named remained in the service.

Rennell's health had been remarkably good up to his encounter with the Sanyasis, but from that time it became permanently deteriorated, and in 1777 he resigned, having attained the rank of major two years earlier (January 1775). In those days no regular pension-system existed ; but, when permission for Rennell's retire- ment was given, in December 1776, by the governor and council, it was accompanied by the grant of a pension of 500 rupees a month from the Calcutta treasury, till the court's pleasure should be known. In passing this resolution the board remark that they "' think fit to adopt this mode as most satisfactory to Major Rennell, whose fortune will not permit him to leave India without some certainty of support in the decline of life."® It is impossible, in reading this last phrase, to withhold a smile at the proverbial longevity of pensioners, when we remember that the illustrious subject of the resolution drew the allowance for fifty-three years after his retirement. The court of directors, after his arrival in England, conferred a pension of £600 a year in licu of the Calcutta one.

Major Rennell and his wife, with a daughter born at St Helena during a stoppage on the way home, reached England, 12th February 1778. For the rest of his long life he lived in London, and for much the greater part of the time in Nassau Strect (formerly ealled Suffolk Street) near the Middlesex Hospital, a quarter then inhabited by gentlefolks, though now quite deserted by fashion.

When applying in 1776 for permission to retire, Rennell had written—"T desire not to eat the bread of idleness, but rather to make myself as useful as possible, even after my return to England," and went on to submit a scheme for the utilization of the large mass of geographical material laid up and perishing in the India House.§ He cannot have been long in England before he buckled to this task. He is said to have been offered employment of a considerable character and to have declined it. Of this we know no more DUG apparently he had laid out his own course of life, in devoting him-

4 Rennell, in announeing his marriage to Mr Burrington, speaks of his wife as the "daughter of the late Mr Thackeray who kept Harrow School." 5 MS. Records in the India Office. § India Offiee Records.

self to the laborious literary elucidation of geography, and to that enjoyment of the society of his friends to which he often refers in his correspondence as the chief happiness to which he looked for- ward in his retirement.

His first publication after his return was A Chart of the Banks and Currents at the Lagullas in South Africa (1778), accompanied by a memoir. In the same year appeared 4 Description of the Boads in Bengal and Bahar, &c., printed by order of the Court of Directors. 'This is a small 12mo, and only a book of routes. In 1781 came out his Bengal Atlas, containing Maps of the Theatre of War and Commerce on that side of Hindustan, compiled from the original Surveys, with Tables of Routes and Distances from Calcutta, through the principal Internal Navigations. This is in folio, and contains twenty-one maps, a work leaving far behind everything in Indian cartography published up to that date. In the same year Rennell read before the Royal Society, to which he had been elected March 8, " An Account of the Ganges and Burrampootur Rivers. a

These were preliminary flights. His great work on Indian geography was the Memoir of a Map of Hindustan ; and even this was of gradual growth. In its first form, as published in 1788, it contained only pp. xiv and 132. A second edition in 1785 had con- siderable additions. In 1788 a Afemoir was issued altogether en- larged in scope, and of this again a second edition appeared in 1792, and a third, still enlarged, in 1798, which contains pp. cxli+428 +51, pp. 620in all. The work, which thus went through five de- velopments in all, was that which especially established Rennell's reputation, —though his knowledge and ability were appreciated in London from an early date after his return to Europe, and the con- tinued series of works which he issued from time to time during some five and thirty years spread and augmented his fame as a geo- grapher. After a brief interval of extreme old age, the series was resumed in the publication of valuable posthumous works.

But, to return to earlier days, Rennell speedily found a place in the most intelligent circles of society, counting among his friends, as years passed on, not only men of science and literature like Sir Joseph Banks, Sir

Everard Home, Bishop Horsley, Sir George Staunton, Dr Robertson the historian, Dean Vincent, Mr Alexander Dalrymple, Mr William Marsden, &c., but also such men as Lord Mornington (afterwards the famous Marquis Wellesley), Lord Spencer (first lord of the Admiralty 1794-1801), and Lord Holland. His closest friends appear to have been Sir Joseph Banks, Lord Spencer, and Dr Gillies the historian, and in later years Captain (afterwards Sir Francis) Beaufort.

In 1791 he received from the Royal Society, at the hands of the president Sir Joseph Banks, the Copley medal, assigned hin for his geographical labours, and especially for his paper "On the Camel's Rate, as applied to Geographical Purposes." The follow- ing passage, perhaps not quite free from exaggeration, occurs in the president's address on this occasion :—

"J should rejoice could I say that Britons . . . eould boast a general map of their island as well exeeuted as the Major's delineation of Bengal and Bahar, a traet of countries considerably larger in extent than the whole of Great Britain and Ireland; but it would be injustice to the Major's industry, were I not here to state that the distriets he has perambulated and planned exceed probably in extent the whole tract of surveyed country to be found in the maps of the European kingdoms put together; while the aecuracy of his particular surveys stands yet unrivalled by the most laborious performanee of the best eounty maps this nation has hitherto been able to produce."

In 1792 Rennell published The Marches of the British Army in the Peninsula of India during the Campaign of 1790-91, illustrated and explained by a map and other plates; and in 1794 an 8vo pamphlet entitled War with France the only seewrity of Britain, by an" Old Englishman." Some years before this time Rennell had also turned his attention to African geography, in connexion with the African Association, of which he was one of the earliest members. Of this body, which was the progenitor, though not the immediate parent, of the Royal Geographical Society, an account may be read in Mr Clements Markham's most interesting record of the fifty years' work of that society. The association was established in 1788, and sent out several travellers of note. Maps and geographical mentoirs from Rennell's pen were issued on

various occasions ; and especially were his African labours associated with the name and first journey of Mungo Park. Rennell published in all some five or six dissertations on African geography. And this branch of his work may account, after a fashion, for an odd confusion made in a public report of Livingstone's burial in Westminster Abbey.?

The Philosophical Transactions, whose atmosphere in those days was not confined to the same rarefied altitudes as at present, con- tain occasional papers from Rennell's hand. We have mentioned the paper on "Camel's Rate" in 1791; in 1793 we have " Observations on a Current that often prevails to the westward of Scilly, and endangers the safety of ships" (the current in question has since been known by Rennell's name), in 1809 " On the Effect of Westerly Winds in raising the Level of the British Channel." In the

1 There was an intermediate body called the Raleigh Club, founded in 1826-27, which aetually developed into the R.G. 8. Rennell's great age doubtless pre- vented his joining the elub. The society was founded the month after his death.

2 " At Livingstone's feet lies the head of Major Reynell (sic), himself a noted African traveller."'— Times, April 20, 1874.

Archeologia we find the following:—in vol. xvii. 242, "Observations on the Topography of Ancient Babylon," and in vol. xxi. three dissertations: —(1) p. 92, "On the Voyage and Place of Shipwreck of St Paul"; (2) p. 188, "Concerning the Identity of the Remains at Jerash, whether they arc those of Gerasa or Pella" ; (8) p- 501, read May 1826, when the venerable author was in his eighty-fourth year, "Concerning the place where Julius Cesar landed in Britain." This does not, we believe, exhaust the list of his occasional writings, and he gave much incidental help to other writers who touched his own subjects, e.g., to Dean Vincent in his well-known work on the Commerce and Navigation of the Ancients. The detail of these minor works has carried us away from the chronological order of his productions. That which added most largely to the reputation acquired as the geographer of India was his book on the Geographical System of

Herodotus, 4to, with eleven maps (1800). Another great task undertaken by him was a T'reatise on the Comparative Geography of Western Asia. On this field he had formed a most comprehensive project, too vast indeed for the time of life at which he undertook it, when probably he had already reached threescore. Of this project his Herodotus was indeed itself a portion, and others were his separate publications of a Dis- sertation on the Topography of the Plain of Troy (4to, 1811), and of the Illustrations of the Eapeditions of Cyrus and the Retreat of the Ten Thousand, and an additional mass of matter, prepared with many years' labour, and left beliind him in a very perfect state of transcription, was published after his death by his daughter, in 2 vols. 8vo, with an atlas (1831),

Another posthumous work was An Investigation of the Currents of the Atlantic Ocean, and of those which prevatl between the Indian Ocean and the Atlantic. For this work Rennell had examined and collated the logs of a vast number of the ships of war and Indiamen which had traversed those seas during thirty or forty years, re-com- puting observations, and reducing them to one general system. The results of this toil were left ready for the press, and were published in large charts, with a thin volume of text, under the editorship of Mr John Purdy, in 18382. The first contributions to the scientific knowledge of currents had been Rennell's papers on the Lagullas, and on the Scilly Currents, and the present work contained nearly all that existed in the generalization of such data till more than twenty years after his death.?

'Major Rennell," says an account of him, in a work privately printed by a member of his wife's family, "was of Taal size, well proportioned, with a grave yet swect expression on his coun- tenance, which is said to have conciliated the regard of all he spoke with."*

The existence of this happy faculty we have already noticed as deducible from his earlier history in India. The sweet gravity of which the writer speaks is very recognizable in his portraits, alike in middle life and in extreme old age.> A contemporary, quoted in the work just referred to, said of him :—"In his intercourse with his friends he possesses a remarkable flow of spirits, and abounds with interesting subjects of

conversation ; at the same time, as to what relates to himself, he is one of the most diffident, unassuming men in the world."

One of the obituary notices at the time of his death says that Rennell's "' political and religious feelings arc said to have operated in causing him to decline the acceptance of an invitation to become a member of the French National Institute." This can hardly have had any basis of fact. Rennell, in politics, was always attached to what would be called, in present language, the Liberal party; though his Liberalism, as we may gather from the title of his pamphlet of 1794, and from expressions used in the dedication to Earl Spencer of his Herodotus, had nothing of that character which loves to dis- parage those who are jealous for the greatness of England. As a matter of fact he was elected a foreign associate of the Institute during the peace of Amiens, in 1802, and accepted the honour with unmistakable cordiality and satisfaction, as his reply, which we have scen, testifies. In his eighty-third year a gold medal was awarded to Rennell by the Royal Society of Literature ; and, as his infirmities prevented his attendance at their place of mecting, a deputation, headed by the president, visited him forthe purpose of presenting it at his own house in Nassau Street.

When more than eighty-seven years of age Major Rennell slipped from a chair, and broke his thigh. He hardly ever left his bed afterwards, and died 29th March 1830. He was buried in the nave of Westminster Abbey on the 6th April. A tablet to his memory, with a bust, stands in the north-west angle of the nave.

Mrs Rennell had died in 1810. Three children of the marriage

3 See Mr A. G. Findlay in the Jour. Roy. Geog. Soc., vol. xxiii.

4 Memorials of the Thackeray Family, by the late Mrs Bayne.

5 Among portraits we may mention one engraved by Cardon from a drawing by Scott, of which impressions were published in the European Magazine for 1802, and in both the posthumous editions of the Herodotus, There is another profile, engraved by Daniel after Dance, in a collection of portraits by these artists, and a medallion in poreelain

executed at Paris, probably after his death, and showing him in old age. There is also the bust by Baily in Westminster Abbey; and an admirable wax relief of him in old age is in the possession of Major Rodd, his grandson.

grew up. Of these, Thomas, the second, died in 1846; William, the third, went to India in the Civil Service, and died some years before his father (1819) ;? Jane, the eldest, married Captain Rodd, afterwards Vice-Admiral Sir John Tremayne Rodd, K.C.B., and survived both her brothers, dying in 1863. 1t was through Lady Rodd's active filial zeal that Rennell's posthumous works were pub- lished, including, besides the two already named, a second edition of the Herodotus.

What has been said in the cnumeration of his writings sufficiently shows how laboriously he worked. But to this great industry were joined in all his works sagacity, excellent judgment, and a love of truth which made him never ashamed to confess a difficulty, and always ready to do justice to other writers. The man whom we find already at fourteen serving as a midshipman in time of war could have grown up with little instruction but what he sought, and found for himself, in the course of his career. On many of the sub- jects on which he wrote, fresh light has been so abundant that the value of his works as guides has in great measure passed away, yet even now no one can deal with Herodotus or Xenophon without cou- sulting Rennell's views, directly or indirectly. Obliged to depend, as regards the former, for his text on the inaccurate translation of Beloe, it has been shown that Rennell's sagacity often discerned the true meaning of the historian when his interpreter had gone astray. What he did for the geography of India, not by his own surveys merely, but by his labour on the often remoulded Memoir, in coordinating the information gathered during forty ycars, may be best appreciated by a comparison of the celebrated D'Anville's

claircissemens Géographiques sur la Carte de UV Inde (1753) with the final edition of the Memoir (1793). Putting aside the great additions to positive knowledge which favoured the later writer, we are mistaken if the perusal of both works will not leave the im- pression that, in most of the

qualities of a geographer, Rennell's place is not in any respect behind that of the famous Frenchman, for whom he himself always entertained and expressed the deepest respect.

We conclude with an extract from a tribute to his memory which appeared in the Times of the day after his funeral in the Abbey:—

"" Another characteristic of this amiable philosopher was the gencrous facility with which he imparted his stores of learning in conversation, A memory remarkably tenacious, and so well arranged as to be equally ready for the recep- tion or for the distribution of knowledge, made him a depository of facts to which few ever applied in vain; adapting himself to the level of all who consulted him, he had the happy art of correcting their errors without hurting their feelings, and of leading them to truth without convicting them of ignorance."

Till Rennell's time it could hardly be said that England could boast of any geographer of the first class. His pre-eminence in that character is still undisputed, like that of D'Anville in France, and of Ritter in Germany.

In this sketch of Rennell's career, use has been made of a mass of letters addressed, during his service in the navy and in India, to the Rev. G. Burrington, kindly lent by Mr C. Langley of Chudleigh ; of papers courteously communicated by Rennell's descendants; of the " Memorials" quoted above; and of India Office records; supplemented by a good deal of other research. (H. Y.)

RENNES, a town of France, formerly the capital of Brittany and now the chief town of the department of Ille-et-Vilaine, is situated at the meeting of the Ille and the Vilaine and at the junction of several lines of railway connecting it with Paris (232 miles east-north-east), St Malo (51 miles north), Brest (147 west-north-west), dc. It is the seat of an archbishop and the headquarters of the 10th corps d'armée (with a large arsenal and bar- racks). For the most part rebuilt on a regular plan since the seven days' fire of 1720, the town is rendered more monotonous by the houses being of dark-coloured granite and nearly all after the same type. Of trade and industry there is little trace in the dull and de- serted streets. The main portion of the old town occu- pies a hill which looks down on the

confluence of the streams. Along the north side flows the Vilaine in a deep hollow bordered with quays and crossed by four bridges leading to the new town near the railway station. The canalized Ile forms the first section of the Ile and Rance Canal which unites St Malo to Rennes, and then descends the Vilaine to Redon, and the canal from Nantes to Brest. The cathedral of Rennes is rebuilt in a pseudo-Ionic style on the site of two churches dating originally from the 4th century. The archbishop's palace occupies in part the site of the abbey of St Melaine, whose church is the sole specinien in the town of 11-13th century architec-

1 There is in the B. Af. Catalogue 'Experimental Philosophy, or

the Effects of Chemistry ; A Play in Three Acts, by William Rennell, Calcutta, 1807-8."

ture. A colossal statue of the Virgin was placed above the dome of this church in 1867. In the palace is pre- served the old altar screen from the cathedral, perhaps the finest in all France. The Mordelaise Gate, by which the dukes and bishops used to make their state entry into the town, is a curious example of 15th century architecture, and accidentally preserves a Latin inscription of the 3d century, a dedication by the Redones to the emperor Gordianus. Architecturally the finest building in the town is the old parliament house (now the court-house), designed by Jacques Debrosse in the 17th century, and decorated with statues of legal celebrities, carved work, and paintings by Coypel and Jouvenet. The town-house was erected in the first half of the 18th century by Gabriel, the architect of the Place de la Concorde in Paris. In the modern building occupied by the faculties of law, science, and literature there are scientific collections of various kinds, and one of the finest picture galleries out-side of Paris, with pieces by Paul Veronese, Tintoretto, Vandyck, Rembrandt, Rubens, &c., and sketches by Michelangelo, Titian, and other great masters. The town library contains 50,000 volumes and 220 MSS.; and the municipal archives are of primary importance for the history of Brittany. The Promenade du Thabor, with a statue of Duguesclin, the adjoining botanic gardens, the Promenade de la Motte a little lower down, and the Mail, a fine avenue planted in 1657 by the duke of Chaulnes, add

greatly to the beauty of Rennes. About 2 miles from the town is the castle of La Prévalaye. The local industries are varied but not extensive. The population of the town in 1881 numbered 57,430; that of the com- mune 60,974.

Rennes, the chief city of the Redones, was formerly (like some other places in Gaul) called Condate (hence Condat, Condé), pro- bably from its position at the confluence of two streams. Under the Roman empire it was included in Lugdunensis Tertia, and became the centre of various Roman roads still recognizable in the vicinity. The name Urbs Rubra given to it in the oldest chroniclers is explained by the bands of red brick still found in the foundations of its first circuit of walls. In 843 a.p. Nomenoé, Charles the Bald's lieutenant, declared himself independent and took the title of king of the Bretons; but the country was afterwards torn to pieces by the struggles of the various counts who wished to make themselves masters of it and by the invasions of the Normans. About the close of the 10th century Conan le Tort, count of Rennes, subdued the whole province, and it was his son and successor Geoffrey who first took the title duke of Britrany (q.v.). It wasat Rennes the dukes were crowned, and before entering the city by the Mordelaise Gate they had to swear to preserve the privileges of the church, the nobles, and the commons of Brittany. During the War of Succession the city was captured by Jean de Montfort in 1341, by Charles of Blois in 1342, and again by Jean de Montfort. During the troubles of the League the duke of Merccenr attempted to make himself independent at Rennes (1589), but his scheme was defeated by the loyalty of the local parliament. Henry. IV. entered the city in state on May 9, 1598. An insurrection at Rennes caused by the taxes imposed by Louis XIV., in spite of the advice of the parliament, was cruelly suppressed by the duke of Chaulnes, governor of the province. The parliament was banished to Vannes till 1689, and the inhabitants crushed with forfeits and in great numbers put to death. The fire of 1720 which destroyed eight hundred houses completed the ruin of the town. During the last year of the monarchy Rennes more than once resisted the imposition of taxes not authorized by the states of Brittany. 1n1765 the cclebrated procureur-général La Chalotais was imprisoned, and in 1788 the parliament was suspended from May to October. At the commencement of the Revolution Rennes was again the scene of

bloodshed caused by the discussion about doubling the third estate for the convocation of the states-general. On January 26, 1789, the students, with Moreau (afterwards general) at their head, broke into the hall where the nobles sat in council in defiance of the decree of suspension issued against them by the Government. During the Reign of Terror Rennes suffered less than Nantes, partly through the courage and uprightness of the mayor Leperdit. It was soon afterwards the centre of the operations of the republican army against La Vendée. After the 10th of Brumaire it was accused of royalism and put to ransom by Brune. Besides La Chalotais, Gerbier the advocate and Admiral De la Motte-Picquct were born at Rennes.

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RENNIE, Joun (1761-1821), engineer and architect, was the son of a farmer, and was born at Phantassie, East Lothian, 7th June 1761. While attending the parish school of East Linton he had to pass the workshop of Andrew Meikle, the inventor of the thrashing niachine, and evinced such a strong interest in the operations there in progress that the workmen were in the habit of lending him their tools and teaching him their various uses. In his twelfth year he left school and placed him- self under Meikle, but at the end of two years he went to a school at Dunbar, in order to obtain a more thorough knowledge of mathematics and mechanical drawing. After- wards he occasionally assisted Meikle, but before his eighteenth year he had erected several corn mills. on his own account, while in the winter months he visited Edin- burgh to attend the classes of physical science at the university. By Prof. Robison of Edinburgh he was intro- duced to Messrs Boulton & Watt of Soho near Birming- ham, for whom in 1786 he superintended the construction of the Albion flour mills near Blackfriars Bridge, London. It is believed that the difficulties which occurred at the Albion mills in regard to the ebb and flow of the tide first led Rennie to the study of that branch of civil engineering connected with hydraulics and hydrodynamics, in which he became so celebrated as to have no rival after the death of Smeaton. Immediately after the completion of the Albion mills Rennie's reputation

was so firmly established in everything connected with mill work that he found himself in a very extensive line of business. In the con- struction of sugar mills in Jamaica and the other West Indian Islands he soon had almost a monopoly, and among other mills constructed by him in England mention may be made of the powder mill at Tunbridge, the great flour mill at Wandsworth, and the rolling and triturating mills at the Mint on Tower Hill. Wherever the machinery of his mills was impelled by steam, the engines of his friends Messrs Boulton & Watt supplied the motive power. It is, however, on his achievements as an architect and civil engineer that the fame of Rennie chiefly rests. Of the bridges connecting the banks of the Thames at London, three have been built from his designs,—Southwark Bridge, in the construction of which he introduced a method of employing cast iron which formed a new epoch in the history of bridge-building ; Waterloo Bridge, which then had no parallel for its magnitude, elegance, and solidity ; and London Bridge, on the model of Waterloo Bridge. Bridges at Leeds, Musselburgh, Kelso, Newton-Stewart, Bosten, New Galloway, and numerous other places bear similar testimony to his skill and taste. His earliest canal project was that of the Crinan Canal, and following it was the Lancaster Canal, which besides other difficulties pre- sented that of an aqueduct over the Lune. His execution of these works so established his reputation that his opinion and assistance were required from all quarters in regard to similar undertakings, among others the construction of the Great Western Canal in Somersetshire, the Polbrook Canal in Cornwall, the Portsmouth Canal, and the Avon and Kennet Canal. But more important than these were his works in connexion with docks and harbours, his designs embracing the London Docks, the East and West India Docks at Blackwall, and docks at Hull, Greenock, Leith, Liverpool, and Dublin. The harbours of Queens-ferry, Berwick, Howth, Holyhead, Kingstown, Newhaven, and several others owe their security and convenience to his labours. But even these works must yield to what he executed in connexion with the Government dockyards at Portsmouth, Chatham, Sheerness, and Plymouth. One other effort of his genius falls to be mentioned, the drain- age of that vast tract of marsh-land bordering upon the rivers Trent, Witham, Welland, and Ouse which for cen-

turies had baftled the skill of some of the ablest men in that department of civil engineering. Rennie's industry was very extraordinary ; though fond of the society of his select friends and of rational conversation, he never suffered amusement of any kind to interfere with his business, which seldom engaged him less than twelve hours and frequently fifteen in the day. His conversation was always amusing and instructive. In person he was of great stature and strength; and his noble bust by Chantrey, when exhibited in Somerset House, obtained the name of Jupiter Tonans. He died 16th October 1821.

His son Sir Jonn Rennie (born August 30, 1794, died Sept. 1874) succeeded him as engineer to the Admiralty, and acquired a high reputation in the same line of business as his father. On the completion of the London Bridge from his father's designs in 1831, he received the honour of knighthood. He was the author of The Theory, Formation, and Construction of British and Foreign Harbours, 4 vols., 1851-54.

RENT is classed in English law as an incorporeal heredi- tament, that is, a profit issuing out of a corporeal heredi- tament (see Ruat EstarTE). A rent issuing but of an incorporeal hereditament can only be possessed by the crown, or by a subject under statutory authority. Rent is said to lie in render, as distinguished from profits & prendre in general, which are said to lie in prender. At the present day rent is generally a sum of money paid for the occupa- tion of land. It is important to notice that this concep- tion of rent is attained at a comparatively late period of history. The earliest rent seems to have been a form of personal service, generally labour on the land, and was at the same time fixed by custom. The exaction of a com- petition or rack rent beyond that limited by custom was, if one may judge from the old Brehon law of Ireland, due to the presence upon the land of strangers in blood, probably at first outcasts from some other group.! The strict feudal theory of rent admitted labour on the lord's land as a lower form, and at the same time developed the military service due to the crown or a lord as ahigher form. Rent service is at once the oldest and the most dignified kind of existing rent. It is the only one to which the power of distress attaches at common law, giving the landlord a preferential right over other creditors exercisable without judicial authority (see Distress). In course of time the increasing importance of

socage tenure, arising in part from the convenience of paying a certain amount, whether in money or kind, rather than comparatively uncertain ser- vices, led to the gradual evolution of the modern view of rent as a sum due by contract between two independent persons. At the same time the primitive feeling which regarded the position of landlord and tenant from a social rather than a commercial point of view is still of importance.

Rents as they now exist in England are divided into three great classes—rent service, rent charge, and rent seck. A rent service is socalled because by it a tenure by means of service is created between the landlord and- the tenant. The service is now represented by fealty, and is nothing more than nominal. Rent service is said to be incident to the reversion, that is, a grant of the reversion carries the rent with it (see RumarnpER).

1 "The three rents, viz., rack rent from a person of a strange tribe, a fair rent from one of the tribe, end the stipulated rent which is paid equally by the tribe and the strange tribe."—Senchus Mor, p. 159, cited by Maine, Village Communities, p. 180.

REN T

Such power must liave been given him by the instrument creating the rent charge. The Statute of Uses, 27 Hen. VIIL c. 10, gave a power of distress for a rent charge created under the statute. The Conveyancing Act, 1881 ; 44 & 45 Vict. c. 41, § 44, now gives a power of distress for a sum due on any rent charge which is twenty-one days in arrear. By § 45 a power of redemption of certain perpetual rents in the nature of rent charges is given to the owner of the land out of which the rent issues. Rent charges granted since April 26, 1855, otherwise than by marriage settlement or will for a life or lives or for any estate determinable on a life or lives must, in order to bind lands against purchasers, mortgagees, or creditors, be registered in the central office of the Supreme Court (18 & 19 Vict. c. 15). In certain other cases it is also hecessary to register rent charges, for instance, under the Improvement of Land Act, 1864, and the Land Transfer Act, 1875. Forms of rent charge of special interest are tithe rent charge (see TrrHEs), ground rents, and the rent charges for the purpose of conferring votes usually called "faggot votes." Ground rents are rent

charges in fee simple issuing out of land sold for building purposes. The lessee erects buildings according to the terms of the lease, making his profit by subletting either at a rack rent or on the terms of a fine on entrance into possession, with an annual rent slightly larger than the ground rent. In the latter case the rent is called an improved ground rent. Ground rents are regarded as particularly eligible investments owing to the extent of the security afforded. Rent charges of the annual value of 40s. for the purpose of creating votes are now rendered ineffective by the tepresentation of the People Act, 1884, 48 Vict. c. 3, § 4, which enacts (subject to a saving for existing rights and an exception in favour of owners of tithe rent charge) that a man shall not be entitled to be registered as a voter in respect of the ownership of any rent charge. A rent seck (redditus siccus) is a rent charge reserved without power of distress. But, as power of distress for rent seck was given by 4 Geo. II. c. 28, the legal effect of such rent has been since the Act the same as that of a rent charge. There are varieties of these main divisions of rent to which special names are given. Rents of assize or quit rents are a relic of the old customary rents. They are pre- sumed to have been established by usage, and cannot be increased or diminished. They are found only in manors. Those paid by the freeholders are also called chief rents. Fee farm rents are rents reserved on grants in fee. Accord- ing to some authorities they must be at least one-fourth of the value of the lands. They, like quit rents, now occur only in manors, unless existing before the Statute of Quia Limptores or created by the crown (see REAL Estate). A rent which is equivalent or nearly equivalent in amount to the full annual value of the land is a rack rent. A dead rent is a fixed annual sum paid by a person working a mine or quarry, in addition to royalties varying accord- ing to the amount of minerals taken. Rents in kind still exist to a limited extent; thus the corporation of London is tenant of some lands in Shropshire by payment to the crown of an annual rent of a faggot. All pepper-corn or nominal rents seem to fall under this head. Services rendered in lieu of payment by tenants in grand and petit serjeanty may also be regarded as examples of rents in kind. Labour rents are represented by those cases, not unfrequent in agricultural leases, where the tenant is bound to render the landlord a certain amount of team work or other labour as a part of his rent. It was held in the Queen's Bench in 1845 that tenants who occupied houses on the terms of sweeping the parish church and of

ringing the church bell paid rent within the meaning of the Limitation Act of 3 & 4 Will. IV., ¢. 27.

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Apportionment.—In regard to estate a rent scrvice is apportion- able at common law, as well as under certain Acts of Parliament, such as the Land Clauses Act. A rent eharge was formerly not apportionable, for it issued out of every part of the land and was at the same time in contemplation of law against common right as not being incident to tenure. The legal effect of this was that (with some exceptions) a release of part of the land out of which a rent charge issued was a release of the whole. It was provided by 22 & 23 Vict. c. 35, § 10, that the release from a rent charge of part of the hereditaments charged does not extinguish the whole rent charge, but operates only to bar the right to recover any part of the rent charge out of the hereditaments released. In regard to time, at common law no kind of rent was apportionable. The effect of this was that if the person entitled to the rent died between rent days no rent was due to the succeeding reversioner for the inter- mediate period. This was remedied by 11 Geo. II. c. 19, and other Acts, which are now practically superseded by the Apportionment Act, 1870, 33 & 84 Vict. c. 35. By this Act all rents are, in the absence of stipulation to the contrary, to be considered as accruing from day to day, and apportionable in respect of time accordingly.

FKemedies.—Rent is due in the morning of the day appointed for payment, but is not in arrear until after midnight. It should be demanded just before sunset. The landlord has besides distress his ordinary remedy by action. In addition special statutory remedies are given in the case of tenants holding over after the expiration of their tenancy. By 11 Geo. II. ¢. 19 any tenant giving notice to quit and holding over is liable to pay double rent for such time as he continues in possession. By 1 & 2 Vict. c. 74 a tenant at a rent not exceeding £20 per annum who fails to deliver up possession after his interest has ended may be ejected by summary pro- ceedings before justices. By 19 & 20 Vict. c. 108 a similar remedy is given in the county court whcre the rent does not exceed £50 per annum. Analogous provisions are contained in Acts dealing with the metropolitan

distriet. It should be noticed that, since the writing of the article Disrress, the landlord's power of distress has been considerably limited in the case of agricultural tenancies falling within the Agricultural Holdings Act, 1883, 46 & 47 Vict. c. 61. § 44 confines the right of distress to one year's arrears of rent instead of six ycars' arrears, which could be distrained for before the Act. An extension of time is allowed in cases where in the ordinary course of dealing between landlord and tenant the payment of rent has been allowed to be deferred for a quarter or half year after the rent became legally due. By § 45 live stock belonging to another person and taken in by a tenant to be fed has a qualified privilege from distress ; that is, it is not distrainable where there is other sufficient distress to be found. If so distrained for want of other sufficient distress, it may be redeemed by the owner on payment of any sum due for the feeding. Agricultural or other machinery on the premises of the tenant for hire or use and live stock on the premises solely for breeding pur- poses are absolutely privileged from distress. The Act further makes appraisement before sale unnecessary, and enacts that bailiffs to levy distress are to be appointed by county court judges. For other provisions of the Act dealing with procedure, see REPLEVIN.

Lreland.—The main differences between Irish and English law have been caused by legislation (see LANDLORD AND TENANT), One of the most noticeable is the power of ejectment for non-payment of rent given by 28 & 24 Vict. c. 154. In England such a power can only be conferred by express agrcement.

Scotland.—Rent is properly the payment made by tenant to landlord for the use of lands held under lease. The rent paid by vassal to superior is called feu-duty (see Fru). Its nearest English equivalent is the fee farm rent. Rents are recovered by an action of maills and duties in the Sheriff Court or the Court of Session, and in non-agricultural tenancies by hypothec. The right of hypothec over land exceeding 2 acres in extent let for agriculture or pasture has been abolished as from November 11, 1881 (see HyPpo- THEC). The Agricultural Holdings (Scotland) Act, 1883, 46 & 47 Vict, c. 62, provides by § 27 that when six months' rent of the holding is due and unpaid the landlord may raise an action of removing before the sheriff against the tenant, concluding for his removal at the

term of Whitsunday or Martinmas next ensuing ; and, unless the arrears are paid or caution is found, the sheriff may decern the tenant to remove. The tenant so removed has the rights of an outgoing tenant. Labour or service rents were at one time very frequent in Scotland. The events of 1715 and 1745 showed the vast influence over the tenantry that the great proprietors ac- quired by such means. Accordingly the Acts of 1 Geo. I., sess. 2, c. 54, and 20 Geo. II. c. 50, provided for the commutation of services into money rents. Such services may still be created by agreement, subject to the summary power of commutation by the sheriff given by the Conveyancing Act, 1874, 37 & 38 Vict. c. 94, §§ 20, 21. "In the more remote parts of Scotland it is understood that there still exist customary returns in produce of various kinds, which being regulated by the usage of the district or of the barony or estate cannot be comprehended under any general rule" (Hunter, Landlord and Tenant, vol. ii. 298). Up to within forty

years ago existed steelbow lcases, by which the landlord stocked the farm with corn, cattle, implements, &c., the tenant returning similar articles at the expiration of his tenancy and paying in addition to the ordinary rent a steelbow rent of 5 per cent. on the value of the stock.

United States.—Agricultural rents are, from the different position of the cultivators of the land, of less importance than in England. The law is in general accordance with that of England. The tendency of modern State legislation is unfavourable to the continuance of distress as a remedy. In some States, such as Ohio and Tennessee, it never existed. Fee farm rents exist in some States, like Pennsylvania, which have not adopted the Statute of Quia Emptores as a part of their common law. (J. Wt.)

REPLEVIN. Since the article Distress (g.v.) was written the Agricultural Holdings Act, 1883, has made some changes in the law of replevin in England. The period of five days during which the tenant or owner of goods may replevy by 2 Will. & Maryc. 5, § 1, is extended in the case of holdings within the Act to fifteen days, on the tenant or owner making a request in writing to that effect and giving security for additional costs. A summary remedy in the nature of replevin is given, a court of summary

jurisdiction having a jurisdiction concurrent with that of the county court conferred upon it in the case of distress on a holding within the Act.

REPORTING. The curious among those who seek to trace political developments may, without any great strain on the imagination, find an intimate relation between the growth of newspaper reporting and the growth of demo- cratic institutions; at any rate the two have always been found together. The history of reporting in Great Britain brings out the relationship with much clearness. There was no truly systematic reporting until the beginning of this century, and not until many years afterwards did it grow to be a most important, if not the most important, feature in newspapers. There was parliamentary reporting of a kind almost from the time when parliaments began. Single speeches, and even some consecutive account of particular proceedings in parliament, were prepared. But long after newspapers were commonly published no effort had been made to give reports either of the proceedings of parliament or of those of any other assembly dealing with the public interests. The first attempts at parliamen- tary reporting, in the sense of seeking to make known to the public what was done and said in parliament, began in a pamphlet published monthly in Queen Anne's time called The Political State. Its reports were mere indica- tions of speeches. Later, the Gentleman's Magazine began to publish reports of parliamentary debates. Access to the Houses of Parliament was obtained by Cave, the publisher of the magazine, and some of his friends, and they took surreptitiously what notes they could. These were subsequently transcribed and brought into shape for publication by another hand. There was a strict prohibi- tion of all public reporting ; but the Gentleman's Magazine appears to have continued its reports for some time without attracting the attention or rousing the jealousy of the House of Commons. The publisher, encouraged by immunity from prosecution by parliament, grew bolder, and began in his reports to give the names of the speakers. Then he was called to account. The latest standing order on the subject at that time was one passed in 1728, which declared "that it is an indignity to, and a breach of, the privilege of this House for any person to presume to give, in written or printed newspapers, any account or minute of the debates or other proceedings; that upon discovery of the authors, printers, or publishers of any such newspaper this House will proceed against the

offenders with the utmost severity." Under this and other standing orders, Cave's reports were challenged, as were those of other publishers in other magazines. They were denounced by resolution ; and threats of prosecution were made, with the result that

the reports appeared still, but without the proper names of the speakers, and under the guise of "Debates in the Senate of Lilliput" or some other like title. Long afterwards, in the latter half of the century, the newspapers began to report. parliamentary debates more fully, with the result that, in 1771, several printers, including those of the Morning Chronicle and the London Evening Post, were ordered into custody for publishing debates of the House of Commons. A long and bitter struggle 'between the House and the public ensued. John Wilkes took part in it. The lord mayor of London and an alderman were sent to the Tower for refusing to recognize the Speaker's warrant for the arrest _ of certain printers of parliamentary reports. But the House of Commons was beaten. In 1772 the newspapers published the reports as usual ; and their right to do so has never since been really questioned. Both Houses of Parliament, indeed, now show as much anxiety to have their debates' fully re- ported as aforetime they showed resentment at the intrusion of the reporter. Provision has been made in the House of Lords and in the House of Commons for reporters. 'There are galleries in which they may take notes, and writing rooms in which those notes may be extended. In short, reporting is now one of the best marked of parliamentary institutions.

But parliamentary reporting is only a small part of such work in newspapers. The newspapers in the be- ginning of this century rarely contained more than the barest outline of any speech or public address' delivered in or in the neighbourhood of the towns where they were published. As parliamentary reporting began to grow, so did local reporting. After the peace of 1815 a period of much political fermentation set in, and the newspapers began to report the speeches of public men at greater length. All the attempts that were made from time to time to repress public meetings and demonstrations of dissatisfaction with the existing order of things did but increase the demand for reporting. It grew

as the fetters were struck off public institutions. With the Reform Act of 1832 it got a great start forward; and the Municipal Reform Acts gave it a still stronger impulse. Then the proceedings of town councils could be reported, and every local newspaper took care that this was done. It was not, however, until well into what may be called the railway era that any frequent effort was made by newspapers to go out of their own district for the work of reporting. The London newspapers had before this led the way. In London alone were there daily newspapers. The proprietors of these papers had been compelled by the requirements of the public to make provision for the systematic reporting of the proceedings of parliament. For many years after the right to report those proceedings had been practically established, the work was done ina dilatory and clumsy fashion. Early in the present century, however, greater freedom of access to both Houses was given, and the manager' of the Morning Chronicle established a staff of reporters. They began the system which with improvements has continued to this time. Each reporter took his " turn" —that is, he took notes of the proceedings for a certain time, and then gave place to a colleague. The reporter who was relieved at once extended his notes, and thus prompt publication of the debates was made possible. Reporters had been found to supply the demand, and it had become the habit of the proprietors of the London newspapers to employ these men, out of the session of parliament, in reporting the speeches of public men in the country. The practice grew until there was a good deal of competition among the papers as to which should first issue a report of any speech of note. Railways were not ; and reporters had frequently to ride long distances in post chaises, doing their best as they jolted along the*

roads to transcribe their' notes, so that they might be ready for the printer on arrival at their.destination. Charles Dickens used to tell several stories of his adventures of this kind while he held an engagement on the Jlorning Chronicle. He.was, indeed, perhaps the best reporter of his time, and he was most successful in outstripping many of his rivals. One result of the efforts thus made was that the provincial newspapers were stimulated to greater efforts. Reporters were rapidly trained, and in all direc- tions reporting grew. There were none but weekly news- papers; but they devoted much of their space to report- ing, and public men became more ready to speak as they found that what they said would be more widely made known. As railways were extended, the newspapers were able to extend the sphere of their work of this kind, and reporting spread apace. Then, with changes in the fiscal policy of the country, daily newspapers sprang up in all directions ; the electric telegraph was being improved and developed so that greater facilities were given for report- ing; and in a few years the old supremacy of the London journals in this department of newspaper work had well- nigh disappeared. The country newspapers did more reporting of speeches and public meetings than the metro- politan papers. No public man made a speech but it was faithfully reproduced in print. Local governing bodies, charitable institutions, political associations, public com- panies—all these came in a short time to furnish work for the reporter, and had full attention paid tothem. Curiously enough, while the country newspapers have thus cultivated reporting, and have made it one of their chief features, the London newspapers, for reasons into which this article need not enter, have fallen behind, and have for some years past given little attention to the work of which they were the originators. This fact explains a development of reporting which may be more fully described.

When the second half of this century began, par- liamentary reporting was a leading feature of the Lon- don newspapers. They had a monopoly of it. All the reporting arrangements in the House of Lords and in the House of Commons were made with sole regard to their requirements. There had indeed been a long battle between the Times and some of the

other London news- papers as to which should have the best parliamentary report, and the Zwmes had established its supremacy, which has never been shaken. But, while its reporting was fuller than that of other London daily newspapers, they did not neglect the work, and they gave in shorter compass admirable digests of the proceedings, with full reports of the most important speeches. The provincial newspapers were in the main obliged to copy the reports thus provided, and rarely made any attempt to get reports of their own. When the electric telegraph came into use for commercial purposes a change began. . The company which first carried wires from London to the principal towns in the country started a reporting service for the country newspapers. It gathered up scraps of news and sent them to the journals that subscribed for the service. In addition, it procured admission to the parliamentary galleries for reporters in its employ- ment, and began to send short accounts of the debates to the newspapers in the country. These newspapers were thus enabled to publish in the morning some account of the parliamentary proceedings of the previous night, instead of having to take like reports a day later from the London journals. The effect was greatly to stimulate the appetite of the provincial public for parlia- mentary reporting. The telegraph companies for a long time could or would do no more than they had begun by doing ; and they offered no inducements to the provincial newspapers to telegraph speeches. The public meanwhile

wanted to know more fully what their representatives were saying in parliament, and gradually the leading pro- vincial newspapers adopted the practice of employing reporters in the service of the London journals to report debates on subjects of special interest in localities; and

these reports, forwarded by train or by post, were printed

in full, but of course a day late. 'The London papers paid little attention to such debates, and thus the provincial papers had parliamentary reporting which was not to be found elsewhere. Bit by bit this feature was developed. It was greatly accelerated by a movement which the Scotsman was the first to bring about. The telegraph companies had increased in number, but they had not given more facilities for newspaper reporting.

About 1865, however, a new company having come into existence, it was agreed that wires from London should be put at the disposal of such newspapers as desired them. Each newspaper was to have the use of a wire—of course on payment of a large subscription—from six o'clock at night till three o'clock in the morning. This was the beginning of the "special wire" which now plays so important a part in the production of almost all newspapers. The arrangement was first made by the Scotsman and by other newspapers in Scotland. The immediate result was that the parlia- mentary reporting in these papers was greatly increased, and was no longer confined to debates on local affairs. The special wires were used to their utniost capacity to con- vey reports of the speeches of leading statesmen and politicians ; and, instead of bare summaries of what had been done, the newspapers contained pretty full reports. When the telegraphs were taken over by the state, the facilities for reporting were increased in every direction. But now, as to parliamentary reporting, a new difficulty arose. The London papers, with the exception of the Times, had given less and less attention to parliamentary debates. There were, indeed, fairly long reports in one or two other newspapers in London, but the tendency was to shorten them, while on the other hand several of the provincial newspapers were giving more space than ever to the debates. These newspapers had to get their reports as best they could. The demand for such report- ing had led, on the passing of the telegraphs into the hands of the state, to the formation of news agencies which undertook to supply the provincial papers. These agencies were admitted to the reporters' galleries in the Houses of Parliament, and they provided longer or shorter reports of the debates, to meet the wishes of their clients. But the reports which any agency supplied were identical; that is to say, all the newspapers taking a particular class of report had exactly the same material supplied to them— the reporter producing the number of copies required by means of manifold copying paper. It is easy to see that, though this might serve the purpose of most of them, it could not meet the requirements of all; and accordingly attempts were made to get separate reports by engaging the services of some of the reporters employed by the London papers. Nothing else indeed was possible. The "gallery" was shut to all, save the London papers and the news agencies. The Scotsman sought in vain to break through this exclusiveness. The line, it was said, must be drawn somewhere, and the proper place to draw it was at the

London press. Once that line was departed from every newspaper in the kingdom must have admission. But in 1880 a select committee of the House of Commons was appointed to consider the question. It took evidence, and it reported in favour of the extension of the gallery and of the admission of provincial papers. The result was that some of the papers entered into combinations to procure reports ; that is to say, three or four papers which would be satisfied with the same report joined in providing

the necessary reporting staff. In other cases individual newspapers put themselves on the same footing as the London newspapers by engaging separate staffs of reporters. This is the arrangement now. Parliamentary reporting is much fuller in the leading provincial newspapers than it is in most of the London papers, though the reports for the former have in all cases to be telegraphed to them.

The mode in which parliamentary reporting is carried out deserves some description. It has been said that the manager of the Morning Chronicle early in the century laid the foundation of the present system when he divided the work of reporting debates among a staff of reporters. That is exactly what is done now. The " gallery," as it is familiarly called, is arranged with boxes for note-takers overlooking the floor of the House, and with seats behind for other note-takers who are waiting to take their turn. The Zimes has three of the front boxes—one for the chief of its staff of reporters, one for a summary writer, and one for the note-taker engaged in the full report. Most of the other London papers have each two boxes—one for a summary writer, the other for a reporter. ach of the press agencies has two boxes. Hansard has one. The rest are occupied by provincial newspapers or by combina- tions of those newspapers. The staff of reporters attached to each paper or combination of papers numbers from six to sixteen shorthand writers. If, for the purpose of describing the work of parliamentary reporting, a staff of eight be assumed, the process can be made clear. One other preliminary point should be kept in mind: an expert and intelligent reporter can transcribe from his notes as much matter as that contained in a column of the Times in rather less than an hour and a half. The staff of eight men may have

*turns of a quarter of an hour or of half an hour, or of any other length of time that may be agreed upon. The House of Commons begins its ordinary sitting at a quarter to four. At that time reporter No. 1 takes his place in the box and notes all that passes in the House. At four, assuming quarter hour turns, No. 2 relieves him; at a quarter past four No. 8 relieves No. 2, and at half past four No. 4 relieves No. 3. It will thus be seen that the eight reporters will cover a period of two hours, and that each of them has an * hour and three quarters in which to extend his notes. If he has had a quarter of an hour's note-taking of an important speaker he will have about three-quarters of a column of matter to write, and this he can do easily and have some time for rest before he has to take another "turn." In the case of an important debate extending far into the night, or into the morning, the "turns" are shortened. Instead of a quarter of an hour, each reporter takes ten minutes, or five, or even three. The reporters go from the box to a writing room and there transcribe their notes, their "copy" being gathered by messengers attached, to their paper, and carried by them to the printers. In the case of the provincial newspapers, the "copy" has to 'be telegraphed over the "special" or other wires, before it can reach the hands of sub-editors or compositors. That, however, is no affair of the reporter's. He has to produce his report with as much rapidity as he can. In the case of the 7%mes his efforts are seconded by what is in practice an annihilation of the space between the House of Commons and the office of the paper. The reporter reads out from his notes to an operator on a telephonic wire, who speaks what he hears through that wire to the office of the paper. When it is received there it is spoken off again to a compositor at a composing machine; and thus it is most commonly in type and ready for printing long before the reporter's "copy" could have been received from the House of Parliament. The telephone is also used in a similar way by*

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some of the newspapers which have special wires. The latest parts of the report of a night's sitting are spoken through the telephone to the point from which the special wire starts, and they are promptly telegraphed to the newspaper for which they are intended. Thus it often happens that the finishing passages of a report of a late sitting in the House of Commons

are actually in type in a newspaper office 400 miles away, before the members who have taken part in the proceedings have got on their greatcoats for their walk home.

Parliamentary reporting, important as it is, yet forms a small part of the reporting which is done by the news- papers. All the public expositions of our complicated and busy social and national system are reported with a fulness, and on the whole with an amount of accuracy, that are surprising. Every newspaper of importance in the provinces has a more or less numerous staff of reporters at its command. In some cases, papers have separate staffs in different parts of the country. It is the business of these gentlemen to report all that is worth reporting for their journal. In the case of a long and important speech or meeting they will take turns in the reporting of it in the same way as turns are taken in the Houses of Parliament. But no newspaper is able to confine its reporting to events in its own neighbourhood. It must give to the public full accounts of speeches of prominent public men, no matter where they are delivered. Sometimes a reporter is sent far away to do this work. In such a case he usually joins for the occasion the staff of one of the newspapers of the neighbourhood ; or he and other reporters from a distance make up a staff to do the work. Again the system of turns comes in. But, for the most part, speeches of statesmen in different parts of the country are reported for newspapers at a distance by one or other of the news agencies, which send down staffs of reporters for the work. In some cases, all these modes of working are seen together—there are representatives of individual newspapers from far and near, and there are the staffs of the news agencies. During Mr Gladstone's Midlothian campaign he had seldom fewer than seventy reporters in his train.

As a rule, reporters are shorthand writers. That became a necessity when the demand for reporting greatly in- creased, and when the very words of a speaker had to be given. But what is spoken of as verbatim reporting is in no sense the best. It is a necessity, but to a great extent is merely mechanical, The reporter has acquired dexterity in shorthand writing, and he can read his notes fluently. Far more is required for that better reporting which conveys to the public the full sense of what a speaker has said without giving all his superfluous words. This is an art which is not

universally acquired by reporters. They have learned to depend so much upon their notes that they do not learn to exercise their brains. There is much report- ing which shortens speeches by wholesale excisions rather than by judicious and intelligent compression. It would, however, be unjust to pass over the many proofs of high intelligence which the reporting in our newspapers contains. The task of the reporter is often not easy. He has, to use a familiar adage, to make many silk purses out of sows' ears; and he does it patiently and well—so welk that the author of the material operated upon is often inclined to take all the credit to himself.

So far, the reporting which has been spoken of is that by which speeches and debates arc produced in print for the public informa- tion. But there is another kind of reporting which ought not to be passed over. What is commonly called "descriptive reporting " has in some cascs nearly shouldered the reporting of speeches out of newspapers. Is there a royal progress, or a military display, or a pageant of any kind—the descriptive reporter is called into requisition. He has to describe as best he can all that happens.

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It is a simple statement of fact to say that newspapers have on many occasions had word pictures from their descriptive reporters which have never been surpassed in prose writing for elegance and vividness and force. The special correspondent is a " descriptive reporter." He goes to war to describe what he sees. The electric telegraph has made a great change in the manner and perhaps in the character of his work ; but he is still among those who help in newspaper reporting.

Mention has been made of the connexion of the electric telegraph with reporting; and it has been said that, since the telegraphs have been extended and telegraphing has been cheapened, the sphere of reporting has been widened and the demand for it has increased. No daily newspaper now confines its reporting to the affairs of the part of the country in which it is published. The electric telegraph brings the most distant places within easy reach of every newspaper. It has also made the work of the reporter more arduous and his responsibility greater. He

cannot postpone the transcription of his notes toanother day. The speech that is not finished in Manchester at midnight must be printed in full in the London newspaper which goes to press before three o'clock in the morning. The meeting which does not finish at Wick till midnight must be reported in the next day's papers in Edinburgh. All this means that the reporter must work under

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I. AnimaL REPRODUCTION, § 1. ASEXUAL REPRODUCTION.

AS a general account of this process has already been

given (see Bronoey, vol. iii. p. 686), and the details of its occurrence in the various groups are described in the articles devoted to them (see Protozoa, Hyprozoa, TaPeworm, &c.), it suffices here to recall the very broadest aspect of the phenomena,—that asexual reproduction is simply discontinuous growth, and that, as we make an ascending survey of the Metazoa, that simple form of discontinuous growth which we term asexual reproduction becomes niore and more subordinated to, and at last wholly replaced by, that more differentiated or "sexual" form of reproduction characterized by the union of two hetero- geneous cell-elements—never to reappear save in degenerate forms. See SEX,

§ 2. SEXUAL REPRODUCTION.

In the lowest forms of animal life the process of sexual reproduction is found in its simplest imaginable expression unassociated with any of those complexities which arise among the higher animals and plants. All that is to be observed is the growth of the reproductive organs, the maturation of their products, and the passive liberation of these,—the fecundation of the ovum and the fate of the embryo being entirely left to the circumstances of the environment. In higher forms, however, not only does this process of maturation become more complex and of far more marked influence over the other functions of the organism, but the attraction of the sexes becomes distinct and leads to new specializations of function and structure.

Maturation.—The maturation of the sexes acquires, as has been said, increasing definiteness in the higher forms, where it is associated with various characteristic accom- paniments. The profound reaction of reproductive maturity upon the whole system is best marked in Birds and Mammals,-and perhaps most of all in Man.

Thus in a young male Bird the circulation in the testes is greatly increased, and these organs. increase greatly in size and weight and commence to develop spermatozoa. Meanwhile the "secondary sexual characters" of the adult—gayer plumage for alluring the female, or weapons for contest with other males—make their appearance, the voice and note may alter, and a marked increase of strength and courage may appear. Among Mammals the changes are of similar order, the secondary sexual char-

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great pressure, and that he must exercise the greatest care in extending his notes. He has no time for revision, no opportunity of amending any doubtful passage. When these drawbacks are considered, it will most likely be felt that the work of reporting is not easy. Yet its importance could not well be overrated. Re- porting is the feature in the journalism of to-day which the public could least afford to lose. The editor of a newspaper may influence public opinion, but the reporter furnishes the material for its for- mation. Fair reporting is indeed a great security for freedom and for moderation. It enables all who can read to see the arguments for and against any proposal; it shows how public bodics dis- charge their duties ; it indicates the wants and wishes, the hopes and fears of the public; it puts within easy reach the mcans of combating wild and foolish propositions, however superficially attractive they may be; in short, it makes the whole country an open council on all questions affecting the souls and bodies, the education and the government, of the people. It is but fair to add that reporting is done as a rule with great ability and fairness, The reporter rarely carries his likes or his dislikes into his work. He is scrupulously just, and as scrupulously impartial, though it may be that this is not always the opinion of some men who make speeches of which little is scen in the shape of reporting. (C. CO.)

REPOUSSE. See Mrrat-Worx and PLATE.

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acters of course differing in detail. The minor changes at puberty in Man associated with the commencement of spermatogenesis are (besides the reflex excitation of erec- tion due to distension of the seminal vesicles, and the more or less periodic expulsion of their contents during sleep) the growth of hair on the pubic region and later on the lower part of the face, and the rapid modification of the laryngeal cartilages and the lengthening of the vocal chords, so rendering the voice harsh and broken during the change and ultimately deepening it by about an octave. The marked strengthening of bones and muscles and the profound psychical changes which accompany the whole series of processes are also familiar. See SEx.

The local and cellular activity within the ovary, which is the fundamental part of maturation in the female, is not less remarkable than that in the testes. That even in lower Invertebrates the enlargement and escape of the ova are part of a normal cellular rhythm is interestingly shown by their not unfrequent relapse to the amceboid state, or by the fatty degeneration and death of ova which have not accomplished their destiny. The escape of ripe ova in the Vertebrate ovary is especially remarkable: each Graafian follicle, as it ripens, bursts, expelling its ovum ; its cavity contracts ; it is filled up by blood, of which the white cor- puscles form a framework resembling connective tissue, in which the solids and corpuscles of the serum with colour- ing matter derived from the hemoglobin of the latter are retained ; and the whole constitutes the "corpus luteum," which, should pregnancy occur, may persist and undergo further retrogressive changes, or otherwise gradually dis- appear.

The direct causes of this process of ovulation have been sometimes ascribed to the congestion of the blood-vessels of the ovary and to its own internal turgidity, or to the existence of a slight contractility of its stroma; it seems, however, rather to depend upon the growth and turgescence of the individual follicle. The question of the relation of ovulation to the process of copulation in the higher animals has also been much

discussed. Though we certainly know that ovulation is of regular occurrence whether fecundation takes place or not, it seems that in many cases copulation is speedily followed by the libera- tion of an ovum; nor is it difficult to see how the profound nervous and circulatory excitement associated with the former process might accelerate the bursting of a follicle. Leopold has conclusively shown, however, that ovulation may also long precede impregnation.

In many forms it is not easy to see how the ova once liberated into the body-cavity find their way safely into the small opening of the discontinuous oviduct. In the Frog, however, tracts of the peritoneal epithelium become ciliated, so propelling the ova in the right direction. In Reptiles, Birds, and Mammals the open end of the oviduct is widened and fringed, and lies close to or even touching the ovary; muscular fibres too are present, and more or less active movements of this dilated end over the ovarian surface have been alleged to occur. The oviduct once reached, the downward progress of the ovum is ensured by the cilia of the epithelial lining, and probably also by peristaltic movements of its muscular coat. (1)

Menstruation.—The process of menstruation (menses, catamenia), although from the earliest times the subject of medical inquiry, is by no means yet clearly understood. It occurs usually at intervals of a lunar month in all women during their period of potential fertility (fecundity), and, so far from being confined to the human species, has been observed at the period of "heat" in a large number of Mammals. Though thus clearly a normal physiological process, it yet evidently lies on the borders of pathological change, as is evidenced not only by the pain which so fre- quently accompanies it, and the local and constitutional disorders which so frequently arise in this connexion, but by the general systemic disturbance and local histological changes of which the discharge is merely the outward expression and result. The histological facts are briefly as follows. The mucous lining of the uterus consists of a loose vascular connective tissue covered by ciliated epithe- lium and containing numerous glands of clear alkaline secretion. This mucous lining before

the outset of men- struation becomes loose and cedematous, its lymphatics being greatly distended; it thus thickens considerably, pressing against the cervix of the uterus. An extrava- sation of blood from the capillaries next takes place over the whole surface of the mucous layer, and the discharge is thus set up. This consists at first of blood largely diluted with the secretion of the uterine glands, but soon becomes mixed with detritus from the disintegration of the mucous coat, of which not only the general epithelial cells but those of the neck of the glands, and even part of the subjacent connective tissue, undergo fatty degeneration and fall off, occasionally even ina mass. After from three to six days the blood ceases to appear, and the lost epithe- lium is rapidly replaced, apparently by proliferation from the necks of the glands. By the ninth or tenth day the mucous coat is fully healed and the beginnings of the next menstrual process recommence.

The age at which the process commences varies with race and climate, with nutrition and growth, with habit of life (e.g., with differences between town and country life), and with mental and moral characteristics. Of these, however, climate seems most important; thus, while in northern Europe the average age is reckoned at the begin- ning of the fifteenth year, in the tropics it seems to commence in the ninth or tenth. The cessation of men- struation usually takes place between the age of forty-five and fifty, and, somewhat as tlie secondary characteristics of female puberty coincide with its appearance, a less distinct reduction of these is associated with its close; in many cases secondary resemblances to the masculine type may supervene.

The old theories of menstruation were that it served to rid the system of impure blood, that it simply corre- sponded to the period of "heat" observed in lower animals, or, later, that it was associated with ovulation, — which indeed seems broadly to correspond with the end of

1 These numbers refer to the bibliography at p. 422.

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the menstrual period. At present there may be said to be two rival theories. According to the first of these the pro- cess is viewed as a kind of surgical

“freshening” of the uterus for the reception of the ovum, whereby the latter during the healing process can be attached safely to the uterine wall. The other view is exactly the reverse of this. Its upholders regard the growth of the mucous coat before the commencement of the flow as a preparation for the reception of an ovum, if duly fertilized, and the menstrual process itself as the expression of the failure of these pre- parations, in short as a consequence of the non-occurrence of pregnancy.

Comparative Anatomy of the Reproductive Organs. —The multicellular animals afford a remarkable series of grada- tions from the simplest imaginable case in which certain cells, independently of accessory organs, and even isolated from each other, develop into ova and spermatozoa, In the vast majority of cases, however, definite groups of cells are set apart as the essential reproductive glands—the ovary and the testis. The contents of these may simply break loose, but definite excretory ducts are very frequently present, and upon these very varied complications may arise. To the male ducts a seminal reservoir may be added. More or less specialized glandular regions may contribute their secretion to the seminal fluid, and a more or less complicated copulatory apparatus may also be superadded.

The female accessory organs are equally simple in prin- ciple and complex in detail. Nutritive material may be furnished to the ova by special yolk glands, or by the walls of the oviduct; this too may supply special enve- lopes, and may exhibit dilatations for the preservation or development of the ova (uterus), for the reception of the male copulatory organ (vagina), or for the temporary storage of the seminal fluid thus introduced (receptaculum seminis). It is necessary therefore briefly to outline the most important facts of the comparative anatomy and physiology of these organs in the various groups.

Passing over the little-understood Orthonectida and Dicyemida (see PARASITISM, Vol. xviil. p. 259), the Sponges present the very simplest case above referred to. Here and there throughout the mesoderm a cell may be observed enlarging to form an ovum, or segmenting to form a mass of spermatozoa, but no definite reproductive glands, much less any duct or accessory organ, are present, and at most the ovum forms for

itself a kind of nest among the sur- ~ rounding cells, an approach towards the epithelial follicle of higher forms being thus presented.

Coelentera.—In Anthozoa the generative organs are developed as ridges on the gastric septa, their products passing out by the mouth; and in the Ctenophora each radial canal bears an ovarian ridge on one side and a testicular on the other. Keen controversy has raged over the state of matters in the Hydromeduse. Kleinenberg derived both ovum and sperms in Lfydra from the ecto- derm, while Van Beneden endeavoured to prove the invariable origin of the ovarian tract from the endoderm and that of the testicular from the ectoderm; but sub- sequent observers, so far from confirming the constancy of this arrangement, have affirmed in many forms the ecto- dermic and in others the endodermic origin in both cases.

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| Weismann and De Varenne have recently very completely

demonstrated the more remarkable fact that in a great number of forms the generative elements do not arise in the so-called generative buds or gonophores at all, but actually migrate thither from the parenchyma (ccenen- chyma) of the nutritive polyp or trophosome—the latter observer indeed going so far as to allege the primitive origin by ova and spermatozoa in all cases from the endo-

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derm of the nutritive polyp. These conclusions not only invalidate Van Beneden's attractive theory, but tend to overthrow the ordinary view of the alternation of genera- tions in the Hydromeduse.

Vermes.—The incipient ovary and testis are seen in their simplest expression in such a case as that of the hermaphrodite Bryozoa, or even better in the low Cheto- pod Worm Yomopteris (fig. 1), in which a patch of cells of the lining membrane of: the «© celom proliferate and enlarge into ova, or divide into sperma- tozoa, fall off, and become ex- truded. In higher Worms (e.g., Lumbricus) the glands become localized in definite segments, he Rice deaeas ee. and excretory ducts, apparently nating from

the lining epithelium specialized segmental organs, ap- of a parapodinm of Zomopterts. pear. Among the Platyhelminthes, on the other hand, the most extraordinary specializations occur. The generative apparatus reaches a complexity which in some respects even excels that of the higher Vertebrates, and which, since it occurs not only among the parasitic forms but also in their less modified free-living allies (if not ancestors), the Turbellarians, must be regarded, not as any mere adapta- tion to parasitic life, but as an important factor in explaining (by the peculiar advantage which such increased reproductive efficiency affords; see Parasitism) the wide prevalence of parasitism in the Platyhelminthes.

Lichinodermata.—Here the reproductive organs are of extreme simplicity —mere lobed glands usually provided with a duct or pore, or sometimes merely bursting into the body-cavity.

Arthropoda.—The essential organs never exceed one pair,—a simple median germ-gland being probably, as Gegenbaur suggests, the primitive condition. The acces- sory organs, however, reach great complexity, especially among the higher Znsecta.

Mollusca.—The lower Lamellibranchs have paired herm- aphrodite glands opening in relation to the excretory organs ; in the hermaphrodite Gasteropoda, however, high complexity of the accessory organs occurs (¢.g., Helix). In the dicecious Cephalopoda the oviduct is single, and there are remarkable accessory female glands, while in the male the formation of the spermatophores and the curious modi- fication of an arm for copulatory purposes are noteworthy.

Tunicata,—In this group (so frequently hermaphrodite) the reproductive apparatus is again greatly reduced, the paired or. single sexual glands being sometimes even duct- less, while accessory organs are absent.

Vertebrata.—Starting again, in the lowest Vertebrates, with organs of an exceedingly simple and primitive kind, we find the series presenting all gradations up to a very high complexity. Thus in Amphioxus the reproductive glands are little modified patches of the lining epithelium of the ccelom, and arise in a paired series,—an arrange- ment recalling that of the simpler segmented Worms. In other Vertebrates, however, the

essential organs are most distinctly localized in origin, never exceeding a single pair, and are also much more evolved in structure. In its earliest recognizable state the generative gland is a slight thickening of the peritoneal epithelium and the subjacent connective tissue on each side of the mesentery, lying near and parallel to the incipient renal apparatus.

Leaving the histological details of the process by which this " germinal epithelium," with the subjacent connective tissue of the "genital ridges," develops into ovary and testis with their characteristic products to the sections dealing with oogenesis and spermatogenesis respectively, and confining ourselves to the gross anatomy of these essential organs, we may note their very simple character

in the Marsipobranchii, where in the Lampreys they extend for a great length along the ccelom, and exhibit a number of tolerably regular lamellar folds, recalling the segmental arrangement of lower forms. In the remain- ing Vertebrates these organs are usually less elongated and relatively smaller and more compact, though it is interesting to note that some Amphibians (notably many Cexcilre) exhibit traces of a more or less discontinuous, perhaps serial, arrangement.

In Plagiostome Fishes the sexual glands arise along only a portion of the genital ridge, the remainder having its stroma mainly enlarged, and forming the so-called epigonal gland. In many of the higher Amphibians accessory organs of unknown function, the so-called fatty bodies or corpora adiposa, are attached to the ovaries and testes ; and in the Toad and other Anwra another organ in close relation to the testis, and in histological structure resembling a rudi- mentary ovary, has also been described.

A considerable tendency towards loss of symmetry appears in the essential organs, particularly the ovaries, of many Vertebrates. Thus in Myzxine neither ovary nor testis is present on the left side, and in many Sharks and Dogfish the left ovary is rudimentary. In Snakes the left ovary is smaller

than the right and usually lies behind it, while in Birds the left ovary is alone functional, that of the right side becoming so completely atrophied at an early stage of development that traces of it in the adult are only found surviving in a few forms, especially some of the diurnal birds of prey. Among Mammals symmetrical development is the rule, yet in the curiously Bird-like Ornithorhynchus the left ovary is much smaller than the right.

The relative size of the ovaries varies greatly throughout the Vertebrate series, in relation partly to the relative proportion of stroma to germinal tissue in the histological structure of the organ, to the fecundity of the species, and to the number of ova produced, partly also to the presence or absence of a food yolk, and the consequent size of the ova. In many forms a great increase of size takes place at breeding-time.

In the majority of Vertebrates, as in lower forms, the essential organs remain throughout life in the position in which they develop, or at most depend into the ccelom supported by a mesenteric fold. In most Mammals, how- ever, a certain change of position takes place, the ovaries usually shifting more or less backwards towards the pelvis. The testes too in the Monotremata leave their embryonic position at the inner edge of the primitive kidneys and travel backwards. In Edentates, Hyrax, Elephants, and Cetaceans they remain near or a little below the kidneys, but they usually reach the abdominal wall, which they may more or less completely pass through in the inguinal region (as in many of the lower Rodents and Carnivores), or even descend into a more or less distinct diverticulum or hernial protrusion of the integuments of the abdominal wall, the scrotum. This protrusion arises usually at the posterior margin of the primitive urinogenital opening, but, by exception, in Marsupials in front of it. The cavity of the scrotal pouch may remain throughont life in con- tinuity with that of the abdomen, so enabling the testes to pass backwards and forwards at each breeding season (Marsupials, Rodents, Jnsectivora, Bats, &c.), while in the higher forms, ¢g., Ungulates, Primates, &c., the scrotum retains the testes permanently shut off from the abdominal cavity.

The origin and homologies of the genital ducts in Vertebrates, and the accessory organs in relation to them, may now, after a very great amount of anatomical and embryological inquiry, be considered as tolerably settled, at least in their main outlines.

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In Jlyxine and the Lampreys no ducts are present, but the generative organs void their contents into the ccelom, whence they pass out by the abdominal pore; some Teleosteans too (Salmonidz) and at least one Elasmobranch (Lemargus) exhibit the same primeval simplicity of structure and function. Even here the exit of the sexual products is hardly independent of the aid of the excretory system, since there is reason to regard the abdominal pores as the least modified survivals of segmental organs; and in all higher forms the definite efferent ducts which are present in more or less close relation to the essential generative organs develop in the closest relation to, and in fact at the expense of, the renal excretory apparatus. For an account of the complex details of this process in the higher Vertebrates, however, the reader must consult the classical monographs of Balfour and Semper, or the larger manuals. (2)

Copulation.—We have noted above the importance of the copulatory process to secure fertilization of the ovum, and can thus readily understand its occurrence in the higher members of all the more complex animal groups. Though the result is in all cases the same, the process presents curious variations in principle as well as detail. Thus (¢. g.) the hermaphrodite Earthworms become firmly attached by their characteristic thickened band of fused rings (clitellum). Among the higher Crustaceans the sper- matozoa are conducted to the ova along the grooves of a modified pair of the appendages of the male, while in In- sects the modifications of the posterior abdominal segments and their limbs for copulatory purposes are often extra- ordinarily complex and varied. In Spiders, again, the spermatic fluid is passed into a receptacle in the chela, and thence pushed into the cloaca. In the higher J/ollusca, the complex copulatory apparatus of the Common Snail and the process of hectocotylization among the Cephalo- pods, so curiously analogous to the

process in Spiders, are too familiar to need more than mention (see Moxtusca, Cortie-Fiso). In many Fishes no copulatory process exists ; thus in any of our Salmon rivers the male fish can be seen voiding the milt upon the ova after their deposi- tion. In many Elasmobranchs a portion of the posterior pair of limbs,! presenting very peculiar cartilaginous and glandular structures, though known as '" claspers," seems to be introduced into the cloaca during fertilization. But it is among Amphibians that we find the earliest trace of a true penis; a portion of the cloaca is distinctly ever- sible in Ceecilians; in Snakes and Lizards paired eversible processes arise from the posterior cloacal wall, while in Chelonians, Crocodiles, and most Birds it is the anterior wall which bears these processes. In Monotremes, too, the organ is distinctly double; in higher Mammals it is single ; but the function is in all cases essentially the same. The nervous, muscular, and circulatory mechanisms of the pro- cess are described in works on human physiology. (8)

Gestation and Birth—While in the majority of lower forms the offspring leaves the parent as an unfertilized ovum, we have seen even among Sponges the impregna- tion and development of the embryo in its primitive position, and thus almost from the outset of an ascending zoological survey we can recognize the passage from Oviparous to viviparous forms. The Invertebrates, how- ever, are mainly oviparous, despite a few exceptions, of which perhaps the most surprising and aberrant are that of LEntoconcha mirabilis, which exhibits an ordinary Molluscan development within the body of its Holothurian host, and that in what resembles a special ovarian tube, but is really the body of its utterly degenerate parasitic parent. Among

1 In the curious Holocephalous Fish Callorhynchus, Jeffery Parker has recently adduced arguments for regarding the claspers as the surviving rudiments of a third pair of limbs.

Insects a certain degree of viviparous development may be reached; and this goes curiously far in the Dipterous Insect Cecidomyia, in which

larvee develop within the body of their parents (themselves at the larval stage), the cavity of which they destroy and burst in order to become free. Thus within the same species there comes about exactly the state of things in which the ova of a parasite develop at the expense of its host.

Among Fishes viviparous birth occurs more commonly : in some Teleosteans the young develop within the ovaries ; in many Sharks and Dogfish the development takes place within the oviduct, and in one case (J/ustelus lxvis) an actual placenta is formed by the interdigitation of folds of the yolk sac with those of the oviduct. Even the terres- trial Amphibians usually lay their eggs in water, yet in some‘ types, notably the Alpine Salamander (Salamandra atra), development takes place within the oviduct. That this is a clear case of adaptation to the eminently terrestrial environment has indeed been well shown by experiments in which the young larve taken from the parent and trans- ferred to pond water developed like ordinary Newts. To all such forms, viviparous in the sense of bringing forth their young alive, the somewhat confusing term “ ovovivi- parous” is often applied. Birds, and also Reptiles, with few exceptions, of which the Jchthyosauria seem to have presented a striking case, are oviparous ; so too, as has been recently established by Caldwell, is the in all respects so curiously Bird-like Mammal Echidna. Its congener Orni- thorhynchus probably agrees in this; but in Marsupials the embryo is not born until it has reached a comparatively advanced state of development, when it is transferred to the brood pouch or marsupium, where the process is com- pleted. In the remaining Mamma/ia intra-uterine develop- ment goes much farther, the nutrition of the embryo being, in absence of the abundant food yolk of lower forms, effected by the aid of a placenta analogous but not homolo- gous to that of JZustelus, since developed, not from the yolk- sac, but from the allantois (see ANaTomy and MamMMatta).

The physiological processes of birth show a similar rise in complexity,— due chiefly to the increasing strain upon the parental organization which this progress in the nutrition and protection of the embryo during its develop- ment involves; for, while an ovum can be extruded by simple ciliary action, or at most by the gentle contractions of the oviduct, the expulsion of the relatively enormous Mammalian foetus involves

mechanical difficulties of the most serious kind. And, besides these stresses and strains upon the pelvic basin itself or the muscular and connective tissues of the uterus, vagina, and its outlet, the inevitable rending asunder of the large closely interwoven and highly vascular placenta must evidently occasion an additional physiological disturbance. (4)

Parental Care.—Not-to mention cases of mere conceal- ment of the ova or construction of egg cases, the lowest forms exhibiting such parental care are probably certain Holothurians and Starfishes described by Sir Wyville Thomson during the voyage of the " Challenger," in which the developing young are borne upon the dorsal surface of the parent. Many Crustaceans carry about their ova during development, and an Amphipod has been described as fol- lowed by its newly-hatched young like a hen by its chickens. The female Spider too, though ferocious towards the male, frequently spins a nest and shows some maternal solicitude ; but such cases are far commoner among even the lower Vertebrates than the highest Invertebrates. Thus among Fishes the case of the nest-building Stickleback is especially familiar; some Siluroids and Lophobranchs (and usually the males) carry about their young,—the latter in ventral pouches, the former in the mouth.

But the quaintest examples of care of offspring are those

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presented by some of the Amphibians, notably by the Frog Alytes obstetricans, where the male winds the string of ova as laid round his body, sits in concealment until their

Fig. 2 (after Sir Wyville Thomson, and Murray, ' Challenger" Narrative),—Sea- urchin (Hemiaster cavernosus, Kerguelen Islands) and Sea eueumber (Clado- dactyla rosea, Falkland Islands), bearing their young.*

development is sufficiently advanced, and then takes to

the water, or in the grotesque Surinain Toad (Pipa suri-

namensis), where the male places the ova one by one in hollows in the loose skin of the back of the female, where they accomplish their development. Reptiles rarely show any care beyond at most burying their ova, but in Birds the evolution of parental care (no doubt associated with the need of high temperature for development) approaches its highest and most general evolution. The case of Mam- mala is also too familiar to need any description; but there is evidently good ground for the idea (of late ably popularized by Miss Buckley) that the marked success of

Birds and Mammals in the struggle for existence is to be

attributed perhaps not less to their peculiar care of offspring

than to any advance in organization. (5)

The Spermatozoon,

History.—In 1677 Leeuwenhoek's attention was drawn by Hamm, one of his pupils, to the active moving con- stituents of the seminal fluid, and he described these as ammalcula spermatica or spermatozoa (oréppa, seed ; Léov, animal), Although known to be of constant occurrence, they were long regarded as parasites, and classified as Helminthes or as Infusoria (see also article ' Zoophytes," Encyclopedia Britannica, 8th ed.), even Von Baer main- taining this view as late as 1835, Soon after this date R. Wagner demonstrated their constant presence in fertile males and their absence in infertile bastards. Von Siebold discovered them in many Vertebrates, while KoOlliker recognized them as definite histological elements arising within the testes. The old name, however, has persisted despite various proposals to replace it (¢9., spermatozords, Von Siebold ; jila spermatica, Kolliker). (6)

Anatomy and Physiology of Spermatozoa.—Without attempting completeness it is necessary to note a few of the best marked forms of spermatozoa. The familiar type, that of a small more or less ovoid "head," with delicate thread-like cilium or "tail," is of the commonest occurrence throughout the animal kingdom ; it is seen with specific modifications in 1-4 and 12~16 in fig. 3. Much less differentiated forms, however, occur, especially among the Branchiate Arthropods, of which some exhibit

almost amoeboid forms, as in the Daphnoid Moina, or in Crabs (7 in fig. 3); others are rigid, with radiating processes, as in the Lobster (8 in fig. 3). That of Ascaris is a small nucleated cell without tail or process, but bearing a cap of protoplasm ;

this, like the lateral process in the spermatozoon of the Cheetopod Cleta (4 in fig. 3), is not, as might at first appear, an additional or accessory portion, but a mere persistent

Fic. 3.—Forms of Spermatozoa. 1, Sponge; 2, Medusa; 38, Bothriocephalus; 4, Cleta (Cheetopod); 5, Ascaris; 6, Motna (Daphnid); 7, Crab; 8, Lobster; (9-11), Plagiostomum forms with elongated nucleus; 12, Salamander; 13, Ray; 14, Man; 15, Coditis; 16, Mole.

embryonic structure, as will be understood from the out-

line of the facts of development given below. In a large

number the nucleus is more or less drawn out to form either a continuous rod or a series of fine granules, the protoplasm in such cases forming a delicate film with lateral fringes, which may also be produced on one or both ends into a filament. This form is seen in many Planarians

(compare 9-11 in fig. 3). In the Newt the head is elon-

gated, and the tail bears a vibratile membrane. In Man

a middle piece separates the peculiarly shaped head from

the tail, and this seems to end in a still finer filament (14

in fig. 3). Miescher and others describe their minute struc-

ture with yet greater detail, distinguishing in the head a

wall enclosing peculiarly differentiated contents, in the

middle piece a similar structure, and even an axial fila- ment in the tail.

The movements of spermatozoa have attracted consider- able attention, their action being mechanically comparable to that of cilia, and being affected similarly by reagents. Their great activity and prolonged vitality are note- worthy ; thus not only do they remain in movement for many hours—indeed until the onset of putrefaction—after their ejaculation from the body, but in many of the higher animals they may remain active in the oviducal passages for weeks. In the Bat the spermatozoa lie in the uterus awaiting the ovum from autumn till spring; while a queen Bee may go on laying the fertilized eggs (from which workers arise) for swarm after swarm for three years after her first and only fertilization, without entirely exhausting the supply of active and mobile spermatozoa in the, receptaculum, and such cases forcibly suggest that the spermatozoon has not only a vast intrinsic store of energy, but must also absorb nutritive matter from the environing tissues or secretions, much in fact as would an Infusorian parasite. (6)

The chemical analysis of spermatozoa, though as yet but rude, yields results of interest. Thus, not only is the proportion of solid matter to water extremely high, but the small quantity of ordinary albumens and the high percentage of ethereal extractives are to be noted, the whole composition being more analogous to that of brain and nerve than of any other tissues. In round numbers, nearly 50 per cent. of the Salmon milt is nuclein, more than 25 per cent. is protamin, 10 per cent. is a mixture of ordinary albumens, and less than 5 per cent. is fat; while 74 per cent. of lecithin, 24 per cent. of cholesterin, with traces of other products of metabolism, make up the reat. (7)

Development of Spermatozoa (Spermatogenesis).—Probably no subjeet within the whole range of histology (at least if we exeept that of the strueture of striped muscular tissue) presents so many difficulties, or has been the sulject of more prolonged

research and eontroversy; and it is thus essential to elearness to recapitulate the history of the inquiry in some detail. The modern

period of investigation, despite a few observations by Wagner and others, practically opens with K@lliker's fundamental observation (1841) that the head of each spermatozoon arose from the meta- morphosis of a seminal cell.

In 1844 Haeckel described in Helix the cells destined to become spermatozoa as arising on the surface of an epithelial cell of the germ follicle. In amore elaborate paper (7. W. Z., 1856) Kolliker compared the process of spermatogenesis in the Bull, Dog, and Rabbit with considerable detail, distinguishing in all cases the lining of the tubule into two kinds of cells,—the outer having large nuclei and nucleoli, and undergoing rapid multiplication, while the thick inner layer of smaller cells was becoming differentiated into the true sperm-cells, which might be either unicellular or multicellular "cysts." He also described the origin of the head of the sperma- tozoon (and indeed also that of its tail) from the nucleus of this parent cell, and the breaking loose of the spermatozoon from its parent.

, Henle (1865) showed that the tail was developed from a portion of the protoplasm, thus preparing for the comparison with ciliated epithelial cells soon afterwards instituted by Schweigger-Seidel. Sertoli (1865) described certain "ramified cells" in the seminal tubules, and Merkel (1871) regarded these as forming a framework (Stiitzzellen) for other cells from which the spermatozoa developed. In the same year, however, appeared the important researches of Von Ebner, whose views will be understood by the aid of fig. 4. He described the large cells just mentioned as provided with a large and well-defined nucleus and nucleolus, and as being con- fluent at their base with each other, so forming a protoplasmic layer (Keimnetz), but stretching forwards into the lumen of the duct as irregular prolongations ; these become lobed or fingered, each lobe independently developing a nucleus, the large primitive nucleus remaining unchanged. To the whole prolongation with its lobes he applies the term spermatoblast. From.each lobe a spermatozoon develops, the nucleus lengthening to form the main portion of the head, while a thin

film of the protoplasm elongates into the cilium or tail. The young spermatozoa at first press

I. IIL. IV. ive Fic. 4.—Spermatogenesis (after Landois), I., cross seetion through a seminal tubule; IJ., unripe spermatoblast, with blunt rounded lappets, the young sperms; III., spermatoblast with ripe eiliated heads; IV., spermatoblast after separation of sperms.

downwards into the body of the spermatoblast, so as to form bundles, but, when ultimately liberated, curl themselves up to roll down the seminal tubule, the more or less branched stump of the spermatoblast alone remaining along with the smaller cells of the tubules, which, according to him, take no part in the process, but merely perform nutritive or mechanical functions. '

A vigorous controversy at once arose, but Merkel claimed these spermatoblasts as being simply his "Stiitzzellen," and described the spermatozoa as arising from the small round cells, and as being only secondarily received into cavities of the former, a view which Henle also adopted. Sertoli also regarded Ebner's spermato- blasts as his "ramified cells," and ascribed all spermatogenetic functions to the round cells, which he distinguished in their youngest state as "germinative," and later as "seminiferous" cells, which then divided to form "nematoblasts," these directly developing into spermatozoa. Blumberg (1873) attempted to reconcile the disputants by ascribing spermatogenetic functions both to the spermatoblasts and to the round cells. Neumann, while supporting Von Ebner in the main, describes his spermato- blasts as not processes of the nutritive network ("Keimnetz"), but as nodified from the ordinary epithelium of the seminal tubule, and disputed the existence of Merkel's framework altogether ; and this essential confirmation of Von Ebner's view was supported by Mihalkovicz, Landois, and others. In a later paper he attempted to show that the lobes of Von Ebner's spermatoblasts might become separated off as the small round cells, and might then either break up or develop into spermatozoa. Krause (1876), while otherwise supporting Von Ebner, graphically described the sperma- toblasts as ciliated cells with ramified and even anastomosing processes, so doing

away with any connective-tissue system altogether. Sertoli, however, continued to support his own view with greater elaborateness than ever.

Semper's well-known researches (1875) on the urinogenital system of Elasmobranchs included an important contribution on

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j spermatogenesis.

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He described an invagination of the germinal epithelium or of the primitive ova into the subjacent stroma, where they form a primitive follicle, which again comes into relation with the incipient tubule. The central cell of the follicle undergoes mucous degeneration and becomes absorbed, leaving a cavity lined by a single layer of epithelial cells, which divide rapidly, becoming cylindrical, with large round nuclei. These divide into a " cover- cell" and a "mother-cell"; the nucleus of the latter divides repeatedly until about sixty sperm nuclei are formed, which elongate to form the heads of the spermatozoa. As these develop they come to lie ina bunch, lying into the cavity of the follicle, their expulsion being effected by the swelling of the nucleus of the cover-cell.

An important series of researches by Von La Valette St George on spermatogenesis among Vertebrates was meanwhile in progress. In his final paper (1878) he describes the seminal tubules as con- taining two distinct types of cell. One kind, resembling young ovules, which he terms primitive seminal cells or spermatogonia, divide into a mass or spermatogemma of small cells (sperina- toeytes). These spermatocytes may either (a) all develop into spermatozoa (Mammals), or (b) a single spermatocyte may become modified as a basilar cell (Plagiostome Fishes), or (¢) a number may form an envelope or cyst around the others (Amphibians and Fishes). The second kind of primitive cells he terms "follicle- cells," and regards as non-essential ; these are united into a loose tissue and envelop the spermatogonia and spermatogemma.

In this view we have a inarked divergence from both preceding theories, as the author does not hesitate to point out. He regards Von Ebner's "Keimnetz" and "spermatoblasts" as confounding both his follicle cells with their included spermatogemme, and interprets Neumann's figures confirmatory of Von Ebner in the same way. Merkel's "Stiitzzellen" he identifies as his " follicle- cells" altered by reagents.

The subsequent researches of Helman (1880), Krause, and Nussbaum among Vertebrates need only be mentioned as essenti- ally confirmatory of the observations of La Valette. Meyer's careful observations (1880) also led him to the same general view, with the important difference, suggested by one of the preceding authors, that the " follicle cells" of La Valette were not inert as he supposed, but the earliest stages of his spermatogonia and spermatogemme. Klein's views (1881) have perhaps most relation to those of Sertoli.

Some important work was meanwhile being done among Inverte- brates. In 1877 F. E. Schultze described spermatogenesis in the Sponge Halisarea,—a germinal cell, analogous to that which gives rise to an ovum, becoming covered by an epithelium, and divid- ing into a multitude of segments, each of which becomes drawn out into a spermatozoon. In 1844 Meckel had described the sper- matozoa of the Snail as arising superticially from a mother-cell, and this view had been confirmed by various authors. In 1879 Duval described in the same animal the spermatocytes as arising by the endogenous division of a mother-cell, and subsequently coming to its surface, aud Hallez described an essentially similar process in some Planarians. Graff, however, found in other species that no remnant survived, but that the whoie of the spermatogonia became converted into spermatocytes. In 1880 Blomfield investi- gated the processin the Earthworm, his results resembling rather those of Von Ebner (fig. 4) than those of La Valette. Strongly em- phasizing, however, the importance of the nutritive basal cell or spermatoblast of Von Ebner, he proposed yet another nomenclature. In a subsequent paper (1882) he describes the process in the Snail and the Frog. The former agrees substantially with the Worm, but in the Frog a hollow spermatogemma arises; each of its cells elongates to form a spermatozoon ; these while still immature arrange them- selves in bundles round one of the more

superficial cells, which "become blastophoral corpuscles,"—a view which recalls Merkel's explanation of Ven Ebner's spermatoblasts, mentioned above, viz., that the spermatozoa only became temporarily lodged in their recesses after completing their development.

In this respect the view of Renson (1882) is especially interesting. He describes the follicular cells of La Valette as segmenting into

Fie. 5 (after Renson.)—1, follieular cells; 2, spermatogemma; 3-8, separate nematoblasts developing into spermatozoa; 9, nematoblasts grouped on sup- porting eell; 10-11, successive stages of the penetration of the young sper- matozoa, ,

"multinuclear cysts" (spermatogemme), of which the constituent

"nematoblasts " develop into young spermatozoa. These immature

nematoblasts group themselves round the extremity of certain long projecting epithelial cells, the supporting cells (or "cellules de soutien," obviously the spermatoblasts of Von Ebner), and actually sink into their protoplasm to complete their development. When fully developed, the heads of the young spermatozoa have attained the base of the supporting cell, but this now elongates and bears them anew to the lumen of the duct, where new nematoblasts are by this time waiting to take their place (fig. 5).

The researches of Hermann (1882) in Elasmobranchs are broadly confirmatory of those of Semper, while those of Jensen and of Swaen and Masquelin (1883) are especially corroborative of the views of La Valette. The latter are, however, of importance as tend- ing towards reconciliation. The primitive ampulle being formed, the "male ovules" and the follicular cells are henceforth distinct: the former segment into spermatogemme ; the latter (at first form- ing incomplete envelopes to the male ovule) mostly disappear, save one which travels downwards until it lies between the wall of the ampulla and the spermatogemma, thus constituting its "basilar cell." The spermatogemma meanwhile is developing a central

cavity (“loge caudale”), from which the tails of the incipient spermatozoa or “nematoblasts” project into the lumen of the duct. he basilar cell has also been enlarging, and fusing with the intercellular substance of the spermatogemma; the nematoblasts thus come to be plunged into the basilar cell, and sink downwards towards its nucleus ; but this again elongates to expel them. In the Salamander these follicular cells form a complete envelope to the male ovules during their whole segmenta- tion and subsequent evolution. In Mammals the male ovule divides into an active and a temporarily inert portion (follicular cell of La Valette, germinative cell of Sertoli and Renson) ; the former segments into the spermatogemma, of which the resultant nematoblasts plunge into the basilar cells, much as described by Renson. They compare the intercellular substance of the sper- matogemma to the blastophor described by Blomfield in Worms, and regard the follicular cells as a secondary addition peculiar to Vertebrates, and homologous with the follicular cells of their ova.

The first step towards any understanding of the process of spermatogenesis amid this maze of controversy is to collate the various observations ; hence the present attempt to summarize the main observations ou the subject, and afford a key to the nomencla- ture. But how shall we reconcile the different theories ? Each author formulates his own view of spermatogenesis, and sometimes even admits only asingle method (e.g., Von Ebner, Blomfield, &c.); yet, unless we attach considerably greater weight to the observations of at least a majority of all these workers than they sometimes incline to grant to those of each other, the literature and iconography of histology become of little worth. Since La Valette, however,

most observers have admitted the existence of several methods ;

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Fig. 6.—Hypothetical comparison of oogenesis and spermatogenesis. The forms of ovum segmentation on the upper line represent in very diagrammatic form —(A) complete equal segmentation, (B) total but unequal segmentation, (C) centrolecithal, (D) partial, with the blastoderm cells distinctly marked off from the yolk, (E) partial, with the blastoderm eells indistinetly marked off, (F) in- cipient epibolie gastrula form. The lower line of figures represent in similar diagrammatie form different modes of spermatogenesis—(A') spermatogemma or spermosphere, (B') spermatogonium of La Valette, with large nutritive sperm-yolk or blastophor, (C') spermatoblasts round central mass in Weliz, (D') spermatoblasts distinctly separated off from supporting eell, (E') spermato- blast of Von Ebner, (F') spermatogenesis as described by Semper in Elasmo- braneh; these may be termed respectively (A') regular sperm morula, (B') with large yolk cell, (C') centrolecithal form, (D') and (E') sperm-blastoderm, (F') sperm-obgastrula (invagination of preeeding inverted).

the homology—indced the primordial identity of the primitive germinal cells—of male ovule with female ovule has been often pointed out, and the general resemblance of the process of spermatogenesis to that of segmentation has been noted, and even accented by the use of terms like sperm-morula, sperm-blastula, &c. But it is not enough to make such a comparison in general terms ; it must be either susceptible of definite refutation or con- firmation by appeal to details; and the present writer has hence elsewhere attempted to compare the various modes of eee: genesis with the corresponding modes of segmentation of the ovum, and so reconcile the conflict of testimony and opinion upon the subject. (8)

Ontogeny of the Spermatozoon.—The origin of the spermatozoon from the spermatocyte is, as we have seen above, a phenomenon of considerable complexity. It has long been known to arise from the nucleus and the tail from the protoplasm, and Flemming in 1880 gave further precision to our knowledge by tracing the head of the

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spermatozoon of Salamandra from the chromatin of the nucleus. Various observers had also noted, besides the nucleus, the appear- ance of a small denser mass of protoplasm within the spermatocyte, the " accessory corpuscle" (Nebenkern, corpuscle précurseur), but its origin and fate have scarcely yet been settled with complete clear- ness. It appears, however, to arise from the nucleus, the remaining portion of the nucleus going to form the main portion of the head, while a film of superjacent protoplasm stretches over it, thickens somewhat to form the middle piece, and becomes drawn out into the filamentous tail, which frees itself from the remains of its sper- matocyte and swims away (8 to 8 in fig. 5). Von Brunn has recently described in Birds the origin of this accessory corpuscle with especial clearness by the division of the nucleus of the developing spermato- zoon. In Mammalia the "cap" of the young spermatozoon is de- scribed by Renson as nucleus, and by others as protoplasm, and it has been compared by many authors to the polar vesicle of the ovum. In Plagiostome Fishes Semper describes, and others con- firm, the existence of an additional nucleus, or " problematic body," which appears to correspond to the sum of the accessory corpuscles of all the spermatozoa, and this, after their escape, has been shown by Swaen and Masquelin to fuse with the nucleus of the basilar cell. The resemblance of this embryonic and transi- tory structure to the permanent post-nuclear segment of the curious almost amceboid spermatozoon of Ascaris is closely sugges- tive of their homology, and it is also interesting to note, in figures of the developing spermatozoa of Seclachians, their considerable resemblance to the fringed adult spermatozoa of many Platyhel- minthes, (8)

The Ovum.

History.—From the earliest times naturalists have of course been familiar with the form and function of the ova of a great'number of animals; the only seriously disput- able question (excepting that of spontaneous generation) has been that of the like origin of the embryo in Mammals. The history of the discovery is a curious one. Galen had described the human ovaries as testes muliebres, but the term ovary is due to Steno

(1664), who like our most modern investigators started in his comparisons from the corresponding organs in Sharks and Rays. In 1672 Regner de Graaf, in a remarkable work upon the structure of the ovary and its accessory organs, not only described in the ovary in Birds and Mammals the follicles which now bear his name, and which he regarded as the ova, but made the generalization of the universal occurrence of ova through- out the animal kingdom, and even observed the ovum in the oviduct of the Rabbit. His opinion, however, was overborne by the authority of his more famous countryman Leeuwenhoek, who regarded not the oviduct but the ovary, and more precisely the corpus lutewm, as the seat of de- velopment of the embryo. The observation of De Graaf was repeated at the end of last century by Cruikshank, and again by Prévost and Dumas. The definite establishment of our present knowledge of the Mammalian ovum dates only from 1827, when Von Baer clearly traced the ovum from the uterus back to its earliest appearance in the ovi- duct, and thence to its origin within the Graafian follicle. Piirkinje had meanwhile (1825) described the '" germinal vesicle" in the Chick, Coste showed its occurrence in the Mammalian ovum, and Wagner discovered (1836) the "germinal spot" in Mammalian and other ova. (9)

Mass and Chemical Composition of the Ovum.—The absence of any extensive measurements of the ovum in the various groups, either absolutely or in comparison with the bulk of the parent, renders it impossible to generalize with any great degree of definiteness. While from some comparisons it is at once apparent that the higher the organization the larger the ovum, many inde- pendently variable factors affect this, e.g., the size, organi- zation, or maturity of the parent, the duration of stay in the oviduct, and the climate and other surroundings. Examples of such variation are readily seen; it is natural that self-supporting larval forms should start with smaller food-yolk than those which develop before leaving the egg, and among placental Mammals that the continuous supply of nutriment from the parental resources should

supersede what would otherwise require to be a gigantic store of yolk.

Our as yet crude analyses of ova of course reveal the presence of numerous highly nutritive substances, both albuminous and fatty—none, however, characteristic of the ovum alone. The general analysis of the Fowl's yolk is quoted by Hensen as follows :—water 47:2 per cent., albumin stuffs 15-6, ethereal extracts 31:4, alcoholic extract 4°8, ash 1 =100,—these results of course covering an unknown degree of complexity. Thus numerous more or less distinct albuminoid substances have been described by different authors—vitellin, ichthin, ichthidin, emydin, &ec., while nuclein seems to be of special importance ; the ethereal extract yields very distinct fats, not only non- nitrogenous, but nitrogenous (e.g., lecithin); cholesterin and many other complex products of anabolic and kata- bolic change are also present ; and so on. The subject is at present peculiarly unfit for profitable summarization, and details must be sought from the bibliography. (10)

Oogenesis.—Since the different modes of origin of the ova in the various groups are at once less complicated and in general outline less debateable than the corresponding process of spermatogenesis, in regard to which the state of opinion is so unsettled, a much less detailed account must here suffice, especially since a review of the different processes in any detail would involve an unwieldy com- pression of the available summaries of Balfour and others. Ouly a few of the more interesting and suggestive examples can be here mentioned.

The origin of the ova within the mesoderm of the Sponge, which has been already referred to, is obviously one of the simplest cases, recalling the occurrence of reproductive cells in such a sub- Metazoan form as Volvow. In regard to the Celentera the con- troversy over Van Beneden's hypothesis of the endodermic origin of the ova has been already mentioned; and in connexion with this Weismann's theory may be noted, according to which in most Hydroids the reproductive cells are only differentiated late in life, so that the actual germinal substance or mother-protoplasm is not present from the first in cellular form but in molecule groups, scattered among the somatic cells and spread perhaps over various asexual generations, to be gathered up at some favourable epoch and in the most convenient situation in the definite form of ova.

In the group of Vermes the general history is that some favour- ably situated cells of the epithelial lining of' the coelom proliferate, enlarge, assume the characters of ova, and fall off into the body- cavity. A simple instance of this in Tomopteris has been already referred to (fig. 1).

Sagitta furnishes a very suggestive illustration of oogenesis—where one half of the primitive reproductive cell goes to form the ovary and the other half the testis. In Bonellia we find a beautiful exainple of the very frequent subordination of several reproductive cells to the perfecting of one. Iu each mass of possible ova (which arise from the division of primitive germinal cells situated round the ventral vessel just above the nerve cord) only one—adjoining the stalk and therefore near the source of nutrition—becomes a differentiated ovum, while the others atrophy. In Platyhclminthes the later stages of oogenesis are especially interesting, because the nutritive equipment of the ovarian ova is in many cases partially furnished by the direet absorption of some of the cells of the yolk- gland or vitellarium, which is itself probably a degenerate portion of the ovarian tract in which over-nutrition has checked repro- duction. Thus the ovum comes to be the result of a number of cells. Weismann's interesting observations on the winter-eges of some Crustaceans afford beautiful illustration of the subordination of a large number of germinal cells to the nutrition of a few, while in Mollusca this nutrition of the ovum is otherwise effected by the direet passage of food-material from the ordinary epithelial cells of the ovarian pouches.

The oogenesis of Insects, which has been the subject of so much discussion, is chiefly characterized by the very frequent presence in

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Fic, 7.—Formation of follicular nuclei (after Will). A, B, division of nucleus in morula fashion; C, nuclef have travelled to periphery; D, germinal vesicle formed from residue of division.

the ovarian tube of a large number of germinal cells which are wholly nutritive, and which serve to equip the minority of truly reproductive cells. Such cases inevitably raise the long-standing dispute as to the unicellular character of the ovum,—some authors

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(c.g., Brandt) describing the ovum as a cell of the second order, formed from a complex of the primitive nuclei or "ooblasts," which are combined in the terminal chamber of the ovarian tube, and which unite to form on the one hand the germinal vesicle of the ovum with enveloping protoplasm, and on the other the surrounding folli- culareells. One of the most recent discussions of Insect oogenesis is that of Will, who maintains the origin of the follicular nuclei from a multiple division of the original primitive nucleus or ooblast, the residue forming the germinal vesicle, a mode of origin previously maintained by other investigators both of oogenesis and spermato- genesis (fig. 7). In some Lchinodermata, and in other groups, it has been repeatedly observed that the undifferentiated germinal cells form the elements of the follicular epithelium round the ova.

A debateable but suggestive theory of oogenesis has been pro- pounded, especially by Nussbaum and Weismann, who maintain that in many cases the reproductive cells do not arise as differentia- tions of somatic cells, but are marked off from the first, in some cases even before the formation of the germ-layers. According to this ingenious hypothesis,—supported, however, by little direct observation—the reproductive elements would form a continuous immortal chain connecting the highest forms with their Protozoan aneestry, whose direet protoplasmic continuity has been of late also strongly insisted upon (see Protozoa), |

Dispute has also arisen as to the origin of the follicular cells of the Tunicata, some deriving them from external juxtaposition of germinal cells, and others from migration of nuclei from within outwards, as in some Insecta ; and a similar uncertainty prevails as to the nature and

origin of certain cell-like bodics (“ test-cells ”) which appear within the yolk.

In the Craniata the ova appear in the germinal epithelium of the ovarian ridge, which is always in contact with the stroma, They differ from the surrounding cells at first mainly in their greater size, being possessed of abundant protoplasm and a large granular nucleus. asin in number by division or by con- tinued differentiation of other epithelial cells, the primitive ova usually form into masses, as the result of which some atrophy and others predominate. The permanent ova once formed and defined are surrounded by a special follicle, probably resulting in most cases from superjacent epithelial cells.

None of the disputes above referred to can be said to invalidate the general view of the essentially unicellular nature of the ovum (see below); and a discussion of the numerous speculations on the more fundamental problem of the stages of sexual differentiation is deferred to the article Sex. (11)

Structure of the Ovum.—While the structure of a sufti- ciently young ovum is simply that of an ordinary embry- onic cell, its protoplasm being naked and often amoeboid, and provided with a nucleus and nucleolus, the developed ovum has usually a quite characteristic appearance. Not only have its parts usually undergone considerable enlarge- ment in size, but also in details of minute structure ; the nucleus and nucleolus are, however, still recognizable as the germinal vesicle and germinal spot, while the protoplasm has usually become modified by the presence of a more or less considerable quantity of food-yolk, and by the de- velopment of an external membrane.

The young amoeboid phase of so many (perhaps all) ova was first well described in the egg of Hydra (fig. 8, 6), in which the nucleus and nucleolus, the lobed pseudopodial processes of the protoplasm, and the abundant yolk spherules can be well made out. A somewhat later phase of development is well shown in the next figure of the egg of a Sea-Urchin, in which the process of encystment has begun, and the protoplasm is seen with its amceboid processes radiating through the incipient egg-membrane, while in fig. 8, d the protoplasm has no longer an amceboid

Fig. 8.—a, diagram of ovum showing granular protoplasm, nucleus (germinal vesicle), and nucleolus (germinal spot); 6, amceboid oyum of Hydra (from Balfour—after Kleinenberg) ; ¢, early ovum of Toxopneustes variegatus, with pseudopodia-like processes (from Balfour after Selenka) ; d, ovum of Toxo- bneustes lividus, more nearly ripe (from Balfour—after Hertwig.)

character—the investing membrane or zona radiata is regularly perforated by radiating canals, of which the

pseudopodial origin and the nutritive function are equally obvious. 'The resemblance of such stages to definite Protozoan types is not a little remarkable; thus, while, in fig. 8, b is perfectly amceboid, the resemblance of ¢ to a Heliozoon or of d to a Gregarine is almost equally striking.

The ovum is rarely destitute of egg-membranes, but these may be of very various kinds: thus we may have a vitelline membrane proper, formed by the protoplasm of the ovum, or a chorion formed by the cells of the follicle ; or secondary membranes may be present (alone or in addi- tion to the primary membrane) like the shell of a Bird's egg, which is formed by the walls of the oviduct, or the shell of many Trematode ova, which is secreted by a special gland.

Any or all of these membranes may be provided with a special aperture, the micropyle, first discovered by Keber, but this is by no means universally present, as he supposed. This may correspond to the point of attachment of the immature ovum, or may arise elsewhere ; in the first case its function is obviously nutritive, though later it may also serve for the entrance of the spermatozoon.

The identification of the ovum as a cell, and of its germinal vesicle and spot as nucleus and nucleolus, although a result only established after prolonged contro- versy, and of capital importance, is sufficiently familiar. The invaluable labours of the older generation of embryo- logists from Von Baer to Allen Thomson, and even the still classical

monographs of such recent workers as Waldeyer or Ludwig (1874), can only be alluded to; this department of the subject is, however, of peculiarly easy access, thanks to the exceptionally excellent state of its bibliography, and to the recent discussions of Balfour, Hensen, and others. Much, however, remains to be ascer- tained respecting the finer histology of the ovum, and many investigations are at present in active progress, along the lines of that more general inquiry into the minute structure of cells in general which has of recent years been again becoming of paramount interest in morpho- logical research.

The protoplasm of the ovum may, as has been said, acquire a very varying quantity of food yolk,—may become, that is to say, more or less closely packed with highly refracting spherules of modified protoplasm (see egg of Hydra, fig. 8, 6), which may again present various morphological differentiations, as in Ascaris (fig. 11). And, as explained below under segmentation, it is with regard to the presence, amount, and position of the food- yolk that the important varieties of that process are to be understood.

The great differentiation both of protoplasm and of yolk in the animal series, as might be expected, appears to exhibit all gradations from the most simple amceboid state of a more or less granulated or semi-fluid mass to the most problematical complexity. Of this the best known instance is probably that of the egg of Ascaris, described by Van Beneden (vide infra, pp. 416 sg.). Not only has a protoplasmic network been frequently described in both holoblastic and meroblastic ova, but a radiate struc- ture as well,—the former evidently corresponding to the stroma first described by Frommann and Heitzmann and subsequently by so many authors in both animal and vegetable cells, while the latter appearance recalls the striated appearance of the ectoplasm of certain ameeboid organisms described by Strasburger. The concentric differentiation of the ovum has also often been described, and is lately well discussed by Flemming, Brass, and others. Thus Pfliiger, in the half-ripe ovum of the Cat, describes the central mass as clear, the cortical layer as rich in granules; Van Beneden in the egg of the Bat

enumerates two similar layers surrounded by an almost granular cortical layer; while Flemming himself, in the ovum of the Rabbit, describes a coarsely granular region around the nucleus, a clearer central region finely granular and with a reticulated structure, and a coarsely granular cortical region. We have still, however, to learn how far such differentiations in structure—reticulate, radial, and concentric—are constant for individual or general cases, and how far they may be permanent or merely incidental to certain phases of development.

In these regards the recent publications of Carnoy and Brass are of special interest—the former on account of its minuteness of micrographic detail, the latter in its attempt at physiological interpretation. 'The results of the former will be best understood from his own figures (fig. 9).

Fic. 9 (after Carnoy).—A, two cells from the leaf pareneliyma of Allium Cepa, showing on the right the nucleus uninjured, with its nuclear network and two nucleoli, and on the left a nucleus in which the razor has unrolled or dragged away the eoiled filament of nuclein, but left a protoplasmie reticulum with nucleolus; B, intestinal epithelium eell of an Insect, showing in the proto- plasm a radiating reticulum with granular semifluid contents, and in the nucleus a similar structure, but with a convoluted nuclein filament which has shrunk together; C, cell of the larval genital gland of a parasitie Fly, show- ing various forms of protoplasmic network formed in different cells, and in the nucleus the same distinctness of its finely granular protoplasmie reticulum and its eontained striated nuelcin filament; D, yonng ovum of beetle, in whieh nuelvin filament has broken down into spherules.

Brass, starting from the familiar structure of an amoeba, with its clear and granular ectoplasm, from which the pseudopodia are emitted, its semi-fluid and highly granular endoplasm around the nucleus, and the less granular intermediate zone, assigns to these definite physiological functions,—to the first that of contractility (Bewegungs- plasma), to the second that of nutrition (Lrnahrungs- plasma), and to the third that mainly of respiration (Athmungsplasma, Nahrungsschicht). He holds that some such concentric disposition of the protoplasm is a normal and

constant fact of cell-structure, and insists upon it with special reference to the ovum. From his somewhat vague and diffuse development of these views, it must suffice here to note his opinion that the chromatin of the nucleus, as well as the protoplasmic reticulum, and in fact all the former constituents of the cell, are of quite secondary importance to the colourless protoplasm. 'The former is to him in fact no more than reserve material, while to the latter he assigns all active functions,—thus substantially reviving the view so long and energetically maintained by Beale. The recent observations of Wielowiejski may also be noted in this connexion, as he not only brings his con- tribution to the ontogeny of the ovum, but to some extent also distinguishes a regional adaptation of its protoplasmic structure to its functions.

From the rapid succession of new contributions to the solution of the problem of egg and cell structure might be gathered many other points of interest, morphological and physiological, empirical and speculative. Thus, for in- stance, Sabatier describes senile degeneration in Ascidian ova, an observation of wide suggestiveness ; while, again, on the important problem of the relation of nucleus to protoplasm there are many recent discussions, ¢g., from

Flemming and Strasburger, Pfliiger and Hertwig; the solution, however, is not complete. Again, can we recognize in the ovum any indication of the position of the future embryo—any fixed points, anterior and pos- terior, lateral or even polar—further, of course, than the obvious distinction due to the presence of yolk? After the old theory of "evolution" of the embryo, according to which the egg contained the complete organism in miniature, had been finally replaced by that of epigenesis, the wholly undifferentiated form of the ovum seems to have become tacitly assumed. Recent observers, ¢., Van Beneden (see below), have, however, been so far reviving the old view in that they endeavour to distin- guish, even in the unfertilized ovum, the position of the ends and sides of the embryo; others dispute this, and an interesting controversy is in progress. The specula- tion that a more or less considerable share in the differen- tiation of the ovum might be due to the separation of its

various constituents according to their different specific gravities—at first apparently emitted by Jiger,—has also reappeared in this regard. Pfliiger has observed the segmentation of Frogs' ova fixed in various positions, and describes the plane of first segmentation as constantly vertical, whatever might be its angle to the morphological axis of the ovum, uniting black and white poles. Devel- opment too was usually normal, save that when the upper hemisphere was entirely white abnormality and death followed, and even if inversion was less complete segmenta- tion often stopped. Further experiments led him to the conclusion that the nervous system, and correspondingly other organs, may develop from any portion of the egg- substance—that the egg in short is "isotropic." Certain limitations, however, appeared: the blastopore never arose on the upper hemisphere, nor (like the nervous system) ever on the black region, but both always at the intersec- tion of the white area with the third equatorial plane of segmentation. This he terms the point of crystallization of the specialized organism, and goes on to speculate as to the molecular structure of the ovum.

These results have, however, been the subject of keen criticism. Thus Roux showed that the specific gravity of the black pole is distinctly less than that of the white, and found that on eliminating the action of gravity by the use of a centrifugal machine the development remained normal, and on repeating Pfliiger's own fundamental observations described the axis of segmentation as coincid- ing with that of the ovum. After similarly eliminating light, heat, and earth-magnetism, he sums up in precisely opposite terms to Pfliiger, who had laid all stress on the influence of the forces of the environment, and regards development as purely a process of self-differentiation. O. Hertwig also maintains that the influence of gravity is only a secondary one, the plane of division being for him determined by the position of the axis of the dividing nucleus, and this again having a definite relation to the form and state of differentiation of the surrounding proto- plasm. He admits, however, the indirect importance of gravity on eggs having a yolk, and so leaves the question still to a considerable extent open. In another paper he adopts Pfliiger's conception of the isotropy of the ovum, holding that the yolk is not so organized that from any definite region of it a definite organ arises, but that the nucleus is the sole centre of activity and control. It is thus evident

that a reinvestigation is needed which would embrace the whole question of geotropism. See Paysio- LoGY (VEGETABLE). (12)

Maturation of the Ovum.—Polar Bodies.—The period of development and nutrition of the ovum may be regarded as complete when the full size and complex structure above described have been reached, and in this state it

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most frequently leaves the body of the parent. In the majority of cases at least, new changes have still to be gone through before fertilization takes place, still more development ; and a series of important structural modi- fications, doubtless the expression of extensive functional rearrangements, takes place. To this new and obscure phase of the life- history of the ovum the term maturation has conveniently been applied.

Although some of these phenomena have long been familiar to embryologists, the classical investigations are the comparatively recent ones of Biitschli, Oscar Hertwig, and especially Fol (1877); more lately those of Sabatier, of Flemming, and above all of Van Beneden. If we postpone details, the main facts of the process as until recently understood can be most readily grasped from Fol's figures of the ovum of the Starfish, of which the most important are copied in fig. 10. In the new-laid egg the germinal

Fia, 10.—A, ripe ovum of Asterias glactalis, with excentric germinal vesicle and spot; B-E, gradual metamorphosis of germinal vesicle and spot; F, de- tachment of first polar body and withdrawal of remaining part of nuclear spindle within the ovum; G, portion of living ovum with first polar body; H, formation of second polar body; I, after formation of do., showing the remaining internal half of the spindle in the form of two clear vesicles; K, ovum with two polar bodies and radial strie round female pronuctleus; L, expulsion of polar body. (A-K after Fol; L after Hertwig.)

vesicle is at first a clearly defined sphere, with well- marked membrane, reticulum, and germinal spot. It begins, however, to become irregular and changeful in form, its membrane and reticulum meanwhile disappear- ing, with the apparent dissolution of a portion of its con- tents in the yolk. The germinal spot also vanishes, and two ill-defined clear spots are alone distinguishable in the yolk. Treatment with reagents shows these clear spots to correspond to two star-like figures like those of a certain stage of the division of nucleus of an ordinary cell, while in a somewhat later stage a nuclear spindle is shown near the surface of the egg. The upper portion of this is segmented off (surrounded by very little of the protoplasm of the ovum) as a polar body, while the lower portion of the body remains as the "female pronucleus," and may be seen surrounded by radial striz. Two or even more polar bodies may be formed, but they never take any part in the subsequent life-history of the ovum, and sooner or later disappear.

In view of the profound theoretic importance of this subject, it is necessary to summarize some of the most important recent observations. Thus Balbiani and Weismann (1882) describe the occurrence of polar vesicles in the ova of Insects, in which they had long been supposed not to occur, and Flemming (1885) repre- sents a nuclear figure whieh he regards as corresponding to at any rate the first stage of the formation of a polar vesicle, in the ova of Mammals, at the period of bursting of the Graafian follicle. Such researches practically complete the chain of evidence for the generalization that the process of maturation of the ovum is essentially similar in all classes of Metazoa, and this not only in its initial stages of internal rearrangement or modification, but even in its later stage of polar vesiele formation. The absence of polar vesicles in parthenogenetic ova (predicted on theoretic grounds) om, however, possible in some cases, but is by no means certain in all.

Our knowledge of the process of maturation has been much extended and modified by the recent elaborate monograph of E. Van Beneden (1883). He finds the egg of Ascaris to show not only two definite poles-—a "pole of impregnation" and an opposite "neutral pole "»—but some indication of the anterior and posterior regions and consequently of the right and

left sides of the embryo. The substance of the ovum is also remarkably differentiated, —that

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of the "polar disk" alone exhibiting a vertical striation, and differentiating into two layers, superficial and subjacent (termed achromophilous and chromophilous respectively). The subjacent vitellus is distinguished into several layers, (central, intermediate, and cortical), and contains yolk elements of three distinct kinds, while the enveloping protoplasm has a distinctly reticulated and fibrillar structure, like the stroma of so many animal and vegetable cells, The germinal vesicle is practically homogeneous save that the portion surrounding its eccentric germinal spot is distinguished into an investing portion or spherical envelope, the " prothyalo- soma," and an "accessory portion," which usually contains one or two "pseudo-nucleoli." In the ripe egg Van Bencden describes new complexities within the germinal spot; this consists of two juxtaposed quadrilateral disks, each containing four chromatin globules, united by a substance having less affinity for colouring matter. Radiating from these two -disks, achromatin threads arise in the prothyalosoma, but stress is laid on the fact that no grouping of the chromatin elements into a star-like figure takes place. The spherical shape of the germinal spot is now modified by the intrusion on each side of a large homogeneous droplet from the vitellus into the prothyalosoma, so that in optical section it comes to have a T-shape, the accessory portion being mainly compressed to form the stalk of the T. At this stage the spermatozoon usually commences to work its way into the ovum, but does not yet affect the germinal vesicle or germinal spot, which proceed to the formation of polar globules. The T-shaped gradually passes into the " ypsiliform " figure, so called from its resemblance to the Greek Y. Its steadily diverging branches, which are formed from the prothyalosoma, move upwards till they reach the surface of the vitellus, their fibrillar structure already noted meanwhile becoming well marked. Each bundle bears one of the two groups of four chromatin globules which compose the germinal spot.

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- ee pseudo-karyokinctic figure; li, I, J, K, expulsion of first polar globole.

Next the vertical branch of the ypsiliform figure swings upwards to the surface, and a new branch is formed as a continuation of the same line; the whole figure is thus cross-shaped, with the prothyalosoma in the centre, but this cross soon disappears, leaving the prothyalosoma with its two chromatin groups. These are now divided, by a plane tangential to the surface of the vitellus, into two equal parts, and the upper of these, containing of course half the prothyalosoma with half of each of the two chromatin disks, becomes the first polar globule. Van Beneden lays great stress on the fact that this plane of division is not transverse to the oblique spindle formed by the diverging branches of the Y, as was to be expected from the views of all previous observers, but on the contrary is parallel to it.

The remaining portion of the prothyalosoma with its two chromatin disks, together with the surrounding protoplasm, now proceeds to the separation of the second polar vesicle. Despite differences in detail, the essential facts are the same: a spindle with a star-like figure at each end is formed; this at first lies radially in the vitellus, but afterwards becomes superficial, and its division takes place as before by an axial not an equatorial plane.

A still later and also elaborate discussion is due to Sabatier (1884), While combating the peculiar views suggested by

Weismann and others as to the polar globules of Insects (as that they re- enter the ovum to form the rudiments of the future repro- ductive organs), he admits that they may be emitted at both poles of the ovum, and may either break up, be reabsorbed, or even in some cases form peculiar structures surrounding the ovum (e.g., the follicular cells of Ascidians). He describes in Buccinum, &c., the extrusion of somewhat amceboid masses of om

clear protoplasm at several distinct points and frequently without the appearance of any nuclear spindle; and these may even re- peatedly divide. He holds that the centri- fugal extrusion of elements from ova is much more general than is usually recognized, and Fic. 12 (after Sabatier).— distinguishes these into three kinds :—(1) Ov¥™ of Buccinumunda- 'globules précoces," which usually go to form the elements of the follicle ; (2) " glob- ules tardifs," which appear later; and (3) true polar vesicles, which alone are associated with karyokinetic changes of the nucleus.

Like Van Beneden, he notes that polar vesicle formation is not strictly comparable to ordinary cell-division in being not trans- verse but longitudinal to the nuclear spindle.

From this point little advance has been made, though careful reviews of the subject are due to Flemming, J. T. Cunningham, and others. (13)

Fertilization or Impregnation.of the Ovum.—The funda- mental generalization now so familiar—that the process of fertilization for plant and animal alike lies in the material union of both sexual products—although said to have been propounded by Alemzon (580 B.c.), and even described by Hartsoeker (1750), is pointed out by Hensen to be essentially due in the first place to the experimental re- searches on plant hybridization of Kélreuter (1761). Jacobi soon afterwards artificially fertilized the eggs of Trout and Salmon, but the most important and really convincing work was that of Spallanzani (1780), who experimented on the Frog, Tortoise, and Bitch. He unfortunately, however, concluded that spermatozoa might be absent without pre- venting fertilization, and ascribed all fertilizing powers to their fluid medium, so establishing an error which required for its elimination many successive researches.

Prévost and Dumas (1824) showed that filtration really deprived the seminal fluid of its powers. Martin Barry (1843) actually observed spermatozoa within the zona pellucida of the Rabbit's ovum ; Leuckart (1849) repeated both pre- ceding observations in the Frog; Nelson (1852) observed the entrance of the spermatozoa into the ovum of Ascaris; while Keber (1853) discovered the micropyle in the ovum of the Mussel, and watched the passage of the spermatozoon through it into the yolk. It only remained for these results to be confirmed by the high authority of Bischoff and Allen Thomson (1854); and the knowledge of the subject thus reached its second stage, where it practically remained for nearly twenty years.

Aided by the advance of histological technique, a new plane was reached (1875-76) by the brilliant researches of Van Beneden on the ovum of the Rabbit, and of O. Hertwig and Fol on Echinoderm ova. The spermato-zoon! was thus shown not to disappear into the yolk, but to form from its head or nucleus the "male pronucleus," which meets and fuses with the "female pronucleus," as the germinal vesicle is termed, after the extrusion of the polar body. This new " conjugation-nucleus" soon ex-hibits karyokinetic changes and divides, and the segmenta- tion of the ovum rapidly progresses. |

As a full account of these and other papers up to 1880 is given by Balfour (Zmbryology, vol. i.), it will suffice to note the more important subsequent researches, especially as those, though with

tum, showing extrusion of polar globules and the associated elevation of clear protoplasm.

1 That, though more than one spermatozoon may pass through the vitelline membrane, only one normally enters the vitellus and becomes a male pronucleus has been well made out by Hertwig, Fol, and others. In the rare cases where more spermatozoa than one force an entrance, Fol has observed the monstrous double segmentation of the ovum, and argues forcibly for the hypothesis that we have to look in this process of "polyspermy " for the explanation of numer- ous teratological and pathological changes.

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Fig. 13 (after Fol).—A, spermatozoa in mucilaginous coat of ovum of Asterias glacialis, a prominence rising from surface of ovum towards a spermatozoon; in B they have all but met, and in C they have met; D, spermatozoon enters ovum through distinct opening; H, ovum showing polar vesicles, and approach of male and female pronuclei; E, F, G, later stages in coalescence of the two nuclei,

Oscar Hertwig had clearly enunciated in 1875 that “ fertilization depends upon the conjugation of two sexually differentiated nuclei.” This view has, however, lately (1888) been controverted by A. Schneider, who regards the radii whieh are seen in the ovum about the pronuclei as arising from the substance of the germinal vesicle alone, and who maintains the origin of the male pronucleus independently of the spermatozoon, which he believes to disappear. As Van Beneden, Nussbauin, and Flemming have since, however, successively controverted these views, Hertwig’s aceount of the process may safely be retained, at any rate with the slight modi- fication insisted on by Flemming, who prefers to describe the con- jugation-nueleus as arising from the union of “the chromatin of a male with that of a female nuclear body.”

In Van Beneden’s work on the fecundation of Ascaris the penetration of a single spermatozoon into the vitellus and its transmutation into the male pronucleus are copiously figured and deseribed. Most important, however, is perhaps his account of the formation and segmentation of the conjugation-nucleus. The female pronucleus undergoes changes resembling those preceding ordinary nuclear division; so also does the

male; and the ehromatin of each breaks up from the state of a single eontinuous and convoluted fibril into two V-shaped loops. The two pro-nuclear membranes now fuse ; and the resultant conjugation-nucleus thus contains four loops of chromatin, of which two are male and two female. Each loop now undergoes longitudinal division ; a nuclear spindle is meanwhile forming from the achromatin substance of the segmentation-nucleus, and this now proceeds to divide, but in such wise that each of the two daughter nuclei receives two of its four half loops of chromatin from the female and two from the male pronucleus. A circular furrow appears, dividing the ovum equatorially ; a cell plate like that of a vegetable cell arises in the same plane; and the two first blastomeres are soon completely formed, and proceed to redivide in the same way.

The results of Nussbaum are essentially similar so far as they go; Strasburger's recent work summarized below contains a thorough confirmation of these accounts of the process of fecunda- tion so far as plants are concerned ; while most recently (1885) 0? Hertwig has re-stated his original theorem with a discussion of its physiological aspects and consequences. (14)

Segmentation of the Ovum.—The process of segmenta- tion has already been repeatedly mentioned. As with the other histological problems presented by the ovum, our knowledge of its minute details is in a somewhat unsettled yet rapidly advancing state, due to the pro- gress of the wider inquiry into cell structure and cell division in general. The essential correspondence of the changes to be observed in the conjugation-nucleus and yolk with those of ordinary cell-division (see PRoTozoa, vol. xix. p. 833, fig. 1) has been worked out by many

Fic. 14—Regular segmentation of ovum (after Gegenbaur).

observers, and Van Beneden's more minute account of the process is sunimarized above. Our knowledge of its external features is of much older date, and has been com- paratively recently brought together by Balfour (Zmbryo- 'logy, i., chap. iii.); the present limits permit only the briefest summary.

In the simplest case—that of small ova destitute of food-yolk,—the ovum divides by a vertical plane into two segments or blastomeres, each of these again into two, and

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so on, and a mass of 4, 8, 16, 32, 64, &e., cells is thus formed, but in the resultant mulberry-mass or morula the cells are all equal and similar. Such segmentation is termed regular; commonly, however, the regularity and equality of ordinary cell-division is more or less interfered with by the presence of food-yolk. In this regard Balfour enunciates the valuable general law "that the velocity of segmentation in any part of the ovum is, roughly speak- ing, proportional to the concentration of the protoplasm there, and that the size of the segments is inversely pro- portional to the concentration of the protoplasm." Bear- ing this in mind, the varieties of segmentation are intelli- gible enough ; thus the unequal segnientation of the Frog's ovum (fig. 15) needs no further explanation. These two

Fria. 15.—Unequal segmentation of Freg's egg, (From Balfour—after Ecker.)

preceding types, in which segmentation is complete, were distinguished by Remak as "holoblastic," and were long looked upon as wholly distinct from '" meroblastic" ova like that of Fowls or most Fishes, in which segmentation is partial, .e., confined to a small area of the surface of the yolk. ° Balfour's law, how- ever, explains these cases as only an ex- aggeration of the pre- ceding case, due to the greater accumula- tion of food-yolk, and the consequent check to segmenta- tion at the lower or vegetative pole. Another form of partial segmentatien is presented by many Arthropods, in which the yolk occupies a central position within the ovum, and three varieties of this "centrolecithal" process are dis- tinguished—equal, unequal, and superficial.

While the ontogenetic process of segmentation in general and of regular segmentation in particular is usu- ally regarded as being a recapitulation of the phylogenetic development of the primitive Metazoon from its

Protozoan ancestor, the vast nutritive importance of the food-yolk, and the consequent high variability of its quantity in relation to the habits and circumstances both of parent and offspring, render its wide variations in detail a totally unsafe guide to affinities. A single genus may, in fact, exhibit extreme forms. (11)

Fig. 16 (after Balfour).—A, section of developing ovum of an Elasmobranch, showing meroblastic segmentation; B, optical section of centrolect- thal Crustacean ovum.

§ 3. SYSTEMATIC AND GENERAL EMBRYOLOGY.

While it is impossible to compress within the limits of the present article the subject-matter of a full treatise on embryology, an attempt must be made to touch in turn upon (1) the empirical facts, (2) the concrete inductions, and (3) the abstract generalizations of development.

1. A sketch of the history of this branch of the science is given under Empryoxoey (g.v.), while for detailed infor- mation as to the division and differentiation of the ovum in each group, and as to the more or less marked changes by which the resulting embryonic forms assume the adult organization, the reader must be referred to the separate articles (SponcEs, Hyprozoa, Motiusca, é&ec.), as well as to the classical work of Balfour. The more important empirical facts need thus only the briefest outline.

Protozoa, —Since the young Protozoon, whatever its mode of origin from the parent form may be, rarely differs from the latter

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except in size and phase of cell-life, there is little to be noted here in regard to the development of the group, except in such cases as Katallacta and Volvocineex, where a primitive attempt towards a more or less temporary multicellular form affords us a first hint of the Metazoan segmentation of the ovum.

Dicyemida.—In this degenerate and still somewhat problematical intermediate group the asexually produced ovum segments to form an embryo of great simplicity, where a few outer (ectodermal) cells cluster round a single inner (endodermal) one, and where we thus find the first differentiation of the embryo into the cell-layers constantly exhibited in the succeeding groups, though it is unsettled whether this represent the incipient or the degenerate Metazoan type.

CD oetea. —In a calcareous Sponge, such as Sycandra, the fertilized

ameeboid ovum segments within the parent to form a hollow blastosphere, most of the cells of which are clear and ciliated, and partially cover a number of larger granular cells,—the future endoderm and ectoderm respectively. In the free-swimming embryo the latter nutritive cells increase rapidly in size, and, growing ultimately over the locomotor and respiratory ciliated cells, cause them to become invaginated to form the endoderm. This invagination resulting in the obliteration of the ‘‘segmen- tation cavity” and the formation of the-“gastrula” stage is perfected as the young Sponge settles down and becomes fixed by processes from the amceboid ectoderm cells. The cilia of the endoderm disappear; the blastopore is obliterated ; between ectoderm and endoderm there appears a third germinal layer or mesoderm, and in it the calcareous spicules of the Sponge are developed. A perforation at the top of the inverted gastrula forms the exhalent aperture ; peripheral inhalent pores also arise ; and this renewed exposure of the endoderm cells to direct contact with the water is followed by their return to the ciliated form. See SPoNnGcEs. :

Celentera.—The generally equal segmentation of the ovum re- sults as usual in a solid or hollow morula. The formation of the two layers, as in some other groups, may occur either by invagina- tion, as above described, or by a process of separation of inner from outer, termed delamination. In most Celeniera the tissues which in higher groups are strictly mesodermal originate from the direct differentiation of the two primary layers. The larval form most constant in the Celentera is the planula (see Hyprozoa, vol. xii. p- 557). It is ciliated, two-layered, almost cylindrical, with a rudi- mentary digestive cavity, generally closed. For

discussion of the alternation of generations so characteristic of many Ccelenterates see Hyprozoa and Sex.

Vermes.—The development of the unjointed Worms is too varied to admit of general summary. In some we find illustration of that mode of gastrula formation (epibolic), so common in higher groups, where, owing to the large size of the food-packed endoderm cells, an actual invagination is impossible, but the ectoderm cells grow round the others and thus come to enclose them as in the more primitive process. In such a typical higher Worm as Lumbricus, the segmentation, which varies in regularity according to the species, results in the formation of a blastosphere with readily distinguishable ectoderm and endoderm ; the invagination of the latter results in a somewhat cylindrical gastrula. The blasto- pore narrows anteriorly to form the permanent mouth, while in some other Chetopods a similar narrowing in the opposite direction forms not the mouth but the anus. The mesoderm appears very early in the form of posteriorly situated cells on each side of the middle line, and soon two mesoblastic bands are formed extend- ing to the mouth. These are subsequently divided into blocks or somites, the anterior and posterior walls of two adjacent blocks uniting to form the cross partitions of the adult Worm, while the outer and inner walls form respectively the somatic and splanchnic layers. The ventral nerve cord results from the sinking in and union of two epiblastic thickenings, developed one on each side of a ventral furrow, while the supra-cesophageal ganglion has a distinct origin from a dorsal thickening. The somewhat isolated Sagitta affords good illustration of the formation of the body- cavity from two lateral lobes of the archenteron. The simple enteric cavity normally formed exhibits anteriorly a division into a middle lobe and two side pouches uniting behind in the single cavity. The middle lobe is separated off from lateral and posterior cavities as a blind tube which afterwards forms the alimentary canal; the side pouches form the body-cavity (sce TAPEWORMS, PLANARIANS, NEMERTINES, ANNELIDA, &c.).

Echinodermata.—The generally uniform segmentation results in a blastosphere, usually elongated in the direction of the axis of invagination.

of the archenteron, and the water-vascnlar vesicle which comes to lie round the oesophagus has a similar origin. For an outline of the nature of the larval forms and the passage of the embryonic organs into those of the adult the reader is referred to EoHINo- DERMATA.

Arthropoda.—The interesting Peripatus (see MyRiapopDa, vol. xvii. p. 116) exhibits in its development phenomena, sueh as that of the elongated blastopore gradually closing from the middle, so as to leave month and anus, and that of the surrounding nerve cord, which suggest affinities through the whole animal kingdom from Celentera on the one hand to Vertebrata on the 'other; but of these discussion is still far from ended. The development of the Insect ovum illustrates what is termed centrolecithal segmentation, where a single uniform layer of superficial cells encloses a nucleated but undivided central yolk mass. The blastoderm becomes thickened ventrally; and along the middle line of the ventral plate there appears a groove which is the seat of the mesoderm formation. The development of the Vertebrate amnion is recalled by the formation of two enveloping membranes from folds of the blastoderm, whieh arch over and coalesce over the ventral plate, and at the same time spread upwards to cover the dorsal integument from which they are eventually separated. Both disappear through absorption or rupture either before or during hatching. The inesoderm is divided into two lateral bands, and these into hollow somites, which together form the perivisceral cavity. As usual the outer layer of mesoderm follows the ecto- derm, the inner the endoderm, which probably arises from a secondary segmentation of the yolk. The ventral plate extends to a slight extent dorsally both before and behind, and on it the appendages appear as hollow outgrowths of ectoderm and endo- derm. The ventral nerve cord arises from two sunken thickenings of ectoderm, the trachee as invaginations of the same. The middle section of the alimentary tract is formed from endoderm, the anterior and posterior portions from ectodermic invaginations. For an account of larval metamorphosis, &c., see INsxcTs.

Crustacea.—In these the segmentation is usually centrolecithal, and results in a uniform blastoderm enelosing a eentral yolk mass without traces of division. The gastrula stage is represented by an invagination of a patch of the blastoderm, which forms the endoderm, and from which the mesodermic cells seem also to arise. A ventral thickening of ectoderm continnous with the invaginated portion forms the ventral plate on which the embryo is mapped out. Along it the nerve cord appears as a median thickening, and the sense organs have as usual a similar ectodermic origin. The mesoderm appears to form the nsual tissues (muscles, heart, &c.), but has apparently less definiteness of arrangement into layers and somites than is usually the case. The original invagination forms the mesenteron, and the lining endoderm cells absorb the yolk The antcrior and posterior portions of the alimentary tract are formed as usual by subsequent independent invaginations. Much less proportionally is known of the organogeny than of the very interesting and suggestive larval forms, for which see CrusTACEA.

Mollusca.—The typical Molluscan segmentation is markedly unequal, the disproportion between ectoderm and endoderm cells varying according to the proportion of food-yolk. The gastrula stage is more frequently reached by the growth of the ectoderm cells over the larger and fewer endoderm cells than by any actual invagination. The blastopore may close apparently towards either the oral or the anal extremity, forming mouth or anus or neither. In Cephalopoda the segmentation is confined toa germinal disk of formative material as in partially segmenting Vertebrate ova, though there are besides cells from the yolk which underlie the germinal region of the blastoderm and also accompany it in its growth round the yolk, forming the inner blastodermic layer or yolk membrane. 'The mesoderm appears at the lips of the blasto- pore, or in an equivalent position ; it forms a complete layer between ectoderm and endoderm, and within it the body cavity is formed usually by a definite splitting into two layers. The invaginated endoderm forms the mesenteron ; and the history of the formation of the anterior and posterior portions of the tract varies with the fate of the blastopore. In the Cephalopoda at least, the nervous system appears not as usual from the ectoderm but from the meso- derm. 'The characteristic larval organs, the shell gland and the foot, are ectodermic in origin—the former arising as a thickened invagination on

the posterior and dorsal side of the embryo, and the latter as a ventral protuberance. Further details and larval changes are thoroughly treated under Motiusca.

Lunicata.—The complete and generally quite equal segmenta- tion results in the formation of a blastosphere with a large seementa- tion cavity. 'The cavity is obliterated by a normal invagination, and a typical gastrula isformed. In the formation of the nerve cord from the elosure of a medullary groove and of the notochord from a cord of cells on the dorsal wall of the arehenteron, in. the appear- ance of respiratory slits in the anterior portion of the enteric cavity and of a cerebral eye, and in fact in all the cssential features of their development they present the amplest evidence of their Vertebrate affinities and degenerate origin (scc TUNICATA).

Vertebrata. —The segmentation is total and equal in Amphioxus, total and not markedly unequal in Mammalia, total and uncqual in Amphibia, Acipenser, Petronyyzon, partial in Birds and Reptiles, Teleostcans and Elasmobranchs, but the limits between these types are not sharply defined, being mainly determined by the store of food-yolk. In Amphioxus there is no interference with the forma- tion of the typical gastrula, and this form is also readily recogniz- able in the Amphibia, Acipenser, and Petromyzon, where, however, the process of formation is less simple. Ata point corresponding to the future lind end of the embryo a true invagination takes place, forming, however, only the dorsal wall of the archenteron, at the same time the ectoderm cells have been growing round the yolk, and the floor of the enteric cavity is formed from yolk-cells. The blastopore is eventually closed, but a communication between the archenteron and the neural canal persists for some time as the neurenteric canal. In the Elasmobranchs and Teleosteans, though there is no true invagination nor recognizable gastrula form, there are not wanting hints of its ancestral occurrenee and of homologies with the typical form. The comparison of the different Ichthyop- sidan gastrule with the typical form and with that of the Sawrop- sida, and such problems as the occurrence of an epibolic gastrula in Mammalia are still

under discussion. The most important stages in the further Vertebrate development, the formation of the medullary groove and canal, the appearanee of the notochord as an axial differentiation of hypoblast, the origin of the body- cavity from paired outgrowths from the archenteron, the occur- rence of gill-pouches opening externally from the throat, the ex- pansion of the medullary cord anteriorly to form the vesicles of the brain, the outpushing of a cerebral eye, and so on, are described in all text-books. (11)

2. But it is not enough empirically to record the ob- served phenomena of reproduction in the various groups, primarily essential though such labours are; it is further necessary to generalize them. We should ascertain, that is to say, from a comprehensive and a comparative sur- vey, what degree of unity of structure is discovered actually to prevail within and among the various groups. Were this knowledge once definitely reached and incor- porated with the results of comparative anatomy and paleontology, that complete conspectus of the animal kingdom which is the goal to which all morphological inquiries converge would come clearly into view. Such an exposition of the contributions of the study of de velopment to morphological knowledge may evidently pro- ceed in either of two ways,—either by starting from the later and more superficial similarities which are expressed in the classification of the different groups, and working downwards towards earlier and deeper unities in the various organs and tissues; or by starting from the most primitive homology, and working upwards, so demonstrat- ing the unities which are observed to obtain in the suc- cessive stages, from segmentation and layer differentiation onwards. For our present purpose, it is more convenient to follow the latter course, and to note the main concrete generalizations of development in ascending order from the deepest and most general to the more superficial and specific.

1. Ovum Theory.—The most fundamental unity upon which all the others really depend is the familiar fact that all organisms, plant and animal alike, develop from a single germinal cell or ovian essentially comparable with any ordinary cell. The import- ance of these results may be best expressed by a quotation from Agassiz's once famous Essay on Classification :—Von Baer " thus showed for the first time that there is

no essential difference in the mode of reproduction of the so-called viviparous and oviparous animals, and that Man himself developed in the same manner as animals. It was indeed a gigantic step to demonstrate such an identity in the material basis of the development of all animals, when their anatomical structure was already known to exhibit such radically different forms, The universal presence of eggs in all animals, and the unity of their structure, which was soon after- wards fully ascertained, constitute in my opinion the greatest discovery in the natural science of modern times." The ovum has long ceased to be regarded as a mysterious 1nicroorganism, and, while in some cases a number of cells unite to nourish and perfect it, the generalization remains unshaken, that the ovum of every organism is a simple. cell. The minute structure of the ovum, its differentiations and variations, its fertilization and development, must be expressible in terms of the morphology

and physiology of the ordinary cell. The elucidation will be obviously mutual, for the analysis of the phenomena observed in the case of the highly differentiated reproductive cells, with their consequent greater physiological simplicity, will shed light on analogous phenomena in ordinary cellular and Protistan life where, with less differentiation, there is greater physiological complexity, — while such problems as the origin and import of polar globule extrusion, fertilization, &c., receive some elucidation from sugges- tive analogies among the Protozoa. See Sex. (11)

2. Segmentation.—The segmentation of the ovum of the Metazoa varies in regularity and completeness throughout the gronps, but the different types are not sharply defined from one another and are, aS has been already noted, partially at least explicable as mechanically conditioned by the quantity of nutritive as opposed to formative material. Segmentation being only a special case of ordinary cell-multiplication (to which in behaviour of nuclei, &c., it fully corresponds), it awaits whatever elucidation may arise out of the present conflict of speculation as to the physical and physio- logical causes of division in general. It has further to be compared on the one hand with such cases of multiple division as are

observed in spermatogenesis, and on the other hand, and more especially, with the earliest attempts to form cell aggregates and so effect the passage from Protozoa to Metazoa. (11)

3. Gastrea Theory.—We lave seen in the development of © the various groups how the result of segmentation is not a mere aggregate of cells but an integrated two-layered individual with a distinct enteric cavity. In 1872 Hacckel emphasized the import- ance of this form,"and in 1875 heelaborated his "gastrea" theory, according to which all animals pass through a gastrula stage which, in its typical form, resembles the ancestral Afetazoon. He showed how the variously modified quasi-gastrula forms of the higher groups might be derived from the normal type, and corroborated his theory by reference to the persistence of the gastrula stage in certain Porifera, as well as in those Celentera and Vermes where the adult animal is not far above the level of the gastrula organi- zation. The occurrence of the planula and the delamination pro-cess in some cases alongside of the invaginate gastrula is a difli- culty in the way of his theory so far as it defines the primitive Metazoan ancestor, and this has given rise to Lankester's rival planula theory. The case on either side is fairly stated in Balfour's Embryology (vol. ii, chap. xiii.). (Recent researches on Hydrozoa seem to show that delamination is an extreme form of immigra- tion, which is itself a modified invagination.) The passage from Protozoa to Afetazoa was, according to Biitschli, effected neither by planulan nor gastrula but by a disk-like "placula." The ingenious 'coelom theory" of the Hertwigs is an attempt to divide all the Metazoa with three germinal layers into two distinct groups characterized by different modes of formation of body-cavity and mesoderm, and by other minor differences. In the Enterocela, which include the Chetopoda, Gephyrea, Brachiopoda, Nematoda, Arthropoda, Echinodermata, Enteropneusta, and Chordata, the body- cavity is formed in the fashion noted in the case of Sagitta by two ingrowths from the archenteron, the bulk of the mesoderm arising from the differentiation of the epithelium of these diverticula, though sometimes partially also from amceboid cells budded off into the gelatinous tissue between ectoderm and endoderm. In the smaller group of Pseudocela, including the Mollusca, Polyzoa, Rotifera, and Platyhelminthes, the mesoderin originates in the second of these ways, and the body-cavity is formed by a

split in this "mesen- chyme." This theory has been criticized by Balfour (Hmbr., ii. 18), and more recently ably defended by Haeckel and others ; further detailed studies are at least needed before it can claim full con- firmation. (15)

4. Unity of Tissuesand Homology of Layers.—Since it is impos- sible that all the cells resulting from segmentation can continue to occupy the same position, a certain lamination or layer formation with consequent division of labour and structural modification invariably occurs, finding its first expression in the two-layered gastrula stage to which we have referred. Just as in the embryo of the higher plants there arise an outer dermatogen, an inner plerome, and a middle layer or periblem, so in the animal embryo there constantly occur three germ layers, the ectoderm, the endo- derm, and the intermediate layer formed from them—the meso- derm. As early as 1768 Wolff scems to have had a definite presentiment of the formation of the different systems from distinct germ layers; in 1817 Pander distinguished in the embryo chick the outer or "serous" from the inner or "mucous" layer, aud Von Baer in 1828 yet more definitely distinguished them as animal and vegetative respectively. A great step towards the recognition of the full significance of these germ layers was due to the brilliant insight of Huxley (1859) in comparing them to the ectoderm and endoderm which he had demonstrated in Cwlentera. The researches of Remak, Rathke, Kowalevsky, and others led to their general recognition throughout the Aetazoa. Modern progress is marked by the demonstration of the general homology of all the three germ layers and consequently of the systems of organs which arise from them. While much uncertainty still obtains as to the

origin of the mesoderm, and while the different layers undoubtedly exhibit in some cases the possibility of differentiation into tissues different from those to which they usually give origin, yet the general homology of the layers is now indisputable. The ectoderm, which is indeed the primitive sensory and protective organ, forms the epidermis, sense organs, and nervous system of the adult ; the nutritive endoderm lines the enteric cavity, &c.; and from the mesoderm are derived the muscular, vascular,

and lymphatic systems and the greater part of the connective tissue, as also the excretory and generally also the generative system. Not only then is the occurrence of these three layers constant, but, with few exceptions, so is the differentiation of each into definite systems of organs. This correspondence, which is of high—in most cases of final—importance in determining homologies, may be termed homodermic. See MorpHotocy. (15)

5. Unity of Anatomical Structure.—The study of development leads, however, to the recognition of a more detailed and specific unity than the general one of homodermy. For, just as the development of the flower reveals the original resemblance of organs which become subsequently widely differentiated, so organs which in their adult modification seem hardly comparable are seen to be moulded from one pattern when compared in their embryonic simplicity. The same holds good obviously of the comparison of organs in different animals ; organogeny is the necessary foundation of comparative anatomy. Thus of late years it has been demon- strated that the nervous system and sense organs, throughout at any rate the vast majority of Metazoan forms, not only constantly arise from the ectoderm—that is to say, are homodermic—but their development exhibits correspondences even in detail. Recent studies of the development of the Vertebrate skeleton, and more especially of the skull, afford vivid instances of that fundamental unity of structure of which, in another department, the final unravelment of the complex problem of the structure of the urinogenital organs of Vertebrates through the researches of Balfour and Semper is one of the most recent and admirable instances. (11)

6. Unity of Type.—It has been the general history of classifica- tion both of plants and animals that arrangements based on super- ficial resemblance were superseded by those founded on internal organization, while the latter have been in turn either corroborated or amended by the relationships revealed by the study of develop- ment, as from the preceding generalizations must indeed be obvious. Just as the separation of the Monocotyledons and Dicotyledons into two great alliances was anatomically recognized by Ray, and en- bryologically corroborated by De Jussieu, so the developmental studies of Von Baer led him independently

to the establishment of the four great types which had been previously distinguished by the anatomical labours of Cuvier. And, apart from the recognition of the morphological unities of the greater groups, it is familiarly known how in the case of problematical forms, such, for instance, as Cirripedes or Ascidians, where the adult organization is obscured by degeneration, the detection of the true relationship is due to em- bryology. In proportion, too, as the recapitulation during develop- ment of adult structure becomes shortened and effaced, so does the determination of their real affinities become difficult ; hence the relatively slow progress of the botanist towards a knowledge of the deeper affinities of his " natural orders." (11)

As the preceding outline of embryological detail is being rapidly filled up, and the resultant concrete gene- ralizations are being more and more clearly defined, and also united with those of comparative anatomy and palz- ontology, the embryologist is rapidly approximating that tolerably adequate knowledge of the morphological rela- tions of plants and animals alike which finds its graphic expression in the "family tree" of the Organisata. While, for instance, the discrepant speculations of Semper, Hubrecht, Sedgwick, and others, as to the ancestral form of the Chordata, afford illustration of how far we are from being able to construct a thoroughly definite genea- logical tree, on the other hand no better evidence alike of the rapid stages by which our knowledge has advanced and of the utility of such a method of graphic nota- tion can be obtained than by comparing the necessarily vague and hypothetical tree sketched by Haeckel only twenty years ago with any of its numerous and shortlived successors. (16

3. The result of the study of development is not, how- ever, merely to establish the existence of such concrete structural unities as those just indicated, but leads further to the recognition of certain abstract generalizations, ex- pressive of the most comprehensive conclusions which can

be drawn from the observed succession of developmental phenomena.

(a) Heredity.—It is an every-day observation that the offspring of any organism repeats the organization of the parent; and the very familiarity

of the fact is apt to conceal the marvellousness of the process in which every egg cell develops, either directly or indirectly, into a form which not only resembles the parent in general and specific characters, but may even repeat those individual character- istics which arose by so-called spontaneous variation, or which were even impressed upon the parent by the direct influence of the external environment. The difficulty of analysing the factors which give rise to this result,—that is, of understanding how the history of the developing ovum is determined by its constitution—the uncertainty as to the degree in which acquired parental characteristics can be said to be transmitted, the absence in fact of any established causal explanation of the resemblance between offspring and parent, in specific and individual characters, does not of course affect the fact. Although, in analysing the popular generalization that "like begets like," it may eventually be shown how much of that likeness may be due to the hammering of the same environmental forces which formerly played upon the parent, a mysterious transmission of properties has still to be accounted for, and interpreted in terms of the physiological and niorphological, the chemical and physical, composition and properties of the germinal matter of parent and offspring. To explain this mystery, various "theories of heredity" have been from time to time propounded ; from the present purely morpho- logical point of view it suffices here, however, to note the fact of heredity, leaving the discussion of its rationale to its more natural place at the outset of the article Varia- TION AND SELECTION. (6)

(0) Von Baers Law.—In comparing the degree of organization attained by different forms, we are accustomed to distinguish the general morphological ground-plan con- stant throughout the group from the detailed histological differentiation or elaboration of the various organs. Great histological simplicity may co-exist with a high general morphological plan, and vice versa. A survey of the animal and vegetable kingdom reveals a branching and ascending series of increasingly complex ground-plans, while, in any of the groups determined by these, similar branching series more and more highly differentiated in detail are to be distinguished. Von Baer (1828) was the first to discern the embryological aspect of this law of pro- gress, and to show that, in the development alike of the organism and of its component parts, there was a

progress from the simple to the complex, from the general to the special. Thus, in the development of one of the higher Mammalia, those characters which are common to the low- est Vertebrates are at first alone distinguishable. Thence the embryo passes through stages resembling those of successively higher forms, till the general Mammalian type is reached, this again passing through higher and less general stages till the specific characters finally make their appearance; and this progressive differentiation from gene- ral to special holds equally of the histological differentia- tion of the organs. Von Baer guarded against the error involved in many popular versions of his generalization, by maintaining that the developing embryo resembled, not the adults, but merely the embryos of lower forms; and, although he narrowed his proposition to the limits of the great groups, denying, for example, any resemblance between Vertebrate embryos and those of any Invertebrate type, this must be admitted a thoroughly legitimate reserve when we consider the actual state and practical possibilities of embryological research at the time. The real value and import of Von Baer's law, however, could

not be appreciated until the parallel between this developmental progress and the advance of anatomical type which had been exposed by Cuvier received its rational explanation at the hands of Darwin. (17) ~

(c) Haeckel's "'Biogenetic Law."—While Von Baer was the first to appreciate the value of embryology in its relation to classification and comparative anatomy, we are indebted to Haeckel for the detailed application of the Darwinian theory to the phenomena of embryology and the conse- quent restatement of Von Baer's law in its developed form. In his Generelle Morphologie (1866) he formulates the "fundamental law of development" (biogenetisches Grund- gesetz). Introducing the term "ontogeny" to denote the development of the individual organism, and " phylogeny " to express the historic evolution of the " phylon" or tribe, he affirms that "ontogeny is an epitome of phylogeny," or, more explicitly, "the organism recapitulates in the short and rapid course of its individual development the most important of those form-modifications undergone by the successive ancestors of the species, in the course of their long and

slow historic evolution, and the causal relation of the two histories is to be explained in terms of heredity and adaptation. When these are thoroughly analysed, it will be possible to say that the phylogeny is the mechanical cause of the ontogeny."

Much as Von Baer had distinguished the general morphological ground-plan from the more detailed differ- entiations of the organs, Haeckel analysed ontogeny into (a) the "palingenetic " process, in which the truly ancestral characters conserved by heredity are reproduced in de-velopment, and (0) the "kenogenetic" process, or modified evolution, to which are due those non-primitive characters which have resulted in consequence of a secondary adapta- tion of the embryo to the peculiar conditions of its own environment. The true recapitulation is constantly liable to be disguised, not only by the frequent occurrence of that abbreviated and more direct ontogeny which the need for economy tends alike to originate and to conserve, but by the action of these kenogenetic processes. Hence the corollary that ""'the ontogenetic recapitulation of the phylogeny is the more perfect the more the palingenetic process is conserved by heredity, and the more imperfect in proportion as the later modified evolution (kenogenesis) is introduced by adaptation."

While this distinction between adaptive characters and underlying morphological type is not only legitimate but indispensable, it must not, however, be forgotten that the difference between these is nowhere absolute,—the deepest morphological characters being but the most ancient results of adaptation (cf MorpHonoey, vol. xvi. p. 845). Yet it is only by the careful application of this principle that the embryologist can unravel the perplexing entanglement of primitive and adaptive characters pre- sented by so many larval forms, or solve the scarcely less difficult problems of organogeny. In this regard Balfour's dissertation on the origin and affinities of larval forms is especially valuable, while a vivid illustration of the em- ployment of the biogenetic law, in one of the most diffi- cult departments of ontogeny, may be borrowed from Prof. Parker. Reviewing the development of the skull in the Chick, he says—

" Whilst at work I seemed to myself to have been endeavouring to decipher a palimpsest, and that not erased and written upon again just

once, but five or six times over.

“Having erased, as it were, the charaeters of the culminating type—those of the gaudy Indian Bird—I seemed to be amongst the sombre Grouse, and then, towards ineubation, the eharaeters of the Sand-Grouse and Hemipod stood out before me. Rubbing these away, in my downward walk, the form of the Tinamou looked me in the face; then the aberrant Ostrich scemed to be

deseribed in large arehaie eharacters; a little while and these faded into what could just be read off as pertaining to the Sea Turtle ;

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whilst, underlying the whole, the Fish in its simplest Myxinoid form eould be traeed in morphologieal hieroglyphies.” (17)

(d) Spencer on Development.—The most generalized treatment of embryology is that of Spencer, who, after carefully distinguishing mere growth in bulk from de- velopment of structure, points out that development takes place primarily around a central point, as in the lowest and chiefly unicellular organisms. Central development is either unicentral or multicentral, while, according as the insubordination to a single centre, implied in the latter case, is more. or less thorough, the organism is of irregular form (eg., many Alge), and so may readily even become discontinuous. From central we pass insensibly to axial development, and this may be uniaxial or multiaxial. Here, too, development may be continuous or discontinuous, familiar instances of both being furnished by many animals and plants. The fundamental importance of these simple conceptions to the adequate treatment alike of the pro- blems of individuality (cf. MorpHotoey) and of the nature of the reproductive process is justly to be insisted upon, for the definition of reproduction as but a discontinuous growth and development finds here its origin and justi- fication.

Spencer, moreover, expresses Von Baer's essential law in yet more general phrase :—"' Development is a change from an incoherent indefinite homogeneity to a coherent definite heterogeneity." The relation of ontogeny to phylogeny is not overlooked, and a yet farther parallel advance in dif- ferentiation of the organism from its environment is illus- trated alike in structure aud form, in chemical composition and specific gravity, in temperature and self-mobility. The deductive interpretation of these laws is also cautiously suggested. (17)

Bibliography.—Without any attempt to deal with the very copious literature of the subject, it is sufficient to name some of the more important general and special works, from whieh full details ean in turn be obtained. From the time of Haller perhaps no eminent anatomist or physiologist has omitted a more or less general treatment of the subjeet, and sueh discussions as those to be found in the well-known works of Johannes Miiller, Milne- Edwards, Owen, or Carpenter are still valuable, especially as embodying the past development of the subject. More recent dis- eussions are to be found in the leading text-books, alike morpho- logieal (Huxley, Gegenbauer, Claus) and physiological (Hermann, Foster, Landois, &e.). The embryologieal movement ean be followed by the aid of the article Empryonocy, and the valuable systematie treatise of Balfour, while the most generalized treat- ment of the subjeet must at first be sought in the works of Spencer and Haeekel. For almost all purposes, however, the reeent careful monograph of Hensen (Physiologie d. Zeugung, forming the second part of vol. vi. of Hermann's Handbuch d. Physiologie, Leipsie, 1881), although, of eourse, by no means eompletely satisfactory, will be found not merely servieeable but indispensable to the student. The various Jahresberichte must be also, of course, eon- stantly appealed to, especially for progress in detail. The present state of the theory of reproduetion is discussed in Hensen, op. cit.

(1) cf. Hensen, op. cit., general manuals, and gynecological works, eg., Williams, "On the Structure of the Mucous Membrane of the Uterus," Odstetr. Journ., 1875; Barnes, System of Midwifery, 1885; Lusk, Sci. and Art, of Mid- wifery, 1882. (2) Huxley, Anat. of Invert. Animals, 1879; Gegenbaur, Comp. Anat., London, 1882; Wicdersheim, Lehrb. d. Comp. Anat. d. Wirbelthiere, Jena, 1883; Semper, D. Urinogenital Syst. d.

Plagiostomen, in his Arbdeiten, vol. ii.; Balfour, Comp. Embryology, 1882. (8) Hensen, op. cit.; Foster's and Landois's manuals of physiology. (4) Werth, " Physiologie d. Geburt," in chap. xiii, of Hensen, op. cit.; Spiegelberg, Lehrb. d. Geburtshiilfe, Lahr, 1878. (5) Milne-Edwards, Lecons s. la Phystologte, and later manuals. (6) Hensen, op. cit. (7) Gamgee, Physiol. Chem. of Anim. Body, 1880, and Hensen, op. cit. (8) V. La Valette, "Ucb. d. Genese d. Samenk6rper," Archiv f. Mikr. Anat., xv.; Blom- field, Quart. Journ. Micro, Sci., 1880; Renson, Arch. d@. Biol,, 1882; Swaen and Masquelin, Arch, d. Biol., 1888 ; Geddes and Arthur Thomson, ' On the Iistory and Theory of Spcrmatogenesis," Proc. Roy. Soc. Edin., 1885-86. (9) Sec EMBRYOLOGY, and article "Ovum" (by Allen Thomson), in Todd's Cyclop. of Anat. and Physiol. (10) Gamgee, op. ctt.; Hensen, op. cté. (11) Balfour, op. cit., and manuals. (12) Balfour, op. cit.; Flemming, Zel/substanz, &c., Leipsic, 1882; Strasburger, Zellbildung, &c., Leipsic, 1882, and Neue Untersuch., &c., 1884 ; Carnoy, Biologie Cellulaire, Louvain, 1885; Brass, Betts. z. Zellphysiologie, Leipsic, 1885; Hertwig, Jena. Zeitschr., xviii., Heft 2, 1885. (18) Balfour, op. cit.; V. Beneden, Arch. d. Biol., 1883 (also summarics in Q. J. Af. S., and Biol. Central- Blatt for 1885, by Cunningham and Flemming respectively); Sabaticr, Conts7b. aU étude d. globules polaires, Montpellicr, 1884. (14) Works above cited and Hertwig, Jena, Zetischr., 1885. (15) Balfour, op. cit.; Waeckel, " Ursprung u. Ent- wick, d. thier. Gewebe," Jena. Zeitschr., xviii., 1885, (16) Hacckel, Gen. Morphol., 1866; Herdman, Phylogeny of Animal Kingdom, Liverpool, 1885. (17) Spencer, Princ. of Byol., 1880; Waeckel, Gen. Morphol., 1866; Parker, Aforphology of the Skull, 1877. (P. GE.)

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IL. REPRODUCTION oF PLANTS.

The various modes by which plants are reproduced may be conveniently classified in two groups, namely, vege- tative multiplication and true reproduction, the distinction between them being this, that, whereas in the former the production of the new individual may be effected by organs of the most various kinds, in the latter it is always effected by means of a

specialized reproductive cell. This distinction will become apparent in the following discus- sion,

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bulbils or " starch-stars" of Chara stelligera, which are Bulbils.

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underground nodes, and the branches with naked base and the pro- embryome branches found by Pringsheim on old nodes of Chara fragilis. In the Mosses small tuberous bulbils frequently occur on the rhizoids, and in many instances (Bryum annotinum, Aulacomnion androgynum, Tetraphis pellucida, &c.) stalked fusiform or lenticular

multicellular bodies containing chlorophyll, termed gemmez, Gemme.

are produced on the shoots, either in the axils of the leaves or in special receptacles at the summit of the stem. Gemme of this kind are produced in vast numbers in

Multi- Vegetative Multiplication.—The simplest case of vege- | Marchantia and Lunularia among the Liverworts. plication tative multiplication is afforded by unicellular plants. | Similar gemmez are also produced by the prothallia of of uni- When the cell which constitutes the body of the plant has | Ferns. In some Ferns (eg., Nephrolepis tuberosa and N. cellular é ¢ nee AP ns ae : ; : : c

plants, by 4ttained its limit of size, it gives rise to two, either by | undulata) the buds borne on the leaves or in their axils division; division or gemmation ; the two cells then grow, and at | become swollen and filled with nutritive materials, con-

the same time become separated from each other, so that eventually two new distinct individuals are produced, each of which precisely resembles the original organism. A good example of this is to be found in the gemmation of the Yeast plant. This mode of multiplication is simply

stituting bulbils which fall off and give rise to new plants. This conversion of buds into bulbils which subserve vegetative multiplication occurs also occasionally among Phanerogams, as, for instance, in Lilium bulbiferum. But many other adaptations of the same kind occur among

the result of the ordinary processes of growth, All plant- cells thus grow and divide at some time of their life; but, whereas in a multicellular plant the products of

Phanerogams, notably among annuals. Bulbous plants, Bulbs, for instance, produce each year at least one bulb or corm corms, from which a new plant is produced in the succeeding }',...,

of higher

division remain coherent, and add to the number of the cells of which the plant consists, ina unicellular plant they separate and constitute new individuals. In more highly

plants, by organized plants vegetative multiplication may be effected

year. In other cases, as in the case of the Potato, tubers are developed from subterranean shoots, each of which in the following year gives rise to a new individual, In other cases, again, as in Dahlia, Thladiantha dubia, &c.,

ken of _ bY the separation of the different parts of the body from | tuberous swellings are found on the roots, from each of ion of : ; Matin é members, cach other, each such part subsequently developing the | which a new individual may spring. missing members and thus constituting a new individual. True Reproduction.—It was mentioned above that the Structure This takes place spontaneously, and in a marked manner | true reproduction of plants is effected by specialized cells ; of spores. in Mosses. The main stem gradually dies away from be- | these cells may be generally designated spores. The hind forwards ; the lateral branches thus become isolated, | structure of a spore is essentially this: it consists of a and constitute new individuals. nucleated mass of protoplasm, enclosing starch or oil as Vege- The remarkable regenerative capacity of plant-

members | reserve nutritive material, usually enclosed by a cell-wall. tative is largely made use of for the artificial propagation of | In those cases in which the spore is capable of germinating eerodne- plants. A branch removed from a parent-plant will, | immediately on its development the cell-wall is a single tings. under appropriate conditions, develop roots, and so con- | delicate membrane consisting of cellulose; but in those stitute a new plant; this is the theory of propagation by | cases in which the spore may or must pass through a "cuttings." A portion of a root will similarly develop | period of quiescence before germination the wall becomes one or more shoots, and thus give rise to a new plant. | thickened and may consist of two layers, an inner, the An isolated leaf will, in many cases, produce a shoot and | endospore, which is delicate and consists of cellulose, and a root, in a word, a new plant; it is in this way that | an outer, the ewospore, which is thick and rigid, frequently Begonias, for instance, are propagated. The production | darkly coloured and beset externally with spines or bosses, of new plants from the leaves occurs also in nature, as, for | and which consists of cutin. In some few cases among Vivi- instance, in the so-called " viviparous" plants, of which | the Fungi multicellular spores are produced; these Parous = Bryophyllum calycinum (Crassulacee) and many Ferns | approximate somewhat to the gemmzx mentioned above as _. (Nephrodium [Lastrea] Filix-mas, Asplenium | Athyrium] | highly specialized organs for vegetative multiplication. Filix-foemina, and other species of Asplenium) are | In some cases, particularly among the Alge and also in examples. An interesting case of the vegetative develop- | some Fungi (Peronosporee, Saprolegniee, Myxomycetes, ment of new individuals from other plant-organs is afforded | Chytridiacez), spores are produced which are for a time by Strasburger's observations on Cclebogyne ilicifolia, | destitute of any cell-wall, and are further peculiar in that Funkia, Mothoscordum fragrans, and Citrus; he found, | they are motile, and are therefore termed zoospores ; they Zoospores. Embryos namely, that in these plants, an adventitious formation of | move, sometimes in an amoeboid manner by the protrusion

formed by embryos takes place by budding from the tissue of the

budding.

nucellus bounding the embryo-sac. But it is in the Mosses, of all plants, that the capacity for vegetative propagation is most widely diffused. Any part of a moss, whether it be the stem, the leaves, the rhizoids, or the sporogonium, is capable, under appropriate conditions, of giving rise to filamentous protonema on which new moss- plants are then developed as lateral buds.

of pseudopodia, but more frequently they are provided with one, two, or many, delicate vibratile protoplasmic filaments, termed cilia, by the lashing of which the spore is propelled through the water. The zoospore eventually comes to rest, withdraws its cilia, surrounds itself with a cell-wall, and then germinates.

Spores are developed in various ways, and a prefix is in many cases added to the word "spore" to indicate the

In a large number of plants we find that provision is

made for vegetative multiplication by the development of

Soredia of more or less highly specialized organs. In Lichens, for Kichens. instance, there are the soredia, which are minute buds of the thallus containing both algal and fungal elements ;

these are set free on the surface in large numbers, and

each grows into a thallus. In the Characec there are the

nature of the process of development. Leaving details for spores subsequent discussion, we will now confine our attention formed to the main fact that all spores are developed in one or other ¢ither

of two ways, either asexually or sexually. In the fornier geal case a single reproductive organ gives rise to cells which asexually. are capable, each by itself, of developing into a new

organism ; such an organ is an asexual reproductive organ,

Asexual and. sexual organs.

and such cells are asexually produced spores. In the latter case the reproductive organs are such that they do not singly give rise to cells capable, each by itself, of developing into a new organism. These are sexual repro- ductive organs. In some instances the sexual organ does not give rise to reproductive cells at all until it has received into itself more or less of the protoplasmic contents of another different, at least physiologically, sexual organ; and the cells which it then produces are capable, each by itself, of developing into a new organism. In others the sexual organ produces reproductive cells without any such previous fusion of protoplasm, but the cells thus produced are incapable, each by itself, of developing into a new organism. Such cells are sexual reproductive cells. It is only by the fusion of two such cells, physiologically different, that a reproductive cell is formed which is capable of developing into a new organism. The fusion either of the protoplasmic contents of two different sexual organs or of two different sexual cells constitutes the sexual process. It may take place, according to circumstances, either within the organs or, in those cases in which sexual cells are produced and are set free, externally to them. The resulting cells are sexually produced spores.

In some exceptional cases the normal production, sexual or

asexual, of spores does not take place, but the new organism is developed vegetatively from the parent. When the sexual

Apogamy production of sporcs is suppressed, the case is one of apogamy ;

*and when the asexual production of spores is suppressed, the case is one | With a cell-wall; stylospores are spores which are developed, *P°‘s: apospory. of apospory. The following are instances of apogamy: in certain | not in sporangia, but by abstriction as mentioned above ; Ferns (Pteris erctiea, Aspidium Saleatum) the prothallium produces tetraspores is the name given to the spores of the Floridez no sexual organs, but the fern-plant rises vegetatively as a bud upon it. Apospory has been observed to occur in Mosses and in | tO denote the fact that four spores are produced by the some Ferns (Athyrium Filia-femina, Polystichwm angulare): in |*

division of the mother-cell. The wredospores of the Mosses a new plant may be developed vegetatively from the | Uredines are those which are produced during the tissue of the sporogonium ; in Athyrium the sporangium, instead | symmer, whereas the teleutospores of these plants are those of producing spores, develops into a fern-prothallium. In the . : . : Characex apospory appears to be the rule. Apogamy and apospory | Which are formed in the autumn, at the end of the period will be more fully discussed subsequently in connexion with the | of growth. It was the custom, at one time, to speak of subject of alternation of generations. the spores of Fungi as conidia; and at the present time the Asexual Reproduction.—Reproduction by means of | macrospores and the microspores of Phanerogams are better asexually produced spores is common to nearly all | known as embryo-sacs and pollen-grains respectively. families of plants. It is wanting, among the Algw, in The organs which give rise to the asexually produced the Conjugate, the Fucaces, and the Characex ; among | spores are usually not confined to a particular part of the the Fungi, in a few Peronsporee (Pythiwm vexans, Arto- | plant in the Thallophytes. Instances of this do, however, trogus), in Ancylostes Closterti, in Aplanes Brawnii, among | occur among the Ascomycetous Fungi—namely, in the the Saprolegniew ; and, among the Ascomycetes, in Ere- Pyrenomycetes. Here the production of the stylospores Pyenidia, mascus, Sordaria (Hypocopra),

reproductive organ of the nature of a sporangiwm. In more highly organized plants special organs are differen- tiated for the production of spores. In the majority of

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the Ferns, Equisetacex, and Lycopodiaces the sporangium is multicellular, but simple in structure. This is true also in the Rhizocarpe and in the Ligulate (Selaginella, Isoetes), but in these plants there is this peculiarity that there are sporangia of two kinds,—some, namely, which produce one, or a few, large spores, macrospores, and are hence termed macrosporangia, and others which give rise to a large number of small spores, microspores, and are hence termed microsporangia, The

Phanerogams also bear two kinds of sporangia, which have received special names :— the macrosporangium, which produces only one mature spore, is termed the ovwle; the microsporangium, which produces a large number of microspores, is termed the pollen-sac.

formed by abstriction. This occurs in some Mucorini, such as Cheetocladium, in the Ustilaginex, the Entomoph- thorew, the Peronosporer, the Ascomycetes, the Rusts (Uredinese), and the Basidiomycetes.

These asexually produced reproductive cells are com monly spoken of simply as spores, but in many cases some addition has been made to the word, or an altogether different name is applied to them, in order to mark some peculiarity in their mode of origin, to indicate their order of development, or to assign them without periphrasis to

a particular group of plants. Thus, as has been mentioned, Termin- zoospores are motile spores unprovided, for a time at least, ology of

aggregated together, and such an aggregate of sporangi- ferous leaves constitutes a flower.

Seaual KReproduction.—In nearly all classes of plants No sexual

Tn some cases among the Fungi the spores are Forma- not produced in the interior of a sporangium, but are tion of

cases the special organ is a sporangium, that is, a hollow

above the Protophyta spores are formed by a sexual reproduc- capsule in the interior of which the spores are developed.

process ; aud in those in which no such process can be Hon i Proto-

In the Thallophytes the sporangium is a single cell. In the Muscinez it is a multicellular capsule; in Riccia, in which the structure of the capsule is simple, the whole of the internal cells give rise by division to spores; in other Liverworts, and in the Mosses, in which the structure of the capsule

becomes progressively more and more complex, a portion only of the internal cells give rise to spores. In

detected its absence is due, not, as in the Protophyta, to the fact that sexuality has not yet been developed, but to its gradual disappearance. The phenomena of sexual reproduction will be most intelligibly stated by tracing them in the different main divisions of the Vegetable Kingdom— the Alge, the Fungi, the Archegoniata, and the Phanerogams.

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Sexual The protophytic Alge are reproduced by asexually developed reproduc- spores, but in some forms an indication is already given of the tion of differentiation of these spores into sexual reproductive cells which Alge. takes place in the higher forms of the group. In Protococcus, for instance, zoospores are produced, but the zoospores are not all precisely similar. In some cases the protoplasm of the cell divides only once or twice, the result being the formation of two or four relatively large zoospores, macrozoospores; in other cases the protoplasm divides a greater number of times so that a considerable number of relatively small zoospores, microzoospores, are pro- duced. Functionally these zoospores are alikc; they all come to rest, and form new Protococci. Amongst the Confervoide, which are more highly organized plants than the protophytic Alge, we find forms, of which Ulothrix may be taken as the type, which likewise produce macrozoosporcs and microzoospores in their Conjuga- cells. The macrozoospores of Ulothrix simply come to rest and tion of germinate; they are distinctly asexual spores. The microzoospores plano- may also do this, but not unfrequently they coalesce in pairs; the gametes. product of fusion, the zygospore, as it is termed, then develops into a Ulothrix filament. This fusion of two similar reproductive cells— this conjugation, as it is termed—is one of the simplest forms of the sexual process ; the zygospore is then a sexually produced spore, and the two cells which conjugate to form it are spoken of as gemetcs — planogamcetes when thcy possess cilia, aplanogametes when they do not.

Comparing Ulothrix with Protococcus, we see that in both the macrozoospores are asexual reproductive cells, whereas the micro- zoospores of Ulothrix exhibit an imperfect sexuality, inasmuch as they

may germinate without previous conjugation. The plano- gametcs of Ulothrix are, however, to be directly connected with the microzoospores of Protococcus; that is to say, the gametes are to be traced back to asexual spores. This isa point of fundamental importance.

Similarly, in Botrydium, one of the Siphonce, there are two kinds of zoospores, some of which are asexual and others sexual ; the visible difference between them is, in this case, not one of size, but the gametes have two cilia and the zoospores only one.

In the conjugation which takes place in the above-mentioned plants the gametes are quite similar in form and size, and take an equal part in the formation of the zygospore. The first indication

Differen- of the differentiation of sexual gametes is afforded by Lceto- tiation of carpus siliculosus and Scytosiphon, belonging to the Pheosporee. sexual The zoospores of these plants arc produced in well- defined sporangia, gametes. some of which are multilocular and others unilocular. Inasmuch as only the zoospores developed in the multilocular sporangia have been observed to conjugate, that is, to be gametes, those developed in the unilocular sporangia are probably asexual. This being so, the multilocular sporangia are to be regarded, not as mere sporangia, but as sexual organs (Gamctangia) producing sexual reproductive cells. The process of conjugation of the gametes is, according to Berthold, as follows :—the gametes are at first quite similar in every respect; some of them, however, soon withdraw their cilia and come to rest, whereas others remain actively motile ; one of the still motile gametes then coalesces with one which has come to rest to form a zygospore. The gametes in this case behave differently in the proccss of conjugation: the one is passive, the other active; the former is to be regarded as the female, and the latter as the male reproductive ccll. But even in this case the gametes, if they fail to conjugate, can germinate independently.

In Cutleria the sexual differcntiation of the reproductive cells is more marked ; the male and female cells are developed in distinct sporangia, which may be termed respectively antheridia and oogonia, two male cells being formed in cach antheridium, and one female ccll in each oogonium; the female cell is considerably larger than the male, but they

are both planogametes, that is, conjugating cells which swim by means of cilia; the female cell, however, soon withdraws its cilia and comes to rest, and then conjugation takes place, with the formation of a zygospore, much in the same way as in Ectocarpus described above.

The next stage in the sexual differentiation of the Alge is to be found in such forms as Volvox, Vaucheria, @idogonium, Fucus, and the Characee. In these plants, as in Cutleria, the reproductive cells are entirely incapable of independent germination ; they have lost altogether that characteristic property of spores ; asin Cutleria also they are developed in two kinds of sporangia—antheridia and oogonia—and they are very different from each other in thcir form, size, and behaviour. In most cascs the oogonium gives rise to a single relatively large cell, the oosphcre, which is at no time provided with cilia, and is not set free from the oogonium ; in some of the Fucacex, there may, however, be two (Pelvetia), four (Ozothallia [Ascophyllum]), or eight (Fucus) oosphcres produced in each oogonium, and in all the Fucacez the oospheres are set frec from the oogonium, The antheridium gives rise to a large number of small ciliated cells, the antherozvids, one of which subsequently fuses with the oosphere. The coalescence of two such highly differen- tiated sexual cells is termed fertilization, to distinguish it from

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the conjugation of similar sexual cells, and the product of fertiliza- tion is termed an oospore, to distinguish it from the product of conjugation, the zygospore. In these plants the antherozoids still retain the essential characters of planogametes, whereas the Sa a have lost them.

ut it is not in all Alge that sexual reproduction is cffected by Sexual the fusion of well-defined sexual cells. In the Floridex the sexual reproduc- reproductive organs are well differentiated. The male organ is an tion of antheridium which produces antherozoids ; but these antherozoids Floridex. are peculiar in that they have no cilia, and are surrounded by a cell-wall ; they are frequently, on this account, termed spermatia. The female organ is termed a procarpiuwm or carpogoniwm ; it may consist of

one or many cells, but in all cases it consists of a pro- jecting filament, the trichogyne, and a more expanded basal portion, It is peculiar in that no well-defined oosphere exists within it. Fertilization is effected by the antherozoid (spermatium) being passively brought into contact with the trichogyne ; complete fusion then takes place, the contents of the spermatium passing into the trichogyne; the trichogyne now withers, and changes take place in the basal portion of the procarpium, one or more of the cells termed carpogenous cells divide, and by a process of budding give rise to a cluster of cells which are capable of germinating, and pro- duce new plants; these are termed carpospores. At the same time the cluster of spores frequently becomes surrounded by an up- growth of tissue ; the mature fructification is termed a cystocarp. From the female organ of the Floridex there are, then, formed, in consequence of fertilization, a number of reproductive cells, the carpospores, each of which corresponds to the oospore of plants like Fucus, Vaucheria, &c. A more detailed comparison with Fucus makes this correspondence at once apparent. In Fucus the contents of the female organ (oogoniuin), which is a single cell, divide into eight oospheres, which are subsequently fertilized ; in the Floridee there is, before fertilization, no differentiated oosphere, but the organ, as a whole, is fertilized by the spermatium, and it is in this case after, and not before, fertilization, as in the case of Fucus, that a process of cell-formation takes place in the female organ ; hence the reproductive cells formed by the fertilized female organ of the Floridex are at once fertile, and correspond to the fertilized oospheres (oospores) of Fucus.

The peculiarities of the sexual reproduction of some of the Floridee are of sufficient gcncral interest to be mentioned here.

In the Corallinex, according to Solms-Laubach, the procarpia are produced several together in a conceptacle ; it is, however, only the central procarpia of the group which are capable of being fertilized, and the peripheral procarpia which produce carpospores.

After the fertilization of the central procarpia, the carpogenous

cells of the whole of the procarpia fuse together to form one large

en the periphery of which the carpospores are produced by udding.

TAS Shiysiblopieal division of labour is more marked in Dud- resnaya, and a few other Floridee. In these plants some of the procarpia are destitute of a trichogync, whereas others possess that organ. The spermatia fertilize those procarpia which posscss a trichogyne, but these procarpia do not produce carpospores ; but there grow out from them filaments which fertilize the procarpia destitute of a trichogyne, and these then give risc to carpospores.

The development of the carpospores in the Bangiacee (Bangia, Porphyra) is peculiar. The carpogenons cell does not in this case, as in other Floridex, produce spores by budding, but its proto- plasm divides into eight portions; these are set free as naked masses of protoplasm, which move about for a time in an ameeboid manner and then come to rest and surround themselves with a ccll- wall.

In some of the higher Alge, namely, in the Sphacelariew and in No sexual the Laminariex, families belonging to the Phxosporex, no sexual process process has been observed as yet; but, as our knowledge of the observed life-history of these plants is imperfect, it cannot be definitcly in some stated at present that they are entirely asexual. Algee.

In the somewhat aberrant group of the Conjugate the scxual Con-

process is peculiar. In the Desmidiex and the Mesocarpee it is jugate. effected in this way, that two adjacent cells, belonging usually to different filaments, throw out corresponding latcral protuberances which mect, and, the intervening walls being absorbed, form a canal placing the cavities of the two cells in direct communication ; the protoplasm of each cell contracts, forming an aplanogamete, and travels into the canal, where the two masses meet and fuse. This is clearly a process of conjugation, similar to that of plano- gametes, and the product is likewise a single cell which is termed a zygospore. In the Zygnemes, of which Spirogyra is a familiar example, the process is slightly different. Here the protoplasm of one of the two conjugating organs contracts first and passes over into the cavity of the other, there to fuse with its protoplasm.

Turning now to the Fungi, we find that in the simplest forms Fungi. (Schizomycetes, Saccharomycetes) there is no trace of sexual reproduction, whereas in the higher forms, with some exceptions, sexual reproductive organs are present, though they are in many cases functionless.

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The lowest Fungi in which a sexual process has been observed are the Chytridiacese (Polyphagus Euglenz), the Mucorini, and the Entomophthoree. In these, when it occurs, it takes the form of conjugation, with the production of zygospores. Conjugation is here effected in essentially the same manner as that described above for the conjugation among the Algw, by the fusion of two similar sexual organs. Conjugation of planogametes has been observed by Sorokin in Tetrachytrium and in Haplocystis, pro- bably belonging to the Chytridiaces, a fact of some interest as it is the only case of this form of the sexual process known in the Fungi.

ey Protomyces and the Ustilaginex a process takes place which appears to be of a sexual nature, resembling the conjugation of the Mucorini. Certain reproductive cells of an elongated form, termed sporidia, are produced, which become connected by a transverse canal so that they then resemble the letter H. No zygospore is formed, but the conjugated sporidia are its equivalent. The question of the sexual nature of this process is still under discus- sion, but it is made highly probable by the fact that, in all fully investigated cases, the sporidia are incapable of independent germination.

In the allied groups of the Peronosporee and Saprolegnice two

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paraphyscs, which lie amongst the asci, whereas others form an investing wall. The result is the formation of a fructification, termed an apothcctum. Within each ascus eight spores are formed.

In those Ascomycetes which have spermatia fertilization is effected, as in the Floridee among the Alge, by the fusion of a spermatium with the trichogyne. The result is the same as in Pyronema : the fertilized ascogonium gives rise to hyphe which bear asci, and these, together with sterile hyphe, form a fructi- fication.

It is of interest to note the similarity between the products of fertilization in these Ascomycetes and in the Floridee. In both cases the female organ produces no differentiated oosphere, and in both cases the product of its fertilization is a many-spored frncti- fication. It was pointed ont, in speaking of the Floridex, that each carpospore is the equivalent of a fertilized oosphere (oospore) ; this holds good also with regard to the carpospores (ascospores) of the Ascomycetes.

It may be that a similar sexual process takes place in the other forms mentioned above, viz., the Erysiphew, Penicillium, Sordaria, &c., but it has not been observed ; in any case, the ascogonium in all these plants gives rise to asci and ascospores, and a more or less

complex fructification is produced. But there is also some ground Sexual for believing that in some at least of these cases the sexual organs, degenera- though morphologically differentiated, are functionless. For there tion in are clear indications of sexual degeneration in the Ascomycetes, Ascomy- In some cases, for instance (e.g., Chetomium, Melanospora), no cetes. antheridium can be distinguished, but the ascogonium eventually produces asci nevertheless. In others (¢.g., Xylaria, as far as

kinds of sexual organs are present, male and female, which corre- spond to the autheridia and oogonia of the Alge. The female organ is here also termed an oogonium, and, like that of the Alge, it may produce one oosphere (Peronosporese) or many (most Saprolegniez). The male organ is also usually termed an anthe- ridium, but it is sometimes spoken of as a

pollinodiwm on account of the mode in which it effects the fertilization of the oosphere.

In one of the plants allied to these groups—namely, in Monoble- pharis spherica, according to Cornu—the protoplasm of the antheridium becomes differentiated into motile antherozoids ; this is the only case of the kind known among the Fungi. In the other members of these groups in which fertilization takes place the antheridium lies in contact with the oogonium, and produces at its apex a delicate tubular outgrowth, which bores its way through the wall of the oogonium and comesinto contact with an oosphere ; the tube then opens, and protoplasm from the antheridium passes

known at present) no male organ is produced, but there is an ascogonium which does not, however, give rise to asci; the asci, as well as the rest of the fructification, arise from the vegetative hyphex. In others, again (¢.g., Claviceps, Cordiceps, Pleospora), all trace of the sexual organs has disappeared, but a fructification containing ascospores is produced, as in Xylaria, from the vegeta- tive hyphe. In others, finally, no ascospores are known, the only reproductive cells being the characteristic asexually produced stylospores.

through into the oosphere and fuses with it to form an oospore. In the remaining groups of Fungi, the Uredinee and the Basidio- Fungi in

Sexual In the Ascomycetes sexual organs are very commonly present, | mycetes, no sexual reproduction is known, In the Basidiomycetes which organs of but it is only in a few cases that a scxual process has been observed | no kind of sexual organ has been discovered. In the Uredinex sexual Ascomy- actually to take place. The sexual organs differ considerably in | spermatia are commonly produced, as in the Ascomycetes mentioned reproduc- cetes. their form in the different genera. In some (e.g., Gymnoascus, | above, but no female organ is known ; however, fructifications tion is un- Eremascus, Eurotium, Penicillium) the sexual organs are similar; | termed acidia are in some cases developed. These resemble known, they are unicellular or multiccllular hyphe, but in some the | somewhat those of the Ascomycetes, but differ in that here the female organ, termed in the Ascomycetes the

ascogoniwm or carpo- | spores (zcidiospores) are formed by abstriction, and not in asci as goniwm, may be distinguished from the male organ, which is a | in the Ascomycetes. pollinodial antheridium like that of the Peronosporex, in that it It may be suggested that the ascospores of the asexual Ascomy- is wound into a close spiral. In others (¢.g., Erysiphex, Ascobolus, | cetes and the xcidiospores of the Uredinex should not be included Pyronema [Peziza] confluens) the sexual organs are readily dis- | in an account of the sexual reproduction of the Fungi. It is true tinguishable. In the Erysiphew and in Pyronema the asecogonium | that these spores are asexually produced, but their evident homo- is a single relatively large ovoid cell ; that of Pyronema produces | logy with the sexually produced spores makes it inconvenient to a delicate tubular outgrowth, the trichogyne; the antheridium | treat of them apart. They differ from the sexually produced spores also is unicellular, but it is more slender. In Ascobolus the | in that they are developed apogamously. ascogonium consists of a row of five or six relatively large cells ; Under the name Archegoniata we may conveniently group Arche- the antheridium is a slender multicellular hypha. In all these | together the Muscinee and the Vascular Cryptogams (Plerido- goniata. cases the sexual organs are developed in such close proximity to | phyta). The sexual organs, as also the process of fertilization, are each other that they come into contact. In other Ascomycetes | essentially the same throughout. The female organ produces a belonging to the Discomycetons Lichens (Collema, Synechoblastus, | single oosphere, and is termed an archegoniwm ; it is essentially Leptogium, Physma), aud to the Pyrcnomycetcs (Polystigma), the | similar to the oogonium of the Thallophytes, the only difference antheridial filaments, termed sterigmata, are developed at a dis- | being that, whereas the archegonium is multicellnlar, the oogonium tance from the female organ in separate receptacles, spermogonia. | is unicellular. The male organ, here also termed the antheridium, In this case the formation of male cells isa necessity. Accordingly | is likewise multicellular, and gives risc to a larger or smaller cells, termed spermatia, are produced from the sterigmata by | number of motile antherozoids. Fertilization is effected by the abstriction, which resemble the male cells of the Floridex in that | fusion of an antherozoid with the oosphere, which then clothes they are non-motile and have a cell-wall. itself with a cell-wall and becomes an oospore.

With regard to the process of fertilization, it must be premised In the Phanerogams the sexual organs are essentially of the Phanero- that in no Ascomycete is the protoplasm of the ascogonium ever | nature of archegonia and of antheridia, but they are somewhat gams. differentiated into an oosphere. When the sexual organs are | modified and are called by other names. The female organ of the ascogonia and pollinodial antheridia, fertilization takes place by | Gymnosperms, termed a corpusculwm, closely resembles the arche- the fusion of the undifferentiated protoplasmic contents of the two | gonium of the Archegoniata, and produces a single oosphere. In organs, a mode of fertilization which recalls the conjugation in the | the Angiosperms, the female organ is much reduced, consisting Mucorini, and in the Conjugate among the Alge. This has only | only of three cells, one of which is the oosphere, the other two been observed to take place in Eremascus and in Pyronema; in | being the synergidx which assist in the process of fertilization ; the latter the antheridium applies its apex to the trichogyne of | the organ is termed the egg-apparatus. The male organ in the the ascogonium, the intervening walls are absorbed, and the pro- | Phanerogams is a unicellular filament termed the pollen-tube ; its toplasm of the two organs coalesces. Although this process of | protoplasm does not undergo differentiation into antherozoids, fertilization resembles the conjugation occurring in the Mucorini, | The sexual organs of tle Phanerogams recall those of the Perono- the product is very different. The product of conjugation iu the | sporee and the Saprolegniex ; in both cases the female organ pro- Mucorini is a single cell, the zygospore ; the product of fertiliza- | duces an oosphere, and in neither does the protoplasm of the

Asco- tion in the Ascomycetes is a .umber of cells, termed ascospores or | antheridium produce antherozoids. The process of fertilization

spores carpospores. Thus in Eremascus the product of fertilization is a | will be described subsequently.

we a ie ae picid the ascus, in which eight ascospores are Physiology of Reproduction.—From the fact that in uct of formed. In Pyronema the fertilized ascogonium enlarges and : : : :

fertiliza- gives rise to a ries Bat of outgrowths which produce rs ep ime | the most highly organized plants ie isolated portion

tion. same time a number of hyphe grow up from below around the of one member is capable of producing, not merely a

developing asci, some of which produce delicate filaments, termed

member like itself, but other members also, so that a new

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individual is constituted, it is clear that the protoplasm of plants is imperfectly differentiated physiologically. Never- theless all plants produce cells to which the work of repro- duction is especially assigned. It is of interest to recall the fact that a suppression of spore-formation, either asexual or

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would appear that the former are in some way incomplete, that something is lacking to them which the latter possess, and that this lack is supplied in the sexual process. In

many cases facts have been observed in connexion with the development of the sexual cells which indicate that

sexual, may occur, and vegetative multiplication be reverted to, as in aposporous and some apogamous plants.

they are thus incomplete. In Acetabularia the whole of Difference the protoplasm of the gametangium is not used up in the between

Tt has been shown above that the reproductive cells of | formation of the gametes, and in the Peronosporez only a 8%"! plants are of two kinds— thcse, namely, which are indivi- | portion of the protoplasm of the oogonium forms the asexual dually capable, and those which are

individually incapable, | oosphere ; the remainder is simply the periplasm. In cells.

of giving rise to a new organism; the former are the asexual, the latter the sexual reproductive cells. It has also been indicated that the latter are to be regarded as derivatives of the former, a point which may now be somewhat more fully established. It was pointed out, namely, that the gametes of Ulothrix will, if they fail to conjugate, germinate independently; the sexual differen- tiation of these gametes is clearly imperfect, and they differ but little from asexual zoospores. The same thing has been observed in Botrydium, and this is a specially interesting case inasmuch as it throws some light upon the conditions which determine sexual differentiation of the reproductive cells in these lowly organized plants. It has been ascertained that the nature of the cells produced from the resting-spore, in the manner described above, depends upon the age of the spore producing them: when the spore is young, the cells produced by it are sexual gametes ; if they fail to conjugate they perish ; when the spore is old, the cells produced by it are entirely asexual zoospores ; they never conjugate, but each by itself gives rise to a new indi- vidual. The imperfect sexual differentiation of the gametes has also been observed in Ectocarpus; if they fail to con- jugate they germinate independently. The occurrence of this in Ectocarpus is rather surprising when it is remem- bered that the gametes of this plant are to some extent sexually differentiated as male and female (see above). From these cases in which the typically sexual repro- ductive cells still possess the properties of asexual spores we pass to others, like Acetabularia, in which they have entirely lost these properties. The planogametes of this plant are definitely sexual; but they are quite similar, as far as external appearance goes, to each other ; there is no perceptible distinction between male and female cells. This is the case also in the Mesocarpex and the Desmidiez among the Conjugate; here the non-ciliated conjugating masses of protoplasm (aplanogametes) are externally similar Differen- and take an equal part in the sexual process. In Cutleria lation of the planogametes, and in the Zygnemee the aplanogametes,

Sexnal cells derived from asexual.

ee give indications of further sexual differentiations ; in Cut- cells, leria the female gamete is much larger than the male and comes sooner to rest ; in the Zygnemez the one aplanoga- mete passes over into the cell producing the other aplano- gamete and fuses with it; the former is to be regarded as male, the latter as female. Finally, in the oosporous Alge, in the Muscinez, and in the Pteridophyta the two cells are quite distinct in form, size, and behaviour; the male cell (antherozoid) alone retains the character of a planogamete, the female (oosphere) is non-motile and is many times larger than the antherozoid. In this series the gradual differentiation of the highly differentiated sexual cells from asexual cells can be clearly traced. Sexual If the sexual reproductive cells are to be traced back to an asexual spores, then the organs which produce the sexual Bom reproductive cells are also to be traced back to those which spor- produce the asexual spores, namely, the sporangia; the angia, most highly differentiated sexual organ—the antheridium,

the oogonium, the archegonium, the carpogonium—is derived from the sporangium.

The question now arises as to the nature of the differ- ence between sexual and asexual reproductive cells. It

Vaucheria and other Algee a mass of protoplasm escapes from the oogonium when it opens. In other cases a pro- cess of cell-division has been observed to accompany the formation of the oosphere which recalls the production of the " polar bodies" in the developing eggs of animals. In the Archegoniata the central cell of the archegonium does not directly give rise to the egg, but a portion, the ventral canal-cell, is first cut off; this takes place also in the cor- pusculum of most Gymnosperms. Similarly in the develop- ment of antherozoids, the whole of the protoplasm of the mother-cell is never used up in their formation.

In the germinating microspore of most of the Heterosporous Vascular Cryptogams and of the Phanerogams a process of cell- division takes place which Strasburger interprets as the formation of a polar body. The protoplasm of the microspore undergoes division so that two cells are formed, which may be distinguished as the vegetative and the generative, the former being much smaller than the latter in the Vascular Cryptogams

and in the Gymno- sperms, whereas in the Angiosperms the converse is the case; usually the separation of the two cells is permanent, but in most Angiosperms it is transitory, the only permanent indieation of the cell-division being the presence of two nuelci in the pollen-grain; in some Gymnosperms two or three more vegetative cells may be cut off from the generative ccll. The antheridinm is in all cases formed from the generative cell. These vegetative cells Stras- burger regards as of the nature of polar bodies. The nucleus of the generative cell undergoes division, to form in the Heterosporous Vaseular Cryptogams the nuclei of the mother-cells of the anthero- zoids, and in the Phanerogams the nuclei which take part in the sexual process, as will be more fully described below.

The assumption of the incompleteness of the sexual, cells may be extended to those sexual reproductive organs which, like the procarpia of the Floridex, the pollinodial antheridia of the Peronosporez, the ascogonium and pol- linodial antheridia of the sexual Ascomycetes, do not give rise to differentiated sexual cells.

There is reason to believe that the sexual reproductive cells are spores which, by the loss of certain of their con- stituents, have undergone sexual differentiation, and that those sexual organs which directly take part in the sexual process without the intervention of reproductive cells are sporangia which have undergone sexual differentiation in the same way. 'This is finally proved by the fact that in cases in which the normal phenomena of sexual differen-

tiation do not take place the reproductive cells can ger- Partheno- minate without fertilization, and the female sexual organ genesis.

can produce, without fertilization, cells capable of germina- tion. These cases are examples of that form of apogamy which is known as parthenogenesis. Parthenogenesis in plants producing differentiated sexual cells has been observed in the Mucorini, the Entomophthorex, and the Saproleg- nieze among the Fungi, and in Chara crinita among the Alge. In some Mucorini (occasionally in Absidia septata, A, capillata, Muco fusiger, Sporodinia, always in Jucor tenuis) and in some Entomophthorez, namely, the conjugat- ing hyphee remained closed, and

the protoplasmic contents of each surrounds itself with a cell-wall, the cells thus pro- duced being quite similar to the normal zygospore ; these cells are termed azygospores. In the Saprolegnies and in Chara crinita the oospheres behave like oospores and germinate in the same manner. The details of the development of these asexual sexual reproductive cells has been fully investigated by De Bary in the case of the

oospheres of the Saprolegniex. In this case that differen- tiation of the protoplasm of the oogonium into ooplasm and periplasm which has been described above as occurring in the closely allied and completely sexual Peronosporee does not take place, but the whole is used in the formation of the oospheres. It is quite clear also that in the Sapro- legniez no sexual process takes place. In some species of Saprolegnia the antheridia are altogether absent, in others they are rudimentary, and even in those Saprolegnice (some species of Saprolegnia, Achlya, Aphanomyces) in which the antheridia are well-developed they remained closed. No case is known of male parthenogenesis, that is, of the development of an individual from a male repro- ductive cell, among plants in which the sexual differentia- tion of the reproductive cells is well-marked, but there are instances of the kind in more lowly organized plants. Thus in the Mucorini, mentioned above, one of the azygo- spores produced may be regarded as belonging to a male organ; again, in Ectocarpus the male planogamete germi- nates independently as well as the female. Among plants the sexual organs of which do not produce specialized re- productive cells instances of parthenogenesis also occur. Thus the spores (ascospores) which are produced by the female organ (ascogonium) of those Ascomycetes, such as the Erysiphez, Penicillium, Melanospora, Xylaria, in which the male organ is functionless or absent can only be regarded

the two nuclei were found to differ qualitatively, inasmuch as the generative nucleus stained readily when treated with carmine, picro-carmine, methyl-green, &c., whereas tle vegetative nucleus stained imperfectly or not at all. On the formation of the pollen- tube, the generative nucleus, and sometimes the vegetative nucleus also, is carried down into it, and the former then undergoes division into two; occasionally one of the new nuclei divides again. The pollen-tube grows down the style, enters the ovary, and is directed to the micropyle of an ovule. In the ovule the egg-apparatus lies at the mieropylar end of the embryo-sac, and the delicate wall of the embryo-sac covering it undergoes absorption. In its further growth the pollen-tube comes into contact with the synergide ; in some cases its growth now stops, and a portion of its protoplasm, with one or both of the generative nuclei, passes through the mucilaginous wall at the apex of the tube, without leaving any opening behind it, and travels to the oosphere ; in other cases the pollen-tube grows between the synergids to the oosphere, and at once pours a portion of its protoplasm with a generative nucleus into it. This is followed by the appearance of a second nucleus in the oosphere (the male pronucleus), which is the generative nucleus derived from the pollen-tube, which now travels towards the nucleus of the oosphere (female pronucleus) and fuses with it ; when the two pronuclei have each a nucleolus these also eventually fuse. Fertilization is now complete.

The synergide take no direct share in the process of fertilization, but become disorganized; their disorganization usually begins when the pollen-tube first comes into contact with them. They serve merely to direct the pollen-tube or its escaped contents to the oosphere and to provide nourishnient for them.

‘he fusion of the male and female pronuclei has been observed also in the oosphere of the Gymnosperms, and in the conjugation of Spirogyra.

as being parthenogenetically produced. Since plants are so commonly able to reproduce vege- Signifi-

Admitting, then, that sexual differ from asexual | tatively, the question arises as to the necessity of the joe of reproductive cells in the lack of

something which the | production, either sexually or asexually, of spores. The gicion

Cause of sexuality.

Sexual process

in Angio- generative cell, and a larger, the vegetative cell.

sperms.

latter possess, and which was thrown off either from the former or from the organs which produce them, we may go on to inquire what this something may be. Our in- formation on this point is very scanty, but Strasburger's views throw some light upon it. He considers, namely, that the formative processes of the cell are regulated by the hyaline plasma of the nucleus—the nucleo-idioplasma, as he terms it; the richer the nucleus is in this substance the more capable is the cell of producing new cells. The asexual reproductive cells are then cells the nuclei of which are especially rich in this substance. He considers that the differences between asexual and sexual reproductive cells is quantitative and not qualitative—that the nuclei of the former are rich in nucleo-idioplasma, those of the latter poor, either originally or by the throwing off of part of their substance in the mode described above. In en- deavouring to account for the further differentiation of sexual reproductive cells into male and female, it seems natural to suggest that the respective nuclei have under- gone a qualitative differentiation, and that in the sexual process the qualitative, as well as the quantitative, incompleteness of each is made good. Strasburger is, however, strongly of opinion that this is not so, but that the difference is purely quantitative. But it must be pointed out that, according to this view, there is no reason why a sexual process should not take place, either between two male cells or organs, or between two female cells or organs, a possibility which is never. realized, nor is it possible to account for the fact to be subsequently dis- cussed that in many cases a sexual process cannot take place between sexual cells or organs of a closely-allied origin.

The nature of the sexual process will be better under- stood by a detailed description of it in some particular case. Strasburger's observations on the process of fertilization in Angiosperms.

At the period of the dehiscence of the anther, the protoplasm of the pollen-grain undergoes division into two cells—a smaller, the At the time of pollination, when the pollen-grain is mature, it is usually the

case that the only persisting indication of the previous cell-division is the presence of two nuclei in the protoplasm. In many cases

The following isa brief account of the results of |

biological importance of these cells is very great. They are capable, namely, of retaining their vitality under external conditions, such as long drought, absence of food, extremes of heat and cold, which would prove fatal to the plant, and they therefore are essential to the maintenance of the species. F'urther they are of importance in the distribution of the species; they are light, readily transportable by wind or water, in some cases themselves actively motile. In this way they serve to prevent that close aggregation of individuals of the same species which would result from a continued vegetative multiplication, and would prove in- jurious to the species. In the case of Phanerogams, in which the macrospore is not set free from its sporangium, the same ends are obtained by the production of seeds.

The further question now arises as to the importance of the sexual process.

It appears that, if any given species, at least among Import- of ance of d sexuality,

the higher plants, is reproduced through a long series generations in a non-sexual manner, the individuals ten to degenerate, and the original well-developed form can only be reattained by the formation of a sexually produced spore. This result is to some extent realized by the fusion of two sexual cells or organs belonging to the same indi- vidual—that is, by self-fertilization—but more completely when the fusion takes place between

sexual cells or organs belonging to distinct individuals—that is, by cross-fertiliza-

tion. In some plants, as in the Peronospores and in those Cross fer-sexual Ascomycetes which have pollinodial antheridia, self- tilization.

fertilization alone is possible ; this is also the case in certain Phanerogams in which the arrangements are such (notably in cleistogamous flowers) that only pollen from its own anthers can reach the stigma of the flower. In most cases, however, the conditions under which the sexual process is carried on, such as the formation of free-swimming gametes

-and antherozoids, and of spermatia and pollen-grains which

can be readily conveyed from place to place, are such as to favour the occurrence of cross-fertilization. are special arrangements for the attainment of this end, the most general of which is diecism, that is, the produc- tion of the male and female organs by distinct organisms. Thus in certain Fucacee (Fucus vesiculosus, I'. nodosus,

In some there Diceism.

Forma- tion of fruit.

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F. serratus, Himanthalia lorea) some individuals bear only antheridia, and others only oogonia; among the Muscinex the plants are frequently either male or female; in the Isosporous Vascular Cryptogams the prothallia are usually hermaphrodite ; but exclusively male and female prothallia occur not unfrequently in the Filices and asa rule in the Equisetacese. In the Heterosporous Vascular Cryptogams dicecism is brought about in a somewhat different manner: these plants have, as mentioned above, two kinds of spores, macrospores and microspores; the former on germination always give rise to a female (archegoniate) prothallium, the latter to a male (antheridial) prothallium; hence the male and female organs are necessarily borne on distinct organ- isms. In some

Phanerogams even the two kinds of spores are produced by separate individuals, the flowers of the one producing pollen-grains (microspores) but no embryo-sacs, those of the other producing embryo-sacs (macrospores) but no pollen-grains. More special arrangements are to be found in the flowers of Phanerogams for ensuring cross-fertiliza- tion, and preventing self-fertilization, e.g., the development of highly-coloured perianth-leaves and the secretion of nectar to attract insects, dichogamy, heterostylism, &c. ; but it is impossible to do more than mention these here.

But besides these obvious structural arrangements for ensuring cross-fertilization and preventing self-fertilization there are in some cases imperceptible physiological con- ditions which even more certainly lead to the same results. It appears, namely, that in such cases no sexual process can take place between reproductive cells or organs of closely-allied origin. Thus, among the Algz, in Ecto- carpus and in Acetabularia, conjugation only takes place between planogametes derived from distinct gametangia, and in Dasycladus it only takes place between plano-gametes derived from gametangia borne by different indi- viduals. Again, in many Phanerogams, as Darwin has shown, the pollen of one flower is quite incapable of fertilizing the oospheres of its own ovules, and the pollen- grains from another flower borne by the same plant is but slightly, if at all, more potent. The pollen from the flower of another individual of the same species is potent, and this the more so the wider the difference between the individuals; the pollen from an individual of a different variety is more potent than that from an indi- vidual of the same variety.

The effect of the sexual process is not necessarily con- fined to the cells or organs which directly take part in it ; not infrequently it makes itself felt in adjoining organs, stimulating them to active growth, giving rise to the formation of a fruit or fructification. Thus in the Mu- corini an outgrowth of filaments, forming an incomplete or complete (Mortierella) investment to the zygospore, takes place from the sexual organs after conjugation; in Coleochzte the oogonium becomes surrounded, after the fertilization of the oosphere, by an investment formed by outgrowths from the adjacent vegetative cells; a cellular investment is formed in the same way round the fertilized procarpium in most Floridex, and round the

fertilized ascogonium in the Ascomycetes. The most familiar case of fruit-formation is that occurring in the Phanerogams ; here in many instances the carpels, in some the floral leaves of the perianth, and in some the floral receptacle (torus) grow actively after the fertilization of the oospheres has taken place, giving rise to a mass of succulent parenchymatous tissue. In the Orchidex the develop- ment of the ovules does not take place at all until the flower has been pollinated.

Germination of the Spores and Alternation of Generations. —tThe spores of plants may either germinate immediately on their production, or they may undergo a. longer or shorter period of quiescence ; those which are destined for

immediate germination have, as described above, a thin cell-wall, whereas those which are capable of undergoing a period of quiescence have a thick cell-wall. In some cases the spores are incapable of immediate germination, notably sexually produced spores; for instance, among the Algz, immediate germination is only known to take place in the case of the zygospores of Botrydium and Ectocarpus, and of the oospore of Fucus; among the Fungi the zygospores of the Mucorini and the oospores of the Peronosporez and Saprolegniez pass through a period of quiescence.

The mode of germination is not always the same.

either by protruding one or more filamentous outgrowths, or by the division of its protoplasm to form the tissue of the embryo. In some cases the spore behaves like a reproductive organ; from its protoplasm are formed a larger or smaller number of cells, either motile or non- motile, which are set free. In Acetabularia, and under certain circumstances in Botrydium, the asexually pro- duced spore behaves like a sexual reproductive organ (gametangium), giving rise to a number of planogametes ; similarly the spore of Protomyces produces within itself a number of conjugating sporidia. In some Peronospores (always in

Cystopus; occasionally, according to circum- stances, in Pythium, Phytophthora, and Peronospora) the asexually produced spore behaves like a sporangium, and gives rise to a number of zoospores from each of which a new individual is developed. This happens occasionally also in sexually produced spores. Among the Fungi, the formation of zoospores in the oospore occurs in various species of Peronosporez and Saprolegnies. Among the Algze, zoospores are formed in the zygospores of Pandorina and Ulothrix, and in the oospores of Cidogonium and Spheroplea. Cases of a similar kind are known also in the Phanerogams ; thus in some Coniferze, and notably in the Gnetaceous Ephedra altissima, a process of cell-forma-

tion goes on in the oospore, resulting in the formation of a Polyem- a larger or smaller number of cells from each of which an bryony.

embryo plant is developed. These cases, in which, namely, the spore, whether sexually or asexually produced, gives rise to a number of cells, each of which is capable, by itself, of developing into a new individual, are instances of what is known as polyembryony.

In some cases the cells formed in the sexually produced spore do not each give rise to a new individual; this obtains in the Hydro- dictyeer. In Hydrodictyon utriculatum the protoplasm of the zygospore gives rise to two or four large zoospores which cventu- ally come to rest and remain quiescent for several months ; these resting spores are termed, on account of their form, polyhedra. Ou germination, the protoplasm of the polyhedron gives rise to a number of small zoospores, the endospore protruding asa delicate vesicle, within which the zoospores are in active movement ; the zoospores eventually come to rest, without escaping from the en- dospore, and arrange themselves so as to form the meshes of a small sac-like net, which is a young Hydrodictyon ; the endospore is then disorganized, and the young net is set free as an independ- ent ccenobium.

Occasionally it happens that a portion only of the spore gives rise to the embryo. 'This is the case in the sexnally produced spores (oospores) of the Charace, and in those of the Conifer ; in Selaginella and in the Angiospermous Phanerogams one-half of the oospore gives rise to a

filamentous structure, the suspensor, the other half to the main body of the embryo.

It is very commonly the case that the spore, on germina- tion, gives rise to an organism unlike that by which the spore was produced.

sporogonium, consisting typically of a longer or shorter stalk, the seta, bearing a capsule (theca) which produces the spores. When one of these spores germinates, it does not give rise to another sporogonium, but to an incon- spicuous, usually filamentous, structure, the protonema,

In Germina-

most cases the spore gives rise directly to a new organism, tion of spores.

In a Moss, for example, the asexu- Alterna-

ally produced spores are developed by an organism, the tion of genera-

tions

Forma- tion of seed.

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upon which are developed, as lateral buds, moss-plants consisting of stem and leaves and bearing the sexual reproductive organs. Similarly, when the oospore has been formed by fertilization in the archegonium, it does not give rise to the sexual moss-plant, but to the asexual sporogonium. There is thus in the life-history of a Moss a regular alternation of a sexual with an asexual genera- tion; the former may be conveniently termed the oophore, the latter the sporophore; the asexually produced spore always gives rise to the oophore (moss-plant), the sexually produced spore (oospore) of the moss-plant always gives rise to the sporophore (sporogonium).

This kind of life-history is not peculiar to the Muscines, but it can be traced, more or less clearly, in all the vascular plants (Pteridophyta, Phanerogams). In the Isosporous Vascular plants, those, namely, which

produced spores of one kind only (Filices, Equisetaceze, Lycopo- diacez), the asexually produced spore gives rise, on germination, to a small inconspicuous organism consisting entirely of cellular tissue, termed the prothallium, on which the sexual reproductive organs, the antheridia and archegonia, are borne; the oospore produced by fertiliza- tion in the archegonium gives rise to the well-developed plant, consisting of stem, root, and leaves, which produces the sporangia and spores. The prothallium, derived from the asexually produced spore, is clearly the sexual genera- tion or oophore; the fully-developed plant derived from the sexually produced spore is the asexual generation or sporophore. In the Heterosporous Vascular plants, those, namely, which produce spores of two kinds (Rhizocarpe, Ligulatse, Phanerogams), the spores likewise give rise to prothallia, though they may be rudimentary. The micro- spore gives rise to a prothallium which is reduced to a single antheridium, and which, with the exception of Salvinia among the Rhizocarps, and of the Phanerogams, does not project from the spore; in Salvinia and in the Phanerogams it projects from the spore in the form of a closed tube, which is known in the Phanerogams as the pollen-tube. Similarly the macrospore of these plants gives rise to a small cellular prothallium bearing one or more archegonia, which in the Rhizocarps extends beyond the limits of the spore, but does not become free from it ; in the Ligulate (Selaginella and Isoetes) the prothallium is only partially exposed by the rupture of the coats of the spore, and in the Phanerogams, where it is termed the endosperm, it remains permanently and completely enclosed within the spore (embryo-sac). In the Heterosporous Vascular plants, then, as in the Isosporous, the asexual generation or sporophore is that which is termed the plant, which is highly differentiated morphologically and histolo- gically, and which produces the sporangia and the spores ; the sexual generation or oophore is here represented by two prothallia, the one exclusively male, the other exclu- sively female, derived respectively from the microspores and the macrospores.

Such a life-history can be stated generally in the follow- ing manner :— twice in its course the individual consists of a single cell, the spore, which in the one case has been produced asexually, in the other sexually; the sexual generation (oophore) springs from the asexually produced spore, and gives rise to the sexually produced spore (oospore) from which the

asexual generation (sporophore) is developed. It is of interest to note that in most cases the organism developed from the sexually produced spore is much more highly organized than that developed from the asexually produced spore.

A peculiarity of the macrospores of the Phanerogams is worthy of mention here, as it leads to the production of that structure, the seed, which is characteristic of Phanerogams; the production of a seed constitutes, in fact, the only real and constant distinction betwecn Phanerogams and Cryptogams.

REPRODUCTION

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Asa rule the asexually produced spores of plants become free from the sporangium in which they have been formed. In Phanerogams this is true only of the microspores (pollen-grains), the macrospores (embryo-sacs) remaining permanently enclosed in the sporangia (mucellus) producing them. This being the case, their germination, 7.¢., the formation of endosperm, must take place within them whilst enclosed in the sporangium ; and, further, the formation of the female reproductive organs and the development of the embryo must take place under these circumstances also. The result is the production of a seed. In a typical secd three generations of the plant are represented ; they are as follows : — sporangial tissue belonging to the parent sporophore=perispcrm ; tissue belonging to the oophore =cndosperm ; the new sporophore =embryo.

In the seed the development of the new asexual plant procecds to a certain limit. When this is reached the development ceases, and it is only when the seed is placed under favourable conditions that the further development of the embryo, ¢.¢., the germination of the seed, can take place.

It has now been shown that in the life-history of the Muscineze and in plants above them in the vegetable kingdom there is a regular alternation of generations, and the question now arises as to how far this is true of

the life-history of plants lower than the Mosses, that is, in the Thallophytes. It is clear that no such alternation can take place in the life-history of those which are known to reproduce only either sexually or asexually, nor in that of those individuals which produce spores both sexually and asexually, either simultaneously or at different times.

The following are instances of the above-mentioned possible cases :—

Thallophytes reproduced only by asexually produced spores :—

Algxw: Cyanophycee or Phycochromacee ; Protococcacee ; Sphacelarie and Laminaries so far as known at prescnt.

Fungi: Schizomycetcs ; Saccharomycetes ; Myxomycetes ; some Chytridiee ; probably many Mucorini; a few Peronosporee (probably Phytophthora infestans and Pythiwm intermedium) ; some Ascomycetes and Ure-

dine ; Basidiomycetes.

Thallophytes reproduecd only by secually produced spores :—

Alge: Conjugate ; Fucacee ; Spheroplee. The case of the Characex will be subsequently discussed.

Fungi: afew Peronosporee (Pythiwm vexans, Artotrogus) ; Aneylistes Clostertt ; Aplanes Brawnit among the Sapro- leeniex ; some Ascomycetes, Eremascus, Sordaria (Hypocopra), Ascobolus furfuraccus, Pyronema confluens, Gymnoascus, Collemacce and other Lichen-Fungi ; some Uredinex in which only ecidiospores are known.

Thallophytes in which the same form produces spores both asexually and sexually :—

Algz: Vaucheria, Hydrodictyon, Ulothrix, CGidogonium, some Floridesx (¢.g., Polysiphonia vartegata).

Fungi: Mucorini; most Peronosporee and Saprolegniese ; Monoblepharis ; among the Ascomycetes, the Erysi- phee, Eurotium, Penicillium,

Nectria; some Uredince (Uromyces appendiculatus, U. Behenis, U. Serophulariz, U. Cestri, Puceinia Berberidis).

In some of the Alge, as in the Volvocineze, in the life- history of which distinct sexual and asexual forms occur, no alternation of generations can be traced, since there is no certainty as to the nature of the form arising from any given spore; the form developed from the asexually pro- duced spore is not, as in the typical life-listory of the Moss, necessarily sexual, nor is the individual produced from the sexually produced spore necessarily asexual. But in the life-history of some others an alternation of genera- tions istraceable. Thus in the Siphonaceous Acetabularia the plant produces spores; these, as mentioned above, behave on germination as gametangia; the gametes con- jugate to form a zygospore, and from the zygospore the asexual Acetabularia springs. Here there is a distinct and regular alternation of generations; the Acetabularia- plant is the asexual generation (sporophore), the gamet- angia alone representing the sexual generation (oophore). The life-history of Botrydium, another Siphonaceous Alga, is essentially the samé as that of Acetabularia, but it is frequently less regular ; thus the resting-spores, instead of producing gametes, may directly germinate to form a

Alterna- tion of genera- tions in Thallo- phytes;

in Alge;

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Botrydium-plant, a process which is clearly a case of apogamy; and, further, the Botrydium-plant does not necessarily produce resting-spores, but may produce zoospores by which it is directly reproduced. In Coleo- cheete, too, alternation of generations is indicated. The oospore produces by division a small individual which is always asexual, giving rise to zoospores which likewise produce asexual individuals; this asexual reproduction may continue through a number of generations until eventually a sexual individual is developed. In Coleo- cheete it is only in the case of the sexually produced spore that the nature of the resulting organism is known; it always gives rise to an asexual form, whereas the asexually produced spores give rise to an individual which may be either sexual or asexual. In the Characesw the oospore always gives rise to an imperfectly developed form, the proembryo, which is to be regarded as the sporophore ;

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Polystigma (Ascomycete), the ascospore gives rise to a promycelium which bears sporidia, and these sporidia give rise to the sexual form. In Endophyllum (Uredinez) the life-history is precisely the same as that of Polystigma: the promycelium is the sporophore generation, the myce- lium developed from the sporidium the oophore. In other Uredinew the life-history is slightly modified in that asexually produced spores of at least two kinds make their appearance. The sexually produced spore (xecidiospore) gives rise to a mycelium which, in Gymno- sporangium and Hemipuccinia, bears asexually produced spores, teleutospores ; in Puccinia Graminis the formation of teleutospores is preceded by that of somewhat different spores, the uredospores; in any case the teleutospore gives rise, on germination, to a second asexual generation, the

promycelium, which bears sporidia; from these the sexual cecidium-bearing generation is developed.

The rule that, in the alternation of generations, the alter- Alterna- nate generations are developed from spores produced either tion of sexually or asexually is not, however, without exceptions, bee for in some instances the one generation may spring Vege- sorfered tatively from the other without the intervention of a spore. with by This is brought about by the suppression either of the apogamy

sexually produced spore or of the asexually produced spore ; ° ®PS-

however, it never produces spores, but gives rise to the sexual Chara-plant (oophore) vegetatively by budding. in The study of the life-history of the Fungi is attended Fungi. with considerable difficulty, partly on account of the fact that in many cases the development of the sexual organs is dependent upon a combination of external circumstances which may but rarely present itself, and partly on account

of there being frequently a great difference in habit between the sexual and asexual forms of the same plant, a difference which is sometimes accentuated, in parasitic Fungi, by the occurrence of the two forms on different plants as hosts (heterecism). But there are Fungi in the life-history of which alternation of generations has been ascertained. Before entering upon an account of these, it must be stated that the term "sexually produced spore" will be applied not only to those the formation of which is known to be preceded by a sexual process, but also to those which are formed probably or actually without a sexual process—in a word, apogamously—but which may be considered, as pointed out above, to be homologous with those which are actually sexually produced.

In Mucor Mucedo and Phycomyces nitens among the Mucorini, for instance, the zygospore gives rise on germination to an imperfectly developed individual (pro- mycelium) which is entirely asexual and produces spores; one of these spores, in turn, gives rise to an individual which produces spores asexually but may also bear sexual reproductive organs. Essentially the same life-history may be traced in certain Peronosporex (Phytophthora omnivora, Pythium proliferum). In these

cases the form developed from the sexually produced spore is always asexual, where- as that derived from the asexually produced spore may be sexual, but it always produces spores asexually; hence there is not a strict alternation of an asexual and a sexual generation. In others the alternation is complete. In the Ustilagineze, for instance, the asexually produced spore gives rise to an imperfectly developed mycelium (promycelium), which is the sexual generation; it produces the sporidia, which conjugate in pairs, and from the product of conjugation springs the mycelium, which bears asexually produced spores.

Essentially the same life-history has been traced in some Ascomycetes and Uredinexw. In Claviceps (Ascomy- cete) the sexually produced spore (ascospore) gives rise to an asexual form, long regarded as a distinct genus under the name of Sphacelia, from the spores of whick the sexual form is reproduced. In Sclerotunia (Pexiza) Fuckeliana (Ascomycete), a similar regular alternation of generations occasionally but not always occurs; the ascospore may give rise to an asexual form, long known as Botrytis cinerea, and when it does so the alternation of generations is complete ; but it may give rise to another sexual genera- tion, in which case no alternation takes place. In

the former is an instance of apogamy, the latter of apospory.

Thus in the apogamous Ferns mentioned above, the asexual generation (sporophore) is developed as a bud upon the sexual generation (oophore); and in Botrydium the gametangium which is the representative of the sexual generation may, instead of producing gametes, produce zoospores, in which case the new asexual individual is not developed from a sexually produced zygospore, but from an asexually produced zoospore. Similarly, in the apo- sporous Ferns and Mosses and in the Characee the oophore is developed as a bud from the sporophore.

The alternation of generations may be also interfered with by a combination of apogamy and apospory. This is the case, namely, when one generation gives rise to its like by vegetative budding, sporophore to sporophore, oophore to oophore. For instance, when, as in the Phanerogams mentioned above (Cclebogyne, Funkia, Nothoscordum, Citrus), embryos are produced vegetatively from the tissue of the nucellus,

that is, sporophore from sporophore, the typically intervening formation of spores, first, by the asexual method and, secondly, by the sexual method is suppressed. This is necessarily always the case among Phanerogams when one plant is produced vegetatively from another. A striking instance of the same thing has been observed by Goebel in some species of Isoetes, in which an Isoetes plant was produced on the leaf in place of a sporangium. Similarly when oophore springs vegetatively from oophore, the typically intervening formation, first, of the sexually produced spore and, secondly, of the asexu- ally produced spore, is suppressed. This occurs when, as mentioned above, a Moss-plant gives rise by budding or by means of gemmz to another Moss-plant, and when a Fern- prothallium gives rise to another by means of gemme.

BiptiogRaPuy. —General: Sachs, Yext-book, 2d English edition, 1882; Goebel, Grundziige der Systematik, 1882; Vines, " Alternation of Gencrations in Thallophytes," Journal of Botany, 1879; Pringsheim, "Ueber den Generationswechsel bei den Thallophyten," Jahrb. f. Wiss. Bot., xi., 1877. Algw: Falkenberg, in Schenk's Handbuch der Botanik, ti., 1882; Vines, "The Pro-embryo of Chara," Journal of Botany, 1878. Fungi: De Bary, Vergleichende Morphologie und Biologie der Pilze, 1884. Ferns: Cramer, " Ueber die geschlechtslose Vermehrung des Farn-prothaliums," in Denk- schriften der Schweitz. naturforsch. Gesellschaft, xxviii., 1880; Bower, "On Apospory in Ferns," Jour. Linn. Soc., Botany, vol. xxi., 1885. Afosses: Pringsheim, Monatsbericht d. Akad. d. Wiss. in Berlin, 1876; Stahl, Botanische Zeitung, 1876. Phystology : Strasburger, Ueber Befruchtung wnd Zellthetlung, 1878, and Neue Untersuchungen tiber den Befruchtungsvorgang bet den Phanero- gamen, 1884. (SH. V.)

REPSOLD, a family of German instrument makers. JOHANN GeEoRG Repsotp (1771-1830), was born at Wremen in Hanover on September 23, 1771, became an engineer and afterwards chief of the fire brigade in Hamburg, where he started business as an instrument maker early in the present century. He was killed by the fall of a wall during a fire on January 14, 1830. The busi- ness has been continued by his sons Georg and Adolf and his grandsons Johannes and Oscar.

REPT

NTELINN SAN writers comprised the animals which popularly are known as Tortoises and Turtles, Croco- diles, Lizards and Snakes, Frogs and Toads, Newts and Sala- manders, under the name of Oviparous Quadrupeds or four- limbed animals which lay eggs. Linnzus, desirous of giving expression to the extraordinary fact that many of these animals pass part of their life in the water and part on land,! substituted the name of Amphibia for the ancient term. Subsequent French naturalists (Lyonnet? and Brisson') considered that the creeping mode of locomotion was a more general characteristic of the class than their amphibious habits, and consequently proposed the scarcely more appropriate name of Leptiles.

As naturalists gradually comprehended the wide gap existing between Frogs, Toads, &c., on the one hand, and the other Oviparous Quadrupeds on the other, they either adopted the name of Batrachia for the former and that of Amphibia for the latter, or they restricted the term Amphibia to Batrachians, calling the remainder of these creatures Reptiles. Thus the term Amphibia, as used by various authors, may apply (1) to all the various animals mentioned, or (2) to Batrachians only—and thus it has been used in the article AmMpuipia in the present work. The term Reptiles is used (1) by some for all the animals mentioned above, and (2) by others, as in the present article, for the same assemblage of animals after the ex- clusion of Batrachians. Other terms more or less synony- mous with Amphibians and Reptiles in their different senses have been used by the various systematists, as we shall see hereafter.

Equally varying are the limits of the term "Saurians," which occurs so frequently in every herpetological treatise. At first it comprised living Crocodiles and Lizards only, with which a number of fossil forms were gradually associ- ated. As the characters and affinities of the latter became better known, some of them were withdrawn from the Sau- rians, and at present it is best to abandon the term alto- gether.

History AND LITERATURE. a. The General Subject.

By some feature of their organization or some peculiarity in their economy Reptiles have always forced themselves upon the observation of man or excited his imagination, so that certain kinds are mentioned in the earliest written records or have found a place among the fragments of the oldest relics of human art. Such evidences of a popular knowledge of Reptiles, however, form no part of a succinct review of the literature of the subject such as it is proposed to give here. We distinguish in it five periods :—(1) the Aristotelian; (2) the Linnean (formation of a class Amphibia, in which Reptiles and Batrachians are mixed) ; (3) the period of the elimination of Batrachians as one of

1 " Polymorpha in his amphibiis natura duplicem vitam plerisque concessit."

2 Théologie des Insectes de Lesser (Paris, 1745), i. 91, note 5.

3 Regne animal divisé en neuf classes (Paris, 1756).

J. G. Repsold introduced essential improvements in the meridian eircles by substituting mieroseopes (on Ramsden's plan) for the ver- niers to read the ecireles, and by making the various parts perfeetly symmetrical. For a nuniber of years the firm was foremost in this special braneh and furnished meridian cireles to the observatories at Hamburg, Konigsberg, Pulkova, &e.; later on the aetivity in this direction declined, while Pistor and Martins of Berlin rose to emi- nenee in the manufacturing of transit circles. But after the diseon- tinuanee of this firm that of Repsold has again come to the front, not only in the construction of transit circles, but also of equatorial mountings and more especially of heliomcters (see M1CROMETER).

ILES

the Reptilian orders (Brongniart) ; (4) that of the separa- tion of Reptiles and Batrachians as distinct subclasses ; (5) that of the recognition of a class Reptilia as part of the Sauropsida (Huxley).

1. The Aristotelian Period.—As in other branches of Aristotle.

zoology, we have to start with ARISTOTLE, who was the first to deal with the Reptiles known to him as members of a distinct portion of the animal kingdom, and to point out the characteristics by which they resemble each other and differ from other vertebrate and invertebrate animals. As the plan of his work, however, was rather that of a comparative treatise of the anatomical and physiological characters of animals than their systematic arrangement and definition, his ideas about the various groups of Reptiles are not distinctly expressed, but must be gleaned from the terms which he employs. And even when we make due allowance for the fact that we are in posses- sion of only a part of his writings, we cannot but per- ceive that he paid less attention to the study of Reptiles than to that of other classes; this is probably due to the limited number of kinds with which he could be ac- quainted from the fauna of his own country, and to which only very few extra-European forms, like the Crocodile, were added from other sources. And, whilst we find in some respects a most remarkable accuracy of knowledge, there is sufficient evidence that he neglected every-day op- portunities of information, as if Reptiles had not been a favourite study. Thus, he has not a single word about the metamorphoses of Batrachians, which he treats of in connexion with Reptiles.

Aristotle makes a clear distinction between the scute or scale of a Reptile, which he describes as qoAis, and that of a Fish, which he designates as Aemis. He mentions Reptiles (1) as oviparous quadrupeds with scutes, viz., Saurians and Chelonians; (2) as oviparous apodals, viz., Snakes ; (3) as oviparous quadrupeds without scutes, viz., Batrachians. He consideted the first and second of these three groups as much more nearly related to each other than to the third. He says :—

"The genus of Snakes resembles that of Lizards, nearly all the charaeters being common to both, if the Lizard be conceived of as prolonged and without legs. They possess seutes, and are similar to Lizards above and below, but they lack testicles; and, like Fishes, they possess two excretory duets which coalesce, and the uterus is large and bipartite. In other respects their internal parts are like those of Lizards, save that all the intestines are long and narrow. The tongue is narrow, long, black, and very exsertile. It is a peculiarity of Snakes and Lizards that they possess a

bifid tongue ; but the points of the tongue of Snakes are fine like hairs. All Snakes are "careharodont" (have acute teeth) ; they have as many ribs as there are days in the month, viz., 30. Some say that Snakes recover the loss of an eye ; the tail is reproduced in Lizards and Snakes when eut off," &c.

Thus accurate statements and descriptions are sadly mixed with errors and stories of, to our eyes, the most absurd and fabulous kind. The most complete accounts are those of the Crocodile (chiefly borrowed from Herodo- tus) and of the Chameleon, which Aristotle evidently knew from personal observation, and which he had dis-

sected himself. The other Lizards mentioned by him are the common Lizards (cavpa), the common Seps (xadkiés or fuyvis), and the Gecko (doxadkaBdrys or KopOvAos). Of Snakes (of which he generally speaks as édus) he knew the Vipers (éxus or éidva), the common Snake (#8pos),

of Reptiles mentioned in his work. But it may be estimated at about fifty, not including some marine fishes and fabulous creatures. He figures (or rather reproduces the figures of) about forty,—some species being represented by several figures.

and the Blindworm (rvpdivys dsdis), which he regards as a Snake; he further mentions the Egyptian Cobra and Dragons (dpéxwv)—North-African Serpents of fabulous size.

2. Linnean Period: Formation of a Class Amphibia,— Precur- Within the century which succeeded these compilatory sors of works (1650-1750) fall the labours which prepared the Lim#us.

John- ston.

f Chelonians he describes in a perfectly recognizable manner Land Tortoises (yeAdvy), Freshwater Turtles (€uvs), and Marine Turtles (yeAdvy 4 Oadarria).

Passing over eighteen centuries we find the knowledge of Reptiles to have remained as stationary as other branches of natural history, perhaps even more so. The Reptile fauna of Europe was not extensive enough to attract the energy of a Belon or Rondelet; popular prejudice and the difficulty of preserving these animals deterred from their study ; nor was the mind of man sufficiently educated not to give implicit credence to the fabulous tales with which every account of Reptiles in the 15th and 16th centuries was replete. The art of healing, however, was developing into a science based upon rational principles, and consequently not only those Reptiles which formed part of the materia medica but also the venomous Snakes became objects of study to the physician. Snakes, and especially the Viper, were treated of in distinct divisions of general works, or in separate monographs. It is true that these treatises were written less with the view of elucidating the natural history of the animals than with that of describing their poisonous nature and indicating the manner in which they should be used as medicaments, the majority of the writers being ignorant of the structure of the venom-apparatus, and of the distinction between non-venomous and venomous Snakes.

Nothing can show more clearly the small advance made by herpetology in this long post-Aristotelian period than a glance at the celebrated work, De Differentiis Animalium Libri decem (Paris, 1552), by Epwarp Worron (1492- 1555). Wotton treats of the Reptiles which he designates as Quadrupedes ovipare et Serpentes in the sixth book of his work. 'They form the second division of the Quadrupedes que sangunem habent, and are subdivided in the following " genera " :—

Crocodilus et scineus (cap. ev.) ; Testudinum genera (cvi.); Ran- arum gencra (cvii.); Lacerte (cviii.); Salamandra et seps quad- rupes (cix.); Stellio (cx.); Chameleo (cxi.) ; Serpentes (cxii.), a general account, the following being different kinds of Serpents: —Hydrus et alii quidam serpentes aquatiles (cxiii.) ; Serpentes berrestres et primo aspidum genera (cxiv.); Vipera, dipsas, cer- astes, ct hammodytes (cxv.); Hemorrhus,

sepedon, seps, cenchris, ct cenchrites (cxvi.); Basiliscus ct alii quidam serpentes quorum vencnum remedio caret (cxvii.) ; Draco, amphisbzna, et alii quidam serpentes quorum morsus minus affert periculi (cxviii.).

As regards the treatment of the subject, Wotton's work might with propriety be termed " Aristoteles redivivus." The plan is the same, and the observations of the Greek naturalist are faithfully, sometimes literally, reproduced. It is surprising that even the Reptiles of his native country were most imperfectly known to the author.

A new impetus for the cultivation of the study of natural history was given through the observations and writings of travellers in India, Africa, and America. With the enlargement of geographical knowledge that of Reptiles was also advanced, as is sufficiently apparent from the large encyclopzedic works of GEsNER, ALDROVANDI, and Jounston. The last-named author especially, who published the various portions of his natural history in the middle of the 17th century, was able to embody in his compila- tions notices of numerous Reptiles observed by Francisco Hernandez in Mexico and by Marcgrave and Piso in Brazil. As the author had no definite idea of the Ray-Linnzan term species," it is not possible to give the exact number

way for and exerted the greatest influence on Ray and Linneus. Although original researches in the field of herpetology were limited in extent and in number, the authors had freed themselves from the purely literary or scholastic tendency. Men were no longer satisfied with reproducing and commenting on the writings of their pre- decessors ; the pen was superseded by the eye, the micro- scope, and the knife, and statements were tested by experiment, This spirit of the age manifested itself, so far as the Reptiles are concerned, in CHARA's and Repr's admirable observations on the Viper, in Masor's and VaL- LISNIERI'S detailed accounts of the anatomy of the Chame- leon, in the researches of JacoBmus into the metamor- phoses of the Batrachians and the structure of Lizards, in Duray's history of the development of the Salamander (for Batrachians are invariably associated with Reptiles proper); in Tyson's description of the anatomy of the Rattlesnake, &c. The natural history collections formed by institutions and wealthy individuals now contained

not merely skins of Crocodiles or Serpents stuffed and transformed into a shape to correspond with the fabulous descriptions of the ancient dragons; but, with the discovery of alcohol as a means of preserving animals, Reptiles entire or dissected were exhibited for study ; and no opportunity was lost of obtaining them from travellers or residents in foreign countries. Fossils also were now acknowledged to be re- mains of animals which had lived before the flood, and some of them were recognized as those of Reptiles.

The contributions to a positive knowledge of the animal kingdom became so numerous as to render the need of a methodical arrangement of the abundance of new facts more and more pressing. Of the two principal systematic attempts made in this period the first ranks as one of the most remarkable steps of the progress of natural history, whilst the second can only be designated as a signal failure, which ought to have been a warning to all those who in after years classified animals in what is called an "artificial sys- tem." As the latter attempt, originating with Kier (1685 — 1759), did not exercise any further influence on herpeto- logy, it will be sufficient to have merely mentioned it. Joun Ray (1628-1705) had recognized the necessity of in- troducing exact definitions for the several categories into which the animals had to be divided, and he maintained that these categories ought to be characterized by the structure of animals, and that all zoological knowledge had to start from the "species" as its basis. His defini- tion of Reptiles as " animalia sanguinea pulmone respirantia cor unico tantum ventriculo instructum habentia ovipara" fixed the class in a manner which was adopted by the naturalists of the succeeding hundred and fifty years. Nevertheless, Ray was not a herpetologist; he never made these animals his special study, as is evident from the way in which he subdivides the class, as well as from his imperfect treatment of the species. His knowledge of Reptiles is chiefly derived from the researches of others, from whose accounts, however, everything not based upon reliable demonstration is critically excluded. He begins with a chapter treating of Frogs (Rana, with two species), Toads (Bufo, with one species), and Tortoises!

1 In associating Tortoises with Toads Ray could not disengage him- self from the general popular view as to the nature of these animals, which

found expression in the German Schildkréte (“ Shield-toad ”).

XX. — 55

Ray.

Linnezeus,

Laurenti.

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(Testudo, with fourteen species). The second group com- prises the Lacert#, twenty-five in number, and includes the Salamander and Newts; and the third the Serpentes, nine species, among which the Limbless Lizards are enumerated.

Except in so far as he made known and briefly char- acterized a number of Reptiles, our knowledge of this class was not advanced by Linnaius. His notions as to the relation of the various types among themselves and to the other vertebrates were the same as those of Ray, and the progress made by herpetology in the various editions of the Systema Nature is therefore of a merely formal character. That Linneeus associated in the 12th edition cartilaginous and other Fishes with the Reptiles under the name of Amphibia Nantes was the result of some misunderstanding of an observation by Garden, and is not to be taken as a premonitory token of the recent discoveries of the relation between Batrachians and Fishes. Linnzeus places Reptiles, which he calls Amphibia, as the third class of the animal kingdom; he divides the genera thus :—

ORDER 1. Reprites.—Testudo (15 species); Rana (17 sp.); Draco (2 sp.) ; Lacerta (48 sp., including 6 Batrachians).

ORDER 2. SERPENTES.—Crotalus (5 species); Boa (10 sp.) ; ae (96 sp.); Anguwis (15 sp.); Amphisbena (2 sp.) ; Cecilia

Sp.).

None of the naturalists who under the direction or influence of Linneeus visited foreign countries possessed any special knowledge of or predilection for the study of Reptiles; all, however, contributed to our acquaintance with tropical forms, or transmitted well-preserved specimens to the collections at home, so that GMELIN, in the 13th edition of the Systema Nature, was able to enumerate three hundred and seventy-one species.

The man who, with the advantage of the Linnzan method, first treated of Reptiles monographically, was Laurent. In a small book! he proposed a new division of these animals, of which some ideas and terms have survived into our times, characterizing the orders, genera, and species in a much more precise manner than Linnzeus, giving, for his time, excellent descriptions and figures of the species of his native country. Laurenti might have become for herpetology what Artedi was for ichthyology, but his resources were extremely limited. He himself complains that he had no literary intercourse with foreign naturalists, and access to but a few works (he especially mentions Seba's Thesaurus) and one collection only,

The circumstance that Chelonians are entirely omitted from his Synopsis seems due rather to the main object with which he engaged in the study of herpetology, viz., that of examining and distinguishing Reptiles reputed to be poisonous, and to want of material, than to his convic- tion that Tortoises should be relegated to another class. He divides then the class into three orders :—

1. SALIENTIA, with the genera Pipa, Bufo, Rana, Tyla, and one species of " Proteus," viz., the larva of Pseudis paradoxa.

GRADIENTIA, the three first genera of which are Tailed Batrach-

ians, viz., two species of Proteus (one being the P. anguinus), Triton, and Salamandra; followed by true Saurians— Caudiverbcra, Gecko, Chameleo, Iguana, Basiliscus, Draco, Cordylus, Crocodilus, Scincus, Stellio, Seps.

3. SERPENTIA, among which he continues to keep Amphisbana, Cecilia, and Angwis, but the large Linnean genus Coluber is divided into twelve,

chiefly from the scutellation of the head and form of the body.

The work concludes with an account of the experiments made by Laurenti to prove the poisonous or innocuous nature of those Reptiles of which he could obtain living specimens,

u Specimen medicum exhibens Synopsin Reptilium emendatam cum experimentis circa venena et antidota Reptilium Austriacorum, Vienna, 1768 (8vo, pp. 214, with 5 plates).

REP Pines

The next general work on Reptiles is by LAc#PEDE. Lacépéde.

[11sTORY.

It appeared in the years 1788 and 1790 under the title Tlistoire Naturelle des Quadrupédes Ovipares et des Serpens (Paris, 2 vols. 4to). Although as regards treatment of details and amount of information this work far surpasses the modest attempt of Laurenti, it shows no advance towards a more natural division and arrangement of the genera. The author depends entirely on conspicuous external characters, and classifies the Reptiles into (1) oviparous quadrupeds with a tail, (2) oviparous quad- rupeds without a tail, (3) oviparous bipeds (CAzrotes and Pseudopus), (4) Serpents,—an arrangement in which the old confusion of Batrachians and Reptiles and the imper- fect definition of Lizards and Snakes are continued, and which it is worthy of remark we find also adopted in Cuvier's Tableau Elémentaire de UV Histoire Naturelle des Animaua (1798), and nearly so by LATREILLE in his Histoire Naturelle des Reptiles (Paris, 1801, 4 vols. 12mo). Lacépéde's monograph, however, remained for many years deservedly the standard work on Reptiles, on account of the ability with which the author collected all reliable information on the various species, and on account of the facilities which it afforded for determining them. The numerous plates with which the work is illustrated are, for the time, well drawn, and the majority readily recog- nizable.

3. The Period of Elimination of Batrachians as one of the Brong- Reptilian Orders.—A new period for herpetology com- niart.

mences with ALEX. Bronentart,? who in 1799 first recog- nized the characters by which Batrachians differ from the other Reptiles, and by which they form a natural passage to the class of Fishes. Cecilia (as also Langaha and Acrochordus) is left by Brongniart with hesitation in the order of Snakes, but Newts and Salamanders henceforth are no more classed with Lizards. He leaves the Batra- chians, however, in the class of Reptiles as the fourth order. The first order comprises the Chelonians, the second the Saurians (including Crocodiles and Lizards), the third the Ophidians—terms which have been adopted by all succeeding naturalists. Here, however, Brongniart's merit on the classification of Reptiles ends, the definition and disposition of the genera remaining much the same as in the works of his predecessors.

The activity in France in the field of natural science Daudin,

was at this period, in spite of the political disturbances, so great that only a few years after Lacépéde's work another, almost identical in scope and of the same extent, appeared, viz., the Histoire Naturelle Générale et Parti- culiére des Reptiles of F. M. Davpin (Paris, 1802-3, 8 vols. 8vo). Written and illustrated with less care than that by Lacépéde, it is of greater importance to the herpetologists of the present day, as it contains a consider- able number of generic and specific forms described for the first time. Indeed, at the end of the work, the author states that he has examined more than eleven hundred specimens, belonging to five hundred and seventeen species, all of which he has described from nature. The system adopted is that of Brongniart, giving to the work a character by which the modern herpetologist is most favourably impressed. The genera are well defined, but ill arranged; it is, however, noteworthy that Cexcidea takes now its place at the end of the Ophidians, and nearest to the succeeding order of Batrachians.

The next step in the development of the herpeto- logical system was the natural arrangement of the genera. This involved a stupendous amount of labour; by a careful thorough examination of all the types of Reptiles

then known, reliable characters had to be discovered, and by means of the principle of the subordination of

2 Bull. Acad. Sci., 1800, Nos. 35, 36.

Dumeéril, Oppel, and Cuvier.

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characters the genera had to be grouped into families within Brongniart's orders. Although many isolated con- tributions were made by various workers, this task could be successfully undertaken and completed in the Paris Museum only, in which, besides Seba's and Lacépéde's collections, many other herpetological treasures from other museums had been deposited by the victorious generals of the empire, and to which through Cuvier's reputation objects from every part of the world were attracted ina more peaceful and voluntary manner. The men who devoted themselves to this task were A. M. C. DumERIL, OppEL, aud Cuvier himself. It is the duty of the bio- grapher rather than the historian to ascertain what share of the merit in building up the new system should be allotted to each of these three. Oppel was a German who, during his visit to Paris (1807-8), attended the lectures of Duméril and Cuvier, and at the same time studied the materials to which access was given to him by the latter in the most liberal manner. Duméril} main- tains that Oppel's ideas and information were entirely derived from his lectures, and that Oppel himself avows this to be the case. The passage,? however, to which he refers is somewhat ambiguous; and it is certain that there is the greatest possible difference between the arrange- ment published by Duméril in 1806 (Zoologie Analytique, Paris, 8vo) and that proposed by Oppel in his Ordnun- gen, Lamilien, und Gattungen der Reptilien (Munich, 1811, 4to). There is no doubt that Oppel profited largely by the teaching of Duméril; but, on the other hand, there is sufficient internal evidence in the works of both authors, not only that Oppel worked independently, but also that Duméril and Cuvier owed much to their younger fellow- labourer, as Cuvier himself indeed acknowledges more than once.

Oppel's classification may be shortly indicated thus :—

Orprr 1, TESTUDINATA orn CHELONIENS.

HISTORY. |

Fam. 1. Cnenonii (gen. Mydas, Coriacea). Fam. 2. AMyD& (gen. Trionyx, Chelys, Testudo, Emys). ORDER 2. SQUAMATA. Sect. A. SAURII. Fam. 1. Crocopinini (gen. Crocodilus, Gavialis, Alligator). Fam. 2. Grckorpxs (gen. Gecko, Stellio, Agama). Fam. 3. IevANorpes (gen. Camexleo, Draco, Iguana, Basiliscus, Lophyrus, Anolis). Fam. 4. Lacerrini (gen. Zupinambis, Dracena, Lacerta, Tachy- dromus). Fam, 5, SciNcoIDES (gen. Seincus, Seps, Scheltopusik, Anguwis). Fam, 6. Cuaucipicl (gen. Chalcides, Bimanus, Dipes, Ophi- SQUurTUs). Sect. B. Opnip11. Fam. 1. ANGUIFORMES (gen. Tortrix, Amphisbena, Typhlops). Tam. 2. ConstTRICTORES (gen. Boa, Eryx). Fam. 3. Hypri (gen. Platurus, Hydrophis). Fam. 4, PsEUDO-VIPER& (gen. Acrochordus, Erpeton). Fam. 5. CRoTauini (gen. Crotalus, Trigonoccphalus). Fam. 6. VIPERINI (gen. Vipera, Pseudoboa). Fam, 7. CoLuBRINI (gen. Coluber, Bungarus).

Orpver 3. NUDA or BATRACII.

In this classification we notice three points, which indicate a decided progress towards a natural system. (1) The four orders proposed by Brongniart are no more considered cosubordinate in the class, but the Saurians and Ophidians are associated as sections of the same order, a view held by Aristotle but abandoned by all following naturalists. The distinction between Lizards

1 Erpét. génér., i. p. 259.

2 "Ware es nicht die Ermunterung . . . dieser Freunde gewesen, so wiirde ich uiberzeugt von den Miangeln, denen eine solche Arbeit bei aller méglichen Vorsicht doch unterworfen ist, es nie gewagt haben, meine Eintheilung bekannt zu machen, obwohl selbe Herr Duméril in seinen Lectionen vom Jahre 1809 schon vorgetragen, und die Thiere im Cabinet darnach bezeichnet hat" (preface, p. viii), A few lines further on he emphatically declares that the classification is based upon his own researches.

and Snakes is carried out in so precise a manner that one genus only, Amphisbena, is wrongly placed. (2) The true Reptiles have now been entirely divested of all heterogeneous elements by relegating positively Caxcilia to the Batrachians, a view for which Oppel had been fully prepared by Duméril, who pointed out in 1807 that "les cécilies se rapprochent considerablement des batraciens auxquels elles semblent lier ordre entier des serpens."? (3) An attempt is made at arranging the genera into families, some of which are still retained at the present day.

In thus giving a well-merited prominence to Oppel's labours, we are far from wishing to detract from the influence exercised by the master spirit of this period, Cuvier. Without his guidance Oppel probably never would have found a place among the promoters of herpetological science. But Cuvier's principal researches on Reptiles were incidental or formed part of some more general plan ; Oppel concentrated his on this class only. The latter acquired a more correct view as regards the higher divisions, while Cuvier was enabled by a more detailed study of the genera to define certain families more precisely and arrange them in a more natural manner, and to add not a few to the generic forms. Cuvier adopts the four orders of Reptiles proposed by Brongniart as equivalent elements of the class, and restores the Blind- worms and allied Lizards, and, what is worse, also the Ceecilias, to the Ophidians. The Chameleons and Geckos are placed in separate groups, and the mode of dividing the latter has been retained to the present day. Also a natural division of the Snakes, although the foreign ele- ments mentioned are admitted into the order, is sufficiently indicated by his arrangement of the 'vrais serpens proprement dits" as (1) non-venomous Snakes, (2) venomous Snakes with several maxillary teeth, and (3) venomous Snakes with isolated poison-fangs. Without entering into those long descriptions of the species which continue to be the bane of modern zoology, he distinguishes the species of Reptiles with a precision not attained in any previous work, critically examining the literature and adding the principal references.

Cuvier's researches into the osteology of Reptiles had not only the object of forming the basis for their arrange- ment, but also of discovering the

means of understanding the fossil remains which now claimed the attention of French, English, and German naturalists. Extinct Clelo- nian and Crocodilian remains, Pterodactylus, Mosasaurus, Iguanodon, Ichthyosaurus, Teleosaurus, became the subjects of Cuvier's classical treatises which form the contents of the 5th volume (part 2) of his Recherches sur les Ossemens Lossiles, ot Von rétablit les caractéres des plusieurs animaux dont les révolutions du globe ont détrut les espéces (new ed., Paris, 1824, 4to).

All the succeeding herpetologists adopted either Oppel's or Cuvier's view as to the number of orders of Reptiles, or as to the position Batrachians ought to take in their relation to Reptiles proper, with the single exception of D. pg Buarnvitte. He divided the ' oviparous subtype" of Vertebrates into four classes, Birds, Reptiles, Amphi- bians, and Fishes,' a modification of the system which is all the more significant as he designates the Reptiles "Squammiferes Ornithoides, écailleux," and the Amphibians " Nudipelliféres, Ichthyoides nus." In these terms we perceive clear indications of the relations which exist to the class of Birds on the one hand, and to that of Fishes on the other; they are signs which cast their shadow before them, but, unfortunately, Blainville himself did not follow

*3 Mémoires de Zoologie et d' Anatomie Comparée, Paris, 1807, 8vo, p. 45. * Bull. Sci. Soc. Philomat., July 1816.*

Merrem.

Latreille.

Gray.

Wagler.

up the ideas thus expressed, and abandoned even the terms in a later edition of his systematic tables.

The direct or indirect influence of the work of French anatomists manifested itself in the systems of the other herpetologists of this period. The Crocodiles, especially, which hitherto (strange to say, even in Cuvier's classifica- tion) had been placed as one of the families of Saurians, now commence to be separated from them. MERREM (Versuch eines Systems der Amphibien, Marburg, 1820, 8vo) distinguishes two classes of "Amphibians," Dho- lidota and Batrachia.

The Pholidota (or Reptiles) arc divided into three orders, dis- tinguished chiefly by osteological and splanchnological characters:—

1. TESTUDINATA ; 2. LoricaTa (=Crocodiles) ; 3. SquaMATA (=Oppel's Sguamata, excluding Crocodiles).

Merrem's subdivision of the Squamata into (1) Gradientia (=limbed Lacertilia), (2) Repentia (=limbless Lacertilia), (3) Serpentia (=Snakes and Amphisbena), (4) Inccdentia (= Chirotes), and (5) Predentia (=Chamzleons) was based chicfly on the modifications of the limbs, and not adopted by his successors. The greater part of his work is occupied with a synopsis of all the species of Reptiles known, each being shortly characterized by a diagnosis ; but, as only a small proportion (about one hundred and seventy) were known to him from autopsy, this synopsis has all the faults of a compilation.

LATREILLE, who commenced the study of Reptiles as early as 1801, had kept pace with the progress of science when he published, in 1825, his Mamlles Naturelles du Régne Animal (Paris, 1825, 8vo). He separated the Batrachians as a class from the Reptiles, and the latter he divides into two sections only, Cataphracta and Squamosa,— in the former Crocodiles being associated with the Che- lonians. He bases this view on the development of a carapace in both, on the structure of the feet, on the fixed quadrate bone, on the single organ of copulation. None of the succeeding herpetologists adopted a combination founded on such important characters except J. E. Gray, who, however, destroyed Latreille's idea of Cataphracta by adding the Amphisbzenians! as a third order.

Cuvier's account of the genera and species of Reptiles in the Regne Animal was too succinct, and Merrem's bore too much the character of acompilatory list, to furnish efficient aid in the arrangement of the mass of new materials which began to accumulate from all parts of the world in European museums. Among others, Spix had brought from his travels in Brazil a rich spoil to the Munich Museum, and the Bavarian Academy charged Jon. WAGLER, who was engaged in working out these materials, to pre- pare a general system of Reptiles and Batrachians. His work,? the result of ten years' labour, is a simple but lasting monument to a young naturalist,? who, endowed with an ardent imagination, only too frequently misin- terpreted the evidence of facts, or forced it into the service of preconceived ideas. Cuvier had drawn attention to certain resemblances in some parts of the osseous structure of Ichthyosaurus and Pterodactylus to Dolphins, Birds, Crocodiles, &c. Wagler, seizing upon such ana- logical resemblances, separated those extinct Saurians from the class of Reptiles, and formed of them and the Monotremes a distinct class of Vertebrates, intermediate between Mammals and Birds, which he called Gryphi. When we consider that the discovery of the mode of pro- pagation of the Monotremes is probably reserved for the present decennium, and that the propagation of those extinct Reptiles may remain an unsolved mystery, we must

1 Catalogue of the Tortoises, Crocodiles, and Amphisbenians in the Collection of the British Museum, London, 1844, 16mo, p. 2.

2 Natiirliches System der Amphibien mit vorangehender Classifica- tion der Stiugethiere und Végel,—ein Beitrag zur vergleichenden Zoologie, Munich, 1830, 8vo.

3 Wagler was accidentally killed three years after the publication of his System.

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admit that Wagler has made free use of his imagination by defining his class of Gryphi as "vertebrates with lungs lying free in the pectoral cavity; oviparous ; development of the embryo (within or) without the parent; the

young fed (or suckled !) by the parents." By the last character this Waglerian class is distinguished from. the Reptiles.

Reptiles (in which Wagler includes Batrachians) are divided into eight orders :—Testudines, Crocodili, Lacertex, Serpentes, Angues, Cecilix, Rane, and Ichthyodi. He has great merit in having employed, for the subdivision of the families of Lizards, the structure of the tongue and the mode of insertion of the teeth in the jaws. On the other hand, however well the genera of Snakes are defined by him—and their number has been increased to ninety-six— Wagler has entirely failed in arranging them in natural families, venomous and non-venomous types being mixed in the majority of his groups.

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L. Frrzmncer was Wagler's contemporary; his first Fitzinger.

work' preceded Wagler's system by four years. As he says in the preface, his object was to arrange the Reptiles in "anatural system, a system in which the objects are arranged in accordance with their greatest similarity, with their natural affinities. Such a system is a faithful image of the gradual progress of nature, expressed in words." Unfortunately, in order to attain this object, Fitzinger paid regard to the most superficial points of resemblance; and in the tabula affinitatum generum which he constructed to demonstrate "the progress of nature" he has been much more successful in placing closely allied generic forms in contiguity than in tracing the relationships of the higher groups. That table is prepared in the form of a genealogical tree, but Fitzinger wished to express thereby merely the amount of morphological resemblance, and there is no evidence whatever in the text that he had a clear idea of genetic affinity. The Batrachiansare placed at the bottom of the scheme, leading through Hyla to the Geckos (clearly on account of the digital dilatations) and through Cecilia to Amphisbena. At the top Draco leads through Ptero-dactylus to the Bats (Pteropus), Ichthyosaurus to the Cetaceans (Delphinus), Emys to the Monotremes, T'estudo to Manis, and the Marine Turtles to the Divers and Penguins.

In Fitzinger's system the higher groups are, in fact, identical with those proposed by Merrem, while greater originality is shown in the subdivision of the orders. He differed also widely from Wagler in his views as to the relations of the extinct forms. The order of Loricata consists of two families, the Jchthyosawroidea and Crocodiloidca, the former comprising Jgwanodon, Plesiosawrus, Saurocephalus, and Ichthyosaurus. In the order Syuamata Lacer- tilians and Ophidians are combined and divided into twenty-two families, almost all based on the most conspicuous external characters : the first two, viz., the Geckos and Chameleons, are natural enough, but in the three following Iguanoids and Agamoids are sadly mixed, Pterodactyles and Draco forming one family ; Megalosaurus, Mosasawrus, Varanus, Tejus, &c., are associated In another named Ameivoidea; the Amphisbenide are correctly defined ; the Colwbroidea are a heterogenous assemblage of thirty genera; but with his family of Bungaroidea Fitzinger makes an attempt to separate at least a part of the venomous Colubrine Snakes from the Viperines, which again arc differentiated from the last family, that of Crotaloidca.

There is sufficient evidence in this early publication that Fitzinger had at that time a good eye for seizing upon those characters by which the creation of small groups, such as genera, is regulated, and if this little work had been his only performance in the field of herpetology his name would have been honourably mentioned among his fellow-workers. But the promise of his early labours was not justified by his later work, and if we take notice of the latter here it is only because his name has become attached to many a Reptile through the pedantic rules of

4 Neue Classification der Reptilien nach ihren natiirlichen Ver- wandtschaften, Vienna, 1826, 4to.

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Dumeéril and Bibron,

zoological nomenclature. The labours of Wiegmann, Miiller, Duméril, and Bibron exercised no influence on him, and when he commenced to publish a new system of Reptiles in 1843,! of which fortunately one fasciculus only appeared, he exhibited a classification in which morphological facts are entirely superseded by fanciful ideas of the vaguest kind of physiosophy, each class of vertebrates being divided into five "sense" series, and each series into three orders, one comprising forms of superior, the second of medium, and the third of inferior development. In the generic arrangement of the species, to which Fitzinger devoted himself especially in this work, he equally failed to advance science. From a superficial study of such species as were accessible to him, but chiefly from the descriptions of other authors, he selected any characters for the establishment of genera, and, abandoning entirely the value of a genus as a systematic category, he introduced a number of names, under the cloak of which he hid the superficiality of his work ; many were adopted by his suc- cessors, who, however, had to substantiate their validity by a deeper study of the taxonomic characters.

We have now arrived at a period distinguished by the appearance of a work which, by the ability of its authors, by the comprehensiveness of its scope, by the treatment of the general subject as well as of the details, superseded all its predecessors, which formed the basis for the labours of many succeeding years, and which will always remain one of the classical monuments of descriptive zoology,— the Erpétologie Générale ou Histoire Naturelle compléte des Reptiles of A. M. C. Dumurit and G. Brsron (Paris, 8vo). The first volume appeared in 1834, and the ninth and last in 1854, No naturalist of that time could have been better qualified for the tremendous undertaking than C. Duméril, who almost from the first year of half a century's con- nexion with the then largest collection of Reptilia had chiefly devoted himself to their study. The task would have been too great for the energy of a single man; it was, therefore, fortunate for Duméril that he found a most devoted fellow-labourer in one of his assistants, G. Bibron, whose abilities equalled those of the master, but who, to the great loss of science, died (in 1848) before the completion of the work. Duméril had the full benefit of Bibron's knowledge for the

volumes containing the Snakes, but the last volume, which treats of the Tailed Batrachians, had to be prepared by Duméril alone.

The work is the first which gives a comprehensive scientific account of Reptiles generally, their structure, physiology, and literature. Nearly the whole of the first volume is devoted to these chapters. And again each of the four orders admitted by the authors is introduced by a similar general account. In the body of the work 121 Chelonians, 468 Saurians, 586 Ophidians, and 218 Batra- chians are described in detail and with the greatest pre- cision, Ou the principles of arrangement of the various orders we shall have to speak subsequently, and we men- tion here only that, singularly enough, the authors revert to Brongniart's arrangement, in which the Batrachians are co-ordinate with the other three orders of Reptiles.? This must appear all the more strange as Von Baer? in 1828, and J. Miiller in 1831, had urged, besides other essential differences, the important fact that no Batrachian*

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1 Systema Reptilium, Vienna, 1843, 8vo.

2 The author of the article AmMpHipia in the present work (vol. i. p. 750) states that Gtinther, like Dum@¢ril and Bibron, in his Catalogue, in substance, adopts Brongniart's " arrangement." There isno founda- tion whatever for this statement, the relation of the Batrachians to the class of Reptiles not being even alluded to in that work. In a later division of the Reptilia by Giinther (Phil. Trans., 1867) the Batrachians are likewise excluded.

3 Entwicklungsgeschichte der Thiere, p. 262.

4 Tiedemann's Zeitschrift fiir Phystologie, vol. iv. p. 200.

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embryo possesses either an amnion or an allantois, like a Reptile.

4, Period of the Separation of Reptiles and Batrachians as Distinct Classes or Subclasses.—In the chronological order which we have adopted for these historical notes, we had to refer in their proper places to two herpetologists, Blainville and Latreille, who advocated a deeper than merely ordinal separation of Reptiles from Batrachians, and who were followed by F. 8. Leuckart. But thi view only now began to find more general acceptance. MULier and Srannivus were guided in their classification entirely by anatomical characters, and consequently recog- nized the wide gap which separates the Batrachians from the Reptiles; yet they considered them merely as sub- classes of the class Amphibia. The former directed his attention particularly to those forms which seemed to occupy an intermediate position between Lacertilians and Ophidians, and definitely relegated Anguis, Pseudopus, Acontias to the former, and Typhlops, Rhinophis, Tortriz, but also the Amphisbenoids to the latter. Stannius interpreted the characteristics of the Amphisbzenoids dif- ferently, as will be seen from the following abstract of his classification ® :—

Suse.assis : AMPHIBIA MONOPNOA (Leuckart).

Sect. 1. STREPTOSTYLICA (Stann.). Quadrate bone arti- culated to the skull; copulatory organs paired, placed out- side the cloacal cavity.

Orpo 1. OPHIDIA.

Subordo 1. EurystromMaTa or Macrostomata (Miill.). The facial bones are loosely connected to admit of great extension of the wide mouth.

Subordo 2. ANGIOSTOMATA or MicrosromaATA (Miill.). Mouth narrow, not extensile; quadrate bone attached to the skull and not to a mastoid.

Orpvo 2. SAURIA.

Subordo 1. AMPHISBHNOIDEA.

Subordo 2, Kronocrania (Stann.)= Lizards.

Subordo 8. CIAMZLEONIDEA.

Sect. 2. MONIMOSTYLICA (Stann.). Quadrate bone suturally united with the skull; copulatory organ simple, placed within the cloaca.

Orpo 1. CHELONIA. Orpdo 2. CROCODILIA.

This classification received the addition of a fifth Rep- tilian order which with many Lacertilian characters com- bined important Crocodilian affinities, and in certain other respects differed from both, viz., the New Zealand Hatteria, which by its first describers had been placed to the Agamoid Lizards. GwUnrHxr,® who pointed out the characteristics of this Reptile, considered it to be coordi- nate with the other four orders of Reptiles, and charac- terizes it thus :—

Eehynchocephalia.—Quadrate bone suturally and immov- ably united with the skull and pterygoid; columella present. Rami of the mandible united as in Lacertilians. Temporal region with two horizontal bars. Vertebre amphiceelian. Copulatory organs none.

5. Pertod of the Recognition of a Class of Reptilia as part of the Sauwropsida.—Although so far the discovery of every new morphological and developmental fact had pre- pared naturalists for a class separation of Reptiles and Batrachians, it was left to T. H. Huxley to demonstrate, not merely that the weight of facts demanded such a class separation, but that the Reptiles hold the same relation to Birds as the Batrachians to Fishes. In his Hunterian Lectures (1863) he divided the vertebrates into Mammals, Sauroids, and Ichthyoids, subsequently substituting for the last two the terms Sauropsida and Ichthyopsida." The

5 Siebold and Stannius, JZandbuch der Zootomie—Zootomie der Amphibien, 2d ed. Berlin, 1856, 8vo.

6 "Contribution to the Anatomy of Hatteria (Rhynchocephalus, Owen), in Phil. Trans., 1867, part ii.

7 An Introduction to the Classification of Animals, London, 1869, 8vo, pp. 104 sq.

J.J. Miiller

Owen.

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Sauropsida contain the two classes of Birds and Reptiles, the Ichthyopsida those of Batrachians and Fishes. The position thus assigned to Reptiles in the system is now adopted by the majority of zoologists.

R. Owen, while fully appreciating the value of the osteological characters on which Huxley based his division, yet admitted into his consideration those taken from. the organs of circulation and respiration, and reverted to Latreille's division of warm- and cold-blooded (hzemato- thermal and hematocryal) vertebrates, thus approximat- ing the Batrachians to Reptiles, and separating them from Birds. He says!—

'Although the Aves and Mammalia agree as hot-blooded vertebrates in their higher cerebral development and in the more complex heart and lungs, Birds, by genetie and developmental characters as well as by the general plan of their organization, are more intimately and naturally allied to the Oviparous Saurians than to the Viviparous Mammals. In their generation and development modern Batrachians differ from other cold-blooded air-breathers, and agree with Fishes. Present knowledge of extinet forms more clearly exposes the artificial nature of the primary groups of the oviparous vertebrates. An important link, the Pterosawria, or Flying Reptiles, with wings and air-saes, more closely connecting Birds with the actual remnant of the Reptilian class, has passed away. Other extinet orders (Ganocephala and Labyrinthodontia) have demonstrated the artificial nature of the distinction between Fishes and Reptiles, and the close transitions that connect together all the cold-blooded Vertebrates."

The Reptiles (or fonopnoa, Leuck.), then, form the high- est of the five sub-classes into which, after several previous classifications, Owen? finally divides the Zematocrya, The sub-class is composed of the following nine orders :—

a, IcHTITYOPTERYGIA (extinct)—Ichthyosaurus.

b, SAUROPTERYGIA (extinet)—Plesiosaurus, Pliosawrus, Notho-

saurus, Placodus.

C eee (extinct) —Dicynodon, Rhynchosaurus, Ouden-

oaon,.

. CHELONIA.

. LACERTILIA (with the extinct Mosasawrus).

. OPIIDIA.

: oo (with the extinct Teleosaurus and Streptospon- dylus).

h. aria (extinet)—Iguanodon, Seclidosaurus, and Mcgalo-

SAHULUS,

7 Prerosaunia (extinet)— Dimorphodon, Rhamphorhynchus,

and Pterodactylus.

As this ordinal arrangement deals in a uniform measure with extinct as well as living Reptiles, it is more complete than, and marks as great a progress in the history of herpetology as, any of the classifications recorded hitherto.

The study of fossil Reptiles had been continued after Cuvier by many workers, as Goldfuss, E. Geoffroy St Hilaire, Harlan, Mantell, G. F. Jiiger, Phillips, Leidy, Falconer, Cautley, Alton, Bronn, Kaup, Quenstedt, and especially H. von Meyer, who devoted the whole of his extra-official time to drawing with his own hand-numerous treasures preserved in Continental collections. But none contributed more to the knowledge of fossil Reptiles than Owen himself. Indefatigable in collecting materials, and able to bring to bear upon the subject an unsurpassed knowledge

ranging over' the whole field of comparative anatomy, he was unrivalled in elucidating the affinities of fossil remains as well as in the production of graphic descriptions. He showed that the number of living Rep- tilian types bears but asmall proportion to that of extinct forms, and, therefore, that a systematic arrangement of the entire class must be chiefly based upon dental and osteo- logical characters.

In this he was followed by Huxitey and Copr who, however, have restricted still more the selection of classi- ficatory characters by relying for the purposes of arrange- ment on a few parts of the skeleton only. This is a matter of necessity in dealing with fossil remains, but a

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1 Anatomy of Vertebrates, London, 1866, 8vo, vol. i. p. 6. 2 (OV, Bilog, 1s WE.

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tendency has thereby been fostered in our times of apply-

ing the same principles in the subdivision of living

Reptiles to the greater or less exclusion of the considera-

tion of other parts of their organization.

Huxley and Cope attempted a further grouping of the orders which in Owen's system were merely serially enumerated as cosubordinate groups. Huxley used for Huxley, this purpose almost exclusively the position and character of the rib-articulations to the vertebral centre, the orders themselves being the same as in Owen's system :—

A. PLEUROSPONDYLITIA. Dorsal vertebrae devoid of transverse processes and uot movable upon one another, nor are the ribs movable upon the vertebre. Aplastron. Order 1, CHELONIA.

B. The dorsal vertebrae (which have either complete or rudiment- ary transverse processes) are movable upon one another, and the ribs upon

them. No plastron. :

a. The dorsal vertebre have transverse processes which are either entire or very imperfectly divided into terminal facets (ERPETOSPONDYLIA).

a, Transverse processes long ; limbs well developed, pad- dles; sternum and sternal ribs absent or rudiment- ary. Order 2, PLESIOSAURIA (=Sauropterygia, Ow.).

B. Transverse processes short.

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aa. A pectoral arch and urinary bladder. Order 8, LACERTILIA.

bb. No pectoral arch and no urinary bladder. Order 4, OPHIDIA.

b. The dorsal vertebrae have double tubercles in place of trans- verse processes (PEROSPONDYLIA). Limbs paddle-shaped. Order 5, IcHTHYoSAURIA (=Jchthyopterygia, Ow.).

e. The anterior dorsal vertebra have elongated and divided transverse processes, the tubercular being longer than the capitular division (SUCHOSPONDYLIA).

a. Only two vertebra in the sacrum. DILIA. 8. More than two vertebre in the sacrum. aa. Manus without a prolonged ulnar digit. aa. Hind-limb Saurian. Order 7, DicyNonon- TIA (= Anomodontia, Ow.). 8B. Hind-limb Ornithie. Order 8, Ornitio- SCELIDA (= Dinosauria, Ow.). bb. Manus with an extremely long ulnar digit. Order 9, PTEROSAURIA.

Finally, Cope,? by combining the modifications of the Cope. quadrate and supporting bones with the characters used by Huxley further developed Owen's classification, separat- ing the Pythonomorpha and Rhynchocephalia as distinct orders from the Lacertilia. Whenever practicable he was guided in his nomenclature by priority. The following is an abstract of his classification :—

Order 6, Croco-

I. Extremities beyond proximal segment not differentiated to form. Order 1. IclITHYOPTERYG1A (Ow.). {I. Extremities differentiated. A. STREPTOSTYLICA (Stann.). Order 2. LACERTILIA. Order 3. PyrHonoMonrpuA (Cope). Order 4. OPHIDIA. B. S¥NAPTOSAURIA (Cope). Order 5, RiurynconocEPHALIA (Gthr.). Order 6. TESTUDINATA. Order 7. SAUROPTERYGI1A (Ow.). C. ARCHOSAURIA (Cope). Order 8, ANOMODONTIA (Ow.). Order 9. Dinosauria (Ow.). Order 10. CRrocopiLia (Ow.). Order 11, ORNITHOSAURIA (Fitz.).

The most recent general work on Reptiles is from the Hoff- pen of Dr C. K. Horrmann, and appears since the year mann. 1879 in Brown's Klassen und Ordnungen des Thierretchs.

The author treats with predilection the parts which relate to the anatomy of Reptiles, and which will prove to be of the greatest help to the student; each chapter is pre- ceded by a list of the most important publications. The systematic part is composed with less critical discernment, and its usefulness for scientific purposes will scarcely be

3 Proce. Amer. Assoc. for the Advancement of Science, 19th mecting, Cambridge, 1871, 8vo, pp. 2380 sq.

Works on

Croco- dilians and Lacer- tilians ;

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comniensurate with the amount of labour bestowed on its compilation.

b. Special Systematic Works.

After having followed the general history of herpetology to the present period, we have to mention the works by which our knowledge of certain orders or of the various Reptilian faunze has been specially advanced.

Crocodilia and Lacertilia.—We have already shown that the animals of these two orders were by the earlier authors thrown together in one group, of which a natural subdivi- sion into families was attempted by Oppel and Cuvier, that Merrem (1820) was the first to recognize in the Cro- codiles a separate group for which he proposed the name of Loricata, being followed therein by Blainville, who named the group Lmydo-sauriens, and that Latreille actually recog- nized their affinities to the Chelonians, uniting them under the name of Cataphracta. In Wagler's and Fitzinger's systems a distinct advance is manifested by the employ- ment of the tongue and also of the dentition as important characters. These, combined with the scutellation, the form of the toes, and the entire habitus, were also the characters on which the subsequent classifications by Wiegmann, Duméril and Bibron, Gray, and Stannius were based, the classifications varying according to the manner in which those characters are subordinated to one another. But, while the German and English herpetologists assign to the Amphisbeenians, Chameleons, and Crocodiles a rank more or less above, and distant from, the Lacertilian families, Duméril and Bibron take a singularly retrograde step in dividing Lizards into eight equivalent families, of which the first comprises the Crocodiles, and the second the Chamz- leons, the Amphisbenians forming part of the family Chalcidide. narrow-mouthed Snakes such as Uyphlops and Rhinophis among Lizards.

In the two most recent classifications of the families of

Lizards osteological (or rather craniological) characters |

supersede almost entirely those previously employed. Copz,! who had led the way in this direction, still allows subordinal value to the dentition as well as to the form of the tongue, as may be seen from the following scheme :—

Suborder 1. Rurproerossa. Fam. 1. Chamexleontide. Suborder 2. PACHYGLOSSA. Fam. 2. Agamide. Suborder 3. NycrisaAuRA. Fam. 3. Gecconide. Suborder 4. PLEURODONTA, a. Iguania. Fam. 4, Anolide; 5, Iquanidex. b. Diploglossa. Fam. 6, Anguidw; 7, Gerrhonotide ; 8, Xenosauridx; 9, Helodermidez. ce. Thecaglossa. Fam. 10. Varanide. d. Leptoglossa. Fam. 11, Zecide ; 12, Lacertide ; 18, Zonuridx ; 14, Chal-

eididx ; 15, Seineidxe; 16, Sepside. e. Typhlophthalini. Fam. 17, Anelytropidx ; 18, Acontiide ; 19, Aniellidez. Suborder 5, OPHIOSAURI. Fam. 20, Amphisbentde ; 21, Trogonophide.

Finally, whilst adopting in principle Cope's classification, G. A. BouLeNncEr,? partly by extending his examination on types not seen by Cope, partly by differently valuing the various craniological characters, introduced considerable modifications :—

1 Proc, Acad. Nat. Set. Philadelphia, 1864, pp. 224 sq., and Proe. Amer. Assoe. for the Advaneement of Seience, 1870 (1871), pp. 236 sq.

2 For an outline of his classification consult Ann. and Afag. Nat. Tfist., Aug. 1884, or Catalogue of Lizards, vol. i., 1885, p. 1.

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Gray was the last who dared to place the-

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Suborder 1. LACERTILIA VERA.

A. Tongue smooth or with villose papille ; clavicle dilated, loop-shaped proximally; no postorbital or postfrouto- squamosal arches.

Fam. 1, Geekonide ; 2, Hublepharide.

B. Tongue smooth or with villose papille ; clavicle not dilated proximally.

Fam. 3, Uroplatide; 4, Pygopodide ; 5, Agamidx; 6, Iguanide; 7, Xenosauride; 8, Zonuride; 9, Anguide ; 10, Antellide; 11, IHelodermatide ; 12, Varanide.

C. Tongue covered with imbricate, scale-like papille or with oblique plice; clavicle dilated proximally, frequently loop-shaped.

Yam. 18, Xantusiide ; 14, Tetide ; 15, Amphisbenide ; 16, Laeertide; 17, Gerrhosauride ; 18, Seineide ; 19, Anelytropidx ; 20, Dibamide.

Suborder 2. RHIPTOGLOSSA. Fam. 21. Chameleontide.

The principal works to be consulted by the student of recent Crocodilians are the following :—

Cuvier, Ossemens fossiles, vol. v. part 2 (1824); Geoffroy St Hilaire, " Descriptions des Crocodiles du Nil," in Mém. del' Institut d' Egypte (1818); Duméril and Bibron, Zrpétologie générale, Paris, 8vo, vols. ii, ili. (1835-36) ; Huxley, "On the dermal armour of Jacare and Caiman, with notes on the generic and specific characters of recent Croeodilia," in Jour. Proe. Linn. Soe., Zoology, vol. iv. pp. 1-28 (1860) ; Brithl, Das Skelett der Krokodiliner, dargestellt in 20 Tafein (1862); Strauch, "Synopsis der gegenwartig lebenden Crocodiliden," in Afém. Acad. St Petersburg, vol. x. (1866) ; Rathke, Untersuehungen iiber die Entwiekelung und den Korperbaw der Croeodile, Brunswick, 4to (1866); Gray, Catalogue of Shield- Reptiles in the Collection of the British Musewm,—part ii., Emydo- saurians, Rhynchocephalia, and Amphisbenians, London, 4to (1872) ; Parker, On the Structure and Development of the Skull in the Crocodiles, London, 4to (1888).

The principal special works to be consulted by the student of recent Lacertilians are the following :—

Wiegmann, Herpetologia mexieana,—Pars 1, Sawrorum speeies amplectens, Berlin, fol. (1834); Duméril and Bibron, Z7rpétologie générale, Paris, 8vo, vols. 2-5 (1836-39) ; Gray, Catalogue of the Speeimens of Lizards in the Colleetion of the British Musewm, London, 16mo (1845); Briicke, Betérdge zur vergleiehenden Ana- tomte und Physiologie des Gefdss-Systems der Amphibien, Vienna, 4to (1852); Rathke, Ueber den Baw und die Entwicklung des Brustbeins der Saurier (1854); Fritsch, Zur vergleichenden Ana- tomie des Amphibien-Herzens, Berlin, 8vo (1869) ; Fiirbringer, Die Knochen und Muskeln der Extremitdten bet den sehlangendhintiehen Sauriern, Leipsic, 4to (1870); Braun, Das Urogenitalsystem der einheimisehen Reptilien, Wirzburg, 8vo (1877); Parker, On the Strueture and Development of the Skull in the Lacertilia, (1879) ; Boulenger, Catalogue of the Lizards in the British Museum, 2d edition, London, 8vo (vol. i. in progress, 1885).

In a short sketch like the present it would be impossible to refer even to a small part only of the immense number of contributions by which our knowledge of Lizards has been advanced within the last forty years, either by adding to that of species previously imperfectly known, or by de- scribing new generic and specific forms. But an idea of this increase may be formed by a comparison of Gray's and Boulenger's catalogues ; whilst the former enumerated 186 species out of the families Geckonide and Agamide, Boulenger describes not less than 490 belonging to the same groups.

Ophidia.—We have already mentioned that in Oppel's system (1811) the first step is taken towards a natural classification of Snakes. Neither C. Duméril nor Merrem, Fitzinger nor Wagler, indicated the way towards a more natural arrangement; it seemed almost as if with the increase of the number of distinct genera their arrange- ment became more and more hopeless. In the meantime the Rijks Museum of Leyden had enriched itself under the able direction of Temminck, through the efforts of traveller- naturalists like Reinwardt, Kuhl, Van Hasselt, Boie, and Siebold from the Dutch colonies in the East. and West Indies, with materials fairly rivalling those accumulated in Paris. They were at first studied by the brothers Friederich Boie and Heinrich Boie, who well characterized

on Ophi- dians ;

a number of genera but failed in the attempt to arrange them in a natural or logical system. All the more remark- able, therefore, is the production by H. ScHLEGEL of an Essai sur la Physionomie des Serpens (Leyden, 1837 ; 2 vols. 8vo, with atlas in fol.). In this classical work the whole of the subject is treated throughout in a scientific manner ; the Species are described with a clear discernment of really dis- tinctive characters, the description being generally accom- panied with a faithful outline figure of the head, and with a critical examination of the literature. Schlegel, besides, has the merit of having recognized the great importance of exactness with regard to localities, and of giving a general account of the geographical distribution of Snakes. The principle of classification adopted by Schlegel, indeed, is not one which will be recognized as final

or even as legitimate at the present time, but it is one which is pre- ferable to that employed by Miller, Duméril, and Bibron, which led, as we shall see presently, to the most artificial grouping of species. He divided the Snakes into families according to their " physiognomy," that is '" impression totale que fait sur nous ensemble d'un étre quelconque, impression que lon peut sentir, mais qu'il est impossible de rendre au moyen de paroles; elle est le résultat de Vharmonie de toutes les parties isolées, dont on embrasse la confirmation d'un coup d'oeil, et dans leurs rapports mutuels." Schlegel had no training in, or knowledge of, anatomy; he, therefore, ignored Miiller's researches which appeared a few years before his work; yet it is note- worthy that his classification stands in the main, and has not yet been superseded. He divides Snakes as follows :—

I. Non-venomous Snakes.

Fam. 1. Burrowing. Gen. Tortrix. Fam. 2. Worm-like. Gen. Calumaria, Fam. 3. Terrestrial. Gen. Coronella, Xenodon, Heterodon, Lycodon, Coluber, Herpetodryas, Psammophis. Fam. 4. Arboreal. Gen. Dendrophis, Dryophis, Dipsas. Fam. 5. Freshwater. Gen. Tropidonotus, Homealopsis. Fam. 6. Boas. Gen. Boa, Python, Acrochordus. Venomous Snakes. Fam. 7. Colubriform. Gen. Hlaps, Bungarus, Naja. Fam. 8. Marine. Gen. Hydrophis. Fam. 9. Venomous Snakes proper. Gen. Trigonocephalus, Crotalus, Vipera.

Already in 1832 J. Mttier had proposed "a natural classification of Snakes on anatomical principles,"+ in which he paid particular attention to the osteology of the hitherto dubious forms of Ophidians, but in the end based his arrangement entirely on the structure of the jaws and on the dentition. As he did not extend his examination into other parts of the organization of the various genera, it may suffice here to state that he divided all Snakes into two sections, the first of which (Ophidia microstomata) comprised the four families Amphisbenoidea, Typhlopina, Uropeltacea, and Tortricina, and the second (Ophidia macrostomata) all the other Snakes, which he referred to seven families.

The direction thus indicated by Miller was followed by DuMERIL and Brsron, who, however, by their much more detailed knowledge of Snakes,

were enabled to subdivide the unwieldy categories formed by Miiller; also the genera which in Schlegel's system comprised Snakes with very different dentition had to be subdivided, and were defined with greater precision than had been done by any

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1 Tiedemann's Zeitschr. f. Physiologie, vol. iv. p. 268 sq.

previous herpetologist. They divide Snakes into five

equivalent sections ?:—

1. OpoTERoponTEs. Teeth in one of the jaws only: 2 families and 8 genera.

2, AGLYPHODONTES. and 86 genera.

3. OPISTHOGLYPHES. and 37 genera.

4. ProTérocLypurs, Anterior maxillary tooth grooved and fol- lowed by other smooth teeth : 2 families and 16 genera.

5. SoLfnociypues. Anterior maxillary teeth perforated and iso- lated : 2 families and 13 genera.

The progress made in ophiology from the time of the appearance of this work down to the present period consists rather in the increase of our knowledge of the great variety of species and genera than in the further development of the system. Gray, Reinhardt, Peters, Giinther, Cope, Bocage, Jan, Krefft, and others described a large number of forms, so that the number of those known to Duméril and Bibron has now been perhaps trebled or quadrupled. Unfortunately, no general work corresponding to the present state of science exists. But two works

published subsequently to the Lrpétologie générale are indispensable to the student.

The first is the Catalogue of the Specimens of Snakes in the Collection of the British Museum, of which the first part, containing the Viperine Snakes, Water-Snakes, and Boas, by J. E. Gray, appeared in 1849, and the second, containing the Colubrines, by A. GUNTHER in 1858. The classification, which was much behind its time, was fixed by the former of the two authors, so that the latter had to accommodate the arrangement of his part to that of his predecessor. However, he strongly opposed the application of the character of grooved posterior teeth to the formation of large sections, and generally adopted the principle advocated by Schlegel, whose generic groups were raised into families. A great number of Snakes unknown to Duméril are described in these catalogues, whilst others which happened not to be represented in the British Museum are omitted.

G. JAN in his Hlenco sistematico degli Ofidi descritti e disegnati per ? Iconograyia generale (Milan, 1863, 8vo) gene- rally adopts the families created by Giinther, but institutes under each two divisions, Aglyphodonta and Glyphodonta. Jan's great merit is the publication of his Iconographie générale des Ophidiens (Milan, 1860-763), in which he figures all species which were in the Milan Museum or lent to him by other institutions, and which thus forms an invaluable aid in the determination of species. The author died during the progress of the work, but it was continued by his artist, Sordelli. No descriptive letter- press worthy of the name accompanies this work.

The anatomy of Ophidiaus has hitherto received less attention than that of the other Reptilian orders. Be- sides the information contained in general works, we refer here only to two important special treatises :—

Rathke, Hntwicklungsgeschichte der Natter, Konigsberg, 1839, 4to; and Parker, On the Structure and Development of the Skull in the Common Snake (Tropidonotus natrix), London, 1879, 4to.

Chelonans.—Of ante-Cuvierian authors who paid special attention to this suborder the following deserve special mention :—J. G. Warpaum, J. G.*

ScHNeIDER,® J. D. Scoorpr,® and A. F. ScoweiccEr.' Five or six

2 Duméril changed the nomenclature adopted in his sixth volume when, eight years afterwards, he published the seventh after the death of Bibron. We give here the revised nomenclature.

3 The latest, parts were issued without date between 1876 and 1882. Pe aoe oder Beschreibung einiger Schildkréten, Liibeck, i 0.

® Allgemeine Naturgeschichte der Sehildkréten, Leipsic, 1788, 8vo.

8 Historia Testudinum tconibus illustrata, Erlangen, 1792-1801, 4to (left incomplete by the death of the author),

7 Prodromi Monographie Cheloniorum sect. 1a et 2a, Konigsberg, 1814, 8vo.

Teeth in both jaws, none grooved: 12 families

Posterior maxillary teeth grooved: 6 families

on Che- loniaus.

Reptilian faunas.

LITERATURE. |

distinct types of Chelonians were soon recognized, and appear also in Cuvier's Hégne Animal, viz., Testudo, Emys, Chelys, Trionyx, Chelonia with Sphargis. These types were at first recognized as genera, and raised by the sub- sequent authors to the rank of families, in which many more genera were distinguished, the arrangements merely differing in the various methods of subordination of the different families.

The anatomy of Tortoises was investigated chiefly by C. Perrault, who gave a detailed description of one of the Gigantic Land Tortoises in Mém. Ac. Sc. Paris, iii. (1666- 69); by Cuvier in the Ossemens fossiles; by Wiedemann in Arch. f. Zool. und Zoot., 1802 ; by Geoffroy St Hilaire in Ann. Mus., xiv.; and especially by L. H. Bojanus,! who published an

anatomical monograph of Hmys europea, in which all parts are illustrated in detail, the plates being accompanied by an explanatory text. H. Rathke? studied their development, and L. Agassiz? and W. K. Parker4 that of the Turtles.

The most complete systematic and descriptive work is that by J. E. Gray. He engaged in the study of Tortoises at various times, subdividing the principal groups, as the materials grew under his hands, at first principally on the ground of external characters, and afterwards of such craniological features as seemed to him of generic value.® ALEXANDER STRAUCH contributed two painstaking me- moirs,® the second of which is especially valuable as it contains a collection of all the published facts concerning the distribution of Tortoises over the globe. The authors mentioned associated Sphargis with Chelonia, the later ones generally as the type of a distinct family, all the marine Turtles being comprised in a section Pinnata or Huereta (Stannius) ; and it was only Cope who recognized in the want of specialization of the skeleton of the Leathery Turtle sufficient grounds for separating it into a distinct section, Athecex.

c. Faunistic Works.

In noticing the principal faunistic works, we omit the majority of the older and antiquated publications, and almost all treatises which appeared in periodicals, as their existence can be readily ascertained by reference to works of more modern date or of a more general scope.

Europe.—(1) T. Bell, A History of British Reptiles; 2d ed., London, 1849, 8vo. (2) 8S. Nilsson, Scandinavisk Fauna, pt. iii. ; Amfibicrne, 2d ed., London, 1860, 8vo. (3) A. Strauch, " Die Schlangen des Russischen Reichs," A/ém. Ac. Sc. St Pétersburg, xxi. 1873, 4to. (4) H. Schlegel, De Dieren van Nederland: Kruipende Diercn, Waarlem, 1862, 8vo. (5) F. Leydig, Die in Deutschland icbenden Arten der Saurter, Tiibingen, 1872, 4to; and Ueber die cinheimischen Schlangen, Frankfort, 1888, 8vo. (6) E. Schreiber, Herpetologia Huropxa, Brunswick, 1875, 8vo. (7) V. Fatio, Fawne des Vertebres de la Swisse, vol. iii. of Hist. nat. des Reptiles et des Batraciens, Geneva, 1872, 8vo. (8) C. L. Bonaparte, Jconografia della Fauna ttalica, vol. ii., "Amfibi," Rome, 1832-41, fol. (9) E. de Betta, Hrpetologia delle provincie Venete e del Tirolo meridional, Verona, 1857,

8vo. (10) A. Strauch, “ Essai d’une Erpétologie de lAlgérie,” Mém. Acad. Sct. St Pétersburg, 1862, 4to. (11) F. Latastc, Essai d’une Faune Herpétologique de la Gironde, Bordeaux, 1876, 8vo. (12) J. von Bedriaga, Die Amphibien und Reptilien Griechenlands, Moscow, 1882, 8vo.

Persia.—W. T. Blanford, Eastern Persia, vol. ii., London, 1876, 8vo.

1 Anatome Testudinis europe, Vilna, 1819-21, fol.

2 Ueber die Entwicklung der Schildkréten, Brunswick, 1848, 4to.

3 “Embryology of the Turtle,” in Contributions to the Natural History of the United States of America, vol. i., Boston, 1857, 4to.

4 “The Development of the Green Turtle,” in Voy. “Challenger,” Zoology, vol. i., London, 1880, 4to.

5 Catalogue of Shield-Reptiles in the Collection of the British Museum,—part 1, Testudinata, London, 1855, 4to; followed by Supplement to the Catalogue, dc., 1870, and by Appendix to the Catalogue, dic., 1872.

8 “Chelonologische Studien” and “Die Verbreitung der Schild- kroten iiber den Erdball,” in Afémoires de 1’ Acad. de St Pétersb., 1862 and 1865.

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Japan.—H. Schlegel, Fauna Japonica—Reptiles, Leyden, fol.

ast Indics.—(1) P. Russel, Account of Indian Serpents, collccted on the coast of Coromandel, containing Descriptions and Drawings of each Specics, London, 1796, fol., and A Continuation of an Account of Indian Serpents, London, 1801-3, fol. (2) H. Schlegel, Abbildungen neuer oder wnvolistindig bekannter Amphibien, Diisseldorf, 1837-44, text 8vo, atlas fol. (3) J. E. Gray and Hardwicke, Jllustrations of Indian Zoology, London, 1830-32, fol. (4) T. Cantor, Catalogue of Reptiles inhabiting the Malayan Peninsula and Islands, Calcutta, 1847, 8vo. (5) A. Giinther,

Reptiles of British India, London, 1864, fol. (6) W. Theobald, Catalogue of the Reptiles of British India, Calcutta, 1876, 8vo. (7) J. Fayrer, The V'hanatophidia of India, London, 1874, fol. (8) J. Anderson, Anatomical and Zoological Researches, comprising an account of the Zoological Results of the two Expeditions to Western Yunnan, London, 1878, 4to.

Africa.—(1) Description de VEgypte—Histoire naturelle—Reptiles, Paris, fol., 1809, &c. (2) A. Smith, Jdlwstrations of the Zoology of South Africa, London, 8vo, 1849. (8) W. Peters, Naturwissen- schafiliche Reise nach Mossambique—Zoologie, iii., " Amphibien," Berlin, 1882, 4to.

North America.—(1) R. Harlan, American Herpetology, or Genera of the North American Reptilia, with a Synopsis of the Species, Philadelphia, 1827, 8vo. (2) J. E. Holbrook, North American Her- petology, or a Description of the Reptiles inhabiting the United States, 5 vols., with numerous col. plates, Philadelphia, 1836-48, 4to. (3) D. H. Storer, " Report on the Reptiles of Massachusetts," in Boston Jour, Nat. Hist., iii., 1841, pp. 1-65. (4) J. E. De Kay, Zoology of New York, vol. iii., " Reptiles and Amphibia," Albany, 1842, 4to. (5) 8. F. Baird and 8. Girard, Catalogue of North American Reptiles in the Museum of the Smithsonian Institution, pt. i. ' Serpents," Washington, 1858, 8vo. (6) Id., Reports upon Reptiles in Reports of Explorations for a Railroad from the Mississippi to the Pacific Ocean, Washington, 1859, 4to. (7) L. Agassiz, Contributions to the Natural History of the United States of America, vol. ii., ' North American TZestudinata," Boston, 1857, 4to. (8) S. Garman, "On the Reptiles and Batrachians," Afem. Mus. Comp. Zool., Cambridge, 1883, 4to. (9) H. C. Yarrow, Check-List of the North American Licptiles and Batrachians, with Catalogue of the Specimens in the U. §. National Museum, Washington, 1883, 8vo. (10) E. D. Cope is the author of numerous memoirs and papers in the various North American periodicals.*

Tropical America. —(1) Prince Maximilian von Wied, Abbildungen zur Naturgeschichte Brasiliens, Weimar, 1822-81, fol., and Beitrdge zur Naturgeschichte von Brasilien, i. " Amphibien," Weimar, 1825, 8vo. (2) J. B. Spix, Serpentum Brasiliensium species nove, Munich, 1824, fol.; Id., Ranw et Testudinis Brasiliensis species nove, Munich, 1825, fol.; Id.,

Animalia nova sine species nove Lacertarum quas in itinere per Brasiliam annis 1817-20, jussw et auspiciis Maximiliani Josephi I., Bavarizx regis, suscepto collegit et descripsit, d&c., Munich, 1825, fol. (8) A. F. A. Wiegmann, Zerpcto- logia mexicana, pars i., Saurorum species amplectens, Berlin, 1834, fol. (4) J.J.v. Tschudi, Untersuchungen tiber die Fauna peruana auf einer Reise in Peru wihrend der Jahre 1888-42, St Gall, 1846, fol. (5) Guichenot, in C. Gay's Historia fisica y politica de Chile, ii., " Reptiles," Paris, 1848, 8vo, atlas fol. (6) Cocteau and Bibron, in Ramon de la Sagra's Histoire physique, politique, et naturelle de Pile de Cuba—Reptiles, Paris, text 8vo, atlas fol. (7) F. de Castelnau's Expédition dans les parties centrales de Amérique du Sud—Zoologie—Reptiles, by A. Guichenot, Paris, 1855, 4to. (8) C. Girard, Reptiles (from Chili) in U. S. Naval Astronomical Expedition to the Southern Hemisphere, vol. ii., Washington, 1855, 4to. (9) S. F. Baird, U. S. Exploring Expedition, vol. xx., " Herpetology," Philadelphia, 1858, atlas fol. (10) Duméril and Bocourt, fission scientifique au Mexique et dans l Amérique Centrale—Etudes sur les Licptiles et les Batraciens, Paris, 1870, 4to (in progress), (11) A. Giinther, in Salvin and Godman's Biologia Centrali-Americana— Reptiles, London, 1885, 4to (in progress). (12) E. D. Cope, numerous papers in the various North American periodicals.

Australia.—(1) J. E. Gray and A. Giinther treat of the Lizards in Zoology of the Voyage of H. M.S. " Erebus" and " Terror," London, 1844, 1875, 4to. (2) G. Krefft, The Snakes of Australia, Sydney, 1869, 4to. (8) W. Peters and J. Doria, in Ann. Mus. Genov., xiii., 1878, 8vo.

GENERAL CHARACTERS OF THE CLASS AEPTILIA.

Reptiles are vertebrate animals, the skin of which is covered with horny or bony plates (scales or scutes). The heart has two auricles, but with the ventricular chamber generally incompletely divided ; two arterial trunks emerge from the right portion of the ventricle; the blood of the arterial and venous systems mixes either in the heart or at the origin of the aortic arches. Respiration takes place by lungs, never by bronchi ; portions of the lungs are simple without minute subdivision of the cavity ; and the. respira-

tory movements are slow and irregular. In consequence, Reptiles are cold-blooded animals. Their blood-corpuscles are red and nucleated. The thoracic and abdominal viscera are never separated by a complete diaphragm. The intestinal tract and the urogenital organs open into a common cloaca; the oviducts are developed from the Miillerian ducts, and dilated in their lower course for the reception of the ova; all Reptiles are oviparous or ovoviviparous.

The vertebral column articulates with the skull almost invariably by means of a single convex occipital condyle. The mandible consists of several distinct pieces, of which the articular bone articulates with a quadrate bone, interposed between skull and mandible. When the appendicular parts of the skeleton are present, the sternum is never replaced by membrane bone, and the posterior sternal ribs are attached to a median prolongation of the sternum. The ilia are prolonged farther behind the acetabulum than in front of it; the pubic bones directed downward and forward, and, like the ischia, forming a median symphysis. The metatarsal bones are not anchylosed among them- selves or with the distal tarsal bones.

As in Birds and Mammals, the foetus of Reptiles is enclosed in an amnion and allantois (Ammniota), and nourished from the vitellus of the egg.

In some of the most important characters mentioned above Reptiles agree with Birds, as in the. presence of a single occipital condyle, a complex lower jaw articulated to the skull by a quadrate bone, and nucleated blood-cor- puscles. The majority of naturalists, therefore, consider the two classes to constitute one of the main divisions of Vertebrates, the Sauropsida, At the present epoch, indeed, Birds are strikingly differentiated from Reptiles, but the discoveries within recent years of a number of extinct Birds with Reptilian characters offer ample evidence that Birds are the descendants of some branch or branches of the Reptilian type, in which the power of flight was developed, and with it other anatomical peculiarities by which Birds are now distinguished from living Reptiles.

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REPTILES

[CLASSIFICATION.

THE DIVISION OF AREPTILIA INTO ORDERS.

Of the various modifications that have been proposed in the classification of Reptiles the more important are mentioned in the historical part of this article. We adopt here a serial arrangement of those orders which seem to be well established, having already referred to the attempts that have been made to arrange these orders into higher groups.

‘Order 1, [onTHyoprerycria (extinct). Marine Reptiles with a Cetacean-like naked body and with four limbs formed into paddles, the parts of which after the humerus are not differentiated as to form or function. Tail long. Vertebrae numerous, biconcave; no sacrum. Dorsal vertebrae with double tubercles ; ribs movable, the anterior with bifurcate heads. Head large, with long powerful snout, joined to the trunk without neck. Quadrate bone immovably articulated to squamosal. A foramen parietale is present. Orbits ~~very~~ large with a circle of sclerotic

Fic. 1.—Skeleton of Iguanodon bernissartensis (after Dollo).

plates. A pair of clavicles rest upon an interclavicle and pass laterally to the scapule ; a pair of broad not over- lapping coracoids form the posterior part of the pectoral arch. A sternum is replaced by a series of abdominal splints.

Fam. a. Sawranodontide. Edentulous. Genus: Sawranodon, from the Jurassic formations of the Rocky Mountain region.

Fam. 0. Ichthyosauridw. Teeth numerous, implanted in a com- mon alveolar groove. Genus: Tchthyosaurus, from Mesozoic strata up to the Chalk.

Order 2. AnomoponvtA (extinct). Lacertiform Reptiles, the skull and four limbs of which are Lacertilian in most of their characters. Vertebra biconcave, four or five of them anchylosed together and forming a sacrum. The tubercular and capitular articulations are separated, the former and longer being on the diapophysis, the latter and shorter on the centrum; ribs movable, the anterior with a bifurcate head. Os quadratum suturally connected with the skull. A foramen parietale is present. Jaws Chelonian and probably cased in horny sheaths; either

edentulous or each maxillary bone was armed with a long evergrowing tusk, which sometimes was accompanied by other smaller teeth. The pectoral arch consisted of scapula and coracoid, but a clavicle seems to have been absent. Pelvis very strong, with continuous ischio-pubic symphysis.

Genera: Dicynodon, Galesaurus.

Order 3. Drnosaurta (extinct), This comprises Reptiles of a great diversity of form and size, some adapted for a terrestrial, others for an aquatic life, some carnivorous, the majority herbivorous, but all distinguished by charac. ters leading more or less closely from the Reptilian up to the Avian "type. The majority of trunk vertebre have flat or slightly concave articular ends, sometimes a few of the anterior are convex in front ; cervical vertebrae numer- ous; a sacrum is formed by more than two coalesced vertebree. Neural arches united to the centra by sutures. Thoracic ribs movable, with a bifurcate head; cervical ribs united to the vertebra either by suture or anchylosed.

CLASSIFICATION. |

Os quadratum suturally connected with the skull. The premaxillary bones are separate, and the rami of the lower jaw united in front by cartilage only. Form of the teeth variable ; they are not anchylosed to the bone. Two pairs of limbs are present, of which the hinder pair is the longer and larger, and generally ambulatory. The struc- ture of the pelvis and hind limbs partly Ornithic ; the pelvic bones are not coalesced with each other or with the sacrum ; the pubis enters into the formation of the ace- tabulum, and the ilium is prolonged forwards in front of the acetabulum;

ischia united in a median ventral symphysis. The head of the femur is placed at a right angle to the condyles; tibia with a procnemial crest, and a ridge for the fibula, which is complete. The proximal row of tarsals is formed by the astragalus and caleaneum only, and the former sometimes anchylosed with the tibia, thus forming the upper portion of the ankle-joint.t

1 Tn the case of no other group of Reptiles has knowledge, within the last few years, advanced so much as in that of Dinosaurians. It has supplied, on the part of the Reptilian type, the remarkable forms by which the chasm between living Birds and Reptiles is bridged over. Huxley's interpretation as to the affinities of these fossils, which was at first based on very imperfect materials, but on sufficient evidence to lead him to substitute the name of Ornithoscelida for the older one of Dinosauria, has been fully verified by the astonishing discoveries of most perfect remains at Bernissart in Belgium and in Jurassic formations of the United States. Compared with these recent, dis- coveries, the materials upon which Von Meyer, Owen, Leidy, Hulke, and Sceley based their researches must appear very fragmentary. The specimens found in the Wealden of Bernissart were those of different species of Jyuanodon, the skeletons of which were almost complete, the bones being preserved in their natural position and connexion ; they have formed the subject of a series of memoirs by L. Dollo (Bull. Mus. R. d' Hist. Nat. Belg., 1882-84). But these materials are far surpassed, as regards number and diversity of forms, by the discoveries in America, which have been made kuown by Cope and especially by O. C. Marsh.

All the Dinosaurian remains known at present belong to the Mesozoic age; they appear first in the Triassic, but the majority from these formations are so fragmentary that their classification is subject to much uncertainty. Some at least of the celebrated three-toed foot- prints which were discovered some fifty years ago in the United States, and about the origin of which much uncertainty existed, are evidently those of Dinosaurs. In the Jurassic these Reptiles attained their greatest development, Marsh distinguishing among the fossils of this period four orders with numerous families, The largest exceeded any other land animal in size, and measured from 50 to 80 feet. Dinosaurs continued to

the end of the Cretaceous period, and some genera became highly specialized, although none attained to the same large size as some of the Jurassic forms.

The disproportion in length and strength between the fore and hind limbs clearly shows that the mode of progression differed widely from that of ordinary Reptiles, and was bipedal at least in some of the genera. In assuming an erect position, their long tail assisted them in balanc- ing the body. Some possessed a dermal armour, the scutes being sometimes produced into enormous spines; others were provided with defensive weapons in the shape of spines attached to the fore-feet. The teeth vary exceedingly : in some of the carnivorous genera they are sharp, pointed, serrated, and recurved, in others flat, in others broad and molar-like ; in some the premaxille are toothed, in others toothless and beak-like.

Marsh compares the Dinosaurs, as regards diversity of form, with the Marsupials, and thinks that, like these latter, they should take the rank of a subclass rather than order. The following is an abstract of his latest classification of the proposed subclass Dino- sauria :—

Order 1. Savropopa. Feet plantigrade, ungulate; five digits in manus and pes; second row of tarsals and carpals unossified. Pubes united distally by cartilage; no post-pubis. Anterior vertebra opisthoceelian. Presacral vertebrae hollow. Fore and hind limbs nearly equal; limb bones solid. Sternal bones paired. Premaxillaries with teeth. Anterior nares at top of the skull.—Herbivorous.

Fam. a. Atlantosaurid#. Ischia directed downwards, with ex- panded extremities meeting ou median line. Anterior caudal verte- bre with lateral cavities. Genera: Atlantosaurus, Apatosaurus, Bronto- saurus. Gigantic Dinosaurians from Upper Jurassic deposits of Colorado, species of the first genns having attained to the enormous length of 80 feet. They are the least specialized forms of the subclass, and approach in some respects Mesozoic Crocodilians,

Fam. b. Diplodocide. Ischia with a straight shaft, not expanded distally, directed downward and backward, with the ends meeting in the median line. Caudal vertebre deeply excavated below.—One genus:

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Order 4. OrnitTHosaurta (extinct). Reptiles with the fore limb adapted to support a flying membrane, and

Diplodocus, from the same formation as the preceding, with very weak dentition, limited to the fore part of the jaws.

Fam. c. Morosauride. Ischia slender, with twisted shaft, directed backward, and with the sides meeting in the median line. Anterior caudal vertebrae solid. Genera, occurring in Europe as well as America : Bothriospondylus, Cetiosaurus, Chondrosteosaurus, Euca- merotus, Ornithopsis, Pelorosaurus.

Order 2, SteGosaurRra, Feet plantigrade, ungulate ; five digits in manus and pes ; second row of carpals unossified, Post-pubis present. Fore limbs very small ; locomotion mainly on hind limbs. Vertebree and limb bones solid. An osseous dermal armour.—Herbivorons.

Fain. a. Stegosauride. Vertebre biconcave. Ischia directed back- ward, with the sides meeting iu the median line. Astragalus coalesced with tibia. Metatarsal short. Genera: Stegosaurus (Hypsirhophus), some 30 feet long, from the Jurassic beds of the Rocky Mountain region, well armed with enormous bucklers, some of which bore spines ; Diracodon; Amosaurus, from British formations (Kimme- ridge Clay).

Fam. 6. Scelidosauridz. Astragalus not coalesced with tibia ; metatarsals elongate. Genera European: Scelidosaurus, from the Lias ; Acanthopholis, from the Chalk ; Oratwomus ; ITylwosaurus, from the Wealden ; and Polacanthus. é

Order 3. OrnITHOPODA. Feet digitigrade with five functional digits in manus and three or four in pes. Post-pubis present. Vertebre solid. Fore limbs small; hind-lintbs hollow. Premaxil- laries edentulous in front. — Herbivorous.

Fam, a. Hadrosaurid#. Several series of teeth, forming with use a tessellated grinding surface. Anterior vertebre opisthoccelous. Genera Americau: Madrosaurus, Agathaumas (?), Cionodon,

Fam. 6. Hypsilophodontide. A single series of teeth. Four functional digits in pes, A single rhomboidal sternal ossification. Genus : Hypsilophodon, from the Wealden of the Isle of Wight.

Fam. c. [guanodontidw. A single row of teeth. Three functional digits in pes. Two symmetrical sternal ossifications. Two genera from Europe : Jguanodon and Vectisaurus ; and three comparatively small forms from the Dinosaurian deposits in North America: Camptonotus, Laosaurus, Nanosaurus. Of these Zguanodon is the one which was first discovered (1825), and of which skeletons have been obtained as complete as we can ever hope to see of these creatures. The remains occur in formations from the Kimmeridge Clay to the Upper Greensand, and have been referred to three species, varying in size from 10 to 385 feet in length. They most probably were aquatic in their habits, using their powerful tail as a propelling organ, like the Crocodiles; but they differed from them in their mode of locomotion on shore, walking on their hind legs like a Struthious Bird. (See fig. 1.)

Order 4. THEROPODA. Feet digitigrade; digits with prehensile claws. Pubes distally coalesced. Vertebra more or less cavernous, Fore limbs very small; limb bones hollow. Premaxillaries with teeth.—Carnivorous, 'This order, although on the whole comprising less gigantic fossils than the preceding, includes some very large forms which are believed to have preyed upon the weaker herbivorous members of Dinosaurians.

Fam. a. Megalosauride. Vertebre biconcave. Pubes slender and united distally. Astragalus with ascending process. Five digits in inauus and four in pes. Genera: Alegalosaurus (Huropean) ; Allosaurus, Celosaurus, Creosaurus, Dryptosaurus (Lelaps) (American).

Fam. 6. Zanclodontidy. Vertebree biconcave. Pubes broad, elongate plates with anterior margins united. Astragalus without ascending process, Five digits in manns aud pes. Genera: Zanclodon, Teratosaurus (?) from the European Trias.

Fam. c. Amphisauridx#. Vertebre biconcave. Pubes rod-like ; five digits in manus and three in pes. Genera: Amphisaurus (Mega- dactylus), Bathygnathus (?), Clepsysawrus(?) (American), Palwosaurus and Thecodontosaurus, European Trias,

Fam. d. Labrosauride. Anterior vertebre opisthocelous and cavernous. Metatarsals much elongated. Pubes slender, with anterior margins united. Genus: Labrosawrus, from America.

Fam. ¢. (or suborder) Celuria. Bones pneumatic or hollow. Anterior cervical vertebre opisthoceelous, the other biconcave. Metatarsals very long and slender. Genus: Caldurus, from America. Very imperfectly known; the remains indicate animals not larger than a wolf, and possibly of arboreal habits.

Fam, f. (or suborder) Compsognatha. Anterior vertebre opis- thoceelous. Three functional digits in manus and pes. Ischia with a long symphysis in the median line. One genus: Compsognathus, froni Solenhofen ; a small form, with long neck, lightly built head, strongly toothed jaws, small fore and very long hind limbs; its femur was shorter than the tibia.

Order 5. HALLovopa. Feet digitigrade, unguiculate ; three digits in pes; metatarsals much elongate; caleaneum much produced backwards. Fore limbs very small; vertebrs and limb bones hollow ; vertebre biconcave. Genus: Z/allopus. Its pertinence to the Dino- saurians is doubtful. The hind feet were adapted for leaping.

with the remainder of the skeleton secondarily modified for aerial progression. Vertebre not numerous, proccel- ous; from three to six forming a sacrum; cervical vertebrae exceeding in size the others. No neuro-central suture. Anterior ribs with bifurcate heads. Skull large, bird-like, with long jaws. Os quadratum suturally con- nected with the skull. Orbits very large, with a ring of sclerotic plates. Sternum broad, completely ossified, with a median crest anteriorly. Scapula and coracoid slender, Bird-like; no clavicle. Phalanges of the ulnar digit exceedingly

elongate. Pelvis weak; hind limb smaller than fore limb. Bones generally hollow, many with pneumatic foramina.

Fam. a. Pterosauria. Jaws toothed; scapula and coracoid separate. Genera; Pterodactylus, Rhamphorhynehus, Dimorphodon, from Jurassic formations of Europe ; of small or moderate size.

Fam. 6. Pteranodontia. Edentulous; scapula and coracoid solidly united, the former articulating with the common neural spine of the vertebre. Genus: Pteranodon, from Cretaceous strata of Kansas ; specimens with a spread of wing of some 20 feet.

Order 5. Crocopit1a. Reptiles with Lizard-like body,

and long powerful tail adapted for swimming. Limbs short, especially the anterior; five digits in manus and four in pes; only three of the digits are clawed. A dermal armour, consisting of flattened bony scutes, covers the Teeth in a single Nostrils generally at

back, and in some genera the abdomen. row, implanted in distinct sockets,

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or near the end of the snout. Vertebrae with the neuro- central suture persistent. Two sacral vertebree only. The majority of the cervical and trunk ribs double-headed, attached to the diapophysis and centrum of the vertebre. From seven to nine of the anterior dorsal ribs are united with the sternum by sternal ribs. Bones of the skull very solid, firmly united by sutures, as is also the quadrate bone. Heart with a double ventricle. Copulatory organ single, situated in the cloaca. .

Fam. a. (or suborder) Procelia, With proccelous vertebrae. All

living genera and the extinct forms down to the Chalk belong to this division.

Fam. 6. (or suborder) Amphieelia. With amphiccelous vertebre. All the genera are pre-Cretaceous: Teleosaurus, Goniopholis, Strep- tospondylus,

Steganolepis, Galesawrus (?), Belodon.

Order 6. SAURopreRyGIA (extinct). Marine Reptiles with long neck, small head, long tail, natatory limbs, and a naked skin. Hind and fore limbs identical in structure and form, transformed into Cetacean-like paddles with five digits, which were composed of numerous phalanges and enclosed ina common skin. Teeth in a single row in both jaws, implanted in distinct sockets. Vertebrae amphiccel- ous, with the neuro-central suture persistent; single- headed ribs are attached to the long diapophyses of the dorsal vertebre. Sacral vertebra two. Quadrate bone suturally united with the skull. A parietal foramen. No sclerotic ring. Neither sternal ribs nor sternum are

Fig. 2,—Skeleton of Clidastes (after Cope).

present; but a system of free abdominal ribs is developed. The pectoral arch consists of a pair of large coracoids, meeting in the median line, and clavicular elements extending from one scapula to the other. Pelvis large, with the ilia, pubes, and ischia not coalesced, and all sharing in the formation of the acetabulum.

These characters may not fully apply to all the genera which have been referred to this order, as some are known from their skulls or other fragments only.

The best known are the PLEsIOsAURIANS (q.v.) proper :—Neusti-cosawrus, from the Trias, with paddles in front and ordinary limbs behind ; gigantic forms from the Trias, as Nothosaurus, Stmo- saurus, Pistosawrus, or post-Triassic, as Plesiosawrus, and Plio- saurus, Polycotylus, and Hlasmosaurus (or Discosaurus) from the Lias and Chalk.

Order 7. RayNcnocerHatia. Lacertiform Reptiles, with four limbs. Vertebra with flat ends; two in the sacrum; the tubercular and articular surfaces are united ; ribs single-headed. Os quadratum suturally united with the skull and pterygoid; an osseous infra-temporal bar. Foramen

parietale present. Sternum and a system of abdominal ribs well developed. Copulatory organs absent; urinary bladder present.

One recent genus: Hatteria. Represented in the Upper Cretaceous

- *It is very doubtful whether Placodus, originally described as a Fish, belongs to this order.*

and Lower Eocene by Champsosawrus, in the Trias by Rhyncho- saurus, Hyperodapedon, and in the Permian by Proterosawrus, Sphenosaurus, Telerpeton (2), Sawrosternwm (2).

Order 8, Lacerrimia. Lizards. Vertebre generally proccelous, with short or rudimentary transverse processes ; sacral vertebree not exceeding two; ribs single-headed. Os quadratum articulated with the skull. Parts of the ali- and orbito-sphenoid regions fibro-cartilaginous. Temporal region without, or with only one, osseous bar. Limbs four, two, or absent ; when they are present, a sternum with sternal ribs and a pelvis are developed. Copulatory

organs paired; urinary bladder present. Integuments with horny or sometimes bony scutes. For the numerous recent genera see Lizarps. Distinguishable

representatives of the order appear first in Jurassic formations and thence downward to our period: Acrosaurus, Ardeosaurus, Pleuro- sawrus, Saphiosaurus, Atoposaurus, and Homeosaurus from the Oolite; Nuthetes, Saurtilus, Maeellodon from the Wealden; Dolicho- saurus, Aeteosaurus, Coniosaurus, Rhaphiosaurus from the Chalk. From Tertiary formations in Europe numerous small remains are known, whilst those described from Australia belonged to much larger forms, showing more or less affinities to the Lizards of the present Australian fauna,

A distinct division of this order includes the extinct Mosasaurians, which are, in fact, the Pinnipedes among Lacertilians. Their limbs, of which they had two pairs, are transformed into paddles; by their long Snake-like

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body and large size the marine Reptiles form the nearest approach in nature to the modern creature of imagination, the "Sea-Snake." There is no question that they deviate more from the Lacertilian type than any of the other fossil forms mentioned above, especially in some of their cranial characters, which are more Ophidian. Hence Cope placed them into a distinct order of Reptiles, Pythonomorpha, Their body was covered with osseous scutes,

Besides Afosasawrus, remains of which have been known and described since the year 1766, a number of other genera from Cretaceous rocks of Europe and North America have been distin- guished by Owen, Cope, Marsh, and Dollo: Liodon, Clidastes (fig. 2), Sironectes, Platccarpus, Baptosaurus, Diplotomodon, Edestosawrus, Holosaurus, Lestosaurus, Tylosaurus, Pterycollasaurus, Plioplate- carpus,

Order 9. Opnipia. Snakes. Vertebre proccelous, extremely numerous; no sacrum ; ribs single-headed. No chevron bones on any of the vertebrae. Not only the quadrate bone is movably articulated to the skull, but also the suspensorium and the bones of the palatal maxillary apparatus are movable; brain capsule entirely osseous. No quadrato-jugal arch. No foramen parietale. Rami of the mandible united by ligament. No trace of anterior extremities, and posterior only sometimes rudi- mentally indicated. Copulatory organs paired ; urinary bladder absent. Integuments folded into regularly ar- ranged scales.

For the numerous recent genera see SNAKES. Fossil forms are searce, and do not appear before the Eocene (Laophis, Palwophis, Paleryx).

Order 10. Cuetonta. Tortoises and Turtles. Cervical and dorsal vertebrae not numerous. The dorsal vertebrz and expanded ribs (with the exception of Sphargis) are united into a carapace, the elements of which are immov- able, and which is completed ventrally by a number of dermal bones, a true sternum being absent and replaced by a plastron. All the bones of the skull are suturally united, with the exception of the mandible and hyoid ; the dentary portion of the mandible consists of one bone only. Pectoral arch consisting of the scapula, with which the precoracoid is united, and the coracoid. Clavicles are represented by the antericr elements of the plastron. The pelvis consists of the usual bones, but is not attached to a

sacrum. ‘Two pairs of limbs. No teeth, these being replaced by horny sheaths of the jaws. Copulatory organ single. Integuments consisting of horny scutes covering the carapace, and of scales and tubercles on the soft parts.

ANATOMY. |

For the numerous living genera see TortTorsEs. Remains of extinct Tortoises are found from the Trias downwards, but they do not show any approximation to some other Reptilian type, or indicate a successive development. The most generalized type, Sphargis, is not older (according to present evidence) than some of the more specialized genera, its earliest representative being the remarkable Protostega from North-American Cretacean formations. Some of the Tertiary fossils excceded in size the largest of living forms, such as the Himalayan Oolossochelys, the German Macrochelys, the North-American Adlantochelys. (A. C. G.)

Tue ANATOMY OF REPTILES.

As the principal features known of the anatomy of extinct Reptiles have been sufficiently noticed in the several separate articles devoted to them, this chapter will deal almost exclusively with the general structure of living forms.

Inasmuch as the class of Reptiles is one of the classes which make up that great primary zoological division known as “vertebrate animals,” they of course possess all those structural characters which are common to that division (see VERTEBRATA). They also possess in common a certain number of structures which they share with

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*Birds (see SavRopsiDA), and which will be indicated in our General notice of the different sets, or systems, of organs which char- compose the bodies of the animals of which this article *”-*

treats.

Every Reptile has a body made up of a head, a trunk, and a tail, though, as in some Lacertilia and many Ophidia, these regions are not marked off one from another by any constriction or noticeable alteration of diameter. The posterior aperture of the alimentary tube always marks the termination of the trunk and the commencement of the tail. In some kinds of Reptiles—as, ¢e.g., in the genera Anguis and Amphisbena amongst the Lacertilia, and in such forms as Typhlops and Uropeltis amongst the Ophidia —the whole body consists of little more than a very elon- gated trunk with a small head at one end and a short or even quite rudimentary tail at the other. A neck may be interposed between the head and the trunk; this, how- ever, is generally short, as in the Lacertilia and Crocodilia, but may be more or much elongated, as in the Chelonia. It was extraordinarily long in the extinct Sawropterygia— like that of a Swan.

The head may be very large, as in the Crocodilia and extinct Ichthyopterygia, or small, as in the Sawropterygia, or very small indeed, as in 7'yphlops and Uropeltis. It always contains the organs of taste, smell, hearing, and sight, but there may be, as in many Lizards and all Snakes, no external indication of an ear, and the eyes are almost hidden by the skin in Snakes such as Z'yphlops, and certain Lizards such as Amphisbeenians and some Skinks. The mouth may be very large, as in the Crocodiles, or very small, as in Z'yphlops.

The trunk may be exceedingly elongated, as in the instances just above referred to, or relatively very short and broad, as in the Chelonia.

The tail may vary in development from its rudimen- tary condition in Z'yphlops to a length which exceeds that of the body several times, as in not a few Lacertilia. Its distal end may be prehensile and form an important grasping organ, as in almost all Chameleons.

Besides these regions, there are generally two pairs of limbs,—one pectoral, the other pelvic,—though these may be altogether wanting as far as regards any external mani- festation, as in all Ophidians and certain Lacertilians like Anguis and Ophisaurus. Internal rudiments of limbs may, however, be present when there is no external indication of them, as will be pointed out when describing the appen- dicular skeleton.

There may be but one pair of limbs, and these pectoral, as in the Lizard Czrotes; or there may be but one pair, which are pelvic, as in the Lizards Pseudopus, Lvalis, and Ophiodes.

The pectoral and pelvic limbs are, as a rule, pretty equal in development, and they may be very much so, as in Chelonians and the Sauropterygia. Both may be exceedingly small, as in many Lizards, such as a number of the Scincidx, or both may be relatively large, as in Cheloni- ans. In no existing Reptile with four limbs does either pair very greatly exceed the other in length and size, but in extinct Dinosauria the pelvic limbs were greatly in excess, while the reverse was the case with the extinct Ornithosauria.

The extremities never terminate in more than five distinct digits, and the number may be reduced to one in front, as in Zhodona, or one behind, as in Dibamus. The extremities may end bluntly and be undivided, as in land and marine Chelonians, and as in the extinct Ichthyop- terygia and Sauropterygia. The pectoral and pelvic limbs are generally not very divergent in form and structure, and they may be wonderfully alike, as in the existing Tortoises and in the extinct Ichthyopterygia and Sauro-

pterygia. 'They were, on the contrary, extremely divergent in certain Dinosauria, and still more in the Ornithosauria.

Every Reptile has a body composed of organs of nutrition, circulation, respiration, secretion, reproduction, sensation, and motion, supported internally by a solid framework, the internal skeleton or endoskeleton, and enclosed in a firm investment, constituting the external skeleton or exoskeleton.

The External Skeleton.

The external investment of the body consists of two layers. The outer of these, the epidermal layer, or epidermis, is of an epithelial horny nature and never becomes bony. The deeper or dermal layer, the dermis, is a

fibrous structure which may become bony. Neither hairs nor feathers are developed.

The exoskeleton is characterized in this class of animals by being composed of distinct superficial thickenings placed side by side and separated one from another by thinner interspaces. According to the size and form of these thickenings they are known by different names. If they are very small and rounded they are called "tubercles," and such we see on the body of the Chameleons and Geckos. If they are large, flat, and not overlapping, they are called shields, and such we see, eg., on the head of the true Lizards. If the hinder part of each thickening is more or less prolonged over the anterior part of one or more next behind it, structures of this kind are called scales, such as we find dorsally clothing the bodies of most Lizards and many Serpents. If the median part of each such scale is still more thickened longitudinally, then such a scale is said to be carinate. In most of these cases the epidermis itself is also more or less thickened locally, as well as the subjacent dermis, remaining thin in the folds or interspaces. The dermis may be ossified, forming dense bony plates, or scutes, beneath the epidermal investment. The whole body may be thus clothed, as in the Lizard Cyclodus and others, or the bony plates may be confined to parts of the back, as in some Crocodilians. The development of the exo- skeleton is carried to the highest degree in Chelonians, when large osseous plates form, in the Land Tortoises and Terrapins, a complete and continuous bony case for the body, invested externally by a rich corneous epidermis, and becoming internally anchylosed with the endoskeleton itself,

*Exoskele- In most Ophidians the body is clothed with scales ton of above and with large transversely elongated shields beneath ri cet (single or double beneath the tail), though the body may * be entirely invested by small scales except the head, as in Typhlops, or by tubercles, as in Acrochordus.*

Sometimes, as in Cerastes and the River Jack, two horny appendages are erectly developed over the nose and sometimes, as in Herpeton tentaculatum, cutaneous appendages project from the snout, or the snout may be exceptionally produced. The skin of the side of the body just

behind the head may form a distensible fold, as in Naja, and there may be, as in Python, a claw on each side of the vent, which claw is a rudiment of the pelvic limb, as will be explained in describing the appendicular skeleton. A peculiar cutaneous depression exists between the nostril and the eye in Crotalus and the other Pit-Vipers. For full details on these subjects see the separate articles on the orders.

ofLacer- In the Lacertilia we find a number of different tilians; cutaneous conditions which have been already noticed in describing the various groups systematically. It will then suffice here to remind the reader that the Amphis- beenians have quadrate shields over the entire body except the head, arranged in transverse rings, and that in such forms as Chalets the scales are also verticillate, while in

the Scincoidea and Anguide they are imbricate, and on the Chameleons granulate. The head may be covered with large shields, as in the Lacertidx, or with small scales like those of the body, as in the Monitors, and there are often long sharp spines on the head and body, as in Grammatophora, Phrynosoma, and Moloch, The in- tegument may also extend out from the body along the back and tail, as in Basiliscus and Lophura, or from beneath the throat, as in Jguana, or largely across the neck, as in Chlamydosaurus, or on either side of the tail, as in Ptychozoon, or from each side of the body so as to be distensible and to serve as a parachute, as in Draco; while in the Ornithosauria it passed from the elongated hand to the body and leg as in the wing of the existing Bats. It has also been before stated that in certain cases different genera are distinguished by pores, 7.¢., the apertures of small cutaneous sacs placed on the inner side of each thigh or in front of the cloacal aperture. Folds of skin may invest the digits and constitute webbed feet, as in some Geckos, as well as in Crocodiles and Terrapins, or may bind the digits in two opposite bundles, as in each ex- tremity of the Chameleons. Normally each digit is ter- minated by a claw.

In Crocodilia the epidermal thickenings do not overlap as in some Lizards, but form conspicuous prominences in the dorsal region, which serve as specific characters, and which have bony plates beneath,—which plates may, as in Alligators, exist on the belly as well as the back, and may

form continuous rings round the tail, those of each anterior row overlapping those of the row next behind. Not all the digits are provided with claws. The feet are webbed.

of Croco-

dilians ;

The Chelonca present considerable differences as to the of Che- exoskeleton. The Mud Tortoises, Trionyx, have a soft lonians.

epidermis, and Sphargis has a coriaceous outer layer of

Fie, 3.—A portion of the osseous plates of the earapace of Sphargis coriacea, showing three large keeled plates of one of the longitudinal ridges of the carapace, with a number of the small irregular plates on either side of them. (From nature.)

integument covering a carapace divided into small sub- hexagonal shields. In the other Chelonians there are large epidermal shields, which may overlap, as in the Tortoise- shell Turtle (C. imbricata) and others, or may be conter- minous, as in Zestudo and Emys. These shields form a mid-dorsal series and two lateral rows on either side, while there are two longitudinal series on the ventral side of the body.

Beneath the epidermal layer of the integument osseous plates are found, which plates do not coincide either in

Skeleton of the trunk ;

SKELETON. |

number, size, or shape with the epidermal shields which (save in T'rionyx and Sphargis) cover them. Their condition in Sphargis is quite peculiar. In the skin of its back there are imbedded a great number of small plates flexibly united in a mosaic-like pattern, Seven longitudinal rows of these plates (one median, six lateral) differ from the rest by their large size and raised surfaces. On the ventral surface of the body there is one large thin

median plate—the epister- num, together with other very slender ossificatious forming a very imperfect bony framework. All these latter bony plates, however, are very imperfectly ossified, with numerous vacuities. In the Land Tortoises and Terrapins, on the other hand, we have the exoskeleton in its greatest perfec- tion. On the back there is a series of ten median plates, the first one of which is called nuchal and the last one pygal. On each side of these series and suturally connected therewith is a series of large lateral plates also suturally united together and with the median plates. Finally, a series of marginal plates suturally connected together and with the foregoing complete a bony investment of the back which is complete and continuous, and which is known as the carapace. On the ventral surface of the body nine other bony plates form another continuous shield termed the plastron. The most anterior pair correspond with the bones known as clavicles in Man and many other animals. The azygous plate between and behind them answers to the episternum of many animals. The carapace and plastron are united at the sides of the body, but are separated medianly in front and behind to allow the protrusion and retraction of the head and the four limbs and tail. In Chelonia similar plates exist, but they are less developed, and merely form an imperfect species of investment, with many vacuities between the plates. The same is the case in 7'rionyx, wherein the marginal plates are also wanting.

The skin of the neck and limbs is covered with scales. The skin of the neck may develop fimbriated processes and caruncles, as in Chelys, and the nose may be produced into a short proboscis, as in Z'rionyx, True claws may be absent, as in Sphargis, or there may be but one on each foot, as in Chelone, or two, as in Caretta, or three, as in T'rionyz, or four or five, as in Z'estudo and Hmys. The claws may approximate in form to hoofs in some of the large Land Tortoises. There may be a web between the digits, as in Emys, or the whole extremity may be united into a solid paddle, as in Chelone.

In all cases the skin of the jaws is found thickened and condensed so as to form a horny beak with a cutting edge.

In many Chelonians there are two pairs of glands on each side just in front of the junction of the plastron and carapace, while in the Mud Tortoises, 7rionyx, there is yet another gland on each side in front of the margin of the plastron.

The Internal Skeleton.

The endoskeleton of Reptiles, as of most Vertebrate animals, consists of parts which are divisible into two categories :—(a) those which form the skeleton of the head and trunk, t.¢, the azial skeleton; (b) the parts which form the skeleton of the limbs, 7.e, the appendt- cular skeleton.

Tue AxtaL SKELETON.—In describing the axial skeleton it will be well to begin with that part of it which belongs to the trunk, leaving the more complex skeleton of the head, a.¢., the skull, for subsequent consideration.

Skeleton of the Trunk.—The backbone, spinal column, or spine consists in all adult Reptiles of a series of ossi- fied vertebrae, many, almost all, of which are separate and not anchylosed one to another. Nevertheless the

spinal or vertebral column varies in its structure much more in the class of Reptiles than even in the Jfamma, lia, and very much more than in the class of Birds, with which the Reptiles are so much allied. This variation consists in differences not only as regards the number of regions or vertebral categories and the extent and struc- ture of each region, but also as regards the form of the individual vertebre and notably the form of the vertebral centra.

There may or may not be distinct cervical vertebra with or without movable ribs. The first two vertebra are differentiated as axis and atlas, and in front of the latter there may be a rudiment of another vertebra, which has been distinguished as the proatlas.! There are always dorsal vertebrae, some of the ribs of which may not, but more generally do, join

a sternum. These dorsal ribs are generally movable, aud may be, as in Serpents, organs of locomotion. They may, on the contrary, be firmly fixed by suture one to another as in Chelonians. There may or may not be lumbar vertebree, and two or more (in some extinct forms many) vertebrse may unite to form a sacrum. There are always caudal vertebre, and these generally have chevron bones beneath them. Sometimes vertebree which are not sacral become anchylosed together, as in the dorsal vertebrae of Chelonians. Articular processes always connect together adjacent vertebrze which are not thus anchylosed, and there may be accessory articular processes peculiar to the class, and which will be shortly described later. As to the form of the vertebral centra, they may be flat in front and behind, or biconcave (amphiccelous), or biconvex, or with a ball behind and a cup in front (pro- ccelous), or with a ball in front and a cup behind (opistho- coelous).

In the Crocodilia all the above-mentioned regions are in Croco- distinct, there being usually 9 cervical, 11 to 12 dorsal, 2 dilians;

to 3 sacral, and about 40 caudal vertebrae. In existing species all the vertebree are proccelous except the atlas, axis, sacral, and first caudal vertebrae. The adjacent sur- faces of the centra of the sacral vertebre are flat, and the centruin of the first caudal is biconvex. The atlas consists of five pieces,? and the odontoid bone is not anchylosed to the axis. The caudal vertebree are elongated and com- pressed, and, except the most anterior and posterior, support chevron bones. Ribs are very generally present. Those attached to the atlas and axis are single in origin. Hach rib of the other cervical vertebree bifurcates at its upper end into a tubercular and a capitular process, which respec- tively articulate with the neural arch and centrum of their supporting vertebra, and the interval thus left in the succeeding vertebrze forms a canalis centralis. The ribs of the middle five cervical vertebrae so expand distally as to impede the lateral flexion of the neck. The neural arches articulate by suture with the vertebral bodies. The dorsal ribs become attached to processes which pass out from each vertebra to the tubercular and capitular processes of the ribs respectively, and their situation with respect to the neuro-central suture changes by degrees, through the vertebral series, till in the twelfth dorsal one long trans- verse process, passing out above the neural central

suture, supports both processes. Thence backwards these arti- culating surfaces approximate till at last there is but a single articular surface between each rib and its sup- porting vertebra, as was the case in those of the atlas and axis.

The dorsal ribs consist of two pieces—the distal piece remaining cartilaginous ; and most ribs support an imper- fectly ossified processus uncinatus, nearly as in Birds, which extends backwards from the distal portion of its ossified

1 Discovered by Prof. Paul Albrecht. 2 In front of it a rudimentary proatlas has been found.

in Hat- teria;

piece (fig 4). From seven to nine of these ribs have ossified sternal ribs which serve to connect them with the sternum. The lumbar vertebree have only ns ngs ng

long transverse processes which i arise above the neuro-central suture. The sacral vertebrz support very stout transverse processes, each of which includes a rib element and becomes anchylosed to the centra only at a late period of life, as do @< the comparatively long and slender caudal _— transverse processes. Inferior sé hans: hyp 7 Fra. 4.—Lateral sateen of three thoraeic vertebra

physes, which are of Crocodilus vulgaris (from nature). c, cup on the azygous, descend one sneror surface of centrum; cp, expitul of bss from beneath the ribs; Uy uncinate processes ; vr, vertebral ribs. centrum of each of the more posterior cervical and anterior dorsal vertebree.

The sternum consists of an ossified rhomboidal plate, with the hinder side of which two pairs of costal cartilages articulate. A narrower piece extends backwards from this plate (connected with it by ligament), and ends in two diverging processes. With this the other sternal ribs articulate.

A long slender bone, the interclavicle, or episternum, lies in a median groove of the sternal plate, and extends forwards beyond it.

There is a so-called abdominal sternum made up of a series of seven or eight slender bones which lie in the aponeurosis of the external oblique muscle of the abdomen behind the true sternum and in front of the pelvis. It lies at a lower level than the sternum, and has no direct connexion with the vertebral column.

In Hatteria, the only living member of the order Rhynchocephalia, as well as in the extinct species, the vertebral bodies have flat or concave surfaces in front and behind. There are 8 cervical, 14 dorsal, 3 lumbar, 2 sacral, and 36 caudal vertebre. There is no persistent neuro- central suture in //atteria, though there may be in some extinct forms of the order. Rudiments of the proatlas are sometimes present. The atlas consists but of three pieces, and the odontoid bone is anchylosed with the atlas, and is concave anteriorly. An autogenous hypapophysis is wedged into the inferior interspace between the centrum of the axis and the third vertebra, and similar parts are developed thence backwards to beneath the seventh and eighth vertebre. Hatteria has the faculty of reproducing its tail after mutilation. When the tail is broken the fracture takes place in the middle of one of its centra and not between two adjacent centra. This is owing to the fact that each caudal vertebra is divided into an anterior and a posterior part (fig. 5), and is weakest at this line of Kg junction which passes behind =tmc the transverse process.

The first rib is attached to the fourth vertebra. Those Fie. 5—Vertical section of four (7th of the ninth and the following oie tae of og the vertebre attain the sternum. middle of centrum. (After Giinther.) The more posterior ribs become connected with the abdo- minal sternum. All the ribs are single at their proximal ends, a bifurcation being scarcely indicated even at the most anterior one. Processus uncinati are fully developed.

The sternum is a rhomboidal, semi-cartilaginous plate, with a medianly situated long and slender episternum which unites with a pair of clavicles. An abdominal sternum is

more fully developed than in any other living Reptile. It consists of about twenty-five transverse rods, each of which is composed of three pieces. These rods are con- nected and disconnected with the ribs in an alternate manner, every other rod being suspended from a pair of the true ribs.

Lacertilia.—In this extensive order of living Reptiles, in Lacey. the vertebrae are proccelous except in the Geckotide and tiliaus ; Uropeltide, where they are biconcave. There may or may not be distinct cervical, lumbar, and sacral regions, and the number of vertebra, generally considerable, may be very large. 'The distinctness of the vertebral regions depends on the development of the anterior and posterior limbs.

When a cervical region can be distinguished, there are never more than nine such vertebrae. Only in rare instances are there distinct lumbar vertebrae. The sacral vertebree are never more than two. The neural arch is always anchylosed to the centrum in adults. The atlas consists of three parts, and the axis may or may not have the odontoid bone anchylosed to it and convex in front. Ribs are attached to most of the cervical as well as to the dorsal vertebrae ; but the former are not expanded distally as in the Crocodile, and thus the latter do not support uncinate processes. The more anterior ribs show two proximal articular surfaces, but these never diverge into distinct capitular and tubercular processes as in the Croco- diles, nor, as in the latter, do any of the dorsal vertebrae develop double, superimposed transverse processes. The | more anterior (usually the first three or four) dorsal ribs | are connected with the sternum by sternal cartilages. | Those behind may be similarly connected with the diverg- '

ing backward prolongations of the sternum, or may be

directly connected with their fellows of the opposite side,

as in the Chameleon, a median cartilage being joined on

either side by the sternal cartilage continuous with an

ossified rib. In Acontias and other limbless Lacertilians

which have but a rudimentary sternum, or none, the corre-

sponding ribs of the right and left sides are connected

across the mid-ventral line as they are in Chameleo. In : Draco the more posterior ribs are greatly prolonged, and their distal cartilages are bent backwards. This is to enable them to support the wing-like membrane which extends from either side of the body to serve as a parachute. In those Lizards which have a lumbar region, transverse processes are there developed. The caudal vertebrae (except the most anterior and the small posterior ones) have chevron bones, which are not generally anchy- losed to the vertebrae which support them.

In addition to the ordinary articular processes, there are in Iguana certain accessory articulating structures such as are commonly found in the vertebree of Serpents; these will be described in the next section.

The sternum consists of a rhomboidal semi-ossified or cartilaginous plate, which is sometimes continued back- wards into a pair of long diverging processes. There is generally an episternum, which is often T-shaped, but it may be absent, as in Chameleons. In the limbless Lizards the sternum is cartilaginous, and there is none whatever in some forms, as, ¢.g., in Amphisbena and T'yphline. /

In many Lizards, notably in the commonest English . Lizard, the tail if broken off can be reproduced. In them the centra of the caudal vertebrae have a vertical median division similar to that already described in Hatteria.

In Ophidians the number of vertebre is generally very in Ophi- large, and may exceed four hundred. They are all proccel- dians ; ous, and the ball behind each is nearly hemispherical. There is no distinction of cervical, lumbar, or sacral vertebra ; but all the vertebree after the atlas may be considered as either dorsal or caudal. The mode of articulation between the vertebree is more complex than in almost any Lizards.

in Che- Jonians.

SKELETON. |

In addition to the ordinary articular processes (or zygapo- physes), which are here broad and flattened, often with an accessory process, there are two noteworthy structures. The first of these is called the zygosphene, and consists of a wedge-shaped process with two articular surfaces, which projects forward from the anterior surface of each neural arch. The other is called the zyg- antrum, and is a corresponding excavation with two articular sur- faces on the hinder side of the neural arch, and receives the zygo- sphene of the vertebra next behind it. It was structures such as these that were referred to in the last paragraph as existing so exception- allyamongst Lacertilians inJgwana.

The atlas and axis have a form similar to that already described as existing in the Lacertilia. Long azygous hypapophyses nearly always depend from the centre of the anterior trunk vertebrae, or even from the whole of them, being especially large and numerous in some of the most poisonous Serpents, ¢g., Crotalus and Naja. In Dasypeltis scaber some of these processes in the ante- rior dorsal region are made to minister to alimentation,—their tips being coated with tooth sub- ic, 7 poses saps stance, and penetrating within the nature), a, articular processes; alimentary canal, as will be again aithunes na neural evel: me mentioned further on. neural spine; ¢, transverse pro-

*The ribs assume the function of °°} *% 77santrum. locomotion, and are therefore very movably articulated to short transverse processes. Hach has two proximal articu- lar surfaces, but they are close to- gether, there being no diverging articular and tubercular processes. Each rib terminates in a short car- tilage. The caudal vertebrae may, in rare instances, be very few, and they may be very numerous—from five to two hundred. They do not Fie. 8.—Anterior aspeet of a possess chevron bones, but bifold La cr, 8 rom depending hypapophyses, and they «<, cup on the surface of the have transverse processes which also [Ctvalspiner £ transverse pre, are generally bent downwards. cess ; 26, Zygosphene, ”*

Sometimes, at the limit between the body and the tail, the transverse process, or the rib, as the case may be, bifurcates or develops an ascending process, as, ¢.g., in Boa, Naja, and Echidna.

No Ophidian has any sternum.

Chelonia.—The Tortoises and Turtles present a spinal structure remarkably divergent from that of all other Reptiles, and especially divergent from that of Ophidians. Nevertheless the Chelonia agree with the Ophidia in having no sternum, and in having at least a portion of the vertebral column formed for extreme mobility, in spite of the excessive rigidity and immobility of the trunk. Only in Sphargis do we find a structure generally resembling that of other Reptiles and diverging from that common to other Chelonians. With the exception of Sphargis, the structure of the vertebral column of which will be sub- sequently noticed, the Chelonians present the following characters. The endoskeleton of the dorsal region is intimately united with those ossified exoskeletal plates which have been already described (supra, p. 447) as investing both dorsally and ventrally the entire trunk. The median series of plates are united with the neural spines and arches, and the lateral plates are similarly

Fig. 6.—Lateral aspeet of two trunk vertebra of Python(from nature), a. artieular processes; na, neural arehes; ms, neural spines; ¢, transverse processes; z8, zygosphene.

united with the ribs, so that the carapace is formed both of endoskeletal and exoskeletal elements intimately united. The constancy of the number of vertebra is very excep- tional, as is also the very small number of those of the body. There are always 8 cervical, 12 dorsal, and 2 sacral vertebrae. The number of caudal vertebre varies, but is never great. The cervical vertebree have very small processes, whereby they are better fitted for great mobility. They vary greatly.as to the form of their centra, some being opisthoccelous, others proccelous, others biconvex, while one at least is flattened both in front and behind— the arrangement differing even in differént species of the same genus. The atlas consists of three pieces, and the os odontoideum is separate. The neuro-central suture per- sists. The centra of the first ten dorsal vertebrae are amphiccelous, and but loosely connected with twin neural arches, each neural arch being superimposed over the posterior half of one vertebra and the anterior half of the

vertebra next behind. The sacral vertebrae have either stout ribs suturally attached or transverse processes anchy- losed to the vertebrae. The caudal vertebrée are proccelous, and generally have a pair of separate descending processes, which may (as in Chelydra) unite distally and form chevron bones.

In Sphargis the endoskeleton is quite distinct from the exoskeleton. Its neural arches are very loosely united to the centra, so that they can be separated with the greatest ease. The trans- verse processes of the caudal vertebrze also remain unan- chylosed to their , centra. The dorsal (/ vertebrae pass so gradually into the caudal that the boundary can only

be determined by Fic. 9.—Three vertebrae of Sphargis coriacea (from the somewhat in- nature). ¢, vertebral centra; 2, neural arches; r, ribs.

creased thickness of the transverse process of the two sacral vertebree. The summits of the neural arches are somewhat dilated (as if from superincumbent pressure) or obtusely keeled. The ribs are not much expanded, their heads fitting into a hollow formed by the centra of two vertebrae together with the neural arch superimposed upon the two. They become shorter and narrower behind, that of the tenth dorsal vertebra being even smaller than the sacral ribs.

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The Skull.—The anterior portion of the axial skeleton, The or cranium, differs markedly from that of every other skull ;

class of Vertebrates, while it presents a much greater diversity of structure than does the cranium of Mammals or of Birds. It differs from the cranium of the lower Vertebrate classes by its more complete ossification and by a greater prolongation backwards of the nasal cavity, which causes a greater expanse and density of the palatal structure. The skull, however, is not so much ossified as in Mammals, and the bones do not become anchylosed together so quickly and certainly as in Birds. The occipital region always consists of four occipital elements, and there is an ossified basisphenoid in front of a well- developed basioccipital. The skull almost always arti- culates with the atlas by a single occipital condyle.

The lower jaw is always suspended to the skull by the inter- vention of a quadrate bone with which the os articulare of the mandible articulates. Besides the last-mentioned bone the mandible consists of as many bones as in Fishes, with the addition of a supra-angular and a complementary bone.

The bones of the cranium may form a very solid and

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in Croco- dilians ;

in Hat- teria ;

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[ANATOMY.

very continuous open case, with no mobility save that of | Crocodiles, of two outstanding " parotic processes," made the lower jaw; or it may consist of bones several of | up of the exoccipital, prootic, and opisthotic bones,—

which are so conditioned as to allow much mobility to | beneath which is the

several other parts. In all cases, however, the side wall

of the anterior part of the cranial cavity is very imperfectly | pterygoids.

ossified.

The skull of the Crocodilia is distinguished from that of all other Reptiles by its very extensive bony palate, which exceeds in completeness that of even any Mammal save the Anteaters and Cetaceans, for not only the maxilla and palatines but also the pterygoids—all as expanded bony plates suturally united—concur in its com- position in all existing

Crocodilians (though not in the extinct Z'eleosaurus or Belodon), and the pterygoids sur- round the posterior nares. The skull forms a solid whole composed of bones united by suture except at the antero- lateral and median boundaries of the cranial cavity, where it is cartilaginous or membranous. There isan interorbital septum. The quadrate bone is immovably fixed and of large size, and unites with the pterygoid, but by its upper and inner surface only. 'The alisphenoid is a large broad bone. The tympanic cavity is completely enclosed by the prootic and opisthotic (the latter being united with the exoccipital), the squamosal, the postfrontal, and the basioc- cipital and basisphenoid. It opens into the mouth by three apertures, one niedian and two lateral,! which terminate complex canals having communications among each other. There are two lateral, quasi-zygomatic arches to the skull —an upper one formed by the postfrontal and squamosal, and a lower one by the maxilla, jugal, quadrato-jugal, and quadrate. There is no foramen in the parietal region of the skull, and there is an azygous parietal bone and frontal. On either side of the hinder region of the skull the periotic and exoccipital bones form large parotic processes. There is a distinct perforated lachrymal. There are two vomers, which are generally hidden in the palate by the junction of the extensive maxillze and palatines. There are a pair of nasal bones. Various cranial bones are pneumatic, including the os articulare of the mandible. The hyoid is very simple, and consists only of a broad cartilaginous or partly osseous basihyal, with two bony cornua, not directly connected with the skull. There is a very small carti- laginous stylohyal on the upper hinder part of the quad- rate.

Hatteria.—The skull of this living type of an extinct order resembles that of the Crocodilia in that there is a lower zygomatic arcade formed by the quadrato-jugal bone interposed between the malar and the quadrate, as well as a superior zygomatic arcade formed by the squamosal and postfrontal, and in that the quadrate bone is immov- ably fixed between the pterygoid, squamosal, and quadrato- jugal. The palate is pretty complete with wide plate-like ossifications, still it is much less so than in the Crocodiles ; but the posterior nares are much more anteriorly situated —very near the anterior end of the palate—and are on each side, being each bounded by the premaxilla in front, the vomer internally, the maxilla externally, and the palatine behind. At the side of the skull we find a bone

distin- guished as the "columella," which passes upwards from above the suture between the pterygoid and quadrate to the parietal, to which it is attached by a slip of cartilage. It is a flattened bone, somewhat expanded above and below, and constricted towards its middle. The lateral wall of the skull at the part which in the Crocodile is occupied by the alisphenoid, and in front of that part is not osseous but fibro-cartilaginous. There is an interorbital septum. The postero-lateral region of the skull consists, as in the

1 For a full description with good figures of this very complex structure, see Owen, Phil. Trans., February 28, 1850, vol. ex). p. 521, pls. 40-42.

"columella auris." The basi- sphenoid sends down two processes to abut against the The parietal is perforated by a small median

ad Fig, 10,—Skull of Hatterta (after Gtinther). 1, ventral aspect; 2, lateral aspect;

sp

8, latcral aspect of mandible. ar, articular; 60, basioccipital; 6s, basi-sphenoid; ¢, coronoid; ca, columella auris; @, dentary; j, jugal; m, max-illa; n, nasal; pa, parietal; pl, palatine; pm, premaxilla; pr, prefrontal; ps, postfrontal ; pt, pterygoid; g, quadrate; gj, quadrato-jugal ; s, squamosal; sp, splenial ; v, vomer. fontanelle. The premaxille are separate, and together form a sort of beak, their large teeth becoming thoroughly anchylosed and united with the bones supporting them. The nasals are double, and each sends forth a process (some-

what as in Birds) from its outer anterior angle.

The Lacertilian skull is formed mainly upon one of two in Lacer-

diverging types of structure—(1) that of ordinary Lizards, and (2) that of Chamzleons. In both the quadrate bone is almost always movable and the inferior zygomatic arcade is wanting, though generally represented by a ligament ; the palate is incompletely ossified, and the rather anteriorly situated posterior nares bounded internally by the bifold vomers. In the

ordinary Lizard type the skull has the appearance of consisting of a system of osseous bars con- necting the solid occipital parts (with its pair of parotic processes) with a flattened cranial roof and the more or less well ossified snout. The skull has an interorbital septum. The lateral walls of the cranium are, as in /Zatteria, fibro-cartilaginous, though they may contain some insig- nificant ossifications; and a "columella," as in Hatteria, generally ascends from the pterygoid to the parietal. The last-named bone sends a backward prolongation to the parotic process and squamosal, and is movably united to the occipital ; and thus, through the imperfect ossifica- tion of the cranial parietes, the facial part of the skull is capable of more or less flexion upon the occipital part.

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There is generally a superior zygomatic arcade formed by the junction of the postfrontal with the squamosal ; and, very generally, the orbit is enclosed posteriorly by a junction of this postfrontal with the malar. The basi- sphenoid sends down (as in Hatteria) two processes to abut against the pterygoids, which again join the quadrate bones. An os transversum unites the pterygoid, palatine, and maxilla of either side. The maxilla is thus a fixed bone ; the premaxilla is generally single, and sends a median

SKULL. |

process backwards. The nasals, frontals, and pariectals may be single or double. There is generally a parietal fontanelle.

By very rare exception, as in Monopeltis, there may be two occipital condyles, that (median) portion which is formed from the basioccipital aborting.

Fig. 11.—Skull of Monopeltis sphenorhynchus (from nature). 1, dorsal aspect 5 2, ventral aspect; 3, lateral aspect; 4, posterior aspect. ar, articular; bs, basisphenoid ; d, dentary ; f, frontal; m, maxilla; m, nasal; oc, uc, occipital condyles; of, occipital foramen; pal, palatine; pa, parietal; pm, premaxilla; ptg, pterygoid; g, quadrate ; so, supraoccipital; sq, squamosal; v, vomer.

The hyoid consists of two pairs of cornua, whereof the anterior is generally the longer, attached to a median portion from which azygous a bifold process may proceed both anteriorly and _poste- riorly.

*In the Amphisbenians the skull is more solidly and con- tinuously ossified than is usual in Lizards, though there is no columella and though the { low ali- and orbito-sphenoidal regions are membranous. The parietal is not movably arti- culated to the exoccipital, and the facial part is solidly ossi- fied and not movable upon the hinder portion of the skull. The orbits are not enclosed *¢ So ‘ behind, and there is no superior Fic. 12.—Dorsal aspect of skull of Helo-*

aes dermahorridum. f,frontal; J, jugal ; zygomatic arcade. 7, lachrymal ; m, maxilla; n, nasal;

The skull of ‘Helodermaca 24: pareuls ya, premasilis; pr,

i. j prefrontal ; ps, postfrontal ; pé, ptery- very remarkable in thatit has goid; g, quadrate ; s, squamosal ; so, no zygomatic arch whatever, ‘“P™occ!pital

and in that the pre- and postfrontal bones unite and exclude

the frontal bone from the margin of the orbit.

The skull of the Chameleons has even more the aspect of an osseous scaffolding than has that of ordinary Lizards in spite of the absence of a columella, This is owing to the presence of a long supraoccipital arcade formed by

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a long posteriorly and inwardly extending process of the squamosal, which joins the adjacent side of the singularly prolonged and upwardly and backwardly extending pro- cess of the parietal, which itself is solid- ly united to an up- wardly extending p2 process of the supra- occipital. Thus the facial part of the skull is not movable upon its occipital portion. The orbits are enclosed by bone, and there is a superior zygomatic arcade, the frontal joining the squamosal behind and the malar in front. The frontal savamosal.

bone is small and single. There are a pair of narrow nasals, but these do not form the boundary of any part of the an- terior nares, but are excluded therefrom by the junction of the prefrontals with the maxilla, and these two bones may be prolonged so as to form great horn-like processes. The pterygoids do not articulate with the quadrates, and there is no interorbital septum. The hyoid has its posterior cornua much the longer, and a bony median basihyal. ,

The Ophidians, like the Lizards, have skulls which are formed on more than one type:—(1) those of the ordinary wide-mouthed Serpents; and (2) those of the Serpents with a very narrow gape, such as we find, e.g., in Typhlops and Uropeltis.

The wide-mouthed Serpents, or Hurystomata, have a skull which in some respects is much less completely ossified and more movable than in ordinary Lizards, while in other respects it is more ossified and less movable. Thus the lateral walls of the anterior parts of the cranial

"J ag J post- Fig. 13,—Skull of Chameeon vulgaris (from nature), ag, angular; ar, articular; 6s, basisphenoid; d, dentary ; 7, Jugal; m, maxilla; me, median eth- moid; pl and p2, parietals; p/, palatine; pr, prefrontal; ps, postfrontal, pt, pterygoid; q, quadrate; sg, surangular; so, supraoccipital; sq,

Fic, 14.—Skull of Python seb (from nature). ar, artierlar; ca, columella auris, d, dentary; jf, fiontal; m, maxilla; p, parietal; pm, premaxilla; po, prootic; pr, prefrontal; ps, postfrontal; pt, pterygoid; g, quadrate; s, squamosal ; ¢, transversum ; 70, turbinal.

cavity are well ossified, so that the anterior part of the skull is no longer movable on the occipital segment, while on the contrary the total absence of both zygomatic arcades, the non-union directly of the palatine with the vomer, the laxity of union of the premaxilla and maxilla, and especially the movable condition not only of the quadrate but also of the squamosal (often an elongated bone) from which it is suspended, all give an excessive mobility to the facial part of the skull. To this it may be added that, at the symphysis, the rami of the mandible are only united by soft, very extensible tissue. There is usually but one premaxilla, and that is edentulous. The palatines are usually connected with the maxilla by transverse bones, while the pterygoids connect them with the quadrate bones. There is no interorbital septum, and

in Che- jonians.

no fontanelle in the cranial roof. The basisphenoid is prolonged forwards into a long bony rostrum, on the upper surface of which thecartilaginous " rods (the per- @ sistent trabecu- le cranit) ex- tend forwards to blend with the median cartilage of the ethmoi- dalregion. The supraoccipital is excluded from the margin of Frq. 15.—Skull of Vipera nasicornis (from nature). ar, the foramen articular; ca, columella auris; d, dentary; J, frontal ; magnura by the frais ps pahontal; pe perteelal g guakeaes 6 exoccipital. The squamosal; é, transversum.

frontal bones descend laterally to the dorsum of this basi- sphenoidal rostrum and then turn inwards to meet together in the median lines on the floor of the cranial cavity. The parietals also descend laterally but unite with the basi- sphenoid by suture. There are a pair of nasals, and also lachrymals and postfrontals, but there is no jugal or quad- rate jugal. The palatines do not bound the posterior nares behind. They are widely separated, and their long axes are longitudinal. The maxille may be long and may support a number of teeth,as in most non-venomous Snakes, or may be very short and support a single large fang, as, e.g., in Vipers.

The small-mouthed Serpents, or Angiostomata, have the pterygoids separated from the quadrates. The squamosal is small or absent, the quadrate being attached directly to the cranium. They have no postfrontal and no transverse bone, while the palatine bones have their long axis trans- verse, and meet, or nearly meet, on the under surface of the skull. The two rami of the mandible are also closely united together. In other details of cranial structure they agree generally with ; the Lurystomata.

The hyoid is rudi- mentary, and only consists of a pair of cartilaginous threads, medianly united and lying side by side be- neath the trachea.

In the Chelonians the skull presents cer- tain resemblances to that of the Crocodil- ians. Thus the qua- drate is immovably? fixed and its upper | part is joined by the pterygoid, and there is a quadrato-jugal bone. The pterygoids and palatines unite

by suture and form : £0

horizontal plates be- Fic. 16.—Dorsal aspeet of skull of Testudo tabu- ° .. lata(from nature). an, anterior nares; f, frontal, neath the basis crant. on either side of whieh are the orbits, bounded

behind by ps, the postfrontal ; 0, basioecipital ; Nevertheless these ep, epiotic; $0, supraocecipital ; q, quadrate ; s, bones differ widely squamosal; pa, parietal ; po, periotic bones.

from their homologues in the Crocodiles inasmuch as the posterior nares open in front of the pterygoids and are bounded by the palatines and the azygous vomer. The epiotic bone is generally quite distinct from the exoccipital. There are large parietals, which send down a process that serves the purpose of the absent alisphenoid. In front of this, the sides and front of the cranial cavity are unossified.

REPTILES

[ANATOMY.

There are a pair of frontals, and in front of them a pair of bones which bound the anterior nares above. There may

Fra. 17.—Side view of skull of Testudo tabulata (from nature). an, angular; ar, articular; d, dentary; 7, frontal; j, jugal; m, mandible; n, naso-prefrontal ; pa, parietal; pl, palatine ; ps, postfrontal; q, quadrate ; gj, quadrato-jugal.

be one or two premaxille. Sometimes, as ¢.g.,in Chelone, the parietal, post- frontal, jugal, and squamosal send out plate-like processes which unite and form a sort of false outer skull covering in 'the temporal fossa, and quite ex- ternal to the real outer wall of the cranial cavity. Thus the cranium of these Reptiles is, as it were, at the opposite extreme tothatof the Serpents as regards massiveness, solid- ity, and the immov- ability of its several parts one on another. It may be excessively flat and depressed,

as Nn Chelydra. Fra. 18.— Ventral surfaee of skull of Testudo tabu-

The dentary bone Jata (from nature), bo, basioecipital ; bs, basisphe- : 5 noid ; ep, epiotic; m, maxilla; pl, palatine; pm, of the mandible is premaxilla; pt, pterygoid ; g, quadrate ; g/, quad-

azygous, as in Birds, %2t0-Jugal ; so, supraoceipital. The hyoid consists of two pairs of cornua, whereof the

pir

bo Fic. 19.—Dorsal aspect of skull of Chelys matamata (from nature). 0, pasioccipital; eo, exoeeipital; 7, frontal; J, jugal; m, maxilla; pm, premaxilla; pa, parietal; pr, prefrontal ; ps, postfrontal ; pé, pterygoid; ¢, quadrate; s, squamosal; so, supraoecipital.

anterior may or may not be the larger, attached to a

Limb girdles and limbs.

of limb skeleton, as in Amphisbena.

SKELETON. |

broad, more or less cartilaginous, or variously ossified median portion. ;

Toe APPENDICULAR SKELETON.—The appendicular skeleton of Reptiles, like that of Vertebrates generally,

AQY

Fic. 20.—Lateral aspect of skull of Chelys matamata (trom nature), an, angular; ar, articular; bo, basioccipital; d, dentary; ep, epiotic; m, maxilla; pa, parietal ; pm, premaxilla; pr, prefrontal; ps, postfrontal; pt, pterygoid; q, quadrate; s, squamosal; sg, surangular.

consists of a pair of limb girdles (pectoral and pelvic), with a pair of skeletal appendages proceeding from either girdle. Each such skeletal appendage has also, normally, the typical differentiation into (1) a single upper limb bone, (2) a pair of lower limb bones, (3) a group of small foot-

root bones or cartilages (carpus or tarsus), (4) a series of middle foot bones (metacarpus or metatarsus), and (5)

Fic. 21.—Ventral aspect of skull of Chelys matamata (from nature). bo, basioccipital ; 6s, basisphenoid; mdi, mandible; oh, opisthotic ; pl, palatine ; pm, premaxilla; po, prootic; pi, pterygoid ; 9g, quadrate; s, squamosal,

a group of small bones (phalanges) arranged in_ series according to the number of digits, but the number in each digit varying in different digits and in different groups of Reptiles.

Every trace of an appendicular skeleton may, however, be wanting, as is the case in most Ophidians.

There may be a pectoral limb girdle without any rudi- ment of a fore-limb skeleton, as in Angwis, Acontias, and Amphisbena, There may be a pelvic girdle without any rudiment of a hind-limb skeleton, as in at least some, if not all, Zyphlopide. Very rarely there may be both rudimentary pectoral and pelvic girdles without any trace Thus, of the two categories, (1) limb girdles, and (2) girdle appendages or limbs, the former is the more constant, as we never find rudimentary extremities and limbs without any trace of a girdle, while the contrary we do find here and there.'

The Limb Girdles. —Each girdle consists of two lateral halves, and each such lateral half further consists of two

1 This is interesting because it is probable that genetically the limb is prior to the limb girdle, which was an ingrowth from the former. See Trans. Zool. Soc., 1879, vol. x. p. 439.

divisions which diverge from the articular surface offered to the limb by such lateral half. From that articular surface one division descends dorsally and does not con- nect itself with its fellow of the opposite side.

The other ventral division passes inwards and somewhat downwards and normally does connect itself, directly or indirectly, with its fellow of the opposite side. The dorsal ascending division is generally single, and consists of two parts in serial succession. The ventral division consists normally of two or more parts, which, though diverging, pass ven- trally side by side, or one in front of the other. Hach girdle normally connects itself with the axial skeleton either towards the dorsal or ventral aspect of the latter.

The Pectoral Girdle.—This girdle only becomes con- Pectoral nected (except in Chelonians) with the ventral part of the sivdle.

appendicular skeleton,—to wit, where it abuts against either side of the sternum. In its most complex condition —that found in some Saurians, e.g., Jgwana—the dorsal division consists of a scapula (with a forwardly extending

Fic. 22.—Sternum and shoulder girdle of Amblyrhynchus subcristatus (after Stein. dachner). cl, clavicle; co, coracoid; h, humerus; ic, interclavicle ; mc, meso- coracoid; ms, mesoscapula; pc, precoracoid; s, scapula; sé, sternum,

process—the mesoscapular), and is continued upwards into

a suprascapular ; while the ventral division consists of a

coracoid, which abuts against the sternum, and from which \y ¢/ Sy ~ three parts (the precoracoid, 2 a

the epicoracoid, and the meso- Fic, 23.—Rudiments of pectoral arch— coracoid) diverge forwards 1, of Acontias meleagris; 2, of Typhic- and inwar ds, and also of a saurus aurantiacus (after Ftirbinger). clavicle, between which and its fellow of the opposite side an interclavicle is interposed. This girdle normally in Reptiles, as in all other Vertebrates, embraces more or less of the axial skeleton externally ; only in adult Chelonians it becomes drawn in within the circuit of the ribs.

In the Ophidia, as has been said, there is no pectoral girdle.

In certain Sauria it is in its simplest possible form, as, é.g., in Acontias and T'yphlosawrus, where each lateral half consists of a minute ossification representing the clavicle and coracoid, which is not connected with its fellow of the opposite side by any hard structure, as both sternum and interclavicle are wanting. It is also quite rudimentary m Amphisbena, but it is fairly developed in Chirotes. Its most complex condition in Saurians has been already described. The Chameleons have a simple girdle consist- ing of a long and narrow scapula with suprascapula and a long and narrow coracoid, the anterior part of which

envelops (or is overlapped by) its fellow of the opposite side, while its hinder part joins the sternum. There is no clavicle or interclavicle.

Hatteria has both a scapula with a mesoscapular pro- cess and a cartilaginous suprascapula, also a coracoid with a large cartilaginous epicoracoid. There is an inter- clavicle, the diverging anterior arms of which, as clavicles, are connected by ligament with the scapula.

The Crocodilia have a simple girdle, consisting only of a scapula with a cartilaginous suprascapula and a cora- coid without processes or epicoracoid, nor are there any clavicles but only a median anteroposteriorly directed interclavicle.

In the Chelonia the girdle lies between the dorsal and ventral shields. The dorsal division is a columnar scapula, which ascends to be connected by ligament or cartilage, which sometimes contains points of ossification, with the transverse process of the first thoracic vertebra. Of the bifold ventral division, the anterior bone is a direct con- tinuation of the scapula, and connects itself with the inter- clavicle of the plastron, whilst the posterior bone is a coracoid and ends freely (there being no sternum). In Sphargis the end of the right coracoid underlies that of the left. coracoid. .

The Pele Girdle.—-This girdle only becomes connected with the dorsal part of the appendicular skeleton—to wit, where it abuts against the sacral vertebre.

In general each of its halves consists of a dorsal divi- sion more or less simple and columnar, the ilium, united to the vertebral column by cartilage, and of a bifold ventral division, the parts of which, pubis and ischium, unite in the middle line by the intervention of a median 'longi- tudinal cartilage or ligament, a process extending forwards from the front margin of the more anterior part—the pubis—while an azygous bone, the os cloace, extends back- wards from behind the symphysis formed by the junction of the more posterior part, the ischium, with its fellow of the opposite side. The ilium, pubis, and ischium form the acetabulum.

Although it has been elsewhere already described, it may be well again to mention here that in certain ex- tinct Reptiles not only is the ilium greatly expanded above antero-posteriorly but the pubis sends back a long slender post-pubis nearly parallel with the ischium and closely resembling the so-called pubis of Birds.

In the Ophidia the pelvic girdle is generally entirely absent, and, when a rudiment is present, that rudiment is never united with the axial skeleton. It may consist merely of a pair of subparallel slender pubic spicules or cartilages, as in T'yphlops, or of a rudimentary ilium, pubis, and ischium on each side, as in Cylindrophis, Hysia, Stenostoma, and Boa. A rudimentary pelvis also exists in Python, Eryx, and Tortrix.

In Saurians the girdle may also be detached from the axial skeleton and most rudimentary, as in Lepidosternon, where it consists of no il more than in Zyph- ip. lops, and in Anguis, x \ "a a) where each half of it / consists of an elon- ip gated ossicle with three @ processes correspond- Fic. 24.—Rudiments of pelvie limb—1. of Lialis

° Bartonit; 2, of Anguis fra,ilts; 3, of Amphis- ing to the three nor- dna fuliginosa. f femur: il, ilium;

Jt pectineum; p, pnbis; ¢, tibia. may be even more simple and yet attached to the verte- bral column, as in Acontias, Pseudopus, and Ophisaurus.

1 See especially a paper by Professor Marsh in Amer. Jour. of Sci. and Arts, vol. xvii. (January 1879), pl. 8, and one by Dollo in the Bull. Mus. Roy. d' Hist. Bot. de Belgique, vol. ii, 1888, " Troisiéme note sur les Dinosaurs, plas: :

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In all Saurians with ordinary hind limbs the pelvic girdle is fully developed.

The Chelonians have long ilia nearly vertical in posi- tion and with a cartila- ginous margin. The pubis and ischium form an acute angle, and are only connected with their fellows of the opposite side by liga- ment. There is no og cloacee.

fatteria has a la- certilian pelvis. The Fro. 25.—1, Rudimentary pelvis and limb of pubis has a small for- Siosoris macelpt 2, The ame pars wardly extending pro- itium; ép, bone called "iliopectineum " by cess, and the ischium Fiirbinger; p, pubis; ¢, tibia,

a much more prominent backwardly extending one.

In the Crocodilia the acetabulum is formed by the ilium and ischium only, and is imperfectly ossified inter- nally. The two ischia are united by synchondrosis, and each develops a forwardly extending process contributing to close the acetabulum, from which the pubic bone extends forwards, downwards, and inwards. The two pubic bones are only united together by membrane.

The Chelonia have the pelvic girdle, like the pectoral one, enclosed between the carapace and plastron. In most forms it is not united with either shield, the ilium being merely attached to the transverse processes of the sacral vertebra. In some forms, however, as in Chelys, Chelodina, Pelomedusa, and others, the ilia firmly unite with the posterior plates of the carapace, while the ischia and pubes unite with the plastron. The three bones concur to form the acetabulum, and the two pubes and the two ischia respectively unite in ventral symphyses. The space be- tween the pubis and ischium of either side, the obturator foramen, is in Chelone

and Sphargis separated from that of the other side by a ligament only, which proceeds from the ischiatic symphysis forwards to the pubic symphysis. In the Land Tortoises, however, the pubes and ischia so expand ventrally that the obturator foramen is (on each side) enclosed by the junction of the pubis and ischium of either side at their distal ends, Each pubis has ordinarily a downwardly bent spinous process at its anterior margin, and the ischium often has a process projecting from its hinder margin. The pubes are generally widely expanded bones, very much larger than either the ischia or the ilia.

[ANATOMY.

The Pectoral Limb.—The skeleton of this limb in its full Pectoral and normal differentiation resembles in its main features limb.

that of Mammals; it may, however, be simplified toa greater extent than in any other air-breathing Vertebrate class, and this according to two modes of simplification. Thus it may be a relatively minute member ending in what is (at least practically) but a single digit, asin Rhodona.2 It may, on the contrary, be simplified by being made up of parts all so exceedingly similar that the typical differentiation of the limb can be with difficulty traced, while the digital elements seem to indicate more than pentadactylism, as in the extinct Ichthyosauri.

A peculiar complexity and extreme differentiation of this limb, however, exists, as is well known, in another extinct group, the Pterodactyles, wherein the outermost or ulnar digit is enormously elongated so as to support the wing membrane as do the four digits of existing Bats.

The following are the main conditions of the limb met with in the existing Reptilian orders. In most Lacertilia there is an elongated humerus, the proximal end of which is compressed and furnished with two tuberosities. Of the

2 See Gray, Ann. Nat. Hist., ii. 385; and Ginther, Ann. and Mag. Nat. Hist., 1867, xx. p. 46.

Pelvic limb.

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lower arn: bones, the ulna is stronger than the radius, and its olecranon forms a short projection. The carpus consists of nine bones, one at the end of each lower limb, one at the base of each metacarpal, one—the os centrale—between these five and the two at the end of the midlimb bones, and one—the pisiforme—outside these latter two. There are five metacarpals and five digits, the latter composed of pha- langes, which for the most part number two for the inner- most digit or pollex, three for the next or index, four for the third digit, five for the fourth (generally the longest) digit, and three for the outermost or ulnar digit. In the Chameleons the five proximal carpals coalesce with the metacarpals, and the phalanges are 2, 3, 4, 4, and 3 respectively; the digits, moreover, are very exceptionally disposed, the three inner or radial digits being opposed to the two outer or ulnar ones. The digits may be but four in number, as in Sawrophis, Gymnophthalmus, Tetradactylus, and others ; or but three, as in Chalcis, Seps, and others ; or but two, as in [[eteromeles, Chelomeles, and others; or, finally, but one, as in Rhodona, &c., as we have already seen. The limb may be entirely wanting, as in Pygopus, Delma, Lialis, Anguis, Acontias, and others.

In the Ophidia the pectoral limb is entirely absent, not even a rudiment of it being found.

In Hatteria the limb is Lacertilian in form but has ten carpals.

The Crocodilia have the long limb bones well developed. The carpus has two large long ossicles articulated with the radius and ulna respectively, and a pisiforme; and an oblong bone and disk of cartilage lie between the large carpals aud the five metacarpals. The third digit is the longest, and the number of phalanges of the digit from within out- wards (as before) is 2, 3, 4, 4, 3.

In the Chelonia the humerus may be nearly straight, as in Chelone, or very much curved, as in Z'estudo. The radius and ulna, which, though susceptible of very little motion, are generally distinct, may become anchylosed to- gether towards their distal ends, as in Chelone. The carpus has generally nine ossicles. The pisiforme may be very large, as in

Chelone. There are always five digits, which —botli their metacarpals and phalanges—may be very long, as in Chelone, or exceedingly short, as in Z'estudo. The number of the phalanges may be but two to each digit, as in Testudo, but generally it is 2, 3, 3, 3, 2, from pollex to the ulnar digit.

The Pelvic Limb.—The skeleton of this limb, like that of the pectoral one, is in its main features normally con- ditioned as is that of Mammals, save as to the mobility of the tarsus, as will be shortly explained. It may, however, be simplified in two ways like the pectoral limb—namely, by the great similarity and want of differentiation of its numerous parts, as in Ichthyosaurus, or by excessive reduc- tion in the number of its parts, as in certain Ophidians, and in Saurians such as Pseudopus and Lialis.

Its resemblance to the pectoral limb, which, as we have seen, is so exceedingly close in Zchthyosaurus and Plesio- saurus, may be, in other conditions, hardly less complete in some Chelonians, such, ¢.g., as Chelydra. When all four limbs are fairly developed, the pelvic ones are in no existing forms so inferior in size to the pelvic ones as in the extinct Ornithosauria, or so superior in size to the latter as in some of the extinct Dinosauria, as, eg., in Compsognathus.

Amongst existing Reptiles the Lacertilians present us with very varied conditions. Generally there is an elon- gated femur furnished proximally with a trochanter on its inner side. Of the lower limb bones the tibia is larger than the fibula. A knee-pan bone, or patella, is placed in front of the junction of the upper and lower limb bones. The tarsus consists of a proximal segment made up of

two large ossicles more or less firmly and immovably united by fibrous tissue to the tibia and fibula and of a distal segment, which consists of a cuboid bone and which is capable of motion upon the proximal segment, while it is firmly connected with the five metatarsals. Thus the flexion of the foot upon the leg takes place, not as in Mammals between the whole tarsus and the leg-bone, but between the distal and proximal segments of

the tarsus itself. The outermost or peroneal metatarsal is more or less bent toward its proximal end. The fourth digit is the longest, and the number of the phalanges of the digits, from within outwards, is 2, 3,4, 5,4. In the Chameleons the distal tarsals coalesce with the meta- tarsals, and two inner or tibial digits are opposed to the three outer or peroneal ones. The foot may have but four digits, as in Campsodactylus, Tetradactylus, and others ; or but three digits, as in Seps, [eteromeles, and others; or only two, as in Chelomeles, Rhodona, and others; or but a single one, as in Chalcis. There may be but a very small and slender femur, to which a still smaller tibia unites a rudiment of a tarsal ossicle at its distal end, as in Lialis, or but a rudiment of a femur and tibia only, as in Pseudo- pus; or the limb may be entirely wanting, as in Angus, Acontias, Chirotes, Amphisbena, and Lepidosternon.

In the Ophidia the limb is generally wanting, and there is never any rudiment of the tarsus or digits, but there may be a rudiment of a femur, as in Stenostoma, or of a tibia as well as a femur, the tibia ending in a hooked pro- cess, as in Oylindrophis, Ilysia, and Boa.

In Hatteria the limb is as it normally is in Lacertilians.

In the Crocodilia there is a well-developed femur, and also a tibiaanda fibula. The tarsus has two proximal bones (less closely united than in Lizards), whereof that adjoining the fibula has a large calcaneal process. The distal seg- ment of the tarsus consists of two rounded ossicles on the peroneal side and a thin plate of cartilage on the tibial side. There are four long tibial metatarsals supporting digits and a rudimentary fifth one to which no rudiment of a digit is attached. Of the four digits the third is generally the longest, and, like the fourth digit, has four phalanges. The second digit has three, and the inner- most, or hallux, but two.

In Chelonians the femur has a strong, rounded articular head, which forms a marked angle with the body of the bone. Sometimes, as in Amys and T'rionyz, there are two troch- anters separated by a groove. The lower limb bones are always distinct. They are longest in the Land Tortoises, and shortest in the Marine Turtles. There is no patella. The tarsal bones vary by coalescence from eight to six in number. They are exceptionally flattened in Chelone. In Testudo the metatarsals are short,

but are longer than are the metacarpals, whereas the reverse is the case in Chelone. There are always five digits, except in Testudo, where the fifth is only represented by a rudimentary metatarsal. The metatarsals are shortest in TZ'estudo and its allies, though they are not so short as are the digits of the hand. They are longest in the aquatic forms, though they are not so long in Chelone as are the digits of its hand. The number of phalanges, counting from within outwards, may be 2, 2, 2, 2, as in Zestudo, or 2,3 3 3, 2, as in Trionyx, or 2, 3, 3, 3, 3, as in Chelone.

Myology.

The muscles of four-footed Reptiles other than the Muscles.

Chelonians are arranged in a general way on the same fundamental plan as in the Mammals, though the deter- mination of the true homology of many of them is more or less difficult if not impossible now to deterniine. The muscular masses are thus arranged in a similar longitudinal manner on the dorsum of the trunk, and expand into large

Muscles of trunk and tail;

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continuous horizontal sheets of fibres in the ventral region, while for a greater or less extent longitudinal bundles of fibres underlie the vertebral bodies in different parts of the neck and trunk, and prolongations backwards of the dorsal and ventral: muscles clothe the skeleton of the caudal region. Muscles like the temporal, masseter, pterygoid, and digastric of Mammals help to open and shut the jaws of Reptiles. Others descend from the dorsal region of the spine to the pectoral and pelvic girdles and to the limb bones, which latter are furnished with flexors and exten- sors, abductors and adductors, in essentially the same way as are the limbs of birds.

There are two special deviations from this more normal type of structure. We find one of these in the Serpents, which, being limbless and without a neck, and requiring an extraordinary mobility in the ~~parts of the axial skele~~ ton, have the muscles which clothe the trunk raised to their highest

degree of multiplication and differentiation. The other exceptional type is furnished us by the Chelonians, which, having a perfectly rigid body and long neck and limbs singularly situated, have the muscles of the trunk atrophied to an extreme degree, the neck richly supplied with muscles, and also the limbs, while the limb muscles are so strangely different, in either origin or inser- tion, from those of other animals that their true nature and correct designations do not szem as yet to admit of precise and accurate determination.

The Muscles of the Trunk and Tail,—In Saurians the caudal muscles often take the form of a series of hollow cones successively enclosed one within the other, while their continuations forward in the trunk become the longissiinus dorsi, sacro-lnmbalis, spinalis, levatores costarum, and the other muscles familiar to anatomists. Subvertebral continuations form muscles which proceed from the vertebral bodies to the inner surfaces of the ribs, which they tend to pull back—retrahentes costarum—and further forwards, such muscles as answer to the longus colli, rectus capitis, &c., of Mammals. Ventral muscles take the form of the two obliques and transversalis, but the differentiation may be greater than in Mammals, as ¢.g., in Jguwana, where the obliquus externus consists of three distinct layers. Tendinous or harder structures may produce a segmentation in the abdominal muscles, which, under special names, are prolonged to the hyoidian cornna and mandible.

In Serpents the dorsal muscles are essentially the same as in Lizards, but are more developed, while small superficial muscles run from the ribs to the inside of the abdominal shields which are agents of locomotion. The limbless Serpent is practically some- what like a Centipede, aud moves by the successive protrusion and retraction of cach pair of ribs, which serve as two feet. For each pair is attached to a ventral shield the edge of which is applied to and removed from the ground by the ribs attached to it, according as these are protrnded or retracted—the shields thns serving as a number of small levers to propel the body along. The subvertebral muscle nay also be very recia developed, as in Naja and Crotalus, the long hypapophyses of which have been already noted, and which serve for the attachment of such muscles. By their contraction the force of the downward flow of the poison fangs is greatly increased. That subvertebral

series already mentioned as the retrahentes costarum is very extensively developed in the Ophidia.

In the Croeodilia the arrangement is substantially as in Saurians, but the so-called abdominal ribs induce certain differences. Some muscles lie above, some below, and some between these "ribs." Subvertebral mnscles extend beneath the cervical and anterior dorsal vertebrx, and farther back there arc retrahentes costarum.

Hatteria has special muscles inserted into the distal expansions of its ribs, which may sometimes aid its motions in a very subordi- nate co as those of Serpents are so helped in the highest degree.

In the Chelonians the dorsal niuscles are well developed in the neck and tail. Bifold muscles pass from within the hindmost lateral plates of the carapace to the dorsum of the caudal vertebrae. Other muscles extend between the articular and transverse pro- cesses of the caudal vertebree. Dorsal muscles are entirely wanting in the thorax of Testudo, but in Emys and Chelydra a longitndinal muscle lies upon the transverse processes of the trunk vertebra. In the neck there are a number of mnscles extending with various degrees of complexity between the transverse and articular pro- cesses. The neck is retracted partly by a muscle passing from it to the procoracoid and partly by a long muscle passing to the

- *See Phil. Trans., pt. ti. for 1867, p. 17.*

ILES

head and neck from a greater or less number of the spines and neural arches of the more posterior trunk vertebre. Pyramidal muscles pass from the pelvis to the plastron, and oblique muscles arise from inside the costal marginal plates of the carapace and pass to the pelvis and plastron, and a transversalis extends from within the costal plates and also passes to the plastron. A dia- phragm springs from the bodies of certain dorsal vertebre and one or niore ribs, and invests the surface of the lungs.

The Muscles of the Head.—In ordinary Saurians, the temporal inuscle is embraced by the upper (in them the only) zygomatic arch, and descends

from the side of the head to the coronoid process of the mandible. The niasseter takes origin from the quadrate and columella. Of the two pterygoid muscles one arises from the upper surface of the pterygoid bone and the other from the os transversuin. The digastric descends from the hinder part of the cranium to the posterior end of the mandible.

In the Ophidia the muscular apparatus is much more complex, as might be predicted from the great mobility of theirjaws. There are on each side three elevators aud several depressors of the lower

of head ;

jaw, and sometimes, as, ¢.g., in Trigonocephalus, a muscular belly °

connected with one of the elevators is so arranged as to be able to compress the poison gland. In poisonous Serpents also a tendon gocs from the external pterygoid to the short maxilla, so that the latter can be erected by its intervention. The suspensorium is drawn upwards and backwards by a muscle arising from the neural spines of the anterior trunk vertebre, and downwards and forwards by another arising from the basisphenoid. Four other mnscles on

either sidc of the head are devoted to moving the palatine apparatus. °

The Crocodilia have a temporalis, an internal and external pterygoid, and a digastric. There are also a pair of sternomandi- bular muscles, and of hyomandibulars (from the cornua of the hyoid), a pair of genioglossi, and a superficial mylohyoid.

The Chelonia have only an internal pterygoid, besides the temporal and digastric. But they have also a geniohyoid and genioglossus as Well as a inylohyoid.

The Museles of the Peetoral Girdle and Limb.—In ordinary

of pee-

Saurians and in Crocodiles the scapula is drawn forwards and toral upwards by a trapezius and levator, and there are also a serratus girdle magnus and a sternoscapular muscle, a cleidomastoid or sterno- and

mastoid, and generally an omohyoid. shoulder-girdle museles are very reduced and peculiar, and no muscle draws it towards the skull, but a muscle arises from the sides of the cervical vertebre and is inserted into the scapula. Another (smaller) passes from the second dorsal transverse pro- cess and the part of the carapace therewith connected to the scapula, which it draws backwards. Another muscle goes from the coracoid to the hyoid, and yet another-—a sort of sternomastoid— from the plastron to the skull.

Lacertilians have an ordinary pcctoralis and generally a subjacent small muscle passing from the coracoid to the great tuberosity of the humerus. There is a latissimus dorsi going to the lesser tuberosity and a large subscapularis. A triceps ends by a tendon inserted into the olecranon, often containing an ossicle analogous to a patella. There is also a biceps, coracobrachialis and brachialis, anticus, with other Mammalian muscles, flexors, and extensors of the digits, with even lumbrical muscles, but not with that perfeet arrangement of perforating and perforated tendons which character- izes the highest class.

The muscles of the pectoral limb of Crocodiles, though showing many minor differences from those of Saurians, yet present a fundamental general resemblance to the latter.

It is otherwise with Chelonians. In them the pectoralis major is represented by two muscles, one a muscle extending from the median plastron plate and external border of the carapace to the inner of the two tuberosities of the humerus, and another musele inserted beside the former and taking rise from the most anterior plate of the plastron. There is also a superior pectoralis, which arises from the coracoid and coracoacromial ligaments, and which is partly inserted into the same tuberosity and partly extends beyond it. 'There are also a coracobrachialis and a deltoid, bnt no suprascapular. All the muscles which arise from the scapula are inserted into the external tuberosity of the humerus. There is a muscle which represents the latissimus dorsi. It arises beneath the most

anterior plate of the carapace, and is inserted into the external tuberosity. The muscles of the forearm and extremity are less exceptional.

In the Chelonia the limb ;

Museles of the Pelvic Girdle and Limb.—In Lacertilians there are of pelvic several hind-limb muscles which have a subeaudal origin; some of girdle

these end at the thigh, while others extend to the feet. numerous flexors of the leg. tail, and is inserted by a broad tendon into the femur. From the inferior margin of that tendon another slender tendon arises, sometinies ending (as, ¢.g., In Zywana) in the interarticular cartilage of the knee-joint. The muscles of the thigh, leg, and foot have a general similarity to those of Mammals generally, as have those of the arm and hand, but those which represent the ham-string muscles have generally much eomplexity and intricacy of arrangement of

There are and A powerful muscle arises beneath the limb.

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their tendons and much connexion with other muscles in the popliteal space.

The Crocodilia have an adductor femoris, which arises from beneath the transverse processes of the lumbar region and is inserted by a broad tendon into the femur. An iliacus arises from the inner side of the ilium and ischium, and goes to the inner side of the femur. Several adductors proceed to the femur from the isehium. A loug muscle arises from the chevron bones and transverse pro- cesses of the anterior third of the tail, and is inserted by a strong tendon into the trochanter ; thence descends another tendon along the flexor side of the femur to join the‘tendon of origin of the gastrocnemius, which springs from the external condyle.

The Chelonia possess an abductor femoris, which passes from beneath the transverse processes of the thoracic vertebra, and also a sort of psoas extending from their transverse processes to the ilium. Another muscle goes from the hiudmost thoracic transverse processes to the femur. A muscle, attrahens pelvim, arises from within the plastron and goes to the outer process of the pubis. Another muscle which antagonizes this, the retrahens pelvim, springs from the

_hindermost part of the plastron and goes to the pubis. Other retractors pass from the caudal chevron bones to the front border of the obturator foramen, and another muscle with a similar origin is inserted into the ischial symphysis. The muscles of the more fe part of the limb are less peculiar, and need not be described nere.

MUSCLES. |

The Alimentary System.

Ali- .—Alll Reptiles agree in having an alimentary tract which mentary begins with jaws armed mostly with teeth, rarely with horny system— sheaths, but never in existing Reptiles with both, though (as has been elsewhere described) such a combination is found in some fossil forms. Moreover, teeth are mostly found not only at the margins of the jaws but also on the palate.

Almost always there is a tongue, and glandular structures around the mouth pour their secretion into that cavity, which communicates, by tubular prolongation, with the ears, the eyes, and the nostrils. The mouth opens posteriorly into the commencement of a more or less prolonged ali- mentary canal, the anterior part of which is not, while the greater and less posterior part is, embraced by the peri- toneum. At its hinder end this canal opens into a chamber called the cloaca, into which the urinary and generative ducts also open, and which itself opens beneath the hinder part of the trunk by a roundish longitudinal or transversely extended aperture. Two accessory glands aid digestion by the products they pour into the canal. These are the pancreas and the liver, and the latter is always provided with a gall-bladder. A spleen is also always found in the vicinity of the stomach or specially digestive dilatation of the alimentary canal

towards its anterior end and separated from the mouth only by the cesophagus.

The several main groups of existing Reptiles present the following characters :—

The Ophidia all possess teeth, mostly well developed and anchylosed to the bones which support them. By rare excep- tion, as in Dasypeltis scaber, the teeth may be quite minute,—the hypapophyses of the antcrior trunk vertebr penetrating the dorsal wall of the alimentary canal and being tipped with tooth substance, and taking the place of teeth, as already mentioned in describ- ing the axial skeleton. Teeth generally exist on the palatines and pterygoids as well as on the maxille and mandible, and in Python and Yortriz in the premaxilla. They may be absent from the palate, as in Uropeltis. But the varions conditions as to the dis- position of the teeth have already been given in the systematic part of this article.

In the majority of Serpents the teeth are solid or have but their pulp cavity, but in some harmless ones one or more of the hind- most teeth which are set on the maxilla are longitudinally grooved along their convex side. In poisonous Serpents each maxilla supports a poison fang or tooth so deeply grooved that the margins of the groove meet and so convert the grooved tract into a canal, down which the duct of a poison gland passes. This fang may be the only functional maxillary tooth, as in Crotalus and Vipera, or there may be other teeth behind it, also grooved, as in Naja, or entire, as in Bungarus. Almost all Ophidians have a row of small

labial salivary glands along either margin of each jaw, their secretion escaping into the mouth by numerous small apertures. In addition to this, some apparently innocuous snakes with grooved teeth have an additional glandular mass connected with the upper labial gland and pouring its secretion by a duct into the dental groove. The truly poisonous Serpents possess a gland placed above the maxilla

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in Ophi- dians ;

and os transversum and beneath and behind the ball of the eyc, and of different size and extent in different genera. In Naja it may extend for about one-sixth the length of the body, but in Callophis}

'it may be yet greater and extend throughout nearly half the length

of the entire body of the animal. The poison gland has a fibrous investment, which is often contractile from the presence in it of muscular fibres, and often jaw muscles are so arranged (as already mentioned) as to exert pressure on the gland by their contraction. A nasal gland and a lachrymal gland also convey their secretion into the mouth.

The tongue is long, bifurcated anteriorly, and extremely mobile, being capable of protrusion from and retraction into a membranous sheath, placed on the floor of the mouth beneath the ventral wall of the larynx.

The cesophagus is long. The stomach begins by a well-defined limit beside the liver, and may or may not form a curve, but is always simple. A valve at its pyloric end marks the commencement of the duodenum. The small intestine varies much as to the number of its convolutions, which are connected by bands of fibrous tissue and are not followed by foldings'of the mesentery. A circular protuber- ance gencrally marks its junction with the shorter large intestine, and sometimes there is a cecum, as in Lyphlops, Tortrix, Python, aud others, The large intestine may be simple, and its internal cavity may be augmented by valves or partial partitions. The cloaca opens externally by a transverse aperture. The liver is not sub- divided into conspicuous lobes. he gall-bladder lies separate from the liver and posterior to it. The ductus choledochus passes through the pancreas, which lies behind the pylorus at the right side of the duodenum and is pyramidal (or rounded), or compact, or in scparate parts, as in Hydrophis. The spleen lies immediately behind the pancreas. It is rounded, small, and generally entire, not lobed.

The Lacertilia all possess teeth along the margins of the jaws in Lacer- aud very often in the palatines also; but it is only by rare tilians ; exception, as, ¢.g., in Jguana, that the pterygoids bear teeth. In the

Chameleons the teeth are very rudimentary, little more than an enamelled dentated ridge on the margin of cither jaw. The teeth of most Saurians are either acrodont, ¢.c., anchylosed to the free margins of the jaws (as, ¢g., in Psammosawrus), or pleuro- dont, t.e., anchylosed to the inner side of the jaws, their crowns projecting above the margin (as, ¢.g., in Iguana). Generally more or less conical, the teeth may be acutely pointed, or cxtremely obtuse, as the hinder teeth of Cyclodus, Sometimes, as, ¢.g., in Igwana, the teeth may be compressed with a median external vertical ridge and a serrated margin. By rare exception, as, ¢g., in Chlamydosaurus, the teeth of cither jaw may be much dif- ferentiated. Here we have a simulation, or antieipation, of that division of the teeth into incisors, canines, and molars which is so general in the class Mammalia.? In the genus Heloderma the teeth are vertically grooved so as to remind us of their structure in Serpents. The teeth indeed are more grooved than in them, for one vertical groove passes down on the antero-inner side and another on the postcro-outer side of each tooth. Labial salivary glands generally exist, but are small. In Heloderma, however, and in no other known Lizard, there is a very large salivary gland on either side of the lower jaw. The quality of its saliva is distinctly poisonous, small animals bitten by Heloderma in our zoological gardens dying as if bitten by a venomous Serpent. No other such case is known to exist amongst the Lacertilia.

The tongue presents a number of variations of form which have been already referred to as diagnostic characters in the systematic part of this article. It will suffice here to remind the reader that it may be broad and flat without any sheath, and with a pair of anterior and of posterior processes, as in Amphisbena ; or short, broad, and slightly notched in front, as in Gecko; or short with a slight bifurcation in front and two long processes behind, as in Chalcis ; or with a sheath, and much like that of Serpents, as in Psammosaurus; or cylindrical and wonderfully extensile, as in Chameeleo,

The cesophagus passes into a stomach, which is generally elon- gated and curved. The small intestine may be hardly at all convoluted (as in Amphisbena) or very much so, but if so the mesentery here follows its folds. Similarly the large intestine may be short and straight, or long and

with internal folds. There may be a caecum, as, ¢.g., in Amphisbena and some Chameleons. The cloaca opens externally by a transverse aperture.

The liver is but little lobed, and its gall-bladder lies in a fissure on its left side. The pancreas and spleen usually lie between the folds of the mesentery at the junction of the small intestine with the stomach. There is generally a pair of anal glands,

In Hatteria the large teeth in the premaxille become completely in Hat- anchylosed with those bones, reminding us of the extinct Rhyncho- teria 2 saurus and Hyperodapedon. Most of the teeth which lie along the

*1 See A. B. Meyer, Monatsb. der Akad. d. Wissen. z. Berlin, 1869. * This fact thus affords an interesting illustration of the independent origin of similar structures. DX ane 58*

margin of the jaws and the palatines soon wear down to form mere enamelled cutting edges to the bones, with which they become immediately anchylosed. The extinct Dicynodonts, with their large

pancreas between the folds of the duodenum. The various viscera of the abdominal eavity lie, as in Birds, in separate serous sacs.?

In the Chelonia there arc horny sheaths to the jaws but no teeth, in Che- though numerous rudiments of teeth have been found in_ the lonians. embryo of Trionyx.? The tongue is not extensible, but is differ- ently conditioned in different genera. There appears to be only a sublingual salivary gland, though the palate of the Land Tortoise exhibits the apertures of numerous cutaneous follicles.

The cesophagus leads to the left part of the transversely placed stomach. The extent of both the small and the large intestine varies; the latter is at its shortest in Z'rionyx. The cloaca opens externally by a somewhat rounded aperture.

The liver is mostly large, and in two lobes connected by one or more transverse bands of its substance. The gall-bladder lies on its right and may be sunk within its substance. The pancreas has often several excretory ducts, and the spleen is generally of large size.

[ANATOMY.

The Respiratory System.

All the Reptilia breathe air from the first moment of Respi- their separate existence, and are never furnished with ratory anything in the shape of gills. The apparatus by which system

in Croeo- dilians ;

Fig. 26.—Skull of Chiamydosaurus kingti (01d male, from nature), showing much differentiated teeth. 1, ventral aspect; 2, posterior; 3; profile, showing tho enormous process at the hinder end of the lower jaw.

canine-like teeth, growing from permanent pulps, behind the edentulous beak-like front part of the mouth, and those Ornitho- sauria which similarly have an edentulous beak in front of the toothed parts of their Jaws, may but have carried out further and more completely « that process of tooth reduction which we & find to be effected with age in Hatteria. The liver consists of two lateral lobes. There is a pair of anal glands.

The Crocodilia have teeth in the max- ille, premaxille, and mandible, but none in the palatines or pterygoids. They are implanted in distinct alveoli. The tongue is so flat and closely attached to the floor of the mouth that it can hardly be con- sidered as having a distinct existence. A transverse fold of membrane extends along its hinder border and another similar fold descends in front of the posterior nares. There are no salivary glands. mase tooth, showing a very

The cesophagus is wide, and the stomach _ faint longitudinal groove. nearly circular and gizzard-like, having thick muscular walls formed of fibres radiating from central tendons. The small intestine con- sists of two

parts,—an anterior part much convoluted, thin-walled, and lined with villi, which is succeeded by a thicker-walled part with internal zig-zag folds. Thereis no cecum, but a circular pro- minence marks the commencement of the large intestine, which is short and wide with a smooth lining. It is funnel-shaped, and opens by a very narrow aperture into a very clongated cloaca, the external opening of which is rather longitudinal.

The liver, like that of Hatteria, is in two lobes, and the gall- bladder is beside the right lobe. The spleen lies behind the

Fig. 27.—Two aspects of a tooth of Heloderma hor- ridum (after Bocourt). 1, antero-internal aspect ofthe tooth, showing a very deep longitudinal groove ; 2, pos- tero-external aspect of the

their respiration is effected is always a pair of sacs or lungs —whereof one sometimes aborts—into and from which air is introduced and removed by the intervention of an azygous tube, the trachea, which, passing forwards ventrally to the cesophagus, or beside it, opens in the floor of the mouth behind the tongue. The more or less dilated most anterior portion of the azygous tube is the larynx, which may become a vocal organ.

In the Lacertilia the external opening of the larynx may, by in Lacer- rare exception, as in Phrynosoma, be placed in front of the hind- tilians;

most margin of the tongue, so that the larynx scems to per- forate that organ, but is in fact merely enclosed by the posterior, exterior, and median junction of two lingual processes. A mem- branous or cartilaginous epiglottis may protect the entrance to the larynx as in Mammals. The larynx may be composed of one cartilage, which is produced anteriorly into two arytenoid processes, but generally these latter are distinct cartilages. Folds of membrane or vocal cords may exist, as in the Geckos and Chameleons, and the latter have also a wide membranous sac connected with the larynx. The trachea is generally short, but may be long, as in Amphisbena and Lepidosternon. It is never convoluted, and its cartilages may or may not form complete rings. It ends posteriorly by dividing into two bronchi, which are anal very short, but may be of

moderate length, as in Psammosaurus. . The lungs are generally of about equal size, but in the Snake-like Lizards the right lung is the longer, and sometimes, as in Z'yphline and Acontias, the left lung may be quite rudimentary. The lungs may be simple bags or may give out lateral processes or pouches of varying extent. In the Chameleons their hinder halves are

rolonged into narrow tubular processes.

Each lung is enclosed in a fold of peritoneum.

The Ophidia have the opening of the larynx behind the tongue in Ophi- The nature dians ;

rather prominent, with only a rudimentary epiglottis. of their prey and their mode of eating do not readily expose them to the danger of small particles of food finding their way into the trachea. The cartilaginous framework of the larynx is very elongated. The trachea has its more anterior cartilages in the form of complete rings. The lungs are unsymmetrical in all the genera, but much moreso in some than in others —one lung entirely abort- ing in Z'yphlops, Acrochordus, and Vipera amongst others. The two lungs are both of tolerable size in Python, Boa, and Eryz, which have the bronchi leading from the trachea to the two pulmonary sacs. These sacs may or may not be divided into subordinate cells towards the hinder end of each. Sometimes part of the trachea itself may be dilated dorsally into cellular promin- ences like an accessory lung, as in Hydrophis, or ventrally, as in Acrochordus. A pulmonary sac may extend not only far back- wards but also forwards to the hyoidean region, as in Heterodon.

In the Chelonia the opening of the larynx or glottis is longi- in Che- It may be furnished with a membranous cpiglottis, or lonians ;

tudinal. may have none, asin Yestudo. There may becricoid and arytenoid cartilages in addition to main cartilages, but the details of structure differ in different genera. There are no vocal cords. The trachea and bronchi vary in length, the former being long in most forms, the latter in Zestudo. In Cinixys the trachea and bronchi are contorted. The lungs are invested

anteriorly and on their ventral side by peritoneum, and also by the diaphragm as they lie between it and the carapace, and therefore they do not project freely into the abdominal cavity.

1 Stannius pointed out emphatically, as long ago as 1856, the resem- blanee which exists in many points between Crocodilesand Birds. Sce his Amphibien, p. 193, note 1. 2 See Owen, Odontog., p. 179.

in Croco- dilians.

Vascular system.

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VASCULAR SYSTEM, |

The Crocodilia have no epiglottis, but the larynx is attaclied by tendinous fibres to the front part of the shield-like basihyal. The larynx consists of a ring-shaped principal cartilage and arytenoid cartilages. There are folds which serve for vocal cords. The trachea is long, with two short bronchi. The former is gcnerally straight, but may be contorted. The more anterior tracheal eartilages are incomplete dorsally ; those of the hinder part and of the bronchi are gencrally complete. Each lung consists of pouches or cells, the cavities of which open into each other, and com- municate with the cavity of the bronchus by the lateral openings just mentioned. The lungs are enclosed in pouches of peritoneum, and lie, freely suspended, in the body cavity.

The Vascular System.

The vascular system of Reptiles consists of a sanguine- ous and a lymphatic system, and the former is further subdivided into an arterial and a venous system, as in the higher Vertebrates, though the latter two are less completely differentiated. In all there is a heart, which consists of at least three distinct cavities, namely, two auricles (which are almost always distinct) and a ventricle, which latter may or may not be completely subdivided into two dis- tinct chambers, a right and a left ventricle. Reptiles differ from the higher Vertebrates in the heart always

giving rise to at least two great vessels, which ultimately join to form a single vessel, and from these all the arteries are given off. Most of the blood of the hind limbs and tail passes either through a portal system in the liver, or else in the kidney, on its road to the heart. That which goes to the liver goes to it for the most part through the anterior abdominal veins or vein. The venous blood is conveyed to the right ventricle through a rhythmically contractile sinus venosus. The lymphatic system is well developed, with large reservoirs, and communicates freely with the venous system by a pair of rhythmically contractile so- called 'lymphatic hearts."

| Heartand The Heart and Arterial System.—In all the existing Reptiles

arteries,

except the Crocodilia—that is to say, in the Rhynchocephalia, Lacertilia, Ophidia, and Chelonia—the two auricles are divided by a complete septum (except in some Chelonians), but the ventricle is only imperfectly divided into aright and left chamber. Of these the latter is the narrower, the more dorsal in position, and mostly has thicker walls, and communicates directly with the lcft auricle. The right chamber of the ventricle is broader, more ventral, and posterior, and mostly with thinner walls, and communicates directly with the right auricle. No arteries proceed from the left chamber, but three proceed from the right chamber, one of which, the pulmonary artery, goes to the lungs, and the other two con- stitute the trunk roots of the whole systenric set of arteries or the two aorte. Between the mouths of their trunk root and that of the pulmonary artery a muscular ridge or valve extends, which imperfectly divides the right chambcr of the ventricle into two cavities, which, during the latter part of the ventricle's contrac- tion, become completely divided by it so as to shut off the con- tained blood from any further access to the pulmonary artery. These great arterial vessels thus leaving the heart are at first closely connected together and are invested with the pericardium, and sometimes, in Chelonians, their investment has been observed to contain striated muscular fibres, thus reminding us of the '"bulbus arteriosus" of Amphibians. Afterwards the grcat arteries proceed in diverging and opposite dircctions, one aorta arching over to the right and the other to

the left, and then meeting and uniting on the dorsal side of the heart to form by their junction the single great dorsal aorta.

Amongst the Laecertilia, the Monitors are remarkable for the almost complete septum between their ventricular chambers. In many Lizards the great arteries going to the head may be so con- nected with the two primitive arterial roots as to form two arches ealled aortic arches on either side, but in the Monitors, Chameleons, and Amphisbena these complications are wanting, there being but a single aortic arch on cither side. Generally the right trunk root, or right fundamental aortic arch, after supplying small arteries to the heart itself, gives off a common carotid artery, which divides into a right and a left carotid, and these subdivide to supply the head and neck. It also gives off the subclavian arteries for the fore Hmbs and arteries to the trunk. 'The left trunk root, or left fundamental aortic arch, gives off arteries to the viscera, and then anastomoses with the right trunk root, the two anastomosing to form the single dorsal aorta, which passes backwards bencath the bodies of the vertebre, and gives off branches to the stomach and the viscera, and to the kidneys, sexual glands, hind limbs, and tail.

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.the great arterial trunks.

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In the Ophidia the heart is elongated and very distant from the head, and there are of course no limb arteries given off from the aorte.

The heart is also distant from the head in the Chelonia, but it is broad in shape and lies above the coracoids. Striated muscular fibres invest the aortic roots in mys.

In the Crocodilia the ventricle is subdivided by a complete septum into two thoroughly distinct chambers, and a trunk root or fundamental aorta proceeds forth from cach,—the left aorta and the pulmonary artery procecding from the right chamber, and the right aorta from the left ventricle. Nevertheless, though there is here no communication between

the chambers whence these two aorte arise, there is a communication between these two aorte themsclves, and that not only when they anastomose after arching different ways, as in all other Reptiles, but also by a direct com- munication between them. When they cross one another, as the aorta from the right chamber arches to the left and that from the left chamber arches to the right, a small aperture places their cavities in communication just outside the heart and close to their respective origins.

Lhe Venous System.—The systemic veins arising in all parts of Veins.

the body collect together and anastomose till their three finally formed trunks open into a more or less capacious contractile cavity, the sinus venosus, which communicates with the right auricle. The anterior two of these three final trunks are called vene anonyme, and the single posterior one is called the vena cava. The former are formed by the gradual junction of the veins of the head, neck, fore limbs, and vertebral region (jugular veins, sub- clavian azygous veins, &c.), and the vena cava is formed by the junction of the iliac veins or those of the hind limbs, together with the veins of the rest of the body.

The veins of the alimentary canal, splecn, and pancreas, and the abdominal veins (running between the peritoneum and the abdominal muscles) or vein—there being one in the Ophidia— commonly collect and unite to enter the liver to form a portal system.

In the Ophidia the veins of the alimentary canal, generative organs, fatty appendages, pancreas, and spleen thus unite, while the caudal vein with some veins of the generative organs and intestine go to form a subordinate secondary circulation in the kidney or reni-portal system. In the Lacertilia the veins of the hind limbs collect in part to form a reni-portal system, and also communicate with the abdominal veins, which join the ordinary visceral veins to form the true portal system. In the Chelonia the veins of the tail and hind limbs join the abdominal] veins above the plastron, and there with others from the bladder and viscera go to form the portal system, while small branches from the abdominal veins join others from the generative organs and vertebral veins to form a reni-portal system. In the Crocodilia the caudal vein divides on entering the trunk and joins the posterior limb and body veins, and goes on to form,

with the visceral veins, a portal system, giving off in this way veins to the kidneys to forin the reni-portal system.

In all Reptiles the veins of the lungs collect together and empty themselves into the left auricle as thcy do in all other air-breathing Vertebrates.

The Lymphatic System and Vascular Glands.—In Reptilia Lym- gencrally there is a pair of lymphatic hearts placed over the phatic transverse processes of the vertebra at the junction of the tail with system.

the trunk. Each usually opens with a small vein which communi- cates with the iliac vein. Besides these bodies, more or less considerable lymphatic canals follow the course of the great arterial trunks in the body and tail, and, when there are limbs, comimuni- cate with the iliac veins. Other canals accompany the aortic arches and approach and open into the vene anonyme, and others extend backwards towards these from the head and. anterior limbs.

A pair of bodics which answer to the thymus gland of Mammals lie close to the jugular veins and lymphatics at the anterior part of the thoracic cavity. They are elongated in Ophidians and roundish in other Reptiles, and they are much larger in young than in old individuals.

A thyroid exists in front of the pericardium on the ventral side of It is bilobed in the Crocodiles.

The supra-renal capsules are yellowish bodies which lie more in connexion with the generative glands than the kidneys. They are very elongated in the Ophidia, flattened in the Chelonia, and roundish in the Crocodilia.

The Nervous System and Organs of Sense.

Reptiles, in common with other Vertebrates, have a Nervous nervous system divisible into an axial portion or neural system.

axis made up of brain and spinal marrow, and a peri- pheral portion made.up of the multitude of nerves which proceed from or are connected with this, and one portion of which is more or less distinctly separable and known as

Axial portion.

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the sympathetic system. Reptiles also generally possess three distinct organs of sense—(1) ears, (2) eyes, and (3) nasal organs—though one or more of them may be excep- tionally rudimentary and defective.

The Neural Axis,—The spinal marrow extends through nearly the whole length of the neural canal of the skeleton in the form of a long nervous cylinder with a small central cavity, with a deep furrow along the middle of its dorsal and a shallow one on the middle of its ventral aspect. It becomes more or less augmented in volume about the region of the shoulders and loins, where the nerves of the limbs are given off from it. Even where most enlarged, however, the tracts on either side of the dorsal furrow do not diverge and leave a space or sinus as they do in the lumbar enlargement of Birds. Where the spinal marrow comes to join the brain it enlarges considerably. At the medulla oblongata it is bent down at a marked angle with the more posterior part of the neural axis. The two halves of its dorsal portion also diverge so as to expose the dorsal surface of the more ventral portion in a space which is known as the fourth ventricle or ventricle of the medulla. This medulla advances forward, expanding and becoming locally differentiated to form the brain, its ventricle being continued on into a more anterior and more completely enclosed cavity known as the third ven- tricle. The nervous roof of the hinder part of this latter ventricle is produced into two smooth prominences placed side by side and called the optic globes or corpora bigemina (which may themselves contain a cavity), immediately behind which is an azygous nervous structure, the cerebel- lum, which more or less roofs over the hindmost or fourth ventricle. In front of the optic lobes are the larger rounded smooth neural masses—the cerebral hemispheres, each of which contains a cavity—the lateral or first and second ventricles, which both communicate with the anterior end of the third ventricle

through an aperture termed the foramen of Munro. Between the hinder ends of these hemispheres an azygous structure projects upwards—the pineal gland—while from beneath the floor of the third ventricle another azygous structure projects downwards— the pituitary body. In front of the hemispheres are the other rounded and smaller neural masses, the olfactory lobes, which are generally elongated and contain cavities that are continuations forwards of the lateral ventricles. Three transverse bands of nervous tissue connect the struc- tures which bound the third ventricle laterally; the first ,, of these, placed just behind the lamina terminalis or the front boun- 2 opl

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nervous masses it py

joins are the cor- Fie. 28.—Brain of, Lacerta agilis (atter Leydig). 1,

o Dorsal aspect; 2, vertical longitudinal section. cb,

pora striata. An- cerebellum; ch, cerebral hemisphere; m, medulla

other more pos- oblongata; olf, serge gered : on, vie a op

; ° optic lobes; p, pineal gland; py, base of pituitary y. teriorly situated

band is called the soft commissure ; and the third, a little farther back still, is the posterior commissure. The masses joined by those last two commissures are called the optic thalami. The brain is invested with membranes in the same general way as it is in Mammals.

In the Lacertilia the cerebellum is a thin very small body projecting rather upwards, and may be transversely segmented, as in Platydaetylus. In the Chameleons the optic lobes and

hemispheres are of nearly equal size, and the olfactory lobes are neither separated off nor hollow. In the Ophidia the cerebellum

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nearly covers the fourth ventricle, the hemispheres are of consider- able size, and the olfactory lobes may be immediately annexed to them. In the Chelonia the cerebellum is rather large, but it is only in the Crocodilia that it is marked by transverse grooves, as is the central part of the cerebellum or dermis in Mammals; the hemispheres also are of considerable volume.

In some extinct Reptilia, e.g., in the Dinosaurian Stegosawrus, the brain was exceedingly small, probably weighing but the hundredth part of that of the Alligator compared with the weight of the bodies of the-two animals. Moreover, the cerebral hemi- spheres but little exceeded the optic lobes in size, while the transverse diameter of these lobes only slightly exceeded that of the medulla. The cerebellum also was very small. In the Ornithosauria, how- ever, the optic lobes were unlike in their situation those of any existing Reptiles, they being depressed and placed laterally instead 4 a the dorsum of the brain, thus resembling the optic lobes of

irds.

The Peripheral System.—As in the higher Maminals, so Peri- also in Reptiles, the neural axis gives off a series of special pheral nerves, which in a general way correspond in number with PTO”

the vertebrae they pass out between. Lach also arises by a superior and inferior root, whereof the former is furnished with a ganglion. After the junction of these two roots the whole nerve thus formed divides into ascending and descending branches—the latter, in the trunk, running between the internal oblique and transverse muscles.

The cranial nerve which comes forth from the brain nearest the spinal marrow is the hypoglossal. It passes out through a condy- loid foramen in the occipital bone, and goes to the tongue, hyoid, and larynx.

In the Chelonia the spinal accessory may take origin as far back as the root of the fourth cervical nerve. The pneumogastrie and glosso-pharyngeal pass out from the skull separately as in Saurians, and not through one foramen as in Ophidians and Crocodilians.

Those spinal nerves which continue to supply the limbs form certain more or less complex unions with each other termed plexuses, and from each plexus the nerves of the fore or hind limbs, as the case may be, proceed. The plexus which supplies the nerves of the fore limb is called the brachial plexus. It is formed by the blending of about the sixth, seventh, eighth, and ninth spinal nerves in the Turtle and Crocodile, and the nerves it gives forth are the axillary, ulnar, radial, musculo-spiral, and median as in Mammals. Certain of the more posterior nerves unite to form a crural plexus and others just behind the former blend to form a sacral plexus, and from these the nerves of the leg and pelvic region proceed. Amongst these nerves are the crural, obturator, and especially the great sciatie nerve, which passes to the back of the thigh and divides into the tibial nerves.

As to the particular spinal nerves which go to form these plexuses respectively, and as to the mode of their interlacement and mode of giving origin to the limb nerves, thereis not only diversity between different genera of the same order and species of the same genus, but also between different individuals of the same genus, and even between the two sides of the same individual Reptile.

The Sympathetie Nervous System—nerves which copiously Sym- supply the viscera—is least marked in the Ophidia, in which pathetic this system is not distinct, in the greater part of the body, system.

from the spinal nerves. Essentially the system consists of two antero-posteriorly extending nervous cords, which run on either side of the axial skeleton in its ventral aspect. Each of these two cords is joined by fibres

from the spinal and cranial nerves adjacent to it except the nerves of the nose, eye, and car. At the points of

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junction between the spinal nerves and the sympathetic cords there are ganglia, and from these sympathetic nerves proceed to the viscera, the heart, and the various blood-vessels.

Lhe Har.—The auditory organ may consist of three parts—the external, median, and internal ear. The ex- ternal ear, however, hardly exists in Reptiles, for there is

no external fold of skin representing the external ear of

Mammals in any save in the Crocodiles, and in them it is little more than a rudiment.

The true internal ear always exists, and is composed of

two parts—(1) a membranous labyrinth, containing fluid,

enclosed in (2) a bony labyrinth, which has also fluid con- tents. The former consists of three membranous semi- circular canals which open into a membranous sac, the

vestibule, which is connected with a tubular structure, the membranous cochlea. It is to these parts that the ultimate fibres of the auditory nerve are distributed. The bony labyrinth is formed of the otic bones (prootic, epiotic,

and opisthotic), which enclose it completely save at the

points where openings are left called the fenestra ovalis

and the fenestra rotunda. The latter is entirely sur- rounded by the opisthotic. The fenestra ovalis is partly

enclosed by the prootic and partly by the opisthotic. The prootic specially protects and shelters the anterior vertical

semicircular canal of the membranous labyrinth, and cor-

respondingly constitutes that of the bony labyrinth. The posterior vertical semicircular canal is similarly related to the epiotic, and the external horizontal semicircular canal is sheltered by the prootic and opisthotic. The membranous cochlea helps to almost divide the bony chamber in which it lies into two parts called scale, which communicate at the apex of the cavity.

Such being the innermost ear of Reptiles and an outer- most ear existing only in rudiment in Crocodiles, there is also a median ear which may or may not exist in this class of animals. This median ear is the tympanic cavity or chamber. It is into this cavity when present that the fenestra ovalis looks, while the fenestra rotunda looks into the cochlea. Both fenestra are closed with membrane, so that the fluid in which the membranous labyrinth. is suspended cannot escape through them. 'The fenestra ovalis has fitted to the outer side of its closing membrane a small ossicle of similar shape to itself, which generally has projecting from its outer side a more or less elongated and slender ossicle, the stapes or columella auris. This rod may be wanting, however, as in Z'yphlops, Ihinophis, and Yortrim. When a middle or tympanic cavity exists, the stapes traverses it from the ossicle, closing the fenestra ovalis to become attached to a membrane, the tympanic membrane, which forms part of the external wall of the tympanum. Where there is no tympanic cavity, the stapes simply extends outwards amongst the muscles which lie external to the internal ear. In the Ophidia and Amphis- beenians and some other Snake-like Lacertilians there is no tympanic cavity, and there is none in Hatteria. Its pres- ence is sometimes inconstant in those Lizards; thus in the Slow Worm, Anguis fragilis, it may exist in some in- dividuals and not in others. When it exists, it may not show any external indication of its presence as in the Chameleons and some Chelonians. Generally, however, the tympanic membrane is covered by a scale of correspond- ing size, so that its presence is plainly marked externally.

The tympanic cavity communicates with the back of the mouth by a wide opening in Lacertilians; but in Chelonians this communication is contracted into a arrow passage, the Eustachian tube, which opens (one from each tympanum) by a separate aperture on the roof of the mouth. In the Crocodilia these passages become further complicated and connected so that, in addition to the aperture on either side of the mouth, there is also a

median aperture which is connected with both the Eustachian tubes, that of the right ear and that of the left,

The Kye.—All Reptiles have eyes, although in some Eye.

forms they are quite rudimentary and hidden beneath the skin, which is not at all or but very slightly modified in structure where it passes over them, as, eg., in Z'yphlops and Zyphline.

The eye consists of the same parts as in other Verte- brates, namely, of a nervous expansion at the back (the retina) derived from the optic nerve, a coloured lining (the choroid), a transparent medium (the vitreous humour) separated from one more anterior (the aqueous humour) by a sort of diaphragm (the iris), and a solid, transparent body (the crystalline lens), whilst the whole structure is enclosed by a fibrous membrane, the sclerotic, to form the "ball of the eye," a superficial part of the sclerotic being transparent and distinguished as the cornea.

The ball may have the skin which invests it externally separated in front of it into two folds, the eyelids. When the skin is not so separated, then a closed sac of delicate transparent membrane, the conjunctiva, lies over the cornea between it and the skin, and when the skin is divided into folds or eyelids then the conjunctiva is divided also, one layer lying as before next to the cornea, and the

other layer being reflected from the outer margin of the

cornea into the inside of the eyelids which it lines. There is often a third eyelid, which can be drawn obliquely over the eye, and is called the nictitating membrane. A glandular structure, the lacrymal gland, lies on the outer side of the front of the eyeball, its secretion passing into the mouth by the lacrymal canal; another gland, the Harderian gland, may lie on the inner side of the eyeball. The sclerotic may be strengthened by bony plates being formed within it. A vascular coloured membrane, thie pecten, may project into the vitreous humour from near the entrance of the optic nerve. The ball of the eye is moved by four straight and two oblique muscles, and may also be suspended by a funnel-shaped muscular sheath, the choanoid muscle. There are also special muscles of the eyelids.

In the Ophidia the eye is generally rather large, but very small in the Typhlopide and Uropeltide. Iu no Ophidians is the skin over the eyes divided into eyelids, so that the sac of the con- junctiva beneath it is never subdivided. In the Eurystomatous Ophidians, however, the skin, when it passes over the eyeball, is transparent. The outer (or epidermal) layer of the skin is cast with the rest of the skin of the body. The lacrymal canal is wide, but opens into the mouth by a narrow aperture on the inner side of the palatine bone. In some Trigonocephali the lacrymal gland extends almost all round the eyeball. 'he sclerotic never develops bony plates in any Serpcut.

Amongst the Lacertilia, many, such as the Amphisbenians, the Geckos, and many Skinks, have the eyelids undivided, as they arc in Ophidians. Most Lizards, however, have an upper and an under eyelid, and also a nictitating membrane, and there may be a cartilaginous or bony disk in the lower eyclid. Many Skinks have the lower eyelid more or less transparent. The eye of the Chameleon is most peculiar. The larger eyclids have but a minute aperture, and the two eyeballs can be rotated independently, so that their axes may be differently directed simultaneously. There is a rudiment of a third eyelid, and there is a bony plate in the lower part of the large eyelid. The Harderian gland is large, but the lacrymal is small. The lacrymal canal opens below in the outer wall of the posterior nares. In most Lacertilians there are overlapping bony plates in the sclerotic, but these are wanting in Chameleons and

Geckos. There is mostly a pecten. In some species the lacrymal gland appears to be wanting. The nictitat- ing or third eyclid is drawn over the eye by the simultaneous action of two curiously arranged structures. One of these is a muscle which takes origin from the postero-inner orbital wall and ends by forming a fibrous loop. The other is a tendon which passes throngh the loop to be attached at one end to the nictitating membrane, and at the other to the inner wall of the orbit.

In Hatteria there are cyelids—the lower with a cartilaginous disk—and a nictitating membrane. The sclerotic contains osseous lamella, and there is no pecten.

The Crocodilia have three eyelids, and no bony plate in any part

Nasal organ.

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of the eyc. A muscle arises from the surface of the sclerotic on its inner side and ends in a tendon which passes backwards and down- wards over the optie nerve to attach itself to the margin of the nictitating membrane. There is a rudimentary pecten.

In the Chelonia the sclerotic is furnished with bony plates. The Harderian gland is small, but the lacrymal is considerable. There are three eyelids, and the nictitating one has the muscle which moves it combined with the elevator muscle of the eyelids. Both arise from the inner side of the sclerotic. One arches over the optic nerve and goes to the third eyelid, and the other goes from the outer angle of the eye to the lower eyelid. The fibres of these two muscles are elosely interrelated at their origin.

The Olfactory Organ.—There are two olfactory organs in every Reptile, consisting of tracts or foldings of mucous membrane richly supplied with nerves and supported and protected by cartilaginous or bony structures. In existing Reptiles they always lie at, and extend near to, the anterior end of the muzzle, though in the Ichthyosauri and Plesiosaurt they opened

anteriorly far back and near the orbits. The olfactory membranes are always enclosed or supported by carti- lages which proceed out from an azygous septum which divides them one from the other. Each nasal organ has an anterior and posterior opening, though the anterior openings may so meet as to form but one superficial aperture, as in the Crocodilia, and the two posterior apertures may open, not directly into the mouth, but into an azygous forwardly-extending diverticulum from it, the posterior opening of which diverticulum forms practi- cally a common posterior termination for both the organs of smell. The nasal passages are short in all existing Reptiles save the Crocodilia, and open posteriorly far forwards —as has been already noticed in describing the skull, when the prolongation backwards of the posterior nares in the Crocodiles was also described. In the Chelonia the anterior external apertures of the nostrils are distinct though near together. Sometimes, as in Chelys and Trionyz, they are tubular, and open externally at the end of a short proboscis.

A structure called the nasal gland exists and is well- developed in the Ophidia. It is a peculiar rather soft body, often shaped like a mushroom with a very short stalk. It lies immediately beneath the floor of the nasal capsule, and the membranous wall of the cavity on which it lies is covered and protected by a bone, commonly called the "turbinal," which extends out from the median nasal septum to the maxilla. These cavities open on the palate by narrow apertures placed in front of the posterior nares.

In the Chelonians we find a soft, egg-shaped, whitish, azygous body (without any internal cavity), also placed in front of the posterior nares in the skin of the palate, behind the palatine part of the premaxille. It is supplied with palatine nerves.

The Urogenital System.

In Reptiles the urinary and generative systems are distinct, save as regards the approximation of their pos- terior terminations, thus agreeing with higher Vertebrates and differing from Amphibians, in which the renal and secreting organs generally continue throughout life more or less connected.

The Urinary System.—The urinary system of the Rep- tilia always consists of a pair of renal glands or kidneys, with excretory ducts which pass down to the cloaca. There may or may not be a urinary bladder, also opening into the cloaca. Besides these parts there are also a pair of Wolffian bodies, which are more or less aborted remnants of large organs which are always developed during embryonic life.

The Kidneys—The kidneys are more or less symnuetrically placed on the dorsal side of the peritoneum, in the hinder half of the trunk. Each consists of a mass of cecal tubules into the distal end of which a tuft of minute vessels projects, thus forming what is called a glomerulus or Malpighian body.

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In the Ophidia the kidneys are least symmetrical, the right one extending the farthest forwards. They are elongated and lobed, and sometimes in such a way as to appear spirally twisted. Each ter- minates behind considerably in front of the cloaca. The duct of each ureter begins at the anterior end of the kidney and thence proceeds along its inner border, and accessory ducts open into it from the interspaces of the lobes of the kidneys. The two ureters open into the sides of the cloaca, In the males each opens upon a papilla in close proximity to the opening of the male sexual duct or vas deferens. In the females the ureter opens beside the mouth of the female sexual duct or oviduct. There is never any urinary bladder.

In Lacertilians the kidneys are more posteriorly placed than in Serpents. They lie at the hindmost part of the body cavity above the cloaca, and they generally much approximate together. They are also more symmctrically placed; only in the Amphisbenians the right kidney extends the more forward, thus resembling Ophidians. There is always a urinary bladder, which is a ventral diverticulum of the cloaca. The kidneys are usually transversely furrowed. The ureters run along the inner side of the kidneys, and open into the sides of the cloaca, not into the bladder.

In Chelonians the kidneys lie near the cloaca in the cavity of the pelvis. They are rather short and thick, and more or less trihedral. Their surface is marked with many shallow meandering grooves and fewer deeper furrows. The urcters proceed as usnal along the inner sides of the kidneys, and several large canals successively open from them into the urcters, which extend backwards, but to a trifling extent, beyond the kidneys. They open rather anteriorly into the eloaca close to the neck of the urinary bladder, which vessel is always present and voluminous, and is often two-horned.

The Crocodilia also have posteriorly situated pelvic kidneys, but they have no urinary bladder. The kidney is concave dorsally and flatter ventrally. Its surface has meandering convolutions separated by furrows. The ureters for the greater part of their length run deeply sunk in the substance of the kidneys. The ureters leave the hinder ends of the kidneys and run freely for a short distance to the cloaea, which they enter close behind the rectum.

The Wolffian Bodies.—These bodies lie one on each side on the dorsum of the body cavity, and each consists of a series of cecal tubes with vascular balls or glomeruli like those of the kidney, the various tubes always opening at first into a common excretory duct which leads towards the cloaca. In adults they are but small organs. Ina Python 10 feet long they measure but aboutan inch. In Serpents generally they are slender and lobed bodies which lie close to the veins in front of the kidneys.

The Generative Organs.—Reptiles, like all the higher Vertebrates, have the sexes divided, with two sets of organs which respectively characterize male and female indivi- duals. In both sexes, as in Birds, there is a pair of sexual glands, each furnished with a passage for the exit of its product, together with, almost always, external organs destined to effect and facilitate impregnation. Unlike Mammals, however, all Reptiles have the sexual glands placed within the abdominal cavity, and, also unlike Mam- mals, the male external organ or agent for copulation may be either azygous or bifold according to the group to which any Reptile may belong. Unlike the more inferior Verte- brates, however, Reptiles, with the

solitary exception of Hatteria, always possess such a copulating organ, and im- pregnation is invariably effected internally.

The male organs consist of a pair of glands, the testes, with their ducts, the vasa deferentia, and the external organs, penis or penes. The female organs consist of a pair of glands, the ovaries, with their ducts, the oviducts, to- gether with rudimentary representatives of the extérnal sexual organs of the males.

The Testes and Vasa Deferentia.—These are two compact and rather small glands, consisting of a mass of excal convoluted tubes, lying in the dorsal region of the abdominal cavity and completely invested by peritoneum, and with a dense albugineal coat of their own. From the mass of tubules a certain variable number of efferent tubes, vasa efferentia, come forth and soon unite in the single excretory duct of the gland, the vas deferens.

In the Ophidia the testes are not symmetrically placed, the right one being somewhat more voluminous and also in front of the other. Consequently the right vas deferens is larger than the left one. Each testis lies in front of the kidney of its own side, aud is more or less elongated in form. The vas deferens proceeds

along the inner margin of the testicle, and is a convoluted tube which narrows as it proceeds backwards. The opening into the

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cloaca is somewhat oblique, and is situated in a somewhat funnel- shaped depression beside the opening of the ureter.

In the Lacertilia the testes are spheroidal and almost symmetri- cally placed. The vasa efferentia come forth from their inner side and pass into a canal lying in a fold of peritoneum. This canal, the vas deferens, begins cxcally much in front of the union of the vasa efferentia with it, and this anterior portion runs along the ventral side of the kidney in a fold of

peritoneum and has the appearance of a knot of tubuli or of a body transversely convoluted. The vas deferens passes backwards in numerous close-set convolu- tions, and often dilates towards its hinder end. It ultimately narrows, and opens on the cloaca, beside the ureter, on a small papilla.

The Chelonia have testes which lie somewhat external to the kidneys as well as behind them. The vas deferens terminates upon a small papilla in the cloaca, but its proximal end—anterior to the junction with it of the vasa efferentia—is wide, aud consists of a very complicated mass of tubes, and it may have (as in Chelodina) five or six short cecal diverticula.

The testes of the Crocodilia are of an elongated oval form, and lie partly in front of and partly on the inner side of the kidneys. The testis may be divided into two portions connected together dorsally. The vasa efferentia pass from the outer border of the testis to a vas deferens, which has rather thick walls with a marked dilatation towards its hinder end. It lies above the peritoneum, and opens at its distal end into a groove at the base of the penis.

The Ovaries and Oviducts.—The ovaries are, as in the class Mammals, the glands which correspond with the testes, but which, unlike the latter, are not composed of a mass of tubules, while each does not discharge its product into a tube directly continuous with it (as does the testis into the vas deferens) but into a tube, the oviduct, the distal end of which is open and discontinuous with the ovary save for a broad fold of peritoneum which connects them. The ovaries always lie in the dorsal part of the abdominal cavity enclosed in peritoneum.

In the Ophidia the ovaries are, like the testes, elongated and placed one in advance of the other. The right ovary is more voluminous, and the right oviduct is, of course, the longer one. The ova are so arranged within them as to form a longitudinal series. The proximal end of each oviduct shows a transversely expanded wide opening. The oviduct passes backwards in con- volutions which are often spirally arranged, and itis very extensible, being lined with numerous close-set effaceable folds. The oviducts open into the cloaca by a crescentic fissure behind the opening of the rectum.

In the Lacertilia, cme the Amphisbenians and probably some other Serpentiform Lizards, the ovaries have not their contained ova serially arranged. They may or may not be symmetrically disposed. The oviducts are usually broad and spirally disposed. Unstriated muscular fibres often exist in the folds of membrane which support their convolutions.

The Chelonia have ovaries symmetrically placed, often of a broad and flattened shape. The oviduct varies much in capacity in different parts of its course. The ovaries of the Crocodilia are com- pact in structure and somewhat more advanced in position than in most Reptiles, The oviduct is more uniform in diameter than in the Chelonia.

The External Generative Organs.—As has been already mentioned, all Reptiles have such external organs with the exception of Hatieria. In the rest of the class we always find such organs connected with the cloaca, and capable of being everted for use or retracted and hidden within or behind that chamber. The whole class is thus divisible into two groups according to the bifold or azygous condition of these parts. é

In the Lacertilia and Ophidia | they are bifold, and consist in {| the males of two hollow, inver- \S tible, imperforate, cutaneous cones placed one on each side of the cloaca, containing erectile tissue and capable of being pro- truded or retracted by appro- priate muscles. The lining of each cone is continuous both with the external skin of the adjacent parts and also with the mucous lining of the cloaca. A tortuous groove which begins within the cloaca, at the aperture of the vas deferens, is continued on to the apex of the cone. When erected for use the lining membrane of the cones, with its grooves, becomes the external coat of each copulatory organ. In the females there are rudimentary

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Fig. 29.—Male copulatory organs of Lacer- taagtlis (after Leydig). 1, po, organs of right and left sides—between them is the anal aperture; pp, preanal plate.

-corresponding rudimentary structure exists in the females.

but quite similar organs, just as in Mammals the clitoris of the female is present as the rudimentary representative of the penis of the male. In the Ophidia these hollow penes may or may not bifurcate distally, and if they bifurcate then the groove bifurcates also. "The lining membrane of the cone may be smooth, as in Python, or spiny, asin Trigonocephalus and Crotalus, or may have transverse rows of soft lamelle, asin Boa marina. The Lacertilia, like the Ophidia, may have each pénis single to its apex or bifur- cating distally with various other minor modifications as to relative size, the form of the apex, and the appendages borne upon it. The cones are exceptionally short in the Chameleons.

The male Chelonia and Crocodilia have an azygous penis, and a This organ lies at the ventral wall of the cloaca; it is not hollow or evertible, but purely distensible and so erectile. It is therefore its external coat which is continuous with the lining of the cloaca. Muscles proceeding from beneath the hinder trunk vertebre are inserted into it. The penis is imperforate, but two ridges are continued on to it from the wall of the cloaca, and so form a groove, and during erection a temporary canal, which passes along it from root to apex. At its distal end there is a prominence which, though imperforate, may remind us of the "glans" of the Mam- malian penis. The whole body of the organ, including this distal prominence, contains erectile tissue. In the Chclonia the penis may divide distally, and if so the groove it bears divides also. In Chelodina it has an undivided distal end and two lateral pro- cesses. In 7rionyx it subdivides distally into four terminal parts. The penis of the Crocodile has a deep groove which reaches to the extreme end of the penis, a quasi-glans projecting freely beneath it.

A few Reptiles have secondary sexual characters—notably the Chameleons, the males of which alone have the horns and other cephalic appendages which characterize certain species. In most Reptiles, however, the two sexes have hardly any distinctive external characters.

Embryology.

Most of the Reptilia are oviparous, but certain of the Lacertilians and many Ophidians, notably Vipers and Sea-Snakes, hatch their eggs before they are laid ; that is, they are ovoviviparous. The oviduct supplies the ovum during its exit with an albuminous investment, the white of the egg, and with a shell, or testa, which may be thin and flexible, as in the Lacertilia and Ophidia, or hard and calcareous, as in the Crocodilia and Chelonia, the eggs of which animals much resemble those of Birds.

_The embryo Reptile closely resembles in its general features the embryo Bird, and, as the process of develop- ment of the chick (which can be so conveniently studied) is now comparatively thoroughly well known (see REPRo- DUCTION), we cannot here make more than a cursory mention of the leading structural changes. Inasmuch as embryonic Reptiles thus resemble embryonic Birds, it of course follows that they present all those features which embryonic Birds share with Vertebrate animals generally, such as the segmentation of the yolk, the resulting forma- tion on its surface of the blastoderm, and its division into the three germinal layers. As in Birds, the yolk segmen- tation is meroblastic.

The blastoderm spreads rapidly over the yolk, but before it has half enclosed it a pyriform patch, the embryonic shield, or area pellucida, appears at its centre. The head of the embyro is formed at the broader end of the pyriform patch. Towards its hinder end a streak of the epiblast is formed, the primitive groove,! and then in front of it another longitudinal indentation, the " medullary groove," the walls of which are the "medullary plates"; and it is: this groove and plates with the parts immediately sub- jacent which lay the foundation of the developing body. The lining of the medullary groove becomes the cerebro- spinal axis, while a longitudinal cellular rod which is formed beneath it, and which is called the notochord, lays the foundation of the future axial skeleton as far forward as the hinder margin of the cranial support of the pituitary body of the brain. The anterior end of the medullary

a ee a ee ee 1 Supposed to be an indication of a form of invagination of the germinal layers characteristic of lower forms.

groove shows serial enlargements corresponding with the successive portions of the adult brain, while the medullary plates close over the medullary groove and convert it into a canal which ultimately persists as the central canal of the spinal cord and the ventricles into which that canal opens anteriorly. The eyes arise as outgrowths from the brain aided and modified by ingrowths from the surface of the embryo. The ears and nasal organs arise mainly from superficial ingrowths. From the tissue on either side of the notochord and medullary groove are gradually formed the axial skeleton of the trunk and the muscles and other structures adjacent to it. The sides of the medullary plates bend down on either side and form the ventral laminze which split longitudinally, or they descend —the inner layer joining with its fellow of the opposite side to form the alimentary tube. The two outer layers form the lateral walls of the trunk, the space between the two inner and the two outer layers constituting the first condition of what is subsequently the first peritoneal cavity.

The limbs first appear as outgrowths from the external layers of the ventral laminz, but no rudiment of the limbs seems ever to be developed in the apodal Ophidians. On each side of that region which subsequently becomes the head and neck a series of perforations successively appear, and for the most part disappear, known as the visceral clefts, while their intervals are known as the visceral arches. The only visceral cleft which ever per- sists in the Heptilia is that which becomes the passage from the inner end of the Eustachian tube to the outer surface of the tympanic cavity. The foundations of the skull are laid in a cartilaginous investment of the anterior end of the notochord and of the incipient membranous labyrinth, whence two columnar prolongations, the tra- becul, pass forwards on either side of the support of the pituitary body. We have seen the persistent nature of these trabeculze in the cranium of Ophidians. The central part of the facial region of the skull is formed by a car- tilaginous ethmoidal process at the anterior end of the trabecules. Hence and from the side of the auditory cartilage cartilaginous processes go forth which lay the foundation of the jaws, palatine structures, and hyoid apparatus. The circulating system in its earliest condition is very different from that which ultimately exists. At first the heart is not a tubular structure, but it gradually folds and subdivides itself. The arteries proceeding from it (and the veins converging to it) at first follow the general course of the arteries

(and veins) of Fishes and aquatic breathing Amphibians. The arteries ascend within the visceral arches to meet in a dorsal aorta, as they must needs do in the animals just mentioned, seeing that in them it is the visceral arches which become the gill-bearing structures wherein alone the blood is aerated.

The urinary organs are at first represented by Wolffian bodies only, which are formed from beneath the dorsal region of the body cavity, but subsequently, as has been mentioned, they become replaced by the two kidneys. The sexual glands themselves arise in connexion with the Wolffian bodies.

At a very early stage of development the embryo as it were sinks into the surface of the ovum, while a membrane arises on all sides of it meeting dorsally over it, consti- tuting the embryonic envelope known as the amnion. From the hind part of the abdominal region of the embryo there also grows forth a vesicle which, becoming greatly enlarged and richly supplied with blood-vessels, spreads itself out on all sides just within the egg shell, and serves as the organ of respiration for the embryo. This directly respiratory structure is the allantois. The ventral surface of the embryo remains long open and connected with the ever-diminishing remains of the food yolk. As this

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ventral surface closes in, the remains of the yolk or vitellus become connected with the alimentary canal, but by a very narrow tube called the vitelline duct. Before the process of development is complete, however, the last remains of the yolk become absorbed and taken up, and the abdominal wall is finally closed.

Space does not here allow of more than this brief indication of some of the leading facts of bodily development. We cannot attempt to describe the complex processes of ossification by which the first foundations of the skeleton, and especially of the skull, become differentiated into its manifold component bones. For an account of this process, and of all the

other details of embryonic development, the reader is referred to the valuable treatises to be found enuinerated in the following list of herpetological works.

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Mesozoic.

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DISTRIBUTION OF REPTILES IN TIME.

The first appearance of Reptiles on the surface of the globe is indicated by very fragmentary remains. Speci- mens of deeply biconcave vertebre of Carboniferous age from Nova Scotia are believed to be those of a marine Saurian (Hosaurus acadianus); if this view is correct, this oldest of Reptiles would bear the stamp of one of the most Fish-like of the class.

Formations of Permian age in North America as well as in Europe contain fossils with undoubtedly Reptilian characters ; they are still associated with true Labyrintho- donts, and with remains which are too fragmentary to be assigned with certainty either to Labyrinthodonts or Reptiles. The vertebrae of all are amphiccelous. These Reptiles are Rhynchocephalians,—the oldest and best preserved being Proterosaurus from the Copper-Slate of Thuringia, a Reptile about six feet in length, with a com- paratively long neck (which, however, was composed of seven or nine vertebra only), with numerous abdominal splints, a long tail, and well developed and differentiated limbs.

In the Mesozoic times the Reptilian type appears in such variety and in such a high state of development that this era has been distinguished as the “ Reptilian age.” Yet we know chiefly such forms only as possessed bones of a size and solidity sufficient to ensure their preservation. Of small Reptiles, animals under or scarcely exceeding two feet in length, comparatively few have been discovered, although they too must have existed in abundance. In the Trias there appear first of the marine Saurians large Sauropterygians with narrow ossifications between the vacuities of the skull, such as Simosaurus, Nothosaurus, and Pistosaurus from the German Muschelkalk. The highly interesting genus Meusticosaurus, the smallest of the group, with the four limbs modified into paddles, but with the hind limbs retaining the structure of those of a terrestrial animal, seems to afford evidence of this order having been

developed from a terrestrial type. Fragments of true Plesrosaurus and Ichthyosaurus begin to appear in the Rheetic bone beds of England. Also the Placodonts, the systematic affinities of which are not yet satisfactorily understood, are contemporaries of these early Enalio- saurians. The precursors of our Crocodiles were two genera, Lelodon and Steganolepis, with dorsal scutes, but with amphiccelian vertebra and anterior choane, neither palatines nor pterygoids being dilated into the osseous palate which is characteristic of later Crocodiles. Another order, the Anomodontva, flourished and died in this epoch ; some fifteen genera have been distinguished, all from the South-African Trias; however, this type is probably also represented in Russian formations of the same age. Rhynchocephalians continue in several genera in Euro- pean and American strata. But the largest of terrestrial

Reptiles belonged to the Dinosaurs, whose presence in numerous species belonging to distinct groups, some with three, others with five toes to the hind feet, is testified by their osseous remains as well as by the tracks of their hind feet, which they left during their bipedal progression over stiff mud. These Triassic Dinosaurs were chiefly herbi- vorous, and already much more numerous in North America than in Europe (Zanclodon).

This Reptilian fauna continued to flourish in the Jurassic Jurassic.

period ; the types of the Trias increased in variety ; still more gigantic forms were developed ; and new orders which were absent in the preceding period were added. Of the marine Saurians alone some fifty species are known from European formations: the Jchthyosawri inhabited chiefly the northern seas of the eastern hemisphere, and were re- placed in the western by Reptiles of similar structure and size, but without teeth (Sawranodon); the Sauropterygians have considerably advanced beyond their Triassic precursors in having more solidly ossified skulls, and are also repre- sented by a greater number of genera in America as well as Europe; of Plesiosaurus alone some twelve species are known from the Lias and seven from the Oolite. Ptero- dactyles make

their first appearance. Crocodilians have developed into the " Mesosuchian" type, their palatine bones being prolonged, pushing the choanz backwards to the middle of the under surface of their skull, but their vertebre are still amphiccelian ; they appear in numerous genera (Z'eleosaurus) and species. Terrestrial Reptiles keep pace in development with the marine and freshwater types ; the giants of the order of Dinosaurs have left their remains in a more or less perfect condition in the Jurassic strata of both hemispheres (Cetiosaurus, Atlantosaurus, Iguan- odon, Morosaurus, Apatosaurus) ; forms with three toes on the hind feet lived simultaneously with four- or five-toed ones ; carnivorous types (AMegalosaurus, Creosaurus, &c.) represent in habit as well as relative size Mammalian Carni- vora; they preyed upon the gigantic but weaker members of the order. The Dinosaurian type extended also into the southern hemisphere, as is testified by the West-Australian genus Deuterosaurus. The Chelonians, which appear first in the Upper Keuper, are in the Lias of highly advanced types, and not essentially different from recent families ; they occur in many localities of Europe as Freshwater Turtles, chiefly Chelydide ; but Emydide are also repre- sented, showing, however, a less solid ossification of the carapace than the recent forms. No distinct evidence of the presence of Marine Turtles and Zrionyx has been found hitherto in Jurassic formations.

This abundance of Reptilian life not only continues in Creta- the Cretaceous period, but is still more increased in ceous

variety and reaches its highest point of culmination. Ich- thyopterygians and Sauropterygians reached an enormous size; Discosawrus, with a neck 22 feet long and composed of sixty vertebra, must have been the most formidable enemy to the Fishes of the sea. Moreover these large Saurians which survived from the preceding period were – now joined by a new type of marine monsters with a Snake-like body and very short extremities, the Mosa- saurians, which attained to a length of from 10 to 80 feet and veritably filled the place of Sea-Serpents. Although their skull exhibits not a few Ophidian characters, their genetic relation to that order is not by any means proved. They were most numerous in the western hemisphere, some forty American species referable to many genera having been described by North-American authors; in Europe they are

comparatively scarce. On the other hand no less than fifteen species of Pterodactyles are known from European formations, all armed with formidable teeth, whilst the gigantic Pterodactyles of North America

are, with one exception, toothless. Together with the sur- XX. — 59

Tertiary.

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viving Mesosuchian Crocodiles of the Jurassic period Gavial-like forms existed, and genera with posterior choanz and proccelous vertebrae (Eusuchians),—among them a true Crocodile from the Cambridge Upper Greensand. The western hemisphere exceeded the eastern as regards the abundance of Dinosaurians in this period still more than in the preceding, although it should be remembered that of the latter part of the globe in fact only a small portion has been opened up, and that the little we know of the geology of Central Asia and western China points to the probability of vast paleontological treasures being reserved for the study of future generations. Rhynchoce- phalian genera continue in considerable variety, whilst other small-sized forms are referred to the Lacertilians. The types of Freshwater Turtles which lived in the Jurassic period pass into the Cretaceous. They appear now also in North-American strata: Chelydidex first, ac- companied or immediately followed by Hmydidx, a few Trionyx and Chelonia, and the remarkable Protostega, a precursor of Sphargis. Towards the end of the Cretaceous period its abundant Reptilian life is swept away, and not only every species but almost every Mesozoic genus dis- appears, a wide gap being left in our knowledge of the succession of Reptilian life between this period and the Tertiary era.

In the lowermost strata of Tertiary age a few isolated remains remind us still of the extinct Mesozoic fauna ; such are one or two genera allied to the Dinosaurians (Agathau- mas) from the Laramic beds of North America. In other respects the Tertiary Reptiles bear already the character of the present fauna; although families or genera which are distinct from the living predominate in the Eocene, from the Miocene Reptiles gradually approach more and more the specific forms of our

time. True Crocodiles (of which one species occurred already in the Cretaceous period), Gavials, Alligators have now entirely superseded the '" Mesosuchian" type. The remains of Lacertilians are fragmentary and generally indistinct, so as to offer a wide field for generic distinctions. Anguide have been distinctly traced back to the Miocene of North America. With a single exception, that of a poisonous Serpent, apparently a Vipera, the remains of which have been found in Miocene deposits at Sansan (south of France), Snakes do not appear before the Eocene, in England as well as North America; they are mostly large species, with un- certain affinities, but all innocuous (Palxophis, Dinophis, Boavus, Lithophis). Their remains are scarce, and even those of the later Tertiary formations show a greater resemblance to genera which are now-a-days locally far removed than to those living in the same geographical district. Chelonian remains are numerous throughout, probably on account of the resistance which their solid carapaces offered to destructive agencies. Chelydidz, Emydidx, and Trionycide and also Marine Turtles con- tinue to exist in an almost uninterrupted series, and approach so much the modern genera that, for instance, in Trionyx, if specific distinctions existed between Miocene and recent species, they cannot be determined in those parts of their skeleton which have been preserved. A peculiar type intermediate between the Marine Turtles and Emys existed in the English Eocene (Chelone). Land Tortoises, the most specialized type of the order, probably did not appear before the Miocene. A number of smaller forms are referable to the genus Testudo, but gigantic forms existed then as now in isolated localities, and exceeded in size the living, like the Colossochelys of the Siwalik Hills, with a carapace computed to be 20 feet long, and the smaller Jfacrochelys from the German Molasse. It is extremely singular that the existence of these colossal Chelonians would seem to coincide with the

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period of the first appearance of the type of Land Tor- .

toises.

Of the first appearance of most of the families of the recent fauna, and of their distribution in the Quaternary period,! we know next to nothing. With few exceptions the Reptilian type had dwindled to forms of such small size that their remains, if preserved, escape observation or are too indistinct for determination.

THE DISTRIBUTION OF EXISTING REPTILES OVER THE Earti's SURFACE.

Serious obstacles present themselves at the present time to a satisfactory treatment of the geographical distribution of Reptiles. We have mentioned at the end of the preceding section that the geological record is much too incomplete to permit a comparison to be drawn between their distribution in the present and next preceding periods, and that we are therefore ignorant as to the modes in which their dispersal was brought about, and unable to account otherwise than hypothetically for the numerous instances of apparently anomalous distribution. And, when we limit ourselves merely to the task of describ- ing the facts of their distribution at the present day, it is necessary for such an attempt that the whole class should have previously undergone a thorough rearrangement in accordance with the present state of science, and that the scattered contributions to the various faunz should have been critically examined and treated by the same uniform method. This is unfortunately not the case with the class of Reptilia. The systems and lists of Lacertilia and Ophidia which formed the bases for the treatises on the geographi- cal distribution of these orders by Schlegel, Giinther, and Wallace are buried under an accumulation of an immense number of additions of very different value, which require a uniform critical revision before they can be used in an inquiry of a general biological scope.?

In the following notes we have been able to include the majority of the genera of Chelonians and Ophidians, with an approximate estimate of the specics of each that are known at present. As regards the former Strauch? has done much to clear the way, although the small amount of materials known to him from autopsy interfered much with his critical judgment. Not many additions have bcen made to this order since the time of the publication of his memoirs. Of the numerous Ophidian gencra and

species we have climinated all which are based on trivial distinctions, or are named by authors without special acquaintance with the subject. We have not entered into a full consideration of Laccrtilian genera, as this would have been useless at a time when they are undergoing a revision, but have restricted ourselves to the families recently proposed by Boulenger.

One of the most important results obtained by this inquiry is that the same arrangement of the so-called primary zoological regions is not applicable to all orders of Reptiles, and that the differences in their distribution are so fundamental that they can be accounted for only on the assumption of the various orders and families having appeared and spread over the globe at very distant periods, when land and water were differently distributed over the surface of the globe. At the end of this section we shall show in a short résumé the mutual relations between the various regions with respect to the several orders of Reptiles.

The means of dispersal of Reptiles are very limited.

1 An important memoir on Indian Chelonia is published whilst this

_ article is passing through the press, "Siwalik and Narbada Chelonia,"

by R. Lydekker, in Palgontol. Ind., vol. iii. ser. x., 1885.

2 Whilst this article is being written, the Zacertilia are undergoing the much-needed arrangement by Boulenger (as mentioned at p. 439), who also has recently published preliminary notes on the distribution of the families of Lacertilians, which have been of great use to the present writer (Anz. and Mag. Nat. HWist., August 1885, p. 77).

3 "Chelonologische Studien," and "Die Verbreitung der Schild- kréten tiber den Erdball," in Afémoires de ? Acad. de St Pétersb., 1862 and 1865.

Quater-

nary.

Geo-

graphical distribu-

tion.

Marine forms.

Marine Turtles.

Indian region. Che- lonians.

‘DISTRIBUTION. |

They are much specialized in their mode of life and pro- pagation, and ill adapted to accommodate themselves to a change of external conditions. As air-breathing cold- blooded animals they are unable to withstand prolonged cold ; they are therefore entirely absent in the arctic and antarctic zones ; and such as escape the effect of the winter months in temperate zones by passing them in a torpid condition in well-sheltered places are not peculiarly organized forms, but offshoots from those inhabiting warmer climes. The tropical and subtropical zones are the real home of the Reptilian type, which there has reached its greatest development as regards size and variety of forms. In the north Chelonians advance only to 50° lat. in the western and to 56° in the eastern hemisphere, Lizards to about 56° in British Columbia, and close to the Arctic Circle in Europe, whilst Snakes disappear some degrees before the Lizards. Also in the south Lizards extend into higher latitudes than Snakes, viz., to the Straits of Ma- gellan, whilst the latter do not seem to have advanced beyond 40° §. lat. and Chelonians only to 36°.

We exclude from our account of the distribution of terrestrial Reptiles those few forms which pass almost the whole of their life in the sea, and therefore belong to the marine fauns, viz., the Marine Turtles and Sea-Snakes.

1. The shores of the continents and islands of the equatorial zone arc the home of the Marine Turtles. Endowed with a wonderful power of

locomotion, the several species are now distri- buted over the greater part of this zone, occurring in the Atlantic as well as the Indo-Pacific ; and, although some of them are common in certain districts and scarcer or even absent in others, it is pro- bable that in the course of time their distribution will be still more general and uniform, as far as other conditions (such as access toa suitable locality for the successful propagation of their kind) will permit. Frequently Marine Turtles stray far into the temperate zones, and it thus happens that one and the same species (Sphargis cortacca) has been found on the south coast of England, near Cape Cod in North America, and on the coast of Chili. In short the geographical distribution of these Reptiles is that of pelagic animals generally, although by their mode of pro- pagation they are compelled to sojourn near land during a certain period of the year.

2. The Sea-Snakes are restricted to, and highly characteristic of, the fauna of the tropical Indo-Pacific Ocean, and more especially of parts between Arabia and North Australia. They prefer the vicinity of land, but never leave the water, with, perhaps, the single exception of Platurus. Their distribution is not erratic; only one species, Pelamys bicolor, a Sea-Snake which more than any other is organized for a marine life, has spread far beyond the original home of its kindred, viz., westwards to the coasts of Madagascar and south-eastern Africa, and eastwards to the further- most limits of the region, viz., to the coasts of ceutral and northern South America.

All other Reptiles! are terrestrial, and, as they are chiefly developed in the tropics, we begin our account with the regions? of the equatorial zone. The scope of this article does not allow us to enter into an examination of the subregions which have been proposed by various authors.

1. Lhe Indian Region.—Of the four principal groups of terrestrial Chelonians, the Emydide and Trionycide (Freshwater Tortoises and Freshwater Turtles) predomi- nate over the Z'estwdinidx, which are scarce and restricted, the fourth (Chelydide) being absent altogether. We know fifty-seven species from this region :—

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soanooodanhovouncone le CISTUMONIC MOLE), cccec see ~~caccesuects soso. aerate oF 35 Biys WAL AtSESUIDOOMETA, ...~~..ucersenasees ess 30 ,,, HRaleat rs GeM MALIN SM ainteiteistajae'- «os ewseaesseinemieneenasan 5 Ha "PN OSUSG54 dne ne aR ORB AER aaBRaR Ener Rata auG He soneansuccbuC . DERLAM aise .oenagencrestseeile seierihagethitie gts aes 8 Ap Me

1 The fact that Oreocephalus enters the sea habitually and Cher- sydrus frequently does not entitle these Reptiles to be classed among marine animals ; they pass the greater part of their life on land, and never leave its close vicinity.

? As regards the general boundaries of the zoo-geographical regions we refer to Wallace's Geographical Distribution of Animals (London, 1870, 4to) or to the article IcHTHyYOLOGY (vol. xii. pp. 668 sq.).

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Three of these genera are peculiar to the region, viz., Manouria,3 Platysternum, and Emyda. Characteristic is the scanty repre- sentation of Testudo. One species which is common in the Indian peninsula (7'. stel/ata) is so similar to an African species as to have been considered identical with it; the Burmese Tortoise is also closely allied to it, and the two others extend far into western Central Asia. Thus this type is to be considered rather an immi- grant from its present headquarters, Africa, than a survivor of the Indian Tertiary fauna, which comprised the most extraordinary forms of Land Tortoises. Wallace's line marks the eastern bound- ary of Trionyx; species of this genus are common in Java and Boruco, and occur likewise in the Philippine Islands, but are not found in Celebes, Amboyna, or any of the other islands east of Wallace's line. 4

Of Crocodilide true Crocodiles are represented by four, Croco-

and Gavials by two species. Alligators are absent.

Although the region is characterized by numerous highly Lacer- specialized genera of Lacertilia, not one of the families is tilians.

peculiar to it.

Agamide are exceedingly numerous, and are represented chiefly by arboreal forms ; terrestrial forms, like Agama and Uromastiz, inhabit the hot and sandy plains in the north-west, and pass unin- terruptedly into the fauna of western Central Asia and Africa. The Geckonidx, Scincide, and Varanidez are likewise well repre- sented, but without giving a charactcristic feature to the region by special modification of the leading forms, The Lacertidz are repre- sented by one characteristic genus, T'achydromus,—Ophiops and Cabrita being more developed beyond the limits assigned to this region, Finally, the Hublepharide and Anguidz, families whose living representatives are probably the scattered remains of once widely and more generally distributed types, have retained respec- tively two species in western India, and one in Khassia (Khasi Hills), whilst the presence of a single species of Chameleon in Southern India antl Ceylon reminds us again of the relations of this part of the fauna to that of Africa.

The Indian region excels all the other equatorial regions Ophi- in the great variety of generic types and number of dians.

species of Snakes. The Jatter amount to no less than four hundred and fifty, which is nearly one-third of the total number of species known. They are referable to about one hundred genera, of which the majority do not range beyond the limits of the region. Of higher groups (termed families for the sake of convenience), the Xenopeltidz, Rhinophidx, Oligodontide, Xenodermidex, and Acrochordide are peculiar to, and characteristic of, this fauna,—but not more so than a number of genera which will be mentioned presently.

Of Typhiopidx more than twenty species are known.

Of Tortricidx, the genus Cylindrophis is spread over several of the subregions.

The Calamartide are represented by a whole string of genera, of which thirteen are peculiar to the region. The most characteristic and geographically most important types are Calamaria, with twenty-four species, spread over the archipelago and the eastern parts of the continent, and Aspidura and Haplocercus, with four species, which are limited to Ceylon and southern India.

Species of those generalized forms which are termed Coronedlidz and Colubridw are likewise numerous (sixty-six species), and referable to seventeen genera, of which ten are limited to this region. In the north-western and northern parts the genus Zamenis, which is one of the most characteristic types of the warmer parts of the Europo-Asiatic fauna, is represented by six species.

Freshwater Snakes are abundant in genera, species, and indivi- duals. Of 7'ropidonotus alone some forty very distinct species have been described, besides three others which arc sufficiently differen- tiated to deserve generic separation. Of the so-called Homalopside all the genera, twelve in number, are peculiar, and the great development of these Snakes is, therefore, one of the most striking features of this region.

Besides two species of Psammophis allied to African forms, a dis- tinct genus Psammodynastcs has a wide range over the eastern parts of the continent and the archipelago.

Tree Snakes are represented by eight genera and twenty-six species, mostly characteristic forms.

3 Its existence in Australia is extremely doubtful.

4 The statement that specimens of Trionyx had been obtained by Ida Pfeiffer in Amboyna rests upon a misunderstanding, like that of the discovery of a Barbel by the same traveller in the same island. Dr Jentink also informs us that none of the Freshwater Turtles in the Leyden Museuni came from islands east of Java and Borneo.

Reptiles of Japan.

African region.

Che- lonians,

Croeo- dilians,

Lacer- tilians,

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Dipsadide are more numerous (eighteen species) than in the other equatorial regions.

Elachistodon and Hologerrhwm may be mentioned as remarkable types not found elsewhere, but with a very local distribution. _

The development of Lycodonts India has in common with Africa ; but the genera, six in number, are distinct.

Also the presence of gigantic Snakes of the genus Python is a feature which India shares with Africa.

Of Erycide three species are Indian, Gongylophis and Cursoria being peculiar to the region. ; ;

Poisonous Snakes are numerous, the proportion to innocuous Snakes being as 1:10, Out of forty-six species, only two belong to the family of true Vipers, and they are restricted to the Indian peninsula with Ceylon, one (Zchis) being even specifically identical with the African species, and the other (Daboiw) having its ouly congener in the Mediterranean district. The remainder of the poisonous Snakes belong to the Hlapide and Crotalide or Pit Vipers. The former are represented by six genera, of which no less than five are highly characteristic of the region, whilst the Cobras (Naja) are equally distributed over Africa. Of Pit Vipers five genera have been distinguished, the most characteristic being an arboreal form, Trimeresurus, with seventeen species. Also the other five genera are peculiar to India, with the exception of the genus Halys which is Central-Asiatic.

The relations of the Indian region to the others will be considered as we proceed with the accounts of those faunas. Japan, with regard to its Reptilian fauna as a whole, must be referred to this regiou. This is clearly shown by the presence of species of Ophites, Callophis, Trimeresurus, Tachydromus,—characteristically Indian forms, with which species of Clemmys, Trionyx, Gecko, Halys, and some Colubrines closely allied to Chinese or Oentral-Asiatic species are associated. The few Reptiles inhabiting the northern part of Japan are probably Palearctic species.

2. The African Region.—Owing to its strictly continental character and diminished variety of physical features, this region is inhabited by a much smaller number of Reptiles than one might be led to expect from the large extent of its geographical area. There are but few small outlying islands, furnishing a small number of interesting additions to this fauna. Madagascar, indeed, would supply a con- siderable contingent of distinct forms, but it is questionable whether this large island should be united with the African region, as we shall see hereafter.

The African region is characterized by the development of three of the four principal divisions of terrestrial Chelonians, viz., Zestudinide, Chelydide, and Trionycide ; the Hmydidex are absent, being represented by one species only, in the north-western corner of the region (mys

platyceps). The thirty-seven species are distributed thus :— pela iiisnie sausages age eAaION OTe Ee ORE with 16 species CLUS UNG) anerneeanna careanennemnnocssanancnbocd , i ages EAVERAISS Breccia tnetaraa ne snes oe a4 lea a (CUTTS Tae esc vs ccicsies'vna essed ce dane ee meee ne EO) Mes BE yon sis eh basis gl ov caves cesnshae eee Pe ee 1 AE Ne PLES cart iis eannnt-cnessd Oe oes 5° lee SECPNOPMOT US) .,..sc0ceescssesnneasstenssaneere .5. See) Be MOCO cnicvciesaresccesavcintine nee neee a es Bg ABN ce asc secs on oawaa ee oyeec neem sy. ME os 6 MOVE OND yan «stid.en's a viecee sa dvieeoetannnee rae eeig

The majority of the genera are peculiar, viz., Chersine, Pyais, Cinyxis, Dumerilia, Sternotherus, Pelomedusa, and Oycloderma ; and no other region shows a similar development of Land Tortoises, This last type has not only diverged into four genera, but is also represented by several of

those gigantic forms which survived into geologically recent times. In the African region they inhabited only the neighbouring oceanic islands, viz., the Aldabra group, Mauritius, and Rodriguez; out of the eight species, which have been recognized chiefly from their osseous remains, one only sur- vives at the present day. Also in Madagascar fossil remains of gigantic species, which must have been contemporaries of Zipyornis, have been discovered by Grandidier ; but on the continent no trace of these large creatures has been found hitherto. The Chelonians of the eastern and western halves of the continent do not essenti- ally differ from each other, but Trionyx does notextend southwards

beyond the tropic.

Of Crocodilidx, Crocodilus is represented by three or four species. Alligators are absent.

Of the families of Lizards inhabiting Africa the majority occur in the southern portion. Agamide are numerous,

and represented chiefly by terrestrial forms. The Gecko- nidx, Scincide, Lacertidx, and Varanide are likewise well represented ; Hublepharide by a single genus and species in West Africa. The presence of several genera of Amphisbenide, some of which are even identical with South-American, is highly suggestive. G'errhosauride, Zonuride, and Anelytropide are peculiar to tropical Africa ; but the most important feature of this Lacertilian fauna is the almost universal distribution of Chameleons in numerous and highly specialized species.

Leaving aside, for the present, the island of Madagascar, Ophi- we estimate that the number of species of African Snakes dians.

does not exceed two hundred, which are referable to about seventy genera, of which no less than fifty do not range beyond the limits of the region. On the whole the east coast genera are different from those of the

west coast, but in the southern parts no such differentiation can be shown. Very little is known as regards the range of the species and genera towards the central districts. As regards higher groups only two families, the Dasypeltide and Dinophidz, are peculiar to Africa; and, although they have a wide range over the region, they consist of very few species only. Other families show a greater variety of genera and spécies here than in any other part of the globe. The almost entire absence of the genus Z'rogi- donotus and the scanty representation of Colubers are very noticeable features. Poisonous Snakes are numerous, all the various families being well represented, with the exception of the Pit Vipers; singularly enough innocuous Colubrine Snakes with facial pits occur (Dothrophthalmus, Bothrolycus).

Of Typhlopide nearly forty species have been described, and, besides, the Stenostomatide are represented by seven species.

Hight out of ten Calamaroid genera are peculiar to this fauna, and remarkable is the frequency with which among them tle sub-caudal shields coalesce into a single series.

The Caronellide are represented by some twenty species, but no true Coluber occurs, the four species which approach this type most closely belonging to distinct genera (Scaphiophis, Xenwrophis, Herpctathiops).

Almost entire absence of Tropidonotus isa characteristic feature of this fauna. Also of other Freshwater Snakes only six genera with seven species are known.

The small family of Psammophidx is well represented by three genera and nine species, of whicli six belong to Psammophis.

Of Tree-Snakes there are six genera, of which Ahetulla (Philo- thamnus) is most generally distributed, in twelve species,

Of Dipsadideg there are five genera and ten species, four of which belong to Dipsas proper. :

The Lycodonts are as well developed as in India, by seven genera and fourtcen species ; all the genera are peculiar to Africa, and some of them are modified for an arboreal mode of life.

Of Pythons three species are distinguishable ; but, besides, a mem- ber of the Booid family (Pelophilus fordit) occurs on the west coast.

Two species of Lryx occur.

Poisonous Snakes are extremely numerous, the proportion to innocuous Snakes being as 1:5. Of Hlapidx four genera occur, among which Naja figures with at least two species; besides this . family the Dinophidx are a remarkable and characteristic type, having assumed entirely the appearance and mode of life of Tree Snakes. The

The Reptilian fauna of Madagascar is a most remarkable mixture Mada- of types belonging to different regions, which cannot be accounted gasear for in the present state of our knowledge of the geological changes Reptiles.

that have taken place whilst the present fauna was already in existence.

The Chelonians? offer a marked point of distinction from those of

1 The Chelonians of Madagascar require a thorough eritieal examina- tion ; some of the species whieh are reeorded as having been brought from that island have been evidently introduced from the Afriean continent. Others, as also certain species of Snakes, are certainly not natives of Madagascar.

Rela- tions of

Africa to

India.

Tropical Pacific region, Clie- lonians.

DISTRIBUTION. | ‘i EP T

Africa: no Trionyx occurs in Madagascar. On the other hand species are found of Z'estudo, Chersine, Sternothcrus, and Pelomedusa, whieh are spread also over a greater or lesser area of the eontinent. Two Chelonians, Pyxis and Dumerilia, are peeuliar to Madagasear, the latter nearly allied to the South-Ameriean Peltocephalus. The Madagasear Croeodile is elosely allied to the eommon African speeies ; and its presenee in the island ean be easily aecounted for.

Among the Lizards we find a distinetly South-American element in two Iguanoid genera, Hoplurws and Chalarodon, replaeing the Old World Agamidx. The absenee of Varanide, Lacertide, and Amphisbenide removes Madagasear from Africa, whilst the extra- ordinary development of Chamezlconidx (more than twenty species) and the presenee of Gerrhosauride and Zonuride are important features eonlmon to both. Avery small family (Uroplatide) is peeuliar to Madagascar. No special relation to the Indian region is shown by this Laeertilian fauna.

With regard to Ophidians, Madagascar has hardly anything in eommon with Africa. The Afriean fauna is characterized by the great development of Lycodonts,—they are absent in Madagascar ; and of the four families of African poisonous Snakes Madagasear does not possess a single one. When we analyse the affinities of the twenty-seven species known at present from Madagascar, we arrive at the following eonclusions :—

1. Snakes without distinet relations to any particular region :— Typhlops (six speeies), Ablabes (one species), Ithycyphus (one species), Dipsadoboa (one species).

2. Snakes with affinities to the African fauna :—J/imophis (one species), Pelophilus (one species).

3. Snakes with affinities to the Indian fanna:—Ptyas (one speeies), Langaha (one species).

4, Snakes with affinities to the South-Ameriean fauna :—Liophis (one species), Zachymenis (one species), Pseudoxyrhopus (two speeies), Heterodon (two species), Dromicus (one speeies), Herpeto- dryas (one

species), Philodryas (one species), Dipsas (two species), Xiphosoma (one species).

Africa shows affinities to all the three other equatorial regions, but chiefly to the Indian. No sharply defined boundary exists between the two regions, the intervening parts of Asia being inhabited by a desert fauna which penetrates into districts of similar nature in Africa as well as in India. Certain genera and species belonging to this desert fauna are therefore common to both regions. But there are, besides, other points of affinity of deeper signifi- cance, such as the development in both of a distinct Trionycoid genus, besides the typical Trionyzx, the general distribution of Agamoids and Varanidz,! the presence of the remarkable family of Lycodonts, which do not occur anywhere else, of the large forms of Python with con- comitant absence of Booids, and of the Zlapide, of which one genus (aja) extends from the west coast of Africa to Borneo. But these resemblances are fully counterbalanced by great differences in other portions of the Reptilian fauna: the Indian Emydoids are replaced by Chelydidx in Africa, a type which it has in common with Australia and South America, whereas India possesses no Amphisbenide, no Chameleons. With regard to Ophidians, the number of forms generally is greatly diminished in Africa, but the proportion of poisonous Snakes is doubled. The Pit Vipers of India are wholly absent, and are replaced by true Vipers. In the Indian region arboreal Agamoid Lizards prevail; in Africa the Snakes show a greater tendency towards a modification of the habitus and structure for arboreal life. The Freshwater Snakes and Colubers which are so numerous in India are much reduced in numbers in Africa, Tropidonoti being almost entirely absent. ;*

3. The Tropical Pacific Region.—So far as Reptiles are concerned, Tasmania has to be included in this region. No Trionyx or E'mys goes eastwards beyond Wallace's line. In fact, the Chelonian type disappears in the islands between this line and the Australian continent— with two exceptions. A species of Zestudo (J. forstenii) occurs in, and is limited to, the island of Gilolo; and

1 Both these Lacertilian families extend into the Australian region ; in fact they replace the Iguanoids of the western hemisphere and

Madagascar.

2 With the single exception mentioned above.

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Cuora ambownensis, the most common Tortoise of Malaya, occurs in many of the eastern islands, but it has probably been imported by man, and by the same means may be still extending its range. On the continent of Australia Chelydide only occur, viz., eight species of Chelemys and five of Chelodina. In Tasmania, again, Chelonians are absent.

Besides the common Indian Crocodilus porosus, which Croco- may be considered an immigrant into this region, one or dilians. two other species of the same genus inhabit the fresh waters of the truly tropical parts, and are peculiar to Australia,

- The bulk of the Lacertilian fauna is composed of Skinks, Lacer- Geckos, Agamoids, and Varanidx, with the addition of a tilians. small family which is peculiar to the region, the Pygo- podide. A peculiar type, Dibamus, has been found in New Guinea; and, finally, a single Iguanoid, Brachylophus, is common in the Fiji Islands; how it came there, or how it survived its severance from the American stock, is a mystery. The Skinks are in this region more highly developed and more specialized than in any other part of the world; they exceed in numbers the Geckos, which generally accompany the Skinks in their range over the smaller islands of the Pacific; in these islands members of these two families represent the whole of the Lacer- tilian fauna. The Australian Agamoids are chiefly peculiar and partly much differentiated forms, but some have distinct affinities to, or are even identical with, Indian genera. The Varanidz are also closely allied to Indian species,

The total number of Snakes amount to ninety species, Ophi- of which twelve are Zyphlops, eight other innocuous dians. Colubrines, fifty Zlapidex, one Erycine, fourteen Pythonide, and five Boidez. The number of poisonous Snakes, there- fore, exceeds that of innocuous, a proportion quite un- paralleled in any other part of the world. The few innocuous Colubrine Snakes belong to Indian genera, and evidently have spread from that region; but all the genera of Hlapide (twelve), Erycide (one), Pythonide (five), and Bovde (three) are peculiar to this region.

In Australia we meet, therefore, with the interesting

fact' that, whilst it is closely allied to South America, but totally distinct from India, by its Chelonians, its Lizards and Colubrine Snakes connect it with this latter region. With regard to the other Ophidians, they, although peculiar genera, have their nearest allies partly in India partly in South America; and the character of the Australian Snake fauna consists chiefly in its peculiar composition, differing thereby more from the other

equatorial regions than these do among themselves. Wallace's line marks the boundary between India and Australia only as far as Chelonians are concerned, but it is quite effaced by the distribution of Lizards and Snakes. Thus in New Guinea Lizards of the Indian region are mixed with Pygopodide, and an island as far east as Timorlaut is inhabited by six Snakes, three of which are peculiarly Indian, whilst the other three are as decidedly Australian. The islands north of New Guinea and of Melanesia are not yet occupied by the Ophidian type, and only species of Hnygrus have penetrated eastwards as far as the Low Archipelago, whilst the Fiji Islands and the larger islands of Melanesia have sufficiently long been raised above the level of the sea to develop quite peculiar genera of Snakes. Tasmania is tenanted by poisonous Snakes only.

4, The Tropical American Region.—An examination of Tropical the distribution of Chelonians in the New World leads to American a different division of its regions from that of the other (°.°™ Reptiles. Central America and the West Indies, with ope regard to Chelonians, cannot be united with the Southern

Croco- dilians.

Lacer- tilians,

Ophi- dians.

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continent. The Chelonians of South America proper are the following (forty-three species) :—

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MO WOCOTMGNIG 65. ses scce.rieaenenssac casa bans el oe al ROU OCIETINISMM ey ovens sy cicasi oaeseuessaonnaies sco! aes

NE PlEGeMMy Spence cette = cc che cchistevcaeaerss ace ss Ge 29 nV CGIMGMUISAM . sce cacwcieereerace.aeer ey oosoes ae 1D! 55

(Glaallel, ae stee. a cntengw po cheertene mer csnortnne ie Re.

The Chelydide thus predominate to the exclusion of the Eimydidex. They belong to five distinct genera, of which one, Chelys, is the most specialized of the family. They do not extend to the western side of the Andes, and cease in the south with the system of the Plate River. Northwards they penetrate to Trinidad, but become scarcer in the degree in which their place is occupied by the Lmydidew, which have spread from Central America over the northern parts of this region. One, Emys d'orbignit, following the course of the Uruguay, has penetrated southwards to the mouth of the Plate River.

Land Tortoises (Zestudo) are at the present day almost extinct in this region, two species only (Zestudo tabulata or carbonaria and 7. argentina) being found on the continent of South America. The six other species belong to the Occanic Island Tortoises of gigantic size, and inhabit or inhabited the Galapagos group.

Trionyx is entirely absent.

The Crocodilian order is more developed in this region than in any other. Besides at least three species of Crocodilus, six Alligators occur. The former occupy Central America, with Mexico, the coast of Florida, the West Indies, Ecuador, and the system of the Orinoco ; the latter extend much farther southwards, throughout the system of the Plate River, whilst in North America this genus is represented by a distinct species, A. méssis- sippensis.! Alligators found in some of the West Indian islands are believed to be immigrants from the continent.

The Lacertilian fauna connects Central with South America,—all the six families found in the latter area, viz., Geckonide, Anguide, Amphisbenide, Tefidx, Igua- mdx, and Scincidx, being represented in Central America. But Central America possesses, besides, five other families, small in species and restricted in range (some belonging to the fauna of great elevations), but highly interesting types. These are the Hublepharidx,

Xenosauridx, Aniel- lide, Helodermatidx, and Lepidophymatidx. Their locali- zation and differentiation can be accounted for on the hypothesis that they are the remains of the fauna of the various islands into which Central America was broken up at a former period.

By far the larger number of Lizards of the Tropical American region are Jguanidzx, a family which in the New World repeats the Old-World Agamidz. They are spread over the whole of the region, having adapted themselves in their mode of life and structure to every variety of ground. One species (Liolaemus magellanicus) ranges to the Straits of Magellan. The largest Iguanoids inhabit the Galapagos Islands, where they live on the rocks of the shore, one species (Oreocephalus cristatus) entering sea-water and feeding on sea-weeds. The next numerous family is the Tejide, the New-World representatives of the Old-World Lacertide ; Geckonidx, Scincidx, Amphisbenidx, and Anguidx are less numerous, but have also a wide range over the region. The Lacertilian fauna of the West Indies is wholly South-American ; it does not comprise any peculiar family, and only a few character- istic genera, of which Anolis is, perhaps, the most highly specialized and the one which is composed of the greatest number of species ; this genus, however, is also well represented on the continent, especially in Central America.

With regard to Ophidians the Tropical American region approaches the Indian in the number of species, which amounts to about four hundred, but it exhibits a com- paratively less variety of generic and peculiar forms 5 Ol the eighty genera only about fifty do not range beyond its limits. However, a boundary line which would separate the Ophidian fauna of South America from that of the north does not exist. In Central America and

1 We may mention here, in anticipation, that a species of Alligator has recently been discovered in China.

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Mexico the generic types of the south and north are intermingled, and as the climate, in accordance with latitude and altitude, assumes a more temperate character the specifically tropical Snakes disappear and are in part replaced by those of North America. This mixture of the two faunz and the great variety of physical conditions within a small area account for the relatively very large number of Snakes of Central America. About one hundred and fifty out of the four hundred species attri- buted to the whole region belong to this district. The West- Indian Ophidians belong to the Tropical American fauna ; many continental generic forms of the latter occur in the islands, and such genera as are peculiar to the West Indies do not exhibit a common feature, or are founded on slight characters. The exact limits to which Snakes extend southwards are not known ; they seem to be very scarce on the southern confines of the Argentine Republic. Quite recently a Crotaline Snake, Rhinocerophis, has been discovered in eastern Patagonia.?

Of families peculiar to or highly characteristic of this fauna we can mention one only, viz. the small family Scytalidx, which replaces the Lycodonts of the Old World. The Boidx are likewise a prominent feature, although not exclusively confined to South America; of eleven genera eight are Tropical American, and three Australian. The true Boas include the most gigantic of Snakes, and replace the Old-World Pythons.

In this fauna a peculiar and highly ornamental pattern of coloration, which consists of more or less regularly alternate rings of black, red, and yellow, seems to be the more worthy of notice, as it occurs in very distinct families, viz. the Calamariidex, Coronellide, Natricidx, Leptognath- idx, Scytalide, Tortricide, Elapide.

Of Typhlopide more than twenty species have been described, and, besides, the Stcnostomatidex are represented by seven species.

Of Tortricidx one species occurs.

The Calamariid# ave represented by thirteen genera, of which ten are peculiar. The most characteristic and geographically important are Elapomorphus with ten, Hamalocraniwm with sixteen, Minia with four

species. The Indian genus Geophis is represented in Tropical America by twenty-five species.

Coronellide are extremely numerous (sixty-six species referable to thirteen genera). Of these Xenodon with twelve species, Lio- phis with sixteen, Hrythrolamprus, and Pliocercus deserve special mention.

Of Colubers forms with elongate compressed body, approaching arboreal forms (Spilotcs), are not scarce.

Freshwater Snakes are not abundant, but a genus peculiar to the region, Helicops, occurs in eight species. ropidonotus might be regarded ag absent, but for three or four species which occur north of the Isthmus of Panama and in the West Indies ; also the allied genus Tretanorhinus is confined to Central America and the West Indies.

Tree Snakes are extreinely abundant—some seventy species refer- able to six genera, of which Dromicus, Philodryas, and Herpetodryas are very characteristic forms. Of Ahextulla some seventeen species are known.

Of Dipsas and allied genera only four species occur, but of the peculiarly South-American Leptognathide# some twenty-five specics have been distinguished.

In Central America there occur two extremely singular forms which, however, are imperfectly known and seem to be restricted to a very lmited area. One, Loxocemus, is considered a represcnta- tive of the family Pythonidx, and the other, Notopsis, is stated to be the type of a distinct family allied to the Indian Xcnodermidz.

Of the twenty species of Boidw the West Indian contingent amounts to no less than eight or nine, a fact which clearly demonstrates the pertinence of the West Indies to this region.

Erycide are absent.

Poisonous Snakes are numcrous, the proportion to innocnons Snakes being as 1: 8. Besides the singular occurrence in Venezuela ofa member

of the Atractaspididx, Dinodipsas, the Colubriform poisonous Snakes are represented by one genus only, Elaps, which, however, shows numerous varieties or species, and is extremely common and widely spread over the region. Viperidex are absent; but the largest forms of Pit Vipers (Crotalide) are developed in this

- *There is reason to believe that Ewophrys, which has been plaeed among the Psammophidz, is likewise a Patagonian form.*

Relations of South America to other regiuns,

North- Ameri- can

region.

Che- lonians.

DISTRIBUTION. |

region, and represented by five genera, which, if not peculiar to Tropical America, are at least confined to the New World, like Cenchris and Crotalus.

The Reptilian fauna of tropical America thus shows relations to the other equatorial regions in three of its constituent parts only, viz., in the Chelydidx, Amphis- benide, and Crotalide. It has the former type in common with Africa and Australia; but, whilst the presence of Z'rionyx on the African continent forms an important distinctive feature, the resemblance of South America to Madagascar is as great as, or even greater than, that to Australia, which lacks J'estudo.

On the other hand the Lacertilian fauna is essentially distinct from that of the Old World, with the exception of Amphisbenide (and of species of Hublepharide), whose presence in South America and Africa is a most remark- able fact, and very strong evidence of the former existence of intervening land. The Skinks and Geckos, which are generally distributed over the warmer parts of the globe, cannot come into consideration.

The Snakes of Tropical America differ also much more from those of the Old-World regions than certain other portions of its fauna, as, for instance, its Batrachians and Freshwater Fishes. A distinct affinity with India is expressed only by the development of the family of Pit Vipers,—the presence in both regions of numerous Tree Snakes, of species of the genus Geophis, of the family Tortricide, &c., being less significant points of resemblance. But these resemblances are more than counterbalanced by the absence in South America of Lycodonts, Z'ropidonoti, Pythomdx, Erycidx. The African Ophidian fauna! is still further removed by Crrotalide being entirely wanting and replaced by Vipertdx ; only a few genera, like Steno- stoma, Coronella, Leptodira, Dipsas, Ahzxtulla, are examples in which species are found in both regions. In both Troyrdonotus is almost absent. ;

As all the innocuous Colubrine Snakes of Australia are derived from the Indian region, they form no part ina comparison between the Australian and South-American faune. Of the other Ophidian types these regions have not a single genus in common, nor a family which would not be represented also either in Africa or India or both.

5. The North-American Region.—While the Chelonians of the North-American or Nearctic region (in which, so far as this Reptilian order is concerned, Central America and the West Indies have to be included) are essentially different from those of South America, the Lizards and Snakes of both belong to the same family types, and pass in an unbroken series from the northern to the southern parts of the New World.

In this region the Hmydidz have attained to as great a development as in the Indian, and are associated with a few representatives of Z'estudo and T'rionyx. The species, which are altogether about fifty in number, and of which a few are common to the Central-American and North-

American sections, are distributed as follows :—

Central America,

including Mexico, N+ America.?

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1 Of the relations existing between the Snakes of South America and Madagascar we have spoken above, p. 469. 2 Ina Check-list published by the U.S. National Museum in 1883

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It may be seen from this list that no Chelydoid passes northward beyond the Isthmus of Panama ; the Chelonians of Central Aierica belong exclusively to the Emydidzx, which arc represented by some thirty species ; the majority do not extend cither into South or North America; two of the genera, Dermatemys and Staurotypus are peculiar to it, and Cinosternwm has its headquarters in this section. Neither Trionyx nor Testudo ocenrs. Procecding beyond the Mexican boundary, we find still the Lmydidx predominating, a few of the species of Central America ranging northwards into the United States ; distinct species of Clemmys,? Cinosternum, Chelydra, &c., appear, with the wonderful genus Macroclemmys. An instance of the isolated occurrence of a Testudo (7. polyphemus) is met with here ; and from the lower part of the Mississippi northward one of the most charactcristic features of the North-Amcrican fauna makes its appearance, viz., two species of Z'rionyx, of which one at least follows the ramifications of that river northward and has found its way into Lake Winnipeg (51°N. Iat.). West of the Rocky Mountains Tortoises are scarce and of distinct species.

In the West Indies the following species have been found :— 1, Testudo tabulata ; 2, Podocnemis dumeriliana; 8, Emys concinna ; 4, H. decussata; 5, H. rugosa. Of these the first two are identical with South-American, and the third with a North-American specics, and, therefore, may be regarded as strangers which in compara- tively recent times have been introduced into the West Indies. On the other hand the last two are species peculiar to the islands, and, as they belong to a North-American generic type, clearly prove the pertinence of this island district to the northern continent, so far as Tortoises are concerned.

The south-eastern parts of North America are inhabited by an Alligator which is specifically distinct and locally separated from the southern species.

The tropical Lacertilian and Ophidian faunz gradually merge into that of the temperate north, and any boundary line drawn between the north and south is more or less arbitrary. As a matter of fact so many truly tropical forms advance north of the tropic of Cancer (which by many authors is taken as the boundary line) that we are inclined to restrict the limits of this region to the district about the Rio Grande, whilst, on the other hand, the northern fauna extends to a lower latitude on the plateau of Mexico. Thus restricted, the North-American fauna includes about fifty species of Lizards, belonging to genera which with very few exceptions are already represented in Central America, or éven farther southwards. By far the greatest number are Jguanidex; the Scincide, Anguide, and Tejule are represented by several, the Geckonidle by fewer species, whilst single species occur of the Amphisbanide, Aniellide, Lepidophymide, and LHeloder- matidx,—all Central-American types. In fact, North America does not possess one family of Lizards peculiar to it.

It is worthy of notice that Lizards do not extend so far north- wards in the western as in the eastern hemisphere; one spccics (Gerrhonotus cweruleus) ranges into British Columbia, another into Minnesota (Humeces septentrionalis), and a third into Massachusetts (Humeces fasciatus).

Of Snakes about one hundred# species could be enumerated, with a proportion of 1:14 of poisonous to innocuous Snakes. All the families

represented in this fauna occur also in tropical America, and there is a great agreement of the genera with those of the Cen- tral-American district, so that less than one-half can be considered as peculiar to this region, viz., Conocephalus, Carphophis, Contia, Cemophora, Hypsiglena, Chersodromus, Rhinochilus, Pituophis, Ischnognathus, Charina, Wenona, Lichanura. Calamariide and

a much larger number of " North-American" terrestrial Chelonians is given, viz., forty-three. This is partly due to the southern boundary of " North America" being extended to the tropic of Cancer, partly to the fact that species are admitted in a diffcrent sense from those of the herpetologists of the Old World. By adopting these species a very erroneous impression would be created as regards the comparative numbers of the groups in the several regions. That check-list includes three species of Testudo, three of Cistudo, twenty-one of imys and its subgenera, five of Cinosternum, two of Aromochelys, one each of Macroclemmys and Chelydra, and six of Trionyz.

3 Emys blandingii may be erased from the list of species ; we have recently examined a specimen ; it is identical with mys lutaria, and has evidently been introduced from Europe.

4 One hundred and eighty, according to some authors, who include a great part of Mexico, and adopt every variation to which a binomial term has been applied.

Croco- dilians.

Lacer-

tilians

and Ophi-

ans,

Europo- Asiatic region,

Che- lonians,

Croco- dilians,

Lacer- tilians.

Ophi- dians.

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Coroncllide are numerous; so are Colubers, of which Piiwophis is the most characteristic. Freshwater Snakes abound, especially of the genus Zropidonotus. Of Tortricide three genera have been distinguished. No true Vipers occur, but Pit Vipers are represented by three genera, of which two are Rattlesnakes.

After what has been stated already, the affinities of this to other regions can be summed up in a few words. The Reptilian fauna of North and South America forms, with the exception of the Chelonians, a homogeneous whole by which the Neogean division proposed by Sclater for Passerine Birds is well characterized. On the other hand, the Chelonian fauna of North America is entirely distinct from that of South America, and most closely allied to that of India.

6. The Europo-Asiatic Region.—Whilst the north of the western hemisphere has at least one order of Reptiles, the Chelonians, by which it is distinguished from the south, the temperate region of the eastern hemisphere possesses no important distinguishing type of Reptile. Its Reptilian fauna is merely an offshoot of those of the two adjoining tropical regions; and, if we were to add the genera most characteristic of the Palearctic fauna to either Africa or India, the character of neither would be modified or changed. Thus, so far as Reptiles are concerned, a Pala- arctic region does not deserve to rank with the other primary regions.

The Chelonians are represented by nine species only, viz. :—

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—types which are only specifically distinct from those of the two southern tropical regions. The Land Tortoises are confined to the warmer districts of the western portion, penetrating into the centre of the Siberian sub-region, and entirely absent in the northern and eastern parts; of Hmys one species (#. lutaria) is still found in north-castern Germany as far north as 54° N. lat.!; and probably some other species will be found in similar latitudes in the little explored Amur country, where also a species of Trionyx (7. maacktt) occurs. The second species of this latter genus which is referable to this region inhabits the Euphrates and Tigris.

The recent discovery of an Alligator in central China is a highly interesting fact, but not surprising, when we remember the occur- rence in China of not a few North-American types of Batrachians and Freshwater Fishes. The common African Crocodile still lingers in the Mediterranean district,—its presence in Syria having been placed beyond doubt, and its occurrence in Sicily having been asscrted on very good authority.

The Lacertilians include the only family type which this region has not derived from either Africa or India, viz., the Anguidw. Two genera of this family, Anguis and Psewdopus,? are widely spread in Europe, and closely allied, the former to the South-American Ophiodcs, and the latter to the North-American Ophiosaurus. Lacertide are abundant as in Africa, and Amphisbenide and Chameleontide represented at least in the Mediterranean district. Towards the central parts of Asia the terrestrial Agamide are con- tinued from north-western Africa, partly with but slight modifica- tions, Phrynocephatus being a specifically Central-Asiatic genus. In the Manchurian sub-region these African types are replaced by some Indian forms, such as Geeko and Tachydromus. The northern range of Lizards in this region extends as far as Lapland (Lacerta vivipara and Anguts fragilis).

The most characteristic Ophidian genus of the region is Zamenis, a Colubrine form which is very widely spread, and includes more species (eleven) than any other Palearctic genus. This genus extends over Arabia, and even into the island of Socotra, without being associated there so far as is known at present with Snakes of an either peculiarly African or Indian type. The total nuinber of Palearctic Snakes amounts to sixty, of which twelve are poisonous Snakes, viz., nine Viperines and three Halys. The majority inhabit the Mediterranean district and western Asia.

Four Typhlops and a single Stenostoma have been found in the Mediterranean district and Persia.

Of the small number of Calamariid# and Coronellide, Lhyncho- en aces See ee ok a a

1 Emys lutaria is one of the Tortoises the range of which has become much restricted in post-Glacial times, its remains having been found in peat beds in Norfolk, Belgium, Denmark, and Sweden, where it is now completely extinct.

2 The isolated occurrence of a species of Pseudopus in Khassia has been mentioned above.

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calamus, Psilosoma, Lytorhynchus, and Ditypophis (Socotra) are genera not found beyond this region.

Colubride are comparatively numerous, and show less affinity to African than Indian forms. Besides Zamenis, Coluber and Elaphis occur in four species each, and Rhinechis and Acontiophis (Afghanistan) are peculiar genera.

Three or four species of Z'ropidonotus represent the groups of Freshwater Snakes.

The Psammophide are well developed; besides two species of Psammophis, Taphrometopon and Celopeltis are peculiar genera, but not extending into eastern Asia.

There is one species of Lryax.

One species of Naja reaches the Caspian.

The three species of Halys are Central-Asiatic.?

Of the nine species of Viperines six belong to Vipera and Cevastes. Daboia and Echis may be considered to have their head- quarters in this region, but they extend into southern India, and Echis has spread east and west along the barren plains or deserts of North Africa and north-western India.

7. New Zealand.—The southernmost parts of South New America, Africa, and Australia are not inhabited by a Zealand.

sufficiently differentiated fauna to be separated from the tropical regions of which they are the continuation. None of the small oceanic islands south of 40° or Tierra del Fuego possess any Reptiles. On the other hand New Zealand is by the possession of //atteria, the sole living remnant of the extinct order Rhynchocephalia (not to mention other scarcely less important parts of its fauna), so much distinguished from the other regions that it can- not be associated with any of them. Although the climate and other physical conditions seem to be well adapted for the existence of the Chelonian and Ophidian types, neither is represented ; and of Lizards only representatives of the ubiquitous Skinks and Geckos have reached its shores ; but some of the latter must have inhabited New Zealand for a long period, as they belong to a distinct genus, Naultinus, which is peculiar to this group of islands.

At the conclusion of this section it will be useful first Résumé to recapitulate the principal features of the Reptilian of Rep-

faunze for each of the primary regions into which the land of the globe has been divided by zoologists, and which nearly coincide with the

geographical divisions, and secondly to arrange the regions according to the natural relations as expressed by this class of animals. A division into zones comprising the corresponding parts of both hemispheres cannot be maintained for Reptiles, since the greater portion of the faunze of the temperate are merely the offshoots of tropical faunz, no peculiar types of a higher than generic rank being developed in them.

1. The INDIAN ReG@Ion is characterized by Trionycide and Emydidx, but few Testudinide. Crocodilidx, with Gavials. Lacer- tilians and Ophidians very numerous. Agamide chiefly arboreal (Draco), and Varanidx. Pythonide and Lycodontide. Ground Snakes, Colubers, Tree Snakes, and Freshwater Snakes abundant in genera. T'ropidowotus, Poisonous Snakes in the proportion of species as 1:10, and comprising Crotalidx and Elapidex, but only two Viperidx.

2. The AFRICAN REGION (exclusive of Madagascar) is characterized by Land Tortoises, Trionycidex, and Chelydidw. Species of Crocodt- dus only. Lacertilians and Ophidians rather numerous. Agamide chiefly terrestrial; Lacertide and Varanidew are well represented. Amphisbenidx, Gerrhosauride, and Zonuride are peculiar to the region. Chamezlcontide. Pythonide and Lycodontide. True Colubers and T'ropidonotus almost absent. Psammophide. Poison- ous Snakes in the proportion of 1:5, comprising Viperide and numerous venomous Colubrines.

3. The Evropo-AsIATIc REGION is composed of a mixture of Indian and African generic and family types; and only a few peculiar genera have their centre of distribution in this part, such as Anguis, Pseudopus, Phrynocephalus, Vromastyx, Stenodactylus, Also- phylax, Ceramodactylus, Scincus, Zamenis, Celopeltis, Taphrometo- pon, Daboia, Echis, Halys. The majority inhabit the sub-tropical

'and warmer parts abutting upon the neighbouring tropical regions,

and are rapidly reduced in number in the more temperate portion. 4. The Tropica Pactric ReGIon possesses one of the terrestrial Chelonian types, Chelydidw, and species of Orocodilus only.

3 Viperine and Crotaline Snakes meet in the centre of the Siberian sub region (Peters, Afonatsder. Berl, Ak., 1877, p. 736).

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Besides Skinks and Geckos, terrestrial Agamide and Varanide are well represented ; Pygopodidx. Eryeide, Pythonidx, and Boidz are autochthonous, whilst a small number of innocuous Colubrines are iminigrants from the East Indies. The poisonous Snakes sur- pass in number the non-poisonous, and belong to the Elapide.

5. MADAGASCAR possesses Chelydidx and Testudinide without Trionyx, like South America.

6. The Troprcan AMERICAN REGION is characterized by the full developinent of Testudinidex and Chelydid# and absence of Trionyz ; Emydoids are immigrants from the north. Crocodiles and Alli- gators. Lacertilians numerous in familics and species, the majority being Iguanide# ; the Old-World Lacertidz replaced by Zejidz. Other families, Anguidx, Amphisbunide, Eublepharide, Heloder- pnatid#, &c., well represented. Snakes numerous: Botde and Seytalid# ; Ground Snakes, Colubers, and Tree Snakes abundant, less so Freshwater Snakes ; Z'vopidonotus almost abscnt. Poison- ous Snakes in the proportion of species as 1: 8, and comprising Crotalide and Elaps.

7. The NorrH-AMeERIcAN Recton differs from the Tropical in possessing the Hmydide# in their full development and Trionyz ; only one Testudo. One Alligator. As regards Lacertilians and Ophidians this region occupies the same relation to tropical South America as the Palearctic region does to Africa and India.

8. New ZeEALanpd is characterized by the possession of the Rhynchocephalian type, without any other Reptile with the

exception of certain Skinks and Geckos.

Arranging these primary divisions of the globe in ." accordance with the distribution of the several orders of Che Reptiles, we find that with regard

to CHELONIANS the lonians ; Tegions stand in the following relation to each other :—

I, Emydide fully developed. A. Trionycide fully developed. 1. Testudinide in small numbers or immigrants : a. Indian-Palwaretic regions, and 6. WNorth- American region (including Central America). II. Chelydide fully daveleelt A. Trionycide fully developed. 1. Testudinide fully developed: African region. B. Trionycide absent. 1. Testudinide fully developed: a. Tropical American region, and 6. Madagascar. 2. Testudinide absent: Tropical Pacific region. III. Chelonians entirely absent: New Zealand,

Relations

as to The types of Crocopmt1An and RHYNCHOCEPHALIAN a orders are too few in number and either very widely or ians ;

very locally distributed, so that no general division of the globe's surface can be based upon them alone.

The two large Lacertmtan families Gleckonide and Scincide are generally distributed over the warmer parts of the globe, and therefore not well adapted for the distinc-

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tion of the primary regions. Nevertheless, in a more detailed account many of the genera would have to come into consideration, being confined to more or less limited areas. Both families are represented in great variety in Australja, but scantily in South America. With regard to other families the regions can be arranged thus :—

I. Agamide and Varanide fully developed.

A. Chameleontide, Lacertide, and Amphisbenide: African region (including as sub-region the Western Palearctie portion, characterized by Anguide).

B. Amphisbenide and Chameleons (except one species) absent; Lacertide few: Indian region with Manchurian sub-region,

C. Pygopodide : Tropical Pacifie region.

II. Iguanide fully developed.

A. Chameleontide : Madagasear.

B. Tejide, Amphishenide, and Anguide : South-American and North-American regions.

ITI. Skinks and Geckos only : Mew Zealand.

Of the families of Opnrm1ans the Pythonide and as to Boidx, the Crotalidz and Viperidex, the Lycodontide and Ophi- Scytalidx replace each other in their distribution, and are, U"- therefore, best adapted for determining the relations of the zoological regions. Although the first two are so far as we know at present the geologically oldest types, and therefore might be employed in the first instance in the arrangement of the regions, their distribution is limited to the equatorial zone, and fails to show the close relations existing between the temperate and equatorial parts of the Old World on the one hand and those of the New on the other. The relations of Madagascar to Tropical America are in the following scheme less distinctly expressed than they are in nature.*

I, Viperide fully developed.

A. Pythonide and Lycodontide : African region.

B. Tropidonoti and true Colubers: western portion of the Europo-Asiatie region.

II. Crotalide fully developed. A. Pythonide and Lycodontide in the tropical parts ; Tropidonoti and true Colubers ; none of the Crotalines with rattles : Indian region (including Manchuria). RB. Tropidonoti and true Colubers; some of the Crotalines with rattles; intermediate between the Manchurian sub-region and tropical America: North-American region.

C. Boidw and Scytalide: Tropical-American region III. Colubrine venomous Snakes only.

A. Pythonide and Boide: Tropical Pacific region. IV. Venomous Snakes entirely absent.

A. Boidee : Madagascar.

V. Snakes entirely absent : New Zealand. (AC3Gs)

REQUENA, a town of Spain, in the province of Valencia, 41 miles to the west of that city on the road to Cuenca, occupies a strong position near the river Oleana in the rocky mountainous district called Las Cabrillas separating Valencia from Castile. It is commanded by a castle, and still has traces of the walls that anciently en- eircled it. The tower of the church of San Salvador is the only other feature of architectural interest. The principal industries are those connected with the culture of grain, fruit, wine, saffron, and silk. The population of the muni- eipality in 1877 was 13,527.

RESERVOIR. See WaTrERWwoRKS.

RESHAL, ae. RaBBeNU SHELoMoH Lorta (or Luria, vulgo Lurye), was one of the famous "Five! Sages" (Rabbis) of the 16th century. His father's name was

1 The other four were—(1) R. Mosheh Isserls of Cracow (the

celebrated " Rema') ; (2) R. Lewa b. Besaleel (the great Halakhist and

Cabbalist), chief rabbi of Prague; (8) R. Mordekhai Yaphe (the

author of the Lebushim), chief rabbi of Posen, &c. ; and (4), last but

| not least, R. Yoseph Caro, principal of the academy of Safed in } Palestine, and compiler of the normative Shulhan 'Arukh,

R. Yehiel of Ostroff (8. W. Russia), a descendant of Rasar? (q.v.). He is also known under the name of Rashal, or Maharshal (7.e., Morenu

Harab R. Shelomoh Loria). He himself was chief rabbi of Lublin, where he died in 1573. His works are of importance on account of the numerous, though only incidental, notices they contain in connexion with the history of Jewish literature, We name six of these works—one edition of each :-—

(1) Hokhmath Shelomoh, discussions on the Babylonian Talmud, Rashi, the Tosaphoth, &c. This work is now an integral part of the Talniud editions. (2) Yam shel Shelomoh:—(a) on Yomtob (or Besah), Lublin, 1636, and reprints ; (6)on Yebamoth, Altona, 1739 ; (c) on Kethuboth (first four perakim), Stettin, 1862 ; (d) on Kiddu- shin, Berlin, 1766 ; (¢) on Gittin, Berlin, 1761, and reprint ; (f) on Bobo Kammo, Prague, 1616, and reprint ; (g) on Hullin, Cracow, 1646, and reprints. All these arein folio. (8) Yerc'oth Shelomoh, supercommentary on Rashi on the Pentateuch, with special refer- ence to Mizrahi's supercommentary, Prague, 1608, 4to. (4)'Atereth Shelomoh, on the Iilieita et Licita of R. Yishak of Diiren, Bascl, 1599, and reprint, folio. (5) "Ammaude Shelomoh, on the Sepher Hammigvoth of R. Mosheh of Coucy, Basel, 1599, 4to. (6) Re- sponse, Lublin, 1574, 4to, and reprints in folio. (S. M. 8.-8.)

2 Yam shel Shelomoh, on Yebamoth, iv. 33.

RESHD. See Rasur.

RESINA, a town of Italy, 6 miles south-east of Naples and practically a southern continuation of Portici, is well known as the usual starting place for tourists on their way up Vesuvius, and as the nearest town to the buried city of Herculaneum. It had 13,626 inhabitants in 1881 (commune 15,593).

RESINS. A resin is a secretion formed in special resin canals or passages of plants, from many of which, such as, for example, coniferous trees, it exudes in soft tears hardening into solid masses in the air. Otherwise it

may be obtained by making incisions in the bark or wood of the secreting plant. Resin can also be extracted from almost all plants by treatment of the tissue with alcohol, and it is formed by the oxidation of essential oils, many authorities being of opinion that all true resins, which are in chemical composition oxidized hydrocarbons, result primarily from the action of oxygen on essential oils. Resinous substances are further produced by the dry distillation of numerous organic compounds and by the drying of fatty drying oils. Certain resins are obtained in a fossilized condition, amber being the most notable instance of this class, and African copal and the kaurie gum of New Zealand are also procured in a semi-fossil condi- tion. The resins which are obtained as natural exudations are in general compound bodies containing more than one simple resin and varying proportions of essential oil. These compounds when soft are known as oleo-resins, and when imperfectly fluid they are called balsams, Other resinous products are in their natural condition mixed with gum or mucilaginous substances and known as gum-resins. Vary- ing in constitution as these bodies do, they also differ widely in physical properties ; but the general conception of a resin is a noncrystalline body, insoluble in water, mostly soluble in alcohol, essential oils, ether, and hot fatty oils, combining with alkalies to form resin soap, soften- ing and melting under the influence of heat, not capable of sublimation, and burning with a bright but smoky flame. A typical resin is a transparent or translucent mass, with a vitreous fracture and a faintly yellow or brown colour, inodorous or having only a slight turpentine odour and taste. Many compound resins, however, from their admixture with essential oils, are possessed of distinct and characteristic odours. A series of gradations among resins may be traced from the hard glassy transparent copals through soft elemis and oleo-resins, semi-fluid balsams and fluid wood oils, to the most limpid essential oils. The hard transparent resins are principally used for varnishes

and cement, while the softer odoriferous oleo-resins and gum-resins containing essential oils are'more largely used for pharmaceutical purposes and incense. No systematic classification of resins has yet been attempted, and there is much uncertainty as to the botanical source of

some well-known commercial varieties, while the chemical con- stitution and relations of many still require elucidation. The following list embraces the principal resins of commerce, and particulars regarding the more important of these will be found under their respective headings. See also Rosin, Gum, and Basa.

I. Copailline or Varnish Resins :—African Copal or Gum Animé (see CopaL, vol. vi. p. 842); Mexican Copal, from Hymenea sp. ; Brazilian Copal, from Hymeneasp. and Trachylobinm Martianwm ; Piney Resin, or White Dammar, Vateria indica and V. acuminata ; Sal Damimar, Shorea robusta and other species; Dammar of Hopea robusta; Black Dammar, from Canarium strictwm; Mastic, Pistaeia Lentiseus (vol. xv. p. 621); Lac (vol. xiv. p. 181); East Indian Dammar (sce DAMMAR, vol. vi. p. 795); Kaurie or Coudie Resin, Dammara australis (see TURPENTINE) ; Sandarach, from Callitris quadrivalvis (see SANDARACH) ; Dragon's Blood (vol. vii. p. 389).

II. Soft or Oleo-Resins :—Manila Elemi, from Canariam com-. mune (see ELEMI, vol. vill. p. 122); Mexican Elemi, Amyris elemi- fera; Brazilian Elemi, Jcica Icicariba and other sp.; Tacamahac (American), Laphrinm tomentosum; Tacamahac (Kast Indian), Calophyllim Inophyllum; Wood Oil, Dipterocarpus turbinatus ; Chian Turpentine, Pistacia Terebinthus; Turpentine, Common Frankincense, and Thus from various Coniferx (see FRANKINCENSE, TURPENTINE, and Rosin) ; Balsam of Canada, Abies canadensis (see BALSAM).

Ill. #ragrant Oleo-Resins and Cum-Resins :—Myrrh, Balsamo- dendron Myrrha (vol. xvii. p. 121); Bdellium or Googul, Balsamo- dendron Roxburghit; Balsam of Gilead or Mecca Balsam, Balsamo- dendron Berryt; Olibanum or Frankincense, Boswellia Carteri, &c. (see FRANKINCENSE, vol. ix. p. 709); Benzoin, Styrax Benzoin and Balsamodendron Mukul (vol. tii. p. 581); Solid Styrax, Styrax officinalis (see StorAX); Liquid Storax, Ligqauidambar orientalis (see SToRAX); Balsam of Peru, Syrospermum perniferum (see BatsaM); Balsam of Tolu, Alyrospermum toluiferum; Labdanum or Ladanum, Cistns ereticus, var. labdaniferus.

IV. Fetid Gum Resins :—Ammoniacum, Dorema anmmoniacun (vol. i. p. 742); Asafoetida, Fernla Narthex and F. Scorodosma (vol. ii. p. 675) ; Galbanum, Fernla galbaniflua and F. rubricaulis (vol. x. p. 22); Opoponax, Opoponax Chironium ; Sagapenum, Ferula sp. ; Sarcocol.

V. Medicinal Resins :—Gamboge, Garcinia sp. (vol. x. p. 60) ; Guaiacum, Guatacwm officinale (vol. xi. p. 230); Euphorbium, Luphorbia resinifera ; Balsam of Copaiba, Copaifera officinalis (sce BALSAM).

VI. £xtract Resins forma class of products principally important from a medicinal point of view. They embrace Scammony from Convolvuins Scammonia, Jalap Resin from Jpomea Jalapa, Podo- phyllum Resin from Podophylium peltatum, Churrus from Indian Hemp (Cannabis sativa), Cubeb Resin from Cubeba officinalis; and many other medicinal products owe their virtues to resinous bodies present in them.

RESPIRATION

jl pe continued existence of an amoeba in a pool of water,

or of a white blood-cell in the liguor sanguinis, de- pends upon a continual interchange of substances between the organism and the surrounding medium. The substances in question pass from the medium into the organism in a certain chemical form; they pass from the organism into the surrounding medium with their chemical form modi- fied. Regarding merely the initial and final stages of this reconstitution of chemical form, we may speak of it as being of the nature of an oxidation. This view does not profess to be comprehensive ; nevertheless, it is true that the metabolic and anabolic processes of cells, taken as a whole, resemble combustion at least to this extent that oxygen and oxidizable carbon take part in them, and that carbon dioxide results from them. Partly as a matter of tradition, and partly as a matter of convenience, physio- logists have described the introduction of oxygen into the

organism and the emission of carbon dioxide from it as the complemental portions of one process of respiration. Although such a combined consideration is not strictly

‘philosophical, inasmuch as it leaves out of view the intro-

duction of the carbon into the organism, yet it is extremely convenient. because the two processes referred to do, in all classes of the animal kingdom from the highest to the lowest, involve the same organs and tissues in their per- formance. Respiration may therefore be defined as the ageregate of those processes which are concerned in the introduction of oxygen into the system and the escape of carbon dioxide from it.

Respiration in such an organism as an amceba is ex- tremely simple. The medium surrounding it contains a practically unlimited supply of oxygen, and is so vast that the carbon dioxide put out into the medium is quickly removed from the neighbourhood of the organism. The

interchange of oxygen and carbon dioxide takes place at the surface of the organism, so far as we know, continu- ously. In the higher animals, constituted as they are of a vast number of structural units accurately packed together, each resembling more or less in its physiological instincts the unicellular amceba, respiration presents a much more intricate problem. The fine interstices which exist between the structural elements do indeed contain a small quantity of a fluid medium which serves the function of the water bathing the amceba ; but the store of oxygen in the medium would speedily become exhausted, and the emitted carbon dioxide would quickly accumulate to a dangerous degree, if the medium were not continually restored to its original purity. This revival is effected by the circulating blood which is brought by its capillaries into the neighbour- hood of the remotest cells of the body. But even the mass of the blood is small compared with that of the cells it nourishes ; unless it be itself purified and restored in turn the interstitial juices which depend upon it for their purification must soon fail to support the respiration of the cells. Such restoration of the blood takes place in certain organs called lungs or gills, where the blood acquires a fresh store of oxygen and parts with its excess of carbon dioxide.

Respiration in the higher animals may therefore be divided into (1) internal respiration, or the interchange of oxygen and carbon dioxide

between the cells of the body and the fluid drenching them, and (2) external respiration, or the gaseous interchange taking place in the special re- spiratory organs (lungs, gills). The first is really a part of Nutrition (¢.v.) ; the second, or respiration proper, is the subject of the present article.

It will be evident on reflection that the process of respiration naturally falls to be described under two divisions, the first of which is concerned with the move- ments of the chest in inspiration and expiration and the manner in which they are brought about, and the second with the interchange of gases which takes place between the blood and the air in the lungs.

THE MovEMENTS oF RESPIRATION.

Structure of the Organs of Respiration.

In order to understand the movements it is necessary first to know the structure of the air passages and thorax.

Anatomy of the Air Passages.—The essential organs of respira- tion consist of an air tube called the trachea, communicating at its upper end with the mouth and bifurcating below into two bronchi, one on the right hand and one on the left. Each bronchus divides and subdivides, diminishing in calibre at every division until a diameter of about 1 mm. is attained ; such a diminutive bronchial tube is called a bronchiole. Every bronchiole is a cylindrical tube which divides dichotomously and rapidly several times, and finally terminates in irregular alveolar passages. The sides of the alveolar passages, and of the subdividing bronchioles in less abundance, are studded with hemispherical dilatations called air cells or alveoli. The terminal portion of au alveolar passage, with its air cells, is sometimes spoken of as an infundibulum—a term we may wisely forget at once, since it points to a distinction where no essential difference exists. The alveoli cluster in great abundanee about the alveolar passages, and, although we have spoken of them as hemispherical, they are in reality made polygonal by mutual com- pression. They are surrounded by connective tissue of a very elastic quality, which gives to their delicate walls a firm support, and is so disposed about them that all the alveoli

derived from one bronchiole are more closely knit together than they are bound to those of a neighbouring bronchiole; hence we may speak of a bronchiole with the assemblage of its members as a dobule, a term of peculiar importance since it will be evident on reflection that each lobule contains all the essential parts of a lung—is in fact a lung in miniature. By connecting tissue the lobules are compacted to form lobes, of whieh two on the left side and three on the right go to make up the respective lungs.

The trachea and larger bronchi are composed of a series of super- posed crescentic pieces or imperfect rings of hyaline eartilage which with a tough fibrous and elastic membrane form a tube ; in the trachea the incomplete cartilage-rings are so placed that their hiatuses are at the back. In the bronchial tubes, especially the

smaller ones, the cartilages are fewer, and less regular in shape, being in fact mere nodules in the bronchial walls. In the bronchioles there is no cartilage. There is an external fibrous and elastic layer investing the trachea and bronchi; and stretching from tip to tip of the imperfect cartilaginous rings are bands of involuntary muscular fibres. The function of the cartilages is doubtless to maintain the patency of the primary air passages by resisting external compression ; that of the mnscular fibres is pro- bably to resist unusual distension of the tubes, as in the strain of coughing, &c. The mucows membrane of the trachea consists of a mucosa, of fine connective tissue, mixed with some tissue of the ade- noid sort, and with elastic fibres, disposed in longitudinal bundles. Beneath the mucosa is the slight swbmucosa, which supports large blood-vessels, lymphatics, and mucous glands, and unites the mucosa to the eartilages. Above the mucosa lies the basement membrane, supporting a stratified epithelium, the upper cells of which are columnar and ciliated and may include amongst them the well-known goblet-cells, while the deeper layers are squamous and capable of regenerating the upper stratum if this be lost. The epithelium is pierced by the ducts of glands. Blood-capillaries, lymphatics, and fine nerves have all been shown to exist in the tracheal mucosa.

The same structural elements as are found in the trachea con- tinue to be found in all the series of bronehial tubes above 1 mm. in diameter ; they are arranged in mueh the same order, save that the muscular fibres are relatively increased and that they surround the whole tube (within the zone occupied by the cartilaginous nodules) somewhat like the tunica media of an artery. The mucous membrane is still ciliated, but its surface-cells are squat. On the other hand the bronchioles and alveolar passages have a different structure: cartilage and glands are no longer found ; the epithelium is flat and ciliated; and the muscular fibres gradually thin out on the walls of the alveolar passages.

It is, however, the air-cells which have most interest for the physiologist. They are about 74th inch in diameter, and their walls are made up of a delicate film-like basement membrane, on the outside of which are numerous elastic fibres. Elastic connective tissue intervenes between neighbouring alveoli, and mingled with it are not a few involuntary muscular fibres, The alveoli are lined with flat cells in a single layer, some cells being large, clear, and polygonal, while others are small and granular, and are found singly or in groups of two or three inserted between the edges of the clear sort. The cells are united together by cement in which fine holes are sometiines to be scen ; through these holes, or pseudo- stomata, migratory leucocytes can make their way into and out of the alveoli,

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Fria, 1.—Histology of the lung-vesicles. V,V, blood-vessels bordering on the alveoli; c, c, blood capillaries of an alveolus; J, f, alveolar epithelium shown separately; E,E, relative position of alveolar epithelium and blood-capillartes ; e, é, elastic texture of lung-substance. (From Wermann's Handbuch der Physiologie.)

The blood-vessels of the lung are of two sorts, nutritive and funetional, z.e., eoncerned in the function of the organs. The former are ealled bronchial, and arise from the aorta or intercostal arteries. 'They serve to nourish the tissues of the lung, and the blood they contain finds its way,

in part into the bronchial veins and thence into the vena azygos, intercostal vein, or superior vena cava, and in part into veins of the functional system. The latter system of vessels consists of the pulmonary arteries, which arise in the

right ventricle and run through the lung substance part passu with the bronchial tubes to the lobules. Here they branch into a dense network of capillaries which spread over the outside of the alveoli, enineshing them so tightly as to indent their walls. From the capillaries the blood flows into pulmonary venules which run together to form the large pulmonary veins, which open into the left auricle. The pulmonary venules may anastomose freely, but the arteries never do so. The veins possess no valves.

The lymphatic vessels of the lung abound in all parts, but are usually described as having a threefold distribution,—(a) in the layer of tissue beneath the membrane investing the whole lung, (0) in the perivascular tissue, and (e) in the peribronchial tissue. When fine carbon particles are introduced into the alveoli of the lung they find their way with the greatest ease into the inter- alveolar tissues, and finally come to lie in the three positions just referred to, as may be demonstrated in the lung of any coal miner. The lymphatics of the membrane investing the lung communicate with the free surface of that membrane by means of openings not unlike the stomata of leaves.

The lungs, with the heart and great vessels, are the chief organs contained in the thorax, or that division of the great body cavity which lies above the diaphragm. Each lung is invested with a membrane called pleura, which plays a most important part in the mechanism of respiration.

The Pleural Membrane.—Let ts imagine a bag shaped like an hour glass, and let us suppose one half of this bag to be ana up small and pushed through the constricted portion of the hour glass into the interior of the other half. We should then have a bag shaped like one half of an hour glass but provided with double walls —a more or less globular double-

walled bag with a narrow opening into it. Iffurther we imagine the interior of this double-walled bag (not the interior of the hour glass) to be entirely filled with one lung, we shall have an exact conception of the relationship of the lung to the pleura. The lung so covered is placed in its proper half of the thorax, which in circumstances of health it accurately fills. The outer layer of the double-walled bag is closely glued to the inner wall of the thorax. The inner layer is as firmly adherent to the surface of the lung. The space between the double walls, i.¢., the interior of the original hour glass, is called the plewral eavity ; it is vacuous in health, being moistened by a mere trace of fluid. The substance of the pleural membrane is mainly connective tissue ; and the interior of the pleural cavity is lined with a single layer of flat epithelial cells exhibiting the stomata already referred to.

Lhe Thorax.—The chest or thorax is formed by the dorsal section of the spinal column behind, with the ribs that spring from it on each side, and the sternwm, which lies between the ends of the ribs, in front. The dorsal spine is bowed, so that its concavity looks forward, The ribs, speaking generally, are bowed with their con- cavity turned towards the interior of the chest ; and if we consider the plane of each rib, ¢.¢., that plane in which the arched rib would (approximately) lie flat, we shall find that it declines from the hori- zontal in a twofold manner—first the rib-plane slopes from behind downwards and forwards, and secondly it slopes on each side from the mesial plane of the body downwards and outwards. The ribs 1-7 are connected with the sternum by means of pieces of cartilage which really form the anterior portion of each rib arch ; these ribs are called " true" ; the eighth, ninth, and tenth ribs are united by cartilage, not to the sternum, but to the cartilages of the seventh, eighth, and ninth ribs respectively ; these ribs are called "false" ; the eleventh and twelfth ribs are called 'floating " because they are unattached anteriorly. Hach rib has a head, by which it is joined to the vertebral bodies constituting the spinal column; a tuberele or shoulder at a little distance away from the head, by which in all cases, except those of the tenth and eleventh ribs, it is joined to the transverse process of a vertebra; an angle or rough line a little beyond the tubercle, where the rib, rather suddenly, begins to sweep forwards ; and a neck, the part intervening between the head and tubercle. The space between the ribs is filled u by

two layers of muscles called intereostal—an outer or superficial ew whose fibres

run from above downwards and forwards, and _a deeper or internal .

layer, whose fibres cross those of the former. The outer layer is not found between the costal cartilages in front, nor the inner layer between the costal necks behind. The upper opening of the thorax is filled by the windpipe blood-vessels and other structures pass- 8 into or out of the thorax. The floor of the thorax is formed

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The Diaphragm.—tThis consists of a thin arched muscular partition, whose fibres spring from the edge of the lower opening of the thorax and converge towards a sheet of tendon in the centre, which is shaped somewhat like a trefoil leaf. We may group the muscular fibres of the diaphragm according to the quadrant from which they spring :— (1) a vertebral portion, whose fibres stretch down to be attached in two well-marked columns or pillars to the bodies of some of the lumber vertebre and by tendinous arches to the transverse processes of the first lumbar vertebra and the twelfth rib ; (2) asternal portion, which springs from the back of the tip of the sternum, and from the sheath of the rectus abdominis muscles below it; (3) and (4) two

lateral or costal portions, which spring from the lower edge of the thorax all round from the tip of the twelfth rib to the junction between the sixth and seventh costal cartilage where the sternal portion begins. The whole diaphragm forms a dome or cu- pola projecting so far into the thorax that the lateral vertical portions of the dome lie in close apposition to the walls of the thorax, as is shown in fig. 2. The top of the dome is somewhat flat and the right moiety of the top is on a higher level than the left, the highest point corresponding with the level of the junction of the right fifth rib with the sternum.

Other Museles of Re- spiration.—The ribs are movable in the sense that each rib plane, which has been described as declining in two ways from the horizontal plane, may be made to approach the horizontal, and ! may

afterwards re- Fig, 2.—Section through tip of 12th rib. turn to its original (From Hermann.) position, To accomplish these movements various muscles are provided, the exact position of which need not be very fully de- scribed. Suffice it to say that in-general they arise from the verte- bral axis, or from some extra-thoracic fixed point, and take hold of the movable parts of the thorax in such a manner that they can pull them up or pull them down. Such muscles are the following (enumerated without reference to their function as inspiratory or expiratory muscles; particular descriptions of them must be sought in the article ANATomMyY) :—levatores costarum ; the three scalene muscles ; the sterno-cleidomastoid ; serratus posticus superior ; parts of the great erector spine muscle ; possibly serratus magnus ; pectoralis minor and major in certain positions of the arm; obli- quus externus ; obliquus internus ; transversalis abdominis ; trian- gularis sterni; serratus posticus inferior; quadratus lumbormn. In addition to these muscles many others may lend occasional aid in respiration by fixing points, such as the scapula, otherwise too freely movable to act as a point d'apput ; such are trapezius, latis- simus dorsi, rhomboidei, and levator anguli scapuli.

Dimensions of the Thorax.—The circumference of the chest just below the level of the arms is about 344 inches in men, and 32 inches in women. At the level of the tip of the sternum it is 82 aud 804 inches respectively. The measurement from clavicle to lower edge of thorax varies very much in different cases. The transverse diameter above the nipple is about 10 to 104 inches in men, and about 94 to 92 inches in women. 'The antero-posterior diameter, measured from the spines of the vertebre behind to the surface of the chest in front is in the upper part of the chest about 64 inches, and in the lower 74 inches. The right half of the chest is generally somewhat larger than the left, because its muscles are usually better developed. Instruments for measuring the exact circumference of the chest ata given level are called cyrtometers ; the best of these is a strip of lead which can be laid along the side of the chest from the spine round to the sternum, and which is pliable enough to follow the incqualities of the chest wall, yet resistent enough to keep the shape imparted to it.

For other figures illustrating the structure of thorax and lungs, see ANATOMY.

The Physiological Actions of the Respiratory Organs.

The organs above described perform during the whole of life certain movements. The commonest are the move- ments of ordinary quiet respiration, but we must include under the head of physiological actions, as distinguished from those provoked by disease, other movements, viz., forced respiration, such as accompanies strenuous muscular exertion, and those modifications of the respiratory act called coughing, hawking, sneezing, snoring, crying, sigh- ing, laughing, yawning, and hiccoughing.

RESPIRATION 477

Normal Resprration.—If the naked body of a person asleep or in perfect inactivity be carefully watched, it will be found that the anterior and lateral walls of the chest move rhythmically up and down, while air passes into and out of the nostrils (and mouth also if this be open) in correspondence with the movement. If we look more closely we shall find that with every uprising of the chest walls the membranous intercostal portions sink slightly as if sucked in, while at the same time the flexible walls of the abdomen bulge as if protruded by some internal force. If respiration be in the slightest degree hurried these motions become so marked as to escape the attention of no one. The elevation of the chest walls is called inspira- tion, their depression expiration. Inspiration is slightly shorter than expiration, and usually there is a slight pause or momentary inaction of the chest between expiration and the following inspiration. Apparatuses for measuring the excursion of a given point of the chest wall during respiration are called thoracometers or stethometers. Appa- ratuses for recording the movements of the chest are called stethographs or pneumographs.

Frequency of Respiration.—The frequency of respiration during perfect rest of the body is 16 to 24 per minute, the pulse rate being usually four times the rate of respiration ; but the respiratory rhythm varies in various conditions of life. The following are the means of many observations ~~made by Quetelet: at the age of one year the number of respirations is 44 per minute; at 5 years, 26; from 15 to 20 years, 20; from 25 to 30, 16; from 30 to 50, 18°1. Muscular exertion always increases the frequency of respira~~ tion. The higher the temperature of the environment the more

frequent is the respiration. Bert has shown that with higher atmospheric pressures than the normal the frequency of respiration is diminished while the depth of each inspira- tion is increased. The frequency of respiration diminishes until dinner time, reaches its maximum within an hour of feeding, and thereafter falls again ; if dinner is omitted, no rise of frequency occurs. The respiratory act can be inter- rupted at any stage, reversed, quickened, slowed, and vari- ously modified at will, so long as respiration is not stopped entirely for more than a short space of time; beyond this limit the will is incapable of suppressing respiration.

Depth of Respiration.—The depth of respiration is measured by the quantity of air inspired or expired in the act ; but the deepest expiration possible does not suffice to expel all the air the lungs contain. The following measure- ments have been ascertained, and are here classified accord- ing to the convenient terminology proposed by Hutchinson. (1) Restdual air, the volume of air remaining in the chest after the most complete expiratory effort, ranges from 100 to 130 cubic inches. (2) Reserve or supplemental air, the volume of air which can be expelled from the chest after an ordinary quiet expiration, measures about 100 cubic inches. (3) 7%dal air, the volume of air taken in and given out at each ordinary respiration may be stated at about 20 cubic inches. (4) Complemental air, the volume of air that can be forcibly inspired over and above what is taken in at a normal inspiration, ranges from about 100 to 130 cubic inches. By wtal capacity, which once had an exaggerated importance attached to it, is meant the quantity of air which can be expelled from the lungs by the deepest possible expiration after the deepest possible inspiration ; it obviously includes the complemental, tidal, and reserve airs, and measures about 230 cubic inches in the Englishman of average height, ze. 5 feet 8 inches (Hutchinson). It varies according to the height, body weight, age, sex, position of the body, and condition as to health of the subject of observation.

Vital eapaeity is estimated by means of a spirometer, a grad- uated gasometer into whieh air may be blown from the lungs.

The residual air, which for obvious reasons eannot be actually measured, may be estimated in the following way (Harless, Gréhant). At the end of

ordinary expiration, apply the mouth to a mouth-pieee eommunieating with a vessel filled with pure hydrogen, and breathe into and out of this vessel half a dozen times—until, in faet, there is reason to suppose that the air in the lungs at the time of the experiment has beeome evenly mixed with hydrogen. Then ascertain by analysis the proportion of hydrogen to expired air in the vessel and estimate the amount of the air whieh the lungs contained by the following formula :—

v: V+v=p: 100; v(100-p) , Vv rs 3

where V =volume of air in the lungs at the time of experiment, v= volume of the vessel eontaining hydrogen, p=proportion of air to hydrogen in the vessel at the end of the experiment. V, then, is the volume of air in the lungs after an ordinary expiration; that is, it ineludes the residual and the reserve air; if we subtract from this the amount of reserve air ascertained by direet measurement, we obtain the 100-180 eubie inches which Hutehinson arrived at by a study of the dead body.

Volume of Respiration.—It is clear that the ventilation of the lungs in ordinary breathing does not merely depend on the quantity of air inspired at each breath, but also on the number of inspirations in a given time. If these two values be multiplied together we get what might be called the volume of respiration (Athmungsgrésse, Rosenthal) in contra- distinction to depth of respiration and frequency of respira- tion. Various instruments have been devised to measure the volume of respiration, all more or less faulty for the reason that they compel respiration under somewhat ab-normal conditions (Rosenthal, Gad, Panum, Hering). From the data obtained we may conclude that the respiratory volume per minute in man is about 366 cubic inches (6000 cubic centim.). In connexion with this subject it may be stated that, after a single ordinary inspiration of hydrogen gas, 6-10 respirations of ordinary air must occur before the expired air ceases to contain some trace of hydrogen.

Types of Respiration.—The visible characters of respira- tion in man vary considerably according to age and sex. In men, while there is a moderate degree of upheaval of the chest, there is a considerable although not preponderating degree of excursion of the abdominal walls. In women the chest movements are decidedly most marked, the excur- sion of the

abdominal walls being comparatively small. Hence we may distinguish two types of respiration, the costal and the abdominal, according to the preponderance of movement of one or the other part of the body wall. In forced respiration the type is costal in both sexes, and so it is also insleep. The cause of this difference between men and women has been variously ascribed (a) to con- striction of the chest by corsets in women, (6) to a natural adaptation to the needs of childbearing in women, and © to the greater relative flexibility of the ribs in women per- mitting a wider displacement under the action of he inspiratory muscles.

Certain Concomitants of Normal Respiration.—If the ear be placed against the chest wall during ordinary respiration we can hear with every inspiration a sighing or rustling sound, called "vesicular," which is _pro- bably caused by the expansion of the air vesicles; and with every expiration a sound of a much softer sighing character. In children the inspiratory rustle is sharper and more pronounced than in adults. If a stethoscope be placed over the trachea, bronchi, or larynx, so that the sounds generated there may be separately communicated to the ear, there is heard a harsh to-and-fro sound dur- ing inspiration and expiration which has received the name of " bronchial."

In healthy breathing the mouth should be closed and the ingoing current should all pass through the nose. When this happens the nostrils become slightly expanded with each inspiration, probably by the action of the M.

dilatatores naris. In some people this movement is hardly perceptible unless breathing be heavy or laboured. As the air passes at the back of the throat behind the soft palate it causes the velum to wave very gently in the current; this is a purely passive movement. If we look at the glottis or opening into the larynx during respira- tion, as we may readily do with the help of a small mirror held at the back of the throat, we may notice that the glottis is wide open during inspiration and that it becomes narrower by the approximation of the vocal chords during expiration. This alteration is produced by the action of the laryngeal muscles. Like the movements of the nostril, those of the larynx are almost imperceptible

in some people during ordinary breathing, but are very well marked in all during forced respiration. The Mechanics of Respiration.

In the description of the anatomy of the thorax it has been shown that the thorax is practically a closed box entirely filled by the lungs, heart, and other, structures contained within it. If we were to freeze a dead body until all its tissues were rigid, and then were to remove a portion of the chest wall, we should observe that every corner of the thorax is accurately filled by some portion or other of its contents. If we were to perform the same operation of removing a part of the chest wall in a body not first frozen we should find, on the other hand, that the contents of the thorax are not by any means in such circumstances bulky enough to fill up the space provided for them. If we were to measure the organs carefully we should find that those which are hollow and whose cavities communicate with the regions outside the thorax are all larger in the frozen corpse than in that which was not frozen. In other words, the organs in the thorax are distended somewhat in order that they may completely fill the chest cavity ; and the nature of this curious and important condition may best be illustrated by the simple diagrams, figs. 3 and 4 (from Hermann's Physiologie des

Fig. 3 Fig. 4. Menschen),—where t is the trachea, / the lung, v the auricle of the heart, & the ventricle, 7 an intercostal space with its flexible membranous covering. When the interior of the vessel is rendered vacuous by exhaustion through the tube 0, the walls of the lungs and heart are expanded until the limits of the containing vessel are accurately filled, while all flexible portions of the walls of the vessel (corre- sponding to the intercostal membranes and the diaphragm of the thorax) are sucked inwards.

From this description it follows that the lungs, even when the thorax is most contracted, are constantly over-

distended, and that, when the cause of this over-distension is removed, the lungs, being elastic, collapse. It further follows that if the thorax is dilated, the flexible hollow organs it contains must perforce be still more distended, —a distension which in the case of the lungs is followed by an indrawing of air through the trachea in all cases where the trachea is

open. Thus, as the act of respiration is primarily a dilatation of the thorax, the part played by the lungs is, as Galen knew, a purely passive one.

How is dilatation of the thorax effected? It has been pointed out that the rib-planes decline from the horizontal in two directions, viz., from behind forwards, and from the antero-posterior mesial plane outwards; a glance at fig. 5 will make this double sloping clear to the reader. It has, moreover, been explained that the diaphragm arches upwards into the thorax in such a manner that the lateral parts of the arch are vertical and in contact with the inner face of the tho- racic walls (see fig. 2), This being the structure of the thorax, the enlargement of its : cavityis broughtabout (1) by raising the rib- planes until they ap- proach the horizontal, and (2) by depressing the diaphragm and making its rounded dome more cone-likein outline. A moment's consideration willshow how these actions en- large the boundaries of the thorax. (a) When the postero-an- terior slope of the rib- planes is diminished by the raising of the anterior ends of the ribs, the whole ster- num is thrust upwards and forwards, and the antero- posterior diameter of the thorax is increased. (6) When the lateral slope of the rib-planes is diminished by the ribs being moved upwards about an axis passing through their sternal and vertebral extremities, it is evident that the lateral diameter of the thorax must be increased. (c) When the muscular portion of the diaphragm contracts, the curves of its dome-like shape are straightened, the whole diaphragm comes to look more conical on section, and the apposition of its lateral parts to the inner surface of the thorax is destroyed ; the two apposed surfaces are drawn apart much as the leaves of a book might be, and a space is formed between them, into which some portion of the lung slips. (d) When the diaphragm descends it draws with it the whole contents of the thorax; inasmuch as the contents as a whole are conical in shape with the apex upward and are fitted into the conical space of the thoracic cavity, it is clear that the descent of the contents will tend to create a space between them and the thoracic walls ; for each stratum of lung, &c., which is adapted to fit a eertain level of thorax, will thereby be brought into a lower and (as the thorax is conical) a more spacious level. Hence the descent of the diaphragm causes a much greater enlargement of the thorax than is measured by the mere elongation of the vertical diameter.

In this manner the thorax is distended and air is drawn into the lungs. The contraction of the thorax in expiration is brought about by the return of the ribs and diaphragm to their original position of rest. }

Fie. 5.—Showing slope of ribs. (From Hermann's Handbuch.)

RESPIRATION

We must now explain how the respiratory muscles effect these movements.

How the Inspiratory Movements are Produced.—The Rib Movements.—These are caused by the contraction of muscles which are fixed either to the central axis of the body (including under that term the head and vertebral column) or to some point rendered sufficiently stable for the pur- pose by the action of other adjuvant muscles. Thus the M. levatores costarum arise from the transverse processes of the 7th cervical and eleven upper dorsal vertebrae, and are attached to the ribs below in series; the M. scaleni spring from the cervical vertebre, and are attached to the anterior parts of the first and second ribs; he M. sterno- cleido-mastoidei arise from the side and back of the skull, and are inserted into the upper part of the sternum and the

clavicle ; the M. pectoralis minor arises from the coracoid process of the scapula, and is inserted into the anterior ends of some of the ribs; the M. serratus posticus superior arises from certain of the cervical and dorsal vertebree, and is inserted into the posterior part of certain of the ribs; the M. cervicalis ascendens (part of the M. erector spinz) arises from certain of the cervical vertebra, and is inserted into the posterior part of certain ribs) The M. serratus magnus and the M. pectoralis major, which are affixed on the one hand to the upper arm and to the scapula respec- tively and on the other to the ribs and to the sternum respectively, may in certain elevated positions of the arm and shoulder act as in- spiratory muscles. When all these muscles contract, A the ribs are raised in the twofold way already de- scribed, some pulling up the anterior ends of the ribs, and others causing the arched ribs to rotate p about an axis passing through their vertebral and sternal joints.

In addition to the muscles just enumerated the M. in- tereostales externi are undoubtedly inspiratory muscles, Every ex- ternal intercostal muscular fibre between a pair of ribs must, when it contracts, of necessity raise both ribs, as is clearly shown by the accompanying diagram (fig. 6). Here a'd' must be shorter than ad, for if BAa=2, then

ab? = AB? + (Bb — Aa)?

+2AB (Bb- Aa) cos x; hence ab will be larger the smaller the angle x, for the cosine increases as the angle diminishes.

By a similar geometrical treatment of the question it may be shown that the in- ternal intercostal muscles when they contract must of necessity depress both the ribs to which they are attached. angle BAe' =z (fig. 7), then

ed? = AB? + (Ae' — Bd')? – 2A B(Ae' — Ba') cos x ; hence e'd' will be larger the larger the angle a.

The case, however, is not so clear with reference to the anterior portions of the internal intercostals which lie between the carti- lages; for it is evident that these fibres have the same direction with regard to the sternum as an axis as the external intercostals have with regard to the vertebral column as an axis; that is to say, the geometrical diagrain in fig. 6 applies to the intercartilaginous internal intercostals as perfectly as it does to the interosseous parts of the external intercostals, the inference being that the inter- cartilaginous internal intercostals tend to elevate the pair of ribs between which they stretch. The geometrical argument is, how- ever, overborne by physiological experiment: Martin and Hartwell have observed in the dog and the cat that the internal intercostals

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throughout their whole extent contract (not synchronously) but alternately with the diaphragm; hence we must conclude that their

funetion throughout is not inspiratory like that of the diaphragm, but expiratory.

The Movements of the Diaphragm.—The muscular fibres of the diaphragm are arranged in a radial manner, or more strictly speaking in a manner like the lines of longitude on a terrestrial globe. The central tendon of the diaphragm corresponds to the pole of such a globe. The contraction of the fibres is expended on straightening the longitudinal curves rather than on pulling down the central tendon to a lower level ; in fact the central tendon moves very little in ordinary respiration.

How the Expiratory Movements are Produced.—The action of inspiration disturbs many organs from the position of rest into which gravity and their own physical properties have thrown them. The ribs and sternum are raised from the position of lowest level; the elastic costal cartilages are twisted; the elastic lungs are put upon the stretch; the abdominal organs, themselves elastic, are compressed and thrust against the elastic walls of the belly, causing these to bulge outwards. In short the very act of inspira- tion stores up, as it were, in sundry ways the forces which make for expiration, As soon as the inspiratory muscles cease to act these forces come into play, and the position of rest or equilibrium is regained. It is very doubtful whether any special expiratory muscles are called into action during ordinary respiration. The internal intercos- tals may in man be exercised in ordinary expiration (al- though they are certainly not so exercised in the dog and the cat); but in laboured expiration many muscles assist in the expulsive effort. The muscles forming the belly walls contract and force the abdominal contents against the relaxed diaphragm in such a manner as to drive it farther and farther into the thorax. At the same time by their attachment to the lower edge of the thorax these same muscles pull down the ribs and sternum. The M. triangu- laris sterni, which arises from the back or thoracic aspect of the sternum and lower costal cartilages and is inserted into the costal cartilages higher up, can obviously depress the ribs. So also can the M. serratus posticus inferior, which arises from the thick fascia of the loins and is in- serted into the last four ribs. So also can the M. quadratus lumborum, which springs from the pelvis and is attached to the last rib. Indeed there is hardly a muscle of the body but may be called into play during extremely laboured

respiration, either because it acts on the chest, or because it serves to steady some part and give a better purchase for the action of direct respiratory muscles.

Certain Abnormal Forms of Respiration.

Coughing. —There is first a deep inspiration followed by closure of the glottis. Then follows a violent expiratory effort which bursts open the glottis and drives the air out of the lungs in a blast which carries away any light irritating matter it may meet with. The act is commonly involuntary, bunt may be imitated exactly by a voluntary effort.

Hawking, or Clearing the Throat.—In this act a current of air is driven from the lungs and forced through the narrow space between the root of the tongue and the depressed soft palate. This action ean only be caused voluntarily.

Sneezing. —There is first an inspiration which is often nnusually rapid ; then follows a sudden expiration and the blast is directed through the nose. The glottis remains open all the time. 'Ihe act is generally involuntary, but may be more or less successfully imitated by a voluntary effort.

Snoring is caused by unnsually steady and prolonged inspirations and expirations through the open mouth, —the soft palate and uvula being set vibrating by the currents of air.

Crying consists of short deep inspirations and prolonged expira- tions with the glottis partially closed. Long-continued erying leads to sobbing, in which sudden spasmodic contractions of the diaphragm cause sudden inspirations and inspiratory sounds generated in larynx and pharynx.

Sighing is a sudden and prolonged inspiration following an unusually long pause after the last expiration.

Laughing is caused by a series of short expiratory blasts which provoke a clear sound from the vocal chords kept tense for the purpose, and at the same time other inarticulate but very character- istic sounds from the vibrating structures of the larynx and pharynx. The face has a characteristic expression. This act is essentially involuntary, and often is beyond control; it can only be imitated very imperfectly.

Yawning is a long deep inspiration followed by a shorter expiration, the mouth, fauces, and glottis being kept open in a characteristic fashion. It is involuntary, but may be imitated.

Hiccough is really an inspiration suddenly checked by closure of the glottis; the inspiration is due to a spasmodic contraction of the diaphragm. The closure of the glottis generally leads to a characteristic sound.

Innervation of the Respiratory Movements.

The respiratory actions are seen from the above description to be very complicated: their regular performance depends upon the coordination of a great number of factors ; and, inasmuch as the respiratory movements do not happen invariably after one stereo- typed pattern, but admit of various modifications, such as sighing, hiccoughing, &c., we must infer that the coordination is such as to admit of corresponding variations. The coordination of the inspiratory and expiratory movements is brought about through the nervous system, the connexion of which with the organs of respiration already described must now be stated.

Speaking very generally, there is a nervous centre in the cerebro-spinal axis from which certain nerve fibres proceed to the muscles of respiration ; these are called the efferent or centrifugal fibres. There are other fibres which run from the peripheral parts of the body towards the same centre and exert a control over it ; these are called afferent or centripetal. The impulses to movement start from the centre and travel down the efferent fibres to the muscles, while impressions arising in the periphery of the body are carried along the afferent fibres to the centre and modify its action.

The Respiratory Centre.—There is a portion of the medulla oblongata destruction of which causes immediate and permanent cessation of all respiratory movements. This spot has been found to lie in the grey substance near the tip or nib of the calamus scriptorius; it extends on both sides of the middle line, and has re- ceived the name of "le nceud vital" (Flourens). If the spinal cord be severed immediately below the spot, all respiratory movements in the parts of the body below the level of section cease at once, while movements of respiration in parts situated above the level (e.g., in the face) continue momentarily. If the severance be made above the vital knot, the facial movements of respiration cease, while those of the trunk continue. The nervous centre is bilateral, each half serving its proper side of the body; if the medulla oblongata be split longitudinally in the middle line, through the noeud vital, respiration goes on unchecked ; but if one lateral half of the vital area be destroyed, respiration at once ceases on the same side of the body.

While the above hypothesis of a respiratory centre in the medulla presiding over the movements of respiration is in all probability substantially correct, it must be stated that, in certain circum- stances of experiment (¢.g., when the animal is young and has been poisoned with strychnia, or is kept in a warm chamber), respira- tory movements do occur even when the medulla oblongata with the noeud vital has been removed. That is to say, there are centres in the cord of a lower order than the medullary respiratory centre which are under ordinary circumstances dependent on the main centre but which may act independently.

The respiratory centre must be regarded as the seat of origin of the impulses which cause the muscular movements of inspiration and expiration. During the whole of intra-utcrine life the centre is inactive, but almost immediately after the child is born, or the placental circulation is interrupted by compression of the umbilical blood-vessels, the centre becomes quickened, and fails not to yield the appropriate stimulus at short intervals during the whole after- period of life. Itis impossible to resist the conclusion that the immediate cause of the activity of the respiratory centre is the impure and impoverished state of the blood, which it is the function of respiration toremedy. So long as the placenta performs the function of purifying the blood of the fetus and supplying it

with oxygen the respiratory centre is quiescent; the moment the placenta becomes incapable of purifying the foetal blood, as, for example, when the mother is suffocated or asphyxiated, the respiratory centre prepares to act and respiratory movements follow.

If it is true that the presence of impure or venous blood in the respiratory centre is the cause of the first respiratory act of an animal, it is also true that the presence of highly arterialized blood is sufficient to render the centre absolutely inactive again. If air or oxygen gas be driven through the lungs of an animal and allowed to escape through holes made in the chest walls, the blood becomes so rapidly and perfectly purified that the whole vascular system is filled with the pure blood which is commonly found in the arteries only. In this casc the movements of respira-

tion cease until such time as the blood has again lost its purity, when respiration begins, as one might say, da capo. There is no doubt that the essential cause of the inactivity of the respiratory centre in this experiment is the presence in excess of oxygen gas, and that the absence of a certain proportion of oxygen in the blood circulating in the body endows the blood with a power of stimulat- ing directly or indirectly the respiratory centre. To this subject we shall return.

The Efferent Fibres.—The fibres proceeding from the respiratory centre run down the spinal chord and emerge for the most part in the cervical and dorsal region. Some fibres are collected into a nerve trunk which takes its rise in the third, fourth, and fifth cervical nerves; this is the phrenic nerve, which supplies that half of the diaphragm lying on the corresponding side of the body. Section of one phrenic nerve causes paralysis of the corresponding half of the diaphragm. Other fibres run in the tntercostal nerves for the supply of the intercostal muscles, levatores costarum, &c.; others again run in the cervical nerves for the supply of the sterno- mastoid, scaleni, &c. Section of these nerves leads to paralysis of the muscles supplied by them. The facial muscles of respiration are supplied by efferent fibres from the seventh cranial nerve, and the laryngeal muscles by the laryngeal branches of the vagus.

In addition to the nerves which supply the respiratory muscles, there are efferent fibres which run in the course of the vagus to the muscles supplying the larynx and the bronchial tubes. The vagi (also called the pneumogastric nerves) are two important trunks which arise from the medulla oblongata, and, after receiving communications for neighbouring nerves, run down by the side of the windpipe to reach the thorax and abdomen. By means of appropriate apparatus, of which several varieties have been devised, contraction of the small bronchial tubes may be readily made sensible and even graphically recorded. A study of the experi- mental results obtained after electrical stimuiation of the pneumo- gastric nerves leaves no doubt that these nerves contain motor fibres for the bronchial tubes. The exact distribution of the superior and inferior laryngeal branches of the vagus to the muscles of the larynx is described under ANATOMY.

The Afferent Fibres.—Many nerve fibres have been ascertained by physiological experiment to have communication with the respira- tory centre. For example, the nerves of the skin of the chest, when stimulated by the application of cold water, cause a gasping inspiration ; the nerves of the skin of the sides of the body and of the soles of the feet, when stimulated by tickling, cause that peculiar series of spasms of the diaphragm which constitute laugh- ing; and soon. But the vagus nerve is that which contains the afferent fibres of chief importance to the respiratory movements. The vagus fibres proceeding from larynx, trachea, lung, and stomach certainly, and possibly also those proceeding from other organs of the abdomen, are all capable of influencing the activity of the main respiratory centre. If the trunk of the vagus nerve on each side of the neck be laid bare and divided in an animal such as a rabbit, the respiratory movements become much less frequent but at the same time deeper. Ifthe end of the nerve above the point of section be carefully stimulated by a weak electric current, respiration again becomes quicker and proportionately shallow until in fact the natural type is restored. If the strength of stimulus be still further increased, the rapidity and the shallowness of breath- ing become still more remarkable, until a degree of stimulation is reached when there is no longer any rhythmical character in respiration, which is reduced to a feeble inspiratory spasm. These facts are conveniently grouped and explained by the following

hypothetical statement. The vagus nerve contains fibres running up to the respiratory centre which have the function of modifying the native tendencies of the centre in such a manner as to accelerate its explosions of activity and at the same time render them less formidable. These fibres are constantly in action during healthy life ; hence, on dividing the vagus trunk including these fibres, the respiratory centre reverts to its natural type of slow and deep action. On stimulating these fibres artificially they may be brought to spur on the centre once more, or even carry the accelerating process to the point of producing continuous inspiration.

Experiment has, however, shown that the influence of the vagus nerve is not so simple as is here supposed. There are other fibres in the vagus which seem to arise in the larynx and run in the trunk of the two laryngeal (but chiefly in the superior laryngeal) branches of the nerve ; these have powers exactly opposed to those ascribed to the main-trunk fibres. If the superior laryngeal nerve be divided and the higher end at the point of division be stimu- lated, respiration becomes less frequent and more powerful. These fibres of opposite tendencies run side by side in the vagus trunk, and must be alike excited when an electrical stimulus is thrown into the nerve. The fact that the total result of stimulation is in favour of the first-described accelerating nerves may be hypothetically explained by supposing the accelerating fibres to be more numerous, or more potent with the given stimulus, than the slowing fibres.

Nature of the Activity of the Respiratory Centre. —Various interest-

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ing questions arise as to the exact mode of action of the respiratory centre. Is there an expiratory centre apart from the inspiratory ? In ordinary quiet breathing expiration is not a muscular act in the sense that inspiration is ; but in laboured breathing many muscles are coordinated

to help in the act; we may therefore assume that there is an expiratory coordinating mechanism as well as an inspira- tory. Another inquiry touches the question of the stimulation of the respiratory centre. We have arrived at the conclusion that a certain impoverished or impure state of the blood is the cause of the activity of the respiratory centres. Is it by a direct action of the blood on the nerve centre, or is it by an action of the blood upon the end-organs of nerves in the peripheral parts of the body which indirectly induce the respiratory centre to act? In other words, would the respiratory centre act under the stimulus of a certain degree of impurity of its blood if it were cut off absolutely from its afferent fibres? This is not a question which admits of an absolutely decisive experimental answer ; but this may be said in reference to it, that, if the cerebrum be extirpated, the pneumo- gastric nerves divided, and the spinal chord severed at a poiut below that from which the main respiratory efferent nerves

emerge, notwithstanding that the respiratory centre is thus-

separated from by far the greater number of the sensory nerves of the body, respiration still goeson. Further, if the spinal axis is divided at a level immediately above that of the respiratory centre, respiration goes on in the lower parts of the body but ceases in the upper—that is, the facial movements cease ; while, if the division be carried through a point immediately below the level of the respiratory centre, although chest movement ceases and respiration may in strictness be said to be permanently stopped, yet the facial movements, which are just as essential to the complete idea of respiration, and which are innervated from the common respiratory centre, continue to be performed so long as any life remains in the mutilated animal. There is therefore a very strong presumption that the respiratory centre is automatic, that is, that it has within itself the spring of its own activity, and that the impurity of the blood which sets the respiratory mechanism agoing does so by acting upon the respiratory nervous centre directly, However started, the inspiratory stimulus is discharged rhythmically down the efferent respiratory nerve during healthy life. The rhythm is capable of wide variation, both by the exercise of the will and by the operation of external conditions, such as heat and muscular exercise of the body, which

accelerate respiration independently of the will. The question why the dis- charge is rhythmical js one of the deeper problems of physiology, and touches the essential nature of nervous actions in general. It is customary in physiological treatises to illustrate it by supposing a mechanism which offers a resistance to the discharges of its own energy ; when the energy reaches a certain degree of tension resistance is overcome and the discharge takes place, but a certain time must elapse before energy can again accuinulate to the extent of ovcrcoming resistance. lt is further supposed that resistance is capable of being varied by external agencies ; when it is increased the discharges oceur at longer intervals, because more energy must be accumulated before resistance can be over- borne, but at the same time they are more violent; when resistance is diminished, the discharges are more rapid but less powerful, until, when resistance becomes nil, the discharge is continuous. Such illustrations are, however, of very doubtful value ; they impart a sense of clearness to our views of nervous action by turning attention from the problem we wish elucidated to another and altogether different problem. There is in fact no probability whatever, so far as facts yet go, that nervous rhyth- niical action is brought about in any such way.

CHEMISTRY OF RESPIRATION.

The mechanism which has just been described has for its object an interchange of substances between the body and the external medium. Certain substances pass out of the body at the lungs, and others are taken into the body. The discussion of this interchange pertains to what is called the Chemistry of Respiration.

Comparison of Inspired and Expired Air.—No incon- siderable knowledge of this exchange of matters may be obtained at once by a simple comparison of inspired and expired air. The air we breathe varies somewhat accord- ing to the various circumstances of season, time of day, height above sea level, prevailing wind, &c.; but all samples of pure atmospheric air have substantially the following composition :—

1. Gases :— 0}. A pecisies aetna 20°84 to 20°92 vols. p.c. DNPIGRO SEM «cx cseco nisinemsieaertie vel 79:00 to 79°05, Garhow dioxide ….....02 Whee vesees 0-04 =a,

2, Aqueous vapour.—The absolute amount of this ingredient varies very much, and must be distinguished carefully from the relative or sensible moisture, which depends more upon the temperature of the air than upon the absolute quantity of watery vapour it contains,

Air which is expired from the lungs has approximately the following composition :—

1. Gases :— aT ayy sc vn4sksevaxeases Pucrnengeeee 16°03 vols. p.c. Nitrogen …... eerie on ae cere con desoeatec (oL02

Carbommdioxtds ~ .....eseas 3°3 to 5:5 An

Probably there is an — ceedingly small excess of nitrogen in expired air as compared with inspired air.

2. Aqueous vapour.—The absolute amount is always such as to saturate the air at the temperature which it has on expiration, 1.€., 86°:3 C,

3, Organic matter of uncertain composition but hurtful when reinhaled. ;

On an average (subject, however, to cousiderable varia- tions) it appears that the body takes up in respiration oxygen gas to the amount of 4°78 vols. per cent. of the air inhaled, and it gives off carbon dioxide to the average amount of 4°38 vols. per cent., besides traces of nitrogen, ammonia, hydrogen, and light carburetted hydrogen. Leaving out of calculation the minute traces of the latter bodies, it will be observed that the volume of oxygen taken into the body is larger than the volume of carbon dioxide given off; and, since, under like conditions of pressure and temperature, equal volumes of oxygen gas and carbon dioxide gas contain the same quantity of oxygen, it is clear that more oxygen enters the body at the lungs than escapes from it; therefore the whole of the oxygen taken into the body does not leave it as carbonic acid or expired air. The ratio of CO, expired to O absorbed is called the "respiratory quotient"—

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Composition of Air in the Air Cells—The whole of the air of the lungs is not expelled at each breath, some remain- ing in the depths as residual air lodged in the alveoli or air cells. Hence we cannot assume, from an examination of expired air, that we know the constitution of the air in the recesses of the lungs where it comes most intimately into contact with the blood. To attain such knowledge it is necessary to examine the deeper air directly, and the air is obtained for such purposes by means of a lung catheter.1 In this way it has been ascertained that the alveolar air of a dog's lung contained about 3°8 per cent. of CO, at a time when the expired air contained about 2°8 per cent. As to the amount of O we may safely assume that the alveolar air never in ordinary circumstances contains less than 10 per cent. when the expired air contains 16 per cent.

Daily Quantity of Substances Exchanged.—During 24 hours an average person would take in about 10,000 grains of oxygen in respiration, and give out about 12,000 grains of carbon dioxide, corresponding to 3300 grains of carbon; at the same time about 9 oz. of water would be exhaled. These quantities vary, however, within wide limits according to the conditions of age, sex, atmospheric pressure, and the like. Thus, for example, in young per- sons the O absorbed is relatively greater than the CO, given off, and a child gives off twice as much CO, in relation to its body weight as an adult. Again, males

1 This is a flexible tube so thin as to pass readily into a small bronchial tube. It is provided with an india-rubber collar, which is capable of inflation. 'The apparatus is passed (with the collar col- lapsed) through a hole in the trachea and guided into one of the finer bronchial tubes; the collar is then inflated, and serves to fix the catheter hermetically in the bronchial tube and to place that tube with its tributary tubes and alveoli in direct communication with the outer air through the fine catheter. Breathing is unimpeded ; and air may be collected from the recesses of the lung for analysis.

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after the first few years of life give off more CO, than females. When the external temperature is so low as to depress the body temperature, less CO, is given off ; if it is so high ag to raise the body temperature, the CO, is increased. If, however, the surrounding medium is cooler than the body but not cold enough to lower the body temperature, more O is taken in, and more CO, is given out; and wee versa. Muscular exercise also increases considerably the CO, given off; and more COQ, is given off a short time after a meal than during fasting, especially when the meal includes substances rich in carbon. Speak- ing generally, alcohols, ethers, tea, &c., diminish the CO, ; but the results are not constant. Again, while the number and depth of the respirations do not influence the formation of CO, in the body, they affect the removal of that which is already formed. Increased rate of respira- tion and increased depth of respiration both cause an absolute increase in the quantity of CO, expired, although with reference to the total amount of air which passes into and out of the lungs during such laboured breathing the CO, is relatively diminished. Lastly, when the atmo- spheric pressure is diminished, as in ballooning, respira- tion becomes difficult, CO, is imperfectly removed from the body, and the blood contains less O. When pressure is increased, respiration is easy and slow (2-4 per minute), the capacity of the lungs increases, the activities of the tissues are marked, and as a result of this more O is absorbed and more CO, is excreted.

The Blood in Respiration.

Having ascertained the nature and quantity of the materials exchanged in the lungs, we may now ask con- cerning the method of the exchange. There is no difficulty in understanding how the cold air introduced into the lungs is warmed and saturated with moisture by contact with the moist walls of the air passages and bronchi. As to the gaseous substances which appear in traces in the expired air nothing definite is known; they may in part arise in the decomposition of the solid organic impurities of expired air, and may in part escape from the blood itself. The origin of the solid poisonous organic substances, which are of such vital interest from a sanitary point of view, is alsoa matter of great obscurity. Some portions of it doubtless consist of effete particles of tissue from the walls of the bronchial tubes and cavity of the mouth and nose; for example, epithelial

scales may be discovered in the condensed moisture of the air expired into an ice-cold globe, and so also may the organized bacilli of tubercle when the subject of experiment happens to be phthisical. Other portions may spring directly from the blood. The chief inquiry, however, centres about the origin of the carbon dioxide and the absorption of the oxygen, for the understanding of which a knowledge of the blood is necessary.

The Blood.—This, as it circulates in the vessels of man and vertebrates generally, isa viscous and to the naked eye homogeneous liquid of red colour,—the blood of the pulmonary veins, of the left side of the heart, and of the systemic arteries being normally of a bright scarlet hue, and the blood of the right side of the heart, of the systemic veins, and of the pulmonary artery being of a brownish-red colour. In other words the blood enters the capillaries of the lungs of a brownish-red colour, and leaves them bright scarlet in hue; it enters the general capillaries of the body as a bright scarlet fluid and leaves them as a brownish-red fluid. Although homogeneous to the naked eye, the blood is found on Microscopic examina- tion to consist of a colourless fluid, called liquor sanguinis or plasma, holding in suspension large numbers of solid

bodies, the corpuscles of the blood; the more numerous of |

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these are red, the others are colourless and are commonly spoken of as white. The specific gravity of blood probably varies between 1045 and 1075. Fresh blood is feebly alkaline in reaction.

When blood is shed it remains for a minute or two as fluid as it is in the blood-vessels; but in 2—6 minutes it begins to pass into the state of a soft red jelly, which gradually acquires greater consistence, and by the contrac- tion of one of its constituents at length expresses a fluid ; the contracted jelly is called the clot, or crassamentum ; the expressed fluid is the serwm; and the whole process is denominated coagulation. Contraction of the clot may go on for 10-48 hours. This process of coagulation is due to the separation from the plasma of a body called fibrin, which entangles in its meshes the corpuscles of the blood. When coagulation is delayed for several minutes (as it

always is in horse's blood, and as it usually is in the blood

of men suffering from inflammatory diseases), the blood corpuscles, being specifically heavier than the plasma, have time to subside a little way before coagulation commences. Hence the uppermost layers of such blood become nearly free from coloured corpuscles ; and subsequently, when the blood coagulates, the clot exhibits the phenomenon of the buffy coat,—that is, the upper part of the clot is of a yellowish colour. If, instead of allowing blood to coagulate undisturbed, it be stirred or whipped with twigs, the fibrin does not entangle the corpuscles but separates as a stringy mass which adheres to the twigs; the corpuscles remain in the serum and constitute defibrinated blood. Coagula- tion is promoted (a) by exposure to a temperature slightly higher than that of the living body ; (0) by contact with foreign matter; (c) by the addition of minute quantities of common salt or other neutral salts. It is delayed or suspended (a) by exposure to an ice-cold temperature ; (0) by contact with the living blood-vessels; (c) by the addi- tion of a sufficient quantity of sodium chloride, sodium sulphate, or some other neutral salts.

Reviewing all the facts which have been ascertained respecting coagulation, it would appear that the process is dependent upon the presence in the liquor sanguinis of a proteid body called fibrinogen, which under favourable circumstances undergoes conversion, or perhaps decomposi- tion, into fibrin. This conversion, when it occurs outside the body, appears to be connected with the action of a ferment produced in the colourless corpuscles, and pro- bably only set free when they break down.

The red corpuscles of man and the Mammalia gener- ally, except the Camelidz, are biconcave disks, possessing neither skin nor nucleus or interior body. In birds, reptiles, and most fishes they are nucleated, elliptical, and biconvex. In the camel the red corpuscles are oval. The average diameter of the disk in man is 3,),5 inch and the thickness about 315, inch.

The substance of which the red disks is composed is elastic ; the disks may therefore be squeezed through fine chinks smaller than their own diameter and may after- wards regain their original shape. When in the

blood- vessels the red corpuscles are hurried along indiscrimately in the blood current, but when the blood stands the red corpuscles cling together in rows like piles of coin, which are technically called rowleaux; this is a physical pheno- menon entirely due to the shape of the corpuscles. The white or colourless corpuscles are globular masses of granular protoplasm, provided with one or more interior bodies called nuclei, but destitute of a skin. They have the power of independent movement, which the red cells have not, resembling in this respect the amoeba. They can send out processes, change their outline, and move from place to place by laying hold on resistent objects by means of a projected process and dragging their bodies

RESPIRATION

along. They have a diameter of 54,5 inch when at rest |

and globular. They are far less numerous than the red corpuscles ; the proportion of white and red corpuscles in various conditions is shown in the following table :—

In the morning fasting state…..... eto tss0S elles SLE vests 1: 716 Malt an; out Arter DVCAKTARE, 6.5.06 em rwnarncisee «need me sacnmens 1:347 Thives hours after broakfagt/.....00:scsesesesessoedeseeee 1:1514 Ter thie eploniie Veli. tapagt Feac vd teunneat det Soyeuse eede tes 1:60 Pie NEG Gpleaie BOI oii gen peee des thyeyenagiynae sds iows s 1 : 2260 In the hepatic vein,..... uke ining hoes SAW Aen nati 7170 ee en ee ere 1:740

In addition to typical white and red corpuscles there are others, provisionally called intermediate corpuscles, red granular corpuscles, or hematoblasts, which are granular and nucleated. Probably these corpuscles are involved in a special manner in the development of the fibrin-ferment. It has been calculated that one cubic millimetre (7c. a cube whose side measures about =; inch) contains five million corpuscles of all kinds.

The chief constituents of the blood may now be dis- cussed seriatim :—

Constituents of the Liquor Sanguinis.

Fibrin.—When fresh this is an elastic substance belonging to the group of proteid bodies ; it is insoluble in pure water, but

Fre. 8.— Blood corpyscles, A, Moderately magnified ; red corpuscles in roul- eaux; white corpuscles at a, a. B, CO, D, Red corpuscles more highly magnified. , Red corpuscle swollen to a sphere by imbibition of water. F, White corpuscle, magnified same as B; G, the same, throwing out blunt processes ; K, the same, treated with acetic acid, and showing nucleus magnified same as D. 4H, J, Red corpuscles puckered or crenate —Z/, all over, J, at edge only. (From Huxley's Elementary Physiology.)

is soluble in solutions of common salt and in dilute hydrochloric

"aba at the temperature of the body. Human venous blood yields

rom 2'2 to 2°8 parts per

thousand of fibrin. So far ad Se .

as we know, fibrin does

not exist as such in the plasma hefore it is coagu-

lated; but there does exist 1

a body, fibrinogen, which

is the precursor of fibrin.

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posed that fibrin arises in the union of the two bodies fibrinogen and para-globulin.

Serum-albumin.—This is a proteid body which coagulates on heating.

Certain extractive matters.—These include neutral fats, lecithin, and cholesterin ; sugar; urea, uric acid, creatine, creatinine, &c. ; and a yellow pigment.

Inorganic Salts.—These are the chlorides, phosphates, and sulphates of sodium, potassium, calcium, and magnesium ; sodium and chlorides are the main constituents.

Gases. —Especially CO, ; but see below.

Constituents of the Red Corpuscles.

Oxryhxmoglobin.—This interesting substance has the general chemical composition of an albuminous body with the addition of the element iron: —C, 54:00; H, 7°25; N, 16°25; Fe, 0°42; S, 0°63; O, 21°45=100°00.

It is the cause of the red colour of the corpuscles. It may be obtained in the form of beautiful crystals by a variety of methods, which all have the following steps in common :—(1) to effect the solution of the oxy- hemoglobin of the red corpuscles in the serum or in water, and (2) to effect the crystallization of it from solution either by adding alcohol, or by cold, or by both combined. The forms of the crystals differ in different animals ; the chief forms are given in fiz. 9. Oxy- hemoglobin has the property of giving up a portion of its oxygen on very slight provocation, C.4s5 when treated with easily oxidizable sub- stances, or when sub- mitted to moderate heat in a vacuum. The resulting sub- stance is called re- duced hemoglobin or, shortly, hzemo- globin ; it is capable of reproducing the original oxyhemo- globin on simple ex- posure to oxygen or toair. This property is of the highest im- portance in the func- tion of respiration, as will be explained in the section on the gascs of the blood.

Solutions of oxyhemoglobin of moderate strength have the fine scarlet hue of arterial blood. When interposed between the sun and a spectroscope they cause the absorption of definite portions

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It may be separated from plasma by diluting the 9 plasma freely with water

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at an ice-cold tempera- ture, and passing for a long time a stream of CO, 4 through it; or by adding common salt to plasma until the plasma contains 12 to 16 per cent. of salt the fibrinogen is precipitated in a flaky form. Besides fibrinogen, liquor sanguinis contains another proteid body intimately concerned in the formation of fibrin; this is serwm-globulin or para-globulin. It also may be precipitated from diluted plasma by a stream of CO,; but it may be much more perfectly eliminated by adding magnesium sulphate until the plasma is saturated. It is a body the presence of which greatly facilitates or promotes the develop- ment of fibrin from fibrinogen ; indeed some observers have sup-

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Fig. 10.—1, 2, Spectra of solutions,—1 containing less than 0-01 per cent. and 2 containing 0:37 per cent. of oxyhamoglobin ; 8, spectrum of solution containing about 0°2 per cent. of haemoglobin.

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of the spectrum, and give a characteristic appearance to it. After the solution has been reduced (as it may be very readily by means of an alkaline solution of a ferrous salt, in which precipitation of ferrous hydrate is prevented by the presence of tartaric or citric acid), it assumes a brownish colour and the absorption spectrum becomes changed. The

spectra of oxyhemoglobin and of reduced hemoglobin when the solutions are of moderate strength are given in fig. 10.

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It has been determined that 1 gramme of hemoglobin can link to itself 1°671 cc. of oxygen gas (at 0° C. and 760 mm. pressure) in the above-described loose manner,—that is, in such a manner that when admitted to a vacuous space at a moderate temperature the two become again dissociated. {

When blood or a solution of oxyhemoglobin is shaken up with carbon monoxide, the "dissociable" or "respiratory" oxygen is displaced, and a new compound of CO and hemoglobin is formed which has a spectrum very like that of oxyhemoglobin, but is incapable of reduction by the means which are sufficient to reduce oxyhemoglobin. In like manner (with certain precautions) a com- pound of hemoglobin with NO may be formed. _ ;

Various products of the destructive decomposition of hemoglobin are known, possessing characteristic spectra and properties ; these need not be further described.

Proteid Substances.—Besides oxyhemoglobin, the red corpuscles contain other proteid substances, probably for the most part para- globulin.

Lecithin.

Cholesterin.

Inorganic Salts:—Potassium and phosphates are the main con- stituent ; sodium, calcium, and magnesium are also found as chlorides and sulphates.

Gases. —See halo.

Constituents of the White Corpuscles.

Proteid Substances.—Several varieties have been separated. Lecithin.

Certain extractives, including glycogen.

Inorganic Salts,—Kspecially potassium and phosphates.

The Gases of the Blood.

The blood when admitted into a vacuous space readily gives up more than half its volume of mixed gases, consisting of oxygen, carbon dioxide, and nitrogen. The oxygen is present in much larger quantities than could be held in simple solution by the water of the blood ; it is in fact mainly held in feeble combination by the hemoglobin of the coloured corpuscles ; only a trace of it is, under ordinary circumstances, held in true solution. The carbon dioxide, whilst not existing in larger quantity in blood than would be possible if it were simply dissolved by the water of that fluid, is

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Fig. 11.—Pump for extracting gases of the blood. a, filling-globe; 6, barometer bulb ; d, three-way stopcock (B C D, the same enlarged, A, its plug); e, gas- delivery tube; 7, mercurial gauge; g, drying apparatus, containing sulphuric acid ; , froth-chamber ; 7, bulb in which the blood is boiled.

nevertheless to a small extent in a state of loose chemical combina- tion in which both plasma and corpuscles share. The nitrogen is held in a state of simple solution in the liquor sanguinis. These gases are yielded in

different proportions by arterial and venous blood, as is shown in the following table :—

RESPIRATION

From 100 vols. of Blood.

0. | CO;; N. ATteriellse saa: coro d 22 vols. 85 vols. 1-2 vols. WenOmls), ce sen sac soxcacss 8-12 vols. 40-50 vols. 1-2 vols.

The method of extracting the gases of the blood which has been found to be most convenicnt is one in which the blood is introduced into the Torricellian vacuum existing above the column of mercury in a barometer. Blood is collected over mercury in such a way as to avoid all access of air; it is then introduced by an appropriate mechanism into the space above the barometric mercury. At once the gases froth up and fill the space ; the aqueous vapour which at the same time arises is absorbed by a special drying apparatus com- municating with the vacuum. Means exist of warming the vacu- ous space up to about 45° C., which is a temperature sufficient to cause the escape of nearly all the gases of the blood ; the last por- tions of carbonic acid are, however, more rapidly evolved by allowing a small volume of a thoroughly boiled-out solution of phosphoric acid to enter the blood receptacle near the close of the operation.

How the Gaseous Exchanges are Effected in Respiration.

For the purposes of description, and in reference exclusively to its respiratory function, the blood may be looked upon as a watery solution of certain substances having respectively a slight chemical attraction for oxygen and for carbon dioxide. The chief of these substances is haemoglobin, which is concerned solely with the oxygen ; others, less perfectly known, are concerned with the carbon dioxide, and include certain saline constituents of the plasma (NaHCO,)! and perhaps also certain constituents of the corpuscles. The affinity of these substances for oxygen and carbon dioxide respectively is of so slight a nature that the mere exposure of the substances to a vacuum at a certain moderate temperature is sufficient to overcome the affinity, and dissociate the

captive gases. Granted such a solution in the blood-vessels of the lungs, separated from the air of the air cells by the thin moist membranes of the alveolar walls, how are the gaseous exchanges of respiration brought about? In the first place we must premise certain physical relationships which exist between gases and fluids in contact with one another. If a definite quantity of pure water be exposed to the air it will at a given temperature dissolve a definite volume of air. If the air be compressed to one-half (or one-quarter) of its original bulk the water will still absorb the same volume of it, albeit that volume now contains twice (or four times) the former quantity of gas. If the pressure be diminished again the air will escape from the water exactly in proportion to the diminished pressure. This is a con- crete example of Dalton's law that the quantity ofa gas dissolved by a liquid varies directly as the pressure of the gas at the surface of the liquid. What is true of the air is true of its constituents. In the above example the quantity of the constituent oxygen absorbed after the compression of the air is twice (or four times) the quantity absorbed before compression. But the quantity which is absorbed of any constituent of a gaseous mixture depends, not upon the total pressure exerted on the liquid by all the gases of the mixture in contact with its surface, but by the partial pressure, or fraction of the total pressure, exerted by the constituent in question. To take an ex- ample, let us suppose that a solution of oxygen in water made at a certain definite pressure is exposed to an atmo- sphere of pure nitrogen exerting as great a pressure, or even a greater, on the surface of the liquid ; notwithstand- ing this pressure the oxygen would escape from solution as readily asif the solution had been placed in a perfectly vacuous space. If water be exposed in a certain space of air (which is, roughly, a mixture of nitrogen and oxygen), the oxygen which it is capable of absorbing would be

1 In a vacuum 2HNaCO, splits up into N a,CO; + CO, + H,0.

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equally well absorbed if all the nitrogen were removed from the space and the oxygen alone left to fill it. These remarks are equally true of a liquid separated from a gas by moist membranes. In short, the blood of the pulmonary vessels, regarded as a simple liquid capable of absorbing O

and CO,, and apart from the remarkable chemical bodies contained in it, obeys Dalton's law like any other liquid.

The blood is, however, not a simple fluid, but contains substances having a peculiar affinity for certain of the gases of the atmosphere ; especially does it contain hamo- globin. It has been stated that the "dissociable" or "respiratory" oxygen of oxyhemoglobin is all yielded to a vacuum at the temperature of the body. his yield differs from the yield of a gas simply dissolved in a liquid (which also is perfect in a vacuum) in not proceeding pari passu as the pressure approaches ni/. On the contrary in the case of solutions of hemoglobin, as the oxygen pres- sure is diminished at the surface of the solution, no changes occur in the oxyhemoglobin until the oxygen pressure reaches 25 mm. (about 1 inch) of mercury ; then the oxyhemoglobin yields up_ its respiratory oxygen. If the steps are retraced, and oxygen is gradually read- mitted to exercise pressure upon the hsemoglobin solution, the latter takes up oxygen once more as soon as the oxygen pressure reaches or exceeds 25 mm, of inercury.

We may now consider the actual physical conditions of the blood in the lungs. Venous blood is hurried into the capillaries surrounding the air cells; much of its hemo- globin has been "reduced " (or deprived of its dissociable oxygen), and further it is rich in carbon dioxide, which it has obtained from the active tissues in distant organs. In the alveolar walls it comes into relationship with the air of the alveoli ; probably these are filled with air which never contains less than 10 per cent. of oxygen, and which (in the dog, be it remembered) contains 3:8 per cent. of CoO; at a time when the expired air contains 2-8 per cent. Are these conditions such that, owing to the physical laws described, oxygen must pass into the blood, and carbon dioxide out of it? First, as regards the oxygen, An atmosphere containing 10 per cent. of oxygen implies a partial O-pressure of 76 mm. of mercury (10 per cent. of 760 mm.); as this is far above the dissocia- tion point (25 mm.) of oxyhemoglobin, it is clear that any reduced hemoglobin present would greedily absorb oxygen from such an atmosphere. When the air breathed is much rarefied, the case is different ; the partial O-pres- sure in the alveoli may be so far reduced that the absorp- tion of O by the blood becomes most difficult or impos- sible. As regards the carbon dioxide the matter is not so clear ; but, inasmuch as

air drawn from the depth of the lung by means of a catheter contains (in a dog) 3-8 per cent. of CO,, while at the same time the venous blood of the right side of the heart possesses a CO, tension of approximately the same percentage, we may assume that CO, escapes from the pulmonary capillaries into the alveoli until equilibrium ensues. It is, however, conceivable that the epithelium of the air cells may assist the elimination of CO, from the blood by a process of true excretion independently of the above merely physical considerations.

So-called Internal Respiration.

Venous blood yields up its carbon dioxide and takes up oxygen in the capillaries of the lungs; arterial blood passes to the general capillaries of the tissues and there yields up its oxygen and receives carbon dioxide. To this act, which in its issues is complementary to the inter- changes of pulmonary respiration, the term internal respira- tion, or respiration of the tissues, has been applied. With as much propriety we might speak of internal urination in reference to the nitrogenous effete matters which the tissues

cast into the blood. We are in fact not ina position to form any clear picture of the interchanges which occur between the blood and the tissues other than that which is sketched under Nurririon (vol. xvii. pp. 678-682). Muscle is the tissue whose metabolic processes are most clearly understood. Living muscle yields no oxygen to a vacuum, although it gives up carbon dioxide freely ; there- fore it is presumably itself in a condition to take up oxy- gen from arterial blood and to give up carbon dioxide to it. But the absorption of oxygen is not immediately necessary to the escape, or the formation, of the carbon dioxide, how- ever much it is so in the last instance. In other words, the oxygen passes into the tissue and is at once combined into some intermediate compound which only at a later stage decomposes and yields carbon dioxide. Whenever an organ is active its blood-vessels dilate and permit a more copious flow of blood through it than when it is at rest. In the salivary glands the blood may even pulsate in the veins and look like true arterial blood in colour. After

passing through active muscles the blood contains both more CO, and less O than after passing through resting muscle.

Dyspnoca and Asphyxia.

When the entrance of air to the lungs is entirely pre- vented the phenomena of dyspnoea and asphyxia begin to appear. At first respiration is deeper and more frequent than usual (dyspnoea), the extraordinary muscles being called into play in both inspiration and expiration; the heart beats more quickly at first, but afterwards more slowly ; this is the first stage. It is succeeded by the second stage, in which the violence of respiration is less marked, although the coordination of the act is more irregular ; indeed towards the end of the stage respiratory movements merge in general convulsions of the whole body. Throughout this stage expiration is more marked than inspiration, and the pressure of the blood in the blood- vessels is very great. The third stage is one of exhaustion, which supervenes suddenly, and is marked by loss of con- sciousness, dilated pupils, and absence of the powers of reflex action. The animal seems dead, except that at long intervals feeble inspiratory gasps occur. Finally there comes one great inspiratory effort: the mouth is fixed wide open, the head thrown back, the body arched back- wards, the nostrils dilated, and the pulse after a second or two is indistinguishable (asphyxia). The whole series of events lasts from three to five minutes if the interruption to the entrance of air has been absolute. After death the right side of the heart, with the vessels immediately open- ing into it, viz., the venz cavee and veins of the neck and the pulmonary artery, are engorged with black blood con- taining little or no oxyhemoglobin. The left side of the heart and the systemic arteries are contracted and empty. All these phenomena are best explained by the known power of venous blood to stimulate the nervous centres. As the blood becomes more and more venous it stimulates more powerfully the great nerve-centres of the medulla oblongata. The respiratory centre is stimulated, especially its expiratory portion; and, finally, the whole muscular centres of the spinal system are excited, causing general convulsions. The vaso-motor centre is stimulated, causing the rise of blood pressure in the early stage. The slowing of the heart during the close of the first and second stages is due to stimulation of the vagus cardio-inhibitory centre in the medulla.

Finally the centres become exhausted from the impurity of the blood bathing them, and their activity fails altogether.

Stemulation of the Respiratory Centre.

It remains to ask what property of venous blood confers upon it the power of stimulating nerve centres. Venous

blood differs from arterial blood chiefly in the relative amounts of O and CO, it contains. Which of these substances is it whose deviation from the arterial standard causes stimulation? It so happens that we can experi- mentally separate the two factors. If an animal be placed in a chamber of some inert gas, such as nitrogen, the escape of CO, from the lungs is unimpeded and no accumu- lation of CO, in the blood is brought about ; nevertheless dyspnoea and asphyxia follow as if the entrance of air to the windpipe had been interrupted. Here there is no accumulation of CO, in the blood, but total deficiency of O. On the other hand, if an animal be placed in a chamber containing a large excess of CO, beyond the standard of expired air, but at the same time a superabundant supply of O, no dyspnoea supervenes, and no asphyxia threatens. The animal may suffer from drowsiness (for CO, is narcotic in its effects), but true dyspnoea never occurs so long as the supply of O is sufficient. There is little doubt there- fore that the absence of O from venous blood is the essen- tial condition of its stimulating property.

Diversity of Modes in which the Function is Carried cn.

Respiration, if we assume the essential fact of that process to be the absorption of O and the elimination of CO, by the animal body, is coextensive with the whole

RESTIF, Nicotas Epmxz (1734-1806), called RestrF DE LA BRETONNE (the form Rerir, though occasionally used by the author himself, and adopted by M. Monselet, has the less authority), was born at Sacy in the present department of the Yonne, France, on 23d October 1734. His father was a farmer of not the lowest rank, and the vanity of Restif has

preserved or invented an extraordinary genealogy (supposed to date from his grandfather's time) in which the family is traced to the Roman emperor Pertinax. This Restif did not take very seriously, but he is himself almost the only authority for the details of his own career, which he has voluminously recorded, and these details are in part so incredible, in part so obviously dis- torted by various motives, that it is very hard to do more than discover the general outline of his life. He was well educated—partly if not chiefly by his own devotion to books—he was apprenticed to a printer at Auxerre, and, having served his time, went to Paris. Here he worked as a journeyman printer for some time (indeed he con- tinued his manual work for the greater part of his life), and in 1760 he married Anne or Agnes Lebégue, a relation of his former master at Auxerre. He soon tired of her, and has left the most unfavourable pictures of her morals and temper. In the early years of their married life they were but little together, and for the last twenty they never saw each other; but Restif's own account is sufficient to show that certainly not all, and pro- bably very few, of the faults were on the wife's side. It was not till five or six years after his marriage that Restif, who by his own account had written voluminously from his earliest youth but had published nothing, appeared as an author, and from that time to his death on February 2, 1806, he produced a bewildering multitude of books (amounting to something like two hundred volumes, and many of them printed with his own hand) on almost every conceivable variety of subject. The most noteworthy are Le Pied de Fanchette, a novel (1769); Le Pornographe (same date), a plan for regulating prostitution which is said to have been actually carried out by the emperor Joseph IL, while not a few detached hints have been adopted by Continental nations; Ze Paysan Perverti (1774), a novel in which much of his own experience is worked in;

animal kingdom. It is not, however, in every case served by special air- containing organs or lungs. Indeed the essential interchange of respiration goes on wherever the blood comes into sufficiently close contact with oxygen. For example, the air which happens to be swallowed with our food is so closely in contact with the blood of the intestinal vessels that an interchange of gases occurs, con- stituting a true intestinal

respiration. The J/ammalza all possess true lungs. In birds also there are lungs, but the mechanism of respiration is unlike that of man, since the diaphragm is wanting. There are, in birds, besides lungs, "air sacs" lying among the viscera and communicating with cavities in the bones, these sacs being supplied with air from the lungs. Reptiles and some amphibians breathe by lungs, other amphibians breathe by gills, as also do the young of some of the air-breathing Amphibia (frogs). Fishes breathe by gills, using the O dissolved in water. Many invertebrates respire in air, which is carried into the midst of their tissues in trachee or air-tubes branched like a tree; other invertebrates breathe by gills in water ; others again have lungs. In some the oxygenized water is carried into the body along a series of tubes—the water-vascular system; and in still simpler animals the general surface of the body seems to serve the respiratory function. (awa.)*

La Vie de Mon Pere (1779), a really remarkable monu- ment of filial piety ; Les Contemporaines (42 vols., 1780-85), a vast collection of short stories showing at once Restif's fertility of invention, his narrative faculty, and his accurate observation of the manners of Paris; Ingénue Saxancour, also a novel (1789) ; and, lastly, the extraordinary autobio- graphy of Monsieur Nicolas (16 vols., 1794-97; the last two are practically a separate and much less interesting work), in which at the age of sixty he has set down voluminously his remembrances, his notions on ethical and social points, his hatreds, and above all his numerous or innumerable loves real and fancied. The original editions of these, and indeed of all his books, have long been bibliographical curiosities owing to their rarity, the beautiful and curious illustrations which many of them contain, and the quaint typographic system in which most are composed. The author's life during this long period was a singular mixture of hard work and perpetual falling in love. He seems to have really seen society of the most varied kind, though in this as in all other matters he certainly exaggerates and perhaps invents in a way which makes it impossible to dis- cern the exact truth. Some of his books sold well, and, as has been said, he was always industrious as an author or a printer and sometimes as both. But he had repeated losses, and though never in actual want was never in easy circumstances. He was arrested once during the Revolu- tion but had no difficulty in getting off ; indeed he seems to have been a convinced

republican. In 1795 he received a gratuity of 2000 francs from the Government, and just before his death Napoleon gave him a place in the ministry of police, which he did not live to take up. After his death Cubiéres Palmeaux, a gentleman literary-hack of the day, wrote his life.

Restif de la Bretonne undoubtedly holds a remarkable place in French literature, though the rarity and curious character of his books have sometimes induced his editors and commentators to take too high a view of his merits. He was inordinately vain, of extremely relaxed morals, and perhaps not entirely sane. His books were written with such haste and in such bulk that they can only be praised with great allowance. Their licence of subject and language renders some if not most of them quite unfit for general perusal. But when every deduction is made there will remain on a just estimate the facts that Restif had a singular and profound knowledge of the human heart 'the second title of his Monsieur

Nicolas is Le Ceur Humain Dévoilé), that among his random and often chimerical speculations on social, ethical, and political matters thoughts of extraordinary justness now and then occur, that his observation of manners was keen, and that his narrative faculty, at least in short tales and detached passages, was exception- ally good.

Original editions of Restif are, as has been said, bibliographical curiosities, The works of Ch. Monselet (1853) and P. Lacroix (1875), Assézat's selection from the Contemporaines, with excellent introductions (3 vols., 1875), and the valuable reprint of Afonsieur Nicolas (14 vols., 1883-84), will be sufficient to enable even curious readers to form a judgment of him. The selection from the Contem- poraines preserves Restif's curious printing and spelling.

RESTOUT, Jean (1692-1768), French painter, born at Rouen, March 26, 1692, was the son of Jean Restout, the first of that name, and of Marie M. Jouvenet, sister and pupil of the well-known Jean Jouvenet. Jean Restout's father died young, and his son was placed at Paris with his uncle Jean Jouvenet. In 1717, the Royal Academy having elected him a member on the work which he had executed for the Great Prize, he

remained in Paris, instead of proceeding to Italy, exhibited at all the salons, and filled successively every post of academical distinction. He died on January 1,1768. He left several pupils, none of whom were of great distinction. His works, chiefly of vast size—altarpieces (Louvre Museum), ceilings, designs for Gobelin tapestries—were much engraved by Cochin, Drevet, and others; his diploma picture may still be seen at St Cloud.

RESTOUT, JEAN Bernarp, son of the above, was born at Paris, February 22, 1732, and died in the same city on July 18, 1797. In 1758 he won the Great Prize, and on his return from Italy was received into the Academy ; but his refusal to comply with rules led to a quarrel with that body which alienated him from his profession. Roland brought him into notice by appointing him keeper of the Garde Meuble, but this piece of favour nearly cost him his life during the Terror: he was cast into prison and was only saved from the guillotine by the reaction of Thermidor. The St Bruno painted by him at Rome is in the Louvre.

RETFORD, East, a market town and borough of Nottinghamshire, is situated on the Idle and on the Great Northern and Manchester, Sheffield, and Lincolnshire Railways, 36 miles north-east of Nottingham by rail, and eight south-west of Gainsborough. The church of St Swithin, a large cruciform structure with a square em- battled tower, dates from the 13th century, but was rebuilt in 1658 by a brief granted by Richard Cromwell. Among the modern buildings are the town-hall, the corn exchange, the court-house, and the covered markets. There is a large trade in corn, cheese, and hops, and the town possesses iron foundries, paper and corn mills, and india-rubber works. The population of the municipal borough in 1871 was 3194, but in 1878 the area was extended to 4532 acres, and in 1881 the population was 9748.

The town derives its name from an ancient ford over the Idle. In Domesday it is written Redeford, and early in the 13th century it is called Hste Reddfurthe. It is a borough by prescription, and was granted in 1279 to the burgesses by Edward I. at a fee farm rent of £10, with the right of choosing a bailiff. Its rights were confirmed and extended by Edward III., Henry IV., and James I. It sent two members to parliament in the reign of

Edward I., but the privilege was dormant from 1380 to 1571. The parliamentary borough, which was largely rural, having been extended in 1829 to include the whole wapentake of Bassetlaw, and comprising 207,906 acres in 1881, ceased to exist as a borough in 1885. The municipal borough is divided into threc wards, and is governed by a mayor,-six aldermen, and eighteen councillors.

RETHEL, Atrrep (1816-1859), historical painter, was born at Aix-la-Chapelle in 1816. He very early showed an interest in art, and at the age of thirteen he executed a drawing which procured his admission to the academy of Diisseldorf. Here he studied for several years, and pro- duced, among other works, a figure of St Boniface which attracted much attention. At the age of twenty he removed to Frankfort where he studied under Philip Veit ;

and, having, in common with so many of the German artists of the period, manifested an aptitude for fresco-paint- ing, he was selected to decorate the walls of the imperial hall at Romer with figures of famous men. At the same period he produced a series of designs illustrative of Old Testament history. Four years later he was the successful competitor for the work of ornamenting the restored council house of his native city with frescos depicting prominent events in the career of Charlemagne, but various discussions and delays prevented the execution of this work for some six years. Meanwhile Rethel occupied himself with the production of easel pictures, and of drawings ; and in 1842 he began a most striking and important series of designs dealing with the Crossing of the Alps by Hannibal, in which the weird power which animates his later art becomes first apparent. In 1844 Rethel visited Rome, occupying his time both in study and in production, and executing, along with other subjects, an altarpiece for one of the churches of his native land. In 1846 he returned to Aix, and commenced his Charlemagne frescos, But the strain of production, aggravated by a lack of sympathy, and by vexatious delays and interferences, produced a most injurious effect upon both the health and the spirits of the artist. Symptoms of mental derangement, remotely attri- butable, it is believed, to an accident from which he suffered in childhood, began to manifest themselves in strange and groundless suspicions against his friends and brother artists. While he hovered

between madness and sanity, “ with a mind ”—as Mr Ruskin has said in reference to the very parallel case of William Blake—“disturbed, but not deceived, by its sickness, nay, partly exalted by it,” Rethel produced some of the most striking, individual, and impressive of his works. Strange legends are told of the effect produced by some of his weird subjects. He painted Nemesis pursuing a Murderer—a flat stretch of landscape, with a slaughtered body relieved against the flushing evening sky, while in front is the assassin speeding away into the darkness, clutching his blood-stained knife, thorns and thistles springing up around his path, and above, hover- ing over his head, with unhasting but ceaseless flight, an angel of vengeance, holding an hour-glass from which the last sands are escaping, and a sword which is slowly descending upon the fated head. The picture, so the story goes, was won in a lottery at Frankfort by a personage of high rank, who had been guilty of an undiscovered crime, and the contemplation of lis prize drove him to distraction, and he became a lunatic. Another design which Rethel executed was Death the Avenger, a skeleton appearing at a masked ball, scraping daintily, like a violinist, upon two human bones. The drawing haunted the memory of his artist friends and disturbed their dreams; and, in expia- tion, he produced his pathetic design of Death the Friend, a skeleton draped in long monk’s robes, tolling solemnly the passing bell in a church tower, while beside the open window, lit by the last sunset radiance, sits an old sexton, with the peaceful face of a quiet departure. Rethel also executed a powerful series of drawings—the Dance of Death—suggested by the Belgian insurrections of 1848. It is by such designs as these, executed in a technique founded upon that of Diirer, and animated by an imagina- tion akin to that of the elder master, that Rethel is most widely known. Certainly his fame can rest very securely upon such works as Death the Avenger and Death the Friend,—those “inexpressibly noble and pathetic wood- cut grotesques,” as Mr Ruskin has so justly styled them. Rethel died at Diisseldorf on December 1, 1859.

His picture of Peter and John at the Beautiful Gate of the Temple, is preserved in the Leipsic Museum, and his St Boniface and several of his cartoons for the frescos at Aix in the Berlin

National Gallery. His life by Wolfgang Miiller von Konigswinter has been published. See also Art Journal, November 1865.

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RETZ, Jean Francois PavL DE GONDI, CARDINAL DE (1614-1679), was born at Montmirail in 1614. The family was one of those which had been introduced into France by Catherine de' Medici, but it had acquired great estates in Brittany and had been connected with the noblest houses of the kingdom. It may be added that Retz himself always spelt his designation " Rais," and the spelling is not inconvenient for foreigners. He was the third son, and according to Tallemant des Réaux was made a knight of Malta on the very day of his birth. The death of his second brother, however, destined him for a closer connexion with the church. The family of Retz had military traditions, for the cardinal's father, Philippe Emmanuel, was general of the galleys, and his grandfather Albert was marshal of France. But it had also much church influence, Retz's uncle being archbishop of Paris, and, despite the very unclerical leanings of the future cardinal, which were not corrected by the teachings of St Vincent de Paul, who was his tutor, the intentions of his family never varied respecting him. It was in vain that, as he has recounted with some vanity in his famous memoirs, he flirted, fought duels, and endeavoured in every way to show that he had no vocation. His friends night have some excuse for doubting his aptitude for a more active career despite his vivacious temperament, for by unanimous consent his physical appearance was not that of a soldier. He was short, near-sighted, ugly (though his ugliness had much in common with that of Wilkes), and exceptionally awkward of hand and gesture. Retz, however, despite the little inclination which he felt towards clerical life, was not a man to leave any kind of career to which he had access untried. He entered into the disputes of the Sorbonne with vigour, and when he was scarcely eighteen wrote the remarkable Conjuration de Fiesque, a little historical essay of which he drew the material from the Italian of Mascardi, but which is all his own in the negligent vigour of the style and the audacious insinuation, if nothing more, of revolutionary principles. It is said, though the anecdotes of this time are always suspicious, that Richelieu's verdict after reading the pamphlet was '" voila un homme dangereux." However this

may be, Retz received no preferment of importance during Richeliew's life, and even after the minister's death, though he was presented to Louis XIII. and well received (the king offered him a bishopric), he found a difficulty in attaining the object of his wishes, that is to say, the coadjutorship with reversion of the archbishopric of Paris. But almost immediately after the king's death Anne of Austria appointed him to the coveted post on All Saints' Eve, 1643. Retz, who had according to some accounts already plotted against Richelieu, set himself to work to make the utimost political capital out of his position. His uncle, who was old, indolent, and absurdly proud, had lived in great seclusion; Retz, on the contrary, by assiduously cultivating the parish cwrés and distributing large sums in alms, gradually acquired a very great influ- ence with the populace of the city. This influence he gradually turned against Mazarin —partly from the general dislike which the French nobles had to that low-born adventurer, but partly also, it would appear, because he himself was not in Mazarin's place. No one had more to do than Retz with the outbreak of the Fronde in October 1648, and his history for the next four years is the history of that confused and, as a rule, much misunderstood movement. Of the two parties who, sometinies in union and sometimes at variance with each other, opposed the system of absolute monarchy carried on by an omnipotent minister, Retz could only depend on the bourgeoisie, not on the nobles, and even in the case of the bourgeoisie he had little influence out of Paris. The fact, more-

over, that although he had some speculative tendencies in favour of popular liberties, and even perhaps of re- publicanism, he represented no real political principle, as the parliament of Paris did and as did great nobles like La Rochefoucauld, inevitably weakened his position. His adroitness of intrigue and his boldness in action (which was even shown on the field of battle) served him little in the long run, and when the break up of the Fronde came he was left in the lurch, having more than once in the meanwhile been in no small danger from his own party. One stroke of luck, however, fell to him before his down- fall. He was made cardinal almost by accident, and under a misapprehension on the pope's part. Then, in 1652, he was arrested and imprisoned, first at Vincennes, then at

Nantes ; he escaped, however, after two years' captivity, and for some time wandered about in England and else- where. He made his appearance at Rome more than once, and had no small influence in the election of Alexander VII. He was at last, in 1662, received back again into favour by Louis XIV. and on more than one occasion formally served as envoy to Rome,—commissions which have left abundant records in the shape of official documents. Retz, however, was too shrewd, and perhaps too weary of political intrigue to attempt any interference with the new order of things at home, and he was glad in making his peace to resign his claims to the archbishopric of Paris. The terms were, among other things, his appointment to the rich abbacy of St Denis and his restoration to his other benefices with the payment of arrears. .

The last seventeen years of Retz's life were compara- tively quiet, and were passed partly in -his diplomatic duties (he was again in Rome at the papal election of 1668), partly at Paris, partly at his estate of Commercy, but latterly at St Mihiel in Lorraine. His retirement to this place was made under circumstances which were unusual for the age. His debts were as enormous as his revenues were large, and, as the latter were almost entirely derived from ecclesiastical appointments, his creditors had no remedy. In 1675 he resolved to make over to them all his income except twenty thousand livres, and, as he said, to "live for his creditors." This plan he carried out, though he did not succeed in living very long, for he died at Paris on the 24th August 1679. One of the chief authorities for the last years of Retz is Madame de Sévigné, whose connexion he was by marriage. Great friendship existed between them, and the cardinal was especially devoted to Madame de Grignan, who seems to have treated him with her usual selfish indifference.

Retz and La Rochefoucauld, the greatest of the Frondeurs in literary genius, were personal and political enemies, and each has left a portrait of the other. La Rochefou- cauld's character of the cardinal is on the whole harsh but scarcely unjust, and one of its sentences formulates, though in a manner which has a certain recoil upon the writer, the great defect of Retz's conduct,—" I a suscité les plus grands désordres dans |'état sans avoir un dessein formé de s'en prévaloir." The last two words indicate but too clearly the self-seeking which was the bane of the Fronde

and of the French noblesse generally. But it is perfectly true that no general design of benefiting either himself or his country, or even any party or order in his country, can be traced in Retz's conduct, and that he seems to have kindled the fires of civil war in pure gaiety of heart. He would have been less, and certainly less favourably, remembered if it had not been for his Afemozrs, which, with Madame de Sévigné's notices, give a rather high idea of the amiability of his character at the same time that they confirm its levity, and above all prove his possession of remarkable literary faculty. They were

certainly not written till the last ten years of his life, and they do not go further than the year 1655. They are addressed in the form of narrative to a lady who is not known, though guesses have been made at her identity. In the beginning there are some gaps. They display, in a rather irregular style and with some oddities of dialect and phrase, extraordinary narrative skill and a high degree of ability in that special art of the 17th century—the drawing of verbal portraits or characters. Few things of the kind are superior to the sketch of the early barri- cade of the Fronde in which the writer had so great a share, the hesitations of the court, the bold adventure of the coadjutor himself into the palace, and the final trmmph of the insurgents. Dumas, who has drawn

from this passage one of his very best scenes in Vingt

Ans aprés, has done little but throw Retz into dialogue and amplify his language and incidents. Besides these memoirs and the very striking youthful essay of the Conjuration de Fiesque, Retz has left diplomatic papers,

sermons, Mazarinades, and correspondence in some con-

siderable quantity.

The Memoirs of the Cardinal de Retz were first published in a very imperfect condition in 1717 at Nancy. The first satisfactory

edition was that which appeared in the twenty-fourth volume of

the collection of Michaud and Poujoulat (Paris, 1836). They were then re-edited from the autograph manuscript by Géruzez (Paris, 1844), and by Champollion-Figeac with the Mazarinades, &c. (Paris, 1859). In 1870 a complete edition of the works of Retz was begun by M. Feillet in the collection of Grands Eerivains. The editor dying, this passed into the hands of M. Gourdault and then into those of M. Chantelauze, who had already published studies on the connexion of St Vincent de Paul with the Gond1 family, &c. The edition is still incomplete, and the critical biography of Retz which it may be expected to contain is much wanted. (G. SA.)

REUBEN (13‘8), ‘Pov, ‘PovBir), eldest son of Jacob and of Leah (Gen. xxix. 32). Reuben plays no great part in the patriarchal legend ; in the Elohistic version of the story of Joseph he appears in a somewhat favourable light, but in Gen. xxxv. 22 he is charged with a grave offence, which in Gen. xlix. 4 is given as a reason why the tribe which called him father did not take in Hebrew history the place proper to its seniority. The Reubenites settled east of the Jordan on the Moabite border. In Judges v. they are described as a pastoral tribe which took no share in the patriotic movement under Barak and Deborah. The Moabites soon proved too strong for them (comp. Moas, vol, xvi. p. 534) and overspread their country (comp. Isa, chap. xv. sg. with Josh, xiii. 16 sg.); in Deut. xxxiii. 6 the tribe appears as threatened with extinction. Dathan and Abiram (Num. xvi., Deut. xi. 6), whom the earth swal- lowed up for rebellion against Moses, were Reubenites. After this time only the book of Chronicles has any- thing considerable to relate of the tribe (@hion:¥) Lasg., 18 sq.).

REUCHLIN, Jon (1455-1522), the first great German humanist and the restorer of Hebrew and in large measure also of Greek letters among his countrymen, was born February 22, 1455, at Pforzheim in the Black Forest, where his father was intendant of the Dominican monastery. In the pedantic taste of his time the name was Grecized by his Italian friends into Capnion, a form which Reuchlin himself uses as a sort of transparent mask when he introduces himself as an interlocutor in the De

Verbo Mirifico. Yor his native place Reuchlin always retained an affection ; he constantly writes himself Phorcensis, and in the De Verbo, when he tells how he had sojourned at Paris and almost all the great schools of France and Germany, as well as at several Italian seats of learning and finally at Rome, the "caput studiorum," he does not forget to ascribe to Pforzheim his first disposition to letters. Here he began his Latin studies in the monastery school, and, though in 1470 he was a short time in Freiburg,

that university seems to have taught him little. Reuchlin's career as a scholar appears to have turned almost on an accident; his fine voice gained him a place in the household of the margrave of Baden, and by and by, having already some reputation as a Latinist, he was chosen to accompany to the university of Paris the third son of the prince, a lad some years his junior, who was destined for an ecclesiastical career, This new connexion lasted but a year or so, but it determined the course of Reuchlin's life. He now began to learn Greek, which had been taught in the French capital since 1470, and he also attached himself to the leader of the Paris realists, John a Lapide, a really worthy and learned man, whom he presently followed to the vigorous young university of Basel (1474). At Basel Reuchlin took his master's degree (1477), and began to lecture with success, teaching a more classical Latin than was then common in German schools, and also explaining Aristotle in Greek. His studies in this language had been continued at Basel under Andronicus Contoblacas, and here too he formed the acquaintance of the bookseller Amorbach, for whom he prepared a Latin lexicon (Vocabularius Breviloguus, 1st ed. 1475-76), which did good service in its time and ran through many editions. This first publication and Reuchlin's account of his teaching at Basel in a letter to Cardinal Hadrian, February 1518, show that he had already found the work which in a larger sphere occupied his whole life. He was no original genius, but a born teacher. He had neither brilliant literary power like Erasmus nor epoch-making ideas like Luther, but he was the great master of all Germany, guiding his countrymen to sound learning, first in Latin and then in Greek and in Hebrew. But this work of teaching was not to be done mainly from the

professor's chair. Reuchlin soon left Basel to seek further Greek training with George Hieronymus at Paris, and learn to write a fair Greek hand that he might support himself by copying MSS. And now he felt that he must choose a profession. His choice fell on law, and he was thus led to the great school of Orleans (1478), and finally to Poitiers, where he became licentiate in July 1481, and so could look forward to honourable office in his native country, where he could pursue his scholarly tastes in an independent position, From Poitiers Reuchlin came in December 1481 to Tiibingen. There he found friends to recommend him to Count Eberhard of Wiirtemberg, who was about to journey to Italy and required an interpreter. Reuchlin was selected, and in February 1482 left Stuttgart for Florence and Rome. The journey lasted but a few months, but it brought the German scholar into contact with several learned Italians, and his connexion with the count became permanent. On his return to Stuttgart he was named Geheimrath, and soon after he became doctor of laws and assessor in the high court. About this time he appears to have married, but little is known of his married life. He left no children; but in later years his sister's grandson Melanchthon was almost as a son to him till the Reformation estranged them. Reuchlin's life at Stuttgart was often broken by important missions, and in 1490 he was again in Italy. Here he saw Pico, to whose Cabbalistic doctrines he afterwards became heir, and also made the friendship of the pope's privy secretary, Questemberg, which was of service to him in his later troubles. Again in 1492 he was employed on an embassy to the emperor at Linz, and here he began to read Hebrew with the kaiser's Jewish physician Loans. He knew something of this language before, but Loans's instruction laid the basis of that thorough knowledge which he afterwards improved on his third visit to Rome in 1498 by the instruction of Obadiah Sforno of Cesena. XX. — 62

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In 1496 Count Eberhard died, and enemies of Reuchlin had the ear of the new prince. He was glad therefore hastily to follow the invitation of John of Dalburg the scholarly bishop of Worms, and flee to Heidelberg, which was then the seat of the '" Rhenish Society," a lively and active circle of humanists under Dalburg's presidency, equally zealous in the service of

Apollo and Bacchus. In this court of letters Reuchlin's appointed function was to make translations from the Greek authors, in which his reading was already extremely wide. Many of these versions were never printed, but a considerable number of pieces were given to the press at intervals down to the year 1519, and formed an important element in his efforts to spread a knowledge of Greek. For, though Reuchlin had no public office as teacher, and even at Heidelberg was prevented from lecturing openly, he was during a great part of his life the real centre of all Greek teaching as well as of all Hebrew teaching in Germany. No young man of promise who came to him for help was rejected ; he taught many and found teachers for others, or gave direction and solution of difficulties to more advanced scholars. Thus he was a sort of unofficial general director of the studies of Germany, and to carry out this work he found it necessary to provide a series of helps for beginners and others. He never published a Greek grammar, though he had one in MS. for use with his pupils, but he put out several little elemen- tary Greek books; and these with the series of transla- tions were in fact the text books of the German youth. Reuchlin, it may be noted, pronounced Greek as his native teachers had taught him to do, 7.¢., in the modern Greek fashion. This pronunciation, which he defends in Dza- logus de Recta Lat. Grecique Serm. Pron., 1519, came to be known, in contrast to that used by Erasmus, as the Reuchlinian.

At Heidelberg Reuchlin had many private pupils, among whom Franz von Sickingen is the best known name ; and all his relations, except with the monks who stopped his attempt to lecture on Hebrew, were very pleasant. With the monks he had never been well; at Stuttgart also his great enemy was the Augustinian Holzinger. On this man he took a scholar's revenge in his first Latin comedy Sergius, a satire on worthless monks and false relics which his young Heidelberg friends were eager to act. But, Dalburg thinking this unsafe, he wrote for them a new piece, Scenica Progymnasmata or Henno, based on the old French play of Maitre Pathelin, which is not without humour and sparkle of language, and much better constructed than the French piece.

Through Dalburg, Reuchlin came into contact with Philip of the Pfalz, who employed him to direct his son's studies, and in 1498 gave him the

mission to Rome which has been already noticed as fruitful for Reuchlin's progress in Hebrew. He came back laden with Hebrew books, and found when he reached Heidelberg that a change of Government had opened the way for his return to Stuttgart. His wife had remained there all along; so that we may assume that he never looked on his exile as more than temporary. His friends were the party of order and good government, who could not long remain powerless. They had now again the upper hand, and knew Reuchlin's value. In 1500, or perhaps in 1502, he was named "triumvir of Swabia," a very high judicial office in the Swabian League, which he held till 1512, when he retired to a small estate near Stuttgart. By this time the long conflict which gives Reuchlin's life its chief interest had already begun.

For many years Reuchlin had been increasingly absorbed in Hebrew studies, which had for him more than a mere philological interest. Though he was always a

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good Catholic, and even took the habit of an Augustinian monk when he felt that his death was near, he was too thorough a humanist to be a blind Catholic. He knew the abuses of monkish religion, and was interested in the reform of preaching (De Arte Predicandi, 1503—a book which became a sort of preacher's manual); but above all as a scholar he was eager that the Bible should be better known, and could not tie himself to the authority of the Vulgate. To him the Old Testament Scriptures meant the Hebrew text, and this he was determined to study with an independent love for truth: "I honour St Jerome as an angel; I value Lira as a master; but I worship truth as my God." The key to the //ebrea veritas was the grammatical and exegetical tradition of the medieval rabbins, especially of Kimhi, and when he had mastered this himself he was resolved to open it to others. In 1506 appeared his Rudimenta Hebraica—grammar and lexicon—mainly after Kimhi, yet not a mere copy of one man's teaching. The edition was costly and sold slowly. In 1510 he was glad to offer Amorbach seven hundred and fifty copies at the reduced price of a florin for three copies. Even then Amorbach could hardly find purchasers, but Reuchlin bade him be patient, "for if I hve Hebrew must with God's help

come to the front." One great difficulty was that the wars of Maximilian in Italy pre- vented Hebrew Bibles coming into Germany. But for this also Reuchlin found help by printing the Penitential Psalms with grammatical explanations (1512), and other helps followed from time to time. But Reuchlin had yet another interest in Hebrew letters. His Greek studies had interested him in philosophy, and not least in those fantastical and mystical systems of later times with which the Cabbala has no small affinity. Following Pico, he seemed to find in the Cabbala a profound theosophy which might be of the greatest service for the defence of Christianity and the reconciliation of science with the mysteries of faith—an unhappy delusion indeed, but one not surprising in that strange time of ferment, when the old and the new intellectual life had not yet clearly dis- criminated themselves, and when men of progress sought less to free themselves from mere tradition than to find an ancient tradition of truth which had been lost in the darkness of medieval ignorance. Reuchlin's mystico- cabbalistic ideas and objects were expounded in the De Verbo Mirifico, 1494, and finally in the De Arte Cabba- listica, 1517. We see therefore that not only the philo- logical tradition but the most esoteric wisdom of the rabbins was in his eyes of the greatest value.

Unhappily many of his contemporaries held other views, and thought that the first step to the conversion of the Jews was to conquer their obstinacy by taking from them their books. This view had for its chief advocate the bigoted John Pfefferkorn, himself a baptized Hebrew. Pfefferkorn's plans were backed by the Dominicans of Cologne ; and in 1509 he got from the emperor authority to confiscate all Jewish books directed against the Christian faith. Armed with this mandate, he visited Stuttgart and asked Reuchlin's help as a jurist and expert in putting it into execution. Reuchlin evaded this demand, mainly because the mandate lacked certain formalities, but he could not long remain neutral. The execution of Pfeffer- korn's schemes led to difficulties and to a new appeal to Maximilian. It was resolved to call in the opinion of experts, and in 1510 Reuchlin was summoned in the name of the emperor to give his formal opinion on the suppres- sion of the Jewish books. His answer is dated from Stuttgart, November 6, 1510; in it he divides the books into six classes—apart from the Bible which no one pro- posed to destroy—and,

going through each class, he shows that the books openly insulting to Christianity are very

few and viewed as worthless by most Jews themselves, while the others are either works necessary to the Jewish worship, which was licensed by papal as well as imperial law, or contain matter of value and scholarly interest which ought not to be sacrificed because they are con- nected with another faith than that of the Christians. Instead of destroying a whole literature, which was what Pfefferkorn proposed, he proposed that the emperor should decree that for ten years there be two Hebrew chairs at every German university for which the Jews should furnish books. The other experts and all the universities consulted, except Heidelberg, proposed that all books except Bibles should be taken from the Jews to be investi- gated by a commission ; and, as the emperor still hesitated, the bigots threw on Reuchlin the whole blame of their ill success. Pfefferkorn circulated at the Frankfort fair of 1511 a gross libel (the Handspiegel) declaring that Reuchlin had been bribed; and Reuchlin, burning with the indigation of a man of unsullied integrity, retorted as warmly in the Augenspiegel (1511). His adversary's next move was to declare the Augensmegel a dangerous book ; the Cologne faculty, with their dean the grand inquisitor Hochstraten, took up this cry, and, encouraged perhaps by some signs of timidity in letters from Reuchlin to two of the Cologne theologians, they called on him to recant not a few dangerous utterances and misapplications of Scripture. Reuchlin was timid, but he was honesty itself. He was willing to receive corrections in theology, which was not his subject, but he could not unsay what he had said; and as his enemies tried to press him into a corner he at length turned and met them with open defiance in a Defensio contra Calumniatores, 1513. The universities were now appealed to for opinions, and were all against Reuchlin. Even Paris (August 1514) condemned the Augenspiegel, and called on Reuchlin to recant. Meantime a formal process had begun at Mainz before the grand inquisitor, but Reuchlin by an appeal succeeded in trans- ferring the question to Rome. It is needless to follow the long windings of ecclesiastical process; judgment was not finally given till July 1516 ; and then, though the decision was really for Reuchlin, the trial was simply

quashed, The result had cost Reuchlin years of trouble and no small part of his modest fortune, but it was worth the sacrifice. For far above the direct importance of the issue was the great stirring of public opinion which had gone forward. All who loved learning and progress were banded together as they had never been before against the bigots and the stupid universities; and all humanists felt that the victory was theirs. And if the obscurantists escaped easily at Rome, with only a half condemnation, they received a crushing blow in Germany. No party could survive the ridicule that was poured on them in the Epistole Obscurorum Virorum. Reuchlin did not long enjoy his victory in peace. In 1519 Stuttgart was visited by famine, civil war, and pestilence. From November of this year to the spring of 1521 the veteran statesman, whom the universal respect felt for his scholarship could not secure against the dangers involved in his political relations, sought refuge in Ingolstadt and taught there for a year as professor of Greek and Hebrew. It was forty-one years since at Poitiers he had last spoken from a public chair; but the old man of sixty-five had not lost his gift of teaching, and hundreds of scholars crowded round him. This gleam of autumn sunshine was again broken by the plague ; but now he was called to Tiibingen and again spent the winter of 1521-22 teaching in his own system- atic solid way. But he was now in shaken health; in the spring he found it necessary to visit the baths of Liebenzell, and here he was seized with jaundice, of which he died 30th June 1522, leaving in the history of the new learning

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a name only second to that of his younger contemporary Erasmus.

The authorities for Reuchlin's life are enumerated in L. Geiger, Johann Reuchlin, 1871, which is the standard biography. 'The controversy about the books of the Jews is well sketched by Strauss, Ulrich von Hutten. Some interesting details about Reuchlin are given in the autobiography of PELLICANUS (q.v.), which was not published when Geiger's book appeared. (W. R. S$.)

REUNION, formerly Bourzon, an island in the Indian Ocean, belonging to France and considered one of her more important colonies. St Denis, the capital, stands on the north side in 20° 51'S. lat. and 53° 9' E. long.

Physi- cally it may be described as the southmost subaerial summit of the great submarine ridge which, running north-east by Mauritius, Albatross Island, &c., and curving round by the Seychelles, connects with the platform of Mada- gascar at its north-eastern extremity. The great submarine valley which is thus enclosed between Madagascar and the Mascarene-Seychelles ridge has a depth of from 2000 to 2400 fathoms. In a straight line Réunion lies 115 miles from the east coast of Madagascar; and Mauritius, with which it communicates by optic signalling since 1882, is 115 miles to the north-east. The island has an area of 721,314 acres or 1127 square miles. It is usual to regard it as divided into a windward and a leeward district by a line, practically the watershed, running in the direction of the greater axis. The whole island is the result of a

Island of Réunion.

double volcanic action. First there arose from the sea a mountain whose summit is approximately represented by Piton des Neiges (10,069 feet), and at a later date another crater opened towards the east, which, piling up the mountain mass of Le Volcan, turned what was till then a circle into an ellipse 44 miles by 31. In the older upheaval the most striking features are now three areas of subsidence—the cirques of Salazie, Riviere des Galets, and Cilaos—which lie north-west and south of the Piton des Neiges and form the gathering grounds respectively of the Riviere du Mat, the Riviére des Galets, and the Riviére de St Etienne. The first, which may be taken as typical, is surrounded by high almost perpendicular walls of basaltic lava, and its surface is rendered irregular by hills and hillocks of debris fallen from the heights. Towards the south lies the vast stratum of rocks (150 to 200 feet deep) which, on the 26th November 1875, suddenly sweeping down from the Piton des Neiges and the Gros Morne, buried the little village of Grand Sable and nearly a hundred of its in- habitants. A considerable piece of ground, with its trees,

crops, and houses practically intact, along with the pro- prietor, who was seated at his own door, was carried a distance of nearly 14 miles. Along the whole eastern side of the cirque between the village of Salazie and

Hellbourg is a series of waterfalls issuing at a great height from above a vast bank of lava. They are probably the overflow of a subterranean basin connected, it may be, with the sources, on the other side of the wall, of the Rivi¢re du Bras de Caverne. At the source of the Riviere du Mat, which escapes from the cirque by a narrow and precipitous gorge, is a magnificent sheaf of basaltic columns boldly curving out over the bed of the torrent. Having climbed up the eastern side of the cirque, the traveller reaches the well-wooded plain of the Salazes ; farther east, and separated from it by ridges of rock is the Plaine des Caffres at a height of 5250 feet above the sea, and by a descent of 1500 feet this dips north-eastward into the Plaine des Palmistes. The eastern summit or Piton de Fournaise is cut off from the rest of the island by two curious enclosures, each about 500 or 600 feet deep. The traveller approaching the present craters from the west has consequently to descend upwards of 1000 feet by two abrupt stages before he begins the ascent of the cones. The outer "enclosure" runs across the island in a north and south direction; but the inner forms a rude kind of parabola with its arms (Rempart du Tremblet on the south and Rempart du Bois Blanc on the north) stretching eastwards to the sea and embracing not only the volcano proper but also the great eastward slope known as the Grand Brfilé. There are two principal craters, each on an elevated cone,—the more westerly, now extinct, known as the Bory Crater after Bory de St Vincent, the eminent geologist, and the more easterly, simply called the Burning Crater or Fournaise. The latter is partially surrounded by an "enclosure" on a small scale with precipices 200 feet high. Eruptions, though not in- frequent (thirty were registered between 1735 and 1860) are seldom serious; the more noteworthy are those of 1745, 1778, 1791, 1812, 1860, 1870, 1881. Basaltic or vitreous lavas rich in chrysolite are the usual products, and it is hardly possible to conceive of a discharge sufficient in volume to overflow the "ramparts" and carry destruction to the rest of the island! Besides the Piton des Neiges (10,069 feet high), the Bory Peak (8612 feet), and the Burn- ing Peak (8294), the principal summits in Réunion are the Grand Bénard (9490), Morne L'Angevin (7845), and Cim- andef (7300). The streams which radiate out in all direc- tions from the central highlands are for the most part com- paratively small except during the rainy season, when they become impetuous and destructive torrents. Hot mineral springs are found in various parts of the island: the Source de Salazie (discovered in

1831) lies 2860 feet above sea- level, has a temperature of 90°, and discharges 200 to 220 gallons per hour of water impregnated with bicarbonate of soda, and carbonates of magnesium and lime, iron, &c.; that of Cilaos (discovered in 1826) is 3650 feet above the sea with a temperature of 100°; and that of Mafate 2238 feet and 87°. At the first there are a military hospital and a group of dwelling houses and villas.

‘ Vertically Réunion may be divided into five zones. The first or maritime zone contains all the towns and most of the villages, built on the limited areas of level alluviumoccurring at intervals round the coast (128 miles). In the second, which lies between 2600 and 4000 feet, the sugar planta-

1 The geology and volcanoes of Réunion were the object of elaborate study by Bory de St Vincent in 1801 and 1802 (Voyages dans les quatre principales tles des Mers d’ Afrique, Paris, 1804), and have recently been examined by Drasche (see Bericht K.~~K. Geol. Reich~~ sanstalt, Vienna, 1875-76) and Velain (thesis presented to the Faculté des Sciences, Paris, 1878).

tions make a green belt round the island and country houses abound. ‘The third zone is that of the forests ; the fourth that of the plateaus, where European vegetables can be cultivated ; and above this extends the region of the mountains, which occupies more space than any of the others.

The following statements in regard to climate refer more particu- Climate.

larly to the lower zones. The year divides into two seasons—that of heat and rain from November to April, that of dry and more bracing weather from May to October.

According to observations taken at St Denis between 1863 and 1870, and reduced to sea-level, the mean monthly temperature varies as follows:— January, 80°°36; February, 80°°36; March, 80°-12; April, 78°62; May, 75°°30; June, 72°53; July, 71°‘22; August, 70°°59; September, 71°°6; October, 73°°43 ; November, 76°62; December, 78°°92; and the rainfall

was distributed thus :— January, 8‘2 inches; February, 10°9; March, 5°17; April, 4°78 ; May 2°9; June, 6:1; July, 0°27; August, 1°7; September, 0°80 ; October, 1°67; November, 8°09; December, 5°25; making an annual average of 45°57 inches, falling in 79°7 days. The prevailing winds are from the south-east, sometimes veering round to the south, and more frequently to the north-east ; the west winds are not so steady (three hundred and seven days of east to fifty-cight of west in the course of the year). Itis seldom calm during the day, but there is usually a period of complete repose before the land wind begins in the evening. Several years sometimes pass without a cyclone visiting the island ; at other times they occur more than once in a single “winter.” From April till Octobcr there is little fear of them. That of March 1879 was particularly destructive. The raz de marée occasionally does great damage. On the leeward side of the island the temperature is higher than at St Denis. The winds are generally from the west and south-west, and bring little rain. Mist hangs almost all day on the tops of the mountains, but usually clears off at night. The mean annual temperature at Salazie is 66° and at the Plaine des Palmistes 61°-7.

The fauna of Réunion is not very rich in variety of species ; it Animals.

lies midway between the Indian and the African type. The mam- mals are a brown maki (Lemur mongoz, Linn.) from Madagascar, Pteropus edwardsti now nearly extinct, several bats, a wild cat, the tang or tamec (Centetes setosus, Denn.), several rats, the hare, and the goat. Among the more familiar birds are the “oiseau de la vierge” (Muscipeta borbonica), the tec-tec (Pratincola sybilla), Certhia borbonica, the cardinal (Foudia madagascariensis), various swallows, ducks, &c. The visitants from Madagascar, Mauritius, and even India, are very numerous. Lizards and frogs of more than one species are common, but there is only one snake known in the island. Various species of Gobius, a native species of mullet, Nestis cyprinoides, Osphronamus olfax, and Doules rupestris are ainong the freshwater fishes.

In the forest region of the island there is a belt, 4500-5000 feet Vegeta- above the sea, characterized by the prevalence of Bambusa alpina ; tion.

and above that is a similar belt of Acacia heterophylla. Besides this last the best timber-trees are Casuarina laterifolia, Fotida mauritiana, Imbricaria petiolaris, Elwodendron orientale, Calo- phyllum spurium (red tacamahac), Terminalia borbonica, Parkia speciosa. The gardens of the coast districts display a marvellous wealth of flowers and shrubs, partly indigenous and largely gathered from all parts of the world. Fruits grown in the island are—the banana, the cocoa-nut, bread-fruit, and jack-fruit, the bilimbi, the carambola, the guava, the litchi, the Japanese medlar, the mango- steen, the tamarind, the Abelmoschus esculentus, the chirimoya, the papaya, &c.

Sugar, introduced in 1711 by Pierre Parat, is now the staple crop In- in Réunion, a greater proportion of the soil being devoted to it dustries.

than to all other objects of cultivation. The methods employed in growing and manufacturing are not up to the Mauritius standard, and since 1878 the ravages of the phylloxera have ruined many of the plantations. In the 18th century the first place belonged to coflee (introduced from Arabia in 1715) and to the clove tree, brought from the Dutch Indies by Poivre at the risk of his life. Both are now cultivated on a very limited scale. Vanilla, intro- duced in 1818, though it occupies only about 1500 acres, some- times produces acrop worth from £40,000 to £65,000. The average produce of the sugar crop in the five years 1873-77 was 35,493 tons of sugar with 777,710 gallons of syrup and treacle ; from 1878 to 1883 the averages were 35,580 tons (40,176 in 1883) and 816,455 gallons, Rum is largely distilled, and is the favourite drink of all classes.

While potatoes, beans, manioc, sweet potatoes, and yams of Imports.

local growth furnish a considerable amount of food, the far more important article rice has to be imported from.India and Madagascar. India also sends castor-oil, wheat, and lard ; Australia, flour and wheat ; England, coals; the Cape and Muscat, salt fish ; Buenos Ayres and Montevideo, mules and horses; the United States petroleum (largely used throughout the island), lard, pork, and pitch-pine.

Harbour.

Aailway.

Com- munes.

Popula- i tion.

‘of 18,000 since 1837.

RE U—

The complete absence of natural harbours has all along been a great hindrance to the commercial development of Réunion. Whenever a storm is observed to be brewing an alarm gun is fired, and the vessels in the roadstcads make off from the dangerous coast. Since 1848 an artificial harbour capable of containing forty vessels has been constructed at Pointe des Galets at the north- west corner of the island. The port is connected by rail with La Possession on the one hand and with the Riviére des Galets on the other, and thus communicates with the railway which was com- pleted in 1881 round the coast from St Picrre, by St Paul, St Denis, &c., to St Benoit, a distance of 83} miles. This line is carried through a tunnel nearly 64 miles long between La Possession and St Denis.

The windward arrondissement or division of Réunion comprises the eight communes of St Denis, Ste Marie, Ste Suzanne, St André, St Benoit, Salazie, Ste Rose, and Plaine des Palmistes; and the leeward division the six communes of St Paul, St Leu, St Louis, St Pierre, St Joseph, and St Philippe. St Denis, the capital of the island, lies on the north coast. Itis built in the form of an amphitheatre and presents a most attractive appearance from the sea, Covering as a commune an area of 37,065 acres, it has a population of 30,835 according to the census of 1881, an increase It has an abundant supply of pure water. Though the harbour is only an open roadstead, it has hitherto been the most frequented in the island. St Pierre, the chief town of the leeward arrondissement, has a communal area of 98,190 acres and a population of 27,748. Its artificial harbour, commenced in 1854 but afterwards interrupted, and resumed in 1881, has room for five or six vessels besides coasting craft.

The population was 185,179 in 1872, 183,529 in 1878, and 170,734 in 1882. The males are largely in excess of the females (97,961 to 72,773 in 1882), owing to the number of agricultural labourers introduced from abroad for a term of years. Among the whites born on the island an infusion of alien blood is so com- mon that in Mauritius the phrase Bourbon white is applied to linen of doubtful cleanness; the original settlers frequently married Malagasy wives. The name Petits Blancs is in Réunion given to a class of small farmers who lead an independent kind of life in the upper districts, supporting themselves by their garden-plots and hunting. By the beginning of the 18th century the number of Negro slaves in the island was 64,000, four times that of their masters ; they were all (to the number of 20,000) emancipated in 1848, and have gradually acquired a large measure of social equality with the creoles. Various elements have been added to the popu- lation since the middle of the century—coolies from India in large numbers, Africans from the east coast, Chinese and Anamites, Malays, &c. The immigration of the Indian coolies is controlled by a convention between the British and French Governments of date July 1, 1881.

Réunion is usually said to have been first discovered in April 1518 by Mascarenhas, whose name is still applied to the archipelago of which it forms a part; but it scems probable that it must be identified with the island of Santa Apollonia discovered by Diego Fernandes Pereira on February 9, 1507. When in 1638 the island was taken possession of by Captain Gaubert or Gobert of Dieppe, it was still uninhabited ; a more formal annexation in the name of Louis XIII. was effected in 1643 by Pronis, agent of the "Compagnie des Indes" in Madagascar; and in 1649 Flacourt, Pronis's more emi- nent successor, repeated the ceremony at La Possession, and changed the name from Mascarenhas to Bourbon. By decree of the Con- vention in 1798, Bourbon in turn gave place to Réunion, and, though during the empire this was discarded in favour of fle Bonaparte, and at the Restoration people naturally went back to Bourbon, it has remained the official designation since 1848. Between July 8, 1810, and April 6, 1815, the island was in the possession of England. It is now practically almost a department of France, sends a representative to the chamber of deputies, is governed by means of laws and not of decrees, and possesses a council-general and municipal

councils elected by universal suf- frage. In the general budget for 1881 the expenditure amounted to 6,866,272 francs, including 1,916,143 contributed by the home Government; in 1888 the total was 7,468,426, npwards of 3,420,000 being for communal expenses.

See, besides the works already mentioned, Demanet, Nouv. hist. de VAfrique Frangaise, 1767; 'Thomas, Essai de statistique de Vile Bourbon, 1828; Dejean de la Batie, Wotice sur l'tle Bourbon, 1847; J. Mauran, Impressions dans un voy. de Parts & Bourbon, 1850; Maillard, Notes sur ile de la Réunion, 1862; Azéma, Hist. de Vile Bourbon, 1862; Roussin, Album de Vile de la Réunion, 1867-69, and 1879; an claborate article in Encyclopédie des Sciences Meédicales ; Bionne, 'La

Réunion," in Exploration, 1879. Most maps are based on Maillard's; one by Paul Lepervanche in four sheets was published in 1885 by Dufrenoy. (H.A. W.)

REUS, a town of Spain, in the province of Tarragona, is situated at the foot of a chain of hills in a fertile plain about four miles from the sea. It is connected by rail

with Tarragona, 94 miles to the east, and with Lerida,

541 miles to the north-west. It consists of two parts, the old and the new, separated by the boulevard-like Calle

Arrabal, which occupies the site of the old wall, some vestiges of which still remain: the old town centres in the Plaza del Mercado, from which narrow and tortuous lanes radiate in various directions; the new dates from about the middle of the 18th century, and its streets are wide and straight. The public buildings have no special archi- tectural or historical interest, but the view from the tower of the church of San Pedro is exceptionally fine. Réus, next to Barcelona itself, is the most flourishing manufac- turing centre in Catalonia, the staples being silk and cotton ; imitations of French wines are also extensively made, and the miscellaneous industries include tanning, distilling, and the like. The

cotton factories exceed eighty in number, and one of them employs upwards of six hundred hands. Most of the traffic of Réus passes through the comparatively sheltered port of Salou, four miles distant. The population of Réus in 1877 was

27,595.

The earliest records of Réus date from about the middle of the 18th century. Its modern prosperity is traced to about the year 1750, when a colony of English settled there and established a trade in woollens, leather, wine, and spirits. The principal incidents in its political history arose out of the occurrences of 1843, in con-

nexion with which the "villa" became a "ciudad" and Generals Zurbano and Prim each received the title of count of Réus.

REUSS is the name of two small sovereign principali- ties of the German empire, with a joint area of 440 square miles, forming part of the complex of Thuringian states, and consisting, roughly speaking, of two principal masses of territory, separated by the Neustadt district of the duchy of Saxe-Weimar. The more southerly and much the larger of the two portions belongs to the bleak moun- tainous region of the Frankenwald and the Voigtland, while the northern portion is hilly but fertile. The chief rivers are the Elster and Saale. About 37 per cent. of the total surface is occupied by forests, while 40 per cent. is under tillage and 19 per cent. in meadow and pasture. Since 1616 the lands of Reuss have been divided between an elder and a younger line (Reuss dlterer Linie and Reuss jiingerer Linie) of the ancient princely house. The male members of both branches of the family all bear the name of Henry (Heinrich), the individuals being distinguished by numerals. In the older line the enumeration begins again when the number one hundred is reached, while in the younger house it opens and closes with the century. Thus the reigning prince of Reuss jiingerer Linie, born in 1832, is styled Henry XIV., and he succeeded his father Henry LXVII., born in 1789. The princes of Reuss are very wealthy, and their private domains comprise great part of the territory over which they rule. In the event of the extinction of either line, its possessions fall to the other. The troops of

Reuss furnish a few companies to the seventh regiment of Thuringian infantry.

ReEvss-GREIZ, or REUSS ALTERER LINIE, with an area of 122 square miles, belongs to the larger of the two main divisions above mentioned, within which it consists of three large and several smaller parcels of land, bordering on Saxony, Reuss jiingerer Linie, Schwarzburg-Rudolstadt, and the Prussian exclave of Ranis. The soil is on the whole little favourable for agriculture, but cattle-rearing is carried on with some success. No less than 63 per cent. of the inhabitants are supported by industrial pursuits, the chief products of which are the woollen fabrics of Greiz, the capital, and the stockings of Zeulen- roda, both largely exported. The population of the prin- cipality in 1880 was 50,782, of whom only 450 were Roman Catholics and 60 Jews. The constitution of Reuss-Greiz dates from 1867, and provides for a repre- sentative chamber of twelve members, of whom three are appointed by the prince, while two are elected by the nobles, three by the towns, and four by the rural districts.

The revenue and expenditure for 1885 were each estimated at £36,254, while the public debt in 1884 was £46,886.

Revss-ScHLe1z, or REUSS JUNGERER LInIE, with an area of 318 square miles, includes part of the southern and the whole of the northern of the two main divisions above indicated, touching Bavaria on the south and Prussian Saxony on the north. The former portion is known as the Oberland, the latter as the Unterland. Owing to the fertility of the Unterland, agriculture is carried on here with greater success than in Reuss-Greiz, fully one quarter of the population being supported by tillage and cattle- breeding. The industrial activity is, however, also large, supporting one-half of the population. The principal pro- duct consists, as in Reuss-Greiz, of woollen goods, and the manufacture centres in the capital, Gera, a busy town with 27,118 inhabitants. A considerable trade is carried on in the products of the manufactories, and in timber, cattle, and slate. The iron mining of the Oberland is limited by the want of sufficient railway communication. Large quantities of salt are yielded by the brine springs of Heinrichshall. In 1880 Reuss-Schleiz contained 101,330 inhabitants, including 442 Roman Catholics and 69 Jews. The annual revenue and expenditure for 1885-1886 were calculated at £66,060; the public debt in 1884 was £61,780.

The history of Reuss stretches back to the times when the Ger- man emperors appointed voigts, or bailiffs, to represent them in lands conquered froin the Sorbs or other Slavonic races. The forefathers of the present princes of Reuss appear in this capacity at an early period, and the historical head of the family is generally recognized in Henry, voigt of Weida, who flourished about the middle of the 12th century. The name of Reuss came to be applied to the territory ruled over by his descendants from the sobriquet of "Der Russe," or the Russian, which one of them acquired about 1280 from the nationality of his mother. The district embraced by the name was at one time much more extensive than at present, taking in the Bavarian town of Hof and the whole of the Saxon Voigtland. Of the numerous lines and sub-lines into which the family was divided nearly all became sooner or later extinct, till in 1616 none were left except the two that still subsist. Since 1616 numerous subdivisions have again taken place within these families, and it was not till 1848 that Reuss jiingerer Linie became again a united whole. The rulers of Reuss were created counts of the German empire in 1671 and sovereign princes

in 1778. In 1807 both principalities joined the Confederation of the Rhine, and in 1866 Reuss-Greiz had to atone for its active sympathy with Austria by the payment of afine. Since 1871 both principalities have been members of the German empire, each sending one member to the fedcral council and one representative to the Reichstag.

REUTER, Frirz (1810-1874), the greatest writer in Platt Deutsch, was born on the 7th November 1810, at Stavenhagen, in Mecklenburg-Schwerin, a small country town which had few means of communication with the rest of the world. His father was burgomaster and sheriff (Stadtrichter), and in addition to his official duties carried on the work of a farmer. Until his fourteenth year Reuter was educated at home by private tutors. He was then sent to the gymnasium at Friedland, in Mecklenburg- Strelitz, and afterwards he passed through the higher classes of the gymnasium at Parchim. He had a con- siderable talent for drawing, and wished to become an artist; but, as his father decided that he should be a lawyer, he began in 1831 to attend lectures on juris-prudence at the university of Rostock. In the following year he went to the university of Jena. The German Governments, alarmed by the revolutionary agitation of 1830, were on the alert to detect symptoms of popular discontent ; and a formidable riot at Frankfort in 1833 gave them an excuse for treating the universities with great harshness. Reuter, as a member of the Burschen- schaft " Germania" at Jena, was arrested by the Prussian Government ; and, although the only charge which could be proved against him was that he had been seen wearing the German colours, he was condemned to death for high

treason. This monstrous sentence was commuted by King Frederick William ITI. of Prussia to imprisonment for thirty years ina Prussian fortress. Reuter accepted his fate calmly, and he had need of all his courage, for during the next few years he was taken from one Prussian fortress to another, in each of which he was kept in close confine- ment. In 1838, through the personal intervention of the grand-duke of Mecklenburg, he was delivered over to the authorities of his native state, but on condition that he should still be a prisoner. The next two years he

spent in the fortress of Domitz. In 1840 to his great joy he was set free, an amnesty having been proclaimed after the accession of Frederick William IV. to the Prussian throne.

Although Reuter was now thirty years of age, he went to Heidelberg to resume his legal studies; but he soon found it necessary to return to Stavenhagen, where he aided in the management of his father's farm. During his imprisonment he had studied many works on agricul- ture and on the sciences related to it, and he was able to make good use of the knowledge he had thus obtained. After his father's death, however, he was compelled by want of capital to abandon farming, and in 1850 he settled as a private tutor at the little town of Treptow in Pomerania. Here he married Luise Kunze, the daughter of a Mecklenburg pastor. They had been betrothed when Reuter was at Stavenhagen, and their union proved to be one of uninterrupted happiness.

At Treptow he had to work hard as a private tutor for small pay, but in the evenings he found time to amuse himself by writing, in Platt Deutsch, in prose and verse, a number of tales and anecdotes. This collection of mis- cellanies was published in 1853 in a volume entitled Léuschen und Riemels. The book contains many lively sketches of manners in North Germany, and it was received with so much favour that Reuter was encouraged to make new ventures in literature. Fortunately he decided to go on writing in Platt Deutsch. There are so many abstract terms in High German that few writers succeed in the attempt to use it as a vehicle for the powerful utterance of simple and natural feeling. Platt Deutsch, on the contrary, although limited in its range, is fresh and vigorous, and in direct contact with the motives which give unfading charm to old popular songs and ballads. All the resources of this strong and expressive dialect were at Reuter's service. He thought in Platt Deutsch, and in his greatest efforts was always able to find the right word for that exquisite blending of humour and pathos which is one of the most characteristic notes of his writings.

The work which succeeded Lduschen wnd Riemels was Polterabendgedichte, and in the same year (1855) appeared De Reis nach Belligen, a humorous poem describing the adventures of some

Mecklenburg peasants who resolve to go to Belgium (which they never reach) to learn the secrets of an advanced civilization. These writings attracted much attention, and Reuter was so confident of success that in 1856 he left Treptow and established him- self at Neubrandenburg, resolving to devote his whole time to literary work. His next book (published in 1858) was Kein Hrisung, a poem in which he presents with great force and vividness some of the least attractive aspects of village life in Mecklenburg. This was followed, in 1859, by Hanne Niite un de liitte Pudel, the best of the works written by Reuter in verse. The qualities of those who have a part to play in the story are brought out with remarkable distinctness, and the action provides the poet with many opportunities of giving free expression to his ardent love of nature.

In 1861 Reuter's popularity was largely increased by Schurr-Murr, a collection of tales, some of which are in

High German, but this work is of slight importance in comparison with the series of stories which he had already begun, and by which he was to establish his fame as one of the foremost writers of his age. To this series he gave the general title Olle Kamellen. The first volume, Zwei Lustige Geschichte, published in 1860, contained Woans tk tau ne Fru kamm and Ut de Franzosentid. Ut mine Lestungstid (1861) formed the second volume ; Ut Mine Stromtid (1864) the third, fourth, and fifth volumes ; and Dorchléuchting (1866) the sixth volume. Woans ik tay 'ne Fru kamm is a bright little tale, in which Reuter tells, in a half serious half bantering tone, how he wooed the lady who became his wife. In Ui de Lranzosentid he undertook a more difficult task, which enabled him for the first time to do full justice to his genius. The scene is laid in and near Stavenhagen (Platt Deutsch, Stemhagen) in the year 1813, and the principal complica- tions spring from the disappearance of a Frenchman, which gives rise to suspicions of foul play. In this powerful tale the characters are depicted by means of a few bold and rapid strokes, and our interest in them is heightened by the fact that their personal fortunes are associated with the great events which at the beginning of the 19th century stirred the heart of Germany: to its depths. Ut mine Festungstid is of less general interest

than Ut de Franzosentid, but it is not less vigorous either in conception or in style It contains a narrative of Reuter's hardships during the term of his imprisonment, and it awakens sympathy all the more effectually because it is brightened by many a gleam of kindly and humorous feeling. Ut mine Stromtid is by far the greatest of Reuter's writings, and ranks with the most famous master- pieces of modern fiction. He records few incidents which might not happen in the lives of ordinary men and women, yet he never loses his hold over the imagination of his readers, so full of vitality are the characters of his story, and so deep is his insight into the enduring facts of human nature. The most original character in the book is Brisig, an eccentric old bachelor, fond of gossip and apt to interfere too much in the affairs of his neighbours, but huniorous, loyal to the core, and coming out most brightly when his good qualities are put to the severest test. There is a touch of romance, too, in this simple and genial nature, for he retains to the last his love for the woman who had fascinated him in his youth, and is always at hand to serve her when she needs his help. Another powerfully conceived character is Havermann, a man of solid and serious judgment, calm and undemonstra- tive, of sterling rectitude, and revealing at the great crises of life infinite depths of love and pity. Equally attractive in their own way are the good pastor and his wife, who bring up Havermann's daughter, Louise, in their quiet parsonage; and we come to know intimately every member of the pleasant household in which Havermann's frank and comely sister (whom Brasig secretly loves) is the central figure. In this great book Reuter displays imaginative power of the highest order in the expression of every mood and passion within the proper range of his art; and he fails, or at least does not perfectly succeed, only when he deals with characters belonging to classes he had never had an opportunity of studying closely. As in Ut de Franzosentid he describes the deep national impulse in obedience to which Germany rose against Napoleon, so in Ut mine Stromtid he presents many aspects of the revolutionary movement of 1848. He shows little sym- pathy with some of the most characteristic aspirations of the period, but in many passages he indicates by slight but significant touches the strength of the forces which had-begun to make for social as distinguished from merely political reorganization,

In 1863 Reuter transferred his residence from Neubran- denburg to Hisenach; and here he died on the 12th June 1874. In the works produced at Eisenach he did not maintain the high level of his earlier writings, Dérchléuchting, although it contains some striking passages, lacks the freshness and spontaneity of the other tales of the series to which it belongs ; and admirers of his genius found little to interest them in Die Montecht und Capuleti in Konstantinopel, which he wrote after a visit to the Turkish capital.

Reuter is the most realistic of the great German writers. To the dreamers of the romantic school he has not the faintest resem- blance, nor does he ever attempt to describe ideally perfect vharacters. The men and women of his stories are the men and women he knew in the villages and farmhouses of Mecklenburg, and the circumstances in which he places them are the circum- stances by which they were surrounded in actual life. His fidelity to facts is as exact as that of the Dutch school of painters, and, like them, he thinks nothing too minute for his use, if by smal] details he can give variety and animation to his pictures. But he docs not merely glide over the surface of life ; he penetrates to the inmost springs of feeling, and in simple peasant folk finds char- acteristics which in his hands become types of universal qualities. The sources of tears and the sources of laughter he touches with equal ease; but, while his humour js sometimes rather extra- vagant, his pathetic passages are always marked by perfect truth and delicacy. His description of the death of the old pastor in Ut mine Stromtid is one of the gems of modern literature, and the scene in which Brasig dies, holding the hand of the woman he has loved all his life, is in a different way not less impressive. Reuter's only serious defect as an artist is that he fails to main- tain the due proportion between the different parts of his stories. If an idea attracts him, he cannot resist the temptation to unfold its full significance, whether or not it is in organic relation with his scheme as a whole. To some extent, however, the reader is compensated for these interruptions by happy strokes of humour which would have been rendered impossible had Reuter forced himself to adopt a more rigid method.

Reuter's Sdmmtliche Werke in thirteen volumes (edited by Ad. Wildbrandt) were published in 1863-68. To these were added in 1875 two

volumes of Vach- gelassene Schriften, with a biography; and in 1878 a comedy, De dret Langhénse. See Glagau, Fritz Reuter und Seine Dichtungen, 1866; Ebert, Fritz Reuter, 1874; and Zeil, " Fritz Reuter," in Unsere Zeit, 1875, (J. 8

REUTLINGEN, a manufacturing town of Wiirtemberg, situated in a fertile and pretty district on the Echatz, an affluent of the Neckar, near the base of the Achalin, and 20 miles to the south of Stuttgart. It is a quaint but well-built town, with numerous picturesque houses and a fine Gothic church of the 13th and 14th centuries, overtopped by a lofty spire. The tanneries of Reutlingen are extensive, producing large quantities of leather ; and its other industrial products are very niultifarious, including cotton, woollen, and knitted goods, lace, ribbons, hats, shoes, paper, machinery, hardware, and lime. To fruit- growers Reutlingen is interesting as the seat of a celebrated pomological institute, while the Christian-socialist refuges of Pastor Werner are widely known in philanthropic circles. In 1880 the town contained 16,609 inhabitants, of whom 809 were Roman Catholics and 44 Jews,

Reutlingen was made a free imperial town by Frederick II. in 1240, and was unflinching in its loyalty to the emperors of his Hine. It successfully resisted a siege by Heinrich Raspe, the rival of Conrad IV., and in 1377 its citizens defeated Count Ulrich of Wiirtemberg at the Achalm. Ata later period Reutlingen became a member of the Swabian League, and it was among the first Swabian towns to embrace the Reformation. It was annexed to Wiirtemberg in 1802.

REVAL, or Reve (Russian Revel, formerly Kolywaa ; Esthonian Tallina), a seaport of Russia, capital of Esthonia, is situated in a bay on the southern coast of the Gulf of Finland, in 59° 27'N. lat. and 24° 45' EB. long., 230 miles west of St Petersburg by rail. The city consists of two parts—the "Domberg" or "Dom," which occupies a hill, and the lower town on the beach—and is surrounded by pleasant suburban houses with gardens. The "Dom" contains the castle, where the provincial administration has its seat, and the slopes of the hill are covered with the well-built houses of the German aristocracy. It has

its own administration, separate from that of the lower town. This last retains a medieval character, with narrow tortuous streets and high tile-roofed houses often enclosing large storehouses within their thick walls. Reval has more interesting antiquities than any other town of the Russian Baltic provinces. The old church of St Nicholas, built in 1317, contains many antiquities of the old Catholic times and old German paintings, of which a Dance of Death is especially worthy of notice. It contains also the graves of Holstein Beck and of the Duc de Croy, who was denied burial for his debts, and whose mummy, dressed in velvet and fine lace, was exposed until 1862. The "Domkirche" contains many interest- ing shields, as also the graves of the circumnavigator Krusenstern, of Pontus-de-la-Gardie, Henry Matthias, Karl Horn, &c. The church of St Olai, first erected in 1240, and often rebuilt, was completed in 1840 in Gothic style ; it has a bell tower 429 feet high. The oldest church is the Esthonian, built in 1219, Water is brought from Lake Jarvikyla by an aqueduct. The pleasant situation of the town, surrounded by beautiful parks, attracts in summer thousands of people for sea-bathing.

The population of Reval has increased rapidly since it has been connected by rail with St Petersburg and with Baltic Port, 30 miles distant ; it reached 50,490 in 1881, against 27,325 in 1867, of whom one-third are Germans, the re- mainder Esthonians, with afew Russians and Jews. Nearly 15,000 inhabitants belong to the Greek Church. The manufactures are not important, but trade grows steadily. In 1882 the exports (grain, spirits, dc.) were £1,746,244, the imports (coal, iron, chemicals, &c.) £6,858,247. In 1882 Reval was visited by 589 foreign ships (291,450 tons), mostly English, German, and Scandinavian, and by 802 coasters (103,000 tons). It has regular steam com- munication with St Petersburg, Helsingfors, Konigsberg, &e.

The high Silurian crag now known as Domberg was early occupied by an Esthonian fort, Lindanissa. In 1219 or 1233 the Danish king Waldemar II. erected there a strong castle and founded the first church of the Holy Ghost. In 1228 the castle was taken by the Livonian knights, but nine years later it returned to the Danes. About the same time Liibeck and Bremen merchants settled there under the protection of the castle, and their settlement soon became an important seaport of the Hanseatic

League. It was fortified early in the 14th century, and in 1343 sustained the siege of the revolted Esthonians. Waldemar ITI. sold Reval and Esthonia to the Livonian knighthood for 19,000 silver marks, and the town belonged to the knighthood till its dis- solution in 1561, when Esthonia and Reval surrendered to the Swedish king Erik XVI. A great conflagration in 1433, the pesti- lence of 1532, the bombardment by the Danes in 1569, and still more the Russo-Livonian War, broke down its formerly wealthy trade. The Russians not only devastated the neighbouring country but also besieged Reval twice, in 1570 and 1577. It was still, however, an important fortress, the forts and walls having been enlarged and fortified by the Swedes. In 1710 the commander Patkull surrendered it to Peter I., who immediately began there the erection of a military port for his Baltic fleet. The successors of Peter I. continued to fortify the access to Reval from the sea, large works being undertaken especially in the first part of the present century. During the Crimean War the suburb Reperbahn, situated on a low slip of coast, was destroyed in view of a possible landing of the allies.

REVELATION, Boox or. The book of the New Testa- ment called " Revelation of John" (Azoxddviis "Iwdvvov) so long passed for the most obscure and difficult document of early Christianity that scholars hesitated to apply to it the historico-critical method of investigation. Since this hesitation has been overcome, it appears that the matter of the book is neither obscure nor mysterious, although many special points still remain to be cleared up. With- out being paradoxical we may affirm that the Apocalypse is the most intelligible book in the New Testament, because its author had not the individuality and originality of Paul or of the author of the Fourth Gospel, and because

historically we can trace and comprehend its author's posi-~

tion much better than we can, for instance, the theology of Paul. But all interpretations not strictly historical must be excluded. The ethico-spiritualistic, rationalistic, and dogmatic explanations, such as were first attempted by the Alexandrine theologians, are fatal to the understanding of the book, as are also the explanations drawn from church history which were first put forward by medieval sects. To see with Hengstenberg

“demagogy” in “Gog and Magog” (xx. 8), to identify ‘“Apollyon” (ix. 11) with “Napoleon,” or in antichrist to detect the emperor or the pope or Mohammed or Luther or Calvin—these interpretations are not a bit worse than those which turn the book into a compendium of morality or dogma wherein is set forth by means of imagery and allegories the triumph of virtue over vice or of orthodoxy over heterodoxy. The justification of the interpretation which explains the book entirely in the light of the historical circumstances attend- ing its origin and of the views current amongst primitive Christians follows, above all, from observing that as a literary production the Revelation of John is by no means unique, but belongs to a class of literature (comp. ApocaLyptic LirEraTurE, vol. ii. p. 174) which then had a very wide currency amongst the Jews, and the numerous remains of which even the most orthodox theologians do not hesitate to interpret by the help of the history of the time. Theapocalyptic literature, in the strict sense of the word, began with the Jews in the 2d century B.c. ; in fact it developed as an aftergrowth of the prophetical literature, from which it differs less in kind than in degree. For more than three centuries it had sought to revive the drooping spirit of the people by revelations of a near future when, after one last dreadful onset of a hostile world, Jahveh would appear in the person of His Messiah to con- quer the nations of the world and to set up the kingdom of glory for Israel. Every time the political situation cul- minated ina crisis for the people of God the apocalypses appeared, stirring up the believers. In spirit, form, plan, and execution they closely resembled each other. Their differences sprang only from the difference of the times, for every apocalyptic writer painted the final catastrophe after the model of the catastrophes of his day, only on a vaster scale and with deepened shadows. They all spoke in riddles; that is, by means of images, symbols, mystic numbers, forms of animals, &c., they half concealed what they meant to reveal, The reasons for this procedure are not far to seek :— (1) clearness and distinctness would have been too profane— only the mysterious appears divine ; (2) it was often danger- ous to be too distinct. The apocalyptic writers in their works supplied revelations on all possible questions, but their principal achievement was regularly a revelation of the history of mankind in general and of the people of Israel in particular; in their most essential features the apocalypses are political manifestos. It is characteristic of all apocalypses that they pass under

false names, being attributed to the most celebrated persons of the Old Testament; thus we still possess apocalypses under the names of Daniel, Baruch, Ezra, Moses, and Enoch. These old heroes are represented in the respective works as speaking in the first person, and exhorting their readers to await with hope and patience the coming of the Messiah. Usually the apocalypse contains a brief summary of history, beginning with the time of the nominal and ending with that of the actual author, in order that the reader, perceiving how much of the prophecy has already been fulfilled to the letter, may look with assured con- fidence for the fulfilment of the rest. Lastly, the particular features in the descriptions as well as the images and metaphors are usually borrowed in great measure from the books of the old prophets, but they are painted in

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heightened colours on an ampler canvas. "The imagery is alive with the burning breath of the East; a luxuriant fancy sacrifices beauty to boldness and sets proportion at defiance ; all that is sweet and human yields to all that is monstrous and repulsive.

As Jesus Christ had promised to come again, the Jewish expectations of a Messiah who should be revealed continued unabated among many of His disciples; that which as Jews they had hoped from the first and only advent they now deferred till the second. True, the kingdom of God which He had promised did not tally with the materialistic hopes of the people, but on the other hand He had not infrequently Himself employed the figurative language of the prophets and apocalyptic writers; and, after He had left the earth, many sayings borrowed from the Jewish apocalypses were put in His mouth by a vitiated tradition! In the expectations of Christians of the Ist century spiritual and material elements were strangely blent. Hence not only were the Jewish apocalypses, the genuineness of which no one doubted, read in the Christian communities and transmitted to the Gentile converts, but soon there appeared new apocalypses written by Christians. We cannot wonder at this, for all conditions favourable to the production of such writings were to be found in the churches also; above all, men were conscious of possessing the

spirit of prophecy in a far fuller measure than ever before, and this spirit necessarily manifested itself not only in signs and wonders but also in revelations and predictions. Of the Christian apocalypses written between 70 and 170 a.p. only a very small portion is known to us; for the later church viewed them as dangerous and got rid of them. Even of the apocalypse of Peter, written in the lst century and regarded as canonical in some provinces as late as the 3d, only a very few fragments have come down to us.2_ But the great Apocalypse which bears the name of John has been preserved. It is to its reception into the canon that we owe the preservation of this precious, indeed unique, monument of the earliest Christian times.

form, Contents, and Purpose.—If we leave out of view chapters 1. to ill. the Apocalypse of John does not differ very materially in form from the Jewish apocalypses; but undoubtedly its arrangement is better, and its execution simpler and grander, and therefore more tasteful.? In its contents, however, the distinction between this Christian apocalypse and its Jewish fellows is marked; for, while the latter have not and could not have any actual know- ledge of the Messiah whom they promise, the Apocalypse of John centres round the crucified and risen Jesus, the Lamb that was slain. The author knows whom he and the Christian community have to expect; to him Jesus Christ is the alpha and the omega, the first and the last ; he is the Lord of the world and of history. And this faith

1 .g., the saying of Jesus handed down by Papias in Iren. v. 38 ; conipare with it Apoc. Baruch, 29. In the eschatological speeches of Jesus reported by the synoptical writers there is no doubt that sayings are introduced which are derived not from Jesus but from the Jewish apocalyptic writers. See the discussions in Weiffenbach, Der Wiederkunftsgedanke Jesu, 1873.

2 See Hilgenfeld, Nov. Test. extra Can. recept., fasc. iv.

3 The literary value of the Apocalypse of John is much higher than that of any of the Jewish apocalypses. The author possessed the art of keeping his readers enthralled and excited from first to last ; by a suitable

arrangement he has really reduced his motley material to order, and by skilful description he has contrived to make even the repulsive endurable,

gives to the Apocalypse of John a tone of assured con- fidence and hope such as is not to be found in the Jewish apocalypses. On the other hand, however firm and sure the Christian faith of the author appears, he was still com- pletely hide-bound in the old forms; it is really a case of new wine in old bottles. But this very circumstance gives to the book its peculiar charm, for in no other early Christian writing are new and old to be found so com- pletely mingled as in this. The author's attitude towards the world and the state is still entirely the Jewish attitude of surly hate—this disciple of the gospel has not yet learned that we are bound to love our enemies; but his attitude towards God and his view of the value of a man's own works show no longer the Jewish but the new Christian belief, for he sees God in Christ, he has accepted the doctrine of the forgiveness of sins through the blood of the Lamb, and regards himself as a priest and king before God. Hence too he lives and moves no longer in the law but in the prophets and the psalms. From them, especially from the prophets Ezekiel, Zechariah, and Daniel, he borrowed most of his imagery and symbols. What he has done in his book is to create a great apoca- lyptic painting or rather a drama worked out. in different acts. Impatient longing for the end, a deep abhorrence of the heathen state, a firm faith in Christ and His second coming, a minute and painstaking study of the old prophecies—these are the sources from which the descrip- tion of the future are drawn. The purpose is the same as that of all apocalypses—to confirm and strengthen the little family of believers in their patience, their courage, and their confidence, by pointing out that the sufferings of the time will last but a brief span and that the present troubles are already the beginning of that end when sorrow and suffering will in a moment be transformed into glory unspeakable.#

The revelation proper begins with iv. 1,—the first three chapters forming an introduction (the seven letters to the seven churches of Asia Minor, which are prefixed, are marked by poeti- cal beauty and power of language). 'he future is written in a book with seven scals, which the Lamb opens onc after the other (iv., v.). The opening of each scal brings a plague upon the carth (vi.). Before the seventh scal is opencd, the church

of the latter days is itself sealcd that it may be preserved harmless from the assaults of the powers of hell (vii.). At the opening of the seventh seal seven angels with trumpets ae on the scene, each of whom blows a trumpet-blast as a prelude to new horrors on the carth (viii., ix.) With the sixth trumpet the preliminary judg- ments are at an end (lence the episode, ch. x.). The judgment proper begins with the fall of Jerusalem (xi.). Then the seventh trumpet sounds as the signal for the last dread horrors and for the final judgment of the world and of all wickcdness. This is preceded, however, by a description of the preservation of the church of the latter days (xii.), forming one of those pauses in the narrative which give the reader breathing time and relieve the horror of the description by the introduction of scenes of peace and words of comfort. The power of the world that opposes Christ (the Roman empire) is described along with all its devilish accomplices (xiii.), and (xiv.) its destruction is by anticipation set forth in figures. The seven angels follow with the seven vials of wrath, which are poured forth and represent the beginning of the final catastrophe (xv., xvi.). This final catastrophe, involving the imperial city, the antichristian emperor, his governors, and, last of all, the devil himself, is described in xvii.~~xx. 3,—xix. 11 sq. forming the climax, when Christ himself appears on a white horse and vanquishes all his foes. The devil is chained in the bottom~~ less pit for a thousand years; during this time the saints of the latter days—not all believers—reign with Christ. After the devil

4 The way in which the author has given expression to this practical purpose by means of scenes and images reveals the great artist.

5 This idea, germs of which are to be found in the Jewish apo- calypses, is easily explained when we remember that two different views of the resurrection and of the future kingdoin prevailed amongst the Jews. According to the one view only favoured persons, accord- ing to the other every one would rise from the dead; according to the one view the future kingdom would have only a limited duration, according to the other it would be eternal. Inthe Revelation of John the two suppositions are combined.

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has becn released once more and has made war on the holy city he is for ever overthrown and the last judgment follows (xx.). In xxi.-xxii. 5 the glory of the heavenly and eternal Jerusalem is set forth. In xxii, 6-21 several epilogues ay be detected.

Unity and Integrity.—The above analysis will have shown the essential unity of the book. The more atten- tively we scan the connexion of the descriptions with each other the more clearly do we perceive the unity, the artistic and systematic arrangement, of the book. This is completely overlooked by those who fancy that in the seven seals, the seven trumpets, the seven vials of wrath, the whole course of the judgment is simply repeated in ever new imagery. Leaving all other objections out of account, this supposition is refuted by the simple observa- tion that the author has not merely placed the different scenes side by side but has linked them together in such a way that each scene follows as a consequence from the scene before. A correct perception of the plan of the book further negatives the opinion of older scholars and of Vélter in modern times (Die Entstehung der Apokalypse, 1882) that the book consists of different parts by different authors. But it is probable enough that the work has been interpolated and touched up in various places (certainly in i. 1-3); and several verses of the epilogue (xxii. 6-21) are not by the author of the book, as indeed the language itself is sufficient to prove. Unless we are utterly deceived, the book underwent systematic if not very radical revisions even before the middle of the 2d century.? To the additions then made belong, amongst others, the famous words (xix. 13) kat KéxAnrau 76 dvopna airov 6 Adyos Tod Geo, which do not fit into the passage. An exact investigation of the extent of the alterations and additions would be a very useful work.®

Language.—The language is more Hebraic than that of any other New Testament book. The author thought in Hebrew and wrote in Greek. But the gross violations of Greek grammar are not to be explained from ignorance. "Tn the language of the Apocalypse there is nothing of the bungling and happy-go-lucky style of a beginner; indeed it bears the stamp of consistency and purpose." The author writes, ¢.g, xdpis kal

eipyvy ad 6 dy Kal 6 A Kal 6 €pxopevos kal ard TO éxrTa Tvevpatwv … Kal dard "Incod Xpurrod, 6 waptus, 6 murrds (i. 4, 5), although he has shown in a hundred passages that he knew very well the rules which he has here broken. He must have deliberately intended to break them in order to give to the words of his greeting a certain elevation and solemnity. Of course only to a foreigner could it have occurred to employ those means for this end.

Author's Standpoint.—That the book is not written by a disciple of the apostle Paul, that its author is filled with Jewish hatred and abhorrence of the heathen state, that in other ways traces of the Jewish spirit crop up here and there in the Apocalypse, is beyond question. But many critics, especially the so-called Tiibingen school, as well as Renan, Mommsen, and others, have gone still farther ; the author of the Apocalypse, say they, was an Ebionite and a decided opponent of the apostle Paul. In support of this hypothesis, which they put forward as if it were an

1 See Theol. Lit.-Zeitung, 1882, No. 24.

2 The redaction of the Apocalypse took place long before Irenzus (before 185 a.D.), for it can be shown that the orovdata rat apy aia avadypaba to which he appeals already exhibited the Apocalypse in the form in which we now read it (Iren., v. 30).

3 The state of the text is much more uncertain than in most of the New Testament books, because there are far fewer uncial MSS. of our book than of the Gospels and Epistles ; infact there are only five, of which only three are complete. The best MSS. are the Sinaitic, the Alexandrine, and the Ephraemi Parisiensis (incomplete). The so- called textus recepius of the Apocalypse is especially bad, owing to causes which Delitzsch was the first to point out (Handsehriftliche Funde, 1861-62).

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established truth, they appeal chiefly to the following observations :—(1) in ch. vii. only 144,000 Jews are sealed, therefore the author regarded only born Jews as full members of the Messiali's kingdom ; consequently (ver. 9 sq.) the multitude which is not numbered forms a wider circle, viz.,

the proselytes, who are not counted and also not sealed, and are therefore of lower rank; (2) in ii.—iii. the author displays the greatest abhorrence of those who eat meat which has been offered to idols and who practise "fornication"; by these none but disciples of Paul can be meant; (3) in xxi. 14 the author speaks only of twelve apostles, and thereby undoubtedly excludes Paul; (4) the author praises (ii. 2) the Ephesians because they have found the false apostles to be liars and have rejected them, but by these false apostles only Paul could be meant; (5) the author cannot conceive (xi. 1, 2) that the temple at Jerusalem should ever be destroyed, and proves by this how much he himself still clung to the temple worship.

The point in dispute is of the highest importance for the proper understanding of the history of primitive Christianity. If the Tiibingen school is right, the Pauline epoch was followed in Asia Minor by an Ebionitic epoch, and in this case catholicism may very well be the product of a compromise between Paulinism and Jewish Christianity. But on this very point it can be clearly shown that the Tiibingen school is in the wrong; for the

above arguments amount to nothing.

(1) The 12× 12,000 (vii. 4 sg.) can only, like James i. 1, be in- terpreted allegorically and referred to Christians generally without respect of nationality ; the twelve tribes are the Christians, This interpretation is the only possible one, because (@) in xiv. 8 it is said of the 144,000 that they are bought from the earth, and because (b) besides the 144,000 who are sealed no one survives the horrors of the last tine. We must not overlook the fact that in ch. vii. two entirely different visions are presented, which are not to be fused into a single vision: the 144,000 are on earth, the unnumbered multitude (ver. 9 sq.) are not a supplement of these 144,000, but are already in heaven and represent the sum of all the children of God from the beginning. Thus, if the 144,000 were exclusively Jews, in the last time there would be no Christian at all from among the heathen ; that is, no heathen would be saved. But that this is the author's meaning not even the Tiibingen critics can maintain. Thus the "twelve tribes" are to be understood allegori- cally. As Abrahain is the father of all believers, so all believers make up the nation of the twelve tribes. (2) The polemic

against the eating of meat offered to idols and against " fornication " is not peculiar to the author, but is to be found in several early Christian writings. It is not a polemic against Paul ; at most it is a polemic against lax disciples of Paul ; further it is no sign of Ebionitism, for very many Gentile Christian writers of the 2d century (¢.g., Justin) combated the eating of meat offered to idols. The rule mentioned in Acts xv. 29 may really have been made between 58 and 70 a.p., and may have been a condition of intercourse betwecu Jewish and Gentile Christians. Aftcr that time 1t gradually prevailed all over Christendom. (38) In the ideal description of the new Jerusalem it would have been impossible for the author to speak of thirteen apostles. (4) The plural dréoroAo: (ii. 2) shows that Paul is not ineant, and the comparison with ii. 9 and iii, 9 makes it probable that Jewish emissaries are intended. But, apart from this, we see better than heretofore by the newly discovered Zeaching of the Apostles that the name "apostle" was not confined to the twelve apostles and Paul. Ifthe author had wished to express abhorrence of Paul he could not have done it more obscurely than he has done it init. 2, (5) The author says expressly (xxi. 22) that he saw no temple in the new Jerusalem, " for the Lord is her temple and the Lamb"; hence he felt that the temple worship was no longer needed to satisfy his religious wants; in excepting the temple buildings from the universal destruction (xi. 1) he follows a Jewish notion, to which in his heart he has already risen superior.

The arguments to prove the Ebionitism of the Apoca- lypse are therefore insufficient; rather, we should say, the Apocalypse shows us a Christianity free from the law, free from national prejudices, universal, and yet a Christianity which is quite independent of Paul. It is this that consti- tutes the high importance of the book. The author speaks not at all of the law— the word does not occur in his work; he looks for salvation from the power and grace of God and

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Christ alone, and knows that to be clean a man must wash his robes in the blood of the Lamb; nowhere has he made a distinction between Gentile and Jewish Christians; in this respect he is even more liberal than Paul, for Paul believes in a continued preference accorded to the people

of Israel, while our author knows of no such thing; in his view preference is given only to the martyrs and confessors of the latter days; they alone shall reign with Christ a thousand years ;! the people of Israel, so far as it has rejected Christ, is to our author simply a "synagogue of Satan" (ii. 9; iii. 9). In this respect it clearly appears that the author of the Apocalypse has cast aside all national religious prejudices. Accordingly to him Jesus is not the Messiah of the Jews—of this there is no mention in the book—but the Saviour of the world, the Lord of heaven and of earth, the disposer and director of history. The Christology of the Apocalypse is nowhere Ebionitic ; rather it stands midway between that of Paul and that of the Fourth Gospel, and is more elevated than the former: Christ is made almost equal with God and has the same predicates and names as God.°

The Apocalypse teaches us that even in the apostolic age the conceptions of Paulinism and Ebionitism do not explain everything; it is neither Pauline nor Ebionitic. It shows us that at the close of the apostolic age there was a Christianity which was free from the law and universal, and yet continued to adhere to Jewish modes of expres- sion; it shows us that it was possible to think and feel like a Jew in politics, and yet in religious thoughts and feelings to be evangelical and superior to all earthly limitations. These, however, are glaring contradictions which could not last. But the fact that in the Apocalypse we possess a document exhibiting these contradictions imparts to the book its high importance. From Paul's epistles we can only learn how a great mind has worked its way from the letter of the law up to freedom; from the Apocalypse we can learn how from the Jewish fusion of religion, nation- ality, and politics thousands were gradually led upwards to the gospel, and we can further learn that the step from the premises to the conclusion is one of the hardest to take. The author of the Apocalypse has in many points not yet drawn the conclusions.

Date and Historical Position.—All impartial scholars are now agreed that in chapters xiii, and xviii. of the Apocalypse we must look for the key to the comprehension of the book as well as to the question of the date of its composition. That the beast (xiii. 1 sg.; xvii. 3 sg.) is the Roman empire, that the seven heads are seven

emperors, that the woman (xvii. 3-9) is the city of |

Rome, that the ten horns (xiii. 1; xvii. 3, 12 sq.) are imperial governors—all this is now beyond dispute. Also it is settled that a Roman emperor will be the antichrist, and that the author abhorred nothing so much as the worship of the emperor. Hence it is very probable, and has been maintained by Mommsen especially on good grounds, that the second beast (xiii. 11) is meant to describe the imperial representatives in the provinces, especially the Roman governors in the Asiatic continent. Finally, almost every one regards the year 64 as the terminus a quo of the composition of the book, inasmuch as the bloody persecution of the Christians in Rome (xiii.*

1 Observe that in his brief description of the millenium (ch. xx.) the author neither speaks of the Jewish people nor introduces any grossly material conception. This is the strongest proof that he was not an Ebionite.

2 Compare also xi. 8, where Jerusalem is called "Sodom and

on br) is Christological conceptions and formulas which occur in the book are not always consistent. This is not, however, in itself a proof

of interpolation. 4 Diisterdieck alone regards the ten horns as emperors.

7; xvil. 6; xviii, 20-24) is presupposed in the narra- tive.®

'But, while scholars are at one on these points, they still differ on the question of the person of antichrist. The one side affirm that the author regarded Nero returned from the grave as antichrist (so Ewald, Liicke, De Wette, Credner, Reuss, Volckmar, Mommsen, Renan, &c.); the other side deny this (so Weiss, Diisterdieck, Bruston, &c.), and try to identify antichrist either with Domitian or with an emperor not defined. But the grounds on which they conibat the former hypothesis are of little moment. That the antichrist of the Apocalypse is Nero returned to life results from the following considerations :—

(1) In ch. xiii. 3 it is said that one of the heads of the beast received a deadly wound bnt was afterwards healed to the astonish- ment of the world. Now ifit is scttled that the beast is the Roman empire, and that by the heads are designated the emperors, the statement is only applicable to Nero, in whose death it is well known that the people did not believe, many persons expecting that he would return from the East.6 (2) In xvii. 8, 11 one head is identified with the whole animal, and of the animal it is said that "'it was and is not and will come again," meaning that the eighth head is not a new one but one of the seven. From this it necessarily follows that in the author's view the antichrist will be an emperor who has reigned once already and who represents the whole wickedness of the empire (the beast) concentrated and embodied in himself; but this can only be Nero, for of no other emperor was the report current in the empire that he wonld come again, and no empcror but Nero had instituted a persecution of the Christians. (3) In xiii, 18 it is said that the number of the beast —that is, according to the Hebrew art of Gematria, the sum of the numerical values of the letters of his name—is the number of a man, and is 666. Down to 1835 this saying was a riddle which no man could read, though Ireneus (v. 30) had attempted an explana- tion: he thought of Tcitan, Evanthcs, Lateinos. But in 1835 Fritzsche, Benary, Reuss, and Hitzig discovered simultaneously that the numerical values of the words $302 DP ("Emperor Neron ")=100 + 60 + 200 + 50 + 200+6+50=666. The old variant 616 must be regarded as a confirmation of this explanation, for 616 is=11) IDP (" Emperor Nero"). It may certainly appear strange that the calculation is made according to the numerical value of the Hebrew letters, while the book is written in Greek ; but, as there is no doubt that the author has thought as a Semite from first to last, it is not surprising that he has set forth his great secret in Hebrew lettcrs (comp. 'Apuayedév, xvi. 16). (4) Down to the 5th century it was belicved by Western Christians that Nero would come again and be the antichrist or his precursor.' In the East also this belief can be shown (see the Sibyllinc oracles) to have still existed in the 2d century.

For these four reasons it is certain that the author of

the Apocalypse believed that Nero would come again, and regarded him as the antichrist. He wrote under the impression of the story current in

the East that Nero had gone to the Parthians and would return with them to reclaim his empire.

Hence the Apocalypse was written after the summer of 68 a.p.,® but the question still remains whether it was written under Gadba or Vespasian or Domitian. Most of the scholars who accept the right explanation of the antichrist suppose it to have been written under Galba ; the beginning of Vespasian's reign is preferred by Liicke (whose earlier opinion was different), Bleek, Béhmer, and also Diisterdieck and Weiss ; Mommsen upholds the later years of Vespasian ; but the old tradition of the church

> The statement of Epiphanius (J/@r., li. 12) that the Apocalypse was written under Clandius is untenable.

6 Bruston refers the wounded head to Cesar; but what could have induced the author to niention and put in the foreground an event which had taken place about one hundred years before ?

7 See the Carm. Apolog. of Commodian; the commentary of Victorinns on the Apocalypse; Lactantius, De Mort. Persec., 2; Martin of Tours in Sulp. Severus, Dial., ii. 14 ; Sulp. Sev., Chron., ie2S, 20, rece

8 Against Bruston, who supposes that it was written between 64 and 68 a.D., by reckoning the eniperors (xvii. 10) from Cesar, and hence taking the reigning emperor to be Nero. But Bruston is thus compelled to reject the explanation that the returned Nero is the antichrist, and he cannot account for the mention in the Apocalypse of numerous martyrs at Rome,

represents the work as written under Domitian and even towards the close of his reign. This tradition rests on very ancient testimony, that of Irenzeus,) but has met with no approval from critics of the present century ; only the traditionalists who reject the historical interpreta- tion accept it. It is the only case in the whole range of the New Testament where criticism assigns to a writing a higher antiquity than is allowed it by tradition, Whether criticism has not been too hasty in setting aside the statement of Irenzeus will appear in the sequel.

In support of the supposition that the Apocalypse was written before August 70 a.p., the chief argument adduced is that ch. xi. assumes that Jerusalem and the temple are still uninjured. Mommsen (6m. Gesch., v. 521) has not succeeded in satisfactorily disposing of this argument. The Apocalypse is cognizant of the flight of the Jewish Christians into the country beyond Jordan towards Pella (ch. xii.) ; it expects the partial destruction of Jerusalem in the immediate future.2 But this very expectation as well as the confidence that the temple would remain uninjured shows that at that time city and temple were still standing. Hence, as ch. xi. was written before August 70, most critics, assuming that the whole book dates from one and the same time, conclude that it was composed under Galba,—that is, between autumn 68 and spring 69. In their view the five emperors who have fallen are Augustus, Tiberius, Claudius, Caligula, and Nero, therefore the reigning emperor is Galba,® and the reason why the author does not make antichrist (the returning Nero) immediately succeed Galba is a wish to carry on the number seven, and because "even a prophet owes some consideration to the powers that be"; but he allows this unknown successor only a short reign, and then comes the returned Nero and the end of the world.4 Lastly, these critics point to the fact that a false Nero appeared immediately after the death of the real Nero (Tacitus, /Zist., 11. 8, 9). This position is very strong, but there are two objections to it,—in the first place, it is uncertain whether Galba should be included in the list of emperors at all—so eminent an authority as Mommsen is against including him, and reckons Vespasian as the sixth, and, secondly, the author of the Apocalypse thinks of a false Nero who will ally himself with the Parthians (see ch. ix. and elsewhere). Therefore his false Nero appears not to be that of Tacitus, but the one who in the last years of Vespasian found a following in the Euphrates district and was acknowledged in the reign of Titus by King Artabanus, who prepared to restore him at Rome by force of arms, but was at last surrendered by the Parthians, about 88, to Domitian (so Mommsen ; compare Persia, vol. xviii. p. 603). On this view the Apocalypse was written about 75-79, Thus we see that we have here two discrepant calculations (autumn 68 to spring 69; about 75-79); each has much in favour of it, but also at least one strong argument against it :—against the first calculation there is the argument that the false Nero who best suits the case did not appear till about 75, while against the second cal-

culation there is the argument that according to ch. xi. the destruction of Jerusalem had not yet taken place.> In these

- *Tren, v. 80, 8: 4 dmoxdavwis ob mpd wordod xpdvov Ewpadn, GAAG oxeddy em) ris Huetépas yeveas, mpds TE TEAEL THs AomiTiavod apx7s.*

? The three and a half years in xi. 2, xii. 14, xiii. 5 are taken ie the Apocalypse of Daniel, and no deeper ineaning is to be sought in them.

3 Hildebrand regards the sixth as Vitellins (Zisch. f. wiss. Theol., 1874, p. 76 sq.).

- *So Reuss, Volckmar, Credner, De Wette, also Renan (Antechrist), but the last-mentioned, though he put the Apocalypse in the reign of Galba, begins the enumeration of the heads with Julius Cesar, and hence gets into difficulties.*

5 The view that the Apocalypse was written between the spring of

circumstances it appears perhaps best to assume that the Apocalypse was written under Galba, that is, that the con- ception and the first draught of it date from this time, but that the seventeenth chapter was afterwards revised in the last years of the reign of Vespasian, about 75- 79. Now it is to be remembered that Ireneus asserts most explicitly that it was revealed in the last years of Domitian. Such a statement is not to be simply set aside, especially when it seems to make a writing later, and not earlier, and when there is internal evidence that the book underwent revisions. Further exact investigation of the details of the Apocalypse will perhaps supply positive proofs ; at present the following can be put forward merely as an hypothesis, for which only a certain probability is claimed :—the Apocalypse was written under Galba, but afterwards underwent revisions under Vespasian, about 75-79, and perhaps in Domitian's reign of terror, about 93-96 (compare what has been said above on the unity and integrity).

Place of Composition—A uthorship.—That the Apocalypse was written at some place on the west coast of Asia Minor has never, so far as known to the present writer, been doubted by any critic of note.

The tradition of the church ascribes the Apocalypse to the apostle John,® and the Tiibingen school has felt bound in this case to agree with tradition, Within the last twenty years or so the question has been much complicated by being mixed up with the question of the origin of the Fourth Gospel; all, however, agree that the book was written by a born Jew. At present the following views are maintained :—(1) the Gospel and the Apocalypse of John are by the apostle John (Ebrard, Hengstenberg and his school, Hofmann and his school, Kliefoth) ; (2) the Gospel is by an unknown autlior, the Apocalypse is by the apostle John (Baur, Schwegler, Kostlin, Hilgenfeld); (3) the Gospel is by the apostle John, the Apocalypse is by a man called John, the otherwise known presbyter, who had no wish to be taken for the apostle (Liicke, Bleek, Ewald, Credner, De Wette, Neander, Reuss, Diisterdieck, Keim, Holtzmann, &c.) ;7 (4) the Apocalypse is by another John, one of the apostle's disciples, who afterwards received the tacit approval of the apostle, so that the Revelation passed in the church as a work of the apostle (Renan); (5) the Apocalypse was foisted on the apostle John without his knowledge (Volckmar, &c.). Of these views the first and fourth may be summarily dismissed, the latter because Renan has not brought forward even the shadow of a proof, the former because the differences between the Apocalypse and the Gospel in language and opinions are too great to allow us to suppose that the books are by the same author.® It is true that on the other hand both writings have much in common, nay, even that there is a profound aftinity between them, but this only proves that their authors lived in tle same country, and were to some extent subject to the same intellectual influences. Even Hase, who formerly thought it possible to refer Gospel and Apocalypse to the apostle John (see his work, Die Tiibinger Schule, 1855), has renounced this view. But what is to prevent us from ascribing at least the Apocalypse to the apostle 69 and August 70, hence in the beginning of Vespasian's reign, has least to recommend it. Some of the critics who have maintained it are much biased. Thus Diisterdieck regards the sixth emperor (xvii. 10) as Vespasian, the seventh, who is to remain for only a short time, as Titus, and the eighth as

Nero. But, as the book was written, according to Diisterdieck, shortly before 70, it follows that ' we have here a prophecy which definitely announces certain historical events beforehand." Thus the claim of the Apocalypse to be an actual prophecy is justified, though only in one verse.*

® So Justin; see Dial. c. Tryph., 81.

7 Some of these scholars also deny that the Gospel is by John.

8 This was observed by Dionysius of Alexandria (in Euseb., HW. Z., vii. 27).

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John? Certainly the external testimony is very good,! the doubts entertained by the Alexandrians, by Eusebius, and by Byzantine theologians as to the apostolic authorship of the book have not much weight, the book being little to their mind, and the substance of the Revelation would in

many respects suit John Boanerges. But the following

considerations speak against the apostle John as author :— (1) the so-called " Alogi" (Epiph., Hzr., li.) denied that the work was by the apostle, and declared that it came from Corinth and hence was a forgery; but the Alogi

were in Asia Minor about 160 and their negative, if

not their positive, evidence has therefore great weight ;? (2) the author of the Apocalypse does not style himself an

apostle, and nowhere does he designate himself as a per- sonal disciple of Jesus or as an eye-witness; (3) the author speaks (xxi. 14) in such an objective way of the twelve apostles of the Lamb that it is scarcely credible that he himself belonged to them; (4) the descriptions of

Christ in the Apocalypse are:~~psychologically scarcely intel~~

ligible on the assumption that they were written by a per- sonal disciple of the Lord. On these grounds we must say that, though not quite impossible, it is very improbable that the apostle Jolin was the author of the Apocalypse. But uot less improbable is the supposition that the real author

wished to pass for the apostle John and fathered the work on him. It is true that amongst the Jews apocalypses were fathered by their authors on famous men ; but the fraud is always very patent. But in this case the name of John occurs only four times (i. 1, 4, 9; xxii. 8), and in the whole book there is nothing that reveals the author's intention to pass for the apostle John. And we have further to remember that, according to trustworthy evi- dence, the apostle John was still living at the time in Asia Minor. It is at least improbable that another dweller in Asia Minor should have fathered a book on hii under his very eyes. ;

In these circumstances only one hypothesis seems left —that started by the Alexandrians in order to get rid of the inconvenient authority of the Apocalypse—that the book is from the pen of another John in Asia Minor, uamely, the presbyter. But, though this hypothesis has had much acceptance in our time, it is far from probable ; for—and here Zahn and Renan are right—the existence of a conspicuous presbyter John in distinction from the apostle is very uncertain. The Apocalypse, as the tradi- tional text of the first chapter now runs, is certainly not the work of any ordinary person of the name of John: itis by a John who enjoyed the highest consideration in the churches (see i. 1, 4). If besides the apostle John there

was no second John who possessed such authority in Asia |

Minor in the Ist century, and if it is impossible that the Apocalypse can be the work either of the apostle John or of a literary forger, the only supposition left is that the name of John was interpolated in the last revision (after the death of the apostle John). Observe once more that this name occurs only in the first verses of the first chapter, and in a verse of the last. No hypothesis solves the pro- blem so well as this. Whether originally a different name appeared in i. 9, and how ch. i. gradually arose, are ques- tions into which we cannot enter here. In this difficult

sub- ject absolute certainty is unattainable, but the supposition that the Revelation was written by an unknown Christian of Asia Minor, and that the name of John is a later addition

1 Appeal, however, must not be made to the fact that according to tradition the apostle John was banished to Patmos, and that the author of the Apocalypse says of himself (i. 9), "I was in the isle that is called Patinos for the word of God," for the tradition is based on the Apocalypse, and, what is more, on a misunderstanding of it.

? From Eusebius, WZ. Z., iti. 28, 1 many have assumed that the Roman presbyter Caius (about 200 a.D.) was of the same opinion as the Alogi, but this is improbable.

in order to ascribe the Revelation to the apostle John, labours under fewer difficulties than any other that has hitherto been started. That, thus introduced, John is not expressly designated as apostle need not surprise us, for at the beginning of the 2d century every one in Asia Minor knew who "John the servant of God" was. The epistles also with the heading "the elder" are meant to be regarded as written by the apostle John, although they do not contain the title apostle.®

Authority in the Church.—The Apocalypse, which as early as the time of Justin and Papias enjoyed a high re- putation as the work of the apostle John, was admitted into the canon of the New Testament (see Murat. fragm., Treneus, Tertullian), In the West it has always been retained in the canon, but in the East it was discredited through Montanism, and the spiritualistic Alexandrians who gave the tone threw more and more doubts upon it, so that towards the end of the 3d century it began to be omitted from the New Testament. For nearly a thousand years the Apocalypse was not recognized by the majority of the Greek Church as a canonical book (and hence it is that we possess so few ancient Greek MSS. of the Apocalypse), but, as no formal condemnation was pronounced against it, the book was never suppressed, and regained its footing towards the end of the Middle Ages, the Greek Church following the example of the Latin. At present the Apocalypse forms part of the New Testament all over Christendom, and rightly so, for it is one of the most instructive documents of early Christianity. Narrow or dogmatic spirits, it

is true, will never be able to value it aright, and will therefore either reject it or seek to correct it by false interpretations.

Literature.—Liicke, Versuch einer vollstindigen Kinleitung in die Offend. Joh., 2d ed., 1852; comp. the introductions to the New Testament by Reuss, Credner, Bleck-Mangold, Hilgenfeld, Davidson, &. ; Gebhardt, Der Lehrbegriff der Apok., 1873 ; Renan, L' Antechrist, 1873; Mommsen, Rém. Geschichte, v. p. 520 sq. Commentaries by Ewald, 1828, 1862; De Wette, 1848, 1862 ; Nengstenberg, 1861, 1863; Ebrard, 1859; Diisterdieck, 1865 ; Volckinar, 1862; Bleek, 1862; Lange, 1871; Fiiller, 1874; Klicfoth, 1874-75; Bisping, 1876. Schneckenburger, De Falsa Neronis Fama, 1846; Weiss, " Apokal. Studien," in Studien und Kritiken, 1869, i.; Bruston, Le ehiffre 666 et UVhypothése du retour de Néron, 1880; Bochmer, Verfasser wu. Abfassungszeit der Joh. Apoc., 1855; Hilgenfeld, "Nero der Antichrist," in Zedt- schrift f. wissensch. Theol., 1869, iv. ; Hildebrandt, "Das rom. Antichristenthum zur Zeit der Offenb. Joh.," in Zeitschr. J. wiss. Theol., 1874, i.; Ronsch, "Gematrisches zu Apoc. xii. 18," in Zeitschr. f. wiss. Theol., 1873, p- 258 sq.; Vtibing. Theol. Quartalschr., 1872, i. ; Hausrath in Schenkel's Bibelleatcon, i. p- 153 sq. (A. HA.)

REVERSION. See Remarnper.

REVIVAL OF LEARNING. See RENAISSANCE.

REWAH, the principal native state in Baghelkhand, under the political superintendence of the Baghelkhand and Central India Agencies. It has an area of about 10,000 square miles, and lies between 22° 39' and 25° 12" N. lat., and between 80° 46' and 82° 51' E. long.; it is bounded on the N. by the British districts of Banda, Allahabad, and Mirzapur in the North-Western Provinces ; on the E. by Mirzapur district and by native states in Chutia-Nagpur ; on the S. by the districts of Chhatisgarh, Mandla, and Jabalpur in the Central Provinces; and on the W. by other native states of Bhagelkhand. Rewah state is divided into two well-defined portions. The northern and smaller division is the plateau lying between the Kaimur range of hills and that portion of the Vindhyas

3 The view here put forward as to the author of the Apocalypse ig further recommended by its agreement with the general history of early Christian literature in the church. Originally writings derived their authority from the nature of their contents, afterwards from their author, When writings by obscure persons were intended to attract attention, it was necessary to pass them off under the names of celebri- ties ; sce Harnack, Die Lehre der 12 Apostel, p. 106 sq.

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known as Biujh, which overlook the valley of the Ganges. This plateau is for the most part cultivated and well peopled; the soil varies from a rich black loam to a sandy laterite; but in the greater part of this area good land predominates, and rich harvests both of kharif and rabi crops are generally obtained. Water is plentiful, and the country is full of large tanks and reservoirs, which, however, are not used for irrigation purposes; the only system of wet cultivation which has any favour with the villagers is that of bandhs, or mounds of earth raised at the lower ends of sloping fields to retain the rain water for some time after the monsoon rains cease. The Rewah plateau is reported to possess every natural advantage, and the whole of its area could be brought under rich culti- vation. 'The country to the south of the Kaimur Hills comprises by far the largest portion of the state; but here cultivation is restricted to the valley between the hills and the Sone river, and to a few isolated patches in scattered parts of the wild and magnificent forest wastes. Rewah is rich in minerals and forests. Operations lately undertaken to determine the extent of its coal fields have proved highly successful. Until very recently Rewah possessed no roads to speak of or means of internal com- munication ; but good progress is now being made, and by this means it is anticipated that the state will soon develop its rich resources. The principal river is the Sone, which, receiving the Mahanadi from the south, flows through the state in a north and north-easterly directiqn into Mirzapur district; another important river is the Tons; but none of the rivers are navigable. The average rainfall at Rewah is about 574 inches.

The population of the state in 1881 was 1,305,124 (654,182 males, 650,942 females); Hindus in the same year numbered 971,788,

Mohammedans 31,107, and aboriginals 302,107. The inhabitants of Rewah are reported to be a singularly simple, pleasant, and well-disposed raee, and they greatly appreeiate the efforts which are now being made to benefit them. The revenue of the state in 1882-83 amounted to £110,946, of which the land contributed £71,798. The ehief town is Rewah, situated in 24° 31' 30" N. Jat. and 81° 20' E. long., and containing in 1881 a population of 22,016.

The state came under British influence in 1812, when the first formal treaty was made with Jai Sinh Deo, by which he was acknowledged as ruler of his dominions and was brought under the proteetion of the British Government. The raja, however, failed to fulfil his obligations, and a second treaty was made eon- firming the first and defining more clearly his relations with the 3ritish Government. The administration of Rewah is now entirely in the hands of the British owing to the death of the maharaja Raghuraj Sinh and the suceession of his infant son.

REYNOLDS, Sir Josnua (1723-1792), English por- trait-painter, was born at Plympton Earl, in Devon- shire, on July 16, 1723. He was educated by his father, a clergyman and the master of the free grammar school of the place, who designed his son for the medical profession. But the boy showed a distinct preference for painting. He was constantly copying the plates in Dryden's Plutarch and Cat's Emblems, and poring over Jonathan HNichardson's Treatise on Art. At the age of eight, aided by the instructions in Zhe Jesuit's Perspective, he made a sufficiently correct drawing of the Plympton schoolhouse, which greatly astonished his father. It was at length decided that the lad should devote himself to art, and in October 1741 he proceeded to London to study under Thomas Hudson, a mediocre artist, a native of Devon- shire, who was popular in the metropolis as a portrait painter. Reynolds remained with Hudson for only two years, acquiring with uncommon aptitude the technicalities of the craft, and in 1743 he returned to Devonshire, where, settling at Plymouth Dock, he employed himself in portrait painting. By the end of 1744 he was again in

London. He was well received by his old master, from.

whom he appears previously to have parted with some cold-

ness on both sides. Hudson introduced him to the artists' club that met in Old Slaughters, St Martin's Lane, and gave him much advice as to his work. Reynolds now painted his portraits of Captain Hamilton, father of the marquis of Abercorn, of Mrs Field, of Alderman Tracey, now in the Plymouth Atheneum, and of the notorious Miss Chudleigh, afterwards duchess of Kingston. To this period, or per- haps to one slightly later, is referable the artist's excellent oval bust portrait of himself, which was included in the Grosvenor Gallery Exhibition of 1884. At Christmas 1746 he was recalled to Plympton to attend the last hours of his father, after whose death he again established him- self, now with two of his sisters, at Plymouth Dock, where he painted portraits, and, as he has himself recorded, derived much instruction from an examination of some works by William Gandy of Exeter, whose broad and forcible execution must have been an excellent corrective to the example of Hudson's dry and hard method.

Meanwhile the pleasant urbanity of manner which dis- tinguished Reynolds throughout life had been winning for him friends. He had made the acquaintance of Lord Edgcumbe, and by him was introduced to Captain (after- wards Viscount Keppel), who was to play an important and helpful part in the career of the young painter. Keppel was soon made aware of Reynolds's ardent desire to visit Italy ; and, as he had just been appointed to the command of the Mediterranean squadron, he gracefully invited the artist to accompany him in his own ship, the "Centurion." The offer was gladly accepted. While Keppel was conducting his tedious negotiations with the dey of Algiers, relative to the piracy with which that potentate was charged, Reynolds resided at Port Mahon, the guest of the governor of Minorca, painting portraits of the principal inhabitants ; and, in December 1749, he sailed for Leghorn, and thence, with all eagerness, made his way to Rome.

He has confessed that his first sight of the works of Raphael was a grievous disappointment, and that it required lengthened study before he could appreciate the correctness and grace of the master. By the dignity and imagination of Michelangelo he was deeply impressed ; to the end of

life the great Florentine remained for Reynolds the supreme figure in art; his name was con- stantly upon his lips, and, as he had wished, it was the last that he pronounced to the students of the Royal Academy. Of the influence of Correggio, of his sweetness of expression, of his method of chiaroscuro, we find frequent traces in the works of Sir Joshua, especially in his paintings of children ; but after all it was from the Venetians that the Inglish painter learned most. His own strongest instincts were towards richness and splendour of colour, and in these qualities he found unsurpassable examples in the produc- tions of Titian and Veronese. :

While in Rome he avoided, as far as possible, the temptation to spend his time in copying specific pictures, which he considered "a delusive kind of industry," by which " the student satisfies himself with an appearance of doing something, and falls into the dangerous habit of imitating. without selecting." His method of becoming acquainted with the old masters, and of assimilating their excellences, was by diligent examination and comparison, aided by studies of general effect and of individual parts. His knowledge of the Roman art treasures was dearly purchased, While working in the corridors of the Vatican he caught a severe cold, which resulted in the deafness that clung to him for the rest of his life, and rendered necessary the ear-trumpet which he used in conversation.

. – After a residence of two years in Rome, Reynolds, in

the spring of 1752, spent four months in visiting Parma, Florence, Venice, and other important cities of Italy; and, after a brief stay in Devonshire, he established himself as

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a portrait painter in St Martin's Lane, London, whience he afterwards removed to Great Newport Street, and finally, in 1760, to Leicester Square, where he continued

to paint till his death.

His first reception on his return was hardly a favourable one. Hudson called to see his productions and told him, " Reynolds, you don't paint so well as when you left England." Ellis, another accepted portrait painter

of the time, who had studied under Kneller, exclainied,

"This will never answer. Why, you don't paint in the least like Sir Godfrey,"—adding, as he abruptly left the room, "Shakespeare in poetry, Kneller in painting." The verdict of the public, however, was all on the side of the young innovator. Lord Edgcumbe played the part of the generous patron, and exerted himself to obtain com- missions for his protégé, of whose ability the portraits

which he now produced—of the duchess of Hamilton,

the countess of Coventry, Lord Holderness, and especially of his old friend Keppel—were sufficient guarantee. The artist's painting-room was thronged with the wealth and fashion of London, " with women who wished to be trans- mitted as angels, and with men who wished to appear as

heroes and philosophers" ; and he was already afloat upon

that tide of prosperity which never ebbed till the day of

his death. Various other artists contested with lim for popular applause. First the Swiss Liotard had his moment of popularity; and at a later period there was

Opie, and the more formidable and sustained rivalry of

Gainsborough and of Romney; but in the midst of all, then as now, Reynolds niaintained an admitted supremacy. And, if the magic of his brush brought him crowds of sitters, his charm of manner gathered round him numerous friends. During the first year of his residence in London he had made the acquaintance of Dr Johnson, which, diverse as the two

men were, became a friendship for life. To him Burke and Goldsmith, Garrick, Sterne, Bishop Percy, and, it seems, Hogarth, were before long added. At the hospitable dinner table of Reynolds such distin- guished men enjoyed the freest and most unconstrained companionship, and most of them were members of the » Literary Club," established, at the painter's suggestion, in 1764,

In 1760 the London world of art was greatly interested by the novel proposal of the Society of Artists to exhibit their works to the public. The hall of the society was at their disposal for the purpose; and in the month of April an exceedingly successful exhibition was opened, the pre- cursor of many that followed. To this display Reynolds contributed four portraits. In 1765 the association obtained a royal charter, and became known as "The Iucorporated Society of Artists"; but much rivalry and jealousy was occasioned by the management of the various exhibitions, and an influential body of painters withdrew from the society, and proceeded to consider the steps that should be taken in order that their corporate existence might be recognized. They had access to the young king, George IIL, who promised his patronage and help. In December 1768 the Royal Academy was founded, and Reynolds was elected, by acclamation, its first president, an honour which more than compensated for his failure to obtain the appointment of king's painter, which, the pre- vious year, had been bestowed on Allan Ramsay, a more courtly but more commonplace artist. In a few months the king signified his approval of the election by knighting the new president, and intimating that the queen and himself would honour him with sittings for portraits to be presented to the Academy.

Reynolds was fitted for his new position no less by his urbane and courteous manner and by his wide general culture than by his eminence as an artist. With unwearied

assiduity, with unfailing tact, he devoted himself to furthering the interests of the new Academy. It was at his suggestion that the annual banquet was instituted. To the specified duties of his post he added the delivery of a presidential address at the distribution of the prizes, and his speeches on these occasions form the well-known "discourses" of Sir

Joshua. Expressed as they are with simple elegance and_perspicuous directness, these discourses alone would be sufficient to entitle their author to literary distinction; indeed, when they were first delivered, it was thought impossible that they could be the production of a painter, and Johnson and Burke have been credited with their composition, in' spite of the specific denials of both, and of Dr Johnson's indignant exclamation —" Sir Joshua, sir, would as soon get me to paint for him as to write for him!"

In the unwearied pursuit of his art, and in the calm enjoyment of his varied friendships, Sir Joshua's life flowed on peacefully and happily enough. He was too prosperous and successful an artist altogether to escape the jealousy of his less fortunate and less capable brethren, and he suffered in this way sometimes, especially from the attacks of Barry, a painter who lived long enough to regret and, so far as he was able, to rectify his fault. In 1784, on the death of Ramsay, Reynolds was appointed painter to the king, Two years previously he had suffered from a paralytic attack; but, after a month of rest, he was able to resume his painting with unabated energy and power. In the summer of 1789 his sight began to fail; he was affected by the gutta serena, but the progress of the malady was gradual, and he continued occasionally to practise his art till about the end of 1790. His last years were embittered by a most unfortunate disagreement with the Royal Academy, relative to the appointment of a professor of perspective. Under the impression that there was a conspiracy against him among the various members, he signified his intention of leaving the presidential chair, a resignation which he was after- wards induced to withdraw, and his final discourse was delivered on the 10th December 1790. He was still able to enjoy the companionship of his friends, and he exerted himself in an effort to raise funds for the erection of a monument in St Paul's to Dr Jolinson, who had died in 1784. Towards the end of 1791 it was evident to the friends of Reynolds that he was gradually sinking. Fora few months he suffered from extreme depression of spirits, the result of a severe form of liver complaint, and on the 23d February 1792 this great artist and blameless gentle- man passed peacefully away.

Reynolds's first discourse deals with the establishment of an academy for the finc arts, and of its value as being a repository of the traditions of the best of bygone practice, of 'the principles which many artists have spent their lives in ascertaining." In the sccond lecture the study of the painter is divided into three stages, —in the first of which he is busied with processes and technicalities, with the grammar of art, while in the second he examines what has been done by other artists, and in the last compares these results with nature herself. In the third discourse Reynolds treats of "the great and leading principles of the grand style"; and succeeding addresses are devoted to such subjects as " Moderation," "Taste," "Genius," and "Sculpture." The fourteenth has an especial interest as containing an appreciative but discriminating notice of Gainsborough, who had died shortly before its delivery ; while the concluding discourse is mainly occupied with a panegyric on Michelangelo.

The other literary works of the president eomprise his three essays in Lhe Idler for 1759-60 (" On the Grand Style in Painting," and "On the True Idca of Beauty "), his notes to Du Fresnoy's Art of Painting, his Remarks on the Art of the Low Countrics, his bricf notes in Johnson's Shakespeare, and two singularly witty and brilliant fragments, imaginary conversations with J ohnson, which were never intended by their author for publication, but, found among his papers after his death, were given to the world by his niece, the marehioness of Thomond.

But the literary works of Reynolds, exeellent as these are, were

the occupation of his mere bye hours and times of leisure. The main effort of his life was directed to painting, a pursuit which, as he was never weary of impressing on younger artists, was enough to occupy a man's whole time, even were it longer than it is, and to call forth his utmost energy. The unceasing application, perseverance, and assiduity which form the recurrent burden of Reynold's discourses found the most complete illustration in his own career. He laid it down as a distinct principle that each fresh portrait to which he set his hand should exeel the last, and no effort was wanting to realize this aim. In his search for perfeetion he would paint and repaint a subject ; when a visitor asked

how a certain portion of the infant Hereules had been executed, he replied, " How can 1 tell! There are ten pictures below this, some better, some worse." A method like this contrasts curiously with the swift certainty of Gainsborough's practiee, but it must be confessed that the produc- tions of Reynolds have an abiding charm that is wanting in the exquisite but slighter and more mannered work of his great rival. In range, too, of subject, as well as of method, the art of Sir Joshua has by far the wider reach. "How various the man is," said Gainsborough once, after he had been examining the president's portraits hung in an Academy exhibition ; and the remark gains an added poiut and emphasis when we compare the paintings of Reynolds with Gainsborough's own.

In the work which the painter produced shortly after his return from Italy —in the Lady Cathcart and her Daughter of 1755, the Lady Elizabeth Montague and the George, Earl of Warwick, of 1756, and the Countess of Hyndford of 1757—we find a certain dignity and elegance of pose and arrangement which bears witness to his foreign studies, joined to some coldness of colour, hardness of execution, and insistance on definiteness of outline, which con- trasts with the sweet felicity and tenderness of his fully developed manner, with its perfect colour, and its form which is lost and found again in an exquisite mystery. But soon all that is tenta- tive and immature disappears from his works. In 1758 we have the gracious and winning full-length of Elizabeth Gunning, Duchess of Hamilton, and the stately Duke of Cumberland, followed in 1760 by the Kitty Fisher, and a host of admirable portraits in which the men and women and children of the time live still before our eyes, each possessed with a nameless dignity, or grace, or sweetuess. As the artist advanced towards old age his hand only gained in power, his colour in richness and splendour; his works show no decadence till the day when he finally laid aside his brush. We have nothing finer from his hand than the Mrs Nesbitt as Circe of 1781, the Mrs Siddons as The Tragic Muse of 1784, the Duchess of Devonshire and her Child of 1786, and the Infant Hereules and the Miss Gawtkin as Simplicity of 1788.

In the midst of his constant practice as a portrait-painter Reynolds was true to his early admiration of "the grand style," to his veneration for the old masters of Italy, to his belief that the imaginative paths which these

men pursued were the highest ways of art. At the conclusion of his last Academy discourse, while speaking of Michelangelo, he breaks forth with uncontrollable emotion, " Were I now to begin the world again, I would tread in the steps of that great master ; to kiss the hem of his garment, to catch the slightest of his perfections, would be glory and dis- tinction enough for an ambitious man."

From the Italians Reynolds conveyed into his own portrait- subjects a dignity and a grace, along with a power of colour, which were previously unknown in English art ; but he essayed also to follow them into their own exalted and imaginative paths, to paint Holy Families and Nativities, to picture the cardinal virtues, and to realize the conceptions of the poets. But tle English portrait- painter wanted the visionary power necessary for such tasks ; his productions of this class form the least interesting portion of his

work. They arc most successful when the symbolism and the

allegory in them are of the slightest, when the human element is the main attraction, when he paints as cherub faces five different views of the countenance of one living English girl, or titles as "Simplicity " his portrait of Offy Gawtkin or as "Hebe" his portrait of Miss Meyer. His series of "The Virtues," designed for the window of New College, Oxford, show simply studies of grace- ful women, lightly draped, and pleasantly posed. His Macbeth and his Cardinal Beaufort have no real impressiveness, no true terror ; and the finest of the subjects that he painted for Boydell's Shakespeare is the Puck, in which the artist's inspiration was eaught, not from the realms of imagination or fancy, but from observation of the child nature which he knew and loved.

Much has been said regarding the recklessness and want of care for permanency which characterized the technical methods of Sir Joshua. While he insisted that his pupils should follow only such ways of work as were well known and had been tested by time, he was himself most varying and unsettled in his praetice. In his earnest desire for excellence he tried all known processes, and made all kinds of fantastic experiments. He was firmly convinced that the old inasters were possessed of technical seerets which had been lost in later times, and he even scraped the

surfaces from portions of valuable works by Titian and Rubens in the vain attempt to

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probe the mystery. In his efforts to attain the utmost possible power and brilliancy of hue he made use of pigments which are admittedly the reverse of stable and permanent, he worked with dangerous vehicles, he employed both colours and varnishes which in combination are antagonistic. Orpiment was mingled with white lead ; wax-medium, egg-varnish, and asphaltum were freely used ; and, when we read the aceount of his strangely hap-hazard methods, we are ready to echo Haydon's exclamation—" The wonder is that the picture did not crack beneath the brush!" and are prepared for such a sight of the vanishing ghosts of master- pieces as was afforded by so many works in the Reynolds Exhibition at the Grosvenor Gallery in 1884. Our only consolation lies in the truth expressed by Sir George Beaumont, when his recommen- dation of Sir Joshua for the execution of a certain work was met by the objection that his colours faded, that he "made his pictures die before the man." "Never mind," said Sir George, "a faded portrait by Reynolds is better than a fresh one by anybody else. :

See Malone, Zhe Works of Sir Joshua Reynolds, Knight (3 vols., 1798); North- cote, Memoirs of Sir Joshua Reynolds, Knight, &c. (1813); Farrington, Memoirs of the Life of Sir Joshua Reynolds (1819); Beechy, Literary Works of Sir Joshua Reynolds (1835); Cotton, Sir Joshua Reynolds and his Works (edited by Burnct, 1856); Leslie and Taylor, Life and Times of Sir Joshua Reynolds (2 vols. 1865); and Redgrave, A Century of English Painters, vol. i. (1866). (J. M. G.)

RHADAMANTHUS, in Greek mythology, a son of Zeus and Europa and brother of Minos, king of Crete. At first he helped his brother to rule his island empire. His justice earned him the admiration of his subjects and the jealousy of his brother, wherefore he fled to Beeotia, where he wedded Alemene. On account of his inflexible integrity he was made one of the judges of the dead in the other world. According to Plato, Rhadamanthus

judged the souls of Asiatics, while AZacus judged those of Europeans, and when they could not agree Minos had a casting vote.

RHATIA was the name given in ancient times to a province of the Roman empire, which included a consider- able tract of the Alpine regions that separated the great valleys of the Po and the Danube, comprising the districts occupied in modern times by the Grisons and the Austrian province of Tyrol. Before their subjugation by Rome the Rheetians are described as one of the most powerful and warlike of the Alpine tribes; but little or nothing is known as to their origin and history. It is indeed stated distinctly by Livy (v. 33) that they were of Etruscan origin, and a tradition reported by Justin (xx. 5) and Pliny (7.W,, iii. 24, 133) affirmed that they were a portion of that people who had been settled in the plains of the Po and were driven into the mountains by the irruption of the Gauls, when they assumed the name of Rhetians from a leader of the name of Rhetus. Very little value can, however, be attached to such traditions, and the attempts of some modern writers to support them by philological researches have led to no satisfactory result. But the ethnical connexion of the Rhetians with the Etruscans has been accepted by Niebuhr, aud its general reception by the Romans would seem to prove that they were a distinct race from their neighbours the Ligurians as well as from the Gauls and Germans.

The name of the Rhetians is first mentioned by 'Polybius, but merely incidentally, and they played no part in Roman history till after the fall of the republic. It is certain, however, that they continued virtually independent until Augustus undertook their subjugation, in common with that of the neighbouring Alpine tribes bordering upon Italy. The importance he attached to this task is shown by his having deputed its execution to his two step-sons, Drusus and Tiberius, who ina single campaign reduced them all to subjection (15 B.c.), so that their territory was shortly after incorporated as a province in the Roman empire and their name never again appears in history. The exploits of the imperial youths on this occasion have been immortalized in two well-known odes of Horace (Od., iv. 4and 14). Inthe time of Strabo their territory was considered as extending from the Lakes of Como and Garda to that of Constance (the Lacus Brigantinus), while the

| allied people of the Vindelici, who had shared in their

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_ was considered equal to any of those grown in Italy itself.

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name it is said to have borne among the aboriginal inhabitants of Brazil, where the Portuguese settlers called

contest against the Roman arms, as well as in their final subjugation, extended down the northern slope of the Alps as far as the Danube. By far the greater part of this extensive region was occupied by rugged mountains, the inhabitants of which, when compelled to abandon their predatory habits, subsisted principally upon the produce of their flocks, Some of the valleys, however, which extended on the south side down to the plains of Italy, were rich and fertile, and produced excellent wine, which

The most important of these valleys was that of the Adige, which descends from the high Alps adjoining the Brenner to Verona; of this the upper portions were held by the }reuni, whose name is still perpetuated in that of the Brenner, while the lower and more fertile region was occupied by the Tridentini, whose chief town of Tridentum was the same as the now celebrated city of Trent. The next people towards the west were the Triumpilini, in the valley still known as Val Trompia; the Camuni in Val Camonica; the Orobii, who appear to have occupied the Val Tellina and adjoining districts ; and the Lepontii, between the Lago Maggiore and the Pennine Alps. The tribes in the interior and heart of the mountain ranges cannot be for the most part assigned to definite localities. The Genauni, mentioned by Horace as well as by Strabo, are supposed to have occupied the Val di Non, and the Vennones or Venostes the lofty ranges near the source of the Adige.

The boundaries of the Roman province were repeatedly changed. At first it appears to have comprised all Vinde- licia, so as to have extended to the Danube from its sources to its confluence with the Inn, which constituted

its eastern boundary on the side of Noricum. But at a later period this northern tract was separated from the central mountain region, and the two were named Rhetia Prima and Rheetia Secunda, in which form they appear in the Wotitia. At the same time the southern valleys were gradually incorporated with Italy and assigned to the territory of the neighbouring municipal towns. Thus Tridentum, which was originally a Rhetian town, came to be included in Venetia, and is assigned by Pliny to the tenth region of Italy. The only important town in the northern part of the province was the Roman colony of Augusta Vindelicorum, which still retains the name of Augsburg. The same is the case with Curia, now Chur or Coire, the capital of the Grisons, and Brigantia (Bregenz), which gave namein ancient times to the lake now called the Lake of Constance.

The province of Rhetia was traversed by two great lines of Roman roads, —the one leading from Verona and Tridentum (Trent) across the pass of the Brenner to Inns- bruck (Pons (Eni), and thence to Augsburg (Augusta Vin- delicorum), and the other from Bregenz on the Lake of Constance, by Coire and Chiavenna, to Como and Milan,

RHAPSODIST. See Homer, vol. xii. p. 109 sg.

RHAZES. See Mepicrnz, vol. xv. p. 805.

RHEA, the name given in 1752 by Méhring! to a South-American bird which, though long before known and described by the earlier writers—Nieremberg, Marcgrave, and Piso (the last of whom has a recognizable but rude figure of it)—had been without any distinctive scientific appellation. Adopted a few years later by Brisson, the name has since passed into general use, especially among English authors, for what their predecessors had called the American Ostrich; but on the European continent the bird is commonly called Vandu,? a word corrupted from a

? What prompted his bestowal of this name, so well known in classical mythology, is not apparent.

2 The name Touyou, also of South-American origin, was applied to it by Brisson and others, but erroneously, as Cuvier shews, since by that name, or something like it, the JaBrru (vol. xiii. p. 529) is properly meant.

it Zma (cf. Emxv, vol. vii. p. 171). The reseniblance of

the Rhea to the Osrricu (vol. xviii. p. 62) was at once perceived, but the differences between them were scarcely less soon noticed, for some of them are very evident. The former, for instance, has three instead of two toes on each foot, it has no apparent tail nor the showy wing-plumes of

the latter, and its head and neck are clothed with feathers, while internal distinctions of still deeper significance have since been dwelt upon by Prof. Huxley (Proc. Zool. Society, 1867, pp. 420-422) and the late Mr W. A. Forbes (op. cit., 1881, pp. 784-787), thus justifying the separation of these two forms more widely even than as Families 1 and there can be little doubt that they should be regarded as types of as many Orders—Struthiones and Rhex—of

Rhea,

the Subclass Ratitx.? Structural characters no less im- portant separate the Rheas from the Emens, and, apart from their very different physiognomy, the former can be readily recognized by the rounded form of their contour-feathers, which want the hyporrhachis or after-shaft that in the Emeus and Cassowaries is so long as to equal the main shaft, and contributes to give these latter groups the appearance of being covered with shaggy hair. Though the Rhea is not decked with the graceful plumes which adorn the Ostrich, its feathers have yet a considerable market value, and for the purpose of trade in them it is annually killed by thousands, so that it has been already extirpated from much of the country it formerly inhabited,4 and its total

3 Ann. Nat. History, ser. 4, xx. p. 500.

4 Mr Harting, in his and Mr De Mosenthal's Ostriches and Ostrich Farming, from which the woodcut here introduced is by permission copied, gives (pp. 67-72) some portentous statistics of the destruction of Rheas for the sake of their feathers, which, he says, are known in the trade as " Vautour " to distinguish them from those of the African bird.

extinction as a wild animal is probably only a question of time. Its breeding habits are precisely those which have been already described in the case of other Ratite birds. Like most of them it is polygamous, and the male performs the duty of incubation, brooding more than a score of eggs, the produce of several females—facts known to Nieremberg more than two hundred and fifty years since, but hardly accepted by naturalists until recently. From causes which, if explicable, do not here concern us, no examples of this bird seem to have been brought to Europe before the beginning of the present century, and accordingly the descriptions previously given of it by systematic writers were taken at second hand and were mostly defective if not misleading. In 1803 Latham issued a wretched figure of the species from a half-grown specimen in the Leverian Museum, and twenty years later said he had seen only one other, and that still younger, in Bullock’s collection (Gen. Hist. Birds, viii. p. 379). A bird living in confinement at Strasburg in 1806 was, however, described and figured by Hammer in 1808 (Ann. du Muséum, xii. pp. 427-433, pl. 39), and, though lhe does not expressly say so, we may infer from his account that it had been a captive for some years. In England the Report of the Zoological Society for 1833 announced the Rhea as having been exhibited for the first time in its gardens during the preceding twelvemonth. Since then many other living examples have been introduced, and it has bred both there and elsewhere in Britain, but the young do not seem to be very easily reared.”

Though considerably smaller than the Ostrich, and, as before stated, wanting its fine plumes, the Rhea in general aspect far more resembles that bird than the other Ratitex. The feathers of the head and neck, except on the crown and nape, where they are dark brown, are dingy white, and those of the body ash-coloured tinged with brown, while on the breast they are brownish-black, and on the belly and thighs white. In the course of the memorable voyage of the “Beagle,” Darwin came to hear of another kind of Rhea, called by his informants Avestruz petise, and at Port Desire on the east coast of Patagonia he obtained an example of it,

the imperfect skin of which enabled Mr Gould to describe it (Proc. Zool. Society, 1837, p. 35) as a second species of the genus, naming it after its discoverer. Rhea darwini differs in several well-marked characters from the earlier known &. americana. Its bill is shorter than its head ; its tarsi are reticulated instead of scutellated in front, with the upper part feathered instead of being bare ; and the plumage of its body and wings is very different, each feather being tipped with a distinct whitish band, while that of the head and neck is greyish-brown. A further distinction is also asserted to be shewn by the egas—those of #. americana being of a yellowish-white, while those of . darwini have a bluish tinge. Some years afterwards Mr Sclater described (op. cit., 1860, p. 207) a third and smaller species, more closely resembling the RF. americana, but having apparently a longer bill, whence he named it A. macrorhyncha, more slender tarsi, and shorter toes, while its general colour is very much darker, the body and wings being of a brownish-grey mixed with black. The precise geographical range of these three species is still undetermined. While &. americana is known to extend from Paraguay and southern Brazil through the state of La Plata to an uncertain distance in Patagonia, #. darwint seems to be the proper inhabitant of the country last named, though

1 The ninth edition of the Companion to this collection (1810, p. 121) states that the specimen "was brought alive" [? to England].

2? Interesting accounts of the breeding of this bird in confinement are given, with much other valuable matter, by Mr Harting in the work already cited.

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M. Claraz asserts (op. cit., 1885, p. 324) that it is occasion- ally found to the northward of the Rio Negro, which had formerly been regarded as its limit, and, moreover, that flocks of the two species commingled may be very frequently seen in the district between that river and the Rio Colorado. On the "'pampas" &. americana is said to associate with herds of deer (Cariacus campestris), and f. darwint to be the constant companion of guanacos (Lama huanaco)—just as in Africa the Ostrich seeks the society of zebras and antelopes. As for R. macrorhyncha, it was

found by Forbes (Jdis, 1881, pp. 360, 361) to inhabit the dry and open "sertoés" of north-eastern Brazil, a discovery the more interesting since it was in that part of the country that Marcgrave and Piso became acquainted with a bird of this kind, though the existence of any species of Rhea in the district had been long overlooked by or unknown to succeeding travellers.

Besides the works above named and those of other recognized authorities on the ornithology of South America such as Azara, Prince Max of Wicd, Prof. Burmeister, and others, more or less valu- able information on the subject is to be found in Darwin's Voyage ; Dr Bocking's " Monographie des Nandu" in (Wiegmann's) Archiv fiir Naturgeschichte (1868, i. pp. 218-241); Prof. R. O. Cunning- ham's Natural History of the Strait of Magellan and paper in the Zoological Society's Proceedings for 1871 (pp. 105-110), as well as Dr Gadow's still more important anatomical contributions in the saine journal for 1885 (pp. 808 sq.). (A. .)

RHEA (or Ruega) FIBRE is a textile material yielded by one or more species of Béhmeria (nat. ord. Urticaceex), plants found over a wide range in India, China, the Malay Peninsula and islands, and Japan. Rhea is also capable of being grown in temperate latitudes, and has been experi- mentally introduced into the south of France and Algeria. The most important source of rhea fibre, known also very inappropriately as China grass, or by its Malay name Ramie, is B. nivea. It is a shrubby plant growing to the height of from 5 to 8 feet with foliage and inflorescence like the common nettle, but destitute of stinging hairs. Some authorities consider the variety cultivated in China to be specifically distinct from the Indian plant. An allied plant called Pooah or Puya, B. Puya, found growing wild in the north of India, is also a source of rhea fibre. Among the Chinese much care is bestowed on the cultiva- tion of Chu or Tchou Ma, as rhea is called by them, and they prepare the fibre by a tedious and costly process of selection and manual labour. The plant thrives in hot, moist, shaded situations; propagated from slips or root cuttings, it throws up from three to five crops of stems in the course of a season, although not more than three crops are commonly reckoned on. Each such crop may yield about 250 Ib of marketable fibre per acre, that total output being exceeded only by the jute crop. The stems when ripe are

cut down, stripped of leaves and branchlets, and, either split or whole, are freed from their cortical layers till the bast layer isexposed. In this state they are made up in small bundles and placed where they receive strong sunlight by day and dews by night for several days, after which the fibrous bast layer is peeled with ease off the woody core, and the separated fibres are thereafter treated with boiling water to remove as far as possible adherent gummy and resinous matter in which the fibres are em- bedded in the stalks. The fibre so obtained is usually bleached by exposure on the grass, and it comes into the market as brilliant white filaments with a fine silky gloss, having a strength, lustre, and smoothness unequalled by any other vegetable fibre.

The fibre first appeared in the European market in 1810, and a cord then spun from it was found to sustain a weight of 252 fh, while a similar cord of Russian hemp was estimated by Admiralty test not to bear more than 87 tb. A fibre possessed of such strength and beauty immediately attracted great attention, and throughout the early half of the century numerous efforts were made by the Kast India Company to introduce it as a textile staple. But many diffi-

eulties have been encountered in its working, some of which are not yet overcome. The fibre itself is very difficult of extraction owing to the large amount of adhesive matter in which it is embedded, and it is proportionately so expensive that it practically comes into competition only with silk and wool. Further, rhea is hard and in- elastic, and on the machinery adapted for spinning other textiles it can only be spun into a rough, harsh, and hairy yarn, while fabrics into which it is woven are rigid, and show permanent creases at every fold. In the form of cordage, moreover, it cuts and gives way at sharp knots and twists. Notwithstanding all disappoint- ments and drawbacks, the Indian Government considered the fibre of such importance that in 1869 two prizes of £5000 and £2000 and again in 1877 prizes of £5000 and £1000 were offered for maehinery or processes by which the fibre could be prepared at such a cost per ton as would render its introduction into the market prac- ticable. Competitive trials were made at Saharanpur in 1872 and 1879, but no machine was

*found to satisfy the conditions of success, although in 1872 a reward of £1500 was granted to Mr John Greig, jun., of Edinburgh, and in 1879 £500 and £100 respectively were paid to two of the competitors. The extraction of rhea continues to attract attention, and quite recently (1885) it has been announced that Prof. Frémy of Paris, assisted by M. Urbain, has success- fully overcome all difficulties. The raw material used by Prof. Fremy is obtained by a process devised by M. Fevier, which consists in submitting the newly cut stems to low-pressure steam for twenty minutes, after which the whole rind is separated in ribands from its woody core with the utmost ease. These ribands are then dried, and on them Prof. Frémy operates with alkaline solutions which are varied in strength according to the appearance of the material dealt with, and a pure fibre in fine working condition is thus obtained. Rhea has yet to establish its position among Euro- pean textiles, but in the East its valuc is well recognized. It is extensively used for cordage, fishing nets, &c. ; and it is very little affected by water. The Chinese prepare an exceedingly fine * grass cloth" from single filaments of rhea, knotted or gummed end to eud in the way they employ the finest filaments of Manila hemp for making " Pina" gauze.*

RHEGIUM. See Recaro.

RHEIMS, a city of France, chief town of an arrondisse- ment of the department of Marne, lies 81 miles east-north- east of Paris (99 miles by rail) on the right bank of the Vesle, a tributary of the Aisne, and on the canal which connects the Aisne with the Marne. To the south and west rise the "montagne de Rheims" and the vine-clad hills where the wine is grown which constitutes the chief object of the industry and commerce of the town. Rheims has been, since the last Franco-Prussian War, surrounded with detached forts that render it a great entrenched camp, and it still preserves eleven of the gates of its old enceinte, that of Paris, constructed on occasion of the coronation of Louis XVI, being specially noticeable. Beyond the boulevards the town spreads out in several suburbs—the faubourgs of St Anne on the south, Vesle on the west, Laon on the north-west, and Cérés on the north- east. The town is well planned and built, and its streets are traversed by tramways.

The spinning and weaving of wool is carried on in seventy factories, employs 10,000 hands, and annually turns £3,500,000 worth of the raw material into flannels, merinoes, cloth, blankets, &c. Dyeing and " dressing " are carried on in the outskirts of the town. Fifty firms with 2000 workmen are employed in the champagne manufacture ; the cellars are vast excavations in the chalk rock. Rheims is also famous for its biscuits, ginger- bread, and dried pears. Machinery, chemical products, candles, soap, stained glass, common glass, and paper are also manufactured. In respect of population (93,683 in 1881) Rheims ranks as the eleventh city of France.

The oldest monument in Rheims is the Mars Gate (so called from a temple to Mars in the neighbourhood), a triumphal arch 108 feet in length by 43 in height erected by the Remi in honour of Cesar and Augustus when Agrippa made the great roads ter- minating at the town. In its vicinity a curious mosaic measuring 35 feet by 26, with thirty-five medallions representing animals and gladiators, was discovered in 1861. But by far the most interesting architectural feature of the town is the cathedral of Notre Dame, where the kings of France used to be crowned. It replaced an older church burned in 1211, which had been built on the site of the basilica where Clovis was baptized by St Remigius.

The whole cathedral, with the exception of the facade, was com- pleted by 1231 ; but it has undergone numerous alterations. The present fagade was erected in the 14th century after 13th-century designs, —the nave having in the meantime been lengthened so as to afford room for the vast crowds that attended the coronations. In 1481 a terrible fire destroyed the roof and also the spires, which have never been restored to their original state. In 1875 the National Assembly voted £80,000 for repairs of the facade and balustrades. This facade is the finest portion of the building, and one of the most perfect masterpieces of the Middle Ages. The portals and the rose window are laden with statues and statuettes ; the "gallery of the kings " above has the baptism of Clovis in the centre, and also has statues of Charlemagne and his father Pippin the Short. The towers, 267 feet high, were originally designed to rise 394 feet ; that on the south contains two great bells, one of which, named by Cardinal de Lorraine in 1570, weighs more than 11 tons. The transepts are also decorated with

sculptures,—that on the north with statues of the principal bishops of Rheims, a representation of the last judgment, and a. figure of Christ, while that on the south side has a beautiful rose window with the

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Plan of Rheims.

prophets and apostles. Of the four towers which formerly flanked the transepts nothing remains above the height of the roof since the fire of 1481. Above the choir rises an elegant bell-tower in timber and lead, 59 feet high, reconstructed in the 15th century. The interior of the cathedral is 455 feet long, 984 feet wide in the nave, and 125 feet high in the centre. It has a profusion of statues similar to those of the outside, and is further adorned with stained glass of the 13th eentury and with tapestries. The rose window over the main portal and the gallery beneath are of rare magnificence. Forty pieces of tapestry bestowed in 1530 by Robert de Lenoncourt, and devoted to the history of the Virgin, are remarkable for the richness of colour and the variety of costume they display. Of six pieces presented by Cardinal de Lorraine in 1570, only three have been preserved ; one of them representing the coronation of Clovis and the battle of Soissons affords valuable evidence relating to the military costumes of the 16th century. Archbishop Henry of Lorraine also presented seventeen large pieces of tapestry representing the life of Christ, in 1633 ; they are called Pepersack's tapestries after the maker, a celebrated tapestry

weaver of Charleville. Thc Canticles tapestries, four pieces repre- senting scenes in Louis XIV.'s youth, originally belonged to the castle of Hanteville. In the right transcpt are two great Gobelins tapestries executed after Raphael's designs, and dealing with the life of St Paul. The left transept contains a fine organ in flamboyant Gothic with 3516 pipes and 53 stops. The choir clock is ornamented with curious mechanieal devices. Several paintings, by Titian, Tintoretto, Nicolas Poussin, and others, and 'the carved woodwork and the railings of the choir, also deserve to be mentioned; and among the numerous objects of antiquarian interest in the cathedral "treasury " is the reliquary of the sacred plial which contained the oil used in anointing the kings, but was broken during the Revolution. The archiepiscopal palace, built between 1498 and 1509, and in part rebuilt in 1675, was oceupied by the kings on the occasion of their coronation. The saloon chamber, where the royal banquet was held, hasan immense stone chimney of the 15th century, medallions of the archbishops of Rheims, and portraits of fourteen kings crowned in the city. Among the other rooms of the royal suite, all of which are of great beauty and richness, is that now used for the meetings of the Rheims Academy ; the building also contains a library of 16,000 volumes. The chapel of the archiepiscopal palace consists of two stories, the upper of which still serves as a place of worship, while the lower is occupied by an antiquarian museum, in which is pre- served the marble cenotaph (almost entire) of the consul Jovinus, who in the 4th century led his fellow-townsmen at Rheims to embrace Christianity. After the cathedral the most celebrated church is that of St Remi, built in the 11th and 12th centuries on the site of an older place of worship. The valuable monuments with which it was at one time filled were pillaged during the Revolution, and even the tomb of the saint is a modern piece of work ; but there still remain the 18th-century glass windows of the apse and tapestries representing the history of St Remigius. The churches of St Jacques, St Maurice (partly rebuilt in 1867), St André, and St Thomas (erected in 1847, under the patronage of Cardinal Gousset, now buried within its walls), as well as the chapels of the lycée and of several monasteries, are all more or less interesting. There are also in the city two Protestant churches and a synagogue.

The town-house, erected in the 17th century and enlarged in 1880, has a pediment with an cquestrian statue of Louis XV. and a tall and clegant campanile. It contains a picture gallery, a natural history museuin, and a library of 60,000 volumes and 1500 MSS. Of the many curious old houses which still exist in the town it is enough to mention the House of the Musicians, so called from the seated figures of musicians which decorate the front. Rheims is the seat of an academy of science, arts, and literature, founded in 1841 and composed of forty-five members, a preparatory school of medicine and pharmacy, several hospitals, and a modern theatre. It is the headquarters of one of the divisions of the 6th corps d'armée (Chalons). Colbert's statue adorns the Cours; Louis XV.'s (in bronze) stands in the centre of the handsome Place Royale ; and Marshal Drouet d'Erlon's is in another of the public squares.

History.—Rheims (Duroeortorum), an important town in the time of Cesar, made voluntary submission to the Romans and by its fidelity throughout the various Gallic insurrections secured the special favour of its conquerors. Christianity was introduced about the middle of the 4th century. Jovinus, already mentioned as an influential supporter of the new faith, repnlsed the barbarians who invaded Champagne in 836; but the Vandals captured the town in 406 and slew St Nicasus, and Attila afterwards put everything to fire and sword. Clovis, after his victory at Soissons (486), was baptized at Rheims in 496 by St Remrcivus (q.v.). From this period the see acquired new lustre. The kings of the second and third dynasties desired to be consccrated at Rheims with the oil of the sacred phial which was believed to have been brought from heaven by a dove for the baptism of Clovis and was preserved in the abbey of St Remi. Historical meetings of Pope Stephen III. with Pippin the Short, and of Leo III. with Charlemagne, took place at Rheims ; and there Louis the Debonnaire was crowned by Stephen IV. Inthe 10th century Rheims had become a centre of intellec- tual culture, Archbishop Adalberon, seconded by the monk Gerbert (Sylvester II.), having founded schools where the "liberal arts" were taught. Adalberon was also one of the prime authors of the revolu- tion which put the Capet house in the place of the Carlovingians. The archbishops of Rheims held the temporal lordship of the city and coined money till the close of the 14th century. But their most important prerogative was the consecration of the king,—a privilege

which was regularly exercised from the time of Philip Augustus to that of Charles X. Louis VII. granted the town a communal eharter in 1189. Councils met within its walls in 1119 and 1148. The treaty of Troyes (1420) ceded it to the English, who had made a futile attempt to take it by siege in 1360; but they were expelled on the approach of Joan of Arc, who in 1429 caused Charles VII. to be duly conseerated in the cathedral. A revolt at Rheims cansed by the salt tax in 1461 was cruclly repressed by

Louis XI. The town sided with the League (1585), but submitted to Henry IV. after the battle of Ivry. In the foreign invasions of 1814 it was captured and recaptured ; in 1870-71 it was made by the Germans the seat of a governor-general and impoverished by heavy requisitions.

RHEINGAU. See RHINE.

RHENANUS, Beats (c. 1485-1547), German human- ist, was born about 1485 at Schlettstadt in Alsace, where his father, a native of Rheinau, was a prosperous butcher. He received his early education in Schlettstadt, and afterwards (1503) went to Paris, where he came under the influence of Faber Stapulensis; here, among his other learned pursuits, we must include that of correcting the press for Henry Estienne. In 1511 he removed to Basel, where he became intimate with Erasmus, and took an active share in the publishing enterprises of Frobenius. Some time after 1520 he became a comparatively wealthy man through the death of his father; returning to Schlettstadt he devoted himself to a life of learned leisure, enlivened with free epistolary and personal intercourse with Erasmus, Reuchlin, Pirckheimer, Lasky, and many other scholars of his time. He died at Strasburg, while returning from Baden in Switzerland, whither he had gone for his health, in 1547, leaving behind him a high reputa- tion not only for sound learning but also for singular gentleness, modesty, and simplicity.

His earliest publication was a life of Geiler of Strasburg (1510). Of his subsequent works the principal are Rerum Germanicarum Libri IIT,

(1581), and editions of Velleius Paterculus (ed. princeps, from a MS. discovered by himself, 1520) ; Tacitus (1538, exclusive a ae li ; Livy (1535); and Erasmus (with a life, 9 vols. fol.,

RHENISH PRUSSIA. See Prussia, RuEntsu.

RHETICUS, or RuztTIcvs, a surname given to GEORGE Joacumm (1514-1576) from his birth at Feldkirch in that part of Tyrol which was anciently the territory of the Rheti. Born in 1514, he was appointed professor of mathematics at Wittenberg in 1537. His first appearance before the public was in the character of an enthusiastic convert to the newly broached opinions of Copernicus. No sooner had he adopted these opinions than, resigning his chair, he repaired to Frauenberg to sit at the feet of their great promulgator. All his energy was forthwith devoted to the new system, and, as has been mentioned under CoPEr- NIcUS, it was he who superintended the printing of the De Orbiwm Revolutione. Rheticus now commenced his great treatise, Opus Palatinum-de Triangulis, and continued to work at it while he occupied his old chair at Wittenberg, while he taught mathematics at Leipsic, while he travelled over different parts of the Continent, and indeed up to his death in Hungary in 1576. The Opus Palatinum of Rheticus was published by Otho in 1596. It gives tables of sines and cosines, tangents, &c., for every 10 seconds, calculated to ten places. He had projected a table of the same kind to fifteen places, but did not live to complete it. The sine table, however, was afterwards published on this scale under the name of Thesaurus Mathematicus (Frankfort, 1613) by Pitiscus, who himself carried the calculation of a few of the earlier sines to twenty-two places.

RHETORIC. A lost work of Aristotle is quoted by Diogenes Laertius (viii. 57) as saying that Empedocles "invented " (eipetv) rhetoric ; Zeno, dialectic. This is cer- tainly not to be understood as meaning that Empedocles composed the first "art" of rhetoric. It is rather to be explained by Aristotle's own remark, cited by Laertius from another lost treatise, that Empedocles was "a master of expression and skilled in the use of metaphor "—quali- ties which may have found scope in his political oratory, when, after the fall of Thrasydzeus in 472 3B.c., he opposed the restoration of a tyranny at Agrigentum. The founder of

rhetoric as an art was Corax of Syracuse (c 466 B.c.). In 466 Thrasybulus the despot of Syracuse was

Early Greek rhetoric —={ Olonth ey

The topic of eixds.

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overthrown, and a democracy was established. One of the immediate consequences was a mass of litigation on claims to property, urged by democratic exiles who had been dispossessed by Thrasybulus, Hiero, or Gelo. If, twenty years after the Cromwellian settlement of Ireland, an opportunity had been afforded to aggrieved persons for contesting every possession taken under that settlement in the ten counties, such persons being required to plead by their own mouths, the demand for an "art" of forensic rhetoric in Ireland would have been similar to that which existed in Sicily at the moment when Corax appeared. If we would understand the history of Greek rhetoric before Aristotle, we must always remember these circum- stances of its origin. The new "art" was primarily intended to help the plain citizen who had to speak before a court of law. "Ten years ago," a Syracusan might urge, "' Hieron banished me from Syracuse because I was suspected of popular sympathies, and gave my house on the Epipole to his favourite Agathocles, who still enjoys it. I now ask the people to restore it." Claims of this type would be frequent. Such a claim, going many years back, would often require that a complicated series of details should be stated and arranged. It would also, in many instances, lack documentary support, and_ rely chiefly on inferential reasoning. The facts known as to the "art" of Corax perfectly agree with these conditions. He gave rules for arrangement, dividing the speech into five parts,—proem, narrative, arguments (dydves), sub- sidiary remarks (apéxGacus), and peroration. Next he illustrated the topic of general

probability (cixds), showing its two-edged use: ¢.g., if a puny man is accused of assault- ing a stronger, he can say, "Is it likely that I should have attacked him?" If vice versa, the strong man can argue, "Is it likely that I should have committed an assault where the presumption was sure to be against me?" This topic of eikdés, in its manifold forms, was in fact the great weapon of the earliest Greek rhetoric. It was further developed by Tisias, the pupil of Corax, as we see from Plato's Phedrus, inan "art" of rhetoric which antiquity possessed, but of which we know little else. Aristotle gives the «ixés a place among the topics of the fallacious enthymeme which he enumerates in [het. ii. 24, remarking that it was the very essence of the treatise of Corax, and points out the fallacy of omitting to distin- guish between abstract and particular probability, quoting the verses of Agatho,—" Perhaps one might call this very thing a probability, that many improbable things will happen to men." Gorgias of Leontini, who visited Athens as an envoy from his fellow-citizens in 427 B.o., captivated the Athenians by his oratory, which, so far as the only considerable fragment warrants a judgment, was characterized by florid antithesis. But he has no definite place in the development of rhetoric as a system. It is doubtful whether he left a written "art"; and his mode of teaching was based on learning prepared passages by heart,—diction (Aé£is), not invention or arrangement, being his great object.

The first extant Greek author who combined the theory with the practice of rhetoric is the Athenian Antiphon, the first on the list of the Attic orators. His works belong to the period from 421 to 411 Bo Among them are the three "tetralogies." Each tetralogy is a group of four speeches, supposed to be spoken in a trial for homicide. Antiphon was the earliest repre- sentative at Athens of a new profession created by the new art of rhetoric—that of the Aoyoypados or writer of forensic speeches for other men to speak in court. The plain man who had not mastered the newly invented weapons of speech was glad to have the aid of an expert. The tetralogies show us the art of rhetoric in its transi-

tion from the technical to the practical stage, from the school to the law-court and the assembly. The four skeleton speeches of each tetralogy are

ordered as follows: —A, the accuser states his charge; B, the accused makes his defence ; C, the accuser replies ; D, the accused rejoins to the reply. The imaginary case is in each instance sketched as slightly as possible; all details are omitted ; only the framework for discussion is supplied. The organic lines of the rhetorical pleader's thought stand out in bold relief, and we are enabled to form a clear notion of the logographer's method. We find a striking illustra- tion of the fact noticed above, that the topic of "pro- bability," so largely used by Corax and Tisias, is the staple of this early forensic rhetoric. Viewed generally, the works of Antiphon are of great interest for the history of Attic prose, as marking how far it had then been influ- enced by a theory of style. The movement of Antiphon's prose has a certain grave dignity, "impressing by its weight and grandeur," as a Greek critic in the Augustan age says, "not charming by its life and flow." Verbal antithesis is used, not in a diffuse or florid way, but with a certain sledge-hammer force, as sometimes in the speeches of Thucydides. The imagery, too, though bold, is not florid. The structure of the periods is still crude; and the general effect of the whole, though often powerful and impressive, is somewhat rigid.

As Antiphon represents what was afterwards named the "austere" or "rugged" style (atorypa dppovia), so Lysias was the model of an artistic and versatile sim- plicity. But the tetralogies give Antiphon a place in the history of rhetoric as an art, while Lysias, with all his more attractive gifts, belongs only to the history of oratory. Ancient writers quote an "art" of rhetoric by Isocrates, but its authenticity was questioned. It is

certain, however, that Isocrates taught the art as such, Isocrates.

He is said to have defined rhetoric "as the science of persuasion" (émornunv meots, Sextus Empir., Adv. Mathem., ii. § 62, p. 301 sg.) Many of his particular precepts, both on arrangement and on diction, are cited, but do not suffice to give us a complete view of his method. The drocodia, or "theory of culture," which Iso- crates expounds in his discourses " Against the Sophists " and on the " Antidosis," was in fact rhetoric applied to politics. First came technical expositions: the pupil was introduced to all the artificial resources which prose com- position employs (ras id€as dmdcas als 6 Adyos Tuyydver xpomevos, Antid., §

183). The same term (idéac) is also used by Isocrates in a narrower sense, with reference to the "figures" of rhetoric, properly called oynpara (Panath., § 2); sometimes, again, in a sense still more general, to the several branches or styles of literary com- position (Antid., § 11). When the technical elements of the subject had been learned, the pupil was required to apply abstract rules in actual composition, and his essay was revised by the inaster. Isocrates was unquestionably successful in forming speakers and writers. This is proved by the renown of his school during a period of some fifty years, from about 390 to 340 Bc. Among the states- men whom it could claim were Timotheus, Leodamas of Acharne, Lycurgus, and Hyperides. Among the philosophers or rhetoricians were Speusippus, Plato's suc- cessor in the Academy, and Iseeus ; among the historians, Ephorus and Theopompus.

In the persou of Isocrates the art of rhetoric is thus thoroughly established, not merely as a technical method, but also as a practical discipline of life. If Plato's mildly ironical reference in the Huthydemus to a critic "on the borderland between philosophy and statesmanship " was meant, as is probable, for Isocrates, at least there was a wide difference between the measure of acceptance

accorded to the earlier Sophists, such as Protagoras, and the influence which the school of Isocrates exerted through the men whom it had trained. Rhetoric had won its place in education. It kept that place, through varying for- tunes, to the fall of the Roman empire, and resumed it, for a while, at the revival of learning.

Aristotle's Rhetoric belongs to the generation after Isocrates, having been composed between 330 and 322 p.c. Ag controversial allusions sometimes hint, it holds Isocrates for one of the foremost exponents of the subject. From a merely literary point of view, Aristotle's Rhetoric (with the partial exception of book iii.) is one of the driest works in the world. From the

historical or scientific point of view, it is one of the most curious and the most interesting. If we would seize the true significance of the treatise, it is better to compare rhetoric with grammar than with its obvious analogue, logic. A method of grammar was the conception of the Alexandrian age, which had lying before it the standard masterpieces of Greek literature, and deduced the "rules" of grammar from the actual practice of the best writers. Aristotle, in the latter years of the 4th century B.c., held the same position relatively to the monuments of Greek oratory which the Alexandrian methodizers of grammar held rela- tively to Greek literature at large. Abundant materials lay before him, illustrating, in the greatest variety of forms, how speakers had been able to persuade the reason or to move the feelings. From this mass of material, said Aristotle, let us try to generalize. Let us deduce rules, by applying which a speaker shall always be able to per- suade the reason or to move the feelings. And, when we have got our rules, let us digest them into an intelligent method, and so construct a true art. Aristotle's practical purpose was undoubtedly real. If we are to make persua- sive speakers, he believed, this is the only sound way to set about it. But, for us moderns, the enduring interest of his Rhetoric is mainly retrospective. It attracts us as a feat in analysis by an acute mind—a feat highly character- istic of that mind itself, and at the same time strikingly illustrative of the field over which the materials have been gathered.

Rhetoric is properly an art. This is the proposition from which Aristotle sets out. It is so because, when a speaker persuades, it is possible to find out why he succeeds in doing so. Rhetoric is, in fact, the popular branch of logic. Now hitherto, Aristotle says, the essence of rhetoric has been neglected for the accidents. Writers on rhetoric have hitherto concerned themselves mainly with "the exciting of prejudice, of pity, of anger, and such- like emotions of the soul." All this is very well, but "it has nothing to do with the matter in hand; it has regard to the judge." The true aim should be to prove your point, or seem to prove it.

Here we may venture to interpolate a comment which has a gencral bearing on Aristotle's Rhetoric. It is quite true that, if we start from the conception of rhetoric as a branch of logic, the phantom of logic in rhetoric claims precedence over appeals to passion. But Aristotle does not

sufficiently regard the question— What, as a matter of experience, is most persuasive? The phantom of logic may be more persuasive with the more select hearers of rhetoric; but rhetoric is not for the more select; it is for the many, and with the many appeals to passion will sometimes, perhaps usually, be more effective than the semblance of the syllogism. And here we seem to touch the basis of the whole practical vice—it was not strictly a theoretical vice—in the old world's view of rhetoric, which, after Aristotle's day, was ultimately Aristotelian. No formulation of rhetoric can corre- spond with fact which does not leave it absolutely to the genius of the speaker whether reasoning (or its phantom) is to be what Aristotle calls it, the "body of proof" (c@ua rlerews), or whether the stress of persuading effort should not be rather addressed to the emotions of the hearers. This is a matter of tact, of instinct, of oratorical genius.

But we can entirely agree with Aristotle in his next remark, which is historical in its nature. The deliberative branch of rhe- toric had hitherto been postponed, he observes, to the forensic. We have already seen the primary cause of this, namely, that the very origin of rhetoric in Hellas was forensic. The most

urgent need which the citizen felt for this art was not when he had to discuss the interests of the city, but when he had to defend (perhaps) his own property or his own life. The relative subordination of deliberative rhetoric, however unscientific, had thus been human. Aristotle's next statement, that the master of logic will be the master of rhetoric, is a truism if we conccde the essential primacy of the logical element in rhetoric. Otherwise it is a paradox; andit is not in accord with experience, which teaches that speakers incapable of showing even the ghost of an argument have sometimes been the most completely successful in carrying great audiences along with them. Aristotle never assumes that the hearers of his rhetorician are as of yaplevres, the cultivated few; on the other hand, he is apt to assume tacitly—and here his individual bent comes out—that these hearers are not the great surging crowd, the xaos, but a body of persons with a decided, though imperfectly developed, preference for sound logic.

What is the use of an art of rhetoric? It is fourfold, Aristotle replies. Rhetoric is useful, first of all, because truth and justice are naturally stronger than their opposites. When awards are not duly given, truth and justice must have been worsted by their own fault. This is worth correcting. Rhetoric is then (1) corrective. Next, it is (2) instructive, as a popular vehicle of persuasion for persons who could not be reached by the severer methods of strict logic. Then it is (8) suggestive. Logic and rhetoric are the two impartial arts; that is to say, it is a matter of indifference to them, as arts, whether the conclusion which they draw in any given case is aflirmative or negative. Suppose that I am going to plead a cause, and have a sincere conviction that I am on the right side. The art of rhetoric will suggest to me what might be urged on the other side; and this will give me a stronger grasp of the whole situation. Lastly, rhetoric is (4) defensive. Mental effort is more distinctive of man than bodily effort; and "it would be absurd that, while incapacity for physical self-defence is a reproach, incapacity for mental defence should be no reproach." Rhetoric, then, is corrective, instructive, suggestive, defensive. But what if it be urged that this art may be abused? The objection, Aristotle answers, applies to all good things, except virtue, and especially to the most useful things. Men may abuse strength, health, wealth, generalship. Ea

The function of the medical art is not necessarily to cure, but to make such progress towards a cure as each case may admit. Similarly it would be inaccurate to say that the function of rhetoric was to persuade. Rather must rhetoric be defined as "the faculty of discerning in every case the available means of persuasion." Suppose that among these means of persuasion is some process of reasoning which the rhetorician himself knows to be unsound, That belongs to the province of rhetoric all the same. Iu relation to logic, a man is called a "sophist" with regard to his moral purpose (mpoalpeois), 7.¢., if he knowingly uses a fallacious syllogism. But rhetoric takes no account of the moral purpose. It takes account simply of the faculty (Sdvapis) —the faculty of discovering any means of persuasion.

The "available means of persuasion," universally considered, may be brought under two classes. (1) First, there are the proofs external to the

art,—not furnished by rhetoric,—the “ inartificial proofs” (&rexvoi lores). Such are the depositions made by witnesses, documents, and the like. (2) Secondly, there are the proofs, z.e., the agents of persuasion, which the art of rhetoric itself provides, the “artificial proofs” (yrexvot miorets). These are of three kinds :—(a) logical (Aoyix} wlorts)—demonstration, or seeming demonstration, by argument ; (0) ethical (761 wioris), when the speaker succeeds in conveying such an impression of his own character as may lead the hearers to put trust in him; (c) emotional (ranrix} riots), When the speaker works persuasively on the feelings of the hearers. It follows that, besides logical skill, the rhetorician should possess the power of analysing character, in order to present himself in the ethical light which will be most effective with his audience. He must also under- stand the sources of the emotions, and the means of producing them. Hence rhetoric has a double relationship. While in one aspect—the most important to it as an art—it may be regarded as popular logic, in another aspect it is related to ethics. And hence, says Aristotle, political science (modrtixh) being a branch of ethical, as the citizen is one aspect of the man, “rhetoric and its professors slip into the garb of political science (émoddera: rd oxXiua 7d THs woATixys), either through want of education, or from pretentiousness, or from other human causes.”

Uses of rhetoric.

Rhetoric defined.

The wloTels classified.

Aristotle now proceeds to analyse the first of the "artificial The

proofs," the logical (Aoyinh wlotis). syllogism of logic, rhetoric has its popular syllogism, to which Aristotle gives the name of "enthymeme" (év@dunpa). This term (from the verb évéuuetoba, 'to revolve in the mind"), means properly "aconsideration" or "reflection." It occurs first in Isocrates, who uses it simply of the " thoughts" or "sentiments"' with which a rhetorician embellishes his work (rots évO@uphuact aperdyrws brov Toy Aéyoy KaramoitAa, Or., xiii. § 16). Whether the technical sense was or was not known before Aristotle, it is to

Answering to the strict logical

proof.

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The enthy- meme.

Suppres- sion of one pre- miss not essential.

The example,

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him at least that the first extant definition is due. He defines the enthymeme as a species of syllogism, namely, as "a syllogism from probabilities and signs" (é eixérwy kad onuelwv). The "probability " (eixés) is a general proposition, expressing that which usually happens, as, 'wise men are usually just." The 'sign " (onuetov) is a particular proposition, as, " Socrates is just." The "sign" may be fallible or infallible. If we say, " wise men are just ; for Socrates was wise and just," this is an enthymeme from a fallible 'sign," the implied syllogism being " Socrates was wise ; Socrates was just (anpetov); .. all wise men are just a: and here the "sign" is, in Aristotle's phrase, "as a particular to a universal," because from the one case of Socrates we draw an inference about all men. If, again, we say,—" Here is a sign that he is ill—he is feverish" ; our enthymeme is using an infallible sign, the syllogism being, " All who are feverish are ill; he is feverish (onuetoy); .. he is ill." Here, again, the "sign" is "as a particular to a universal." When the "sign"' is thus infallible, it is properly called tekmerion (rexuhptov), the matter having been demonstrated and concluded (aemepacudvoy)—"for tekmar and peras mean the same thing ('limit') in the old language." Sometimes, again, the fallible sign is "as universal to particular," e.g., ' Here is a sign that he has a fever —he breathes quick," the syllogism being, " Feverish men breathe quick ; he breathes quick (onuetov) ; .. he has a fever," where a particular cause is unsoundly inferred from an effect (the " universal") which might have other causes.*

When Aristotle thus describes the enthymeme, or rhetorical syllogism, as dealing with ' probabilities" and ' signs," he is describing its ordinary or characteristic materials, qua rhetorical syllogism. He does not mean to say that rhetoric cannot use syllogisms formed with other material. It would be hardly need- ful to point this out, were it not that, in spite of his own clear words, his meaning has sometimes been misunderstood. " The premises of rhetorical syllogisms," he says, "seldom belong to the class of necessary facts. The subject matter of judgments and deliberations is usually contingent; for it is about their actions that men debate and take thought ; but actions are all contingent, no one of them, so to say, being necessary. And results which are merely usual and contingent must be deduced from premises of the same kind, as necessary results from uccessary premises. It follows that the propositions from which

*enthymemes are taken will be sometimes necessarily true, but more often only contin- gently true." Among the materials of the enthymeme, the *" sign" which is infallible (the onwetov which is also a Texunptoy) is so because it is to some necessary truth as part to whole.*

*Aristotle did not regard the suppression of one premiss in the statement as essential to the enthymeme. Thesyllogism, of which the enthymeme is mercly a kind, was regarded by him "not in re- lation to the expression" (od xpds roy Zéw Adyov), but to the process in the mind (4AAa mpbs roy év TH WuxH Adyov, Anal. Post., i. 10). As Sir W. Hamilton has justly said, he could not then have intended to distinguish a class of syllogisms by a verbal accident. The distinction of the rhetorical syllogism, in Aristotle's view, was in its matter, not in its form. This is, indeed, made sufficiently clear by his own remark that the enthymeme may "often" be more conciscly stated than the full, or normal, syllogism (Rhet., i. 2). There is obviously no reason why the rhetorical reasoner should not state both his premisses, if he finds it convenient or cffective to do so. Since, however, one of the premisses is often left to be mentally supplied, some of the later writers on rhetoric came to treat this as part of the essence,of the enthymeme. It was then that the word areajs was interpolated after ovadoyiopds in Aristotle, Analyt. Prior., ii. 27, where the enthymeme is defined as ovAdoytouds € eixdtwy Kal onuelwy.! Hence Quintilian says of the enthymeme (v. 10), "alii rhetoricum syllogismum, alii imperfectum syllogismum vocant " ;. hence, too, Juvenal's **curtum enthymema."*

The other branch of the "logical proof" in rhetoric corresponds to the induction of strict logic, and consists in giving the semblance of inductive reasoning by the use of one or two well-known examples. As Aristotle calls the enthymeme a rhetorical syllo- gism, so he calls the example (zapdSecyua) 'a rhetorical induction." Thus if a man has asked for a body-guard, and the speaker wishes to show that the aim is a tyranny, he may quote the " examples " of Dionysius and Pisistratus.

Aristotle next distinguishes the " universal " from the " special " topics, or commonplaces of rhetoric. The word rézos, ' place," means in this context "that place in which a proposition of a given kind is to be sought." The rézo., then, are classifications of propositions and

arguments which rhetorie makes beforehand, with a view to readiness in debate. Cicero well illustrates the phrase—“ As it is easy to find hidden things when the placc has been pointed out and marked, so, when we want to track out an argument, we ought to know the places, as Aristotle has called these seats, abodes, as it were, from which arguments are drawn.

1 On this interpolation, sce Sir W. Hamilton’s Discussions, p. 154.

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So a commouplace, or topic, may be defined as the abode of an argument (Zicet definire locum esse argumenti sedem ; Cic., Topica, ii, 7). So elsewhere he describes the réxot of rhetoric as “regiones intra quas venere et pervestiges quod queras”— ‘“‘haunts in which one may hunt and track out the object of quest ” (De Orat., ii. 34). témot) are general heads of argument applicable to all subjects and

whatsoever—as, ¢.g., on the “possibility ” or ‘‘impossibility ” of special.

anything. The special commonplaces (rémot rév €iday, Tthet., ii. 22, more briefly called ef) arc those which are drawn froin special branches of knowledge, as from politics, ethics, &c. Here Aristotle observes that the more a rhetorician enters on the subject-matter of any particular science the more will he tend to pass out of the domain which properly belongs to the art of rhetoric.

In that domain three provinces are distinguished.

it keeps in view, or its standard—is advantage (or detriment) to the persons addressed. Forensic rhetoric (Sicavixh) is concerned with accusation or defence, and with time past; its standard is justice or injustice. Epideictic rhetoric—the ornamental rhetoric of “display” (émiSetrieh)—is concerned with praise or blame, and usually with time present ; its standard is honour or shame.

1. Let us begin with deliberative rhetoric, says Aristotle, and see Delibera. The subjects tive,

what things a deliberative speaker ought to know. with which, in a public assembly, he will have to deal are mainly these five :—(1) finance, (2) foreign war, (8) home defence, (4) commerce, (5) legislation. Under all these heads, he ought to be provided with some e¥$, or special commonplaces. F urther, all his suasion or dissuasion has reference to the happiness of those whom he addresses. Hence he must be acquainted with the popular notious of happiness which are actually prevalent. Here Aristotle gives a series of popular definitions of happiness, and a list of the elements which are generally regarded as constituting it. A similar analysis of " good" (dya0éy) follows.

The scientific spirit of the rhetoric is strongly accentuated by the unscientific character of these and subsequent analyses. Aristotle never forgets that his rhetorician wants to know, not what a thing is, but what it is generally thought to be. There is nothing of cynicism or sarcasm in all this. He is simply going through his prescribed task. He is making rhetoric, as such, into a method. But suppose the question arises—"Of two good things which is the better?' Our deliberative speaker must be able to treat the 'funiversal commonplace" of degree (uaAAov xa ntrov). Then, he must also know something about the chief forms of government, — democracy, oligarchy, aristocracy, monarchy,—not as they are or should be, but as they are popularly conceived.

2. The ornamental rhetoric (émiSemrich), which is taken next, Epideic-

is somewhat briefly dismissed. It might be conjectured, in ex- tic. planation of its place in the treatment—we should have expected it to come third—that Aristotle was the first writer who recog- nizcd it as an independent kind, and that he viewed it as an off- shoot froin the deliberative branch. The epideictic speaker must know what most men think " honour" or "shame," 'virtue " or "vice." At this point a verbal distinction of some interest occurs :—praise (&ravos) implics moral approbation ; but an "en- comium"' (€yx@utov) is given to "achievements" (Zpya) as such. The most generally useful "topic" for the ornamental speaker is a'inots (magnifying),—as the rhetorical induction (mapdSeryua) most helps the deliberative speaker, and the rhetorical syllogism (€v@vunua) is most useful to the forensic,

3. In forensic rhetoric, we must begin by analysing injustice. Forensic.

And first, “ What are the inotives and aims of wrong-doing ?” Actions are either voluntary from habit, reason, anger, lust, or in- voluntary from chance, nature, force. In reference to the voluntary actions, it is needful to know the popular conception of pleasure. Secondly, “What is the character which disposes a man to do wrong, or which exposes him to suffering it ?” These topics must be familiar, in a popular way, to the forensic speaker. He must also know the general grounds on which actions are classcd as just or unjust. Actions must be considered, first, in reference to law, which is either special (760s), whether written or unwritten, the law of particular places and communities, or else universal (xowdés), the law of nature. The second question about an “unjust” action is whether it hurts an individual or the community. “The definition of “being wronged” (43:efo Oa) is, ‘to be unjustly treated by a voluntary agent.” Further, the definition of a particular offence (éxlypauua) sometimes raises a legal issue. A man may admit an act, and deny that it corresponds to the description given of it by the accuser, It is needful, then, to know the definitions of the principal crimes. It may be noticed that Aristotle here anticipates a topic which played a large part in the later rhetoric. The contested issues which he calls aupisBnrhoets The (Rhet., iii. 16) were the ordcets (constitutiones or status) of later «« days. Thus the issue as to the proper definition of an offence, to

which he refers here (Rhct., i. 18), coincides with the later

The “ universal commonplaces” (korvol universal

Deliber- The three ative rhetoric (cvuBovdeuvtixh) is concerned with exhortation or kinds of dissuasion, and with future time; its ‘end ” (réAos)-———that which rhetoric.

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the “logical proof” giveu in bk. i. ch. 2. The ‘“‘example,” or “The ex. rhetorical induetion, had been rather cursorily treated there, and ample” is now illustrated more fully (ii. 20). There are two kinds of con- “example ”—the historical (rd mpdyuara A€yerv) and the artificial

tinued. (rd abtov mwowety). The artificial example, again, has two species —

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otdaots épixh. The distinction between justice and equity (76 dixaov and 7d émenés) is noticed. Equity is "a kind of justice, but goes beyond the written law," as in the Zthies (v. 10) equity is said to be a corrective of the law, where the latter fails through generality,—7.e., through the lawmaker's inability to

The The analysis of the three branches of rhetoric—deliberative, | of the horse who asked the man to help him against a deer. If arexvo. epideictic, forensic—is now finished. In the elosing chapter of | you have no arguments of a logical kind (enthymemes), says mlores. his first book, Aristotle briefly considers and dismisses the "inarti- | Aristotle, the "example" must do duty as proof; if you have ficial proofs,"—the means of persuasion, that is, which arise from | enthymemes, it can serve as illustration. ; inatters external to the art itself, though the artuses them. These, The use of yv@ua:, or general moral sentiments, next claims The use having regard to the actual circumstances of his time and country, | attention (cli. 21). These are of two elasscs—those which are self- of yv@uan. he declares to be five: (1) laws; (2) witnesses ; (3) cvidence given | evident, and those which, not being so obviously true, require 'under torture—Sdoavos; (4) documents; (5) oaths, meaning | some confirmatory comment (émiAcyos), as when Medea says that chiefly treaties between states. With regard to (3) it may be re- | no sensible man should allow his childven to be exquisitely marked that the rhetorieal theory of torture in the ancient world | educated, because it makes them fastidious and unpopular. Such was, that a person under torture will tcll the truth because it is | maxims with an ''epilogue" are, in fact, virtually enthymemes. his interest to do so. This is stated, ¢g., in the Mhetorica ad | Apropos of yyéua:, Aristotle remarks that spurious generalization Alexandrum, xv. § 1. Among the Attic orators, Iseus gives his | is particularly useful in the utterance of bitter complaint (¢.g., emphatic adhesion to this view (Or., viii. § 12). On the other | "frailty, thy name is woman"), Then it is often effective to land, the common-sense view of the

matter is very well put by | controvert received maxims, ¢g., "It is not well to 'know another Attic orator, Antiphon, in his speech De Cade Herodis | oneself' ; for if this man had known himself, he would uever have ($$ 81-88), when he remarks that "in the torturers is the hope | become a general" (ch. 21). of the tortured." "So long, then," Antiphon proceeds, "as the Some precepts on the enthymeme follow. The rhetorical reasoner On the slave felt that his prospects in slandering were hopeful, he was | must not have too many links in the chain of his argument; and use of obstinate in the calumny ; but, when he saw that he was to die, | he must omit those propositions which his hearers can easily the enthy- heu at last he told the truth, and said that he had beeu per- | supply. Also, it is highly important to know the special topics meme, suaded by the persecutors to slander me." It would have been | (ef) from which enthymemes can be drawn in each subject. The interesting if Aristotle had given some indication of his view on | enthymeme is either (1) deccT:xdv, demonstrative, establishing a this, his third, &rexvos wioris ; but he simply accepts it as a fact | point, or (2) éreyerixdy, refutative, destroying a position by a of his day, and, taking it along with the rest, gives a number of | comparison of conflicting statements (7d rd dvouodoyobmeva ovvd- general arguments which may be used on either side, according as | yew). Aristotle now gives (ii. 23) an enumeration of classes or the particnlar &rexvos mioris is for us or against us. Here the | heads of argument (év@vunuatixod rém01) from which enthymemes first book ends. can be constructed. These apply nominally to all three branches Book If. At the beginning of the second book, Aristotle returns to the | of rhetoric, but in fact chiefly to the deliberative and the forensic. "artificial proofs" (yrexvor mioreis)—those which rhetoric itself | The demonstrative enthymeme is almost exclusively treated, since srovides. Of these, the logical proof has already been in part | the refutative form ean, of course, be inferred from the other. A The iscussed (i. 2). He therefore turns to the "ethical" proof. The | chapter (24), answering to the treatise on fallacies in logic (rept 40K) speaker's character may be so indicated by his speech as to pre- | cogiorindv éréyxwy), is devoted to the fallacious (paivduevov) miorts. possess the hearers; and this result depends chiefly on three | enthymeme, of which ten "topics" ave explained and illustrated. things. He should make them feel that he possesses (1) gpdvnois | Another chapter is given to the two general types of Avows, or —intelligence ; (2)

dperq—virtue ; and (83) e%yor—good-will to | refutation (ch. 25), viz., (1) direct counter-argument-(7d ayticva- them. Aristotle then proceeds to furnish the speaker with the | AoylCec@a:), opposing one enthymeme to another ; (2) objection to materials for seeming intelligent and good, referring for these to | a particular point in the adversary's ease (7d evlotacda). The lis previous analysis of the virtues (i. 9). As to the means of | second book then concludes with 'some supplementary remarks, seeming friendly, these will be furnished by an analysis of the | meant, seemingly, to correct crrors made by previous writers on affections (md@n). Here we are already on the boundary line | rhetoric (ch. 26). between the "ethical proof" and the third of the évrexvor mioreis, In his first two books Aristotle has thus dealt with invention Book IIT. The the 'emotional proof." In regard to each affection (wd@os), we | (efpeo1s)—the discovery of means of persuasion. In the third book madyrixh have to see (1) what it is; (2) what things predispose men to it; | he deals with expression and arrangement (A¢é:s and rdfis). The wtotts. (3) the objects and conditions of its manifestation. The next ten subject is prepared by some remarks on the art of delivery (éméipicis), Delivery. ehapters of the second book (2-11) are accordingly devoted to an | which Aristotle defines as the management of the voice. "It is analysis of those emotions which it is most important for the | the art of knowing how to use the voice for the expression of each rhetorician to understand :—viz. (1) anger, and its opposite, mild- feeling, of knowing when it should be loud, low, or moderate, of ness ; (2) love and hatred ; (3) fear and boldness ; (4) compassion, managing its pitch—shrill, deep, or middle—and of adapting the envy, emulation; (5) shame and shamelessness; (6) gratitude | cadences to the theme." Aristotle says nothing on gesture or play (xdpis) ; (7) righteous indignation (véueots). But, in appealing to | of feature, which Cicero and Quintilian recognize as important. these various emotions, the speaker must have regard to the general | He includes them by implication, however, in saying that the art eharacter of his audience, according, ¢.g., as they are young or | of delivery, whenever it is reduced to method, "will perform the old, rich or poor, &¢c. Hence it is necessary to know the character- | function of the actor's art," adding that "the dramatic faculty is istics of the various periods and conditions of life. Aristotle | less a matter of art than of nature." therefore delineates the chief traits of the young, of the old, and But verbal expression, at least, is

clearly in the province of art, of men in their prime; of the well-born, the rich, and the power- | and to that he now turns. He deals first with diction (Aéés) in Djetion. ful. With regard to the well-born, he makes a remark which seems | the proper sense, as eoncerned with the choice of words and phrases. equally true of the rich: "the possessor of good birth is the more | The first excellence of diction is clearness (caphveta), which is ambitious ; for all men, when they have got anything, are wont | attained by using words in their proper sense (xvpia). Next, the to add to the heap" (ch. 12-17). The analysis of the "ethical" | diction must be "neither too low nor too grand, but suitable to the and the " emotional" proof is now finished. subject." In prose (éy tots WiAots Adyots) there is less seope for After a concise retrospect, Aristotle passes to the treatment ofa | ornament than in poetry, though in the latter, too, much depends The subject barely indicated in the first book (ch. 2). The xouvo? témot, | on the speaker or the theme. And here Aristotle remarks that kool or "'universal commonplaces," applicable to all materials, are Euripides was the first poet who produeed a happy illusion by taking témot. mainly four:—{1) 7d duvardy and 7d &ddvarov—possibility and | his words from the language of daily life (éx rijs ciwOvlas SiadeKTov).

frame a general rule which should precisely fit the circumstances of every particular case. True to his conception of a method, Aristotle next applies "the topic of degrce" to injustice,—as, in an earlier chapter (Rhet., i. 7) he had applied it to the idca of tt good, 3

impossibility ; (2) 7d yeyovds and +4 wéAAoyv—past and future ; (3) 7d abfew kad wetody (or uéyeOos and mixporns)—great and small ; (4) 7d waAAov kal Hrrov—greater and less. Aristotle means that all subjects whatsoever admit of arguments into which these idcas enter. The first comes into play when we argue, "since this is possible, that must be so also"; the second, when we say, "if this has been, that has been also," or 'if this is to happen, that will happen also." For the third and fourth of the so.vo) TOTol, magnitude and degree, we are referred back to bk. i. ch. 7 and 8, where they have already been handled. The second book is ecom-pleted by a sort of appendix, intended to supplement the sketch of

—(1) eomparison, rapaBoAh,—as when Socrates said that magis- trates ought not to be chosen by lot, for this is like choosing athletes by lot, rather than for athletic power; (2) fiction, or fable in the special sense—Ad-yo: ; as when Stesichorus warned the people of Himera against establishing a despot by telling them the fable

With a view to adorning prose, and giving it "distinction" (the term which best represents Aristotle's phrase &¢voy or kevirdy mroteiv), nothing is more important than the judicious use of metaphor. Aristotle admits that "the art of metaphor eannot be taught" ; but he gives some sensible hints on the subject, and on the use of epithets. The poet Simonides, he tells us, when the winner of a mule race offered him a small fee, declined to write an ode on "half- asses," but, when the price was raised, sang " Hail, daughters of windswift steeds." The perceptions which made the best Greek prose so good are illustrated by Aristotle's next chapter (iii. 3) on Wuxpd, "frigidities," "faults of style." He traces these to four

Meta- "proportional" metaphor mentioned here requires a passing com- | rhetoric, on the other hand, is like drawing in light and shade phor, ment. Aristotle used the term "metaphor" (ueragopd) in a larger | (without colours), gKiaypapdta—like scene-painting, we should sense than ours. He meant by it "any transference of a word to | rather say, ¢.¢., it is meant to produce its effects at a distance, asense different from its proper sense." Thus he can distinguish | and will not bear looking at too closely. (Poet., c. 21) four classes of metaphor:—(1) "from genus to From expression we now pass to the other subject announced at Arrange- species," as when "vessel" means "ship"; (2) from species to | the opening of the third book, arrangement (rdis), which occupies ment. genus, as when "the lilies of the field" stand for "flowers" | the last seven chapters (18-19). The received system, which had generally. These two kinds are not what we call "metaphors," | been popularized, if not originated, by Isocrates, recognised four but are examples of the figure which was afterwards named "synec- | divisions of a speech: (1) exordium (or proem), smpooluiov ; (2) doche." Aristotle's third class of metaphor is (3) "from species | narrative, d:fynots ; (3) proof, lores ; (4) peroration, émlroyos. to species," under which head come almost all familiar metaphors, | Aristotle adopts this fourfold partition as his basis,—with the as to "scent

a plot,”—the generic notion, “ find out,” being common preliminary remark, howevcr, that only two elements are neces- to the special terms, “scent” and “detect”; (4) then lastly there sarily present in every case, viz. “statement” of one’s subject, is the “proportional” metaphor (4 évdAoyov), when A is not’simply | rpdeo1s, and ‘fargument”’ in its support, rloreis. He then takes compared with B (on the strength of something obviously common | the four divisions in order. The contents of the proem usually 1. Proem. to both), but A’s relation to C is compared with B’s relation to D. | come under one of two heads—(1) exciting or allaying prejudice ; To call old age “the evening of life ” implies that old age is to life | (2) amplifying or detracting. In epideictic rhetoric the connexion as the evening to theday. Obviously a “proportion” of this kind | of proem with sequel may be comparatively loose ; it is like a flute- is implicit in the metaphors of Aristotle’s third class; but in the player’s prelude (xpoadvaiov), which he deftly links on to the key- fourth class proportion is expressly indicated by the mention of | note (ev3dcmmoy) of his prineipal theme. The forensic proem, on the seeond term (“life” in our example). the other hand, may be likened to the prologue of an epie or a The first four ehapters having thus dealt with expression in the | tragedy (ch. 14, 15). Narrative is least needed in deliberative 2. Narra- narrower sense of diction (Aéés proper), Aristotle devotes the next | speaking, since this deals chiefly with the future. In forensic nar- tive, Compo- cight (iii, 5~12) to composition, which would be properly called | rative, the object must be to bring out clearly the issues on which sition, o¥vGeos. After remarks on the first requisites—grammatical cor- | accuser or accused relies, with an effective colouring of ethos and rectness, and purity of idiom (rd rh eel ee have some hints | pathos. In the epideictic branch, the narrative should not form a on “dignity” of style (8yxos). “ Propriety” (rd xpémov) is defined | continuous whole, but should be divided and varied by comments as depending chiefly on three qualities :—(1) expression of the feel- | (eh. 16), The rhetorician’s proofs (lores) will, in the forensic 3. Proof. ings which it is desired to move in the hearer; (2) fitness to the | branch, be relevant to one of four issues :—(1) fact : was the alleged character and position of the speaker; and (8) congruity with the | aet done, or not? (2) damage: if done, was it hurtful? (3) crimin- level of the subject. A certain “rhythm ” (fv@uds), or harmonions | ality: if hurtful, was the hurt justifiable ? (4) quantity or degree, movement, should be

*sought in prose ; but this must not be so pre- | Aristotle's four "issues " (augpiaBynrhoes) here correspond with the Prose cise as to give the effeet of metre. The elements of rhythm are | ordoeis, "' positions" or " questions," usually three, of later legists thythm. "times," ¢.e., in writing, long or short syllables, the short syllable | and rhetoricians: (1) ordois oroxacrixh, status conjecturalis, the being the unit. Here, following the early writers on music (comp. | question of fact; (2) ordots épixh, status definitivus, nomen, or Plato, Rep., 400 B), Aristotle recognizes three "rhythms": (1) the | initio, the question of legal definition ; (8) ordois moidryros "heroic" or dactylic, —~~, which is in the ratio of equality, | status qualitatis or jurtdicialis, the question of justice or injustice. since — = ~~, or 1:1; (2) the iambic or trochaic (~— or | Thus Cicero says, "res (controversiam facit) aut de vero (1), aut — ~~), which has the ratio of 2 to 1; (8) the peonic, —-v, | de recto (3), aut de nomine" (2), Orat,, xxxiv. 121. In delibera. which has the ratio of 83:2. Of these, the heroic is too grand for | tive rhetoric, the four "'issues" can be applied to the future, since, prose ; the iambic is too commonplace, being the very eadence | if. speaker anticipates certain results from a course of a policy, his of ordinary talk (airh éorw 4 Adkis roy woAAay); the trochee is | adversary can deny their (1) probability, (2) expediency, (3) justice, too comic. The peon remains. It is the best rhythm for prose, | or (4) importance. The enthymeme is most useful in the delibcra- since it will not, by itself, produce a metrical effect (u@aaov | tive branch, as the '*example," or rhetorical induction, is most AavOdve:). The "first" paon (—— ~~) is most suitable to the | useful in the forensic. The 'ethical" proof from the speaker's beginning of sentences, the "fourth" pwon(\—) to the | indicated character is always a most important adjunct to the close. Rhythm having been attained, a framework is supplied by | logical proof (ch. 17), A chapter is now given to one special re- The the period (mepfodos). A "compact" or periodic style (kareorpay- | source by which a proof can often be enforeed, viz., interrogation periodic wévy Ags) is so called in contrast with that " running " style | of the adversary (épéryois), which has usually one of two objects— | style. (eipouévn A€tis) which simply strings clause to clause, "having | (1) redwctio ad absurdum, or (2) to entrap him into a fatal admis- no necessary end until the thought is finished," and is unpleasing | sion (ch. 18). The last chapter of the book, and of the treatise, 4. Epi- because it is unlimited ; "for all men wish to*

descry the end.” | deals with the peroration or “ epilogue” (értAoyos). This aims logue. The periodie style pleases for the opposite reason, because the | usually at one of four things :—(1) to conciliate the hearers ; nearer always fancies that he has grasped something and has got | (2) to magnify or lower the importance of topics already treated ; something defined. The period may consist of several parts or | (3) to excite emotion in the hearers ; (4) to refresh their memories members (xAa), or it may be “simple,” forming a unit (4pea4s, | by a short recapitulation. Reinarking that asyndeton gives force sovéxwdos). The rhetorical use of antithesis is then noticed in | to the close of an epilogue, Aristotle ends his rhetoric with the its application to the period. Two kindred figures arc also men- | last words (not quite aceurately quoted) of the great speech in which tioned, —parisosis, a parallelism of structure between clauses of | Lysias denouneed Eratosthenes—ratooua: xatyyopav. akynkdare, equal leugth, —and paromoiosis, a resemblance in sound, when the | éwpdxare, wemdvOare, xere, dindCere. ee Oe clause has an echo, asit were, in the same Aristotle’s Rhetoric is incomparably the most scientific Vivaeity. i Two chapters (10, 11) are nowgiven to the sources of vivacity in work which exists on the subject. It may also be regarded speaking. Those “smart sayings” (r& doreia) which win applause | a8 having determined the main lines on which the subject “must be invented by the clever or practised man ; the business of | was treated by nearly all subsequent writers. The extant ee me Gy eee ag) i oahu oe ate GAA : treatise on rhetoric entitled ‘Pyropuxh mpds “AXéEavSpov metaphor antithesis, a1 vividness—7.¢., . : 7 De cribed « Ness the eyes of the hearer” (rd apd Bama moteiy), | Was undoubtedly by Anaximenes of Lampsacus, and was = fe This is called by Aristotle évépyeo, ‘actuality ” (which must be | probably composed about 340-330 B.c., a few years before ae carefully distinguished from évdpyeso, another term for ‘“‘vivid-) Aristotle’s work. The introductory letter prefixed to it is ness”’), since things are represented not merely in their potentiality | » late forgery. If the treatise of Anaximenes is compared cotnoanell (3évayis), but as living and moving. One of the most effective | +44 41 a4 of Aristotle the distinctive place of the latter with Aris- kinds of point (says Aristotle) is “a metaphor with a surprise, ; ; ; ivoule fois: z.¢e., with the disclosure of a likeness not perceived before, the | 10 this field becomes clearer. Anaximenes, who knew the source of the pleasure being the same as in riddles. treatise of

Isocrates, and could profit by all the preceding The . The whole subject of expression is concluded by a chapter on the | Gyeek «“ arts,” is, for us, the sole representative of technical general general types of style, in their relation to the three branclies of rhetoric before Aristotle, and probably represents it at its types of rhetoric (ch. 12). There is a literary style (ypadieh Aétis) and a ‘ca ‘th es 1 iP ee i : style. style suited to oral contest or debate (dywvori«h). The literary | best. We miss the intellectual power, the grasp o

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chief sources,—the use of tawdry or ungainly compounds (3:raa évépuara), the use of rare or obsolete words (yAérrat), and infelicity of epithet or metaphor.

A simile (eiéy) is a metaphor with an explanation (Aéyos): ¢.9., in speaking of Achilles, “he sprang on them like a lion ” is simile; “the lion sprang on them” is metaphor. Simile is less available than metaphor for prose, being more poetical. The

style is that which admits of the highest finish (axp:Beordrn), and

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is best suited to the epideictic branch of rhetorie, since the latter is properly addressed to readers. The other, or “agonistic,” style is best adapted to delivery (Smoxpitixwrdrn). It is so mainly through two things —adaptation to the character of speaker and hearer, and skilful appeals to feeling. Forensic and deliberative rhetoric both use it; but the forensic branch admits of higher finish, and so far approximates to the literary style. Deliberative

principles, and the subtle discrimination which belong to

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the work of Aristotle. On the other hand, the practical character is more strongly marked. It might, indeed, be said of Aristotle's treatise that it is rather a Philosophy of Rhetoric than a Rhetoric proper. It is a body of abstract principles and general rules. These will enable the student to dissect a good speech ; but, by themselves, they will not go far towards enabling him to make one. Aristotle's purpose was to annex rhetoric to the realm of science. He succeeded, as far as success was possible. But the new province was somewhat of a Poland. The rigid system which was found necessary for holding the unruly dependency did not leave much scope for spon- taneous vigour or native exuberance.

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made a complete digest of the scholastic rhetoric from the time of Hermagoras of Temnos (110 B.c.). It is contained in five extant treatises, which are remarkable for clearness and acuteness, and still more remarkable as having been completed before the age of twenty-five. Hermogenes continued for nearly a century and a half to be one of the chief authorities in the schools.

extant; and the more celebrated treatise On Sublematy (rept tous), if not his work, is at least of the same period. About 315 a.p. Aphthonius composed the " exercises " (rpoyvpvdcpara) which superseded thework of Hermogenes. At the revival of letters the treatise of Aphthonius once

Longinus Other (c. 260 A.D.) published an Art of Rhetoric which is still writers.

The During the three centuries from the age of Alexander to | more became a standard text-book. Much popularity was period that of Augustus the fortunes of rhetoric were governed | enjoyed also by the exercises of Adlius Theon (380 a.p.). ae ace by the new conditions of Hellenism. Aristotle's scientific | Space would fail if we attempted to enumerate the writers to Angus- method lived on in the Peripatetic school. Meanwhile, how- | on rhetoric who, during these centuries, attained to more tus. ever, the fashion of florid declamation or strained conceits | or less repute. In the editions of the Rhetores Greci by prevailed in the rhetorical schools of Asia, where, amid | Spengel and by Walz the

fecundity of the literature can mixed populations, the pure traditions of the best Greek | be seen. taste had been dissociated from the use of the Greek lan- The theory of rhetoric engaged this industry, because the guage. The " Asianism" of style which thus came to be | practice of the art was in greater vogue than ever before contrasted with "Atticism" found imitators at Rome, | or since. During the first four centuries of the empire Practice among whom must be reckoned the orator Hortensius (c. | several causes contributed to this result. First, there was of the- Herma- 95 8.¢.). Hermagoras of Temnos in Aolis (c. 110 B.c.) | a general dearth of the higher intellectual interests ; politics oe goras. claims mention as having done much to revive a higher con- | gave no scope to energy; philosophy was stagnant, and aad ception. Using both the practical rhetoric of the time before | literature, as a rule, either arid or frivolous. Then the Aristotle and Aristotle's philosophical rhetoric, he worked | Greek schools had poured their rhctoricians into Rome, up the results of both in a new system,—following the | where the same tastes which revelled in coarse luxury philosophers so far as to give the chief prominence to | welcomed tawdry declamation. The law-courts of the "invention." He thus became the founder of a rhetoric | Roman provinces further created a continual demand for which, as distinguished from the practical and the philo- | forensic speaking. Asia, Gaul, and Africa are now the sophical, may be called the scholastic. Through the | regions which supply the largest proportion of successful influence of his school, Hermagoras did for Roman elo- | orators. The passion for rhetoric was everywhere. " Thule quence very much what the school of Isocrates had done for | talks of engaging an orator," says Juvenal. "You call Athens. Above all, he counteracted the view of "Asian- | a man a thief," says Persius; "he answers you with ism," that oratory is a mere knack founded on practice, | finished tropes." Athens, Smyrna, Rhodes, Tarsus, and recalled attention to the study of it as an art.! Antioch, Alexandria, Massilia, and many other cities had Cicero. Cicero's rhetorical works are to some extent based on the | seats of learning at which rhetoric was taught by pro- technical system to which he had been introduced by | fessors who enjoyed the highest consideration. The public Molon at Rhodes, and by other contemporary teachers. | teacher of rhetoric was called "sophist," which was now The " so- : But Cicero further made an independent use of the best | an academic title, similar to "professor" or "

doctor." Phists." among the earlier Greek writers, as Isocrates, Aristotle, and | In the 4th century B.c. Isocrates had taken pride in Theophrastus. Lastly, he could draw, at least in the later | the name of coduorys, which, indced, had at no time of his treatises, on a vast fund of reflection and experience. | wholly lost the good, or neutral, sense which originally Indeed, the distinctive interest of his contributions to the | belonged to it. The academic meaning which it acquired theory of rhetoric consists in the fact that his theory can | under the early empire lasted into the Middle Ages (see be compared with his practice. The result of such a com- | Ducange, s.v., who quotes from Baldricus, " Egregius parison is certainly to suggest how much less he owed to | Doctor magnusque Sophista Geraldus"). While the his art than to his genius. Some consciousness of this is | word rhetor still denoted the -faculty, the word sophistes perhaps implied in the idea which pervades much of his | denoted the office or rank to which the rhetor might hope writing on oratory, that the perfect orator is the perfect | to rise. So in Lucian's piece (160 a.p.), the "Teacher of oh. man. The same thought is present to Quintilian, in whose | Rhetoricians" says (§ 1),—" You ask, young man, how lian, great work, De Instituteone Oratoria, the scholastic you are to become a rhetor, and attain in your turn rhetoric receives its most complete expression (c. 90 a.D.). | to the repute of that most impressive and illustrious title, Quintilian treats oratory as the end to which the entire | sophist." mental. and moral development of the student is to be Vespasian (70-79 a.p.), according to Suetonius, was the directed. Thus he devotes his first book to an early | first emperor who gave a public endowment to the teach- discipline which should precede the orator's first studies, | ing of rhetoric. But it was under Hadrian and the aes ie i pi to : discipline of the whole man which Antonines (117-180 A.D.) _ that the public chairs of Chairs of yon em. Some notion of his comprehensive | rhetoric were raised to an importance which made them rhetoric. method may be derived from the circumstance that, | objects of the highest ambition. The complete constitu- in connexion with precepts for storing the speaker's | tion of the schools at Athens was due to Marcus Aurelius. aa he introduces a succinct estimate of the chief | ThePhilosophical School had four chairs (@pévor),—Platonic, pices (ee © jer of ay kind, from Homer | Stoic, Peripatetic, Epicurean. The Rhetorical School had eS os – i. – — the next | two chairs, one for "sophistic," the other for "political". ae. Sl cal. iowa.

6 ai signalized in the history of | rhetoric. By “sophistic” was meant the academic teach- genes, a Os a wlio about 170 «.p. | ing of rhetoric as an art, in distinction from its “ politi-

1 See Professor Jebb’s Attic Orators, vol. ii. p. 445.

cal” application to the law-courts. The “sophistical ” chair was superior to the “political” in dignity as in

Declama- scholastic declamations were chiefly of two classes. (1) | “declamations” served the same purpose. tions. The swasorix were usually on historical or legendary The fortunes of rhetoric in the modern world, as briefly Modern subjects, in which some course of action was commended | sketched above, may suffice to suggest why few modern writers on or censured; thus Juvenal, alluding to his school-days, | writers of ability have given their attention to the subject. thetoric. cries— Perhaps one of the most notable modern contributions to “T, too, have counselled Sulla to resign, the art is the collection of commonplaces framed (in Latin) And taste those joys for which dictators pine.” by Bacon, “to be so many spools from which the threads These swasoriz belonged to deliberative rhetoric (the | °” be drawn out as occasion serves,’ a truly curious Bovdevrixdy yévos, deliberativum genus). (2) The contro- works of that acute and fertile mind. He called them versie turned especially on legal issues, and represented Antitheta.” A specimen is subjoined :— the forensic rhetoric (diKxavxdy yévos, judiciale genus). Uxor ev LIBert. But it was the general characteristic of this period that abn. Against, all subjects, though formally “deliberative ” or “ forensic,” “Attachment to the state} “He who marries, and has were treated in the style and spirit of that third branch | begins from the family.” a has given hostages to pe Aristotle distinguished, the rhetoric of erideigis Or} «<-wite and children area dis-| “The immortality of brutes is isplay.” The oratory produced by the age of the | oijine in humanity. Bachelors | in their progeny ; of men, in academic sophists can be estimated from a large extant | are morose and austere.” their fame, services, and institu- literature. It is shown under various aspects, and pre- , __ | tons.” an sumably at its best, by such writers as Dion Chrysostom | , De oe pon plileg of eeli- a Regard be igh ae at the end of the Ist century, Atlius

Aristides in the eeu? eae alae — aiid 2d, Themistius, Himerius, and Libanius in the 4th. Tite Secs Ab ouamiilinot Aecetotlcs tates, le It would be unjust to deny that, amid much which is tawdry – = ae ant rae Ties tecinwaidte imcute ant or vapid, these writings occasionally present passages of Se AN sie no ae hs areata jen true literary beauty, while they constantly offer matter of ae oa a ee ey, I —_ : hs ene the highest interest to the student of the past. i us Phil omar y — il – eee ae Medieval In the medieval system of academic studies, grammar, Ber ee ts i . cee y ps Si eit ie a ie AN study of logic, and rhetoric were the subjects of the trivium, or CC eau 8 Die eeceeoL, Map epee rhetoric. though often marred by an imperfect comprehension of

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emolument, and its occupant was invested with a jurisdic- tion over the youth of Athens similar to that of the vice- chancellor in a modern university. Thus it is said of Theodotus, the first holder of the chair of sophistic as constituted by Marcus Aurelius, tpo¢ory 8¢ Kal tis Trav "AOyvaiwy vedrytos mp@ros (Philostr., Vit. Soph., I. ii. p. 566). The Antonines further encouraged rhetoric by granting immunities to its teachers. Three '"sophists " in each of the smaller towns, and five in the larger, were exempted from taxation (Dig., xxvii. 1, 6, § 2). The wealthier sophists affected much personal splendour. One of them, Polemon (c. 130 a.D.), was attended on his journeys by an enormous retinue—slaves, beasts of burden, horses, and hounds—while he himself drove in a costly equipage. Another, Adrianof Tyre (c. 170 4,p.), was drawn to his lectures by horses '" with silver bits," wore the richest attire and the rarest jewels, and en- deared himself to the Athenian students by the entertain- inents which he provided for them. In all this foppery there was calculation, The aim of the sophist was to impress the multitude. Popular applause was the breath of life to him. His whole stock in trade was style, and this was directed to astonishing by tours de force. The

course followed during the four years of undergraduateship. Music, arithmetic, geometry, and astronomy constituted the quadrivium, or course for the three years from the B.A. to the M.A. degree. These were theseven liberalarts. Accord- ing to Hallam (Zit. Lur., vol.i.), the idea of a

trivium and quadrivium dates from the 6th century. The well-known memorial couplet can be traced to ¢. 1420 a.p. :-—

Gram. loquitur, Dia. vera docet, Rhet. verba colorat : Mus. canit, Ar. numerat. Geo. ponderat, As. colit astra.

A shorter formula was—"' lingua, tropus, ratio; numerus, tonus, angulus, astra." In the Middle Ages the chief authorities on rhetoric were the latest Latin epitomists, such as Martianus Capella (5th century), Cassiodorus (5th century), or Isidorus (7th century).

After the revival of learning, the better Roman and Greek writers gradually returned into use. Some new treatises were also produced. Leonard Cox (died 1549) wrote Zhe Art or Craft of Rhetoryke, partly compiled, partly original, which was reprinted in Latin at Cracow.

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The Art of Ehetorique by Thomas Wilson (1553), after- wards secretary of state, embodied rules chiefly from Aristotle, with help from Cicero and Quintilian. About the same time, treatises on rhetoric were published in France by Tonquelin (1555) and Courcelles (1557). The general aim at this period was to revive and popularize the best teaching of the ancients on rhetoric. was regularly taught at the universities, and was, indeed, important. At Cambridge in 1570 the study of rhetoric was based on Quintilian, Hermogenes, and the speeches of Cicero viewed as works of art. An Oxford statute of 1588 shows that the same books were used there. In 1620 George Herbert was delivering lectures on rhetoric at Cam- bridge, where he held the office of public orator. The decay of rhetoric as a formal study at the universities set in during the 18th century. In 1712 Steele regrets that Oxford and Cambridge have "grown dumb in the study of eloquence." The function of the rhetoric lecturer passed over into that of correcting written themes; but his title remained long after his office had lost its primary meaning If the theory of rhetoric fell into neglect, the practice however, was encouraged by the public exercises ("acts' and '"'opponencies") in the schools. The college prizes fo

logic. But undoubtedly the best modern book on the subject is Whately's Elements of Rhetoric. Aristotle's view, that rhetoric is "an offshoot from logic," Whately treats it as the art of "argumentative composi- tion." He considers it under four heads :—(1) the address to the understanding (= Aristotle's Aoyuxy riots) ; (2) the address to the will, or persuasion (= Aristotle's 70c«y and raQyrixi) miotis); (3) style; (4) elocution, or delivery. At the outset he makes some judicious remarks on the popular objections to the art. "It has been truly observed that 'genius begins where rules end.' But to infer from this, as some seem disposed to do, that, in any depart- ment wherein genius can be displayed, rules must be useless, or useless to those who possess genius, is a very rash conclusion. What I have observed elsewhere con- cerning logic, that 'a knowledge of it serves to save a waste of ingenuity,' holds good in many other depart- ments also." 'A drayman, we are told, will taunt a comrade by saying, 'you're a pretty fellow,' without

The subject Rhetoric

Starting from Whately.

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having learnt that he is employing the figure called irony." But when it is thus urged that—

- *All a rhetorician's rules "But teach him how to name his tools,"*

the assumption is tacitly made that an accurate nomen- clature and classification of these tools must be devoid of practical use. The conditions of modern life, and especially the invention of printing, have diminished the importance which belonged in antiquity to the art of speaking. But few would deny that a large measure of value may still be claimed for rhetoric in the more comprehensive sense which Whately gives to it, as the art of argumentative coniposition. His treatise, the work of an able and also witty man, will be found instructive and entertaining even by those who do not go to it fora discipline. Nor can it fail to suggest a further remark. While abounding in fresh thought and modern

illustration, it constantly reminds us that, in almost all essentials, the art of rhetoric must be regarded as the creation of Aristotle. (R. 0. J.)

RHEUMATISM, a constitutional disease having for its chief manifestations inflammatory affections of the fibrous textures of joints and other parts, together with a liability to various complications. Two forms of rheumatism are recognized, and will be now briefly described, namely, the acute and the chronic, the latter either resulting from the former or arising independently. In addition to these, a disease which has received the name of chronic rheumatic (or rheumatoid) arthritis, and which presents many resem- blances to chronic rheumatism, although the relation between them is questionable, may be noticed here.

Acute Ruervmatism, frequently called RuEUMATIO Fever, is mainly characterized by inflammation affecting various joints, with a tendency to spread in an erratic manner, and accompanied with much pain, febrile disturb- ance, and perspiration.

The nature of this disease has been extensively discussed by pathologists and physicians; but, although numerous, and many of them ingenious, theories have been advanced and supported by evidence drawn from experimentation as well as clinical observation, it cannot yet be said that any one of them has gained general acceptance. It has been held that rheumatism is produced by an excess of lactic acid in the system in connexion with morbid states of the nutritive functions. Support to this view was given experimentally by Dr Richardson, but experiments by others have led to a different conclusion. Again, it has been held that the disease is a textural inflammation due to chill acting upon the parts, either locally through the circulation or through the agency of the nervous system, whereby the nutrition of the joints and other structures is lowered. Another view regards it as arising primarily in a profound disturb- ance of the heat-regulating mechanism of the body by chill, which specially affects the muscular system, causing heat to be generated without work, one of the consequences being that impressions of pain are conveyed to the brain by the articular nerves instead of those of work performed (see ParHonocy). The view has been held, too, that

rheumatism is to be referred to a germ or parasite, or a miasm analogous to the poison of malaria.

Without attempting to discuss the relative probability of these and other theories, it may be stated that those which point in the direction of a nutritional change in the

special tissues affected (the fibrous) as the result of chill |

or other depressing cause operating through the agency of the nervous system appear more consonant with the pathological evidences of the disease itself than those which would refer the morbid process to the influence of any poison circulating in the blood.

There are certain points of importance in connexion with the causation of this form of the disease which are

generally agreed upon. Thus an hereditary tendency is recognized as among the causes predisposing to acute rheumatism. The extent of this has been variously esti- mated, but it would appear to be well established that it shows itself in about one-fourth of the cases, Age is another important predisposing condition, the acute form of rheumatism being much more a disease of youth than of later life. The period of adolescence, from sixteen to twenty, is that in which probably the greater number of the cases occur; but even in early childhood the disease may manifest itself, or at any period of life, although it is rarely observed in old age. Persons much exposed to all kinds of weather are specially liable to suffer, and hence the disease is more common among the poorer classes. Any depressing cause acting upon the general health, such as overwork or anxiety, or any habitual drain upon the system, such as overlactation, in like manner has a similar effect. Climate, too, is a factor of great importance, for, although not unfrequently met with in temperate or even warni climates, the disease is unquestionably of more com- mon occurrence in cold and damp regions. Attacks of acute rheumatism are brought on in most instances by exposure to cold, by getting wet through, sometimes also by excessive fatigue such as in walking long distances,

especially if in addition there have been overheating of the body and subsequent chill. Persons who have once suffered from this disease are very liable to a recurrence on a renewal of the exciting cause, and even apparently independently of this from such causes as digestive disturbances,

An attack of acute rheumatism is usually ushered in by chilliness or rigors followed with feverishness and a feeling of stiffness or pain in one or more joints, generally those of larger or medium size, such as the knees, ankles, wrists, shoulders, &c., which soon becomes intense, and is accom- panied with severe constitutional disturbance and prostra- tion. The patient lies helpless in bed, restless, but afraid to move or to be touched, and unable to bear even the weight of the bed-clothes. The face is flushed, and the whole body bathed in perspiration, which has a highly acid reaction anda sour disagreeable odour. The tempera- ture is markedly elevated (103° to 105°), the pulse rapid, full, and soft; the tongue is coated with a yellow fur; and there are thirst, loss of appetite, and constipation. The urine is diminished in quantity, highly acid, and loaded with urates. At first the pain is confined to only one or two joints, but soon others become affected, and there is often a tendency to symmetry in the manner in which they suffer, the inflammation in one joint being shortly followed by that of the same joint in the opposite limb. The affected joints are red, swollen, hot, and ex- cessively tender. The inflammation seldom continues long in one articulation, but it may return to those formerly affected. In severe cases scarcely a joint large or small escapes, and the pain, restlessness, and fever render the patient's condition extremely miserable.

An attack of acute rheumatism is of variable duration, sometimes passing away in the course of a few days, but more frequently lasting for many weeks. Occasionally, when the disease appears to have subsided, relapses occur which bring back all the former symptoms and prolong the case, it may be for months. Again, after all acute symp- toms have disappeared, the joints may remain swollen, stiff, and painful on movement, and the rheumatic condition thus becomes chronic.

After an attack of rheumatism, the patient is much reduced in strength and pale-looking for a considerable time, but should no conplication have arisen there may be complete recovery, although doubtless there remains a liability to subsequent attacks. This disease derives much of its serious import from certain accompaniments

or complications which are apt to attend its progress. Among these may be mentioned excessive fever (hyper- pyrexia), which is sometimes developed in a sudden and alarming manner, the temperature rising quickly to 108°-110° or more, and thus endangering life. Indeed in most of such instances death speedily follows unless prompt treatment be resorted to. Another danger is the occurrence of serious head symptoms in the form of delirium or excitement, which may exist in conjunction with hyperpyrexia or independently. Chorea or St Vitus's dance is also an occasional accompaniment of acute rheumatism. Besides these, other complications pertaining to the respiratory organs, such as pleurisy, pneumonia, bronchitis, é&c., sometimes arise in the course of the disease, as well as certain disorders of the skin. But the most frequent and important of all are those affecting the heart. These cardiac affections are regarded by some as an integral part of the rheumatic disease rather than as results of it, especially as it would seem that occasionally they are the only local manifestation of the attack.

Pericarditis (inflammation of the investing membrane of the heart) and endocarditis (inflammation of the lining membrane of the heart) are the two most common forms which these heart complications assume, and it is the latter which is specially important as tending to lay the foundation for valvular heart disease (see Heart). It is the liability to these inflammatory heart affections that causes special anxiety during the earlier stages of an attack of acute rheumatism, when it would appear they are more apt to occur. The risk of cardiac complications seems to be greater the younger the patient, and doubt- less the foundation of organic heart disease is often laid in early childhood, when, as is now well known, rheumatism is by no means uncommon. ;

The name subacute rheumatism is sometimes applied to attacks of the disease of less severe type than that now described, but where yet the symptoms exist in a well- marked degree. Cases of this kind may be of even longer duration and more intractable than the more acute variety, although probably the danger to the heart is less.

Curonic RHEUMATISM appears occasionally to be deve- loped as the result of the acute form, but is more frequently an independent constitutional affection, and is usually a complaint of later life. The causes associated with its occurrence are habitual exposure to cold and damp; hence its frequency among outdoor workers. It is also apt to arise in persons debilitated by overwork or privation. Certain poisons introduced into the system are often attended with symptoms of chronic rheumatism, ¢.9., lead, syphilis, &c. This disease is often hereditary. It differs from acute rheumatism in being less frequently attended with fever and constitutional disturbance and less liable to dangerous complications, but on the other hand it is much more apt to produce permanent alterations in the joints and parts affected. The joints tend to become swollen both from effusion of fluid and from chronic inflammatory thickening of the textures, and the result is stiffness and sometimes complete immobility. But in addition the

sheaths of muscles and of nerves are apt to be affected by

chronic rheumatisni, causing much suffering. This form of rheumatism is less migratory in its progress than the acute, and tends to remain fixed in a few joints, often in those which are specially exposed to atmospheric influences or tooverwork. The chief symptoms are pain and stiffness in movement, more particularly when the efforts begin to be made, becoming less after the limbs and body have been in exercise. . Creaking or crackling noises accompany the movements. The pain is apt to be increased during the night, and is besides markedly influenced by the state of the atmosphere, cold and damp aggravating it.

This form of rheumatism, although not directly danger- ous to life, tends to lower the health and render the patient more vulnerable to other morbid influences. Besides this, by long continuance it may lead to great

deformity and disablement of the frame, in some instances resulting in a condition of utter helplessness.

Treatment.—Few diseases have had so many remedies recommended for their alleviation, and vaunted as specifics, as rheumatism; and, when it is remembered how many are the theories of the nature of the malady, it is obvious that even as regards principles the methods proposed must be numerous and diverse. Nevertheless, there are certain well-recognized systems of treatment which in most instances will be found to be of benefit. The treatment differs in the two forms of the disease. As regards acute rheumatism the general management of the case from the outset requires attention. The patient should be placed in bed between blankets, and should wear a flannel shirt, the front and arms of which should be opened to admit of the examination of the heart and of the joints. Movements of all kinds should be as far as possible avoided. The affected joints should be enveloped in cotton wool, kept in position by a light bandage. Sometimes the bathing of these parts with warm water containing opium or other sedative affords relief. The local application of blisters in the neighbourhood of the painful joints, as pro- posed by Dr Herbert Davies, is in some instances followed with benefit, but is obviously applicable only where the rheumatism is limited in its extent. The same may be said of the local application of electricity to the joints. Constitutional remedies are of undoubted value in this disease, and the number of available agents for this purpose is so large that mention can only be briefly made of some of the more approved. For long the alkalis, especially the salts of potassium, were the chief remedies resorted to, and for them it was claimed that they shortened the attack, relieved pain, and prevented heart complications. They are certainly very valuable in many instances. Of late a new series of substances has been tried with great success, namely salicin (first suggested for acute rheumatism by Dr T. J. Maclagan), salicylic acid, and salicylate of soda. These remedies, which are known to have a powerful effect in reducing febrile temperatures, appear to exercise a special influence in acute rheumatism, not merely by lowering the fever, but by relieving pain and cutting short the attack, thereby lessening the risk of complications. From 20 to 30 grains of these drugs every two hours require to be given for about twenty-four hours in order to produce the desired effect, and the quantity is reduced as the acute symptoms subside.

Although they do not succeed in all cases, and sometimes give rise to symptoms (delirium, sickness, &e.) which necessitate their suspension, it will be admitted by most physicians that cases which appeared likely to be of a severe character have under this treatment been cut short in a few days, and that even where this result was not attained the pain and other distressing symptoms were materially alleviated. Tonics, such as iron and quinine, have also been employed in acute rheumatism, but their advantage is more apparent in the convalescence, when there are anemia and debility, rather than in the height of the disease. The pain and sleeplessness may render necessary the administration of opiates, but in many instances both are completely overcome by the remedies previously mentioned. In the dangerous complication of hyperpyrexia the cold bath (in which the water is quickly cooled down from 94° to 68°) has frequently been suc- cessful in speedily lowering the temperature and saving life. Persons who have suffered from acute rheumatism should ever afterwards be careful to avoid exposure to

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damp and chill, and to protect the skin by suitable under- clothing.

In chronic rheumatism the remedies are innumerable. This form of the disease is less under the power of medicinal agents than the acute, although much may be done to alleviate the suffering produced by it as well as to limit its extension. Salicin and the salicylates so useful in acute rheumatism are not found asa rule to be of much service, while on the other hand alkalis in combination with sulphur, iodine, arsenic, and tonics, such as iron, quinine, cod-liver oil, &c., are the most serviceable remedies. Turpen- tine is also recommended. Friction of the affected parts with stimulating or soothing liniments, counter-irritation with blisters, iodine, or the button cautery are useful local applications, as is also galvanism. Hot baths or Turkish baths may occasionally be used with advantage. The mineral waters, and baths of various well-known resorts are of undoubted benefit, especially those of Buxton, Bath, Strathpeffer, or Harrogate in Great Britain, or those of Aix- les-Bains, Wiesbaden, Homburg, Ems, Wildbad, Aix-la- Chapelle, and many others on the Continent. Changes to warmer climates during the colder season where

practicable are also to be recommended, as well as every other measure calculated to improve the general health.

RHEUMATOID ARTHRITIS.—This term (syn. chronic rheu- matic arthritis, arthritis deformans) is employed to desig- uate a chronic inflammatory affection of joints, involving specially the synovial membranes and articular cartilages, of slow development and progressive character, resulting in stiffening and deformity of the parts.

This disease is held by some to partake of the nature of both rheumatism and gout (hence occasionally termed rheumatic gout); others regard it as simply a variety of chronic rheumatism; while in the opinion of several eminent authorities it is an independent constitutional affection occurring in persons with a strumous or tubercular tendency. It does not appear to be hereditary. It is more common in women than in men, and occurs at all ages. It is closely connected with conditions of ill health ; and hence its frequent occurrence among those whose blood is impoverished by insufficient food, by hardship, or by any drain upon the system. It occasionally follows an attack of acute rheumatism ; hence the supposed connexion.

The disease in most cases is slowly developed, and shows itself first by pain and swelling in one joint (knee, wrist, finger, &c.), which soon subside and may remain absent for a considerable time. Sooner or later, however, another attack occurs either in the joint formerly affected or in some other, and it is noticed that the affected articulation does not now regain its normal size but remains somewhat swollen. The attacks recur with increasing frequency, gradually involving more joints, until, in course of time (for its progress is very chronic), scarcely an articulation in the body is free from the disease. Thickening of the textures, with stiffness, is the result, and often considerable deformity from the joints being fixed in certain positions, The muscles of the affected limbs undergo atrophy and contrast strikingly with the abnormally enlarged joints. Painful inflammatory attacks often occur in the affected joints, and the patient is much reduced in strength by the constant irritation of the disease. In the young the hands are very liable to suffer, and the disease gradually extends to involve other parts; while in old persons it is

apt to fasten upon one joint, often the hip, and is not so apt to spread. The chief changes in the joints are (1) in the synovial membrane, which is at first simply inflamed and contains fluid, but ultimately becomes much thickened, and (2) in the articular cartilage, which tends to split up and become gradually absorbed, leaving the articular ends of the bone exposed. The osseous surfaces thus brought into

contact become hard and polished by friction. These changes and others affecting the ligaments are apt to produce partial dislocation as well as stiffening of the joint, rendering it deformed and useless. This disease often lasts for many years, sometimes continuing for a lengthened period without much change, but tending gradually to progress and to render the patient more and more helpless. It is not attended with the complications of rheumatism, and is not inconsistent with long life, but its weakening effects upon the system and the ill health with which it is usually associated render the subject of it more liable to the inroads of other diseases. Rheumatoid arthritis is less amenable to treatment than rheumatism, the remedies for which are not found to be of much value in this disease. Most success is obtained if it is recognized early and measures are taken to strengthen the patient's general health. The best medicinal agents are iron, quinine, cod- liver oil, arsenic. Chalybeate mineral waters, such as those of Schwalbach, Spa, Pyrmont, &c., are often of service. Locally blisters or milder counter-irritation to the affected joints, as well as the employment of galvanism, may be advantageously resorted to. J. 0. A.)

RHEYDT, a manufacturing town of Rhenish Prussia, is situated on the Niers, 14 miles to the west of Diissel- dorf. The principal products of its numerous factories are silk, cotton, woollen, and mixed fabrics, iron goods, machinery, lamp wicks, and roofing pasteboard. Dyeing and finishing are also carried on. The most prominent buildings are the old parish church and a new one erected in 1866. Rheydt is an ancient place, but its industrial importance is of very recent growth. At the beginning of the present century it did not contain more than 2000 to 3000 inhabitants,

whereas in 1880 the population of the municipal commune was 19,087, two-thirds of whom were Protestants.

RHIN, Havr-, a department of France before 1871. See FRaNcg, vol. ix. p. 508.

RHINE (Lat. Rhenus, Germ. Rhein, Fr. Rhin, Dutch Rhijn), the chief river of Germany and one of the most important in Europe, is about 800 miles in length and drains an area of 75,000 square miles.1 The distance in a direct line between its source in the Alps and its mouth in the German ocean is 460 miles. Its general course is north-north-west, but it makes numerous deflexions and at one point is found running in a diametrically opposite direction. About 250 miles of its length are in Switzer- land, 450 in Germany, and 100 in Holland; but the German half is in every respect so much the more import- ant that it 1s no misnomer to call the Rhine a German river, even if the word German be confined to its modern political signification, The name Rhine, which is apparently of Celtic origin, is of uncertain import, but has been supposed to mean "flowing" or "clear." The sources of the Rhine are found in the Swiss canton of Grisons, where the drainage of at least 150 glaciers unites to form its headwaters. Among these streams, all of which are termed Rhin in the Ladine dialect of the district, two are generally recognized as the main sources of the river, viz., the Vorder Rhein and the Hinter Rhein. The chief feeder of the former rises in the small Lake of Toma, situated on the south-east slope of the St Gotthard,? at a height of 7690 feet above the sea and at no great distance from the source of the Rhone, which rises on the west side of the same mountain mass. It first flows to the east, receiving the waters of the Medelser Rhein and several other glacier streams, and after a course of about

1 This is the current estimate, but Strelbitzki, the latest authority, does not allow the Rhine a length of more than 710 miles.

*2 "*Reticarum Alpium inaccesso ac precipiti vertice," says Tacitus.*

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45 miles unites with the Hinter Rhein at Reichenau. As far as Ilanz the Vorder Rhein is simply a mountain torrent, descending 1200 feet in the first 12 miles of its course. At Disentis, where it is joined by the Medelser Rhein, it is 15 feet wide, and at Ilanz it is about thrice as large. The Hinter Rhein has its cradle in the Rheinwald glacier, near the St Bernardino Pass, 7270 feet above the sea and 40 miles south of Reichenau. The Vorder Rhein con- tributes the greater volume of water to the joint stream, but the Hinter Rhein belongs to a more developed system.

Beyond Reichenau the united stream, 150 feet in width, bears the name of Rhine without any qualifying epithet. It is now navigable for rafts, and small boats begin to be seen a little further on, at Coire, where it turns to the north. On reaching the Lake of Constance the Rhine deposits the debris that it has brought down from its mountain sources, and the stream that emerges from the west end of the Untersee is of a clear deep green colour. Between the Lake of Constance and Basel the Rhine flows towards the west and practically forms the boundary be- tween Germany and Switzerland, At Schaffhausen, in penetrating the barrier of the Jura, it forms the imposing falls of the Rhine, where it is precipitated over a ledge of rock in three leaps 50 or 60 feet in height. Near Lauter- burg, where the river encounters the gneiss of the Black Forest, is a series of formidable cataracts, and about 15 miles lower down are the rapids of Rheinfelden. At Basel, which it reaches aftcr a tortuous course of 250 miles, though it is only about a third of that distance from its source in a direct line, the Rhine turns once more to the north and enters Germany. Its breadth here is between 550 and 600 feet, while its surface now lies not more than 800 feet above the sea, showing that the river has made a descent of 6900 feet by the time it has traversed a third of its course. From Basel to Mainz the Rhine flows through a wide and shallow valley, bordered on the east and west by the parallel ranges of the Black Forest and the Vosges. Its banks are low and flat, and numerous islands occur. The tendency to divide into parallel branches has been curbed in the interests of navigation, and many windings have been cut off by leading the water into straight and regular channels. At Mannheim the river is nearly 1500 feet in width, and at Mainz, where it is diverted to the west by the barrier of the Taunus, it is still wider. It follows the new direction for

about 20 miles, but at Bingen it again turns to the north and begins a completely new stage of its career, entering a narrow valley in which the enclosing rocky hills abut so closely on the river as often barely to leave room for the road and railway on the bank. This is the most beautiful part of the whole course of the river, abounding in the ruined castles, the romantic crags, the sunny vineyards, and the picturesque lateral ravines that have combined to make the Rhine so favourite a resort of lovers of natural beauty. At Coblentz the valley widens and the river is 1200 feet broad, but the hills close in again at Andernach, and this ravine-like part of its course cannot be considered as ending till below the Seven Mountains, where the river once more expands to a width of 1300-1600 feet. Beyond Bonn and Cologne the banks are again flat and the valley wide, though the hills on the right bank do not completely disappear till the neighbour- hood of Diisseldorf. Further on the country traversed by the Rhine is perfectly level, and the current becomes more and more sluggish. On entering Holland, which it does below Emmerich, its course is again deflectcd to the west. Within Holland the banks are so low as to require at places to be protected by embankments against inundations. The river now loses its individuality in a number of separate branches, and the name of Rhine has often arbi- trarily clung to the smaller arm after a bifurcation. Almost

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immediately after entering Holland the stream divides into two arms, the larger of which, carrying off about two-thirds of the water, diverges to the west, is called the Waal, and soon unites with the Maas. The smaller branch to the right retains the name of Rhine and sends off another arm, called the Yssel, to the Zuyder Zee. The Rhine now pursues a westerly course almost parallel with that of the Waal. At Wijk another bifurcation takes place, the broad Lek diverging on the left to jom the Maas, while the "Kromme Rhijn" to the right is com- paratively insignificant. Beyond Utrecht, where it is again diminished by the divergence of the Vecht to the Zuyder Zee, the river under the name of the " Oude Rhijn" or Old Rhine degenerates into a sluggish and almost stagnant stream, which requires the artificial aid of a canal and sluices in finding its way to the sea. In Roman times the Rhine at this part of its course seems to have been a full

and flowing river, but by the 9th century it had lost itself in the sands of Katwijk, and it was not until the beginning of the 19th century that its way to the sea was re-opened. Though the name Rhine thus at last attaches to a very insignificant stream, the entire district between the Waal on one side and the Yssel on the other, the Znsula Batavorum of Czesar, in reality belongs to the delta of the famous river! See vol. xii. Plate I.

The Rhine is said to receive, dircctly or indirectly, the waters of upwards of 12,000 tributaries of all sizes. Leaving out of account the innumerable glacier streams that swell its volume above the Lake of Constance, the most important affluents to its upper course are the Wutach, the Alb, and the Wiese, descending on the right from the Black Forest, and the Aar, draining several Swiss cantons on the left. In the Upper Rhenish basin, between Basel and Mainz, the tributaries, though numerous, are mostly short and unimportant. The Ill and the Nahe on the left and the Neckar and the Main on the right are, however, notable exceptions. Before joining the Rhine the Ill runs almost parallel with it and at no great distance for upwards of 50 miles. In the narrow part of the valley, between Bingen and Cologne, the Rhine receives the waters of the Lahn and the Sieg on the right, and those of the Moselle? (bringing with it the Saar) and the Ahr on the left. Still lower down, but before the Dutch frontier is reached, come the Ruhr and the Lippe on the right, and the Erft on the left. The numerous arms into which the Rhine branches in Holland have already been noticed.

The Rhine connects the highest Alps with the mud banks of Holland, and touches in its course the most varied geological periods ; but the river valley itself is, geologically speaking, of comparatively recent formation. Rising amid the ancient gneiss rocks of the St Gotthard, the Rhine finds its way down to the Lake of Constance between layers of Triassic and Jurassic formation; and between that lake and Basel it penetrates the chalk barrier of thie Jura. The upper Rhenish valley is evidently the bed of an ancient lake, the shores of which were formed by the gneiss and granite

of the Black Forest on the one side and the granite and sandstone of the Vosges on the other. Within the valley all the alluvial

1 The nomenclature of the Rhine branches in the Netherlands is, according to Mr J. Dirks, a singular but historie system, by which the rivers are chopped up, as it were, into longitudinal pieces.

2 The Moselle rises in France, in the canton of Ramonchamp, at a height of 2379 feet above the sea, on the west side of the Vosges. Its length is 315 miles (of which 190 are in France), but the direct line from souree to confluence is only about 170 miles. At Hpinal (1040 feet) the Moselle passes out of the rocky mountain-glen where its course has hitherto been. It enters the Lorraine plateau, but the sides of the valley still remain high and steep. Below Metz (550 feet) the bottom-lands spread out to a considerable width ; in the section between Sierck and Coblentz the hills again close in upon the river. Rafts can generally be floated from Arches down to Frouard, and there, by the junction of the Meurthe (itself navigable, though with difficulty, from Nancy), the depth becomes sufficient for boats. Since 1840 steamboats have plied between Treves and Coblentz.

deposits are recent. Between Bingen and Bonn the Rhine forces its way through a hilly and rocky district belonging to the Devonian formation. The contorted strata of slate and greywacke rock must have been formed at a period vastly anterior to that in which the lake of the upper valley managed to force an ontlet through the enclosing barriers. Probably this section may be looked upon as the oldest portion of the river course proper, con- necting the upper Rhenish lake with the primeval ocean at Bonn. In this district too, as has already been remarked, is the finest scenery of the Rhine, a faet due in great part to the grotesque shapes of the quartzose roeks, left denuded of the less durable slate aud sandstone. All the strata intersected by the Rhine between Bingen and Bonn contain fossils of the same classes. The deposits of the actual valley here, belonging to the Miocene group of the Tertiary system, are older than the deposits either farther up or farther down the river; but they are contemporaneous with the basalts of the Rhine, which at Coblentz and in the peaks of the Seven Mountains also contribute to the scenic charm of the river. The very extensive pumice deposits at Neuwied and the lava and

other voleanic rocks belong toa more recent epoch. Below Bingen the formations belong almost entirely to the Post-Tertiary period.. Numerous extinct voleanoes rise near Neuwied. In the flatter parts of the valley occur large beds of loam and rubble, sometimes in terraces parallel with, but several hundred feet above, the river, —proving by their disposition and appearance that the valley has been formed by the action of water.

The Rhine has been one of the chief waterways of Europe from the earliest times; and, as its channel is not exposed to the danger of silting up like those of the Elbe and the Oder, it has always been comparatively easy to keep it open. The Romans exerted them- selves to improve the lower navigation of the river, and appointed prefects of the Rhine to superintend the shipping and to exact the moderate dues imposed to keep the channel in repair. The Franks continued the same policy and retained a system of river-dues. Afterwards as the banks became parcelled out among a host of petty princelings, each of whom arrogated the right of laying a tax on pene vessels, the imposts became so prejudicial as seriously to 1amper the development of the shipping. Many of the riparian potentates derived the bulk of their revenue from this source, and it is calculated that in the,18th century the Rhine yielded a total revenue of £200,000, in spite of the comparatively insignificant amount of the shipping. The first proposal for a free Rhine was mooted by the French at the congress of Rastatt (1797-1799), but Holland, commanding the mouth of the river, placed every obstacle in the way of the suggestion. In 1831, on the separation of Holland and Belgium, the former had become more amenable to reason ; and a system was agreed upon which practically gave free navigation to the vessels of the riverine states, while imposing a moderate tariff upon foreign ships. 1t was not, however, till 1869 that the last vestige of a toll disappeared and the river was thrown open without any restriction. he management of the channel and navigation is now vested in a Central Commission, mecting at Mannheim. The channel has been greatly improved and in many places made more direct since the beginning of the present century,—large sums being annually spent in keeping it in order. Capacious river harbours have been formed at various points, about twenty-five of these being in Germany and eight or ten more in Holland. The total weight of the goods forwarded each year on the Rhine has of late amounted to nearly 1,000,000 tons, the chief articles

being timber, coal, iron, agricultural produce, and manufactured goods of various kinds. The position of the river is highly favourable for the development of its trade. It flows through the most populous regions of the continent of Europe, to discharge into one of the most frequented seas opposite Great Britain, and, besides serving as a natural outlet for Germany, Belgium, and Holland, is connected with a great part of central and southern France by the Rhine-Rhone and the Rhine- ea Canals, and with the basin of the Danube by the Ludwigs-

anal,

The introduction of steam has greatly increased the shipping on the Rhine; and small steamers ply also on the Main, the Neckar, the Maas, and the Mosclle. The first Rhine steamer was launched in 1817 ; and now the river is regularly traversed by upwards of a hundred, from the small tug up to the passenger saloon-steamer. The steamboat traffic has especially eneouraged the influx of tourists, and the number of passing travellers may now be reckoned as between one and two millions annually. The river is navigable without interruption from Basel to its mouth, a distanee of 550 miles, of which 450 lie within Germany. Above Spires, how- ever, the river craft are comparatively small, but lower down vessels of 500 and 600 tons burden find no diffieulty in plying. Betwecn Basel and Strasburg the depth of water is sometimes not more than 8 feet; between Strasburg and Mainz it varies from 5 to 25 feet ; while below Mainz it is never less than 9 or 10 feet. The deepest point is opposite the Lurlei Rock near St Goar, where it is 75 feet in depth ; at Diisseldorf the depth is about 50 feet. One of the most interesting features of the Rhine navigation is

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afforded by the huge rafts of timber that are floated down the river. Single tree trunks sent down to the Rhine by the various tributaries are united into small rafts as they reach the main stream ; and these again are fastened together to form one large raft about Andernach. Though not so large as formerly, these timber-rafts are still sometimes 400 or 500 feet in length, and are navigated by 200 to 400 men, who live in little huts on the raft, forming actual floating villages. On reaching Dort the rafts are

broken up and sold, a single raft sometimes producing as much as £30,000, The voyage from Bingen to Dort takes from one to six weeks, and the huge unwieldy struetures require to be navigated with great care. The commerce carried on by-the river itself is supplemented by the numerous railways, which skirt its banks and converge to its principal towns. Before the introduction of railways there were no permanent bridges across the Rhine below Basel ; but now trains cross it at about a dozen different points in Germany and Holland.

The salmon fisheries of the Rhine, lying mainly between Bach- arach and St Goar, have long been famous; but their produce has been seriously diminished since the advent of the steamer. Pike, carp, and other white fish are also caught.

The long array of ancient and flourishing towns along its banks bear witness to the great importance of the river. These are most frequent in the upper Rhenish basin and again below Bonn, the places in the narrower part of the valley being generally more remarkable for their picturesque situation than for their commercial or political influence. Beyond the borders of Germany the only large towns on the Rhine are Basel in Switzerland, and Arnheim, Utrecht, and Leyden in Holland. Within Germany, as we trace the course of the river form south to north, we come successively to Spires, Mannheim, Mainz, Coblentz, Bonn, Cologne, Diisseldorf, and Wesel. Worms, which was formerly washed by the Rhine, lies about $ mile distant from the present course ; and Strasburg, which hes on the II], 2 miles from the Rhine, may also be reckoned as one of its towns.

Politically the Rhine has always played a great part; and it would require no great straining to write a history of this majestic river which would also be a history of the western half of conti- nental Europe. The whole valley seems to have been originally occupied by Celtic tribes, who have left traces of their presence on the contents of tombs and in the forms of names (Moguntiacum or Mainz, Borbetomagus or Worms, &c.); but at the beginning of the historical period we find the Celts everywhere in retreat before the advancing Teutons. Probably the Teutonic pressure began as early as the 4th century before Christ, and the history of the next

few hundred years may be summed up as the gradual substitution of a Germanic for a Celtic population along the banks of the Rhine. Its second historical period begins with the advent of the Romans, who stemmed the advancing Teutonic tide. Augustus and his successors took good care to fortify the Rhine carefully, and a large proportion of the Roman legions were con- stantly in garrison here. For two hundred years the Rhine formed the boundary between the Roman empire and the Teutonic hordes ; and during that period the left or Roman bank made prodigious strides in eivilization and culture. The wonderful Roman re- mains at Treves and elsewhere, the Roman roads, bridges, and aqueducts, are convincing proofs of what the Rhine gained from Roman domination. This Roman civilization was, however, des- tined to be swamped by the current of Teutonic immigration, whieh finally broke down the barriers of the Roman cmpire and overwhelmed the whole of the Rhenish district. Under Charle- magne, whose principal residence was in Aix-la-Chapelle, the cul- ture of the Rhine valley again began to flourish, its results being still to be traced in the important architectural remains of this period. At the partition of the domains of Charlemagne in 848 a.p. the Rhine formed the boundary between Germany and the middle kingdom of Lotharingia ; but by 870 it lay wholly within the former realm. Fornearly eight hundred years it continued in this position, the frontier of the German empire coinciding more or less with the line of the Rhone. During the early Middle Ages the bank of the Rhine formed the most cultured part of Germany, basing its civilization on its Roman past. The Thirty Years' War exercised

a most prejudicial effect upon the district of the Rhine; and the pence of Westphalia gave France a footing ou the left bank of the itherto exclusively German river by the acquisition of Alsace. The violent seizure of Strasburg by France in 1681 was ratified by the peace of Ryswick in 1697, which recognized the Rhine as the boundary between Germany and France from Bascl to about Germersheim. It was an easy inference for the French mind that the Rhine should be the boundary throughout and the Gaul of Cesar restored. This ideal was realized in 1801, when the whole of the left bank of the Rhine was formally ceded to France. The

congress of Vienna (1815) restored the lower part of the Rhenish valley to Germany, but it was not till the war of 1870-71 that the recovery of Alsace and Lorraine made the Rhine once more "Germany's river, not Germany's frontier." In the military history of all these centuries constant allusion is made to the Rhine, its passages, and its fortresses. Every general who has fought in its neighbourhood has at onc time or another had to provide for a crossing of the Rhine, from Julius Cesar, who crossed it twice, down to our own time. The wars carried on here by his Most Christian Majesty Louis XIV. are still remembered in

the Rhine district, where the devastations of his generals were of

the most appalling description ; and scarcely a village or town but has a tale to tell of the murder and rapine of this period.

The Rhine has always exercised a peculiar sort of fascination over the German mind, in a measure and in a manuer not easily paralleled by the case of any other river. "Father Rhine" is the centre of the German's patriotism and the symbol of his country. In his literature it has played a prominent part from the Wibelungenlied to the present day; and its weird and romantic legends have been alternately the awe and the delight of his childhood. The Rhine was the classic river of the Middle Ages ; and probably the Tiber alone is of equal historical interest among European rivers. Victor Hugo has perhaps best described the mingled feelings which the Rhine awakens. "Le Rhin," he says, "réunit tout. Le Rhin est rapide comme le Rhine, large comme la Loire, encaissé comme la Meuse, tortueux comme la Seine, limpide et vert comme la Somme, historique comme le Tibre, royal comme le Danube, mystérieux comme le Nil, pailleté d'or comine un fleuve d'Amérique, couvert de fables et de fantémes comme un flenve d' Asie." (J. F. M.).

RHINOCEROS, a name applied by the ancients to an animal the most striking external peculiarity of which is certainly the horn growing above its nose (f.vdKepus, nose-horn),

The various existing and extinct species are grouped into a family, Rhinocerotidx, which is a division of the Perissodactyle (odd-toed) section of the great order of Ungulata or hoofed mammals, of which section the

tapirs and horses are the only other surviving members (see MamMatta, vol. xv. p. 428),

The following are the general characters applicable to all the members of the family.

First, as regards dentition. Incisors variable, generally reduced in number and often quite rudimentary, and early deciduous. Canines, in existing species, absent. Molar series, consisting of the full number of four premolars and three molars above and below, all in contact and closely resembling each other, except the first, which is

Fig, 1.—Grinding surface of a moderately worn right upper second molar of Rhinoceros. A, Rhinoceros unicornis; B, Rhinoceros sondaicus. I, anterior surface ; 2, posterior surface ; 3, internal surface: 4, external surface (wall or dorsum); 5, antero-internal pillar or cusp; 6, postero-internal pillar or cusp; 7, anterior sinus; 8, median sinus; 9, posterior sinus; 10, accessory sinus or valley ; 11, crista (anterior combing plate); 12, crochet (posterior combing

plate). much smaller than the rest and often deciduous. The others gradually increasing in size up to the penultimate. The upper molars have a very characteristic pattern of crown, having a much-developed flat or more or less

sinuous outer wall, and two transverse ridges running

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obliquely inwards and backwards from it, terminating internally in conical eminences or columns, and enclosing a deep (middle) sinus between. The posterior sinus is formed behind the posterior transverse ridge, and is bounded externally by a backward continuation of the outer wall and behind by the cingulum. The anterior sinus is formed in the same manner, but is much smaller,

‘The middle sinus is often intersected by vertical laminz

("combing plates ") projecting into it from the anterior sur- ' face of the posterior transverse ridge or from the wall, the development of which is a useful guide in discriminating the species, especially those no longer existing and known only by the teeth and bones. The depressions between the ridges are not filled up with cernentum as in the horse. The lower molars have the crown formed by a pair of crescents ; the last has no third lobe or talon.

Head large, skull elongated, elevated posteriorly into a transverse occipital crest. No post-orbital processes or any separation between orbits and temporal fossa. Nasal bones large and stout, co-ossified, and standing out freely above the premaxille, from which they are separated by a deep and wide fissure ; the latter small, generally not meeting in the middle line in front, often quite rudimen- tary. Tympanics small, not forming a bulla. Brain cavity very small for the size of the skull. Vertebree :— cervical, 7; dorsal, 19-20 ; lumbar, 3; sacral, 4; caudal, about 22. Limbs stout, and of moderate length. Three completely developed toes, with distinct broad rounded hoofs on each foot.1 Mammze two, inguinal. Eyes small. Ears of moderate size, oval, erect, prominent, placed near the occiput. Skin very thick, in many species thrown into massive folds. Hairy covering scanty. All existing species have one or two median horns on the face. When one is present it is situated over the conjoined nasal bones ; when two, the hinder one is over the frontals. These horns, which are of a more or less conical form and usually recurved, and often grow to a great length (three or even four feet), are composed of a solid mass of hardened epidermic cells growing from a cluster of long dermal papilla. The cells formed on each papilla consti- tute a distinct horny fibre, like a thick hair, and the whole are cemented together by an intermediate mass of cells which grow up from the interspaces between the papille. It results from this that the horn has the appearance of a mass of agglutinated hairs, which, in the newly growing part at the base, readily fray out on destruction of the softer intermediate substance ; but the fibres differ from true hairs in growing from a free papilla of the derm, and not within a follicular involution of the same.

The Ahinocerotidex are all animals of large size, but of little intelligence, generally timid in disposition, though ferocious when attacked and

brought to bay, using the nasal horns as weapons, by which they strike and toss their assailant. Their sight is dull, but their hearing and scent are remarkably acute. They feed on herbage, shrubs, and leaves of trees, and, like so many other large animals which inhabit hot countries, sleep the greater part of the day, being most active in the cool of the evening or even during the night. They are fond of bathing and wallowing in water or mud. None of the species have been domesti- cated. Animals of the group have existed in both the Old and New Worlds since the beginning of the Miocene period. In America they all became extinct before the end of the Pliocene period. In the Old World their distribution has become greatly restricted, being no longer found in Europe and North Asia, but only in Africa and in portions of the Indian and Indo-Malayan regions.

1Tn some extinct species a small outer toe is present on the

forefoot. XX. — 66

522 RHINOCEROS

The existing species of rhinoceros are naturally grouped into three sections, which some zoologists consider of generic value.

I. Rhinoceros proper. The adults with a single large compressed incisor above on each side, and occasionally a small lateral one; below, a very small median, and a very large, procumbent, pointed lateral incisor. Nasal bones pointed in front. A single nasal horn. Skin very thick, and raised into strong, definitely arranged ridges or folds.

There are two well-marked species of one-horned rhino- ceroses. (1) The Indian Rhinoceros, &. wnicornis of Lin- neeus,! the largest and best known, from being the most frequently exhibited alive in England, is at present only

Fra, 2,—Indian Rhinoceros (Rhinoceros unicornis). This and the following woodcuts are reduced from drawings by J. Wolf, from animals living in the London Zoological Society's Gardens.

met with in a wild state in the terai region of Nepal and Bhutan, and in the upper valley of the Brahmaputra or province of Assam, though it formerly had a wider range.

Fra, 3.—Javan Rhinoceros (Rhinoceros sondaicus).

The first rhinoceros seen alive in Europe since the time when they, in common with nearly all the large remarkable

1 Many authors use Cuvier's name, 2. indicus, in preference to this, on the ground that there are more than one species with one horn, forgetting that the name substituted is equally inconvenient, as more than one species live in India. The fact of a specific name being applicable to several members of a genus is no objection to its restriction to the first to which it was applied ; otherwise changes in old and well-received names would constantly have to be made in consequence of new discoveries.

Roman shows, was of this species. It was sent from India to Emmanuel, king of Portugal, in 1513 ; and from a sketch of it, taken in Lisbon, Albert Diirer composed his cele- brated but rather fanciful engraving, which was repro- duced in so many old books on natural history. (2) The Javan Rhinoceros, R. sondaicus, Cuvier, is distinguished by smaller size, special characters of the teeth and skull, and different arrangement of the plications of the skin (as seen in the figures) ; the horn in the female appears to be very little developed, if not altogether absent. This has a more extensive geographical range, being found in the Bengal Sunderbans near Calcutta, Burmah, the Malay Peninsula, Java, Sumatra, and probably Borneo.

Il. Ceratorhinus. The adults with a moderate-sized compressed incisor above, and a laterally placed, pointed, procumbent incisor below, which is sometimes lost in old animals. Nasal bones narrow and pointed anteriorly. A well-developed nasal, and a small frontal horn separated by an interval. The skin thrown into folds, but these not so strongly marked as in the former section. The smallest living member of the family, the Sumatran Rhinoceros, R. sumatrensis, Cuv., belongs to this «group. Its geo- graphical range is nearly the same as that of the Javan species, though not extending into Bengal; but it has been found in Assam, Chittagong,

Burmah, the Malay Peninsula, Sumatra, and Borneo. It is possible that more than one species have been confounded under this designation, as two animals now living in the London Zoological Gardens present considerable differences of form and colour. QOne of them, from Chittagong, has been named by Sclater 2. lastotis, the Hairy-Eared Rhinoceros, but until an opportunity is afforded for anatomical ex- amination, it is difficult to pronounce upon the value of the distinction.

IIL. Atelodus. In the adults, the incisors are quite rudi- mentary or entirely wanting. Nasal bones thick, rounded and truncated in front. Well-developed anterior and pos- terior horns in close contact. Skin without any definite permanent folds.

The two well-marked existing species are peculiar to the African continent.

1. The common Two-Horned Rhinoceros, FR. bicornis, Linn., is the smaller of the two, with a pointed prehensile upper lip, and a narrow compressed deep symphysis of the

Fic. 4.—Common African Rhinoceros (Rhinoceros bicornis).

lower jaw. It ranges through the wooded and watered districts of Africa, from Abyssinia in the north to the Cape Colony, but its numbers are yearly diminishing, owing to

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the inroads of European civilization, and especially of English sportsmen. It feeds exclusively upon leaves and branches of bushes and small trees, and chiefly frequents the sides of wood-clad rugged hills. Specimens in which the posterior horn has attained a length as great as or greater than the anterior have been separated under the name of ft. keitloa, but the characters of these appendages are too variable to found specific distinctions upon. The two- horned African rhinoceros is far more rarely seen in mena- geries in Europe than either of the three Indian species, but one has lived in the gardens of the London Zoological Society since 1868. Excellent figures from life of this and the other species are

published in the ninth volume of the "Transactions of the society, from which the accompanying woodcuts are reduced.

2. Burchell's or the Square-Mouthed Rhinoceros (2. simus), sometimes called the White Rhinoceros, though the colour (dark-slate) is not materially different from that of the last species, is the largest of the whole group, and differs from all the others in having a square truncated upper lip and a wide, shallow, spatulate symphysis to the lower jaw. In conformity with the structure of the mouth, this species lives entirely by browsing on grass, and is therefore more partial to open countries or districts where there are broad grassy valleys between the tracts of bush. It is only found in Africa south of the Zambesi, and of late years has become extremely scarce, owing to the persecutions of sportsmen; indeed, the time of its complete extinction cannot be far off. No specimen of this species has ever been brought alive to Europe. Mr F.C. Selous gives the following description of its habits from extensive personal observation :—

"The square-mouthed rhinoceros is a huge ungainly-looking beast, with a disproportionately large head, a large male standing 6 feet 6 inches at the shoulder. Like elephants and buffaloes they lie asleep during the heat of the day, and feed during the night and in the cool hours of early morning and evening. Their sight is very bad ; but they are quick of hearing, and their scent is very keen; they arc, too, often accompanied by rhinoceros birds, which, by running about their heads, flapping their wings, and screeching at the same time, frequently give them notice of the approach of danger. Whien disturbed they go off at a swift trot, which soon leaves all pursuit from a man on foot far behind ; but if chased by a horseman they break into a gallop, which they can keep up for some distance. However, although they run very swiftly, when their size and heavy build is considered, they are no match for an average good horse. They are, as a rule, very easy to shoot on horseback, as, if one gallops a little in front of aud on one side of them, they will hold their couse, and come sailing past, offering a magnificent broadside shot, while under similar circumstances a prehensile-lipped rhinoceros will usually swerve away in such a manner as only to present his hiud-quarters for a shot. When either walking or running, the square-mouthed rhinoceros holds its head very low, its nose nearly touching the ground. When a small calf

accompanies its mother, it always runs in front and she appears to guide it by holding the point of her horn upon the little animal's rump; and it is perfectly wonderful to note how in all sudden changes of pace, from a trot to a gallop or vice versa, the same position is always exactly main- tained. During the autumn and winter months (i.e., from March to August) the square-mouthed rhinoccros is usually very fat; and its meat is then inost excellent, being something like beef, but yet having a peculiar flavour of its own. The part in greatest favour among hunters is the hump, which, if cut off whole and roasted just as it is in the skin, in a hole dug in the ground, would, I think, be difficult to match either for juiciness or flavour."—Prvoe. Zool, Soc., 1881, p. 726

Extinct Species of Rhinoceros. —The family once contained many more species, which were far more widely distributed than at present. As in similar cases, our knowledge of them is as yet but fragmentary, though constantly augmenting, especially by dis- coveries made in the Tertiary deposits of North America, a region in which they all died out long ago, though, judging from the evidence at present available, this was the locality in which they first made their appearance. In the Eocene formations of the Rocky Mountains are found the remains of numerous niodifications of the primitive Perissodactyle type, from which the rhinoceroses nay have originated. In the Lower Miocene a form called Hyracodon by Leidy already presented many of the

characteristics of the family, though, especially as regards the dentition, in a very generalized condition. The next stage of specialization is represented by Accratherium, found in the Miocene of both Europe and America, which still, like the last, shows no sign of having possessed a nasal horn. It differed from the existing species also in having four toes on the anterior limb, instead of only three. At the same period forms occurred (Dicera- therium, Marsh) which show a pair of lateral tubercles on the nasal bones, apparently supporting horns side by side. These, how- ever, soon disappeared and gave way in the Old World to species with one or two horus in the median line, a stage of development which apparently was never reached in America. In the Pliocene and Pleistocene of Europe

and Asia numerous modifications of the existing types have been found. The present African two-horned type was represented in the Early Pliocene of Greece by R. pachy- grathus, the skeleton of which is described by Gaudryas intermediate between the existing R. bicornis and R. simus. As many as three species were inhabitants of the British Isles, of which the best known is the Tichorhine or Woolly Rhinoceros, R. antiquitatis of Blumenbach, nearly whole carcases of which, with the thick woolly external covering, have been discovered associated with those of the mammoth, preserved in the frozen soil of the north of Siberia, and which, in common with some other extinct species, had a solid incdian wall of bouc supporting the nasals, from which it is in- ferred that the horns were of a size and weight surpassing that of the modern species. The one-horned Indian type was well repre- sented under several modifications (R. sivalensis, paleindicus, &e.), in the Pliocene deposits of the sub-Himalayan region, and forms more allied to the African bicorn species have also been found in India. &. schleirmachert of the late European Miocenes was in some respects allied to the existing Sumatran rhinoceros, possessing incisor teeth and two horns. (We, BS)

RHODE ISLAND, one of the six New England States, and the smallest in extent of all the States, is one of the original thirteen which formed the American Union. It has an actual land area of only 1054°6 square miles, the waters of Narragansett Bay, its chief physical feature, comprising an additional area of not far from 360 square miles. It lies between 41° 18 and 42° 3' N. lat., and 71° 6' and 71° 55' W. long,, its greatest length from north to south being about 48 miles, and its greatest width from east to west about 35 miles. It is shut in on the east and north by Massachusetts, and on the west by Connecticut, while its southern shores are washed by the Atlantic Ocean. |

Physwal Characteristics—The geological formation of the western portion of the State is chiefly that of the Montalban gneiss, which characterizes a great part of southern New England (see geological sketch map of New England, in article New Hampsuirg, vol. xvii. p. 391), but under the bay and to the east of it is an extensive coal-bearing formation, from which at different times upwards of 750,000 tons of coal have been taken. The only other important deposit is one of magnetic

oxide of iron. The climate of Rhode Island, though variable, differs from that of the exposed coast of Massachusetts Bay in the absence of harassing east winds; while the proximity of the southern parts of the State (Newport and vicinity) to the Gulf Stream results in an atmosphere of unusual warmth and moisture, and at the same time comparatively equable. No great extremes, either of heat or of cold, are experienced in the State.

+ Population.—The earliest authentic estimate of population is that of 7181 in 1708. The War of Independence (1775-88) had the effect of reducing it from 59,707 in 1774 to 52,347 in 1782. The subsequent United States censuses show stcady gains, as follows :—1790, 68,825; 1800, 69,122; 1810, 77,031; 1820,

83,059 ; 1830, 97,210; 1840, 108,830; 1850, 147,545; 1860,

174,620 ; 1870, 217,353 ; 1880, 276,531 (143,501 males, 133,030 females); while a State census in 1885 (advance returns) gives 304,419. The census of 1880 showed Rhode Island to be surpassed in aggregate population by all except Colorado, Oregon, Delaware, and Nevada, but in density it was surpassed by none (254°9 per square mile, the average for the whole United States being 13°92). By the same census the number of persons of foreign birth was 73,993, or 26°8 per cent., no State cast of Lake Michigan showing

1 The town of New Shoreham, which lies on an island 10 miles from shore, is beyond this limit.

a higher percentage; of these 30,973 (over 41 per cent.) were natives of the United Kingdom or its colonies. About 100,000 of the population are Roman Catholics; of the remainder, the Baptists (who have been in Rhode Island from its earliest settle- ment) are most numerous, while the eommunicants of the Protest- ant Episcopal church, with the Congregationalists and Methodists, have also a large representation. ;

Industries.—No portion of the State can be described as excep- tionally fertile; and only 8 per cent. of the population are engaged in agriculture. The favourable sitnation of Newport and Provi- dence, at the two extremitics of Narragansett Bay, led_to the development in the last century of a flourishing trade. This was long ago greatly reduced, and the tonnage of these ports is now chiefly that of a coasting trade. With the final cheek given to foreign commeree in the war of 1812-14, manufaetures gained at once that prominence in the local industries of the State whieh they have ever since held. The census of 1880 returned the total number of persons in Rhode Island engaged in " gainful and reputable " occupations as 116,979, of whoni 66,160, or more than 55 per cent., were classed under the heading " manufactures, mechanics, and mining."! From Samuel Slater's efforts at Providence and Pawtucket Falls, in 1790-98, may in fact be dated the real development of the cotton manufacturing industry in America, Slater, who had served an apprenticeship in England with a partner of Arkwright, having then been able from memory to set up in Rhode Island the whole set of recently improved spinning machinery. In 1791 only 5858 yards of cotton cloth were made in Providence and vicinity, but in 1810 in Rhode Island 735,319 were made. Two years later, in 1812, there were fifty-three eotton mills within a radius of 30 miles of Providence, nearly three-fifths of them being in Rhode Island. The number of cotton mills in Rhode Island was 33 in 1812, 116 in 1831, and 139 in 1870. Owing to the widespread depression in business the number was greatly reduced throughout the country during the next decade, but even in 1880 the number in Rhode Island was sur- passed by that of no other State except Massachusetts. Accord- ing to the census of 1880, the amount of capital invested in the manufacture of cotton goods was $24,609,461; woollen goods $15,410,450; dyeing and finishing textiles, $6,874,254 ; foundry and machine-shop products, $6,231,707 ; worsted goods, $6,177,754 ; jewellery, $5,650,133 ; slaughtering and meat-packing, $3,876,740 ; mixed textiles, $2,718,822; rubber and elastic goods, $2,217,000. Thus Rhode Island is second to but one other State—Massa- chusetts—in its aggregate production of cotton goods; and in the total amount of capital invested in all manufactures it ranks ninth. In each of the five following industries—cotton, woollen, worsted, mixed textiles, and dyeing and finishing—it stands at the head of all the States in amount of production

per head of population. In jewellery the yearly product of a single city, Pro- vidence, exceeds that of every other city in the country ($5,444,092 in 1880). The same city ranks ninth in the value of its foundry and machine-shop products, $4,522,179; Pawtucket, closely ad- joining, adds about $1,600,000.

Wealth and Finances.—The assessed valuation of the State was—in 1850, $80,508,794; in 1860, $135,337,588 ; in 1870, $296, 965,646 ; and in 1880, upwards of $420,000,000—a gain of 500 per cent. in thirty years. In aggregate valuation it was sur- passed in 1880 by twenty-four States (its population in the same year being exceeded by that of thirty-two States), but in valuation per head it ranked third ($1518°82 in 1880). Notwithstanding the large foreign-born population, the number of persons classed as paupers is very small,—only 553 in 1880, as compared with 15,217 in New York. In 1884 thirty-eight savings banks contained deposits to the amount of $51,079,160°66, with 115,752 depositors (more than 40 per cent. of the entire population). The number of other banks in the State was, in 1883, scventy-three, with a capital of $22,330,579°00. The State tax in 1880 amounted to $383,489 °23 ; and in the same year the rate of taxation per head for all purposes ($9°74) was exceeded only by that of Massachusetts, New York, and California. The debt of the State, held in bonds issued during the war of 1861-65, has for the last few years been steadily diminishing. In 1880 it stood at $2,534,500, and in 1884 at $1,372,000.

Cities and Towns.—The five counties into which Rhode Island is divided contain in all thirty-six towns and cities, of which six lie ou the narrow strip bordering the eastern shore of the bay, five ou islands in the bay and ocean, and the remaining twenty-five on the mainland, to the west and north-west of the bay. By the State census of 1885 six cities and towns had a population exceed- ing 10,000 :—Providence, 117,607 ; Pawtucket, 22,873 ; Newport, 20,339 ; Lincoln, 17,262 ; Woonsocket, 16,005 ; Warwick, 13,281. Only two of these places, Providence and Newport, have hitherto been organized as cities; but a third, Pawtucket (the largest in the country under a town government), is also now (1885) about to be organized under a city eharter. The quaint old city of Newport, situated at the southern end of the island (Rhode

1 Mining has long been unrepresented among Rhode Island industries.

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Island) from which the State receives its name," has for many years been nearly stationary as regards the development of its population and industries, but is well known on both sides of the Atlantic for its social attractions. In 1880 the "urban" population of Rhode Island constituted 77 per cent. of the total—a percentage surpassed only in the District of Columbia. Yet the growth of manufaeturing industries in the State has resulted in building up compact settlements (in not a_ few instances almost continuous), with little regard to town lines and boundaries. On the Blackstone river are sixteen of these "villages" situated within five different towns; on the Woonas- quatueket river twelve, in four cities and towns; and on the Pawtuxet river and its branches thirty-two, in five towns. In 1875 there were 186 " villages."

Education.—It was not until 1828 that the present public school system was established ; but, owing largely to the excep- tional organizing ability of the first commissioner of public schools, Henry Barnard, a most efficient system was securely built up. From various causes (including the presence of a large foreign- born element), illiteracy is a serious problem in this State, —the percentage unable to write (11°2) being in 1880 higher than in any other Northern State. Imperfect attendance is also a serions difficulty in the manufacturing villages. While the number of children registered by the school census of 1880 as of " school age" was 52,273, only 338,504 of these were actually enrolled as pupils in the public schools. Even after counting those who attend private and parochial schools, those "not attending any school" comprise so large a number as 12,279. Under the operation of a newly enacted compulsory law encouraging progress has been made. The public school funds in 1884 amounted to $659,585 °50. Educa- tional institutions, other than public, include Brown University, the Friends' School, and various others at Providence. Brown University was founded in 1764, under the name of Rhode Island College, and was the seventh college established in America.

Libraries, —The Redwood Library, at Newport, still in existence, incorporated in 1747, was the fourth public library founded in New England. The Providence Library was founded only a few years later, and is still perpetuated in the Providence Atheneum, an – admirably conducted shareholders' library (43,656 volumes in 1884). The Brown University Library, founded 1772, had in June 1885 more than 62,000 volumes, including several spccial collec- tions of great rarity and value. There were, moreover, in the same year thirty-two "public libraries" in the State (free to all readers), with a total of about 100,000 volumes. The largest of these (31,650 volumes in 1885) is the Providence Publie Library.

History and Constitution. —The planting of the three scattered and independent settlements (Providence, 1636; Portsmouth, 1638 ; Newport, 1639) by Roger Williams and others whose views of chnrch polity and doctrine had been found unpalatable to the Massaehusetts Puritans, was not in the outset a movement for the establishment of a colony. The need of mutual protection, however, led to their combination; and the first general union of these three towns (together with a fourth, Warwick), was secured in 1647, under the charter of March 14, 1643-44. The union effected by this instrument was of the very loosest description, but under the pressure of causes which threatened the very existence of the colony a new and much more comprehensive charter was obtained in 1668. This extraordinarily liberal instrument consti- tuted the fundamental law of Rhode Island for the next hundred and eighty years, through a succession of remarkable vicissitudes. The charters of Massachusetts and other American colonies were withdrawn in 1686, but the efforts of the royal agent were frus- trated in Connecticut and Rhode Island; and in this colony the government was siniply committed temporarily to the separate towns which had constituted the colony, the charter government being peacefully resumed three years later, in 1689. Rhode Island was hardly free, during the next seventy years, from some form of conflict with the mother country over the question of charter rights; and in thie steps which served to precipitate the War of Independence (1775-83), as well as in the war itself, it was among the foremost. In the military operations of this war Nathanael Greene, a Rhode Island officer, ranks easily second to Washington in generalship. Reluctant as Rhode Island was to

acknowledge other authority than that of its own colonial charter, even after the close of the war, it did not accede to the constitution of the United States until June 1790, more than a twelvemonth after the new government had gone into operation under Washington as president. Nor did iteven then follow the example of the other States in framing a State constitution for the govern- ment of its local affairs, but retained its colonial charter of 1663 until almost the middle of the present century. In 1841 and 1842 the dissatisfaction with this mode of government culminated in a series of revolutionary movements; and a convention called by citizens of the State adopted what was known as the " people's

2 The official name of the State is "the State of Rhode Island and Providence

- Plantations."

constitution," under whose provisions it was elaimed that Thomas Wilson Dorr was chosen governor. Later in the year 1842 a eonvention ealled by the regularly constituted authorities adopted the present constitution, under whose provisions the State government was organized in 1843. The governor (chosen annu- ally) has no veto power. The legislative body, known as the General Assembly, comprises a senate and a house of representa- tives, each one of the thirty-six cities and towns ehoosing a single senator. The General Assembly begins its annual sessions in May at Newport, adjourning, after a few days, fora much more extended session at Providence. beginning in the following January. The judicial body consists of one supreme eourt, with subordinate courts for the respeetive counties, the justices being chosen by vote of the General Assembly. The suffrage is a lHmited one, a property qualification being required in certain instanecs, The State is represented in the national Congress by two senators and two representatives. In the quadrennial election of president, Rhode Island has four votes in the "electoral eollege." In the Civil War of 1861-65 Rhode Island took an active part, furnishing for

the defence of the Union 24,042 men. (W. E, F.)

RHODES, an island in the Aigean Sea, belonging to the Turkish empire, lying off the south-west coast of Asia

Minor, between 35° 52’ and 36° 28’ N. lat. and 27° 40’ and 28° 15’ KE. long., about 10 miles south of Cape Alepo. Its length is about 45 miles from north-east to south-west, its greatest breadth 22 miles, and its area nearly 424 square miles.

The island is diversified in its surface, and is traversed from north to south by an elevated mountain range, the highest point of which, named in ancient times Atabyris or Atabyrium, and still called Atairo, rises to an elevation of 4560 feet. It commands a view of the elevated coast of Asia Minor towards the north, and of the Archipelago, studded with its numerous islands, on the north-west ; while on the south-west is seen Mount Ida in Crete, often veiled in clouds, and on the south and south-east the vast expanse of waters which wash the African shore. The rest of the island is occupied in great part by ranges of moderately elevated hills, on which are found extensive woods of ancient pines, planted by the hand of nature. These forests were formerly very thick, but they are now greatly thinned by the Turks, who cut them down and take no care to plant others in their place. Beneath these hills the surface of the island falls lower, and several hills in the form of amphitheatres extend their bases as far as the sea, —

Rhodes was famed in ancient times for its delightful climate, and it still maintains its former reputation. The air is pure and salubrious, and it is said that there is hardly a day throughout the year in which the sun is not visible. The winds are liable to little variation ; they blow from the west, often with great violence, for nine months in the year, and at other times from the north ; and they moderate the summer heats, which are chiefly felt during the months of July and August, when the hot winds blow from the coast of Anatolia.

Rhodes, in addition to its fine climate, is blessed with a fertile soil, and produces a variety of the finest fruits and vegetables. Numerous streams and rivulets, which take their rise in the central range, water the surround- ing plains and valleys of the island. The inhabitants have a

great taste for gardens; and around the villages are extensive cultivated fields and orchards, containing

§, pomegranate, and orange trees. On the sloping hills carob-trees, and others both useful and agreeable, still grow abundantly ; the vine also holds its place, and produces a species of wine which was highly valued by the ancients, though it seems to have degenerated greatly in modern times. The valleys afford rich pastures, and the plains produce every species of grain; the wheat is of an excel- lent quality ; and, but for the extortions of its barbarian rulers, the island might be the seat of agriculture as well as comnierce, and might export large quantities of corn,

The commerce of the island has been of late years in- creasing at a rapid rate. Many British manufactures are imported by indirect routes, through Smyrna, Constanti- nople, Beyrout, and other places. Cotton stufis, calicoes, and grey linen are among the goods most in demand. It is not so much, however, the peasantry of the island who use these British goods, for they prefer their own home- made stuffs; but they are exported to the neighbouring coast of Anatolia, between Budrum and Adalia, and thence conveyed into the interior. The expansion of the trade has been very much owing to the establishment of steam navigation direct to the island, which is now visited regu- larly by French and Austrian steamers, as well as by some from England to Smyrna.

The only town of any importance in the island is the capital, Rhodes, which stands at the north-east extremity. It rises in an imposing manner from the sea, on a gentle slope in the form of an amphitheatre. It is surrounded with walls and towers, and defended by a large moated castle of great strength. These fortifications are all the work of the Knights of St John. Above them rise the domes and minarets of the mosques, and the tufted stems of the palm trees, which adorn this like most other Oriental towns. The interior of the city does not correspond to its outward appearance. No trace exists of the splendour of the ancient city, with its regular streets, well-ordered plan, and numerous public buildings. The modern city of Rhodes is in general the work of the Knights of St J ohn, and has altogether a medixval aspect, the strects being for the most part

narrow and winding, though the houses, as well as the public edifices, are in general solidly built of stone, and present at almost every step some memorial of the past in the escutcheons and coats of arms with which they are adorned. The picturesque fortifications also by which the city is surrounded remain almost unaltered as they were in the 15th century, and it has been remarked by numerous travellers that scarcely any city of western Europe has preserved its medieval aspect so unchanged as this last refuge of European civilization in the East. The principal buildings which remain are the church of St John, which is become the principal mosque ; the hospital, whence the charity of the knights was liberally dispensed to the faithful from all quarters of the world, and which has been transformed into public granaries ; the palace of the grand master, now the resi- dence of the pasha; and the senate-house, which still contains some marbles and ancient columns. Of the streets, the best and widest is a long street which is still called the Street of the Knights. It is perfectly straight, and formed of old houses, on which remain the armorial bearings of the members of the order. On some of these buildings are still seen the arms of the popes and of some of the royal and noble houses of Europe.

The only relics of classical antiquity are the numerous inscribed altars and bases of statues, as well as architectural fragments, which are found scattered in the courtyards and gardens of the houses in the extensive suburbs which now surround the town, the whole of which were comprised within the limits of the ancient city. The foundations also of the moles that separate the harbours are of Hellenic work, though the existing moles were erected by the Knights of St John.

Rhodes has at present two harbours. The least of these lies towards the east, and its entrance is obstructed by a barrier of rocks, so as to admit the entrance of but one ship atatime. It is sufficiently sheltered, but by the negligence of the Turks the sand has been suffered to accumulate until it has been gradually almost choked up. The other harbour is larger, and also in a bad condition ; here frigates of thirty guns may anchor, and are sheltered from the west

winds, though they are exposed to the north and north-east winds. The two harbours are separated by a mole which runs obliquely into the sea. At the eastern entrance is the fort of St Elmo, with a lighthouse; but the light is very feeble, and visible only a few miles.

History.—The numerous poetical legends current among the Greeks with respeet to Rhodes bear testimony to the importanee whieh it attained in very early times. Of these the most familiar is that celebrated by Pindar in one of the most beautiful of his odes (Ol. vii.), according to which the island was raised from the depths of the sea by Helios, the god of the sun, who always eon- tinued to be its tutclary deity, and whose image is found upon all its coins. The poet as usual derives its name from a nymph Rhoda, but there is no doubt that it was really derived from

dor, a rosc, the symbol that invariably accompanies the head of

Helios on its coins. Another set of legends connected it with the Telchines, a mythical people celebrated for their skill as workers in bronze and other metals, while another version of the same tale represented these Telehines as themselves expelled by the Heliade, who became the first introducers of civilization. It is not improbable that both traditions had some reference to the Pheenicians, who may well have been the first to establish settle- ments in an island that lay so directly on their way to the A'gean. But the first reeord that can claim anything like an_ historical eharaeter is that of the occupation of the island by a body of Doric

emigrants from the Peloponnesus, who founded the three eities of

Lindus, Ialysus, and Camirus, which long continued to divide the island among them, and together with those of Cos, Cnidus, and Halicarnassus formed the Doric Hexapolis or league of six cities. These cities, like the more important Ionie confederacy, had a common sanctuary on the Triopian Promontory near Cuidus, but they do not appear to have formed a political union, though the distinct predominance in them all of the Doric element would naturally lead to a community of interest as well as of feeling. Nothing is known of their history for several centuries, during which they appear to have developed a remarkable amount of mari- time power and enterprise, and became the founders of numerous colonies in

distant parts of the Mediterranean, including Gela in Sieily, as well as Rhoda on the coast of Spain, and Salapia on the Adriatic coast of Italy. Towards the east also they were the recog- nized founders of Corydalla and Phaselis in Lycia and Soli in Cilicia.

Notwithstanding these evidences of early prosperity and power, we meet with very scanty notices of the Rhodian cities in the first period of Greek history. After the Persian War they appear to have passed into the condition of tributaries to Athens, and were compelled as sueh to join in the Athenian expedition to Sicily, but in 412 n.c. they deserted the Athenian cause and joined that of the Pelopormesians. It was shortly after this (in 408) that they adopted a resolution which became the foundation of their future greatness, the inhabitants of the three cities having agreed to abaudon their homes and found a new city on the site which has ever since con- tinued to be the capital of the island.

The architect was Hippodamus of Miletus, who had planned and embellished the Pireus at Athens ; and the new city soon became one of the most splendid in the world, adorned with magnificent buildings and exquisite works of art. When Conon and his fleet restored the Athenian power by his victory off Cnidus (394 B.c.), Rhodes again embraced the victorious cause ; but her fidelity during the subsequent contests was not very great. Sparta afterwards reeeived the allegiance of the island; and in the Social War (3857-5) it joined the alliance against Athens, and, with the assistance of the Carian monarch Mausolus, succeeded in achieving independ- ence. But, finding the power of that king dangerous to their liberties, the Rhodians once more sued for the Athenian protection, which they obtained through the eloquence of Demosthenes. But neither they nor the rest of Greece could resist the overwhelming power of Macedonia, though Memnon, a Rhodian, was one of the ablest generals under the last Persian king, and attempted to check the carcer of Alexander. Rhodes received a Macedonian garrison ; but it was expelled after the death of Alexander, and a resolute resistance was begun to the Maccdonian power. This formed one of the most illustrious periods in the history of the island. The capital was besieged in 304 B.c. by Demetrius Poliorcetes, with a large army and a eomplete train of the artillery of that age. Although a breach was effeeted in the walls, the desperate valour of the

defenders foiled all the attempts to carry it by assault, and cost the besiegers the lives of some of their generals and a great number of their soldiers. This heroic resistance obtained for the Rhodians great renown ; and the period which followed was one of the most brilliant in the history of the city. They enjoyed the friendship of Rome, and obtained possession of some of the adjacent islands and coasts, including a eonsiderable distriet on the main- land which was known as the Rhodian Perea. For arts as well as arms the island was then renowned ; the Rhodian laws, especially on maritime affairs, were reckoned the best in antiquity, and

many of them adopted into the Roman code. ischines, who had contended in eloquence with the greatest of orators, opened a school of rhetoric here, which became the parent of a new school of oratory, regarded by the ancients as possessing a Greeco-Asiatic character. Protogenes embellished the city with his paintings, and Chares of Lindus with the celebrated colossal statue. The Colossus, erroneously supposed to have oecupied a position striding over the entrance to the harbour, stood for fifty-six years, till an earthquake prostrated it in 224 n.c. Its enormous fragments con- tinued to excite wonder in the time of Pliny, and were not removed till 656 A.p., when Rhodes was conquered by the Saracens, who sold the remains for old metal to a dealer who employed nine hundred camels to carry them away. Besides this not less than three thousand statues are said to have adorncd the eity, which was said by Strabo to surpass all others in beauty and ornainental character. Being the sovereigns of the seas, the Rhodians by thcir fleets ren- dered good service to Rome, with whom they were in alliance, and retained their independence for a long time. The severest blow they suffered was from Cassius in 42 B.c., who plundered the island even to the bare temple walls in the nominal cause of liberty, for it had embraced the side of Cwsar. . Under the empire the liberty of Rhodes was repeatedly permitted and withdrawn according to the capriee of the sovereign ; but ultimately it became a part of the Roman empire, and, after its partition, of the Eastern, till 616 A.D., When Chosroes the Persian obtained possession of it for a short time. It was subsequently conquered by Moawiyah, one of Othman's generals ; but, recovered by the Byzantine empire, it proved the

last of their Asiatic possessions that succumbed to the infidel. In 1808 it was granted by the emperor Emmanuel to the Knights of St John, who soon after resisted a siege by the sultan Othman. They strengthened the natural advantages of the place by skilful fortifications, and by discipline and equipments made themselves nearly a match for the superior numbers of the Turks. Nor did the knights restrict their efforts to self-defence ; they conquered Smyrna, and established an outpost there in 1344, and at a later period formed a league against the common enemy of Christendom. But in 1401 Smyrna was takeu by Timur; in 1480 Mohammed II. besieged Rhodes with a vast train of artillery ; and, though then averted by the courage of its few defenders, the downfall of the place eould not long be delayed. The last and most famous siege of Rhodes took place in 1522, when, after a desperate resistance for four months to the overwhelming numbers of the Ottomans, the knights, being left unassisted by all the European powers, capitulated on honourable terms, and evacuated the island. On the first day of 1528 Villiers de Lisle Adam, the grandmaster, embarked the last of the small band, carrying away all the property of the order, and leaving the ruins of their city to the enemy. The knights subsequently settled in Malta, where they also gained great renown. Rhodes has since been in the pos- session of the Turks, and is now the residence of the pasha of the Archipelago. The sites of Lindus, Ialysus, and Camirus, which in the most ancient times were the principal towns of the island, are clearly marked, and the first of the three is still oeeupied by a small town with a medieval castle, both of them dating from the time of the knights, though the castle occupies the site of the ancient acropolis, of the walls of which considerable remains are still visible. There are no ruins of any importance on the site of either Ialysus or Camirus, but excavations at the latter place have produced valuable and interesting results in the way of ancicnt vases and other antiquitics, which are now in the British Museum.

The population of the island is estimated at about 27,000, of whom 6000 are Turks, 3000 Jews, and the remainder Greeks. Of these nearly 20,000 are contained in the city and its suburbs ; the rest of the island is very thinly peopled, though numerous small villages are scattered over its whole extent.

A large mass of matter relating to the ancient history and institutions of Rhodes are collected by Meursius in his dissertation (Opera, vol. iii.); the present eon- dition of the island, and the objects of interest still visible there, are fully deseribed by Ross (Reisen auf den Griechischen Inseln, vol. iii., Stuttgart, 1840) and Newton (Travels and Discoveries in the Levant, vol. i., London, 1865). The inscriptions that have becn discovered there, which are very numerous, have un- fortunately been published in a very irregular manner, and are seattered through a number of works, many of them not easy of access. By far the most com- plete collection of all that relates to the ancient condition of the island, as well as its history and antiquities, will be found ina treatise by Mr C. Torr, entitled

Rhodes in Ancient Times, which is passing through the Cambridge University Press while this artiele has been in preparation. (E. H. B.

RHODIUM. See PLatinum.

RHODODENDRON. Classical writers, such as Dios- corides and Pliny, seem, from what can be ascertained, to have called the oleander (Werium Oleander) by this name, but in modern usage it is applied to a large genus of shrubs and trees belonging to the order of heaths (Ericacee). No adequate distinction can be drawn be- tween this genus and Azalea,—the proposed marks of dis- tinction, however applicable in particular cases, breaking down when tested more generally. The rhododendrons,

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then, are trees or shrubs, never herbs, with simple, ever- green or deciduous leaves, and flowers in terminal clusters surrounded in the bud by bud-scales but not as a rule by true leaves. The flowers are remarkable for the frequent absence or reduced condition of the calyx. The funnel- or bell-shaped corolla, on the other hand, with its five or more lobes, is usually conspicuous, and in some species so much so as to render these plants greatly prized in gardens. The free stamens are usually ten, with slender filaments and anthers opening by pores at the top. The ovary is five-or many-celled, ripening into a long woody pod which splits from top

to bottom by a number of valves, which break away from the central placenta and liberate a large number of small bran-like seeds provided with a mem- branous wing-like appendage at each end. The spccies are for the most part natives of the mountainous regions of the northern hemisphere, extending as far south as the Malay Archipelago and New Guinea, but not hitherto found in South America or Australia. None are natives of Britain. They vary greatly in stature, some of the alpine species being mere pigmies with minute leaves and tiny blossonis, while some of the Himalayan species are moderate sized trees with superb flowers. Some are epi- phytal, growing on the branches of other trees, but not deriving their sustenance from them. The varieties grown in gardens are mostly derived from the Pontic species (JR. ponticum) and the Virginian 2. catawbiense. These are mostly hardy in England. The common Pontic variety is excellent for game-covert from its hardiness, the shelter it affords, and the fact that hares and rabbits rarely eat it. Variety of colour has been infused by crossing or hybridiz- ing the species first-named, or their derivatives, with some of the more gorgeously-coloured Indian varieties. In many instances this has been done without sacrifice of hardihood, but even where the infusion of Indian blood has brought about a tenderness of constitution the magnificence of the bloom amply repays the very slight shelter which is re- quisite in winter.

What arc termed greenhouse rliododendrons are derivatives from certain Malayan and Javanese species, and are consequently much more tender. They are characterized by the possession of a cylindrical (not funnel-shaped) flower-tube and other marks of dis- tinction. Azaleas now referred to Rhododendron are derived from Chinese and Japanese specics chiefly. The "Indian" azaleas, so- called, have nearly evergreen foliage like a rhododendron, but with stiff hairs on the under surface of the leaf, and the flower-buds comprise leaves and not bud-seales only as in true rhododendrons. Rhododendron (Azalea) indicwm is truly a native of China and Japan, but not of India. What are called in gardens Ghent azalcas are hardy varieties with deciduous gummy foliage and tufts of fragrant, brilliantly-coloured flowers. These are derivatives from A. calendulacea, A. viscosa, and other north-east American species. Another group of garden azaleas are derivatives from Rhododendron (Azalea) sinense (of which BR. mollis is a form). These are scarcely less hardy

than the preceding. Azalea amena of gardens is a dwarf form of #. indicwm, remarkable for having "hose in hose" flowers, a state of things brought about by the fact that the calyx in this variety becomes petaloid like the corolla. The foliage of rhododendrons contains much tannin, and has been used medicin- ally. Whether the honey mentioned by Xenophon as poisonous was really derived from plants of this genus as alleged is still an open question.

RHONE (Fr. Rhéne), the largest European river flow- ing directly into the Mediterranean, rises in the Swiss canton of Valais, passes through the Lake of Geneva, strikes

across the line of the Jura, and turning southward through

France falls into the Gulf of Lyons. It has a length of 447 miles according to Strelbitzky (505 according to other authorities), and its principal affluent the Sadne has a length of 268 miles above the confluence, which is 200 miles inland. The drainage area of the whole river- system is 38,000 square miles, and the mean discharge at the river mouth is 60,000 cubic feet per second, the maxi- mum being 428,840 cubic feet and the minimum 19,426.

The natives give the name of source of the Rhone (locally Rotten or Rodden) to three warm springs that rise in a circular stone basin near the Hétel du Glacier du Rhéne ; but the real beginning of the river is the well-known glacier. According to M. Gosset,! a Swiss engineer, the Rhone glacier, which at present measures about 9 miles in length by about 3200 feet in width, is proved to have retreated 3028 feet between 1856 and 1881 and sunk upwards of 300 feet. In geological time the Rhone glacier filled the whole valley to a depth of 4800 feet and spread out over the Swiss plain now partly occupied by the Lake of Geneva. Obstructed by the Jura, it divided into two branches, one of which found its way (as the river does still) by the "écluse" between the Jura and the western Alps to deposit its erratic blocks on the heights in the neighbourhood of Lyons, while the other branch, bending northward, widened out so as to distribute its burden at Freiburg, Bern, Soleure, and even Aarburg.?

In the first 30 miles from the foot of the glacier (5751 feet) to Brieg (2214 feet) the stream has a fall of 1 in 46; in the next 70 miles to Villeneuve it descends at the rate of 1 in 378.3 It passes between the Bernese and the Pennine Alps, receiving the tribute of 260 glaciers, of which the Aletsch is one of the most important. At Martigny, where it is joined by the Drance (a glacier-fed stream memorable for the terrible inundation of 1818 caused by the sudden bursting of the ice barrier by which its waters had been dainmed back), the Rhone turns suddenly north- west, and below the defile of St Maurice (about 90 miles from its source) it enters the wide alluvial plain formerly occupied by the south-eastern arm of the Lake of Genrva (7.v.), Which has now retreated about 12 miles northward. The limpid character of the Rhone water as it issues from the south-western end of this great settling vat has become a commonplace of geographical illustration, and equally well-known is the contrast afforded at the confluence about a mile below Geneva between the current of the main river and that of its turbulent affluent the Arve, which has found no resting place in its 2000 feet descent by a course of 60 miles from the valley of Chamouni and the glaciers of Mont Blanc. It is the Arve that is mainly responsible for the dangerous inundations of the Rhone valley farther down ; while its volume is sometimes not more than 1235 per second,‘ at other times it pours into the Rhone (whose maximum at this point is 2000 cubic feet) no less than 24,700 cubic feet, sometimes causing the river to flow backwards towards the Lake of Geneva.> To obviate the evils of their irregularity it has been proposed to divert the lower course of the Arve into the Lake of Geneva. The annual maximum of the Rhone at Geneva, according to observations between 1806 and 1880, occurs on the 7th of August. Since 1862 there has been an increase of high levels owing to the dyking of the river and the destruction of forests (see Plantamour, “Obs. limnimétriques,” in Mém. de la Soc. de Genéve, 1880). The defile or “écluse” by which the Rhone passes between Grand Credo, the terminal bastion of the Jura, and Mont Vouache, one of the Alps of Savoy, is com- manded by one of the great frontier fortresses of France,

1 A sketch of M. Gosset’s remarkable labours is given in the Alpine Journal, 1878-80.

? See Falsan and Chantre, Monographie géologique des anciens glaciers et du terrain erratique de la partie moyenne du bassin du Rhé6ne, 1880. See also the map illustrating Auguste Jaccard's paper in Bull. de la Soc. Vaudoise, Feb. 1885.

3 A large-scale profile of the upper Rhone accompanies Gerlach's paper " Die Penninischen Alpen" in dfém. de la Soc. Helv., 1869.

4 Professors Paul Chaix and Plantamour, on one occasion in March, found the volume of the Arve as lowas 812 cubic feet per second, and that of the Rhone 1612.

> See the. annual Observations hydrométriques suisses sur le bassin du Rhéne issued by the Bureau fédéral des travaux publics.

Fort de |'Ecluse. About 5} miles farther down occurs the famous Perte du Rhone, a partially subterranean passage,

now considerably modified by blasting.

"The rocks forming the funnel come so close at one place that there is only a distance of about two feet from bank to bank, and a man of moderate height could stand with one foot on the Freneh

side and the other on the Savoy side and see between the beautiful river trembling as it were with rage and hastening to escape from the defile through which it is doomed to pass. A little way farther down the river has hollowed outa passage about 30 feet wide, which retains this width fora depth of from 30 to 85 feet, when it con- tracts considerably. At this depth a stratum of harder rock has resisted the action of the water, which, however, has scooped out beneath it almost as much as above it. Along each side of the ravine the harder rock projects for eight or ten feet like a cornice. At first the water is seen through the opening down the middle ; but farther on great masses of rock from the walls of the ravine lave fallen down, and, resting on the double cornice, conceal the river for a distance of some 60 paces."?

During the summer floods the water filled the ravine far above the level of the fallen blocks, and the Perte du Rhéne was no longer visible.2 The rocks through which the "perte" is cut belong to the Urgonian sub-division of the Cretaceous system,—the stratum which has been hollowed out being described as calcaire gris. Just below the ravine the Rhone is joined by the Valserine, whith a little above Bellegarde passes through a " perte" of a similar character. Since 1871 the motive power of the main river has been utilized for the industries of Belle- garde; a large tunnel 20 feet high and more than half a kilometre long brings the water from the south side of the perte to turbine wheels placed in the bed of the Valserine, and wire ropes transmit the power to the Bellegarde workshops on the plateau 400 feet above.' Below Belle- garde the river is deflected southwards by the western chain of the Jura. It receives from the left the Usses, the Fiar (which drains the lake of Annecy), and the emissary of the Lake of Bourget, the largest of the purely French lakes, and then at the junction of the Guiers (from the Grande Chartreuse) it turns north-west round the southern end of the Jura. The Ain (118 miles long), which joins it from the right, is navigable in the direction of the current, and in its upper waters has a "perte" of some interest. Farther down the main river meanders for a time with shifting channels in a bed about two miles broad, but it. gathers into a single stream before its junction with the Sadne. This important confluent (the ancient Arar, which according to Cesar flows "incredibili lenitate") has its source at Vioménil in the Vosges

1300 feet above the sea, and has been joined by the Doubs, which, rising in the district. between the Jura and the Vosges, is famous for the beauty of its upper gorges and for the waterfall (70 feet) known as the Saut du Doubs.4 Southwards from Lyons, where it is 530 feet above the sea, the united river continues to be still the "arrowy Rhone"; in the 61 miles from the Sadne mouth to the Isére it falls 180 feet, in the 18 from the Isére to the Drome 56 feet, in the 38 from the Drome to the Ardéche 164, and in the 34 from the Ardéche to the Durance 883. Those affluents, all except the last from the Savoy and Maritime Alps, are in general of little importance, but at times become formidable torrents. The same is true of the much shorter streams which bring down the waters from the eastern slopes of the Cevennes. During the inundation of the 10th September 1857, which has been frequently exceeded, the three streams the Doux,

1 De Saussure, Voyage dans les Alpes (1780-1796), ii. 90 sq.

2 See the elaborate papers, with maps and sections, by Renevier in AMém. dela Soc. Helvétique, 1855 (" Mém. Geol. sur la Perte du Rhéne et et ae ») and in Bull. de la Soe. Géologique, 1874-5, 3d ser. vol. iii.

3 See Reclus, Vouv. Geogr. Univ., "La France," p. 215.

4 See "La Saut du Doubs," in Tour du Monde, 1880.

the Erieux, and the Ardéche poured into the Rlrone 49,000 cubic feet per second. At Fourques d'Arles, 25 miles from the sea, the river begins to forin its delta, breaking up into two main branches, the Grand Rhone passing from Arles south-east towards the Gulf of Fos, and the Petit Rhéne south-west towards the Little Cam- argue. With all its rapidity of current and mass of waters it is not able to keep a clear passage to the sea through its own alluvium, which, according to M. Reclus's estimate, has since the Gallo-Roman period added from 75 to 100

square miles to the area of its delta.

From the time that Marius caused his soldiers to excavate the Fosse Marianse which have left the name of Fos to the bay already mentioned the endeavour to maintain a navigable channel inland from the sea has perplexed successive generations. Vauban himsclf declared " Les embouchures du Rhéne sont incorrigibles." The method of contracting and embanking a principal channel right out to sea failed, either because the embankments were not carried out far enough, or more probably because the tides of the Mediterranean are not sufficiently strong to aid in removing the alluvium. A canal constructed in 1802-1832 from Arles to Bouc (on the east side of the Gulf of Fos) proved too shallow for the new steam traffic. At length in 1863 a scheme brought forward by Hippolyte Peut in 1846 was adopted for the making of a canal, 11,480 feet long, 210 fect wide and 19} fect deep at low tide, from Tour St Louis on the left bank of the Grand Rhone to the Anse de Repos in the Gulf of Fos. The canal was completed in 1871, and the quays of the port of St Louis by the close of 1878, at a cost of 26,000,000 francs. Hostile critics main- tain that it will be possible to keep this channel open at the seaward end only by continual and costly dredging, but hitherto their fears seem exaggerated. The new port has 'been very success- ful, 1261 vessels (318,745 tons) entering in 1881 and 2317 vessels (448,757 tons) in 1882. The regulation of the river itself is still a problem. 'The rapidity of the current from Lyons downwards, the extremely shifting character of the channel, and the varia- tions that take place in the volume of water are the great obstacles to be overcome. Two months of the year are lost for navigation through floods or lack of water or fogs orice. At present (1885) a scheme combining the two systems of regularization and canaliza- tion is being carried out for the purpose of securing everywhere at low water a depth of 5 feet 3 inches.

In the beginning of the preseut century even passenger boats used to be hauled up the river by towing ropes, and when steam was introduced it was found that the vessels had to be specially constructed to make head against the current. The laying of a continuous chain all the way from Lyons to Arles is impracticable through the shifting character of the bed; but several methods have been adopted to overcome the difficulties of the ascent. Thus some boats advance by means of long jointed levers which catch into the ground. Or a stcel wire cable with one of its ends fixed at a

given spot is unwound asa steam tug descends the stream and then the tug with its convoy of boats makes its way up again by simply winding in. Or two tugs are employed, the first going in advance of the other so far that the cable which it pays out takes a sufficient hold of the bottom to enable the second to haul by it. Or, lastly, Dupuy de Lome's system is adopted, by which the boat grips the river bottom by means of two continuous chains perpetually sunk in front and emerging behind. The Saéne is much more easily dealt with than the Rhone. It is navigable as far up as Port-sur-Sadne, and a system of movable dams and sluices has been established to secure a depth of 6 to 7 feet at low water.

The basin of the Rhone communicates with the Loire by the Canal du Centre (joining the Sadne at Chalons), with the Seine by the Burgundy Canal (joining the Saéne at St Jean de Losne), with the Rhine by a canal (1783-1834) which passes from the Sadne at Saint Symphorien to the Doubs, and finally ends at Strasburg, and with the Meuse and the Belgian system by a canal (Canal de 1'Est)

constructed since 1875 from the Saéne to the Moselle.

See Boissel, Voy. pitt. et navigation exécutée sur une partie du Rhone reputée non-navigable, 1795, and works on the river by Hippolyte Peut (1846), Surell (1847), Desjardins (1866), Adrian German (1872), and De la Rochette. Also Lentheric, Les villes mortes du Golfe de Lyon, 1875, and a paper in Mev. des Deux Mondes, 1880; Blerzy, Torrents, fleuves, et canausx de la France, 1878. (H. A.W.)

RHONE, a department of south-eastern France, deriv- ing its name from the great river on which Lyons, its chief town, is situated, was formed in 1793 from the eastern por- tion of the department Rhéne-et-Loire, comprising parts of Lyonnais and Beaujolais. It is bounded on the N. by Sadne-et-Loire, on the E. by Ain and by Isére, on the 8. and W. by Loire, and lies between 45° 27' and 46° 18' N. lat. and 4° 15' and 4° 53' E.long. The Sadne and the Rhone, each for a distance of 26 miles, form its natural

boundary on the east. The department . belongs almost

entirely to the basin of the Rhone, to which it sends its

waters by the Sadne and its tributary the Azergues, and by the Gier. The watershed between the Rhone and the Loire rises to the west of the department, and from north to south forms four successive groups—the Beaujolais Mountains, the highest peak of which is 3320 feet ; the Tarare group ; the Lyonnais Mountains (nearly 3000 feet) ; and Mont Pilat, the highest peak of which belongs to the department of Loire. The lowest point of the department, where it is left by the Rhone, is 460 feet above the level of the sea. The meteorological conditions vary greatly with the elevation and exposure. Snow sometimes lies in the mountains from November to April, whilst at Lyons and in the valleys the mean temperature in winter is 36° Fahr., and in summer 70°, the annual mean being 53°. The average rainfall is somewhat higher than is general over France owing to the amount of the precipitation on the hilly region.

Of a total arca of 689,545 acres, 286,000 are arable, 120,000 are pasture meadow land, 79,000 under vines, 79,000 wood, and 66,000 moorland. From 1874 to 1883 the average annual harvests yielded 253,869 quarters of wheat, 7509 of meslin, 114,468 of rye, 3035 of barley, and 98,808 of oats. In 1883 there were pro- duced 5,390,000 bushels of potatocs, 106,650 bushels of buck- wheat, 41,320 tons of beetroot, 12 of hemp seed, and 838 of hemp. Between 1874 and 1883 the average annual yield of the vines was 16,533,956 gallons of wine; in 1883 it was only 11,918,084. In 1881 the live stock numbered 12,350 horses, 2000 asses, 600 mules, 9000 oxen or bulls, 65,000 cows, 12,500 calves, 49,000 sheep (pro- ducing 110 tons of wool), 16,000 pigs, 36,000 goats, 8000 bec- hives (producing 48 tons of honey and 16 tons of wax); 78 cwts. of cocoons were produced in 1882, while in 1883 there were only 47 ewts. The soil of the department is for the most part stony and only moderately fertile. Fruit trees, such as peaches, apricots, walnuts, and chestnuts, grow well, but the wood in general is little more than copse and brushwood. The wealth of the department is mainly derived from its industries. Its transactions with the Bank of France at Lyons in 1882 amounted to £30,398, 960—a figure only exceeded by the departments Seine and Nord. The popula- tion is

principally engaged in the manufacture of chemicals, of machinery, and of silk. In 1881 324 factories, with 18,500 spindles, 700 power-looms, and 43,000 hand-looms, were employed in the spinning and weaving of silk; 58 works, with 35,800 hack- ling and reeling machines, in the preparation of the raw material ; 7 works, with 450 spindles, 230 power-looms, and 1250 hand-looms, in the manufacture of mixed goods, and 800 looms in the manufacture of lace ; 80 dyeworks employ 4000 workmen. In 1879 it was calculated that the turnover for silk articles amounted to £15,000,000 (£5,000,000 for labour and £10,000,000 for the raw material). Lyons (q.v.) is the centre for the silk manufacture and Tarare for that of muslins, velvets, plush, calicoes, and prints, there being 26 factories, with 33, 000 spindles, 540 power-looms, 4800 hand- looms ; 2000 workmen are also employed in the manufacture of counterpanes. In 1882 88,115 tons of iron were produced. The chief workshops for repairing the locomotivesof the Paris, Lyons, and Mediterranean line are in this department. There are also foundries of copper, bronze, and bell-metal, as also gold, silver, and steel wire works. The manufacture of gold and silver plate and jewellery has an annual turnover of £320,000, that of edible pastes amounts to £480,000, and that of paper to £54,000. The manufacture of wall papers is only second to that of Paris. In addition there are 15 chemical works, 8 glass works employing 1000 workmen with a turnover of £190,000 in 1879, 9 candle works (£268,800), 12 soap works (£102,200), and 700 mills. In 1881 there were in the department 1448 industrial establishments, employing 1558 steam engines with an aggregate horse power of 13,077. Coal and anthracite are found (36,169 tons in 1882), as well as argentiferous lead, manganese, and copper pyrites; there are also large stone quarries. The cold mineral spring of Charbonnieére, containing bicarbonates, iron, and sulphur, is 19 miles west of Lyons. The means of communication include 76 miles of navigable river, 5 of canal (the canal of Givors), 141 miles of Government road, 8685 miles of other-roads, and 165 miles of railway connecting, Lyons with Paris, with Roanne by Tarare, with Montbrison, St Etienne, Nimes, Marseilles, Grenoble, Chambéry, Geneva, Bourg, and Trévoux, Beaujeu with Belleville (on the Lyons and Macon line), and Thizy with Cours (two manufacturing towns in the neighbour- hood of Tarare on the line from Lyons to Roanne). The popula- tion, which owing to the development of industries has doubled since 1801, was 741,470 in 1881—

266 per square kilometre, the average in France being 71. There are two arrondissements, Lyons

and Villefranche, 29 cantons, and 264 communes. Rhénc belongs to the diocese of Lyons, is under the jurisdiction of the superior court of Lyons, and is divided between the corps d'armée of Clermont and of Grenoble. The chief towns are Lyons (q.v.); Tarare (13,352); Villeurbane (11,176); Caluire-et-Cuire (9740) and Oullins (7536), suburbs of Lyons ; Givors (11,470), a stirring town on the Rhone at the junction of the canal by which coal ig brought from St Etienne to the Rhone, with glass works, blast furnaces, foundries, brick and tile works, and potteries ; Amplepius (7118) ; and Cours (6929).

RHUBARB, This name is applied both to a drug and to a vegetable.

1. The drug has been used in medicine from very early times, being described in the Chinese herbal Pen-king, which is believed to date from 2700 B.c, The name seems to be a corruption of Rhewm barbarum or Reu barbarum, a designation applied to the drug as early as the middle of the 6th century, and apparently identical with the pHov or pa of Dioscorides, described by him as a root brought from beyond the Bosphorus. Rha is said by Ammianus Mar- cellinus to take its name from the river Rha (Volga), on the banks of which a species of Rheum (Ze. Rhaponticum) grows. It is not, however, known whether the root of this species was the article used under the name of Rha ponticum or Rha barbarum, or whether these names were applied to the drug brought overland from China by way of the Caspian Sea. It is, however, certain that in the early part of the 11th century Chinese rhubarb was dis- tinguished as superior to the Rha barbarum. In the 14th century rhubarb appears to have found its way to Europe by way of the Indus and Persian Gulf to the Red Sea and Alexandria, and was therefore described as "Rast Indian" rhubarb. Some also came by way of Persia and the Caspian to Syria and Asia Minor, and reached Europe from the ports of Aleppo and Smyrna, and became known as "Turkey" rhubarb. Subsequently to the year 1653, when China first permitted Russia to trade on her fron- tiers, Chinese rhubarb reached Europe chiefly by way of Moscow ; and in 1704 the rhubarb trade became a mono- poly of the Russian Government, in

consequence of which the term “Russian” or “crown” rhubarb came to be applied to it. Urga was the great depdt for the rhubarb trade in 1719, but in 1728 the depdt was transferred to Kiachta. All rhubarb brought to the depdt passed through the hands of the Government inspector, acting under the instructions of the Russian minister of war, and all pieces except those of good quality were rejected. Hence Russian rhubarb was invariably good and obtained a remarkably high price. This severe supervision naturally led, as soon as the northern Chinese ports were thrown open to European trade, to a new outlet being sought; and the increased demand for the drug at these ports resulted in less care being exercised by the Chinese in the collection and curing of the root, so that the rhubarb of good quality offered at Kiachta rapidly dwindled in quantity, and after 1860 Russian rhubarb ceased to appear in European commerce. The drug from that date became known as Chinese rhubarb, although the older names still con- tinue in domestic use in England. Owing to the expense of carrying the drug across the whole breadth of Asia and the difficulty of preserving it from the attacks of insects, thubarb was formerly one of the most costly of drugs. In 1542 it was sold in France for ten times the price of cin- namon and four times that of saffron, and in an English price list bearing date of 1657 it is quoted at 16s, per fh, opium being at that time only 6s. and scammony 12s.

er Ib. : Rhubarb is used in medicine as a mild purgative and cholagogue, promoting digestion and improving the appe- tite when given in small doses, probably by stimulating the intestinal secretions. It has a subsequent astringent effect due to the rheotannic acid it contains but this can XX. — 67

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be counteracted by giving it with alkaline preparations. It is especially valuable in the treatment of duodenal catarrh or catarrh of the biliary ducts with jaundice ; and in certain skin diseases it has proved to be a valuable medicine, the results obtained being probably due to the chrysophan contained in it.

The botanical source of Chincse rhubarb cannot be said to have been as yet definitely cleared up by actual identification of plants observed to be

used for the purpose. Rheum palmatum, R. officinale, R. palmatum (var. tanguticum), R. colinianum, and R. Franzenbachii have been variously stated to be the source of it, but the roots produced by these species under cultivation in Europe do not present the characteristic network of white veins exhibited by the best specimens of the Chinese drug (sce Goebel and Kunze, pt. ii, pl. i. figs. 20, 30).

Chemistry.—The chief chemical constituents of Chinese rhubarb are chrysophan (Cy;H,)0,), rheotannic acid (CyyEH5,0,4), emodin (C,;H,,0,), 2 neutral eolourless crystalline substance having the formula C,)H,.0,, a white and a dark brown crystalline resin; it also contains mucilage in the proportion of 11 to 17 per cent., and a considerable quantity of oxalate of lime. An albuminoid principle coutaining nitrogen and sulphur is also found in the root, which, in the presence of water, as recently shown by Kubli decomposes the chrysophan into chrysophanic acid and glucose, and apparently exerts a similar action on rheotannic acid, giving rise tothe formation of rheumic acid (CoH 4,0.) and a fermentable sugar. Rheumic acid is a reddish-brown powder, sparingly soluble in cold water. The albuminoid principle is in- soluble in rectified spirit of wine ; consequently a preparation of the root made with that menstruum contains the active principles of the drug in the natural state, whilst an aqueous extract contains them in an altered condition.

Production and Commerce.—Rhubarb is produced in the four northern provinces of China proper (Chih-li, Shan-se, Shen-se, and Ho-nan), in the north-west provinces of Kan-suh formerly included in Shen-se, but now extending across the desert of Gobi to the frontier of Tibet, in the Mongolian province of Tsing-hai, including the salt lake Koko-nor, and the districts of Tangut, Sifan, and Turfan, and in the mountains of the western provinces of Sze-chuen. According to Richthofen the best rhubarb is collected exclusively from wild plants in the high mountains of western Sze-chuen between the sources of the Hoang-ho and the rivers Ya-lung Keang and Min-keang, and comes into trade under the name of Shen-se rhubarb.2_ Two of the most important centres of the trade are Sining-fu in the province of Kan-suh and Kwan- hien in Sze-chuen. From Shen-se, Kan-suh, and Sze-chuen the rhubarb is forwarded to Hankow, and thence carried to Shanghai, whence it is spt pe to Europe.

Lesser quantitics are shipped from Tien-tsin, and occasionally the drug is exported from Canton, Amoy, Fuh-chow, and Ning-po.

Very little is known concerning the mode of preparing the drug for the market. According to Mr Bell, who on a journey from St Petersburg to Peking had the opportunity of observing the plant in a growing state, the root is not considered to be mature until it is six years old. It is then dug up, usuallyin the autumn, and deprived of its cortieal portion and smaller branches, and the larger pieces are divided in half longitudinally ; these pieces are bored with holes aud strung up on cords to dry, in some cases being previously subjected to a preliminary drying on stone slabs heated by fire underneath. In Bhutan the root is said to be hung up in a kind of drying room, in which a moderate heat is regularly maintained. The effect produced by the two drying processes is very different ; when dried by artificial heat, the exterior of the pieces becomes hardened before the interior has entirely lost its moisture, and consequently the pieces decay in the centre, although the surface may show no change. These two varieties are technically known as kiln-dried and sun-dried ; and it was on account of this difference in quality that the Russian officer at Kiachta had every piece examined by boring a hole to its centre. The best rhubarb occurs in pieces of a yellowish colour externally, more or less marked with a network of whitish veins, the surface being convex and smooth. Internally it presents no signs of decay, but is eompact, marbled with reddish-brown and white, mixed sometimes with iron grey. The smaller cylindrical sections of the root which have not been divided longitudinally are technically known as "rounds," and have usually a hole with a piece of string left in it; the flat pieces are more rarely pierced. Inferior qualities are

1 Jour. Pharm, Soc., [8], vi. p. 65.

2 Aeeording to Mr F. Neweombe, Alea. Press and Circ., August 2, 1882, the Chinese esteem the Shen-se rhubarb as the best, that coming from Kanchow being the most prized of all; Sze-ehuen rhubarb has a rougher surfaee and little flavour, and brings only about half the priee ; Chung-chi rhubarb also is greatly valued, while the Chi- ehuang, Tai-huang, and Shan-huang varieties are eonsidered worthless.

shrunken aud shrivelled on the surface, and externally of a prowuish tint, showing traccs of the darker bark, and when broken open are frequently decayed in the centre.

European Rhubarb. —As early as 1608 Prosper Alpinus of Padua cultivated as the true rhubarb a plant which is now known as Rheum Rhaponticum, L., a native of southern Siberia and the basin of the Volga. This plant was introduced into England through Sir Matthew Lister, physician to Charles L., who gave seed obtained by him in Italy to the botanist Parkinson. The culture of this rhubarb for the sake of the root was commenced in 1777 at Banbury in Oxfordshire, by an apothecary named Hayward, the plants being raised from seed sent from Russia in 1762, and with such success that the Society of Arts awarded him a silver medal in 1789 and a gold one in 1794. The cultivation subsequently ex- tended to Somersetshire, Yorkshire, and Middlesex, but is now chiefly carried on at Banbury. English rhubarb root is sold at a cheaper rate than the Chinese rhubarb, and forms a con- siderable article of export to America, and is said to be used in Britain in the form of powder which is of a finer yellow colour than that of Chinese rhubarb. The Banbury rhubarb appears to be a hybrid between R. Rhaponticum and R. undulatwm,—the root, according to E. Colin, not presenting the typical niicroscopic structure of the former. During the last few years very good rhubarb has been grown at Banbury from Rheum officinale, but these two varieties are not equal in medicinal strength to the Chinese article, yielding less extract,—Chinese rhubarb affording, according to H. Seier, 58 per cent., English rhubarb 21 per cent., and R. officinale 17 per cent. In France the cultivation of rhubarb was commenced in the latter half of the last century,—J. com- pactum, R. palmatum, R. Rhaponticum, and R&R. wndulatum, L., being the species grown. The cultivation has, however, now nearly ceased, small quantities only being prepared at Avignon and a few other localities.

The culture of Rhewm compactwm was begun in Moravia in the beginning of the present century by Prikyl, an apothecary in Austerlitz, and until twenty-five or thirty years ago the root was largely exported to

Lyons and Milan, where it was used for dyeing silk, As a medicine 5 parts are stated to be equal to 4 of Chinese rhubarb, Rhubarb root is also grown at Auspitz in Moravia and at Ilmitz, Kremnitz, and Frauenkirchen in Hungary; 2. Hmodi is said to be cultivated for the same purpose in Silesia.

The cultivation of Rhewm palmatum, var. tanguticum, has been begun within the last few years in the United States.

Rhubarb is also prepared for use in medicine from wild species in the Himalayas and Java.

2. The rhubarb used as a vegetable consists of the leaf stalks of several hybrids between the species A. rhaponticum, R. undulatum, R. palmatum. The petioles of R. officinale have also been proved to be edible; but that plant is grown more frequently on account of its ornamental foliage (see Horricunrurr, vol. xii. p. 287). (E. M. B.)

RHYL, a watering-place of North Wales, in the county of Flint, is situated near the mouth of the Clwyd, 30 miles north-west of Chester and 10 north-north-west of Denbigh, a railway line to which here joins that from Chester to Holyhead. Only recently it was a small fishing village. Its chief advantages as a watering-place are the pure air and extensive firm sands. Although the situation of the town was formerly bare and cheerless, much has been done to improve it. There are many handsome houses, and the neighbouring country is interesting both from its scenery and from its castles and other ancient buildings. The town possesses a town-hall, extensive winter gardens, racquet courts, lawn-tennis grounds, and other attractions. The east and west parades face the sea, and the pier, constructed of iron, is 700 feet in length. There is daily communication by steamer with Liverpool, Llandudno, Bangor, &c. The population of the urban sanitary district (area 600 acres) in 1871 was 4500, and in 1881 it was 6029.

RHYMER, Tuomas rox. See THomas or ERCELDOUNE.

RHYMNEY, an urban sanitary district of Monmouth- shire, on the borders of Glamorganshire, is situated in the valley of the Rumney river,

20 miles west of Abergavenny, and 22 north of Cardiff. It owes its importance to the neighbouring coal mines and to its iron and steel works, which employ nearly the whole population. The works of the Rhymney Iron Company, including blast furnaces and

rolling mills, are among the largest of the kind in England. The town consists chiefly of plain houses inhabited by workpeople, the principal building being the church, a handsome structure in the Doric style erected in 1842, The population of the urban sanitary district (area 2890 acres) in 1871 was 8138, and in 1881 it was 8663.

RIAZAN, See Ryazan,

RIBAULT, or Ripavt, JEAN (c. 1520-1565), a French navigator rendered famous by his connexion with the early settlement of Frorma (q.v.), was born at Dieppe, probably about 1520. Appointed by Coligny to the command of a colonizing expedition (from which the admiral was not deterred by the failure of Nicolas Durand de Villegagnon on a similar mission), Ribault sailed on 18th February 1562 with two vessels, and on Ist May landed at St John's river, or, as he called it, Riviére de Mai. Having settled his colonists at Port Royal Harbour and built Fort Charles for their protection, he returned to France to find the country in the throes of the civil war. In 1563 he appears to have been in England and to have issued The whole and true discoverie of Terra Florida. In April 1564 Coligny was in a position to despatch another expedition under Laudonniére; but meanwhile Ribault's colony had come to an untimely end, the unfortunate adventurers, destitute of supplies from home, having revolted against their governor and attempted to make their way back to Europe in a boat which was happily picked up, when they were in the last extremities, by an English vessel. In 1565 Ribault was again sent out to satisfy the admiral as to Laudonniére's management of his new settlement, Fort Caroline, on the Riviére de Mai. While he was still there the Spaniards under Menendez de Avila, though their country was at peace with France, attacked the French ships at the mouth of the river. Ribault set out to retaliate on the Spanish fleet, but his vessels were wrecked by a storm near Cape Caiiaveral and he had to attempt to return

to Fort Caroline byland. The fort had by this time fallen into the hands of the Spaniards, who had slaughtered all the colonists except a few who got off with two ships under Ribault's son. Induced to sur- render by false assurances of safeguard, Ribault and his men were also put to the sword in October 1565. The massacre was avenged in kind by Dominique de Gourgues two years later.

See Haag, La France Protestante, s.v. ; French, Hist. Collections of Louisiana and Florida; Parkman, Pioneers of France in the New World.

RIBBON-FISHES (Zrachypteride), a family of marine fishes readily recognized by their long, compressed tape- like body, short head, narrow mouth, and feeble denti-

deviates in its direction from the longitudinal axis of the body. The pectoral fins are small, the ventrals composed of several rays, or of one long ray only. Ribbon-fishes possess all the characteristics of fishes living at very great depths. They are extremely fragile when found floating on the surface or thrown ashore, and rarely in an uninjured condition ; the rays of their fins especially, and the mem- brane connecting them, are of a very delicate and brittle structure. In young ribbon-fishes some of the fin-rays are prolonged in an extraordinary degree, and sometimes provided with appendages (see fig. 2). The largest of

Fic, 2.—Young Trachypterus.

ribbon-fishes are the species of Regalecus (see OaRr-Fisn), of which specimens some 20 feet long by 12 inches in depth of body and 2 inches in thickness have been found. Like all deep sea fishes they occur in all seas. The most common of the British seas is the Vagmaer or Deal-Fish (Trachypterus arcticus) from 3 to 5 feet long, of which almost every year after the equinoctial gales specimens are picked up on the coasts of North Britain, of the Orkneys, Scandinavia, and Iceland (see also IcuTHyYoLoey, vol. xii. pp. 684, 691).

RIBBONS. By this name are designated narrow webs, properly of silk, not exceeding nine inches in width, used primarily for binding and tying in connexion with dress, but also now applied for innumerable useful,

ornamental, and symbolical purposes. Along with that of tapes, fringes, and other smallwares, the manufacture of ribbons forms a special department of the textile industries. It is obvious that the weaving of very narrow fabrics, piece by piece, on separate looms would be a tedious and expensive process ; yet for ages such was the only method of making ribbons. The essential feature of a ribbon loom is the simultaneous weaving in one loom frame of two or more webs, going up to as many as forty narrow fabrics in modern looms. To effect the conjoined throwing of all the shuttles and the various other movements of the loom the automatic action of the power-loom is necessary ; and it is a remarkable fact that the self-acting ribbon loom was known and extensively used more than a century before the famous invention of Cartwright. A loom in which several narrow webs could be woven at one time is men- tioned as having been working in Dantzic towards the end of the 16th century. Similar looms were at work in Leyden in 1620, where their use gave rise to so much dis- content and rioting on the part of the weavers that the states general had to prohibit their use. The prohibition was renewed at various intervals throughout the century, and in the same interval the use of the ribbon loom was interdicted in most of the principal industrial centres of Europe. About 1676, under the name of the Dutch loom or engine loom, it was brought to London ; and, although its introduction there caused some disturbance, it does not appear to have been prohibited. In 1745 the celebrated John Kay, the inventor of the fly-shuttle, obtained, con-

Fia. 1.—TZrachypterus tenia.

tion. A high dorsal fin occupies the whole length of the back ; an anal is absent, and the caudal, if present,

jointly with Joseph Stell, a patent for improvements in the ribbon loom; and since that period it has benefited by the inventions applied to weaving machinery generally.

Ribbon weaving is known to have been established near St Titienne (dep. Loire) so early as the 11th century, and that town to the present day

continues to be the headquarters of the industry. In the time of Louis XIV. the ribbon trade there gave employment to about 6000 persons ; now about 17,000 looms are in operation in the district, 1500 of which are power-looms 1D factories. Statistics compiled in 1881 give the annual value of the trade at 63,400,000 francs, of which 45,000,000 francs was the value of ribbons proper, the remainder being represented by scarfs, trimmings, elastic web, chenille, &c. During the Huguenot troubles, ribbon weavers from St Etienne settled at Basel and there established an industry which now rivals that of the original seat of the trade. In the Basel district the looms number 8000 ; but one-half of these are power-looms in factories, which have a much greater productive capacity than the domestic looms. Crefeld is the centre of the German ribbon industry, the manufac- ture of black velvet ribbon being there a specialty. In Vienna about 2000 looms are employed. Next to St Etienne and Basel, Coventry is the most important seat of ribbon making, and to some extent the industry is also prosecuted at Norwich and Leicester. The average annual value of the ribbon trade of western Europe and America is £16,000,000. A large proportion of the ribbons now made are mixed fabrics of silk and cotton.

RIBERA, Juszpz, or, in Italian, GIUSEPPE (1588~ 1656), commonly called Lo SpAGNoLETTo, or the Little Spaniard, a leading painter of the Neapolitan or partly of the Spanish school, was born near Valencia in Spain, at Xativa, now named S. Felipe, on 12th January L586. His parents intended him for a literary or learned career ; but, having an innate tendency to design, he neglected the regular studies, and entered the school of the Spanish painter Francisco Ribalta, Fired with a longing to study art in its Italian headquarters, he somehow, while still quite a youth, made his way to Rome, worked vehemently, and struggled with hunger and destitution. Early in the 17th century a cardinal noticed him in the streets of Rome drawing from the frescos on a palace fagade ; he took up the ragged stripling and housed him in his mansion. Artists had then already bestowed upon the alien student, who was perpetually copying all sorts of objects in art and in nature, the nickname of Lo Spagno- letto. In the cardinal's household Ribera was comfortable but dissatisfied; he found his studies in abeyance, and one day he decamped. He then betook himself to the famous painter Michelangelo da

Caravaggio, the head of the naturalist school, called also the school of the Tene- brosi, or shadow-painters, owing to the excessive contrasts of light and shade which marked their style. In this method of art Ribera, though not claiming the first place as initiator, was destined to rank as hardly second to Caravaggio himself. The Italian master gave every encouragement to the Spaniard, but not for long, as he died in 1609. Ribera, who had in the first instance studied chiefly from Raphael and the Caracci, had by this time acquired so much mastery over the tenebroso style that his performances were barely distinguishable from Caravaggio's own. He now went to Parma, and worked after the frescos of Correggio with great zeal and efficiency ; in the museum of Madrid is his Jacob's Ladder, which is regarded as his chef-d'auvre in the Correggesque manner. From Parma Spagnoletto returned to Rome, where he resumed the style of Caravaggio, which was doubtless more conformable to his natural bent, and shortly afterwards he migrated to Naples, which became his per- manent home.

Ribera was as yet still poor and inconspicuous, but a rich picture-dealer in Naples soon discerned in him all the stuff of a successful painter, and gave him his daughter in marriage. This was the turning point in the Spaniard's fortunes. He painted a Martyrdom of St Bartholomew, which the father-in-law exhibited from his balcony to a

rapidly increasing and admiring crowd. The popular excitement grew to so noisy a height as to attract the attention of the Spanish viceroy the Count de Monterey. From this nobleman and from the king of Spain, Philip IV., commissions now flowed in upon Ribera. Various professional honours followed; he painted with incessant vigour; his house became a centre of fashionable concourse ; and he made vast sums of money. In the streets he only appeared in his carriage—then a sure criterion of affluence. After a while he found it necessary to curb his own and his patrons' appetite for work, and he limited himself to six hours in the day, ending towards noon. With pro- sperity came grasping and jealous selfishness, Spagno- letto, chief in a triumvirate of greed, his abettors being a Greek painter, Belisario Corenzio, and a Neapolitan, Giambattista

Caracciolo, determined that Naples should be an artistic monopoly; by intrigue, terrorizing, and personal violence on occasion they kept aloof all com- petitors. Annibale Caracci, the Cavalier d'Arpino, Guido, Domenichino, all of them successively invited to work in Naples, found the place too hot to hold them. Domeni- chino was so persecuted and victimized that his life was probably abridged by these truly '"'tenebrous" machina- tions, The cabal ended at the time of Caracciolo's death in 1641.

The close of Ribera's triumphant career has been variously related. If we are to believe Dominici, the historian of Neapolitan art, he totally disappeared from Naples in 1648 and was no more heard of,—this being the sequel of the abduction, by Don John of Austria, son of Philip IV., of the painter's beautiful only daughter Maria Rosa. Dominici indeed will not even allow that Ribera was a Spaniard by birth: he alleges that the painter, though of Spanish descent, was born at Gallipoli, in the province of Lecce, kingdom of Naples. But these as- sertions have not availed to displace the earlier and well- authenticated statement that Ribera, a genuine Spaniard in the fullest sense, died peaceably and wealthy in Naples in 1656. His own signature on his pictures is constantly "Jusepe de Ribera, Espafiol." His daughter, so far from being disgraced by an abduction, married a Spanish noble- man who became a minister of the viceroy.

The pictorial style of Spagnoletto is extremely powerful ; or one might bettcr define its special quality as immensely forcible,

equally sustaining the test of a distant and general or of a close and scrutinizing view. In his earlier style, founded (as we have seen) sometimes on Caravaggio and sometimes on the wholly diverse method of Correggio, the study of Spanish and Venetian masters can likewise be traced. Along with his massive and predominat- ing shadows, he retained from first to last great strength of local colouring. His forms, though ordinary and partly gross, are cor- rect; the impression of his works gloomy and startling. He delighted in subjects of horror: an agonizing martyrdom—the grid- iron of Lawrence, the flaying knife of Bartholomew, or the vulture of Prometheus—had for him no repulsion

but a grim fascination, He had many imitators, his influence extending from Naples to other parts of Italy, and also to his native Spain. Salvator Rosa and Luca Giordano were his most distinguished pupils ; also Giovanni Do, Enrico Fiammingo, Michelangelo Fracanzani, and Aniello Falcone, who was the first considerable painter of battle-pieces. Among Ribera's principal works should be named St Januarius Emerging from the Furnace, in the cathedral of Naples ; the Descent from the Cross, in the Neapolitan Certosa, generally regarded as his masterpiece ; the Adoration of the Shepherds (a late work, 1650), now in the Louvre; the Martyrdom of St Bartholomew, in the museum of Madrid; the Pieta in the sacristy of S. Martino, Naples. His mythologic subjects are generally unpleasant—such as the Silenus, in the Studi Gallery of Naples, and Venus Lamenting over Adonis, in the Corsini Gallery of Rome. The Louvre contains alto- gether twenty-five of his paintings ; the London National Gallery two—one of them, a Pieta, being an excellent though not exactly a leading specimen. He executed several fine male portraits ; among others his own likeness, now in the collection at Alton Towers. He also produced twenty-six etchings, ably treated. For the use of his pupils, he drew a number of elementary designs, which in 1650 were ctched by Francisco Fernandez, and which continued much in

vogue for a long while among Spanish and French painters and students.

Besides the work of Dominici already referred to (1840-46), the Diccionario Historico of Cean Bermudez isa principal authority regarding Ribera and his works. (W. M. RB.)

RIBES. See Currant and GooseBerry.

RICARDO, Davip (1772-1823), a celebrated political economist, was born at London 19th April 1772. He was the third son of his father, a Jewish gentleman of Dutch birth, whose family, it is said, had formerly resided in Portugal. The elder Ricardo bore an honourable character, and was a successful member of the Stock Exchange. The son was placed for two years at a com- mercial school in Holland, and at the age of fourteen entered his father's office, where he showed much aptitude for business.

About the time when he attained his majority he abandoned the Hebrew faith, and conformed to the Anglican Church, a change which seems to have been connected with his marriage to Miss Wilkinson, which took place in 1793. In consequence of the step thus taken he was separated from his family and thrown on his own resources. His ability and uprightness were known, and he at once entered on such a successful career in the profession to which he had been brought up that at the age of twenty-five, we are told, he was already rich. He now began to occupy himself with scientific pursuits, and gave some attention to mathematics as well as to chemistry and mineralogy ; but, having met with Adam Smith's great work in 1799 at Bath, whither he had gone for his wife's health, he threw himself with ardour into the study of political economy.

His first publication (1809) was The High Price of Bullion a Proof of the Depreciation of Bank Notes. 'This tract was an expansion of a series of articles which the author had contributed to the Morning Chronicle. It gave a fresh stimulus to the controversy, which had for some time been discontinued, respecting the resumption of cash payments, Ricardo argued that the premium on bul- lion and the unfavourable state of the exchanges could only be explained by the depreciation of the inconvertible paper money then in circulation, which had fallen 25 per cent. below the value of specie in consequence of its over-issue. A committee to consider the whole question, commonly known as the Bullion Committee, was nominated by the House of Commons in February 1810. Amongst the members were Francis Horner, who was appointed chair- man, Alexander Baring (afterwards Lord Ashburton), William Huskisson, and Henry Thornton, author of the well known Inquiry into the Nature and Effects of the Paper Credit of Great Britain (1802). The report, which was presented to parliament in June of the same year, was the joint production of Horner, Huskisson, and Thornton. It asserted the same views which Ricardo had put forward, and recommended the repeal of the Bank Restriction Act. Notwithstanding this, the House of Commons of the fol- lowing year, on the motion of Mr Vansittart (afterwards Lord Bexley), declared in the teeth of the facts that paper had undergone no depreciation, and negatived Horner's resolutions founded on the report of the committee. One of the strongest opponents of Ricardo's opinions was Mr Bosanquet; he published in 1811

a pamphlet entitled Practical Observations on the Report of the Bullion Committee, and this drew forth from Ricardo an elaborate reply. Both this tract and its predecessor attracted much attention. They propound no new economic principles, but are based on the doctrines of Smith. They do not give such a systematic and complete view of the subject as Huskisson's well-known tract (Zhe Question respecting the Depreciation of the Currency Stated and Examined, 1810), but they are well reasoned, and, as to their main conclusions, convincing. It has, however, been maintained

that there were features of the case which Ricardo did not sufficiently take into account, especially the demand for bullion created by the necessity of meeting the foreign payments of England, which, in consequence of the Con- tinental system, could not be otherwise discharged.

In 1811 he made the acquaintance of James Mill, whose introduction to him arose out of the publication of Mill's tract entitled Commerce Defended. The conversation of Ricardo's new friend seems to have largely influenced his views ; Bentham indeed declared him to be Mill's intel- lectual child ; but, whilst Mill doubtless largely affected his political ideas, he was, on his side, under obligations to Ricardo in the purely economic field ; Mill said in 1823 that he himself and J. R. M'Culloch were Ricardo's disciples, and, he added, his only genuine ones.

In 1815, when the Corn Laws were under discussion, he published his Hssay on the Influence of a Low Price of Corn on the Profits of Stock. This was directed against a recent tract by Malthus entitled Grownds of an Opinion on the Policy of Restraining the Free Importation of Foreign Corn. The reasonings of the essay are based on the theory of rent which has often been called by the name of Ricardo ; but the author distinctly states that it was not due to him. "In all that I have said concerning the origin and progress of rent I have briefly repeated, and endeavoured to elucidate, the principles which Malthus has so ably laid down on the same subject in his Inquiry into the Nature and Progress of Rent." We now know that the theory had been fully stated, before the time of Malthus, by Anderson ; it is in any case clear that it was no discovery of Ricardo. Even the conception of the soils of a country as comparable to a series of

machines of different original powers, though capable of improvement by the application of capital, is quoted from Malthus. Ricardo states in this essay a set of propositions, most of them deductions from the theory of rent, which are in substance the same as those afterwards embodied in the Principles, and regarded as characteristic of his system, such as that increase of wages does not raise prices; that profits can be raised only by a fall in wages and diminished only by a rise in wages; and that profits, in the whole progress of society, are determined by the cost of the pro- duction of the food which is raised at the greatest expense. It does not appear that, excepting the theory of foreign trade, anything of the nature of fundamental doctrine, as distinct from the special subjects of banking and taxation, is laid down in the Principles which does not already appear in this tract. We find in it, too, the same exclu- sive regard to the interest of the capitalist class, and the same identification of their interest with that of the whole nation, which are generally characteristic of his writings. "Rent," he says, "is in all cases a portion of the profits previously obtained on the land," a proposition by which, for the sake, it is to be feared, of creating a political prejudice, he obscures his own doctrine that true rent can never be a part of profit; and he alleges what is in a sense true, but has a most invidious effect,—that "the interest of the landlord is always opposed to the interest of every other class in the community," though the existence of a distinct landlord class is by no means a necessity, and the owner of rent, which somebody must own, could not, even by entirely remitting it, alter the price of food, or increase the profits of the capitalist, except by presenting him with a gift to which he has no economic claim. At the close of the tract he endeavours to show in opposition to Malthus that the danger of dependence on foreign supply for a large part of our food, and the losses on invested capital which would result from a legislative change, could not be so serious as to counter- balance the advantages arising from a free importation.

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Both parts of this proposition are probably true ; but he does not establish the first in a very satisfactory manner.

In the Proposals for an Economical and Secure Currency (1816) he first disposes of the chimera of a currency without a specific standard, and pronounces in favour of a single metal, with a preference for silver, as the standard. He then puts forward a scheme which had been already briefly indicated in the appendix to the 4th edition (1811) of his High Price of Bullion. This was that the bank should be obliged to deliver on demand, not coin, but uncoined bullion or gold standard bars, in exchange for its notes, whenever the notes presented together for payment reached a moderate fixed amount. The con- sequence would be that, all the smaller payments being made in the cheap medium, paper, the country would enjoy the profit derivable from the metallic currency used as a capital; the wear of the coinage, too, would be pre- vented, and a saving thus effected. By this method the public would secure itself against any variations in the value of the currency beyond those to which the standard itself is necessarily subject; and, at the same time, the circulation would be carried on in the least expensive way. Thus, whilst the use of the precious metals as the medium of exchange was, in the earlier stages of social life, one of the most important steps towards the improvement of commerce and the advancement of civilization, it is pro- posed to us, and on grounds which it is difficult to gain- say, to banish them once more from such employment in almost all the internal transactions of a country. A kindred revolution, tending to the further elimination of metallic money, Jevons has spoken of as "a return to barter"; but that expression is misleading, for in the modern system of settlement by writing off liabilities against each other a metallic standard is always supposed, and lies at' the basis of every transaction, whereas in the primitive method of dealing commodities were directly compared. Ricardo's plan was in operation for some time, but was then given up on the ground, urged by the bank, of the frequent forgery of one pound notes, and the consequent necessity of replacing them with coin—a very insufficient reason, as experience demonstrates, though a good argument in favour of such an improved manu- facture of notes as would effectually defeat fraudulent imi- tation. Ina later tract (Plan for a National Bank) Ricardo proposes that one pound notes should be confined to the country districts. The general plan has been objected to on the ground that it would not provide for a sufficient inetallic reserve to meet sudden emergencies arising from the necessity of foreign payments.

Ricardo's chief work, Principles of Political Economy and Taxation, appeared in 1817. A full account of the general theory expounded in this treatise has been given under Potrricat Economy ; a very brief statement must here suffice. The fundamental doctrine is that, on the hypothesis of free competition, exchange value is deter- mined by the labour expended in production,—a proposi- tion not new, nor, except with considerable limitation and explanation, true, and of little practical use, as " amount of labour" is ayague expression, and the thing intended is incapable of exact estimation. Ricardo's theory of dis- tribution has been briefly enunciated as follows :—" (1) the demand for food determines the margin of cultivation ; (2) this margin determines rent ; (3) the amount necessary to maintain the labourer determines wages ; (4) the dif- ference between the amount produced by a given quantity of labour at the margin and the wages of that labour determines profit." These theorems are too absolutely stated, and require much modification to adapt them to real life. His theory of foreign trade has been em- bodied in the two propositions—'" (1) international values

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are not determined in the same way as domestic values ; (2) the medium of exchange is distributed so as to bring trade to the condition it would be in if it were conducted by barter." His views on currency and banking will be gathered from the present article.

A considerable portion of the work is devoted to a study of taxation, which requires to be considered as a part of the problem of distribution. A tax is not always paid by those on whom it is imposed; it is therefore necessary to determine the ultimate, as distinguished from the immediate, incidence of every form of taxation. Smith had already dealt with this question; Ricardo develops and criticizes his results. The conclusions at which he arrives are deduced from the theory of rent and from the assumptions of a uniform rate of profits and of a rate of wages coincident with the necessary subsistence of the labourer. They are in the main as follows :— a tax on raw produce falls on the consumer, but will also diminish profits; a tax on rents on the landlord ; taxes on houses will be divided between the occupier and the ground land- lord; taxes on profits will be paid by

the consumer, and taxes on wages by the capitalist. These propositions of course participate in the infirmity of the premises from which they are deduced, or must at least be taken with limitations corresponding to those to which the premises are subject. Ricardo adopts and even extols as a " golden maxim" the shallow dictum of Say, that "the very best of all plans of finance is to spend little, and the best of all taxes is that which is of least amount."

In 1819 Ricardo, having retired from business and become a landed proprietor, entered parliament as member for Portarlington. He was at first diffident and embarrassed in speaking, but gradually overcame these difficulties, and was heard with much attention and deference, especially when he addressed the house on economic questions. He probably contributed in a considerable degree to bringing about the change of opinion on the question of free trade which ultimately led to the legislation of Sir Robert Peel on that subject.

In 1820 he contributed to the supplement of the Hncy- clopedia Britannica (6th ed.) an Essay on the Funding System. In this, besides giving an historical account (founded on Dr Robert Hamilton's valuable work On the National Debt, 1813, 3d ed., 1818) of the several succes- sive forms of the sinking fund, he urges that nations should defray their expenses, whether ordinary or extra- ordinary, at the time when they are incurred, instead of providing for them by loans ; and, not believing that the system of a sinking fund would ever be consistently and perseveringly carried out, he maintains that the national debt should be paid off by a tax on property—an operation which he thought might be completed in two or three years during peace. Thus, by a single effort we might, he says, get rid of those great sources of demoralization, the customs and the excise, and our commerce would be freed from "all the vexatious delays and interruptions which our present artificial system imposes upon it. "i

In 1822 he published a tract On Protection to Agricul- ture, which is an able application to controversy of the general principles laid down in his systematic work. Its arguments and conclusions are therefore subject to the same limitations which those fundamental principles re- quire. He does not advocate an absolutely free importa- tion of corn, but proposes,

in consideration of the special burdens on agriculture, to impose on the foreign commodity a duty equivalent to the exclusive taxes imposed on home growers, as well as to allow a drawback on exportation equal to the duty. The only point of much interest in the tract, apart from the question of protection, is the assertion of the doctrine that a high rate of interest is

beneficial to a country—a view curiously opposed to that held by Child and others in the 17th century. ‘ Profits and interest,” he says, “cannot be too high. Nothing contributes so much to the prosperity and happiness of a country as high profits.” It seems to follow that, the pro- ductiveness of labour being given, wages cannot be too low, which can only be true on the supposition,} tacitly assumed by Ricardo in many places, that wages coincide with the cost of the labourer’s maintenance. The proposition, too, appears to lead to economic pessimism, for, according to his own doctrines, the rate of profits must inevitably decline in the course of the history of any society.

In his Plan for the Establishment of a National Bank, published posthumously in 1824, he proposes that the issue of the paper currency should be taken out of the hands of the Bank of England, and vested in commissioners appointed by the Government, but not removable except on an address from one or both Houses of Parliament. These functionaries should in no case lend money to the ministers of the crown, who, when they wanted it, should raise it by taxation or have recourse to the general market. The commissioners would act as bankers to all the public departments, but would be precluded from fulfilling the same office for any corporation or individual whatever. Their great business would be to regulate the issue of paper by the price of bullion, so as to keep the value of the former equal to that of the coins it would represent. The tract describes in detail the measures to be adopted for the introduction and working of the new system. A certain step towards realizing the objects of this scheme, though on different lines from Ricardo’s, was taken in Sir Robert Peel’s Act of 1844, by which the discount business of the bank was separated from the issue department.

Ricardo died on the 11th September 1823, at his seat (Gatcomb Park) in Gloucestershire. He was only fifty- one years of age, and there had been nothing in his general health to give rise to apprehension; the cause of death was a cerebral affection resulting from disease of the ear. He was much regretted, as he had been highly esteemed, both in public and private life. His character is represented in very favourable colours by those who knew him best. He is described as modest, candid, and ever open to conviction,—as affectionate in his family, steady in his friendships, and generous and kind in his wider per- sonal relations. James Mill, who was intimately acquainted with him, says (in a letter to N apier of November 1818) that he knew not a better man, and on the occasion of his death published a highly eulogistic notice of him in the Morning Chronicle. —A lectureship on political economy, to exist for ten years, was founded in commemoration of him, M'Culloch being chosen to fill it.

In forming a general judgment respecting Ricardo, we must have in view not so much the minor writings, to which this article has been in great part devoted, as the Principles, in which his economic system is expounded as a whole. Bya study of this work we are led to the conclusion that he was an economist only, not at alla social philosopher in the wider sense, like Adam Smith or John Mill. He had great acuteness, but little breadth. For any large treatment of moral and political questions he seems to have been alike by nature and preparation unfitted ; and there is no evidence of his having had any but the most ordinary and narrow views of the great social problems. His whole conception of human society is material and mechanical, the selfish principle being regarded, after the manner of the Benthamites, as omnipotent, not merely in practical economy, but, as appears from his speech on the ballot and his tract on reform, in the whole extent of the social field. Roscher calls him "ein tiefer Menschenkenner " ; it would be diffi- cult to characterize him more inaptly. The same writer remarks on his "capitalistic " tone, which, he says, becomes "mammonistic " —_ SS ee eee

1 The same assumption had been previously made by the Physio- crats. Turgot says, "En tout genre de travail, il doit arriver et il arrive que le

salaire de l'ouvrier se borne a ce qui est nécessaire pour se procurer sa subsistance."

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in some of his followers; but the latter spirit is already felt as the pervading atmosphere of Ricardo's works. He shows no trace of that hearty sympathy with the working classes which breaks out in several passages of the Wealth of Nations ; We ought, perhaps, with Held, to regard it as a merit in Ricardo that he does not cover with fine phrases his deficiency in warmth of social sentiment. The idea of the active capitalist having any duties towards his employés never seems to occur to him ; the labourer is, in fact, merely an instru- ment in the hands of the capitalist, a pawn in the game he plays, His principal work is the ultimate expression of what Comte calls "'Vignoble métaphysique qui prétend étudier les lois générales de lordre matériel en l'isolant de tout autre," Against such a picture of industrial life as a mere sordid struggle of conflicting interests contemporary socialism is the necessary, though formidable, pro- test ; and the leaders of that movement have eagerly seized his one- sided doctrines and used them for their own ends.

He first introduced into economics ona great scale the method of deduction from a priori assumptions. The conclusions so arrived at have often been treated as if they were directly applicable to real life, and indeed to the economic phenomena of all times and places. But the truth of Ricardo's theorems is now by his warmest admirers admitted to be hypothetical only, and they are stated as applying, at most, to the existing highly-developed condition of European, and especially of English, commerce. Bagehot, however, seems right in believing that Ricardo himself had no consciousness of the limitations to which his doctrines are subject. Be this as it may, we now see that the only basis ou which these doctrines could be allowed to stand as a permanent part of economic science is that on which they are placed by Roschcr, namely, as a stage in the preparatory work of the economist, who, beginning with such abstractions, afterwards turns from them, not in practice merely, but in the completed theory, to real life and men as they actually are or have been. But it may well be doubted whether it is not better to discard them

altogether, and begin, as we end, with an historical method, which, it may be added, will of necessity lead to the introduction of those moral and social considerations which would otherwise be almost certainly overlooked.

The criticisms to which Ricardo's general economic scheme js open do not hold with respect to his treatment of the subjects of cur- rency and banking. These form precisely that branch of economics into which moral ideas (beyond the plain prescriptions of honesty) can scarcely be said to enter, and where the operation of purely mer- cantile principles is most immediate and invariable. They were, besides, the departments of the study to which Ricardo's early train- ing and practical habits led him to give special attention ; and they

have a lasting value independent of his systematic construction.

Ricardo's collected works were published, with a notice of his life and writings, by J. R. M'Culloch in 1846, A French translation of the Principles by Constancio, with notes by Say, appeared in 1818; the whole works, translated by Constancio and Fonteyraud, form vol. xiii.(1847) of the Collection des Principaux Economistes, where they are accompanicd by the notes of Say, Malthus, Sismondi, Rossi, &c. The Princtples was first "naturalized " in Germany, says Roscher (though another version by Von Schmid had previously appeared), by Edward Baumstark in his David Ricardo's Grundgesetze der Volkswirthschaft und der Bestewerung iibersetzt und erldutert (1837), which Roscher highly commends, not only for the excellence of the rendering, but for the value of the explanations and criticisms which are added.

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RICCATI, James, Count (167 6-1754), a lohienicad Italian mathematician, was born at Venice, May 8, 1676, and died at Treviso, April 15, 1754. He studied at the university of Padua, where he graduated in 1696. Riccati was deeply read in history, belles lettres, architecture, and poetry—ain fact, was a highly cultivated man; his favourite pursuits, however, were scientific, and his authority on all questions of practical science was referred to by the senate of Venice. He corresponded with

many of the European savants of his day, and contributed largely to the Acta Eruditorum of Leipsic. He was offered the pre- sidency of the academy of science of St Petersburg ; but this high distinction he declined, preferring the leisure and independence of life in Italy. Riccati's name is best known and will be preserved by mathematicians in con- nexion with his celebrated problem called Riccati's equa- tion, published in the Acta Eruditorum, September 1724. A very valuable and complete account of this equation and its various transformations has been recently given by Mr J. W. L. Glaisher, F.R.S., in the Z'ransactions of the Royal Society (1881, pp. 759-829),

After Riccati's death his works were collected by his sons and published in four volumes. His sons, Vincenzo (1707-1775) and Giordano (1709-1790), inherited his talents. The former was professor of mathematics at Bologna, and published, among other works, a large treatise on the calculus. Giordano was distinguished both as a mathematician and an architect.

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RICCI, Marreo (1552-1610), is eminent as practically the founder of Christian missions in modern China.

He was born of a noble family at Macerata in the March of Ancona on 7th October 1552, two months before Francis Xavier, burning with the desire to carry his message into China, died at its gates. After some education at a Jesuit college in his native town, Ricci, at the age of sixteen, was sent by his father to study law at Rome. But the youth had already contemplated entering the Jesuit Company, and this purpose he accomplished about 1571, without informing his father, of whose opposition he was aware, until the step had beer taken. The father instantly started for Rome, but was stopped by illness, and abandoned opposition.

In 1577 Ricci and several other Italian students of

noble birth offered themselves for the East Indian mis-

sions; and Ricci, without visiting his family to take leave, proceeded to Portugal. His comrades were Rudolfo Acquaviva, Nicolas Spinola, Francesco Pasio, and Michele Ruggieri, all afterwards, like Ricci himself, famous in the Jesuit annals. They arrived at Goa in September 1578. After four years spent in India, Ricci was summoned to the task of opening China to evangelization.

Several attempts had been made by Xavier, and since his death, to introduce the church into China,—as by Melchior Nunes of the Jesuit society operating from Sanchian! in 1555; by Gaspar da Cruz, a Dominican, in that or the following year; by the Augustinians under Martin Herrada, 1575; and in 1579 by the Franciscans led by Pedro d'Alfaro; but all these attempts proved abortive. In 1571 a house of the Jesuits had been set up at Macao (where the Portuguese were established in 1557), but their attention was then occupied with Japan, and it was not till the arrival at Macao of Alessandro Valignani on a visitation in 1582 that work in China was really taken up. For this object he had obtained the services first of M. Ruggieri and then of Ricci. After various disappointments they found access to Chau-king- fu on the Si-Kiang or West River of Canton, where the viceroy of the two provinces of Kwang-tung and Kwang-si then had his residence, and by favour of this personage they were enabled to establish themselves, and there spent several years. 'Their proceedings were very cautious and tentative; they excited the curiosity and interest of even the more intelligent Chinese by their clocks, their globes and maps, their books of European engravings, and by Ricci's knowledge of mathematics, including dialling and the like, and the projection of maps. They conciliated some influential friends, and their reputation spread pretty widely in China. This was facilitated by the Chinese system of transfer of public officers from one province of the empire to another, and in the later movements of the missionaries they frequently met with one and another of their old acquaintances in office, who were more or less well disposed. Eventually troubles arose at Chau-king which compelled them to seek a new locality; and in 1589, with the viceroy's sanction, they migrated to Chang- chau in the northern part of Kwang-tung, not far from the well known Meiling Pass.

During his stay here Ricci was convinced that a mistake had been made in adopting a dress resembling that of the bonzes, thus identifying the missionaries with a class who were the objects either of superstition or of contempt. With the sanction of the visitor it was ordered that in future the missionaries should adopt the costumes of Chinese literates. And, in fact, they before long adopted Chinese manners altogether.

1 'The island (properly Shang-chuan) on which the Portuguese had a

oes settlement before they got Macao, and on which F, Xavier ied.

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Chang-chau, as a station, did not prove a happy selec- tion, but it was not till 1595 that an opportunity occurred of travelling northward. We cannot follow Ricci's move- ments in detail, or the vicissitudes of favour and trouble which attended his plans. The latter were, on the whole, never very grave. For some time his residence was at Nan-chang-fu, the capital of Kiang-si; but in 1598 he was enabled to proceed under favourable conditions to Nan- king, and thence, for the first time, to Peking, which had all along been the goal of his missionary ambition. But circumstances were not then propitious, and the party had to return to Nanking. The fame of the presents which they carried had, however, reached the court, and the Jesuits were summoned north again, and on the 24th January 1601 they entered the capital. Wan-lieh, the emperor of the Ming dynasty, in those days lived in seclu- sion, and saw no one but his women and the eunuchs. But the missionaries were summoned to the palace ; their presents were immensely admired ; and the emperor had the curiosity to send for portraits of the fathers them- selves.

They obtained a settlement, with an allowance for sub- sistence, in Peking, and from this time to the end of his life Ricci's estimation among the Chinese was constantly increasing, as was at the same time the amount of his labours. Visitors, who were never turned away, thronged the mission residence incessantly ; inquiries coming to him from all parts of the empire, from strangers as well as acquaint- ances, respecting the doctrines which he taught, or the numerous Chinese publications which he issued, had to be answered. This in itself was a great burden, as

Chinese composition, if wrong impressions are to be avoided, demands extreme care and accuracy. As head of the mission, which now had four stations in China, he also devoted much time to answering the letters of the priests under him, a matter on which he spared no pains or detail. The new converts had to be attended to—always welcomed, and never hustled away. Besides these came the composi- tion of his Chinese books, the teaching of his people, and the maintenance of the record of the mission history which had been enjoined upon him by the general of the order, and which he kept up to the most recent dates. Thus his labours were wearing and incessant. In May 1610 he proke down, and after an illness of eight days died on the 11th of that month, aged fifty-eight. His coadjutor Pantoja applied to the emperor for a burying-place outside the city. This, after due consideration by the boards concerned, was granted, with the most honourable official testimonies to the reputation and character of Ricci ; and

a large building in the vicinity of the city was at the

game time bestowed upon the mission for their residence.

Ricci's character, his acquirements, and the use he made of them were certainly worthy of all honour. We do not know what amount of success in conversion had rewarded his labours during his life, but some eminent and creditable converts there were, and his work was the foundation of the considcrable spread which the Roman Catholic Church has since attained in China. When the missionaries of other Roman Catholic orders made their way into China, some twenty years after the death of Ricci, they found great fault with the manner in which ccrtain Chinese practices had been dealt with by the Jesuits, a matter in which Ricci's action and policy had given the tonc to the mission in China,—though in fact that tone was rather inherent in the Jesuit system than the outcome of individual character, for controversics of an exactly parallel nature arosc two generations later in southern India, between the Jesuits and Capuchins, regarding what were called "Malabar rites." The controversy thus kindled in China burned for considerably more than a century with great fierceness," and we can here, in connexion with the carecr of Ricci, but indicate its existence. The chief points of controversy were (1)

the lawfulness and expediency of certain terms employed by the i nr RRS i we ee

2 The list of the literature of this controversy occupies forty-one columns in M. Cordier's excellent Bibliographie de la Chine.

Jesuits in naming God Almighty, such as Tien, " Heaven," and Shang-tt, "Supreme Ruler" or "Emperor," instead of Tien-Chu, "Lord of Heaven,' and in particular the erection of inscribed tablets in the churehes, on which these terms were made use of ;! (2) in respect to the ceremonial offerings made in honour of Confucius, and of personal ancestors, which Ricci had recognized as merely "civil"' observances; (3) the erection of tablets in honour of ancestors in private houses; and (4), more generally, sanetion and favour accorded to ancient Chinese sacred books and philosophical doctrine, as not really trespassing on Christian faith.

Probably no European name of past centuries is so well known in China as that of Zi-ma-teu, the form in which the name of our missionary (Ri-cci Mfat-teo) was adapted to Chinese usage, and by whieh he appears in Chinese records." The works which he composed in Chinese are numerous; a list of them (apparently by no means complete, however) will be found in Kircher's China Illustrata, and also in Abel Rémusat's Nowveaux Mélanges Astatiques (ii. pp. 218-215). They are said to display an aptitude for clothing ideas in a Chinese dress very rare and remarkable in a foreigner. One of the first which attracted attention and re- putation among Chinese readers was a Treatise upon Friendship, in the form of a dialogue containing short and pithy paragraphs ; this is stated in the De EHxpeditione to have been suggested during Ricci's stay at Nan-chang by a conversation with the prince of Kien-ngan, who asked questions regarding the laws of friendship in the West.

In the early part of his residence at Peking, when enjoying con- stant intereourse with scholars of high position, Ricci brought out the 7°icn-chu shih-t, or " Veritable doctrine of the Lord of Heaven," which deals with the divine character and attributes under eight heads. "'This work," says Mr A. Wylie, "contains some acute reasoning in support of the

propositions laid down, but the doctrine of faith in Christ is very slightly touched upon. The teachings of Buddhism are vigorously attacked, whilst the author tries to draw a parallel between Christianity and the teachings of the Chinese literati."

In 1604 Ricci completed the Hrh-shih-wu yen, a series of short artieles of moral bearing, but exhibiting little of the essential doctrines of Christianity. Chi-jén shih pien is another of his pro- ductions, completed in 1608, and consisting of a record of ten con- versations held with Chinese of high position. The subjects are :— (1) Years past no longer ours; (2) Man a sojourner on earth ; (8) Advantage of frequent contemplation of eternity; (4) Prepara- tion for judgment by such contemplation ; (5) The good man not desirous of talking; (6) Abstinence, and its distinction from the prohibition to take life; (7) Self-examination and self-reproof inconsistent with inaction; (8) Future reward and punishment ; (9) Prying into futurity hastens calamity; (10) Wealth with covetousness more wretched than poverty with contentment. To this work is appended a translation of eight Huropean hymns, with elucidations, written in 1609.

Some of the characteristics briefly indicated here may have suggested, though probably they are far from justifying, the bitterness of attacks made upon Ricei's theology, long after he had been in his grave, by some of the opponents of the Jesuits in the eontroversies to whieh we have referred. An example of these is found in the work called Anecdotes sur ? Etat de Religion dans la Chine, Paris, 1788-85, the author of which (Abbé Villers) speaks of the 7'ien-chu shih-i in this fashion—" The Jesuit was also so ill versed in the particulars of the faith that, as the holy bishop of Conon, Monsgr. Maigrot, says of him, one need merely read his book on the true religion to convince oneself that he had never imbibed the first elements of theology". ... The writer goes on to say other things even mueh more bitter.

Ricci's pointed attacks on Buddhism, and the wide eirculation of his books, called forth the opposition of the Buddhist clergy.

1 Compare Browning, The Ring and the Book, x., The Pope,

1589-1608.

2 The name eomes forward prominently in the mouth of the emperor Kang-hi, in a dialogue which took place between him and Monsgr. Maigrot, the leader of the anti-Jesuit movement (mentioned in Browning's lines referred to above), at the summer residence in Tar- tary, August 1706,—a dialogue whieh the Jesuits have reported

with not a little maliee :—

"' Emperor, 'Tell me why do the people call me Van-sui (10,000 years).' The Most Reverend (i.e., Maigrot), 'To express their desire for your Majesty's long life.' mp. 'Good. You see, then, Chinese words are not always to be taken literally. We pay cult to Confucius and to the dead to express our respect for them. How is that inconsistent with your religion? When did it begin to be so? Is it since Ly-Mattheu'stime? Hast thou ever read Ly-Mattheu? The Most Reverend, turning to P. Parenin, whispers, " Who's he?" and learning that it was P. Matteo Ricci,... answered the emperor: 'I have not read that book.' Zmp. ' Ly-Mattheu and his fellows came hither some two centuries ago; and before their time China never heard anything of the Incarnation, any- thing of Tien-chu, who had not become incarnate in this part of the world. Why then, if it was lawful to call God Tien before Ly-Mattheu's time, should it be improper now?"—Zpistola de Eventu Apostolice Legationis, seripia a PP. Misstonariis . . . ad Prepositum Generalem S. J., An. 1706, 1 Novembris,

One of the ablest who took their part was Chu-hang, a priest of Hang-chau, who had abandoned the literary status for the Bud- dhist cloister. He wrote three articles against the doctrine of the missionaries. These were brought to Ricci's notice in an ostensible tone of candour by Yu-ehun-he, a high mandarin at the capital. This letter, with Ricci's reply, the three Buddhist declamations, and Ricci's confutation, were published in a collected form by the Christian Sen-Kwang-K'e.

Another work of Ricci's which attracted attention was the Hsi-kuo fa, or ' Art of Memory as practised in the West." Ricci was himself a great expert in memoria technica, and astonished the Chinese by his performances in this line. He also wrote or edited various Chinese works*

on geography, the celestial and terrestrial spheres, geometry, and arithmetic.? And the detailed history of the mission was drawn out by him, which after his death was brought home by P. Nicolas Trigault, and published at Augsburg, and in a complete form at Lyons a year later under the name De Hxupeditione Christiana apud Sinas Suscepta, ab Soc. Jesu, Ex P. Mat. Ricci ejusdem Societatis Commentarits, in which Tri- gault himself added a large amount of interesting matter respecting China and the Chinese.

Among the scientific works of his time whieh Ricci took with him into China, there was a fine set of maps, which at first created great interest, but disgust afterwards when the Chinese came to perceive the insignificant place assigned therein to the "Middle Kingdom," thrust, as it seemed, into a corner, instead of being set in the centre of the world like the gem inaring. Ricci, seeing their dissatisfaction, set about eonstructing a map of the hemisphere on a great scale, so adjusted that China, with its subject states, filled the eentral area, and, without deviating from truth of projection, occupied a large space in proportion to the other kingdoms gathered round it. All the names were then entered in Chinese calligraphy. This map obtained immense favour, and was immediately engraved at the expense of the viceroy, and widely circulated.

In the accompanying cut we have endeavoured to realize this Jesuitical map, as we fear it must be called. The projection we have adopted is a perspective of the hemisphere, as viewed from a point at the distance of one diameter from the surface, and situated on the production of the radius which passes through the intersec- tion of 115° EK. long. (Green- wich) with 30°

f "UY near this must have been Li- ma-teu's projec- tion. With a vertex much more distant the desired effect would be impaired, and with one nearer neither of the poles would be seen, whilst the exaggeration of China would have been too gross for a professed representation of the hemisphere.

The chief facts of Ricci's career are derived from Trigault ; some contemporary works on the rites controversy have also been consulted; in the notice of Ricci's Chinese writings valuable matter has been derived

from Notes on Chinese Litera- ture by Mr A. Wylie,4 an indefatigable scholar, and perhaps our only contem- porary who can speak of these from actual examination. 'The projection of the sphere by the present writer appeared in the (now defunct) Geographical Magazine for July 1874. A number of Ricci's letters are extant in the possession of the family, and access to them was afforded to Giuseppe La Farina, author of the work called Za China, consideraia neila sua Storia, &c., Florence, 1843, by the Marchese Amico Ricci of Macerata, living at Bologna (see vol. i. p. 112 sq.). La Farina's quotations contain nothing of interest. There is a curious Chincse

account of Ricci published by Dr Breitschneider in the China Review, iv. 391 sq. (sa)

RICCIARELLI, Danrerz (1509-1566), Italian artist, generally called, from the place of his birth, DANIELE Da

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3 In the eatalogue of the London Mission Library, Shanghai, 1857, we find the following entries :—"197. Chi'ho yian pén, Elements of Geometry (MS.). This is the first six books of Euelid, translated by Matthew Rieei and his disciple Sen-Kwang-K'e, 1607." '198. Tung-wen suan-ehth. Guide to Arithmetie, 9 vols. incomplete; this treatise was drawn up by Ricci, with the aid of his disciple Le-Che- tsaou, and published in 1613." "199. Chigén shih pien" (see above).

4 Shanghai and London, 1867.

VoLTERRA, was born in 1509, and studied painting under Razzi and Peruzzi. 'The young artist, settling in Rome, strove most unweariedly to attain eminence in his profes- sion. No efforts were spared on his pictures. He pro- ceeded with a careful slowness, attempting to reach his ideal by a close imitation of Michelangelo. It is even said that he sometimes in a difficulty had recourse to the more direct aid of that great master's own hand. The result of this earnest labour was that Ricciarelli obtained abund- ant encouragement. His constant friend, Michelangelo, recommended him on all possible occasions. He had the honour to beautify with works of art a chapel in the church of the Trinitd, to paint in the Farnese Palace, to execute certain decorations in the Palazzo de' Medici at Navona, and to begin the stucco work and the pictures in the Hall of the Kings. Nor was he less highly patronized when, towards the close of his life, he turned his atten- tion to statuary. His last work was a bronze horse intended for an equestrian statue of Henry II. of France. He died in 1566. 'The principal extant works of Ric- ciarelli are at Rome. These are a St John the Baptist in the picture gallery of the Capitol, a Saviour bearing the Cross in the Palazzo Rospigliosi, and a Descent from the Cross, his masterpiece, in the church of Trinita de Monti. There is also an Elijah at Volterra.

RICCOBONI, Mapamz (1714-1792), whose maiden name was Marie Jeanne Laboras de Méziéres, and who married and was deserted by an actor and author of little merit, was born at Paris in 1714. She herself was an actress, but did not succeed on the stage. She then took to novel writing and deserves a considerable place in the history of the sentimental novel. Her first work was the remarkable Histoire du Marquis de Cressy (1758). This was followed by Milady Catesby, Fanny Butler (both of them, as indeed are almost all her books, in letter form), Ernestine (sometimes thought her masterpiece), three series of Lettres in the names of Adelaide de Dammartin (often quoted as Madame de Sancerre), Elizabeth Sophie de Valliére, Milord Rivers, and others. These books were much admired, but brought their author little money. She obtained, however, a small pension from the crown, but the Revolution deprived her of it, and she died in 1792 in great indigence. Besides the works named she translated Fielding's Amelia, and tried a continuation (but not the conclusion

sometimes erroneously ascribed to her) of Marivaux's unfinished Marianne.

All Madame Riccoboni's work is very clever, and there is real pathos init. But it is among the most eminent examples of the "sensibility" novel, of which no examples but Sterne's have kept their place in England, and that not in virtue of their sensibility. A still nearer parallel may.be found in the work of Mackenzie. Madame Riccoboni is an especial offender in the use of mechanical aids to impressiveness—italics, dashes, rows of points, and the like. The principal edition of her complete works is that of Paris,

1818. The chief novels appear in a volume of Garnier's Bzblio- theque Amusante, Paris, 1865.

RICE. According to Roxburgh the cultivated rice with all its numerous varieties has originated from a wild plant called in India Newaree or Nivara (Oryza sativa). It is said to grow on the borders of lakes in the Circars and elsewhere in India, and is also native in tropical Australia. The rice plant is an annual grass with long linear glabrous leaves, each provided with a long sharply- pointed ligule. The spikelets are borne on a compound or branched spike, erect at first but afterwards bent down- wards. Each spikelet contains a solitary flower with two outer small glumes and two inner, larger and folded lengthwise, the outer one of the two rather larger and sometimes provided with an awn. Within these are six stamens, a hairy ovary surmounted by two feathery styles which ripens into the fruit (grain), and which is invested

'Persians.

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by the husk formed by the persistent glumes. The culti- vated varieties are extremely numerous, some kinds being adapted for marshy land, others for growth on the hill-sides. The cultivators make two principal divisions according as the sorts are early or late. Other subdivisions depend upon the habit of the plant, the presence or absence of an awn, the colour of the grain, and other particulars. Rice has been cultivated from time

immemorial in tropical countries. According to Stanislas Julien a ceremonial ordinance was established in China by the emperor Chin-nung 2800 years B.c., in accordance with which the emperor sows the rice himself while the seeds of four other kinds may be sown by the princes of his family. This fact, joined to other considerations, induced Alphonse de Candolle to consider rice as a native of China. It was very early culti-vated in India, in some partsof which country, as in tro- pical Australia, it is, as we have seen, indigenous. It is not mentioned in the Bible, but its culture is alluded to in the Talmud. |/|/ There is no evi- }// dence of the exist- ||| ence of rice in Egyptian remains, nor is there any trace of it as a native plantamong the Greeks, Ro- mans, or ancient There is proof of its culture in the Euphrates

valley and in

Syriafour hundred

years before Christ.

*Crawfurd on phi- *

lological grounds SS |

*considers that rice NY *

*was _ introduced *

into Persia from N

southern India. Rice (Oryza sativa).

The Arabs carried A, spikelet (enlarged); B, bearded variety ; the plan . wate C, spikelet of B (enlarged).

Spain under the name "aruz," the arros of the Spanish, the rizo of the Italian, whence our word rice. Rice was first cultivated in Italy near Pisa in 1468. It was

not introduced into Carolina until 1700, and then, as it is said, by accident, although at one time the southern United States furnished a large proportion of the rice introduced into commerce. Rice, says Crawfurd, sports into far more varieties than any of the corns familiar to Europeans, for some varieties grow in the water and some on dry land; some come to maturity in three months, while others take four and six months to do so. The Hindus, however, are not content with such broad distinctions as might be derived from these obvious sources, but have names for varieties the distinctions between which are unappreciable by Europeans ; besides terms for this corn founded on variety, on season, and on mode of culture, the grain itself bears one name in the straw, another when threshed, one name in the husk and another when freed from it, and a fifth when cooked. A similar abundance of terms is found in the languages of the Malay and Philippine Islands. Such minute nomen-

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clatures seem to point to a great antiquity in the culture of this cereal.

Rice constitutes one of the most important articles of food in all tropical and subtropical countries, and is one of the most prolific of all crops. The rice yields best on low lands subject to occasional inundations, and thus enriched by alluvial deposits, An abundant rainfall during the growing season is also a desideratum. Rice is sown broadcast, and in some districts is transplanted after a fort- night or.three weeks. No special rotation is followed ; indecd the soil best suited for rice is ill adapted for any other crop. In some cases little manure is employed, but in others abundance of manure is used. No special tillage is required, but weeding and irrigation are requisite. Rice in the husk is known as "paddy." On cut- ting across a grain of rice and examining it under the microscope, first the flattened and dried cells of the husk are seen, and then one or two layers of cells elongated in a direction parallel to the length of the seed, which contain the gluten or nitrogenous matter. Within these, and forming by far the largest part of the seed, are large polygonal cells filled with very numerous and very minute angular starch grains. Rice is not so valuable

as a food as some other cereals, inasmuch as the proportion of nitrogenous matter (gluten) is less. Payen gives only 7 per cent. of gluten in rice as compared with 22 per cent. in the finest wheat, 14 in oats, and 12 in maize. The percentage of potash in the ash is as 18 to 23 in wheat. The fatty matter is also less in proportion than in other cereals. Rice, therefore, is chiefly a farinaccous food, and requires to be combined with fatty and nitrogenous sub- stances, such as milk or meat gravy, to satisfy the requirements of the system.

The imports of rice into the United Kingdom range from 7,000,000 cwt. to 8,000,000 cwt. annually, having an estimatcd value of from £8,000,000 to £3,500,000. Nearly the whole of this comes from British Burmah and Bengal.

RICE PAPER. The substance which has received this name in Europe, through the mistaken notion that it is made from rice, consists of the pith of a small tree Aralia papyrifera cut into thin slices) The tree grows in the swampy forests of Formosa and apparently nowhere else, and large quantities of the stems are conveyed to Chin- chew, where the snow-white delicate pith is carefully sliced by spiral cuts into uniform sheets of a fine ivory-like texture. It is dyed various colours, and extensively used for the preparation of artificial flowers, while the white sheets are employed by native artists for water-colour drawings.

RICH, Cuaupius Jamzs (1787-1821), Eastern traveller and scholar, was born near Dijon, March 28, 1787. While still an infant he was taken to Bristol, where he spent his youth. At a very early age he developed a wonderful capacity for the acquisition of languages, soon becoming familiar not only with Latin and Greek but also with Hebrew, Syriac, Persian, Turkish, and other Eastern tongues. His unusual intelligence and extraordi- nary acquirements in Oriental languages procured for him in 1803 a nomination to a writership in the Bombay establishment of the East India Company. In 1804 Rich proceeded to Constantinople, where, and at Smyrna, he stayed a considerable time, perfecting himself in the Turkish language. Proceeding to Alexandria as assistant to the British consul-general there, he devoted himself to Arabic and its various dialects, and made himself master of Eastern manners and usages. On

leaving Egypt he proceeded by land to the Persian Gulf, disguised as a Mameluke, visiting Damascus, and entering the great mosque undetected. At Bombay, which he reached in September 1807, he was the guest of Sir James Mack- intosh, whose eldest daughter he married in January 1808, proceeding soon after to Baghdad as resident. While gaining the respect of Turks of all classes, as well as of Europeans, he now began his investiga- tions into the geography, history, and antiquities of the vastly interesting region in the midst of which he was

placed, the results of which give him a high place among Eastern students. He made collections of all kinds, visited and examined the remains of Babylon, and projected a geographical and statistical account of the pashalic of Baghdad. The results of his investigations at Babylon appeared first in the Vienna serial the Mines de UOrient, and in 1811 in England, under the title Narra- tive of a Journey to the Site of Babylon in 1811. In 1839 this was republished by his widow, with Major Rennell's remarks upon it, and a second memoir by Rich in reference to these remarks, together with the narrative of a journey to Persepolis. In 1813-14 Rich spent some time in Europe, and on his return to Baghdad paid special atten- tion to the geography of Asia Minor, and collected much information in Syrian and Chaldean convents concerning the Yezzidis. He continued, too, to collect manuscripts of all kinds, his collections being probably the most extensive and valuable brought together by any private person up to that time. His collection of coins—Greek, Parthian, Sasanian, and Moslem—as well as of gems and engraved stones, was much enlarged. During this period he made a second excursion to Babylon, and in 1820 he undertook an extensive tour to Kurdistan—from Baghdad north to Sulimania, eastward to Sinna, then west to Nineveh, and thence down the Tigris to Baghdad. The narrative of this journey, which for the first time furnished accurate know- ledge (from scientific observation) regarding the topography and geography of the region traversed, was published by bis widow in 1836. It abounds with information on the country and the people, their history and traditions, the ruins and inscriptions met with, characterized by the pro- fundity and thoroughness of the real scholar and trained observer. He visited many of the ancient Christian churches in Chaldeea, adding largely to his stock of manu- scripts, including ancient Syrian and Chaldzan versions of the

Scriptures. In 1821 Rich went to Basora, whence he made an excursion to Shiraz, visiting the ruins of Per- sepolis and the other remains of antiquity in the neighbour- hood. An account of these excursions is given in the post- humous publication referred to, which also contains many notes on Rich's collections and minor excursions as well as a brief memoir. At Shiraz he was struck down by cholera on October 5, 1821. His early death was a vast loss to Oriental investigation. The work he did accomplish was of great value for Eastern archeology and history.
RICHARD I. (1157-1199), king of England, called even before his death 'the Lion" or " Coeur de Lion," was the third son of Henry IL. and Eleanor of Aquitaine. He was born, probably at Oxford, on September 8, 1157. When little more than eleven years old he was invested with the duchy of Aquitaine, and imbibed in southern France the spirit of the adventurer and the troubadour which characterized him through life. In 1173 he joined the league against Henry II., but when the rebellion was suppressed in 1174 he was pardoned by his father. Shortly afterwards he was affianced to Alice, the daughter of Louis VII. The death of his brother Henry in 1184 made Richard heir to the throne. From this time he was the centre of the disturbances which troubled the last five years of Henry II.'s reign. The pretext for his quarrel with his father was the refusal of the latter to allow the barons to do fealty to Richard as heir, and Henry's wish to transfer Aquitaine to his younger son John. War was for some time averted by the preparations for the third crusade, and Richard himself took the cross (1187). Next year, however, a quarrel between Richard and his neighbour the count of Toulouse led to the final breach. Vhilip, king of France, took advantage of this quarrel to invade Berri, whence he was driven out again by Richard, who so far was acting in concert with his father. A truce

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opportunity to separate Henry from his son. In November 1188 Richard did homage to Philip for his French pro- vinces, and the latter demanded that Henry should acknowledge him as heir. Henry hesitated, and Richard openly joined Philip. In the spring of 1189 the allies overran Maine and Touraine, and forced Henry, in a meeting at Colombiéres, to

submit to their demands. Two days later Henry died at Chinon (July 6, 1189), and Richard became king of England.

Richard's reign falls into two equal divisions—the one comprising his crusade and captivity, the other his wars against Philip in France. On his father's death he was at once acknowledged as duke of Normandy and count of Anjou. On September 3, 1189, he was crowned with great pomp at Westminster. This is the first English corona- tion of which we have a full account, and the formalities then adopted have been followed with little alteration ever since. Richard at once set to work to collect funds for the crusade. He sold ecclesiastical and temporal offices, released the king of Scotland from the vassalage to which Henry II. had subjected him ; and, having by these means and by taxation collected a large sum of money, he crossed to Calais on December 12. Soon afterwards he met Philip at St Remy and made a treaty with him for a joint crusade. On June 27, 1190, the two armies assembled at Vezelai, whence they marched together as far as Lyons. There Philip took the route to Genoa, while Richard went by Marseilles. Visiting Naples on the way, he landed at Messina on September 23, where he found the French army and his own fleet awaiting him. The two kings remained in Sicily during the winter. William II., king of Sicily, husband of Richard's sister Joanna, had died shortly before, and Tancred, nephew of William, had seized the throne. During the negotiations for the recovery of Joanna and her dowry, disturbances broke out which ended in Richard's forcing his way into Messina at the head of his army. His real enemy was, however, not Tancred, but Philip. The natural jealousy of the two kings grew into mutual hatred during their stay in Sicily, and Tancred informed Richard of French intrigues. In March 1191 Richard made a treaty with Tancred, and recognized him as king of Sicily. At the same time he repudiated Alice, Philip's sister, and betrothed himself to Berengaria of Navarre. Philip was the first to leave Sicily. He arrived at Acre early in April. On April 10 Richard set sail, and a month later reached Cyprus, where he married Berengaria (May 12). He then proceeded to conquer Cyprus, took Isaac Comnenus and his daughter prisoners, and set out again for the Holy Land, reaching Acre on June 8. Guy of Lusignan, who claimed the throne of Jerusalem, had besieged that fortress since 1189, but the Christian army was itself hemmed in by the forces of Saladin. NRichard's

arrival encouraged the besiegers, and on July 11 Acre surrendered. The two kings now settled the dispute between Guy of Lusignan and Conrad of Montferrat about the throne of Jerusalem and on August: 3 Philip left the Holy Land. Saladin having failed to fulfil the terms on which Acre had surrendered, Richard ordered the massacre in cold blood of some three thousand Mohammedan prisoners. Soon afterwards he set out for Jaffa, and on the way thither won the battle of Arsuf. Having rebuilt Jaffa, he started for Jerusalem. About Christmas 1191 he arrived at Beit-ntiba, within sight of the Holy City, but, owing to the reluctance or desertion of his French allies, he found it impossible to besiege it, and therefore withdrew to the coast. In April 1192, at the instance of his followers, he recognized Conrad as king of Jerusalem, indemnifying Guy with the crown of Cyprus. The murder of Conrad immediately afterwards

was made between the two kings, and Philip used the.

was laid, probably without sufficient ground, to the charge of Richard, who conferred the vacant throne on Henry, count of Champagne. Bad news from England now made him anxious to go home, but he resolved on one more attempt to save Jerusalem. He set out on June 4, arrived again within sight of the city, and again retired without venturing to attack. Jaffa, which had been taken by Saladin, was retaken on August 1. This was Richard's last exploit in the East. On September 1 he made a three years' truce with Saladin, on the basis of the status guo; and on October 9 he sailed for home, leaving behind him a name long remembered by the Saracens, but, beyond the capture of Acre, having accomplished none of the objects with which he set out.

Fearing to go through France, Richard sailed up the Adriatic, and made his way on foot, as a pilgrim and almost alone, to Erdburg near Vienna. Here he was dis- covered (December 21, 1192) by Leopold, duke of Austria, of whom, while at Ascalon, he had made a bitter enemy. After being confined for some time at Diirrenstein on the Danube, he was surrendered in March 1193 to the emperor Henry VI., who imprisoned him first at Trifels and afterwards at Worms. Legend was already rife about him, but the story of his discovery by Blondel only dates from the

following century, and is of French origin. In order to liberate himself, Richard resigned his crown to Henry VI. as overlord of Christendom, promised to pay a yearly tribute, and received back the crown as a vassal of the emperor. At Easter a diet was held at Spires, at which Richard was charged with various misdoings,—the recognition of Tancred, the conquest of Cyprus, the murder of Conrad, even with the betrayal of the Holy Land to Saladin. He defended himself eloquently, and the charges were dropped. Shortly afterwards a treaty was made at Worms (July 29) for Richard's release on payment of a ransom of 150,000 marks, with other condi- tions. Great efforts were made in England to collect the money, two-thirds of which was paid over to Henry, hostages being given for the rest. Philip and John were able, however, by offers of money and other means, to induce the emperor to detain Richard till the following spring. At length he was liberated. On March 18, 1194, he set foot again in England. He found his dominions in great confusion owing to the intrigues of Philip and John. He rapidly made himself master of the castles which held out for John, and on April 17, 1194, he was crowned a second time. He then collected more money from the impoverished country for the rest of his ransom and for an expedition to France, and on May 12 left England again never to return. Philip retired before him; John submitted and was pardoned. For the remaining five years of his reign Richard kept up an intermittent struggle with Philip, a struggle marked by no great battles, and interrupted only by fruitless negotiations and truces which were never kept. Neither party was strong enough to inflict a severe blow upon the other. In the autumn of 1198 the war went decidedly against Philip, but in January 1199 a peace for five years was made, each side retaining what it held. Shortly afterwards Richard, while besieging the castle of Chaluz near Limoges, which was held against him by one of his vassals, was wounded by an arrow. He died on April 6, 1199, and was buried at Fontevraud. His brother John succeeded him.

In person Richard was tall, muscular, ruddy, with light brown hair. He was lavish, generous, and fearless; a skilful commander, but incapable of extensive combina- tions or far-reaching plans; more religious than his father or brothers, but equally vicious ; a bad husband and a bad son, with much of the ferocity that characterized his race ;

in fact, a typical representative of the faults as well as the virtues of the chivalry of his day. His reign was sig- nalized by no great legal or administrative reform, and England owes him nothing but barren fame.

Chief Authoritics.—Hoveden, Chronica; Ralph de Diceto, Imagines Historiarum; Gervase of Canterbury, Chronica, &c. ; Chronicles and Memortals of the Reign of Richard I. ; Gesta Regis Henrici IT,, &c. (ascribed to Benedict of Peterborough) ; all the above have been edited, with most valuable prefaces, by Dr Stubbs for the Rolls Series ; also William of Newburgh, Historia Rerwm Anglicarwm, edited for the Engl. Hist. Society by H. C. Hamil- ton, and for the Rolls Series by R. Howlett; Richard of Devizes, Chronicon, &c., edited for the Engl. Hist. Society by J. Stevenson ; Pauli, Geschichte von England, vol. iii.; Stubbs, Harly Plantagencts ; Lingard, History of England, vol. ii. (Cau i5 125)

RICHARD II. (1366-1400), king of England, the only son of Edward the Black Prince and Joan of Kent, was born at Bordeaux, April 13, 1366. He succeeded to the throne on the death of his grandfather Edward III., on June 21, 1377. He was crowned on July 16. During the first eleven years of his reign, Richard was in a position of tutelage. His uncles, John of Gaunt, duke of Lancaster, and Thomas, duke of Gloucester, were the most influential persons in the kingdom. The evils naturally inherent in a minority were intensified by war abroad, religious and social troubles at home, the existence of a turbulent nobility, and the intrigues and rivalries which broke up the royal house. Under the incapable rule of Lancaster, the southern coasts were ravaged by French fleets, the northern frontier was harried by the Scots, and the taxes collected for national purposes were wasted or embezzled. The weakness and unpopularity of the Government pro- duced a ferment among the lower classes, which, aggravated by the heavy taxation of 1379 and 1380, culminated in the Peasants' Revolt of June 1381. This revolt gave Richard, then a lad of fifteen, his first opportunity of dis- tinguishing himself. On June 14 he met the rebels at Mile End, and, by promising the abolition of villenage, induced the Essex contingent to return home. Next day he met the Kentish men at Smithfield. In the parley which followed, their leader, Wat

Tyler, was killed. The mob were about to avenge his death when the young king, riding forward alone, calmed their irritation and induced them to follow him to Islington. Here a body of troops came to the king's aid, but Richard prevented a conflict, and persuaded the rioters to disperse. His presence of mind, extraordinary in one so young, not only saved his own life but averted a general disaster. In January 1382 he married Anne of Bohemia, daughter of the emperor Charles IV. Meanwhile the influence exerted by John of Gaunt was becoming more and more irksome to him. Charges of conspiracy brought against his uncle in 1384, though denied by Lancaster, so worked upon Richard that he attempted to seize him, but a reconciliation was soon afterwards effected. In 1385 the king led an expedition to Scotland. His refusal to allow the army to penetrate beyond Edinburgh is said to have caused another quarrel with the duke of Lancaster. The efforts made by Richard to form a party of personal adherents, in opposition to his uncles, are to be seen in the elevation of De Vere to the marquisate of Dublin and of De la Pole, the chancellor, to the earldom of Suffolk. After John of Gaunt's departure to Portugal (July 1386) the quarrel between the king's party and the opposition headed by Gloucester came to a head. Gloucester, supported by a strong majority in parliament, demanded the dismissal of the chancellor and the treasurer, to which Richard was obliged reluctantly to consent. The blow was followed up by the appointment of a committee of government which, like the baronial committee of 1258, practically superseded the monarchy. Richard submitted, but immediately set about making plans for the recovery of his authority. In November 1387 he

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came to London in order to overthrow the committee, but was anticipated by Gloucester, who, with Henry of Derby and three others, "appealed," or impeached the king's chief adherents of high treason. The party in power always found it easy to manipulate the elections, and the parliament which met in February 1388 was altogether on the side of the "appellants." The leaders of the king's party were executed, banished, or imprisoned, and Glou- cester won a complete triumph. He failed, however, to establish his power on a firm basis, and in May 1389 Richard

threw off the yoke. On the ground that he was now of full age, he suddenly informed his council that he intended to rule alone. Gloucester made no resistance} the nation acquiesced; and Richard was at last really king.

Richard did not for some time abuse his power. The 'fappellants" were not punished, and even remained members of the council. William of Wykeham, however, became chancellor, and it was apparently by his advice and that of John of Gaunt, who returned to England in 1389, that Richard regulated his conduct. For eight years he ruled constitutionally. The country was at peace at home and abroad. In June 1394 the queen died. In October of the same year Richard went to Ireland and received the submission of some of the chiefs. He remained in Ireland till May 1395. Next year he concluded a twenty-five years' truce with France, and engaged to marry Isabella, the French king's daughter. In September 1396 he went to Calais and returned with his bride, a child of eight years old. This alliance seems to have encouraged Richard to carry out a stroke of policy which he had probably long contemplated. In July 1397 he suddenly seized the "appellants," Warwick, Arundel, and Gloucester. The parliament, which met in September, repealed the acts of 1386, and declared the "appellants" guilty of high treason. Arundel was executed, Warwick imprisoned Gloucester died, probably by violence, in prison. Next year the parliament conferred on Richard tonnage and poundage for life, and delegated their authority to a committee of eighteen, practically chosen by the king, thus making him an absolute monarch. A treasonable conversation between Hereford and Norfolk, reported by the former, gave a pretext for the banishment of both. In February 1399 John of Gaunt died, and Richard seized the Lancaster estates, thus reducing Hereford to desperation. The latter at once began to prepare to recover his inheritance, and Richard, apparently ignor- ant of the danger, went over to Ireland (May 29), thus leaving the kingdom open to his rival. Henry landed in Yorkshire early in July, and rapidly collected an over-powering force. Richard returned to find Henry in possession of power and himself deserted by the nation. He surrendered to Henry at Flint (August 19) and was conveyed to London. On September 29 he executed a deed by which he resigned the crown. Next day the deed was read in parliament. Formal sentence of deposition was pronounced, and Henry

claimed and received the crown. A month afterwards the late king was sentenced to perpetual imprisonment, and was removed to Pontefract. The conspiracy against Henry IV., which was discovered in January 1400, sealed Richard's fate. The manner of his death is unknown, but there can be little doubt that he died by violence. He is said to have been buried at Langley, February 14, 1400.

In person Richard was slight, fair-haired, beardless, with rounded face and elegant but rather feminine features. His character, a strange mixture of strength and weakness, courage and irresolution, indolence and energy, remains an enigma to the historian. He protected Wickliffe, encouraged Chaucer, and made a serious attempt to establish an absolute monarchy. His reign, whether we regard it from

the religious, the political, or the social point of view, is one of very great importance, and its history has as yet been by no means fully elucidated.

Chief Anthorities. Knighton, De Eventibus Angliz, ed. Twysden in the Decem Scriptores, 1652; Walsingham, Historia Anglicana, ed. Riley (Rolls Series) ; Adam de Usk, Chronicon, ed. Thompson, 1876 ; Chronicon Angliw, by a monk of St Albans, ed. Thompson (Rolls Series); Historia Vite et Regni Ricardi IT., by a monk of Evesham, ed. Hearne, 1729; Cronieque de la traison et mort de Richart deux, &c., ed. Williams (Engl. Hist. Society); Histoire du Roi @ Angleterre Richard, ed. Webb, in Archeol. Brit., vol. xx.; Froissart, Chronicles; Stubbs, Constitutional History, vol. ii. ; Pauli, Geschichte von England, vol. iv. (G. W. P.)

RICHARD III. (1452-1485), king of England, third son of Richard, duke of York, and Cicely Nevil, was born at Fotheringay on October 2, 1452. Having been sent out of England for safety on the death of his father in 1460, he was recalled next year by his brother Edward IV., who created him duke of Gloucester and appointed him lord high admiral. He remained faithful to his brother during the latter's reign, sharing in his flight in 1470, and aiding him on his return in the victories of Barnet and Tewkesbury. In 1474 he married Anne, daughter of the earl of Warwick and widow of Prince Edward. In 1482 he led an army into Scotland to aid

the duke of Albany against James III., occupied Edin- burgh and captured Berwick. On the death of Edward IV. (April 9, 1483) Richard at once made himself master of the situation by seizing Prince Edward, his nephew. Having assumed the title of Protector, he rapidly deve- loped his plans for securing the crown. Under the pre- text of a plot against his life, he seized and beheaded Hastings, Grey, and others (June 13), forced the queen mother to give up her younger son Richard, and, on June 26, 1483, assumed the crown. The children of Edward IV. were set aside on the plea that their father was illegitimate. On July 6 Richard was crowned king. Shortly afterwards it was publicly reported that the sons of Edward IV. were dead; their actual fate is to the present day unknown. In October 1483 the rebellion of the duke of Buckingham was put down; the duke himself was executed on November 2: A parliament which met in January 1484 acknowledged Richard as king, in return for which he assented to an Act abolishing benevolences. His only legitimate son, Edward, died on April 9, 1484, and in March 1485 the boy was followed by his mother. To strengthen his position Richard had made treaties with Scotland and Brittany (1484), and he now proposed to marry his niece Elizabeth. From this course, however, he was dissuaded. His short reign was mainly occupied in preparing to resist the invasion of Henry of Richmond. Unable to prevent Henry's landing (August 7, 1485), Richard met his rival in battle at Bosworth (August 22), and at the same moment lost his crown and his life.

Tradition is divided as to Richard's personal appear- ance, and the story of his deformity is possibly derived from Lancastrian malignity and from a misunderstanding of his nickname Crouchback. His courage, energy, and ability would have made a great and honoured name had not those qualities been matched by extreme ferocity and unscrupulousness, and perverted to an evil use by the tur- bulence of the time and his own nearness to the throne.

Chief Authorities. —Fabyan, Concordance of Histories, ed. Ellis, 1811; Historia Croylandensis, ed. Fell, Quinque Scriptores, 1687 ; Ross, Historia Regum Angliz ; Paston Letters, ed. Gairdner, 1875 ; Letters and Papers illustrative of the reigns of Richard ITI. and Henry VII, ed. Gairdner (Rolls Series) ; Sir T. More, Histories of Edward V. and Richard

ITT, 1556; H. Walpole, [Historie Doubts on Richard ITI., 1768 ; Gairdner, Life and Reign of Richard LII., 1878. (G. W. P.)

RICHARD, earl of Cornwall and king of the Romans (1209-1272), second son of John, king of England, and Isabella, was born at Winchester, January 5, 1209. In

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1225 he undertook the government of Gascony. In 1240 he went on a crusade, returning in 1241, after concluding a treaty with the sultan of Egypt. In 1242 he accompanied his brother on his unsuccessful expedition to Poitou. In 1244 and 1246 we find him heading the parliamentary opposition against Henry IIL. and a few years afterwards he befriended Simon de Montfort against his accusers. When Henry went to France in 1253, Richard, together with the queen, acted as regent. He had already (1252) declined the pope's offer of the kingdom of Sicily, but in January 1257 he was elected emperor by a majority of the electors, and soon afterwards was crowned at Aix-la-Chapelle. In 1259 he returned to England and swore to observe the Provisions of Oxford. Next year he acted as peace- maker between Henry and the barons, and, after spending another year in Germany, he returned to England in 1263. It was largely owing to his mediation that the two parties submitted to the arbitration of Louis IX., but on the renewal of the civil war he took his brother's side. Taken prisoner at the battle of Lewes, he was kept in confinement by De Montfort for a year, but released after the battle of Evesham. One of his last known acts was his mediation between the earl of Gloucester and the king. In 1269 he went to Germany again for a short time, and returned to England to die at Kirkham in 1272. He was thrice married—(1) to Isabella, sister of the earl of Pembroke ; (2) to Sancia, daughter of Raymond, count of Provence; (3) to Beatrice of Falkenstein.

For authorities, see under Henry III. (G. W. P.)

RICHARD, duke of Normandy. See Normanpy, vol. xvii. p. 541 sq.

RICHARD or Bury. See AUNGERVYLE, RICHARD.

RICHARD or Crrencester (1335-1401), historical writer, was a member of the Benedictine abbey at West- minster, and his name ('Circestre") first appears on the chamberlain's list of the monks of that foundation drawn up in the year 1355. In the year 1391 he obtained a licence from the abbot to go to Rome, his design being to visit limina Apostolorum, and in this licence the abbot gives his testimony to Richard's perfect and sincere ob- servance of religion for upwards of thirty years. In 1400 Richard was in the infirmary of the abbey, where his death took place in the following year. His only known extant work is Speculum Historiale de Gestis Regum Anglhx, 447-1066. The manuscript of this is in the university library at Cambridge, and has been edited for the Master of the Rolls by Professor John E. B. Mayor (2 vols., 1863-1869). It is in four books, and at the con- clusion of the fourth book Richard expresses his intention of continuing his narrative from the accession of William I., and incorporating a sketch of the Conqueror's career from his birth. This design he does not, however, appear to have carried into effect. The value of the Speculum as a contribution to our historical knowledge is but slight, for it is mainly a compilation from Rodger Wendover, Geoffrey of Monmouth, William of Malmesbury, Florence, Asser, Henry of Huntingdon, and other writers; while even in transcribing these the compiler is guilty of great carelessness. He gives, however, numerous charters relat- ing to Westminster Abbey, and also a very complete account of the saints whose tombs were in the abbey church, and especially of Edward the Confessor, with whose reign the fourth book is entirely occupied. The work was, notwithstanding, largely used by historians and antiquaries, until, with the rise of a more critical spirit, its value became more accurately estimated. Besides the Speculum Richard also wrote, according to the statement of William Woodford in his Answer to Wickliffe (Brown, Fasciculus Rerum expetendarum, p. 193), a treatise De Oficus ; and there was formerly in the cathedral library

at Peterborough another tractate from his pen, entitled Super Symbolum. Of neither of these works, however, does any known copy now exist.

Of the Speculum the main value may be said to be of a negative character, in that it affords the most conclusive proof of the spuriousness of another work attributed to Richard and long accepted by the learned world as his. This was the De Situ Britanmex, an elaborate forgery relating to the antiquities of Roman Britain which first appeared at Copenhagen in the year 1758. It was printed along with the works of Gildas and Nennius, under the editorship of Charles Julius Bertram, professor of English in the academy of Copenhagen in the middle of the last century, with the following special title :—" Richardi

Corinensis monachi Westmonasteriensis de situ Britanniz.

libri duo. E Codici MS. descripsit, Notisque et Indice adornavit Carolus Bertram."

This forgery was accepted as genuine by a well-known antiquary of the last century, Dr William Stukeley, and under the sanction of his authority continued for a long time to be regarded in the same light by numerous scholars and antiquaries. Among their number were Gibbon, John Whitaker, Richard Gough, and Lingard. On the other hand, critics of a later date, such as J. J. Conybeare, Dr Guest, Wex, Raine, and Woodward, from time to time gave expression, on various grounds, to a contrary conclusion. All doubt on the subject may, however, be held to have been effectually set at rest by the masterly and exhaustive exposure of the whole fraud drawn up by Professor Mayor in the preface to the edition above referred to of the Speculwm. He has there not only demonstrated, from the external and internal evidence alike, the spuriousness of the whole treatise, but in a collation (extending to nearly a hundred pages) of numerous passages with corresponding passages in classical medieval anthorities, has also traced out the various sources from whence Bertram derived the terminology and the facts which he reproduced in the De Situ. "To say nothing," says Professor Mayor, " of antiquaries whose canons of criticism are so lax that they cite a supposed monk of 1400 a.p. as authority for events of 1000 B.c., we find a forger alike contemptible as penman, Latinist, historian, geographer, critic, imposing upon members of the Royal and Antiquarian Societies, and of the two ancient universities, of the youthful Society D. U. K., on the writers of Germany

and Denmark, of England, and of Scotland,—the last bribed by the invention of Vespasiana."' J. B. M.)

RICHARD oF Sr Victor (0b. c. 1173), a sseby by birth, was subprior of his convent in 1159 and prior in 1162, and was a friend of St Bernard, to whom some of his books are dedicated. The tendency of his mysticism has been characterized in vol. xvii. p. 132. Of his works, which embrace exegesis, moral and dogmatic subjects, and mystical contemplation, the first edition appeared at Paris in 1528, the best at Rouen in 1650.

RICHARDSON, Sir Jonn (1787-1865), naturalist, was born at Dumfries on November 5, 1787, and died near Grasmere on June 5, 1865. He became a surgeon in the navy in 1807, and is known by his share in the arctic explorations of Parry and Franklin, 1819-22 and 1825-26 (see Pouar ReEGions, vol. xix. p. 319), and in the Franklin search expedition of 1848-49 (2b., p. 321), but especially by his Fauna Boreali-Americana (1829-37, 4 vols. 4to). He also wrote Arctic Searching Expedition (1851), and other works on the zoology of the Arctic regions. He was knighted in 1846.

RICHARDSON, Samvet (1689-1761), as the inventor or the accidental discoverer of a new literary form, the modern novel of domestic life and manners, is entitled toa more prominent place in history than his powers, whether of thought or style, would justify. He stumbled on novel writing by accident and late in life. The son of a Derby- shire joiner (born in 1689), he had been apprenticed at the age of seventeen to a London printer (Wilde of Stationers' Hall), had spent some years as a press reader or proof corrector—not a bad position for acquiring some know- ledge of literature—had married his master's daughter, and acquired an extensive business, trying his hand occasionally in composition as a writer of prefaces and

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dedications to the books that he printed. When he was near the age of fifty some bookseller friends of his, struck perhaps by the excellence of his letters, had suggested to him that he should compose a "familiar letter-writer "— "a little volume of letters, in common style, on such sub- jects

as might be of use to those country readers who were unable to indite for themselves." Richardson improved upon the suggestion. As it happened, he had had a singular experience in the way of writing letters for others. When he was a boy of thirteen three young women who could not write had employed him to conduct their correspondence with their sweethearts, which he did, he tells us, much to the satisfaction of his employers and without betraying their confidence. It occurred to him, turning over the project of the booksellers in his mind, and reverting to this early experience, that he might tell a story in a series of letters which would serve equally well as models for letter-writing and at the same time cultivate the principles of virtue and religion in the minds of the youth of both sexes. Accordingly, the publication being for country readers, he chose a country girl, Pamela, in the service of a young squire Mr B. (Fielding after- wards expanded the initial to "' Booby"), and made her relate in letters to her friends her experiences from day to day and week to week in very trying circumstances. Friends write to advise Pamela in her difficulties, and so the story is carried on with circumstantial minuteness, Pamela describing with the most careful elaboration every particular of what happens to her, and adding her own reflexions, surmises, and appeals for approbation and counsel, The natural effect of this method is that, if we have any sympathy with the heroine, we get intensely interested in her perplexities,—the very fulness of the details and the close truth to nature with which the novelist follows every turn in the girl's thoughts com- pelling us to read on. This effect was fully realized in days when the voluminous moralizing was more in har- mony with the general taste than it is now, and the kind of thing was new and fresh. The success of Pamela was immediate and widespread, and extended at once far beyond the circle of country cousins for whom it was designed. It is said that ladies at Ranelagh Gardens were to be seen holding up one to another their copies of Pamela to show that they had in their possession the most popular book of the day. The industrious antiquary has cast doubt upon this anecdote, pointing out that Ranelagh Gardens were not open to the public till eighteen months after Pamela had begun to run through many editions. Vauxhall, however, was open if Ranelagh was not, and the incident may have been observed there, At any rate the fact expressed by the anecdote is true enough, that the novel was at once and universally popular. Pamela, the first of one long line of novels, was published in November

1740. In January 1741 the following appeared in the Gentleman's Magazine :—' Several encomiums on a series of Familiar Letters, published but last month, entitled Pamela, or Virtue Rewarded, came too late for this magazine, and we believe there will be little occasion for inserting them in our next, because a second edition will then come out to supply the demands of the country, it being judged in town as great a sign of want of curiosity not to have read Pamela as not to have seen the Wrench and Jtalian Dancers." This testimony is hardly less quaint and significant than the accredited anecdote.

It was thus that this industrious prosperous printer, a stout, rosy, vain, precise little man, carrying himself with sensitive dignity, not at all the kind of man that might have been expected to be a fashionable novelist, stumbled in the natural course of his business upon a new species of composition for which he had an unsuspected genius.

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The fame of Pamela made him a great personal favourite, especially with women, of whose hearts and fancies he had shown a knowledge so intimate. Several ladies of quality made a pet of him, deluged him with questions and con- fidences, and urged him to write more. Under this flatter- ing encouragement, the sedate author, still keeping his head and following his own plans amidst a multitude of counsellors, produced Clarissa Harlowe (1749), a model of every virtue in higher life, and Sir Charles Grandison (1753), his ideal of a perfect gentleman. Clarissa is universally acknowledged to be his masterpiece. An anec- dote was given by Macaulay which shows how entrancing the story may become to readers once fairly caught by the current of it. He took the whole eight volumes with him, when he was in India, to a hill station during the hot sea- son, and one day lent the first volume to the governor's wife. She read it and lent it to the governor's secretary, and went to Macaulay for the second. Thus all the eight volumes passed from hand to hand, and for a week or more the whole station was in a ferment over the fortunes of Clarissa, the readers anxiously waiting their turn for the successive volumes. Richardson is long-winded and prolix to a degree; but that, in spite of all his faults, he had the art of interesting his own generation was

abun- dantly proved, and apparently his greatest novel is still capable in favourable circumstances of exerting its spell. Richardson has long received the honour of being regarded as the founder of the English novel, but of late it has been customary to go a little farther back and trace the beginnings of the novel in the papers of Addison and Steele in the Tatler and the Spectator. The novel, it is said, was developed, not created, by Richardson. Now this is hardly fair to the ingenious printer, if it is meant to deny him any of the credit generally given to originators of new forms in literature. It is true that the novel was developed and not ereated, but it is not more true of Richardson's novel than of any other new species of composition, such as Marlowe's tragedy, or Scott's romantic tale, or Byron's personal epic. All alike are not created but developed in this sense that they have strongly marked affinities with kinds of writing immediately anterior to them. Thus in the novel of manners there are two elements—there is description of ordinary character, and there is plot-interest, 7.¢., there is astory. Both of these elements are found in the genera- tion before Richardson. But not in combination. 1t was he that combined them in his novel of manners, and therefore he is entitled to the praise of being the father of a new species of composition. There is abundance of description of manners in the Spectator and there are many delicate studies of character. And the general reader in the days of Queen Anne and of George I. had abundance of stories to choose from—tales of scandal, of crime, of high-flown romance. But it had not occurred to anybody before Richardson to make a heroine out of such a character as Jenny Simper, or a hero out of her baronet Sir Anthony Love, or a story out of incidents within the probabilities of ordinary life. The epistolary form in which his stories were cast, and which remains as a memorial of their first suggestion, was abandoned by Richardson's first great follower and satirist, Fielding; but it was Richardson that led the way into the new field of literature. He lived long enough to see many imitators. Within twelve years of the publication of Pamela, the Monthly Review began to complain of the labour of reading the multitude of novels submitted to its judgment, and the master- pieces of Fielding, Smollett, and Sterne were produced before his death in 1761. His correspondence was published in six volumes in 1804. (W. M.) RICHELIEU, Armanp bu Puesssis, CARDINAL DE (1585-1642), the greatest French statesman of the 17th century. As the chief

events of his life have been recorded in connexion with the sketch of his political career in the article FraNcE (vol. ix. pp. 567-570), it only remains briefly to mention here some matters of second- ary importance. In the early days of his courtiership when he retired for a time to Avignon Richelieu wrote two religious works which attained to considerable popu- larity—Principaua points de la foy deffendus contre Pescrit adressé au roy par les quatre ministres de Charenton (1617), and La méthode la plus facile et assurée de convertir ceux gut sont séparés de l Hglise (Paris, 1651). After he became master of France, his desire for distinction as a

man of letters and especially as a dramatic author led him to resort to various devices that were as undignified and ludicrous as they were high-handed and arbitrary. In the life of Corneille it has already been told how he employed " five poets" to "wash his dirty linen" (as Voltaire described the similar service he rendered to Frederick the Great), and how he attempted to revenge himself on Corneille, the greatest of the five, by causing the French Academy to pass a hostile verdict on the Cid. Even this high treason against art may perhaps be for- given in consideration of the practical services the cardinal rendered to the cause of literature. Les Thuileries, La Grande Pastorale, Mirame, and the other plays, over whose fate he trembled as over the result of an embassy or a campaign, have long been forgotten; but a permanent interest attaches to his MMJémoires and correspondence (though owing to his way of working with substitutes and assistants it has been a difficult task to settle how much of what passes under his name is authentic) :—Jfémoire d'Armand du Plessis de Richelieu, évéque de Lucon écrit de sa main, Vannée 1607 ou 1610, alors qwil méditait de paraitre &@ la cour, edited by Armand Baschet, 1880; LI' Histoire de la Mére et du Fils, (v.e., of Mary de' Medici and Louis XIII), Amsterdam, 1730, extending from 1610 to 1624, frequently attributed to Mézeray ; Mémoires from 1624-1638, published in Petitot's collection (Paris, 1823) ; Journal de M. le Cardinal de Richelieu, 1630- 1631 (Amsterdam, 1664, 2 vols.); Zestament politique du Cardinal de Richelieu (Paris, 1764); Les lettres, instruc- tions diplomatiques, et papiers Wétat du Cardinal de fichelieu, collected and

edited by M. Avenel, and forming five volumes of the Collection de documents inédits sur Vhistoire de France (Paris, 1853-56).

Besides the older works of Aubery (1660) and Leclerc (1694) see A. Jay, Hist. du ministere de Richeliew, 1815 ; Capefigue, Richelieu, Mazarin, la Fronde, &c., 1844; Caillet, L'administration en France sous Richelicu, 1860; Martineau, Le Cardinal de Richelicu, 1865; Topin, Louis XIII, et Richelicu, 1877 ; Sainte-Beauve, Causeries du lundi, vol. vii.

RICHELIEU, Lovis Francors ARMAND DU PLEssis, Duc pE, marshal of France and grand-nephew of Cardinal Richelieu, was born in Paris, 13th March 1696, and died in the same city 8th August 1788. Besides his reputation as the most scandalous Lovelace of a scandalous age, he attained, in spite of a deplorably defec- tive education, distinction as a diplomatist and general. As ambassador to Vienna (1725-1729) he settled in 1727 the preliminaries of peace; in 1745 he helped to gain the victory of Fontenoy; three years afterwards he made a brilliant defence of Genoa; in 1756 he expelled the English from Minorca by the capture of the San Felipe fortress; and in 1757-1758 he closed his military career by those pillaging campaigns in Hanover which pro- cured him the sobriquet of Petit Pére de la Maraude. In his early days he was thrice imprisoned in the Bastille,— in 1711 at the instance of his stepfather, in 1716 in consequence of a duel, and in 1719 for his share in Alberoni's conspiracy against the Regent. He was thrice married : first, against his will, at the age of fourteen to Mademoiselle de Noailles; secondly, in 1734, by the in- trigues (according to the witty Frenchman's own account) of Voltaire, to Mademoiselle de Guise ; and thirdly, when he was eighty-four years old, to an Irish lady. Marshal Richelieu's Jlémoires published by Soulavie in nine volumes (1790) are partially spurious.

RICHELIEU, Armanp EMMANUEL pu Ptessis, Duc DE (born 25th September 1766, died 17th May 1822), grandson of the marshal, is remembered mainly as the enlightened and heroic governor of Odessa (1803-1813) who guided the city through the terrible years of the plague, and as the minister of foreign affairs under Louis

XVIII. to whom it fell to sign the treaty of 1815. A pension of 50,000 francs, voted to him by the two chambers, he bestowed on the public charities of Bor- deaux.

RICHERUS, a chronicler of the 10th century, son of Rodulf, a trusty councillor and captain of Louis IV., studied at Rheims under Gerbert, afterwards Pope Silvester IJ. His intimacy with this famous man gave him many opportunities of knowing the history of his time, and when Gerbert became archbishop of Rheims he charged Richerus with the task of writing a history of the Gauls. This history in four books begins with Charles the Fat and Eudes, and goes down to the year 995. From 969 onwards Richerus had no earlier history before him, and his work is the chief source for the period when the Capets superseded the Carlovingians. It was first edited in Pertz's Monumenta Germaniz, vol. iii., and there have since been several separate editions.

RICHMOND), a town of Surrey, is situated on the south bank of the Thames, here crossed by a stone bridge of five arches, 84 miles west of Hyde Park Corner by road, and 9? from the Waterloo station of the South-Western Rail- way. The town, anciently called Syenes and afterwards Schene and Sheen, until the name was in 1500 changed to Richmond by command of Henry VIL, grew up round the royal manor house, which became a frequent residence of different sovereigns, but of which nothing more than a gateway now remains. Edward I. received the Scotch commissioners at his manor of Sheen in 1300. The palace was rebuilt by Edward III., who died there in 1377. It was frequently resided in by Richard II., and here his wife Anne of Bohemia died, upon which he cursed the place and "caused it to be thrown down and defaced." By Henry V. it was, however, rebuilt, and a great tourna- ment was held at it in 1492 by Henry VIL, who after its destruction by fire in 1499 restored it and named it Rich- mond. Henry VIII. gave it to Wolsey to reside in, after the latter presented him with the new palace of Hampton Court. James I. settled it on his son Henry, prince of Wales, who restored and embellished it at great expense. Charles I. added to it the new deer park generally known as Richmond Park, 2253 acres in extent, which is sur- rounded by a wall 11 miles in length. After the execu- tion of the king, the parliament presented the park to the citizens of London, who again presented it to

Charles IT. at the Restoration. Though partly dismantled, the palace was the residence of the queen dowager till 1665, and by James II. it was used as a nursery for the young prince ; but, gradually falling into decay, it was, about 1720, parcelled into tenements. In the old deer park extending northwards from the site of the palace towards Kew an observatory was erected in 1769, occupying the site of a Carthusian convent founded by Henry V., and a dwelling house in which Swift for some time resided. To the south-east of the town, at the entrance to Richmond Park, is Richmond Hill, from which is the famous view of the Thames with the surrounding country to the west. The White Lodge in Richmond Park is usually the residence of some inember of the royal family. The town itself is without special interest, and consists chiefly of one long and irregular street running north and south. The church of St Mary Magdalen is of considerable antiquity, but has been almost entirely rebuilt; it contains a large number of monuments to celebrated persons. The theatre, first established in 1719, was during his later years leased by Edmund Kean. The town has a Wesleyan theological college founded in 1834, a free public library, and public baths. The population of the urban sanitary district (area 1210 acres) in 1871 was 15,113, and in 1881 it was

19,066.

O45

RICHMOND, a borough in the North Riding of Yorkshire, is finely situated on the Swale, at the terminus of the Richmond branch of the North-Eastern Railway, 44 miles north-west of York and 15 south-west of Darlington. The interest of the town centres in the castle, said to have been founded by Alan Rufus, son of Hoel, count of Bretagne, who is also said to have rebuilt the town on his obtaining the estates of the Saxon Earl Edwin, embracing two hundred manors of Richmond and extending over nearly a third of the North Riding. When Henry VII. came to the throne these possessions reverted to the crown. Henry VIII. gave it to his son Henry by a daughter of Sir John Blount, and Charles II. bestowed the title of duke of Richmond on his son by the duchess of Portsmouth. The castle is situated on a perpendicular rock rising about 100 feet above the Swale, and from its great strength was con- sidered inaccessible.

Originallyit covered an area of 5 acres, but the only portions of it now remaining are the Norman keep, with pinnacled tower and walls 100 feet high by 11 feet thick, and some other smaller towers. A portion of it is now occupied by the North York Rifles militia. The old church of St Mary, chiefly in the Gothic style, though with some traces of Norman, has been restored under the direction of Sir Gilbert Scott. For the free grammar school founded by Elizabeth a Gothic building was erected in 1850, in memory of the Rev. James Tate, a former master. The tower of the Franciscan abbey founded in 1258 still remains. The chief modern buildings are the town-hall, the masonic hall, and the workmen's hall. The principal trade is in agricultural produce, but there are a paper mill and an iron and brass foundry. The town received its first charter from Elizabeth. Under the Municipal Corporations Act it is governed by a mayor, four aldermen, and twelve councillors. Up to 1885, when it ceased to be separately represented, Richmond was a parliamentary borough, returning two members till 1868, and one after that date. The population of the municipal borough (area 2520 acres) in 1871 was 4443, and in 1881 it was 4502.

RICHMOND, a city of the United States, the county seat of Wayne county, Indiana, is situated in a fine agricultural region on the east branch of the White Water River (a sub-tributary of the Ohio), 68 miles east of Indianapolis. It is an important railway junction, has a city park 135 acres in extent, manufactures machinery, agricultural implements, &c., and contains a public library (15,000 volumes), a museum, two theatres, and two edu- cational institutions (Earlham College, 1859) belonging to the Society of Friends, which is strongly represented in the city. The population was 9445 in 1870, and 12,742 in 1880. The city obtained its charter in 1845.

RICHMOND, a city of the United States, the capital of Virginia, is situated in Henrico county, on the north side of the James River, at the point where the lower falls (100 feet in 6 miles) mark the limit of the tide ascending from Chesapeake Bay. On the other side of the river, and in the county of Chesterfield, but connected with Richmond by bridges, is Manchester. By rail the city is 116 miles south-south-west of Washington. At mean high tides vessels drawing 14 feet of water can come up to

Rocketts, as the lower district is called. The town proper occupies a group of hills—Gamble's Hill, Shockoe Hill, Church Hill, &e.—and looks down over the river, from which it is separated by a strip of flat ground. Main Street is a typical street after the old Southern style, the large portion burned in 1865 having been rebuilt in keeping with the remnant that escaped. By far the most conspicuous edifice in the city is» the Capitol, on the summit of Shockoe Hill, designed by Thomas Jefferson, after the Maison Carrée of Nimes. Beneath the dome of

the central hall stands Houdon's marble life-size statue of Washington in the uniform of a pre-Revolutionary Ameri- can general, and in the esplanade near the west gates of Capitol Square is Crawford's famous bronze equestrian statue of the same hero (1858), surrounded by bronze figures of Patrick Henry, Thomas Jefferson, John Marshall, George Mason, Thomas Nelson, and Andrew Lewis. North of the Capitol stands Foley's bronze statue of General "Stonewall" Jackson, the gift of English ad- mirers of that great Confederate leader. A governor's house, a State penitentiary, a custom-house and post office, a city-hall and almshouse, and two market-houses are among the principal public buildings. Libby prison, in which thousands of Federal prisoners were confined during the Civil War, was originally a disused tobacco factory, and is now scarcely distinguishable from the other dilapidated brick warehouses in its vicinity. St John's Episcopal church on Church Hill was, in 1775, the meeting-place of the Virginia convention to which Patrick Henry addressed his famous "Give me liberty or give me death," and in 1788 of another convention summoned to discuss the ratification of the Federal Constitution. Monumental Church (Episcopal) commemorates the disas- trous burning in 1811 of the theatre which then occupied the site. The State Library, the Virginia Historical Society, Southern Historical Society, Richmond College, and the Medical College (1838) are institutions of note. Holywood Cemetery, occupying a district of great natural beauty to the west of the city, contains the graves of thousands of Confederate

soldiers and the monuments of President Monroe and General J. E. B. Stuart, and the Confederate soldiers' monument. Previous to the Civil

War Richmond was the commercial capital of the South |

and a great entrepdt for the produce of the Southern States, Cuba, South America, and Great Britain. Its clipper ships made fast voyages to the Pacific for tea, silk, and other Eastern wares. Its auction sales (monthly or even fortnightly) drew buyers from every part of the Union, even from the northern cities which now supply it with the very commodities they then visited it to pur- chase. When the war was over Richmond was without ships, merchants, or capital. The tea trade had gone to London, the South-American to New York and Boston, In recent years, however, a new period of commercial pro- sperity appears to have set in, and, while several of the old sources of wealth have disappeared, the city still remains the natural centre of some of the principal trades of the Sonth. Before the war more tobacco was sold in Rich- mond than perhaps in any city of the Union (fifty-six manufacturers were numbered in 1857), and this still remains an important staple. The flour trade is also of great extent. There are a large number of iron works, including those of the Tredegar Company; and granite quarries are worked in the vicinity of the city. In 1857 the real estate of Richmond was assessed at $18,259,816, and the personal property at $10,287,278. By 1885 the corresponding figures were $34,502,903 and $15,000,000. The city is the owner of both gas and water works. The population, which was only 5737 in the beginning of the century, has increased as follows :—9785 in 1810; 12,067 in 1820; 16,060 in 1830; 20,153 in 1840; 27,570 in 1850; 37,910 in 1860; 51,038 in 1870; 63,600 in 1880 (27,832 coloured).

The first settlement on part of the site of Richmond is said to date from 1609 ; and Fort Charles was erected as a defence against the Indians in 1644-45. But the real origin of the town, which was incorporated in 1745, was Byrd's warehouse, erected by Colonel William Byrd in the close of the 17th century. It was still a small village when in 1779 it was made the capital of the State of

Virginia. From May 1861 till April 1865, when it was occupied by the Federal army, Richmond was the seat of government of the

Confederate States. On the capture of Petersburg by General Grant the Confederate leaders thought it impossible to hold the city, in spite of the strength of its fortifications ; and Ewell, who com- manded the rear-guard of the retreating army, set the great tobacco factories and flour-mills and the arsenal on fire; the conflagra- tion lasted till the evening of the following day. In September 1870 part of the city was laid under water by the floods of the James river.

RICHMOND, Leen (1772-1827), writer of tracts, was born 29th January 1772 at Liverpool, where his father was a physician. He was educated at Trinity College, Cambridge, where he graduated B.A. in 1794 and M.A. in 1797. In 1798 he was appointed to the joint curacies of Brading and Yaverland in the Isle of Wight. Through the petusal of Wilberforce's Practical View an evangeli- cal bias was given to his mind, which led him to devote himself with great earnestness to the reclamation of the masses. He took a prominent interest in the British and Foreign Bible Society, the Church Missionary Society, and various other institutions of a similar kind. In 1805 he became chaplain to the Lock Hospi- tal, London, and in the same year was presented to the rectory of Turvey, Bedfordshire, where he remained till his death, 8th May 1827. He was also appointed chaplain to the duke of Kent. The best known of the tracts of Legh Richmond is the Dairyman's Daughter, of which as many as four millions in nineteen languages were circulated before 1849. A collected edition of his tracts was first published in 1814 under the title of Annals of the Poor. He was also the author of Domestic Portraiture, and Memoirs of his Three Children; and he edited a series of the Fathers of the English Church.

See Memoirs by Grimshawe, 1828 ; Life by Bedell, 1829.

RICHTER, Ernst Frieprich Epuarp (1808-1879), writer on musical theory and composition, was born at Grosschénau in Saxony, on October 24, 1808. He first studied music at Zittau, and afterwards at Leipsic, where he attained so high a reputation that in 1843 he was appointed professor of harmony and counterpoint at the conservatorium of music, then newly founded by Men- delssohn. On the death of Hauptmann, January 3, 1868, he was elected cantor of the Thomasschule, which office

he retained until his death, April 9, 1879. He is best known by three theoretical works — Lehrbuch der Harmonie, Lehre vom Contrapunct, and Lehre von der Fuge—originally written for the use of his pupils at the Conservatorium, but now everywhere accepted as valuable text-books, and well known to English students through the excellent translation by Mr Franklin Taylor.

RICHTER, Joann Pav Frieprich (1763-1825), usually called Jean PavL, the greatest German humorist, was born at Wunsiedel, in Bavaria, on the 21st March 1763. His father was a schoolmaster and organist at Wunsiedel, but in 1765 he became a pastor at Joditz, and in 1776 at Schwarzenbach, where he died in 1779. Having attended the gymnasium at Hof for two years, Richter went in 1780 to the university of Leipsic. His original intention was to enter his father's profession, but theology did not interest him, and he soon devoted himself wholly to the study of literature. Unable to maintain himself at Leipsic, he secretly left it in 1784 and lived with his mother at Hof. From 1787 to 1789 he served as a tutor at Tépen, a village near Hof; and afterwards he taught the children of several families at Schwarzenbach. During all these years he had to struggle with extreme poverty,

but he never lost the buoyancy of his temper, nor did he

doubt for a moment that his genius would in the end be generally recognized. His hardships left no trace of bitterness on his frank and manly spirit.

Richter began his career as a man of letters by writing the Grinldndische Processe and Auswahl aus des Teufels

Papieren, the former of which was issued in 1783-84, the | reader, and forgot nothing that had ever touched his fancy or

latter in 1789. These works were not received with much favour, and in later life Richter himself had little sympathy with their satirical tone. His next book, Die Unsichtbare Loge, a romance, published in 1793, had all the qualities which were soon to make him famous, and its power was immediately recognized by some of the best critics of the day. Soon after the appearance of this book he abandoned his work at Schwarzenbach, and lived again with his mother at Hof, occasionally paying long visits to a friend at Baireuth. Encouraged by the reception of Die Unsicht- bare Loge, he sent forth in rapid succession Jfesperus (1794), Biographische Belustigungen unter der Gehirnschale einer Riesin (1796), Leben des Quintus Fixlein (1796), Blumen-, Frucht-, und Dornenstiicke, oder Ehestand, Tod, und Hochzeit des Armenadvocaten Siebenkds (1796-97), Der Jubelsenior (1797), and Das Kampaner Thal (1798). This series of writings secured for Richter a great place in German literature, and during the rest of his life every work he produced was welcomed by a wide circle of admirers.

After his mother's death he went in 1797 to Leipsic, and in the following year to Weimar, where he had much pleasant intercourse with Herder, by whom he was warmly appreciated. He did not become intimate with Goethe and Schiller, to both of whom his literary methods were repugnant ; but in Weimar as elsewhere his remarkable conversational powers and his genial manners made him a favourite in general society. He was especially liked by women, and Frau von Kalb, who has also a place in the biography of Schiller, even offered to obtain a divorce in order to marry him. In 1801, however, he married Caroline Mayer, a bright, accomplished, and amiable lady whom he met in Berlin in 1800. They lived first at Meiningen, then at Coburg; and finally, in 1804, they settled at Baireuth. Here Richter spent a quiet, simple, and happy life, constantly occupied with his work as a writer. In 1808 he was fortunately delivered from anxiety as to outward necessities by the kindness of the prince primate, who gave him a pension of a thousand florins. Before settling at

Baireuth, Richter had published Das heimliche Klaglied der jetzigen Mcnner (1801), and Titan (1800-3) ; and these were followed by Flegeljahre (1804-5). Titan and Flegeljahre he regarded as his masterpieces, and this judgment has been confirmed by posterity. His later imaginative works were Dr Katzen- berger's Badereise (1809), Des Leldpredigers Schmelze [Reise nach Fldtz (1809), Leben Fibels (1812), and Der Komet, oder Nikolaus Marggraf (1820-22). In Vorschule der Aesthetik (1804) he expounded 'his ideas on art; he discussed the principles of education in JLevana, oder Eraehungslehre (1807); and the opinions suggested by current events he set forth in I'riedenspredigt (1808), Démmerungen fiir Deutschland (1809), Mars und Phébus Lhronwechsel im J. 1814 (1814), and Politische Fasten- predigten (1817). In his last years he began Wahrheit aus Jean Paul's Leben, to which additions from his papers and other sources were made after his death by C. Otto and E. Forster. In 1821 Richter lost his only son, a youth of the highest promise ; and he never quite recovered from this shock. He died of dropsy on the 14th November 1825.

Schiller said of Richter that he would have been worthy of admiration 'if he had made as good use of his riches as other men made of their poverty." And it is true that in the form of his writings he never did full justice to his great powers. In working out lis conceptions he found it impossible to restrain the expres- sion of any powerful feeling by which he might happen to be moved. He was equally unable to resist the temptation to bring in strange facts or notions which occurred to him ; and of such facts and notions he had a vast store, for he was an omnivorous

awakened his sympathies. Hence every one of his works is irregular in structure, and in some of them it is hard to detect the governing idea by which the relation of the parts to the whole is supposed to be controlled. His style, too, lacks directness, precision, and grace. With the main idea of a sentence he almost invariably associates a crowd of subordinate ideas ; and they are often grouped in an order so capricious and so fantastic that the meaning can be made out only by the closest study. The splendour of Richter's genius, however, makes it easy for the class of readers to whom he appeals to forgive even these grave defects. His

imagination was one of extraordinary fertility, and he had a surprising powcr of suggesting great thoughts by means of the simplest incidents and relations. No German prose writer has presented more fascinating pictures of childhood and youth, of friendship and love; nor has any one shown more fincly how sordid circumstances may evoke the noblest qualities of loyal and generous minds. The love of nature was one of Richter's deepest pleasures, and he communicates his own delight in its beauty by many a description glowing with all the colour and the radiance of the real world. His expressions of religious feelings are also marked by a truly poctic spirit, for to Richter visible things were but the symbols of the invisible, and in the unseen realities alone he found clements which seemed to him to give significance and dignity to human life. His humour, the most distinctive of his qualities, cannot be dissociated from the other characteristics of his writings. Itmingled with all his thoughts, and to some extcut determined the form in which he embodied even his most serious reflections. That it is sometimes extravagant and grotesque cannot be disputed, but it is never harsh nor vulgar, and generally it springs naturally from the perception of the incongruity between ordinary facts and ideal laws. 'here are works of imaginative genius which we may read and enjoy without necessarily thinking of the author. The writer may reflect nature with so much fidelity that at first sight no element may scem to be imported into his conceptions from his personal peculiarities. But we appear always to sce Richter's face and to hear his voice behind the printed page ; and his creations are true and suggestive only in so far as they are manifestations of his own inward life. This means, of course, that his genius was not in any important sense dramatic, and that he was much more closely akin to the romantic than to the classic school ; but it does not imply that his works produce a monotonous impression. Richter's personality was so deep and many-sided that in every new book he had some fresh secret to disclose. And the more he is known through his unconscious self- revelation the more he is loved and honoured; for we soon learn that with all his wilfulness and eccentricity he was a man of a pure and sensitive spirit, with a passionate scorn for pretence and an

ardent enthusiasm for truth and goodness.

1n 1826-38 a complete edition of Richtcr's works was published in sixty-five volumes, including several posthumous works. The second edition (1840-42) was in thirty-three volumes, the third (1860-63) in thirty-four. There are also a good many volumes of Richter's correspondence, Sce Déring, Leben und Charakteristik Richter's (1826); Kunz, Jean Paul Friedrich Richter (1839); and Nerrlich, Jean Paul und seine Zeitgenossen (1876), There are two admirable articles on Richter in Carlyle''s Miscellanies.

RICIMER, created "comes" of the empire under Valentinian III., was the son ofa chief of the Suevi, who had married a daughter of Wallia king of the Visigoths. He was brought up at Valentinian's court, and served with distinction under Aetius. In 456 a decisive naval victory over the Vandals off Corsica, followed soon after- wards by the defeat of their land forces near Agrigentum, earned for him the title of ''Deliverer of Italy" and brought him within sight of the goal of his ambition. Having vanquished and deposed the emperor Avitus in October of that year, he for some time exercised every function of sovereignty over Italy under the title of "patrician," which he received from Leo in February 457. Precluded by his barbarian origin from aspiring to the imperial title, he consented to the elevation of Majorian in April 457, but, encouraged by the misfortunes of that brave but simple-minded soldier, he was equally ready to force his deposition four years afterwards (August 461). The puppet on whom the imperial dignity was now bestowed was Libius Severus, but Ricimer continued to command armies, negotiate alliances, and wield an inde- pendent and despotic authority over the Italian peninsula, although his power throughout the rest of the Western empire was practically neutralized by the influence of Marcellinus in Dalmatia and Aigidius in Gaul. When Anthemius, invested with the purple by Leo, arrived at

Rome in 467, Ricimer was politic enough to acquiesce with a good grace, and was rewarded by being made the son-in-law of the new emperor; but subsequently a quarrel with his father-in-law occasioned his withdrawal to Milan, whence he marched at the head of an army upon Rome, which he besieged and sacked, Anthemius being among the slain (July 11, 472).

Olybrius was next made emperor at the instance of the Roman "kingmaker," who died of a malignant fever on August

18, 472.

RICKETS, a disease of childhood characterized chiefly by a softened condition of the bones and by other evidences of perverted nutrition. As regards its nature and causa- tion rickets has been so fully considered under PATHOLOGY that all that appears now necessary is to give a few details as to its chief manifestations, and to refer briefly fo some points in relation to its prevention and treatment.

Although, as already indicated, rickets may have its origin (at least in some instances) during intra-uterine life, it is seldom that it can be recognized until several months after birth, and it most commonly attracts atten- tion at about the end of the first year. The symptoms which precede the outward manifestation of the disease are marked disorders of the digestive and alimentary functions. The child's appetite is diminished, and there is frequent vomiting together with diarrhcea or irregularity of the bowels, the evacuations being clay-coloured and unhealthy. Along with this there is a falling away in flesh. Import- ance is to be attached, as pointed out by Sir William Jenner, to certain other symptoms present in the early stages, namely, profuse sweating of the head and upper parts of the body, particularly during sleep, with at the same time dry heat of the lower parts and a tendency in the child to kick off all coverings and expose the limbs. At the same time there is great tenderness of the bones, as shown by the pain produced on moving or handling the child. The urine contains a large amount of calcareous salts. Gradually the changes in the shape of the bones become visible, at first chiefly noticed at the ends of the long bones, as in those of the arm, causing enlargements at the wrists, or in the ribs, producing a knobbed appear- ance at the junction of their ends with the costal carti- lages. The bones also from their softened condition tend to become distorted and misshapen, both by the action of the muscles and by the superincumbent weight of the body. Those of the limbs are bent outwards and forwards, and the child becomes "' bow-legged " or "in-kneed " often to an extreme degree. The trunk of the body likewise shows various alterations and deformities

owing to curvatures of the spine, the flattening of the lateral curves of the ribs, and the projection forwards of the sternum. The cavity of the chest may thus be contracted and the development of the thoracic organs interfered with as well as their func- tions more or less embarrassed. The pelvis undergoes dis- tortion, which may reduce its capacity to a degree that in the female may afterwards lead to serious difficulties in parturition. The head of the rickety child is large-looking in its upper part, the individual bones of the cranium sometimes remaining long ununited, while the face is small and ill-developed, and the teeth appear late and fall out or decay early. The constitutional conditions of ill-health continue, and the nutrition and development of the child are greatly retarded.

The disease may terminate in recovery, with more or less of deformity and dwarfing, the bones although altered in shape becoming firmly ossified, and this is the common result in the majority of instances. On the other hand, during the progress of the disease, various intercurrent ailments are apt to arise which may cause death, such as the infectious fevers, bronchitis and other pulmonary affec-

tions, chronic hydrocephalus, convulsions, laryngismus stri- dulus, &c.

An acute form of rickets of rare occurrence has been described by writers on diseases of children, in which all the symptoms are of more rapid development and progress, the result in many instances being fatal.

The treatment of rickets is necessarily more hygienic than medi- cinal, and includes such preventive measures as may be exercised by strict attention to personal health and nutrition on the part of mothers, especially where there appears to be any tendency to a rickety development inany members of the family. Very important also is the avoidance of too prolonged nursing, which not only tends directly to favour the development of rickets in the infant nursed, but by its weakening effects upon the mother's health is calculated to engender the disease in any succeeding children. At the same time it must be admitted that, when the mother is healthy, her milk abundant, aud nursing

discontinued before the lapse of the first year, there is no better means of preventing the occurrence of rickets than this method of feeding an infant, the disease, as is well known, being far more frequently met with in children brought up by hand. The management of the child exhibiting any tendency to rickets is of great importance, but can only be alluded to in general terms. 'The digestive disorders characteristic of the setting in of the disease render necessary the greatest care and watch- fulness as to diet. Any one system of feeding the infant may at times be found to disagree, and may require to be changed or modified in some particulars. Thus, if the child be not nursed but fed artificially, milk, either fresh or condensed, should be almost the only article of diet for at least the first year, and the chief element for the next. When not digested well, as may at times be shown by its appearance as a curd in the evacuations, it may be diluted with water or lime water, or else discontinued for a short time, carefully-made gruel or barley water being sub- stituted. Many of the so-called "infant's foods" which are now so extensively used appear to be well adapted for their purpose, but when employed too abundantly and to the exclusion of the due amount of milk are often productive of digestive and in- testinal disorders, probably from their containing a greater amount of starchy matter than can be utilized. From the end of the first year light animal soups may occasionally be given with advantage. The medicinal remedies most to be relied on are those which improve the digestive functions and minister to nutrition, and include such agents as the preparations of iron, quinine, and especially cod-liver oil. The administration of lime salts in large quantity has been proposed by some physicians under the idea that in this way the deficient earthy matter might be supplied to the bones. M. Piorry recommended for this purpose powdered fresh bones which contain a large amount of phosphate of lime. No great success can be claimed for this plan, and it is generally recognized that the most useful method of treatment is that which is directed to the feeble assimilative powers, and seeks to supply food of a kind which will be at once readily digested and nutritious. Of no less importance, however, are abundance of fresh air, cleanliness, warm clothing, and attention to the general hygiene of the child and to regularity in all its functions.

When the disease is showing evidence of advancing, it is desir- able to restrain the child from walking, as far as possible. But this precaution may be to some extent rendered unnecessary by the use of splints and other apparatus as supports for the limbs and body, enabling the child to move about without the risk of bending and deformity of the bones which otherwise would probably be the result. (J. O. A.)

RICKMAN, Tuomas (1776-1841), architect and writer on the styles of the Middle Ages, was born in 1776 at Maidenhead, Berkshire, where his father practised as a surgeon, and was brought up as a member of the Society of Friends. In 1797 he was apprenticed to a London druggist as a step towards entering his father's profession, but finding the work distasteful he gave it up, and for several years tried one employment after another with little success. He married early, and lost his wife, who was his cousin, in 1808. At that time he was a partner in a corn-factor's business in London, but he afterwards went to live in Liverpool as assistant to an insurance broker, and was soon led to take a very keen interest in the study of ancient buildings, especially churches. All his spare time was spent in sketching and making careful measured drawings, till he gained a knowledge which was very remarkable at a time when but little taste existed for the beauties of the Gothic styles. In this way Rickman

was led to make designs of his own, founded upon his study of old examples ; and, when a large grant of money was made by the Government to build new churches, he sent ina design of his own which was successful in an open competition; thus he was fairly launched upon the profession of an architect, for which his natural gifts strongly fitted him. Rickman then moved to Birmingham, and at first worked at his new profession with Mr H. Hutchinson as managing clerk ; and when he died in 1830 Rickman entered into partnership with Mr Hussey, having become one of the most successful architects of his time. He built an immense number of churches, chapels, and other buildings, among which some of the chief are churches at Hampton Lucy, Ombersley, and Stretton-on- Dunsmore, St George's at Birmingham, St Philip's and St

Matthew's both in Bristol, two in Carlisle, St Peter's and St Paul's at Preston, St David's in Glasgow, Grey Friars at Coventry, and many others. He also designed the new court of St John's College, Cambridge, a palace for the bishop of Carlisle, and several large country houses. These are all in the Gothic style, but, though superior perhaps to the buildings of his predecessors, they show more know- ledge of the outward form of the medizval style than any real acquaintance with its spirit, and are little better than dull copies of old work, disfigured by much poverty of detail. Rickmann nevertheless was an important stage in the revival of taste for medievalism, perhaps in that respect only second to Pugin. His book entitled An Attempt to Discriminate the Styles of Architecture in England is a work which deserves great credit for its painstaking research ; a great many editions of it were published, and it was eventually much improved and enlarged. Rickman died in 1841.

RIDDLES are probably the oldest extant form of humour, They spring from man's earliest perception that there are such things as analogies in nature. Man observes an example of analogy, puts his observations in the form of a question, and there is the riddle ready made. Some Beeotian humorist, for example, detected the ana- logy between the life of humanity—the child on all fours, the man erect on two legs, old age with its staff—on one side, and on the other the conception of an animal with a varying number of limbs. Put this ina question, and it is the riddle of the Sphinx. Another instance is the ques- tion—" What we caught we threw away, what we could not catch we kept." Homer is said to have died of vexation at not being able to discover the answer to this riddle, still current on the coast of Brittany, in Germany, and in Gascony. After inventing the riddle, men began to use it in a kind of game; bets were staked on the answer, and sides were made, each side backing its champion. These sports in Marriner's time were common in Tonga ; they are no less popular among the African Woloffs. The example of Samson's riddle set to the Philistines is an instance of the sport in a Semitic country. In mahrchen and ballads, the hero's chance of winning his beloved, or of escaping threatened punishment, is often made to turn on his power of answering riddles. It follows from the artless and primitive character of the riddle that regular popular riddles (Devinettes) are widely distributed, like popular tales, popular songs, and popular customs. The Woloffs ask,

“ What flies for ever and rests never?” Answer, The Wind. The Basutos put this riddle—“‘ What is wing- less and legless, yet flies fast and cannot be imprisoned 1” Answer, The Voice. The German riddle runs—“ What can go in face of the sun yet leave no shadow 1” Answer, The Wind. In riddles may perhaps be noticed the ani- mistic or personalizing tendency of early human thought, just beginning to be conscious of itself. The person who asked these riddles had the old sense of wind, for example,

o4+9

as a person, yet probably, unlike the Bushmen, he would never expect to see the personal wind. He knew the distinction between the personal and impersonal well enough to be sure that his enigma would present some difficulty. The riddle, to be brief, is an interrogatory

form of the fable, and like the fable originates among

rude people, and is perpetuated in the folklore of peasantry.

Probably the best book on the riddle (a subject less frequently studied than the mahrchen or the myth) is Eugene Rolland, Devinettes ou Enigmes Populaires, with a preface by M. Gaston Paris. The power of answering riddles among the people who invented the legend of Solomon and the queen of Sheba seems to have been regarded as a proof of great sagacity. The riddle proper is all’ but extinct outside folklore and savage life, and has been replaced by the conundrum, which is a pun in the interrogative form.

RIDING. See Horsemansuip, vol. xii. p. 195.

RIDLEY, Nicuouas (c. 1500-1555), bishop of London, and a martyr to the Reformation, was descended from a family long seated in Northumberland. The second son of Nicholas Ridley of Unthank near Willimoteswick in that county, he was born in the beginning of the 16th cen- tury. From the grammar school of Newcastle-upon-Tyne he was sent to Pembroke College, Cambridge, about 1518, being supported there by his uncle, Dr Robert Ridley, fellow of Queen’s College. At the university he specially distin- guished himself in Greek. He proceeded B.A. 1522-23,

became a fellow of his college, and, having taken orders, was sent about 1527 at the expense of his uncle to study on the Continent, first at the Sorbonne, Paris, and afterwards at Louvain. On his return to Cambridge he was in 1530 chosen under-treasurer of the university ; and in 1534 he was senior proctor, when along with the vice-chancellor and the other proctor Richard Wilkes he signed the decree of the university against the jurisdiction of the pope in England. About this time he began to distinguish himself as an orator and disputant, and was chosen chaplain of the university, and "Magister Glo- merie,"—an office in which most probably (for its duties have been much disputed) he had to instruct the university entrants in Latin, Cranmer, archbishop of Canterbury, after Ridley had proceeded B.D. in 15387, appointed him one of his chaplains, and in April 1538 collated him to the vicarage of Herne, Kent, where he began to preach the doctrines of the Reformation. In 1540, having commenced doctor of divinity, he was made king's chaplain; and in the same year he was elected master of his college in Cambridge. Soon after he was appointed a canon of Canterbury. At the instigation of Bishop Gardiner he was accused in the bishop's court of preaching against the doctrine of the Six Articles, but after the matter had been referred to commissioners specially appointed by the king he was acquitted. In 1545 he renounced the doctrine of tran- substantiation, and was made a canon of Westminster. In 1547 he was presented by the fellows of Pembroke Hall to the living of Soham, Cambridgeshire, and the same year was consecrated bishop of Rochester. In 1550 he was one of the commissioners for examining Bishops Gardiner and Bonner. He concurred in their deprivation, and succeeded the latter in the see of London. In 1552, returning from Cambridge, he paid a visit to the princess, afterwards Queen Mary, at Hunsdon, Hertfordshire. On account of her unqualified condemnation of the Reformed doctrines, he from this time concurred in the proposals to exclude her from the throne, and he signed the will of Edward VI. settling the crown on Lady Jane Grey. On the death of the king, he, in a sermon at St Paul's Cross, 16th July

1553, affirmed that Mary was illegitimate, and predicted that her accession would be disastrous to the religious interests of England. After

the proclamation of Mary he set out for Framlingham to confess his offences against her, but was met with a warrant for his arrest and was committed to the Tower. In March 1554 he was sent down, along with Cranmer and Latimer, to Oxford to be tried before a committee of convocation. He was convicted of heresy, and after refusing to recant was sentenced to death. The trial having been declared irregular, he was, in September 1555, along with Cranmer and Latimer, tried by special commissioners, and on the 16th October he, in company with Latimer, was burnt at the stake at Oxford.

The collected edition of the works of Ridley, published in 1841 with a biographical notice by Rev. Henry Christmas, includes 4 Treatise concerning Images in Churches ; A brief Declaration of the Lord's Supper ; Certain godly and comfortable Conferences between Bishop Ridley and Mr Hugh Latimer during their imprisonment ; A Comparison between the comfortable Doctrine of the Gospel and the Lraditions of the Popish Religion; and a variety of other pamphlets. His life by his relative Dr Gloucester Ridley appeared in 1763. See also Foxe's Adets and Monuments ; Strype's Cranmer ; Burnet's History of the Reformation; Wood's Athenze Oxon.; Cooper's Athenz Cantab. ; and Froude's History of England.

RIEMANN, Gore Frizprich Brernnarp (1826- 1866), mathematician, was born on the 17th September 1826, at Breselenz, near Dannenberg in Hanover. His father Friedrich Bernhard Riemann came from Mecklenburg, had served in the war of freedom, and had finally settled as pastor in Quickborn. Here with his five brothers and sisters Riemann spent his boyhood and received, chiefly from his father, the elements of his education. He showed at an early age well-marked mathematical powers, and his progress was so rapid in arithmetic and geometry that he was soon beyond the guidance not only of his father but of schoolmaster Schulz, who assisted in the mathematical department of his training.

In 1840 he went to live with his grandmother at fanover, where he attended the lyceum. After her death, two years later, he entered the Johanneum at Liineburg, where he finished in four years more his gymnasial educa- tion. Notwithstanding some disadvantages due to

defects in his earlier training, and more particularly to shyness arising from his rustic upbringing, he speedily distinguished himself in all the branches of the gymnasial course, and was already known by the school authorities as a mathe- matician of great promise. The director, Schmalfuss, encouraged him in his mathematical studies by lending him books (among them Euler's works and Legendre's Theory of Numbers), and readily understood that he had no ordinary schoolboy to deal with when he found that works of such profoundity were read, mastered, and returned within a few days. In 1846, in his twentieth year, Riemann entered himself asa student of philology and theology in the university of Gottingen. This choice of a university career was dictated more by the natural desire of his father to see his son enter his own profession, and by the poverty of his family, which rendered the speedy earning of his living a matter of importance, than by his own preference. He sacrificed so far to the bent of his genius as to attend lectures on the numerical solution of equations and on definite integrals by Stern, on terrestrial magnetism by Goldschmidt, and on the method of least squares by Gauss. It soon became evident that his mathematical studies, undertaken at first probably as a relaxation, were destined to be the chief business of his life; and he obtained his father's permis- sion to devote himself entirely to a scientific career. By this time he had exhausted the resources of Gottingen in the shape of mathematical lectures ; and he proceeded in the beginning of 1847 to Berlin, attracted thither by that brilliant constellation of mathematical genius whose prin-

cipal stars were Dirichlet, Jacobi, Steiner, and Eisenstein. He appears to have attended Dirichlet's lectures on theory of numbers, theory of definite integrals, and partial dif- ferential equations, and Jacobi's on analytical mechanics and higher algebra. It was during this period that he first formed those ideas on the theory of functions of a complex variable which led to most of his great discoveries. One stirring social incident at least marked this part of his life, for, during the revolutionary insurrection in

March 1848, the young mathematician, as a member of a company of student volunteers, kept guard in the royal palace from 9 o'clock on the morning of the 24th March till 1 o'clock on the afternoon of the following day.

In 1850 he returned to Gottingen and began to prepare his doctor's dissertation, busying himself meanwhile with "Naturphilosophie" and experimental physics. In pur- suit of the latter he entered the mathematical and physical seminary, then newly started by Weber, Ulrich, Stern, and Listing. This double cultivation of his scientific powers, doubtless due more to the influence of Gottingen as represented by Gauss than to Berlin, had the happiest effect on his subsequent work; for the greatest achieve- ments of Riemann were effected by the application in pure mathematics generally of a method (theory of potential) which had up to this time been used solely in the solution of certain problems that arise in mathematical pliysics.

In November 1851 he obtained his doctorate, the thesis being " Grundlagen fiir eine allgemeine Theorie der Functionen einer veriinderlichen complexen Grésse." This memoir excited the admiration of Gauss, and at once marked its author's rank as a mathematician. The funda- mental method of research which Riemann employed has just been alluded to; the results will be best indicated in his own words :—

'The methods in use hitherto for treating functions of a complex variable always started from an expression for the function as its definition, whereby its value was given for every value of the argument; by our investigation it has been shown that, in consequence of the general character of a function of a complex variable, in a definition of this sort one part of the determining conditions is a consequence of the rest, and the extent of the deter- mining conditions has been reduced to what is necessary to effect the determination. This essentially simplifies the treatment of such functions. Hitherto, in order to prove the equality of two expressions for the same function, it was necessary to transform the oue into the other, .¢., to show that both expressions agreed for every value of the variable ; now it is sufficient to prove their agreement to a far less extent" [merely in certain critical points and at certain boundaries].

The time between his promotion to the doctorate and his habilitation as privat-docent was occupied by re- searches undertaken for his MHabilitationsschrift, by " Naturphilosophie," and by experimental work partly as Weber's assistant in the mathematical physical seminary, and partly as collaborateur with Weber and Kohlrausch in special researches on electricity. In connexion with the results of Kohlrausch regarding the residual discharge of condensers, Riemann worked out a theory of this pheno- menon which he intended to have published in Poggen- dorf's Annalen. For some reason not fully explained it was not published at all during his lifetime, and its place in the Annalen was taken by an elegant little paper on Nobili's rings.

The subject he had chosen for his Habilitationsschrift was the " Representation of a Function by means of a Trigono- metrical Series," a subject which Dirichlet had made his own by a now well-known series of researches. It was fortunate no doubt for Riemann that he had the kind advice and encouragement of Dirichlet himself, who was then on a visit at Géttingen during the preparation of his essay ; but the result was a memoir of such originality and refinement as showed that the pupil was fully the equal of the master. Of the customary three themes which he

suggested for his trial lecture, that "On the Hypo- theses which form the Foundation of Geometry" was chosen at the instance of Gauss, who was curious to hear what so young a man had to say on this difficult subject, on which he himself had in private speculated so _pro- foundly (see PaRraLuELs, vol. xviii. p. 254). Dedekind tells us that Riemann's lecture, which surpassed his utmost expectation, filled him with the greatest astonish- ment, and that on the way back from the faculty meeting he spoke to Wilhelm Weber with the highest apprecia- tion, and with an excitement rare with him, regarding the depth of the thoughts to which Riemann had given utterance.

In .1855 Gauss died and was succeeded by Dirichlet, who along with others made an effort to obtain Riemann's nomination as extraordinary professor. In this they were not successful; but a Government stipendium of 200 thalers was given him, and even this miserable pittance was of

great importance, so straitened were his circum- stances. But this small beginning of good fortune was embittered by the deaths of his father and his eldest sister, and by the breaking up of the home at Quickborn, where he had so often found solace when ill and dejected. Meantime he was lecturing and writing the great memoir (Borchardt's Journal, vol. liv., 1857) in which he applied the theory developed in his doctor's dissertation to the Abelian functions. It is amusing to find him speaking jubilantly of the unexpectedly large audience of eight which assembled to hear his first lecture (in 1854) on partial differential equations and their application to physical problems. The rustic shyness which had troubled his schoolboyhood seems still to have haunted him ; for he says, speaking of these lectures, " The nervousness which I had at first has pretty well subsided, and I accustom my- self to think more of my hearers than of myself, and to read in their faces whether I may go on, or whether the matter requires further explanation."

Riemann's health had never been strong. Even in his boyhood he had shown symptoms of consumption, the disease that was working such havoc in his family; and now under the strain of work he broke down altogether, and had to retire to the Harz with his friends Ritter aud Dedekind, where he gave himself up to excursions and " Naturphilosophie." After his return to Géttingen (November 1857) he was made extraordinary professor, and his salary raised to three hundred thalers. As usual with him, misfortune followed close behind ; for he lost in quick succession his brother Wilhelm and another sister. In 1859 he lost his friend Dirichlet ; but his reputation was now so well established that he was at once appointed to succeed him. It now seemed for a little as if the world was to go smoothly with him. Well-merited honours began to reach him; and in 1860 he visited Paris, and met with a warm reception there. He married, and married happily, Fraulein Elise Koch in June 1862, but the following month he had an attack of pleurisy which proved the beginning of a long illness that ended only with his death. His physician recommended a sojourn in Italy, for the benefit of his health, and Weber and Sartorius von Waltershausen obtained from the Government leave of absence and means to defray the cost of the journey. At first it seemed that he would recover ; but on his return in June 1863 he caught cold on the Spltigen Pass, and in August of the same year had

to go back to Italy. In November 1865 he returned again to Géttingen, but, although he was able to live through the winter, and even to work a few hours every day, it became clear to his friends, and clearest of all to himself, that he was dying. He was very desirous to finish some of the many investi- gations which had presented themselves to him, and

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eagerly asked his doctors to tell him how long he might reasonably expect to live, so that he might take up what he had most chance of finishing. In order to husband his few remaining days he resolved in June 1866 to return once more to Italy. Thither he journeyed through the confusion of the first days of the Austro-Prussian war, and settled in a villa at Selasca near Intra on Lago Maggiore. Here his strength rapidly ebbed away, but his mental faculties remained brilliant to the last. On the 19th of July 1866, attended by his wife, he lay under a fig-tree greatly enjoying the beautiful landscape and working at his last unfinished investigation on the mechanism of the ear. The day following he died.

There are few more pathetic stories than the life of Riemann, few finer instances of victory gained by inborn genius over a host of adverse circumstances. Few as were the years of work allotted to him, and few as are the printed pages covered by the record of his researches, his name is, and will remain, a household word among mathe- maticians. Most of his memoirs are masterpieces—full of original methods, profound ideas, and far-reaching imagina- tion. Few sources, we imagine, have been fuller of inspira- tion for the younger mathematicians of our day than the octavo volume of five hundred pages or so that contains his works ; and many an advance in mathematical science will yet be made, with increase of reputation to the maker, by carrying out his suggestions.

The collected works of Riemann were published by H. Weber assisted by R. Dedekind (8vo, Leipsic, 1876). At the end of this volume there is a touching account of his life by the latter, from which the above sketch is almost entirely taken. (G. CH.)

RIENZI, Cota pr (1313-1354). See Rome.

RIESENER, Juan Henri (1725-1806), the celebrated cabinet-maker of Louis XVI, was born at Gladbeck near Cologne in 1725. He was employed by Jean Francois Oeben in the arsenal, and in 1769 married Oeben's widow, by whom he had one son.

RIESENGEBIRGE (Bohemian Arkonose), or Giant Mountains, a lofty and rugged group on the common boundary of Silesia and Bohemia, between the upper courses of the Elbe and the Oder. They form the highest portion of the Sudetic system, which separates south-east Prussia from the Austrian empire, and finds its natural continuation towards the north-west in the Erzgebirge, the Thuringian Forest, and the Harz Mountains. Adjoining the Isergebirge and the Lausitzergebirge on the west, and the Eulengebirge and the Adlergebirge on the east and

south-east, the Riesengebirge proper run south-east and north-west between the sources of the Zacken and the Bober, for a distance of 23 miles, with a breadth of 14 miles. They cover an area of about 425 square miles, three- fourths of which is in Austrian and the remainder in Prussian territory. The boundary line follows the crest of the principal chain or ridge (Riesenkamm), with the highest summits, which stretches along the northern side of the group, with an average height of over 4000 feet. Its principal peaks are the Reiftrager (4430 feet), the Hohe Rad (4968 feet), the Great Sturmhaube (4862 feet), the Little Sturmhaube (4646 feet), and, near the east extremity, the Schneekoppe or Riesenkoppe (5266 feet), the loftiest mountain in northern or central Germany. Roughly parallel to this northern ridge, and separated from it by a long narrow valley known as the Sieben- griinde, there extends on the south a second and lower chain, of broad massive "saddles," with comparatively few peaks. The chief heights here are the Kesselkoppe (4708 feet), the Krkonose (4849 feet), the Ziegenriicken, and the Brunnenberg (5072 feet). From both ridges spurs of greater or less length are sent off at various angles,—those from the Bohemian ridge being longer, broader, and less abrupt than those from the Riesenkamm. On its northern side this mountain group rises ruggedly and precipitously from the Hirscliberg valley ; but on its southern side its slope towards Bohemia is very much

more gradual. The scenery is in general bold and wild,— the projecting crags and deep rocky gorges and precipices often presenting striking, sometimes even sublime, land- scapes. The Bohemian ridge is cleft about the middle by a deep gorge through which pour the headwaters of the river Elbe, which finds its source in the Siebengriinde. The Iser, Bober, Aupa, Zacken, Queiss, and a great number of smaller streams also rise among these mountains or on their skirts; and small lakes and tarns are not unfrequent in the valleys. The Great and Little Schneegruben,—two deep rocky gorge-like valleys in which snow remains all the year round—lie to the north of the Hohe Rad. Nearly the whole of the Riesenkamm and the western portion of the southern chain are granite; the eastern extremity of the main ridge and several mountains to the south-east are formed of a species of gneiss ; and the greater part of thie Bohemian chain, especially its summits, consists of mica-slate. Blocks of these minerals lie scattered on the sides and ridges of the mountains and in the beds of the streams; and extensive turf moors occupy many of the mountain slopes and valleys. The lower parts of the Riesengebirge are clad with forests of oak, beech, pine, and fir; above 1600 feet only the last two kinds of trees are found, and beyond about 3950 feet only the dwarf pine (Pinus Pumilio). Various alpine plants are found on the Iiiesengebirge,—some having been artificially introduced on the Schneekoppe. Wheat is grown at an elevation of 1800 feet above the sea-level, and oats as high as 2700 feet. The inhabitants of this mountain region, who are tolerably numerous, especially on the Bohemian side, live for the most part, not in villages, but in scattered huts called '"Bauden." They support themselves by the rearing of cattle, tillage, glass-making, and linen-weaving. Mining is carried on only to a small extent for arsenic, although there are traces of former more extensive workings for other metals. Several spots in the Riesengebirge are a good deal frequented as summer resorts; and the Schnee- koppe and other summits are annually visited by a con- siderable number of travellers, who find shelter in the Bauden. The Riesengebirge is the legendary home of Number Nip (Riibezahl), a half-mischievous half-friendly goblin of German folklore; and various localities in the group are more or less directly associated with his name.

RIKE—

RIE

RIETI, a city of Italy, in the province of Perugia, 184 miles south-east of Terni, which is 69 miles by rail from Rome. It occupies a fine position 1396 feet above the sea on the right bank of the Velino (a torrent sub-tributary to the Tiber), which at this point issues from the limestone plateau ; the old town occupies the declivity and the new town spreads out on the level. While with its quaint red- roofed houses, its old town walls (restored about 1250), its castle, its cathedral (13th and 15th centuries), its episcopal palace (1283, Andrea Pisano), and its various churches and convents Rieti has no small amount of mediaeval pictur- esqueness, it also displays a good deal of modern activity in wine-growing, cattle-breeding, and sugar-boiling. The fertility of the neighbourhood is celebrated both by Virgil and by Cicero. A Roman bridge over the Velino, Thorwaldsen's monument to Isabella Alfani, and a statue of St Barbara by Berdini, both in the cathedral, and the Palazzo Vincentini by Vignola deserve to be mentioned. The population was 7875 in 1871, and 9618 (with suburbs, 13,679 ; in the commune, 16,822) in 1881.

According to Terentius Varro (himself perhaps of Reatine birth) and others who have followed him, the people who founded Cures, and afterwards settled on the Palatine at Rome, were natives of the Reatine territory; but this is of somewhat the same questionable character as the other story about the companion of Hercules who was buried at this point near the Via Salaria. About the Via Salaria itself, there is no doubt it led from the sea to Reate and onwards towards Ancona, and was from a very early date the great route for the conveyance of salt to the Sabine country. While hardly mentioned in connexion with the Punic or Civil Wars, Reate is described by Strabo as exhausted by those long contests. Its inhabitants received the Roman franchise at the same time with the rest of the Sabines (290 3.c.), but it appears as a prefectura and not as a municipium down to the beginning of the empire. It was never made a colonia, though veterans of the Pretorian and of the legions Octava and Decima Augusta were settled there by Vespasian, who belonged to a Reatine family and was born in the neighbourhood. For the contests of the Reatines with the people of Interamna see Terni. About the middle of the 12th century the town was besieged and captured by Roger I. of Sicily. In the struggle

between church and empire it always held with the former; and it defied the forces of Frederick II. and Otho IV. Pope Nicholas IV. long resided at Reati, and it was there he crowned Charles II. of Anjou king of the Two Sicilies. In the 14th century Robert, and afterwards Joanna, of Naples managed to keep possession of Reati for many years, but it returned to the States of the Church under Gregory IX. About the year 1500 the liberties of the town, long defended against the encroachments of the popes, were entirely abolished. An carthquake in 1785 was in 1799 followed by the much more disastrous pillage of Reati by the papal troops for a space of fourteen days.

See Aldus Manutius, " Dissert. epistolica de Reati," in Nov. Thes. Antig. Rom., i.; Angelotti, Descrizione, 1635; Schenardi, Antiche lapidi, 1820; and Michaeli, Note per la storia di Riett, 1868, 1870.

RIETSCHEL, Ernst Frrepricn Aucusr (1804-1861), one of the most distinguished of modern German sculp- tors. Born at Pulsnitz in Saxony in 1804, at an early age he became an art student at Dresden, and subsequently a pupil of Rauch in Berlin. Ne there gained an art studentship, and studied in Rome in 1827-28. After returning to Saxony he soon brought himself into notice by a colossal statue of Frederick Augustus, king of Saxony, was elected a member of the academy of Dres- den, and thenceforth became one of the chief sculptors of his country. In 1832 he was elected to the Dresden professorship of sculpture, and had many foreign orders of merit conferred on him by the Governments of different countries. His death occurred at Dresden in

1861.

Rietschcl's style was very varied; he produced works imbued with much religious feeling, and to some extent occupied the same place as a sculptor that Overbeck did in painting. Other import- ant works by Rietschel were purely classical in style. He was specially famed for his portrait figures of eminent men, treated with much idealism and dramatic vigour ; among the latter class his chief works were colossal statues of Goethe and Schiller for the town of Weimar, of Weber for Dresden, and of Lessing for Bruns-

wick. He also designed the memorial statue of Luther for Worms, but died before he could carry it out. The principal among Rietschel's religious pieces of sculpture are the well-known Christ- Angel, and a life-sized Pieta, executed for the king of Prussia. He also worked a great deal in rilievo, and produced many grace- ful pieces, especially a fine series of bas-reliefs representing Night and Morning, Noon and Twilight, designed vis much poetical feeling and imagination.

For a good biography of Rietschel and account of his works see Appermann, Ernst Rietschel, Leipsic, 1863. (J. H. M.)

RIFLE. See Gunmaxine, vol. xi. p. 281-5.

RIFLEMAN-BIRD, or Ririz-Birp, names given by the English in Australia to a very beautiful inhabitant of that country,! probably because in coloration it resembled the well-known uniform of the rifle-regiments of the British army, while in its long and projecting hypochondriac plumes and short tail a further likeness might be traced to the hanging pelisse and the jacket formerly worn by the members of those corps. Be that as it may, the cock bird is clothed in velvety-black generally glossed with rich purple, but having each feather of the abdomen broadly tipped with a chevron of green bronze, while the crown of the head is covered with scale-like feathers of glittering green, and on the throat gleams a triangular patch of brilliant bluish emerald, a colour that reappears on the whole upper surface of the middle pair of tail-quills. The hen is greyish-brown above, the crown striated with dull white; the chin, throat, and a streak behind the eye are pale ochreous, and the lower parts deep buff, each feather bearing a black chevron. According to James Wilson (J//. Zoology, pl. xi.), specimens of both sexes were obtained by Sir T. Brisbane at Port Macquarie, whence, in August 1823, they were sent to the Edinburgh Museum, where they arrived the following year; but the species was first described by Swainson in January 1825 (Zool. Journal, i. p. 481) as the type of a new genus Ptiloris, more pro- perly written Ptidorrhis,? and it is generally known in orni- thology as P. paradisea. It inhabits the northern part of New South Wales and southern part of

Queensland as far as Wide Bay, beyond which its place is taken by a kindred species, the P. victorix of Gould, which was found by John

Macgillivray on the shores and islets of Rockingham Bay. |

Further to the north, in York Peninsula, occurs what is considered a third species, P. alberti, very closely allied to and by some authorities thought to be identical with the P. magnifica (Vieillot) of New Guinea—the " Promerops " of many writers. From that country a fifth species, P. wilsoni, has also been described by Mr Ogden (Proce. Acad. Philadelphia, 1875, p. 451, pl. 25). Little is known of the habits of any of them, but the Rifleman-bird proper is said to get its food by thrusting its somewhat long bill under the loose bark on the boles or boughs of trees, along the latter of which it runs swiftly, or by search- ing for it on the ground beneath. During the pairing- season the males mount to the higher branches and there display and trim their brilliant plumage in the morning sun, or fly from tree to tree uttering a note which is syllabled " yass" greatly prolonged, but at the same time making, apparently with their wings, an extraordinary noise like that caused by the shaking of a piece of stiff silk stuff. Verreaux informed Mr Elliot that he believed they breed in the holes of trees and lay white eggs; but on that score nothing is really known. The genus Pédorrhis, thought by Gould to be allied to Climacteris, has been generally placed near Hpimachus, which is now considered,

1 Curiously enough its English name seems to be first mentioned in ornithological literature by Frenchmen—Lesson and Garnot—in 1828, who say (Voy. " Coquille," Zoologie, p. 669) that it was applied "pour rappeler que ce fut un soldat de la garnison [of New South Wales] qui le tua le premier," —which seems to be an insufficient reason, though the statement as to the bird's first murderer may be true.

2 Some writers have amended Swainson's faulty name in the form Ptilornis, but that is a mistake.

| village opposite.

with Drepanornis and Seleucides, to belong to the Para- diserdz, or Birds-of-Paradise, and in his Monograph of that Family all the species then known are beautifully figured by Mr Elliot. ALN, RIGA (Esth. Ria-Lin), a seaport of Russia, in 56° 57' N. lat. and 24° 6' E. long., 375 miles south-west of St Petersburg, is in population the fifth city of the empire, while in foreign trade it ranks next to St Petersburg and Odessa. It is the seat of the governor-general of the Russian Baltic provinces, and also the capital of the province of Livonia. The Gulf of Riga, 115 miles long ~ and 100 miles in width, with shallow waters of inconsider- able salinity (greatest depth 27 fathoms), freezes to some extent every year. The town is situated at the southern extremity of the gulf, 8 miles above the mouth of the Diina (Dwina), which brings Riga into water communication with an extensive region, as also with the basins of the Dnieper and Volga. Below the town the Diina, from 580 to 2300

yards in breadth, divides into several branches, among islands and sand banks, receiving before it enters the sea the Bolderaa river, and expanding towards the east into wider lacustrine basins.

At its sea entrance the water a O

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Sot PAN Plan of Riga,

on the bar has an average depth of only 14 feet, and the entrance of the river is protected by the fortress of Diina- miinde, connected by rail with Riga, while another line on the right bank connects the city with the Miihlgraben As the Diina freezes at Riga for an average of 127 days annually, the port remains closed for navigation from December to March. The roadstead at the mouth of the river, though now protected by a mole, is still too much exposed, so that only such vessels as cannot pass the bar remain there, the others discharging part of their cargo at Bolderaa or Miihlgraben and then entering the Diina, which also they leave only partially laden. Improvements designed to obviate these incon-

veniences are now going on both at the outer harbour and at the new one, the " Zollhafen."

Riga consists of four parts—the old town and the St Petersburg and the Moscow suburbs standing on the right bank of the Diina, and the Mitau suburb on the left bank, connected by a floating bridge which is removed in winter, and by a viaduct, 820 feet long, resting on light piers of solid stone, and leaving a passage for ships. The old town still preserves its Hanseatic features—high storehouses, with spacious granaries and cellars, lining the narrow, winding, and busy streets. The only open spaces are the market-place and two other squares, one of which, facing the citadel, is ornamented by a granite column erected in commemoration of the defeat of Napoleon I. The old

city is so limited that its population increases very slowly. The so-called suburbs on the other hand, with their broad and quiet boulevards on the site of the former fortifications, are steadily growing and undergoing new improvements. The St Petersburg suburb, connected with the city by an avenue of trees, is the seat of the wealthy German aristocracy and merchant community. The rich ' poly- technicum" and the new theatre are situated there.

Few antiquities of the medieval town still remain. The oldest church, the " Domkirche," founded in 1204, was burned in 1547, and the present building dates from the second half of the 16th century. Its organ, with a gas-engine of 4-horse power, and 6826 pipes—dating from 1883—is said to be the largest in the world. St Peter's church, with a beautiful tower 440 feet high, was erected in 1406. The castle, built in 1494-1515 by the master of the Knights of the Sword, Walter von Pletten- berg—a spacious building often rebuilt—is now the seat of the governor-general and the Russian authorities. The "House of the Black Heads" (opposite the elegant new town-house), which was the seat of a military corpora- tion founded in 1232, and subsequently became the meet- ing place of the wealthier youth of the place, has some valuable contents. Of the recent

erections, the poly- technic, the exchange, the municipal picture gallery, the monument of Herder, who lived at Riga towards the end of the last century, the gymnasiums of Lomonossoff and Alexander I., and the large bonded warehouse are worthy of notice. The esplanade (where a Greek cathedral now stands), the quiet Wéhrmann's Park, and the well- shaded " Kaiserliche" Park are much visited. The environs of Riga are undergoing constant improvement, and some of them, such as Dubbeln and the sea-bathing resorts of Bilder- lingshof and Majorenhof, have numerous visitors in summer,

In 1867 Riga had a population of 102,590 (city, 18,246; St Petersburg suburb, 27,155; Moscow suburb, 41,318; Mitau suburb, 15,871). On December 25, 1881 it had 168,728 inhabi- tants, the suburbs alone showing an incrcase of 64,263 (city, 20,091; suburb of St Petersburg, 45,3845; of Moscow, 73,705 ; and of Mitau, 29,587). "About one half of the population is German, the remainder being Russian and Lettish in nearly equal proportions, with some 2000 Ksthonians and nearly 5000 foreigners. 'The life of the city has a German character throughout, but the Russians (many of whom were serfs until 1861), and still more the Letts and Esthonians, also display a steadily progressive intellectual life. Both are seeking to counteract the German influence by increasing the number of their educational institutions, the Letts also by the stage and the press. The larger commerce is wholly in German and (to a less extent) English hands. Owing to its communication by water and rail with the forests of White Russia and Volhynia, Riga is a great mart for timber, which in value stands third among the exports. Flax and linseed occupy the first place, Riga being the chief Russian port for the extensive flax-producing region of north-west Russia. Owing to the great rail- way which crosses the country from Riga to Smolensk, afterwards dividing into two branches, to Orenburg and Tsaritsyn on the lower Volga respectively, Riga is also the great storehouse and place of export for hemp coming by rail from west central Russia, and for corn, Riga merchants sending their buyers as far east as Tamboff. Oats, in particular, are extensively exported to Eng- land from the central provinces. Tallow, leather, tobacco, rugs, feathers, and other minor items add considerably to the total value of the exports. The competition of the port of Libau (with exports amounting in 1882 to 31,473,590 roubles) is

counter- balanced by the steady development of the Russian railway system, so that the exports of Riga, which in 1851-1860 averaged 17,737,000 roubles, and were 23,964,000 in 1866, amounted in 1882 to 64,159,076 roubles or £6,415,900 (food stuffs, £1,706,300 ; raw produce, £4,690,170, including timber, £1,295,520; and manu- factured wares, £19,436). The imports, consisting chiefly of salt, fish, wine, and cotton, with metals, machinery, coal, oils, fruits, tobacco, and other minor articles, are also rapidly increasing (4,876,000 roubles in 1851-1860, 6,751,000 roubles in 1866, and 34,304,100 roubles in 1882). The food stuffs (salt, fish, tobacco, wine, oils, &c.) reached £514,847 ; raw produce (chiefly cotton, coal, and metal), £2,043,804 ; and manufactured wares, €871,132. In 1882 the port was visited by 2347 foreign vessels of 906,200 tons burden ; of these 537 (367,110 tons) were from Great Britain ;

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161 vessels of 89,990 tons, engaged in the coasting trade, also entered the port. Riga is in railway communication with Libau (via Mitau), and with St Petersburg (va Diinaburg), Warsaw, and central Russia ; the traffic is very active,—no less than 11,247,000 ewts. of various wares having been brought to Riga by rail, and 844,000 cwts. shipped on the Duna.

The manufactures of the town and neighbourhood are yearly developing ; the chief items are woollen cloth, cottons, machinery, metal wares, cigars, corks, glass, and paper.

The educational institutions include, besides the polytechnic, a Greek seminary, four gymnasiums, some ten private schools for secondary education of boys and girls, and a comparatively large number of primary schools. The municipal library contains very interesting materials relating to the history of the Baltic provinces. The book trade is rapidly extending.

History.—Riga was founded in 1158, as a storehouse at the mouth of the Diina, by a few Bremen merchants. Its name is supposed to be derived from Righ-6, an island formerly separated from the mainland by a branch of the Dina. About 1190 the Augustinian monk Meinhard erected a

monastery there, and in 1199-1201 Bishop Albert I. of Livonia obtained from Innocent II. permission for German merchants to land at the new settlement, and chose it for his seat, exercising his power over the neighbour- ing district in connexion with the Teutonic Knights. As early as the first half of the 13th century the young city obtained the right of electing its own magistracy, and enlarged the walls crected during Albert I.'s time. It joined the Hanseatic League, and from 1253 refused to recognize the rights of the bishop and the knights. Karly in the 14th century Riga repelled the attack of the Kuron ruler Lamehinas, and during the next century it had to contend with the knights. In 1420 it fell once more under the rule of the bishop, who maintained his authority until 1566, when it was abolished in consequence of the Reformation. Sigismund III., king of Poland, took Riga in 1547, and in 1558 the Russian commander Prince Serebryanyi reached the town, burned its suburbs and many ships on the Diina, and remained for three days under the walls of the fort. In 1561 Gotthard Kettler publicly abdicated his master- ship of the order of Knights of the Sword, and Riga, together with southern Livonia, became a Polish possession ; after some unsuccess- ful attempts to reintroduce Roman Catholicism, Stephen Batory recognized the religious freedom of the Protestant population. Throughout the 17th century Riga—which for nearly three centuries had been a wealthy centre of the commerce of the whole region, and was at this time visited by from three to five hundred ships annually—became a bone of contention between Sweden, Poland, and Russia. In 1621 Gustavus Adolphus took it from Poland, and held it against the Poles and the Russians who besieged itin 1656. Duringthe Northern War it was courageously defended, but after the battle of Poltava it succumbed, and was taken in July 1710 by Sheremetyeff. In 1781 it was made by Russia the capital of the Riga viceroyalty, but fiftcen years later, the viceroyalty having been abolished, it was made and still remains the capital of Livonia. In 1812, the approach of the French being apprehended, the sub- urbs were burnt. Riga still maintains many of its old municipal institutions. The "magistrate" of Riga exercises patrimonial rights over a district comprising several communcs around the city. (PA…)

RIGAUD, Hyacintue (1659-1743), French painter, born at Perpignan 20th July 1659, was the descendant of a line of painters. Having early lost

his father, he was sent by his mother to Montpellier, where he studied under Pezet and was helped by Rane, then to Lyons, and in 1681 to Paris. There, whilst following the regular course of academical instruction, Rigaud produced a great number of portraits so good that Lebrun advised him to give up going to Rome and to devote himself wholly to this class of work. Rigaud, although he had obtained the Great Prize, followed this advice, and for sixty-two years painted at the rate of thirty to forty portraits a year, all carried through with infinite care by his own hand. He had a magnificent emphatic manner appropriate to the rendering of the pompous types of the age, but, although some of his most famous works belong to the class of official portraiture, his talent showed to even greater advantage in the painting of subjects whose life and position admitted of less formal treatment. His portraits of himself, of the sculptor Des- jardins (Louvre), of Mignard, and of Lebrun (Louvre) may be cited as triumphs of a still more attractive, if less impos- ing, character than that displayed in his grand repre- sentations of Bossuet (Louvre) and Louis XIV. (Louvre), while his beautiful portraits of his mother, Marie Serre

(Louvre), must for ever remain amongst the masterpieces of French art. Rigaud, although the great successes to which he owed his fame were won without exception in portrait painting, persisted in pressing the Academy to admit him as an historical painter. This delayed his reception, and it was not until January 2, 1700, that he succeeded in obtaining his desire. He presented as his diploma works a St Andrew (Louvre) and the portrait of Desjardins already mentioned, exhibited at the salon of 1704, and filled in turn all the various posts of academical distinction. Having attained a professional position of unsurpassed eminence, Rigaud died at the age of eighty- four on 27th December 1743, having never recovered from the shock of losing his wife in the year previous. He had many pupils, and his numerous works had the good fortune to be reproduced by the greatest of French engravers — Edelinck, Drevet, Wille, Audran, and others.

RIGGING. See SEAMANSHIP.

RIGHT, Petition or. See Petition, vol. xviii. p. 705.

RIGHTS, Britt or. On the 13th February 1688-89 the Declaration of Right was delivered by the Lords and Commons to the prince and princess of Orange. In October 1689 the rights claimed by the declaration were enacted with some alterations by the Bill of Rights, 1 Will. and M., sess. 2, c. 2, next to Magna Charta the greatest landmark in the constitutional history of England and the nearest approach to the written constitutions of other countries. The Act (the full name of which is "An Act declaring the Rights and Liberties of the Subject, and settling the Succession of the Crown"), after reciting the unconstitutional proceedings of James II. the abdication

of that king, the consequent vacancy of the crown, and |

the summons of the convention parliament, declared, on the part of the Lords and Commons, "for the vindicating and asserting their ancient rights and liberties—

*'*1, That the pretended power of suspending of laws or the execu- tion of laws by regal authority without consent of parliament is illegal. 2. That the pretended power of dispensing with laws or the execu- tion of laws by regal authority, as it hath becn assumed and exer- cised of late, is illegal. 8. That the commission for erecting the late court of commissioners for ecclesiastical causes, and all other commissions and courts of like nature, are illegal and pernicious. 4. That levying money for or to the use of the crown, by pretence of prerogative, without grant of parliament, for longer time or in other manner than the same is or shall be granted, is illegal. 5. That it is the right of the subjects to petition the king, and all commitments and prosecutions for such petitioning are illegal. 6. That the raising or keeping a standing army within the kingdom in time of peace, unless it be with consent of parliament, is against law. 7. That the subjects which are Protestants may have arms for their defence suitable to their conditions, and as allowed by law. 8. That elections of members of parliament ought to be free. 9. That the freedom of speech, and debates or proceedings in parlia- ment, ought not to be impeached or questioned in any court or place out of parliament. 10. That excessive bail ought not to be required, nor excessive fines imposed, nor cruel and unusual punish-*

ments inflicted. 11. That jurors ought to be duly impanelled and returned, and jurors which pass upon men in trials for high treason onght to be freeholders. 12. That all grants and promises of fines and forfeitures of particular persons before conviction are illegal and void. 18. And that for redress of all grievances, and for the amending, strengthening, and preserving of the laws, parliament ought to be held frequently. And they do claim, demand, and insist upon all and singular the premises, as their undoubted rights and liberties. ”

The further provisions of the Act were concerned with the settlement of the crown upon the prince and princess of Orange, with the exception of § 12, which negatived the right of dispensation by zon obstante to or of any statute or any part thereof, unless a dispensation be allowed in the statute itself or by bill or bills to be passed during the then session of parliament. An example of an Act giving a dispensing power is 7 & 8 Will. IIL, c. 37, by which the crown is empowered to grant licences to hold in mortmain non obstante the Mortmain Acts,

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It is to be noticed that the Declaration of Right and the Bill of Rights introduced no new principle into the English constitution. In the words of Lord Macaulay, “the Declaration of Right, though it made nothing law which had not been law before, contained the germ of every good law which has been passed during more than a century and a half, of every good law which may hereafter in the course of ages be found necessary to promote the public weal, and to satisfy the demands of public opinion” (story of Lingland, vol. ii. p. 396). In the United States, the main provisions of the Bill of Rights, so far as they are applicable, have been adopted both in the constitution of the United States and in the State constitutions.

RIMINI. The city of Rimini is bounded on three sides by water. It faces the Adriatic to the north, has the torrent Aprusa, now called Ausa, on the east, and has the river Marecchia, the Arimnum of the ancients and later known as the Ariminum, on the west. It stands in a fertile plain, which on the southern side soon swells into pleasant slopes backed by the jagged peaks of the Umbrian Apennines. The foremost foothill of the range is the

steep crag of Mons Titanus crowned by the towers of San Marino. This oldest and smallest of republics com- mands a prospect of almost unrivalled beauty over hill and plain—to Ravenna on one side, Pesaro on the other, the mountains of Montefeltro, Rimini and its rivers, and across the Adriatic to the Dalmatian coast.

Of the foundation of Rimini nothing certain is known. It was first inhabited by the Umbrians, then by the Etruscans for many centuries. In the 4th century B.c. it was invaded by the Senones, who advanced as far as Sinigaglia. Brennus established himself in Rimini, and marched thence upon Rome, which he destroyed by fire in 390 B.c. After more than a century of dominion the Senones were expelled by the Romans, who founded a military colony in Rimini and made it the seat of the pretor governing the province designated as Ariminum or Gallia Togata. Owing to its position, Rimini rose to increased importance under its new masters. The Romans reopened the mint formerly established by the Gauls, which had issued the "es grave," the heaviest Italic coin that has been preserved. Rimini was the starting point of the Flaminian Way leading to Rome, and of the Emilian Way to Piacenza. Later, 134 B.c., the Popilian Way lead- ing as far as Venice was made. In 82 B.c. Rimini was withdrawn from the province of Gaul and included in Italy, of which the frontier was now extended from the Esino to the Rubicon, about ten miles from Rimini near Cesena. This added to the city's importance. We find continual mention of it in the wars of Marius and Sulla, and by the latter it was afterwards sacked. In 49 B.c. Julius Cesar crossed the Rubicon with the 13th legion, entered Rimini, and harangued his troops in the great square that still bears his name. A _ pillar marks the spot on which, according to tradition, he delivered his address! From Rimini, after having assembled the tri- bunes of the people aud summoned the other legions, he went forth on the great expedition that was to lead to the battle of Pharsalia and ultimately to the foundation of the empire.

Rimini was highly favoured under Augustus. That emperor restored the Flaminian Way, and the senate decreed the erection in his honour of the famous arch that is still one of the grandest of ancient monuments. It seems that this arch was originally crowned by a statue of Augustus mounted on a triumphal car (quadriga).

1 A stone originally stood there, mentioned by 15th-century writers as "the big stone (wetronc), on which he (Cesar) stood to make his speech." But this stone, vetustate collapswm was replaced in 1555 by the existing column.

But in the Middle Ages this was removed and replaced by the turrets which remain still. Contemporaneously with the arch was built the beautiful bridge over the Marecchia, the only other ancient monument to be found in Rimini, since of the amphitheatre scarcely a stone is left.

During the Middle Ages the history of Rimini has no importance. Alternately captured by Byzantines and Goths, it was rigorously besieged by the latter in 538 A.D. They were, however, compelled to retreat before the reinforcements sent by Belisarius and Narses; thus the Byzantines, after various vicissitudes, became masters of the town, appointed a duke as its governor, and included 'tin the exarchate of Ravenna. It afterwards fell into the power of the Longobards, and then of the Franks, who yielded it to the pope, for whom it was governed by counts to the end of the 10th century. Soon after this period the imperial power became dominant in Rimini. In 1157 Frederick I. gave it, by imperial patent, the privilege of coining money and the right of self-govern- ment; and in the 13th century we find Rimini an inde- pendent commune waging war on the neighbouring cities. But throughout these times the main feature of its history is its alternate subjection to pope and emperor. And, weak as the sway of either was, it was strong enough to pre- vent any genuine local prosperity. During the continued struggle between church and empire, the withdrawal of the one was the signal for the other to advance, and these speedy mutations gave the commune no chance of achieving independence. This state of things went on until the rise of the despots, who, for similar reasons, were powerless to establish themselves on a firm and inde- pendent footing. Such indeed was the fate of nearly every city of Romagna excepting Bologna.

In the year 1216 Rimini, being worsted by Cesena, adopted the desperate plan of granting citizenship to two members of the powerful Malatesta tribe, Giovanni and Malatesta, for the sake of their aid and that of their

vassals in the defence of the state and the conduct of the war. This family quickly struck root in the town and gave birth to future tyrants; for in 1237 Giovanni was named podesta, and this office was the first step towards the sovereign power afterwards assumed by his descendants. Meanwhile Rimini was torn by the feuds of Guelf and Ghibelline. The latter were the dominant party in the days of Frederick I1., although very unpopular on account of the grievous taxes imposed by the empire. Accordingly the majority of the urban nobles joined the Guelfs and were driven into exile. But before long, as the Swabian power declined in Italy, the Guelf party was again pre- dominant.

Then followed a long period of confusion in which, by means of conspiracies and crimes of every kind, the Malatesta succeeded in becoming masters and _ tyrants of Rimini. And, albeit this string of events is of no historic value, it may serve nevertheless to give an idea of what was occurring throughout Romagna at that time. Giovanni Malatesta had died in 1247 and been succeeded by his son Malatesta, born in 1212, and surnamed Malatesta da Verrucchio. This chieftain, who lived to be a hundred years old, had ample time to mature his ambitious designs, and was the real founder of his house. Seizing the first suitable moment, he placed himself at the head of the exiled Guelfs and restored them to Rimini. Then, as the empire acquired fresh strength in Italy, he quietly bided his time and, on the descent of the _ Angevins, again assumed the leadership of the Guelfs, who

now had the upper hand for a long time. Being re- peatedly elected podesta for lengthy terms of office, he at last became the virtual master of Rimini. Nor was he

RIMINI

checked by Rome. of the rights and traditional pretensions of the Holy See,

Pope Boniface VITI. was fully aware

but preferred to keep on good terms with one who had

so largely contributed to the triumph of the Guelfs in

Romagna. Accordingly he not only left Malatesta un- molested, but in 1299 conferred on him fresh honours and estates, so that his power went on increasing to the

day of his death in 1312.

Four sons had been born to Malatesta—Malatestino, Giovanni the Lame, Paolo the Handsome, and Pandolfo ; but only the oldest and youngest survived him. Giovanni the Lame (Sciancato), a man of a daring impetuosity only equalled by his ugliness, had proved so useful a general to Giovanni da Polenta of Ravenna as to win in reward the hand of that potentate's beautiful daughter, known to history as Francesca da Rimini. But her heart had been won by the handsome Paolo, her brother-in-law ; and the two lovers, being surprised by Giovanni, were murdered by him on the spot (1285). This episode of the story of the Malatesta has been immortalized in Dante's Inferno. Giovanni died in 1304. Thus in 1312 Malatestino became lord of Rimini, and on his decease in 1317 bequeathed the power to his brother Pandolfo. Even in his father's lifetime the new lord had helped to extend the dominions of his house in Pesaro, Fano, Sinigaglia, and Fossombrone. He quickly perceived that, however willing Boniface VIII. might have been to tolerate the increased power of a chief who, like Malatesta da Verrucchio, had rendered such excellent service to the Holy See, it could not be expected that the papacy would really sanction the estab- lishment of a strong and independent state in Romagna. He accordingly turned to the empire, and, siding with Louis the Bavarian, won that monarch's favour for him- self and his sons, who in 1342 were appointed imperial vicars.

Pandolfo died in 1326, leaving two heirs, Malatesta and Galeotto. The former was nicknamed CGuastafamiglia, because, although at first willing to let his brother share his power, he rid himself by violence and treachery of other kinsmen who claimed their just rights to a portion of the state. His intent was to become sole lord and to aggrandize | his tiny principality. But the reigning pope Innocent NL, despatched the terrible Cardinal Albornoz to Romagna and it was speedily reduced by fire and sword. In 1355 the Malatesta shared the fate of the other potentates of the

land. Nevertheless it was the cardinal's policy to let existing Governments stand, provided they promised to act in subordination to the papal see. Thus, he granted the Malatesta brothers the investiture of Rimini, Pesaro, Fano, and Fossombrone, and they arranged a division of the state. Guastafamiglia took Pesaro, which was held by his descendants down to the brothers Carlo and Galeazzo. The former of these, who died in 1439, was father to the Parisina beheaded in Ferrara, whose tragic love story has been sung by Byron. 'The latter won the title of "VTnetto" (the Incapable) by the foolish sale of his rights over Pesaro to the Sforza in 1447.

Galeotto, on the other hand, retained the lordship of Rimini, ruling tranquilly and on good terms with the popes, who allowed him to add Cervia, Cesena, and Bertinoro to his states. Dying in 1385 at the age of eighty, he left two sons—Carlo, who became lord of Rimini, and Pandolfo, who had Fano for his share. Carlo (1364-1429) was energetic, valiant, and a friend of the popes, who named him vicar of the church in Romagna. He was a patron of letters and the arts, and during his reign his court began to be renowned for its splendour. As he left no issue, his inheritance was added to that of his brother Pandolfo, and Fano was once more united to Rimini. Pandolfo (1370-1427) had led the life of a

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condottiere, taking a prominent part in the Lombard wars following on the death of Galeazzo Maria Visconti, and held rule for some time in Brescia and Bergamo. He left three natural sons, who were declared legitimate by Pope Martin V. The eldest, Galeotto (1411-32), was an ascetic, gave little or no attention to public business, and, dying early, bequeathed the state to his brother Sigismondo Pandolfo. The third son, Novello Malatesta (1418-65), ruled over Cesena.

Sigismondo (1417-68) is the personage to whom Rimini owes its renown during the Renaissance, of which indeed he was one of the strangest and most original representa- tives. He was born in Brescia, and when called to the succession, at the age of fifteen, had already given proofs of valour in the field. Of a robust and handsome person, he was a daring soldier and an astute politician. His knowledge of antiquity was so profound as to

excite the admiration of all the learned men with whom he discoursed, even when, as in the case of Pius II., they chanced to be his personal enemies. A captain of renown and a skilful military engineer, he was also a generous patron of the fine arts and of letters. To him is due the erection of the church of St Francis, or temple of the Malatesta, one of the rarest gems of the Renaissance and the greatest of Rimini's treasures. Sigismondo devoted enormous sums of money and much time and care to this building, giving it so original a stamp and one so thoroughly expressive of his own mind and character that, to a great extent, it may be considered his work. But he too was a man devoid of all faith and conscience, of all respect human or divine. Of so dissolute a life that, although married, he had children by several mistresses at the same time, he gave vent to all his passions with a ferocity that was bestial rather than human. And—as the crowning con- tradiction of his strange nature—from his youth to the day of his death he remained the devoted lover of the woman for whose sake he became a poet, whom he finally made his wife, and whom he exalted in every way, even to the point of rendering her almost divine honours. Yet this love never availed to check his excesses. The blood in his veins resembled that of the Borgia; and of him, as of that iniquitous race, tradition has added much to the evil recorded by history, and truth and false- hood have been so subtly mingled that it is often diffi- cult, sometimes impossible, to distinguish the one from the other.

On assuming power in 1432 Sigismondo was already affianced to the daughter of Count Carmagnola, but when that famous leader was arraigned as a traitor by the Venetians, and ignominiously put to death, he promptly withdrew from his engagement, under the pretext that it was impossible to marry the child of a criminal. In fact he aimed at a higher alliance, for he espoused Ginevra d'Este, daughter of the duke of Ferrara, and his entry into Rimini with his bride in 1434 was celebrated by splendid festivities. In 1437 a son was born to him, but died within the year, and in 1440 the young mother followed it to the grave. Every one declared that she died by poison administered by her husband. This, however, was never proved. The duke of Ferrara remained his friend, nor is it known what motive Sigismondo could have for wishing to get rid of his wife. Two years afterwards he married Polissena, daughter of the

famous condottiere Francesco Sforza, who in 1443 bore him a son named Galeotto Roberto. But by this time he was already madly in love with Isotta degli Atti, and this was the passion that endured to his death. The lady succeeded in gaining an absolute ascendency over him, which increased with time. She bore him several children, but this did not prevent his having others by different concubines. Nor

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was this the sum of his excesses. He presently conceived a frantic passion for a German lady, the wife of a certain Borbona, who repulsed his advances. Thereupon he planned an ambuscade on the road to Fano in order to seize her by force. The lady arrived escorted by armed men, but Sigismondo attacked her so furiously that she was killed in the struggle, and it is said that he then wreaked his lust on her corpse (19th December 1448). Such being the nature of the man, it is not astonishing that, as his ardour for Isotta increased, he should have little scruple in ridding himself of his second wife. On the Ist June 1450 Polissena died by strangling, and on the 30th of the same month Isotta's offspring were legitimated by Nicholas V.

It is only just to record that, although Malatesta's intrigue with Isotta had long been notorious to all, and he had never sought to conceal it, no one ever accused her of either direct or indirect complicity in her lover's crimes. Isotta's history, however, is a strange one, and opens up many curious questions. She was of noble birth and seems to have attracted Sigismondo's notice as early as 1438, for at the age of twenty he produced verses of some merit in praise of her charms. She was indeed widely celebrated for her beauty and intellect, culture, firmness, and prudence ; and even Pope Pius II. proclaimed her worthy to be greatly loved. When Sigismondo was absent she governed Rimini wisely and well, and proved herself a match for the statesmen with whom she had to deal. The leading poets of the court dedicated to her a collection of verses entitled Jsottx:, styled her their mistress and the chosen of Apollo. Artists of renown perpetuated her features on canvas, on marble, and on many exquisite medals, one of which has a closed book graven on the reverse, with the inscription "Elegie" in allusion to poems she was said to have written.

Never- theless M. Yriarte, in his well-known book on the Malatesta and Rimini, asserts that there is documentary evidence to prove that Isotta was unable to sign her own name. He has arrived at this couclusion on the strength of certain documents found in the archives of Siena. These consist mainly of two letters addressed to Malatesta in 1454, when he was encamped near Siena, and both written and signed by the same hand. The first, signed Isotta, gives him news of his children, affectionately reproaches him with having betrayed her for the daughter of one Messer Galeazzo, and winds up by saying that she cannot be happy until he fulfils his often renewed promise, z.e., to make her his wife. The second, bearing the same date, is signed with the initials of another woman: "De la V. S. serva" (Your Highness's servant) "8S. de M."— probably one of the Malatesta. This correspondent says that she had already written to him that day, by command of Isotta, who had gone with her to see Messer Galeazzo's daughter, and freely vented her just indignation. Therefore M. Yriarte maintains that, had Isotta been able to write herself, she would not have employed another to speak of her love and jealousy and of the desired marriage. He feels assured that Isotta must have been altogether illiterate, since even the signature was written by another.! But, as the second letter proves that Isotta went with her confidant to vent her rage on her rival, it is plain that she had no secrets from that friend. It is also possible that S. de M. (particularly if a Malatesta) had

1 The two letters are dated respectively 20th and 21st December ; but this must be an error, inasmuch as the second begins thus— "To-day Madonna Isotta made me write to you." The year is not given, but it must have been 1454, since it was then, as we shall presently see, that the Sienese seized the papers of their general Malatesta, who, after betraying them, had hastily fled from the camp.

Thus these letters, and other Malatestian documents, came to be pre-served among the archives of Siena where they are still to be seen.

been charged by Sigismondo to watch over Isotta, and therefore not only acted as her amanuensis, but also wrote privately to explain or confirm that which she had already written to him by Isotta's wish. For the tyrant

of Rimini was of a brutally jealous nature. At any rate the second letter solves the doubts suggested by the first. Nor is it at all surprising that Isotta should have her letters written and signed by another hand, when such was by no means an uncommon practice among the princes and nobilities of her day. lLucrezia Borgia, for instance, frequently did the same. It is besides simply incredible that a woman of the Italian Renaissance, of Isotta's birth, standing, and reputation, should have been unable to write.

Her marriage with Malatesta did not take place until 1456; but of the ardent affection that had long bound them together there are stronger proofs than the lover's juvenile verses, or than even the children Isotta had borne to him. For, more than all else, the temple of St Francis has served to transmit to posterity the history of their loves. Malatesta decided on building this remarkable church as a thankoffering for his safety during a danger- ous campaign undertaken for Pope Eugenius IV. about the year 1445.

The first stone was laid in 1446, and the work was carried on with so much alacrity that inass was performed init by the close of 1450. Sigismondo entrusted the execution of his plans to L. B. Alberti, who had to encase in a shell of classic architecture a 18th-century Franciscan church. The original edifice being left intact, it was a difficult question low to deal with the windows and the Gothic arches of the interior. Alberti solved the problem with marvel- lous skill, blending the old architecture with the new style of the pe om and giving it variety without destroying its unity of efiect. :

Being eager to adorn his temple with the most precious marbles, Sigismondo's veneration for antiquity did not prevent him from pillaging many valuable classical remains in Rimini, Ravenna, and even in Greece. Such was the zeal with which Alberti pursued his task that the exterior of the little Rimini church is one of the finest and purest achievements of the Renaissance, and surpasses in beauty and elegance all the rest of his works. But it is much to be deplored that he should have left the upper part of the facade unfinished. Alberti came to Rimini, made his design, saw the work begun, and then left it to be carried out by very skilful

artists, on whom he impressed the necessity of faithfully preserv- ing its general character so as "not to spoil that music."

The internal decorations, especially the enormous quantity of wall ornaments, consisting chiefly of scrolls.and bas-reliefs, were executed by different sculptors undcr the personal direction of Malatesta, who, even when engaged in war, sent continual instruc- tions about their work. It is difficult to give an exact idea of this extraordinary church to those who have no personal acquaint- ance with it. The vault was never finished, and still shows its rough beams and rafters. The eight side chapels alone are com- plete, and their pointed arches spring -from Renaissance pilasters planted on black marble elephants, the Malatesta emblems, or on baskets of fruit held by children. The surface of the pilasters is divided into compartments encrusted with bas-reliefs of various subjects and styles. Everywhere—on the balustrades closing the chapels, round the base of the pilasters, along the walls, beneath the cornice of both the exterior and the interior of the church—there is one ornament that is perpetually repeated, the interwoven initials of Sigismondo and Isotta. This monogram is alternated with the portrait and arms of Malatesta; and these designs are enwreathed by festoons linked together by the tyrant's second emblem, the rose. The most singular and characteristic feature of this edifice is the almost total absence of every sacred emblem. Rather than to St Francis and the God of the Christians it was dedicated—and that while Sigismondo's second wife still lived— to the glorification of an unhallowed attachment. Nature, science, and antiquity were summoned to celebrate the tyrant's love for Isotta. he bas-reliefs of one of the chapels represent Jupiter, Venus, Saturn, Mars, and Diana, together with the signs of the zodiac. And these subjects are derived, it appears, from a poem in which Sigismondo had invoked the gods and the signs of the zodiac to soften Isotta's heart and win her to his arms. The pageants of Mars and Diana seem to have been suggested by the Trionfi of Petrarch. Elsewhere we see prophets and sibyls, per- sonifications of the theological virtues and of the sciences. The delicate bas-reliefs of botany and medicine, history and astronomy, have been judged by some writers to be Grecian, on account of the

ancient appearance of their marble, their inscriptions in Greek and Latin, and others that have never been deciphered. Buta moment's examination of the sculptures is enough to destroy this hypothesis. Besides, some of the inscriptions are very easily read and record " Apollo Ariminzus" and " Jupiter Ariminzus."'

*In the first chapel on the left is the family tomb of the Malatesta, with sculptured records of their triumphs and of their alleged descent from Scipio Africanus. Better worthy of notice is the third chapel to the right, known as that of the Angels, on account of the angels and children carved on its pillars. It isnominally dedicated to the archangel Michael, whose statue is enshrined in it ; but the figure has the face of Isotta, the ruling deity of this portion of the church. For here is the splendid and fantastic tomb erected to this lady, during her life and previous to the death of Sigismondo's second wife. No monument, be it remarked, is raised over the burial-place of Ginevra and Polissena. The urn of Isotta's sarco- phagus is supported by two elephants, and bears the inscription, **T). Isotte Ariminensi B. M. Sacrum, MCCCCL." The " D." has been generally interpreted as " Dive" and the "B. M." as "Beate Memorie." But some, unwilling to credit such profanity, allege that the letters stand for " Bones Memorie." Nevertheless all who have seen the church must admit the improbability of simi- lar scruples.*

The numerous artists employed on the interior of the church were under the direction of the proto-maestro Matteo de Pasti, the celebrated medallist. And indeed the peculiar and fantastic character of the sculptures in this chapel frequently recalls the designs of his famous works. All this devoration is in strange con- trast with the grandly austere simplicity of the fagade and outer walls of the church. There no ornament disturbs the harmony of the lines. The frieze beneath the cornice, reproducing the lovers' initials and the Malatestian ensigns, is in such very low relief that it only enhances the perfection of "'that music" produced by the marvellous skill of Leo Battista Alberti. Also the colour of the stone, a soft creamy white, adds to the general beauty of effect. And everything both within and without contributes to the profane and pagan character which it was Sigismondo's purpose to impress on the Christian church. On each of its outer walls are seven arched recesses, intended to

contain the ashes of the first literati and scientists of his court. In the first, to the right, is the urn of the poet Basinio, one of his pensioners, in the second that of Giusto de' Conti, author of some rhymes on the Bella Mano, while the third bore the more famous name of Gemisthus Pletho. This well- known Byzantine philosopher was the diffuser of Platonism in Florence during the time of Cosimo de' Medici, and had faith in the revival of paganism. Returning to his own people, he had died in tho Morea. Sigismondo, having gone there in command of the Venetian expedition against the Turks, exhumed the philo- sopher's bones as holy relics, and brought them to Rimini for worthy sepulture in his Christian pantheon. All this is solemnly recorded in the inscription, which is dated 1465. The fourth sarcophagus was that of Roberto Valturio, the engineer, author of De Ke Militari, who had been Sigismondo's minister and had aided him in the construction of the castle of Rimini. The other urns on this side were placed by Malatesta's successors, and the arches on the left wall remained untenanted. ;

Sigismondo understood the science of fortification. He was also the first to discard the use of wooden bomb shells, and substitute others cast in bronze. As a soldier his numerous campaigns had shown him to be possessed of all the best qualities and worst defects of the free captains of his time. He began his military career in 1432 in the service of Eugenius IV.; but, when this pope doubted his good faith and transferred the command to another, he sided with the Venetians against him, though at a later date he again served under him. On the decease of Filippo Maria Visconti in 1447, he joined the Aragonese against Venice and Florence, but, presently changing his flag, fought valiantly against Alphonso of Aragon and forced him to raise the siege of Piombino. In 1454 he accepted a command from the Sienese, but suddenly, after his usual fashion, he made peace with the enemies of the republic, and had to save himself by flight from arrest for his perfidy. It was then that the letters from Isotta were confiscated. After this he began scheming to hasten the coming of the Angevins, and took part in new and more hazardous campaigns against adversaries such as the duke of Urbino, Sforza of Milan, Piccinino, and, worst of all, the Sienese pope, Pius IL, his declared and mortal foe. This time Sigismondo had blundered; for the cause of Anjou was hopelessly ruined in Italy. He

was therefore driven to make his submission to the pope but, again rebelling, was summoned to trial in Rome (1460) before a tribunal of hostile cardinals. All the old charges against him were now revived and eagerly confirmed. He was pronounced guilty of rapine, incendiarism, incest, assassination, and heresy. The murder and violation of Borbona's wife was brought up; he was accused of having tortured his former preceptor, in revenge for punishments received in his youth, and of having killed three wives— although it seems that he had only two besides his ever- beloved Isotta, who survived him. He was also severely blamed for the erection of a temple which, as the pope justly remarked, was better adapted for the worship of pagan demons than of the Christian God. Nor was it forgotten how, when Pius IL had proclaimed a crusade against the infidels at the assembly at Mantua, Sigismondo had secretly invited the Grand Turk to make a descent upon Italy. Consequently he was sentenced to the depriva- tion of his state (which was probably the main object of the trial), and to be burnt alive as a heretic.

This sentence, however, could not easily be executed, and Sigismondo was only burnt in effigy. But the pope marked the intensity of his hatred by causing the dummy to be carved and dressed with such life-like resemblance that he was almost able to persuade himself that his hated enemy was really consumed in the flames. Malatesta could afford to laugh at this farce, but he nevertheless prepared in haste for a desperate defence (1462). He knew that the bishop Vitelleschi, together with the duke of Urbino and his own brother Novello Malatesta, lord of Cesena, were advancing against him in force; and, being defeated by them at Pian di Marotta, he was driven to Rome in 1463 to again make submission to the pope. This time he was stripped of all his possessions excepting the city of Rimini and a neighbouring castle, but the sentence of excommunication was withdrawn. For, now that Malatesta's power was crushed, the object of the war was attained. Its continuance would have been inex- pedient, and might have too suddenly roused the fears of the other potentates of Romagna, who were all destined, sooner or later, to share the same fate. The once mighty tyrant of Rimini found himself reduced to penury with a state chiefly composed of a single town. He

there- fore took service with the Venetians, and in 1464 had the command of an expedition to the Morea. Here his movements were so hampered by the interference of the commissioners of the republic that, with all his valour, he could achieve no decisive success. In 1466 he was able to return to Rimini, for Pius II. was dead, and the new pope, Paul IL, was less hostile to him. Indeed the latter offered to give him Spoleto and Foligno, taking Rimini in exchange ; but Malatesta was so enraged by the proposal that he went to Rome with a dagger concealed on his person, on purpose to kill the pope. But, being forewarned, Paul received him with great ceremony, and surrounded by cardinals prepared for defence ; whereupon Sigismondo changed his mind, fell on his knees and im- plored forgiveness. His star had now set for ever. For sheer subsistence he had to hire his sword to the pope and quell petty rebellions with a handful of men. At last, his health failing, he returned to his family, and died in Rimini on the 7th October 1468, aged fifty-one years.

‘ He was succeeded, according to his desire, by Isotta and his son Sallustio. But there was an illegitimate elder son by another mother, named Roberto Malatesta, a valiant and unscrupulous soldier. Befriended by the pope, this man undertook to conquer Rimini for the Holy See, but came there to further his own ends instead (20th October 1469), and, while feigning a desire to share the government with Isotta and her son, resolved, sooner

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or later, to seize it for himself. This aroused the pope’s wrath, and Roberto instantly prepared for defence. Find- ing an ally in the duke of Urbino, whose eyes were now opened to the aggressive policy of the church, he was able to repulse its forces. Paul II. died soon after, and was succeeded by Sixtus IV. Roberto’s position was now more secure, and in order to strengthen his recent allianee he betrothed himself to the daughter of the duke of Urbino. The next step was to dispose of his rival kindred. On the 8th August 1470 Isotta’s son was found murdered in a well belonging to the Marcheselli family; and a blood- stained sword, placed in their courtyard by Roberto, made it appear as though they had been guilty of the crime. Towards the end of the same year Isotta died also, apparently

of a slow fever, but really, it was believed, by poison. Another of her sous, Valerio, born in 1453, still lived, but he was openly put to death by Roberto on a trumped-up charge of treason. In 1475 the new tyrant celebrated his nuptials with the duke of Urbino's daughter, and, being again taken into favour by the pope, valiantly defended him in Rome against the attacks of the duke of Calabria, and died there in 1482 of the hardships endured in the war. His widow was left regent during the minority of his son Pandolfo, who was nicknamed Pandolfaccio on account of his evil nature. Directly he was of age, he seized the reins of government by killing some relations who had plotted against him, and crushed another conspiracy in the same way. A daring soldier, he distinguished himself at the battle of the Taro against the French ; but his tyranny made him hated by his subjects. In 1500, when Cesare Borgia fell on Romagna with violence and fraud, this Malatesta shared the fate of other petty tyrants and had to fly for his life. After the fall of the Borgia he returned, but, being bitterly detested by his people, decided to sell his rights to the Venetians, who had long desired to possess Rimini, and who gave him in exchange the town of Cittadella, some ready money, and a pension for life.

This arrangement was naturally disapproved by Rome, and especially by Julius II, who had already repeatedly vowed that, unless Venice restored the cities she had so unjustly seized—Cervia, Ravenna, and Rimini—he would turn the world upside down to regain them. And he kept his word. For he contrived the league of Cambray on purpose to ruin the Venetians, who were crushingly defeated in 1509. Thereupon the pope, having accom- plished his own ends, made alliance with the Venetiarts, who were now prostrate at his feet, and, with them, the Spaniards, and the Swiss, fought against the French at Ravenna in 1512. Here the French were victors, but owing to their heavy losses and the death of their renowned leader, Gaston de Foix, were compelled to retreat. Thus Julius became master of Rimini and the other coveted lands. Malatesta made more than one attempt to win back his city, but always in vain, for his subjects preferred the papal rule. He returned there for the last time while Marshal Bourbon was laying siege to Rome; but in 1528 Pope Clenient VII. became definitive master of the town. Thus, after two hundred and fifty years, the sway of the Malatesta came to an end, and Pandolfo was

reduced to beggary. In fact, we find him petitioning the duke of Fer- rara for the gift of a couple of crowns and promising to ask for no more. He died in 1534, leaving a daughter and two sons in great poverty. The elder, Sigismondo, after various military adventures, died at Reggio d'Emilia in 1543; and Malatesta, the younger, went to fight in the Scotch and English wars, and was never heard of again. Sigismondo had left male heirs who made another attempt to regain Rimini in 1555, but Pope Paul IV. declared them deposed in perpetuity in punishment of Pandolfaccio's misdeeds.

Egyptian rings.

Cylin- ders.

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From that time the Malatesta became citizens of Venice ; their names were inscribed in the Golden Book, and they were admitted to the grand council. With the death, in 1716, of Christina Malatesta, the wife of Niccolo Boldu, the Rimini branch of the family became extinct. The descendants of Giovanni, brother of Malatesta da Verrucchio, who married one of the Sogliano, were known as the Sogliano-Malatesta. The representatives of this branch settled in Rome.

The history of Rimini practically ends with its inde- pendence. It fell into obscurity under the rule of the popes, and was not again mentioned in history until, in 1831 and 1845, it took a prominent part in the revolu- tionary movements against papal despotism and in favour of Italian independence. Although Rimini, like many other cities of Romagna, is now harassed by republican and socialistic sects, it is a thriving town and enjoys increasing prosperity. It had in 1881 a population of 37,248 souls, being the centre of a district containing 88,110 inhabi- tants, and is part of the province of Forli, which, divided into the three districts of Cesena, Forli, and Rimini, has a total population of 252,883 souls. Many small manufac- tures are carried on at Rimini, but agriculture is its principal resource, and its produce in corn and wine is considerably in excess of the local consumption. Its sea- bathing establishment attracts many visitors during the summer months, and conduces to the prosperity of the

town. Rimini also boasts a good public library of 28,000 volumes, inclusive of 850 MSS.; and it has a record office containing several thousand ancient MSS.

Authorities. —Moroni, Dizionario di erudizione storico-ecclesi- astica (vol. lvii., s.v. "Rimini"); Ch. Yriarte, Rimini: Un Con- dotticre au XV. Siecle: Etudes sur les lettres et les arts a la cour

des Malatesta (Paris, 1882); Tonini, Storia di Rimini (Rimini, 1848-82). (P. V.)

RINDERPEST. See Murramy, vol. xvii. p. 59.

RING (Gr. daxrvAcos, Lat. annulus).1 At an early period, when the art of writing was known to but very few, it was commonly the custom for men to wear rings on which some distinguishing sign or badge was engraved (éricnpov), so that by using it as a seal the owner could give a proof of authenticity to letters or other documents. Thus, when some royal personage wished to delegate his power to one of his officials, it was not unusual for him to hand over his signet ring, by means of which the full royal authority could be given to the written commands of the subordinate. The enlarged part of a ring on which the device is engraved is called the " bezel," the rest of it being the " hoop."

The earliest existing rings are naturally those found in the tombs of ancient Egypt. The finest examples date from about the 18th to the 20th dynasty ; they are of pure gold, simple in design, very heavy and massive, and have usually the name and titles of the owner deeply sunk in hieroglyphic characters on an oblong gold bezel. Rings worn in Egypt by the poorer classes were made of less costly materials, such as silver, bronze, glass, or pottery covered with a siliceous glaze and coloured brilliant blue or green with various copper oxides. Some of these had hieroglyphic inscriptions impressed while the clay was moist. Other examples have been found made of ivory, amber, and hard stones, such as carnelian. Another form of ring used under the later dynasties of Egypt had a scarab in place of the bezel, and was mounted on a gold hoop which passed through the hole in the scarab and allowed it to revolve.

In ancient Babylonia and Assyria finger rings do not appear to have been used. In those countries the signet took a different form, namely, that of a cylinder cut in

1 Compare Gums, vol. x. p. 186.

crystal or other hard stone, and perforated from end to end. A cord was passed through it, and it was worn on the wrist like a bracelet. This way of wearing the signet is more than once alluded to in the Old Testament (Gen. xxxviii. 18, Revised Version, and Cant. vili. 6).

The Etruscans used very largely the gold swivel ring mounted with a scarab, a form of signet probably intro- duced from Egypt. Some found in Etruscan tombs have real Egyptian scarabs with legible hieroglyphs; others, probably the work of Phoenician or native engravers, have rude copies of hieroglyphs, either quite or partially illegible. A third and more numerous class of Etruscan signet rings have scarabs, cut usually in sard or carnelian, which are a link between the art of Egypt and that of Greece, the design cut on the flat side being Hellenic in style, while the back is shaped like the ordinary Egyptian scarabeeus beetle.

Among the Greeks signet rings were very largely worn, and were usually set with engraved gems. In Sparta a sumptuary law was passed at an early time to forbid any substance more valuable than iron to be used for signet rings; but in other parts of the Hellenic world there appears to have been no restriction of this sort. In some of the numerous tombs of Etruria and Kertch (Panti- capseum) in the Cimmerian Bosphorus gold rings of great magnificence have been discovered, apparently of the finest Greek workmanship. One from Etruria, now in the British Museum, is formed by two minutely modelled lions whose bodies form the hoop, while their paws hold the bezel, a scarab engraved with a lion of heraldic char- acter. Many other examples of this design have been found, some of which are among the finest existing speci- mens of Hellenic or Greeco-Etruscan jewellery. Another remarkable specimen from an Etruscan tomb is of Etrusco- Latin work. The hoop of the ring is formed by two minute gold figures of Hercules and Juno Sospita, the stone being set between their

heads. Many of the Greek rings are of thin repoussé gold, so as to make the most show for the least cost ; one fine example, early in date, has its hoop formed of two dolphins, holding a plain white stone.

The Romans appear to have imitated the simplicity of Lacedemonia. Throughout the republic none but iron rings were worn by the bulk of the citizens. Ambassadors were the first who were privileged to wear gold rings, and then only while performing some public duty. Next senators, consuls, equites, and all the chief officers of state received the jus annuli aurei. One early Roman ring of the highest historical interest still exists; it belonged to Cornelius Scipio Barbatus, consul in 298 B.c., in whose sarcophagus, now in the Vatican, it was found in 1780.? It is of plain rudely hammered gold, and is set with an intaglio on sard of a figure of Victory, purely Roman in style, dating before 300 B.c. In the Augustan age many valuable collections of antique rings were made, and were frequently offered as gifts in the temples of Rome. One of the largest and most valuable of the dactyliothece was dedicated in the temple of Apollo Palatinus by Augustus's nephew Marcellus, who had formed the collection (Pliny, H. N., xxxvii. 5). The temple of Concord in the Forum contained another; among this latter collection was the celebrated ring of Polycrates, king of Samos, the story of which is told by Herodotus (see vol. xix. p. 417); Pliny, however, doubts the authenticity of this relic (#/. W., mateevil. 2),

Different laws as to the wearing of rings existed during the empire: Tiberius made a large property qualification necessary for the wearing of gold rings; Severus conceded the right to all Roman soldiers; and later still all free citizens possessed the jus annuli aurei, silver rings being

2 This ring afterwards passed into the Beverley collection.

Etrusean

rings,

Greek rings.

Roman rings.

Celtic rings.

Episco- pal rings,

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worn by freedmen and iron by slaves. Under Justinian even these restrictions passed away.

In the 3d and 4th centuries Roman rings were made engraved with Christian symbols. Fig. 1 shows two silver rings of the latter part of the 4th century, which were found in 1881 concealed in a hole in the pavement of a Roman villa at (Fifehead Neville, Dorset, together with some coins of the same period. Both have the monogram of Christ, and one has a dove within an olive wreath rudely cut on the silver bezel. These rings are of special interest, as Roman objects with any Christian device have very rarely been found in Britain.

Large numbers of gold rings have been found in many parts of Europe in the tombs of early Celtic races. They are usually of very pure gold, often penannular in form—with a slight break, that is, in the hoop so as to form a spring. They are often of gold wire formed into a sort of rope, or else a simple bar twisted in an ornamental way. Some of

Fia. 1.—-Roman silver rings.

the quite plain penannular rings were used in the place.

of coined money.

Throughout the Middle Ages the signet ring was a thing of great importance in religious, legal, commercial, and private matters.

The episcopal ring! was solemnly conferred upon the newly made bishop together with his crozier, a special formula for this being inserted in the Pontifical. In the time of Innocent II]. (1194) this was ordered to be of pure gold mounted with a stone that was not engraved ; but this rule appears not to have been strictly kept. Owing to the custom of burying the

episcopal ring in its owner's coffin a great many fine examples still exist. Among the splendid collection of rings formed by the distinguished naturalist Edmund Waterton, and now in the South Kensington Museum, is a fine gold episcopal ring decorated with niello, and inscribed with the name of Alhstan, bishop of Sherborne from 824 to 867 (see fig. 2).2 In many cases an antique gem was mounted in the : bishop's ring, and often an inscrip- tion was added in the gold setting of the gem to give a Christian name to the pagan figure. The monks of Durham, for example, made an intaglio of Jupiter Serapis into a portrait of St Oswald by adding the legend capvT s. oswaLpI. In other cases the engraved gem appears to have been merely regarded as an ornament without meaning, as, for example, a magnificent gold ring found in the coffin of Seffrid, bishop of Chichester (1125- 1151), in which is mounted a Gnos- tic intaglio. Another in the Water- ton collection bears a Roman cameo in plasma of a female head in high relief ; the gold ring itself is of the 12th century. More commonly the episcopal ring was set with a large sapphire, ruby, or other stone cut ~~ en cabochon, that is, without ee 'Ss and very magnificent in effect (see Fre. 3.—13th-century episco- fig. 3). is was worn over the bishop's. Youn, of den a coal gloves, usually on the fore- finger of — # Sapplure en cabochon. the right hand ; and this accounts for the large size of the hoop of these rings. In the 15th and 16th centuries bishops often wore three or four rings on the right hand

Alhstan.

1 See a paper by Edm. Waterton, in Arch. Jour., xx. p. 224. 2 See NIELLO (vol. xvii. p. 494) for a cut of. another specimen of au early ring decorated in a similar way.

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in addition toa large jewel which was fixed to the back of each glove.

Cramp rings were much worn during the Middle Ages Cramp as a preservative against cramp. They derived their rings. virtue from being blessed by the king; a special form of service was used for this, and a large number of rings were consecrated at one time, usually when the sovereign touched patients for the king's evil.

Decade rings were not uncommon, especially in the 15th Decade

century; these were so called from their having ten rings. knobs along the hoop of the ring, and were used, after the manner of rosaries, to say nine aves and a paternoster. In some cases there are only nine knobs, the bezel of the ring being counted in, and taking the place of the gaude ina rosary. The bezel of these rings is usually engraved with a sacred monogram or word.

Gemel or gimmel rings, from the Latin gemedlus, a twin, Gemel were made with two hoops fitted together, and could be rings. worn either together or singly ; they were common in the 16th and 17th centuries, and were much used as betrothal rings.

Posy rings, so called from the "poesy" or rhyme en- posy graved on them, were specially common in the same cen- rings. turies, The name posy ring does not occur earlier than the 16th century. ZHCAIC, XAIPE, KAAH, or votis meis Claudia vivas. In the Middle Ages many rings were inscribed with words of cabal- istic power, such as anam zapta, or Caspar, Melchior, and Balthasar, the supposed names of the Magi. In the 17th century they were largely used as wedding rings, with such phrases as "love and obaye," "fear God and love me," or "mulier viro subjecta esto."*

In the same century memorial rings with a name and jemorial date of death were frequently made of very elaborate rings. form, enamelled in black and white ; a not unusual design was two skeletons bent along the hoop, and holding a coffin which formed the bezel.

In the 15th and 16th centuries signet rings engraved Mer. with a badge or trademark were much used by merchants chants' and others; these were not only used to form seals, but Tings. the ring itself was often sent by a trusty bearer as the proof of the genuineness of a bill of demand. At the same time private gentlemen used massive rings wholly of gold with their initials cut on the bezel, and a graceful knot of flowers twining round the letters. Of this kind is Shakespeare's ring, now in the British Museum, which was found near the church of Stratford; on it is cut a cord arranged in loops between the letters Wand S. Other fine gold rings of this period have coats of arms or crests with graceful lambrequins.*

Poison rings with a hollow bezel were used in classical Poison times; as, for example, that by which Hannibal killed rings. himself, and the poison ring of Demosthenes. Pliny records that, after Crassus had stolen the gold treasure from under the throne of Capitoline Jupiter, the guardian of the shrine, to escape torture, " broke the gem of his ring in his mouth and died imniediately.". The medizval anello della morte, supposed to be a Venetian invention, was actually used as an easy method of murder. Among the elaborate ornaments of the bezel a hollow point made to work with a spring was concealed ; it communicated with a receptacle for poison in a cavity behind, in such a

3 See Waterton, in Arch. Jour., xvi. p. 307.

4 The celebrated ring given to Essex by Queen Elizabeth was meant to be used for a similar purpose. It is set with a fine cameo por- trait of Elizabeth cut in sardonyx, of Italian workmanship.

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Papal

rings.

Hebrew rings.

Thumb rings.

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way that the murderer could give the fatal scratch while shaking hands with his enemy. This device was probably suggested by the poison fang of a snake.

The so-called papal rings, of which many exist dating from the 15th to the 17th centuries, appear to have been given by the popes to new-made cardinals. They are very large thumb rings, usually of gilt bronze coarsely worked, and set with a foiled piece of glass or crystal. On the hoop is usually engraved the name and arms of the reigning pope, the bezel being

without a device. They are of little intrinsic value, but magnificent in appearance. —

Another very large and elaborate form of ring is that used during the Jewish marriage service. Fine examples of the 16th and 17th centuries exist. In the place of the bezel is a model, minutely worked in gold or base metal, of a building with high gabled roofs, and frequently movable weathercocks on the apex. This is a conven- tional representation of the temple at Jerusalem.

Perhaps the most magnificent rings from the beauty of the workmanship of the hoop are those of which Benvenuto Cellini produced the finest examples. They are of gold, richly chased and modelled with caryatides or grotesque figures, and are decorated with coloured enamels in a very skilful and elaborate way. Very fine jewels are sometimes set in these magnificent pieces of 16th-century jewellery.

Thumb rings were commonly worn from the 14th to the 17th century. Falstaff boasts that in his youth he was slender enough to "creep into any alderman's thumb ring" (Shakes., Hen. IV., Pt. I, act ii. sc. 4).

The finest collections of rings formed in Britain have been those of Lord Londesborough, Edmund Waterton (now in the South Kensington Museum), and those still in the possession of Mr A. W. Franks and Mr Drury Fortnum.

See Gorleus, Dactyliotheca, Lyons, 1601; King, Antique Gems and Rings, 1872; Jones, Finger-Rings, 1878; Edwards, History of Rings, New York, 1875 ; and various articles by Waterton and others in the Archeological Journal. (J. H. M.)

RINGWORM. See ParasitisM, vol. xviii. p. 269, and Sxin DIsHAsEs.

RIOBAMBA, or RoyaBamsBa, a town in the South- American republic of Ecuador, situated on the road from Guayaquil to Quito in "a sand valley or plain of the great central highland of the Andes—Chimborazo, Car- guairazo, Tunguragua, and Altar all being visible from its plaza." The town has occupied its present site only since the close of the 18th century;

in 1797 the old town, which lay about 12 miles to the west at Cajabamba, was com- pletely destroyed by a vast landslip (still recognizable) from Mount Cicalfa in one of the most terrific convulsions recorded even in that region of volcanic activity. Ruins still remain to show that Riobamba was a much larger and finer place then than at the present day. Though said to have 16,000 inhabitants, and to manufacture woollen gloves, sacking, and coverlets, the town is poorly built and comparatively lifeless.

RIO DE JANEIRO (in full form Sao Sepastido po Rio DE JANEIRO, and colloquially shortened to Rro), the capital of Brazil, and one of the principal seaports of South America, is situated on the western side of one of the finest natural harbours in the world in 25° 54' 23" S. lat. and 43° 8' 34" W. long. (the position of the observatory). Along with its environs it is separated from the province of Rio de Janeiro (whose chief town is Nitherohi) and constitutes an independent municipality (municipio neutro), with an area of about 540 square miles, divided into nineteen (formerly sixteen) parishes or frequezias. Most of the streets are narrow and mean- looking; even the fashionable Rua do Ouvidor, which is

lined on both sides with handsome shops, is a mere alley. The Rua Direita, or, as it is now called officially, Rua Primeiro de Marco, is the principal business street, and is wide and pleasant. It runs from the gate of the royal palace (a building of small preten- sions) to the con- vent of Sao Bento, and contains the exchange, the post office, and _ the custom-house, as well as the impe- rial chapel (1761) and several other churches. The churches and mo- nastic buildings of Rio de Janeiro number upwards of fifty, mostly built in the "Jesuit" style, but striking from their size and the barbaric mag- nificence of their decorations, as well as on account of their well-chosen sites. La Candellaria (17th century) is conspicuous from the height of its towers, and La Gloria crowns a beautiful eminence on the bay. The monastery of Sao Bento is reputed to be the wealthiest in the empire, with large possessions in land and mines; and its chapel is not unworthy of that reputation. Besides the famous

Harbour of Rio de Janeiro.

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Rio de Janeiro and its Environs,

hospital of Dom Pedro IL, better known as La Miseri- cordia, because built (1841) on ground belonging to the fraternity of that name, there are several smaller institu- tions of the same class in the city ; and a large and hand- some lunatic asylum, founded in 1841 with funds obtained by selling titles of nobility at a fixed tariff, occupies a good position in the Botafogo suburb. The military hospital is also an extensive establishment. Among the literary and scientific institutions of the city, the College Dom Pedro

RIO—RIO

II. (which is well organized), national museum, institute of history, geography, and ethnology (1838), polytechnic institute, national educational museum, polytechnic school, military, naval, and normal schools, lyceum of arts, musical conservatory, geographical society, and astronomical and meteorological observatory deserve special mention. The great national library owes its foundation to the bequest of Joao VI., and now numbers upwards of 120,000 volumes open to the public daily (see Liprariss, vol. xiv. p. 530, where the lesser libraries are also mentioned). One of the pleasant features of the city is the abundant supply of excellent water distributed to numerous stately fountains in the streets and public squares. The chief aqueduct, begun in the middle of the 17th century, starts at Tijuca, about 12 miles distant, and crosses the valley (740 feet wide and 90 feet deep) between Monte de Santa Theresa

and Monte de Santo Antonio by a beautiful double tier of arches (erected in 1750), which form a striking feature in some of the finest views of the city. Its entire length being covered in with stone work, the water is kept remark- ably cool. As the city has extended, other aqueducts of less architectural pretensions have had to be constructed ; and a good deal has been done by an English company in recent years to provide a proper system of sewers. The bay of Rio de Janeiro has been the subject of poetic panegyric ever since it was discovered ; and the traveller who comes to it after a voyage round the world seems as susceptible to its charm as if it were his first tropical experience.! The actual entrance, between Fort St Juan and Fort Santa Cruz, is 1700 yards wide. Within there are fifty square miles of anchorage, or even more for vessels of light draught, the bay having a width varying from 2 to 7 miles and stretching inland from the sea for 16 miles. Its coast-line, neglecting minor indentations, measures 60 miles. Such a sheet of water would be beautiful anywhere ; but, when on all sides it is surrounded by hills of the most varied contour, the beauty is enhanced a thousandfold. Its surface is broken by a large num- ber of islands—from the Ilha do Governador (6 miles long and 2 broad ; population 2500) down to the little cluster of the Jerubahibas.

Rio is the seat of the principal arsenal in the empire, and most of the Brazilian cruisers have been built in its dockyards. The roadstead for vessels of war is between Villegagnon Island, with its fort, and the islands at the north-east angle of the town called respectively Ilha das Cobras (Snake Island) and Ilha dos Ratos (Rat Island). On the north side of Ilha das Cobras is the naval arsenal with two large docks. On Ilha das Enchadas (Coaling Island) there is a fine commercial dock 385 feet long, on keel blocks, 45 feet wide at the entrance and 28 feet deep. Between 1846 and 1855 the average number of vessels that cleared from the port of Rio was over 680 with an average total burden of 221,280 tons. In 1867 1811 vessels (522,407 tons) entered and 1032 (596,663 tons) cleared ; in 1883 1218 (1,220,330 tons) entered and 1067 cleared, while, besides, the coasting trade was represented by 1414 vessels (454,739) entering. England has the greatest share of the foreign shipping trade, Germany ranking next, and France third. How completely (in spite of the fact that Santos and Rio Grande have become more independent) Rio de Janeiro is the commercial as well as the political capital of Brazil is evident from the

fact that the exports from Rio are on the average fully equal in value to those from the rest of Brazil; for instance, the value of the exports from the capital in 1859-60 was £5,938,850 out of £11,826,121 from the empire, in 1879-80 £10, 566, 800 out of £18,928,635, and in 1881-82 £7,550,966 out of

1 "This bay," says Mr Gallenga, "is the very gate to a tropical paradise. There is nowhere so bold a eoast, such a pieturesque eluster of mountains, sueh a maze of inlets and outlets, such a burst of all-pervading vegetation. The city itself is like Lima or Buenos Ayres, a mere chess-board of shabby narrow streets. But the environs all round—the Botafogo Bay, the vale of Larangerias, the height of Tejuea, San Cristoval, Santa Teresa, and others… . may well challenge comparison with any of the loveliest localities of either hemisphere. You are bidden drive out to the Botanic Gardens (at Botafogo), but the whole road inland or along the water is nothing but a continuous garden."

£18,522,050. To this large total coffee has long contributed 40-50 per cent., and in 1880-81 (an exceptional year) the ratio rose to 86 per cent. Though the cofiee plant was not introduced till 1770, Brazil is the greatest eoffce-producing country in the world, and Rio de Janeiro is consequently the largest coffee-exporting city. The other exports of moment are brandy (in decreasing quantities), sugar, hides, diamonds, tapioca (mainly to France), tobacco and cigars, medicinal herbs, gold dust, and jacaranda, rosewood, and other timbers. The imports comprise cotton goods, machinery, pitch pine, and petroleum. Among the comparatively few local industries are the weaving of eoloured buckskins (by a German firm) and other woollen and half woollen stuffs, the extensive manufacture of artificial mineral waters and liquors, brewing, carriage-building, and hat-making. Rio de Janeiro is the terminus of the Dom Pedro II. Railway, and thus of nearly the whole railway system of the country ; and it communicates regularly by steamer with Nitherohi on the other side of the bay, which is the terminus of another line. The population of the municipality of Rio de Janeiro was in 1850 stated at 266,466, of which 205,906 were in the town proper; but this, like most of

the earlier figures, appears to be an exaggeration, as the census in 1872 gave only 274,972, of which about 190,000 were in the town and suburbs, the slaves numbering 48,939 and the foreigners (mainly Germans, French, and Italians) 84,279. The Italian element has been rapidly increasing. 'The bulk of the population is Portuguese with a mixture of Negro blood. The native Indian races are scarcely represented.

The annual rainfall at Rio de Janeiro is about 60 inches, the greatest precipitation taking place in February (12 inches), and the least in August (under 1 inch). The monthly ranges of tein- perature for 1882 were—January 97°-68° , February 95°-68°; March 95°-69°; April 87°-64°; May 84°-60°; June 82°-59°; July 85° 59°; August 98°-54°; September 80°-50°; October 92°-59°; No- vember 97°-59° ; December 96°-62°.

The bay of Rio de Janeiro, the Nitherohi or " Hidden Water" of the natives, was first observed on 1st January (hence the name) by Alphonso de Souza, who supposed, as the Rio indicates, that he had discovered the mouth of a large river. How Villegagnon in 1558 took possession of the island which now bears his name but was then called after his patron Coligny, and how his colony was destroyed by the Portuguese, has been told in the article Braziu (vol. iv. p. 229). The eity of Rio de Janeiro did not become the capital of the viceroyalty till 1763, when José I. chose it in preference to Bahia because it was a better centre for defensive operations against the Spaniards. In 1711 it had been captured by Duguay-Trouin, who exacted 70,000 eruzados as ransom. It became the residence of the Portuguese royal family in 1808; in the same year its port was declared free to foreign trade ; and in the course of a short time it was made by Doin Joo VI. the seat of so many important institutions that Portugal became jealous at finding the relation between mother country and colony practically reversed. When Jofio VI. returned to Portugal and Pedro was declared emperor of Brazil in 1822, Rio de Janeiro naturally remained the capital of the new state. LEcclesiastically the city was at first (from the foundation of the church of Sio Sebastifo by Mendo de Sa in 1567) subject to the diocese of Bahia (San Salvador). It was made a suffragan bishoprie of Bahia by papal bull of 19th July 1576; and when Bahia was by the bull of 16th November 1676 created the metropolitan

archbishopric of. Brazil, Rio de Janeiro was (along with Pernambuco) declared a bishopric, the bishop's authority extending over the province of Espirito Santo northwards and southwards to the Rio de la Plata (Rio da Prata). The first bishop relinquished his dignity without taking possession ; and the second did not reach his diocese till 1682, when he made the church of St Sebastian on the Castle Hill his cathedral. This distinction was in 1734 transfcrred to the Church of the Cross and in 1788 to that of the Rosary. A new cathedral was begun in 1749 by D. Frei Antonio do Desterro, but the works were discontinued on his death, and in 1840 the materials served for the military academy.

See Milliet de Saint-Adolphe, Diccionario… . do Imp. do Brazil, Paris, 1846; G. Gardiner, Travels in the Interior of Brazil, 1846; Burmeister, Reise nach

Brasilien, Berlin, 1853 ; llerbert H. Smith, Brazil, 1880; C.F. van Delden Laerne, Brazil and Java, 1885. i eAS W.)

RIO GRANDE (that is, " Great River " in both Spanish and Portuguese), a descriptive epithet which in a vast number of cases has become a proper name. (1) Rio GranbDE (or Rio Bravo) pEL Norrs, which rises in the Rocky Mountains between the La Plata and San Juan ranges in the south-west of Colorado, has a total course of about 1800 miles, and forms for 1100 miles the boundary between the United States and Mexico, but owing to the shallowness of its ordinary current is navigable for steamers only to Kingsbury's Rapids, 450 miles from the sea. (2) Rio GRANDE DO Norte, or Potengi, or Potingi,

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which gives its Portuguese name to a northern province of Brazil, rises in the Serra dos Cairiris-Novos, passes Natal, the capital of the province, and falls into the sea to the south of Sao Roque. (3) Rio GRANDE Do SUL, the out- let of the Lagda dos Patos, wrongly supposed by the early explorers to be the mouth of a great river, gives its name to a city and province of Brazil (see below). (4) Rio GRANDE, a river of Western Africa, enters the sea opposite the Bissagos Archipelago (see SENEGAMBIA).

RIO GRANDE DO SUL, or in full Sio PepRo po Rio GRANDE Do SUL, a city of Brazil, in the province of the same name, near the mouth of the estuary of Rio Grande. Including the suburbs it is a place of from 30,000 to 35,000 inhabitants (1880), with a considerable trade and various manufactures. The bar at the mouth of the "Rio" does not admit vessels of full 10-feet draught ; but dredging operations undertaken by the Government in 1882 are considerably increasing the depth. In 1881-84 a railway was constructed from Rio Grande do Sul to Bage, 125 miles inland, The average annual value of the imports in the six official years ending June 30, 1882, was about £589,043, reckoning the milreis at 2s. In 1881 651 vessels (133,779 tons) crossed the bar inwards, and 555 (133,276) outwards. Among the foreign vessels the British are most numerous. The imports are very various, to supply the colonies of Germans, Italians, &c., settled throughout the province ; the exports on the other hand are mainly hides, skins, bones, hair, tallow, &c.

Rio Grande do Sul was a long time the chief town of the captaincy of El Rei (which included both the present province of Rio Grande do Sul and that of Santa Catharina). It was first founded as an encampment of Portuguese troops in 1737 on the south side of the RioGrande. The settlement was removed to its present site by Gomes Freire d'Andrade in 1745. The Spaniards occupied this part of the country from 1763 to 1776. In 1807 the two districts of Sio Pedro and Santa Catharina were united and erected into a province with Sio José de Porto Alegre for its chief town ; and, though Rio Grande was declared a city in 1809, Porto Alegre retained its position even after the separation into two comarcas in 1812. The name of the province has been rendered familiar in Europe through the remarkable success which has attended the establishment of German and Italian agricultural colonies. In 1872 there were 36,458 foreigners in the province to 330,564 free- born Brazilians and 67,791 slaves; and by 1882 it was estimated that the German population alone amounted to 102,000, while the Italians, who began to immigrate in 1875, were rapidly approaching 50,000. The first German settlement was that of So Leopoldo on the Rio do Sino, founded by Dom Pedro I. in 1825. By 1830 the inhabitants numbered 5000, and in 1854 the town was made a municipium. Others of the same nationality are Novo Mundo (1850), Nova Petropolis (1858), Santa Maria da Soledade, Marato, Sao

Benedicto, Sdo Salvador, Montenegro, Feliz, Teutonia (1858), Estrella (1856), Santa Cruz (1849), Mont Alverne, Germania, Sao Lorenzo (1858), Santa Clara, Sao Silvano, Domingos, &c. The principal Italian colonies are Caxias, Conde d'Eu, Douna Isabel, and Silviera Martins, which in 1884 had respectively 13,680, 6287, 9595, and 6000 inhabitauts. The success of these colonies is one of the most important elements in the development of the Brazilian empire. eae aes ea nh, ee osteo the Italian colonies, Breitenbach's paper in Globus (1885) ; and, for the Lagéa dos Patos, Ihering in Deutsche geogr. Bldtter (Bremen, 1885),

RIOM, a town of France, with 9590 inhabitants, at the head of an arrondissement in the department of Puy-de- Déme, 8 miles north of Clermont-Ferrand on the railway to Paris, occupies an eminence on the left bank of the Ambéne (a left-hand tributary of the Allier) rising above the fertile plain of Limagne. It is surrounded with boule- vards and has wide streets, but the houses, being built of black lava, have a rather sombre appearance. Some date from the 15th and 16th centuries, with turrets and ancient carved work, The church of St Amable goes back to the 12th century, but has suffered by repeated restorations. The old ducal palace (now occupied by the court of appeal, &c.) has a collection of portraits of Auvergne celebrities. A feature in the town is the fountains, of which some are

of the Renaissance period. Riom trades in the products of Limagne—grain, wine, hemp, preserved fruits, and especially a conserve of apricots—and has a tobacco manu- factory.

Riom (Ricomagus or Ricomwm of the Romans) was long the rival of Clermont. Along with Auvergne it was seized for the crown by Philip Augustus, and it was the capital of this province under the dukcs of Berri and Bourbon. During the religious wars it long held with the League. Its courts of law, always famous, are associated with the memory of D'Aguesseau.

RIONERO IN VOLTURE, a city of Italy, in the pro- vince of Potenza, 4 miles from Atella, is pleasantly situated at the foot of Monte Volture, has the repute of being the best built and best kept of the towns of the Basilicata, and has long been distinguished by the industrious character of its inhabitants (11,383 in 1881). It does not seem to be older than the first half of the 17th century. In 1851 it suffered severely from the earthquake. .

RIOT is "an unlawful assembly which has actually begun to execute the purpose for which it assembled by a breach of the peace and to the terror of the public. A lawful assembly may become a riot if the persons

assembled form and proceed to execute an unlawful purpose to the terror of the people, although they had not that purpose when they assembled" (Stephen, Digest of the Criminal Law, art. 73). The above is the definition of a riot at common law in England. The offence is the most grave kind of breach of the peace known to the law, short of treason. In its previous stages it may be an affray, an un- lawful assembly, or a riot, according to circumstances, and it may, if carried far enough, become treason. An affray is the fighting of two or more persons in the public street. An unlawful assembly is an assembly of three or more persons with intent to commit a crime by force or carry out a common purpose, lawful or unlawful, in such a way as to give reasonable grounds for fearing a breach of the peace. A rout is an unlawful assembly which has made a motion towards the execution of its common purpose. If the unlawful assembly should begin to demolish a particular inclosure, that would be a riot; if it should proceed to pull down all inclosures, that would be treason. It was considered as early as the 14th century that the common law gave an insufficient remedy against riot. In 1360 the statute of 34 Edw. III. c. 1 gave jurisdiction to justices to restrain, arrest, and imprison rioters. In 1393 the statute of 17 Ric. IT. c. 8 conferred similar powers on the sheriff and posse comitatus. Numerous other Acts extend- ing the common law were passed, especially in the Tudor reigns (see Stephen, History of the Criminal Law, vol. i. p. 202). The effect of existing legislation is to constitute certain statutory offences similar to riot at common law. The earliest Act now in force is one commonly called the Riot Act, 1 Geo. I. st. 2,¢.5. That Act makes it the duty of a justice, sheriff, mayor, or other authority, wherever twelve persons or more are unlawfully, riotously, and tumultuously assembled together to the disturbance of the public peace, to resort to the place of such assembly and read the following proclamation :—" Our Sovereign Lady the Queen chargeth and commandeth all persons being assembled immediately to disperse themselves, and peaceably to depart to their habitations or to their lawful business, upon the pains contained in the Act made in the first year of King George for preventing tumultuous and riotous assemblies. God save the Queen." It is a felony punishable with penal servitude for life to obstruct the reading of the proclamation or to remain or continue together unlawfully, riotously, and tumultuously for one hour after the proclamation was made or for one hour after it would have been

made but for being hindered. The Act requires the justices to seize and apprehend all persons continuing after the hour, and indemnifies them

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and those who act under their authority from liability for injuries caused thereby. Any prosecution for an offence against the Act must be commenced within twelve months after the offence.

By 24 & 25 Vict. c. 97, § 11, it isa felony punishable with penal servitude for life for persons riotously and tumultuously assembled together to the disturbance of the public peace to unlawfully and with force demolish or begin to demolish or pull down or destroy any building, public building, machinery, or mining plant. By § 12 it is a misdemeanour punishable with seven years' penal ser- vitude to injure or damage such building, &c. A riotous assembly of three or more seamen unlawfully and with force preventing, hindering, or obstructing the loading or unloading or the sailing or navigation of any vessel, or unlawfully and with force boarding any vessel with intent to do so, constitutes a misdemeanour punishable with twelve months' hard labour, 33 Geo. ITI. c. 67. In addi- tion to these Acts, there are others aimed at crimes of a somewhat similar nature, such as assembly for the purpose of smuggling, going armed in pursuit of game by night, forcible entry and detainer, political meetings in the city of Westminster, tumultuous petitioning, and unlawful drilling. For these offences see Stephen, Digest of the Criminal Law, art. 76-82.

It is the duty of a magistrate at the time of a riot to assemble subjects of the realm, whether civil or military, for the purpose of quelling ariot. In this duty heis aided by the common law, under which all subjects of the realm are bound to assist on reasonable warning, and by various enaetments enabling the authorities to call out the auxiliary and reserve forces for the suppression of riot, and to close public houses where a riot isapprehended. It is his duty to keep the peace ; if the peace be broken, honesty of intention will not avail him if he has been guilty of neglect of duty. The question is whether he did all that he knew was in his power and which could be expected from a man of ordinary prudence, firm- ness, and activity. The law as thus stated is gathered from the opinions of the judges on the trials of the lord mayor of London and the mayor of

Bristol on indictments for neglect of duty at the time of the Gordon riots of 1780 and the Bristol riots in 1831.!_ In addition to his liability to an indictment at common law, a defaulting magistrate is subject under the provisions of 18 Hen. IV. c. 7 and 2 Hen. V. st. 1, c. 8, to a penalty of £100 for every default, the default to be inquired of by commission under the great seal. A matter of interest is the extent of the protection afforded by the Riot Act to soldiers acting under the eommands of their officers. The soldier is at the same time a citizen, and the mere fact of his being a soldier is not sufficient to exonerate him from all responsibility. No case in which the question has called for decision seems to have arisen. It is the opinion of Mr Justice Stephen that a soldier would be protected by orders for which he might reasonably believe his superior officer to have good grounds (History of the Criminal Law, vol. i. 206). On the other hand, he would probably not be protected by an order plainly unnecessary, such as an order to fire into a crowd of women and children when no violence was observable.

The civil remedy given to those whose property has suffered by riot is of an exceptional charaeter. The action is brought against the hundred in which the riot took place. This liability of the hundred is a survival of the pre-Conquest obligation of the huudred and tithing to pursue and do justice on the thief: the hundred is supposed to guarantee the orderly conduct of its inhabitants, and is liable to damages for its failure to preserve order. The liability of the hundred in case of robbery was enacted as early as the Statute of Winchester, 13 Edw. I. st. 2. That and subsequent Acts were repealed by 7 & 8 Geo. IV. c. 27, and their provisions were consolidated and amended by 7 & 8 Geo. IV. c. 81. The Act gives a remedy against the hundred in the ease of any church, chapel, house, machinery, &c., being "feloniously demolished, pulled down, or destroyed, wholly or in part, by any persons riotously and tumultuously assembled together." A summary remedy is given for damage not exceeding £30. The remedy is extended to injury to threshing machines by 2 & 3 Will. IV. c. 72. It has becn held that damage to a house will not entitle the owner to compensation from the hundred unless the intention of the riotcrs was to totally destroy the house.

The Riot Act does not extend toIreland. But similar provisions are contained in the Act of the Irish Parliament of 27 Geo. III. c.

‘ Reports of these trials will be found in Carrington and Payne’s Reports, vol. v., p. 254.

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15, as amended by 5 & 6 Vict. c. 28. An offence peculiar to Ireland and punishable with penal servitude for life under the provisions of the Aets above mentioned is the sending of a notice, letter, or message exciting or tending to exeite a riot. The Prevention of Crimes Act, 1882, enabled summary proeeedings to be taken against rioters. The Act was temporary only, expiring with the session of Parliament 1885.

In Scotland a riot may be either rioting and mobbing or rioting and breach of the peace. The first is much the same as the riot of English law. “ Mobbing consists in the assembling of a number of people and their combining against order and peace to the alarm of the lieges” (Macdonald, Criminal Law, 180). The second offence occurs where concourse or a common purpose are wanting. Numerous Acts against riot and unlawful convoeation were passed by the Scottish parliament at different times, beginning as early as 1457. The Riot Aet (1 Geo. I.) applies to Seotland. The liability of the county or burgh for destruction of property by riot is pro- vided for by the Riot Act and by several Acts of Parliament of the reign of George III.

In the United States the law is based upon that of England. In some States there is a statutory proelamation for the dispersion of rioters in words almost identieal with those of the British Riot Act. The city, town, or county, according to circumstances, is liable for the damage caused by rioters. In some cases a remedy over against the rioters is given by legislation. (J. Wt.)

RIPARIAN LAWS. By the law of England the property in the bed and water of a tidal river as high as the tide ebbs and flows at a medium spring tide is pre- sumed to be in the crown or a grantee of the crown, generally the lord of a manor, and the bed and water of a non-tidal river

are presumed to belong to the person through whose land it flows, or, if it divide two properties, to the riparian proprietors, the rights of each extending to mid- stream (ad medium filum aque). In order to give riparian rights, the river must flow in a defined channel, or at least above ground. The diminution of underground water collected by percolation does not give a cause of action to the owner of the land in which it collects, though he is entitled to have it unpolluted unless a right of pollution be gained against him by prescription. Asa general rule a riparian proprietor, whether on a tidal or a non-tidal river, has full rights of user of his property. The most important limitations of these rights will be found under the headings FisHEertes and Navigation Laws. In both these cases the rights of the riparian proprietors are subject to the intervening rights of other persons. These rights vary according as the river is navigable or not, or tidal or not. For instance, all the riparian proprietors might combine to divert a non-navigable river, though one alone could not do so as against the others, but no combination of riparian proprietors could defeat the right of the public to have a navigable river maintained undiverted. It is proposed in this place to consider shortly the rights enjoyed by, and the limitations imposed upon, riparian proprietors, in addition to those falling under the head of fishery or navigation. In these matters English law is in substantial accordance with the law of other countries, most of the rules being deduced from Roman law. Perhaps the main difference is that running water is in Roman law a res communis, like the air and the sea. In England, owing to the greater value of river water for manufacturing and other purposes, it cannot be said to be common property, even though it may be used for navigation. The effect of this difference is that certain rights, public in Roman law, such as mooring and unloading cargo, bathing and towing, are only acquirable by prescription or custom in England. A hut might lawfully be built on the shore of a tidal river by Roman law; in England such a building would be a mere trespass.

The principal rights enjoyed by riparian owners as such are the right of increase of property by means of alluvion and the right of use of the water.

Alluvion is the gradual and imperceptible increase of land by deposit; a sudden and violent changing of the course of a streain by a flood does not change the property. The addition to property

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by alluvion is occasionally of considerable practical importance. In the reign of Charles I. the estate of Lord Berkeley was increased by 300 acres left dry by the Severn. The land was claimed for the crown, but judgment was given in favour of Lord Berkeley. Ifan island be formed in the stream, it belongs to the proprietor to whose land it is nearest; if it be exactly in mid-stream, it belongs to the riparian proprietors equally. The right of use of the water of a natural stream cannot be better described than in the words of Lord Kingsdown :—" By the general law applicable to running streams, every riparian proprietor has a right to what may be ealled the ordinary use of water flowing past his land,—for instance, to the reasonable use of the water for domestic purposes and for his cattle, and this without regard to the effect which such use may have in case of a deficiency upon proprietors lower down the stream. But, further, he has a right to the use ofit for any purpose, or what may be deemed the extraordinary use of it, provided he does not thereby interfere with the rights of other proprietors, either above or below him. Subject to this condition, he may dain up a stream for the purposes of a mill, or divert the water for the purpose of irrigation. But he has no right to intercept the regular flow of the stream, if he thereby interferes with the lawful use of the water by other proprietors, and inflicts upon them a sensible injury," (Miner v. Gilmour, 12 Moore's Privy Council Cases, 156). The rights of riparian proprietors where the flow of water is artificial rest on a different principle. As the artificial streain is made by a person for his own benefit, any right of another person asa riparian proprietor does not arise at common law, as in the case of a natural stream, but must be established by grant or prescription. The rights of a person nota riparian proprietor who uses land abutting on a river by the licence or grant of the riparian proprietor are uot as full as though he were a riparian proprietor, for he cannot be imposed as a riparian proprietor upon the other proprietors without their consent. The effect of this appears to be that he is not

entitled to sensibly affect their rights, even by the ordinary as distinguished from the extraordinary use of the water.

The limitations to which the right of the riparian proprietor is subject may be divided into those existing by common right, those imposed for public purposes, and those established against him by crown graut or by eustom or prescription. Under the first head eomes the public right of navigation, of anchorage and fishery from boats (in tidal waters), and of taking shell-fish (and probably other fish except royal fish) on the shore of tidal waters as far as any right of several fishery docs not intervene. Under the second head would fall the right of eminent domain by which the state takes riparian rights for public purposes, compensating the proprietor, the restrictions upon the fishery rights of the proprietor, as by Acts forbidding the taking of fish in close time, and the restrictions on the ground of public health, as by the Rivers Pollution Act, 1876. The jurisdiction of the state over rivers in England may be exer- cised by officers of the crown, as by commissioners of sewers or by the Board of Trade under the Crown Lands Act, 1866. PRESCRIPTION). Among such rights are the right to bathe, to land, to discharge cargo, to tow, to dry nets, to beach boats, to take sand, shingle, or water, to have a sea-wall main- tained, to pollute the water (subject to the Rivers Pollution Act). In some cases the validity of local riparian customs has been re- cognized by the legislature. The right to enter on lands adjoining tidal waters for the purpose of watching for and landing herrings, pilchards, and other sea-fish was confirmed to the fishermen of Somerset, Devon, and Cornwall by 1 Jac. I. c. 28. The digging of sand on the shore of tidal waters for use as manure on the land was granted to the inhabitants of Devon and Cornwall by 7 Jae. I. c. 18, The public right of taking or killing rabbits in the day- time on any sea bank or river bank in the county of Lincoln, so far as the tide extends, or within one furlong of such bank, was pre- served by 24 & 25 Vict. c. 96, §17. It should be noticed that rights of the public may be subject to private rights. Where the river is navigable, although the right of navigation is common to the subjects of the realm, it may be connected with a right to exclusive access to riparian land, the invasion of which may form the ground for legal proceedings by the riparian proprietor (see eae hes, Fishmongers' Company, Law Reports—Appeal Cases, vol. i., :

A freshwater lake appears to be governed by the same law as a non-tidal river. The preponderance of authority is in favour of the right of the riparian proprietors as against the erown.

Unlawful and malicious injury to sea and river banks, towing

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paths, sluices, floodgates, milldams, &c., or poisoning fish is a crime under 24 & 25-Vict. c. 97.

Scotland. —The law of Scotland is in general accordance with that of England. One of the principal differences is that in Scotland, if a charter state that the sea is the boundary of a grant, the fore- shore is included in the grant, subject to the burden of crown rights for publie purposes. Persons engaged in the herring fishery off the coast of Scotland have, by 11 Geo. III. ¢. 31, the right to use the shore for 100 yards from high-water mark for landing and drying nets, erecting huts, and curing fish. Similar powers were given to those engaged in any white fish fishery by 29 Geo. II. c. 23 ; but the section of the Act giving these powers was repealed by the Sea Fisheries Act, 1868.

United States.—1n the United States the common law of England was originally adopted, the State succeeding to the right of the crown. This was no doubt sufficient in the thirteen original States, where rivers of the largest size do not occur, but was not generally followed in later times when it had become obvious that English law was insufficient to meet the case of the vast rivers and lakes of North America. "In Pennsylvania, North Carolina, South Carolina, Iowa, Mississippi, and Alabama, it has been determined that the common law does not prevail, and that the ownership of the bed or soil of all rivers navigable for any useful purpose of trade or agriculture, whether tidal or fresh water, is in the State" (Bouvier, Law Dict., s.v. "River"), The supreme court of the United States in 1857 declared constitutional an Act of Congress of 1845, extending the admiralty jurisdiction of the United States to all publie navigable rivers and lakes where commerce is carried on between different States or with foreign nations (The Propeller Genesee Chief v, Fitzhugh, 12 Howard's Reports, 443). The right of eminent domain has been exercised to a much

greater extent than in England in the acquisition of sites for mills under the powers of State legislation in encouragement of trade. Snch a course has never been necessary in England (see Angell, Law of Watercourses, § 478). The law as to subterranean water seems to be still unsettled. Some State decisions have recognized a public right to moor vessels and place cargo on the shore. (J. Wt.)

RIPH (59 or 48”), ¢.¢, RABBENU YISHAK B. YA‘AKOB HaAxKKoHEN! At-pHasiI or AL-FEZI, after the death of his teachers the greatest rabbi of Africa, and subsequently of the Peninsula, in the 11th and 12th centuries, was born in 1013 at Kal‘at-Ibn-Hammad near Fez, and died at Lucena in 1103. His teachers were the great rabbins Rabbenu Nissim and Rabbenu Hananeel, both of Kairawan (ob. 1055). What Rasui (q.v.) was to the Ashkenazic Riph was for the Sepharadic Jews,? not only a teacher of the deepest learning, but also one who made new paths altogether for the students of the Talmud. Otherwise these two great men differed widely from one another in their activity. Rashi left the Babylonian Talmud, correc- tions of the text excepted (which he, however, confined to his own commentary, and by which his own disciples and publishers corrected the Talmud text), in its old state. Al-phasi, however, first separated from it the Agadah, which he cast aside almost entirely, and then he sifted the Hala- khah® thoroughly, retaining only the practical part of it. Thus either title his book has received is correct, the Lvttle Talmud or the Decisions of Rab Al-phez. Late in the 12th century and in the 13th a host of rabbins respectively attacked and defended Al-phasi (see Rasap III, and RamBan), whilst others commented on him (see below). One of the commentaries accompanying the Riph is by Rashi. This commentary, however, which is now an integral part of the book, was not written for it by Rashi himself, who could scarcely have known of Riph’s exist- ence, and much less of his work.. The fact is the enter- prising publisher of the second edition (Venice, 1521-22, fol.), the famous Daniel Bombergi, had one of the three recensions which Rashi had made on the Talmud excerpted and applied to corresponding parts of the Riph which has the very wording of the Talmud, or something near it. Where no Rashi was to be found in the passages of the

1 That Riph was a Kohen, or Aaronite, will be seen from the epitaph given in Haggahoth Hariph in the collection Tummath Yesharim (Venice, 1622, fol.).

2 On these names see MAHzOR, vol. xv. p. 293.

3 On these terms see Miprasu, vol. xvi. p. 285, and MISHNAK, p.

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Talmud (see Rasui) Rasrpam (q.v.) was utilized. Riph was not only a great Talmudist, but also a man of the greatest magnanimity and highest morality, as may be seen from the following two facts. When R. Yishak Ibn Albalia, who had been his bitterest enemy, lay at the point of death, he recommended his son to Riph, who received him with the greatest kindness, and at once adopted him as son.! Again, when Riph himself was at the point of death he recommended to the congregation of Lucena for successor, not his own learned and virtuous son Ya'akob, but the yet more learned, though not more virtuous, R. Yoseph Ibn Migash,? who became the teacher of the teachers of MAIMoNIDES (q.v.).

Although Riph's works which are known are only two, the editions of onc of these and the commentaries thereon are very numerous ; we can only mention a few of them.

I. Hilekhoth Rab Al-phez. (1) With the Novellw of Rabbenu Nissim b. Reuben, the Decisions of R. Mordekhai b. Hillel (see Rosu), the Novellxw of one of the disciples of Rabbenu Yonah, the com- mentaries of R. Yehonathan Hakkohen of Lunel and R. Yoseph Habibo (Constantinople, 1509, fol.). (2) The second edition we have already mentioned. (8) With the Strictures by R. Zerahvah Hallevi (author of the Maor) and Nachmanides's defence called Milhamoth Adonai (see RAMBAN), &c. (Venice, 1552, fol.) Each subsequent edition contains additional matter.

II. Responsa, originally some, if not all of them, written in Arabic (Leghorn, 1781, and reprint, Vienna 1794, both in 4to).

For more literature by andon Riph see Zemim De‘im in the collection Tum- math Yesharim, (8S. M. 8.-S.)

RIPLEY, a well-built market town of Derbyshire, situ- ated near the river Derwent and the Cromford Canal, and on a branch line of the Midland Railway 10 miles north of Derby and 10 south of Chesterfield. The principal public building is the market-hall erected in 1880. In the neighbourhood there are extensive collieries, and coke is largely manufactured. Besides the large concern of the Butterley Iron Company, which includes foundries, blast furnaces, and boiler works, the town possesses silk and cotton mills. The charter for the market was granted by Henry III. The population of the urban sanitary district (area 1211 acres) in 1871 was 5639, and in 1881 it was 6087.

RIPLEY, GEORGE (1802-1880), critic and man of letters, was born at Greenfield, in western Massachusetts, on October 3, 1802. He was educated at local schools and at Harvard College, where he took his degree in 1823, ranking first in his class, and then studying theology was in 1826 ordained pastor of a Unitarian church in Boston. Here his success as a thoughtful preacher was marked ; but in 1840 he resigned his charge, and he subsequently retired from the active ministry altogether.

It was during those years that there grew up in New England that form of thought or philosophy known as Transcendentalism—a name, as Emerson said, “ given no- body knows by whom, or when it was applied.” Its growth was part of what Dr Holmes has termed the “‘in- tellectual or, if we may call it so, spiritual revival ” which during the period from 1820 to 1840 was so strongly marked in the New England “churches, in politics, in philanthropy, in literature.” Ripley was prominent, if not the leader, in all practical manifestations of the movement; and it was by his earnestness and practical energy that certain of its more tangible results were directed. The first meeting of the Transcendental Club was held at his house in September 1836. He was a founder and a chief supporter of the famous magazine The Dial, which was the organ of the school from 1840 to 1844. Most important of all, however, he was the originator and

conductor of an experiment which was the most interesting practical result of the thought and ten-

1 See Sepher Hakkabbalah of RaBan II. (q.v.). 2 See Hemdah Genuzah (Koenigsberg, 1856, 8vo), leaf 30a.

dencies of the time,—the foundation of "The Brook Farm Association for Education and Agriculture." This project, in the words of its originator, was intended 'to insure a more natural union between intellectual and manual labour than now exists; to combine the thinker and the worker, as far as possible, in the same individual; to guarantee the highest mental freedom by providing all with labour adapted to their tastes and talents, and securing to them the fruits of their industry; to do away with the necessity of menial services by opening the benefits of education and the profits of labour to all; and thus to prepare a society of liberal, intelligent, and cultivated persons whose relations with each other would permit a more simple and wholesome life than can be led amidst the pressure of our competitive institutions." In short, its aim was to bring about the best conditions for an ideal civilization, reducing to a minimum the labour necessary for mere existence, and by this and by the simplicity of its social machinery saving the maximum of time for mental and spiritual education and development. At a time when Emerson could write to Carlyle, 'We are all a little wild here with numberless projects of social reform; not a reading man but has a draft of a new community in his waistcoat pocket,"—the Brook Farm project certainly did not appear as impossible a scheme as many others that were in the air. At all events it enlisted the co-operation of men whose subse- quent careers show them to have been something more than visionaries. The association bought a tract of land in West Roxbury, some ten miles from Boston, and with about twenty members actually began its enterprise in the summer of 1841.

For three years the undertaking went on quietly and simply, subject to few outward troubles other than financial difficulties, the number of associates increasing to seventy oreighty. Pictures of the life they led have been preserved by many hands. It was during this period that Haw-

thorne had his short experience of Brook Farm, of which so many suggestions appear in the Blithedale Romanee, though his preface to later editions effectually disposed of the idea-—which gave him great pain—that he had either drawn his characters from persons there, or had meant to give any actual description of the colony. Emerson, though he refused in a kind and characteristic letter to join in the undertaking, and though he afterwards wrote of Brook Farm with not uncharitable humour as ‘‘a per- petual picnic, a French Revolution in small, an age of reason in a patty-pan,” yet spoke of the design as “noble and generous,” and among its founders were many of his near friends.

In 1844 the growing need of a more scientific organiza- tion, and the influence which Fourier’s doctrines had gained in the minds of Ripley and many of his associates, combined to change the whole plan of the community. It was transformed, with the strong approval of all its chief members and the consent of the rest, into a Fourierist “phalanx” in 1845. There was an accession of new members, a momentary increase of prosperity, a brilliant new undertaking in the publication of a journal, The LHar- binger, in which Ripley, Charles A. Dana, Francis G. Shaw, and John Dwight were the chief writers, and to which Lowell, Whittier, George William Curtis, Parke Godwin, Story, Channing, Higginson, Horace Greeley, and many more now and then contributed. But the individu- ality of the old Brook Farm was gone. The association was not rescued even from financial troubles by the change. With increasing difficulty it kept on till the spring of 1846, when a fire which destroyed its building or “phalanstery” brought losses which caused, or certainly gave the final ostensible reason for, its dissolution. Its failure left Ripley poor and feeling keenly the defeat of

his project ; but the event forced him at last to devote himself to that career of literary labour in which the real success of his life was achieved. He wrote for The [Har- binger during the year of its continuance, but in 1849 he joined the staff of Zhe Tribune, founded eight years before by Horace Greeley in New York, and in a short time became its literary editor. This position, which, through his steadiness, scholarly

conservatism, and freedom from caprice as a critic, soon became one of great influence, he held until his death on July 4, 1880.

During the greater part of the time of his connexion with The Tribune, Ripley was also the adviser of a leading publishing house, an oecasional contributor to the magazines, and a co-operator in several literary undertakings. The chief of these, and the most lasting work that bears his name, was the American Cyclopedia. Begun under the editorship of Ripley and Charles A. Dana in 1857, the first edition was finished in 1862, under the title of the New American Cyclopedia—distinguishing it from its only import- aut Amcrican predecessor in the field, the small Encyclopedia Americana of many years before, which Dr Francis Lieber had edited, and which had been largely an adaptation of Brockhaus's Conversations-Lexikon. The new undertaking was upon a much larger seale, and enlisted a great number of well-known contribu- tors. It proved exceedingly popular; and its commercial success led the publishers to undertake a complete revision of it ten years later—still under the same editors—the result of which, with the dropping of the word "new" from the title, was the American Cyclopedia now before the public.

Ripley's Life, written by the Rey. O. B. Frothingham, forms one of the volumes of the series American Men of Letters. (E, L. B.)

RIPON, a cathedral city and borough in the West Riding of Yorkshire, is situated at the confluence of the Ure with the Laver and the Skell, and on the Great Northern Railway, 22 miles north-west of York and 11 north of Harrogate. The Ure is crossed by a fine bridge of 9 arches. The streets are for the most part narrow and irregular, and, although most of the houses are compara- tively modern, some of them still retain the picturesque gables characteristic of earlier times. In the spacious market-place there is a modern cross, erected in 1781. The cathedral, although not ranking among those of the first class, is celebrated for its fine proportions, and is of great interest from the various styles of architecture which it includes. Its entire length from east to west is 266 feet, the length of the transepts 130 feet, and the width of the nave and aisles 87 feet. Besides a large square central tower, there are two western towers. The cathedral was founded on the ruins of St Wilfrid's abbey about 680 a.p. in the reign of

Egfrid, but of this Saxon building nothing now remains except the crypt, called St Wilfrid's Needle. The present building was begun by Archbishop Roger (1154-81), and to this Transition period belong the tran- septs and portions of the choir. The western front and towers, fine specimens of Early English, were probably the work of Archbishop Gray (1215-55), and about the close of the century the eastern portion of the choir was rebuilt in the Decorated style. The nave and portions of the central tower were rebuilt towards the close of the 15th century in the Perpendicular style. The whole building underwent renovation under the direction of Sir G. G. Scott from 1862 to 1876 at a cost of £40,000. There are a number of monuments of historical and antiquarian interest. The bishop's palace, a modern building in the Tudor style, is situated in extensive grounds about a mile from the town. The principal secular buildings are the town-hall, the public rooms, and the mechanics' institution. There are several old charities, including the hospital of St John the Baptist founded by the archbishop of York in 1109, the hospital of St Mary Magdalene for women founded by the archbishop of York in 1341, and the hospital of St Anne founded about the time of Edward IV. by an unknown benefactor. From an early period till the 16th century Ripon was celebrated for its manufactures of woollen cloth. After this industry declined the town

became so well known for its spurs that "as true steel as Ripon rowels" became a current phrase; and both Ben Jonson and Davenant refer to Ripon spurs in their verses. This manufacture, with those of buttons and various kinds of hardware, continued to prosper till the beginning of the present century, when the rise of the mechanical industries in the large towns caused it to decline. The population of the borough (area 1580 acres) in 1871 was 6806, and in 1881 it was 7390.

The city is first mentioned under the name of Jnhrypum in con- nexion with the establishment of a monastery in 660 by Abbot Eata of Melrose. A few years after it was bestowed on St Wilfrid, who was elevated to the see of Northumbria. After the division of the bishopric in 678, a see was erected at Ripon. 'The city suffered severely in connexion with the incursions of the Danes and the invasion of William the Conqueror, and

was burut by Robert Bruce in 1819 and 1323. During the Civil War it was for a time oecu- pied by the Parliamentary forces, but it was retaken by the Royalists in 1643. It was first represented in parliament in the reign of Edward I. It lost one of its two members in 1868, and ceased to be separately represented in 1885. Surrounding the town is an extensive district called the liberty of Ripon, over which the areh- bishop of York at one time exercised spccial jurisdiction, not yet altogether annulled.

RIPPERDA, Jonn Witt1am, Baron (1680-1737), a political adventurer, was born of noble parents in the province of Groningen in the Netherlands, in 1680, and was educated in the college of the Jesuits at Cologne. Shortly after leaving the college he married a Protestant, and assumed the Protestant creed. In 1715 he was sent by the states on an embassy to Spain. Having gained the favour of Philip V., he resigned the office of Dutch ambassador, became a penitent convert to the Catholic faith, and took up his permanent residence in Madrid. He made use of every influence to advance himself to the first position at court, and if possible to supplant Alberoni, who, provoked by his intrigues, deprived him of his pension and estate. After the fall of Alberoni he suc- ceeded in ingratiating himself with the queen, Elizabeth of Parma. Returning from an embassy to Vienna in 1725, he pretended to the queen that he had effected her favourite scheme of betrothing her son Don Carlos to the eldest archduchess. His immediate elevation to a duke- dom and to the office of prime minister compelled him to persist in this imposture. Lie was backed up by lie ; the nation was impoverished to furnish him with hush- money ; and he continued to try every bungling shift until, in May 1726, he was deprived of his offices, and sent a prisoner to Segovia. Making his escape after two years' imprisonment, he went to England. His hopes of in- fluence there having been overthrown by the treaty of Seville in 1729, he finally collected his property and set sail for Holland, arriving at The Hague in November 1731. Thence he sailed to Morocco, where he was welcomed by the emperor Muley Abdallah, and, becoming a Moham- medan, was placed at the head of the administration of the country. But his royal patron was soon driven from the throne, and he himself was glad to escape with his head to Tetuan, where he could find no better employment for his restless spirit than that of asserting himself

to be the last and greatest of the prophets. He died at Tetuan towards the end of 1737.

Sce Mattér, Historia del Duque de Riperdd (2d ed., Madrid, 1796); Memoirs of the Duke de Ripperda (2d ed., London, 1740); Moore, Lives of Cardinal Alberoni, the Duke of Ripperda, and Marquis of Pombal (2d ed., London, 1814),

RIPUARIAN LAW. See Saric Law.

RIST, Jonann (1607-1667), German hymn-writer, was born at Ottensen in Holstein on March 8, 1607, and edu- cated at Hamburg, Bremen, Leyden, Utrecht, and Leipsic. In 1635 he became a preacher at Wedel on the Elbe, and there he died on 31st August 1667 (see Hymns, vol. xii. pp. 586-7).

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RITSCHL, Frreprich Witnetm (1806-1876), an eminent German scholar, was born in 1806 in Thuringia. His family, in which culture and poverty were hereditary, were Protestants who had immigrated several generations earlier from Bohemia. Ritschl was fortunate in his school training, at a time when the great reform in the higher schools of Prussia had not yet been thoroughly carried out. His chief teacher, Spitzner, a pupil of Gottfried Hermann, divined the boy's genius and allowed it free growth, applying only so much either of stimulus or of restraint as was absolutely needful. After a wasted year at the university of Leipsic, where Hermann stood at the zenith of his fame, Ritschl passed in 1826 to Halle. Here he came under the powerful influence of Reisig, a young '""Hermannianer" with exceptional talent, a fascinating personality, and a rare gift for instilling into his pupils his own ardour for classical study. The great controversy between the '"Realists" and the " Verbalists" was then at its height, and Ritschl naturally sided with Hermann against Boeckh. The early death of Reisig in 1828 did not sever Ritschl from Halle, where he brilliantly attained the doctorate, and in 1829 became privat-docent, in 1832 an extraordinary professor. He began his

professorial career with a great reputation and brilliant success, but soon hearers fell away, and the pinch of poverty compelled his removal to Breslau, where he reached the rank of "ordinary " professor in 1834, and held other offices. The great event of Ritschl's life was a sojourn of nearly a year in Italy (1836-37), spent in libraries and museums, and more particularly in the laborious examination of the Ambrosian palimpsest of Plautus at Milan. From this journey Ritschl's whole temperament and intellect received a new and richer colouring, and the remainder of his life was largely occupied in working out the material then gathered and the ideas then conceived. Bonn, whither he removed on his marriage in 1839, and where he remained for twenty-six years, was the great scene of his activity both as scholar and as teacher. The philological seminary which he controlled, although nominally only joint director with Welcker, became a veritable officina Litterarum, a kind of Isocratean school of classical study ; in it were trained many of the foremost scholars of the last forty years. The names of Georg Curtius, Ihne, Schleicher, Bernays, Ribbeck, Lorenz, Vahlen, Hiibner, Biicheler, Hel- big, Benndorf, Riese, Windisch, Brugmann, who were his pupils either at Bonn or at Leipsic, attest his fame and power as a teacher. In 1854 Otto Jahn took the place of the venerable Welcker at Bonn, and after a time suc- ceeded in dividing with Ritschl the empire over the philo- logical school there. The two had been friends, but after gradual estrangement a violent dispute arose between them in 1865, which for many months divided into two hostile forces the universities and the press of Germany. Both sides were steeped in fault, but Ritschl undoubtedly received harsh treatment from the Prussian Government, and pressed his resignation. He renounced not only Bonn but Prussia, though strongly attached to his country, which he had often refused to leave when plied with advantageous offers. He accepted a call to Leipsic, where he died in harness in 1876,

Ritschl's character was strongly marked. The spirited element in him was powerful, and to some at times he seemed overbearing, but his nature was noble at the core; and, though intolerant of inefficieney and stupidity, he never asserted his personal claims in any mean or petty way. He was warmly attached to family and friends, and yearned continually after sympathy, yet he established real intimacy with only a few. Both at Breslau and at Bonn he complained of isolation, which (though he was

himself unconscious of the fact) was in part the natural fruit of his own superiority. The interests of his pupils were at all times dear, perhaps even too

dear, in his eyes. He was far from being a dreamy scholar ; his talent for practical affairs would have secured him eminence in

almost any walk of life, and he was credited with diplomatic finesse. That Ritsch] had a great faculty for organization is shown by his administration of the university library at Bonn, and by the eight years of labour which carried to success a work of infinite complexity, the famous Priscx Latinitatis Monuwmenta Epigraphica (Bonn, 1862). This volume presents in admirable facsimile, with prefatory notices and indexes, the Latin inscriptions from the earliest times to the end of the republic. It forms an intro- ductory volume to the Berlin Corpus Inscriptionum Latinarum, the excellence of which is largely due to the precept and example of Ritschl, though he had no hand in the later volumes.

In all that he did Ritschl exhibited rare genius combined with a precision unsurpassed. But to bring out to the full his great powers the zest of discovery was indispensable. When he was on the track of a new idea, he worked with a fiery energy which triumphed over his almost life-long physical weakness, and left him no peace till every difficulty was cleared away. But the toil of carrying his discoveries to their consequences he was only too apt to leave to feebler hands than his own. He was fertile in great projects, and struck out the main ideas which should guide them, but one only did he pursue to absolute completion, the Prisce Latinitatis Monumenta,—precisely because, from the nature of this work, he was buoyed up from first to last by the occurrence or thie expectation of novelty. The results of Ritschl's life are mainly gathered up in a long series of monographs, for the most part of the highest finish, and rich in ideas which have leavened the scholarship of the time.

As a scholar, Ritschl was of the lineage of Bentley, to whom he looked up, like Hermann, with fervent admiration. His best efforts were spent in studying the languages and literatures of Greece and Rome, rather than the life of the Greeks and Romans. He was sometimes, but most unjustly, charged with taking a narrow view of "Philologie." That he keenly

appreciated the importance of aucient institutions and ancient art both his published papers and the records of his lectures amply testify. He had in reality no prejudice against any department of learning. He was ever anxious to discern precisely the work for which each pupil was fitted, and he despatched many explorers into fields where he could not labour himself. Ritschl for the most part devoted himself to the study of ancient poetry, and in particular of the early Latin drama, This formed the centre from which his investigations radiated. Starting from this he ranged over the whole remains of pre-Ciceronian Latin, and not only analysed but augmented the sources from which our knowledge of it must come. Before Ritschl the acquaintance of scholars with early Latin was so dim and restricted that it would perhaps be hardly an exaggeration to call him its real discoverer.

To the world in general Ritsch] was best known as a student of Plautus. When he began his studies, the text of that author was like some ancient picture, defaced alike by time and by much repainting. He cleared away the accretions of ages, and by efforts of that real genius which goes hand in hand with labour, brought to light many of the true features of the original. It is infinitely to be regretted that Ritschl's results were never combined to form that monumental edition of Plautus of which he dreamed in his earlier life. For one such palace from the master buildcr's hand we could well have sacrificed some of the abundant material which he left for punier architects to handle. Ritschl's examination of the Plautine MSS. was both laborious and brilliant, and greatly extended the knowledge of Plautus and of the ancient Latin drama. Of this two striking examples may be cited. By the aid of the Ambrosian palimpsest he recovered the name T. Maccius Plautus, for the vulgate M. Accius, and proved it correct by strong extrancous arguments. On the margin of the Palatine MSS. the marks C and DV continually recur, and had been variously explained. Ritsch proved that they meant " Canticum" and " Diverbium," and hence showed thatin the Roman comedy only the conversations in iambic senarii were not intended for the singing voice. Thus was brought into strong relief a fact without which there can be no true appre- ciation of Plautus, viz., that his plays were comie operas rather than comic dramas.

In conjectural criticism Ritsch] was inferior not only to his great predecessors but to some of his contemporaries. His emendations do not often present that perfect wedding of art and fortune which we see in the best work of Madvig or Cobet. His imagination was in this field (but in this field only) hampered by erudition, and his judgment was unconsciously warped by the desire to find in his text illustrations of his discoverics. His remedies were often need- lessly violent. But still a fair proportion of his textual labours has stood the test of time, and he forged the weapons which are destined to conquer for us the true text of Plautus, so far as an envious fate permits. Ritschl rendered immense service by his study of Plautine metres, a field in which little advance had been made since the time of Bentley. In this matter Ritschl was aided by an accomplishment rare (as he himsclf lamented) in Germany—the art of writing Latin verse.

In spite of the incompleteness, on many sides, of his work,

Ritschl must be assigned a place in the history of learning among a very select few. His studies are presented principally in his Opuscula collected partly before and partly since his death. The Trinummus (twice edited) was the only specimen of his contem- plated edition of Plautus which he completed. The edition has been continued by some of his pupils—Goetz, Loewe, and others— aud is still (1885) in progress.

The facts of Ritschi's life may be best learncd from the elaborate biography by Otto Ribbeck (Leipsic, 1879). An interesting and discriminating estimate of Ritschl's work is that by Lucian Mueller (Berlin, 1877). (J. S. R.)

RITSON, Josepu (1752-1803), was the most militant and ill-tempered, and at the same time one of the most learned and accurate, of the antiquaries of the 18th century. Born at Stockton-on-Tees, of a Westmoreland yeoman family, in 1752, he was bred to the law, and settled in London as a conveyancer at the age of twenty-two. Already he had

shown eccentricity of temper, had become a fierce apostle of vegetarianism, and a zealous student of anti- quities. His first notable publication was in 1782, an attack on Warton's History of English Poetry. The fierce and insulting tone of his Observations, in which Warton was treated as a showy pretender, and charged with cheating and lying to cover his ignorance, made a great sensation in literary circles. In nearly all the small points with which he dealt Ritson was in the right, and his corrections have since been adopted, but the unjustly bitter language of his criticisms roused great anger at the time, much, it would appear, to Ritson's delight. In the following year Johnson and Steevens were assailed in the same uncere- monious fashion for their text of Shakespeare. Bishop Percy was next subjected to a furious onslaught in the preface to a collection of Ancient Songs (printed 1787, dated 1790, published 1792). The only thing that can be said in extenuation of Ritson's unmatchable acrimony is that he spared no pains himself to ensure accuracy in the texts of old songs, ballads, and metrical romances that he edited. His collection of the Robin Hood ballads is perhaps his greatest single achievement. Scott, who admired his industry and accuracy in spite of his temper, was almost the only man who could get on with him. On one occasion, when he called in Scott's absence, he spoke so rudely to Mrs Scott that Leyden, who was present, threatened to "thraw his neck" and throw him out of the window. Spelling was one of his eccentricities, his own name being an example: Ritson is short pronunciation for Richardson. He died in 1803.

RITTENHOUSE, Davin (1732-1796), astronomer, was born at Germantown, Pennsylvania, on April 8, 1732. First a watchmaker, he afterwards became treasurer of Pennsylvania and (from 1792) master of the United States mint ; he was largely occupied in settling the boundaries of several of the States. As an astronomer, Rittenhouse's principal merit is that he introduced the use of spider lines in the focus of a transit instrument. His priority with regard to this useful invention was acknowledged by Troughton, who brought spider lines into universal use in astronomical instruments (see Von Zach's Monatliche Cor- respondenz, vol. ii. p. 215), but Felice Fontana (1730- 1805) had already anticipated the invention, though no doubt this fact was unknown to Rittenhouse. He died on 26th June 1796.

RITTER, Cart (1779-1859), the greatest geographer of modern times, was born at Quedlinburg on August 7th, 1779, and died in Berlin, September 29th, 1859. His father, a physician of some local eminence, having died, leaving his family in somewhat straitened circumstances, Carl, along with an elder brother and a young man, Johann Gutsmuths, who had been his private tutor, was re- ceived into the Schnepfenthal institution then just founded by Salzmann for the purpose of putting his educational theories to the test of experience. Gutsmuths, who had continued to teach his pupils without remuneration after

their father's death, remained their special guardian and instructor at Schnepfenthal, and in his letters to their mother every little detail of their mental development is affectionately recorded. The Salzmann system was practi- cally that of Rousseau: conformity to natural law and en- lightenment were its watchwords; great attention was given to practical life ; and the modern languages were carefully taught to the complete exclusion of Latin and Greek. In 1787 Gutsmuths reports about Carl that, "while not much of a hand at making money [trading with counters for coin was a regular branch of the Schnepfenthal education], he draws better maps than the biggest boys, and is making great strides towards becoming a professor of geography." When his school days were drawing to a close his future course was determined in a curious way by an introduction to Bethmann Hollweg, a banker in Frankfort. It was arranged that Ritter should become tutor to Hollweg's children, but that in the meantime he should attend the university at his patron's expense. In October 1796 he accordingly bade adieu to Schnepfenthal, and his next two winters were spent at Halle, where he resided in the house of Professor Niemayer, then at the height of his fame, and attended the lectures of Riidiger on statistics and science, . Sprengel on European history, Meinert on scientific agri- culture, &c. His duties as tutor in the Hollweg family began at Frankfort in 1798 and continued for the next fifteen years. In one matter he went directly counter to the Salzmann theory: he gave a large place to the study of the ancient classics, of which he had grown passionately fond. The years 1814—1819, which he spent at Géttingen in order still to watch over the welfare of his pupils, were

those in which he began to devote himself exclusively to geographical inquiries. In accordance with a promise exacted by Pestalozzi (with whom he had become acquainted at Yverdun on one of his many tutorial tours) he had several years previously drawn up a manual of physical geography in which many features of his later work are to be traced, but the book was not published. He now brought out his first masterpiece, Die Lrdkunde im Verhdltniss zur Natur und zur Geschichte des Menschen (Berlin, 2 vols., 1817-1818). In 1820 he was called to be professor extraordinarius of history at Berlin, where shortly afterwards he began also to lecture on statistics at the military college. He remained in this position till his death.

The service reudered to geography by Ritter was mainly tlirec- fold. His personal influence, due largely to the moral character of the man and partly to the skill of the teacher, was unusually potent on those who came within its range during the long years that he acted as a professor. Had he done nothing inore than use this influence in disseminating the geographical ideas of his time he would have stood high with his own generation. But, secondly, his investigations and teaching were informed by a fresh concep- tion of his subject which imparted life to what had been its dry bones and dust. Geography was, to use his own expression, a kind of physiology and comparative anatomy of the earth: rivers, moun- tains, glaciers, &c., wereso many distinct kinds of organs, each with its own appropriate functions ; and, as his physical frame is the basis of the man, determinative to a large extent of his life, so the structure of each country is a leading element in the historic pro- gress of the nation. This naturally led him to attach great import- ance to the vertical as distinguished from the horizontal develop- ment of the earth's surface, and also to give perhaps quite as much attention to the history of civilization and of the individual animals and plants by which civilization has been affected as to questions of purely physical geography. And, thirdly, he was a scientific compiler of the firstrank. Such portions of his universal geography as he completed remain each the standard thesaurus for its territory. This is especially the case with the sections devoted to Palestine and to Central Asia. Among Ritter's minor works may be mentioned Vorhalle europiiseher Volkergeschichten vor Herodot (Berlin, 1820); Die Stupas. . . . an der indobaktrischen Kénigsstrasse u. d. Kolosse

von Bamiyan (1888) ; Hinlettung zur allgemeinen vergleiehenden Geographie (Berlin, 1852); “ Bemerk- ungen tiber Veranschaulichungsmiittel rdumlicher Verhaltnisse bei graphischen Darstellungen durch Form u. Zahl,” in the Trans. of the Berlin Academy, 1828. After his death Danicl published selec-

tions from his lectures under the titles Geschichte der Erdkwnde (1851), Allgemeine Frdkunde (1862), and Europa (1863). Several of his works (e¢.g., the “Palestine” volumes of his Erdkunde) have been translated into English.

See Kramer, Carl Ritter, ein Lebensbild (1864 and 1870, 2d ed. 1875); Gage,

The Life of Carl Ritter (Edinburgh, 1867); Guyot, Carl Ritter, an address to the-

American Geogr. and Stat. Soc. (Princeton, 1860); F. Marthe, “ Was bedeutet Carl Ritter fiir die Geographie,” in Zettsch. der Ges. f. Erdk., Berlin, 1879.

RIVAROL, Antone DE (1753-1801), was born at Bagnols in Languedoc on the 26th June 1753, and died at Berlin on the 13th April 1801. It seems to be undisputed that his father was an innkeeper, but no researches have thrown any certain light on the question of his origin; later he assumed the title of Comte de Rivarol, and attributed hiniself to a noble family of Italian origin. His enemies declared that the family name was really Riverot, and that, whether Italian or not, it had nothing whatever to do with countship. It is certain that he bore several names, and that when he was among the foremost defenders of aristocracy his claim to share in it was by no means allowed by his associates. He was well educated, and is said to have been admitted by the bishop of Uzés to a theological seminary, then to have held a tutorship at Lyons under the name of Longchamps, then to have appeared in Paris under the further travesty of Chevalier de Parcieux with no better reason than that his mother was related to a man of science of that name. All this, however, is of very little

consequence ; it is sufficient that he appeared in Paris in 1780 (just when the operation of liberal ideas was throwing society most freely open to men of letters), with youth, good address, fair knowledge, and a very unusual stock of wit and literary ability. After competing for and sometimes winning several of the aca- demic prizes then in greatest vogue, Rivarol distinguished himself in the year 1784 by a treatise Sur l'universalité de la langue Francaise (which shows, if not much learning, the utmost critical acumen and a very happy faculty of expres- sion), and by a translation of the Inferno, very free but of no small merit. The year before the Revolution broke out he, with some assistance from a man of similar but lesser talent, Champcenetz, compiled a lampoon entitled Petzt Almanach de nos grands Hommes pour 1788, in which some writers of actual or future talent and a great many nobodies were ridiculed in the most pitiless manner. It made him many enemies, but scarcely more than his speeches in society had made. When the Revolution developed the importance of the press, Rivarol at once took up arms on the royalist side. The Journal Politique of Sabatier de Castres and the Actes des Apétres of Peltier were the chief papers in which he wrote. But he emigrated early in June 1792, and established himself at Brussels, whence he removed successively to London, Hamburg, and Berlin. For ten years he occupied himself not too strenuously with political pamphlets and literary projects, receiving pensions for his services to the royalist cause. He had married an Englishwoman, but had quarrelled with her, and during his later years had for his companion a pretty but totally uneducated girl named Manette, to whom he addressed certain often-quoted verses which are nearly poetry. Rivarol's genius, however, was essentially a genius of prose, though not a prosaic genius. No single work of his of any length has very great merit, and he is accordingly only known to posterity by volumes of " beauties" and selec- tions, composed of epigrammatic remarks, short passages of criticism, and the like. Rivarol could not tell an anecdote with quite the point of his contemporary and rival Cham- fort; but he has had no rival in France except Piron, and none in England except Sydney Smith, in sharp isolated conversational sayings. These were mostly ill-natured, and in some cases the full appreciation of them demands a more considerable acquaintance with the facts and men of the time than most readers possess. 'The brilliancy of Rivarol's

O71 phrase, however, can escape no one. Burke was hyperboli- cal, and not altogether happily hyperbolical, in calling him the Tacitus of the Revolution, because the description sug- gests a power of historical portrait painting which Rivarol did not possess. But the expression no doubt really re- ferred to the detached phrases which are so striking in Tacitus, and which Rivarol did in truth sometimes equal.

The works of Rivarol were published in five volumes by his friend Chéncdollé (who has reported much remarkable conversation of his in his last days) and Fayolle (Paris, 1805); but thcir perusal as a whole can only be recommended to the student of literature. Selections are frequent: that published by Dc la Hays (Paris, 1858), with introductory matter by Sainte-Beuve and others, and that edited in 1862 by M. de Lescure, may be specified. The last- named editor published, in 1883, a study on Jtivarol et la Société Francaise, which is the fullest treatment of the subject.

RIVE DE GIER, a town of France, in the department of Loire, situated 13 miles to the east-north-east of St Ktienne, on the Lyons Railway at the head of the canal of Givors on the Gier. The town, which is constantly enveloped in a dense cloud of smoke, and presents a dirty and unattractive appearance, is principally dependent on the coal industry, there being fifty pits in the basin of the Gier, with an annual output of over 19,000,000 bushels. There are twenty-two coke and lamp black furnaces, and five glass works, the products of which—coloured glass and so-called Nuremberg mirrors—are celebrated, on account of the fineness and purity of the sand found on the banks of the Rhone and the Sadne. Mining machinery, railway plant, and coarse ironmongery are also manufactured, and there are iron and steel works. A large number of persons are also employed in winding and spinning silk and in tape-weaving. The population in 1881 was 15,760.

Rive de Gier is a place of some antiquity, as appears from remains of Gallo-Roman buildings, and mosaics and coins found at various times. In the 11th century the canons of Lyons were its superiors. At a later period the town was surrounded by a wall and protected by a fortress, of which, however, but few traces arc visible. In the time of Henry IV. the working

of the mines had already given to the locality a measure of importance which has steadily increased. At one time it was feared that the coal basin, which was considered distinct from that of St Etienne, would soon be exhausted, but it has now been proved that the two are in reality one, and that they have a long future before them.

RIVER. See Gronocy, vol. x. p. 272-278.

RIVER ENGINEERING. 'The improvement of rivers Plate V.

may be considered under two aspects, for rivers form the natural channels for conveying the surplus rainfall from the districts through which they pass to the sea, and they can also be utilized for the purposes of inland navigation. If a river, owing to the small section of its channel, or the slight inclination of its bed, is incapable of discharging the whole volume of water which drains into it in rainy seasons, the lands along its banks become flooded, frequently to the great detriment of the crops, and sometimes with disastrous results to life and property. If, on the other hand, a river is impeded by rapids, by shoals, or by a bar at its mouth, it is prevented from serving as a natural highway for the traffic of the district through which it flows. Accordingly the mitigation of floods and the regulation of rivers are the problems which have to be grappled with in the engineering of rivers. The first aims at remedying an existing evil, and the second deals with the development of the resources and trade of a country by the improve- ment of its water communications.

Floods.—Floods are of two kinds, according to the nature Two

of the country traversed by the rivers producing them. Tor- rential rivers, flowing over impermeable strata and having a rapid fall, rise rapidly after a heavy rainfall, and produce a high flood which quickly subsides. Gently flowing rivers on the contrary rise slowly, and do not attain the same height as torrential rivers; but their floods subside slowly, and consequently, though less high, remain longer

Winter and summer floods.

Causes of floods.

Extent of pre- vention.

Methods of pre- vention.

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on the land than torrential floods. The valleys, moreover, of torrential rivers are steeper and less fertile than the alluvial plains of gently flowing rivers ; and, consequently, the high short floods of the former are less injurious than the long continuing lower floods of the latter. The long duration of a flood is also the more prejudicial, as some- times a flood remains long enough on the land for a second flood to come down before the first has subsided, thereby producing an increased rise.

Floods are generally largest in the winter monthis, for, owing to the absence of evaporation, a much larger pro- portion of rainfall finds its way into the rivers at that period ; and the greatest floods occur when rain falls on melting snow. High floods, however, sometimes occur in the summer after an exceptionally heavy rainfall; and they are necessarily far more injurious at that time of the year, devastating the crops on the land which they inundate.

Floods are due to the inadequacy of the river channel to carry off the water poured into it within a given period. The bed of a river, being formed and maintained by its stream, is merely adequate to carry the ordinary dis- charge. Large floods octur at too distant intervals to scour a sufficient channel for their passage, and conse- quently they overflow the banks and inundate the adjacent districts. Other causes, moreover, tend to aggravate this evil.

A river carries down a large amount of solid matter which has been either ground from the mountain rocks by glaciers, washed from the land by the inflowing streams, or thrown into it as refuse from towns and manufactories. This material tends to settle in the channel wherever the current is checked, and consequently raises its bed and impedes the flow of the stream. Moreover, a river flow- ing through a plain gradually increases its serpentine course, thereby diminishing its fall and reducing its velo- city. Accordingly the tendency of rivers is to deteriorate when left

to themselves; and the discharging capacity of their channels becomes less, whilst the extension of subsoil drainage causes the rain to flow more rapidly and com- pletely into the river upon whose basin it falls.

The available fall of the river is frequently diminished by the erection of fixed weirs across the channel, at various places, for the purpose of forming a head of water for mills, or of providing still-water navigation. These weirs are generally constructed with high sills, and of inadequate width ; and where flood openings closed by draw-doors are adopted the doors are frequently not fully raised till a flood has actually arrived. These weirs consequently not merely reduce the discharging capacity of the channel by diminishing the available fall of the water surface, but also actually restrict the section of the channel. The result is that floods occur more frequently, rise higher, and remain on the land for a longer period.

Prevention of Floods.—The entire prevention of floods

would entail a larger expenditure than the results would

justify. In most cases, the prevention of summer floods and the mitigation of winter floods would suffice; for, whilst summer floods are always very injurious, winter floods prove sometimes beneficial in depositing the mud which they bring down, provided they do not remain very long upon the land. Occasionally, however, where large tracts of low-lying country are exposed to inundation, and especially where portions of towns are below the flood level, it is necessary to extend the protection so as to ensure entire immunity from floods.

There are three methods by which floods may be pre- vented or mitigated, namely,—(1) improvement of channel ; (2) embankment of channel ; (3) pumping.

(1) Improvement of Channel.—The discharging capacity

of a river may be increased by enlarging the section of its channel ; by the formation of straight cuts, which reduce its length, and consequently increase its fall; by dredging away shoals, and thus rendering the fall of its bed more uniform ; and by removing obstacles to its flow at weirs.

The channels of the English Fen rivers have been enlarged and straightened, and additional straight drains have been excavated for the more effectual drainage of the low-lying Fen country. Catchwater drains have also been formed to collect the rainfall of the higher lands and convey it into the river lower down, thus gaining a better fall than could be obtained if the upland waters were allowed to flow down to the low lands, besides relieving the low lands of this additional discharge.

Straight cuts are very useful when the fall is slight and the velocity of flow is consequently small; but they are not so suitable for more rapid streams, and, besides modifying the flow, and thus tending to produce shoals below, their straight course is liable to be altered by the irregularities of the current, especially if joining a sharp bend above.

The banks in such cases need protection against erosion,

which adds considerably to the cost of the works. The improvement of the upper Mississippi by cut-offs has not proved satisfactory ; and it has been found preferable to train the river by brushwood mattresses and dykes.

Solid weirs across a river form serious impediments to its flow; and draw-door or movable weirs should be pro- vided with adequate waterways, and sills level with the bed of the river. Old bridges, also, with wide piers and narrow arches retard the discharge of a river, and their rebuilding with wide openings would afford considerable relief. All obstacles in the river bed, such as weeds, fallen trees, and refuse, should be periodically removed, and fish-traps at weirs should be discarded, as they collect floating leaves and rubbish in their meshes and thus soon become entirely blocked up.

(2) Embankment of Channel.—When it is essential that the lands bordering a river should be absolutely protected from inundation, the enlargement of a river bed to an adequate extent for discharging the

greatest floods would be too costly, especially when the fall is small; and it becomes necessary to resort to the expedient of increasing the channel, above the surface of the ground, by forming embankments along each side. By making the banks with material excavated from the channel, the earthwork serves the double purpose of enlarging the river bed and forming a bank. A flood channel of considerable dimensions can. be readily obtained by placing the embankments some distance back from the margin of the river, thus greatly enlarging the section when the waters rise above the level of the land, whilst leaving the natural river bed unaltered for the ordinary flow. In some cases merely low embank-

'ments are constructed, which retain small floods but are

submerged when large floods come down. Embankments, however, formed to secure the surrounding country from inundation must be high enough to exceed the highest flood level of the river, strong enough to resist the pres- sure of the water at that level, and perfectly watertight. If water can percolate through the bank, a breach is readily formed ; and if a high bank is overtopped by the river, the rush of the stream over it soon destroys a portion of the embankment and produces a disastrous inundation from the large volume of water suddenly liberated. The Fens of Lincolnshire, a large portion of Holland, the valley of the Po, and large tracts of low-lying land bordering the Mississippi are protected by embankments.

The defects in the system of embanking rivers are—that weak points in the banks are liable to be breached ; that the banks are liable to be overtopped by unusually high floods ; and that the muddy waters of the river in flood

Flood storage reser- Voirs.

Canaliza- tion of a river,

RIVER ENGINEERING

deposit their sediment in the bed of the river, instead of spreading it over the adjacent land, and thus gradually raise the river bed and consequently

the height of the floods. The remedies for these defects are strong high banks made of the best materials, and a periodical cleans- ing of the river bed. Neglect of these precautions has led to serious disasters. Large tracts in the Fens have been occasionally flooded by the bursting or overtopping of badly constructed banks. Numerous breaches have occurred in the embankments of the Po, resulting in the devastation of its valley; and the flood level of the Po has been so much raised that it has been decided not to heighten the embankments for fear of occasioning still greater disasters. The gradual silting up of the river Theiss, near Szegedin, produced a rise in its flood level which led to the overtopping of the protecting embank- ment in 1879, and the formation of a breach; and the water thus set free destroyed a portion of Szegedin, and inundated a tract of 200 square miles. The rise of the bed of some rivers in Japan, from the deposit of silt, has been followed up by the gradual raising of the embank- ments ; and this system has been carried out to such a degree, and the accumulated deposit is so great, that some of these embanked rivers have their beds as much as forty feet above the level of the plains over which they flow. These high embankments necessarily require constant attention ; and any failure is attended with serious in- undations. They serve as a warning against the extensive raising of embankments to counteract the silting up of a river.

(3) Pumping.—When lands are very flat and low, lying sometimes actually below the general drainage level of the district and the waterlevel of the streams, it is impossible for rivers to perform their ordinary function of draining the land by gravitation. It is necessary in such cases to create an artificial fall by pumping the drainage waters up so as to be discharged into the adjacent streams. This method has the advantage of ensuring the effectual drain- age of the lands, provided adequate pumping power is supplied ; but it forms an additional tax on the land, as steam has to be applied to do what is under ordinary con- ditions effected by nature, and the land has also to be surrounded by banks,

This system has been adopted for the drainage of the Haarlem Meer reclamation, and also for the lands re- claimed from Lake Y in the construction of the Amster- dam ship canal. instances, supplemented by

pumping; and a portion of the Witham basin has been secured against floods by this means.

The formation of large reservoirs in river valleys has been proposed for storing the surplus waters till a flood has subsided. A reservoir has indeed been formed, by constructing a high masonry dam across a narrow gorge of the Furens valley, which both supplies the town of St Etienne with water and preserves it from inundation. It is also proposed to prevent.the floods of the river Chagres from interfering with the Panama Canal, by impounding its flood waters in an extensive reservoir to be formed by building a high dam across a suitable point of its valley. In these cases, however, the deep valleys with their narrow gorges are peculiarly well adapted for the forma- tion of reservoirs having a considerable capacity, whereas most river valleys are unsuitable for reservoirs, and the construction of the long lengths of the banks that would be required would entail a very large expenditure, so that this system could only have a very restricted application.

Improvements of the Upper Portions of Rivers.—Most rivers are not suitable by nature for navigation in their non-tidal portion, or, in the case of tideless rivers, at

The drainage of the Fens is, in several |

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a considerable distance from their mouths, as the fall of their bed increases towards their source, and they gene- rally present irregularities in depth and flow, with occa- sional sharp bends. Even where the depth is adequate, an irregular or rapid flow offers a great obstacle to up-stream traffic. Moreover, the fall of the waterlevel in dry seasons would often make a river too shallow for navigation. Accordingly, whilst improving the worst bends and remov- ing shoals, it is frequently necessary to retain the water, when the flow is small, so as to maintain a sufficient depth. This is accomplished by dividing the river into a series of sections or reaches, and pounding up the water at the end of each reach by means of a dam or weir.

Formerly rivers used to be penned in by a series of stanches near shoal places, which held up the water, and, when several boats were collected in the pool above a stanch, it was suddenly opened, and the sudden rush of water floated the boats over the shallows below. This primitive method of navigation, termed flashing, was formerly practised on the Thames and the Severn, and also on some of the rapidly flowing rivers in France, such as the Yonne. The stanches on the Severn were removed in 1842; but a few still exist across the Thames above Oxford, where the barge navigation follows a lateral canal. These stanches, consisting of beams swung across the river and supporting a series of spars and paddles, were easily removed in flood time or for the passage of boats. The stanches on the Yonne, which were more recently erected, were of a more elaborate description, known as needle weirs, and are still retained as weirs for holding up the water, though the process of flashing has been discon- tinued.

As the demands of navigation increased, these primitive methods proved inadequate, and, moreover, they were quite unsuited for up-stream traffic. Accordingly weirs were substituted for stanches, to hold up the water in each reach ; and locks were constructed, in suitable side channels, for enabling vessels to be passed from one reach to the next with little loss of water, and with equal facility either up or down. Rivers have been thus converted into still-water navigations, with level reaches forming a series of steps, having a fall at each lock, in place of the natural inclination of the river bed; so that the up-river traffic is in a great measure relieved from the serious hindrance of an opposing current. In order that the water held back by the weir may be retained within the channel, it is necessary to raise the banks on each side for some distance above the weir; and, as the gradual rise in the river bed towards the upper end of the reach reduces the depth, it is necessary to deepen the river along the upper portion of the reach to secure a uniform draught of water. A river is thus practically converted into a canal, with this sole difference that it has still to discharge the drainage waters of its basin. This primary object of rivers, to which indeed they owe their existence, was in many instances somewhat overlooked when rivers were utilized for naviga- tion ; and weirs appear to have been often regarded merely as dams for retaining the water, rather than as regulators of its flow.

Weirs.—Loeks have been already considered in the article on CANALS (q.v.); so that it will suffice here to describe briefly the different forms of weirs, whieh are essentially river works.

Weirs have been divided into three elasses, namely, overfall weirs, draw-door weirs, and movable weirs.}

Overfall Weirs.—An overfall weir is a solid barrier placed aeross a stream for the purpose of raising the waterlevel (Plate V. fig. 1°), and only affords an outlet for the discharge of the river when the

water rises above its crest. The waterlevel of the river is thus per-manently raised, not merely in dry seasons, but also in flood time,

1 L. F. Vernon-Harcourt, Rivers and Canals, p. 112. 2 The fig. references in the present article all indicate Plate V.

Stanches,

Introduc-

tion of

locks and

weirs,

Overfall

weirs.

Draw- door weirs.

Tedding- ton weir.

Free rollers to draw- doors.

Movable weirs.

Frame weir,

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and its fall is correspondingly reduced. Accordingly, the dis- charging capacity of a riveris materially diminished by the erection of overfall weirs; and this is only partially remedied by the deepening of the channel for navigation, espeeially as deposit more readily accumulates in the lower part of a reaeh, owing to the reduction in velocity of the current by the conversion of the river into level reaches. Endeavours have been made to alleviate this defect by placing the weir in a wide place ou the river, and at an angle to the cross scetion of the channel, thereby increasing the length of its sill, and consequently the discharge over it for any definite height of the river (fig. 2). The gain in length of an oblique weir is somewhat neutralized by the weir not being at right angles to the direction of the eurrent ; and, cven if the cross section of the channel above the sill of the weir is as large as the average seetion of the river bed, the change in shape, and the small hydraulic radius of the section over the weir, check the discharge of the stream.

Draw-door Weirs.—In order to afford a freer flow than is attain- able with the best-designed overfall weir, draw-door weirs are sometimes adopted, which serve equally well to retain the water above during dry weather, and provide a large opening for the discharge of the stream in floods. Draw-door weirs eonsist of a row of doors, or sluice gates, sliding vertically in grooves formed at the sides of frames, piles, or piers, which are shut down when the flow is small, but are raiscd to admit the passage of flood waters. These weirs generally serve to supplement an ordinary overfall weir ; and, whilst the overfall weir regulates the flow in dry weather, the draw-door weir provides for its more rapid discharge in flood time. The relief, however, afforded by draw-door weirs depends eutirely on the opening they furnish ; they are rarely, if ever, made eqnal in section to the river channel, and their sills are usually raised some feet above the bed of the river; but, nevertheless, they are much superior to overfall weirs in respect of drainage, especially when the river has a small fall and low banks.

A large oblique overfall and draw-door weir has been erected across the Thames, by Mr Leach, at the limit of its tidal flow at 'Teddington, having a total length of 480 feet. This weir is divided into four bays, the two side bays being overfalls, whilst the two central bays, 1724 feet and 693 feet wide respectively, are closed by large iron draw-doors sliding in grooves at the sides of strong iron frames supporting a foot bridge from which the doors are raised. The frames rest upon piles, and on the top of a rubble mound raised about a foot above low-tide level.}

The friction of large draw-doors against the grooves, in being lifted, is considerable when there is a head of water on one side ; but this has been much reduced by Mr F. Stoney, in a large weir in Brazil, by making the doors, 20 feet in width, bear on each side against a row of free rollers suspended in the grooves.?

Movable Weirs.—Although draw-door weirs afford a much freer diseharge for a river than overfall weirs, the vertical frames or piers in which the doors slide offer more or less impediment to the flow. This defect is avoided by movable weirs, which, whilst equally efficient in retaining the water when raised, can be entirely lowered or removed so as to leave the channel quite open in flood- time.

There are three types of iovable weirs which have been regularly adopted abroad, whilst other forms have been occasionally tried. The two types most extensively used are the frame or needle weir and the shutter weir, whereas the drum weir has been only erected on the Marne.

The frame weir consists of a series of movable iron frames, placed at intervals across the ehanncl of a river end on to the current, carrying a foot bridge at the top, and supporting a wooden water- tight barrier which forms the actual weir. Till recently the barrier was always composed of a series of long square wooden spars, or needles, placed close together and nearly vertical, resting against a sill at the bottom and against a horizontal bar con- necting the frames near the top (fig. 3). This type of weir has, aceordingly, been very commonly called a needle weir (barrage & aiguilles) ; but this term would not now include every form of the frame weir. The first needle weir was erected across the Yonne in 1834 ; and till 1881 all the weirs on the Seine below Paris were of this form. The needle

weir is opened by lifting each needle successively from the foot bridge; one of the end frames is then disconnected from the rest by unfastening and withdrawing the connecting bars, the corresponding portion of the foot bridge is taken up, and the frame, which is hinged at the bottom, is lowered by chains on to the apron of the weir, and the whole of the frames are similarly lowered in succession, leaving the passage quite

clear. The weir is closed again by a precisely reverse series of operations.

As the weight of the needle, which should be readily lifted by

one man, imposes a limit to the height of the weir, the large frame weir recently erected at Port-Villez near Vernon, having a height

i L, F. Vernon-Harcourt, op. cit., plate iv. figs. 9 and 10. ~ Minutes of Proceedings Inst. C. H., vol. 1x. p. 88.

of 18 feet, has been closed by a sort of wooden hinged shutter which spans the interval of 34 feet between each frame, and can be rolled up from the bottom and removed when the weir is to be opened.

'a serics of similar hinged shutters are designed to close donble intervals between the frames, about 7 feet wide, of the frame weir in progress at Poses, the next weir above Martot weir which is at the boundary ofthe tidal Seine above Rouen. Poses weir has a form quite distinct from all frame weirs hitherto constructed, for its vertical frames are suspended from an overhead girder, and rest against a sill at the bottom when down, but cau be raiscd entirely out of water into a horizontal position when the weir is open. The girders carry a foot bridge, from which the frames and hinged shutters are raised and lowered, and rest on masonry piers dividing the river into seven bays, the two navigable passes being 1064 feet and the five shallower passes 99 feet wide. The girders spanning the two navigable passes leave a clear headway of 174 feet above the navigable high water, whilst the rest of the girders are merely placed above flood level. The fall at the weir is 18 feet. The system is costly, with its girders and piers, but it secures all the movable parts of the weir from

injury in flood, and enables the weir to be worked with perfect ease and safety.

Sliding panels have been adopted for closing the frame weir across the Rhone at Mulatiére, near Lyons, erected in 1882; and a comparison is being made of the relative durability of sliding panels and hinged shutters by placing the two systems side by side at Suresnes weir just below Paris.

The earliest form of shatter weir consisted of a gate, or shutter, turning on a horizontal axis at the bottom, supported by a prop when raised against the stream, and falling flat on the apron of the weir when the prop was withdrawn. As considerable force would be required to raise such a shutter against a strong stream, a second up-stream gate is usually provided, which, rising with the stream and being retained by chains, relieves the pressure on the down-stream gate, and enables it to be readily raised and propped up. The waterlevel is then equalized on both sides of the upper gate, which is then lowered ; and the lower gate forms the actual weir, which can be opened by merely releasing the prop. In India, where this form of shutter weir has been adopted on a large scale, the strain on the retaining chains was so great, when the upper shutter was raised in a strong current to shut off the river from the irrigation canals, that hydraulic brakes have been substituted, by Mr Fouracres, for controlling the motion of the up-streain shutters. A closed cylinder full of water is fixed on the apron of the weir above the upper shutter, in which a piston, attached to the upper side of the shutter, is fitted. Directly the current tends to lift the shutter, the piston is drawn against the cushion of water in the cylinder, which controls its motion. The pressure of the piston forces the water gradually out of some small orifices along the side of the cylinder, so that the piston is enabled to travel slowly along the cylinder. In its progress, however, it passes by some of the orifices, whereby the rate of efflux of the remaining water is reduced, and a greater resistance offered to the motion of the piston. Whilst therefore the shutter in rising presents a greater surface to the stream, and consequently exerts a greater pull upon the piston, the retarding force is similarly increased, and the shutter is thus gradually raised without any jar.

At Brulée Island weir, on the Yonne, the up-stream shutter has been dispensed with; and the shutter forming the weir is raised against the stream by a piston working in a hydraulic press (fig. 4), the water pressure being supplied from an accumulator which is charged by means of a turbine worked by the fall of water at the weir. The weir is closcd by seven shutters, 114 feet long and 6 feet high, which can be raised in five minutes ; and the power for damming up the stream is actually obtained from the stream itself.

The form of shutter weir most commonly adopted in France is shown in fig. 5, representing a section of the largest and most recent weir of this type, erected at Port-a-l'Anglais weir on the Seine, two or three miles above Paris; and weirs on the same systen1 have been erected across the Great Kanawha river in the United States. The shutter revolves upon a horizontal axis placed just above the centre of pressure on the down-stream side of the shutter. The axis is fastened on an iron tressel hinged to the apron of the weir; and the shutter and tressel are supported in position by a wrought-iron prop resting against a cast-iron shoe fixed on the apron. When the weir is closed, the shutter butts against a sill at the bottom, as is shown on fig. 5. The weir can be more or less opened, from the foot bridge, by means of chains fastened to the top and bottom of the shutter; and it can be completely lowered in flood time by releasing the prop from its shoe, when the prop, tressel, and shutter fall flat upon the apron, their fall being regulated by aid of the chains; the frames also supporting the foot bridge, being hinged to the apron, can be lowered as in the ordinary frame weir. The weir is raised by first reinstating the foot bridge, and then raising the shutters, with the connected tressels and props, by means of the chains. Each

Shutter

weir.

Drum weir,

Waru- ings of floods.

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shutter of the navigable pass at Port-a-l'Anglais is 3} feet wide, and rises 12% feet above the sill of the weir. Smaller shutter weirs, of a similar form, are placed on the top of overfalls to regulate the discharge, being so adjusted that the shutters dip when the water attains a certain height above them. Sometimes the regulation of the flow is effected through the large shutters by means of sinall shutters fixed in their upper panels, called butterfly valves, which open spontaneously when the water rises above the required height. The smaller shutters on the overfalls are entirely lowered in flood-time, like the large shutters, but, being un-provided with a foot-bridge, they are raised by aid of boats on the approach of the dry season. The earlier shutters crected across the navigable passes were similarly raiscd; but, though a foot bridge adds considerably to the cost of a shutter weir, it greatly facilitates its working.

The navigable passes in French rivers, which are always closed elther by frame or shutter weirs, serve for the passage of vessels during floods when the locks are submerged.

With thie exception of the primitive movable stanchcs, there is only one exainple of a movable weir in England. This self-acting shutter weir has been erected across the Irwell at Thostlenest near Manchester; and a section of it is given in fig. 6. The weir consists of a series of shutters turning on a central horizontal axis. When the weir is closed, each shutter is inclined at an angle of 35° to the vertical, as shown in fig. 6, and revolves to a horizontal position for opening the weir. It resembles in fact the Freuch shutter weirs, except that the shutters and their supports are not renioved from the channel, so that the waterway at Thostlenest is not so uninipeded as in the French system. The shutters are so adjusted that they open when the river rises 23 feet above its ordi- nary level; but, lest the rush of water, which would result from their sudden opening, should injure the river bed, an arrangement has been made for opening any of the shutters by means of a set of chaius worked by crabs from eacli bank, so as to release the pent-up waters more gradually." This weir, designed by Mr Wiswall, consists of fourteen shutters, each 10 feet wide above the axis and 9 feet below, and 12 feet long. The actual height of the weir above the floor is only 10 feet, owing to the inclination of the shutters, so

that it presents a surface of 1400 square feet to the stream when closed, which is reduced to 293 feet when open.

The drwm weir, which has been adopted in several instances on the river Marne, consists of an upper and an under iron paddle capable of making a quarter of a revolution round a horizontal central axis. The upper paddle forms the weir, and the under one revolves in a closed recess, shaped like the quadrant of a cylinder, laid below the sill of the weir, from which the term drwim is derived (fig. 7). The under paddle and the drum are so formed that a space is left between the upper face of the paddle and the top of the drum when the paddles are horizontal ; and a similar space exists between the down-stream face of the paddle and the vertical wall of the drum when the paddles are vertical, as represented in fig. 7. These spaces serve as sluiceways by which water can be admitted into the series of drums on the upper or under side of the under paddles. The weir is closed by placing the upper sluiceway in communication with the upper pool, when the pressure of water on the upper faces of the under paddles overcomes the pressure of the stream upon the upper paddles, causing them to rise, and closing the weir against the stream. The weir is readily opened by shutting off communication between the upper pool and the upper sluiceway, aud opening communication with the lower pool ; the stream then depresses the upper paddles, or the action can be quickened by opening communication between the upper pool and lower sluiceway. The pressure on either side of the under paddles can be easily adjusted with the utmost precision, enabling the paddles to be placed at any angle, so that the most absolute control is obtained over the discharge at the weir. The largest example of this type of weiris at Joinville, on the Marne, only a few miles above Paris. The weir is formed by forty-two paddles, 34 feet high and 4% feet wide, which are worked with great ease by meats of sluice gates on the left bank, being opened or closed in three or four minutes by one man. This type of weir has the defect of not being suited for navigable passes, owing to the depth of the foundations for the drum below the floor of the weir having to exceed the height of the actual weir.

Movable weirs possess the great merit over other forms of weirs of offering little or no impediment to the passage of floods ; and this advantage is still further enhanced by the system of warnings, organized

for the Seine, the Loire, and other French rivers, whereby timely information of the approach of a flood is telegraphed to the various weir keepers, so that they may fully open the weirs before its arrival, and thus aid in facilitating its descent. By telegraphic intimation of the rise in the upper tributaries, and of the rainfall in the basin, it is possible to predict with remarkable accuracy the probable rise of the river at places lower down, and to afford valu- able warning of a coming flood to the riparian proprietors.

1 The Engineer, Sept. 1, 1882.

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Tidal and Tideless Rivers.

Rivers may be broadly divided into two classes in respect of the lower portion of their course, for the tide is propagated up some rivers to a considerable distance from their mouth, commingling with the fresh water and pro- ducing an ebb and flow far into the interior; whilst rivers flowing into tideless seas descend with an unimpeded current to their outlet. Tidal and tideless rivers, possess- ing very distinct physical characteristics, necessarily pre- sent different features and require different methods of improvement, and will be therefore separately considered. Tidal rivers are the more numerous, owing to the greater extent of tidal seas. The great differences also in the tidal rise introduce numerous variations in the tidal influ- ence on rivers, and the rise of the river bed determines the distance to which the tidal flow extends. Accord- ingly, tidal rivers exhibit a greater diversity in their natural condition than tideless rivers, which are only affected by the volume of their fresh-water discharge, the amount of sediment carried in suspension, and the inclina- tion of their bed. These latter conditions affect also the state of tidal rivers, but their influence is greatly modified by the ebb and flow of a large volume of tidal waters. The effect of the tidal ebb and flow is most readily per- ceived in contrasting the mouths of tidal and tideless rivers. The mouths of the Mississippi, the Nile, the Danube, and the Rhone present very marked differences to the outlets of the St Lawrence, the Seine, the Thames, and the Severn. 'Tideless rivers divide into a number of mouths, whereas tidal rivers are confined to a single out- let; and the

effect of tidal influence on this difference is still further confirmed by the instance of the Maas, which, with a very slight tidal range, exhibits a tendency to deteriorate into the dispersion of mouths of a tideless river. The value of tidal flow in maintaining a river is fully manifested by comparing the navigable condition of the Thames or of the muddy Humber with the delta of the Nile or the Rhone, though the latter rivers possess a much larger fresh-water discharge. The tidal rise also frequently allows of the access of vessels to a river whose entrance is barred at low water.

The general improvements of the upper portions of both tidal and tideless rivers may be carried out on similar principles, though on approaching their mouths they need a totally different treatment. To give a river a uniform depth, its channel and flow require regulation. Hard shoals may be permanently removed by dredging; but silty shoals, even when dredged away, will re-form unless the channel is contracted. Formerly rivers were regulated by building out jetties at intervals at right angles to the banks, especially in wide shoal places, in order to contract the channel and concentrate the stream, so as to scour a deeper central channel. These cross jetties, however, whilst effecting a deepening in front of their extremities, caused irregularities in the flow of the current in the intervals between them, thus producing differences in depth. Continuous longitudinal jetties, or training banks, though more costly, are much more efficient in regulating

'a river, and are now generally adopted for procuring a

uniform width, and, consequently, a regular depth. Where the fall alters, a corresponding variation must be made in the section of the channel ; and, in the case of tidal rivers, the section should gradually increase as it approaches the sea, so as to admit the increasing volume of sea water which enters but does not pass far up the estuary whose upper portion has been filled by the earlier flow. Most rivers, whether tidal or tideless, are more or less impeded for navigation by a bar at their mouth. A bar | is a ridge or shoal extending across the navigable channel,

Regula- tion of Tivers.

Causes of

bars.

over which there is a less depth than either above or below it. The lowering of such a bar forms one of the main objects of river improvement, as upon the depth that can be obtained over the bar depend the class of vessels that can enter the river, and, in tidal rivers, the period of time during which the entrance can be navigated. A bar may result from the action of the sea, which tends to form a continuous beach across any inlet, and would obliterate the mouths of rivers if the channels were not maintained by the ebb and flow of the tide and the fresh-water dis-charge; or it may be formed by the conflict of the sea and river water, which checks the current at the mouth and causes the river to deposit the sediment which it held in suspension. The bars at the mouths of the Mersey, the Liffey, and the Adour are due to the first cause ; whilst the bars at the mouths of tideless rivers, such as the Missis- sippi, the Danube, and the Rhone, are mainly due to the second. Improvement of Tidal Rivers.

Tidal rivers differ greatly in their natural character- istics, owing to the variety in the different conditions

tions of Which affect them. 'Thus the Mersey, with an extreme

tidal rise of 30 feet at its mouth, is only tidal for 46 miles, whilst the Seine, with a rise of 22 feet, is tidal for 91 miles, and the Scheldt, with a rise of only 13} feet, is tidal up to Ghent, a distance of 105 miles. These differ-ences are mainly due to the different falls of the river- beds, but they are also affected by the facility of entry afforded to the flood tide, and the form of the channel up which it flows. The tidal capacity of a river depends on the rise of the tide and the configuration of the banks. The tidal flow into the Mersey amounts to 710,000,000 cubic yards at a high spring tide, whilst the flow into the Scheldt at Flushing, with less than half the tidal rise, reaches 475,000,000 cubic yards. The tidal capacity of the Seine, together with its estuary, formerly exceeded that of the Mersey,

but it has been greatly reduced by the training works which have been carried out on it since

1848.

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water discharge, which, being penned up during the flood tide, reinforces the ebb and preserves an equilibrium.

The fresh-water discharge of a river, depending upon Value of

the area of the basin and the available rainfall, naturally !resh- water dis-

charge,

varies greatly in different rivers—being, for instance, greater in the Tyne and the Clyde than in the Mersey, though these rivers have little more than one-thirteenth of the tidal capacity of the Mersey. The Seine, with a drainage area of 30,500 square miles, nearly six times the size of the Thames basin, has a discharge of 28,000,000 cubic yards, on the average, each tide (about twenty-eight times that of the Mersey), though this volume sinks into insigni- ficance when compared with the flow of the Danube with a basin of ten times the size, or still more of the Missis- sippi with a basin forty times as large. A large fresh- water discharge is of great value to the maintenance of an estuary, especially when, as in the case of the Seine, it carries little silt in suspension; whilst a small discharge in proportion to the size of an estuary, of which the Mersey is a notable instance, renders the state of the estuary very delicate, and necessitates great vigilance in maintaining its tidal capacity, to which its existence is almost wholly due.

The silt brought down by tidal rivers, instead of being carried to their mouths and there deposited, is met by the incoming tide at points varying daily with the states of the tides; and, moreover, except during slack tide, it is maiutained in constant motion up and down the estuary, till at length it gets to the sea. Accordingly, though the sediment of tidal rivers is more or less deposited wherever the velocity of the current is checked, it does

not tend to accumulate in one particular part, as in the case of tideless rivers, and therefore the formation of a bar at the mouth is mainly due to the drift by waves along the beach. A flood also, though more largely charged with silt, by giving additional power to the ebb, scours the channel and lowers the bar. 'The Humber, whose waters are densely burdened with mud which is readily deposited in still water, is nevertheless free from a bar.

The best form of estuary for a tidal river is when it Forms of

enlarges gradually as it approaches the sea, thus affording estuaries. an increasing capacity for the admission of the tide, and The estuaries approximating to

Influence The tidal ebb and flow passing and returning through of tides, the entrance channels of a river twice a day exercise a

very important influence on its maintenance. The effect of tidal scour is manifested in the history of the harbours of Calais and Ostend,! which in old times possessed deep outlet channels, but were injured by reclamation, and in the deterioration of the outfalls of the Fen rivers as soon as the tidal flow was curtailed by the erection of sluices. The power of the tidal scour necessarily varies with the volume of water producing it, and therefore one of the first principles of tidal river improvement is that the tide should be admitted as far up a river as possible, and all obstructions to its flow removed. If, however, the main- tenance of an estuary depended solely upon the tidal ebb and flow, the estuary would gradually silt up, for the flood tide brings in matter in suspension which it washes from the adjacent shores and sandbanks, especially during rough weather, when the waves stir up the sand and silt. The impetus of the tide running up the rising bed of an estuary is gradually checked, till at last slack water occurs, and the silt begins to deposit, which the ebb tide, enfeebled by the friction of the tidal water in its passage up and down the estuary, would of itself be unable com- pletely to remove. The erection of any obstructions to

promoting a regular flow. such a form are generally free from bars—as, for instance, the Thames, the Severn, and the Scheldt. When, how- ever, a

river expands abruptly into a wide estuary on a sandy coast, it winds through the enlarged estuary in an unstable shallow channel, owing to the reduced velocity of the ebb in expanding out, and the checking of the flood tide on reaching the head of the wide estuary. Thus the Seine, with a deep stable channel from Rouen to La Mailleraye, had formerly a shallow shifting dangerous channel from thence to the sea; the Ribble, with a good depth at Preston, has a shoal irregular channel towards its mouth; and the Dee, with a moderate channel at Chester, is almost barred to vessels, except at high tide, below Connah's Quay. These estuaries do not possess a well-defined bar, but their long shallow winding channels offer a still more serious impediment to navigation. The worst form is a very irregular estuary with abrupt expan- sions and contractions, of which the Mersey is a pro- minent example, for, in spite of its large rise of tide, it possesses a shallow, irregular, and shifting channel above Liverpool, and is encumbered by a wide bar below.

There are three obstructions to which tidal rivers are Methods subject, namely, a bar, a shifting channel, and inadequacy of im- of depth ; and there are three general methods which may ee be resorted to for their improvement, namely, jetties, : training walls, and dredging, in addition to the regulation of their upper portion by longitudinal jetties, or banks, as previously mentioned.

the tidal flow, such as sluices and weirs, increases the period of slack tide, and consequently not only reduces the volume of ebb and flow but also promotes the deposit of silt, to the further detriment of the estuary. The main- tenance of estuaries is secured by the aid of their fresh-

1 L. F, Vernon-Harcourt, Zarbouwrs and Docks, pp. 149 and 155.

Jetties.

Forms of

jetties.

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Jetties. —A bar being caused by the littoral drift, and by the impotence of the expanded current to scour the channel over it to the same depth as elsewhere, it is neces- sary either to arrest the drift or to concentrate the current across the bar. 'he drift, which comes from the direction of the prevalent winds, might be temporarily arrested by projecting a groyne, or jetty, from the shore on the wind- ward side of the outlet. The material, however, carried along the coast would accumulate against the jetty, and eventually form a bar beyond, or, sweeping round the end of the jetty, deposit in the channel under its shelter. Accordingly a second jetty is added, on the opposite side of the outlet, to direct and concentrate the current over the bar, and thus increase the depth of the channel, and also to drive into deep water any material that may be carried round the windward jetty, or convey it within the influence of any littoral current farther out. The jetties are either made parallel, or slightly diverging, so as to form a sort of continuation of the banks of the river across the beach, or they are commenced far apart and made to converge towards their extremities, so as to admit a larger volume of tidal water and concentrate the flow into a narrow channel over the bar. The parallel jetty system has been adopted for the new outlet of the Maas (fig. 13), the mouth of the Adour near Bayonne (fig. 16), and the mouths of the Wear at Sunderland, the Yare at Yarmouth, and the Ouse at Newhaven; whilst the con- verging jetty system has been carried out at Charleston (figs. 17 and 18) and Aberdeen, and at the mouths of the Liffey, the Tyne (fig. 8), and the Tees.

The ordinary form of jetty is a timber pier resting upon a base of rubble stone, like the jetties of the North Sea jetty harbours of Calais, Dunkirk, and Ostend, so that the solid lower portion may concentrate the ebb, whilst the open upper portion permits the passage of the littoral currents in order that a rapid advance of the foreshore may be pre- vented. Such structures, however, simply delay, and do not stop, the advance of the foreshore, as manifested at Newhaven and Dunkirk, where the accumulation of shingle in the one case and of sand in the other brought low- water mark out to the extremities of their western jetties. The solid northern jetties of the Wear and the Yare have naturally produced a similar advance of their northern beaches, both being exposed to a north-easterly drift.

A special form of jetty has been constructed at the mouth of the Adour to combine the advantages of open and closed jetties. These jetties consist of a row of cylindrical columns placed at intervals and carrying iron girders on the top. Grooves are formed at the sides of the columns, down which panels can be lowered from the roadway above to confine the issuing current, whilst when the panels are open the spaces between the columns admit the flood tide and the passage of the currents. Nevertheless there are indications of an advance of the foreshore; the sand passing through the spaces in the northern jetty has encroached upon the channel, and the depths are reduced beyond the end of the jetties (fig. 16);

The most important examples of training jetties, includ- ing converging jetties, have been made solid, though sometimes they have not been raised to high-water level at their outer ends, in order to provide for the freer admis- sion of the flood tide. The converging jetties, or walls, at the mouth of the Liffey consist of mounds of rubble stone, and the outer portion cf the northern jetty is only raised to half-tide level. The jetties at the mouth of the Maas (figs. 13 and 15) are formed of fascine mattresses ; and the Charleston jetties (figs. 17 and 18) are similar in construction ; in both these cases the outer portions have not been raised above half-tide level. The converging jetties or piers at Aberdeen, the Tyne (fig. 8), and the

ol7 Tees are in reality breakwaters,! though they serve the same purpose of protecting the entrance channels from the littoral drift, and promoting scour over the bar, as the less solid structures at Dublin and Charleston, The Tees breakwaters are random mounds of slag; the Aber- deen breakwaters at the mouth of the Dee are upright walls of concrete; and the Tynemouth piers are masonry and concrete-block walls upon a rubble foundation. The breakwaters afford a much better shelter for vessels and for dredging operations, but the lower fascine-work jetties at the mouth of the Maas are equally effective in directing the current.

Training Walls.—The wandering shallow channel of a river through a wide sandy estuary may be improved by training the channel, in a suitable direction, by means o longitudinal mounds of rubble stone, commonly termed training walls. These walls fix the channel and prevent the current

eroding the sandbanks and thus changing its course. Moreover, by guiding the channel into a more direct line, making the ebb and flow follow the same course, and concentrating the current, the scouring capa- city of the stream is increased and the channel is deepened. The flood tide ascends the trained channel more readily, and therefore is able to extend its influence farther up ; whilst the ebb tide flows out of the improved and deepened channel earlier, and thus lowers the low-water line and increases the tidal capacity in the channel.

Object of

training

f walls.

The trained channel must be gradually widened out and Form of carried into deep water, otherwise the abrupt expansion training

which occurs beyond the ends of the training walls would so enfeeble the ebbing current that a shallow shifting channel would be formed only a short distance below. Training walls which stop in the middle of a wide sandy estuary, like the walls carried out on the Seine (fig. 10) and the Ribble, can be only regarded as incomplete works, which sooner or later will have to be extended if the full benefit of a trained channel is to be realized. When the channel is to follow close along one shore of the estuary, a single training wall on the outer side is suffi- cient; and a single wall is sometimes adequate for main- taining a channel in the middle of an estuary, when placed along the concave side of a bend.

The proper width between the training walls depends upon the fall, the tidal range, and the fresh-water dis- charge, and should gradually increase down stream so as to admit as much tidal water as possible with a steady flow. As the scour of the fresh-water discharge is greater with a contracted channel, the tendency is to place the training walls too close together, which, though improving the depth in the channel between the walls, reduces the volume of tidal water that can get up the channel and thus compromises the maintenance of the outlet beyond the walls. The training walls on the Scine and on the Ribble, whilst improving the

trained channels, have been preju- dicial to the channels beyond; and an extension of the works has been authorized on the Ribble. The widths also adopted between these walls are not compatible with an adequate widening out towards their outlet for the free admission of the flood tide, so that these estuaries will eventually be deficient in tidal capacity.

The training of a wandering channel is always beneficial to the maintenance and depth of the channel. wanderings, however, of the channel, which are thus arrested, though very prejudicial to navigation, are advan- tageous in preventing the silting up of an estuary by the constant erosion and stirring up of the sandbanks which they effect in shifting their position, and which they carry by gradual stages throughout the whole of the

1 |, F. Vernon-Harcourt, Harbours and Docks, pp. 200, 817, 3841. | XX, — 73

walls.

Iiffects of The training

walls.

estuary. The scouring current predominates at one time in one part and at another time elsewhere, so that slack water is never permanent in any part of the estuary, and accretion cannot progress for a long period without dis- turbance. When, however, a channel is permanently fixed by training walls, the condition of the estuary is com- pletely transformed. The flood tide, indeed, comes in with its burden of silt as before, rising sooner up the improved channel, and therefore dispersing with a somewhat gentler flow over the rest of the estuary. The ebb tide, however, is mainly concentrated along the trained channel, especi- ally when it attains its maximum scouring efficiency towards low water. Accordingly, whilst the flow in the trained channel is increased, stagnation occurs more or less over the rest of the estuary, and silting-up inevitably occurs, resulting eventually ina large reduction of tidal capacity. The accretion,

moreover, is not confined to the portion of the estuary behind the training walls, but gradually creeps down, on each side of the estuary, for a considerable distance beyond the ends of the walls. Low training walls hardly rising above the adjacent sandbanks have been tried with the object of preventing this accre- tion, but the improved flow in the trained channel and the reduced velocity elsewhere still promote accretion behind the low walls, and the deposit, rising first along the shores of the estuary, gradually attains high-water level over a great portion of the area at the back of the training walls, and from thence slopes down to the top of the walls on each side of the channel. Though the pro- cess of accretion is less rapid with low training walls, the ultimate result is only delayed and not prevented, as clearly manifested by observations on the Seine and other rivers, so that the view formerly entertained by some engineers, that if training walls were kept down to the level of the existing sandbanks no accretion would take place, has been proved to be erroneous by the results of experience ; and it may be accepted as a general law that training walls, whether high or low, inevitably lead to accretion if the flood tide is charged with silt.

Remarks The most careful consideration should be given to all

on trait- the conditions of an estuary before training works are

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walls, commenced, for when once begun they niust be eventually carried out to deep water; and, if ports exist along the shores of the estuary, they are liable to be injured by the accretion resulting from the works unless the trained channel can be led close along them. The training works of the Seine estuary, though very advantageous to the inland port of Rouen, are compromising the approach channels to Honfleur and Havre, and have silted up the port of Harfleur, so that the extension of the training walls to Honfleur has been urged in the interests of that port, whilst large works have been executed to preserve its entrance, and a new direct channel into the sea is being proposed for Havre. Though the training works on the Dee have not been carried out hitherto in a judicious direction, having been formed mainly with a view to land reclamation, it would be advantageous for the ports of Chester and Connah's Quay to

extend these works towards the sea, as there are no ports below the present limits of the training walls to be injured by the effects of their pro- longation, and the navigable channel would be much improved, provided the works were carried out to deep water. The training walls in the Ribble estuary must eventually be extended, even beyond the limits at present authorized, if a good navigable channel is to be secured to Preston, but these works will produce an entire trans- formation in the estuary, of which large portions have been already reclaimed as a consequence of the works already accomplished. The Mersey estuary would need a very comprehensive scheme for its improvement, owing to

the very defective natural condition of the estuary, and the situation of the ports along its banks. The mere training of the channel in the upper estuary, for the bene- fit of the up-river ports, would result in the reclamation of the wide estuary between Runcorn and Liverpool, and thus deprive the channels between Liverpool and the sea of their natural scouring reservoir of tidal water; whilst the training of a channel below Liverpool out to the bar would necessitate very extensive works in deep water and in an exposed situation.

Dredging.—The improvements effected within recent Dredging,

years in the ordinary dredging machinery, and the intro- duction of the sand-pump dredger, have facilitated and cheapened dredging operations to such an extent that some of the most remarkable river improvements have been effected by dredging. The great increase in depth realized on the Tyne and the Clyde has been effected by means of steam bucket-dredgers aided by hopper barges, whilst the maintenance of the entrance channel to St Nazaire on the Loire, and the deepening of the approaches to Dunkirk and Calais, have been accomplished by sand pumps, which have the advantage of being able to work when exposed to moderate waves. Dredging merely con- sists in removing material from the river bed and thus enlarging and deepening it; and the extent to which this method of improvement may be carried simply depends upon the economical consideration as to how far the improvement of the traffic on the river by an increase of depth will afford an adequate return for the outlay. Dredging, however, furnishes a cheap method of excava- tion owing to

the small cost of carriage by water. Dredg- ing, being a purely artificial means of improvement, generally necessitates regular maintenance; whereas the improvement from scour effected by jetties and training walls is permanent, being realized by natural means. Frequently, however, training walls and jetties are supple- mented by dredging, for the walls and jetties render the deepening by dredging easier and more permanent ; whilst, on the other hand, dredging enables a greater depth to be attained, and even maintained, than could have been effected by scour alone.

The improvements on the Tyne and on the Clyde have mainly resulted from very extensive dredging operations, but they have been aided by training walls on the Clyde, and by the Tynemouth piers on the Tyne, which protect the entrance channel from drift and the dredgers from waves, and concentrate the scour over the bar. The three methods of improvement described above have been re- sorted to on the Tees: for training walls have been formed through the wide estuary below Middlesborough for fixing the channel ; converging jetties are being constructed for sheltering the channel from wave-borne sand, and for directing the scour over the bar; and dredging is being employed for deepening the trained and sheltered channel. On the Maas also, and at Charleston, dredging is being used for attaining a depth for navigation which the jetties alone were unable to produce.

River Tyne Improvement Works.

The Tyne has a drainage area of 1053 square miles ; its tidal Plate V. flow extends 18 miles from its mouth, and the range of spring figs. 8, 9.

tides at its outlet is 143 feet. Being by nature a small winding irregular river, with little tidal capacity and no estuary, its depth was small and variable, and a bar existed atits mouth, which opens directly on to the sea-coast. The first improvement works, com- menced in 1848, consisted in training the river by cross jetties, subsequently connected by low training walls, so as to regulate the width and consequently the depth of the river. As, however, the volume of water in the river was small, the scour was not adequate to effect a great improvement in the depth ; the bed of the river between Neweastlc and the sea, in 1860, was in many places above low-water level ; and the depth on the bar at low tide was only 6 feet (fig. 9). The picrs at the mouth were commenced in 1856,

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for the purpose of facilitating the removal of the bar and for sheltering vessels entering the river, and were originally designed to terminate in a depth of 13 feet at low water ; but eventually a larger sclleme was adopted for forming a refuge harbour in com- bination with the improvement of the river, and the piers, which are still in progress, are to extend into a depth of 30 feet. In 1861 extensive dredging opcrations were commenced for improving the depth of the river, and a maximum of 3,515,000 cubic yards was removed in 1866 ; the work has been regularly continued, and the totalamount dredged since the commencement, in 1838, reached 49,668,000 cubic yards in 1884, being an average of nearly 2,000,000 cubic yards aunually since 1861, when systematic dredging operations were begun. The iniprovement in depth that was effected between 1860 and 1884 is shown on the longitudinal section of the river (fig. 9); and the deepening of the river between Newcastle and Hedwin Streams, a distance of 84 miles, isin progress, being carried on by six dredgers. The river has also been regulated by making a straight cut across Lemington Point, and widening the channel from 150 feet to 400 feet opposite Blaydon ; the obstruction offered to the Tyne by the old Newcastle Bridge has been removed by rebuilding the bridge with larger openings ; and a sharp bend in the river has been eased by removing the high projecting rock at Bill

Point (fig. 8). The tidal capacity of the river has been in- creased by 14,000,000 cubic yards; the bar has becn lowered 14 fect since 1860; and the least depth at low watcr up to Newcastle is 20 fect, and 18 feet for 3 miles above. The deepening of the channel has produced a very beneficial lowering of the flood line in the river, thereby preserving the adjacent lands from inundation. The improvement of the river has led to a great increase in the tonnage of the vessels frequenting it, and a large development of its trade. The average tonnage of the vessels, which was 163 tons in 1863, had risen to 396 tons in 1883; and the total tonnage of the vessels entcring and clearing the Tyne ports rose from 4,382,000 tons in 1868 to 13,043,000 tons in 1883.

River Clyde Improvement Works.

The Clyde is a small river, with a drainage area of only 945 square iniles, and a tidal flow of about 20 miles ; it opens, however, into a deep well-sheltered estuary, or arm of the sea, called the Firth of Clyde, and is free from a bar. The rise of spring tides at its mouth is about 10 feet. The Clyde was by nature an insignificant stream, with numerous hard gravel shoals, and a ford 12 miles below Glasgow which could be crossed on foot. The regulation of the river by cross jetties, and the removal of hard shoals, was commenced in 1778. Early in the present century the jetties were made more uniform, others were added, and their ends were eventually connected by low training walls which were gradually raised as deposits formed behind. The river had to be subsequently widened to accommodate the increasing trade and a larger size of vessels. As scour alone could only produce a very moderate depth, systematic dredging operations were conimenced in 1844, and reached a total of 28,648,000 cubic yards by the middle of 1884, the maximum accomplished in a single year (1878-79) reaching 1,502,000 cubic yards. Dredging is still being continued with six dredgers in order to maintain as well as deepen the river; for the channel up to Glasgow has been deepened so far beyond its natural limit that any matter in suspension which enters the river is readily deposited. Of the 1,041,000 cubic yards dredged in 1883-84, as mueli as 703,000 cubic yards consisted of deposit, or more than two-thirds of the whole quantity removed. The river has a depth of 24 feet at high water from Glasgow to Port Glasgow, and from 13 to 15 fect at low water.

The tide falls 8 feet lower at Glasgow than it did before any works were begun, which not merely adds to the tidal capacity of the river, but also prevents the fresh-water floods which formerly inundated the low-lying portions of Glasgow. The improved depth has caused the average tonnage of the vessels frequenting the port of Glasgow to rise from 199 tons in 1863 to 315 tons in 1883 ; whilst the total tonnage entered and cleared has increased from 1,757,000 tons in 1863 to 5,544,000 tons in 1883.

River Tees Improvement Works.

The Tees was formerly a very irregular winding river between Stockton and Middlesborough, and after passing that town it opens out into a wide sandy estuary about 6 miles long and 8 miles across at its widest part. It is tidal for about 17 miles, and the rise of spring tides at its mouth is 15 feet. The improvement of the river between Stockton and the estuary was commenced in 1810 by making a straight cut near Stockton ; another cut was made in 1830, and the river was also regulated by cross jetties. These works provided a more direct channel, and increased the depth by about from 2 to 5 feet. The ehannel, however, between the jetties was irregular in depth; and the navigable channel through the estuary was shallow and variable, with a rocky shoal across it, and a bar at the mouth of the river. Accordingly, in 1853 training walls were cominenced, both for connecting the ends of the cross

1 Pp, J. Messent, C.E., River Tyne Improvement, 1882.

jetties, and also for guiding the channel through the estuary. Dredging was commenced in 1854 for removing shoals and deepen- ing the channel; and the ridge of rock across the estuary channel has been removed by blasting. The total amount dredged up to Oct. 31, 1884, reached 13,145,000 cubic yards, and a maximum of 1,220,000 cubic yards was dredged in 1883-84. Vessels of 3000 tons, drawing 21 feet of water, can leave Middlesborough fully laden ; the average tonnage of vessels frequcnting the Tees has risen from 169 tons in 1873 to 803 tons in 1883;

and the total ton- nage entered and cleared lias increased from 1,212,000 tons in 1873 to 2,528,000 tons in 1883. Itis proposed at present to deepen the channel by dredging, so as to obtain a depth at low water of 12 feet up to Middlesborough, and 10 feet from thence up to Stock- ton; and it is hoped that eventually 2 feet additional depth may be attained by the same means. Two breakwaters have been designed, starting from opposite sides of the estuary and con- verging over the bar, in order to protect the entrance, to facilitate dredging, and to keep out drifting sand. The southern break- water has been completed, and the northern breakwater is in pro- gress. The breakwaters and the training walls are constructed of slag obtained free of charge from the neighbouring iron-works.

Training Walls on the Tidal Seine.

The Seine has a very winding course between Rouen and the sea, Plate V. as well as in its upper portion, but it possesses a good natural figs, 10, depth between Rouen and La Mailleraye, a distance of about 87 11, 12.

miles. Below this point, however, the natural condition of the river was very unsatisfactory, for tlie channel through the estuary was constantly shifting, and high shoals existed at Aizier and Villequier with a depth over them of only 10 feet at spring tides, so that. vessels of from 100 to 200 tons found the passage difficult, and even dangerous at times. Training walls, formed of mounds of chalk obtained from the neighbouring clitis, were commenced in 1848, and were gradually cxtended along both sides of the channel, as shown in fig. 10, and were tcrminated at Berville in 1869, a further extension of the northern wall for 1} miles having been refused in 1870 for fear of endangering Havre. These works have effected a remarkable increase in depth in the channel between the walls, as shown by a comparison of the longi- tudinal sections of the river in 1824 and 1875 (fig. 11); for dredging has only been used for deepening the worst shoals. The improvement, however, ccascs beyond the terminatiou of the works; and the channel betwecn Berville and the sea is still changeable and shallow. High walls were for the most part adopted down to Tancarville on the right bank and to La Roque on the left bank. These walls, however, produced sueh rapid accretion behind them that low walls, raised only from 3 to 5 feet above low water of spring tides, were

adopted below these points. This precaution, however, has not arrested the accretion in the estuary, which is still proceeding, though sixteen years have elapsed since the works were stopped. The accretion resulting from the training works had reduced the tidal capacity of the estuary by 274,000,000 cubic yards in 1875; and a survey in 1880 showed that a still further loss of over 40,000,000 cubic yards had occurred between 1875 and 1880. More than 28,000 acres of land have been reclaimed in the upper part of the estuary, as shown by cross lines on the plan; whilst large tracts have been raised to high-water level, as indicated by dotted lines, extending as much as 84 miles below the ends of the training walls. The walls werc originally merely rubble chalk mounds; but the bore and the currents injured the mounds, so that the walls are being strength- ened by pitching or concrete on the river slope, with an apron of concrete, and piling at the toe (fig. 12). The regulation of the river, by bringing deep water about 25 miles nearer the sea, enables vessels of about 2000 tons, and drawing about 20 feet, to pass the shallow estuary between the sea and Berville at high tide and thus reach Rouen. The prolongation of the training walls has been frequently urged; but the fear of injuring Havre, and the difficulty of devising a suitable channel which would effectually serve both Honfleur and Havre on opposite sides of the estuary, have hitherto prevented the continuation of the work. The Tancarville Canal is in progress for connecting Havre with the Seine at Tancarville (fig. 10), so as to enable river craft to avoid the dangers of the lower estuary; and the canal is being made so as to be capable of being readily converted into a ship-canal if the growing accretions should impede access between Berville and, the sea. Works at the Mouth of the Maas.

The Scheur branch of the Maas, which forms the most direct Plate V. channel to Rotterdam, gradually silted up at its outlet, so that figs. 18, The 14, 15.

vessels had to seek more southern and circuitous channels. length of the deepest channel was shortened in 1829 by the eonstruction of the Voorne Canal, but even this course became inadequate for the increasing draught of vessels. Accordingly, in 1862 works were commenced for providing a new direct outlet for the Scheur branch of the river by a straight cut

across the Hook of Holland, with fascine-work jetties for training and maintaining

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the channel across the sandy beach into deep water (fig. 18). The cut, three miles long, was only partially excavated, its completion being effected by damming up the old channel and directing the fresh-water discharge and tidal current through the new cut. The scour soon deepened the narrow cut; but some of the sand washed from the cut settled in the wider channel formed by the jetties. The cut also, being scoured deeper than the adjacent channel above and below, was not adequately widened, and consequently impedes the entry of the flood tide up the river (figs. 18 and The desired depth of 23 feet at high water not having been attained as anticipated from the works, dredging has been resorted to for deepening the outlet ; and the widening out of the cut to the proper full width would improve the tidal influx. The jetties consist of faseine mattresses secured by piles and stakes and weighted with stone (fig. 15); and their outer portions have been

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off the other three outlets and extended into the sea at its mouth, the increased discharge brought down the whole sediment of the river, and a bar formed again farther out. Accordingly the St Louis Canal was formed, between 1863 and 1873, going from the head of the delta into the Bay of Foz beyond the limits of the delta. A similar plan was proposed for the Mississippi, but was abandoned in favour of the jetty system. The canal constructed by the emperor Claudius for connecting the Tiber with the harbour of Ostia proved a failure, as its outlet at Ostia was not sufficiently removed from the delta, so that it gradually silted up and is now 2 miles from the coast.

The success of the jetty system depends upon the exist- Require- ence of a littoral current to carry away the sediment in the ments of stream conveyed by aid of the jetties into deep water, or Jetty

kept down to half-tide level to promote the freer admission of the flood tide, whilst serving equally to concentrate the latter part of the ebb.

Charleston Jetties. th al 1 0 Reid system. Plate V. The largest jetty works in the world for lowering a bar in front sis . eos P rolongation of the jetties to keep pees figs. 17, of a tidal estuary are being constructed at the entrance to Charles- with the progression of the delta. The outlets of the 18- ton harbour (fig. 17). The jetties are being formed after the | Danube and the Mississippi have both been improved by type of the Maas jetties, with log and fascine mattresses weighted | training one of their minor delta channels into deep water ; with rubble stone (fig. 18). They start from the shore about and hitherto the depth the' i 0 ' 2} miles apart and converge to a width of about 2000 feet over | 7 itherto the depth over the bars has been a d. the bar, which stretches across the entrance to the harbour at 1 In the case of the Danube, the southerly current sweeping miles from the shore. The object of the works is to concentrate the | across the outlet carries away a portion of the issuing tidal and fresh-water current from the land-locked estuary, having | sediment. The Mississippi jetties direct the discharge into an area of 15 square miles, into which the Ashley and Cooper | ouch q rat death ln veliact ' rivers flow, and whose mouth forms the entrance to Charleston ee a ene Ve aay, that i ey harbour. 'The northern jetty, which was commenced in 1878, be premature to decide to what extent the maintenance of attained the present length of 14,860 feet in 1881; and the the depth may be due to a westerly current in the gulf; southern jetty had been carried out 14,130 feet towards the end of | but hitherto from one cause or the other, or probably from 1883. The outer portions, lying in the direction of the flood cur- | poth combined. the bar h t f a Sancdiap rent, are to be raised ; but the inner portions are to be kept low, in ny ae ae ee ene Mee) Sagem front of order to interfere as little as possible with the littoral drift and the jetties. thus avoid an advance of the foreshore, and also in order to admit Sulina Piers of the Danube Delta. freely the flood tide. Though scour has already commenced, it will The delta of the Danube commences about 45 miles from the Plate V. ie yom i = ES by Se ae in order to attain a depth of 21 | Black Sea, and has anarea of 1000 square miles. The river divides figs. 19, place of the former depth of 114 feet. se ie ete ior the northern or Kilia branch conveys more 20, 21. om : — than three-fifths of the*

discharge, but it forms an independent delta ; oe Improvement of Tideless Rivers. near its outlet and is consequently unsuitable for improvement (fig. Deltas. Tideless rivers on entering the sea have their velocity | 19). The southern or St George branch is the next largest, and checked, and consequently deposit the silt which they gee oe ee Ot “ i near its outlet into two srevrouale darned & . : ~ | channels, which are both barred. he central or Sulina branch, I y carried Pore 2 I In process of time this though narrower and less good than the St George branch, and accumulated deposit forms a tract of low-lying land | conveying less than one-thirteenth of the total discharge, possessed protruding into the. sea, through which the river flows in | the only navigable outlet in 1858, and was therefore selected for several shallow channels to the sea owing to the impedi- the provisional improvement works begun in that year. The works ments offered to its flow by the sediment which it deposits. ee a fi Oe e pt cl vat EO a The form which these diverging channels assume has led diem ‘seucio0, Moir TaNd lake Men, thie Canale ame ics to the term delta being applied to the mouths of tideless | (fig. 20). The piers were at first constructed of rubble mounds rivers and the tract of land which they- create (figs. 19 | With piles carrying a platform strengthened at intervals by timber and 22). These deltas are always advancing, and con- cribs; but subsequently they were; consolidated with concrete sequently reducing the ver ll fall of i h ; blocks (fig. 21). These piers serve to concentrate the discharge of ery small tall of the channels | across the bar, and increased the least depth at the outlet from 9 through them by prolonging their course. The rate of | feet in 1857 to 20 feet in 1872, a year after the final completion advance varies with the amount of sediment brought down, of the works ; and this depth has been since maintained. The the depth of the sea in front, and the extent to which the es ota ee Sete all ag oe were a i of the southern littoral current, which, diverting a portion of the sine pes out. The Rhone delta has at present a | deposit, has reduced the rate of advance of the Sulina delta from yearly average progression of 140 feet ; the Kilia mouths | 94 feet to 44 feet ina year. This progression, however, will event- of the Danube delta have been estimated to advance 200 | ually necessitate the extension of the piers. har ee ns tear Mississippi delta, extending 220 The Mississippi Jetties. othe Gull of Mexico, is supposed to have taken | Though the Gulf of Mexico is in communication with the Plate V. four thousand four hundred years in forming, which would

Atlantic Ocean, it is almost tideless, for the average rise of tide in figs. 22, a. equivalent to an average annual advance of 264 feet, On oe Hee. die ae is only 14 He and Cae is only 23. the resent advance G D907 . r, ay. 1e ISSISS1P Pl, accordingly, 1S a tideless river, si nthe pe ae Ot | — ws 207 feet in a year. , and forms a delta which has an area of 12,300 square miles, and s The y method of improving the outlet of a tideless | has three main channels, or passes, leading the discharge of the : : : of gs river is to concentrate the current flowing through one of | river into the gulf (fig. 22). The general features of the delta the channels, and to prolong the banks of the regulated have been already described, and the various schemes for improving channel into deep water by means of parallel jetties the outlet referred to (see Misstssipp1). In flood time the river . — The only other aapot texaasietiay" vc" Tal : — brings down in suspension 2800 cubic feet of solid matter per ot ying t impediments to | second ; and before the jetties were commenced the annual advance

navigation at the mouths of tideless rivers is by avoiding the delta channels altogether, and constructing a canal connecting the deep river above the delta with the sea at some suitable place beyond the influence of the river alluvium. This expedient has been resorted to for the trade of the Rhone ; for, though the discharge of the river was concentrated into a single outlet by forming embank- ments on each side, between 1852 and 1857, which shut

of the bars at the mouths of the passes was 300 feet at the South- rai Pass, 260 feet at Pass 4 l'Outre, and 110 feet at the South

ass.

1n 1874 Mr Eads offered to make and maintain a channel 28 feet deep across the bar of the South-West Pass, which had only 18 feet of water over it. The South Pass is narrower, having a width of from 600 to 800 feet ; it conveys only about a tenth of the total dis- charge of the river ; it was impeded by a shoal at the head of the pass with a depth of only 15 feet over it ; and the depth on the bar at its mouth, where it expanded to 2 miles in width, was only 8

Conclud- ing re- marks.

RLY =

feet. The South Pass, however, was selected by Congress for improvement, partly on account of the smaller cost of the works required, and partly because it was the pass which had been pre- ferred by a previous commission. The depth of the South Pass through the delta, a distance of about 13 miles, was 30 feet; so that the obstructions to be removed were restricted to the head and mouth of the pass. Dredging had been tried for deepening the outlet of the South-West Pass, and had necessarily failed in pro- ducing any permanent improvement, for sediment soon filled up again the portion of the channel which had been enlarged beyond its natural limits of maintenance. The object aimed at in the South Pass was to contract the width of the channel at the head and outlet, so that the current might be forced to regain its required section of channel by scouring out in depth what it lost in width. At the mouth of the South Pass this result could be effected by concentrating the current over the bar with parallel jetties, thus prolonging the banks of the pass artificially into deep water, and contracting the current sufficiently to ensure the requisite depth. At the head, however, of the South Pass, the conditions were more complicated ; for, as soon as the entrance channel there was contracted, a portion of the discharge tended to desert the impeded pass for the other more open passes, and the head works by themselves would therefore have deprived the South Pass of a portion of its natural flow, which would have necessarily led to a reduction of the channel below the head. Accordingly the entrances to the other passes had to be correspondingly reduced, so as not to absorb more than their former proportion of the dis- charge and thus leave the discharge through the South Pass un- diminished.

The works consist mainly of willow mattresses, which are specially suitable where osiers are abundant, and where settlement on the. soft alluvial bottom is inevitable. The funnel-shaped entrance at the head of the South Pass was contracted across the shoal into a uniform channel, 800 feet wide, by means of mattress dykes ; and mattress sills, 30 to 40 feet wide, 60 to 70 feet long, and 2 feet thick, were laid right across the entrances to the other two passes to restrict the volume of their discharge to its normal amount.

The parallel jetties on cach side of the mouth of the South Pass consist of tiers of willow mattresses, 100 feet long, from 20 to 50 feet wide, and about 2 feet thick, consolidated with rubble stone, and capped at the outer ends with concrete blocks to secure them against waves (fig. 23). They have been raised to flood-tide level to within 1000 feet of their extremities. The east jetty is 23 miles long, and the west jetty 14 miles; they terminate at the same distance out, in a depth of thirty feet. They are placed about 1000 feet apart, and are curved slightly towards their extremitics, so as to bring the channel at right angles to the westerly littoral enrrent in the gulf. The jetty chaunel has been contracted to a width of 700 feet by mattress spurs, in order to promote the scour in the central channel, which was lessened at first by leakage through the mattresses owing to their want of consolidation from difficulties in the supply of stone. +

The works were commenced in 1875, and completed in 1879. The channel was to be made, according to the terms of the con- tract, 26 feet deep and 200 fect wide, with a central depth of 30 fect. According toa survey made in May 1884, the least central depth through the jetty channel is 33 feet, and the width of the 26-foot channel is 290 feet ; and beyond the jetties the least central depth is 31°8 feet, and the least width of the 30-foot channel is 70 feet. At the head of the South Pass there now cxists a straight channel with a minimum central depth of 35 feet ; and the 30-foot channel has a minimum width of 275 feet. There is now a depth of 80 feet right through the South Pass.

The latest surveys indicate only a slight shoaling beyond the outlet, showing that hitherto the accelerated current, being pro- truded into deep water and aided by the littoral current, has not created a fresh bar by the deposit of its sediment. As the littoral current caunot be expected to convey away more than a portion of the sediment brought down, the material must be accumulating beyond the outlet, and after having filled up the deep places in front, will gradually rise beyond the ends of the jetties, where the dispersed river current will be unable to carry it away. This shoaling, however, may be delayed for a considerable time by the distance to which the velocity of the trained current carries the sediment, and the depth in which the sediment is deposited ; and when it becomes

prejudicial to navigation, it can be readily removed by an extension of the jetties.

The method of lowering a bar at the mouths of rivers by means of jetties has been applied, as indicated above, to both tidal and tideless rivers ; but the systems employed for each type of river are based on different principles which must not be confounded together. A tideless river ig maintained solely by its discharge, and therefore the more its channel is contracted the greater is the depth

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attained. As, however, a tidal river depends largely for its maintenance on its tidal flow, a contraction at its mouth checks the entrance of the flood tide and reduces the tidal flow. The contracted width between the Adour jetties (fig. 16) has reduced the tidal rise at Bayonne in spite of the openings formed in them for the admission of the tide; and the narrow width of the cut at the Maas outlet (figs. 13 and 14), whilst affording an improved depth in the cut, is prejudicial to the depth elsewhere. A parallel channel with high jetties is suitable for tideless river mouths; but a slightly diverging channel, with the outer ends of the jetties below high-water level, is expe- dient for tidal rivers. Converging jetties, like those of Dublin and Charleston (fig. 17), would be perfectly use- less at tideless outlets; but these jetties, by not being unduly contracted at their extremities, and by being kept low towards their ends, freely admit the tidal flow, whilst the increased capacity obtained by their enlarged form increases the tidal scour at the outlet. The comparatively small improvement in depth over Charleston bar, as com- pared with the magnitude of the works, may be due to the want of concentration of tidal scour, owing to the small elevation of the inner portions of the jetties, which allows of the dispersion of part of the ebb.

The greatest difficulty in training tidal rivers is so to adjust the width of channel that the free admission of the flood tide may be secured whilst affording adequate scouring power for the current. If the influx of the tide is checked by a sufficient reduction of width to ensure improvement in depth by scour, the capacity of the estuary is eventually reduced, and a portion of the scouring power is lost, as in the case of the Seine. It is

better, therefore, to regulate the width so as to ensure a free admission of the tide, and to provide for any deficiency in scour and depth by dredging. Deepening by dredging can be easily and economically effected to any desired extent, as shown by the Tyne and Clyde improvements ; whereas tidal capacity in an estuary, when once lost, can never be regained.

For further information about the works described, reference may be made to Rivers and Canals, by L. F. Vernon-Harcourt ; Liver Tyne Improvements, by P. J. Messent; 'The River Clyde," by James Deas, Proc. Inst. OC. H., vol. xxxvi.; " The Delta of the Danube," by Sir Charles Hartley, Proc. Inst. C. #., vols. xxi. and xxxvi.; A History of the Jettics at the Mouth of the Mississippi River, by E. L. Corthell. (i> BY V.-E) RIVIERA or Genoa. See Iraty, vol. xiii, p. 437. It is customary to speak of the Eastern and Western Riviera (Riviera di Levante and Riviera di Ponente), which meet at Genoa.

RIXDORF, a large village to the south-east of Berlin, and practically an outlying suburb of that city, with which it is connected by tramway, is chiefly interesting as a foundation of Moravian Brethren from Bohemia, who settled here in 1737, under the protection of King Frederick William I. German Rixdorf, which is now united with Bohemian Rixdorf, was a much more ancient place, and appears as Richardsdorf in 1630 and as Riegenstorp in 1435. The inhabitants of the united community (who numbered 18,729 in 1880, though only 3421 in 1852) are engaged chiefly in weaving, in the manufacture of india- rubber goods, and in the various industries of the neigh- bouring capital.

RIZZIO, Davip, a servant of Mary, queen of Scots, was, according to Buchanan, a native of Turin, and came to Scotland in 1561 in the train of the Piedmontese ambassador. He entered the queen's service as a musician in 1564, and was also employed by her as private foreign secretary. He was murdered in 1566, as has been related in the article Mary (vol. xv. p. 596).

RJEV. See RZHEFF.

Roman roads.

ROACH (Leuciscus rutilus), a fish of the family of Carps (Cyprinide) and of the genus Leuciscus, which comprises also the Rudd, Chub, and Dace. It is one of the most common freshwater fishes of Europe north of the Alps, and extends northwards as far as Lapland. Its pharyngeal teeth are in a single series, five or six on each side. The body is generally rather deep, its greatest depth being about one-third of the total length, the caudal fin not included. The scales are large, from forty-two to forty- four along the lateral line, seven or eight series being above it, and three between the lateral line and ventral fin. The first dorsal rays are inserted vertically above, but not in advance of the root of the ventral fin. The anal fin is supported by from twelve to fourteen rays. The general colour is silvery, in adult fishes with a red tinge about the lower fins, Roach spawn from April to May, and frequently produce hybrids with other allied fishes, such as the rudd and the bream. They never attain to a large size, a roach of 1} ib being considered an unusually large fish. As a food-fish this species is not held in esteem ; but by the pleasure it affords to a large class of humble anglers it rivals any of the freshwater fishes which give more pretentious sport, and has properly been made the subject of a special work, Zhe Book of the Roach, by Greville Fennell (London, 1870).

ROADS anp STREETS. 'The earliest roads about which anything definite is known are those of ancient Rome, one of the oldest of which and the most celebrated for the grandeur of its works—the Appian Way—was com- menced in 312B.c, Roman roads are remarkable for pre- serving a straight course from point to point regardless of obstacles which might have been easily avoided. They appear to have been often laid out in a line with some pro- minent landmark, and their general straightness is perhaps due to convenience in setting them out. In solidity of construction they have never been excelled, and many of them still remain, often forming the foundation of a more modern road, and in some instances constituting the road surface now used. It is consequently possible, with the help of allusions of ancient writers, to follow the mode of construction. T'wo parallel trenches were first cut to mark the breadth of the road; loose earth was removed until a solid foundation was reached; and it was replaced by proper material consolidated by ramming,

or other means were taken to form a solid foundation for the body of the road, This appears as a rule to have been composed of four layers, generally of local materials, though sometimes they were brought from considerable distances. The lowest layer consisted of two or three courses of flat stones, or, when these were not obtainable, of other stones, generally laid in mortar; the second layer was composed of rubble masonry of smaller stones, or a coarse concrete; the third of a finer concrete, on which was laid a pavement of poly- gonal blocks of hard stone jointed with the greatest nicety. The four layers are found to be often 3 feet or more in thickness, but the two lowest were dispensed with on rock. The paved part of a great road appears to have been about 16 feet wide, and on either side, and separated from it by raised stone causeways, were unpaved side-ways, each of half the width of the paved road. Where, as on many roads, the surface was not paved, it was made of hard concrete, or pebbles or flints set in mortar. Sometimes clay and marl were used instead of mortar, and it would seem that where inferior materials were used the road was made higher above the ground and rounder in cross section. Streets were paved with large polygonal blocks laid as above described and footways with rectangular slabs. Specimens are still to be seen in Rome and Pompeii. There are no traces of Roman influence in the later roads in England, but in France the Roman method appears to

have been followed to some extent when new roads were constructed about the beginning of the 18th century. A foundation of stones on the flat was laid, and over that two layers of considerable thickness, of larger and smaller stones, bordered by large stones on edge, which appeared on the surface of the road. In 1764 Tresaguet set the foundation-stones on edge and reduced the thickness of the upper layers, and his method was generally followed until the influence of Macadam began to be felt. A French chaussée with accotements still retains some resemblance to the old Roman roads.

The almost incredibly bad state of the roads in England

English

towards the latter part of the 17th century appears from T@ds,

the accounts cited by Macaulay (Hist. c. iii.). It was due chiefly to the state of the law, which compelled each parish to maintain its own roads by statute labour, but the estab- lishment of turnpike trusts and the maintenance of roads by tolls do not appear to have effected any great improve- ment. At the time of Arthur Young's six months' tour in 1770 the roads would seem to have been almost as bad as ever, and it is doubtful if there was much improvement up to the beginning of the present century. The turnpike roads were generally managed by ignorant and incompetent men until Telford and Macadam brought scientific prin- ciples and regular system to their construction and repair. The name of Telford is associated with a pitched foundation, which he did not always use, but which closely resembled that which had been long in use in France, and the name of Macadam often characterizes roads on which all his precepts are disregarded, Both insisted on thorough drainage and on the use of carefully prepared materials, and adopted a uniform cross section of moderate curvature instead of the exaggerated roundness given before; but, while Telford paid particular attention toa foundation for the broken stone, Macadam disregarded it, contending that the subsoil, however bad, would carry any weight if made dry by drainage and kept dry by an impervious covering. Macadam was engaged more with the repair of old roads than with the construction of new ones, and, though it is not possible to agree with all his doctrines, the improve- ment which he effected in road management and main- tenance was great and lasting.

Construction of Roads.—A road should be as short as possible between two points to be connected, but straightness must often be sacrificed to avoid difficulties and expense and to secure good gradients. The latter should be as easy as practicable, having re- gard to the country to be traverscd, and it is desirable that there should be a ruling gradient than which none should be steeper. On a level macadamized road in ordinary repair the force which the horse has to put forth to draw a load may be taken as onc- thirtieth of the load. But in going uphill the horse has also to lift the load, and the additional force to be put forth on this account is

very nearly equal to the load drawn divided by the rate of gradient. Thus on a gradient of 1 in 80 the force spent in lifting is one-thirtieth of the load, and in ascending a horse has to exert twice the force required to draw the load ona level. In de- scending, on the other hand, on such a gradient, the vehicle, when once started, would just move of itself without pressing on the horse. A horse can without difficulty exert twice his usual force for a time, and can therefore ascend gradients of 1 in 30 on a mac- adamized surface without sensible diminution of speed, and can trot freely down them. These considerations have led to 1 in 80 being generally considered as the ruling gradient to be aimed at on first- class roads, though 1 in 40 has been advocated. Telford adopted 1 in 80 as the ruling gradient on the Holyhead road through North Wales, and there are only two gradients steeper, in places where they were unavoidable. All unnecessary rises and falls should be avoided, but a dead level is unfavourable for drainage, and ou this account 1 in 100 to 1 in 150 is the flattcst gradient that is desirable. Such slight rises and falls are probably rather favourable than other- wise to ease of draught by horses.

In transverse section, roads in the United Kingdom generally

18th century.

Con- STRUC- TION OF ROADS. Gradient.

Cross

comprise the carriage-way, a space on each side, on one or both of section.

which there may be a footpath, then the fences, and outside all the ditches. The width of the carriage-way may be from 15 feet, which allows of the easy passage of two vehicles, to 30 or 50 feet

Thick- ness,

Binding.

Rolling.

for roads of importance near towns. The side spaces may be from 4 or 5 to 8 or 10 fect wide ; wide sides give the sun and air access to the road, and tend to keep it dry, and also atford space for the deposit of road imaterials and scrapings. In cuttings or on em- bankments the transverse section has of course to be modified. The road surface should have just enough convexity to throw the wet off freely, and a very moderate amount is sufficient when a good surface is maintained. On a too convex road the traffic keeps to the middle, and wears ruts which retain the water, so that the surface is not so dry as with a flatter section which allows the traffic to distribute itself over the whole width. Telford used a cross section differing slightly from an arc of a circle in being more convex in the middle than at the sides. Walker recommended two straight lines joined in the middle of the road by a curve, and inclined about 1 in 24 towards the sides, the objection to which is that the flat sides are liable to wear hollow. An arc of a circle is often used, and is a.good form, but on the whole a curve more convex at the centre than towards the sides is the best. The rise in the curve from the sides to the centre need not exceed one- fortieth of the width, and one-sixtieth is generally enough on well-kept roads, and if seven-eighths of the total rise are given at one-fourth the distance from the centre to the sides and five-eighths at half that distance a curve of suitable form will be obtained. It is generally best to obtain the requisite convexity by rounding the formation surface or seat of the road and giving a uniform thickness to the coating of stone. When there is not a kerb there should be a " shouldering" of sods and earth on each side to keep the road materials in place, and to form with the finished surface the water tables or side channels in which the surface drainage is collected, to be conveyed by outlets at frequent intervals to the side ditches. The outlets are open cuts through the sides or drains beneath the footpaths. The side ditches should be deep enough to thoroughly drain the foundation of the road, and cross or mitre drains under the road communicating with the side ditches may be required in wet soil. A thorough drainage of the subsoil is of the greatest importance, and it is economical in the end to go to considerable expense to secure it. In a cutting, or where there are no side ditches, the surface water may be taken off by gratings and under drains beneath the side channels.

The thickness to be given to a road made altogether of broken stone will depend on the traffic it isintended for. On a good well- drained soil a thickness of 6 inches will make an excellent road for ordinary traffic, and Macadam's opinion that 10 inches of well-con- solidated material was sufficient to carry the heaviest traffic on any substratum if properly drained has proved to be generally correct. In a new road the loss of thickness during consolidation must be allowed for, and the materials should be laid about one-half thicker than the coating is intended to be. When the materials are not rolled, a thickness of 8 to 6 inches should be laid first, and when that has partly consolidated under the traffic other coats may be added to make up the full thickness, There is great wear and waste of the matcrials in consolidating if they are laid too thickly at once. Inferior material is sometimes used in the lower part of the road coating, especially when the surface is to be of granite or other hard expensive stone. Thus flints or gravel may be used for the lower 5 or 6 inches of a road to be coated with 8 or 4 inches of granite. Telford covered the broken stone of new roads with 14 inches of gravel to act as a binding material. Macadam absolutely inter- dicted the use of any binding matcrial, leaving the broken stone to work in and unite by its own angles under the traffic. An un- sound road may be made by the improper use of a binding material, but there is no doubt that broken stone consolidates more quickly, and without losing its angular form, when binding is moderately used. About one half the volume of broken stone is void space, and, as the results of examinations into the composition of the coat- ings of roads when thoroughly consolidated prove that a very large proportion must necessarily be small stones and detritus, it is much better to give some portion of this at first rather than to obtain it by the crushing and grinding of the materials by the traffic. The binding material—fine gravel, sand, or road scrapings— should be spread over the surface after the broken stone is laid and not be mixed with it. Uniform consolidation is much aided by raking.

Whenever it is possible a new road should be finished with a roller. The materials are consolidated with less waste, and wear and tear of vchicles and horses is saved. MHorse-rollers, if heavy enough to be eflicicnt, require a number of horses to draw them and are cumbersome to use. A ton or a ton and a half weight per foot of width is desirable, and to obtain

it a roller 4 feet wide must be loaded to 5 or 6 tons, and will require as many horses to draw it. In Great Britain horse-rollers have to a great extent been super- seded by steam road rollers in consequence of the superiority and economy in the work done. A 15-ton roller, 7 feet wide, giving upwards of 2 tons weight per foot, can thoroughly consolidate 1000 to 2000 square yards of newly-laid materials per day. The materials should be formed to the proper section, and not more than 4 or 5 inches in thickness ; if a greater thickness is required

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it is better to roll two coats separately. After several passages of the roller any hollows must be filled up with small materials, and the rolling must be continued until it causes no motion among the stones. When this result has been attained the binding material may be added. It should be spread dry and uniformly in moderate quantities and should be rolled into the interstices with the aid of watering and sweeping. Provided that all the interstices in the upper stratum of stones are filled after the stones are thoroughly consolidated, the less binding that is used the better. By using binding in larger quantity, and before the stone is thoroughly con- solidated, the amount of rolling required is lessened, but at the expense of durability in the road. Watering is necessary from the commencement of the rolling unless the weather is wet, but excessive watering, especially in the earlier stages, tends to soften the foundation.

A pitched foundation like that used by Telford is always desir- Founda- It consists of flat tion.

able for a road that is subject to heavy traffic. stones carefully set on edge in courses across the road with the broadest edges downwards. The upper edges should not exceed 4 inches in breadth, to hold the broken stone well. All inequalities must be knocked off, and small stones and chips must be firmly pinned into the interstices with a hammer, so as to form a regular convex surface, with every stone firmly fixed in place. The thick- ness of the pitching is generally 6 or 7 inches; it should not be less than 4, and it may generally be thicker without any sensible increase of cost. At least 4 inches of broken stone are required over the pitched foundation, and, when consolidated, 6 are always suffi- cient.

The qualities required in a good road stoue are hardness, tough- Materials,

ness, and ability to resist the action of the weather, and these are not always found together in the same stone. Limestones possess another quality, that of furnishing a mortar-like detritus which binds the stone together, and enables it to wear better than a harder material that does not bind. For heavy traffic the best materials are traps, basalts, greenstones, and syenite ; quartzose grits and cherty sandstones are also excellent materials. Yor moderate traffic the harder limestones are sufficiently durable and make the smoothest and plcasantest roads. Coefficients of quality for various road materials have been obtained by the engineers of the French " Administration des Ponts et Chaussees." The quality was assumed to be in inverse proportion to the quantity consumed on a length of road with the same traffic, and measurements of traffic and wear were systematically made to arrive at correct results. These processes requiring great care and considerable time, direct experiments on resistance to crushing and to rubbing and collision have also been made on 673 samples of road materials of all kinds. The coefficients obtained by these experiments, which were found to agree fairly well with those arrived at by actual wear in the roads, are summarized in the following table. The coefficient 20 is equiva- lent to "excellent," 10 to "sufficiently good," and 5 to "bad."'

| Materials. Coefficient of Wear. | Coefficient of Crushing. SESeilition.arofeteroovers eletercrets craters 12°35 to 24°2 12°1 to 16 TWO? ponnnnonosanoone 14°1 ,, 22°9 8°38 ,, 16°3 Ginsk,| Aaah densspemnceenear 10°3 ,, 19 13-4 ,, 14°8 GATE Ve cresseectas «carsaia eri « 78 oy tls WG py, aes} S\Sinlts. Boo annanbonognan WINIGs Fy Lee 12°4 ,, 18 SIE? BBS cagnp hac ace ere 14°5 ,, 15°3 PO) gy, aaicil CUMAMEZULCUN crete yeiaciaessiaisscsters 13°8 ,, 30 TPA) gy PALS) Quartzose sandstone …... 14°3 ,, 26:2 99 ,, 16°6 GUIDE UZirsiate ecsiarsyerssajeusjessialsre eras Wee) Ay dats) 12°38 ,, 18°2 Siler ee as 98 ,, 21:3 14:2 |, 17°6 Clalaflints: 9… o:cesc cen 3°5 ,, 16°S 17°8 ,, 25°5 NEITME RD OMCs rire enter 1s eleieiere s 6:6), Los 6°5 ,, 18°5

Stone for a new road should be evenly broken to a size that will pass every way through a ring 24 inches in diameter. For repairs, especially when the material is.tough, a gauge of 2} or 2 inches may be used with advantage, as the stone covers a larger surface, consolidates sooner, and makes a smoother surface. Stone is best broken by hand, but stone-breaking machines have been introduced which supersede hand-breaking to some extent, especially wherc large quantities of hard stone are to be broken. There is always a certain amount of crushing in breaking by a machine, from which softer stones suffer more, and machine-broken stone is never nearly so cubical, uniform in size, or durable as stone well broken by hand. Broken road material contains about 55 per cent. of solid stone to 45 of void space. Ina well-consolidated road the void is filled up by small fragments, detritus, and mud, the result of wear, and specimens of good road surfaces weigh from 93 to 95 per cent. of the weight of the solid stone of which they are made. In the

coating of a well-maintained road the proportion of stones of various sizes varies, but generally from one-third to one-half is found to consist of detritus under three-eighths of an inch in diameter, and there is a very constant proportion of about one-fifth of mud and detritus under one-thirtieth of an inch in diameter. This appears to be the amount necessary to fill the voids between the fragments of stone when compacted together. In an ill-kept road, from which the mud is not removed, the proportion of detritus is much higher, and mud may constitute nearly one-half of the coatmg. — In pro- portion as the detritus and mud are kept down to the minimum by constant removal from the surface, so will the road be able to resist the action of wet and frost and the wear of the traffic.

already described) is essential, and it is generally desirable to loosen the old surface to ensure the incorporation of the new coating with it. Scraping and attention are required between one coating and another and also slight repairs to the surface, as, however well the materials may be laid and rolled, the wear of the ordinary traffic will search out places

which have escaped the full pressure of the roller and produce inequalities.

Besides a regular application of new materials to replace wear, there must be in road maintenance on proper principles a systematic removal of the detritus by scraping or sweeping, which must be regarded as keeping the whole coating in proper condition, and not as mere surface cleansing. The wear should also be reduced as far

Wear. The wear of materials, resulting in their gradual reduction to | as possible by providing sufficient thickness to carry the traffic, by detritus, is due to the joint action of the traffic and the weather, | keeping an even surface on which water can never stand and soak, which cause surface wear, wear arising from cross breaking, and and by good drainage both of surface and subsoil. An adequate from rubbing of the stones together. When there is no movement | amount of skilled manual labour is necessary for economy of main- in the body of the road, and the wear is confined to the crushing | tenance, and this and the constant attention which is required to and grinding at the surface, it is the least possible ; but, when a | keep a road in good order are best secured by putting a man in road is weak from insufficient thickness or solidity on a yielding | permanent charge of a defined length. In the autumn and winter, foundation, bending and cross breaking of the coating take place when more labour is wanted, extra men should work under the under passing loads in addition to the surface wear, and the effects | directions of the permanent road labourer, whose knowledge of his are aggravated by the softening action of water finding its way into length ofroad will enable him to employ them to the best advantage. the road through cracks formed in the surface and by the disinte- Concrete macadam, formed by grouting with lime or cement Conerete grating action of frost. The wear and waste are thus far larger than | mortar a coat of broken stone laid over a bed of stone previously and tar on roads of sufficient strength, properly maintained. The destruc- | well rolled, has been tried as an improvement on an ordinary mae-

tive effect of wheels is greater as the diameter is less, and to a much greater degree as the tire is narrower. On hard and strong roads no

greater width of wheel than 44 inches is useful, as a wider tire does not bear evenly, but on yielding roads a greater width is of some advantage, though it does not prevent damage from bending and cross breaking of the whole coating under excessive loads. A good deal of attention has been given by French engineers to the measurement of traffic, wear, and the consumption of road materials. Without a knowledge of the amount of traffic accurate comparisons of wear are impossible, and an account of the traffic on the roads of France is taken periodically in "collars" or horses drawing loads, and in the weight drawn. 'Traffic as measured by weight drawn has of late been observed in some of the streets of London and Liverpool, and has been reduced for comparison to the weight per foot or yard of width of the carriage-way. Wear may be measured by loss of thickness in the coating; but the loss of stone in proportion to detritus must also be ascertained before all the effects of wear can be determined. The accurate measurement

macadamized surface, but not hitherto with much success. cleanliness is of importance, and great durability is not required, tar macadam or bituminous concrete may be usefully employed. It is sometimes made by first spreading a coating of broken stone and consolidating it by a roller, and then pouring over it a mixture of coal-tar, pitch, and creasote oil, upon which a layer of smaller stone is spread and rolled in, and the surface finished with stone chippings rolled in. More usually the broken stone and bituminous mixture are well incorporated together before they are spread, the stone sometimes being previously heated. The lower layer, about 4 inches thick, may be of stone broken to 24 inches gauge, and the next layer, about 2 inches thick, may be of smaller stone. Each layer must be well rolled, and when perfectly solid a thin coating of fine stone or granite chippings is spread over the surface and rolled in. Hard limestone is found to be more suitable than sili- cious or igneous rocks for this material. A road surface well made in this manner will last several years under light traffic without any repairs, and it can easily be patched when necessary.

of wear as practised by the French engineers is a complicated process, Stone Pavements.—Early pitched roadways consisted of pebbles Stone and it must suffice here to state that measured by thickness the | or

rounded boulders, bedded in the natural surface or in sand or Pavr- wear is seldom found to exceed half an inch, or on the most fre- | gravel. The next step in advance was to employ roughly-squared Mznts. quented roads of France one inch, of consolidated surface per year, | blocks; but the wide and irregular joints admitted the water to and that about 100 cubic yards of good materials per mile per year | the subsoil, and the mud worked up and the stones sank irregu- are considered as the average consumption under 100 collars of traffic | larly under the traffic. Telford, who was called upon to report on per day. Observations in the United Kingdom on roads well and | the street pavements of the parish of Hanover Square in 1824, saw systematically maintained have confirmed these results. the necessity of cutting off all connexion between the subsoil and Mainte- ~The new materials may be added to the road either in thin coats | the paving stones. He recommended a bed of about 6 inches of Founda- nance. and small patches year by year or in a thick coat consolidated by | clean river ballast, rendered compact by being travelled upon for tion.

rolling. The first method, by which the wear is replaced annually and the traffic is depended on to work the materials into the road, can be followed with excellent results, and at no great inconveni- ence to the public under proper managemeut when the traffic is not excessive. Considerable care in the use of matcrials is required that none may be unnecessarily applied. The annual employment of one-fifth or one-sixth the quantity which it would take to cover the whole surface one stone in thickness is often sufficient to replace wear, and it will then take five or six years to coat every part of the road if it is covered regularly. It is therefore important to apply the new materials only where they are needed, and not to use them where the road is already sufficiently thick. The irregularity of wear and of thickness enables a good roadman to judge where new materials must be applied, and he will apply them in small quanti- ties wherever weak places appear. 'To facilitate this the materials should be placed in heaps by the roadside in the summer, and they should be carefully spread in the autumn and attended to after- wards to ensure consolidation without waste. By good manage- ment a large quantity of materials may be incorporated in a road before the middle of the winter without harassing the traffic, and the strength may not only be

maintained but increased. On a hard strong road consolidation may be aided by loosening the sur- face with a pick; generally only the margin of a patch need be picked up. Butif the road is soft or weak it is better not to disturb the surface at all. Binding may sometimes be used to aid con- solidation, but it is seldom necessary if the materials are properly laid and attended to, as the coating already contains dctritus enough. In the second method a coating of materials is laid on at once sufficient to endure the wear of several years with such slight repairs as may be necessary to keep a good surface, and, when the wear has gone as far as it can be safely allowed to go, the process is repeated. Unless the wear is very considerable there is no economy in this method, though the convenience to the public, especially in towns, is undeniable. Consolidation by rolling (after the manner

some time before the paving was laid, but he subsequently con- sidered that nothing short of 12 inches of broken stone, put on in layers 4 inches thick and completely consolidated by carriages passing over them, would answer the purpose. He recommended paving stones of considerable depth and of from 44 to 6 or 74% inches in breadth for the greatest thoroughfares, and he pointed out the importance of working the stones flat on the face and square on all sides, so as to joint close and preserve the bed or base as nearly as possible of the same size as the face, and of carefully placing together in the same course stones of equal breadth. Many pavements thus laid with stones of considerable breadth still re- inain, but experience proved that it was a mistake to suppose that broad stones having a larger base would support better the weight and shocks of heavy traffic ; on the contrary, a wide stone has a tendency to rock on its bed, and also to wear round on the top and become slippery. 'To obtain an evener surface and a better foot- hold for the horses the stones were reduced in width, and in 1840 a granite pavement was laid by Walker on Blackfriars Bridge, which may be considered the first of modern set pavements. The stones were 8 inches broad and 9 deep; they were laid on a bed of concrete 1 foot thick aud were jointed with mortar. The reduc- tion of breadth to about 8 inches was generally followed, but it is only of late years that a concrete foundation has been employed to any great extent, the frequent breaking up to which streets are subject having prevented it. In London a foundation of broken stone has been continued

in the chief thoroughfarcs, the sets being evenly bedded in gravel upon it and rammed with a heavy wooden rammer. Hard core—a mixture of broken stone, clinker, brick rubbish, and old building materials—has also been largely used to form a foundation. In the northern towns of England cinders have been employed, and where the traffic is exceptionally heavy a pitched foundation of stones on edge has been laid when the sets were not paved upon an old macadamized surface. The con- crete for a foundation to a paved street should be made with the

When adam.

Materials.

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best Portland cement, thoroughly mixed in proper proportions with the sand and gravel or other materials used, water being added as sparingly as possible. A thickness of 6 inches of well- made cement concrete is sufficient for the heaviest traffic, and it can be cut out in slabs for pipe-laying or repairs and can be relaid and cemented in its place. To obtain the best result a new foundation should not be paved upon for a week. A foundation of bituminous concrete is sometimes used where only a thin bed ean be laid, in consequence of there being an old foundation which it is undesirable to disturb. It is made by pouring a composition of coal-tar, pitch, and creasote oil while hot over broken stone levelled and rolled to the proper form, and then spreading a thin layer of smaller broken stone over the surface and rolling it in. It has the advantage that it can be paved upon a few hours after it has been laid.

The best materials for pavement sets are the hard igneous and metamorphic rocks, though millstone grit and other hard sedi- mentary rocks of the same nature are used when the traffic is com- paratively light. Excessively hard stone which wears smooth and slippery is objectionable in spite of its durability. Penmaen-Mawr stone, which is much used in many of the large Lancashire towns, is of this character, and its use was discontinued in London in

the joints have for many years past been made by first filling them with clean gravel, well shaken in by ramming, and then pouring in a composition of coal-tar, pitch, and creasote oil. The Manchester pavements are good examples of this system of trusting to impervious jointing to prevent unequal settlement. The founda- tion, where there is not already an old road surface, is a bed of cinders about 1 foot thick, over which are laid 3 inches of gravel, which are thoroughly consolidated by allowing the traffic to pass over them. The sets are evenly bedded and well rammed after the joints have been filled with clean gravel, ramming and gravel- ling being repeated till the joints are full of gravel. The mixture of coal-tar, pitch, and creasote oil, well boiled, is then poured over the surface and allowed to percolate and fill up all interstices in the joints, and the pavement is finished by covering it with small gravel. Joints so formed are impervious to wet and have a certain amount of elasticity ; the foundation is kept dry ; and the pavement keeps its form well for many years. The objection is made that in hot weather the composition runs from the joints and makes tlc streets unpleasant for foot-passengers. This sort of jointing is used in Liverpool and some other large towns, where the sets are laid on a concrete foundation. The elasticity diminishes vibration and noise, and pavements so jointed arc said to wear better than others.

A curve like that before described, flattening gradually towards Cross the sides, and having a rise equal to one-sixtieth of the width of section, the carriage- way, is a common cross section for a paved street. Sometimes the rise is even less.

A pavement consisting of broad, smooth, well-jointed blocks of Granite grauite for the whcel tracks, and pitching between for the horse tramway.

consequence of its slipperiness and noise. Guernsey granite (syenite) and Mount Sorrel granite (syenite) have the same nature in a less degree, and in London Aberdeen blue granite is preferred, as, though it wears faster, it keeps a rough surface. Walker's observations on the wear of tram stones showed that Aberdeen granite wore three and a quarter times as fast as Guernsey granite, and in the

Jointing.

*set pavement of Blackfriars Bridge it was found that after thirteen and a half years' wear the Aberdeen stone had worn 14 inches, while the Guernsey granite had only worn one-fourth of an inch (equal to '11 and *019 inch per year respectively), or that the foriner had worn six times as fast as the latter. Observations made by Mr Haywood showed the general rate of wear of Aberdeen granite under heavy traffic in the City of London pavements to have been from '14 to '23 inch per year. The rate of wear of Penmaen- Mawr and odiateremshite sets in Liverpool under the greatest traffic is stated to be seldom more than °02 inch per year. A certain proportion between the depth and the length and breadth of sets is required for stability. A shallow stone is more easily tilted up by a heavy weight coming on one edge, and a nar- row stone has a tendency to turn over sideways. The length, measured across the street, must be sufficient to break joint pro- perly, as two or inore joints nearly in a line lead to the formation of grooves. For the softer stones a breadth of 4 or 5 inches may be adopted, but for sets of granite or other hard material, with which the joints must be depended on for foothold, the breadth should not much exceed 3 inches. The depth should not be less than twice the breadth, and, as deeper scts weigh more and cost more than shallower ones and the loss by wear is but slight, there is some reason for not exceeding the minimum depth. Where, however, the speedy relaying of a street pavement is of more im- portance than a saving in first cost, deeper sets are used, and when they have become so worn as to be uneven the strcet is relaid with new sets and the old ones are removed to be redressed for use in other streets, the sets being used again and again in less important streets as their depth is reduced. In London sets 8 inches wide, 10 to 15 long, and originally 9 deep are used in this manner. In Liverpool sets 4 to 14 inches wide, to average with the joints, 5 to 7 inches long, and 6 to 74 deep according to the traffic are used. In Manchester the sets are 8 to 34 inches wide, 5 to 7 long, and 5 to 6 deep, or 7 in exceptional situations. Sets should be well squared and not taper from the face downwards ; both joints and face should be free from irregular projections. On a concrete foundation sets are generally bedded on a thin layer of sand or fine gravel ; sometimes they are laid in a bed of fine cement concrete, enough of which is spread over the concrete foundation to be covered while fresh by the sets, which are put in place and smartly tapped, and the joints are grouted at once with cement grout. To allow the cement to become*

thoroughly set it is desirable that traffic over the pavement should not be allowed for a fortnight, if that can be arranged. 'The courses of sets are laid square across the street, no advantage arising from a slanting direction, which makes the wear more irregular. At junctions of streets the courses are laid meeting at an angle at the centre line of the narrower street, so that the courses may not run in the direction of the traffic. On steep inclines the sets are sometimes slightly tilted on their beds, forming a serrated surface to give foothold, and slate has been in- serted in the joints for the same purpose. The water channels are formed by two or tliree courses of sets laid parallel to the kerb. Joints simply filled in with gravel are of course pervious to water, and a grout of lime or cement does not make a permanently water- tight joint, as it becomes disintegrated under the vibration of the traffic. Grouted joints, however, make a good pavement when there is a foundation of concrete or broken stone or hard core. Where there is not a regular foundation iniperviousness in the joints is of great importance. In some of the Lancashire towns

track, was laid by Walker in Commercial Road (London) for the heavy traffic to the West India Docks in 1825, and similar pavements have been successfully used elsewhere, principally for heavy traffic, in streets only wide enough for one vehicle. In Milan, Turin, and other towns of northern Italy tramways of the same sort are ex- tensively used for the ordinary street traffic. 'The tractive force required is small, while the foothold on the horse track is good ; but the train-stones are slippery for horses to pass over. The rigid- ity of the roadway renders it more suitable for slow heavy traffic than for light quick vehicles, and the improvement in other pave- ments has limited the application of this one in ordinary streets.

Wood Paving.—Wood pavements were introduced in England in Woop Hexagonal blocks of fir, 6 to 8 inches across and 4 to 6 PAVING.

1839.

deep, were bedded in gravel laid on a foundation previously levelled and beaten. The blocks were either bevelled off at the edges or grooved across the face to afford foothold. Other wood pave- meuts were tricd in London about the same time, but they soon got out of order from unequal

settlement of the blocks, and most of them lasted but a few years. The best of these was Carey's, which consisted of blocks 64 to 74 inches wide, 18 to 15 long, and 8 or 9 deep, the sides and ends having projecting and re-entering angles locking the blocks together with the view of preventing unequal settlement. Pavements on this system were laid in Minc- ing Lane in 1841 and in Gracechurch Street in 1842. In the latter street the blocks appear to have been relaid every three or four years and to have been entirely removed about every eleven years, until the pavement was removed in 1871, to be superseded by asphalt. Experience led to a reduction in the width of the blocks to 4 inches and in the depth to 5 or 6, and the salient and re-entering angles disappeared from the sides. With these modifications Carey's pavement remained in use froin 1841 until after the introduction of more modern systems in recent years. The "improved wood pavement" was first used in London in 1871. After the foundation was forined to the proper cross section a bed of sand 4 inches deep was laid, upon which came two layers of inch deal boards saturated with boiling tar, one layer across the other. The wooden blocks were 3 inches wide, 5 deep, and 9 long; they were dipped in tar and laid on the boards with the ends close together, but transversely the courses were spaccd by fillets of wood three-fourths of an inch wide nailed to the floor and to the blocks, The joints were filled up with clean pebbles rammed in and were run with a composition of pitch and tar, the surface being dressed with boiling tar and strewed with small sharp gravel and sand. In this pavement a somewhat elastic foundation was pro- vided in the boards, which were also intended to prevent unequal settlement of the blocks; but the solidity of the pavement depended upon its water-tightness, for, when the surface water reached the sand, as it did sooner or later, settlement and dislocation of the blocks under the traffic arose. Pavements on this system were laid between 1872 and 1876, and were kept in repair and relaid from time to time, but about 1877 the plank foundation was abandoned for a foundation of cement concrete.

A concrete foundation for a wood pavement appears to have been Founda- first employed in a pavenient laid in 1872 in Gracechurch Street by tion.

the Ligno-Mineral Company. The concrete was of blue lias lime 4 inches thick formed to the curve of the road. The blocks were of beech, mineralized by a special process, 34 inches wide, 44 deep, and 7% long, with the ends cut to an angle of 60°, so that each block might derive support from the next one. They were laid with the

ends inclining in opposite directions in alternate courses. The upper edges of the blocks were chamfered, and there was a cham- fered groove near the bottom. Ina few years this form of block was abandoned for rectangular blocks, and mineralized fir was sub- stituted for beech. The blocks were bedded in Portland cement and laid with joints one-fourth of au inch wide, partly filled with asphalt and then grouted with mortar. 'The adoption of a bed of concrete as the weight-bearing foundation of the road marks a new departure, and in all the more recent systems of wood pave- ment a substantial foundation of concrete is an essential feature. In Norwich, however, a large quantity of wood pavement has been laid on the old street foundation, the blocks being bedded in gravel and sand and rammed, and the joints grouted with lime and sand. The experience of from four to seven years has proved the pavements to be snecessful, but the foundation is exceptionally dry and hard and the traffic not very heavy. With a concrete foundation there is no reason for complicated shapes and contrivances for locking the blocks together ; and wood pavements in their modern form consist of rectangular blocks (obtained by cutting off the end ofa deal plank), bedded on the concrete with the fibres of the wood vertical, thus constituting a slightly elastic wearing surface on a rigid foundation, by which the weight of the traffic is borne. There is, however, considerable variation in the method of bedding and jointing the blocks. The Asphaltic Wood Pavement Company laid half an inch of asphalt upon the concrete, and formed the lower part of the joint of asphalt and the upper part of a grout of Port- land cement and gravel, the advantage claimed being a slightly elastic bed for the blocks and water-tight joints. The blocks have been laid in unset cement over the concrete and rammed to an cven surface; but the ramming is

liable to split the blocks, and the indentations formed in the cement surface of the foundation have to be removed when the time comes for renewing the blocks. It is now more usual to bed the blocks directly on the concrete, a smooth surface being formed either with the concrete itself or by a floating of cement, and to fill the joints with a grout of cement and gravel, A cement joint adheres to the blocks, resists wet, and does not wear down too much below the surface of the wood, and so form a receptacle for mud. In Henson's system, which has been largely used, the blocks are bedded and jointed with ordinary roofing felt, a strip of which, cut to a width equal to the depth of the blocks, is placed between every two courses. The joint is made as close as possible by driving up the blocks as every eight or ten courses are laid with heavy mallets,—a plank being laid along the face of the work. A perfectly close and slightly elastic joint is thus formed. A continuous layer of felt is likewise laid over the concrete foundation to give a slightly elastic bed to the blocks. A V-shaped groove along the centre of every fourth block was at first considered necessary for foothold, but its use has been dis- continued except on gradients steeper than 1 in 30. The surface of the pavement is dressed over with a hot bituminous compound, and covered with fine clean grit. This method of laying a wood pavement, although somewhat more expensive, is probably the best that has hitherto been devised for smoothness and durability. The blocks are laid in courses across the streets, any change in the direction of the latter being accommodated by shorter courses ending with wedge-shaped blocks. At street junctions the courses are laid diagonally, or meeting at right angles. Two or three courses are laid parallel with the kerb to form a water channel. The blocks may be laid close end to end across the street if some allowance be made for expansion by wet, without which the kerb- stones and footways will be displaced, or the courses will be bent in reversed curves. To afford relief the joints of the courses parallel to the kerb may be left open, or the course next the kerb may be left out until expansion has ceased, the space being temporarily filled in with sand. In the direction of the traffic joints more or less wide are generally thought necessary for foothold. A wide joint allows the fibres of the wood to spread and give way at the upper corner of the blocks for want of lateral support, and it also forms a receptacle for mud aud wet. Experience has shown that the space of three-fourths of an inch or one inch, once thought necessary for foothold,

may safely be reduced to one-fourth or three-eighths of an inch. For spacing the courses to form the joints strips of wood of the proper thickness may be laid in and removed before the joints are filled, or they may be nailed to the lower part of the blocks. Two fillets have been nailed on, or three cast-iron studs fixed in the sides of each block to keep them steady in place until the joints are filled and thoroughly set. The latter method secures more uniformity in the width of the joints.

There is some difference of opinion as to the best material fora wood pavement. Pitch pine and the harder red and yellow deals arc the most durable, but they are less elastic than the softer woods, and are apt to wear slippery. Soft white woods have been recom- mended for the sake of a more elastic surface ; but on the whole either Memel or Swedish yellow deal is generally considered the best material. Whatever wood is used, it should be sound, close-grained, even in quality, free from knots and sap, and from the blue tinge which is a sign of incipient decay. After the blocks are cut, all

Henson pave- ment.

Materials.

ROADS

those that are unsound, knotty, or badly shaped should be care- fully rejected, as defective blocks soon cause holes in the surface and must be replaced, or the adjoining blocks will suffer undue wear and the surface become irregular. The breadth of the blocks never now exceeds 4 inches, and it is generally 3, the length being determined by the breadth of the deal or batten from which they are cut. The depth is usually 5 or 6 inches; 5 inches are con- sidered by many to be enough to give sufficient depth for as long as the pavement will retain a sufliciently good surface without renewing the wood, and blocks of that depth have been laid in many London streets. It is doubtful if any advantage is derived from creasoting or from dipping the blocks in creasote oil or coal tar. Dipping affords a cover for the use of defective or inferior wood, and thorough creasoting, though it preserves the wood from decay, has little or no influence on the wear, which in almost all cases determines the life of the blocks.

With a curved cross section like that already described a rise Cross from the mean level of the channels to the crown of the road equal section, to one-sixtieth or one-seventieth of the width of the carriage-way is enough. The necessary profile must be accurately given to the concrete foundation when wet. Wooden moulds or templates are fixed across the street 10 or 12 feet apart, over which a straight batten is worked to give the concrete the required form and a smooth surface. The moulds are removed when the concrete is partially set and the spaces are made good with cement mortar. In a level street provision should be made in the foundation for a Founda- fall in the side channels towards the gullies of not less than 1 in tion. 150, and the necessary modifications of cross section at the inter-section of streets must also be provided for. Every care should be taken to ensure a good homogeneous concrete for the foundation, as upon that the strength of the road depends. With a well-made Portland cement concrete a thickness of 6 inches is sufficient. It should be allowed to set thoroughly before the blocks are laid, and traffic should not be allowed to pass over it fora week. The finished pavement should be covered with a thin layer of sharp grit, which is forced into the wood by the traffic and forms a hard face. Several applications of grit are desirable at first, and from time to time afterwards, both as a protection to the wood and to prevent slipperiness. Systematic cleansing is required to prevent slipperiness and foul smells, and to preserve the pavement. Cleans- ing may be aided by washing, and when it is thoroughly carried out but little watering is required to keep down the dust. A wood pavement is the quietest for the residents, pleasant to travel over, and favourable to the wear of vehicles. Traction on it is easy and foothold good, so that it may be laid on gradients as steep as 1 in 20.

The wear of wood pavements in London is stated by Mr Stayton to be from ‘065 inch per year in Sloane Street, with a traffic of 279 tons per yard of width per day, to 456 inch per year in Fleet Street, with a traffic of 1360 tons per yard of width per day. Reduced to a standard of traffic of 750 tons per yard per day, the comparative annual wear becomes ‘175 in the former and ‘251 in the latter street. In Parliament Street, Westminster, blocks removed after four years in places where patching was required had lost 14 to 14 inches in thickness, equal to one-third of an inch per year under traffic stated to be 1106 tons per yard of width per day. From

information afforded by Mr Haywood it appears that in the City of London under traffic of from 300 to 660 vehicles per yard of width per day of 12 hours the wear is from ‘2 to ‘8 inch per year, and that in King William Street, London Bridge, under a tratiic of about 1200 vehicles per yard of width in 12 hours the wear was found to be 25 inches in 34 years in the middle of the road, or 81 inch per year. This is the heaviest traffic to which wood pavement has been sub- jected. The wear is generally considered to be as much due to the horses’ feet as to the whecls, and the action of the former is more destructive on steep gradients. Towards the end of the life of the blocks the wear is more rapid than at first. Few wood pavements retain a sufficiently good surface after about six years’ wear without extensive repairs, and it is probably not advantageous to lay blocks of a greater depth than will provide for a duration of seven years ; 5 inches are almost always sufficient for this.

Wood pavements of plain blocks on a cement conercte bed are Cost. now (1885) laid at from 10s. 6d. to 12s. 6d. per square yard, a con- siderable reduction ou the prices paid for patented systems a few years ago. Of the above prices 2s. 8d. to 8s. 9d. is the cost of the foundation, which does not require renewal like the blocks. As- suming the average life of the latter to be seven years, Mr Stayton estimates the annual cost of wood paving in Chelsea with a traffic of 500 to 750 tons per yard of width per day to be 1s. 9d. per square yard, which includes the cost of original construction, repairs and renewals, and interest, spread over fifteen years. Cleansing and sanding are estimated to cost 5d. per square yard in addition.

Asphalt Paving.—Asphalt was first used for street paving in ASPHALT Paris in 1854. It was introduced in London in 1869, when Thread- pavine. needle Street was paved by the Val de Travers Asphalt Company, and since then it has been extensively used for paving both strects and footways. The material is a hard limestone impregnated with bitumen in the proportion of from 6 to 8 per cent. in the Seyssel

Com- parative cost.

ROADS

rock, and from 10 to 12 in that from Val de Travers. Asphalts con- taining less than the former proportion have not sufficient coher- euce for street pavements, and those containing more than the lattcr proportion soften from heat in the summer. Asphalt is employed either as a mastic or compressed. The mastic is pre- viously prepared in cakes and is melted for use in caldrons with a small quantity of bitumen, and for a street pavement is thoroughly wixed with sand or grit. It is spread in one thickness on a concrete foundation, covered with sand, and beaten to an even surface. This material has not proved so successful for street surfaces as com- pressed asphalt. To produce this the rock asphalt, previously reduced to a fine powder by mechanical means, is heated in revolv- ing ovens to from 220° to 250°, spread while still hot, and compressed into a solid mass by hot disk-shaped rammers, and afterwards smoothed with irons heated to a dull redness, The original rock is thus as it were reconstructed by taking advantage of the power of coherence of the molecules under- pressure when hot. In heating the powder the moisture combined in the limestone must be driven off without reducing the proportion of the bitumen more than is unavoidable. The powder cools very slowly and nay be conveyed long distances from the ovens; it may even be kept till the next day before use. When laid it should still retain a temperature of from 150° to 200°. It is spread evenly with a rake by skilled workmen for the whole width of the strect to a thickness about two-fifths greater than the finished coating is intended to be. Ramming is commeuced with light blows to ensure equality of compression throughout and is eoutinucd with increased force until the whole is solidified. The ramming follows up the spreading, so that a joint is required only when the work is interrupted at the end of a day, or from some other cause. Ina few hours after it has been laid an asphalt pavement may be used for traffic. When finished, its thickness may be from 14 to 2} inches, according to the traffic; a greater thickness than the latter eannot be evenly compressed with certainty. The asphalt loses thickness by com- pression under the traffic for a long time and to the extent, it is said, of one-fifth or one-fourth, but the wear appears to be very small. A pavement in Paris which had lost more than one-fourth of its thickness was found to have lost ouly 5 per cent. of its weight after sixteen years' wear. The pavement in Cheapside, after four- teen years under exceptionally heavy traffic, has becn reduced, where not repaired,

from its original thickness of 24 to about 13 inches. The wear-resisting power of the asphalt is due to its elasticity ; tracks are made by the wheels at first, but when thoroughly compressed by the traffic the surface retains little or no trace of the heaviest loads. Repairs are easily and quickly made by cut- ting out defective places and ramming in fresh heated powder, which can be done in the early morning without stopping the traffic. An unyielding foundation is indispensable ; it should be of the best Portland cement concrete, 6 inches in thickness, which must be well set and perfectly dry throughout before the asphalt is laid, or the steam generated on the application of the hot powder will prevent coherence and lead to cracks and holes in the asphalt, which quickly enlarge under the traffic. For the same reason the asphalt should be laid in dry weather. The concrete foundation must be carefully formed to the proper profile, with an inelination towards the sides of not more than 1 in 50, which is sufficient with so smooth a surface. About 1 in 50 is the steepest gradient at which an asphalt pavement can be safely laid. When either dry or wet it affords good foothold for horses, but when beginning to get wet, or drying, it is often extremely slippery. This is said to be due to dirt on the surface, and not to the nature of the material. Sand is strewed over the surface to remedy the slip- periness ; it tends, however, to wear out the asphalt, and great cleanliness is the best preventive. An asphalt pavement can be kept cleaner than any other, is impervious to moisture, and dries quickly. It is noiseless, except from the clatter of horses' feet on it; it is the pleasantest pavement to travel upon, but it has the drawback of imperfect foothold and slipperiness at times. The cost of a compressed asphalt pavement 2 to 24 inches thick on a Portland cement concrete foundation 6 inches thick is from 18s. to 16s. a square yard, and the maintenauce is usually undertaken for a period of seventeen years by the company laying the pave- ment, the first two years frce and at 3d. to 1s. 6d. per square yard, according to the traffic, in succeeding years.

Comparison of Street Surfaces.—The comparative cost of various street surfaces in Liverpool, including interest on first cost, sinking fund, maintenance, and scavenging, wheu reduced to a uniform standard traffic of 100,000 tons per annum for each yard in width of the carriage-way, is given by Mr Deacon as follows :-—

Per square yard per year, Set: pavement of hard granites ….....6.θ-2e 0s lldd. softer granites

Bituminous concrete ….....ceccecceceeueecceneces 1s. 104d. Vi OCG OEE podoooansocebonGDoadooEmonanoDOD OD 2s. 24d. Macadam, on hand-pitched foundation …..... Qs, 113d.

Taking the standard of traffic at 40,000 tons per annum for each yard in width, the cost for the last three pavements is :—

587

UB IPMMNINOMSRCOMCLECE Ms «scree clere wie aie re eitcace else ses winnie. 015 YGOCM DANONE UNlig farsi sisccreiere sieves oeversGiarmteietern sine cols ots 1s. Sid. ICANN «(Sats <1o/01<) ete e/a{sie'inse, oni daeenoereiere ole arouse tects 1s. 11}d.

Asphalt paving may be placed between wood and bituminous con- erete in the above order. These comparisons show the high cost of a macadamized surface in a street where the traffic is great. However well it may be maintained, a macadamized strect must be dirtier and dustier than any paveinent, though it is superior to them all in safety and to set pavements in the matter of noise. Bituminous concrete or asphalt macadain is eheaper, cleaner, and quieter than ordinary maeadam and is sufficiently durable when the traffic is not heavy. For heavy traffie no pavement is so econo- mical as granite sets; but for the sake of quiet and cleanliness a wood or asphalt pavement is often preferable. Asphalt can be kept cleaner than any other pavement and is the pleasautest to travel over; wood, on the other hand, is quicter for the residents, less slippery, and can be laid on steeper gradients.

The comparative ease of draught on various surfaces is largely Dranght.

influenced by the amount of foothold afforded, and it may be doubted if dynamometer experiments, however carefully made, are altogether conclusive. The tractive force is influeneed by the gradient, the diameter of the wheels, the friction of the wheel axles, and the speed, as well as by the resistance of the road surface, and these must be all taken into

account to obtain accurate results. Some recent experiments made, under the direction of Sir J. W. Bazalgette, with Easton and Anderson's horse dynamometer ou London strect surfaces gave the following mean results : —

Tractive force on the level.

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The gross load was 4 tons, drawn at a speed of from 2 to 6 miles an hour. It is remarkable that the tractive force on asphalt is so high ; but the other results are consistent with former experiments by Morin, Macneill and others.

The comparative safety of granite, wood, and asphalt pavements Safety.

in the City of London was the subject of careful observations, which were fully reported on by Mr W. Haywood in 1873. The pavements selected were granite sets 3 inches wide, ligno-mineral pavement of beech blocks 34 inches wide, improved wood pavement of fir blocks 3 inches wide, and Val de Travers compressed asphalt pavement. On known lengths of these the traffic, the accidents to horses, the weather, and other circumstances were observed for fifty days, and when the distance traversed was taken into account it was found that as a mean result a horse might be expeeted to travel 132 miles on granite without falling, 191 on asphalt, and 446 on the im- proved wood pavement. The condition of the weather had consider- able effect: on the granite when dry a horse might be expected to travel 78 miles without falling, when damp 168, and when wet 537 ; on wood when damp 193 miles, when wet 432, and when dry 646 ; on asphalt when damp 125 miles, when wet 192, and when dry 228. It thus appeared that wood pavement was less slippery than either granite or asphalt in a marked degree, it being only more slippery than granite when both pavements were wet. About 85 per cent. of the falls on the wood pavement were falls on the knees, which are less likely to injure the horses and are less incon- venient to the traffic than other falls. On the granite the falls

were falls on the knees or complete falls in about equal proportions, with about 7 per cent. of falls on the haunches. On the asphalt 43 per cent. were complete falls and 24 per cent. falls on the haunches.

Watering.—On macadamized roads in Great Britain watering is Water- only good for the road itself when the materials are of a very sili- ing.

cious nature and in dry weather. With other materials the effect is to soften the road and increase wear. In and near towns water- ing is required for the comfort of the inhabitants, but it should not be more than enough to lay the dust without softening the road, and the amount required for this may be greatly reduced by keeping the surface free from mud, and by sweeping off the dust when slightly wetted. Pavements are watered to cleanse them as well as to lay the dust, but it must be remembered that both wood and asphalt are more slippery when wet, and that therefore watering should be obviated as far as possible by thorough cleans- ing. Hydrostatic vans, by improvements in the distributing pipes and regulating valves, water a wide track uniformly with an amount of water which can be regulated at pleasure. Where hydrants exist in connexion with a water supply at high pressure, street watering ean be effected by a movable hose and jet, a method much more effective in cleansing the surface, but using a much larger quantity of water. Anotler method which has been tried, but not much used, is to lay perforated pipes at the back of the kerb on each side of the road, from which jets are thrown upon the surface. The first cost is considerable, and the openings for the jets are liable to choke and get out of order. Deliquescent salts have been used for street watering, by which the surface is kept moist, but at the expense of the moisture in the air. Sea water has the same effect in a less degree.

Cleans- jng.

Foot- ways.

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Cleansing. —The principal streets of a town are generally cleansed daily, either by hand-sweeping and hand-scraping or by machines. Whitworth's

machine consists of a series of revolving brooms on an endless chain, whereby the mud or dust is swept up an incline into the cart. A less costly and cumbersome machine consists of a revolving brush mounted obliquely, which sweeps a track 6 feet wide and leaves the dust or mud on one side to be gathered up by

hand. A horse scraping- machine which delivers the mud at the.

side is also used, the blades of the scrapers being mounted obliquely and covering a width of 6 feet. For general use, more especially in the country, scraping machines worked by a man from side to side of the road, and scraping a width of about 4 feet, are more convenient.

All street surfaces suffer from the constant breaking up and dis- turbance to which they are subjected for the purpose of laying and repairing gas and water pipes. Subways, cither under the middle of the road or near the kerbs, in which the pipes may be laid and be always accessible, have often been advocated, and in a few instances have been constructed; but they have not hitherto found general favour.

Footways.—Gravel is the most suitable material for country or suburban footways ; it should be bottomed with a coarser material, well drained, and should be laid with a roller. An inclination towards the kerb of about half an inch in a foot may be given, or the surface may be rounded, to throw off the wet. Where greatcr cleanliness is desirable and the traffic is not too great a coal-tar concrete similar to that already described, but of smaller materials, makes a good and economical footway. The coating should be 24 or 3 inches thick, composed of two or three layers each well rolled, the lower layer of materials of about 1} inches gauge, and the upper of a half or a quarter of an inch gauge, with Derbyshire spar, or fine granite chippings over all. Concrete footways require to be care- fully made and must be allowed to set thoroughly before they are used. Concrete has a tendency to crack from contraction, especially when in a thin layer, and it is better to lay a footway in sections, with joints at intervals of about 2 yards. Concrete slabs, especially when silicated and constituting artificial stone, make an excellent footway. The material is composed of crushed granite, gravel, or other suitable material, mixed with Portland cement and cast in moulds, and when set saturated with

silicate of soda. This paving has proved more durable than York stone flagging, but it is more slippery, especially when made with granite. York stone makes a good and pleasant foot pavement, but is somewhat expensive con- sidering its durability ; it is apt to wear unevenly and to scale off when the stone is not of the best quality. It should not be laid of a less thickness than 2 inches; 24 or 3 inches are more usual. The flags should be square jointed, not under-cut at the edges, and should be well bedded and jointed with mortar. Caithness flag is

_ much more durable than York stone and wears more evenly ; it is

Kerbing.

Side channels.

impervious to wet and dries quickly by evaporation. The edges are sawn, and the hardness of the stone renders it difficult to cut it to irregular shapes or to fit openings. Staffordshire blue bricks and bricks made of scoria from iron furnaces aré both very durable, though somewhat brittle. Asphalt either laid as mastic or com- pressed is extensively used for footways ; the former is considered inferior in durability to York stone and the latter superior to it. Asphalt should not be laid less than three-fourths of an inch thick on 4 inches of cement concrete, aud 1 inch of asphalt is desirable where there is great traffic. :

Footways in a street must be retained by a kerbing of granite, York stone, Purbeck, or other stone sufficiently strong to stand the blows from wheels to which it is subjected. It should be at least 4 inches wide and 9 deep and in lengths of not less than 3 feet. A granite kerb is usually about 12 by 6 inches, either placed on edge or laid on the flat. When set on edge a kerb is generally bedded on gravel with a mall; when laid on the flat a concrete bed is desirable.

In a macadamized street pitched or paved water channels are required, to prevent the wash of the surface water from under- inining the kerb. The pitching consists of cubical blocks of hard stone about 4 inches deep, bedded on sand or mortar, or preferably on a bed of concrete. A paved channel consists of flat stones about 1 foot wide inclining slightly towards

the kerb. Moulded bricks and artificial stone are also used both for side channelling and for kerbing. Such an inclination must be given to the channel as will bring the surface water to gullies placed at proper intervals, and the level of the kerbing and consequently of the footway will depend to some extent on the surface drainage as well as on the levels of adjacent houses. To lay out a street satisfactorily the longitudinal and transverse sections must be considered in ee to these matters as well as to the levels of intersecting

reets,

For fuller information on the subject see Sir Henry Parnell, A Treatise on Roads ; Thomas Codrington, The Maintenance of Maratea Roads : Debauve, Manuel de VInégnieur des Ponts et Chaussées; Annales des Ponts et Chaussées ; Minutes of Proc. Inst. Civ. Eng., "Street Pavements," vol. lviii. p. 1, and

Wood Pavements," vol. xxviii. p. 240; Reports by W. Haywood, engineer to the commissioners of sewers of the City of London. (fr. C.)

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FeO" ap

ROANNE, a town of France, at the head of an arron- dissement in the department of the Loire, lies on the left bank of the Loire in 46° 2' 26" N. lat. at a height of 912 feet above the sea. It is now the point of juncticn for the railway from Paris (262 miles north-north-west) to Lyons (50 miles south-east), a Tarare, with the line from Paris to St Etienne (50 miles south-south-east), and a branch connecting Roanne with Paray le Monial ; and as the terminus of the Roanne-Digoin Canal (1832-38) the town is the real starting-point of the Loire navigation. Besides the modern town-house (1868-73), it is enough to mention the ruins of a castle with a tower dating from the llth century, and a fine bridge of seven arches con-necting Roanne with the industrial suburb of Le Céteau on the right bank of the river. Cotton is the staple manufacture, employing 1200 hands. Hosiery, hats, woollen yarn, weaving looms, chemicals, and paper are also produced ; and, as the town stands in the centre of the Loire and

Rhone coal-field (output 4224 tons in 1884) and in the neighbourhood of the St Etienne coal-field, it has a considerable trade in coal and coke. In 1881 Roanne had a population of 24,992.

Roanne (Rodomna, Ptolemy; Roidomna, Tab. Peut.) was an ancient city of the Segusiani and a station on the great Roman road from Lyons to the ocean. The absence of coins later than the time of Constantius II. among the numerous local relics of the Roman period seems to show that the town was sacked by the barbarians in the 4th century. In 1447 the lordship of Roanne became the property of the celebrated banker Jacques Coeur. A favourite scheme of his was to make the town a great industrial centre by regulating the course of the Renaison, an affluent from the Monts de la Madeleine which joins the river a little higher up ;

his death prevented its execution, but the subject has since been frequently revived.

ROBBERY. See THeErr.

ROBBIA, Detua, the name of a family of great dis- tinction in the annals of Florentine art. Its members are enumerated in chronological order below.!

I. Luca petua Ropzra (1399 or 14002-1482) was the son of a Florentine named Simone di Marco della Robbia. According to Vasari, whose account of Luca's early life is little to be trusted, he was apprenticed to the silversmith Leonardo di Ser Giovanni, who from 1355 to 1371 was working on the grand silver altar frontal for the cathedral at Pistora (q.v.) ; this, however, appears doubtful from the great age which it would give to Leonardo, and it is more probable that Luca was a pupil of Ghiberti. During the early part of his life Luca executed many important and exceedingly beautiful pieces of sculpture in marble and bronze. In technical skill he was quite the equal of Ghiberti, and, while possessing all Donatello's vigour, dramatic power, and originality, he very frequently ex- celled him in grace of attitude and soft beauty of expres- sion. No sculptured work of the great 15th century ever surpassed the singing gallery which Luca made for the cathedral at Florence between 1431 and 1440, with its ten magnificent panels of singing angels and dancing boys,

far exceeding in beauty those which Donatello in 1433 sculptured for the opposite gallery in the same choir. This magnificent work now lies scattered in various parts of the

1 Genealogical tree of Della Robbia sculptors :— Simone di Marco.

|

Marco. Luca

(1400-1482).

Andrea

(1435-1525).

. | | Girolamo Luca Paolo Giovanni Marco

(1488-1566), (1475-15507), (1470- 2), (1469-1529 2), (1468- %,

worked mostly worked in Dominican worked mainly Dominican in France. Florence monk. in Florence. monk. and Rome.

2 Not 1388, as Vasari says. teggio Inedito, i. pp. 182-186.

See a document printed by Gaye, Car-

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Bargello. The general effect of the whole can best be seen at the South Kensington Museum, where a complete cast is fixed to the wall. The same museuni possesses a study in gesso duro for one of the panels, which appears to be the original sketch by Luca's own hand.

In May 1437 Luca received a commission from the signoria of Florence to execute five reliefs for the north side of the campanile, to complete the series begun by Giotto and Andrea Pisano. These panels are so much in the earlier style of Giotto that we must conclude that he had left drawings from which Luca worked. They have representative figures chosen to

typify grammar, logic, philosophy, music, and geometry,—the last represented by Euclid and Ptolemy. In 1438 Luca received an order for two marble altars for chapels in the cathedral, a third being ordered from Donatello. The reliefs from one of Luca's—St Peter's Deliverance from Prison and his Cruci- fixion—are now in the Bargello. It is probable that these altars were never finished. A tabernacle for the host, made by Luca in 1442, is now at Peretola in the church of S. Maria. A document in the archives of 8. Maria Nuova at Florence shows that he received for this 700 florins 1 lira 16 soldi (about £1400 of modern money). In 1437 Donatello received a commission to cast a bronze door for one of the sacristies of the cathedral; but, as he delayed to execute this order, the work was handed over to Luca on 28th February 1446, with Michelozzo and Maso di Bartolomeo as his assistants. Part of this wonder- ful door was cast in 1448, and the last two panels were finished by Luca in 1467, with bronze which was supplied to him by Verrocchio.2. The door is divided into ten

square panels, with small heads in the style of Ghiberti projecting from the framing. The two top subjects are the Madonna and Child and the Baptist, next come the four Evangelists, and below are the four Latin Doctors,

Fic. 1.—Bronze relief of one of the Latin Doctors, from the sacristy door in the cathedral of Florence, by Luca.

each subject with attendant angels. The whole is modelled with the most perfect grace and dignified simplicity ; the heads throughout are full of life, and the treatment of the drapery in broad simple folds is worthy of a Greek sculptor of the best period of Hellenic art. These exquisite reliefs

1 Vasari is not quite right in his account of these reliefs: he speaks

of Euclid and Ptolemy as being in different panels. 2 See Cavallucci, S. Maria del Fiore, pt. ii. p. 137.

are perfect models of plastic art, and are quite free from the over-elaboration and too pictorial style of Ghiberti. Fig. 1 shows one of the panels. A terra-cotta relief at Berlin and another in the South Kensington Museum are probably original studies by Luca for two of the panels of the doctors.

The most important existing work in marble by Luca

-(executed in 1457-58)3 is the tomb of Benozzo Federighi,

bishop of Fiesole, originally placed in the church of S. Pancrazio at Florence, but now in 8. Francesco di Paola on the Bello Sguardo road outside the city. A very beautiful effigy of the bishop in a restful pose lies on a sarcophagus sculptured with graceful reliefs of angels holding a wreath, which contains the inscription. Above are three-quarter- length figures of Christ between St John and the Virgin, delicately carved in low relief. The whole is surrounded by a rectangular frame formed of painted majolica tiles of the most exquisite beauty, far surpassing any other exist-ing work of the same sort. On each tile is painted, with enamel pigments, a bunch of flowers and fruit in brilliant realistic colours, the loveliness of which is very hard to describe The perfect mean between truth to nature and decorative treatment has never been more thoroughly obtained than, in these wonderful tile pictures, each of which is worthy of the most careful study ; and they are also of special interest as being among the earliest ex- amples of Italian majolica. Though the bunch of flowers on each is painted on one slab, the ground of each tile is formed of separate pieces, fitted together like a kind of mosaic, probably because the pigment of the ground required a different degree of heat in firing from that needed for the enamel painting of the centre. The few other works of this class which exist do not approach the beauty of this early essay in majolica painting, on which Luca evidently put forth his utmost skill and patience.

In the latter part of his life Luca was mainly occupied with the production of terra-cotta reliefs covered with enamel,—a process which he improved upon, but did not invent, as Vasari asserts. The secret of this process was to cover the clay relief with an enamel formed of the ordi- nary ingredients of glass (marzacotto) made an opaque white by oxide of tin,—

*a method practised with great success in the 13th century in Persia * (see PorrEry, vol. xix. pp. 620, 628). Though Luca was not the inventor of the process, yet his genius so improved and extended its application that it is not unnaturally known now as Della Robbia ware ; it must, however, be remembered that by far the majority of these reliefs which in Italy and else- where are ascribed to Luca are really the work of some of the younger members of the family. Comparatively few exist which can with certainty be ascribed to Luca himself. Among the earliest of these are medallions of the four Evangelists in the vault of Brunelleschi's Pazzi chapel in S. Croce. These fine reliefs are coloured with various metallic oxides in different shades of blue, green, purple, yellow, and black. It has often been asserted that the very polychromatic reliefs belong to Andrea or his sons, and that Luca's were all in pure white; this, however, is not the case: colours were used more freely by Luca than by his successors. A relief in the South Kensington Museum furnishes a striking example and is of especial value from its great size, and also because its date is known. 'This is an enormous medallion containing the arms of René of Anjou and other heraldic devices; it is*

3 Gaye, Carteggio Inedito, i. p. 183.

4 It is described by Theophilus, Diversarum Artium Schedula (11th century), and by Pietro del Bono in his Margarita preciosa (1330). An example earlier than any of Luca's exists at Florence over the door of 8. Egidio (in S. Maria Nuova). It is a relief of the Coronation of the Virgin executed by Lorenzo de' Bicci in 1424; see Milanesi, Archivio Storico Italiano, 1860, pp. 182-183. Contemporary writers call this enamelled clay "terra invetriata,"

surrounded by a splendidly modelled wreath of fruit and flowers, especially apples, lemons, oranges, and fir cones, all of which are brilliantly coloured. This medallion was set up on the facade of the Pazzi Palace to commemorate René's visit to Florence in 1442. Another early relief by Luca, also highly polychromatic, is that of the Ascension in the tympanum of one of the sacristy doors in the cathedral, executed between 1446 and 1450, as is recorded in a document published by Rumohr

(Jtalien. Forsch., ii. pp. 364-365). Other existing works of Luca in Florence are the tympanum reliefs of the Madonna between two Angels in the Via dell' Agnolo, a work of exquisite beauty, and another over the door of §. Pierino del Mercato Vecchio. The only existing statues by Luca are two lovely enamelled figures of Kneeling Angels holding candlesticks, now in the canons' sacristy.!. A very fine work by Luca, executed between 1449 and 1452, is the tympanum relief of the Madonna and four Monastic Saints over the door of 8. Domenico at Urbino.2 Luca also made the four coloured medallions of the Virtues set in the vault over the tomb of the young cardinal-prince of Portugal in a side chapel of S. Miniato in Florence (see RossELiino). By Luca also are reliefs of the Madonna and various medallions outside Or San Michele. One of his chief decorative works which no longer exists was a small library or study for Piero de' Medici, wholly lined with painted majolica plaques and reliefs.3 The South Kensington Museum pos- sesses twelve circular plaques of majolica ware painted in blue and white with the Occupations of the Months ; these have been attributed to Luca, but have no resem- blance to any known works of his. Their provenance is unknown.

In 1471 Luca was elected president of the Florentine artists' guild, but he refused this great honour on account of his age and infirmity. It shows, however, the very high estimation in which he was held by his contemporaries. He died on 20th February 1482, leaving his property to his nephews Andrea and Simone. His chief pupil was his nephew Andrea, and probably also Agostino di Duccio, who executed many pieces of sculpture at Rimini, and the graceful but mannered marble reliefs of angels on the facade of 8. Bernardino at Perugia.' Vasari calls this aya Luca's brother, but he was not related to him at all.*

I]. ANDREA DELLA Ropsia (1435-1525), the nephew and pupil of Luca, carried on the production of the enamelled reliefs on a much larger scale than his uncle had ever done ; he also extended its application to various architectural uses, such as friezes and to the making of lavabos (lavatories), fountains, and large retables. The result of this was that, though the finest reliefs from the workshop of Andrea were but little if at all inferior to those from the hand of Luca, yet some of them, turned out by pupils and assistants, reached only a lower stand- ard of merit. Only

one work in marble by Andrea is known, namely, an altar in §. Maria delle Grazie near Arezzo, mentioned by Vasari (ed. Milanesi, ii. p. 179), and still well preserved.

One variety of method was introduced by Andrea in his enamelled work; sometimes he omitted the enamel

3 The South Kensington Museum possesses what seem to be fine replicas of these statues. ; ? The document in which the order for this and the price paid for it = recorded is published by Yriarte, Gaz. d. Beaux Arts, xxiv. p. 143.

" It is fully described by Filarete in his Trattato dell' Architectura, written in 1464, and therefore was finished before that date ; see also bine ee wi Florence, 1880, ii. p. 174.

is will, dated 19th Februar i i

Ind. tp, TSB, y 1471, is published by Gaye, Cart.

: In the works of Perkins and others on Italian sculpture these Perugian reliefs are wrongly stated to be of enamelled clay.

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on the face and hands (nude parts) of his figures, especi- ally in those cases where he had treated the heads in a realistic manner ; as, for example, in the noble tympanum relief of the meeting of St Domenic and St Francis in the loggia of the Florentine hospital of S. Paolo,—a design suggested by a fresco of Fra Angelico's in the cloister of St Mark's. One of the most remarkable works by Andrea is the series of medallions with reliefs of Infants in white on a blue ground set on the front of the found- ling hospital at Florence. These lovely child-figures are modelled with wonderful skill and variety, no two being alike. Andrea produced, for guilds and private persons, a large number of reliefs of the Madonna and Child varied with much invention, and all of extreme beauty of pose and sweetness of expression. These are frequently framed with realistic and yet very decorative garlands of fruit and flowers, all painted with enamel

colours, while the main relief is left white. Fig. 2 shows a good example of these

Fic. 2.—Enamelled clay relief of Virgin and Child, by Andrea,

The hospital of S. Paolo, near S. Maria Novella, has also a number of fine medallions with reliefs of saints, two of Christ Healing the Sick, and two fine portraits, under which are white plaques inscribed—"dall' aiio 1451 all' ano 1495"; the first of these dates is the year when the hospital was rebuilt owing to a papal brief

smaller works.

sent to the archbishop of Florence. Arezzo possesses a number of fine enamelled works by Andrea and his sons —a, retable in the cathedral with God holding the Crucified Christ, surrounded by angels, and below, kneeling figures of 8. Donato and 8. Bernardino ; also in the cathedral is a fine relief of the Madonna and Child with four saints at the sides. In S. Maria in Grado is a very noble retable with angels holding a crown over a standing figure of the Madonna; a number of small figures of worshippers take refuge in the folds of the Virgin's mantle, a favourite motive for sculpture dedicated by guilds or other corporate

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bodies. Perhaps the finest collection of works of this class is at La Verna, not far from Arezzo (see Vasari, ed. Milanesi, ii. p. 179). The best of these, three large retables with representations of the Annunciation, the Crucifixion, and the Madonna giving her Girdle to St Thomas, are probably the work of Andrea himself; the others being by his sons. In 1489 Andrea made a beauti- ful relief of the Virgin and two Angels, now over the archive room door in the Florentine Opera del Duomo; for this he was paid twenty gold florins (see Cavallucci, S. Maria del Fiore). In the same year he modelled the fine tympanum relief over a door of Prato cathedral, with a half-length figure of the Madonna between St Stephen and St Lawrence, surrounded by a frame of angels' heads.

In 1491 Andrea was still working at Prato, where many of his best reliefs still exist. One of his finest works is a large retable at Volterra in the church of 8. Girolamo, dated 1501; it represents the Last Judgment, and is re- markable for the fine modelling of the figures, especially that of the archangel Michael, and a nude kneeling figure of a youth who has just risen from his tomb. Other late works of known date are a Resurrection of Christ, made in 1501 for S. Frediano at Florence (the lower half of this only exists, in the court of the Casa Mozzi), and a medal- lion of the Virgin in Glory, surrounded by angels, made in 1505 for Pistoia cathedral.t Andrea's last known relief is a Nativity, made in 1515 for S. Maria in Pian di Mugnone at Florence."

TIl., IV. Five of Andrea's seven sons worked with their father, and after his death carried on the Robbia fabrique ; the dates of their birth are shown in the table on p. 588 above. Early in life two of them came under the influ- ence of Savonarola, and took monastic orders at his Domi- nican convent ; these were Marco, who adopted the name of Fra Luca, and Paoto, called Fra Ambrogio. One relief by the latter, a Nativity with four life-sized figures of rather poor work, is in the Cappella degli Spagnuoli in the Sieuese convent of 8. Spirito; a MS. in the convent archives records that it was made in 1504.

V. The chief existing work known to be by the second son Luca is the very rich and beautiful tile pavement in the uppermost story of Raphael's loggie at the Vatican, finely designed and painted in harmonious majolica colours. This was made by Luca at Raphael's request and under his supervision in 1518.° It is still in very fine preservation.

VI. GriovANNI DELLA Roppra (1469-15291) during a great part of his life worked as assistant to his father, Andrea, and in many cases the enamelled sculpture of the two cannot be distinguished. Some of Giovanni's independ- ent works are of great merit, especially the earlier ones ; during the latter part of his life his reliefs deteriorated in style, owing mainly to the universal decadence of the time. A very large number of pieces of Robbia ware which are attributed to Andrea, and even to the elder Luca, were really by the hand of Giovanni. One of his finest works, quite equal in beauty to anything of his father's, from whom the design of

the figures was probably taken, is the washing- fountain in the sacristy of S. Maria Novella at Florence, made in 1497.4 It is a large arched recess with a view of the seashore, not very decorative in style, painted on majolica tiles at the back. There are also two very beauti- ful painted majolica panels of fruit-trees let into the lower part. In the tympanum of the arch isa very lovely white

1 See Gualandi, Memorie risguardanti le Belle Arti, Bologna, 1845, vi. pp. 33-35, where original documents are printed recording the dates and prices paid for these and other works of Andrea.

2 See a document printed by Milanesi in his Vasari, ii. p. 180.

3 It is illustrated by Gruner, Fresco Decorations of Italy, London, 1854, pl. iv.; see also Miintz, Raphaél, sa Vie, &c., Paris, 1881, p. 452, note i., and Vasari, ed. Milanesi, ii. p. 182.

4° See a document printed by Milanesi in his Vasari, ii. p. 193.

relief of the Madonna between two Adoring Angels (see fig. Long coloured garlands of fruit and flowers are held

3).

Fig. 3.—Relief of Madonna and Angels in the tympanum of the lavabo (8S. Maria Novella, Florence), by Giovanni.

by nude boys reclining on the top of the arch. All this part is of enamelled clay, but the basin of the fountain is of white marble. Neither Luca nor Andrea was in the habit of signing his work, but Giovanni often did so, usually adding the date, probably because other potters had begun to imitate the Robbia ware.®

Giovanni lacked the original talent of Luca and Andrea, and so he not only copied their work but even reproduced in clay the marble sculpture of Pollaiuolo, Da Settignano, Verrocchio, and others. A relief by him,

evidently taken from Mino da Fiesole, exists in the Palazzo Castracane Staccoli. Among the very numerous other works of Gio- vanni are the large retable in the Castellani chapel of 8. Croce, a relief in the wall of a convent in the Via Nazionale at Florence, and two reliefs in the Bargello dated 1521 and 1522. The latter is a many-coloured relief of the Nativity, and was taken from the church of S. Girolamo in Florence ; it is a too pictorial work, marred by the use of many different planes. Its predella has a small relief of the Adoration of the Magi, and is inscribed "Hoc opus fecit Joanes Andree de Robia, ac posuit hoc in tempore die ultima lulii afio, Di. mpxxi." At Pisa in the church of §. Silvestro is a relief in Giovanni's later and poorer manner dated 1520; it is a Madonna surrounded by angels, with saints below—the whole overcrowded with figures and ornaments. Giovanni's largest and perhaps finest work is the polychromatic frieze on the outside of the Del Ceppo Hospital at Pistoia, for which he received various sums of money between 1525 and 1529, as is recorded in documents which still exist among the archives of the hospital. The subjects of this frieze are the Seven Works of Mercy, forming a continuous band of sculpture in high relief, well modelled and designed in a very broad sculpturesque way, but a little injured perhaps by the crudeness of some of its colouring. Six of these reliefs. are by Giovanni, namely, Clothing the Naked, Washing the Feet of Pilgrims, Visiting the Sick, Visiting Prisoners, Burying the Dead, and Feeding the Hungry. The seventh,

5 Examples of these imitations are a retable in 8. Lucchese near Poggibonsi dated 1514, another of the Madonna and Saints at Monte San Savino of 1525, and a third in the Capuchin church of Arceria. near Sinigaglia ; they are all inferior to the best works of the Robbia family.

8 The hospital itself was begun in 1514.

Giving Drink to the Thirsty, was made by Filippo Pala- dini of Pistoia in 1585; this last is of terra-cotta, not enamelled, but simply painted with oil colours. Giovanni also executed the medallions in the spandrels of the arches under this frieze, with reliefs of the Annunciation, the Visitation, and the Coronation of the Virgin.

A large octagonal font of enamelled clay, with pilasters at the angles and panels between them with scenes from the life of the Baptist, in the church of S. Leonardo at Cerreto Guidi, isa work of the school of Giovanni; the reliefs are pictorial in style and coarse in execution. Giovanni's chief pupil was a man named Santi, who was at first apprenticed to Buglioni,! and when the latter died in 1521 he went into Giovanni's bottega. His work is very inferior to that of his master.

VII. Grroramo DELLA Rosptra (1488-1566), another of Andrea's sons, was an architect and a sculptor in marble and bronze as well as in enamelled clay. During the first part of his life he, like his brothers, worked with his father, but in 1528 he went to France and spent nearly forty years in the service of the French royal family. Francis I. employed him to build a palace in the Bois de Boulogne called the Chateau de Madrid. This was a large well- designed building, four stories high, two of them having open loggie in the Italian fashion. Girolamo decorated it richly with terra-cotta medallions, friezes, and other archi- tectural features.2. For this purpose he set up kilns at Suresnes. Though the palace itself has been destroyed, drawings of it exist.®

The best collections of Robbia ware are in the Florentine Bargello and Accademia, the South Kensington Museum (the finest out of Italy), the Louvre, the Cluny, and the Berlin Museums. Many fine specimens exist in Paris in the private collections of M. Alphonse de Rothschild, M. Gavel, and M. Dreyfus. The greater part of the Robbia work still remains in the churches and other buildings of Italy, especially in Florence, Fiesole, Arezzo, La Verna, Volterra, Barga, Montepulciano, Lucca, Pistoia, Prato, and Siena. The best accounts of the Della Robbia family are those given by De Jouy, Les Della Robbia, Paris, 1855; Bode, Die Kinstlerfamilie Della Lobdbia, Leipsic, 1878; and Cavallucci and Molinier, Les Della Rodbia, Paris, 1884, an ably-written and well-illustrated work. See also Vasari, ed. Milanesi, Florence, 1880, ii. p. 167 sg., and various works on Italian sculpture. (J. HM)

ROBERT I., king of France, son and successor of Hugh Capet, was born at Orleans in 971 and died at Melun in 1031. See Francs, vol. ix. p. 536. He is sometimes cited as Robert IJ., Robert I. being then taken to mean

Robert, duke of France (0b. 923), the second son of Robert "the Strong" (ob. 866) ; comp. Francg, vol. ix. p. 535.

ROBERT, called Tue Bruce (1274-1329), king of Scotland, was the son of the seventh Robert de Bruce, lord of Annandale in his own right and earl of Carrick in right of his wife Marjory, daughter of Neil, second earl, and thus was of mingled Norman ® and Celtic blood. His*

1 Benedetto Buglioni (1461-1521) appears to have produced ena- melled ware independently of the Robbia family. In 1484 he made arelief of the Harrowing of Hell for the Servite monks at Florence; see Baldinucci, Notizie de' Professori del Disegno, Milan, 1811, vi. p. 18.

2 The Sevres Museum possesses some fraginents of these decorations.

3 See Laborde, Chateau de Madrid, Paris, 1853, and Comptes des Batiments du Rot, Paris, 1877-80, in which a full account is given of Girolamo's work in connexion with this palace.

- *For Rosert II. (1816-1390) and Roperr III. (ad. 1406) of Scotland, see SCOTLAND.*

® The first Robert de Bruce, a follower of William the Conqueror, was rewarded by the gift of many manors, chiefly in Yorkshire, of which Skelton was the principal. His son, the second Robert, received from David I., his comrade at the court of Henry I., a grant of the lordship of Annandale, and his grandson, the third Robert, siding with David against Stephen at the battle of the Standard, became a Scottish instead of an English baron. The fourth Robert married Isobel, natural daughter of William the Lion, and their son, the fifth Robert, married Isabella, second daughter of David, earl of Hunting- don, niece of the same Scottish king. Thus royal kin made natural the ambition to gain a crown,—an object not beyond the ambition of a powerful noble in feudal times.

grandfather, the sixth Robert de Bruce, claimed the crown of Scotland as son of Isabella, second daughter of David, earl of Huntingdon ; but

Baliol, grandson of Margaret, the eldest daughter, was preferred by the commissioners of Edward I. The birthplace of the Bruce—perhaps Turn- berry, his mother's castle, on the coast of Ayr—is not cer- tainly known. His youth is said by an English chronicle to have been passed at the court of Edward I. At an age when the mind is quick to receive the impressions which give the bent to life he must have watched the pro- gress of the great suit for the crown of Scotland. Its issue in favour of Baliol led to the resignation of Annan- dale by Bruce the competitor to his son, the Bruce's father, who, either then or after the death of the aged competitor in 1295, assumed the title of lord of Annandale. Two years before he had resigned, on the death of his wife, the earldom of Carrick to Robert the Bruce, who presented the deed of resignation to Baliol at Stirling on 3d August 1293, and offered the homage which his father, like his

grandfather, was unwilling to render. Feudal law required

that the king should take sasine of the earldom before regranting it and receiving the homage, and the sheriff of Ayr was directed to take it on Baliol's behalf. As the disputes between Edward and Baliol, which ended in Baliol losing the kingdom, commenced in this year it is doubtful whether Bruce ever rendered homage; but he is henceforth known as earl of Carrick, though in a few instances this title is still given to his father. Both father and son sided with Edward against Baliol. Towards the end of 1292 the elder Robert had a safe-conduct from Edward to visit Norway with a daughter, Isabella, who married Erik, king of Norway, the widower of Margaret of Scotland,—a fact marking the high standing of the family of Bruce. On 20th April 1294 the younger Robert, earl of Carrick, had a similar safe-conduct or permission to visit Ireland till Michaelmas and a year following, and a further mark of Edward's favour by a respite for the same period of all debts due by him to the exchequer. His father, having done homage to Edward, was entrusted in October 1295 with the custody of the castle of Carlisle by a patent in which he is styled lord of Annandale; and Baliol retaliated by seizing Annandale, which he conferred on John Comyn, earl of Buchan. On 28th August 1296 Robert de Bruce "le vieil" and Robert de Bruce "le jeune," earl of Carrick, swore fealty to Edward at Berwick; but (according to Hemingford), in breach of this oath, renewed at Carlisle on the Gospels and the sword of Thomas a

Becket, the young earl joined Wallace, who had raised the standard of Scottish independence in the name of Baliol after that weak king had himself surrendered his kingdom to Edward. Urgent letters were sent ordering Bruce to sup- port Warenne, Edward's general, in the summer of 1297; but, instead of complying, he, along with the bishop of Glasgow and the steward of Scotland, laid waste the lands of those who adhered to Edward. On 7th July Percy forced Bruce and his friends to make terms by the treaty called the Capitulation of Irvine. The Scottish lords were not to serve beyond the sea against their will and were pardoned for their recent violence, while in return they owned allegiance to Edward. The bishop of Glasgow, the steward, and Sir Alexander Lindesay became sureties for Bruce until he delivered his daughter Marjory as a hostage. Wallace almost alone maintained the struggle for freedom which the nobles as well as Baliol had given up, and Bruce had no part in the honour of Stirling Bridge or the reverse of Falkirk, where in the following year Edward in person recovered what his generals had lost and drove Wallace into exile. Shortly afterwards Bruce appears again to have sided with his countrymen; Annandale was wasted and Lochmaben taken by Clifford, while Bruce (according

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to Hemingford), '"'when he heard of the king's coming, fled from his face and burnt the castle of Ayr which he held." Yet, when Edward was forced by home affairs to quit Scotland, Annandale and certain earldoms, including Carrick, were excepted from the districts he assigned to his followers,—Bruce and the other earls being treated as waverers whose allegiance might still be retained. In 1299 a regency was appointed in Scotland in name of Baliol, and a letter of Baliol mentions Robert Bruce, lord of Carrick, as regent, along with William of Lamberton, bishop of St Andrews, and John Comyn the younger,— a strange conbination, Lamberton the friend of Wallace, Comyn the enemy of Bruce, and Bruce a regent in name of Baliol. Comyn in his own interest as Baliol's heir was the active regent ; the insertion of the name of Bruce was an attempt to secure his co-operation. For the next four years he kept studiously in the background waiting his time. A statement of Langtoft that he was at the parlia- ment of Lincoln in 1301, when the English barons repudi- ated the

claim of the pope to the suzerainty of Scotland, is not to be credited, though his father may have been there. In the campaign of 1304, when Edward renewed his attempt on Scotland and reduced Stirling, Bruce sup- ported the English king, who in one of his letters to him says, "If you complete that which you have begun we shall hold the war ended by your deed and all the land of Scotland gained." But, while apparently aiding Edward, Bruce had taken a step which bound him to the patriotic cause. On 11th June, a month before the fall of Stirling, he met Lamberton at Cambuskenneth and entered into a secret bond by which they were to support each other against all adversaries and undertake nothing without consulting together. The death of his father in this year may have determined his course and led him to prefer the chance of the Scottish crown to his English estates and the friendship of Edward.

This determination closes the first chapter of his life ; –

the second, from 1304 to 1314, is occupied by his contest for the kingdom, which was really won at Bannockburn, though disputed till the treaty of Northampton in 1328 ; the last, from 1314 to his death in 1329, was the period of the establishment of his government and dynasty by an administration as skilful as his generalship. It is to the second of these that historians, attracted by its brilliancy even amongst the many romances of history and_ its importance to Scottish history, have directed most of their attention, and it is during it that his personal character, tried by adversity and prosperity, gradually unfolds itself. But all three periods require to be kept in view to form a just estimate of Bruce. That which terminated in 1304, though unfortunately few characteristics, personal or indi- vidual, have been preserved, shows him by his conduct to have been the normal Scottish noble of the time. A con- 'flict of interest and of bias led to contradictory action, and this conflict was increased in his case by his father's residence in England, his own upbringing at the English court, his family feud with Baliol and the Comyns, and the jealousy common to his class of Wallace, the mere knight, who had rallied the commons against the invader and taught the nobles what was required in a leader of the people. The merit of Bruce is that he did not despise the lesson. Prompted alike by patriotism and ambition, at the prime of manhood he chose the cause of national independence with all its perils,

and stood by it with a constancy which never wavered until he secured its triumph. Though it is crowded with incidents, the main facts in the central decade of Bruce's life may be rapidly told. The fall of Stirling was followed by the capture and execution of Wallace at London on 24th August 1305. Edward hoped still to conciliate the nobles and gain Scotland by a

policy of clemency to all who did not dispute his authority. A parliament in London (16th September), to which Scottish representatives were summoned, agreed to an ordinance for the government of Scotland, which, though on the model of those for Wales and Ireland, treating Scotland as a third subject province under an English lieutenant, John de Bretagne, was in other respects not severe. Bruce is reputed to have been one of the advisers who assisted in framing it ; but a provision that his castle of Kildrummy was to be placed in charge of a person for whom he should answer shows that Edward not without reason suspected his fidelity. Challenged by the king with the bond between him and Lamberton (according to one account discovered by the treachery of John Comyn, with whom a similar engagement had been made or attempted), Bruce secretly quitted London, and on 10th February 1306 met by appointment, in the church of the Friars Minor at Dumfries, Comyn, whom he slew at the high altar for refusing to join in his plans. So much is certain, though the precise incidents of the interview were variously told. It was not their first encounter, for a letter of 1299 to Edward from Scotland describes Comyn as having seized Bruce by the throat at a meeting at Peebles, when they were with difficulty reconciled by the joint regency.

The bond with Lamberton was now sealed by blood and the confederates lost no time in putting it into execution. Within little more than six weeks Bruce, collecting his adherents in the south-west, passed from Lochmaben to Glasgow and thence to Scone, where he was crowned by the bishop of St Andrews on 25th March, the bishops of Glasgow and Moray, with the earls of Lennox, Athole, and Errol, being present. Two days later Isabella, countess of Buchan, claimed the right of her family the Macduffs, earls of Fife, to place the Scottish king on his throne, and the ceremony was repeated with an addition flattering to the Celtic race. Though a king, Bruce had not yet a king- dom, and his efforts to obtain it were till the death of Edward I. disastrous failures. In June he was defeated at Methven by Pembroke, and on 11th August he was sur- prised in Strathfillan, where he had taken refuge, by Lord Lorn. The ladies of his family were sent to Kildrummy in January, and Bruce, almost without a follower, fled to Rathlin, an island off Antrim (Ireland). Edward, though suffering from his last illness, came to the north in the following spring. On his way he granted the Scottish estates of Bruce and his adherents to his own followers, Annandale falling to the earl of Hereford. At Carlisle there was published a bull excommunicating Bruce, along with another absolving Edward from the oath he had taken to observe Magna Charta and the other charters on which the English constitution rests. Elizabeth the wife, Marjory the daughter, Christina the sister of Bruce, were captured in a sanctuary at Tain and sent prisoners to England. The countess of Buchan was confined in a cage at Berwick and another of Bruce's sisters, Mary, in a cage at Roxburgh. The bishops of St Andrews and Glasgow and the abbot of Scone were suspended from their bene- fices and sent as prisoners to the south of England. Nigel Bruce, his youngest brother, was beheaded at Berwick, Christopher Seton, his brother-in-law, at Dumfries. The earl of Athole was sent to London and hanged on a gallows 30 feet higher than the pole on which the head of Wallace still stood. Two other brothers of Bruce, Thomas and Alexander (dean of Glasgow), met the same fate at Carlisle. There were many minor victims, but the chronicler of Lanercost notes that the number of those who wished Bruce to be confirmed in the kingdom increased daily. While thus wreaking his vengeance Edward himself was summoned by death at Burgh-on-the-Sands, on the Solway,

on 7th June 1307. By his dying wish the inscription "Fdwardus Primus, Scotorum Malleus, Pactum Serva" was put on his tomb, In a moment all was changed. Instead of being opposed to the greatest, Bruce now had as his antagonist the feeblest of the Plantagenets. Quitting Rathlin (after a short stay in Arran), Bruce had before Edward's death attempted to take Turnberry and Ayr, but had failed, though he defeated Pembroke at Loudoun Hill. No sooner was his father dead than Edward I. recalled his banished favourite Gaveston. After wasting the critical moment of the war in the diversions of a youthful court, the new king made an inglorious march to Cumnock and back without striking a blow, and then returned south to celebrate his marriage with Isabella of France, leaving the war to a succession of generals. Bruce, with the insight of military genius, seized his opportunity. Leaving Edward, now his only brother in blood and almost his equal in arms, in Galloway, he suddenly trans- ferred his own operations to Aberdeenshire. In the end of 1307 and again in May 1308 he overran Buchan, where at Inverury on 22d May he defeated its earl, one of his chief Scottish opponents. Then crossing to Argyll he surprised Lord Lorn in the Pass of Brander and took Dunstaffnage. In 1309 a truce, scarcely kept, was effected by the pope and Philip of France, and in 1310, in a general council at Dundee, the clergy of Scotland—all the bishops being present—recognized Bruce as king. The support given him by the national church in spite of his excom- munication must have been of great importance in that age, and was probably due to the example of Lamberton. The next three years were signalized by the reduction one by one of the strong places the English still held,—Lin- lithgow in the end of 1310, Dumbarton in October 1311, Perth by Bruce himself in January 1312. Encouraged by these successes, he made a raid into the north of England, and on his return reduced Butel (in Galloway), Dumfries, and Dalswinton, and threatened Berwick. In March 1313 Sir James Douglas surprised Roxburgh, and Randolph surprised Berwick. In May Bruce was again in England, and, though he failed to take Carlisle, he subdued the Isle of Man. Edward Bruce about the same time took Ruther- glen and laid siege to Stirling, whose governor, Mowbray, agreed to capitulate if

not relieved before 24th June 1314. Bruce's rapidity of movement was one cause of his success. His sieges, the most difficult part of medizeval warfare, though won sometimes by stratagem, prove that he and his followers had benefited from their early training in the wars of Edward I. We know that he had been specially employed by that king to prepare the siege-train for his attack on Stirling. By the close of 1813 Berwick and Stirling alone remained English. Edward IT. felt that if Scotland was not to be lost a great effort must be made. With the whole available feudal levy of England, a con- tingent from Ireland, and recruits even out of jails —for murderers were pardoned on condition of joining the army —he advanced from Berwick to Falkirk, which he reached n 22d June. After a preliminary skirmish on Sunday the 23d, in which Bruce distinguished himself by a per- sonal combat with Henry de Bohun, whom he felled by a single blow of his axe, the battle of Bannockburn was fought on Monday the 24th; and the complete rout of the English determined the independence of Scotland and confirmed the title of Bruce. The details of the day, memorable in the history of war as well as of Scotland, have been singularly well preserved, and redound to the credit of Bruce, who had studied in the school of Wallace as well as in that of Edward I. He had chosen and knew his ground,—the New Park between St Ninian's and the Bannock, a petty burn, yet sufficient to produce marshes dangerous to heavily-armed horsemen, while from

the rising ground on his right the enemy's advance was seen. His troops were in four divisions; his brother com- manded the right, Randolph the centre, Douglas the left. Bruce with the reserve planted his standard at the Bore Stone, whence there is the best view of the field. His camp-followers on the Gillies' Hill appeared over its crest at the critical, moment which comes in all battles. The plain on the right of the marshes was prepared with pits and spikes. But what more than any other point of strategy made the fight famous was that the Scots fought on foot in battalions with their spears outwards, in a cir- cular formation serving the same purpose as the modern square. A momentary success of the English archers was quickly reversed by a flank movement of Sir Robert Keith. The Scottish bowmen followed up his advantage, and the fight became

general ; the English horse, crowded into too narrow a space, were met by the steady resist- ance of the Scottish pikemen, who knew Bruce told them truly that they fought for their country, their wives, their children, and all that freemen hold dear. The English rear was unable to come up in the narrow space or got entangled in the broken ranks of the van. The first re- pulse soon passed into a rout, and from a rout into a headlong flight, in which Edward himself barely escaped. Like Courtrai and Morgarten, Bannockburn marked the momentous change from medieval to modern warfare. The armed knights gave place to the common soldiers led by skilful generals as the arbiters of the destiny of nations. In the career of Bruce it was the turning-point. The enthusiasm of the nation he had saved forgot his late adhesion to the popular cause, and at the parliament of Ayr on 25th April 1315 the succession was settled by a unanimous voice on him, and, failing males of his body, on his brother Edward and his heirs male, failing whom on his daughter Marjory and her heirs, if she married with his consent. Soon after she married Walter the Steward.

The last part of Bruce's life, from 1315 to 1329, began with an attempt which was the most striking testimony that could have been given to the effect of Bannockburn, and which, had it succeeded, might have altered the future of the British Isles. This was no less than the rising of the whole Celtic race, who had felt the galling yoke of Edward I. and envied the freedom the Scots had won. In 1315 Edward Bruce crossed to Ireland on the invita- tion of the natives, and in the following year the Welsh became his allies. In autumn Robert came to his brother, and they together traversed Ireland to Limerick. Dublin was saved by its inhabitants committing it to the flames, and, though nineteen victories were won, of which that at Slane in Louth by Robert was counted the chief, the success was too rapid to be permanent. The brothers retreated to Ulster, and, Robert having left Ireland to protect his own borders, Edward was defeated and killed at Dundalk in October 1318. On his return Bruce ad- dressed himself to the siege of Berwick, a standing menace to Scotland. While preparing for it two cardinals arrived in England with a mission from Pope John XXII. to effect a truce, or, failing that, to renew the excommunication of Bruce. The cardinals did not trust themselves across the border; their messengers, however, were courteously received by Bruce, but with a firm refusal to admit the bulls

into his kingdom because not addressed to him as king, Another attempt by Newton, guardian of the Friars Minor at Berwick, had a more ignominious result. Bruce admitted Newton to his presence at Aldcamus, where he might see the works for the siege going on by night and day, and was informed that Bruce would not receive the bulls until his title was acknowledged and he had taken Berwick. On his return Newton was waylaid and his papers seized, not without suspicion of Bruce's connivance.

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In March 1318 first the town and then the castle of Berwick capitulated, and Bruce wasted the English border as far as Ripon. In December he held a parliament at Scone, where he displayed the same wisdom asa legislator which he had shown as a general. The death of his brother and his daughter rendered a resettlement of the crown advisable, which was made in the same order as before, with a provision as to the regency in case of a minor heir in favour of Randolph, and failing him Douglas. The defence of the country was next cared for by regula- tions for the arming of the whole nation, down to every one who owned the value of a cow,—a measure far in ad- vance of the old feudal levy. Exports during war and of arms at any time were prohibited. Internal justice was regulated, and it was declared that it was to be done to poor and rich alike. Leasing-making—a Scottish term for seditious language—was to be sternly punished. The nobles were exhorted not to oppress the commons. Reforms were also made in the tedious technicalities of the feudal law. In 1319 an attempt to recover Berwick was repelled by Walter the Steward, and Bruce took occasion of a visit to compliment his son-in-law and raise the walls 10 feet.

His position was now so strong that foreign states began to testify their respect. Bruges and Ypres rejected a request of Edward to cut off the Scottish trade with Flanders. The pope, who had excommunicated Bruce, was addressed by the parliament of Arbroath in 1320 in a letter which compared Bruce to a Joshua or Judas Maccabzeus, who had wrought the salvation of his people, and declared they fought 'not for glory, truth, or honour, but for that liberty which no virtuous man will survive." Moved

by this language and conscious of the weakness of Edward, the pope exhorted him to make peace with Scotland, and three years later Randolph at last procured the recognition of Bruce as king from the papal see by promising aid in a crusade. Jn 1326 the French king made a similar acknowledgment by the treaty of Corbeil. Meantime hostilities more or less constant continued with England, but, though in 1322 Edward made an incursion as far as Edinburgh, the fatal internal weakness of his government prevented his gaining any real success. Some of his chief nobles—Lancaster in 1321 and Sir Andrew Hartcla in 1322—entered into correspondence with the Scots, and, though Hartcla's treason was detected and punished by his death, Edward was forced to make a treaty for a long truce of thirteen years at Newcastle on 30th May, which Bruce ratified at Berwick. The intrigue of the queen with Roger Mortimer led to the end of the ignominious reign by Edward's deposition and murder in 1327; and one of the first acts of the new reign, after a narrow escape of the young king from capture by Randolph, was the treaty of York, ratified at Northampton in April 1328, by which it was agreed that "Scotland, according to its ancient bounds in the days of Alexander JIL. should remain to Robert, king of Scots, and his heirs free and divided from England, without any subjection, servitude, claim or demand whatsoever." Johanna, Edward's sister, was to be given in marriage to David, the infant son of Bruce, and the ceremony was celebrated at Berwick on 12th July.

The chief author of Scottish independence barely survived his work. His last years had been spent chiefly at the castle of Cardross on the Clyde, which he acquired in 1326, and the conduct of war, as well as the negotiations for peace, had been left to the young leaders Randolph and Douglas, whose training was one of Bruce's services to his country. Ever active, he employed himself in the narrower sphere of repairing the castle and improving its domains and gardens, in shipbuilding on the Clyde, and in the exercise of the royal virtues of hospitality and charity. The reli-

gious feeling, which had not been absent even during the struggles of manhood, deepened in old age, and took the form the piety of the times

prescribed. He made careful provision for his funeral, his tomb, and masses for his soul. He procured from the pope a bull authorizing his confessor to absolve him even at the moment of death. He died from leprosy, contracted in the hardships of earlier life, on 7th June 1329, and was buried at Dunfermline beside his second wife, Elizabeth de Burgh, whom he had married about 1304, and who bore him late his only son, David, who succeeded him, Of two surviving daughters, Matilda married Thomas Ysaak, a simple esquire, and Margaret became the wife of William, earl of Sutherland. Marjory, an only child by his first wife, Isabella of Mar, had pre- deceased him. Several children not born in wedlock have been traced in the records, but none of them became in

any way famous.

In fulfilment of a vow to visit the Holy Sepulchre, which he could not accomplish in person, Bruce requested Douglas to carry his heart there, but his faithful follower perished on the way, fight- ing in Spain against the Moors, and the heart of Bruce, recovered by Sir William Keith, found its resting-place at Melrose. When his corpse was disinterred in 1819 the breast-bone was found severed to admit of the removal of the heart, thus confirming the story pre- served in the verses of Barbour. That national poet collected in the earliest Scottish poem, written in the reign of Bruce's grandson, the copious traditions which clustered round his memory. It is a panegyric ; but history has not refused to accept it asa genuine representation of the character of the great king, in spirit, if not in every detail. Its dominant note is freedom—the liberty of the nation from foreign bondage, and of the individual from oppression. It is the same note which Tacitus cmbodied in the speech of Galgacus at the dawn of Scottish history. Often as it fe been heard before and since in the course of history, seldom has it had a more illustrious champion than Robert the Bruce. (45. M.)

ROBERT, the name of two dukes of Normandy. See NorMANDY, vol. xvii. p..542 for Ropert I. (d. 1035) and p. 544 for Ropert JI. (d. 1134); see also ENGLAND, vol. vill. p. 301,

ROBERT, Huzert (1753-1808), born at Paris in 1753, deserves to be remembered not so much for his skill as a painter as for the liveliness and

point with which he treated the subjects he painted. The contrast between the ruins of ancient Rome and the life of his time excited his keenest interest ; and, although he had started for Italy on his own responsibility, the credit he there acquired procured him the protection of the minister Marigny and an official allowance. His incessant activity as an artist, his daring character, his many adventures, attracted general sympathy and admiration. In the fourth canto of his Z' Imagination Delille celebrated Robert's miraculous escape when lost in the catacombs ; later in life, when imprisoned during the Terror and marked for the guillotine, by a fatal accident another died in his place and Robert lived. The quantity of his work is immense; the Louvre alone contains nine paintings by his hand and specimens are frequently to be met with in provincial museums and private collections. In spite of a certain naturalness in details which was wanting to his predecessor Panini, all Robert's work has more or less of that scenic character which justified the taste of Voltaire when he selected him to paint the decora- tions of his theatre at Ferney. Robert fell, struck by apoplexy, on 15th April 1808. His brush was in his hand; he had painted till the last moment. He was much en- graved by the abbé Le Non, with whom he had visited Naples in the company of Fragonard during his early days ; in Italy his work has also been frequently reproduced by Chatelain, Liénard, Le Veau, and others.

See C. Blanc, Hist. des Peintres; Villot, Notice des Tableauzx du Louvre ; Julius Meyer, Gesch. mod. fr. Maleret.

ROBERT, Louis L&opotp (1794-1835), French painter, was born at Chaux de Fonds (Neufchatel) in Switzerland on 13th May 1794, but left his native place with the en-

graver Girardet at the age of sixteen for Paris. He was on the eve of obtaining the great prize for engraving when the events of 1815 blasted his hopes, for Neufchatel was restored to Prussia and Robert was struck off the list of competitors as a foreigner. Having fortunately whilst continuing his studies under Girardet never ceased to frequent the studio of David, he now determined to be- come a painter, and only returned to his native country when his master himself was exiled. At Neufchatel he

had the good fortune to attract the notice of Roullet de Mezerac, who enabled him by a timely loan to proceed to Rome. At Rome Robert soon struck the vein of subject destined to render his talent celebrated. In depicting the customs and life of the people, of southern Italy especially, he showed peculiar feeling for the historical characteristics of their race, All his work of this class was distinguished by an individual style: the actors bore themselves with an air of distinction and something of gravity which witnessed to their ancient lincage, and the rhythmical play of line which characterized all these compositions had a peculiar affinity to the nature of the types which figured in them. The charm of choice in these types, the beauty of this play of line, and the plastic restraint and measure which also marked Robert's treatment of his favourite subjects were the points to which he owed the wide recognition of his talent, for his command of his own powers was anything but ready and his difficulty in bringing out what he desired to produce shackled him, and especially so because paint- ing requires a sure and ready hand if its means are to be used with brilliant effect. After executing many detached studies of Italian life Robert conceived the idea of paint- ing four great works which should represent at one and thc same time the four seasons in Italy and the four lead- ing races of its people. In the Return from the Féte of the Madonna dell' Arco (Louvre) he depicted the Neapol- itans and the spring. This picture, exhibited at the Salon of 1827, achieved undoubted success and was bought for the Luxembourg by Charles X.; but the work which ap- peared in 1831——the Summer Reapers arriving in the Pontine Marshes (Louvre), which became the property of Louis Philippe — established the artist's reputation, an' Robert found himself with all his hopes of honour fulfilled and reckoned as one of the leading masters of his day. Florence and her autumn vineyards should now have furnished him with his third subject. He attempted to begin it, but, unable to conquer his unhappy passion for Princess Charlotte Napoleon (then mourning the violent death of her husband, Robert's devoted friend), he threw up his work and went to Venice, where he began and carried through the fourth of the series, the Fishers of the Adriatic. This work was not equal to the Reapers. Worn by the vicissitudes of painful feeling and bitterly discouraged, Robert committed suicide before his easel, 20th March 1835, on the tenth anniversary of the melan- choly suicide of a brother to whom he had been much attached.

See Villot, Notice des Tableau dw Louvre; C. Blanc, Hist. des Peintres; Feuillet de Conches, Correspondance de L. L. Robert; Julius Meyer, Gesch. mod. fr. Maleret.

ROBERT or GroucestEr, an English antiquary and historical writer, who lived in the second half of the 13th century, was a monk of the abbey at Gloucester, and is supposed by Hearne, the editor of his Chronicle, to have been sent to preside over the foundation at Oxford (after- wards Worcester College), where the younger members of the abbey were partly educated. This, however, is mere conjecture. The evidence which establishes his claim to be the author of the Chronicle (by which he is best known) is also extremely slight. In the Harleian MS. 201 (from which Hearne printed his edition) there occurs (fol. 159b

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place on 11th August 1297.

oy to 160) an account of the battle of Evesham. The narra- tion implies that the writer was living at that time (1265),

for he describes the dark and dismal weather that pre vailed on the day of the battle, adding, "This isci Roberd,

That verst this boc made,"—a passage, however, which may possibly have reference not to the versifier but to the original compiler of the Chronicle! The period at which the Chronicle was composed was evidently late in the 13th or early in the 14th century, as it contains a reference to the canonization of St Louis, king of France, which took From an historical point of view, however, the Chronicle is of but little value. The

internal evidence shows it to have been a translation from

the French and the original in turn to have been a mere compilation. The narrative commences with a description of Britain, taken from Henry of Huntingdon; the material is next derived mainly from Geoffrey of Monmouth, and then, again, from William of Malmesbury, special

informa- tion being supplied, here and there, from Henry of Hunt-ingdon, Ailred of Rievaulx, and the Annals of Winchester.

On the other hand, the value of the Chronicle as an illustration of the versification and language of the period is considerable. As a writer of English verse Robert comes first in order, being prior

to both Robert of Brunne and Laurence Minot, and he has accord-

ingly been styled the Ennius of English literature. His diction, again, affords many interesting points of comparison with that

known as Old English on the one hand and the language of

Chaucer and William Tyndale on the other. In his verses we first find the term "Saxons" used in opposition to Normans (Hcarne, p. 363), although " English" is the term by which, throughout the Chronicle, the original population is more generally designated. Of the English tongue itself, however, he says (zb., p. 125) that "(te Saxones speche it was, and porw hem ycome yt ys." Many

of the most noteworthy peculiarities of his diction will be found pointed out in Mr. Kingdon Oliphant's Old and Middle English, pp. 430-439.

Other compositions attributed to Robert of Gloucester are—a Life of St Alban in verse (MS. Ashmole, 43), a Life of St Patrick, also in verse (MS. Tanner, 17), a Life of St Bridget (MS. C. C.C. Camb., 145), and a Life of St Alphege (MS. Cott. Julius, Dax.)

The only complete edition of the Chronicle is that edited by Thomas Hearne – (Oxford, 1724), 2 vols. 8vo, partly from the Harleian MS. 201, and partly from the Cottonian MS. Calig. A. xi., and reprinted at London in 1810, 2 vols. 8vo. This, however, is extremely defective, Hearne's collation of the important MS. in the library of the college of Arms being very imperfect. For further fre aia see llardy's Descriptive Catalogue of MSS., ill. 181-189, i. 25, 68,

ROBERT GUISCARD (c. 1015-1085), duke of Apulia and Calabria, sixth of the twelve sons of Tancred de Hauteville, was born at Hauteville near Coutances in Normandy about the year 1015. At an early age he followed into Apulia his three elder brothers William Bras- defer, Drogo, and Humphrey, who had established a foot- ing there as military adventurers ; and in 1053 he took a prominent part in the battle of Civitella, which resulted in the defeat and captivity of Pope Leo IX. On the death of Humphrey in 1057 Robert, who already had earned the sobriquet of "Guiscard" ("Sagacious" or Cunning"), sueceeded to the chief command of the Norman troops, and, already designated by them duke of Apulia and Calabria, was confirmed in that title in 1059 by Pope Nicholas II., who at the same time named him gonfalonier of the church. For the next one-and-twenty years he was continually engaged, along with his youngest brother Roger, in warlike operations against the Greeks and Saracens in the south of the Italian peninsula and in Sicily, the principal events being the capture of Bari in 1070, that of Palermo in the following year, and that of Salerno in 1077. In 1081 he felt himself strong enough to carry his arms abroad against Alexius Commenus, ostensibly on behalf of the deposed emperor Michael Ducas, the father-in-law of his daughter. The defeat of Alexius under the walls of Durazzo in October 1081 was followed by the capture of that place in February 1082, Mb, ee ee eee

1 There were others known by the same name; see Hearne, Pref., p. 58.

and by a victorious march towards Constantinople. But before Robert had reached the capital he was summoned back by Gregory VII, his suzerain, to rescue him from the emperor Henry IV., by whom he was being besieged in Rome. After capturing and sacking the city in May 1084 and conducting Gregory to a place of safety in Salerno, Guiscard resumed his operations against Alexius, defeating the united Greek and Venetian fleets, and raising the siege of Corfu in November 1084. While still engaged in active warfare he died of pestilence at Cephalonia on 17th July 1085. He was succeeded in the dukedom by his younger son Roger Bursa, whose son William died without issue in 1127. Guiscard's eldest son was Marc , BOHEMOND (¢..).

ROBERTS, Davip (1796-1864), landscape painter, was

born at Stockbridge, Edinburgh, on 24th October 1796. At an early age he manifested a great love for art; but his father, a shoemaker, wished him to follow the same trade. He was, however, apprenticed for seven years to a painter and house-decorator ; and during this time he employed is evenings in the earnest study of art. For the next few years his time was divided between work as a house-painter and as a scene-painter, and he even appeared occasionally on the boards as an actor in panto- mimes. In 1820 he formed the acquaintance of Clarkson Stanfield, then painting at the Pantheon, Edinburgh, by whose advice and example he greatly profited and at whose suggestion he began his career as an exhibitor, sending three pictures in 1822 to the "Exhibition of Works by Living Artists," held in Edinburgh. In the same year he removed to London, where he worked for the Coburg Theatre, and was afterwards employed, along with Stanfield, at Drury Lane. In 1824 he exhibited at the British Institution a view of Dryburgh Abbey, and sent two works to the first exhibition of the Society of British Artists, which he had joined, and of which he was elected president in 1831. ' In the same autumn he visited Normandy, and the works which were the results of this excursion began to lay the foundation of the artist's reputation,—one of them, a view of Rouen Cathedral, being sold for eighty guineas. By his scenes for an opera entitled The Seraglio, executed two years later, he won much contemporary praise, and these, along with the scenery for a pantomime dealing with the naval victory of Navarino, and two panoramas executed jointly by him and Stanfield, were among his last work for the theatres. In 1829 he exhibited his imposing subject the Departure of the Israelites from Egypt, a commission from Lord Northwick, in which the style of the painter first becomes clearly apparent ; and three years afterwards he travelled in Spain, and passed over to Tangiers, return- ing in the end of 1833 with a supply of effective sketches, which were speedily elaborated into attractive and popular paintings. His Interior of Seville Cathedral was exhibited in the British Institution in 1834, and sold for £300 ; and he executed a fine series of Spanish illustrations for the Landscape Annual of 1836, a publication to which he con- tributed for four years; while in 1837 a selection of his Picturesque Sketches in Spain was reproduced by

litho- graphy, many of the subjects being carefully retouched on the stone by the artist's own hand.

In 1838 Roberts made a long tour in the East, sailing up the Nile, visiting Luxor and Karnak, and afterwards mnaking his way to the Holy Land. He thus accumulated a vast collection of sketches of a class of scenery which had hitherto been hardly touched by British artists, and which appealed to the public with all the charm of novelty. The next ten years of his life were mainly spent in elaborat- ing these materials. Many Eastern subjects were painted, and an extensive series of drawings was lithographed by Louis Haghe in the superb work, Sketches in the Holy

Land and Syria, 1842-49. In 1851, and again in 1853, Roberts visited Italy, painting the Ducal Palace, Venice, bought by Lord Londesborough, the interior of the Basi- lica of St Peter's, Rome, Christmas Day, 1853, and Rome from the Convent of St Onofrio, presented to the Royal Scottish Academy. His last volume of illustrations, Jtaly, Classical, Historical, and Picturesque, was published in 1859. He also executed, by command of the queen, a picture of the opening of the Great Exhibition of 1851, a laborious and rather uncongenial task. In 1839 he was elected an associate, and in 1841 a full member of the Royal Academy ; and in 1858 he was presented with the freedom of the city of Edinburgh. The last years of his life were occupied with a series of views of London from the Thames. He had executed six of these and was at work upon a picture of St Paul's Cathedral, when on 25th November 1864 he was seized with an attack of apoplexy and expired the same evening.

The quality of Roberts's work is exceedingly equal and uniform during his whole career. The architecture, which is so prominent a feature in his paintings, is introduced with great picturesqueness and an easy command of its salient points, but with little care for the minutie of detail. His art was conventional, essentially scenic and spectacular in character, showing effective composition and an unerring instinct for broad general effect, but destitute of that close adherence to nature, that delicacy and truth of tone and colour, which are becoming increasingly characteristic of the productions of the English school. Something of the scenc-painter

appears in all his works, and his certainty and speed of execution were un- doubtedly founded upon his carly practice for the stage.

A Life of Roberts, compiled from his journals and other sources by James Ballantine, with etchings and pen-and-ink sketches by the artist, appeared in Edinburgh in 1866.

ROBERTSON, Freperick Wittram (1816-1853), one of the most brilliant and influential preachers of modern times, was born in London, on 3d February 1816. The first five years of his life were passed at Leith Fort, where his father, a captain in the Royal Artillery, was then resi- dent. The impressions made upon the child in those early years were never effaced ; the military spirit entered into his blood, and throughout life he was characterized by the qualities of the ideal soldier,—courage, self-devotion, sense of duty, hatred of cruelty and meanness, chivalrous defence of the weak. In 1821 Captain Robertson retired to Beverley, where the boy was educated first at home, then at the grammar-school. At the age of fourteen he spent a year at Tours, from which he returned to Scotland and continued his education at the Edinburgh Academy and university. His father, who had remarked and fostered his singular nobility of character, his passion for purity and truthfulness, and his deepening religious feeling, now proposed that he should choose the church as his profes- sion, but received the decisive answer, "Anything but that ; I am not fit for it." At the age of eighteen he was accordingly articled to a solicitor in Bury St Edmunds, but the uncongenial and sedentary employment broke down his health in a year's time. It was then resolved to yield to his deep-rooted craving for a military career: his name was placed upon the list of the 3d Dragoons then serving in India, and for two years he devoted himself with ardour to the work of preparing for the army. But, by a singular conjuncture of circumstances and at the sacrifice of his own natural bent to his father's wish, he matriculated at Braze- nose College, Oxford, just two weeks before his commis- sion was put into his hands. Oxford he did not find wholly congenial to his intensely earnest spirit, but he read hard, and, as he afterwards said, 'Plato, Aristotle, Butler, Thucydides, Sterne, Jonathan Edwards, passed like the iron atoms of the blood into my mental constitution." At the same time he made a careful study of the Bible, committing to memory the

entire New Testament both in English and in Greek. The Tractarian movement had no attraction for him, although he admired some of its

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full, vivid, and penetrating mind. He was not, indecd, a scientific theologian ; but his insight into the principles of the spiritual life is unrivalled ; and for men approaching the truth from the same side as himself he is an invaluable guide. His own lonely and in- dependent struggle had taught him where foothold was secure, and had enabled him to throw light on many a forgotten stepping-stone of truth. As his biographer says, thousands have found in his sermons "a living source of impulse, a practical direction of thought, a key to many of the problems of theology, and above all a path to spiritual freedom." In his hands spiritual facts assume an aspect of reasonableness which is irresistible. Religion is felt to be no longer a mystery for the cxercise of professional minds, nor an extravagance suitable for enthusiastic temperaments, but an essen- tial of life for all, and in line with the order of things in which we now are. For his sermons obtained their large circulation partly because they were new in kind. They marked the transition from the period in which religion was treated as a series of propositions

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leaders. He was at this time a moderate Calvinist in doc- trine and enthusiastically evangelical. Ordained in July 1840 by the bishop of Winchester, he at once entered on ministerial work in that city, and during his ministry there and under the influence of Martyn and Brainerd, whose lives he affectionately studied, he carried devotional asceticism to an injurious length, rising early, refraining from meat, subduing his nature by self-imposed austerities, and binding himself to a system of prayer. In less than a year he was compelled to seek relaxation; and going to Switzerland he there met and married Helen, third daughter of Sir George William Denys, Bart. Early in 1842, after a few months' rest, he accepted a curacy in

Cheltenham, which he retained for upwards of four years. "Tt was during this period that the basis of his theological science was entirely changed;

his principles of thought attained, but not as yet systematized ; his system of inter- preting the Bible reduced to order ; his whole view of the relation of God to man and man to God built up into a new temple on the ruins of the old." The questioning spirit was first aroused in him by the disappointing fruit of evangelical doctrine which he found in Cheltenham, as well as by intimacy with men of varied reading. But, if we are to judge from his own statement, the doubts which now actively assailed him had long been latent in his mind: "a man who had read theological and philosophical controversy long before with painful interest—a man who at different times had lived in the atmosphere of thought in which Jonathan Edwards, Plato, Lucretius, Thomas Brown, Carlyle, Emerson, and Fichte lived—who has steeped his soul and memory in Byron's strongest feel- ings—who has walked with Newman years ago to the brink of an awful precipice, and chosen rather to look upon it calmly, and know the worst of the secrets of the darkness, than recoil with Newman, in fear and tender- ness, back to the infallibility of Romanism—such a man is not likely to have been influenced by a few casual state- ments of difficulties which he had read of a thousand times before." This was written from Heidelberg in 1846. The crisis of his mental conflict had just been passed in Tyrol, and he was now beginning to let his creed grow again from the one fixed point which nothing had availed to shift: "the one great certainty to which, in the midst of the darkest doubt, I never ceased to cling —the entire symmetry and loveliness and the unequalled nobleness of the humanity of the Son of Man." After this mental revolution he felt unable to return to Cheltenham, but after doing duty for two months at St Ebbe's, Oxford, he entered in August 1847 on his famous ministry at Trinity Chapel, Brighton. Here he stepped at once into the foremost rank asa preacher. His church was thronged with thoughtful men of all classes in society and of all shades of religious belief, with those also who relished brilliant and sometimes impassioned oratory, and with those who felt their need of sympathetic and helpful teach- ing. But his closing years were full of sadness. His sensi- tive nature was subjected to extreme suffering, partly from the misconstruction and hatred of the society in which he lived, partly from his inability to accomplish the heavy work of his position. He was crippled by incipient disease of the brain, which at first inflicted unconquerable lassitude and depression, and latterly agonizing pam. On

the 5th June 1853 he preached for the last time; and on the 15th August of the same year, at the age of thirty-seven, he found relief in death.

The causes of his success as a preacher are obvious. His fine ap- pearance, his flexible and sympathetic voice, his manifest sincerity, the perfect lucidity and artistic symmetry of his address, and the brilliance with which he illustrated his points would have attracted hearers even had he had little to say. But he had much to say. No sermons were ever more compact. They were the utterance of a

to that in which it is presented as an essence penetrating the whole of human life. The accusations of heretical and dangerous teaching

which were persistently brought against him, though possibly not so malignant as he himself supposed, were certainly more mis-

chievous than the teaching against which they were levelled. Few men have ever more perfectly understood the spirit of Christ, and

few have so fully made that spirit their own.

Robertson's literary remains include five volumes of sermons, two volumes of expository lectures, on Genesis and on the Epistles to the Corinthians, a volume of miscellaneous addresses, and a Key to 'In Memoriam. Robertson's Life has been written by Stopford A. Brooke. (M. D.)

ROBERTSON, THomas Witt1am (1829-1871), English dramatist, was born on 9th January 1829. Asa dramatist he had a brief but very brilliant career. It is not too much to say that he was the most successful and distin- guished writer of plays in his generation. The son of a provincial actor and manager, chief of a "circuit" that ranged from Bristol to Cambridge, Robertson was familiar with the stage from his childhood ; but it was not till the last seven years of his life that he made his mark. He was never, as he admitted himself, very successful as an actor. He tried his hand also at writing plays, and a farcical comedy by him, A Wight's Adventure, was produced at the Olympic under Farren's management as early as 1851. But this did not make good his footing, and he remained

for some years longer in the provinces, varying his work as an actor with miscellaneous contributions to newspapers. In 1860 he went to London with the inten- tion, it is said, of making his living by journalism and light literature. He edited a mining journal and con- tributed to it a novel afterwards dramatized with the title Shadow Tree Shaft. He wrote a farce entitled A Cantad, which was played at the Strand in 1861. Then, in 1864, came his first marked success, David Garrick, produced at the Haymarket with Sothern in the principal character. It was not, however, till the production of Society at the Prince of Wales Theatre in 1865, under the management of Miss Marie Wilton, afterwards Mrs Bancroft, that the originality and cleverness of the dramatist were fully recognized. Play-writer and company were exactly suited one to another; the plays and the acting together—the small size of the playhouse being also in their favour —were at once recognized as a new thing, and, while some critics sneered at the "cup-and-saucer comedy," voted it absurdly realistic, said there was nothing in it but commonplace life represented without a trace of Sheridanian wit and sparkle, all London flocked to the little house in Totten- ham Street, and the stage was at once inundated with imi- tations of the new style of acting and the new kind of play.

Robertson, although his health was already undermined, followed up Society in quick succession with the series of characteristic plays which made the reputation of himself, the company, and the theatre. Ours was produced in 1866, Caste in 1867, Play in 1868, School in 1869, U.P. in 1870. For twenty years there probably has not been a week, hardly a night, in which some one of Robertson's plays has not been produced somewhere in Great Britain,

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and still they show no sign of abating popularity. The masterly stage-craft is undoubtedly one of the elements in this remarkable conquest of the play-going public; the purity and generous morality of the plays another; the dialogue—which is always bright and clever, without any straining after or indeed much attaining to wit—a third ; the humour, distinctness, and typical representativeness of the characters a fourth. That there is more art and individuality in the plays than critics at first were willing to

admit is clear from the fact that none of Robertson's numerous imitators have succeeded in catching his happy knack. Another proof of something like genius—dramatic genius if not literary genius—is the skill with which he repeats the same idea with such variations that each time it 1s as fresh as if it were new. Again and again his situations owe their point to the contrast between generous kindness of heart and sordid worldliness, or between the ardent trustful affections of youth and the cynicism of disenchanted middle age. Pleasant sunny brightness and ingenuity within a narrow range constitute Robertson's distinction rather than breadth or fertility or striking bril- liancy of wit. He knew his powers and worked steadily within them, not striving to go beyond. With the excep- tion of David Garrick and Home, written for the Hay- market, and Dreams for the Gaiety, all his well-known plays were written for the Prince of Wales Theatre, with which his distinctive style of comedy is identified. Un- happily he did not live long to enjoy his success, but died in London in February 1871.

ROBERTSON, Wituiam (1721-1793), an eminent Scottish historian, born at Borthwick, Midlothian, on the 19th September 1721, was the eldest son of the Rev. William Robertson and of Eleanor Pitcairn. He received his early education at the school of Dalkeith,—at that time one of the best in Scotland; but at the age of twelve he was removed to the university of Edinburgh, where he soon manifested that sustained ardour in the pursuit of knowledge which he preserved throughout his long life. On his commonplace books, written when he was a mere youth, he always inscribed the motto: Vita sine literis mors est. He was from the first intended for the ministry; when twe.icy-two years old he was presented to the living of Gladsmuir in East Lothian, and almost immediately afterwards he lost both his father and his mother, who died within a few hours of each other. The support and education of a younger brother and six sisters then de- volved upon him, and, though his income was only £100 a year, he sheltered them all in his house and "continued to educate his sisters under his own roof till they were settled respectably in the world" (Stewart). Robertson's inclination for study was never allowed to interfere with his duties as a parish minister, which he rather increased than diminished: "it was his custom during the summer months to convene on Sunday morning the youth of the parish of Gladsmuir half an

hour before the commence- ment of the regular service of the church, and to employ that time in explaining to them the doctrines of the Catechism." His attention to his pastoral duties and his power and distinction as a preacher had made him a local celebrity while still a young man.

His energy and decision of character were brought out vividly by the rebellion of 1745. When Edinburgh seemed in danger of falling into the hands of the rebels he laid aside the pacific habits of his profession and joined the volunteers in the capital, When the city was surrendered he was one of the small band who repaired to Haddington and offered their services to the com- mander of the royal forces. Such a man could not remain in obscurity, and in the year 1751, when not quite thirty years of age, we find him already taking a prominent part

in the business of the General Assembly. On the first occasion when he spoke (in seconding a motion by John Home for the suspension of certain presbyters who had refused to take part in an unpopular settlement) he was listened to with great attention, but his words had so little immediate effect on the assembly that on a division he was left in a minority of eleven against two hundred. A young man might well have been daunted by such a defeat, but his energy and self-reliance refused to yield. His great oratorical power, at once lucid, cogent, and per- suasive, had made an impression on men's minds, and within so short a period as one year, when he again advocated his principles in connexion with what is known as the Inverkeithing case, he carried the house completely with him, and with the deposition of Thomas Gillespie secured a triumph for the policy he had adopted. From that moment his influence in the councils of the Scottish Church as leader of the "moderate party " was for many years nearly supreme (compare PRESBYTERIANISM, vol. xix. p. 685). The production of Home's tragedy of Douglas on the Edinburgh stage (1757) afforded Robertson another occasion for displaying that union of courage and caution which formed a marked feature of his character. Al- though the influence of moderatism was now visibly in the ascendant, there was still enough of the older spirit of Scottish Puritanism left to take alarm and raise an outcry against a stage play written by a minister and

witnessed by many clergymen who were the author's friends. One of these, the famous Dr Alexander Carlyle, was prosecuted before the synod for having gone to the theatre, and he tells us in his Autobiography that he purposely contrived to exclude Robertson from the post of moderator because "his speaking would be of more consequence if not in the chair." This testimony is the more noteworthy as Carlyle shows throughout his memoirs a grudging and unfriendly tone when speaking of Robertson. The latter, indeed, was able to render his incriminated colleague great service on this occasion, not only by his talent as a speaker, but by reason of the detached and unassailable position which his customary prudence had led him to take up. He never went to the play himself, he said, but that was not because he thought it wrong but because he had given a solemn promise to his father never to do so. He could not there- fore join in censuring other clergymen who were held by no such vow as he had made: "it was sacred to him, but not obligatory on them." Carlyle was acquitted and Robertson had the credit—which he perhaps somewhat too constantly aimed at and generally secured—of standing well with all parties, of advocating the claims of culture and liberal sentiment without giving ground to their opponents for attacking his personal conduct and character.

But during all this period of prominent activity in the public life of Edinburgh Robertson was busy with those historical labours which have given him a permanent place in British literature. He had conceived the plan of his History of Scotland as early as the year 1753; in July 1757 he had proceeded as far as the Gowrie conspiracy, and in November of the following year David Hume, then residing in London, was receiving the proof-sheets from Strahan and making friendly but searching criticisms on the work in letters to the author, Till he had finished his book Robertson had never left his native country ; but the publication of his history necessitated a journey to London, and he passed the early months of the year 1758 partly in the capital and partly in leisurely rambles in the counties of England. Hereturned on horseback in company with Alexander Carlyle and other Scotsmen, riding all the way from London to Edinburgh in about eighteen days.

The success of the Listory of Scotland was immediate and splendid, and within a month a second edition was

called for. Before the end of the author's life the book had reached its fourteenth edition; and in the opinion of some it remains Robertson's greatest work. It soon brought him other rewards than literary fame. In 1759 he was appointed chaplain of Stirling Castle, in 1761 one of His Majesty's chaplains in ordinary, and in 1762 he was chosen principal of the university of Edinburgh. Two years latcr the office of king's historiographer was revived in his favour with a salary of £200 a year. His income greatly surpassed the revenue of any Presbyterian minister before him and at least equalled that of some of the bishops when Episcopacy was established in Scotland. It is the more surprising therefore that this moment of exceptional prosperity should have been chosen by some of his most valued friends to advise him to forsake the Scottish for the English Church and try for preferment south of the Tweed; and the surprise becomes wonder when we learn that those friends were Sir Gilbert Elliot and David Hume. The imprudence, to say nothing of the questionable morality, of such a step would seem too glaring to allow of its recommendation by any honourable well-wishers. Perhaps no man was more fitted than Robertson to measure and reject such injudicious advice, and he probably never gave the matter a second thought. He remained at home among his own people.

The rest of Robertson's life was uneventful to a degree even surpassing the proverbial uneventfulness of the lives of scholars. He was casting about for another historical subject in the very year in which his first work appeared, and he was wont to consult his friends on the choice of a period with a naiveté which shows how little the arduous- ness of historical research was then understood. Hume advised him to write a history of Greece or else lives in the manner of Plutarch. Dr John Blair urged him to write a complete history of England, while Horace Wal- pole suggested a history of learning. It must be recorded to Robertson's credit that he showed a preference from the first for the subject which he ultimately selected, 7'he History of the Reign of the Emperor Charles the

Fifth. He took uncommon pains with the work and devoted to it ten consecutive years of labour. It appeared in three volumes quaito in 1769. In 1777 he published his Z/istory of America and in 1791 his Disqwisition concerning the Knowledge which the Ancients had of India, which concluded his historical labours and appeared only two years before his death, which occurred near Edinburgh on the I1th June 1793. His fame had long been European, and he left no rival in the field of historical composition save Gibbon alone.

For an adequate appreciation of Robertson's position in British literature, and more especially of his rank as an historian, we have to consider the country and the age in which he was born and his own personal qualities and limits.

Considering the small size and poverty of the country, Scotland had made a more than creditable figure in litera- ture in the great age of the Reformation and the Renais- sance. Its scholars, civilians, and professors of logic and philosophy were welcomed wherever learning flourished, except, perhaps, in England. All Europe could not show a more brilliant writer and publicist than Buchanan, and "the best romance that ever was written" (the words are Cowper's) was produced by a Scottish contemporary of Shakespeare, viz., the once famous Argenis of John Barclay. But the early triumphs of Scottish genius were all won in a foreign if familiar idiom, the common language of the learned; and when Latin retreated before the growing importance of modern tongues the Scots had no literary vernacular on which to fall back. For a century and a half (1600-1750) a Scottish writer to be read was forced to

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use a foreign language,—Latin, English, and even occasion- ally French. As Burton! has well remarked, this alone was sufficient to account in a large measure for the hterary barrenness of the country. There was unquestionably another cause at work,—the fervent religious zeal with which the principles of the Reformation had been em- braced: neither science, literature, nor art could obtaim much attention from men who

regarded them all as " de- ceitful vanities," leading the mind away from the one thing In a small and sparsely peopled country, with- out wealth, commerce, or even politics in the larger sense, theology became a too absorbing and unique mental stimu- lus. This was, we may say, proved by the fact that as soon as the union with England opened a wider scope for Scottish energy and enterprise the theological temperature immediately fell,—a change witnessed with natural alarm by the more zealous clergy. "The rise of our too great fondness for trade," writes the Rev. Robert Wodrow in 1709, "to the neglect of our more valuable interests, I humbly think, will be written on our judgment" (Buckle, vol. ii, p. 301). The growth of wealth stimulated the

growth of the other great factor of civilization, that of knowledge, and by the middle of the 18th century, just

at the time when Robertson was planning his History of Scotland, a wide spirit of inquiry was abroad. Scottish intellect had risen from the tomb in which it had lain entranced for more than a hundred years. The Scottish contribution to British literature in the last half of the century is distinctly superior to that produced in the southern portion of the island. In philosophy and political

and economic science the balance is immensely in favour

of Scotland. Robertson was therefore no inexplicable prodigy—an "obscure Scotch parson" writing "hike a

minister of state," as it pleased Walpole and the London fops to regard him. He lived in a society far more pro- pitious to high literary work than could be found in London

or the English universities.

The connexion between philosophy and history is closer than appears at first sight. The study of man and his faculties, even ontological speculations as to the nature and origin of the universe, lead by a logical sequence to a consideration of human evolution in time, that is, to history. The coincidence of philosophical speculation with historical achievement

so repeatedly manifested can- not be accidental. The topic cannot be developed here ; but from the days of the Attic historians, who lived in an atmosphere electric with speculation, to the Hegelian historical school of Germany, the higher planes of history are found in near proximity to loftier peaks of philosophy. Hume, wonderful in all things, was perhaps most wonder- ful in this, that in him the two characters of the philo- sopher and the historian were completely united. He did not only, like Kant and Hegel, speculate about history ; he wrote it. Again, we must admire the peculiar fortune of Robertson : he lived during many years in close contact and intimacy with the greatest philosophic genius of his age, perhaps of modern times.

Of the three great British historians of the 18th century two were Scotsmen. The exact place of Robertson with regard to his two friends Hume and Gibbon, and to such historians as the rest of Europe had to offer, presents a question of some nicety, because it is complicated by extraneous considerations, so to speak, which should not weigh in an abstract estimate, but cannot be excluded in a concrete and practical one. If we regard only Robert- son's potential historic power, the question is not so much whether he was equal to either of his two friends as whether he was not superior to both. The man who wrote the review of the state of Europe prefixed to the

Y Wist. of Scotland, vol, viii. p. 544. J

History of Charles V., or even the first book of the History of Scotland, showed that he had a wider and more synthetic conception of history than either the author of the Decline and Fall or the author of the History of England. These two portions of Robertson's work, with all their short- comings in the eye of modern criticism, have a distinctive value which time cannot take away. He was one of the first to see the importance of general ideas in history. He saw that the immediate narrative of events with which he was occupied needed a background of broad and con- nected generalizations, referring to the social state of which the detailed history formed a part. But he did more than this. In the appendix to the view of Europe called "Proofs and Illustrations" he enters into the

difficult and obscure question of land tenure in Frankish times, and of the origin of the feudal system, with a sagacity and knowledge which distinctly advanced the comprehension of this period beyond the point at which it had been left by Du Bos, Montesquieu, and Mably. He was fully acquainted with the original documents,—many of them, we may conjecture, not easy to procure in Scotland. It must have been a genuine aptitude for historical research of a scientific kind which led Robertson to undertake the labour of these austere disquisitions of which there were not many in his day who saw the importance. Gibbon, so superior to him for wide reading and scholarship, has pointedly avoided them. It need hardly be said that many, perhaps the majority, of Robertson's views on this thorny topic are out of date now. But he deserves the honour of a pioneer in one of the most obscure if also important lines of inquiry connected with European history. On the other hand, it must be admitted that he showed himself only too tame a follower of Voltaire in his general appreciation of the Middle Ages, which he regarded with the mingled ignorance and prejudice common in the 18th century. In this particular he was not at all in advance of his age.

The neglect and gradual oblivion which are now over- taking the greater part of Robertson's historical work are owing to no fault of his. He had not and could not have the requisite materials: they were not published or access- ible. Justice requires that we should estimate his per- formance in view of the means at his command, and few critics would hesitate to subscribe to the verdict of Buckle, "that what he effected with his materials was wonderful." His style, whether of narrative or disquisition, is singularly clear, harmonious, and persuasive. The most serious re- proach made against it is that it is correct to a fault and lacks idiomatic vigour, and the charge is not without foundation. But there can be no doubt that, if Robertson's writings are less read than they formerly were, the fact is to be attributed to no defects of style but to the growth of knowledge and to the immense extension of historical research which has inevitably superseded his initiatory and meritorious labours. (gs. ©. MO.)

ROBERVAL, GiiiEs PERSONNE DE (1602-1675), French mathematician, was born at the village of Roberval near Beauvais in 1602. His name was originally Gilles Per- sonne, that of Roberval, by

which he is known, being taken from the place of his birth. Like Descartes, he was present at the siege of La Rochelle in 1627. In the same year le went to Paris, where he was appointed to the chair of philosophy in the Gervais College in 1631, and after- wards to the chair of mathematics in the Royal College of France. A condition of tenure attached to this chair was that the holder should propose mathematical questions for solution, and should resign in favour of any person who solved them better than himself; but, notwithstanding this, Roberval was able to keep the chair till his death, which occurred at Paris in 1675.

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Roberval was one of those mathematicians who, just before the invention of the calculus, occupied their attention with problems which are only soluble, or can be most easily solved, by some method involving limits or infinitesimals, and in the solution of which accordingly the calculus is always now employed. Thus he devoted some attention to the quadrature of curves and the cuba- ture of surfaces, which- he accomplished, in some of the simpler cases, by a method of his own, called by himself the " Method of Indivisibles" ; but he lost much of the credit of the discovery as he kept his method for his own use, while Cavalieri published a similar method of his own. Another of Roberval's discoveries was a very general method of drawing tangents, by considering a curve as described by a moving point whose motion is the resultant of several simpler motions. His own description of his method may be translated as follows :—" General rule. By means of the specific properties of the curve, which will be given, examine the different motions of the tracing point at the place where you wish to draw the tangent; the direction of the tangent is that of the resultant of these motions." He also discovered a method of deriving one curve from another, by means of which finite areas can be obtained equal to the areas between certain curves and their asymptotes. To these curves, which were also applied to effect some quadratures, Torricelli gave the name of Robervallian lines. Between Roberval and Descartes there existed a feeling of ill-will, owing to the jealousy aroused in the mind of the former by the criticism which Descartes offered to some of the methods employed by him and by Fermat ; and this led him to criticize and oppose the new geometry which Descartes introduced about this time.

As results of Roberval's labours outside the department of pure mathematics may be noted a work on the system of the universe, in which he supports the Copernican system and attributes a mutual attraction to all par- ticles of matter; and also the invention of a special kind of balance which goes by his name (see BALANCE, vol. ili. p. 266).

ROBESPIERRE, Maximiren Marre Istpore (1758- 1794), the most fanatical and most famous of the repub- lican leaders of the French Revolution, was born at Arras on 6th May 1758. His family was of Irish descent, having emigrated from Ireland at the time of the Reformation on account of religion, and his direct ancestors in the male line had been notaries at the little village of Carvin near Arras from the beginning of the 17th century. His grand- father, being more ambitious, established himself at Arras as an avocat; and his father followed the same profession, marrying Mademoiselle Josephine Carraut, daughter of a brewer in the same city, in 1757. Of this marriage four children were born, two sons and two daughters, of whom Maximilien was the eldest ; but in 1767 Madame Derobes- pierre, as the name was then spelt, died, and the discon- solate widower at once left Arras and wandered about Europe until his death at Munich in 1769. The children were taken charge of by their maternal grandfather and aunts, and Maximilien was sent to the college of Arras, whence he was nominated in 1770 by the bishop of his native town to a bursarship at the Collége Louis-le-Grand at Paris. Here he had for fellow-pupils Camille Des- moulins and Stanislas Fréron. Completing his law studies with distinction, and having been admitted an avocat in 1781, Robespierre returned to his native city to seek for practice, and to struggle against poverty. His reputa- tion had already preceded him, and the bishop of Arras, M. de Conzié, appointed him criminal judge in the diocese of Arras in March 1782. This appointment, which he soon resigned, to avoid pronouncing a sentence of death, did not prevent his practising at the bar, and he speedily became known as a careful and painstaking advocate. His argument in the question of the legality of paraton- nerres or lightning-conductors, which was widely reported and translated into both English and German, raised his fame as an advocate to its height, and with this success his struggles against poverty were over. He now turned to the pleasures of literature and society and came to be esteemed as one of the best writers and most popular

dandies of Arras. In December 1783 he was elected a member of the academy of Arras, whose meetings he attended regularly ; and, like all other young Frenchmen with literary proclivities, he began to compete for the

prizes offered by various provincial academies. In 1784 he obtained a medal from the academy of Metz for his essay on the question whether the relatives of a condemned criminal should also be punished; but the prize was awarded to Lacretelle atné, an avocat and journalist at Paris, who triumphed again over his provincial antagonist in the Parisian press, and who in after days when Robes- pierre was all-powerful was surprised that he was not sent to the guillotine. An éloge on Gresset, the author of Vert-Vert and Le Méchant, written for the academy of Amiens in 1785, was not more successful; but Robespierre was compensated for these failures by his great popularity – in the society of the Rosati at Arras,—a little society whose members prided themselves on being men of fashion and wit, and spent one evening a week in conviviality and in read- ing poems, epigrams, and vers de société. There the sympa- thetic quality of Robespierre's voice, which afterwards did him such good service in the Jacobin Club, always caused his indifferent verses to be loudly applauded by his friends.

Such had been the life of the future republican leader up to 1788, when he took part in the discussion as to the way in which the states-general should be elected, showing clearly and forcibly in his Adresse & la Nation Artésienne that, if the former mode of election by the members of the provincial estates was again adopted, the new states- general would not represent the people of France. Necker also perceived this, and therefore determined to make the old royal bailliages and séné-chaussées the units of election. Under this plan the city of Arras was to return twenty- four members to the assembly of the bailliage of Artois, which was to elect the deputies. The corporation claimed the right to a preponderating influence in these city elec- tions, and Robespierre headed the opposition, making him- self very conspicuous and drawing up the cahier or table of

complaints and grievances, for the guild of the cobblers. Although the leading members of the corporation were elected, their chief opponent succeeded in getting elected with them. In the assembly of the bailliage rivalry ran still higher, but Robespierre had already made his mark in politics ; by the Avis aux Habitants de Campagne (Arras, 1789), which is almost certainly by him, he secured the support of the country electors, and, though but thirty years of age, poor, and without influence, he was elected fifth deputy of the tiers état of Artois to the states-general.

When the states-general met at Versailles on 5th May 1789, the young deputy of Artois already possessed the one faculty which was to lead him to supremacy : he was a fanatic. As Mirabeau said, "That young man believes what he says; he will go far." Without the courage and wide tolerance which make a statesman, without the greatest qualities of an orator, without the belief in himself which marks a great man, nervous, timid, and suspicious, Robespierre yet believed in the doctrines of Rousseau with all his heart, and would have gone to death for them; and in the belief that they would eventually succeed and regenerate France and mankind he was ready to work with unwearied patience. While the constituent assembly occupied itself in drawing up an unworkable constitu- tion as the grand panacea, Robespierre turned from the assembly of provincial avocats and wealthy bourgeois to the people of Paris. However, he spoke frequently in the constituent assembly, and often with great success, and was eventually recognized as second only to Pétion de Villeneuve—if second to him—asa leader of the small body of the extreme left,—the thirty voices, as Mirabeau con- temptuously called them. It is hardly necessary to exa- mine minutely Robespierre's speeches and behaviour before Li 91, when the death of Mirabeau left the way clear for the influence of his party; but what is noteworthy, as proving the religious cast of his mind and his belief in the

necessity of a religion, is that he spoke several times in favour of the lower clergy and laboured to get their pensions increased. When he instinctively felt that his doctrines would have no success in the assembly, he turned to the Jacobin Club, which had consisted originally of the

Breton deputies only, but which, after the assembly moved to Paris, began to admit among its members various leaders of the Parisian bourgeoisie. As time went on, many of the more intelligent artisans and petits commergants became members of the club, and among such men Robespierre found the hearers he sought. They did more than listen to him: they idolized him ; the fanatical leader had found fanatics to follow him, and their ultimate supremacy be- came merely a question of time. As the wealthier bour- geois of Paris and deputies of a more moderate type seceded to the club of '89 the influence of the old leaders of the Jacobins (Barnave, Duport, Charles de Lameth) diminished ; and, when they themselves, alarmed at the progress of the Revolution, founded the club of the Feuillants in 1791, the followers of Robespierre dominated the Jacobin Club. The death of Mirabeau strengthened Robespierre's influence in the assembly; but in May 1791 he proved his lack of statesmanlike insight and his jealous suspicion of his colleagues by proposing and carrying the motion that no deputies who sat in the constituent could sit in the succeeding assembly. The flight of the king on 21st June and his arrest at Varennes excited Robespierre's suspicions, and made him declare himself at the Jacobin Club to be "ni monarchiste ni republicain." But the vigorous conduct of Lafayette and the National Guard on the Champ de Mars on 17th July 1791 terrified him, for he believed that he was a predestined victim, until he was succoured by Duplay, a cabinetmaker in the Rue St Honoré, and an ardent admirer of his, in whose house he lived (with but two short intervals) till his death. At last came his day of triumph, when on 30th September, on the dissolution of the constituent assembly, the people of Paris crowned Pétion and himself as the two incorrupt- ible patriots.

On the dissolution of the assembly he returned for a short visit to Arras, where he met with a triumphant re- ception. In November he returned to Paris, and on 18th December made a speech which marks a new epoch in his life. Brissot, the dme politique of the Girondin party which had been formed in the legislative assembly, urged vehemently that war should be declared against Austria, and the queen was equally urgent in the hope that a vic- torious army might restore the old absolutism of the Bour- bons. Two men opposed the projects of the queen and the Girondins,—Marat and Robespierre: Marat opposed them for statesmanlike reasons

(see Marat), and Robes- pierre on humanitary grounds and because as a follower of Rousseau he disliked war. This opposition from those whom they had expected to aid them irritated the Giron- dins greatly, and from that moment began the struggle which ended in the coups @état of 31st May and 2d June 1793. Guadet accused Robespierre of superstition in be- lieving in a providence, and declared that, as the people's idol, he ought to ostracize himself for the good of his country. Robespierre persisted in his opposition to the war, and the Girondins, especially Brissot, attacked him so violently that in April 1792 he resigned the post of public prosecutor at the tribunal of Paris, which he had held since February, and started a journal, Le Defenseur de la Constitution, in his own defence. It is noteworthy that during the summer months of 1792, in which the fate of the Bourbon dynasty was being sealed, neither the Girondins in the legislative assembly nor Robespierre took any active part in overthrowing it. Stronger men with practical instincts of statesmanship, like Danton and

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PBillaud-Varenne, who were not afraid of blood, and who dared to look facts in the face and take the responsibility of doing while others were talking, were the men who made the 10th of August and took the Tuileries. The Girondins, however, were quite ready to take advantage of the accomplished fact ; and Robespierre, likewise, though shocked at the shedding of blood, was willing to take his seat on the commune of Paris, which had overthrown Louis XVI., and might check the Girondins. The strong men of the commune were glad to have Robespierre's assistance, not because they cared for him or believed in him, but because of the help got from his popularity, his reputation for virtue, and his influence over the Jacobin Club and its branches, which spread all over France. He it was who presented the petition of the commune of Paris on 16th August to the legislative assembly, demand- ing the establishment of a revolutionary tribunal and the summons of a convention. The massacres of September in the prisons, which Robespierre in vain attempted to stop, showed that the commune had more confidence in Billaud than in him. Yet, as a proof of his personal popularity, he was a few days later elected first deputy for Paris to the national convention.

On the meeting of the convention the Girondins im- mediately attacked Robespierre ; they were jealous of his popularity and knew that his single-hearted fanaticism would never forgive their intrigues with the king at the end of July, and would always be opposed to their plans for raising the duke of Orleans to the throne. As early as 26th September the Girondin Lasource accused him of aiming at the dictatorship ; afterwards he was informed that Marat, Danton, and himself were plotting to become triumvirs ; and eventually on 29th October Louvet attacked him in a studied and declamatory harangue, abounding in ridiculous falsehoods and obviously concocted in Madame Roland's boudoir. But Robespierre had no difficulty in rebutting this attack (5th November). All personal dis-putes, however, gave way by the month of December 1792 before the great question of the king's trial, and here Robespierre took up a position which is at least easily understood. These are his words spoken on 3d December: "This is no trial; Louis is not a prisoner at the bar; you are not judges; you are—you cannot but be statesmen, and the representatives of the nation. You have not to pass 'sentence for or against a single man, but you have to take a resolution on a question of the public safety, and to decide a question of national foresight. It is with regret that I pronounce the fatal truth ; Louis ought to perish rather than a hundred thousand virtuous citizens; Louis must die, that the country may live." This great question settled by the king's execution, the struggle between Robespierre and the Girondins entered upon a more acute stage, and the want of statesmanship among the latter threw upon the side of the fanatical Robespierre Danton and all those strong practical men who cared little for personal questions, and whose only desire was the victory of France in her great struggle with Europe. Had it been at all possible to act with that group of men of genius whom history calls the Girondins, Danton, Carnot, Robert Lindet, and even Billaud-Varenne would have sooner thrown in their lot with them than with Robespierre, whom they thoroughly understood ; but the Girondins, spurred on by Madame Roland, refused to have anything to do with Danton. Government became impossible; the federalist idea, which would have broken France to pieces in the very face of the enemy, grew and flourished, and the men of action had to take a decided part. In the month of May 1793 Camille Desmoulins, acting under the inspiration of Robespierre and Danton, published his Histoire des Brissotins and Brissot dévoilé ;

Isnard declared that Paris must be destroyed; Robespierre preached insurrection at the Jacobin Club; and on 31st May and 2d June the commune of Paris destroyed the Girondin party. For a moment it seemed as if France would avenge them; but patriotism was stronger than federalism. The defence of Lyons only exasperated the men who were working for France, and the armies who were fighting for her, and on 27th July 1793, when the struggle was practically decided, the convention elected Robespierre to the committee of public safety.

This election marks an important epoch, not only in the life of Robespierre, but in the history of the Revolution. Danton and the men of action had throughout the last two years of the crisis, as Mirabeau had in the first two years, seen that the one great need of France, if she was to see the end of her troubles without the interference of foreign armies, was the existence of a strong executive government. The means for establishing the much-needed strong executive were found in the committee of public safety. The success of this committee in suppressing the Norman insurrection had confirmed the majority of the convention in the expediency of strengthening its powers, and the committee of general security which sat beside it was also strengthened and given the entire management of the internal police of the country. When Danton, who had been a member of the committee from April to 10th July 1793, left it Robespierre was elected ; and it was not until then that he became one of the actual rulers of France. Indeed the committee was not finally constituted until the 13th of September, when the last two of the "great" twelve who held office until July 1794 were elected. Of these twelve at least seven, Carnot, Billaud-Varenne, Collot d'Herbois, Prieur (of the Marne), Prieur (of the Céte d'Or), Jean Bon Saint-André, and Robert Lindet, were essentially men of action, all of whom despised rather than feared Robespierre owing to his sup- posed timidity, and were entirely free from his influence. Of the other four Hérault de Séchelles was a professed adherent of Danton; Barére was an eloquent Provengal, who was ready to be the spokesman to the convention of any view which the majority of the committee might adopt; and only Couthon and Saint-Just shared Robes- pierre's political enthusiasm for the regeneration of

France by the gospel of Rousseau. It is necessary to dwell upon the fact that Robespierre was always in a minority in the great committee in order to absolve him from the blame of being the inventor of the enormities of the Terror, as well as to deprive him of the glory of the gallant stand made against Europe in arms.

After this examination of Robespierre's position it is not necessary to investigate closely every act of the great committee during the year which was pre-eminently the year of the Terror; the biographer is rather called upon to examine his personal position with regard to the estab- lishment of the Terror and the fall of the Hébertists and Dantonists, and then to dwell upon the last three months in which he stood almost alone trying to work up an effective counterbalance to the power of the majority of the great committee. The Terror was the embodiment of the idea of Danton, that it was necessary to have resort to extreme measures to keep France united and strong at home in order to meet successfully her enemies upon the frontier. This idea was systematized by the committee of public safety, or rather by two members of it acting for the majority, Billaud-Varenne and Collot d'Herbois, with- out much consideration as to who were to be the victims. With the actual organization of the Terror Robespierre had little or nothing to do; its two great engines, the revolu- tionary tribunal and the absolute power in the provinces of the representatives on mission, were in existence before he

joined the committee of public safety, and the laws of the maximum and of the suspects were by no means of his creation. The reason why he is almost universally regarded as its creator and the dominant spirit in the committee of public safety is not hard to discover. Men like Carnot and Billaud-Varenne were not conspicuous speakers in the convention, nor were they the idols of any section of the populace; but Robespierre had a fanatical following among the Jacobins and was admittedly the most popular orator in the: convention. His panegyrics on the system of revolutionary government and his praise of virtue led his hearers to believe that the system of-the Terror, instead of being monstrous, was absolutely laudable ; his pure life and admitted incorruptibility threw a

lustre on the com- mittee of which he was a member; and his colleagues offered no opposition to his posing as their representative and reflecting some of his personal popularity upon them so long as he did not interfere with their work. Moreover, he alone never left Paris, whilst all the others, except Barére, were constantly engaged on missions to the armies, the navy, and the provinces. It has been asserted that Robespierre, Couthon, and Saint-Just took upon them- selves the direction of "la haute politique," while the other members acted only in subordinate capacities; un- doubtedly it would have suited Robespierre to have had this believed, but as a matter of fact he was in no way especially trusted in matters of supreme importance.

After this explanation it may be said at once that Robespierre was not the author of the overthrow of the Dantonists and the Hébertists, though he thoroughly agreed with the majority and had no desire to save them, the principles of both parties being obnoxious to him. The Hébertists were communists in the true meaning of the word. They held that each commune should be self- governing, and, while admitting the right of a central authority to levy men and money for the purposes of the state, they believed that in purely internal matters, as well as in determining the mode in which men and money were to be raised, the local government ought to be supreme. This position of the Hébertists was of course obnoxious to the great committee, who believed that suc- cess could only be won by their retention of absolute power; and in the winter of 1794-95 it became obvious that the Hébertist party must perish, or its opposition to the committee would grow too formidable owing to its paramount influence in the commune of Paris. Robes- pierre shared his colleagues' fear of the Hébertist opinions, and he had a personal reason for disliking that party of atheists and sansculottes, since he believed in the necessity of religious faith, and was too much of a gentleman not to detest their imitation of the grossness that belongs to the lowest class of the populace. In 1792 he had indig- nantly thrown from him the cap of liberty which an ardent admirer had placed upon his head ; he had never pandered to the depraved tastes of the mob by using their language; and to the last day of his life he wore knee-breeches and silk stockings and wore his hair powdered. His position towards the Dantonist party was of a different character. After having seen established the strong executive he had

laboured for, and having moved the resolutions which finally consolidated the power of the committee of public safety in September 1793, Danton retired to his country house to enjoy the pleasures of domestic life. But to his retreat came the news of the means the committee used to maintain their supremacy. Danton was not a man who scrupled to shed blood when necessary, but he did not see that this continuous series of sacrifices on the guillotine was necessary ; hence he inspired Camille Desmoulins to protest against the Terror in the Vieux Cordelier, the noblest expression of revolutionary thought. Where is

this system of terror to end? what is the good of a tyranny comparable only to that. of the: Roman emperors as described by Tacitus? Such were the questions which Camille Desmoulins asked under Danton's inspiration. This "moderantism," as it was called, was as objectionable to the members of the great committee as the doctrines of the Hébertists. Both parties must' be crushed. Before the blows at the leaders of those two parties were struck, Robespierre retired for a month (from 13th February to 13th March 1794) from active business in the convention and the committee, apparently to consider his position ; but he came to the conclusion that the cessation of the Reign of Terror would mean the loss of that supremacy by which he hoped to establish the ideal of Rousseau, for Danton, he knew, was essentially a practical statesman and laughed at his ideas. He must have considered too that the result of his siding with Danton would probably have been fatal to himself. The result of his deliberations was that he abandoned Danton and co-operated in the attacks of the committee on the two parties. On the 15th of March he reappeared in the convention; on the 19th Hébert and his friends were arrested ; and on the 24th they were guillotined. On the 30th of March Danton, Camille Desmoulins, and their friends were arrested, and on the. 5th of April they too were guillotined.

It was not until after the execution of Danton that Robespierre began to develop a policy distinct from that of his colleagues in the great committee, an opposition which ended in his downfall. He began by using his influ- ence over the Jacobin Club to dominate the commune of Paris

through his devoted adherents, two of whom, Fleuriot- Lescot and Payan, were elected respectively mayor and pro- cureur of the commune. He also attempted to usurp the influence of the other members of the great committee over the armies by getting his young adherent, Saint-Just, sent on a mission to the frontier. In Paris Robespierre de- termined to increase the pressure of the Terror: no one should accuse him of moderantism ; through the increased efficiency of the revolutionary tribunal Paris should tremble before him as the chief member of the great committee ; and the convention should pass whatever measures he might dictate. To secure his aims, Couthon, his other ally in the committee, proposed and carried on the 10th of June the outrageous law of 22d Prairial, by which even the appear- ance of justice was taken from the tribunal, which, as no witnesses were allowed, became a simple court of condemna- tion. The result of this law was that between the 12th of June and the 28th of July, the day of Robespierre's death, no less than 1285 victims perished on the guillotine at Paris. But before this there had taken place in Robes- pierre's life an episode of supreme importance as illustrat- ing his character and his political aims: on the 7th of May he secured a decree from the convention recognizing the existence of the Supreme Being. In His honour a great féte was held on the 8th of June; Robespierre, as presi- dent of the convention, walked first and delivered his harangue, and as he looked around him he may well have believed that his position was secured and that he was at last within reach of a supreme power which should enable him to impose his belief on all France, and so ensure its happiness. The majority of the great committee found his popularity—or rather his ascendency, for as that in- creased his personal popularity diminished—useful to them, since by increasing the stringency of the Terror he strengthened the position of the committee, whilst attract- ing to himself, as occupying the most prominent position in it, any latent feeling of dissatisfaction at such stringency. Of the issue of a struggle between themselves and Robes- pierre they had little fear: they controlled the committee of general security through their alliance with its leaders,

Amar and Vadier; they were certain of obtaining a majority in the convention, for they knew that the chief deputies on the left or the

Mountain were Dantonists, who burned to avenge Danton's death ; while they felt sure also that the mass of the deputies of the centre or the Marsh could be hounded on against Robespierre if they were to accuse him of aiming at the dictatorship and pour on him the obloquy of having increased the Terror; and they knew finally that his actual adherents, though devoted to him, were few in number. The devotion of these admirers had been further excited by the news that a half-witted girl, named Cécile Renault, had been found wandering near his house, with a knife in her possession, intending to play the part of Charlotte Corday. She was executed on the 17th of June, on the very day that Vadier raised a laugh at Robespierre's expense in the convention by his report on the conspiracy of Catherine Théot, a mad woman, who had asserted that Robespierre was a divinity.

For a statesman to be laughed at in France is fatal to his power, and Robespierre himself felt that he must strike his blow now or never. Yet he was not sufficiently audacious to strike at once, as Payan and Coffinhal, the ablest of his adherents, would have had him do, but re- tired from the convention for some weeks, as he had done before the overthrow of the Hébertists and the Dantonists, to prepare his plan of action, This retirement seemed ominous to the majority of the great committee, and they too prepared for the struggle by communicating with the deputies of the Mountain, who were either friends of Danton or men of proved energy like Barras, Fréron, and Tallien. These weeks, the last of his life, Robespierre passed very peacefully, according to his wont all through the Revolution. He continued to live with the Duplays, with whose daughter Eléonore he had fallen in love, and used to wander with her and his favourite dog, a great Danish hound, named Bruant, in the Champs Elysées during the long summer evenings. At last, on the 26th of July, Robespierre appeared for the first time for more than four weeks in the convention and delivered a carefully studied harangue, which lasted for more than four hours, in which he declared that the Terror ought to be ended, that certain deputies who had acted unjustly and exceeded their powers ought to be punished, and that the committees of public safety and general security ought to be renewed. Great was the excitement in the convention : all wondered who were the deputies destined to be punished ; all were surprised that the Terror should be imputed as a fault to the very

comniittee of which Robespierre had been a member. The majority of the great committee determined to act promptly. The convention, moved by Robespierre's eloquence, at first passed his motions ; but he was replied to by Cambon the financier, Billaud-Varenne, Amar, and Vadier, and the convention rescinded their decrees and referred Robespierre's question to their committees. On the following day, the 27th of July, or in the revolution- ary calendar the 9th Thermidor, Saint-Just commenced to speak on behalf of the motions of Robespierre, when violent interruptions showed the temper of the conven- tion. Tallien, Billaud-Varenne, and Vadier again attacked Robespierre ; cries of "Down with the tyrant!" were raised ; and, when Robespierre hesitated in his speech in answer to these attacks, the words '"'C'est le sang de Dan- ton qui t'étouffe" showed what was uppermost in the minds of the Mountain. The excitement increased, and at five in the afternoon Robespierre, Couthon, and Saint-Just, with two young deputies, Augustin Robespierre and Lebas, the only men in all the convention who supported them, were ordered to be arrested. Yet all hope for Robes- pierre was not gone; he was speedily rescued from his prison with the other deputies by the troops of the com-

mune and brought to the Hotel de Ville. There he was surrounded by his faithful adherents, led by Payan and Coffinhal, but the day was past when the commune could overawe the convention ; for now the men of action were hostile to the commune, and its chief was not a master of coups détat. On the news of the release of Robespierre, the convention had again met, and declared the members of the commune and the released deputies hors de la lov. The national guards under the command of Barras had little difficulty in making their way to the Hotel de Ville ; Robespierre was shot in the lower jaw by a young gen- darme named Merda while signing an appeal to one of the sections of Paris to take up arms for him, though the wound was afterwards believed to have been inflicted by himself; and all the released deputies were again arrested. After a night of agony Robespierre was the next day taken before the tribunal, where his identity as an outlaw was proved, and without further trial he was executed with Couthon and Saint-Just and nineteen others of

his adherents on the Place de la Révolution on the 10th Ther- inidor (28th July) 1794.

The character of Robespierre when looked upon simply in the light of his actions and his authenticated speeches, and apart from the innumerable legends which have grown up about it, is not a difficult one to understand.

The great authority for Robespierre's life is Ernest Hamel's elaborate Vie de Robespierre, 3 vols., Paris, 1865-67, in which every fact regarding hiin is care- fully sifted ; it is indeed an unqualified defence and eulogy throughout, but, without adopting his particular views, Hamel's biography is the only one of any value. Consult also for his early life M. Paris's La Jewnesse de Robespierre.

The Mémoires de Robespierre and the Mémoires de Charlotte Robespierre are both worthless forgeries. 8.)

ROBIN HOOD. The oldest mention of Robin Hood at present known occurs in the second edition—what is called the B text—of Piers the Plowman, the date of which is about 1377. In passus v. of that poem the figure of Sloth is represented as saying :

'T can nou3te perfitly my pater-noster, as the prest it syngeth :

But I can rymes of Robyn Hood and Randolf Erle of Chesterer." He is next mentioned by Wyntown in his Scottesh Chron- icle, written about 1420:

'¢ Lytel Jhon and Robyne Hude Waythmen ware commendyd gude ; In Yngilwode and Barnysdale Thai oysyd all this time [c. 1283] thare trawale " ;

next by Bower in his additions to Fordun's Scotichronicon about 1450:

'Hoc in tempore [1266] de exheredatis et bannitis surrexit et caput crexit ille famosissimus sicarius Robertus Hode et Littill Johanne cum eorum complicibus, de quibus stolidum vulgus hianter

in comeediis et trageediis pruricnter festum faciunt et super ceteras romancias, mimos, et bardanos cantitare delectantur."

Of his popularity in the latter half of the 15th and in the 16th centuries there are many signs. Just one pass- age must be quoted as of special importance because closely followed by Grafton, Stow, and Camden. It is from Mair's Historia Majoris Britanniz tam Anglie quam Scotix, which appeared in 1521.

'Circa hee tempora [Ricardi Primi], ut auguror, Robertus Hudus Anglus et Parvus Joannes latrones famatissimi in nemoribus latuerunt, solum opulentorum virorum bona deripientes. Nullum nisi eos invadentem vel resistentem pro suarum rerum tuitione occiderunt. Centum sagittarios ad pugnam aptissimos Robertus latrociniis aluit, quos 400 viri fortissimi invadere non audebant. Rebus hujus Roberti gestis tota Britannia in cantibus utitwr. Feminam nullam opprimi permisit nec pauperum bona surripuit, verum eos ex abbatum bonis sublatis opipare pavit. Viri rapinam improbo, sed latronum omnium humanissimus et princeps erat."

Tn the Elizabethan era and afterwards mentions abound ; see the works of Shakespeare, Ben Jonson, Drayton, Warner, Munday, Camden, Stow, Braithwaite, Fuller, &c.

Of the ballads themselves, Robin [food and the Monk is possibly as old as the reign of Edward II. ; Robin Mood and the Potter and Robyn and Gandelyn are certainly not later than the 15th century. Most important of all is A Lytell Geste of Robyn IHode, which perhaps was first printed about 1490, although the earliest extant complete copy belongs to about 1520. This is evidently founded on older ballads; we read in Zhe Seconde Fytte, ll. 176 and ie

'¢ He wente hym forthe full mery syngynge, As men have told in tale." In fact it does for the Robin Hood cycle what a few years before Sir Thomas Malory had done for the Arthurian romances,—what in the 6th century B.c. Pisistratus is said to have done for the Homeric poems.

These are the facts about him and his balladry. Of conjectures there is no end. He has been represented as the last of the Saxons,—as a Saxon holding out against the Norman conquerors so late as the end of the 12th century (see Thierry's Norman Conquest, and compare Ivanhoe). Others maintain that he was a follower of Simon de Montfort. A third theory associates him with the earl of Lancaster of Edward II.'s time : Hunter believed that he could identify him with a certain Robin Hood mentioned in the Exchequer accounts of this reign.

For our part, we are not disinclined to believe that the Robin Hood story has some historical basis, however fanci- ful and romantic the superstructure. We parallel it with the Arthurian story, and hold that, just as there was probably a real Arthur, however different from the hero of the trouveres, so there was a real Hood, however now enlarged and disguised by the accretions of legend. That Charlemagne and Richard I. of England became the sub- jects of romances does not prevent our believing in their existence ; nor need Hood's mythical life deprive him of his natural one. Sloth in Langland's poem couples him, as we have seen, with Randle, earl of Chester; and no one doubts this nobleman's existence because he had '"'rymes" made about him. We believe him to have been the third Randle (see Bishop Percy's Folio MS., ed. Hales and Furnivall, i. 260). And possibly enough Hood was contemporary with that earl, who "flourished" in the reigns of Richard [L., John, and Henry III. Wyntown and Major, as we have seen, assign him to that period. It is impossible to believe with Hunter that he lived so late as Edward IT.'s reign. This would leave no time for the growth of his myth; and his myth was, as is evident from what we have already said and quoted, full grown in the first half of the 14th century.

But, whether he lived or not, and whenever he lived, it is certain that many mythical elements are contained in

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his story. Both his name and his exploits remind us of the woodland spirit Robin Goodfellow and his merry pranks. He is fond of disguising himself, and devoted to fun and practical jokes. And the connexion of the May games with him points to a fusion with some older memory, —with some

sun-god. In fact, the outlaw would seem to have become a centre around which gathered and settled older traditions of men and of spirits and of gods. Folk- lore that was rapidly perishing thus gave itself a new consistency and life. The name Robin (a French form from Rob, which is of course a short form for Robert) would serve both for "the shrewd and knavish sprite"—the German Knecht Ruprecht (see Grimm's Zeut. JLyth., p. 504, trans. Stallybrass)—and for the bandit (see "Roberdes Knaues" in the Prologue of Piers the Plowman, |. 44 and the note in Warton's Hist. of Eng. Poet., ii. 95, ed. 1840). The name Hood is still a common enough surname, of which the earlier shape is Odo (see " Houdart," &c., in Larchey's Dict. des Noms); notice too the name Hudson. But it also reminds one of the German familiar spirit Hudekin, or possibly of the German Witikind (see Wright's Essays on the Middle Ages, ii. 207). How certain it is that the Robin Hood story attracted to it and appropriated other elements is illustrated by its subsequent history,—its history after the 14th century. Thus later on we find it connected with the Morris dance; but the Morris dance was not known in England before the 16th century, or late in the 15th. And the form of the story was greatly modified in the beginning of the 17th century to suit the ideas of the age. It was then that a peer was imported into it, and the yeoman of the older version was meta- morphosed into the earl of Huntingdon, for whom in the following century Stukeley discovered a satisfactory pedi- grec! At last, with the change of times, the myth ceased growing. Its rise and development and decay deserve a more thorough study than they have yet received.

What perhaps is its greatest interest as we first see it is its expression of the popular mind about the close of the Middle Ages. Robin Hood is at that time the people's ideal as Arthur is that of the upper classes. He is the ideal yeoman as Arthur is the ideal knight. He readjusts the distribution of property: he robs the rich and endows the poor. He is an earnest worshipper of the Virgin, but a bold and vigorous hater of monks and abbots. He is the great sportsman, the incomparable archer, the lover of the greenwood and of a free life, brave, adventurous, jocular, open-handed, a protector of women. Observe his instructions to Little John :—

' Loke ye do no housbonde harme*

That tylleth with his plough.

No more ye shall no good yeman That walketh by grene wode shawe,

Ne no knyght ne no squyer That wolde be a good felawe.

These bysshoppes and thyse archebysshoppcs Ye shall them bete and bynde ;

The hye sheryfe of Notynghame Hym holde in your mynde."'

And we are told

- *Robin loved our dere lady For doute of dedely synne ; Wolde he never do company harme That ony woman was ynne." See also Drayton's Polyolbion, Song xxvi. The story is localized in Barnsdale and Sherwood, 7.¢., between Don- caster and Nottingham.*

The best collections of the Robin Hood poems are those of Ritson (8vo, 1795) and Gutch (2d ed., 1847), and of Professor Child in the 5th volume of his invaluable English and Scotch Ballads. The versions in the Percy Folio MS. are unhappily mutilated; but they should be consulted, for they are all more or less unique, and that on " Robin Hoode his death" is of singular interest. The literary and artistic value of the Robin Hood ballads cannot be pronounced consider-

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able; their value is great, but it is in other respects. There is, however, real vigour and force in this fragment on the hero's death. The earliest "Garland" was printed in 1670. (J. W. H.)

ROBIN REDBREAST. See REDBREAST.

ROBINS, Bensamin (1707-1751), an English natural philosopher, was born at Bath in 1707. His parents were Quakers in poor circumstances, and gave him very little education. Aided solely by his own talent for exact science, he made considerable progress, and attracted so much notice that he was introduced to Pemberton, who befriended and encouraged him.

For a time he maintained himself by teaching mathematics, but soon devoted him- self to more congenial work. In particular he carried out an extensive series of experiments in gunnery, the results of which were afterwards embodied in his famous treatise on New Principles in Gunnery (8vo, London, 1742). In this treatise is described the ballistic pendulum, an instru- ment which has become classical in the history of dynamics, and which bears the name of its inventor. Robins also made a number of very important experiments on the resistance of the air to the motion of projectiles, and on the force of gunpowder, with computation of the velocities thereby communicated to military projectiles. He com- pared the results of his theory with experimental deter- minations of the ranges of mortars and cannon, and gave practical maxims for the management of artillery. He also made observations on the flight of rockets and wrote on the advantages of rifled barrels. So great was his fame as a scientific artillerist that Euler translated his work on gunnery into German and added to it a critical comment- ary of his own. Of less interest nowadays are Robins's more purely mathematical writings, such as his Dzscourse concerning the Nature and Certainty of Sir Isaac Newton's Methods of Fluaions and of Prime and Ultimate Ratios (8vo, London, 1735), "A Demonstration of the Eleventh Proposition of Sir Isaac Newton's Treatise of Quadratures " (Phil. Trans., 1727), and similar works. Besides his scien- tific labours Robins took an active part in politics. He wrote pamphlets in support of the opposition to Sir Robert Walpole, and was secretary of a committee appointed by the House of Commons to inquire into the conduct of that minister. He also wrote a preface to the Report on the Proceedings of the Board of General Officers on their Haa- mination into the Oonduct of Lieutenant-General Sir John Cope, in which he gave an apology for the affair at Preston- pans. In 1750 he was appointed engineer-general to the East India Company, and went out to superintend the re- construction of their forts. The climate, however, dis- agreed with him, and he died on 29th July 1751. His works were published in two volumes 8vo in 1761.

ROBINSON, Epwarp (1794-1863), author of the Biblical Researches, a son of the Rev. William Robinson, of Puritan ancestry, was born at Southington, Connecticut, United States, on 10th April 1794. He was educated at Hamilton College, New York, where he graduated in 1816. He

served as a tutor at the college during 1817-18, and then engaged in private study of the Greek classics until 1821, when he went to Andover, Massachusetts, in order to publish an edition of the Jliad. There he became a pupil of Moses Stuart, the enthusiastic professor of Biblical studies in the theological seminary, and was made in- structor of Hebrew there in 1823. In 1826 he resigned his position at Andover and went to Europe, where he studied Hebrew under Gesenius at Halle, and also history at Berlin under Neander, remaining in Europe until 1830. In 1828 he married Therese Albertine Luise von Jakob, daughter of an eminent professor of philosophy at Halle. This highly cultured lady was already well known as an authoress under the pseudonym of " Talvj." She became of great assistance to her husband in his learned pur-

suits. In 1830 he was again called to Andover as pro- fessor extraordinary of Biblical literature, and entered with enthusiasm upon the work of instruction and the publication of scholarly works upon the Bible. In 1831 he founded the Biblical Lepository, a theological review which introduced a new era in theological periodicals in America, and which subsequently passed over into the Bibliotheca Sacra. In the same year he received the degree of D.D. from Dartmouth College. In 1832 he published a revised edition of Taylor's translation of Calmet's Dictionary of the Lrble, and in the ensuing year a popular Dictionary of the Bible and a translation of Buttmann's Greek Grammar (3d ed., 1851). Such severe literary work deprived him of his health and he was compelled to resign his professorship. He now devoted himself entirely to literary pursuits for some years. In 1834 he published a revised edition of Newcome's Greek ilarmony of the Gospels. In 1836 he issued a translation of Gesenius's Hebrew Lexicon and in the same year a Greek and English Lexicon of the New Testament. These lexicons have been the companions of Biblical students until the present time, having passcd through a series of revisions. The /7Zebrew Lexicon reached a fifth edition in 1854, the Greek Lexicon a second edition in 1847. They are both now (1885) passing through another revision by his pupils. In 1837 Robinson was called to the professorship of Biblical literature in the Union Theo- logical Seminary, New York, in which position he re-

mained until his death, giving it the reputation of his scholarship and the benefits of his great experience in Biblical study and practical skill in instruction. In his letter of acceptance he gave an outline of the field of Biblical study which showed his mastery of the subject and his forecast of its future in America. He accepted this position with the understanding that he should receive leave of absence for some years in order to explore the lands of the Bible. He spent a considerable portion of the year 1838 in these explorations and became the pioneer and father of modern Biblical geography. He published his Biblical Researches in 1841 in three volumes, simultaneously in Berlin and Boston. His services were recognized by a gold medal from the Royal Geographical Society of London in 1842, the degree of D.D. from the university of Halle in 1842, and the degree of LL.D. from Yale College in 1844. In 1852 he made a second visit to Palestine and published its results in the supplemental volume to the second edition of his Biblical Researches in 1856. The third edition of the whole work appeared in 1867 in three volumes. Robinson regarded these researches as preliminary to a systematic work on the geography of the Bible; but he was spared only to complete a mere fragment, which was published posthumously under the title of Physical Geography of the Holy Land in 1865. In 1845 Robinson also issued a Greek Harmony of the Gospels and in 1846 an English Harmony, both of which have passed through many editions and have remained the standard text-books in America until the present day. The Greek Harmony has renewed its life in a revised edition by Professor Riddle in 1885, Besides these more important works he published from time to time a vast number of articles in periodicals, and in 1859 a Memoir of the Rev. William Robinson, his father. Robinson was an ordained minister of the Presbyterian Church, but his voice was seldom heard in the pulpit or in ecclesiastical bodies. In his declining years he was afflicted with an incurable disease of the eyes and other maladies. He died in New York City on 27th January 1863.

Robinson's work in Biblical geography was both fundamental

and monumental. Dean Stanley once said, " Dr Robinson was the first man who saw Palestine with his eyes open to what he ought

to see"; and Ritter recognizes the "union of the acutest observa- tion of topographical and local conditions with much preparatory study." He was gifted with great practical sense and unusual accuracy of observation ; but he was extreme in his criticism of the local legends of the Holy Land, and not sufficiently skilled in historic criticism. Although great progress has becn made in Biblical geography in the last quarter of this century, yct the work of Robinson is still classical.

See The Life, Writings, and Character of Edward Robinson, by Henry B. Smith and Boswell D. Hitchcock (New York, 1863), and Services in Adam Chapel at the Dedication of the New Buildings of Union Theological Seminary (New York, 1885).

ROBINSON, Joun (1575-1625), one of the founders of Independency in England (see vol. xii. p. 725), was born most probably near Scrooby in Nottinghamshire in 1575. He was entered of Corpus Christi College, Cambridge, in 1592, and graduated in ordinary course, becoming a fellow in 1599. Having taken orders he officiated for some time in the neighbourhood of Norwich, but his Puritan leanings soon caused his suspension by the bishop. After having ministered for some time to a congregation of sympathizers in Norwich he resigned his fellowship in 1604, and, pro- ceeding to Gainsborough in Lincolnshire, he there joined a company who had bound themselves by covenant before God "to walk in all His ways made known or to be made known unto them, according to their best endeavours, whatever it should cost them." In 1606 he became minister at Scrooby, but the increasing hostility of the authorities towards nonconformity soon forced him and his people to think of flight, and, not without difficulty, they succeeded in making their escape in detachments to Hol- land. Robinson settled in Amsterdam in 1608, but in the following year removed to Leyden, and ministered there to members of his former congregation. In 1620 a consider- able minority of these sailed for England in the '" Speed- well," and ultimately crossed the Atlantic in the '" May- flower" ; it was Robinson's intention to follow as soon as practicable along with the rest of his flock, but he died before the plan could be carried out, on Ist March 1625.

Besides preaching to his congregation, and, during his later years, corresponding with those of his people who had settled in New England, Robinson devoted himself to theological study, and be- came a member of the university of Leyden. Amongst his other publications may be mentioned Justification of Separation from the Chureh (1610), Apologia Brownistarwm (1619), A Defence of the Doctrine propounded by the Synod of Dort (1624), and a volume of Essays, or Observations Divine and Moral, printed in 1628. His

Works, with a memoir by R. Ashton, were reprinted in 3 vols. in 1851.

ROBINSON, Joun Toomas Romnzy (1792-1882), the inventor of the cup-anemometer, was born in Dublin on 23d April 1792. He studied at Trinity College and ob- tained a fellowship in 1814; for some years he was deputy professor of natural philosophy, until he relinquished his fellowship in 1821 on obtaining the college living of Enniskillen, In 1823 he was appointed astronomer of the Armagh observatory (see OBsERVAToRY), with which he (from 1824) combined the living of Carrickmacross, but he always resided at the observatory, engaged in re- searches connected with astronomy and physics, until his death on 28th February 1882.

Robinson wrote a number of papers in scientific journals and transactions, and the Armagh catalogue of stars (Places of 5345 Stars observed from 1828 to 1854 at the Armagh Observatory, Dublin, 1859), but he is best known as the inventor of the cup-anemometer for registering the velocity of the wind. This instrument (which he erected at the Armagh observatory in 1846 and which has since come into general use) consists of four light arms forming a hori- zontal cross, carrying four hemispherical cups and turning freely about a vertical axis. By an endless screw attached to the axis a system of wheelwork is set going, and the velocity of the wind is indicated by one or more dials, or it may be registered continuously by a pencil drawn by clockwork along'a dial-or drum turned by the anemometer, or (as in the modification now generally used) by a metallic screw of only one thread, which leaves a tracing on a sheet of metallic paper folded round a drum revolving by clockwork. It nas been found by elaborate experiments by Dr Robinson (Trans. Lt. Irish Academy, vol. xxii. ; Phil. Trans., 1878 and 1880) and

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R @ 3 others that the centre of each cup moves with a velocity very nearly equal to one-third of that of the wind.

ROB ROY (c. 1660-1734), the popular designation of a famous Highland outlaw whose prowess is the theme of one of Sir Walter Scott's novels, was by descent a Macgregor, being the younger son of Donald Macgregor of Glengyle, who had attained the rank of lieutenant-colonel in the army of James II., by his wife, a daughter of William Campbell of Glenfalloch. He received the name Roy from the red hair which clustered in thick curls over his brow, and latterly adopted Campbell as his surname on account of the Acts proscribing the name of his clan. Though in stature not much above the middle height, he was so muscular and thickly set that few were his equals in feats of strength, while the unusual length of his arms gave him an extraordinary advantage in the use of the sword. His eyes were remarkably keen and piercing, and his whole expression indicated a mental prowess forming: an appropriate complement to his powerful physical frame. He inherited a small property on the Braes of Balquhidder, and at first devoted himself to the rearing of cattle. Hav- ing formed a band of armed clansmen, he obtained, after the accession of William III., a commission from James II. to levy war on all who refused to acknowledge him as king, and in the autumn of 1691 made a descent on Stirlingshire to carry off the cattle of Lord Livingstone, when, being opposed by the villagers of Kippen, he also seized the cattle from all the byres of the village. Shortly afterwards he married Mary, daughter of Macgregor of Comar. On the death of Gregor Macgregor, the chief of the clan, in 1693 he managed, though not the nearest heir, to get himself acknowledged chief, obtaining control of the lands stretching from the Braes of Balquhidder to the shores of Loch Lomond, and situated between the posses- sions of Argyll and those of Montrose. To assist in carry- ing on his trade as cattle-dealer he borrowed money from the duke of Montrose, and, being on account of losses un- able to repay it, he was in 1712 evicted from his property and declared an outlaw. 'Taking refuge in the more in- accessible Highlands, Rob Roy from this time forward

sup- ported himself chiefly by depredations committed in the most daring manner on the duke and his tenants, all attempts to capture him being unsuccessful. During the rebellion of 1715, though nominally siding with the Pre- tender, he did not take an active part in the battle of Sheriffmuir except in plundering the dead on both sides. He was included in the Act of Attainder; but, having for some time enjoyed the friendship of the duke of Arygll, he obtained, on making his submission at Inveraray, a promise of protection. He now established his residence at Craigroyston near Loch Lomond, whence for some time he levied black mail as formerly upon Montrose, escaping by his wonderful address and activity every effort of the English garrison stationed at Inversnaid to bring him to In his later years he was, through the mediation of Argyll, reconciled to Montrose. According to a notice in the Caledoman Mercury he died at Balquhidder on 28th December 1734. He was buried in Balquhidder churchyard.

K. Macleay, Historical Memoirs of Rob Roy (1818 ; new ed. 1881); oan Scott, Highland Clans; A. H. Miller, Story of Rob Roy

ROBUSTI, Jacoro (1518-1594), commonly called In TINTORETTO or TINTORET, one of the greatest painters of the Venetian or of any school, was born in Venice in 1518, though most accounts say in 1512. His father, Battista Robusti, was a dyer, or "tintore"; hence the son got the nickname of '"Tintoretto," little dyer, or dyer's boy. In childhood Jacopo, a born painter, began daubing on the dyer's walls; his father, noticing his bent, took him round, still in boyhood, to the studio of Titian,

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to see how far he could be trained as an artist. We may suppose this to have been towards 1533, when Titian was already fifty-six years of age. Ridolfi is our authority for saying that Tintoret had only been ten days in the studio when Titian sent him home once and for all. The reason, according to the same writer, is that the great master ob- served some very spirited drawings, which he learned to be the production of Tintoret; and it is inferred that he became at once jealous of so promising a scholar. This, however, is mere conjecture ; and perhaps it may be fairer to suppose that the drawings exhibited so much independ- ence of manner that Titian judged that young Robusti, although he might become a

painter, would never be pro- perly a pupil. From this time forward the two always remained upon distant terms,—Robusti being indeed a pro- fessed and ardent admirer of Titian, but never a friend, and Titian and his adherents turning the cold shoulder to Robusti. Active disparagement also was not wanting, but it passed disdainfully unnoticed by Tintoret. The latter sought for no further teaching, but studied on his own account with laborious zeal; he lived poorly, collecting casts, bas-reliefs, &c., and practising by their aid. His noble conception of art and his high personal ambition were evidenced in the inscription which he placed over his studio,— Il disegno di Michelangelo ed il colorito di Tiziano" (Michelangelo's design and Titian's colour), He studied more especially from models of Buonarroti's Dawn, Noon, Twilight, and Night, and became expert in modelling in wax and clay,—a method (practised likewise by Titian) which afterwards stood him in good stead in working out the arrangement of his pictures. The models were sometimes taken from dead subjects dissected or studied in anatomy schools; some were draped, others nude, and Robusti was wont to suspend them in a wooden or cardboard box, with an aperture for a candle. Now and afterwards he very frequently worked by night as well as by day. The young™painter Schiavone, four years Robusti's junior, was much in his company. 'Tintoret helped Schiavone gratis in wall-paintings; and in many subsequent instances he worked also for nothing, and thus succeeded in obtaining commissions. The two earliest mural paintings of Robusti—done, like others, for next to no pay—are said to have been Belshazzar's Feast and a Cavalry Fight, both long since perished. Such, indeed, may be said to have been the fate of all his frescos, early or later. The first work of his which attracted some considerable notice was a portrait-group of himself and his brother—the latter playing a guitar—with a nocturnal effect ; this also is lost. It was followed by some historical subject, which Titian was candid enough to praise. One of Tintoret's early pictures still extant is in the church of the Carmine in Venice, the Presentation of Jesus in the Temple; also in 8. Benedetto are the Annunciation and Christ with the Woman of Samaria. For the Scuola della Trinita (the scuole or schools of Venice were more in the nature of hospitals or charitable foundations than of educational in- stitutions) he painted four subjects from Genesis. Two of these, now in the Venetian Academy, are Adam and Eve and the Death of Abel, both noble works of high mastery, which leave

us in no doubt that Robusti was by this time a consummate painter,—one of the few who have attained to the highest eminence by dire study of their own, un- seconded by any training from some senior proficient. Towards 1546 Robusti painted for the church of §. Maria dell' Orto three of his leading works—the Worship of the Golden Calf, the Presentation of the Virgin in the Temple, and the Last Judgment—now shamefully re-painted ; and he settled down in a house hard by the church. It is a Gothic edifice, looking over the lagoon of Murano to the Alps, built in the Fondamenta de' Mori,

still standing, but let out cheap to artisans. In 1548 he was commissioned for four pictures in the Scuola di §8. Marco—the Finding of the Body of St Mark in Alexandria (now in the church of the Angeli, Murano), the Saint's Body brought to Venice, a Votary of the Saint delivered by invoking him from an Unclean Spirit (these two are in the library of the royal palace, Venice), and the highly and justly celebrated Miracle of the Slave. This last, which forms at present one of the chief glories of the Venetian Academy, represents the legend of a Christian slave or captive who was to be tortured as a punishment for some acts of devotion to the evangelist, but was saved by the miraculous intervention of the latter, who shattered the bone-breaking and blinding implements which were about to be applied. These four works were greeted with signal and general applause, including that of Titian's intimate, the too potent Pietro Aretino, with whom Tintoret, one of the few men who scorned to curry favour with him, was mostly in disrepute. It is said, however, that Tintoret at one time painted a ceiling in Pietro's house; at another time, being invited to do his portrait, he attended, and at once proceeded to take his sitter's measure with a pistol (or else a stiletto), as a significant hint that he was not exactly the man to be trifled with. The painter having now executed the four works in the Scuola di S. Marco, his straits and obscure endurances were over. He married Faustina de' Vescovi, daughter of a Venetian nobleman. She appears to have been a careful housewife, and one who both would and could have her way with her not too tract- able husband. Faustina bore him several children, prob- ably two sons and five daughters.

The next conspicuous event in the professional life of Tintoret is his enormous labour and profuse self-develop- ment on the walls and ceilings of the Scuola di 8. Rocco, a building which may now almost be regarded as a shrine reared by Robusti to his own genius. The building had been begun in 1525 by the Lombardi, and was very defi- cient in light, so as to be particularly ill-suited for any great scheme of pictorial adornment. The painting of its interior was commenced in 1560. In that year five prin- cipal painters, including Tintoret and Paul Veronese, were invited to send in trial-designs for the centre-piece in the smaller hall, named Sala dell' Albergo, the subject being S. Rocco received into Heaven. 'Tintoret produced not a sketch but a picture, and got it inserted into its oval. The competitors remonstrated, not unnaturally; but the artist, who knew how to play his own game, made a free gift of the picture to the saint, and, asa bye-law of the foundation prohibited the rejection of any gift, it was re- tained in situ,—Tintoret furnishing gratis the other decora- tions of the same ceiling. In 1565 he resumed work at the scuola, painting the magnificent Crucifixion, for which a sum of 250 ducats was paid. In 1576 he presented gratis another centre-piece,—that for the ceiling of the great hall, representing the Plague of Serpents; and in the following year he completed this ceiling with pictures of the Paschal Feast and Moses striking the Rock,—accepting whatever pittance the confraternity chose to pay. Robusti next launched out into the painting of the entire scuola and of the adjacent church of S. Rocco. He offered in November 1577 to execute the works at the rate of 100 ducats per annum, three pictures being due in each year. This proposal was accepted and was punctually fulfilled, the painter's death alone preventing the execution of some of the ceiling-subjects. The whole sum paid for the scuola throughout was 2447 ducats. Disregarding some minor performances, the scuola and church contain fifty-two memorable paintings, which may be described as vast sug- gestive sketches, with the mastery, but not the deliberate precision, of finished pictures, and adapted for being

looked at in a dusky half-light. Adam and Eve, the Visitation, the Adoration of the Magi, the Massacre of the Innocents, the Agony in the Garden, Christ before Pilate, Christ carrying His Cross, and (this alone having been marred by restoration) the Assumption of the Virgin are leading examples in the scuola; in the church, Christ curing the Paralytic.

It was probably in 1560, the same year when he began working in the Scuola di S. Rocco, that Tintoret commenced also his numerous paintings in the ducal palace ; he then executed there a portrait of the doge, Girolamo Priuli. Other works which were destroyed in the great fire of 1577 succeeded,—the Excommunication of Frederick Bar- barossa by Pope Alexander III. and the Victory of Lepanto. After the fire Tintoret started afresh, Paul Veronese being his colleague; their works have for the most part been disastrously and disgracefully retouched of late years, and some of the finest monuments of pic- torial power ever produced are thus degraded to com- parative unimportance. In the Sala dello Scrutinio Robusti painted the Capture of Zara from the Hungarians in 1346 amid a hurricane of missiles; in the hall of the senate, Venice, Queen of the Sea ; in the hall of the college, the Espousal of St Catherine to Jesus ; in the Sala dell' Anticollegio, four extraordinary masterpieces—Bacchus, with Ariadne crowned by Venus, the Three Graces and Mercury, Minerva discarding Mars, and the Forge of Vulcan—which were painted for fifty ducats each, besides naterials, towards 1578; in the Antichiesetta, St George and St Nicholas, with St Margaret (the female figure is sometimes termed the princess whom St George rescued from the dragon), and St Jerome and St Andrew ; in the hall of the great council, nine large compositions, chiefly battle-pieces. We here reach the crowning production of Robusti's life, the last picture of any considerable import- ance which he executed, the vast Paradise, in size 74 feet by 30, reputed to be the largest painting ever done upon canvas. It is a work so stupendous in scale, so colossal in the sweep of its power, so reckless of ordinary standards of conception or method, so pure an inspiration of a soul burning with passionate visual imagining, and a hand magical to work in shape and colour, that it has defied the connoisseurship of three centuries, and has generally (though not with its first Venetian contemporaries) passed for an eccentric failure; while to a few eyes

(including those of the present writer) it seems to be so transcendent a monument of human faculty applied to the art pictorial as not to be viewed without awe nor thought of without ainazement. While the commission for this huge work was yet pending and unassigned Robusti was wont to tell the senators that he had prayed to God that he might be commissioned for it, so that paradise itself might perchance be his recompense after death. Upon eventually receiving the commission in 1588 he set up his canvas in the Scuola della Misericordia and worked indefatigably at the task, making many alterations and doing various heads and costumes direct from nature. When the picture had been brought well forward he took it to its proper place and there finished it, assisted by his son Domenico for details of drapery, é&c. All Venice applauded the superb achieve- ment, which has in more recent times suffered from neglect, but fortunately hardly at all from restoration. Robusti was asked to name his own price, but this he left to the authorities. They tendered a handsome amount ; Robusti is said to have abated something from it, which 1s even a more curious instance of ungreediness for pelf than earlier cases which we have cited where he worked for nothing at all.

After the completion of the Paradise Robusti rested for a while, and he never undertook any other work of

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importance, though there is no reason to suppose that his energies were exhausted, had his days been a little pro- longed. He was seized with an attack in the stomach, complicated with fever, which prevented him from sleeping and almost from eating for a fortnight, and on 3lst May 1594 he died. A contemporary record states his age to have been seventy-five years and fifteen days. If this is accurate, 16th May 1519 must have been the day of his birth ; but we prefer the authority of the register of deaths in S. Marciliano, which states that Tintoret died of fever, aged seventy-five years, eight months, and fifteen days,— thus bringing us to 16th September 1518 as the true date of his birth. He was buried in the church of S. Maria dell' Orto by the side of his favourite daughter Marietta, who had died in 1590, aged thirty ; there is a well-known tradition that as she

lay dead the heart-stricken father painted her portrait. Marietta had herself been a por- trait-painter of considerable skill, as well as a musician, vocal and instrumental; but few of her works are now traceable. It is said that up to the age of fifteen she used to accompany and assist her father at his work, dressed as a boy ; eventually she married a jeweller, Mario Augusta. In 1866 the grave of the Vescovi and Robusti was opened, and the remains of nine members of the joint families were found in it; a different locality, the chapel on the right of the choir, was then assigned to the grave. Tintoret painted his own portrait at least twice, one of the heads being in the Uffizi Gallery of Florence and the other, done when his age was advanced, in the Louvre. It is a very serious face, somewhat blunt and rugged, but yet refined without the varnish of elegance—concentrated and resolute, its native ardours of frankness and energy welded down into lifelong laboriousness, with a pent look as of smouldering fire. The eyes are large, dark, and round; the grizzled hair close and compact. The face has been held to bear some resemblance to that of Michel- angelo, but this does not go very far. Robusti appears also as one of the figures in the two vast pictures by Paul Veronese,—the Marriage in Cana and the Feast in the House of Levi.

Audacious and intrepid, though not constantly correct, as a draughtsman, majestically great as a colourist, prodigious as an executant, Tintoret was as absolute a type of the born painter as the history of art registers or enables us to conceive. hatever he did was imaginative—sometimes beautiful and suave (and he was eminently capable of painting a lovely female countenance or an heroic man), often imposing and romantic, fully as often tur- bulent and reckless, sometimes trivial, never unpainter-like or prosaic. When he chose—which was not always—he painted his entire personages characteristically ; but, like the other highest masters of Venice, he conceded and attendcd little to the expression of his faces as evincing incidental emotion. In several of his works —as especially the great Crucifixion in 8. Rocco—there is powerful central thought, as well as inventive detail ; but his imagination is always concrete: it is essentially that of a painter to whom the means of art—the form, colour, chiaroscuro, manipulation, scale, distribution—are the typical and neccssitated realities. What he imagines is always a visual integer, a

picture—never a treatise, however thoughtfully planned or ingeniously detailed. Something that one could see—that is his ideal, not something that one could narrate, still less that one could deduce and demonstrate. In his treatment of action or gesture the most constant peculiarity is the sway and swerve of his figures: thcy bend like saplings or rock like forest-boughs in a gale; stiffness or immobility was entirely foreign to his style, which has therefore little of the monu- mental or severe character. Perhaps he felt that there was no other way for combining "the colour of Titian with the design of Michelangelo." The knitted strength and the transcendent fervour of energy of the supreme Florentine might to some extent be emulated ; but, if they were to be united with the glowing fusion of hue of the supreme Venetian, this could only be attained by a process of relaxing the excessive tension and modifying muscular into elastic force. In this respect he was a decided innovator ; but he had many imitators,—comparatively feeble, if we except Paul Veronese.

Tintoret scarcely ever travelled out of Venice. He loved all the arts, played in youth the lute and various instruments, some of

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them of his own invention, and designed theatrical costumes and

_ properties, was versed in mechanics and mechanical devices, and was a very agreeable companion. For the sake of his work he lived in a most retired fashion, and even when not painting was wont to remain in his working room surrounded by casts. Here he hardly admitted any, even intimate friends, and he kept his modes of work secret, save as regards his assistants. He aboundcd in pleasant witty sayings whether to great personages or to others, but no smile hovered on his lips. Out of doors his wife made him wear the robe of a Venetian citizen ; if it rained she tried to indue him with an outer garment, but this he resisted. She would also when he left the house wrap up moncy for him in a handkerchief, and on his return expected an account of it; Tintoret's accustomed reply was that he had spent it in alms to the poor or to prisoners. In 1574 he obtained the reversion of the first vacant broker's patent in a fondaco, with power to bequeath it,—an advantage grantcd from time to time to pre-eminent painters. For his phenomenal energy in painting he was termed "J]

Furioso." An agrecment is extant showing that he undertook to finish in two months two historical pictures each containing twenty figures, seven being portraits. The nuinber of his portraits is enormous; their merit is unequal, but the really fine ones cannot be surpassed. Sebastian del Piombo remarked that Robusti could paint in two days as much as himself in two years ; Annibale Caracci that Tintoret was in many pictures equal to Titian, in others inferior to Tintoret. This was the general opinion of the Venctians, who said that he had three pencils—one of gold, the second of silver, and the third of iron. The only pictures (if we except his own portrait) on which he in- scribed his name are the Miracle of Cana in the church of the Salute (painted originally for the brotherhood of the Crociferi), the Miracle of the Slave, and the Crucifixion in the Scuola di S. Rocco; the last was engraved in 1589 by Agostino Caracci. Generally he painted at once on to the canvas without any preliminary. Some of his dicta on art have been recorded as follows by Ridolfi :—" the art of painting remains increasingly difficult"; " painters in youth should adhere to the best masters, these being Michelangelo and Titian, and should be strict in representing the natural forms" ; 'the first glance at a picture is the crucial one"; "black and white, as developing form, are the best of colours" ; "drawing is the foundation of a painter's work, but drawing from life in the nude should only be essayed by well-practised men, as the real is often wanting in beauty."

Of pupils Robusti had very few; his two sons and Martin de Vos of Antwerp were among them. Domenico Robusti (1562-1637), whom we have already had occasion to mention, frequently assisted his father in the groundwork of great pictures. He himself painted a multitude of works, many of them ona very large scale; they would at best be mediocre, and, coming from the son of Tintoret, arc exasperating ; still, he must be regarded as a considerable sort of pictorial practitioner in his way.

We conclude by naming a few of the more striking of Tintoret's very numerous works not already specified in the course of the article. In Venice—(S. Giorgio Maggiore), a series of his later works, the Gathcring of the Manna, Last Supper, Descent from the Cross, Resurrection, Martyrdom of St Stephen, Coronation of the Virgin, Martyrdom of St

Damian ; (S. Francesco della Vigna) the Entombment ; (the Frari) the Massacre of the Innocents ; (S. Cassiano) a Crucifixion, the figures seen from behind along the hill slope; (St Mark's) a mosaic of the Baptism of Christ, —the oil-painting of this composition is in Verona. In Milan (the Brera), St Helena and other saints. In Florence (Pitti Gallery), Venus, Vulcan, and Cupid. In Cologne (Wallraff-Richarts Museum), Ovid and Corinna. In Augsburg (the town-hall), some historical pictures, which biographers and tourists alike have unaccountably neglected,—one of the siege of a fortified town is astonishingly fine. In England—(Hampton Court), Esther and Ahasuerus, and the Nine Muses ; (the National Gallery) Christ washing Peter's Feet, a grand piece of colour and execution, not greatly interesting in other respects, also a spirited smallish work, St George and the Dragon.

The writer who has done by far the most to establish the fame of Tintoret at the height which it ought to occupy is Professor Ruskin in his Stones of Venice and other books; the depth and scope of the master's power had never before been adequately brought out, although his extraordinarily and somewhat arbitrarily used executive gift was acknowledged. Ridolfi (Meraviglie dell' Arte) gives interesting personal details; the article by Dr Janitschek in Kunst und Kiinstler (1876) is a solid account. For an English reader the most handy narrative is thatof Mr W. R. Osler (Tintoretto, 1879), in the series entitled " The Great Artists." Here the biographical facts are clearly presented ; the sesthetic criticism is enthusiastic but not perspicuous. (W. M. R.)

ROG, or more correctly Ruxu, a fabulous bird of enormous size which carries off elephants to feed its young. The legend of the roc, familiar to every one from the Arabian Nights, was widely spread in the East; and in later times the home of the monster was sought in the direction of Madagascar, whence gigantic fronds of the Raphia palm very like a quill in form appear to have been brought under the name of roc's feathers (see Yule's

Marco Polo, bk. iii. ch. 33, and Academy, 1884, No. 620). Such a feather was brought to the Great Khan, and we read also of a gigantic stump of a

roc's quill being brought to Spain by a merchant from the China seas (Abu Hamid of Spain, in Damiri, s.v.). The roc is hardly different from the Arabian 'ankd, already mentioned under PHanIx ; it is also identified with the Persian simurgh, the bird which figures in Firdausi's epic as the foster-father of the hero Zal, father of Rustam. When we go farther back into Persian antiquity we find an immortal bird, amrwu, or (in the Minéi-khiradh) sinamrt, which shakes the ripe fruit from the mythical tree that bears the seed of all useful

things. Sinamri and simurgh seem to be the same word, In Indian legend the garuda on which Vishnu

rides is the king of birds (Benfey, Pantschatantra, ii. 98). In the Pahlavi translation of the Indian story as repre- sented by the Syrian Kalilay and Damnag (ed. Bickell, 1876), the simurgh takes the place of the garuda, while Ibn al-Mokaffat (Calila et Dimna, ed. De Sacy, p. 126) speaks instead of the 'anka. The later Syriac, curiously enough, has bekmoth,—apparently the behemoth of Job transformed into a bird.

For a collection of legends about the roc, see Lane's Arabian Nights, chap. xx. notes 22, 62, and Yule, wt supra. Also see Bochart, Hieroz., bk. vi. ch. xiv.; Damiri, i. 414, ii. 177 sq; Kazwint, i. 419 sq.; Ibn Batiuta, iv. 305 sg.; Spiegel, Lran. Alterthumsk., Wh, WG.

ROCH, Sr (Lat. Rochus; Ital. Rocco; Span. Rogue ; Fr. Roch or Roque), according to the Roman Breviary, was a native of Montpellier, France. The name of his father was John and that of his mother Franca or Libera. He was born with the mark of a red cross upon his person, and this was at once interpreted as signifying his future eminence. In his twelfth year he began to manifest strict asceticism and great devoutness, and on the death of his parents in his twentieth year he gave all his substance to the poor and joined the Franciscan Tertiaries. Coming to Italy during an epidemic of plague, he was very diligent in tending the sick in the public hospitals dt Aquapendente, Cesena, and Rome, and effected many miraculous cures by prayer and simple contact. After similar ministries at Piacenza he himself fell ill, and would have perished as he passed through the forest had not the dog of a certain nobleman daily supplied him with bread. On his return to Montpellier he was

arrested as a spy and thrown into prison, where he died, having previously obtained from God this favour, that all plague-stricken persons invoking him should be healed. The date of his death was 16th August 1327, in the thirty-second year of his age. During the sittings of the council of Constance in 1414, when the city was visited with the plague, the efficacy of St Roch's intercession was 'most manifestly" experienced. His remains were removed in 1385 to Venice, where they now lie. He is commemorated, chiefly in Italy and France, as the patron of the sick, and especially of the plague-stricken.

ROCHDALE, a municipal and parliamentary borough of south-east Lancashire, is situated on the river Roch and on the Lancashire and Yorkshire railway, 11 miles north-north-east of Manchester and 12 east of Bolton. By means of the Rochdale Canal, extending from the duke of Bridgewater's canal, Manchester, to the Calder and Hebble navigation at Sowerby Bridge, it has water communication with the most important towns in the north of England. Within recent years the town has largely increased. Though inhabited chiefly by the working classes, the streets generally are spacious and regular, The sanitary arrangements are very satisfactory, the main drainage having been executed on a very large scale. The gas- works and waterworks are in the hands of the corporation, which also erected public baths in 1868. There is a public cemetery belonging to the corporation, and also a public

park 12 acres in extent. The parish church of St Chad, occupying the high grounds overlooking the town, is built on the site of a church which was erected in the 12th century. The town-hall is a very extensive and elaborate structure in the Decorated Gothic style, and had originally a tower surmounted by a gilded spire 140 feet in height, which was destroyed by fire in 1883, The building, com- pleted in 1871 at a cost of £150,000, includes a large hall for public meetings and various municipal rooms. For the free public library, with about 40,000 volumes, a new building was opened in 1884. Of the educational charities the principal are the Archbishop Parker free grammar-school, founded in 1565, and the free English school, Among the other public institutions are the infir-

mary (lately much enlarged), the literary and scientific society, and the art society. The staple manufactures are those of woollens and cottons. There are, besides, foundries, iron-works, and machine-factories. Coal and stone are obtained extensively in the neighbourhood of the town. Rochdale was the birthplace of the co-operative movement. The town was first incorporated in 1856 and divided into three wards, but when the area of the muni- cipal borough was extended and made coextensive with the parliamentary borough it was divided into ten wards, governed by a mayor, ten aldermen, and thirty councilmen. tochdale has returned one member to the House of Com- mons since the Reform Act of 1832. The population of the borough (area, 4172 acres) in 1871 was 63,485, and in 1881 it was 68,866.

In early times Roehdale was situated entirely in the township of Castleton, where at one time stood the castle which gave its name to the township. Near the town are the remains of a Roman road leading over the Blackstone Edge Hills, which separate Lancashire and Yorkshire. The name Rochdale appears in Domesday Book as liecedam, and it was subsequent to the Norman Conquest that the town began to spread into the valley of the Roch. From the time of William the Conqueror the manor and estates were held by the De Lacys, but after some centuries they beeame merged in the erown. By Elizabeth they were bestowed on Sir John Byron, and in 1823 they were sold by Lord Byron the poct to James Dearden, in whose family they now remain, The town obtained a charter for a market in the veign of Riehard I. ; this charter was con-

firmed by Henry III., who added the privilege of holding an annual fair.

ROCHEFORT, a town of France, the chef-lieu of an arrondissement of the department of Charente Inférieure and of the fourth maritime prefecture, lies on the right bank of the Charente, 9 miles from the Atlantic, and is built partly on the side of a rocky hill and partly on old marshland, which renders the position unhealthy. The town is laid out with great regularity in chess-board fashion, The fortifications are sufficient merely to prevent it being taken by surprise. By rail it is connected with La Rochelle (18 miles north-north-west), Niort, and Saintes. There are both a naval and a commercial harbour. The former

has the advantage of deep anchorage well pro- tected by batteries at the mouth of the river, and the roadstead is perfectly safe. The windings of the channel, however, between Rochefort and the sea, and the bar at the entrance render navigation dangerous. 'This harbour and arsenal, which are separated from the town by a line of fortifications with three gates, contain large covered building yards (where eighteen vessels of the first class may be upon the stocks at once), eleven slips, three repair- ing docks, and on the right bank of the Charente in the Gardette meadows a large timber basin capable of floating 1,766,000 cubic feet of timber. Besides the various estab. lishments implied in the name, the arsenal is the seat of a ropewalk dating from 1666, a school of navigation and pilotage, a signal-tower 98 feet high (once attached to a church), the offices of the maritime prefecture, the navy commissariat, a park of artillery, and various boards of direction connected with the navy. About 5000 or 6000

men are usually employed in the arsenal. Other Govern- ment establishments at Rochefort are barracks for infantry, artillery, and marines, a provision factory, and the naval hospital (800 beds) and school of medicine. In the grounds of this last institution is an artesian well, sunk in 1862-66 to a depth of 2800 feet and yielding water at a temperature of 107° Fahr. The commercial harbour, higher up the river than the naval harbour, has two basins with an aggregate area of 5 acres and 3400 feet of quays, and a third basin is being constructed (1885) 25 acres in extent with 3800 feet of quays, capable of admit- ting large vessels on every day of the year. The town has good public and botanic gardens, and the Place Col- bert contains an allegorical group representing the ocean and the Charente mingling their waters. Besides ship- building, which forms the staple industry of Rochefort, sailcloth and furniture are the local manufactures, and hemp for cordage is grown in the vicinity. Along with Tonnay-Charente, 4 miles higher up, Rochefort has a trade in brandies, salt, grain, flour, cattle, horses, fish, colonial wares, timber, and coal. There is regular steamboat com- munication with the United Kingdom. In 1882 285 vessels (128,570 tons) entered and 270

(123,501) cleared. The population of the town was 26,022 in 1881 (27,854 in the commune).

The lordship of Rochefort, held by powerful nobles as early as the 11th century, was united to the French crown by Philip the Fair in 1303; but it was alternately seized in the course of the Hundred Years' War by the English and the French, and in the wars of religion by the Catholics and Protestants. Colbert having in 1665 chosen Rochefort as the seat of a repairing port between Brest and the Gironde, the town rapidly increased in importance : by 1674 it had 20,000 inhabitants; and, when the Dutch admiral Tromp appeared at the mouth of the river with seventy-two vessels for the purpose of destroying the new arsenal, he found the ap- proaches so well defended that he gave up his cnterprise. It was at Rochefort that the naval school now transferred to Brest was originally founded. The town continued to flourish in the later part of the 17th century. In 1690 and in 1703 it escaped from the attempts made by the English to destroy it. Its fleet under the command of La Galissonniére, a native of the place, did dis- tinguished service in the wars of American independence, the re- public, and the empire. But the destruction of the French fleet by the English in 1809 in the roadstead of Ile d'Aix, the preference accorded to the harbours of Brest and Toulon, and the unhealthiness of its climate have seriously interfered with the prosperity of the place. The convict establishment founded at Rochefort in 1777 was suppressed in 1852.

ROCHEFOUCAULD. See La Rocurroucautp.

ROCHELLE, La, a town and seaport of France, the chef- lieu of the department of Charente-Inférieure, is situated on the Atlantic coast in 46° 9' N. lat., 296 miles by rail south-west of Paris. Its fortifications, which were con- structed by Vauban, have a circuit of 34 miles with seven gates. In population (20,028 in 1881; 22.464 in the commune) it ranks after Rochefort. The harbour, one of the safest and most accessible on the coast, comprises an

outer harbour, a tidal basin, a wet dock, and a graving

dock. The outer harbour is still protected by the dry stone mole, about a mile long, constructed by Richelieu. The wet dock (7 acres) is capable of receiving ships of 1000 tons. Behind these is the Maubec basin, the water of which along with that of the Niort Canal helps to scour the port and navigable channel. On the fortifications towards the sea are three towers, of which the oldest (1384) is that of St Nicholas. The apartment in the first story was formerly used as a chapel. The chain tower (1476) was at one time connected with that of St Nicholas by a great pointed arch. The lantern tower (1475-76), seven stories high, affords a fine view of the town, the roadstead, and the surrounding islands, and at present is used asa military prison. Of the ancient gateways only one has been preserved in its entirety, that of the " grosse_hor- loge," a huge square tower of the 14th or 15th century,*

the corner turrets of which have been surmounted with trophies since 1746. The cathedral of La Rochelle (St Louis or St Bartholomew) is a heavy Grecian building (1742-1862) with a dome above the transept, erected on the site of the old church of St Bartholomew, destroyed in the 16th century and now represented by a solitary tower dating from the 14th century. Externally the town-house (1486-1607) has the appearance of a fortress in the Gothic style and internally that of a Renaissance palace. The belfries are beautifully decorated with carved work, and the council-chamber, where the mayor Guiton presided during the siege, is now adorned by his statue. Tn the old episcopal palace (which was in turn the resid- ence of Sully, the prince of Condé, Louis XIIJ., and Anne of Austria, and the scene of the marriage of Alphonso VI. of Portugal with a princess of Savoy) accommodation has been provided for a library of 25,000 volumes, a collection of records going back to the 13th century, and a museum founded in 1842 by the society of the Friends of the Arts. Other buildings of note are an arsenal, an artillery museum, a large hospital, a special Protestant hospital, a military hospital, and a lunatic asylum for the department. In the public gardens there is a museum of natural history. Medizeval and Renaissance houses still give a peculiar character to certain districts of the town: several have French, Latin, or Greek inscriptions of a moral or religious turn and in general of

Protestant origin. Of these old houses the most interesting is that of Henry IJ. or Diana of Poitiers. The parade-ground, which forms the principal public square, occupies the site of the castle, demolished in 1590. Some of the streets have side-arcades ; the public wells are fed from a large reservoir in the Champ de Mars ; and among the promenades are the Cours des Daimes with the statue of Admiral Duperré (1869), and, outside, the tree-planted ramparts and the Mail, a beautiful piece of greensward. In this direction are the sea-bathing estab- lishments. La Rochelle, besides a celebrated manufactory of barrels, contains saw-mills, copper and iron foundries, and factories for patent fuel made out of coal dross. In 1882 465 vessels (225,449 tons) entered and 431 (215,820) cleared. Coals from England and iron-ore from Spain are among the staple imports. In the neighbourhood the principal industries are getting salt from the marshes and rearing oysters and mussels,

La Rochelle existed at the close of the 10th century under the name of Rupella. In 1199 it received a communal charter from Eleanor, duchess of Guienne, and it was in its harbour that John Lackland disembarked when he came to try to recover the domains seized by Philip Augustus. Captured by Louis VII. in 1224, it was restored to the English in 1360 by the treaty of Brétigny, but it shook off the yoke of the foreigner when Duguesclin recovered Saintonge. During the 14th, 15th, and 16th centuries La Rochelle, then an almost independent commune, was one of the great maritime cities of France. From its harbour in 1402 Jean de Bethencourt set out for the conquest of the Canarics, and its seamen were the first to turn to account the discovery of the New World. The salt- tax provoked a rebellion at Rochelle which Francis I. had to come to repress in person; in 1568 the town secured exemption by the payment of a largesum. At the Reformation La lochelle early became one of the chief centres of Calvinism, and during the reli- gious wars it armed privateers which preyed on Catholic vessels in the Channel and the high seas. In 1571 a synod of the Protestant churches of France was held within its walls under the presidency of Beza for the purpose of drawing up a confession of faith. After the massacre of St Bartholomew, La Rochelle held out for six and a half months against the Catholic army, which was ultimately obliged to raise the siege after losing more than 20,000 men. The peace of 24th June 1573, signed by the people of La Rochelle in the

name of all the Protestant party, granted the Calvinists full liberty of worship in several places of safety. Under Henry AV, the town remained quiet, but under Louis XIII. it putitself again at the head of the Huguenot party. Its vessels blockaded the mouth of the Gironde and stopped the commerce of Bordeaux, and also seized the islands of Ré and Oléron and several vesscls of the royal fleet. It was then that Richelieu resolved to subdue the town once for all. In spite of the assistance rendered by the English

troops under Buckingham and in spite of the fierce energy of their mayor Guiton, the people of La Rochelle were obliged to capitulate after eight months' siege (October 1628). During this investment Richelieu raised the celebrated mole which cut off the town from the open sea. La Rochelle then became the principal port for the trade between the mother-country of France and the colony of Canada. But the revocation of the Edict of Nantes deprived it of 3000 of its most industrious inhabitants, and the loss of Canada by France completed the ruin of its commerce. Its privateers, however, still maintained a vigorous struggle with the English during the republic and the empire.

Among the men of mark born at La Rochelle may be mentioned Jean Guiton, T'allemant des Réaux, Réaumur the physicist, Admiral Duperré, Bonpland the botanist, and the painters Fromentin and Bouguereau. |

ROCHELLE SALT. See Tarraric Acrp.

ROCHESTER, an episcopal city and municipal and parliamentary borough of Mid-Kent, is situated on the Medway, on the Medway Canal, and on the London, Chat- ham, and Dover and the South-Eastern railway lines, 33 miles east of London, contiguous to Chatham and Strood. Here the river is crossed by a railway bridge and by an iron swing bridge for carriage traffic, erected to take the place of a stone bridge destroyed in 1856. The present bridge occupies the site of that which spanned the Medway before the Conquest. On the eminence overlooking the right bank of the river and commanding a wide view of the surround- ing country are the extensive remains of the Norman castle which is generally

supposed to have been built by Gun- dulph, bishop of Rochester, towards the close of the 11th century, and which was besieged by King John, by Simon de Montfort in the reign of Henry IIL, and in the reign of Richard II. by a party of rebels during the insurrection of Wat Tyler. It was repaired by Edward IV., but soon afterwards fell into decay, although the massive keep is still in good preservation. The cathedral was originally founded by Augustine in 604, but was partially destroyed by the Danes, and was rebuilt by Bishop Gundulph in the beginning of the 12th century. Though a comparatively small building, being only 310 feet in length and 68 in breadth at the nave, it is of considerable architectural interest, the most remarkable feature being the Norman west front with a richly sculptured door. There is a large number of monuments of great antiquity. In the garden of the deanery there are portions of the wall of St Andrew's priory, founded about the same time as the cathedral. Among the principal public buildings of a secular character are the town-hall (1687), the corn exchange (1871), the county court offices (1862), the working men's institute (1880), and the Richard Watts's almshouses, in the Tudor style. Besides these almshouses there are a number of other charities. The principal schools are the cathedral grammar-school, founded in the reign of Henry VIIL., and the Williamson mathematical school, formerly for the sons of freemen, but now open to all. The oyster fishing is of some importance, and there is a considerable shipping trade, a quay and landing-place having been erected by the corporation at great expense. In 1883 the number of vessels that entered the port was 5969 of 855,019 tons burden, and the number that cleared 5496 of 709,040 tons. There is a large steam-engine manufactory. Rochester returned two members to parliament down to 1885, when it was deprived of one. The population of the borough (area,! 2909 acres) in 1871 was 18,352, and in 1881 it was 21,307; this includes 5395 persons in the town of Strood, situated on the opposite side of the Medway.

Rochester was the Durobrivx of the Romans, and was intersected by the Roman Watling Street from Canterbury. It was formerly surrounded with walls, of which there are still a few remains. It was the foundation of the cathedral by Ethelbert that first raised

it to importance. By the Saxons it was named Jrofe-ccastre, which was gradually corrupted into the present name. In 676 it

“1 The parliamentary borough also includes 11,768 acres of tidal water and foreshore along the river Medway.

was plundered by Ethelred, king of Mercia, and subsequently it suffered severely from the ravages of the Danes. About 930, when three mints were established there by Athelstan, it had grown to be one of the principal ports of the kingdom. William the Con- queror granted the town to his half-brother Odo, bishop of Bayeux, who, on account of his connexion in the conspiracy in favour of Robert, duke of Normandy, was besieged in the castle and deprived of his possessions. In 1180 and again in 1137 the city was nearly destroyed by fire. A grand tournament was held at the castle by Henry III. in 1251. The city was visited in 1522 by Henry VIII. accompanied by the emperor Charles V., and in 1573 Elizabeth remained there five days. Charles II. passed through it on his way to London at the Restoration, and at the Revolution James II. embarked at the port on his way to France. The bishop’s see was founded in 600, and the city received its first charter of incorpora- tion from Henry II. in 1165. It has returned members to parlia- ment since the 23d of Edward I.

ROCHESTER, a city of the United States, capital of Monroe county, New York, lies 229 miles to the west of Albany (43° 9° 22’°44 N. lat. and 77° 36’ 50’-97 W. long.), in arich agricultural region, upon a plateau on both banks of the Genesee river, 7 miles from its mouth at Lake Ontario and 263 feet above the lake level. There are three falls in the river of 96, 26, and 83 feet respectively within the city limits, the banks below the first fall vary- ing in height from 100 to 210 feet. To this abundant water-power of the Genesee, supplemented by the trans- portation facilities afforded by the Erie Canal and the various railway connexions, Rochester mainly owes its progress and prosperity. The streets of the city are gen- erally wide, and well paved and lighted (partly by elec- tricity), and trees and flowering plants are abundant. Rochester is an important railway centre. The New York

Central Railroad, with elevated tracks through the city, has two lines east to Syracuse, two west to Buffalo and Niagara Falls respectively, and one north to Charlotte, where connexion is made with the Rome,. Watertown, and Ogdensburg line; a branch of the New York, Lake Erie, and Western Railway connects with the main line at Corning and with the Buffalo branch at Avon; the Roch-

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ester and Pittsburgh Railway runs south to Salamanca, and the Genesee Valley Railway to Olean, crossing the West Shore Railway a short distance south of the city line ; and there are also railway lines to Irondequoit Bay and Windsor beach, and about 30 miles of street railway, radiating from the centre in all directions. The manu- factures of Rochester are numerous and varied. Though no longer at the head of the flour industry, it still possesses twenty mills, capable of producing 2900 barrels daily. The principal manufacture is that of ready-made clothing, the sales reaching $9,000,000 annually. In its boot and

ROCHESTER

shoe trade the city ranks fourth in the country (5000 hands ; annual sales, $6,500,000). There are also sixteen breweries and ten malt-houses; some eighty or ninety cigar-makers and tobacconists have a total output of about 2,000,000 ib of tobacco, 18,000,000 cigars, and 140,000,000 cigarettes; while furniture-making employs 1000 hands. The lumber business is extensive; and of late years the city has been one of the principal centres for the distribution of the anthracite and bituminous coal of Pennsylvania. Its numerous nurseries are a peculiar feature of the place ; and there is a great variety of other industries. The main supply of water is brought in iron conduits (147 miles of pipe) from Hemlock Lake, 29 miles to the south ; an additional supply for subsidiary purposes is

drawn from the Genesee river (114 miles of pipe). The total cost of the works has been $3,744,749. The princi- pal cemetery, Mount Hope, with an area of 200 acres, is exceedingly picturesque and well cared for. Rochester has two State institutions, the Western House of Refuge and the Western New York Institution for Deaf Mutes. The former, opened in 1849, is a substantial structure of brick, with accommodation for 600 inmates, built at a cost of $373,000; it receives juvenile delinquents com- mitted by magistrates ; they are instructed in trades and labour upon the farm belonging to the refuge. The insti- tution for deaf mutes (1875) instructs about 160 pupils annually. Among the eleemosynary institutions of the city are the Rochester city hospital, St Mary's hospital, the Rochester, St Patrick's, St Mary's, St Joseph's, and the Jewish orphan asylums, the home for the friendless, the industrial school, the church home, the home of in- dustry, and the home for truant children. There are 75 churches, including the Roman Catholic cathedral, 6 Baptist, 10 Methodist Episcopal, 10 Protestant Episcopal, 11 Presbyterian, 5 Lutheran, and 11 Roman Catholic churches, and 5 Jewish synagogues. The public school system of Rochester includes a free academy (cost $125,000) and thirty grammar-schools (with classes in the orphan asylums), in which 200 teachers are engaged and 10,000 pupils taught. There are also thirty private institutions, academies, seminaries, and parochial schools. The univer- sity of Rochester was established in 1850, under Baptist auspices ; its faculty consists of a president and ten pro- fessors, and the annual attendance of students is about 160. It has two buildings,—Anderson Hall and Sible Hall. The Rochester theological seminary (Baptist), founded in 1850 and housed in two commodious buildings—Trevor and Rockefeller Halls—has eight professors and about seventy students, besides a German department. Other public libraries in addition to those of the university and the theological seminary are the central and Reynolds. There are four English and two German daily newspapers, and twelve weekly and nine monthly publications. Among edifices not already mentioned are the city-hall, the United States Government building, the court-house, the Warner astronomical observatory, the Rochester and East Side savings banks, the Powers buildings, with their famous art gallery, and the Warner and Kimball factories. The population (89,366 in 1880) was estimated at 115,000 in 1885; the area of the city, which is divided into sixteen wards, is 4 square

miles. The assessed valuation of real and personal property in 1885 was $40,952,070, and the debt was $5,249,000.

Rochester derives its name from Nathaniel Rochester, who pro- jected a settlement here in 1810; the first house was built in 1812; and the incorporation of the city dates from 1834.

ROCHESTER, Joun Witmort, Ear or (1647-1680), born in Oxfordshire in 1647, was one of the unworthics of the reign of the "merry monarch, scandalous and poor,"

"Who never said a foolish thing Nor ever did a wise one."

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Rochester is the author of both these imperishable descrip- tions of Charles II., and by them and his poem "' Upon Nothing," and his death-bed conversation with Bishop Burnet he is now chiefly known. His poetry has hardly had a fair chance against that of his contemporaries, for owing to his scandalous character, which was probably worse than the time only in respect of his ostentatious defiance of proprieties, all kinds of indecencies were fathered upon him and inserted in unauthorized editions of his works. This has ensured his exclusion from decent libraries, an edition issued in 1691 by friends careful of his memory having been pushed out of sight by these mnore piquant publications. His letters to his wife and his son show that the real man was much better than the public estimate of him, which he invited by his occasional daring breaches of decorum and morality. Some of his lyrics are very pretty, full of ingenious fancy and musical rhythm, but wit and intellect are more marked in his writing than the free flow of lyrical sentiment. For wit, versatility, and intense vitality of intellect this strangely wasted life stood high above the level of its age. In his youth Rochester distinguished himself in the Dutch wars by acts of signal personal bravery ; his alleged cowardice afterwards in street brawls and personal quarrels looks rather like daringly contemptuous cynicism. had a taste for the humours of low life, and is said to have haunted the low quarters of the town in various disguises, on one occasion personating a mountebank on Tower Hill. He died on 26th

July 1680, at the early age of thirty-three, and the common account is that his constitution was undermined and exhausted by profligate excesses.

ROCHE-SUR-YON, La, a town of France, the chief town of the department of La Vendée, lies 278 miles south- west of Paris by the railway to Sables d'Olonne, on an eminence 164 feet above the sea on the right bank of the Yon, a little tributary of the Lay, itself an affluent of the Pertuis Breton. In 1881 the population of the town was 9965, of the commune 10,634. The castle of La Roche- sur-Yon, which probably existed before the time of the crusades, and which was frequently attacked or taken in the Hundred Years' War and in the wars of religion, was finally dismantled under Louis XIII. ; and when Napoleon in 1805 made this place the chief town of a department the stones from its ruins were employed in the erection of the administrative buildings, which, being all produced at once after a regular plan, have a monotonous effect. The equestrian statue of Napoleon I. in an immense square over- looking the rest of the town ; the statue of General Travot, who was engaged in the " pacification" of La Vendée ; the museum, with several paintings by P. Baudry, a living native artist of note, are the only objects of interest. The dog fairs of Roche-sur-Yon are important. Napoleon- Vendée and Bourbon-Vendée, the names borne by the town according to the dominance of either dynasty, gave place to the original unpolitical name after the revolution of 1870.

ROCKET. See AmmuNITION and PyrorecHny ; for the use of rockets to rescue the shipwrecked see LirEBoat, vol. xiv. p. 572.

ROCKFORD, a city of the United States, the county seat of Winnebago county, Illinois, on both banks of the Rock river, which, rising in Wisconsin, falls into the Mis- sissippi after a course of 350 miles. By rail it lies 92 miles north-west of Chicago and is a junction of the Chicago and North-Western, the Chicago, Milwaukee, and St Paul, and the Chicago, Burlington, and Quincy Rail- roads. Abundant water-power was secured by a dam 800 feet long constructed across the river in 1844. The chief objects of industry of Rockford, one of the largest manu- facturing centres in the Mississippi valley, are agricultural

implements, furniture, watches, silver-plated ware, cutlery, tacks and nails, bolts, wire-cloth, netting, woollen and cotton goods, paper, flour, oatmeal, glucose. Waterworks on the Holly system (1874) are capable of pumping 5,500,000 gallons through the mains in twenty-four hours. The city stands in a fine agricultural district, is handsomely built and well shaded, and has a public library, a public high school, and ten other public school buildings, a seminary for girls (1849), five banks, and twenty-one churches. The population was 6976 in 1860, 11,049 in 1870, and 13,129 in 1880 (township, 14,525). Rockford was settled about 1836 ; in 1852 it received incorporation as a city. ROCKHAMPTON, a town of Queensland, is situated some 40 miles up the Fitzroy river, nearly on the Tropic of Capricorn. The streets are well formed and kept, bordered by trees, with ever-flowing water down the channels. Em- bosomed in hills, it has a climate, in spite of heat, of singular salubrity, the death-rate being only about half that of London. 'The population in 1884 was about 11,000. Rockhampton is the gateway to a fine pastoral interior and is a port of export for wool. The hills in its neighbourhood are rich in metallic wealth ; and Mount Morgan, 30 miles from Rockhampton, seems likely to eclipse the production of Victoria and New South Wales. If anything be needed to complete the prospective im- portance of Rockhampton, it is the growing development of sugar plantations at no great distance from the town. ROCKINGHAM, Cxartes Watson WENTWORTH, SECOND Marquis or (1730-1782), twice prime minister of England, was the only

son of Thomas Watson Wentworth, whose father had inherited the great Wentworth estates in Yorkshire on the death of William Wentworth, fourth earl of Strafford, and who had himself succeeded his second cousin as sixth Lord Rockingham in 1746 and been created marquis of Rockingham in the same year. Charles Watson Wentworth was born in 1730 on the 19th of March (Albe- marle), or the 13th of May (Collins), and was educated at Eton. He showed his spirit as a boy by riding across from Wentworth to Carlisle in 1745 with but one servant, to join the duke of Cumberland in his pursuit of the Young Pretender. He was created earl of Malton in the peerage of Ireland on 4th September 1750, and succeeded his father as second marquis of Rockingham on 14th December in the same year. In 1751 he became lord-lieutenant of the North and West Ridings of Yorkshire and a lord of the bedchamber, and in 1760 was made a knight of the Garter. After George III. had begun his policy of divid- ing the great Whig families, those Whig noblemen and gentlemen who did not choose to join the sections headed by the Grenvilles, the duke of Bedford, or any other great nobleman, selected as their chief the young marquis of Rockingham. In May 1762 the king's favourite, the earl of Bute, became first lord of the treasury, and the marquis of Rockingham was amongst those who in the following year were dismissed from their lord-lieutenancies. The opposition now grew so strong that Lord Bute resigned in April 1763 and the king, true to his policy, appointed George Grenville to be his successor. But Grenville's section of the Whig party was not strong enough to main- tain him in power long, and on 12th July 1765 Lord Rockingham formed his first administration with General Conway and the duke of Grafton as secretaries of state. The cabinet seemed stronger than it really was, for it was divided by intestine quarrels, and the earl of Chatham refused to have anything to do with it. Nevertheless Rockingham recovered his lord-lieutenancies and won reputation as a good administrator. In May 1766 the duke of Grafton, a far abler man than Rockingham, though neither so conciliatory in his manners nor so generally popular, seceded from the Government, and in August

1766 he succeeded his former chief as first lord of the treasury and prime minister. Then followed many years of fruitless opposition to the king's personal authority as exhibited through his ministers, but at last, on 27th March 1782, Lord Rockingham again became prime minister with Fox and Shelburne as secretaries of state. This time he enjoyed office for but a few weeks, for he died on Ist July 1782.

See Memoirs of the Marquis of Rockingham and his Contemporaries by George Thomas, Earl of Albemarle, 2 vols., 1852, and such bio- graphical works as Macknight's Life of Burke, Lord E. Fitzmaurice's Life of Lord Shelburne, &c.

ROCK ISLAND, a city of the United States, the capital of Rock Island county, Illinois, is situated opposite Davenport on the left bank of the Mississippi, about 3 miles above the mouth of the Rock river and at the foot of the Upper Rapids, which extend for about 16 miles. Distant by rail 181 miles west of Chicago and 247 miles north of St Louis, Rock Island is one of the great centres of railroad and river traflic. With Davenport (in Iowa) it is connected by a two-story road and railway bridge constructed by the Government in 1870. Among the public buildings are a large public library and St Augus- tana College, founded by the Swedish Lutherans. Glass- works, a plough factory, a distillery, flour-mills, and a stove factory are the principal industrial establishments. The city, however, is best known from the great national arsenal situated on the island from which it derives its name. This island is a ridge of limestone rock about 3 miles long and with an area of 960 acres. As the site of Fort Armstrong it became known in the Black Hawk War ; the prison was used for the detention of Confederate prisoners during the Civil War; and since that date the Government has constructed the present extensive works, intended to be the central United States armoury. There are ten vast stone workshops, each with a stone house in the rear, as well as officers' quarters, offices, &c. The population of Rock Island city was 5130 in 1860, 7890 in 1870, and 11,659 in 1880. Its charter dates from 1849,

ROCKLAND, a city and seaport of the United States, county town of Knox county, Maine, is situated 60 miles by rail east-north-east of Portland on Owl's Head Bay, an inlet of Ponobscot Bay. It was

incorporated in 1854, has an area of 7000 acres and a sea frontage of about 44 miles, and numbered 7599 inhabitants in 1880 (in 1870 7074). Lime-burning is the staple trade (1,000,000 barrels per annum). The adjacent islands—Dix Island, Hurricane Island, &c.—are known by their granite quarries. Water for the city is obtained from Lake Chickawaukie,

ROCKY MOUNTAINS. See Untrep Srarss,

_ROCROI, a town of France, the chef-lieu of an arron- dissement in the department of Ardennes, lies 15 miles in a straight line northnorth-west of Méziéres and within 2 miles of the Belgian frontier, at a height of 1083 feet above the sea. As a fortified place it commands the Ardennes plateau between the valley of the Meuse and the headwaters of the Oise. The present fortifications were constructed by Vauban. In 1881 the population was 1649 (commune 2977).

This spot, originally called Croix-de-Rau or Rau Croix, was fortified in the 16th century and besieged by the imperialists in 1555. Invested by the Spaniards in 1648, it was relieved by the

young duke of Enghien (afterwards the Great Condé) after a brilliant

victory. Captured in 1658 by the same duke, then in the Spanish service, it was not restored to France till the treaty of the Pyrences in 1659. In 1815 Rocroi was besieged for a month by the allies.

RODBERTUS, Kart JoHann (1805-1875), by some considered to be the founder of scientific socialism, was born at Greifswald on 12th August 1805, his father being a professor at the university there. He studied law at Gottingen and Berlin, thereafter engaging in various legal occupations ; and, after travelling for some time, he bought the estate of Jagetzow in Pomerania, whence his name of Rodbertus-Jagetzow. In 1836 he settled on this estate, and henceforward devoted his life chiefly to economic and other learned studies, taking also some interest in local and provincial affairs. After the revolution of March 1848 Rodbertus was elected member of the Prussian national assembly, in which body he belonged to

the left centre ; and for fourteen days he filled the post of minister of public worship and education. He sat for Berlin in the second chamber of 1849, and moved the adoption of the Frankfort imperial constitution, which was carried. When the system of dividing the Prussian electorate into three classes was adopted, Rodbertus recommended abstention from voting. His only subsequent appearance in public life was his candidature for the first North German diet, in which he was defeated. His correspondence with Lassalle was an interesting feature of his life. At one time Rodbertus had some intention of forming a "social party" with the help of the conservative socialist Rudolf Meyer and of Hasenclever, a prominent follower of Lassalle ; but no progress was made in this. Rodbertus was neither disposed nor qualified to be an agitator, being a man of a quiet and critical temperament, who believed that society could not be improved by violent changes, but by a long and gradual course of development. He warned the work- ing men of Germany against connecting themselves with any political party, enjoining them to be a "social party " pure and simple. He died on 8th December 1875.

The general position of Rodbertus was 'social, monarchical, and national." With his entire soul he held the purely economic part of the.creed of the German social-democratic party, but he did not agree with their methods, and had no liking for the productive associations with state help of Lassalle. He regarded a socialistic republic as a possible thing, but he cordially accepted the monarchic institution in his own country and hoped that a German emperor might undertake the réle of a social emperor. He was also a true patriot and was proud and hopeful of the career that lay before the regencrated empire of Germany. The basis of the economic teach- ing of Rodbertus is the principle laid down by Adam Smith and Ricardo and insisted on by all the later socialists, that labour is the source and measure of value. In connexion with this he developed the position that rent, profit, and wages are all parts of a national income produced by the united organic labour of the workers of the community. Conscquently there can be no talk of the wages of labour being paid out of capital; wages is only that part of the national income which is received by the workmen, of a national income which they have themselves entirely produced. The wages fund theory is thus summarily disposed of. But the most important result of the theory is his position that

the possession of land and capital enables the landholders and capitalists to compel the workmen to divide the product of their labour with those non- working classes, and in such a proportion that the workers only obtain as much as can support them in life. Thus the iron law of wages is established. Hence also Rodbertus deduces his theory of commercial crises and of pauperism, and in the following way.' In spite of the increasing productivity of labour, the workers obtain in general only sufficient to support their class, and therefore a smaller relative share of the national income. But the producers form also the large mass of consumers, and, with the decline of their relative share in the national income, must decline the relative purchasing power of this large class of the people. The growing production is not met by a correspondingly growing consumption ; expansion is succeeded by contraction of production, by a scarcity of employ- ment, and a further decline in purchasing power on the part of the workers. Thus we have a commercial crisis bringing with it pau- perism as a necessary result. In the meantime the purchasing power of the non-producing capitalists and landholders continues relatively to increase ; but, as they have already had cnough to buy

all the comforts of life, they spend the more in the purchase of luxuries, the production of which increases.

A fundamental part of the teaching of Rodbertus is his theory of social development. He recognized three stages in the economic progress of mankind: (1) the ancient heathen period in which property in human beings was the rule; (2) the period of private property in land and capital; (3) the period, still remote, of pro- perty as dependent on service or desert. The goal of the hnman race is to be one society organized on a communistic basis; only in that way can the principle that every man be rewarded accord- ing to his work be realized. In this communistic or socialistic state of the future land and capital will be national property, and the entire national production will be under national control ; and means will be taken so to estimate the labour of each citizen that he shall be rewarded according to its precise amount. An immense staff of state

officials will be required for this function. As we have already said, Rodbertus believed that this stage of social develop- ment is yet far distant ; he thonght that five centuries will need to pass away before the ethical force of the people can be equal to it.

From temperament, culture, and social position Rodbertus was averse to agitation as a means of hastening the new era; and, in the measures which he recommends for making the transition towards it he showed a scrupulous regard for the existing interests of the capitalists and landholders. He proposed that those two classes should be left in full possession of their present share of the national income, but that the workers shonld reap the benefit of the increasing production. To secnre them this increment of pro- duction he proposed that the state should fix a 'normal working day " for the various trades, a normal day's work, and a legal wage, the amount of which should be revised periodically, and raised according to the increase of production, the better workman receiv- ing a better wage. By measures such as these carried out by the state in order to correct the evils of competition wonld Rodbertus seek to make the transition into the socialistic era.

The economic work of Rodbertus is therefore an attempt made in a temperate and scientific spirit to elucidate the evil tendencies inherent in the competitive system, especially as exemplified in the operation of the iron law of wages. The remedy he proposes is a state management of production and distribution, which shall extend more and more, till we arrive at a complete and universal socialism,—and. all based on the principle that as labour is the source of value so to the labourer should all wealth belong. It is therefore an attempt to place socialism on a scientific basis; and he is certainly entitled to be regarded as one of the founders of " scientific socialism " (see SOCIALISM).

*The following are the most important works of Rodbertus :—Zur Erkenntniss unserer staatswirthschaftlichen Zustdnde (1842); Sociale Briefe an von Kirchmann (1850); Creditnoth des Grundbesitzes (2d ed., 1876); '*Der Normal-Arbeitstag," in Tib. Zeitschrift (1878) 5 Letters to A. Wagner, &c., Tiib. Zeitschrift (1878-79) ; Letters to Rudolf Meyer (1882). Within recent years Rodbertus has received great attention in Germany,*

especially from Adolf Wagner (ib. Zeitschrift, 1878); see also Kozak's work on Rodbertus (1882), and an excellent, monograph by G. Adler (Leipsic, 1884).

RODERICK. See Sparn.

RODEZ, a town of France, chef-lieu of the department of Aveyron and the see of a bishop, 412 miles south of Paris by the railway which continues to Béziers, is built at a height of 2077 feet on a promontory surrounded by the Aveyron, a sub-tributary of the Garonne by the Tam. In population—14,425 inhabitants (15,333in the commune) in 1881—it ranks next to the industrial town of Millau. The cathedral was built between 1277 and 1535. A great flamboyant rose window and a gallery in the same style are the chief features of the principal facade. Each tran- sept has a fine Gothic doorway. At the north side of the building rises a tower (erected in the beginning of the 16th century) which ranks by its height as one of the wonders of the south of France, and bears aloft a colossal statue of the Virgin surrounded by the four evangelists. The interior has a fine rood loft and several interesting tombs. The episcopal palace with its collection of sculp- tured stones; the church of St Amans, in the Romanesque style, but entirely restored externally in the 18th century ; and several curious old houses of the 13th, 15th, and 16th centuries, such as the Hétel d'Armagnac, on the site of the old palace of the counts, also deserve to be mentioned. The ruins of a Roman amphitheatre still exist, and the town is supplied with water by the old Roman aqueduct recently restored.

Rodez, called Segodunum under the Gauls and Ruthena under the

Romans, was the capital of a tribe allied to the Arvernians. In the 4th century it adopted the Christian faith and St Amans, its

first bishop, was elected in 401. During the Middle Ages con- tests were rife between the bishops in the "city" and the counts in the "bourg." The Albigenses were defeated near Rodez in 1210. The countship of Rodez depended in succession on the count of Toulonse, on the king of France,

and from the close of the 13th century on the count of Armagnac. From 1360 to 1368 the English held the town. After the confiscation of the estates of the Armagnacs in 1473 it passed to the dukes of Alencon and then to the D'Albrets. Henry IV. finally annexed it to the crown of France. Neither the Protestants nor the Leaguers any more than in earlier days the Albigenses were able to make themselves masters of Rodez.

RODNEY, Grorce Brypeus Ropnuy, Baron (1718- 1792), English admiral, second son of Henry Rodney of Walton-on-Thames, was born there on 19th February 1718. His father had served in Spain under the earl of Peter- borough, and on quitting the army obtained command of the king's yacht. George was sent to Harrow when quite young, and on leaving entered the navy. By warrant dated 21st June 1732 he was appointed as volunteer on board the "Sunderland," a fourth-rate. While serving on the Mediterranean station under Admiral Haddock he was made lieutenant in the "Dolphin," his promotion dating 15th February 1739. In 1742 he attained the rank of post-captain, having been appointed to the " Plymouth," 9th November. After minor services of an active charac- ter in home waters, he obtained command of the " Eagle," sixty guns, and in this ship took part in Hawke's victory off Ushant, 14th October 1747, over the French fleet under L'Etanduére. On that day Rodney gained his first laurels for gallantry, under a chief to whom he was in a measure indebted for subsequent success. On 9th May 1749 he was appointed governor and commander-in-chief of New- foundland, with the rank of commodore, it being usual at that time to appoint a naval officer, chiefly on account of the fishery interests. Returning home, he was elected M.P. for Saltash in May 1751, and married his first wife, Jane Compton, sister to the earl of Northampton, 3d February 1753. During the Seven Years' War Rodney rendered important service. In 1757 he had a share in the expedi- tion against Rochefort, commanding the "Dublin," seventy- four. Next year, in the same ship, he served under Admiral Boscawen at the taking of Louisburg (Cape Breton). On 19th May 1759 Rodney became a rear- admiral and was shortly after given command of a small squadron intended to destroy a large number of flat- bottomed boats and stores which were being collected at Havre for an invasion of the English coasts. He bom- barded the town for two days and nights without

ceasing, and inflicted great loss of war-material on the enemy. In July 1760, with another small squadron, he succeeded in taking many more of the enemy's flat-bottomed boats and in blockading the coast as far as Dieppe. Elected M.P. for Penryn in 1761, he was in October of that year appointed commander-in-chief of the Leeward Islands station, and within the first three months of 1762 had reduced the important island of Martinique, while both St Lucia and Grenada had surrendered to his squadron. During the siege of Fort Royal his seamen and marines rendered splendid service on shore. At the peace of 1763 Admiral Rodney returned home, having been during his absence made vice-admiral of the Blue and voted the thanks of both Houses of Parliament.

In 1764 Rodney was created a baronet by patent of 21st January, and the same year he married Henrietta, daughter of John Clies of Lisbon. From 1765 to 1770 he was governor of Greenwich Hospital, and on the dissolution of parliament in 1768 he successfully contested Northamp- ton at a ruinous cost. When appointed commander-in-chief of the Jamaica station in 1771 he lost his Greenwich post, but a few months later received the office of rear-admiral of Great Britain. Till 1774 he held the Jamaica com-

mand, and during a period of quiet was active in improv- ing the naval yards on his station. Sir George struck his flag with a feeling of disappointment at not obtaining the governorship of Jamaica, and was shortly after forced to settle in Paris. Election expenses and losses at play in fashionable circles had shattered his fortune and now broke up his family till the eve of war with France. In February 1778, having just been promoted admiral of the White, he used every possible exertion to obtain a com- mand from the Admiralty, to free himself from his money difficulties. By May he had, through the splendid gener- osity of his Parisian friend Maréchal Biron, effected the latter task, and accordingly he returned to London with his children. Sir George was enabled to remit at once to his benefactor the full loan, and it is worthy of record that the English Government in later years awarded pensions to the maréchal's

daughters in recognition of their father's chivalrous act.! That an attempt was made by the French ministry during the war crisis to seduce Rodney into accepting high rank in the French navy is undeniable from the evidence we possess, but the details of the com- mon version must be accepted with reserve, excepting the undoubted instant rejection of the offer. To the English cabinet the honour of both Rodney and Biron remained untarnished, if we may judge of the former by his letters, public and private, and of the latter by the pension awarded to his relatives."

Sir George was appointed once more commander-in-chief of the Leeward Islands, 1st October 1779, but did not sail till 29th December. He captured a Spanish convoy bound to Cadiz on 8th January 1780, and eight days later defeated the Spanish admiral Don Juan de Langara off Cape St Vincent, taking or destroying seven ships. On 17th April an action, which, owing to the carelessness of some of Rodney's captains, was indecisive, was fought off Martinique with the French admiral Guichen. Rodney, acting under orders, captured the valuable entrepdt of St Eustatius, and by his strong measures for stopping illegal and contra- band trade evoked an attempt at censure on the part of his political opponents. After a few months in England, recruiting his health and defending himself in parliament, Sir George returned to his command in February 1782, and a running engagement with the French fleet on 9th April led up to his crowning victory off Dominica, when on 12th April with thirty-five sail of the line he defeated Comte de Grasse, who had thirty-three sail. The French inferiority in numbers was more than counterbalanced by the greater size and superior sailing qualities of their ships, yet five were taken and one sunk, after eleven hours' fight- ing. This important battle saved Jamaica and ruined French naval prestige, while it enabled Rodney to write— 'Within two little years I have taken two Spanish, one French, and one Dutch admirals." A long and wearisome controversy exists as to the originator of the manceuvre of "breaking the line" in this battle, but the merits of the victory have never seriously been affected by any differ- ence of opinion on the question. A shift of wind broke the French line of battle, and advantage was taken of this by the English ships in two places.

Rodney arrived home in August to receive unbounded honour from his country. He had already been created Baron Rodney of Rodney Stoke,

Somerset, by patent of 19th June 1782, and the House of Commons had voted him a pension of £2000 a year. From this time he led a a a ee Se

1 See Barrow's Life of Anson, pp. 328-329,

*; * See Naval Chronicle, 1799, i. 369-370; Mundy, Life of Rodney, i. 183 3 United Service Journal, 1830, pt. ii. pp. 37-38, for diver- gent evidence about the French offer of service, See also Academy,*

4th October 1884, for the identification of a letter which perhaps bears upon Sir G. Rodney's prospects in 1778.

quiet country life till his death, which occurred on 24th May 1792, in London, while on a visit to his son. Next to Nelson we may fairly place Rodney, not only because of his well-merited successes, but for masterly decision and confident boldness in grappling with fleets of the three chief maritime states of Europe while in the plenitude of their power. He fought his equals in naval science, but conquered by superior practical skill.

See General Mundy, Life and Correspondence of Admiral Lord Rodney, 2 vols., 1830; Rodney letters in 9th Report of Hist. MSS. Com., pt. ili. ; "Memoirs" in Naval Chronicle i. 353-393; and Charnock, Biographia Navalis v. 204-228, Lord Rodney published in his lifetime (probably 1789) Letters to His Majesty's Ministers, d&c., relative to St Eustatius, &c., of which there is a copy in the British Museum. Most of these letters are printed in Mundy's Life, vol. ii, though with many variant readings. (G. F. H.)

RODOSTO, a town of European Turkey, in the sandjak of Tekfur Daghi or Rodosto in the vilayet of Adrianople (Edirne), is situated on the coast of the Sea of Marmora about midway between Gallipoli and Constantinople. Its picturesque bay is enclosed by the great promontory of Combos, a spur about 2000 feet in height from the hilly plateau to the north, and round about the town are stately cypress groves. 'The church of Panagia Rhevmatocratissa contains the graves, with long Latin inscriptions, of the Hungarian exiles of 1696. Rodosto has long been a

great depot for the produce of the Adrianople district, but its trade has suffered considerably since Dedeagatch became the terminus of the railway up the Maritza. In 1880 the value of exports and imports was £230,824. The popula- tion, formerly about 30,000, was in 1840 about 10,000, and at present (1885) may be estimated at 17,000, about half Turks, a quarter Armenians, and the remainder Greeks, Jews, and Latins.

Rodosto is the ancient Rhedestus or Bisanthe, said to have been founded by Samians. In Xenophon's Anabasis it is mentioned as in the kingdom of the Thracian prince Seuthes. Its restoration by Justinian is chronicled by Procopius. In 813 and again in 1206 it was destroyed by the Bulgarians, but it continues to appear

as a place of considerable note in later Byzantine history, being captured and recaptured in successive wars.

RODRIGUEZ, an island in the Indian Ocean in 19° 41'S, lat. and 63° 23' E. long., which, after the Seychelles, forms since 1814 the most important dependency of the British colony of Mauritius, from which it is distant 344 nautical miles. It is the easternmost of all the islands con- sidered as belonging to Africa. With a length of 13 miles east and west and a breadth of 3 to 6 north and south it has an area estimated at 424 square miles. On all sides it is surrounded by a coral reef, which on the north and south forms a large flat area partly dry at low water. The island proper was long believed to consist of granite overlaid with limestone and other modern formations, and thus it was regarded as a striking exception to the rule that all mid-ocean islands are of volcanic origin, and served in the hands of Peschel and others as a proof of the fermer exist-

ence in the Indian Ocean of the hypothetical continent of

Lemuria. The investigations of the Transit of Venus Ex- pedition have shown that it is built up of " doleritic lavas which have been poured out at a considerable number of orifices," now difficult to identify, at successive periods of uncertain date. The lavas are rich in olivine. In some places, as in the Cascade Valley, the disintegration of the rocks has produced beds of earthy clays varying in colour from a dull brick red to a liver brown, and forming a prominent feature in the landscape. A central ridge of

considerable elevation (Grande Montagne, 1140 feet) runs through the island from east to west, sending off a variety of spurs (Le Piton, 1160 feet). Deep-cut river valleys, often interrupted by cascades, run down in all directions to the sea. On the south-west there is a large plain of coralline limestone, remarkable for the caves of all sizes (some beautifully stalactitic) with which it is riddled,

Along the north and west coast there are on the reef a number of islands of volcanic origin ; those on the south- east are all of coralline limestone or sand. There are only two passages through the reef available for large vessels, —these leading respectively to Port Mathurin and to Port South-East. Rodriguez is comparatively arid; and the streams are as short-lived for the most part as they are beautiful. The climate is like that of Mauritius, but more subject to hurricanes during the north-west monsoon (November to April).

About 1845 the population of Rodriguez was about 250 persons. The original nucleus consisted of slaves from Mauritius, and recruits arrived from Madagascar and the African continent. By 1871 they had increased to 1108 and by 1881 to 1436. The island is governed by a civil commissioner, who is also a police magistrate. Capitalists from Mauritius are beginning to pay attention to the natural advantages of the island. A carriage road has been constructed from Mathurin to Gabriel, the only other village, where the Roman Catholic priests have their chapel and residence.

When originally discovered and down into the 17th century Rodriguez was clothed with fine timber trees; but goats, cattle, and bushi-fires have combined to destroy the great bulk of the old vegetation, and the indigenous plants have in many cases been ousted by intrusive foreigners. When the island was in French possession many settlers cultivated large estates, and fortunes were realized ; but with the liberation of the slaves the area of cultiva- tion decreased, and it is now of very limited extent. The staple crop is the sweet potato ; and manioc, maize, millet, and rice grow well, but are not much cultivated. Wheat is seldom seen, mainly because of the parakeets and the Java sparrows. Beans (Phaseolus

lunatus), lentils, gram (Cicer arietinum), dholl (Cajanus indicus), and ground-nuts are all grown to a certain extent in spite of the ravages of the rats (Balfour). Mangoes, bananas, guavas, pine-apples, custard- apples, and especially oranges, citrons, and limes, are the fruits that flourish best. Of the timber trees the most common are Eleoden- dron orientale, much used in carpentry and for pirogues, and Latania Verschafeltt (Leguat's plantane). At least two species of screw- pine (Pandanus heterocarpus, Balf. fil. and P. tenutfolius) occur freely throughout the island. The total number of known species, according to Professor I. B. Balfour, is 470, belonging to 85 families and 293 genera; and of these 297 are phanerogamous and 173 cryptogamous. The families represented by the greatest number of species are G'raminewx (21 indigenous, 6 introduced), Leguminose (14 ind., 15 intr.), Convoluulacee (11 ind., 4 intr.), Malvaceex (9 ind.), Rubiaces (8 ind.), Cyperacce (8 ind.), Huphorbiacex (8 ind.), Liliacese (6 ind.), Compositz (5 ind., 6intr.). Mathurina pendulifiora (Tur- neraece) is interesting, as its nearest congener is in Central America, and the family has not hitherto been found in the Mascarenes. Of 33 species of mosses 17 are peculiar. Variability of species and heterophylly are characteristic of the flora to quite an unusual degree. To the naturalist Rodriguez is as interesting as it is to the botanist. At present the only indigenous mammal is a species of fruit-eating bat (Pteropus rodericensis), and the introduced species are such familiar creatures as the pig, rabbit, rat, mouse, &c. ; but down toa recent period the island was the home ofa very large land-tortoise (Testudo Vosmaert or rodericensis), and its limestone caves have yielded a large number of skeletons of the dodo-like solitaire (Pezophaps solitarius), which still built its mound-like nest in the island in the close of the 17th century, but is now extinct (see vol. iii. p. 732). Of indigenous birds 13 species have been registered. The guinea-fowl (introduced) has become exceedingly abundant, partly owing to a protective game-law ; and a francolin (F. ponticerianus), popularly a " partridge," is also common. The marine fish-fauna does not differ from that of Mauritius, and the freshwater species, with the exccption of Mugil rodericensis and Myxus cecuticus, are common to all the Mascarenes. Thirty-five species of crustaceans are known. 'The insects (probably very im- perfectly registered) comprise 60 specics of Coleoptera, 15 Hymeno- plera, 21 Lepidoptera, 15 Orthoptera, and 20 Hemiptera. Forty- nine species of

coral have been collected, showing a close affinity to those of Mauritius, Madagascar, and the Seychelles.

Rodriguez or Diego Ruy's Island was discovered by the Portu- guese in 1645. In 1690 Duquesne prevailed on the Dutch Govern- ment to send a body of French refugecs to the Island of Bourbon, at that time, he believed, abandoned by the French authorities. As the refugees, however, found the French in possession they pro- ceeded to Rodriguez, and there eight of their number were landed on 30th April 1691 with a promise that they should be visited by their compatriots within two years. The two years were spent

without misadventure, but, instead of waiting for the arrival of their friends, the seven colonists (for one had meanwhile died) rashly left the island on 8th May 1693 and made their way to Mauritius, where they were treated with great cruelty by the governor. The account of the enterprise left us by Francis Leguat— Voyages et Aventures (London, 1708), or, as it is called in the English trans- lation, 4 New Voyage to the East Indies (London, 1708)—is a most garrulous and amusing narrative, and was for a long time almost the only source of information about Rodriguez. His description of the solitaire is of course unique.

See Charles Grant, Hist. of Mauritius and the Neighbouring Islands, 1801 ; Higgin, in Jour. R. G. Soc., London, 1849; the Reports of the results of the Transit of Venus Expedition, 1874-75, published as an extra volume of The Philosophical Transactions (clxviii.), London 1879 (Botany, by I. B. Balfour ; Petrology, by N. 8. Maskelyne, &c.); Behm, in Petermann's Mittheilungen, 1880; Colonial Office List, 1884, 1885.

ROE. See Duzer, vol. vii. p. 24.

ROE or Row, Sir THomas (156871644), an eminent political agent of the reigns of James I. and Charles L., was born in 1568 (?) at Low Leyton near Wanstead in Essex (being a grandson of Sir Thomas Roe, a well-known lord mayor of London). He was entered as a commoner at Magdalen College, Oxford, in 1593, but shortly after- wards he left the

university and, having read for the bar, became esquire of the body to Queen Elizabeth. From James I, he received the honour of knighthood in 1604, and in 1609 he was sent by Prince Henry on a mission to the West Indies, during which he visited Guiana and the river Amazons, As member of parliament in 1614 he supported the principles of Sandys and Whitelocke. His permanent reputation was mainly secured by the success which attended his embassy in 1615-18 to the court at Agra of the Great Mogul (Jahangir, son of Akbar), whose importance had been made known by Sir John Hawkins, —the principal object of the mission being to obtain the protection of an English factory at Surat. Sir Thomas Roe's Journal, reprinted in a more or less complete shape in the collections of Purchas, Pinkerton, and Kerr, forms one of tlie leading authorities for the reign of Jahangir. Appointed ambassador to the Porte in 1621, he filled this difficult position under Osman, Mustapha, and Amurat ; and after his return from the East he continued to be em- ployed on various political missions to Poland, Denmark, and other European courts, till in 1641 he was sent by Charles I. to the diet of Ratisbon. Roe died in 1644.

The Society for the Encouragement of Learning proposed to pub- lish a whole series of Roe's papers, but owing to lack of funds only one of the five volumes, edited by Samuel Richardson, ever saw the light—The Negotiations of Sir Thomas Roe in his Embassy to the Ottoman Porte, 1621-1628 (London, 1740). In regard to his minor publications and manuscript remains see Wood's Athenx Oxontenses ; Allibone's Dictionary of British … Authors; and Notes and Queries, vli., viii., ix., and xi. (2d ser.).

ROEBLING, Jonn Avucusrus (1806-1869), civil en- gineer, was born at Miihlhausen, Prussia, 6th June 1806. Soon after his graduation from the polytechnic school at Berlin he removed to the United States, and in 1831 entered on the practice of his profession in western Penn- sylvania. He established at Pittsburgh a manufactory of wire rope, and in May 1845 completed his first important structure, the suspended aqueduct of the Pennsylvania Canal across the Monongahela river. This was followed by the Monongahela suspension bridge at Pittsburgh and several suspended aqueducts on the Delaware and Hudson Canal. Removing his wire manufactory to Trenton, New Jersey, he began, in 1851, the erection at

Niagara Falls of a long span wire suspension bridge with double roadway, for railway and carriage use (see Bripcx, vol. iv. pp. 338-339), which was completed in 1855. Owing to the novelty of its design, the most eminent engineers, including Stevenson, regarded this bridge as foredoomed to failure ; but, with its complete success, demonstrated by long use, the number of suspension bridges rapidly multiplied, the use of wire-ropes instead of chain-cables becoming all but universal, The completion, in 1867, of the still more

remarkable suspension bridge over the Ohio river at Cincinnati, with a clear span of 1057 feet (see CINCINNATI, vol. v. p. 782), added to Roebling's reputation, and his de- sign for the great bridge spanning the East River between New York and Brooklyn was accepted.' While personally engaged in laying out the towers for the bridge, Roebling received an accidental injury, which resulted in his death, at Brooklyn, from tetanus, 22d July 1869.

At the time of his death Roebling's work on Long and Short Span Bridges (New York, 1869) was in the press. It is devoted to an exposition of his belief that "the principle of suspension will of necessity become the main feature in our future long span railway bridges," and was intended as the initial volume of a series relating to his general theory of bridge construction, with detailed plans and descriptions of the larger works erected by him.

ROEMER, O xz (Latinized Otavs) (1644-1710), Danish astronomer, was born at Aarhuus in Jutland, 25th Septem- ber 1644. He studied mathematics at the university of Copenhagen until 1671, when he assisted Picard in de- termining the geographical position of Tycho Brahe's observatory (Uranienburg on the island of Huen). In 1672 he accompanied Picard to Paris, where he remained nine years, occupied with observations at the new royal observatory and hydraulic works at Versailles and Marly. In 1675 he read a paper before the Academy on the suc- cessive propagation of light as revealed by a certain in- equality in the motion of the first of Jupiter's satellites (see PARALLAX, vol. xviii. p. 251). In 1681 he returned to Copenhagen, where he spent the remainder

of his days as professor of astronomy, but his great ability and prac- tical talents were made use of in several other public employments. He died on 23d September 1710.

Roemer's name is now best known by his discovery of the finite velocity of light. Most of his contemporaries doubted the reality of this discovery, chiefly because the eclipses of the three outer satellites of Jupiter did not show similar irregularities to those exhibited by the first satellite. This is not surprising, as the mutual attraction of the satellites makes their motions far more complicated than astronomers imagined before the development of the theory of gravitation, and it should perhaps be chiefly ascribed to chance that Roemer brought forward his theory, which Bradley's discovery of the aberration of light about fifty years later proved to be a true one. Roemer's ingenuity has, however, appeared very pro- minently in the important improvements which he carried out in the construction of astronomical instruments. The large ' armil- lary spheres," first constructed by the astronomers of Alexandria and also used by Tycho Brahe, had been superseded by the meridian or mural quadrant for measuring meridian zenith distances, and by the sextant for measuring distances between stars in order to find their difference of right ascension by solving the spherical triangle between the pole and the two stars. Both these instruments were introduced by Tycho Brahe. Roemer, however, saw that Tycho's idea of making the rotating earth itself an astronomical instrument by observing the transits of stars across the meridian could be carried out better by fixing a telescope at right angles to a hori- zontal axis plaeed exactly east and west, so that the telescope could only move in the meridian. The first transit instrument was con- structed in 1689 and erected in Roemer's house in 1690. In the same year hie erected in the university observatory an instrument with altitude and azimuth circles (for observing equal altitudes on both sides of the meridian) and an equatorial instrament, In 1704 he constructed a private observatory at Vridlésemagle, a few miles west of Copenhagen, and mounted a meridian circle (the transit instrument and vertical circle combined) and a transit instrument moving in the prime vertical. Roemer may thus be considered the inventor of nearly all our modern instruments of precision, and it is much to be regretted that his ideas were not adopted by astro- nomers until about a century later. All the results of his observa-

tions were destroyed in a great conflagration in 1728, except three days' work, which has been discussed by Galle (0. Roemer triduum observationwm astronomicarum a. 1706 tinstitutarwm, Berlin, 1845). His disciple Horrebow has left us a very detailed description of Roemer's instruments and ideas in his Opera mathematieo-physiea (3 vols., Copenhagen, 1740-41). Grant's History of Physieal Astro- nomy (London, 1852) gives a very correct account of Roemer and his Inventions. About his life see also an article by Philipsen in Nordisk Universitets Tidsskrift, vol. v., 1860.

1 For description of this the largest wire

suspension bridge in the world, see New Yorx City, vol. xvii. p. 465 – =

ROE—ROG

ROERMOND or RorErMonne (i.e., "'Roer-Mouth"), a town of the Netherlands in the province of Limburg (formerly Guelderland), on the right bank of the Maas (Meuse) at the mouth of the Roer, which separates it from the suburb of St Jacob. It is 294 miles from Maestricht by the railway to Venlo (opened 1865). The old forti- fications were dismantled in 1819 and have been partly turned into promenades. At this point the Maas is crossed by a bridge erected in 1866-67, and the Roer by one dating from 1771 and replacing the older structure destroyed in 1764, The finest building in the town is the Romanesque minster church, begun in 1218, and dedicated by Arch- bishop Engelbert of Cologne. In the middle of the nave is the tomb of Count Gerhard III. of Guelderland and his wife Margaret. The cathedral of St Christopher is also of note; on the top of the tower (246 feet) is a copper statue of the saint and the interior is adorned with paint- ings by Rubens, Jacob de Wit, &c. The Reformed church was once the chapel of the monastery of the Minorites. The old bishop's palace is now the court-house, and the old Jesuits' monastery with its fine gardens is now occu- pied as a higher burgher school. Woollen, cotton, silk, and mixed stuffs, paper, flour, and beer are manufactured at Roermond. The population of the town was 5712 in 1840 and 8797 in 1870; and that of the commune has increased from 6005 in 1840 to 10,470 in 1879,

Till the 13th century Roermond was only a village with a hunt- ing lodge known as Pot. The erection of the monastic church in 1218 was followed by the building of town walls in 1231 by Count Otho II. In 1543 Roermond was occupied by the troops of Charles V., and in the course of the Kighty Years' War few places more frequently changed hands. The peace of Miinster (1648) left it in the Spanish Netherlands ; but between 1702 and 1716 it was held by the forces of the United Provinces.

ROGATION DAYS, the Monday, Tuesday, and Wednes- day before Ascension Day. The week in which they occur is sometimes called Rogation Week. See Lirany, vol. xiv. pp. 695-696.

ROGER I, "grand count" of Sicily, the twelfth and youngest son of Tancred de Hauteville in Normandy, was born about 1031. – He joined his brother Roprrtr GuiscarD (q.v.) in Italy in 1058, and after taking part with him in his conquests on the mainland passed over to Sicily in 1061. There such success attended his arms that in 1071 he took the title of count ; in 1089 he became " grand count" and in 1098 received from the pope for himself and his suc- cessors the title of "legate apostolical " in Sicily. He died in 1101, See Srcity.

ROGER IL, count of Sicily, son of the preceding, was born about 1093 and died in 1154. He obtained from the antipope Anacletus II. the title of king of Sicily in 1130, and was crowned in the same year. The title was afterwards confirmed in 1139 by Innocent II. See Sicrty.

ROGER or Hovepon. See Hovenoy, vol. xii. p. 319.

ROGER oF Wenpover, who was a monk in the abbey of St Albans, and who died prior of Belvoir in 1237, was long regarded as the sole author of .a Latin chronicle entitled Flores Historiarum, being a history of the world from the creation down to the year 1235. Recent investi- gation, however, has disclosed that only the portion from 1189 onwards is from his pen, and that the remainder must be attributed to John de Cella, who was abbot of St Albans from 1195 to 1214. See vol. xv. p. 634.

ROGERS, Joun (c. 1500-1555), editor of the English Bible known as Matthew's. See vol. viii. p. 386.

ROGERS, Samurn (1763-1855), the 'melodious Rogers" of Byron, the ""memory Rogers" of the general reader, has a unique reputation among English men of letters. Not only was he a poet of sufficient mark to be hailed by Byron—with perverse but sincere admiration— as one of the few men of genuine weight in an age of

ROGERS

scribblers, but he was also for fifty years the most cele- brated entertainer of celebrities in London. From 1803, when he removed from his chambers in the Temple, till the last year of his long life, his house, 22 St James's Place, was the common meeting-ground of men of distinc- tion in every walk of life. Hence, though his poems are no longer read except by the student, his name is kept alive in the letters and diaries of associates whose works are more permanent than his own,—kept alive, too, not merely as that of a cultured Amphitryon but as that of a conversational wit whose tart sayings are worthy of record.

He was born at Newington Green (London) on 30th July 1763, the son of a wealthy London banker, and re- lated on the mother's side to the celebrated Noncon- formist divines Philip and Matthew Henry. Dr Price, the Unitarian, Burke's antagonist, was the family pastor and a frequent visitor at his father's house. The influ- ence of this writer's philosophy can be traced in Rogers's poems. Rogers was educated at the famous Nonconformist academy at Newington Green, where Defoe had been a pupil a hundred years before. Attention to English studies had been a distinct object in this school from its founda- tion, and Rogers, his youthful ambition awakened, rushed into print as an essayist in the Gentleman's Magazine at the age of eighteen. His main desire then was to be a preacher like Dr Price; but he yielded to his father's advice and entered the paternal bank. But he was far from abandoning his love for literature. He read Gray and Goldsmith on his way to the bank, and in 1786 proved his admiration for these exemplars in a volume containing some pretty imitations of Goldsmith and a wildly apostrophic Ode to Superstition after the manner of Gray. This volume contains one of the few passages of his that are often quoted—

'There 's such a charm in melancholy, I would not, if I could, be gay."

Following Gray's example, the youthful poet took great pains with his verses, and, after nine years' maturing, published in 1792 a more elaborate and more successful bid for poetic laurels, The Pleasures of Memory. This poem may be regarded as the last blaze of the poetic diction of the 18th century before its final extinction. We see here carried to the extremest pitch the theory of elevating and refining familiar themes by abstract treat- ment and noble imagery. So simple an act as that of trying to remember a half-forgotten fact or fancy is elabo- rately and beautifully compared to the search of an im- patient mother for a child lost in a forest. The common organ-grinder becomes "the blithe son of Savoy," and as such is presented in a most romantic situation as an object for refined sympathy. The good familiar creature memory itself is transfigured into a gracious personifica- tion of most benignant and wide-reaching power. In this art of "raising a subject," as the 18th century phrase was, the Pleasures of Memory is much more perfect than Campbell's Pleasures of Hope, published a few years later in imitation. Byron's criticism is complete,—" there is not a vulgar line in the poem." This is the acme of positive praise for the fashionable serious poetry of the 18th century: when this can be said of a poet, he has reached the perfection of its ideal of poetic diction. In this poem the characters of the school can be analysed in cold blood, for there is not much excitement in laboured reflexions on the pleasures of memory. Human interest is at a minimum in such frigid exercises; it is almost entirely an affair of diction. The chief feeling excited is astonishment at the pains taken by the poet to provide thick and showy wrappages for such starveling little children of thought.

It was six years before Rogers was ready with another

of his elaborate poems,—An Epistle to a Friend (1798). This has at least the advantage of some personal interest. It describes the poet's ideal of a comfortable life, and may be put side by side with Pomfret's Choice for literary comparison, and with the poet's own life for fifty years afterwards. Although for conventional poetic reasons Rogers establishes his ideal house in the country instead of in St James's Place, still the

principles of living are the same which afterwards regulated his real life and were carried out with easy steady perseverance. "It is the design of this Epistle to illustrate the virtue of True Taste; and to show how little she requires to secure not only the comforts but even the elegancies of life. True Taste is an excellent Economist." Rogers illustrated this maxim in proceeding to surround himself with rare and beautiful works of art and letters, and to make his house the centre for all that was most distinguished and agreeable in London society. Many persons in his time spent ten times as much in the pursuit of a similar object without one-tenth of the success. 'I believe," Mrs Norton wrote, '""no man ever was so much attended to and thought of who had so slender a fortune and such calm abilities. His God was Harmony ; and over his life Harmony presided sitting on a lukewarm cloud." When he moved to St James's Place in 1803 he withdrew from active concern in the bank, contenting himself with a moderate income as a sleeping partner; and so careful a manager was he of this income that he was able not only to entertain and to buy choice things—his collection, which seems to have contained hardly a particle of rubbish, fetching £50,000 when sold after his death—but also to extend generous help to struggling men of letters. It was Rogers who came to Sheridan's relief in his last days when he was deserted by his titled friends; Moore and Campbell received help in need from him, as munificent as it was delicately offered ; and he was always ready to befriend much less distinguished merit in distress. It was perhaps character- istic of a man so cautious, equable, and dispassionate that his wit had a depreciating turn and was often exercised with calm insolence at the expense of fussy pretence. But that the man was on the whole of a kindly and lovable nature was shown by an incident late in his life. His popularity was put to the test of misfortune by the robbery of his bank. Most of the money was recovered, but upon the news of the misfortune several men of wealth and title came forward with large offers of assistance.

Although the laureateship was pressed upon Rogers by the prince consort on Wordsworth's death in 1850, he had not been a prolific poet during his long life of cultured leisure and social enjoyment. He continued his practice of writing little and writing slowly. Fourteen years in- tervened between the Lpistle and the publication of the Voyage of Columbus in

1812. In method this poem was a compromise between the old school of reflective poetry and the new school of narrative. The story of Columbus was the theme, but the story was not told: it was only indicated in a series of reflexions on its most striking moments. The experiment helped forward the literary movement ; the new school through Byron took the hint, and The Giaour, though interpenetrated with a more vigorous life, was avowedly written on the model of Columbus, and dedicated to Rogers. In his next poem, Jacqueline, which was published in the same volume with Byron's Lara in 1814, much to the benefit of the wits of the time, Rogers may be said to have gone over to the new school, adopting their four-accent measure and show- ing his skill, which was considerable, in pure narrative. His reflective poem on H/uman Lrfe, though published in 1819, can hardly be described as a reversion, for he had been engaged on it off and on for twelve years. It is

much the best of his meditative poems, as elegant and finished in diction as the Afemory, and much more incisive in thought and touching in sentiment. His last, longest, and most interesting published work was Italy, the first instalment of which was published in 1821 and the last in 1834. It is said that, when the publisher complained that the public would not buy Jéaly, Rogers affirmed that he "would make them buy it"; and, calling in the aid of Turner and Stothard, he produced the sumptuous illus- trated edition at a cost of £15,000. Apart from these adventitious charms Jtaly has much greater general interest than any other of Rogers's poems, and is likely to be read for long, if only as a traveller's companion. 'The style is studiously simple; the blank verse has quite an Eliza- bethan flavour, and abounds in happy lines ; the reflexions have a keen point; and the incidental stories are told with admirable brevity and effect. Passages of prose are inter- spersed, wrought with the same care as the verses, and the notes are models of interesting detail concisely put. For the last five years of his life Rogers, who had been extremely active till his eighty-eighth year, was confined to his chair in consequence of a fall in the street. He died in London on 18th December 1855, in his ninety-third year. Only very fragmentary records are preserved of the brilliant gatherings at breakfast and dinner in his house. Fragments are

to be gleaned in the diaries of Byron, Moore, Sydney Smith, and others. Recollections of his table-talk were published in 1856, and a volume of his Recollections of celebrities in 1857. A complete Life is understood (1885) to be in preparation, with Mr P. W. Clayden as editor. Mr Hayward's essay is the most complete account of Rogers hitherto published. (w. M.) ROHAN, Henrt px (1579-1638), a general and writer of eminence and one of the last and best representatives of the independent French noblesse, was born at the chateau of Bleins in Brittany on 21st August 1579. His father was René IL, count of Rohan, and head of a family which had hardly a superior in France for antiquity and distinction, and which was connected with most of the reigning houses of Europe. Rohan was by birth the second son, but his elder brother René dying young he becaine the heir of the name. He appeared at court and in the army at the age of sixteen, and was a special favourite with Henry IV., after whom, failing the house of Condé, he might be said to be the natural chief of the French Protestants. Having served till the peace of Vervins, he travelled for a considerable time over Europe, including England and Scotland, in the first of which countries he received the not unique honour of being called by Elizabeth her knight, while in the second he was godfather at Charles I's christening. On his return to France he was made duke and peer at the age of twenty-four and married Marguerite de Béthune, Sully's daughter, receiving lucrative appointments. After the assassination of Henry IV.,, which was a great blow to him, Rohan fought with success at the siege of Jiilich. But from this time onwards he was for the greater part of many years either in active warfare against the Government of his country, or in active though peaceable opposition to it. Fora time, however, he abstained from actual insurrection, and he endeavoured to keep on terms with Marie de' Medici ; he even, despite his dislike of De Luynes, the favourite of Louis XIII. , Te- appeared in the army and fought in Lorraine and Piedmont, It was not till the decree for the restitution of church property in the south threw the Bearnese and Glascons into open revolt that Rohan appeared as a rebel, His authority and military skill were very formidable to the royalists, forced them among other checks to raise the Slege of Montauban, and brought about the treaty of Montpellier (1623), But Rohan did not escape the re-

sults of the incurable factiousness which showed itself more strongly perhaps among the French Huguenots than among any other of the numerous armed oppositions of the 17th century. He was accused of lukewarmness and treachery, though he did not hesitate to renew the war when the compact of Montpellier was broken. Again a hollow peace was patched up, but it lasted hardly any time, and Rohan undertook a third war, the first the events of which are recounted in his celebrated Memoirs. This last war (famous for the siege of La Rochelle, in which, however, Rohan's brother Soubise, not Rohan himself, was principally concerned) was one of considerable danger for Rohan: he was condemned to death, and a great reward was offered for him dead or alive. Nor at the close of the war did he think it best to remain in France, but made his way to Venice. Here he lived quietly for some time and is said to have received from the Porte the offer of the sovereignty of Cyprus. It is more certain that his hosts of Venice wished to make him their general-in-chief, a design not executed owing to the peace of Cherasco (1631). Soon afterwards Rohan was again called to serve his lawful sovereign. Richelieu had had experience, though not friendly experience, of his abilities, and when France began once more to take a vigorous part in the Thirty Years' War Rohan was appointed to the task of occupying the Valtelline, and thus cutting off the communication between Germany and Italy. He was entirely successful and re- peatedly beat both the imperialists and the Spaniards. But, despite this service, Rohan was still thought dangerous to the peace of France owing to his influence with the Huguenots, and objection was even made to his residence in Geneva. He therefore joined Bernhard of Saxe-Weimar, and was serving in his army when he met with the wound which caused his death at Rheinfelden on 14th March 1638. His body was buried at Geneva and his arms solemnly bequeathed to and accepted by the Venetian re- public. Rohan's wife was a woman of talent and energy, though she did not escape scandal. His younger brother Benjamin, generally known as Soubise, was, like him, a famous Huguenot leader. His daughter and only re- cognized surviving child, named Marguerite, carried the honours of Rohan into the Chabot family.

What has chiefly preserved Rohan's memory is not his military achievements, though they were remarkable, nor his political posi- tion, though it was high, but his admirable A/emoirs. These cover the civil wars in three books, while a fourth contains the narrative of the Valtclline campaigns ; and they rank among the best products of the singular talent for memoir-writing which the French aristo- cracy of the 16th and 17th centuries possessed. Alike in style, in clearness of matter, and in shrewdness of thought they deserve very high praise. The first three books appeared in 1644, that on the Valtelline War not till 1758. Some suspicions were thrown on the genuineness of this latter, but it would seem groundlessly. Rohan also wrote Le Parfait Capitaine, an adaptation of the military pre- cepts and examples of Cesar to modern warfare ; an account of his travels ; a political tract, L'Intérét des Etats et des Prinees de la Chrétienté, &c. The Memoirs, which alone have continued to be reprinted, may be conveniently found in the collection of Michaud and Poujoulat, vol. xix.

ROHAN, Louis Reni Epovarp, CARDINAL DE (1734- 1803), prince de Rohan-Guéménée, archbishop of Stras- burg, the hero of the scandal of the diamond necklace, and a cadet of the great family of Rohan (which traced its origin to the kings of Brittany, and was granted the precedence and rank of a foreign princely family by Louis XIV.), was born at Paris on 25th September 1734. Members of the Rohan family had filled the office of arch- bishop of Strasburg from 1704,—an office which made them princes of the empire and the compeers rather of the German prince-bishops than of the French ecclesiastics. For this high office Louis de Rohan was destined from his birth, and soon after taking orders, in 1760, he was nominated coadjutor to his uncle, Constantine de Rohan-

Rochefort, who then held the archbishopric, and he was also consecrated bishop of Canopus. But he preferred the elegant life and the gaiety of Paris to his clerical duties, and had also an ambition to make a figure in politics. He joined the party opposed to the Austrian alliance, which had been cemented by the marriage of the arch- duchess Marie Antoinette to the dauphin. This party was headed by the duc d'Aiguillon, who in 1771

sent Prince Louis on a special embassy to Vienna to find out what was being done there with regard to the partition of Poland. Rohan arrived at Vienna in January 1772, and made a great noise with his lavish fétes. But the empress Maria Theresa was implacably hostile to him; not only did he attempt to thwart her policy, but he spread scandals about her daughter Marie Antoinette, laughed at herself, and shocked her ideas of propriety by his dis- sipation and luxury. On the death of Louis XV., in 1774, Rohan was recalled from Vienna, and coldly received at Paris; but the influence of his family was too great for him to be neglected, and in 1777 he was made grand almoner, and in 1778 abbot of St Vaast. In 1778 he was made a cardinal on the nomination of Stanislaus Ponia- towski, king of Poland, and in the following year succeeded his uncle as archbishop of Strasburg and became abbot of Noirmoutiers and Chaise-Dieu. His various preferments brought him in an income of two and a half millions of livres ; yet the cardinal was restless and unhappy until he should be reinstated in favour at court and had appeased the animosity which Marie Antoinette felt against him. Though a man of some ability, he became infatuated with the notorious charlatan Cagliostro in 1780, and lodged him in his palace, and in 1782 he made the acquaint- ance of Madame de Lamotte-Valois, a descendant of an illegitimate branch of the Valois, but a poor adventuress, and married to an adventurer. These people, having ac- quired great influence over Rohan, determined to turn his excessive desire to become reconciled to the queen to their own advantage. They persuaded him that Marie Antoi- nette wished him well, and contrived an interview between him and a girl named Oliva, who greatly resembled the queen, in the gardens of Versailles in August 1784, so skilfully that he believed he had seen the queen herself and that she had given himarose. The adventuress then persuaded him that the queen would be much gratified by the present of an extremely valuable diamond necklace which she had refused in 1778 and 1781, and on 26th January 1785 the cardinal purchased it for 1,600,000 franes, to be paid in three instalments, and handed it over to a pretended valet of the queen on receipt of a forged letter of thanks signed "Marie Antoinette of France." The comte de Lamotte-Valois at once started for London, and, after breaking up the necklace, began to sell the diamonds separately. The plot soon came to light, and the king sent the cardinal to the Bastille. This arrest of a great nobleman and an archbishop excited the wrath of both the nobility and

the bishops, and the large party opposed to the Austrian alliance regarded him as a martyr. In this feeling the old courtiers and the judges of the parlement of Paris participated, for they hated the queen for her abolition of strict etiquette and for her extrava- gance and frivolity. The people, who had also been taught by pamphleteers to hate her and to regard her as the cause of all their ills, shared the feeling of their superiors in education ; and, when the parlement of Paris solemnly absolved the cardinal of all blame on 3lst May 1786, his acquittal was received with universal enthusiasm, and regarded as a victory over the court and the queen. Though acquitted by the parlement of Paris, the cardinal was deprived of his office as grand almoner and exiled to his abbey of Chaise-Dieu. He was soon allowed to return

to Strasburg, and his popularity was shown by his election in 1789 to the states-general by the clergy of the bailliages of Haguenau and Weissenburg. He at first declined to sit, but the states-general, when it became the national assembly, insisted on validating his election. But as a prince of the church in January 1791 he refused to take the oath to the constitution, and went to Ettenheim, in the German part of his diocese. In exile his character improved, and he spent what wealth remained to him in providing for the poor clergy of his diocese who had been obliged to leave France; and in 1801 he resigned his nominal rank as archbishop of Strasburg. On 17th February 1803 he died at Ettenheim.

For the affair of the diamond necklace and the life of the cardinal see the Mémoires of his seeretary, the Abbé Georgel, of the baroness d'Oberkirch, of Beugnot, and of Madame Campan; the Ifémoires inédits du Comte de Lamotte-Valois, ed. Louis Lacour, 1858, in which Rohan is ably defended and Marie Antoinette stigmatized ; Marie Antoinette et le Procts dw Collier, by Emile Campardon, 1863 ; and Carlyle's "The Diamond Necklace," in Fraser's Maga- zine (1837), republished in his Zssays.

ROHILKHAND or Routcunn, a division or commis- sionership in the North-Western Provinces of India, lying between 27° 35' and 30° 1' N. lat. and between 78° 1' and 80° 26' E. long. It comprises the six districts

of Bijnaur (Bijnor), Murddabad, Buddun, Bareli (Bareilly), Shahjahdnpur, and Pilibhit, together containing an area of 10,885 square miles, with a population (1881) of 5,122,557 (males 2,728,761, females 2,393,796). By religion, Hindus numbered 3,921,989, Mohammedans 1,192,263, and Christ- ians 6304. In the same year there were 11,327 towns and villages in the division and 639,604 occupied houses. Of the total area 6446 square miles were returned as culti- vated and 2516 as cultivable. In 1883-84 Rohilkhand division had 2592 miles of road and 163 miles of railway ; in the same year its gross revenue amounted to £980,682, of which the land-tax contributed £695,181.

ROHTAK, a British district of India, in the Hissar division, under the lieutenant-governorship of the Punjab, lying between 28° 19' and 29° 17' N. lat. and between 76° 17' and 77° 30'E. long. It contains an area of 1811 square miles, and is bounded on the N. by Karnal, on the E. by Delhi, on the 8. by Gurgaon, and on the W. by Hissar and the native state of Jhind. Rohtak district is situated in the midst cf the level tableland separating the Jumna and the Sutlej valleys; it is one unbroken plain, consisting of a hard clay copiously interspersed with light yellow sand, and covered in its wild state by a jungle of scrubby brushwood. It possesses no grand scenery, but on the whole the features of the district are more diversi- fied than many of the plain districts of the Punjab. The only natural reservoir for its drainage is the Najafgarh Jhil, a marshy lake lying within the boundaries of Delhi. The Sahibi, a small stream from the Ajmere hills, traverses a corner of the district, and the northern portions are watered by the Rohtak and Butana branches of the Western Jumna Canal, but the greater portion of the central plain, comprising about two-thirds of the district area, is entirely dependent upon the uncertain rainfall. The climate, though severe in point of heat, is generally healthy; the average rainfall is about 194 inches. Rohtak has no railway ; it is, however, well provided with roads, which cross it in every direction, and telegraphic com- munication is now under construction.

In 1881 the population of Rohtak distriet numbered 553,609 (296,224 males and 257,385 females). By religion Hindus numbered 468,905, or nearly 85 per eent. of the total population, and Moham- medans 79,510. There are only two towns in the district with inhabitants exceeding

10,000, namely, RouTax (see below) and Jhajjar with 11,650. Rohtak is a purely agrieultural distriet, but its produce hardly more than suffices for its home consuinption. Of the total area of 1811 square miles, 1416 were in 1883-84 re- turned as cultivated and 269 as cultivable. The chief products

are food grains, pulses, cotton, and sugar-cane. There are no manufactures of more than local importance excepting ornamental turbans at Rohtak and saddlery at Kalanar. Pretty pottery is made at Jhajjar, and cotton cloth for home use is woven in large quan- tities. The gross revenue of the district in 1883-84 was £78,346, of which £65,440 was derived from the land-tax.

Rohtak was formerly included within the region known as Hariana, which in 1718 was granted by the emperor Faroksher to his minister Rukhan-ad-Daula, who in his turn made over the greater part of it to a Baluch noble, Faujdar Khan, afterwards created nawab of Farakhnagar. The district, together with the other possessions of Scindia west of the Jumna, passed to the East India Company in 1803. Until 1832 Rohtak was under the ad- ministration of a political agent, resident at Delhi, but in that year it was brought under the general regulations and annexed to the North-Western Provinces. The outbreak of the mutiny in 1857 led to the abandonment, for a time, of the district by the British, when the mutineers attacked and plundered the civil station of Rohtak, destroying every record of administration. It was not until after the fall of Dclhi that the authority of the British Government was permanently restored. The constitution of the present district was then taken in hand, and Rohtak was trans- ferred to the Punjab Goverument.

ROHTAK, municipal town and headquarters of the above district, lying in 28° 54’ N, lat and 76° 38’ E. long., with a population in 1881 of 15,699 (males 8155, females 7544). It is situated 44 miles to the north-west of Delhi on the road to Hissar, and, viewed from the sandhills to the south, forms with its white mosque in the centre and the fort standing out boldly to the east a striking and picturesque object. Rohtak is a town of great

antiquity, but beyond the fact that it became the headquarters of a British district in 1824 it is of no considerable importance.

ROJAS-ZORILLA, Francisco pz, Spanish dramatist, a contemporary of Lope de Vega and Calderon, was born about the beginning of the 17th century. Of his personal history hardly anything has been recorded, but we know that he lived at Madrid, and about the year 1641 he seems to have become a knight of Santiago. Of his dramatic compositions some thirty still survive, which can be read in the 54th volume of the Biblioteca de Autores Espaitoles (1861); the best by general consent is held to be that entitled Del Key abajo Ninguno, otherwise known by the name of its hero as Garcia de Castafar. Of the others, apart from their intrinsic merit, a double literary in- terest attaches to the Vo hay Padre siendo Rey, which was borrowed by Rotrou for his Venceslas, to the Donde hay Agravios no hay Zelos and the Amo criado, which were imitated by Scarron in his Jodelet Souffleté and Mattre Valet, and to the Entre Bobos anda el Juego, to which Thomas Corneille has acknowledged his obligations for his Bertrand de Cigarral. The Garcia de Castafiar, Donde hay Agravios, and Entre Bobos anda el Juego are given by Ochoa in his Vesoro del Teatro Espaiol.

ROKITANSKY, Carn von Roxrransky, FREIHERR von (1804-1878), the founder of the Vienna school of pathological anatomy, was born in 1804 at Konigegratz in Bohemia. He got his schooling in his native town as well as at the gymnasium of Leitmeritz, after which he became a student of medicine at Prague. He finished his medical studies at Vienna, graduating there in 1828. Soon after he became assistant to Wagner, the professor of patho- logical anatomy, and succeeded him in 1834 as prosector, being at the same time made extraordinary professor. It was not until ten years later (1844) that he reached the rank of full professor. To his duties as a teacher he added in 1847 the onerous office of medico-legal anatomist to the city, and in 1863 an influential office in the ministry of education and public worship, wherein he had to advise on all routine matters of medical teaching, including patron- age. A seat in the upper house of the reichsrath rewarded i ae labours in 1867, and on his retirement from all

ces in 1874 he was made a commander of the Order of Leopold. He joined the Imperial Academy of

-franche near Lyons in 1732.

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Sciences as a member in 1848, and became its president in 1869. He was president also of the medical society of the Austrian capital and an honorary member of many foreign societies. On his retirement at the age of seventy his colleagues celebrated the occasion by a function in the aula of the university, where his bust was unveiled. In his leave-taking speech he said that work had always been a pleasure to him and pleasures mostly a toil. His death in 1878 elicited many genuine expressions of affection and of esteem for his upright character. Two of his sons be- came professors at Vienna, one of astronomy and another of medicine, while a third gained distinction on the lyric

stage.

With Rokitansky's name is associated the second great period of the medical school of Vienna, its first success having been identified with the liberal patronage of it by Maria Theresa and with the fame of Van Swieten, whom the empress had attracted thither from Leyden. The basis of its second reputation was morbid anatomy, together with the precision of clinical diagnosis dependent thereon, and associated with the labours of Rokitansky's lifelong friend Skoda. The anatomical vogue had begun under Wagner while Rokitansky was still a student; but it reached its highest point while the latter was assistant in the dead-house and afterwards prosector and professor. The enthusiasm for the post-mortem study of disease brought one very serious consequence at the outset, in the enorinous increase of the death-rate from puerperal fever in the lying- in wards of the general hospital. A comparison between the slight mortality in the wards that were afterwards reserved for the train- ing of midwives and the excessive mortality in those set apart for the training of students proved that the cause was the conveyance of cadaveric poison from the dead-house by the hands of the latter. The precautions introduced after 1847 succeeded in removing that grave reproach from the study of morbid

anatomy. Another and more lasting consequence of the assiduous pursuit of post-mortem study, counterbalancing somewhat the advantage of a more precise and localized diagnosis, was the loss of faith in the power of drugs to remedy the textural changes—the so-called " nihilism" of the Vienna school. The immediate outcome of Rokitansky's close application to the work of the dead-house was his Handbuch der pathologischen Anatomie (1842-46), in 8 vols., of which the first was published last. The value of the work lies in the second and third volumes, containing succinct descriptions of the visible changes and abnormalities in the several organs and parts of the body. Whenever Rokitansky touched the vital problems of general pathology, as he did in the postponed first volume, he revealed a metaphysical bent, which was strong in him behind all his un- doubted powers of outward observation and accurate description. Being a few years too soon to profit by the microscopic movement which led to the cellular pathology, he endeavoured to reconcile the old humoral doctrine with his anatomical observations, and to read a new meaning into the doctrine of the various dyscrasias. The third and last edition of his Handbuch was published from 1855 to 1861. In 1862 he entered into possession of a new patho- logical institute, in which he found means, for the first time, to dis- play his extensive collection of specimens ina museum. Although he had no direct share in the newer developments of pathology, he was far from indifferent or reactionary towards them ; indeed the laboratories and chairs for microscopic and experimental pathology and for pathological chemistry were warmly encouraged and aidéd by him.

Rent to his Handbuch, of which the Syd. Soc. published an English trans- lation in 4 vols., 1849-52, his most important writings were four memoirs in the Denkschriften of the Vienna Academy of Sciences (on the Anatomy of Goitre, Cysts, Diseases of Arteries, and Defects in the Septa of the Heart), the last as late as 1875. Other papers of less importance brought up the total of his writings to thirty-eight, including three addresses of a philosophical turn, on

"'Freedoin of Inquiry " (1862), "The Independent Value of Knowledge" (1867), and "The Solidarity of Animal Life" (1869).

ROLAND. Jean Mariz RoLanD DE LA PLATRIERE (1732-1793), who, along with his wife. Manon JEANNE Pauipon (1754-1793), played a prominent part in the his- tory of the French Revolution, in connexion chiefly with the policy and fortunes of the Girondists, was born at Ville- He received a good educa- tion, and early formed the studious habits which remained with him through life. Proposing to seek his fortune abroad, he went on foot to Nantes, but was there pros- trated by an illness so severe that all thoughts of emigra- tion were perforce abandoned. For some years he was employed as a clerk; thereafter he joined a relative who was inspector of manufactures at Amiens, and he himself speedily rose to the position of inspector, To these two

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employments may be ascribed those qualities of assiduity and accuracy, and that familiarity with the commerce of the country, which distinguished his public career. In 1781 he married Manon Jeanne Phlipon, who was his junior by twenty-two years. She was the daughter of Gratien Phlipon, a Paris engraver, who was ambitious, speculative, and nearly always poor. From her early years she showed great aptitude for study, an ardent and enthu- siastic spirit, and unquestionable talent. She was to a considerable extent self-taught ; and her love of reading made her acquainted first with Plutarch—a passion for which author she continued to cherish throughout her life —thereafter with Bossuet, Massillon, and authors of a like stamp, and finally with Montesquieu, Voltaire, and Rousseau. These studies marked stages of her develop- ment ; and as her mind matured she abandoned the idea of a convent which for a year or two she had entertained, and added to the enthusiasm for a republic which she had imbibed from her earlier studies not a little of the cynicism and the daring which the later authors inspired. She almost equalled her husband in knowledge and infinitely excelled him in talent and in tact. Through and with him she exercised a singularly powerful influence over the destinies of France from the outbreak of the Revolution till her death.

For four years after their marriage Roland lived at Amiens, he being still an inspector of manufactures ; but his knowledge of commercial affairs

enabled him to con- tribute articles to the Encyclopédie Nouvelle, in which, as in all his literary work, he was assisted by his wife. On their removal to Lyons the influence of both became wider and more powerful. Their fervent political aspirations could not be concealed, and from the beginning of the Revolution they threw in their lot with the party of advance. The Courrier de Lyon contained articles the success of which reached even to the capital and attracted the attention of the Parisian press. They were from the pen of Madame Roland and were signed by her husband. A correspondence sprang up with Brissot and other friends of the Revolution at headquarters. In Lyons their views were publicly known; Roland was elected a member of the municipality, and when the depression of trade in the

south demanded representation in Paris he was deputed'

by the council of Lyons to defend the interests of the city before the constituent assembly. Accompanied by his wife, he appeared in the capital in February 1791.

They had made many and influential friends in advance, and Madame Roland's salon soon became the rendezvous of Brissot, Pétion, Robespierre, and other leaders of the popular movement. In person Madame Roland was attract- ive though not beautiful; her ideas were clear and far- reaching, her manner calm, and her power of observation extremely acute. It was almost inevitable that she should find herself in the centre of political aspirations and pre- siding over a company of the most talented men of pro- gress. Her resolve was fixed, and gradually she impressed it upon all: the France of 1791 was a France of transi- tion; a republic alone was its destiny, was the ideal of philosophy, the expression of liberty, the goal of history. This was the constant aim of her influence and her speech ; it was accompanied with a petty animosity, almost hatred, towards the king and queen; but it found a ready echo in the minds of those leaders who willingly admired her calm and learned reasoning. The royal flight in June and the ignominious return lent impetus to these ideas ; a journal entitled The Republican appeared in Paris, but at its second number was suppressed. Madame Roland had a hand.

In September 1791, Roland's mission being executed, they returned to Lyons.

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Meanwhile the inspectorships .

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of manufactures had been abolished; he was thus free; and they could no longer remain absent from the centre of affairs. In December they again reached Paris. Roland became a member of the Jacobin Club. The rupture had not yet been made evident between the Girondist party and that section still more extreme, that of the Mountain. For a time the whole left united in forcing the resig- nation of the ministers. When the crisis came the Giron- dists were ready, and in March 1792 Roland found him- self appointed minister of the interior. As a minister of the crown Roland exhibited a remarkable combination of political prejudice with administrative ability. While his wife's influence could not increase the latter it was success- fully exerted to foment and embitter the former. He was ex officio excluded from the legislative assembly, and his declarations of policy were thus in writing,—that is, in the form in which she could most readily exert her power. A great occasion was invented. The decrees against the emigrants and the non-juring clergy still remained under the veto of the king. A letter was penned by Madame Roland and addressed by her husband to Louis. It remained unanswered. Thereupon, in full council and in the king's presence, Roland read his letter aloud. It con- tained many and terrible truths as to the royal refusal to sanction the decrees and as to the king's position in the state ; but it was inconsistent with a minister's position, disrespectful if not insolent in tone, disloyal in spirit, and grossly disfigured by repeated threats of violence on the part of the people. It was meant, and it was used, simply as a lecture to the king's face and as an accusation behind his back. Roland's dismissal followed. Then he com- pleted the plan: he read the letter to the assembly ; it was ordered to be printed, became the manifesto of dis- affection, and was circulated everywhere. In the demand for the reinstatement of the dismissed ministers were found the means of humiliation, and the prelude to the dethronement, of the king.

After the abolition of royalty on the 10th of August, Roland was recalled to power, one of his colleagues being Danton. To his dismay he found that the passions which he had lent his aid in evoking he was powerless to allay, and that the party of the Mountain was, on the contrary, utilizing these passions for purposes of incredible excess. From this moment, though too late, the conduct of Roland, his wife, and the whole Gironde became heroic. They fearlessly denounced the massacres of September, Roland writing boldly to the assembly on the subject. Both husband and wife became the butt of calumny and the object of increasing dislike on the part of the ultra-re- volutionists,—Robespierre shunning them, Danton de- nouncing them, and Marat in his journal heaping upon them the foulest falsehoods. Still the Girondists, from Vergniaud downwards, banded themselves bravely on their side; but on 22d January 1793 Roland sent in his resigna- tion. It was the day after the execution of the king.

Still they remained in Paris, unflinchingly, but with ever less and less success, attempting to regulate and elevate the Revolution. Calumny continued. Once Madame Roland appeared personally in the assembly to repel the falsehoods of an accuser, and her ease and dignity evoked enthusiasm and compelled acquittal. But violence suc- ceeded violence, and early on the morning of the Ist of June she was arrested and thrown into the prison of the Abbaye. Roland himself escaped secretly to shelter in Rouen. Released for an hour from the Abbaye, she was again arrested and thrown among the horrors of Sainte Pélagie. Finally she was transferred to the Conciergerie. In prison she won the affections of the guards, and was allowed the privilege of writing materials and the occa- sional visits of devoted friends. She there wrote her

Appeal to an Impartial Posterity, those memoirs which display a strange alternation between self-laudation and patriotism, between the trivial and the sublime. On 8th November 1793 she was conveyed to the guillotine. Before yielding her head to the block, she bowed before the clay statue of Liberty erected in the Place de la Revolution, uttering her famous apostrophe—'" O Liberty! what crimes are committed in thy name!" One

week later Roland, having heard of his wife's death, wandered some miles from his refuge in Rouen ; maddened by despair and grief, he wrote a few words expressive of his horror at those massacres which could only be inspired by the enemies of France, protesting that "from the moment when I learned that they had murdered my wife I would no longer remain in a world stained with enemies." He affixed the paper to his breast, and unsheathing a sword-stick fell upon the weapon, which pierced his heart, on 15th November 1793. (T. 8.) ROLAND, Lrcenp or. The main incident of this legend is founded upon an undoubted historical event, —the Spanish expedition of Charlemagne .(778). The Frankish king, having crossed the Pyrenees and captured Pamplona, was beaten back from the walls of Saragossa.! On his return the " Gascons" (Basques) surprised his rear- guard, and, according to the testimony of Eginhard, cut it off to a man (Vet. Car., c. i.),—" In which battle were slain Eggihard, provost of the royal table . . . and Hruod- landus, prefect of the Britannic march." 'This account is supported by other evidence more or less contemporary, as, for example, the Vita Hludowici.2 From this work we gather that at the time of its composition (c. 840) the Roncesvalles disaster was already the subject of popular tradition ; for its author, speaking of the Frankish chiefs slain in this battle, says, "quorum, quia vulgata sunt, nomina dicere supersedi." Yet in its earliest extant form the legend has already worked in the names and traditions of a later age, eg., the traitor Ganelon, who probably, as Leibnitz has suggested, represents Wenelon, archbishop of Sens, accused of treason towards Charles the Bald in 859.3 It is interesting to note that during the last few-years Diimmler (Romania, ii, 146-148) has discovered what appears to be the epitaph of the above-mentioned Eggihard. This, as G. Paris remarks, renders it highly probable that the similar elegiac verses quoted in the Pseudo-Turpin (cc. 24, 25), which make Roland thirty-eight years old at the time of his death, are also genuine survivals from the Carolingian era. According to Diimmler's discovery, the battle of Roncesvalles was fought on 15th August. ELarhest Hutant Forms.—The legend of Roland makes its first appearance in (a) the so-called History of Archbishop Turpin and (b) the Chanson de Roland. The former, according to Paris, may be divided into two parts ; of these the first (cc. 1-5), written about 1050, deals with Charle- magne's conquest of Spain, but contains no allusion to Roland. The latter section, written by a monk of Vienne between 1109 and 1119,

gives the main outlines of the familiar legend: Marsilius and Baligant appear (c. Dis Roland fights with the giant Ferracute, Ariosto's Ferrat (Orl. Fur. c. 1); then follow the narrative of Ganelon's treachery (c. 21) and punishment (c. 26), the episode of Roland's horn, Roland's address to his sword (c. 22), his last prayer, his death (c. 23), and Charles's vengeance on the Saracens (c. 26).4 The Chanson de Roland, in its extant version probably composed in England between 1066 and 1095, looks like the expansion of an earlier poem written towards the beginning of the same century. = 5 ee ee re ee

is Annales Eyinhardi, 778, with which comp. Dozy, Hist. des Muss. d' Espagne, i. 376-380. 2 Ap. Pertz, ii. 608.

3 Ann. Imperti, ed. Pertz, i. 77.

4 Turp. Hist., ed. Castets, 1880.

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It gives the legend in much the same form as the Pseudo- Turpin, but with far more detail and poetic fire. There are, however, a few striking differences between the two accounts. Such deal with the causes and method of Ganelon's treachery, the personality of Baldwin, and the fate of Archbishop Turpin. Above all, the Latin prose- writer has no second hero in Oliver and knows nothing of Roland's love for Aude.

Additions to the Early Legend.—The name of Roland was soon transplanted from its native soil in the gestes of Roncesvalles into almost the whole cycle of later Charlemagne romance; and by weaving these notices of him together we may construct the legendary story of his life. Thus the Enfanees Roland (c. 1200) tells of his parents' disgrace and his infant valour; in the Chanson @ Aspremont (late 12th century) we read how he became possessed of his famous sword Durendal; Girars de Viane (e. 1200) recounts his great fight with Oliver and his love for that hero's sister Aude. Roland plays scarce less prominent a part in Renaud de Montauban (13th century) and figures in Mierabras (12th century), Otinel (e. 1250), and the Voyage & Jerusalem (e. 1180). Nicholas of Padua's Lintrée en Espagne (e. 1820) makes Roland quarrel with Charles

and fly to Persia, whence he only returns to aid in the siege of Pam- plona and to perish at Roncesvalles.

Diffusion of the Roland Legend in Literatwre.—The immense popularity of the Chanson de Roland and the Pseudo-Turpin may be measured by the influence they have exercised on the literature of nearly every country of western Europe. To the original Chanson de Loland a poet of perhaps the reign of Philip Augustus added a new ending of some 2000 lines. From this full version are descended the Remaniements or Roncevaux, of which so many French MSS. remain. During the 12th century a Swabian priest, Conrad, translated the Chanson into rhymed German verse. This Rolandslied forms the basis of the Stricker's Karl (ec. 1230), in its turn the foundation for the Roncesvalles section of the so-called Karl Meinet (early 14th century). In England Taillefer's singing of a "cantilena Rollandi" prefaced the first Norman charge at Hastings ;° but, curiously enough, the English Roland of the 14th century in some places seems to look back for its original to the Psewdo- Turpin rather than to the Chanson de Roland, which received its final shape in England.6 It was probably from that country that the Roland legend passed to Scandinavia and Iceland. There the battle of Roncesvalles forms the eighth section of the great Karlamagnus Saga (13th century), which is of critical import- ance, as it preserves some details not to be found in the Chanson de Ltoland as we now have it. Translated into Danish, this work took the form of the Kejser Karl Magnus (15th century), to this day a popular book in Denmark. The legend penctrated eastward into Hungary and Bohemia; while in the west Roland appears in the Welsh Mabinogion and the tales of Ireland. M. Bormans has published Flemish fragments of the Roncesvalles story ; and these,

'which belong to the 13th and the 14th century, are based on the

Chanson. In the 16th century the same legend circulated through- out the Low Countries in one of the most popular books of the day. In the 13th century the Spanish "fabule histrionum," of which Roderic of Toledo speaks (d. 1247), and which may, on one hypo- thesis, have been the sources whence the Pseudo-Turpin drew his materials, gave way to a new and more patriotic legend, in which Bernard del Carpio takes the leading

place; but three centuries later (1528) Nicolas di Piamonte revived the purer Frankish tradi- tion in the still popular Karlo Magno.

It is, however, on the literature of Italy that the Roland legend has exercised its widest influence. Here the songs, chanted by the carly French jongleurs, towards the end of the 12th century made place for the Italianized Remaniements, till the epoch of Nicholas of Padua (e. 1320), whose gigantic Entrée en Espagne (with its sup- plement the Prise de Pampelune), though but a mosaic of earlier materials, formed the groundwork of the Tuscan poem, the Spagna

(1850-1380), on which the Rotta di Roneisvalle in its turn is founded.

Somewhat later than the verse Spagna came the Spagna in prose ; and the extraordinary popularity of the legend in its new guise made the names of Charlemagne's paladins familiar down to the age of the Renaissance. We have now reached the era of the great Italian poets Pulci (Morgante Maggiore, 1481), Boiardo (Orlando Innamorato, 1486), Ariosto (Orlando Furioso, 1516), and Berni (1541), whose poems, however, with the exception of Pulci's, are indebted to those of their predecessors for little more than the names of their chief characters and their general plan.

Roland in Medieval Art.—The earliest remaining statue of ees ee eaaee ay aek opemtgl Ol age a a

5 Will. of Malmes., Gest. Reg. Angl., iii. 242 ; Wace, ed. Andresen, hi. 1. 8035-40,

§ Still more applicable is this remark to Roland and Vernagou (e. 1330), and the death of Roland in Caxton's Charles the Grete. All

three works have been edited for the Early English Text Society by Mr Herrtage.

Roland seems to be the 12th-century statue in the church of San Zeno at Verona.! The whole history of Roncesvalles is blazoned in the 13th-century window in Chartres cathedral.? A similar window existed formerly in the abbey church of St Denis. M. Vétault (Hist. de Ch., p. 496) has also figured a Carolingian coin which bears the names of both Roland and Charles. The so-called Roland statues of Germany are most probably symbolical of the judicial and other rights once possessed by the people of those towns where they are to be found. In some cases at least the name seems to have been transferred to what were originally meant to be representations of the first Othos (10th century). The earlicst known allusion to a "statua Rolandi" under this name occurs in a privilegium granted by Henry V. to the town of Bremen (1111). The word "Rolandssiule" is perhaps a piece of folk-ctymology for an earlier " Rothland-siule" or red-land-pillar, 7.¢., the before- mentioned figure or pillar, which significd that the state in which it stood had the power of life and death,—in other words, was a Blutgerichtstatte. Grimm suspects a connexion between the Roland statues and those old Teutonic pillars of which the Irminsul de- stroyed by Charlemagne is the best-known example.? These Roland statues are sometimes in the open air, as at Bremen and Magdeburg ; or against the town-house, as at Halbcrstadt ; or in the church, as formerly at Gottingen. Sometimes they ride on horseback, as at Haldensleben near Magdeburg ; but more gencrally they are to be found standing upright. They always bear a sword in their right hand and very frequently a shield in their left. They are usually armoured, as at Magdeburg, but are occasionally dressed in more peaceful robes, as at Halle (on the Saale), or both cloaked and armoured, as at Wedel in Holstein and at Bremen. Sometimes they are crowned, as at Wedel and Nordhausen. The heads of the statues differ extremely,—being long-bearded at Erfurt, short-bearded at Wedel, and absolutely smooth-faced at Bremen. At Brandenburg the Roland was ornamented with silver and perhaps with gold. The statues are often of colossal height, that of Belgern (Merseburg) being over 9 ells high, exclusive of its pedestal. Perhaps the most famous Roland pillar still remaining is that of Bremen.

For further information on this subject see Leibnitz, Annales Imperit, i. 478, &e.; the treatises of Gryphiander (ed. 1666) Eggelingius (1700), B, Carpzov (1742), J. H. Hartmann (1735), and Nicholas Meyer, De

Wicbildis (1789); and Zoeptil's exhaustive account in vol. iii. of his Alterthiimer des deutschen Reichs. Yor the Roland legend generally consult Léon Gautier's Epopées Frangaises, iii., and Chanson de Roland, edd. 1870 and 1881. Besides these, see the various romances of the Charlemagne cycle edited for the series of Anciens Poétes de France, the various volumes of Romania, and the late editions of the several 1 kegs alluded to in the foregoing article. For the relationship of the Roland

egend to the Italian poets see the works of P. Rajna. (T. A. A.)

ROLLER, a very beautiful bird so called from its way of occasionally rolling or turning over in its flight,4 some- what after the fashion of a Tumbler-Pigeon. It is the Coracias garrulus of ornithology, and is widely though not very numerously spread over Europe and Western Asia in summer, breeding so far to the northward as the middle of Sweden, but retiring to winter in Africa. It occurs almost every year in some part or other of the British Islands, from Cornwall to the Shetlands, while it has visited Ireland several times, and is even recorded from St. Kilda, But it is only as a wanderer that it comes hither, since there is no evidence of its having ever attempted to breed in Great Britain ; and indeed its conspicuous appear- ance—for it is nearly as big as a Daw and very brightly coloured—would forbid its being ever allowed to escape the gun of the always ready murderers of stray birds. Except the back, scapulars, and tertials, which are bright reddish-brown, the plumage of both sexes is almost entirely blue—of various shades, from pale turquoise to dark ultra- marine—tinted in parts with green. The bird seems to be purely insectivorous. The genus Coracias, for a long while placed by systematists among the Crows, has really no affinity whatever to them, and is now properly considered to belong to the heterogeneous group of Birds in this work called Picarix (ORNITHOLOGY, vol. xviii. p. 41), in which

1 Figured in Gautier's Chanson, ed. 1881, p. 88.

- *Figured in Vétault's Wist. de Charlemagne, pp. 74, 545.*

3 Poeta Saxo, ap. Jaffé, 64-68; see Grimm's Teut. Myth. (Stally- brass), i, 119.

4 Gesner in 1555 said that the bird was thus called, and for this reason, near Strasburg, but the name seems not to be generally used in Germany, where the bird is commonly called Rake, apparently from its harsh note. The French have kept the name Rollier. It is a eurious fact that the Roller, notwithstanding its occurrence in the Levant, cannot be identified with any species mentioned by Aristotle.

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it forms the type of the Family Coractide; and its alliance to the Bee-eaters, Jeropide, and KING-FISHERS (vol. xiv. p. 81), Alcedinidx, is very evident. Some eight other species of the genus have been recognized, one of which, C. leuco- cephalus or C'. abyssinus, is said to have occurred in Scotland. India has two species, C. indicus and C. affinis, of which thousands upon thousands are annually destroyed to supply the demand for gaudy feathers to bedizen ladies' dresses, One species, C. temmincki, seems to be peculiar to Celebes and the neighbouring islands, but otherwise the rest are natives of the Ethiopian or Indian Regions. Allied to Coracias is the genus Lurystomus with some half dozen species, of similar distribution, but one of them, EZ. pacificus, has a wider range, for it inhabits Australia and reaches Tasmania. Madagascar has four or five very remarkable forms which have often been considered to belong to the Family Coraciidx ; and, according to Professor A. Milne- Edwards, no doubt should exist on that point. Yet if any may be entertained it is in regard to one of them, Lepto- somus discolor, which on account of its zygodactylous feet some authorities place among the Cuculidx, while others have considered it the type of a distinct Family Lepto- somatide. The genera Brachypteracias and Atelornis pre- sent fewer structural differences from the Rollers, and perhaps may be rightly placed with them ; but the species of the latter have long tarsi, and are believed to be of terrestrial habit, which Rollers generally certainly are not. These very curious and in some respects very interesting forms, which are peculiar to Madagascar, are admirably described and illustrated by a series of twenty plates in the great work of MM. Grandidier and A. Milne-Edwards on that island (Ozseaux, pp. 223-250), while the whole Family Coracudx is the subject of a monograph by Mr Dresser, as 4 companion volume to his monograph on the Meropide. (A. N.)

ROLLER MILL. See Frovur, vol. ix. pp. 345, 346.

ROLLIN, Cuaruzs (1661-1741), was born at Paris on 30th January 1661. He was the son of a tradesman, but distinguished himself at school, and at the age of twenty- two was made a master in the Collége du Plessis. He was successively promoted to various other posts of the same kind. In 1694 he was rector of the university of Paris. He held that post for two years instead of one, and was then appointed principal of the Collége de Beau- vais. He was of Jansenist principles, and in the later years of his life was for this cause deprived of his appoint- ments and disqualified for the rectorship, to which in 1719 he had been re-elected. It is said that the same reason prevented his election to the French Academy, though he was a member of the Academy of Inscriptions. He was concerned in the affair of the deacon Paris, and shortly before his death (14th December 1741) protested publicly against the acceptance of the bull Unigenitus.

Rollin's literary work dates chiefly from the later years of his life, when he had been forbidden to teach. His once famous Ancient History (Paris, 1730-38) and the less generally read Roman History which followed it were avowed compilations, and compila- tions which were not only far from critical but even somewhat in- accurate. But they have had the merit not merely of instructing but of interesting generation after generation almost to the pre- sent day. A more original and really important work, though less generally known out of France, was his Z'raité des Htudes (Paris, 1726-31). It contains asummary of what was cven then a reformed and innovating system of education, including a more frequent and extensive use of the vulgar tongue and discarding the medieval traditions that had lingered in France. It had very considerable influence. Rollin's style is good and his personal character was irreproachable.

ROLLING MILL. See Iron, vol. xiii. p. 328 sq.

ROLLO, Rotr, or Rov, Scandinavian rover, born ec. 860, died 932. He made himself independent of Harold of Norway, visited Scotland, England, and Flanders in pirating expeditions, and about 912 established himself

on the Seine and laid the foundation of the duchy of NorMANDy (see vol. xvii. p. 539).

ROLLOCK, Roperr (1555-1599), the first principal of the university of Edinburgh, was the son of David Rollock of Powis near Stirling, and was born in 1555, He received his early education at the school of Stirling from Thomas Buchanan, a nephew of George Buchanan, and after graduating at St Andrews became regent of philosophy there in 1580. In 1583 he was appointed by the Edin- burgh town council sole "regent" of the 'town's college " ("Academia Jacobi Sexti"), and three years later he received from the same source the title of " principal or first master," and also, with consent of the presbytery, professor of theology. From 1587 he also preached regularly to large audiences every Sunday morning at 7 A.M., and ultimately, yielding to urgent entreaties, he accepted 'the full burden of one of the eight ministers of the city." He took a prominent part in the somewhat troubled church politics of the day, and distinguished himself among his compeers by gentleness and tact, as well as ability. In 1593 he was appointed, along with some others, by parliament to confer with the popish lords, and in 1597 it was through his mediation with the king that the ministers of Edinburgh, banished in consequence of a "tumult" in December 1596, were permitted to return. For his eminent services he was chosen moderator of the General Assembly held at Dundee in May 1597. His death took place at Edinburgh on 8th February 1599.

Rollock published in Latin a commentary On the Epistle to the Ephesians (1590), a similar work On Daniel (1591), a Logical Analysis of the Epistle to the Romans (1594), Questions and Answers on the Covenant of God (1596), a treatise On Hfectual Calling (1597), and commentaries on Thessalonians (1598), fifteen selected Psalms (1599), and the Gospel of St. John (1599). Soon after his death eleven Sermons were published from notes taken by his students, and his Select Works by the Wodrow Society in 1849.

ROLLS, Masrer or tHE, is the third member of the Supreme Court of Judicature in England, the lord chancel- lor, president of the Chancery Division, being the first and the lord chief justice, president of the

Queen's Bench Division, being the second. At first he was the principal clerk of the Chancery and as such had charge of the records of the court, especially of the register of original writs and of all patents and grants under the great seal. Until the end of the 15th century he was called either the clerk or the keeper of the rolls, and he is still formally designated as the master or keeper of the rolls. The carliest mention of him as master of the rolls is in 11 Hen. VII. c. 18; and in 11 Hen. VIL. c. 24 he is again described as clerk of the rolls, showing that his official designation still remained unsettled. About the same period, however, the chief clerks of the Chancery came to be called masters in Chancery and the clerk, master, or keeper of the rolls was always the first among them whichever name they bore. In course of time, from causes which are not very easy to trace, lis original functions as keeper of the records passed away from him and he gradually assumed a juris- diction in the Court of Chancery second only to that of the lord chancellor himself. In the beginning he only heard causes in conjunction with the other masters in Chancery and his decrees were invalid until they had been approved and signed by the lord chancellor, But later on he heard causes without assistance and his decrees held good until they were reversed on petition either to the lord chancellor or afterwards to the lords justices of appeal (15 and 16 Vict. c. 83). Before any judge with the formal title of vice-chancellor was appointed the master of the rolls was often spoken of as vice-chancellor, By 1 and 2 Vict. c. 94 the custody of the records was restored to him, and he is chairman of the State Papers and Historical Manuscripts Commissions, Under 38 and 39

Vict. c. 77 and 39 and 40 Vict. c. 59 he now always sits with the lords justices in the Court of Appeal, whose decisions can be questioned only in the House of Lords. The master of the rolls was formerly eligible to a scat in the House of Commons,—a privilege enjoyed by no other member of the judicial bench; but he was deprived of it by the Supreme Court of Judicature Act of 1873 (36 and 37 Vict. c. 66), which provides that all judges of the High Court of Justice and the Court of Appeal shall be incap- able of being elected to or sitting in the House of Com- mons. The master of the rolls is always sworn of the privy council,

ROMAN CATHOLIC CHURCH, the name generally given to that very numerous body of Christians who ac- knowledge the pope, or bishop of Rome, as head of their church. This name also signifies that the Roman Catholic Church is " Roman in its centre and catholic in its cireum- ference." The number of Catholics throughout the world is variously estimated, some statisticians placing it as low as 152,000,000, others at 213,518,000, and others at 218,000,000. The author of the Katholischer Missions- Atlas (Rev. O. Werner, §.J.), largely furnished with Pro- paganda returns, distributes them as follows :—in Europe, 150,684,050; in Asia, 8,311,800; in Africa, 2,656,205 ; in both Americas, 51,422,566; in Australia and adjacent islands, 443,442; total, 213,518,063. But he considers that this calculation gives less than the whole number of Catholics throughout the world, and adds nearly a million more, making the total 214,370,000. Dr Hugo Franz Brachelli, superior of the Austrian Statistical Department,

'in Die Staaten Europa's for 1884, gives the number of

Catholics in Europe as 155,900,000, distributed mainly as follows :—

US ms RMN ais lo ghe a via fn ncneau woke nadauiont 20,229, 825

PrtissianandeGermnean Stabes! s.cheseewsicseessascnee 16, 229,498 Great Britain and Ireland …….....cecceeeeees 6,000,000 EA GC Gamrener on tere se crete ccietren hte: ae csaeae sts 35,387,708 Tee ee eer kee 26,658, 679 Boel meee fas acs as nice agit ous ei ua natn 8,500, 000 Scandinavia: Sweden (1870), Norway (1875),

IDiepaamaaniks (CUSSION) Aapnanontnencnpacddnsor snsosabenctoc 4,075 ENC HC TIAN SP kiriisectnes vnc vet saistseetieaneeimoaes 1,439, 137 UGisemnll uae nee weneeresyete seis avs coaaeinemenntees) ova ner 207,782 Belem (Op. BeolOS44)) ...cceetegeseaeactarses «es 5,501,844 Liechtenstein, Monaco, &c., almost entirely.

Spain and Portugal (pop. 21,164,380) ..... 21,148,880 Greece and Montenegro, over……....sssseccssee .. 124,000 NE EN REE ne ae ig MEO ee cae ect ate reunite 218, 254 BOSiia ANU EEVZCROVINA ccc. cenveceecsesseves aves ane 209,391

The supreme pontiff, who traces his succession from St Peter (see Popepom), is regarded by Catholics as "vicar of Christ, head of the bishops, and supreme governor of the whole Catholic Church, of whom the whole world is the territory or diocese." He is also patriarch of the West, bishop of Rome and its district, and temporal prince over the states of the church known as the Pontifical States—though the exercise of the last prerogative has been in abeyance since the events of 1859 and 1870. The pope has a primacy or supremacy, not only of honour but of power, authority, and immediate jurisdiction, over the universal church. When he is canonically elected, and has given his consent to the election, he possesses, without any other confirmation, authority over the whole church, even though at his election he"may not have been either bishop, priest, deacon, or subdeacon, but a simple layman. In the early ages of the church subdeacons were occasionally elected, deacons more frequently, and bishops rarely. In the 11th century Gregory VIL, previously known as the deacon Hildebrand, was ordained priest after his election and consecrated bishop later. The first pope invested with the episcopal dignity prior to his election to the pontificate was Formosus, bishop of Porto, elected

oma CARIPOLIC CHURCH

891. From the end of the 13th century it was the ordi- nary custom to choose the pope from the bishops; and from 1592 to 1775 only three were elected who had not been bishops previously. Clement XIV., Pius V., and Gregory XVI. were simple priests when elected to the papacy. The cardinals, to whom the election of the pontiff is reserved, generally select one of their own body for this important position. The privilege of consecrating the pope is reserved to the cardinal bishop of Ostia. From the moment of election the pope may perform all acts appertaining to his jurisdiction, such as granting indul- gences, issuing censures, giving dispensations, canonizing saints, instituting bishops, creating cardinals, and suchlike. The powers inherent in the priesthood and episcopate, such as the remission of sins, the administration of the sacraments of confirmation, holy orders, &c., he cannot exercise unless he be ordained and consecrated. Hence the office of sovereign pontiff is a dignity not of order but of jurisdiction. His pronouncements are regarded as in- fallible

when he defines a doctrine regarding faith and morals to be held by the whole church.

The office of pope is elective (see ConcLAVE), and lasts during the life of the occupant, although he may renounce his dignity. When the election has taken place the fact is made known by the cardinal dean. Many ceremonies follow, such as coronation and taking possession of the cathedral church of Rome, St John Lateran. This latter ceremony is not strictly necessary, for after his coronation the pope enjoys the papal power in all its plenitude ; but its object is his enthronization as bishop of the city and diocese of Rome and patriarch of the West. The cardinals are the princes and senators of the church, counsellors of the pontiff, co-operators with him, and vicars in the func- tions of the pontificate (see CaRDINAL). To Pope Evaris- tus, fifth successor of St Peter, is attributed the creation of the first ¢des or parishes of Rome, the occupants of which were afterwards known as cardinals. At the begin- ning of the 3d century twenty-five of these titles existed. In the course of time they were increased to fifty and after- wards to seventy. Inthe Gerarchia Cattolica the titles are thus divided : suburban sees (cardinal bishops), 6 ; titular churches (cardinal priests), 52; and diaconates (cardinal deacons), 16; making a total of 74. The cardinalate, in the sense at present attached to it, is different from what it was in earlier ages, being now the highest dignity after the papacy. The greater part of the administration of the church—the chief subject of this article—is directed by the cardinals who are members of congregations, which correspond, in a certain measure, to the political ministries in modern states. These congregations are established in Rome by the sovereign pontiff, and their objects are to inquire into, discuss, and decide the important affairs of the whole church and of the temporal dominions of the holy see. The cardinals are assisted by consultors or prelates, by distinguished ecclesiastics secular and regular, and by other officials appointed by the pope.

The head of every congregation is a cardinal prefect, though some congregations have the pope as prefect, ¢.9., the holy office, the apostolic visit, and the consistory. The secretary is ordinarily a prelate; in the holy office he is a cardinal. The acts, decrees, rescripts, and letters issued in the name of a congregation are subscribed gener- ally by the prefect, and

always by the secretary. These two officials chiefly regulate the affairs of the congregation and submit to the pope, at periodical audiences, the matters which require his approval. The following are the more important congregations :—inquisition, consistorial, apo- stolic visit, bishops and regulars, council, residence of bishops, state of regulars, ecclesiastical immunities, propa- ganda fide, propaganda fide for Oriental affairs, commission

for correction of books of the Oriental Church, index, sacred rites, ceremonial, regular discipline, indulgences and relics, examination of bishops, fabbrica of St Peter's, extra- ordinary ecclesiastical affairs and studies. The congrega- tion of the Holy Roman Inquisition or Holy Office (see In- QUISITION) occupies the first place in regard to the quality of the matters of which it treats, as well as from its an- tiquity. Its object is the extirpation of heresies. It was formally established by Innocent III. (1198-1216), on the suggestion of St Dominic. The following class of cases falls within its judgment :—crimes of heresy and heretical blasphemy, simultaneous polygamy, robbery of the sacred particles accompanied by insult offered to the same, soli- citations ad turpia with abuse of sacramental confession, affected sanctity, contempt of sacred images, divination and sorcery, retention and reading of heretical books, &c. This congregation also proceeds against any one who, having been baptized, returns to paganism ; against any one who celebrates mass or hears confessions, not being a priest ; against false witnesses who depose in causes of faith, &c. Its authority extends, in matters of faith, over every person of whatsoever grade, condition, or dignity, whether bishops, magistrates, or communities, and no local or personal privilege exempts from its jurisdiction. Bishops, according to the council of Trent, being subject to the pope only, the Inquisition may institute inquiries, but may not pronounce sentence, this being reserved to the pontiff. Consistorial, instituted by Sixtus V., 1587, considers and judges on matters appertaining to the erec- tion of new metropolitan or cathedral churches, or their limits ; instances of bishops who desire to resign their churches ; matters relating to chapters and the confirma- tion or exclusion of subjects elected by them to metro- politan, episcopal, or monastic dignities

; the examination of coadjutors ; presentations or nominations of bishops made by sovereign princes and republics ; concession of rights to the pallium; retention of dignities and major benefices inconipatible with episcopal rights, and suchlike. The Apostolic Vist insists on the observance of that decree of the council of Trent which enjoins, as a duty, that every bishop shall visit in person or by means of a dcle- gate the churches, pious institutions, &c., in his diocese. Bishops and Regulars: this congregation has to do chiefly with the government of monasteries and with complaints from the inmates of these against bishops. It examines new institutions and their constitution ; the founding of new monasteries for both sexes, and the removal of sub- jects from one monastery to another ; questions regarding the alienation of the ecclesiastical property of regulars ; differences between ordinaries, parish priests, and regulars ; and a variety of questions of a similar nature. The Council: the fathers of the council of Trent, anticipating – that doubts might arise concerning the interpretation of the doctrines and decrees published therein, besought Pius IV. to provide in the most fitting manner for such contingencies. This the pontiff did in approving and solemnly confirming the council in the bull Benedictus Deus (1563), interdicting, under severe penalties, any person whatsoever, secular or ecclesiastic, from publishing commentaries, glosses, &c., or any interpretation whatso- ever, upon the decrees of the council of Trent, it being enacted that all controversies, questions, and doubts should be submitted to the congregation of the council. The object of this congregation, therefore, is the interpret- ation of these doctrines and decrees. The congregation of Resrdence of Bishops may be considered as auxiliary to that of the council. It treats of the questions which con- cern the bishops' obligation to reside in their own dioceses, —a most important matter treated of in the council of Trent. Even in 1352 Innocent VI. ordered, under pain

of excommunication, that bishops and other beneficiaries having care of souls should reside in their respective dioceses. Innocent X. forbade cardinals to depart from Rome or its district—that is, a radius of 40 nules —with- out licence from the pope. The State of Regulars was instituted for enforcing on religious orders and congrega- tions the observance of

their special rules and constitu- tions. Kcclesiastical Immunities treats of controversies concerning the liberty and independence of ecclesiastical jurisdiction and its violations, and prescribes that the im- munities due to churches be respected. This congrega- tion receives appeals of causes which in the first instance were brought before the episcopal courts. The various concordats entered into between Governments and the holy see have diminished the number of causes which come under the judgment of this congregation. For Pro- paganda Fide, see PropacanDa. Propaganda Fide for Oriental Affairs, which provides for the affairs of the Eastern Church, was created by Pius IX. in a brief dated 6th January 1862. It depends upon the cardinal prefect of Propaganda, but has its own secretary, consultors, and officials. The Commission for the Correction of Books of the Oriental Church took its origin from a report made by Philip IV. of Spain to Urban VIII. in 1631, to the effect that the United Greeks inhabiting the Spanish dominions, especially Sicily, complained that schismatics had printed an Luchologium, or liturgy of the mass, filled with errors, and he begged the pontiff to provide a remedy for the evil and its consequences. The correction of the L'ucholo- gvum was decreed, and a special congregation—now called commission—composed of five cardinals, assisted by bishops and ecclesiastics of the Oriental Church, was appointed to correct the books of the Oriental Church, and to publish a correct Huchologium. The office of the congregation of the Zndex is to examine printed books and works contrary to faith or morals, and to compile an index or list, which is published at intervals, of the works the reading of which is prohibited. The method now followed in the examina- tion and condemnation of books, especially by Catholic authors, was fixed by Benedict XIV. A consultor examines the suspected work, and reports at a meeting of the con- gregation what it contains contrary to faith, good morals, ecclesiastical jurisdiction, &c. An examination of these passages is made, and it is determined by vote—the car- dinals having the decisive vote—whether the book shall be prohibited or corrected. The congregation of Sacred Kites was instituted by Sixtus V. in 1587, in order that in all the churches of Rome and the world, and in the pontifical chapel, in masses, divine offices, and everything clse regarding divine worship, the ancient ceremonies may be rigorously followed; that if any primitive rite have fallen into disuse it may be restored to its ancient splendour or reformed ; that the pontificals, rituals, ceremonials, and all

books of sacred rites may be emended and renewed ; and that the divine offices of the saints may be examined. Particular attention is likewise given by this congregation to all things concerning the canonization of saints, the celebration of their feasts, so that all may be done in an orderly manner, correctly, and according to the traditions of the fathers. Hence this congregation decides contro- versies on all these and on cognate matters. Its most serious work consists in processes for the beatification and canonization of the servants of God, the honours paid to saints, and the recognition of martyrdoms suffered for the Catholic faith. Its first cause in this line was that of the twenty-three minor observants martyred in Japan in the pontificate of Urban VIII. One of the rules established by this pope for the recognition of saints enjoins that, ex- cept by licence of the congregation, no one can proceed to any act of canonization, beatification, or declaration of

martyrdom until fifty years after the death of the subject. The congregation of Ceremonial investigates and watches over the exact fulfilment of the sacred liturgy, and regu- lates and decides questions and doubts regarding for- malities, pre-eminence amongst cardinals, prelates, and others, as well as certain sacred ceremonies in pontifical functions.

The work of the church in the world is directed im- mediately by the bishops, who receive their jurisdiction from the pope. The power inherent in the episcopal character and order is received from God directly and immediately. When established in a diocese by the pope, the bishop, in virtue of his title, receives the power of governing and of taking cognizance of all spiritual causes which regard his flock, whether laymen or ecclesiastics, with the exception of what is specially reserved to the head of the church, and he possesses and exercises these prerogatives under the jurisdiction of and in dependence on the pope. The bishops in the Catholic Church at the present time are (Gerarchia Cattolica, March 1885) thus divided: (a) patriarchal sees, of the Latin rite, 7; of the Oriental rite, 5; (>) archiepiscopal sees, of the Latin rite, immediately subject to the holy see, 14; with ecclesiastical provinces, 137; Oriental rite, with ecclesiastical provinces, 3; subject to patriarchates, 21; (c)

episcopal sees, Latin rite, immediately subject to the holy see, 86; suffragans in ecclesiastical provinces, 579 ; Oriental rite, immediately subject to the holy see, 2; suffragans in ecclesiastical pro- vinces, 8; subject to patriarchates, 41; (d) sees nullius dvceceseos, 17. The titles dependent on the sacred congre- gation of Propaganda are—apostolic delegations, 7; vicari- ates apostolic, 123; prefectures apostolic, 35. The total of these hierarchical titles amounts to 1085, and, including the 74 cardinalitial titles, to 1159. The vacant titles of all kinds amount to 107, and thus the whole hierarchy of the Catholic Church in March 1885 reached the total of 1266. Priests, placed in the second degree of the ecclesi- astical hierarchy, who are generally divided into parish priests and curates or assistants, are immediately under the direction of the bishops and administer directly to the people. Their primary office is the offering of the sacrifice of the mass. They also preach, bless, and administer bap- tism, penance, communion, and extrenie unction. Their functions are numerous and important, and they constitute the working force of the church in its direct relations with its members throughout the world. Priests of religious orders exercise like functions, save those properly parochial.

The Oriental churches in communion with the holy see, holding the same belief and the same principle of authority as the Latin Church, have their own special rites, discipline, and liturgical language. These are chiefly the Greek, Melchite, Bulgarian, Ruthenian, Maronite, Syro-Chaldaic, Coptic, Armenian, and Roumanian rites. The Greek Ori- ental rite is admitted by the pure Greeks, the Slavs (in the Slav language), the Melchites of Syria (in Arabic), the Roumanians (in the Roumanian tongue), and the Georgians (in their own language). The Georgian Greek rite has no hierarchy, and many Georgians in Russia have passed to the Latin or Armenian rites. The Greek and Slav languages are approved by the church as ritual lan- guages ; Arabic is only tolerated.

Greeks in Communion.—These are found at present in Constanti- nople, in the mission of Malgara in Thrace, and consist of about sixty families, having one bishop and about ten priests. In this rite marriage is permitted to clerics previous to the reception of sacred orders ; but there is a tendency to abolish the practice. In Greece nearly 30,000 Greeks have

followed the Latin rite, and these have seven bishops and about a hundred priests. The mass of St Basil is celebrated by the Greeks ten times a year, —on the three vigils of Christmas, the Epiphany, Easter, Holy Thursday, the Feast of St Basil, and the first five Sundays of Lent. After St Basil, St John Chrysostom abbreviated this mass and gave it the

Greek language ; and after the schism in the 5th century the liturgy became Coptic, as the patriarchs were Copts. liturgies in use at present— that of St Basil, that of St Gregory

form which has existed down to the present time amongst all the Orientals who follow the Greek rite.

Melehites.—The Melchites (see MEucitirEs) have the Greek rite in the Arab language. They are found scattered throughout Syria, Palestine, and Egypt, and have one patriarch and ten bishops ruling over from 70,000 to 80,000 souls. Their clergy are, for the mnost part, regular, following the rule of St Basil, and are divided into three congregations, — that of San Salvatore near Saida (Sidon) in Lebanon, with about 300 persons who mostly have the care of souls ; the second, of St John the Baptist, is at Scieur in Lebanon, with thirty members ; and the third is the congregation of Aleppo, at St George in Lebanon, with forty members between priests and brothers. A small group of secular clergy is attached to the patri- archate. Besides these there are about forty secular married priests throughout the dioceses, The patriarchal residence is Damascus, which has two bishops-vicars,—one in Damascus, the other in Kgypt. The ten dioceses are Tyre, Hauran, Saida or Sidon, Ptolemais, Beyrotit, Zakle, Baalbec, Emessa, Aleppo, and Tripoli. Thus there are twelve bishops in all.

Bulgarians.—The United Bulgarians have the same Greek rite, with the mass in the Slav language. Their origin dates from 1860, when many prelates and people passed over to the Catholic Chureh. At present (1885) their numbers are somewhat diminished, amounting to about 9000 souls. They have one archbishop, who resides in Constantinople, a vicar-apostolic for Thrace, who resides in Adrianople, and another vicar-

apostolic for Macedonia, who resides in Salonica, The Turkish Government officially recognizes them as Catholics. They are spread amongst the villages in Turkey and especially in Macedonia. Besides these there are in the diocese of Philippopolis about 15,000 Bulgarian Catholics who have em- braced the Latin rite. These are administered by a vicar-apostolic of the order of Capuchins.

Liuthenians.—The Ruthenians attribute their conversion to Chris- tianity to St Methodius (860) and his brother St Cyril. The Ruthenian rite is Greek in the vicinity of Greece and Latin in the countries of western Europe. The Slav is the language used in both rites. The Ruthenians are numerous in eastern and western Galicia, in Poland, and in Hungary. In Russia they have two dioceses. In Galicia they number about 2,600,000 with 2000 priests ; in Hungary the two dioceses of Eperies and Munkacs count half a million of Catholics. In Galicia they have one metro- politan (Lemberg) and two bishops, in Hungary two bishops, and in Crisio one, with about 200 priests in these three dioceses. They have a Greek Ruthenian college at Rome and another in Vienna.

Maronites.—The greater number of the MARonirss (g.v.) are in Lebanon, where the patriarch resides ; others are in Syria, in Egypt, and in Cyprus. The patriarchal title is Antioch ; the archbishops are those of Aleppo, Archis, Berito, Damascus, Tyre and Sidon, and Tripoli; the bishops of Cyprus, Heliopolis, and Gibail and Botti. The Maronites of Alexandria are administered by a procurator of the patriarch. The population of these dioceses is nearly 400,000. The number of regular priests is about 1200, of secular priests about 600. In Mount Lebanon there are seventy-five convents of men and women. Five colleges or seminaries depend upon the patriarch and four others on the archbishops. In these seminaries the clerics learn Arabic, Syriac, Latin, French, and Italian, The language used in the mass and in the offices of the church is Syriac, that spoken by the people is Arabic.

Syro-Chaldeans.—The Oriental Syrians are called, ecclesiastically, Chaldeans. This name comprises, not only the inhabitants of Chaldea, but also those of Assyria, Mesopotamia, and a part of Persia, To distinguish them from those having other rites equally Syrian, they were exclusively

termed Chaldeans by Pope Eugenius IV, (1431-1447). Previous to the council of Florence (1438) they were called Orientals or Syro-Orientals. The Catholic Chaldeans have a patriarch who for a long period has had his residence at Mosul (Mesopotamia), and has the title of patriarch of Babylonia with archiepiscopal jurisdiction over the city of Baghdad. There are five archdioceses—Amida or Diarbekir in Mesopotamia, Secrt in Assyria, Salmas and Adorbigana in Persia, Kerkuk (Carcha) in Parthic Assyria, and Amadia in Kurdistan, The dioceses are Mardin and Gezira in Mesopotamia, Zaku in Assyria-Media, Sena in Persia, Bassorah on the Persian Gulf, and Acri and Zebari in the mountains of Kurdistan. The number of secular clergy in the patriarchate, archdioceses, and dioceses approximatcs 200. There 1s a congregation of Antonian monks, having the title of 8S. Hor- misdas, who have an abbot-gencral, five houses or convents, forty priests, and a hundred monks. The other religious houses bear the names of Mother of God, St George, St Abraham, and St James. The largest number of Catholics is in the diocese of Mosul with

Baghdad, 25,000. In all there are over 90,000 Catholics. The language of the mass and church office is Syro-Chaldaic. ab one

Copts.—The Coptic rite prevails throughout all Egypt. time there was a liturgy of Lower and another of Upper Egypt. In the former the Memphitic dialect was in use and the Theban dialect in the latter. Butas the patriarchs of Alexandria were Greeks they, followed by several churches in Egypt, changcd the liturgy into the

andria.

‘(protopapas), and by 1561 priests.

651

There are three

Nazianzen, and that of St Mark, rearranged by St Cyril of Alex- The Theban dialect is no longer psed ; but the Memphitic still prevails, and in it the offices of the church are recited. The Catholic population is only

about 6000, with twenty-two priests, one bishop, and a vicar-apostolic, whose residence is at Cairo.

Armenians.—The Armenians (see ARMENIAN CuURCH) regard St Gregory the Illuminator as their apostle. Pope Benedict XIV. instituted the patriarchate of Cilicia in 1742, and Pius VIII. in 1830 instituted the Armenian Catholic primacy in Constantinople. In 1867 Pius IX, united Cilicia with the primacy of Constantinople, so that the patriarch now bears the title of Cilicia and has his residence in Constantinople. Turkcy, Russia, Asia Minor, Armenia (Greater and Lesser), Mesopotamia, Syria, and Egypt have Armenian Catholics, who altogether number 100,000 at the present time (1885). There are ten archbishops and bishops and over 350 pricsts. They also possess religious orders, the Mechitarists of Venice and of Vienna, and have an Armenian college at Rome and an Armenian seminary at Bzommar in Mount Lebanon. The liturgical language is literary Armenian, and they have a special rite and liturgy. The people speak vulgar Armenian and Turkish. There is an institute of Armenian sisters of the Immaculate Conception at Constantinople to attend to the education of young girls, especially those newly converted,

Lioumanians, —As early as the council of Florence the Roumanian metropolitan of Moldavia subscribed the decree of union ; but the time had not yet come for an actual union with Rome. In 1700, under the metropolitan Theophilus and his successor Athanasius L., the great national synod of Alba Julia (Fogaras) was held, in which the bishop, the arehpriests, and all the clergy of the Roumanian Church of Transylvania " freely and spontaneously by the impulse of God" concluded a union with the Roman Catholic Church. This declaration was signed by the metropolitan, by fifty-four archpriests Historians say that 200,000 families were united to Rome on that day. Some afterwards again fell away, but there is at present a great movement prevailing amongst these towards union. The United Catholics are chiefly in Transylvania and Hungary and number about a million and a half, with from 1500 to 1600 priests. In 1854 Pius IX. erected into an ecclesiastical province the United Roumanian Church with an arch- bishoprie, Alba Julia (Fogaras), and threc bishoprics. To the diocese of Grosswardein in Hungary was added that of Lugos in the Banat and that of Armenopolis (Samos-Ujvar), which

constitute a flourish- ing ecclesiastical province. For the education of the clergy four places for students were given by Pius IX. in the Greek college at Rome, and they have sixteen places in the central seminary of Budapest. They have two seminaries, one in the metropolitan diocese with fifty and another at Armenopolis with sixty students. In the diocese of Armenopolis the number of souls is 647,666, with 486 parishes and a monastery. In the archdiocese of Alba Julia the number is 361,000, with 729 parishes and 706 priests. At Grosswardein and Lugos the number of Catholics is less. The rite in use is the Greek, but the language is the Roumanian. This is the only rite which employs the vulgar tongue. Ce Cy)

English Law relating to Roman Catholics,

The history of the old penal laws against Roman Catholics in the United Kingdom has been sketched in the articles ENGLAND and IrELAND.! The principal English Acts directed against "popish recusants "?2 will be found in the list given in the Acts repealing them (7 and 8 Vict. ce. 102; 9 and 10 Vict. c. 59). The principal Scottish Act was 1700, c. 3; the principal Irish Act, 2 Anne ec. 3. Numerous decisions illustrating the practical operation of the old law in Ireland are collected in Howard's Cases on the Popery Laws, 1775, The Roman Catholic Emancipa- tion Act, 1829 (10 Geo. IV. ¢. 7), although it gave Roman Catholic citizens in the main complete civil and religious liberty, at the same time left them under certain disabilities, trifling in comparison with those under which they laboured before 1829. Nor did the Act affect in any way the long series of old statutes directed against the assumption of authority by the Roman see in England. The earliest of these which is still law is the Statute of Provisors of 1351 (25 Edw. III. st. 4). Most of what has been already stated

1 See also Stephen's History of the Criminal Lav, vol. ii. p. 483 ; Anstey, The Law affecting Roman Catholics, 1842.

A recusant signified a person who refused to duly attend his parish church.

under NonconrorMIty (q.v.) as to the legal position of nonconformity may be applied to the Roman Catholic faith. The effect of 2 and 3 Will. IV. ¢. 115 is to place Roman Catholic schools, places of worship and education, and charities, and the property held therewith, under the laws applying to Protestant nonconformists. The Tolera- tion Act does not apply to Roman Catholics, but legisla- tion of a similar kind, especially the Relief Act of 1791 (31 Geo. IIL ¢. 32), exempts the priest from parochial offices, such as those of churchwarden and constable, and from serving in the militia or on a jury, and enables all Roman Catholics scrupling the oaths of office to exercise the office of churchwarden and some other offices by de- puty. The priest is, unlike the nonconformist minister, regarded as being in holy orders. He cannot, therefore, sit in the House of Commons, but there is nothing to pre- vent a peer who is a priest from sitting and voting in the House of Lords. If a priest becomes a convert to the Church of England he need not be re-ordained. The remaining law affecting Roman Catholics may be classed

under the following five heads.

(1) Office. There are certain offices still closed to Roman Catholics. By the Act of Settlement a Papist or the husband or wife of a Papist cannot be king or queen. The Act of 1829 provides that nothing therein contained is to enable a Roman Catholic to hold the office of guardian and justice of the United Kingdom, or of regent of the United Kingdom; of lord chancellor, lord keeper, or lord commissioner of the great seal of Great Britain or Ireland or lord heutenant of Ireland ; of high commissioner to the General Assembly of the Church of Scotland, or of any office in the Church of England or Scotland, the ecclesiastical courts, cathedral founda- tions, and certain colleges. The disability in the case of the lord chancellor of Ireland was removed by statute in 1867, with neces- sary limitations as to ecclesiastical patronage, and the office has been held twice since that date by the late Lord O'Hagan. The Act of 1829 preserved the liability of Roman Catholics to take cer- tain oaths of office, but these have been modified by later legisla- tion (see 29 and 30 Vict. c. 19; 80 and 31 Viet. c. 75; 31 and 382 Vict. c. 72). Legislation has been in the direction of omitting words which might be supposed to give offence to Roman Catholics. (2) Title. The Act of 1829 forbids the assumption by

any person, other than the person authorized by law, of the name, style, or title of an archbishop, bishop, or dean of the Church of England. The Ecclesiastical Titles Act, 1851, went further and forbade the as- sumption by an unauthorized person of a title from any place in the United Kingdom, whether or not such place were the seat of an archbishopric, bishopric, or deanery. This Act was, however, repealed in 1867, but the provisions of the Act of 1829 are still in force. (3) Lcligious Orders. It was enacted by the Act of 1829 that "every Jesuit and every member of any other religious order, eom- munity, or society of the Church of Rome bound by monastic or religious vows" was, within six months after the commencement of the Act, to deliver to the clerk of the peace of the county in which he should reside a notice or statement in the form given to the schedule to the Act, and that every Jesuit or member of such religious order coming into the realm after the commence- ment of the Act should be guilty of a misdemeanour and should be banished from the United Kingdom for life (with an exception in

favour of natural-born subjects duly registered). A secretary of state, being a Protestant, was empowered to grant licences to Jesuits, &c., to come into the United Kingdom and remain there for a period not' exceeding six months. An account of these licences was to be laid annually before parliament. The admission of any person as a regular ecclesiastic by any such Jesuit, &c., was made a misdemeanour, and the person so admitted was to be ban- ished for life. Nothing in the Act was to extend to religious orders of females. These provisions exist 7m posse only, and have, it is believed, never been put into force. (4) Superstitious Uses. Gifts to superstitious uses are void both at common law and by statute. It is not easy to determine what gifts are to be regarded as gifts to superstitious uses. Like contracts contrary to public policy, they depend to a great extcnt for their illegality upon the discretion of the court in the particular casc. The Act of 23 Hen. VIII. ec. 10 makes void any assurance of lands to the use (to have obits per- petual) or the continual service of a priest for ever or for threescore or fourscore years. The Act of 1 Edw. VI. c. 14 (specially direeted to the suppression of chantries) vests in the crown all money paid by corporations and all lands appointed to the finding or

maintenance of any priest or any anniversary or obit or other like thing, or of any light or lamp in any church or chapel maintained within five years before 1547. The Act may still be of value in the construc- tion of old grants, and in affording examples of what the legislature regarded as superstitious uses. Gifts which the courts have held void on the analogy of those mentioned in the Acts of Henry VIII. and Edward VI. area devise for the good of the soul of the testator, a bequest to certain Roman Catholic priests that the testator may have the benefit of their prayers and masses, a bequest in trust to apply a fund to cireulate a book teaching the supremacy of the pope in matters of faith, a bequest to maintain a taper for evermore before the image of Our Lady. The court may compel discovery of a secret trust for superstitious uses. Since 2 and 3 Will. IV. c. 115 gifts for the propagation of the Roman Catholic faith are not void as made to superstitious uses. It should be noticed that the doctrine of superstitious uses is not confined to the Roman Catholic religion, though the question has generally arisen in the case of gifts made by persons of that religion. The Roman Catholic Charities Act, 1860, enables the court to separate a lawful charit- able trust from any part of the estate subject to any trust or provision deemted to be superstitious. It also provides that in the absence of any written document the usage of twenty years is to be conclusive evidence of the application of charitable trusts. (5) Patronage. A Roman Catholic eannot present to a benefice, pre- bend, or other ecclesiastical living, or collate or nominate to any free school, hospital, or donative (3 Jac. I. c. 5). Such patronage is by the Act vested in the universities, Oxford taking the city of London and twenty-five counties in England and Wakes mostly south of the Trent, Cambridge the remaining twenty-seven. The principle is affirmed in subsequent Acts (1 Will. and Mary, sess. 1, c. 26; 12 Anne, st. 2, c. 14; 11 Geo. II. e. 17). If the right of presentation to an ecclesiastical benefice belongs to any office under the crown, and that office is held by a Roman Catholic, the archbishop of Canterbury exercises the right for the time being (10 Geo. IV. c. 7,8. 17) No Roman Catholic may advise the erown as to the exercise of its ecclesiastical patronage (7b., s. 18). A Roman Catholic, if a member of a lay corporation, cannot vote in any ecclesiastical appointment (7b., s. 15). Grants and devises of advowsons, &c., by Roman Catholics are void, unless for valuable consideration to a Protestant purchaser (11 Geo. II. e. 17, s. 5). Where a quare impedit is pending before any court, the court

may compel the patron to take an oath that there is no secret trust for the bencfit of a Roman Cathohe. Sce Quarn Impepit. (J. Wt.)

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OMANCE!? in its widest sense includes the entire literature of fiction, as well as the early narrations

in which fact and legend were blended in historical form, before the simple minds of the people had acquired a clear conception of their distinctness. There are, however, certain ill-defined limitations in the analysis of fiction which enable us to assign distinct places to the legend, the ballad, the epic, the fable, the tale, the romance, and the novel. As usual in all attempts at precise classifica- tion, we find that the lines of demarcation cannot be re ke

1 In the 9th century the Romana or Romance language made its first appearance in writing. For many centuries, however, it was only used to embody the tales and ballads of each country in which ae other form of the speech was vernacular, so that the word 'romance" became finally appropriated to the compositions which were the staple literature of the Lingua Romana or Romance,

drawn with rigid exactness, and that many works may be referred to more than one division. But the general con- ception of romance is the one which will here be followed, and which roughly divides the subject into (i.) Romances of Chivalry—chiefly their prose forms—and (ii.) the Liomances of Love and Adventure, which follow them. Romance, as a distinct branch of the literature of fiction, belongs essentially to the Middle Ages and to Europe.

The romance of chivalry, as it is called, prevailed during Romance

the four centuries of knighthood, and there can be little of

doubt that the institutions of chivalry were considerably chivalry.

influenced by the works of the early romancers. The establishment of the orders of St John and the Temple was based upon an exalted conception of duty and devo- tion, which the hard test of experience soon modified, and which would have perished utterly but for the em-

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The characters of Galaad and the original Perceval represent types of unattainable perfection, and were therefore models which, although commanding reverence, failed to excite as

bodiment of its ideal in the Round Table romances.

deep an interest as did the second Perceval, Sir Lancelot, Sir Tristan, and Sir Gawain. In.these the noblest qualities

were blemished by human frailties, and, as a necessary

consequence, the knights miscarried a little below the summit of perfect achievement. Walter Map cannot be sufficiently eulogized for the tact and skill with which he drew the two first-named personages. Galaad is brought

npon the stage for but a very short time, and is then dis-

inissed in a blaze of saintly glory, while Perceval, although adapted from the French writer's purer knight of that name, is allowed a much larger space upon the canvas, at the cost of a few minor sins which suffice to ensure his failure and to prove hima man. The other knights are brave, generous, self-sacrificing, and devout, but the indis- pensable virtue of chastity is absent from their lives, and they are foredoomed to misfortune. The perfect ideal, however, underlies the description of all their acts and motives, and the reader or hearer was never allowed to forget it amid the more powerful attractions of the story. The real prototype of the chivalric romance was the ancient epic: the Greek and Latin poems upon the win- ning of the Golden Fleece, the siege of Troy, the wander- ings of Ulysses and of Adneas, furnish the truest parallel Classical to the medizval romances of knighthood. The tales Tomances.which are usually dignified

with the name of "classical romances" have really no claim to that rank; they were produced in the age of decadence and correspond much more closely to the medieval fabliau and the 17th-century novel than to the romance proper. As a matter of course every nation had its legends and popular tales, co-exist- ent with literary works of greater importance ; but the Greeks at least, and the Romans following their example, never condescended during their ages of intellectual vigour to put such figments into written form, so that even the famous Milesian tales are now quite lost. It was not until the Greeks became a widely dispersed, a subject and deteriorated race, and not till the strength and manhood of Rome were buried in the slough of imperial corruption, that sophists and rhetoricians began to construct those artificial tales which we call Greek and Latin romances. They form, however, an epoch, as the earliest prose works of imagination in a European language, and cannot there- fore remain unnoticed here. They were succeeded in time by Christian narratives, usually woven into the lives of saints or used as illustrations in the sermons of great preachers ; these latter formed a transition to the semi-religious story of the Grail, a bowl or goblet confounded with the chalice used at the Last Supper, with the cup used to collect the precious blood of our Lord, and sym- bolically with the Holy Sepulchre itself. The achievers of the Grail-quest, or kings of the Grail, were typified in the Knights Templars and the Knights of St John; thus the true school of romance arose in intimate connexion with the changes in European life and manners which were brought about by the crusades.

The chansons de geste, which constituted a poetical intro- duction to the romances of chivalry in France, were fol- lowed by the fabliaux, metrical novelettes which furnished material to the Italian writers of prose tales in the 14th and 15th centuries,—a form of composition which was not acclimatized elsewhere than in Italy till the 16th century, and which then became the remote prototype of the modern novel. The older and nobler knighthood blossomed in France for the last time in Bayard, in England in Sir Philip Sidney; but the genuine literature of chivalric romance may be said to have come to an end with the

Fabliaux.

15th century. The knightly romances produced in the 16th century were belated and artificial examples of their class ; and, although the effects of the conquest of Granada and the discovery of America did not wholly put an end to the lingering romantic spirit in Spain, it hardly sur- vived them for half a century. Hence the inferior char- acter of most of the libros de caballerias, which chiefly date from the 16th century. Out of them grew the fictions known as 16th and 17th century romance in Spain, France, and England,—monstrous and uninviting examples of per- verted ingenuity, utterly dissonant from the literature of pure romance as we conceive it in the chivalrous fictions of the 12th, 13th, and 14th centuries. A more practical and utilitarian spirit set in with the latter half of the 17th century, in which readers found themselves out of sympathy with the imaginative and mysterious atmosphere of romance. Accordingly the modern novel arose, a form of composition in which the manners and customs of everyday life were more or less faithfully depicted, and which has remained in undiminished popularity to the present time.

The subject will be dealt with in the following order :— I. Greek and Latin romance, under the subdivisions—(a) classical and _post-classical prose fictions and (6) pseudo- classical works. II. Medieval romance, embracing—(a) the Arthurian cycle, (b) the Charlemagne cycle, (c) the Spanish cycle, (d) Teutonic and Anglo-Danish, and (e) unaffiliated. III. Modern romance to the 17th century.

I.—GREEK AND LATIN RoMANCE.

(a) Classical and Post-Classical Prose Fictions.

Although the distance in manner is immense between Prose. the Ass of Lucian and the Amadis de Gaula, and again between the latter and Ivanhoe or Eugénie Grandet, there are few varieties of modern fiction which are not faintly shadowed forth in the literatures of Greece and Rome (including in this denomination the post-classical periods of Italy and Byzantium): fables and tales, historical, philosophical, and religious novels, love-stories and narra- tives of adventure, marvellous voyages, collections of fic- titious letters—all forms are represented. As even the

Andaman Islander and the Bushman have their stories, it is reasonable to suppose that the Greek, who attained a high state of civilization at an extremely remote period, had long been familiar with this method of intellectual gratification. Artistic form was first given to the higher class of such narrations by the Jonians of the Asiatic colonies, when they sang the deeds of gods and heroes in epic poetry and put together the story of Troy now current under the name of Homer. From the Attic Greeks belong- ing to the same stock came the drama in its highest de- velopment,—a fresh step in the representation of events in oral shape. Greek romance is a double misnomer. First, the word " romance" is wrongly applied to the tales we shall shortly discuss ; and secondly, we have no right to call anything in art or literature Greek unless it was produced before the time of Alexander the Great, either in Hellas or Ionia or Sicily, or, say, between 800 and 300 B.c. After the defeat of the Greeks at Cheronea, Mace- donia became the ruling centre, and the free 'political life of the Greek cities passed away. The conquests of Alex- ander, a Greeco-Albanian monarch, spread Greek civiliza- tion throughout the known world, but crushed Greece proper out of existence. This civilization (see GREECE, vol. xi. p. 136 sg.), influencing peoples foreign to the Greek race, is designated Hellenistic as opposed to the Hellenic, and the chief note of Hellenistic literature is that of imitation. The original springs of Hellenic poetry were dried up, and from the 3d century B.c. the newly

Milesian tales.

we find first represented by Iamblichus.

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affiliated peoples, whose centre was Alexandria, expressed their fancies in novels rather than in epics. _

When, about the 1st century of the Christian era, verse gave place in general favour to rhetorical prose the greater ease of the style lent itself to more detailed nar- ratives than the eclogue and love-poem ; and the sophist who might formerly have devoted his attention to poetry became in the decadence of Greek literature a writer of novels. From this period to the 10th century were pub- lished the works it is now proposed to analyse. The Greek novel being a late, and it must be confessed an inferior, kind of prose, it would be well if one could trace its rise, progress, and development. This is, however, im- possible here ; it is sufficient to refer in passing to the fables of primitive invention, the tales inserted by histo- rians, the Atlantis of Plato, the Cyropxdia of Xenophon, the forged histories of Alexander, the fictitious lives of eminent men, the fabulous voyages,! and the apocryphal sacred books of Christians and Jews, as supplying in turn material for building up the highly artificial novel which One element may, however, be spoken of specially, although it is rather a forerunner of the tale as distinct from the novel or romance. The Ionic Greeks, living under an Asiatic sky and corrupted by Oriental luxury, were the first to culti- vate to any extent that kind of literature which, without demanding any intellectual labour, tickles the fancy by voluptuous pictures told in a brief and witty manner. Miletus was especially famous for such tales; hence they were usually known as Milesian (MiAnoiaxé). What was their exact shape it is difficult to say, as they have entirely perished, leaving only the reputation of the universal favour they enjoyed. Perhaps the story of the Ephesian niatron told by Petronius in the Satirx, and (though less likely) that of Cupid and Psyche in the Asinus of Apuleius, are more closely allied to them than anything we now possess. They must be considered as a natural growth of the imagination, although some may have been contributed by Orientals or Egyptians ; and, while forming a portion of the materials upon which the later Hellenistic novel was constructed, they differed widely from it in

form and matter. Ovid cannot be considered as a person easily shocked, yet in two passages of the 7'ristia he says—

- *Junxit Aristides Milesia crimina secum" (7 rist., ii, 418). '* Vertit Aristiden Sisenna, nec obfuit illi Historie turpes inseruisse jocos" (1b., 443-444), Plutarch (Crassus, 32) refers to the fact of a copy of this very translation by L. Cornelius Sisenna (a contem- porary of Sulla) having been found in the baggage of a Roman officer, which gave occasion for Surenas to anim- advert upon the Romans carrying with them infamous books during war time. This testimony gives sufficient indication of the nature of the Milesian tales. They must have been short and witty anecdotes, turning chiefly upon the subject of love in its grosser form, and may be regarded as the prototypes of the Italian novelle and the Provengal and French fabliawr. All that remains to us consists of the names of a few writers and some imita- tions and translations. The best-known writer whose fame has reached us is Aristides of Miletus, though we are ignorant of his life and even of the age in which he lived. A more recent author of the same class was Clodius Albinus, the rival of Septimius Severus. We also hear of Ephesian, Cyprian, and Sybaritic tales, the last almost as*

? Strabo considered all those who had written about India down to his time as mere fictionists, and at their head he placed Daimachus and Megasthenes. From the analysis furnished by Diodorus Siculus (ii, 55-60) of the Fortunate Island of Iambulus we are led to believe that the writer, who lived before the Ist century, intended the work as a kind of social utopia similar to the Ailantis,—tfnll of marvels and surprises like all the other imaginary voyages,

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famous as those of Miletus. Aristophanes (as well as Ovid) specially refers to them. Yet after all they exercised but little influence upon the Hellenistic novel beyond perhaps furnishing the more indecent incidents. The lost '"Epwrixd of Clearchus of Soli, a pupil of Aristotle, may have been more closely connected with that branch of our subject. The love-stories (Ilept epwrixdv raPnpdrwv) of Parthenius of Nicwa are also

different. They consist of thirty-six brief tales ending in an unfortunate manner, and were dedicated to Cornelius Gallus as forming subjects for poet- ical treatment. The author carefully indicates the sources whence lie took them, thus giving a special value to his collection. He informs us that some were derived from "the Milesian adventures" of Hegesippus, and also men- tions Naxian, Pallenian, Lydian, Trojan, and Bithynian tales. Like Parthenius, Conon was of the Augustan age, and compiled a collection of fifty narratives (Auyijoess) of heroic times, relating chiefly to the foundation of colonies. They are analysed by Photius. Cervantes has used one of them in Don Quixote.

The first we hear of the Greek or Hellenistic novel is in Greek the time of Trajan (c. 110), when Iamblichus, a Syrian by ovels.

descent and a freeman, born and educated at Babylon, wrote in Greek his Babylonica, which is known from Suidas, Photius, and a scholium discovered by Henry Estienne on an ancient MS. of the latter writer. A complete codex existed in 1671; and a considerable fragment has been reprinted by Mai (Nova Coll. Script. Vet., ii. 349, &c.). Suidas states that the Babylonica consisted of thirty-nine books, but Photius, who gives a full abstract (Bibliotheca, cod. 94), only mentions seventeen. The story is that of Sinonis and Rhodanes, 'married lovers, persecuted by Garmus, king of Babylon, who is fascinated by Sinonis. They fly, and are pursued by the royal eunuchs, who give them no peace through many adventurous scenes. A remarkable resemblance between the fugitives and another couple, Euphrates and Mesopotamia, is the chief subject of the plot. We now meet, incorporated in the works of writers whose dignity might be supposed above the sus- picion of story-telling, short tales of a didactic nature, such as those given by Plutarch under the title "On the Virtues of Women." Dion Chrysostom, the most eminent of the rhetoricians and sophists, has also left among his orations a short novel called The Hunter. The narrator is supposed to have been wrecked on the shores of Eubcea and meets a hunter who tells him his history. Two married couples (the hunter and his wife being one) were living in friendly solitude, when one day a stranger came, and asking for money received all the recluses were able to give in the shape of two deerskins. The hunter goes to the city with the traveller, and his first impressions are happily told. He is frightened

by the bustle and excitement, and debates with an idler upon the comparative advantages of town and country life. The return home is very delicately drawn. Lucian of Samosata, one of the chief essay-writers of the post-Christian age, has left two romances, Lucius or the Ass and the True History, both of which have been briefly analysed in the article Luctan (vol. xv. p. 48). The former was considered by Photius (cod. 129) to have been taken from a fable by Lucius of Patrae and to have thus had a common origin with the Asinus of Apuleius; others consider Lucian himself to have been the original inventor of the story. The True History has been drawn on by Rabelais, Cyrano de Bergerac, Swift, and the author of Baron Munchausen. Like the productions of more modern satirists, it loses much of its point and meaning when the allusions upon which the chief interest is based can no longer be understood. Rather of the nature of the fictitious voyage was The Wonders beyond Thule of Antonius Diogenes, only known from the account given by Photius

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(cod. 166), who was of opinion that he belonged to a remote age, shortly after Alexander, and that he served as model to all subsequent writers of romance, including Lucius.

romances.from a lost Greek original, and therefore claims a place

here, as representing one of the earliest love-stories we can assign to that literature. It may date from the 3d or 4th century, and was perhaps translated into Latin verse in the 5th century. What we now possess (beyond the Anglo-Saxon version mentioned below) is a second Latin prose translation made in the 12th or 13th century. The first mention of the work is ina list of books belonging to Wando, abbot of Fontanelle (742), in the diocese of Rouen. The story runs that Antiochus, king of Syria, entertaining an undue affection for his daughter Tarsia, keeps off suitors by an unsolvable riddle. But Apollonius, king of Tyre, discovers the answer, is obliged to fly, and (as well as Tarsia) undergoes many trials from pirates and other persecutors. An abridgment is included in the Gesta Komanorum. An ancient Anglo-Saxon translation was printed by

Thorpe in 1834. Gower derived his adapta- tion in the Confessio Amantis (bk. viii.) from the rhymed redaction of Godfrey of Viterbo (1185). This formed the foundation of Shakespeare's Pericles (1609). The earliest English version (1510) is made from the French Appollyn, Roy de Thire.

The author of the Cyropxdia has already been alluded to. Suidas mentions other writers of fictions of the name of Xenophon,—a native of Antioch, who wrote Babylonica like Iamblichus; a native of Cyprus, who composed a similar book under the title of Cypriaca ; and Xenophon of Ephesus, of whom alone we possess anything. This last is the author of the romance Hphesiaca, or the Loves of Anthia and Abrocomas, of which the Monte Cassino MS. (first published in 1726) is the only one extant. His age is unknown: by Locella, one of his editors, he is placed in the time of the Antonines ; Peerlkamp, another editor, considers him to be the oldest of the romancers writing in Greek, and that similar writers imitate him closely. Some go so far as to regard him as an imitator of Achilles Tatius and of Heliodorus, and bring him down to the 5th or 6th century. The story runs that Anthia and Abrocomas are married, and, being forbidden by an oracle to travel, of course do so, and are captured by pirates, who take them to Tyre, where Manto, daughter of the chief, falls in love with Abrocomas. Repelled by him, she marries Mceris and accuses Abrocomas of an attempt to violate her. Moeris in his turn pays improper attentions to Anthia. The great beauty of the hero and heroine causes them many trials at the hands of pirates, brigands, and other stock ornaments of the Greek novel. The local names of the tales of Iamblichus and Xenophon were probably suggested by the MtAnowaxe collected by the earlier writers Dionysius and

Aristides of Miletus. This is the weakest of the class we have under review ; its only merit lies in a simple and natural style. By far the best of the romances is the ithiopica of Hetioporus of Emesa (¢.v.). From its first appearance and throughout the whole Byzantine period this work enjoyed a reputation which it has not entirely lost. Within recent times three Frenchmen of mark have praised it,—Amyot, who translated it; Racine, with whom it was a favourite ; and Boileau, who compared it with the

Zélémaque of Fénelon. It influenced consider- ably the French romance-writers of the 17th century, D'Urfé, Gomberville, and Mademoiselle de Scudéry. The dénofiment is imitated in the Pastor Fido of Guarini; Tasso drew from it the early life of Clorinda in Geru- salemme Liberata; and Raphael painted scenes from it. It was first brought to light in modern times in a MS. from the library of Matthias Corvinus, found at the sack of Buda (Ofen) in 1526, and printed at Basel in 1534. Other codices have since been discovered. The title is taken from the fact that the action of the beginning and end of the story takes place in Athiopia. The daughter of Persine, wife of Hydaspes, king of AZthiopia, was born white through the effect of the sight of a marble statue upon the queen during pregnancy. Fearing an accusation of adultery, the mother gives the babe to the care of Sisi- mithras, a gymnosophist, who carries her to Egypt and places her in charge of Charicles, a Pythian priest. The child is taken to Delphi, and made a priestess of Apollo under the name of Chariclea. Theagenes, a noble Thes- salian, comes to Delphi and the two fall in love with each other. He carries off the priestess with the help of Calasiris, an Egyptian, employed by Persine to seek for her daughter. Then follow many perils from sea-rovers and others, but the chief personages ultimately meet at Meroe at the very moment when Chariclea is about to be sacrificed to the gods by her own father. Her birth is made known, and the lovers are happily married. The rapid succession of events, the variety of the characters, the graphic descriptions of manners and of natural scenery, the simplicity and elegance of the style, give the thiopica great charm. Its chaste tone compares favourably with many of the other works of the same class.

Perhaps the most widely known is the delightful pastoral of Daphnis and Chloe (or AeoBuaxd), generally attributed to Longus, a Greek sophist, who is supposed to have lived in the 4th or the early part of the 5th century. Longus shows traces of an imitation of the ZWthiopica of Heliodorus, with whom he may be placed in the first rank of such writers. His work formed the model of the Streine of Honoré d'Urfé, the Diana of Montemayor, the Amunta of Tasso, and the Grentle Shepherd of Allan Ramsay, and has been translated into every European language. The trans- lation of Amyot, afterwards revised by P. L. Courier, has made it extremely popular in France, where the subject has frequently been made

use of by Gérard and other painters. The celebrated Paul et Virginie is an echo of the saine story. Daphnis and Chloe, two children found by shepherds, grow up together, nourishing a mutual love which neither suspects. The development of this simple passion forms the chief interest, and there are few incidents. Chloe is carried off by the inevitable pirate, and ultimately regains her family. A few rivals alarm the peace of mind of Daphnis; but the two lovers are recognized by their parents, and return to a married and happy life in the country. The picture of rural felicity and the innocent affection of the children make the charm of a book which comes nearer perhaps in spirit to the modern novel than any other of its class. Unfortunately there are details here and there which shock modern ideas of decent propriety. Achilles Tatius or Statius, an Alexandrian rhetorician of

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the latter half of the 5th or beginning of the 6th century, wrote The Adventures of Leucippe and Cleitophon, upon the model of Heliodorus; though an ingenious story, it does not reach the standard of the work it imitates. Like his predecessor, Achilles uses the marvellous with discretion, but the accumulation of difficulties is very tedious. Leucippe and Cleitophon fall in love and fly to escape parental anger. They suffer shipwreck, are seized by brigands, and separated. Cleitophon first believes that Leucippe is dead, then finds her, to lose her once more, and again to meet her, a slave, at the very time he is going to marry her mistress, Melitta, a rich Ephesian widow. It so happens that the husband of the latter is not dead but returns to persecute with his love and jealousy both Leucippe and Cleitophon. The descriptions are the best part, the incidents being either tiresome or repulsive and the character of the hero pitiable. Most of the book is written with taste and judgment, but the digressions are too frequent.

Achilles Tatius is the last of these authors who can be said to have the slightest merit. Of the romances which followed his one of the least bad is perhaps Chereas and Callirhoe, by one who called himself Chariton of Aphro- disias, placed by various authorities between the 5th and the 9th century. Here the two lovers are already married, and as usual are of superhuman beauty. Unfortunately Cheereas possesses a somewhat irritable temper, and on a jealous suspicion gives his lovely wife a terrible kick in the stomach. She is considered dead and is carried to her grave. But during the night brigands carry her away to Ionia, where her purchaser, Dionysius, falls in love with her. The wife remains faithful to her husband, but, as she is enceinte, consents to marry Dionysius in order that her child may have a father. Meanwhile Chereas, having learned the ravishment of the supposed corpse, starts in pursuit of lis wife. He also is captured by pirates and taken to Caria. The two finally come together, when Callirhoe forsakes Dionysius and her son and returns to Sicily with her first husband.

Equally frigid was The Loves of Hysmine and IHysminias by Eustathius or Eumathius, probably a Byzantine, who is placed by Wolf as late as the 12th century, but who may have lived six hundred years earlier. Only a few more remain to be mentioned. Philip of Amphipolis wrote 'Poduaxa (specially referred to by Suidas for its obscenity), Qacvaxé, and other works, all lost. Severus of Alexandria, a man of fortune with a large library, living in the latter part of the 5th century, has left a few short stories after the style of Parthenius. Photius (cod. 130) also preserves the titles of some works by a certain Damascius, such as Incredible Fictions, Tales of Demons, Marvellous Stories of Appearances from the Dead, &c. The same authority tells us (cod. 188) of a writer of the name of Alexander who compiled a book of marvels. The credit of having written the worst of the Greek romances may be claimed either by Theodorus Prodromus, a monk of the early part of the 12th century, for his metrical history, in nine books, of Rhod- anthe and Dosicles, or by Nicetas Eugenianus, who lived somewhat later, for his iambic poem LMistory of the Lives of Drusilla and Charicles, imitated from the former work. Constantinus Manasses (also 12th century) composed a poetical romance on the loves of Aristander and Callisthia, fragments of which were first printed by Villoison (Anecdota Greca, 1781),

Under Bartaam anp Josapuar (vol. iii. p. 37 5) will be found the origin and development of the story by St John of Damascus, which belongs rather to religious apologues than to romances, Its origin is entirely Eastern, from India. The early Christians eagerly seized upon fiction as affording them a vehicle for spreading their views.

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'Their contributions to our subject have a strong family

likeness, and usually either close with a martyrdom or are written in praise of a monastic life. To the former class belong the Clementine Recognitions (2d century), Paul and Thekla (3d century), and Cyprian and Justina, which con- tains the germs of the episode of Faust and Gretchen. The ascetic novels include Xenophon and his Sons, Huphrosyne, Zosimus and Mary, Thais, ke. Christian imaginary travels are represented by the Voyage of Macarius to Paradise and comic tales by Agape, Irene, and Chionia.

Besides the forged letters attributed to men of mark, we have from the Greek sophists collections of fictitious letters serving the same purpose as the epistolary novels of Rousseau and Richardson. The best known of those writers were Alciphron, Aristzenetus, and Theophylactus Simocatta. Alciphron, the most eminent, of whom we possess 116 Letters in three books, lived in the 3d or 4th century. Many of the letters are written by courtezans and supply curious information on contemporary life and manners. The fifty Hrotic Epistles of Aristeenetus form a much less entertaining series than those of Alciphron. Theophylactus Simocatta, an Egyptian by birth, died at Constantinople about the year 640. He wrote eighty-five Letters, divided into moral, rustic, and amatory. They are little else than brief moral treatises mingled with stories,

The review of the origines of the Greek novel shows that it arose with the decay of old Greek literature and carried on a feeble existence down to the 12th century. Two facts make themselves apparent. First, the romance (or novel) proper came late into the field, where it remained in a secondary place; and secondly, it invariably turned upon a hackneyed circle of incidents and never attained anything of the highly artistic

development reached by modern examples. The sameness observable in Greek romance arises from the fact that it was the product of literary decrepitude and impotence. The writers were in- capable of rivalling the glories of the old Hellenic litera- ture, and they endeavoured to supply originality with reminiscences more or less disguised. The literary and social surroundings in which these authors passed their lives gave them few fresh subjects for investigation, and the characters they describe are mere names. Human nature and the human heart have little meaning for them ; but, as with the Western writers of fiction who closely follow them in point of date, incident is crowded upon incident to the verge of satiety, in order that the attention of the reader may never flag.

Fictitious letters.

of Greek

' Review | romance, :

The contributions of Roman literature are limited to Roman productions by two writers, Petronius and Apuleius and Tomances.

one story by Martianus Capella, of more recent date and less typical nature. In the comic romance of PETRoNIUS ARBITER (q.v.), the tale of the matron of Ephesus first appears among Western popular fictions. This was un- doubtedly one of the Ephesian tales already referred to. We find it reproduced in the Seven Wise Masters, in the French fabliaux, and in Brantéme. It is also to be found in the Chinese. The opening words of the Golden Ass of Apuleius indicate that his romance and the Ass of Lucian were both inspired from the same source, per- haps through the medium of Lucius of Patra mentioned by Photius. Lucian seems to have reproduced the story in a condensed form; the Latin writer paraphrased and embellished it with other tales, among which the best known is that of Cupid and Psyche,—an antique gem in an unworthy setting. The hero, punished for his curiosity by being turned into an ass, passes through adventures similar in kind to those depicted in the Greek romance. The story ends with a fine description of the mysteries of Isis, into which the hero is initiated and through

which he becomes purified. The first two books of the cyclopzedia of the 5th century, the Satyrica of Martianus Capella, known as De Nuptis Philologix et Mercurn, form a kind of philosophico-allegorical romance in prose mingled with verse. Mercury, wishing to marry, goes, accompanied by Virtue, to Apollo on Parnassus and finds him occupied in taking from four urns the elements of all things. Apollo proposes that Mercury should marry Philology, but the consent of Jupiter must be asked. Jove hesitates and assembles a council of the gods to decide the ques- tion. The request is granted and Philosophy transcribes a decree permitting mortals of superior merit to be ad- mitted amoung the gods. The second book is devoted to the marriage. At first Philology has fears as to its ad- visability, and the Muses form a chorus by whom she is admonished. She is visited by Prudence, Justice, Tem- perance, and the three Graces. At last the bride goes to Mercury's house and all set out for the palace of Jupiter, who receives them surrounded by the gods and many deified mortals.

Of these three works the last does not comply with all our conditions, and of the first two Apuleius is after all merely a translator. The Satire of Petronius is thus the sole genuine representative of Latin prose romance. When compared with the Greek compositions it will be found to offer a remarkable variation. In the Satire we at once cone in contact with contemporary scenery and habits; the characters have well-marked individuality ; and the book is full of life. It must not, however, be considered merely as a novel; its chief object was to satirize the manners of the time. The same tendency to draw a strongly marked picture of the vices and follies of the hour appears also in the Asimus. In the qualities of vigour, interest, and originality of form and substance Apuleius and Petronius are far beyond their Greek rivals.

The texts of the Seriptores Erotict Greet have been edited by C. W. Mitscherlich (Zweibriicken, 1792-94, 3 vols. in four parts) ; by F. Passow (Leipsic, 1824-33, 2 vols. 8vo) ; in Didot's collection, the most complete (Paris, 1856, la. 8vo) ; and by R. Hercher (Leipsic, 1858-59, 2 vols. 12mo). The texts of many of the fictitious historians and biographers are

*given in Fragmenta Historicorum Grecorum (Paris, 1841-51, 4 vols. la. 8vo), and Seriptores de Rebus Alexand. AM. (ib., 1846, 8vo). Photius (Bibliotheca, Berlin, 1824, 2 vols. 4to) has. analysed a great many writings now lost. Early biographical information (not always trustworthy) is supplied by Suidas, and latterly and more perfectly by Fabricius (Biblioth. Greea). Trans- lations into Tanck are contained in Bibliotheque des romans grecs, tr. en francois (Paris, 1797, 12 vols. 18mo); Collection de romans grees, tr. avec des notes par Courier, Larcher, de., précédée d'an essat sur les romans grecs par M. Villemain (Paris, 1822, 12 vols. 18mo, unfinished) ; Romans grees, tr. en fran. par Ch. Zevort, précédés d'une introduction sur le roman chez les grees (Paris, 1856, 2 vols. sm. 8vo). In Italian we have LHrotiet greci (Florence, 1814-17, 6 vols. 8vo), and in English, Greek Romances, by C. Smith (1855, sm. 8vo). The general authorities are referred to under GREECE (vol. xi. p. 147). The following are special treatises on the subject :—J. C. F. Manso, "Ueber den griech. Roman," in his Verm. Schriften (Leipsic, 1801) ; F. Jacobs, " Conjecture de locis nonnullis Achillis Tatii," &c., in Wolf's Litt. Analecten (Berlin, 1820); Wiedemann, " Der gr. Roman," in Arb. dev kurldnd. Ges., 1848, hft. 3; R. Hercher, "Zur Litt. d. gr. Erotiker," in Jahrb. f. class. Phil., 1858, vol. 1xxvi. ; O. Jahn, " Eine antike Dorfgeschichte," in Aus d. Alterthumsw. ; H. Peter, "Der Roman bei den Griechen," in Newces Schweiz, 1866; A. Nicolai, Ueber Entstehung uw. Wesen d. gr. Romans (Berlin, 1867, 8vo); B. Erdmannsdorffer, " Das Zeitalter der Novelle in Hellas," in Preus. Jahrb., vol. xxv.; C. Hartung, "Die byzantinische Novelle," in Arehiv f. d. Stud. d. n. Spr., 1872; TH. Usener, * Zur Gesch, des gr. Romans," in Rhein. Afus., 1878, vol. xxviii. (N. F.); K. Rohde, "Ueber gr. Novellendichtung," in Versamvml. deutscher Philologen, 1875; Id., Der gr. Roman u. seine Vorléufer (Leipsic, 1876, 8vo); J. Wimmer, " Der gr. Roman," in Blédtter f. d. bayer. Gymn., 1877) ; "Greek Romances," in For. Quar. Rev., Nov. 1829 ; 'Early Greek Romances," in Blackwood's Mag., July 18438; S. Baring Gould, " Early Christian Greek Romances," in Contemp. Rev., Oct. 1877; Chardon de la Rochette, " Notice sur les romans grecs," in Mélanges (Paris, 1812, vol. ii.); Struve, "Romans et nouvelles chez les grees," in Jowrnal gén. de PInsir, Publ., 13th Aug., 17th Sept., 1885 ; V. Chauvin, Les romaneters grees et latins*

(1864, sm. 8vo); A. Chassang, Hist. du roman dans l'antiq. grec. et lat. (1862, sm. 8vo); P. D. Huet, De orig. fab. rom. (Hague, 1682); P. Paciaudi, De Libris Eroticis Antiquorum (Leipsic, 1808, 8vo); H. Paldamus, Rémische Erotik (Greifswald, 1838, 8vo).

(6) Pseudo-Classical Works.

The literature of the Middle Ages recognized three great epic cycles, distinctly defined by Jean Bodel (13th century) in his Chanson des Saisnes (t.e., Saxons) :

' Ne sont que troi materes, a nul homme entendant—*

De France, de Bretaigne, et de Rome la Grant ;

Et de ces troi materes n'i a nule semblant." Under "Rome la Grant" were comprehended the stories of Troy and the Trojans, A'neas, Alexander the Great, Julius Czesar, Judas Maccabeeus, &e., from Latin sources, —that is to say, the whole ancient world seen through the language of Rome.

The romances derived from antiquity may be arranged in three classes—(1) those which were believed to be direct reproductions, such as Hneas, Thebes, César, and the Roman de Trove, whose authors acknowledged indebted- ness, after their fashion, to Virgil, Statius, Dares Phrygius, Dictys Cretensis, &e.; (2) those based upon ancient histories not previously versified,—for example, the legend of Alexander from Quintus Curtius and the Pseudo-Cal- listhenes ; (3) those which merely reproduce the names of antiquity and nothing else, such as Aths et Profilias, Ypomédon, and Protésilaus,

1. The chief of the first class was the Homan de Trove, Legend which exercised greater influence in its day and for cen- of Troy.

turies after its appearance than any other work of the same order. Just as the chansons de geste of the 10th century were the direct ancestors of the prose romances which afterwards spread throughout Europe, so, even

before the novels of Heliodorus and Achilles Tatius, there were quasi-histories which reproduced in prose, with more or less exactness, the narratives of epic poetry. Among these nothing has ever equalled in vitality the tale of the two sieges and capture of Troy, and the subsequent destinies of the Trojan and Greek heroes, "It would require a large volume," says Grote (History of Greece, 1. p. 386), "to convey any tolerable idea of the vast extent and expansion of this interesting fable, first handled by so many poets, epic, lyric, and tragic, with their endless addi- tions, transformations, and contradictions, then purged and recast by historical inquirers, who, under colour of setting aside the exaggeration of the poets, introduced a new vein of prosaic invention." Long previous to the "Hpwixds of Philostratus (2d century) the Trojan War had been the subject of many a prose fiction dignified with the title of history ; but to remodel the whole story almost in the shape of annals, and to give a minute personal description of the persons and characters of the principal actors, were ideas which belonged to an artificial stage of literature. This task was commenced by PHILosTRATUS (g.v.), whose "Hpwixds bears ample traces of having been compiled from a number of current figments. Philostratus, however, only pictures several characters and a few isolated scenes. His method was subsequently followed in a more complete fashion by two anonymous writers, who either borrowed from him or from a more ancient source common to all three. A spurious history, professing to give the chief incidents of the siege, and said to have been written by | Dictys of Crete, a follower of Idomeneus, was known as early as the time of lian, and has been largely quoted by the Byzantine chroniclers. This was translated into Latin prose at an early period under the title of Dactyos Cretensis de Bello Trojano libri VI. With Dictys is always associated Dares, a pseudo-historian of more recent date. Old Greek writers mention an account of the destruction of the city earlier than the Homeric poems, and also in

the time of Aulian this Iliad of Dares, priest of Hepheestus at Troy, was believed to exist. Nothing has since been heard of it; but an unknown Latin writer living between 400 and 600 took advantage of the tradition to compile what he styled Daretis Phrygit de Excidio Trojx Hustoria. It is in

prose, and professes to be translated from an old Greek manuscript. Of the two works that of Dares is the later, and is inferior to Dictys. The matter-of-fact form of narration recalls the poem of Quintus Smyrnzeus. Both compilations lack literary merit ; the gods and every- thing supernatural are suppressed; even the heroes are degraded. The long success, however, of the two works distinguishes them above all apocryphal writings, and they occupy an important position in literary history on account of the impetus they gave to the diffusion of the Troy legend throughout western Europe. The Byzantine writers from the 7th to the 12th century exalted Dictys as a first- class authority, with whom Homer was only to be con- trasted as an inventor of fables. Western people preferred Dares, because his history was shorter, and because, favour- ing the Trojans, he flattered the vanity of those who be- lieved that people to have been their ancestors. Many MSS. of both writers were contained in old libraries ; and they were translated into nearly every language and turned into verse. In 1272 a monk of Corbie translated "sans rime L'Estotre de Trotens et de Troie [de Dares] du Latin en Roumans mot & mot" because the Roman de T'roie (to be mentioned lower down) was too long. Geoffrey of Waterford put Dares into French prose; and the British Museum possesses three Welsh MS. translations of the same author,—works indeed of a much later period.

We know that the taste for Greek letters was never entirely lost in western Europe. Eginhard tells how Charlemagne understood Greek and how he encouraged the study. Alcuin states, with pardonable pride, that the library at York contained "Grecia vel quidquid trans- misit clara Latinis," which may, however, simply refer to Latin translations. Under any circumstances, however, this knowledge must have been confined to a few. It was through Latin that the Middle Ages knew the ancient world, and in that language read the Pseudo-Dares and Dictys, the Fables of sop, and the Iliad of Homer.} Through these translations came many of the traces of Greek literature which occur in the fabliaux and romances. How numerous these traces were in the Arthurian cycle will be pointed out. The tale of the Dog of Montargis, familiar to readers of Milles et Amys (Carolingian cycle), is derived from Plutarch. Cerberus may be found in the Chanson @Antioche ; the story of Tarquin in the chanson de

geste Momage Guillaume; the judgment of Paris in Foulkes de Candie; and Cupid and Psyche in the romance of Parten- opex of Blois.

For a thousand years the myth of descent from the dis- persed heroes of the conquered Trojan race was a: sacred literary tradition throughout western Europe, of which a possible survival still remains in the popular phrase which speaks of a generous and courageous fellow as a Trojan. The classical traditions of extensive colonization subsequent to the Trojan War were adopted by Western nations at a very early date. The first Franco-Latin chroniclers con- sidered it a patriotic duty to trace their history to the same origin as that of Rome, as told by the Latin poets of the Augustan era; and in the middle of the 7th century Fredegarius Scholasticus (Rer. Gall. Script., ii. 461) relates how one party of the Trojans settled between the Rhine,

; 1 The name of Homer never ceased to be held in honour; but he is invariably placed in company with the Latin poets. Few of those who praised him had read him except in the Latin redaction in 1100 verses which passed under the name of Pindar. It supplied the chief

incidents of the Iliad with tolerable exactness and was taught in schools,

the Danube, and the sea. In a charter of Dagobert occurs the statement, ‘ex nobilissimo et antiquo Trojanorum reliquiarum sanguine nati.” The fact is repeated by chroniclers and panegyrical writers, who also considered the History of Troy by Dares to be the first of national books. Succeeding kings imitated their predecessors in giving official sanction to their legendary origin : Charles the Bald, in a charter, uses almost the same words as Dagobert—‘“‘ex preclaro et antiquo Trojanorum sanguine nati.” In England a similar tradition had been early formulated, as appears from the Pseudo-Nennius (put together between the 7th and 9th centuries) and Geoffrey of Monmouth. Otto Frisingensis (12th century) and other German chroniclers repeat the myth, and the apocryphal hypothesis is echoed in Scandinavian sagas.

In the 11th century the tale of Troy became the theme of Neo-Latin verse. About 1050 a monk named Bernard wrote De Excidio Troje, and in the middle of the 12th century Simon Chevre d'Or followed with another poem on the fall of the city and the adventures of Alneas, blend- ing the Homeric and Virgilian records. We now come to a work on the same subject in a modern language, which in its own day and for centuries afterwards exercised an extraordinary influence throughout Europe.

England, under the eyes of Henry II., about the year 1184 a poem in 30,000 lines entitled Roman de T'roie. It forms a true Trojan cycle and embraces the entire heroic history of Hellas, The introduction relates the story of the Argo- nauts, and the last 2680 verses are devoted to the return of the Greek chiefs and the wanderings of Ulysses. With no fear of chronological discrepancy before his eyes, Benoit reproduces the manners of his own times, and builds up a complete museum of the 12th century,—its arts, costumes, manufactures, architecture, arms, and even religious terms. Women are repeatedly introduced in unwarranted situa- tions ; they are spectators of all combats. The idea of personal beauty is different from that of the old Greeks ; by Benoit good-humour, as well as health and strength, is held to be one of its chief characteristics. The love- pictures are another addition of the modern writer. We find traces of the Odyssey of Homer and the trilogy of Aischylus? as well as of Ovid and Virgil. The author speaks enthusiastically of Homer, but his chief source of information was the pseudo-annals of Dictys and Dares, more especially the latter, augmented by his own imagina- tion and the spirit of the age. It is to Benott alone that the honour of poetic invention is due, and in spite of its obligation for a groundwork to Dictys and Dares we may justly consider the Roman de Troie as an original work. From this source subsequent writers drew their notions of Troy, mostly without naming their authority and generally without even knowing his name. This is the chef d'ccuvre of the pseudo-classical cycle of romances: it shows the most lofty conception, and in it poetical imagination has the freest and most lively play. The Roman de Troie was extremely popular. When Benoit, by reason of his lengthi- ness, failed to please, the Latin version of Guido revived general interest. The story passed through every country of Europe, first in verse and then as a prose fiction, and portions

of it furnished matter for the genius of Boccaccio, Chaucer, and Shakespeare.

The first work inspired by the success of the Roman de Imita-

Troie was the De bello Trojano of Joseph of Exeter, in six books, a genuine poem of no little merit, written soon after Benoit's work or about the years 1187-88. It was directly

2 The Middle Ages had their Latin Oresteia, see Orestis Tragadia, carmen epicum seculo post Christum natum sexto compositum, ed. S. Schenkl, Prague, 1867, 8vo.

Benoit de Benoit's Sainte- More, the Anglo-Norman trouvére who wrote in Roman verse Chroniques des Ducs de Normandie, composed in @ 770

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drawn from the pseudo-annalists, but the influence of Benoit was considerable. Another was the Z'roalus of Albert of Stade (1249), a version of Dares, in verse, brought back to all its severity and affected realism. But these Latin works can only be associated indirectly with Benoit, who had closer imitators in Germany at an early period. Herbort von Fritslar reproduced the French text in his Lied von Troye (early 13th century), as did also

toires, &c., in which the Middle Ages studied antiquity. {t reappeared in the religious dramas called Mysteries. Jacques Millet, who produced La Destruction de Trove la Grande between 1452 and 1454, merely added vulgar real- ism to the original. Writers of chap-books borrowed the story, which is again found on the stage in Antoine de Montchrestien's tragedy of Hector (1603)—a last echo of the influence of Benoit.

Although the Troie reveals the greatest power of imagination, Adapta- and was the most influential and important, of these adaptations tions of of ancient classical stories, it was not the earliest of them. It other

Konrad von Wiirtzburg (d. 1287) in his Buch von Troye of 40,000 verses. To the like source may be traced a poem of 30,000 verses on the same subject by Wolfram

von Eschenbach, still unpublished. The Low Countries were not behind Germany.

In Italy Guido delle Colonne, a Sicilian, commenced in 1270 and finished in 1287 a prose Mrstoria Trojana. Although Guido knew some Greek, he did not translate Dictys and Dares, as some MSS. affirm, but reproduced the Roman de Troie of Benoit, and so closely as to copy the errors of the latter and to give the name of Peleus to Pelias, Jason's uncle. As the debt was entirely un- acknowledged, Benoft at last came to be considered the imitator of Guido, The original is generally abridged, and the vivacity and poetry of the Anglo-Norman trouvére disappear in a dry version. The immense popularity of Guido's work is shown by the large number of exist- ing MSS. The French Bibliothéque Nationale possesses eighteen codices of Guido to thirteen of Benoit, while at the British Museum the proportion is ten to two. Guido's History was translated into German about 1392 by Hans Mair of Nérdlingen. Two Italian translations, by Antonio Cessi (1324) and by Bellebuoni (1333), are still preserved in MS. at Florence. The book passed the seas, and in the 14th and the comniencement of the 15th century four ver- sions appeared in England and Scotland. The best known

was preceded by a Roman d' Eneas, written, like the Roman de Troie, Roman

by an Anglo Norman at the court of Henry II., a contemporary of Giraldus Cambrensis and John of Salisbury. There is, indeed, every reason to believe that the author was Benoit de Sainte-More himself. The work is a tolerably close reproduction of the 4neid, some passages being faithfully translated and others elaborated. But the religious character of Virgil's work is wanting, as well as the spirit of Roman greatness shadowed forth in the ancient epie. Long extracts from the Hneas have been published by M. Pey (Paris, 1856), but it has not yet been printed in full. Soon after its appearance it was translated with great fidelity into German by Heinrich von Veldeke. The Roman de Thebes is an imitation

of the Thebais of Statius, with the saine general characteristics as the Eneas. In eacli case the trouvére found a Latin model on which to superimpose an elaborate structure of his own. In each case also the original is abridged, while all polish is effaced, and the pagan marvels replaced by others more familiar to contemporary readers. The change is specially visible in matters of religion. Lydgate translated the Thebes, and Chaucer used the romance in his Canterbury Tales. It was composed after the Troie by another pen than that of Benoit. Lucan's Pharsalia was the last of the great Roman epics to be appropriated. Li Ronwnz de Julius Cesar by Jacques de Forez, of which only one MS. exists, dated 1280, is from this source. It adheres to Lucan's text with more fidelity than the other adaptations ; but the general intention is changed. While the classic poem ends in the middle of the 10th book, Jacques de Forez conducts Cesar back to Rome. These romances—Lneas, Thebes, and J. Ceswr—are mere translations, and are, indeed, our first renderings of Virgil, Statius, and Lucan in modern dialects. But the trouveres rearranged and transformed their originals. Fairies, magic, and enchanters, the novel position of women, the sentiments of Christianity, and the spirit of chivalry are strangely at variance with the stories familiar to us in the language of im- perial Rome. The influence of new ideas derived from the crusades and the East is plainly visible. Some of the marvels are found in William of Malmesbury, which indicates that they were of popular acceptation.

is the Troy Book of Lydgate, who had both French and Latin texts before him. An earlier and anonymous render- ing exists at Oxford. There is the Gest Historiale of the

lt is a remarkable fact that, while the origines of the pseudo- Second- classical romances are earlier than any of the others, the prose re- ary re- compositions are of later construction than almost all those we are produc- about to consider. The Reeweil des Histoires de Troyes, Herewle, tions.

Destruction of Troy (Early Eng. Text Soc., 1869), also an earlier Scottish version by Barbour. The invention of printing gave fresh impetus to the spread of Guido's work. The first book printed in English was a

translation by Caxton from the French of Raoul Lefévre, issued by the foreign press of Caxton about 1474. Lefévre's own version appeared from the same press about the same time and was the first book printed in the French language. There were also translations into Italian, Spanish, High German, Low Saxon, Dutch, and Danish; Guido had even a Flemish and a Bohemian dress. But not one of these translators even suspected that the writer was only a feeble repre- sentative of an old trouvere.

Thus far we have only considered works more or less closely imitated from the original. Boccaccio, passing by the earlier tales, took one original incident from Benoit, the love of Troilus and the treachery of Briseida, and com- posed Filostrato, a touching story. This was borrowed by Chaucer about 1360 for his Boke of Troilus and Cresside, and also by Shakespeare for his Z'rotlus and Cressida (1609). One reason why the Round Table stories of the 12th and 13th centuries had a never-ceasing charm for readers of the two following centuries was that they were constantly being re-edited to suit the changing taste. The Roman de Trote experienced the same fate. By the 13th century it was translated into prose and worked up in those enormous compilations, such as the Jer des His-

Jason, Gdipus, Alexandre, Virgilius, &c., belong to the second half of the 15th century. They have little interest and intrinsic merit, but their immediate originals exercised an extraordinary in- flueuce on the literature of the Middle Ages, an influence which appears even in the romances of other cycles and in those composed in prose at an earlier date than those we are now discussing.

Reeucil des Histoires de Troyes was "composé par venérable homme Raoul le Feure prestre chappellain de mon tres redoubté seigneur monseigneur le duc Phelippe de Bourgoingne en l'an de grace 1464," but probably printed in 1474 by Caxton or Colard Mansion at Bruges. It is in three books, of which the first deals with the story of Jupiter and Saturn, the origin of the Trojans, the feats of Perseus, and the first achievements of Hercules; the second book is wholly taken up with the "prouesses du fort Herculez"'; the third, "traictant de la generalle destruction de Troyes qui vint a l'ocasion du rauissement de dame Helaine," is little else than a

translation of that portion of Guido delle Colonne which relates to Priam and his sons. Two MSS. of the Recwedd in the Bibliothéque Nationale wrongly attribute the work to Guillaume Fillastre, a voluminous author, aud predecessor of Lefevre as secre- tary to the duke. Another codex in the same library, Histoire aneienne de Thebes et de Troyes, is partly taken from Orosius. The Bibliotheque Nationale possesses an unpublished Histoire des Troyens et des Thébains jusqud la mort de Turnus, @Maprées Orose, Ovide et Raoul Lefebre (early 16th century), and the British Museuni a Latin history of Troy dated 1408.

Hereules.—The cnd of the first and the whole of the second book of the Recweil are reproduced in Les prowesses et vaillances du preux Hercule (Paris, 1500), with the addition of a prologue and the genealogy of the champion. The character and adventures of Hercules were of a nature to attract the fancy of a romancist. His labours are represented as having been performed in honour of a Beotian princess ; Pluto isa king dwelling in a dismal castle; the

Histories of Alex- ander.

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Fates are duennas watching Proserpine ; the entrance to Pluto's castle is watched by the giant Cerberus. Hercules conquers Spain and takes Merida from Geryon. The book is translated into English as Hereiles of Greece (n.d.). The marquis de Villena took from the same source his prose Libro de Jos Trabajos de Hercules (Zamora, 1498), and Fernandez de Heredia wrote Trabajos de Hereules (1682), also in prose. Le Fatiche d'Ereole (1475) is a romance in poetic prose by Pietro Bassi, and the Dodeci Travagli di Ereole (1544), a poem by J. Perillos. ; Jason.—Les fais et prowesses du noble et vaillant chevalier Jason was composed in the middle of the 15th century by Lefevre on the basis of Benoit, and presented to Philip of Burgundy, founder of the order of the Toison d'Or. Jason is shown as a foremost figure in tournaments, overthrowing all competitors at one held by the king of Beeotia to celebrate the knighting of his son Hereules. The two become staunch friends and attend the marriage eeremony of Hippodamia, Centaurs interrupt and are exterminated by Jason. He performs other knightly exploits, and on his

return is malici- ously sent by his uncle Peleus (Pelias) on the Argonautic expedition.

The narrative of the jonrney to Lemnos and Colchos, the love of

Medea, and the episode of the Golden Fleece follows the elassical traditions. When Jason rcturns to the country of the Myrmidons, Medea by enchantment restores the old king to youth and brings about the death of Peleus. For this last good deed Medea is banished, with Jason's consent, and is carried off by four dragons. She soars long over Greece before she is able to find her lover ; at length she discovers that he is going to wed the princess of Corinth. She descends amid thunder and lightning, kills the two children she bore to Jason, and allows her attendant dragons to destroy with fire Corinth and all its inhabitants, She then inveigles the old Egeus, king of Athens, into marriage, but is banished upon suspicion of attempting to poison her new son-in-law Theseus. Meeting with Jason, who had escaped the burning of Corinth, she becomes reconciled to him, and, abjuring magic, on the death of Eson becomes a good wife and queen. The manners and senti- ments of the 15th century are made to harmonize with the classical legends after the fashion of the Italian pre-Raphaelite painters, who equipped Jewish warriors with knightly lance and armour. The story is well told; the digressions are few; and there are many touches of domestic life and natural sympathy. The first edition is believed to have been printed at Bruges in 1474; the type is the same as that used in the first edition of the Recueil. Caxton translated the book at the command of the duchess of Burgundy. A Dutch translation appeared at Haarlem in 1495. M. Paulin Paris doubts whether the romance was written by Lefévre, whose authorship is distinctly asserted by Caxton. Montfaucon refers to a MS. by Guido delle Colonne, Historia Medex et Jasonis (unpublished). There is a Histoire de la Thotson d'Or (1516) by Guillaume Fillastre, written about 1440-50.

Gidipus.—A kind of introduction to the Reeuetl is Le Roman ad' Gdipus, Fils de Layus (n.d.), written in the 15th century by an unknown pen. The story follows the fable told by the Greek poets, adapted, of course, to the

taste and habits of later times. The sphinx is drawn as a giant of great subtlety and ferocity.

2. The wonders revealed through the Asiatic expedition of Alexander gave rise to a remarkable development of the marvellous in historical composition. The histories of Onesicritus, Aristobulus, and Clitarchus, themselves mem- bers of the expedition, were so full of unheard-of things that they soon fell into disrepute. Callisthenes, another companion of Alexander, also wrote an account, which is lost, but his name remains connected with a spurious work in which were crystallized all the fabulous tales of the con- queror. The life of Alexander had every quality to. appeal to the imagination. His marvellous career, his genius as a soldier and ruler, the beauty of his person, his early death, were subjects for legend almost in his own day ; and a cloud of mythical story soon floated round his memory. Quintus Curtius, who drew from some of these suspicious sources, is a more critical authority, though he allowed rhetorical fancy to embellish his narration. It is a great fall from the Latin historian to the Pseudo- Callisthenes. The work we possess under the latter title represents the second stage of the Alexander myth. Some of the MSS. attribute it to Aristotle, Ptolemy, and Alsop, as well as to Callisthenes,—all with equal verisimilitude. To reconstruct the true from the spurious work is an im- possible task after the increased vogue given to the latter by the re-opening of the East to Europe by the Romans, when all the traditions became remoulded in the form they

now possess. Among the histories separate from Pseudo- Callisthenes and subsequent to Quintus Curtius is an Ltinerarium Alexandrt, in Latin, but of Greek origin, which is little else than an amplification of the apocryphal letter of Alexander to Aristotle. It is dedicated to Con- stans, son of the emperor Constantine. Similarities be- tween the Jtineraritwm and the Latin version of Pseudo- Callisthenes prove that the stories were current in the 4th century, and may have emanated from the same source ; but, while the Zénerarium is inferior in authority to Quintus Curtius, it is less a collection of mere fables than is Callisthenes. The Greek text of the latter is supposed to have been written in Alexandria at the

commencement of the third century, and to have been translated into Latin by Julius Valerius before 340. The translation was abridged in Latin some time before the 9th century. Much of the work is a running travesty of the true history of the conqueror. The first book deals with his birth and early exploits. The trace of Alexandrian influence is to be found in the pretence that his actual father was Nec- tanebus, a fugitive king of Egypt. The latter was a great magician, able, by operating upon waxen figures of the armies and ships of lis enemies, to obtain complete power over their real actions, He was obliged, however, to fly to Pella, where he established himself as a doctor and was visited by Queen Olympias to get advice upon her con- tinued sterility. He promised that Jupiter Ammon should perform the cure in the shape of a dragon. To make quite sure Nectanebus himself took the place of the animal, and nine months afterwards Philip became the father of the future Alexander. At first there was some unpleasant- ness, but a reappearance of the dragon convinced every- body that the infant really was the son of a god, so that the putative father could no longer object. Alexander was small and somewhat deformed, but of great courage and intelligence. He was educated under the supervision of Nectanebus, who at last died through a fall into a pit, into which he had been playfully pushed by his royal pupil. The second book continues the various conquests, and the third contains the victory over Porus, the relations with the Brahmans, the letter to Aristotle on the wonders of India, the histories of Candaces and the Amazons, the letter to Olympias on the marvels of Further Asia, and lastly the account of Alexander's death in Babylon.

Callisthenes was translated into Syriac and Armenian in the 5th century. A second Latin abridgment is known as LHistoria de Preliis. The letter from Alexander to Aristotle on the marvels of India, the correspondence between the king and the wise Brahman Dindimus, and De Gentibus Indix, ascribed to Palladius, are different parts of the same legend. The myth had a wider circulation than any of the others we have yet dealt with, and the East contributed its share as well as the West. Persians and Arabs told the deeds of Iskander ; and Firdousi made use of the story in the Shah-Namah. Another early Persian poet, Nizami, made the story specially his own. The crusaders brought back fresh developments ; Gog and Magog (partly Arab and partly Greek) and some Jewish stories were

then added. In the 11th century Simeon Seth, protovestiarius at the Byzantine court, translated the fabulous history from the Persian back into Greek. In the following century was built up the Geste d' Alexandre by the successive labours of Lambert le Cort, Alexandre Bernai, Jehan le Nevelais, Gautier de Cambrai, Pierre de Saint-Cloud, Brisebarre, &c. Alexander becomes then a knightly king, surrounded by his twelve paladins. Bernai says that the foundation was Latin (? Valerius or some other Latin version of Pseudo-Callisthenes) :

"Un clere de Casteldun, Lambert li Cors l'escrit, Qui del Latin le traist, et en Roman le mit."

Coulogne (1534). The Bible as well as the classics was laid under contribution. Gaultier de Belleperche wrote a metrical Homan de Judas Machabée about the year 1240, of which a prose reproduction is Les chroniques du prince Judas Machabeus, Vun des neufs preux, et aussi de ses quatres fréres (Paris, 1514).

The Enchanter Virgil.—After turning the heroes of antiquity The en- into knights-errant, it was a simple task to transform ancient poets chanter and philosophers into necromancers ; and Virgil and Aristotle be- Virgil.

The same origin is to be sought for the Alexander myths found in Renart le Bestourné and the Speculum Historiale of Vincentius Bellovacensis. Quintus Curtius was largely used for the Alewandreis (c. 1176-1202) of Gaultier de Chatillon.! It was the theme of poetry in all European languages: six or seven German poets dealt with the subject, and it may be read in English, Spanish, Danish, Swedish, Icelandic, Flemish, and Bohemian.

Towards the close of the 15th century an anonymous writer worked up the subject into a prose romance, L'hvs- toire du noble et vaillant roy Alixandre le Grant (1506), in which the Historia de Preliis is followed with tolerable exactness. After an account of the ancient history of Macedonia and of the intrigue of Nectanebus we are told how Philip dies, and how Alexander subdues Rome and re- ceives tribute from all

European nations. He then makes his Persian expedition; the Indian campaign gives occasion to descriptions of all kinds of wonders. The conqueror visits a cannibal. kingdom and finds many marvels in the palace of Porus, among them a vine with golden branches, emerald leaves, and fruit of other precious stones. In one country he meets with women, who, after burial in the winter, become alive again in the spring full of youth and beauty. Having reached the ends of the earth and conquered all nations, he aspires to the dominion of the air. He obtains a magic glass cage, yoked with eight griffins, flies through the clouds, and, thanks to enchanters knowing the language of birds, gets information as to their manners and customs, and ultimately receives their submission. The excessive heat of the upper regions compels him to descend, and he next visits the bottom of the sea ina kind of diving-bell. The fish crowd round him and pay hom- age. Alexander returns to Babylon, is crowned with much pomp, and mass is celebrated. He dies by poison soon afterwards,

The Vawe du Paon and Restor du Paon are chansons de geste attached to the Alexander cycle, to which also belongs Florimont, a poem by Aimé de Varennes, said to have been written in 1188. Florimont was a son of the duke of Albania and father of Philip of Macedon by the heiress of the latter country. This poem gave rise to two prose romances—La conqueste de Grece faicte par Philippe de Madien, by Perrinet du Pin, first printed in 1527, and Histoire du rot Florimond (1528).

came popularly famous, not for poetry and science, but for their supposed knowledge of the black art. One of the earliest references to the magical skill of Virgil? occurs in a letter of the chancellor Conrad (1194), reproduced by Arnold of Liibeck in the continua- tion of the Chronicon Slavorwm of Helmold. John of Salisbury alludes to the brazen fly fabricated by Virgil ; Hélinand (d. 1227) speaks of similar marvels in a work from which Vincentius Bello- vacensis has borrowed ; and Gervase of Tilbury, in his Otéa Im- perialia (1212), and Alexander Neckham (d. 1217), in De Natura Rerum, have reproduced these traditions, with additions. German and French poets did not overlook this accessory to their réper- toire. The Roman de Cléomades of Adenez (12th century) and the Invage du Mondc, an encyclopedic poem of Gauthier de Metz (18th

century), contain numerous refercnces to the prodigies of the en- chanter. Reynard the Fox informs King Lion that he had from the wise Virgil a quantity of valuable receipts. He also plays a considerable part in the popular folk-tale The Seven Wise Masters, aud appears in the @csta Romanorwm and that curious guide- book for ee the Airabilia Rome. He is to be found in Gower's Confessio Amantis aud in Lydgate's Bochas. A Spanish romance, Vergilios, is included by E. de Ochoa in his Zesoro (Paris, 1838), and Juan Ruiz, arclipriest of Hita (d. 1851), has also written a poem on the subject. Many of the tales of magic throughout Europe were referred to Virgil, and gradually developed into a completely new life, strangely different from that of the real hero. They were collected in French under the title of Les Faitz Mer- vetlleux de Virgille (c. 1499), a quarto chapbook of ten pages, which became extremely popular, and was printed, with more or less additional matter, in all languages. We are told how Virgil be- guiled the devil at a very early age, in the same fashion as the fisherman used the jinn in the Arabian Nights when he got him to re-enter Solomon's casket. Another reproduction of a widely spread tale was that of the lady who kept Virgil suspended in a basket. To revenge the affront the magician extinguished all the fires in the city, and no one could rekindle them without subject- ing the lady to an ordeal highly offensive to her modesty. Virgil made for the emperor a castle in which he could see and hear every- thing done or said in Rome, an ever-blooming orchard, statues to preserve the safety of the city, and a lamp to supply light to it. He abducted the soldan's daughter, and built for her the city of Naples upon a secure foundation of eggs. At last, having performed

Rp- 3. We now come to the third order of romances in- | many extraordinary things, he knew that his time was come. In

: ¢é " : order to escape the common lot he placed all his treasures in a a cluded in the cycle of "Rome la Grant, : pt 'ane castle defended by images unceasingly wielding iron flails, and merely wetely reproduce the names of antiquity. e enchanter | directed his confidential servant to hew him in pieces, which he classieal Virgil is the most famous of those who have given rise to | was to salt and place in a barrel in the ccllar, under which a

names. prose works, and what passes under his name is less a | lamp was to be kept burning. The servant was assured that after

romance than a collection of popular tales, many of Eastern derivation. Among romances in verse we have LHraclés, Anseys de Carthage, Cléomadeés, Athis et Profilias, Proté- silaus, and Ypomédon. The first part of Athis et Profilias, by Alexandre de Bernai (latter part of 12th century), is adapted from the tale of the two merchants in the Descr- plina Clericalis of Pedro Alfonso, and is the source of Boccaccio's "Tito e Gisippo" (Decam., x. 8). In Ypomé- don, written by Hue of Rotelande about 1185, most of the characters are named from the 7hebais. As early as the year 1210 we find a rhymed translation of Ovid's Metamorphoses in German by Albrecht von Halberstadt. From Ovid is taken the story of Pyramus and Thisbe in Chaucer's Legend of Good Women, which is the subject of a prose work in Italian, Piramo e Tisbe (Milan, s.a.). The episode of Orpheus and Eurydice furnished the plot of the poetical Histoire d'Orphée of Guillaume de Machault (d. 1370) and the English Sir Orphes. The tale of Theseus was handled by Boccaccio and supplied the title and names to the prose romance /fistoire du chevalier Theseus de

1 The author of the much-quoted line, "Incidis in Seillam eupiens vitare Charybdim." The twelve-syllabie verse known as alexandrine is supposed to have taken its name from being first used in the French Geste d' Alexandre.

seven days his master would revive a young man. The directions were carried out; but the emperor, missing his medicine- man, forced the servant to divulge the secret and to quiet the whirling flails. The emperor and his retinue entered the castle and at last found the mangled corpse. In his wrath he slew the servant, whereupon a little naked child ran thrice round the barrel, crying,

'Cursed be the hour that ye ever came here," and vanished. Literature.— On the subject generally, see A. Chassang, Histoire du roman dans Vantiquité, 1862; P. Paris, Les MSS. Francois de la Bibl. du Roi, Paris, 1835-48, 7 vols.; H. L. D. Ward, Cat. of Romances in the Dep. of MSS., British Museum, 1883; E. Du Meéril, Preface to Flore et Blancheflor, 1856; Egger, Héllen- isme en France, 1869. The Troy legend is dealt with

in the elaborate work of A. Joly, Benoit de Sainte-More et le Roman de Troie, 1870-71, 2 vols.; G. Korting, Der alifranz. Roman de Troie, 1883; F. Settegast, Benoit de Ste-More, Breslau, 1876; Frommann, Herbort v. Fritzlar u. Benoit de Ste-More, Stuttgart, 1857; R. Jackel, Dares Phrygius u. Benoit de Ste-More, Breslau, 1875; HK. Juste, Sur Vorigine, des poémes attrib. & Homére et sur les cycles épiques de Vantig. et du Moyen-Age, Brussels, 1849; J. A. Fuchs, De varietate fabularum Trotcarum questiones, Cologne, 18830; H. Dunger, Die Sage vom trojan. Kriege, Leipsic, 1869; G. Korting, Dictys wu. Dares, Halle, 1874; H. Dunger, Dictys Septimius, Dresden, 1878 ; L. Havet, "Sur la date du Dictys de Septimius" (Rev. de Philol., 1878); F. Meister, "Zur Ephem. belli Troiani von Dictys" (Philologus, 1879); T. Mommsen, "' Zu Dictys" (Hermes, 1876); E. Rohde, " Zu Dictys Cretensis"' (Philologus, 1873); R. Barth, Guido de Columna, Leipsic, 1877; A. Mussafia, "Sulle versione Italiane della Storia Troiana" (Sitz. d. k. Akad. Wien, 1871, vol. lxvii.), and " Ueber d. Span. Versionen" (ib., 1871, vol. lxix.); Pey, Essat sur lt romans d'Eneas, 1856. The Alexander legend is treated by J. Zacher, Pseudo-Callisthenes, Halle, 1867 ; J. Berger de Xivrey, "'Sur Pseudo-Callisthenes" (Notices et Extracts, xiii., 1888); A. Westermann, De Callisthéne, 1838-42, 4 parts ; E. Talbot, Sur la légende d' Alexandre dans les romans francais, 1850; Florian

2 The Irish apostle to Carinthia, St Virgilius, bishop of Salzburg (d. 784), who held original views on the subjeet of antipodes, may have been the real eponym of the legend. Naples was a eentre for pseudo-Virgilian stories.

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Donath, Die Alexandersage im Talmud Us Midrash, Fulda, 1873. For the Virgil myth see D. Comparetti, Virgilio nel Medio Evo, Leghorn, 1872, 2 vols.; W. J. Thoms, Early Eng. Prose Romances, 1853, 3 vols. ; G. Brunet, Les faite merveilleux de Virgile, Geneva, 1867 ; E. Dumeéril, "' Virgile enchanteur (Mélanges Arch., 1850); Gervase of Tilbury, Otia Imper., ed. Liebrecht, 1856 ; Pp. Schwubbe, Virgilius per mediam etatem, Paderborn, 1852 ; Siebenhauer, De fabulis que media wtate de Virgilio circumy., Berlin, 1837 ; J. G. T. Graesse, Beitrage zur Litt. u. Sage des Mittelalters, 1850; Bartsch, "Gedicht auf d. Zaub. Virgil (Pfeiffer's Germania, iv., 1859); F. Liebrecht, " Der Zauberer Virgilius (id. xe 1865); K. L. Roth, "' Ueber d. Zaub. Virgilius (ib., iv., 1859); W. Victor, " Der Ursprung der Virgilsage " (Zeit. f. rom. Phil., i., 1877). For Ovid see K. Bartsch, Albrecht v. Halberstadt u. Ovid im Mittelalter, Quedlinburg, 1861.

ROMANCE

and the neid exhibits that pseudo-tradition in its most permanent and powerful embodiment. A similar desire affected the Romanized Britons, and we may confidently assume that before the end of the 3d century a poetical form had been given to the story of the Trojan Brutus who founded the kingdom of Britain, blended with some- thing of the real traditions of the Celtic race. No such form survives at present, but we may discern its traces and results in Nennius (sec. viii.-x.), Geoffrey of Monmouth (d. 1154), and in all the subsequent chronicles.

In the 11th century the Anglo-Saxons of England had Ethno-

their old Germanic stories of Beowulf, Sigfrid, and the ee Nibelungen ; the Britons of the west enjoyed their Celtic 2°me's

: : 9 : +7, in Brits and Britanno-Celtic myths ; the Saxonized Britons of Wilt- ain, 11th shire and elsewhere combined the legends of both the century.

Il.—Mepi2zvaL RoMANCE. (a) Arthurian Cycle.

Origines.

The oldest and certainly the most important of the cycles of medieval romance is that which passes under the name of King Arthur, or of the Round Table. The names, characters, and actions of its heroes have permeated modern literature throughout Europe; yet so little do we know concerning the origines and the first authors of the tales which form the body of Arthurian romance that there are few subjects in literary history.more obscure and undefined. It can only be said with assurance that from about the year 1150 several poems! were composed by minstrels (a class of men recruited from all ranks of society) upon incidents and personages familiar to readers of what is called the Morte Arthur, a compilation of the second half of the 13th century. The Morte Arthur was not originally so called, and it was not a direct compilation from the ballads of the 12th century, but seems rather to have been a mere unskilful reduction into a single corpus of some five or six prose romances which had already grown out of the poems, and each of which professed to relate the adventures of nearly the same set of heroes. The first appearance of these stories in prose compositions is here our chief concern ; and it is, unfortunately, likewise our chief difficulty. The sources of information upon the subject are defective and vitiated to a singular degree; and the light thrown by the investigations of recent writers is frequently of the nature of cross-lights. The following attempt at constructing a brief literary history of the Arthurian romances is not offered as a complete analysis of the work which has been done, but as a sum- mary of facts and probabilities.

The Roman conquests in Spain, Gaul, and Britain im- posed upon a large portion of the conquered peoples the necessity of using the Latin language, which thereby be- came, and for centuries remained, the medium of educated intercourse and the language of the towns and the centres of government in those countries. In common speech, naturally, it became depraved in course of time, and the pure lingua Latina of the high officials and the clergy existed side by side with the corrupt lingua Romana of the Romanized people. The latter was, however, ignored by polite literature, and probably never appeared in a written form till it was used for political purposes on the occasion of the celebrated partition of Charlemagne's empire among his grandsons. We may say that the literature of romance begins with popular poetry of the 10th or 11th

century ; but, as its subject-matter was derived to some extent from the more respectable lingua Latina, we must go back a few centuries earlier to find the origines. When the people of Rome became acquainted with the civilization and literature of Greece they framed a fabu- lous history to connect themselves with the superior race,

é Chansons de geste, or ballads of knightly adventure, produced by wandering minstrels called in northern France and England trowvéres,

in southern France, Spain, and northern Italy trobadors (troubadours),

in Germany minnesinger, and intended for recitation with more or less musical accompaniment,

others; and the best educated men amongst the clergy had an acquaintance with Virgil, Ovid, and Statius. Here was a rich material for the imagination, and the invasion of the Normans brought a fructifying element. In France, Roman, Franco-German, Celto-Breton, and Scandinavian traditions were already intermingled ; and the reintroduc- tion into Saxonized England, from the south, of Celtic myths nearly identical with those which the Anglo-Normans found in Wales before the end of the 11th century gave to the latter a fresh life and a distinct predominance over all the other traditions of the composite people. Hence arose the British cycle of romance, accepted partly as history, partly as fiction by the new people of Norman England. Bretons, Britons, Normans and French, the Saxonized Britons, the Franco-Gallicized Scandinavians, and the Dano-Saxons all found a common basis of amalga- mation, and it is no mere metaphor to say that the publi- cation of Geoffrey of Monmouth's fabulous chronicle formed a momentous era in the history of England.

When the Saxons entered Britain in the 5th century they found in the middle and the south a Romanized kingdom ruled by a monarch with a British or Cymric name. The vernacular tongue of Britain was then and for centuries afterwards much nearer in form to the Gaelic of Ireland and of western and northern Scotland, the Pictish of Scotland, and the Gaulish of France than the Cymric of Wales is now or was then. It was a long time before the Saxon conquests extended so far as to leave the

Cymry or Welsh the sole distinct people of the original inhabitants of the country. In the meantime there had been con- flicts with the Pictish kings of the north, the Gaelic or Cambro-Gaelic kings of Strathclyde, and the princes of North and South Wales. Amongst their opposers the most successful and the most memorable was a prince or chief of Strathclyde, who is called by Nennius " Arthur dux bellorum," by the English "King Arthur," by the Welsh "the Emperor Arthur." After the departure of the Romans there were several independent monarchies or principalities in the island—that of the Romanized Britons occupying the centre, south, and south-east of the country ; two Cymric principalities in Wales (North and South) ; the Cambro-Gaelic kingdom of Strathclyde, extending from the Clyde to Chester; the unmixed Gaels in the north-west of Scotland ; the Pictish kingdom in the north- east; and a Scandinavian population between the Firth of Forth and Norwich. It is now settled by scholars that the Pictish speech was a dialect, like Gallic, Gaelic, and Cymric, of the common Celtic language; and in the early centuries of the Christian era the radical unity of all these tongues had not yet been effaced by the action of local varieties of pronunciation and arbitrary rules of orthography ; consequently there was no such sentiment of national or racial distinction between the divisions of the Celtic race as is nowadays produced by political frontiers. The real Arthur, whoever he was, has been claimed by the

Welsh as their own man, a champion of the beaten Celts retirmg westward to the mountain-fastnesses before the victorious Saxons. They have lost sight of the fact that there were always Cymry in Wales, who must have re- garded their brothers in Loegria (England) much in the sanie way as they did those of Strathclyde, namely, as kinsmen and allies sometimes, as fair game for attack and plunder more frequently. The struggle between the Celtic and Germanic race was a long one, and it can only have been after the power of the Romanized Britons of Loegria and of the men of Strathclyde was broken, in the battles to which we may attach the name of Arthur, that the tide of war reached Wales along with the British fugitives who crowded thither and to Brittany; hence the appearance of Roman names among the British warriors. It may be surmised that Arthur is not

a name but a title given to a Strathclyde warrior, corresponding to the Latin ¢mperator.}

The traces of Roman occupation and of Roman culture were not wholly effaced for many centuries in the west of England, and, besides the Latin quasi-historical writings attributed to Gildas and Nennius, there must have been something like a British Livy and a British Virgil in existence between the time of Constantine and that of the pseudo-classical compositions of Geoffrey of Monmouth and Joseph of Exeter, It is quite certain that the work we call by the name of Nennius did not furnish all the sub- ject-matter of Geoffrey's Historia, and the mysterious old volume which his friend William of Wallingford brought to him from Brittany about 1130 must have contained poetic legends as well as prose pseudo-history. Another mysterious volume is the 'Latin book" in the nionas- tery at Salisbury, to which the romancists of 1160-1220 professed to have resorted for their narratives. In Geof- frey's Historva, compiled, as he says, from William of Wallingford's book, we find three elements blended —(1) the epic of Brutus (which must have been written in Britain before 300); (2) a record of British kings down to the Saxon invasion (probably a corrupt version of. the same real history that appears distorted and truncated in Nennius); (3) the lives of Arthur, Guenhumara, and Merlin (old British popular legends, wrought into union with a later Cymric tradition in which the British or Gadelic Arth-vaur, Art-vor, or Ard-tur had been converted into a Welsh king Arthur).

The Round Table romances had their starting-point in Origin of Geoffrey's Historia, first published in 1138-39, revised and . republished in its present form in 1147.2 Yet there is no romances, Mention in Geoffrey of Lancelot and Tristan, two heroes

of much greater importance in the romances than Arthur himself. It does not seem to have been observed before that there is a curious set of resemblances between the personages of the romances and those of the Homeric siege of Troy. The names of Arthur and Uter suggest Atrides (Menelaus and Agamemnon rolled into one); Mark, again, is Menelaus; Guenhuinara and Yseult are

1 The name Arthur is found for the first time in Nennius (where the hero is said not to be a king but only duz bellorwm). He explains it as meaning either the "dreadful bear" or the "iron hammer." Now, although the former may refer equally well to Cymric and to Gaelic, ¢.e., arth-vaur or art-vor, the alternative sense is better sought in Gaelic, ord, a hammer, being a known word in that language, while there is no trace of it in Cymric. The second syllable of ord- dur is common to both languages, equivalent to the Latin durus, and has assumed in Welsh the meaning of "steel." It probably also meant "iron." This observation shows that Nennius did not know whether the name was a Gaelic or a Cymric one, and the mere uncertainty is in itself an argument that Arthur was distinctly not Cambrian. If it were permissible to seek a purely Gaelic etymology for Arthur we should find it in ard-tur=altus dux, high chief or generalissimo. In the two early authorities Gildas and Bede the British champion of the 5th century is named Ambrosius Aurelius, a man of Roman family.

2 His poem on the Life and Prophecies of Merlin was a separate work, published in 1136-37 and again in 1149.

like Helen, Guenhumara also resembling Chryseis and Briseis ; Lancelot and Tristan are like Achilles and Paris. Lancelot becomes for a time the enemy of his king (Arthur = Atrides) and stands aloof from him ; he is un- successful in his quest of the Grail, as Achilles dies before Troy is taken ; his son Galaad, like the Achilleid Neo- ptolemus, achieves the father's unfinished task. Lancelot (lanc-e-loc= child of the lake) is 'brought up in conceal- ment by the Lady of the Lake, just as Thetis (the goddess of the sea) brings up her son Achilles, disguised as a girl, in obscurity. Chiron, to whose care the young Achilles is at first entrusted by Thetis, resembles Merlin, the friend or lover of the Lady of the Lake, in his half divine, half human nature.? Again, not only does Galaad by his name remind us of the hero of the Achilleidos (it must have been as usual to give this genitive name to the poem of Statius as that of Hneydos to Virgil's), but there are other curious similitudes. The name of King Perles or Pelles, by whose daughter Lancelot becomes the father of Galaad, is suggestive of, or may have been suggested by, the Greco-Latin appellation of Achilles, Pelides son of Peleus. One of the meanings that has been

suggested for the name of Lancelot is /'ancelot=the serving man, in reference to one of the incidents of his story. Although a dif- ferent origin is hinted at above, it would not be inappro- priate to designate Achilles in his female disguise at Delos Pancillet (=the male damsel, in attendance on Deidamia). As in the old Greek poems we have Atrides and Pelides contesting for Briseis, and the minor Atrides, Menelaus, similarly contending with Paris the ravisher of Helen, so in the romances we find Guenhumara the object of mutual strife between her lover Lancelot and her husband Arthur, son of Uter Pendragon, and Yseult the cause of war between King Mark and Tristan. Again, a resemblance is to be found in the incidents of fabulous birth between Arthur and Hercules, Arthur and Alexander the Great.

These observations are not intended to contradict the claims of the Cymric people to have furnished the romances with much of their material; for it would be difficult to resist the evidence of such names as Tristan and Yseult, which indicate sufficiently their British or Breton origin, and even Lancelot might have been, as first suggested above, a Welsh or British translation of an epithet which would apply to Achilles in connexion with the following words from Statius.t Thetis says (as the Lady of the Lake might have said of Lancelot) —

- *Seepe ipsa (nefas!) sub inania natum Tartara et ad Stygios iterum fero mergere fontes ;"*

while her son's guardian, Chiron, is named in the same place " Carpathius vates," which at once reminds us of the "'Caledonius vates" (Merlin) of Geoffrey of Monmouth. At the same time the name of Guenhumara (Guinevere) makes one think of Thetis, the white-footed lady of the sea. As the name Guenhumara certainly preceded in date all the Anglo-French romances and is undoubtedly an old one, we may as well say at once that the intention is here to suggest an hypothesis that Britain produced Latin poets during the time of the Roman occupation, who wrote works not only on the fable of a British descent from the Trojans through Brutus, a fabled kinsman of Aineas, but also on the various subjects of classic mythology, the stories of Thebes, Troy, the Golden Fleece, and Alexander.® This

3 The names of several beings of this mixed nature in the early romances begin with the same word, mer, merh], or mel, as Merlin, Melusine, Melior, Melion.

4 Hugh of Rutland's poem of Zpomedon (written in 1185) evinces by the names of its personages such an acquaintance with the Thebais of Statius as the maker of the Lancelot seems to have had with the Achilleis of the same poet. He usually calls his King Arthur Atreus.

> Yeuerne, the name of Arthur's mother, was perhaps akin in its original British sense (although in Cymric it means " the true" or "the

hypothesis, which requires to be associated with the corol- lary that British translations or adaptations were formed when the Roman influence began to wane, would account for the curious circumstance that some of the Greek and Oriental fictions are found in Anglo-Saxon versions of much greater antiquity than any that have survived in the other vernaculars of Europe. Direct transference of such works from classical codices can hardly be presumed to have been the custom of a rough and semi-barbarous nation of Teutonic invaders ; the medium must have been the existence of Brito-Latin and British poems among the conquered people.

The success of Geoffrey of Monmouth's Historza and of his Werlin brought indignant comment from some of the Anglo-Norman historians, but it inflamed the minds of other writers already excited by the extraordinary events of the period. The result was the genesis of modern fiction. Within a few years after Geoffrey's publication the Norman Wace translated the Historia Britonum into French verse (1155), making some additions ; and in his

1270-75 to unify or harmonize in a single compilation the scattered Arthurian romances, and it is considered probable that the result was the French prose original of the exist- ing Morte Arthur. But it is also certain

that there exist prose Arthurian romances in MSS. at least as old as 1270, and that they were copies of yet older ones. Rusticien's work must have been simply one of compression and com- bination. We know from the MSS. of two different prose translations of a totally different romantic chronicle (the Pseudo-Turpin's Chronicle of Charlemagne), written in and about 1200, that metrical narrative was losing credit and that French prose composition had already set in. This statement, which refers to the French kingdom, is likely to be yet more applicable to England, where metrical suc- cess would naturally be more difficult to achieve than in the true home of French speech. As prose was current in France before 1200, it is not rash to assume that it had an earlier and less limited currency in England. Reckon- ing thus we may assume that the Lancelot and the Tristan were written in prose before 1190.

work entitled Roman de Brut we find the words— " King Ertur made the Round Table Of which Bretons tell many a fable "— from which we may infer that the Round Table stories, which led to the construction of the French romances,

The Round Table and the Grail are so closely connected Early that it is difficult to regard them as having had each a Round separate origin. The mention of the former by Wace ale proves the existence of stories of a Round Table current ¢,ai before 1155. The Round Table as it appears in the current stories.

were derived directly from Brittany, just as Geoffrey de- clares his Htstoria to have been. Wace, as a Jersey man, could have made no confusion between the Waleis of Cambria and the Bretun of Armorica.

Recapitulating what has been already said, we may chronologically tabulate the first elements of Arthurian story thus—I. Arthur, Guinevere, Merlin (in Geoffrey), 1136-49 ; IL. the Round Table (as shown by Wace), before 1155; II. Lancelot ; IV. the Grail; and V. Tristan.

texts of the romances is simply an important portion of the furniture of the narratives: it does not represent a cycle of incidents or even a number of special episodes. One might suppose from the form of Wace's phrase that the word was with him, as it is now, a general epithet to designate

Arthurian stories, rather than merely the name of a material object, as it is in the romances. But we cannot assume the fact for lack of specific information. The first and also the chief instance which we have of the

Gast's The original Zristan was earlier than the Lancelot, and appearance of the Round Table (beyond Wace's allusion) Tristan was presumably a French poem (or prose work ?), written | is in the existing Lancelot, which we may refer to about ae about 1160 by Luc de Gast, a trouvére of English birth | 1190. In the epilogue of the Tristan, Hélie de Borron am who lived near Salisbury, and is said to have had access } speaks of Luc de Gast's original work on that hero as the

to the book of stories referred to in a previous paragraph. The poem (?) and the book have perished, and the Tristan story was written under the name of Le Bret (=the Breton), to distinguish it from Le Brut (=the Briton) of Wace, at a later date, with so much additional matter that it must be placed after the Lancelot. Walter Map (g.v.) of Here- ford, who died archdeacon of Oxford in the year 1210, was a man of Welsh origin or kindred. In 1185 Hue de Rote- lande of Credenhill near Hereford wrote a French romantic poem, in which the names of the characters are all derived from the Thebais of Statius, but the incidents are wholly imaginative or derived from other sources. In it he speaks, in deprecation of any blame for his falsification of the truth of history, of Walter Map as being quite as great a romancer as himself. In connexion with statements fre- quently repeated in the early MSS. of the romances, this remark suffices to prove that before 1185 Walter Map had already published his Lancelot. We may fairly put the date before 1175, say about 1170; and it would be prob- ably correct to assume that the Lancelot was a French poem (or prose work ?) composed while the author was still young (1165-70). It has perished, like Luc de Gast's Tristan, and we can only conjecture that it had some similar connexion with the Achilles of Statius to that of Hue de Rotelande's poem with the Thebais. It was, how- ever, reduced to or rewritten in prose and amplified before 1200 in the form in which we now find it in several old MSS. (none earlier than the 13th century). It is certain that Rustighello or Rusticien of Pisa was employed about

faithful”) to “ Alemena,” and may have meant “ manly,” “ roueme

Arthur proves his fitness

for kingship by the perf r – ful feats like the labours — ene ae

of Hercules.

first of “les grans livres de la tauble roonde.” There is no reason to imagine that this phrase was written after the year 1200; and it indicates sufficiently that several books were collectively styled “Romances of the Round Table” between 1155 and the end of the century. One of these books was Joseph of Arimathea, or the History of the Holy Graal, written about 1170-80 by Robert de Borron or Robert of Bouron, a trouvére born near Meaux. This narrative seems to have taken at least two forms before it was incorporated in the prose Lancelot, and the alterations were sO numerous and important that some writers con- sider the Grand Graal to have been a rewriting effected in collaboration by Walter Map and Robert de Borron. The earher portion of the History of the Graal was but lightly treated on its incorporation in the Lancelot, and the form in which we have it in the separate romance of the Graal is of more modern compilation. The later portion of the Grail story—namely, the Queste du Graal, which was utilized by Map (or his recompiler) in the Lancelot—differs from that of the French writer in making Galaad the achiever, while Perceval was the hero of the quest in Robert de Borron’s work and its recompilations, as well as in the separate prose romance of Perceval and the separate Histoire du Graal. We may conclude that the older works (the original Lancelot, Merlin, and Tristan) had nothing of the Grail in them, and that the publication in French of the Tristan by Luc de Gast and the Lancelot by Walter Map (produced in this succession between 1160 and 1180) were accidentally contemporaneous with Robert de Borron’s poem (or prose work) on the grail (=chalice) or cup of Christ’s passion and the table of the Last Supper, based upon an old legend (connected in some way with the

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ancient popular Gospel of Nicodemus), according to which Joseph of Arimathea brought Christianity to Britain in the time of Vespasian. Then Robert de Borron continued his story in another work which represented the quest or re- discovery of the Grail in Avalon, Brittany, or Britain, by Perceval, the grand-nephew of Joseph of Arimathea ; and Walter Map appropriated so much of De Borron's Histoire and Queste as suited him, working it up in a continuation of his story on Arthur, Guinevere, and Lancelot, whilst adding to and altering the incidents of the narrative very considerably. Finally, Hélie de Borron (about 1190) re- wrote the Zristan in something like its existent form, weaving it by enlargement into connexion with the other tales, and probably soon after 1200 united for the first time in one enormous and unharmonized corpus the full set of Arthurian stories. One reason why we cannot assign this first combination to a later date (as those do who hold the work of Rusticien of Pisa to have been something more than a mere compression) is that the Guiron, written by Hélie de Borron (probably soon after 1200), is not in-corporated in the Jforte Arthur, which it would assuredly have been if Rusticien (about 1270-75) had been employed to unite a number of detached stories rather than to re-edit an already existing compilation. Of Hélie de Borron we only know that he was a relative of Robert; that he was the virtual author of the Bret or Tristan, in which he incorporated the substance of tales written by Luc de Gast and Gasse li Blont; that he also wrote Palamedes in two parts (Meliadus and Guiron le Courtois); and that his work was done at the request of a king of England, alleged to have been Henry II. or Henry III. Of the other early writers of Arthurian stories the chief were the trouvére Chrestien de Troyes (about 1180-90), who com- posed a poem upon an episode of Map's Lancelot story, and another upon the Perceval (in which he may have combined Robert de Borron and Map), and Guyot de Provins (about 1190-95), who wrote a romance of Perceval, now lost, and only known through the German translation of Wolfram von Eschenbach (about 1205). As for the Welsh stories in the Mabinogion and the Welsh Seint Greal, there is really no evidence to show their anteriority to the English Morte Arthur, except the fact that two of the tales (Geraint and the Lady of the Fountain) are of similar substance to the poems of Chrestien de Troyes, Erec et Enide and Le Chevalier au Lyon,—narratives of Arthurian personages but not embodied in the French prose romances, Even the Welsh chronicles

which are supposed to have furnished the original text of Geoffrey of Monmouth's Historia have been ascertained to be merely translations from the Latin version. It is a safe con- clusion to say that anything in Welsh literature corre- sponding with portions or incidents of the French romances was simply a translation made in the 13th or 14th century from a French original. This refers, of course, to what is now extant, for there can be little question that Breton and Cymric legend furnished the earlier romancists with names and legends in plenty. Returning to the consideration of names, it is obvious that when Lawnselot dy Lak appears in Welsh it is simply a corruption of the Franco-English Lancelot, and that the Cymric writer had no idea of its above-suggested origin in a British lanc-e-loc (a conjecture which is fortified by the pleonasm of du-lak or del-lak) or in a French l'ancillet. Consequently the original Lancelot story has left no trace in purely Welsh literature. With Perceval we may think differently ; the Welsh name Pere- dur, under which he is known, is a sufficient warrant for supposing that portions of the Welsh tale are at least as ancient as Walter Map. The very form Pered-ur, like that of Arth-ur, is archaic, and with the latter it requires a different interpretation from that which Welsh scholars

have given it. Here it may be observed that the terminal ur, whatever may have been its true sense, is remarkable for its frequent use in the names of Pictish princes. As for Perceval, wherever Robert de Borron got the name (see below), Walter Map, in adopting it for the hero of the story that belongs to Peredur, made the two names thenceforward identical.

Analysis of the Arthurian Romances.

I. Il. Arthur and the Round Table had no separate romanee, or else it has perished. It exists now substantially as part of Laneelot (111.).

I. Merlin.—Most of his story appears in Geoffrey of Monmouth Merlin.

and in Wace, from whom it was probably worked up into a French poem (or prose work) by Robert de Borron about 1160-70. The Freneh prose composition, embracing his life and, as an appendix, his propheeies

(Latin by Geoffrey), was apparently written about 1200 (by Hélie de Borron) in the form in which it exists in certain MSS., and nearly as it appears in printed books. Merlin, the son of an incubus, rescued at his birth by sudden baptism from the malignant destiny for which his diabolical parent had begotten him, is always described as amagician. He is ealled by the Welsh Myrddin, a form which betrays the posteriority of the existing Cambrian legends not only to the date of Geoffrey but also to the French romances ; in one of the earliest incidents of his story, however, he himself gives his name as Ambrosins.!_ He is repre- sented as living apparently at the time of the Saxon invasion of England. He was not a friend of Vortigern ; this king, whom we know from English sources to have been attached more to the Saxons than to his countrymen, was represented in the old Merlin story as a usurper reigning in an interval between Moines, son of Constans, and the two brothers of Moines, Uter and Pendragon. After the suceessive deaths of Vortigern and Pendragon (on whose fall Uter adds his brother's name to his own) Merlin continues to be the friend and counsellor of King Uter Pendragon. In that eapacity he helps the king to assume the shape of Gorlais, duke of Tintagel, and thereby to beget Arthur upon the Duchess Ygnerne. (The name Pendragon and the action remind ns of the fabulous birth of Alexander the Great ; the name Uter, in connexion with the go-between Merlin, and the probable Celtic meaning of Yguerne remind us of Jupiter, Mercury, and Alemena.) The result is the birth of a hero who resembles both Hercules and Alexander. He grows up and is held to be merely the son of Gorlais, in spite of the fact that he was born after Yguerne (already a widow) had married Uter Pendragon ; but he proves his right to royal place after the king's death by performing some extraordinary feats. In these he has Merlin's aid, as well as in the eonduct of his sub- sequent wars with the Gauls and the Saxons. Merlin has a lover or mistress in Viviane, the Lady of the Lake, to whom in an un- lueky moment (as Samson to Delilah) he betrays a certain spell. She uses it to try her power, without having learned the converse eharm, and poor Merlin vanishes into the midst of a thornbush, whenee his voiee can be heard ; but he is seen no more. Here the romance ends,—one of the most interesting, as well as one of the best-constructed and most simply told of the Arthurian series. The name and deeds of the enchanter have found their way into most modern literatures. One of Merlin's actions was to institute a round

table at Carduel, at which room was made for King Arthur and fifty of his nobles, with a vacant place for the Holy Grail. This was a ceremony to be performed once every year, and it was on the first of these occasions that Gorlais brought his wife Yguerne with him to court, and that King Arthur fell in love with her (as David with Bathsheba). This cireumstance, although of later date than the original Merlin, leads us to the next romanee in the cyele.

IV. 1. The Holy Grail.—The Grail romance began with Borron's Holy An old tradi- Grail.

poem (or prose narrative) on Joseph of Arimathea. tion maintained that Joseph of Arimathea (confounded in some respects with the centurion at the erucifixion and with Josephus the historian) brought the gospel to Britain or to Gaul in the first eentury of our era. The French romance on this subject, whichever of its existent early forms in verse and prose was the earlier, relates the story thus :—Pilate allowed Joseph to take down the body of Christ from the cross, and gave Him also son vaissewl, by which was evidently meant the chalice of His passion, or the eup used at the Last Supper. Of all the numerous interpretations suggested for the word "grail" or "graal"' the only tenable one is that of 'Ceup," whieh plainly refers to the words "son vaisseul." In that eup Joseph colleeted the preeious blood of his Saviour. He loses it when pnt in prison by the Jews, but it is restored to him in

1 When we remember that the Ambrosius Aurelius of Gildas was probably the Arthur of Nennius and the romances, and that Merlin was called Ambrosius Merlinus, we are drawn to believe in the Romano- Briton origin of the stories, and to conclude that " Arthur" and " Mer- lin" are two explicative or distinguishing epithets attached to the older names.

Perceval.

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his cell by Christ Himself. Vespasian, son of the emperor Titus, falls ill, hears of Christ, frees Joseph from his prison, becomes a Christian, and reduces the Jews to slavery. Joseph takes leave of Vespasian, goes forth

with those who had joined him and his brother-in-law Bron. After a while the adherents suffer privation for having sinned secretly, and Joseph is directed by the voice of Jesus speaking from the vaisseul (graal) to establish a test of righteousness and sin by meaus of the holy blood, calling to re- membrance His own words about Judas, that " he who shall betray Me is eating and drinking with Me." The place of the rejected Judas should be filled, not at the table of the Last Supper, but at another table which Joseph should make in token of it,—a square one, and not until Bron's grandson (the third man of Joseph's lineage) should be fit to take it. The table was constructed, a repast prepared, one place left empty, and the Graal put upon the board, with some fish which had been caught by Bron for the occa- sion. Those who could find a place at the board felt a sense of satisfaction and were known to be righteous; those who could find no place were recognized as the sinners whose secret licentiousness had caused the distress among them. Then the name of graal was given to the vaissewl, because of its gracious and delightful? influence. A hypocrite named Moyse who attempts to sit at the table without avowing his sins is swallowed up in the earth. Alan, the son of Bron, grows up to be head of the line, and is en- trusted with the knowledge of all things that Joseph could teach and a sight of the Grail, He leads his kinsmen to the far West, to the vale of Avaron or Avalon, whither the disciple Petrus or Perron precedes them with a letter given him by Joseph, after he has seen the latter transfer to Bron the custody of the vaisseul. The son of Alan is in due time to grow to manhood, to read Peter's letter, and again to see the Grail—a boon which is as it were to renew the covenant of the Saviour with the family and followers of Joseph of Arimathea—to expose and expel the false, and to bring celestial happiness upon all the true. The race is now settled in Britain, and Perceval, the son of Alan, is the third man who is to see the Grail, after having passed through a perilous quest. Up to this point the mystic and pious romance of the Grail was derived by Robert de Borron from sources other than those which furnished the Arthurian stories; but the new realm of fiction was open (it was about 1160-70), and the Franco-British tales coming to his knowledge must have supplied him with the incidents of his third man's quest and even the very name of Perceval. It is diffi- cult to assign the exact proportion of give and take among the early romances; but at this point there 1sa new departure in which several writers took various parts.

IV. 2. Perceval.—The original story of the knight Perceval, before he takes up the quest, is simply that of an inexperienced youth who knows nothing of arms and chivalry, but whose rustic retirement with his mother has not deteriorated the instincts of his noble birth. After some amusing incidents, in which his youthful

1 This simply indicates a defective knowledge of etymology in the 12th

century. Robert de Borron supposed the word came from gratus or agréer, not knowing that it was a Gallicization of the low Latin cratella=a cup.

awkwardness is playfully depicted, he exhibits so much courage and skill as to become a doughty champion, the vanquisher of bullies and the protector of ladies ; and, when he reaches the court of King Arthur, knighthood is offered him. Chrestien de Troyes related the tale in verse (before 1191), but he probably had it from the (prose or poetic) narrative woven (about 1170-75) by Walter Map into his work which we call Lancelot. The agreement, so far, of those writers and the text of the Mabinogi of Peredur on the same subject leads to a supposition that the latter represents a Cambrian story older than Walter Map; but the introduction of the cup and the lance into it invalidates the theory that its existent Welsh form is the original. Robert de Borron continued his Graal, by relating the quest of the holy vessel—still in the hands of Bron, le Roi Pécheour, but hidden from all save the predestined per- fect knight —pursued by Bron's grandson Perceval, the only man who, by his origin, had a right to search for and find it so as to fill the vacant place at the table. Robert de Borron must have written his story more than once, and the result was that he also introduced his hero to Arthur's court, where Merlin had founded a round table. This round table, probably an independent element in the Breton legends, must have caught Robert de Borron's fancy as lending a further symbol of trinity (being the third table) to his own conception of the third descendant of Joseph of Arimathea. In his relation of the quest Perceval (whom he in no way identifies with the rustic Perceval or Peredur mentioned above) starts from Arthur's court, and after various adventures sees his grandfather, the Grail, the lance, and the broken sword without knowing with whom

he is or making inquiry. Ina second attempt he is more successful. Bron reveals himself, explains all the signs (the lance is that which pierced the Saviour's side), and communicates the precious truths which Joseph of Arimathea had ordered to be told only to the third of his lineage. Then the fisher-king dies; all the enchantments of Britain pass away (we presume the reign of idolatry is meant); and Perceval is left as the custodian of the Grail. This version of the Pereeval and the preceding Saint Graal, both by Robert de Borron, have only been printed of late years (the former as a supplement to the latter) from rare and little known MSS., and differ enormously from the old printed Grail and Perceval, and most of the MSS. which contain them. The introduction, however slightly, of Arthur, Merlin, and Gawain into Robert de Borron's Perceval simply shows that he had made acquaintance with Walter Map's Lancelot ; yet the large use made by Map of the Frenchinan's Grail and Perceval implies that they wrote contem- poraneously, but that De Borron's second part preceded Map's second part. In the latter the young rustic is represented as the youngest son of King Pellinore, brought by an elder brother out of his retirement and presented for an inferior class of knighthood at Arthur's court. He then meets all the other companions of the Round Table, to whom, as well as to Arthur and Guinevere, he makes himself very dear. He becomes one of the knights who undertake the quest of the Grail, a task which is proposed for accomplishment by him who is the best knight in the world. According to the Lancelot fiction he fails because of having slightly

PEDIGREE OF THE RouND-TABLE HEROES.

/ineas.

| \ Ascanius. |

| Silvius.

Joseph of — His brother-

—s Roman-Breton | Atimathea. eae Woy or Loegrian or Leithan R sayit SPREE Oe sources. ila Constans, king Alan. of Britain. "iy | Leodegran, MERLIN, m. Viviane, King Pellinore. Eyrawe, Scottish king. the en- Lady

of prince of Moines. Pendragon. UTER Vortigern, chanter the Lake, North PENDRAGON. usurper of Britain. = Country. bring up son of Ban j ee — ee | (king of Benoic or Perceval le Galeis. Peredur. PERCEVAL, Wife of Loth, king © Morgan, m. Urien, king ARTHUR ™ GUINEVERE ie, re of Orkney. the Fay of Rheged' (retires to a _LANCELOT (fails in PERCEVAL (Cumberland). nunnery after West, and retires to (of the Lancelot ; Gawain, Owen, or Twain Morprep Agee . a monastery after fails in quest, and retires to a monastery, Gualganus, (not associated with supposed neph ew death). Arthur's death.) where he dies).

or Gwalchmai quest ; end un- of Arthur, but

(fails in quest, known). really his son by

dies from wounds ~~ his half-sister, the

ina fight with Cambrian sources, wife of King Loth Lancelot). (rebels ; killed at Camlan).

.

Strathelydian or Albanian sources.

Fair Ysectr of Ireland m. Mark, king of Cornwall. fonns an adulterous union with Tristan. |

Ysaie.

GALAAD Cambro-Breton sources. (achieves quest, and

dies).

ers

Meliadus, or Tallwch m. sister of King Mark. king of Leonnais, Cornwall.

| TRISTRAM or TRIsTAN 1 m. Yseult of Brittany. (dies in despair of seeing fair Yseult).

Cornish-British sources.

1 In the second Arthurian compilation Tristan is annexed to the knights of the Round Table, and joins the quest, but the original story is quite independent.

Lancelot.

mt OMAN C E

infringed a vow, and the labour is achieved by one even purer than himself among the Round Table heroes, namely, Galaad, the son of Lancelot. All this is of Map's own invention, and much of it must have been posterior to Chrestien's poem, in which (although based partly on Map and partly on Robert de Borron) Perceval remained the achiever of the quest.!_ The Borronesque view of Perceval as one of a line of successive Grail-custodians or Grail-kings impressed the imagination of Guyot de Provins, and led him to regard with contempt the pleasant episodes of Perceval's youth as told by Chrestien. In Wolfram von Eschenbach's poem there is a long succession of Grail-kings, beginning with Titurel, and ending with Partzifal (Perceval)? ; the scene of their rule is shifted to Anjou and Spain ; the story is said to draw its origin from a book found at Toledo; several Moorish and Catalan names are found in it; and finally the Grail-kings and their people are confounded with the Templars, struggling against the heathens. The romance of Perceval le Gallois, such as we have it since its first appearance in print in 1530, is a prose compilation derived from the poem begun by Chrestien de Troyes about 1180 and finished by Manessier about 1230.

III. ZLancclot.—This hero, like Perceval, lias furnished an addi- tion to European nomenclature. In this romance, which there is so much evidence for ascribing to the celebrated Walter Map (see above), the substance of Geoffrey's Arthur, Guinevere, and Merlin was used as the introduction to a powerful fiction in which a new hero, Lancelot of the Lake, carries on an adulterous amour with Queen Guinevere, while at the same time he reveres and loves King Arthur and performs deeds of heroic daring under the influ- ence of the most generous feelings. The tale, although lengthy end overladen with a crowd of adventures which have

no bearing on the direct development of the plot, and notwithstanding the unpleasant nature of the chief subject, is one of extraordinary interest. The character of Lancelot remains unaltered throughout the course of the story, and is drawn with a masterly hand. Although his love is criminal, and he frequently does pious penance for his sins, yet his utter self-sacrificing devotion to the queen weakens by its exquisite fidelity the reader's sense of his treachery towards the king, whom he never ceases to regard with a feeling of the deepest affection and reverence. His faults are such that he recognizes his own incompetence to become the achiever of the quest ; but he begets, upon Elaine, the daughter of King Pelles, a son Galaad, to whom the glory of winning the Grail and redeeming his father's sins is reserved. Even here the romancer takes care to show that he was not untrue to Guinevere, his senses having been deceived by a spell (used by Elaine's maid to gratify her mistress's longing), which makes him imagine that his bedfellow is the queen. Nemesis begins to work when, upon a second use of the spell, Guinevere, after having waited for him in vain, finds him in the arms of King Pelles's daughter. She reproaches him bitterly and drives him from her presence with such cruel words that he becomes insane and wanders about the woods and fields like Nebuchadnezzar. Some years elapse before he is recognized by Elaine, when chance takes him to the castle of Corbin, in which King Pelles has custody of the Grail. She cures him by means of the sacred vessel ; but it is not long before he quits her again and finds his way to Camelot. Arthur and the queen and his fellow-knights are rejoiced to see the lost Lancelot again, and the usual round of tournaments begins. We now come to the episode of Galaad. On the eve of Pentecost an old man dressed in white brings a youth to Arthur's court. When all the knights are assembled at the ensuing banquet every seat is filled save that which was always left vacant for the Holy Grail, so that there is no place for young Galaad. Certain wondrous signs are pointed out by the old man which indicate that the "seat perilous" is meant to be filled by the young hero, who at once accomplishes another test which has foiled Gawain and Perceval. The Grail appears, and light and perfume fill the hall; it passes away again, and the next day the knights depart upon the quest of the holy vessel, Arthur giving way to a pathetic regret that his merry company of Round Table champions is to be broken up for ever. Galaad, the pure knight, is the only one who succeeds, and becomes king of the Holy City ;

then Joseph of Arimathea appears, and Galaad dies, his task accomplished. Gawain and Bors fail; Lancelot and Perceval nearly succeed, but are foiled. Bors brings back an account of Perceval's death, and Lancelot returns to court, a moody man ; he and Guinevere fall back into the old sin. 'The qucen is accused of having poisoned a knight, and is exposed to the usual ordeal. Lancelot saves her by conquering her accuscr, but receives wounds which break open at the next secret meeting between them. Scandal

1 As Chrestien never finished his poem, and as he had two or three continu- ators before 1244, he may not be responsible for the Borronesque ending ; but it is to be remarked that Robert de Borron and Chresticn were both from Cham-

agne.

: 2 Whatever be the meaning of the Welsh name Peredur, that of Perceval seems to be also British and to mean " possessor of the Grail." It may not have been one man's appellation but a title applicable to Bron, Alan, or the last achiever. The British words of which it seems compounded are perchen, a

root which implies ownership or possession, and mail (initially inflected vatt), a cup or chalice, so that the earliest form was perhaps Perchenval.

has been busy ; spies are on the watch; and, although, when the lovers are surprised, he escapes by dint of hard fighting, the stains of blood found in the queen's bed are sufficient to condemn them. She is doomed to the stake, but at the moment of execution Lancelot appears and rescues her. They fly together to his castle of Joyeuse Garde, in which he is soon besicged by King Arthur, the king's nephew Gawain, and the other faithful knights. He offers to give up the queen if no harm shall be done her; Arthur rejects the offer; and, after long fighting, news comes of a papal interdict promulgated against the kingdoin so long as King Arthur refuses to take back his wife. Guinevere is then received by her husband, but Arthur is advised by Gawain to continue the war against Lancelot,

whom he follows to his castle of Gannes in France. During the siege Arthur has tidings of an insurrection in Britain : his nephew Mordred has seized the throne, and the queen has fortified herself in London against the usurper. He returns, and after a series of desperate battles Mordred is killed and Arthur wounded to death. Flinging his sword away, the king disappears from mortal view and is borne by fairies to Avalon. Lancelot also returns to England, Jaments the king's death, pays a monrnful visit to the queen, now in a nunnery, retires himself to a monastery, and dies soon afterwards in sorrow and repentance. The original Laneclot was the true Arthur or Round Table romance, although when first written it probably contained no mention of Perceval and Galaad. To it all the other tales and episodes gravitated, and the above analysis represents probably its final fori about the year 1200. When at a later period, in the 13th century, it was abridged, and the Bret (Tristan) also, and both of them amal- gamated in the general Arthurian work now extant in many MSS. of the 14th and 15th centuries, the compilation came into existence which was translated into English by Sir Thomas Malory under the title Morte Arthur. The original complete Lancelot may be considered as a corporate work including the five branches which had previ- ously been separate, namely, (1) Merlin ; (2) Arthur and the Round Table ; (3) Arthur, Guinevere, and Lancelot ; (4) Joseph of Arima- thea and the Grail; the Quest of the Grail and Perceval modified into (5) the new Quest of the Grail and Galaad. A sixth element was added in the French compilation, which formed the original of the Morte Arthur of Sir Thomas Malory, namely, (6) the story of Tristan and Yseult.

V. Tristan.—This beautiful Breton or Cornish romance was Tristan.

originally a work totally independent of the Arthurian, Round Table, and Grail fictions ; and, if it is said by Hélie de Borron to have been left incomplete by its first author, the Anglo-Norman knight Luc or Luces, of the castle of Gast, Galt, or Gau, near Salis- bury, and by Gasse li Blont (Eustace Blunt), who is spoken of as a continuator, we may presume that his statement was based upon no deficiency in the original narrative, but simply on the absence of all allusion to the Round Table. He therefore set to work to produce what he called the Bret, or the complete 7J'ristan, by constructing a number of episodes which exhibit Tristan as one of the

Round Table knights, as also having engaged in the quest, and as having been with his lady-love entertained for soine time at Lancelot's castle of Joyeuse Garde. The Saracen knight Palamedes, who takes an important place in the complete 7ristan, and who is not one of the least interesting characters, seems to have been one of the additions. Whether the first author was really a knight or not, and whether he wrote in poetry or prose, it may here be said once for all that the earliest exoteric reference to the authors of the Round Table romances is that of Hélinand, who, writing close to the date of Walter Map's death (c. 1210), mentioned them as " quosdam proceres," a phrase whieh could only be used as indicating personages ranking at least as high as knights. Tristan (in the old English form, Tristram) of Lyonesse is the nephew of King Mark of Cornwall.3 Warned by a dwarf that his nephew's existence will be pernicious to him, the king resolves to compass his death. His attempt is frustrated: the child is carried to the court of the Frank king Faramond, and there grows up towards man's estate. He wins the love of Faramond's daughter, on the discovery of which he is compelled to fly to his uncle at Tintagel, with whom a reconciliation is effected. A prince called Morhoult or the Morhoult4 of Ireland lands in Cornwall to claim tribute of King Mark. Tristan challenges him to single combat, wounds him mortally, and compels him to reimbark in a dying condition, but is himself wounded by the poisoned lance of his adversary. Seek- ing afterwards a healer for his wounds, he is borne by the wind to Ireland, and well received by the king of Ireland and his daughter Yseult, who restore him to health. It is, however, observed that he is wearing the sword of Morhoult, and he is obliged to take a hasty departure. On his return to Cornwall the incidents of the complete Tristan begin to connect him with Arthur and the Round Table, but his victory over a knight, there said to have accused the

3 His father Meliadus and mother Isabel, as well as the preceding generations of ancestors, were probably invented by Hélie de Borron, as well as the account of his premature birth in the open country.

4 Is this a corruption of Muircheartarch or Murhartarch, and, if so, was it suggested by a recollection of the visit of Diarmuid MacMuircheartarch to England to claim help from the Normans in 1168?

Irish king of treason before King Arthur, is probably part of the original tale. He goes with the absolved monarch to Ireland at his request, and is prayed to accompany Yseult to Cornwall, whither her father sends her as King Mark's bride. Yseult's mother delivers a philtre or love- potion to Brangian (or Bronwen), her daughter's nurse, which the latter is commissioned to give Yseult to drink on the wedding-day, in order that she may conceive a true wifely affection for her stranger husband. Brangian, however, gives it to Tristan and Yseult, who drink, unconscious of the spell that is about to influence their lives. They love each other at once and for ever. During the voyage they land on an island, where Tristan, by overcoming an enchantment, ptoves that he and his companion are the best knight and fairest lady in all the world. They reach Cornwall at last, and think with dread on the approach of the fatal night which is to separate them and to make King Mark aware of his bride's fault. A device, which appeared to the old romancers one of easy performance, is suggested by Brangian, who, to save her mistress's honour, takes her place on the marriage night, trusting that King Mark's carousals and the darkness will cover the fraud. The scheme is carried out satisfactorily ; but the fair Yseult hires two ruffians to slay Brangian, lest the fact should ever come to light. The intending murerers, hcowever, are smitten with pity, and simply leave their victim bound to a tree, from which position she is soon afterwards rescued. As her rescuer was Palamedes, the Saracen knight, who must be looked upon as one of the inventions of Hélie de Borron, we may venture to hope that Yseult's unwomanly cruelty formed no part of the original story. Palamedes is a magnanimous and interesting char- acter, who loves Yseult with a purer love than Tristan, and who spends his life in a generous antagonism to his rival. The man who invented Palamedes and Guiron must have been himself a knight of the noblest type. The intrigue of the two lovers is carried on for some time, till Mark's suspicions are aroused and Tristan leaves Cornwall. Again he receives by treachery a poisoned wound ; but, as he cannot return to Mark's court to obtain healing at the hands of the fair Yseult, he decides upon going to Brittany, to seek a remedy there from her cousin, the white-handed Yseult, who is equally expert in treating wounds. She cures him and falls in love with him; he marries her

from gratitude. The descrip- tion of the wedding night proves that he still loves the other Yseult, for he remains faithful to her in the most material point, the white-handed lady being so innocent that she is unaware of the slight cast upon her charms. He makes his wife's brother Peredur or Pheredur his confidant, and the two quit Brittany to- gcther and reach Cornwall. A fresh source of misery opens for him

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written by any of the original writers of the Round Table stories, Meliadus was composed by Hélie de Borron about 1220 at the desire of and Henry III. of England (who paid him noble guerdon for his labour). Guiron.

Hc had already made Palamedes (the Saracen knight finally baptized and adopted to the Round Table) so prominent and so noble a char- acter in his Bret, or romance of Yristan, that the king wished for another book on the subject. Since the story was to be one of knightly courtesy, its name should be Palamedes. Ag that hero takes only a minor part in the transactions of the story it is diffi- cult to believe that he meant the name as other than a metaphor. The book is divided into two distinct tales,—one relating the adven- tures of Meliadus, who begat Tristan upon the adulterous queen of Scotland, and the other those of a knight whose name appears here for the first time,—Guiron le Courtois.! JAfeliadus is a dull and clumsy composition, chiefly remarkable for the circumstance that it alludes to the Charlemagne romances, and includes among its per- sonages Aryhoan of Saxony, ancestor of Ogyers le Danois (Ogier the Dane). Even the account which it gives of Tristan's birth is wholly at variance with that which the writer had already given (or accepted) in the romance of Tristan and Yseult. As for Guiron, the beauty of his character redeems the tediousness of the narrative. From the point of view of human noble-mindedness it is the best of all the Arthurian tales, Guiron being equally free from the criminal sensuality of Lancelot and Tristan on the one hand, and distant from the superangelical purity of Galaad and Perceval on the other. Under the most trying circumstances he keeps himself chastely aloof from sin, although love is mutual between himself and his friend's wife ; and, when on one occasion he reflects how near he has been to the verge of criminality, he strikes his own sword into his

breast as a punishment. It is needless to say that he does not die but lives to see that same friend, Denain le Roux, carry off a maiden on whom he (Guiron) has bestowed a more justifiable affec- tion. When, after a year's vain search, he meets his false friend and his ravished lady-love together, he fights and conquers Denain but spares his life, and goes away with the lady, still in love with her. Denain exhibits his friendship and gratitude effectually after- wards, but the story is left unfinished, Guiron and Bloye having been entrapped by treachery and lying still within the walls of a dungeon. The author refers to his Afeliadus for an account of their liberation ; but this simply shows that he intended to rewrite Meliadus. Fifty or sixty years later Rusticien of Pisa abridged the Palamedes, and inserted the incidents of the two in his compila- tion of Arthurian romances, now lost as a whole, although usually confounded with the Alorte Arthur. From his compilation the printed Meliadus and Guiron were further abridged and finally

printed so in separate form.

Ysaie le Triste, Arthus de Bretaigne, and Pereeforest are three Ysaie, romances which had also considerable vogue, but, although they Arthus belong to the Arthurian cycle, they have no real connexion beyond de Bret- the use of British names and the supposed kinship of the heroes aigne, with those of the old stories. Almost as much might be alleged and against the Meliadus and the Guwiron, but they were at least written Perce- by one of the first authors of the genuine works, and he had pre- forest.

now, as Pheredur falls in love with fair Yseult. Tristan becomes insane and wanders away ; but after some time he is brought back to the court, where Yseult restores him to reason, at the cost, how- ever, of reawakening the jealous wrath of King Mark, who compels him to quit Cornwall, making him swear never to return. Hélie's Tristan now joins the Round Table company at King Arthur's court, and King Mark, still unsatisfied, goes thither also with the purpose of bringing about his nephew's death. The unfavourable view of

Mark's character is here heightened by making him speak and act in the most ridiculous manner. Arthur reconciles the uncle and the nephew ;

Tristan goes back with Mark, and frees Cornwall from an invasion by the Saxons ; but he fails to win favour from the king, who puts him in a dungeon. He is released by an insurrec- tion and King Mark himself is imprisoned; Tristan flies with Yseult aud is received in Joyeuse Garde by Lancelot, until King Arthur brings about a fresh reconciliation, and Yseult is restored to Mark along with his kingdom. Tristan now returns to his neglected wife, but finds that a revolt has fortunately saved him from the necessity of repaying her devotion with caresses. He goes forth to fight, and subdues the rebel count, but is sorely wounded again. The white- handed lady tends him, cures him, and becomes his wife in deed as Well asin name. He quits her once more, and renews his secret intercourse with fair Yseult in Cornwall, until discovery compels him to return to Brittany. In giving his aid to the unsuccessful prosecution of an amour by his brother-in-law he is once more poisonously wounded. He comes to such a dangerous pass that at last he sends a secret messenger to fair Yseult, to bring her back with him if possible. Should she be able and willing to come the ship is to be rigged with white sails; with black, on the con- trary, if the mission is unsuccessful. Tristan's anxiety comes to the knowledge of white-handed Yseult, who, seized with sudden Jealousy, when the white-sailed vessel comes gaily dancing over the waves, goes to her sick husband and tclls him that the sails are black. He bids her at once farewell and dies of a broken heart. Fair Yseult, on reaching land, hears of his death, makes her way to the chamber where his corpse is lying, and dies upon her dead hero's breast. Their bodies are conveyed to Cornwall, along with Tristan's sword, formerly Morhoult's, and Mark learns the story of the love- potion. Seized with pity, he has the two lovers buried not far from each other, and a wondrous tree extends its branches to overshadow their two graves.

Palamedes; Meliadus and Guiron.— This, the last romance

sumably some acquaintance with the British folk-legends. The fact that Rusticien of Pisa about 1270-75 abridged and compiled in a single great book the scattered and discordant stories of the earlier period, at the request of Prince Edward (afterwards Edward I.) of England, is universally conceded. That compilation has never been printed ; it is even uncertain whether any MS. in existence repre- sents it, for, although the

English Morte Arthur is usually supposed to have been compendiously translated from it, we may infer with greater probability that Sir Thomas Malory used an earlier compila- tion, perhaps the work of Hélie de Borron. One reason to justify such a conjecture may be found in the absence of Guéron and Meliadus from the English book, which would hardly be the case if the former notion were corrcct, since we know that Rusticien published an abridged text of those two works. Rusticien's compilation could in fact only be recovered approximately by re- uniting the texts of the various Arthurian romances as printed in French in the 15th and 16th centuries,—these abridged and inferior texts having apparently been derived or rewritten from his book, not from MSS. of the separate old romances. The Morte Arthur was printed by Caxton from Sir Thomas Malory's MS. translation or adaptation made in England not many years beforc the printer's establishment at Westminster. As an early English text and as the only existing homogeneous embodiment of the ancient Franco- British romances, it is of the highest interest, while at the same time it breathes the earnest and simple feeling which animates the originals,—differing thus toto celo from the colder, more arti- ficial, and less interesting narratives which were invented in the 15th century, and of which the YVsaie, Arthus de Bretaigne, and Perceforest are examples. All thrce may be referred to the first half of that century, although it has been alleged that the second was written in the 14th. Ysade forestalls to some extent the type of the 16th and 17th century French romances. It is an early instance

1 Guiron appears to be the Breton or Cymric word which means "loyal," "true," or "honest," and is a fitting title for the hero.

Minor Arthur- jan ro- mances,

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of the use of a favourite device in later fiction, by which fairies are introduced who bestow special gifts at the birth of a hero ; and amongst its chief personages is the misshapen dwarf Tronc, after- wards named Aubron—that is, Oberon—and made beautiful. He was adopted from the old French story of Huon de Bordeaux, just as the Oberon of the latter had his origin in the Elberich of the Heldenbueh. The original

composition of Pereeforest has been assigned without reason to the 13th century, and it is possible that some insignificant portion of the romance may have been written in the 14th ; but the probability is that David Aubert was the real author of the extant work, and that he wrote it at the court of Burgundy about 1450. It would be difficult to imagine a work more absurd, heterogeneous, and wearying in its immensity than this. The very "variety" for which Dunlop praises it merely indicates the mass of multifarious and incongruous incidents, un- conncted and uninteresting, of which it is full. Antiquaries, how- ever, find it useful for the history of those knightly sports called tournaments, immense numbers of which are described in minute detail. Arthur of Little Britain must have been considcred a very interesting romance when Lord Berners translated it into English, but we cannot discover its attractiveness. It is a dull inartistic composition, with scarcely any distinctiveness in the drawing of its personages.

A great number of poetic and prose compositions, beginning with chansons and fabliaux in the 12th and 13th centuries, form a large portion of the literature of Arthurian romance ; but in most instances they deal only with episodes, and are better described in the articles relating to the literature to which they belong than they could be, or ought to be, here. Some of them may, however, be mentioned briefly in chronological succession. In the 12th century —that is, between 1170 and 1200—Arnaud Daniel the troubadour wrote a poem, now quite lost, on Lancelot and Guinevere ; Chresticn de Troyes the trouvére wrote one entitled the Charrette, t.c., in refer- ence to Lancelot's unknightly mode upon one occasion of hurrying to the rescue of Guinevere in a cart for want of a horse; this story was continued by Godefroi de Leigni. Chrestien wrote another poem on (Peredur) Pereeval, which was continued by three other hands, in which Perceval remains the achiever of the Grail-quest. He also wrote Eree et Enide, a poem which contains the same substance as the Welsh story of Geraint in the Mabinogion, and which never appeared in any of the Arthurian romances; and the Chevalier aw Lyon, which is similarly identical with the Lady of the Fountain in the Mabinogion. Owen or Ywain, the Chevalier au Lyon, is a prominent Round Table knight in the romances, but his story is not incorporated in them. Hartmann von der Aue translated Chrestien's poem

into German verse before 1200 ; in English it appeared as Ywain and Gawain in the 14th century ; another English poem, Sir Gawaine and the Green Knight, was written about 1360, as well as a Scottish Golagrus and Gawaine, in the 14th century. A poem, dated 1212, containing Le Roman de Joseph d' Arimathie, has been published by Francisque Michel, and is supposed by many to be Robert de Borron's original work. Its substance is the same as the first part of the prose Petit Graal, which Hucher has published as Borron's real original. About the same time, or a few years earlier, Ulrich von Zatzikhoven translated Arnaud Daniel's Lancelot into German verse; the lost Pereeval in verse of Guyot de Provins and Wolfram von Eschenbach's metrical German version of it (in which he miscalls the trouvére " Kiot der Provenzal") have already been mentioned. There is an early German poem called Wigalois, composed by Wirnt of Grafenberg (t.e., Gui, son of Gawain), evidently derived soon after 1200 from a French original, Gui Galeis or Giglan, which is lost. On Gawain himself there are two French poems by Raoul and Renault or Raoul de Beaujeu, of the 13th century ; and one of Chrestien de Troyes's chansons (before 1200) celebrates Cliges, a nephew of Gawain. A French poem on Merlin dates from about 1300. There is a Petit Tristan or Brun de la Montagne, written in verse in the 14th century. The French poems of Marie de France, written in England early in the 13th century, contain lays of Lanval and of Chevre-fewille (on Tristan), which are professedly Arthurian subjects. Of the English works on the Round Table romances the chief are the metrical History of the Grail, trans- lated early in the 15th century by Henry Lonelich, and published from a MS. by the Roxburghe Club, and Sir Thomas Malory's Morte Arthur. An English prose romance of Merlin was written about 1450, and a metrical Arthowr and Merlin is probably fifty or sixty years older. A further Life of Arthur in English verse is supposed to have been composed about 1428. There is a metri- cal version of Renault de Beaujeu's Giglan, probably of the latter part of the 14th century. Two poenis both entitled Aforte Arthur exist, one written about 1390, which especially treats of King Arthur, and another belonging to the middle of the 15th century, of which the story of Lancelot is the subject-matter ; and there isa Scottish Lancelot of the Laik in verse, which was composed late in that century. A romance of the Seint Graal, in verse, written about 1350, was probably a translation of Robert de Borron's Joseph d' Arimathie. Between 1838 and 1849 Lady Charlotte

Guest printed and translated the JJabinogion (Children's Stories) from the Welsh MS. known as the Llyfr Coch o Hergest, tran- scribed late in the 14th century, and now preserved at Oxford, in the library of Jesus College. At first it was believed that these stories, so far as they agreed with the narratives of the printed French romances, were copies of the original legends used by Walter Map and the Borrons; but there can be little doubt that only those portions which are not found in the romances are of independent Celtic or Cambrian origin, while the remainder was derived from the French stories or poems of the 13th and 14th centuries.

BiBlioGRAPHICAL List OF EARLIEST EDITIONS oF CHIEF RoUND TABLE Romances.—Partzifal und Titwrel, in German verse, 2 vols. fol., 1477. This book is a translation by Wolfram von Eschenbach, about 1205, of Guyot's lost French poem, based upon Robert de Borron's Histoire du Graal.

Perceval, fol., Paris, 1530. A totally distinct work from the Franco-German Partzifal mentioned above. Various poems in French and English of early date exist on the adventures of Perceval, but they are not to be identified with the prose romance.

Morte Arthur, fol., print. by William Caxton, 1485. Sir Thomas Malory's Eng- lish translation of the sccond French Arthurian compilation which had been made about 1250, and united Tristan with the so-called Lancelot.

Laneelot du Lac, 3 parts, fol., Rouen, 1488; and Paris, A. Vérard, 1494. This, the first Round Table compilation, was made about 1200, and embodied three or four tales which had previously had a separate existence. An Italian trans- lation appeared in 8 vols. 8vo, Venice, 1558-59. A Spanish translation appears to be the Demunda del Sancto Grial, fol., Toledo, 1515, which may possibly be the whole Lancelot notwithstanding its name. A Dutch Roman van Lancelot of the 138th century was printed by Jonckbloet in 2 vols. 4to, 1846-49, from a MS. It may not bea translation of the French romance. The Maitland Club

painted in 1839 a Lancelot du Lac in Scottish metre, from a MS. of the 15th century.

Tristan, fol., Rouen, 1489; and Paris, Vérard, about 1499. Don Tristan de Leonis, fol., Valladolid, 1501, is a Spanish translation. The Italian I due Tristani, 2 vols. 8vo, Venice, 1555, is a compilation of the two romances of Tristan and his son Ysaie. 'The two stories were united also in the late Spanish versions, if not in the first edition of 1501. A Scottish poem on Sir Tristram was written by Thomas Rhymer of Ercildoune in the 13th century; published by Sir Walter Scott. Various early poems on the same subject have been printed in Tristan by Francisque Michel, 2 vols. 12mo, 1835-37. A German poem of Tristan und Isolde, begun by Gottfried of Strasburg early in the 13th century, and continued by others in the same century, was published at Berlin in 1821, 4to, by Groote, and by Von der Hagen in 2 vols. 8vo, Breslau, 1822, This poem and the Scottish one are supposed to be derived from a French Tristan in verse by a trouvére Thomas, which is included in Michel's Tristan. 'There exist also an Icelandic Saga af Tristam og Isond, of the 13th century, published in Miiller's Saga-Bibliothek, and old popular chapbooks on the same subject in German, Danish, Italian, Bohemian, and modern Greek. The oldest German edition of the popular Tristrant was printed in 4to at Augsburg in 1484.

Artus de Bretagne, fol. (no place), 1498; also at Lyons in 1496. An English translation was made by Lord Berners, Arthur of Lytell Brytayne, fol. (print. by Robert Redborne, no date, but probably about 1565).

Vie et Prophéties de Merlin, 3 vols. fol., Paris (ed. Vérard), 1498. There exist an Italian translation, Historia di Merlino, made by Antonio Tedeschi in 1379, fol., Venice, 1480, and a Spanish translation, El Baladro del Sabio Merlin, fol., Burgos, 1498. The Lytel Treatys of the Byrth and Prophecye of Merlin, published by Wynkyn de Worde, 4to, 1510, is a popular poem; and the Life of Merlin, 4to, 1641, is an original work by Thomas Heywood. The Early English Text Society has published Merlin or the Early History of King Arthur (8vo, 1869-77), in prose, from an English MS. of the 15th century, which was made from a French original. 'There exists also an Arthour and Merlin in verse, written about

1400, which has been printed for the Abbotsford Club, 4to, 1838. Geoffrey of Monmouth's original De Vita et Vaticiniis Merlini, in verse, was printed by the Roxburghe Club in 1830, 4to. His prose narrative (portion of the Historia Britonwm) was first printed in the Brittannia# utriusque Regum Origo, 4to, Paris, 1508, and afterwards better in the Heidelberg Script, Rerwm. Britann., fol., 1587,

Gyron le Courtoys, fol., Paris, Vérard, no date (about 1501). Two old Italian translations of the 14th or 15th century have been printed from MSS. in Italy, 8vo, Verona, 1834, and 8vo, Florence, 1835. Alamanni's Girone el Cortese is a poem on the subject of the romance, written for Francis L., 4to, Paris, 1548.

Histoire (et Queste) du S. Graal, fol., Paris, 1516. The Spanish Demanda del Sancto Grial and Baladro de Merlin have probably no connexion with this book, but are rather to be considered as drawn from the Lancelot. A French poetic Roman du Saint-Graal of the beginning of the 14th century has been published by Francisque Michel, 12mo, Bordeaux, 1841; and a prose one of earlier date (perhaps the remote original of the French romance printed in 1516) has beeu published by Hucher, 12mo, Le Mans, 1874. The Early English Text Society has printed (Svo, 1871) a 14th-century poem, Joseph of Arimathea, derived fron the earlier French. The English verse Seynt Graal, by Henry Lonelich, pub- lished by the Roxburghe Club, 4to, 1863-64, must be considered as derived from the Lancelot rather than from the Histoire du S. Graal. ;

Ysaie le Triste, fol., Paris, 1522. For Italian and Spanish translations see Tristan, above. ;

Meliadus de Leonnoys, fol., Paris, 1528. Of this there exists an Italian trans- lation, Egregi Fatti del gran Re Meliadus, 2 vols, 8vo, Venice (Aldo), 1559-50.

Perceforest, 6 vols. fol., Paris, 1528.

(b) Charlemagne and his Twelve Peers.

The cycle of Franco-Teutonic or French romance of which the mythical history of Charles the Great forms the central design is, so far as its original literary elements are concerned, more ancient than the Franco-British cycle of Arthur and his knights. The reduction into prose of the old chansons de geste and of the poémes cycliques which followed them was, however, of much later date than the similar conversions of Round Table poems; and the 15th- century prose romances are so mangled and altered from the character of the earlier stories in verse that without a short notice of the latter it would be impossible to get a

true notion of the richness and copiousness of Frankish romance.

We know from Eginhard that the Frankish heroic ballads were reduced to writing by Charlemagne's order, and thus the first step was taken which led to the creation of similar ballads about himself and his principal warriors. His own large and catholic spirit seems to have embraced all the people within his dominions, and thus indirectly brought about the official employment of the French lan- guage in the famous compact between his grandsons in 841. He was then only twenty-eight years dead, yet his influence was still so mighty that even the Gauls and Aquitanians are declared ina 9th-century chronicle to have gloried in bearing the name of Franks. This both implies an amal- gamation of the two races more complete than is usually believed, and accounts for the creation of French as well as of Frankish ballads on the life and exploits of Charle- magne in the second half of the 9th century. The number of persons who could speak only Theotisc (Teutonic lan- guage) and of those who could speak the two languages was of. course constantly diminishing, and the chanson de geste soon displaced the Heldengedicht within the limits of modern France. Of all the French ballads current in the 9th and 10th centuries some have perished utterly, others survive only in later refusions; the most ancient now extant is the Chanson de Roland, in the modified form which was given to it soon after 1066 by a Norman called Turold. This poem contains so many references to others on Charlemagne and his dowze pairs or paladins as to make it certain that such a ballad-literature existed in the 9th and 10th centuries. None of the existing chansons de geste represents those older forms; all are rifaci- menti of the 12th and 13th centuries, and bear evidence of additions, interpolations, and arbitrary changes. In the 13th century we find the older episodical ballads re- arranged in the form of "cyclic poems," and falling into three groups, which take each its name from the central personage or subject. One is the Geste of the king (Charlemagne, his

father, and grandfather) ; the next is the Geste of Provence or of Garin de Montglane; and the third, the most heterogeneous, is the Geste of Doon of Mayence. Each of these is composed of many separate parts, but the first may be generally described as the entire mythical history of Charles the Great, his family, and his faithful peers; the second a separate and independent set of narratives concerning his conquest of Narbonne ; the third a history of his wars with rebellious vassals and with traitors, including Ganelon, through whom the peers were defeated and slain at Roncesvalles. The number and names of the peers are variously given in nearly all the poems, but Roland and Oliver are included in all the lists, united as in a proverbial English phrase. Roland is the daring warrior, Oliver the wise one; the one is the Achilles, the other the Ulysses of the Carolingian epopee. Many of the early chansons give the name of Turpin, arch- bishop of Rheims (an actual historical contemporary of Charlemagne), as one of the patr's,—warrior and priest com- bined; and there is a chronicle bearing his name which has furnished the later romancers with a goodly propor- tion of their matter. This Pseudo-Chronicle of Turpin was written in Latin, by various hands and in various places between 1000 and 1150, being apparently constructed from the chansons for the purpose of forging history to sult monastic ends. It took its final and existing form between 1160 and 1180, when edited by Géoffroy de Brueil, and was for many centuries regarded as actual his- tory. 'This work was not the first so-called history which embodied monastic fiction in the narrative of Charlemagne's career. A monk of St Gall wrote about 890 a chronicle De Gestis Karoli Magni, based partly upon oral tradition,

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in which certain fabulous incidents appeared for the first time, such as Pippin's fight with the lion, and the conversa- tion about the Iron Emperor between Ottokar the Frank (better known as Ogier the Dane) and the Lombard king Desiderius, on the walls of Pavia, when Charlemagne was advancing to besiege it. Another fabulous incident of great moment in the romances is Charlemagne's sup- posititious journey to the Holy Land, which was related for the first time by Benedict, monk

of St André, about 968, in his Descriptio qualiter Carolus M. Clavum et Coronam Donuni a Constantinopli Aquisgrani attulerit.

A great deal of historical truth underlies the absurdities of the Turpin Chronicle and the rhapsodies of the chansons de geste. Compare Rotanp, Lecenp or. In fact all the older poetic literature of this cycle is based upon purely historical events and real personages ; it is only at a later date that the events are multiplied or variously misapplied, and that the personages also are arbitrarily distorted and augmented, according to the fancy and local sentiments of the various writers. As for the language in which the older poems were written, the idea that they were chiefly the work of troubadours in the langue d'oc is now aban- doned. Gaston Paris holds the curious theory that the French language (langue d'otl) was popularly current over the north of Italy, instancing the works of Rusticien of Pisa as an illustration, besides certain works in Italianized French which belong to this class. Such a notion cannot be accepted readily, as we know that the langue d'oc was the general language of southern France, western Spain, and north-west Italy. But it is possible that the French language (langue d'oil) may have been used as a general literary vehicle for the Charlemagne cycle of poetical fiction, and that Rusticien or Rustighello may have com- piled an abridgment of the Frankish stories. Such a work, if it ever existed, has perished; and it is in the Italian language of Tuscany that we find the first prose compila- tion of Carolingian romance. The Reali di Francia (Princes of France), if it had been completed, would have occupied a corresponding position to the Morte Arthur of the British cycle ; for, while no such popular compilation appears to have ever been made in France itself and in the French tongue (unless the late 15th-century Mera- bras may be considered to take that rank), the Reali in verse and in prose was current in Italy early in the 14th century. From some peculiarities in the language it is conjectured that the author, although writing in Tuscan, was a Venetian. In France at the same period we find only the separate fictions, mostly in verse, but a few in prose. The first French prose compilation of the whole cycle was made by David Aubert in 1458 for Philip of Bur- gundy ; but it was dead-born and has never been printed. The second, in three books, was made a few years later by Jean Bagnyon, for Henri Bolomier, canon of Lausanne ; it was first printed in 1478, and is entitled in some editions La Conqueste

que fist Charlemagne es Espaignes, and in others Merabras ; both titles are insufficient, having appa- rently been merely created to supply the lack of a general heading. 'The first section is a summary chronicle of the history of the Franks from Clovis to Charlemagne, the second an abridgment of the old poem of Merabras, and the third an account of the Spanish expedition, taken from the Pseudo-Turpin. This work became very popular in and out of France, and most readers during the 16th and 17th centuries derived their entire knowledge of the Charlemagne romance from it. Although the French prose works of the cycle were for the most part very late in their construction, there were three French prose transla- tions or adaptations of the Turpin Chronicle executed soon after 1200.

The names as well as the offices of the douze pairs varied

Charle- considerably in the earlier chansons. The final conception which Doon of Mayence was the head) distinguish themselves ; Een S appears to be that which is contained in the Fierabra s; | Algoland is beaten and killed. Charlemagne next attacks Navarre, Pae™® but the substitution of new personages for the old ones oe be oan te oe me the ean aed . "ps . : : oland, and is overcome e i 80 great that 1t 1s not possible to regard the douze latter by means of a stratagem. Cordova is next Gritoeel Get purrs as a definite set of dramatis persone on the stage. | taken possession of, and Charlemagne retraces his steps, but re- Nor mdeed do any of the heroes of the printed prose | members that he has left two other Saracen kings unsubdued— romances belong to that society, however frequently its oe ee ae Saragossa, He sends Ganelon to claim ee einer mr thetmstoninn, "Onigmelipritnnmuld seit'! Hy omens deehlo, ani Iecsanw tic De that some fortuitous coincidence between the number of | leads the monarch to forget military precautions by dividing his the apostles and the number of the captains who headed pk into two portions. He himself with the advanced half passes Charlemagne's evangelizing expedition into Spain had been | the Pyrenees in safety, but Roland, Oliver, and the rear-guard are utilized by some of the monkish lopendunies,,.andlWilitte ie suddenly attacked in the pass of Roncesvalles. All perish in the : Be fight except Roland, who, mortally wounded, dies alone in the wild early chansons became affected with a mystic respect for | mountain gorge,

*after having flung his famous sword away, and the douze pairs. But each writer allowed himself the | blown such a blast upon his horn that it bursts and the sound licence of excluding and including any warrior he chose in fail a at as a a The emperor returus to Ronces- that number. The Pseudo-Turpin makes no reference to | *,° 5 4Y8 the Saracen host, recovers the body of Roland and a he me gets it embalmed, and causes Ganelon to be torn to pieces by wild such a society, although it gives the names of the niore horses, After a time his health suffers and his death apigtlios celebrated knights. The full story of Roland has no prose | Turpin becomes aware of a multitude of demons who are preparing romance to itself (see Rotanp, Lecenp or). The story | mc geese oy On, ips ie a a bone! Sh : ce ee , however, by enis, who, in return for Charlemagne's bene- of Oliver 1s in similar case, unless the prose romance of | yalenee towards the church, rescues his soul and bears it to heaven. Galien, Oliver's son, may be held to embody it. Regnault Ficrabras. —The basis of this romance was the lost poem upon Fiera- de Montauban (the chief of the four sons of Aymon), Huon | the amir Balan, a Saracen leader conquered by Charlemagne in bras. of Bordeaux, Amys and Milles, Jourdain, Galien, Maugis, Italy ; the a ia es was put ck from Turpin a Saimy Mabrian, and many other heroes of the printed romances | *°'7CeS 89,28 to form the one general prose romance of Charle- i A ' magne, 'The scen h d fi Italy t in i P are unknown to the earliest ballad-histories of Charlemagne aa Wesiveas the ant, inten of Baloo ena ee a and his barons. Ogier the Dane seems to have grown out joes Rome, is met by the Frankish host ; Oliver encounters and of two historical personages, a real Othger or Ottokar. a | defeats him ~~n single combat ; the giant is converted and baptized Frankish a diana icieaata a real Olgar by tn Mail, of Florent, bat eoeives sae his father's kingdom 5 4 ' > when his father is conquered and slain. F oripas, sister of Fierabras, or Hulger, a Danish or Norse warrior who plundered Aix~~ marries Gui de Bourgogne, who takes the other half. The Spanish la-Chapelle some seventy odd years after the Frankish mee Historia del Emperador Carlo Magno, printed in 1528, is a Othger had accompanied Roland into Spain. Othger | translation ; there is also a German version. fought with the Lombards against Charlema gne in 773: Guerin de Montglave (or properly Garin de Montglanc).—This Garin de : o° : : ; mance of the 15tl t 3 bas – Mont- and Amys and Milles, in the battle in which they won a Coin de Vaehin*

and pe on tanec ih aoe See Pe the crown of martyrdom, are said to have fallen by his | It is a spirited and entertaining fiction relating the adventures of hand. Beaten by the emperor, he became his vassal and ee. four pe of urn che . the heroes of ek elder Provencal five years later commanded the advanced guard of the cycle, and 1s misnamed, in so far as it contains only the story of his ; family, not of himself. The four sons are sent forth to seek ad- army whose rear-guard was destroyed at Roncesvalles. M. | yenttres. Arnaud, the eldest, asserts his right to the dukedom of Gaston Paris has admirably discussed the historical bear- Aquitaine against a usurper who has succeeded on his uncle's ings and the various phases of the original chansons de geste | death. He is treacherously persuaded to seck the hand of the imshis, Bustovre Poétique de Charlemagne, but has dismissed :| Princess Fregonde, daughter of the Saracen sultan of Lombardy. é : : His traitorous kinsman, Hernault, contrives to set Arnaud and the with a brief r eference all the printed prose romances we | sultan at enmity, and Arnaud is flung into a dungeon, where the _ are now about to consider. daughter, ready to accept Christianity for love of him, secretly Reali di The Reali di Francia exists both in metrical and in prose form, | visits him. Hernault apostatizes and goes back with a promise of Francia. and it is difficult to decide which is the earlier; the metrical | the sultan's help to conquer Aquitaine for himself, but turns aside version was certainly current in the 18th century, and there seems | from some qualm of conscience to confess his sins toa giant hermit, little reason to doubt that the prose story was in existence before | who happens to have been an old comrade of Garin. Thus learning 1300. The latter was first printed at Modena in 1491. It is a | the peril of Arnaud, the giant hermit Ribastre slays Hernault, and, general work on the subject of Frankish romantic history, and is | seeking ine on a old comrade, a converted magician divided into six books, of which the subjects are as follows:—(1) | named Perdigon, sallies forth to the aid of the imprisoned hero. Clovis and Rizier ; (2) Fioravante and Rizier; (3) Ottaviano de | In disguise he obtains admittance to the captive and the princess, Leone (the emperor Octavian and his sons Florent and Lion); (4) | baptizes the latter, kills the jailer, and sends Armaud forth free Buovo d'Antonna (Bevis of Hampton); (5) Buovo avenged by | to reconquer Aquitaine and to bring aid, while he and the lady his sons Guido and Sinibaldo and King William of England ; hold the dungeon

~~*tower, which is at once besieged by the sultan. (6) birth of Charlemagne, death of Pippin and his natural sons. = ae fights, in which Perdigon's magic is the chief actor, Thus we may conclude that it was, so far as printed under the | Ribastre and the princess get away without having received help name feali, the first part of a compilation of all the Charlemagne | from Aquitaine, and on reaching that land find Arnaud a prisoner cyclical stories. The first book of the continuation Aspramonte, a in the power of Hernault's uncle. Ribastre kills the latter ; Arnaud translation from the French poem of Aspremont, or rather a prose | is restored to his duchy and marries Fregonde ; the sultan turns composition from an Italian version of that poem, exists in MS. | Christian; and all ends well. But the romance does not close here; The Reali di Francia has been drawn upon by many later writers. | it proceeds to narrate the honours which fall to the other sons, Pseudo*~~ *Chronicle' of the Pseudo-Turpin.—The early part of this work | Milon de Pouille, Regnier de Génes, and Girard de Vienne, or de Turpin. was evidently forged by some monk interested in exalting the glory | Toulouse, through the favour of Charlemagne, who feels himself*

of St James's shrine at Padron in Galicia (Spain), before it was transferred to Compostella. He represents St James as appearing in successive visions to Charlemagne, urging him to conquer Spain, the land in which the saint's bones are laid and of which the Saracens are masters. Charlemagne advances with a Frankish army and besieges Pamplona, which is invincible to his arms, but falls a prey to his prayers. After further exploits and the founda- tion of many churches, he returns home, but is brought out again very speedily by news that the Saracen king, Aigoland, has once more seized the country. This king is borrowed from the older chansons relating to the war against the Lombards; but for the 12th century all Charlemagne's foes were Saracens. The topo- graphical difficulty is made light of, and Aspremont is placed in Spain. Roland, Oliver, and Ganelon (afterwards infamous for his treachery, the hereditary result of his kinship to the family of

bound to Garin's family in consequence of the obligation attached toa rash game of chess formerly lost by him to that hero. However, when Arnaud's son has grown up, an accidental affront put upon the empress by him changes Charlemagne's friendly feeling to hate. He makes a long war upon Girard in Vienne, who is aided by his brother, and it is agreed at last to settle the affair by a duel between Roland, the emperor's nephew, and Oliver, the son of Regnier de Génes. The two had previously become fast friends, and Roland loves Aude, Oliver's sister ; consequently, although they fight with great vigour and equality of strength, they throw aside their swords in the middle of the combat and embrace one another as worthy brothers-in-arms. A fitting compromise is found between the wairing parties in an agreement that they shall all unite and attack the Saracen conquerors of Spain. Then begins the famous expedition which ended at Roncesvalles.

Galien.

Milles et Amys.

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Galien le Rhetoré.—This romance was first printed in 1500. It is partly of late composition, although sufficiently ancient to have rendered the word "rhetoré" (¢.c., rhetorized, or narrated in elegant prose) incomprehensible at the time of its impression. The word was supposed to mean "restored," and to indicate the restoration of chivalry by Galien. The chief substance of the story was the ancient tale of Charlemagne's journey to the East and the Turpin Chronicle. Hugues, emperor of Constantinople, at first receives the Frankish emperor and his peers courteously, but is informed by a spy of certain vaunting expressions to which, as is the Frankish nianner, they have given utterance amongst themselves after supper. These "gabes," as they are called, are merely froliesome braggadocio, spoken in lightheartedness, and not intended to convcy any serious intention. The spy and the Greek emperor, however, take them as the threats of dangerous magicians; the Franks are seized and menaced with death if they fail to fulfil their words. Oliver is first put to the test; his speech had had reference to the Greek princess Jacqueline, and might better have befitted the lips of a Parisian gamin of to-day than

of a young paladin. He, however, awakens a tender interest in the lady's heart, and she indulgently informs her father the next morning that the knight's boast has been fulfilled. Hugues requires that the others shall also exhibit their power, which they do to his satisfaction, partly by celestial succour and partly by the use of mother-wit. He finally dismisses them with presents. After Oliver has gone, Jacqueline becomes the mother of Galien, who grows up in time to hear of the ex- pedition to Spain and to arrive just too late for the battle in the pass of Roncesvalles. His dying father there acknowledges him, and Galien signalizes himself in the renewed fighting in which Charlemagne takes reprisals for the loss of his peers and the treachery of Ganelon. After various deeds of valour in the West, Galien returns to the East, saves his mother from a shameful death, and resumes the imperial crown. '

Milles et Amys.—The prose romance in its existing form was written in the 15th century, and first printed by Vérard about 1503. The martyrdom of the two friends is supposed to have taken place in 774 in Charlemagne's war against the Lombards, and their story was popularly current in the 12th century. Milles was the son of Anceaume, count of Clermont, and Amis the son of the count's seneschal. Milles's parents celebrate his birth by making a pilgrimage to Jerusalem. During their adventures and captivity in the East Milles is robbed of his inheritance at home and Amys is brought up under a feigned name. They enter into the elosest friendship and set out for Constantinople, where Milles diseovers his captive mother acting as nurse to the Greek princess Sidoine, whom by her assistanee he weds, after having taken a chief part in forcing the sultan of Acre to raise the siege of Con- stantinople. He beeomes emperor of Byzantium, but after a while returns to France with Amys, regains possession of his estates, and makes Amys a duke. Hearing that the Saracens have again attacked Constantinople and that his Greek wife has perished in the flames, he allows himself to be seduced by Bellisant, the daughter of Charlemagne, who, however, makes an honest man of him by marriage and behaves honourably ever after. Amys also gets married. Then the two friends also go ona pilgrimage to

. Jerusalem, from which Amys returns stricken with leprosy. His

wife refuses to receive him, but he is carefully tended by Milles in his own eastle ; and now the most striking episode in the story takes place. Amys learns in a dream that he can only be healed by bathing in the blood of his friend's offspring and tells Milles of it. The latter is painfully affected, but does not hesitate to strike off the heads of his two children. Amys is cured and the devotion of Milles repaid by a miracle from heaven: the children's heads are replaced upon their shoulders. Afterwards Milles and Amys set out on another pilgrimage to Santiago de Compostella. Ogier the Dane, then at war with Charlemagne, meets and treacherously slays them on their way homeward. A continuation follows, nar- rating the adventures of the infant children of Milles. The widow of Amys plots for their destruction, but they are zealously tended by a wise ape, which shares their fortunes until separated from them by malice and mishap. Florisset becomes a Saracen leader in Venice and Aneeaume a brave warrior in the army of Charle- magne. The two brothers have a desperate eneounter in the war whieh takes place, but are reeognized by the ape (which has already brought about the punishment of the wicked widow of Amys, in a similar fashion to that of the celebrated dog of Mout- argis). A restoration takes place: the two young men are acknow- ledged the emperor's grandsons, and the ape dies.of joy.

Jourdain de Blaves (or de Blaye).—The prose romance, first printed in 1520, is altered from a 15th-century poem. It is affili- ated to Milles et Amys, the hero being the grandson of Amys. He undergoes the most varied fortunes: he throws his wife with his yet unborn child into the sea, enclosed in a box, when the vessel bear- ing himself and his warriors is in peril of shipwreck ; he searches for her some years later, and finds her ina refuge, to whieh she has fled from the love of the man who fished her out of the sea, and who exposed her baby-girl at the birth ; and next, when hunt-

ing in a forest, he finds his daughter rnnning wild in company with a biteh and her young. This is a reflexion of the story of Apollonius of Tyre, and is rather a dull work.

Doon of Mayenee.—Doon or Doolin of Mayence is the hero of a Doon of 14th-century poem, adapted as a prose romance in the 15th cen- Mayence,

tury, first printed by Vérard in 1501. He is represented as defying and almost defeating his lord the emperor, whom he treats at first with disrespect. In his earlier history he appears as a son of Gui of Mayence, who, as penance for an unintentional crime, retires to a hermitage. On his disappearanee his wife is aceused of murder, eondemned to death, and her children banished. Doon meets his father and returns to fight as his mother's champion, conquers his enemies, and assumes his rightful possessions. He falls in love with a Saracen princess and wins her by force, with the help of Charlemagne, after the episode of his quarrel with the emperor. The lady's father has been aided by the king of Denmark ; Doon, after his victory, seizes the Danish crown, which he transmits through his son Geoffrey to his grandson Ogier.

Ogier le Danois.—There are twelve chansons upon the story of Ogier the this hero, dating from the 12th and 13th centuries, and based Dane.

upon still older poems now lost. The trouvéres Raimbert and Adenez le Roi were among the authors. The story was recomposed in prose, from the poem of the latter writer, probably in the second half of the 14th century. The fairies who preside at Ogier's birth and endow him with many gifts are a later addition to the story ; one of them is Morgan la Fay, King Arthur's sister, who foretells that at the end of his career he shall go to live with her in im- mortal youth at Avalon. While yet a little boy he is sent asa hostage to Charlemagne and is brought up at the imperial court. When fourteen years of age he is banished to the castle of St Omer, whiere he falls in love with the young chatelaine, but is soon afterwards ordered out of his prison to accompany Charle- magne on an expedition to Italy against the invading Saracens. Here, for the first time, he is subjected to the hatred and envy of young Charlot, the emperor's son; but on the triumph of the Frankish arms he aceompanies the monarch in his return to Paris and learns that his father is dead and that the chatelaine has borne him ason. He departs to assume the crown of Denmark, but lays it down after a few years and returns to Charlemagne.

His son has grown up and is one day engaged in a game of chess with Charlot, who, having lost it, becomes irritated, and kills him with the chess-board (an ineident frequently met with in old fietion), Ogier, in his fury for revenge, uses such language that he is com- pelled_to fly, and betakes himself to the court of the Lombard king Desiderius, then at war with the emperor. It is on this occasion that the famous dialogue takes place on the walls of Pavia. Desiderius or Didier wonders, as he and Ogier look forth together, at the great number of the Frankish warriors advaneing over the plain, and, as each successive body of troops, ever inereasing in strength and grandeur, makes its appearance, he says, "Is this the emperor?" Ogier to each question answers, '" Not yet," till at last he cries, "When thou shalt see the fields bristling with an iron harvest, and the Po and the Ticino, swollen with sea-floods, inun- dating the walls of the city with iron billows, then perhaps shall Karl be nigh at hand." Soon after the Iron Emperor with his mightiest host darkens the horizon, and Didier falls sinitten with terror. The Lombard king is beaten; Ogier is made prisoner while sleeping, and brought to the emperor. He still refuses to be re- conciled until the monareh yields Charlot to hisrevenge. Charle-magne at last gives way ; Ogier, when just on the point of striking off the prinee's head, abstains, and foregoes his vengeance. Then, returning to his old station as one of the emperor's chief paladins, he fights an invading army and slays their giant leader. He next saves the king of England's daughter Clarice from captivity, marries her, and is recognized as king of that country; but he abandons for a second time the kingly dignity and sets out for the conquest of the Holy Land. Whilst returning to France, he is shipwrecked, comes upon a diamond castle, invisible by day, and finds himself in Avalon in the company of Morgan la Fay. She puts the ring of perpetual youth on his finger, the crown of forgetfulness on his head, and he lives a life of joy for two cen- turies. Then the crown is taken off; he remembers his old life, and betakes himself to the new and degenerate Freneh kingdom which has sueceeded to the empire of Charlemagne. After restor- ing the spirit of the older knighthood, vanquishing the Norse invaders, and passing through some curious adventures in con- nexion with his ring, he is carried away by Morgan la Fay and disappears for ever.

Meurvin.—This was a romance of late origin, first printed at Meurvin.

Paris in 1531. Meurvin was the son of Ogier by Morgan la Fay, and is a personage of little interest, except for his connexion with . the romanee of the Knight of the Swan, whose ancestor he is repre- sented to be through his son Oriant.

The Four Sons of Aymon; or Regnault de Montauban and his Four Three Brothers.—This, one of the most popular and delightful of sons of the romances of this cyele, was printed many times in the 15th Aymon.

and 16th centuries, and in later abridgments as a chap-book.

Maugis d'Aigre- mont.

Gerard d'Eu- phrate.

Huon of

Bor- deaux.

ROMANCE

Adapted from a 18th-century poem, it has been considered as the work of Huon de Villeneuve based upon earlier chansons. Aymon de Dordogne, brother of Beuves d'Aigremont and of Girard de Rous- sillon, brings his four sons to the court of Charlemagne. They are knighted by the emperor, who makes a present of the marvel- lous steed Bayard to the eldest, Regnault. This is the charger pictorially represented as bearing all the four champions on his back at once. Bertholais, the nephew of Charlemagne, plays one day a game of chess with Regnault, and, losing, petulantly strikes his adversary, who smites him dead with the board. All the four sons of Aymon are compelled to fly and war is immediately declared against them as outlaws, in which their unhappy father, as the feudal vassal of Charlemagne, is obliged to take an active part. Numerous incidents of deadly peril and adventure on both sides are recorded, and Regnault displays so much daring, skill, and magnanimity as to create in the reader's mind a hatred of the ungenerous monarch who relentlessly pursues the brothers. It will be remarked how singularly the character of Charlemagne has deteriorated from the earlier type. The famous Bayard

plays a notable part in the story. On one occasion, by the help of his cousin, the enchanter Maugis (son of Charlemagne's assassinated enemy Beuves), Regnault captures the emperor, Roland, Ogier, Naimes of Bavaria, and Turpin. Although they are in his power, the chivalrous knight and his brothers merely kneel to Charlemagne and beg for peace and pardon. The monarch's hatred is implac- able ; but Regnault nobly sets his captives free, and the war begins again. Regnault, who is lord of Montauban, a castle given him by Yvon, sovereign of Gascony, for having repelled a Saracen invasion, retires from the strife and makcs a pilgrimage to Pales- tine. On his return he goes as a simple mason to aid in the bnild- ing of Cologne cathedral, and is there slain by the treachery of his fellow-workmen.

Maugis d& Aigremont.—The special romance bearing this title (first printed about 1520) is not the only one in which Maugis the enchanter plays a prominent part. He is originally derived from the 13th-century poem on the four sons of Aymon, to whom he furnished material assistance in the struggle against Charlemagne. He also appears as a comrade and helper of Renaud in the Conquest of Trebisond, and again in the romance of Mabrian (1530), in which he is elected pope, and finally perishes in a cave to which Charlemagne sets fire. These are all three of late origin; and the Conqueste de Trebisonde (s.a., about 1520) is not even of French com- position, but is adapted from the 14th-century Italian poem of Trabisonda. The four sons of Aymon, especially Regnault (Tasso's hero Rinaldo), and their kinsman Maugis seem to have been especi- ally dear to the Italian imagination.

Gerard d@ Euphrate.—This, printed in 1549, and professedly trans- lated from a metrical Walloon original, is an absurd tale of magic, containing nothing except names to connect it with the ancient poem on Girard de Fratte, one of the vassals who warred against the emperor. Although split into two personages in course of time, Girard de Fratte (not d'Euphrate) and Girard de Roussillon seem to have been originally identical. Girard was one of the sons of Doon of Mayence, and therefore brother to Aymon. Con- sequently this romance may be placed in connexion with the Four Sons of Aymon, and also serves to link it with Garin de Montglane, as it is

evident that Girard de Vienne in the latter romance is only another form of the older Girard.

Huon of Bordeaux,—This interesting story was compiled in prose in 1454, from a late form of a poem which was current towards the end of the 12th century, and which has often been attributed to the trouvere Huon de Villeneuve, but without reason. Huon, duke of Guienne, one of the paladins of Charlemagne, is on his way to Paris to pay his respects to his liege lord, when he is attaeked by the malicious and envious Charlot, whom he kills in self-defence. The emperor grieves so much for his son's death that he dooms the unlucky Huon to death also, notwithstanding the intercession of all the peers and councillors. At last Huon is pardoned, but only on condition that he shall make a journey to the East and bring back from Baghdad a part of the Saracen amir's beard and four of his back teeth, after having slain one of the Saracen lords and kissed the amir's daughter before his face. These impossible tasks he is enabled to accomplish by the help of the pretty dwarf Oberon, who presents him with a magical cup and horn. A loud blast upon the latter suffices to bring Oberon and 100,000 warriors tohis aid. At the most critical instant his magic powers fail him, simply because he had been guilty of deceit in announcing himself asa Mohammedan in order to gain entrance. The princess Esclar- monde has, however, fallen in love with him and succours him. He is at length brought out to fight the giant Agrapard, who has invaded Baghdad ; he conquers him, and tries to persuade the amir to turn Christian. Again when he is in danger, Oberon saves him ; and the tecth and beard are taken from the dead Saracen. Then begins a series of adventures full of peril and distress. Huon over- comes strong temptations practised on his chastity and the deadly straits in which he is placed by Saracen foes and treacherous kins- men, and at last makes Esclarmonde his lawful wife and justifies

himself before Charlemagne. Oberon always makes his appearance when the needs are sorest, and in fact plays the best part in the

narrative. This romance has no connexion with the actual history of Charlemagne ; but it is an attractive work of imagination.

Valentin et Orson.—This well-known and charming story, first Valen- printed in 1489, relates the lives of two brothers exposed 'in in- tine and After many adventurcs, Orson.

fancy, one of whom is suckled by a bear. they regain their rightful position and each learns his relationship. The events are supposed to take place in France in the time of Pippin. It is a composition of the 15th century.

Octavien, or Florent et Lyon, is a similar story, never printed in Oetavien,

French, although written in that language, probably in the 15th century, from an episode of the Reali di Francia.

Beuve @ Hanstoné, or, as he is called in English, Bevis of Hampton, Bevis of is the subject of an old French story which was embodied in the Hamp- Reali, and is only connected with Charlemagne by the mention of ton.

King Pippin and the hero's kinship with the sons of Aymon. As a French prose romance it was printed by Vérard about 1500. It had been printed separately in Italian at Bologna in 1480. An old English poem on Bevis was in the 15th or 16th century turned into a prose romance, and was printed about 1560.

Morgant le Géant is only a translation of Pulci's poem Morgante Maggiore, and Guérin Mesquin is similarly translated from an Italian prose recomposition of an old Italian poem. Little more. than the names was derived from the old Charlemagne chansons de geste; and the same may be said of the famous poems of Boiardo,

Berni, and Ariosto upon Roland (Orlando).

Bibliography of the first printed Prose Romances, including Texts and Transla- tions. —Reali di Franza, fol., Modena, 1491. Pseudo-Turpini chronica, fol., Frank- fort, 1566 (forming a portion of Schard's Rerum German. IV. vetustiores chrono- grapht); Chronique composée par Turpin, fol., Paris, 1476 (forming part of the Chroniques de 8. Denys;

first independent edition, Paris, 1527). Galien Rethoré, fol., Paris, Vérard, 1500. Fierabras le Géant, fol., Geneva, 1478—printed also under the title of Conqueste du grand roy Charlemagne, fol., Lyons, 1486; in English, Charles the Great, Caxton, 1485; in Spanish, 1528. Guerin de Mon- glave, fol., Paris, 1518. Doolin de Mayence, fol., Paris, Vérard, 1501. Ogier le Danois, fol., Paris, Vérard, c. 1498. Quutre Filz Aymon, fol., Lyons, c. 1480; in English, The Fowre Sonnes of Aymon, fol., Caxton; in Spanish, Reynaldos de Montalvan, fol., Seville, 1525 (translated from an unprinted Italian ver- sion of the Quatre Filz and the Trébisonde united); Conqueste de Trebisonde (Regnault de Montauban), 4to, Paris, c. 1520. Chronique de Mabrian, fol., Paris, 1530. Maugist ad' Aygremont, 4to, Paris, c. 1520. Beuves d'Anthonne et la belie Josienne, fol., Paris, Vérard, c. 1500; in English, Syr Bevis of Hampton, 4to, W. Copland, c. 1560. Roman de Meurvin, fils d'Oger le Danois, 8vo, Paris, 1531. Gérard d' Euphrate, fol., Paris, 1549 ; Gérard de Roussillon, Lyons, ¢. 1530. Milles et Amys, fol., Paris, Vérard, c. 1503; in Italian, Milles e Amvis, 4to, Venice, 1503 ; Jourdain de Blaves, fol., Paris, 1520. Huon de Bordeaula, fol., Paris, 1516; in English, Huon of Bordeux, Copland, c. 1540. Valentin et Orson, fol., Lyons, 1489; in English, Valentine and Orson, 4to, ed. Copland, c. 1560; in Italian, Valentino ed Orsone, 8vo, Venice, 1557. Clamades et Clermonde, fol., Lyons, 1480 ; in Spanish, Clamades y Claramonda, 4to, Burgos, 1521. [Octavien:] Florent et Lyon, 4to, Paris, s.a.; in German, Keyser Octavianus, fol., Strasburg, 1535. Morgant le Géant, fol., Paris, 1519. Guérin Mesquin, 4to, 1530; in Italian, Guerino Meschino, fol., Padua, 1473; in Spanish, Guerino Mesquino, Seville, 1512.

(c) Spanish Cycle: Amadis and Palmerin.

Arthur had become in Britain not only a national hero Amadis of romance but also a leading figure around whom might of Gaul.

be grouped the adventures of subordinate knights. Charle- magne filled a similar place for French writers, but had the advantage of being a more distinct historical character than Arthur. In the Iberian peninsula, where we find the next great cycle of stories, the circumstances which pro- duced the national hero (the Cid) were still progressive, and his history

was too real to melt into such romantic fiction as dealt in France and England with remote and shadowy paladins and the wonders of fairyland. There- fore, while the Cid had an ever-present reality in ballads, the earliest appearance of prose romance in Spain was in an artificial imitation of the Franco-British cycle. As it was a work of great merit, its fictitious hero became, as it were, the central figure in the stories which followed and which bore to one another a strong faimily likeness. Most of the chief heroes are illegitimate, like Amadis; the adven- tures of two brothers are told; and there is much similarity of incident and character. Many of the scenes are laid in Constantinople. Amadis de Gaula is the poetical sire of an extraordinary series of romances, which in the words of Cervantes! form an "inumerable linaje," and is itself the most interesting and remarkable of them. Although its reputation is due to the Spanish redaction of Mont- alvo, there was an earlier Portuguese version by Vasco de Lobeira (d. 1403), a gentleman of the court of Joao L.

1 Under Amapis of Gaul (vol. i. p. 650) may be seen the different references in Don Quixote to the romanee.

Transla- tions of Amadis,

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At the end of the 16th century a manuscript of this ver- sion was in the possession of the dukes of Aveiro at Lisbon, but since the middle of the 18th century all traces of it have been lost. There is, however, reason to believe that the earliest form of the story was in Castilian (c. 12501), also entirely lost. In a moral poem, £7 Rimado de Palacio, written about 1400, we find Pedro Lopez de Ayala speaking of having wasted his youth with '¢ Libros de desvaneos e mentiras probadas Amadis e Lanzarote,"

which is sufficient to prove that Amadis existed about the period 1350-60. There is also a reference to Galaor, brother of Amadis, in the chronicle of Ramon Muntaner (1325-28), as well as to Tristan, Lancelot, and "other knights of the Round Table." There are several allusions in the Cancionero of Baena (1440-50) to an ancient version, one especially to its being "en tres lybros." The earliest form is likely to have been in verse. The author was well acquainted with the Arthurian legends, and we find

a marked imitation of Zristan and especially Lancelot. Many of the names indicate a Celtic origin: Gaula cer- tainly means Wales and not France, as they who insist upon a French original of the romance would lead us to believe. There still remains much that is entirely novel. In the words of M. Baret, to whom the literary history of this romance owes so much—

*'*Si, par la tradition primitive, l'Amadis de Gaule dérive de la source commune des romans de la Table Ronde, si méme il a existé une version Portugaise, c'est néanmoins & l'Espagne que doit de- meurer l'honneur d'avoir créé, sur un théme ancien, une composi- tion originale, en introduisant dans un cadre emprunté la nuance particuliére de sentiments et l'art nouveau qui donnent & notre roman son importance et sa valeur spéciales" (De l' Amadis, p. 21).*

Of the primitive Amadis, probably in three books, which charmed the youth of Ayala nothing is known. The prose romance we now possess was written about 1465 by Garci-Ordofiez de Montalvo, governor of Medina del Campo, to whom we may assign all traces of a spirit later than the first years of the 14th century, and to whom the whole of the fourth book may be due. This book is more refined and more romantic than the others. One of the chief reasons of the popularity of this version is the happy manner in which the improvement in manners is indicated. For the first time in chivalric romances we find distinct traces of the personality of the writer. The tastes, feelings, and prejudices of Spain towards the end of the 15th century are well expressed, without loss of the high chivalry of an earlier and simple time. It was first printed at Saragossa in 1508.1 Within the next fifty years thirteen or fourteen more editions issued from the press, and Amadis became fully established as the popular hero of Spanish romance. When the Spaniards first saw Mexico in 1519 they were reminded of the enchantments of the story.

Francis I. made acquaintance with the Amadis during his Spanish captivity and directed Nicolas de Herberay, seigneur of Essarts, a gentleman of Picardy, to translate it. The first four books of the original work were first printed in French in 1540. De Her. beray also translated most of the continuations down to the ninth book. He died about 1552, and Boileau, Gohorry, and others con- tinued the work. Estienne

Pasquier, in his Recherches de la France (1611), alludes to the popularity of the French Amadis, 'dans lequel vous pouvez cueillir toutes les belles fleurs de nostre langue Frangoyse. Jaimais livre ne feut embrassé avec tant de faveur que cestuy." De Herberay gives as his reason for the translation, "pour ce quil est tout certain qu'il fust premier mis en nostre langue Frangoyse, estant Amadis Gaulois et non Espagnol. Et qu'ainsi soit, Jen ai trouvé encores quelque reste d'un vieil livre escrit 4 la main en langage Picard." This contention, which cannot seriously

1 Until tecently bibliographers considered an edition printed at Salamanca in 1519 as the editio princeps, although Clemencin and others cited one of 1510, which no one had seen. A most interesting discovery was, however, made at Ferrara in 1872 ofan entirely unheard- of edition produced at Saragossa by G. Coci in 1508,

be held, was insisted upon by M. de Tressan in his abridgment of the Amadis de Gaule (1779), wherein a French origin for the first three books is claimed upon the authority of certain MSS. in that language. Amadis romances was printed at Venice in 1546, and the stories became equally popular in that language. on a mission to Spain about 1535, read the Amadis with delight and afterwards based upon it his poem of Amadigi di Francia

The commencement of an Italian translation of the

Bernardo Tasso, while

(1560). He preferred the Amadis to all the French romances, not even excepting Lancelot. Living at that time, his evidence is ex- tremely valuable. He does not seem to have heard of Lobeira's version nor yet of the French and Portuguese pretensions. In his opinion the story was taken from some ancient British history. The romance was translated into German in 1569 and into Dutch

in 1619. Graesse (Z'résor, vii. p. 80) describes a Hebrew translation

of the first four books by Jacob ben Moses Algabbai, printed at Constantinople by Eliezer ben Gerson Soncini, without date. The

Amadis was first read in English through a version from the French

by Anthony Munday (1592). Robert Southey's Amadis of Gaul (London, 1808, 4 vols. sm. 8vo) is an excellent translation, in which, however, there are constant signs of editorial pruning. W. S. Rose put the romance into verse from De Herberay's French text (London, 1803, sm. 8vo). Besides the Amadigi of Tasso, the romance gave rise to Amadis, a drama by Gil Vicente (1521), the Portuguese Plautus, to an opera by Lulli, represented at the Académie Royale de Musique at Paris (1684), to a poem by Wieland (1771), the forerunner of his Oberon, and to another by Creuzé de Lesser (1813). The translation of De Herberay had an extra- ordinary success, It penetrated even to the convents. The Hugue- not La Noue and the Catholic Possevino protested against it in vain. The allusions to the Amadis and its continuations are end- less ; for instance,—" La gloire de N icquée," used for the bracket seat of a coach; the proverbial saying "envoyer chez Guillot le songeur"; "Dariolette," the name for a confidant ; " Urgande la desconnue," a phrase with Scarron and La Fontaine; and many more. The romance even furnished Christian names to some noble families, as to the lovely Corisande, countess of Guiche. The festal pageantries in vogue at the court of Charles V. were imitated from it. A poetical title of Queen Elizabeth was "the fair Oriana." Burton refers to the reading of the romance in his Anatomy of Melancholy (1621).

The period of Los Quatro Libros del Cavallero Amadis de Sketch Gaula is supposed to be earlier than that of Arthur or of of the Charlemagne. The hero is the illegitimate child of Perion, "Y- king of Gaul, and of Elisena, princess of Brittany, and is set adrift at sea inacradle. He is picked up by a Scottish knight, who takes him to his own country; he calls him the Child of the Sea and educates him at the king's court, Having been knighted, Amadis goes to the assistance of his father Perion (the relationship being then unknown), who in the meantime had married Elisena, by whom he had a lawfully begotten son, Galaor. The second child is stolen by a giant. Amadis becomes revealed to his parents through a ring, and consoles

them in their new loss, He overthrows the king of Ireland, who had invaded Gaul, and returns to England. The adventures of the two brothers Amadis and Galaor in England, France, Germany, and the East occupy the remainder of the work, which is full of combats between them and other knights, magicians, and giants. While a youth at the Scottish court Amadis met Oriana, daughter of Lisuarte, king of England, who had been sent away from home in consequence of political troubles. The vicissitudes of their love form a marked feature of the tale. At one time the hero, disguised and under the name of Beltenebros,? retires to a hermitage upon receiving a cruel letter from Oriana. After defeating a hundred knights by whom Lisuarte had been attacked, and some further exploits, Amadis has to leave Oriana and the English court owing to the jealous suspicions of the king. He returns to rescue the princess from the Romans, and afterwards carries on a long war with Lisuarte, who is also attacked by a second enemy, Aravigo. In this per- plexity Lisuarte is generously assisted by Amadis, who

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> From the French translation "Le beau ténébreux" comes the popular application of the phrase to taciturn and melancholy lovers. The episode, parodied by Cervantes, is derived from the romance of Tristan. Amadis was also known by the names of the Knight of the Sword and the Greek Knight,

ROMANCE

slays Aravigo. Lisuarte then consents to the marriage of his daughter with Amadis on the Firm Island, whose wonders are brought to an end by Oriana entering a certain magic chamber,—a feat only to be accomplished by the fairest and most faithful of women.!

The Amadis is one of the best of the romances and contains many passages of much beauty and even tender- ness. The boyish attachment between the Child of the Sea and Oriana is well told. The princess is weak and jealous, and not altogether a pleasing character. Amadis is a fine creation and is well distinguished from his brother Galaor. Both are brave, but the elder is grave and the younger gay. Amadis is the type of a

constant lover ; his brother is more changeful. A modern reader may be wearied by the intolerable length of the Amadis and by the continual recurrence of similar adventures all ending in the same way. But these repetitions seemed no fault to readers whose tastes were easily satisfied and to whom such fictions came as an entirely new source of delight.

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Lisuarte de Greeia y de la Muerte del Rey Amadis, pretended that his work was taken from the Greek. It also is a continuation of Florisand and was not translated.

We now come to Libro Noveno, que es la Chroniea del Prineipe y Cavallero de la Ardiente Espada, Amadis de Greeia, a continuation of the seventh and not of the eighth book, and more full of marvels" than any of its predecessors. Amadis of Greece, the son of Lisu- arte and Onoloria, is carried off by pirates when an infant and sold to a Moorish king. He derived his name from the figure of a flain- ing sword upon his breast. The exploits commence, like those in the Hsplandian, at the Forbidden Mountain, and the family history concludes, as in the same romance, with the enchantment by Zirfea of all the heroes and princesses in the Tower of the Universe in order to prevent their death ata fated moment. Feliciano de Silva is the reputed author. Stimulated by the success of his two anonymous productions, the same writer continued the series with four more parts, of which the Coroniea de los Valientes Caballeros D. Florisel de Niquea y el Fuerte Anaxartes forms the tenth book and contains the first two parts. Genealogically the romance isa con- tinuation of Lisuarte and Amadis de Greeia. Florisel is the son of the latter person and the princess of Niquea. In these fictions a new character is introduced, Darinel, a kind of comic shepherd, in love with the heroine Sylvia, daughter of Lisuarte and Onoloria, through whom Florisel becomes acquainted with the heroine. All

Con- The continuations are inferior to their prototype and become : eaae

tinua- more full of complicated incidents and strange adventures as they ES see ae by eae tions proceed. The characters alter: for instance, the Urganda of the ie ued Menezon Alastraxerea, whose adlgaatt aneey cattle

a great ofthe first four books is a fairy like Morgan la F ay, but subsequently she portion of the tale, which culminates in the siege of Constantinople story. develops into an enchantress of a more Eastern and malignant : a

nature like her rivals Zirfea and Melia. Besides his redaction of the Amadis, Montalvo composed about 1485 an original work, about one-third as long, giving the history of a son of the hero, called Esplandian. In order that it might share in the popularity of the father's achievements, it came forth as Quinto Libro d@' Amadis de Gaula, o las Sergas del Cavallero Esplandiano. The curate justly decreed that "the merits of the father must not be imputed to the son"? when he cast the volume on the bonfire in Don Quixote's courtyard. Although perhaps the best of the continuations, it is not equal to the original. We read that before marriage Oriana bore a child to Amadis, and in order to hide her shame the boy is sent to a distant country. While those in charge of him are passing through a forest a lioness carries him off, but a hermit meets and rebukes the animal, which subsequently suckles the young Esplandian. When he grows up the lioness continues her care and accompanies him to the chase. King Lisuarte one day witnesses this, which is the cause of Oriana recognizing her son by certain marks on his body. He is brought up at the court of Lisuarte and receives knighthood. He then begins his adventures under the title of the Black Knight (from his armour), and sails for Turkey, where most of his exploits take place. The Christians are assisted by the enchantress Urganda and the infidels by her rival Melia. Amadis, Galaor, Esplandian, and the knights being in great danger of death, Urganda saves them by putting them all to sleep on the Firm Island until Lisuarte, son of Esplandian, could obtain possession of a certain magie sword. The romance was first printed in 1510, and five editions appeared before the end of the century. This was soon followed by other similar romances, each with an illegitimate descendant of Amadis for a hero, with a son who performs exploits still more wonderful than those of his father, —a perpetual succession of heroes. At the end of the Lsplandian Montalvo speaks of writing another book to carry on the history still further. This caused some one, believed to be Paez de Ribera, to bring out HI Sexto Libro, en que. se euentan los Grandes Heehos de Florisando, nephew of Amadis, taken from an Italian source. This was translated into

English and Italian, but not into French. The Septimo Libro, en el qual se trata de los Grandes Heehos en armas de Liswarte de Greeia y Perion de Gaula, deals with the life of the The other character is Perion,

by all the potentates of western Europe in consequence of Florisel having carried off Helena, princess of Apollonia. Among other new characters are the enchantress Armida and the "strong" Anaxartes, who marries young Oriana, sister of Florisel. The amount of bloodshed throughout the work is only equalled by the number of marriages. The third part of Florisel forms the eleventh book of Amadis and is known as Chroniea de Don Florisel de Niquea, en la qual se trata de D. Rogel de Greeia y el Segundo Agesilao. Rogel is the son of Florisel and Helena, and brother of Agesilao the Second, so called to distinguish him from Agesilao of Colchos. A few years later Feliciano de Silva published the fourth part of Don Florisel, in two books, the second of which treats of the loves of Rogel of Greece and Archisidea, and of Agesilao and Diana, daughter of Queen Sidonia. The author in his preface implies that the work was intended as an allegorical celebration of the military and domestic virtues of Charles V.

The hero of La Dozena Parte que traeta de los grandes Heehos en Armas del Cav. Don Silves de la Selva, was the son of Amadis of Greece and Finistea. Born on a desert island, Don Silvio first dis- tinguishes himself at the siege of Constantinople described in the tenth book. The Greek empresses and princesses having been carried off by enchantment, he accompanies the knights who go in seareh of them. The ladies are rescued, but during their absence have become mothers, among others of Spheramond, son of Rogel, and Amadis of Astre, son of Agesilao. Feliciano de Silva some- times passes for the author, who was really Pedro de Lujan. The work is in two parts, which in French make the thirteenth and fourteenth books. Lepolemo 6 el Caballero de la Cruz and Leandro el Bel are considered to make the thirteenth and fourteenth books. From a unique first edition (1521) of Lepolemo discovered a few years since it appears that it professed to be a translation by Alonso de Salazar. The hero was the son of the emperor Maximilian and was carried away in infancy to the Hast. N. Antonio speaks of a certain romatce composed by a Portuguese, entitled Penalva, the last of the line of the

original Amadis. It is supposed to have dealt with the last exploits and death of Lisuarte of Greece, but if it existed at all no printed eopy has ever yet been seen. The other Spanish romances usually appended to the Amadis series are mentioned in the bibliographical list below.

son of Esplandian and Leonorina. son of Amadis and Oriana, and the type of the fickle lover, as opposed to Lisuarte, who is more like Amadis. The book com- mences with the voyage of Perion from England to Ireland, but a lady in a boat with a crew of four monkeys separates him from

In the French series more and more liberties are taken with the The original as the work proceeds. As shown in the table below, the French nunbers of the books do not tally. The fifteenth, entirely due to series of Antoine Tyron, describes the feats of Sferamond (so called from eontinu- a birthmark representing a globe) of Greece and Amadis d'Astre. ations.

his followers. He goes to Trebizond and falls in love with Grieileria, daughter of the emperor. When Lisuarte is a prisoner in charge of the king of the Giants' Isle, Gradaffile, the daughter of the latter, escapes with him to Constantinople, where after many combats he obtains the magic sword and enables Amadis and the knights to escape from the magic sleep in the Firm Island (see Hsplandian above). Lisuarte eventually marries Onoloria, sister of Grieileria. The work continues Florisand and is attributed to Feliciano de Silva. Juan Diaz, the author of El Octavo Libro, que trata de

1 This kind of ineident, which is frequently to be found in the subse- quent books as a test of chastity, is connected with the kindred story of the ill-fitting eloak in the Arthurian legend. Spenser uses it in the Laerie Queene (iii. 12) where,

" The maske of Cupid and th' enchant-ed Chamber are displayed."

The sixteenth to the twenty-first books continue the adventures of Sferamond and were translated from the Italian of Mambrino Roseo by Gabriel Chappuys. Duplicate versions from the Italian were made by Nicolas de Montreux of the sixteenth, by Jacques Charlot of the

nineteenth, and by Jean Bovion of the twentieth books. The twenty-second to the twenty-fourth books, devoted to Fulgoran, Safiraman, and Hercules d' Astre, continue and form a new conclusion of the French Amadis. Only one edition appeared (Paris, 1615, 3 vols. 8yo), now extremely rare. The naive and pure style of the earlicst of the series degenerates into an uninteresting suecession of coarse and obscene ineidents. In the twenty-third book we are taken for the first time to America. lores de Greece (1552) is con- sidered to form the twenty-fifth book. Genealogically it would be the sixth, as the hero is the second son of Esplandian. In the 16th century the French Amadis library extended to 30 vols. of various

Although the Palmerins have not enjoyed the celebrity Palmerin of the line of Amadis, they were nevertheless closely allied "¢ Oliva.

sizes. In the 17th century appeared a new work forming, as it were, the preliminary, being the history of the Chevalier du Soledl

and his Brother Rosiclair, sons of the emperor Trebatius (Paris, 1620-25, 8 vols.), not identical with the Spanish Febo. Belianis de Gréce (1625) forms one vol., and the Roman des Romans (1626-29) —containing the end of the career of the Knight of the Sun, all the Amadises, Flores, and Belianis—forms 8 vols., and finishes this long series of about 50 vols. The Thresor de tous les Livres dW Amadis (1559-60, frequently reprinted) is a selection of the speeches, letters, cartels, complaints, &c.; it was translated into English as The Treasury of Amadis of France (H. Bynnenian, n.d.; about 1575). The Italian translation, which is extremely difficult to obtain complete, conforms more closcly to the Spanish. The Sferamundi romances were first composed in that language by Mambrino Roseo. A perfect set of the German version is also very rare. Some of these volumes were translated by a Protestant, who made changes to suit his religious views, such as altering "mass" to " sermon."

Pedigree of the Amadis Heroes.

Perion, king of Gaul, m. Elisena.

| ier

Melicia, Florestan, Amadis of Gaul, Galaor, m. Bruneo m. Sardamira. m, Oriana. m. Briolania. de Bonamar. Florisand. | i a a Lo Flores of Brisena, Esplandian, Perion Perion. Talan- Gar- Greece or 'm. emp. m, Leon- of Gaul, que. inter. Florisand. of Rome. orina. m, Gricileria. : | Lisuarte of Greece, Flores of Greece II., m. Onoloria. Knight of the Swan. | Sylvia, Amadis of Greece,

m, Anaxartes. m. princess of Niquea. : . . Silvio de la Selva,

son of Amadis and Finistca,

Anaxartes, Florisel de Niquea,

4 Alastraxerea, m,. Oriana. m. Helena.

| Agesilao the Second, m. Diana.

| Felix Marte

Rogel of Greece, of Greece.

m. Archisidea.

| Amadis of Astre. Spheramond.

Lisuarte, m, Brisena.

| | Oriana, Leonora.

m. Amadis. Bibliographical List of first Editions of Amadis Romanees. Bk. Spanish.

1-4,| Amadis (Montalvo, 1508) ..

| Norandel, m. Menoressa.

French. Italian. English.

(Herberay, 1540) (1546) ....)(A. Munday,

1592

5, | Asplandian (Montalvo, 1510)| (Do., 1541).....

(Mambrino | (J. Johnson,

'Roseo,1550); 1664)

Not translated. .) (1550) ....|(F. Kirkman,

1652

(Herberay, 1546)|(Do.)..... (1693)

6, | Florisando (Paez de Ribera,

1510)

7, | Lisuarte de Grecia y Perion de Gaula (Feliciano de Silva, 1514)

8. | Liswarte de Grecia y Muerte de Amadis (Juan Diaz,

1526)

9, | Amadis de Grecia (Feliciano

Not translated ..| Not trans.

Herberay, 1546- 5 de Silva, 1535) a 'i — 10. | Florisel de Niquea, pts. 1-2 | (G. Boileau, 1552; (1551) (Fel. de Silva, 1532) J. Gohorry, 1555) ll. | Rogel de Grecia, pt. 3 of| (J.Gohorry,1554; (1551) Florisel (1536) G. Aubert, 1556) 12. | Silvio de la Selva (1546) ....|(Do., 1571; A, (1561) , Tyron, 1576) 13, | Lepolemo o el Caballero de la | Méliadus, ditle..| Cav.

della Cruz (1521) Chev. de la Croix| Croce (P. (1534) Loro,1580) 14. | Leandro el Bel (1563) ..... Not translated..} Not trans. Esferamundi de Grecia ….| Sferamondi et | Sferamundi Amadis d'Astre| pts. 1-6 pt. 1 (A. Tyron, | (1558)

1577)

Sferamondi, pts. – . Chap- ' puys, 1578-82) Febo y Rosicler, 4 pts. (Or-| Chev. du Soleil (1557) ....1(1585) tufiez de Calahorra and (1620) others, 1562-89) Belianis de Grecia (J. Fer- | (1625) ..... (1586) ....1(1598)

nandez, 1547) See Fulgoran (1615) Flores de Gréce (Herberay, 1552) Roman des Ro- mans (1626-29)

Penalva. serene ' ee ee

in dignity and importance, and their histories are written in evident imitation of their distinguished original. At the head of this second great family of Spanish romances stands El libro del Cauallero Palmerin de Oliva. From some Latin verses at the end it appears to have been written by a woman, said to have been a carpenter's daughter of Burgos, or a lady of Puente del Arzobispo (Augustobriga), at the beginning of the 16th century. Only one copy is known of the editzo princeps of Salamanca (1511). The love-scenes are described with more volup- tuous detail than is usually to be expected in a female author. But this warmth of colouring may have been one of the causes of the success of the romance. There are many Spanish and Portuguese editions, and it was first translated into French by Jean de Voyer, vicomte de Paulmy, in 1546, into Italian by Mambrino Roseo in 1544, into English by Anthony Munday in 1588, and into Flemish in 1602.

Like most of his compeers, Palmerin was not born in wedlock. He was the son of Griana, daughter of Reymicio, emperor of Byzantium, and of Florendos of Macedon. The infant was exposed on a hill covered with palm trees and olives (whence the name) and was discovered by a peasant, who reared him as hisown son. Palmerin's earliest exploit is to save a travelling merchant from a lioness. The grate- ful traveller furnishes him with arms and a horse, and Palmerin sets forth in quest of adventures, the

first of which is to kill a serpent that guards a fountain whose waters are necessary to Primaleon, king of Macedon. He then succours the emperor of Germany, with whose daughter, Polinarda, he falls in love. Like the lady in Arthus de Bretaigne, she had previously appeared to him in a dream. Norway, England, and Greece are success- ively the scene of his daring. He delivers from the power of the Grand Turk the princess Agriola, who ulti- mately marries Trineus, the companion of Palmerin. After many combats, enchantments, and love escapades, the hero at length marries Polinarda and becomes emperor of By- zantium upon the death of Reymicio.

The same fair unknown also produced Libro Segundo que trata Continu- de los Heehos en Armas de Primaleon y Polendos, both of them ations.

sons of Palincrin by different mothers, the first by Polinarda and the second by the qucen of Tharsus. While with his mother Polendos one day ill treats an old woman, who mutters that it was not thus that his father treated the helpless. This sets him to look for his sire. He meets with Primaleon and goes to the court of Duardos (Edward) of England. The beautiful Gridonia, daughter of Duke Hormedes, bears two sons to Primaleon, the second of whoin is made the hero of the next romance, or third book, Historia del Cav. Don Polindo (Polendo is the fourth part of the Italian series). The fourth book is La Croniea del Cav. Platir, the son of Primaleon and Gridonia, and very properly condemned by the barber. The fifth book consists of Historia del Cavallier Flortir, which is only to be found in Italian.

The sixth book, Libro del Cav. Palmerin de Inglaterra, was the most serious rival to the popularity of Amadis. Formerly this work was considered to have been first written in Portuguese and was attributed to Francisco Moraes, from the first edition then known in that language, printed at Evora in 1567. The state- ment of Moraes, now proved to be true, that it was translated from the French (1552), was looked upon merely as a literary device. Ou the discovery of the original cdition in Spanish (Toledo, 1547- 48) it was seen that the real author was Luis Hurtado, a Toledo poet. It was translated into French by Jacques Vincent in 1552, and into Italian by Mambrino Rosco in 1554-55. The first Portu-

guese version was republished at Lisbon in 1786 (8 vols. 4to) under the name of Moraes, and from this Southey edited his revision of Munday's translation (London, 1807, 4 vols. sm. 8vo). Palmerin and Florian are the twin children of Flerida (daughter of Palmerin de Oliva) and Duardos, king of England. The mother gives birth to them in a forest and they are taken away by a savage as food for his two lions. Duardos is in the power of an amiable giant, Dramuziando, and Primaleon with a company of knights starts from Constantinople to England in order to relieve him. In the meantime the children are being tended by the wife of the savage and reared with her son Selvian. Florian falls into the hands of

Sir Pridos, son of the duke of Wales, who educates him under the name of the Child of the Desert. Palmerin, his twin brother, meets with Poleudos, who takes him and Selvian to Constantinople. Palmerin's first love-affair is with Polinarda, who repulses his affec- tion, and he travels to England under the title of the Knight of Fortune. In the middle of a battle with Florian the brothers are separated by Flerida and the secret of their birth divulged by Daliarte, 2 magician. Their subsequent adventures are beyond enumeration, those of the Perilous Isle being the most interesting, A part of the story relates to the castle of Almourol, where resides the proud Miraguarda, whose peerless beauty is championed by enamoured knights. The giant Dramuziando becomes one of her admirers. In this romance the marriages take place in the middle, giving ample opportunity for many more combats, abductions, ravishments, murders, and other deeds of violence or valour. This is evidently so close an imitation of the Amadis, while only second to it in popularity and intrinsic merit, that a comparison between the two naturally arises. As in its prototype, there are two heroes. We have Palmerin, the faithful lover, and Florian, the fickle one, as well as Daliarte, the magician, and the Perilous Isle. The characters are well discriminated : Palmerin is generous, brave, and chivalrous; Florian, witty and courageous. The giant Dramuziando actually excites our sympathy and interest, and the emperor Primaleon is a fine and courtly old gentleman. Much feeling for the beauties of nature is shown; the dialogue is good. On the other hand, the story is not so

simple and natural as the original Amadis. There are too many knights and battles, and the romance is distinctly inferior as a work of art.

The seventh book consists of Yereeira [e Quarta] Parte de Pal- meirim de Inglaterra onde se econtam os Feitos do Don Duardos Segundo seu Filho, which continues the Portuguese version of Moraes, to which the two parts are the third and fourth books. It was composed by Diogo Fernandez de Lisboa. The eighth and last book of the Palmerin series are the fifth and sixth parts of the sanie work, being Chronica do Famoso Prineepe Don Clarisol de Bretanha, by Balth. Gongalvez Lobato. Like the preceding, it was written in Portuguese and not translated.

Pedigree of the Palmerin Heroes.

Primaleon. | Florendos, Arismena, m. Griana. mm. king of Sparta. | Armida, Palmerin de Oliva, Francelina, m. Frisol, king m. Polinard m. Polendos, king of Hungary. of Thessaly. "a [I Vasilla, Flerida. Primaleon, Polendos, king of Thessaly m. Gridonia. (son of Palinerin and the queen ° Tharsus). – | [if Florendos. Platir, Polinarda. Franciano. Clarisea. m. Sidela. Polendos. | > | | Frederic, king of Primaleon. Gridonia. Palmerin Flortir. England,

of Lacedemonia. m. daughter of Meliadus.

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Don Duardos (Edward), m. Flerida. ll ee, c Palmerinof Florian. England,

m. Polinarda.

t Don Duardos II.

i Don Clarisol.

Bibliographical List of first Editions of Palmerin Romanees.

Bk, _ Spanish. French. Italian. English. 1. | Palmerin de Oliva (1511) ..| (1546) .....06. (Mambrino | (A. Munday, | Roseo,1544) 1588 2, fe roapal oaven Us) aaaeaeono|| (015/50) ian apennoc (1548) ....|(Do., 1595) BMV

Rolenao(1526)) cc. c- er cee Not in French. .| Platir(1548) aes 4, | Platir (1533) .....-0+08. Geers anette as. 6 ore Polendo

(1566)

5. | Flortir (no Spanish edition)! Do. .....++ Palmerino says dInghil- (P.of England. terra (1554-| A. Munday,

55) 1602)

6. Palmerin de Inglaterra | (1552) .....++. Flortir oved (1547; in Portuguese, (1554)

1567)

7. Don Duardos II.de Bretanha | Not translated..| Not trans. | Not trans. (Portug. by Diogo Fer- nandez de Lisboa, 1587) 8. Don Clarisol de Bretanha (B.| Do. Do. ....-+ Do. Goncalvez Lobato, 1602)

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(d) Teutonic, Anglo-Danish, &c.

Outside the four great cycles of medieval romance there le some minor cycles, as well as various isolated fictions, to which we must now make reference.

The origins of the Teutonic cycle belong to epic or Teutonic.

ballad literature, as we find them in the Wilkinasaga, in the Nibelungenlied, and the Leldenbuch. As those works have already been treated separately or in connexion with the national literature to which they belong, we need only make brief allusion to the fact that the Germanic legend of Siegfried (Sigurd, Siegmund, Sigenot) is very ancient, and that the Norse or Icelandic sagas embody its oldest existing form. The High German WVibelungenlied, Hilde- brandslied, Hadubrand, Dietrichssaga (or Heldenbuch), Konig Rother, &c., are probably specifically older than the Norse books, but they contain the legend in a later shape,— the fTeldenbuch especially deviating from the

first two by the introduction of a number of names and incidents arbitrarily adapted from the history of the Gothic, Lom- bard, Burgundian, and Hunnic wars during the 5th and 6th centuries. There are no prose romances on these themes, but the mythical hero Siegfried, called Horn-Siegfried or Hérnen-Siegfried, gave his name to the French and English stories of Lorn and Rimenhild (Rimenhild being derived from Chrimhild, the wife of Siegfried). Before these last came into existence there had arisen in England a set of legends of which Anlaf Sitricson, the Danish king of Dublin (converted to Christianity 943, deceased on a pilgrimage in 981), was the hero. They were combined in a French poem called Havelok, by Geoffrey Gaimar (12th century), the name Havelok being a corruption of Anlaf or Olaf, and reappearing still later in the form of Hamlet. Various trouvéres composed ballads of greater length on the same theme, with many additions, and finally others appeared in English. In all of them we find mixed elements, includ- ing incidents which connect this Dano-Saxon romance with Guy of Warwick and the French King Horn.

The fact last mentioned tends to justify the assumption Anglo- of an Anglo-Danish cycle, which may be said to begin with Danish.

the poem of Beowulf. Between the mythical Siegfried and Beowulf of the early centuries and the fictitious Horn and Guy of the 18th the Anglo-Danish Havelok of the 12th intervened, and furnished material to the trouvéres who composed the last two works. In Lorn and Rimen- hild there is little more than the names to connect the story with the old Siegfried poem, but much that brings it into contact with Anlaf and Danish or Norse history. Its reappearance in prose as Pontus et Sidoine belongs to the second half of the 15th century. Guy of Warwick, from whatever actual personage its hero may have been derived, is a purely English story of the 13th century, connected with HHavelok by its evident relation to legends of Danish wars in England, and with King Jorn by its embodiment of the most striking incidents of that story,— namely, the return of Guy as a disguised palmer to his own castle, and the use of a ring by which he discloses himself to his wife.

Havelok the Dane appeared first in a French poem by Geoffrey Havelok Gaimar (12th century), and was inserted by him between his Brut the Dane.

or translation of Geoflrey of Monmouth (now lost) and his Hstorie des Engles. The story runs that Adelbrict, a Dane, is king of Norfolk, while Edelsi is king in Lindsey. The former marries a sister of the latter, and both die ; a girl, Argentille, remains, whio is given by her uncle, out of spite, in marriage to a scullion-jongleur, Cuheran. She dreams that her new husband is of superior origin ; he confesses that he comes from Grimsby. They both start for this place and discover that Cuheran's putative father, Grim, is dead. It turns out that Cuheran is the son of Gunter, an exiled king of Denmark, aud that his real name is Havelok. He and Argentille set out for Denmark, where Edulf, the brother of the usurper, has become king. Sigar, formerly seneschal to Gunter, is lord of the town where Havelok lands and assists him when Argentille is attacked by iniscreants. Havelok is made known by his power to

Guy of Warwick.

King Horn.

Ponthus et Sidoine.

Outlaw ro- manees.

sound Gunter's horn and is saluted as king. He returns to England, fights with Edelsi, and gains the day through Argentille's device of setting up the dead warriors on stakes. When Edelsi dies Have- lok and Argentille reign in Lindsey as well as in Norfolk. The tale may have filtered through Welsh channels, as it seems to have gathered British elements before it was taken up by the Anglo- Danes. Argentille (or Argantel) appears to be formed from a Welsh name, which the early English writers converted to Goldborough. The Freneh ehanson belongs to the early part of the 12th

century. It has no direct prose representative. Gaimar's text was first edited by Madden iat ea Club, 1828), in the Monumenta Hist. Brit. (1848), and by T. Wright (Caxton Soc., 1850). A French Jai on the same subject is included in the Roxburghe and in the Caxton volumes; it was issued separately by Francisque Michel in 1838. An English poem is also to be found in the Roxburghe volume, and was likewise edited by W. W. Skeat (Early Eng. Text Soc. 1868), : :

Guy of Warwiek is dealt with in vol. xi. p. 341. Besides the many editions of the prose romance, there is an unpublished Heraud ad' Ardennes, sometimes known under the name of its other hero Rembrun, the son of Guy of Warwick, who is found in English metrical versions. :

King Horn. —The primitive English form of the poem is lost, but is represented in the existing chanson de geste (Horn et Rimenhild, 12th century). An early version supplied some of the incidents for Richard of Ely's Gesta Herewardi Saxonis (first half of 12th century), whieh claims to be partly derived from an old book written by Leofric, Hereward's chaplain at Bourne. English MSS. (in verse) are preserved at the British Museum, Oxford, and Cam- bridge. Allof, king of Sudenne, is killed by Saracen (Danish) pirates, who also drive away his wife Godylt and turn their son Horn adrift at sea, with Athulf, Fykenild, and ten other children. They land at Westness (Cornwall) and the children are reared by King Aylmer. Horn is banished for a love passage with the king's daughter, Rymenild, and sails for Ireland under the name of God- mod, He returns with Irish warriors and by himself joins a feast held to celebrate the espousals of Rymenild with a King Mody. Horn, disguised as a pilgrim, drops a ring into Rymenild's cup with the words "' Drink to Horn of horn." He defeats Mody and rein- states his mother in Sudenne. Rymenild is carried off by Fykenild, who is ultimately killed by the hero, by whom the lady is rescued. The only copy known of the knightly romance of Horn Childe and Maiden Rimnild is the Auchinleck MS. The story was very popular in Scotland. Horn and Horn Childe have both been printed by Ritson (Aneient Eng. Metr. Rom., 1802, ii., iii.) Francisque Michel has edited Horn et Rimenhild, including the English and Scottish poems (Bannatyne Club, 1845). The Cambridge MS. was edited by J. R. Lumby for the Early Eng. Text Soc. (1866) and by KE.

Matzner in Altenglische Sprachproben (1867), and the Oxford text by C. Horstmann in Herrig's Achiv (1872).

Ponthus et la Belle Sidoine.—In this prose romance the soldan of Babylon sends his three sons to seek their fortune at sea. One of them, Broadas, occupies Galicia and kills King Thibor, whose young son Pontus with the other children is sent off in a boat to France. They are wrecked off the coast of Brittany, and the story proeeeds very much asin the poem of Horn. Nearly all the names are ehanged, however, and there are additional knightly episodes. The romance was first printed at Lyons about 1480, "A German translation appeared at Augsburg in 1483, and an English version was printed by Wynkyn de Worde in 1511.

The Anglo-Danish cycle of romance, by reason of its origin and type of adventures, may be fitly supplemented by the stories, eminently English in character, although furnished with an Anglo-Norman setting, which have been called " outlaw romances."

Tales of outlaws form a considerable portion of English fiction, and, as elsewhere, the same incidents occur over and over again, being always attributed to the favourite hero of the day. The oldest was that of Hereward the Saxon, whose exploits against William were renowned in prose and verse soon after his own time. Most of the outlaw Stories remain in ballad form; a prose example is the French uk Fitewarin (about 1320), descriptive of outlaw life in the Welsh marches and other parts of England, Spain, &c.,—an embellished record of actual events from 1201 to 1203. We learn that Payn Peverel, having over- come a devil that tenanted the body of a Cornish giant, Geomagog, who haunts a ruined British village in Shrop- shure, builds a castle near the place with the assistance of his kinsfolk. A certain Melette Peverel marries Warin de Meez, and their son Fulk Fitzwarin js himself the father

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of five sons, who go through scenes many of which are obviously suggested by the Charlemagne chansons, such as the fatal chess-board quarrel, the taunting of Ogier by Roland, &c. The five brothers are outlawed and seek adventures. One of their followers, John de Rampayne,

resembles Friar Tuck in his skill in playing, singing, and the use of the quarterstaff. The story ends with the sub- mission and pardon of Fulk, the eldest of the brothers, the death of his wife Mahaud, his marriage with Clarice de Auberville, and his subsequent blindness,—all real his- torical events. It was the first wife of Fulk who became a personage as Maid Marian in the Robin Hood stories and in the plays of Munday and Chettle. The romance was first published by Francisque Michel in 1840, by T. Wright in 1855 (Warton Club), and at the end of Ralph de Coggeshall (Rolls Series, 1875).

The exploits of the earlier outlaws, Hereward and Fulk Robin Fitzwarin, reappear under the name of Rosin Hoop (q.v.), Hood.

The extensive ballad literature relating to the last and his companions Maid Marian, Friar Tuck, Little John, &c., needs only a passing reference. The Life of Robin Hood, a prose rendering of the Geste of Robyn Hode (Wynkyn de Worde, c. 1495), is reproduced by W. J. Thoms in his Early Eng. Prose Romances, 1858.

One of the most popular stories connected with the Robin Hood cycle is Gamelyn (e. 1840), sometimes inserted among Chaucer's Canterbury Tales. Here three sons are left equal shares in their father's property, — Gamelyn, the youngest, being under the charge of the cldest, John, who neglects him. At the age of sixteen he gains a ram at a wrestling match and invites the spectators home. After the guests retire John and Gamelyn quarrel. The latter is aeyiticeattl but released by Adam the Spencer, an old servant, and the two escape together. Gamelyn is made king of the outlaws and John becomes sheriff. Gamelyn is captured, but is bailed out by his other brother, Ote. Finally, John is hanged by Gamelyn. The tale was used by T. Lodge for Rosalynde (1590) and dramatized by Shakespeare in ds You Like It (ed. W. W. Skeat, 1884).

(e) Unaffiliated Romances.

*The works of this class are of less importance than those Unafiili- which belong to the great cycles ; for, indeed, there are few ated 10- which have not been drawn somehow into one or other of ™2°**

these last. Amongst the most striking we have Pierre de Provence et la Belle Maguelonne, a story of love, adventure, and magic, which existed in Provencal verse at the end of the 12th century, but was first compiled in French prose in 1457 (the text being printed at Lyons about 1478). it was very popular in Spain, and a Spanish translation appeared as a quarto volume at Toledo in 1526.—A similar romance is Paris et Vienne, belonging apparently to the first half of the 15th century ; the first edition was printed at Antwerp, by Gerard Leeuw, in 1487, five years after the appearance of an Italian translation (Treviso, 1482), and two years after Caxton had issued an English version (Westminster, 1485).—Another French romance (better corresponding to the modern use of the word) is Jean de Paris (Paris, c. 1535), written by Pierre de la Sippade (1490-1500). It is a pleasant fiction, full of disguises and surprises like the works of G. P. R. James, and may be compared with Le petit Jehan de Saintré (Paris, 1517), written by Antoine de la Sale about 1470, in which we find a true picture of the manners of the French court in the first half of the 15th century.—The 7rods Filz de ftoys is a heavy and dull romance written in Flanders late in the 15th century.—A work of far superior order is Tivant lo Blanch, written in the Valencian language in the 15th century by Joannot Martorell. This was printed, with the fourth book added after the author's death, at Valencia in 1490, and has the honour of being the first romance which came from the Spanish press. The author professes to derive his stories from English sources, but he seems to be indebted only to Guy of Warwick for some

of his situations and the names of the English localities in which his scenes are laid. Three other Spanish ro- mances may be mentioned here. Though the earliest printed edition of Oliveros y Artus is in French, the work (printed in Spanish at Burgos in 1499) is undoubtedly of Spanish origin. It has been popular in all languages. An English version came from the press of Wynkyn de Worde in 1518. Felix Marte de Hyrcania (Valladolid, 1556), by Melchor Ortega, is chiefly remarkable as having been read by Dr Samuel Johnson, who is likely to have been the only person since the 16th century capable of such a feat. The Guerras de Granada (1595-1619) of Perez de Hita con- tains some of the finest

ballads in the language, and is an interesting and well-written fiction. The first (and best) part deals with the reign of the last Moorish king of Granada, and the second part relates the final ruin of the Moors in Philip JII.'s reign.—Another favourite fiction in many lands is that in which a chaste wife is wrongfully accused of infidelity and punished. The character even appears among the earliest ballads of the Charlemagne cycle (La reine Sibelle); but here we have to mention three distinct narratives which have attracted generations of readers, and which are widely known from their adop- tion by many writers. These are Patient Grizel (Griseldis), Genevieve of Brabant, and La belle Héléne. The story in each is similar, and the plot or some of the incidents may be traced in the Lai del Fresne of Marie de France (c. 1220), in the Latin legendary history of St Genevieve (written about 1272), in several old monkish lives of St Helena of Constantinople, in the late romances of Valentine and Orson, Florent et Lyon, and other stories,—the heroine being variously described as the Chaste Empress, the Chaste Queen, or the Chaste Duchess. The most celebrated of these stories is that of Griseldis. She is said to have been the wife of Walter, marquis of Saluces or Saluzzo, in the llth century, and her misfortunes were considered to belong to actual history when they were handled by Boc- eaccio and Petrarch, although the probability is that Boc- caccio borrowed his narrative from a Provengal fadliau. He included it in the recitations of the tenth day (Deca- merone), and must have written it about 1350. Petrarch Latinized it in 1378, and his translation formed the basis of much of the later literature. These works, however, really belong to a different class from that treated here, and may be referred to popular tales, like the narratives which have been repeated in many forms and in many lands from the time of Bidpai downwards. The prose French romance, La Patience de Griselidis (Bréhan-Loudéac, 1484), was derived from Petrarch, as also Chaucer's nar- rative in the Canterbury Tales, and the Elizabethan drama in which Dekker was a collaborateur.—The De Duobus Amantibus (or Eurialus and Lucretia) of Aineas Sylvius is usually included amongst romances, but it is rather an historical novel based upon the imperial court gossip of his own day.—The Spanish Carcel de Amor, composed about 1480-90 by Diego de San Pedro, is also a novel ; the famous or infamous Celestina is a drama of surpassing vigour and interest ; and the pastoral romances of Diana, Pastor Fido, and Arcadia belong to a

different class from that of medieval romance.—As much may be said of the English romances produced in the 16th and the earlier part of the 17th century, which are chiefly weak novelistic initations of the later adjuncts to Amadis and Palmerin.— The Seven Champions of Christendom is a popular tale.— The Romance of the Fox (Reynard the Fox) and the Loman de la Rose likewise belong to totally distinct orders of literature, the former to that of tales (Volksbiicher) and the latter to the large class of allegorical poems.—The Norman stories of Robert the Devil and Robert of Srily are also popular tales.

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III. Moprrn Romance to THE 17TH CENTURY.

The inspiration of medizval romance is gone; but it is necessary briefly to trace its final reflexions to the close of the 17th century, when prose fiction began to assuine more definitely the character of the modern novel.

We have seen how large a place in the history of France.

romances is occupied by France down to the end of the 16th century. We first meet with the so-called " pastoral romance" in French in L'Astrée (1612) of Honoré d'Urfé, an enormous work inspired by Montemayor, which, how- ever, La Rochefoucauld found interesting. It was fre- quently reprinted and had many continuations and imita- tions. Camus de Pontcarré wrote in opposition religious pastorals such as Palombe. To the same class belong Floris et Cléonthe (1613) by Moulinet du Pare, Les Bergeries de Vesper (1618) by G. Coste, Chrysérionte de Gaule (1620) by De Sonan, Le Courtisan Solitaire (1622) by J. Lourdelot, Le Mélante (1624) by L. Videl, L'Endimion (1624) by J. Ogier de Gombauld, Cléomédes et Sophonisbe (1627) by De Gerzan, Le Berger Extravagant (1627) by Ch. Sorel, Anaz- andre et Orazie (1629) by Boisrobert, Ariane (1632) and Roxane (1639) by J. Des Marets. Le Roy de Gomberville led the way to the new school of French romance in Polewandre (1632-39) and La Cythérée (1640-42), which were the models for the still more ponderous productions of La Calprenéde and De Scudéry. La jeune Alcidiane (1651), an unfinished continuation of Polexandre, was com-

pleted by Mademoiselle M. A. Gomez. These form a link between the genuine romance of chivalry and the so-called heroic style. We still meet with giants and extravagant exploits. The adventures with pirates and the sea scenes show the influence of translations of Greek novels. Made- leine de Scudéry produced her romances under the name of her eccentric brother Georges, but the authorship was well known. The first to appear was Jbrahim, ou '[llustre Bassa (1641); then the work for which she is best known, Artaméne, ou le Grand Cyrus (10 vols., 1649-53) ; Clélze, histoire romaine (10 vols., 1650-53), contains the famous "carte du pays de Tendre"; then came Almalhide, ou VEsclave Reyne (1660), Les Femmes Illustres (1665), and La Promenade de Versailles (1669). One of the causes of her great popularity was her representation of living characters under flimsy disguise. Keys to Le Grand Cyrus have been published. Gauthier de Costes, chevalier de la Calprenéde, wrote Cassandre (1642-50); Cléopdtre (12 vols., 1647-58), the best of his works, which contains the character of Juba satirized by Boileau; Maramond (12 vols., 1661-70), continued by Pierre Dortigue de Vau- moriére ; and Les Nouvelles (1661). In spite of their appalling length and their tedious conversations and de- scriptions, La Calprenéde's romances are not without merit. The author has imagination, and his heroes have a share of the noble sentiments of their predecessors. érénice (1648) by J. R. de Segrais, Za Précieuse (1656-58) by Mich. de Pure, Histoire du Temps (1654) and Afarcarise (1664), both by Hédelin, and the mystical romances of the Jesuit Ceriziers, belong to the same school. Nearly all the familiar machinery of the old romances is now absent : we no longer meet with dragons, necromancers, giants, and enchanted castles. Formerly love was secondary to heroic achievement; now it becomes the ruling passion, and knightly deeds are performed only to excite the applaud- ing smile of a mistress and not for the sake of military glory. The jargon of gallantry used.in these fictions exercised an evil influence upon contemporary literature, until it was laughed out of existence by the Précreuses Ridicules of Molitre and the dialogue of Boileau on Les Héros de Roman. Such works as Marie Stuart (1675) by P. Le Pesant de Boisguilbert, Vowvelles d' Elisabeth (1680),

England,

Other Euro- pean coun- tries.

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and Irédérie de Stcile (1680) are a connecting link be- tween the romance of De Scudéry and the modern his- torical novel.

After the invention of printing England produced féw original contributions to the literature of chivalric romance. There was a large number of translations of the old French works, and, in addition to these, a rich store of romantic ballads, which formed the customary literature of the people. The yeoman and the outlaw had succeeded the steel-clad knight in public favour. Robin Hood and his merry men appealed to a wider range of sympathies than did Arthur and his companions, and such tales as the Hxploits of Robin Hood, Tom a Lincoln, George a Green the Pinder of Wakefield, and Thomas of Reading retained their vogue in abbreviated shape as chapbooks down to the end of the 18th century. The stage monopolized the chief forces of imaginative narration during the Elizabethan and Jacobean periods, and the next specimen of a native romance is to be found in the Huphues (1579-80) of John Lyly, who drew largely from Spanish sources. Euphuism gave rise to the Philo- tumus (1583) of Brian Melbanck, to Lodge's Rosalynde (1590), to Greene's Dorastus and Fawnia (1588), which was the foundation of Shakespeare's Wenter's Tale, and to Philomela (1592) by the same writer. Sir Philip Sidney's The Countess of Pembroke's Arcadia, which appeared in 1590, after the author's death, is the most brilliant prose fiction in English of the century, and a genuine pastoral and heroic romance. We should not forget Parismus, Prince of Bohemia (1598), based upon Palmerin de Oliva, and Ornatus and Artesia (1607), both by Emanuel Ford ; Pheander, a Maiden Knight (1595), by Henry Roberts ; and The Miseries of Malvillia (1606), by Breton. Such compilations as Painter's Palace of Pleasure (1566), Whet- stone's Heptameron (1582), Westward for Smelts (1620), and Goulart's Admirable Histories (1607) are composed of translations or imitations of Italian and French tales. Boccaccio, Giraldi Cinthio, Apuleius, Heliodorus, and Montemayor appeared in English in the latter half of the 16th century, and to the laborious Munday we owe ver- sions of Amadis (1592) and Palmerin of England (1602) through the

French. In the 17th century La Calprenéde, Scudéry, Gombauld, and other romancists were translated, and Mrs. Behn, Lee, Lord Orrery, Settle, Banks, and Dryden adapted their works for the stage. Barclay's Argems, a politico-heroic romance with characters repre- sentative of real and historical personages, first came out in Latin in 1622; Bishop Hall's Mundus alter et idem (1607) is an imitation of Rabelais. liana (1661) is a caricature of all the absurdities of the contemporary French school. The last of the English romances is the Parthenissa (1665) of Roger Boyle, earl of Orrery, which, although prolix and incongruous, has literary merit and a certain narrative interest.

The last of the Spanish romances is Policisne de Boccia (1602) by Juan de Silva. They received their death-blow in Spain at the hands of Don Quixote in 1605, and even those of the greatest merit and popularity almost entirely ceased to be reprinted after that date. Although the pastoral romance of Diana (1560) by Monte- mayor does not really belong to the present subject, it should be inentioned as forming a distinct school of fiction with a family of successors scarcely less numerous than the lineage of Amadis. It was continued by Gil Polo, and in it, as in the Galatca (1584) of Cervantes, figure real persons and incidents. The earlicst re- presentative of the picaresque tale is to be found in Lazarillo de Tormes (1554).

The heroic romance never became thoroughly naturalized in Portugal, and the narrative class chiefly found 'its way through Spain. The romancists Rodriguez Lobo, Eloi de Sa Sotomayor, and Pires de Rebello may be mentioned. The Menina e Moga (1554) of Bernardim Ribeiro is the earliest specimen of the pastoral style in the Portuguese language.

Although the Pastoralia of Longus is to be considered as the

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remote prototype of the modern works, Arcadia (1502), the Italian poem of Sannazaro, undoubtedly influenced the Diana of Montce- mayor, and through it inspired the Arcadia of Sir Philip Sidney. A few translations and weak imitations of foreign romances were printed in Italy in the 16th

and 17th centuries, but novelle or short tales formed the staple of the national prose fiction during that period.

French romance—translations of Amadis in the 16th and the writings of Mademoiselle de Scudéry and her compeers in the 17th century — exercised a supreme influence in Germany, where the pastoral romance was represented by innumerable "Schifereien." Herkules und Valisca (1659) of A. H. Bucholz is a specimen of the voluminous and tiresome heroic romance of the period. Simplicis- simus (1669) by Hans Jakob von Grimmelshausen, in which the hero traverses the scenes of the Thirty Years' War, is less a romance than the first national novel. C. W. Hagdorn's Acquan, oder der grosse Mogul (1670) is an adaptation of La Calprenéde's Cassandre, and KE. W. Happel's Der insulanische Mandorell (1682) is a kind of foreshadowing of Robinson Crusoe. Two of the most admired fic- tions of the time were the Asiatische Banise (1688) of H. Anselm von Ziegler und Klipphausen and the Arminius und Thusnelda (1689) of D. K. von Lohenstein. Historical tales and love stories were the chief favourites at the end of the 17th and ' Robin- sonaden" or imitations of Defoe in the second quarter of the 18th century.

In Holland the French heroic school was mirrored in the works of Johan van Heemskerk, Hendrik Zoeteboom, and Lambertus Bos, published in the middle of the 17th century.

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ROMANCE LANGUAGES is the name generally adopted for the modern languages descended from the old Roman or Latin tongue, acted upon by inner decay or growth, by dialectic variety, and by outward influence, more or less marked, of all the foreign nations with which it came into contact. During the Middle Ages the old Roman empire or the Latin-speaking world was called Romania, its inhabitants Romani (adj. Romanicus), and its speech Romancium, Vulgar Romancio, Italian Romanzo, from Komanice logui=to speak Romance; in Old French nominative romanz, objective roman(t), Modern French roman, "a novel," originally a composition in the vulgar tongue. In English some moderns use Romanic (like Ger- manic, Teutonic) instead of Romance ; some say Neo-Latin, which is frequently used by Romance-speaking scholars. By successive changes Latin, a synthetical language, rich in inflexions, was transformed into several cognate analy- tical tongues of few inflexions, most of the old forms being replaced by separate form-words. As the literary language of the ancient Roman civilization died out, seemingly ex- tinguished by the barbarism of the Middle Ages, all the forms of the old classical language being confounded in the most

hopeless chaos, suddenly new, vigorous, and beautiful tongues sprang forth, ruled by the most regular laws, related to, yet different from, Latin. How was this wonderful change brought about? How can chaos produce regularity? The explanation of this mystery has been given by Diez, the great founder of Romance philology. The Romance languages did not spring from literary class- ical Latin, but from popular Latin, which, like every living speech, had its own laws, not subject to the changing literary fashions, but only to the slow process of phonetic change and dialectic variety. It is wonderful how like the very oldest archaic Latin is to the youngest, Modern Romance. A great number of old sounds, forms, and expressions, which were discarded or disused by classical Latin, reappear in late vulgar Latin, and live on in the modern languages. Here especially the words of Horace come true : :

" Multa renascentur, quae jam cecidere, cadentque Quae nunc sunt in honore vocabula, si volet usus, Quem penes arbitrium est et jus et norma loquendi." The present article, embracing all the Romance languages, dwells chiefly on their common origin and formation. Much of their general history has been treated under

LATIN ; only some points, especially phonetic, which need a fuller discussion, are taken up again here.

We will now briefly review the fate of popular Latin through its successive stages, showing everywhere the earliest appearance of the germs of Modern Romance.

I. Furst (Pre-Classical) Period: to c. 80 B.c. (Cicero).

Latin, like all other literary languages, began as a living Latin popular speech. There was during this first period practi- dialects.

cally little difference between the vulgar and the literary language. In the oldest historical time Latin was spoken only in the small territory called Latium. The greater part of Italy proper was occupied by the Umbro-Oscan tribes, whose languages were Italic, related to Latin, yet so different as to be unintelligible to the Romans. The two most distinct types were Umbrian in the north and Oscan in the south. The chief difference

between them is that Umbrian was in a much more advanced state of phonetic decay, and was in many respects a precursor of Italian and Romance, while Oscan was still more antique than Latin. When the territories where these dialects were spoken became subject to the Romans, about the beginning of the 3d century B.c., the language of the conquerors was intro- duced, but of course modified by the speech of the con- quered. Thus two groups of provincial dialects! were formed, (1) The North or Umbrian and Sabellian Latin, with which Etruscan Latin was closely connected, was peculiarly important, since it spread southwards and ex- tended to the neighbourhood of Rome; thus Falerii, Preeneste, and Tusculum spoke it. Later it spread to Northern Italy. Being really a fuller development of the tendencies of the old popular Latin and easier to pro- nounce than literary Latin, at last from the surrounding peasantry it reached the people of Rome and became the source of the modern tongucs. (2) The South or Oscan Latin was Latin with sonie slight phonetic modifications,

1 The Latin dialects have been investigated by K. Sittl, Die lokalen Verschiedenheiten der lateinischen Sprache, Erlangen, 1882. On Latiu sounds generally see Seelmann, Die Aussprache des Latewn, Heilbronn, 1885. Both these books, however, must be used with caution. Sittl has the merit of having traced the relations of North Latin, but has many rash assertions ; see Zettschr. f. rom. Phil., vi. 608 sq. Seel- mann is superior to Corssen as a phonetician, but is often obscure and given to elaborating strange theories. Thus he arrives at the absurd conclusion that the differences of quantity did not exist in the class-

ical age, but that the poets judged of quantity by the close or open sound of the vowel.

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which, in Modern South Italian, have lived through the levelling influence of the north dialect. Between the Umbrians and the Oscans lay the Sabellians, occupying linguistically as geographically a middle position, yet somewhat nearer to the north dialect than to the south. To

the west of Umbria lay the mysterious Etruria, whose language, preserved in numerous inscriptions, has long been an unsolved riddle and is still a matter of dispute, some considering it as utterly unconnected with Italic or even Aryan, some, as Deecke and Sophus Bugge, thinking it Aryan, intermediate between Greek and Italic, but partly decayed. In the last respect it has much in common with Umbrian, but its tendency to a rapid and slovenly utter- ance is still more distinctly traceable than in Umbrian.

Of the other languages spoken in old Italy, such as Messapian, Celtic, Venetian, and Ligurian, too little is known to enable us to form an estimate of their phonetic character ; but in general we see the peculiarities of North Latin penetrating more or less everywhere, in the north of Italy and in Spain (subjected at the end of the 3d century B.c.), as well as in Gaul, of which the southern part, Pro- vincia (later Provence), was subjected first, and the rest, by Cesar, in the lst century B.c. All these countries were rapidly Latinized ; but the provincial dialects did not always follow the phonetic development of the mother speech, just as American does not always follow the changes of English.

Old Popular Latin.

A. Phonetics. 1. Final consonants, especially s,!m, partly ¢, d,7, were feebly pronounced and often dropped in writing : s in nomina-

- tives, as Cornelio (T. Scip.),2—even Ennius wrote certissimu'

nuntiw' mortis ; gen. Seipione filios (T. Scip.); ace. vivo' nostros (Plaut.). In verse s was not counted in the metre till the manhood of Cicero, who, though he had himself followed the earlier use in his youth, calls it "subrusticum," which shows that it continued in the country. This agrees with Umbrian, where s was often aroupee as Ikuvinu® Iguvini (nom. plur.), agre agri (gen.), &c. ; with North Latin, as matrona Pisaurese (nom. plur. ; at Pisaurum); maxomo maximus, zenatuo (gen. at Falerii) = Old Lat. senatuos ; militare (nom. ; at Tusculum) looks quite Italian. Jf was often cuonpeds as in the well-known hone oino duonoro optumo fuise viro (T. Scip.). It was, by the express statement of Quintilian, obscurely pronounced (see LATIN), and must have been very loosely articu- lated, the lips probably only approaching, not closing, much like

Polish Dabrowski (Dombrowski), which gives a sound between a feeble m and a nasal vowel. In Umbrian this dropping of the m is frequent, as poplo for populum, and in Faliscan sacru, datu. T, on the contrary, was generally retained in Old Latin, but frequently dropped in Umbrian, as dede dedit, habe habet, habia habeat ; likewise in North Latin, as dede dedit, dedro and dedrot for dederunt (T. Pis.) ; dede (Tibur) ; ewpa and eupat for cubat (Fal.). Some- times d was used, as feeid (Prenestc), in Osc. fefacid, deded. In the perfects, however, @ is perhaps the older sound. JD is the final consonant that was first dropped, as in in altod marid (Col. Rostr.), a Gnaivod patre, but also longa vita (T. Scip)., later fre- quently. Pate®, soro®, colo®, occur in Plautus with r dropped or slightly pronounced (not counted in the metre); in pate® venit (Terence ; see LATIN); in Fal. wxo, mate; in fEquian wo ; and in Ital. frate, suora, moglie. N was dropped in tame(n) sus- picor (Ter.) ; Umb. nome and numem, pointing perhaps. to a weak nasal vowel ; Ital. nome.

2. D after vowels sometimes became 7, as ar ad, arvorsum adversum, arfuise, arger agger,—rustic ar me advenias (Plaut., True., ii. 2); it was vetained in classical Latin in arbiter, areesso, meridies. In Old Umbrian d constantly changes to a peculiar sound, here transcribed d, in Later Umbrian spelt 7's, as ad, ars ad, petur- pursus quadrupedibus, dupursus bipedibus. This sound appears to be only a less trilled variety of the Roman sound. In some few instances this old r reappears later, as in Medieval Lat. armes- saris (Lex Salica), in Roum. armesariu, Ital. drgine, Ven. drzare, Span. dreen= Lat. arger (agger). In Modern South Italian r for d

is quite common, as Neap. rurece, Sicil. duriei=Ital. dodici, Lat. duodecim.

1 There is nothing to prove that this s was voiced, like Eng. 2; probably it was voiccless and weakly articulated, much the same as in Andalusian loth) bag for Span. los padres, "the parents."

a Abbreviations —T. Scip., Tituli (Elogia) Scipionum ; Col. Rostr., Columna

*ostrata ; Bacch., Epistola Consolum de Bacchanalibus 77. Pts, DituhePisaur- at? sl. Lets, Low or Late Latin ; * before a word means hypothetical.*

Spaced letters signify the inscriptions in the national character, generally

supposed to be older ; itali i ipti i toe yomicee ics mean the inscriptions in Roman letters, supposed

in the ancient augural books, perhaps Etruscan Latin(?).

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*3. Zfor sis found in some unintelligible fragments of the Carmen Saliare, mentioned by Varro (L.LZ., vii. 26), but in the text he says that the ancients used s for r. Coz(ano), but also Cosano, is found on two old coins from Cosa, though here may be due to Oscan influence. On the other hand, veter, quirquir, were found But the ordinary form of Old Latin was s, as in asa, honos, honosis, flosem, Lases, Fusius, Papisius, Valesius. Not 2, but s or ss was used to render Greek ¢,—Saguntwm, eomissor, massa; in this last word (Fr. masse) the present pronunciation still testifies to the old voiceless sound. Thus the whole theory of the ancient Latin z becomes somewhat doubtful; yet it is probable that it existed in the oldest prehistoric Latin, and that forms like *easwm reswm were pronounced with z, like the Osc. eizazwne egmazum (same meaning). Later on s (z) passed into 7, following in this the Umb. urnasiaru, pracatarum, &c. In most words Latin now got 7, even in some where Umbrian retained s; comp. Lat. ara with Umb. asa, Lat. plenarius, ordinarius with Umb. plenasier, urnasier. In Lat. nasus—nares the relation must be somewhat like that in A.S. eedsan, ceds—euron, gecoren (choose, chose, chosen),*

probably owing to an original difference of accent. In many cases where Latin retained s it was originally double, as in eaussa, cassus (=cad- tus), thus spelt by Cicero and Virgil (Quint., i. 7, 20) ; formonsus and formossus ; this is the reason why Italian has always s hard (voiceless) in cosa (Ven. cossa), doloroso, &c., as Ascoli has shown. Thus, every 2 or voiced s having passed into 7, the sound 2 must have disappeared from the language, and it was only much later that it was reintroduced. The sound of z seems to be especially at home on Celtic ground ; the voiceless sound still exists in the south of Italy (Rome, Naples, Sicily) and of Spain. The English pronunciation of Latin words like morose, jocose, and of Greek words like dosis, erisis, is probably due to ancient tradition.

4, N was often dropped before s, as eosol consol, cesor censor, cosentiont (T. Scip.), mo(n)strare, Mostellaria (Plaut.); even jfes- tram for fenestram (fen'stram; Ennius); Aldiesis dies dicebatur (Fest.) ; meses (inscr. Neap.), &c. ; nearly always formossus, for- méosus for formonsus (see 3). This agrees with Umb. Z£ikvasese and N. Lat. Pisaurese, Pomp. castresis, pesa, and reappears in Ital. Afilanese, Genovese, mese, pesare, Fr. mois, peser. In Latin n generally did not quite disappear, but was feebly pronounced, very like French x in penser, or probably still more like the Polish nasal vowel in meso, "flesh," ge, " goose," half vowel, half consonant. By this partial absorption of 7 the preceding vowel was lengthened, eo"sol. Cicero expressly mentions insanus, Gellius pénsito, the grammarians mdns, méns, géns. The same was the case before jf, as infelix mentioned by Cicero; sometimes dropped before 1, eoventionid (Bacch., 187 3B.c.); comp. Umb. kuveitu convehito, kuvertu convertito, Fr. cowvent, Eng. covent, covenant. WN is rarely dropped before ¢ and d except in N. Lat. dedro(t) (T. Pis.) ; but this does not count, as the ¢ was mute. Cicero testifies to indoetus, which proves the full sound of ». The spellings tamdtae, sentemtiam, damda, tuemdam, &e., of the Lex Julia (45 B.c.) are probably only analogical from ewmdem, eamdem, &c., pronounced 1. AM disappears in Popont, Seproni, but perhaps only apparently, as Priscian tells us that medial m, as in wimbra, had a middling force, not the obscure sound of final 2. In most old spellings, as in the Scandinavian Runes, we frequently find nasals dropped before corresponding "mutes" or stops, where there is no suspicion of an obscured sound, ¢.g., in Run. LAT for land the nasal is simply

understood. Likewise in Umbrian the older ustetu is shown by the Latin spelling to mean ostendu, &c. In Modern Romance only Celtic districts have produced nasal vowels.

5. His sometimes dropped from the 2d century B.c. downwards— "Parcissime ea [H littera] veteres usi etiam in vocalibus, quum oedos [tread aedos] ireosque dicebant" (Quint., i. 5, 20); "in Latio rure edus, in urbe aedus" (Varro), for haedus=Goth. gaits, " goat"; likewise olera, asta (Varro); in Marsian Lat. Jrtius for Hirtius, Ostilius ; comp. Umb. eretu=heritu "velit." HH must have had a rather feeble sound, something like French h aspirée.

6. Zs is found assimilated in russwm (risum), sussuwm (sisunr),

Nasals.

&c., in MSS. of Plautus and Cato, and in some inscriptions, always –

in présa (but prorsus) and eéna, Umb. gersnatur "cenati," dos- suarius (Varro); "sic,et dossum per duos… quidam ut levius enuntiaverunt " (Vel. Long.). Comp. Umb. Zursce, T'useom "Tus- cum"; Ligurian Lat. suso (bronze tablet near Genoa, 117 B.c.). But this assimilation was never carried out consistently ; we have L. Lat. suswm et gusum (sursum et deorsum), Ital. swe gix, older suso e giuso; dosso, but corso, verso, orso (ursus), Fr. owrs, Span. oso.

7. Iwas doubled between vowels, as in "antiqui maites," which Priscian distinctly explains to have been pronounced with the sound of 7 consonant (Eng. y in you), and " Pompeiit ut si dicas Fom- pelli."" Cicero spelt aito, Matiam; "quod si est, etiam jungetur [¢] ut consonans" (Quint., i. 4, 11). Comp. also Ose. Pompazians. Out of the older and popular majjus, pejjus grew Ital. maggio, peggio, whereas classical Latin had majus, péjus. For filius=filjus, see 23 below, p. 664.

8. V occurs in Old Lat. perplovere perpluere (comp. pluvia),

Greek

conflovont (comp. floviom ; fluvidus, Lucretius), sovo, suvo, suo, ingenuvae, clovacas. Comp. Umb. tover and twer, tui; Ose. suvad, &c. It reappears in Petronius, urceatiin plovebat, and in Ital. piovere, rovina, védova, Genova, Mantova, chidvica, Span. llovér, Fr. plewvotr.

9. In qu the wu after q was only a lip glide, defined by the grammarians as ‘“‘neither vowel nor consonant,” as it did not count in the metre. It was therefore easily dropped altogether, as in Cinti for Quincti in an old inscription. This was especially peculiar to Etruscan Latin, as in the very old Aecetiai Aequitiae, Tarcna, Ktrus. Tarxnas, Tarquinius. Instances occur later every- where, as cocus for coguus, cottidie (Lex Julia), &c. ; L. Lat. cingue, cinguaginta (Edict. Diocl., 301); Ital. chi qui, che quid, cudcere coquere, eucina=vulg. Lat. coquina (=culina), cingue, &c. But generally Italian retains gw with the old sound, gwinto, quanto, Span. cuanto, but gue, guinto (=k), Fr. qu=k.

10. The Old Romans, having no aspirates in their own speech,

aspirates. could not pronounce the Greek ¢, x, 6, but generally turned them

Vowels,

into p, ¢, t, as Pilippus Pidurmos, Prune Ppivn, colapus, Bacanal. In some words the old popular pronunciation continued later, as class. ampulla, purpura; Silver Age, percolopabant (Petron.) ; Medizval, colopus, colpus, Ital. colpo, Fr. coup; spaera, Old Ital. spera (Dante), Early Eng. spere (Chaucer), vulg. Eng. spear, “sphere”; Josepus, Ital. Giuseppe ; Stepanus, Span. Estéban, Slav. Stepan.

11. Greek initial + was often rendered b, as Burrus Tvgpéds, also adj., “burrum antiqui quod nunc dicimus rufum ” (Fest.) ; hence, through bur®eus, Ital. bujo, “ dark”; likewise buxus muéébs, Ital. busso, bosso, Fr. buis, ‘box tree”; from mugis, class. pyxis, popu- lar and L. Lat. buaxis, buaida, Fr. boite.

*12. Fafter vowels is rare in Latin, but frequent in Umbro-Oscan, as Umb. prufe probe, Osc. amprufid improbe, Safintm Samnium (*Sabinium), corresponding in cognate words to Greek aspirates where Latin commonly had 6: Lat. vafcr, "sly," orig. "varius"; comp. vabrum "varium"' (Gloss. Isid.), Umb. vufru. The re- lation between Lat. rufus, Umb. rofu and Lat. ruber is very like that between nasus and nares, or that between veho and lingo, ligurio as representing Gr. x. We may suppose that fis the older and stronger common Italic form, sometimes retained in old popular Latin speech, partly by provincial influence. We find sifilare for sibilare mentioned as archaic by Nonius, as vulgar in the appendix to Probus, Ital. 2w/folare, Fr. sificr. F is preserved in many pro- vineial names, as Safinius (Petron.) and Tifernuwm, Ital. Trferno. We find this / again in the Italian ¢aféno tabanus, béfolo bubalus, Eng. buffalo. The Neapolitan attrufe, " October,' has a very Oscan appearance,*

*18. Old Latin often prefers short e, especially original and un- accented, to 7, as in dedet, fuet (T. Scip.), cepet, refecet (Col. Rostr.), velet (Bacch.), Condetios (inscr.), acetarc=agetarc (Fest.), dubenrs dominus (Fest.), componcto (Cato), genetrix, mereto, calecare (inscr.), Jamelia, magester (Quint.). It stands for radical 7, mostly orig. ¢, as in en, endo=Gr. év, semul (Plaut.)—comp. Ital. insieme, Fr. en- semble; Afenerva (inscr., and mentioned by Quintilian). Sometimes it stands even for original 4, as ¢empestatebus, aidiles (T. Scip.), navebos, navaled, but marid (Col. Rostr.), set ques, si quis (Bacch.). This is quite Umbrian ; comp. kanetu canito, urfetam orbitam, fratreks "fratricus," facefele=L. Lat. facibilis, Old Fr. fesible feasible, famedias familiae (nom. plur.), kvéstretie quaestura, formed like Lat. segnities. In North Latin we find Etrus. Lat. Aecctiai Aequitiae; Umb. Lat. Publece, menesterium (T. Pis.), Apolenet, dcde, Nome(lia); Mars. dedet, mercto ; and rustic " rustici etiam nunc quoque viam vcham appellant" (Varro). #, being more subject to be obscured than 7, is not uufrequently dropped, as in cante for *canete, class. canite (Carm. Sali.), Nwmtortai (inscr. ¢. 290 B.C.), oimvorsct (Bacch.), waverswm (Lucretius), ealdus (Cato), ardus, frigdaria (Lucilius); always fert, fertc=gépere. Popular Latin here approached the North dialect, where such syncopes were constant: comp. Ub. nomne nomine, éermnu termino, postro postero; they were still more violent in Etruscan, as Elysentre Alexander, Sehtmnal Septimiend nata, Tarxnas*

Tarquinius ; Pis. Lat. dedro(t) dederunt, Lebro Liberum ; Umb. Lat. ccdre cedere, &c. South Latin, on the contrary, favoured 7 (see below).

14. Of long ¢ Lucilius distinguishes two kinds—close {(¢ tenue), as in pila, “ mortar,” and open (¢ pingue), approaching to ¢, written e7, asin peilum, “spear,” meilia, “ thousands”; he might have added Jetlius, “son,” comp. félarc, On}. There was an original diph- thong ci, as in deicere, Osc. devewm, Gr. decxvivat, which was early contracted into this middle sound, exactly like Eng. ey in money from Old Fr. moncie. This too is quite Umbrian, spelt e¢ and ee, c, as enetu inito, Arch. Lat. eneito, feliuf filios, sercihior, screhto scripti, preve privus, Joveine= Tjovine, Iguvini; comp. the datives Juve patre, mehe, tofe (tibi), Osc. Diuvel, paterct ; also Umb. Lat. Jel=filius, and Pis. Lebro. In North Latin datives in ¢ are gener- ally constant (Apolenei, Pis., uncontracted), as Junone matre, Jove, patre, Marte, &c., extending sometimes even farther south ; and Gallo-Lat. nisc (Lex Rubr. de Gall. Cisalp.). Livy used sibe and

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quase (originally ~~ci). This exactly agrees with the rustic pro~~ nunciation vélla, spécea reeorded by Varro, lzber by Festus—“ab antiquis et amect et amecae per e litteram efferebantur” (Fest.). And this again surprisingly agrees with the Modern Emilian (Romagnudlo) pronunciation, as Bolognese méga mica, dég dico, mél mille, plur. méla=Ital. mila, véta vita, maré marito, prém primo. Thus this old rustic sound seems to have extended north- wards, but later to have becn driven from its old home by the classic close 7, which penetrated everywhcre else, and is generally represented in all the Romance languages.

15. Old Latin often prefers short 0, especially original and un- accented, to w, as in consol (T. Scip.), tabola (Bacch.), pocolom (many old inscr.), poyolum (Tab. Bantina), epistola=émwrodh, Patricoles, Hercoles, colpa (Prise.), Volcanom (inser. 3d century B.c.), volgo and volt, &c. (Plaut.; o after v continued in the classical age), sont sunt, cosentiont (T. Scip.), denontiari (Tab. Bant.); in termina- tions—Venos, opos, robose, filtos, and Luciom, &c. (T. Scip.); in Umb. acc. poplo, salvo, tertio; even for orig. w—ascriato eest, observa- tum ibit ; radical—molia multa, “ fine,” onse (h)uinero, Ital. émero, Span, ombro, somo summo (orig. sup-mo),

Ital. sémmo; in North Latin moltaticod (T. Picen.); in Fal. maxomo, zenatuo; and in Ligurian Latin floviom, infumo, suso (bronze tablet near Genoa, 117 B.c.). O reappears in Late Latin and Italian mdlto, délce, &e. Medial o is often dropped before J, as in omni poplo (Plaut. Pseud.), teglarvus (inscr.), Fostlus (Faustulus, 114 3.c.), Hercle (Plaut.), singlaritcr (Lucr.)—comp. Fr. sanglier, Ital. cinghiale—coplata (Lucr.) ; in some cases, as poclwm, periclum, the contraction does not appear till the empire ; at Pompeii anglata, subla, &c. As Umbrian always has contraction, pihaclom, anglom, Treblanir, vitlu, katlu, stiplo, whilst Oscan distinguishes diminutive forms like zicolom, zteelet, ztculud from such forms as sukaraklom, pestlom, the strongest impulse must have come from the north, although there must have been a pretty general tendency to syncope every- where. In Italian contraction is the rule in popular words, as veechio for vet lus, Late veclus, occhio oc'lus, &c. In popolo, tévola, isola, &c., and diminutives like rivolo and géndola, the original vowel has remained throughout. South Latin favoured u (see below).

16. The use of o for ¢ after v is shown by Old Lat. oinwvorsei, voricre ; in vostrum (Plaut., Ambrosian palimpsest), the original sound (from vos) occurs, which must have been universal in popular speech, since it reappears in Latc Latin and all the Romance lan- guages—Ital. vostro, Fr. votre, &c. There was a tradition that Scipio Africanus had been the first to spell these words with ¢ (Quint., i. 7,25). Here Umbrian distinguished between ¢ and 9, as in vestra, covertu (pres.), but covortws (perf.); Lat. vorsare is perhaps Span. vosar, bosar, "to vomit"; in other words ¢ is now universal.

17. U occurred for ¢ before labials; but the old optwmo has scarcely left any trace, yet Ital. has menomo besides minimo. Later « was pronounced with the sound of a, Gr. v, Fr. «, which at last was turned into 7, as in optimus, Ital. ottimo. But in some few words the old popular form has survived—stupwla, Ital. stéppia, Fr. éouble, "stubble," dissaupare, Ital. servupare.

18. Ustands for o—" Frundes, funtes vetustissimi ; quae tamen a primoribus repudiata sunt, quasi rustico more dicta" (Prise. }— contrary to the general rule (see 15). Spellings like muns, muwntem, Juntcem

abound in Late Latin, as puntifer (already in 98 a.D.), Zerrouowriw (Plut., c. 100); whence Old Fr. and Old Eng. muné, "mount," Ital. mdnte, ponte, fonte with close 0. In Sienese we have even pognere, ponto, Ital. and Florentine pugnere, punto (pungere, ptnctum); the connexion, however, of 6 with Old Latin uw is doubtful.

19. Greek v was pronounced w, as in Bruges Pp'yes, Burrus, purpura, gubernum, gubcrnare, cupressus,—the last four also class- ical ; otherwise the classical age adopted the Greek sound y, as in Cyprus. In popular Latin the old sound remained, and wu was sometimes (before 7, as in fore) even changed into 9, as in storax (Ter.), ancora (Nevius). In Low Latin wu is frequent: ewprum, "copper, for which Pliny used Cypriwm (aes) ; comp. bursa, Ital. borsa, Fr. bourse, crupta, Ital. grotta, twmba, Ital. tomba, &c.

In popular Latin there was a general tendency to contract the Diph-

old diphthongs, in aceordance with Umbrian and North Latin.

20. Au in North Latin began very early to be contracted into long open 0, as Pola (inscr. Picen., 218 B.c.). In Umbrian this is a constant law—ote aut, Ital. 6, Umb. torw tauros, Ital. toro, &c. The only form of the oldest Roman Latin was au, as Taurasia, Aulla (T. Scip.), Clawdi (Bacch.). When the Umbrian poet whose provincial name was Plot(u)s settled in Rome in the latter half of the 3d century B.c. his name was Latinized into Plautus. Meauwhile the North Latin 6 began to penetrate into Latium as rustic, vulgar, and familiar; Cato and Varro often use it in their books De Re Rustica, as colcs (Cato), colis, orata (Varro): " Orata genus piscis appellatur a colore auri, quod rustici orwm dicebant, ut auriculas, oriculas" (Fest.). But in the classical age there was a good deal of reaction against this vulgarism, and there is a well-known anecdote of Mestrius Florus warning the emperor Vespasian against saying plostra, and being next day facetiously greeted by the emperor as Flaurus (Suet., Vesp., 22). At Pompeii

Vowels of com- pounds,

Accent and quantity.

eopo took the place of cawpo, o(p)scultat of auscultat. It is scarcely possible to fix the precise period at which 6 for aw became general with the upper classes; but, as it was never changed into ud like the original open 0, the general contraction of au is probably later than that of ae to 2, which was accomplished about the time of the introduction of Christianity. That the contracted sound is open 0, not closed, may be inferred from the Italian 0 in oro, toro, cosa, povero, in Old French ehdse, povre, as is shown by the rhymes, only in Mod. Fr. chése, povre (etymologically spelt pawvre). The Eng. eausc, sauce, poverty, have kept the Old French sound ; the Spanish forms are cosa, oro, pobre. The old diphthongal pronuncia- tion of aw was never quite lost, but preserved in literary tradition all through the Middle Ages, as in Italian and Spanish literary words like causa. It even appears to have been popular in some Roman provinces, judging from the Prov. paubre, causa, in Mod. Prov. couzo (spelt by the French "coouso"), and the Portug. ouro, cousa (also otro, eoisa). Even Fr. chose, chow presuppose cause, caulis, not cosa, colts. In Italian, words like cavolo, " cabbage, Paolo, "Paul," are vare exceptions. It is to be especially noted that eawda seems to be false, céda being the correct Latin form, which is corroborated by Ital. edda with close o. Some philologists, however, think 6 is the old contraction, unconnected with 0.

21. Ae, oldest form ai, occurs very early, as in acs, praedad (Col. Rostr.), and was general at the time of the Gracchi. The difference between ai and ae is really very slight, the sound of 7 being open, which is very near "raised_¢" (both vowels occur in Eng. pity). The pronunciation must have been essentially the

same as in the Osc. at, which in the Latin transcription of the Tab. Bantina wavers between az and ae. The contraction of ae into é first occurs in the north, where it was constant, for example Umb. kvéstir, pré, méstro magistra, dat. asé arae; North Latin— Fal. pret(or), Cesilia; T. Pis. Cesula; Etrus. Lat. Quectld (= Ceeili for Caecilit), Cnevia Gnaevia, Gnaeja, &c. From the north it spread to Latium, where it first occurs as a rustic pronunciation scoffed at by Lucilius, as quoted by Varro: "Rustici

Pappum Mesiwm, non MMaesium, a quo Lucilius scribit—Cecilius Pretor ne rusticus fiat." "In Latio rure edus, in urbe aedus" (Varro). We find e for ae quite commonly uscd in the vulgar dialect of the Ist century A.D.,—at Pompeii Ictus, gucres, etate, presto, tabule, que. In Rome e became the pronunciation of the upper classes only in the Chris- tian period, 3d and 4th centuries, as Hmiliano, pede = filiae (inscr. 3d century), Cesar (4th century). Servius (4th century) says "é is pronounced almost like ae," that is, with the same sound, only shorter (at least in theory), equus like acquus.

22. In Old Latin compound words often did not soften their radical vowel; the preposition being then an adverb, and each word having a distinct stress, the compound was separable, as in manuin endojacito (XII. Tables) =injicito ; 0b vos sacro, vos obsecro, and sub vos placo, vos supplico, in ancient prayers ; transque dato= '"et tradito," in ancient laws. This was imitated by classic poets (tmesis)—inque ligatus (Virg.). Only some of these separable com- pounds continued later on, such as the intensifying per, in per ecastor scitus (Ter.), nobis ista sunt pergrata perque jucunda (Cic., De Or.), per mihi mirum visum est (Cic., 7.), Platoni per fuit Jamiliaris (Gellius). Instances of the unchanged vowel in verbs— écquid placeant, mé rogas? immo vero hercle pérplacent (Plaut.), and ea mihi perplacct (Cic.), to which correspond exactly the Old Fr. par est bons, par me plaist, While the older Latin acceutua- tion was dffatim, ddmodwm, these words seem at the time of Gellius to have been pronounced affdtim, admédum. We have here a first step towards the modern systein of accenting the last clement gf compounds ; comp. the modern Comasco ammo, Roum. ama, " just now." Quomodo is continued in Ital. come, but is formed anew in the dialectic comodo, emdd. In Late Latin and Romance the old systcm reappears unimpaired ; many of the old compounds, having been lost in popular speech, were formed anew with stress on the last element and unchanged vowel: for instance, class. displicet, vulg. displdcet, Ital. dispidce, Span. despldce, Fr. déplait ; class. dcctdit, vulg. accddet, Ital. accdde (inf. aceadére); rélégo becomes Ital. riléggo, &e.

23. Stress, which in Old Latin was often farther from the end than in classical Latin, seems early to have become pretty strong, so as to induce

the voice to hurry over unaccented syllables even though they were long by position (see LaTrn), as magistratus, ministertum, volintate, in Plautus, where st,nt were pronounced as quickly as in Eng. voluntary, magistrate. The vowels, too, were hurried over; that fénéstra was pronounced as Jen'stra is corro- borated by the Ennian festra=ferstra,—comp. Ital. mesticro= ministerium. Scansions like sagittis, simillumae show that double consonants might count as long or short ; position was not regarded so nicely as in Greek till the classical age. The real reason may have been the stress on the first syllable. In accented syllables double consonants cannot have been really short, considering the full length of Italian double consonants in bello, anno, saétta, &c. Likewise final vowels of iambic words were shortened, as novo, habe, puta, bene, homo (see Latin). This is important, as marking the first step towards the Romance levelling of the old quantities.

ROMANCE LtANGUAGHES

This tendency, too, was carefully restrained during the classical age, but reappears early in the post-classical period. Another effect of the strong popular stress is the pronunciation of 7 before vowels as a consonant; thus words like /filizis in Plautus often count as two syllables, fijus (j= Eng. y). This is evidently the preparatory stage to the Romance figlio, &c., with palatal 7,—/ and j having been fused into one sound. This pronunciation, too, was carefully suppressed by the classics.

B. Vocabulary.—We append, in chronological order, a brief Vocabu- selection of archaic words, disused, vulgar, colloquial, or used with lary.

a disparaging sense, in the classical age, but reappearing later as quite usual and dignified expressions. The many modern deriva- tives should be noticed. '

*Livius ANDRONICUS (c. 240 B.c.): sortus surrectus, Ital. sorto, sortire, Fr. sortir de eau. PLauTus (254-184): bucea, "mouth" (fam. Cic.), bucca panis (Petron.), Ital. bdécca, Fr. bouche ; mina- ciae, "threats," Ital. minaccia, Fr. menace ; calceolarius, 'shoe- maker," Ital. calzolaio. Diminutives—vidulus, vid'lus, " wallet," Ital. valigia (*vid'litia, Diez), Fr. valise ; awricula, Ital. orecchia, Fr. oreille; apicula, Fr. abeille;*

Zusciniola, Ital. usignudlo, rosi- gnudlo, Fr. rossignol ; sororcula, Ital. sirocchia, commonly sorella ; vitellus, Ital. vitello, Fr. veau, Eng. veal ; agnedlus, Ital. agnello, Fr. agneau ; putillus, 'little boy," Ital. putello (putus fam. for puer, Virg.). Adjectives—bellus (later fam. Cic.)—the Romance bello has quite superseded puleher; minutus, "small," populus minutus (Petron.)=Fr. le menu peuple ; rivalis, originally a law term, figuratively of a rival in love (class. acmulus; fam. Cic.); ebriacus, "drunk," Ital. ubbridco; sucidus, 'juicy,' " dirty," Ital. sticido, stidicio, Span. sticio, Verbs—ambuilare, '"walk," "go," familiar in all ages, hence according to Dr. Vilh. Thomsen the Romance andare, aller, Roum. wnbld, Ladino amnar; bajulare, "carry," bajulus, "carrier," L, Lat. "educator," Ital. bdlio, "steward," bdlia, "nurse," Fr. baller, "reach," "give"; mandiicus, "glutton," manducare, "chew," 'eat," frequent in Old Latin—the emperor Augustus wrote familiarly manducavi duas bucecas=Ital. mangiai due bocconi—in the Vulgate manducat et bibit, Ital. mangiare, Fr. manger ; auscultare, " listen" (once Cic., mihi ausculta), Ital. ascoltare, Span. escuchar, Fr. écouter; cantare, frequent in Old and classical Latin, the only word in Romance (cancre has been lost) ; adjutare, Ital. ajutare, Fr. aider (adjuvare lost) ; earadicare, eradicare, Ital. sradicare, Fr. arracher; mendicare, Ital. mendi- care, Fr. mendier; batuere, battwere, "strike," Ital. bdttere, Fr. battre (dtto from battuo), L. Lat. battwalia, Ital. battaglia, Fr. bataille ; muttire, "mutter"—palam mutirc, 'speak' (Ennius)— L, Lat. subst. muttwm nullum emiseris, "not a word," Ital. motto, Fr. mot; sapere, "understand"—sometimes very near to the modern sense, sapit scelesta multum (Plaut.)=Ital. la scellerata sa molto, nullam rem sapis=Ital. non sai nulla—Ital. sapére, Span. sabér, Fr. savoir ; comederc, "eat" (Cic. fam.), comedere numos= Fr. manger son argent, Span. comér ; despoliare (Cic., Ep.; Liv. once), Ital. spogliare, Fr. dépouiller ; comparare, "to procure," later "to buy" (Suet.), Ital. comprare. Greek words—colaphus (colapus), " buffet," " box on the ear" (fam. Quint., Plin.), percolo- pabant (Petron.), L. Lat. eolpus, Ital. colpo, Fr. coup. Ennrus (239-169); etvitas, "city"' (reappears in Petronius and later), Ital. citta, Fr. cité, Eng. city ; campsare, "double (a cape)," a d&mrat Aeyouevov, recognized by Diez in the Ital. (s)eansare, 'to avoid"; nitidare, Ital. nettare ; petra, "rock," frequent in Pliny and later —in the Vulgate tu es Petrus, et super hanc Petram aedificabo ecclesiam meam—lItal. piétra, Fr. pierre. Cato (284-149): nascere nasci, Ital. nascere, Fr.

naitre; fracidus, “mellow,” ‘damaged (olives),” Ital. frdcido, fradieio, “rotten.” Pacuvius (219-129): causari, ‘to plead,” not classical, reappears in the Silver Age in the sense of pleading as an excuse, still later in that of disputing, discussing, Fr. causer, “ to chat, talk”; comp. Ladino plidar (plead), ‘“‘to speak.” Lucintus (¢. 148-103): acceptor for accipiter, ‘a hawk,” frequent in Low Latin, Ital. astére, Kr. autour; quwiritare, ‘ery ””—ut quiritare urbanorum, sic judilare rusticorum est (Varro ; fam. Cic.)—Ital. gridaré, Fr. crier. Greek words—gubernum, “rudder,” Ital. governo; schediwm, “improvised or unpolished poem,” Ital. schizzo, “sketch”; caballus, “jade,” seems first to occur here—optat arare caballus (Hor.)—later “horse,” “ steed,” Ttal. cavallo, Span. caballo, Fr. cheval, L. Lat. cadallarius, “chevalier,” “knight”; cyma, “ young sprout of cabbage ” (later Plin., Colum.), Ital. eima, “top.” Q. CLAUDIUS QUADRIGARIUS —Gellius blames several expressions of his as vulgar or rare: diurnare diu vivere, comp. Ital. soggiornare, Fr. séjourner, Eng. sojourn, and aggiornare, ajourner, adjourn; arboretwm, “grove,” Ital. arboreto, Span. arboleda. Varro (116-28), especially in De fe Rustica: belarc balare, Ital. belare, Fr. béler ; olor odor, Span. olor; eapitiwm, “ bodice,” Ital. capezzale, “cape,” “pillow” ; nervium =vevptov, Span. nérvio; rubeus, “red” (later Colum., Pallad.), Fr. rouge, Span. ribio, “fair”; badius, ‘bay (horsc),” a rare word, Ital. bajo, Fr. bai. Laperius (105-43) is blamed by Gellius for using obsolete, rare, and vulgar words : lavandaria lavanda, later “lauudress,” Ital. lavandaja ; gurdus, “ stupid,” a Spanish word, says Quintilian, and in fact we find Old Span.

Gram- mar.

Syntax and phrase-

ology.

Second period.

ROMANCE

gordo, “stupid,” Mod. Span. “fat,’—comp. pingwis Minerva ; pittacium, “patch,” “label,” =mirrdxov, Span. pedazo, ‘ piece”; nanus, “ dwarf,” =vavos, Ital. nano, Fr. nain ; botulus, ‘ sausage 7” (also Petron.), dim.*

botellws (Martial), later = “ bowels,” Ital. budello, plur. budella, Fr. boyaux. Lucretius (94-55): baubare, “bark,” Ital. abbajare, Fr. aboyer, Eng. bay; russus, ‘red ”— arare word, russa gingiva (Catull.), mentioned as usual by Gellius —lItal. résso, “red,” Fr. roux, rousse, “red-haired.” Old words mentioned by GRAMMARIANS: burrus (see 11, above); artitus= bonis instructus artibus, Prov. artista, “trade,” Fr. artisan; gluto (Fest.), glutto (Persius and later), Ital. ghiottone, Fr. glouton (comp. Lat. glut glut, Fr. glouglow); planca tabula plana, Fr. planche, Eng. plank ; sarpere putare, “to imp,” Fr. serpe, ‘ prun- ing knife.”

C. Grammar (Plautine, when no author quoted).—Gender: collus collum, Old Fr. cols, now cou; dorsus, &c. Declensions : Iacte lac, Ital. latte (Petron. unum Jlactem biberunt); vasum, Umb. vaso®, Ital. vaso ; osswm, Ital. osso, Fr. os 3 pauper,-a,~~um (also Petron.), Ital. povero. Comparison: magis pulcer=Span. mas hermoso ; even magis majores, as vulg. Ital. pid meglio, vulg. Fr. plus meilleur, vulg. Eng. more better(er). The ordinary Rom~~ ance formation with plus only appears in the 8d period. With ego ipsissumus, “my very self,” comp. ipsimus, “himself,” 4.¢., the master of the house (Petron.). Out of (ego)met-ipsimus grew Ital. medesimo, Span. mismo, Fr. méme. Pronouns: dat. fem. illae for illi, Ital. le ; eccwm=ecce eum, Ital. ecco—pater eccwm advenit= ceco che viene il padre ; ecciste, eccista=Old Fr. cist, ceste, Mod. Fr. ce, cet, cette ; eccille, eccilla=Old Fr. cil, cele, Mod. Fr. celui, celle. In Italian these were replaced by eccum istwm, Ital. questo, and eccum illwm, Ital. quello, analogous to the Plautine eccwm ipsum, eccam eampse, &c. 3 quotumus, “which of the number ”— quotwmo die huc pervenisti? Ital. lavorare a cdttimo, “work by the job.” Unus indefinite was sometimes very like the modern indefinite article—Huic filia wnw est, ‘he has a daughter,” Ital. qnest’uomo ha wna figlia. lle was sometimes used very like the modern definite article—Imponit geminorum alteruni in nave pater, lium reliquit alterwm apud matrem domi, Ital. lascid 7’altro colla madre a casa. Note also matus nemo in aedibus, “not a living sonl,” “not a mother’s son,” Span. nadie, “nobody,” likewise from nata (res), Span. nada, “nothing,” whereas the Catalan pre- fers res, Prov. ren, re, Fr. rien (rem). Homo is sometimes like an indefinite pronoun—Nequior nemo, quisquamst, quem homo aut amet aut adeat, Fr. on. ae fey morirt moti, Ital. morire, Fr. mourir. Active for deponent—jocare, Ital. giocare, Fr. jouer, partire=Ital.;

fabulare, Span. hablar. Perfects in si—parsi, prae- morsi, Ital. morsi; the formation in si greatly increased in Rom- ance. Habere with past part. often approaches to modern com- pound tenses, Res omnis relictas habeo, Ital. ho lasciato tutto. Adverbs: Alvorswm ire for alié, Prov. alhors, Fr. ailleurs. Pre- positions: de for genitive, dimidium de praeda mihi dare, Ital. la met' del bottino ; ad for dative, te ad patrem esse mortuom re- nuntiem, Ital. dire al padre ; cwm instrumental, cwm virgis caseum radere, Ital. con; de instr., quam illa de meis opulentiis fiat pro- pensior, Ital. di. Peculiar local uses are 77 Ephesum ire, in Epheso esse, ab domo, "from home," ex Epheso, "from Ephesus"; ab, from (at) one's house, as Esne tu ab dlo militc, servus ejus = from (at) the soldier's, foris concrepuit a vicino sene, Ital. dal soldato, dal vecchio vicino.

Syntax and Phraseology.—Pater tuus ts erat patruelis meus ; comp. Fr. le pere est-7a/, Ital. il padre Zo conosco. Pone aedem 7bi sunt homines, Ital. vi sono degli uomini. Scio jam quid vis dicere, Ital. so (quel) che vuot dire. Ne time, ne fac, Fr. ne fais pas cela. Totus gaudeo, tota sum misera, even Cic. falsum est id totum, 'it is all false," Ital. 6 tutto falso, son tutta contenta, Fr. elle est toute joyeuse. Afultum miseri, even Cic. fam. multwm bonus, Ital. molto buono, Span. muy bueno, Port. muito bom. Bene morigerus (Plaut.), bene saepe (Enn.), bene mane (Cic.), Ital. ben bene, ben tosto, Fr. bien bon, bientét, bien souvent. Bene velle alicut, Ital. voler bene ad alcuno. Epityrum estur ¢nsanc bene (Plaut.), showing that the Suriecusement bien of the Précieuses was no novelty. Aequo animo stare, Ital. star di buon animo ; stabam tanquam mortuus (Petron.), Ital. stava come morto, stare in letto, star seduto, &c. Dictwm (ac) Jjactum (Ter.), Ital. detto fatto, "said and done." Cwm (bona) gratia, "with a good grace" (Ter.), Fr. de bonne grace. Jd restabat (deerat, wt), used ironically, (Ter.), It. questa mancava ancora, Fr. il ne manquait (plus) que cela.

IT. Second (Classical) Period: 80 B.c. to 100 (150) A.p.

At this time we begin to have an idea of what South Latin was, of which the chief characteristics were—(1) its conservative character: supported by the antique forms of the Oscan language ; (2) its pre- ferring 7 to c, as in sinatum, cinsuerint, cintum, rim, ris, diibus (Lex Jul.; Heraclea) ; nigatis, tenimus, Lucritius, dicembres, ocilli (Pompeii), tentmus=Mod.

Neap. tenimmo ; fruminto, siptim (Pute- oli) ; ventrandae (Nap.); later sicwndo, siptim (Borgia, 386) ; (3) its preferring w to 0, as in furtunilla, posteru, aliw (Pompeii). These forms are constant in Modern South Italian. Now classical

Latin was an approach to South Latin, and there arose a strong reaction against the vulgar North Latin forms. But even a purist like Cicero could not always abstain from using colloquial forms, and he sometimes gives us precious information about familiar pro- nunciations, as cwn nobis for cwm nobis, showing the assimilation of mn to nn. He hesitates to use the new word medietas, which later became the ordinary expression, Ital. meta, Spau. mitad, Fr. moitié. Catullus has cnvolare, "steal," Ital. involare, Fr. voler, and basiwm, Ital. bacio (for basio, bagio, like cacio caseus), Span. beso, Fr. baiser, and the familiar caressing dssa for ipsa, Ital. essa. He and Horace have platéa, "street" (for platéa=)areia), Ital. piazza, Fr. place. Vitruvius has octwaginta, Ital. ottanta, a peregre = 'from abroad," and the Greek words chalare, Ital. calare, zelus, Ital. geloso, Fr. jaloux, and schidia, "wooden chip," "splinter," Ital. scheggia. The transition from } to v begins, triwmphavit for -bit (Lex Jul.). Gradually the popular speech undermined the classical correctness of the brief Golden Age, and at the beginning of the empire again rose to the surface. The emperor Augustus was fond of talking slang and bad grammar, as simus for swmus, and he wrote as he spoke in his familiar letters, although he was very hard npon a poor legatus consularis for barbarously writing iwi instead of tpst (Suet., dug., 88; comp. proximus for propsimus).

At Pompeii and Herculaneum we find a town dialect fully de- veloped, half South Latin, half vulgar Roman. Final consonants were dropped, for instance m in the acc. pwella, laudata; t in the verse "quisquis ama valia, perta qni nosci (?=nescit) amare (Pomp.); s rarely, valea=valeas (Pomp.). H, the right pronuncia- tion of which had become a mark of education, just as in English (Rusticus fit sermo, si aspires perperam ; Nigid. Figulus), was con- stantly dropped, as in abcto, abuaerit (Pomp.), abiat

(Herc.). Nn took the place of md: verecunnus (Pomp.), later innulgen. (Abella, 170 A.D.), agennae (Puteoli), were generally Italic ; comp. Umb. pthancr piandi (distennite, dispennite, Plaut.), Osc. opsannam operandam ; now South Italian—Roman monno, Neap. mwnno, Sicil. muwnnw=Ital. mondo, Lat. muudus. Ss was used for cs (x) as in words in -triss for -triz (Pomp.). © popularly became p, as Aprodite, but with those who ae to speak fine 7, just as they made the Greek uv an i—Jacintus, Amarillis, Dafne, Filetus, Ital. Jisico, fisonomia, &c. E for oe seems first to occur during the empire, for example, pomerti (8 B.C.), pomerium (49 A.D.), Phebus (Pomp.). There is no certain evidence of the sound of Germ. 6, Fr. ew; we see that the first vowel is absorbed by the second. According to Diez, oe becomes close e, ae open ¢, which is true for popular words like Ital. yéna, Fr. peine, but untrue for Latinisms like fete, fedo, améno, céto, commédia, tragédia, Feébo, oc in Low Lat. being constantly confounded with ae. Original oe never becomes ze, as ae does (cielo, ficno).

Vocabulary.—We remark at Pompeii eamuccavit emunxit, Ital. Vocabu-dial. smoccare, "snuff (the candle)"; mi stmilat, Ital. mi somiglia, lary.

Fr. il me ressemble, elsewhere only in Late Latin. PETRONIUS: bisacciwm, Ital. bisaccia, Fr. besace; nesapius, " unwise," Ital. savio, saggio, Span. sdbio, Fr. sage; berbex, Fr. brebis; peduclus, Ital. pidocchio, Fr. pou (panus facit diminutivuam panucula, Fest., Ital. pannocchia—comp. L. Lat. genuculum, acucula, Ital. ginocchio, agocchia, Span. hinojo, aguja, Fr. genou, aiguille); striga, "witch," Ital. strega ; fatwus, Fr. fat; basiavit me sptssiws, Ital. spésso, "often." Instances of Petronius's grammar are—vinus, caelus, comp. Old Fr. vins, cicls ; jacebat tanqnam bovis, Ital. bove, bue; hoc vetare nec Jovis potest (Old Lat. Jovis pater=Jupiter), Ital]. Giove ; munus excellente, neuter, shows the L. Lat. declension, Ital. eccellente ; habet wnde=il a de quoi (vivre); unus de nobis= uno di noi (see also LATIN). PLINy mentions sanguisuga as vulgar for hirwdo, Ital. sanguisuga, Fr. sangsue; he has gyrare =Ital. girare, "turu," ""roam about." Prrstus (84-62) has stloppo tumidas rumpere buccas, "a slap," L. Lat. sclopus, sclupare, Ital. schioppo, "gun." QUINTILIAN (c. 40-118): duvardy quod nostri possibile nominant, quae ut dura videatur appellatio, tamen sola est, Ital.

possibile, &c. JuveNnau has buccé foculwm excitat, Ital. fuoco, Fr. feu, and Tacitus spatha, Ital. spada, Fr. épée (see also LATIN).

Ill. Third (Post-Classical) Period: 100 (150) to 300 (350).

This period is represented by the latest pagan inscrip- Third On the decay of class- period.

tions, by Gellius, Apuleius, &c. ical Latin, see Latin. In pronunciation only few decided changes appear.

1. Z is inserted before s impurum, as 'tscripta (Afr., 197), ecoTretpetTw = ispirito (Rome, 269); later this was universal, but in Italian only after consonants—non ista (collog. non sta), in isptrito, in iscritto; Span. always, as espiritu, esta, escribir, escuela; Fr. esprit, écrirc, école.

2. Tt is put for pt, as Setemb. (Helvet., 219), Setimus (Afr., 3d century), later frequent. This assimilation originally came from the north ; comp. Etrus. Lat. Nethunus (th=t), Etrus. Ne@uns, Neptunus, Etrus. Lat. Sctumnal, Etrns. Sehtmnal=Septimiend nata

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Vocabu- lary.

Fourth period.

666 ROWAT CE PANGUAC ES

(inser. biling.), Setwme, Sctimi, Septimius, Umb. serethtor, serehto, Ital. Settimo, Nettuno, atto aptus, cattivo, seritio. :

8. Tt takes the place of ct, as in Beneditus (204), lattwca (Edict. Diocl., 301). This too came from the north ; vitorza occurs on an ancient mirror, probably Etruscan. Comp. Umb. subahtu and subator, formally =subacti, rehte recte, where h, originally sounded, had become mute or nearly so, which is further proved by the spellings ambrehtu, ambretu, ambito, &c. ; eomp. tettom(e), probably =Ital. teéfo tectum, just as Ital. retto rectus, atto actus, otto oeto, notte noctem. This change was restricted to Italy ;

elsewhere et became 7, as Fr. fait factum, Port. feito, Span. hecho (= feitjo). Likewise cs (x) became in Italy ss, as in Lat. eossim, visstt, elsewhere és, as Span. and Port. seis, Fr. cwtsse, laisser. ;

4, @ before a single ¢, ¢ becomes palatal (like the old-fashioned Eng. gyarden, &c.) or nearly j (Eng. y in you), so that both are confounded—magestati (inscr. before 248) ; eogiugi, eonjugi. The sign for Jin the Gothic alphabet, taken from Latin G, shows the pronunciation of the 4th century. — ;

5. Ngn for gn, as eongnato, singno, belongs perhaps to this period—connato, &c., is also found—E. Ital. sengno, now spelt segno, with palatal n, degno dignus, regno regnun, &e., Fr. digne, &c.; sometimes n(n), as in condscere, Fr. connattre. There are traces of some other transitions that appear to have been completed only in the next period. ;

6. Vocabulary. —APULEIUS has sapidus, " savoury" (comp. in- sipidus), Old Fr. sade, whence Fr. maussade (mal-sade) ; morsicare =Ital. ; follieare, " breathe" (like a bellows), Port. folgar, Span. holgar, "rest," "lounge"; mastieare, Ital. masticare, Fr. macher ; minart (equum baculis), "threaten," hence " drive," Ital. menare, Fr. mener; eambiare (better than eambire), Ital. eambiare, Fr. changer ; vietwalis adj., in the 6th century subst. vetwalia (nom. plur.), Old Fr. and E. Eng. vitadlle, Eng. vitiles, spelt etymologically victuals ; aucilla, auecila for avicella, the existence of which had been denied by Varro, L. Lat. awcellus, Ital. wecello, poet. argello, Prov. auzels, Old Fr. otsel, Mod. Fr. oiseau. Cmiius AURELIANUS (2d or 8d century) has testa, ""skull," frequent in the 4th century, Ital. testa, "head," Fr. téte. Lampripivs (e. 250): papilio= pavilion, pullicenus, Ital. pulcino, Fr. poussin ; pipio, ' pigeon"; platea, "place." TERTULLIAN, first Christian author: rememorare, "yemember," aefernalis, " eternal," eompassio, " compassion," and many other modernisims, such as plus miser=Ital. piu misero, Fr, plus misérable. DriocueTIAN: fata, parca, Ital. fata, Fr. fée. SoLINusS (c. 8d century): repatriare, "to repair (to). APICIUS (c. 83d century): exealdare, Ital. scaldare, Fr. échauder ; spatula, Ital. spalla, Span. espalda, Fr. épaule.*

IV. Fourth Period : 800 (350) to 500 (550).

This period extends from the introduction of Christianity to the Middle Ages and the great migrations. Christianity marks an important epoch in the history of the Romance languages. Pagan literature was abhorred, and classical traditions lost. Popular speech got the upper hand; the gospel was preached to the people in the people's own language, and the New Testament translated into vulgar Latin. Several phonetic changes which formerly had been wavering and uncertain became rapidly fixed and decided. The whole language was revolutionized.

1. Palatal g or j was developed into dj (like gy in Hung. Magyar =palatal d+ Eng. y) or dzh (Eng. j), sometimes dz, and was eon- founded with original di—Zerax, Hierax (Cuma, 202); Zovdae (pagan inscr.), comp. Diuliali (568), Madias (364), also Mazas= majas, Gianuaria (503), also Zanuari, &e. Italian still retains the sound of dzh in giungere jungere, Giove Jovem, genere, giacére, &e. Original di in Aziabenico (Afr., 195), medius, pronounced medsius according to Servius (4th century) and Consentius (5th century), Ital. mezzo, pronounced med-zo (but giorno from diurnus).

2. Zi was assibilated before vowels; there are no certain pre- Christian instances. In the 4th century the Gothie laiktjo=

lectio shows that the change had only begun; e¢ and ti were.

sometimes eonfounded, as in xdArwos ealceus (Plut., ¢. 100; Ed. Diocl., 301), octo (Rome, 389); we have ¢ for si in aecletiae (carly Christ. inser.). In the 5th century the change appears as fully accomplished ; the grammarian Pompeius (probably a Maure- tanian) expressly teaches the pronunciation Zitius as Titsius, and Consentius (a Gaul) etiam as eziam, i.c., etsiam. In the 6th century we have the Gothie kavtsjon, eautionem. It is probable that this change too originally came from the north, especially from Etruria, where it was very old: we have Etrus. Ventia Venza, Arniia Arnza, Etrus. Lat. Vencsi, Vensius, Arnzius (while Umbrian has tertio, Martie, &c.), Mars. Lat. Martses, evidently the source of the Latin Marst. At length this pronunciation 'reached the capital and became general, mostly expressed by e, as in eciam, ter- clus, milicia, Justicia, staeio, nacionem, &e. The pronunciation ts is eonfirmed for Spain by Isidore in the 7th century. This sound is

still preserved by Italian in words like piazza, grazia, nazione, giustizia, likewise by Old French, as nactwn, place, whereas in Spanish és has coalesced into a lisped s, as in graeia, nacion, and in Portuguese, Provencal, and Modern French it has been assimi- lated into a hard (voiceless) s, as in plaga, plassa, place.

3. Ci was assibilated before vowels. In the 4th century we have the Gothic faskja, which shows no change. Schuchardt is probably right in supposing that e¢ was assibilated a good decal later than #2, —an inference from the comparative rarity of instances of ehangc, and from the silence of the grammarians. From instances like ocio (see 2) it would appear that c? and ¢ had the same sound, but this cannot have been the case, as Italian still keeps up a differ- ence, as in piaceia placeat, piazza platea. Yet there may have been a beginning of a palatal affection, making the two sounds somewhat like each other. In the 6th century we have the Gothic unkjane (unciarum) and ovvxa in the Ravenna eharters, but on the other hand mpexeew=precio for pretio, Urbitcius (588, which, however, may be a miscorrection, ¢ being added instead of substituted for 4), Mauriscius on a Gaulish coin, from the same period,—making it probable that the assibilation had been accomplished. In the 7th and 8th centuries spellings like onzia for wncia are quite eommon.

4, The most important change of all was the victory of stress Accent over quantity and tones. The popular songs of the classical period and show a decided prevalence of accent. In the soldiers' songs from quantity. the end of the 3d eentury stress has quite superseded quantity and is the ruling principle of the metre :—

- *Unus homo mille, mille, mille decollavimus. Tantum vini nemo hdbet quantum fudit sanguinis."*

This is just like the metre of early Christian hymns—" Dées irae, dtes illa," and "O Rex aeterne, Démine," &c. The old quantities had been levelled. St Augustine (354-430) says that in his time only a few grammarians had kept up the distinction between mérac and mére, and that the Africans eonfounded Js and és. Servius (4th century) could only find out quantity from stress iu words like tmpius, amieus. Consentius says that some, especially Africans, said piper for piper and Ordtor for

drdtor. This does not necessarily mean that all short accented vowels before single consonants had become long ; probably both short and long eoalesced to a medial quantity, rather short than long, and there was no very marked difference of quantity between accented and unaccented vowels. This appears plainly from the nature of Romance poetry, where stress has only a moderate importance—namely, in the most prominent parts of the verse—while the chief principle is the uumber of syllables. In Italian, especially in the Tusean dialeet, we may hear bambino with short accented 4, the unaccented 0 being rather longer than the accented 7, just as Eng. y in pity, when emphatic, is longer than 7. In Spanish words like mdno, priméro, senoéra the accented vowel is generally as short as the unaccented or even shorter, which does not prevent the Spaniards from count- ing it as "dos tiempos" (duas moras) ; the unaecented final syllables are often rather longer, as in Eng. pity. In Italian the longest syllables are those containing two or more consonants after the accented vowel, as tempo, paziénea, bécca, gatto; the chicf difference between fatto and fdio is the length of the ¢ in the former. In Spanish and French even long consonants are shortened, as Span. boca, gato, Fr. ehatte; jette and achéte are equally short; vowcls are generally short or medial, as une belle ville (not like veal, as the English make it), and are long only by compensation, as in dine, chante (where the nasal is absorbed by the vowel). The old distinction of tone necessarily disappeared with these, the acute or high even (2omd) and the circumflex or high falling tone (Réma) being dependent on the quantities.

5. Vocabulary.—Avsontius (Burdigala, 309-392): burrae, nugae, Vocabu- Ital. burla, "joke." ARnoxtus (Afr.,c. 330): coguina, Ital. eucina, lary. Fr. cuisine. Firmicus MATERNUS (e. 340 2): comptitus, Ital. conto, Fr. compte. PALLADIUS (e. 350): cdtus, "cat"; specics=Fr. épices. AMMIANUS MARCELLINUS (end of 4th eentury): molina, Ital. molino, Fr. moulin; tmpedieare empéeher ; pilare=cxpilare, Fr. piller, Ital. pigliare ; proba, preuve. VxEGETIUS (end of 4th cen- tury): burgus, eastellum parvum, Ital. borgo, Fr. bourg. JEROME (831-420) : camisia (Celtie), Ital. camicia, Span. camisa, Fr. chemise; earrieare, Ital. caricare, Span. cargar, Fr. charger ; impostor= Eng. ; raneor, "vancour." THE VULGATE: grossus, Ital. grosso, Fr. gros (see also LATIN). SERVIUS (¢. 390): faleo, Ital. falcone, Fr. faucon. LAcrTantivs (d. ¢. 330):

meridionalis. AUGUSTINE (354-430): eom- binare; vanitare vanter. CopEx Tirronos. (488): exagiwm, Ital. saggio, Fr. essai; paraverédus, L. Lat. palafredus, Ital. palafreno, Fr. palefroi; aewewla, aiguille. Casstoporus (beginning of 6th eentury) : modernus, "modern." CopEX JUSTINIAN. (527-565) : amicabilis, "amiable."

V. Fifth Period: 500 (550) to c. 900 (1000). This period, which extends from the migrations to the Fifth first appearance of the modern Romance languages, is the period.

age of Low or barbarous Latin, as written especially in charters and laws. While Christianity had brought vulgar

Charae- teristics of fifth period.

Aeeented 3. # for accented % became frequent.

ROMANCE LANGUAGES

Latin into the foreground, barbarism quite made away with literary Latin. Latin was not only dead but for- gotten. The old sounds and forms had been lost, and the scribes, ignorant of classical grammar, tried neverthe- less to make a show of learning by putting Latin forms at random. This makes the language look much more barbarous than it really was. It is sometimes very hard to find out the living popular form under the Latin varnish, and harder still to find out what is proper to each country, as Low Latin is very much the same everywhere. The

following were some of the chief peculiarities.

1. Old Latin forms reappeared, especially in Italy. Final con- sonants, especially m, ¢, s, were dropped or wrongly put. In Italy the nom. annus (-os), the acc. annum (~~om), the dat. abl. anno, the acc. plur. annos, coalesced in anno; as this was the real pro~~ nunciation, the scribes confounded the Latin forms. There being no longer any difference between in locum and in loco, both were eonfounded ; even in locus, per locus, &c., were written. The pre- valence of the type anno on the one hand and the growing use of the preposition de for the genitive on the

other made the genitive anni disappear, and anni (with which annis coalesced) was used solely for the plural, likewise ford, monti. Sometimes, as in Old French, the objective form anno, Old Fr. an, was used as a genitive, of which Hétel-Diew is stilla remnant. In the same way Ital. rosa became the common singular, rose the common plural form. Out of Italy, final s being retained, the plural form was aznos, rosas, flores, which is the Spanish (afios) and Portuguese form, and partly the French, as roses, with flewrs and ans as accusatives. In Provencal and Old French s was kept in the nom. sing. masc., ans, but in the nom. plur. the oldest form was 7, retained in some Old French monosyllables—Zi illi, dut, tret, twit from éwtti, used in the Gloss. of Cassel ; in polysyllables this 7 was lost, and an remained, likewise flor ("flort; comp. sapienti, Gloss. Cass.), munt. The verbs canto, cantas, cantat in Spanish only lost ¢; in Ital. cantas through cantis (caused by the affinity of s to 7) became canti?. In French both s and ¢ were kept—chante, chantes ; chantet, later chante ; est, vit, vient, and from the analogy of these Mod. Fr. aime-t-il, chante-t-il. Many old tenses were lost, as ama(ve)ram, which even in Latin sometimes had the sense of the simple past (see LATIN), only in the oldest Fr. rovéret, roga(ve)rat=rogavit. Ama(v)i be- came Ital. amai, Fr. aimat, and was used as simple past (perfectum historicum) ; the praesens perfectum was expressed by a new tensc, as habco amatwm (of which early germs are found), Ital. ho amato, Span. he amado, Fr. jai aimé. The old future was destroyed and a uew future formed out of amare habeo (of which early traces are found), Old Ital. amcraggio, Mod. Ital. ameréd, Span. amaré, Fr. J aimerai, &e. In consequence of the general loss of body, short words dwindled down so much that they became unfit for use, and were superseded by fuller words or reinforced by composition ; this is especially the case in pronouns and particles. As ad became a, Lat. a, ab could no longer kecp its ground, and was replaced by de, likewise vis by fortia, &c. (see Latin). Hic disappeared and was replaced by zste, which remained uncomposed in Span. estc, and in the others was composed with ecce, eccwm (see above). Abante, Mod. Ital. avanti, Fr. avant, occurs in a pagan inscription. Lat. wnde became de wade, Ital. donde ; in Spanish this was further composed with ad, as adonde, and as this in time came to mean 'where'? a new de had to be added,—de adonde, &c.

2. C became assibilated before single ¢, 7. That during all the preceding periods ¢ had the sound of & is proved by Old Latin spellings like dcekem ; by Greek transcriptions, as Kixépwy, Katoap ; by the German renderings Kaiser (Old Eng. cdsere), Keller, "cellar," Kirsche, " cherry," &c., and by the use of ¢ for # in Old English, as in cynne, "kin," cennan, "ken"; by late Latin spellings like ques- quenti, quiescenti, pache (Rome, 408), chingxit (Gaul, 676), vachis (Lucca, 722)—in Italian still ch =A, as chi quis, che quid; and lastly dulkisma (Pisaur., 410), ofikina (Gallic vase, end of 6th century; see Romania, xiii. 485). Yet c before e, i must early have had a more palatal sound than before a, 0, uw, something like the old- fashioned English pronunciation kyard for card. But it was not until very late that the difference became so marked as to be ex- pressed by different letters: the palatal sound began to he assibi- lated into something like Italian ce, ct, Eng. ch (as in child from Old Eng. cild), about the 6th century, although perhaps not cqually early everywhere. We find xecrave and tzitane (Ravenna charter, 591), and paze (inscr. about the same time). Ital. c= Eng. ch in pace, diect (in Central Italy mostly pronounced sh), cielo ; Span. paz, diez, cielo (lisping s from ts); Fr. ciel (Old ts, Mod, s). As original 7 and % were no

and un- longer different in quantity, they had to be distinguished by quality ;

aecented

vowels.

accordingly vinwm became Ital. vino, minus (minus, open 2), Ital. méno, with the same vowel as in véna from véna; thus Latin % and é coalesced ; likewise we have scrivo scribo, bévo bibo, sévo sébum, fido fidus, féde fides, créde crédit, scritto scriptum, detio dictum.

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We find traces of this in the Pomp. veces, Ital. vece. In Low Latin menus, fedes, &c., are constant. But many who had a little more learning retained the Latin spelling minus, pronouncing méno(s), and by this were induced to write constantly 7 for elose ¢ especially accented, as habire,

vedire, cridcre=Ital. avére, vedére, crédere; vindere, stilla=véndere, stélla, Ital. véndere, stélla, Piedm. esteila, Old Fr. esteile, Fr. étoile. In some few instances this may represent a provincial 7, as in Sicil. avirt, or special cases like Fr. tenir, plaisir, merct.

4, Unaccented e¢ for %, which is frequent in Old Latin and not unfrequent in the post-classical age, returns in Low Latin with re-doubled force. Thus we find fedelis (404), later Domenecus, septemus, decemus, anema, deposeta, genetor, capete, soledos; in the Ravenna charters vecedomeno, vendecare, ordenata, &c.; in Frankish charters decemo, Fr. dime, Domenecus, venerabelis, nobvelis, lacrema, caretate, veretate, femcna, placetus, &c. This penetrated even into Central Italy, as in the Tuscan Latin of the 8th century, dedet, placetum, homents, inviolavelis. In Middle Italian woment, in Modern Italian Domeneddio, ospedale, are rare remnants of the earlier form. Gener- ally classical 7 has prevailed in Florentine and Italian, as womini, Jemmina, anima, asino, ordine, spirito. In the Sienese dialect e has remained, as ordendre, cardendle, and in North Italian — Venet. dment, femena, menéstra, drdene, dscno; Lomb. omen, dsen, ordendri, &e. InSpanish it is not unfrequent—drden, uimedo, nove- ddd, corredér ; comp. Prov. lagrema, semenar, conoissedor, and Old Fr. aneme, pronounced dnme (the spelling points to an older stage).

*5. Unaccented inedial e was often dropped, though less in Italian, except in the north, as in L. Lat. dwlkisma, dulcissima (Pisaur., 410), answering to modern Romagnudlo forms like 'strissm=illus- trissimo ; generally L. Lat. domnus, domna=Ital. donna, "lady," "woman." In French all proparoxytones are contracted ; for in- stance, Old Fr. (asinum, *as'no) asne Ane, (anima, *an'ma) anme Ame, (hominem, *hom'ne) honume, (femina, *fem'na), femme.*

6. Accented o for %, not unfrequent in the preeeding period, was constant in Low Latin. While Lat. licem became Ital. lice, Lat. crticem, niicem (nitcem, open Ww) became crécc, néce, like véce from vocem ; comp. justus, Ital. giusto, Fr. juste, but augdstus, Ital. agdsto, Fr. aotit. This caused many to write w for close 0, as oxure uxore, geneture genitorem, although this may partly represent a provincial uw, as in Sicil. amiri. In

*Old Fr. we have honour, favour, and still amour, and in L. Lat. curte=cohortem, *corte, Ital. corte, Fr. cour, Eng. court.*

7. Unaccented o for % as in Old Latin is frequent, as in L. Lat. tabola, popolo, sccolom, regola, volontate, Ital. tdvola, popolo, ke. ; even for original u, as mano, spirito.

8. Unaccented medial o was often dropped before 7, in which case the unfamiliar group ?'2 was changed into cl, as in L. Lat. oclus oculus, Ital. dcchio, Span. ojo, Fr. ceil; vecius vetulus, Ital. vecchio (Old Ital. veglio), Span. viejo, Fr. vieil, vieux ; also L. Lat. tabla= Span. tabla, poplom=Span. pueblo. In French syncope is a law— table, peuple, sangle cingulum, &c.

9. Final unaccented vowels in Italian on the whole obey the general laws. By the loss of the Latin final consonants all words end in a vowel, except such as per, con, non, in, un bel giorno, buon giorno. In South Italian 7, 2 stand for e, 0. In Spanish e is some- times dropped, as sed sitim, Ital. séte ; paréd parietem, Ital. paréte ; Jacl, érden. In Portuguese o is pronounced uw, but often only whispered ; cis nearly always whispered or mute. In North Italian, Ladino, Catalan, Provengal, and French all final vowels are generally dropped, except a, which remains in Provengal, as port, but porta (Mod. porto). In Catalan @ is mostly pronounced as open ¢; in French this becomes obscure e, which in modern French is mute except in such cases as table ronde.

10. Accented ze stands for é, wo for 0. As and , 6 and 6 were levelled in quantity, they were already distinguished in quality, as in Ital. béne bene, véne vénae; Portuguese has got no further than this. But generally this was not distinct enough for the wauts of the speakers, and unconsciously é (in which é from Lat. ae was included) became 72, and 6 (in which 0 from Lat. aw was not included) became wd, both diphthongs being generally accented on the last vowel—Ital. and Span. viéne, Fr. vient venit; Ital. buono, Span. buéno; Ital. swdno, Span. swéno (generally sonédo) sonus, different from Ital. séno sunt, Span. son. This ehange must be very old, as it is found in nearly all the Romance languages. In Spanish, Provencal, and French wo was changed into wé, and this in Modern French to eu, eu, contracted into the sound of 6. In Spanish the

use of diphthongs is extended to position—tiémpo, siéte septem, Ital. sétte, Aiérro, Ital. férro, cwérpo, Ital. corpo, muérte, Ital. morte. Mark the displacement of stress in popular Latin— pariétem for pariétem, Ital. paréte, Span. paréd, Fr. paroi ; filidlus for filiélus, Ital. figliuédlo, Span. hijuélo, Fr. filleul.

11. Of mediae (voiced stops) for tenwes (voiceless stops), especially between vowels, we find some few earlier instances, as grassws for crassus, Ital. grasso, Fr. gras. This is generally rare in Italian Latin, as gubitus, cubitus, Ital. gémito, and is still compara- tively rare in Italian. Yet it occurs in some of the most familiar words, as ago acus, lago, lwogo, segare, pagare (pacare, "to satisfy,"

ROWAN CEH BAN GUAGE?

VI. Sixth (Last) Period.

For the sixth and last period—that is, for the history and Modern distinctive traits of the great modern Romance languages Romance —the reader is referred to the separate articles. _

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"nay "), pregarc, budcllo, parentado, contado (comitatus), eontrada, spada, strada ; p from 6 becomes », as in riva, riviera, povero, savio ; before r—padre, madre, segreto, lebbra. This recalls similar changes in Umbrian, and was perhaps originally North Italian and from

thence penetrated into Tuscany. In Spanish the voiced sounds guage

Vocabu- lary.

*are the general rule, as fuégo, Ital. fudco, amigo, Ital. amico, amado, finido, Ital. amato, finito, sabér, Ital. sapére, &c., yet there are some exceptions, such as poco (paucum). In Old French the soft sound is the constant law, but this mostly disappears later, as in aimé, aiméc (see FRANCE, vol. ix. p. 632 sg.). A general Romance ease is placitum, Old Ital. piatéo, Ital. piato, Span. pleito, Old Fr. plaid, through *plagito,*

**plajeto, which is singularly like the Umbrian feitu, feetu for fagitu. A limited case is that of such words as Fr. raison, Ital. ragionc from rationem, probably first changed to ratsiéne, *radsiénc, thence to rastone, which sometimes occurs in Late Latin, and often in Early Italian, Span. razon ; comp. Ital. cagione occasionem.*

12, Zand e unaccented before vowels, especially post-tonic, be- came j, as filjus (Plautus), odiwm pron. oljo. J coalesced with the preceding consonant, making it palatal, as in Ital. jiglio, oglio, jiglia, maravigltia (mirabilia), battaglia; Span. maravilla, batalla 9 Fr. fille, merveille, batailic (in North French the palatal sound is replaced by ¢ or 7), &. N—Ital. vigna vinea, Spagna Hispania, ingegno, castagna, campagna, bagno balneum ; Span. Lspafia, can- pana; Fr. vigne, champagne. In some cases 7 was assibilated, as Span. granja, estranjero, Fr. songe, grange, étrange.

*13. Sometimes attraction takes place, ¢ being transposed to the radical syllable, especially in French, as hudle, bain, témoin, Antoine, gloirc, histoire. Before and after 7 peculiar forms appear—Ital. primaio (-jo); muojo morior; Ital. primiero, cavalicre, from primario, probably assimilated into *primer(z)o (Dr Thomsen). Forms like paner, sorecrus are found as early as the 8th century.*

14. Vocabulary.—During this period the Roman world, after being conquered by the Germanic nations, adopted many words from their conquerors. The German influence was strongest in France ; hence we find Germanic expressions for many of the most common words except form-words, though the stock of the language remains Latin. A curious instance, characteristic of the Middle Ages, is rauba, which from "robbery," " prey," came to mean " property," Ital. roba (robba), "things in general," Span. ropa, "linen," "stuff," Fr. robe, "gown." In Rumonsch we have la rauba e'aud a mi, "the property that belongs tone." The German h, as in hair, old hadir = "hate," is peculiar to French, and is still sounded in Normandy. Some Germanic sounds had to be modified, as w to gu, for instance, guerra from werra, 'war'; guanto, Old Fr. quant, Fr. gant, from want, Dan. Vante; in North French w remained, whence Eng. war, &e. Among the leges barbarae, the LEx Sauica is perhaps the

most remarkable as a document of Low Latin. It has sentences and words like—hoce sunt pariculas eausas=ce sont pareilles choses ; si in dominica ambactia fuerit occupatus, Ital. ambasciata, Fr. ainbassade ; si quis alterum voluerit occidere et colpus praeter Jallierit, Ital. se il colpo fallisce; si quis alterum de sagitta toxicata percutere voluerit et praeter sclupaverit (see stloppus, p. 665); si quis caballum extra consilium domini sui caballicaverit, Ital. caval- care, Fr. chevaucher ; si quis per malo ingenio in ewrte (Ital. corte, Fr. cour) alterius aut in casa (Ital. casa, "house") aliquid de furtwm miserit ; compantum, Ital. compagnia; bare, baronis, "a free man," Old Fr. nom. ber, obj. barwn, hero," "baron"; diffacere, Ital. disfare, Fr. défaire ; cxcortieare, Ital. scorticare, Fr. écorcher. From OTHER LAWS we have—/ortia, Ital. forza, Fr. force; hostis exercitus, Eng. host; vassus (Celtic), "a vassal"; auca, Ital. dca, Fr. oie (from avica) ; troppus, grex (from Germ. thorp), Ital. truppa, Fr. troupe, and also Ital. troppo, 'too much," Fr. trop ; forestis (from forts), ' foreign," Ital. forestiere ; marca (Germ.), ** border," whence marchensis, Ital. marchese, Fr. marquis; tornare (Greek ; also Dacian Latin'). Gnrecory or Tours (6th century) has pagensis, Ttal. paése, Fr. pays. Grucory THE GREAT has merces, '*mercy" ; fiasco, Ital. fiasco, "a flask." Corrppus (Afr, c. 570): eara, " face " (Gr. «dpa, "head"), Span. cara, Old Fr. chiere, whence bonne chére, "good cheer" (originally the kind, hospitable countenance of the entertainer). VENANTIUS ForTUNATUS (e. 580): cofea, "coif" ; crema, "cream"; viaticwm, Ital. viaggio, Fr. voyage. OTHER SOURCES : caminus, "'road" (Spanish Latin, 7th century ; probably Celtic), Ital. cammino, Fr. chemin ; directum, jus (Italian Latin 551), Ital. diritto, Fr. droit. The late AGRIMENSORES : cireare, Ital. cercare, Fr. chercher. Op eLossrs (7th and 8th centuries) : aciariwm, Ital. acciaio, Fr. acier ; cosinus, consobrinus, Ital. cugino, Fr. cousin ; gamba, Ital. gamba, Fr. jambe (Gloss. Cass,). Ismore: triveta, Fr. truite, Eng. trout ; cama, Span. cama, "bed"; jficatwm,*

'liver " (properly Jjecur ficatwm, liver of geese fed with figs), Ital, fegato, Span. higado, Fr. foie ; and custre, consuere, Ital. cuscire, cucire, Span. coser, Fr. coudre (Gloss, Isid.) ; selvaticus, Ital. sel- vaggio, Fr. sauvage ; Sormatiewm, Ital. formaggio, Fr. fromage.

ul The Greek historians Theophylact (c. 600) and Theophanes relate that the Dacian soldiers said in their native tongue Topva, Tbpva, ppdrpe, perdpva. This has been called by some the earliest trace of Roumanian. '

1. Ltalian is distinguished by its harmonious form, its vocalic endings, and the rich fulness of its tones.

2. Spanish is distinguished by its regularity, by its short, distinct sounds and its fixed tones, and by many Arabic words. Certain "thick" sounds, as the j (like Dutch and South German ch, though in the south of Spain much weaker, almost /) and the lisping c, z seem to be rather modern developments than due to direct Arabic influence.

3. Portuguese is, with Gallego (the dialect of Galicia), the western dialect of Spanish, and has almost the same words, but a very different pronunciation ; in sound it approaches somewhat to French, as in the nasal vowels (which, however, are less purely vocalic than in French) and the voiced sounds of s, z, and j. It has partly retained the Old Spanish form, as in jilho for Span. hijo, and partly it has a character of its own owing to its many obscured vowels and contractions, as boa for bona, dér for dolor.

4, Provencal in many respects represents the earliest form of French; in others it has peculiar developments (see PROVENGAL). Catalan is the southern dialect of Provengal.

5. french makes up for the want of the full forms and tones of Italian by its grace and delicacy. It has more ofa history than the other Romance languages, Old French being very different from: Modern.

6. Ladino (Rumonsch,' Germ. Churwalsch, from the town of Chur) or Central Romance extends from the Grisons to Friuli on the Adriatic. It is not uniform, being only an agglomeration of cognate dialects; and it is scarcely more Latin than any other Romance language. It has chiefly been elucidated by Ascoli.

7. Rowmanian has probably not survived from the old Roman colonists of Dacia, but been imported from Istria (which has a cognate dialect) or

Northern Italy. It has been greatly mixed up with Slavonic words and sounds (such as the "mixed" vowels), and has some distinctive marks, sucli as the post-positive article, Romunul =Romanus ille ; compare the similar phenomenon in the Slavonic dia- lect of Bulgaria and in the Albanian language.

Literature.—The real founder of scientific Romance philology and linguistics is Friedrich Diez, in his Gramimatik der romanischen Sprachen, 3 vols., Bonn, 1836-42, and Htymologisehcs Worterbuch der romanisehen Sprachen, 2 vols., 1852. He also published Altro- manische Sprachdenkmdler, 1846; Zwei altromanisehe Gedichte, 1852; and Altromanische Glossare, 1865. Pott contributed several articles on the Low Latin of the lcges barbarae in the Zeitschriften of Hofer and Kuhn. Other authorities on various branches of the subject are—Ducange, Glossarium mediz et infimex latinitatis, 7 vols. ; Marini, Papiri diplomatiet ; Muratori, Antiquitates Italice ; Schuchardt, Der Vocalismus des Vulgdérlatcins, 8 vols., 1866-68 (a valuable collection of materials), also several minor works by the same author ; and Gaston Paris, Ktudc sur le Role del Accent Latin dans la Langue Francaise, Paris, 1862, and La Vic de St Alexis (a poem of 11th century), 1872. The principal magazines devoted to the subject are—Jahrbuch fiir romanisehe und englische Literatur (ed. Wolff, Ebert, and Lembcke), later only fiir romanische Liter- atur; Archiv fiir das Studiwm der neueren Sprachen (ed. Herrig), of a more popular character; Romania (a quarterly, ed. Gaston Paris and Paul Meyer, since 1872), contains articles of the most eminent Romanists; Revuc des Langues Romancs (Montpellier, from 1870 onwards), chiefly devoted to Provencal ; Romanische Studien (ed. Boehmer) 3 Zeitschrift fiir romanische Philologie (ed. Grober, since 1877); and Romanische Forsehungen (ed. Vollméller, since 1884). Mussafia has written many articles and treatises, chiefly in the Transactions of the Vienna Academy of Sciences. Ascoli, author of Studi Critici, has edited since 1873 the Archivio Gléttologico, which has articles by Flecchia. The Rivista di Filologia Romanza (ed. Manzoni, Monaci, and Stengel, 1873) in 1878 became Giornale di Filologia Romanza (ed. Monaci). For the etymological dictionaries of the separate languages see the special articles. (g. 81.")

1 Rumonsch is properly the dialect of the upper Rhine valley, Ladino that a as Engadine. Ascoli includes all varieties under the common name of adino.

CHAPTER I.—THE REGAL PERIOD.

Original Contributories to People, Customs, and Law.—The union

elements of the Latin, Sabine, and, to a small extent, Etruscan

a _ bands that, as conquerors or conquered, old settlers or new

™ immigrants, together constituted the first elements of the Roman people, did not necessarily involve contemporaneous adoption of identical institutions or identical notions of law. Although they were descended from the same Indo- European stock, and inherited the same primitive ideas about religion and government, those ideas must have been modified in the course of centuries of separate and independent development. The characteristics of the Latin race are said to have been its sense of the importance of discipline and the homage it paid to power and might ; those of the Sabines were their religious feeling and their reverence for the gods; the characteristic of the Etruscans was their subservience to forms and ceremonies in matters both divine and human. Corresponding influences are very manifest in the growth of Rome's early public institu- tions, civil, military, and religious. It does not seem too much to say that these same influences are traceable also in the institutions of the private law. The patria potestas, with the father's power of life and death over his children ; the manus and the husband's power over his wife; the doctrine that those things chiefly was a man entitled to call his own which he had taken by the strength of his arm; the right which a creditor had of apprehending and imprisoning his defaulting debtor and reducing him to slavery,—all these seem to point to a persuasion that might made right. The religious marriage ceremony and the recognition of the wife as mistress of the household and participant in

its sacred offices as well as its domestic cares; the family council of kinsmen, maternal as well as paternal, who advised the paterfamilias in the exercise of the domestic jurisdiction; the practice of adoption, to obviate the extinction of a family and to prevent its de- ceased members being deprived of the prayers and sacri- fices necessary for the repose of their souls,—these seem to have flowed from a different order of ideas and to bear evidence of Sabine descent. Etruscan influence could make itself felt only at a later date; but to it may pos- sibly be attributed the strict regard, that came to be required to the observance of ceremonials and words of style in the more important transactions both of public and private life.

While it can hardly be doubted that the result of the union of Latins and Sabines was that regulations were at once adopted which should apply to their public life as a united people, it is not only conceivable but probable that each tribe, as regarded the private relations of its members, continued for a time to accord a preference to its own ideas and traditions of right and law, and that the amal- gamation was a gradual process, partly silent, partly due to regal or pontifical intervention. .

Patri- Patricians, Clients, and Plebeians.—There was part of cians. the law of Rome that even in the empire was known by the name of Jus Quiritium, the Law of the Spearmen ; and this in the regal period constituted its main element. The Quwirites were the members of the gentile houses, organized in their curies, primarily for military and secondarily for political purposes. They alone of the rapidly increasing population settled round the urbs quad- rata ranked as citizens, down at least to the time of Servius Tullius. They alone could consult the gods through the medium of auspicia, and participate in the services offered to the tutelary deities of Rome. From

their number the king drew his council of elders, and they alone could take part in the curiate comitia, the assembly of the warriors. They alone could contract a lawful marriage and make a testament; in a word, it was they alone that were entitled directly to the benefit of Rome's peculiar institutions.

These prerogatives they enjoyed as members of the gentile houses. Patrician Rome was a federation of gentes or clans, the, clans aggregations of families bearing a common name, and theoretically at least tracing their descent from a common ancestor. Whether or not the traditional account of the numerical proportion of families to clans and of clans to curies has any substantial historical foundation, and whatever may be the explanation of the method by which the symmetry on which the old writers dwell with so much complacency was attained, it is beyond doubt that the gentile organization was common to the two races at least that contributed most largely to the citizenship of Rome, and that it was made the basis of the new arrangements. Federation necessitated the appoint- ment of a common chieftain and common institutions, religious, military, political, and judicial. But it was long before these displaced entirely the separate institutions of the federated gentes. Every clan had its own cult, peculiar to its own members; this was the universal bond of association in those early times. It had its common pro- perty and its common burial-place. It must have had some common council or assembly, for we read not only of special gentile customs but of gentile statutes and decrees. Instances are on record of wars waged by indi- vidual gentes ; so they must have had the right to require military service alike from their gentiles and gentilici. Widows and orphans of deceased clansmen were under the guardianship of the gens, or of some particular member of it to whom the trust was specially confided. If a clans- man left no heirs, his property passed to his fellow gentiles. Over the morals of its members the gens exercised super- vision and discipline, interfering to prevent prodigality and improvidence, restraining abuses of the domestic authority, and visiting with censure and probably in grave cases with punishment any breach of faith or other dis- honourable conduct; and it is difficult to suppose that, within its own limits, it was not constantly called upon, through the medium of its chief, to act the part of peace-maker and arbiter. Finally, its members were always entitled to rely upon its assistance, to have maintenance when indigent, to be ransomed from captivity, to be upheld in their just disputes and quarrels, and to be avenged when killed or injured.

The successes of the burgesses in one petty war after Clients.

another deprived many small communities of their inde- pendent existence, leaving their members bereft alike of their religion, their territory, and their means of subsist- ence. These had to turn elsewhere for protection, and in large numbers they sought it from their conquerors. To many others, both voluntary immigrants and refugees from other cities, the new settlement proved a centre of attrac- tion. It was quite ready to receive them, but as subjects only, not as citizens. Following a custom familiar to both Latins and Sabines, the new-comers invoked the protection of the heads of patrician families of repute, to whom they attached themselves as free vassals. The relationship was known as that of patron and client. (See PaTRoN AND Cii1enT, vol. xviii. p. 412.) The client became a dependent member of his patron's clan,—not gentilis, however, but only gentilicius. His patron had to provide him with all that was necessary for his sustenance and that of his wife

Ple- beians.

Fas.

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and children ; and, as private holdings increased in extent, it was not unusual for the patron or his gens to give him during pleasure a plot of land to cultivate for himself. The patron had, moreover, to assist him in his transactions with third parties, obtain redress for him for his injuries, and represent him before the tribunals when he became involved in litigation. The client, on the other hand, had to maintain his patron's interests by every means in his power. But the advantage must have been chiefly on the side of the client, who, without becoming a citizen, obtained directly the protection of his patron and his clan, and indirectly that of the state.

The plebeians, as distinguished from the clients, must be regarded as a heterogeneous mass of non-gentile freemen, small probably in numbers at first, but augmenting with ever greater rapidity, who had of choice or compulsion

made Rome their domicile, but declined to subject them-

selves toa patron. That there was any general cohesion amongst them before the time of Servius there is not the slightest reason to believe. They were of different races,

settling in Rome from different motives, practising in many

matters different customs. The bulk of them, however, were undoubtedly Latins, with traditions and customs much the same as those of the greater number of the patrician houses ; and this it was that in time caused the triumph of Latinism and the predominance of the master- ful spirit in the jus Quiritium. But by the ruling caste those traditions and customs were simply ignored ; till the time of Servius what protection the plebeians got was simply of the grace of the kings, whose policy it was to conciliate them as a body that in time might be a valuable auxiliary against the pretensions of the patricians.

The Regulatives of Public and Private Order.—We look in vain for, and it would be absurd to expect, any definite system of law in those early times. What passed for it was a composite of fas, jus, and boni mores, whose several limits and characteristics it is extremely difficult to define. This may to some extent be accounted for by the fact that much of what was originally within the domain of Sas, once it had come to be enforced by secular tribunals, and thus had the sanction of human authority, was no longer distinguishable from jus; while it may be that others of its behests, once pontifical punishments for their contraven- tion had gone into desuetude, sank to nothing higher than precepts of bone mores.

By jas was understood the will of the gods, the laws given by heaven for men on earth, much of it regulative of ceremonial, but a by no means insignificant part em- bodying rules of conduct. It appears to have had a wider range than jus. There were few of its commands, prohibi- tions, or precepts that were addressed to men as citizens of any particular state ; all mankind came within its scope. Jt forbade that a war should be undertaken without the prescribed fetial ceremonial, and required that faith should be kept even with an enemy when a promise had been made to him under sanction of an oath. It enjoined hospitality to foreigners, because the Stranger guest was presumed, equally with his entertainer, to be an object of solicitude to a higher power. It punished murder, for it was

the taking of a god-given life; the sale of a wife by her husband, for she had become his partner in all things human and divine; the lifting of a hand against a parent, for it was subversive of the first bond of society and reli- gion,—the reverence due by a child to those to whom he owed his existence ; incestuous connexions, for they defiled the altar ; the false oath and the broken vow, for they were an insult to the divinities invoked ; the displacement of a boundary or a landmark, not so much because the act was provocative of feud, as because the march-stone itself, as the guarantee of peaceful neighbourhood, was under the

Jaus of the Vedas, and the jaes of the Zend-Avesta,

guardianship of the gods. When an offence against any of these rules or prohibitions was inexpiable, the punish- ment was usually what is called sacratio capitis, excom- munication and outlawry of the offender. The homo sacer was in every sense of the word an outcast,—one with whom it was pollution to associate, who dared take no part in any of the institutions of the state, civil or reli- gious, whose life the gods would not accept as a sacrifice, but whom, nevertheless, any one might put to death with impunity as no longer god-protected. The precepts of the jas therefore were not mere exhortations to a blameless life, but closely approached to laws, whose violation was visited with punishments none the less effective that they were religious rather than civil.

Recent philology derives the word jus from the Sanscrit Jus. Ju, to "join, bind, or unite," from which some deduce as its

signification "that which binds," "the bond of society," others "that which is regular, orderly, or fitting." The latest inquirer (M. Bréal) identifies it with the jos, jaos, or words whose exact meaning is controverted, but which he inter- prets as "the divine will." Jubeo is generally allowed to be a contraction of jus hibeo, "hold or take as jus." Tf Bréal's definition can be adopted we obtain a very significant inter- pretation of the words addressed by the presiding magistrate to the

assembled comitia in asking them whether they assented to a law proposed by him,—Velatis, jubeatis, Quirites, &e., "Is it your pleasure, Quirites, and do you hold it as the divine will, that," and so on. As legislation by the comitia of the curies and centuries was regarded as a divine office, and their vote might be nullified by the fathers on the ground that there had been a defect in the auspicia, and the will of the gods consequently not clearly ascertained, this explanation of Bréal's seems not without support,—voxr populi vox dei. If it be right, then the only difference between fas and jus was that the will of the gods, which both embodied, was in the one declared by inspired and in the other by merely human agency.

This jus might be the result either of traditional and inveterate custom (jus moribus constitutwm) or of statute (lex). We look in vain for any legislative enactment establishing such an institution, for example, as the patria potestas, or fixing the rules of succession on death. Statute may have regulated some of their details ; but they had taken shape and consistency before Rome had its beginning. It can well be believed, however, that in the outset the customs in observance may have been far from uniform, that not only those of the different races but those also of the different gentes may at first have varied in some respects, but undergoing a gradual approximation, and in course of time consolidating into a general jus Quritium. That the bulk of the law was customary is universally admitted. But Pomponius speaks of certain laws enacted by the comitia of the curies, which he calls leges regiae and which, he says, were collected by one Sext. Papirius in the reign of one of the Tarquins, under the name of Jus Papirianum. The opinion of the best autho- rities is that it is a mistake to attribute these so-called "royal laws" to that assembly. According to the testi- mony of the old writers it had very little share in the work

1 There is controversy about the etymology of the word lex. It was used by the jurists in two distinct senses—(1) as meaning a comi< tial enactment (Gai., i. 3), and hence was occasionally called lex publica (Gai., ii. 104, iii. 174) ; (2) as meaning an obligation, restriction, con- dition, declaration, or what not, expressly incorporated in a private deed (lex privata), as in the phrases lex mancipit, lex contractus, lex testamenti, &c.

Its most likely derivation is from Aéyerv, "to say" or "'to speak." The lex publica was always put to the comitia by word of mouth; and the XII. Tables, in declaring the binding effect of a lex privata when grafted on a conveyance or contract per aes et

Libram, use in reference to it the phrase uti lingua nuncupassit (Festus, s.v. Nuncupata; Bruns, Fontes Jur, rom. antiqui, p. 23).

Boni mores.

Quiri- tian family.

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of legislation. Romulus jura dedit at his own hand, not jura tulit. Mommsen is probably near the mark when he describes the leges regiae as mostly rules of the fas which were of interest not merely for the pontiffs but for the public, with which it was of importance that the latter should be acquainted, that they might know the risks they incurred from their contravention.! It is not to be assumed that there was no legislation beyond this; some of the laws of which we have record were of a different character. But on the whole it seems beyond doubt that it was custom rather than statute that was the main factor of the jus of the regal period.

What went by the name of bone mores, quite distinct from the jus mortbus constitutum, must also be regarded as one of the regulatives of public and private order. Part of what fell within their sphere might also be ex- pressly regulated by fas or jus; but there was much that was only gradually brought within the domain of these last, and even down to the end of the republic not a little that remained solely under the guardianship of the family tribunal or the censor's regimen morum. Its function was twofold: sometimes it operated in restraint of law by con- demning—though it could not prevent—the ruthless and unnecessary exercise of legal right, as, for example, that of the head of a house over his dependants; and sometimes it operated supplementarily, by requiring observance of duties that could not be enforced by any compulsitor of law. Dutiful service, respect, and obedience from inferiors to superiors, chastity, and fidelity to engagements, express or implied (ides), were

among the officca that were thus inculcated, and whose neglect or contravention not only affected the reputation but often entailed punishments and disabilities, social, political, or religious. It was the duty of those in authority to enforce their observance by such animadversio as they thought proper,—the paterfamilias in his family, the gens among its members, the king in relation to the citizens generally ; and many a wrong was prevented not by the fear of having to make reparation to the party injured but by the dread of the penalties that would follow conduct unbecoming an upright citizen.

The Quiritian Family.—The word familia in Roman law had at once a more extensive and a more limited meaning than it has in its English form.? Husband, wife, and children did not necessarily constitute an independent family among the Romans, nor were they all necessarily of the same one. Those formed a family who were all subject to the right or power—originally manus,? but latterly jus—of the same family head (paterfamilias). He might have a whole host dependent on him,—wife and sons and daughters, and daughters-in-law, and grand-

1 The most recent and comprehensive treatise on the subject of the Royal Laws, which also contains references to the earlier literature, is that of Voigt, Ueber die Leges Regiae, Leipsic, 1876, 1877 (republished from the Transactions of the Saxon Academy). A collection of them from Livy, Dionysius, Plutarch, Servius, Macrobius, &c., will be found in Bruns, p. 1 sg. Of the Jus Papirianum referred to by Pomponius no remains are extant; but Paul (Dig. 1. 16, fr. 144) mentions inci- dentally that it was commented on by one Granius Flaccus, who was of the time of Julius Cesar.

2 Familia and " family" are used in this section solely to designate the group of persons subject to the same paterfamilias. Occasionally the word meant (1) a gens (or group of families in the stricter sense) ; or (2) the family estate proper, as in the provisions of the XII. Tables about succession—dadgnatus proximus familiam habeto; or (3) the family slaves collectively, as in the phrases fumilia urbana, familia rustica.

3 This word manus, though in progress of time used chiefly to express the power a husband had over the wife who had become a member of his

family, was originally the generic term for all the rights exercised not only over the things belonging but also the persons subject to the head of the house; for a slave when enfranchised was said to be " manumitted,'? and the same phrase was also employed occasionally to express the condition of a jiliusfamilias released from the potestas, although " emancipated" was the usual one.

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children by his sons, and possibly remoter descendants related through males; so long as they remained subject to him they constituted but one family, that was split up only on his death or loss of citizenship. But if his wife had not passed in manum—and that was common enough even during the republic, and universal in the later empire —she did not become a member of his family: she re- mained a member of the family in which she was born, or, if its head was deceased or she had been emancipated, was the sole member of a family of her own. Both sons and daughters on emancipation ceased to be of the family of the paterfamilias who had emancipated them.

With the early Romans, as with the Hindus and the Marriage.

Greeks, marriage was a religious duty a man owed alike to his ancestors and to himself. Believing that the happi- ness of the dead in another world depended on their proper burial and on the periodical renewal by their descendants of prayers and feasts and offerings for the repose of their souls, it was incumbent upon him above all things to per- petuate his race and his family cult. In taking to him- self a wife, he was about to detach her from her father's house and make her a partner of his family mysteries. With the patrician at least this was to be done only with divine approval, ascertained by auspicia. His choice was limited to a woman with whom he had conubiwm (ervyapia) or right of intermarriage. 'This was a matter of state arrangement ; and in the regal period Roman citizens could have it outside their own bounds only with menibers of states with which they were in alliance, and with which they were connected by the bond of common religious observances. A patrician citizen, therefore, if

his marriage was to be reckoned lawful (justae nuptiae), had to wed either a fellow-patrician or a woman who was a member of an allied community. The ceremony was a religious one, conducted by the high priests of the state, in presence of ten witnesses, representatives probably of the ten curies of the bridegroom's tribe, and was known as confarreatio. Its effect was to dissociate the wife entirely from her father's house and to make her a member of her husband's ; for confarreate marriage involved what was called in manum conventio, the passage of the wife into her husband's "hand" or power, provided he was himself paterfamilias ; if he was not, then, though nominally in his hand, she was really subject like-him to his family head. Any property she had of her own—which was a possible state of matters only if she had been independent before marriage—passed to him as a matter of course; if she had none, her pater- familias provided her a dowry (dos), which shared the same fate. Whatever she acquired by her industry or otherwise while the marriage lasted also as a matter of course fell to her husband. In fact, so far as her patri- monial interests were concerned, she was in much the same position as her children ; and on her husband's death she had a share with them in his inheritance as if she had been one of his daughters. In other respects manus conferred more limited rights than patria potestas; for Romulus is said to have ordained that, if a man put away his wife except for adultery or one of two or three other very grave offences, he forfeited his estate half to her and half to Ceres, while if he sold her he was to be given over to the infernal gods.

The patria potestas was the name given to the power Patria exercised by a father, or by his paterfamilias if he was potestas.

himself in potestate, over the issue of such justae nuptiae.

Adroga- tion and adoption.

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The Roman jurists boasted that it was a right enjoyed by none but Roman citizens; and it certainly was peculiar to them in this sense, that nowhere else, except among the Latin race from which they had sprung, did the paternal power attain such an intensity. The omnipotence of the

puterfamilias and the condition of utter subjection to him of his children im potestate became greatly modified under the empire ; but originally the children, though in public life on an equality with the house father, in private life, and so long as the potestas lasted, were subordinated to him to such an extent as, according to the letter of the law, to be in his hands little better than his slaves. They could have nothing of their own: all they earned was his ; and, though it was quite common when they grew up for him to give them peculia, "cattle of their own," to manage for their own benefit, these were only de facto theirs, but de jure his. For offences committed by them outside the family circle, for which he was not prepared to make amends, he had to surrender them to the injured party, just like slaves or animals that had done mischief. If his right to them was disputed he used the same action for its vindication that he employed for asserting his owner- ship of his field or his house: if they were stolen, he pro- ceeded against the thief by an ordinary action of theft ; if for any reason he had to transfer them to a third party, it was by the same form of conveyance that he used for the transfer of things inanimate. Nor was this all; for, according to the old formula recited in that sort of adop- tion known as adrogation, he had over them the power of life and death, jus vitae necisque. This power was subject to certain restrictions during the infancy of a child; but, when he had grown up, his father, in the exercise of his domestic jurisdiction, might visit his mis- conduct, not only in private but in public life, with such punishment as he thought fit, even banishment, slavery, or death.

It might happen that a marriage was fruitless, or that a man saw all his sons go to the grave before him, and that the paterfamilias had thus to face the prospect of the extinction of his family and of his own descent to the tomb without posterity to make him blessed. To obviate so dire a misfortune he resorted to the practice of adop- tion, so common in India and Greece. If it was a pater-

familias that he adopted the process was called adroga-

tion (adrogatio) ; if it was a filiusfamilias it was simply adoptio. The latter, unknown probably in the earlier regal period, was a somewhat coniplicated conveyance of a son by his natural parent to his adopter, the

purpose of course being expressed ; its effect was simply to transfer the child from the one family to the other. But the former was much more serious, for it involved the extinction of one family! that another might be perpetuated. It was therefore an affair of state. It had to be approved by the pontiffs, who probably had, to satisfy themselves that there were brothers enough of the adrogatee to attend to the interests of the ancestors whose cult he was renouncing ; and on their favourable report it had to be sanctioned by a vote of the curies, as it involved the deprivation of his gens of their possible right of succession to him. The result was that the adrogatus, from being himself the head of a house, sank to the position of a jfiliusfamilias in the house of his adopting parent ; if he had had wife or child- ren subject to him, they passed with him into his new family, and so did everything that belonged to him and that was capable of transmission from one person to another, The adopting parent acquired potestas and power of life and death over the adopted child exactly as if he were the issue of his body ; while the latter enjoyed in his

u A paterfanvilias who had no person subject to him constituted a "family" in his own person.

new family the same rights exactly that he would have had if he had been born in it.

The manus and the patria potestas represent the master- Domestic

ful aspects of the patrician's domestic establishment. conjugal and parental ones, however, though not so pro- minent in the pages of the jurists, are not to be lost sight of. The Roman family in the early history of the law was governed as much by fasas by jus. It was an associa- tion hallowed by religion, and held together not by might merely but by conjugal affection, parental piety, and filial reverence. The purpose of marriage was to rear sons who might perpetuate the house and the family sacra. In entering into the relationship the wife renounced her rights and privileges as a member of her father's house; but it was that she might

enter into a lifelong partnership with her husband, and be associated with him in all his family interests, sacred and civil. The husband was priest in the family, but wife and children alike assisted in its prayers, and took part in the sacrifices to its lares and penates. As the Greek called his wife the house-mistress, Seo7ouwva, so did the Roman speak of his as materfamilias,? the house-mother. She was treated as her husband's equal. As for their children, the potestas was so tempered by the natural sense of parental duty on the one side and filial affection on the other that in daily life it was rarely felt as a grievance; while the risk of an arbitrary exercise of the domestic jurisdiction, whether in the heat of passion or under the impulse of justifiable resentment, was guarded against by the rule which required the paterfamilias to consult in the first place the near kinsmen of his child, maternal as well as paternal. Even the incapacity of the subject members of the family to hold property of their own cannot in those times have been regarded as any serious hardship ; for, though the legal title to all their acquisitions was in the house-father, yet in truth they were acquired for and belonged to the family as'a whole, and he was but a trustee to hold and administer them for the common benefit.

In Greece the patria potestas never reached sucli dimensions as in Rome, and there it ceased, de facto at least, when a son had grown up to manhood and started a household of his own. But in Rome, unless the pater- Jamilias voluntarily put an end to it, it lasted as long as the latter lived and retained his status. The marriage of a son, unlike that of a daughter passing into the hand of a husband, did not release him from it, nor did his children become subject to him so long as he himself was in potestate. On the contrary, his wife passed on marriage into tle power of her father-in-law, and their children as they were born fell under that of their paternal grand- father ; and the latter was entitled to exercise over his daughters-in-law and grandchildren the same rights he had over his sons and unmarried daughters. But there was this difference, that, when the paterfamilias died, his sons and daughters who had remained in potestate and his grandchildren by a predeceased son instantly became their own masters (su juris), whereas grandchildren by a surviving son simply passed from the potestas of their grandfather into that of their father.

Itg relations,

The acquisition of domestic independence by the death Guard- of the family head frequently involved the substitution of i@nship

the guardianship of tutors (tutela) for the potestas that °

had come to an end. This was so invariably in the case of females sui juris, no matter what their age: they remained under guardianship until they had passed by marriage in manum mari. It was only pupil males, however, who re- quired tutors, and their office came to an end when puberty

2 Materfamilias is used in the texts in two distinct senses, —(1) as

a woman sui juris, t.e., not subject to any family head, and (2) as a wife in manu maritt.

f tutors,

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was attained. It is doubtful whether during the regal period a testamentary appointment of tutors by a husband or parent to wife or children was known in practice,— probably not. If so the office devolved upon the gens to which the deceased paterfamilias belonged ; and it may

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however, were not the property of their occupant ; it was the lands acquired by assignation or purchase that were alone regarded as his ex jure Quiritiwm,—what he held in independent ownership to him and his heirs according to the law and custom of the Quirites.

reasonably be assumed that it delegated the duties to one of its members in particular, retaining in its collective capacity a right of supervision.

There are some who maintain that in the regal period, Property anterior to the reign of Servius Tullius, there was no pri-i2 mov- vate property in movables. The proposition thus broadly ables.

Quiri- The Quritian Law of Property.—The distribution of | stated is manifestly untenable. If no more be meant by tiaulaw Jand amongst the early Romans is one of the puzzling | it than this, that movables were not then recognized as – problems of their history. The Servian constitution classi- | objects of quiritarian right that could be vindicated as in land, fied the citizens and determined their privileges, duties, | such by a real action per sacramentum, it may be ad-

and burdens according to the extent of their freeholds ; and yet we know very little with certainty of the way in which these were acquired.!. We have indeed a traditional account of a partition by Romulus of the little territory of his original settlement into three parts, not necessarily of equal dimensions, one of which was intended for the maintenance of the state and its institutions, civil and religious, the second (ager publicus) for the use of the citizens and profit of the state, and the third (ager privatus) for subdivision among his followers. Varro and Pliny further relate that to each of them he assigned a home- stead (heredium) of two jugers, equal to about an acre

mitted that down to the time of Servius, with exception perhaps of captured slaves and cattle, there was no pro- perty in movables. But, if it be meant to negative the right of a man to alienate by tradition what he held as his own, and to protect himself, or have protection from the authorities, against any attempt to deprive him of it by theft or violence, then the non-existence of ownership of movables must be emphatically denied. Theft was theft, though the stolen article had been acquired only by natural means,—by barter in the market, by the industry of the maker, or as the product of something already be- longing to its holder.

The Quiritian Law of Succession.—The legal order of Quiri- succession in the regal period was extremely simple. It tian law was this: on the death of a paterfamilias his patrimony ke

and a quarter, to be held by him and his heirs (quae here- dem sequerentur),—Pliny adding that to none did the king

give more. There can be no doubt that a portion of the territory, gradually augmented through new conquests, was reserved as ager publicus ; that is sufficiently attested by the complaints made for centuries by the plebeians of its monopolization by the patricians. But it is impossible to admit the accuracy of the account of the mode in which the ager privatus was dealt with. The fact that the majority of the Servian local tribes bore the names of well-known patrician gentes leads to the conclusion that many at least of the clans held tracts of land in their corporate capacity, and. that their constituent families settled alongside each other, each with its own homestead in separate and independent right. It can hardly be assumed, however, that two and a half jugers was its maximum. Seven jugers, about 44 acres, seems to have been the normal extent of royal grants to plebeians, and a patrician's freehold is not likely to have been less ; probably in the ordinary case it was larger, seeing the ininimum qualification for the third Servian class was ten jugers, and for the first twenty.? To enable him to make grants during pleasure to his clients he must have held more than seven. But he did not necessarily hold all his lands by gratuitous assignation either from the state or from his gens; purchase from the former was by no means uncommon ; and it may have been on his purchased lands, outside his herediwm proper, that his clients were usually employed. 'Those dependants were also employed in large numbers upon those parts of the ager publicus which were occupied by the patricians under the name of possesscones,

and which really were the source of their wealth. These,

1 See Giraud, Recherches sur le droit de propriété chez les Romains, Aix, 1838 (only first vol. published) ; Macé, LWistoire de la propriété, du domaine public, et des lois agraires chez les Romains, Paris, 1851 ; Hildebrand, De antiquissinae agris Romani distributionis fide, Jena, 1862; Voigt, " Ueber die bina jugera d. iltesten rom. Agrarverfass- ung," in Rhein. Mus. f. Phil., vol. xxiv. (1869), p. 52 sq., the opinions in which are somewhat modified in his XZ/. Tafein, Leipsic, 1883, vol. i. § 102; Karlowa, Rém. Rechtsgeschiehte, Leipsic, 1885, vol. i. § 15.

2 At the same time the writers of the empire frequently refer to the early herediwm of seven jugers as having been amply sufficient for its frugal owner, content to till it himself with the aid of his sons. The case of Cincinnatus in the year 293 v.c. is often mentioned : having a freehold of just that extent, he had to sell three jugers , to meet engagements for which he believed himself in honour respon- sible, and yet found the remaining four ample enough to maintain him with all the dignity of a man who had been consul and who be- came dictator.

devolved upon those of his children in potestate who by that event became sw juris, his widow taking an equal share with them, and no distinction being made between movables and immovables, personalty and realty; and, failing widow and children, it went to his gens. The notion that between the descendants and the gens came an intermediate class under the name of agnates does not seem well founded as regards the regal period ; they were introduced by the XII. Tables to meet the case of the plebeians, who, having no gentes, were without legal heirs in default of children.®

The later jurists more than once refer to the perfect equality of the sexes in the matter of succession in the ancient law. But it was more nominal than real. A daughter who had passed into the hand of a husband during her father's lifetime of course could have no share in the latter's inheritance, for she had ceased to be a member of his family. One who was én potestate at his death, and thereby became swt juris, did become his heir, unless he had pre- vented such a result by testamentary arrangements. But even then it was in the hands of the gens to prevent risk of prejudice to themselves: for she could not marry, and so carry her fortune into another family, without their consent as her guardians ; neither could she without their consent alienate any of the more valuable items of it; nor, even with their consent, could she make a testament disposing of it in prospect of death. Her inheritance, therefore, was hers in name only ; in reality it was in the hands of her guardians.*

Of primogeniture or legal preference of one member of the family over the others there is not the faintest trace. And yet we find record of hercdia remaining in a family not for generations merely but for centuries,—a

state of matters that would have been im- possible had every death of a paterfamilias necessarily involved a splitting up of the family estate. It is conceivable that this was sometimes prevented by arrangement amongst the heirs themselves ;

3 It is quite true, however, that from the first the order of suc- cession was agnatic; for it was those only of a man's children who were agnate as well as cognate that had any claim to his inheritance ; – and the gens was, theoretically at least, just a body of agnates. The supposed mention of agnates in a law attributed to Numa rests sim- ply on a conjecture of LG. Huschke's (Analecta litteraria, Leipsic, 1826, p. 375). The law, which is preserved in narrative by Servius, In Virg. Eclog.,iv. 43, runs thus: "In Numae legibus cautum est, ut si quis imprudens occidisset hominem, pro capite occisi ct natis ejus in cautione (Scalig., concione) offerret arietem."' Huschke's substitu- tion of agnatis for et natis is all but universally adopted ; but, even were it necessary, it need mean nothing more than his children 17 potestate or his gens.

4 The Voconian law of 585 v.c. avowedly introduced something new in prohibiting a man of fortune from instituting a woman, even his only daughter, as his testamentary heir; but even it did not touch the law of intestacy.

and the practice of every now and then drafting the younger mem- bers of families to colonies diminished the number of those who had a claim to participate. But the simplest plan of avoiding the difficulty was for the paterfamilias to regulate his succession by testament ; and there can be little doubt that originally such a deed was had recourse to, not so much for instituting a stranger heir when a man had no issue—according to patrician notions his duty then was to perpetuate his family by adopting a

son—as for partitioning the succession when he had more children than one.

There were two sorts of testaments made use of by the patricians of the regal period,—that made in the comitia of the curies (test. calates comitiis) and that made in the presence of a few comrades on the eve of battle (test. in procinctu factum). The first at least—and the second was just a substitute for it on an emergency—was far from being an independent exercise of the testator's voluntas. For, though in course of time, and under the sanction of the ute legassit ita jus esto of the XII. Tables, the curies may have become merely the recipients of the oral declara- tion by the testator of his last will, in order that they might testify to it after his death, it is impossible not to see in the comitial testament what must originally have been a legislative act, whereby the testator's peers, for reasons which they and the presiding pontiffs thought sufficient, sanctioned in the particular case a departure from the ordinary rules of succession. The pontiffs were there to protect the interests of religion, and the curies to protect those of the testator's gens; and it is hardly con- ceivable that a testament could have been sanctioned by them which so far set at nought old traditions as to deprive a jilvusfamilias of his birthright, at least in favour of a stranger.

Famaly, Property, and Succession amongst the Plebeians. —If perfect identity of law and custom cannot be assumed to have existed amongst the patricians in the earliest years of Rome, far less can it be supposed to have existed amongst the heterogeneous population that constituted the plebs. A large proportion of them, it is true, were of Latin descent, to whom gentile institutions and the manus and the patria potestas of the family were nothing strange; but alongside of them were other tribes that Rome had vanquished, who had very different traditions, and some of whom, as is thought by one or two writers of note, laid more store on female kinship than on that through males. From the moment that any of the former became part of the Roman plebs everything like gentile organiza- tion was of course suppressed ; public policy could not suffer the continuance of what might have proved an element of danger to the state. The inevitable consequence was a disturbance of the whole family system. Having no longer any clansmen to stand by them in emergencies,

to avenge their quarrels and deaths, and to act as guardians of their widows and orphans, the plebeians of Latin origin seem to have drawn closer in their ideas to their fellows of Etruscan and Hellenic descent, and to have transferred their regards to the circle of their relatives by blood and marriage (cognati et adfines). It is remarkable that, not- withstanding the pre-eminence given to agnates by the AIT. Tables in matters of tutory and succession, the law reserved to the cognates, as distinguished from the agnates, certain rights and duties that in patrician Rome must have belonged to the gens,—tfor example, the duty of prosecut- ing the murderer (originally of avenging the death) of a kinsman, and the right of appeal against a capital sen- tence pronounced upon a kinsman. This can only have been because in olden times, when agnation was unknown as distinet from the gens, it was plebeian practice to entrust those rights and duties to the sobrinal circle of cognates, 1

In the discussions on the Canuleian law in the year 309

? On this subject see Klenze,

Das Familienrecht der Cognaten und Afinen nach rém. u, verwandten

Kechten, Berlin, 1828,

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U.c. it suited the line of argument of patrician orators to decry plebeian unions as something not deserving of the name of nuptiae, and to stigmatize them as mere matri- monia,—relations entered into between men and women for the sake of making the latter mothers, but involving none of those features that characterized patrician mar- riage.? That there may have been laxity amongst many of the plebeians in their domestic relations is extremely probable. them, and coemption (as seems likely) was not yet in- vented, so that the only way of contracting a marriage

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The ceremony of confarreation was denied to

that was open to them was simple interchange of consent, which was not legally creative of manus. Whether it was creative of patria potestas over the issue of the union may

be doubted. Some of the plebeians may have been of opinion that it did create it and may de facto have ex-

ercised the right it conferred, while others may have been indifferent as to whether it did or not; but we may be

very sure that the patricians denied its possibility, on

the ground that it was a prerogative of Roman citizens, amongst whom the plebeians had no claim to rank.

The accounts of the early distributions of land amongst Property,

the plebeians are even more uncertain than those we have of its distribution amongst the patricians. They had un- doubtedly become freeholders in large numbers before the Servian reforms. But they probably attained that position only by gradual stages. There are indications that their earliest grants from the kings in their character of royal clients (as Cicero calls them) were only during pleasure ; but latterly, as they increased in numbers and importance, they obtained concessions of heredia varying in extent from two to seven jugers. That those who had the means also frequently acquired land by purchase from the state may be taken for granted. In fact there is good reason to believe that by the time of Servius the plebeians were as free to hold land in private property as the patricians, although the stages by which they reached equality in this respect are uncertain and difficult to follow. As for movable property their rights in it were presumably the same as those of the patricians.

As regards the law of succession it may safely be assumed Succes- that by custom at all events the children of a plebeian usu- sion, wa ally took his estate on his death. But, as he was not athe ple. member of a gens, there was no provision for the devolu- peians, tion of his succession on failure of children. The want of them he could not supply by adrogation, as he had for long no access to the assembly of the curies ; and it is very doubtful if adoption of a jiliusfamilias was known before the reforms of Servius Tullius. The same cause that dis- quahfied him for adrogating a

paterfamilias disqualified him for making a testament calatis comitiis ; and even one in procinctu was impossible, since, although before the time of Servius plebeians may occasionally have served in the army, they were not citizens, and so had not the requisite capacity for making a testament. Until there- fore the XII. Tables introduced the succession of agnates a plebeian unsurvived by children was necessarily heirless,— that is to say, heirless in law. But custom seems to have looked without disfavour on the appropriation of his herediwm by an outsider : a brother or other near kinsman would have the earliest opportunity, and, if he maintained his possession of it in the character of heir for a reason- able period, fixed by the XII. Tables at a year, the law dealt with him as heir, and in course of time the pontiffs imposed upon him the duty of maintaining the family sacra. This was the origin, and a very innocent and laudable one, Re ee

? The same notion accounts for the grammatically untenable ex- planation of patricii in Liv., x. 8, § 10, "Qui patrem ciere possunt," t.€., patricians were father's sons, while plebeians, before they were admitted to citizenship and conubium, were only reckoned mother's sons,

Contract and its breach.

REGAL PERIOD. |

of the usucapio pro herede, which Gaius condemns as an incomprehensible and infamous institution, and which un- doubtedly lost some of its raison Wétre once the right of succession of agnates had been introduced.

Contract and its Breach.—To speak of a law of obliga- tions In connexion with the regal period, in the sense in which the words were understood in the later jurispru- dence, would be a misapplication of language. It would be going too far to say, however, as is sometimes done, that before the time of Servius Rome had no law of con- tract ; for men must have bought and sold, or at least bartered, from earliest times,—must have rented houses, hired labour, made loans, carried goods, and been parties to a variety of other transactions inevitable amongst a people engaged to any extent in pastoral, agricultural, or trading pursuits. It is true that a patrician family with a good establishment of clients and slaves had

within itself ample machinery for supplying its ordinary wants, and was thus to a great extent independent of outside aid. But there were not many such families ; and the plebeian farmers and the artisans of the guilds were in no such for- tunate position. There must therefore have been contracts and a law of contract ; but the latter was very imperfect. In barter—for at that time money was not yet in use—with instant exchange and delivery of one conmmodity against another, the transaction was complete at once without the creation of any obligation. But in other cases, such as those alluded to, one of the parties at least must have trusted to the good faith of the other. What was his guarantee, and what remedy had he for breach of engage- ment ?

His reliance in the first place was on the probity of the party with whom he was dealing,—on the latter's reverence for Fides, and the dread he had of the disapprobation of his fellows should he prove false, and of the penalties, social, religious, or pecuniary, that might consequently be imposed on him by his gens in the case of a patrician, by his guild in the case of a craftsman, or by the king in the case of any other plebeian.! If the party who had to rely on the other's good faith was not satisfied with his promise and the grasp of the right hand that was its seal, he might require his solemn oath (jusjuwrandum) ; and it can hardly be doubted that, whatever may have been the case at a later period, in the time of the earlier kings he who for- swore himself was amenable to pontifical discipline. If he preferred a more substantial guarantee, he took some- thing in pledge or pawn from the other contractor; and, though he had no legal title to it, and so could not recover it by judicial process if he lost possession, yet so long as he retained it he had in his own hand a de facto com- pulsitor to performance. Upon performance he could be forced to return it or suffer a penalty,—not by reason of obligation resulting from a contract of pledge, for the law as yet recognized none, but because, in retaining it after the purpose was served for which he had received it, he was committing theft and liable to its punishment. At this stage breach of contract, as such, does not seem to have legitimated any action for damages or reparation*

1 Such as debarment from gentile or guild privileges, exclusion from right of burial in the gentile or guild sepulchre, fines in the form of cattle

and sheep, &c. ;

2 Some of the old writers (e.g., Liv., i. 21, § 4, xxiii. 9, § 3; Plin., H.N., xi. 45; Serv., In Aen., iii. 687) say that the seat of Fides was in the right hand, and that to give it (promittere dextram,—is this the origin of the word "promise" ?) in making an engagement was empha- tically a pledge of faith. See a variety of texts illustrating the signifi- cance of the practice, and testifying to the regard paid to Fides before foreign influences and example had begun to corrupt men's probity and trustworthiness, in Lasaulx, Ueber d. Kid bei d. Romern, Wiirz- burg, 1844, p. 5 sg.; Danz, Der sacrale Schutz im roin. Rechtsver- kehr, Jena, 1857, pp. 189, 140; Pernice, ZLabeo, vol. ii., Halle, 1878, p. 408 sq.

before the civil tribunals; but it is not improbable that, where actual loss had been sustained, the injured party was permitted to resort immediately to self-redress by seizure of the wrongdoer or his goods. Such self-help was according to the spirit of the time,—not self-defence merely in presence of imminent danger, but active measures for redress of wrongs already completed.

Public and Private Offences and their Punishment.—For Offences anything like a clear line of demarcation between crimes, 24 their

offences, and civil injuries we look in vain in regal Rome. Offences against the state itself, such as trafficking with an enemy for its overthrow (proditio) or treasonable prac- tices at home (perduellio), were of course matter of state concern, prosecution, and punishment from the first. But in the case of those that primarily affected an individual or his estate there was a halting between, and to some extent a confusion of, the three systems of private venge- ance, sacral atonement, and public or private penalty.® It has been attempted to explain the coexistence of these systems by reference to the different temperaments of the races that constituted united Rome; and this certainly is a consideration that cannot be left out of view. But the same sequence is observable in the history of

the laws of other nations whose original elements were not so mixed, the later system gradually gaining ground upon the earlier and eventually overwhelming it. The remark- able thing in Rome is that private vengeance should so long not only have left its traces but really continued to be an active power. It must still have been an admitted right of the gens or kinsmen of a murdered man in the days of Numa; otherwise we should not have had that law of his providing that, where a homicide was due to misadventure, the offering to them of a ram should stay their hands. To avenge the death of a kinsman was more than a right: it was a religious duty, for his manes had to be appeased ; and so strongly was this idea enter- tained that, even long after the state had interfered and made murder a matter of public prosecution, a kinsman was so imperatively bound to set it in motion that if he failed he was not permitted to take anything of the inherit- ance of the deceased. Private vengeance was lawful too at the instance of a husband or father who surprised his wife or daughter in an act of adultery ; he might kill her and her paramour on the spot, though, if he allowed his wrath to cool, he could afterwards deal with her only judicially in his domestic tribunal. The talion we read of in the XII. Tables is also redolent of the wndicta privata, although practically it had become no more than a compulsitor to reparation. And even the nexal creditor's imprisonment of his defaulting debtor (infra, p. 694), which was not abolished until the fifth century of the city, may not unfittingly, in view of the cruelties that too often attended it, be said to have savoured more of private venge- ance than either punishment or procedure in reparation. Hxpiatio, supplicium, sacratio capitis, all suggest offences against the gods rather than against either an individual or the state. But it is difficult to draw the line between different classes of offences, and predicate of one that it was a sin, of another that it was a

crime, and ofa third that it was but civil injury done to an indi- vidual.4 They ran into each other in a way that is somewhat

3 See Abegg, De antiquissimo Romanorum jure criminali, Konigs- berg, 1823, p. 36 sg. ; Rein, Das Criminalrecht der Rémer, Leipsic, 1844, p. 24 sq. ; Clark, Karly Roman Law: Regal Period, London, 1872, p. 34 sq.

4 Voigt (XII. Tafeln, vol. i. p. 484) observes that the patrician looked upon every offence as committed at once against gods and men, and held that the punishment should be one that satisfied both ; hence the deo necart, sacratio capitis, and consecratio bonorum. The plebeians regarded its two moments as separable, and (as appears from the spirit of the XII. Tables) left it to the pontiffs to protect the gods, putting it on the state to protect itself by ordinary death punishment, addiction into slavery, declaration of tmprobitas or intestability, talion, and pecuniary penalties,

Bffect of

Servian reforms,

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perplexing. Apparently the majority of those specially mentioned in the so-called deges regiae and other records of the regal period were regarded as violations of divine law, and the punishments appropriate to them determined upon that footing. Yet in many of them the prosecution was left to the state or to private indi- viduals. It is not clear, indeed, that there was any machinery for public prosecution except in treason and murder, —the former be- cause it was essentially a state offence, the latter because it was comparatively early deemed expedient to repress the blood-feud, which was apt to lead to deplorable results when friends and neighbours appeared to defend the alleged assassin.! ; on

Take some of those offences whose sanction was sacratio capitis. Breach of duty resulting from the fiduciary relation between patron and client, maltreatment of a parent by his child, exposure or kill- ing of a child by its father contrary to the Romulian rules, the ploughing up or removal of a boundary stone, the slaughter of a plough-ox,—all these were capital offences; the offender, by the formula sacer esto, was devoted to the infernal gods. Festus says that, although the rules of divine law did not allow that he should be offered as a sacrifice to the deity he had especially offended (nee Jas est eum immolari), yet he was so utterly beyond the pale of the law and its protection that any one might kil! him with impunity. But, as the saeratio was usually coupled with forfeiture of the offender's estate or part of it to religious uses, it is probable that steps were taken to

have the outlawry or excommunication judi- cially declared, though whether by the pontiffs, the king, or the curies docs not appear; such a declaration would, besides, relieve the private avenger of the incensed god of the chance of future questiou as to whether or not the citizen he had slain was sacer in the eye of the law.

That there must have been other wrongful acts that were regarded in early Rome as deserving of punishment or penalty of soine sort, besides those visited with death, sacratiou, or forfeiture of estate, total or partial, cannot be doubted ; no community has ever been so happy as to know nothing of thefts, robberies, and assaults, The XII. Tables containcd numerous provisions in reference to them ; but it is extremely probable that, down at least to the time of Servius Tullius, the manner of dealing with them rested on custom, and was in the main self-redress, restrained by the inter- vention of the king when it appeared to him that the injured party was going beyond the bounds of fair reprisal, and frequently bought off with a composition. When the offence was strictly within the family, the gens, and perhaps the guild, it was for those who exercised jurisdiction over those corporations to judge of the wrong and prescribe and enforce the penalty.

Lffect of the Servian Reforms on the Private Law.—The aim of the constitutional, military, and financial reforms of Servius Tullius was to promote an advance towards equality between patricians and plebeians. While it may be an open question whether the institution of the comitia of the centuries was of his doing, or only a result of his arrangements in after years, it seems clear that he had it in view to admit the plebeians to some at least of the privileges of citizenship, imposing on them at the same time a proportionate share of its duties and its burdens. Privileges, duties, and burdens were alike to be measured by the citizen's position as a freeholder; the amount of real estate with its appurtenances held by him on quiri- tarlan title was to determine the nature of the military service he was to render, the extent to which he was to be liable for tribute, and, assuming Servius to have con- templated the creation of a new assembly, the influence he was to exercise in it. .

To facilitate the execution of his scheme it was neces- sary to establish a register of the citizens (census), which should contain, in addition to a record of the strength of their families, a statement of the value of their lands and appurtenances, and which should be revised periodically. In order to ensure as far as possible certainty of title, and relieve the officials of troublesome investigations into the genumeness of every alleged change of ownership between two valuations, it was further declared—presumably by Servius—that no alleged transfer would be recognized which had not been effected publicly, with observance of certain prescribed solemnities, or else by surrender in

eo On murder (parrieidium) in regal Rome, see Osenbriiggen, Das altrdmische Paricidium, Kiel, 1841, and review by Dollmann in eee s Krit. Jahrbueh, vol. xi. (1842), p. 144 sg. ; Clark, op. eit., p. 41 sq.

court before the supreme magistrate. The form of con- : veyance thus introduced got the name of mancipium, and

at a later period mancipatio, while the lands and other

things that were to pass by it came to be known—whether from the first or not is of little moment—as res mancipi. Hence arose in the law of property a distinction of great importance, only abolished by Justinian more than a thousand years later, between ves mancipt, which were transferable in quiritarian right only by mancipation or surrender in court, and res nec mancipi, which were trans- ferable by simple delivery.

Mancipation is described by Gaius, but with particular reference Mancipa- to the conveyance of movable res mancipi, as a pretended sale in tion. presence of five citizens as witnesses and a libripens holding a pair of copper scales. The transferee, with one hand on the thing being transferred, and using certain words of style, declarcd it his by purchase with an as (which he held in his other hand) and the scales (hoe aere aeneaque libra) ; and simultaneously he struck the scales with the as, which he then handed to the transferrer as figurative of the price. The principal variation when it was an immovable that was being transferred was that the mancipation did not require to be on the spot: the land was simply described by its known name in the valuation roll. Although in the

time of Gaius only a fictitious sale—in fact the formal conveyance upon a relative contract—yet it was not always so. Its history is very simple. The use of the scales fixes its introduction to a time when coined money was not yet current, but raw copper nevertheless had become a standard of value and in a manner a medium of ex- change. That, however, was not in the first days of Rome. Then, and for a long time, values were estimated in cattle or sheep, fines were imposed in them, and the deposits in the legis aetio sacra- mento (infra, p. 681) took the same form. The use of copper as a Substitute for them in private transactions was probably derived from Etruria. But, being only raw metal or foreign coins, it could

be made available for loans or payments only when weighed in the

scales: it passed by weight, not by tale. 'There is no reason for ' supposing that the weighing was a solemuity, that it had any significance beyond its obvious purpose of enabling parties to ascer-

tain that a vendor or borrower was getting the amount of copper

for which he had bargained.

It was this practice of everyday life in private transactions that Servius adopted as the basis of his mancipatory conveyance, eu- grafting on it one or two new features intended to give it publicity and as it were state sanction, and thus render it more serviceable in the transfer of censuable property. Instead of the parties them- selves using the scales, an impartial balance-holder, probably an oflicial, was required to undertake the duty, and five citizens were required to attend as witnesses, who were to be the vouchers to the census officials of the regularity of the procedure. They are generally supposed to have been intended as representatives of the five classes iu which Servius had distributed the population, and thus virtually of the state; and the fact that, when the parties appealed to them for thcir testimony, they were addressed not as testes but as Quirites lends some colour to this view. Servius is also credited with the introduction of rectangular pieces of copper of different but carefully adjusted weights, stamped by his authority with various devices (aes signatwm), which are usually supposed to have been intended to take the place of the raw metal (aes rude) formerly in use, and so facilitate the process of weighing; but

there is more reason for thinking they were cast and stamped as standards to be put into oue scale, while the raw metal whose weight was to be ascertained was put into the other.

Instead, therefore, of being a fictitious sale, as Gaius describes it, : and asit became after the introduction of coined money early in the 4th century, the mancipiwm or mancipation, as regulated by Servius, was an actual completed sale in the strictest seuse of the term. What were the precise words of style addressed by the trans- feree to the transferrer, or what exactly the form of the ceremonial, we know not. But, as attendance during all the time that some thousands of pounds perhaps of copper were being weighed would have been an intolerable burden upon the five citizens convoked to discharge a public duty, it may be surmised that it carly became the practice to have the price weighed beforehand, and then to reweigh, or pretend to reweigh, before the witnesses only a single little bit of metal (rawduseulwm), which the transferee then handed to the transferrer as " the first pound and the last," and thus repre- sentative of the whole.2 Whatever may have been its form, how-

° The conjecture is suggested by the words of style in the solutio per aes et libram, Gai., iii. §§ 178, 174. There were some debts from which a man could be effectually discharged only by payment (latterly fictitious) by copper and scales in the presence of a libripens and the usual five witnesses. In the words addressed to the creditor by the debtor making payment these occurred—hane tibi libram primam

ever, its effect was instant exchange of property against a price weighed in the scales. The resulting obligation on the vendor to maintain the title of the vendee, and the qualifications that might be superinduced on the conveyance by agreement of parties—the so-called leges manetpiz—will be considered in connexion with the provisions of the XII. Tables on the subject (ifra, p. 690).

the lay writcrs, but these were matters of usage and fashion rather than of law, and it might be, aud often was, accompanied also with religious rites, which, however, were private, not public as iu confarreation. It is common, but not quite accurate, to speak of coemption as a form of marriage. It was strictly the acquisition of manus by the husband over his wife, and probably in most cases

Res The things included in the class of res mancipi were lands and | contemporaneous with the marriage ; but they were really distinct, mancipi. houses held on quiritarian title, together with rights of way and | the latter being completed simply by interchanged consent. That aqueduct, slaves, and domestic beasts of draught or burden (oxen, | this was so latterly at least is evident from two facts,—(1) that, horses, mules, and donkeys) ; all others were res nee maneipt. In | according to Gaius, the eoemptio might follow the marriage at any the time of Servius and during the greater part of the republic the | distance of time; and (2) that, according to the same authority, domain land (ager publiews) in Italy, until it was appropriated by | though the marriage was dissolved by divorce, the manus still private owners, was also reckoned as res nee mancipi ; like all | remained until put an end to by remancipation (on which the other things of the same class, it passed by simple delivery, where- | divorced wife was entitled to insist). as res mancipt could not be transferred in full ownership except It has also been cxplained that the plebeians were in a very Mortis by mancipation or surrender in court. Many theories have been | much worse position than the patricians in regard to their power of causa propounded to account for the distinction between these two classes | disposing of their estatcs in contemplation of death. Their eleva- convey- of things, and to explain the principle of selection that admitted | tion to the rank of citizens did not apparently give them admission ance per oxen and horses into the one, but relegated sheep and swine, ships | to the comitia of the curies; and, as it was many years after the aes et

and vehicles, to the other. But there is really little difficulty. Under the arrangement of Servius what was to determine the nature and extent of a citizen's political qualifications, military duties, and financial burdens was the value of his heredium (and other freeholds, if he had any), and

what may be called its appur- tenances—the slaves that worked for the household, the slaves and beasts of draught and burden that worked the farm, and the servi- tudes of way and water that ran with the latter. It may be that in course of time slaves without exception were dealt with as res mancipi,—without consideration, that is to say, whether they were employed on their owner's house or farm or on any part of the public lands in his occupancy—and reasonably, because they were often shifted from the one to the other. But the cattle a man depastured on the public meadows were no more res mancipi than his sheep. To say that the things classed as res maneipi were selected for that distinction by Servius because they were what were essential to a family engaged in agricultural pursuits would be to fall short of the truth. They constituted the familia in the sense of the family estate proper; whereas the herds and flocks, and in time everything clse belonging to the paterfamilias, fell under the denomination of peewnia. So the words are to be under- stood in the well-known phraseology of a testament, familia

assassination of Servius before the comitia of the centuries was con-libram.

vened, they had still no means of making testaments unless perhaps in the field on the eve of battle. So here again the expedient of mancipation was taken advantage of, not indeed to make a testa- ment instituting an heir, and to take effect only on the death of the testator, —the form of the transaction, as an instant acquisition in exchange for a price real or nominal, could not lend itself to that without statutory intervention—but to carry the transferrer's familia! to a friend, technically familiac emptor, on trust to let the former have the use of it while he survived,? and on his death to distribute according to his instructions whatever the transferee was not authorized to retain for himself. Like so mauy others of the transactions of the carly law, it was legally unprotected so far as the third parties were concerned whom the transferrer meant to benefit ; they had no action against the trustee to enforce the trust ; their sole guarantee was in his integrity and his respect for Fides. Dionysius credits Servius with the authorship of more than fifty enactments relative to contracts and crimes, which he says were sub- mitted to and approved by the assembly of the curics. The great majority of those so-called enactments

were probably nothing more than formularizations of customary law, for the use of the private judges in civil causes whom the king is said to have instituted.

peeuniague mea. There was one contract, however, notorious in after years under the Con- The public solemnity of mancipatio thus sanctioned as | uame of nexuwm, that manifestly was influenced, either directly or tract : ONGni 6 ‘ indirectly, by his legislation. In its normal estate it was a loan of per aes a mode of transferring ‘ eae a i eee 1 money, or rather of the raw copper that as yet was all that stood et libram.

*for which manus was probably as yet the only technical | for it: Whether before the time of Servius it was accompanied by descriptive word in use, was not long of being adapted to | any formalities beyond the weighing of it in a pair of scales (which other transactions in which manus of a different sort was he eae than Soo * ae te , ma what right it c __ ; ee conferred on the creditor over his debtor who failed to repay can ea be. Lig ers for Siete ibe ape panics ae only be mattcr of speculation. But there are indications that, in adoption of a jiliusfamalias, the contract of newwm, release | thc exercise of undefined self-help, defaulters were treated with con- of a nexal debtor, and that mortis causa alienation of his | siderable severity, being taken in satisfaction and put in chains by estate by a plebeian which in time developed into the testa- | their creditors ; for Servius is reported to have promised to pay ment per aes et Vien their debts himself in ps to obtain Ea release, and to pass ; xs be*

per aes et Servius, the matrimonial unions of the plebeians were not, in the

librani.

estimation of the patricians at least, regarded as lawful marriages (justae nuptiae), although amongst themselves they may have been held effectual and productive, if not of manus, at all events of patria potestas. For this there were two reasons: (1) not being citizens, they did not possess the preliminary qualification for justae nuptiae, namely, conubium; and (2) not being patricians, the only ceremony of marriage known to the law was incompetent to them. The first obstacle was removed by their admission

by Servius to the ordinary rights of citizenship, the second by the in- troduction of the civil ceremony of coemption. Once the efficacy of mancipation as a mode of acquiring manus over things was established, its adoption by the plebeians, now citizens enjoying conubium, as a method of acquiring manus over their wives was extremely natural. The scales, the Jibripens, and the five wit- nesses were all there; but, as there was no real price to be paid, the only copper that was needed was a single rawduseulum. The words recited in the ccremonial, unfortunately not preserved, were necessarily different from those in an ordinary mancipation, and, according to the testimony of a considerable number of ancient writers, and as the word co-emptio itself seems to indicate (though this is disputed by most modern civilians), the nominal purchase was mutual; the man acquired a materfamilias who was to bear him children and enable him to perpetuate his family, while she ac- quired a paterfamilias who was to maintain her while the marriage lasted, and in whose succession she was to share when a widow. It was accompanied with other observances described by many of

postremamque expendo ('I weight out to you this the first and the last pound"). The idea is manifestly archaic, and the words, taken strictly, are quite inappropriate to the transaction in the form it had assumed long before the time of Gaius.

his promise we are not informed ; but the second part of it was impracticable, since a debtor's failure to repay a loan was in most cases attributable to his insolvency and want of means with which to satisfy his creditor. So, apparently, Servius had to be content with regulating and ensuring the publicity of the contract, and making a creditor's right of self-redress by apprehension (manus injeetio) and confinement of his debtor conditional on the obser- vance of the prescribed formalities of the newwm. These were the weighing of the copper that was being advanced in a pair of scales held by an official /ibripvens ; the reweighing of a single piece in the presence of five citizen witnesses, and its delivery by the lender as representing the whole; and the simultaneous recital of certain words of style, which had the effect of imposing on the borrower an obligation to repay the loan, usually with interest, by a certain day.

‘The consequence of this, the earliest independent contract of the jus civile, is explained in p. 693.

Servian Amendments on the Course of Justice.—Of the course of justice in the regal period, whether in criminal or civil matters,

1 The familia was the collective name for a man’s heredium and other lands, with their slaves and other mancipable appurtenances —an aggregate of res mancipi, and therefore itself capable of mancipa- tion. ‘The conveyance was universal, z.¢., the items of the aggregate, even though movable, did not require to be conveyed separately or to be handled in conveying ; and apparently the peeunta was carried along with the familia as an accessory, at least if expressly mentioned.

2 Sir Henry Maine (Ancient Law, p. 206) is of opinion that, as a mancipation could not be subject to a limitation either of condition or time, there must have been not only instant but total divestiture of the transferrer, But that this was not necessarily the result is shown infra, p. 691.

Early course of justice.

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before the time of Servius we know little that can be relied on. Antiquity used to speak of the king as having been generally supreme in both. But this can be accepted only with considerable reservation. For the paterfamilias, aided by a council in cases of importance, was judge within the family, —his jurisdiction some- times excluding that of the state, at other times concurring with it, and not to be stayed even by an acquittal pronounced by it. He alone was competent in any charge against a member of the family for a crime or offence against the domestic order,— adultcry or unchastity of wife or daughter, immorality of his sons, unduti- ful behaviour of children or clients; while there are instances on record of his interference judieially where an offence such as murder or theft had been committed by a member of his family against a stranger, and even when his crime had been treason against the state. Death, slavery, banishment, expulsion from the family, imprisonment, chains, stripes,

withdrawal of peculium, were all at his eommand as punishments; and it may readily be assumed that in imposing them he was freer to take account of moral guilt than an outside tribunal. The indications of criminal jurisdiction on the part of the gens are slight ; but its organization was such that it is impossible not to believe that it must occasionally have been called on to exercise such functions. And it must not be lost sight of that, as murder secms to have becn the only crime in regard to which private revenge was absolutely excluded, the judicial office of the kings must have been considerably lightened, public opinion approving and not condemning self-redvess so long as it was kept within the limits set by usage and custom.

The boundary between civil and criminal jurisdiction, if it ex- isted at all, was extremely shadowy. Theft and robbery, for ex- ample, if one may conclude from the position they held in the later jurisprudence, were regarded not as public but as private wrongs ; and yet when a thief was caught plying his trade by night he might be slain, and when taken in the act by day might be sold as a slave. But in both cases it may also be assumed that a practice,

. afterwards formally sanctioned by the XII. Tables—that of the

- the wrongdoer,

The king as Judge.

Servian reforms,

thief compounding for his life or freedom—was early admitted, and the right of self-redress thus made much more beneficial to the party wronged than when nothing was attained but vengeance on In assaults, non-manifest thefts, and other minor wrongs, self-interest would in like manner soon lead to the general adoption of the practice of compounding ; what was originally a matter of option in time came to be regarded as a right; and with it there would be occasional difficulty in settling the amount of the composition, and consequent necessity of an appeal toa third party. Here seems to be the origin of the king's jurisdiction in matters of this sort. He was the natural person to whom to refer such a

dispute ; for he alone, as supreme magistrate, had the power to use coercion to prevent the party wronged insistin g on his right of self-redress, in face of a tender by the wrongdoer of what had been de- clared to be sufficient reparation. But that self-redress was not stayed if the reparation found due was withheld; as the party wronged was still entitled at a much later period to wreak his venge- ance upon the wrongdoer by apprehending and imprisoning him, it cannot reasonably be doubted that such also was the practice of the regal period.

How the kings acquired jurisdiction in questions of quiritarian right, such as disputes about property or inhcritance, is by no means so obvious. Within the family, of course, such questions were impossible, though between clansmen they may have been settled by the gens or its chief. The words of style used in the sacramental real action (infra, p. 682) suggest that there must have been a time when the spear was the arbiter, and when the con- tending parties, backed possibly by their clansmen or friends, were actual combatauts, and victory decided the right. Such a pro- cedure could not long survive the institution of a state. In Rome there seems to have becn very early substituted for it what from its general complexion one would infer was a submission of the question of right to the pontiffs as the repositories of legal lore. Their proper functions, however, were sacred, So, to bring what was a question of purely civil right within their jurisdiction, they engrafted on it a sacral element, by requiring each of the parties to make oath to the verity of his contention ; and the point that in form they decided was which of the two oaths was false and there- fore to be made atonement for. In substance, however, it was a finding on the real question at issue ; and the party in whose favour it was pronounced was free to make it effectual if necessary by self-redress in the ordinary way.

Of Servius, Dionysius says—using, as he often docs, language more appropriate to the republican than to the regal period—that he drew a line of separation between public and private judicial processes, and that, while he retained the former in his own hands, he referred the latter to private judges, aud regulated the procedure to be followed in causes brought before them. Something of the sort was absolutely necessary. He

was cnormously increasing the number of the citizens,—that is to sa , of those who were to enjoy right,—and multiplying the

in future the privileges of quiritarian sources of future disputes that would have to be determined by the

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[JUS CIVILE.

tribunals. The nature of the provision madc by him to meet the new aspect of things is much controverted ; but we are disposed to credit him alike with the establishment of the collegiate court of the centumvirs and the institution of the single judge (unus Judes).

The centumviral court and centumviral causes are often referred Centum- to by Cicero, and the range of their jurisdiction seems to have viral included every possible question of manus in the old sense of court. the word,—status of individuals, property and its easements and burdens, inheritance whether testatc or intestate,—in other words, all questions of quiritarian right. By the time of Gaius the only matters apparently that were brought before it were questions of right to an inheritance of the jus civile ; but the spear, the emblem of quiritarian right generally, was still its ensign.

That Servius should substitute for king and pontiffs a numcrous court of citizens, originally, as there is reason to assume, all patri- cians, to try questions of quiritarian right on remit from himself, was quite in accordance with the general spirit of his reforms. It was not mere matters of personal dispute they had to dccide, but they had to build up by their judgments a law which was to be of general and permanent application; and, as it was beyond the power of the king to overtake the task, what could be a more ap- propriate substitute than a court of his counsellors acting under pontifical guidance ?

But there were many cases requiring judicial assistance in which Unus no question of quiritarian right had to be determined, but only judex. one of personal claim—of alleged indebtedness, whether arising out of a legal or

illegal act, denied either zx foto or only as to its amount. Matters of that sort were supposed to involve no general principle of law, but to be rather mere disputes or differences about facts, which could well be decided by a single judge. To meet their case the wnws judex was introduced ; he was appointed for each case as it arose, and acted really as the king's commissioner.

This was the beginning of a system that bore wondrous fruit in after years, and that, as will be shown in the sequel, eventually displaced altogether the more imposing court of the centumvirs.

CHAPTER II.—THE JUS CIVILE.

(From the Establishment of the Republic until the Subjuga- tion of Central and Southern Italy.)

I. ForMATIVE AGENCIES OF THE LAW.

The Legislative Bodies of the Period.—The limits and Ple- scope of this article do not permit of any detailed account beians' of the consequences of the change from kings to consuls, once or of the tribulations of the plebeians during the first two ity. \ centuries of the republic. Stage by stage they fought and conquered in the uphill battle for social and political equality. In 260 v.c. they got their own special protectors in their tribunes, with the ediles as their assistants, and Judices decemviri to act under their instructions as arbiters in disputes amongst themselves. In 283 they obtained state sanction for their conciliwm, and recognition of its power to regulate purely plebeian interests. The XII. Tables of 303 were the fruit of their agitation for a revision and written embodiment of the law. It was in deference to their complaints of their practical disfranchisement through the unduly preponderating influence of the patri- clans in the comitia of the centuries that in 305 the comitia of the tribes was instituted. Their repeated pro- tests against the monopolization of the public domain land by members of the higher order resulted at last in the definite recognition of their right to participate in its occupation by one of the Licinian laws of 387. The long course of cruel oppression of plebeian insolvents by their patrician creditors was put an end to by the Peetilian law of 428 abolishing nexal contract, and prohibiting the use of

chains and fetters on persons incarcerated for purely civil debt. By the Hortensian law of 467 the resolutions of the plebeian council (plebiscita) were declared binding not only on the plebeians themselves but on the whole body of the citizens. And from 333, when a plebeian first reached the magistracy through the questorship, down to 502, when they attained to the supreme pontificate, they gradually vindicated their right as citizens to share in all the honours and dignities of the state.

The legislative bodies were thus three in number,—the comitia of the centuries, the conciliwm plebis, and the

Comitia of the centuries.

JUS CIVILE. |

comitia of the tribes. The first, if not organized by Servius Tullius, at all events grew out of his distribution of the populace into classes and centuries according to the value of their freeholds as appearing on the census-list. As just the national army assembled for a peaceful purpose (exercitus civilis), it could be convened and presided over originally only by a magistrate possessing the military imperium, v.¢., a consul; but, after the creation of the censorship in 311 and the preetorship in 387, the holders of those offices were entitled to convoke it,—the former for its assent to arrangements for the census, and the latter for state trials. It was the centuries that passed the XII. Tables; but for the most part their legislation was upon questions affecting public and constitutional rather than private interests. The procedure in the centurlate comitia was somewhat cumbrous. There was publication of the proposed law (promulgatio rogationis) a fortnight before.the day appointed, sometimes one or more meetings (conciones) being held in the interval for its consideration and discussion. When the day arrived, the auspicia were taken by the presiding magistrate, assisted by an augur; if favourable, the citizens were

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more than a plebiscitum, and of force only amongst the plebeians themselves. But there was an exception when, because of some constitutional change proposed by it, the senate had previously sanctioned the legislation, as in the case of the Terentilian law, which paved the way for the XII. Tables, of the Canuleian law authorizing the inter- marriage of patricians and plebeians, of the Licinian laws about the occupation of the public lands, &c.; in such cases, although the final vote was that of the conciliwm, the enactment was binding on the citizens generally, and was spoken of asa dex rather than asa plebiscittum. The latter name seems practically to have been dropped after the Hortensian law had equalized them so far as their effects were concerned. The greater part of the legislation for amending the private law latterly fell to the concilium, owing so far, perhaps, to the greater simplicity of its pro- cedure, but also to some extent to the fact that the pretors preferred making their amendments tentatively by edicts (which were revocable), instead of embodying them in statutes, which, as passed under divine auspices and representing the divine will, could not easily be repealed.

The XII, Tables.—We have already shown the efforts Uncer- made by Servius Tullius to secure that the dispensation of tainty of justice should neither be neglected nor left to caprice or hap- !#

summoned anew by blast of trumpet, and on their assenitbling, which originally they did under arms, prayer and sacrifice were offered by president, pontiffs, and

augurs. A final concio might then be held if thought necessary ; and, after it was over, on the order to "' proceed to the comitia," the citizens marched to the Campus Martius (the formal assembly being incompetent within the city). There the rogatio was read and, if no sign from heaven indicated the dissent of the gods and warned the assembly to disperse, was at once put to the vote— "Ts it your pleasure, Quirites, to hold this as law?" The vote was taken by centuries, those of the knights and the freeholders of full valuation voting first; if they were unanimous it went no further, for these formed more than & majority of the whole comitia. The resolution, if adopted, was populc jussum, but not yet law. It had still to run the gauntlet of the "fathers,"—whether the senate or only its

patrician members is disputed; it was in their power to refuse to authorize it (auctores jierc), usually putting their dissent on the ground that the gods willed it not; but if they ratified it, then it became a Jez, ordinarily getting the name of tle magistrate by whom it had been proposed. The power of veto, however, was considerably qualified by a Publilian law of the year 415, which enacted that in future the "fathers" should grant (or refuse) their auctoritas before the vote was taken.

hazard, one rule to-day and another to-morrow. With the consulate and the disregard of the "royal laws" and of Servius's instructions to the judges all this was changed. The consuls, with their harassing military engagements, could have little time to devote to their judicial functions or properly to instruct those to whom they delegated the duty of investigating and adjudicating on the merits of a complaint ; and the yearly change of magistrates must itself have been a serious obstacle to uniformity either of rule or practice so long as the law rested on nothing but unwritten custom. One can well believe too, when feeling was so embittered between the orders, that it was no rare thing for a consul to use his magisterial punitive powers (coercitio) with undue severity when a plebeian was the object of them, or to turn a deaf ear to an appeal for justice addressed to him from such a quarter. The state of matters had become so intolerable that in the year 292 the demand was made by C. Terentilius Arsa, one of the tribunes, that a commission should be appointed to define in writing the jurisdiction of the magistrates, so that a check might be put on their arbitrary, high- handed, and oppressive administration of what they were pleased to call the law. His colleagues induced him for the moment not to press his demand, which he was urging

Con- The points of difference between the enactments of the | th :

cilium concilium plebis and the later comitia tributa are indicated | with a violence of invective that was unlikely to promote a by Mommsen in a paper in his Researches! (1) The | his object. But next year they made common cause with Se iiiis comitia was an assembly of the whole body of the people, | him, requiring that the whole law, public and private, ofthe voting according to tribes instead of centuries; the should be codified, and its uncertainty thus as far as tribes. conciliwm was an assembly of

plebeians only, also voting | possible be removed. After a few years' resistance the

tributim. (2) The comitia was convened and presided over by a patrician magistrate, not necessarily, however,

senate was induced to give its assent to a demand that in itself was too reasonable to be longer withstood.

The first practical step towards its realization was the Compila- despatch of a mission to Greece and the Greek settlements ee a in southern Italy, to study their statute law and collect 0" ~

with military imperium, and therefore very frequently by the praetor ; whereas the conciliwm could be convened and Tables.

presided over only by a plebeian official, either a tribune or an edile. (3) In the comitia the auspicia had to be taken before the proceedings commenced ; in the concaliwm the will of the gods was not demanded, although listened to if communicated in a thunder-storm or the like. (4) The resolution of the comitia required to be confirmed by the "fathers"; while that of the concilium did not. (5) An enactment of the comitia was a lex, and bound the whole people ; but before the Hortensian law an enact- ment by the conciliuwm plebis was in the ordinary case no

1 "Die Sonderversammlungen der Plebs," in his Rom. Forschungen, vol. i., Berlin, 1864, p. 177 sq.

any materials that might be of service in preparing the projected code. On the return of the ambassadors in 302 all the magistracies were suspended, and a commission of ten patricians (decemviri legibus scribundis) was appointed with consular powers, under the presidency of Appius Claudius, for the express purpose of reducing the laws to writing. Before the end of the ensuing year (303) the bulk of the code was ready, and was at once passed into law by the comitia of the centuries, and engraved or per- haps painted on ten tables of wood, which were exposed in the Forum. Next year the decemvirate was renewed

In form the laws contained in the Tables were of remarkable General brevity, terseness, and pregnancy, with something of a rhythmical charac- cadence that must have greatly facilitated their retention in the teristics,

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with a slight change of personnel, but under the same presidency as before ; and in the course of a few months

it had completed the supplemental matter, which was passed in due form, and displayed on two other tables, thus bringing the number up to twelve and giving the code its official name of Lea XII. Tabularum.

memory. Here and there the rules they embodicd were potestative ; but for the most part they were peremptory, running on broad lines, surmounting instead of removing difficulties. Their application might cause hardship in individual instances, as when a man was held to the letter of what he had declared in a ncxwm or mancipa-

Sources. There were provisions in them that were almost literal renderings tion, even though he had done so under error or influenced by poe ae 'pel Selec Ue be ee Se fraudulent misrepresentations ; the decemvirs admitted no excep- or ine they were directly borrowed. By far the greater pro- eee penne a ae in be ee = spel iosy ae portion of them, however, were native and original,—not that they eee eer Een re Tn ae sep ter peer er eeratio amounted to a general formularization of the hitherto floating Bs ae saecr esto) ca eat ata ae Se, Gate. GR ete customary law, for, notwithstanding Livy's eulogium of them as Teblos i ¢ occlite only omeen marci ttiiie mn tata tee snare the "fountain of the whole law, both pao aoe aca ane to an offence that ould be omenibied eas by a patrician, —material leas that many branes of wee da wth the Tables onl \| Joe caused by apeiron fo hin lint (grow clio frou

; , ; ' 'nent axsit, saccr csto). In all other cases the idea that a crime was an ee i as a A uae Rees nee ae : offence against public order, for which the community was entitled ecient Labi ; in self-protection to inflict

punishment on the criminal, is as pro- ments, the main features of the order of judicial procedure, gud a minent as the older one that it was-a sin against the go Pets ah forth,—of all of these a general knowledge was presumed, and the c feeble : =a aaa decemvirs thought it unnecessary to define them. What they had eet by rg ace ee ae SE eee to do was to make the law equal for all, to remove every chance of aeaile Mites at' tHeeemice pine aed g from the Tarte oale a arbitrary dealing by distinct specification of penalties and precise ie Tl 1 ees t with; th niles. saat declaration of the circumstances under which rights should be held | oye ae ene sera eee ees ee ee ene eee? aL re have arisen or been lost, and to make such eats as were often, poet aie rey , the hanging and eu sue is at oe necessary to meet the complaints of the plebeians and prevent th 8 Bararaleee one ns oe anette ten whom the goods 0 their oppression in the name of justice. Nothing of the customary Te ionit unmonthe Bree. Chee eae eae law, therefore, or next to nothing, was introduced into the Tables Of Hie solde saan ff ori a, Mae CHEN ae Gitta that was already universally recognized, and not complained of as alae pieces be a coal a m4 i cis Bales ~ either unequal, indefinite, defective, or oppressive. Only one or | o…n4tally the same proced a eee ae hee he +h. is two of the laws ascribed to the kings reappeared in then, and that | 4 agit; uM – p aan Alea ae aa Oe a bs : in altered phraseology; yet the omission of the rest did not mean a eee eat ae ee ae . + ea ee Leah aii their repeal or imply denial of their validity, for some of them Y ib a eat Ae whil; Hd 1 re i Thin ae he were still in force in the empire, and arc founded on by Justinian or ; Poa ee Tease ole eu ae akg he in his Digest. Neither were any of the laws of the republic anterior Bae : 1 ens e . _ fog tun to h hes a Orie to the Tables embodied in them, although for long afterwards many | ; uring the day if he used arms in resisting his appre SN eats all a mau had to submit to prosecution under them and to suffer the ing to Cicero there Dee a ErOy eee these words— he telum manu penalties they imposed. In saying, therefore, that for the most fugit magis quam jecit, arietem ae ;_this is dant ee part the provisions of the decemviral code were of native origin, | °2t in illustrative language of the aw attributed to Numa, that all that is meant is that they were the work of the decemvirs them- i ee by ee if the ¥ an " Ere fr be the selves, operating upon the hitherto unwritten law in the directions aon a ys. a. he gt oe oT*

pre ae a already indicated. peace-offering to the kinsmen of him who had been slain. The

Remains. The original Tables are said to have been destroyed when Rome original purpose must have been to stay the blood revenge, and it

was sacked and burned by the Gauls. But they were at once re- »wroduced, and transcripts of them must have been abundant if, as

icero says was still the case in his youth, the children were required to commit them to memory as an ordinary school task. This ren- ders all the more extraordinary the fact that the remains of them are so fragmentary and their genuineness in many cases so debatable. They were embodied in the 7'ripertita of Sextus Alius Petus in the year 557 ; they must have formed the basis of all the writings on the jus civile down to the time of Servius Sulpicius Rufus (who first took the preetor's edicts as a text); and they were the subjects of monographs by a number of authors of distinction, amongst them by M. Antistius Labeo in the early years of the empire and by Gaius probably in the reign of Hadrian. Yet a couple of score or so are all that can be collected of their provisions in what profess to be the ipsissima verba of the Tables,—though in a form in most cases more modern than what we encounter in other remains of archaic Latin. These are contained principally in the writings of Cicero, the Noctes Atticae of Aulus Gellius, and the treatise De verborum significatione of Festus, the last two dealing with them rather as matters of antiquarian curiosity than as rules of positive law. There are many allusions to particular provisions in the pages of Cicero, Varro, Gellius, and the elder Pliny, as well as in those of Gaius, Paul, Ulpian, and other ante-Justinianian jurists ; but these are not implicitly to be relied on, as we have evidence that they frequently represent the (sometimes divergent) glosses of the inter- preters rather than the actual provisions of the statute. Recon- struction has therefore been a work of difficulty, and the results far from satisfactory, that of the latest editor, Voigt, departing very considerably from the versions generally current during the last half century.} i

1 Dirksen's Uebersicht der bisherigen Versuche zur Kritik u. Her- stellung d. 4wilf-Tafet-Fragmente, Leipsic, 1824, supplies the basis of all

the later work on the Tables anterior to that of Voigt. Schoell in his Legis XII. Tub. reliquiae, Berlin, 1866, made a valuable con- tribution to the literature of the subject from a philological point of view. His version has been adopted substantially by Bruns in his Fontes Juris romani antiqut, and by Wordsworth in his Fragments and Specimens of Early Latin, Oxford, 1874, p. 258 sq. The latter, in a& subsequent part of his volume (pp. 502-538), has added notes, historical, philological, and exegetical, which constitute a valuable commentary on the Tables asa whole. Voigt's two volumes, under the title of Geschichte und System des Civil- und Criminal-Rechtes, wie

may even have been so with Numa; but in the Tables it can only have been intended to stay the prosecution which it was incumbent on the kinsmen of a murdered man to institute. So with talionic penalties: "si membrum rupit, ni cum eo pacit, talio esto"—such, according to Gellius, were the words of one of the laws of the Tables, and they undoubtedly contain a reminiscence of a time when talion was recognized, "an eye for an eye, a tooth for a tooth"; but in the mouths of the decemvirs they were nothing more than a clumsy mode of enabling an injured man to exact the greatest money recompense he could, and to have it measured according to the © position and fortune of the individual who had done him injury.

The structure of the provisions of the Tables was not such as to Inter- enable the plain citizen to apply them to concrete cases, or know pretation how to claim the benefit of them in the tribunals, without some of the Pomponius states that no sooner was Tables.

sort of professional advice. the decemviral legislation published than the necessity was felt for its interpretation, and for the preparation by skilled hands of styles of actions by which its provisions might be made effectual. Both of these duties fell to the pontiffs as the only persons who, in the state of civilization of the period, were well qualified to give the assistance required ; and Pomponius adds that the college annually appointed one of its members to be the adviser of private parties and of the judices in those matters. The interpretatio, commenced by the pontiffs and continued by the jurists during the republic, which, Pomponius says, was regarded as

part of the jus civilc, was not confined to explanation of the words of the statute, but was in some cases their expansion, in others their limitation, and in many the deduction of new doctrines from the actual jus scrip- twm, and their development and exposition. An event that did much to diminish the influence of the pontiffs in connexion with it was the divulgement in the year 450 by Cn. Flavius, secretary of Appius Claudius Cxcus, and probably at his instigation, of a formulary of actions and a ealendar of lawful and unlawful days, which got the name of Jus Flavianwm. The practice adopted in the beginning of the 6th century by Tiberius Coruncanius, the

-Processes, der XII. Tafeln, nebst deren Fragmenten, Leipsic, 1883, contain an exposition of the whole of the earlier jus civile, whether embodied in the Tables or not. The history of them occupies the first hundred pages or thereby of the first volume ; his reconstruction of fragments and allusions—a good deal fuller than any earlier one, and supported by an imposing array of authorities—is in the same volume, pp. 693-737.

Subse- quent legisla- tion.

Legis actiones gener- ally.

-nized and indirectly confirmed by the Tables.

JUS CIVILE. |

first plebeian chief pontiff, of giving advice in law in public had a still greater effect in popularizing it; and the Jus Aclianwm, some fifty years later—a collection that included the Tables, the intcr- pretatio, and the current styles of actions—made it as much the heritage of the laity as of the pontifical college.

Subsequent Legislation.—Of legislation during the fourth

and fifth centuries that affected the private law we have

but scanty record. The best-known enactments are the Canuleian law of 309 repealing the decemviral prohibition of marriages between patricians and plebeians ; the Genu- cian, Marcian, and other laws about usury and the rate of interest ; the Pcetilian law of 428, abolishing the nexal contract ; the Silian law, probably not long afterwards, which introduced a new form of process for actions of debt and appears to have given statutory sanction to the stipulation (in its earliest form of sponsio); and the Aquilian law of 467, which amended the decemviral provisions about actions of damages for culpable injury to property, and continued to regulate the law on the subject even in the books of Justinian.

Il. Tae Actions or THE Law.

The Legis Actiones generallyiAmWe owe to Gaius the only connected (though, owing to the state of the Verona MS., rather fragmentary) account we possess of the legis actiones, as the system of judicial procedure was called which prevailed in Rome down to the substitution of that per formulas by the AXbutian and Julian laws,—the first early in the sixth century of the city, and the second in the age of Augustus. He tells us that as genera agendt or generic forms of process they were five in number, each taking its name from its characteristic feature, viz., (1) sacramento, (2) per judicis postulationem, 7 per condic- tionem, (4) per manus injectionem, and (5) per pignoris capionem. The third was unknown in the decemviral period, and was introduced by the Silian law alluded to in last paragraph. The other four were all more or less regu- lated by the XII. Tables, but must in some form have been anterior to them. It is utterly impossible, however, to say of any one of them at what time it was introduced, or what was the statute (Je) by which it was sanctioned ; it may well be that they were not of statutory introduction at all, but were called legis actiones simply because recog- In char- acter and purpose they were very different. The first three were directly employed for determining a question of right or liability, which, if persistently disputed, inevitably re- sulted in a judicial inquiry. The fourth and fifth might possibly result in judicial intervention ; but primarily they were proceedings in execution, in which the party moving in them worked out his own remedy. As regards their comparative antiquity there is much to be said for the opinion of Ihering and Bekker that manus injectio, as

essen- tially nothing more than regulated self-help, must have been the earliest of the five, and that the legis actio sacramento and the judicis postulatio must have been introduced in aid of it, and to prevent too hasty resort to it where there was room for doubt upon question either of fact or law.

In the three judicial legis actioncs the first step was the in jus vocatio or procedure for bringing the respondent into court, minutely

1 The literature on the subject is very voluminous, great part of it in periodicals. Amongst the leading works are those of Keller, Der rém. Ctvilprocess u. die Actionen, 1st ed. 1852, 6th ed. by Wach, Leipsic, 1883, §§ 12-21; Bethmann-Hollweg, Der rim. Civilprocess in seiner geschichtl. Hntwickelung, 8 vols., Bonn, 1864-66, the first volume of which is devoted to the legis actiones ; Buonamici, Delle Legis Actiones nell' antico diritto romano, Pisa, 1868 ; Bekker, Die Aktionen d. rim. Privatrechts, 2 vols., Berlin, 1871-73, particularly vol. i. pp. 18-74; Karlowa, Der rém. Civilprozess zur Zeit a. Legis- actionen, Berlin, 1872 ; Padeletti, 'Le Legis Actiones," in the Archivio Giuridico, vol. xvii. (1875), p. 821 sq. Schultze, Privatrecht wu. Process in threr Wechselbeziehung, vol. i., Freiburg, 1883 (vol. ii. not yet pub- lished), in pp. 489-532 presents some novel and uot unimportant views.

regulated by the provisions of the first of the XII. Tables. This duty was not committed to any officers of the law ; there was no writ of summons of any sort ; the party moving in the contemplated litigation had himself to do what was needed. Once before the magistrate (consul or pretor), the plaintiff stated his contention. If admitted unqualifiedly by the defendant, the magistrate at once pronounced his decree, leaving the plaintiff to work out his remedy as the law prescribed. But, if the case presented was met either with a denial or a qualified defence, and appeared to the magistrate to be one proper for trial, he remitted it for that purpose either to the centumviral tribunal or to one or more private citizens as judges or arbiters. The act of remit was technically Zitis contestatio or ordinatio

judicti, the first so named because originally the parties called upon those present to be witnesses to the issue that was bein g sent for trial. This was the ordinary practice under both the system of the degis actioncs and that of the formulae, and prevailed until the time of Diocletian. In the first stage the proceedings were said to be in jure, and the duties of the magistrate in reference to them made up his jurisdictio; in the second they were said to be in judicio, those presiding in it being styled judiccs. All that the judge or judges had to do was to pass judgment on the question remitted to them. They were "right-declarers" only, not "right-enforcers." If their judgment was for the plaintiff, and he failed to obtain an amicable settlement, he had himself to make it opera- tive by subsequent proceedings by manus injcctio, and that under the eye of the magistrate, not of the judge.

From an enumeration in Cicero of a variety of causes proper to the centumviral court the conclusion seems warranted that it was its peculiar province to decide questions of quiritary right in the strictest acceptation of the word. They were all apparently real actions (vindicationes),— claims of property in land or of servitudcs over it, of right as heir undcr a testament or in opposition to it, of rights of tutory and succession ad intcstato as agnate or gentile, and so forth. In all these it was a numcrous court of Quirites, advised in the early republic by a pontiff, that determined by its vote the question of quiritary right submitted to it. Many such questions in course of time, and possibly at first of express consent of parties, came to |» referred to a single judge ; but some, and notably claims of inheritance under or in opposition to a testament, were still remitted to the centumviral court iu the classical period. Personal actions, however, do not appear ever to have fallen within its cog- nizance : they were usually sent to a single judge—a private citizen —selected by the parties, but appointed by the magistrate, and to whom the latter administered an oath of office. But, in a few cases in which an action involved not so much a disputed question of right as the exercise of skill and discretion in determining the nature aud extent of a right that in the abstract was not denied, the remit was to a plurality of private judges or arbiters, usually three.

The Legis Actio Sacramento.2— The characteristic feature Sacra-

of this legis actio, as described by Gaius, was that the parties, after a somewhat dramatic performance before the consul or pretor, each challenged the other to stake a certain sum, the amount of which was fixed by the Tables, and which was to abide the issue of the inquiry by the court or judge to whom the cause was eventually remitted. This stake Gaius refers to indifferently as sacramentum, summa sacramenti, and poena sacramentt. The formal question the court had to determine was,— whose stake had been justified, whose not (cujus sacramentum justum, cujus injustum) ; the first was returned to the staker, the second forfeited originally to sacred and afterwards to public uses. But the decision on this formal question necessarily involved a judgment on the matter actually in dispute, and, if it was for the plaintiff, entitled him, failing an amicable arrangement, to take ulterior steps for making it effectual. The procedure was still employed in the time of Gaius in the few cases

2 To the literature in the last note may be added Asverus, Die legis actio sacramenti, Leipsic, 1837 ; Huschke (rev. Asverus), in Richter's Krit. Jahrbuch, vol. iii. (1839), p. 665 sg. 3; Stintzing, Verhdliniss d. 0. a. sacramento zum Verfahren durch sponsio pracjudicialis, Heidelberg, 1853 ; Danz, Der sacrale Schutz, pp. 151-221; Maine, Ancient Law, p. 375 sq. ; Danz, " Die]. a. Sacram. u. d. Lex Papiria," in the Zeitschr. J. Rechtsgeschichte, vol. vi. (1867), p. 339 sq.; Huschke, Die Multa u. d. Sacramentum, Leipsic, 1874 ; Lotmar, Zur U. a. sacramento in rem, Munich, 1876 ; Brinz (crit. Lotmar), 'Zur Contravindication in d. 1. a. sacr.," in the Festgabe zu Spengel's Doctor-Jubiliwm, Munich, 1877, pp. 95-146 ; Miinderloh, " Ueber Schein u. Wirklichkeit an d. 1. a. sacramenti," in the Z. f. Rechtsgesch., vol. xiii. (1878), p. 445 sq.3 E. Roth, in the 7. d. Savigny Stiftung, vol. iti. (1882), Rom. Abtheil., p. 121 sq. ; Fioretti, Leg. act. sacramento, Naples, 1883 ; Ihering, " Reich u. Arm im altrém. Civilprozess," in his Scherz u. Ernst in der Juris-

prudenz, Leipsic, 1885, p. 175 sq. XX. — 386

that continued to be referred to the centumviral court, but otherwise it had been long in disuse.

Gaius explains that it was resorted to both in real and personal actions. Unfortunately the MS. of his Institutes is defective in the passage in which he described its ap- plication to the latter. We possess the greater part of his account of the actio in rem as employed to raise and deter- mine a question of ownership; but his illustration is of vindication of a slave, and not so interesting or instructive as the proceedings for vindication of land. _These, how- ever, can be reconstructed with tolerable certainty with the

aid derived from Cicero, Varro, and Gellius.

*The parties appeared before the magistrate, each armed with a rod (festwea) representing his spear (quer or hasta), the symbol, as Gaius says, of quiritarian ownership. The first word was spoken by the raiser of the action, and addressed to his opponent : "*T say that the land in question [describing it sufficiently for identifica- tion] is mine in quiritary right (mewm esse cx jure quiritiwm) ; where- fore I require you to go there and join issue with me in presence of the magistrate (in jure manwm consererc)." Thereupon, accord- ing to the earliest practice, the magistrate and the partics, accom- panied by their friends and backers, proceeded to the ground for the purpose: the court was transferred from the forum to the land itself. As distances increased, however, and the engagements of the consuls multiplied, this became inconvenient. Instead of it, this course was adopted: the parties went to the spot without the magistrate, but on his command, and there joined issue in the presence of 'their seconds, who had been ordered to accompany them, and who probably made a report of the due observance of formalities on their return. Still later the procedure was further simplified by having a turf brought from the place beforehand— probably as time advanced there would be no very particular in- quiry as to where it had been obtained— and deposited a few yards from the magistrate's chair; and, when he ordered the parties to go to the ground and join issue, they merely brought forward the turf and set it before him, and proceeded to make their formal vindications upon it, as representing the whole land in dispute.*

The ritual was as follows. The raiser of the action, addressing his adversary, again affirmed his ownership, but this time with the significant addition—" As I have asserted my right by word of mouth, look you, so do I now with my vindicta"; and there- with he touched the turf with his rod, which was called vindicta when employed for this purpose. The magistrate then asked the other party whether he meant to counter-vindicate. If he replied in the negative or made no response, there was instant decree (addictio) in favour of the first party, and the proceedings were at an end. If, however, he counter-vindicated, it was by repeating the same words and re-enacting the same play as his ad- versary :—"I say that the land is mine in quiritary right, and I too lay my vindicta upon it." The verbal and symbolical vindica- tion and counter-vindication completed what was technically the manus consertio. The parties were now in this position: each had asserted his ownership, and had figuratively had recourse to arms in maintenance of his contention. But the matter was to be settled judicially, so the magistrate once more intervened and ordered both to withdraw from the land. The dialogue was then resumed, the vindicant demanding to know from his opponent upon what pretence (cawsa) he had counter-vindicated. In the illustra- tion in Gaius he avoided the question and pleaded the general issue, —"T have done as is my right in laying my vindicta on the land." But there can be little doubt that in certain circumstances the counter-vindicant would deem it expedient to disclose his title. This was very necessary where he attributed his right to a con- veyance upon which two years' possession had not yet followed ; in such a case he had to name his author (auwctorem laudare) if he desired to preserve recourse against the latter on the warranty implied in the mancipation. That probably entailed a suspension of the proceedings to allow of the authov's citation for his interest ; and on their resumption, if he appeared and admitted his auctoritas, he was formally made a party to the action.

The proceedings had now reached the sacramental stage proper. The first challenge came from the vindicant,—"Since you have vindicated unrightfully, I challenge you with a sacrament of 500 asses," to which the counter-vindicant responded,—" And I you." This was technically the sacramento provocatio. The magistrate thereupon remitted the matter for trial to the centumviral court, or possibly, in certain cases, to a single

judge, and in the presence of witnesses called by the parties (Jitis contestatio) declared what exactly was the question put in issue which the court or judge was to decide. At the same time, according to Gaius's account of the procedure, he required sureties from the partics for the eventual payment by him who was unsuccessful of the sacrament he had offered to stake, and which became a forfeit to the exchequer. (The original practice was for the stake to be deposited by both partics

in the hands of the pontiffs before they were heard by the cen- tuniviral court ; after judgment that of the gainer was reclaimed by him, while that of the loser was retained for religious uses.) The magistrate also made arrangements for the interim possession of the land by one or other of the litigants, taking security from him that, if he was eventually unsuccessful, it should be returned to his opponent, along with all the fruits and profits drawn in the interval. At the trial, as both parties were vindicants, there must have been a certain burden of proof upon both sides. The vindicant, one may believe, must have been required to establish in the first instance that the thing he claimed had at some time becn his; and then, but probably not till then, the counter-vindicant would have to prove a later title in his person sufficient to exclude that of his oppouent. The judgment, as already observed, necessarily involved a finding on the main question; but in form it was a de- claration as to the sacrament: that of the party who prevailed was declared to be just, and that of his unsuccessful opponent unjust.

Looking at this ritual as a whole the conviction is irresistible that it could not have been so devised by one brain. It reveals and combines tlree distinct stages in the history of procedure,— appeal to arms and self-help, appeal to the gods and the spiritual power, appeal to the civil magistrate and his judicial office. As Gellius says, the real and substantial fight for might, that in olden days had been maintained at the point of the spear, had given place to a civil and festucarian combat in which words were the weapons, and which was to be settled by the interposition of the pretor. But this docs not explain the sacramentum. Very various theories have

been proposed to account for it. According to Gaius, it was nothing more than the sum of money staked by each of the parties, which was forfeited originally to sacred and after- wards to public uses by him who was unsuccessful, as a penalty for his rashly running into litigation; and substantially the same explanation is given by Festus in one of his definitions of the word. But this is far from satisfactory; for it involves the absurdity of declaring that a penalty imposed by law could be unjust (‘njustwm) in any case, and the still greater absurdity of declaring it just in the case of the party who was in the right, and unjust in the case of him who was in the wrong. There is another detinition in Festus—“a thing is said to be done sacramento when the sanction of an oath is interposed ”—which lends support to the opinion that there was a time when parties to a question of right were required to take an oath to the verity of their respective assertions ; that they were also required concurrently to deposit five bullocks or five sheep, according to the nature or value of the thing in dispute, to abide the issne of the inquiry ; that the question for determination was whose oath was just and whose unjust ; and that he who was found to have sworn unjustly forfeited lis cattle or ae as a piamentum—a peace-offering to the outraged deity— while the other party reclaimed his from the repository in which they had been detained in the interval.?

1 It was the Lex Aternia Tarpeia of the year 300 v.c. that com- muted the five bullocks and five sheep into 500 and 50 tb of copper respectively (Cic., De Rep., ii. 85, § 60, where the words usually printed “de multae sacramento” should read “de multa et sacramento”); Fest., s.v. “Peculatus ” (Bruns, Fontes, p. 279). For the pounds’ weight of raw metal the XII. Tables substituted the same number of asses, declaring that 500 should be the summa sacramenti when the cause of action was worth 1000 asses or more, 50 when worth less or the question one of freedom or slavery (Gai., iv. 14).

2 Varro, De L. L., v. 180 (Bruns, p. 303), says that, even after the summa sacramenti had been converted into money, it was deposited ad pontem,—some bridge, he does not say which, where there was a sacred “pound.” (Curiously enough, the Irish spelling of “pound” is “ pont’; Skeat’s Htym. Dict., s.v. ‘“Pound.”) A most ingenious and plausible explanation

was suggested by Danz in 1867, in the Zezéschr. J. Rechtsgesch., vol. vi. p. 859. Recalling the facts that there had been discovered in the Tiber Island sacella of Jupiter Jurarius and Dius Fidius, the two deities to whom solemn oaths were usually addressed, and that the island was spoken of as "inter duos pontes," because con- nected with both banks of the river by bridges bearing no particular names, he suggested that the island may have been the place to which disputants resorted to make their sacramenta, and that the cattle, sheep, or money were deposited in a place for the purpose before the bridge was crossed. Much the same explanation was offered by Huschke two years later in his book Das alte rimische Jahr (Breslau, 1869), p. 360, apparently without being aware of Danz's speculation. He adds, on the authority of the Iguvine Tables, that, while bullocks were offered to Jupiter, only sheep were offered to Dius Fidius, The island, he thinks, must have been selected as neutral ground to which all parties might have access, and which obviated intrusion into the temples of the two gods on the Capitol and Quirinal respectively. And it is to its use as the scene of the sacramental procedure that he ~ attributes its name of "holy island," rather than to the fact of its having been the seat of the temple of Asculapius. Huschke recurs to and enforces this view in his Multa und Sacramentum (1874), p- 410, where he does refer to Danz's paper.

The writers who adopt this view are far from being unanimous as to details. But there seems to be cnough to render it more than probable that, at an intermediate stage between the vera solida vis of ancient times and the vis civilis et festuearia which Gellius and Gaius depict, there was a procedure by appeal to the gods through means of oaths of verity sworn by the parties, in the manner and with the consequences that have been indicated. That in time it should have dropped out of the ritual is quite in the order of things. Its tendency was to become a mere form, imposing no real restraint on reckless litigation. The restraint was rather in the dread of forfeiture of the sacramental cattle, sheep, or money that would follow a verdict that an oath had been unjust. And it must have been felt besides that it was unfair to brand a man as a false- swearer, needing to cxpiate his offence by an offering to the gods, whose oath had been perfectly

honest. That he should suffer a penalty for his imprudencc in not having taken more care to ascertain his position, and for thus causing needless annoyance to others, was reasonable, but did not justify his being dealt with as one who had knowingly outraged the deity to whom he had appealed. So the oath—the original sacramentwm—disappeared, the naine passing by a natural enough process to the money which had been wont to be deposited before the oath was sworn, but which now ceased to be an offering in expiation by a false-swearer, and became a mere penalty of rash litigation (poena temere litigantis).

It may be assumed that in most cases the finding of the cen- tumvirs as to the justness or unjustness of the respective sacraments of the partics was the end of the case,—that it was at once accepted and loyally given effect to. Festus, however, preserves a law of the XII. Tables which, according to Mommsen's rendering, declared that, when it turned out that interim possession had becn awarded to the wrong party, it was to be in the latter's power to demand the appointment of three arbiters who should ascertain the value of the object of vindication and its fruits, and assess the damages due for non-restitution at double the amount. This provision seems to have been intended to afford the wrongful interim possessor, who was not in a position to make specific restitution to his suc- cessful opponent, a means of avoiding the apprehension and im- prisonment which were the statutory consequences of failure to im- plement a judgment. It is probable that in time this duplicated moncy payment came to be regarded as the satisfaction to which the successful party in a vindication was entitled in every casc in which, no matter for what reason, he was unable to obtain the thing itself and its fruits from their interim possessor ; that con- sequently an arbitrium litis aestimandae, or reference to arbiters to assess their value, resulted in every such case; and that it was to assure its payment that the praetor required the party to whom the interim possession was awarded to give to his opponent the sureties (pracdes litis et vindieiarwm) to whom Gaius alludes.

After this explanation of the procedure in the sacramental action for vindication of land it is unnecessary to enter into any detail of what was done when it was a movable that was being vindicated, or when the action was a personal one for payment of money. The teal action about a

movable was of course simpler than that described ; for the thing was always in praesentia. As regards per- sonal actions, the ordinarily received opinion, which rests, however,

which is generally interpreted—te, praetor, judicem arbi- trumve postulo uti des. This petition to the magistrate —king, consul, preetor—to appoint a judge, arbiter, or arbiters (as the case might be) in all probability was part of the procedure in the action, and that from which it derived its distinctive name. Beyond this all is conjecture, alike as to the nature and form of the action and the cases to which it was applicable. Gaius says of the legis actio sacramento that it was general, and that it was the procedure that was to be resorted to where no other was prescribed by statute. The extant fragments of the XII. Tables contain no such indications as this would lead us to expect; there is not a hint in them of an express instruction that proceedings in any particular case were to be per judicis postulationem.

While it is impossible with certainty to trace the history of this procedure to its first beginnings, yet the impression is gencral that it must have originated in the regal period. There were three dif- ferent positions in which an appeal for aid might be made to a court of justice, —(1) when it was a question of civil right that had to be decided in terms directly affirmative or directly negative of the contention of the raiser of the action, and one in which ques- tions of both law and fact were involved ; (2) when it was only a question of fact that had to be ascertained,—the legal result of the fact, if established, being known beforehand ; (3) when facts had to be set against facts, and a result arrived at that in the judgment of those who had to balance them was fair and reasonable in the cir- cumstances. In the first case, as when the contention was meum essc or dart oportere (otherwise than under an obligationary nexwm), the procedure was sacramento and the reference originally (in all probability) to the pontiffs, although afterwards to the centumviral court or to a yudex ; in the second, as when the question was—had or had not the defendant assaulted the plaintiff, and so incurred the invariable statutory penalty,

the reference was probably to a judex without the intervention of a sacrament; in the third, as when the matter in hand was the partitioning of an inheritance amongst co-heirs, or the determining whether operations of the de- fendant were interfering with the natural drainage of the plaintiff's land and how the mischief was to be abated, or the assessment of damages for injury to property, or of the sum sufficient to relieve from talion or the statutory penalty of theft, the reference was to an arbiter or arbiters. In the procedure sacramento the pleadings opened directly with an averment of right—"I say that this is mine," "I say that the defendant is bound to pay me so much" ; but in that per judicts arbitrive postulatio there is reason to surmise that they commenced with an averment of fact, followed by the resulting demand of the plaintiff. The details, however, are quite uncertain, with the exception that in some arbitria the plaintiff expressly threw himself upon the discretion of the arbiters—quantwm aegius melius cst ob cam rem mihi dari.

The Legis Actio per Condictionem.—This the youngest Per con- "action of the law" was introduced, Gaius says, by the diction- Silian law as a means of recovering a liquid money debt ™

ou slender foundations, is that from the first the parties met on equal terms; that, if it was a case of money debt, the creditor commenced the procecdings with the averment that the defendant

owed him the sum in question, —"I say that you ought to pay me (dare oportere) 1000 asses"; that this was met with a denial; and that a sacramental challenge followed on either side. All are agreed that the remit was to a single yudex after an interval of thirty days from the proceedings in gure ; that where the claim was for a definite sum the plaintiff had to establish his case to the letter ; and that his sacrament was necessarily declared unjust if he failed to prove his claim by a single penny. But there is considerable diversity of opinion as to whether by this form of process a claim of uncertain amount could be insisted on,—as, for example, for damages for breach of a warranty of acreage of lands sold, or of their freedom from burdens. If it could, then probably the ques- tion raised and dealt with sacramento was the abstract one of liability, —Was the warranty given, and has it failed? the sum due in

respect of the breach being left to be dealt with in a subsequent arbitral process (arbitriwm litis aestimandac).

(certa pecunia), and afterwards made available by the Cal- purnian law for enforcing personal claims (as distinguished from real rights) for anything else definite and certain (omnis res certa), and in both its forms, therefore, essen- tially an action of debt. The date of both enactments is matter of controversy, although there is no question that the Silian was the earlier. Gaius says of it that its pur- pose was far from obvious, as there was no difficulty in recovering money either by a sacramental action or one per judicis postulationem. He overlooks the fact that money due under a nexal contract was recoverable by neither of these processes, but by the much more suinmary one of manus injectio. By the Peetilian law of 428 this

>. Phe Legis Actio per Judicis Postulationem.'—The defects | was declared unlawful. We are disposed to regard the 7. of the Verona MS. have deprived us of Gaius's account of | Lex Silia and the new procedure it authorized as a result tionem, this legis actio. There is little elsewhere that can with | of the change. To have put off a creditor for money lent

any certainty be said to bear upon it. The most import- ant is a note in Valerius Probus—7.PR.LA.V.P.V.D.,

1 To the literature on p. 681, note 1, add Baron, "Zur leg. act. per judicis arbitrive postulationem," in the Festgabe fiir Aug. W. Ilefter, Berlin, 1873, p. 29 sq.; Huschke, Multa, &c., p. 394 sq.; Adolf Schmidt, " Ueber die 1. a. per jud. post.," in the Zettschr. d. Sav. Stift., vol. ii. (1881), Rom. Abtheil., p. 145 sq.; Voigt, XI. Tafeln, vol. i. § 61.

either with a sacramental action or one per judicis postula- tionem would have been to deprive him of the advantages of manus injectio to a greater extent than was called for. So it was provided by the Silian law that, when a man disputed his liability for what was called pecunia certa credita, and forced his creditor to litigation, not only was the defendant bound in the first place either to deny his

liability under oath or else to pay the sum claimed; but if he did deny it the plaintiff was entitled to require from him an engagement to pay one-third more by way of penalty in the event of judgment being against him, while the soi-disant creditor had to give an engagement to pay as penalty the same amount in case of judgment in favour of the alleged debtor. These engagements (sponsio et resti- pulatio tertiae partis) were not allowed in every case 1n which a definite sum of money was claimed per condhe- tionem, but only when it was technically pecunia credita. In Cicero's time creditum might arise either from loan, stipulation, or literal contract (expensilatio) ; but the last dated at soonest from the beginning of the 6th century, and stipulation apparently was a result of the Silian law itself, so that the pecunia credita of this enactment can have referred only to borrowed money. The same phrase, ac- cording to Livy, was employed in the Pcetilian law ; it was thereby enacted, he says, that for pecunia credita the goods, not the body of the debtor, ought to be taken in execu- tion. A connexion, therefore, between the Peetilian law and the abolition of the zexwm on the one hand, and the Silian law and the introduction of the legis actio per condictionem on the other, can hardly be ignored, and raises more than a probability that the latter statute was a consequence of the former, and must have been passed immediately or soon after the year 428. In the action for a money debt that was not technically pecunia credita, and in the action on the Calpurnian law, it is probable that the defendant could be required to negative the claim under oath (jusjurandum im jure delatum) on pain of being held as confessed ; but there was no penalty of a third part on either side.

Little is known of the procedure! in this legis actio, for, in consequence of the loss of a leaf in the Verona MS., we are with- out part of Gaius's account of it. It got its distinctive name, he says, from the condictio or requisition made by the plaintiff on the defendant, whom he had brought into court in the usual way, to attend again on the expiry of thirty days to have a judge ap- pointed. It was probably only on the reappearance of the partics, and after the defendant had had time for looking into the facts, that the latter could be required to make oath as to his defence of non-indebtedness. In the action for pecunta crcdita it would be then also, and after the oath, if demanded, had been given, that the sponsio et restipulatio tertiae partis were exchanged ; and it is probable that, if

either party refused on the pretor's command so to oblige himself towards the other, judgment was at once pronounced in favour of the latter without any remit to a judcr. How the issue was adjusted when the sponsion and restipulation were duly given we are not informed ; but, judging by analogy from the pro- cedure in an action for breach of interdict under the formular system, and on the broader ground that there must have been machinery for a condemnation of the plaintiff on his restipulation in the event of his being found in the wrong, it may reasonably be concluded that there were in fact three concurrent issues sent to the same judex,—the first on the main question, the second on the defendant's sponsion, and the third on the plaintiff's restipula- tion. When a sum of money other than pecunia credita or a thing or quantity of things other than money was sued for, those sub- sidiary issues were uunecessary, as there was neither spousion nor restipulation.

As Baron has demonstrated, it was not the usual practice to introduce any words explanatory of the ground of indebtedness when the action was either for money (other than pecunia credita) or for a thing or quantity of things. It might be loan, or bequest, or sale, or purchase, or delict, or unjustifiable enrichment, or any of a hundred causae; it would have to be condescended on of course before the judge ; but in the initial stage before the praetor and in the issue all that was necessary was the averment that the defendant was owing such a sum of money or such a thing. It was for the judge to determine whether or not the averment was established and, in certain cases, that non-delivery was due to the fault of the defendant; the plaintiff, however, was bound to make his averment good to the letter of his claim. In the event of the — on a a ee ee

a To the literature on p. 681, note 1, add Asverus, Die Denuncia- tion d. Rémer, Leipsic, 1848, p. 129 sg.; Mommsen (rev. Asverus), in Richter's Krit. Jahrbuch, vol. ix. (1845), p. 875 sq.; Bekker, Aktionen, vol. i. cap. 4-7; Voigt, Jus naturale, dc. d. Romer, 4 vols., Leipsic, 1856-75, vol. iii. §§ 98, 99, and vol. iv. Beilage xix. Nos. 1, 2, 4; Baron, Die Condictionen, Berlin, 1881, §§ 15, 16. :

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plaintiff being successful in an action for corte pecunia, but delay was made by the defendant in satisfying the judgment, execution fol- lowed in ordinary form. How the matter was arranged in an action on the Calpurnian law for a certa res is not so obvious. What the plaintiff wanted was specific delivery or damages, and by some the opinion is entertained that he formulated his claim alternatively. Of this there is no evidence ; and,Gaius's statement that under the system of the legis actioncs condemnation was always in the ipsa res, i.c., the specific thing sued for, leads to the assumption that a judgment for the plaintiff, on which specific implement failed, must have been followed by an arbitriwm litis aestimandae for assessment of the damages in money, and that execution procecded thereon as if the judgment had been for a sum of money in the first instance. The general opinion, however, is that the judge to whom the issue was remitted assessed the damages himself and as a matter of course,—that the instruction to him was quanti res crit, tantam pecuniam condemnato.

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The Legis Actio per Manus Injectionem.2—This "action Per of the law" was ordinarily employed as a means of execu- manus

tion against the body of a judgment-debtor or one who had confessed liability in the first stage of a process. But, in certain cases in which it was thought proper that a creditor should have a more summary remedy than was afforded by a sacramental action or one per judicis postulationem, he was allowed to apprehend his debtor without any ante- cedent judgment; and, if the debtor disputed liability, the question could be tried only in proceedings at his in- stance, or sometimes at that of a third party on his behalf, for a stay of execution. It will simplify matters, however, to confine our attention to it in the meantime as a means of execution against the body of a judgment-debtor. Gaius's description of it is very general ; for details we are indebted principally to the octes Atticae of Aulus Gellius, in an account which he gives (put into the mouth of Sext. Cecilius Africanus, a well-known jurist of about the same time as Gaius, and a contemporary of his own) of the provisions of the XII. Tables in reference to it. Afri- canus is made to say that according to his belief

(opnor) the words of the statute were these :—"'For admitted money debts and in causes that have been regularly determined by judgment (aerts confessi rebusque jure judicatis) there shall be thirty days' grace. After that there may be manus enjectio. 'The apprehending creditor shall then bring his debtor before the magistrate. If he still fail to satisfy the judgment, and no vindex come forward to relieve him, his creditor may carry him home and put him in chains. He may live at his own cost; if not, his creditor must give him daily a pound of spelt, or more if he please." Africanus continues narrativé: "There was still room for the parties to come to terms; but, if they did not, the debtor was kept in chains for sixty days. Towards the end of that time he was brought before the preetor in the comitium on three consecutive market-days, and the amount of the judgment-debt proclaimed. After the third capite poenas dabat,"—what these words mean will be considered in the sequel,—" or else he was sent across the Tiber to be sold to a foreigner. And this capital penalty, sanctioned in the hope of deterring men from unfaithfulness to their engagements, was one to be dreaded because of its atrocity and of the new terrors with which the decemvirs thought proper to invest it. For, if it was to more creditors than one that the debtor had been adjudged, they might, if they pleased, cut up and divide his body. Here are the words

? To the literature on p. 681, note 1, may be added Huschke, Nexum, 1846, p. 79 sg.; Savigny, "Das altrém. Schuldrecht," in his Verm. Schriften, vol. ii., 1850, p. 369 sq.; Hoffmann, Die Forcten u. Sanaten, nebst Anhang iiber d. altrém. Schuldrecht, Vienna, 1866, p. 54 sq. ; Unger, in the Zeitschr. f. Rechtsgesch., vol. vii. (1868), p. 192 sq.; Vainberg, Le nexum et la contrainte par corps en droit Rom., Paris, 1874, p. 36 sq.; Bruns, in the Zeitschr. f. Rechtsgesch., vol. xii. (1876), ' p. 128 sg.; Exner, in the Zettschr. f. Rechtsgesch., vol. xiii. (1878), p. 392 sq.; Voigt, "Ueber d. Gesch. d. rém. Executionsrechtes," in the Berichte d. k. stichs. Geselisch. d. Wissenschaften (Phil. -Hist. Cl.), vol. xxxiv. (1882), p. 76 sq.; Voigt, XII. Tafeln, vol. i. 8§ 63-65 ; Ihering (as on p. 681, note 2), pp. 196 s¢., 232 Sq.

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of the statute,—'Tertiis nundinis partis secanto. minusve secuerunt, se fraude esto.' "

Such is Gellius's account of the provisions of the XII. Tables in reference to this legis aetio. But it is to be borne in mind that he does not vouch for its accuracy ; the Tables were already in his time matter of antiquity, and even the jurists knew nothing of them beyond what was still in observance. That he has repro- duced them only partially seems almost beyond question ; for in another chapter he himself quotes a couple of sentences that are to all appearance from the same context. We have to face, therefore, the extreme probability that the record is incomplete and the possibility besides that it is not literally accurate. There is room for error, conscquently, in two directions ; but the nature and effect of the procedure in its main features may be gathered from the texts as they stand with reasonable certainty.

It was competent only after thirty days from the date of judg- ment or confession. It was apprehension of the debtor by the creditor himself,—in its first stage, at least, an act of pure self-help. The debtor had at once to be brought before the magistrate, in order that his creditor might obtain authority to carry him away and provisionally confine him in the domestic lock-up. Such a course, however, was avoided either (1) by instant payment or other implement of the judgment, or (2) by the intervention of a vindex or champion. The position taken by the latter was not exactly that either of a surety or of an attorney for the judicatus demanding a rehearing of the case: he appeared rather as a con- troverter in his own name of the right of the creditor to proceed further with his execution, on the ground that the judgment was invalid, This necessitated an action between the vindex and the creditor, in which the former was plaintiff, but to which the debtor was not a party. If it failed, then the vindex was liable for double the amount of the original debt, as a penalty on him for having improperly interfered with the course of justice ; but on payment he had relief against the original debtor who had been liberated through his intervention. Failing a vindex and failing payment, the ercditor took his debtor home and incarcerated him, dealing with him for sixty days in the manner above described. On their expiry, without any arrangement, there was a magisterial decree (addietio) awarding the debtor to his creditor.

What right did this addictio confer upon the creditor? The debtor, says Gellius, ‘“‘capite poenas dabat,” which he interprets as meaning that his creditor might put him to death, the alterna- tive being his sale as a slave beyond the Roman frontier. Accord- ing to this view a man sentenced to twenty-five asses for a petty assault, which he could not pay, might have to suffer death in- stead. Manifest theft was considered a greater offence, or at least to merit a heavier punishment, than non-manifest,—slavery for the former, a pecuniary penalty for the latter ; but, ifit had been the case that every judicatus who failed within three months to satisfy his creditor might be put to death, then the non-mauifest thief against whom a judgment had becn obtained must often in the end have suffered a penalty more serious than that which overtook him whose theft had been manifest,—slavcry for the graver offence, death for the lighter. Capite poenas dabat, therefore, cannot have meant death. But it is just as impossible that it can have meant slavery. And there is abundant evidence that the addictus, even after the completion of his two months of provisional detention, was still de jure frce,—that he was not capite minutus even as regarded citizenship or family rights, and that any property he had still remained his own. The only other cxplanation is that “he paid the penalty with his person,” in contradistinction to “his means.” Caput is used in opposition to bona. Under the law of the Tables, when the manus injeetio was at the instance of one creditor only, the extent of the latter’s right was to detain his debtor in free bondage, making what use he could of his services, and exercising discipline over him as if he were a slave. But for the mistaken notion that a creditor was entitled after the expiry of the three months to put his debtor to death—of which there is uot a single instance on record—it is unlikely that any one would have thought of imputing to the partis sccanto such an inhuman meaning as that a plurality of creditors might cut the body of their addictus in pieces and each take a share. ;

The opinion is entertained by many jurists that the partis secanto of the Tablcs referred not to the body but to the belongings of the debtor,—that when there were concurrent creditors they shared his familia amongst them. There are two difficulties to face, tl) that, once a debtor was in the hands of a creditor, even provisionally, manus injectio by a second creditor was impossible ; and (2) that the debtor’s estate did not fall

within the power of the incarcerat- ing creditor. The first is removed by a suggestion of Voigt's, that the plurality of creditors Gellius speaks of may have referred to the case of co-heirs taking proceedings against a debtor of their ancestor's. The second disappears on a slight rearrangement of the words of the Tables as Gellius records them.! The result to

1 Reconstructions are always hazardous. But, on the footing above explained, the provision of the Tables may have been something like

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which it brings us is this: where there was but one creditor con- cerned, and the two months of provisional detention expired with- – out payment, or intervention of a vindex, or compromise of some sort, the debtor definitively became his creditor's free bondman in virtue of the magisterial addietio; but, where co-heirs were con- cerned, as bondage and service to all of them would have been inconvenient if not impossible when thcy were not to continue to possess the inheritance in common, the debtor was sent across the Tiber and sold as a slave, and the price got for him divided among them. If one or other got more than his fair share, no harm was done; for the disproportion could eventually be redressed in an action of partition (aectio familiac erciscundae).

The disgraceful cruelties and indignities to which credi- tors subjected both their judgment and nexal debtors led to many a commotion in the first two centuries of the republic. The latter were probably much more numerous than the judicati, and, being in great part the victims of innocent misfortune, it was the sufferings they endured at the hands of relentless creditors that so often roused the sympathies and indignation of the populace. But the judgment-debtors had suffered along with them; and some of the provisions of the Peetilian law of 428 were meant to protect them against the needless and unjustifiable severity that had characterized their treatment. The manus injectio itself was not abolished, nor the possible intervention of a wndex; neither were the domum ductio

that followed, and the provisional imprisonment with the light chains, authorized by the Tables while it lasted ; nor was the formal addictio of the debtor to his creditor when the sixty days had expired without arrangement. But after addiction, if it was for nothing more than civil debt, there were to be no more dungeons and stripes, fetters and foot-blocks ; the creditor was to treat his debtor and his industry as a source of profit that would in time diminish and possibly extinguish his indebtedness, rather than as an object upon which he might perpetrate any cruelty by way of punishment. Although the edict of P. Rutilius of 647 vu.c. provided a creditor with machinery for attacking the estate of his debtor, he had still the alternative of incarceration. This might be avoided under the Julian law of cessio by the debtor's making a complete surrender of his goods to his creditor; but, failing such surrender, incarceration continued to be resorted to even under the legislation of Justinian. Latterly, however, it was not by manus injectio that the incarceration was effected ; for it went out of use with the definitive establishment of the formular system of procedure.

It was as directed against judgment and nexal debtors (see infra, p- 698) that manus injectio was of most importance and chiefly made its mark in history. But there were other cases in which it was resorted to under special statutory authority, where a remedy secmed advisable more sharp and summary than that by ordinary action. In some of these it was spoken of as manus injectio pro judicato (t.¢., as if upon a judgment), in others as simple manus injectio (manus injectio pwra). In the first the arrestee was not allowed to dispute his alleged indebtedness in person ; he could do so only through a vindex ; and if no one intervencd for him in that character he was carricd off and dealt with by his arresting creditor as if a judgment had been obtained against him. In the second he was not required to find a vindcaw, but might himself dispute the verity of the charge made against him, under penalty, however, of a duplication of his Hability if he failed in his contention. By a Lee Vallia, probably in the latter half of the 6th century of the city, this manus injectio pura was substituted for that pro judieato in all cases in which the ground of arrest was neither judgment nor

depensum, t.e., payment by a surety or other party on account of the true debtor, who failed to relieve the former within six months

thereafter. ; ; : The Legis Actio per Pignoris Capionem.?—In the ritual

this: "Tertiis nundinis addicitor. Capite poenas dato, Si plures sunt, trans Tiberim peregre venum danto, partis secanto. Si plus minusve secuerunt, se fraude esto "—" On the third market-day there shall be decree of addiction. The addictus shall then pay the penalty with his person. If there be several creditors to whom he is awarded, let them sell him beyond Tiber and divide the price. If any of them have got more or Jess than his fair share, no harm shall result,"

2 To the literature on p. 681, note 1, add Degenkolb, Die Lex Hiero-

Per pignoris capio- nem.

Pro- cedure outside legis actiones.

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of the actio sacraments the vis civilis et festucaria was a reminiscence of the vera solida vis with which men settled their disputes about property in the earliest infancy of the commonwealth. Manus injectio was a survival from times when the wronged was held entitled to lay hands upon the wrongdoer, and himself subject him to punishment ; custom and legislation intervened merely to regulate the conditions and mode of exercise of what essentially was still self-help. In pignoris capio self-help was likewise the dominant idea. It may be fairly enough described by the single word distress,—the taking by one man of property belonging to another in satisfaction of or in security for a debt due by the latter which he had failed to pay. The taking did not proceed upon any Judgment, nor did it require the warrant of a magistrate; it might be resorted to even in the absence of the debtor; but it required to be accompanied by certain words of style, spoken probably in the presence of witnesses. It was only in a few exceptional cases that it was competent, in some by force of custom, in others by statute. What was the procedure, and what its effects, are far from certain. Thering, founding on some expressions of Cicero's,

con- jectures that, whether the debt was disputed or not, the distrainer could neither sell nor definitely appropriate his pignus without magisterial authority,—that in every case he was bound to institute proceedings in justification of his caption, and to take in them the position of plaintiff. The idea is ingenious, and puts the pignoris capio in a new and interesting light. It makes it a summary means of raising a question of right for whose judicial arbitra- ment no other process of law was open,—with the addi- tional advantage that it secured instant satisfaction to the raiser of it in the event of the question being deter- mined in his favour. If against him, the inevitable result, in substance at least, must have been a judgment that he had no right to retain his pledge, with probably a finding that he was further liable to its owner in the value of it, as a punishment for his precipitancy.}

Judicial or Quasi-Judicial Procedure outside the Legis Actioncs. ~— Whatever may have been the extent of the field covered by the actions of the law, they did not altogether exclude other judicial or quasi-judicial agencies. The supreme magistrate every now and then was called upon to intervene in matters brought under his cognizance by petition or complaint, in which his aid was sought not so much to protect a vested right of property or claim as to maintain public order, or to prevent the occurrence or continu- ance of a state of matters that might prove prejudicial to family or individual interests. The process was not an action, with its stages in jure and in judicio, but an inquiry conducted from first to last by the magistrate himself; and his finding, unless it was a dis- missal of the complaint or petition, was embodied in an order (decretwm, interdictwm) which it was for him to enforce by such means as he thought fit,—manw militari or by fine or imprison- ment. Some jurists are disposed to give a very wide range to this magisterial intervention. One of its most important manifestations was in connexion with disputes about the occupancy of the public domain lands. These did not belong in property to the occupants, so that an action founded on ownership was out of the question. But, as the occupancy was not only recognized but sanctioned by the state, it was right, indeed necessary in the interest of public order, that it should be protected against disturbance. In the measures resorted to for its protection Niebuhr recognized the origin of

the famous possessory interdict wét possidctis; and, al- though opinions differ as to whether protection of the better right EP eee a Cte ee

nica, Berlin, 1861, p. 95 sg.; Thering, Geist d. rim. Rechts, vol. i. Sula Voigt, XII. Tafeln, vol. i. p. 502 Sq.

‘ This was according to the spirit of the early system, which en- deavoured to check reckless or dishonest litigation by penalties, —e.g., forfeiture of the swmma sacramenti and duplication of the value of un- restored property and profits in the sacramental procedure ; duplica- tion of the value of the cause when judgment was against the defend- ant in an action upon an engagement embodied in a lea mancipit or les neat ; duplication against a vindex who interfered ineffectually in manus ingectio against a judgment-debtor ; duplication against an heir who refused without judicial compulsitor to pay a legacy bequeathed per damnationem ; the addition of one-third more by way of penalty against a debtor found liable in an actio certae creditae pecuniae, &c.

or prevention of a breach of the peace was what primarily influ- enced the magistrate’s intervention, there is a pretty general accord in accepting this view. Another illustration of this magisterial intervention is to be found in the interdiction of a spendthrift,—a decree depriving of his power of administration a man who was squandering his family estate and reducing his children to penury ; a third presents itself in the removal of a tutor from office on the ground of negligence or maladministration, brought under the notice of the magistrate by any third party in what was called postulatio suspecti tutoris ; and a fourth in the putting of a creditor in possession of the goods of an insolvent debtor, which must have been common enough even before the general bankruptcy regula- tions of the Rutilian edict. These are to be taken merely as ex- amples of this magisterial intervention, which manifested itself in very various directions ; and it is easy to see how largely such pro- cedure might be utilized for remedying the grievances of persons who, from defect of complete legal

title, want of statutory authority, or otherwise, were not in a position to avail themselves of the "actions of the law."

In one of the Valerio-Horatian laws consequent on the second secession of the plebcians there was mention of ten judges (jadices decemvirt), whose persons were declared as inviolable as those of the tribunes of the people and the plebeian ediles. These were a body of judges elected to officiate on reniit from a tribune or edile in questions arising between members of the plebeian body. We are without details as to the institution of this plebeian judicatory, the questions that fell under its cognizance, the forms of process employed, the law administered by it, and the effect of its judg- ments. It is not much referred to by the historians; and its decadence has been attributed to the fact that the Lex Hortcnsia of 468 made the nwndinac lawful court days (dies fasti), and so made it possible for the country folks coming to the city to market to carry on their processes before the pretor.

As all in a manner exercising judicial or quasi-judicial functions must also be mentioned the pontiffs, the consuls, and afterwards the censors as magistri morum, the chiefs of the gentes within the gentile corporations, and heads of families within their households. While it may be the fact that with the enactment of the XII. Tables the jurisdiction of the pontiffs? was materially narrowed, it certainly did not disappear,—witness the famous case in which Cicero made before them the oration of which he was so proud, Pro domo sua. The action of the consuls and afterwards of the censors as guardians of public morals, and the social and political disqualifications and pecuniary penalties with which they visited persons who had been guilty of perjury or gross perfidy, did not a little to foster fidelity to engagements. Through the same agency the exercise of a variety of rights whose abuse could not be made niatter of action—the husband's powcr over his wife, the father's over his children—was controlled and kept within bounds. It was not on light grounds, indeed, that the majesty of the patcr- familias within the household could be called in question ; it was only when he forgot that in the exercise of serious discipline within his family he was bound to act judicially. For he also was a judge —judex domesticus, as he is often called, though in all cases of gravity he was required to invoke the advice of his kinsfolk ina

family council. On him lay the duty of controlling his family ; if he failed to do so he was himself in danger of censorial animad- version. That his gens also, if he were a patrician, had some super- vision and power of calling him to account is extremely probable ; every corporation had it more or less over its members ; but neither historians nor jurists give us any definite information.

Between citizens and foreigners with whom Rome was in alliance Recupe- by a treaty conferring reciprocal right of action the proceedings ratio.

took the form known as recuperatio.? It was an international process, modelled to some extent upon, and deriving some of its technical terms from, the fetial clarigatio. The action was always raised in the forum contractus. The magistrate ordinarily presiding there heard what parties had to say in plaint and defence, and then put in simple shape the points of fact arising on them, authorizing the recuperators to whom the matter was remitted to find for plaintiff or defendant according to circumstances. The recuperators were sometimes three, sometimes five, sometimes still more numer- ous, but always in odd number ; whether the nationality of both parties required to be represented we are not told. Expedition being in most cases a matter of importance, recuperators were re- quired to give judgment within ten days. How execution pro- ceeded upon it, if it were for the plaintiff, does not clearly appear ;

2 See Hiillmann, Jus pontijictum der Romer, Bonn, 1837 ; Cauvet, Le droit pontifical chez les anciens Romains, Caen, 1869 ; Bouchc- Leclerq, Les pontifes de Vance. Rome, Paris, 1871; Marquardt, Rom. Staatsverwalt., vol. iii. p. 290 sq.

3 See Collman, De Romanor. jud. recuperatorio, Berlin, 1835; Carl Sell, Die recuperatio der Rémer, Brunswick, 1837 ; Huschke (rev. Sell), in Richter's Arit. Jahrbiicher, vol. i. (1837), pp. 868-911 ; Voigt, Jus naturale, &c., vol. ii. §§ 28-32; Karlowa, Rém. Civilprocess, pp.

218-230.

The citizen and his caput.

Capitis demi- nutio.

JUS CIVILE. |

Voigt, founding on a few words in Festus, concludes it must have becn by something like pignorts capio. This recuperatory pro- cedure in time came to be resorted to in some cases even where both parties were citizens. There are numerous instances of it in Cicero ; and it is remarkable that in most of the pretorian actions ex delicto the remit was not to a judex but to recuperators, The explanation may be in the comparative summariness of the remedy.

III. DEVELOPMENT OF THE SUBSTANTIVE INSTITUTIONS OF THE Law.

The Citizen and his " Caput."—The early law of Rome was essentially personal, not territorial. A man enjoyed the benefit of its institutions and of its protection, not because he happened to be within Roman territory, but because he was a citizen,—one of those by whom and for whom its law was established. The theory of the early jus genttum was that a man sojourning within the bounds of a foreign state was at the mercy of the latter and its citizens, that he himself might be dealt with asa slave, and all that belonged to him appropriated by the first comer ; for he was outside the pale of the law. Without some sort of alliance with Rome a stranger had no right to claim protection against maltreatment of his person or attempt to deprive him of his property ; and even then, unless he belonged to a state entitled by treaty to the in- ternational judicial remedy of recuperatio, it was by an appeal to the good offices of the supreme magistrate, or through the intervention of a citizen to whom he was allied by the (frequently hereditary) bond of hospitium, and not by means of any action of the jus civile set in motion by himself. A non-citizen—originally hostis, and afterwards usually called peregrinus 1—in time came to be regarded as entitled to all the rights the jus gentium re-cognized as belonging to a freeman, and to take part as freely as a Roman in any transaction of the jus gentium ; but that was not until Rome, through contact with other nations and the growth of trade and commerce, had found it necessary to modify her jurisprudence by the

adoption of many new institutions of a more liberal and less ex- clusive character than those of the jus civile.

A citizen's civil personality was technically his caput. The extent of it depended on his family status. It was only among citizens that the supremacy of the paterfamilias and the subjection of those 7m manu, potestate, or mancipto were recognized,—only among them therefore that the posi- tion of an individual in the family was of moment. While in public life a man's supremacy or subjection in the family was immaterial, in private life it was the pater- familias alone who enjoyed full jural capacity. Those subject to him had a more limited personality; and, so far as capacity to take part in transactions of the jus civile was concerned, it was not inherent in them but derived from their paterfamilias: they were the agents of his will, representatives of his persona in every act whereby a right was acquired by them for the family to which they belonged.

Whenever a citizen either ceased altogether to be a mem- ber of a Roman family or passed from one family into an- other, there was technically capitis minutio or deminutio, ex- cept in the cases of filiifamulias and jiliaefamalras becoming flamens or vestals ; for, though they changed their family,

1 Neither "alien" nor 'foreigner' is an adequate rendering of peregrinus. For peregrint included not only citizens of other states or colonies, independent or dependent, but also aé\cdes,—men who could not call themselves citizens (cives) at all, as, for example, the dediticii whom Rome had vanquished and whose civic organization she had destroyed, offenders sent into banishment, &c. ; and until Caracalla's general grant of the franchise the greater proportion of her provincial subjects were also spoken of as peregrins. This, though linguistically objectionable, is a safer word than '"'non-citizen" ; for the latter would include the Junian Latins of the early empire, who, though not citizens, yet were not reckoned as péregrini.

yet it was by passing from a human into a divine one. When a citizen forfeited his freedom, his capitis deminutio was said to be maxima ; he lost all capacity, whether under the jus covile or the jus gentium. When, retaining freedom, he went into exile or joined a Latin colony, or otherwise became a peregrin, the diminution of his capacity was only media or minor; it was his rights and privileges under the jus civile that alone were affected. When both free- dom and citizenship remained, and no more occurred than the severance of his connexion with a particular family (familiae mutatio), the diminution was said to be minima. Very simple illustrations present themselves in the case of a paterfamilias becoming filiusfamilias by adrogation, or a materfamilias passing into the hand of a husband by con- farreation or coemption ; in both cases he or she who had been sez juris thereby became alieni juris. This was descent in the family scale. It almost appears as if some of the later Roman jurists assumed, as do many moderns, that such descent or degradation was essential to the idea of minutro capitis; for Paul accounts for its presence in the case of emancipation—which converted a filiusfamilias into a paterfamilias, and thus manifestly improved his status— by the observation that in the process of release from his father's potestas a child had to pass, for however brief a period, through a condition of quasi-slavery (mancipiwm). But in reality degradation had nothing to do with it. It was immaterial whether the change was from a higher family position to a lower, or from a lower to a higher," or to the same position in the new family that had been held in the old,—as when a filiusfamilias was transferred by his father into the potestas of an adopter, or when the Jilufamilias of a person giving himself in adrogation passed with him into the potestas of the adrogator: in every case there was capitis minutio. It was not the change of family position that caused it, but the change of family itself,— the change from one family to another. The civil per-sonality of Titius while a jfiliusfamilias in the potestas of Sempronius,— the expectancy of succession, the agnatic relationships, the derivative capacity for being a party to a mancipation or a sponsio that resulted from the rela- tionship,—all came to an end through the severance of the family tie. He might acquire a new and independent capacity on becoming swt juris by emancipation, or a new derivative capacity on passing into the potestas of Mzevius by adoption; but his old personality

quoad civilia was extinguished. This is what some of the jurists mean when they say that capitis deminutio was civil death.

The most important consequence of minima capitis de- minutio was that it not only extinguished patria potestas where it existed, but severed the bond of agnation between the capite minutus and all those who had previously been related to him as agnates. There was no longer any right of succession between them on intestacy ; their reciprocal prospective rights of tutory were defeated, and the mnutzo of either tutor or ward put an end to a subsisting guardian- ship, assuming always that it was a tutela legetima or agnatic cura furiosit. Very remarkable, yet quite logical, was the doctrine that the mnutio extinguished the claims of credi- tors of the minutus ; their debtor, the person with whom they had contracted, was civilly dead, and dead without an heir, and therefore there was no one against whom an action of the jus civile could be directed in order to enforce payment. But equity eventually provided a remedy, by giving the creditors a preetorian action in which the mnutio was held as rescinded, and which the new paterfamilias was bound to defend on pain of having to give up all the estate

2 Children who became swt juris by their parent's death did not change their family ; the change was not in them, but in the disappear- ance of the family head ; therefore they were not regarded as capite minutt.

Law of family relations.

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he had acquired through the adrogation or im manum con- ventwo.

The Law of the Family Relations.—So far as appears no serious inroad was made by the XII. Tables on the law affecting husband and wife, unless in the recognition of the legality of marriage entered into without any solemnity, and not involving that subjection of the wife to the hus- band (manus) which was a necessary cousequence of the patrician confarreation and plebeian coemption. These were left untouched. But it seems to have become a practice with some of the plebeians to tie the marriage bond rather loosely in the first instance,—possibly (as became

quite general at a later period) in consequence of objection by the women to renounce their independence and right to retain their own property and earnings, more probably because taking a woman to be merely the mother of their children (matrimonium) had been forced upon them before coemption had been introduced as a means of making her a lawful wife, and so they had become in a manner habituated to it. But there seems also to have been an idea that, as a man might acquire the ownership of a thing to which his legal title was defective by pro- longed possession of it, so he might acquire manus, with all its consequences, over the woman with whom he had thus informally united himself by prolonged cohabitation with her as his wife. This had become customary law. The Tables accepted it; all that was needed was to define the conditions under which manus should be held to have been superinduced, and the wife converted from a doubtful uxor into a lawful materfamilias. Hence the provision that, if a woman, married neither by confarreation nor coemption, desired to retain her independence, she must periodically absent herself for three nights from her hus- band's house (trinoctialis usurpatio),—twelve months' un- interrupted cohabitation being required to give him that power over her which would have been created instantly had the marriage been accompanied by either of the recognized. solemnities.

Amongst the fragments of the Tables so industriously collected

'there is none that refers to a wife's marriage portion (dos) ; but it

is hardly conceivable that it was as yet unknown. Justinian says that in ancient times it was regarded as a donation to the husband with his wife, rather than as a separate estate that was to be used by him while the marriage lasted but to revert to her or her repre- sentatives on its dissolution. And it is easy to see that, where there was manus, the wife becoming a member of her husband's family and everything of hers becoming his, such must originally have been its character. But even then, when a man gave his daughter (filiafamilias)—who could have nothing of her own—in marriage, and promised her husband a portion with her, there must have been some process of law for compelling him to pay it ; and Voigt's conjecture that an actio dictac dotis was employed for

the purpose has much in its favour. As regards divorce, Cicero alludes vaguely to a provision in the Tables about a man depriving his wife of the house-keys and turning her out of doors, with some such words as "take what is thine and get thee gone." This can- not have applied to confarreate marriages, which could be dissolved only by the religious ceremony of diffarreation. And even as regards other marriages the statement of the historians is that divorces were few and far between until the 6th century of the city, and that, until the same date, any man who turned his wife away, however serious the ground, without the cognition of the family council was liable to penalties at the hands of the censors.

Of the two or three provisions of the Tables that affected details of the patria potestas, which itself was assuined to be so well estab- lished by customary law as to need no statutory sanction or defini- tion, one was in the words "si paterfamilias ter filium venum duit, a patre filius liber esto." This came to be construed by the jurists as meaning that so powerful was the bond of the potestas that it could not definitively be loosed until the father had three times gone through the process of fictitious sale by which emancipa- tion was effected. But the conception of the law seems to indicate that its original purpose must have been rather to confer a benefit ona son in potestate, by declaring him zpso jure free from it on a certain event, than to place difficulties in the way of his emancipa- tion. "Ifa housc-father have thrice sold his son, the latter shall be free from his father." It reads as if the intention were to rescue the

son from what, by its frequent repetition, was suggestive of a total absence of parental affection rather than reluctant obedience to over- whelming necessity. May not its object have been to restrain the practice, which prevailed toa late period in the empire, of men giving their children to their creditors in security for their loans,—a process that, at the time of the Tables, could be effected only by an actual transfer of the child per aes et libram as a free bondman (mancipti causa), under condition of reconveyance when the loan was repaid ?

The nature of the relation between master and slave, like that of manus and patria potestas, seems also to have been too notorious to require exposition in the Tables. 'We find recorded only two re- ferences to it, one dealing with the case of a slave who had a con- ditional testamentary gift of freedom (state liber), the other with noxal surrender (noxae deditio). The provision about noxal sur- render in all probability was not limited to a slave ; it was to the effect that, if a member of a man's family (familiaris, 7.e., a son or a daughter in potestate or a slave) committed a theft from or did mischief to property belonging to a third party, or a domestic animal belonging to one man did harm to another, the father of the delinquent child, or the owner of the slave or animal, should either surrender him or it to the person injured or make reparation in damages. In course of time the surrender came to be regarded as a means of avoiding the primary obligation of making reparation. But comparative jurisprudence recognizes in the enactment of the Tables a modified survival of the ancient right of an injured party to have the delinquent corpus,—man, beast, or thing,—given up to him to wreak his revenge upon it privately, the modification con- sisting in the alternative of reparation offered to the owncr. This noxal surrender, failing reparation, had gone out of use in the case of daughters in potestate before the time of Gaius, and in the case of sons before that of Justinian ; but the law remained unchanged so far as slaves and domestic animals were concerned even in that emperor's legislation.

Guardianship and the Introduction of the Order of Agnates.

Gentile

—So long as Rome was patrician the gens charged itself guard- with the guardianship of a clansman's orphaned pupil #2ship.

children and his widow and unmarried daughters above pupilarity after his decease (¢utela), as well as with that of male members of his family who were sat juris, but above the age of pupilarity, when they chanced to be lunatic, im- becile, prodigal, or helplessly infirm (cura, curatio, curatela). That was on the supposition, as regarded children, widow, and unmarried daughters above pupilarity, that no testa- mentary appointment of tutors by their deceased parent had displaced the gens, though whether testamentary nomi- nations were then held competent it is impossible to say. The gens in council, in all probability, appointed one of its members to act as tutor or curator as the case might be, itself prescribed his duties, and itself called him to ac- count for any failure in his administration.

But, as this gentile tutory could not be extended to the plebeians, among whom some law of guardianship was as much required as among their fellow-citizens of the higher order, the decemvirs found it expedient to devise a new one of universal application. The Tables contained no express authority for testamentary nomination of tutors to the widow of the testator, or to his pupil children and grown-up unmarried daughters; but such appointment, if unknown previously, was soon held to be justified by a liberal interpretation of the very inclusive provision, "uti legassit suae rei, ita jus esto." In the absence of testa- mentary appointment the nearest male agnates of lawful age were to be tutors. This tutory of agnates was an in- vention of the decemvirs, just as was the agnates' right of succession on intestacy. The plebeians had no gentes, at least until a much later period ; so, to make the law equal for all, it was necessary to introduce a new order of heirs and tutors. 'Tutores … ex lege XII. Tabularum in- troducuntur … agnati" is the very notable language of Ulpian. And his words are very similar in speaking of their right of succession; for, while he says of testament- ary inheritances no more than that they were confirmed by the XII. Tables, he explains that the legitimae hereditates of agnates and patrons were derived from them.! The

1 Ulp., Frag., xxvii. 5, "legitimae hereditatis jus… ex lege Duodecim Tabularum descendit." This derivation of agnatic inherit-

Guard- ianship of agnates.

Owner- ship in res Inan- cipi and res nec mancipi.

JUS CIVILE. |

phrases legitema cognatio, legitima hereditas, legitimt heredes, tutela legitima, tutores legitimi themselves proclaim the origin of agnation, agnatic inheritance, and agnatic tutory ; for, though the word legitimus might be applied to any in- stitution based on statute, yet in the ordinary case it indi- cated one introduced by the XII. Tables, the law of laws.

A man's agnates were those of his kinsmen who were subject to the same patria potestas as himself, ar would have been had the common ancestor been still alive. A man's sons and daughters im potestate, therefore, whether the relationship was by birth or adoption, and his wife in manu (being jfiliae loco) were each other's agnates. But a wife not im manu was not their agnate ; nor were children who had been emancipated or otherwise capite minuti the agnates of either their brothers and sisters or their mother an manu, A man was an agnate of his brother's children, assuming always that there had been no capitis deminutio on either side; but he was not an agnate of his sister's children, for they were not ejusdem familiae: they were agnates of their father's family, not of their mother's. In like manner, and again assuming the absence of minutio capitis, the children of brothers were each other's agnates, but not the children of a brother and a sister or of two sisters. Brothers and sisters were agnates of the second degree ;! a man and his brother's children were of the third, the children of two brothers (consobrini) of the fourth, and so on,—it being a condition, however, that the kinship should always result either from lawful marriage or from adoption in one or other of its forms.

When, therefore, a man died leaving pupil male descendants or unmarried female descendants who by his death became swi juris, they got their brothers of lawful age as their tutors ; if he was sur- vived by his

wife, and she had been tn manu, her sons, or it might be stepsons, acted for her in the same capacity ; in either case they took office as the nearest qualified male agnates. If the widow had no sons or stepsons of full age, and the children consequently no brothers, the tutory devolved on the agnates next in order,—d.e., the brothers germane and consanguinean of the deceased husband and father; for they were agnates of the third degree. And so with agnates of the fourth and remoter degrees. Failing agnates who could demonstrate their pop the tutory probably passed to the gens when the ward happened to belong to one. This is nowhere expressly stated ; but Cicero gives what he represents to be an enactment of the Tables, making the fellow-gentiles of a lunatic his guardians on failure of agnates; and analogy seems to justify the extension of the same rule to the case of sane pupil and female wards.

The curatory of minors above pupilarity was of much later date than the Tables. The only curatories they sanctioned were those of lunatics and spendthrifts. A lunatic (furiosus) was committed to the care of his agnates, and, failing them, of his fellow-gentiles ; and a few words in Festus seem to suggest that arrangements had to be made by them for his safe custody.

Mancipation and the Law of Property.—In the early law there was no technical word for ownership of things; it was an element of the house-father's manus. In time, although it is impossible to say when, the word dominium

came into use; but, so far as can be discovered, it did not

occur in the XIJ. Tables, and must have been of later introduction. In those days, when a man asserted owner- ship of a thing, he was content to say, "It 1s mine," or, "It is mine according to the law of the Quirites." The distinction was this, that, while the first was sufficient to entitle a man de facto holding a thing as his own to pro- tection against a thief or any one attempting forcibly to ance from the XII. Tables was specially noticed by Danz in his Gesch. d. rom. Rechts, 2d ed., Leipsic, 1871-73, vol. ii, p. 95, but is generally ignored. ;

1 To determine the degree of propinquity between two persons it was necessary to count the generations upwards from the first to the common ancestor and downwards from him to the second. Conse- quently brothers were related in the second degree, uncle and nephew in the third, first cousins in the fourth, and so on: "tot gradus quot generationes."

dispossess him, the second was necessary when he appealed toa court of law to declare the legality of his title and his right to oust an individual withholding the possession neither theftuously nor by force. It is said by some jurists of eminence that under the law of the Tables what after- wards came to be called "dominium ex jure Quiritium" was competent only in the case of res mancipt,—of a man's house and farm, and the slaves and animals with which he worked them. But the usucapion (or acquisition by pro- longed possession) which they confirmed and regulated undoubtedly conferred quiritarian right ; and, as it applied to all things ownable without exception, it seems impossible .to maintain that res nec mancipi could not then be held in quiritarian ownership as fully as res mancipi.

The modes in which these two classes of things might be acquired in property were very various. But there was this important difference,— that, while a natural mode of acquisition sufficed in the case of res nec mancipi, some civil one was necessary for the derivative acquisition, at all events, of res mancipi. The most important were mancipation, surrender in court, usucapion, and bequest as singular modes, and inheritance, in manwm conventio, adrogation, and purchase of a confiscated estate as univer- sal modes. All these, with the exception of mancipation, applied equally to res nec mancipi. But the commonest of all the modes of transferring things of the latter class was simple tradition. If the transfer was by the owner, with the intention of passing the property, then the simple delivery of possession was enough, unless it was in virtue of a sale; in such a case, and because a vendor had as yet no action for the price, the Tables provided that the ownership should remain with him,

notwithstanding the change of possession, until the price was paid or security given for it.

_ The origin of the distinction between mancipable and non-man- Manci- cipable things, and of the form of conveyance by mancipation pation.

applicable to the first, has been explained in connexion with the reforms of Servius Tullius (supra, p. 676).2 As he introduced it, mancipation (then called mancipiwm) was not the imaginary sale that Gaius speaks of, but as real a sale as could well be conceived, —the weighing in scales, held by an official, of the raw metal that was to be the consideration for the transfer of a res manctpt, and the handing of it by the transferee to the transferrer, with the de- claration that thereby and therewith the thing in question became his in quiritary right,—and all this in words of style, and in the presence of certain witnesses who represented the pcople, and thus fortified the conveyance with a public sanction. As already shown, there is some reason to believe that, when large quantities of metal had to be weighed, the practice crept in of having this done before the witnesses had assembled ; and in the formal act only a single pound was weighed as representing the whole amount. This paved the way for the greater change that resulted from the introduction by the decemvirs of coined money. From that moment weighing became unnecessary. The price was counted out before the ccre- mony, and sometimes left to be done afterwards ; and, though, in that spirit of conservatism that was so marked in the adhesion to time-honoured forms after their raison d'étre was gone, the scale- bearer and the scales were still retained as indispensable elements of the mancipation, yet the scales were simply tonched by the pur- chaser with a single coin, in order that he might be able to recite the old formula—"T say that this slave is mine in quiritary right, and that by purchase (for such and such a price ?) with these scales and this bit of copper." And that one coin, says Gaius, was then handed by the trausferee to the transferrer, as if it were in fact the price of the purchase (quasi pretii loco). Thus transformed, the mancipation was undoubtedly an imaginary sale ; for the real price might have been paid weeks or months before, or might not be paid until weeks or months afterwards. The mancipation had become nothing more than a conveyance, and in this form it continued down to the end of the 3d

century of the empire to be the appro- priate mode of transfer of a rcs mancipt, or at least of conferring on the transferee of such a thing a complete legal title (dominium ex jure Quiritium). After that, however, it seems gradually to have gone into disuse, being inapplicable to lands out of Italy that did

2 Literature :—Leist, Mancipation und Higenthumstradition, Jena, 1865; Ihering, Geist d. rém. Rechts, vol. ii. § 46; Bechmann, Geschichte d. Kaufs im rim. Recht, Erlangen, 1876, pp. 47-299 ; Voigt, XJZ. Tafeln, vol. i. § 22, vol. ii. §§ 84-88.

XX. — 87

Surren- der in court,

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not enjoy what was ealled jus Italicwm ; and long before the time of Justinian it had entirely disappeared. ; ;

The effects of a mancipation, provided the price had been paid or security given for it, were that the property passed instantly to the purchaser, and that the transferrer was held to warrant the transferee against eviction from the moment the price was received. In the absence of either payment or sureties for it, the title still remained with the vendor, so that it was in his power, by means of a real action, to get back what had been maneipated, even though it had passed into the possession of the vendee. The vendor's liability to the vendee in the event of eviction is usually supposed to have arisen tpso jure, that is to say, without anything expressly said about it; the acceptance by the transferrer of the coin with whieh the scales had been struck was held to have im- posed upon him an obligation to maintain the transferee in posses- sion, under a penalty of double the amount of the price, recoverable by the latter by what is usually called an actio auctoritatis. But this ipso jure obligation did not arise when the mancipation was either really or fictitiously gratuitous, — really, in the case of dona- tions, &c., fietitiously, when, on purpose to exclude the warranty, the reeital of the transferee was that the price was a single sesterce. . The right of a vendee to sue an actio auctoritatis arose

only when eviction resulted from a decree in a regular judicial process at the instance of a third party disputing his title, and was conditional on his having done all that was necessary on his part to bring his vendor (auctor) into the field to defend his own interests. And the duration of the auctoritas was limited by statute to two years in the case of lands and houses, to one year in the case of other things. As possession for those periods was sufficient to cure any defeet in the vendee's title, it was but reasonable that with their expiry the vendor's liability on his warranty should be at an end.

By a provision of the Tables in the very inclusive terms, 'cum nexum faciet mancipiumque, uti lingua nuncupassit, ita jus esto," the importance of mancipation was immensely increased ; for any sort of qualification germane to the transaction might be super- indueed upon it, and the range of its application thus greatly extended. Such qualifications were spoken of as leges mancipii,— self-imposed terms, conditions, or qualifications of the conveyance, which, as integral parts of the transaction per aes ct ibram, partook of its binding character and were law between the parties. The matter of oral declaration might be the acreage of lands, their freedom from burdens or right to easements, reservation of a usu- fruct, limitation of their mode of use, undertaking to reconvey on a certain event, or what not; the result was just so many obliga- tions created per acs ct libram, whose contravention or denial (Cicero tells us) was punished with a twofold penalty. Ordinarily the words spoken in the hearing of the witnesses fixed the begin- ning and the end of the liability ; it was enough that they were literally complied with, however much the other party might be injured by something inconsistent with their spirit, or which he had not taken the precaution to require should be made matter of declaration. But there was an exception (although possibly not introduced until long after the Tables) in the ease of that parti- cular mancipatory agreement which was known by the name of Jiducia, t.c., where the mancipation was to a creditor in security or to a friend for safe eustody, and the engagement was to return the thing mancipated in the one case when the debt secured by it was paid and in the other on demand. In such cases the transferee took the conveyance more in the transferrer's interest than his own . he became a trustee, entitled to be treated with consideration, and neither mulcted in a twofold

penalty when his inability to reconvey was due to no fault of his, nor forced to reconvey until relieved of eharges incurred by him in reference to the property. Accordingly it became the practice to import into the mancipation a reference to fides —"fidei fiduciae meum esse aio," with explanation of the purpose, &c., of the fiducia in the relative lex mancipit; this had the effect of freeing alike the right of the vendor and the obligation of the vendee from the hard-and-fast lines of the jus strictum, and subordinating them to the principles of bona fides,

Of the civil modes of acquiring property on singular title appli- cable to both res mancipt and res nec mancipi surrender in eourt (in jure cessio) was just a rct vindicatio arrested in its initial stage. The parties, cedent and eessionary, appeared before the magistrate ; the eessionary, taking the position of plaintiff, declared the thing his in quiritary right ; the cedent, as defendant, was asked what he had to say in answer; and, on his admission or silence, the magistrate at once pronounced a decree (addictio) which completed the transfer, but which might be subject to a condition or other limitation, or even to a fiduciary reservation. It was probably more resorted to for the constitution of servitudes, both real and personal, and transfer of such rights as patria potestas, tutory-at-law of a woman, or an inheritance that had already vested, than for con- veyance of property. For it was not only inconvenient, inasmuch as it required the parties to appear before the supreme magistrate in Rome, and eould not be earried through by a slave on his owner's behalf (as maneipation might), but it had the serious dis- advantage that it did not dpso jure imply any warranty of title by

the cedent or afford the eessionary any action against him in the event of eviction. The reason was that in form the right of the cessionary flowed from the magisterial decree,—"Since you say the thing is yours, and the cedent does not say it is his, I declare it yours,'—and not from any act or word of the cedent's, who was passive in the matter.

Adjudication was the decree of a judge in a divisory action, such Adjudi- as one for partition of an inheritance amongst co-heirs; it con- eation,

ferred upon each of them a separate and independent right in a part of what as a whole had previously been joint property.

Usucapion,! regulated by the XII. Tables, but not im- Usuea- probably recognized previously in a vague and uncertain pion.

way, converted uninterrupted possession (wsus) into quiri- tary property by efflux of time. The provision in the Tables was to this effect-—" usus auctoritas fundi biennium esto, ceterarum rerum annuus esto." The relation in which the words usus and auctoritas stand to each other has been a subject of much discussion : the prevailing opinion amongst modern civilians is that the first alone refers to usucapion, and the second to the warranty of title incum- bent on the vendor in a mancipation, and that both were limited to two years in the case of lands (and, by extensive interpretation, houses), and to one year in the case of any- thing else. In the later jurisprudence the possession re- quired to be based on a sufficient title and the possessor to be in good faith. But the decemviral code, as is now generally admitted, contained no such requirements ; any citizen occupying immovables or holding movables as his own, provided they were usucaptible and he had not taken them theftuously, acquired a quiritary right in two years or one, as the case might be, simply on the strength of his possession. Originally, therefore, it was simply the conversion of de facto possession, no matter how acquired so long as not by theft, into legal ownership when pro- longed for the statutory period,— too often the mainte- nance of might at the cost of right. But in time it came to be regarded rather as a remedy for some defect of title, arising either from irregularity of conveyance or incapacity of the party from whom a transfer had been taken; and with the progress of jurisprudence it developed into the carefully regulated positive prescription which has found a place in every modern system.

The conception of the abstract notion of a real right in Jura in (or over) the property of another person (jus in re aliena) re aliena.

is not to be looked for at so early a period in the history of the law as that now under consideration. The rural servitudes of way and water were no doubt very early re- cognized, for they ranked as res mancipi, and the XII. Tables contained various regulations in reference to the former. Usufruct, too, was probably not unknown ; but the urban preedial servitudes bear the impress of a some- what later jurisprudence. Pignorate and hypothecary rights were unknown as rights protected by action at the time now being dealt with.2 Between private parties the only thing legally recognized of the nature of a real security was the jiducia that is described above. Ap- proaching more nearly to the modern idea of a mortgage was the security praedibus praediisyue required by the state from those indebted to it in assurance of their obli- gations. Here there was the double guarantee of sureties (praedes) and mortgaged lands of theirs (praedia subsig-

1 Literature :—Stintzing, Das Wesen von bona fides und titulus in d. rim. Usucaptonslehre, Heidelberg, 1852 ; Schirmer, Die Grundidee d. Usucapion im rim. Recht, Berlin, 1855; Pernice, Labeo, vol. ii. pp. 152 sg. ; Voigt, XII. Tafeln, vol. ii. § 91; Esmein, "Sur Vhistoire de Y'usueapion," in the Vowv. Rev. Hist., &e., vol. ix. (1885), p. 261 sq.

? Hypotheeary rights were certainly unknown until near the end of the republic. But Festus (s.v. " Naneitor ;" see Bruns, Fontes, p. 274) speaks of a provision in the Cassian league between Rome and the Latin states of the year 262 u.c.—" Si quid pignoris naseiscitur, sibi habeto" —which makes it difficult to believe that the Romans were altogether unaequainted with pledge or pawn of movables as a transaction of some value de facto if not de jure.

Forms of

testa- ment.

Testa-

ment per by Gaius as a written instrument.

aes et libram,

nata); but how they were dealt with when the debtor made default is by no means clear.

Changes in the Law of Succession.—The two forms of testament of the regal period (supra, p. 674) still remained in use in the early republic; but in course of time they were displaced by the general adoption of that executed with the copper and the scales (¢estamentum per aes et libram). It seems to be the general opinion that it was to the first two that the words applied which stood in the forefront of the provisions of the XII. Tables about in- heritance,—"' uti legassit suae rei, ita jus esto." Whether resort was to the comitia or to the army, the testator's own will in the matter was henceforth to be supreme. There was to be no more reference to the pontiffs as to the expediency of the testament in view of the interests of the family sacra and of creditors of the testator's; from legislators, sanctioning a departure from the ordinary rules of succession, the assembled Quirites became merely wit- nesses,—recipients of the oral declaration of the testator's will in regard to his inheritance.

The testament with the copper and the scales is depicted But he presents it in what was apparently the third stage of its history. Its probable origin has been explained in describing the result of the Servian reforms upon the private law. It was then not a testament but only a makeshift for one. A plebeian was not qualified in the regal period to make a testament in the comitia; so, instead, he transferred his estate to a friend on whom he could rely with instructions how to distribute it on his death. The transferee was called Jamiliae emptor, because the conveyance was in form a mancipation for a nominal price.

It is not at all unlikely that the same device may occasionally have been resorted to by a patrician who had neglected to make a regular testament, and was seized with mortal illness before he had an opportunity of appealing to the curies. But such a disposition was not a testament, and may not have been so called. A testa- ment was the nomination of a person as the testator's heir, —some- times the substitution of an individual of the testator's choice for the heir assigned to him by law, sometimes the acceptance of the latter but in the character of

testamentary heir, so that the testator might be able to impose upon him what burdens he pleased as the tacit condition of heirship. It made the person instituted as fully the representative of the testator after his death as his heir-at-law would have been had he died intestate. The mortis causa manci- pation that opened the way for the testament per aes et Libram conferred upon the familiae emptor no such character. Gaius says that he stood in place of an heir (heredis loco), inasmuch as he had such of an heir's rights and duties as the familiae venditor had it in his power to confer and impose ; but the transaction was but a conveyance of estate, with a limitation of the right of the grantee. It has been argued that, as the law did not recognize conditional mancipation, the conveyance must have operated as a complete and immediate divestiture of the grantee. But this does not follow. For it was quite competent for a man, in transferring property by mancipation, to reserve to himself a life interest ; and apparently it was equally competent for him to postpone delivery of possession, without infringing the rule that the mancipation itself could not be ex certo tempore. So far as one can see, therefore, there was nothing to prevent the grantee of the conveyance (or quasi-testator) bargaining that he was to retain the posscssion till his death ; and, as the familia was an aggregate of estate (untversitas rerum) which retained its identity notwithstanding any change in its component elements, he must in such case have been as free to operate on it while he survived as if he had never conveyed it by mancipation.

Cicero incidentally remarks—what indeed the nature of the business of itself very distinctly suggests—that the true testament with the copper and the scales had its sta- tutory warrant, not in the wtz legassit suae rei of the XII. Tables, but in the provision contained in the words,—" cum nexum faciet mancipiumque, uti lingua nuncupassit, ita jus esto." Reflexion on the import and comprehensiveness of these words led the interpreters to the conclusion that there was nothing in them to prevent the direct institution of an heir in the course of the verba nuncupata engrafted on a mancipation. From the moment this view was adopted

and put in practice the familiae mancipatio ceased to be a transfer of the testator's: estate to the familiae emptor : the latter's purchase was now for form's sake only, though still an indispensable form, since it was it alone that, according to the letter of the statute, imparted efficacy to the nuncupatio. But it was the nuncupatio—the oral de- claration addressed to the witnesses—that really contained the testamentary disposition, ¢.c., the institution of an heir, with such other provisions as the testator thought fit to em- body in it. This was the second stage in the history of the testament per aes et libram. The third was marked by the introduction of tablets in which the testamentary provisions were set out in writing, and which the testator displayed to the witnesses, folded and tied up in the usual manner, declaring that they contained the record of his last will. Gaius narrates the words spoken by the familiae emptor and addressed to the testator as follows :—" Your estate and belongings (familia pecuniaque tua), be they mine by purchase with this bit of copper and these copper scales, subject to your instructions, but in my keeping, that so you may lawfully make your testament ac- cording to the statute (quo tu jure testamentum faccre possis secundum legem publicam)." The meaning of the words "in my keeping (endo custodelam mcam)" is not quite obvious ; they may have been rem- nants of an older style, or may be due to a clerical error of the writer of the Verona MS, Certain it is that they no more imported a real custody than a real property in the familiae emptor ; for the testator remained so entirely master of his estate that the very next

'day if he pleased he might mancipate it anew to a different pur-

chaser, and nuncupate fresh testamentary writings. The nuncupa- tion was in these terms: 'As is written in these tablets so do I give, so do I legate, so do I declare my will; therefore, Quirites, grant me your testimony"; and, adds Gaius, " whatever the testa- tor had set down in detail in his testamentary tablets he was regarded as declaring and confirming by this general statement." 'To the appeal of the testator the witnesses responded by giving their testimony in words which unfortunately are not preserved; and then the testament was sealed by testator, officials, and witnesses, the seals being outside according to the early fashion.

Although this testament with the copper and the scales was justi- fied in the first instance by the provision of the XII. Tables as to the effect of nuncupative words annexed to a mancipation, yet in course of time it came to be subordinated to that other one which dealt directly with testamentary dispositions, —wtt legassit suae ret, ita jus esto. Upon the words uti legassit the widest possible meaning was put by the interpreters: not only was a testator held entitled on the strength of them to appoint tutors to wife and children, to enfranchise slaves, and make bequests to legatees, but he might even disinherit his proper heir (swes heres) in favour of a stranger, so long as he did so in express terms. Institution of a stranger without mention of the proper heir, however, was fatal, at least if the latter was a son; for without express disherison (exheredatio) his father could not deprive him of the interest he had in the family property as in a manner one of its Joint owners. It can hardly be supposed that disherisonu was contemplated by the compilers of the Tables: it was foreign to the traditional conception of the family and the family estate. But it was aright whose concession could not be resisted when claimed as embraced in the wt degasstt, although generally discountenanced, and as far as possible restrained by the strictness of the rules imposed on its exercise.

In the absence of a testament, or on its failure from Intestate

any cause, the succession opened to the heirs ab intestato, Succes- t s10n.

So notoriously were the suc heredes entitled to the firs place—and that not so much in the character of heirs as of persons now entering upon the active exercise of rights hitherto existing, though in a manner dormant—that the compilers of the XII. Tables thought it superfluous ex- pressly to declare it. 'If a man die intestate, leaving no suus heres, his nearest agnate shall have his estate. If the agnate also fail, his gentiles shall have it." It has been pointed out, in dealing with the tutory of agnates, that the notion of agnation, as a bond distinct from that which connected the gentile members of a clan, was due to the de- cemvirs. They had to devise a law of intestate tutory and succession suitable alike to the patricians who had gentes and to the plebeians who had none. To put the latter in exactly the same position as the former was beyond their power ; for the

fact had to be faced that the plebeians had no gentile institutions, and to create them was impossible.

Position of heirs.

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The difficulty was overcome by accepting the principle of agnation upon which the patrician gens was constructed, and establishing an agnatic circle of kinsmen within the sixth degree, to which the gens as a corporation should be postponed in the case of the patricians, and which should come in place of it in the case of the plebeians. It was not perfect equalization, but the nearest approach to it that the circumstances permitted. The difference was that, when the agnates of a plebeian intestate failed, his inherit- ance was vacant, whereas, on failure of those of a patrician, there was devolution to his gens in its collective capacity. And this devolution was rendered all the more frequent by two "interpretations" put upon the statute, —(1) that, if the nearest agnates in existence declined the succession, those next in degree were not allowed to take it ; and (2) that no female agnate could take it except a sister of the deceascd intestate. The division among two or more agnates was always per capita, not per sturpes.

The order of intestate succession thus established by the XII. Tables, which prevailed until amended by the preetors probably in the 8th century of the city, was first to the sui heredes of the deceased, next to his nearest agnate or agnates, and finally, if the deceased was a patri- cian, to his gens. His sai heredes included those of his de- scendants in his potestas when he died who by that event (or even after it, but before his intestacy became manifest) became sui juris, together with his wife in manu (who, as regarded his succession, was reckoned as a daughter) ; but they did not include children whom he had emancipated or daughters who had passed in manum of a husband. Eman- cipated children did not even come in as agnates on failure of sui; for emancipation severed the tie of agnation as well as that of potestas. or the same reason no kinsman who had been emancipated, and so cut off from the family tree, could claim as an agnate ; for those only were agnates who were subject to the same patria potestas, or would have been had the common family head been still alive.

The opening of a succession (technically delatio hereditatis) in favour of swi heredes, whether in virtue of a testamentary institu- tion or by operation of law on intestacy, at once invested them with the charaeter, rights, and responsibilitics of heirs. No accept- ance was necessary, nor, according to the rules of the jus eivile, was any declinature competent. They had been all along in a manner joint owners with their parent of the family cstatc, which by his death had become, nominally at least, an inheritance ; and, as he had not thought fit to terminate their interest in it by emancipat- ing or disinheriting them, they were not now allowed to disown it. Hence they were spoken of as necessary heirs (heredes sui et necessarit). A slave, too, whom his owner had instituted in his testament was a necessary heir: he could not decline, and was invested with the character of heir the moment the testator died. Not so with stranger institutes or agnates taking on intestacy: they were free to take or reject the inheritance as they saw fit; consequently an act of acceptance (aditio) was necessary on their part to make them heirs. It was not unusual for a testator, in instituting an heir, to require that he should make a formal de- claration of acceptance within a limited time, failing which his right should pass to a substitute, who in turn was required to enter within a certain time; and so on with any nunber of substitutes, the series ending with one of his slaves, who became heir without entry, and thus saved the testator from the disgrace of post mortem bankruptcy in the event of the inheritance proving insolvent. The wéz legasstt of the Tables, as already remarked, conferred upon a testator very great latitude of testamentary disposition, even to the extent of disherison of swi heredes. This was a course, how- ever, that was rarely resorted to unless when a child had been guilty of gross ingratitude, or when the parent had reason to believe his estate was insolvent and desired to protect his children from the responsibilities of inheritance. Usually his sud, if he had any, would be his institutes, and the purpose of the testament either to apportion the estate amongst them as he thought cxpedient, or to give him an opportunity of appointing tutors, bequeathing legacies, or enfranchising slaves. On intestacy the sui took equally, but ber stirpes; that is to say, grandchildren by a son who had predeceased or been emancipated, but who themselves had been retained in their grandfather's potestas, took amongst them the share to which their father would otherwise have been entitled, instead of taking equal shares with their surviving uncles. It was

by no mcans uncommon, when the whole inheritance descended to sons, for them to hold it in common for many years as partners (eonsortes); but any one of them was entitled at any moment to claim a partition, which was effected judicially, by an arbitral procedure introduced, termed a judietwm (or arbitrium) familiae ereiseundae. Where two or more strangers were instituted testamentarily, whether to equal or unequal shares, if one of them failed either by predecease or declinature his share accrued ipso jure to the others; for it was arule that very early became proverbial that a man could not die partly testate and partly intestate. Thcre was the same accrual among agnates on intestacy ; and both they and stranger testament- ary institutes had the same action for division of the inheritance that was made use of by swt heredes.

According to Gaius it was as a stimulus to heirs to enter as soon Usucapio

as possible to an inheritance that had opened to thein, and thus pro make early provision alike for satisfying the claims of creditors of herede,

the deceased and attending to his family saera, that the law came to recognize the somewhat remarkable institution of usucapion or prescriptive acquisition of the inheritance in the character of heir (usueapto pro herede). Such usucapion was impossible—there was no room for it—if the deceased had left swe heredes; for the inherit- ance vested in them the moment he died. But, if there were no sui heredes, then any person taking posscssion of the property that had belonged to the deceased, and holding it for twelve months without interruption, thereby acquired it as if he were heir: in fact, according to the views then held, he acquired the inhcritance itself. Gaius characterizes it as a dishonest acquisition, inasmuch as the usucapient knew that what he had taken possession of was not his. But, as already explained, the usucapion of the XII. Tables did not require bona fides on the part of the usucapient ; he might acquire ownership by prolonged possession of what he knew did not belong to him so long as he did not appropriate it theftu- ously, t.e., knowing that it belonged to another. But an inherit- ance unappropriated

by an heir who had nothing more than a right to claim it belonged in strictness to no one; and there was no theft, therefore, when a person took possession of it with a view to usucapion in the character of heir. 'There can be little doubt that on the completion of his possession he was regarded as heir just as fully as if he had taken under a testament or as heir-at-law on in- testacy,—that is to say, that he was held responsible to creditors of the deceased and required to charge himself with the family saera. Gaius does not say as much; but both the Coruncanian and the Mucian edict imposed the latter burden upon him who had usucapted by possession the greater part of a deceased pcrson's estate ; and it is but reasonable to suppose that the burden of debts must in like manner have fallen on the usucapient or usucapients in proportion to the shares they had taken of the deceased's property.

The Law of Obligations.—The jurists of the classical Law of period attribute obligation either to contract, or delict, or obliga-

miscellaneous causes (variae causarum figurae) ; and those arising from contract fill a place in the later jurisprudence vastly greater than those arising from delict. In the XII. Tables it was very different. In them delicts were much more prominent than contracts,—wrongs entitling the sufferer to demand the imposition of penalties upon the wrongdoer that in most cases covered both reparation and punishment. The disproportion in the formulated provisions in reference to the two sources of obligation, however, is not surprising. For, first of all, the purpose of the decemviral code was to remove uncertainties and leave as little as possible to the arbitrariness of the magis- trates. In nothing was there more scope for this than in the imposition of penalties; and, as different offences re-quired to be differently treated, the provisions in reference to them were necessarily multiplied. In the next place, the intercourse that evokes contract was as yet very limited. Agriculture was the occupation of the great majority ; trade and commerce were more backward than in the later years of the regal period ; coined money was just beginning to be used as a circulating medium. Lastly, the safeguards of engagement then lay to a great extent in the sworn oath or the plighted faith, of which the law had hardly begun to take cognizance, but which found a protection

quite as potent in the religious and moral sentiments that had so firm a hold on the people.

It may be asked—If a man purchased sheep or store cattle, a Contract

ONS.

plough, a toga, a jar of wine or oil, had he no action to compel in

delivery, the vendor no action for payment of the price ? hire of a horse or the loan of a bullock create no obligation? Was partnership unknown and deposit and pledge and suretyship in

Did the general.

Requi- sites of binding contract.

JUS CIVILE. |

any other form than that of vadimoniwm? One can have no hesitation in answering that, as transactions of daily life, they must all have been more or less familiar. It does not follow, how- ever, that they were already regulated by law and protected by the ordinary tribunals, The historical jurists are pretty well agreed that not only the real contracts of loan (mutuum and commodatum), deposit, and pledge, but also the consensual ones of sale, location, partnership, and mandate, and the verbal one of suretyship, were as yet very barely recognized by law. Sale was the offspring of barter, —of instant exchange of one thing for another. With such instant exchange there was no room for obligation to deliver on either side, even when the ware (merx) given by one of the parties was so much rough copper weighed in the scales. The substitution of coined money for the raw metal can hardly have effected any radical change: the ordinary practice of those early times must still have been ready-money transaction,—an instant exchange of ware for price; and it can only have been when, for some reason or other, the arrangement was exceptionally for delivery or pay- ment at a future date, say next market day, that obligation was held to have been created. Was that obligation enforceable by the civil tribunals? Some jurists hold that it was,—that at no time were

the jus gentiwm contracts outside the protection of judicial remedies, although by a simpler procedure than that resorted to for enforceinent of the contracts of the jus civile. But two provisions in the XII. Tables seem to prove very clearly that it was not so enforceable. The first is onc recorded by Justinian,—that, where a thing was sold and delivered, the property, nevertheless, was not to pass until the price had been paid or sureties (vades) for it accepted by the vendor. Far from being a recognition of the obligatory nature of the transaction, this provision is really a recognition of the inability of the law to enforce payment of the price by the vendee ; it is a declaration that, on the latter's failure to pay, the vendor, unprotected by any ia action, should be entitled to get back the thing sold as still his own, no matter in whose hands he found it. The second related to the case of a person who had bought a victim for sacrifice, but had failed to pay for it. A real action for its revindication by the seller after it had been consumed on the altar was out of the question ; so he was authorized by the Tables, by the process of pignoris capio (supra, p. 686), at his own hand to appropriate in satisfaction a sufficient equivalent out of the belong- ings of the purchaser, against whom he had no personal action.

It was a principle of the law of Rome through the whole of its history, though in course of time subject to an increasing number of exceptions, that mere agreement between two persons did not give him in whose favour it Was conceived a right to demand its enforcement. To entitle a man to claim the intervention of the civil tri- bunals to compel implement of an engagement under- taken by another, it was necessary (subject to those ex- ceptions) either that it should be clothed in some form prescribed or recognized by the law, or that it should be accompanied or followed by some relative act wluich ren- dered it something more than a mere interchange of consent. Under the jurisprudence of the XII. Tables the formalities required to elevate an agreement to the rank of contract and make it civilly obligatory sometimes combined cere- monial act and words of style, sometimes did not go beyond words of style, but in all cases took place before witnesses. Dotis dictio, the undertaking of a parent to provide a dowry with his daughter whom he was giving in marriage, and vadimonium, the guarantee of a surety for the due fulfilment of the undertaking either of a party to a con- tract or a party to a litigation,

probably required nothing more than words of style before persons who could if necessary bear witness to them; whereas an engagement incident to a mancipation, or an undertaking to repay borrowed money, required in addition a ceremony with the copper and the scales. This undertaking to repay arose from the contract of nexum, which was older than the Tables ; both it and the verbal contract by sponseo or stipulation, which was younger, merit further consideration.

The Nexal Contract1—The tumults and seditions so

1 Literature :—Savigny, "Ueber d. altrém. Schuldrecht," in his Verm. Schriften, vol. ii. p. 396 sg. ; Scheurl, Vom Nexum, Erlangen, 1839 ; C. Sell, Dejuris Rom. nexo et mancipio, Brunswick, 1840; Van Heusde, De Lege Poetilia Papiria, Utrecht, 1842; Bachofen, Das Nexum, &c., Basel, 1843; Huschke, Ueber d. Recht des Nexum, Leipsic, 1846; Giraud, Des Next ou de la condition des débiteurs chez les Romains, Paris, 1847; Bekker, Die Aktionen des rém. Privatrechts, vol. i.,

frequent in Rome during the first two centuries of the Causes of republic are more frequently attributed by the historians Plebeian

to the abuses of the law of debt than to any other cause, F social or political. The circumstances of the poorer ple- ~ beians were such as to make it almost impossible to avoid borrowing. Their scanty means were dependent on the regular cultivation of their little acres, and on each opera- tion of the agricultural year being performed in proper rotation and at the proper season. But this was every now and again interfered with by wars which detained them from home at seed-time or harvest, practically render- ing their farms unproductive and leaving them and their families in straits for the commonest necessaries of life. A poor peasant, in such a case, had no alternative but to apply to a capitalist for a loan. But it was not to be had without security, and rarely without interest. It was not that the lender doubted the borrower's honesty and willing- ness to repay his debt ; it was rather that there was every chance that next

year a fresh war might again interfere with the latter's agricultural operations, leavé him again without a crop, and thus render repayment impossible. And so, while interest accumulated and was periodically added to capital, new loans had year after year to be con- tracted as long as any acres remained that could serve as a security ; failing all things, the debtor had to impledge or hypothecate himself ;2 for, phrase it how we may, this was substantially the result of the contract of neaum.

The practice of lending per libram was doubtless of Nexal great antiquity, —indeed the intervention of the scales was contract.

a necessity when money or what passed for it had to be weighed instead of counted; and not improbably old custom conceded to a lender who had thus made an advance in the presence of witnesses some very summary and stringent remedy against a borrower who failed in repayment. How Servius subjected it to much the same formalities as he appointed for mancipation—the state scales, the official libripens, the five witnesses representing the nation—has been shown already. With the introduction of a coinage the transaction, instead of being per ibram simply, became © one per aes et Libram ; the scales were touched with a single piece, representing the money which had already been or was about to be paid, a formula recited whereby the obliga- tion of repayment was imposed on the borrower, and an appeal made to the witnesses for their testimony. Unfortu- nately this formula is nowhere preserved. Huschke and Giraud, assuming that the: lender was the only speaker, formulate it thus—" quod ego tibi mille libras hoc aere aeneaque libra nexas dedi, eas tu mihi post annum jure nexi dare damnas esto"—' whereas with this coin and these copper scales I have given thee a thousand asses, be thou therefore bound jure neat to repay them to me a year hence." The phrase damnas esto, like the rest of the formula, is unsupported by any conclusive authority ; but, as it was that most frequently employed in the republic for imposing by a public act liability to pay a fixed and definite sum, it may not be wide of the mark.

What was the effect of this procedure? The question is one not easily answered. Brinz has expressed the opinion that the creditor

was entitled in virtue of the nexum to take his debtor into custody at any time when he considered such a course necessary for his own

Berlin, 1871, cap. 2; Vainberg, Le Nexum.. . en droit Romain, Paris, 1874; Brinz, "Der Begriff obligatio," in Griinhut's Zeitschr., vol. i. (1874), p. 11 sg.; and Voigt, XJI. Tafeln, vol. i. §§ 63-65. There is a réswmé of the principal theories (down to 1870) in Danz, Gesch. d. rém. Rechts, vol. ii., 2d ed., Leipsic, 1873, § 146.

*2 '*Fe told them how he had been obliged to borrow money, be- cause, when he had been away fighting against the Sabines, his farm had remained uncropped, his house had been burned, his cattle driven off, everything plundered, and at the same time, unhappily for him, a tribute imposed ; how first his ancestral lands had gone, then his other property, and at last, like a wasting disease, it had come to his body ; how his creditor, instead of putting him to work (tm servitiwm), had thrown him into a dungeon and a torture-chamber"' (Liv., ii. 23).*

protection, even before the conventional term of repayment, —that the debtor was in bonds, virtually a pledge, from the very first, and the tightness or looseness of them a matter in the discretion of his ereditor.1 Voigt holds that the nexwm did not give the creditor any peculiar hold over his debtor, and that on the latter's failure to repay an ordinary action was necessary, to be followed by the usual proceedings in execution if judgment was in favour of the former. 'These views may be said to be the two extremes ; and be- tween them lie a good many others, more or less divergent. The difficulty of arriving at a conclusion is caused to some extent by the ambiguity of the words nexus and nexwm. 'The transaction itself was called nexum ; the money advanced was nexwm acs (hence newt, 1.€., aeris datio); the bond was nexus (of the fourth declension) ; and the debtor on whom the bond was laid was also nexus (of the second). All this is simple enough. But we find the same word nexus employed by the historians as almost synonymons with vinctus, —to denote the condition of a debtor put in fetters by his creditor. That might be the condition either of a nexal borrower or of an ordinary judgment-debtor. The former in such a case was doubly nexus ; he was at once in the bonds

of legal obligation and in those of physical constraint. In many passages- in which Livy and others speak of the ncxi it is extremely difficult, sometimes impossible, to be sure in which sense they use the word. It is therefore not sur- prising that there should be considerable diversity of opinion on the subject, and such frequent identification of the legal status of a nexal debtor (nexus) with that of a judgment-debtor (judicatus).

Almost all writers—Voigt? is a distinguished exception—concur in opinion that the nexal contract entitled the creditor, after expiry of thirty days from the conventional date of repayment of the loan, to proceed against his debtor by manus injectio without any ante- cedent action or judgment, and failing settlement to detain him, and put him to servile labour and subject him to servile treatment, until the loan was repaid. The parallel of such a course is to be met with aniongst all ancient nations,—Jews, Greeks, Scandinavians, Germans, &c.3 And it was not altogether unreasonable. If a borrower had already exhausted all available means of raising money, had sold or mortgaged everything he possessed of any value, what other course was open to him in his necessity except to im- pledge himself? That the creditor should have been entitled to realize the right he had thus acquired without the judgment on it of a court of law is equally intelligible. The nexal contract was a public act, carried out in the presence of the representatives of the people, who were witnesses alike of the acknowledgment of indebted- ness and of the tacit engagement of the debtor. The only valid ob- jection that could be stated against the creditor's apprehension of his debtor in execution was that the indebtedness no longer existed, —that the loan had been repaid. Buta nexal debt could be legally discharged only by neat liberatio, which also was a solemn proce- dure per aes ct "ubram in the presence of five citizen witnesses. What need for a judicial inquiry in the presence of facts so notorious? A creditor would rarely be daring enough to proceed to manus injectio if his loan had becn repaid; if he did, the testimony of the wit- nesses to the discharge would at once procure the release of his alleged debtor. It was probably to give opportunity for such proof, if there was room for it, that the XII. Tables required that a creditor who had apprehended a nexal debtor should bring him into court before carrying him off into detention,

_ But there was no room for the intervention of a vindcx or cham- pion, for there was no judgment whose regularity he could impugn. Nor was there any room for a magisterial addictio of the debtor to his creditor ; for the latter's right of detention was founded on contract, and needed no decree to strengthen it. The creditor was entitled at once, after apprehension of his debtor and production of him in court in terms of the statute, to carry him home with him, take such steps as were necessary to ensure his safe custody, and employ his services in profitable industry. But that he could kill him or sell him, as some suppose, is a proposition that is destitute of any authority to support it. Equally untenable is the notion

1 Brinz, in Griinhut's Zettschr., vol. i. p. 22. He likens the position of the nexus to that of a thing—land, say—mortgaged to a creditor in security of a claim. Such security the Roman jurists constantly speak of as Tes obligata, and sometimes as res nexa. As Brinz observes, the thing was obligata from the first, and continued so as long as the debt it secured was unpaid, even though the creditor found it unnecessary to reduce it into possession or interfere with it in any way.

He holds that there was nothing peculiar in the obligation created nexo, v. ¢., that it did not impose any immediate liability on the borrower which the lender could enforce without judicial intervention, but that the latter required to proceed against the former in ordinary course by what he calls an actio pecuniae nuncupatae.

See authorities in Brinz's paper in Griinhut's Zeitschr., vol. i. p. 25. The Greek phrase was él gupare davelfey. There is a curious style in Marculfus (Form., ii. 27), in which a borrower engages that, until he shall have repaid his loan, his creditor shall have right to his services So many days a week, and shall have power to inflict corporal punishment if there be dilatoriness in rendering them.

that the nexus became a slave, or that, while retaining his freedom, his wife, children, and belongings fell with him into the hands of his creditor. He certainly was not in a worse position than an addictus, of whom Quintilian states distinctly that he still retained his position in the census and in his tribe. Manya time, when the exigencies of the state required it, were the nexi temporarily released in order to obey a call to arms,—to fulfil the duty incumbent on them as citizens. In fact a nexal debtor suffered no capitis demin- utto at all because of his detention. If he was a house-father he still retained his manus over his wife and potestas over his children. But they did not share his quasi-servitude. Their earnings legally belonged to him, but were no doubt retained by them with his consent for their own support. They certainly did not fall to his creditor. It was the body of his debtor that he was entitled to, and too often he wreaked his vengeance on it by way of punishment ; there was as yet no machinery for attaching the debtor's goods in substantial reparation for the loss causcd by his breach of contract.

_The abuses to which the system gave rise alike in the case of Peetilian nexal and of judgment debtors have already been alluded to. In the law.

year 428 a more than ordinarily flagrant outrage committed by a creditor upon one of his young nexi, who, Livy says, had given himself up as responsible for a loan contracted by his deceased father, roused the populace to such a pitch of indignation as to necessitate instant remedial legislation. The result was the Po- tilian law (Lex Poetilia Papiria). So far as can be gathered from the meagre accounts of it we possess, it contained at least these three provisions—(1) that fetters and neck, arm, or foot blocks should in future be applied only to persons undergoing imprisonment for crime or delict ; (2) that no one should ever again be the nexus of his creditor in respect of borrowed money; and (8) that all existing next qui bonam copiam jurarent should be released. The first was intended to prevent unnecessary restraint upon judgment-debtors formally given over to their creditors. The second did not neces- sarily abolish the contract of loan per aes et Libram, but only what had hitherto been an dpso jure consequence of it,—the creditor's right to incarcerate his debtor without either the judgment of a court or the warrant of a magistrate. For the future, execution was to be done against a borrower

only as a judgment-debtor form- ally made over to his creditor by magisterial decree, and under the restrictions and limitations imposed by the Peetilian law itself. This very soon led to the disuse of nexal obligation ; once it was deprived of its distinctive processual advantages it rapidly gave place to the simpler engagement by stipulation enforceable per con- dictionem. As for the release of the then existing newt, Cicero, Livy, and Dionysius say nothing of any condition annexed to the boon the statute conferred upon them; it is only Varro who limits it to those qui bonam copiam jurarunt,—those apparently who were able to declare on oath that they had done their best and could do no more to meet their ercditors' claims. Such a limitation can hardly be called unreasonable, even were we to assume—as prob- ably we ought to do—that the release spoken of was only from the bonds of physical restraint, not from those of legal obligation.

Introduction of the Stipulation.A—Few events in the Stipula- history of the private law were followed by more far- tion.

reaching consequences than the introduction of the stipu- lation. It exercised an enormous influence on the law of contract; for by means of it there was created a unilateral obligation that in time became adaptable to almost every | conceivable undertaking by one man in favour of another, By the use of certain words of style in the form of ques- tion and answer any lawful agreement could thereby be made not only morally but legally binding, so that much which previously had no other guarantee than a man's sense of honour now passed directly under the protection of the tribunals. Stipulations became the complement of engagements which without them rested simply on good faith, as when a vendor gave his stipulatory promise to his vendee to guarantee peaceable possession of the thing sold or its freedom from faults, and the vendee in turn gave his promise for payment of the price. The question and answer in the form prescribed by law made the en- gagement fast and sure. Hence the generic name of the

4 Literature :—Liebe, Die Stipulation u. das einfache Versprechen, Brunswick, 1840; Schmidt (rev. Liebe), in Richter's Krit. Jahrb., vol. v. pp. 869 sg., 961 sg.; Gneist, Die formellen Vertrdge d. rim. fechis, Berlin,

1845, p. 118 sq. ; Heimbach, Die Lehre vom Creditum, Leipsic, 1849 ; Danz, Der sacrale Schutz im rim. Rechte, Jena, 1857, pp. 102-142, 286 sg. ; Schlesinger, Zur Lehre von den Formalcontracten, Leipsic, 1858, § 2; Voigt, Jus nat., &c., d. Rim., vol. ii. § 38, vol. iv., Beilage xix. ; Girtanner, Die Stipulation, Kiel, 1859; Bekker, Akitonen, vol. i. pp. 382-401 ; Karsten, Die Stipulation, Rostock, 1878.

Its

contract ; for Paul's derivation of it from stipulum, " firm," is much to be preferred to the earlier and more fanciful ones from styps or stipula. It was round the stipulation that the jurists grouped most of their disquisitions upon the general doctrines of the law of contract,—capacity of parties, requisites of consent, consequences of fraud, error, and intimidation, effects of conditions and specifications of time, and so forth. It may well be said, therefore, that its introduction marked an epoch in the history of the law.

There is, however, no certainty either as to the time or as to the manner of its introduction. So far as appears it was unknown at the time of the compilation of the XII. Tables, at least in private life ; one of the first unmistakable allusions to it isin the Aquilian law of 476 u.c. The mention of it in that enactment, however, is with regard to a phase of it which cannot have been reached for many years after it had come into use ; and the probability is that it originated before the middle of the 5th century, its first statu- tory recognition being in the Silian law introducing the legis actio per condictionem (supra, p. 683). In its earliest days it bore the name not of st¢pulatio but of sponsio, for the reason that the inter- rogatory of the party becoming creditor was invariably formulated with the word spondes—e.g., centum dare spondes?—while the alswer was simply spondeo.

There has been much speculation as to the origin of the con-

by introducing in certain cases words that excluded action in presence of fraud, antecedent or subsequent, on the part of the creditor, and afterwards by pretorian exceptions, such as a plea of "no value," or by having the contract set aside on the motion of the nominal debtor before proceed- ings had been taken upon it by the creditor. Originally the stipulation was employed only in regard to engagements whose terms were in every respect definite and certain, and was enforced by the legis actio per condictionem. But in time it came to be employed in engagements that were from the first indefinite. This seems to have been due to the intervention of the preetors, and to have originated after the system of the legis actiones had begun to give place to that per formulas. The remedy in such a case was not spoken of as a condiction but as an actio ex stipulatu.

CHAPTER IIIL—THE JUS GENTIUM AND JUS HONORARIUM.

(Latter half of the Republic.) I, INFLUENCES THAT OPERATED ON THE LAW.

origin. ee, Modern oem has ae eel? iat Pa the Growth of Commerce and Influx of Foreigners.—While Influx verbal remuant of the nexwm, after the business with the copper | ; : f ve . and the scales had gone into disuse ; (2) that it was evolved out of it mey be admitted that commerce Was beginning to take ee the oath at the great altar of Hercules and the appeal to Fides | Toot in Rome in the 5th century, yet 1t was not until the (supra, p. 675); (8) that it was imported from Latium, which it | 6th that it really became of importance. The campaigns had reached from some of the Greek settlements farther south. | in which Rome was en gaged until the end of the First Punic The last view is the most probable. Verrius Flaccns, as quoted by | War absorbed all its energies. But after that time the Festus, connects it with the Greek or&dew and orovdy; and Gaius | . 4 f rae : : incidentally observes that it was said to be of Greek origin. A | Influx of strangers, and their settlement in the city for libation (o7ovd7) is frequently referred to by Homer and Herodotus | purposes of trade, became very rapid,—first Latins and as an accompaniment of treaties and other solemn covenants,— | other allies, and afterwards Greeks,

*Carthaginians, and a common offering by the parties to the gods which imparted | Asistics. For them and the regulation of their affairs the sanctity to the transaction. Leist! is of opinion that the practice | * le — ie. | ij R rg ai passed into Sicily and Lower Italy, but that gradually the libation | J¥S cwvue—the law peculiar to Rome and its citizens— and other religious features were dropped, although the word | was applicable only if they were members of allied states orovdy was retained in the sense of an engagement that bound | to which commercium and recuperatio were guaranteed by parties just as if the old ritual had been observed, and that it treaty. But multitudes were not in this favoured posi- travelled northward into Latium and thence to Rome under the eat cond hy i eoumieele £ name of sponsio, being used in the first instance in public life for | HON, and even those who were soon lound the range o the conclusion of treaties, aud afterwards in private life for the con- | Roman modes of acquiring property and contracting clusion of contracts. The meaning of spondes as a question by a obligations too narrow for their requirements. Hence a creditor to his debtor (although latterly, we may well believe, un- jus gentium was gradually developed? which very early known to them) thus came to be—" Do you engage as solemnly as | %. ge, Pel stoma Sides tak 'i 'at if the old ceremonial were gone through between us?" There are | 1 148 Hlstory drove treaty covenants ror TEE CRECUO OME, many examples of such simplification of terms, none more familiar | Use; 1ts application may for a time have been limited to than when a man says—'"'] give you my oath upon it," without | transactions between non-citizens or between citizens and oe nee a the individual addressed thinking it necessary to non-citizens, but it was eventually accepted in the deal- go through the form. : ss ae . ' Its It is not a little remarkable that, although the idea was es ee i ae a nature. derived from abroad, the use of the words spondes and | 4 j .*

spondeo in contracting were, down at least to the time of Gaius, confined in Rome to Roman citizens. The sponsio as a form of contract was essentially juris civilis. So at first were the later and less solemn forms of stipulation, — promittisne ? promitto, dabisne ? dabo, and the like. Gaius speaks of these as juris gentium, t.e., binding even between Romans and peregrins. Such they became eventually, but not until towards the end of the republic. Yet, although juris civilis, both the sponsio and the later

forms were from the first free from many of the impediments of the earlier actus legitimz. No witnesses were required to assist at them ; and they were always susceptible of quali- fication by conditions and terms. It was very long, how- ever, before parties had much latitude in their choice of language ; spondeo was so peculiarly solemn that no equi- valent could be admitted ; and even the later styles may be said to have remained stereotyped until well on in the empire. And it was the use of the words of style that made the contract. It was formal, not material ; that is to say, action lay upon the promise the words embodied, apart from any consideration whether or not value had been given for it. In time this serious disadvantage was abated ; first

1 @reco-Itilische Rechtsgeschichte, Jena, 1884, pp. 465-470. Upon the sponstonis vinculum internationally, see Livy, ix. 9.

"the common law of mankind," "the law in use among all nations" ; but the language must not be taken too literally. The Roman jus gentiwm was not built up by the adoption of one doctrine or institution after another that was found to be generally current elsewhere. In the earliest stages of its recognition it was "an inde- pendent international private law, which, as such, re- gulated intercourse between peregrins or between peregrins and citizens on the basis of their common lilertas" ;3 during the republic it was purely empirical and free from the influence of scientific theory, but its extensions in the early empire were a creation of the jurists,—a com- bination of comparative jurisprudence and rational specu- lation. To say that it was de facto in observance every- where is inaccurate; on the contrary, it was Roman law, built up by Roman jurists, though called into existence through the necessities of intercourse with and among non-Romans.

It may be a little difficult for a modern jurist to say

2 On the Roman jus gentium, see Voigt, Das jus naturale, aequum et bonum, und jus gentium d. Romer, 4 vols., Leipsic, 1856-75; Nettle- ship, in the Journal of Philology, vol. xiii. (1885), p. 169 sq.

3 Voigt, Jus nat., vol. ii. 661. He distinguishes the jus civile, jus gentium, and jus naturale as the systems which applied respectively to the citizen,

the freeman, and the man.

The peregrin preetor.

Reforms of Aibu- tian law.

Effects of pro- vincial adminis- tration.

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with perfect precision what were the doctrines and institu- tions of the jus gentium as distinguished from the jus cave. But the distinction must have been very familiar to the Romans ; otherwise we should not have had the statement of Marcian in reference to the dmdAcdes,—that they en- joyed all the rights competent to a man under the former, but none of those competent to him under the latter. _

Institution of the Peregrin Pretorship.—The preetorship! was an outcome of the Licinian laws of the year 387 U.c. Down to the end of the 5th century the pretor then ap- pointed superintended single-handed the administration of justice, alike between citizens and foreigners. But with the altered condition of things in the beginning of the 6th century, and the influx of strangers which has already been alluded to, the work seems to have been found too onerous for a single magistrate, and a second preetor was appointed. 'The.date is not absolutely certain, although generally assumed to have been about the year 512 v.c. ; but Pomponius says distinctly that the creation of the new office was rendered necessary by the increase of the peregrin population of Rome, and that the new magistrate got the name of praetor peregrinus because his principal duty was to dispense justice to this foreign element. After the submission of Sicily and Sardinia the number of the preetors was increased to four and after the conquest of Spain to six; Sulla raised the number to eight, and Casar eventu- ally to sixteen. But all the later creations were for special purposes ; the ordinary administration of justice within the city was left with the representatives for the time of the two earliest, who came to be distinguished as praetor urbanus (qui jus inter cives dicit) and praetor peregrinus. It would be going too far to speak of the latter as the prin- cipal author of the jus gentium ; for a large proportion of the actions for

enforcing jus gentium rights were civil, not honorary,—a fact which proves that the rights they were meant to protect and enforce had their origin in the jus cwvile, although moulded to meet new requirenients by tacit consuetude and the agency of the jurists. But even in this view the peregrin praetor must have had a powerful influ- ence in giving shape and consistency to the rising juris- prudence, by means of the formulae he adjusted for giving it practical effect.

Simplification of Procedure and Introduction of New Remedies under the butian Law.—The Lea Aebutia is only twice mentioned by ancient writers, and we know neither its precise date nor its specific provisions. And yet, to judge by its cffects, it must have been one of the most important pieces of comitial legislation in the latter half of the republic ; for Gellius speaks of it as having given the deathblow to many of the institutions of the XII. Tables, and Gaius couples it with two Julian laws as the statutory instru- ments whereby the formular system of procedure was substituted for that per legis actioncs. The probability is that it was enacted immediately or soon after the institution of the peregrin prector- ship. Its purpose, whatever may have becn its terms, seems to have been to empower the pretors to adapt existing remedies to altered circumstances, and to fashion new actions on the jus civile for the use of the peregrins to whom the procedure of the legis Getiones was incompetent ; while it may possibly at the same time have expressly authorized the insertion in the styles to be devised by them of clauses that would give protection when required against claims that in law were well founded but in fact inequitable. But, whatever may have been the actual provisions of the statute, thie result was the introduction of a procedure which gradually sup- planted that by the "actions of the law," which was much more pliant than the latter, and whose characteristic was this,—that, instead of the issue being declared by word of mouth by the parties, and requiring in many cases to embody with perfect accuracy the statutory provision upon which it was based, it was now formulated In writing by the pretor, in the shape of an instruction to the judge to inquire and consider, with power to condemn or acquit according to his finding (see infra, p. 707). . __ Provincial Conquests.—The growth of commerce and the enormous increase of wealth, which made great capitalists and enabled them

1 See Labatut, Wistoire de la Rim. Staatsrecht, vol, ii. vol. i. p. 217 sq.

Préture, Paris, 1868 ; Mommsen, p. 176 sg.; Karlowa, Rom. Rechtsgeschichte,

‘through the agency of freedmen and slaves to carry on trade on a

seale hitherto unknown, and which thus helped to foster the jus gentium, was no doubt due toa large extent to provincial conquests. But these operated also in othcr directions. The authorities who proceeded to the conquered provinces as governors found themselves face to face with laws and institutions in many respects differing from those of Rome. Political considerations dictated how far these were to be respected, how far subverted. In some provinces, more especially the Eastern ones, it was thought unnecessary to do more than supplement the existing system by the importation of doctrines of the jus gentiwm and the procedure of the pretor’s edicts ; while in others, in which it was deemed expedient to destroy as rapidly as possible all national feeling and every national rally-ing point, a Romanizing of all their institutions was resorted to, even to the extent of introducing some of the formal transactions which previously had beeu confined to citizens. But in either case there was a reflex action. The native institution had to be studied, its advantages and disadvantages balanced, the means considered of adapting it to the pretorian procedure, and the new ideas so presented as to make them harmonize as far as possible with the old. All this was a training of no small value for those who, on their return to Rome, were to exercise an influence on legislation and the administration of the law. They brought back with them not merely an experience they could not have obtained at home, but sometimes a familiarity with foreign institutions that they were very willing to acclimatize in Italy. Rome thus enriched its law from the provinces, deriving from them its emphyteutic tenure of land, its hypothce, its Rhodian law of general average, and a variety of other featurcs that were altogether novel. Some of them were sanctioned by

tacit recognition, others by edicts of the pretors ; but, in whatever way received, they were indirectly fruits of provincial conquest.

Spread of Literature and Philosophy.—The effect on Roman Influence civilization of the addiction of educated men in the later republic of litera- to literature and philosophy is a matter for consideration in con- ture and

nexion with Rome's general history. It is not proposed to consider here the question how far specific doctrines of Roman law bear the impress of the influence of the schools, especially that of the Stoics ; it is a subject much too large to be disposed of in a few lines.2 The matter is mentioned simply for the sake of noting that the spirit of critical inquiry aroueel and fostcred by literary and philosophical study, seriously and conscientiously undertaken, contributed greatly to promote a new departure in jurisprudence that became very marked in the time of Cicero—the desire to subordinate form to substance, the.word spoken to the will it was mcant to manifest, the abstract rule to the individual case to which it was proposed to apply it. This was the first effort of what then was called equity to temper and keep within bounds the rigour of the jus strictum. The pretors, the judges, and the jurisconsults all had their share in it. Although modern jurists are prone to speak of pretorian equity as if it were a thing apart, yet the same spirit was leavening the law in all directions and in the hands of all who had to deal with it, the difference being that the form and publicity of the edict gave to its applications by the pretors a more pro- minent and enduring record than was found in the decisions of private judiccs or the opinions of counselling jurisconsults.

Decline of Leligion and Morals.—It would be equally Decline

out of place to enlarge here on the causes and manifesta- tions of that decline in religious sentiment and public and private virtue which was fraught with such disastrous results in the later days of the republic. The private law was influenced by it to a considerable extent, alike in those branches which regulated the domestic relations and those which dealt with property and contract.

The ever-increasing disregard of the sanctity of the marriage tie is one of those features in the history of the period which strikes even the most unobservant. While from the first the law had denounced causeless separation and visited it with penalties, in principle it maintained the perfect freedom of divorce,—that it was improper to force persons to continue in the bonds of matrimony between whom matrimonial affection no longer existed. With the simple and frugal habits of the first five centuries

? It is one that was diseussed with much greater fervour a century ago than it is now. Of the later literature may be mentioned—Van Vollenhoven, De exigua vi quam philosophia Greca habuit in effor- manda jurisprudentia Romana, Amsterdam, 1834; Ratjen, Hat die Stoische Phil. bedeutenden Einfluss gehabt, &e.? Kiel, 1839; Voigt, Jus nat., &e., vol. i. §§ 49-51 ; Laferriére, De Vinfluence du Stoicisme sur la doctrine des jurisconsultes Romains, Paris, 1860; Hildenbrand, Gesch. u. System d. Rechts- und Staats- Philosophie, Leipsic, 1860, vol. i, §§ 141, 142. The earlier literature is given in Hildenbrand, p. 593.

philo- sophy.

of reli-

gion ani

morals,

JUS GENTIUM, ETC. |

of Rome, and the surveillance of the consiliwm domesticum, the recognition of this principle produced no evil results ; family misunderstandings were easily smoothed over, and divorces were of rare occurrence. But from the time of the enactment of the Meenian law in 586 there seems to have been a change for the worse. It inter alia displaced the family council as a divorce court and transferred its functions in that matter to a judicium de moribus,—a court of inquiry nominated by the pretor, and having as its duty to decide to what extent there should be forfeiture of the nuptial provisions in case of separation

or repudiation. The motives of the statute may have been of the best ; but its tendency was injurious, for not only did it indirectly facilitate divorce, but it rendered the idea of it familiar, and overthrew that respect for the domestic council which had hitherto been a check upon it. What wonder that with increasing luxury and licentiousness divorce became so common !

This looseness of the marriage bond, as was naturally to be expected, had its effect on the other family relations. The obligation of a father to provide for his children began to be lightly esteemed. The law—possibly only the inter- pretation put upon the w#i legassit of the XII. Tables— had empowered him testamentarily to disinherit them, or in instituting them to limit their right to a mere fraction of the inheritance ; but it was assumed that this power would be exercised with discretion and only when justified by circumstances. But in the latter days of the republic, amid the slackened ties of domestic life, paternal as well as conjugal duty seems to have often been lost sight of, and children disinherited or cut off with a nominal share of the inheritance in order that a stranger might be enriched. This led to the introduction by the centumviral court, without any legislative enactment or practor's edict to warrant it, of what was called the querela inofficiosi testamenti,—challenge of a testament by a child whose natural claims had been capriciously and causelessly dis- regarded. While the practice may for a time have been hesitating and uncertain, yet before long, through means of this guerela, the rule came to be established that every child was entitled, notwithstanding the terms of his father's testament, to at least a fourth (portio legitima, quarta legi- tima, the legitim of the law of Scotland and various Con- tinental countries) of what would have come to him had his parent died intestate, unless it appeared that the latter had had adequate grounds for excluding him or limiting him toa smaller share. A parent might in like manner chal- lenge an undutiful testament made by his child to his pre- judice ; and in certain cases so might brothers and sisters inter se.

The decline of morals had an equally marked effect on the transactions of daily life, calling for precautions and remedies that had not been found requisite in the hey-day of the rioris TOv "Pwpalwv. Men no longer relied on each other's good faith unless backed by stipulations, cautions

(cautiones), and guarantees. The Rutilian bankruptcy arrangements and the actio Pauliana for setting aside alienations in fraud of creditors indicate a laxity in mer- cantile dealings that was perhaps an inevitable consequence of the growth of trade and commerce. But, that such remedies as, for example, the exceptio rei venditae et traditae or the exceptio non numeratae pecuniae should have been found necessary—the one an answer to a vendor (with the price in his pocket) who attempted to dispossess his vendee because some of the formalities of conveyance had been neglected, the other an answer to an action on a bond for repayment of money that by some accident had never been advanced—proves that the law had now to encounter fraud in all directions, and that Graeca fides had toa great extent displaced the old Roman probity.

II. Factors or tHe Law.

Legistation.—It cannot be said that during the period of nearly Legisla- two centuries and a half embraced within the present chapter the tion.

private law owed much to legislation. The vast majority of the enactments of the time referred to by the historians dealt with constitutional questions, municipal and colonial government, agrarian arrangements, fiscal policy, sumptuary prohibitions, criminal and police regulations, and other matters that affected the public law rather than the private. Those of the latter class men- tioned by Gaius and Ulpian in their institutional works barely exceed a score in number ; and of these not above half a dozen can be said to have exercised a permanent influence on the principles (as distinguished from the details) of the law. Most of them were enactments of the conciliwm plcbis or of the comitia of the tribes, to which ordinary legislation had passed as more readily convencd and more easily worked than the comitia of the centuries.

Ldicts of the Magistrates..\—The practice of propounding edicts Magis- was very ancient, and had been followed by kings and consuls long trates'

It was one of the most edicts.

before the institution of the pretorship. obvious ways of exercising the tmpcriwm with which the supreme magistrate was invested,—to lay an injunction upon a citizen and enforce his obedience, or to confer upon him some advantage and maintain him in its enjoyment. It was one of the ways in which public order was protected where there had been no invasion of what the law regarded as a right, and where, consequently, there was no remedy by action. That the earlier edicts of the pretors were of this character—issued, that is to say, with reference to particular cases, and what afterwards came to be called edicta re- pentina or prout res incidit posita—there is little reason to doubt. In time a new class of edicts appeared which got the name of edicta perpctua (or perpetuae jurisdictionis causa proposita),—announce- ments by the pretor, published on his album (as the white boards displayed for the purpose in the forum were called), of the relief he would be prepared to grant on the application of any one allcg- ing that the state of facts contemplated had arisen. The next year's praetor was frec to adopt the edicts of his predecessor or not ; but it was usual for him to do so if they had been found beneficial in practice, he adding to them new provisions suggested by de- mands made upon past pretors for edicta repentina but which they had not generalized, or even proposing for acceptance some remedy entirely of his own devising. As each new pretor entered upon office he announced his jurisdictional programme,—his lex annua, as it was called from this particular point of view, by far the greater part of it tralaticiwm, 7.¢., transmitted from his predecessors, and only a few paragraphs, diminishing in number as time pro- gressed, representing his own contribution. And so it went on in the first years of the empire, until the pretorian function was eclipsed by the imperial ; and at last, after having, by instruction of Hadrian, been subjected to revision, and consolidated with the edicts of the peregrin pretors and provincial governors, it was sanctioned as statute law for the empire through the medium of a senatusconsult.

There is some reason for supposing that the edict attained con- sidcrable proportions in the time of Cicero ; for he mentions that, whercas in his youth the XII. Tables had been taught to the boys in school, in his later

years these were neglected, and young men directed instead to the pretor's edicts for thcir first lessons in law. Of a few of them the date and authorship are known with tolerable precision ; but of the history of the majority, including some of the most important, such as those introducing restitutio in integrum on the ground of lesion through error, absence, minority, and the like, and those revolutionizing the law of succession, we are to a great extent in the dark. It is not necessary to assume either that the Julian consolidation exhibits all the provisions that from first to last appeared on the album, or that those preserved in it were originally in the shape in which they are there presented. It is much more likely that we have in it only those that had stood the test of generations, and that many of them are the result of the combined wisdom and experience of a series of pretors. It was one of the great advantages the edicts had over legislative enact- ments that they might be dropped, resumed, or amended by a new pretor according to his judgment of public requirements. For the edict was viva vox juris civilis,—intended to aid, supplement, and correct it in accordance with the ever-changing estimate of public necessities ; and this would have been impossible had its provisions from the first been as stereotyped as they became by the consolida- tion in the time of Hadrian.

The Edict seems to have contained two parts,—the first what may be called the edict or edicts proper, and the second an appendix of styles of actions, &c., whether derived from the jus civile or from the jus praetorium. The contents of the edict proper were in de- tail very various, but all devoted to an exposition of the ways in which the praetor meant to exercise his jurisdiction during his year

1 See Lenel, Beitrige zur Kunde des praetorischen Edicts, Stuttgart, 1878, and the introductory chapters in his Das Edictum Perpetuum, Leipsic, 1883 ; Karlowa, Rim. Rechtsgesch., § 60.

of office. They were not didactic or dogmatic formulations of law, but rather announcements or advertisements of what remedy he would grant

in such and such circumstances, or direct orders to do or prohibitions against doing certain things. A party claiming an action or whatever else it might be under any of them did so not of right, as he would have done had his claim had a statutory or customary foundation, but of gracc,—on the strength of the pretor's promise to grant him what he claimed and make the grant effectual. That was why originally such an action had to be raised and concluded within the particular pretor's year of office,—a rule which in time, by abuse, was converted into the somewhat different one that a purely pretorian aetion (i.e¢., not originally of the jus civile, even though remodelled and regulated by the pretor) had to be raised within a year of the occurrence to which it referred.

As already observed, the praetors' edicts proceeded to a greater extent than the earlier legislation of the comitia upon lines of equity ; that is to say, they set themselves against the strictness and formalism of the jurisprudence of the XII. Tables. Such may be said to have been the general tendency of the edicts as a whole. But it was the tendency of the whole jurisprudence of the time, and by no means peculiar to the pretorian creation. Nowhere in the texts are the preetors spoken of as the mouthpieces of equity as distinguished from law. Such a distinction recurs frequently in Cicero ; he identifies aequitas with the spirit of a law or agreement, and jus with its letter, but it is in order to sing the praises not of the pretors but of the pleaders who maintained the former as against the latter, and of the judges who were persuaded by their arguments. Much of what was contained in the Edict might quite as well have been embodied in statute, and we know that in time statute came to its aid ; witness a very remarkable provision of it, —"I will give bonorum possessio as may be enjoined by statutc, whether comitial enactment or senatusconsult."'

Of the edicts of the peregrin pretor and their relation to that of his urban colleague little is known. That they differed in some respects there cau be no doubt, for in the Lex Rubria (of 706 2) for settling the government of Cisalpine Gaul the magistrates are directed, with reference to a certain action, to formulate it in the way prescribed in the edict of the peregrin pretor. The latter, therefore, must to some extent have been in advance of that of the urban preetor, probably in this respect, that, being prepared

primarily for the regulation of questions affecting non-citizens, it more thoroughly than the other avoided formalitics that were com- petent only to citizens, and thus to a greater extent simplified pro- cedure. 'he edicts of the provincial governors must have varied according to circumstances, being in all cases composites of pro- visions, more or less numerous, borrowed from the edicts of the pretors and additions suggested by the peculiar wants of the different provinces for which they were framed (provinetale genus edicendi). As for those of the curule ediles, who amongst other duties were charged with the supervision of markets, their range was very limited, their most important provisions having reference to open sales of slaves, horses, and cattle, and containing regula- tions about the duties of vendors exposing them, and their responsi- bility for latent faults and vices.

expensilation or formless loan created such an obligation as was covered by the words pecuniam dari oportere. There may for a time have been a divergent practice, contradictory findings, as Cicero says there were in his day upon the question whether aequ7- tas or jus strictunt was to be applied to the determination of certain matters; but the gradual ascendency and eventual unanimity of judicial opinion in the affirmative was but the expression of the general sentiment of the citizens, of whom the judices were the representatives.

These arc but examples of the way in which consuetudinary law was constructed. It required the combined action of the laity and the judices, both at times acting under professional advice; in some cases even that of the preetors was necessary. It would have been impossible, for instance, to have introduced the consensual contracts into the Roman system and determined what were the obligations they imposed on either side, without magisterial co- operation in framing the formulae that were to be submitted to the judges. Taking the action on sale as an illustration, the formula substantially was this :—"It being averred that the defendant sold such or such a thing to the plaintiff, whatever, judge, it shall ap- pear that the defendant ought in good faith to give to or do for the plaintiff in

respect thereof, in the money equivalent thereof condemn the defendant ; otherwise, acquit him." It is very mani- fest that the free hand here given to the judge must immensely have facilitated the reception of customary doctrine into the law. The judge was to a great extent the spokesman of the forum ; his judgment was formed in accordance with current public opinion, which he had ample opportunity of gauging; it was the reflexion of that general sentiment of right, which, phrase it how we may, is the real basis of all customary law. And so in an action for establishing a right of property in a res nec mancipt. The formula was very simple : —"Ifit appear that such or such a thing belongs to the plaintiff in quiritary right, then, judge, whatever be its value for the plaintift in that condemn the defendant; should it appear otherwise, acquit him." The primary duty of a judge on such a remit was to detcrmine whether the title on which the plaintiff founded his peeteusions gave him a right that came up to property; and it can hardly be disputed that it was by the decisions of a series of judges, in a series of such actions, that the long list of natural modes of acquiring property given by Justinian under technical names was gradually brought into view. Those decisions, whether upon the obligations of a vendor, direct or indirect, or upon the sufficiency of a title founded on by a party averring a right of property by natural acquisition, may in many cases have been arrived at under professional advice, and were in all cases embodied in judgments. But that does not in the least deprive the doctrine deduced from them of its character of customary law. It was not until the empire that the opinions of the jurists sub- mitted to a judge (responsa prudentiwm, see p. 705) were invested with quasi-legislative authority. During the republic, if a judge deferred to them, it was simply because he regarded them as in consonance with well-qualified public opinion ; and what a series of consistent judgments of this sort built up was in the strictest sense a law based on consuetude.?

Consue- — Conswetude, Professional Jurisprudence, and Res Judicatac. —Great As regards the professional jurists in particular it has already Profes- tudinary as may be the difficulty experienced by philosophical jurists in de- | been observed that, according to the testimony of the historians, sional law. fining the ground of the authority of consuetudinary law, there is | the law was a monopoly of the patricians down at lcast to the jurispru-

no room to dispute the importance of its contributions to every system of jurisprudence ancient and modern. The men who first drew, accepted, and endorsed a bill of exchange did as much for the law as any lawgiver has ever accomplished. They may or may not have acted on the advice of jurists ; but, whether or not, they began a practice which grew into custom, and as such was recog- nized by the tribunals as a law-creating one,—one conferring rights and imposing obligations. There is much of this—far more probably than is commonly imagincd—in the history of every system of law.

In Rome the process was sometimes wonderfully expeditious ; witness what Justinian narrates of the introduction and recognition of testamentary trusts and of codicils to last wills, both in the time of Augustus. It can hardly be doubted that the literal contract

per expensilationem originated in the same way, probably in the

end of the 5th or the beginning of the 6th century. The keeping of domestic account-books may have been enjoined and enforced by the censors ; but it was custom, and neither statute nor preetor's edict, that made an entry in them to another person's debit creative of a claim against the latter for certa pecwnia credita, that might be made effectual ki an action under the Silian law. It must have been in exactly the same way that mutuwm, formless loan of money, came to be regarded as the third varicty of certa credita pecunia, and to be held recoverable under the same action. True, this could not have been attained without the co-operation of the courts. But then those courts were eomposed each of a single private citizen, whose office ended with his judgment in the particular case remitted to him, and who was untrammelled by the authority of any series rerum judicatarwm.+ He had simply to decide whether in his view

1 It was not until the empire that a 'series rerum perpetuo similiter judica- tarum," a uniform series of precedents, was held to be law. During the repub-

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middle of the 5th century of the city. Livy goes so far as to dence.

speak of it as in penetralibus pontificum repositum,—among the secrets of the pontifical college. It was so to a very great extent in the regal period. But after the publication of the XII. Tables this could be the case only in a qualified sense, the pontiffs becom- ing the official interpreters of that which in the letter was patent to the world. The Jus Flavianum, with its formulary of actions, in the year 450, the practice of giving advice in law in public adopted by Tib. Coruncanius in the beginning of the 6th century, and the Jus dilianum, embodying the current interprctatio, some fifty years later, put an cnd not only to pontifical. but to patrician monopoly. From this time onwards there was a series of jurists (prudentes), gradually increasing in number and eminence, of whom a list is given by Pomponius, and many of whom are signalized by Cicero, particularly in his Orator and Brutus. They occupied themselves in giving advice to clients (see ParRoN AND CLIENT, vol. xviii. p. 412), teaching, pleading at the bar, framing styles of contracts, testaments, and various other deeds of a legal character, or writing commentaries or shorter treatises on different branches of the law.®

lic a judge was much freer, and not only entitled but bound to decide according to his own notion of what was right, taking the risk of consequences if his judgment was knowingly contrary to law.

2 The doctrines of the classical jurists as to the necessity of longa, inveterata consuetudo, and so forth, had no application to the formative jurisprudence of the republic, and in fact refer not to general consuetude but to particular custom when founded on in derogation of the common law.

3 Rudorff, Rém. Rechtsgeschichte, vol. i. §§ 62-65; Sanio, Zur Geschichte der rom. Rechtswissenschaft, Konigsberg, 1858; Grellet-Dumazeau, Etudes sur le barreaw Romain, 2d ed., Paris, 1858; Danz, Gesch. d. rém. Rechts, vol. i. § 49; Karlowa, Rom. Rechtsgesch., § 61.

Pub- lician edict.

JUS GENTIUM, ETC.]

III. SussTANTIVE CHANGES IN THE LAW DURING THE PERIOD.

The Publician Edict.—There were necessarily many changes during the period in the law of property and of minor real rights, several of them of no mean importance. But the greatest of all was that effected by the Publician edict,! indirectly recognizing the validity (1) of what Theophilus calls dominiwm bonitarium as an aetual though inferior ownership of res mancipi, and (2) of what got the name of bonae fidei possessio as a fictitious ownership of either ves mancipt or res nec mancipt, valid against all the world except the true dominus. The aecounts we possess of this edict are somewhat inconsistent and even contradictory; the explanation

posed of by a stranger behind his back, there would have been no equity in giving him an action; but as against all the world exeept the truc owner his 'better right" was recognized by the pretor, who accorded to him also a vindication proceeding on a fiction of completed usucapion, for usucapion cured the defect of his title, just as it did that of the bonitarian owner. In this way the preetors introduced that bonac fidet posscssio which was worked out with much skill by the jurists of the early empire, and which assumed very large proportions in the Justinianian law when the term of prescription had been greatly extended, and the difficulty of proving property (as distinguished from bona jide possession) consequently very much inereased.

may be that it went through a process of amendment and cxpansion at the hands of successive pretors, and that eventually it may have had more than one section, without our always being able to say to which of them the criticism of a particular commentator is directed.

Development of the Law of Contract.3—It is impossible within Changes , the limits of an artiele sueh as this to indicate a tithe of the amend- in law ments that were effected on the law of obligations during the period of

con- whose distinguishing features were the rise of a jus gentiwm and tract.

Domini-

um boni-

tarium.

Bonae

But there is no doubt of its general tendency,—of the defects it was meant to correct and of the way in which the correction was accomplished.

One of the defects was this: if a man had taken a transfer of a res mancipi from its rightful owner, but simply by tradition instead of by mancipation or cession in court, he did not acquire dominium ex jure Quiritiwm, and the transferrer remained undi- vested. The result was that the latter was in law entitled to raise a rei vindicatio and oust the transferee whose money he might have in his pocket, while if a third party had obtained possession of the thing, but in such a way as not to be amenable to an interdict, the transferee could have no effectual vindication against him, as he was not in a position to prove dominium ex jure Quiritium. The first difficulty was overcome by the exceptio rei venditac et traditac, also a preetorian remedy, and probably older than the Publician ; to the transferrer's vindication on the strength of his unextin- guished quiritary right the transferee pleaded sale and dclivery as an effectual pretorian defence. But, when a third party was in possession, aud the transferee by simple delivery had to take the initiative, the position was more complicated. Such third party might be in perfect good faith ; he might even have acquired from the original transferrer and fortified his acquisition with a formal conveyance. But that was no sufficient reason in equity why he should be allowed to defeat the prior right of the original trans- feree, who, if he had possessed for the requisite period of usucapion before the third party came upon the scene, would have cured the defect of the informal] delivery and acquired an unassailable quiri- tary right. So the praetor announced in his edict that, if a man came to him and represented that he had bought a res mancipi from its owner,

and had had it delivered to him, but had lost ed sion within the period of usucapion, he (the prstor) would allow him a vindication cmbodying a fietion of completed usucapion (infra, p. 708), with which he might proceed either against the transferrer or any third party withholding the thing in question.

The publication of such an cdict and the formula of the action based upon it—which, though of pretorian origin, was in many respects dealt with as an actio juris civilis and just a variety of the ret vindicatio—had the same effect as if the legislature had directly enacted that in future delivery of a res mancipi in pursuance of a sale or other good cause would confer a right of ownership in it even before usueapion had been completed. Till completed, how- ever, the transferec was not quiritary owner: the thing in question was only in bonis, "of his belongings," and the legal title, though a very empty one—nwdum jus Quirittwm—remained in the trans- ferrer ; it was only with the completion of the usuecapion that it became the transferee's pleno jurc. The inevitable result of the re- cognition of this tenure in bonis was that mancipation came to be regarded in many cases as an unnecessary formality ; and the marvel is that it continued to hold its ground at all. The explanation may be that it afforded a substratum for and gave forcc of law to the verba nuncupata that aceompanied the negotiwm per aes et Libram ; and, although many of these might quite well be thrown into the form of stipulations, yct there were others that it may have been thought safer to leave to take effect under the provisions of the earlier law.

The second ease that was met by the Publician edict—whether

fidei pos. as originally published or by an amendment of it cannot be deter-

sessio.

mined—was that of the bona fide transferee of a thing by purehase or other sufficient title who, having lost possession of it before usucapion, found to his cost that the transferrer had not been its owner, that no ownership therefore had been transmitted to him (the transferee), and that consequently he was not in a position to raisc a vindication with its

averment of dominiwm cx jurc Quirt- tium.? As against the true owner, whose property had been dis-

1 See Ribéreau, Théorie de l'in bonis habere ow dela propriété prétorienne, Paris, 1867; Voigt, Jus naturale, &c., vol. iv., App. xxi., p, 470 sq.; Huschke, Das Recht der Publicianischen Klage, Stuttgart, 1874; Schulin (rev. Huschke), in the Krit. Vierteljahrschrift, vol. xviii. (1876), p. 526 sq.; Lenel, Beitrdge zur Kunde d. praetorischen Edicts: I. Das Public. Ed., Stuttgart, 1878.

2 This case is the only one alluded to by Justinian (Inst., iv. 6, 4). He had

abolished the distinction between quiritarian and bonitarian property, and so .

it was unnecessary for him to mention the other.

the construction of the preetor's cdict. In every branch of it there was an advance not by steps but by strides,—in that of obligations arising from contract, of those arising from delict, and of those arising from facts and cireumstances, such as unjustifiable enrich- ment at another person's cost. The law of suretyship, in its three forms of sponsio, fidepromissio, and fidejussio, received considerable attention, and formed the subject of a series of legislative enact- ments for limiting a surety's liability ; while that of ageney, which was sparingly admitted in Rome, had a valuable contribution from the pretorian edict in the recognition of a man's liability, more or less qualified, for the contractual debts of his filiifamilias and slaves, as also, and without qualification, for the debts properly contracted of persons, whether domestically subject to him or not, who were managing a business on his account, or whom he had placed in command of a ship belonging tohim. The development of the law in the matter of obligations generally was greatly facilitated by the preetorian simplification of procedure and the introduction of new forms of aetions,—thc instruction to a judge, " Whatever in respect thereof the defendant ought to give to or do for the plaintiff, in that condemn him," preceded by a statement of the cause of action, giving wide seope for the recognition of new sourees of liability.

The origin of the verbal contract of stipulation and its action- Stipu- ability under the Silian and Calpurnian laws have already been lation.

explained (pp. 694, 684). It was theoretically a formal contract, i.é., creative of obligation on the strength of the formal question and answer interchanged by the parties, even though no substantial ground of debt might underlie it; but in time it became the prac- tice to introduce words —the single word recte was enough—exelud- ing liability in case of malpractice (clawsula doli); and finally even that beeame unnecessary when the pretors had introduced the general caceptio doli, pleadable as an equitable defence to any ae ae action. And it was cssentially productive only of uni- ateral obligation, 7.¢., the respondent in the interrogatory alone incurred liability; if mutual obligations were intended it was necessary that each should promise for his own part, with the result that two eontraets were executed which were perfectly inde- pendent. Originally the only words that could be employed were spondes? on the one side, spondco on the other; and in this form the contraet was juris civilis and competent only to eitizens (and non- citizens enjoying commercium?!). In time the words promvittis ? promitto, came to be used alternatively. They seem, eventually at least, to have been competent to peregrins as well as to citizens, although that may not have been until the stipulation had become of daily use amongst the former in the still simpler phraseology dabis ? dabo, facics? factam.. Originally eompetent only for the creation of an obligation to pay a definite sum of money, and after- wards one for delivery of a specific thing other than money, the contract came in time, by the simplification of the words of inter- rogatory and response—the substitution of the condictions of the formular system for the Jcgis actioncs of the Silian and Calpurnian laws, and the introduction of the actio ca stipulatu to meet cases of indefinite promise—to be adaptable to any sort of unilateral engagement, whether initiated by it or only confirmed. It was of immense service too outside the ordinary range of contract in what were called necessary (in contradistinetion to voluntary) stipula- tions, of which a variety of illustrations are given infra, p. 709. In all directions advantage was taken of it to bind a man by forma] eontract either to do or to refrain from doing what in many eases he might already be bound 7pso jure to do or to abstain from doing, and

that because of the simplicity of the remedy—an action on his stipulation —that would lic against him in the event of his failure.

A second form of contract that eame into use to a considerable Literal extent in the latter half of the republic is what is commonly called contract.

the literal contract, or, as Gaius phrases it with greater aeeuracy,

3 See Bekker, Aktionen, vol. i. chaps. 5-8, and App. D, E, F, and vol. ii. chaps. 15, 16; Voigt, Jus naturale, &c., vol. ili. §§ 106-124, and vol. iv., App. da bie aah,

4 Such obligations—usually imposing the duty of restitution of unjustifiable gains—filled a considerable space in the practice and doctrine of the period, and early gave rise to a variety of brocards, e.g., "' Nemo cum alterius damno lucrari debet," " Nemo damnum sentire debet per lucrum alterius," &c.

Con- sensual contracts.

the nomen transscripticium.! Notwithstanding the prolific litera- ture of which it has been the subject, it must be admitted that in many points our knowledge of it is incomplete and uncertain. The prevalent opinion, formed before the discovery of the Verona MS. had made known Gaius's description of it, and almost univer- sally adhered to ever since, is that such contracts were ereated by entries in the account-books which the censors insisted that all citizens of any means should keep with scrupulous regularity. They are often alluded to by the lay writers ; but the text princi- pally relied on is what remains of Cicero's speech for the player Roseius. From the tenor of the argument in that case, and inci- dental remarks elsewhere, the conclusion has been formed that a citizen who made an entry in his codew—whether of the nature of a cash-book or a ledger is much disputed—to the debit of another, thereby made the latter his debtor for a sum recoverable by an actio ccrtae creditae pecuntiae. Gaius in his description of the con- tract does not mention the

codices; but his account is not ineon- sistent with the notion that the entries (nomina) of which he speaks were made in them. He says that those entries were of two sorts, nomina arcaria and nomina transscripticia. 'The former were entries of cash advances ; and of them he observes that they did not create obligation, but only served as evidence of one already ereated by payment to and receipt of the money by the borrower. Of the latter he says that there were two varieties, the entry tran- scribed from thing to person and that transcribed from one person to another, and that both of them were not probative merely but creative of obligation. The first was effected by a creditor (A) entering to the debit of his debtor (B) the liquidated amount of what the latter was already owing as the price of something pur- chased, the rent of a house leased, the value of work done, or the like. The second was effected by A transcribing B's debt to the debit of a third party ©, hitherto a debtor of B's, and who con- sented to the transaction, —A at the same time crediting B with the sum thus booked against C, and B in his books both crediting CO with it (acceptilatio) and debiting A (capensilatio).

All this at first sight seems just a series of bookkeeping opera- tions. But it was much more than that for the Roman citizens who first had recourse to it. There was a time when sale, and lease, and the like, so long as they stood on their own merits, created no obligation enforcible at law, however much it might be binding as a duty to Fides or (as moderns would say) in the forum of conscience ; to found an action it required to be clothed in some form approved by the jus civile. The nexwm may have been one of those forms, the vendee or tenant being fictitiously dealt with as borrower of the price or rent due under his purchase or lease ; the stipulation was another, the obligation to pay the price or rent being made legally binding by its embodiment in formal question and answer. But stipulation was competent only between persons who were face to face, whereas expensilation was competent also as between persons at a distance from each other. 'This of itself gaye expensilation—which, originally at least, was as much a ncgo- tium juris civilis as the sponsio—an advantage in some cases over stipulation. But it had also a further advantage, which was not affected by the subsequent recognition of the real and consensual contracts as productive of legal obligation on their own merits: it paved the way for subsequent transcription from one

person to another. This last must have been of infinite convenience in com- merce, not only by enabling traders to dispense with a reserve of coin, but by obviating the risks attending the transit of money over long distances, It was this that led, as Theophilus says was the case, to the conversion even of stipulatory obligations into book-debts ; it was not that thereby the creditor obtained a tighter hold over his debtor, but that an obligation was obtained from him which in a sense was negotiable and therefore more valuable.

The evolution of the four purcly consensual eontracts—sale, loca- tion, partnership, and mandate—supplies matter for one of the most interesting chapters in the whole history of the law. But, as it is impossible in such an article as this to attempt to mark the successive stages in the progress of all of them, we shall confine ourselves to sale. The others did not and could not follow identi- cally the same course: location ran most nearly parallel with sale ; but partnership and mandate, from their nature, not only started ata different point from the other two, but rcached the same goal with them—that of becoming productive of obligation simply on the strength of consent interchanged by the parties—by paths that were sometimes far apart. Nevertheless a sketch of the history of the origin of the contract of sale may be sufficient to indicate generally some of the milestones that were successively passed by all four.?

1 Literature :—Savigny, " Ueber den Literaleontract der Rémer" (originally 1816, with adaitions in 1849), in his Verm. Schriften, vol. i. p, 205 sq.; Keller. in Sell's Jahrb. f. hist. u. dogm. Bearbeit. des rém. Rechts, vol. i. (1841), p. 98 sq. : Gneist, Die formellen Vertrdge d. rim, Rechts, Berlin, 1845, p. 321 sq.; Heim- bach, Die Lehre vom Creditum, Leipsic, 1849, p. 309 sq.; Pagenstecher, De literar. obligatione, &c., Heidelberg, 1851; Danz, Gesch. d. rém. Rechts, vol. ii. p. 42 sq. (where there is a résumé of the principal theories); Gide, in the Rev. de Législat., vol. ili. (1873), p. 121 sq.; Buonamici, in the Archivio Giwridico,

vol. xvi. (1876), p. 3 sq.; Gide, Etudes sur la Novation, Paris, 1879, p. 185 sq. : Baron, Die Condictionen, Berlin, 1881, §$ 11, 12. : a aes

2 The literature on the history of the contract of sale is profuse, but mostly

Going back as far as history carries us we meet with it under the Con- names of emptio and venditio, but meaning no more than barter ; for tracts of — emere originally signified simply "to take" or "'acquire." Sheep sale. and cattle (wecus, hence pecunia) may for a time have been a very usual article of exchange on one side, and then came raw metal weighed in the scales. But it was still exchange, instant delivery of goods on one side against simultaneous delivery of so many pounds | weight of copper on the other. With the reforms of Servius Tullius came the distinction between res mancipi and res nec mancipt, and with it a regulated mancipation for sale and conveyance of the former. It was still barter; but along with it arose an obligation on the part of the transferrer of the res mancipi to warrant the transferce against eviction,—a warranty that was implied in the mancipation. Whether this rule obtained from the first or was the growth of custom it is impossible to say; but it is in the highest degree probable that it was the XII. Tables which fixed that the measure of the transferrer's liability to the transferee in the event of eviction should be double the amount of the price. Equally impossible is it to say when the practice arose of embody- ing declarations, assurances, and so forth in the mancipation (Jcges mancipti), which were held binding on the strength of the negotiwm juris civilis in which they were clothed. They received statutory sanction in the Tables, in the words already referred to more than once—"cum nexum faciet mancipiumque, uti lingna nuncupassit, ita jus esto," substantially "whatever shall by word of mouth be declared by the parties in the course of a transaction per acs et Libram in definition of its terms shall be law as between them."

The substitution by the decemvirs of eoined money, that was to be counted for rough metal that had been weighed, converted the contribution on one side into price (pretiwm), as distinguished from article of purchase (mera) on the other ; and sale thus became distinct from barter. In contemplation of the separation of the mancipa- tion and the price-paying, and the degeneration of the former into a merely imaginary sale, they enacted that, mancipation notwith- standing, the property of what was sold should not pass to the purchaser until the price had been paid or security by

sureties (vades) given for it to the vendor; and it was probably by the interpretation of the pontiffs that this was added to the rule,— a that until the price was paid no liability for eviction should attach to the transferrer (or auctor). The reason of the provision in the XII. Tables was that a vendor who had mancipated or delivered a thing sold by him before recciving the price had no action to euforce payment of the latter; and in such circumstances it was thought but right to give him the opportunity of getting back the thing itself by a real action. It might be, however, that the price had been paid, and yet the vendor refused to mancipate. It was long, apparently, before the purchaser could in such a case compel him to do so. With the introduction of the legis actio per condic- tionem he (the purchaser) had undoubtedly the power to recover the money on the ground of the vendor's unjustifiable enrichment, —that the latter had got it for a consideration which had failed (causa data, causa non sccuta); and it is possible that before that he had a similar remedy per judicis postulationem.

Down to this point, therefore, say the beginning of the 6th century, there were several obligations consequent on sale of a 7cs mancipt ; but not one of them arose directly out of the sale itself, or could be enforced simply on the ground that it had taken place. The vendor was bound to support the purchaser in any action by a third party disputing his right, and to repay him the price two- fold in the event of that third party's success ; and he was bound, moreover, to make good to him any loss he had sustained through a deficiency of acreage he had guaranteed, non-cxistence of servi- tudes he had declared the lands enjoyed, existence of others from which he had stated they were free,? incapability of a slave for labour for which he was vouched fit, and soon. But these obliga- tions were binding, not in virtue of the sale per se, but of the transaction per acs et libram superindueed upon it; and, if the vendor had at any time to return the price on failure to mancipate what he had sold, it was not because he had committed a breach of contract, but because he had unjustly enriched himself at the purchaser's expense.

In sales of res ncc mancipi, just as in those of rcs manecipi, a vendor who had been incautious enough to deliver his wares before he had been paid, or had got stipulatory security for the price, or had converted it into a

book-debt, night recover them by a real action if payment was unduly delayed; while the purchaser who had paid in advance but failed to get delivery might also get back his money from the vendor on the plea of unwarrantable enrichment. But, as

scattered in periodicals and much of it very fragmentary. It may be enough to refer to Bechmann, Gesch. d. Kaufs im rom. Recht, Erlangen, 18763; three articles by Bréard, in the Nowv. Rev. Hist., vol. vi. (1882), p. 180 sq., vol. vii. (1883), p. 586 sq., and vol. viii. (1884), p. 395 sg.; and Mommsen, " Die rém. Anfinge von Kauf u. Mietlie," in the Zettschr. d. Savigny Stiftwng, vol. vi. (1885), Rom. Abtheil., p. 260 sq.

3 Cicero says (De Off., iii. 16, § 65) that, though by the XII. Tables it was enough if a vendor per aes et libram made good his positive assurances (uti lingua nuncupassit, ita jus esto), the jurists.held him responsible for reticence about burdens or defects he ought to have revealed, and liable for a poena dupli exactly as if he had guaranteed their non-existenee.

Confir- matory stipula- tions.

JUS GENTIUM, ETC. |

mancipation was unnecessary for carrying the property (and, as some think, incompetent), some other machinery had to be resorted to than that of the copper and the scales for imposing upon the vendor an obligation of warranty against eviction, defects, and so forth. It may be that, until trade began to assume considerable proportions, and when a transaction was between citizens, a pur- chaser was content to rely partly on the honesty of his vendor, partly on the latter's knowledge that he ran the risk of an action for theft if what he sold belonged to another,! and partly on the maxim common in all ages and climes, eaveat emptor. When it was one between a citizen and a peregrin, a different set of rules may have come into play ; for between them disputes were settled by recuperators whose decisions were arrived at very much on con- siderations of natural equity. It was the popularization of the stipulation that facilitated a further advance, rendered all the more necessaty by the expansion of intercourse with forcigners and the cessation of recuperation.

We read of a satisdatio seewndwm manetpium, a stipulatio habere licere, and a stipwlatio duplae. 'The nature of the first is obscure ; it seems to have been connected with mancipatory sales, and prob- ably to have been the guarantee of a sponsor for the liabilities im- posed upon the vendor by the transaction per aes et libram and the verba nuneupata that were covered by it. The stipulation habere licere occurs in Varro, in a collection of styles of sales of sheep, cattle, &c., some of which he says were abridgments of those of M. Manilius, who was consul in the year 605. It was the guarantee of the vendor of a res nee maneipi, or even of a res manetpi sold without mancipation, that the purchaser should be maintained in possession of what he had bought ; it entitled him to reparation on eviction, measured not by any fixed standard but according to the loss he had sustained. It cannot have been introduced, thcre- fore, until after the Lex Aebutva and the formulation by the praetor of the aetio ex stipulatu. The idea of the stipwlatio duplae may have been borrowed from the duplwm incurred by a vendor on the eviction of a purchaser acquiring a thing by mancipation ; for one of its earliest manifestations was in the edict of the curule ediles, who insisted on it from persons sclling slaves, probably because the dealers were for the most part foreigners, and therefore unable to complete their sales per aes et Libram. Judging from Varro, it was a form of stipulation against eviction that in his time was used only in sales of slaves, although he adds that by agrcement of parties it might be limited to a svmplwm.

We learn from the same writer—what is also indicated in various passages of Plautus—that the vendor at the same time and in the body of the saine stipulation guaranteed that the shecp or cattle he was selling were healthy and of a healthy stock and free from faults, and that the latter had not done any mischief for which their owner could be held liable in a noxal action; and similarly that a slave sold was healthy and not chargeable for any theft or other offence for which the purchaser might have to answer. If any of these guarantees turned out fallacious the purchaser had an actio ca stipulatu against the vendor: ' Whereas the plaintiff got from the defendant a stipulation that certain sheep he bought from him were healthy, &c. [repeating the words of guarantee], and that he, the plaintiff, should be free to hold them (habere licere), whatever it shall appear that the defendant ought in respect thereof to give to or do*

for the plaintiff, in the value thereof, judge, con- demn him ; otherwise, acquit him." Itisan observation of Bekker's?

Origin of that the aetio emptt in its original shape was just a simplification

actio empti,

of the aetio ex stipulatu on a vendor's guarantecs ; the stipulations to which we have been alluding had become such unfailing accom- paniments of a sale as to be matters of legal presumption, the result being that the words "whereas the plaintiff bowght from the defendant the sheep about which this action has arisen" were substituted in the demonstratio (as the introductory clause of the formula was called) for the detailed recital of what had been stipu- lated. Bekker justifies this by reference to the language of Varro, who seems to include under the words emptio, venditio not merely the agreement to buy and sell but also the stipulations that usually went with it.

The introduction of an aetio empti in this shape, however, was far from the recognition of sale as a purely consensual contract. If the price was not paid at once, the purchaser gave his stipulatory promise for it, or got some one on whom the vendor placed more reliance to do so for him, or else made a book-debt of it; and, if it had to be sued for, it was in all these cases by a condietio certi and not by an action ou the sale. If the price was paid but the thing purchased not delivered, the only remedy open to the purchaser was to get back his money by the same condiction, unlcss, indeed, the guarantee habere licere was held to cover delivery, in which case the purchaser might obtain damages in an aetio ex stipulatu under the name of actio empti. But this aetio empti, whether in- sisted on on the ground of uon-delivery, eviction, or breach of some other warranty, was really an action on the verbal contracts

ee ee

1 "Jp rebus mobilibus … qui alienam rem vendidit et tradidit furtum committit" (Gai., ii. 50).

2 Bekker, Aktionen, vol. i. p. 158.

that had accompanied the sale,—a strietwm jus action in which the judge could not travel beyond the letter of the engagements of the purchaser. In the latter years of the republic, and probably from the time of Q. Mucius Scevola, it was a bonae fidet action. How had the change come about? A single case of hardship may have been sufficient to induce it, such as the defeat of a claim for damages for eviction on the ground that the stipulatory guarantee had been accidentally overlooked. Ulpian says, " As the stipulatio duplae is a thing of universal observance, action on the ground of eviction will lie ex empto if perchance the vendor of a slave have failed to give his stipulatory guarantee, for everything that is of general custom and practice ought to be in view of the judge in a bonae fide judietum." *

Very little was required to convert the strveti juris aetio empti, really nothing more than an actio ex stipulatu, into a bonae jfidet one,—simply the addition by the pretor of the words "on con- siderations of good faith" (ex fide bona) to the "whatever the defendant ought to give to or do for the plaintiff." The effect, however, was immeasurable,—not that it did away with the prac- tice of stipulatory guarantees, for Varro wrote after the time of Q. Mucius (who speaks of the action on sale as a bonae fidet onc), and references to them are abundant in the pages of the classical jurists ; but it rendered them in law unnecessary. It made sale a purely consensual contract in which, in virtue of the simple agreement to buy and sell, all the obligations on either side that usually attended it were held embodied without express formulation or (still less) stipulatory or literal engagement. And, in instructing the judges to decide in every case between buyer and seller suing ex empto or ex vendito on principles of good faith, it really empowered them to go far beyond " general custom and practice," and to take cogniz- ance of everything that in fairness and equity and common sense ought to influence their judgment, so as to enable them freely to do justice between the parties in any and every question that might directly or indirectly arise out of their relation as seller and buyer.

The history of the four nominate real contracts—mutuwm (1.¢e., Real con- loan of money or other things returnable generically), commo- tracts.

date (¢.¢., loan of things that had to be returned specifically), deposit, and pledge—is more obscure than that of the consensual ones. Down to the time of the Peetilian law loan of mouey, corn, &c., was usually contracted per aes et libram; and it is probable that after the abolition of the nexum the obligation on a borrower to repay the money or corn advanced to him was made actionable, under the Silian and Calpurnian laws respectively, by a stipulation contemporaneous with the loan. With the rise of the jus gentiwm loan became actionable on its own merits,—that is to say, the advance and receipt of money as a loan of itself laid the borrower under obligation to repay it, even though no stipu- latory engagement had intervened ; the res (in this case the giving and receiving mutui causa)*

completed the contract. The obliga- tion that arose from it was pee unilateral, and enforcible, where the loan was of money, by the same action as stipulation and literal contract ; and so strictly was it construcd that interest on the loan was not claimable along with it, the ves given and received being the full measure of the obligation of repayment. The other three— commodate, deposit, and pledge—became independent real contracts very much later than mutwum, possibly not all at the same time, and none of them apparently until very latc in the republic. All of them, of course, had been long known as transactions of daily life ; the difficulty is to say when they first became actionable, and under what guise.

It is impossible within the space at our command to criticize the various theories entertained of their vicissitudes, for they neces- sarily vary to some extent in regard to each. We must content ourselves, therefore, with the simple statement that eventually, and within the period with which we are now dealing, they came to be recognized as independent real contracts, the res by which they were completed being the delivery of a thing by one person to another for a particular purpose, on the undcrstanding that it was to be returned when that purpose was served. And it is to be noted that, while mutwwm transferred the property of the money lent, the borrower being bound to return not the identical coins but only an equal amount, in pledge it was only the possession that passed, while in commodatc and deposit the lender or depositor retained both property and (legal) possession, the borrower or de- positary having nothing more than the natural detention. In all but matwum, therefore, there was trust ; the holder was bound, to an extent varying according to circumstances, to care for what he held as if it were his own, and entitled to be reimbursed for outlay on its maintenancc,—bound to return it, yet excused if his failure to do so was due to a cause for which in fairness he could not be held responsible. Consequently the actions on these three con- tracts, differing from that on mutwum, were all bonae fidei, the

3 Ulp., 'Lib. I. ad ed. aedil.," in Dig., xxi. 1, fr} 315.8) 20)

4 See Heimbach, Creditum, pp. 498 sq., 633 sg.; Bekker, Loci Plautini de rebus creditis, Greifswald, 1861; Deinelius, in the Zeitschr. f. Rechtsgesch., vol. ii, (1863), p. 217 sq.; Bekker, Aktionen, vol. i. p. 306

sqg.; Ubbelohde, Zur Gesch. d. benannten Realcontracte, Marburg, 1870; Huschke, Lehre vom Darlehn, Leipsic, 1882.

judge being vested with full discretion to determine what was fair and equitable in each individual case. ; ; Preetor- Pretorian Amendments on the Law of Succession.—The most im- ianbon- portant change in the law of succession during the latter half of the orum pos- republic was due to the pretors. They introduced, under the eee sessio. of bonorum possessio,' what was really beneficial enjoyment of the estate of a deceased person without the legal title of inheritance. There is much to lead to the conclusion that the series of provisions in regard to it which we find in the Julian consolidation of the Ediet were the work of a succession of pretors, some of them prob- ably not under the republic but under the empire ; but it will be convenient to give here a general view of the subject as a whole, disregarding the consideration that some. of its features may not have been given to it within the period now under notice.

Justinian, speaking of the origin of bonorwm possessio, observes that in promising it to a petitioner the pretors were not always actuated by the same motives; in some eases their object was to facilitate the application of the rules of the jus civile, in some to amend their application according to what they belicved to be the spirit of the XII. Tables, in others, again, to set them aside as in- equitable. It is not unreasonable to assume that it was with the purpose of aiding the jus ctvile that the first step was taken in what gradually beeame a momentous reform ; and it is extremely prob- able that this first step was the announcement by some pretor that, where there was dispute as to an inheritance, and a testament was

resented to him bearing not fewer seals than were required by law, te would give possession of the goods of the defunct to the heir named in it? In this as it stands there is nothing but a regulation of possession of the dona of the inheritance pending the question of legalright. Just as between two parties contending about the owner- ship of a specifie thing in a red windicatio the pretor first settled the question of interim possession, so did he promise to do here when a question was about to be tried about the right to an inheritance (si de hereditate ambigitur). It was

a provisional arrangement merely, and very necessary in view of the state of the law which permitted a third party, apart from any pretence of title, to step in and com- plete a wsueapio pro herede by a year's possession of the effects of the inheritance (supra, p. 692). Even at the time when the Edict was closed it was not necessarily more than a provisional grant ; for, if heirs-at-law of the deceased appeared and proved that, although the testament bore on the outside the requisite number of seals, yet in fact some solemnity of execution, such as the familiae venditio or testamenti nuncupatio, had been omitted, the grantee had to yield them up the possession that had been given him pending inquiry. It was only by a rescript of Marcus Aurelius's that it was declared that a plea by the heir-at-law of invalidity of a testament on the ground of defeet of formalities of execution might be defeated by an exceptio doli, on the principle that it was contrary to good faith to set aside the wishes of a testator on a technical objection that was purely formal. Thus was the bonorwm possessio seeundwm tabulas, ?.é., in accordance with a testament, from being originally one in aid of the jus civile, in course of time converted into one in contra- dietion of it. That the motives and purposes of the series of pretors who built up the law of bonorwmn possessio must have varied in progress of years is obvious ; and, once the machinery had been invented, nothing was easier than to apply it to new ideas. The pretor could not make a man heir,—that he always disclaimed ; but he could give a man, whether heir or not, the substantial ad- vantages of inheritance, and protect him in their enjoyment by pretorian remedies. He gave him possession of the goods of the deceased, with summary remedies for ingathering them, which, once in his hands, would become his in quiritarian right on the expiry of the period of usucapion ; and, by interpolation into the

Jormula of a fiction of heirship, he gave him effectual personal actions against debtors of the deceased, rendering him lable in the same way to the deceased's creditors.

Another variety of the bonorwm possessto was that contra tabulas, —In opposition to the terms of a testament. If a testator had neither instituted nor expressly disinherited a son who was one of his sui heredes, then his testament was a nullity, and the child passed over had no need of a

preetorian remedy. Where swt heredes other than sons were passed over the jus civile allowed thein to par- ticipate with the instituted hcirs by a sort of accrual. But the Edict went further ; for, if the institute was a stranger, t.¢., not brother or sister of the child passed ovcr, then, on the petition of the latter, the preetor gave him and any other swi concurring with him possession of the whole estate of the deceased, the institute being left with nothing more than the empty name of heir. Another

1 For a résumé of the principal theories (down to 1870) about the origin of honorum possessio, see Danz, Geschichte d. rim. Rechts. vol. ii. § 176. Of the later literature it is enough to mention Leist, in the first 4 vols. of his con- tinuation of Gliick's Pandecten-Commentar, Erlangen, 1870-79,

2 Cic., In Verr. II., i. 45,§ 117. He says (writing in 684) that an edict to that effect was already tralaticium, i.e., had been adopted year after year by a Series of preetors. Gaius (ii. 119) speaks of seven at Jeast as the requisite num- ber of seals ; ¢.¢., those of the libripens and the five citizen witnesses, and that

of the antestatus, whose functions are not well understood, but whose official

designation appended to his seal recurs so regularly in i ipti 4 no doubt that his was the seventh. 7 En ea al

application of the bonorwm possessio contra tabulas was to the case of emancipated children of the testator's. By the jus civile he was not required to institute or disinherit them ; for by their emanci- pation they had ceased to be sui heredes, and had lost that interest in the family estate which was put forward as the reason why they had to be mentioned in the testament of their paterfanvilias. The pretors—although probably not until the empire, and when the doctrines of the jas natwrale were being more freely recognized— put them on the same footing as unemancipated children, requiring that they also should be either instituted or disinherited, and giving them bonorum possessio if they were not. It was contra tabulas in the sense that it displaced the instituted heirs either wholly or partially,—wholly when the institutes were not children of the deceased, partially when they were. In the latter case, at least when sui

were affected by it, the grant of bonorwm possessio was under the very equitable condition that the grantees should col- late or bring into partition all their own acquisitions since their emancipatian.

The third variety of bonorum possessio was that granted ab intes- tato. As has been shown on a previous page (p. 692), the rules of the jus cévile in reference to succession on intestacy were extremely strict and artificial. They admitted neither emancipated children nor agnates who had undergone capitis deminutio; they admitted no female agnate except a sister; if the nearest agnate or agnates declined, the right did not pass to those of the next degree ; mere cognates, kinsmen of the deceased who were not agnates, ¢.g., grand- children or others related to him through females and agnates capite minutt, were not admitted at all; while a wife had no share unless she had been im manu of the deceased and therefore filiae loco. All these matters the pretors amended, and so far paved the way for the revolution in the law of intestate succession which was accom- plished by Justinian.

The classes they established were four. (1) Displacing the swt Pretor- heredes of the jus civile, they gave the first place to descendants ian order (dibert), including in the term all those whom the deccased would of intes- have been bound either by the jus civile or the Edict to institute tate suc- or disinherit had he made a will, 7.¢., his wife in manu, his natural cession.

(as distinguished from adopted) sons and daughters whether én potestate at his death or emancipated, the representatives of sons who had predeceased him, and adopted children in his potestas when he died. (2) On failure of liberi the right to petition for bonorwm possessio opened to the nearest collateral agnatcs of the intestate, under their old name of legitimd heredes. (3) Under the Jus civile, on failure of agnates (and of the gens where there was one), the succession was vacant and fell to the fisc, unless perchance it was usucapted by a stranger possessing pro herede. The frequency of such vacancies was much diminished by the recognition by the pretors of the right of cognates to claim bonoruwm possessio in the third place. Who they had primarily in view under the name of "'cognates" it is impossible to say. The epithet is most frequently

applied by modern writers to kinsmen related through females ; but in its widest sense it included all kinsmen without exception, and in a more limited sense all kinsmen not entitled to claim as agnates. There were included amongst them thcrefore—although it is very probable that the list was not made up at once, but from time to time by the action of a series of pretors—not merely kins- men related through females (who were not agnates), but also agnates of a remoter degree who were excluded as such because the nearest agnates in existence had declincd, persons who had been agnates but by reason of capitis minatio had lost that character, female agnates more distantly related than sisters, and ehildren of the intestate's who at the time of his death were in an adoptive family, All these took according to proximity. (4) Finally, the claim passed to the survivor of husband and wife, assuming always that their marriage had not involved manus. This list constituted the pretorian order of succession on intestacy.

All these bonorwm possessiones had to be formally petitioned for. In that ab intestato descendants were allowed a year for doing so, while other persons were limited to 100 days, the period for those entitled in the second place beginning when that of those entitled in the first had expired, and soon, The grant was always made at the risk of the petitioner; nothing was assured him by it; it might turn out real and substantial (cwm re) or merely nominal (sine re), according as the grantee could or could not maintain it against the heir of the jus civile. For the latter was entitled to stand on his statutory or testamentary right, without applying for bonorwm possessio, although in fact he often did so for the sake of the summary procedure it supplied him for ingathering thc effects of the deceased.

Lhe Law of Procedwre.—The substitution of the formular system Law of of procedure for that by the "actions of the law" commenced long pro- before the end of the period now under eonsideration ; and we have cedure.

had occasion more than once to observe how greatly it facilitated the development of the institutions of property and contractual obligation. But as the change was only completed in the early empire it will be more

convenient to defer explanation of the nature of the new procedure in the meantime. (See infra, p. 707 sq.)

JUS NATURALE. |

CHAPTER IV.—THE JUS NATURALE AND MA- TURITY OF ROMAN JURISPRUDENCE.

(The Empire until the time of Diocletian.)

TI, CHARACTERISTICS AND FoRMATIVE AGENCIES OF THE LAW DURING THE PERIOD.

Characteristics generally and Recognition of a Jus Naturale in particular. —The first three centuries of the empire witnessed the perfection of Roman jurisprudence and the commencement of its decline. During that time the history of the law presents no such great landmarks as the enactment of the XII. Tables, the commencement of a preetor's edict, the recognition of simple consent as creative of a contractual bond, or the introduction of a new form of judicial procedure; the establishment of a class of patented jurists speaking as the mouthpieces of the prince, and the admission of all the free subjects of the empire to the privileges of citizenship, are about the only isolated events to which one can point as productive of great and lasting results. There were, indeed, some radical

But many of them refer again and again to the jus naturale s and Gaius is the only one (Justinian following him) who occasionally makes it synonymous with jus gentium. There can be no question that the latter was much more largely imbued with precepts of natural law than was the jus cvile, but it is impossible to say they were identical ; it is enough to cite but one illustration, pointed out again and again in the texts: while the one admitted the legality of slavery, the other denied it. While the jus civile studied the interests only of citizens, and the jus gentium those of freemen irrespective of nationality, the law of nature had theoretically a

wider range and took all man- kind within its purview. We have no hint that the doc- trine of the jus gentiwm differed in this respect from the Jus cwile—that a slave was nothing but a chattel; yet we find the latter, when tinctured with the jus naturale, re- cognizing many rights as competent to a slave, and even conceding that he might be debtor or creditor in a con- tract, although his obligation or claim could be given effect to only indirectly, since he could neither sue nor be sued.

Voigt thus summarizes the characteristics of this speculative Charaec- Roman jus natwrale :—(1) its potential universal applicability to teristies all men, (2) among all peoples, (8) at all times, and (4) its corre- of jus spondence with the innate conviction of right (innere Reehtsiber- naturale.

changes in particular institutions, such as the caduciary legislation of Augustus, intended to raise the tone of

domestic morality and increase fruitful marriages, and the legislation of the same emperor and his immediate suc- cessor for regulation of the status of enfranchised slaves ; but these, although of vast importance in themselves, and the first of them influencing the current of the law for centuries, yet left upon it no permanent impression. It was by much less imposing efforts that it attained the perfection to which it reached under the sovereigns of the Severan house,—a steady advance on the lines already marked out in the latter years of the republic. The sphere of the jus Quiritium became more and more cir- cumscribed, and one after another of the formalities of the jus civile was abandoned. The manus of the husband practically disappeared ; the patria potestas of the father lost much of its significance by the recognition, notwith- standing it, of the possibility of a separate and independ- ent estate in the child; slaves might be enfranchised by informal manumission ; res mancipt constantly passed by simple tradition, the right of the transferee being secured by the Publician action ; servitudes and other real rights informally constituted were maintained as effectual tuctione praetoris; an heir's acceptance of a succession could be accomplished by any indication of his intention, without observance of the formal cretzo of the earlier law; and many of the incidental bargains incident to consensual contract, but varying their

natural import, that used to be embodied in words of stipulation, came to be enforcible on the strength of formless contemporaneous agreements.

zeugung). Its propositions, as gathered from the pages of the jurists of the period, he formulates thus :—(1) recognition of the claims of blood (sanguinis vel cognationis ratio); (2) duty of faithfulness to engagements, —is natura debet . . . cujrus fidem secuti sumus; (8) apportionment of advantage and disadvantage, gain and loss, aecord- ing to the standard of equity ; (4) supremacy of the volwntatis ratio over the words or form in which the will is manifested.? It was regard for the first that, probably pretty carly in the principate, led the pretors to place emancipated children on a footing of perfect equality with unemancipated in the matter of succession, and to admit collateral kindred through females as well as those related through males; and that, in the reigns of Hadrian and Mareus Aurelius respectively, induced the senate to give a mother a pre- ferred right of succession to her children, and vice versa. It was respect for the second that led to the recognition of the validity of what was called a natural obligation,—one that, because of some defect of form or something peculiar in the position of the parties, was ignored by the jus eivile and incapable of being made the ground of an action for its enforcement, yet might be given effect to indirectly by other equitable remedies, Regard for the third was nothing new in the jurisprudence of the period ; the republic had already admitted it as a principle that a man was not ta be unjustifiably enriched at another's eost ; the jurists of the empire, however, gave it a wider application than before, and used it as a key to the solution of many a difficult question in the domain of the law of contract. As for the fourth, it was one that had to be applied with delicacy ; for the volwntas could not in equity be pre- ferred to its manifestation to the prejudice of other parties who in good faith had acted upon the latter. We have many evidences of the skilful way in which the matter was handled, speculative opinion being held in check by cousiderations of individual interest and general utility.*

A remark of Voigt's on the subject is well worthy of being kept in view, that the risk which arose from the setting up of the pre-

Idea of ded by jurists and judges to the | cepts ofa speculative jus natwrale, as derogating from the rules of 5 ns. ‘ = ae ae ail yd euieient a pee an for | the jus eivile, was greatly diminished through the position held by Jus gentium over the jus cote 18 In the jurists of the early empire.

naturale.

these and many other changes in the same direction, as well as for the ever-increasing tendency evinced to sub- ordinate word and deed to the voluntas from which they arose. They are rather to be attributed to the striving on the part of many after a higher ideal, to which they gave the name of jus naturale.’ It is sometimes said that the notion of a jus naturale as distinct from the jus gentewm was peculiar to Ulpian, and that it found no acceptance

Their jus respondend? (infra, p. 705) made them legislative organs of the state, so that, in introducing principles of the jus naturale, or of aequum ct bonwm, they at the same Imoment positivized them and gave them the force of law. They were, he says, “ philosophers in the sphere of law, searehers after the ultimate truth ; but, while they—usually in reference to a concrete case—sought out the truth and applied what they had found, they combined with the freedom and untrammelledness of speeulation the life-freshness of practice and the power of assuring the operativeness of their abstract propositions.” +

Influence of Constitutional Changes.—Tle ehanges in the con- Position stitution aided not a little the current of the law. Men of foreign and char- desecnt reached the throne and recruited the senate,—proud indeed acter of of the history and traditions of Rome, yet in most cases free from jurists. prejudice in favour of institutions that had nothing to recommend them but their antiquity. Military life had not the same attrac- tions as during the republic; there was no longer a tribunate to which men of ainbition might aspire ; the comitia soon eeased to afford an outlet for public eloquence ; so that men of education and

2 Voigt, lc, p. 804. 3 Voigt, pp. 321-23. + Voigt, p. 341.

with the Roman jurists generally. But this is inaccurate. Justinian, indeed, has excerpted in the Digest and put in the forefront of his Znstitutes a passage from an elementary work of Ulpian's, in which he speaks of a jus naturale that is common to man and the lower animals, and which is substantially instinct. This is a law of nature of which it is quite true that we find no other jurist taking account.

1 See Voigt, Das Jus naturale … der Romer, particularly vol. i. §§ 52-64, 89-96; Maine, Ancient Law, chap. iil.

Exten- sion of citizen- ship to whole

empire.

FEnact-

position had all the more inducement to devote themselves to the conscientious study and regular practice of the law. This was greatly encouraged by the action of Augustus in creating a elass of licensed or patented jurists, privileged to give answers to questions submitted to them by the judges, and that ex auctoritate prineiprs, and still more so, perhaps, by Hadrian's reorganization of the im- perial privy couneil, wherein a large proportion of the seats were assigned to jurists of distinction. With several of the emperors lawyers were amongst their most intimate and trusted friends. Again and again the offiee of pretorian prefect, the highest next the throne, was filled by them; Papinian, Ulpian, and Paul all held it in the reigns of Septimius Severus and Alexander. Juris- prudenee, therefore, was not merely an honourable and luerative profession under the new arrangements, but a passport to places of eminence in the state ; and till the death of Alexander the ranks of the jurists never failed to be recruited by men of position and accomplishment.

Extension of Citizenship to the Empire generally.—It must have been between the years 212 and 217 that Caracalla published his constitution conferring citizenship on all the free inhabitants of the empire. Far-

reaching as were its consequences, the primary pur- pose was purely fiseal. Augustus had imposed a tax of five per eent. on inheritances and bequests, exeept where the whole sueces- sion was worth less than 100,000 sesterces or the heir or legatee was a near kinsman of the deeeased. It was continued by his suc- cessors, and was very profitable, thanks to the propensity of the well-to-do classes for single blessedness, followed by testamentary distribution of their fortunes amongst their friends. But it affeeted only the suecessions of Roman citizens, so that the great mass of the provincials escaped it. Caracalla, being needy, not only in- ereased it temporarily to ten per eent., but widened the area of its operation by elevating all his free subjects to the rank of eitizens. The words of Ulpian are very inclusive,—"in urbe Romano qui sunt… eives Romani effecti sunt"; but there is considerable diversity of opinion as to their meaning, caused by the fact that peregrins are still mentioned by some of Caraealla's suceessors. Limit the constitution, however, as we may, there can be no ques- tion of its immense importanee. By conferring eitizenship on the provincial peregrins it subjeeted them in all their relations to the law of Rome, and qualified them for taking part in many trans- actions both inter vivos and mortis eausa whieh previously had been incompetent for them. It did away with the necessity for the jus gentiwm as a separate positive system. Its principles and its doctrines, it is true, survived, and were expanded and elabo- rated as freely and sueeessfully as ever ; but they were so dealt with as part and pareel of the civil law of Rome, whieh had ceased to be Italian and become imperial.

Legislation of Comitia and Senate.—Augustus, clinging as much

ments of as possible to the form of republican institutions, thought it ex-

Augus- tus ;

about mar- riage ;

about manu- Inission.

pedient not to break with the old practice of submitting his legis- lative proposals to the vote of the comitia of the tribes. Some of them were far from insignificant. Besides various measures for the amendment of the

eriminal law, three groups of enactments of considerable importance owed their authorship to him, the first to improve domestie morality and encourage fruitful marriage, the second to abate the evils that had arisen from the too lavish ad- mission of liberated slaves to the privileges of citizenship, and the third to regulate procedure in publie prosecutions and private litigations.

The first group included the Lex Julia de adulteriis coercendis of 736 and the Lew Julia et Papia Poppaca,—the latter a voluminous matrimonial code, which for two or three eenturies exercised such an influence as to be regarded as one of the sourees of Roman law almost quite as mueh as the XII. Tables or Julian's consolidated Edict. It was often spoken of as the Lex Caducaria, one of its most remarkable provisions being that unmarried persons (within certain ages and under certain qualifications) should forfeit entirely anything to whieh they were entitled under a testament, and that married but ehildless persons should forfeit one-half, the lapsed provisions (cadwea) going to the other persons named in the will who were qualified in terms of the statute, and failing them to the lise. However well intended, the language of Juvenal and others raises doubts whether the law did not really do more harm than good. By the Christian emperors many of its provisions were repealed, while others fell into disuse; and in the Justinianian books hardly a trace is left of its distinctive features.

The second group included the Alia-Sentian law of the year 4 A.D., the Fufia-Caninian law of the year 8, and the Junia-Norban law of the year 19,—the last passed in the reign of Tiberius, but was probably planned by Augustus. The Atlia-Sentian law regulated the matter of manumission, with the result that a manumittee might on that event, and aecording to eireumstances minutely described, become (1) either a citizen, or (2) a freedman with the possibility of attaining eitizenship by a process indicated in the statute, or (3) a freedman who, beeause of his bad eharaeter, was forbidden to reside within a hundred miles of Rome and denied the hope of ever becoming a citizen (libertus deditieius). The Junian

law was passed in order to define more preeisely the status in the meantime of those freedmen who had a potentiality of citizenship. It did so by assimilating them to the eolonial Latins, denying to them the rights of a citizen proper so far as coneerned family and suecession, but eoneeding to thei all the patrimonial rights of a eitizen and the fullest power of dealing with their belongings so long as not mortis causa and to the prejudice of their patrons. This was the Junian Latinity so prominent in the pages of Gaius, but of which our limits exelude any detailed description.

The third group of enactments referred to included the two Leges Judici- Juliae judiciariae, of which we know but little. That regulating ary laws. procedure in private litigations is the same that is mentioned by Gaius as having completed the work of the Abutian law in sub- stituting the formular system for that per legis aetiones. It must have been a somewhat comprehensive statute, as a passage in the Vatican Fragments refers to a provision of its 27th section ; and our ignorance of its eontents therefore, beyond one or two trifling details, is the more to be regretted.

From the time of Tiberius onwards it was the senate that did Legisla- the work of legislation, for the simple reason that the eomitia were tion of no longer fit for it. And very active it seems to have been. This senate. may have been due to some extent to the fact that so many pro- fessional jurists, aware from their practice of the points in which the law required amendment, possessed seats in the imperial couneil, where the drafts of the senatuseconsults were prepared. It was the senatusconsults that were the principal statutory factors of what was called by both emperors and jurists the jus sovwm,—law that departed often very widely from the prineiples of the old jus civile, that was much more in aecordance with those of the Zdvet, and that to a great extent might have been introduced through its means had not the authority of the pretors been overshadowed by that of the prince. In the end of the 2d and the beginning of the 3d century the supremaey of the latter in the senate became rather too pronouneed, men quoting the oratio in whieh he had submitted to it a projeet of law instead of the resolution whieh gave it legislative effect. No doubt it must have been earefully eonsidered beforehand in the imperial council, and rarely stood in need of further discussion ; but the ignoring

of the formal act that followed it tended unduly to emphasize the share borne in it by the sovereign, and made it all the easier for the emperors after Alexander Severus to dispense altogether with the time-honoured praetice.

The Consolidated Edietum Perpetuum.—The ediets of the preetors, Julian's which had attained very considerable proportions before the fall of Edictum, the republic, certainly received some additions in the early empire. But those magistrates did not long enjoy the same independence as of old; there was a greater imperium than theirs in the state, before which they hesitated to lay hands on the law with the bold- ness of their predecessors. They continued as before to publish annually at entry on office the ediets that had been handed down to them through generations; but their own additions were soon limited to mere amendments rendered necessary by the provisions of some senatusconsult that affeeted the jus honorarium. They ceased to be that viva vox juris eivilis which they had been in the time of Cicero ; the emperor, if any one, was now entitled to the epithet ; the annual edict had lost its raison d'étre. Hadrian was of opinion that the time had eome for writing its " explicit," and giving it another and a more enduring and authoritative shape,— for so fashioning and so sanctioning it that it might be reeeived as law, and not merely as edict, throughout the length and breadth of the empire. He accordingly commissioned Salvius Jnlianus, urban pretor at the time, to revise it, with a view to its approval by the senate as part of the statute law.

The revisal, unfortunately, like the XII. Tables, is no longer extant. Itis only a very slight account we have of the revision,— a line or two in Eutropius and Aurelius Victor, and a few lines in two of Justinian's prefaces to the Digest. We may assume, from what is said there, that there were both abridgment and rearrange- ment of the ediets of the urban pretor ; but the question remains how far Julian consolidated with them those of the peregrin preetor and other officials who had contributed to the jus honorarium. Those of the eurule ediles, we are told, were ineluded ; Justinian says that they formed the last part of Julian's work, and may have been a sort of appendix. There is reason to believe that so much of the ediets of the provincial governors as differed from those of the pretors were also ineorporated in it, and that the edicts of the peregrin pretors, in

so far as they contained available matter not embodied in those of their urban colleagues or the provincial governors, were dealt with in the same way. The consolidation got the name of Hdietwm Perpetwum in a sense somewhat different from that formerly imputed to edieta perpetua as distinguished from edicta repentina, and, after approval by Hadrian,' seems to have been formally sanctioned by senatusconsult. It was thus a closed ehapter so far as the preetors were eoncerned ; for, though it may have continued for a time to hold its place on their album with its formularies of actions, they had no longer any power to alter or make additions to it. It had ceased to be a mere efflux of their imperium and had become matter of statute ; and its interpreta-

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of the emperor.

The Julian diet does not seem to have been divided into books, but only into rubricated titles ; and the general impression is that the formularies of actions were split up and distributed in their appropriate places. The arrangement is not difficult to discover by comparison of the various commentaries upon it, particularly those of Ulpian and Paul, which each contained over eighty books. First came a series of titles dealing with the foundations and first steps of all legal procedure,—jurisdiction, summons, intervention of attorneys or procurators, &c. ; secondly, ordinary process in vir- tue of the magistrate's jurisdietio; thirdly, extraordinary process, originally in virtue of his dmperiwm ; fourthly, execution against judgment-debtors, bankrupts, &c. ; fifthly, interdicts, exceptions, and preetorian stipulations ; and lastly, the edilian remedies. From the quotations from the Julian Hdict embodied in the fragments of the writings of the commentators preserved by Justinian re- peated attempts have been made to reproduce it. Most of them are nothing more than transcripts or attempted reconstructions of passages in the Digest which are supposed to have been borrowed from it, and are of comparatively little value. The only really scientific and worthily critical efforts are those of Rudorff in 1869 and Lenel in 1883. +

The Responses of Patented Cownsel.—The right of responding

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- tion and amendment were no longer in their hands but in those

-some relief he proposed to grant.

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magistrate the empcror had the same jus edicendi that kings, con- suls, and pretors had had before him, and used it as they did to indicate some course of action he meant to adopt and follow or His range, of course, was much greater than that of the pretors had been ; for his authority en- dured for life, and extended over the whole empire and every department of government. But originally, and in principle, his successor on the throne was no more bound to adopt any of his edicts than a praetor was to adopt those of his predecessors. That it was not unusual for an edict to be renewed, and that it occasion- ally happened that the renewal was not by the immediate successor of its origina] author, are manifest from various passages in the texts, Very frequently, when its utility had stood the test of years, it was transmuted into a senatusconsult ; this fact proves of itself that an edict per se had not the effect of statute. But their adoption by a succession of two or three sovercigns, whose reigns were of average duration, may have been held sufficient to give them the character of consuetudinary law ; and, by a not unnatural process, unreflecting public opinion may have come to impute force of statute to the edict itself rather than to the longa consuetudo that followed on it, thus paving the way for the assertion by the sove- reigns of the later empire of an absolute right of legislation, and for the recognition of the lex edictalis (infra, p. 710) as the only form of statute.

The imperial rescripts and decrees (reseripta, deereta) had force of Rescripts law (legis vicem habent) from the earliest days of the empire, and and their operation was never limited to the lifetime of the prince from decrees.

sponses under imperial authority (jus respondendi ex auctoritate principis), of first granted by Augustus and continued by his successors down to patented the time of Alexander Severus, did not imply any curtailment of

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Eclicts of

the right of unlicensed jurists to give advice to any one who chose to consult them. What it did was to give an authoritative char- acter to a response, so that the judge who had asked for it and to whom it was presented—for the judges were but private citizens, most of them unlearned in the law—was bound to adopt it as if it had emanated from the emperor himself. It may be that Augus- tus was actuated by a political motive,—that he was desirous by this concession to attach lawyers of eminence to the new régime, and prevent the recurrence of the evils experienced during the re- public from the too great influence of patrons. But, whatever may have prompted his action in the matter, its beneficial consequences for the law can hardly be overrated. For the quasi-legislative powers with which they were invested enabled the patented counsel to influence current doctrine not speculatively merely but positively (jura econdere), and so to leaven their interpretations of the jus civile and jus honorarium with suggestions of natural law as to give a new complexion to the system.

Instead of giving his opinion like the unlicensed jurist by word of mouth, either at the request of the judge or at the instance of one of the parties, the patented counscl, who did not require to give his reasons, reduced it to writing and sent it to the court under seal. Augustus does not seem to have contemplated the possibility of conflicting responses being tendered from two or more jurists equally privileged. It was an awkward predicament for a judge to be placed in. Hadrian solved the difficulty by declaring that in such a case the judge should be entitled to use his own discretion. That on receiving a response with which he was dis- satisfied he could go on calling for others until he got one to his mind, and then pronounce judgment in accordance with it on the ground that there was «lifference of opinion, is extremely unlikely. The more probable

explanation of Hadrian's rescript is, that the number of patented responding counsel was very limited; that a judge, if he desired their assistance, was required by this rescript to consult them all (quorwm omniwm si, &c.); that, if they were unanimous, but only then, their opinion had force of statute (legis vieem optinet); and that when they differed the judge must decide for himself. é

Constitutions of the Emperors.?—Gaius and Ulpian coucur in

emperors, holding that every imperial constitution, whether in the shape of

rescript, decree, or edict, had the force of statute. It may be that by the time of Ulpian that was the prevailing opinion ; but modern criticism is disposed to regard the dictwm of Gaius, written in the time of Antoninus Pius, as coloured by his Asiatic notions, and not quite accurate so far as the edicts were coneerned. As supreme

1 Rudorff, De jurisdictione edictum: edicti perpetui quae reliqua sunt, Leipsic, 1869, and rev. by Brinz in the Arit. Vierteljahrschrift, vol. xi. (1870), p. 471 sg.; Lenel, Das Edictwm Perpetuum : ein Versuch zu dessen Wiederherstellung, Leipsic, 1883. The last gained the "Saviony Foundation Prize" offered by the Munich Academy in 1882 for the best restitution of the formulae of Julian's Edict, but goes far beyond the limited subject prescribed ; see Brinz's report upon it to the Academy in the Zeitschr. d. Sav. Stift., vol. iv. (1883), Rom. Abtheil., p. 164 sq. :

2 Gaius, i. 7. Justinian, Znst., i. 2, § 8, gives it somewhat differently.

3 Gai. i. 5; Ulp., in Dig., i. 4, fr. 1, § 1; Mommsen, Rom. Staats- recht, vol. ii. p. 843 sq. ; Wlassak, Krit. Studien zur Theorie der Rechts- quellen im Zeitalter d. klass. Juristen, Gratz, 1884; A. Pernice (crit. Wlassak), in Zeitschr. d. Sav. Stift., vol. vi. (1885), Rém. Abtheil., p. 293 sq.; Karlowa, Rim. Rechtsgesch., vol. i. § 85.

whom they had proceeded. But they were not directly acts of legislation. In both the emperor theoretically did no more than authoritatively interpret existing law, although the boundary be- tween interpretation and

new law, sometimes difficult to define, was not always strictly adhered to. The rescript was an answer by the emperor to a petition, either by an official or a private party, for an instruction as to how the law was to be applied to the facts set forth ; when the answer was in a separate writing it was usually spoken of as an epistula; when noted at the foot of the application its technical name was subseriptio or adnotatio. The decree was the emperor's ruling in a case submitted to him judicially ; it might be when it had been brought before him in the first instance extra ordinem, or when it had been removed by supplicatio from an inferior court in its earliest stage, or when it came before him by appeal. It was asa judge that the emperor pronounced his decree ; but, proceeding as it did from the fountain of authoritative interpretation, it had a value far beyond that of the sentence of an inferior court (which was law only as between the parties), and formed a precedent which governed all future cases involving the same question. Those decrees and rescripts constituted one of the most important sources of the law during the first three centurics and more of the empire, and were elaborated with the assistance of the most eminent jurists of the day, the rescripts being the special charge of the magister libellorum. From the time of the Gordians to that of the abdication of Diocletian they were almost the only channel of the law that remained.

Professional Jurisprudence, —A sketch of the history of Roman law can hardly be considered complete without some account of the jurists of the first two centuries and a half of the empire, who con- tributed to it the great body of doctrine embalmed in the Digest of Justinian. But the exigencies of space compel us to refrain from entering upon a branch of our subject that cannot be satisfactorily treated without considerable detail, and to content ourselves with referring the reader to the recent work of Mr Roby, or the Reehts- gesehichte of Professor Karlowa of Heidelberg, where all will be found that the most inquisitive could desire. For an account of the extant remains of their writings outside the Justinianian Digest, such as the Jnstitutes of Gaius, the Rules of Ulpian, the Sentences of Paul, and a variety of minor pieces, we must likewise refer to Karlowa's book,® which promises to be the most elaborate history of Roman law as yet given to the public.*

IL. SursrantivE CHANGES IN THE Law.

Concession of Peculiar Privileges to Soldiers.—While the period with which we are dealing saw the substantial dis- appearance of the distinction between citizen and peregrin, it witnessed the rise of another, —that between soldiers and civilians (mites, pagant). The most remarkable effluxes

4 Roby, Introduction to the Study of Justinian's Digest, Cambridge, 1884, chaps. ix.~~xv. ; Karlowa, Rdm. Rechtsgeschichte, vol. i, (Staats~~ recht und Rechtsquellen), Ueipsic, 1885, §§ 87-91. Karlowa's 2d vol. will contain the history of the private law, the criminal law, and civil and criminal procedure. ,

5 Karlowa, op. cit., § 92. An account of the jurists of the empire and their remains outside the Digest will be found in an expansion of the present article now in the press, under the title of Historical Intro- duction to the Private Law of Rome.

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The Family.— The legislative efforts of Augustus to encourage Family marriage, to which persons of position showed a remarkable dis- relations.

Military of the jus mlitare (as it is sometimes called) were the

testa- military testament and the castrense peculiwm. The first taste, have already been mentioned. The relation of husband and mnguts. "setrat naught all the rules of the jus civile and the preetors' | wife still in law required no more for its creation than deliberate edict alike as to the form and substance of last wills. It uaterea age, of nuptial concent ainece ly oy one or two BUDA . . +48 the bride's home-coming to her husbaud's house was regarded as might be in writing, by word of mouth, by _ acc the

criterion of coinpleted marriage. But it was rarely accom- signs perhaps of a dying man ; all that was required was the panied with manus. So repugnant was such subjection to patrician voluntas so manifested as not to be mistaken. More extra- ladies that they declined to submit to confarreate nuptials ; and so ordinary still,—it was sustained even ¢hough its provisions | great consequently became the difficulty of finding persons qualified ran counter to the most cherished rules of the common law. | by confarreate use es ree priesthoods ar ea in the ; ld die partly testate | °™pire it had to be decreed that confarreation should in future be Contrary to the maxim that ee Cou 2 – | productive of manus only quoad saera, and should not make the and partly intestate, a soldier might dispose of part of his | \ite a member of her husband's family. Manus by a year's unin- estate by testament and leave the rest to descend to his | terrupted cohabitation was already out of date in the time of Gaius; heirs ab intestate. Contrary also to the maxim seme | and, although that by coemption was still in use in his time, it prob- : a) he might sive his estate to A for life or | ably was quite unknown by the end of the period. Husband and heres semper heres, Se es wife therefore had their separate estates, the common establish- for a term of years, or until the occurrence of some event, | jiont being maintained by the husband, with the assistance of the with remainder to B. Contrary to the general rule, a | revenue of the wife's dowry (dos), —an institution which received Latin or peregrin, or an unmarried or married but child- ner ag Ai aan' hat of the I a an es to some pase . . : regulate statute. Divorce was unfortunately very common ; i less pemou, might take an inheritance me tie ponent ee othe lawful Sie without any assignable cause ; a iN blame attached a soldier as freely as could a citizen with children. "IS | to either side, he or she suffered deprivation to some extent of the testament, in so far as it disposed only of bona castrensia, nuptial provisions, but there were no other penal consequences. was not affected by capitis deminutio minima. It was not Not only in the case of a /iliusfamilias who had adopted a mili- invalidated by preeterition of suc heredes, nor could they | tary career, but in all cone there was manifested a ee : Hed dese unalen ae Gea to place restrictions on the exercise of the patria potestas. 11s challenge it because they ke : ; was due in a great degree to the hold that the doctrines of natural "legitim"; nor could the instituted heir claim a Fal- | jaw were gaining within the Roman system, partly also to the cidian fourth, even

though nine-tenths of the succession had | fact that the emperors, having succeeded to the censorial regimen been assigned to legatees. Finally, a later testament did | ™orwm, allowed it freely to influence their edicts and rescripts. ye : ae ; di to-Be sWennnenin Exposure of an infant was still allowed ; but a parent was no longer a nullify an earlier one, if it appeared to be the intention permitted, even in the character of household judge, to put his of the soldier testator that they should be read togetlier. son to death; in fact his prerogative was limited to moderate All this is remarkable, manifesting a spirit very different from | chastisement, the law requiring, in case of a grave offence that that which animated the common law of testaments. True, it was | merited severer punishment, that he should hand his child over to a principle with the jurists of the classical period that the voluntatis | the ordinary tribunal. His right of sale, in like manner, was re- ratio was to be given effect to in the interpretation of testamentary | gtricted to young children, and permitted only when he was in writings ; but that was on the condition that the requirements of | great poverty nal unable to maintain them, while their impignora- law as to form and substance had been serupulously observed. But | tion by him was prohibited under pain of banishment. in the military testament positive rules were made to, yield to the Except in the solitary case of a, son who was a soldier, a pater. voluntas in all respects: the will was almost absolutely unfettered. | familias was still recognized as in law the owner of all the earnings Roman law in this matter gave place to natural law. One would | 'and other acquisitions of his children in potestate ; but the old rule have expected the influence of so great a change to have manifested | still remained that for their civil debts he was not liable beyond itself by degrees in the ordinary law of testaments ; yet it is barely | the amount of the fund he had advanced them to deal with as de visible. In a few points the legislation of Constantine, Theodosius | facto their own (peculium profectictum), except when he had derived II., and Justinian relaxed the strictness of the old rules ; but there advantage from their contract or had expressly or by implication was never any approach to the recognition of the complete supre- | authorized them to enter into it as his agents. To the party with macy of the voluntas. In the Corpus Juris the contrast between the | whom he had contracted a Jiliusfamilias was himself liable as fully lestamentum paganwm and the testamentwm militare was almost as | as if he had been a paterfamilias,

with one exception, namely, when marked as in the days of Trajan. The latter was still a privileged | his debt was for borrowed money ; in that case, with some very deed, whose use was confined to a soldier actually on service, and | reasonable qualifications, it was declared by the notorious Mace- which had to be replaced by a testament executed according to the | donian senatusconsult (of the time of Vespasian) that the lender __., usual forms of law within twelve months after his retirement. should not be entitled to recover payment, even after his borrower ern The peeuliwm eastrense had a wider influence ; for it was the first | had become sut juris by his father's death. Between a father and castrense,

of a series of amendments that vastly diminished the importance of the patria potestas on its patrimonial side. It had its origin in the concession by Augustus to filiifamilias on service of the right to dispose by testament of what they had acquired in the active exer- cise of their profession (quod in eastris adquisierant). But it soon went much further. Confined at first to filiifamilias on actual service, the privilege was extended by Hadrian to those who had obtained honourable discharge. The same emperor allowed them not merely to test on their peeuliwm castrense, but to manumit slaves that formed part of it; and a little step further recognized their right to dispose of it onerously or gratuitously inter vivos. By and by the range of it was extended so as to include not only the soldier's pay and prize but all that had come to him, directly or indirectly, in connexion with his profession,— his outfit, gifts made to him during his service, legacies from comrades, and so on. All this was in a high degree subversive of the doctrines of the common law. It may almost be called revolutionary ; for it in- volved in the first place the recognition of the right of a person alient juris to make a testament as if he were sui juris, and in the second place the recognition of a separate estate in a filiusfami- lias which he might deal with independently of his paterfamilias, whieh could not be touched by the latter's creditors, and which he was not bound to collate (or bring into hotch-pot) on claiming a share of his father's succession. The radical right of the parent, however, was rather suspended than extinguished ; for, if the soldier son died intestate, the right of the paterfamilias revived :

- he took his son's belongings, not as his heir appropriating an in-

heritance, but as his paterfamilias reclaiming a peeulium,)

- This was altered by Justinian's 118th Novel, under which a father ae any part of a deceased son's estate did so as his heir 3 see infra, p. : ;

his emancipated son there was, and always had been, perfect free- dom of contract; but so was there now between a father and his soldier son in any matter relating to the peeuliwm eastrense, even though the son was in potestate. What is still more remarkable is that the new sentiment which was operating on the jus civile admitted the possibility of natural obligation between paterfamilias and /iliusfamilias even in reference to the peeulium profecticium, which, though incapable of direct enforcement by action, was yet to some extent recognized and given effect to indirectly.

In the matter of guardianship, while the tutory of pupils was carefully tended and the law in regard to it materially amended during the period under review (particularly by a senatusconsult generally referred to as the Oratio divi Severi, prohibiting aliena- tion of the ward's property without judicial authority), that of women above the age of pupilarity gradually disappeared. The guardianship or curatory (ewra) of minors above pupilarity owed its institution to Marcus Aurelius. The Pletorian law of the middle of the sixth century of the city had indeed imposed penalties on those taking undue advantage of the inexperience of minors, i.e., persons sui yuwris under the age of twenty-five ; and from that time the pretors were in the habit of appointing curators to act with such persons for the protection of their interests in particular affairs. But it was Marcus Aurelius who first made curatory a general permanent office, to endure in the ordinary case until the ward attained majority. The powers, duties, and responsibilities of such curators became a matter for careful and elaborate defini- tion and regulation by the jurists, whose exposition of the law of guardianship, whether by tutors or curators, has found wide accept- auce in modern systems of jurisprudence.

The Law of Suecession and particularly Testamentary Trusts.— There were far more positive changes in the law of succession than

Law of succes- sion,

in either that of property or that of obligation. The rise and progress of the military testament has already been explained. The testament of the common law was still ostensibly that per aes et Libram ; but the practice of granting bonorum possessto seeundum tabulas to the persons named as heirs in any testamentary instru- ment that bore outside the requisite number of seals led, from the time of Marcus Aurelius, to the frequent neglect of the time-honoured formalities of the familiae maneipatio and nuneupatio testamentt. It was a rescript of his, declaring that an heir-at-law should no longer be entitled to dispute the last wishes of a testator on the technical ground of non-compliance with the purely formal require- ments of the law, that practically introduced what Justinian calls the pretorian testament.

One of the commouest provisions in the testaments of the period was the jideicommissum,—a request by the testator to his heir to enter to the inheritance and thereafter denude wholly or partially in favour of a third party. It was introduced in the time of Augustus by (it is said) a testator who had married a peregrin wife, and desired thus indirectly to give to his peregrin children the succession which, as not being citizens, they could neither take ab intestato nor as his direct testamentary heirs.! The practice soon gained ground, and became thorouglily established once the emperor, shocked at the perfidy of a trustee who had failed to comply with the request of his testator, indicated his approval of the new institution by remitting the matter to the consuls of the day, with instructions to do in the circumstances what they thought just. So quickly did it establish itself in public favour, and so numerous did the questions become as to the construction and ful- filment of testamentary trusts, that before long it was found neces- sary to institute a court specially charged with their determination, —that of the practor fideicommissarius.

The employment of a trust as a means of benefiting those who were under disqualifications as heirs or legatees, as, for example, persons who had no testamenti faetio, women incapacitated by the Voconian law, unmarried and married but childless persons inca- pacitated by the Julian and Papia-Poppzan law, and so on, was in time prohibited by statute ; but that

did not affect its gencral popu- larity. For, whethcr what was contemplated was a transfer of the universal hereditas or a part of it to the beneficiary (/ideicommisswm hercditatis), or only of some particular thing (fideteommissum ret singularis), a testamentary trust had various advantages over either a dircct institution or a direct bequest (legatwm). In theory the imposition upon the heir of a trust in favour of a beneficiary, whether it required him to denude of the whole or only a part of the inherit- ance, did not deprive him of his character of heir or relieve him of the responsibilities of the position ; and at common law therefore he was entitled to decline the succession, often to the great prejudice of the beneficiary. In order to avoid such a mischance, and at the same time to regulate their relations inter se and towards debtors and creditors of the testator's, it became the practice for the parties to enter into stipulatory arrangements about the matter ; but these were to some extent rendered superfluous by two senatusconsults, the Trebellian in the time of Nero and the Pegasian in that of Vespasian, which at once secured the beneficiary against the trustee's (i.e., the heir's) repudiation of the inheritance, protected the latter from all risk of loss where he was trustee and nothing more, and enabled the former to treat directly with debtors and creditors of the testator's and himself ingather the corporeal items of the inheritance. '

It was one of the advantages of a trust-bequest, whether universal or singular, that it might be conferred in a codicil, even though unconfirmed by any relative testament. The codicil (codiczdz), also an invention of the time of Augustus, was a deed of a very simple nature. It was inappropriate either for disherison of sw or institu- tion of an heir; but if confirmed by testament it might contain direct bequests, manumissions, nominations of tutors, and the like, and whether confirmed or unconfirmed miglit, as stated, be utilized as a vehicle for trust-gifts. Latterly it was held operative even in the absence of a testament, the trusts contained in it being regarded as burdens ou the heir-at-law. ; '

The most important changes in the law of intestate succession during the period were those accomplished by the Tertullian and Orphitian senatusconsults, fruits of that respect for the precepts of natural law which in so many directions was modifying the doctrines of the jus civile.

The first was passcd in the reign of Hadrian, the second in the year 178, under Marcus Aurelius. Down to the time of the Tertullian senatusconsult a mother and her child by a mar- riage that was unaccompanied with manus stood. related to each other only as cognates, being in law members of different fainilics ; consequently their chance of succession to each other was remote, being postponed to that of their respective agnates to the sixth or seventh degree. The purpose of the senatusconsult was to prefer a

nother to all agnates of her deceased child except father and brother a EEE EE EE ——————————————EEE

1 They could not even have a claim as cognates under the pretorian rules ; for the pretors followed the rule of the jus civile to this extent, that they did not grant bonorwm possessio to a person who had not testamenti factio with him whose succession was in question.

and sister; father and brother excluded her; but with a sister of the deceased, and in the absence of father or brother, she shared equally, While there can be little doubt that it was natural con- siderations that dictated this amendment, yet its authors were too timid to justify it on the abstract principle of common humanity, lest thereby they should scem to impugn the wisdom of the jus civile, and so they confined its application to women who had the jus liber- orwm, 7.e., to women of free birth who were mothers of three children and freedwomen who were mothers of four, thus making it osten- sibly a reward of fertility. The Orphitian senatusconsult was the counterpart of the Tertullian. It gave children, whether legitimate or illegitimate, a right of succession to their mother in preference to all her agnates ; and subsequent constitutions extended the prin- ciple, admitting children to the inheritance not only of their mater- nal grandparents but also to that of their patcrnal grandmother.

III. Jupic1an PRocEDURE.

The Formular System.2—The ordinary procedure of the first three Formular centuries of the empire was still two-staged ; it commenced before system.

the preetor (in jwre) and was concluded before a judex (in judicio). But the legis aetiones had given place to preetorian formulae. Under the older system parties, and particularly the plaintiff, had them- selves to formulate in statutory or traditional words of style the matter in controversy between them ; and as they formulated, so did it go for trial to centumviral court or judex or arbiters, with the not infrequent result that it was then all too late discovered that the real point in the case had been missed. Under the formu- lar system parties were free to represent their plaint and defence to the pretor in any words they pleased, the plaintiff asking for a Jormula and usually indicating the style on the album that he thought would suit his purpose, and the defendant demanding when necessary an exception, @.¢., a plea in defence, either pretorian or statutory, that, without traversing the facts or law of the plain- tiff's case, avoided his demand on grounds of equity or public policy. It was for the preetor to consider and determine whether the action or exception should or should not be granted, and, if granted, whether it should be according to the style exhibited on the album or according to a modification of it. The result he embodied in a written and signed appointment to a judge, whom he instructed what he had to try, and empowered to pronounce a finding either condemning or acquitting the defendant. This writing was the formaila.

Although it was not until the early empire that this system of procedure attained its full development, yet it had its commence- ment two centuries before the fall of the republic. Gaius ascribes its introduction and definitive establishment to the Lex Aebutia (probably of the second decade of the sixth century of the city) and two judiciary laws of the time of Augustus (sepra, pp. 696, 704). The Abutian Jaw, of which unfortunately we know very little, is generally supposed to have empowered the pretors (1) to devise a simpler form of procedure for causes already cognizable per legis aettonem, (2) to devise forms of action to meet cases not cognizable under the older system, and (3) themselves to formulate the issue and reduce it to writing. It was by no means so radical

a change as is sometimes supposed. There were formulae employed by the pretor both in the procedure per judicis postulationem and in that per condietionem. The difference between them and the formulae of the Aibutian system was that the former were in part mere echoes of the statutory words of style uttered by the plaintiff, and that they were not written but spoken in the hearing of witnesses.

A large proportion of the personal actions of the formular system Its appli- were evolved out of the legis actio per condictionem. 'The sequence cation to Taking the personal simplest form of it, the action for certa pecunita under the Silian actions.

of operations may have been something like this.

law, the first step was to drop the formal condietio from which it derived its character of legis aetio, thus avoiding a delay of thirty days ; the plaintiff stated his demand in informal words, and, if the defendant denied indebtedness, the prector straightway formulated a written appointment of and instruction to a judge, embodying in it the issue in terms substantially the same as those he would have employed under the earlicr procedure :—"Titius be judge. Should it appear that N. N. ought to pay (dare oportere) 50,000 sesterces to A. A., in that sum condemn N.N. to A. A. ;? should it not so appear, acquit him." This was no longer the legis actio per condietionem, because what had made it legis actio was gone, but the certi eondietio of the formular system. The condictio triti- earia of the same system ran on the same lines: " Titius be judge. Should it appear that N. N. ought to give A. A. the slave Stichus, then, whatever be the value of the slave, in that condemn N. N. to A. A.," and soon. In both of these examples the formala included only two of the four clauses that might find place in it,4—an " in-

2 See Keller (as on p. 681, note 1), §§ 23-43; Bethmann-Hollweg (as in same note), vol. ii. §§ 81-87; Bekker (as in same note), vol. i. chaps. 4-7, vol. ii. chaps. 15, 19, 20; Baron, Gesch. d. rém. Rechts, Berlin, 1884, vol. i. §§ 202-215.

3 In the typical Roman styles of actions the plaintiff was usually called Aulus Agerius and the defendant Numerius Negidius.

4 Gaius enumerates them as the demonstratio, intentio, adjudicatio, and con-

Tts appli- cation to real actions.

Formulae

injusand infactum con- eeptae,

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tention" and a "condemnation." The matter of claim in both cases was certain,—so much money in one, a slave in the other ; but, while in the first the condemnation also was certain, in the second it was uncertain. What if the claim also was uncertain,— say a share of the profits of a joint adventure assured by stipulation ? It was quite compctent for the plaintiff to condescend on a definite sum, and claim that as due to him ; but it was very hazardous, for unless he was able to prove the debt to the last sesterce he got nothing. To obviate the risk of such failure the preetors devised the incerti condictio, whose formula commenced with a "demon- stration" or indication of the cause of action, and whose "inten- tion" referred to it and was conceived indefinitely: "Titius be judge. Whereas A. A. stipulated with N. N. for a share of the profits of a joint adventure, whatever in respect thereof N. N. ought to give to or do for (dare facerc oportet) A. A., in the money amount thereof condemn N. N.," and so on.! Once this point was attained further progress was comparatively easy, the way being open for the construction of formulae upon illiquid claims arising from trans- actions in which the practice of stipulation gradually dropped out of use (supra, p. 701), till at last the bonac fidei judicia were reached, marked by the presence in the "intention" of the words ex fide bona,—" whatever in respect thereof N. N. ought in good faith to give to or do for A. A." ;

In the case of real actions the transition from the legis actiones to the formulae followed a different course. The Abutian law did not abolish the procedure per sacramcentum when reference was to be to the centumyiral court on a question of quiritarian right. In the time of Cicero that court was apparently still in full activity (p. 678), but by that of Gaius it is

doubtful if it was resorted to except for trial of questions of inheritance. In his time questions of pro- perty were raised eithcr per sponsionem or per formulam petitoriam. The procedure by sponsion must be regarded as the bridge between the sacramental process and the petitory vindicatio. In the first as in the second the question of real right was determined only indirectly. The plaintiff required the defendant to give him his stipulatory promise to pay a nominal sum of twenty-five sesterces in the event of the thing in dispute being found to belong to the former; and at the same time the defendant gave sccurity for its transfer to the plaintiff, with all fruits and profits, in the same event. The formula that was adjusted and remitted to a judge ex facie raised only the simple question whether the twenty-five sesterces were due or not: the action was in form a personal, not a real one, and was therefore appropriately remitted to a single judcx instead of to the centumviral tribunal. But judgment on it could be reached only through means of a finding (sententia) on the ques- tion of real right ; if it was for the plaintiff he did not claim the amount of the sponsion, but the thing which had been found to be his; and, if the defendant delayed to deliver it, with its fruits and profits, the plaintiff had recourse against the latter's sureties. The petitory formula was undoubtedly of later introduction and much more straightforward. Like the certé condictio it contained only "intention" and "condemnation." It ran thus: "Titius be judge. Should it appear that the slave Stichus, about whom this 'action has been raised, belougs to A. A. in quiritary right, then, unless the slave be restored, whatever be his valuc, in that you will condemn N. N. to A. A.; should it not so appear, you will acquit him."

The formulae given above, whether applicable to real or personal actions, are so many illustrations of the class known as Sormulae juris civilis or in jus conceptae. The characteristic of such a formula was that it contained in the "intention " one or other of the follow- ing phrases—ejus esse cu jure Quiritium, adjudicart oporterc,? dari oportere, dri fiert oporterc, or damnum decidi oporterc.2 Such a formula was employed where the right to be vindicated or the obligation to be enforced had its sanction in the jus civile, whether in the shape of statute, consuetude, or interpretation. Where, on the other hand, the right or obligation had its sanction solely from the preetor's edict, formulae so conceived were inappropriate and incompetent. The actions employed in sueh cases were actiones juris

honorarii, and these either actioncs utiles or actiones in Sactum. The first were adaptations of actions of the Jus civile to cases that did not properly fall within them ; the second were actions entirely of preetorian devising, for the protection of rights or redress of wrongs unknown to the jus civile.4

demnatio, and describes their several functions in iv. §§ 39-48. Besides these a formula might be preceded by a praescrintio (Gai., iv. §§ 130-137), and have incorporated in it fictions (§§ 32-88), exceptions (§§ 115-125), and replications, duplications, &c. (§§ 126-129),

1 This was specifically called the actio ex stipulatu, but was really nothing more than a variety of the condictio incerti. The later actions on the consensual contracts, and on all the nominate real contracts except mutuwum, in like manner had specific names, but in fact were just incerti condictiones in the larger sense of the phrase.

2 Employed only in the divisory actions, i.e., for dividing common property, partitioning an inheritance, or settling boundaries ; the demand was that the Judge should adjudicate (or assign) to each of the parties such a share as he thought just.

3 Employed in certain actions upon delict, where the old penalties of death, slavery, or talion had in practice been transmuted into money payments, and the defendant. consequently called upon to make a settlement in that way.

4 In a few instances (not satisfactorily explained) there was both civil and

Of the actiones utiles some were called actiones fieticiac.

adversely criticized accordingly. But every amendinent on the law is an admission of defect in what is being amended ; and it was in sympathy with the spirit of Roman jurisprudence, when it found an action too

narrow in its definition, to include some new case that ought to fall within it, rather by feigning that the new case was the same as the old, to bring it within the scope of the existing and familiar action, than to cause disturbance by either altering the definition of the latter or introducing an entirely new remedy. A bonorum possessor (supra, p. 702) held a position unknown to the Jus civile; he was not an heir, and therefore not entitled offhand to employ the actions competent to an heir, either for recovering the property of the defunct or proceeding against his debtors. The preetor could have had no difficulty in devising new actions to mect his case ; but he preferred the simpler expedient of adapting to it an heir's actions, by introducing into the formula a fiction of civil heirship; so he did with the bonorwm emptor or purchaser of a bankrupt's estate at the sale of it in mass by his creditors. Emptio bonorum was a purely pretorian institution, and the pretor, if he had thought fit, could casily have fortified the purchaser's acquisition by giving him pretorian remedies for recovering the property and suing the debtors of the bankrupt ; but here again he followed the simpler course of giving him, as if he were a universal successor, the benefit of an heir's actions by help of a fiction of heirship.® A peregrin could not sue or be sued for theft or culpable damage to property, for the XII. Tables and the Aquilian law applied only to citizens; but he could both sue and be sued under cover of a fiction of citizenship. A man who had acquired a res mancipt on a good title, but without taking a conveyance by mancipation or surrender in court, if he was dispossessed before he had completed his usucapion, could not sue a rez vindicatio for its recovery, for he was not in a position to affirm that he was quiritarian owner ; neither, for the same reason, could a man who in good faith and on a sufficient title had acquired a thing from one who was not ina posi- tion to alienate it. Butin both cases the prator granted him what was in effect a red vindicatio proceeding on a fiction of completed usu- capion,—the Publician action referred to on p. 699.*

These are examples of actiones fictictae,—actions of the jus civile adapted by this very simple expedient to cases to which other- wise they would have been inapplicable, and forming one of the

most important varieties of the actioncs wtiles. Quite different was Actiones the course of procedure in the actiones in factwm, whose

number in fac- and varieties were practically unlimited, although for the most tum.

part granted in pursuance of the preetor's promise in the edict that under such and such circumstances he would make a remit to a judex (judieiwm dabo),6 and formulated in accordance with the relative skeleton styles also published on the albwm. A great number of them canie to be known by special names, as, for example, the actio de dolo, actio negotiorum gestorum, actio hypothecaria, actio de pecunia constituta, actio vi bonorwm raptorum, actio de superficie, &c.,—the generic name actio in factum being usually confined to the inuo- minate ones. Their formulae, unlike those i jus conccptae, sub- mitted no question of legal right for the consideration of the judge, but only a question of fact, proof of which was to bé followed by a condemnation. That of the act'o de dolo, for example, ran thus: 'Titius be judge. Should it appear that, through the fraud of N.N., A. A. was induced to convey and cede posscssion to him of his farm (describing it), then, unless on your order N.N. restores it, you will condemn him in damages to A. A. ; if it shall not so appear, you will acquit him."

Our limits do not admit of any explanation of the purpose, form, or effect of the prescriptions, exceptions, replications, &c., that were engrafted on a formula when required ; or of the ways in which the "'condemnation" was occasionally "taxed" by the pretor, so as to prevent the award of extravagant damages ; or of the con- sequences of defects in the formula; or of the procedure in jure before it was adjusted, or in judicio afterwards; or of appeal for review of the judgment by a higher tribunal; or of execution (which was against the estate of the judgment-debtor, and took the form of incarceration only when his goods could not be at- tached). Our main object has been to show how elastic was this procedure, and how the pretorian formulae, in conjunction with the relative announcements in the edict, supplied the vehicle for the introduction into the law of an immense amount of new doctrine. The system was fully developed before Jnlian's consolidation of the

pretorian remedy for the same wrong ; for Gaius observes (iv. 45) that in com- modate and deposit failure of the borrower or depositary to return

the thing lent to or deposited with him gave rise to actions that might be formulated either in jus or in factum. In the same section he gives the styles of actiones depositi in jus and in factum conceptae ; their comparison is instructive.

° Gai., iv. 35. Theophilus (Par. Inst., iii. 12) calls the bonorwm emptor mpaTwpios dcddoxos (pretorian successor) of the bankrupt.

*6 Examples: 'Si quis negotia alterius .. . gesserit, judicium eo nomine dabo" (Dig., iii. 5, 3, pr.); **Quae dolo malo facta esse dicentur, si de his rebus alia actio non erit et justa causa esse videbitur, judicium dabo " (Dig., iv. 3, 1,§ 1); " Nautae caupones stabularii quod cujusque salvum fore receperint, nisi restituent, in eos judicium dabo " (Dig., iv. 9, 3, 1); "Quod quis commodasse dicetur, de eo judicium dabo" (Dig., xiii, 6, 1, pr.).*

Resort Actiones to a fiction is sometimes said to be a confession of weakness, and ficticiae,

Proced-

JUS NATURALE. |

Edict ; and the statutory recognition which the latter then obtained did nothing to impair its efficiency. Procedure extra Ordinem.1—The two-staged procedure, first in

ure extrajwre and then in judicio, constituted the ordo judiciorum priva-

ordinem. forwm.

Direct magis- terial inter- vention.

Inter- dicts.

Early in the empire, however, it became the practice in certain cases to abstain from adjusting a formula and making a remit to a judex, and to leave the cause in the hands of the magis- trate from beginning to end. This eourse was adopted sometimes because the claim that was being

made rested rather on moral than on legal right, and sometimes in order to avoid unnecessary dis- closure of family misunderstandings. Thus, the earliest questions that were raised about testamentary trusts were sent for considera- tion and disposal to the consuls, apparently because, in the existing state of jurisprudence, it was thought incompetent for a beneficiary to maintain in reference to the heir (who had only been requested to comply with the testator's wishes) that he was bound in law (dare oportere) to pay him his bequest. Had the difficulty arisen at an earlier period, and in the heyday of the constructive energy of the pretors, they would probably have solved it with an actio in factum. As it was, it fell to the emperors to deal with it, and they adopted the method of extraordinaria cognitio, the jurisdic- tion which they in the first instance conferred on the consuls being before long confided to a magistrate specially designated for it,— the praetor fideicommissarius. Questions betwecn tutors and their pupil wards in like manner began to be dealt with extra ordinem, the cognition being entrusted by Marcus Aurelius to a practor tute- laris; while fiscal questions in which a private party was interested went to a practor fisci, whose creation was due to Nerva, Claims for aliment between parent and child or patron and freedman rested on natural duty rather than on legal right ; they could not therefore well be made the subject-matter of a yudictwm, and con- sequently went for disposal to the consuls or the city prefect, and in the provinces to the governor. Questions of status, especially of freedom or slavery, at least from the time of Marcus Aurelius, were also disposed of extra ordinem ; and so were claims by physicians, advocates, and public teachers for their honoraria, and by officials for their salaries, the Romans refusing to admit that these eould be recovered by an ordinary action of location. In all those extra- ordinary cognitions the procedure began with a complaint addressed to the magistrate, instead of an in jus vocatio of the party com- plained against ; it was for the magistrate to require the attendance of the latter (evocatio) if he thought the complaint relevant. The decision was a judicatwm or decretwm according to circumstances.

Jural Remedies flowing directly from the Magistrate's Imperiwm.? — Great as were the results for the law of the multiplication and simplification of judicia through the formular system, it may be

uestioned whether it did not benefit quite as much from the

irect intervention of the pretors in certain cases in virtue of the supreme power with which they were invested. This manifested itself principally in the form of (1) interdicts ; (2) preetorian stipula- tions; (3) missto in possessionem ; and (4) in integrum restitutio.

1. The interdicts® have already been referred to as in use under the régime of the jus civile; but their number and scope were vastly increased under that of the jus practoriwm. The char- acteristic of the procedure by interdict was this,—that in it the pretor reversed the ordinary course of things, and, instead of wait- ing for an inquiry into the facts alleged by a eomplainer, provision- ally assumed them to be true and pronounced au order upon the respondent, which he was bound either to obey or show to be unjustified. The order pronouneed might be either restitutory, exhibitory (in both cases usually spoken of in the texts as a decree), or prohibitory :—restitutory, when, for example, the respondent was ordained to restore something he was alleged to have taken posses- sion of by violent means, to remove impediments he had placed in the channel of a river, and so on; exhibitory, when he was ordained to produce something he was unwarrantably detaining, e.g., the body of a freeman he was holding as his slave, or a will in which the complainer alleged that he had an interest ; prohibi- tory, as, for example, that he should not disturb the status quo of possession as between the complainer and himself, that he should not interfere with a highway, a watercourse, the access to a sepulchre, and so forth. If the respondent obeyed the order pro- nounced in a restitutory or exhibitory decree, there was an end of the matter. But frequently, and perhaps more often than not, the interdict was only the commencement of a litigation, facilitated by sponsions and restipulations, in which the questions had to be tried (1) whether the interdict or injunction was justified, (2) whether there had been breach of it, and, (3) if so, what damages were due in consequence. The procedure therefore was often anything but summary.

1 See Keller (as on p. 681, note 1), § 81; Bethmann-Hollweg (as in same note), vol. ii. § 122; Bekker (as in same note), vol. ii. chap. 23; Baron, Gesch. d. rom. Rechts, vol. i, § 220.

2 Keller, §§ 74-80; Bethmann-Hollweg, vol. ii. §§ 98, 119-121; Bekker, vol. ii, chaps. 16-18; Baron, vol. i. §§ 216-219. :

3 In addition to the authorities in last note, see K. A, Schmidt, Das Inter-diktenverfahren d. Rom. in geschichtl. Entwickelung, Leipsic, 1853 ; Machélard, Théorie des interdits en droit romain, Paris, 1864.

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__ In the possessory interdicts wt? possidetis and wtrubi in particular it was extremely involved, due to some extent to the fact that they were double interdicts (interdicta duplicia), t.e., addressed indifferently to both parties. Gaius says, but, as most jurists think, erroneously, that they had been devised as ancillary to a litigation about owncrship, and for the purpose of deciding which of the parties, as possessor, was to have the advantage of standing on the defensive in the rci vindicatio.t That they were so used in his time, as in that of Justinian, eannot be doubted. But it is amazing that they should have been, for they were infinitely more cumbrous than the vindicatio to which they led up. Take the interdict uti possidetis, which applied to immovables, as wérubi did to movables. Both partics being present, the pretor addressed them to this effect: "I forbid that one of you two who does not possess the house in question to use force in order to prevent the other who is in possession, provided he is so neither by elandes- tine or violent exclusion of the first, nor in virtue of a grant from him during pleasure, from eontinuing to possess as at present." It is manifest that this decided nothing; it was no more than a pro- hibition of disturbance of the status quo ; it left the question entirely open which of the parties it was that was in possession, and which that was forbidden to interfere. The manner of its explication was somewhat singular. Each of the parties was bound at once to commit what in the case of one of them must have been a breach of the interdict, by a pretence of violence offered to the other (vis cx conventu) ;> cach of them was thus in a position to say to the other —"We have both used force ; but it was you alone that did it in defiance of the interdict, for it is I that am in possession." The intcrim enjoyment of the fruits was then awarded to the highest bidder, who gave his stipulatory promise to pay for them to

his adversary in the cvent of the latter being successful in the long run; penal sponsions and restipulations were exchanged upon the question which of them had committed a breach of the interdict ; and on these, four in number, formulac were adjusted and sent to a judca for trial. If the procedure could not thus be explicated, because either of the parties declined to take part in the vis ex conventu, or the bidding, or the sponsions and restipulations, he was assumed to be in the wrong, and, by what was ealled a secondary interdict, required to abstain from disturbing the other "'in all time coming." Whatever we may think of the action system of the tomans in the pan of the elassical jurisprudence, one cannot help standing aghast at a procedure so cumbrous and complex as that of their posscssory interdicts. 2, A pretorian stipulation ® was a stipulatory engagement im- Pretor- posed upon a man by a magistrate or judge, in order to secure a ianstipu- third party from the chance of loss or prejudice through some act lations. or omission either of him from whom the engagement was exacted or of some other person for whom he was responsible. Although called pretorian, because the cases in which such stipulations were exigible were set forth in the Edict, there can be no question that they originated in the jus civile; in fact they were just a means of assuring to a man in advance the benefit of an action of the jus civile whereby he might obtain reparation for any injury suffered by him through the occurrence of the act or omission contemplated as possible. Ulpian classifies them as cautionary (cautionalcs), judicial, and common. The first were purely pre- cautionary, and quite independent of any action already in depend- ence between the party moving the magistrate to cxact the stipu- lation and him on whom it was desired to impose it. There were many varieties of them, connected with all branches of the law,— for example, the cautio damni infecti, security against damage to a man's property in consequence, say, of the ruinous condition of his neighbour's house, the cautio usufructuaria that property usufructed should revert unimpaired to the owner on the expiry of the usu- fructuary's life interest, the edilian stipulation against faults in a thing sold, and so forth. In all these cases the stipulation or cautio was a guarantee against future loss or injury, usually cor- roborated by sureties, and made effectual by an action on the stipu- lation in the event of loss or injury resulting. Judicial stipulations, according to Ulpian's classification, were those imposed by a judge in the course of and with reference to an action in dependence

before him, as, for example, the cautio sudicatum solvi (that the defendant would satisfy the judgment), the cawtio de dolo (that a thing claimed in the action would not be fraudulently impaired in the meantime), and many others. Common were such as might either be imposed by a magistrate apart from any depending action or by a Judge in the course of one, such as that taken from a guardian for the faithful administration of lis office, or from a procurator that his principal would ratify what he did.

3, Missio in possessionem was the putting of a person in possession

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4 If that had been their original purpose, they must have been unknown as tong as a rei vindicatio proceeded per sacramentum ; for in the sacrainental real action both parties vindicated, and both consequently were at once plaintiffs and defendants.

5 So Gaius calls it; it was probably the same thing as the vis moribus facta referred to by Cicero, Pro Caec., 1, § 2, 8, § 22.

6 To the authorities in notc 1 above add Schirmer, Ueber die priitorischen Judicial-Stipulationen, Greifswald, 1853.

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Missio in either of the whole estate of another (missio in bona) or of some par- posses- ticular thing belonging to him (missio i rem). The former was by sionem. far the more important. It was resorted to as a means of execution not only against a judgment-debtor but also against a man who frandulently kept out of the way and thus avoided summons in an action, or who, having been duly summoned, would not do what was expected on the part of a defendant; against the estate of a person deceased to which no heir would enter, thus leaving creditors without a debtor from whom they could enforce payment of their claims ; and also against the estate that had belonged to a person who had undergone capitis deminutio, if the family head to whom he had subjected himself refused to be responsible for his debts. Missio in rem was granted, c.g., where a man

refused to give cautio damni infeeti ; the applicant was then put in possession of the rninous property for his own protection. Cie.

4. In integrum restitutio,' reinstatement of an individual, on grounds of equity, in the position he had occupied before some occurrence which had resulted to his prejudice, was one of the most remarkable manifestations of the exercise of the ¢mpertwm. It was not that the individual in question, cither directly by action or indirectly by exception, obtained a judgment that either rendered what had happencd comparatively harmless or gave him compensa- tion in damages for the loss he had sustained from it, but that the magistrate—and it could only be the preetor, the urban or preetorian prefect, a provincial governor, or the emperor himself—at his own hand pronounced a decree that as far as possible restored the status quo ante. It was not enough, however, to entitle a man to this extraordinary relief, that he was able to show that he had been taken advantage of to his hurt, and that no other adequate means of redress was open to him; he required in addition to be able to fouud on some subjective ground of restitution, such as minority, or, if he was of full age, intimidation which could not be resisted, mistake of fact, fraud, absence, or the like. What should be held to amount toa sufficient ground of restitution, either objcctive or subjective, was at first left very much to the discretion of the magis- trate ; but even here practice and jurisprudence in time fixed the lines within which he ought to confine himself, and made the principles of in integrum restitutio as well settled almost as those of the aetio quod metus causa or the actio de dolo.

CHAPTER V.—THE PERIOD OF CODIFICATION. (Diocletian to Justinian.) I. HistoricAL EVENTS THAT INFLUENCED THE Law.

Emperors Supremacy of the Emperors as Sole Legislators.—From

solelegis- the time of Diocletian downwards the making of the law

ators. wag exclusively in the hands of the emperors. The senate still existed, but shorn of all its old functions alike of government and legislation. The responses of patented jurists were a thing of the past. It was to the imperial consistory alone that men looked for interpretation of old law or promulgation of new.

In the reign of Diocletian rescripts were still abundant ; but the constitutions in the Theodosian and Justinianian Codes from the time of Constantine downwards are mostly of a wider scope, and of the class known as general or edictal laws (leges generales edictales). It would be wrong, however, to infer that rescripts had ceased ; for Justinian's Code contains various regulations as to their form, and the matter is dealt with again in one of his Novels. The reason why so few are preserved is that they were no longer authoritative except for the parties to whom they were addressed. This was expressly declared by the emperors Arcadius and Honorius in 898 in reference to those in answer to applications for advice from officials ; and it is not unrcasonable to assume that a limitation of the same sort had been put at an earlier date on the authority of those addressed to private parties. Pnchta is of opinion that the enactment of Honorius and Arcadius applied equally to deereta, for the reason that during this period matters of litigation did not come under the cognizance of the emperors except on appeal, and that under the new arrangements of Constantine the judg- ment of affirmance or reversal was embodied in a rescript ad- dressed to the magistrate from whom the appeal had been taken. The rule of Arcadius and Honorius was renewed in 425 by Theo- dosins and Valentinian, who qualificd it, however, to this extents that, if it contained any distinct indication that the doctrine it laid down was meant to be of general application, then it was to be received as an edict or lex gencralis. To this J ustinian adhered in so far as rescripts in the old sense of the word were concerned ; but he declared that his judgments (decreta) should be received everywhere as laws of general application, and so should any inter- pretation given by him of a lex generalis, even though elicited by

In in- tegrum resti- tutio.

1 In addition to the authorities in note 2, p. 709, see Savigny, System d. rim. Reehts, vol. vii. §§ 315-343.

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the petition of a private party. The imperial edicts, adjusted in the consistory, were usually addressed to the people, the senate, or some official, civil, military, or ecclesiastical, according to the nature of their subject-matter.

Establishment of Christianity as the State Religion.2—A disposi- Chris- tion has sometimes been inanifested to credit nascent Christianity tianity with the humaner spirit which began to operate on some of the the state institutions of the law in the first century of the empire, but which religion. in a previous section we have ascribed to the infiltration into the jus civile of doctrines of the jus naturale, the product of the philo- sophy of the Stoa. The teaching of Seneca did quite as much-— nay far more— to influence it then than the lessons that were taught in the little assemblics of the early converts. It would be a bold thing to say that, had Christianity never gained its pre- dominance, that spirit of natural right would not have continued to animate the course of legislation, and to evoke, as ycars pro- gressed, most of those amendments in the law of the family and the law of succession that were amongst the most valuable contribu. tions of the imperial constitutions to the private law. It may well be that that' spirit was intensified and rendered more active with the growth of Christian belief; but not until the latter had becn publicly sanctioned by Constantine, and by Theodosius declared to be the religion of the state, do we meet with incontestable records of its influence. We find them in enactments in favour of the church and its property, and of its privileges as a legatee ; in those conferring or imposing on the bishops a supervision of charities and charitable institutions, and a power of interfering in matters of guardianship ; in the recognition of the efficacy of certain acts done in presence of two or threc of the clergy and thereafter re- corded in the church registers ; in the disabilities as to mairiage and succession with which heretics and apostates were visited, and in a variety of minor matters. Of greater importance were three features for which it was directly responsible,—the repeal of the caduciary provisions of the Papia-Poppean law, the penalties im- posed upon divorce, and the institution of the episeopalis audientia.

The purpose of the caduciary law was to discourage celibacy and encourage fruitful marriages ; but legislation in such a spirit could not

possibly be maintained when cclibacy had come to be inculcated as a virtue, and as the peculiar characteristic of a holy life. The penalties alike of orbitas and coelibatus were abolished by Constan- tine in the year 320. Thc legislation about divorce, from the first of Constantine's enactments on the subject down to those of Justin- ian, forms a miserable chapter in the history of the law. Not one of the emperors who busied himself with the matter, undoing the work of his predecessors and substituting legislation of his ow quite as complicated and futile, thought of interfering with the old prin- ciple that divorce ought to be as frce as marriage and independent of the sanction or deerce of a judicial tribunal. Justinian was the first who, by one of his Novels, imposed a condition on parties to a divorce of common accord (commun consensn), namely, that they should both enter a convent, otherwise it should be null ; but, so distasteful was this to popular feeling, and so little conducive to improvement of the tone of morals within the conventual precincts, that it was repealed by his successor. The legislation of Justinian's predecessors and the bulk of his own were levelled at one-sided re- pudiations, imposing penaltics, personal aud patrimonial (1) upon the author of a repudiation on some ground the law did not recog- nize as sufficient— and the lawful grounds varied from reign to reign —and (2) upon the party whose misconduct gave rise to a repudia- tion that was justifiable. The bishop's court (episcopale jucieiwm, episcopalis audientia) had its origin in the practice of the primitive Christians, in accordance with the apostolic precept, of submitting their differences to one or two of their brethren in the faith, usu- ally a presbyter or bishop, who acted as arbiter. On the establish- ment of Christianity the practice obtained legislative sanetion, Constantine giving the bishop's court concurrent jnrisdiction with the ordinary civil courts where both parties preferred the former, and by a later enactment going so far as to empower one of the partics to a suit to remove it to the ecclesiastical tribunal against the will of the other. For various reasons, advantage was taken of this power of resorting to the bishop to an extent which seriously interfered with the proper discharge of his spiritual functions, so that Honorius judged it expedicnt to revert to the original rule, and, at least as regarded laymen, to limit the right of resort to the episcopal judicatory to cases in which both parties consented. It is impossible to say with any approach to exactitude what effect this intervention of the clergy as judges in ordinary civil causes— for they had

no criminal jurisdiction—had on the development of the law. But it can hardly have been without some influence in still further promoting the tendency to subordinate act and word to will and animus, to deal leniently with technicalities, and to temper the rules of the jus civile with equity and considerations of natural right.

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2 See Troplong, De Vinfluence du ehristianisme sur le droit civil des Romains, Paris, 1843 (and subsequently) ; Merivale, The Conversion of the Roman Empire (Boyle Lectures for 1864), London, 1864.

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aPiioas mular system, with its remit from the pretor to a sworn judex | law the aforesaid five have imported into their own works,— of pro- who was to try the cause, was of infinite advantage to the law; | Scevola, for example, and Sabinus, and Julian, and Marcellus,—and cedure, for the judgment was that of a free and independent citizen, un- | of all others whom they have been in the habit of quoting as autho- trammelled by officialism, fresh from some centre of business, and | rities (ommtwmgque quos ili eclebrarunt), provided always, as their in full sympathy with the parties between whom he had to decide. | antiquity makes them uncertain, that the texts of those earlier Such a system was incompatible with the political arrangements | jurists are verified by collation of manuscripts. If divergent dicta of Diocletian and Constantine; and it is with no surprise that | be adduced, that party shall prevail wlio has the greatest number of we find the former of these sovereigns instructing the provincial | authorities on his side; if the number on each side be the same, that governors that in future, unless when prevented by pressure of | one shall prevail which has the support of Papinian ; but, whilst he, business (or, according to a later constitution of Julian's, when | most excellent of them all, is to be preferred to any other single the matter was of trifling importance), they were themselves to | authority, he must yield to any two. [Paul's and Ulpian's notes hear the causes brought before them from first to last, as had pre- | ou his writings, however, as already enacted, are to be disregarded.] viously been the practice in the extraordinariae ecognitiones. 'The | Where opinions are equal, and none entitled to

preference, we leave remit in such cases was not, as formerly, to a private citizen, but | it to the discretion of the judge which he shall adopt." to what was called a judex pedaneus, probably a matriculated This constitution has always been regarded as a signal proof of member of the local bar; and for a time his delegated authority | the lamentable condition into which jurisprudence had sunk in was embodied in a formula after the old fashion. But even this | the beginning of the 5th century. Constantine, a hundred ycars exceptional use of it did not long survive, for an enactment by | earlier, had condemned the notes of Ulpian and Paul upon Papin- the two sons of Constantine, conceived in terms the most compre- | ian. There were no longer any living jurists to lay down the law hensive, declared fixed styles to be but traps for the unwary, and } (jura condere) ; and, if it was to be gathered from the writings of forbade their use in any legal act whatever, whether contentious | those who were dead, it was well that the use of them should be or voluntary. The result was, not only the formal disappearance | regulated. Tho Valentinianian law proceeded so far in the same of the distinction between the proceedings in jure and in judicio, | direction. It made a selection of the jurisconsults of the past but the practical disappearance also of the distinctions between | whose works alone were to be allowed to be cited,— Papinian, Paul, actions in jus and in factwm, and between actioncs dircctae and | Ulpian, and Modestine, the four latest patented counsel of any actiones wtiles, the conversion of the interdict into an actio ex inter- | distinction ; Gaius, of authority previously only in the schools, dicto, admission of the power of amendment of the pleadings, con- | but whose writings were now approved universally, notwithstand- demnation in the specific thing claimed, if in existence, instead of | ing that he had never possessed the jus respondendi ; and all the its pecuniary equivalent, and execution accordingly by the aid of | earlier jurists to whom those five had accorded their imprimator. officers of the law. But it went yet a step further, for it declared all of them, with the Under the new system a process was full from first to last of | sole exception of Papinian, to be of the same authority, and de- intervention by officials. The in jus vocatio of the XII. Tables | graded the function of the judge in most cases, so far at least as a —the procedure by which a plaintiff himself brought his adversary | question of law was concerned, to the purely arithmetical task of into court—was a thing of the past. In the earlier part of the | counting

up the names which the industry of the advocates on period the proceedings atonal with the litis denuntiatio intro- | either side had succeeded in adducing in support of their respective duced in the time of Marcus Aurelius and remodelled by Constan- | contentions. It is probable that, from the days of Hadrian down tine; but under Justinian (though probably begun before his | to Alexandcr Severus, when the emperor in his council had to frame reign) the initial step was what was called the /ibellus conventionis. | a rescript or a decree, its tenor would be decided by the vote of the This was a short and precise written statement addressed by the | majority ; but that was after argument and counter-argument, plaintiff to the court, explaining (but without detail) the nature | which must in many cases have modified first impressions. Taking of the action he proposed to raise and the claim he had to prefer; | the votes of dead men, who had not heard each other's reasons for this was accompanied with a formal undertaking to proceed with | their opinions, was a very different process. It may have been the cause and follow it out to judgment, under penalty of having | necessary ; but it can have been so only because a living juris- to pay double costs to the defendant. If the judge was satisfied | prudence had no existence,—because the constructive talent of the of the relevancy of the libel, he pronounced an interlocutor (intcr- | carlier cmpire had entircly disappeared. locutio) ordaining its service on the respondent; this was done by an officer of the court, who cited him to appear on a day named, IL. ANTEIUSTINIANIAN COLLECTIONS OF STATUTE AND usually at a distance of two or three months. The defendant, TURISPRUDEROR through the officer, put in an answer (dibcllus eontradictionis), at jee eae the same time giving security for the proper maintenance of the The Gregorian and Hermogenian Codes.—The first of these Codes Grego- defence and eventual satisfaction of the judgment. On the day | was a collection of imperial rescripts (with a few edicts, &c.) made rian and appointed the parties were first heard on any dilatory pleas, such | by one Gregorianus in the very end of the 3d century, and probably Hermo- as defect of jurisdiction ; if none were offered, or those stated re- | at the instigation of Diocletian, though whether in the East or the genian pelled, they then proceeded to expound their respective grounds | West critics are unable to decide. The collection of Hermogenianus, Codes. of action and defence, each finally making oath of his good faith | also of rescripts,

seems to have been a supplement to the earlier in the matter (jwramentum calumniac), and their counsel doing | one. As the latest enactment in it belongs to the year 365, the prob- the same. ability is that the collection was published about that time. Both From this point, which marked the itis contestatio or joinder of | Codes, although the work of private partics, received statutory re- issue, the procedure was much the same as that in judicio under the | cognition from Theodosius and Valentinian in their commission for formular system. But in all cases in which the demand was that | the preparation of a collection of edictal law; and from thc language a particular thing should be given or restored, and the plaintiff | of Justinian in reference to them there is reason to believe that in desired to have the thing itself rather than damages, execution was | the courts they were regarded as authoritative, even to the ignoring specific and effected through officers of the law (manw militart). | of all rescripts not embodied in them. : Where, on the other hand, the condemnation was pecuniary, the The Theodosian Code and Post-Theodosian Novels,~~Three years Theodo~~ usual course was for the judge, through his officers, to take pos- | aftcr the publication of the "law of citations" Theodosius nonti- sian Code session of such things belonging to the defendant as were thought | nated a commission to initiate the preparation of a bodyof law which, sufficient to satisfy the judgment (pignus in causa judieati captum), | if his scheme had been carried into exccution, would have rendered and they were eventually sold judicially if the defendant still | that of Justinian unnecessary, In a constitution some ten years refused to pay ; the mssio in bona of the classical period was rarely | later he explains the motives that had actuated him,—that he saw resorted to except in the case of insolvency. with much concern the poverty-stricken condition of jurisprudence Valen- The Valentinianian Law of Cttations.2 —This famous enact- | and how very few men there were who, notwithstanding the prizes tinian's ment, the production of Theodosius (II.), tutor of the youthful | that awaited them, were able to make themselves familiar with the law of Valentinian III., was issued from Ravenna in the year 426, and | whole range of law; and that he attributed it very much to the citations. was addressed to the Roman senate. It ran tlius:— multitude of books and the large mass of statutes through which it

CODIFICATION. |

Abandonment of the Formular System of Procedwre.1—'The for-

" We accord our approval to all the writings of Papinian, Paul, Gaius, Ulpian, and Modestine, conceding to Gaius the same authority that is enjoyed by Paul, Ulpian, and the rest, and sanctioning the citation of all his works, We ratify also the jurisprudence (scicn-

1 Wieding, Der Justinianeische Libellprocess, Vienna, 1865; Bethmann-Hollweg (as on p. 681, note 1), vol. iii. (1866); Muther (crit. Wieding), in the Krit. Vierteljahrschrift, vol. ix. (1867), pp. 161 sqg., 329 sg.; Wieding, in same Journal, vol. xii. (1870), p. 228 sq.; Bekker (as on p. 681, note 1), vol. ii. chaps. 23, 24; Baron, Gesch. d. rém. Rechts, vol. i. p. 448 sq.

2 Theod. Cod., i. 4,8; Puchta, in the Rhein. Museum f. Jurisprud., vol. v. (1832), p. 141 sq., and Verm. Schriften, Leipsic, 1851, p. 284 sq. ; Sanio, Rechtshist. Abhandl. u. Studien, Konigsberg, 1845, p. 1 sq.; Karlowa, Rom. Rechtsgesch., vol. i. p. 933 sq.

tia) of those earlier writers whose treatises and statements of the

was dispersed, and which it was next to impossible for any ordinary mortal to master. His scheme was eventually to compile one single code from materials derived alike from the writings of the jurists, the Gregorian and Hermogenian collections of rescripts, and the edictal laws from the time of Constantine downwards. His lan- guage leaves no doubt that it was his intention to have this general code very carefully prepared, so as to make it a complete exponent of the law in force, which should take the place of everything, statutory or jurisprudential, of an carlier date. The collection of edicts which he directed his commissioncrs to prepare, and which was to contain all that had not been displaced by later legislation, even though some of them might be obsolete by disuse, was to be

Collatio.

Vatican Frag- ments.

Consul- tatio.

Romano-

barba- rian codes.

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the first step in the execution of his project. For some reason or other nothing followed upon this enactment ; and in 485 a new and stronger commission was nominated to collect the edicts, but nothing was said in their instructions about anything ulterior, The work was completed in three years, and published at Constantinople early in the year 488, with the declaration that it should take effect from Ist January following ; and a copy was communicated to Valentinian, who ordained that it should come into force in the West from 12th January 489. The arrangement is in sixteen books, subdivided into titles, in which the constitutions are placed in chronological order. They cover the whole field of law, private and public, civil and criminal, fiscal and municipal, military and ecelesiastical. The private law is contained in the first five, which unfortunately are very defective. The imperial ediets subsequent to the publication of the Code got the name of Novels (novellae constitutiones).

The Collatio, the Vatiean Fragments, and the Consultatio.— These were unofficial collections, The first—Collatio Legum Mosaiea- rum et Romanarum, otherwise Lex Dei quam Dominus praccepit ad Moysen—is a parallel of divine and hurnan law, the former drawn from the Pentateuch and the latter from the writings of Gaius, Papinian, Paul, Ulpian, and Modestine, rescripts from the Gregorian and Herniogenian Codes, and one or two later general enactments. Its date is probably about the year 390, but its authorship is un- known. The Vatican Fragments were discovered by Mai in a palim- psest in the Vatican in 1820,— evidently part of a book of practice compiled in the Western empire, and of very considerable dimensions. The extant fragments deal with the law

of sale, usufruet, dowries, donations, tutories, and processual agency, and are drawn from the writings of Papinian, Ulpian, and Paul, the two collections of re- seripts, and a few general enactments, the latest dating from the year 372. The compilation, therefore, may be of about the same antiquity as the Collatio. The Consultatio (Veteris cujusdam Juriseonsulti Consultatio) was first published by Cujas in 1577. It seems to be part of a collection of answers upon questions of law submitted for the opinion of counsel, and is of value for the fragments it contains from Paul's Sentences and the three Codes. It is thought to have been written in Franee in the end of the 5th or beginning of the 6th century,

The Romano-Barbarian Codes.—This title is usually applied to three collections compiled in western Europe after it had thrown off the sovereignty of Rome.

1. The Edietum Theodories was compiled at the instance of Theodoric, king of the Ostrogoths, in or very soon after the year 500. Its materials were drawn from the writings of the jurists— principally the Sentences of Paul—the Gregorian, Hermogenian, and Theodosian Codes, and the later Novels, all reduced into 154 sections, with no systematic arrangement, but touching upon all branches of the law public and private, especially criminal law and procedure, It was professedly intended to apply to all Theodoric's subjects, both Goths and Romans.

2. The Lex Romana Visigothorum or Breviartum Alaricianum was a much more ambitions and important collection. It was eon- piled by a commission appointed by Alaric IL, king of the Western Goths, with approval of the bishops and nobles, and published at Aire in Gascony in the year 506. The compilers selected their material partly from deges (statute law) and partly from jus (juris- prudential law), taking what they considered appropriate, without altering the text except in the way of excision of passages that were obsolete or purely historical. For the leges they utilized some 400 of the 3400 enactments (according to Haenel's estimate) of the Theodosian Code, and about 30 of the known 104 post-Theodosian Novels ; for the jus,—the Institutes of Gaius, Paul's Sentences, the Gregorian and Hermogenian rescripts, and the first book of Papinian's Responses (a single sentence). All of these, except Gaius,

were accompanied with an "interpretation," which re- sembles the interpretatio of the XII. Tables in that it is often not so much explanatory of the text as qualifieative or eorrective, Gaius is contained in an epitome in two books, believed to have been only a reproduction of an abridgment already current, and dating from about the beginning of the 5th century. The Breviary exercised very considerable influence in Europe generally; and there is no question that, until the rise of the Bologna school in the 12th century, it was from it, rather than from the books of Justinian, that western Europe acquired its scanty knowledge of Roman law. .

3. The Lex Romana Burgundionum, of a transcriber, called Papianus, is the collection which King Gundobald, when publishing his code of native law (Lex Bur- gundionum or Gundobada), had promised should be prepared for the use of his Roman subjects.. It deals with private law, criminal law, and judicial procedure, distributed through 47 titles, and is arranged very much after the order of the Gundobada, from which it has a few extracts. Its statutory Roman sources are the same as those of the Breviary: the jurisprudential authorities referred to are Gaius and Paul, the latter in his Sentences, and the former (only three times altogether) in some other book than his Institutes.

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III. Tue JUstiniaANiAn LEGISLATION.

Justiman's Collections and his own Legislation.—It is unnecessary to revert to the history of Justinian outside his legislative achievements, or even to speak of his collec- tions in detail, for both have already been described in the article Justrytan I. (vol. xiii. p. 792 sq.). Am- bitious to carry out a reform more complete even than that which Theodosius had planned but failed to execute, he took the first step towards it little more than six months after the death of his uncle Justin, in the appointment of a commission to prepare a collection of statute law (leges), among which he included the rescripts of the Gregorian and Hermogenian Codes, It

was published in April 529; and in rapid succession there followed his Fifty Decisions (529-532), his Institutes (21st November 533), his Digest of excerpts from the writings of the jurists (16th December 533), and the revised edition of his Code, in which he incor- porated his own legislation down to date (16th November 534). From that time down to his death in 565 there followed a series of Novels (novellae constitutiones), mostly in Greek, which were never officially collected, and of which probably many have been lost.

Justin- tan's codifiea- tion.

Taking his enactments in the Code and his Novels to- His own gether we have of Justinian's own legislation about 400 enact

constitutions. about three times as numerous; but most of them professed to be nothing more than short declaratory statements of pre-existing law, whereas Justinian's, apart from his Jifty Decisions, were all reformatory enactments, many of them as long as an average Act of Parliament, and dealing with diverse matters under the same rubric. They cover the whole field of law, public and private, civil and criminal, secular and ecclesiastical. It cannot be said that they afford pleasant reading: they are so disfigured by redun- dancy of language, involved periods, aud nauseous self- glorification. But it cannot be denied that many of those which deal with the private law embody reforms of the highest importance and of most salutary tendency. He sometimes loved to pose as the champion of the simplicity and evenhandedness of the early law, at others to denounce it for its subtleties ; sometimes he allowed himself to be influenced by his own extreme asceticism, and now and again we detect traces of subservience to the imperious will of his consort; but in the main his legislation was dictated by what he was pleased to call humanitas so far as the law of persons was concerned, and by naturalis ratio and public utility so far as concerned that of things. The result was the eradication of almost every trace of the old jus Quritium, and the substitution for it, under the name of jus Romanum, of that cosmopolitan body of law which has contributed so largely to almost every modern system.

Amendments on the Law of the Family.—With the Christian emperors the last traces disappeared of the old conception of the Jamilia as an

aggregate of persons and estate subject absolutely to the power and dominion of its head. Janus, the power in a hus- band over his wife and her belongings, was a thing of the past ; both stood now on a footing of equality before the law; perhaps it might be more accurate to say, at least with reference to the Justinianian legislation, that the wife was the more privileged of the two in respeet both of the protection and the indulgence the law accorded her. With manus the old confarreation and coemption had ceased, marriage needing nothing more than simple interchange of consent, except as between persons of rank or when the inten- tion was to legitimate previous issue ; in the latter case a written marriage settlement was required, and in the former either such a settlement or a marriage in church before the bishop and at least three clerical witnesses, who granted and signed a certificate of the completed union. The legislation of the Christian emperors on the subject of divorce, largely contributed to by Justinian in his Novels, has already been referred to. In regard to dowries many new pro- visions were introdneed, principally for curtailing the husband's power of dealing with the dowry while the marriage lasted, enlarging the right of the wife and her heirs in respect of it, and simplifying

Diocletian's contributions to the Code are ™™

Law of family relations.

CODIFICATION. |

the means of recovering it from the husband or his heirs when the marriage was dissolved. Between the time of Constantine and that of Theodosius and Valentinian it had become the practice for 2 man to make a scttlement on his intended wife of a provision which was to remain his property (but without the power of aliena- tion) during the marriage, but to pass to her on his predecease ; it got the naine of donatio ante nuptias or sometimes, as being a sort of return for the dos, antipherna. The earliest legislation about it was by the last-mentioned emperors; Zeno and Justin followed suit ; and Justinian, in Code and Novels, published five or six enact- ments for its regulation. The general result was that, wherever a dos was given or promised on the part of the wife, there a donatio was to be constituted on the part of the husband ; that, if one was increased

during the marriage, a corresponding increase was to be made to the other ; that it might be constituted after the marriage without infringing the rule prohibiting donations between husband and wife, which caused Justinian to change its name to donatio propter nuptias ; that the wife might demand its transfer to her (as she could that of the dos) on her husband's insolvency, but undcr obligation to apply its income to the maintenance of the family ; and that on the dissolution of the marriage by her hus- band's death or by a divorce for which he was in fault she had ample remedies for reducing it into possession.

The change in the complexion of the relations between husband and wife under the Christian emperors, however, was insignificant when compared with that whieh had overtaken the relation between parent and child. Justinian in his Jnstitwtes reproduces the boast of Gaius that nowhere else had a father such power over his children as was exercised by a Roman paterfamilias. True it is that the patria potestas in name still held a prominent place in the Justin- lanian collections; but it had been shorn of most of the prerogatives that had characterized it in the republic. To expose a new-born child was forbidden under penalties. To take the life of a grown- up one—unless it was a daughtcr slain with her paramour in the act of adultery—was murder ; for the domestic tribunal, with the judicial power of life and death in the paterfamilias as its head, had long disappeared. For the same rcason a parent could no longer sell his child asa slave, at least he could do so only when the child was an infant aud he in such extreme poverty as to be nnable to support it. Even the right to make a noxal surrender of his son to a party who had suffered from the latter's delict had silently become obsolete; so greatly had altered sentiment, in

sympathy with legislation, curtailed the power of the paterfamilias |

over those in his potestas. All that remained of it in the latest Justinianian law was no more than is sanctioned in most modern systems as natural emanations of the paternal relationship, —the rights of moderate chastisement for offence, of testamentary noniina- tion of guardians, of pupilary substitution (enlarged by Justinian), and of withholding consent

from the marriage of a child, but subject to magisterial intervention if used unreasonably.

How the right of the paterfamilias over the earnings and acqnisi- tions of his children was modified by the recognition of the peeuliwm eastvense has been shown in a previous page (p. 706). But the modification was carried to such an extent by the Christian em- perors as finally to negative the father's ownership altogether, except as regarded acquisitions that were the outcome of funds advanced by him to his child for his separate use (pecwliwm pro- Jecticium). Of some of the child's acquisitions his father had, down to the time of Justinian, the life interest and right of ad- ministration ; but by his legislation even these might be excluded at the pleasure of the parties from whom the acquisitions had been derived. By the classical law the father's radical right in his son's peculiwm castrense revived on the latter's death; for if he died intestate the former appropriated it not as his son's heir, but as an owner whose powers as such had been merely temporarily sus- pended. But by one of the chapters in the famous Novel on the law of intestate succession even this prerogative of the paterfamilias was abolished, and all a child's belongings except his peewliwm profecticium were recognized as his own in death as well as in life, so that if any of them should pass to his parent on his intestacy it should only be by title of inheritance and in the absence of descendants.

In every other branch of the law of the family the same reform- ing spirit was manifested. Adoption was no longer followed in all cases by a change of family for the adoptee, but only when the adopter was in fact one of his parents, such asa paternal or maternal grandfather,—when there was a natural potestas to underlie and justify the civil one. The modes of legitimation of children born

converted into the mildcr condition of colonate ; but, even where this did not happen, the rights of owners were not allowed to be abused ; for slaves were permitted to claim the protectiou of the magistrate, and

cruelty by a master might result in his being deprived of his human property. Kinship that had arisen between two persons when one or both were slaves (servilis eognatio) was recognized as creative not only of disabilities but of rights. The modes of manumission were multiplied, and the restrictions of the legislation of the early empire abolished ; and a freedman invari- ably became a citizen, Juniau Latinity and dediticiancy being no longer recognized.

Amendments on the Law of Property and Obligation.—In the law Law of of property the principal changes of the Christian empire were the property.

simplification of the forms of conveyance, the extension of the colonate, the introduction and regulation of emphyteusis, and the remodelling of the law of prescription. Simplification of the forms of conveyance was necessary only in the case of res maneitpi, for res nee mancipt had always passed by delivery. From the Theodosian Code it is apparent that movable res maneipt usually passed in the same way from very early in the period, and that for the mancipa- tion of lands and houses (for in jwre eessio had disappeared with the formular system) a solemnis traditio, a written instrument and delivery following thereon, and both before witnesses, was gradu- ally substituted. Of this there is no trace in the Justinianian Code. For Justinian abolished all remains of the distinction between res mancipi and res nee mancipi, between full ownership, bonitarian ownership, and nudwm jus Quiritiwmn, placing movables and im- movables on a footing of perfect equality so far as their direct con- veyance was concerned. But, as regarded the possession required of an alienee to cure any defect in the conveyance, he made a marked difference between them. For, amalgamating the old positive usu- capion of the jus eivile with the negative " prolonged possession " (longi temporis possessio) that had been introduced in the provinces (probably by the provincial edict), he declared that possession on a suflicient title and in good faith should in future make the possessor legal owner of the thing possessed by him, provided that the posses- sion of himself and his author had endured nninterruptedly for three years in the case of a movable, and in the case of an immovable for ten years if the party

against whom he possessed was resideut in the same province, or for twenty if he resided in another one.

The same causes that led to the colonate induced the introduc- Emphy- tion of emphyteusis,'—an institution which had already existed in teusis.

some of the Kastern provinces when independent, and which came to be utilized first by the emperors, then by the church, and after- wards by municipalities and private landowners, for bringing into cultivation the large tracts of provincial land belonging to them which were unproductive and unprofitable through want of supcr- vision on the spot. Its nature and conditions were carefully de- fined by Zeno and amended by Justinian. The emphyteuta, as the grantee of the right was called, did not become owner ; the granter still remained dominus, all that the grantee enjoyed being a jus in re aliens, but de facto so extensive as hardly to be distinguishable from ownership. 1t conferred upon him and his heirs a perpetual right in the lands included in the grant, in consideration of a fixed annual payment to the lord (canon) and due observance of couven- tional and statutory conditions; but he was not entitled to abandon it, nor able to frce himself of the obligations he had undertaken, without the lord's consent. The latter was entitled to hold the grant forfeited if the eanon fell into arrear for three years (in church lands for two), or if the land-tax was in arrear for the same period, or if the emphytewta allowed the lands to deteriorate, or if he at- tempted to alienate them (alienare meliorationes, as the text says) without observance of statutory requirements. These were that he should intimate an intended alienation and the name of the intended alience to the lord, so that the lattcr, before giving his assent, inight satisfy himself that he would not be a loser by the transac- tion ; and, if the alienation was to be by sale, he had to state the price fixed, so as to give the lord the opportunity of exercising his statutory right of pre-emption at the same figure. If those require- ments were complied with, and the lord had no reasonable objection to the proposed alienee, he was not cntitled to resist the alienation, provided a payment (Jawdemiium) was made to him of two per cent. of the sale-price in consideration of his enforced consent.

The changes in the law of obligation were more superficial than those in the law of property, and consisted principally in the simpli- fication of formalities and in some cases in their entire abolition. To describe them, however, would carry us into details which would here be out of place.

Amendments on the Law of Succession.—The changes niade in the Testa- law of succession by Justinian's Christian predecessors, espccially mentary Theodosius IJ. and Anastasius, were far from insignificant ; but succes- his own were in some directions positively revolutionary. The gion. testament per wes et Libram of the jus civile probably never obtained any firm footing in the East; for it was only by Caracalla's con-

out of wedlock, especially that by subsequent marriage of the parents, first introduced by Constantine, were regulated, and the extent of the rights of the legitimated issue carefully defined. Emancipation was simplified, and the old procedure by sales and manunussions, which degraded the child too much to the level of a slave, dispensed with. Tutory at law was opened to the pupil's nearest kinsman, whether on the father's side or the mother's ; and the mother herself, or the child's grandmother, might be allowed, uuder certain conditions, to act as its guardian. Slavery was often

1 See Elia Lattes, Studi storici sopra il Contratio d' Enfiteusi nelle sue relaziont col Colonato, Turin, 1868, chaps. 1 and 3; and Frangois, De l' Emphytéose, Paris,

stitution conferring citizenship on all his free subjects that pro- vincials generally acquired testamenti factio; and by that time a testament bearing externally the requisite number of seals had been recognized as sufficient for a grant of bonorwm possessio, unchallenge- able by the heirs-at-law, even though they were able to prove that neither familiae maneipatio nor testament? nuneupatio had inter- vened. Hence the universal adoption of what Justinian calls the pretorian testament, which, however, underwent considerable re- form at the hands of the emperors, notably in the requirement (in the ordinary case) of signature by the testator and subscription by the witnesses. There was much hesitating legislation on the subject before the law was finally established as it stands in the Justinianian books; and even at the last we find it encumbered with many ex- ceptions and reservations in favour of testaments that were merely deeds of division by a parcnt among his children, testaments made in time of plague, testaments recorded in books of court, testaments entrusted to the safe-keeping of the emperor, and so forth. Codicils had become deeds of such importance as, in the absence of a testa- ment, to be dealt with as imposing a trust on the heir-at-law ; it was therefore thought expedient to deny effect to them unless attested by at least five witnesses. And a most important step in advance was taken by Justinian in the recognition of the validity of an oral mortts causa trust ; for he declared that, if it should be represented to a competent judge that a person on his deathbed had

advances to his child during his life or left him a legacy which quantitatively equalled the legitim ; his idca was that a child was entitled to recognition by his parent as one of his heirs, and that to deny him that position was to put upon him an indignity which the law would not permit.

Amongst the other beneficial changes effected by Justinian may Other be mentioned the assimilation so far as possible of hereditas and changes,

bonorwm possessio, so that the latter might be taken like the former without formal petition for a grant of it; the equiparation of legacies and singular trust-gifts, and the application of some of their rules to mortis causa donations ; the extension of the rule of 'transmission'? to every heir without exception, so that, if he died within the time allowed him for considering whether or not he would acccpt (tempus deliberandt), his power of acceptance or declinature passed to his heirs, to be exercised by them within what remained of the period; the introduction of entry under inventory (eum beneficio inventarti), which limited the heir's re-spousibilities and rendered unnecessary the nine or twelve months of deliberation ; and the application of the principle of collation to descendants generally, so that they were bound to throw into the mass of the succession before its partition every advance they had received from their parent in anticipation of their shares.

IV. THE JUSTINIANIAN LAw-Booxs.

by word of mouth directed his heir-at-law to give something to the complainant, the heir should be required either on his oath to deny the averment or to give or pay what was claimed.

Their Use in the Courts and in the Sehools.—Although the Jnsti- Justin-tutes were primarily intended to serve as a text-book in the schools, janian it was expressly declared that they and the Digest and the Code law-

The In the matter of intestacy there was long a halting between two | should be regarded as just so many parts of one great piece of books. 118th opinions, —a desire still further to amend the law in the direction | legislation and all of equal authority, and that, although Digest novel. taken by the prators and by the legislature in the Tertullian and | and Code were but collections of legislation and doctrine that had Orphitian senatusconsults, and yet a hesitancy about breaking pie originally from many different hands, yet they were to altogether from the time-lallowed principle of agnation. Justinian | be treated with the same respect as if they had been the work of in his Code went far beyond his predecessors, making a mother's | Justinian himself. But, while everything within them was to be right of sueecssion independent altogether of the jus liberorum ; | held as law, nothing outside them was to be looked at, not even

e.’tending that of a daughtcr or sister to her descendants, without | the volumes from which they had been collected ; and so far did any deduction in favour of agnates thus excluded; admitting | this go that, after the publication of the revised Codc, neither the emancipated collaterals and their descendants as freely as if there | first edition of it nor the Fifty Decisions were allowed to be referred had been no eapttis deminutio minima ; applying to agnates the | to. If a case arose for which no precedent was to be found, the same suecessio graduum that the pretors had allowed to cognates, | emperor was to be resorted to for its decision, as being outside his and so forth. But it was by his Vovels, especially the 118th and | collections the only fountain of the law. ‘To preserve the purity 127th, that he revolutionized the system, by eradicating agnation | of the texts Justinian forbade the use of conventional abbreviations altogether and settling the canons of descent —which were the | (sigla) in making transcripts, visiting an offender with the penalties same for real and personal estate—solcly on the basis of blood kin- | of falsification (erimen falsi). Literal translations into Greek were ship, whether through males or females, and whether crossed or | authorized, and indeed were very necessary for many of his subjects ; not by a capitis deminutio. First came descendants of the intestate, | so were rapd7irha or summaries of the contents of individual titles male and female alike, taking per capita if all were of the same | (although the jurists read the word less strictly). Commentaries degree, per stirpes if of different degrees. Failing descendants, the | and general summaries were forbidden under heavy penalties, as succession passed to the nearest ascendants, and, concurrently with | an interference with the impcrial prerogative of interpretation ; but them, to brothers and sisters of full blood and (by Nov. 127) the | the prohibition does not seem to have been enforced, as we have children of any that had predeceased. Where there were ascend- | accounts and remains not only of translations but of comment- ants alone, one-half of the succession went to the paternal line | aries, notes, abridgments, excerpts, and general summaries even and one-half to the maternal; where there were ascendants and | in Justinian’s lifetime. Thesc, it is true, were mostly by professors brothers and sisters, or only brothers and sisters, the division | (antecessores), and their productions may have been intended pri- was made cqually per eapita ; when children of a deceased brother | marily for educational

purposes ; but there can be little doubt that or sister participated it was per stirpes. In the third class came | they soon passed into the hands of the practitioners and were used brothers and sisters of half-blood or by adoption and their children ; | without scruple in the courts. A Greek Paraphrasc of the Insti- the division here was on the same principle as in the second class. | tutes, usually attributed to Theophilus, a professor in Constantinople The fourth class included all other collaterals according to pro- | and one of Justinian's commissioners, is commonly supposed to have pinquity, and without distinction between full and half blood ; | been used by him in his prelections. It embodies much more his- the primary division was per stirpes, but all of the same degree | torical matter than is to be found in the Institutes ; but its value took per capita. has been very differently rated by different critics. Its latest editor, The A reform effected by Justinian by his 115th Novel ought not to | Ferrini, who puts a high estimate on it, is of opinion that the 115th pass unnoticed ; for it rendered superfluous all the old rules about | original of it was a paraphrase of Gaius, which was remodelled novel, disherison and preterition of a testator's children, practically | after the plan of Justinian's Jnstétwtes, and had their new matter

abolished bonorum posscssio contra tabulas, and established the principle that a child had, as a general rule, an inherent and inde- feasible right to be one of his father's heirs in a certain share at all events of his succession, and that a parent had the same right in the succession of his child if the latter had died without issue. The enactment enumerated certain grounds upon which alone it should be lawful for a parent to disinherit his child or a child his parent, declaring that in every case of disherison the reason of it should be stated in the testament, but giving leave to the person disinherited to dispute and disprove the facts when the testament was opened. If a child who had not been disinherited—and one improperly disinherited was eventually in the same position—was not instituted to at least his "'legitim" (legitima or debita portio), he was entitled to have the testament declared null in so far as the Institutions in it were concerned, thus opening the succession to himself and the other heirs-at-law, but without affecting the minor provisions, such as bequests, nominations of tutors, &c. The legitim, which under the practice of the centumviral court had been one-fourth of the share to which the child

would have been entitled ab intestato, was raised by Justinian to one-third at least and one-half where there were five or more entitled to participate. He did not allow challenge of the will to be excluded, as in the earlier querela inofficiosi testamenti, because the testator had made

incorporated in order to adapt it to the altered conditions ; but he doubts if there be any sufficient authority for ascribing it to Theo- philus. If he be right in assuniing that it was really a redaction of Gaius, the historical explanations will be.received with all the more confidence.

Fate of the Justinianian Books in the East.—The literary work Their indicated in the preceding section was continued throughout the 6th fate in century. Butthe next three were comparatively barren, the only the Hast

thing worth noting being the "Exd\oy} r&v véuwr ey cuvrdum yevouern of Leo the Isaurian in 740, professcdly an abstract of the whole Justinianian law amended and rearranged; but it was repealed by Basil the Macedonian on account of its imperfections and its audacious departure from the law it pretended to summarize. The last-named emperor, with his son Leo the Philosopher, set them- selves in the end of the 9th and beginning of the 10th centuries to the production of an authoritative Greek version of the whole of the Justinianian collections and legislation, omitting what had be- come obsolete, excising redundancies, and introducing such of the post-Justinianian legislation as merited preservation. The result was the Basilica (Ta Baowhixd, ¢.¢., vdueua), which was completed in the reign of Leo, though probably issued in a preparatory stage in the reign of Basil, who also published a sort of institutional work, the Ipéxeipov, which was revised and republished by Leo under

Their fate in theWest.

ROM—ROM

the name of 'Exavaywyy tof véuov. The Basilica consists of sixty books, subdivided into titles, following generally the plan of the Justinianian Code, but with the whole law on any particular sub- ject arranged

consecutively, whether from Digest, Code, or Novels (see BASILICA, vol. iii. p. 419). Leo's son, Constantinus Porphyro- genitus, made an addition to it in the shape of an official com- mentary collected from the writings of the 6th-century jurists, the so-called Ilapdéypapat r&v waha:dy, which is now spoken of as the seholia to the Basilica, and has done good exegetical service for modern civilians. The Basilica retained its statutory authority until the fall of the Byzantine empire in 1453. But long before that it had practically been abandoned ; and not a single complete copy of it exists. Its place was taken by epitomes and compendia, the last being the Hédé8.8dos of Constantinus Harmenopulus of 1345, 'ta miserable epitome of the epitomes of epitomes," as Bruns calls it, which survived the vicissitudes of the eenturies, and finally received statutory authority in the modern kingdom of Greece in the year 1835, in place of the Basilica, which had been sanctioned thirteen years before, in 1822.

Their Fate in the West.—Before the rise of the Bologna school it was to a much greater extent from the Romano-barbarian codes than from the books of Justinian that central and western Europe derived their acquaintance with Roman law. Theodoric's Kdict can have had little influence after Justinian's recovery of Italy, and the Romano-Burgundian law was no doubt gradually displaced by the Breviary (Lea Rom. Visigothorum) after Burgundy had fallen into the hands of the Franks ; but the Breviary itself found its way in all directions in France and Germany, penetrating even into England, to a great extent through the agency of the church. There must, however, have been other repertories of Roman law in circulation, as witness a testament made in Paris in the end of the 7th century, preserved by Mabillon, in which the testator uses the old formula of the jus eivile,—"' ita do, ita lego, ita testor, ita vos Quirites testimonium mihi perhibetote,"—words: that are not to be found either in the Visigothic or the Justinianian collections. :

In his pragmatic sanction of the year 554 Justinian anew accorded his imperial sanction to the jwra and leges, i.¢., the Digest and Code, which he says he had long before transmitted to Italy, at the same time declaring that his ovels were to be of the same authority there as in the East. Two years after this came Julian's Latiu epitome of them, not improbably prepared by eommand of the empcror himself. That they all came at once

to some extent into use is beyond question ; for there is preserved in Marini's collection the testament of one Mannanes, executed at Ravenna in the reign of Justinian's immediate successor Justin II., in which the requirements of both Code and Novels are scrupulously observed. Of other monuments of the same period that prove the eurrency of the Justinianian law in Italy several are referred to by Savigny in the second volume of his History of the Roman Law in the Middle Ages, among which may be mentioned the Turin gloss of the Jn- stitutes, which Fitting ascribes to about the year 545, and two little pieces known as the Dictatwm de consiliartis and the Collectio de tutoribus, which form an appendix to some manuscripts of Julian's epitome of the Novels, and may possibly have been from his pen. The invasion of the Lombards, the disturbance they caused in Italy for two centuries, and the barrier they formed between it and the rest of Europe militated against the spread of the Justinianian law north- wards ; but it was taught without much interruption in Ravenna, the seat of the exarchs, to which (but this is doubtful) the school (studiwm) of Rome, revived by Justinian, is said to have been trans- ferred. By the Lombards, as their savagery toned down, the Roman

law was so far recognized that they allowed it to be applied to the Romans living within their territory; and it is said to have cven been taught in Pavia, which they had established as their cayital. Their overthrow by Charlemagne opened an outlet for it beyond Italy; and in the 9th century therc is evidence that the Justinian- ian books or some of them were already circulating in the hands of the clergy in various parts of Europe. Yet there are very few remains of any literature indieating much acquaintance with them. Almost the only pieces worth mentioning are the so-called Summa Perusina, an abridgment of the first eight books of the Code, ascribed to the 9th century; the Quaestiones ae monita, to the Lombardic laws, drawn mostly from the Jnstitutes, but with a few texts from the Digest, the Code, and Julian's Epitome, and supposed to have been written early in the 11th century; the Brachylogus, an abbreviated revision of Justinian's Jnstitutes, with referenecs to his other books, which is thought to have been written in France (Orleans?), according to

Fitting between 999 and 1002, but accord- ing to other authoritics nearer the end of the 11th century; and the Petri exeeptiones legum Romanarum, a systematic exposition of the law in four books, written in the south of France early in the latter half of the 11th century, and mostly compiled from Justinianian sources,

It was in the very end of the 11th century or the beginning of The glos- the 12th that at Bologna, and under one Imerius, who appears not sarists.

to have been a professional jurist but originally a teacher of letters, the study of Ronan law began somewhat suddenly to attract students from all parts of the world. Through the action of the clergy the only parts of the Justinianian legislation that had hitherto been in ordinary use were the Jnstitutes, the Code, and the Novels. The first, from its elementary character, had naturally commended itself ; the Code, with its opening title on the Trinity and its seeond on Holy Church, and the Novels, with their abundant legislation on matters ecclesiastical, were in many respects charters of the church's privileges, and were prized accordingly ; but the Digest, as being the work of pagan jurists, had been practically ignored. The Code and the Novels, however, with their modicum of wheat concealed in such a quantity of chaff, offcred little attraction to laymen of intelligence ; and, when a copy of a portion of the Digest, with its infinitely purer diction and its clear and incisive reasoning, came into the hands of Irnerius, it must have been for him asa new revelation. The text of it secms to have reached him by in- stalments; at least this is the only reasonable explanation of its division by the glossarists (as Irnerius and his successors of the Bologna school were called, the name being derived from the glossae, notes marginal and interlinear, with which they furnished it) into three parts, Digestwm Vetus (books 1 to 24, tit. 2), Infortiatum, and Digestum Novum (book 89 to the end), the general idea being that, after first the old and then the new Digest had come to light, the connecting link unexpectedly turned up, and got in conse- quence the somewhat singular name by which it continued to be known for centuries. The whole collection was by the glossarists distributed in five volumes, the fourth containing the first ninc books of the Code, and the fifth, called Volumen parvum legum, containing the Institutes, a Latin translation of 134 of the Novels known as the Authentiewm, and the last three books of

the Code which had been recovered subsequently to the others. With these five volumes, the teaching that accompanied them, and the glossae, summae, casus, broearda, &c., with which they were enriched from the rise of the school with Irnerius till its close with Franciseus Accursius in 1260, Roman jurisprudence began a new career, which it would carry us beyond the limits of this article to attempt to trace even in meagrest outliue.! (Joe)

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T would be impossible within the limits allowed for iI this article to attempt, even in outline, any history of the course of Roman literature which would include an account, not only of the extant works which it con- tains and of their authors, but also of the principal works and writers known to us from ancient testimony. The mere enumeration of these in chronological order, without some attempt to ascertain their individual features and to estimate their relation to the intellectual movement of their time, could be of no interest or use to any one. All that is possible to accomplish here is to pass in rapid review the first four of the five periods into which Roman literature may most conveniently be divided, to ascertain the chief literary motives and characteristics of each, and to connect these with the works and writers in whom they

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are most conspicuously displayed. It will be unnecessary to give any biographical account even of the greatest authors or to criticize their works in detail, as these have been sufficiently treated in separate articles of the present work. The object of the following survey will be to obtain some appreciation of the relation in which the

1 The great authority on the matter of this section is still Savigny's Gesch. d. rim. Rechts tm Mittelalter, 7 vols., 2d. ed., Heidelberg, 1834-51 ; but much additional light has been thrown on it by Merkel, Stintzing, Blume, Fitting, Bruns, Mommsen, Kriiger, Ficker, Rivier, Courat (Cohn), and others, whose writings, mostly in periodicals, are too numerous to mention. On the early traces of Roman Jaw in England, see Amos, LHistory and Principles of the Civil Law of Rome, London, 1888, p. 443

sq. ; Caillemer, Le Droit Civil dans les pro- vinces Anglo-Normandes, Caen, 1883; Scrutton, The Influence of the Roman Law on that of England, Cambridge, 1885.

Early forms.

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individual authors noticed stand to the whole subject, 2.e., to the collective literary expression, so far as they found an expression, of the action, the ideas, the character, the various feelings, passions, and moods, of ancient Rome and of the races which it absorbed, so long as that literature has a distinct unity and individuality.

The actual beginning of Roman artistic literature can be assigned to a definite date, the year 240 B.c., when Livius Andronicus produced on a Roman stage a drama with a regular plot, instead of the unconnected dramatic

‘dialogues (sature) by which the holidays of the people

had previously been enlivened, Yet the germs of an indi- genous literature had existed independently at an earlier period in Rome and in the country districts of Italy. Although these cannot be said to have exercised any marked influence on the subsequent development of litera- ture, they have an importance as indicating natural wants in the Italian race, which were ultimately satisfied by regular literary forms. The art of writing was first em- ployed in the service of the state and of religion for the preservation of the sacred hymns, books of ritual, treaties with other states, the laws of the XII. Tables, &e. An approach to literature was made in the Annales Maximi, although it cannot be supposed that the pontifex maximus in drawing up the dry records of the prodigies and events of the year had any thought of gratifying intellectual curi- osity or imparting intellectual pleasure. But in the satis-

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Roman epic poetry, and that form of Roman oratory known as "'laudationes," and in some of the Odes of Horace. The latest and probably the most important of these rude and inchoate forms was that of dramatic saturx (medleys), put together without any regular plot, and consisting appa- rently of contests of wit and satiric invective, and perhaps of comments on current events, accompanied with music ("saturas impletas modis," Liv., vii. 2). These have a real bearing on the subsequent development of Roman literature. They prepared the mind of the people for the reception of regular comedy. They may have contributed to the formation of the style of comedy which appears at the very outset much more mature than that of serious poetry, tragic or epic. They gave the namie and some of the characteristics to that special literary product of the Roman soil, the "satura," addressed to readers, not to spectators, which ultimately was developed into pure poetic satire in Lucilius, Horace, Persius, and Juvenal, into the prose and verse miscellany of Varro, and into something approaching the prose novel in Petronius.

First Period: from 240 to about 80 B.c.

The historical event which brought about the greatest change in the intellectual condition of the Romans, and thereby exercised a decisive influence on the whole course of human culture, was the capture of Tarentum in 272, After the capture many Greek slaves were brought to

Rome, and among them the young Livius Andronicus, Livius

faction they afforded to the commemorative and patriotic who was employed in teaching Greek in the family of his Androni-

instincts they anticipated an office afterwards performed by From that time

the national epics and the works of regular historians.

But it was rather in extemporaneous effusions than in written compositions that some germs of a native poetry might have been detected. The most genuine indication of that impulse which ultimately

finds its realization in artistic literature appears in the use of a metre of pure native origin, the Saturnian, which by its rapid and lively movement gives expression to the vivacity and quick apprehension of the Italian race. This metre appears to have been first used in ritual hymns, which seem to have assumed definite shapes out of the exclamations of a prinitive priesthood engaged in a rude ceremonial dance. It was also employed by a class of bards or itinerant sooth- sayers known by the name of "vates." It was used also in the "Fescennine verses," which gave expression to the coarse gaiety of the people and to their strong tendency to personal raillery and satiric comment. This tendency, which under the stern censorship of the patrician rulers of the early republic was repressed by stringent laws, found ultimately its legitimate outlet in Roman satire. The metre was also employed in commemorative poems, accom- panied with music, which were sung at funeral banquets in celebration of the exploits and virtues of distinguished men. These had their origin in the same impulse which ultimately found its full gratification in Roman history,

master, a member of the Livian gens. to learn Greek became a regular part of the education of a Roman noble. The capture of Tarentum was followed by the complete Romanizing of all Southern Italy. Soon after came the First Punic War, the principal scene of which was Sicily, where, from common hostility to the Carthaginian, Greek and Roman were brought into friendly relations, and the Roman armies must have become familiar with the spectacles and performances of the Greek theatre. In the year following the conclusion of the war (240), after the armies had returned and the people were at leisure to enjoy the fruits of victory ("et post Punica bella quietus," Hor., £p., ii. 162), Livius Andronicus "took the bold step" ("ausus est primus argumento fabulam serere," Liv., vii. 2) of substituting at one of the public festivals a regular drama translated or adapted from the Greek for the musical medleys (satwrx) hitherto in use. From this time dramatic performances became a regular accompaniment of the public games, and came more and more to encroach on the older kinds of amuse- ment, such as the chariot races. The dramatic work of Livius was, however, merely educative ; it can hardly be called in any sense of the word literary. The same may be said of his later work, which was still used as a school- book in the days of Horace,—the translation of

the Odyssey ; and probably the religious hymn which he was called upon to compose in the latter part of the Second Punic War had no higher literary pretension. He was, however, the first to make the old name of poet a title of honour instead of reproach; and by familiarizing the Romans with the forms of the Greek drama and the Greek epic he determined the main lines which Roman literature followed for more than a century afterwards.

His immediate successor, Cn. Nevius, was not, like Nevius.

Livius, a Greek, but either a Roman citizen or one who enjoyed the limited citizenship of a Latin, and who had served in the Roman army in the First Punic War. His first appearance as a dramatic author was in 235. He adapted both tragedies and comedies from the Greek, but the bent of his genius, the tastes of his audience, and the condition of the language, developed through the active

- Plautus.

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Ennius,

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intercourse and business of life, gave a greater impulse to comedy than to tragedy. Neevius tried to use the theatre, as it had been used by the writers of the Old Comedy of Athens, for the purposes of political warfare, and thus seems to have anticipated by a century the part played by Lucilius. Satiric and censorious criticism rather than a humorous sense of the comedy of human life and character was apparently the chief motive of his representation. But the state censorship, which in a more revolutionary time tolerated the free criticism of public men in works addressed to a select class of readers, arrested at the out- set all such criticism addressed to the mass of the people assembled in the theatre; and Neevius, after being im- prisoned, had to retire in his old age into banishment. He was not only the first in point of time, and according to ancient testimony one of the first in point of merit, among the comic poets

of Rome, and in spirit, though not in form, the earliest of the line of Roman satirists, but he was also the oldest of the national poets. Besides cele- brating the success of Marcellus in 225 over the Gauls in a play called Clastedium, he gave the first specimen of the "fabula przetexta" in his Alimonium Romuli et Remi, based on the most national of all Roman traditions. Still more important service was rendered by him in his long Saturnian poem on the First Punic War, in which he notonly told the story of contemporary events but gave shape to the legend of the settlement of Avneas in Latium,—the theme ultimately adopted for the great national epic of Rome.

His younger contemporary Plautus (d. 184) was the greatest comic and dramatic genius of Rome, and is still read as one of the great comic and dramatic writers of the world. He lived and wrote only to amuse his contempo- raries, and thus, although more popular in his lifetime and more fortunate than any of the older authors in the ultimate survival of a large number of his works, he is less than any of the great writers of Rome in sympathy with either the serious or the caustic spirit in Roman literature. Yet he is the one extant witness to the humour and vivacity of the Italian temperament at a stage between its early rudeness and rigidity and its subsequent degeneracy.

Thus far Roman literature, of which the predominant characteristics are dignity, gravity, and fervour of feeling, and which more than any other literature aimed at forti- fying and elevating the character, seemed likely to become a mere vehicle of amusement adapted to all classes of the people in their holiday mood. But a new spirit came over the Italian Camene in the time of Plautus, which hence- forth became predominant. Roman literature ceased to be in close sympathy with the popular spirit, either in political partisanship or in ministering to general amuse- ment, but became the expression of the ideas, sentiment, and culture of the aristocratic governing class. It was by Q. Ennius (239-169) of Calabria that a new direction was given to Roman literature and new and deeper springs of emotion were elicited from the native genius. Deriving from his birthplace the culture, literary and philosophical, of Magna Grecia, having served with distinction in the Roman armies, and gained the friendship of the greatest of the Romans living in that great age, he was of

all the early writers most fitted to be the medium of conciliation between the serious genius of ancient Greece and the seri- ous genius of Rome. Alone among the older writers he was endowed with the gifts of a poetical imagination and animated with enthusiasm for a great ideal. With the widest culture and knowledge among all the men of his generation, he had also the justest discernment of the rela- tion of culture and knowledge to actual life and to the work which he had to accomplish.

First among his special services to Roman literature was the fresh impulse which he gave to tragedy. He turned

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the eyes of his contemporaries from the commonplace social humours of later Greek life to the contemplation of the heroic age. But he did not thereby denationalize the Roman drama. He animated the heroes of early Greece with the martial spirit of Roman soldiers and the ideal magnanimity and sagacity of Roman senators, and im- parted weight and dignity to the language and verse in which their sentiments and thoughts were expressed. Al- though Rome wanted creative force to add a great series of tragic dramas to the literature of the world, yet the spirit of elevation and moral authority breathed into tragedy by Ennius passed into the ethical and didactic writings and the oratory of a later time.

Another work, the rdpepyov of his serious activity, was the sature, written in various metres, but chiefly in that which came nearest to the spoken language of Rome, the trochaic tetrameter. He thus became the inventor of a new form of literature ; and, if in his hands the satura was rude and indeterminate in its scope, it was a proof of the practical bent of his understanding that he found a vehicle by which to address a reading public on matters of the day, or on the materials of his wide reading, in a style not far removed from the language of common life. His greatest work, which made the Romans regard him as the father of their literature, was his epic poem, in eighteen books, the Annales, in which the record of the whole career of Rome was unrolled with idealizing enthusiasm and realistic detail. The idea which inspired Ennius was ultimately realized in both the national epic of Virgil and the national history of Livy. And the metrical vehicle which he conceived as the only

one adequate to his great theme was a rude experiment, which was ultimately de- veloped into "the stateliest metre ever moulded by the lips of man." Even as a grammarian he performed an important service to the literary language of Rome, by fixing its prosody and arresting the tendency to decay in its final syllables. Although we know his writings only in fragments, these fragments are enough, along with what we know of him from ancient testimony, to justify us in regarding him as the most important among the makers of Roman literature,—the most important indeed among Roman authors before the age of Cicero.

There is still one other name belonging partly to this, partly to the next generation to be added to those of the men of original force of mind and character who created Roman literature, that of M. Porcius Cato (234-149), the younger contemporary of Ennius. More than Nevius and Plautus he represented the pure native element in that literature, the mind and character of Latium, the plebeian pugnacity, which was one of the great forces in the Roman state. He had no poetic imagination, and set himself in antagonism to the literature of imagination created by Ennius. He strove to make literature ancillary to politics and to objects of practical utility, and thus started prose literature on the main lines which it after-wards followed. Through his industry and vigorous understanding he gave a great impulse to the creation of Roman oratory, history, and systematic didactic writing. He was one of the first to publish his speeches and thus to bring them into the domain of literature. Cicero speaks of 150 of these speeches as extant in his day. He praises them for their acuteness, their wit, their conciseness. He speaks with emphasis of the impressiveness of Cato's eulogy and the satiric bitterness of his invective. As an orator he seems to have been akin in spirit to Nevius and Lucilius, and to the last genuine representative of the native temper in literature, the satirist Juvenal.

Porcius Cato also heads the roll of the Roman historians, at least of those whose works were ranked as literature. His Origines, the work of his old age, was written with

Cato.

Terence,

that thoroughly Roman conception of history which re- gards actions and events not in relation to their causes or their general human interest but as incidents in the continuous and progressive life of the state. Such is the conception of the past in Livy and Tacitus, and in Ennius and Virgil. But in one respect Cato seems to have formed a truer conception of his subject than any of these writers except Virgil, who, availing himself of the labours of Cato, realized and perfected his conception. Cato felt that the record of Roman glory could not be isolated from the story of the other Italian communities, which, after fighting against Rome for their own independence, shared with it the task of conquering the world. To the wider national sympathies which stimulated the researches of the old censor into the legendary history of the Italian towns we owe some of the most truly national parts of the inetd. There is another point of contact between the work done by Cato and that of Virgil, although they may be regarded as the most dissimilar in intellectual and imaginative gifts in the whole range of Roman literature, the one being the most realistic and prosaic, the other the most idealistic and imaginative. While the ideal charm of the old rural life and industry of Italy still lives in the Georgics, the practical utilitarian prose of that life may best be learned from the De Fe Rustica of Cato.

Neevius, Plautus, Ennius, and Cato not only represent but may be said actually to have been the contending forces which strove for ascendency in determining what was to be the character of the new literature. Although their combined activity was spread over nearly a century, yet so vigorous was their vitality and so prolonged their career that they may be spoken of as contemporaries. Cato, the youngest of the four, was a man of mature years, actively engaged in the service of the state, when Nevius was still in the full vigour of his powers, and before Plautus had reached the most productive period of his career. It is characteristic of the time that the genius of all these writers was ripest in their old age. They were thus able partially to overcome the difficulties incident to the beginning of their art. They acquired by the rude attempts of their earlier activity the faculty which they exercised with unabated natural force till the end of their lives. In their prolonged career of intellectual energy they remind us

of some of the early philosophers and travellers of Greece. The work begun by them was carried on by younger contemporaries and successors, that of Plautus by Cecilius Statius and others, the tragedy of Ennius by his kinsman, Pacuvius, and, in the following generation, by Accius. The impulse given to oratory by Cato, Sulpicius Gallus, and others, and along with it the development of prose composition, went on with increased momentum till the age of Cicero. But the interval between the death of Ennius (169) and the beginning of Cicero's career, while one of progressive advance in the apprecia- tion of literary form and style, was much less distinguished by original force than the time immediately before and after the end of the Second Punic War. The one complete survival of the generation after the death of Ennius, the comedy of Terence (185-159), exemplifies the gain in literary accomplishment and the loss in literary freedom. Terence has nothing Roman or Italian except his pure and idiomatic Latinity. His relation to the Greek authors whom he copied is that of a fine engraver to the great painters of another age and time. The Athenian elegance of Terence affords the strongest contrast to the Italian rude- ness of Cato's De Re Rustica. By looking at them together we understand how much the comedy of Terence was able to do to refine and humanize the manners of Rome, but at the same time what a solvent it was of the discipline and ideas of the old republic. What makes Terence an

important witness of the culture of his time is that he wrote from the centre of the Scipionic circle, in which what was most humane and liberal in Roman statesman- ship was combined with the appreciation of what was most vital in the Greek thought and literature of the time. Cicero tells us that the peculiar glory of that age was the purity of its Latinity; and it is natural to ascribe to the members of that aristocracy of birth and culture the senti- ment ascribed to Ceesar a century later, that to maintain the purity of the Latin tongue was due to the sense both of personal and of national dignity. The comedies of Ter- ence may therefore be held to give some indication of the tastes of Scipio, Leelius, and their friends in their youth. The influence of Panzetius and Polybius was more adapted to their maturity, when they led the state in war, states- manship, and oratory, and when the humaner teaching of Stoicism began to enlarge the synipathies of Roman jurists. But in the last years during which this circle

kept together a new spirit appeared in Roman politics and a new power in Roman literature,—the revolutionary spirit evoked by the Gracchi in opposition to the long-continued ascendency of the senate, and the new power of Roman satire, which was exercised impartially and unsparingly against both the ‘ excesses of the revolutionary spirit and the arrogance and

incompetence of the extreme party among the nobles.

Roman satire, though in form a legitimate development of the indigenous dramatic satura through the written ‘ satura of Ennius and Pacuvius, is really a birth of this

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time, and its author was the youngest of those admitted into the mtimacy of the Scipionic circle, C. Lucilius of Lucilius. Aurunca (166 71-102). Among the writers before the age of Cicero he alone deserves to be named with Neevius, Plautus, Ennius, and Cato as a great originative force in literature. For about thirty years the production of the satires of Lucilius, in which the politics, morals, society, and letters of the time were criticized with the utmost freedom and pungency, and his own personality was brought immediately and familiarly before his contemporaries, was much the most important event in Roman literature. The years that intervened between his death and the beginning of the Ciceronian age are singularly barren in works of original value.

The general results of the last fifty years of the first General period, from c. 130 to c. 80, may be thus summed up. In rh poetry we have the satires of Lucilius, the tragedies of Accius a and of a few successors among the Roman aristocracy, who thus exemplified the affinity of the Roman stage to Roman oratory; the “comeedia togata” of Afranius, in which : comedy, while assuming a Roman dress, did not assume

the virtue of a Roman matron; various annalistic poems

intended to serve as continuations of the great poem of

Ennius ; minor poems of an epigrammatic and erotic char-

acter, unimportant anticipations of the Alexandrian tend-

ency operative in the following period ; works of criticism

in trochaic tetrameters by Porcius Licinus and others,

forming part of the critical and grammatical movement |

which almost from the first accompanied the creative move-

ment in Roman literature, and which may be regarded '

as rude precursors of the didactic epistles that Horace |

devoted to literary criticism. i. ; The only extant prose work which may be assigned to

the end of this period is the treatise on rhetoric known by –

the title Ad Herennium, a work indicative of the attention

bestowed on prose style and rhetorical studies during' the

last century of the republic, and which may be regarded

as a precursor of the oratorical treatises of Cicero in the

following generation and of the work of Quintilian in the

first century of the empire. But the great literary pro-

1 The reasons for rejecting the date usually assigned to his birth (148) have been given under the heading Lucinius.

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Oratory.

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duct of this period was oratory, developed indeed with the aid of these rhetorical studies, but itself the immediate outcome of the imperial interests, the legal conflicts, and the political passions of that time of agitation. The speakers and writers of a later age looked back on Scipio and Lelius, the Gracchi and their contemporaries, L. Crassus and M. Antonius, as masters of their art. We can only judge of what they were by the fame of their speeches and a few unimportant fragments. But as we infer from the artistic excellence of the Homeric poems that many poets of power and genius, whose names were soon forgotten, preceded the great master; as we know that the art of Shakespeare did not come without due preparation into the world ; so from the mature perfection of the art of Cicero we may, in a measure, judge of the power and accomplishment of the orators who came before him, from whom he professes to have learned much, and whom he regarded with generous admiration.

In history, regarded as a great branch of prose literature, it is not probable that much was accomplished, although, with the advance of oratory and grammatical studies, there must have been not only greater fluency of composi- tion but the beginning of a richer and more ornate style. Yet Cicero, so candid and indulgent in his estimate of early Roman poetry and oratory, denies to Rome the existence, before his own time, of any adequate historical literature. Nevertheless it was by the work of a nuinber of Roman chroniclers during this period that the materials of early Roman history were systematized, and the record of the state, as it was finally given to the world in the artistic work of Livy, was extracted from the early annals, state documents, and private memorials, combined into a coherent unity, and supplemented by invention and re- flexion. There were also special works on Roman anti- quities and contemporary memoirs, which formed the sources of future historians.

Although the artistic product of the first period of Roman literature which has reached us in a complete shape is limited to the comedies of Plautus and Terence, the influence of the lost literature in determining the spirit, form, and style of the eras of more perfect accom- plishment which followed is unmistakable. While humour and vivacity, which were not surpassed in the more ad- vanced stages of literature, had characterized the earlier, and an urbanity of tone, with which Horace by frequent imitation acknowledges his sympathy, characterizes the later development of comedy, the tendency of serious literature had been in the main practical, ethical, com- memorative, and satirical. The higher poetical imagina- tion had appeared only in Ennius, and had been called forth in him by sympathy with the grandeur of the national life and the great personal qualities of its representative men, Some of the chief motives of the later poetry, such as the love of nature and the pleasures and sorrows of private life, had as yet found scarcely any expression in Roman literature. The fittest metrical vehicle for epic, didactic, and satiric poetry had been discovered, but its movement was as yet rude and inharmonious. The idiom

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and elevated diction of oratorical prose had made great progress, but the language of imagination and poetical feeling was, if vivid and impressive in isolated expressions, still incapable of being wrought into consecutive passages of artistic composition. Although the impulse which awoke the literary energy of Rome had come from the semi-Greeks of the south of Italy, the character of the literature was in the main Roman and Latin; and to this may be attributed the preponderance of the prosaic over the poetical element in it. The Sabellian races of central and eastern Italy and the Italo-Celtic and Venetian races

of the north, in whom the poetic susceptibility of Italy was most manifest two generations later, were not, until after the Social War, sufficiently in sympathy with Rome, and were probably not as yet sufficiently educated to induce them to contribute their share to the national literature. Hence the end of the Social War, and of the Civil War which arose out of it, is

most clearly a deter- mining factor in Roman literature, and may most appro- priately be taken as marking the end of one period and the beginning of another.

Second Period: from 80 to 42 B.c.

The last age of the republic coincides with the first half of the Golden Age of Roman literature. It is generally known as the Ciceronian age from the name of its greatest literary representative, whose activity as a speaker and writer was unremitting during nearly the whole period. It is the age of purest excellence in prose, and of a new birth of poetry, characterized rather by great original force and artistic promise than by perfect accomplishment, The five chief representatives of this age who still hold their rank among the great classical writers are Cicero, Cesar, Sallust, Lucretius, and Catullus. The works of other prose writers, Varro and Cornelius Nepos, have been partially preserved ; but these writers have no claim to rank with those already mentioned as creators and masters of literary style. Although literature had not as yet become, as it did in the age of Martial, and to a certain extent in the age represented in the Epistles of Horace, a trade or pro- fession, an educated reading public already existed, and books and intellectual intercourse filled a large part of the leisure of men actively engaged in affairs. Even oratory was intended quite as much for readers as for the audiences to which it was immediately addressed ; and some of the greatest speeches which have come down from that great age of orators were never delivered at all, but were pub- lished as manifestoes after the event with the view of in- fluencing educated opinion, and as works of art with the view of giving pleasure to educated taste.

Thus the speeches of Cicero (106-43), more certainly than Cicero.

any modern speeches, belong to the domain of literature quite as much as to that of forensic or political oratory. And, although Demosthenes is a master of style unrivalled even by Cicero, the literary interest of most of Cicero's speeches is greater than that of the great mass of Greek oratory, — a result of what from a forensic point of view would now be regarded as a serious defect. Thus it is with justice urged that the greater part of the Defence of Archias was irrelevant to the issue and would not have

been listened to by a Greek court of justice or a modern jury. But it was fortunate for the interests of literature that a court of educated Romans could be influenced by the considerations there submitted to them. In this way a question of the most temporary interest, concerning an individual of no particular eminence or importance, has produced one of the most impressive vindications of literature ever spoken or written. Oratory at Rome assumed a new type from being cultivated as an art which endeavoured to produce persuasion not so much by intellectual conviction as by appeal to those general human sympathies which are the subject-matter with which literature has to deal. In oratory, as in every other intellectual province, the Greeks had a truer sense of the limits and conditions of their art. But command over form is only one element in the making of an orator or poet. The largeness and dignity of the matter with which he has to deal is at least as important. The Roman oratory of the law courts had to deal not with petty questions of disputed property, of fraud, or violence, but with great imperial questions, with matters affecting the wellbeing of large provinces and the honour and safety

of the republic; and no man ever lived who, by the in- tensity of his patriotic and imperial feeling, by his prac- tical experience of great affairs, and by the largeness of his

human sympathies, was better fitted than Cicero to be the

representative of the type of oratory demanded by the

condition of the later republic. He elevates nearly every subject with which he deals, in those speeches at least which he thought worthy of preservation, by connecting it with great political or imperial issues. But with the

patriotic motive of his speeches there is generally com-

bined a great moral motive. Whatever were the weak- nesses and faults of his personal character, no man of antiquity had higher ethical aspirations. Nowhere is the Roman ideal of character humanized by

Greek studies presented with more impressiveness than in the speeches of Cicero. In no writer ancient or modern do we find a greater power of moral indignation. And, while he inveighed against the enormities of the man whom he accused with the grave rebuke of a censor as well as the passion of a personal enemy, no advocate could feel or awaken in others a keener sympathy with the fortunes and the character of the man whom he was defending.

To his great artistic accomplishment, perfected by prac- tice and elaborate study, to the power of his patriotic, his moral, and personal sympathies, and his passionate emo- tional nature, must be added his vivid imagination and the rich and copious stream of his language, in which he had no rival among Roman writers or speakers.! He realizes with the imagination of a great dramatist the personages of his story, their feelings and motives, and the minutest details of their action. It has been said that Roman poetry has produced few, if any, great types of character. But the Verres, Catiline, Antony of Cicero are living and permanent types. The story told in the Pro Cluentio may be true or false, but the picture of provincial crime which it presents is vividly dramatic.

Had we only known Cicero in his speeches we should have ranked him with Demosthenes as one who had realized the highest literary ideal, and thereby secured immortality to an art the effect of which is not often perpetuated. We should think of lim also as the creator and master of Latin style,—the writer by whom the amplest, most passionate, and most living powers of the language had been called forth and combined into a great and orderly literary organ, We know him, moreover, not only as a great orator but as a just and appreciative critic of oratory. But to his ser- vices to Roman oratory we have to add his services not indeed to philosophy but to the literature of philosophy, and his application to the exposition of his doctrines of the calmer and more equable resources of the language. If not a philosopher he is an admirable interpreter of those branches of philosophy which are fitted for practical ap- plication, and he presents us with the results of Greek reflexion vivified by his own human sympathies and his large experience of men. In giving a model of the style in which human interest can best be imparted to abstract discussions, he has used his great oratorical gift and art to persuade the world to accept

the most hopeful opinions on human destiny and the principles of conduct most conducive to elevation and integrity of character.

_ The Letters of Cicero are the best either in his own or in any other language. They are thoroughly natural, — "colloquia absentium amicorum," to use his own phrase. In nearly all other published correspondence there is some medium which interrupts the natural outlet of the man, something of literary mannerism, natural reserve, academic elaborateness, and after-thought. Cicero's letters to Atticus and to the friends with whom he was completely at his

a "Qui non illustravit modo sed etiam genuit in hac urbe dicendi copiam" (Cic., Brut., 73).

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ease are the most sincere and immediate expression of the thought and feeling of the moment. They let us into the secret of his most serious thoughts and cares, and they give a natural outlet to lis vivacity of observation, his wit and humour, his kindliness of nature. It shows how flexible an instrument Latin prose had become in his hand, when it could in accordance with the conditions of perfect literary taste do justice at once to the ample and vehement volume of his oratory, to the calmer and more rhythmical movement of his philosophical meditation, and to the natural interchange of thought and feeling in the every- day intercourse of life.

Among the many rival orators of the age the most eminent were Hortensius and Cesar. The former, like other members of the aristocracy, such as Memmius and Torquatus, and like Q. Catulus in the preceding generation, was a kind of dilettante poet and a precursor of the poetry ~ of pleasure, which attained such prominence in the elegiac poets of the Augustan age. Of Julius Cesar (100-44) as an Cesar, orator we can judge only by his reputation and by the testi- mony of his great rival and adversary Cicero; but we are able to appreciate the special praise of perfect taste in the use of language attributed to him.? In his Commentaries, by laying aside the ornaments of oratory,? he created the most admirable style of prose narrativé, the style which presents

interesting events in their sequence of time and dependence on the will of the actor, rapidly and vividly, with scarcely any colouring of personal or moral feeling, any oratorical passion, any pictorial illustration. While he shows the persuasive art of an orator by presenting the subjugation of Gaul and his own action in the Civil War in the light most favourable to his claim to rule the Roman world, he is entirely free from the Roman fashion of self-laudation or disparagement of an adversary. Yet the character of the man is stamped on every line that he writes, and reveals itself especially in a perfect simplicity of style, the result of the clearest intelligence and the strongest sense of personal dignity. He avoids not only every unusual but every superfluous word ; and, although no writing can be more free from rhetorical colouring, yet there may from time to time be detected a glow of sympathy, like the glow of generous passion in Thucydides, the more effective from the reserve with which it betrays itself whenever he is called on to record any act of personal heroism or of devotion to military duty.

In the simplicity of his style, the directness of his Sallust. narrative, the entire absence of any didactic tendency, Czesar presents a niarked contrast to another prose writer of that age,—the historian Sallust (87-34). Like Varro, he survived Cicero by some years, but the tone and spirit in which his works are written assign him to the republican era. He was the first of the purely artistic historians, as distinct from the annalists and the writers of personal memoirs. He imitated the Greek historians in taking par- ticular actions—the Jugurthan War and the Catilinarian Conspiracy—as the subjects of artistic treatment. He wrote also a continuous work, /istorix, treating of the events of the twelve years following the death of Sulla, of which only fragments are preserved. His two extant works are more valuable as artistic studies of the rival parties in the state and of personal character than as trustworthy narratives of facts. His style aims at effect- iveness by pregnant expression, sententiousness, archaism.

He produces the impression of caring more for the manner of saying a thing than for its truth. Yet he has great value as a painter of historical portraits, some of them those of his contemporaries, and as an author who had 2 "Latine loqui elegantissime."

3 “Nudi enim sunt, recti et venusti, omni ornatu orationis tanquam veste detracto” (Cicero).

Imere- practical affairs. The conditions which enabled the poetic | Alceeus and Sappho in the early days of Greek poetry. tus, genius of Italy to come to maturity in the person of | No poet has surpassed him in the power of vitally repro- . Lucretius (99-55) were entire seclusion from public life | ducing the pleasure and pain of the passing hour, not | and absorption in the ideal pleasures of contemplation and | recalled by idealizing reflexion as in Horace, nor overlaid artistic production. He produces the impression of aman | with mythological ornament as in Propertius, but in all so possessed by intellectual and imaginative enthusiasm as | the keenness of immediate impression. He also introduced to have separated himself from the active interests and | into Roman literature that personal as distinct from poli- social pleasures of his time, and to have passed that period | tical or social satire which appears later in the Hpodes of of his life which was given to literary production in study- | Horace and the Zpigrams of Martial. The sting in ing the laws and watching the spectacle of nature, and in | Catullus, at least in his iambics and phalecians, is more the active exercise of imaginative thought on the problems | concentrated than in the later writers. He anticipated of human life. This isolation from the familiar ways of | Ovid in recalling the stories of Greek mythology into a his contemporaries, while it was, according to tradition and | second poetical life. His greatest contribution to poetic ‘ the internal evidence of his poem, destructive to his spirit’s | art consisted in the perfection which he attained in the health, resulted in a work of genius, unique in character, | phalecian, the pure iambic, and the scazon metres, and in which was a second birth of imaginative poetry in Italy, | the ease and grace with which he used the language of and still stands forth as the greatest philosophical poem | familiar intercourse, as distinct from that of the creative in any language. In the form of his poem he followed a | imagination, of the “rostra,” and of the schools, to give at Greek original ; and the stuff out of which the texture of | once a lifelike and an artistic expression to his feelings. | his philosophical argument is framed was derived from | He has the interest of being the last poet of the free re- Greek science ; but all that is of deep human and poetical | public. In his life and in his art he was the

precursor of meaning in the poem is his own. His sense of the grace | those poets who used their genius as the interpreter and and beauty of language had indeed been educated by | minister of pleasure ; but he rises above them in the spirit the sympathetic study of Homer and Euripides ; but the | of personal independence, in his affection for his friends, philosophical guidance which he followed and his reverence | in his keen enjoyment of natural and simple pleasures, and for his guide were rather a hindrance than an aid to his | in his power of giving vital expression to these feelings. art, and were the cause of his presenting the pure ore of F , his own genius overlaid with great masses of alien alloy. Third Period: Augustan Age, 42 B.c. to 17 A.D. While we recognize in the De Rerum Natura some of the The poetic impulse and culture communicated to Roman most powerful poetry in any language and feel that few | literature in the last years of the republic passed on with- poets have penetrated with such passionate sincerity and | out any break of continuity into the literature of the . courage into the secret of nature and some of the deeper | succeeding age. One or two of the circle of Catullus sur- . truths of human life, we must acknowledge that, as com- | vived into that age ; but an entirely new spirit came over pared with the great didactic poem of Virgil, it is crude | the literature of the new period, and it is by new men, and unformed in artistic design, and often rough and un- | educated indeed under the same literary influences, but equal in artistic execution. Yet, apart altogether from | living in an altered world and belonging originally to a its independent value, by his speculative power and | different order in the state, that the new spirit was ex- enthusiasm, by his revelation of the life and spectacle of | pressed. The literature of the later republic reflects the Influence | nature, by the fresh creativeness of his diction and the | sympathies and prejudices of an aristocratic class, sharing of i elevated movement of his rhythm, he exercised a more | in the conduct of national affairs and living on terms of Paitin: powerful influence than any other on the art of his more equality with one another ; that of the Augustan age, both tions, | perfect successors. in its early serious enthusiasm and in the licence and levity | While the imaginative and emotional side of Roman of its later development, represents the hopes and aspira- / poetry was so powerfully represented by Lucretius, atten- tions with which the new monarchy was ushered into the tion was directed to its artistic side by a younger genera- world, and the pursuit of

pleasure and amusement, which tion, who moulded themselves in a great degree, though | becomes the chief interest of a class cut off from the higher Catullus. not exclusively, on Alexandrian models. Of this small | energies of practical life, and moving in the refining and

been a political partisan and had taken some part in making history before undertaking to write it; and he gives us, from the popular side, the views of a contem- porary on the politics of the time.

In following the development of Roman literature we have seen it become the prose organ of great affairs, but since the appearance of the Annals of Ennius, in whom the poetry of national life had originated, no work of great and original poetical genius had appeared. The powerful poetical force which for half a century continued to be the strongest force in literature, and which created masterpieces of art and genius, first revealed itself in the latter part of the Ciceronian age. The strength with which it burst forth seems indicative of latent sources of imaginative feeling and conception long suppressed in the Italian temperament, owing perhaps to the absorption of the mind and passion of the race in war, politics, and

group of poets, who were bound together by common tastes and friendship, one only has survived, fortunately the man of most genius among them, Valerius Catullus (841.54), He too was a new force in Roman literature.

i The reasons for accepting 84 rather than 87 as the date of his birth have been given in the article CaTULLUs.

Although of a family probably originally Roman, and although brought early in his career into intimate rela- tions with members of the great Roman fanuilies, he was a provincial by birth, and was apparently moved in his earliest youth by that fresh enthusiasm for culture which in his own and the following generation enabled Cisalpine Gaul to do so much to

enrich Roman literature. His nature, in which sensuous passion and warm affection were united, made him fall a victim to the fascinations of the famous Clodia, whom he has celebrated, under the name of Lesbia, in some of the most powerful and charming love poetry found in any language. The subjects of his best art are taken immediately from his own life,—his loves, his friendships, his travels, his animosities, personal and political, His most original contribution to the substance of Roman literature was that he first shaped into poetry the experience of his own heart, as it had been shaped by

enervating atmosphere of an imperial court. The great

inspiring influence of the new literature was the enthu-

siasm produced first by the hope and afterwards by the ful-

filment of the restoration of peace, order, national glory,

under the rule of Augustus. All that the age longed for

seemed to be embodied in a man who had both in his XX. =< QI

Virgil.

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own person and by inheritance the natural spell which sways the imagination of the world. The sentiment of hero-worship was at all times strong in the Romans, and no one was ever the object of more sincere as well as simulated hero-worship than Augustus. It was not, how- ever, by his equals in station that the first feeling was likely to be entertained. The earliest to give expression to it was the humbly-born poet from the Cisalpine pro- vince ; but the spell was soon acknowledged by the calmer and more worldly-wise poet whose first enthusiasm had directed him into the opposite camp. The disgust aroused by the anti-national policy of Antony, and the danger to the empire which was averted by the result of the battle of Actium, with the confidence inspired by the new ruler,

combined to reconcile the great families as well as the great body of the people to the new order of things.

While the establishment of the empire produced a revival of national and imperial feeling, it suppressed all independ- ent political thought and action. Hence the two great forms of prose literature which drew their nourishment from the struggles of political life, oratory and contem- porary history, were arrested in their development. The chief interest of letter-writing had consisted in its being the medium of interchange of thought on politics, and thus, although correspondence between friends still went on as before, no collection of letters was of sufficient im- portance to be preserved. 'The main course of literature was thus for a time diverted into poetry. That poetry in its most elevated form aimed at being the organ of the new empire and of realizing the national ideals of life and character under its auspices} and in carrying out this aim it sought to recall the great memories of the past. It became also the organ of the pleasures and interests of private life, the chief motives of which were the love of nature and the passion of love. It sought also to make the art and poetry of Greece live a new artistic life. Satire, debarred from that comment on political action which had been open to Lucilius and to Catullus and Calvus under the republic, turned to social and individual life, and com- bined with the newly-developed taste for ethical analysis and reflexion introduced by Cicero, One great work had still to be done in prose—a retrospect of the past history of the state from an idealizing and romanticizing point of view. For that work the Augustan age, as the end of one great cycle of events and the beginning of another, was eminently suited, and a writer who, by his gifts of imagina- tion and sympathy, was perhaps better fitted than any other man of antiquity for the task, and who through the whole of this period lived a life of literary leisure, was found to do justice to the subject.

Although the age did not afford that free scope and stimulus to individual energy and enterprise which have been the conditions under which the most truly creative literature has flourished, no age afforded more material and social advantages for the peaceful cultivation of letters. The new influence of patronage, which in other times has chilled the genial current, of literature, became, in the person of Mecenas, the medium

through which literature and the imperial policy were brought into union. Poetry thus acquired the tone of the world, kept in close connexion with the chief source of national life, while it was culti- vated to the highest pitch of artistic perfection under the most favourable conditions of leisure and freedom from the distractions and anxieties of life.

The earliest in the order of time of the poets who adorn this age—Virgil (70-19)—is also the greatest in genius, the most richly cultivated, and the most perfect in art. He is the idealizing poet of the hopes and aspirations and of the purer and happier life of which the age seemed to contain the promise. He elevates the present by associat-

ing it with the past and future of the world, and sancti- fies it by seeing in it the fulfilment of a divine purpose. Poetry is no longer, as in the previous generation, in dis- cord with the dominant tendency of affairs, but in harmony with all that was restorative of the peace, order, and happiness of the world. Virgil is the true representative poet of Rome and Italy, of national glory and of the beauty of nature, the artist in whom all the efforts of the past were made perfect, and the unapproachable standard of excellence to future times. While more richly endowed with sensibility to all native influences, he was more deeply imbued than any of his contemporaries with the poetry, the thought, and the learning of Greece. It was by lean- ing on these supports that his genius felt its way and expanded into higher and wider development. His art begins in imitation of the cadences, the diction, and the pastoral fancies of Theocritus ; but even in these imitative poems of his youth we see that he is perfect master of his materials. The Latin hexameter, which in Ennius and Lucretius was the organ of the more dignified and majestic emotions, became in his hands the most perfect measure in which the softer and more luxurious sentiment of nature has been expressed ; and the Latin language was enriched with its sweetest and most musical variations. The senti- ment of Italian scenery and the love which the Italian peasant has for the familiar sights and sounds of his home found a voice which never can pass away; and the joy and pain of the passion of love were revealed in these poems in a way as yet unapprehended by the world. In this the

earliest and least serious effort of Virgil's genius there is no immaturity of art, and in poems outwardly most remote from the current of active life there is the recogni- tion of the master-force by which that current was destined to be impelled and controlled.

In his next poem, the Georgics, we are struck by the great advance in the originality and self-dependence of the artist, in the mature perfection of his workmanship, in the deepening and strengthening of all his sympathies and convictions. His genius still works under forms prescribed by Greek art, and under the disadvantage of having a practical and utilitarian aim imposed on it. But he has even in form so far surpassed his originals that he alone has gained for the pure didactic poem a place among the highest forms of serious poetry, while he has so transmuted his material that, without violation of truth, he has made the whole poem alive with poetic feeling. The homeliest details of the farmer's work are transfigured through the magical potency of the poet's love of nature in her imme- diate charm of sight and sound and in her all-pervading presence, especially as that charm and presence reveal themselves in the land and climate of Italy ; through his

religious feeling and his pious sympathy with the sanc-

tities of human affection ; through his patriotic sympathy with the national greatness; and through the rich allu- siveness of his art to everything in poetry and legend which can illustrate and glorify his theme.

In the Pastoral Poems and Georgics Virgil is the idealiz- ing poet of the beauty and of the old simple and hardy life of Italy, as the imagination could conceive of it in an altered world. In the #neid he is the idealizing poet of national glory, especially as that glory was manifested in the person of Augustus. The epic of national life, vividly conceived but rudely executed by Ennius, was perfected in the years that followed the decisive victory at Actium. To do justice to his idea Virgil enters into rivalry with a greater poet than those whom he had equalled or sur- passed in his previous works. And, though he cannot unroll before us the page of heroic action with the power and majesty of Homer, yet by the sympathy with which he realizes the idea of Rome, and by the power with which

Horace.

ROWAN LITE RAT U'R-E

he has used the details of tradition, of local scenes, of reli- gious usage, to embody it, he has built up in the form of an epic poem the most enduring and the most artistically constructed monument of national grandeur,

The second great poet of the time—Horace (65-8)—holds a lower place in the reverence of the world, but is perhaps as much loved.and is even more largely and familiarly known. He is both the realist and the idealist of his age. If we want to know the actual lives, manners, and ways of thinking of the Romans of the generation succeeding the overthrow of the republic it is in the Satires and par- tially in the Epistles of Horace that we shall find them. If we ask what there was in the life of that time of more exquisite or more piquant charm, of more elevated enthu- siasm, of graver experience, to stir the fancy and move the mood of imaginative reflexion, it is in the lyrical poems of Horace that we shall find the most varied and trustworthy answer. He was prepared for his double task by the experience of life and his strong hold on the actual world, and by drinking long and deeply of the purer and more remote sources of Greek inspiration.

His literary activity extends over about thirty years and naturally divides itself into three periods, each marked by a distinct character. The first—extending from about 40 to 29—is that of the composition of the Zpodes and Satires. In the former he imitates the Greek poet Archilochus, but takes his subjects from the men, women, and incidents of the day. They are the expression of the least happy part of his career and the least estimable side of his nature. His humorous observation of life and the more serious grain in his character found more congenial occupation in perfecting the national work of Lucilius than in introduc- ing "the Parian iambics to Latium." Personality is the essence of his £podes ; in the Satires it is used merely as illustrative of general tendencies. In the Satires we find realistic pictures of social life, and the conduct and opin- ions of the world submitted to the standard of good feeling and common sense. The style of the Hodes is pointed and epigrammatic, that of the Satires natural and familiar. The hexameter no longer, as in Lucilius,

moves awkwardly as if in fetters, but, like the language of Terence, of Catullus in his lighter pieces, of Cicero in his letters to Atticus, adapts itself to the everyday intercourse of life. The next period is the meridian of his genius, the time of his greatest lyrical inspiration, which he himself asso- ciates with the peace and leisure secured to him by his Sabine farm, The spirit of the child who had lost himself on Monte Voltore seemed to come back to him in his lonely wanderings among the Sabine hills. The life of pleasure which he had lived in his youth comes back to him, not as it was in its actual distractions and disappointments, but in the idealizing light of meditative retrospect, He had not only become reconciled to the new order of things, but was moved by his intimate friendship with Mecenas to aid in raising the world to sympathy with the imperial rule through the medium of his lyrical inspiration, as Virgil had through the glory of his epic art. With the comple- tion of the three books of Odes he cast aside for a time the office of the "vates," and resumed that of the critical spectator of human life, but in the spirit of a moralist rather than a satirist. He feels the increasing languor of the time as well as the languor of advancing years, and seeks to encourage younger men to take up the réle of lyrical poetry, while he devotes himself to the contempla- tion of the true art of living. Self-culture rather than the fulfilment of public or social duty, as in the moral teaching of Cicero, is the aim of his teaching ; and in this we recognize the influence of the empire in throwing the individual back on himself. As Cicero tones down his oratory in his moral treatises, so Horace tones down the

| or of dramatic art marked out for them by Horace. | latest form of poetry adopted from Greece and destined to

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fervour of his lyrical utterances in his Epistles, and thus produces a style combining the ease of the best epistolary style with the grace and concentration of poetry,—the style, as it has been called, of 'idealized common sense," that of the "urbanus" and cultivated man of the world who is also in his hours of inspiration a genuine poet. In the last decennium of his life he resumed for a time, under pressure of the imperial command, his lyrical function, and produced some of the most

exquisite and mature products of his art, But his chief activity is devoted to criticism. He first vindicates the claims of his own age to literary pre-eminence, and then seeks to stimulate the younger writers of the day to what he regarded as the manlier forms of poetry, and especially to the tragic drama, which seemed for a short time to give promise of an artistic revival, It seems strange that, although he must have known the writings of Propertius and the earlier writings of Ovid, he has no word of recognition for them. And, though he writes to Tibullus with friendly regard, he seems to value him as a student of philosophy more than as a poet, and says nothing to indicate that he believed his work would be more enduring than that of Titius or Julius Florus or Julus Antonius,

But the poetry of the latter half of the Augustan age destined to survive did not follow the lines either of lyrical The

gain and permanently to hold the ear of the world was tlic elegy. From the time of Mimnermus this form seems to have presented itself as the most natural vehicle for the poetry of pleasure in an age of luxury, refinement, and incipient decay. Its facile flow and rhythm seem to adapt it to the expression and illustration of personal feeling. It goes to the mind of the reader through a medium of sentiment rather than of continuous thought or imaginative illustration. The greatest masters of this kind of poetry are the elegiac poets of the Augustan age,—Tibullus, Pro-

pertius, and Ovid. Of these Tibullus (d. 19) is the most Tibullus.

refined and tender. As the poet of love he gives utterance to the pensive melancholy rather than to the pleasures associated with it. In his sympathy with the life and beliefs of the country people he shows an affinity both to the idyllic spirit and to the piety of Virgil. There is something, too, in his fastidious refinement and in his shrinking from the rough contact of life that reminds us of the English poet Gray.

A poet of more strength and more powerful imagination, Proper- but of less refinement in his life and less exquisite taste tius.

in his art, is Propertius (c. 50-c. 15), "the Roman Calli- machus." His youth was a more stormy one than that of Tibullus, and was passed, not

like his, among the ‘ healthy woods” of his country estate, but amid all the licence of the capital. His passion for Cynthia, the theme of his most finished poetry, is second only in interest to that of Catullus for Lesbia ; and Cynthia in her fascination and caprices seems a more real and intelligible personage than the idealized object first of the idolatry and afterwards of the malediction of Catullus. Propertius is a less accom- plished artist and a less equably pleasing writer than either Tibullus or Ovid, but he shows more power of dealing gravely with a great or tragic situation than either of them, and his diction and rhythm give frequent proof of a concentrated force of conception and a corresponding move- ment of imaginative feeling which remind us of Lucretius.

The most facile and brilliant of the elegiac poets and the Ovid.

least serious in tone and spirit is Ovid (43 B.c.~~17 a.p.), the latest in order of time. As an amatory poet he is the poet of pleasure and intrigue rather than of tender senti~~ ment or absorbing passion. Though he treats his subject in relation to himself with more levity and irony than real

Livy.

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feeling, yet he alone among the elegiac poets is able to embody it in dramatic form, and by his vivid gifts of fancy to create a literature of romantic passion and adventure adapted to amuse and fascinate the idle and luxurious society of which the elder Julia was the centre. The power of continuous narrative is best seen in the Metamorphoses, written in hexameters, to which he has imparted a rapidity and fluidity of movement more suited to romantic and pic- turesque narrative than the weighty self- restrained verse of Virgil. In his Yast? he treats a subject of national interest; it is not, however, through the strength of Roman sentiment but through the power of vividly conceiving and narrating stories of strong human interest that the poem lives. In his latest works—the Trista and Lx Ponto—he imparts the interest of personal confessions to the record of a unique experience. Latin poetry is more rich in the expression of personal feeling than of dramatic imagination. In Ovid we have both. We know him in the intense liveliness of his feeling and the human weak- ness of

his nature more intimately than any other writer of antiquity, except perhaps Cicero. As Virgil marks the point of maturest excellence in poetic diction and rhythm, Ovid marks that of the greatest facility.

The Augustan age was one of those great eras in the world, like the era succeeding the Persian War in Greece, the Elizabethan age in England, and the beginning of the present century in Europe, in which what seems a new spring of national and individual life calls out an idealizing retrospect of the past. As the present seems full of new life, the past seems rich in glory and the future in hope. The past of Rome had always a peculiar fascination for Roman writers. Virgil in a supreme degree, and Horace, Propertius, and Ovid in a less degree, had expressed in their poetry the romance of the past. But it was in the great historical work of Livy (59 B.c.~~17 a.p.) that the record of the national life, coloured by idealizing retro~~ spect, received its most systematic exposition. The con- ception of his work must have nearly coincided in point of time with the impulses in which the Zneid and the national Odes of Horace had their origin. Its execution was the work of a life prolonged through the languor and dissolution following so soon upon the promise of the new era, during which time the past became glorified by con- trast with the disheartening aspect of the present. The value of the work consists not in any power of critical in- vestigation or weighing of historical evidence but in the intense sympathy of the writer with the national ideal, and the vivid imagination with which under the influence of this sympathy he gives life to the events and personages, the wars and political struggles, of times remote from his own. Although he has no accurate conception of the con- stitutional history of the state, yet nowhere else in ancient history do we find the patrician and plebeian forces in a state by which that history is worked out so vividly and dramatically embodied. He makes us feel more than any one the majesty of the Roman state, of its great magis- tracies, and of the august council by which its policy was guided, And, while he makes the words "senatus popu- lusque Romanus " full of significance for all times, no one realizes with more enthusiasm all that is implied in the words "imperium Romanum," and the great military quali- ties of head and heart by which that empire was acquired and maintained. While the general conception of his work 1s thus animated by national enthusiasm, the details are filled up with all the resources of a vivid

imagination and of literary art. The vast scale on which the work was conceived and the thoroughness of artistic execution with which the details are finished are characteristically Roman. The prose style of Rome, as a vehicle for the continuous narration of events coloured by a rich and picturesque

imagination and vivified by dignified emotion, attained its perfection in him.

Fourth Period: from 17 to about 130 a.p.

For more than a century after the death of Augustus Charac- Roman literature continues to flow in the old channels, teristies Rome continues the centre of the literary movement. The oe characteristics of the great writers are essentially national, 'an a not provincial nor cosmopolitan. In prose the old forms —oratory, history, the epistle, treatises or dialogues on ethical and literary questions—continue to be cultivated.

Scientific and practical subjects, such as natural history, architecture, medicine, agriculture, are treated in more elaborate literary style. The old Roman satura is devel- oped into something like the modern prose novel. In the various provinces of poetry, while there is little novelty or inspiration, there is abundance of industry and ambitious effort. The national love of works of large compass shows itself in the production of long epic poems, both of the historic and of the imitative Alexandrian type. Out of | many others four of these have been preserved, two at least of which the world might have allowed to perish without sensible diminution to its literary wealth. The imitative and rhetorical tastes of Rome showed themselves | in the composition of exotic tragedies, as.remote in spirit and character from Greek as from Roman life, of which the only extant specimens are those attributed to the | younger Seneca. The composition of didactic, lyrical, and elegiac poetry also was the accomplishment and pastime of |

an educated dilettante class. The only extant specimens of any interest are some of the Stlvx of Statius. The only voice with which the poet of this age can express himself with force and sincerity is that of satire and satiric epi- gram. Ovid was the last of the true poets of Rome who combined

idealizing power of imagination with artistic originality. After him we find only imitative echoes of the old music created by Virgil and others, as in Statius, or powerful declamation, as in Lucan and Juvenal. There is a deterioration in the diction as well as in the music of poetry. The elaborate literary culture of the Augustan age has done something to impair the native force of the Latin idiom. The language of literature, in the most elaborate kind of prose as well as poetry, loses all ring of | popular speech. The old oratorical tastes and aptitudes find their outlet in public recitations and the practice of declamation. Forced and distorted expression, exagger- ated emphasis, point and antithesis, an affected prettiness, "melliti verborum globuli," were studied with the view of gaining the applause of audiences who thronged the lecture and recitation rooms in search of temporary excite- ment. Education was more widely diffused, but was less thorough, less leisurely in its method, less than before de- rived from the purer sources of culture. The precocious immaturity of Lucan's career affords a marked contrast to | the long preparation of Virgil and Horace for their high office. Although there are some works of the Silver Age of considerable and one at least of supreme interest, from the insight they afford into the experience of a century of organized despotism and its effect on the spiritual life of the ancient world, it cannot be doubted that the steady literary decline which characterized the last centuries of paganism begins with the death of Ovid and Livy. If the world had not altogether ceased to produce men of genius, the conditions under which their genius could unfold itself were no longer the same. The influences which had inspired the republican and Augustan literature were the artistic impulse derived from a familiarity with the great works of Greek genius, becoming more intimate with every new generation, the spell of Rome over the imagination of the kindred Italian races, the charm of Italy, and the vivid

sensibility of the Italian temperament. These influences were certainly much less operative in the first century of the empire. The imitative impulse, which had much of the character of a creative impulse, and had resulted in the appropriation of the forms of poetry suited to the Roman and Italian character and of the metres suited to the genius of the Latin

language, no longer stimulated to artistic effort. The great sources of Greek poetry were no longer regarded, as they were by Lucretius and Virgil, as "integri" and "sancti fontes," and approached in a spirit at once of daring adventure and reverential enthusi- asm.! We have the testimony of two men of the shrewdest common sense and the most masculine understanding— Martial and Juvenal—to the stale and lifeless character of the art of the Silver Age, which sought to reproduce in the form of epics, tragedies, and elegies the bright fancies of the Greek mythology.

The idea of Rome, owing to the antagonism between the policy of the Government and the sympathies of the class by which literature was favoured and cultivated, could no longer be an inspiring motive, as it had been in the literature of the republic and of the Augustan age. The spirit of Rome appears only as animating the protest of Lucan, the satire of Persius and Juvenal, the sombre picture which Tacitus paints of the annals of the empire, Oratory is no longer an independent voice appealing to sentiments of Roman dignity, but the weapon of the "delatores," wielded for their own advancement and the destruction of that class which, even in their degeneracy, retained most sympathy with the national traditions, Roman history was no longer a record of national glory, stimulating the patriotism and flattering the pride of all toman citizens, but a personal eulogy or a personal invec- tive, according as servility to a present or hatred of a recent ruler was the motive which animated it.

The charm of Italian scenes still remained the same, but the fresh and inspiring feeling of nature as a great power in the world, a great restorative influence on human life, gave place to the mere sensuous gratification derived from the luxurious and artificial beauty of the country villa. The idealizing poetry of passion, which found a genuine voice in Catullus and the elegiac poets, could not prolong itself through the exhausting licence of successive generations. The vigorous vitality which gives interest to the personality of Catullus, Propertius, and Ovid no longer characterizes their successors. The pathos of natural affection is occasionally recognized in Statius and more rarely in Martial, but it has not the depth of tenderness found in Lucretius and Virgil. Human life is altogether shallower, has the same capacity for neither joy nor sorrow.

The wealth and luxury of succeeding generations, the monotonous routine of life, the separation of the educated class from the higher work of the world, have produced their enervating and paralysing effect on the mainsprings of poetic and imaginative feeling.

New elements, however, appear in the literature of this period. As the result of the severance from the active interests of life, a new interest is awakened in the inner life of the individual. The extreme immorality of the age not only affords abundant material to the satirist but deepens the consciousness of moral evil in purer and more thoughtful minds. To these causes we attribute the patho- logical observation of Seneca and Tacitus, the new sense of purity in Persius called out by contrast with the im- purity around him, the glowing if somewhat sensational exaggeration of Juvenal, the vivid characterization of Martial. Thc literature of no time presents so powerfully

1 Contrast with the '"juvat imtegros accedere fontes" and the

"sanctos ausus recludere fontes" of the older poets the first line of Persius's prologue "nec fonte labra prolui caballino."

the contrast between moral good and evil. In this respect it is truly representative of the life of the age. Another new element is the influence of a new race. In the two preceding periods the rapid diffusion of literary culture following the Social War and the first Civil War was seen to awaken into new life the elements of original genius in Italy and Cisalpine Gaul. In the first century of the empire a similar result was produced by the diffusion of that culture in the Latinized districts of Spain. The fervid temperament of a fresh and vigorous race, which received the Latin discipline just as Latium had two or three centuries previously received the Greek discipline, revealed itself in the writings of the Senecas, Lucan, Quintilian, Martial, and others, who in their own time added literary distinction to the Spanish towns from which they came. This new cosmopolitan element introduced into Roman literature draws into greater prominence the characteristics of the last great

representatives of the genuine Roman and Italian spirit,—Tacitus and Juvenal.

On the whole this century shows, in form, language, and substance, the beginning of literary decay. But it is still capable of producing men of original force; it still maintains the traditions of a happier time ; it is still alive to the value of literary culture, and endeavours by minute attention to style to produce new effects. Though it was not one of the great eras in the annals of literature, yet the century which produced Martial, Juvenal, and Tacitus cannot be pronounced barren in literary originality, nor that which produced Seneca and Quintilian in culture and literary taste.

This fourth period is itself subdivided into three divi- sions :—(1) that extending from the accession of Tiberius to the death of Nero, 68,—the only important part of it being the Neronian age, 54 to 68; (2) the Flavian era, from the death of Nero to the death of Domitian, 96 ; (3) the period included in the reigns of Nerva and Trajan and part of the reign of Hadrian.

(1) For a generation after the death of Augustus no Period

new original literary force appeared. The later poetry of the Augustan age had ended in trifling dilettanteism, for the continuance of which the atmosphere of the court was no longer favourable. The class by which literature was encouraged had become both enervated and terrorized. The Fables of Phedrus, the Pierian freedman, a work of no kind of national significance and representative in its morality only of the spirit of cosmopolitan individual- ism, is the chief poetical product of the time. Velleius Paterculus and Valerius Maximus are the most important prose-writers. The traditional culture was still, howevcr, maintained, and the age was rich in grammarians and rhetoricians. The new profession of the "delator" must have given a stimulus to oratory. A high ideal of culture, literary as well as practical, was realized in Germanicus, which seems to have been transmitted to his daughter Agrippina, whose patronage of Seneca had important results in the next generation. The reign of Claudius was a time in which antiquarian learning, grammatical studies, and jurisprudence were cultivated, but no import- ant additions were made to literature. A fresh impulse was given to letters on the accession of

Nero, and this was partly due to the theatrical and artistic tastes of the young emperor. Four writers of the Neronian age still possess considerable interest,—Seneca, Lucan, Persius, and Petronius. The first three represent the spirit of their age by exhibiting the power of the Stoic philosophy as a moral, political, and religious force; the last is the most cynical exponent of the depravity of the time. Sencca (d. 65) is less than Persius a pure Stoic, and more of a moralist and pathological observer of man's inner life. He makes the commonplaces of a cosmopolitan philosophy

interesting by his abundant illustration drawn from the private and social life of his contemporaries. He has knowledge of the world, the suppleness of a courtier, Spanish vivacity, and the "ingenium amcenum " attributed to him by Tacitus, the fruit of which is sometimes seen in the "honeyed phrases" mentioned by Petronius,—pure aspirations combined with inconsistency of purpose,—the inconsistency of one who tries to make the best of two worlds, the ideal inner life and the successful real life in the atmosphere of a most corrupt court. The Pharsalia of Lucan (39-65), with Cato as its hero, is essentially a Stoical manifesto of the opposition. It is written with the force and fervour of extreme youth and with the literary ambition of a race as yet new to the discipline of intellectual culture, and is endowed with a rhetorical rather than a poetical imagination. The Satires of Persius (34-62) are the purest product of Stoicism,—a Stoicism that had found in a living contemporary, Thrasea, a more rational and practical hero than Cato. But no important writer of antiquity has less literary charm than Persius. He either would not or could not say anything simply and naturally. In avoiding the literary conceits and fopperies which he satirizes he has recourse to the most unnatural contortions of expression. Of the works of the time that which from a human point of view is perhaps the most detestable in ancient literature has the most genuine literary quality, the fragment of the prose novel of Petronius. It is most sincere in its repre- sentation, least artificial in

diction, most penetrating in its satire, most just in its criticism of art and style.

(2) A greater sobriety of tone was introduced both into life and literature with the accession of Vespasian. The time was, however, characterized rather by good sense and industry than by original genius. Under Vespasian Pliny the elder is the most important prose-writer, and Valerius Flaccus, author of the Argonautica, the most important among the writers of poetry. The reign of Domitian, although it silenced the more independent spirits of the time, Tacitus and Juvenal, witnessed more important con- tributions to Roman literature than any age since the Augustan,—among them the Institutes of Quintilian, the Pume War of Silius Italicus, the epics and the Stlvw of Statius, and the Zpigrams of Martial. Quintilian (c. 35- 95) is brought forward by Juvenal as a unique instance of a thoroughly successful man of letters, of one not be- longing by birth to the rich or official class who had risen to wealth and honours through literature. He was well adapted to his time by his good sense and sobriety of judg- ment. His criticism is just and true rather than subtle or ingenious, and thus stands the test of the judgment of after-times. The poem of Silius (25-101) is a proof of the industry and literary ambition of members of the rich official class. Of the epic poets of the Silver Age Statius (c. 45-96) shows the greatest technical skill and the richest pictorial fancy in the execution of detail ; but his epics have no true inspiring motive, and, although the recitation of the Thebaid could attract and charm an audience in the days of Juvenal, it really belongs to the class of poems so unsparingly condemned both by him and Martial. Tn the Stlve, though many of them have little root in the deeper feelings of human nature, we find occasionally more than in any poetry after the Augustan age something of the purer charm and pathos of life, But it is not in the artificial poetry of the Silve, nor in the epics and tragedies of the time, nor in the cultivated criticism of Quintilian that the age of Domitian lives for us. Tt is in the Epi- grams of Martial (c. 41-102) that we have a true image of the average sensual frivolous life of Rome at the end of the lst century, seen through a medium of wit and humour, but undistorted by the exaggeration which moral indignation and the love of effect add to the representation

of Juvenal. Martial represents his age in his LEpigrams, as Horace does his in his Satires and Odes, with more variety and incisive force in his sketches, though with much less poetic charm and serious meaning. We know the daily life, the familiar personages, the outward aspect of Rome in the age of Domitian better than at any other period of Roman history, and that knowledge we owe to Martial. Though a less estimable character than some of them, he is a better writer than any of his contemporaries because he did not withdraw into a world of literary in- terests, but lived and wrote in the central whirl of city life. He tells us the truth of his time without the wish either to protest against or to extenuate its vices.

(3) But it was under Nerva and Trajan that the greatest Period and most. truly representative works of the empire were of Nerva, written, those which at once present the most impressive 2*Jan, spectacle to the imagination and have made its meaning Hadrian, sink most deeply into the heart and conscience of the world. The Annals and Histories of Tacitus (54-119), with the supplementary Life of Agricola and the treatise On the Manners of the Germans, and the Satires of Juvenal (c. 47-130) have summed up for all after-times the moral experience of the Roman world from the accession of Tiberius to the death of Domitian, The powerful feel- ings under which they both wrote, the generous scorn and generous pathos of the historian acting on extraordinary gifts of imaginative insight and imaginative characteriza- tion, and the fierce indignation of the satirist finding its vent in exaggerating realism, have undoubtedly disturbed the completeness and exactness of the impressions which they received and have perpetuated; nevertheless their works are the last powerful voices of Rome, the last voices expressive of the freedom and manly virtue of the ancient world. In them alone among the writers of the empire the spirit of the Roman republic seems to revive. The Letters of Pliny (61-c. 115), though they do not contradict the representation of Tacitus and Juvenal regarded as an exposure of the political degradation and moral corruption of prominent individuals and classes, do much to modify the pervadingly tragic and sombre character of their re- presentation, and to show that life even in the higher circles of Roman society had still sources of pure enjoy- ment and wellbeing.

With the death of Juvenal, the most important part of whose activity falls in the reign of Trajan, Roman literature as an original and national expression of the experience, character, and sentiment of the Roman state and empire, and as one of the great literatures of the world, may be considered as closed. There still continued to be much industry and activity in gathering up the memorials of the past and in explaining and illustrating the works of genius of the ages of literary creation, A kind of archaic revival took place in the reign of Hadrian, which showed itself both in affectation of style and in a renewed interest in the older literature. The most important works of the age succeeding that of Juvenal are the Biographies of Suetonius (c. 75-160), which did much to preserve a know- ledge of both political and literary history. The Moctes Attice of Aulus Gellius, written in the latter part of the 2d century, have preserved many anecdotes, some of them of doubtful authenticity, concerning the older writers. The persistence of critical and grammatical studies and of in- terest in the literature of the past resulted in the 4th and Sth centuries in the works of Donatus and Servius and in the Saturnalia of Macrobius. The works of the great Latin grammarians are also to be connected with the scholarly study of antiquity which superseded to a great extent the attempt to produce works of new creation. The writer of most original genius among the successors of Juvenal and Tacitus is probably Apuleius, and his most

original work, the Metamorphoses, has nothing of Roman or Italian colouring. The last writer who combines genius with something of national spirit is the poet Claudian, who wrote his epics under the immediate inspiring influ- ence of a great national crisis and a national hero, As fresh blood came to the nearly exhausted literary genius of Italy from Spain in the first century of the empire, so in the later centuries it came from Africa. Whatever of original literary force appears either in the pagan or Christian literature written in the Latin language between the 2d and the 6th century is due to Romanized settle- ments in Africa. We

have to remember during all these comparatively barren centuries that secular literature had

ROMANS, a town of France, in the department of Dréme, 12 miles north-east of Valence by the railway con- necting this town with Grenoble, stands at the foot of an eminence on the right bank of the Isére, 530 feet above the sea. A fine stone bridge unites it with Bourg du Péage on the other side of the river. Both towns owe their prosperity to their situation in the most fertile part of the valley of the Isere, where land is sometimes sold at £200 per acre. The population of Romans was 11,916 (13,806 in the commune) in 1881. The present parish church belonged to an abbey founded in 837 by St Bernard, forty-ninth bishop of Vienne. now condemned, dates from the 11th century; the prin- cipal portal is one of the finest specimens of 1 2th-century Romanesque ; and the choir and the transept are striking examples of the style of the 13th. Romans has also a wealthy hospital and a large seminary. Besides the silk- trade the local industries comprise shoemaking, tanning, hat-making, oil-refining, &e.

ROMANS, Epistiz ro tux. The origin of the Chris- tian community at Rome is involved in obscurity. Accord- ing to Catholic tradition it was founded by Peter, who was its bishop for a quarter of a century. But neither allega- tion has historical support. The most striking proof of the contrary is precisely this epistle of Paul. It does not contain the remotest reference to either the one fact or the other. And if Paul had written such an epistle to a community founded by Peter he would not only have vio- lated the agreement mentioned in Gal. ii. 9, but would also have gone against his own principle of refraining from intrusion on the mission fields of others (Rom. xv. 20; 2 Cor. x. 16). But neither was Paul the founder of the church in Rome. This also is shown by the present epistle, in which he for the first time opens relations with a community already formed. Thus we are thrown upon mere conjecture. In pursuing the investigation we have this fact to start from, that even before the Christian era there already existed in Rome a strong Jewish colony. After the conquest of Jerusalem by Pompey (63 B.c.) numbers of Jewish prisoners of war were brought to Rome and there sold as slaves. Of these many were soon after- wards emancipated by their masters, Jewish slaves being a peculiarly inconvenient kind of property on account of the strictness of

their observance of their law, especially in the matter of clean and unclean meats (Philo, Leg. ad Cavum, ii. 568, ed. Mangey). These freedmen became the nucleus of a Jewish community, which ultimately settled in Trastevere and organized itself into an independent religious communion. It rapidly increased and became an important element in the life of the capital. By the time of Herod's death (4 B.c.) the independent Jews of Rome—that is, besides women and children—already numbered 8000 according to Josephus (Anézq., xvi. 11, 1; Bell. Jud., ii. 6,1). In the reign of Tiberius indeed this large and powerful organization was dissolved at a single

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again found its organ in the Greek language, and that the new spiritual life of the world had come into stern antagonism with many of the most powerful motives of classical poetry.

Literature.—The most important books on the subject are the Geschichte der rémischen Litteratur, by J. C. F. Bahr; the Grund- riss der rémischen Liticratur, by G. Bernhardy ; and the Geschichte der romischen Litteratur, by W. 8. Teuffel. 'The last of these has been translated into English. There is also a Geschichic der rémischen Litteratur by G. Munck. The most recent books on the subject in English are Mr. G. A. Simcox's History of Latin Literature from Ennius to Boethius, and the History of Roman Literature from the Earliest Period to the Death of Marcus Aurelius, by Mr C. T. Cruttwell. (W. Y. 8.)

stroke, a decree of the senate (19 a.p.) having sent to Sardinia for nulitary service all Jews capable of bearing arms (Tac., Ann., 11. 85; Suet., Ziber., 36 ; Joseph., Anizg., xvul, 3, 5). It is probable, however, that after the death (31 a.D.) of Sejanus, to whom this measure had been mainly due, the Jews were expressly permitted to return to Rome, for we are told by Philo (Leg. ad Caium, ii. 569, ed. Mangey) that after the death of his favourite Tiberius perceived the Jews to have been unjustly calumniated, and ordered the authorities to refrain from oppressing them. At all events the community must ultimately have come together again, for in the reign

of Claudius its existence is again presupposed, the idea of expelling the Jews from the capital having anew been entertained under that emperor. Regarding this proposal, however, accounts vary. According to the Acts of the Apostles (xviii. 2), and also Suetonius (Claud., 25), it was actually carried out ; but according to Dio Cassius (lx. 6) the expulsion was only proposed, and, when it was seen to be impracticable without great tumult, all that was done was to withdraw from the Jews their right of meeting. The latter version is doubtless the more correct. The withdrawal of the right of meeting was equivalent to the prohibition of public worship, and sufficiently explains why numbers left the city (Acts xviii. 2). But the main body must have remained and doubtless have again obtained the privilege of assembly, for from the time of Nero onwards we find the Jews in Rome once more flourishing with undiminished vigour.

From the midst of this Jewish community it was that the Christian congregation doubtless arose. The Jews of the Dispersion, it is well known, kept up an active corre- spondence with the mother-country in Palestine. Every year they sent their gifts and offerings thither, and every one in a position to do so went in person to the great festivals of the Holy City. Asa result of this vigorously maintained intercourse, which was aided also by the interests of trade, tidings of Jesus as the promised Messiah did not fail to reach the capital of the empire. Individual Jews who had become believers came forward in Rome as preachers of the gospel and found acceptance with a section of their countrymen. They found a perhaps still more numerous following among the "God-fearing" or "devout" (ceBopevot, poBovpevor, Tov Oedv) heathen, 2.¢., within that large circle which consisted of those who had adopted the faith of the Jews, observed certain of the more important precepts of their law, and also attended their public worship, but did not, strictly speaking, belong to the communion, and thus represented a sort of Judaism of the second order.! In proportion as faith in Jesus as the Messiah gained ground within the Jewish community, a separation between the believers and the others would of course become more

1 Many scholars identify these "devout" heathen with the "pro-

selytes of the gate’”’ who are met with in Rabbinical literature; but in reality the two are quite distinct and unrelated.

and more inevitable. Under what circumstances and con- ditions the separation actually took place is not now known. We may be sure, however, that it was not brought about without violent internal commotions ; it is probable even that the edict of Claudius itself may have had its occasion in these. The remark of Suetonius (Claud., 25) readily admits of being interpreted in such a sense: “ Judzos impulsore Chresto! assidue tumultuantes Roma expulit.” So interpreted, these words contain our first notice of the Christian Church in Rome; its earliest constitution must have taken place precisely then. For, as has already been seen, the edict of banishment was probably never carried out, or at all events did not continue long in force. Un- fortunately, we do not know the date of it, but it must have belonged to the later years of Claudius, for in the beginning of his reign the disposition of that emperor towards the Jews was friendly (Jos., Antig., xix. 5). In its context also Acts xviil. 2 imphes a late rather than an early date, say about 50-52 a.p.; and there is nothing against this in the circumstance that the edict is mentioned by Dio Cassius towards the beginning of his account of that reign, for in that particular passage the author is characterizing his subject in a general way and not referring to events in their chronological sequence.

If the foregoing suppositions are correct, Paul’s epistle to the church at Rome was written some six or eight years after its formation. Paul was staying in Corinth at the time, in the last month before the eventful journey to Jerusalem which led to his captivity (58 a.p.). The evi- dence that the epistle was written during this last sojourn in Greece, which is only briefly alluded to in Acts xx. 2, 3, is simple and conclusive. We know from the Epistles to the Corinthians that shortly before this stay the apostle had set on foot throughout the churches of Macedonia and Achaia a collection on behalf of the needy church at Jerusalem (1 Cor. xvi.; 2 Oor. viii.-ix.). This collection it was his wish to carry in person from Corinth (1 Cor. xvi. 3-6; 2 Cor. i. 16; Acts xxiv. 17). But the Epistle to the Romans was written, as we learn from the author himself (Rom. xv.

24-28), when the collection had just been concluded and he was on the point of taking it with him to Jerusalem,—in other words, before his departure from Corinth, but not long before.

We have now to inquire into the motive which led the apostle precisely at such a juncture to address a communi- cation so full and elaborate as this to the Christian com- munity at Rome, with which he had no personal acquaint- ance. In general terms we have it from himself at the beginning and end of the epistle (i. 8-15, xv. 14 sq.). He had proclaimed the gospel in all the East from Jerusalem to Hlyricum (xv. 19). He regarded his work in these quarters as for the present finished, and he felt impelled to preach Christ crucified also in the West. He was already looking towards Spain (Rom. xv. 24, 28). He wished first to take the collection to J erusalem, and, that once accomplished, his labours in the West were to begin forthwith. But there, in Rome, the metropolis of the world, a community already existed which had come into being apart from any effort of his. For his activity in the West it was obviously of the utmost importance to secure the organization for himself and his message. Should its attitude be cold, he would be left without any secure base of operations. The purpose of the present epistle, then, is, to speak generally, this: to secure a connexion with the community at Rome, to gain it for himself and the gospel he carried. But had it hitherto been without that gospel ? The community was at any rate already a Christian one.

ie The vulgar pronunciation "Chrestus" for "Christus" is borne witness to in other passages (Tert., Apol., 3, and Ad Nat., i. 3; Lactan., Inst. Div., iv. 7, 5).

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And, if perhaps it was in need of fuller teaching, why did he not wait until he arrived in person in Rome in order to give it? Surely he could have done this more effect- ually by word of mouth than by a written treatise. Why, then, did he send this written message before him? There must have been some perfectly definite circumstances which led him to take this course. The nature of these will become clear to us when we seek to ascertain what at that juncture was the state of the Christian community in Rome.

Assuming that church to have arisen out of the midst of the Jewish community of the place, the most obvious conjecture is that at the period of the present letter it still continued to consist mainly of Jewish Christians, 2.¢., that the majority of its members were Jews by birth who even after their conversion to Christ still continued to regard the Mosaic law in its totality as binding on them. This is the view which Baur in particular sought to establish,? as against the previously prevailing belief in the Gentile Christian character of the church in question. Baur's position was adopted by many subsequent critics, the most careful and elaborate defence of it, though with many modifications in detail, being that of Mangold.? An inter- mediate position between the older view and that of Baur has been sought by Beyschlag, who works out the theory that the Christian community in Rome may possibly have been Jewish Christian in its way of thinking, yet at the same time Gentile Christian in its origin. In direct opposition to Baur, on the other hand, Theodor Schott5 has again maintained the older view as to its Gentile character, and in all essential points this is also defended by Weizsicker,® who, however, recognizes in Baur's hypo- thesis certain elements of truth by which the older theory must be corrected and supplemented.*

In presence of the facts we are compelled to adopt the view of Weizsiicker as on the whole the right one. For the Jewish Christian character of the church Baur and Mangold, besides the argument from its presumable origin, have adduced a number of isolated texts. On the majority of these Mangold no longer lays any stress, since they admit of being otherwise interpreted. Thus when Paul designates Abraham as '"'our father" (rév zpomdropa Hua; iv. 1) he indeed includes his readers under the jor. But in 1 Corinthians, an epistle certainly addressed to a church of Gentile Christians, the fathers of Israel are also called "our fathers" (1 Cor. x. 1). The Christian Church is in point of fact the true Israel; hence the patriarchs of Israel are its "fathers."' In another place (Rom. vii. 1) Paul addresses his readers as persons "who know the law." But this holds true not of born Jews alone but of Gentile Christians as well, to whom also the Old Testament was a sacred book. Mangold finds an "irrefragable evidence of the Jewish Christian character of the community in Rome" in Rom. vil. 4: "ye also, beloved brethren, have died to the law" (kat tpets eOavarwOnre ro vopw). If they have died to it they must of course have

once lived under it: so argues Mangold quite correctly. But the inference that

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? First of all in his essay " Ueber Zweck u. Veranlassung des Romer- briefs," in the Titbinger Zeitschr. f. Theol., 1836, hft. 38, p. 59 sq.

3 Der Romerbrief u. d. Anfinge der rémischen Gemeinde, Marburg, 1866 ; Der Rimerbrief u. seine geschichtlichen Voraussetzungen, Mar- burg, 1884.

*4 ** Ueber das geschichtliche Problem des Rémerbriefs," in Stud. w. Krit., 1867, p. 627 sq.*

® Der Rémerbrief, seinem Endzweck u. Gedankengang nach ausgelegt, Erlangen, 1858.

*§ **Ueber die alteste rémische Christengemeinde," in Jahrbb. f deutsche Theol., 1876, p. 248 sq.*

7 The words xara odpxa in Rom. iv. 1 are not to be construed with Tpotaropa Huay but with the verb evpnxévat. Abraham is thus de- signated as "our father " only in the spiritual and not in the physical sense.

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in such a case they must have been born Jews is neverthe- less a rash one. Not the Jews only, who possess the written law, but the whole of pre-Christian mankind are in Paul's conception ideally under the law,— under its bondage and curse. For all alike redemption is a redemp- tion from the law's penalty and dominion. Hence Paul can say even to born Gentiles, eGavardéOyre TO vopw. But according to Baur and Mangold the decisive evidence for the Jewish Christian character of the Roman Christians is the whole substance of the present epistle. All its arguments have for their aim to establish and vindicate the free gospel of Paul as against the objections of the Judaizers. They therefore conclude that it

can have been designed only for Judaistically-disposed readers whom Paul seeks by these representations to win for his gospel. This line of argument is at bottom sound, and Baur has rendered a real service by showing that the epistle is by no means an outline of the Pauline dogmatic as a whole, but is simply an elucidation of such points in it as were offensive to the Judaically-minded. A brief review of its contents will make this clear.

The epistle falls into two unequal parts,—a theoretical (i.-xi.) and a hortatory (xii.~~xvi.), The latter is almost of the nature of a mere appendix. The proper kernel of the cpistle, that for the sake of which it came to be written, is found in the theoretical exposition of the first eleven chap~~ ters. 'These again fall into two sections,—chaps. i.-v. laying the positive foundations of the Pauline gospel as freed from the law, and chaps. vi.-xi. containing the vindication of that gospel against objectors. Having shown directly in chaps. 1.-v. that we can attain righteousness and so salvation not along the path of legal observance but only along the path of faith, that is to say, believing apprehension of the mercy of God in Christ, he goes on in chap. vi. to refute point by point the positions of the Judaizers. He shows that in the freedom from the law the freedom to sin is by no means involved ; on the contrary, it is with the believer an inherent necessity that he should live a new life in his fellowship with Christ (chap. vi.), and precisely by that fellowship is he for the first time truly enabled so to live (chap. viii.). The law cannot give him this power ; it only commands, and does not at the same time give strength to obey. Hence, although good in itself, it has for men only a pernicious effect, inasmuch ag by its injunctions sinful desire is excited (chap. vii.). A special objection of the Judaizers against the activity of Paul was also this,—that he should have turned to the heathen while still the greater part of Israel remained unconverted. His answer to this is

contained in chaps. ix.~~xi. On the one hand, it is Israel's own fault to have rejected its salvation ; on the other hand, such has been God's will. Israel is at present rejected in order that the heathen may step into the gap thus made. Yet the rejection of Israel is only fora time. By the ad~~ mission of the heathen Israel is to be stirred to jealousy and thus at last to be also

converted. Precisely in such intricate paths as these is the wonderful depth of the divine wisdom made manifest.

Thus all the theoretical disquisitions of the epistle are in reality neither more nor less than a vindication and a polemic against the Jewish Christian point of view. But are we to conclude from this that the readers were them- selves Jewish Christians? Such an inference has against it the fact that Paul, both at the beginning and at the close of his epistle, clearly designates them as Gentile Christians. In i. 5, 6, and i. 13-15, as well as in xv. 15, 16, he appeals to his office as apostle of the Gentiles as justifying him in now writing to the church at Rome and in proposing further labours there. In xi. 13, also, the readers are spoken to as of Gentile birth. The arguments by which Baur and Mangold seek to weaken

the force of this passage are very far-fetched. If, then, the Roman Christians were Gentiles by blood, the theory of Beyschlag, that they were Gentile Christians in origin but Jewish Christians by conviction, appears to have most to commend it in view of the contents of the epistle. If the epistle stopped short at the end of chap. xili., we should indeed be compelled to adopt that theory. But the remaining chapters (xiv., xv.) suggest much rather that the majority were by conviction also Gentile Christians and emancipated from the law. For in the chapters specified Paul deals with a division that has arisen within the community. One section still remained in the bonds of the strictest legal scrupulosity : they regarded a vegetable diet (Adyava) as alone permissible, rejecting the use of animal food (xiv. 2), and they also observed certain days (xiv. 5), by which, there can be no doubt, the Jewish sabbaths and festivals must be under- stood. In fact they were legal Jewish Christians, but Jewish Christians who in their asceticism went beyond the precepts of Mosaism, which indeed prohibits the use of the flesh of unclean animals, but not animal food in general, Over against these Jewish Christian ascetics, called by Paul "the weak in the faith," stood another section, whom he describes as "the strong." They rejected these legal observances, taking their stand on the gospel as freed from the law. But the latter must have

been in the majority, for they are exhorted by the apostle to have a tender regard for the weakness of their brethren, and not by any harsh terrorism to force them into any courses which might offend their consciences. Such an exhortation, as Weizsiicker remarks, would have no meaning if the representatives of the freer view were not in the majority. The majority, then, of the church at Rome was Gentile Christian not only by origin but by conviction.

Here two problems arise, neither of which received sufficient attention from critics before Baur : (1) How are we to explain the origin, outside the limits of Paul's activity, of a Christian community thus free from the fetters of the law? and (2) How came it about that Paul should have addressed to such a community a letter like this,—adapted, as it appears to be, for Jewishly-inclined readers? As regards the first question, in the absence of adequate materials for a conclusive solution, our answer can only be conjectural. The problem is a difficult one, because, following Gal. ii., we must start with the assump- tion that the communities founded under the more direct influence of the original apostles did not reject the Jewish law. In seeking, then, to account for the existence of a community which had so done, we must carry with us the fact that within the wide limits of the Jewish Dispersion very various degrees of strictness in observance of the law were to be found. Even those who were in the truest sense members of the communities of the Dis- persion can hardly have observed the law as strictly as did the Pharisees in Palestine. But the demands made on those "' God-fearing" Gentiles who were wont to attach themselves, more or less closely, to the Jewish communi- ties must of course have been still more accommodating, If only they accepted the monotheistic religion and its worship without the use of images, the ceremonial pre- cepts laid upon them were reduced to a bare minimum,— the observance of Sabbaths, and also of some laws regard- ing meat. Now the community at Rome seems to have chiefly arisen out of the circles of such '" God-fearing" Gentiles. As Paul himself gained access for the preach- ing of the gospel, at Thessalonica, for example, principally among the "God-fearing Greeks" (Acts xvii. 4), so also in Rome do these seem to have been the main element in the church. On this assumption we can understand how

from the outset the community had not been in the habit of observing the Mosaic law. At most it was observed in isolated details, and as new members continued to be added from the outer heathen world these relics of Jewish custom received less and less prominence, fading away in presence of the faith in Jesus as the Redeemer. It is possible that influences from Pauline circles may also have come into play, but of this we cannot be sure.

Tf such were the circumstances in which the majority of the community in Rome had been brought to their attitude of freedom towards the law, that attitude was one of fact rather than of principle. The law was not observed ; but there was no clear consciousness that it had no obligatory force. A community thus placed had no firm basis from which to withstand a Judaizing agitation when it should arise. In such an event there was the greatest danger to its very existence. It is here, then, that we must look for the real occasion of the present epistle. Paul was afraid that the Judaizers who had wrought with such effect within the churches founded by himself in Galatia and Corinth might also lay hold on that at Rome. Perhaps they had already arrived there and the apostle knewit. At all events he perceived a threatening danger. He was unwill- ing to delay till he could visit the church personally, and accordingly sent forthwith an elaborate document in estab- lishment and vindication of the gospel as free from the law, so that the Roman Christians might be confirmed in their free practice and might be strengthened to withstand the agitations of Judaizers. This is the explanation of the fact that a letter addressed to a Gentile Christian church, not in bondage to the law, is yet almost entirely devoted to the refutation of the Judaistic positions.

The genuineness of the epistle is practically undisputed ; not so, however, its integrity. Baur (as had already been done by Marcion in ancient times) disputed the genuine- ness of the last two chapters (xv., xvi.), chiefly on the ground that in them a spirit of concession towards the weak is urged in a wholly un-Pauline manner. Lucht? has sought to separate out the genuine from the spurious in these chapters in a very complicated

manner, but substantially on the lines of Baur's criticism. The most thorough discussion of Baur's and Lucht's views is that of Mangold,? who has very convincingly shown that there is no real ground for refusing to attribute to the apostle the chapters in question. All the exhortations to concession do not, after all, go beyond the principle acted on by Paul himself (1 Cor. ix. 20),—"to the Jews I became as a Jew that I might win the Jews." In two points, however, the defence does not hold: (1) the doxology at the close (Rom. xvi. 25-27) appears certainly to be froin a later hand ; (2) ch. xvi. 3-20 seems to be genuinely Pauline indeed, but not to belong to the present epistle. Not only is the large number of salutations in a letter addressed to a community personally unknown to the apostle in itself strange ; but salutations also occur addressed to per- sons whom one would expect to find rather at Ephesus than at Rome (ver. 3, Aquila and Priscilla; ver. 5, Epzenetus) and in districts where the apostle had resided and laboured. (xvi. 7, 9, 13). Not without reason, therefore, is it con- jectured that here we have a fragment of an epistle to the Ephesians which by mistake has come to be incorporated with that to the Romans.4*

; Ueber die beiden letzten Kapitel des Rimerbriefes, Berlin, 1871. Der Réimerbrief u. s. gesch. Voraussetz., pp. 1-164.

® See Mangold, op. cit., pp. 44-81.

a See espeeially Mangold, op. ¢eit., pp. 147-164. Lightfoot (S¢ Poul's Epistle to the Philippians, 2d ed., pp. 169-176) has shown that many of the names met with in Rom. xvi. 3-20 are found precisely in Roman inscriptions of the period of the emperors, but the faet is more striking than convincing. The names in themselves are eommon. It is not to the names but to the persons charactcrized that we have

ROM—ROM

The more recent literature relating to the Epistle to the Romans has been fully catalogued and discussed in the work of Grafe (Ueber Verantlassung u. Zweck des Rimerbriefes, Tiibingen, 1881). The most important works in the list have already been named in the present article. (ES)

ROMANUS I. (Lecapenus), who shared the imperial throne with Constantine VII. (q.v.) and exercised all the real power from 919 to 944, was admiral of the By- zantine fleet on the Danube when, hearing of the defeat of the army at Achelous (17th August 917), he resolved to sail for Constantinople. Popular caprice as well as his influence over his sailors aided his ambition, and, after the marriage of his daughter Helena to Constantine, he was first proclaimed '"basileopater" in April 919 and afterwards crowned colleague of his son-in-law on 17th December of the same year. His reign, which was un- distinguished and uneventful, was terminated by his own sons Stephen and Constantine, who in 944 carried him off to the island of Prote and compelled him to become a monk. He died in 948.

ROMANUS IL. emperor of the East, succeeded his father Constantine VII. in 959 at the age of twenty-one, and died—poisoned, it was believed, by his wife, Theophano —in 963. He was a pleasure-loving sovereign, but showed judgment in the selection of his ministers. The great event of his reign was the conquest of Crete by Nicephorus Phocas. ;

ROMANUS III. (Argyrus), emperor of the East, was an accomplished but otherwise undistinguished member of the Byzantine aristocracy when, summoned to the palace of the dying Constantine VIII., he was informed that he had been selected to marry one of the imperial princesses and succeed the emperor. His hesitation as already a married man was removed by his wife, who generously took the veil; and his union with Zoe and their joint coronation were celebrated on 19th November 1028. Two days later Constantine died. A serious defeat which Romanus sustained in person at Azaz in Syria, when marching to take possession of Aleppo, considerably im- paired the popularity among his subjects which he had sought to purchase by lavish concession to various classes, and soon afterwards he began to show symptoms of disease, attributed by many to slow poison administered by con- nivance of the empress. His death took place on 11th April 1034, and he was forthwith succeeded by MicHaEn IV. (q.v.).

ROMANUS IV. (Diogenes), emperor of the East from 1068 to 1071, was a member of a distinguished Cappa- docian family and had risen to

distinction in the army when he was convicted of treason against the sons of Con- stantine X. While waiting execution he was summoned into the presence of their mother, Eudocia Macrembolitissa, the empress regent, whom he so fascinated that she granted him a free pardon and shortly afterwards married him. Taking the field soon after his coronation, he carried on three campaigns against the Saracens and Seljuk Turks without achieving any decisive success, and in a fourth he was disastrously defeated by Alp Arslan on the banks of the Araxes and taken prisoner. Released from captivity after promising to pay a large ransom and concluding a treaty of peace, he returned homewards only to find revolu- tion in full flood, and after a second defeat of his arms by the troops of Michael VII. he was compelled to resign the empire and retire to the island of Prote, where he soon died in great misery. It was during this reign that by the surrender of Bari (15th April 1071) the Byzantine empire lost its last hold upon Italy.

ROMAN WALL. See Anroninus, WALL oF, vol. ii. p. 139, and Haprian, Watt of, vol. xi. p. 364.

to look. But of these it is diffieult to believe that they should all have been living in Rome,

See Plate

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Rome a Latin city.

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ROME

PART IL—ROMAN HISTORY.

Section J.—Ancrenr History. I. The Beginnings of Rome and the Monarchy.

OTH the city and the state of Rome are represented iB in tradition as having been gradually formed by the fusion of separate communities. The original settlement of Romulus is said to have been limited to the Palatine Mount. With this were united before the end of his reign the Capitoline and the Quirinal; Tullus Hostilius added the Czelian, Ancus Martius the Aventine; and finally Servius Tullius included the Esquiline and Viminal, and enclosed the whole seven hills with a stone wall. The growth of the state closely followed that of the city. To the original Romans ou the Palatine were added succes- sively the Sabine followers of King Tatius, Albans trans- planted by Tullus, Latins by Ancus, and lastly the litruscan comrades of Celes Vibenna. This tradition is supported by other and more positive evidence. The race of the Luperci on February 15 was in fact a purification of the boundaries of the "ancient Palatine town,"! the "square Rome" of Ennius ;? and the course taken is that described by Tacitus as the "pomoerium" of the city founded by Romulus. On the Esquiline, Varro mentions an "ancient city" and an "earthen rampart,"4 and the festival of the Septimontium is evidence of a union between this settlement and that on the Palatine. The fusion of these " Mounts" with a settlement on the Quirinal "Hill" is also attested by trustworthy evidence ; and in parti- cular the line taken by the procession of the Argei repre- sents the enlarged boundaries of these united communities." Lastly, the Servian agger still remains as a witness to the final enclosure of the various settlements within a single ring-wall. But is tradition right in representing this fusion of distinct settlements as a fusion also of com- inunities of different race? Much of what it says on this point may be at once dismissed as fabulous. The tales of Adneas and his Trojans, of Evander and his Arcadians, of the followers of Heracles, and of the still earlier Aborigines have no claim to a place in history ;® we cannot accept the tradition to which the Romans clung with proud humility of the asylum opened by Romulus, or believe that the ancestors of the Romans were a mixed concourse of outlaws and refugees,® nor, while admitting the probability of the tradition that in remote tinies the **Sicels" had dwelt on the seven hills, can we allow them any part or lot in the historic Roman people.!° That this people were in the main homogeneous and in*

the main of Latin descent is unquestionable. Indications of the truth are not wanting even in the traditions themselves: King

Vewo, L. L., vi. 34.

? Fest., 258; Varro ap. Solinus, i. 17.

3 Tac., Ann., xii. 24. Fora full discussion of the exact limits of the Palatine city see Smith, Dict. Geog., s. v. "Roma"; Jordan, Lopog. d. Stadt Rom, i. cap. 2; Gilbert, Topog. u. Gesch. d. Stadt ftom, i. caps. 1, 2; and "Topography" below.

4L. L., v. 48; cf. ibid., 50.

> Festus, 348 ; Jordan, i. 199; Gilbert, i. 161. The seven "montes" are the Palatine with the Velia and Germalus, the Subura, and the three points of the Esquiline (Fagutal, Oppius, and Cispius).

5 See Mommsen, R. G. (7th ed.), i. 51.

7 Varro, L. L., v. 45, vii. 44; Jordan, ii, 237.

8 For these traditions see Dionys., i. 81-71.

° For a criticism of the myth of the asylum see Schwegler, R. G., i. 465 sq., who, however, exaggerates the mixed character of the Roman people. Hegel, Phil. d. Gesch., 345, takes the story seriously.

10 Dionys., i. 9$ Thuc., vi. 2; Dionys., i. 16, ii. 1.

Faunus who rules the Aborigines on the Palatine is Latin ; "TLatini" is the name assumed by the united Aborigines aud Trojans; the immediate progenitors of Rome are the Latin Lavinium and the Latin Alba. The evidence of the language, the religion, the institutions and civilization of early Rome points to the same conclusion. The speech of the Romans is from the first Latin ;!! the oldest gods of Rome—Saturn, Janus, Jupiter, Juno, Diana, &c.—are all Latin ; "rex," "praetor," "dictator," "'curia," are Latin titles and institutions.!2_ Geographically too the low hills by the Tiber form a part of the strip of coast-land from which the Latini took

their name, and the primitive settlements, with their earthen ramparts and wooden palisades planted upon them out of reach both of human foes and of the malaria of the swampy low grounds, are only typical of the mode of settlement which the conditions of life dictated throughout Latium.!® But tradition insists on the admix- ture of at least two non-Latin elements, a Sabine and an Etruscan, The question as regards the latter will be more fully discussed hereafter ; it is enough to say here that there is no satisfactory evidence that any one of the communities which combined to form Rome was Etruscan, or that there was any important Etruscan, strain in the Roman blood.! With the Sabines it is otherwise.*

That The

union of the Palatine and Quirinal settlements which ceded in

constituted so decisive a stage in the growth of Rome is represented as having been in reality a union of the original Latins with a band of Sabine invaders who had seized and held not only the Quirinal Hill but the northern and nearest peak of the Capitoline Mount. The tradition was evidently deeply rooted. The name of the Quirinal Hill itself was derived from the Sabine town of Cures.1® The ancient worships connected with it were said to be Sabine.1© One of the three old tribes, the Tities, was believed to represent the Sabine element ;!" the second and the fourth kings are both of Sabine descent. By the great majority of modern writers the substance of the tradition, the fusion of a body of Sabine invaders with the original Latins, is accepted as historical; and even Mommsen allows its possibility, though he throws back the time of its occurrence to an earlier period than that of the union of the two settlements.18 We cannot here enter into the

"The theory that Latin was a "mongrel speech" is now discarded; see Schwegler, i, 190, and Latin LANnauaGgE, vol. xiv. p. 327.

12 The title "rex" occurs on inscriptions at Lanuvium, Tusculum, Boville ; Henzen, Bullettino dell. Inst., 1868, p. 159; Orelli, 2279 g Corp. I. Lat., vi., 2125. For "dictator" and " praetor," see Livy, i, 23, viii. 3; ef. Marquardt, Rom. Staatsverwaltung, i. 475; tor "curia," Serv. on Zn. i. 17 ; Marquardt, i. 467.

8 Helbig, Die Italiker in d. Poebene; Pohlmann, Anfange Roms, 40; Abeken, Afittel-Italien, 61 sq.

14 The existence of a Tuscan quarter: (Tuscus vicus) in early Rome probably points to nothing more than the presence in Rome of Etruscan artisans and craftsmen. The Etruscan origin ascribed to the third tribe, the "Luceres," is a mere guess; see Schwegler, i. 504, and Lange, Rom. Alterth., i. 85.

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16 Varro, L. L., v. 74; Schweglcr, i. 248 sq. ; but Mommsen (R. G., i. 58) points out that most of these so-called Sabine deitics are at least equally Latin.

Varro, L. L., v. 553 Liwyy i 18.

8 Mommsen, &. G., i. 48, Schwegler (R. G., i. 478) accepts the tradition of a Sabine settlement on the Quirinal, and considers that in the united state the Sabine element predominated. Volquardsen (Rhein. Mus., xxxiii. 559) believes in a complete Sabine conquest ; and so does Zdller (Latium u. Rom, Leipsic, 1878), who, however, places it after the expulsion of the Tarquins. Gilbert (Topogr., 1. cap. 5) accepts the Sabine settlement, but holds rightly that in the union the Latin element decisively predominated,

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The early state.

The people.

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question at length, but two statements may be safely made respecting it. The Sabine invasion, if it took place at all, must have taken place far back in the prehistoric age; it must have been on a small scale ; and the Sabine invaders must have amalgamated easily and completely with the Latin settlers. The structure of the early Roman state, while it bears evident

marks of a fusion of communities, shows no traces of a mixture of race. Nor is it easy to point to any provably Sabine element in the language, religion, or civilization of primitive Rome.1 The theory of a Sabine conquest can hardly be maintained in the face of the predominantly Latin character of both people and institutions. On the other hand, the probability of a Sabine raid and a Sabine settlement, possibly on the Quirinal Hill, in very early times may be admitted. The incursions of the highland Apennine tribes into the lowlands fill a large place in early Italian history. The Latins were said to have originally descended from the mountain glens near Reate.2 The invasions of Campania and of Magna Grecia by Sabellian tribes are matter of liistory, and the Sabines themselves are represented as a restless highland people, ever seeking new homes in richer lands. In very early days they. appear on tlie borders of Latium, in close proximity to Rome, and Sabine forays are familiar and frequent occurrences in the old legends.

Such is all we know of the manner in which the separate settlements on the seven hills grew into a single city and community. How long Rome took in the making, or when or by whom the work was completed, we cannot say. Nor is it possible to give more than a very meagre outline of the constitution and of the history of the united state in the early days of its existence.

The " populus Romanus" was, we are told, divided into three tribes, Ramnes, Tities, and Luceres, and into thirty "curiae." The three tribes probably represent a primitive clan division, older than the Roman state itself. They survived in later times only as divisions of the ancient "equitum centuriae," and even in the accounts of the earliest constitution they have ceased to serve as a political division of the people.' Of far greater importance is the division into "curiae." In Cicero's time there were still curies, curial festivals, and curiate assemblies, and modern authors are unquestionably right in regarding the curia as the keystone of the primitive political system. It was a primitive association held together by participa- tion in common "'sacra," and possessing common festivals, common priests, and a common chapel, hall, and hearth. The members of a curia were very probably neighbours and kinsmen, but the curia seems to represent a stage in political development midway between that in

which clan- ship is the sole bond of union and that in which such claims as those of territorial contiguity and ownership of land have obtained recognition. As separate associations the curiz

1 See Momunsen, i. 48. The Sabine words in Latin, if not common to both dialects, were probably introduced later, or are Sabinized Latin (Mommsen, Unterital. Dialekten, 347). Schwegler's attempt to distinguish Sabine features in the Roman character is ingenious but unsatisfactory.

2 Cato ap. Dionys., ii. 48, 49.

3 Cato ap. Dionys., ii. 48, 49. For the institution of the "ver sacrum" see Schwegler, Rém. Gesch., i. 240 ; Nissen, Templum, iv.

- *The tradition connecting the Ramnes with Romulus and the Tities with Tatius is as old as Ennius (Varro, L. Z., v. 55). Mommsen (i. 41) explains Ramnes as= Romani, but this etymology is rejected by Schwegler and by Corssen. As regards the Luceres there is little to add to Livy's statement (i. 13), "nominis et originis causa incerta est. _ Cf., on the whole question, Schwegler, i. 505, and Volquardsen Rhein. Mus., xxxiii, 538.*

34 They are traditionally connected only with the senate of 300 patres, with the primitive legion of 3000, with the vestal virgins, and with the augurs (Varro, Z. L., v. 81, 89, 91; Livy, x. 6; Festus, 344; Mommsen, i. 41, 74, 75 ; Genz, Patricisch. Rom, 90),

are probably older than the Roman state, but,® however this may be, it is certain that of this state when formed they constituted the only effective political subdivisions. The members of the thirty curie are the populus Romanus, and the earliest known condition of Roman citizenship is the "'communio sacrorum," partnership in the curial "sacra." Below the curia there was no further political division, for there is no reason to believe that the curia was ever formally subdivided into a fixed number of

gentes and families.' Nor can we assent to the view which would represent the curiz as containing only the "patrician gentes." The primitive Roman people of the thirty curize included all the freemen of the community, siniple as well as gentle.§

At their head was the "rex," the ruler of the united The king. ' 5

people. The Roman "king" is not simply either the hereditary and patriarchal chief of a clan, the priestly head of a community bound together by common sacra, or the elected magistrate of a state, but a mixture of allthree.® In later times, when no " patrician magistrates " were forthcoming to hold the elections for their successors, a procedure was adopted which was believed to represent tle manner in which the early kings had been appointed.® In this procedure the ancient privileges of the old "oentes" and their elders, the importance of maintaining unbroken the continuity of the "sacra," on the trans- mission and observance of which the welfare of the com- munity depended, and thirdly the rights of the freemen, are all recognized. On the death of a king, the auspicia, and with them the supreme authority, revert to the council of elders, the " patres," as representing the "gentes." By the "patres" an "interrex" is appointed, who in turn nominates a second; by him, or even by a third or fourth interrex, a new king is selected in consultation with the "patres." The king-designate is then proposed to the freemen assembled by their curise for their acceptance, and finally their formal acceptance is ratified by the " patres," as a security that the "sacra" of which they are the guardians have been respected.!!_ Thus the king is in the first instance selected by the representatives of the old gentes, and they ratify his appointment. In form he is nominated directly by a predecessor from whose hands he receives the auspicia. But it is necessary also that the choice of the patres and the nomination of the interrex should be confirmed by a solemn vote of the community. It is useless to attempt a precise definition of the prerogatives of the king when once installed in office. Tradition ascribes to hin a position and powers closely

6 It is possible that the curie were originally connected with separate localities; ¢f such names as Foriensis, Veliensis (Fest., 174; Gilbert, i. 218).

7 Niebuhr's supposition of ten gentes in each curia kas nothing in its favour but the confused statement of Dionysius as to the purely nlilitary 5€kades (Dionys., ii. 7; of. Miiller, Phdlologus, xxxiv. 96).

8 The view taken here on the vexed question of the purely patrician character of the curiz is that of Mommsen (Rom. Forschungen, vol. i.).

® Rubino, Genz, and Lange insist on the hereditary patriarchal character of the kingship, Ihne on its priestly side, Schwegler on its elective. Mommsen comes nearest to the view taken in the text, but fails to bring out the nature of the compromise on which the kingship rests.

0 Cic. De Legg., iii. 8; Livy, iv. 7.

11 " Patres auctores facti," Livy, i. 22; '* patres fuere auctores," Id., i. 82. In 386 B.c. (Livy, viii. 12) the Publilian law directed that this sanction should be given beforehand, " ante initum suffragium," and thus reduced it to a meaningless form (Livy,i. 11). It is wrongly identified by Schwegler with the "lex curiata de imperio," which in Cicero's day followcd and did not precede election. According to Cicero (De Rep., ii. 18, 21), the proccedings included, in addition to the "creation" by the comitia curiata and the sanction of the patres, the introduction by the king himself of a lex curiata conferring the imperium and auspicia; but this theory, though generally accepted, is probably an inference from the practice of a later time, when the "ereatio" had been transferred to the " comitia centuriata."'*

The senate.

The assembly.

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resembling those of the heroic kings of Greece. He rules for life, and he is the sole ruler, unfettered by written statutes. He is the supreme judge, settling all disputes and punishing wrongdoers even with death. All other officials are appointed by him. He imposes taxes, dis- tributes lands, and erects buildings. Senate and assembly meet only when he convenes them,

and meet for little else than to receive communications from him. In war he is absolute leader,! and finally he is also the religious head of the community. It is his business to consult the gods on its behalf, to offer the solemn sacrifices, and to announce the days of the public festivals. Hard by his house was the common hearth of the state, where the vestal virgins cherished the sacred fire.

By the side of the king stood the senate, or council of elders. In the descriptions left us of the primitive senate, as in those of the "rex," we can discover traces of a transition from an earlier state of things when Rome was only an assemblage of clans or village communities, allied indeed, but each still ruled by its own chiefs and headmen, to one in which these groups have been fused into a single state under a common ruler. On the one hand the senate appears as a representative council of chiefs, with inalien- able prerogatives of its own, and claiming to be the ultimate depository of the supreme authority and of the "sacra" connected with it. The senators are the " patres "; they are taken from the leading "' gentes" ; they hold their seats for life; to them the "auspicia" revert on the death of a king ; they appoint the interrex from their own body, are consulted in the choice of the new king,? and their sanction is necessary to ratify the vote of the assembled freemen. On the other hand they are no longer supreme. They cannot appoint a king but with the consent of the community, and their relation to the king when appointed is one of subordination. Vacancies in their ranks are filled up by him, and they can but give him advice and counsel when he chooses to consult them.

The popular assembly of united Rome in its earliest days was that in which the freemen met and voted by their curiz (comitia curiata'), The assembly met in the comitium at the north-east end of the forum,' at the summons and under the presidency of the king or, failing him, of the "interrex." By the "rex" or 'interrex " the question was put, and the voting took place "curiatim," the curiz being called up in turn. The vote of each curia was decided by the majority of indivi- dual votes, and a majority of the votes of the curie determined the final result. But the occasions on which the assembly could exercise its power must have been few. Their right to elect magistrates was apparently limited to the

acceptance or rejection of the king proposed by the interrex. Of the passing of laws, in the later sense of the term, there is no trace in the kingly period. Dionysius's statement ® that they voted on questions of war and peace is improbable in itself and unsupported by tradition. They are indeed represented, in one instance, as deciding a capital case, but it is by the express permis- sion of the king and not of right.6 Assemblies of the people were also, and probably more frequently, convened for other purposes. Not only did they meet to hear from the king the announcement of the high days and holidays for each month, and to witness such solemn religious rites aS the inauguration of a priest, but their presence (and

1 For the references, see Schwegler, i. 646 sq.

- *If the analogy of the "rex sacrorum" is to be trusted, the "king " could only be chosen from the ranks of the ''patricii." Cic. Pro Domo, 14; Gaius, i. 122.*

3 Cie. De Rep., ii. 18; Dionys., ii. 14, &c.

4 Varro, L. L., v. 155. For the position of the "comitium," see Smith, Dict. Geog., s.v. " Roma," and Jordan, Topog. d. Stadt Rom.

- *Dionys., dc. 6 Livy, i. 26; Dionys., iii, 22.*

sometimes their vote) was further required to authorize and attest certain acts, which ina later age assumed a more private character. The disposal of property by will? and the solemn renunciation of family or gentile "sacra "8 could only take place in the presence of the assenibled freemen, while for adoption® (arrogatio) not only their presence but their formal consent was necessary.

Such in outline was the political structure of the Roman state at the earliest period known to us. It is clear that it belongs to a comparatively advanced stage in the development of society, and that a long previous

history lies behind it. Traces of an older and more primitive order of things still linger in the three ancient shadowy tribes, in the curie and gentes, in many of the features noticeable in the senate; but they are traces of an order that has passed away. The supremacy of the state is established over the groups out of whose fusion it has grown, and such of these groups as still retain a distinct existence are merely private corporations. Private differ- ences are settled and wrongdoers punished by the state tribunals, and even within the close limits of the family the authority of the head is limited by the claims of the state upon the services of the sons and dependants.

A history of this early Roman state is out of the ques- Rome The names, dates, and achievements of the first under

tion. four kings are all too unsubstantial to form the basis of a i sober narrative ;1° a few points only can be considered as fairly well established. If we except the long eventless reign ascribed to King Numa, tradition represents the first kings as incessantly at war with their immediate neigh- bours. The details of these wars are no doubt mythical ; but the implied condition of continual struggle, and the narrow range within which the struggle is confined, may be accepted as true. The picture drawn is that of a small community with a few square miles of territory, at deadly feud with its nearest neighbours, within a radius of some 12 miles round Rome. Nor, in spite of the repeated victories with which tradition credits Romulus, Ancus, and Tullus, does there seem to have been any real extension of Roman territory except towards the sea. Fidenz remains Etruscan; the Sabines con- tinue masters up to the Anio; Preneste, Gabii, and Tusculum are still untouched; and on this side it is doubt- ful if Roman territory, in spite of the possible destruction of Alba, extended to a greater distance than the sixth milestone from Rome.!! But along the course of the Tiber below the city there was a decided advance. The fortifi- cation of the Janiculum, the building of the "pons sublicius," the foundation of Ostia, and the acquisition of the saltworks near the sea may all be safely ascribed to this early period. Closely connected, too, with the control of the Tiber from Rome to the sea was the subjugation of the petty Latin communities lying south of the river; and the tradition of the conquest and destruction of Poli- torium, Tellenz, and Ficana is

confirmed by the absence in historical times of any Latin communities in this district.

With the reign of the fifth king Tarquinius Priscus a The marked change takes place. the last three kings not only wear a more historical air

? Gaius, ii. 101. 8 Gell., xv. 27.

® Gell., v. 19, "Comitia praebentur, quae curiata appellantur." Cf. Cie. Pro Domo, 18, 14; and see Roman Law.

10 By far the most complete criticism of the traditional accounts of the first four kings will be found in Schwegler's Rém. Geschichte, vol. i.; compare also Ihne's Zarly Rome, and Sir G. C. Lewis's Credibility of Karly Roman History.

U The "fossa Cluilia," 5 miles from Rome (Livy, ii. 39), is regarded by Schwegler (i. 585) and by Mommsen (i. 45) as marking the Roman frontier towards Latium. Cf. Ovid., Fast., ii. 681; Strabo, 230, "peratd yotv tod wéumrrov nad tod Exrov Alou. . . Témos Pijoro. . . dpioy THs TéTe 'Pwuatwy vis."

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The traditional accounts of Tarquins.

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than those of the first four, but they describe something like a transformation of the Roman city and state. Under the rule of these latter kings the separate settle- ments are for the first time enclosed with a rampart of colossal size and extent.1 The low grounds are drained, and a forum and circus elaborately laid out; on the Capitoline Mount a temple is erected, the massive founda- tions of which were an object of wonder even to Pliny.? To the same period are assigned the redivision of the city area into four new districts and the introduction of a new military system. The kings increase in power and surround themselves with new splendour. Abroad, too, Rome suddenly appears as a powerful state ruling

far and wide over southern Etruria and Latium. These startling changes are, moreover, ascribed to kings of alien descent, who one and all ascend the throne in the teeth of estab- lished constitutional forms. Finally, with the expulsion of the last of them—the younger Tarquin—comes a sudden shrinkage of power. At the commencement of the republic Rome is once more a comparatively small state, with hostile and independent neighbours at her very doors. It is difficult to avoid the conviction that the true explanation of this phenomenon is to be found in the supposition that Rome during this period passed under the rule of powerful Etruscan lords. In the 7th and 6th centuries B.c., and probably earlier still, the Htruscans appear as ruling widely outside the limits of Etruria proper. They were supreme in the valley of the Po until their power there was broken by the irruption of Celtic tribes from beyond the Alps, and while still masters of the plains of Lombardy they established themselves in the rich lowlands of Campania, where they held their ground until the capture of Capua by the Samnite high- landers in 423 B.c. It is on the face of it improbable that a power which had extended its sway from the Alps to the Tiber, and from the Liris to Surrentum, should have left untouched the intervening stretch of country between the Tiber and the Liris. Nor are we without evidence of Etruscan rule in Latium. According to Dionysius there was a time when the Latins were known to the Greeks as Tyrrhenians, and Rome as a Tyrrhenian city.© When Aineas landed in Italy the Latins were at feud with Turnus (Turrhenos? Dionys., i. 64) of Ardea, whose close ally is the ruthless Mezentius, prince of Cere, to whom the Latins had been forced to pay a tribute of wine.® Cato declared the Volsci to have been once sub- ject to Etruscan rule,' and Etruscan remains found at Velitre,® as well as the second name of the Volscian Auxur, Tarracina (the city of Tarchon), tend to confirm lis statement. Nearer still to Rome is Tusculum, with its significant name, and at Alba we hear of a prince Tapyxérvos,® lawless and cruel like Mezentius, who consults the "oracle of Tethys in Tyrrhenia." Thus we find the Etruscan power encircling Rome on all sides, and in Rome itself a tradition of the rule of princes of Etruscan origin. The Tarquinii come from South Etruria; their name can hardly be anything else than the Latin equivalent of the Etruscan Tarchon, and is therefore possibly a title*

1 Livy, i. 36.

2 Livy, i. 38, 55; Plin., NV. i, xxxvi, 15.

3 This is the view of O. Miiller, and more recently of Deecke, Gardthausen, and Zéller; it is rejected by Schwegler. Mommscn accepts the Etruscan origin of the Tarquins, but denics that it proves an Etruscan rule in Rome.

_ Zoller, Latium u. Rom, 166, 189; Gardthauscn, Mastarna (Leipsic, 1882); Cuno's Verbreitung d. Etr. Stammes (Graudenz, 1880) is highly fanciful. 5 Dionys., i. 29.

6 Livy, i. 2; Dionys., i. 64, 65; Plut., Q. R., 18.

7 Cato ap. Serv., din., xi. 567.

8 Helbig, Ann. d. Inst., 1865.

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Z Plut., fom., 2, wapavoudratos kal dudtaros; of. Rutulian arquitius, Virg., Jn., x. 550.

M E [1ISTORY. (= "lord" or "prince") rather than a proper name,10 Even Servius Tullius was identified by Tuscan chroniclers with an Etruscan " Mastarna."!! Again, what we are told of Etruscan conquests does not represent them as moving, like the Sabellian tribes, in large bodies and settlmg down en masse in the conquered districts. We hear rather of military raids led by ambitious chiefs who carve out principalities for themselves with their own good swords, and with their followers rule oppressively over alien and subject peoples.!2 And so at Rome the story of the Tarquins implies not a wave of Etruscan immigration so much as a rule of Etruscan princes over conquered Latins.

The achievements ascribed to the Tarquins are not less characteristic. Their despotic rule and splendour contrast with the primitive simplicity of the native kings. Only Etruscan builders, under the direction of wealthy and powerful Etruscan lords, could have built the great cloaca, the

Servian wall, or the Capitoline temple,—monu- ments which challenged comparison with those of the emperors themselves. Nor do the traces of Greek influ- ence upon Rome during this period } conflict with the theory of an Etruscan supremacy ; on the contrary, it is at least possible that it was thanks to the extended rule and wide connexions of her Etruscan rulers that Rome was first brought into direct contact with the Greeks, who had long traded with the Etruscan ports and influenced Etruscan culture.*

These Etruscan princes are represented, not only as hav- The

ing raised Rome for the time to a commanding position in Latium and lavished upon the city itself the resources of Etruscan civilization, but also as the authors of important internal changes. They are represented as favouring new men at the expense of the old patrician families, and as reorganizing the Roman army on a new footing, a policy natural enough in military princes of alien birth, and rendered possible by the additions which conquest had made to the original community. From among the lead- ing families of the conquered Latin states a hundred new members were admitted to the senate, and these gentes thenceforth ranked as patrician, and became known as "gentes minores."!5 The changes in the army begun, it is said, by the elder Tarquin and completed by Servius Tullius were more important. The basis of the primitive military system had been the three tribes, each of which furnished 1000 men to the legion and 100 to the cavalry.!® Tarquinius Priscus, we are told, contemplated the creation of three fresh tribes and three additional centuries of horsemen with new names," though in face of the opposi- tion offered by the old families he contented himself with simply doubling the strength without altering the names of the old divisions. But the change attributed to

10 Miiller-Deecke, i. 69, 70; Zoller, Latium u. Rom, 168; ef Strabo, p. 219; Serv. on 4n., x. 179, 198. The existence of an independent "gens Tarquinia" of Roman extraction (Schwegler, i. 678) is unproven and unlikely. Nor can "Tarquinius" mean " of Tarquinii"; this would require " Tarquiniensis " as a cognomen.

11 See speech of Claudius, Tab. Lugd., App. to Nipperdey's edition of the Annals of Tacitus, "Tusce Mastarna ei nomen erat." For the painting in the Francois tomb at Vulci, see Gardthansen, Afastarna, 29 sq. ; Annalt dell. Instit., Rome, 1859.

12° OF the traditions of Mezentius, of Celes Vibenna, Porsena, &c.

13 Schwegler, R. G., i. 679 sq.

M4 Schwegler, i. 791, 792. He accepts as genuine, and as represent- ing the extent of Roman rule and connexions under the Tarquins, the first treaty between Rome and Carthage mentioned by Polybius (iii. 22); see, for a discussion of the question, Vollmer, Rhein. Afus., xxxii. 614 sq. ; Mommsen, Rém. Chronologte, 20; Dyer, Journ. of Philol., ix. 238. Livy, i. 853; Dionys., iii, 67; Cic. De Rép., ii. 20.

16 Varro, ZL. L., v. 89. W Livy, i. 86; Dionys., iii. 71.

18 The six centuries of horsemen were thenceforward known as "primi secundique Ramnes " (Fest., 344; cf Schwegler, i. 685 sq.).

It is possible that the reforms of Tarquinius Priscus were limited to the cavalry.

THE MONARCHY. |

Servius Tullius went far beyond this. Ilis famous distri- bution of all freeholders (assidui) into tribes, classes, and centuries,! though subsequently adopted with modifica- tions as the basis of the political system, was at first ex- clusively military in its nature and objects.2 It amounted in fact to the formation of a new and enlarged army on a new footing. In this force, excepting in the case of the centuries of the horsemen, no regard was paid either to the old clan divisions, or to the semi-religious semi- political curie. In its ranks were included all free- holders within the Roman territory, whether members or not of any of the old divisions, and the organization of this new army of assidui was not less independent of the old system with its clannish and religious traditions and forms. The unit was the "centuria" or company of 100

men; the centurize were grouped in "classes" and drawn up in the order of the phalanx. The centuries in front were composed of the wealthier citizens, whose means enabled them to bear the cost of the complete equipments necessary for those who were to bear the brunt of the onset. These centuries formed the first class. Behind them stood the centuries of the second and third classes, less completely armed, but making up together with those of the first class the heavy-armed infantry. In the rear were the centuries of the fourth and fifth classes, recruited from the poorer freeholders, and serving only as light- armed troops. The entire available body of freeholders was divided into two equal portions, a reserve corps of "seniores" and a corps of "juniores" for active service. Each of these corps consisted of 85 centuries or 8500 men, i.e., of two legions of about 4200 men each, the normal strength of a consular legion under the early republic.> It is noticeable also that the heavy-armed centuries of the three first classes in each of these legions represented a total of 3000 men, a number which agrees exactly with the number of heavy-armed troops in the legion as described by Polybius. Attached to the legions, but not included in them, were the companies of sappers and trumpeters. Lastly, to the six centuries of horsemen, which still retained the old tribal names, twelve more were added as a distinct body, and recruited from the wealthiest class of citizens.6 The four " tribes" also insti- tuted by Servius were probably intended to serve as the basis for the levy of freeholders for the new army.' As their names show, they corresponded with the natural local divisions of the city territory,® but that they included freeholders residing on Roman territory but out- side Rome is indicated by the fact that both Ostia and Alba belonged to the Palatine tribe.°*

1 Cic, De Rep., ii. 22; Livy, i. 42; Dionys., iv. 16.

2 This is recognized by Mommsen, Genz, and Soltau, as against Niebuhr, Schwegler, and Ihne. Even in the later "comitia cen- turiata" the traces of the originally military character of the organ- ization are unmistakable.

3 The century ceased to represent companies of one hundred when the whole organization ceased to be military and became exclusively political.

4 The property qualification for service in the first class is given at 100,000 asses (Livy), for the second at 70,000, third 50,000, fourth 25,000, fifth 11,000. It was probably originally a certain acreage in land, afterwards translated into terms of money ; ¢f. Mommsen, Rom. Tribus, 115.

- *Polyb., vi. 20; Mommsen, Rim. Trib., 132 sq.*

6 Livy, i. 48. Dionys. (iv. 18) and Cic. (De Rep., ii. 22) ascribe the whole eighteen to Servius. But the six older centuries remained distinct, as the "'sex sulfragia" of the comitia centuriata; Cic. De Mvepe,) We 22.

7 Dionys., iv. 14, eis ras karaypapas Tay oTpaTiwTay.

8 Livy, i. 48. The four were Palatina, Suburana, Hxquilina, Collina.

® See Grotefend, Imperium R. tributim descriptum, 27, 67. The inclusion of landless men (" proletarii") in the tribes belongs to a later time, when the tribes had ccased to have a purely military significance ; ¢f. the formation of a ceutury of " capite censi."'

ROM 139

The last of these Etruscan lords to rule in Rome was Fall of Tarquin the Proud. He is described as a splendid and the mon-

despotic monarch. His sway extended over Latiuin as far south as Circeii. Aristodemus, tyrant of Cume, was his ally, and kinsmen of his own were princes at Collatia, at Gabii, and at Tusculum. The Volscian high- landers were chastised, and Signia with its massive walls was built to hold them in check. In Rome itself the Capitoline temple and the great cloaca bore witness to his power. But his rule pressed heavily upon the Romans, and at the last, on the news of the foul wrong done by his son Sextus toa noble Roman matron, Lucretia, the indignant people rose in revolt. Tarquin, who was away besieging Ardea, was deposed ; sentence of exile was passed upon him and upon all his race; and the people swore that never again should a king rule in Rome. Freed from the tyrant, they chose for themselves two yearly magistrates who should exercise the "supreme

authority, and thus the republic of Rome was founded. Three times the banished Tarquin strove desperately to recover the throne he had lost. First of all the men of Veii and Tarquinii marched to his aid, but were defeated in a pitched battle on the Roman frontier. A year later Lars Porsena, prince of Clusium, at the head of all the powers of Etruria, appeared before the gates of Rome, and closely besieged the city, until, moved by the valour of his foe, he granted honourable terms of peace and withdrew.!? Once again, by Lake Regillus, the Romans fought victoriously for their liberty against Tarquin's son-in-law Mamilins, prince of Tusculum, and chief of the Latin name. Mamilius was slain; Tarquin in despair found a refuge at Cuma, and there soon afterwards died.

So, in brief, ran the story of the flight of the kings, as it was told by the chroniclers whom Livy followed. Its details are most of them fabulous; it is crowded with inconsistencies and improbabilities; there are no trust-worthy dates; the names even of the chief actors are probably fictitious, and the hand of the improver, Greek or Roman, is traceable throughout. The struggle was doubtless longer and sharper, and the new constitution more gradually shaped, than tradition would have us believe. Possibly, too, this revolution in Rome was but a part of a widespreading wave of change in Latium and central Italy, similar to that which in Greece swept away the old heroic monarchies. But there is no room for doubting the main facts of the emancipation of Rome from the rule of alien princes and the final abolition of the kingly office.

II. The Republic.

Pertop I.: 509-265 3.c.l2—(a) The Struggle between the 245-489 Orders. —It is characteristic of Rome that the change from 4-¥-°.

monarchy to republic!® should have been made with the least possible disturbance of existing forms. The title of king was retained, though only as that of a priestly officer (rex sacrorum) to whom some of the religious functions of the former kings were transferred. The two annually elected consuls, or "' praetores,"!4 were regarded as joint heirs of the full kingly authority, and as holding the "imperium," and the correlative right of auspices, by

10 Livy, ii. 9-14. Pliny (W. W7., 34, 14) and Tacitus (Anm., iii. 72) imply the existence of a tradition, possibly that of " Tuscan annalists,"' according to which Porsena actually made himself master of Rome. The whole story is fully criticized by Schwegler (ii. 181 sq.) and Zoller (Latiwm u. Rom, p. 180).

11 See the exhaustive criticism in Schwegler (ii. pp. 66-208).

12 The dates in the margin throughout are the years from the foundation of the city.

13 Schwegler (ii. 92) suggests that the dictatorship formed an intermediate step between the monarchy and the consulate; cf. Ihne, im. Forsch., 42.

1 For the title " praetor," sec Mommsen, Staatsrceht, ii. 70, note.

direct transmission from the founder of the city. They were, it is true, elected or created by a new assembly, by the army of freeholders voting by their classes and centuries (comitia centuriata), and to this body was given also the right of passing laws ; but nevertheless it was still by a vote of the 30 curies (lex curiata) that the supreme authority was formally conferred on the magistrates chosen by the centuries of freeholders, and both the choice of magistrates and the passing of laws still required the sanction of the patrician senators (patrum auctoritas).! Nor, lastly, were the legal prerogatives of the senate altered, although it is probable that before long plebeians were admitted to seats, if not to votes, and though its importance was gradually increased by the substitution of an annual magistracy for the life-long rule of a single king. But the abolition of the monarchy brought with it a change of the utmost importance in the actual working of. the constitution. Though the distinction between patricians and plebeians was at least as old as the state itself, it is not until the establishment of the republic that it plays any part in the history of Rome. No sooner, however, was the overshadowing authority of the king removed than a struggle commenced between the two orders which lasted for more than two centuries. It was in no sense a struggle between a

conquering and a con- quered class, or between an exclusive citizen body and an unenfranchised mass outside its pale.? Patricians and plebeians were equally citizens of Rome, sprung of the same race and speaking the same tongue. The former were the members of those ancient "'gentes" which had possibly been once the "chiefly" families in the small communities which preceded the united state, and which claimed by hereditary right a privileged position in the community. Only patricians could sit in the council of patres, and hence probably the name given to their order.3 To their representatives the supreme authority reverted on the death of the king; the due transmission of the auspicia and the public worship of the state gods were their special care ; and to them alone were known the tra- ditional usages and forms which regulated the life of the people from day to day. To the "plebs" (the multitude, 7700s) belonged all who were not members of some patrician gens, whether independent freenien or attached as "clients" to one of the great houses. The plebeian was a citizen, with civil rights and a vote in the assembly of the curies, but he was excluded by ancient custom from all share in the higher honours of the state, and inter- marriage with a patrician was not recognized as a properly legal union.*

The revolution which expelled the Tarquins gave the patricians, who had mainly assisted in bringing it about, an overwhelming ascendency in the state. The plebs had indeed gained something. Not only is it probable that the strictness of the old tie of clientship had somewhat relaxed, and that the number of the "clientes" was smaller and their dependence on patrician patrons less complete, but the ranks of the plebs had, under the later kings, been swelled by the admission of conquered Latins, and the freeholders among these had with others been enrolled in the Servian tribes, classes, and centuries. The establish- ment of the republic invested this military levy of free-

7 'The present writer has adopted the view of the " patrum auctori- tas taken by Mommsen (Forsch., i.). Others identify it with the

lex curiata," or at least closely connect the two.

eC Here again the present writer has in the main followed Mommsen, as against Schwegler, Ihne, Zoller, and others.

3 Of. “aedilis,” “aedilicius,” é&e.; Cie, De Rep. it, 12. Wivy, i,%8: For a full discussion of other views, see Soltau, 179 sq. ; Christensen Hermes, ix. 196. ‘ ,

4 For the “clientela,”

(i. 638), see Mommsen (Forsch., i.) and Schwegler

holders with political rights as an assembly, for by their votes the consuls were chosen and laws passed, and it was the plebeian freeholders who formed the main strength of the plebs in the struggle that followed. But these gains were greater in appearance than in reality. The plebeian freeholders commanded only a minority of votes in the comitia centuriata. In their choice of magistrates they were limited to the patrician candidates nominated by patrician presiding magistrates, and their choice required confirmation not only by the older and smaller assembly of the curiz, in which the patricians and their clients pre- dominated, but also by the patrician patres. They could only vote on laws proposed by patrician consuls, and here again the subsequent sanction of the patres was necessary. The whole procedure of the comitia was in short absolutely in the hands of their patrician presidents, and liable to every sort of interruption and suspension from patrician pontiffs and augurs.

But these political disabilities did not constitute the main grievance of the plebs in the early years of the re- public. What they fought for was protection for their lives and liberties, and the object of attack was the despotic authority of the patrician magistrates. The consuls wielded the full “imperium” of the kings, and against this “‘con- sular authority” the plebeian, though a citizen, had no protection and no appeal, and matters were only worse when for the two consuls was substituted in some emer- gency a single, all-powerful, irresponsible dictator. In Rome, as in Greece, the first efforts of the people were directed against the arbitrary powers of the executive magistrate.

*The history of this struggle between the orders opens with a concession made to the plebs by one of the consuls themselves, a concession possibly due to a desire to secure the allegiance of the plebeian freeholders, who formed the backbone of the army. In the very first year of the republic, according to the received chronology, P. Valerius Poplicola carried in the comitia centuriata his famous law of appeal.' It enacted that no magistrate, saving only a dictator, should execute a capital sentence upon any Roman citizen unless the sentence had been confirmed on appeal by the assembly of the centuries. But, though the "right of appeal" granted by this law was justly regarded in later times as the greatest safeguard of a Roman's liberties, it was by no means at first so effective a pro- tection as it afterwards became. For not only was the operation of the law limited to the bounds of the city, so that the consul in the field or on the march was left as absolute as before, but no security was provided for its observance even within the city by consuls resolved to disregard it. *

It was by their own efforts that the plebeians first obtained any real protection against magisterial despotism. The traditional accounts of the first secession are con- fused and contradictory,® but its causes and results are tolerably clear. The seceders were the plebeian legionaries recently returned from a victorious campaign. Indignant at the delay of the promised reforms, they ignored the order given them to march afresh against Volsci and Aiqui, and instead entrenched themselves on a hill across the Anio, some three miles from Rome, and known afterwards as the Mons Sacer. The frightened patricians came to terms, and a solemn agreement (lex sacrata)' was con- cluded between the orders, by which it was provided that henceforth the plebeians should have annual magistrates of their own (tribuni plebis), members of their own order, who should be authorized to protect them against the

> Livy, ii. 8, lex Valeria de provocatione; Cic. De Rep., ii. 31; cf. Livy, iii. 20. 6 Schwegler, ii. 226 sq. ? Schwegler, ii. 251, note; Livy, i. 33.

Lex Valeria

@ provo- |

catione,

The first secession and the tribunate.

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Lex Publilia.

283.

Agrarian agitation.

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consuls,! and a curse was invoked upon the man who should injure or impede the tribuue in the performance of his duties.2. The number of tribunes was at first two, then five, and before 449 B.c. it had been raised to ten. The fact that the institution of the tribunate of the plebs was the one result of the first secession is strong evidence that the object of the seceders was not economic or agrarian reform but protection against the consuls. The tribunate gave them this protection in a form which has no parallel in history. The tribune was not, and, strictly speaking, never became, a magistrate of the Roman people. His one proper prerogative was that of granting protection to the oppressed plebeian against a patrician officer. This prerogative (jus auxilii) was secured to the tribunes, not by the ordinary constitution, but by a special compact between the orders, and was protected by the ancient oath (vetus jusjurandum),® which invoked a curse upon the violator of a tribune. This exceptional and anomalous right the tribunes could only exercise in person, within the limits of the " pomoerium," and against individual acts of magisterial oppression. It was only gradually that it expanded into the later wide power of interference with the whole machinery of govern- ment, and was supplemented by the legislative and judicial powers which rendered the tribunate of the last century B.C. so formidable, and the " tribunitia potestas " so essen- tial an element in the authority of the emperors.

But from the first the tribunes were for the plebs not only protectors but leaders, under whom they organized themselves in opposition to the patricians. The tribunes convened assemblies of the plebs (concilia

plebis), and earried resolutions on questions of interest to the order. This incipient plebeian organization was materially ad- vanced by the Publilian law of 471 3.c.,5 which appears to have formally recognized as lawful the plebeian concilia, and established also the tribune's right "cum plebe agere," %.¢., to propose and carry resolutions in them. These assemblies were 'tributa," or, in other words, the voting in them took place not by curies or centuries but by tribes. In them, lastly, after the Publilian law, if not before, the tribunes were annually elected. By this law the founda- tions were laid both of the powerful '"comitia tributa"? of later days and also of the legislative and judicial prerogatives of the tribunes. The patricians maintained indeed that resolutions (plebiscita) carried by tribunes in the concilia plebis were not binding on their order, but the moral weight of such resolutions, whether they affirmed a general principle or pronounced sentence of condemnation on some single patrician, was no doubt considerable.

It is atany rate certain that the passing of the Publilian law was followed by increased activity on the part of the tribunes. The attack on the consular authority was continued, and combined with it we have a persistent effort made to secure for the plebs their fair share of the common lands of the state (agri publici). The main object, however, of this early agrarian agitation was not economic but political. Membership in a tribe was now more than ever important for a plebeian, as giving a vote not only in the comitia centuriata but also in the plebeian " concilia," and membership in a tribe was possible as yet only for freeholders.6 To increase the number of freeholders

1 Cie. De Rep., ii. 34, "contra consulare imperium creati."

2 Livy, iii. 55. 3 Festus, 818; Appian, B. C., i. 138.

Gall, xiii, 12, "wt injuria quae coram fieret arceretur."

® Livy, ii. 56, 60; Dionys., ix. 41 ; Schwegler, ii. 541 ; Soltau, 493.

6 For theories as to the original mode of appointing tribunes, see Mominsen, Forsch., i. 185.

“It is impossible to accept Mommsen’s theory of a patricio-plebeian comitia tributa, as distinct from the plebeian assembly by tribes.

8 “Proletarii” were not admitted before the decemvirate, and according to Mommsen not until 310 B.c. There were now twenty-

one tribes, seventeen having been added shortly after the establish- ment of the republic. Livy, ii. 21; Soltau, 481.

STRUGGLE OF THE ORDERS.]

M EE 137

became therefore a matter of importance, and the simplest mode of increasing the number of freeholders was for the state to create freeholds on the common lands. But such a policy met with bitter opposition from the patricians, who had long enjoyed a virtual monopoly of these lands, and had excluded the plebeians even from those more recently acquired tracts which they had helped to win by their swords. Against this patrician monopoly the tribunes unceasingly protested from a few years after the first secession down to 465 3.c.9 In that year a compromise was effected by the colonization of Antium, which had been taken the year before, and the plebeians obtained land without any disturbance of patrician occupiers. Eleven years later the common lands on the Aventine were reclaimed and assigned to plebeians by a lex Icilia.1°

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But this agrarian agitation, though destined subse- The de- quently to play an important part in the history, was for cemvirate.

the time far less fruitful in results than that which was directed against the consular authority.

The proposal of C. Terentilius Arsa (460 B.c.) to appoint a plebeian commission to draw up laws restricting the powers of the consuls! was resolutely opposed by the patricians, but after ten years of bitter party strife a compromise was effected. A commission of ten patricians was

appointed, who should frame and publish a code of law binding equally on both the orders. These decemviri were to be the sole and supreme magistrates for the year, and the law of appeal was suspended in their favour.!2 The code which they promulgated, the famous XTI. Tables, owed little of its importance to any novelties or improve- ments contained in its provisions. For the most part it seems merely to have reaffirmed existing usages and laws (see Roman Law). But it substituted a public, written law, binding on all citizens of Rome, for an unwritten usage, the knowledge of which was confined to a few patricians, and which had been administered by this nunority in their own interests. With the publication of the code the proper work of the decemvirs was finished ; nevertheless for the next year a fresh decemvirate was elected, and it is conceivable that the intention was per- manently to substitute government by an irresponsible patrician 'council of ten" for the old constitution. How- ever this may have been, the tyranny of the decemvirs themselves was fatal to .the continuance of their power. We are told of a second secession of the plebs, this time to the Janiculum, and of negotiations with the senate, the result of which was the enforced abdication of the decem- virs. The plebs joyfully chose for themselves tribunes, and in the comitia centuriata two consuls were created. But this restoration of the old regime was accompanied by legislation which made it an important crisis in the history of the struggle between the orders. decemvirate this struggle enters upon a new phase. The tribunes appear as at once more powerful and more strictly constitutional magistrates; the plebeian 'concilia" take their place as formal comitia by the side of the older assemblies ; and finally this improved machinery is used not simply in self-defence against patrician oppression but to obtain complete political equality. This change was no doubt due in part to circumstances outside legisla- tion, above all to the expansion of the Roman state, which swelled the numbers and added to the social importance of the plebs as compared with the dwindling forces of the close corporation of patrician gentes. Still the legislation " 9 Whatever the historical value of the story of Sp. Cassius's agrarian law, the existence of a sustained agrarian agitation during this pcriod can ag be doubted (Mommsen, Rom. Forsch., ii. 158 ; Schwegler, ji. 455).

10 Livy, iii. 31; Dionys., x. 31. The Aventine was said to have been previously common woodland.

1 Livy, iii. 9. 12 Livy, iii, 32. XX. — 93

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Valerio- Horatian a

*With the fall of the @™**

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of 449 clearly involved more than a restoration of the old form of government. The Valerio-Horatian laws, besides reaffirming the right of appeal and the inviolability of the tribunes, improved the position of the plebeian assemblies by enacting that " plebiscita" passed in them, and, as seems probable, approved by the patres, should be binding on patricians as well as plebeians.1 By this law the tribunes obtained a recognized initiative in legislation. Hence- forth the desired reforms were introduced and carried by tribunes in what were now styled "comitia tributa," and, if sanctioned by the patres, became laws of the state. From this period, too, must be dated the legalization at any rate of the tribune's right to impeach any citizen before the assembly of the tribes.2 Henceforward there is no question of the tribune's right to propose to the plebs to impose a fine, or of the validity of the sentence when passed. The efficiency of these new weapons of attack was amply proved by the subsequent course of the struggle. Only a few years after the Valerio-Horatian

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advantage, and to this must be added the pressure of war. The death struggle with Veii and the sack of Rome by the Gauls absorbed for the time all the energies of the community. In 377, however, two of the tribunes, C. Licinius Stolo and L. Sextius, came forward with pro- posals which united all sections of the plebs in their support. Their proposals were as follows :—(1) that con- suls and not consular tribunes be elected; (2) that one consul at least should be a plebeian ; (3) that the*

priestly college, which had the charge of the Sibylline books, should consist of ten members instead of two, and that of these half should be plebeians ; (4) that no single citizen should hold in occupation more than 500 acres of the common lands, or pasture upon them more than 100 head of cattle and 500 sheep; (5) that all landowners should employ a certain amount of free as well as slave labour on their estates ; (6) that interest already paid on debts should be deducted from the principal, and the remainder paid off in three years. The three last proposals were obviously

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Lex legislation came the lex Canuleia (445 B.c.), by which | intended to meet the demands of the poorer plebeians,

Canuleia. mixed marriages between patricians and plebeians were | and to secure their support for the first half of the scheme.

309. declared lawful, and the social exclusiveness of the | Ten years of bitter conflict followed, but at last, in 367 patriciate broken down. In the same year with this | B.c., the Licinian rogations became law, and one of their measure, and like it in the interests primarily of the | authors, L. Sextius, was created the first plebeian consul.

Leges Wealthier plebeians, a vigorous attack commenced on the | For the moment it was some consolation to the patricians

Liciniae patrician monopoly of the consulate, and round this | that they not only succeeded in detaching from the consul-

Sextiae. stronghold of patrician ascendency the conflict raged until | ship the administration of civil law, which was entrusted to 387. the passing of the Licinian laws in 367. The original | a separate officer, " praetor urbanus," to be elected by the proposal of Canuleius in 445 that the people should be | comitia of the centuries, with an understanding apparently allowed to elect a plebeian consul was evaded by a com- | that he should be a patrician, but also obtained the promise. The senate resolved that for the next year, in | institution of two additional zdiles

("aediles curules"), who the stead of consuls, six military tribunes with consular | were in like manner to be members of their own order.? powers should be elected,' and that the new office should | With the opening of the consulship, however, the issue of be open to patricians and plebeians alike. The consulship | the long contest was virtually decided, and the next eighty was thus for the time saved from pollution, as the patri- | years witnessed a rapid succession of plebeian victories. cians phrased it, but the growing strength of the plebs is | Now that a plebeian consul might preside at the elections, Opening

shown by the fact that in fifty years out of the seventy- | the main difficulty in the way of the nomination and

310-388. eight between 444 and 366 they succeeded in obtaining | election of plebeian candidates was removed. The pro-

the election of consular tribunes rather than of consuls. A

posed patrician monopoly of the new curule edileship was

good omen for their ultimate success was a victory they won in connexion with the inferior office of the queestorship. Down to the time of the decemvirate the questors had 307. been nominated by the consuls, but in 447 their appoint-

almost instantly abandoned. In 356 the first plebeian 398. was made dictator, in 350 the censorship, and in 337 the 404, 417, preetorship were filled for the first time by plebeians, and

lastly, in 300, by the lex Ogulnia, even the sacred 454.

ment was transferred to the plebeian "comitia tributa,"

colleges of the pontiffs and augurs, the old strongholds of

333. and in 421 the first plebeian was elected to the office. | patrician supremacy, were thrown open to the plebs.$] Despite, however, these discouragements, the patricians | The patricians lost also the control they

had exercised so fought on. Each year they strove to secure the creation long over the action of the people in assembly. The of consuls rather than consular tribunes, and failing this | " patrum auctoritas," the sanction given or refused by the strained every nerve to secure for their own order at least patrician senators to laws and to elections, had hitherto @ majority among the latter. Even the institution of | been a powerful weapon in their hands. But in 339 a 4165. |

319. the censorship (435), though rendered desirable by the | law of Q. Publilius Philo, a plebeian dictator, enacted Publilian

increasing importance and complexity of the census, was, 1t 18 probable, due in part to their desire to discount before- hand the threatened loss of the consulship by diminish- ing its powers.? Other causes, too, helped to protract the struggle. Between the wealthier plebeians, who were ambitious of high office, and the poorer, whose minds were set rather on allotments of land, there was a division of interest of which the patricians were not slow to take

1 Livy, iii. 55, ' quuin veluti in controverso jure esset, tenerenturne patres plebiscitis legem comitiis centuriatis tulere, ut quod tributim plebs Jussisset populum teneret, qua lege tribuniciis rogationibus telum acerrimum datum est." What were the precise conditions under which a plebiscitum " became law, and what was the exact effect of the lex Publilia of 339 and the lex Hortensia of 287, can only be conjectured. One of the two last can hardly have been more than a reaffirmation of a previous law.

? After the decemvirate, the tribunes no longer pronounce capital sentences. They propose fines, which are confirmed by the comitia taba. , 3 Livy, iv. 7; ¢f. Monimsen, Staatsrecht, ii. 165.

; Livy, iv. 43 ; Mommsen, Staatsrecht, ii. 497.

Mommsen, id., 304

*that this sanction should be given beforehand to all laws ;9 @**

and by a lex Maenia, carried apparently some fifty years later, the same rule was extended to elections. Hencefor- ward the ‘“‘patrum auctoritas” sank into a meaningless form, though as such it still survived in the time of Livy. A second Publilian law affirmed afresh the validity of “plebiscita,” 7.e, of measures carried in the plebeian comitia tributa.

found necessary finally to settle the question.!° From 287 onwards it is certain that measures passed by the plebs, voting by their tribes, had the full force of laws without

® Livy, vi. 85, 42; Appian, B. C., i. 8.

7 Livy, vi. 42. 8 Rivy, vil, 17, 22° viii, 15; ino

- *Livy, viii. 12, ‘ut. . . ante initum suffragium patres auctores fierent,” cf Livy, i. 17. For the “lex Maenia,” see Cic, Brut., 14; Soltau, 112.*

1) Plin., MV. W., xvi. 10; Gell., xv. 27; Gaius, i. 8, ‘ plebiscita lege Hortensia non minus valere quam leges.”

Apparently, however, their validity was Lex Hor- still left subject to some conditions, for in 287 a lex tensia Hortensia, carried by another plebeian dictator, was 467

411.

411-485.

347,

League with the Latins and Her- nicans,

261.

CONQUEST OF ITALY.] ROME 739

any further conditions whatsoever. The legislative inde- pendence of the plebeian assembly was secured, and with this crowning victory ended the long struggle between the orders.

(6) Conquest of Italy.—Twelve years after the passing of the lex Hortensia, King Pyrrhus, beaten at Beneventum, withdrew from Italy,and Rome was left mistress of the peninsula. .The steps by which this supremacy had been won have now to be traced. Under the rule of her Etruscan princes Rome spread her sway over the lowlands of Latium, and her arms were a terror to the warlike highlanders of the Sabine and Volscian hills. But with their fall this minia- ture empire fell also, and at first it seemed as if the infant republic, torn by internal dissensions, must succumb to the foes who threatened it from so many sides at once. It was only after one hundred and fifty years of almost con- stant war that Rome succeeded in rolling back the tide of invasion and in establishing her supremacy over the neigh- bouring lowlands and over the hill country which bordered them to the east and south, The close of this first stage in her external growth is conveniently marked by the first collision with the Sabellian peoples beyond the Liris in 343.1 In marked contrast with the slowness of her advance up to this point is the fact that only seventy-five years more were needed for the virtual subjugation of all the rest of the peninsula (343-269).

The expulsion of the Tarquins from Rome, followed as it seems to have been by the emancipation from Etruscan supremacy of all the country between the Tiber and the Liris, entirely altered the aspect of affairs. North of the Tiber the powerful Etruscan city of Veii, after a vain attempt to restore the Tarquins, relapsed into an attitude of sullen hostility towards Rome, which, down to the outbreak of the final struggle in 407, found vent in con- stant and harassing border forays. The Sabines recom- menced their raids across the Anio; from their hills to the south-east the Aqui pressed forward as far as the eastern spurs of the Alban range, and ravaged the plain country between that range and the Sabine mountains ; the Volsci overran the coast-lands as far as Antium, established themselves at Velitree, and even ravaged the fields within a few miles of Rome. But the good fortune of Rome did not leave her to face these foes single- handed, and it is a significant fact that the history of the Roman advance begins, not with a brilliant victory, but with a useful and timely alliance. According to Livy, it was in 493, only a few years after the defeat of the prince of Tusculum at Lake Regillus, that a treaty was concluded between Rome and the Latin communities of the Campagna.? The

alliance was in every respect natural. The Latins were the near neighbours and kinsmen of the Romans, and both Romans and Latins were just freed from Etruscan rule to find themselves as lowlanders and dwellers in towns face to face with a common foe in the ruder hill tribes on their borders. The exact terms of the treaty cannot, any more than the precise circumstances under which it was concluded, be stated with certainty (see Latium), but two points seem clear. There was at first a genuine equality in the relations between the allies ; Romans and Latins, though combining for defence and offence, did so without sacrificing their separate freedom of action, even in the matter of waging wars independently of each other. But, secondly, Rome enjoyed from the first one inestimable advantage. The Latins lay between her and the most active of her foes, the Auqui and Volsci, and served to protect her territories at the expense of their own. Behind this barrier Rome grew strong, and the close of the Aquian and Volscian wars left the Latins

? Livy, vii. 29. 2 Livy, ii, 38; Cic. Pro Balbo, 23.

3 Livy, viii, 2.

her dependents rather than her allies. Beyond the limits of the Campagna Rome found a second ally, hardly less useful than the Latins, in the tribe of the Hernici ('the men of the rocks"), in the valley of the Trerus, who had equal reason with the Romans and Latins to dread the Volsci and Aiqui, while their position midway between the two latter peoples made them valuable auxiliaries to the lowlanders of the Campagna.

The treaty with the Hernici is said to have been con- cluded in 486, and the confederacy of the three peoples 265. —Romans, Latins, and Hernicans—lasted down to the great Latin war in 340, Confused and untrustworthy as 414. are the chronicles of the early wars of Rome, it is clear that notwithstanding the acquisition of these allies Rome made but little way against her foes during the first fifty years of the existence of the republic. In 474, it is true, 280. an end was put for a time to the harassing border feud with Veii by a forty years' peace, an advantage due not so much to Roman valour as to the increasing dangers from other quarters which were threatening the Etruscan states.° But this partial success stands alone, and down to 449 the raids of Sabines, AXqui, and

Volsci continue 305. without intermission, and are occasionally carried up to the very walls of Rome. Very different is the impression left by the annals of the next sixty years (449-390), 305-364. During this period there is an unmistakable development of Roman power on all sides.

In southern Etruria the capture of Veii (396) virtually Capture gave Rome the mastery as far as the Ciminian forest. of Veii. Sutrium and Nepete, "the gates of Etruria," became 358. her allies and guarded her interests against any attack from the Etruscan communities to the north, while along the Tiber valley her suzerainty was acknowledged as far as Capena and Falerii. On the Anio frontier we hear of no disturbances from 449 until some ten years after the sack of Rome by the Gauls. In 446 the A'qui 308. appear for the last time before the gates of Rome. After 418 they disappear from Mount Algidus, and in 336. the same year the communications of Rome and Latium with the Hernici in the Trerus valley were secured by the capture and colonization of Labicum. Successive invasions, too, broke the strength of the Volsci, and in 393 361. a Latin colony was founded as far south as Circeii. In part, no doubt, these Roman successes were due to the improved condition of affairs in Rome itself, consequent upon the great reforms carried between 450 and 442; but 304-312. it is equally certain that now as often afterwards fortune befriended Rome by weakening, or by diverting the atten- tion of, her opponents. In particular, her rapid advance Decline of in southern Etruria was facilitated by the heavy blows Etruscan inflicted upon the Etruscans during the 5th century p.c, PY by Celts, Greeks, and Samnites. By the close of this century the Celts had expelled them from the rich plains of what was afterwards known as Cisalpine Gaul, and were even threatening to advance across the Apen- nines into Etruria proper. The Sicilian Greeks, headed by the tyrants cf Syracuse, wrested from them their mastery of the seas, and finally, on the capture of Capua by the Samnites in 423, they lost their possessions in the fertile 331. Campanian plain. These conquests of the Samnites were part of a great southward movement of the highland Sabellian peoples, the immediate effects of which upon the fortunes of Rome were not confined to the weakening of the Etruscan power. It is probable that the cessation of the Sabine raids across the Anio was partly due to the new outlets which were opened

southwards for the restless and populous hill tribes which had so long disturbed the peace of the Latin lowlands. We may conjecture, also,

4 Livy, ii. 40. 5 From the Celts in the north especially.

Sack of But in 390, only six years after the great victory over | lying between the hills and the sea as far south as

Rome by her ancient rival Veii, the Roman advance was for a | Tarracina. Latin colonies were established at Satricum

He moment checked by a disaster which threatened to alter | (385), at Setia (379), and at Antium and Tarracina some 369, 378,

eae the course of history in Italy, and which left a lasting | time before 348. In 358 two fresh Roman tribes (Pomp- 406, 396

363. : é z : d ona ; ee VE ee impress on the Roman mind. In 391 a Celtic horde left | tina and Publilia) were formed in the same district. their newly won lands on the Adriatic, and, crossing the Rome had now nothing more to fear from the foes who Re- Apennines into Etruria, laid siege to the Etruscan city | a century ago had threatened her very existence. The ae of Clusium (Chiusi). Thence, provoked, it is said, by | lowland country, of which she was the natural centre, the the conduct of the Roman ambassadors, who, forgetting | from the Ciminian forest to Tarracina, was quiet, and league, their sacred character, had fought in the ranks of | within its limits Rome was by far the strongest power, Clusium and slain a Celtic chief, the barbarians marched | But she had now to reckon with the old and faithful allies

364, upon Rome. On July 18, 390 B.c., onlya few miles from | to whose loyal aid her present position was largely due.

393-4. even once penetrated as far south as Campania (361-360), | rather than the equals of Rome, a position which it is the Celts never obtained any footing in Italy outside the | evident that they accepted much against their will, and plains in the north which they had made their own. from which they were yet to make one last effort to

Annexa- Nor, in spite of the defeat on the Allia and the sack of escape.

oa a the city, was Rome weakened except for the moment by We have now reached the close of the first stage in

Etruria, the Celtic attack. The storm passed away as rapidly as | Rome's advance towards supremacy in Italy. By 343 411. it had come on. The city was hastily rebuilt, and Rome | B.c. she was already mistress both of the low country dismayed the enemies who hastened to take advantage of | stretching from the Ciminian forest to Tarracina and her misfortunes by her undiminished vigour. Her con- | Circcii and of the bordering highlands. Her own terri- quests in southern Etruria were successfully defended | tory had largely increased. Across the Tiber the lands against repeated attacks from the Etruscans to the north. | of Veii, Capena, and Cere were nearly all Roman, while

367. The creation in 387 of four new tribes (Stellatina, | in Latium she had carried her frontiers to Tusculum on Sabatina, Tromentina, Arniensis) marked the final annexa. the Alban range and to the southernmost limits of the tion of the territory of Veii and of the lands lying along | Pomptine district. And this territory was protected by a the Tiber valley. A few years later Latin colonies were | circle of dependent allies and colonies reaching northward established at Sutrium and Nepete for the more effectual | to Sutrium and Nepete, and southward to Sora on the

401. defence of the frontier, and finally, in 353, the subjuga- | upper Liris, and to Circeii on the coast. Already, too, she tion of South Etruria was completed by the submission was beginning to be recognized as a power outside the of Care (Cervetri) and its partial incorporation with | limits of the Latin lowlands, The fame of the capture of the Roman State as a "municipium sine suffragio "—the | Rome by the Celts had reached Athens, and her subse-

eet on it 1s said, of its kind,! quent victories over marauding Celtic bands had given

a ext to the settlement of southern Etruria, the most | her prestige in South Italy as a bulwark against northern

Pai and important of the successes gained by Rome between 390 | barbarians. In 354 she had formed her first connexions 400.

Volsci, nd 343 Bo. were those won against her old foes the beyond the Liris by a treaty with the Samnites, and

364-411, "Equi and Volsci, and her old allies the Latins and | in 348 followed a far more important treaty with the great 406.

ermicans, The Aiqui indced, already weakened by their | maritime state of Carthage.5 long feud with Rome, and hard pressed by the Sabellian | Rome had won her supremacy from the Ciminian forest —_ tribes in their rear, were easily dealt with, and after the

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that the growing feebleness exhibited by Volsci and Aiqui was in some measure caused by the pressure upon their rear of the Sabellian clans which at this time established themselves near the Fucine Lake and along the course of the Liris.

Rome, was fought the disastrous battle of the Allia. The defeat of the Romans was complete, and Rome lay at the mercy of her foe. But in characteristic fashion the Celts halted three days to enjoy the fruits of victory, and time was thus given to put the Capitol at least in a state of defence. The arrival of the barbarians was followed by the sack of the city, but the Capitol remained impreg- nable. For seven months they besieged it, and then in as sudden a fashion as they had come they disappeared. The Roman chroniclers explain their retreat in their own way, by the fortunate appearance of Camillus with the troops which he had collected, at the very moment when famine had forced the garrison on the Capitol to accept terms. More probably the news that their lands across the Apennines were threatened by the Veneti, coupled with the unaccustomed tedium of a long siege and the difficulty of obtaining supplies, inclined the Celts to accept readily a heavy ransom as the price

of their withdrawal. But, whatever the reason, it is certain that they retreated, and, though during the next fifty years marauding bands appeared at intervals in the neighbourhood of Rome, and

campaign of 389 we have no further mention of an

- *For the status of Cere, and the "Czrite franchise," see Mar-*

quardt, Staatsverw., i. 28 sq, + Padvic : ; Ital. Bund, 120. ' q-; Madvig, R. Verf., i. 89; Beloch,

M E

/Equian war until the last AZquian rising in 304. Volsci, who in 389 had advanced to Lanuvium, were met and utterly defeated by M. Furius Camillus, the con- queror of Veli, and this victory was followed up by the gradual subjugation to Rome of all the lowland country

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The Latins and Hernicans had suffered severely in the /quian and Volscian wars; it is probable that not a few of the smaller communities included in the league had either been destroyed or been absorbed by larger states, and the independence of all alike was threatened by the growing power of Rome. The sack of Rome by the Celts gave them an opportunity of reasserting their independ- ence, and we are consequently told that this disaster was immediately followed by the temporary dissolution of the confederacy, and this again a few years later by a series of actual conflicts between Rome and her former allies.

Between 383 and 358 we hear of wars with Tibur, Praneste, 371-396.

Tusculum, Lanuvium, Circeii, and the Hernici. But in all Rome was successful.

incorporated with the Roman state by the bestowal of

the full franchise ?; in 358, according to both Livy and 396.

Polybius the old alliance was formally renewed with Latins and Hernicans. We cannot, however, be wrong in assuming that the position of the allies under the new league was far inferior to that. accorded them by the treaty of Spurius Cassius. Henceforth they were the subjects

2 Livy 15. 3 Livy, vi. 26.

- *Mommsen, R. @., i. 347, note; Beloch, Zéal, Bund, cap. 1x.*

5 Livy, vii. 27. For the whole question of the early treaties with Carthage, see Polybius, iii, 22; Mommsen, R. G., i. 418, and Z. Chronol., p. 820; Vollmer, Rhein. Mus., xxxii. 614.

The 450,

In 382 Tusculum was fully 372,

nents i ———_-

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SAMNITE AND LATIN Wars. |

Advance to the Liris as the champion of the comparatively civilized | self deliberately to the task of re-establishing on a new Settle- ane communities of the lowlands against the rude highland | and firmer basis her supremacy over the lowlands, and in ment of Ea vill tribes which threatened to overrun them, and so, when her doing so laid the foundations of that marvellous organiza- Latium ;

Samnite tion which was destined to spread rapidly over Italy, and Wars. from a lowland city against invaders from the hills. While | to withstand the attacks even of Hannibal. The old she was engaged in clearing Latium of Volsci and | historic Latin league ceased to exist, though its memory Aqui, the Sabellian tribes of the central Apennines had | was still preserved by the yearly Latin festival on the rapidly spread over the southern half of the peninsula. | Alban Mount. Most if not all of the common land of the Foremost among these tribes were the Samnites, a por- league becaine Roman territory ;5 five at least of the old tion of whom had captured the Etruscan city of Capua in | Latin cities were compelled to accept the Roman fran- 831, 334. 423, the Greek Cumz in 420, and had since then ruled | chise® and enter the pale of the Roman state. The rest, as masters over the fertile Campanian territory. But in| with the Latin colonies, were ranked as Latin allies of their new homes the conquerors soon lost all sense of Rome, but on terms which secured their complete depend- relationship and sympathy with their highland brethren. | ence upon the sovereign city. The policy of isolation, They

dwelt in cities, amassed wealth, and inherited the | which became so cardinal a principle of Roman rule, was civilization of the Greeks and Etruscans whom they had | now first systematically applied. No rights of '"con- dispossessed ;1 above all, they had before long to defend | nubium" or "commereium" were any longer to exist themselves in their turn against the attacks of their ruder | between these communities. Their federal councils were kinsmen from the hills, and it was for aid against these prohibited, and all federal action independent of Rome that the Samnites of Campania appealed to the rising | forbidden." state which had already made herself known as the bul- In future they were to have nothing in common but wark of the lowlands north of the Liris, and which with | their common connexion with Rome, a connexion based her Latin and Hernican allies had scarcely less interest | in each case on a separate treaty between the individual than the Campanian cities themselves in checking the | Latin community and Rome. The Latin allied state raids of the highland Samnite tribes. retained its internal independence and the old rights of First The Campanian appeal was listened to. Rome with intermarriage and commerce with Rome, but it lost all Samnite her confederates entered into alliance with Capua and the | freedom of action in external affairs. It could wage War. neighbouring Campanian towns, and war was formally | no wars, conclude no treaties, and was bound, so the 411. declared (343) against the Samnites.2 While to the phrase ran, to have always the same foes and friends Latins and Hernicans was entrusted apparently the defence | as Rome herself. In Canipania and the coast-lands and of of Latium and the Hernican valley against the northerly connecting Campania with Rome, a policy of annexa- Cam- members of the Samnite confederacy, the Romans them- | tion was considered safer than that of alliance. Of the Pavia selves undertook the task of driving the invaders out of | two frontier posts of the Volsci, Antium and Velitre, Campania. After two campaigns the war was ended in| the former was constituted a Roman colony, its long 413. 341 by a treaty, and the Samnites withdrew from the galleys burnt and their prows set up in the Forum at lowlands, leaving Rome the recognized suzerain of the Rome, while the walls of Velitree were razed to the Campanian cities which had sought her aid.® ground, its leading men banished beyond the Tiber, and There is no doubt that the check thus given by Rome ! their lands given to Roman settlers. Farther south on to

the advance of the hitherto invincible Sabellian high- | the route to Campania, Fundi and Formie were, after the landers not only made her the natural head and champion precedent set in the case of Cere, declared Roman and of the low countries, south as well as north of the Liris, | granted the civil rights of Roman citizenship, while lastly but also considerably added to her prestige. Carthage | in Campania itself the same status was given to Capua, sent her congratulations, and the Etruscan city of Falerii | Cun, and the smaller communities dependent upon voluntarily enrolled herself among the allies of Rome. | them.8 During the ten years from 338 to 328 the 416-426. Of even greater service, however, was the fact that | work of settlement was steadily continued. Tarracina, like for fifteen years the Samnites remained quiet, for this Antium, was made a Roman colony. Privernum, the last inactivity, whatever its cause, enabled Rome triumphantly | Volscian town to offer resistance to Rome, was subdued to surmount a danger which threatened for the moment | in 330, part of its territory allotted to Roman citizens, and 424. to wreck her whole position. This danger was nothing | the state itself forced to accept the Roman franchise. less than a desperate effort on the part of nearly all her Lastly, to strengthen the lines of defence against the allies and dependents south of the Tiber to throw off the | Sabellian tribes, two colonies with the rights of Latin The Latin yoke of her supremacy. The way was led by her ancient | allies were established at Fregelle and at Cales. The War. confederates the Latins, whose smouldering discontent | settlement of the lowlands was accomplished. From the

legions first crossed the Liris, it was in answer to an appeal

broke into open flame directly the fear of a Samnite attack was removed. From the Latin Campagna and the Sabine hills the revolt spread westward and southward to Antium and Tarracina, and even to the towns of the Campanian plain, where the mass of the inhabitants at once repudiated the alliance formed with Rome by the ruling class. The struggle was sharp but short. In two pitched battles the strength of the insurrection was broken, and two more campaigns sufficed for the complete reduction of such of the insurgent communi- ties as still held out. The revolt crushed, Rome set her-*

Ciminian forest to the southern extremity of the Cam- panian plain, the lands lying between the sea and the hills were now, with few exceptions, Roman territory, while along the frontiers from Sutrium and Nepete in the north to Cales in the south stretched the protecting line of the Latin allied states and colonies. As a single powerful and compact state with an outer circle of closely dependent allies, Rome now stood in sharp contrast with the disunited and degenerate cities of northern Etruria, the loosely organized tribes of the Apennines, and the decaying and disorderly Greek towns of the south.

‘ For the Samnites in Campania, see Mommisen, &. G., i. 353; Schwegler-Clason, 2. G., v. 98 sq.; Beloch, Campanien, Berlin, 1879.

2 Livy, vii. 32.

3 For the difficulties in the traditional accounts of this war, see Mommsen, 7. G., i. 355 note ; Schwegler-Clason, &. G., v. 14 sq.

4 At the foot of Mount Vesuvius, Livy, viii. 9; at Trifanum, Id., viii. 11.

5 Livy, viii. 11.

8 Livy, viii. 14; Lanuvium, Aricia, Nomentum, Pedum, Tusculum.

7 Id., loc, cit., “ceteris Latinis populis connubia commerciaque et concilia inter se ademerunt.”’

8 For the controversy as to the precise status of Capua and the “equites Campani” (Livy, viii. 14), see Beloch, Ztal.,Bund, 122 sq.; Id., Campanien, 317 ; Zumpt, Comment. Epigraph., p. 290.

Second Samnite War,

327-304 = 427-450,

412-427. 422,

427.

450,

433, 436.

438.

492.

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The strength of this system was now to be tried by a struggle with the one Italian people who were still ready and able to contest with Rome the supremacy of the peninsula. The passive attitude of the Samnites between 342 and 327 was no doubt largely due to the dangers which had suddenly threatened them in South Italy. But the death of Alexander of Epirus, in 332,! removed their only formidable opponent there, and left them free to turn their attention to the necessity of checking the steady advance of Rome. In 327, the year after the ominous foundation of a Roman colony at Fregelle, a pretext for renewing the struggle was offered them. The Cumezan colony of Palpolis? had incurred the wrath of Rome by its raids into her territory in Campania. The Samnites sent a force to defend it, and Rome replied by a declaration of war. The two opponents were not at first sight unequally matched, and had the Sabellian tribes held firmly together the issue of the struggle might have been different. As it was, however, the Lucanians to the south actually joined Rome from the first, while the northern clans Marsi, Vestini, Peeligni, Frentani, after a feeble and lukewarm resistance, subsided into a neutrality which was exchanged in 304 for a formal alliance with Rome. An even greater advantage to Rome from the outset was the enmity existing between Samnites and the Apulians, the latter of whom from the first joined Rome and thus gave her a position in the rear of her enemy and in a country eminently well fitted for maintaining a large military force. These weaknesses on the Samnite side were amply illustrated by the events of the war.

The first seven or eight years were marked by one serious disaster to the Roman arms, the defeat at the Caudine Forks (321), but, when in 318 the Samnites asked for and obtained a two years' truce, Rome had succeeded not only in inflicting several severe blows upon her enemies but in

isolating them from outside help. The Lucanians to the south were her allies. To the east, in the rear of Samnium, Apulia acknowledged the suzer- ainty of Rome, and Luceria, captured in 320, had been established as a base of Roman operations. Finally to the north the Romans had easily overcome the feeble resistance of the Vestini and Frentani, and secured through their territories a safe passage for their legions to Apulia. On the renewal of hostilities in 316, the Samnites, bent on escaping from the net which was being slowly drawn round them, made a series of desperate efforts to break through the lines of defence which protected Latium and Campania. Sora and Fregell on the upper Liris were captured by a sudden attack; the Ausones in the low country near the mouth of the same river were encouraged to revolt by the appearance of the Samnite army; and in Campania another army, attracted by rumours of disturb- ance, all but defeated the Roman consuls under the very walls of Capua. But these efforts were unavailing. Sora and Fregellz were recovered as quickly as they had been lost, and the frontier there was strengthened by the estab- lishment of a colony at Interamna. The Ausones were punished by the confiscation of their territory, and Roman supremacy further secured by the two colonies of Suessa and Pontia (312). The construction of the famous Via Appia,® the work of the censor Appius Claudius Czcus, opened a safe and direct route to Campania, while the capture of Nola deprived the Samnites of their last important stronghold in the Campanian lowlands. The failure of these attempts broke the courage even of the Samnites. Their hopes were indeed raised for a moment by the news that Etruria had risen against Rome (310), but their daring scheme of effecting a union with the Etruscans was frustrated by the energy .of the Roman

- *Livy, viii. 8, 17, 24. 2 Livy, viii. 22. 3 Livy, ix. 23,*

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generals. Samnite raid into Campania by an invasion of Samnium itself. Arpinum on the frontier was taken, and at last, after a twenty-two years' struggle, the Second Samnite War was closed by a renewal of the ancient treaty with Rome

(304).4

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The six years of peace which followed (304-298) 450-6,

were characteristically employed by Rome in still further strengthening her position. Already, two years before the peace, a rash revolt of the Hernici® had given Rome a pretext for finally annexing the territory of her ancient allies. The tribal confederacy was broken up, and all the Hernican communities, with the exception of three which had not joined the revolt, were incorporated with the Roman state as municipia, with the civil rights of the Roman franchise. Between the Hernican valley and the frontiers of the nearest Sabellian tribes lay what remained of the once formidable people of the Alqui. In

their case, too, a revolt (304) was followed by the annexa- 450,

tion of their territory, which was marked in this case by

the formation there (301) of two Roman tribes (Aniensis 453.

and Teretina).6 Not content with thus carrying the borders of their own territory up to the very frontiers of the Sabellian country, Rome succeeded in finally detaching from the Sabellian confederacy all the tribes lying' between the north-east frontier of Latium and the Adriatic Sea. Henceforward the Marsi, Peeligni, Vestini, Marrucini, and Frentani were enrolled among the allies of Rome, and not only swelled her forces in the field but interposed a useful barrier between her enemies to the north in Etruria and Umbria and those to the south in Samnium, while they connected her directly with the friendly Apulians. Lastly, as a security for the fidelity at least of the nearest of these allies, colonies were planted in the Marsian 'territories at Carseoli and at Alba Fucentia. A significant indication of the widening range of Rome's influence in Italy, and of the new responsibilities rapidly pressing upon her, is the

fact that when in 302 the Spartan Cleonymus landed in 454.

the territory of the Sallentini, far away in the south-east, he was inet and repulsed by a Roman force.8

Six years after the conclusion of the treaty which ended Third the Second Samnite War, news arrived that the Samnites Samnite were harassing the Lucanians. Rome at once interfered o9¢”999— Samnium was invaded in force, the 456464,

to protect her allies. country ravaged, and one stronghold after another cap- tured. Unable any longer to hold their own in a position where they were hedged round by enemies, the Samnite leaders turned as a last hope to the communities of northern Etruria, to the free tribes of Umbria, and to the once dreaded Celts. With a splendid daring they formed the scheme of uniting all these peoples with themselves in a last desperate effort to break the power of Rome.

For some forty years after the final annexation of Romans southern Etruria (351 3B.c.) matters had remained un-!”:*

changed in that quarter. Sutrium and Nepete still guarded the Roman frontier; the natural boundary of the Ciminian forest was still intact; and up the valley of the Tiber Rome had not advanced beyond Falerii, a few miles short of the most southerly Umbrian town Ocriculum.

But in 311, on the expiry, apparently, of the long truce 443.

with Rome, concluded in 351, the northern Etruscans, alarmed no doubt by the rapid advances which Rome was making further south, rose in arms and attacked Sutrium. The attack, however, recoiled disastrously upon the heads of the assailants. A Roman force promptly relieved Sutrium, and its leader, Q. Fabius Rullianus, without awaiting orders from home, boldly plunged into the wilds of the Ciminian forest, and crossing them safely swept

4 Livy, ixao 5 Livy, ix. 45. 6 Livy, ix. 45.

7 Livy, x. 9. STAY, Se 2.

Five years later (305) the Romans revenged a 449.

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with fire and sword over the rich lands to the north. Then turning southward he met and utterly defeated the forces which the Etruscans had hastily raised in the hopes of intercepting him at the Vadimonian Lake! This decisive victory ended the war. The Etruscan cities, disunited among themselves, and enervated by long years of peace, abandoned the struggle for the time, paid a heavy indem- nity, and concluded a truce with Rome (309-308). In the same year the promptitude of Fabius easily averted a threatened attack by the Umbrians, but Rome proceeded nevertheless to fortify herself in her invariable fashion against future dangers on this side, by an alliance with | Ocriculum, which was followed ten years later by a colony : at Nequinum,? and an alliance with the Picentes, whose position in the rear of Umbria rendered them as valuable | to Rome as the Apulians had proved farther south.

| Battle of Fourteen years had passed since the battle on the

SAMNITE WARS. |

445-6.

Sentinum, Vadimonian Lake, when the Samnites appeared on the 295=459. borders of Etruria and called on the peoples of northern Italy to rise against the common enemy. Their appeal, #- backed by the presence of their troops, was successful. The Etruscans found courage to face the Roman legions once more; a few of the Umbrians joined them; but the ‘ most valuable allies to the Samnites were the Celts, who | had for some time threatened a raid across the Apennines, \ and who now marched eagerly into Umbria and joined the coalition. The news that the Celts were in motion produced a startling effect at Rome, and every nerve was strained to meet this new danger. While two armies were left in southern Etruria as reserves, the two consuls, Fabius and Decius, both tried soldiers, marched northwards up the valley of the Tiber and into Umbria at the head of four Roman legions and a still larger force of Italian allies, At Sentinum, on the further side of the Apennines, they encountered the united forces of the Celts and Samnites, the Etruscans and Umbrians having, it is said, been withdrawn for the defence of their own homes. The

battle that followed was desperate, and the Romans lost one of their consuls, Decius, and more than 8000 men.? But the Roman victory was decisive. The Celts were annihilated, and the fear of a second Celtic attack on Rome removed. All danger from the coalition was over. The Etruscan communities gladly purchased peace by the payment of indemnities. The rising in Umbria, never formidable, died away, and the Samnites were left single-handed to bear the whole weight of the wrath of Rome. During four years more, however, they desperately defended their highland homes, and twice 461, 462, at least, in 293 and 292, they managed to place in the field a force sufficient to meet the Roman legions on equal terms. At last, in 290, the consul M. Curius Dentatus finally exhausted their power of resistance. Peace was concluded, and it is significant of the respect inspired at Rome by their indomitable courage that they were allowed to become the allies of Rome, on equal terms and without any sacrifice of independence. Between the close of the Third Samnite War and the 473, landing of Pyrrhus in 281 B.c. we find Rome engaged, as , her wont was, in quietly extending and consolidating her power. In southern Italy she strengthened her hold on | Apulia by planting on the borders of Apulia and Lucania the strong colony of Venusia.® In central Italy the annexation of the Sabine country (290) carried her frontiers eastward to the borders of her Picentine allies on the Adriatic.6 Farther east, in the territory of the 1 Livy, ix. 39, Ihne (R. G., i. 851 sg.) throws some doubts on the traditional accounts of this war and of that in 296. 2 Narnia, Livy, x. 10. GW Y, X21 1 Livy, Zpit., xi., "pacem petentibus Samnitibus foedus quarto renovatum est." Dion wialweac saeco) Vell Rats, 1 Ay 6 Livy, Hpit., xi.; Vell. Pat., i 14,*

464.

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ME 743 Picentes themselves, she established colonies on the Adriatic coast at Hatria and Castrum (285-283).7 By 469-471.

these measures her control of central Italy from sea to sea was secured, and an effectual barrier interposed between her possible enemies in the north and those in the south. North of the Picentes lay the territories of the Celtic Senones, stretching inland to the north-east borders of Etruria,

and these too now fell into her hands. Ten years after their defeat at Sentinum (285-284) a Celtic force descended into Etruria, besieged Arretium, and defeated the relieving force despatched by Rome. In 283 the consul L. Cornelius Dolabella was sent to avenge the insult. He completely routed the Senones. Their lands were annexed by Rome, and a colony established at Sena on the coast. This success, followed as it was by the decisive defeat of the neighbouring tribe of the Boii, who had invaded Etruria and penetrated as far south as the Vadimonian Lake, awed the Celts into quiet, and for more than forty years there was comparative tranquillity in northern Italy.§

In the south, however, the claims of Rome to supre- War with macy were now to be disputed by a new and formidable Pyrrhus, foe. At the close of the Third Samnite War the Greek ee cities on the southern coast of Italy found themselves ~~ si: once more harassed by the Sabellian tribes on their borders, whose energies, no longer absorbed by the long struggles in central Italy, now found an attractive opening south- ward. Naturally enough the Greeks, like the Capuans sixty years before, appealed for aid to Rome (283-282), and like the Capuans they offered in return to recognize the suzerainty of the great Latin republic. In reply a Roman force under C, Fabricius marched into South Italy, easily routed the marauding bands of Lucanians, Bruttians, and Samnites, and established Roman garrisons in Locri, Croton, Rhegium, and Thurii. At Tarentum, the most powerful and flourishing of the Greek seaports, this sudden and rapid advance of Rome excited the greatest anxiety. Tarentum was already allied by treaty (301) 453. with Rome, and she had now to decide whether this treaty should be exchanged for one which would place her, like the other Greek communities, under the protectorate of Rome, or whether she should find some ally able and willing to assist in making a last stand for independence. The former course, in Tarentum, as before at Capua, was the one favoured by the aristocratic party ; the latter was eagerly supported by the inass of the people and their leaders. While matters were still in suspense, the appear- ance, contrary to the treaty, of a Roman squadron off the harbour decided the controversy. The Tarentines, indig- nant at the insult, attacked the hostile fleet, killed the admiral, and sunk most of the ships. Still Rome, relying probably on her partisans in the city, tried negotiation, and an alliance appeared likely after all, when suddenly

the help for which the Tarentine democrats had been looking appeared, and war with Rome was resolved upon (281-280).°

King Pyrrhus, whose timely appearance seemed for the moment to have saved the independence of Tarentum, was the most brilliant of the military adventurers whom the disturbed times following the death of Alexander the Great had brought into prominence. High-spirited, generous, and ambitious, he had formed the scheme of rivalling Alexander's achievements in the East, by winning for himself an empire in the West. He aspired not only to unite under his rule the Greek communities of Italy and Sicily, but to overthrow the great Pheenician state of Carthage —the natural enemy of Greeks in the West, as Persia had been in the East. Of Rome it is clear that he

7 Livy, Hptt., xi. J 1GiAy, 2, ing Fans OGD, ih Si

? hivy, 2p, xis Plu Pyyrh. 13.

471-2.

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481, 491, 481.

knew little or nothing; the task of ridding the Greek sea- ports of their barbarian foes he no doubt regarded as an easy one; and the splendid force he brought with him was intended rather for the conquest of the West than for the preliminary work of chastising a few Italian tribes, or securing the submission of the unwarlike Italian Greeks. Pyrrhus's first

measure was to place Tarentum under a strict military discipline; this done he advanced into Lucania to meet the Roman consul Levinus. The battle which followed, on the banks of the Liris, ended in the complete defeat of the Roman troops, largely owing to the panic caused by the elephants which Pyrrhus had brought with him (280).! The Greek cities expelled their Roman garrisons and joined him, while numerous bands of Samnites, Lucanians, and Bruttians flocked to his standard. But, to the disappointment of his Greek and Italian allies, Pyrrhus showed no anxiety to follow up the advantage he had gained. His heart was set on Sicily and Africa, and his immediate object was to effect such an arrangement with Rome as would at once fulfil the pledges he had given to the Greeks by securing them against Roman interference and set himself free to seek his fortunes westward. But, though his favourite minister Cineas employed all his skill to win the ear of the senate, and, though Pyrrhus himself lent weight to his envoy's words by advancing as near Rome as Anagnia (279), nothing could shake the resolution of the senate, and Cineas brought back the reply that the Romans could not treat with Pyrrhus so long as he remained in arms upon Italian soil. Disappointed in his hopes of peace, Pyrrhus in the next year (278) turned his forces against the Roman strongholds in Apulia.2 Once more, at Ascu- lum, he routed the legions, but only to find that the indomitable resolution of the enemy was strengthened by defeat. Weary of a struggle which threatened inde- finitely to postpone the fulfilment of his dreams . of empire, Pyrrhus resolved to quit Italy, and, leaving garri- sons in the Greek towns, crossed into Sicily. Here his success at first was such as promised the speedy realiza- tion of his hopes. The Sicilian Greeks hailed him as a deliverer; the Carthaginians were driven back to the extreme west of the island, and Eryx and Panormus fell into his hands. But at this point fortune deserted him. His efforts to take Lilybeum were fruitless; the Carthaginians recovered their courage, while the unstable Greeks, easily daunted by the first threatenings of failure, and impatient of the burdens of war, broke out into open murmurs against him. Soured and disappointed, Pyrrhus returned to Italy (276) to find the Roman legions steadily moving southwards, and his Italian allies disgusted by his deser- tion of their cause. One of the consuls for the year (275), M. Curius Dentatus, the conqueror of Samnium, was encamped at Beneventum awaiting the arrival of his colleague. Here Pyrrhus attacked him, and the

closing battle of the war was fought. It ended in the complete victory of the Romans. Pyrrhus, unable any longer to face his opponents in the field, and disappointed of all assistance from his allies, retreated in disgust to Tarentum and thence crossed into Greece.® A few years later (272) Tarentum was surrendered to Rome by its Epirot garrison; it was granted a treaty of alliance, but its walls were razed and its fleet handed over to Rome. In 270 Rhegium also entered the ranks of Roman allies, and finally in 269 a single campaign crushed the last efforts at resistance in Samnium. Rome was now at leisure to consolidate the position she had won. Between 273 and 263 three new colonies were founded in Samnium and Lucania—Pestum in 273, Beneventum in Pet, NV. Hey vin ae 2 Plut., Pyrrh., 21. 3 Livy, Epit., xiv. > Plut., Pyrrh., 26.

ROME

[WISTORY.

268, AEsernia in 263. territory was increased by the full enfranchisement (268) of the Sabines, and of their neighbours to the east, the Picentes. To guard the Adriatic coast colonies were established at Ariminum (268), at Firmum, and at Castrum Novum (264), while to the already numerous maritime colonies was added that of Cosa in Etruria.®*

Rome was now the undisputed mistress of Italy. The limits of her supremacy to the north were represented roughly by a line drawn across the peninsula from the mouth of the Arno on the west to that of the Asis on the east.6 Beyond this line lay the Ligurians and the Celts ; all south of it was now united as "Italy" under the rule of Rome.

But the rule of Rome over Italy, like her wider rule over the Mediterranean coasts, was not an absolute dominion over conquered subjects. It was in form at least a confederacy under Roman protection and guid- ance; and the Italians, like the provincials, were not the subjects, but the "allies and friends" of the Roman people." Marvellous as are the perseverance and skill with which Rome built up, consolidated, and directed this confederacy, it is yet clear that both her success in forming it and its stability when formed were due in part to other causes than Roman valour and policy. The disunion which, in former times, had

so often weakened the Italians in their struggles with Rome still told in her favour, and rendered the danger of a combined revolt against her authority remote in the extreme. In some cases, and especially in the city states of Etruria, Campania, and Magna Grecia, where the antagonism of the two political parties, aristocrats and democrats, was keen, Rome found natural and valuable allies in the former. Among the more backward peoples of central Italy, the looseness of their political organization not only lessened their power of resistance, but enabled Rome either to detach tribe after tribe from the confederacy or to attack and crush them singly. Elsewhere she was aided by ancient feuds, such as those between Samnites and Apulians, or Tarentines and Iapygians, or by the imminent dread of a foe—Celt, or Samnite, or Lucanian—whom Roman aid alone could repel. And, while combination against her was thus rendered difficult, if not impossible, by internal dissensions, feuds, differences of interest, of race, of language, and habits, Rome herself, from her position in the centre of Italy, was so placed as to be able to strike promptly, on the first signs of concerted opposition. All these advantages Rome utilized to the utniost. We have no means of deciding how far she applied elsewhere the principle upon which she acted in northern Etruria and Campania, of attaching the aristocratic party in a com- munity to Roman interests, by the grant of special privileges; but it is certain that she endeavoured by every means in her power to perpetuate, and even to increase, the disunion which she had found so useful among her allies. In every possible way she strove to isolate them from each other, while binding them closely to herself. The old federal groups were in most cases broken up, and each of the members united with Rome by a special treaty of alliance. In Etruria, Latium, Campania, and Magna Grecia the city state was taken as the unit; in central Italy, where urban life was non-existent, the unit was the tribe. The northern Sabellian peoples, for instance,—the Marsi, Peeligni, Vestini, Marrucini, Frentani,—were now

- *Vell. Pat., i. 14, "suffragii ferendi jus Sabinis datum."*

° Vell. Pat., i. 14; Livy, Zpit.,xv. The present writer has followed Beloch (Ztal. Bund, 142) in identifying the "Cosa" of Vell., loc. cit., and Livy, Hpit., xiv., with Cosa in Etruria; of. Plin., VW. H,, iii. 8, 51. Mommsen and Madvig both place it in Lucania.

6 Mommsen, FR. G., i. 428, note; Nissen, Zéal. Landeskunde, p. 71. 7 Beloch, Jtal. Bund, 203; Monmsen, R. G. , i. 428, note.

In central Italy the area of Roman 486, 491,

486.

486. 490.

Rome as the mistress of Italy,

The Latins.

The Italian allies.

ROME THE MISTRESS OF ITALY. |

constituted as separate communities in alliance with Rome. In many cases, too, no freedom of trade or intermarriage was allowed between the allies themselves, a policy after- wards systematically pursued in the provinces. Nor were all these numerous allied communities placed on the same footing as regarded their relations with Rome herself. To begin with, a sharp distinction was drawn between the "QLatini" and the general mass of Italian allies. The "Qatins" of this period had little more than the name in common with the old thirty Latin peoples of the days of Spurius Cassius. With a few exceptions, such as Tibur and Preeneste, the latter had either disappeared or had been incorporated with the Roman state, and the Latins of 268 B.c. were almost exclusively the " Latin colonies," that is to say, communities founded by Rome, composed of men of Roman blood, and whose only claim to the title "Latin" lay in the fact that Rome granted to them some portion of the rights and privileges formerly enjoyed by the old Latin cities under the Cassian treaty.) Though nominally allies, they were in fact offshoots of Rome herself, bound to her by community of race, language, and interest, and planted as Roman garrisons among alien and conquered peoples. The Roman citizen who joined a Latin colony lost his citizenship,—to have allowed him to retain it would no doubt have been regarded as enlarging too rapidly the limits of the citizen body; but he received in exchange the status of a favoured

ally. The Latin colony did not indeed enjoy the equality and independence originally possessed by the old Latin cities. It had no freedom of action outside its own territory, could not make war or peace, and was bound to have the same friends and foes as Rome. But its members had the right of commercium and down to 268? of connubium also with Roman citizens. Provided they left sons and property to represent them at hone, they were free to migrate to Rome and acquire the Roman franchise. In war time they not only shared in the booty, but claimed a portion of any land confiscated by Rome and declared " public." These privileges, coupled with their close natural affinities with Rome, successfully secured the fidelity of the Latin colonies, which became uot only the most efficient props of Roman supremacy, but powerful agents in the work of Romanizing Italy. Below the privileged Latins stood the Italian allies ; and here again we know generally that there were considerable differences of status, determined in each case by the terms of their respective treaties with Rome. We are told that the Greek cities of Neapolis and Heraclea were among the most favoured ;° the Bruttii, on the other hand, seem, even before the Hannibalic war, to have been less generously treated. But beyond this the absence of all detailed information does not enable us to go.

Rome, however, did not rely only on this policy of isola- tion. Herallies were attached as closely to herself as they were clearly separated from each other, and from the first she took every security for the maintenance of her own para- mount authority. Within its own borders, each ally was left to manage its own affairs as an independent state.4 The badges which marked subjection to Rome in the pro- vinces—the resident magistrate and the tribute—were unknown in Italy. But in all points affecting the relations of one ally with another, in all questions of the general

1 For the "coloniae Latinae" founded before the First Punic War, see Beloch, 136 sq.

?'The year of the foundation of Ariminum, the first Latin colony with the restricted rights ; Cic. Pro Caec., 85; Mommsen, R. G., i. 421, note; Marquardt, Staatsverw., i. 58. Beloch, 155-158, takes a different view.

3 Beloch, Camp., 39; Cic. Pro Balbo, 22.

“For the relation of the “socii Italici” to Rome, see Mommsen, R. G., i. 422; Beloch, /tal. Bund, cap. x.

interests of Italy and of foreign policy, the decision rested solely with Rome. The place of a federal constitution, of a federal council, of federal officers, was filled by the Roman senate, assembly, and magistrates. The maintenance of peace and order in Italy, the defence of the coasts and frontiers, the making of war or peace with foreign powers, were matters the settlement of which Rome kept entirely in her own hands. Each allied state, in time of war, was called upon for a certain contingent of men, but, though its contingent usually formed a distinct corps under officers of its own, its numerical strength was fixed by Rome, it was brigaded with the Roman legions, and was under the orders of the Roman consul.®

This paramount authority of Rome throughout the pen- The

insula was confirmed and justified by the fact that Rome

Roman

herself was now infinitely more powerful than any one ‘#t¢*

of her numerous allies. Her territory, as distinct from that of the allied states, covered something like one-third of the peninsula south of the Aisis. Along the west coast it stretched from Czre to the southern borders of Campania. Inland, it included the former territories of the A%qui and Hernici, the Sabine country, and even extended eastward into Picenum, while beyond these limits were outlying districts, such as the lands of the Senonian Celts, with the Roman colony of Sena, and others elsewhere in Italy, which had been confiscated by Rome and given over to Roman settlers. Since the first important annexation of territory after the capture of Veii (396), twelve new tribes had been formed,® and the number of male citizens registered at the census had risen from 152,000 to 290,000.77 Within this enlarged Roman state were now included

numerous communities with local institutions and government. At their head stood the Roman colonies ("coloniae civium Romanorum"), founded to guard especially the coasts of Latium and Campania.8 Next to these eldest children of Rome came those communities which had been invested with the full Roman franchise, such, for instance, as the old Latin towns of Aricia, Lanuvium, Tusculum, Nomentum, and Pedum. Lowest in the scale were those which had not been considered ripe for the full franchise, but had, like Czere, received instead the "civitas sine suffragio," the civil without the political rights.? Their members, though Roman citizens, were not enrolled in the tribes, and in time of war served not in the ranks of the Roman legions but in separate contingents. In addition to these organized town communities, there were also the groups of Roman settlers on the public lands, and the dwellers in the village communities of the enfranchised highland districts in central Italy.

The administrative needs of this enlarged Rome were obviously such as could not be adequately satisfied by the system which had done well enough for a small city state with a few square miles of territory. The old centraliza- tion of all government in Rome itself had become an impossibility, and the Roman statesmen did their best to meet the altered requirements of the time. The urban communities within the Roman pale, colonies and muni-

5 Beloch, 208. The importance of this duty of the allies is expressed in the phrase "socii nominisve Latini quibus ex formula togatorum milites in terra Italia imperare solent."

6 Four in South Etruria (387), two in the Pomptine territory (358), two in Latium (882), two in the territory of the southern Volsci and the Ager Falernus (318), two in the Aquian and Hernican territory (299). The total of thirty-five was completed in 241 by formation of the Velina and Quirina, probably in the Sabine and Picentine districts, enfranchised in 268. See Beloch, 32.

7 Livy, Zpit., xvi.; Eutrop., ii. 18; Mommsen, 2. G., i. 428; Beloch, cap. iv. p. 77 sq.

8 Ostia, Autium, Tarracina, Minturne, Sinuessa, and, on the Adriatic, Sena and Castrum Novum.

® To both these classes the term " municipia" was applied.

64

358,

Colonies

and muni- cipia.

Prefects.

The military system.

746

cipia, were allowed a large measure of local self-govern- ment. In all we find local assemblies, senates, and magistrates, to whose hands the ordinary routine of local administration was confided, and, in spite of differences in detail, ¢.g., in the titles and numbers of the magistrates, the same type of constitution prevailed throughout.! But these local authorities were carefully subordinated to the higher powers in Rome. The local constitution could be modified or revoked by the Roman senate and assembly, and the local magistrates, no less than the ordinary members of the community, were subject to the paramount authority of the Roman consuls, preetors, and censors. In particular, care was taken to keep the administration of justice well under central control. The Roman citizen in a colony or municipium enjoyed of course the right oi appeal to the Roman people in a capital case. We may also assume that from the first some limit was placed to the jurisdiction of the local magistrate, and that cases falling outside it came before the central authorities. But an additional safeguard for the equitable and uniform administration of Roman law, in communities to many of which the Roman code was new and unfamiliar, was provided by the institution of prefects ("praefecti juri dicundo"),? who were sent out annually, as representatives of the Roman

pretor, to administer justice in the colonies and municipia. To prefects was, moreover, assigned the charge of those districts within the Roman pale where no urban communities, and consequently no organized local government, existed. In these two institutions, that of municipal government and that of prefectures, we have already two of the cardinal points of the later imperial system of government. .

A word must lastly be said of the changes which the altered position and increased responsibilities of Rome had effected in her military system.? For the most part these changes tended gradually to weaken the old and intimate connexion between the Roman army in the field and the Roman people at home, and thus prepared the way for that complete breach between the two which in the end proved fatal to the republic. It is true that service in the legion was still the first duty and the highest privilege of the fully qualified citizen. Every "assiduus" was still liable to active military service between the ages of seventeen to forty-five, and "proletarii" and freedmen were still called out only in great emergencies,' and then but rarely enrolled in the legions. But this service was gradually altering in character. Though new legions were still raised each year for the summer campaigns, this was by no means always accompanied, as formerly, by the disbandment of those already on foot, and this increase in the length of time during which the citizen was kept with the standards had, as early as the siege of Veii, necessitated a further deviation from the old theory of military service—the introduction of pay.® Hardly less important than these changes were those which had taken place in the organiza- tion of the legion itself. In the early days of the republic the same divisions served for the soldier in the legion and the citizen in the assembly. The Roman army in the field, and the Roman people in the comitia on the Campus, were alike grouped according to their wealth, in classes and centuriz. But by the time of the Latin war the

arrangement of the legion had been wholly altered. In a eee ee eee

' For details, see Beloch, Jéal. Bund, caps. v., vi., vii. The enfran- chised communities in most cases retained the old titles for their magistrates, and hence the variety in their designations.

? For the " praefecti," see Mommsen, R. G., i. 419, and Rim. Staats-recht, ii. 569; Beloch, 180-133.

3 Mommsen, F, G., i. 438; Madvig, Livy, viii. 8; Polyb., vi. 17-42.

- *£.9., before the battle of Sentinum (296), Livy, x. 21.*

5 Livy, iv. 59.

Verf. R. Reichs, ii. 467 sq.;

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the new manipular system, with its three lines, no regard was paid to civic distinctions, but only to length of service and military efficiency, while at the same time the more open order of fighting which it involved demanded of each soldier greater skill, and therefore a more thorough train- ing in arms than the old phalanx. resulted from the new military necessities of the time, which was as fruitful of results as the incipient separation between the citizen and the soldier. The citizen soldiers of early Rome were commanded in the field by the men whom they had chosen to be their chief magistrates at home, and still, except when a dictator was appointed, the chief command of the legions rested with the consuls of the year. But, as Rome's military operations increased in area and in distance from Rome, a larger staff became necessary, and the inconvenience of summoning home a consul in the field from an unfinished campaign became intolerable. The remedy found, that of prolonging for a further period the imperium of the consul, was_ first applied in 327 B.c. in the case of Q. Publilius Philo,® and between 327 and 264 instances of this " prorogatio imperii" became increasingly common. This proconsular authority, originally an occasional and subordinate one, was destined to become first of all the strongest force in the republic, and ultimately the chief prop of the power of the Czesars. Already, within the limits of Italy, Rome had laid the foundation stones of the system by which she afterwards governed the world,—the municipal constitutions, the allied

states, the proconsuls, and the prefects. Periop II: Rome anD THE MEDITERRANEAN STATES,

One other change The pro. consulate,

427-490.

265-146 B.c.—(a) Conquest of the West.—Though marked 439-608.

out by her geographical position as the natural centre of the Mediterranean, Italy had hitherto played no active part in Mediterranean politics, but, now that she was for the first time united, it was felt throughout the Mediter- ranean world that a new power had arisen, and Rome, as the head and representative of Italy, found herself irresistibly drawn into the vortex of Mediterranean affairs. With those of the eastern Mediterranean indeed she was not immediately called upon to concern herself. Her repulse of Pyrrhus, and the news that the Greek cities of South Italy had acknowledged her suzerainty, had, it is true, suddenly revealed to the Eastern world the existence of a powerful Italian state. Egypt sought her alliance, and Greek scholars began to interest them- selves keenly in the history, constitution, and character of the Latin republic which had so suddenly become famous. But this was all, and not until fifty years after the retreat of Pyrrhus did Rome seriously turn her attention eastward. Westward of Italy the case was different. The western coasts of the peninsula were the most fertile and populous and wealthy, and it was west- ward rather than eastward that the natural openings for Italian commerce were to be found. But it was precisely on this side that Rome had serious ground for anxiety. Carthage was now at the height of her power. Her out- posts were threateningly near to Italy in Sardinia and in Sicily, while her fleets swept the seas and jealously guarded for the benefit of Carthage alone the hidden treasures of the West. In the east of Sicily, Syracuse still upheld the cause of Greek independence against the hereditary foe of the Greek race ; but Syracuse stood alone, and her resources were comparatively small. What Rome had to fear was the establishment, and that at no distant date, of an absolute Carthaginian domination over the Western seas—a domination which would not only be fatal to Italian commerce but would be a standing menace to the safety of the Italian coasts. Rome had indeed long been

8 Livy, viii, 23, “ut pro consule rem gereret quoad debellatum esset.”

Virst Punic War,

265-241 = 489-518.

489,

498,

492, 493, 494,

ki. ©

connected with Carthage by treaty, and the older purely commercial treaties had quite recently been replaced by a close alliance formed in face of the common danger to which both had been exposed by the adventurous schemes of Pyrrhus. But this danger was past, and it is probable that others besides Pyrrhus foresaw that on the old battleground of Greeks and Pheenicians a struggle must soon be fought out between the Phoenician mistress of the Italian seas and the rulers of the Italian peninsula.

It was above all things essential for Rome that the Carthaginians should advance no farther eastward. But already in 272 Tarentum had almost fallen into their grasp, and seven years later Rome was threatened with a danger at least as serious, the establishment of Car- thaginian rule in the east of Sicily, and within sight of the Italian coast. In 265 a body of Campanian mercenaries, who had seized Messana, found themselves hard pressed by Hiero, king of Syracuse. One party among them appealed for aid to Carthage. The Cartha- ginians readily responded, and a Carthaginian garrison occupied the citadel of Messana. But at Messana, as once at Tarentum, there were others who turned to Rome, and, as Italians themselves, implored the aid of the great Italian republic, offering in return to place Messana under the suzerainty of Rome. The request was a perplexing one. Both Hiero and the Carthaginians were allies of Rome, and Messana, if rescued from the latter, belonged of right to Hiero and not to Rome. Apart, too, from treaty obligations, the Roman

senate naturally hesitated before acceding to an appeal which would precipitate a collision with Carthage, and commit Rome to a new and hazardous career of enterprise beyond the sea. Finally, however, all other considerations gave way before the paramount importance of checking the advance of Carthage. The Roman assembly voted that assistance should be sent to the Mamertines, and in 264 the Roman legions for the first time crossed the sea. Messana was occupied, and, after sustaining a defeat, the Carthaginians and Syracusans were forced to raise the siege and withdraw. The opening years of the war which was thus begun gave little promise of the length of the struggle, and it seemed likely at the outset that Rome's immediate object, the expulsion of the Carthaginians from Sicily, would be soon attained. The accession to the Roman side of King Hiero (263) not only confirmed the position which Rome had already assumed in Italy of the champion of the western Greeks against barbarians, but provided her in eastern Sicily with a con- venient base of operations and commodious winter quarters, and in Hiero himself with a loyal and effective ally. In the next year (262) followed the capture of Agrigentum, and in 261 the Roman senate resolved on supplementing these successes on land by the formation of a fleet which should not only enable them to attack the maritime strongholds which defied the assaults of their legions, and protect their own coasts, but even to carry the war into Africa itself. In the spring of 260 the first regular Roman fleet, consisting of one hundred quinqueremes and twenty triremes set sail;! and the brilliant naval victory off Myle, won by the consul C. Duilius in the same year, seemed to promise the Romans as much success by sea as they had won by land. But the promise was not fulfilled ; and in 256 the senate, impatient of the slow progress made in Sicily, determined on boldly invading Africa. It was a policy for which, if Africa were once reached, the defenceless state of the Carthaginian territories, the doubt- ful loyalty of her Libyan subjects, and the unwarlike habits of her own citizens, gave every hope of success, and, but for the blunders of the Romans themselves, it might have succeeded now as it did fifty years later. The

1 Mommsen, &. G., i. 515.

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passage to Africa was opened by the defeat of the Cartha- ginian fleet off Ecnomus; the two consuls, L. Manlius Vulso and M. Atilius Regulus, landed in safety and rapidly overran the country. But these successes led the senate, at the close of the summer, into committing the serious blunder of recalling one of the consuls, Manlius, with a large portion of the troops. It was one of many instances in which the rules and traditions of the old republican system proved themselves inconsistent with the new requirements of an extended warfare. The consul came back to hold the elections; his soldiers returned, as the custom had been, to their homes after a summer's cam- paign; but the efficiency of the expedition was fatally impaired. The rashness and over-confidence of Regulus aggravated the effects of the senate's action. Emboldened by further successes, and notwithstanding his diminished forces, he met the Carthaginian proposals for peace by terms so harsh that the latter, though the Romans were almost at their gates, their soldiers disheartened, and the nomad tribes swarming on their frontiers, indignantly broke off the negotiations and prepared to resist to the last. At this crisis, so the story runs, the arrival of Xanthippus, a Spartan soldier of fortune, changed the face of affairs, as that of Gylippus had formerly done at Syracuse. His superior military skill remedied the blunders of the Carthaginian generals; confidence was restored; and in

255 he triumphantly routed the Roman forces a few 499.

miles outside the city. Regulus was taken prisoner,? and only a miserable remnant of two thousand men escaped to the Roman camp on the coast. Here they were rescued by a Roman fleet, but their ill-fortune pursued them. On its way home the fleet was wrecked, and all but 80 vessels out of a total of 364 were lost.

Still, though abandoning all thoughts of invading Africa, the Romans were unwilling to renounce all thoughts of facing their enemy on the sea.

But fresh disasters

followed. The hopes raised (254) by the capture of 500.

Panormus were dashed to the ground the next year (253) by the total destruction in a storm of the victorious fleet on its way home from Panormus to Rome. Four years later a second fleet, despatched under P. Claudius to assist in the blockade of Lilybeum, was completely defeated off Drepana, while, to make matters worse, his colleague L. Junius, who had been hastily sent out with reinforce- ments, was wrecked near the dangerous promontory of Pachynus.

Disheartened by these repeated disasters, the senate resolved to trust only to the legions, and by sheer force of perseverance slowly to force the enemy out of the few positions to which he still clung in Sicily. But, though for five years (248-243) no fresh naval operations were attempted, no compensating success by land followed. Hamilcar Barea, the new Carthaginian commander, not only ravaged with his fleet the coasts of Italy, but from his impregnable position at Ercte incessantly harassed the Roman troops in the west of the island, and even recaptured Eryx. Convinced once more of the impossi- bility of driving the Carthaginians out of Sicily as long as their navy swept the seas, the Romans deterniined on a final effort. The treasury was empty; but by the liberal contributions of private citizens a fleet was equipped, and

501.

506-511.

C. Lutatius Catulus, consul for 242, started for Sicily early 512.

in the summer of that year with 200 quinqueremes. From Drepana, whither he had gone to aid in the blockade, he sailed out to meet a Carthaginian fleet, despatched from Africa against him; and a battle took place at the /Kgates islands, sone 20 miles from the Sicilian coast, in which Catulus completely defeated his enemy. The end

2 For criticisms of the story of Regulus, see Mommsen, i. 523 ; Thne, ii. 69; Ranke, Weltgeschichte, ii. 185. Of. art. Recuvus.

513, 516.

of the long struggle had come at last. The Carthaginian government, despairing of being able to send further aid to their troops in Sicily, authorized Hamilcar to treat for peace. His proposals were accepted by Catulus, and the terms agreed upon between them were confirmed in all essential points by the commissioners sent out from Rome. The Carthaginians agreed to evacuate Sicily and the adjoining islands, to restore all prisoners, and to pay an indemnity of 2300 talents.

In its duration and its severity the First Punic War is justly ranked by Polybius above all other wars of his own and preceding times, though neither in the military talent displayed nor in the importance of its results can it be compared with the war that followed. It was distin- guished by no military achievement comparable with Hannibal's invasion of Italy, and with the single excep- tion of Hamilcar it produced no general of the calibre of Hannibal or Scipio. It was in fact a struggle in which both Rome and Carthage were serving an apprenticeship in a warfare the conditions of which were unfamiliar to both. The Roman legions were foes very unlike any against which the Carthaginian leaders had ever led their motley array of mercenaries, while Rome was called upon for the first time to fight a war across the sea, and to fight with ships against the greatest naval power of the age. The novelty of these conditions accounts for much of the vacillating and uncertain action observable on both sides, and their effect in this direction was increased by the evident doubts felt by both antagonists as to the lengths to which the quarrel should be pushed. It is possible that Hamilcar had already made up his mind that Rome must be attacked and crushed in Italy, but his govern- ment attempted nothing more than raids upon the coast. There are indications also that some in the Roman senate saw no end to the struggle but in the destruction of Carthage; yet an invasion of Africa was only once seriously attempted, and then only a halfhearted support was given to the expedition. But these peculiarities in the war served to bring out in the clearest relief the strength and the weakness of the two contending states. The chief dangers for Carthage lay obviously in the jealousy exhibited at home of her officers abroad, in the difficulty of controlling her mercenary troops, and in the ever-present possibility of disaffection among her

subjects in Libya,—dangers which even the genius of Hannibal failed finally to surmount. Rome, on the other hand, was strong in the public spirit of her citizens, the fidelity of her allies, the valour and discipline of her legions. What she needed was a system which should make a better use of her splendid materials than one under which her plans were shaped from day to day by a divided senate, and executed by officers who were changed every year, and by soldiers most of whom returned home at the close of each summer's campaign.

The interval between the First and Second Punic Wars was employed by both Rome and Carthage in strengthen- ing their respective positions. Of the islands lying off the coast of Italy, the most important, Sicily, had fallen to Rome as the prize of the recent war. The eastern end of the island was still left under the rule of King Hiero as the ally of Rome, but the larger western portion became directly subject to Rome, and a temporary arrangement seems to have been made for its government, either by one of the two pretors, or possibly by a queestor.! Sardinia and Corsica had not been surrendered to Rome by the treaty of 241, but three years later (238), on the invitation of the Carthaginian mercenaries stationed in the islands, a Roman force occupied them ; Carthage pro- = Ee OE ee eee

u Marquardt, Rim. Staatsver., i. 92; Mommsen, R. G., i. 548; Appian, Sic., 2.

tested, but, on the Romans threatening war, she gave way, and Sardinia and Corsica were formally ceded to Rome, though it was some seven or eight years before all resist- ance on the part of the natives themselves was crushed.

In 227, however, the senate considered matters ripe for 527.

the establishment of a separate and settled government, not only in Sardinia and Corsica, but also in Sicily. In that year two additional

preetors were elected ; to one was assigned the charge of western Sicily, to the other that of Sardinia and Corsica,? and thus the first stones of the Roman provincial system were laid. Of at least equal importance for the security of the peninsula was the sub- jugation of the Celtic tribes in the valley of the Po. These, headed by the Boii and Insubres and assisted by

levies from the Celts to the westward, had in 225 alarmed 529,

the whole of Italy by invading Etruria and penetrating to Clusium, only three days' journey from Rome. Here, however, their courage seems to have failed them. They retreated northward along the Etruscan coast, until at Telamon their way was barred by the Roman legions, returning from Sardinia to the defence of Rome, while a second consular army hung upon their rear. Thus hemmed in, the Celts fought desperately, but were com- pletely defeated and the flower of their tribesmen slain. The Romans followed up their success by invading the Celtic territory. The Boii were easily reduced to submis- sion. The Insubres, north of the Po, resisted more

obstinately, but by 222 the war was over, and all the 532,

tribes in the rich Po valley acknowledged the supremacy of Rome. The conquered Celts were not enrolled among the Italian allies of Rome, but were treated as subjects beyond the frontier. Three colonies were founded to hold them in check—Placentia and Cremona in the territory of the Insubres, Mutina in that of the Boii; and the great northern road (Via Flaminia) was completed as far as the Celtic border at Ariminum.

On the Adriatic coast, where there was no Carthage to be feared, and no important adjacent islands to be annexed, the immediate interests of Rome were limited to rendering the sea safe for Italian trade. It was with this object

that, in 229, the first Roman expedition crossed the 525,

Adriatic, and inflicted severe chastisement on the Illyrian pirates of the opposite coast. But the results of the expedition did not end here, for it was the means of estab- lishing for the first time direct political relations

between Rome and the states of Greece proper, to many of which the suppression of piracy in the Adriatic was of as much importance as to Rome herself. Alliances were concluded with Corcyra, Epidamnus, and Apollonia; and embassies explaining the reasons which had brought Roman troops into Greece were sent to the Autolians, the Achzans, and even to Athens and Corinth. Everywhere they were well received, and the admission of the Romans to the Isthniian

games 4 (228) formally acknowledged them as the natural 526.

allies of the free Greek states against both barbarian tribes and foreign despots, a relationship which was destined to prove as useful to Rome in the East as it had already proved itself to be in the West.

While Rome was thus fortifying herself on all sides, Cartliage had acquired a possession which promised to compensate her for the loss of Sicily, Sardinia, and Corsica. The genius of her greatest citizen and soldier, Hamilcar Barca, had appreciated the enormous value of the Spanish peninsula, and conceived the scheme of founding there a Carthaginian dominion which should not only add to the wealth of Carthage, but supply her with troops, and with a base of operations for that war of revenge with Rome on which his heart was set. The conquest of southern and

eastern Spain, begun by Hamilcar (236-228), and carried 518-526. |

2 Livy, Epit. xx. 3 Polyb., ii. 8 sq. 4 Polyb., ii, 12.

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526-538.

538.

528.

530.

Second Punic War,

on by his kinsman Hasdrubal (228-221), was completed by his son Hannibal, who, with all his father's genius, inherited also his father's hatred of Rome, and by 219 the authority of Carthage had been extended as far as the Ebro. Rome had not watched this rapid advance without anxiety, but, probably owing to her troubles with the Celts, she had contented herself with stipulating (226) that Carthage should not carry her arms beyond the Ebro, so as to threaten Rome's ancient ally, the Greek Massilia, and with securing the independence of the two nominally Greek communities, Emporis and Saguntum,! on the east coast.

But these precautions were of no avail against the resolute determination of Hannibal, with whom the conquest of Spain was only preliminary to an attack upon Italy, and who could not afford to leave behind him in Spain a state allied to Rome. In 219, therefore, dis- regarding the protests of a Roman embassy, he attacked and took Saguntum, an act which, as he had foreseen, rendered a rupture with Rome inevitable, while it set his own hands free for a further advance.

A second war with Carthage was no unlooked-for event at Rome; but the senate seems to have confidently expected that it would be waged at a distance from Italy—in Africa and in Spain, where Saguntum would have given them a convenient point of support; and to this hope they clung even after Saguntum was lost. In 218, the first year of the war, one consul, P. Cornelius Scipio, was despatched to Spain, and the other, T. Sempronius Gracchus, to Sicily, and thence to Africa. But Hannibal's secrecy and prompt- itude baffled all their calculations. Leaving New Carthage early in 218, in the space of five months he crossed the Pyrenees, reached the Rhone just as Scipio arrived at Massilia on his way to Spain, passed the Alps in spite of endless difficulties and hardships, and startled Italy by de- scending into the plains of Cisalpine Gaul. In two battles on the Ticinus and the Trebia he defeated the forces hastily collected to bar his progress southwards ; the Celtic tribes rallied to his

standard ; and at the beginning of the next year he prepared to realize the dream of his life and carry fire and sword into Italy itself. His own force numbered 26,000 men ; the total available strength of Rome and her allies was estimated at over 700,000.2 But Hannibal's hope lay in the possibility that by the rapidity of his movements he might be able to strike a decisive blow before Rome could mobilize her levies, or get her somewhat cumbrous military.machinery into working order. From a first success he expected no less a result than the break up of the Roman confederacy, and the isolation of Rome herself, while it would also increase the readiness of his own government to render him effective support. His trust in himself and his army was not misplaced, for to the last he had the advantage over the Roman legions wherever he met them in person. Except, however, in South Italy, his brilliant victories and dashing marches brought him no allies, and it was his inability to shake the loyalty of northern and central Italy and of the Latin colonies everywhere, even more than the indomitable perseverance of Rome and the supineness of Carthage, which caused his ultimate failure.

In the spring of 217 Hannibal crossed the Apennines and marched southwards through the lowlands of eastern Etruria, the route taken before him by the Celtic hordes. In April he annihilated Flaminius and his army at the Trasimene Lake,' and pushed on to Spoletium, only a few

play, ext 25: Polyb.,'iii, 15, 31.

- *Polybins (ii. 24 sg.) enumerates the forces of Rome and her allies at the time of the Celtic invasion of 225. For a criticism of his account see Mommsen, #. Forsch., ii. 398; Beloch, /tal. Bund, 80. For Hannibal's force, see Polyb., iii. 35, 56.*

3 For the date see Ovid, Fast., vi. 765; Weissenborn on Livy, xxii, 5; Mommsen, R. G., i. 594.

days' march from Rome. But Rome was not yet his goal ; from Spoletium, which had closed its gates against him, he moved rapidly eastward, ravaging the territories of Roman allies as he went, till he reached the Adriatic and the fertile lands of northern Apulia, where supplies and especially remounts for his Numidian cavalry' were plentiful, and communication with Carthage easy, and where, moreover, he was well placed for testing the fidelity of the most recent and the least trustworthy of the Italian allies of Rome. A second victory here, on the scale of that at the Trasimene Lake, might be the signal for a general revolt against Roman rule. It was not, however, until the summer of the next year that his opportunity came. The patient tactics of Q. Fabius Cunctator had become unpopular at Rome; and the consuls of 216, L. /Qmilius Paulus and M. Terentius Varro, took the field in Apulia, at the head of a larger force than Rome had yet raised, and with orders to fight and crush the daring invader. The result realized for the moment Hannibal's highest hopes. The Roman army was annihilated at Cannz ; and South Italy, with the exception of the Latin colonies and the Greek cities on the coast, came over to his side. Nor did the Roman misfortunes end here. Philip of Macedon concluded an alliance with Hannibal (215), and threatened an invasion of Italy. In the very next year Syracuse, no longer ruled by the faithful Hiero, revolted, and a Carthaginian force landed in Sicily ; lastly, in 212 came the loss of the Greek cities on the south coast. But the truth of Polybius's remark that the Romans are most to be feared when their danger is greatest was never better illustrated than by their conduct in the face of these accumulated disasters. Patiently and undauntedly they set themselves to regain the ground they had lost. Philip of Macedon was first of all forced to retire from the allied city of Apollonia which he had attacked (214), and then effectually diverted from all thoughts of an attack on Italy, by the formation of a coalition against him in Greece itself (211); Syracuse was recaptured in 212, after a lengthy siege, and Roman authority re-established in Sicily. In Italy itself the Roman commanders took advantage of Hannibal's absence in the extreme south to reconquer northern Apulia ; but their main efforts were directed to the recovery of Campania, and above all of Capua. The imminent danger of Capua, which he had named as the successor of Rome in the headship of Italy, recalled Hannibal from the south, where he was besieging a Roman garrison in the citadel of Tarentum. Failing to break through the lines

which enclosed it, he resolved, as a last hope of diverting the Roman legions from the devoted city, to advance on Rome itself. But his march, deeply as it impressed the imagination of his contemporaries by its audacity and promptitude, was without result. Silently and rapidly he moved along the course of the Latin Way, through the heart of the territory of Rome, to within 3 miles of the city,and even rode up with his advanced guard to the Colline gate. Yet no ally joined him; no Roman force was recalled to face him; no proposals for peace reached his camp; and, overcome, it is said, by the unmoved confidence of his foe, he withdrew, as silently and rapidly as he had advanced, to his headquarters in the

south. The fall of Capua followed inevitably (211),° and :

the Roman senate saw with relief the seat of war removed to Lucania and Bruttium, and a prospect opening of some relief from the exhausting exertions of the last five years. Their hopes were quickly dashed to the ground. The

4 Livy, xxiv. 20.

5 Livy, xxvi. 16, 33, gives the sentence passed on Capua: " Ager omnis et tecta publica P. R. facta, habitari tantum tanquam urbem, corpus nullum civitatis esse." For the condition of Capua subse- quently, see Cic,, Z. Agr., i. 6; compare C. J. L., 566 sq.

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faithful Massiliots sent word that Hasdrubal, beaten in Spain, was marching to join Hannibal. in Italy. The anxiety at Rome was intense, and every nerve was strained to prevent the junction of the two brothers. Equally great was the rclief when the news arrived that the bold march of the consul Claudius had succeeded, and that Hasdrubal

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made in the organization and consolidation of her rule. The rate of progress was indeed unequal.

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sions were not either to fall a prey to internal anarchy, or be recovered for Carthage by some second Hamilcar.

In the case of Sicily Sicily and Spain, the immediate establishment of a Roman and government was imperatively necessary, if these posses- SP.

547. had been defeated and slain on the river Metaurus (207).'] Accordingly, we find that in Sicily the former dominions The war in Italy was now virtually ended, for, though | of Hiero were at once united with the western half of the during four years more Hannibal stood at bay in a corner | island as a single province, under the rule of a Roman of Bruttium, he was powerless to prevent the restoration | praetor (201),? and that in Spain, after nine years of a 553. of Roman authority throughout the peninsula. Sicily | provisional government (206-197), two provinces were in 548-557.

548 was once more secure; and finally in 206, the year after | 197° definitely established, and each, like Sicily, assigned the victory on the Metaurus, the successes of the young P. | to one of the praetors for the year, two additional preetors

543-548. Scipio in Spain (211-206) were crowned by the complete | being elected for the purpose. But here the resemblance expulsion of the Carthaginians from the peninsula. | between the two cases ends. From 201 down to the out- 553. Nothing now remained to Carthage outside

Africa but the | break of the Slave War in 136 there was unbroken peace 618. ground on which Hannibal desperately held out, and | in Sicily, and its part in the history is limited to its popular opinion at Rome warmly supported Scipio when | important functions in supplying Rome with corn and in on his return from Spain he eagerly urged an immediate | provisioning and clothing the Roman legions. It became invasion of Africa. The senate hesitated. Many were | every year a more integral part of Italy; anda large pro- jealous of Scipio's fame, and resented his scarcely concealed | portion even of the land itself passed gradually into the intention of appealing to the people, should the senate | hands of enterprising Roman speculators. The governors decline his proposals. Others, like the veteran Q. Fabius, | of the two Spains had very different work to do from that thought the attempt hazardous, with exhausted resources, | which fell to the lot of the Sicilian preetors. Although and while Hannibal was still on Italian soil. But Scipio | the coast towns readily acquiesced in Roman rule, the

549, gained the day. He was elected consul for 205, and given | restless and warlike tribes of the interior were in a con- the province of Sicily, with permission to cross into Africa | stant state of ferment, which from time to time broke if he thought fit. Voluntary contributions of men, money, | out into opem revolt. In Sicily the ordinary preetorian and supplies poured in to the support of the popular hero ; | authority, with at most a few cohorts, was sufficient, but and by the end of 205 Scipio had collected in Sicily a | the condition of Spain required that year after year the

550. sufficient force for his purpose. In 204 he crossed to | pretors should be armed with the consular authority, and Africa, where he was welcomed by the Numidian prince | backed by a standing force of four legions, while more Masinissa, whose friendship he had made in Spain. In | than once the presence of the consuls themselves was

551. 203 he twice defeated the Carthaginian forces, and a large | found necessary. Still, in spite of all difficulties, the party at Carthage were anxious to accept his offer of | work of pacification proceeded. To the elder Cato (consul negotiations. But the advocates of resistance

triumphed. | 195), and to Tiberius Sempronius Gracchus (preetor and 559. Hannibal was recalled from Italy, and with him his brother | propreetor 180-179), father of the two tribunes, is mainly 574-5. Mago, who had made a last desperate attempt to create | due the credit of quieting the Celtiberian tribes of central a diversion in Italy by landing in Liguria. Mago died Spain, and the government of Gracchus was followed by on the voyage, but Hannibal returned to fight his last thirty years of comparative tranquillity. The insurrection battle against Rome at Zama, where Scipio, who had been | headed by Viriathus in 149 was largely caused by the 605.

552. continued in command as proconsul for 202 by a special | exactions of the Roman magistrates themselves, while its vote of the people, won a complete victory. 'The war | obstinate continuance down to the capture of Numantia was over. The Roman assembly gladly voted that the | in 133, was almost as much the result of the incapacity of 621. Carthaginian request for peace should be granted, and | the Roman commanders. But the re-settlement of the entrusted the settlement of the terms to its favourite Scipio | country by Scipio Africanus the younger in that year left and a commission of ten senators. Carthage was allowed | all'Spain, with the exception of the highland Astures and to retain her own territory in Africa intact ; but she under- | Cantabri in the north-west, finally and tranquilly subject took to wage no wars outside Africa, and none inside | to Rome. Meanwhile the disturbed. state of the interior without the consent of Rome. She surrendered all her | had not prevented the spread of Roman civilization on ships but ten triremes, her elephants, and all prisoners of | the seaboard. Roman traders and speculators flocked war. Finally she agreed to pay an indemnity of 10,000 | to the seaport towns and spread inland. The mines talents in fifty years. Masinissa was rewarded by an | became centres of Roman industry ; the Roman legionaries Increase of territory, and was enrolled among the "allies | quartered in Spain year after year married Spanish wives, and friends" of the Roman people.! and when their service was over gladly settled down in

a The battle of Zama decided the fate of the West. The Spain, in preference to returning to Italy. The first Roman

ae power of Carthage was broken, and her supremacy passed | communities established outside Italy were both planted

een Oy the right of conquest to Rome. Henceforth Rome had | in Spain, and both owed their existence to the Roman

rule, no rival to fear westward of Italy, and it rested with her- legions.> Spain even in 133 gave promise of becoming in self to settle within what limits her supremacy should be | time 'more Roman than Rome itself." confined, and what form it should take. The answer to In Africa there was no question at first of the introduc- Afriea— both these questions was largely determined for her by | tion of Roman government by the formation of a province. circumstances. For the next fifty years Rome was too Carthage, bound hand and foot by the treaty of 201, was War deeply involved in the affairs of the East to think of | placed under the jealous watch of the loyal prince of Nu- 153-146= extending her rule far beyond the limits of the rich inherit- ee ee ea

aT ance which had fallen to her by the defeat of Carthage ; | ihe fist heist fi, Sie wen ~ Fea ie ae

and it was not until 125 that she commenced a fresh career of conquest in the West by invading Transalpine Gaul. But within this area considerable advance was

1 Livy, xxx. 43; Polyb., xv. 18.

® Livy, xxx. 27; oF Marquardt, Staatsverw., i. 100, and Hiibner in Hermes, i. 105 sq.

4 Livy, xxvii. 5, "pace ac bello fidissimum annonac subsidium"'; Bi, SoCal, Dif

® Italica (206), Appian, Zder., 38; Carteia (171), Livy, xiii. 3.

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THIRD PUNIC WAR.]

midia, who himself willingly acknowledged the suzerainty of Rome. But it was impossible for this arrangement to be permanent. Every symptom of reviving prosperity at Carthage was regarded at Rome with feverish anxiety, and neither the expulsion of Hannibal in 195 nor his death in 183 did much to check the growing conviction that Rome would never be secure while her rival existed. It was therefore with grim satisfaction that many in the Roman senate watched the increasing irritation of the Carthia- ginians under the harassing raids and encroachments of their favoured neighbour Masinissa, and waited for the moment when Carthage should, by some breach of the con- ditions imposed upon her, supply Rome with a pretext for interference. At last in 151 came the news that Carthage, in defiance of treaty obligations, was actually at war with Masinissa. The anti-Carthaginan party in the senate, headed by M. Porcius Cato, eagerly seized the oppor- tunity, and, in spite of the protests of Scipio Nasica and others, war was declared, and nothing short of the destruc- tion of their city itself was demanded from the despairing Carthaginians. This demand, as the senate no doubt foresaw, was refused, and in 149 the siege of Carthage begun. During the next two years little progress was made, but in 147 P. Cornelius. Scipio AZmilianus, son of L. Aimilius Paulus, conqueror of Macedonia, and grandson by adoption of the conqueror of Hannibal was, at the age of thirty-seven, and though only a candidate for the edileship, elected consul, and given the command in Africa. In the next year (146) Carthage was taken and razed to the ground. Its territory became the Roman province of Africa, while Numidia, now ruled by the three sons of Masinissa, remained as an allied state under Roman suzerainty, and served to protect the new province against the raids of the desert tribes. Within little more than a century from the commencement of the First Punic War, the whole of the former

dominions of Carthage had been brought under the direct rule of Roman' magistrates, and were regularly organized as Roman provinces.

In Italy itself the Hannibalic war was inevitably followed by important changes, and these changes were naturally enough in the direction of an increased Roman predominance. In the north the Celtic tribes paid for their sympathy with Hannibal with the final loss of all separate political existence. Cispadane Gaul, studded with colonies, and flooded with Roman settlers, was rapidly Romanized. Beyond the Po in Polybius's time, about sixty years after the Hannibalic war, Roman civiliza- tion was already widely spread. In the extreme north- east the Latin colony of Aquileia, the last of its kind, was founded in 181, to hold in check the Alpine tribes, while in the north-west the Ligurians, though not finally subdued until a later time, were held in check by the colony of Luna (180), and by the extensive settlements of Roman citizens and Latins made on Ligurian territory in 173.1 In southern Italy the effects of the war were not less marked. The depression of the Greek cities on the coast, begun by the raids of the Sabellian tribes, was com- pleted by the repeated blows inflicted upon them during the Hannibalic struggle. Some of them lost territory ;? all suffered from a decline of population and loss of trade ; and their place was taken by such new Roman settlements as Brundusium and Puteoli.2 In the interior the southern Sabellian tribes suffered scarcely less severely. The Bruttii were struck off the list of Roman allies, and nearly

1 Livy, xlii, 4.

- *#.g., Tarentum, Livy, xliv. 16. A Roman colony was established at Croton in 194, and a Latin colony (Copia) at Thurii in 193 (Livy, xxxiv, 45, 53).*

> Brundusium was established after the First Punic War. Puteoli

was fortified during the Second Punic War, and became a Roman colony- in 194 (Livy, xxxiv. 45).

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Tol all their territory was confiscated. To the Apulians and Lucanians no such hard measure was meted out ; but their strength had been broken by the war, and their numbers dwindled ; large tracts of land in their territories were seized by Rome, and allotted to Roman settlers, or occupied by Roman speculators. That Etruria also suffered from declining energy, a dwindling population, and the spread of large estates is clear from the state of things existing there in 133, of the Latins and their nearest kinsmen, and in the new Latin and Roman settlements throughout the peninsula that progress and activity were henceforth concentrated, and even within this area the Roman, and not the strictly Latin, element tended to preponderate. Of the twenty colonies founded between 201 and 146 only four were Latin.

pulse of Pyrrhus from Italy, Rome had been slowly drift- ing into closer contact with the Eastern states. With one of the three great powers which had divided between them the empire of Alexander, with Egypt, she had formed an alliance in 273, and the alliance had been cemented by the growth of commercial intercourse between the two countries.5 In 228 her chastisement of the Illyrian pirates had led naturally enough to the establishment of friendly relations with some of the states of Greece proper. Further than this, however, Rome for the time showed no desire to go. The con- nexions already formed were sufficient to open the eastern ports to her trade, and the engrossing struggle with Carthage left her neither leisure nor strength for active interference in the incessant feuds and rivalries which had made up Eastern politics since the falling asunder of Alexander's empire. In 214 the alliance between Philip and Hannibal, and the former's threatened attack on Italy, forced her into war with Macedon, but even then she con- tented herself with heading a coalition of the Greek states against him, which effectually frustrated his designs

or

It was indeed in central Italy, the home 621,.

' 553-608. (6) Rome in the East, 200-133.—Ever since the re- 554-621.

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against herself; and at the first opportunity (205) she 549.

ended the war by a peace which left the position un- changed. The results of the war were not only to draw closer the ties which bound Rome to the Greek states, but to inspire the senate with a genuine dread of Philip's restless ambition, and with a bitter resentment against him for his union with Hannibal. The events of the next four years served to deepen both these feelings. Philip entered into a compact with Antiochus of Syria for the partition between them of the dominions of Egypt,° now left by the death of Ptolemy Philopator to the rule of a boy king. Antiochus was to take Ccle-Syria and Phoenicia, while Philip claimed for his share the districts subject to Egypt on the coasts of the Augean and the Greek islands. Philip no doubt hoped to be able to secure these unlawful acquisitions before the close of the Second Punic War should set Rome free to interfere with his plans. But the obstinate resistance offered by Attalus of Perga- mum and the Rhodians upset his calculations. Rome made peace with Carthage, and the senate had leisure to listen to the urgent appeal for assistance which reached her from her Eastern allies. With Antiochus indeed the senate was not yet prepared to quarrel ; Egypt was assured of the continued friendship of Rome, but Antiochus was allowed to work his will in Ceele-Syria.7 With Philip it is clear that the senate had no thoughts of a peaceful settlement. Their animosity against him had been deepened by the assistance he had recently rendered to Carthage. Always an unsafe and turbulent

4 Appian, Hann., 61; Aul. Gell., x. 3; ¢f Beloch, Ztal. Bund. 5 Egypt had supplied corn to Italy during the Second Punic War (Polyb., ix. 44).

S Polyb., iii, 2, xv. 20; Livy, xxxi. 14. 7 Livy, xxxiii. 19.

In 205 549.

In 201 553.

654.

Second Mace- donian War,

200-197 = 554-557.

553.

The liberation of Greece,

560.

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neighbour, he would, if allowed to become supreme in the Aigean, prove as dangerous to her interests in the East as Carthage had been in the West; nor, lastly, could Rome, in honour, look quietly on at the ill-treatment of states which, as Greeks and as allies of her own, had a double claim on her protection. To cripple or at least to stay the growth of Philip's power was in the eyes of the senate a necessity, but it was only by representing a Macedonian invasion of Italy as imminent that they persuaded the assembly, which was longing for peace, to pass a declara-tion of war] (200), an ostensible pretext for which was found in the invasion by Macedonian troops of the terri- tory of Rome's ally, Athens,

The war commenced in the summer of 200 B.c., and, though the landing of the Roman legions in Epirus was not followed, as had been hoped, by any general rising against Philip, yet the latter had soon to discover that, if they were not enthusiastic for Rome, they were still less inclined actively to assist himself. Neither by force nor diplomacy could he make any progress south of Beeotia. The fleets of Pergamum and Rhodes, now the zealous allies of Rome, protected Attica and watched the eastern coasts. The Acheans and Nabis of Sparta were obstin- ately neutral, while nearer home in the north the Epirots and Atolians threatened Thessaly and Macedonia. His own resources both in men and in money had been severely strained by his constant wars,? and the only ally who could have given him effective assistance, Antiochus, was fully occupied with the conquest of Coele-Syria. It is no wonder then that, in spite of his dashing generalship and high courage, he made but a brief stand. T. Quinctius Flamininus (consul 198), in his first year of command, defeated him on the Aous, drove him back to the pass of Tempe, and in the next year utterly routed him at Cynos- cephale. Almost at the same moment the

Achzans, who had now joined Rome, took Corinth, and the Rhodians defeated his troops in Caria.? Further resistance was impossible ; Philip submitted, and early the next year a Roman commission reached Greece with instructions to arrange terms of peace. These were such as effectually secured Rome's main object in the war, the removal of all danger to herself and her allies from Macedonian aggres- sion. Philip was left in possession of his kingdom, but was degraded to the rank of a second-rate power, deprived of all possessions in Greece, Thrace, and Asia Minor, and forbidden, as Carthage had been in 201, to wage war without the consent of Rome, whose ally and friend he now became. Macedon thus weakened could*

no longer be formidable, but might yet be useful, not

only as a barrier against Thracians and Celts,> but as a check upon anti-Roman intrigues in Greece.

The second point in the settlement now effected by Rome was the liberation of the Greeks, The " freedom of Greece" was proclaimed at the Isthmian games amid a scene of wild enthusiasm,® which reached its height when two years later (194) Flamininus withdrew his troops even from the "three fetters of Greece "—Chalcis, Demetrias, and Corinth." There is no reason to doubt that, in acting thus, not only Flamininus himself, but the senate and people at home were influenced, partly at any rate, by feelings of genuine sympathy with the Greeks and rever- ence for their past. It is equally clear that no other course was open to them. For Rome to have annexed Greece, as she had annexed Sicily and Spain, would have been a flagrant violation of the pledges she had repeatedly given both before and during the war; the attempt would have excited the fiercest opposition, ES ee eee eee

1 Livy, sexi 6, 7. 2 Livy, xxxiii., 3.

5 Polyb., xvili, 44-47 5 Livy, xxxiii. 30-34.

Polyb., xviii. 87. 6 Livy, xxxiii. 32, 33.

3 7b., 17.

? Livy, xxxiv. 48-52.

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and would probably have thrown the Asiatic as well as the European Greeks into the arms of Antiochus. Buta friendly and independent Greece would be at once a check on Macedon, a barrier against aggression from the East, and a promising field for Roman commerce. Nor while liberating the Greeks did Rome abstain from such arrange- ments as seemed necessary to secure the predominance of her own influence. In the Peloponnese, for instance, the Achzans were rewarded by considerable accessions of territory; and it is possible that the Greek states, as allies of Rome, were expected to refrain from war upon each other without her consent. The failure of the policy, after all, was due to the impracticability of the Greeks, and the intensity of their civic and tribal feuds. To sup- pose as some have done that Rome intended it to fail is to attribute to the statesmen of the generation of Scipio and Flamininus even more than the cynicism of the time of L. Mummius.§

Antiochus ITI. of Syria, Philip's accomplice in the pro- War with posed partition of the dominions of their common rival, Antiochus,

Egypt, returned from the conquest of Coele-Syria (198) to learn first of all that Philip was hard pressed by the Romans, and shortly afterwards that he had been deci- sively beaten at Cynoscephale. It was already too late to assist his former ally, but Antiochus resolved at any rate to lose no time in securing for himself the possessions of the Ptolemies in Asia Minor and in eastern Thrace, which Philip had claimed, and which Rome now pro- nounced free and independent. Asia Minor and crossed into Thrace. But Antiochus was pleasure-loving, irresolute, and above all no general, and

it was not until 192 that the urgent entreaties of the 562.

/Etolians, and the withdrawal of the Roman troops from Greece, nerved him to the decisive step of crossing the Aigean ; and even then the force he took with him was so small as to show that he completely failed to

appreciate the nature of the task before him.!? At Rome the prospect of a conflict with Antiochus excited great anxiety, and it was not until every resource of diplomacy had been exhausted that war was declared. At a dis- tance, indeed, Antiochus, the great king, the lord of all the forces of Asia, seemed an infinitely more formidable opponent than their better known neighbour Philip, and a war against the vaguely known powers of the East a far more serious matter than a campaign in Thessaly. War, however, was unavoidable, unless Rome was to desert her Greek allies, and allow Antiochus to advance unopposed to the coasts of the Adriatic. And the war had no sooner commenced than the real weakness which lay behind the magnificent pretensions of the "king of kings" was revealed.

Had Antiochus acted with energy when in 192 he 562.

landed in Greece, he might have won the day before the Roman legions appeared. As it was, in spite of the warnings of Hannibal,! who was now in his camp, and of the AXtolians, he frittered away valuable time between his pleasures at Chalcis and useless attacks on petty Thessalian towns. ing force; and a single battle at Thermopyle broke the courage of Antiochus, who hastily recrossed the sea to Ephesus, leaving his Atolian allies to their fate. But Rome could uot pause here. The safety of her faithful allies, the Pergamenes and Rhodians, and of the Greek cities in Asia Minor, as well as the necessity of chastising Antiochus, demanded an invasion of\Asia. A Roman fleet*

8 For the conflicting views of moderns on the action of Rome, see Mommsen, &. G@., i. 718, and on the other side Ihne, R. G., iii. 52- 63, and C. Peter, Studien zur Rém. Gesch., Halle, 1863, pp. 158 sq.

9 Livy, xxxiii. 88; Polyb., xviii. 50, LO Givy. xxve 40.

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In 197-196 he overran 557-8,

In 191 Glabrio landed at the head of an impos- 563.

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had already (191) crossed the A®gean, and in concert with the fleets of Pergamum and Rhodes worsted the navy of Antiochus. In 190 the new consul L. Scipio, accom- panied by his famous brother, the conqueror of Africa, led

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hostility to Rome among his Greek and barbarian neigh- bours. His successor, Perseus, his son by a left-handed alliance, continued his father's work. He made friends among the Illyrian and Thracian princes, connected him-

MACEDONIAN WARS. |

At

the Roman legions for the first time into Asia.

Magnesia, near Mount Sipylus in Lydia, he met and defeated the motley and ill-disciplined hosts of the great For the first time the West, under Roman leader-

king.! ship, successfully encountered the forces of the East, and

the struggle began which lasted far on into the days of

self by marriage with Antiochus IV. of Syria and with Prusias of Bithynia, and, among the Greek peoples, strove, not without success, to revive the memories of the past glories of Greece under the Macedonian leadership of the great Alexander.4 The senate could no longer hesitate. They were well aware of the restlessness and discontent in

_ Settle. the emperors. The terms of the peace which followed | Greece ; and after hearing from Eumenes of Pergamum, ment of the victory at Magnesia tell their own story clearly | and from their own officers, all details of Perseus's intrigues } = enough. 'There is no question, any more than in Greece, | and preparations they declared war. The struggle, in of annexation ; the main object in view is that of secur- spite of Perseus's

courage and the incapacity at the outset ing the predominance of Roman interests and influence | of the Roman commanders, was short and decisive. The throughout the peninsula of Asia Minor, and removing to | sympathy of the Greeks with Perseus, which had been a safe distance the only Eastern power which could be encouraged by the hitherto passive attitude assumed by considered dangerous.?, The line of the Halys and the | Rome, instantly evaporated on the news that the Roman . Taurus range, the natural boundary of the peninsula east- legions were on their way to Greece. No assistance came ward, was established as the boundary between Antiochus | from Prusias or Antiochus, and Perseus's only allies were and the kingdoms, cities, and peoples now enrolled as the | the Thracian king Cotys and the Illyrian Genthius. The allies and friends of Rome. This line Antiochus was for- | victory gained by L. Aimilius Paulus at Pydna (168) 586. bidden to cross ; nor was he to send ships of war farther | ended the war. Perseus became the prisoner of Rome, | west than Cape Sarpedon in Cilicia. Immediately to the | and as such died in Italy a few years later.' Rome had west of this frontier lay the small states of Bithynia and | begun the war with the fixed resolution no longer of . Paphlagonia and the immigrant Celtic Galate, and these crippling but of destroying the Macedonian state. Perseus's frontier states, now the allies of Rome, served as a second | repeated proposals for peace during the war had been line of defence against attacks from the east. The area | rejected; and his defeat was followed by the final extinc- . lying between these "buffer states" and the Algean was | tion of the kingdom of Philip and Alexander.8 Mace- organized by Rome in such a way as should at once reward | donia, though it ceased to exist as a single state, was not | the fidelity of her allies and secure both her own paramount definitely constituted a Roman province.? On the con- authority and safety from foreign attack. Pergamum and | trary, the mistake was made of introducing some of the : Rhodes were so strengthened—the former by the gift of | main principles of the provincial system—taxation, dis- the Chersonese, Lycaonia, Phrygia, Mysia, and Lydia, the | armament, and the isolation of the separate communities— | latter by that of Lycia and Caria—as not only amply to | without the addition of the element most essential for the reward their loyalty, but to constitute them effective props | maintenance of order—that of a resident Roman governor. of Roman interests and effective barriers alike against | The four petty republics now

created were each autonom- Thracian and Celtic raids in the north and against aggres- | ous, and each separated from the rest by the prohibition sion by Syria in the south. Lastly, the Greek cities on the | of commercium and connubium, but no central controlling coast, except those already tributary to Pergamum, were | authority was substituted for that of the Macedonian king. declared free, and established as independent allies of Rome. | The inevitable result was confusion and disorder, resulting Sb4- 565. In a space of little over eleven years (200-189) Rome | finally (149- 146) in the attempt of a pretender, Andriseus, 605-8. had broken the power of Alexander's successors and | who claimed to be a son of Perseus, to resuscitate the ate established throughout the eastern Mediterranean a Roman | ancient monarchy." On his defeat in 146 the senate Spat protectorate. It remained to be seen whether this protec- | hesitated no longer, and Macedonia became a Roman pro- province. torate could be maintained, or whether Rome would be | vince, with a Roman magistrate at its head.1! driven to that policy of annexation which she had adopted The results of the protectorate in Greece, if less Affairs in ; from the first in Sicily and Spain. dangerous to Roman supremacy, were quite as unfavour- STece. | te It was in the western half of the protectorate in Euro-| able to the maintenance of order. But from 189 to the 565-587. joie pean Greece that the first steps in the direction of annexa- | defeat of Perseus in 167, no formal change of importance War, tion were taken. The enthusiasm provoked by the libera- | in the status of the Greek states was made by Rome. The 171-168 tion of the Greeks had died away, and its place had been senate, though forced year after year to listen to the 583-6. taken by feelings of dissatisfied ambition or sullen resent- | mutual recriminations and complaints of rival communi- | ment. Internecine feuds and economic distress had | ties and factions, contented itself as a rule with interven- brought many parts of Greece to the verge of anarchy, | ing just enough to remind the Greeks that their freedom and, above all, the very foundations of the settlement | was limited by its own paramount authority, and to pre- 597. effected in 197 were threatened by the reviving power and | vent any single state or confederacy from raising itself too aspirations of Macedon. Loyally as Philip had aided | far above the level of general weakness which it was the | Rome in the war with Antiochus, the peace of Magnesia | interest of Rome to maintain. After the victory at . brought him nothing but fresh humiliation. He was Pydna,

however, the sympathy shown for Perseus, exag- . forced to abandon all hopes of recovering Thessaly, and he | gerated as it seems to have been by the interested repre- had the mortification to see the hated king of Pergamum | sentations of the Romanizing factions in the various states, installed almost on his borders as master of the Thracian | — an rs i die wl dose ie. Chersonese. Resistance at the time was unavailing, but | re ae eat, Piit, Aged, 15 . ea ~/9. from 189 until his death (179) he laboured patiently and 7 Diod., xxxi. 9; Livy, xlv. 42; Polyb., xxxvii. 16.

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quietly to increase the internal resources of his own king- dom,? and to foment, by dexterous intrigue, feelings of meg ay Oe ees Senge 0!

} Livy (xxxvii. 40): describes the composition of Antiochus's army. > Livy, xxxvii. 55, xxxviii. 38 ; Eoly pesca 17 3 Livy, xxxix. 24 sq.

Livy, xlv. 9. 9 Livy, xlv. 17, 29; Plut., Amil., 28; Mommsen, 7. G., i. 769; Thne, #. G., ili. 216 ; Marquardt, Rém. Staatsverw., i. 160. 10 Polyb., xxxvii. 2; Livy, Zpit., 1. ll For the boundaries of the province, see Ptolemy, iii. 13; Mar- quardt, loc, cit., 161.

XX. — 95

Settle- iment of Greece,

146 = 608.

587.

The Roman protector- ate in Asia,

189-146= 565-608.

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was made the pretext for a more emphatic assertion of Roman ascendency. All those suspected of Macedonian leanings were removed to Italy, as hostages for the loyalty of their several communities,! and the

real motive for the step was made clear by the exceptionally severe treatment of the Achzans, whose loyalty was not really doubtful, but whose growing power in the Peloponnese and growing independence of language had awakened alarm at Rome. A thousand of their leading men, among them the historian Polybius, were carried off to Italy (see Ponysius). In ZEtolia the Romans connived at the massacre by their so-called friends of 500 of the opposite party. Acarnania was weakened by the loss of Leucas, while Athens was rewarded for her unambitious loyalty by the gift of Delos and Samos.

But this somewhat violent experiment only answered for a time. In 148 the Achzans rashly persisted, in spite of warnings, in attempting to compel Sparta by force of arms to submit to the league. When threatened by Rome with the loss of all that they had gained since Cynoscephale, they madly rushed into war.? They were easily defeated, and a "commission of ten," under the presidency of L. Mummius, was appointed by the senate thoroughly to resettle the affairs of Greece? Corinth, by orders of the senate, was burnt to the ground, and its territory confiscated. Thebes and Chalcis were destroyed, and the walls of all towns which had shared in the last desperate outbreak were razed to the ground. All the existing confederacies were dissolved ; no " commercium " was allowed between one community and another. LEvery- where an aristocratic type of constitution, according to the invariable Roman practice, was established, and the pay- ment of a tribute imposed. Into Greece, as into Macedonia in 167, the now familiar features of the provincial system were introduced—disarmament, isolation, and taxation. The Greeks were still nominally free, and no separate province with a governor of its own was established, but the needed central control was provided by assigning to the neighbouring governor of Macedonia a general super- vision over the affairs of Greece. From the Adriatic to the Aigean, and as far north as the river Drilo and Mount Scardus, the whole peninsula was now under direct Roman rule.5*

Beyond the Aigean the Roman protectorate worked no better than in Macedonia and Greece, and the demoraliz- ing recriminations, quarrels, and disorders which flourished under its shadow were aggravated by its longer duration, and by the still more selfish view taken by Rome of the

responsibilities connected with it.6 At one period indeed, after the battle of Pydna, it seemed as if the more vigorous, if harsh, system then initiated in Macedon and Greece was to be adopted farther east also. The level- ling policy pursued towards Macedon and the Acheans was applied with less justice to Rome's two faithful and favoured allies, Rhodes and Pergamum. The former had rendered themselves obnoxious to Rome by their inde- pendent tone, and still more by their power and commer- cial prosperity. Ona charge of complicity with Perseus they were threatened with war, and though this danger was averted' they were forced to exchange their equal alliance with Rome for one which placed them in close

: Livy, xlv. 31. 2 Livy, Hpit., li., lit.

Livy, Xpit., lii.; Polyb., xl. 9 sq. ; Pausanias, vii. 16 ; Momm- sen, FR. G., ii, 47 sq.

- *Mommsen, loc. cit., note; Marquardt, Rim. Staatsverw., i. 164 sq.; A. W. Zumpt, Commentt. Hpigraph., ii. 158.*

5 North of the Drilo, the former kingdom of Perseus's ally Genthius had been treated as Macedon was in 167 (Livy, xlv., 26); ¢f Zippel, Rim. Herrschaft in Illyrien, Leipsic, 1877. Epirus, which had been desolated after Pydna (Livy, xlv. 34), went with Greece; Marquardt,

i Oe § Mommsen, &. G., i. 771-780, ii. 50-67. Livy, xlv. 20; Polyb., xxx. 5.

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dependence upon her, and to resign the lucrative posses- sions in Lycia and Caria given them in 189. their commercial prosperity was ruined by the establish- ment of a free port at Delos,§ and by the short-sighted acquiescence of Rome in the raids of the Cretan pirates. With Eumenes of Pergamum no other fault could be found than that he was strong and successful; but this was enough. His brother Attalus was invited, but in vain, to become his rival. His turbulent neighbours, the Galate, were

encouraged to harass him by raids. Pamphylia was declared independent, and favours were heaped upon Prusias of Bithynia. These and other annoyances and humiliations had the desired effect. Eumenes and his two successors—his brother and son, Attalus II. and Attalus IIJ.—contrived indeed by studious humility and dexterous flattery to retain their thrones, but Pergamum ceased to be a powerful state, and its weakness, added to that of Rhodes, increased the prevalent disorder in Asia Minor. During the same period we have other indica- tions of a temporary activity on the part of Rome. The frontier of the protectorate was pushed forward to the confines of Armenia and to the upper Euphrates by alliances with the kings of Pontus and Cappadocia beyond the Halys. In Syria, on the death of Antiochus Epiphanes

(164), Rome intervened to place a minor, Antiochus 590.

Eupator, on the throne, under Roman guardianship.? In

168 Egypt formally acknowledged the suzerainty of 586, Rome,!9 and in 163 the senate, in the exercise of this new 591.

authority, restored Ptolemy Philometor to his throne, but at the same time weakened his position by handing over Cyrene and Cyprus to his brother Euergetes.!!

But this display of energy was short-lived. From the

Finally, 565.

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death of Eumenes in 159 down to 133 Rome, secure 595-691.

in the absence of any formidable power in the East, and busy with affairs in Macedonia, Africa, and Spain, relapsed into an inactivity the disastrous results of which revealed themselves in the next period, in the rise of Mithradates of Pontus, the spread of Cretan and Cilician piracy, and the advance of Parthia. To the next period also belongs the

conversion, on the death of Attalus TIL, of the kingdom of Pergamum into the Roman province of Asia.

Both the western and eastern Mediterranean now acknowledged the suzerainty of Rome, but her relations with the two were from the first different. The West fell to her as the prize of victory over Carthage, and, the Carthaginian power broken, there was no hindrance to the immediate establishment in Sicily, Sardinia, Spain, and finally in Africa, of direct Roman rule. To the majority, moreover, of her Western subjects she brought a civilization as well as a government of a higher type than any before known to them. And so in the West she not only formed provinces but created a new and wider Roman world. To the east, on the contrary, she came as the liberator of the Greeks; and it was only slowly that in this part of the empire her provincial system made way. In the East, moreover, the older civilization she found there obstinately held its ground. Her proconsuls governed and her legions protected the Greek communities, but to the last the East remained in language, manners, and thought Greek' and not Roman.

Pertop IIL: Tus Periop or THE REVOLUTION (146-49 608-705.

B.C.).—In the course of little more than a century, Rome had become the supreme power in the civilized world. By all men, says Polybius, it was taken for granted that nothing remained but to obey the commands of the Romans.!?_ For

8 Polyb., xxxi. 7, The Rhodian harbour dues suffered severely.

9 Rome had already intervened between Syria and Egypt; Livy, cake WAS Iolite, Sembe, IML, ser, 1M

10 Livy, xiv. 18, "Regni maximum praesidium in fide populi Romani." ll Livy, Zpit., xlvi., xlvii.

12 Polyb., iti. 4.

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Consti- tutional changes,

265-146 = 489-608,

Ascend- ency

of the senate.

CONSTITUTIONAL CHANGES. |

the future the interest of Roman history centres in her attempts to perform the two Herculean tasks which this unique position laid upon her,—the efficient government of the subject peoples, and their defence against the bar-

barian races which swarmed around them on all sides.

They were tasks under which the old republican constitu- tion broke down, and which finally overtaxed the strength even of the marvellous organization framed and elaborated by Augustus and his successors.

At the outset the difficulties of Rome were increased by the rapidity with which her new duties came upon her. From a century, first of deadly struggle, and then of dazzlingly easy success, she emerged to find herself called upon to govern a world with the primitive machinery of a small city state, and to deal with new and complicated ad- ministrative problems which she had as yet had no leisure to study. Nor was it until her own political system had been remodelled that she was able to deal effectively with the government of the empire at large. During the period which has now to be considered, the period of the so-called Revolution, but little advance was made towards a better imperial organization, and that little was made by men who, like Cesar and Pompey, belonged, both in the methods and aims of their policy and in the position they held, to the empire rather than to the republic.

Although in its outward form the old constitution had undergone little change during the age of war and con- quest from 265 to 146,! the causes, both internal and external, which brought about its fall had been silently at work throughout. Its form was in strictness that of a moderate democracy. The patriciate had ceased to exist as a privileged caste,? and there was no longer any order of nobility recognized by the constitution. The senate and the offices of state were in law open to all,' and the will of the people in their comitia had been in the most explicit and unqualified manner declared to be supreme alike in the election of magistrates, in the passing of laws, and in all matters touching the "caput" of a Roman citizen. But in practice the constitution had become an oligarchy. The senate, not the assembly, ruled Rome, and both the senate and the magistracies were in the hands ofa class which, in defiance of the law, arrogated to itself the title and the privileges of a nobility.4 The ascendency of the senate is too obvious and familiar a fact to need much illustration here. It is but rarely that the assembly was called upon to decide questions of policy, and then the proposal was usually made by the magistrate in obedience to the express directions of the senate.® In the enormous majority of cases the matter was settled by a senatus consultum, without any reference to the people at all. The assembly decides for war or peace®, but the conduct of the warand the conditions of peace are matters left to the senate. Now and then the assembly confers a

1 The most important change was the assimilation of the division by classes and centuries with that by tribes, a change effected appa- rently by the censors in their revision of the register, and probably effected gradually. For a full discussion of the point, see Mommsen, Rh. G., i. 818; Lange, Rom. Alterth., ii. 463 (where the literature is given); Madvig, Verf. d. Rim. Reichs, i. 117. A second constitu- tional question was the franchise of the freedmen; see Nitzsch, Die Gracchen, 132 (Berlin, 1847)

2 A few offices of a more or less priestly character were still filled only by patricians, ¢.g., rex sacrorun, flamen Dialis. A plebeian first became "curio maximus" in 209 (545 a.u.c.); Livy, xxvii. 8; see Mominsen, Rém. Forsch., i. 77-127.

3 The "lectio senatus" was in the hands of the censors, but whether before Sulla's time their choice was subject to legal restric- tions is doubtful. Cf. Cicero Pro Sestio, 65, "Deligercntur in id consilium ab universo populo."

4 Mommsen, R. G., i. 781 sq.; Lange, Rom. Alterth., ii.

° "Ex auctoritate senatus." The lex Flaminia agraria of 232 Was an exception, Cic. De Senect., 4; Polyb., ii. 21.

® Livy, xxxi. 5, xxxiii, 25, xxxvii. 55.

command upon the man of its choice, or prolongs the imperium of a magistrate,' but, as a rule, these and all questions connected with foreign affairs are settled within the walls of the senate house. It is the senate which year after year assigns the commands and fixes the number and disposition of the military forces,8 directs the organ- ization of a new province,? conducts negotiations, and forms alliances. Within Italy, though its control of affairs was less exclusive, we find that, besides supervis- ing the ordinary current business of administration, the senate decides questions connected with the Italian allies, sends out colonies, allots lands, and directs the suppres- sion of disorders. Lastly, both in Italy and abroad it managed the finances.!° Inseparably connected with this monopoly of affairs to the exclusion of the assembly was the control which in practice, if not in theory, the senate exercised over the magistrates. The latter had become what Cicero wrongly declares they were always meant to be, merely the subordinate ministers of the supreme council,"! which assigned them their departments, provided them with the necessary equipment, claimed to direct their conduct, prolonged their commands, and rewarded them with triumphs. It was now at once the duty and the interest of a magistrate to be "in auctoritate senatus," "subject to the authority of the senate," and even the once formidable "tribuni plebis" are found during this period actively and loyally supporting the senate, and acting as its spokesmen in the assembly.?"

The causes of this ascendency of the senate are not to Its causes.

be found in any additions made by law to its constitu- tional prerogatives, but first of all in the fact that the senate was the only body capable of conducting affairs in an age of incessant war. The voters in the assembly, a numerous, widely scattered body, many of whom were always away with the legions abroad, could not readily be called together, and when assembled were very imper- fectly qualified to decide momentous questions of military strategy and foreign policy. The senate, on the contrary, could be summoned in a moment,!® and included in its ranks all the skilled statesmen and soldiers of the common- wealth, while its forms of procedure were at least better fitted than those of the comitia for securing the careful discussion and prompt decision of the question before it. The subordination of the magistrates was equally the result of circumstances, though it suited the senatorial advocates of a later day to represent. it as an original prin- ciple of the constitution, and though it was encouraged and confirmed by the policy of the senate itself.!4 Tor, as the numbers of the magistrates, and also the area of govern- ment, increased, some central controlling power became absolutely necessary to prevent collisions between rival authorities, and to secure a proper division of labour, as well as to enforce the necessary concert and co-operation, nor could such a power be found anywhere in the repub- lican system but in the senate, standing as it necessarily did in the closest relations with the inagistrate, and com- posed as it was increasingly of men who were or had been in office.

*Once more, behind both senate and magistrates lay the The – —— '*nobiles,"*

T Wivy, xxix. 40) xecx, 27,641) xxi 50.

8 Livy, xxvi. 1, "consules de republica, de administratione belli, ae provinciis excrcitibusque patres consulucrunt."

9 Livy, xlv. 18.

10 Thne, R. G., iv. 48; Polyb., vi. 13.

11 Pro Sestio, 65, “quasi ministros gravissimi consilii.”

2 Livy, xxvii. 5, xxviii. 45.

13 Livy, xxii. 7; in 191 the senators were forbidden to Icave Rome® for more than a day. Nor were more than five to be absent at once ; Livy, xxxvi. 3.

M4 F.g., the abandonment of the dictatorship and the growing infre- quency of re-election after the Second Punic War.

5 Livy, xxvil. 35; xxxv, 42, 48.

608.

Weakness of the sena- torial govern- ment.

608.

756

whole power and influence of the new nobility.1 These “nobiles” are esseutially distinct from the older and more legitimate patrician aristocracy. Every patrician was of course noble, but the majority of the “noble families” in 146 were not patrician but plebeian.? The title had been gradually appropriated, since the opening of the magistra- cies, by those families whose members had held curule office, and had thereby acquired the “‘jus imaginum.” It was thus in theory within the reach of any citizen who could win election even to the curule edileship, and, more- over, it carried with it no legal privileges whatsoever. Gradually, however, the ennobled plebeian families drew together, and combined with the older patrician gentes to form adistinct order. Office brought wealth and prestige, and both wealth and prestige were liberally employed in securing for this select circle a monopoly of political power, and excluding new men.? Already by the close oi the period it is rare for any one but a noble to find his way into high office or into the senate. The senate and magistrates are the mouthpieces of this order, and are identified with it in policy and interest. Lastly, it must be allowed that both

the senate and the nobility had to some extent justified their power by the use they made of it. It was their tenacity of purpose and devoted patriot- ism which had carried Rome through the dark days of the Hannibalic war. The heroes of the struggle with Carthage belonged to the leading families ; the disasters at the Trasimene Lake and at Cannze were associated with the blunders of popular favourites.

From the first however, there was an inherent weak- ness in this senatorial government. It had no sound con- stitutional basis, and with the removal of its accidental supports it fell to the ground. Legally the senate had no positive authority. It could merely advise the magistrate when asked to do so, and its decrees were strictly only suggestions to the magistrate, which he was at liberty to accept or reject as he chose.4 It had it is true become customary for the magistrate not only to ask the senate's advice on all important points, but to follow it when given. But it was obvious that if this custom were weakened, and the magistrates chose to act independently, the senate was powerless. It might indeed anathematize® the re- fractory official, or hamper him if it could by setting in motion against him a colleague or the tribunes, but it could do no more, and these measures, though as a rule effective in the case of magistrates stationed in Rome, failed just where the senate's control was most needed and most difficult to maintain—in its relations with the generals and governors of provinces abroad. The virtual independ- ence of the proconsul was before 146 already exciting the jealousy of the senate and endangering its supremacy.é Nor again had the senate any legal hold over the assembly. Except in certain specified cases, it rested with the magis- trate to decide whether any question should be settled by a decree of the senate or a vote of the assembly.' If he

1 Mommsen, R. G., i. 782 sq.

® L.g., Livii, Sempronii, Ceecilii, Licinii, &c.

- *Livy, xxii. 34, "plebeios nobiles . . . contemuere plebem, ex quo contemni a patribus desierint, coepisse"; cf. Sall., Jug., 41, " paucorum arbitrio belli domique agitahatur penes eosdem aerarium, provinciae, magistratus." Mommsen, R. G., i. 792, 793. The number*

of new families ennobled dwindles rapidly after 200 B.¢.; Willems, Le Sénat de la République Romaine, i. 366 sq. (Paris, 1878).

4 The senators' whole duty is "sententiam dicere." The senator was asked "quid eenses?" the assembly " quid velitis jubeatis?" Cf, also the saving clause, "Si eis videretur" (sc. consulibus, &c.) in Scta., eg., Cic, Phil., v.19.

- *By declaring his action to be "contra rempublicam." force of this anathema varied with circumstances. value.*

6 Livy, xxxviii. 42, of Cn. Manlius Vulso in Asia, 189 B.c.; of. also the position of the two Scipios.

7 Hence the same things, e.g., founding of colonies, are done in one

The It had no legal

ROME

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decided to make a proposal to the assembly, he was not bound except by custom to obtain the previous approval of the senate, and® the constitution set no limits to the power of the assembly to decide any question whatsoever that was laid before it. The right of the people to govern was still valid, and though it had long lain dormant any year might see a magistrate in office resolved on recalling the people to a larger share in the conduct of affairs by consulting them rather than the senate, and an assembly bent on the exercise of its lawful prerogatives.

And from 167 at least, onwards, there were increasing indications that both the acquiescence of the people and the loyalty of the magistrates were failing. The absorb- ing excitement of the great wars had died away; the economic and social disturbance and distress which they produced were creating a growing feeling of discontent; and at the same time the senate provoked inquiries inte its title to govern by its failure any longer to govern well. In the East there was growing confusion; in the West a

single native chieftain defied the power which had crushed Carthage. At honie the senate was becoming more and more simply an organ of the nobility, and the nobility were becoming every year more exclusive, more selfish, and less capable and unanimous.®

But if the senate was uot to govern, the difficulty arose of finding an efficient substitute, and it was this difficulty that mainly determined the issue of the struggles which convulsed Rome from 133 to 49. As the event showed, ueither the assenibly nor the numerous and disorganized magistracy were equal to the work; the latter were gradu- ally pushed aside in favour of a more centralized authority, and the former became only the means by which this new authority was first encouraged in opposition to the senate and finally established in a position of impregnable strength. The assembly which niade Pompey and Cesar found out too late that it could not unmake them.

It is possible that these constitutional and administra- tive difficulties would not have proved so rapidly fatal to the republic had not its very foundations been sapped by the changes which followed more or less directly on the conquest of the world. These changes: can only be glanced at here. Civic equality and solidarity were alike destroyed by the concentration of wealth in a few hands, the disappearance of the small independent freeholder, and the growing numbers of freedmen and clients. The Roman community became not only unmanageably large, but hopelessly divided by class distinctions and interests, and wide differences in habits of life and modes of thought. The old traditions, beliefs, and usages insepar- ably connected with the republican reginie, and essential to its continuance, lost ground daily before the incoming flood of new fashions, intellectual and social, from Greece and the East. Before the republic fell, Roman society was already in structure, temper, and mind thoroughly unrepublican.

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587,

621-705,

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The first systematic attack upon the senatorial govern-The ment is connected with the names of Tiberius and Gaius Gracht, |

Gracchus, and its immediate occasion was an attempt to deal with no less a danger than the threatened disappear- ance of the class to which of all others Rome owed most

year by a Sctum., in another by a “lex”; ef. Cic. De Rep., ii. 32; Phil., i. 2, of Antony as consul, “mutata omnia, nihil per senatum, omnia per populum.”

8 There was no legal necessity, before Sulla’s time, for getting the “senatus auctoritas” for a proposal to the assembly.

® See generally Mommsen, 2. G., i. bk. iii. cap. 6; Lange, Rém. Alterth., vol. ii.; Thne, v. cap. i. The first law against bribery at elections was passed in 181 B.c. (Livy, xl. 20), and against magisterial extortion in the provinces in 149 (Lex Calpurnia de pecuniis repe- tundis). The senators had special seats allotted to them in the theatre in 194 B.c.; Livy, xxxiv. 44, 54.

133-121 = |

621-633.

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in the past.’ For, while Rome had been extending her sway westward and eastward, while the treasury had been enriched, and while her nobles and merchants were amassing colossal fortunes abroad, the small freeholders throughout the greater part of Italy were sinking deeper into ruin under the pressure of accumulated difficulties. The Hannibalic war had laid waste their fields and thinned their numbers, and when peace returned to

Italy it brought with it no revival of prosperity. The heavy burden of nuilitary service still pressed ruinously upon them,' and in addition they were called upon to compete with the foreign corn imported from beyond the sea,® and with the foreign slave-labour purchased by the capital of wealthier men. Farming became unprofitable, and the hard laborious life with its scanty returns was thrown into still darker relief when compared with the stirring life of the camps with its opportunities of booty, or with the cheap provisions, frequent largesses, and gay spectacles to be had in the large towns. The small holders went off to follow the eagles or swell the proletariate of the cities, and their holdings were left to run waste or merged in the vineyards, oliveyards, and above all in the great cattle-farms, of the rich, and their own place was taken by slaves. The evil was not equally serious in all parts of Italy. It was least felt in the central highlands, in Campania, and in the newly settled fertile valley of the Po. It was worst in Etruria and in southern Italy ; but everywhere it was serious enough to demand the earnest attention of Roman statesmen. Of its existence the government had received plenty of warning in the de- clining numbers of able-bodied males returned at the census, in the increasing difficulties of recruiting for the legions,® in servile outbreaks in Etruria and Apulia,® and between 200 and 160 a good deal was attempted by way of remedy. In addition to the foundation of twenty colonies," there were frequent allotments of land to veteran soldiers, especially in Apulia and Samnium.8 In 180 40,000 Ligurians were removed from their homes and settled on vacant lands once the property of a Samnite tribe,® and in 160 the Pomptine marshes were drained for the purpose of cultivation.!° But these efforts were only partially successful. The colonies planted in Cisalpine Gaul and in Picenum flourished, but of the others the majority slowly dwindled away, and two re- quired recolonizing only eight years after their foundation,¥ The veterans who received land were unfitted to make good farmers ; and large numbers, on the first opportunity, gladly returned as volunteers to a soldier's life. More- over, after 160 even these efforts ceased, and with the single exception of the colony of Auximum in Picenum (157) nothing was done to check the spread of the evil, until in 133 Tiberius Gracchus, on his election to the tribunate, set his hand to the work.*

The remedy proposed by Gracchus !2 amounted in effect

THE GRACCHL. |

- *Mommsen, i. bk. iii. cap. 12, bk. iv. cap. 2; Ihne, v. 1-25; Nitzsch, Die Gracchen ; Long, Decline and Fail of the Roman Republic; Beesly, The Gracchi, Marius, and Sulla.*

2 To Spain alone more than 150,000 inen were sent between 196 and 169 (Ihne, iii, 319); compare the reluctance of the people to declare war against Macedon in 200 B.C., and also the case of Spurius Ligustinus in 171 (Livy, xlii, 34).

- *Mommsen, i. 837 sg. Ihne, v. 16, thinks that Mommsen has exaggerated the depressing effects of foreign competition, but hardly makes out his case, + Beloch, tal. Bund, 80 sq.*

® Livy, xliii. 14 ; Lpit., xlviii., lv. During the period the minimum qualification for service in the legion was reduced from 11,000 to 4000 asses. 6 Livy, xxxii. 26, xxiii, 36, xxxix. 29, 41.

" Sixteen Roman and four Latin colonies. See Marquardt, Staats- verw., 1. 8 H.g., Livy, xxxi. 4, 12, 89, xxxii. 1.

9 Livy, xl. 38. 0 Livy, Epit., xlvi. "1 Sipontum and Buxentum in 186; Livy, xxxix. 23.

"ad BPlut., 7. G., 9-14; Appian, B. C., i. 9-18; Livy, Epit., lviii.;

Mie, L. Agr., ii, 31. Compare also Mommsen, 2. G., ii. 68 sq.;

iv. 178 sg.,

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to the resumption by the state of as much of the Tiberius "common land" as was not held in occupation by author- Gracchus.

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ized persons and conformably to the provisions of the Licinian Jaw. Unauthorized occupiers were to be evicted : in other cases the occupation was reduced to a maximum size of 1000 acres;}3 the public pastures were reclaimed for agriculture.14 And the land thus rescued for the com- munity from the monopoly of a few was to be distributed in allotments.!5 It was a scheme which could quote in its favour ancient precedent as well as urgent necessity. Of the causes which led to its ultimate failure something will be said later on ; for the present we must turn to the constitutional conflict which it provoked. The senate from the first identified itself with the interests of the wealthy occupiers, and Tiberius found himself forced into a struggle with the senate, which had been no part of his original plan. He fell back on the legislative sovereignty of the assembly ; he resuscitated the half-forgotten powers of interference vested in the tribunate in order to paralyse the action of the senatorial magistrates, and finally lost his life in an attempt to make good one of the weak points in the tribune's position by securing his own re-elec- tion for a second year. But the conflict did not end with his death. It was renewed on a wider scale, and with a

more deliberate aim by his brother Gaius, who on his Gaius election to the tribunate (123) at once came forward as Gracchus. The latter suddenly 631.

the avowed enemy of the senate. found its control of the administration threatened at a variety of points. On the invitation of the popular tribune the assembly proceeded to restrict the senate's freedom of action in assigning the provinces.!° It regu- lated the taxation of the province of Asia 17 and altered the conditions of military service.1® In home affairs it inflicted two serious blows on the senate's authority by declaring the summary punishment of Roman citizens by the con- suls on the strength of a senatus consultum to be a viola- tion of the law of appeal,!® and by taking out of the senate's hands the control of the newly established court for the trial of cases of magisterial misgovernment in the provinces.2? Tiberius had committed the mistake of rely- ing too exclusively on the support of one section only of the community; his brother endeavoured to enlist on the popular side every available ally. The Latins and Italians had opposed an agrarian scheme which took from them land which they had

*come to regard as rightfully theirs, and gave them no share in the benefit of the allot- ments.*1_ Gaius not only removed this latter grievance, 2? but ardently supported and himself brought forward the first proposals made in Rome for their enfranchisement.22*

Thne, v. 25; Marquardt, Rém. Staatsverw., i. 437 sq.; Lange, Rom. Alterth., iii. 8 sq.; Nitzsch, Gracchen, 294; .Dureau de la Malle,

con. politique des Romains, ii. 280,

8 Or possibly 750; it was in excess of the limit fixed by the Licinian law; App., B. C., i. 9.

14 Compare the inscription of Popillius Lenas, consul 132, C. J. L., i. 551; Wordsworth, Fragments of Early Latin, p. 221.

© The allotments were to be inalienable, and were charged with payment of a quit-rent. App., B. C., i. 10; Plut.,C. G., 9. Their size is not stated. lt is doubtful if the thirty jugera held " agri colendi causa" (compare the lex agraria, 111 3.0.) refer to the Sempro- nian allotments. See C. J. Z., i. 200, and Mommsen's notes.

16 Lex Sempronia de provinciis consularibus; Cic. Pro Domo, 9; De Prov. Cons., 2, 7; Sallust, Jug., 27.

7 Lex de provincia Asia; Cic. Verr., 3, 6; Fronto Ad Ver, i, p. 125. 18 Plut., C. G., 5; Diod., xxxiv. 25.

19 Plut., C. G., 4; Cie. Pro Domo, 31; Pro Rab. Perd., 4.

°° Questio de repetundis, est. 149 B.c. See Plut., C. G., 5; Livy, fipit., 1x.; Tae, Anm, xii. 603 App., BC, i. 91, For ehe kindred lex Acilia, see C, 7. Z., i. 198; Wordsworth, Fragm., 424,

21 They had succeeded in 129 in suspending the operations of the agrarian commission. App., B. C., i. 18; Livy, Epit., lix.; Cic, De Rep., iii. 41; of. Lex Agraria, line 81; C. I. L., i. 200.

Lange, R. A., iii. 32; Lex Agr., lines Si, is, Mil,

3 The rogatio Fulvia, 125 B.c.; Val. Maz., ix. 0,1; Appeaqe? 1.21.

Failure

of the attemptat agrarian reform.

636.

643,

Marius,

118-100= 636-654.

636,

758 RO

The indifference of the city populace, to whom the pro- spect of small holdings in a remote district of Italy was not a tempting one, was overcome by the establishment of regular monthly doles of corn at a low price.1_ Finally, the men of business—thée publicans, merchants, and money- lenders—were conciliated by the privilege granted to them of collecting the tithes of the new province of Asia, and placed in direct rivalry with the senate by the substitution of men of their own class as judges in the " quaestio de repetundis," in place of senators.? The organizer of this concerted attack upon the position of the senate fell, like his brother, in a riot.

The agrarian reforms of the two Gracchi had little per- manent effect.' Even in the lifetime of Gaius the clause in his brother's law rendering the new holdings inalienable was repealed, and the process of absorption recommenced.' In 118 a stop was put to further allotment of occupied lands,® and finally, in 111, the whole position of the agra- rian question was altered by a law which converted all land still held in occupation into private land.¢. The old controversy as to the proper use of the lands of the com- munity was closed by: this act of alienation. The contro- versy in fnture turns, not on the right of the poor citizens to the state lands, but on

the expediency of purchasing other lands for distribution at the cost of the treasury.'

But, though the agrarian reform failed, the political conflict it had provoked ended only with the dictatorship of Ceesar, and the lines on which it was waged were in the main those laid down by Gaius Gracchus. The sover- eignty of the assembly continued to be the watchword of the popular party, and a free use of the tribunician powers of interference and of legislation remained the most effective means of giving effect to theiraims. At the same time the careers. of both Tiberius and Gaius had illustrated the weak points of their position,—the un- certain temper and varying composition of the, assembly, the limited tenure of office enjoyed by. the tribunes® and the possibility of disunion in their own body, and, lastly, the difficulty of keeping together the divergent interests which Gaius had for a moment united in hostility to the senate. _

Ten years after the death of Gaius the populares once more summoned. up courage to challenge the supremacy of the senate; and it is important as marking a step in advance that it was on a question not of domestic reform but of foreign administration that. the conflict was renewed.

The course of affairs.in the client state of Numidia since .

Micipsa's death in 118 had been such as to discredit a stronger government than that of the senate.? In open defiance of Roman authority, and relying on the influence of his own well-spent gold, Jugurtha had murdered both his legitimate rivals, Hiempsal and Adherbal, and made himself master of Numidia. The declaration of war

1 Plut., C. G@., 53 App., i. 215 Livy, Zpit., 1x.; Festus, 290.

? Hence Gaius ranked as the founder of the equestrian order. Plin., N, I, xxxiii. 84, "judicum appellatione separare eum ordinem . . fee Gracchi ;" Varro ap. Non., 454, "bicipitem civitatem

ecit,

3 Traces of the work of the commission survive in the Miliarinm Popilianum, C. J. Z., i. 554, in a few Gracchan "termini," 7., 552, 553, 554, 555, in the "limites Gracchani," Liber Colon., ed. Lach- mann, pp. 209, 210, 211, 229, &c. Compare also the rise in the numbers of the census of 125 B.c.; Livy, Hpit., 1x.

4 Lex Minucia, 121 B.c.; App., i. 273 Oros., v. 12; Festus, 201.

° The so-called lex Thoria; App., i. 27; Cic. Brut., 86; of. Wordsworth, Mragm., 441.

8 The " lex agraria," still extant in a fragmentary condition in the museum at Naples. See Mommsen, C. J. Z., i. 200; Wordsworth, 441 sq.; Bruns, Montes Juris Rom., 54-67 ; App., i. 27.

7 Cic., Lex Agr., ii. sect. 65.

® Efforts were repeatedly made to get over this difficulty, e.g., the lex Papiria, 131 B.c.; Livy, Hpit., lix. Gaius was himself tribune for two years, 110-109 (¢f. Sall., Jug., 37, " tribuni continuare magis- tratum nitebantur)", and Saturninus in 100 B.c.

$ Sallust, Jug., 5 sq.; Livy, Epit., 1xii., Ixiv.

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wrung from the senate (112) by popular indignation had 642. been followed by the corruption of a consul! (111) and 648. the crushing defeat of the proconsul Albinus." On the news of this crowning disgrace the storm burst, and on the proposal of the tribunes a commission of inquiry was appointed into the conduct of the war.'? But the popular leaders did not. stop here. Cecilius Metellus, who as con- sul (109) had succeeded to. the command in Numidia, was: 645. an able soldier but a rigid aristocrat; and they now resolved to. improve their success by entrusting the com- mand instead to a genuine son of the people. Their choice fell on Gaius Marius (see Marius), an experienced officer and administrator, but a man

of humble birth, wholly illiterate, and one who, though no politician, was by temperament and training a hater of the polished and effeminate nobles who filled the senate.!3 He was triumph, antly elected, and, in spite of a decree of the senate continuing Metellus as proconsul, he was entrusted by a: vote of the assembly with the charge of the war against Jugurtha.14 . Jugurtha was vanquished ; and Marius, who had been a second time elected consul in his absence, arrived at Rome in January 104, bringing the captive prince with him in 650. chains.© But further triumphs awaited the popular hero. The Cimbri and Teutones were at the gates of Italy; they had four times defeated the senatorial generals, and Marius was called upon to save Rome from a second invasion of the barbarians.!6 After two years of suspense the victory at Aque Sextize (102), followed by that on the 652. Raudine plain (101), put an end to the danger by 'the 653. annihilation of the invading hordes ; and Marius, now con- sul for the fifth time, returned to Rome in triumph. There the popular party welcomed him as a leader, and as one who would bring to their aid the imperium of the consul and all the prestige of a successful general. Once more, however, they were destined to a brief success followed by disastrous defeat. Marius became for the sixth time eonsul ;!' of the two popular leaders Glaucia became preetor gatur- and Saturninus tribune. But neither Marius nor his ninus allies were statesmen of the stamp of the Gracchi; and amd i | the laws proposed by Saturninus had evidently no other Dea : serious aim in view than 'that of harassing the senate. — His corn law merely reduced the price fixed in 123 for the 631. monthly dole of corn, and the main point of his agrarian law lay in the clause appended to it requiring all senators to swear to observe its provisions.!§ The laws were carried ; the senators with the exception of Metellus took the oath; but the triumph of the popular leaders was short-lived. Their recklessness and violence had alienated all classes in Rome; and their period of office was drawing to a close. At the elections fresh rioting took place, and at last Marius as consul was called upon by the senate to protect the state against his own partisans. In despair Saturninus and Glaucia surrendered, but while the senate was dis-' cussing their fate they were surrounded and murdered by the populace. The popular party had been worsted once more in their struggle with the senate, but none the less their alliance with Marius, and the position in which their votes placed

7,, 88, 39. a Mey, COS

13 Sallust, Jug., 68; Plut., Marius, 2,3. For the question as to the position of his parents, see Madvig, Verfas.,i.170; Diod., xxxiv. 38.

14 Sallust, Jug., 738.

1 7,, 114. Forthe chronology of the Jugurthine war, see Momm- sen, R, G., ii. 146 note; Pelham, Journ. of Phil., vii. 91.

16 Livy, Hpit., lxvii.; Plut., Mfar., 12; Mommsen, ii. 171 sq.

A MiNi, Leia Iba? Nii 185 Ob, ty AS Sie

18 For the "leges Appulciae," see Livy, Hpit., lxix.; App., i. 29 ; Cic. Pro Balbo, 21; Auct. Ad Herennium, i. 12,21. They included also allotments to Marius's veterans ; Auct. De Vir. Zl., 62.

Military

- reforms – of

Marius.

661.

Discon- tent of the Italian allies,

MARIUS. |

The six consulships of Marius represented not merely a party victory but a protest against the system of divided and rapidly-changing commands, which was no doubt the system favoured by the senate, but was also an integral element of the republican constitution, and in assailing it the populares weakened the republic even more than they irritated the senate. The transference of the political leadership to a consul who was nothing if not a soldier

was at once a confession of the insufficiency of the purely |

civil authority of the tribunate and a dangerous encourage- ment of military interference in political controversies. The consequences were already foreshadowed by the special pro- visions made by Saturninus for Marius's veterans, and in the active part taken by them in the passing of his laws. Indirectly too Marius, though no politician, played an important part in this new departure. His military reforms} at once democratized the army and attached it more closely to its leader for the time being. He swept away the last traces of civil distinctions of rank or wealth within the legion, admitted to its ranks all classes, and substituted voluntary enlistment under a popular general for the old-fashioned compulsory levy. The efficiency of the legion was increased at the cost of a complete severance of the ties which bound it to the civil community and to the civil authorities.

The defeat of Saturninus was followed by several years of quiet ; nor was the next important crisis provoked directly by any efforts of the discredited popular party. It was due partly to the rivalry which had been growing more bitter each year since 122 between the senate and the commercial class, and secondly to the long impending question of the enfranchisement of the Italian allies. The publicani, negotiatores, and others, who constituted what was now becoming known as the equestrian order, had made unscrupulous use of their control of the courts and especially of the '"quaestio de repetundis" against their natural rivals, the official class in the provinces. The threat of prosecution before a hostile jury was held over the head of every governor, legate, and quzstor who ventured to interfere with their operations in the pro- vinces, 'The average official preferred to connive at their exactions ; the bolder ones paid with fines and even exile for their courage. In 93 the necessity for a reform was proved beyond a doubt by the scandalous condemnation of P. Rutilius Rufus,? ostensibly on a charge of extortion, in reality as the reward of his efforts to check the extor- tions of the Roman equites in Asia.

The need of reform was clear, but it was not so easy to carry a reform which would certainly be opposed by the whole strength of the equestrian order, and which, as in- volving the repeal of a Sempronian law, would arouse the resentment of the popular party. The difficulties of the Italian

question were more serious. That the Italian allies were discontented was notorious. After nearly two centuries of close alliance, of common dangers and victories, they now eagerly coveted as a boon that complete amal- gamation with Rome which they had at first resented as a dishonour. But, unfortunately, Rome had grown niore selfishly exclusive in proportion as the value set upon Roman citizenship increased. The politic liberality with which the franchise had once been granted had disappeared. The allies found their burdens increasing and their ancient privileges diminishing, while the resentment with which they viewed their exclusion from the fruits of the conquests they had helped to make was aggravated by

1 Sallust, Jug., 86, " ipse interea milites scribere, non nore majorum neque ex classibus, sed uti cujusque cupido erat, capite censos plerosque." For details, ef, Mommsen, ii. 192; Madvig, Verf, ii. 468, 493; Marquardt, Staatsv., ii, 417, 421.

- *Livy, Epit., Ixx.; Vell. Pat., ii. 13; Cicero, Brud.,*

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time before.

ME 759

the growingly suspicious and domineering attitude of the Roman government.? During the last forty years feel- ings of hope and disappointment had rapidly succeeded each other; Marcus Fulvius, Gaius Gracchus, Saturninus, had all held out promises of relief—and nothing had yet been done. On each occasion they had crowded to Rome, full of eager expectation, only to be harshly ejected from the city by the cousul's orders The justice of their claims could hardly be denied, the danger of continuing to ignore them was obvious—yet the difficulties in the way of granting them were formidable in the extreme. The temper of senate and people alike was still jealously exclusive, and from a higher than a merely selfish point of view there was much to be said against the revolution involved in so sudden and enormous an enlargement of the citizen body. –

Marcus Livius Drusus, who as tribune gallantly took up Marcus the task of reform, is claimed by Cicero® as a member of Livius that party of the centre to which he belonged himself. are Noble, wealthy, and popular, he seems to have hoped to be ¢@3. able by the weight of his position and character to rescue the burning questions of the day from the grasp of extreme partisans and to settle them peacefully and equitably.

But he, like Cicero after him, had to find to his cost that

there was no room in the -fierce strife of Roman politics

for moderate counsels. His proposal to reforin the law courts excited the equestrian order and their friends in the senate to fury. The agrarian and corn laws which he coupled with it® alienated many more in the senate, and roused the old anti-popular party feeling ; finally, his known negotiations with the Italians were eagerly misrepresented to the jealous and excited people as evidence of complicity with a wide-spread conspiracy against Rome. His laws were carried, but the senate pronounced them null and void." Drusus was denounced in the senate house asa traitor, and on his way home was struck down by the hand ° of an unknown assassin.

The knights retained their monopoly of the courts, but The this and all other domestic controversies were silenced for Social the time by the news which followed hard upon the poekoeS murder of Drusus that the Italians were in open revolt ¢g4_665, against Rome. His assassination was the signal for an outbreak which had been secretly prepared for some Throughout the highlands of central and southern Italy the flower of the Italian peoples rose as one man.® Etruria and Umbria held aloof; the isolated Latin colonies stood firm; but the Sabellian clans, north and south, the Latinized Marsi and Peeligni, as well as the still Oscan-speaking Samnites and Lucanians, rushed to arms. No time was lost in proclaiming their plans for the future. A new Italian state was to be formed. The Pelignian town of Corfinium was selected as its capital and re-christened with the proud name of Italica. All Italians were to be citizens of this new metropolis, and here were to be the place of assembly and the senate house. A senate of 500 members and a magistracy

resembling that of Rome completed a constitution which adhered closely to the very political traditions which its authors had most reason to abjure.

Now, as always in the face of serious danger, the action

3 Mommisen, ii, 218; Ihne, iv. 151, v. 253; Marquardt, Staats- verw., i. 57, 58.

4 Lex Junia,'Cic. De Off, iii. 11; lex Licinia Mucia, Cic. Pro Corn., fr. 10; Ascon., p. 67.

5 Cic. De Orat., i. 25, and De Domo, 50; Appian, B. C.,i. 85; Diod. Sic., xxxvii. 10; Ihne, v. 242.

6 For the provisions of the "leges Liviae," see App., B. C., i. 85; Livy, Zpit., lxxi. They included, according to Pliny, W. Z., xxxiii. 3, a proposal for the debasement of the coinage.

7 Cic. Pro Domo, 16.

8 For the Social War, see, besides Mommsen, Thne, Lange; also Kiene, D. Rémische Bundesgenossenkrieg, Leipsic, 1845.

664,

Lex Julia: and lex Plautia

Papiria.

665.

665.

P. Sul- picius Rufus,

88 = 666.

760 RO

of Rome was prompt and resolute. Both consuls took the field;! with each were five legates, among them the veteran Marius and his destined rival L. Cornelius Sulla, and even freedmen were pressed into service with the legions. But the first year's campaign opened disastrously. In central Italy the northern Sabellians, and in the south the Samnites, defeated the forces opposed to them, And though before the end of the year Marius and Sulla in the north, and the consul Cesar himself in Campania, succceded in inflicting severe blows on the enemy, and on the Marsi especially, it is not surprising that, with an empty treasury, with the insurgents' strength still un- broken, and with rumours of disaffection in the loyal districts,~~opinion in Rome should have turned in the direc~~ tion of the more liberal policy which had been so often scornfully rejected and in favour of some compromise which should check the spread of the revolt, and possibly sow discord among their enemies. 'Towards the close of the year 90 the consul Cesar carried the "lex Julia," by which the Roman franchise was offered to all communi- ties which had not as yet revolted; early in the next year (89) the Julian law was supplemented by the "lex Plautia Papiria," introduced by two of the tribunes, which enacted that any citizen of an allied community then domiciled in Italy might obtain the franchise by giving in his name to a pretor in Rome within sixty days. A third law (lex Calpurnia) apparently passed at the same time empowered Roman magistrates in the field to bestow the franchise there and then upon all who were willing to receive it. This sudden opening of the closed gates of Roman citizen- ship was completely successful, and its effects were at once visible in the diminished vigour of the insurgents. By the end of 89 the Samnites and Lucanians were left alone in their obstinate hostility to Rome, and neither, thanks to Sulla's brilliant campaign in Samnium, had for the moment any strength left for active aggression.

The termination of the Social War brought with it no peace in Rome. The old quarrels were renewed with increased bitterness, and the newly enfranchised Italians themselves complained as bitterly of the restriction? which robbed them of their due share of political influence by allowing them to vote only in a specified number of tribes. The senate itself was distracted by violent personal rivalries

—-and all these feuds, animosities, and grievances were

aggravated by the widespread economic distress and ruin which affected all classes. Lastly, war with Mithradates had been declared ; it was notorious that the privilege of commanding the force to be sent against him would be keenly contested, and that the contest would lie between the veteran Marius and L. Cornelius Sulla.5

It was in an atmosphere thus charged with the elements of disturbance that P. Sulpicius Rufus as tribune® brought forward his laws. He proposed—(1) that the command of the Mithradatic war should be given to Marius, (2) that the new citizens should be distributed through all the tribes, (3) that the freedmen should no longer be confined to the four city tribes, (4) that any senator owing more

1 App., B. C., i. 89-49; Livy, Zpit., Ixxii.—lxxvi.

2 For the lex Julia, see Cicero Pro Balbo, 8; Gell., iv. 4; App., B. C., i. 49. For lex Plautia Papiria, see Cic. Pro Archia, 4, and Schol. Bob., p. 353.

- *Vell, Pam, i. 20); App, C4. 49, 53. Madvig (R. Verf., i. 27) follows Appian in holding that the tribes to which the new voters were confined were newly created tribes, Cf. Mommsen Rim. Tribus, ii. a App., B.C., i. 54, and Mithr. 22; Oros., v. 18; Livy, Lipit., XXiv. ; > It had been already declared a consular province for 87, and early in = seems to have been assigned to Sulla by decree of the senate.*

Cf. Cie. De Orat., i. 25, iii. 31, and Brutus, 214; Vell. Party, las 18, for Sulpicius himself. For his laws, see App., B.C., i. 55 sq.; Livy Jipit., \xxvii.; Plutarch, Sulla, 8 sq.

| bodies of the slain.

ME

than 2000 denarii should lose his seat, (5) that those exiled on suspicion of complicity with the Italian revolt should be recalled. Whatever may have been Sulpicius's intentions, these proposals inevitably provoked a

storm. The old voters bitterly resented the swamping of the existing constituency; the senate rallied its forces to oppose the alteration in the franchise of the freedmen and the proposed purging of its own ranks; and, lastly, both the senate and Sulla himself, now one of the consuls, pre- pared to resist the transference of the Asiatic command to Marius. Both sides were ominously ready for violent measures. The consuls, in order to prevent legislation, proclaimed a public holiday.' Sulpicius replied by arm- ing his followers and driving the consuls from the forum, The proclamation was withdrawn and the laws carried, but Sulpicius's triumph was short-lived. From Nola in Campania, where lay the legions commanded by him in the Social War, Sulla advanced on Rome, and for the first time a Roman consul entered the city at the head of the legions of the republic. Resistance was hopeless. Marius and Sulpicius fled, and Sulla, summoning the assembly of the centuries, proposed the measures he con- sidered necessary for the public security, the most import- ant being a provision that the sanction of the senate should be necessary before any proposal was introduced to the assembly. Then, after waiting in Rome long enough

to hold the consular elections, he left for Asia early in 87, 667. Sulla had conquered, but his victory cost the republic Marius

dear. He had first taught political partisans to look for final success, not to a majority of votes in the forum or campus, but to the swords of the soldiery; and he had shown that the legions, composed as they now were, could be trusted to regard nothing but the commands. of a favourite leader. The lesson was well learnt. Shortly after his departure, Cinna as consul revived the proposals of Sulpicius ;!° his colleague Octavius at the head of an armed force fell upon the new citizens who had collected in crowds to vote, and the forum was heaped high with the Cinna fled, but fled like Sulla to the legions. When the senate declared him deposed from his consulship, he replied by invoking the aid of the soldiers in Campania in behalf of the violated rights of the people and the injured dignity of the consulship, and, like Sulla, found them ready to follow where he led. The

neighbouring Italian communities, who had lost many citizens in the recent massacre, sent their new champion men and money ;!? while from Africa, whither he had escaped after Sulla's entry into Rome, came Marius with 1000 Numidian horsemen. He landed in Etruria, where his old veterans flocked to his standard, and at the head of some 6000 men joined Cinna before the gates of Rome. The senate had prepared for a desperate defence, but fortune was adverse, and after a brief resistance they gave way. Cinna was acknowledged as consul, the sentence of outlawry passed on Marius was revoked, and Cinna and Marius entered Rome with their troops. Marius's thirst for revenge was gratified by a frightful massacre, and he lived long enough to be nominated consul for the seventh time. But he held his consulship only a few weeks. Early in 86 he died, and for the next three years Cinna ruled Rome. Constitutional government was virtu-

7 App., loc. cit., quepav apylas roAXGy—a favourite stroke of policy. Cf. Cicero Ad Q. F., ii. 4, 4, "dies comitiales exemit omnes. . Latinae instaurantur, nec deerant supplicationes."

8 Marius finally escaped to Africa (see Martius); Sulpicius was taken and killed ; App., i. 60.

9 App., B. C., i. 59, undéy eri &rpoBovrAcvrov és roy Shuov éopépecOat. For the other laws mentioned by Appian, see Mommsen, 1258. 10 Livy, Zpit., lxxix.; Vell., ii. 20.

1 Cic. Pro Sestio, 77; Catil., iii. 24. 12 Tibur and Preneste especially.

and Cinna,

668.

669, 670.

668.

669.

The return of Sulla,

83=671.

672.

Sulla's dictator- ship, 81

= 678.

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ally suspended. For 85 and 84 Cinna nominated himself and a trusted colleague as consuls.! The state was, as Cicero? says, without lawful authority. One important matter was carried through—the registration in all the tribes of the newly enfranchised Italians, but beyond this little was done. The attention of Cinna and his friends was in truth engrossed by the ever-present dread of Sulla's return from Asia. The consul of 86, Valerius Flaccus, sent out to supersede him, was murdered by his own soldiers at Nicomedia.> In 85 Sulla, though disowned by his government, concluded a peace with Mithradates.6 In 84, after settling affairs in Asia and crushing Flaccus's suc- cessor Fimbria, he crossed into Greece, and in the spring of 83 landed at Brundusium with 40,000 soldiers and a large following of emigré nobles. Cinna was dead,7 murdered like Flaccus by his mutinous soldiers ; his most trusted colleague Carbo was commanding as proconsul in Cisalpine Gaul; and the resistance offered to Sulla's advance was slight. At Capua Sulla routed the forces of one consul, Norbanus ; at Teanum the troops of the other went over in a body to the side of the outlawed proconsul. After a winter spent in Campania he pressed forward to Rome, defeated the younger Marius (consul 82) near Preeneste, and entered the city without further opposition. Iu North Italy the success of his lieutenants Metellus, C. Pompeius, and Marcus Crassus had been fully as decisive. Cisalpine Gaul, Umbria, and Etruria had all been won for Sulla, and the two principal leaders on the other side, Carbo and Norbanus, had each fled, one to Rhodes, the other to Africa. Only one foe remained to be conquered. The Samnites and Lucanians whom Cinna had conciliated, and who saw in Sulla their bitterest foe, were for the last time in arms, and had already joined forces

with the remains of the Marian army close to Rome. The decisive battle was fought under the walls of the city, and ended in the com- plete defeat of the Marians and Italians.®

For a period of nearly ten years Rome and Italy had been distracted by civil war. Constitutional government, whether by senate or assembly, had been in abeyance, while the opposing parties fought out their quarrels with the sword, under the leadership of generals at the head of legions ready and willing to follow them against their fellow citizens and against the established authorities of the state. The strife had spread from the Roman forum to Italy, and from Italy to the provinces ; and for the first time the integrity of the empire was threatened by the conflicts of rival governors.? The tottering fabric of Italian prosperity had been rudely shaken by the ravages of war. Class hatreds and personal feuds distracted the community, while the enfranchisement of the Italians was in itself a revolution which affected the very foundations of the republic. Such was the situation with which Sulla was now called upon to deal. heal the divisions which rent the state asunder, to set in working again the machinery of civil government, and above all so to modify it as to meet the altered conditions,

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It was for him to

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and to fortify it against the dangers which visibly threatened it in the future. The real charge against Sulla!® is not that he failed to accomplish all this, for to do so was beyond the powers even of a man so able, resolute, and self-confident as Sulla, armed though he was with absolute authority and backed by overwhelming military strength and the prestige of unbroken success. He stands convicted rather of deliberately aggravating some and culpably ignoring others of the evils he should have tried to cure, and of contenting himself with a party triumph when he should have aimed at the regeneration and con- firmation of the whole state. His victory was instantly followed, not by any measures of conciliation, but by a series of massacres, proscriptions, and

confiscations, of which almost the least serious consequence was the immediate

loss of life which they entailed.1! From this time forward Effects the fear of proscription and confiscation recurred as a °f the

possible consequence of every political crisis, and it was with difficulty that Caesar himself dissipated the belief that his victory would be followed by a Sullan reign of terror. The legacy of hatred and discontent which Sulla left behind him was a constant source of disquiet and danger. In the children of the proscribed, whom he excluded from holding office, and the dispossessed owners of the confiscated lands, every agitator found ready and willing allies.1? The moneyed men of the equestrian order were more than ever hostile to the senatorial government, which they now identified with the man who cherished towards them a peculiar hatred,!8 and whose creatures had hunted them down like dogs. The attachment which the new Italian citizens might in time have learnt to feel for the old republican constitution was nipped in the bud by the massacres at Praeneste and Norba, by the harsh treat- ment of the ancient towns of Etruria, and by the ruthless desolation of Samnium and Lucania.!4 Quite as fatal were the results to the economic prosperity of the peninsula. Sulla's confiscations, following on the civil and social wars, opened the doors wide for a long train of evils. The veterans whom he planted on the lands he had seized! did nothing for agriculture, and swelled the growing numbers of the turbulent and discontented.16 The "Sullan men" became as great an object of fear and dislike as the "Sullan reign."!" The "latifundia" increased with start- ling rapidity—whole territories passing into the hands of greedy partisans.!8 Wide tracts of land, confiscated but never allotted, ran to waste.!® In all but a few districts of Italy the free population finally and completely dis- appeared from the open country; and life and property were rendered insecure by the brigandage which now developed unchecked, and in which the herdsmen slaves played a prominent part. The outbreaks of Spartacus in

73, and of Catiline ten years later, were significant com- 681. mentaries on this part of Sulla's work.2° His constitutional Consti- legislation, while it included many useful administrative tutional

reforms, is marked by as violent a spirit of partisanship, and as apparently wilful a blindness to the future.

The consuls of 86, 85, 84 were all nominated without election. Livy, Epit., 1xxx., lxxxiii.; App., i. 75.

2 Brut., 227.

3 The nobles had fled to Sulla in large numbers; Velleius, ii. 23.

4 This work was accomplished apparently by the censors of 86; but ef. Lange, iii. 183 ; Mommsen, ii. 315 ; Livy, Zpit., 1xxxiv.

> Livy, Mpit., lxxxii. Appian, Mfithr., 52; Plut., Sudia, 23.

8 Livy, Lpit., \xxxiii,; Vell., ii. 23; Plut., Sudl., 22.

" In 84; App., B. C., i. 78; Livy, Zpit., lxxxiii.

8 Livy, HZpit., lxxxviii., "cum Samnitibus ante portam Collinam debellavit ;" Plut., Sulla, 29, and Crassus, 6. According to App., i. 98, and Livy, Joc. cit., 8000 captives were massacred. Florus, iii. 21, gives 4000. Preneste surrendered, was razed to the ground, and its population put to the sword.

® In Asia between Sulla and Fimbria. In 82 Pompey crushed the Marian leader Carbo in Africa. In Spain Q. Sertorins maintained himself for ten years (82-72).

of the Hirpini.

10 Compare especially Mommsen's brilliant chapter, which is, how- ever, too favourable (ii. 335-377), and also Lange (iii. 144 sq.), where inost of the special literature on the Sullan legislation is given.

App., i. 95 sg.; Dio Cassius, fr, 109; Plut., Sa, 31. The number of the proscribed is given as 4700 (Valer. Max.), including, according to Appian, 2600 members of the equestrian order,

2 #.g., Catiline, in 63. Sall., Cat., 21, 87. For the “liberi pro- scriptorum,” see Velleius, ii. 28. 1 Gic. Pro Cluent., 151.

MN Oic., Phil., v. 48, “tot municipiorum maximae calamitates,” Cic. Pro Domo, 30 ; Cic. Ad Aét., i. 19 ; Florus, iii. 21 ; Strabo, p.

223, 2548

1 Livy, Hpit., lxxxix.; App., B. C., i. 100; Cicero, Cadti., ii, 20.

16 Sall., Cat., 28. Wie, LenvAgn., lie 26:

18 Cic., Lew Agr., ii. 26, 28, iii. 2, —the territories of Preneste and AE Otley Ie Alot, wal, PY! hy Be For the “ pastores ”

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20 See especially Cicero’s oration Pro Tullio. of Apniia, Sall., Cat., 28.

The guna,

666.

650,

762

re-establishment on a legal basis of the ascendency which custom had so long accorded to the senate was his main object. With this purpose he had already, when consul in 88, made the “senatus auctoritas” legally necessary for proposals to the assembly. He now as dictator! followed this up by crippling the power of the magistracy, which had been the most effective weapon in the hands of the senate’s opponents. The legislative freedom of the tribunes was already hampered by the necessity of obtain- ing the senate’s sanction ; in addition, Sulla restricted their wide powers of interference (intercessio) to their original purpose of protecting individual plebeians,? and discredited the office by prohibiting a tribune from holding any sub- sequent office in the state. The control of the courts (quaestiones perpetuae) was taken from the equestrian order and

restored to the senate. To prevent the people from suddenly installing and keeping in high office a second Marius, he re-enacted the old law against re-election,® and made legally binding the custom which required a man to mount up gradually to the consulship through the lower offices. His increase of the number of preetors from six to eight,7 and of questors to twenty,® though required by administrative necessities, tended, by enlarging the numbers and further dividing the authority of the magistrates, to render them still more dependent upon the central direction of the senate, Lastly, he replaced the pontifical and augural colleges in the hands of the sena- torial nobles, by enacting that vacancies in them should, as before the lex Domitia (104), be filled up by co-optation.® This policy of deliberately altering the constitution, so as to make it pronounce in favour of his own party, was open to two grave objections. It was not to be expected that the new legal safeguards would protect the senate any more efficiently than the established custom and tra- dition which the Gracchi had broken down ; and, secondly, it was inevitable that the popular party would on the first opportunity follow Sulla's example, and alter the con- stitution to suit themselves. Still less was Sulla success- ful in fortifying the republican system against the dangers which menaced it from without. He accepted as an accomplished fact the enfranchisement of the Italians,1° but he made no provision to guard against the consequent reduction of the comitia to an absurdity, and with them of the civic government which rested upon them, or to organize an effective administrative system for the Italian communities. Of all men, too, Sulla had the best reason

1 For Sulla's dictatorship as in itself a novelty, see App., i. 98 ; Plut., Sulla, 88; Cic. Ad Adt., 9, 15; Cic. De Legg., i. 15.

2 Cic. De Legg., iii. 22, "injuriae faciendae potestatem ademit, auxilii ferendi reliquit." Cf. Cic., Verr., i. 60; Livy, Hpit., lxxxix.

3 Cic. Pro Cornel., fr. 78; Ascon, In Corn., 78; Appian, i. 100.

4 Velleius, ii. 832; Tac., Ann., xi. 223 Cic., Verr., i. 18.

5 App., B. C., i. 100; of. Livy, vii 42 (842 B.c.), "ne quis enndem magistratum intra decem annos caperet."

6 The custom had gradually established itself. Cf Livy, xxxii. 7. The "certus ordo magistratuum " legalized by Sulla was—questorship, pretorship, consulate; App., i. 100.

7 Pompon., De Orig. Juris (Dig., i. 2, 2); Velleius, ii. 89. Com-

pare also Cicero In Pison., 15, with Id. Pro Alilone, 15. The increase was connected with his extension of the system of " quaestiones perpetuae," which threw more work on the preetors as the magistrates in charge of the courts. : 8 Tac., Ann., xi. 22. The questorship henceforward carried with it the right to be called up to the senate. By increasing the number of queestors, Sulla provided for the supply of ordinary vacancies in the senate and restricted the censors' freedom of choice in filling them up. Fragments of the "'lex Cornelia de XX quaestoribus" survive. See OMT, Lay LOS)

® Dio Cass., xxxvii. 37; Ps. Ascon., 102 (Orelli). He also increased their numbers; Livy, Hpit., Ixxxix.

'° He did propose to deprive several communities which had joined Cinna of the franchise, but the deprivation was not carried into effect ; Cic. Pro Domo, 30, and Pro Cxcina, 38, 35.

" There is no evidence to show that Sulla's legislation touched at all upon municipal government in Italy; ¢f, Mommscn, ii. 361 sq.

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to appreciate the dangers to be feared from the growing independence of governors and generals in the provinces, and from the transformation of the old civic militia into a group of professional armies, devoted only to a successful leader, and with the weakest possible sense of allegiance to the state. He had himself, as proconsul of Asia, con- temptuously and successfully defied the home government, and he, more than any other Roman general, had taught his soldiers to look only to their leader, and to think only of booty.!2 Yet, beyond a few inadequate regulations, there is

*no evidence that Sulla dealt with these burning ques- tions, the settlement of which was among the greatest of the achievements of Augustus.' One administrative re- form of real importance must, lastly, be set down to his credit. The judicial procedure first established in 149 605-673. for the trial of cases of magisterial extortion in the pro- vinces, and applied between 149 and 81 to cases of treason and bribery, Sulla extended so as to bring under it the chief criminal offences, and thus laid the foundations of the Roman criminal law.**

The Sullan system stood for nine years, and was then Over- overthrown—as it had been established—by a successful throw soldier. It was the fortune of Cn. Pompeius, a favourite eel officer of Sulla, first of all to violate in his own person the constitu. fundamental principles of the constitution re-established tion, 70 by his old chief, and then to overturn it. In Spain the =684 Marian governor Q. Sertorius (see SeRTorIUs) had defeated one after another of the proconsuls sent out by the senate, and was already in 77 master of all Hither Spain. To 677. meet the crisis, the senate itself took a step which was in fact the plainest possible confession that the system sanctioned afresh by Sulla was inadequate to the needs of the state. Pompey, who was not yet thirty, and had never held even the quiestorship, was sent out to Spain with proconsular authority.1® Still Sertorius held out, until in 73 he was foully murdered by his own officers. 681. The native tribes who had loyally stood by him submitted, and Pompey early in 71 returned with his troops to Italy, 683. where, during his absence in Spain, an event had occurred which had shown Roman society with startling plainness how near it stood to revolution. In 73 Spartacus,!' a 681. Thracian slave, escaped with seventy others from a gladia- tors' training school at Capua. In an incredibly short time he found himself at the head of a numerous force

12 Sall., Cat., ii., "L. Sulla exercitum, quo sibi fidum faceret, contra morem majorum luxuriose nimisque liberaliter habnerat."

13 There was a " lex Cornelia de provinciis ordinandis," but only two of its provisions are known :—(1) that a magistrate sent out with the imperium should retain it till he re-entered the city (Cic, Ad Fam., i. 9, 25), a provision which increased rather than diminished his free- dom of

action; (2) that an outgoing governor should leave his pro- viuce within thirty days after his successor's arrival (Cic. Ad Fam., iii, 6, 4). A "lex Cornelia de majestate" contained, it is true, a definition of treason evidently framed in the light of recent experience. The magistrate was forbidden "exire de provincia, educere exercitum, belluin sua sponte gerere, in regnum injussu populi ac scnatus ac- cedere," Cic. Jn Pis., 21. Sulla also added one to the long list of laws dealing with extortion in the provinces. But the danger lay, not in the want of laws, but in the want of security for their observance by an absolutely autocratic proconsul. The present writer cannot agree with those who would include aniong Sulla's laws one retaining consuls and pretors in Rome for their year of office and then sending them out to a province. This was becoming the common practice before 81. After 81 it is invariable for pretors, as needed for the judicial work, and invariable but for two exceptions in the case of consuls ; but nowhere is there a hint that there had bcen any legislation on the subject, and there are indications that it was convenience and not law which maintained the arrangement. Mommsen, ii. 855; Marquardt, Staatsverw., i. 378:

4 For this, the most lasting of Sulla's reforms, see Mommsen, ii. 359 3 Rein, Criminal-Recht ; Zumpt, Criminal-Prozess d. Rimer.

15 For the Sertoriau War, see Plutarch, Sertorius.

16 Plut., Pomp., 17; Livy, Zpit., xci. For Pompey's earlier life, see POMPEY.

W App., i. 1163 Livy, Zpit., xev.; Plut., Crass., 8 sq.

682.

683.

676.

Pompey as consul.

684,

Gabinian and Manilian

_ laws,

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of runaway slaves, outlaws, brigands, and impoverished peasants. By the end of 73 he had 70,000 men under his command, had twice defeated the Roman troops, and was master of southern Italy. In 72 he advanced on Rome, but, though he again routed the legions led against him by the consuls in person, he abandoned his scheme and established himself in the now desolate country near Thurii, already the natural home of brigandage. At length in 71 the pretor Crassus, who had been sent against him with no less than six legions, ended the war. Spartacus was defeated and slain in Apulia. In Rome itself the various classes and parties hostile to the Sullan system had, ever since Sulla's death in 78, been incessantly agitating for the repeal of his most obnoxious laws, and needed only a leader in order successfully to attack a government discredited by failure at home and abroad. With the return of Pompey from Spain their Opportunity came. Pompey, who understood politics as little as Marius, was anxious to obtain—what the senate was more than likely to refuse to give him, and what he was not legally entitled to—a triumph, the consulship for the next year (70), and as the natural consequence of this an important command in the Hast. The opposition wanted his name and support, and a bargain was soon struck. Pompey and with him Marcus Crassus, the con- queror of Spartacus, were elected consuls, almost in the presence of their troops, which lay encamped outside the gates in readiness to assist at the triumph and ovation granted to their respective leaders. Pompey lost no time in performing his part of the agreement. The tribunes regained their prerogatives.1 The "perpetual courts" were taken out of the hands of the senatorial judices, who had outdone the equestrian order in scandalous corrup- tion,' and finally the censors, the first since 86 B.c., purged the senate of the more worthless and disreputable of Sulla's partisans. The victory was complete; but for the future its chief significance lay in the clearness with which it showed that the final decision in matters political lay with neither of the two great parties in Rome, but with the holder of the military authority. The recognition of

this fact was fatal to the dignity of politics in the city. In proportion as the mass of the Roman community in Italy, and able aspirants to power, like Czesar, became conscious of the unreality of the old constitutional controversies, they became indifferent to the questions which agitated the forum and the curia and contemptuously ready to alter or disregard the constitution itself, when it stood in the way of interests nearer to their hearts. Of this grow- ing indifference to the traditional politics of the republic, against which Cicero struggled in vain, Pompey is an excellent example. He was absolutely without interest in them, except in so far as they led up to important military commands, and, though he was never revolutionary in intention, his own career, in its quiet defiance of all the established rules of the constitution, did almost more than the direct attacks of others to render the republic impos- sible,

When his consulship ended, Pompey impatiently awaited at the hands of the politicians he had befriended the further gift of aforeign command. He declined an ordinary

POMPEY. |

1 The exact provisions of Pompey's law are nowhere given; Livy, Epit., xcvii., "tribuniciam potestatem restituerunt." Cf. Velleius, li. 30, A "lex Aurelia," in 75, had already repealed the law dis- qualifying a tribune for further office ; Cic., Comnawin, (8%

2 This was the work of L. Aurelius Cotta, pretor in this year. The "judices" were to be taken in equal proportions from senators, equites, and "tribuni aerarii." For the latter and for the law generally, see Madvig, Verf., i. 182, ii. 222; Lange, R. Alt., iii. 198. Com- pare also Cicero's language, Zn Verr., i. 1, 15. The prosecution of Verres shortly preceded the lex Aurelia.

3 Livy, Epit., xcviii. Sixty-four senators were expelled. Cf. Plut., Pomp., 22; Cie. In Vere taleltis

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province, and from the end of 70 to 67 he remained at 684-7.

Rome in a somewhat affectedly dignified seclusion. But

in 67 and 66 the laws of Gabinius and Manilius gave him 687, 688.

all and more than all that he expected. The ravages of the pirates, encouraged in the first instance, by the inactivity which had marked Roman policy in the East after 167, and by the absence of any effective Roman navy in the Mediterranean, had now risen to an intolerable height, and the spasmodic efforts made since 81 had done little to check them. The trade of the Mediterranean was para- lysed, and even the coasts of Italy were not safe from their raids.© Aulus Gabinius, a tribune, and a follower of Pompey, now proposed to the people to entrust Pompey with the sole command against the pirates.© His com- mand was to last for three years. He was to have supreme authority over all Roman magistrates in the provinces throughout the Mediterranean and over the coasts for 50 miles inland. Fifteen legati, all of preetorian rank, were assigned to him, with two hundred ships, and as many troops as he thought desirable. These powers were still further enlarged in the next year by the Manilian law, which transferred from Lucullus and Glabrio to Pompey the conduct of the Mithradatic war in Asia, and with it the entire control of Roman policy and interests in the East.7 The unrepublican character of the position thus granted to Pompey, and the dangers of the precedent established, were clearly enough pointed out by such moderate men as Q. Lutatius Catulus, the "father of the senate," and by the orator Hortensius—but in vain. Both laws were sup- ported, not only by the tribunes and the populace, but by the whole influence of the "publicani" and " nego- tiatores," whose interests in the East were at stake.

Pompey left Rome in 67, and did not return to Italy Cwsar, The interval was marked in 687, 692,

till towards the end of 62. Rome by the rise to political importance of Cesar and

Cicero, and by Catiline's attempt at revolution. When in 70 684.

the removal of the restrictions placed upon the tribunate restored to the popular party their old weapons of attack, Czesar was already a marked

man. In addition to his patrician birth, and his reputation for daring and ability, he possessed, as the nephew of Marius and the son-in-law of Cinna, a strong hereditary claim to the leadership of the popular and Marian party. He had already taken part in the agitation for the restoration of the tribunate; he had supported the Manilian law; and, when Pompey's withdrawal left the field clear for other competitors, he stepped at once into the front rank on the popular side.® He took upon himself, as their nearest representative, the task of clearing the memory and avenging the wrongs of the great popular leaders, Marius, Cinna, and Saturninus. He publicly reminded the people of Marius's services, and set up again upon the Capitol the trophies of the Cimbric War. He endeavoured to bring to justice, not only the ringleaders in Sulla's bloody work of proscription, but even the murderers of Saturninus, and vehemently pleaded the cause of the children of the proscribed. While thus carrying on in genuine Roman fashion the feud of his family, he attracted the sympathies of the Italians by his efforts to procure the Roman franchise for the Latin communities beyond the Po, and won the affections of the populace in Rome and its immediate neighbourhood by the splendour of the games which he gave as curule

edile (65), and by his lavish expenditure upon the improve- 689,

4 Velleius, ii. 31; Plut., Pomp., 28.

> See the brilliant sketch by Mommsen, R. G., iii. 89 sq.

6 Plut., Pomp., 25; Dio, xxxvi. 6; Livy, Zpit., c.

? Cic. Pro Lege Manilia ; Dio, xxxvi. 25; Plut., Pomp., 30.

8 Prof. Beesly, in his essay on Catiline, has vainly endeavoured to show that Catiline and not Cesar was the popular leader from 67 to 63. That this is the inference intentionally conveyed by Sallust, in order to screen Cesar, is true, but the inference is a false one,

689. 691.

Cicero.

691, 696.

705.

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ment of the Appian Way. But it is characteristic of Caesar and of his time that these measures were with him only means to the further end of creating for himself a position such as that which Pompey had already won; and this ulterior aim he pursued with a skill, and with an audacious indifference to constitutional forms and usages, unsur- passed even by Sulla. His coalition with Crassus, soon after Pompey's departure, secured him an ally whose colossal wealth and wide financial connexions were of inestimable value, and whose vanity and inferiority of intellect rendered him a willing tool. The story of his attempted coup @état in January 65 is probably false,' but it is evident that by the beginning of 63 he was bent on reaping the reward of his exertions by obtaining from the people an extraordinary command abroad, which should secure his position before Pompey's return ; and the agrarian law proposed early that year by the tribune Rullus had for its real object the creation, in favour of Cesar and Crassus, of a commission with powers so wide as to place its members almost on a level with Pompey himself.2. It was at this moment, when all seemed going well, that Czesar's hopes were dashed to the ground by Catiline's desperate outbreak, which not only discredited every one connected with the popular party, but directed the suspicions of the well-to-do classes against Cesar him- self, as a possible accomplice in Catiline's revolutionary schemes.?

The same wave of indignation and suspicion which for the moment checked Cesar's rise carried Marcus Tullius Cicero to the height of his fortunes. Cicero, as a poli- tician, has been equally misjudged by friends and foes. That he was deficient in courage, that he was vain, and that he attempted the impossible, may be admitted at once. But he was neither a brilliant and unscrupulous adventurer nor an aimless trimmer, nor yet a devoted champion merely of senatorial ascendency.t He was a representative man, with a numerous following, and a policy which was naturally suggested to him by the cir- cumstances of his birth, connexions, and profession, and which, impracticable as it proved to be,

was yet consistent, intelligible, and high-minded. Born at Arpinum, he cherished like all Arpinates the memory of his great fellow- townsman Marius, the friend of the Italians, the saviour of Italy, and the irreconcilable foe of Sulla and the nobles. A "municipal" himself, his chosen friends and his warmest supporters were found among the well-to-do classes in the Italian towns.> Unpopular with the Roman aristocracy, who despised him as a " peregrinus,"® and with the Roman populace, he was the trusted leader of the Italian middle class, "the true Roman people," as he proudly styles them. It was they who carried his election for the consulship? (63), who in 58 insisted on his recall from exile,® and it was his influence with them which made Cesar so anxious to win him over in 49. He represented their antipathy alike to socialistic schemes and to aristocratic exclusive- ness, and their old-fashioned simplicity of life in contrast

1 The story is so told by Suetonius, Jul., 8. In Sallust, Cat., 18,

it enw as an intrigue originating with Catiline, and Ceesar's name is omitted,

z Cic., Lew Agr., ii. 6, "nihil aliud actum nisi ut decem reges constituerentur." ont That Cesar and Crassus had supported Catiline for the consulship in 65 is certain, and they were suspected naturally cnongh of favour- ing his designs in 68, but their complicity is in the highest degree improbable,

- *Mommsen is throughout unfair to Cicero, as also are Drumann wd Prof. Beesly. The best estimate of Cicero's political position known to the present writer is that given by Prof. Tyrrell in the Introduction to his edition of Ciccro's Letters.*

: Cic. Ad Ait., i. 191, "locupletes. . . noster exercitus.'"'

: Cie. Pro Sulla, 7 ; Sall., Caé., 31, "inquilinus urbis Romae."

: See the De Petitione Consulatus, passim.

De Domo, 28 ; Pro Plancio, 97.

ME

with the cosmopolitan luxury of the capital. By birth, too, he belonged to the equestrian order, the foremost re- presentatives of which were indeed still the publicani and negotiatores, but which since the enfranchisement of Italy included also the substantial burgesses of the Italian towns and the smaller "squires" of the country districts. With them, too, Cicero was at one in their dread of demo- cratic excesses and their social and political jealousy of the "nobiles."!° Lastly, as a lawyer and a scholar, he was passionately attached to the ancient constitution. His political ideal was the natural outcome of these circum- stances of his position. He advocated the maintenance of the old constitution, but not as it was understood by the extreme politicians of the right and left. The senate was to be the supreme directing council,!! but the senate of Cicero's dreams was not an oligarchic assemblage of nobles, but a body freely open to all citizens, and representing the worth of the community.!2 The magistrates, while deferring to the senate's authority, were to be at once vigorous and public-spirited ; and the assembly itself which elected the magistrates and passed the laws was to consist, not of the "'mob of the forum," but of the true Roman people throughout Italy.!3 For the realization of this ideal he looked, above all things, to the establishment of cordial relations between the senate and nobles in Rome and the great middle class of Italy represented by the equestrian order, between the capital and the country towns and dis- tricts. This was the " concordia ordinum," the " consensus Italiae," for which he laboured.1 He failed because his ideal was impracticable. The inveterate selfishness and exclusiveness of the nobles, the indifference of the Italians to constitutional questions, and their suspicious dislike of Roman politicians, above all the incompetency of the old machinery, even if reformed as he would have had it reformed, to govern the empire and control the proconsuls and the army, were insuperable obstacles in his way.*

[HISTORY.

Cicero's election to the consulship for 63 over the heads The was mainly con- spiracy of : 5 : Catiline, easy both by the rumours which were rife of revolutionary ¢

of Ceesar's nominees, Antonius and Catiline, the work of the Italian middle class, already rendered un-

schemes and of Cesar's boundless ambition, and by the numerous disquieting signs of disturbance noticeable in Italy. The new consul vigorously set himself to discharge the trust placed in him. He defeated the insidious pro- posals of Rullus for Czesar's aggrandizement, and assisted in quashing the prosecution of Rabirius. But with the consular elections in the autumn of 63 afresh danger arose from a different quarter. The "conspiracy!°> of Catiline" (see CATILINE) was not the work of the popular party, and still less was it an unselfish attempt at reform ; L. Sergius Catilina himself was a patrician, who had held high office, and possessed considerable ability and courage ; but he was bankrupt in character and in purse, and two successive defeats in the consular elections had rendered him desperate. To retrieve his broken fortuncs by violence was a course which was only too readily suggested by the history of the last forty years, and materials for a conflagration abounded on all sides. The danger to be feared from his intrigues lay in the state of Italy, which made a revolt against society and the estab- lished government only too likely if once a leader pre- sented himself, and it was such a revolt that Catiline

® Cie. Pro Quinctio, 31 ; Pro Cluentio, 46, 153.

10 Cic. In Very., ii. 73; De Pet. Cons.,i. He shared with them their dislike to Sulla, as the foe of their order; Pro Cluentio, 55.

ll De Rep., ii. 36 5 De Legg., ii. 12.

22 Pro Sestio, 65; De Legg., ili. 4.

13 Pro Sestio, 49. Ut Wa wAlets, 1a

15 For Catiline's conspiracy, see Sallust, Catiline ; Cicero In Cati- linam ; Plut., Cicero; Mommsen, R. G., iii, 164 sg. ; and especially C. Jolin, Entstehung d. Catilinarischen Verschawérung (Leipsic, 1876).

3=691.

RO

endeavoured to organize. Bankrupt nobles like himself, Sullan veterans and the starving peasants whom they had dispossessed of their holdings, outlaws of every descrip- tion, the slave population of Rome, and the wilder herdsmen-slaves of the Apulian pastures, were all enlisted under his banner, and attempts were even made to excite disaffection among the newly-conquered people of south- ern Gaul and the warlike tribes who still cherished the memory of Sertorius in Spain. In Etruria, the seat and centre of agrarian distress and discontent, arising actually took place headed by a Sullan centurion, but the spread of the revolt was checked by Cicero's vigorous measures. Catiline fled from Rome, and died fighting with desperate courage at the head of his motley force of old soldiers, peasants, and slaves. His accomplices in Rome were arrested, and, after an unavailing protest from Cesar, the senate authorized the consuls summarily to put them

CSAR. |

ME 769

the relief refused by the senate, and carried an agrarian law of the new type, which provided for the purchase of lands for allotment at the cost of the treasury, and for the assignment of the rich "ager Campanus."? But Cesar aimed at more than the carrying of an agrarian law in the teeth of the senate or any party victory in the

forum. An important military command was essential Czsar's to him, and he judged correctly enough that in the West command

there was work to be done which might enable him to Win a position such as Pompey had achieved in the East. An obedient tribune was found, and by the lex Vatinia he was given for tive years the command of Cisalpine Gaul and Illyricum, to which was added by a decree of the senate Transalpine Gaul also. It was a command which not only opened to him a great military career, but enabled him, as the master of the valley of the Po, to keep an effective watch on the course of affairs in Italy.

Early the next year the attack upon himself which Banish- Cicero had foreseen was made. P. Clodius as tribune nee brought forward a law enacting that any one who had put a (7 a

Roman citizen to death without trial by the people should 53-57 be interdicted from fire and water. Cicero finding him- 696-7.

to death.

The Catilinarian outbreak had been a blow to Cesar, whose schemes it interrupted, but to Cicero it brought, not only popularity and honour, but, as he believed, the realization of his political ideal. The senate and the

Retumof But Pompey was now on his way home,! and again | his tribunate merely illustrated the anarchy which now ay as in 70 the political future seemed to depend on the | inevitably followed the withdrawal of a strong controlling Ko. attitude which the successful general would assume; | hand. A reaction speedily followed. Pompey, bewildered Pompey himself looked simply to the attainment by the | and alarmed by Clodius's violence, at last bestirred himself. help of one political party or another of his immediate | Cicero's recall was decreed by the senate, and early in aims, which at present were the ratification of his | August 57 in the comitia centuriata, to which his Italian arrangements in Asia and a grant of land for his troops. | supporters flocked in crowds, a law was passed revoking It was the impracticable jealousy of his personal rivals in | the sentence of outlawry passed upon him. the senate, aided by the versatility of Czesar, who pre- Intoxicated by the acclamations which greeted him, Renewal sented himself not as his rival but as his ally, which drove | and encouraged by Pompey's support, and by the salutary of the Coali- Pompey once more, in spite of Cicero's efforts, into the | effects of Clodius's excesses, Cicero's hopes rose high, Fre iam of f what was still nominally the popular party. In| and a return to the days of 63 seemed not impos— Pompey. _) 'ac Dee : : 6 One D : y P Cesar, 60, on Cesar's return from his propretorship in Spain, | sible. With indefatigable energy he strove to reconstruct and the coalition was formed which is known by the some- | a solid constitutional party, but only to fail once more. Crassus, what misleading title of the first triumvirate? Pompey | Pompey was irritated by the hostility of a powerful party

60=694. was ostensibly the head of this new alliance, and in return | in the senate, who thwarted his desires for a fresh com- for the satisfaction of his own demands he undertook to | mand and even encouraged Clodius in insulting the support Ceesar's candidature for the consulship. The | conqueror of the East. Czesar became alarmed at the wealth and influence of Crassus were enlisted in the same | reports which reached him that the repeal of his agrarian cause, but what he was to receive in exchange is not } law was threatened and that the feeling against the coali- clear. Cicero was under no illusions as to the significance | tion was growing in strength; above all he was anxious of this coalition. It scattered to the winds his dreams | for a renewal of his five years' command. He acted at of a stable and conservative republic. Pompey, whorn he | once, and in the celebrated conference at Luca (56) the 698.) had hoped to enlist as the champion of constitutional | alliance of the three self-constituted rulers of Rome was government, had been driven into the arms of Cesar. | renewed. Cicero succumbed to the inevitable and with- The union between the senate and the equestrian order | drew in despair from public life. Pompey and Crassus had been dissolved, and the support of the publicani lost | became consuls for 55. Cvzesar's command was renewed 699. by an untimely quarrel over the price to be paid for | for another five years, and to each of his two allies import- collecting the taxes of Asia, and, to crown all, both his | ant provinces were assigned for a similar period —Pompey own personal safety and the authority of the senate were Se ey I ec : ; fades we 3 Jass., 691. le a – seeking Ky eee eat, – a, B. C. li, 10; Suet., One ZON CicmeAg AC, bring US | ii, 16, 18. unconstitutional execution of Catiline's accomplices. His 4 Suet., Cesar, 22; Dio Cass., xxxviii, 8; App., B. C., ii, 13; 695, fears were fully justified by the results. The year 59 saw | Plut., Cws., 14.

equestrian order, the nobles of Rome and the middle class in the country, had made common cause in the face of a common danger; and the danger had been averted by the vigorous action of a consul sprung from the people, under the guidance of a united senate, and backed by the mass of good citizens.

the republic powerless in the hands of three citizens. Cxsar as consul procured the ratification of Pompey's acts in Asia, conciliated the

publicani by granting them

1 For the history of the next eighteen years, the most important ancient authority is Cicero in his letters and speeches.

? Misleading, because the coalition was unofficial. The "trium- virs" of 43 were actual magistrates, " 1iviri reipublicae constituendae causa,

self deserted even by Pompey left Rome in a panic, and by a second Clodian law he was declared to be outlawed.® With Cesar away in his province, and Cicero banished, Clodius was for the time master in Rome. But, absolute as he was in the streets, and recklessly as he parodied the policy of the Gracchi by violent attacks on the senate,

5 Both Jaws were carried in the "comitia tributa." The first merely reaffirmed the right of appeal, as the law of Gaius Gracchus had done. 'The second declared Cicero to be already by his own act in leaving Rome "interdicted from fire and water,"—a procedure for which precedents could be quoted. Clodius was within the letter of the law.

6 Cicero's speech Pro Sestio gives expression to these feelings ; it contains a passionate appeal to all good citizens to rally round the old constitution. The acquittal of Sestius confirmed his hopes. See Ad Q. Fr., ii. 4

Death of Crassus,

538=701.

700.

Pompey sole consul,

§2=702.

706.

Proposed recall of Ceesar.

708-704.

705.

Cesar crosses the Rubicon,

49=705.

709,

766 RO

receiving the two Spains and Africa, and Crassus Syria.! The coalition now divided between them the control of the empire. For the future the question was, how long the coalition itself would last. Its duration proved to be short. In 53 Crassus was defeated and slain by the Parthians at Carrhe, and in Rome the course of events slowly forced Pompey into an attitude of hostility to Cesar. The year 54 brought with it a renewal of the riotous anarchy which had disgraced Rome in 58-57. Conscious of its own helplessness, the senate, with the eager assent of all respectable citizens, dissuaded Pompey from leaving Italy. His provinces were left to his legates, and he himself remained at home to maintain order by the weight of his influence. It was a confession that the republic could not stand alone. But Pompey's mere presence proved insufficient. The anarchy and confusion grew worse, and even strict constitutionalists like Cicero talked of the necessity of investing Pompey with some extraordinary powers for the preservation of order? At last in 52 he was elected sole consul, and not only so, but his provincial command was prolonged for five years more, and fresh troops were assigned him.' The rdle of "saviour of society" thus thrust upon Pompey was one which flattered his vanity, but it entailed consequences which it is probable he did not foresee, for it brought him into close alliance with the senate, and in the senate there was a powerful party who were resolved to force him into heading the attack they could not successfully make without him upon Cesar. It was known that the latter, whose' command expired in March 49, but who in the ordinary course of things would not have been replaced by his successor until January 48, was anxious to be allowed to stand for his second consulship in the autumn of 49 without coming in person to Rome. His opponents in the senate were equally bent on bringing his command to an end at the legal time, and so obliging him to*

dis- band his troops and stand for the consulship as a private person, or, if he kept his command, on preventing his standing for the consulship. Through 51 and 50 the discussions in the senate and the negotiations with Cesar continued, but with no result. On Ist January 49 Cesar made a last offer of compromise. The senate replied by requiring him on pain of outlawry to disband his legions. Two tribunes who supported him were ejected from the senate house, and the magistrates with Pompey were authorized to take measures to protect the republic. Cesar hesitated no longer; he crossed the Rubicon and invaded Italy. The rapidity of his advance astounded and bewildered his foes. Pompey, followed by the consuls, by the majority of the senate and a long train of nobles, abandoned Italy as untenable, and crossed into Greece.> At the end of March Cesar entered Rome as the master of Italy. The story of the civil war which followed, down to the victory at Munda in the spring of 45, has been told elsewhere.6 We are concerned here with the work which Czsar achieved in the brief intervals

1 Livy, Zpit., ev.; Dio Cass., xxxix. 31. Hip. Ad Fam., i. 9; Ad Att., iv. 5.

*2 A dictatorship was talked of in Rome; Plnt., Pomp., 54; Cic. Ad Q. Fr, iii. 8. Cicero himself anticipated Augustus in his picture of a " princeps civitatis" sketched in a lost book of the De Republica, written about this time, which was bascd upon his hopes of what Pompey might prove to be; Ad Att., viii. 11 ; August., De Civ. Dei, v. 18. * Plat., 56; Apps, BC, in 2h*

- *For the rights of the question involved in the controversy between Cesar and the senate, see Mommsen, Rechtsfrage zw. Cxsar und d. ot Guiraud, Le Différend entre César et le Sénat (Paris, 1878).*

Cicero severely censures Pompey for abandoning Italy, but strategically the move was justified by the fact that Pompey's strength

lay in the East, where his name was a powcr, and in his control of the

sea, Politically, however, it was a blunder, as it enabled Ceasar to pose as the defender of Italy.

§ Sce arts. Czsar, CICERO, and Pompry.

For Cicero's views, see

M E of rest allowed him during these stormy years, and with

the place which his dictatorship holds in the history of Rome.

[111SToORY.

The task which Cesar had to perform was no easy one. Dictator. It came upon him suddenly; for there is no sufficient ship of

reason to believe that Czsar had long premeditated revolution, or that he had previously aspired to anything more than such a position as that which Pompey had already won, a position unrepublican indeed, but accepted by republicans as inevitable.' War was forced upon him as the alternative to political suicide, but success in war brought the responsibilities of nearly absolute power, and Cesar's genius must be held to have shown itself in the masterly fashion in which he grasped the situation, rather than in the supposed sagacity with which he is said to have foreseen and prepared for it. In so far as he failed, his failure was mainly due to the fact that his tenure of power was too short for the work which he was required to perform. From the very first moment when Pompey's ignominious retreat left him master of Italy, he made it clear that he was neither a second Sulla nor even the reckless anarchist which many believed him to be® The Roman and Italian public were first startled by the masterly rapidity and energy of his movements, and then agreeably surprised by his lenity and moderation. No proscriptions or confiscations followed his victories, and all

Cesar,

48-44 = 706-710,

his acts evinced an unmistakable desire to effect a sober –

and reasonable settlement of the pressing questions of the hour ; of this, and of his almost superhuman energy, the long list of measures he carried out or planned is sufficient proof. , The "children of the

proscribed" were at length restored to their rights,? and with them many of the refugees 1° who had found shelter in Ceesar's camp during the two or three years immediately preceding the war ; but the extreme men among his supporters soon realized that their hopes of "novae tabulae" and grants of land were illusory. In allotting lands to his veterans, Czesar carefully avoided any disturbance of existing owners and occupiers,!! and the mode in which he dealt with the economic crisis produced by the war seems to have satisfied all reasonable men.!2 It had been a common charge against Ceesar in former days that he paid excessive court to the populace of Rome, and now that he was master he still dazzled and delighted them by the splendour of the spec- tacles he provided, and by the liberality of his largesses.

| But he was no indiscriminate flatterer of the mob. The

popular clubs and guilds which had helped to organize the anarchy of the last few years were dissolved.13 A strict inquiry was made into the distribution of the monthly doles of corn, and the number of recipients was reduced by one half ;1 finally, the position of the courts of justice was raised by the abolition of the popular element among the judices.® Nor did Cxsar shrink from the attempt, in which so many had failed before him, to mitigate the twin evils which were ruining the prosperity of Italy,—the concentration of a*

7 On this, as on many other points connected with Cesar, divergence has here been ventured on from the views expressed by Monimsen in his brilliant chapter on Cesar (R. G., iii. 446 sg.). Too much stress must not be laid on the gossip retailed by Suetonius as to Casar's early intentions.

8 Cicero vividly expresses the revulsion of feeling produced by Cesar's energy, humanity, and moderation on his first appearance in Italy. Compare Ad Att., vii. 11, with Ad Att., viii. 18.

- *Dio, xii, 18. 10 App., ii. 48; Dio, xli. 36.*

" Plut., Czs., 51; Sucton., 37, "adsignavit agros, sed non con- tinuos, ne quis péssessorum expelleretur." Cf. App., ii. 94.

2 For the 'lex Julia de pecuniis mutuis," see Sneton., 42; Cesar, B. C., iii. 1; Dio, xli. 87; App., ii. 48. The "focneratores " were satisfied ; Cic., Ad Fam., viii. 17. But the law displeased anarchists like M. Ceelius Rufus and P. Cornelius Dolabella.

13 Sueton., 42. 14 Sueton., 41; Dio, xliii, 21.

15 Sueton., 40; Dio, xliii, 25,

CmSAR. |

pauper population in tlie towns, and the denudation and desolation of the country districts. His strong haud carried out the scheme so often proposed by the popular leaders since the days of Gaius Gracchus, the colonization of Carthage and Corinth. Allotments of land on a large scale were made in Italy ; decaying towns were reinforced by fresh drafts of settlers; on the large estates and cattle farms the owners were required to find employment for a certain amount of free labour ; and a slight and temporary stimulus was given to Italian industry by the reimposi- tion of harbour dues upon foreign goods.! To these measures must be added his schemes for the draining of the Fucine Lake and the Pomptine Marshes, fora new road across the Apennines, and for turning the course of the Tiber.? It is true that these vigorous efforts to revive the agrarian prosperity of Italy were made along the old lines laid down eighty years before by the Gracchi, and that their final success was no greater than that of preced- ing efforts in the same direction, but they are a proof of the spirit in which Cezesar understood the responsibilities of absolute power, and their failure was due to causes which no legislation could remove. The reform of the calendar, which has been described elsewhere,? completes a record of administrative reform which entitles Czesar to the praise of having governed well, whatever may be thought of the validity of his title to govern at all. But how did Cesar deal with what was after all the greatest problem which he was called upon to solve, the establish- ment of a satisfactory government for the empire? One point indeed was already settled—the necessity, if the empire was to hold together at all, of placing the army, the provinces, and the control of the foreign policy in more vigorous hands than those of a number of changing magistrates independent of each other, and only very

imperfectly controlled by the senate at home. Some centralization of the executive authority was indispensable, and this part of his work Cesar thoroughly performed. From the moment when he seized the moueys in the treasury on his first entry into Rome‘ down to the day of his death he recognized no other authority but his throughout the empire. He alone directed the policy of Rome in foreign affairs; the legions were led, and the provinces governed, not by independent magistrates, but by his ‘legates ;”5 and the title “imperator” which he adopted was intended to express the absolute and unlimited nature of the “imperium” he claimed, as distinct from the limited spheres of authority possessed by republican magistrates. In so centralizing the executive authority over the empire at large, Czesar was but developing the policy implied in the Gabinian and Manilian laws, and the precedent he established was closely followed by his successors. It was otherwise with the more difficult question of the form under which this new executive authority should be exercised and the relation it should hold to the republican constitution. We must be content to remain in ignorance of the precise shape which Cesar intended ultimately to give to the new system. The theory that he contemplated a revival of the old Roman kingship’ is supported by little more than the popular gossip of the day, and the form under which he actually

1 Sueton., 42, 43.

2 Plut., Cws., 58; Suet., 44; Dio, xliii, 51.

3 See CALENDAR, vol. iv. pp. 666-7; Mommsen, R. G., iii. 550; and Fischer, Rém. Zeittafeln, 292 sq.

2 Phiten, Bay LU 1D, saline, 2470

§ Suet., 40; Dio, xliii.44. For this use of the title “ imperator,”’ see Mommsen, &. G., iii. 466, and note.

7 See Mommsen, iii. 467, and Ranke, Weltgeschichte, ii. 319 sq. According to Appian, ii. 110, and Plutarch, Cws., 64, the title “‘rex”’ was only to be used abroad in the East, as likely to strengthen Cesar’s position against the Parthians.

wielded his authority can hardly have been regarded by so sagacious a statesman as more than a provisional arrange- ment. This form was that of the dictatorship; and in favour of the choice it might have been urged that the dictatorship was the office naturally marked out by republican tradition as the one best suited to carry the state safely through a serious crisis, that the powers it conveyed were wide, that it was as dictator that Sulla had reorganized the state, and that a dictatorship had been spoken of as the readiest means of legalizing Pompey's protectorate of the republic in 53-52. theless was a bad one. It was associated with those very Sullan traditions from which Cesar was most anxious to sever himself; it implied necessarily the suspension for the time of all constitutional government ; and, lastly, the dictatorship as held by Cxsar could not even plead that it conformed to the old rules and traditions of the office. There was indeed a precedent in Sulla's case for a dictator '"reipublicae constituendae causa," but Cesar was not only appointed in an unusual manner, but appointed for an unprecedentedly long period,' and the " perpetual dictatorship" granted him after his crowning victory at

Munda (45) was a contradiction in terms and a repudia- 99.

tion of constitutional government which excited the bitterest animosity.® The dictatorship served well enough for the time to give some appearance of legality to Cesar's autocratic authority, but it was not—even, it is probable, in his own eyes—a satisfactory solution of the problem.

A second question, hardly less important than the estab- lishment and legalization of a strong central executive authority over the army and the provinces, was that of the position to be assigned to the old constitution, by the side of this new power. So far as Cxsar himself was concerned, the answer was for the time sufficiently clear. The old constitution was not formally abrogated. The senate met and deliberated ; the assembly passed laws and elected magistrates; there were still consuls, prztors, zdiles, queestors, and tribunes ; and Cesar himself, like his successors, professed to hold his authority by the will of the people. But senate, assembly, and

magistrates were all alike subordinated to the paramount authority of the dictator; and this subordination was, in appearance at least, more direct and complete under the rule of Cesar than under that of Augustus. Czesar was by nature as impatient as Augustus was tolerant of established forms ; and, dazzled by the splendour of his career of victory and by his ubiquitous energy and versatility, the Roman public, high and low, prostrated themselves before him and heaped honours upon him with a reckless profusion which made the existence of any authority by the side of his own an absurdity.!° Hence under Cesar the old constitu- tion was repeatedly disregarded, or suspended in a way which contrasted unfavourably with the more respectful attitude assumed by Augustus. For months together Rome was left without any regular magistrates, and was governed like a subject town by Cesar's prefects.! At another time a tribune was seen exercising authority out- side the city bounds and invested with the "imperium " of a pretor.!2 At the elections, candidates appeared before

8 Cesar's first dictatorship in 49 was simply ''comitiorum haben- dorum causa," and lasted only eleven days. He was appointed dictator again for one year in 48, for ten yearsin 46, and for life in 45.

® Cicero, Phil., i. 2, praises Antony, "quum dictatoris nomen . .. propter perpetuae dictuturae recentem memoriam funditus ex republica sustulisset."

10 For the long list of these, see Appian, ii. 106; Dio, xliii. 43- 45; Plut., 57; Suet., 76. Cf also Mommsen, R. G., iii, 463 sq.; Watson, Cicero's Letters, App. x.; Zumpt, Studia Romana, 199 sq. (Berlin, 1859).

1 Zumpt, Stud. Rom., 241; Suet.,76. © Cic. Ad Att, x. 8a.

The choice never- 701-702.

673.

706.

768

the people backed by a written recommendation from the dictator, which was equivalent to a command.' Finally, the senate itself was transformed out of all likeness to its former self by the raising of its numbers to 900, and by the admission of old soldiers, sons of freedmen, and even "semi-barbarous Gauls."? But, though Czsar's high- handed conduct in this respect was not imitated by his immediate successors, yet the main lines of their policy were laid down by him. These were (1) the municipaliza- tion of the old republican constitution, and (2) its subor- dination to the paramount authority of the master of the legions and the provinces. In the first case he only carried further a change already in progress. Of late years the senate had been rapidly losing its hold over the empire at large. Even the ordinary proconsuls were virtually independent potentates, ruling their provinces as they chose, and disposing absolutely of legions which recognized no authority but theirs. The consuls and preetors of each year had since &1 been stationed in Rome, and immersed in purely municipal business; and, lastly, since the enfranchisement of Italy, the comitia, though still recognized as the ultimate source of all authority, had become little more than assemblies of the city populace, and their claim to represent the true Roman people was indignantly questioned, even by republicans like Cicero.

' The concentration in Ceesar's hands of all authority out-

side Rome completely and finally severed all real con- nection between the old institutions of the republic of Rome and the government of the Roman empire. And, though Augustus and Tiberius elevated the senate to a place beside themselves in this government, its share of the work was a subordinate one, and it never again directed the policy of the state; while, from the time of Ceesar onwards, the old magistracies are merely municipal offices, with a steadily diminishing authority, even in the city, and the comitia retain no other prerogative of imperial importance but that of formally confirming the ruler of the empire in the possession of an authority which is already his. But the institutions of the republic not merely became, what they had originally been, the local institutions of the city of Rome; they were also subordin- ated even within these narrow limits to the paramount authority of the man who held in his hands the army and the provinces. And here Cvesar's policy was closely followed by

his successors. Autocratic abroad, at home he was the chief magistrate of the commonwealth; and this position was inarked, in his case as in that of those who followed him, by a combination in his person of various powers, and by a general right of precedence which left no limits to his authority but such as he chose to impose upon himself. During the greater part of his reign he was consul as well as dictator. In 48, after his victory at Pharsalia, he was given the "tribunicia potestas " for life, and after his second success at Thapsus the "praefectura morum" for three years. As chief magistrate he convenes and presides in the senate, nominates candidates, conducts elections, carries laws in the assembly, and administers justice in court.6 Finally, as a reminder that the chief magistrate of Rome was also the autocratic ruler of the empire, he wore even in Rome the laurel wreath and triumphal dress, and carried the sceptre of the victorious imperator.?

Nor are we without some clue as to the policy which

- *Suet., 41, 'Caesar dictator … commendo vobis illum et*

illum, ut vestro suffragio suam dignitatem teneant."

? Suet., 41, 76 ; Dio, xliii. 47,

é Watson, op. cit., App. x.; Zumpt, Stud. Rom., loc. cit.; Suet., 76, tertium et quartum consulatum titulo tenus gessit."

4 Dio, xlii. 20. > Dio, xliii. 14; Suet., 76.

® Suet., 43, "jus laboriosissime ac severissime dixit."

" App., ii. 106 ; Dio, xliii, 43.

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Cesar had sketched out for himself in the administra- tion of the empire, the government of which he had cen- tralized in his own hands. The much-needed work of rectifying the frontiers he was forced, by his premature death, to leave to other hands, but our authorities agree in

attributing to him the design of extending the rule of Rome to its natural geographical limits §—to the Euphrates and the Caucasus on the east, to the Danube and the Rhine or possibly the Elbe on the north, and to the ocean on the west. Within the frontiers he anticipated Augustus in lightening the financial burdens of the provincials,® and in establishing a stricter control over the provincial governcrs,!° while he went beyond him in his desire to consolidate the empire by extending the Roman franchise! and admitting provincials to a share in the government.!2 He completed the Romanization of Italy by his enfran- chisement of the Transpadane Gauls, and by establishing throughout the peninsula a uniform system of niunicipal government, which under his successors was gradually extended to the provinces, !4

On the eve of his departure for the East, to avenge the Attempt- death of Crassus and humble the power of Parthia, Czesar ¢drestora- fell a victim to the wounded pride of the republican nobles ; i and between. the day of his death (March 15, 44) and that rare on which Octavian defeated Antony at Actium (September 710-711. 2, 31) lies a dreary period of anarchy and bloodshed. 710.

For a moment, in spite of the menacing attitude of 723. Czesar's self-constituted representative Antony, it seemed to one man at least as if the restoration of republican gov- ernment was possible. With indefatigable energy Cicero stroye to enlist the senate, the people, and above all the provincial governors in support of the old constitution. But, though his eloquence now and again carried all before it in senate house and forum, it was powerless to alter the course of events. By the beginning of 43 civil war 711. had recommenced; in the autumn Antony was already threatening an invasion of Italy at the head of seventeen legions. Towards the end of October Antony and his ally Lepidus coalesced with the young Octavian, who had been recently elected consul at the age of twenty, in spite of senatorial opposition ; and the coalition was legalized by The the creation of the extraordinary commission for the second "reorganization of the commonwealth" known as the — "second triumvirate."!6 It was appointed for a period of 43 9g— | five years, and was continued in 37 for five years more.!" 711-726. The rule of the triumvirs was inaugurated in the Sullan 717. fashion, and, in marked contrast to the lenity shown by

Cesar, by a proscription, foremost among the victims of which was Cicero himself.1® In the next year the defeat of Brutus and Cassius at Philippi, by the combined forces of Octavian and Antony, destroyed the last: hopes of the republican party.!9 In 40 a threatened rupture between 714. the two victors was avoided by the treaty concluded at Brundusium. Antony married Octavian's sister Octavia,

*8 Plut., 58, "'ouvdwar tov kbKrov THs tyeuovias'"' ; Suet., 44; Dio, xiii. 51. * Pint., 48; App., v. 4.*

10 He limited the term of command to two years in consular and one year in preetorian provinces; Cicero, Phil., i. 8; Dio, xliii. 25.

1 Suet., 42; Cic. Ad Até., xiv. 12.

12 Suet., 76. 13 Dio, xli. 86; Tac., Ann., xi. 24.

M4 Lex Julia municipalis ; Wordsworth, Fragments of Early Latin, pp. 2138, 464; Mommsen, &. G., iii. 524. Lex Rubria; Wordsworth, pp. 212, 463.

15 For this period see Merivale, Romans under the Empire, vol. iii; Lange, Rém. Alterth., iii. 476 sq.; Ranke, Weltgeschichte, ii. 336 sg.; Watson, Cicero's Letters, Introd. to Part v.

16 The triumvirate was formally constituted in Rome (Nov. 27) by a plebiscitum ; App., iv. 7; Dio, xlvi. 50-56, xlvii. 2; Livy, Hyit., exx. "ut Iviri reipublicae constituendae per quinquennium essent."

7 Dio, xlviii. 54; App., v. 98. For the date, cf. Fischer, Rim. Zeittafeln, 352, 353.

18 Livy, Epit., cxx.; App., iv. 7; and art. CICERO.

19 Dio, xlvii. 35-49 ; App., iv. 87-138.

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The Augustan system, 28-27 — 12e=7,

and took command of the eastern half of the empire; Octavian appropriated Italy and the West ; while Lepidus was forced to content himself with Africa.) For the next twelve years, while Antony was indulging in dreams of founding for himself and Cleopatra an empire in the East, and shocking Roman feeling by his wild excesses and his affectation of oriental magnificence,? Octavian was patiently consolidating his power. Of his only two rivals, Lepidus his fellow triumvir was in 36 ejected from Africa and banished to Circeii, while Sextus Pompeius, who had since his defeat at Munda maintained a semi-piratical ascendency in the western Mediterranean, was decisively defeated in the same year, and his death in 35 left Octavian sole master of the West. The inevitable trial of strength between himself and Antony was not long delayed. In 32 Antony inflicted one more outrage upon Roman feeling, and openly challenged the hostility of Octavian by divorcing Octavia in favour of the beautiful and daring Egyptian princess, with whom, as the heiress of the Ptolemies, he aspired to share the empire of the Eastern world. By a decree of the senate Antony was declared deposed from his command, and war was declared against Queen Cleopatra. On September 2, 31, was fought the battle of Actium.* Octavian's victory was complete. Antony and Cleopatra committed suicide (30), and the Eastern provinces submitted in 29. Octavian returned to Rome to celebrate his triumph and mark the end of the long-continued anarchy by closing the temple of Janus ;° at the end of the next year he formally laid down the extraordinary powers he had held since 43, and a regular government was established.

Tif. The Empire.

Periop I.: THz Principats, 27 B.c.~284 a.p.—(a) The Constitution of the Principate.—The conqueror of Antony at Actium, the great-nephew and heir of the dictator Cesar, was now summoned, by the general consent of a world wearied out with twenty years of war and anarchy,6 to the task of establishing a government which should as far as possible respect the forms and traditions of the republic, without sacrificing that centralization of author- ity which experience had shown to be necessary

for the integrity and stability of the empire. It was a task for which Octavian was admirably fitted. To great admin- istrative capacity and a quiet tenacity of purpose he united deliberate caution and unfailing tact ; while his bourgeois birth' and genuinely Italian sympathies enabled him to win the confidence of the Roman community to an extent impossible for Caesar, with his dazzling pre-eminence of patrician descent, his daring disregard of forms, and his cosmopolitan tastes.

The new system which was formally inaugurated by Octavian in 28-27 B.c.8 assumed the shape of a restora- tion of the republic under the leadership of a " princeps."

1 Vell., ii. 76; Dio, xlviii. 28; App., v. 65.

- *For Antony's policy and schemes in the East, see Ranke, Weligeschichte, ii. 881-885; Merivale, Romans under the Empire, vol. iii. chap, 27 ; Lange, Rém. Alterth., iii. 578 sq.*

3 Suet., Octav., 17 ; Dio, 1. 1-8; Plutarch, Anton., 58.

- *Dio, li. 1; Zonaras, 10, 30.*

> He celebrated his triumph on August 6, 7, 8; Dio, li. 20; Livy, LEpit., cxxxiii. For the closing of the temple of Janus, see Livy, i. 19; Vell., ii. 838; Suet., Oct., 22.

6 Tac., Ann., i. 2, "cunctos dulcedine otii pellexit."

7 Suet., Aw, i. His grandfather was a citizen of Velitree ; "'municipalibus magisteriis contentus. "

® Mommsen, Staatsrecht, ii. 707; Mon. Ancyranum (ed. Momm- sen, Berlin, 1883), vi. 13-23, pp. 144-153; Merivale, Romans under the Empire, chap. xxxi.; Cape's Early Empire, chaps. i.—xii. _? Tac., Ann, iii. 28, "sexto demum consulatu.. . quae Iiviratu Jusserat abolevit, deditque jura quis pace et principe uteremur ;"' 2d7d.,

i. 9, “non regno neque dictatura sed principis nomine constitutam rempublicam.”’

ROME

769

Octavian voluntarily resigned the extraordinary powers which he had held since 43, and, to quote his own words, “handed over the republic to the control of the senate and people of Rome.1° The old constitutional machinery was once more set in motion; the senate, assembly, and magistrates resumed their functions! ; and Octavian him- self was hailed as the “restorer of the commonwealth and the champion of freedom.”!2 It was not so easy to determine what relation he himself, the actual master of the Roman world, should occupy towards this revived republic. His abdication, in any real sense of the word, would have simply thrown everything back into confusion. The interests of peace and order required that he should retain at least the substantial part of his authority; and this object was in fact accomplished, and the rule of the emperors founded, in a manner which has no parallel in history. Any revival of the kingly title was out of the question, and Octavian himself expressly refused the dictatorship.! Nor was any new office created or any new official title invented for his benefit. But by senate and people he was invested according to the old constitutional forms with certain powers, as many citizens had been before him, and so took his place among the lawfully appointed magistrates of the republic ;——only, to mark his pre-eminent dignity, as the first of them all, the senate decreed that he should take as an additional cognomen that of “ Augustus,”!© while in common parlance he was henceforth styled “princeps,” a simple title of courtesy, familiar to republican usage, and conveying no other idea than that of a recognized primacy and precedence over his fellow citizens.16 The ideal sketched by Cicero in his De Republica, of a constitutional president of a free republic, was apparently realised; but it was only in appearance. For in fact the special prerogatives conferred upon Octavian gave him back in substance the autocratic authority he had resigned, and as between the restored republic and-its new princeps the balance of power was overwhelmingly on the side of the latter.*

Under one form or another Octavian had held the

“imperium” since 43, and in 33 he had been formally 711, 721.

acknowledged as “imperator,” by the consent of all.!7 For this somewhat irregular authority was substituted in

27 the regular ‘“proconsulare imperium,”!®8 the authority Imperium under which for nearly two centuries the provinces had Prcou- He received oy —

been governed and the legions led to war. it in the orthodox way, by decree of the senate; and the decree, as was customary, defined the area of his command. The essential difference between the “proconsulare imperium” granted to Octavian and that which had been voted year after year to the ordinary proconsuls, lay in its unprecedentedly wide extent and in its long duration. All the provinces, with the exception of those where no military authority or force was required, were placed under his command, to be governed directly by “ legati ” appointed by him and responsible only to him.19 The “unarmed

10 Mon. Ancyr., vi. 18.

Vel “Pab,, i. 89, revocata,”

” Ovid, Fasti, i. 589. Ona coin of Asia Minor Augustus is styled “‘libertatis P. R. vindex.” Compare, for other evidence, Mommsen, Staatsr., ii. 708, note 1.

18 Dio Cassius describes Augustus as seriously contemplating abdication (lii. 1; liii. 1-11); ef Suet., Aug., 28.

14 Suet., 52; Mon. Ancyr.,i.31. Mon. Ancyr., vi. 16, 21, 28.

16 The explanation of ‘“‘princeps” as an abbreviated form of “princeps senatus” is quite untenable. For its real significance, see Mommsen, Staatsrecht, ii. 733; Pelham, Journ. of Phil., vol. viii. It is not an official title.

7” Mon. Ancyr., v. 8-6, vi. 18, 14. Augustus adopted “inrper- ator” asa prenomen in 40, Mommsen, Staatsr., ii. 727, note 2.

18 Dio, lili, 17, 32 ; Mommsen, Staatsr., 791.

9 Dio, liii. 12; Suet., 47, “provincias validiores ipse suscepit, ceteras proconsulibus sortito permisit.”

‘ XX. — 94

‘‘prisca et antiqua reipublicae forma*

731, 727.

Tribuni- sia potes- tas.

718. 731,

770 kx O

provinces” were to be assigned by lot in the old way to ex-consuls and ex-preetors, and to be nominally under the control of the senate ; but in 23 even their governors were declared to be generally subordinate to Octavian as the holder of a higher authority (“ majus imperium).”! In addition to this control, direct and indirect, of all the pro- vinces, Octavian received also the sole and supreme com- mand of all the military and naval forces of the empire. He alone henceforth levies, pays, and dismisses soldiers, equips fleets, and orders the movements of both army and navy, and he was granted in addition full authority to wage war and conclude treaties with whom he would.” Finally, in 23, if not in 27, he was exempted from the law which required the proconsul to lay down his “im- perium” on entering Rome, and was allowed to exercise it within the sacred limits of the pomerium,? a privilege which facilitated the introduction into the city of the pre- fects, pretorian guard, and summary jurisdiction proper to the proconsul in the province. This “ proconsulare imperium ” was granted in the first instance for ten years,‘ but was renewed for periods of five, five, and ten years successively, and the fiction of its temporary duration and periodic renewal was maintained

under Augustus's suc- cessors by the celebration every ten years of the " decen- nalia."> The supreme importance attached to its posses- sion as the mainstay of the imperial power is sufficiently indicated by the fact that the man on whom it is con- ferred becomes thereby " princeps," and the day on which he receives it ("dies imperii") marks the beginning of his reign.®

The proconsular imperium not only carried with it the control of the army and the provinces, but in Rome itself it gave its holder a position of precedence. In virtue of it he took his seat between the consuls, was preceded by lictors,'? and wore the laurel wreath, paludamentum, and sword of the imperator. But as yet Rome could not be governed like a subject provincial city by proconsular authority ; and, for the necessary direction and regulation of the constitutional machinery which he had restored, Augustus contented himself* with the authority which traditionally invested its holder with a popular leadership, that of the tribunes of the plebs. The "tribunicia potestas" had been granted him for life in 36, and his tenure of it was confirmed in 23.19 Thenceforward it ranked as a constituent element of the principate, second in importance only to the proconsular authority. With but few exceptions it was conferred for life upon all succeeding emperors, and the years of their reigns are reckoned by the years of their tribunician power. It was conferred, as all special "potestas" had been conferred under the republic, by a decree of the senate and vote of the assembly.1!_ It gave its holder all the prerogatives of

1 Dio, liii. 32.

- See the so-called 'lex de imperio Vespasiani," C. J. Z., vi. 980.

3 Dio, liii. 17. 4 Dio, liii. 13.

5 Dio, liii. 16 ; vii. 24; Mommsen, Staatsr., ii. 751, 752.

8 See the passages from the Acta Fratrum Arvalium (ed. Henzen, Berlin, 1874), p. 68. 'Tiberius received it when associated with Augustus as his colleague ; Tac., Ann., i. 3; Suet., Tid., 21.

” Dio, liv. 10, connects these privileges with the bestowal of con- sular power for life, but it is doubtful whether any such power was formally conferred. Mommsen, Staatsrecht, ii. 818; Mon. Ancyr., iil. ts , | Tac, Ann, i, 2. 9 Mon. Ancyr., ii. 21.

io, liii, 32. The years of the ‘‘tribunicia potestas’”’ are reckoned by Augustus from this year. See Mommsen, Staatsr., ii.

753, 754,

| References are found in the Acta Fratrum Arvalium to the comitia in which it was conferred; Acta F. A., ed. Henzen, p. 65. It is possible, as Mommsen thinks, that the extant fragmentary law de Imperio Vespasiani” may be a part of the “lex” conferring the

tribunicia potestas”; see his Staatsr., ii. 818. The ‘‘tribunicia, potestas”” was, like the “proconsulare imperium,” conferred on the chosen colleague or destined successor ; Tac., Anz., i. 2, of Tiberius,

consors tribuniciae potestatis.”

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the tribunate, without the restrictions which hampered the tribunes theniselves. Augustus and his successors were unimpeded in its exercise by the presence of colleagues ; and both their personal inviolability and their right of interference held good outside the pomerium. It enabled them, as representing the acknowledged protectors of the plebs, to control in the name of the people the whole administrative ‘machinery, to introduce laws, to convene the senate, to protect the aggrieved, and to interfere with any exercise of authority by other magistrates, In short, it gave to the man who already wielded an authority abroad more absolute than that granted to Pompey by the Gabinian law all and more than all the power possessed by a Gracchus in Rome.

It was on these two powers that Augustus’s position as Other princeps rested. In virtue of these he was chief magistrate Powers

of the Roman state, and all other offices and privileges conferred upon him are comparatively of secondary import- ance. The consulship which he held continuously from

31 up to 23 he never accepted again but on two occa- 723-731,

sions, in 5 B.c. and in 2 B.c.,!2 though he was twice invested 749, 752. » ' ' §

with "consular authority" for the purpose of taking the census (8 B.C., 14 a.D.).¥8 ordinary "morum legumque regimen," as stated by Sue- tonius and Dio,!4 is extremely doubtful, and his language in the Ancyran monument implies that for this purpose, as for many others, he found the tribunician authority sufficient.1® annonae,"!6 the supervision of the corn supply and the corn largesses at Rome. B.C. he succeeded him as " pontifex maximus," and he was also a member of the augural and other priestly colleges.?" Lastly, at various times, and probably by decree of the senate, he was granted a number of special exemptions and privileges.1§

In theory at least, the Roman world was governed Changes

according to the "maxims of Augustus"!® down to the time of Diocletian. Even in the 3d century there is

still, in name at least, a republic, of which the emperor the prin- is in strictness only the chief magistrate, deriving his cipate.

authority from the senate and people, and with preroga- tives limited and defined by law. The case is quite different when we turn from the theory to the practice. The division of authority between the republic and its chief magistrate became increasingly unequal. Over the provinces the princeps from the first ruled autocratically ; and this autocracy reacted upon his position in Rome, so that it became every year more difficult for a ruler so absolute abroad to maintain even the fiction of republican government at home. The republican institutions, with the partial exception of the senate, lose all semblance of author- ity outside Rome, and even in their altered position as the municipal institutions of the chief city of the empire they retain but little actual power. The real government

even of Rome passes gradually into the hands of imperial pre- fects and commissioners, and the old magistracies become merely decorations which the emperor gives away at his pleasure. And at the same time the rule of the princeps assumes an increasingly personal character, and the whole work of government is silently concentrated in his hands and in those of his own subordinate officials. Closely connected with this change is the different aspect pre- sented by the history of the empire in Rome and Italy on

22 Suet., 26. 13 Mon. Ancyr., ii. 5. 8.

14 Suet., 27 4 Dio, liv. 10, 30.

1 Mon. Ancyr. Gr., iii. 15,and Mommsen's notes, pp. 28-30, 36-38.

16 Mon. Ancyr. Lat., i. 32, 38.

17 Mommsen on Mon. Ancyr. Lat., i. 45, p. 82.

18 Dio, liii. 18. In the "lex de imperio Vespasiani" several such exemptions are mentioned ; Mommsen, Staatsr., ii. 711 sg.

*19 Suet., Vero, 10, '*ex Augusti praescripto."*

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That he ever received an extra- 746.

In 22 sB.c. he was invested with the " cura 732,

On the death of Lepidus in 12 742.

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Decay

of re- publican institu- tions.

705, 726.

The comitia.

The Magis- tracies,

RO

the one hand and in the provinces on the other. Rome and Italy share in the decline of the republic. Polit- ical independence and activity die out; their old pre- eminence and exclusive privileges gradually disappear ; and at the same time the weight of the overwhelming power of the princeps, and the abuses of their power by individual " principes," press most heavily upon them. On the other hand, in the provinces and on the frontiers, where the imperial system was most needed, and where from the first it had full play, unfettered by the fictions of republican government, it is seen at its best as devel- oping or protecting an orderly civilization and maintain- ing the peace of the world.

The decay of the republican institutions had commenced before the revolutionary crisis of 49. It was accelerated by the virtual suspension of all regular government between 49 and 28; and not even the diplomatic defer- ence towards ancient forms which Augustus displayed availed to conceal the unreality of his work of restoration. The "comitia" received back from him "their ancient rights,"! and during his lifetime they continued to pass laws and to elect magistrates. But after the end of the reign of Tiberius we have only two instances of legislation by the assembly in the ordinary way,? and the law-making of the empire is performed either by decrees of the senate or by imperial edicts and coustitutions. Their prerogative of electing magistrates was, even under Augustus, robbed of most of its importance by the control which the princeps exercised over their choice by means of his rights of nomination and com- mendation, rights which effectually secured the election of his own nominees.? By Tiberius even this restricted prerogative was still further curtailed. The candidates for all magistracies except the consulship were thencefor- ward nominated and voted for in the senate-house and by the senators,# and only the "renuntiatio," the formal return of the result, and the introduction of the magis- trates designate to the people took place in the assembly. And, though the election of consuls was never thus trans- ferred to the senate, the process of voting seems to

have been silently abandoned. In the time of the younger Pliny we hear only of the nomination of the candidates and of their formal "'renuntiatio" in the Campus Martius.¢ By this empty form the ancient right of the people to confer all magisterial authority was saved, at least in appearance ; and it was acknowledged in as purely formal @ manner in the case of the princeps himself, who, as long as the principate lasted, continued to receive the "tribunicia potestas" by a vote of the assembly, and was thus held to derive his authority from the people.'

This almost complete effacement of the "comitia" was largely due to the fact that they had ceased to represent anything but the populace of Rome, and the compara- tively greater vitality shown by the old magistracies is mainly attributable to the value they continued to possess in the eyes of the Roman upper class. But, though they were

1 Suet., Aug., 40, "comitiorum pristinum jus reduxit."

- *The "'plebiscita" of Claudius, Tac., Ann., xi. 13, 14, and the "lex agraria" of N erva ; Digest, xlvii. 21, 8; Dio, lxviii. 2; Plin., Epp., vii. 31.*

3 For the nature of these rights, the latter of which was not exercised in the case of the consulship until the time of Vespasian, see Mommsen, Staatsr., ii. 861-869; Tac., Ann., i. 14, 15, 81; Suet., Aug., 56; Dio, lviii. 20.

" Tac., Ann., i. 15, "comitia e campo ad patres translata sunt"; Compare Ann., xiv. 28. The magistracy directly referred to is the pretorship, but that the change affected the lower magistracies also is certain ; see, e.g., Pliny's Letters, passim, especially iii, 20, vi. 19.

® Dio, lviii, 20.

§ Mommsen, Staatsr., ii, 865, 866 ; Plin., Paneg., 92.

" Gaius, i. 5, "cum ipse imperator per legem imperium accipiat."

Mommsen is probably right in referring this to the "lex tribu- nicia,"'

eagerly sought,' and conferred on their holders considerable social distinction, the magistrates ceased, except in name, to be the popularly chosen executive officers of the Roman state. In the administration of the empire at large they had no share, if we except the subordinate duties still assigned to the questor in a province. In Rome, to which their sphere of work was limited, they were over- shadowed by the dominant authority of the princeps, while their range of duties was increasingly circumscribed by the gradual transference of administrative authority, even within the city, to the emperor and his subordinate officials, And their dependence on the princeps was con- firmed by the control he exercised over their appointment. For all candidates the approval, if not the commendation, of the princeps became the indispensable condition of success, and the princeps on his side treated these ancient offices as pieces of preferment with which to reward his adherents or gratify the ambition of Roman nobles, In all instances, too, the dignity of the office was impaired by the practice, begun by Cesar and continued by Augustus and his successors, of granting the insignia to men who had not held the actual magistracy itself. The change is especially noticeable in the case of the consuls, the chief magistrates of the old commonwealth. The con- sulship was still the highest post open to the private citizen,' and consular rank a necessary qualification for high office in the provinces ;! but the actual consuls have scarcely any other duties than those of presiding in the senate, conducting its proceedings, and occasionally exe- cuting its decrees,!? while their term of office dwindles from a year to six and finally to two months.!3 In the age of Tacitus and the younger Pliny, the contrast is striking enough between the high estimate set on the dignity of the office and the frankness with which both its limited powers and its dependence on the emperor are acknow- ledged.1 Of the other magistrates the preetors continued to exercise their old jurisdiction with little formal change down at least to the latter half of the second century, but only as subordinate to the higher judicial authority*

Consul- ship.

Preetor- ship.

of the emperor. The zdiles seem to have retained only Adile-

such petty police duties as did not pass to one or another of the numerous imperial prefects and conmissioners.!6

ship.

The tribunate fared still worse, for, by the side of the Tribu- tribunicia potestas wielded by the princeps, it sank into 24te

insignificance, and it is described by the younger Pliny as a "'shadow and an empty name." !7

- *Plin., Zpp., ii. '9,~~vi, 6. See, generally, Friedlaender, Sitten~~ geschichte Roms (Leipsic, 1869), pp.' 227 sq.*

® The permission to use the " ornamenta consularia, praetoria," &c., was distinct from the "adlectio inter consulares, praetorios," &. See Mommsen, Staatsr., ii, 877 sq.; Suet., Jul., 76; Claud., v. 24; Tac, , Ann., xii, 21, xv. 72; Dio Cass., lx. 8. Cf also Friedlaender, i. 224.

10 Tac., Agric., 44; Pliny, Epp., ii. 1, "summum fastigium privati hominis, "

11 For a consular senatorial province and for the more important of the imperial legateships.

2 Plin., Paneg., 48, graphically sums up the consuls' duties.

13 Mommsen, Staatsrecht, ii. 79. Six months was the usual term

down to the death of Nero; we have then four or two months ; in the 3d century two is the rule. The consuls who entered on office on January 1 were styled "consules ordinarii," and gave their name to the year. Seneca De Jra, iii. 31, "a me numerari voluit annum," Lucan, Phars., v. 398, "careat ne nomine tempus, menstruus in fastos distinguet saecula consul." Plin., Paneg., 58. The others were distinguished as " consules

suffecti"' or "minores" ; Dio Cass., xlviii. 35. 4 Plin., Paneg., 92; Tac., Hist., i. 1; Agric., 44, 1° Mommsen, Staatsr., ii. 206. 16 They lost the "cura annonae" and "cura ludorum" as well as other duties, which passed to such officers as the "praefectus vigilum," and the "curatores viarum, cloacarum," &c, There is no mention of the edileship after the reign of Severus Alexander,

Y Plin., Epp., i. 23, "inanem umbram et sine honore nomen." There are a few instances of the exercise by the tribunes of their power of interference within the senate; Tac., Ann., i. 77, vi. 47, xvi. 26; Plin., Epp., ix. 13. :

The questorship Ques, torship,

The senate,

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suffered perhaps less change than any other of the old offices. It still kept its place as the first step on the ladder of promotion, and there was still a queestor attached to each governor of a senatorial province, to the consuls in Rome, and to the princeps himself as proconsul.}

The senate alone among republican institutions retained some importance and influence. The virtual abolition of the comitia, and the degradation of the magistracies left the senate to stand alone as the representative of repub- licanism, and it thus came to be regarded as sharing the government of the empire with the princeps himself. The magistrates elected by the senate are contrasted with the legates, prefects, and procurators appointed by the emperor. It is to the senate, in theory, that the supreme power reverts in the absence of a princeps. It is by decree of the senate that the new princeps immediately receives his powers and privileges,? though he is still supposed to derive them ultimately from the people, and is as a rule actually the nominee of the soldiers. After the cessation of all legislation by the comitia, the only law-making authority, other than that of the princeps by his edicts, was that of the senate by its decrees? Its judicial authority was parallel with that of the emperor, and at the close of the lst century we find the senators claiming, as the emperor's " peers," to be exempt from his jurisdiction.4

But in spite of the outward dignity and importance of this position, and of the politic deference with which it was frequently treated, the senate became gradually almost as powerless in reality as the comitia and the magistracies. The two great supports of its authority under the republic—its identification with the interests of a powerful aristocracy and the subserviency of the magistrates—both fell away under the empire.

The senators continued indeed to be taken asa rule from the ranks of the wealthy, and a high property qualifica- tion was established by Augustus as a condition of member- ship, but any effect which this may have had in giving in- dependence to the position of a senator was counterbalanced by the facilities it afforded to the emperors for securing their own ascendency by subsidizing those whose property fell short of the required standard, and who thus became

vincials themselves, carried on the same policy, and by the close of the 2d century even the Greek provinces of the East had their representatives among the senators of Rome. Some, no doubt, of these provincials, who con- stituted the great majority of the senate in the 3d century, were men of wealth and mark, but many more were of low birth, on some rested the stain of a servile descent, and all owed alike their present position and their chances of further promotion to the emperor. The procedure of the senate was as completely at the mercy of the princeps as its composition. He was himself a senator and the first of senators ;? he possessed the magisterial prerogatives of convening the senate, of laying business before it, and of carrying senatus consulta ;!° above all, his tribunician power enabled him to interfere at any stage, and to modify or reverse its decisions. The share of the senate in the government was in fact determined by the amount of administrative activity which each princeps saw fit to allow it to exercise, and by the extent to-which he chose to use it as an instrument of government. And this share became steadily smaller. The jurisdiction assigned it by Augustus and Tiberius was in the 3d century limited to the hearing of such cases as the emperor thought fit to send for trial, and these became steadily fewer in number. Its control of

the state treasury, as distinct from the imperial fiscus, and of the so-called senatorial provinces passed in fact to the emperor and his officials, and was only occasionally revived by the special favour of emperors who, like Marcus Aurelius,!! were sincerely attached to old traditions, or, like Severus Alexander and Tacitus, hoped by close alliance with the senate to escape from the evils of a military despotism.!2. Even in Rome and Italy its control of the administration was gradually transferred to the prefect of the city, and after the reign of Hadrian to imperial officers (juridici) charged with the civil adminis- tration.12 The part still played by its decrees in the modification of Roman law has been dealt with elsewhere (see p. 704 supra), but it is clear that these decrees did little else than register the expressed wishes of the emperor and his personal advisers.

The growing impotence of all other authority than that Altered

simply the paid creatures of their imperial patrons. Admission to the senate was possible only by favour of the emperor, as at once controlling the elections to the

of the princeps inevitably altered the character of the Position principate. Even under Augustus, Tiberius, and the % ye

: : rinceps; Claudian emperors, there is a silent and steady concentra- 4

central-

magistracies, which still as of old gave entrance to the curia, and as invested with the power of directly creating senators by "adlectio," a power which from the time of Vespasian onwards was freely used.6 As the result, the composition of the senate rapidly altered. Under Augustus and Tiberius it still contained many represen- tatives of the old republican families, whose prestige, influence, and ancestral traditions were some guarantee for their independence. But this element soon disappeared. The ranks of the old nobility were thinned by natural decay and by the jealous fears of the last three Claudian emperors. Vespasian' flooded the senate with new men from the municipal towns of Italy and the Latinized provinces of the West. Trajan and Hadrian, both pro-

1 Mommsen, Staatsrecht, ii. 532. Caesaris," Hpp., vii. 16.

- *Mommsen, Staatsrecht, ii, 818; Tac., Ann., xii. 69, Hist., i. 47. In the 3d century the honours, titles, and powers were conferred en bloc by a single decree; Vit. Sev. Alex,, 1.*

3 Gaius, i. 4; Ulpian, Dig., i. 3, 9.

4 Under Domitian; Dio Cass., lxvii. 2. Even Septimius Severus pledged himself "non inconsulto senatu occidere senatorem"; Vita Severi, 7 > Suet., Vero, 10; Vesp., 17.

5 Mommsen, Staatsrecht, ii. 879 sq. The power was derived from the censorial authority. Domitian was censor for life ; Suet, Dom., 8. After Nerva it was exercised as falling within the general autho- rity vested in the princeps ; Dio, liii. 17.

7 Suet., Vesp., 90; Tac., Ann., iii. 55.

Pliny was himself " quaestor

tion of all authority in the hands of the princeps ; not only ization of

the army and the provinces, but even Rome and Italy, are an' rity in

in reality governed by him, though still with a lingering

respect for the traditional prerogatives of the senate and ponds,

the senatorial magistrates; in the reigus of Caligula, Claudius, and Nero the politic disguise under which Augustus and Tiberius had endeavoured to conceal the extent of their power was thrown contemptuously aside. In the administration of justice and in finance, as well as in military and foreign affairs, the authority of the princeps is paramount; and his own personal subor- dinates—legates, prefects, procurators, and even his freed- men!+—divide between them the real work of government.

This increase of power was accompanied by a correspond- Outward

ing elevation of the princeps himself above the level pe

of all other citizens. The comparatively modest house- hold and simple life of Augustus were replaced by a more

8 See on this point Friedlaender, Stttengeschichte Roms, i. 197 sq.

9 Mon. Ancyr. Gr., iv. 8, mp&rov akibparos témov.

10 Lex de imp. Vesp., C. Z. Z., vi. 9830: "Senatum habere, relationem facere, remittere ; Scta. per relationem discessionemque facere."'

11 Dio Cass., Ixxi. 10.

12 Vit. Sev. Alex., 3; Vit. Tac., 12, 18.

13 Vit. Hadr., 22. ' Juridici'' were appointed by Marcus Aurelius, Vit. Ant., 11; Marquardt, i. 72, 73.*

14 For the position of the imperial freedmen under Claudius, see Friedlaender, i. 63 sg.; Tac., Ann., xii. 60, xiv. 39, Wist., ii. 57, 95.

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than regal splendour, and under Nero we find all the outward accessories of monarchy present, the palace, the palace guards, the crowds of courtiers, and a court ceremonial. In direct opposition to the republican theory of the principate, the members of the princeps's family share in the dignities of his position. The males bear the cognomen of Cesar, and are invested, as youths, with high | office; their names and even those of the females are ? included in the yearly prayers for the safety of the | princeps!; their birthdays are kept as festivals; the pretorian guards take the oath to them as well as to the princeps himself. Finally, the growing practice of Casar worship invested the chief magistrate of the Roman commonwealth with the divine attributes ascribed to

Eastern monarchs. The death of Nero was followed, it

is true, by a partial reaction. Not only Galba and the Flavian emperors but Trajan, Hadrian, and the Antonines at once affected a certain simplicity in their personal habits, and discountenanced the excessive servility and

DEVELOPMENT OF THE PRINCIPATE. |

adulation encouraged by Caligula and Nero. But this reaction served only to bring into clearer relief the con- tinued advance made towards the establishment of an] autocratic and military rule. Caligula, Claudius, and ingly Nero were all first saluted as imperatores by the military : : C : character SOldiery and then invested with their powers by the

of the princi- pate.

Increas-

*senate,? but this reversal of the constitutional order was rendered less noticeable by the fact that the choice was still made in Rome, and that it fell in each case on one whose birth already marked him out as the natural successor to the purple. The salutation of Galba by the legions in Spain marks the opening of a new epoch.4 Thenceforward, if the legions do not actually select the princeps, it is their acceptance of him which is the one essential condition of his tenure of power, and it is on their support that he relies. Vitellius and Vespasian were chosen by the legions of Germany and Syria, as Galba had been by those of Spain. Domitian emphasized the military character of his rule by entering the senate in | the triumphal dress ;> and under the great soldier Trajan, whose adoption by Nerva was a frank confession of the necessities of the case, the military title "imperator " was already superseding the older and more constitutional | *¢ princeps."*

Sever- Closely connected with the increasingly military char- a acter of the emperor's position was the gradual severance

nexion Of the old ties which connected the emperor, as chief with magistrate, with Rome, as the traditional seat and centre Rome. of political power. Glalba, Vitellius, and Vespasian were already de facto

emperors when they entered Rome from their distant provinces to claim the legal confirmation by the senate. Trajan and Hadrian were both provincials by birth ; the former did not enter Rome for a full year after his accession, and Hadrian courteously apologized to the senate for taking up the imperium in Syria before his acceptance by that body.6 The connexion between the emperors and Rome was further weakened by the increasing frequency and length of their absences from the city. Life in Rome was no doubt irksome to men trained in camps, as Trajan had been, and the state of affairs was such as imperatively to require the emperor's presence in the provinces and on the frontiers. The distant campaigns of Trajan and Marcus Aurelius, and the unwearying travels of Hadrian, were necessary for the safety and good govern- ment of the empire, but they involved the removal from

1 Acta Fr. Arval. (ed. Henzen) 33, 98, 99.

? For Cesar worship, see Mommsen, Staatsrecht, ii. 716 sq. ; Boissier, La Religion Romaine, i. 122-208 ; Marquardt, Rom. Staatsverw., iii. 443-454 ; Preller, Rim. Mythologie, 770 sq.

3 Tac,, Ann., xii, 69, of Nero, "sententiam militum secuta patrum consulta." @-Tac., Lists, 1,4 5 Dio, Lxvii. 4,

6 Dio, lxix. 2.

Rome of the real seat of government. The emperors from Vespasian to Aurelius were, with the exception of Domi-

tian, ready enough to respect constitutional forms, at least

in their personal intercourse with the senate, and Aurelius

seems sincerely to have wished to share with the senate

the overwhelming responsibilities which pressed upon him.

But the improved organization of the administrative system which the times demanded was too urgent a need

to be set aside out of respect for the niceties of an obsolete constitutional government; and this period is marked by

the development and extension of a purely imperial system

of government, the control of which was centralized in

the hands of the emperor alone. The main credit of this achievement is due to Hadrian,' and its immediate effect

was undoubtedly to increase the effectiveness of the administration ; but it accelerated the decay of local inde- pendence and energy, and thus diminished the strength

of the empire. The century which separates the death The em- of Marcus Aurelius from the accession of Diocletian perors of (180-284) completed the destruction of the old Augustan jae system. Now and again, as in the case of Pertinax, of y Severus Alexander, of Maximus and Balbinus, and of Tacitus, the senate succeeded in claiming for itself the selection of an emperor, but with the single exception of Severus Alexander their nominees were not more success-

ful than Nerva in securing the necessary attachment of

the legions; as a rule the emperors of the 3d century

were more than ever the nominees of the soldiery, often

men of obscure origin from the frontier provinces.6 The

worst of them treated the senate with contempt and con- tumely, and the best of them excluded it from all share

in the government. Septimius Severus, a native of Septi- Africa, set the precedent of abstaining from seeking a Spe formal confirmation of his authority from the senate ;9 °°V™ he assumed the title of proconsul*

even in Rome, ad- ministered justice no longer openly in the forum but within the walls of the palace, and finally established the prefect of the preetorian guard as the officer next in power

to the emperor himself. It is, moreover, on his inscrip-

tions that the emperor is first officially styled "dominus."

From the accession of Decius (249), the first of a series The

of able emperors sprung from the Danubian provinces, "Ulyrian the autocratic and military character of the imperial ne a

system rapidly develops. The old distinctions between imperial and senatorial provinces, between the state treasury and the privy purse of the emperor, finally dis- appear. Senators are almost entirely excluded alike from the military and civil services. Under Aurelian (270-275), an able soldier and a vigorous administrator, the breach with the old traditions became complete. He anticipated Diocletian in the completely autocratic methods of his government and in the Oriental pomp and splendour with which he surrounded himself.

(6) General History of the Empire.—From the develop- ment of the principate of Augustus into the avowed despot- ism which it was the great work of Diocletian to organize and consolidate we pass to the general fortunes of the empire during this period. On the accession of Augustus, there could be little doubt as to the nature of the work that was necessary, if peace and prosperity were to be secured for the Roman world. He was called upon to justify his posi- tion by rectifying thefrontiers and strengthening the frontier defences, by reforming the system of provincial government, and by reorganizing the finance; and his success in dealing with these three difficult problems is sufficiently proved

7 See, for a short account, Capes, Age of the Antonines, chap. Lexie of. Schiller, Gesch. d. Kaiserzeit, i. (2) 617 sq.

8 H.g., Maximinus, "de vico Thraciae, barbaro patre ac matre,"' Vit. Max., 1.

® Vita Severi, 7. For the importance of the reign of Severus see Schiller, i. (2) 725, Gibbon, vol. i. 258 sq.

the distracted Roman world desired, it was imperatively | Crassus beyond the Euphrates provoked the first serious The necessary to establish on all sides of the empire really | collision between Rome and Parthia, and the victory at frontiers. defensible frontiers ; and this became possible now that | Carrhze encouraged among the Parthians the idea of an for the first time the direction of the foreign policy of the | invasion of Syria and Asia Minor, while it awakened in state and of its military forces was concentrated in the | Rome a genuine fear of the formidable power which had hands of a single magistrate. To the south and west the | so suddenly arisen in the East. Czesar was at the moment generals of the republic, and Czsar himself, had extended | of his death preparing to avenge the death of Crassus by the authority of Rome to the natural boundaries formed | an invasion of Parthia, and Antony's schemes of founding by the African deserts and the Atlantic Ocean, and in | an Eastern empire which should rival that of Alexander these two directions Augustus's task was in the main con- | included the conquest of the kingdom beyond the fined to the organization of a settled Roman government | Euphrates. But on the Euphrates, as on the Rhine and within these limits. In Africa the client state of Egypt | the Danube, Augustus adhered to the policy which he was formed into a separate province, and the kingdom | recommended to his successors of "keeping the empire of Numidia (25 B.c.) was incorporated with the old | within its bounds"; and the Parthians, weakened by province of Africa. In Spain the hill-tribes of the north- | internal feuds and dynastic quarrels, were in no mood for west were finally subdued, and a third province, Lusitania, | vigorous action. Roman pride was satisfied by the established.2 Until the commencement of Cesar's cam- | restoration of the standards taken at Carrhe. Four paigns (58 8.c.) Roman rule in Gaul had been confined to | legions guarded the line of the Euphrates, and, beyond the single southern province of Gallia Narbonensis (121—| the frontiers of Pontus and Cappadocia, Armenia was 118 B.c.). Caesar subdued the rest of the country, but the | established as a "friendly and independent ally."5 fierce struggles of the Civil War and his early death Next in importance to the rectification and defence Adminis- obliged him to leave to his nephew the task of organizing | of the

frontiers was the reformation of the administra- tative the conquered territory. Augustus (27 B.c.) established | tion, and the restoration of prosperity to the distracted jy" in addition to the "old province" the three new ones of | and exhausted provinces. The most serious defect of pro- The Aquitania, Lugdunensis, and Belgica.? Towards the north | the republican system had been the absence of any vinces. North. the republic had left the civilized countries bordering on | effective contral control over the Roman officials outside the Mediterranean with only a very imperfect defence | Italy. This was now supplied by the general proconsular against the threatening mass of barbarian tribes above | authority vested in the emperor. The provinces were for them. The result of Augustus's policy was to establish a 4 the first time treated as departments of a single state, while protecting line of provinces running from the Euxine to | their governors, from being independent and virtually irre- the North Sea, and covering the peaceful districts to the | sponsible rulers, became the subordinate officials of a higher south,—Meesia (6 a.p.), Pannonia (9 .D.), Noricum | authority. Over the "legati" and '"procuratores" of the (15 B.c.), Reetia (15 B.c.), and Gallia Belgica. Roman | imperial provinces the control of the emperor was as com- rule was thus carried up to the natural frontier lines of the | plete as that of the republican proconsul over his staff in his Rhine and the Danube. Here, after the defeat of Varus | own province. They were appointed by him, held office at (9 a.D.) and the abandonment of a forward policy be- | his good pleasure, and were directly responsible to him for yond the Rhine, Augustus fixed the limits of the empire | their conduct. The proconsuls of the senatorial provinces northward; his successor Tiberius recalled Germanicus, | were in law magistrates equally with the princeps, though as soon as the disaster in the Silva Teutoburgensis had | inferior to him in rank; it was the senate that they been avenged ; and after the peace with Maroboduus, the | were as of old responsible; they were still selected by chief of the Marcomanni on the upper Danube, in the | lot from among the senators of consular and preetorian next year (17 .p.), the defensive policy recommended by | rank. But the distinction did not seriously interfere with Augustus was adopted along the whole of the northern | the paramount authority of the emperor. The provinces frontier. The line of the great rivers was held by an | left nominally to the senate were the more peaceful and imposing mass of troops. Along the Rhine lay the armies | settled districts in the*

heart of the empire, where only the of Upper and Lower Germany, consisting of four legions | routine work of civil administration was needed, and where each; eight more guarded the Danube and the frontiers of | the local municipal governments were as yet compara- Pannonia and Moesia. The command of the troops was tively vigorous. The senatorial proconsuls themselves entrusted to imperial legates, whose posts became the most | were indirectly nominated by the emperor through his coveted prizes in the imperial service, and were not | control of the preetorship and consulship. They wielded unfrequently stepping- stones to tho imperial purple itself. | no military and only a strictly subordinate financial autho- At frequent intervals along the frontier were the military | rity, and, though Augustus and Tiberius, at any rate, colonies, the permanent camps, and the smaller intervening | encouraged the fiction of the responsibility of the senatorial "castella." Flotillas of galleys cruised up and down the governors to the senate, it was in reality to the emperor rivers, and Roman roads opened communication both along | that they looked for direction and advice, and to him that the frontiers and with the seat of government in Italy. they were held accountable. Moreover, in the case of all In the East Rome had other work to do than that of | governors this accountability became under the empire a re-

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by the prosperous condition of the empire for a century and a half after his death.1 To secure the peace which

erecting a barrier against a surging tide of barbarism, for here she was confronted with a well-organized and powerful state whose claims to empire were second only to her own. The conquests of Pompey (66-62 B.c.) had brought Rome face to face with Parthia on the banks of the Euphrates, the limits of Roman authority being marked by the eastern frontiers of the client states of

1 Marquardt, Rim. Staatsverw. , 1. 282, 506.

> Marquardt, i. 101; Mommsen, R. Ge VOSS

3 Marquardt, i. 112; Mommsen, R. Ga va iG:

4 See especially Mommsen, R. G., v. caps. 4 and 6.

Pontus, Cappadocia, and Commagene, and of the newly formed province of Syria. In 54 the rash advance of

ality. Prosecutions for extortion (‘de pecuniis repetundis”), which were now transferred to the hearing of the senate, are tolerably frequent during the first century of the empire ; but a more effective check on maladministration lay in the appeal to Cesar from the decisions of any oe) i i 2 aa

5 Mommsen, R. G., v. cap. 9. Armenia, however, long continued to be a debateable ground between Rome and Parthia, —passing alter- nately under the influence of one or the other.

8 For the provincial reforms of Augustus, see Marquardt, Staats- verw., i. 402-422; Madvig, Verf. d. R. Reichs, ii. 7; Merivale, iv. cap. 32.

governor, which was open to every provincial, and in the right of petition. Under the Antonines, not the least laborious of the duties which devolved upon the emperor and his ministers was the daily one of hearing and deciding the innumerable cases sent up from the provinces. On the other hand, the growing frequency of imperial mandates and rescripts (see above, p. 705), dealing both with ques- tions of general policy and with points of law, attests the close attention paid by all the better emperors to the government of the provinces and the increasing dependence of the governor on imperial guidance. Within the province Augustus curtailed the powers of legate and proconsul alike. In both cases there was a division of authority. By the side of the imperial legate was placed, as the highest financial authority, an imperial procurator, while the proconsul,

in addition to the loss of all military control, was checked by the presence of the imperial officer, also styled procurator, to whom the care of the fiscal revenues was entrusted ; finally, both legate and proconsul were de- prived of that right of requisitioning supplies which, in spite of a long series of restrictive laws, had been the most powerful instrument of oppression in the hands of repub- Financial lican governors. The financial reforms of Augustus! are reforms. marked by the same desire to establish an equitable, orderly, and economical system, and by the same centralization of authority in the emperor's hands. The institution of an imperial census, or valuation of all land throughout the empire, and the assessment upon this basis of a uniform land tax, in place of the heterogeneous and irregular payments made under the republic, were the work of Augustus, though the system was developed and perfected by the emperors of the 2d century and by Diocletian. The land tax itself was directly collected, either by imperial officials or by local authorities responsible to them, and the old wasteful plan of selling the privilege of collection to publicani was henceforward applied only to such indirect taxes as the customs duties. The rate of the land tax was fixed by the emperor, and with him rested the power of remission even in senatorial provinces.2 The effect of these reforms is clearly visible in the improved financial condition of the empire. Under the republic the treasury had been nearly always in difficulties, and the provinces exhausted and impoverished. Under the emperors, at least throughout the Ist century, in spite of a largely increased expenditure on the army, on public works, on shows and largesses, and on the machinery of government itself, the better emperors, such as Tiberius and Vespasian, were able to accumulate large sums, while the provinces show but few signs of distress. A reformed administration and an improved system of taxation were not the only boons for which the empire at large had to thank Augustus. While the republic had almost entirely neglected to develop the internal resources of the pro- vinces, Augustus set the example of a liberal expenditure on public works, in the construction of harbours, roads, and bridges, the reclamation of waste lands, and the erection of public buildings. The crippling restrictions which the republic had placed on freedom of intercourse and trade, even between the separate districts of a single province, disappeared under the empire, and the institution of the provincial councils, as centres of provincial unity, is one among many

instances of the more liberal policy Italy and pursued by the emperors.¢ In the eyes of the republican L 4 Pro- statesmen the provinces were merely the estates of the Mn the Roman people, but from the reign of Augustus dates empire, the gradual disappearance of the old pre-eminence of Rome and Italy. It was from the provinces that the

THE EARLY EMPERORS. |

Liberal policy towards the pro- vinces,

Marquardt, ii, 198 sq., esp. p. 200, note 4, where = literature is given. 2Tac., Ann., ii. 47. 3 Suet., Aug., 18, 47. – Marquardt, i, 365.

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legions were increasingly recruited; provincials rose to high rank as soldiers, statesmen, and men of letters; the growing Roman civilization of the Western provinces and the thriving commerce of the populous cities of the East contrasted significantly with the degenerate cosmo- politanism of Rome, and with the dwindling population and decaying industry of Italy; while even into Rome and Italy the methods of administration formerly distine- tive of the provinces found their way. From Augustus himself, jealous as he was of the traditions and privileges of the ruling Roman people, date the rule of an imperial prefect in the city of Rome, the division of Italy into regiones in the provincial fashion, and the permanent quartering there of armed troops.®

For a century and 'a half the policy initiated by The em. Augustus secured the peace and prosperity of the empire ; Pire from of the emperors who ruled during that period the majority recog were able and vigorous administrators, and even the follies death ot and excesses of Gaius, Claudius, and Nero did little harm Marcus beyond the limits of Rome and Italy. The firm rule of Aurelius, Vespasian repaired the damages inflicted by the wars of 180 4-. the rival emperors after Nero's death, and the abilities of Trajan, Hadrian, and the Antonines, if they failed to revive the flagging energies of the empire, at least secured tranquillity and good government. But few additions of importance were made to the territories of Rome. In Britain' the work begun by Czesar was

taken up by Conquest Claudius, under whom the southern part of the island was of. | constituted a province; the northern districts were subdued Pttains by Agricola (78-84 4.p.), and the limits of the province northward were finally fixed by the Wall of Hadrian (see Britannia). The conquest of Dacia by Trajan (107) of Dacia. was provoked by the threatening attitude of the barbarian tribes on the lower Danube, and, though it remained part of the empire down to 256, its exposed position as lying beyond the Danube frontier rendered it always a source of weakness rather than strength.' To Trajan's reign also belongs the annexation of Arabia Petreea. Otherwise on The the frontiers there was little change. In the north the frontiers revolt of Civilis (69-70 a.p.) owed its temporary success aa mainly to the confusion created by the rivalries of Otho, ; Vitellius, and Vespasian.8 The connexion of the Rhine with the Danube frontier by a continuous wall,a work gradu- ally carried out under the Flavian and Antonine emperors, was a strategical necessity, and involved no general advance of the Roman lines. On the Rhine itself the peaceful state of affairs is sufficiently proved by the reduction of the force stationed there from eight legions to four; and it was only on the Danube that there was any pressure severe enough to strain the strength of the Roman defence. The presence of Trajan himself was required to quell the Dacians under their able king Decebalus, and, though his campaigns were followed by sixty years of peace, a force of ten legions was considered necessary to guard the Danubian frontier. Far more serious was the Invasion irruption of the Marcomanni and other tribes in the reign of the of Marcus Aurelius (162-175.).1° The tide of barbaric rd invasion which then swept across the upper Danube and j over the provinces of Rheetia, Noricum, and Pannonia, till it touched the Alps and the soil of Italy, was indeed driven back after fourteen years of war, but it first revealed to the Roman world the strength of the forces

- *Jung, Romanische Landschaften (Innsbruck, 1881); Budinszky, Die Ausbretung d. Latcinischen Sprache (Berlin, 1881).*

6 Marquardt, i. 67; Suet., Aug., 82.

? Mommsen, R. G., v. 205-208.

8 Tac., Hist., iv.; Mommsen, R. G., v. 116-131.

9 For the "limes imperii," see Mommsen, v. 140-146 ; Cohaugen, Der Rim. Grenzwall (Wiesbaden, 1884) ; Herzog, Die Vermessung d. Rim. Grenzwalls (Stuttgart, 1880).

10 Mommsen, v. 209; Vita Marci, 12 99.

The Rastern frontier.

Condi- tion of the pro- vinces,

Spread of the muui- cipal system ;

of the Roman fran- chise ;

of Ro- man law and civiliza- tion,

Symp- toms of decline.

The empire from

180-284.

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which were gathering unnoticed in the distant regions beyond the limits of the "Roman peace." In the East Rome and Parthia still faced each other upon the banks of the Euphrates, and contended, now by arms now by diplomacy, for supremacy in the debateable land of Armenia. 'Trajan's momentary acquisitions were aband- oned by Hadrian, and on this side of the empire the first changes of importance on the frontier belong to the reign of Septimius Severus.! Within the frontiers the levelling and unifying process commenced by Augustus had steadily proceeded. A tolerably uniform provincial system covered the whole area of the empire. The client states had one by one been reconstituted as provinces, and even the government of Italy had been in many respects assimilated to the provincial type. The municipal system had spread widely ; the period from Vespasian to Aurelius witnessed the elevation to municipal rank of an immense number of communities, not only in the old provinces of the West, in Africa, Spain, and Gaul, but in the newer provinces of the North,

and along the line of the northern frontier ; and everywhere under the influence of the central imperial authority there was an increasing uniformity in the form of the local constitutions, framed and granted as they all were by imperial edict.2 Throughout the empire again the extension of the Roman franchise was preparing the way for the final act by which Caracalla assimilated the legal status of all free-born inhabitants of the empire,® and in the west and north this was preceded and accompanied by the complete Romanizing of the people in language and civilization. Moreover, the empire, that was thus becom- ing one in its administrative system, its laws, and its civilization, had as yet continued to enjoy peace and order. The burdens of military service fell on the frontier pro- vinces, and only the echoes of the border wars reached the Mediterranean territories. Yet, in spite of the internal tranquillity and the good government which have made the age of the Antonines famous, we can detect signs of weak- ness. 'Though the evils of excessive centralization were hardly felt while the central authority was wielded by vigorous rulers, yet even under Trajan, Hadrian, and the Antonines we notice a failure of strength in the empire as a whole, and a corresponding increase of pres- sure on the imperial government itself. The reforms of Augustus had given free play to powers still fresh and vigorous. The ceaseless labours of Hadrian were directed mainly to the careful husbanding of such strength as still remained, or to attempts at reviving it by the sheer force of imperial authority. Among the symptoms of incipient decline which not the most heroic efforts of the government could entirely remove were the growing depopulation especially of the central districts of the empire, the con- stant financial difficulties, the deterioration in character of the local governments in the provincial communities,' and the increasing reluctance exhibited by all classes to under- take the now onerous burden of municipal office. Lastly, the irruption of the Marcomanni, and the revolt of Avidius Cassius (174-175) in the Eastern provinces, anticipated the two most serious of the dangers which ultimately proved fatal to the empire.

Marcus Aurelius died in 180, and his death was followed by a century of war and disorder, during which nothing but the stern rule of soldier emperors, such as Septimius Severus, Decius, Claudius, Aurelian, and Probus saved the empire from dissolution. The want of any legal security

: Mommsen, v. 409.

‘a Marquardt, i. 464 sq.; ef. esp., the “leges Salpensanae et Malaci- tanae”; C.J. L., ii, 1963, 4; Bruns, Fontes Juris Romani, 130 (Berlin, 1879). 3 Dio, Ixxvii. 9 (211-217 a.p.).

Pliny, Epp. ad Trajanum. For the ‘‘curatores” and “ correc- tores ” appointed in the 2d century, see Marquardt, i. 487 and notes.

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for the orderly transmission of the imperial power had been partially supplied during the 2d century by the practice of adoption.

But throughout the 3d century the Roman Internal

world witnessed a series of desperate conflicts between 'issen- 1OnS,

rival generals put forward by their respective legions as claimants for the imperial purple. Between the death of Severus in 211 and the accession of Diocletian in 284, no fewer than twenty-three emperors sat in the seat of Augustus, and of these all but three died violent deaths at the hands of a mutinous soldiery or by the orders of a successful rival. Of the remaining three, Decius fell in battle against the Goths, Valerian died a prisoner in the far East, and Claudius was among the victims of the chronic pestilence which added to the miseries of the time. The

"tyrants," as the unsuccessful pretenders to the imperial The purple were styled, reappear with almost unfailing regu- tyrants,

larity in each reign. The claims of Septimius Severus himself, the first and ablest of the soldier emperors, were disputed by Clodius Albinus in the West, and by Pescen- nius Niger in the East, and at the bloody battle of Lug- dunum and the sack of Byzantium rival Roman forces, for the first time since the accession of Vespasian, exhausted each other in civil war.> In 237-238 six emperors perished in the course of a few months. It was, however, during

the reign of Gallienus (260-268) that the evil reached its Reign of

height. The central authority was paralysed ; barians were pouring in from the North; the Parthians were threatening to overrun the Eastern provinces; and the legions on the frontiers were left to repel the enemies of Rome as best they could. A hundred ties bound them closely to the

districts in which they were stationed; their permanent camps had grown into towns, they had families and farms; the unarmed provincials looked to them as their natural protectors, and were attached to them by bonds of intermarriage and by long intercourse. Now that they found themselves left to repel by their own efforts the invaders from without, they reasonably enough claimed the right to ignore the central authority which was powerless to aid them, and to choose for themselves '"'imperatores" whom they knew and trusted. The first of these provincial empires was that established by Postumus in Gaul (259-272), and long maintained by his successors Victorinus and Tetricus.® Their authority was acknowledged, not only in Gaul and by the troops on the Rhine, but by the legions of Britain and Spain; and under Postumus at any rate (259-269) the existence of the Gallic empire was justified by the repulse of the barbarians and by the restoration of peace and security to the provinces of Gaul. On the Danube, in Greece, and in Asia Minor none of the "pretenders" enjoyed more than a passing success. It was otherwise in the far East, where the Syrian Odeenathus, prince of Palmyra,' though officially only the governor of the East (dux Orientis) under Gallienus, drove the Persians out of Asia Minor

_ Gallienus the bar- 60am

Tyrants in Gaul,

Odena- thus and Zenobia at Pal-

and Syria, recovered Mesopotamia, and ruled Syria, myra.

Arabia, Armenia, Cappadocia, and Cilicia with all the independence of a sovereign. Odenathus was murdered in 266. His young son} Vaballathus succeeded him in his titles, but the real power was vested in his widow Zenobia, under whom not only the.greater part of Asia Minor but even the province of Egypt was forcibly added to the dominions governed in the name of Gallienus by the Palmyrene prince.

Gallienus was murdered at Milan in 268, and_ the Restora-

remaining! sixteen years of this period were marked by the restoration of unity to the distracted empire. Palmyra

tion of unity by Aurelian,

was destroyed and Zenobia led a prisoner to Rome by 273.

5 Gibbon, i. chap. v.; Schiller, Gesch. d. Kaiserzeit, i. (2) 660. 8 Gibbon, i. chap. x.; Mommsen, v. 149 ; Schiller, i. (2) 827. ? Gibbon, i, chap. x.; Mommsen, v. 433 ; ¢f. PALMYRA,

Barbaric inva- sions.

The Goths.

The Sassani- de in Parthia.

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Aurelian in 273 ; in the next year the Gallic empire came to an end by the surrender of Tetricus, and the successors of Aurelian—Tacitus, Probus, and Carus (275-282)—were at least rulers over the whole extent of the empire.

While rival generals were contending for the imperial purple, the very existence of the empire which they aspired to rule was imperilled by foreign invasion. As early as 236 a new enemy, the Alemanni, had crossed the Rhine, but had been driven back by the valour of Maxi- nunus (238), and in the same year the Goths first appeared on the banks of the Danube. It was, however, during the period of internal dissension and civil war from the reign of Philip (244-249) to the accession of Claudius (268) that the barbarians saw and used their opportunity. From across the Rhine bands of Alemanni and Franks swept over Gaul and Spain, and even descended upon the coasts of Africa, until their raids were checked by the Gallic emperor Postumus (253-259). Far more destructive were the raids of the Goths. Towards the close of the reign of Philip (247) they crossed the Danube, and overran Mcesia, Thrace, and Macedonia. In 251 they defeated and slew the emperor Decius ; and, though his successor

Gallus purchased a temporary peace by lavish gifts, the province of Dacia was finally lost to Rome. The Gothic raids by sea which began under Valerian (253-260) were even more destructive. Their fleets issuing from the ports of the Black Sea ravaged the seaboard of Asia Minor, and returned laden with the spoils of the maritime towns. In the reign of Gallienus (260-268) a fleet of five hundred sail appeared off the coasts of Greece itself; Athens, Corinth, Argos, and Sparta were sacked, and Epirus laid waste. On the death of Gallienus (268) the Goths once more marched south- ward, but in the new emperor Claudius they were con- fronted at last by an able and resolute opponent. They were decisively defeated and driven back across the Danube (269). Claudius died of the plague in the next year, but by his successor Aurelian Roman authority was established in Mcesia and Pannonia, and the Danube frontier was put once more in a state of efficient defence. Five years later (276) Probus repulsed a raid of the Franks and Alemanni, and restored peace on the Rhine. But the rule of Rome now stopped short, as in the reign of Tiberius, at the line of the two great rivers; all that had been acquired beyond since the time of Vespasian was abandoned, and on the further banks of the Rhine and Danube stood, in the place of friendly or subject tribes, a threatening array of hostile peoples.

At the close of the 2d century the growing weakness of Parthia seemed to promise an immunity from danger on the Eastern frontier. But with the revolution which placed the Sassanid upon the throne the whole situation was changed." The new dynasty was in blood and religion Persian ; it claimed descent from Cyrus and Darius, and aspired to recover from Western hands the dominions which had once been theirs. In 230 Artaxares (Ardashir) had formally demanded from Severus Alexander the restitu- tion of the provinces of Asia, had invaded Mesopotamia, now a Roman province, and even advanced into Syria. Twenty years later his successor Sapor again crossed the Euphrates ; in 260, ten years after Decius's defeat by the Goths, the emperor Valerian was conquered and taken prisoner by the Persians, who poured triumphantly into Syria and captured Antioch. But here for the time their Successes ended. Three years later Odzenathus of Pal- myra drove them back, and held the East securely in the name of Rome. On the fall of Zenobia (273) they gained

possession for a time of Armenia and Mesopotamia, but eee ee eeoporamaia, bub

*Gibbon, i. chap. x. ; Mommsen, v. 216. * Gibbon, i. chap. viii.; Mommsen, v. 411 ; ¢f PERSIA.*

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were driven out by the emperor Carus (282), and the frontier line as fixed by Septimius Severus was restored.

Although any serious loss of territory had been avoided, the storms of the 3d century had told with fatal effect upon the general condition of the empire.. The "Roman peace" had vanished; not only the frortier territories, but the central districts of Greece, Asia Minor, and even Italy itself, had suffered from the ravages of war, and the fortification of Rome by Aurelian was a significant testimony to the altered condition of affairs. War, plague, and famine had thinned the population and crippled the resources of the provinces. On all sides land was running waste, cities and towns were decaying, and commerce was paralysed. Only with the greatest difficulty were suf- ficient funds squeezed from the exhausted tax-payers to meet the increasing cost of the defence of the frontiers, The old established culture and civilization of the Medi- terranean world rapidly declined, and the mixture of barbaric rudeness with Oriental pomp and luxury which marked the court, even of the better emperors, such as Aurelian, was typical of the general deterioration, which was accelerated by the growing practice of settling bar- barians on lands within the empire, and of admitting them freely to service in the Roman army.

State of the em- pire at the close of the 3d cen- tury.

Prrtop IL: 284-476 a.p.—(a) From the Accession of The re- Diocletian to the Death of Theodosius (284-395 a..).— forms of

The work begun by Aurelian and Probus, that of fortify- ing the empire alike against internal sedition and foreign invasion, was completed by Diocletian and Constantine the Great, whose system of government, novel as it appears at first sight, was in reality the natural and inevitable outcome of the history of the previous century.? Its object was twofold, to give increased stability to the imperial authority itself, and to organize an efficient administrative machinery throughout the empire. In the second year of his reign Diocletian associated Maximian with himself as colleague, and six years later (292) the hands of the two "Augusti" were further strengthened by the proclamation of Constantius and Glalerius as '"Caesares." Precedents for such an arrangement might have been quoted from the earlier history of the empire ;4 and the considerations in favour of it at the time were strong. It divided the overwhelming burdens and respon- sibilities of government, without sacrificing the unity of the empire ; for, although to each of the Augusti and Ceesars a separate sphere was assigned, the Czesars were subordinate to the higher authority of the Augusti, and over all his three colleagues Diocletian claimed to exercise a paramount control. It at least reduced the too familiar risk of a disputed succession by establishing in the two Ceesars the natural successors to the higher position of Augusti, and finally it satisfied the jealous pride of the rival armies of the empire by giving them what they had so constantly claimed, imperatores of their own. The dis- tribution of power between Diocletian and his colleagues followed those lines of division which the feuds of the previous century had only too clearly marked out. The armies of the Rhine, the Danube, and of Syria fell to the lot respectively of Constantius, Galerius, and Diocletian, the central districts of Italy and Africa to Maximian.5 A

3 See Gibbon, vol. iii, chap. xvii.; Marquardt, Staatsverw., i. pp. 81, 336, 337, ii. 217 sq.; Madvig, Verf. d. Rém.™ Reichs, i. 585; Bécking, Wotitia Dignitatum, Bonn, 1853; Hodgkin, Italy and her Invaders, i, 202 sq.; Preuss, Diocletian, Leipsic, 1869.

- *Mommsen, Staatsrecht, ii. 1065 sg. Verus was associated with Marcus Aurelius as Augustus ; Severus gave the title to his two sons. The bestowal of the title "Czsar" on the destined successor dates from Hadrian. Mommsen, op. cit., 1044.*

5 The division was as follows :—(1) Diocletian—Thrace, Egypt, Syria, Asia Minor ; (2) Maximian—lItaly and Africa; (3) Galerius— Ilyricum and the Danube; (4) Constantius—Britain, Gaul, Spain. See Gibbon, ii. 68 ; Aurelius Victor, c. 39.

Diocle- tian and Constan- tine,

Augusti and Caesares,

Altered charac- ter of the im- perial autho- rity.

Level- ling policy of Diocle- tian.

Degrada- tion of

The new adminis- trative system.

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second point in the new system was the complete and final emancipation of the imperial authority from all constitu- tional limitation and control. The last lingering traces of its republican origin disappear. The emperors from Diocletian onwards are autocrats in theory as well as in practice. The divided powers, the parallel jurisdictions, the defined prerogatives of the Augustan system have all vanished. There is but one legal authority throughout the empire, that of the emperor himself ; and that authority is absolute. This avowed despotism Diocletian, following in the steps of Aurelian, hedged round with all the pomp and majesty of Oriental monarchy. The final adoption of the title "dominus," so often rejected by earlier emperors, the diadem on the head, the robes of silk and gold, the replacement of the republican salutation of a fellow citizen by the adoring prostration even of the highest in rank before their lord and master, were all significant marks of the new regime.!_ In the hands of this absolute ruler was placed the entire control of an elaborate admin- istrative machinery. Most of the old local and national distinctions, privileges, and liberties which had once flourished within the empire had already disappeared under the levelling influence of imperial rule, and the level- ling process was now completed. Roman citizenship had, since the edict of

Caracalla, ceased to be the privilege of a minority. Diocletian finally reduced Italy and Rome to the level of the provinces: the provincial land-tax and pro- vincial government were introduced into Italy,? while Rome ceased to be even in name the seat of imperial authority.® Throughout the whole area of the empire a uniform system of administration was established, the control of which was centred in the imperial palace, and in the confidential ministers who stood nearest tlle emperor's person. Be-tween the civil and military departments the separation was complete. At the head of the former, at least under the completed organization of Constantine, were the four pre- fects,' next below them the " vicarii," who had charge of the "dioceses," below these again the governors of the sepa- rate provinces (" praesides," " correctores," " consulares"),° under each of whom was a host of minor officials. Parallel with this civil hierarchy of prefects, vicars, pre- sides, and smaller "officiales" was the series of military officers, from the "magistri militum," the "duces," and '"comites" downwards. But the leading features of both are the same. In both there is the utmost possible sub- ordination and division of authority. The subdivision of provinces, begun by the emperors of the 2d century, was systematically carried out by Diocletian, and either by Diocletian or by Constantine the legion was reduced to one-fifth of its former strength.' Each official, civil or military, was placed directly under the orders of a superior, and thus a continuous chain of authority connected the emperor with the meanest official in his service. Finally, the various grades in these two imperial services were care-

1 Aurel. Victor, 39; Eutrop., ix. 26.

? Marquardt, Staatsverw., i. 80-88, where a list is given of the seventeen so-called " provinciae " into which Italy, together with Sicily, Sardinia, and Corsica, was divided. Each had its own governor ; the governors were subject to the two vicarii (vic. urbis, vic. Italie), and they in turn to the prefect of Italy, whose prefecture, however, included as well Africa and Western I}yricuni.

3 The seats of government for Diocletian and his three colleagues were Milan, Treves, Sirmium, Nicomedia.

4 For these last, see Gibbon, ii. chap. xvii. Pp. 825 3 cf also Notitia Dignitatum and Bocking's notes.

_> "Praefecti praetorio." The four prefectures were Oriens, Ily- ricum, Italia, Gallia, to which must be added the prefectures of Rome and Constantinople.

6 There were 12 dioceses and 116 provinces ; cf. in addition to the authorities mentioned above, Bethmann-Hollweg, Civil-Prozess, iti. ; Walter, Gesch. d. Rém. Rechts, i. pp. 428 sq. (Bonn, 1845).

7 For this and other changes in the military organization, see Madvig, ii. 572; Marquardt, ii. 584 sq.

fully marked by the appropriation to each of distinctive titles, the highest being that of "illustris," which was confined to the prefects and to the military magistri and comites, and to the chief ministers.®

There can be little doubt that on the whole these reforms prolonged the existence of the empire, by creating a machinery which enabled the stronger emperors to utilize effectively all its available resources, and which even to some extent made good the deficiencies of weaker rulers. But in many points they failed to attain their object. Diocletian's division of tle imperial authority among colleagues, subject to the general control of the senior Augustus, was effectually discredited by the twenty years of almost constant conflict which followed his own abdication (305-323). Constantine's partition of the empire among his three sons was not more successful in ensuring tranquillity, and in the final division of the East and West between Valens and Valentinian (364) the essential principle of Diocletian's scheme, the mainten- ance of a single central authority, was abandoned. The "tyrants," the curse of the 3d century, were far from unknown in the 4th, and their comparative paucity was due rather to the hold which the house of Constantine obtained upon the allegiance of their subjects than to the system of Diocletian. This system, moreover,

while it failed altogether to remove some of the existing evils, aggravated others. The already overburdened financial resources of the empire were strained still further by the increased expenditure necessitated by the substitution of four imperial courts for one, and by the multiplication in every direction of paid officials. The gigantic bureaucracy of the 4th century proved, in spite of its undoubted services, an intolerable weight upon the energies of the empire.®

Diocletian and Maximian formally abdicated their high Constan- | Eighteen years later Constantine, the sole tine the

office in 305. survivor of six rival emperors, united the whole empire under his own rule. His reign of fourteen years was marked by two events of first-rate importance,—the recog-

Effects of these

reforms.

reat,

Recog-

nition of Christianity as the religion of the empire,! and nition of

the building of the new capital at Byzantium. The alliance which Constantine inaugurated between the Christian church and the imperial government, while it enlisted on the side of the state one of the most powerful of the new forces with which it had to reckon, imposed a check, which was in time to become a powerful one, on the imperial authority. The establishment of the new "City of Constantine" as a second Rome, with a second senate,

Chris- tianity.

Constan-

a prefect of the city, regiones, and even largesses, did tinople

more than proclaim once again the deposition of Rome from her old imperial position. It paved the way for the final separation of East and West by providing the former for the first time with a suitable seat of government on the Bosphorus. The death of Constantine in 337 was followed, as the abdication of Diocletian had been, by the outbreak of quarrels among rival Cesars. Of the three sons of Constantine who in 337 divided the empire between them, Constantine the eldest fell in civil war against his brother Constans ; Constans himself was, ten years afterwards, defeated and slain by Magnentius; and the latter in his turn was in 353 vanquished by Constantine's only surviving son Constantius. Thus for the second time the whole empire was united under the rule of a member of the house of Constantine. But in 355 Con-

8 The grades were as follows : illustres, spectabiles, clarissimi, per-fectissimi,' egregii. For the other insignia, see Madvig, ii. 590, and the Notitia Dignitatum.

®° The passion for moulding everything after a uniform official pattern extended beyond the departments of civil and military administration to the professions and to society. Walter, op. cit., i. 456; Marquardt, ii. 230 sq.

10 Gibbon, ii. chaps. xv. xvi.; Ranke, Weltgesch., iii. 525.

Constan- tius II.,

351-363.

Julian,

361-368.

Jovian,

363-364.

Valen- tinian I.,

864-375.

Division of the empire,

3864,

Valens,

364-378,

Revolt of the Goths,

Theo- dosius I.,

378-395.

FOURTH CENTURY. |

stantius reluctantly granted 'the title of Cwsar to his cousin Julian and placed him in charge of Gaul, where

the momentary elevation of a tyrant, Silvanus, and still.

more the inroads of Franks and Alemanni, had excited alarm. But Julian's successes during the next five years were such as to arouse the jealous fears of Constantius. In order to weaken his suspected rival the legions under Julian in Gaul were suddenly ordered to march eastward against the Persians (360). They refused, and when the order was repeated replied by proclaiming Julian himself emperor and Augustus. Julian, with probably sincere reluctance, accepted the position, but the death of Constantius in 361 saved the empire from the threatened civil war. The chief importance of the career of Julian, both as Cesar in Gaul from 355 to 361 and during his brief tenure of sole power (361-363), lies, so far as the general history of the empire is concerned, in his able defence of the Rhine frontier and in his Persian campaign ; for his attempted restoration of pagan and in especial of Hellenic worships had no more permanent effect than the war which he courageously waged against the multi- tudinons abuses which had grown up in the luxurious court of Constantius.1_ But his vigorous administration in Gaul undoubtedly checked the barbarian advance across the Rhine, and

postponed the loss of the Western provinces, while, on the contrary, his campaign in Persia, _bril- liantly successful at first, resulted in his own death, and in the immediate surrender by his successor Jovian of the territories beyond the Tigris won by Diocletian seventy years before. Julian died on June 26, 363, his suc- cessor Jovian on February 17, 364; and on the 26th of February Valentinian was acknowledged as emperor by the army at Nica. In obedience to the expressed wish of the soldiers that he should associate a colleague with himself, he conferred the title of Augustus upon his brother Valens, and the long-impending division of the empire was at last effected,—Valentinian became emperor of the West, Valens of the East. From 364 till his death in 375 the vigour and ability of Valentinian kept his own frontier of the Rhine tolerably intact, and prevented any serious disasters on the Danube. But his death, which deprived the weaker Valens of a trusted counsellor and ally, was followed by a crisis on the Danube, more serious than any which had occurred there since the defeat of Decius. In 376 the Goths, hard pressed by their new foes from the eastward, the Huns, sought and obtained the protection of the Roman empire. They were transported across the Danube and settled in Meesia, but, indignant at the treatment they received, they rose in arms against their protectors. In 378 at Hadrian- ople Valens was defeated and killed ; the victorious Goths spread with fire and sword over Illyricum, and advanced eastward to the very walls of Constantinople. Once more, however, the danger passed away. The skill and tact of Theodosius, who had been proclaimed emperor of the East by Gratian, conciliated the Goths; they were granted an allowance, and in large numbers entered the service of the Roman emperor. The remaining years of Theodosius's reign (382-395) were mainly engrossed by the duty which now devolved upon the emperor of the East of upholding the increasingly feeble authority of his colleague in the West against the attacks of pretenders. Maximus, the murderer of Gratian (383), was at first recognized by Theodosius as Czxsar, and left in undisturbed conmand of Gaul, Spain, and Britain; but, when in 386 he proceeded to oust Valentinian II. from Italy and Africa, Theodosius marched westward, crushed him, and installed Valentinian ee ee ee

1 In especial against the overweening influence of the eunuchs, an influence at once greater and more pernicious than even that of the

imperial freedmen in the days of Claudius.

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as emperor of the West. In the very next year, however, the murder of Valentinian (392) by Arbogast, a Frank, was followed by the appearance of a fresh tyrant in the person of Eugenius, a domestic officer and nominee of Arbo- gast himself, Once more Theodosius marched westward, and near Aquileia decisively defeated his Opponents. But his victory was quickly followed by his own illness and

Division of the empire

between Arcadius

death (395), and the fortunes of East and West passed and

into the care of his two sons Arcadius and Honorius.

Honorius.

(0) From the Death of Theodosius to the Extinction of Fall of the the Western Hmpire (395-476).—Through more than a Western

century from the accession of Diocletian the Roman empire had succeeded in holding at bay the swarming hordes of barbarians. But, though no province had yet been lost, as Dacia had been lost in the century before, and though the frontier lines of the Rhine and the Danube were still guarded by Roman forts and troops, there were signs in plenty that a catastrophe was at hand.

From all the writers who deal with the 4th century comes the same tale of declining strength and energy. From Lactantius to Zosimus we have one long series of laments over the depression and misery of the provinces. To meet the increased expenditure necessary to maintain the legions, to pay the hosts of officials, and to keep up the luxurious splendour of the imperial courts, not only were the taxes raised in amount, but the most

oppressive and inquisitorial methods were adopted in order to secure for the imperial treasury every penny that could be wrung from the wretched taxpayer. The results are seen in such pictures as that which the panegyrist Eumenius 2 draws of the state of Gaul (306-312) under Constan- tine, in the accounts of the same province under Julian fifty years later, in those given by Zosimus early in the 5th century, and in the stringent regulations of the Theodosian code, dealing with the assessment and collec- tion of the taxes. Among the graver symptoms of economic ruin were the decrease of population, which seriously diminished not only the number of taxpayers, but the supply of soldiers for the legions ; the spread of infanticide ; the increase of waste lands whose owners and cultivators had fled to escape the tax collector; the declining prosperity of the towns; and the constantly recurring riots and insurrections, both among starving peasants, as in Gaul,* and in populous cities like Antioch.® The distress was aggravated by the civil wars, by the rapacity of tyrants, such as Maxentius and Maximus, but above all by the raids of the barbarians, who seized every opportunity afforded by the dissensions or incapacity of the emperors to cross the frontiers and harry the lands of the provincials. Constantine (306-312), Julian (356-360), and Valentinian I. (364-375) had each to give a temporary breathing space to Gaul by repelling the Franks and Alemanni. Britain was harassed by Picts and Scots from the north (367-370), while the Saxon pirates swept the Northern seas and the coasts both of Britain and Gaul. On the Danube the Quadi, Sarmatz, and above all the Goths, poured at intervals into the provinces of Pannonia and Meesia, and penetrated to Macedon and Thrace. In the East, in addition to the constant border feud with Persia, we hear of ravages by the Isaurian mountaineers, and by a new enemy, the Saracens.®*

Even more ominous of coming danger was the extent

2 Eumenius, Paneg. Vet., vii. For Julian's administration in Gaul see Ammianus, xv.~~xvii.; Julian's own oration to the Athenian senate and people, Juliani Opera (ed. Hertlein, Leipsic, 1875) pp. 346 sq.; Zosimus, ii. 38. Cf Gibbon, ii. 8338, 412; Jung, Roman. Lund~~ schaften, 264, 265 ; Hodgkin, i. 600 sq.

3 Gibbon, ii. 328.

4“ For the Bagaude, see Gibbon, ii. 69, and Jung, op. cit., 264, where the authorities are given.

5 In 387 ; Hodgkin, i. 178. § Amm. Marcel., xiv. 4,

empire.

Distress of the provinces

in the 4th

century.

Rar- barians within the empire.

Barbaric invasions,

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to which the European half of the empire was becoming barbarized. The policy which had been inaugurated by Augustus himself of settling barbarians within the frontiers had been taken up on a larger scale and in a more systematic way by the Illyrian emperors of the 3d century, and was continued by their successors in the 4th. In Gaul, in the provinces south of the Danube, even in Macedon and Italy, large barbarian settlements had been made—Theodosius in particular distinguishing himself by his liberality in this respect. Nor did the barbarians admitted during the 4th century merely swell the class of half-servile coloni. On the contrary, they not only constituted to an increasing extent the strength of the imperial forces, but won their way in ever-growing numbers to posts of dignity and importance in the imperial service. Under Constantine the palace was crowded with Franks.! Julian led Gothic troops against Persia, and the army with which Theodosius defeated the tyrant Maximus (388) contained large numbers of Huns and Alans, as well as of Goths. The names of Arbogast, Stilicho, and Rufinus are sufficient proof of the place held by barbarians near the emperor’s person and in the control of the

provinces and legions of Rome; and the relations of Arbogast to his nominee for the purple, Eugenius, were an anticipation of those which existed between Ricimer and the emperors of the latter half of the 5th century.

It was by barbarians already settled within the empire that the first of the series of attacks which finally separated the Western provinces from the empire and set up a barbaric ruler in Italy were made," and it was in men of barbarian birth that Rome found her ablest and most successful defenders, and the emperors both of East and West their most capable and powerful ministers. The

Alaric and Visigoths whom Alaric led into Italy had been settled

the Visi- goths,

Alaric in Italy.

south of the Danube as the allies of the empire since the accession of Theodosius. The greater part of them were Christians at least in name, and Alaric himself had stood high in the favour of Theodosius. The causes which set them in motion are tolerably clear. Like the Germans of the days of Cesar, they wanted land for their own, and to this land-hunger was evidently added in Alaric's own case the ambition of raising himself to the heights which had been reached before him by the Vandal Stilicho at Ravenna and the Goth Rufinus at Constantinople. The jealousy which existed between the rulers of the Western and Eastern empires furthered his plans. In the name of Arcadius, the emperor of the East, or at least with the connivance of Arcadius's minister Rufinus, he occupied the province of Illyricum, and .from thence ravaged Greece, which according to the existing division of pro- vinees belonged to the Western empire. Thence in 396 he retreated before Stilicho to [lyricum, with the command of which he was now formally invested by Arcadius, and which gave him the best possible starting point for an attack on Italy? In 400 he led his people, with their wives and families, their waggons and treasure, to seek lands for themselves south of the Alps. But in this first invasion he penetrated no farther than the plains of Lombardy, and after the desperate battle of Pollentia

1 Anim,, xv. 5.

? Accounts of the leading ancient authorities for the period 395- 476 will be found prefixed to the several chapters in Hodgkin's Ttaly and her Invaders, vols. i. ii. (Oxford, 1880), especially vol. i. pp. 234, 277. Among standard modern authorities are Gibbon, vol. iv.; Tillemont, Histoire des Emperewrs, vol. v.; Milman, Latin Chris- tvanity, vol. i.; Thierry, Trois Ministres des fils de Theodose (Paris, 1865), and Histoire d' Attila ; Ranke, Weltgeschichte, vol. iv.,—compare especially his criticisms (iv. (2) 249 sg.) on Eusebius, Zosimus, Pro- copius, Jordanes, and Gregory of Tours. For the barbarian migrations see Wietersheim, Gesch. d. V dlkerwanderung.

3 Hodgkin, op. cit., i. 275.

(402) 4 he slowly withdrew from Italy, his retreat being hastened by the promises of gold freely made to him by the imperial government. Not until the autumn of 408 did Alaric again cross the Alps. Stilicho was dead; the barbarian troops in Honorius's service had been provoked into joining Alaric by the insane anti-Teutonic policy of Honorius and his ministers, and Alaric marched unopposed to Rome. This time, however, the payment of a heavy ransom saved the city. Several months of negotiation followed between Alaric and the court of Ravenna. Alaric's demands were moderate, but Honorius would grant neither lands for his people nor the honourable post in the imperial service which he asked for himself. Once more Alaric sat down before Rome, and this time the panic-stricken citizens discovered a fresh mode of escape. Attalus, a Greek, the prefect of the city, was declared Augustus, and Alaric accepted the post of commander-in- chief. But the incapacity of Attalus was too much for the patience of his barbarian minister and patron, and after a few months' reign Alaric formally deposed him and renewed his offers to Honorius. Again, however, they were declined, and Alaric marched to the siege and sack of Rome (410). His death followed hard on his capture of Rome.

Two years later (412) his suc- The Visi- |

cessor Ataulf led the Visigoths to find in Gaul the lands goths in

which Alaric had sought in Italy. the anarchical condition of the West that Ataulf and his Goths should have fought for Honorius in Gaul against the tyrants,° and in Spain against the Vandals, Suevi, and Alani; and it was with the consent of Honorius that in 419 Wallia, who had followed Ataulf as king of the Visigoths, finally settled with his people in south-western Gaul and founded the Visigothic monarchy."

It was about the same period that the accomplished Vandals, |

It is characteristic of 424)

fact of the division of Spain between the three barbarian Suevi, and |

tribes of Vandals, Suevi, and Alani was in a similar manner recognized and approved by the paramount authority of the emperor of the West. These peoples had crossed the Rhine at the time when Alaric was making his first attempt on Italy. A portion of the host led by Radagaisus ® actually invaded Italy, but were cut to pieces by Stilicho near Florence (405); the rest pressed on through Gaul, crossed the Pyrenees, and entered the as yet untouched province of Spain.

Honorius died in 423.

lani in

ain,

His authority had survived the Death of

dangers to which it had been exposed alike from the Honorius,

rivalry of tyrants and barbaric invasion, and with the single exception of Britain?° no province had yet formally broken loose from the empire. But over a great part of the West this authority was now little more than nonuinal ; throughout the major part of Gaul and in Spain the

barbarians had settled, and barbarian states were growing up which still recognized the paramount supremacy of the emperor, but were in all essentials independent of his control. The question for the future was whether this relationship between the declining imperial authority and the vigorous young states which had planted the seeds of a fresh life in the provinces would be maintained.

423.

The long reign of Valentinian IIL. (423-455) is marked Valen-

- *According to others, 403; Hodgkin, i. 310.*

5 For the treatment of Rome by Alaric, see Hodgkin, i. 370, with Gibbon, iv. 101, and Ranke, Wedltgesch., iv. 246. Allowance must be made for the exaggerations of the ecclesiastical writers.

6 For these "tyrants" see an article by Prof. Freeman in the first number of the new English Historical Review (Jan. 1886), pp. 538-86.

? The capital of the new state was Tolosa (Toulouse).

8 Jung, Die Romanische Landschaften, 73 sq.

® For the connexion between his movement and those of Alaric and of the Vandals, see Hodgkin, i. 282, 804; Gibbon, iv. 46.

10 The Roman troops were withdrawn from Britain by Constantine in 409; Jung, 305.

tinian IIL. .

423-455.

y ROME 781

imperial part outside Italy.5 Ricimer died in 47 2, and two years later a Pannonian, Orestes, aspired to fill the place which Ricimer had occupied. Julius Nepos was deposed, x and Orestes filled the vacancy by

*proclaiming as Augustus his own son Romulus. But Orestes's tenure of power was Orestes brief. The barbarian mercenaries in Italy determined to the Pan- secure for themselves a position there such as that which 2°78". their kinsfolk had won in Gaul and Spain and Africa. Their demand for a third of the lands of Italy was refused by Orestes,® and they instantly rose in revolt. On the defeat and death of Orestes they proclaimed their leader, Odoacer the Rugian,' king of Italy. Romulus Augustulus Romulus laid down his imperial dignity, and the court at Con- ee stantinople was informed that there was no longer an * emperor of the West.8*

The installation of a barbarian king in Italy was the King natural climax of the changes which had been taking place Odoacer. in the West throughout the 5th century. In Spain, Gaul, and Africa barbarian chieftains were already established as kings. In Italy, for the last twenty years, the real power had been wielded by a barbarian officer. Odoacer, when he decided to dispense with the nominal authority of an emperor of the West, placed Italy on the same level of independence with the neighbouring provinces. But the old ties with Rome were not severed. The new king of Italy formally recognized the supremacy of the one Roman emperor at Constantinople, and was invested in

by two events of first-rate importance,—the conquest of Africa by the Vandals! and the invasion of Gaul and Vandal Italy by Attila. The Vandal settlement in Africa was conquest closely akin in its origin and results to those of the of Afric. Visiooths and of the Vandals themselves in Gaul and Spain. Here as there the occasion was given by the jealous quarrels of powerful imperial ministers. The feud between Boniface, count of Africa, and Aetius, the "master- general" or "count of Italy," opened the way to Africa for the Vandal king Gaiseric (Genseric), as that between Stilicho and Rufinus had before set Alaric in motion westward, and as the quarrel between the tyrant Con- stantine and the ministers of Honorius had paved the way for the Vandals, Sueves, and Alans into Spain. In this case too, as in the others, the hunger for more land and treasure was the impelling motive with the barbarian invader, and in Africa, as in Gaul and Spain,

the invaders' acquisitions were confirmed by the imperial authority which they still professed to recognize. It was in 429 that Gai- seric, king of the Vandals, crossed with his warriors, their families and goods, to the province of Africa, a province hitherto almost as untouched as Spain by the ravages of war. Thanks to the quarrels of Boniface and Aetius their task was an easy one. The defenceless province was easily and quickly overrun. In 4352 a formal treaty secured them in the possession of a large portion of the rich lands which were the granary of Rome, in

exchange for a payment probably of corn and oil. Car-| return with the rank of "patrician," which had been held thage was taken in 439, and by 440 the Vandal kingdom | before him by Aetius and Ricimer. In Italy too, as in was firmly established. Spain and Gaul, the laws, the administrative system, and

Attila Eleven years later (451) Attila invaded Gaul, but this | the language remained Roman.? But the emancipation of

a Hunnish movement was in a variety of ways different Italy and the Western provinces from direct imperial con-

~ from those of the Visigoths and Vandals. Nearly a trol, which is signalized by Odoacer's accession, has rightly

century had passed since the Huns first appeared in| been regarded as marking the opening of a new epoch. Europe, and drove the Goths to seek shelter within the | It made possible in the West the development of a Roman lines. Attila was now the ruler of a great empire | Romano-German civilization ; it facilitated the growth of in central and northern Europe,' and, in addition to his | new and distinct states and nationalities; it gave a new own Huns, the German tribes along the Rhine and Danube impulse to the influence of the Christian church, and laid and far away to the north owned him as king. He con- | the foundations of the power of the bishops of Rome. fronted the Roman power as an equal; and, in marked Chronological Table of the Roman Emperors. contrast to the Gothic and Vandal chieftains, he treated | ne. A.D. A.D. with the emperors of East and West as an independent = aie 193, { Didi Faanns 268. Claudius sovereign. His advance on Gaul and Italy threatened, not ees

on, ‘SeptiminsSeverat, 270, Aurelian, the establishment of yet one more barbaric chieftain on| jj; Suge 217, Mecrmie 276. Probus. Roman soil, but the subjugation of the civilized and| 5 Ao ce (Guecreate. We cous aes ea tee Christian West to the rule of a heathen and semi-barbarous | 68, 69. {othe a” Valo 283, | merian, conqueror. But Rome now reaped the advantages of the} Veet “a The two Gordiant, | 284, { Pihian soca policy which Honorius had perhaps involuntarily followed. i a. 238, acs and Bal- cents, 280). The Visigoths in Gaul, Christian and already half} 96° Nerva. Gordian III. 305. { Galerius, Au- Romanized, rallied to the aid of the empire against a i foe fe Beet a ae

Battle of common foe. Attila, defeated at Chalons 4 by Aetius, 138. Antoninus Pius, cs and Mmil- | 353. me I.

Chalons. withdrew into Pannonia (200). Ti) thes west gear he| gon fee | ae Valerian, co overran Lombardy, but penetrated no farther south, Division of the Empire. and in 453 he died. With the murder of Valentinian —— ih he wae III. (453) the western branch of the house of Theodosius | fs: Gaentmian Lc sutan (Se et sas 1 came to an end, and the next twenty years witnessed | 283. Valentinian 11. — the accession and deposition of nine emperors. The three | — 395: Honorius. pe ee

Sack of months’ rule of Maximus is memorable onlyfox theanvasion | 75, j‘entinian IIL i Ea

an of italy and the sack of Rome by the Vandals under ses. a eae

Vandals, Caiseric. From 456-472 the actual ruler of Italy was | 461. Severus.

Ricimer ‘icimer, the Sueve. Of the four emperors whom he placed ae atau

supreme On the throne, Majorian (457-461) alone played any | 478. Glycerius.

ue 474, Julius Nepos.

im Italy. 475. Romulus Augustulus. (03G. 195 129)

- *Hodgkin, ii, 283-290; Gibbon, iv. 176-188, 256; Jung, 183.*

The leading ancient authority is Procopius. See Ranke, iv. (2) 285; > Majorian was the last Roman emperor who appeared in person in

Papencordt, Gesch. d. Vandal. Herrschaft in Africa.

2 Prosper, 659; Ranke, iv. (1) 282.

- *The principal ancient authorities are Priscus (Miller, Fragm. Hist. Gr., iv. 69); Jordanes (ed. Mommsen, 1882); Sidonius Apollinaris (ed. Barret, Paris, 1878).*

'For the decisive battle of Chalons, see Gibbon, iv. 234 sq.; Hodgkin, ii. 138, note A, 161, where the topography is discussed.

Spain and Gaul. 8 Hodgkin, i. 531.

7 The nationality of Odoacer is a disputed point. Hodgkin, i. 528 ; Ranke, iv. (1) 372.

8 Gibbon, iv. 298. The authority for the embassy to Zeno is Malchus (Miiller, Fragm. Hist. Gr., iv. 119).

® Gibbon, iv. 302; Jung, 66 sg.; Bryce, 24-33. See also RomAN Law.

Holy Roman Empire,

The Goths.

782

Srcrion I1.—History or THE RomMAN REPUBLIC IN THE MippLe AGES.

The history of the Roman republic during the Middle Ages has yet to be written, and only by the discovery of new documents can the difficulties of the task be com- pletely overcome. Although very different in its origin, the Roman republic gradually assumed the same form as the other Italian

communes, and with almost identical institu- tions. But, owing to the special local conditions amid which it arose, it maintained a distinct physiognomy and character. The deserted Campagna surrounding the city checked any notable increase of trade or industry, and prevented the establishment of the guilds on the solid footing that elsewhere made them the basis and support of the commune. There was also the continual and oppressive influence of the empire, and, above all, the presence of the papacy, which often appeared to absorb the entire vitality of the city. At such moments the commune seemed annihilated, but it speedily revived and reasserted itself. Consequently there are many apparent gaps in its history, and we have often extreme difficulty in discovering the invisible links connecting the visible fragments.

Even the aristocracy of Rome had a special stamp. In the other republics, excepting Venice, it was feudal, of German origin, and in perpetual conflict with the popular and commercial elements which sought its destruction. The history of municipal freedom lay in this struggle. But the infiltration of Teutonic and feudal elements broke up the ancient aristocracy of Rome, and left it at the mercy of the people. Then the popes, by the bestowal of lucrative posts, rich benefices, and vast estates, and, above all, by raising many nobles to the purple, introduced new blood into the Roman aristocracy, and endued it with increasing strength and vitality. Always divided, always turbulent, this irrepressible body was a continual source of discord and civil war, of permanent confusion and turmoil. Amidst all these difficulties the commune struggled on, but never succeeded in long preserving a regular course or administration. What with continual warfare, attacks on the Capitol, and consequent slaughter, pillage, and in- cendiarism, it is no wonder that so few original documents are left to illustrate the history of the Roman republic. Nor have chroniclers and historians done much to supply this want, since, in treating of Roman affairs, their' atten- tion is mainly devoted to the pope and the emperor. Nevertheless we will attempt to connect in due order all the facts gleaned from former writers and published records.

The removal of the seat of the empire to Constantinople effected a radical change in the political situation of Rome ; nor was this change neutralized by the formation of the weak Western empire soon to be

shattered by the Germanic invasions. But we still find Roman laws and institutions ; and no sign is yet manifest of the rise of a medizval municipality. The earliest germ of one is seen during the barbarian invasions. Of these we need only enumerate the four most important,— those of the Goths, Byzantines, Lombards, and Franks. The Gothic rule merely superposed upon the Roman social order a Teutonic stratum, that never penetrated beneath its surface. The Goths always remained a conquering army ; according to the German custom, they took possession of one third of the vanquished territory, but, while forbidding the Romans to bear arms, left their local administration intact. The senate, the curiae, the principal magistrates, both provin- cial and municipal, the prefect of the city, and the Roman Judges enforcing the enactments of the Roman law were all preserved. Already, under the empire, the civil power had been separated from the military, and this separation

was maintained. Hence there was no visible change in the constitution of the state. Only, now there were con- quered and conquerors. All real and effective power was on the side of brute force, and the Goths alone bore arms. In every province they had their comztes, or heads of the army, who had judicial power over their countrymen, especially in criminal cases. Here then was a combina- tion of civil and military jurisdiction altogether contrary to the Roman idea. Nor can it be denied that the comites, as chiefs of the armed force, necessarily exerted a direct or indirect influence on the civil and administrative power of the provinces, and especially upon the collection of the imposts. The civil arm, being virtually subordinate to the military, suffered unavoidable change. Notwithstanding the praise lavished on Theodoric, the kingdom founded by him in Italy had no solid basis. It was composed of two nations differing in race and traditions and even in religion, since the Goths were Arians and the Romans Catholics. The latter were sunk in degeneracy and cor- ruption ; their institutions were old and decrepit. It was necessary to infuse new life into the worn-out body. This was difficult, perhaps impossible; and at any rate Theodoric never attempted the task.

Little wonder then if the Gothic kingdom succumbed to the Byzantine hordes from Constantinople. |

The wars of Belisarius and Narses against the Goths

lasted twenty years (535-555 a.p.), caused terrible slaughter

and devastation in Italy, and finally subjected her to Constantinople. In place of a Gothic king she was now ruled by a Greek patrician, afterwards entitled the exarch, who had his seat of government at Ravenna as lieutenant of the empire. In the chief provincial cities the ruling counts were replaced by dukes, subordinate to the exarch; and the smaller towns were governed by military tribunes. Instead of dukes, we sometimes find magistri malitum, apparently of higher rank. The praefectus praetorio of Italy, likewise a dependant of the exarch, was at the head of the civil administration. The pragmatic sanction (554), promulgating the Justinian code, again separated the civil from the military power, which was no longer allowed to intervene in the settlement of private disputes, and, by conferring on the bishops the superintendence of and authority over the provincial and municipal government, soon led to the increase of the power of the church, which had already considerable influence.

The new organization outwardly resembled that of the Goths: one army had been replaced by another, the counts by dukes; there was an exarch instead of a king; the civil and military jurisdictions were more exactly defined. But the army was not, like that of the Goths, a conquer- ing nation in arms; it was a Greeco-Roman army, and did not hold a third of the territory which was now probably added to the possessions of the state. The soldiery took its pay from Constantinople, whence all instructions and appointments of superior officers likewise proceeded. In Rome we find a magister militum at the head of the troops. The Roman senate still existed, but was re- duced to a shadow. Theodoric had left it intact until he suspected it of hostile designs and dealings with the Byzantines, but then began to persecute it, as was proved by the wretched fate of Boetius and Symmachus. Never- theless the senate survived, added the functions of a cura or municipal council to those of a governmental assembly, and took part in the election of the pope—already one of the chief affairs of Rome. So many senators, however, were slaughtered during the Byzantine

war that it was com- monly believed to be extinct. The pragmatic sanction, conferring on senate and pope the superintendence of weights and measures in Italy, is a convincing proof to the contrary, although, in the general chaos, now that

The By- zantine rule.

The Lom- bards.

popes.

Gregory

1,

The Roman com- Mune,

MEDIAVAL REPUBLIC. |

Rome was a mere provincial city, constantly exposed to attack, we may imagine to what the senate was reduced.

All Roman institutions were altered and decayed ; but their original features were still to be traced, and no heterogeneous element had been introduced into them. The first dawn of a completely new epoch can only be dated from the invasion of the Lombards (568-572), Their conquest of a large portion of Italy was accompanied by the harshest oppression. They abolished all ancient laws and institutions, and not only seized a third of the lands, but reduced the inhabitants to almost utter slavery. But, in the unsubdued parts of the country—namely, in Ravenna, Rome, and the maritime cities—a very dif- ferent state of things prevailed. The necessity for self- defence and the distance of the empire, now too worn out to render any assistance, compelled the inhabitants to depend solely on their own strength. Thus, certain maritime cities, such as Naples, Amalfi, Pisa, and Venice, soon attained toa greater or less degree of liberty and inde- pendence.

A special state of things now arose in Rome. We behold the rapid growth of the papal power and the con- tinual increase of its moral and political influence. This had already begun under Leo I, and been further pro- moted by the pragmatic sanction. Not only the super- intendence but often the nomination of public function- aries and judges was now in the hands of the popes. And the accession to St Peter's chair of a man of real genius in the person of Gregory I., surnamed the Great, marked the commencement of a new era. By force of individual character, as well as by historic necessity, this pope became the most potent personage in Rome. Power fell naturally into his hands ; he was the true representative of the city, the born defender of church and state. His ecclesiastical authority, already great throughout Italy, was specially great in the Roman diocese and in southern Italy. The continual offerings of the faithful had previously endowed the church with enormous possessions in the province of Rome, in Sicily, Sardinia, and other parts. The admini- stration of all this property soon assumed the shape of a small government council in Rome. This protected and succoured the oppressed, settled disputes, nominated judges, and controlled the ecclesiastical authorities. The use made by the pope of his revenues greatly contributed to the increase of his moral and political authority. When the city was besieged by the Lombards, and the emperor left his army unpaid, Gregory supplied the required funds and thus made resistance possible. And, when the defence could be no longer maintained, he alone, by the weight of his personal influence and the payment of large sums, induced the Lombards to raise the siege. He negotiated in person with Agilulph, and was recognized by him as the true representative of the city. Thus Rome, after being five times taken and sacked by the barbarians, was, on this occasion, saved by its bishop. The exarch, although unable to give any help, protested against the assumption of so much authority by the pope ; but Gregory was no usurper, and his attitude was the natural result of events. " For twenty- seven years "—so wrote this pontiff to the imperial government of Constan- tinople—" we lived in terror of the Longobards, nor can J say what sums we had to pay them. There is an imperial treasurer with the army at Ravenna; but here it is I who am treasurer. Likewise I have to provide for the clergy, the poor, and the people, and even to succour the distress of other churches."

It was at this moment that the new Roman commune began to take shape and acquire increasing vigour owing to its distance from the seat of the empire and its resistance to the Lombard besiegers. Its special character was

now to be traced in the preponderance of the military over the civil power. A Roman element had penetrated into the army, which was already possessed of considerable political importance. The prefect of Rome loses authority and seems almost a nullity compared with the magister militum. Hardly anything is heard of the senate. "Quia enim Senatus deest, populus interiit," exclaims Gregory ina moment of despair. The popes now make common cause with the people against the Lombards on the one hand and the emperor on the other. But they avoid an absolute rupture with the empire, lest they should have to face the Lombard power without any prospect of help. Later, when the growing strength of the commune becomes menacing, they remain faithful to the empire in order not to be at the mercy of the people. It was a permanent feature of their policy never to allow the complete inde- pendence of the city until they should be its sole and absolute masters. But that time was still in the future. Meanwhile pope and people joined in the defence of their common interests.

This alliance was cemented by the religious disputes of the East and the West. First came the Monothelite con- troversy regarding the twofold nature of Christ. In order to compel obedience to his edict, the emperor commanded the exarch to take energetic measures, and, provided he could secure the favour of the Roman army, to actually seize the person of Pope Martin I. (649-654). A long and violent struggle ensued, in which the people of Rome and of other Italian cities sided so vigorously with the popes that John VI. (701-705) had to interpose in order to release the exarch from captivity and prevent a definitive rupture with the empire. Later (710-711) Ravenna revolted against the emperor, organized its armed population under twelve flags, and almost all the cities of the exarchate joined in a resistance that was the first step towards the

independence of the Italian communes. A still fiercer religious quarrel then broke out concerning images. Pope Gregory II. (715-731) opposed the cele- brated edict of the iconoclastic emperor Leo the Isaurian. Venice and the Pentapolis took up arms in favour of the pope, and elected dukes of their own without applying to the emperor. Again public disorder rose to such a pitch that the pope was obliged to check it lest it should go too far.

In the midst of these warlike tumults a new constitu- The tion, almost a new state, was being set up in Rome. oS of During the conflict with Philippicus, the Monothelite and "°™ heretical emperor who ascended the throne in 711, the Inber Pontificalis makes the first mention of the duchy of Rome (ducatus Romanae urbis), and we find the people struggling to elect a duke of their own. In the early days of the Byzantine rule the territory appertaining to the city was no greater than under the Roman empire. But, partly through the weakness of the government of Constantinople, and above all through the decomposi- tion of the Italian provinces under the Lombards, who destroyed all unity of government in the peninsula, this dukedom was widely extended, and its limits were always changing in accordance with the course of events. It was watered by the Tiber, and stretched into Tuscia to the right, starting from the mouth of the Marta, by Tolfa and Bleda, and reaching as far as Orte. Viterbo was a frontier city of the Lombards. On the left the duchy extended into Latium as far as the Garigliano. It spread very little to the north-east and was badly defended on that side, inasmuch as the duchy of Spoleto reached to within fourteen miles of the Salara gate. On the other side, towards Umbria, the river Nera was its boundary line.*

The constitution of the city now begins to show the

The first results of the conditions amid which it took shape. The | were always optimates, and guarded the interests of the constitu- separation of the civil from the military power has entirely | army. But the real chiefs of the bands or numerz were tion of disappeared. This is proved by the fact that, after the | the duces or tribunes, and under the Franks the latter a ie year 600, there is no further mention of the prefect. | became comites. These chiefs were styled magnificr 'His office still survived, but with a

gradual change of | consules, optimates de militia, often too judices de mili- functions, until, in the 8th century, he once more appears tia, since, as was the custom of the Middle Ages, they as president of a criminal tribunal. The constitution of wielded political and judicial as well as military authority. the duchy and of the new republic formed during the wars | The title of consul was now generally given to superior with the Lombards and the exarch was substantially of an | officers, whether civil or military. The importance of the aristocratico-military nature. At its head was the duke, | scholae militum began to decline in the 10th century; first elected by the emperor, then by the pope and the | towards the middle of the 12th they disappeared alto- people, and, as his strength and influence grew with gether, and, according to Papencordt, were last mentioned those of the commune, he gradualiy became the most | in 1145. It is probable that the scholae militum signified respected and powerful personage in Rome. The duke | local divisions of the army, corresponding with the city inhabited the palace of the Cesars on the Palatine Hill, | wards, which were twelve in number during the 10th and and had both the civil and the military power in his | 11th centuries, then increased to thirteen, and occasion- hands; he was at the head of the army, which, being | ally to fourteen. It is certain that from the beginning composed of the best citizens and highest nobility of | the army was distributed under twelve flags; after the Rome, was a truly national force. This army was styled | scholae had disappeared, we find it classified in districts, the felicissimus or florens exercitus Romanus or also the | which were subdivided into companies. The division of militia Romana. Its members never lost their citizen | cities into quarters, sestveri or rioni, corresponding with stamp; on the contrary they formed the true body of the | that of the army, and also with that of the municipal citizens. We find mention of other duces in Rome, but | government, was the common practice of Florence, Siena, these were probably other leaders or superior officers of | and almost all the Italian communes. But, while usually the army. Counts and tribunes are found in the subject | losing importance as the guilds acquired power, in Rome cities bound to furnish aid to the capital. In fact during | the insignificance of the guilds added to the strength of the pontificate of Sergius II. (844), when the duchy was | the regiont or rioni, which not only became part of the threatened by a Saracenic invasion, they were requested | army but finally grasped the

reins of government. This to send troops to defend the coast, and as many soldiers | was a special characteristic of the political constitution of as possible to the city. the Roman commune. The At that time the inhabitants of Rome were divided into We now come to a question of weightier import for The different four principal classes—clergy, nobles, soldiers, and simple | all desiring to form a clear idea of the Roman govern- senate eo. of citizens. The nobles were divided into two categories, | ment at that period. What had become of the senate! ee in Rone. first the genuine optimates, i.e., members of old and wealthy | It had undoubtedly lost its original character now that Ages. families with large estates, and filling high, and often | the empire was extinct. But, after much learned dis- hereditary, offices in the state, the church, and the army. | cussion, historical authorities are still divided upon the These were styled proceres and primates. The second | subject. Certain Italian writers of the 18th century— category comprised landed proprietors, of moderate means | Vendettini, for example—asserted with scanty critical but exalted position, mentioned as nobiles by Gregory L, | insight that the Roman senate did not disappear in and constituting in fact a numerous petty nobility and the | the Middle Ages. The same opinion backed by much bulk of the army. Next followed the citizens, ¢.e., the | learned research was maintained by the great German commercial class, merchants, and craftsmen, who, having | historian Savigny. And Leo, while denying the per- as yet no fixed organization and but little influence, were | sistence of the curia in Lombard Italy, adhered to simply designated as honesti cives. These, however, were | Savigny's views as regarded Rome. Papencordt did the quite distinct from the plebeians, plebs, vulgus popult, viri | same, but held the Roman senate to be no more than a humiles, who in their turn ranked above bondsmen and | curia. This judgment was vigorously contested, first by slaves. The honesti cives did not usually form part of the | Hegel and Giesebrecht, then by Gregorovius. These army, and were only enrolled in it in seasons of emergency. | writers believe that after the middle of the 6th century Nevertheless the army was not only national, but became | the senate had a merely nominal existence. According increasingly democratic, so that in the 10th century it | to Gregorovius its last appearance was in the year 579. included every class of inhabitants except churchmen and | After that date it is mentioned in no documents, and the slaves. At that period we sometimes find the whole | chroniclers

are either equally silent or merely allude to its people designated as the exercitus, those actually under | decay and extinction. In the 8th century, however, the arms being distinguished as the militia exercitus Romani. | terms senator, senatores, senatus again reappear. We See This again was divided into bands or "numbers," 2.¢., | find letters addressed to Pippin, beginning thus: Omnis 1tum,

regiments, and also, in a manner peculiar to Rome, into scholae militum. These scholae were associations derived from antiquity, gaining strength and becoming more general in the Middle Ages as the central power of the state declined. There were scholae of notaries, of church singers, and of nearly every leading employment; there were scholae of foreigners of diverse nationalities, of Franks, Lombards, Greeks, Saxons, &c. Even the trades and crafts began to form scholae. These were at first very feeble institutions, and only later gained importance and became guilds. As early as the 8th century there were scholae militum in the army, which was thus doubly divided. But we have no precise definition of their functions. 'They were de facto corporations with separate pro- perty, churches, and magistrates of their own. The latter

senatus atque univers. populi generalitas. When Leo III. returned from Germany he was met by tam proceres clert- corum cum omnibus clericis, quamque optimates et senatus, cunctague militia (see Anastasius, in Muratori, vol. iii. 198 c). But it has been noted that the senate was never found to act as g political assembly ; on occasions when it might have been mentioned in that capacity we hear nothing of it, and only meet with it in ceremonials and purely formal functions. Hence the conclusion that the term senator was used in the sense of noble, senatus of nobility, and no longer referred to an institution but only to a class of the citizens. Even when we find that Otho IIT. (who sought to revive all the ancient institutions of Rome) addressed an edict to the "Consuls and Senate of Rome," and read that the laws of St Stephen

were issued senatus decreto, the learned Giesebrecht merely remarks that no important changes in the Roman con- stitution are to be attributed to the consuls and senate introduced by ;Otho III. Thus for the next glimpse of the senate we must pass to the 12th century, when it was not only reformed, as some writers believe, but entirely reconstituted,

But in this case a serious difficulty remains to be dis- posed of. Gregorovius firmly asserts that the nobles acquired great power between the 7th and 10th centuries, not only filling the highest military, judicial, and ecclesias- tical offices, " but also directing the municipal government, presumably with the prefect at their head." He further adds : —"Notwithstanding the disappearance of the senate, it is difficult to suppose that the city was without govern- ing magistrates, or without a council." Thus, after the 7th century, the optimates at the head of the army were also at the head of the citizens, and "formed a communal council in the same manner in which it was afterwards formed by the banderesi."! Now, if the nobles were called senatores, and the nobility senatus, and if this body of nobles met in council to administer the affairs of the republic, there is no matter for dispute, inasmuch as all are agreed that the original senate must have had a different character from the senate of the Middle Ages. And, since the absence of all mention of a prefect after the 7th century is not accepted as a proof of his non-existence, and we find him reappear under another form in the 8th century, so the silence as to the senate after the year 579, the fresh mention of it in the 8th century, and its reappearance in the 12th asa firmly reconstituted body reasonably lead to the inference that, during that time, the ancient senate had been gradually transformed into the new council. Its meetings must have been held very irregularly, and probably only in emergencies when important affairs had to be discussed, previously to bringing them before the parliament or general assembly of the people. Historians are better agreed as to the sig- nificance of the term consul. At first this was simply a title of honour bestowed on superior magistrates, and retained that meaning from the 7th to the 11th century, but was then—as in other Italian cities—only given to the chief officer of the state.

During this period the Roman constitution was very simple. The duke, commanding the army, and the prefect, presiding over the criminal court, were the chiefs of the republic ; the armed nobility constituted the forces, filled all superior offices, and occasionally met in a council called

secretaries of state. When, on the constitution of the new empire, these ministers were declared to be palatine or imperial as well as papal officials, the primicerius and the secundicerius were also in waiting on the emperor, who sat in council with them, when in Rome. Next came the arcarius, or treasurer, the sacellarius, or cashier; the proto- scriniarvus, who was at the head of the papal chancery; the primus defensor, who was the advocate of the church, and administered its possessions. Seventh and last came the nomenclator, or adminiculator, who pleaded the cause of widows, orphans, and paupers. There were also some other officials, such as the vestiarius, the vicedominus or steward, the cubicularius or majordomo, but these were of inferior importance. They were ecclesiastics, but not bound to be in priest's orders. The first seven were those specially known as proceres clericorum and oftener still as judaces de clero, since they speedily assumed judicial functions and ranked among the chief judges of Rome. But as ecclesiastics they did not give decisions in criminal cases. Thus Rome had two tribunals, that of the judices de clero, or ordinarii, presided over by the pope, and that of the judices de militia, leaders of the army, dukes and tribunes, also bearing the generic title of consuls. First appointed by the exarch and then frequently by the pope, these decided both civil and criminal cases. In the latter they were sole judges under the presidency of the prefect.

The pope was thus at the head of a large administrative The popes powers that were continually and the

body with judicial and civil

on the increase, and, in addition to his moral authority Papal

over Christendom, was possessed of enormous revenues. So in course of time he considered himself the real repre- sentative of the Roman republic. Gregory II. (715-731) accepted in the name of the republic the submission of other cities, and protested against the conquest by the Lombards of those already belonging to Rome. He seemed indeed to regard the territory of the duchy as the patri- mony of the church. The duke was always at the head of the army, and, officially, was always held to be an imperial magistrate. But the empire was now powerless in Italy. Meanwhile the advance of the Lombards was becoming more and more threatening; they seized Ravenna in 751, thus putting an end to the exarchate, and next marched towards Rome, which had only its own forces and the aid of neighbouring cities to rely upon. To avoid being crushed by the brute force of a foreign nation unfit to rule, and only capable of oppression and pillage, it was necessary to make an energetic stand.

power.

the senate, though it had no resemblance to the senate of older times. In moments of emergency a general parlia- ment of the people was convoked. This constitution

Accordingly the reigning pope, Stephen II, (752-757), The popes appealed to Pippin, king of the Franks, and concluded appeal

: : 5 : to the with that monarch an alliance destined to inaugurate a Fishes

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Judices e clero,

differed little from that of the other Italian communes, where, in the same way, we find all the leading citizens under arms, a parliament, a council, and one or more chiefs at the head of the government.

But Rome had an element that was lacking elsewhere. We have already noted that, in the provinces, the admini- strators of church lands were

important personages, and exercised during the Middle Ages, when there was no exact division of power, both judicial and political fune- tions. It was very natural that the heads of this vast administration resident in Rome should have a still higher Standing, and in fact, from the 6th century, their power increased to such an extent that in the times of the Franks they already formed a species of papal cabinet with a share and sometimes a predominance in the affairs of the republic. There were seven principal administrators, but two of them held the chief power,—the primicerius notarioram and the secundicerius, z.e., the first and under eee

Gregorovius, Geschichte, vol. ii. p. 427-8 and note (2d ed.).

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new epoch of the world's history. The pope consecrated Pippin king of the Franks, and named him patricius Lomanorum. This title, as introduced by Constantine, had no longer the ancient meaning, but now became a sign of lofty social rank. When, however, it was after- wards conferred on barbarian chieftains such as Odoacer and Theodoric, and then on the representative of the Byzantine empire in Italy, it acquired the meaning of a definite dignity or office. In fact the title was now given to Pippin as defender of the church, for the pope styled him at the same time patricius Romanorum and defensor or protector ecclesiae. And the king pledged himself not only to defend the church but also to wrest the exarchate and the Pentapolis from the Lombards and give them to Rome, or rather to the pope, which came to the same thing. This was considered as a restitution made to the head of the church, who was also the repre- sentative of the republic and the empire. And, to pre- serve the character of a restitution, the famous " donation of Constantine" was invented during this period (752—

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for aid.

Donation of Pippin.

Charle- magne in Italy.

The papacy, the re- public, and the Franks.

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Pippin brought his army to the rescue (754-755) and fulfilled his promise. The pope accepted the dona- tion in the name of St Peter, and as the visible head of the church. Thus in 755 central Italy broke its connexion with the empire and became independent ; thus was in- augurated the tenporal power of the papacy, the cause of so much subsequent warfare and revolution in Rome.

Its first consequences were speedily seen. In 767 the death of Paul I. was followed by a fierce revolt of the nobles under Duke Toto (Theodoro) of Nepi, who by violent means raised his brother Constantine to the chair of St Peter, although Constantine was a layman and had first to be ordained. For more than a year the new pontiff was a pliable tool in the hands of Toto and of the nobles. But the genuine papal faction, headed by a few judices de clero, asked the aid of the Lombards and made a formidable resistance. Their adversaries were defeated, tortured, and put to death. Toto was treacherously slain during a fight. The pope was blinded and left half dead on the highway. Fresh and no less violent riots ensued, owing to the public dread lest the new pope, Stephen IV. (768-772), elected by favour of the Lombards, should give them the city in return. But Stephen went over to the Franks, whom he had previously deserted, and his succes- sor, Hadrian I. (772-795), likewise adhered to their cause, called the city to arms to resist king Desiderius and his Lombard hordes, and besought the assistance of Charle- magne. This monarch accordingly made a descent into Italy in 773, and not only gained an easy victory over Desiderius, but destroyed the Lombard kingdom and seized the iron crown. Entering Rome for the first time in 774, he confirmed and augmented the donation of Pippin by the addition of the dukedom of Spoleto. He returned several times to Italy and Rome, making new conquests and fresh concessions to Adrian I., until the death of the latter in 795.

The position of Rome and of the pope is now substan- tially changed. Duke, prefect, militia, and the people exist as heretofore, but are all subordinate to the head of the church, who, by the donations of Pippin

and Charle- magne, has been converted into a powerful temporal sovereign. Henceforth all connexion with Byzantium is broken off, but Rome is still the maiaspring of the empire, the Roman duchy its sole surviving fragment in Italy, and the pope stands before the world as representative of both, And, although it is difficult to determine how this came about, the pope is now regarded and regards him- self as master of Rome. In the year 772 he entrusts the vestiartus with judicial powers over the laity, ecclesiastics, freemen, and slaves nostrae Komanae reipublicae. He writes to Charlemagne that he has issued orders for the burning of the Greek ships employed in the slave trade, "in our city of Civita Vecchia" (Centumcell), and he always speaks of Rome and the Romans as "our city," "our republic," "our people." The donations of Pippin and Charlemagne are restitutions made to Saint Peter, the holy church, and the republic at the same time. It is true that Charlemagne held the supreme power, had an im- mensely increased authority, and actively fulfilled his duties as patricius. But his power was only occasionally exercised in Rome; it was the result of services rendered to the church, and of the church's continual need of his help ; it was, as it were, the power of a mighty and indispensable ally. The pope, however, was most tenacious of his own authority in Rome, made vigorous protest whenever rebels fled to Charlemagne or appealed to that monarch's arbitra- tion, and contested the supremacy of the imperial officials in Rome. Yet the pope was no absolute sovereign, nor, in the modern sense of the term, did any then exist. He asserted supremacy over many lands which continually

rebelled against him, and which, for want of an army of his own, he was unable to reduce to obedience without others' help. Neither did the republic acknowledge him as its head. It profited by the growing power of the pope, could not exist without him, respected his moral authority, but considered that he usurped undue power in Rome. This was specially the feeling of the nobles, who had hitherto held the chief authority in the republic, and, being still the leaders of the army, were by no means

willing to relinquish it. The Roman nobles were very different from other aristocratic bodies elsewhere. They were not, as they pretended, descendants of the Camilli and the Scipios, but neither were they a feudal aristocracy, inasmuch as the Teutonic element had as yet madesmall way among them. They were a mixture of different elements, national and foreign, formed by the special conditions of Rome. Their power was chiefly derived from:the high offices and large grants of money and land conferred on them by the popes ; but, as no dynasty existed, they could not be dynastic. Every pope agerandized his own kindred and friends, and these were the natural and often open adversaries of the next pontiff and his favourites. Thus the Roman nobility was powerful, divided, restless, and turbulent ; it was con- tinually plotting against the pope, threatening not only his power, but even his life; it continually appealed to the people for assistance, stirred the militia to revolt, and rendered government an impossibility. Hence, notwith- standing his immense moral authority, the pope was the effective head neither of the aristocracy, the army, nor of the as yet unorganized lower classes. The lord of vast but often insubordinate territories, the recognized master of a capital city torn by internecine feud and plots against himself, he needed the support of an effective force for his own preservation and the maintenance of the authority proffered him from all quarters. Hence the necessity of creating an empire of the West, after having snapped every link with that of the East. Thus the history of Rome is still, as in the past, a history of continual strife between pope, emperor, and republic ; and the city, while imbibing strength from all three, keeps them in perpetual tumult and confusion.

Leo III. (796-816) further strengthened the ties be- tween Charlemagne and the church by sending the former a letter with the keys of the shrine of St Peter and the banner of Rome. Charlemagne had already joined to his office of patrician the function of high justice. The new symbols now sent constituted him mzles of Rome and general of the church. The pope urged him to despatch an envoy to receive the oath of fealty, thus placing him- self, the representative of the republic, in the subordinate position of one of the bishops who had received the immunities of counts. And all these arrangements took place without the slightest reference to the senate, the army, or the people. Much resentment was felt, especially by the nobles, and a revolution ensued headed by the primicerius Paschalis

and the secundicerius Campulus, and backed by all who wished to liberate the city from the papal rule. During a solemn procession the pope was attacked and barbarously maltreated by his assailants, who tried to tear out his eyes and tongue (799). He was thrown into prison, escaped, and overtook Charle- magne at Paderborn, and returned guarded by ten of the monarch's envoys, who condemned to death the leaders of the revolt, reserving, however, to their sovereign the right of final judgment. Charlemagne arrived in December 800, and as high justice assembled a tribunal of the clergy, nobles, citizens, and Franks; he pronounced Leo to be innocent, and confirmed the capital sentence passed on the rebels. But through the intercession of the pope, who dreaded the wrath of the nobles, this was presently com-

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Charle- magne crowned emperor.

Decline of the empire,

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muted into perpetual exile. And finally on Christmas day, in St Peter's, before an assemblage of Roman and Frankish lords, the clergy, and the people, the pontiff placed the imperial crown on Charlemagne's head and all proclaimed him emperor. :

Thus the new emperor was elected by the Romans and consecrated by the pope. But he was their real master and supreme judge. The pope existed only by his will, since he alone supplied the means for the maintenance of the temporal power, and already pretended to the right of controlling the papal elections. Yet Charlemagne was not sovereign of Rome ; he possessed scarcely any regalia there, and was not in command of the army; he mainly represented a principle, but this principle was the law which is the basis of the state. The pope still nominated the Roman judges, but the emperor or his miss¢ presided over them, together with those of the pope, and his decision was appealed to in last resort. lingian

times no mention is found of the prefect, and it would seem that his office was filled by the imperial missus, or legate, the judices de clero, and judices de militia. The power of the pope was now entangled with that of the republic on the one hand and that of the empire on the other. The consequent confusion of sacred and secular func- tions naturally led to infinite complications and disputes.

The death of Charlemagne in 814 was the signal for a fresh conspiracy of the nobles against the pope, who, dis- covering their design, instantly put the ringleaders to death, and was severely blamed by Louis for this violation of the imperial prerogative. While the matter was under dis- cussion the nobles broke out in fiercer tumults, both in Rome and the Campagna. At last, in 824, the emperor Lothair came to re-establish order in Rome, and proclaimed a new and noteworthy constitution, to which Pope Eugenius II. (824-27) gave his oath of adherence. By this the partnership of pope and emperor in the temporal rule of Rome and the states of the church was again confirmed. The more direct power appertained to the pope; the supreme authority, presidence of the tribunals, and final judgment on appeal to the emperor. The new constitu- tion also established the right of contending parties to select either the Roman or the Teutonic code for the settle- ment of their disputes. During the Carolingian period it is not surprising that the commune should have been, as it were, absorbed by the church and the empire. In fact it is scarcely mentioned in history throughout that time. And when, no longer sustained by the genius of its founder, the Frankish empire began to show signs of dissolution, the popes, finding their power thereby strengthened, began to assume many of the imperial attributes. Soon, however, as a natural consequence of the loss of the main support of the papacy, the nobles regained vigour and were once more masters of the city. Teutonic and feudal elements had now largely penetrated into their organization. The system of granting lands, and even churches and convents, as benefices according to feudal forms, becamie more and more general. It was vain for the popes to offer opposi- tion, and they ended by yielding to the current. The fall of the Frankish empire left all Italy a prey to anarchy, and torn by the faction fights of Berengar of Friuli and Guido of Spoleto, the rival claimants to the crowns of Italy and the empire. The Saracens were advancing from the south, the Huns from the north; the

popes had lost all power; and in the midst of this frightful chaos a way was opened for the rise of the republics. Anarchy was at its climax in Rome, but the laity began to overpower the clergy to such an extent that the judices de militia pre- vailed over the judices de clero. For a long time no imperial missi or legates had been seen, and the papacy

754-932. |

During the Caro- °

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positively fallen into the hands of certain beautiful women notorious for their evil life and depravity. The aristo- cracy alone gained strength ; now freed from the domina-

tion of the emperor, it continually wrested fresh privileges °

from the impotent.pontifis, and became organized as the ruling force of the republic. Gregorovius, notwithstand- ing his denial of the continuation of the senate after the 6th century, is obliged to acknowledge that it appeared to have returned to life in the power of this new baronage. And, although this body was now permeated with the feudal principle, it did not discard its ancient traditions. The nobles claimed to be the main source of the empire; they wished to regain the dignity and office of patricius, and to make it, if possible, hereditary in their families. Nothing is known of their system of organization, but it seems that they elected a chief bearing the title of consul, senator, princeps Romanorum, who was officially recognized by the pope, as a patricius presided over the tribunals, and was the head of the commune.

Theophylact was one of the first to assume this dignity. His wife Theodora, known as the senatrix, was one of the women then dominating Rome by force of their charms and licentiousness. She was supposed to be the concubine of Pope John X. (914-928), whose election was due to her influence. Her daughter Marozia, in all things her worthy rival, was married to Alberic, a foreign mercenary of un- certain birth who rose to a position of great influence, and, although an alien, played a leading part

in the affairs of the city. He helped to increase. the power of Theophylact, who seemingly shared the rule of the city with the pope. In the bloody war that had to be waged against the Saracens of southern Italy, and at the defeat of the latter on the Garigliano (916), Theophylact and Alberic were the Roman leaders, and distinguished themselves by their valour. They disappeared from the scene after this victory, but Marozia retained her power, and bore a son Alberic, who was destined to greater deeds. The pope found him- self caught in this woman's toils, and struggled to escape, but Marozia, gaining fresh influence by her marriage with Hugo, margrave of Tuscany, imprisoned the pontiff himself in Castle St Angelo (928). This fortress was the property of Marozia and the basis of herstrength. The unfortunate John died within its walls. Raised to the chair by Theodora, he was deposed and killed by her daughter. The authority of the latter reached its culminating point in 931, when she succeeded in placing her son John XI. on the papal throne. On the death of her second husband she espoused Hugo of Provence, the same who in 928 had seized the iron crown at Pavia, and now aspired to the empire. Dissolute, ambitious, and despotic, he came to Rome in 932, and, leaving his army outside the walls, entered Castle St Angelo with his knights, instantly began to play the tyrant, and gave a blow to Alberic his step-son, who detested him as a foreign intruder. This blow proved the cause of a memorable revolution ; for Alberic rushed from the castle and harangued the people, crying that the time was come to shake off the tyrannous yoke of a woman and of barbarians who were once the slaves of Rome. Then, putting himself at the head of the popu- lace, he closed the city gates to prevent Hugo's troops from coming to the rescue, and attacked the castle. The king fled; Marozia was imprisoned, Alberic proclaimed lord of the Romans, and the pope confined to the Lateran in the custody of his own brother. Rome was again an independent state, a republic of nobles. Rid of the temporal dominion of emperor and pope, and having expelled the foreigners with great energy and courage, it chose Alberic for its chief with the title of princeps atque omnium Romanorum senator. The tendency of the

was incredibly lowered. The election of the popes had | Roman republic to elect a supreme authority, first mani-

Renewed power

e aristo- cracy.

The revolt

of the Romans. Alberic at the head

of the commune,

788

of Alberic, Brancaleone, Crescenzio, Cola di Rienzo, and others. One of the many causes of this tendency may be traced to the conception of the new empire of which Rome was the original and enduring fountainhead. As Rome had once transferred the empire from Byzantium to the Franks, so Rome was surely entitled to reclaim it. The imperial authority was represented by the office of patri- cian, now virtually assumed by Alberic. That he gave the name of Octavian to his son is an additional proof of this fact. In the Eternal City the medizeval political idea has always the aspect of a resurrection or transformation of classic antiquity. This is another characteristic of the history of the Roman comniune.

Alberic's strength was due to his connexion with the nobility, to his father's valiant service against the Saracens at the battle of Garigliano, and to the militia under his command, on which everything depended amid the internal and external dangers now threatening the new state. As yet no genuine municipal constitution was possible in Rome, where neither the people nor the wealthy burghers engaged in industry and commerce had any fixed organization. All was in the hands of the nobles, and Alberic, as their chief, frequently convened them in council, although obliged to use pressure to keep them united and avoid falling a prey to their disputes. Hence the whole power was concentrated in his grasp ; he was at the head of the tribunals as well as of the army. The judices de clero and judices de militia still existed, but no longer met in the Lateran or the Vatican, under the presidency of emperor and pope or their missi. Alberic himself was their president ; and, a still more significant fact, their sittings were often held in his private dwelling. There is no longer

any mention of prefect or patricius. The papal coinage was inscribed with Alberic's name instead of the emperor's. His chief attention was given to the militia, which was still arranged in scholae, and it is highly probable that he was the author of the new division of the city into twelve regions, with a corresponding classi- fication of the army in as many regiments under twelve flags and twelve banderesi, one for every region. The organization of the scholae could not have been very dissimilar, but doubtless Alberic had some important motive for altering the old method of classification. By means of the armed regions he included the people in the forces. It is certain that after his time we find the army much changed and far more democratic. It was only natural that so excellent a statesman should seek the aid of the popular element as a defence against the arrogance of the nobles, and it was requisite to reinforce the army in order to be prepared for the attacks threatened from abroad. This change effected, Alberic felt prepared for the worst, and began to rule with energy, moderation, and justice. His contemporaries award him high praise, and he seems to have been exempt from the vices of his mother and grandmother.

In 933 Hugo made his first attack upon the city, and was repulsed. A second attempt in 936 proved still more unfortunate, for his army was decimated by a

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fested in the case of Theophylact, was repeated in those | attack by that potentate.

[HISTORY.

At last, however, this inveter- ate foe withdrew from Rome, being summoned to the north by the victories of his rival Berengarius. But Alberic, after procuring the election of various popes who were docile instruments of his will, experienced a check when Agapetus IT. (946-955), a man of firmness and resource, was raised to the papal throne. The fortunes of Berengarius were now in the ascendant. In 950 he had seized the iron crown, and ruled in the Pentapolis and the exarchate. This being singularly painful to the pope, he proceeded to make alliance with all

those enemies of Berengarius preferring a distant emperor to a neighbouring and effective sovereign, with the Roman nobles who were discontented with Alberic, and with all who foresaw danger, even to Rome, from the extended power of Berengarius. And Agapetus recurred to the old papal policy, by making appeal to Otho I., whose rule in Germany was distinguished by a prestige almost comparable with that of Charlemagne.

Otho immediately responded to the appeal and descended into Italy ; but his envoys were indignantly repulsed by Alberic, and, being prudent as well as firm, he decided to wait a more opportune moment for the accomplishment of his designs. Meanwhile Alberic died in 954, and the curtain fell on the first great drama of the Roman republic. He had reigned for twenty-two years with justice, energy, and prudence; he had repelled foreign invaders, main- tained order and authority. He seems, however, to have realized that the aspect of affairs was about to change, that the work he had accomplished would be exposed to new dangers. These dangers, in fact, had already begun with the accession of an enterprising pope to the Holy See. The name of Octavian given by Alberic to his son leads to the inference that he meant to make his power hereditary. But, suddenly, he began to educate this son for the priesthood, and, assembling the nobles in St Peter's shortly before his death, he made them swear to elect Octavian as pope on the decease of Agapetus II. They kept their word, for in this way they freed themselves from a ruler. Possibly Alberic trusted that both offices might be united, and that his son would be head of the state as well as the church. But the nobles knew this to be a delusion, especially in the case of a nature such as Octavian's. The lad was sixteen years old when his father died, received princely honours until the death of Agapetus, and was then elected pope with the name of John XII. He had inherited the ungoverned passions of his grandmother Marozia and great-grandmother Theodora, but without their intelligence and cunning. His palace was the scene of the most scandalous licence, while his public acts were those of a baby tyrant. He conferred a bishopric on a child of ten, consecrated a deacon in a stable, invoked Venus and Jupiter in his games, and drank to the devil's health. He desired to be both pope and prince, but utterly failed to be either. Before long, realizing the impossibility of holding in check Berengarius, who still ruled over the

exarchate, he sought in 960 the aid of Otho I., and promised him the imperial crown, Thus the new ruler was summoned by the son of the man

pestilence. Thoroughly disheartened, he not only made peace, but gave his daughter in marriage to Alberic, thus satisfying the latter's desire to ally himself with a

by whom he had been repulsed. Otho vowed to defend Otho I. the church, to restore her territories, to refrain from crowned usurping thé power of the pope or the republic, and was °™P°™

royal house. But this union led to no conciliation with Hugo. For Alberic, finding his power increased, marched at the head of his troops to consolidate his rule in the Campagna and the Sabine land. On the death of his brother, Pope John XL, in 936, he controlled the elec- tion. of several successive popes, quelled a conspiracy formed against him by the clergy and certain nobles insti- gated by Hugo, and brilliantly repulsed, in 941, another

crowned on the 2d February 962 with unheard-of pomp and display.

Accordingly, after being extinct for thirty-seven years, the empire was revived under different but no less diffi- cult conditions. The politico-religious unity founded by Charlemagne had been dissolved, partly on account of the heterogeneous elements of which it was composed, and partly because other nations were in course of formation.

Rising import- ance

of the people.

Another revolu- tion.

933-999.]

Now too the feudal system was converting the officers of the | empire into independent princes, and the new spirit of communal liberty was giving freedom to the cities. Otho once more united the empire and the church,

Italy and Germany, in order to combat these new foes. But the difficulties of the enterprise at once came to light. John XII, finding a master in the protector he had invoked, now joined the discontented nobles who were conspiring | with Berengarius against the emperor. But the latter hastened to Rome in November 963, assembled the clergy, nobles, and heads of the people, and made them take an oath never again to elect a pope without his consent and that of his son. He also convoked a synod presided over by himself in St Peter's, which judged, condemned, and deposed Pope John and elected Leo VIII. (963-965), a Roman noble, in his stead. All this was done at the direct bidding of the emperor, who thus deprived the Romans of their most valued privilege, the right of choosing their own pope. But the people had now risen to considerable importance, and, for the first time, we find it officially represented in the synod by the plebeian Pietro, surnamed Imperiola, together with the leaders of the militia, which had also become a popular institution since Alberic's reign, It was no longer easy to keep the lower orders in sub- jection, and by their junction with the malcontent nobles they formed a very respectable force. On the 3d J anuary 964 they sounded the battle-peal and attacked the Vatican, where the emperor was lodged. The German knights repulsed them with much slaughter, and this bloodshed proved the beginning of an endless feud, Otho departed in February, and John XII, as the chosen pope of the Romans, returned with an army of followers and com- pelled the defenceless Leo VIII. to seek safety in flight. Soon afterwards Leo was deposed and excommunicated by a new synod, and many of his adherents were cruelly murdered. But on the 14th May 964 John suddenly expired ; the Romans, amid violent struggles and tumults, resumed their rights, elected Benedict V. and procured his consecration in spite of the emperor's veto, Otho now

ROME

_to the guilds and the people. _and people had made common cause in Rome; but this harmony was soon to be interrupted. The feudal spirit

| the pedanei. | Franks, and when the edict of Lothair (824) granted

appeared at the head of an army, committed fresh slaughter, besieged the city, reduced it by famine, and, after holding a council which deposed

Benedict and sent him a prisoner to Hamburg, restored Leo VIII. to the papal throne.

But, although the emperor thus disposed of the papacy at hiswill, his arbitrary exerciseof powerroused a long and obsti- nate resistance, which had no slight effect upon the history of the commune. Leo VIII. died in 965, and the imperial party elected John XIII. (965-972). Upon this the nobles of the national party joined the people, and there was a general revolt. 'The nobles were led by Pietro, prefect of Rome. As we have noted, this office seemed to be extinct during the Carolingian rule, but we again meet with it in 955, after an interval of a century and a half. The leaders of the people were twelve decarcont, a term of unknown derivation, but probably indicating chiefs of the twelve regions (dodecarchi, dodecarconi, decarcont). The new pope was seized and confined, first in Castle St Angelo, then in a fortress in the Campagna. But the emperor quickly marched an army against Rome, and this sufficed to produce a reaction which recalled the pope (November 966), sent the prefect into exile, and put several of the rebellious nobles to death. And shortly after the emperor sacked the city. Many Romans were exiled, some tortured, others, including the twelve decarconi, killed. John XIII. died in 972 and Otho in 973.

All these events clearly prove how great a change had now taken place in the conditions of Rome. The people (plebs) had made its appearance upon the stage ; the army had become democratic; the twelve regions were regularly organized under leaders. Opposed to them stood the

nobles, headed by the prefect, also a noble, precisely as in

Florence the nobles and the podesta were later opposed So far, it is true, nobles

had made its way among the Roman aristocrats, had

| Split them into two parties and diminished their strength.

It was now destined to spread, and, as it was always

| vigorously detested and opposed b the people elsewhere g y pp Ne peop

in Italy, so the same consequence was inevitable in Rome.

Another notable change, and a subject of unending con- Judices | troversy, had also occurred in the administration of justice. "tivi.

So far there were the judices de clero, also known as ordinary or palatine judges, and the judices de militia, also styled consules or duces. These judges generally formed a court of seven, three being de clero, four de militia, or vce versa, under the presidency of the papal or imperial missi. In criminal cases the judices de militia had the prefect or the imperial missus for their president. But there was a third order of judges called pedanei, a consulibus creati. It seems clear that the duces, being distributi per judicatus, found themselves isolated in the provinces, and to obtain assistance nominated these pedanei, who were legal experts. In Rome, with its courts of law, they were less needed, but possibly in those sections of the city where cases of minor importance were sub- mitted to a single magistrate reference was made to But many changes were made under the

free choice of either the Roman or Germanic law, and the duces were replaced by comites and gastaldiones, chiefly of German origin, the use of legal experts became increas- ingly necessary. And the custom of employing them was the more easily diffused by being already common among the Franks, whose scabint were legal experts acting as judges, though not qualified to pass sentence. Thus the pedanei multiplied, came to resemble the scabini, and were designated judices dativi (a magistratu dati) or simply dativi. These were to be found in the exarchate in 838, but not in Rome until 961, when the judices de militia had ceased to exist. The great progress of the German legal procedure may then have contributed to the forma- tion of the new office.

Meanwhile Pope John XIII. had been succeeded by Benedict VI, (973-974) and Otho I. by his son Otho IL, a youth of eighteen married to the Byzantine princess Theophano. Thereupon the Romans, who had

supported the election of another pope, and were in no awe of the new emperor, rose to arms under the command of Crescenzio, a rich and powerful noble. They not only seized Benedict VI. by force, but strangled him in Castle St Angelo. The national and imperial parties then elected several popes who were either exiled or perse- cuted, and one:of them was said to be murdered. In 985 John XV. was elected (985-996). During this tur- moil, the national party, composed of nobles and people,*

led by Giovanni Crescenzio, son of the other Crescenzio Giovanni mentioned above, had taken complete possession of the Cres- This Crescenzio assumed the title of patri- °¢22°-

government. cian, and sought to imitate Alberic, although far his inferior in capacity. Fortunately for him the reigning pope was a detested tyrant, and the emperor a child entirely guided by his mother. But the new emperor Otho ITI. was backed by a powerful party, and on coming to Rome in 996 was able, although only aged fifteen, to quell the rebellion, oust Crescenzio from public life, and elect as successor to John XV. his own cousin, Pope Gregory V. (996-999). But this first German pope sur- rounded himself with compatriots, and by raising them to lofty posts even in the tribunals excited a revolt that

Otho III.

The second Giovanni Cres- cenzio.

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drove him from the throne (29th September 996). Cres- cenzio, being master of Castle St Angelo, resumed the title of patrician or consul of the Romans, expelled the Ger- man judges, reconstituted the government, prepared his troops for defence, and created a new pope. But the following year Otho III. came to Rome, and his party opened the gates to him. Although deserted by nearly all his adherents, Crescenzio held the castle valiantly against its besiegers. At last, on the 29th April 998, he was forced to make terms, and the imperialists, violating their pledges, first put him to torture and then hurled him from the battlements. Gregory V.

dying shortly after these events, Sylvester II., another German, was raised to the papacy (999-1003).

Thus Otho III. was enabled to establish his mastery of Rome. But, as the son of a Greek mother, trained amid Greek influences, his fantastic and contradictory nature seemed only to grasp the void. He wished to reconstitute a Romano-Byzantine empire with Rome for his capital. His discourse always turned on the ancient republic, on consuls and senate, on the might and grandeur of the Roman people ; and his edicts were addressed to the senate and the people. The senate is now constantly mentioned, and its heads bear the title of consuls. The emperor also gave renewed honour to the title of patrician, surrounded himself with officials bearing Greek and Roman designa- tions, and raised the prestige of the prefect, who, having now almost the functions of an imperial vicar, bore the eagle and the sword as his insignia. Nevertheless Otho III. was thoroughly German, and during his reign all Germanic institutions made progress in Rome. This was particularly the case with feudalism, and Sylvester IT. was the first pope to treat it with favour. Many families of real feudal barons now arose. The Crescenzii held sway in the Sabine hills, and Preeneste and Tusculum were great centres of feudalism in the 11th century. The system of feudal benefices was recognized by the church, which made grants of lands, cities, and provinces in the feudal manner. The bishops, like feudal barons, became actual counts. And, in consequence of these changes, when the emperor, as head of the feudal system, seeks to impose his will upon the church (which has also become feudal) and control the papal elections, he is met by the great question of the investitures, a question destined to disturb the whole world. Meanwhile the Roman barons were growing more and more powerful, and were neither submissive nor faith- ful to the emperor. On the contrary they resented his attitude as master of Rome, and, when he subjected Tivoli to the Holy See, attacked both him and the pope with so much vigour as to put both to flight (16th February 1001). Thereupon Rome again became a republic, headed by Gregory of Tusculum, a man of a powerful family claim- ing descent from Alberic.

By the emperor's death in January 1002 the race of the Othos became extinct, the papacy began to decline, as at the end of the Carolingian

period, and the nobles, divided into an imperial and a national party, were again predominant. They reserved to themselves the office of patrician, and, electing popes from their own ranks, obtained enlarged privileges and power. At the time when Ardoin, marquis of Ivrea, profiting by the extinction of the Othos and the anarchy of Germany, was stirring Italy in the vain hope of constituting a national kingdom, the Roman republic was being consolidated under another Giovanni Crescenzio, of the national faction. He was now elected patrician ; one of his kinsmen was invested with the office of prefect, and the new pope John XVIII. (1003-9) was one of his creatures. Although the power of Henry of Bavaria was then gaining ascendency in Germany, and giving strength to the imperialist nobles, Crescenzio

still remained supreme ruler of the city and the Campagna. Surrounded by his judges, the senators, and his kinsman the prefect, he continued to dispense justice in his own palace until his death in 1012, after ten years' rule. And, Pope Sergius IV. having died the same year, the counts of Tusculum compassed the election of Benedict VIII. (1012-24), one of their own kin. This pope expelled the Crescenzii, changed the prefect, and reserved the title of patrician for Henry II., whom he consecrated emperor on the 14th February 1014. A second Alberic, bearing the title of "eminentissimus consul et dux," was now at the head of the republic and dispensed placita in the palace of his great ancestor, from whom the counts of Tusculum were also descended.

The new emperor endeavoured to re-establish order in Henry Rome, and strengthen his own authority together with U.

that of the pope. But the nobles had in all things the upper hand. They were regularly organized under leaders, held meetings, asserted their right to nominate both pope and emperor, and in fact often succeeded in so doing. Even Henry II. himself was obliged to secure their votes before his coronation. The terms senate and senator now recur still more frequently in history. Never- theless, Benedict VIII succeeded in placing

his own brother, Romano, at the head of the republic with the title of 'consul, dux, and senator," thus making him

'leader of the nobles, who met at his bidding, and chief of

the militia and the tribunals. The prefect still retained his authority, and the emperor was by right supreme judge. But, a violent revolt. breaking out, the.emperor only stayed to suppress it and then went to Germany in disgust. The pope, aided by his brother, conducted the government with energy ; he awed the party of Crescenzio, and waged war against the Saracens in the south. But he died in 1024, and in the same year Henry II. was succeeded by Conrad II. There was now beheld a repetition of the same strange event that had followed the death of Alberic, and with no less fatal consequences. SBenedict's brother Romano, head of the republic, and still retaining office, was, although a layman, elected pope. He took the name of John XIX. (1024-33), and in 1027 conferred the imperial crown on Conrad the Salic, who, abolishing the Lothairian edict of 824, decreed that throughout Rome and its territory justice should be henceforth administered solely by the Justinian code. Thus, notwithstanding the spread of feudalism and Germanic procedure, the Roman law triumphed through the irresistible force of the national character, which was already manifested in many other ways.

Meanwhile John XIX. was succeeded by his nephew, Benedict IX. (1033-45), a lad of twelve, who placed his own brother at the head of the republic. Thus church and state assumed the aspect of hereditary possessions in the powerful house of the counts of Tusculum. But the vices and excesses of Benedict were so monstrous that the papacy sank to the lowest depth of corruption; there followed a series of tumults and reactionary attempts, and so many conflicting elections that in 1045 three popes were struggling for the tiara in the midst of scandal and anarchy. The streets and neighbourhood of Rome swarmed with thieves and assassins; pilgrims were plundered ; citizens trembled for their lives; and a hundred petty barons threatened the rival popes, who were obliged to defend themselves by force. This state of things lasted until Henry III. came to re-establish order. He appointed a synod to depose the three popes, and then, with the consent of the wearied and anarchy-stricken

Romans, assuming the right of election, proposed a German, Clement IJ., who was consecrated at Christmas 1046. Henry III]. was then crowned, and also took the title of patrician. Thus the

Hilde- brand and the question of inves- titure.

998-1108.]

emperor was lord over church and state. This, however, stirred both people and pope against him, and led to the terrible contest of the investitures, although for the moment the Romans, being exhausted by past calamities, seemed not only resigned but contented.

In fact, the idea of reform and independence was already germinating in the church and was soon to become tenacious and irresistible. Hildebrand was the prompter and hero of this idea. He sought to abolish the simony and concubinage of the priesthood, to give the papal elections into the hands of the higher ecclesiastics, and to emancipate the church from all dependence on the empire. Henry III. procured the election of four German popes in succession, and Hildebrand was always at hand to inspire their actions and dominate them by his strength of intel- lect and still greater strength of will. But the fourth German pope, Victor II, died in 1057, and Henry III. had been succeeded in 1056 by the young Henry IV. under the regency of a weak woman, the empress Agnes. Hildebrand seized this favourable moment for trying his strength and procured the election of Stephen IX. (1057-58), a candidate he had long had in view. Stephen, however, died in 1058; the nobles instantly rose in rebellion ; and Gregory of Tusculum, who had assumed the patriciate, caused an incapable cousin to be named pope (Benedict X.). Upon this Hildebrand postponed his design of maintaining the papacy by the help of Italian potentates and had recourse to the empress. In a synod held at Siena with her consent Benedict was deposed and Nicholas II. (1059-61) elected in his stead. This pope entered Rome escorted by the troops of Godfrey of Tuscany, and, when also assured of help from Naples, assembled a council of one hundred and thirteen bishops (1059), who condemned the deposed pontiff and renewed the prohibition of simony and concubinage among the priesthood. Finally Nicholas instituted the college of cardinals, entrusting it with the election of the pope, who was in future to be chosen

from its ranks. The assent of the clergy and people was left purely formal. The decree also contained the proviso— "saving the honour and reverence due to the emperor"; but this too was an empty expression.

The new decree was a master-stroke of Hildebrand's genius, for by means of it he placed the papal. election in the hands of a genuine ecclesiastical senate and gave a monarchical form to the church. Backed by the Normans who were in Rome, and whose commander, Richard of Capua, did not scruple to strike off the heads of many recalcitrant nobles, Hildebrand and the pope could now pursue their work of reform. Nevertheless the nobles again revolted on the death of Nicholas II. in 1061, and declared their purpose of restoring to Henry IV. the patri- ciate and right of election; but Hildebrand, by speedily convoking the cardinals, procured the election of Alexander IL. (1061-73). This pope, although friendly to the empire, did not await the imperial sanction, but, protected by the Romans, at once entered the Lateran and put some other riotous nobles to death. The German bishops, how- ever, elected Honorius II., who had the support of the barons. Thus the city was split into two camps and a deadly civil war ensued, terminating, despite the vigorous resistance of the nobility, in the defeat of Honorius II. But the nobles persevered in the contest and were the real masters of Rome. By conferring the patriciate on the emperor, as their feudal chief, they hoped to organize them- selves under the prefect, who now, with greatly increased authority, presided over both the civil and criminal courts in the absence of the pope's representative. In a general assembly the Romans elected their prefect, whose investi- ture was granted by the emperor, while the pope elected another. Thus disorder was brought to a climax,

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Alexander died on the 21st April 1073, and thereupon Gregory Hildebrand was at last raised to the chair as pope Gregory VU.

Tol

VIL (1073-85). He reconfirmed his predecessors' de- crees, dismissed all simoniacal and non-celibate priests, and then in a second council (1075) forbade the clergy to receive investiture at the hands of laymen. No bishop

nor abbot was again to accept ring or crozier from king or emperor. Now, as ecclesiastical dignities included the possession of extensive benefices, privileges, and feudal rights, this decree gave rise to tremendous dispute and to fierce contest between the empire and the church. The nobles took a very decided part in the struggle. With Cenci, their former prefect, at their head, they rose in revolt, assailed the pope on Christmas day 1075, and threw him into prison. But their fear of the popular wrath compelled his speedy release; and he then decreed the excom- munication and deposition of the emperor who had declared him deposed. That monarch afterwards made submission to Gregory at Canossa (1077), but, again turning against him, was again excommunicated. And in 1081 he returned to Italy bringing the antipope Clement IIL, and besieged Rome for forty days. Assembling the nobles in his camp, he there arranged a new government of the city with prefect and senate, palatine judges, and other magis- trates, exactly similar to the existing government within the walls. He then took his departure, returned several times in vain, but at last forced his way into the city (March 1084), and compelled Gregory VII. to seek refuge in Castle St Angelo. The emperor was then master of Rome, established the government he had previously arranged, and, calling a parliament of nobles and bishops, procured the deposition of Gregory and the consecration of Clement III., by whom he was crowned in 1084. He then attacked and seized the Capitol, and assaulted the castle in order to capture the pope. But Robert Guiscard brought his army to the rescue. Emperor and anti-pope fled ; the city was taken, the pope liberated, and Rome reduced to ruin by fire and pillage. Upon this Gregory VIL, broken with grief, went away with the Normans, and died at Salerno on the 25th May 1085. He had separated the church from the people and the empire by a struggle that, as Gregorovius says, disturbed the deep sleep of the Middle Ages

Pope Paschal IJ. (1099-1118) found himself entirely Paschal

at the mercy of the tyrannous nobles who were alike II. masters of Rome, of its government, and its spiritual lord. As they were divided among themselves, all the pope could do was to side with one party in order to overcome the other. With the help of his own nephew Gualfredo, the prefect Pietro Pierleone, and the Frangipani, he was able to keep down

the Corsi, and hold the Colonna in check. Being compelled to repair to Benevento in 1108, he left Gualfredo to command the militia, Tolomeo of Tusculum to guard the Campagna, and the consuls Pierleone and Leone Frangipani, together with the prefect, in charge of the government. The consulship was no longer a mere title of honour. The consuls seem to have been elected, as at Ravenna, in imitation of those of the Lombard cities, and were at the head of the nobles and senate. The expressions " praefectus et consules," "de senatoribus et consulibus," are now of frequent occurrence. We have no precise knowledge of the political organization of the city at this moment ; but it was an aristocratic government, similar to that originally formed in Florence, as Villani tells us, with a senate and consuls. The nobles were so completely the masters that the pope, in spite of having trusted them with the government, could only return to Rome with the aid of the Normans. Being now absorbed in the great investiture question, he had recourse to a daring plan. He proposed to Henry V. that the bishops

New power of the people.

Popular revolu- tion. Recon- struction of senate and re- public.

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should resign all property derived from the crown and depend solely on tithes and donations, while the empire should resign the right of investiture. Henry seemed disposed to accept the suggestion, but, suddenly changing his mind, took the pope prisoner and forced him to yield the right of investiture and to give him the crown (1111). But the following year the party of reform annulled in council this concession, which the pope declared to have been extorted by force. By the death of Countess Matilda in 1115 and the bequest of her vast possessions to the Holy See, the pope's dominions were greatly enlarged, but his authority as a ruler was nowise increased. Deeds of violence still continued in Rome; and then followed the death of the prefect Pietro. The nobles of the imperial party, joined with the people, wished to elect Pietro's son, also nephew to Tolomeo of Tusculum, who then held the position of a potent imperial margrave, had territories stretching from the Sabine mountains to the sea, was the dictator of Tusculum, master of Latium, and consul of the

Romans. The pope opposed this election to the best of his strength; but the nobles carried the day, and their new prefect received investiture from the emperor. Upon this the pope again quitted Rome, and on his return, two years later, was compelled to shut himself up in Castle St Angelo, where he died in 1118.

The popes were now the sport of the nobles whom they had aggrandized by continual concessions for the sake of peace. And peace seemed at hand when Innocent II. (1130-43), after triumphing over two antipopes, came to terms with Roger L, recognized him as king of Sicily, and gained his friendship and protection. tumults took place. In consequence of the division of the nobles neither party could overcome its foes without the aid of the people, which thus became increasingly powerful. Throughout Upper and Central Italy the cities were being organized as free and independent communes on a democratic basis, Their example was soon followed in the ancient duchy of Rome and almost in the immediate neighbourhood of the city. [Even Tivoli was converted into a republic. This excited the deepest jealousy in the Romans, and they became furious when this little city, profiting by its strong position in the Teverone valley, not only sought to annex Roman territory, but dared to offer successful resistance to the descendants of the conquerors of the world. In 1141 Tivoli openly rebelled against the mother city, and the pope sent the Romans to subdue it. They were not only repulsed, but ignominiously pursued to their own gates. Afterwards, returning to the assault in greater numbers, they conquered the hostile town. Its defenders surrendered to the pope, and he immediately concluded a treaty of peace without consulting either the people or the republic. 'The soldiery, still flushed with victory, were furious at this slight. They demanded not only the submission of Tivoli to the Roman people, but also permission to demolish its walls and dwellings and expel its population. Innocent II. refused consent to these excesses, and a memorable revolution ensued by which the temporal power of the papacy was entirely overthrown.

In 1143 the rebellious people rushed to the Capitol, pro- claimed the republic, reconstituted the senate, to the almost entire exclusion of the nobles, declared the abolition of the temporal power, issued coin inscribed to the senate, the people, and St Peter, and began to reckon time from the

day of the restoration of liberty. Arnold of Brescia was not, as has been incorrectly stated, the author of this revolution, for he had not yet arrived in Rome. It was the outcome of an historic necessity—above all of the renewed vigour of the people and its detestation of the feudal aristocracy. This body, besides being divided into an imperial and a national party, had almost excluded from

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But now still graver .

[WISTORY.

the government the powerful baronage of the Campagna and the provinces. Also, as we have before noted, the Roman aristocracy was by no means an exclusive caste. Between the great aristocrats and the people there stood a middle or new nobility, which made common cause with the people, whose chief strength now lay in the army. This, divided into twelve and then into thirteen or four- teen regions, assembled under its banners all arm-bearing citizens. Thus the exercitus was also the real populus Romanus, now bent on the destruction of the temporal power. 'This purpose, originating in the struggle of the investitures, was the logical and inevitable result of the proposals of Paschal II., which, despite their rejection, found a loud echo in Italy. Lucius IT. (1144-45) tried to withstand the revolution by seeking Norman aid and throwing himself into the arms of the feudal party, but this only precipitated the course of events. The people, after having excluded nearly all aristocrats from the senate, now placed at its head the noble Giordano dei Pierleoni, who had joined the revolutionary party. They named him patrician, but without prejudice to the authority of the empire, still held by them in respect, and also conferred on him the judicial powers appertaining to the aristocratic and imperial office of prefect. The pope was requested to resign the temporal power, the regalia, and every other possession, and content himself with the tithes and offerings of the faithful according to the scheme of Paschal II. He indignantly refused, marched at the head of the nobles against the Capitol, but was violently repulsed, and received a blow on the head from a stone, which is supposed to have occasioned his speedy death on the 15th February 1145. Eugenius III. was then elected

(1145-53), but soon had to fly to Viterbo in quest of armed assistance, in consequence of the senate's resolve to forcibly prevent his consecration until he recognized the new state of things in the Eternal City.

It was at this moment that Arnold of Brescia arrived Arnold of His ideas, already well known in Italy, had Brescia.

in Rome. inspired and promoted the Roman revolution, and he now came to determine its method and direction. Born at Brescia in the beginning of the 12th century, Arnold had studied in France under the celebrated Abelard, who had instructed him in theology and philosophy, inspired him with a great love for antiquity, and stimulated his natural independence of mind. On returning to his native land he assumed the monkish habit, and proved the force and fervour of his character by taking part in all struggles for liberty. And, together with political reform, he preached his favourite doctrine of the necessary renunciation by the clergy of all temporal wealth. Expounded with singular eloquence, these doctrines had a stirring effect on men's minds, spread throughout the cities of northern Italy, and were echoed on all sides. It seems undoubted that they penetrated to Rome and helped to promote the revolution, so that Arnold was already present in spirit before he arrived there in person. It is known that at the Lateran council of 1139 Innocent II. had declared these doctrines to be inimical to the church and enjoined silence on their author. And, as at that time the party hostile to liberty was triumphant in Brescia, Arnold left his native place, crossed the Alps, and returned to France, where other struggles awaited him. He professed no anti-Catholic dogmas,—only maintaining that when the pope and the prelacy deviated from the gospel rule of poverty they should not be obeyed, but fearlessly opposed. In France, finding his master, Abelard, exposed to the persecutions of St Bernard, he assumed his defence with so much ardour that St Bernard directed the thunders of his eloquence against the disciple as well as the master, saying of the former, "He neither eats nor drinks,

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suffers hunger, and, being leagued with the devil, only thirsts for the blood of souls." In 1142 we find Arnold a wanderer in Switzerland, and then, suddenly reappearing in Italy, he arrived in Rome.

Three different elements entered into his nature and inspired his eloquence—an exalted and mystic tempera- ment, a great and candid admiration for classic antiquity added to an equal admiration for republican freedom independent of the church and the empire, and a pro- found conviction, derived from the Vaudois and Paterine doctrines, that the church could only be purified by the renunciation of temporal wealth. Finding Rome already revolutionized in accordance with his own ideas, he immediately began to preach there. His mystic exhorta- tions against the riches of the church had an inflammatory effect, while his classical reminiscences aroused the enthusi- asm of the Romans, and his suggestion that they should imitate the republican institutions of Upper Italy met the necessities of the time that had created the revolution. He urged the reconstitution of the ancient senate and senatorial order, which indeed was already partially accomplished, and of the ancient equestrian order, and the reconstruction and fortification of the Capitol. His pro- posed senate was a body somewhat resembling the com- munal councils of Upper Italy, his equestrian order a mounted force composed of the lesser nobility, since at Rome, as elsewhere, the lower classes had neither time nor means to form part of it. All his suggestions were accepted ; the citizens laboured strenuously on the fortifica- tion of the Capitol. The pope soon beheld the revolution spread beyond the walls, and several cities of the state proclaimed their independence. The barons of the Cam- pagna profited by the opportunity to act as independent sovereigns. Thus the whole domain of the church was threatened with dissolution. The pope marched towards Rome with his newly gathered army, but hoped to come to terms. The Romans in fact recognized his authority, and he in his turn recognized the republic. The office of patrician was abolished, and seenis to have been replaced by that of gonfalonier, and the prefect, answering to the podesta of the other republics, was revived. The senators received investiture from the pope, who returned to Rome at Christmas 1145.

The republic now seems to have been fully constituted. The senate was drawn from the lower classes and the petty nobility, and this was the special characteristic of the new revolution. In 1144 there were fifty-six senators, pro- bably four to each of the fourteen regions, but the number often varied. By the few existing documents of the period we notice that

the senators were divided into senatores consiliarw and ordinary senators. The former constituted a smaller council, which, like the credenza or lesser council found in other cities, consulted with the head or heads of the republic on the more urgent and secret affairs of the state. And, conjointly with the rest of the senators, it formed the greater council. Thus classic traditions were identified with new republican usages, and the commonwealth of Rome resembled those in other parts of Italy. But, of course, every republic had special local customs of its own. So the Roman senate had judicial as well as political attributes, and there was a curia senatus composed of senators and legal experts.

As was easily to be foreseen, the agreement with the pope was of short duration. The revolution could not be checked ; the Romans desired independence, and _ their spiritual lord fled to France, whence, in 1147, he pro- claimed a new crusade, while the Romans were employed in demolishing Tivoli, banishing its inhabitants, and waging war on other cities. Giordano Pierleone was gonfalonier and head of the republic, and Arnold, sup-

ported by the popular favour and the enthusiasm of the lower clergy, was preaching with even greater fervour than before. But the pope now re-entered Italy, pro- claimed Arnold a schismatic, and then advancing to Tusculum assembled an army in order to attack Rome. In this emergency the Romans applied to Conrad IIL, the first emperor of the house of Hohenstaufen ; and their urgent letters are clearly expressive of Arnold's theories and his medley of ancient and modern, sacred and profane, ideas. "Rome," so they said, "is the fountain of the empire confided to you by the Almighty, and we seek to restore to Rome the power possessed by her under Constantine and Justinian. For this end we conquered and destroyed the strongholds of the barons who, together with the pope and the Normans, sought to resist us. These are now attacking us on all sides. Haste to Rome, the capital of the world, thus to establish thy imperial sway over the Italian and German lands."

After long hesitation the king of the Romans at last replied to these appeals, stating that he would come " to re-establish order, reward the faithful, and punish the rebellious." These words promised ill. In fact Conrad had already arranged terms with the pope; but his life came to an end on the 15th February 1152.

He was succeeded by Frederick I. surnamed Barbarossa, Frederick

who took no notice of the numerous letters urging him to I. come and receive the empire from the Roman people, which alone had the right of conferring it. In accordance with his design of subduing all the independent cities, he made an agreement with the pope, in which he vowed to give no truce to the Romans, but subject them to their spiritual lord, whose temporal power should be restored. The pope, on his side, promised to crown him emperor. Thereupon the people again rose to arms, and Arnold broke off all negotiations with Eugenius III. The senate was re- organized, formed of one hundred members, and, according to the old Roman precedent, had two consuls, one for in- ternal and the other for external affairs. Frederick was a daring statesman, a valiant soldier in command of a powerful army, and was no friend of half measures. Accordingly the nobles ventured on reaction. Finally, to increase the gravity of the situation, an English pope, Hadrian IV., was elected (1154-59), who was also a man of strong and resolute temper. In fact, even before being able to take possession of the Lateran, he requested the Romans to banish Arnold, who, with greater eloquence than ever, was directing his thunders against the papacy. These utterances increased the wrath of Hadrian, who, encouraged by the knowledge that Frederick and his host were already in Italy, at last launched an interdict against Rome. It was the first time that a pope had ventured to curse the Eternal City. The interdict put a summary stop to the religious life of the inhabitants. Men's minds were seized with a sudden terror, and a fierce tumult broke out. Thereupon the senators, whose opposition to the pope was less courageous than that of the fallen magnates, prostrated themselves at his feet and implored pardon. But Hadrian demanded the expulsion of Arnold before consenting to raise the interdict. Arnold was therefore obliged to leave Rome. After having for nine years preached successfully in favour of liberty, after having been the moving spirit of the new

revolution, the new con- stitution, he was now abandoned by all, and forced to wander from castle to castle, in the hope of reaching some independent city capable of shielding him from the fierce enmity of the pope. Meanwhile Frederick I. had achieved his first victories in Lombardy, and, leaving ruined cities and bloodshed in his track, was rapidly advancing towards central Italy. The pope sent three cardinals to him, with a request for the capture and consignment of Arnold, who XX. — 100

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III. recognized and hailed as the legitimate pontiff, and Agree- the prefect of Rome again nominated by the pope, to ment be- whom the emperor restored the temporal power, acknow- eatin ledging him the independent sovereign of Rome and of anq the the ecclesiastical state, from Acquapendente to Ceprano. pope.

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had taken refuge in the castle of the Visconti of Campag- natico. Frederick without delay caused one of the Visconti to be seized and kept prisoner until Arnold was given up, and then consigned the latter to the papal legates. The pope in his turn gave the reformer into the hands of

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Arnold's the prefect, Pietro di Vico, who immediately hanged his Frederick's troops accompanied the pope to Rome, where rxecu prisoner, burnt his body at the stake, and cast his ashes | the republic was forced to make submission to him. But, 'ion. into the Tiber. The execution took place in June 1155. | proudly conscious as it still was of its strength, its The exact date and place of it are unknown; we only | surrender wore the aspect of a voluntary concession, and

know that Arnold met his fate with great serenity and | its terms began with these words—"Totius populi Romani firmness. consilio et

deliberatione statutum est," &c. The senators,

But the Romans who had so basely deserted their | elected yearly in September, had to swear fealty to the champion would not give up their republic. Their | pope, and a certain proportion of nobles was included in envoys went to meet Frederick near Sutri, and made an | their number. On his return to Rome, Alexander received address in the usual fantastic style on the privileges of | a solemn welcome from all, but he had neither extinguished

the Roman people and its sole right to confer the imperial | nor really subdued the republic. On the contrary, men's

crown. But Frederick indignantly cut short their harangue, | minds were more and more inflamed by the example of

and they had to depart full of rage. He then continued | freedom displayed in the north of Italy. He died on the

his march, and, entering Rome on the 18th June 1155, was | 30th August 1181. 'The fact that between 1181 and forthwith crowned in St Peter's by the pope. Thereupon | 1187 there were three popes always living in exile proves

the Romans rushed to arms, and made a furious attack on | that the republic was by no means crushed. During the

the Leonine city and the imperial camp. A desperate | same period another blow was inflicted on the papacy by

battle went on throughout the day; and the knights | the marriage of Henry VI., son and successor to Frederick

proved that the equestrian order instituted at Arnold's | I., with Constance, sole heiress of the Norman line in suggestion was no empty sham. About a thousand | Naples. For thus the kingdom was joined to the empire Romans perished by the sword or by drowning, but their | and the popes were more than ever in the latter's power. fellow-citizens made such

determined preparations to | On the 20th December 1187 Clement IIL. (1187-91), being continue the struggle that Frederick, on the 19th June, | raised to the pontificate, made a solemn agreement with hastily retreated or rather fled, and was escorted as far | the Government of the Capitol before coming to Rome.

as Tivoli by the pope and the cardinals. After all, the | And this peace or concordia had the air of a treaty temporal power of the papacy was not restored, and the | between potentates of equal importance. Rome con-

The re- republic still survived in the form bestowed on it by | fronted the pope from the same standpoint from which public Arnold of Brescia. Its existence was in truth favourable | the Lombard cities had confronted the emperor after a rather than injurious to Frederick, whose aim was to rule Legnano. 'This treaty, the basis of the new constitution,

over Rome and treat the bishops as his vassals. He had not yet discerned that his best policy would have been to use the republic as a lever against the pope. The latter, with keener acumen, while remaining faithful to the feudal party in Rome, made alliance with the communes of Lombardy and encouraged them in their resistance to the emperor. Hadrian IV. died in 1159, and the national party elected Alexander ITI. (1159-1181), who energetic- ally opposed the pretensions of Frederick, but, having to struggle with three antipopes successively raised against him by the imperial party, was repeatedly driven into exile. During these schisms the senate quietly carried on the government, administered justice, and made war on some neighbouring cities and barons. An army compris- ing many nobles of the national party marched against Tusculum, but found it defended by several valiant officers and a strong band of German soldiery, who, on the

was confirmed on the last day of May 1188 (Anno XLIV. of the senate). It begins with these words: —"Concordia inter Dominum Papam Clementem III. et senatores populumque Romanum super regalibus et aliis dignitatibus urbis." The pope was recognized as supreme lord, and invested the senators with their dignity. He resumed the privilege of coinage, but allowed one-third of the issue to be made by the senate. Almost all the old 'pontifical rights and prerogatives were restored to him.

The pope might employ the Roman militia for the defence of his patrimony, but was to furnish its pay. 'The rights of the church over Tivoli and Tusculum were confirmed ; but the republic reserved to itself the right of making war on those cities, and declared its resolve to dismantle and destroy the walls and castle of Tusculum. In this under- taking the pope was to co-operate with the Romans, even should the unhappy city make surrender to him alone.

29th May 1167, inflicted on the Romans so severe a defeat that it is styled by Gregorovius the Cannz of the Middle Ages. Shortly afterwards the emperor arrived in Rome with his antipope Paschal III., and Alexander had to fly

From all this it is clear that the church had been made Rome independent of the empire, and that the republic, despite in its numerous concessions, was by no means subject to the ("

j : th 3 church. The pope, in fact, had obtained liberty of rire

before him to Benevento. 'Then, at last, Frederick came to terms with the republic, recognized the senate, which accepted investiture at his hands, re-established the pre- fecture as an imperial office, and bestowed it on Giovanni, son of Pietro di Vico. He then hastily departed, with- out having advanced outside the Leonine city.

Meanwhile Pope Alexander continued the crafty policy of Hadrian and with better success, for the Lombard cities had now formed a league and inflicted a signal defeat on the emperor at Legnano on the 29th May 1176. One of the results of this battle was the conclusion of an agree- ment between the pope and the emperor, the latter resigning his pretensions on Rome and yielding all that he had denied to Hadrian. And by the treaty of Venice (Ist August 1177) the antipope was forsaken, Alexander

election, and Frederick I, by resigning the investiture of the prefect, had virtually renounced his claim to imperial power in Rome. The republic had no patrician nor any other imperial magistrate, and preserved its independence even as regarded the pope, who merely granted investiture

to magistrates freely chosen by the people, and had no legislative nor administrative power in the city. His temporal dominion was limited to his great possessions, to his regalia, to a supreme authority that was very indefinite, and to a feudal authority over the barons of the Campagna and many cities of a state that seemed ever on the point of dissolution. The senate continued to frame laws, to govern, and to administer justice. The army carried on the wars of the republic, as we see by the tragic fate of Tusculum, which was razed to the ground on the 19th

The nobles re-enter the senate.

Popular revolu- tion and counter- revolu- tion of the aris- tocracy.

The office of pretect becomes heredi- tary.

Innocent I.

elects the senate,

1155-1235. |

April 1191. Thus the powerful counts of Tusculum disappeared ; they sought refuge in the Campagna, and according to all probability the no less potent family of the Colonna sprang from their line. In consequence of these events, the nobles realized that the papacy sought to reduce them to vassalage. And, seeing that the republic remained firmly established and able to help them, they began to adhere to it and succeeded in obtaining admission to the new senate. In fact, whereas since 1143 plebeians and petty nobles had prevailed in its ranks, nobles of ancient descent are now found outnumbering the knights and burghers. But in 1191 this state of things caused a sudden popular outbreak which abolished the aristocratic senate and gave the headship of the republic to a single senator, swummus senator, named Benedetto "Carissimus" or "Carus Homo" or "Carosomo," of unknown, but undoubtedly plebeian, origin. During the two years he remained in office this personage stripped the pope of his revenues, despatched justitiari even to the provinces, and with the aid of the parliament and other popular assemblies promulgated laws and statutes. But he was overthrown by a counter-revolution, and

Giovanni Capoccio of the party of the nobles became senator for two years, and had been succeeded by one of the Pierleoni when, in 1197, a fresh revolution re-established a senate of fifty-six members, chiefly consisting of feudal barons in high favour with Henry VI., who had revived the imperial faction in Rome. But this emperor's life ended the same year as the pope's, in 1198, and the new pontiff Innocent III. (1198-1216) began to make war on the nobles, who were again masters of the republic. Their leader was the prefect Pietro di Vico. Owing to the revolution of 1143 most of the prefectorial attributes were now vested in the senate; nevertheless Pietro still retained a tribunal of police both within and without the city. But his main strength was derived from the vast possessions of the Vico family, in which the office of prefect now became hereditary. Very soon, however, these prefects of Vico were chiefly regarded as the great feudal lords of Tuscia, and the independent municipal office lost its true character. Then the popes made a point of according great pomp and dignity to this nominal prefect, in order to overshadow the senator, who still represented the independence of the republic and had assumed many of the attributes wrested from the prefect.

But Innocent IIT, dissatisfied with this state of things, contrived by bribing the people to arrogate to himself the right of electing the senator, who had now to swear fealty and submission to the pope, and also that of nominating the provincial justitiara, formerly chosen by the Govern- ment of the Capitol. This was a deadly blow to the republic, for the principal rights of the people, i.e., the elec- tion of pope and emperor, prefect and senate, were now lost. The general discontent provoked fresh revolutions, and Innocent III. employed all his political dexterity to ward off their effects. But shortly afterwards the people made a loud outcry for a senate of fifty-six members ; and the pope, again making a virtue of necessity, caused that number to be chosen by twelve mediani specially named by him for the purpose. Even this did not calm the popular discontent, which was also stirred by other dis- putes. The consequence was that when, six months later, the pope again jelected a single senator the Romans rose to arms, and in 1204 formed a Government of Buonz Uomini in opposition to that created by the pope. But an amicable arrangement being concluded, the pope once more nominated fifty-six

senators ; and when, soon after, he again reduced them to one, the people were too weary to resist (1205). Thus the Capitol was subdued, and Innocent IIT. spent his last years in tranquillity.

ROME

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On the 22d November 1220 Honorius IIL. (1216-27) conferred the imperial crown on Frederick II., who con- firmed to the church the possession of her former states, of those bequeathed to her by countess Matilda, and even of the March of Ancona. But it was soon seen that he sought to dominate all Italy, and was therefore a foe to be dreaded. The successor of Honorius, Pope Gregory IX. (1227-41) was speedily insulted and put to flight by the Ghibelline nobles, whose courage had revived, and the republic began to subdue the Latian cities on its own account. Peace was several times made and unmade by pope and people; but no enduring harmony was possible between them, since the former wished to subject the entire state to the church, and the latter to escape from the rule of the church and hold sway over "the universal land from Ceprano to Radicofani" formerly belonging to the duchy. Accordingly the Roman people now appointed judges, imposed taxes, issued coin, and made the clergy amenable to secular tribunals. In 1234 the senator Luca Savelli published an edict declaring Tuscia and Campania territories of the republic, and sent judges thither to exact an oath of obedience. He also despatched the militia to the coast, where it occupied several cities and erected fortresses ; and columns were raised everywhere inscribed with the initials 8. P.Q.R. The pope, unable to prevent but equally unable to tolerate these acts, fled from Rome, hurling his anathema against Savelli, "et omnes illos con- siliarios urbis quorum consilio," &c. The Romans sacked the Lateran and the houses of many cardinals, and marched on Viterbo, but were driven back by the papal troops. When Savelli left office and Angelo Malabranca was elected in his stead, the people made peace and sub- mission in 1235, and were obliged to give up their preten- sions of subjecting the clergy to ordinary tribunals and the urban territory to the republic. Thus matters were virtually settled on the footing established

by Innocent IIL, thanks to the aid given to the pope by Frederick IL., who had been one of the promoters of the rebellion.

It may appear strange that, at this period of their history, the Romans, after showing such tenacious adher- ence to the republic and senate, should have accepted the rule of a single senator without rushing to arms, and passed and repassed from one form of government to another with such surprising indifference. But on closer examination it is plain that these changes were greater in appearance than reality. We have already seen, in treat- ing of Carosomo, how the single senator convoked the people in parliament to pass sanction on the laws. But, whenever there is only one senator, we also continually meet with the expression "consilium vel consilia urbis." It is evident that when, instead of laws to be approved in parliament by a simple placet or rejected by a non-placet, matters requiring consideration had to be discussed, the senator convoked a much smaller council, consisting only of the leaders of the people. These leaders were the heads of the twelve or thirteen regions, of the guilds, now becoming organized and soon to be also thirteen in number, and of the militia. As in the other Italian republics, all these associations had been formed in Rome.

The senator therefore held consultation with the leading men of the city; and, although, especially at first, these meetings were rather loosely organized, it is clear that they took the form of two councils—one numerous (con- siglio maggtore), the other limited (consiglio minore or speciale), co-operating with and forming part of the first. Such was the prevailing custom throughout Italy at the time when Roman institutions most nearly resembled those of the other republics. We already know that, from the date of Arnold's reforms, the senate, with its junta of counsellors, had been divided into two parts, forming when

The republic regains

independ- ence,

The republic submits to the people.

Formation of the greater and lesser councils,

united a species of greater council. Therefore the transition from a senate divided into two parts to the greater and lesser councils must have been very easy and natural. And, seeing that later, when the nomination of a single senator had become a constant practice, the meet- ings of the two councils are frequently mentioned without the slightest remark or hint as to their origin, it is clear that they had been gradually formed and long established. Not long after the revolution of 1143 the grandees sought to re-enter the senate; and the popes themselves, partly from dread of the people and partly to aggrandize their own kindred, contributed to build up the power of a new and no less turbulent nobility. This class, arising between the 12th and 13th centuries, was composed of families newly created by the popes, together with remnants of the old aristocracy, such as the Frargipani, Colonna, &c. These nobles, regaining possession of the senate, so com- pletely eliminated the popular element that, when the popes again opposed them, and, obtaining from the parlia- ment the right of electing the senators, adopted the expedient of appointing one only, the senator was always chosen from the ranks of the nobles. And then the people, unable and unwilling to renounce republican forms, replaced their suppressed senate by a greater and a lesser council. This was an easy task—a natural consequence of the fact that the people now began to constitute the real strength of the republic. Later, with an increasing detestation for their nobility, the Romans decreed that. the single senator should be of foreign birth, and, as we shall see, chose Brancaleone in the middle of the 13th century. Thus, after a long series of frequent changes and revolu- tions, the Roman republic became a commonwealth, with an increasing resemblance to those of the other Italian cities. The people were organized and armed, the guilds almost established, the two councils gradually constituted, and the aristocracy, while retaining special local character-

in the hope of conciliating both factions by simultaneously raising them to power. Afterwards one only was elected, alternately an Orsini and a Colonna, then again two, and so on. But all these changes failed in their

aims, since the struggle between emperor and pope exasperated party feeling in Rome. The political genius of Frederick might have wrought great harm to the city had not his mind teemed with contradictory ideas. Although desirous to emancipate the state from the church, he was opposed to the communal democracy, which was then the chief strength of the secular state in Italy. While combating the church and persecuting her defenders, he yet sent heretics to the stake ; although excommunicated, he undertook a crusade ; he feasted at his table philosophers, sceptic and atheist poets, bishops, and Mussulmans; he proclaimed anti-Christian the possession of wealth by the church, yet made lavish gifts to altar and monastery. Thus, although he had a strong party in Rome, it seemed to dissolve at his approach, inasmuch as all feared that he might abolish the statutes and liberties of the commune. It fact, when he advanced towards Rome on the death of Gregory IX. in 1241 he was energetically repulsed by the people, and later even by Viterbo, a city that had always been faith- ful to him. But after he had withdrawn his adherents gained strength and put to flight his opponent, Innocent IV. (1243-54), the newly elected pope, who then from his asylum in France hurled an excommunication against him. Frederick's death in December 1250 deter- mined the fall of the Ghibelline party and the close of the imperial epoch in Italy. 'The pope instantly returned to Rome with the set purpose of destroying the power of the Hohenstaufens. This was no longer difficult when, by the decease of Conrad IV. (1254), the child Conradin became the last legitimate representative of that line, and negotia- tions were already on foot for placing the Angevins on the Neapolitan throne.

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The istics, assumed its definitive shape. It is not surprising The republic meanwhile preserved its independence Roman to find that Rome, like other Italian cities, now possessed | against the pope, who, among other concessions, had statutes. statutes of its own. There has been much controversy on | entirely given up to it the right of coinage. Never- this point. Certain writers had alluded to a statute of 1246. | theless, being much harassed by the factiousness of the As no one, however, could discover any statute of that date, | nobility, it was obliged in 1252 to decide

on the election others decided that it had never existed. A statute of 1363 | of an alien senator armed with ample powers, precisely as was recently published by Professor Camillo Re, who asserted | other communes gave the government into the hands of a it to be the first and most ancient that Rome had possessed. | podest'. Accordingly a Bolognese noble, Brancaleone degli Branca- But the still more recent researches of Messrs La Mantia | Andald, count of Casalecchio, and a Ghibelline of much pa é ao egli An- and Levi prove that Professor Re's assertions were some- | energy and talent, was invited to Rome. But before gary the what too bold. There is certain evidence of a statutwm | accepting office he insisted on making definite terms. He first senatus existing between 1212 and 1227, of a statutwm | desired to hold the government for three years; and this, foreign vel capitulare senatoris vel senatus of 1235, followed in | although contrary to the statutes, was granted. Further, to Senator 1241 by a statutum urbis. This brings us very near to | ensure his personal safety, he demanded that many scions the statute of 1246 mentioned by Vitale and others. So it | of the noblest Roman houses should be sent as hostages to is well ascertained that, in the first half of the 13th century, | Bologna ; and to this also the republic consented. Then, Rome possessed statutes at large composed of older | in August 1252, he came with his judges and notaries, limited statutes. The consuls of the trade guilds were | made oath to observe justice and the laws, and began to from 1267 regular members of the councils; and the | govern. He was head of the republic in peace and in war, merchants' guild held general meetings in 1255. Its | supreme judge and captain in chief. He nominated the statutes were confirmed in 1296 by the senator Pandolfo | podestas of subject territories, despatched ambassadors, Savelli, and the compilation of these, published in 1880 | issued coin, concluded treaties, and received oaths of by Signor Gatti, refers to 1317. obedience. The pope, who was then at Perugia, was Frede- Meanwhile the struggle between Frederick II. and the | greatly afflicted by the arrival of this new master, but, a Pe pope was once more renewed. The former sought to domi- | despairing of aid from any quarter, was forced to make a a nate Italy, separate the state from the church, and repress | virtue of necessity. Thus Brancaleone was able to seize

the republics. The latter, although really hostile to the Roman free Government, joined it against the emperor, who on his side favoured the

republic of Rome and the nobles most adverse to the pope. Thus the new nobility, composed, as we have seen, of two different elements, was again split into a Guelf party headed by the Orsini and a Ghibelline party under the Colonna. And in 1238 it was deemed advisable to elect two senators instead of one,

the reins of power with a firm grasp. The parliament still met in the square of the Capitol, and the greater and lesser councils in the church of Ara Cceli. There were besides frequent assemblies of the college of Capitoline judges or assectamentum. Unfortunately, no records having been preserved of the proceedings of the Roman councils and parliament, little can be said of the manner in which affairs were conducted. Certainly Brancaleone's govern-

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ment was not very parliamentary. He convoked the councils as seldom as was possible, although he frequently assembled the people in parliament. The chief complaint made against him was of undue severity in the administra- tion of justice. He rendered the clergy amenable to secular tribunals, subdued the neighbouring cities of Tivoli, Palestrina, &c., and commanded in person the attacking force. But his greatest energy was directed to the repression of the more turbulent nobles who were opposed to him; and he soon made them feel the weight of his hand by hanging some, banishing others, and persecuting several more. But he too recognized the expediency of winning the popular favour. He was the first senator to add to his title that of captain of the people ("' Almae Urbis Senator Ill: et Romani Populi Capitaneus"). He befriended the people by promoting the organization of guilds after the manner of those of his native Bologna. There were already a few in Rome, such as the merchants' guild and that of the agriculturists, Bobacteriorum or Bovattari, who must have resembled the so-called mercanti di campagna or graziers of the present day, since no peasant guild existed in Italian republics. The merchants' guild, definitely established in 1255 under Brancaleone's rule, had four consuls and twelve councillors, held meetings, and made laws. The other guilds, thirteen in all, were organized much on the same plan. The admission of their heads into the councils of

the republic in 1267 shows how efficaciously their interests had been promoted by Brancaleone.

The death of Innocent IV. and the election of Alexander IV. (1254-61), who was milder and less shrewd than his predecessor, were favourable events for Brancaleone ; but he failed to check the growing discontent of the clergy and the more powerful nobles, who had received deadly injuries at his hands. And when, on the expiration of his three years' term of office, his re-election was proposed, his enemies rose against him, accused him before the sindacato, threw him into prison, and vehemently protested against the continuance of "foreign tyranny." His life was only spared on account of the hostages sent to Bologna. The next senator chosen was a Brescian Guelf, Emanuele de Madio, a tool of the nobles, who were now masters of the situation. But soon afterwards, in 1257, the guilds rose in revolt, drove the nobles from power, put the pope to flight, and recalled Brancaleone for another three years' term. He ruled more sternly than before, hung several nobles, and made alliance with Manfred, the representative of the Swabian party in Italy. This rendered him increasingly odious to the pope and procured his excom- munication. But, disregarding the thunders of the church, he marched against Anagni, the pope's birthplace, and Alexander was quickly obliged to humiliate himself before the senator of Rome. Brancaleone next set to work to destroy the fortified towers of the nobility, and in razing them to the ground ruined many of the adjacent dwell- ings. Accordingly, a considerable number of nobles became homeless exiles. In 1258, while engaged on the siege of Corneto, Brancaleone was attacked by a violent fever, and, being carried back to Rome, died on the Capitoline Hill. Thus ended the career of a truly remarkable statesman. He was succeeded by his uncle, Castellano degli Andald, who, lacking the political genius of his nephew, only retained office until the following spring (1259), in the midst of fierce and perpetual disturbances. Then the people, being bribed by the pope, joined with the nobles and drove him away. His life too was saved by having followed his nephew's shrewd plan of sending hostages to Bologna. Two senators of Roman birth were next elected ; and on the death of Alexander IV. a French pope was chosen, Urban IV. (1261-64), thus giving fresh predomin- ance in the church to the anti-Swabian policy. But the

1241-1277.]

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internal disturbances of the city soon drove Urban to ° flight.

At this period the fall of the empire had induced many Italian republics to seek strength by placing their governments in the hands of some prince willing to swear respect to their laws and to undertake their defence against neighbouring states and the pope. In Rome the Guelfs and Ghibellines proposed various candidates for this office, and after many fierce quarrels ended by electing a com- mittee of bone homines, charged with the revision of the statutes, reorganization of the city, and choice of a senator. This committee sat for more than a year without nomi- nating any one, so, the Guelf party being now predominant, and all being wearied of this provisional state of things,

the majority agreed on the election as senator of Charles Charles of Anjou, who, at the pope's summons, was already pre- of Anjou He would defend S4tor

paring for the conquest of Naples. Rome against the pope, and the pope would defend Rome against him. By thus taking advantage of either's jealousy the citizens hoped to keep their republic intact. In fact, although Urban IV. had incited Charles to attack Naples, he was by no means willing to see him established as master in Rome. He accordingly declared that, if Charles really wished to obtain the Neapolitan crown, he must only accept the offered dignity pending the conquest of that kingdom. And he must likewise promise to recognize the supremacy of the pope over the senate. Charles soothed him with the amplest verbal promises, but in fact accepted the senatorship for life. In 1265, when Urban was succeeded by Clement IV. (1265-68), who as a Provengal was a subject of Charles, the latter entered Rome and was immediately made senator. Seven days Jater (28th June) he received the investiture of the Neapolitan kingdom, and in the following January its crown. On the 26th February 1266 the battle of Benevento was fought, and, the valiant Manfred being killed, the triumph of the Guelf Angevins in Italy was assured, Then, at the urgent command of the pope, Charles was forced to resign the senatorship in the May of

the same year. Two Romans were elected in his stead, but soon fell out with the pope, because the Guelf nobles again tried to exercise tyranny. The people, however, profited by these disturbances to rise on its own account, and formed a democratic government of twenty-six boni homines with Angelo Capocci, a Ghibelline, as its captain. By this

government Don Henry, son of Ferdinand III. of Castile, Don was elected senator ; and he came to Rome for the purpose Henry of

of promoting a Ghibelline and Swabian policy in favour of Conradin, who was preparing for conflict. The rule of the new senator was very energetic, for he kept down the clergy, subdued the Campagna, persecuted the Guelf nobles, made alliance with the Tuscan Ghibellines, forcibly drove back the troops of King Charles, who was advancing towards Rome, and gave a splendid reception to Conradin. But the battle of Tagliacozzo (23rd August 1268), followed by the murder of Conradin, proved fatal to the Ghibelline party. Charles was re-elected senator immediately after the battle, and the pope confirmed his powers for a term of ten years, after having already named him imperial vicar in Tuscany. On the 16th September Charles for the second time took possession of the Capitol, and ruled Rome firmly by means of vice-governors or vicars.

The Swabian line was now extinct, and in Charles's hands the Neapolitan kingdom had become a fief of the church. The empire had fallen so low as to be no longer formidable. Now therefore was the moment for treating with it in order to restrain Charles, and also for making use of the French king to keep the empire incheck. And this was the policy of Nicholas III. (1277-80), who hastened to extract advantageous promises from Rudolph

The

senate in the hands of the

popes.

Boniface VIII.

of Hapsburg, the new candidate for the imperial crown. In 1278, the ten years' term having expired, he deprived Charles of the senatorship and appointed Rudolph vicar of Tuscany. After declaring that he left to the people the right of electing the senator, he promulgated a new constitution (18th July 1278) which, while confirming the rights of the church over the city, prohibited the election of any foreign emperor, prince, marquis, count, or baron as senator of Rome. Thus the Colonna, Savelli, Orsini, Annibaldi, and other Roman nobles again rose to power, and the republic was again endangered and plunged in disorder. The Romans then gave the reconstitution of the city into the pope's hands by yielding to him the right of nominating senators, declaring, however, that this was a personal concession to himself, and not to the popes in general. So Nicholas proceeded to name senators, alternating a Colonna with an Orsini, or simultaneously choosing one of each faction. The same power over the senate was granted with the same restriction to Martin IV. (1281-85), and he at once re-elected Charles of Anjou. Thus, greatly to the disgust of the Romans, the Capitol was again invaded by French vicars, notaries, judges, and soldiery. But the terrible blow dealt at Charles's power by the Sicilian Vespers (31st March 1282) resounded even in Rome. The Orsini, backed by the people, rose to arms, massacred the French garrison, and quickly re-established a popular Government. Giovanni Cencio, a kinsman of the Orsini, was elected captain and defender of the people, and ruled the city with the co-operation of the senator and a counci! of priors of the guilds. This Government was of brief duration, for, although the pope had professed his willingness to tolerate the experiment, he quickly arranged fresh terms, and, forsaking Charles of Anjou, again nominated two Roman senators. Pope and king both died in 1285, and Nicholas IV. (1288-92), also holding sway over the senate, favoured the Colonna in order to curb the growing mastery of the Orsini. But thus there were two powerful houses instead of one. In fact Giovanni Colonna, when elected senator, ruled from the Capitol as an independent sovereign, conducted in person the campaign against Viterbo, and subjected that city to the republic on the 3d May 1291.

When one of the Gaetani, Boniface VIII. (1294-1303), was raised to the papal chair, the extent of the Colonnas' power became evident to all. Boniface opposed them in order to aggrandize his own kin, and they

showed equal virulence in return. The Cardinals Colonna refused to acknowledge him as the legitimate pope, and he excom- municated them and proclaimed a crusade against their house. Even after he had subdued them and destroyed Palestrina, their principal fief, the drama did not yet come toan end. Boniface had a very lofty conception of the church, and desired to establish her supremacy over the state. The king of France (Philip the Fair) believed, on the contrary, that the Angevin successes entitled him to fill the place in Italy vacated by the Swabians, and to play the master there. This led to a tremendous contest in which all the French sided with their king. And shortly afterwards a plot was hatched against the pope by the agents of France and the Colonna. These determined enemies of the pope met with much favour in Rome, on account of the general irritation against the Gaetani and the enormous power conferred on them by Boniface. Suffice it to say that they were now lords of the whole of lower Latium, from Capo Circeo to Ninfa, from Ceprano to Subiaco. Thus Sciarra Colonna and a Frenchman named Nogaret were able to fall on the pope at Anagni, insult him, and take him prisoner. The people rising to his rescue, the conspirators were put to flight. But when Boniface returned to Rome with the escort and protection of the

Orsini, who had made themselves masters of the city, he found that he was virtually a captive in their hands. He

felt this so keenly that he died of rage and exhaustion

on the 11th October 1303. The brief pontificate of his successor Benedict XI. was followed by that of Clement

V. (1305-14), a Frenchman, who, instead of coming to Rome, summoned the cardinals to France. This was the beginning of the church's so-called exile in Avignon, which, although depriving Rome of a source of wealth and influence, left the republic to pursue its own course. It The re employed this freedom in trying to hold its own against Public the nobles, whose power was much lessened by the absence ae of the pope, and endeavoured to gain fresh strength by demall organizing the thirteen regions, which, as we have shown, cratic were associations of a much firmer nature in Rome than the form. guilds. Accordingly, in 1305, a

captain of the people was elected with thirteen elders and a senator, Paganino della Torre, who governed for one year. The pope was opposed

to these changes at first, but in 1310 he issued a brief granting Rome full permission to select its own form of government. Thus, the first pope in Avignon restored the rights of the Romans. But the latter, even with church

and empire so far removed, still considered Rome the Eternal City, the source of all law, and the only natural

seat of the spiritual and temporal government of the world. To their republic, they thought, appertained a new

and lofty destiny, nor could it ever be content to descend

to the level of other Italian municipalities.

On the 6th January 1309 Henry VII. was crowned king Henry of the Romans at Aix-la-Chapelle; and so greatly were VIL men's minds changed in Italy that, throughout the land, he was hailed as a deliverer. He wished to restore the grandeur of the empire, and the Italians, above all Dante Alighieri, beheld in him the champion of the state against the church, who, after becoming the foe of communal liberty, had forsaken Italy and withdrawn to France.

The Roman people shared these ideas, and awaited Henry with equal impatience, but the nobles rose in opposition. The Orsini, leaders of the Guelfs, and allied with Robert of Naples, took possession of Castle St Angelo and the Trastevere. Hence, when Henry reached Rome in May 1312, after seizing the iron crown at Milan, he was obliged to act on the offensive. He took the Capitol by assault, but, failing in his attack on Castle St Angelo, was pur- sued by its Neapolitan garrison. Forsaken by many discouraged adherents, he was forced to recognize the expediency of departure. First, however, he desired to be crowned at the Lateran, St Peter's being held by his foes. The cardinals refused his request, but were compelled to yield by the threats of the people, who, reasserting their ancient rights, insisted that the coronation should take place without

delay. And the ceremony was performed | on the 29th June 1312. The emperor then resolved to depart in spite of the popular protest against his leaving the natural seat of the empire, and on the 20th August { started for Tuscany, where worse fortune awaited him. |

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Their differences settled, the nobles expelled the cap- Jacopo tain of the people left by Henry, and elected as senators Atlotti Sciarra Colonna and Francesco Orsini. But this was the oo signal for a popular revolt. The Capitol was attacked, the people. senators put to flight, and Jacopo Arlotti elected captain witha council of twenty-six worthies (buoni homini). The new leader instantly summoned the chief nobles before his tribunal, had them chained and cast into prison, and demolished many of their houses and strongholds. But, having thus humiliated their pride, Arlotti dared not put them to death, and, releasing them from confinement, banished them to their estates, where they plunged into hostile preparations. Meanwhile the victorious people convoked a parliament and decreed that, the aristocracy

Sciarra Colonna, captain of the people.

Louis the Bavarian,

1278-1339.]

being now overthrown, the tribunitia potestas alone should invite the emperor to make his triumphal entry into the Capitol, and receive his authority from the people of Rome. This conception of the Roman power will now be seen to become more and more definite until finding its last expression in Cola di Rienzo. Pope Clement, resigning himself to necessity, acknowledged the new government under the energetic rule of Arlotti. The latter now joined the Ghibellines of the Campagna against the Orsini and the Neapolitans, subdued Velletri, and gave it a podesta.

But then the Gaetani, who were Guelfs, united with the Orsini and the Neapolitans, and, giving battle to the Ghibellines in the Campagna, routed them in such wise as to put an end to the popular government. The nobles forced their way into the city, attacked the Capitol, made Arlotti their prisoner, and re-elected the senators Sciarra Colonna and Francesco Orsini. Close upon these reverses came the death of Henry VII. (24th August 1313) at Buonconvento near Siena, which put an end to the Ghibel- line party in Italy. Thereupon King Robert of Naples, being named senator by the pope, immediately appointed avicarin Rome. Clement likewise profited by the vacancy of the imperial throne to name the king imperial vicar in Tuscany. And he died on the 20th April 1314, well content to have witnessed the triumphs of the Guelfs in ltaly.

Affairs took a fresh turn under Pope John XXII. (1316-34). Rome was still ruled by the vicars of King Robert ; but, owing to the continued absence of the popes, matters grew daily worse. Trade and industry declined, revenue diminished, the impoverished nobles were exceed- ingly turbulent, deeds of murder and violence occurred on all sides; even by day the streets of the city were unsafe. Hence there was universal discontent. Meanwhile Louis the Bavarian, who in 1314 had been crowned king of the Romans, having overcome his German enemies at Miihl- dorf in 1322, turned against the pope, one of his fiercest opponents. Louis was surrounded by Minorite friars, supporters of the poverty of the church, and consequently enemies to the temporal power. They were men of the stamp of William of Occam, Marsilio of Padua, Giovanni Janduno, and other philosophers favourable to the rights of the empire and the people. Accordingly the Italian Ghibellines hailed Louis as they had previously hailed Henry. Even the Roman people were roused to action, and, driving out the representatives and partisans of King Robert, in the spring of 1327, seized on Castle St Angelo, and again established a democratic government. 'Nearly all Italy was stirred to new deeds," says G. Villani,

"and the Romans rose to arms and organized the people" |

(bk. x. c, 20). Regardless of the reproofs of the pope, they elected a haughty Ghibelline, Sciarra Colonna, captain of the people and general

of the militia, with a council of fifty-two popolani, four to each region. Then, ranged under the standards of the militia, the Romans gave chase to the foes of the republic, and Sciarra, returning victorious, ascended to the Capitol and invited Louis the Bavarian to Rome. The summons was obeyed ; on the 7th January 1328 the king was already encamped in the Neronian Fields with five thousand horse and a considerable number of foot soldiers, and, with better fortune than Henry VIL., was able to enter the Vatican at once.

Encircled by a crowd of heretics, reformers, and Minorite brethren, he convoked a parliament on the Capitol, asking that the imperial crown might be conferred upon him by the people, from whom alone he wished to receive it. And the people proclaimed him their captain, Senator, and emperor. On the 17th January his corona- tion took place in St Peter's. But, as he had neither money nor practical sense, his method of taxation and the excesses

committed by himself and his over-excited philosophers speedily aroused the popular discontent. His ecclesiastical vicar, Marsilio of Padua, and Giovanni Janduno placarded the walls with insulting manifcstoes against the pope, whom the Minorites stigmatized as a heretic and wished to depose. In April Louis twice assembled the parliament in St Peter's Square, and, after obtaining its sanction to several anti-papal edicts, declared John XXII. degraded and deposed as a heretic. This was a very strange and novel spectacle, the more so that, as was speedily proved, the Romans were stirred by no anti-Catholic spirit, no yearning for religious reform. Jacopo Colonna, a canon of the Lateran, was able to make his way into Rome with four masked companions, to publicly read, at the top of his voice and before a great multitude, the excom- munication launched against the emperor by the deposed pope, to traverse the entire city, and to withdraw un- molested to Palestrina. Meanwhile the emperor contented himself with decreeing that henceforth the popes must reside in Rome,—that if, when invited, they should fail to come they would be thereby held deposed from the throne. As a logical consequence,

proceedings were immediately begun for the election of the new pope, Nicholas V., who on the 12th May was proclaimed by the popular voice in St Peter's Square, and received the imperial sanction. But this ephemeral drama came to an end when the emperor departed with his antipope on the 4th August. This caused the immediate downfall of the democratic Government. Bertoldo Orsini, who had returned to Rome with his Guelfs, and Stefano Colonna were elected senators, and confirmed in the office by Cardinal Giovanni Orsini in the name of the pope. A new parliament cancelled the emperor's edicts, and had them burnt by the public execu- tioner. Later, Nicholas, the antipope, went with a rope about his neck to make submission to John XXIL., and Louis promised to disavow and retract all that he had done against the church, provided the sentence of excom- munication were withdrawn. This, however, was re- fused. Never had the empire fallen so low. Meanwhile King Robert was again supreme in Rome, and, being re- elected senator, appointed vicars there as before. Anarchy reigned. The city was torn by factions, and the provinces rebelled against the French representatives of the pope, who, in their ignorance of Italian affairs, were at a loss how to act.

And after the election of Benedict XII. (1334-42) con- fusion reached so great a pitch that, on the expiration of Robert's senatorial term, the Romans named thirteen heads of regions to carry on the government with two senators, while the king still sent vicars as before. The people, for the sake of peace, once more granted the supremacy of the senate to the pope, and he nominated two knights of Gubbio, Giacomo di Cante dei Gabrielli and Bosone Novello dei Gabrielli, who were succeeded by two other senators the following year. But in 1339 the Romans attacked the Capitol, named two senators of their own choice, re-established a democratic Government, and sent ambassadors to Florence to ask for the ordinances of justice (ordinamenti della giustizia), by which that city had broken the power of the nobles, and also that a few skilled citizens should lend their help in the reconsti- tution of Rome. Accordingly some Florentines came with the ordinamenti, some portions of which may be recog- nized in the Roman statutes, and, after first rearranging the taxes, elected thirteen priors of the guilds, a gonfa- lonier of justice, and a captain of the people after the Florentine manner. But there was a dissimilarity in the conditions of the two cities. The guilds having little influence in Rome,

the projected reform failed, and the pope, who was opposed to it, re-elected the senators.

Reconsti- tution

of the republic,

Cola di Rienzo.

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Thereupon public discontent swelled, and especially when, by the foundation of the papal palace of Avignon, it was evident that Benedict XII. had no intention of restoring the Holy See to Italy. This pope was succeeded in 1342 by Clement VI. (1342-52), and King Robert in 1343 by his niece Joanna ; and the latter event, while plunging the kingdom in anarchy, likewise aggravated the condition of Rome. For not only were the Neapolitan sovereigns still very powerful there, but the principal Roman nobles held large fiefs across the Neapolitan borders.

Shortly before this another revolution in Rome had re-established the government of the Thirteen and the two senators. The people, being anxious to show their intention of respecting the papal authority, had despatched to Avignon as ambassador of the republic, in 1343, a man destined to make much noise in the world. This was Cola di Rienzo, son of a Roman innkeeper, a notary, and an impassioned student of the Bible, the fathers, Livy, Seneca, Cicero, and Valerius Maximus. Thoroughly imbued with a half pagan half Christian spirit, he believed that he had a divinely inspired mission to revive the ancient glories of Rome. Of handsome presence, full of fantastic eloquence, and stirred to enthusiasm by contemplation of the ruined monuments of Rome, he harangued the people with a stilted oratory that enchanted their ears. He hated the nobles, because one of his brothers had been killed by them; he loved the republic, and in its name addressed a stately Latin speech to the astonished pope, and, offering him the supreme power, besought his instant return to Rome. He also begged him to allow the city to celebrate a jubilee every "fifty years, and then, as a personal request, asked to be nominated notary to the urban chamber. The pope consented to

everything, and Rienzi communicated this good news to Rome in an emphatically worded epistle. After Easter, in 1344, he returned to Rome, and found to his grief that the city was a prey to the nobles. He immediately began to admonish the latter, and then, draped in a toga adorned with symbols, exhibited and explained allegorical designs to the people, and announced the speedy restoration of the past grandeur of Rome. Finally he and a few burghers and merchants, whom he had secretly inflamed by his discourses, made a solemn vow to overthrow the nobility and consolidate the republic. The moment was favourable, owing to the anarchy of Naples, the absence of the pope, the weakness of the empire, and the disputes of the barons, although the latter were still very potent and constituted, as it were, a separate government opposed to that of the people. Rienzi, having gained the pope's eccle- siastical vicar to his side, passed in prayer the night of the 19th May 1347, placing his enterprise under the pro- tection of the Holy Spirit, and the following day marched to the Capitol, surrounded by his adherents, convoked a parliament of the people, and obtained its sanction for the following proposals :—that all pending lawsuits should be at once decided; that justice should be equally administered to all; that every region should equip one hundred foot soldiers and twenty-five horse ; that the dues and taxes should be rearranged ; that the forts, bridges, and gates of the city should be held by the rector of the people instead of by the nobility; and that granaries should be opened for the public use. On the same day, amid general homage and applause, Rienzi was proclaimed head of the republic, with the title of tribune and liberator of the Holy Roman Republic, "by authority of the most merciful Lord Jesus Christ." The nobles withdrew scoffing but alarmed. Rienzi engaged a body-guard of one hundred men, and assumed the command of thirteen hundred infantry and three hundred and ninety light horse; he abolished the senators, retained the Thirteen

and the general and special councils, and set the adminis- tration on anew footing. These measures and the prompt submission of the other

cities of the state brought an instant increase of revenue to Rome.

This revolution, as will be noted, was of an entirely novel stamp. For its leader despatched envoys to all the cities of Italy, exhorting them to shake off the yoke of their tyrants, and send representatives to the parliament convoked for the 1st August, inasmuch as the liberation of Rome also implied the "liberation of the sacred land of Italy." In Rienzi's judgment the Roman revolution must be, not municipal, but national, and even in some points universal. And this idea was welcomed with general enthusiasm throughout the peninsula. Solemn festivals and processions were held in Rome; and, when the tribune went in state to St Peter's, the canons met him on the steps chanting the Veni, Creator Spiritus.

/ Even the pope, willingly or unwillingly, accorded his

approval to Rienzi's deeds. The provincial cities did homage to Rome and her tribune, and almost all the rest of Italy gave him its enthusiastic adherence. The ancient sovereign people seemed on the point of resuscitation, And others besides the multitude were fascinated and carried off their feet. Great men like Petrarch were transported with joy. The poet lauded Cola di Rienzo as a sublime and supernatural being, the greatest of ancient and modern men. But it was soon evident that all this enthusiasm was mainly factitious. On the 26th of July a new parlia- ment was called, and this decreed that all the rights and privileges granted to the empire and church must now be vested in the Roman people, from whom they had first emanated. But on the convocation of the national parlia- ment few representatives obeyed the summons and the scheme was a failure. All had gone well so long as principles only were proclaimed, but when words had to be followed by deeds the municipal feeling awoke and distrust began to prevail. Nevertheless, on the Ist August Rienzi assumed the spurs of knighthood and passed a decree declaring that Rome would now resume her old jurisdiction over the world, invoking the Holy Spirit upon Italy, granting the Roman citizenship to all her cities, and proclaiming them free in virtue of the freedom of Rome. This was a strange jumble of the ancient Roman idea combined with the medizval. It was a dream of Rienzi's brain, but it was also the dream of Dante and Petrarch. The conception of the empire and the history of Italy,

particularly that of ancient and medizval Rome, were inevitably preparing the way for the national idea. This Rienzi foresaw, and this constitutes the true grandeur of his character, which in other respects was not exempt from pettiness and infirmity. He pursued his course, therefore, undismayed, and had indeed gone too far to draw back. On the 15th August he caused himself to be crowned tribune with great pomp, and confirmed the rights of Roman citizenship to all natives of Italy. But practical matters had also to be taken into account, and it was here that his weakness and lack of judgment were shown. The nobles remained steadily hostile, and refused to yield to the charm of his words. Hence conflict was unavoidable ; and at first Rienzi succeeded in vanquishing the Gaetani by means of Giovanni Colonna. He next endeavoured to suppress the Guelf and Ghibelline factions, and to restore Italy to "holy union" by raising her from her present abasement.

The pope, however, was weary of toleration, and, coming to terms with the nobles, incited them to war. They accordingly moved from Palestrina, and on the 30th November were encamped before Rome. Rienzi now put forth his energy. He had already called the militia to arms, and a genuine battle took place in which eighty

nobles, chiefly of the Colonna clan, were left dead. This was a real catastrophe to them, and the aristocracy never again achieved the rule of the republic. But Rienzi's head was turned by this sudden success. In great need of money, he began to play the tyrant by levying taxes and exacting instant obedience. The papal legate saw his opportunity and seized it, by threatening to bring a charge of heresy against the tribune. Rienzi was dismayed. He declared himself friendly to the pope and willing to respect his authority; and he even sought to conciliate the nobles. At this moment certain Neapolitan and Hungarian captains, after levying soldiers with the tribune's consent, joined the nobles and broke out in revolt. On their proving victorious in a preliminary encounter with some of Rienzi's guards, the tribune suddenly lost heart, resigned the power he had held for seven months, and took refuge with a few trusty adherents in

Castle St Angelo, on the 15th December 1347. Thence he presently fled to Naples, vainly hoping to find aid, and afterwards disappeared for some time from the scene.

Meanwhile the Romans remained tranquil, intent on making money by the jubilee ; but no sooner was this over than disorders broke out and the tyranny of the baronage recommenced. To remedy this state of things, application was made to the pope. He consulted with a committee of cardinals, who sought the advice of Petrarch, and the poet suggested a popular government, to the complete exclusion of the nobles, since these, he said, were strangers who ruined the city. The people had already elected the Thirteen, and now, encouraged by these counsels, on the 26th December 1351 chose Giovanni Perrone as head of the republic. But the new leader was unable to withstand the hostilities of the nobles; and in September 1353 Francesco Baroncelli was elected tribune. He was a follower of Rienzi, had been his ambassador to Florence, and did little beyond imitating his mode of government and smoothing the way for his return.

Rienzi had spent two years in the Abruzzi, leading a life of mystic contemplation on Monte Maiella. Then, in 1350, he had gone to Prague and endeavoured to convert to his ideas the yet uncrowned emperor Charles IV. When

and, seduced by his promises and hopes, they supplied him with funds. Then, profiting by his prestige, the apparent favour of the pope, and the sums received, he was able to collect a band of five hundred soldiers of mixed nationalities and returned towards Rome. On Monte Mario he was met by the cavallerotti. On the Ist August 1354 he entered the Castello gate, took possession of the government, named Monreale's two brothers his captains, and sent them to lay siege to Palestrina, which was still the headquarters of the Colonna. But then money ran short, and he again lost his head. Inviting Fra Monreale to a banquet, he put him to death for the sake of his wealth, and kept the two brothers in confinement. This act excited general indignation. And when, after his ill-gotten gains were spent, he again recurred to violence to fill his purse, the public discontent

was vented in a sudden revolt on the 8th October. The people stormed the Capitol with cries of "Death to the traitor." Rienzi presented himself at a window waving the flag of Rome. But the charm was finally broken. Missiles were hurled at him; the palace was fired. He hid himself in the courtyard, shaved his beard, and, disguised as a shepherd with a cloth over his head, slipped into the crowd and joined in their cries against himself, Being recognized, however, by the golden bracelets he had forgotten to remove, he was instantly stabbed. For two days his corpse was left exposed to the insults of the mob, and was then burned. Such was the wretched end of the man who, at one moment, seemed destined to fill the world with his name as the regenerator of Rome and of Italy.

In all the Italian cities the overthrow of the aristo- cracy had led to military impotence and pressing danger of tyranny. The same thing had happened in Rome when the nobility, weakened by the absence of church and empire, received its death blow from Rienzi. But, where- as elsewhere tyrants were gradually arising in the citizen class, Rome was always in danger of oppression by the pope. Nor was any aid available from the empire, which had never recovered from its abasement under Louis the Bavarian. In fact, when Charles of Luxembourg came to Rome to be crowned, he was obliged to promise the pope

apparently on the point of success, he was sent under | that he would not enter the city. On Easter day 1355 The arrest to the new pope, Innocent VI. (1352-62), a man | he received the crown, and departed, after counselling the popes of great shrewdness and practical sense. On Rienzi's | Romans to obey the pope. And the pontiffs had greater ee arrival at Avignon it became evident that his popularity | need than ever of an established kingdom. Their position iataae was still very great, and that it would be no easy task to | in France was much endangered by that country's disorder. temporal

dispose of him. The Romans were imploring his return ; | New states were being formed on all sides ; the medizval kingdom.

Petrarch lauded him as a modern Gracchus or Scipio ; and the pope finally released him from confinement. Innocent had decided to send to Italy, in order to settle affairs and bring the state into subjection to the

church, that valiant captain and skilled politician, Cardinal Albornoz. And, having no fear that the latter's hand would be forced, he further decided that Rienzi should be sent to give him the support of his own popularity in Rome. In fact directly the pair arrived Baroncelli was overthrown, the supremacy of the senate granted to the pope, and the government confided to Albornoz, who, without concerning himself with Rienzi, nominated Guido Patrizi as senator. He then marched at the head of his troops against Giovanni, prefect of Vico, and forced him to render submission at Montefiascone on the 5th June 1354. With the same promptitude and skill he reduced Umbria and the Tuscan and Sabine districts, consented to leave the privileges of the cities intact in return for their recognition of the papal author- ity, and planted fortresses in suitable positions. In the meantime Rienzi's popularity was increasing in Rome; without either money or arms, the ex-tribune succeeded by his eloquence in winning over the two Provencal leaders, brothers of the famous free captain Fra Monreale ;

unity was shattered ; and the shrunken spiritual authority of the church increased her need of material strength. As Italian affairs stood, it would be easy for the popes to found a kingdom, but their presence was required in Rome before it could be firmly established. The blood-stained sword of Albornoz had prepared the way before them. In 1355-56 he vanquished the lords or tyrants of Rimini, Fano, Fossombrone, Pesaro, Urbino, and other cities. And all these places had been so rudely oppressed that the cardinal was often hailed as a liberator after subduing their masters by fire and sword. But everywhere he had been obliged to leave existing Governments and rulers a statu quo after exacting their oaths of fealty. Thus the state was still dissevered, and it was impossible to bind it together with the pope at Avignon and Rome a republic. Bologna was still independent, Ordelafti still lord of Forli; Cesena and other cities were still rebel- lious ; and the Campagna was still in the hands of the barons. Some places were ruled by rectors nominated by the pope; at Montefiascone there was an ecclesiasti- cal rector, with a bench of judges, and a captain commanding a mixed band of adventurers. Rome had submitted to the haughty cardinal, but hated him XX. — 101

Foreign senators.

The band- eresi.

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mortally, and, on his departure for Avignon in 1357 to assist the threatened pontiff, immediately conceded to the latter tho supremacy of the senate. And the pope, instead of two senators, hastened to name a single one of foreign birth. This was a shrewd device of Albornoz and another blow to the nobles, with whom he was still at war. Thus was inaugurated, by the nomination of Raimondo de' Tolomei in 1358, a series of foreign senators, fulfilling the functions of a podesta, and changed every six months, together with their staff of judges, notaries, and knights. The people approved of this reform as being inimical to the nobles and favourable to the preservation of liberty. Hitherto the senators had been assisted, or rather kept in check, by the thirteen representatives of the regions. These were now replaced by seven reformers, in imitation of the priors of Florence, the better to follow that city's example. The reformers were soon the veritable chiefs of the republic. They first appeared in 1360, were either popolani or cavallerottc, and were elected by ballot every three months. When Albornoz returned to Italy, although desirous to keep Rome in the same subjection as the other cities, he had first to vanquish Ordelaffi and reduce Bologna. The latter enterprise was the more difficult task, and provoked a lengthy war with Matteo Visconti of Milan. Thus Rome, being left to herself, continued to be governed by her reformers; and the nobles, already shut out from power, were also excluded from the militia, which had been reorganized, like that of Florence, on the democratic system. Three thousand men, mostly archers, were enrolled under the command of two banderesi, "in the likeness," says M. Villani, " of our gonfaloniers of the companies," with four antepositi constituting a supreme council of war. And the whole body was styled the " Felix Societas Balestrariorum et Pavesatorum." It was instituted to support the reformers and re-establish order in the city and Campagna, to keep down the nobles and defend the republic. It fulfilled these duties with much, and sometimes excessive, severity. Banderesi and ante- positi had seats in the special council beside those of the reformers, as, in Florence, the gonfaloniers of the com- panies were seated beside the priors. Later these officials constituted the so-called signoria det

banderesi. In 1362, the Romans having subjected Velletri, which was defended by the nobles, the latter made a riot in Rome. Thereupon the banderesi drove them all from the city, killed some of their kindred, and did not even spare the cavallerotti. The fight became so furious that from gate to gate all Rome was in arms, and even mercenaries were hired. But in the end renewed submission was made to the pope.

On the death of Innocent VI. in 1362, an agreement was concluded with his successor Urban V. (1362-70), also a Frenchman, who was obliged to give his sanction to the government of the reformers and banderesi. And then, Albornoz being recalled in disgrace to Avignon, and after- wards sent as legate to Naples, these Roman magistrates were able, with or without the co-operation of the foreign senator, to rule in their own way. They did justice on the nobles by hanging a few more; and they defended the city from the threatening attacks of the mercenaries, who had now become Italy's worst foes. It was at this period that the Roman statutes were revised and re- arranged in the compilation erroneously attributed by some writers to Albornoz, which has come down to us supplemented by alterations of a later date.

But now the popes, being no longer in safety at Avignon, really decided to return to Italy. Even Urban V. had to pay ransom to escape from the threatened attacks of the free companies. The Romans implored his return, and he was further urged to it by the Italian

literati with Petrarch at their head. In April 1367 he

finally quitted Avignon, and, entering Rome on the 16th October, was given the lordship of the city. Cardinal Albornoz had fallen mortally ill at Viterbo, but, though unable to accompany the pope to Rome, had, before dying, suggested his course of action. Certainly Urban showed Urban V, much acumen in profiting by the first burst of popular begins to enthusiasm to effect quick and dexterous changes in the the al . . . . @- constitution of the republic. After naming a senator, he pupiic, abolished the posts of reformers and banderesi, substituting three conservators, or rather a species of municipal council, alone charged with judicial and administrative powers, which has lasted to the present day. 'The thirteen leaders of the regions and the consuls of the guilds still sat in the councils, which were left unsuppressed. But all real power was in the hands of the pope, who, in Rome, as in his other cities, nominated the principal magistrates. Thus, by transforming political into civil institutions and concen- trating the supreme authority in his own grasp, Urban V. dealt a mortal blow to the liberties of Rome. Yet he felt no sense of security among a people who, after the first

rejoicings over the return of the Holy See, were always on the brink of revolt. Besides he felt himself a stranger in Italy, and was so regarded. Accordingly, in April 1370 he decided to return to France; on the 20th of that month he wrote from Viterbo that no change was to be made in the government; and he died in Avignon on the 19th of December.

The Romans retained the conservators, conferring on Re-estab- them the political power of the reformers; they re-estab- lishment lished the banderesi with the Florentine title of executores 0! the, pees sits, alls wae. « Tepublic justitiae and the four antepositi with that of consiliarii. ang the Thus the "Felix Societas Balestrariorum et Pavesatorum band- Urbis" was restored, and the two councils met as before, eresi. The new French pope, Gregory XI. (1370-78), had to be content with obtaining supremacy over the senate and the possession of the Castle St Angelo. It was a difficult moment for him. The Florentines had come to an open rupture with his legates, and had adopted the expedient of inviting all the cities of the Roman state to redeem their lost freedom. Accordingly in 1375 many of them rose against the legates, who were mostly French and regarded with dislike as foreigners. Florentine despatches, full of classical allusions and chiefly composed by the famous scholar, Secretary Coluccio Salutati, were rapidly sent in all directions. Those addressed to the Romaus were specially fervid, and emphatically appealed to their patriotism and memories of the past. But the Romans received them with doubt and mistrust, for they saw that the revolution threatened to dismember the state, by promoting the independence of every separate city. Besides, while maintaining their republic, they also desired the pope's pre- sence in Rome. Nevertheless they went with the current to the extent of reforming their constitution. In February 1376 they nominated Giovanni Cenci captain of the people, and gave him uncontrolled power over the towns of the patrimony and the Sabine land. The conservators,

with their new political authority, the executores, the antepositi, and the two councils were all preserved, and a new magis- tracy was created, the "Tres Gubernatores Pacis et Libertatis Reipublicae Romanae." This answered to the Eight (afterwards Ten) of War in Florence, likewise frequently called the Eight of Liberty and Peace. It was this Council of Eight that was now directing the war against the pope and braving his sentence of excommuni- cation ; and their fiery zeal had won them the title of the Holy Eight from the Florentines.

Realizing that further absence would cost him his state, Gregory XI. quitted Avignon on the 13th September 1376, and, reaching Corneto in December, despatched to

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Rome three legates, who, on the 21st of the month, concluded an agreement with the parliament. The people gave up the gates, the fortresses, and the Trastevere, and promised that if the pope returned to Rome he should have the same powers which had been granted to Urban V. But, on his side, he must pledge himself to maintain the executores, their council, the Three of War, and allow the Romans the right of reforming the banderesi, who would then swear fealty to him. The terms of this peace and the pope's epistles clearly prove that the two councils still exercised their functions, that the banderesi were still the virtual heads of the Government, and that their sup- pression was not contemplated. In fact, when the pope made his entry on the 17th January 1377 accompanied by two thousand armed men, he perceived that there was much public agitation, that the Romans did not intend to fulfil their agreement, and that the Government of the banderesi went on as before. Accordingly, after naming Gomez Albornoz, a nephew of the deceased cardinal, to the office of senator, he retired to Anagni, and remained there until November 1377. The Romans presently waited on him with conciliating offers, and begged him to negotiate a peace for them with the prefect of Vico. In fact the treaty was concluded at Anagni in October, and on the 10th November confirmed in Rome by the general council. The meeting was held in the great hall of the Capitol, "ubi consilia generalia urbis fieri solent," in the presence of all the members of the

republican Government. But the pope was enraged by the survival of this Government, and, being worn out by the persistent hostility of the Florentines, which reduced his power to a low ebb, had

appearance of order and unity on his state. But fresh tumults soon arose, partly because the conservators and banderesi sought to govern on their own account, and especially because the pope seems for a time to have omitted naming the senator. Boniface was a prudent nian; he saw that events were turning in his favour, now that throughout Italy liberty was tottering to its fall, and bided his time. He was satisfied for the moment by obtaining a recognition of the immunities of the clergy, rendering them solely amenable to ecclesiastical tribunals, and thus distinguishing the powers of the church from those of the state in Rome. The republic also pledged itself neither to molest the prelates nor to levy fresh contributions on them towards repairing the walls, to aid in recovering the estates of the church in Tuscia, and to try to con- ciliate the baronage. This concordat, concluded with the conservators and banderesi on the 11th September 1391, was also confirmed on the 5th March 1392 by the heads of the regions, together with a fresh treaty binding both parties to furnish a certain number of armed men to com- bat the prefect of Vico and the adherents of the antipope at Viterbo. With the exception of this city, Orchi, and Civita Vecchia, all other conquered territory was to belong to the republic. But the Romans soon discovered that they were playing into the hands of the pope, who kept everything for himself, without even paying the troops. Upon this a riot broke out; Boniface fled to Perugia in October 1392, and resolved to exact better terms when next recalled to Rome. Meanwhile the Romans subdued the prefect, captured Viterbo, and, being already repentant, handed it over to the pope and implored his return. He

determined to make peace, wheu surprised by death on { the 27th March 1378.) The next pope, Urban VI. (1378-89), a Neapolitan, was the spirit of discord incarnate. His election was not altogether regular: the French party among the cardinals

then proposed his own terms, which were approved, not Boniface only by the conservators, banderesi, and four councillors, 1X. con- but also by the special council and by the unanimous vote pene sia of a general assembly composed of the above-mentioned ete

authorities, heads of regions, other officials, and a hundred the re-

was against him; and the people were ripe for insurrec- tion. But, regardless of all this, Urban threatened the cardinals in his first consistory, saying that church reform must begin with them; and he used the same tone with the people, reproving them for failing to suppress the banderesi. In consequence of this the cardinals of the French party, assembling at Fondi, elected the antipope Clement VII. (1378-94) and started a long and painful schism in the church. Clement resided in Avignon, while Urban in Rome was engaged in opposing Queen Joanna I. of Naples and favouring Charles of Durazzo, who, on conquering the Neapolitan kingdom, was made gonfalonier of the church and senator of Rome, where he left a vicar as his deputy. Shortly afterwards the pope went to Naples, and made fierce war on the king. Then, after many adventures, during which he tortured and put to death several cardinals whom he suspected of hostile intentions, he returned to Rome, where the utmost disorder pre-

citizens (8th August 1393). the pope was to elect the senator, and that, on his failing so to do, the conservators would carry on the government after swearing fealty to him. The senatorial function was to be neither controlled nor hampered by the banderesi. The immunities of the clergy were to be preserved, and all church property was to be respected by the magistrates. The expenses of the pope's journey were to be paid, and he was to be escorted to Rome in state. Boniface tried to complete his work by abolishing the banderesi, the last bulwarks of freedom ; but the people, although weakened and weary, made efforts to preserve them, and, although their fall was inevitable, the struggle went on for some time.

During the spring of 1394 the banderesi provoked an insurrection in which the pope's life was endangered ; it was only saved by the arrival of King Ladislaus, who came from Naples with a large force in the early autumn.

Urban vailed. The conservators and the banderesi were still at | But for the Neapolitan soldiery Boniface could not have

VI. the head of the Government, and, the pope speedily falling | withstood the long series of revolts that continually

ee out with them, a riot ensued, after which he excommuni- | exposed him to fresh perils and the anxiety caused by

destruc. cated the banderesi. These at last made submission to | the persistent schism of thechurch. The death of Clement

tion of him, and Urban VI. became master of Rome before his | VII. in 1394 was followed by the election of another . – death in 1389. He was succeeded by Boniface IX. | antipope, Benedict XIII. But a new jubilec was in | public.

(1389-1404), another Neapolitan, but a man of greater

prospect for the year 1400, and this was always an effica-

These terms prescribed that public.

cious means of bending the will of the Romans. Depend- Fai of ing upon this and the assistance of Ladislaus, Boniface the band- not only demanded full powers to nominate senators resi and (none having been recently elected), but insisted on the ithe

shrewdness and capacity. His first act was to crown Ladislaus king of Naples, and secure the friendship and protection of this ambitious and powerful prince. In all the principal cities of the state he chose the reigning lords Peal for his vicars.

But he allowed Fermo, Ascoli, and Bologna the privilege of assuming their own vicariate for twenty- five years. And, as these different potentates and Govern- ments had only to pay him an annual tribute, all parties were satisfied, and the pope was able to bestow at least an

suppression of the banderesi. Both requests were granted; but, directly Angelo Alaleoni was made senator, a con- spiracy was hatched for the re-establishment of the banderesi. However, the pope felt sure of his strength ; the plot was discovered and the conspirators were beheaded

on the stairs of the Capitol. This proved the end of the banderesi and of the liberties of Rome. The government was again directed by an alien senator together with three conservators, but the latter were gradually deprived of their political attributes, and became mere civil officers. The militia, regions, guilds, and other associations now rapidly lost all political importance, and before long were little more than empty names. Thus in 1398 the Romans submitted to the complete sway of the pope, and in July of the same year the senator chosen by him was Mala- testa dei Malatesti of Rimini, one of a line of tyrants, a valiant soldier, who was also temporal vicar and captain general of the church. Boniface continued to appoint foreign senators during the rest of his life; he fortified Castle St Angelo, the Vatican, and the Capitol; he stationed galleys at the mouth of the Tiber, and proved himself in all things a thoroughly temporal prince. He aggrandized all his kindred, especially his brother, and, with the aid of his senator, his armed force, and the protection of Ladislaus, succeeded in keeping down all the surviving nobles. In 1400, however, these made an attempt to upset the Government. Niccold Colonna forced his way into the city with cries of "Popolo, popolo! death to Boniface!" But the Romans had grown deaf to the voice of liberty; they refused to rise, and the senator, a Venetian named Zaccaria Trevisan, behaved with much energy. Colonna and his men had to beat a swift retreat to Palestrina. A charge of high treason was immediately instituted against him, and thirty-one rebels were beheaded. The pope then proclaimed a crusade against all the Colonna, and sent a body of two thousand nten and some of the Neapolitan soldiery to attack them. Several of their estates were seized and devastated, but Palestrina con- tinued to hold out, and on the 7th January 1401 the Colonna finally made submission to the pope. Neverthe- less they obtained advantageous terms, for Boniface left them their lands, appointed them vicars of other territories, and made similar agreements with the Gaetani and Orsini. In

this way he became absolute master of Rome. One chronicler remarks that "Romanis tanquam rigidus imperator dominabatur," and the same tone is taken by others. But he did not succeed in putting an end to the schism of the church, which was still going on when he died in the Vatican on the Ist October 1404.

Innocent VII. (1404-6) was the next pope. He too was a Neapolitan, and on his election the people again rose in revolt and refused to acknowledge him unless he consented to resign the temporal power. But Ladislaus of Naples hastened to his help, and an agreement was made which, under the cover of apparent concessions, really riveted the people's chains. Rome was recognized as the seat of the temporal and spiritual sovereignty of the pope, and the pope continued to appoint the senator. The people were to elect seven governors of the city, who were to swear fealty to the pope and carry on the government in conjunction with three other governors chosen by the pontiff or Ladislaus. The stipulations of Boniface IX. concerning ecclesiastical immunities were again confirmed. The barons were forbidden to place more than five lances each at the service of the people, and—which was the real gist of the covenant—the people were henceforth forbidden to make laws or statutes without the permission of the pope. The captain of the people, deprived of his political and judicial functions and reduced to a simple judge, was also to be chosen by the pope. But this treaty, drawn up on the 27th October 1404, was not signed at the time, and many difficulties and disturbances arose when its terms were to be put into effect. The Romans nominated the Seven governors, but, without waiting until the pope had chosen three more, placed the state in their hands,

and styled them governors of the liberty of the Roman

republic. They were in fact banderesi or reformatori under a new name. But the attempt proved inefficacious, for, at the pope's first threat of departure, the Romans made their submission, and the treaty of October was sub- scribed on the 15th May 1405. Nevertheless, as it only bears the

signatures of the "seven governors of the liberty of the Roman republic," the pope would seem to have made some concessions. His position was by no means assured. Ladislaus was known to aspire to absolute dominion in Italy, and, although willing to aid in sup- pressing the republic, tried to prepare the way for his own designs, and frequently held out a helping hand to the vanquished. On the 6th August fourteen influential citizens of Rome boldly presented themselves at the Vatican, and in a threatening manner called the pope to account for giving his whole attention to worldly things, instead of endeavouring to put a stop to the schisms of the church. But, on leaving his presence, they were attacked by Luigi Migliorati, the pope's nephew, and notorious for his violence, who killed eleven of their number, including several heads of the regions and two of the governors. An insurrection ensued, and the pope and his nephew fled to Viterbo. The Colonna tried to profit by these events, and applied to Ladislaus, who, hoping that the moment had come to make himself master of Rome, sent the count of Troia thither with a troop of three thousand horse. But the people, enraged by this treachery, and determined not to fall under the yoke of Naples, awoke for an instant to the memory of their past glories, and bravely repulsed the Colonna and the Neapolitans. And, on the speedy arrival of the Orsini with some of the papal troops, the people voluntarily restored the papal govern- ment, and, assembling the parliament, besought the pope to return on his own terms. Accordingly, after first naming Francesco Panciatichi of Pistoia to the senatorship, the pope came back on the 13th March 1406, bringing his whole curia with him, and also the murderer Migliorati, who, triumphing in impunity, became more arrogant than before. Here indeed was a proof that the Romans were no longer wortlLy of liberty! And now, by means of the Orsini, Innocent had only to reduce the Colonna and other nobles raised to power by Ladislaus; nor was this very difficult, seeing that the king, in his usual fashion, abandoned them to their fate, and, making terms with the pope, was named gonfalonier of the church and again protected her cause. Innocent, dying in 1406, was succeeded by Gregory XIL,, a Venetian, who, as we shall presently see, resigned the chair in 1415. On his accession, finding his state firmly established, he seemed to be seriously bent on putting an end to the Great Schism, and for that purpose arranged a meeting with the antipope Benedict XIII. at the congress of Savona in 1408. But Gregory and Benedict only used the

congress as a pretext for making war upon each other, and were urged on by Ladislaus, who hoped by weakening both to gain possession of Rome, where, although opposed by the Orsini, he had the support of the Colonna. Gregory, who had then fled from Rome, made a momentary attempt to win the popular favour by restoring the govern- ment of the banderesi; but Ladislaus marched into Rome Ladislaus in June 1408 and established a senator of his own. master of Meanwhile the two popes were continuing their shameful ®°™¢ struggle, and the council of Pisa (March 1409), in attempt- ing to check it, only succeeded in raising up a third pontiff, first in the person of Alexander V. (1409-10), and then in the turbulent Baldassare Cossa, who assumed the name of John XXIII. The latter began by sending a large contingent to assist Louis of Anjou against Ladislaus. But the enterprise failed, and, seeing himself deserted by

all, Pope John next embraced the cause of his foe by

End

of the schism, and elec- tion of Martin V.

Rome in a state of anarchy.

The popes of the Renais- sance.

1400-1447.] ROME 805

naming him gonfalonier of the church. Thereupon | foreign intrigues, falsehoods, and treacheries of Italian

Ladislaus concluded a sham peace, and then, seizing Rome, put it to the sack and established his own government there. Thus John, like the other two popes, became a wanderer in Italy. In August 1414 Ladislaus died and was succeeded by the scandalous Queen Joanna II. The Roman people promptly expelled the Neapolitans, and Cardinal Isolani, John's legate, succeeding in rousing a reaction in favour of the church, constituted a govern- ment of thirteen " conservators" on the 19th October.

In November 1414 the council of Constance assembled, and at last ended the schism by deposing all the popes, and incarcerating John XXIII., the most turbulent of the three. On the 11th November 1417 Oddo Colonna was unanimously elected to the papal chair; he was consecrated in the cathedral on the 27th as Pope Martin Y., and, being acknowledged by all, hastened without delay to take possession of his see. Meanwhile disorder was at its height in Rome. The cardinal legate Isolani governed as he best could, while Castle St Angelo re- mained in the hands of the Neapolitans, who still had a party in the city. In this divided state of affairs Braccio, a daring captain of adventurers, nicknamed Fortebraccio, was inspired with the idea of making himself master of Rome. Overcoming the feeble resistance opposed to him, he succeeded in this on the 16th June 1416 and assumed the title of "Defensor Urbis." But Joanna of Naples despatched Sforza, an equally valiant captain, against him, and, without offering battle, Fortebraccio withdrew on the 26th August, after having been absolute master of the eternal city for seventy days. Sforza marched in on the 27th, and took possession of the city in the name of Joanna. Martin V. instantly proved himself a good statesman. He confirmed the legate Isolani as his vicar, and Giovanni Savelli as senator. Leaving Constance on the 16th May 1418, he reached Milan on the 12th October, and slowly proceeded on his journey. While in Florence he despatched his brother and nephew to Naples to make alliance with Joanna, and caused her to be crowned on the 28th October 1419 by his legate Morosini. Upon this she promised to give up Rome to the pope. Her general, Sforza, then entered the service of Martin V., and compelled Fortebraccio, who was lingering in a threatening attitude at Perugia, to make peace with the pope. The latter entrusted Fortebraccio with the conduct of the campaign against Bologna, and that city was reduced to submission on the 15th July 1420. The Romans had already yielded to Martin's brother the legate, and now earnestly besought the arrival of their pope. Accordingly he left Florence on the 19th September 1420, and entered the Vatican on the 28th. Rome was in ruins; nobility and burghers were equally disorganized, the people unable to bear arms and careless of their rights, while the battered walls of the Capitol recorded the fall of two republics.

Martin V. had now to fulfila far more difficult task than that of taking possession of Rome. Throughout Italy municipal freedom was

overthrown, and the Roman republic had ceased to exist. The Middle Ages were ended ; the Renaissance was beginning. The universal unity both of church and of empire was dissolved ; the empire was now Germanic, and derived its principal strength from direct dominion over a few provinces. Independent and national states were already formed or forming on all sides. The papacy itself had ceased to claim universal supremacy over the world's Govern- ments, and the possession of a temporal state had become essential to its existence. In fact Martin V. was the first of the series of popes who were real sovereigns, and more occupied with politics than religion. Involved in all the

diplomacy in the 15th century, their internal policy was imbued with all the arts practised by the tyrants of the Renaissance, and nepotism became necessarily the basis of their strength. It was natural that men suddenly elected sovereigns of a new country where they had no ties, and of which they had often no knowledge, should seek to strengthen their position by aggrandizing so-called nephews who were not unfrequently their sons.

Martin V. reduced the remains of the free Roman The

Government to a mere civil municipality. Following the temporal method of the other despots of Italy, the old republican oe institutions were allowed to retain their names and forms, popes their administrative and some of their judicial attributes, raised on while all their political functions were transferred to the new the ruins Government. Order was re-established, and justice rigidly ° te observed. Many rebellious places were subdued by the 2" sword, and many leaders of armed bands were hanged. The pope, however, was forced to lean on his kinsmen the Colonna and again raise them to power by grants of vast fiefs both in his own state and the Neapolitan territory. And, after first supporting Joanna IT., who had assisted his entry into Rome, he next sided with her adversary, Louis of Anjou, and then with Alphonso of Aragon, the con-queror of both and the constant friend of the pope, who at last felt safe on his throne. Rome now enjoyed order, peace, and security, but had lost all hope of liberty. And when Martin died (20th February 1431) these words were inscribed on his tomb, Temporum suorum felicitas.

*Eugenius IV. (1431-47) leant on the Orsini, and was A revolu- fiercely opposed by the Colonna, who excited the people tion against him. Accordingly on the 29th May 1434 the °xels the Romans rose in revolt to the old cry of " Popolo e popolo," * ~~ and again constituted the rule of the seven governors of liberty. The pope fled by boat down the Tiber, and, being pursued with stones and shots, narrowly escaped with his life. On reaching Florence, he turned his energies to the recovery of the state. It was necessary to quell the people ; but, first of all, the Colonna and the clan of the prefects of Vico, with their renewed princely power, had to be overthrown. The Orsini were still his friends. Eugenius entrusted the campaign to Patriarch (afterwards Cardinal) Vitelleschi, a worthy successor of Albornoz, and of greater ferocity if less talent. This leader marched his army towards Rome, and, instantly attacking Giovanni, prefect of Vico, captured and beheaded him. The family was now extinguished; and, its possessions reverting to the church, the greater part of them were sold or given to Count Everso d'Anguillara, of the house of Orsini. The prefecture, now little more than an honorary title, was bestowed at will by the popes. Eugenius gave it to Francesco, founder of the powerful line of the Gravina- Orsini. Thus one noble family was raised to greatness while another perished by the sword. Vitelleschi had already begun to persecute the Colonna and the Savelli, and committed terrible slaughter among them. Many castles were demolished, many towns destroyed ; and their inhabitants, driven to wander famine-stricken over the Campagna, had to sell themselves as slaves for the sake of bread. Finally the arrogant patriarch marched into Rome, as into a conquered city, at the head of his men, and the Romans crouched at his feet. The pope now began to distrust him, and sent Scarampo, another prelate of the same stamp, to take his place. This new commander soon Eugenius arrived, and, perceiving that Vitelleschi proposed to resist, V- had him surrounded by his soldiers, who were obliged to ee ee use force to compel his surrender. Vitelleschi was carried : j; bleeding to Castle St Angelo, where he soon afterwards died. The pope at last returned to Rome in 1443, and remained there quietly till his death in 1447.*

His successor Nicholas V. (1447-55) was a scholar solely devoted to the patronage of literati and artists. During his reign there was a fresh attempt to restore the republic, but it was rather prompted by literary and classical enthusiasm than by any genuine patriotic ardour. Political passions and interests had ceased to exist. The

Con- conspiracy was headed by Stefano Porcari, a man of the spiracy of people, who claimed to be descended from Cato. He had Stefano once been captain of the people in Florence, and was made a podesta of Bologna by Eugenius IV. He was a caricature of Cola di Rienzo, and extravagantly proud of his Latin speeches in honour of ancient republican liberty. The admiration of antiquity was then at its height, and Porcari found many enthusiastic hearers. Directly after the death of Eugenius IV. he made a first and unsuccessful attempt to proclaim the republic. Nevertheless Nicholas V., with the same indulgence for scholars that had prompted him to pardon Valla for denying the temporal power of the papacy and laughing to scorn the pretended donation of Constan- tine, freely pardoned Porcari and named him podesta of Anagni. He filled this office with credit, but on his return to Rome again began to play the agitator, and was banished to Bologna with a pension from the pope. Nicholas V. had conferred all the state offices upon priests and abbots, and had erected numerous fortresses. Hence there were many malcontents in Rome, in communication with Porcari at Bologna, and ready to join in his plot. Arms were collected, and on the day fixed he presented himself to his fellow-conspirators adorned with rich robes and a gold chain, and harangued them in Latin on the duty of freeing their country from the yoke of the priests. His design was to set fire to the Vatican on the 6th January 1453, the feast of the Epiphany ; he and his followers were to seize the pope, the cardinals, and Castle St Angelo. But Nicholas received timely warning ; the conspirators' house was surrounded ; and Porcari himself was seized while trying to escape, confined in Castle St Angelo, and put to death with nine of his companions on the 9th January. Others shortly suffered the same fate.

Under Calixtus ITI. and Pius II. affairs went on quietly enough, but Paul II. (1464-71) had a somewhat troubled reign. Yet he was a skilled politician. He re- ordered the finances and the courts of justice, punished

crime with severity, was an energetic foe to the Malatesta of Rimini, put an end'to the oppression exercised in Rome by the wealthy and arrogant house of Anguillara, and kept the people in good humour with continual festivities. But—and this was a grave defect at that period—he extended no favour to learning, and, by driving many scholars from the curia to make room for his own kins- men, brought a storm about his ears. At that time the house of Pomponio Leto was the rendezvous of learned men and the seat of the Roman Academy. Leto was an enthusiast of antiquity; and, as the members of the Academy all assumed old Latin names, they were suspected of a design to re-establish paganism and the republican

Men of government. It is certain that they all inveighed against learning the pope; and, as the latter was no man of half measures, vied on GUting the carnival of 1468 he suddenly imprisoned twenty suspicion Academicians, and even subjected a few of them to torture. of re- Pomponio Leto, although absent in Venice, was also

ae arrested and tried ; but he exculpated himself, craved for- dencies, &! ¥eness, and was set at liberty. His friends were also re- leased, for the charge of conspiracy proved to be unfounded. Certain members of the Academy, and notably Platina in his Lives of the Popes, afterwards revenged themselves by stigmatizing Paul II. as the persecutor of philosophy and letters. _ But he was no more a persecutor than a patron of learning ; he was a politician, the author of some useful reforms, and solely intent on the consolidation of his

absolute power. Among his reforms may be classed the revision of the Roman statutes in 1469, for the purpose of destroying the substance while preserving the form of the old Roman legislation, and entirely stripping it of all political significance. In fact the pope's will was now absolute, and even in criminal cases he could trample unhindered on the common law.

There was still a senator of Rome, whose nomination was entirely in the hands of the pope, still three conser- vators, the heads of the rioni, and an

elected council of twenty-six citizens. Now and then also a shadowy semblance of a popular assembly was held to cast dust in the eyes of the public, but even this was not forlong. All these officials, together with the judges of the Capitol, retained various attributes of different kinds. They administered justice and gave sentence. There were numerous tribunals all with undefined modes of procedure, so that it was very difficult for the citizens to ascertain in which court justice should be sought. But in last resort there was always the supreme decision of the pope. Thus matters remained to the time of the French Revolution.

For the completion of this system a final blow had to be dealt to the aristocracy, whose power had been increased by nepotism ; and it was dealt by bloodshed under the three following popes—Sixtus IV. (1471-84), Innocent VIII. (1484-92), and Alexander VI. (1492-1503)—each of whom was worse than his predecessor. The first, by means of his nephews, continued the slaughter of the Colonna, sending an army against them, devastating their estates at Marino, and beheading the protonotary Lorenzo Colonna. Innocent VIII. was confronted by the power of the Orsini, who so greatly endangered his life by their disturbances in the city that he was only saved by an alliance with Naples. Neither peace nor order could be lastingly established until these arrogant barons were overthrown. This task was accomplished by the worst of the three pontiffs, Alexander VI. All know how the mas- sacre of the Orsini was compassed, almost simultaneously, by the pope in Rome and his equally iniquitous son, Ceesar Borgia, at Sinigaglia (1502). This pair dealt the last blow to the Roman aristocracy and the tyrants of Romagna, and thus the temporal dominion of the papacy was finally assured. The republic was now at an end; it had shrivelled to a civil municipality. Its institutions, deprived of all practical value, lingered on like ghosts of the past, subject from century to century to unimportant changes. The his- tory of Rome is henceforth absorbed in that of the papacy.

Nevertheless the republic twice attempted to rise from Post- its grave, and on the second occasion gave proofs of heroism medieval worthy of its past. It was first resuscitated in February Rome. 1798, by the influence of the French Revolution, and the French constitution of the year III. was rapidly imitated. Rome had again two councils—the tribunate and the

senate, with five consuls constituting the executive power. But in the following year, owing to the military reverses of the French, the government of the popes was restored until 1809, when Napoleon I. annexed to his empire the States of the Church. Rome was then governed by a con- sulta straordinaria—a special commission—with the muni-. cipal and provincial institutions of France. In 1814 the papal government was again reinstated, and the old institutions, somewhat modified on the French system, were recalled to life. Pius IX. (1846-77) tried to intro- duce fresh reforms, and to improve and simplify the old machinery of state; but the advancing tide of the Italian revolution of 1848 drove him from Rome; the republic was once more proclaimed, and had a brief but glorious existence. Its programme was dictated by Joseph Mazzini, who with Saffi and Armellini formed the triumvirate at the head of the Government. United Italy was to bea

TOPOGRAPHY. | RO republic with Rome for her capital. The rhetorical idea of Cola di Rienzo became heroic in 1849. The constituent assembly (9th February 1849) proclaimed the fall of the temporal power of the popes, and the establishment of a republic which was to be not only of Rome but of all Italy. France, although then herself a republic, assumed the unenviable task of re-establishing the temporal power by force of arms. But the gallant defence of Rome by General Garibaldi covered the republic with glory. The enemy was repulsed, and the army of the Neapolitan king, sent to restore the pope, was also driven off. Then, how- ever, France despatched a fresh and more powerful force ; Rome was vigorously besieged, and at last compelled to surrender. With June 1849 begins the new series of pontifical laws designed to restore the government of Pius IX., whose reign down to 1870 was that of an absolute sovereign. Then the Italian Government entered Rome (20th September 1870), proclaimed the national constitu- tion (9th October 1870), and the Eternal City became the capital of Italy. Thus the scheme of national unity, the natural outcome of the history of Rome and of Italy, impossible of accomplishment under the rule of the popes, was finally achieved by the monarchy of Savoy, which, as the true representative and personification of Italian interests, has abolished the temporal power of the papacy and made Rome the seat of government of the united country. @v:) Leapinc AvTHORITIES.—Anetent History.—(1) Monarchy and

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PART II.—TOPOGRAPHY AND ARCHEOLOGY.

Rome? is situated (41° 58' 52" N. lat., 12° 28' 40" E. long.) on the banks of the Tiber, Italy, 14 miles from its present mouth, in a great plain of alluvial and marine deposit, broken into elevations by numerous masses of voleanic matter. The nine or ten hills and ridges on which the city stands are formed of masses of tufa or con- glomerated sand and ashes thrown out by neighbouring volcanoes now extinct, but active down to a very recent period. One group of these volcanoes is that around Lago Bracciano, while another, still nearer to Rome, composes the Alban Hills. That some at least of these craters have been in a state of activity at no very distant period has been shown by the discovery at many places of broken pottery and bronze implements below the strata of tufa or other volcanic deposits. Traces of human life have even been found below that great flood of lava which, issuing from the Alban Hills,

scorie into a soft and friable rock ; in other places they still lie in loose sandy beds and can be dug out with the spade. Other masses of tufa again show signs either of having been deposited in water, or else washed away from their first resting-place and redeposited with visible stratifications ; this is shown by the water-worn pebbles and chips of limestone rock, which form a conglomerate bound together by the volcanic ashes into a

sort of natural cement. A third variety is that which exists on the Palatine Hill. Here the shower of red-hot ashes has evidently fallen on a thickly-growing forest, and the burning wood, partly smothered by the ashes, has been converted into charcoal, large masses of which are embedded in the tufa rock. In some places charred branches of trecs, their form well preserved, can be easily distinguished. The so-called

‘ wall of Romulus” is built of this conglomerate of tufa and charred

flowed towards the site of Rome, only stopping about 3 miles short,

by the tomb of Cecilia Metella. | The superficial strata on which Rome is built are of three main

kinds : (1) the plains and valleys on the left bank of the Tiber are

wood ; a very perfect section of the branch of a tree is visible on one of the bloeks by the Scale Caci.

So great have been the physical changes in the site of Rome Physieal since the first dawn of the historic period that it is difficult now changes

Site.

covered, as it were, by a sea of alluvial deposit, in the midst of

which (2) the hills of volcanic origin rise like so many islands ; and |

(3) on the right bank of the Tiber, around the Janiculan and Vatican Hills, are extensive remains of an ancient sea-beach, conspicuous in parts by its fine golden sand and its deposits of greyish white potter’s clay. From its yellow sand the Janiculan has been some- times known as the Golden Hill, a name which survives in the church on its summit called 8. Pietro in Montorio (Monte d’Oro). In addition to these three chief deposits, at a few places, especially in the Aventine and Pincian Hills, under-strata of travertine crop out—a hard limestone rock, once in solution in running water, and deposited gradually as the water lost its carbonic-acid solvent, a process still rapidly going on at Terni, Tivoli, and

other places in the neighbourhood. The conditions under whieh the tufa hills were formed have been very various, as is clearly seen by an ex- amination of the rock at different places. The volcanic ashes and sand of which the tufa is composed appear in parts to lie just as they were showered down from the crater; in that case it shows but little sign of stratification, and consists wholly of igneous pro- ducts. In parts time and pressure have bound together these

Ce ee

1 The limited space available for the following article is devoted mainly to those buildings of which some remains still exist, to the unavoidable neglect of a large number which are known only from documentary evidence. The plan of the Foruin (Plate VII.) and nearly all the cuts have been measured and drawn by the author specially to illustrate this article.

to realize what its aspect once was. Velabrum, the great Campus Martius (now the most crowded part of modern Rome), and other valleys were once almost impassable marshes or pools of water (Ov., Fast., vi. 401; Dionys., 0h, EOE The draining of these valleys was effected by means of the great cloace, which were among the earliest important architectural works of Rome (Varro, Ling. Lat., iv. 149). Again, the various hills and ridges were once more numerous and very much more abrupt than they are now. At an early period, when each hill was crowned by a separate village fort, the great object of the inhabitants was to increase the steepness of its cliffs and render access difficult, At a later time, when Rome was united under one government, the very physieal peculiarities which had originally made its hills so populous, through their natural adaptability for defence, beeame extremely inconvenient in a united city, where architectural symmetry and splendour were above all things aimed at. Hence the most gigantic engineering works were undertaken : tops of hills were levelled, whole ridges eut away, and gentle slopes formed in the place of abrupt clifis. The levelling of the Velia and the excavation of the site for Trajan's forum are instances of this. The same works were continued in the Middle Ages, as when in the 14th century an access was made to the Capitoline Arx? from the side of the Campus Martius ; up to

that time a stcep cliff had prevented all approach except from the side of the Forum. pha i a ae a

2 By the great flight of marble steps up to 8, Maria in Ara Coli.

The Forum Romanum, the in site.

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And under the present Government an even more extensive plan, called the "piano regolatore," is being (1886) gradually carried out, with the object of reducing hills and valleys to one uniform level, ou which wide boulevards are being constructed on the chess- board plan of an American city. 'The constant fires which have devastated Rome have been a great agent in obliterating the natural contour of the ground. The accumulated rubbish from these and other causes has in some places covered the ground to the depth of 40 feet, especially in the valleys.

Climate The climate of Rome in ancient times appears to have been

and colder than it is at present. Malarious fever in and around the

health. city existed to some extent, but to a much less degree thau it does now. The magnificent villa of Hadrian and other country houses near Rome are built on sites which are now very unhealthy. The sanitary superiority of the Campagna in ancient times was mainly due to its more complete drainage and thicker population. That fever did exist is, however, proved in many ways. Altars to the goddess Febris were erected on the Palatine and other hills, and on the Esquiline was a grove dedicated to Mephitis. The popula- tion of Rome! increased with great rapidity, till, during its most populous period in the 4th century, it was probably not less than 24 millions.?

strength and coherence. Stucco, cement, and mortar (teetortwm, opus albarium, structura testacea, and other names) are of many kinds; the ancient Romans especially excelled in their manufac- ture. The cement used for lining the channels of aqueducts (opus signinum) was made of lime mixed with pounded brick or potsherds and pozzolana; the same

mixture was used for floors under the "'nucleus " or finer cement on which the mosaic or marble paving- slabs were bedded, and was called cementum ex testis tunsis. For walls, three or four coats of stucco were used, often as much as 5 inches thick altogether ; the lower coats were of lime and pozzolana, the finishing coats of powdered white marble (opus albarvum) suit- able to receive painting. Even marble buildings were usually coated with a thin layer of this fine white stucco, nearly as hard and durable as the marble itself—a practice also employed in the finest buildings of the Greeks—probably because it formed a more absorbent ground for coloured decoration ; stone columns coated in this way were called "columne dealbate " (Cie., In Verr., ii. 1, 52 sq.). For the kinds of sand used in mortar and stucco Vitruvius (ii. 4) mentions sea, pit, and river sand, saying that pit sand is to be preferred.

Marble appears' to have come into use about the beginning of the Decora- Ist century B.c. Its introduction was at first viewed with great tive |

ANCIENT Roms. Architecture and Construction.

Building The chief building materials uscd in ancient Rome were those

materials. enumerated below. (1) Tufa, the 'ruber et niger tophus" of Vitruvius (ii. 7), the formation of which has been described above, is usually a warm brown or yellow colour. The Aventine, Palatine, and Capitoline Hills contained quarries of the tufa, much worked at an early period (see Liv., xxvi. 27, xxxix. 44, and Varro, L.L., iv. 151). It isa very bad "weather-stone," but stands well if pro- tected with stucco (Plin., H.N., xxxvi. 48). (2) Lapis Albanus, from Alba Louga, is also of volcanic origin, a conglomerate of ashes, gravel, and fragments of stone ; its quarries are still worked at Albano and Marino. (3) Lapis Gabinus, from Gabii, is very similar to the last, but harder and a better weather-stone ; it contains large lumps of broken lava, products of an earlier eruption, and small pieces of limestone. According to Tacitug (Ann., xv. 43), it is fire-proof, and this is also the case with the Alban stone. Both are now called peperino, from the black scorie, like pepper- corns, with which the brown conglomerate mass is studded. (4) Silex (mod. selec), a lava from the now extinct volcanoes in the Alban Hills, was used for aving roads, and when

broken into small pieces and mixed a lime and pozzolana formed an im- inensely durable concrete. It is dark grey, very hard, and breaks with a slightly conchoidal fracture (Plin., H.N., xxxvi. 29; Vitr., ii. 7), but does not resemble what is now called stlex or flint. (5) Lapis Tiburtinus (travertine), the chief quarries of which are at Tibur (Tivoli) and other places along the river Anio, isa hard pure carbonate of lime, of a creamy white colour, deposited from run- ning or dripping water in a highly stratified form, with frequent cavities and fissures lined with crystals. As Vitruvius (ii. 5) says, it is a good weather-stone, but is soon calcined by fire. If laid horizontally it is very strong, but if sct on end its crystalline struc- ture is a great source of weakness, and it splits from end to end. Neglect on the part of Roman builders of this important precau- tion in many cases caused a complete failure in the structure. This was notably the case in the rostra (see below). (6) Pulvis Puteo- lanus (pozzolana), so called from extensive beds of it at Puteoli, is a voleanic product, which looks like red sandy earth, and lies in enormous beds under and round the city of Rome. When mixed with lime it forms a very strong hydraulic cement, of equal use in concrete, mortar, or undercoats of stucco. It is to this material that the concrete walls of Rome owe their enormous strength and durability, in many cases far exceeding those of the most massive stone masonry. Vitruvius devotes a chapter (bk. ii, ch. 6) to this very important material.

Bricks were either sun-dried or kiln-baked (lateres crudi aut cocti). The remarks of Vitruvius (ii. 3) seem to refer wholly to sun-dried bricks, of which no examples now exist in Rome. It is very important to recognize the fact that among the existing ancient buildings of Rome there is no such thing as a brick wall or a brick arch in the true sense of the word; bricks were merely used as a fac-

jealousy, as savouring of Greek luxury. The orator Crassus was materials, the first to use it in his house on the Palatine, built about 92 B.c. ; | and, though he had only six small columns of Hymettian marble, | he was for this luxury nicknamed the " Palatine Venus" by the stern republican M. Brutus (Plin., A.N., xxxvi. 3). The tem- porary wooden theatre of the edile M. Amilius Scaurus, built in 58 B.C., appears to have been the first building in which marble was | more largely used ; its 8360 columns and

the lower order of its scena were of Greek marble (see Plin., H.N., xxxvi. 3, 24). Ina very few : years, under the rule of Augustus, marble became very common. ?

Of white statuary marble four principal varietics were used. (1)) Marmor Lunense, from Luna, near the modern Carrara (Strabo, v.), is of many qualities, from the purest creamy white and the finest grain to the coarser sorts disfigured with bluish grey streaks. (Ex., the eleven Corinthian columns in the Dogana di Terra.) (2) Mar- |

mor Hymettium, from Mount Hymettus, near Athens, is coarser in grain than the best Luna marble and is usually marked with grey or blue striations (Strabo, x.), (Ex., the forty-two columns in the nave ofS Maria Maggiore and the columns in §. Pietro in Vincoli.) (8) Marmor Pentelicum, from Mount Pentelicus, also near Athens, is very fine in grain and of a pure white ; it was more used for : architectural purposes than for statues, though some sculptors pre- | ' |

ferred it above all others, especially Scopas and Praxiteles (Paus., Arcad., viii.). (Ex., the bust of the young Augustus in the Vatican.) (4) Marmor Pariwm, from the Isle of Paros, is very beautiful, though coarse in texture, having a very crystalline structure.

Nine chief varicties of coloured marbles were used in Rome. (1) Coloured Marmor Numidiewm (mod. giallo antico ; Plin., H.N., v. 3), from marbles. Numidia and Libya, hence also called Libycum, is of a rich yellow, deepening to orange and even pink, Enormous quantities of it were used, especially for columns, wall-linings, and pavements. (Ex., six large columns in the Pantheon and seven on the arch of Con- stantine, taken from the arch of 'Trajan ; the eighth column is iu the Lateran basilica.) (2) Marmor Carystiwm (mod. etpollino), from | Carystus in Eubcea (Strabo, x.), has alternate wavy strata of white i] and pale green—the " undosa Carystos " of Statius (Sélv., i. 5, 86). ' From its well-defined layers like an onion (cipolla) is derived its 1 modern name. (Ex., columns of temple of Faustina.) (3) Marmor il Phrygium or Synnadicum (mod. pavonazetto), from Synnada in Phrygia (Strabo, xii. ; Juv., xiv. 307 ; Tibull., iii, 3, 18), is a slightly translucent marble, with rich purple markings, violet . verging on red. _ It was fabled to be stained with the

blood of Atys | (Stat., Stlv., i. 5, 86). (Ex., twelve fluted columns in S. Lorenzo fuori le Mura, and large columns in the apse of S. Paolo fuori, saved | from the ancient nave of the basilica, burnt in 1828.) (4) Marmor Lasiwm (probably the modern porta santa), from asus, is mottled 1 with large patches of dull red, olive green, and white. The "holy | door" of St Peter's is framed with it, hence its modern name. | (Ex., the slabs in front of the Grecostasis and four columns in 8.

Agnese fuori le Mura.) (5) Marmor Chium (probably the modern i Africano), from Chios, is similar in colour and marking to the | porta santa, but more brilliant in tint. (Ex, a great part of the

paving of the Basilica Julia and two large columns in the centre of

the fagade of St Peter's.) (6) Rosso antico (the ancient name is un-

known) is a very close-grained marble of a rich deep red, like blood.

Asa rule it does not occur in large pieces, but was much used for

3 The oft-quoted boast of Augustus (Suet., Aug., 29) that he ' found Roine of brick and left it of marble" has probably much truth in it, if for "brick" we read " peperino and tufa." In the time of Augustus burnt brick was very i little used, the usual wall-facings being opus quadratum of tufa or peperino, and opus reticulatum of tufa only. The confessiones or erypts in front of the high {

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from about the size of a man's fist and embcdded in cement made of lime and pozzolana,—forming one solid mass of enormous

I See a good article on this subject in the Monografia di Roma, vol. ii., 1878 2 Works to be consulted.—GroLoay.—Brocchi, Sue di Roma, 1820, and its supplement by Ponzi, Storia Jisica di Roma, 1867 : Mantovani,

Descrizione geologica della, Campagna di Roma, 1875 ; Giordano and Mantovani, Monograjia di Roma, 1878, vol. i. pp. 1-exxili., and pp. 51-79; Mauro, Analisi chimica delle , 1884; Pinto, Aque potabili nell Agro Romano, 1883. eae AND ZooLocy.—Bonaparte, Fauna Italica, 1835; Sanguinetti, Pro- Lromus Flore Romane ; Deakin, Flora of the Colosseum, 1855 ; Terrigi, ' Flora &c., del Quirinale," in Acad. Pont. d. Lincei, May 1882. '*

altars of St Peter's, 8. Maria Maggiore, 8. Pietro in Vincoli, and other churches in Rome are museums of the rarer and more splendid marbles used by the ancient Romans, as their walls and pavements are covered with the richest Specimens found during excavations. All the fine marbles in Roman churches have been taken from ancient buildings ; an excellent account of these is given by Corsi, Pietre antiche, 1845.

Granites From the latter part of the 1st century B.c. hard stones— granites At first tufa only was used in opus quadratum, as we sec in the Opus and and basalts—were introduced in great quantities. The basalts— | so-called wall of Romulus. Next the harder peperino began to be quad- basalts. "basanites" of Pliny (xxxvi. 11)—are very refractory, and can only | worked: it is used, though sparingly, in the great Servian wall, ratum. be worked by the help of emery or diamond dust. The former was | and during the later republic appears to have been largely employed obtained largely at Naxos; diamond-dust drills are mentioned by | for exterior walls or points where there was heavy pressure, while Pliny (H.N., xxxvii. 76). The basalts are black, green, and brown, | other parts were built of tufa. Thirdly, travertine appears to have 'and are usually free from spots or markings ; examples of all three | been introduced about the 2d century B.C., but was used at first for exist, but are comparatively rare. The red variety called "por- | merely ornamental purposes, very much as marble was under the phyry " was used in enormous quantities. It is the " porphyrites" | empire ; after about the middle of the 1st century A.D. travertine of Pliny (#.N., xxxvi. 11), and was brought from Egypt. It has a | began to be largely used for the solid mass of walls, as in the temple rich red ground, covered with small specks of white felspar; hence | of Vespasian and the a it was also called "leptopsephos." A large number of columns of | Colosseum. The tufa al

HAT il Mh it exist, and it wasmuch used for pavements of opus Alexandrinum. | or peperino blocks uA MN A rich green porphyry or basalt was also largely used, but not in | were roughly 2 (Ro- such great masses as the red porphyry. It has a brilliant green | man) feet thick in ground covered with rectangular light green crystals of felspar. | regular courses, iso- This is the lapis Lacedemonius (wrongly called by the modern | domuwm, by 2 feet Romans "'serpentino"), so named from its quarries in Mount | across the end, and Taygetus in Lacedemonia (Paus., Lac., iii. and viii.; Plin., H.N., | under the republic Xxxvi, 11; Juv., xi. 173). It appears to have been mostly used | often exactly 4 feet for pavements and panels of wall linings. The granites used in | long, so that two Rome came mostly from near Phile on the Nile (Plin., H.N., | blocks set endways xxxvi. 13). The red sort was called lapis pyrrhopecilus and the | ranged with one set grey lapis pswronius, The columns in the Basilica Ulpia are a fine | lengthways. They example of the latter ; both sorts are uscd for the columns of the | were then arranged Pantheon and those of the temple of Saturn in the Forum. Gigantic | in alternate courses ships were specially made to carry the obelisks and other great | of headers and _ monoliths (Plin.,, H.W, xxxvi. 1, 14). stretchers, so as to Archi- The style of architecture employed in ancient Rome may be said | make a good bond ; tectural +o have passed through three stages,—the Etruscan, the Greek, and | this is the "em- styles. the Roman. During the first few centuries of the existence of the plecton" of Vitruvius city, both the methods of construction and the designs employed | (ii. 8). The so- called appear to have been purely Etruscan. The earliest temples were | Tabularium of the either simple celle without columns, as we see on the Palatine by | Capitol is a good the Scale Caci, or else, in the case of the grander temples, such as | example of this (see fig. 1). The harder

ARCH ZOLOGY. |

small cornices and other mouldings in interiors of buildings. Its uarries in Greece are still worked. (The largest pieces known are ie fourteen steps to the high altar of S. Prassede and two columns nearly 12 feet high in the Rospigliosi Casino dell' Aurora.) (7) Nero antico is probably the ancient marmor Tenarium, from Cape Tenarus in Sparta. It is mentioned by Tibullus (iii. 3, 14) in con- junction with Phrygian and Carystian

marbles ; see also Prop., iii. 2, and Plin., H.N., xxxvi. 48. (Ex., two columns in the choir of the church of Ara Ceeli.) (8) Lapis Atracius (verde antieo), found at Atrax in Thessaly (Liv., xxxii. 15), was one of the favourite materials for decorative architecture ; it is not strictly a marble (i.¢., a calcareous stone) but a variety of " precious serpentine," with patches of white and brown on a brilliant green ground. It seldom oceurs in large masses. (The finest known specimens are the twenty-four columns beside the niches in the nave of the Lateran basilica.) (9) The hard Oriental alabaster, the " onyx" or 'falabastrites" of Pliny (H.N., xxxvi. 12, xxxvii. 32); its chief quarries were on the Nile near Thebes,! in Arabia, and near Damascus. In Pliny's age it was a great rarity ; but in later times it was introduced in large quantities, and fragments of a great many columns have been found on the Palatine, in the baths of Caracalla, and elsewhere. It is semi-transparent, and beautifully marked with concentric nodules and wavy strata. An immense number of other less common marbles have been found, including many varieties of breccia, but their ancient names are unknown.

that of Capitoline Jupiter, the columns were very widely spaced (areostyle), and consequently had entablatures of wooden beams. The architectural decorations were more generally in gilt bronze or painted terra-cotta than in stone, and the paintings or statues which decorated the buildings were usually the work of Etruscan

very able engineers, and this led to the development of a new and more purely Roman style, in which the restrictions imposed by the use of the stone lintel were put aside and large spaces were covered with vaults and domes cast in semifluid concrete, a method which had the enormous advantage of giving the arched form without the constant thrust at the springing which makes true arches or vaults of wide span so difficult to deal with. The enormous vaults of the great therme, the basilica of Constantine, and the like cover their spaces with one solid mass like a metal lid, giving the form but not the principle of the arch, and thus allowing the vault to be set on walls which would at once have been thrust

apart had they been subjected to the immense leverage which a true arched vault con- stantly exerts on its imposts.4 This is a very important point, and one which is usually overlooked, mainly owing to the Roman prac- tice of facing their concrete with bricks, which (from an examina- tion of the surface only) appear to be a principal item in the con- struction. The walls of the Pantheon, for example, are covered with tiers of brick arches, and many theories have been invented as to their use in distributing the weight of the walls. But a re- cognition of the fact that'these walls are of concrete about 20 fect thick, while the brick facing averages scarcely 6 inches in thickness, clearly shows that these "relieving arches" have no more con- structional use as far as concerns the pressure than if they were painted on the surface of the walls. Exactly the same reasons apply to the superficial use of brick in all arches and vaults.

and more valuable travertine was not cut in this regular T way, but pieces of all

RAVERT INE: PAVEM Qerare

SS 1G. 1.—Example of op

artists.? The Greek influence is more obvious; almost all the | sizes were used, just "'¢ sot of the stairs of the Tabularium (see Plate temples of the earlier imperial age are Greek, with certain modifi. | as they happened to yr). _The flat arch C is of travertine, the rest of cations, not only in general design but in details and ornaments. | come from the peperino. A. Footing-course of rough stones. L.

Greek architects were largely employed; and Roman architects such as Vitruvius and C. Mutius in the 1st century B.c., Severus and Celer under Nero, and Rabirius under Domitian were Greek by education, and probably studied at Athens (see Vitr., vii., Pref. ; Hirt, Gesch. d. Bauwkunst, ii. p. 257; Burn, Rome, p. 76).2 The Romans, however, though quite devoid of artistic originality, were

1 These Nile quarries have been worked during the present century, and ey blocks were imported into Rome for the rebuilding of S. Paolo fuori le

ura.

_ 2 Pliny (H.N., xxxy. 45), quoting Varro, says that the decorations in paint- ing and sculpture of the temple of Ceres near the Circus Maximus (now 8. Maria in Cosmedin) were the work of the first Greek artists employed in Rome, and that before that (c. 498 B.c.) "all things in temples were Etruscan." Vitruvius (iii. 8) says, "' Ornantque signis fictilibus aut ereis inauratis earuin fastigia Tuscanico more, uti est ad Cireum Maximum Cereris, et Herculis Pompeiani, item Capitolii" (comp. iv. fy, Wa. 8):

3 The frequent use of engaged columns is a peculiarity of Roman architec- ture, but it is not without precedent in Greek buildings of the best period, e.g., in the lion-tomb at Cnidus and the temple of Zeus at Agrigentum. Sur- face enrichments over the mouldings were used far more largely by the Romans than by the Greeks.

Concrete foundation, exposed by the lowering of the

ony = order to paving when the temple of Vespasian was built.

avoid waste: blocks as much as 15 by 8 feet were used, and the courses varied in thickness—the " pseudisodomum" of Vitruvius. When tufa or peperino was mixed with the travertine, it was cut so as to range with the irregular courses of the latter.

It is an interesting point to note the manner in which the Roman builders mixed their different materials according to the weight they had to carry. While tufa was frequently used for the main walls, peperino (¢.g., in the Servian wall on the Aventine) or travertine (¢.g., in the forum of Augustus and the temple of For- tuna Virilis, so called) was inserted at points of special pressure, such as piers or arches (see fig. 21 below). The Colosseum is a particularly elaborate example of this mixed construction with three degrees of pressure supported by three different materials (see fig. 2).

4 In the beautiful drawings of Choisy (L' Art de bdtir chez les Romains, Paris, 1873) the structural importance of the brick used in vaults and

arches is very much exaggerated.

XX, — 102

Mortar,

Clamps,

Opus retieu- latum.

810 ; ROME [TOPOGRAPHY AND

The use of mortar with opus quadratum is a sign of an early rather than a late date.1 It occurs in the Servian wall on the Aventine, in the Tabularium,and, most striking of all, in the Tul- lianum under the "Mamertine prison'? — cer- tainly one of the oldest buildings in Rome (see fig. 11). Under the empire massive blocks, whether of tufa, traver- tine, or marble,

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are set without

any mortar. It

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MORE» SOADeH i a d t rests 7 -. USGL Et – 7 it 1 iw cement to bind ea a the blocks to. Fo i simply to give Beat —$ 0 _Is FEET

the joints a Fra, 2.—Example of construction in which os 8 ing are used ; upper part of one of the inner radiating walls per en mune under the come of the Colosseum. A, A. Marble seats = . ~l© _ on brick and concrete core, supported on vault made of actual binding puinice-stone concrete ©. B. Travertine arch at end of together was raking vault ©. D. One of the travertine piers built in done by clamps flush with the tufa wall to give it extra strength. HE, E. and. dowels. 24 seg? 4 tufa Cy Fags faced with a bricks, . ? ing the vaults of pumice concrete which suppor e

well as by the marbleseats. F. Travertine pier at end of radiating wall. mass and wei ght G. Brick-faced arch of concrete to carry floor of passage. of the reat H, H. Tufa wall, opus quadratum. J, J, J. Line of steps § in next bay. K, K. Surface arches of brick, too shallow

blocks used. Ex- to be of any constructional use, and not meant for orna- cept in the ear- ment, as the whole was stuccoed; they only face the liest masonry, wall (which is about 4 feet thick) to the average depth

*each block was °! * inches.*

very carefully fastened, not only to the next blocks on the same course, which was done with double dove-tailed dowels of wood, but also to those above and below with stout iron clamps, run with lead (Vitr.,

ii. 8). In more ornamental marble TTS eR work bronze clamps were often used.]] WY Qs When concrete was employed it ; 3 was faced cither with blocks of , 7 Pp opus quadratum (¢.9., the Servian yy Ar: Pr wall along

the Aventine) or with opus incertum—small irregularly shaped blocks of tufa 3 to 6 inches across, with pointed ends driven into the concrete while it was soft, and worked smooth on the face only (see fig. 8). Thirdly, in the ~. Ist century B.C. opus reticulatum,? also of tufa, was largely uscd alone ; after that it began to be mixed with brickwork. It is very neat in ap- pearance, and is often fitted with great care, though it was generally _ | covered with stucco. The so-called © "'house of Livia" on the Palatine is a good example of the earlier sort, when the quoins were made \ of small rectangular blocks of tufa. SECTION OF ANGLE JHM The palace of Caligula has it With Fra, 3.—Conerete wall faced with (A) quoins of brick facing. Thoughin opus incertum and (B) opus reticu- Rome opus reticulatum was always latum. C shows the section, similar made of tufa, in the neighbourhood ™ ao

of the city it was sometimes of peperino or even lava, where these materials were found on the spot.

1 Choisy (L' Art de batir chez les Romains, Paris, 1873) is mistaken in his denial of the early use of mortar by the Romans.

2 The expansion of the iron through rust, which caused the stone to split, has frequently been a great source of injury to Roman walls, as well as the practice, common in the Middle Ages, of breaking into the stones in order to extract the metal.

3 These two kinds of stone facings are mentioned thus by Vitruvius (ii. 8),

"reticulatum, quo nune [reign of Au: ustu n i a ra a ' {reign g Ss] omnes utuntur, et antiquum, quod

Of concrete walls faced with burnt bricks no dated example Brick earlier than the middle of the Ist century z.c. is known. The facing, Pantheon (27 B.c.) is the most important early specimen of certain date. The bricks used are always triangular in shape, so as to present a large surface on the face with little expenditure of brick, and also to improve the bond with the concrete behind (see fig. 4).

Even party walls of small rooms, only 7 inches thick, are not built

solid, but have a concrete core faced with brick triangles about

3 inches long. Owing to this method of form- ing the walls it was | necessary to support | the facing until the | concrete was set, which | appears to have been done with a wooden framing covered with || planks on the inside. |} In some cases the planks ag eae were nailed outside the Fic. 4.—Section of concrete wall, showing the wooden uprights, as was use of bricks merely as a facing,

done with the unfaced concrete walls (see below), and then a series of perpendicular grooves appear in the face of the brickwork. Walls faced with opus reticulatum must have been supported temporarily in the same way.

The character of the brick facing is a great help towards dcter- mining the date of Roman buildings; it has been stated that this can be done simply by measuring the number of brick courses that go to a foot,—the more the bricks the earlier the work. This, how- ever, is not the case. In early work the bricks are thick and the joints thin, while in later times the reverse is the case. Thus brickwork of the time of Severus and later usually has more bricks to the foot than that of the Flavian pcriod. The following list gives a few characteristic specimens of different dates.

Average Average Building. thickness of] thickness of

Bricks, Joints. Inches. Inches.

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14 +

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1 %

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The length of the bricks as it appears on the face is no guide | to the date, owing to the fact that one or more of the sharp points of the brick triangles were very frequently broken off before they

were used. Moreover, varieties both in quality of workmanship and

size of the bricks often occur in work of the same date ; anew gang

of workmen or a batch of bricks from a fresh figlina might easily

occasion this. In the remains of Nero's Golden House great

varieties appear, and some of the walls in the inferior rooms are

faced with very irregular and careless brickwork.4 Special care

and neatness were always employed in the rare cases when the wall

was not to be covered with stucco, which in the absence of marble

was usually spread over both inside and outside walls. All these circumstances make great caution necessary in judging of dates;

fortunately after the 1st century A.p., and in some cases even

earlier, stamps impressed on bricks, and especially on the large

tiles used for arches, give clearer indications. The reason of the | almost universal use of smooth facings cither of opus reticulatum | or of brick over concrete walls is a very puzzling question ; for con- crete itself forms an excellent ground for the stucco coating or back- ing to the marble slabs, while the stucco adhcres with difficulty to a smooth facing, and is very liable to fall away. The modern practice of raking out the joints to form a key was not employed by the Romans, but before the mortar was hard they studded the face of the wall with marble plugs and iron or bronze nails driven | into the joints, so as to give a hold for the stncco—a

great waste | both of labour and material.® The quality of the mortar varies

according to its date: during the 1st and 2d centuries it is of most

remarkable hardness, —made of lime with a mixture of coarse

pozzolana of a bright red colour; in the 3d century it began to

be inferior in quality ; and the pozzolana used under the later

empire is brown instead of red.

Concrete was at first always made of lumps of tufa; then traver- Concrete | tine, lava, broken bricks, and even marble were used, in fact all wallsand the chips and fragments of the mason's yard. Under the empire vaults. the concrete used was of travertine or lava mostly for foundations, . of tufa or broken bricks for walls, and of tufa or pumice-stone (for the sake of lightness) for vaults. Massive walls were cast in a

4 Some of the bricks are as much as 2% inches thick, while 1} inches is the usual maximum for Roman bricks. : ;

5 The Roman method of applying stucco to walls with a wooden " float," ex- actly as is done now, is shownin a painting from Pompeii(see Ann. Inst., 1881).

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Marble

linings, &e.

Ancient

‘slab. Fig. 5 gives an

ARCH ZOLOGY. |

mould ; upright timbers, about 6 by 7 inches thick and 10 to 14 feet long, were set in rows on each face of the future wall; planks 9 to 10 inches wide were nailed to them, so as to form two sides of a sort of box, into which the semi-fluid mass of stones, lime, and pozzolana was poured. When this was set the timbers were re- moved and refixed on the top of the concrete wall; then fresh concrete was poured in ; and this process was repeated till the wall was raised to the required height. Usually such cast-work was only used for foundations and cellar walls, the upper parts being faced with brick ; but in some cases the whole wall to the top was cast in this way and the brick facing omitted. In strength and durability no masonry, however hard the stone or large the blocks, could ever equal these walls of concrete when made with hard lava or travertine, for each wall was one perfectly coherent mass, and could only be destroyed by a laborious process like that of quarry- ing hard stone from its native bed. Owing to this method of forming the Roman buildings the progress of the work from day to day can often be traced by a change in the look of the concrete. About 3 feet high appears to have been the average amount of wall raised in a day.

Marble linings were fixed very firmly to the walls with long clamps of metal, —< hooked at the end so as to hold in a hole made in the marble

example, of the time of Augustus, fixed against a stone wall. The quantity of rich inarbles which, for at least three centuries, were being dug out in

countless quarries in ; the East, by whole 56 armies of workmen, = andconstantly poured

into Rome is almost D.

beyond calculation Scarcely a church is without columns and wall-linings _ stolen ; from ancient build ings, and the more

0. ;: 6. 9. IZ.INCHES. magnificent chapels, _

Fria. 5.,—Exainple of marble lining, from the cella of such as those of the " 'the temple bf Concord. A. Slabs of Phrygian Borghese, Corsini, marble. B. Plinth moulding of Numidian " giallo. and Cibo families, ©. Slab of cipollino (Carystian marble). D. Paving

ith the whole cl ', of porta santa. Eand F. "nucleus" and "rudus" ki ewhore churen of concrete bedding. G, G. Iron clamps run with of S. Maria della Vit- toria, owe their splen-

lead to fix marble lining. H. Bronze clamp. J. Cement backing. dour entirely to their wall-linings of ancient marbles, porphyry, and alabaster.1 The blocks were usually marked in the quarry with a number, and often with the names of the reigning emperor and the overseer of the quarry. These quarry-marks are often of great value as indications of the date of a building or statue.? Metropolitan building Acts, not unlike those of moderu London, were enacted by several of the emperors. These fixed the materials to be used, the thickness of walls, the minimum width of streets, the maximum height allowed for houses, and the like. After the great fire in Nero's reign, 64 A.D., an Act was passed requiring external walls to be faced with fire-proof materials, such as peperino or burnt brick ; this Act was being prepared long before the fire,—strong evidence as to this being a wilful act on Nero's part, as is asserted by Suetonius (Nero, 38). . Enormous accumulations of statues and pictures enriched Rome

'orks of during its period of greatest splendour. In the first place, the

art.

numerous statues of the republican and even of the regal period were religiously preserved at a time when, from their archaic char- acter, they must have been regarded rather as objects of sacred or archeological interest than as works of art (Plin., H.W., xxxiv. 9-16, xxxv.7). Secondly came the large Greco-Roman class, mostly copies of earlier Greek works, executed in Rome by Greek artists. To this class belongs most of the finest existing sculpture preserved in the Vatican and other museums. Thirdly, countless statues and pictures were stolen from almost every important

city in Greece, Magna Grecia, Sicily, and western Asia Minor. These robberies began early, and were carried on for many centuries. The importa- tions included works of art by all the chief artists from the 5th century downwards. Long lists are given by Pliny (H.W, XXXiil.- XXXvi.), and pedestals even now exist with the names of Praxiteles, Timarchus, Polycletus, Bryaxis, and others (see Bull. Comm. Arch.

1 Yet for many centuries during the Middle Ages the richest sites of ancient Rome were riddled with lime-kilns, in which the greater part of the marble was destroyed ; see Raphael's letter to Leo X. on this subject published by Visconti (Rome, 1834).

- *See Bruzza, in Ann. Inst., 1870, p. 106.*

Rom., ii. p. 176). These accumulated works of sculpture were of all materials—gold and ivory (Suet., 7%t., 2), of which seventy-four are mentioned in the catalogue of the Breviarium (see Preller, egionen, p. 231), many hundreds or even thousands of silver 3 (Plin., H.N., xxxiii. 54), while those of gilt bronze and marble must have existed in almost untold numbers (Pars., viii. 46). Nor were the accumulated stores of Greek paintings much inferior in number ; not only were easel pictures by Zeuxis, Apelles, Timanthes, and other Greek artists taken, but even mural paintings were carefully cut off their walls and brought to Rome secured in wooden frames (Plin., H.N., xxxv. 49, and compare 7bid., 45).

The basalt (silew) roads were inade of polygonal blocks of lava Roads.

neatly fitted together may and laid on a carefully prepared bed, similar to that used for mosaic paving (see Mosaic and Roaps). Roads thus made were called "vie strate." One portion only exists in Rome of early date, when the blocks were fitted together with the utmost accuracy viz., a piece of the Clivus Capitolinus in front of the temple of Saturn (see fig. 6, which also shows the massive _ travertine curb which bordered the road; in some cases the curb was of lava). The other best preserved vie strate in

Rome are those leading up to the Palatine from the Summa Sacra Via and that which follows the curved line of shops in Trajan's forum. Many others exist, but have all been ah rer ¢ in later times, with badly fitting joints.

The following is a list of the chief roads which radiated from Rome (see Plate VI.) :—(1) Via Appia and (2) Via Latina, both issued from the Servian Porta Capena, and both met at Beneventum ; (3) Via Labicana, from the P. Esquilina, passing Labicum, joined the Via Latina 30 miles from Rome ; (4) Via Gabina (later called Prenestina), also issued from the P. Esquilina and joined the Via Latina,—these two roads pass through the Claudian aqueduct gate (mod. Porta Maggiore) ; (5) Via Tiburtina, from the gate of that name to Tibur ; (6) Vie Nomentana, from the P. Collina, passing Nomen- tum, joined the Via Salaria ; (7) Via Salaria, also from the P. Collina, joined the Via Flaminia at Ancona ; (8) Via Flaminia, its first half-mile or so after leaving the Servian Porta Ratumena was known as the Via Lata ; it afterwards passed out of the Aurelian P. Flaminia, and with many branches led to the chief towns of Northern Italy, and so into Cisalpine Gaul ; (9) Via Aurelia, issued from the trans-Tiberine P. Aurelia and passed through Pisa to Gaul ; (10) Via Portuensis, from the gate of that name, also on the right bank of the Tiber, to Portus Augusti near its mouth ; (11) Via Ostiensis, from the Servian P. T'rigemina and the Aurelian P. Ostiensis to Ostia ; (12) Via Ardeatina, probably a branch from the Via Appia, led to Ardea.

Remains of Prehistorie Rome.

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Fic. 6.—Example of early basalt road by the temple of Saturn on the Clivus Capitolinus, A. Traver- tine paving. B. Polygonal. basalt blocks. ©. Con- crete bedding. D. Rain-water gutter. The curb shown is taken from another part of the road.

It is evident from recent discoveries that the site of Rome was Plate VI. populous at a very remote period. Flint implements and remains Archaic of the early Bronze Age have been found on the Aventine and in pottery.

other places ;° and in 1874, near the arch of Gallienus on the Esquiline, the important discovery was made of a necropolis § ap- parently ot considerable extent, the tombs of which and their con- tents—fictile vases and other objects—were of Phcenician and Etruscan character, dating probably about the time of the tradi- tional founding of Rome. In February 1883 a number of very early cist tombs, formed by two slabs of stone set on edge with a third for the lid, were found during excavations on the Esquiline between the Piazza Vitt. Emmanuele and the Via di Napoleone

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3 Highty silver statues of Augustus, some equestrian and some in quadrigze, are mentioned in the Mon. Ancyr. See p. 822 below.

4 See Nibby, Vie degli Antichi, in Nardini, vol. iv. 1820; also Livy, x. 23, x1 OL, xii 2y.

5 Under the Servian wall on the Esquiline has been found pottery of that very primitive sort which is ornamented only with rudely incised lines, zig- zags, hatchings, and dots, similar to that found under a stratum of peperino rock at Alba Longa.

6 See "Necrop. dell. Esquilino," in Ann. Inst., 1882, p. 5 sq., and Mon. Inst.,

xi., pl. xxxvii.; also Bull. Comm. Arch., iii.

Wall of Romulus.

Aneient fortifiea- tion.

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III.1 Some of the pottery found in the Esquiline necropolis was of that rare kind which is coated with white and coloured stanni- ferous enamels, examples of which have beeu found in Agina and at Camirus in Rhodes, —a method of decoration which is not Hellenic, but was common in Assyria and Egypt.? Some of the Esquiline tombs also contained terra- eotta reliefs of Oriental char- acter, covered with plumbo-vitreous glaze, coloured brilliant blues and greens, like the little figures so commonly found in Egypt. Some dim traditions of these earlier inhabitants certainly existed among the Romans: Dion Cassius (iii. 5), to account for the exist- ence of a city on the Palatine earlier than the traditional Roma Quadrata, invents an earlier Romulus and Remus to be its founders.

The most important existing relics of the time when Roman history first begins, though dimly, to take a definite shape are the so-called 'wall of Romulus," forming the circuit of the famous Roma Quadrata of the Palatine. Unfortunately the accounts of the extent of the Pomerium (Postmeriwm) or sacred enclosure give but little help towards defining its circuit. Even its precise nature is a matter of doubt, in spite of the aecounts of it given by Varro (Z.L., v. 143), Livy (i. 44), and Dionysius (i. 88), as is usually the case with descriptions in ancient writers of what was in their time purely an archeological matter. It is, however, certain that the Pomerium in some way or other followed the circuit of the primi- tive city, called from its shape Roma Quadrata. Its boundaries are given thus by Tacitus (Ann., xii. 24): starting from the Forum Boarium at the west corner of the Palatine, it goes to the Ara Maxima (see Ann. Inst., 1854, p. 28) and the Ara Consi, both prob- ably in the Vallis Murcie, afterwards occupied by the Circus Maximus ; but the exact positions of these points are unknown.® The next stages are the Curie Veteres, the Saccllum Larum, and lastly the Forum Romanum. Unfortunately the known points in this description, namely the two fora, are precisely those which mark that part of the circuit known from existing remains of the walls. It is therefore to the scanty relics of the wall which still exist on the other sides that we must turn to determine the extent of Roma Quadrata. These*

enable us to fix its line along the whole valley of the Velabrum, on the west of the hill, and along the valley of the Cireus Maximus as far as the so-galled Domus Gelo- tiana, about half-way on the south side (see fig. 17). The doubtful point has been whether the line of the wall from north to south included the whole extent of the hill, or passed across it, along the line of that deep natural valley which once divided the Palatine into two parts, and was in later times filled up and built upon by Domitian in the construction of his great palace. Recent excaya- tions have, however, disclosed at several points the existence of this ancient wall cxtending along the south-eastern part of the Palatinc; moreover, there is strong evidence as to Roma Quadrata being co- extensive with the whole hill from Cicero, De Rep., ii. 6, and Aul. Gell., xiii. 14. Traces of the wall have been found running cast- wards from the Porta Mugonia, and that piece of wall by the Domus Gelotiana which starts to run northwards across the middle of the hill has been found to be merely a projecting spur, which again turns eastwards, so as to include apparently the rest of the Palatine where the palace of Severus now stands.

The most perfect remains of the Romulean wall are those near the west angle of the hill (see fig. 7). These show that the forti- fications of Roma Quadrata were formed in the usual manner of Etruscan citics, in which the natural strength given by cliffs was inercased by artificial means. The wall was set neither at the top nor at the foot of the hill, but more than half-way up, a level terrace or shelf all round being eut in the rock on which the base of the wall stood. Above that the hill was cut away into a cliff, not quite perpendicular but slightly " battering" inwards, to give greater stability to the wall, which was built np against it, like a retaining wall, reaching to the top of the cliff, and probably a few feet higher. The stones used in this wall are soft tufa, a warm brown in colour, and full of masses of charred wood. The cutting to form the steep cliff probably supplied part of the material for the wall; and ancient quarries, afterwards used as reservoirs for water, exist in the mass of rock on which the so-called temple of Jupiter Victor stands. It has been asserted that these tufa blocks are not cut but split with wedges; this, however, is not the case. Tufa does not split into rectangular masses, but would be shattered to pieces by a wedge ; moreover, distinct tool-marks can be seen on all the blocks whose surface is well preserved and in the quarries

A Not. degli Scavi, February 1883. An account of pottery found in Rome with archaic incised inscriptions is given in Ann. Inst., 1880.

2 See also Brizio, Pitture e Sepolert sull' Esquilino, 1876, and De Rossi, Ogetti arcarcr rinvenuti nel Viminale, 1878.

: See Becker, Handb. der rim. Alterth., Leipsic, 1848, i. pp. 105-6.

: See Dionys., i, 65 ; Solinus, i. 17; Plut., Rom., 9.

The Ara Maxima of Hercules was probably near the careeres or starting end of the circus (Dionys., i. 40). The Ara Consi (Equestrian Neptune) gave its name to the Consualia, games in honour of this deity held by Romulus, at which the celebrated capture of the Sabine women took place. In later times this altar existed on or below the spina of the circus, apparently near the meta at the opposite end to the carceres; it was usually hidden from sight, but during the Ludi Circenses was uncovered and exposed to view (see Plut., Rom., 14; Varro, L. L., vi. 20; Tertull., De Spec., v. 8).

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themselves. Chisels from one-fourth to three-fourths of an inch in width were used, and also a sharp-pointed pick or hammer, The wall is about 10 feet thick at the bottom, and increases in thickness above as the scarped cliff against which it is built recedes. It is built of blocks laid in alternate courses of headers and stretchers, varying in thickness from 22 to 24 inches, in length from 8 to 5 feet, and in width from 19 to 22 inches. These blocks are _ carefully worked on their beds, },7oP er HILL but the face is left jj, 5? / rough, and the vertical (qj & joints are in some cases |}: open, spaces of nearly 2 inches being left be- tween block and block ; in other cases the ver- tical joints are worked true and close like the beds. The open vertical joints are peculiar to the masonry of this early period ; in the wall of Servius they always fit closely, at least on the visible face of the wall. No mortar was used.. At two points on the side of the Velabrum (see 8 // and 9 on the plan of the | Palatine, fig. 17) wind- =™ < – ing passages are exca- Fic. 7.—Section of prinitive wall of Roma Quad-*

. . rata. A. Original height of wall, B. Upper part vated in the tufa cliff, of cliff, now crumbled away. ©. Cistern cut in the entrance to which the tufarock. D. Levelled platform to receive was once closed by the base of wall. E, E. Cliff made steeper by cutting.

ancient wall. One of these (No. 8) in early times (before water in abundance was brought to the Palatine on aqueducts) was used as a reservoir to collect surface water, probably for use in case of siege ; circular shafts for buckets are cut downwards through the rock from the top of the hill; fig. 7 shows it in section. 'An exactly similar rock-cut cistern with vertical shafts, of very early date, exists at Alba Longa. Opposite the church of S. Teodoro a series of but- tresses belonging to the wall of Romulus exists, partly concealed by a long line of buildings of the later years of the republic and the early empire, to make room for which the greater part of the then useless wall was pulled down, and only fragments left here and there, where they could be worked into the walls of the later houses.

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Three accesses only to the ancient city can now be traced. One Gates of is the so-called Scale Caci, a long sloping ascent cut through the Roma rock (see fig. 17) from the side of the Circus Maximus; some Quadrata.

remains of the earliest wall still exist along the sides of this steep ascent or staircase, The upper part of this has remains of a basalt pavement, added in later times, probably covering the more ancient rock-cut steps. The name of the gate which led at this point into Roma Quadrata is unknown. The only two gates whose name and position can be (with any degree of probability) identified are the Porta Romanula and the Porta Mugionis (Plin., H.W, iii. 5, 9). The former of these, called Porta Romana by Festus (ed. Miiller, p. 262), was at the foot of the Clivus Victoriz (sce fig. 17), at the angle next the Forum Romanum.® According to Festus it was so called by the Sabines of the Capitol because it was their natural entrance to Roma Quadrata (see also Varro, L.L., v. 164, vi. 24). The original approach to it was by a road running up the lower extra-mural

part of the hill from the direction of the Velabrum. In later times a more direct ascent to it was made from the Forum by a flight of steps, probably the Scale Anularie of Suetonius (Aug., 72; see figs. 16 and 17 and plan of the Forum, Plate VII.). The lower part of these stairs, now buried under S. Maria Liberatrice, is shown in the marble plan of Rome; the upper part, that from the Nova Via to the Clivus Victoria, still exists, and has recently been exposed. Traces of the Porta Mugionis or Mugonia (sce Sol., i, 24) have been discovered near the temple of Jupiter Stator, where a basalt paved road leads up into the Palatine from the Summa Sacra Via and the Summa Nova Via, which join near the arch of Titus ; exposure to weather has now destroyed the soft tufa blocks of which this gate was built. This is probably the "veterem portam Palatii" of Livy (i. 12) through which the Romans fled when defeated by the Sabines. ancient Etruscan rule (see Servius, Ad 4n., i. 422), probably ex- isted on the east side of the hill, but its site is uncertain. J udging from the shape of the hill, it may very possibly have been under the existing palace of Severus, where a road Icads from the stadium

6 The present entrance to Caligula's palace is probably exactly on the site of the ancient Porta Romana. The stairs of Cacus, being only an access for men on foot, would not he counted as one of the three necessary gates which existed in every Etruscan city, and were dedicated to Jupiter, J uno, and Minerva.

A third entrance,' according to the °

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Great wall of Servius.

Line of Servian wall.

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down to the valley of the Celian; at other places the east side is precipitous. The buildings of the emperors have, however, made such

radical changes in the form of the ground that any degree of eertainty on this point is impossible. This third gate, according to Varro, who mentions (Z.Z., v. 164-5) all three, was called Janu- alis.! With regard to the last gate there is. some doubt whether he is right in its position ; Macrobius (Satur., i. 9) places it on

the slopes of the Viminal.?

Remains of Period of Kings (753-509 B.c.).

The most important remains of the regal period are the great wall, principally the work of Servius Tullius, by which he included within one circuit the separately fortified hills which were then in- habited,—the Palatine, Capitoline, Aventine, Quirinal, and Ceelian, and added two more, the Esquiline and Viminal. These seven hills formed the Septimontium® (Varro, L. L., iv. 41, vi. 24). Of even earlier date was the fort (Liv., i. 33) on the top of the Jani- culum, connected by walls with the Pons Sublicius, some massive foundations of which still exist, though now buried near the church of §. Pietro in Montorio. Existing remains show that the great wall is of more than one date ; part is probably earlier than Servius, and may be remains of the wall which, according to Livy (i. 36, 38) and Dionysius (iii. 37), was planned and in part carried out by Tarquinius Priscus ; it would seem impossible that a work of such gigantic magnitude could have been begun and completed in the lifetime of one man. It should, however, be remembered that a complete circuit of new wall was not required in this undertaking ; each, probably, of the five hills first inhabited had its own fortifica- tions, and these were utilized in the line of the new wall. The spaee thus included was divided by Servius for political, military, and religious purposes into four regiones (Varro, L. L., v. 46-54)— (1) the Suburana, including the Ccelian, and probably most of its adjacent valleys, with the Subura, the Carine, and part of the Esquiline—the derivation of Suburana from swb wrbe is from Junius, quoted by Varro; (2) Esquilina, the main part of the Esquiline, including the Oppius and Cispius (es-quil-iz, dwellings outside, cf. in-quil-inus) ; (3) Collina, the Viminal and Quirinal, which were ealled "colles" in contradistinction to the other five hills, which were called "montes" ; (4) Palatina, the Palatine and its adjacent spurs, the Velia and Germalus. It

will be observed that these four regiones do not include the Aventine, the Ca itol, and some of their adjacent valleys,—an omission for which it is not easy to account. #

Excavations of the last fifteen years have done much to deter- mine the line of the Servian wall (see Plate VI.), especially the great works undertaken in laying out a new quarter of the city on the Quirinal, Esquiline, and Viminal, which have laid bare and then mostly destroyed long lines of wall, especially along the agger. Beginning from the Tiber, which the Servian wall touched at a point near the present Ponte Rotto, and separating the Forum Olitorium (outside) from the Forum Boarium (inside), it ran in a straight line to the Capitoline Hill, the two crests of which, the Capitolium and the Arx, with the intermediate valley the Asylum, were surrounded by an earlier fortification, set (Dionys., ix. 68) éml Nopas . . . Kal wérpas darorduos. In this short space there were three gates, —(1) the Porta Flumentana next the river (see Cic., Ad Att., vii. 3; Liv., xxxv. 19, 21); (2) Porta Triumphalis, site un- known and usually only mentioned in connexion with triumphal processions (see Cic., Jn Pis., 28; Joseph., Bell. Jud., vii. 5, 4),— it was probably not used except on the occasion of triumphs ; (3) Porta Carmentalis, close to the Capitolium.' From the Capitoline Hill the wall passed to the Quirinal along a spur of elevated ground, afterwards completely cut away by Trajan. Close to the Capitol was the gate afterwards called the Porta Ratumena, whence issued the Via Lata (Plut., In Pudi., 13; Plin., H.2., viii. 42). Remains of the wall and foundations of the gate exist in Via di Marforio, Nos. 81 C and 81 E. After passing Trajan's forum, the first remains of the walls are on the slope of the Quirinal in the Colonna gardens. Near the foot of the Quirinal was the Porta Fontinalis (Liv., xxxv. 10). A piece of the wall has been exposed in the new Via Nazionale, and also an archway under the Palazzo Antonelli, which has been thought to be the Porta Fontinalis. This arch is, however, only 6 feet 6 inches wide and (to the springing of the atch) 5 feet high, which seems too small for one of the principal gates. The Porta Sanqualis (see Festus, ed. Miiller, p. 345) was also on the Quirinal, probably on the slope between the Trevi fountain and the royal palace. Its position is indicated by the

_ } See Dionys., fi. 65; Plut., Rom., ix. ; Dion Cass., various fragments; Liv., i. 7,9; Sol., i.17; Festus (ed. Miiller), pp. 258, 262.

2 See Becker, De Muris et Portis Rome, Leipsic, 1842; also "La fondazione di Roma," in Bull. Comm. Arch., ix., 1881.

3 At an early date the term "Septimontium" hada different meaning (see Plut., Ques. Rom., 69; Burn, Rome, p. 37).

4 Becker suggests (Handbuch, i. 886) that the Capitoline Hill was excluded on account of its sacred character, while the Aventine was not yet thickly populated, and the Janiculum was only occupied by the fort; see also Ann. Tnst., 1861, p. 61. 2

5 See Sol., i. 13; Liv., ii. 49, xxiv. 47, xxv. 7; Ascon., Ad Cie. in Toga, p. 90, Orell.

existence of some tombs which give the line of the road. On the north-west of the Quirinal was the Porta Salutaris (Festus, p. 327 ; Liv., ix. 43), probably near the 'Quattro Fontane." In the Barberini palace gardens, and especially in those of the Villa Bar- berini (Horti Sallustiani), extensive remains of the wall have been recently exposed and destroyed, —which was also the fate of that fine piece of wall that passed under the new office of finance, with the Porta Collina, which was not on the line of the present road, but about 50 yards to the south (see Dionys., ix. 68 ; Strabo, v. 3). Thus far in its course from the Capitol the wall skirted the slopes of hills, which were once much more abrupt than they are now ; but from the Porta Collina to the Porta Esquilina it crossed a large tract of level ground ; and here, by the construction of his great agger, Servius gained the strength whieh elsewhere was given by the natural formation of the hills. The whole linc of this agger has been recently traced and mostly destroyed. About the middle of it the Porta Viminalis was found in 1872; it stood, as Strabo says, 0rd wéow TH xwmaTr, and from it led a road which passed through the Porta Chiusa (ancient name unknown) in

Aurelian's wall. Foundations of the Porta Esquilina were found in 1876 close behind the arch of Gallienus. The further course of the wall across the valley of the Colosseum, with its Porta Querquetulana and Porta Cclimontana, probably a little beyond, is the least known part of the circuit. Hence the wall skirts the slopes of the Celian to the valley along which the Via Appia passed through the Porta Capena, near the church of S. Gregorio. Its line along the Aventine is fairly distinct, and near S. Balbina and in the Vigna Torlonia are two of the best-preserved pieces,—the former 11 courses high (22 feet), the latter 25 (50 feet). Under the Aventine it appears to have touched the river near the existing foundations supposed to be those of the Pons Sublicius. The Porta Trigemina was close by the bank. Hence to our starting-point the river formed the defence of the city, with its massive quay wall, —the xddy dxrn of Plutarch (Rom., 20). A fragmentary passage of Varro (Z. L., v. 163) mentions two other gates, Nevia and Rauduscula, "the bronze gate," but their positions are unknown. The site of the Porta Navalis is also very doubtful ; it was probably not in the Servian wall.

The wall is built of blocks of tufa, usually the softer kinds, but Its eon- varying according to its position, as in most cases the stone used struc- In some places a good deal of tion.

was that quarried on the spot. peperino is used. The blocks average from 23 to 24 inches in thickness—roughly 2 Roman feet—and are laid in alternate courses of headers and stretchers. The best preserved piece of wall—that on the Aventine in the Vigna Torlonia—has one complete arch and the starting of another ; their sills are about 34 feet from the ground outside, and probably level with the ground inside (see fig. 8).

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Fria. 8.—Part of Servian wall on Aventine.

These arches, though built of the harder stone, are not later inser- tions, but are contemporary with the wall itself. The blocks, both beds and vertical joints, are very carefully worked and set in mortar; in most cases they are bevelled round the joints. Some blocks are of great length,— dudtior AlGou Dionysius calls them. At this place the wall is backed with a thick mass of concrete ; the use of the arched openings is doubtful: they may have been embrasures for catapults.

agger, with its wall and foss, begun by the earlier kings and com- pleted by the last Tarquin. Fig. 9 shows it in section ; the earth taken from the foss (which was 100 feet wide at the bottom by 30 deep) was heaped up to form the agger, and was kept in its position by a lofty retaining wall on the front and a lower one behind. The outer wall was in places strengthened with massive buttresses closely set, or with towers ; in other places it had no projections. The back wall, the position of which shows the thickness of the

The discoveries of recent years have shown the cor- Agger of rectness of the description given by Dionysius (ix. 68) of the great Servius.

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agger, is in parts about 33 feet from the front one, but it varies in this respect ; in other parts the agger appears to have been more

PLAN OF WALL.

- 20.30, 40. 50.

SCALE OF SECTION.

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round temple in the Forum Boarium ; it is still in use, and well preserved at most places. Its mouth, an archway in the great quay wall (xdédy dxrn)

nearly 11 feet wide by 12 high, consists of three rings of peperino " voussoirs," most neatly fitted. The rest of the vault and walls is built of mixed tufa and peperino.> Pliny (H.N., xxxvi. 24) gives an interesting account of what is probably this great sewer, big enough (he says) for a loaded hay-cart to pass along. The mouths of two other similar but smaller cloace are still visible in the great quay wall near the Cloaca Maxima, and a whole network of sewers exists under a great part of the Servian city. Some of these are not built with arched vaults, but have triangular tops formed of courses of stone on level beds, each pro- jecting over the one below,—a very primitive method of construc-

*tion, employed in the Tullianum (see fig. 11). The great quay Great wall of tufa and peperino which lined both banks of the Tiber for a quay considerable distance also belongs to the regal period, and was a wall. work of great solidity and strength ; it is now mostly destroyed by the action of the river. In later times this massive wall was ex- tended, as the city grew, all along the bank of the Campus Martius, and, having lost its importance as a line of defence, had frequent flights of stairs built against it, descending to the river. Some of these are shown in one of the fragments of the marble plan (see Jordan, For. Ur. Rom.; Frag. 169). In 1879 a travertine block was dredged up inscribed P. BARRONIVS. BARBA. AED. CVR. GRADOS. REFECIT, dating from the 1st century B.c. This records the repair of one of these numerous river stairs. The name **pul- chrum littus" is not a classical term, but simply a translation of Plutarch's xéAn dxrn.8*

The Tullianum is probably, next to the remains of Roma Quad- 'Tulli- rata, the earliest anun of the existing and buildin gs of Rome. career,

B by)

Fia. 9.—Section and plan (double scale) of wall and agger of Servius.

A, A. Undisturbed earth of fossa, B. Earth heaped up to form the agger. C. Road

at brink of fossa. D, Wall and buttress. E. Back retaining wall of agger. F. Level to which the fossa was filled up and built upon under the empire.

than 50 feet thick. Between the railway station and the Dogana a fine lofty piece of the front wall remains, with traces of the Porta Viminalis and of the lower back wall. Unfortunately the whole of the bank or agger proper has been removed, and the rough back of the great retaining wall exposed. Both tufa and peperino are used; the blocks vary in length, but average in depth the usual 2 Roman feet. The railway cutting which has destroyed a great part of the agger showed clearly the section of the whole work : the strata of different kinds of soil which appeared on the sides of the

— was difficult so (Dionys., iv. 18). A very curious serics of | an early Latin asons' masons' marks word, tullius, a marks. exists on the

Cloace.

foss appeared again in the agger, but reversed as they naturally would be in the process of digging out and heaping up. Dionysius (ix. 68) statcs the length of the agger to have been 7 stadia—that is, about 1400 yards—which agrees (roughly speaking) with the actual discoveries, Originally one road ran along the bottom of the foss and another along its edge ; the latter existed in imperial times. But the whole foss appears to have beensfilled up, probably in the time of Augustus, and afterwards built upon; houses of mixed brick and opus reticulatum still exist against the outside of the great wall, which was itself used as the back wall of these houses, so that we now see painted stucco of the time of Hadrian covering parts of the wall of the kings. Another row of houses seems to have faced the road mentioned above as running along

It is partly cut in the tufa rock of the Capitoline Hill and partly built of 2-feet blocks of tufa, set with thin beds of pure lime mortar, in courses projecting one over the other (sec fig. 11). Its name is ied de- rived, not from

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the upper edge of the foss, thus forming a long street. As early as Servius Tullius, , Tee SECTION the time of Augustus a very large part of the wall of the kings as Varro (v. 151) — a ee ee

had been pulled down and built over, so that even then its circuit

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ON THE AGGER WALL

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buildings of the regal period, es- pecially on the stones of the agger wall and those of the small celle on the Palatine near

*the Scale Caci. Lente, \, H] MV 4 4> tionally an arch, They are deeply — very like the incised, usually on | aun so-called '*tomb*

the ends of the blocks, and aver- age from 10 to 14 inches in length: some are single letters or monograms; others are numbers; and some are doubtful signs,

Fra. 10.—Masons' marks on walls of the regal period.

asserts, but from

spring of water ; its original use was probably that of a cistern or well. It was closed by a conical vault, arched in shape, but not construc-

of Agamemnon" at Mycene, and many early Etrus-

*Ty ¢.9.) L, Which may be the numeral 50 or the Etruscan CH. Fig. ay — Jie 10 shows the chief forms from the Palatine and Ksquiline.4 with ba arched The Servian city did not include what is now the most crowded Ynult. alse of tute Last of sit Sop which under the empire was the most architect- was baile the 816. 11— ta _ section of 7. Deeasians *. ' ener o 2 i i i ison." A. ening in floor over the Tullianum. ae Mee oe nif te . ay ape oe by a upper part of the B, BY Solid tufa Ret nag } &, C. adhd aoe. D, E. A y hed a eine : Vet eaee ae Bee cone seems to _ Position of modern stairs and door. F, F. Front wall Tarquiniorum, but after the expulsion of the Tarquins was named have been re- Of prison with inscription of 22 4.p. G. Probable ori-*

Campus Martius from an altar to Mars, times (Liv., ii. 5).3

Of that wonderful system of massive arched sewers 4 by which, as Dionysius (iii. 68) says, every street of Rome was drained into the Tiber considerable remains exist, especially of the Cloaca Max- ima, which runs from the valley of the Subura, under the Forum (see Plate VII.), along the Velabrum, and so into the Tiber by the

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1 See Bruzza, in Ann. Inst., 1876, p. 72; J ordan, Topogr., i. p. 259.

2 It was specially that part of the Campus Martius which was named after the Circus Flaminius that was remarkable for its architectural splendour.

3 On this whole subject consult Nibby and Gell, Le Mura di Roma, 1820; Piale, Porte del Recinto di Servio, 1833 ; Becker, De Roma Muris, Leipsic, 1842; Lanciani, Ann. Inst., 1871, p. 40, Mon. Inst., ix. pl. xxvii., also Ann. Inst., 1857, p. 62, and Mon. Inst., vi. pl. iv.: Quarenghi, Le Mura di Roma, 1880 (taken from Lanciani) ; comp. Vitruvius, i. 5.

4 See Liy., i. 88, 56; Dionys., iv. 44.

dating from prehistoric

moved, and a flat ginal top of Tullianuin.

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stone floor (a flat arch in construction) substituted. This cannot be other than the ‘“‘carcer . . . media urbe imininens foro” of Livy (i. 33), who speaks also (xxxiv. 44) of an “‘inferiorem car- cerem,” and at xxix. 22 of a criminal being put in the Tul- lianum. That its use as a cistern was abandoned is shown by the cloaca which leads from it, through the rock, to a branch of the Cloaca Maxima. This horrible place was used as a dun-
5 Mommsen is mistaken in his assertion that travertine is used in the vault of this cloaca ; and hence his argument as to its being of later date falls to the ground, “6 A great quay wall with arched cloaca, similar in

style to those in Rome, exists among the remains of the Etruscan city of Gravisem, by the sea near Tarquinii, and also in other Etruscan cities,—a similarity not unnatural if we

accept the statement of historians that the great cloace were the work of Tarquinius Priscus.

Plate VII. Forum Roman- um.

ARCH ZOLOGY. |

geon, prisoners being lowered through a hole in the stone floor, —the only access. The present stairs are modern. The two chambers are vividly described by Sallust (Cat., 55). The en- trance to the upper prison was on the left of the stairs leading up from the Forum to the Clivus Argentarius, the road to the Porta Ratumena (see Plate VI.). Lentulus and the Catiline conspirators, as well as Jugurtha and other prisoners of importance, were killed or starved to death in this fearful dungeon, which is called 76 Bdpabpov by Plutarch (Marius, xii.). According to a doubtful tradition of the Catholic Church St Peter and St Paul were im- prisoned in the Tullianum. The name Mamertine prison is of medieval origin. The front wall of the prison was restored in the reign of Tiberius 22 A.p., and bears this inscription on a projecting string-course—C. VIBIVS.C.F.RVFINVS.M.COCCEIV[S NERVA] COS.EX.S8.C.! The floor of the upper prison is about 16 feet above the level of the Forum, to which access was given by a flight of steps—Scalee Gemoniz—on which the bodies of criminals were ex- posed ;? Pliny (H.N., viii. 61) calls it the " stairs of sighs" (gradus gemitorit). Forwm Romanum and Adjacent Buildings.

The Forum Romantim or Magnum, as it was called in late times to distinguish it from the imperial fora, occupies a valley which extends from the foot of the Capitoline Hill to the north-east part of the Palatine. 'Till the construction of the great cloace it was,

. at least in wet seasons, marshy ground, in which were several pools

of water. In early times it was bounded on two sides by rows of shops and houses, dating from the time of the first Tarquin (Liv., i. 35). The shops on the south-west side facing the Sacra Via, where the Basilica Julia afterwards was built, were occupied by the Taberne Veteres. The shops on the northern side, being occupied by silversmiths, were called Taberne Argentarie (see Liv., xxvi. 27, xl. 51), and in later times, when rebuilt after a fire, were called Taberne Nove.* An altar to Saturn (Dionys., i. 34, vi. 1), tradi- tionally set up by the companions of Hercules, and an altar to Vulcan, both at the end towards the Capitol, with the temple of Vesta and the Regia at the opposite end, were among the earliest monuments grouped around the Forum. The Lacus Curtius vanished, as Varro says (Z.Z., v. 148-149), probably with other stagnant pools, when the cloace were constructed (Liv., i. 38, 56).° Another pool, the Lacus Servilius, near the Basilica Julia, was preserved in some form or other till the imperial period. Under Sulla it was used as a place to expose the heads of many senators murdered in his proscriptions (Cic., Rosc. Am., 32; Seneca, De Prov., 3). The Vulcanal or Hephesteum was an open area, so called from the early altar to Vulcan, and was (like the Comitium) a place of public meeting, at least during the regal period.® It was raised above the Comitium, and probably was a space levelled on the lower slope of the Capitoline Hill behind the arch of Severus; but its exact form and position are very doubt- ful. It was probably much encroached upon when the temple of Concord was enlarged in the reign of Augustus.*

Plate VII. gives a carefully measured plan of the Forum, show- ing the most recent discoveries.

References to Numbers in Plate (VII.) of Forum Romanum.7 1, 1. (Basilica Julia) existing marble piers and fragment of screen. 2. Im- pression of marble pier in the late archway of brick-faced concrete. 3. Only remaining one of ancient travertine piers. 4,4. Chambers of tufa and traver- tine, with traces of stairs. 5. Tabula lusoria, with inscription, sce p. 817. 6. Opening into Cloaca Maxima. 7. Massive travertine pedestal. 8, 8. Paving of porta santa and Africano marbles. 9, 9. Paving of various Oriental marbles. 10. Probable position of arch of Tiberius. 11,11. Exist- ing granite columns of temple of Saturn. 12. Main flight of steps, of which only the concrete core remains. 13. Starting of small side stairs to

chamber under iain flight of steps. 14. Only piece existing of ancient basalt paving (see fig. 6). 15. Platform of porticus of Dii Consentes. 16. Upper door in Tabulariuin blocked up by porticus of Dii Consentes. 17. Door at foot of stairs of Tabularium, blocked up by temple of Vespasian (see fig. 1). 18. Travertine paving of time of Domitian. 19. Pedestal of Vespasian's statue, 20. Three existing columns of temple of Vespasian. 21. Aidicula built by Domitian. 22. Travertine paving of time of Domitian. 23, 23. Long passage and windows in lower story of Tabularium. 24. Pedestal of statue of Concord. 25. Pedestal added by one of the Flavian emperors. 26. Frag- nent of a later pedestal. 27. White marble door-jamband massive threshold of porta santa marble. 28. Remains of some early structure intufa. 29. Three travertine steps down to lower paved level, perhaps that of the Comi- tium. 30. Marble steps to this lower level. 31. Large marble pedestal (not in sitw) inscribed to Fl. Jul. Constantius. 32. Late addition to rostra. 33. Remains of a small marble structure. 34. Marble pedestal of a column, with rude reliefs of the 4th century. 35. Marble pedestal of an equestrian

1 Consules suffecti for 22 a.p.

2 See Tac., Hist., iii. 74, 85; Suet., Vit., 17.

3 See Livy (xliv. 16), who mentions a house of P. Africanus, " pone veteres ad Vortumni signum," which was bought by T. Sempronius to clear the site for the Basilica Sempronia in 169 B.c. This basilica appears to have been afterwards absorbed in the Basilica Julia.

4 Hence these two sides of the Forum are frequently referred to in classical writings as "sub veteribus" and 'sub novis."

5 In later times it appears to have been an enclosed space containing an altar; it is described by Ovid (Fast., vi. 403); according to one tradition it marked the spot where Curtius's self-immolation filled up the chasm which had opened in the Forum (see Dionys., ii. 41).

6 See Dionys., ii. 50, vi. 67; Plin., H.N., xvi. 86; Plut., Quas. Rom., 47.

7 A larger plan, coloured in detail, is given in J. H. Middleton, Ancient Rome in 1885 (A. & C. Black, Edinburgh).

statue, set on end, and inscribed to Arcadius and Theodosius. 36. Marble walls (plutet) with reliefs of time of Trajan (not in situ). 37. Remains of a small marble structure. 38. Large concrete core of a latc pedestal. 39. Steps to column of Phocas, part marble and part tufa. 40. Late building of brick and concrete lined with marble. 41. Existing three columns of temple of Castor. 42, 42. Existing pieces of mosaic pavement. 43. Main steps of temple of Castor. 44. Side steps; only the three lowest remain. 45. Part of circular travertine curb; puteal Scribonis? 46, 46. Original line of Sacra Via, covered with late paving of travertine. 47. Line of side steps of Ades Divi Julii. 48. Simall front stairs up to podium of Ades Divi Julii. 49. Curved recess in podium, which probably once contained an altar to Divus Julius ; now blocked up by late masonry. 50. Fragment of a wall faced with opus reticulatuin. 51. Conerete core of podiuin of temple of Vesta. 52. Small zdicula by entrance to Atrium Veste. 53, 53. Shops adjoining Atriuin Veste. 54. Stairs from Nova Via up to Clivus Victorie and palace of Caligula. 54a. Stairs, shown ona fragment of the marble plan, leading

up from the level of the Forum to that of the Nova Via. 55, 55. Windows in

curia of Diocletian (S. Adriano), now below the ground level; see fig. 12, p.

816. 56. Marble doorway shown by Du Perac, now missing.

Unlike the fora of the emperors, each of which was surrounded by a lofty wall and built at one time from one design, the archi- tectural form of the Forum Romanum was a slow growth. The marshy battle-field of the early inhabitants of the capitol and Palatine becaine, when the ground was drained by the great cloaca, under a united rule the most convenient site for political meetings, for commercial transactions, and for the pageants of rich men's funerals, Zudi scenici, and gladiatorial games. For these purposes a central space, though but a small one, was kept clear of buildings ; but it was gradually occupied in a somewhat inconvenient manner by an ever-accumulating crowd of statues and other honorary monuments. On three sides the limits of this open space are marked by paved roads, faced by the stately buildings which gradu- ally took the place of the simple wooden taberne and porticus 9 of early times. This central space was essentially the meeting-place of the plebs, or the Comitia Tributa, while the patricians, the Comitia Curiata, met on the Comitium, which adjoined the Forum. The Comitium 1° was a level space in front of the Curia; the con- struction of both is ascribed to Tullus Hostilius. For the position of the Comitium and the Curia" see plan of Forum (Plate VIL). Varro (L. Z., v. 155-156) gives the following account of the build- ings which were grouped along the northern angle of the Forum.

"Comitium ab eo quod coibant co comitiis curiatis et litium causa. Curie duorum generum, nam et ubi curareut sacerdotes res divinas, ut Curie Veteres, et ubi senatus humanas, ut Curia Hostilia, quod primum eedificavit Hostilius rex. Ante hanc Rostra, quojus loci id vocabulum, quod ex hostibus capta fixa sunt rostra. Sub dextra hujus a Comitio locus substructus, ubi nationum sub- sisterent legati qui ad senatum essent missi. Is Greecostasis appel- latus a parte ut multa. Senaculum supra

Grecostasim, ubi Aidis Concordie et Basilica Opimia. Senaculum vocatuim, ubi senatus, aut ubi seniores consisterent."'

The Curia or senate-house passed through mauy vicissitudes. At first called Curia Hostilia from its founder Tullus Hostilius (Liv., i. 30), it lasted till 52 B.c., when it was burnt at the funeral of Clodius, and was then rebuilt by the son of Sulla, and from his gens called Curia Cornelia (Dion Cass., xl. 50; Plin., Z.N., xxxiv. 12). It was again rebuilt by Augustus (29 B.c.) under the name of the Curia Julia, as recorded in the inscription of Ancyra (see ANGORA)—CVRIAM. ET. CONTINENS. EI. CHALCIDICVM... FECI. Little is known about the adjoining buildings called the Atheneum and Chalcidicum ; Dion Cassius (li. 22) mentions the group. In the reign of Domitian the Curia Julia was again rebuilt (Prosp. Aquit., p. 571), and lastly by Diocletian. There is strong evidence to show that the existing church of 8. Adriano is the Curia of Diocletian, though of course much altered, and with its floor raised about 20 feet above the old level. Fig. 12 shows the front existing towards the Forum, omitting later windows and doors. As late as the time of Du Perac (Vestig] di Roma) the old entrance and level were preserved. He gives a drawing" of it with steps descending to the doorway. The ancient bronze doors now at the end of the nave of the Lateran basilica originally belonged to this building, and were removed thence by Alexander VII. Vig. 12 is derived from actual measurements of the part above ground, while the lower part, now buried, is derived from Du Perac's drawing and from the bronze doors at the Lateran, which give the size of the opening,

8 The first gladiatorial show in Rome was given in 264 B.c. in the Forum Boarium by D. Junius Brutus at his father's funeral (Liv., Epit., xvi.), the first in the Forum Romanum in 216 B.c. (Liv., xxiii. 30). See also Liv., xxxi. 50, xli. 28; and Suet., Cws., 39; Aug., 43; and Tid., 7. ;

*9 *"Porticus" means a covered colonnade in one or inore stories, either in one straight line or enclosing a space like a cloistered quadrangle. A "crypto- porticus" usually implies a covered passage, with walls instead of columns at its sides.*

10 See a valuable paper on the Comitium by Detlefsen, Ann. Inst., 1860 ; and Dernburg, Die Lage des Comitiums. The Comitium was also tlie chief

law-court, where criminal cases were heard by the triumviri capitales. Dictators, consuls, and other officials of Rome held courts there, and received foreign envoys. It was also used for public shows and games and was a place of execution of criminals.

ll Livy (xlv. 24) indicates their relative positions by the phrase " Comitium vestibulum Curie."

12 This valuable set of drawings was not published till 1575; but internal evidence shows that many of them, if not all, were made as early as 1540. A good account of the Curia and its vicissitudes is given by Lanciani, L' Aula e gli Uffict del Senato Romano, 1883.

Curia.

Comi- tium.

Original rostra.

Greeo- stasis.

Sena- culum.

Basilicee in Forum.

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and show how deeply the buried part descends below the present level. The brick cornice and marble consoles, covered with enriched mouldings in stucco, and the sham marble facing, also of stucco, if com- pared with similar details in the baths of Diocletian, leave little doubt as to this being a work of his time, and not, as has been

usually as- sumed, the work of Pope Presenrueved —— PRESENT LEVEL

. OF GROUND Honorius LL,

who (625-638 A.D.) — conse- crated it as the church of S.

Adriano.

From _ the REMY '_ _ \ TM. Curia a flight 5 Io 20 io 400 OFEET ae. : a Fia, 12.—Curia of Diocletian, as it was in the 16th century.

sag : A, A, A. Original windows now blocked up. B. Bronze mitium (Liv., doors. ©. Stucco facing. D. Cornice with marble consoles 1. 36), the level and enriched stueco mouldings, both existing. E. Raking of which ap- cornice now gone, but shown by Du Perac. pears from the existing steps and pavement near the arch of Severus (see Plate VII.) to have been about 2 feet below that of the Forum, and not above it, as Bunsen and others have asserted. On the Comitium stood the ancient rostra till they were rebuilt on a new site by Julius Cesar in 44 B.c. The ancient rostra were so called in 338 3B.c., when Camillus and Mcenius defeated the Latin fleet at Antium, and the beaks (rostra) of the captured ships were fixed to an existing platform on the Comitium for orators. It was also called a "templum"' because the structure was consecrated by the augurs (Cic., De Orat., iii. 3). Other rostra, named for distinction Rostra Julia, were so called from the beaks of ships taken at Actium and affixed by Augustus to the podium of the teinple built by him in honour of the deified Julius. oth are mentioned by Suetonius (Awg., 100). There were several other platforms or tribunals for orators in and about the Forum, but they were not called rostra. From the original rostra Cicero delivered his Second and Third Catiline Orations, and they were the scene of some of the most important political struggles of Rome, such as the enunciation of their laws by the Gracchi. Beside the Comitium another monument was erected, also adorned with beaks of ships, to commemorate the same victory at Antium. This was the Columna Meenia, so called in honour of Meenius (Plin., H.., xxxiv. 11, vii. 60). The Columna Duilia was a similar monument, erected in honour of the victory of C. Duilius over the Punic fleet in 260 B.c.; a fragment of it with inscription (restored in imperial times) is preserved in the Capitoline Museum.'! Columns such as these were called "columne rostrate."

Near the Comitium, on the side towards the Capitol, was the Greecostasis, a platform where foreign ambassadors stood to hear the speeches (see Varro, loc. cit.). It appears probable that, like the rostra, the Grecostasis

was moved in the 1st century B.C. ; and this name has been given with some probability to the curved marble-faced platform behind the existing rostra.

The Senaculum appears to have been a place of preliminary meeting for the Senate before entering the Curia (Liv., xli. 27; Val. Max., ii. 2, 6) ; it adjoined the temple of Concord, and when this was rebuilt on an enlarged scale in the reign of Augustus it appears probable that its large projecting portico became the Senaculum (Dionys., i. 34, vi. 1). It may possibly have once been identical with the Area Concordie mentioned by Livy (xl. 19) in connexion with the Area Vulcani (comp. xxxix. 46).

A great part of the north-east side of the Forum was occupied by two basilice, which were more than once rebuilt under different names. The first of these appears to have been adjacent to the Curia, on its south side; it was called the Basilica Porcia, and was founded by the elder Cato in 184 z.c. (see Liv., xxxix. 44, and Plut., Cato Major, 19); it was burnt with the Curia at Clodius's funeral. Adjoining it another basilica, called Emilia et Fulvia (Varro, vi. 4), was built in 176 3.c. by the censors M. Fulvius and M. Amilius Lepidus ;? it stood, according to Livy (xl. 51), RE aM scapes Dita! ai in Winters Th LY

1 The column itself is a copy made by Michelangelo ; it is at the foot of the stairs of the Palazzo dei Conservatori.

z The Forum Piseatorium or fish-market appears to have been at the back of this basilica (see Liv., xl. 51).

'post argentarias novas," the line of silversmiths' shops along the north-east side of the Forum. In 50 B.c. it was rebuilt by L. Aimilius Paulus (Plut., Ces., 29; Appian, Bell. Civ., ii. 26), and was more than once restored within the few subsequent years by members of the same family. Its later name was the Basilica Pauli, and it was remarkable for its magnificent columns of Phrygian marble (Plin., H.N., xxxvi. 24) or pavonazetto.

Near the middle of the north-east side of the Forum stood also Temples the small bronze temple of Janus,? the doors of which were shut of Janus. on those rare occasions when Rome was at peace.4 A first brass of Nero shows it as a small cella, with richly ornamented frieze and cornice. Another edicula near that of Janus was the shrine of Venus Cloacina (or the Purifier), probably on the line of the great cloaca (Liv., iii. 48; Plin., H.N., xv. 36). Two or more other shrines of Janus stood on this side, behind the shops of the money- lending argentarii ; and the word "Janus" was used to imply the place of usurers (Hor., Sat., ii. 3, 18).

So far the buildings mentioned have been mostly those whose

sites are still buried under the line of modern houses on the north- east of the Forum, the only part which has not yet been excavated. Turning to those of which existing remains are visible, at the notth-west end the rostra of Julius Cesar mark the limit of the Forum in this direction, as the arch of Fabius beside the temple of Faustina did in the other.

Plate VII. shows the plan of the rostra, with the curved Grecostasis Existing behind it. It is an oblong platform about 78 feet long and 11 feet rostra. high above the level of the Forum; its ground floor, paved with herring-bone bricks, is 2 feet 6 inches below the Forum paving.

Its end and side walls are of tufa blocks, 2 feet thick and 2 feet

wide, each carefully clamped, to the next with wooden dovetail

dowels. Its floor was supported by a series of travertine piers, carrying travertine lintels, on which the floor slabs rested (sce

fig. 13). Outside it was completely lined with Greek marble and

had a richly moulded plinth and cornice; none of the latter is in

situ, "0 many pieces lie scat-

tered around. A Be cosnice, groove cut im sere, fat tous verses the top of the cornice shows the place where marble cancelli were fixed; one of the

cornice : blocks is partly OL MMMM

MARBLE Lining.

without this (NE LINT 25 groove, showing that the screen did not extend along the whole front of the ros- tra. This agrees with a relief on the arch of Con- stantine, repre- rsa or senting the em- f peror making an oration from the rostra, withother buildings at this ; endofthe Foruin py, 13,— Section through front of rostra, showing the shown behind. marble lining, screen, and bronze beaks, the position of

; ; which is shown by the holes in the existing tufa wall. In this be elief the The details are to double scale. > screen is shown

with a break in the middle, so that the orator, standing in the centre, was visible from head to foot. Two tiers of large holes to hold the bronze rostra are drilled right through the tufa wall, and even throngh the travertine pilasters where one happens to come in the way ; these holes show that there were nincteen rostra in the lower tier, and twenty above set over the intermediate spaces of the lower row. The back wall of the rostra is of concrete faced with brick, which, being pone the work of Julius Cesar in 44 B.C., is the earliest dated example of brickwork in Rome. The inside space, under the main floor of the rostra, is coated thickly with stucco,— the brick wall being studded in the usual way with iron nails to form a key for the plaster. In spite of the assertions of Bunsen, Jordan, and others that tlre Curved curved platform behind (conjecturally called the Grecostasis) is a platform. work of late date, it is evident from various constructional points, i visible at the junction of the two structures, that it existed before the rostra, which when built completely hid its rich lining and the pilasters of porta santa marble which decorated its front,—very strong evidence as to the curved platform being earlier in date. The level

TRAVERTINE LIN’

on U, DETAIL

Yl Wi WY, , MARBLE PLINTH.

3 The original temple was one of the prehistoric buildings attributed to Romulus and Tatius (Serv., Ad Afn., i. 291), or by Livy (i. 19) to Numa. 4 See Mon. Ancyr.; Procop., Bell. Goth., i. 25; Liv., 1.19; Suet., Aug., 22.

Umbili- cus and Milliar- ium.

Temple of Saturn.

ARCHEOLOGY. |

of the top of this platform and that of the rostra appear to have eoincided exactly, so that the whole formed one continuous marble- paved platform, and the rostra would be reached, not by steps, but from the higher ground towards the Capitol, from which access is given to the curved platform and so on to the floor of the rostra. The bronze rostra on this structure of 44 B.c. were believed to be the original beaks from Antium, moved from the old rostra (Florus, i. 11). On its marble platform stood many statues,! ¢.g., of Sulla, Pompey, two of Julius Cesar, and others (see Dion Cass., xlii. 18, and xliv. 4). Owing probably to the weight of the many statues proving too much for the travertine piers, which are not set on their natural beds bunt endways, and therefore are very weak, the structure seems to have given way at more than one time and the floor has been supported by piers and arches of brick-faced concrete, inserted either in place of or at the sides of the shattered piers. These later additions, apparently of the 3d and 4th centuries, are omitted in Plate VII. for the sake of clearness. The moulded plinth of the curved platform is of Pentelic marble, some of the blocks of which are ineised with masons' marks, namely, the Greek Ictters T, A, HE, Z, H, ©, and K. A number of metal pins on the face of the slabs of porta santa marble which line its front show that emblemata or reliefs, probably of gilt bronze, were once fastened to the marble.2. The use of Greek marble shows that this platform can be bnt little earlier than the rostra (44 B.c.); and it appcars possible that this is the Grecostasis, transferred, like the rostra, to anew site.? See Varro (Z.Z., v. 155) and Cicero (Ad Quint. Fr., ii. 1), who mention the original structure. Restorations of the later one by Antoninus Pius and Diocletian are mentioned by Capitolinus (Ant. Pius, 8), and in the Catal. Imp. Vienn. given by Preller (Regionen, p. 143),—in both cases after injury by fire, a fact which seems to show that in later times the

Grecostasis had some roofed porticus or shelter and was not a mere open platform as it was originally.

At the northern end of the curved platform there is a cylindrical structure of concrete faced with brick, and lined with thin marble slabs ; it is in three stages, each diminishing in size, and appears to be an addition of about the time of Severus. This is usnally identified with the Umbilicus Rome, or central point of the city, mentioned in the Nodttia and the Einsiedelu MS. (see Preller, Regionen, Reg. viii.). According to another theory it is the base of the gilt statue of the Genius Populi Romani set up by Aurelian ; but this is contradicted by the form of the structure, which is not that of the pedestal of a statuc.4 At the other extremity probably stood the Milliarium Aureum, a marble column sheathed in gilt bronze and inscribed with the names and distances of the chief towns on the roads which radiated from the thirty-seven gates of Rome (Plin., H.N., iii. 9). It was set ie! by Augustus in 29 Bc. and its position "sub edc Saturni"' is indicated by Tacitus (Hist., i. 27; see schol. on Suet., Otho, 6, and Plut., Galba, 24), The Milliarium is mentioned in the Notitia (Reg. viii.) as being near the Vicus Jugarius. The position shown in Plate VII. agrees with both these indications, being near the start of the Vicus Jugarius, and close under the temple of Saturn. Fragments of a curved marble plinth and frieze with floriated reliefs, now lying in the Basilica Julia, probably belonged to the pedestal of this column ; they were found by Canina near the supposed site.? |

The position of the temple of Saturn is described in Aon. Aneyr. (see below) and shown on the marble plan, and is also identified by various passages in ancient writers. Varro (Z.Z., v. 42) speaks of it as being "in faucibus Capitolii";® Servins (4d din, 11. 115) says that it is in front of the Clivus Capitolinus, and near the temple of Coucord (see Plate VIL). It was built against a steep slope or outlying part of the Capitoline Hill (comp. Dionys., 1. (SS ie 2a gg il SiR as ne lI

1 The original rostra had specially honorary statues to those Roman ambassa- dors who had been killed while on foreign service (Liv., iv. 17); these were probably removed during Cicero's lifetime (Cic., Phil., ix. 2; see also Dion Cass., xHii. 49, and Plin., H.N., xxxiv. 11). Ghastly

ornaments fixed to these rostra in the year 43 B.c., shortly after they were built, were the head and hands of the murdered Cicero (Appian, Bell. Civ., iv. 20; Dion Cass., xlvii. 8 ; Juy., x. 120), as on the original rostra had been fixed many heads of the chief victims of the proscriptions of Marius and Sulla (see Appian, Bell. Civ., i. 71, 94; Florus, iii. 21; and Cic., Pro Sext., 35,36). The denarius of the gens Lollia with the legend PALIKANVS was once supposed to have a representation of the rostra on its reverse, but it is now generally admitted that the subject is a harbour containing ships, the beaks of which only are shown. Even if the rostra of the Forum are represented it would be the original suggestum, not that of Julius Cesar.

2 This method of decoration was much employed by the Greeks and largely followed by their-Roman imitators. For further details on the rostra, &c., see Jordan and Fabricius, in Ann. Inst. for 1883; Nichols, Gli Avanzi det Rostri, &e., 1885; and a paper by the present writer in Archaologia (read November 1884). Pp

3 It must, however, be admitted that there is very little evidence in support of this theory.

4 Becker, Handbuch, i. p. 360, adopts this view, and maintains that the Umbilicus and Milliarium were identical, in spite of their being separately catalogued in the Notitia. ; ;

5 What is probably the column of the Milliarium is still lying near its supposed site; it is of Greek marble, and is covered with holes by which the bronze casing was attached. Since the above was written the existing pieces of the marble base have been replaced on its conjectural site. ane

6 In the same passage he mentionsa gate near this temple into the Capitolium once called Porta Saturnia, but in his time P. Pandana.

ROM #

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34) on the site of a prehistoric altar to Saturn, after whom the Capitoline Hill was originally called Mons Saturnius. The public treasury was part of this temple (Serv., Ad dn., ii. 116, and Macrob., Saé., i. 8).? The original temple is said by Varro (ap. Macrob., i. 8) to have been begun by the last Tarquin, and dedi- cated by T. Lartius, the first dietator, 501 B.c. ; but Dionysius (vi. 1) and Livy (ii. 21) attribute it to the consuls A. Sempronius and M. Minucius in 497 B.c. It was rebuilt on a larger scale by Munatius Plancus in the reign of Augustus (Suet., Awg., 29). The only part remaining of this date is the very lofty podium of massive travertine blocks, and part of the lower course of Athenian marble, with which the whole was faced. In the 16th century a piece of the marble frieze was found, inscribed L. PLANCVS.L.F. COS. IMPER.ITER.DE.MANIB. (C.J.Z., vi. 1816). The erection of the six granite columns in the front and two at the sides, with their clumsily patched entablature, belongs to the last rebuilding in the time of Diocletian. Some of these fine columns are evi- dently earlier than this rebuilding, but were refixed with rude caps and bases. One of the columns is set wrong way up, and the whole work is of the most careless sort. Part of the inscription, once inlaid with bronze, recording this latest rebuilding still exists ou the entablature (see Gori, L'Erario di Saturno, 1873).8 On the Forum side the temple is flanked by the Vicus Jugarius, while the steep Clivus Capitolinus winds round the front of the great flight of steps leading up to the cella, and then turns along the north-

west side of the temple.® The Vicus Jugarius (see Plate VII.), part Vicus of the basalt paving of which is now exposed, was so called (see Jugarius.

Festus, ed. Miller, p. 104) from an altar to Juno Juga, the guardian of marriage. Starting from the Forum, it passed between the temple of Saturn and the Basilica Julia, then close under the cliff of the Capitolium (see Liv., xxxv. 21) and on to the Porta Carmen- talis. It was spanned at its commencement by a brick-faced arch lined with marble, the lower part of which exists, and is not earlier than the 3d or 4th century." At this end of the Forum the arch of Tiberius was built across the Sacra Via, which is narrowed as if to bring it under the span of the arch. It was erected in 17 A.D. to commemorate the recovery of the standards lost by Varus.?} A few fragments remain, scattered about in various places

The Basilica Julia? occupies a great part of the south-west side Basilica of the Forum, along the line of the Sacra Via ; its ends are bounded Julia.

by the Vicus Jugarius and the Vicus Tuscus. It was begun by Julius Cesar, finished by Augustus, and again rebuilt by him, as is recorded in the Afon. Ancyr., in an important passage which gives its complete early history. In plan it was a large double porticus, open on three sides, with a range of rooms, tavo or three stories high, on the south-west side. These rooms, of which con- siderable remains exist, are built of tufa with travertine pilasters and bands in the tufa wall. This part probably is of the time of Julius Cesar; Angustus surrounded it with an arcade of arches in two stories and engaged Tuscan columns in Lnna marble, fragments of which cxist at the north-west end. The double aisle which surrounded it was vaulted in conerete, forming uppcr galleries (mxniana), whence spectators heard the law-cases which were con- ducted in the area below (see Plin., Zp., vi. 33). The central space was not roofed, but probably was sheltered by an awning. It is paved with richly eoloured Oriental marbles, namely, pavonazetto, cipollino, giallo, and Africano. The covered aisles are paved with large slabs of white marble. Many tabulz lusorizx, or gambling boards, are scratched on this marble paving (comp. Cic., Phil., ii. 23).16 Low marble cancelli, with moulded plinth, closed the other- wise open arches of the basilica; many fragments exist, and one piece of the subplinth is still im sttw. This basilica held four law- courts with 180 judices or jurors. Trajan and other emperors held law-courts there (Dion Cass., lxxxviii. 10). An inscription fonnd

7 In several inscriptions occurs the title " prafecti" or " queestores cerarii . " (see Gudius, Ant, Insc., p. 125; Suet., Claud., 24; Tac., Ann., xiii.

28, 29).

8 Another important treasury was the temple of Ops, in which were stored the 700,000,000 sesterces left by Julius Cesar at his death (Cic., Phil., ii. 87, and i. 7). It is usually supposed, though without much reason, to have ad- joined the temple of Saturn. Livy (xxvii. 10) mentions another treasury, the £rarium Sanctius, in which a reserve store of gold was kept.

9 A portion of these streets with part of the temple of Saturn and the Basilica Julia is shown on fragments of the marble plan (see Plate VII.)

10 One side of this gate was built against one of the marble piers of the Basilica Julia, a perfect print of which still exists in the concrete of the gate, though the marble pier itself has disappeared. The other side of the gate abutted against the marble-lined podium of the temple of Saturn. ;

1l See Tac., Ann., ii. 41, who says it was " propter edem Saturni." |

12 See Suet., Aug., 29; Gerhard, Bas, Giulia, &c., 1823; and Visconti, Excava- zione della Bas. Giulia. gat

13 "'Forym . Ivlivm . et. basilicam . qvac . fvit . inter .aedem . Castoris. et . aedem . Satvrni. cocpta . profligataqve . opera . a. patre. meo. perfeci . et . eandem. basilicam . consvmptam . incendio . ampliato . eivs . solo. svb. titvlo. nominis . filiorvm . inchoavi. et. si. vivvs . non. perfecissein . perfici . ab. haeredibvs. [ineis . ivssi]." The "'filii" here referred to are Augustus's grand- sons, Caius and Lucius (see Dion Cass., lvi. 27). : '

14 Oneof the late reliefs on Constantine's arch shows this (or a similar build- ing) with the upper galleries crowded with people (see Plin., Ep., vi. 38, 5). The open arches seem to have curtains to keep out the sun.

15 Three medieval lime-kilns were found by Canina within this basilica, which accounts for the scantiness of the existing remains.

16 A few have inscriptions, ¢.g., " Vinces. gaudes: perdes. plangis."

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near it records its restoration by Septimius Severus in 199 a.p. after a fire ; it was again burnt in 282 and restored by Diocletian. These fires had destroyed nearly all the fine marble arches of Augustus ; and Diocletian rebuilt it mostly with brick ov travertine piers, a

few of which remain.! A final restoration is recorded in aninscrip- | The Fons Ju- tion discovered in the 16th century, and another in 1882, as being | turne (see Ov., carried out by Gabinius Vettius Probianus, prefect of the city in | Fast., i. 705,

377 (Gruter, Inscr., clxxi. 7); the latter is on a pedestal which now stands in the Vicus Jugarius. Suetonius (Ca/., 37) mentions that it

was one of Caligula's amusements to throw money to the people | the _Dioscuri below from the roof of this basilica, which probably was a link in | were fabled to the bridge by which this maniac connected the Palatine with the | have watered Capitolium. The line of the bridge, which starts in the upper part | their horses, was of Caligula's palace, passes over a lofty and massive brick-faeed | beside their

building, once lined with marble, which stands on the lower slopes of the Palatine. Suetonius's aecount (Cal., 22) of the bridge makes it very probable that this building is the temple of Augustus, as

there is no other possible site for it on the line from the Palatine | byhas been sup- to the Capitolium. The intermediate stages from the temple to} posed to have , the basilica and thence to the Capitolium were probably merely a | belonged to this. wooden structure, as no traces of it now remain. The temple of'| Its form, how- Augustus was begun by Tiberius and finished by Caligula (Suet., | ever, makes it

Cal., 21).

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Senate, and its lofty podium formed a tribunal for orations.4 Close by it was another tribunal, probably merely a wooden sug- gestus—called the Tribunal Aurelium (see Cic., In Pis., 5, and Pro wSeet.,, 15).

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and Dionys., vi. 13), at which

temple, and the circular traver- tine curb close

more probable

Vieus The Vicus Tuscus passes from the Sacra Via between the Basilica | that it was the

Tuscus, Julia and the temple of Castor to the Velabrum and Circus | plinth of a Maximus ; its basalt paving has been exposed at many points along | screen round its whole line (see Liv., xxvii. 37). A very early statue of one of | the Puteal Scri- the chief Etruscan deities, Vortumnus, stood in this street, a little | bonis or Libouis to the south-west of the Basilica Julia, where part of its pedestal | (Hor., Ep.,i.19, was found in 1549 inscribed VORTVMNVS TEMPORIBVS DIOCLE- | 8, and Sat., ii. ; [TIANI. ET. MAXIMIANI ... (C.J. L., vi. 804? see also Pseudo- | 6, 35),—a cir- —— ==— wT ee Ascon., Ad Cic. Verr., ii. 1, 59). The Vicus Tuscus was also | cular marble _—— OW called Thurarius, from shops of perfume-sellers (see Hor., Saé., ii. | structure like a ie ~aceus™, 4 8, 228, and Ep., ii. 269). It is the street along which processions | well-mouth, or- SACRA VIA POT TERETE passed, mentioned by Cicero (Verr., ii. 1, 59) as extending "a signo | namented with FOUNDATIONS !PLAN OF TENBLE X ae Vertumni in Circum Maximum." reliefs of lyres : ;

Temple The temple of Castor on the south-east side of the Vicus Tus- | and garlands, FiG. 14.—Plan of temple of Castor, half showing igh Sta*

ofCastor. cus was founded to commemorate the apparition in the Forum of | used to enclose #02 a erro ge na rod aches

*A . ° * » Db, Db. OHpurs of roundation wall, of travertine and tula,*

the Dioscuri announcing the vietory of Aulus Postumus at Lake somespotstruck under the three existing columns. C. Steps to small Regillus, 496 B.c., and was dedicated in 482 B.c. by the son of A. | by lightning or chamber in concrete core of podium. D. Existing piece Postumus (Liv., ii. 20, 42 ; Dionys., vi. 13; Plut., Coriol.,3; Ov., | sacred rom f mosaic paving of earlier building.

Fast., i. 707). In 119 B.c. it was restored by the consul L. Metellus Dalmaticus (Ascon., In Cic. Pro Scawr., 46) and finally rebuilt in the reign of Augustus by Tiberius and Drusus, 6 A.D. (Suet., 77%b., 20; Ov., Fast., i: 705; Dion Cass., lv. 8, 27), to which period belong the three existing Corinthian columns and piece of entablature, all very delicate and graceful in detail, and of the finest workmanship, in Pentelic marble; the design is of pure Greek style. One point shows Roman timidity in the use

other causes. It is shown on a denarius of the gens Scribonia. The Sacra Via, in its course from the Regia towards the temple of Saturn, originally passed in front of the temple of Castor ; but in late times its line was changed, and it is now covered at this point by rude paving of travertine and marble, probably not earlier than the 5th century. The ancient line is indicated by the Regia, shown on fig. 16. .

On the other side of the Sacra Via stand the scanty remains of Temple the temple of Divus Julius, erected by Augustus. Though little of Divus | beyond its concrete core is left, its plan can be fairly well made out Julius. |

of a lintel: the frieze is jointed so as to form a flat arch, quite needlessly, with the object of relieving the weight on the archi-

trave. Its plan, hexastyle, with only eleven columns on the sides, is shown in Plate VII. and fig. 14. It had a lofty podium, lined with marble, and decorated with a heavy cornice al, pilasters, one under each column. The podium is an interesting example of the enormous solidity of Roman buildings of the best period. Solid tufa walls, 8 feet thick, are built under the whole of the cella and the front row of columns, while the columns of the sides rest on a i of similar walling, projecting at right angles from that under the cella ; the part immediately under the columns is of travertine, and the spurs are united and strengthened laterally by massive flat arches, also of travertine. With the exception of a small chamber under the steps, entered from the Vicus Tuscus, the entire podium is filled up by a solid mass of concrete, made of broken tufa, pozzolana, and lime, the whole forming a lofty platform, about 22 feet high, solid as a rock, on which the columns and upper structure are erected. Small chambers

formed in the con- crete basement, such as the one in this temple, occur in many instances, ¢.g., in the temples of Saturn, Divus Julius, and Con- cord. They were probably used as strong rooms, in which money and plate were deposited for safe keeping (see Juv., xiv. 260), a purpose for which Roman temples were frequently used. Two fragments of mosaic, with simple lozenge pattern in white marble and basalt, still exist in the cella of this temple. The level of the mosaic shows that it is of earlier date than the rebuilding of Tiberius, as it lies considerably below the level of the later floor. It has all the characteristics of early mosaic—very small tesserae fitted with great accuraey, like the early mosaic in the Regia. The temple of Castor was often used as a meeting-place for the

ee ee as 'a 1 The whole building has unhappily been much falsified by needless restora- ion.

2 A drawing of this pedestal, which is now lost, with MS. note by Ligorio, exists in Cod. Vat., 3439, fol. 46. Propertius (Eleg., iv. 2) gives an interesting oe of Vortumnus, and in 1, 50 mentions the derivation of the name Vicus

scus,

3 The temple of Castor is shown on two fragments of the marble plan (see

Plate VI1.), and its position is also indicated by th sage i 4A ia Er Seay p Ss y the passage in the Mon. Ancyr.

from the voids in the concrete, which show the position of the tufa foundations under the walls and columns (as in the temple of Castor). The temple itself, a hexastyle prostyle building, with close pyknostyle intercolumniation (Vitr., iii. 2), stood on a lofty podium with a curved recess in the front between two flights of stairs (see Plate VII.). The wall which now fills up the recess is a late addition. It is possible that this very unusual plan was, adopted in order that the recess might leave room for the pre- existing altar (Appian, Bell. Civ., ii. 148) or column (Suet., J. Cexs., 85) erected by the Senate with the inscription PARENTI PATRIZ. The podium, which projects in front of the temple itself, was adorned with beaks from the ships taken at Actium (Dion Cass., li. 19), and hence it

was called the Rostra Julia, to distin- guish it from the other rostra described above. Both were used for the funeral orations in honour of Augustus (Suet., dug., 100; see also Dion Cass., liv. 35). Besides the concrete core and the curved tufa wall of the recess, little now exists except a small bit of the mosaic of the cella floor and some fragments of the cornice and pediment, of fine Greek marble. This temple is represented on coins of Augustus and Hadrian.

The temple of Vesta, founded according to tradition by Numa,® Temple stands at the southern angle of the Forum on the ancient line of of Vesta.

the Sacra Via (Ov., Trist., iii. 1, 28). No shrine in Rome was equal in sanctity to this little circular building, which contained the sacred fire.and the relics on which the welfare and even the existence of Rome depended. The shrine was an "des sacra," not a "templum" in the strict sense of the word, which means a build- ing so inaugurated that it could be used for meetings of the Senate. The original building was destroyed in 390 B.c. by the Gauls; it was burnt again in 241 8.c., again in the great fire of Nero's reign, and then in the reign of Commodus; after this it was rebuilt hy

4 One of the mad acts of Caligula was to eonnect the temple of Castor with his palace by breaking a door through the back of the eella (Suet., Cal., 22). Though dedicated to both the Dioscuri, the building was usually called the temple of Castor only (see Suet., J. Cas., 10).

5 Another legend attributes its founding to Romulus.

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Severus, to whose age belong the fragments of columns, cornice, and other architectural features now lyitig around the ruined podium. These, with the help of representations of the temple on coins of Domitian, and an ancient relief in the Uffizi (see Lanciani, L' Atrio di Vesta, 1884, pls. xix.~~xxi.), are sufficient to make an accurate restoration (see Plate VII. and fig. 15). It consisted of a circular cella, surrounded by eighteen columns, with screens be~~ tween them ; the circular podium, about 10 feet high, still exists,

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Se se ess EEE ETE OEE EEE) Fic, 15.—Temple of Vesta, as rebuilt by Severus, conjecturally restored by Comm. Lanciani from existing remains.

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Fig. 16.—Plan showing the remains of the temple of Vesta, the Regia, and the house of the vestals, as rebuilt by Hadrian ; exeavated 1883-84.

destroyed in 390 B.c. by the Gauls, and was again burnt in 210 B.c. (Liv., xxvi. 27), when the temple of Vesta narrowly escaped. Julius Cesar, as pontifex maximus, resided here; and when Augustus succeeded to this office in 12 B.c. he gave the Regia to the vestals, having ‘built himself a large house on the Palatine. When the Atrium Veste or house of the vestals was rebuilt on an enlarged scale the Regia was pulled down and its site partly occupied by

1 The temple of Vesta is also shown on medals of Faustina senior, Lueilla, Crispina, and Julia Domna (see Froehner, Médaillons de’empire Romain, Paris, 1878, pp. 76, 96, 148, 159), It very elosely resembles the so-called tomb of St Luke at Ephesus, a Roman work of about the same date. ne

2 See Lipsius, ‘De Vesta,” inGrevius, Thes. Ant. Rom., v.; Cancellieri, Le sette Cose faiali di Roma, 1812; Preuner, Hestia-Vesta, Tiibingen, 1864 ; Jordan, Vesta und die Laren, Berlin, 1865; Maes, Vesta e Vestali, 1883.

*the new atrium. Ovid (7'rist., iti. 1, 28) describes this end of the Forum thus — ** Hee est a saeris que via nomen habet, Hie locus est Vest, qui Pallada servat et ignem, Hie fuit antiqui Regia parva Nuine."*

The excavations of the last few years have laid bare remains of this very interesting building, and show that it was a large house extending close up to the temple of Vesta,—éuéro.xos, as Dion Cassius (Ivi. 27) says. It was set at a quite different angle from the Atrium and other later buildings which were built over its founda- tions; this angle shows the original line of the Sacra Via, which in later times was diverted into a different direction. The existing remains are of several dates,—first, walls of soft tufa, part possibly of the earliest building; second, walls of hard tufa, of rather later date; and lastly, concrete walls faced with brick, decorated with painted stucco, and columns of travertine, also stuccoed and painted,? with a large quantity of fine mosaic of that early sort which has very small tesseree put together with great accuracy. This last part probably belongs to the rebuilding by Domitius Calvinus in 35 B.c. (Dion Cass., xliii. 42). These valuable remains were preserved in spite of the erection of later buildings over them because the levels of the later floors were higher than those of the Regia, and thus covered and protected the mosaics and lower parts of the walls and columns (see fig. 16). Besides being a dwelling- house, the Regia contained a sacrarium, in which were preserved the sacred spears of Mars (Aul. Gell., iv. 6), and also the shrine of the Dea Ops Consiva, only entered by the vestals and the sacerdos publicus (Varro, L.L., vi. 21).*

The Atrium Vesti or house of the vestals, like the temple, was Atrium many times burnt and rebuilt ; the existing building, which was Veste.

excavated in 1883-84, is of the time of Hadrian, as is shown by the brick stamps. It consists of a large atrium or quadrangle with columns of cipollino. At one end is the tablinum, with three small rooms on each side of it,—probably for the six vestals. A bathroom, bakehouse, servants' offices, and some rooms lined with rich marbles extend along the south-west side. This extensive building is set against the side of the Palatine, which is cut away to admit the lower story. Thus the level of the first

upper floor is nearly the same as that of the Nova Via, on which it faces, about 23 feet above the ground floor. The upper floor is in part well preserved ; it contains a large suite of bath and other rooms, which were probably the sleeping apartments of the vestals. All the better rooms and the baths are lined with polished marbles, many of great beauty and rarity; the floors are mostly mosaic of tesselated work. The paving of the tablinum was a beautiful specimen of inlay in porphyry and marble. In many places alterations and clumsy patchings of the 4th and 5th centuries are apparent.

the Nova Via separates the Atrium Veste from the palace of

Caligula (see Plin., Zp., vii. 19; Aul. Gell., i, 12), which extends over the site of the Lucus Veste, —" qui a Palatii radice in Novam Viam devexus est" (Cic., De Div., 1. 45). A curious octagonal structure in the middle of the atrium (sce fig. 16) looks very much like a border for flower-beds; and it is possible that this miniature garden was made by the vestals when Calignia built over their ex- tensive grove on the slopes of the Palatine. By the main entrance from the Fornm stood a small edicula,—a large pedestal at the angles of which were columns supporting an entablature.® It may have contained a statue of Vesta, there being none within the temple. It is of the time of Hadrian. The last of the vestals is mentioned by Zosimus (v. 38) as being alive in 894 ; but the Atrium continued to be partly inhabited for many centuries later.? In September 1884 a road was discovered leading up past the tablinum end of the Atrium from the Sacra Via to the Nova Via (ee fig. 16). In about the 4th century this road appears to have been blocked up at the Nova Via end by a building which adjoincd the Atrium Veste.

At the east corner of the Forum stood the arch of Q. Fabius Areh of Maximus, consul in 121 3.c., called Allobrogicus from his victory Fabius,

3 See a monograph by the present writer in Archwologia (read November

1884), ;

4 tne eolumns were crimson, the travertine rain-water gutter bright blue, and the inner walls had simple designs in panels of leaf ornament and

wreaths.

5 One of these, a noble figure of the time of Hadrian, is specially remarkable

_as being the only statue known on which the sufibulwm is represented, a sort

of hood, only worn by the vestal at the moment of offering saerifiee (see Festus, ed. Miiller, p. 340; and Varro, L.L., vi. 21). Many points of great interest occur in the inseriptions on the pedestals.

6 The front and one side are now lying near; the former is inscribed SENA- TVS . POPVLVSQVE . ROMANVS . PECVNIA .. PVBLICA . FACIEN- DAM. CVRAVIT. ;

7 In the excavations of December 1883 a pot was found in the north corner containing $30 silver pennies of English kings of the 9th and 10th centuries,— Alfred the Great, Eadward I., Athelstan, Eadmund I., and others. A list of these is given by De Rossi in Laneiani's work, LT' Atrio di Vesta (Rome, 1584), None are later than 946, and a bronze fibula inlaid with silver with the name of Pope Marinus II. (942-946) makes it seem probable that this hoard was con- cealed during his pontificate.

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Temple The temple of Faustina the elder stands at the east angle of the pasian (only about 7 feet in width) a small brick and concrete of Faus- Forum, facing the later line of the Sacra Via. It is prostyle hexa- | edicula stands against the Tabularium. This has been wrongly tina. style, and has monolithic columns of cipollino and arich entabla- | called a shrine of Faustina, on the authority of a small inscribed ture of Greek marble, with graceful reliets of griffins and candelabra | pedestal found near it ;7 but there is clear constructional proof on the frieze.2 The walls are of massive peperino, once lined with | that it is contemporary with the temple of Vespasian, and is there- marble. On the front is inscribed DIVO.

ANTONINO.ET.DIVAE. | fore of the time of Domitian. It inay possibly have been a shrine FAVSTINAE.EX.S.C. This temple, built by Antoninus Pius in | dedicated to Titus, whose name does not occur in the inscription inemory of his wife, who died in 141, was after his death dedicated | of the adjoining temple, though the catalogue in the Curtoswm, also to him, and the first line was then added (Capitolinus, Ant. | Reg. ix., mentions a dedication to both father and son.9 Pius, 6). At an early period it was consecrated as the church of S. The next building is the Porticus XII. Deorum Consentium, a Portiens Lorenzo in Miranda, and a great part of its cella has been destroyed. | large marble platform facing the Clivus Capitolinus, with a row of XII. The front is now excavated to the original level. This temple is | small rooms or shrines partly cut into the tufa rock of the hill Deorum. shown on the reverse of several coins of Antoninus Pius; some | behind. This conjunction of twelve deities was of Etruscan origin; have the legend DEDICATIO. AEDIS. they were six of each sex and were called Senatus Deorum (Varro, Temple The space between the north-west end of the Forum and the | L.Z., viii. 70, and De Re Rust., i. 1)..° The columns are of cipol- of Con- Tabularium is occupied by a range of important buildings (see Plate | lino with Corinthian caps ; on the frieze is an inscription record- cord, VII). The chief of these is the temple of Concord (see Festus, ed. | ing a restoration by Vettius Preetextatus, prefect of the city in 367 Miller, p. 347) shown on a fragment of the marble plan, founded | a.p. Under the marble platform is a row of seven small rooms, by Camillus in 367 3B.c. (Plut., Cam., 42), and rebuilt by the | the brick facing of which is of the Flavian period, used as offices brothers Tiberius and Drusus out of the spoils gained in Germany; | (schola) for scribes and precones of the ediles. It is usually called it was rededicated in 10 a.p, (Suet., T%b., 20; Dion Cass., lv. 25). | the Schola Xanthi from an inscription, now lost, recording its re- It is shown with unusual minuteness on the reverse of a first brass | storation by A. Fabius Xanthus and others, and the erection of of Tiberius. It is probable that an earlier restoration was carried | seven silver statues of gods (Gruter, Znscr., 170, 3).1 out by L. Opimius in 121 Bc. (Plut., C. Gracch., 17; Appian, The arch of Severus stands by the rostra, across the road on the Arch of Bell. Civ., i. 26), The existing remains? are of the rebuilding by | north-east side of the Forum ; the remains of the ancient travertine Severus. Tiberius and Drusus, and show that it was unusual in plan,

having | curb show that originally the road went along a rather different a large cella much wider than its depth, and a very large projecting line, and was probably altered to make room for this great arch. portico. Its construction is an intcresting example of the Roman | It was built in 203 A.D., after victories in Parthia, and was origin- use of many different materials. The lower part of the walls was ally set up in honour of Severus and his two sons Caracalla (here of massive tufa blocks, the upper part of the cella of travertine; | «called M. Aurelius Antoninus) and Geta. Caracalla, after murder- and the inner low wall, which supported ranges of internal columns, ing Geta, erased his name from all monuments to his hononr in was of mixed conerete, tufa, and travertine. The whole was lined | Rome. Representations of the arch on coins of Severus show that ° with marble, white outside, and rich Oriental marbles inside (see | its attic was surmounted by a chariot of bronze drawn by six fig. 5), which were also used for the pavement. The door-sill is | horses, in which stood Severus crowned by Victory ; at the sides made of enormous blocks of porta santa marble, in which a bronze | were statues of Caracalla and Geta, with an equestrian statue at caduceus (emblem of Concord) was inlaid. Between the internal | each angle. The arch, except the base, which is of marble-lined columns of the cella stood rows of statues; and the temple also | travertine, is built of massive blocks of Pentelic marble, and has contained a large collection of pictures, engraved gems, gold and | large crowded reliefs of victories in the East, showing much deca- silver plate, and other works of art, mostly the work of ancient dence from the best period of Roman art. Greek artists (see Plin., H.W, xxxiv. 19, xxxv. 36, 40, xxxvi. 67, The central space of the Forum is payed with slabs of travertine, Central xxxvii. 2). On the apex of the pediment was a group of three | much patched at various dates; it appears to have been marked space of figures embracing ; the tympanum was filled with sculpture; and | out into compartments with incised lines (see Plate VII.), the use Forum. statues were set in the open porch. Though how only the podium of which is not known.'" Numerous clamp- holes all over the and the lower part of the cella wall exist, with foundations of the paving show where statues and other ornaments once stood. The great flight of steps, many rich fragments both of the Corinthian | recorded number of these is very great, and they must once have entablature and of the internal caps and bases are preserved in the thickly.crowded a great part of the central area.

“I’wo short marble Capitol; and some of the marble lining is still in situ. The | walls or plutei covered with reliefs, discovered in 1872, stand on the Einsiedeln MS. gives part of the inscription of the front—S.P.Q. | north side. Their use and original position are not known, as the R. AEDEM . CONCORDIAE . VETVSTATE. COLLAPSAM . IN . MELI- rough travertine plinth on which they have been set is evidently OREM . FACIEM . OPERE. ET. CVLTV. SPLENDIDIORE.RESTITV- | of late date. Each of these marble screens has (on the inside) ERVNT.5 Another temple of Concord, built in 219 B.c., stood on | reliefs of a fat bull, boar, and ram, decked out with sacrificial the Oapitoline Arx (Liv., xxii. 33, xxvi. 23) ; and a bronze edicula | wreaths and vitte—the suovetaurilia. On the outside are scenes of Concord in the Area Vulcani, which must have been close by the | in the life of Trajan: one has the emperor seated on a suggestus great temple. This was dedicated by Cn. Flavius, 305 B.c. (see instituting a charity for destitute children in 99 a.p.—a scene Liv., ix. 46) ; according to Pliny (A.N., xxxiii, 6) it stood “in | shown also in one of his first brasses—with the legend ALIM[ENTA] Grecostasi, que tune supra Comitium erat.” Both these were ITALIAE ;}° at the other end the emperor stands on the rostra, on probably only small shrines. which the two tiers of beaks are shown ; he is addressing a crowd Temple The temple of Vespasian stands close by that of Concord, abutting | of citizens. The backgrounds of this and the other relief are of of Ves- on the Tabularium in a similar way, and blocking up a doorway great topographical interest. In the first is shown the long line pasian. at the foot of a long flight of steps (see fig. 1). It consists of a of arches of the Basilica Julia, with (on the left) what is probably*

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over the Allobroges (schol. on Cic., In Verr., i. 7; Liv., Ep., lvi.; Plin., H.N., vii. 50). It marked the extreme limit of the Forum in this direction (Cic., Pro Plan., 7, 17), as the rostra did at the other end. This arch was dug up and mostly de- stroyed in 1540-50, near the temple of Faustina; on one of the fragments then discovered was inscribed Q. FABIVS OQ) on. EA SVMVS.AED.CVR.REST. About twenty-five other fragments were found in 1882.? The arch of Augustus, erected in 29 B.C., also stood

near this point, but its exact site is uncertain. An inscribed block of its attic was found during the excavations of

1540-50.

nearly square cella with prostyle hexastyle portico of the Corinth- lan order ; three of the columns are still standing, with their rich entablature, the frieze of which is sculptured with sacred instru-

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1 Ann, Inst., 1859, p. 307; Not. degli Scavi, 1882, p. 225.

2 This finely sculptured frieze is almost an exact copy of that on the temple of Apollo at Miletus.

3 The size of the earlier and smaller temple is indicated by the rough blocks on the face of the wall of the Tabularium, close against which the temple stands. When the Tabularium was built it was not thought worth while to dress to a sinooth face that part of its wall which was concealed by the then existing teinple of Concord.

4 The anonymous writer of this MS. appears to have visited Rome in the 9th century. The MS. is named after the monastery in which it is preserved.

® Little is known of the Basilica Opimia, which probably adjoined the earlier temple of Concord, and the existing building appears also to have occupied the site of the Senaculum (see Festus, ed. Miiller, p. 347). For various exciting scenes which took place in the temple of Concord and on its steps, see Cic., Phil., vii. 8; Sallust, Bell. Cat.

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ments. The walls are of enormous blocks of travertine with strong iron clamps; the whole was lined with white Pentelic marble outside, and inside with coloured Oriental marbles. There was an internal range of columns, as in the temple of Concord. This temple was built by Domitian,

c. 94 A.D., in honour of his father Vespasian. The inscription on the entablature, given in the Kinsiedeln MS., re- cords a restoration by Severus and Caracalla—DIVO. VESPASIANO., AVGVSTO.S.P.Q.R.IMPP.CAESS.SEVERVS. ET. ANTONINVS. PII . FELIC . AVGG . R[ESTITVER]VNT; part of the last word only now exists.®

In the narrow space between the temples of Concord and Ves-

[TOPOGRAPHY AND

the temple of Castor and the arch of Augustus. On the right are the statue of Marsyas and the sacred fig-tree (ficws rwminalis),! eS a Nae

6 See Piale, Tempi di Vespasiano e Concordia, 1821.

7 This pedestal is now on the ground floor of the Capitoline Museum ; its inscription is interesting, being a dedication to Faustina by a viator (messen- ger) of one of the questors of the Hrarium Saturni. Its discovery near this eedicula was probably accidental.

8 Exactly that part of the marble plinth of the temple of Vespasian which was concealed by the edicula is left rough, the moulding not being worked, showing that the little shrine is not an addition later than the temple.

9 See Preller, Regionen der Stadt Rom, Reg. ix., and Uhilrichs, Codex Topog. Rome, Reg. ix.

10 Twelve gilt statues are mentioned by Varro.

ll See Grifi, Gli Consenti e loro Portico, 1858.

12 They may possibly have had something to do with the marshalling of the voters of the Comitia Tributa.

33 Colien, vol. ii. 303-305,

14 Pliny (H.N., xv. 20) mentions another fig-tree in the middle of the Forum, which may possibly be the one here represented.

which stood on the Comitium. On the other slab the emperor is seated on the rostra (this part is broken), while in front a crowd of citizens are bringing tablets and piling them in a heap to be burnt. This records the remission by Trajan of some arrears of debt due to the imperial treasury (Spartian, 7). The background here represents again the Basilica Julia, with (on the right) the Ionic temple of Saturn and the Corinthian temple of Vespasian. Between them is an arch, which may be that of Tiberius. On the left the fig-tree and the statue of Marsyas are repeated. Other explanations of these reliefs have been given, but the above appears the most probable.! Towards the other end of the Forum are re- mains of a large coneretc pedestal. This is usually called the base of the cquestrian statue of Domitian (Statius, Si/v., i. 22), which stood in front of the Aides Julii; but its brick facing shows that it is much later than Domitian's time, and, moreover, Domi- tian's statue was destroyed immediately after his death.

The seven cubical brick and concrete structures, once faced with marble, which line the Sacra Via, are not earlier than the time of Constantine.? They are probably the pedestals of honorary columns, such as those shown in the relief on Constantine's arch, mentioned above. The column erected in honour of the tyrant Phocas by Sniaragdus in the eleventh year of his exarchate (608) is still standing. It is a fine marble Corinthian column, stolen from some earlier building ; it stands on rude steps of marble and tufa. The name of Phocas is erased from the inscription; but the date shows that this monument was to his honour. Remains of other small marble structures are shown in Plate VIL, but what they are is not known. In the 4th century a long brick and concrete build- ing faced with marble was built along the whole south-east end of the Forum, probably a row of shops. They were destroyed by Comm. Rosa's order a few ycars ago. Countless fragments of other buildings, reliefs, and statues are strewn all over the Forum. Many of these are of great interest; pieces of large granite columns which probably stood on the seven pedestals

mentioned above are lying in various places ; some of these appear to have been deco- rated with bronze reliefs, the iron fastenings of which, run with lead, still exist.?

Palatine Hill or Palatiwm.

In addition to the walls of Roma Quadrata (see above), a few remains only now exist earlier in date than the later years of the républic ; these are mostly grouped near the Scale Caci (see No. 11 in fig. 17) and consist of small celle and other structures of un- known use.4 They are partly built of the soft tufa used in the wall of Romulus and partly of the lard tufa which resembles peperino. Various names, such as the "lhut of Faustulus" and the " Auguratorium," have been given to these very ancient remains, but with little reason. One thing is certain, that the buildings were respected and preserved even under the empire and were probably regarded as sacred relics of the earliest times. Remains of more than one temple, probably of the early republican period, exist near this west angle of the Palatine; these had peristyles with Tuscan columns of tufa stuccoed and painted. The larger of these (see 14 in fig. 17) has been called conjecturally the temple of

architectural fragments are lying near this temple; they consist of drums and capitals of Corinthian columns, and part of the cornice of the pediment, cut in peperino, and thickly coated with hard white stucco to imitate marble. Between this and the temple (so called) of Jupiter Victor are extensive remains of a large sort of porticus, with tufa walls and travertine piers, also republican in date. The use and name of this building are unknown. The

temple of Jupiter Stator, traditionally vowed by Romulus during Temple his repulse by the Sabines (Liv., i. 12), stood near the Porta of Jupi- Mugionis, and therefore near the road leading up to the Palatine ter Sta- This has been identified with the ruined concrete tor.

Sacra Via.> podium (40 in fig. 17), the position of which suits the above indi- cations; but the admixture of travertine, brick, and even marble with the tufa of the concrete shows that no trace here remains of any early building. On the tufa blocks of a shaft leading down to a large drain by the side of these remains are incised in large

letters— FILOCR DIOCLEA E

—possibly the names of Greek stone-masons (Diocles, Philocrates) ; the form of the letters shows that this inscription is as early as the 2d or even 3d century B.c.

Remains of extensive lines of buildings in early opus reticulatum exist on the upper slopes of the Palatine, all along the Velabrum side, and on the south-west side as far as the so-called Domus Gelotiana. These buildings are constructed on the ruins of the wall of Romulus, a great part of which has been cut away to make room for thein ; their base is at the foot of the ancient wall, on the shelf cut midway in the side of the hill ; their top reached originally above the upper level of the summit. They are of various datcs and caunot be identified with any known buildings.

Tac., Hist., i. 27, and iti. 71); this palace covered a great part of the west corner of the hill.

reticulatumn ; it is usually called the house of Livia. It has a small atrium, out of which open the triclinium and the tablinum with a room (a/a) on each side, all handsomely decorated with good paintings of mythological and domestic scenes, probably the work of Greek artists, as inscriptions in Greek occur,—e.g., EPMHC, under the figure of Hermes, in a picture representing his deliver- ance of Io from Argus.6 The back part of this house was three stories high, and is divided into a great nuinber of very small rooms, mostly bedrooms. The house is built in a sort of hole against the side of an elevation, so that the upper floor behind is level with an ancient paved road. The dampness caused by this is counteracted and kept off the paintings by a lining of flangc-tiles over the external walls, under the stucco, thus forming an air- cavity all over the surface. From the back of the house, at the upper level, a long subterranean passage leads towards the Flavian palace, and then, turning

at right angles and passing by the foundations of the so-called temple of Jupiter Victor, issues In the ancient tufa building mentioned above (20 in fig. 17). Another

Temple Jupiter Victor (Liv., x. 29; Ov., Fast, iv. 621). It stands on a | crypto-porticus starts near this house and communicates with the of Jupi- levelled platform of tufa rock, the lower part of which is excavated | long semi-subterranean passage by which the palaccs of Caligula ter Vic- into quarry chambers, used in later times as water reservoirs. Two | and Domitian are connected (19 in fig. 17). It is ornamented with tor. ancient well-shafts lined with tufa communicate with these sub- | yery beautiful stucco reliefs of cupids, beasts, and foliage, once

terranean hollows. Another extensive building of hard tufa of the republican period exists in the valley afterwards covered by the Macen palace; part of this can be seen under the so-called Accademia (21 in fig. 17). Not far from the top of the Scale Caci are the massive remains of some large cella, nothing of which now exists except the concrete core made of alternate layers of tufa and By it a noble

'also Suet., Cal., 58).

painted and gilt. This private house is probably that of Germani- cus, into which the soldiers who killed Caligula in the long crypto- porticus escaped, as described by Josephus (Ant. Jud., xix. 1; see Some inscribed lead pipes were found in this house ; some pieces bear the inscription IVLIAE. AVG., prob- ably the daughter of Titus.

' Part is ap- Domus parently of the time of the emperor Tiberius, and no doubt belongs Tiberi- to the Domus Tiberiana mentioned by Suetonius (7%b., 5; comp. ana.

C Of about the same date is a very House of interesting and well- preserved private house built wholly of opus Livia.

The palace of Augustus and the Area Apollinis' occupied a great Palace of portion of the central part of the Palatine (see 47 and 48 in fig. Augustus 17); the splendour of its architecture and the countless works of

and Area art in gold, silver, ivory, bronze, and marble, mostly the produc- Apollinis,

Statue of peperino. It was probably once lined with marble. Cybele. colossal seated figure of a goddess was found, in Greek marble, well modelled, a work of the lst century A.D. The head and arms are

missing, but the figure is probably rightly called a statue of Cybele ; and from it her name has been conjecturally given to this temple. Augustus in the Monwmentum Ancyranum records AEDEM. MATRIS .MAGNA.IN.PALATIO. FECI; but it is more probable that his temple to Cybele formed part of the magnificent group of buildings in the area of Apollo (see below). Some interesting early

1 See Brizio, Ann. Inst., 1872, p. 309; Henzen, Bull. Inst., 1872, p. 81; and Jordan, Marsyas aufdem Forum, Berlin, 1883.

2 It is probable that these occupy the line of the Taberne Vetcres.

3 Authorities on the Forwm.—Nichols, Roman Forum, London, 1877 (very use- ful from its collection of passages in ancient authors); Jordan, Capitol, Forum, dc., Berlin, 1881, and Topographie Roms, vol. i., 1878 ; Nibby, Il Foro Romano, 1819; Angelini and Fea, 11 Foro Romano, 1837 ; Tocco, Ripristinazione del Foro, 1858 ; Ravioliand Montiroli, Foro Romano, 1859; Michelet, Das Forum Romanum, Berlin, 1877; Marucchi, I2 Foro Romano, 1881 ; Dutert, Le Forwm Romain, Paris, 1876 (very handsomely illustrated, but more fanciful than trustworthy) ; Canina, IZ Foro Romano, 1845 (open to the same criticism as the work of Dutert, and wholly stultified by later discoveries). For inscriptions found in the Forum, see Jordan, " Sylloge Inserip. Fori Rom.," in the Ephem. Epigraph., lil. p. 248 sq. Some of the more recent excavations are described by Lanciani, ""'Seavi del Foro," in Notizie degli Scavi for 1882. a oh ;

4 Many masons' marks exist on the tufa blocks of the most primitive build- ings near the Scale Caci (see fig. 10).

tion of the best Greek artists, which adorned this magnificent group of buildings must have made it the chief glory of this splendid city. It was approached from a road leading out of the Summa Sacra Via along the line of the present Via di 5. Bonaven- tura; the entrance, probably the Arcus of Pliny (H.., xxxvi. 4, 10), led through lofty propylea into~a very extensive peristyle or porticus, with (at least) fifty-two fluted columns of Numidian giallo; the rest was of white Luna and Athenian marble. In the centre of this enclosure stood the great octostyle peripteral temple of Apollo Palatinus, so called to distinguish it from another temple of Apollo outside the Porta Carmentalis, remains of which exist

5 Dionys., ii. 50; see also Plut., Cic., 16; Ov., Fast., vi. 793, and Trist., iii. 127, Near this temple, and also near the Porta Mugonia, was the house of Tarquinius Priscus (Liv., i. 41; Sol., Polyhist., i. 24). Owing to the strength of its position this temple was more than once selected during troubled times asa safe meeting-place for the Senate ; it was here, as being a "locus muni- tissimus," that Cicero delivered his First Catiline Oration (sce Cic., In Cat., i. 1).

6 See Mon. Inst., xi., pls. xxii., xxiii; Renier, Les Peintures du Palatin, Paris, 1870.

7 See Lanciani's paper in Bull. Comm. Arch. Roma, iv., 1883.

y j Piazza Montanara. This | (Plin., 7.W., xxxvi. 4); round the walls were statues of the nine pn age gHaA ole oe B.C.,! after his Sicilian | Muses (Juy., vii. 37). The pediment had seulpture by Bupalus bet over Sextus Pompeius, and finished in 28 B.c.?, A glowing | and Archermus of Chios (Plin., ALN., xxxvi. 4), and on the apex, scone of the splendours of these buildings is given by Propertius | was Apollo in a quadriga of gilt bronze. The double door was (HI., ii. 8). Inside the, cella were statues of Apollo between Latona | covered with ivory reliefs of the death of the Niobids and the and Diana hy Seopas, Praxiteles, and Timotheus respectively | defeat of the Gauls at Delphi. The Ancyra inseription records that

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Fic. 17.—Plan of the Palatine Hill,—1. Present entrance. 2, 2. Remains of wall of Roma Quadrata. 3. Aqueduct. 4. Early buildings of opus reticulatum. 5. Scale Caci. 6. Buildings of mixed brick and opus reticulatum. 7. Altar to the unknown god, Sei Deo, Sei Deive, &c. 8. Reservoir cut in tufa rock. %. Passage cut in the rock. 10. So-called temple of Cybele. 11. Very early structures of tufa. 12. Tufa arcade and paved road. 13. Building with travertine piers of later republican period. 14. So-called temple of Jupiter Victor. 15. Well communicating with subterranean rock-cut reservoirs. 16, 16. Simall chambers and paved road, part of Tiberius’s building. 17. Piscina, 18, House of Germanicus. 19, 19. Crypto-porticus. 20, 20. Early building of tufa buried and covered by Domitian’s palace. 21. So-called academy and library—part of Domitian’s palace. 22. Triclinium of Domitian’s palace. : 23, Nympheum and piscina. 24, Peristyle. 25. Small rooms at side of peristyle. 26. Stairs down to erypto-porticus. 27. Throne-room. 28. Lararium. 29. Basilica. 80. Branch of crypto-porticus leading to Domitian’s palace. 31. Crypto-porticus of Caligula. $2, 32. Stairs from crypto-porticus to higher level. 33, 33. Early buildings of opus reticulatum. 34, 34. Stairs from Forum to

Porta Romanula, 35 and 38. Stairs to upper rooms of Caligula's palace. 36, 36. Substructures of Caligula's palace. 37. Caligula's bridge. 39. Porta Mugionis. 40. Temple of Jupiter Stator (so called), 41. Remains of wall of Roma Quadrata. 42,42, Remains of Nero's palace. 43. Great concrete platform. 44. Remains of medieval Turris Cartularia. 45, 45. Series of small bath- rooms. 46, So-called basilica of 5th century. 47. Site of temple and libraries of Apollo. 48. Palace of Augustus (now destroyed). 49. Domus Gelotiana. 50. Stadium, with oval hall of Theodoric (). 51. Exedra of Hadrian. 52. Stairs from stadium to higher level of hill. 538, 58. Remains of Hadrian's palace, partly covered by later palace of Severus. 54. Baths of Severus's palace. 55, 55. Lofty substructures of Severus's palace. 56. Aqua Claudia brought on Nero's aqueduct. 57. Shops of opus incertum. 58. Substructures of Circus Maximus. 59. Remains of early tufa building, and brick-faced structures of imperial times. 60, 60. Paved road skirting outside of Circus Maximus.

Augustus sold eighty silver statues of himself and with the money | (Suet., 4wg., 31); and within the cella were vases, tripods, and" "offered golden gifts" to this temple, dedicating them both in his | statues of gold and silver, with a collection of engraved gems dedi- own name and in the names of the original donors of the statues.? | eated by Marcellus (see Plin., H.N., xxxvii. 5). On each side of The Sibylline books were preserved under the statue of Apollo | the porticus was a large library, one Latin and the other Greek ;4

pa ae fea : } 1 TEMPLVM . APOLL ; i ; and a third side of the great enclosure was oeeupied by a large hal EMPTO . FECI tien a Hing TN . SOLO . MAGNAM . PARTEM . where the Senate occasionally met (Tac., Ann., ii. 37), in the centre

2 See Dion Cass., xlix. 15, lili. 1, and C.I.L., i. p. 403. TS Ge ee

3 See also Suet., dug., 52, whose account is rather different. 4 Schol. to Juv., i. 128, and Suet., Aug., 29.

Temple of Victory.

Palace of

of which stood a bronze colossus of Augustus,! 50 feet high (Plin., H.N., xxxiv. 18). Round the portieus, between the Numidian marble columns, were statues of the fifty Danaids, and opposite them their fifty bridegrooms on horseback (see schol. on Pers., ii. 56), many fragments of which have been found. In the centre before the steps of the temple stood an altar surrounded by four oxen, the work of Myron (Proper., Z1., ii. 8,7). Within the same area was a small temple of Vesta (C.I.L., i. p. 392), dedicated on 28th April 12 B.c., when Augustus was elected pontifex maximus ;? the sacred block or altar symbolically called Roma Quadrata, sur- rounded by a circular trench called the Mundus, was also in some part of this great group of buildings. On the side towards the Circus Maximus was the palace of Augustus, which was excavated in 1775, and drawings of which were published by Guattani.?

The palace of Caligula occupies the northern angle of the Palatine,

Caligula. and extends over the Clivus Victorie a long way towards the Clivus

Palatinus (see fig. 17). This part of the Palatine was once occupied by the Lucus Veste, with the Sacellum Volupie and many fine private houses. Among these were the dwellings of Q. Lutatius Catulus, Q. Hortensius, Catiline, Scaurus, Crassus (Plin., H.J., XXxXvi. 3, 24), whose house was aftcrwards bought by Cicero,® and the house of Clodius, the view of which Cicero threatened to block out." Many other wealthy Romans had houses on this part of the Palatine, so that the cost of the site for Caligula's cnormous palace must have been very great. The part now existing is little more than the gigantic substructures built to raise the principal rooms to the level of the top of the hill. The lowest parts of these face the Nova Via, opposite the Atrium Veste, and many stories of small vaulted rooms built in mixed brick and opus reticulatum rise one above the other to the higher levels. The palace extends over the Clivus Victorie, supported on lofty arches so as to leave the road unblocked ; many travertine or marble stairs lead to the upper rooms, some starting from the Nova Via, others from the

livus Victorie. Its enormous extent is referred to by Pliny (H.N., xxxvi. 24).

1 The bronze head, now in the court of the Palazzo dei Conservatori, may possibly have belonged to this colossus ; it is much too sinall for that of Nero, to which it has generally been attributed ; it seems, however, of inferior work- manship to that of the Augustan age. . vi

2 Ovid (Fast., iv. 949) mentions this group as being divided among three gods, namely, Phebus, Vesta, and Augustus (comp. Metam., xv. 864). The plan of a circular temple drawn by Ligorio (Cod. Ursin. Vat., 3439, fol. 25) probably represents this temple of Vesta as discovered in the 16th century ; it is repro- duced in Bull. Comm. Arch. Roma, 1883, pl. xvii.

3 Mon. Ant. ined. di Roma, 1785, p. 56. ? , ao

4 This temple is shown on a rare bronze medallion of Gordianus ITI. ; it is domed, and on the pediment is inscribed NEIKH OIITAOBOPO. See Grueber, Roman Medallions, pl xlii., London, 1874,

5 See Bianchini, Pal. dei Cesari, 1738, p. 236. :

6 Cic., Pro Domo, 43; Val. Max., vi. 83,1; and see Becker, Handb., i. p. 423.

7 Cic., De Harus., 15, 33. ;

8 At this point the Palatine is cut away into four stages like gigantic steps ; the lowest is the floor of the Atrium Vests, the second the Nova Via, the third the Clivus Victoriz, and the top of the hill forms the fourth.

Nova Via. This possibly marks a difference of date, and the occurrence of brick stamps of the latter part of the 1st century A.D. In various parts of the palace shows that a large portion of it is later than the time of Caligula.

The next great addition to the buildings of the Palatine was the Flavian magnificent suite of state apartments built by Domitian, over a Palace.

deep natural valley running across the hill (see fig. 17). The valley was filled up and the level of the new palace raised to a considerable height above the natural soil. Remains of a house, decorated with painting and rich marbles, exist under Domitian's peristyle, partly destroyed by the foundations of cast concrete which cut right through it. The floor of this house shows the original level, far below that of the Flavian palace. The south angle of this great building adjoins the palace of Augustus, and it is connected with the palace of Caligula by a branch subterranean passage leading into the earlier crypto-porticus. These two build- Ings continued to be used as the private apartments of the emperor, the Flavian block consisting only of state rooms; the words AEDES PVBLICA werc inscribed upon it by Nerva to show its public charac- ter. It consists of a large open peristyle, with columns of Oriental marble, at one end of which is the grand triclinium with magnifi- cent paving of opus sectile in red and green basalt and coloured marbles, a piece of which is well preserved ; next to the triclinium, on to which it opens with large windows, is a nympheum or room with marble-lined fountain and recesses for plants and statues. On the opposite side of the peristyle is a large throne-room, the walls of which were adorned with rows of pavonazetto and giallo columns and large marble niches, in which were colossal statues of porphyry and basalt; at one side of this is the basilica, with central nave and apse and narrow aisles, over which were galleries. The apse, in which was the emperor's throne, is screened off by open marble cancelli, a part of which still exists. It is of great interest as show- ing the origin of the Christian basilica ; S. Agnese fuori le Mura is exactly similar in arrangement (see Basic, vol. iii. p. 417).9 On the other side of the throne-room is the lararium, with altar and pedestal for a statue; next to this is the grand staircase, which led to the upper rooms, now destroyed. The whole build- ing, both floor and walls, was covered with the richest Oriental marbles, including all the varieties mentioned on p. 808. Out- side were colounades or porticus,—on one side of cipollino, on the other of travertine, the latter stuccocd and painted. The magni- ficence of the whole, crowded with fine Greck sculpture and covered with polished marbles of the most brilliant colours, is difficult now to realize ;

a glowing description is given by Statius (Sidv., iv. 11, 18; see also Plut., Poplie., 15, and Mart., viii. 86). Doors were arranged in the throne-room and basilica so that the emperor could slip out unobserved and reach by a staircase (30 in fig. 17) the erypto-porticus which communieates with Caligula's palace. The vault of this passage was covered with mosaic of mixed marble and glass, a few fragments of which still remain ; its walls were lined with rieh marbles; it was lighted by a series of windows in the springing of the vault. This, as well as the Flavian palace, appears to have suffered more than once from fire, and in many places important restorations of the time of Severus, and some as late as the 4th century, are evident. In 1720-26 extensive exca- vations were made here for the Farnese duke of Parma, and an immense quantity of statues and marble architectural fragments were discovered, many of which are now at Naples and elsewhere. Among them were sixteen beautiful fluted columns of pavonazetto and giallo, fragments of the porphyry statues, and an immense door-sill of Pentelic marble, now used for the high altar of the Pantheon ; these all came from the throne-room. 'The excavations were carried on by Bianchini, who published a book on the subject.'

In the middle of the slopes of the Palatine, towards the Circus Domus Maximus, are considerable remains of buildings set against the Gelo- This tiana.

wall of Romulus and covering one of its projecting spurs. series of rooms with a long Corinthian colonnade has been sup- posed to be part of the Domus Gelotiana, from which Caligula used to watch the races in the circus below (Suet., Cad.,18). Little, however, of the existing remains is as early as the reign of Caligula, and the marble porticus apparently dates from the time of Severus. The rooms were partly marble-lined and partly decorated with painted stucco, on which are ineised a number of interesting in- scriptions and rude drawings. Here, in 1857, was found the cele- brated (so-called) caricature of the Crueified Christ, now in the Museo Kircheriano, but which, more probably, has a Gnostic meaning.!t The inscription CORINTHVS . EXIT . DE . PEDAGOGIO suggests that this building was at one time used as a school, per- haps for the imperial slaves. A number of soldiers' names also occur, ¢.g.,

HILARVS.MI.V.D.N. (Hilarus miles veteranus domini nostri); some are in mixed Latin and Greek characters, with many

9 The brick stamps on the tiles laid under the marble paving of the basilica have CN. DOMITI. AMANDI. VALEAT. QVI. FECIT.,— the last three words a common augury of good luck stamped on bricks or aimphore; these date from a restoration after a fire in the time of Severus.

10 Pal. dei Cesari, Verona, 1738; see Guattani, Not. di Antich., 1798.

1l See Kraus, Das Spottcrucifizx vom Palatin, Freiburg, 1872, and Becker, Das Spoticrucifiz, &c., Breslau, 1866.

Stadium.

Hadrian's

palace.

Palace of Severus.

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varieties of mis-spelling. After one pair of names is inscribed PEREG, showing that they belonged to the foreign corps called Peregrini, probably stationed here as guards to the imperial resi- dences on the hill above. Most of these inscriptions appear to be as early as the 1st century A.pD.! These interesting graffiti have in great part perished during the last few years, and soon none will remain. ; 7

The great stadium of the Palatine (sce 50 in fig. 17) was begun by Domitian, mainly built by Hadrian, and much altered or restored by Severus. The greater part of the outer walls and the large exedra or apse at the side, with upper floor for the emperor's seat, are of the time of Hadrian, as is shown by the brick stamps, and the character of the brick facing, which much resembles that of the Flavian time (bricks 14 inches and joints 4 inch thick)? The stadium is surrounded with a colonnade of engaged shafts, forming a sort of aisle with gallery over it. Except those at

the curved end, which are of Hadrian's time, these piers are of the time of Severus, as are also all the flat piers along the outer wall,—one opposite each of those in the inner line. This shows either that the stadium must have been left by Hadrian in an unfinished state, or else that it suffered seriously from a fire or earthquake before the reign of Severus.

In addition to the stadium, Hadrian built a number of very handsome rooms, forming a palace on the south-east side and at the south-west end of the stadium. These rooms were partly destroyed and partly hidden by the latcr palace of Sevcrus, the foundations of which in many places cut through and render useless the highly decorated rooms of Hadrian (53 in fig. 17). The finest of these which is now visible is a room with a large window opening into the stadium near the south angle; it has intersecting barrel vaults, with deep coffers, richly ornamented in stucco. The oval structure shown in the plan (50 in fig. 17), with other still later additions, belongs to the 4th or 5th century, when the stadium was no longer used for races ; some of the walls, of opus mixtum, which cut up and disfigure this noble building appear to be the work of Theodoric, c. 500.

The palace of Septimius Severns was very extensive and of enormous height ; it extends not only all over the south angle of the Palatine but also a long way into the valley of the Circns Maximus and towards the Celian. This part (like Caligula's palace) is carricd on very lofty arched substructures, so as to form a level, uniform with the top of the hill, on which the grand apartments stood. The whole height from the base of the Palatine to several stories above its summit must have been enormous. Little now remains of the highest stories, except part of a grand staircase which led to them. xtensive baths, all richly decorated with marble linings and mosaics in glass and marble, cover a great part of the top of the hill. These and other parts of the Palatine were supplied with water by an aqueduct built by Nero in continuation of the Claudian aqueduct, some arches of which still exist on the slope of the Palatine (56 in fig. 17; sce Spart., Sept. Sev., 24). The palace of Severus was restored and enlarged by Heliogabalus and Severus Alexander.? One of the main roads up to the Palatine passes under the arched substructures of Severus, and near this, at the foot of the hill, at the sonth angle, Septimius Severus built an

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was formed. The foundations of part of Nero's palace along the road between this temple and the Esquiline are exposed for abont 20 to 30 feet in height, showing a corresponding lowering of the level here, and the bare tufa rock, cut to a flat surface, is visible on the site of Hadrian's great temple; that the Vclia was once much loftier is also indicated by the story of the removal of Valerius Publicola's dwelling.®

[TOPOGRAPHY AND

On the Velia and the adjoining Summa Sacra Via were two Sacra temples which Augustus rebuilt." The " Aides Larum" is probably Via.

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the "Sacellum Larum" mentioned by Tacitus (Ann., xii. 24) as one of the points in the line of the pomcerium of Roma Quadrata. The Sacra Via started at the Saccllum Strenie, an unknown point on the Esquiline, probably near the baths of Titus (Varro, L.L., v. 47), in the quarter called Cerolia. Thence it probably (in later times) passed round part of the Colosseum to the slope leading up to the arch of Titus on the Velia; this piece of its course is lined on one side by extensive baths, attributed to Heliogabalus (45 in fig. 17), and farther back, against the cliff of the Palatine, are remains of Nero's enormous palace (see 42 in fig. 17). From the arch of Titus 'or Summa Sacra Via the original line of the road has been altered (see Plate VII.) ; the angle at which the scanty remains of the Regia are set probably shows the early direction of the Sacra Via in passing on to the temple of Vesta. Its later course was more to the north-east, passing at a sharp angle from the arch of Titus to the front of Constautine's basilica, and on past the temple of Faustina. It is uncertain whether the continuation of this road to the arch of Severus was in later times called the Sacra Via or whether it rejoined its old line along the Basilica Julia by the cross-road in front of the Ades Julii. Its original line past the temple of Vesta was completely built over in the 3d and 4th centuries, and clumsily-fitted pavements of marble and travertine occupy the place of the old basalt blocks. The course of the

Nova Via ® (sce figs. 16 and 17) along the palace of Caligula !° was Nova According to Varro (Z.Z., vi. 59) it was a Via.

exposed in 1882-84. very old road. It led up from the Velabrum, probably winding along the slope of the Palatine, round the north angle under the church of S. Maria Liberatrice. The rest of its course, gently ascending towards the arch of Titus, is now exposed, as are also the stairs, possibly the Scale Anulariz, which connected it with the Clivus Victorie at the Porta Romanula; a continuation of these stairs, still unexcavated, led down to the Forum.

_. The extent of the once marshy Vclabrum (Gk., Fédos) is not Vela- known, though part of its site is indicated by the church of S. brum.

Giorgio in Velabro; Varro (Z.Z., vi. 24) says, "extra urbem an- tiquam fuit, non longe a porta Romanula." It was a district full of shops (Plaut., Capt., iii. 1, 29; Hor, Sat., ii 8, 229). The Vicus Tuscus on its course from the Forum to the Circus skirted the Velabrnm (Dionys., v. 26), from which the goldsmiths' arch was au entrance into the Forum Boarium (comp. Dionys., i. 40).

Capitoline Hill.

The Capitoline Hill, once called Mons Saturnius (Varro, L. L., v. 42), consists of two peaks, the Capitolium and the Arx,! with an intermediate valley (Asylum). The older name of the Capi- tolium was Mons Tarpeius (Varro, Z. Z., v. 41). Livy (i. 10)

mentions the founding of a shrine to Jupiter Feretrius on the Temple Capitolium by Romulus ;¥ this summit was afterwards occupied of

by the great triple temple dedicated to Jupiter, Juno, and Minerva, Jupiter a triad of deitics worshipped under the names of Tinia, Thalna, Capitol- and Menrva in every Etruscan city. This great temple was (Liv., inns.

outlying part of his palace, a building of great splendour dedicated to the Sun and Moon, called the Septizonium, probably from its seven stories or zone (sce Jordan, Bull. Inst., 1872, p. 145). It has been doubted whether it

can really have been as much as seven stories high ; but this is not improbable when we consider

the cnormons height of the rest of Severus's palace, reaching from the foot of the Palatine to far above its summit. Part of the Septi- zonium cxisted as date as the reign of Sixtus V. (1585-90), who destroyed it in order to use its marble decorations and columns in the new basilica of St Peter ; drawings of it are given by Du Perac, Vestig) di Roma, 1575, and in other works of that century.

i. 38, 53) founded by Tarquin I., built by his son Tarquin II., and dedicated by M. Horatius Pulvillus, consul suffectus in 509 3.c.14 It was built in the Etruscan style, of peperino stuccoed and painted (Vitr., ili, 3), with wooden architraves, wide intercolumniations, and painted terra-cotta statues.!° It was rebuilt many times; the original temple lasted till it was burnt in 838 B.c. ; it was then re-

Velia The Velia and Germalus were two outlying spurs of the Palatine.5 | founded in marble by Sulla, with Corinthian columns stolen from and Ger- Owing to the great altcrations that have been made in the contour | the temple of Olympian Zeus in Athens (Plin., xxxvi. 5), and was malus. of the hill it is now very difficult to identify these ancient districts | completed and dedicated by Q. Lut. Catulus, whose name appeared

(see Ann. Inst., 1865, p. 847). The Germalus or Cermalns was probably on the side towards the Velabrum, while the Velia may be identified with that elevated ground between the Palatine and the Esquiline on which the temple of Venus and Rome and the arch of Titus now stand. It is evident that this was once much loftier and more abrupt than it is now; a great part of it was cut away when the level platform for the temple of Venus and Rome Se ee ee ee ee

: oe bape e he elie eee 1863, p. 72, and 1867, p. 113.

Nparts ot the outer wall brick stamps of the Flavian period appear, e.g. or AVG.1L. CLONI—"{A brick] of Clonius, feeding of ae Five

g S.

3 See Dion Cass., lxxii. 24; Lamprid., Hist. Auy.: Se t. Sev., 19, :

Alex., 24, 25; and Id., Heliog., 3 e 24," – = pinay. ia

a See Jordan, Die Kaiserpal. in Rom, Berlin, 1871; Thon, Pal. dei Cesari, 1828 ; Lanciani, Guida del Pal., 1873; Ann. Inst., 1852, p. 324, and Mon. Inst., v. pl. xxxvi.; Guattani, Roma desc., 1805.

*5 'Huic (Palatio) Germalum et Velias conjunxerunt . . . 'Germalum' a germanis Romulo et Remo, quod ad ficum Ruiminalem ibi inventi" (Varro, L.L., vy. 54). Varro's derivation of Velia from '*vellera," the fleeces of the | pasturing flocks, is obviously wrong. |*

on the front. Augustus, in spite of his having carried out part of the work, did not introduce his name by the side of that of Catulus. It was again burnt by the Vitellian rioters in 70 A.p., and rebuilt by Vespasian in 71.16 Lastly, it was burnt in the three days' fire

6 Liv., ii. 7; Cie., Rep., ii. 831; see also Ascon., Ad Cic. In Pis., 22.

7 AEDEM .LARVM.IN.SVMMA.SACRA.VIA.AEDEM.DEVM. PENATIVM.IN.VELIA .. . FECI (Mon. Ancyr.). ;

8 See Goettling, De Sacra Via, Jena, 1834, and Jordan, Topographie der Stadt Rom, Berlin, 1871 (in progress).

® See Not. d. Scavi, 1882, p. 23 ee

10 See Solinus (i. 24) and Varro (Ap. Gell., xvi. 17), who mention its two ends, "summa" and "infima" (comp. Liv., v. 32).

11 See marble plan on Plate VII. and comp. Ov., Fast., vi. 395.

12 These two peaks are clearly distinguished by Livy and Strabo.

13 This is the earliest temple mentioned in Roman history, though there was probably in Roma Quadrata the usnal triply consecrated temple erected at the qoundig of the city. It was rebuilt by Augustus, as is recorded in the Mon.

meyr.

14 See Plut., Publ., 15; ¢. I. L., i. p. 487; Liv., ii. 8, iv. 51; Dionys., v. 35.

15 Plin., xxxv. 45; see Tac., Hist., iii. 72; Val. Max., v. 10. :

16 Suet., Vit., 15, and Ves.,8; comp. Tac., Hist., iv. 53, and Dion Cass., Ixvi. 10.

of Titus's reign! and rebuilt with columns of Pentelic marble by Domitian ; the gilding alone of this last rebuilding is said to have cost 2} millions sterling (Plut., Publ., 15). There has been much controversy as to the site of this temple and that of Juno Moneta on the Arx; but there is an overwhelming mass of evidence to show that the Capitolium is the peak where the Palazzo Caffarelli stands, and that the church of Ara Cceli occupies the Arx. Livy (xxxyv. 21) mentions the fall of a mass of rock from the Capitolium into the Vicus Jugarius, which passes close under the Caffarelli summit, and is not near the opposite peak. Moreover, extensive substructions of tufa and peperino have been exposed on the eastern peak, the form of which appears to fit this nearly square triple temple, and in 1875 a fragment of a fluted column was found, of such great size that it could only have belonged to the temple of Jupiter. Its actual limits have not been clearly made out, and therefore the truth of Dionysius's description (iv. 61) cannot be

roved.2, The temple is represented on many coins, both repub-

ican and imperial; these show that the central cella was that of

Jupiter, that of Minerva on his right, and of Juno on his left. The door was covered with gold reliefs, which were stolen by Stilicho (c. 390; Zosim., v. 88), and the gilt bronze tiles (Plin., xxxiii. 18) on the roof: were partly stripped off by Genseric in 455 (Procop., De Bell. Vand., i. 5), and the rest by Pope Honorius I. in 630 (Marliano, Topogr., ii. 1). Till 1848, when the steps up to Ara Cceli were built, there was no access to the Capitol from the back ; hence the three ascents to it mentioned by Livy

(iii. 7, v. 26-28) and Tacitus (Hist., iii. 71-72) were all from the inside of the Servian circuit. Even on this inner side it was defended by a wall, the gates in which are called "Capitolii fores" by Tacitus. Part of the outer wall at the top of the tufa rock, which is cut into a smooth cliff, is visible from the modern Vicolo della Rupe Tarpeia ; this cliff is traditionally called the Tarpeian rock, but that must have been on the other side towards the Forum, from whence it was visible, as is clearly stated by Dionysius (vil. 35, viii. 78).? Another piece of the ancient wall has recently been exposed, about half-way up the slope from the Forum to the Arx. It is built of soft yellow tufa blocks, five courses of which still remain in the existing frag- ment. The large temple of Juno Moneta ("the Adviser") on the Arx, built by Camillus in 384 B.c., was used as the mint; hence moneta = "money" (Liv., vi. 20).

A large number of other temples and smaller shrines stood on the Capitoline Hill, a word used broadly to include both the Capitolium and the Arx.4 Among these were the temple of Honos " Virtus, built by Marius, and the temple of Fides, founded by Numa, and rebuilt during the First Punic War. Both these were large enough to hold meetings of the Senate. The temple of Jupiter Tonans® was built by Augustus (Suet., dug., 29), near the great temple of Jupiter. Other shrines existed to Venus Victrix, Ops, Jupiter Custos, and Concord—the last under the Arx (Liv., xxii, 33)—and many others, as well as a triumphal arch in honour of Nero, and a crowd of statues and other works of art (see Plin., H.N., xxxiii. 4; xxxiv. 17, 18,19; xxxv. 36, 45; xxxvi. 5, 8), so that the whole hill must have been a mass of architectural and artistic magnificence, the spoils of the whole Hellenic world.

The so-called Tabularium occupies the central part of the side towards the Forum; it is set on the tufa rock, which is cut away to receive its lower story. It derives its name from an inscription found there in the 15th century, quoted by Poggio (see Gruter, Inscr., 170, 6); but that name was given to many buildings in Rome (Liv., iii. 55, xliii. 16), and there is no reason to suppose that this specially was known as the Tabularium (comp. Virg., Gcor., ii. 501). Catulus, who was also the dedicator of the great temple of Jupiter (Tac., Hist., iii. 72; Dion Cass., xliii, 14), was consul in 78 B.c., but part of this building is probably much earlier in date. Its outer

walls are of peperino, its inner ones of tufa or concrete ; the Doric arcade has capitals and architrave of traver- tine.® A road paved with basalt passes through the building along this arcade, entered at one end from the Clivus Capitolinus, and at the other probably from the Gradus Monetz, a flight of steps leading from the temple of Concord and the Forum up to the temple of Juno Moneta on the Arx (see Plate VII.). The entrance

1 Snet., Dom., 5; Dion Cass., Ixvi. 24.

2 See Bull. Comm. Arch., iii., 1875, p. 165; Mon. Inst., v. pl. xxxvi., x. pl. xxx.a; Hirt, "Der Capit. Jupiter Tempel," in Abhandl. der Berl. Akad., 1813 ; Niebuhr, Rom. Gesch., i. 55-58; Bunsen, Gesch., iii. 5-14; Becker, Handb., i. p. 887. Bee also Ann. Inst., 1851, p. 289, for a relief showing the sculpture in the pediment; the front of the temple is shown in one of the reliefs from the arch of M. Aurelius, now in the Capitoline Museum.

3 See Dureau, La roche Tarpienne, Paris, 1816; a graceful account of the legend of Tarpeia is given by Propertius, Hleg., iv. 4.

4 A structure of great sanctity, dating from prehistoric Etruscan times, was the Auguraculum, an elevated platform upon the Arx, from which the signs in the heavens were observed by the augurs (see Festus, ed. Mitler, p. 18). This was moved under the empire to the Palatine (see Notitia, &c.), probably by Ae What are probably its foundations have been found near the substructures of the great temple (Bull. Comm. Arch. Rom., 1875, ili. p. 165 sq.). It is men- tioned in the list of the Mon. Ancyr.

6 The whole of the frieze and cornice is missing; it is usually supposed that there was once another story above this entablature, but there is no evidence of that except Poggio's statement.

from the Clivus Capitolinus is by a wide flat arch of peperino most beautifully jointed ; the other end wall has been mostly destroyed. The

back of this building overlooked the Asylum or depression between the two peaks. From this higher level a long steep stair- case of sixty-four steps descends towards the Forum; the doorway at the foot of these stairs has a flat arch, with a circular relieving arch over it ; it was completely blocked up by the temple of Ves- pasian (see fig. 1). This was probably the door where the Vitellian rioters broke into the Capitolium (Tac., Hist., iii, 71). Great damage was done to this building by the additions of Boniface VIII. and Nicholas V., as well as by its being used as a salt store, by which the walls were much corroded.§

The Imperial Fora.

The Forum Julium (see fig. 18), with its central temple of Venus Genitrix, was begun in 49 B.c. after the battle of Pharsalia by Julius and completed by Augustus.? Being built on a crowded site it was somewhat cramped, and the ground cost nearly a hundred million sesterces,19 Part of its circuit wall, with remains of five arches, exists in the Via Marmorella ; and behind is a row of small vaulted rooms, probably shops or offices. The arches are flat, slightly cambered, with travertine springers and keys; the rest, with the circular relieving arch over, is of tufa; it was once lined with slabs of marble, the holes for which exist. Foundations of the circuit wall exist under the honses towards 8. Adriano, but the whole plan has not been made out. Palladio (Arch., iv. 31) de- scribes excavations made here, and the discovery of remains of a fine temple, probably that of Venus Genitrix.!"

_ The forum of Augustus (see fig. 18) adjoined that of Julius on its north-east side ; it contains the temple of Mars Ultor, built to

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Fic, 18.—Plan of fora of Julius, Augustus, and Nerva.

commemorate the vengeance taken on Cesar's murderers at Philippi, 42 B.c. (Ov., Fast., v. 575 sq.). It was surrounded with a massive

7 Mommsen (Ann. Inst., 1858, p. 211) comes to the conclusion that this building is the Hrarium Saturni, but that seems hardly possible, as there is the clearest evidence that that xrarium was in or part of the temple of Saturn (see ante, p. 817).

8 The Porta Pandana ("'ever-open gate") was probably situated near the south-west angle of the Tabularium, where the road of the Clivus Capitolinus entered the circuit wall of the Capitoline Hill. See Righetti, Descriz. del Campidoglio, 1833; Azzurri, Antico Tabulario, 1889; Supham, De Capitolio Romano, 1866; and Jordan, Ann. Inst., 1881.

9 See Mon. Ancyr. (quoted at p. 817, note 13, above); Plin., H.N., xxxv. 45, xxxvi. 24.

10 Cic., Ep. ad Att., iv. 16; Suet., Cas., 26,

11 There is no foundation whatever for the theory that these chambers were part of the "Mamertine prison"; their form and position both make that impossible.

S 12 See Dion Cass., xliii. 22; Appian, Bell. Civ., ii. 102; Vitr., iii. 3; Plut.,

2s., 60.

13 The Ancyrean inscription records—IN . PRIVATO . SOLO. [EMP]TO. MARTIS . ULTORIS . TEMPLVM . FORVMQVE . AVGVSTVM . EX. [MANTJBIIS.FECI. See Suet., Aug., 29, 56; Dion Cass., lvi. 27; Plin., H.N.

Forum Jniium.

Forum of Augus-

tus,

XX. — 104 2

Forum Pacis.

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wall of peperino, nearly 100 feet high, with travertine string-courses and cornice ; a large piece of this wall still exists, and is one of the most imposing relics of ancient Rome. Against it are remains of the temple of Mars, three columns of which, with their entablature and marble ceiling of the peristyle, are still standing; it is Cor- inthian in style, very richly decorated, and built of fine .Luna marble. The cella is of peperino, lined with marble ; and the lower part of the lofty circuit wall seems also to have been lined with marble on the inside of the forum. The large archway by the temple (Arco dei Pantani) is of travertine. Palladio (Arch., iv.) and other writers of the 16th century give plans of the temple and circuit wall, showing much more than now exists. The temple, which was octastyle, with nine columns and a pilaster on the sides, occupied the centre, and on each side the circuit wall formed two large semicircular apses, decorated with tiers of niches for statues.)

The Forum Pacis, built by Vespasian, was farther to the south- east ; the only existing piece, a massive and lofty wall of mixed tufa and peperino,

with a travertine archway, is opposite the end of the bases of Constantine. The arch opened into what was probably the Templum Sacre Urbis, which contained a plan of the city of Rome. The original plan was probably burnt with the

whole group of buildings in this forum in 191, in the reign of Com- modus (Dion Cass., Ixxii. 24); but a new plan engraved on marble was made, and the building restored in concrete and brick by Severus. The north-east end wall, with the clamps for fixing the marble plan, still exists, as does also the other (restored) end wall with its arched windows towards the forum (sec fig. 19); one

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Fia. 19.—Group of buildings by the Forum Pacis. and tufa, with travertine doorway. 2. Do. and porch destroyed by Urban VIII. 3. Brick-faced wall of time of Severus against which the marble plan was fixed. 4. Apse built by Felix IV., when he converted the Templum Sacree Urbis into the church of 88. Cosmo e Damiano. 5. Temple of Romulus, built by Maxentius, made by Felix IV. into the porch of his church.

1. Existing wall of peperino

hundred and sixty-seven fragments of this plan were found ¢. 1560 at the foot of the wall to which they were fixed, and are now pre- served in the Capitoline Museum ; drawings of the seventy-four

leces now lost are preserved in the Vatican 2 (Cod. Vat., 3489).

he whole has been published in a valuable work by Professor J ordan, Forma Urbis Romz, Berlin, 1875-82. The fragments which relate to the Forum Magnum are given on Plate VII. The circular building at the end facing on the Sacra Via is an addition built by Maxentius in honour of his deified son Romulus ; like the other buildings of Maxentius, it was rededicated and inscribed with the name of his conqueror Constantine.? The original stone build- ing of Vespasian was probably an archive and record office ; the name Templum Sacre Urbis is with much probability given to it by Jordan, partly on the authority of an inscription now in the

Vatican (see Forma Urbis omz). The fine bronze doors at the entrance to the temple of Romulus are much earlier than the build- ing itself, as are also the porphyry columns and very rich entabla- ture which ornament this doorway. Pope Felix IV. (526-530)

XXXVI. 24, XXxv. 36, xxxiv. 18, Vii. 53, where many fine Greek eg – beltg in the forum of Augustus, r Sie a ig ose o oman leaders and generals, from neas and Ri

rey ee Foro @ Augusto, &c. (Lincei), 1884, ee n interesting description of this discovery is given by Vacea, writing i

pe wore! in sie es ages Ant., ed. Nibby, 1818-20, +a iv.) ; since then

ragments have been found. The scale is

“—— to be not quite uniform. ee ee or accounts of this interesting group of buildings, see De Rossi, B

ay Crist., 1867, p. 62; Tredelemburg, Ann. Inst., 1872, >. 66; and we he

*; * 1. Comm. Arch. Rom., 1882. Ligorio (in a 16th-century MS. ; Cod. Vat.,*

39) and Du Perac (Vestig}) show much more than now exists. ;

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made the double building into the church of SS, Cosmo e Damiano, using the circular domed temple of Romulus as a porch.4 The chief building of Vespasian’s forum was the Templum Pacis,® dedi- cated in 75, one of the most magnificent in Rome, which contained a very large collection of works of art.

The forum of Nerva (see fig. 18) occupied the narrow strip left Forum of between the fora of Augustus and Vespasian; being little more Nerva.

than a richly decorated street, it was called the Forum Transitorium or Forum Palladium, from the temple to Minerva which it con- tained. It was begun by Domitian, and dedicated by Nerva in 97 (see Suet., Dom., 5 ; Mart., Ep., i. 2, 8). Like the other imperial fora, it was surrounded by a peperino wall, not only lined with marble but also decorated with rows of Corinthian columns sup- porting a rich entablature with sculptured frieze. Two columns and part of this wall still exist ; on the frieze are reliefs of weay- ing, fulling, and various arts which were under the protection of Minerva. A great part of the temple existed till the time of Paul V., who in 1606 destroyed it to use the columns elsewhere.® In the reign of Severus Alexander a series of colossal bronze statues, some equestrian, were set round this forum ; they represented all the previous emperors who had been deified, and by each was a bronze column inscribed with his "res geste " (Lamprid., Hist. Aug. ; Sev, Alex., 28),

The forum of Trajan with its adjacent buildings was the last and, Forum of at least in size, the most magnificent of all ; it was in progress from Trajan.

100 to 117. A great spur of hill, which connected the Capitoline with the Quirinal, was cut away to make a level site for this enor- mous group of buildings. It consisted (see fig. 20) of a large dipteral

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Fie. 20.—Forum of Trajan.

peristyle, with curved projections, lined with shops on the side. That against the slope of the Quirinal, three stories high, still partly exists. The main entrance was through a triumphal arch (Dion Cass., Ixviii. 29), from which probably were taken most of the fine relicfs used by Constantine to decorate his arch. Aurei of Trajan show this arch and other parts of his forum." The opposite nT NM a i pill aka a

_ 4 'Hic (Felix) fecit_basilicam SS. Cosme et Damiani. . . In Via Sacra, juxta Templum Urbis Rome" (Anastas. Bibl. , Vita S. Felicis IV.),—important evidence in favour of Jordan's suggestion.

5 Statues by Phidias and Lysippus existed in the Forum Pacis as late as the 6th century (Procop., Bell. Goth., iv. 21).

8 Drawings of it are given in Du Perac and by Palladio (Arch., iv. 8).

7 See Aul. Gell., xiii. 25, 2; and Amm. Mare., xvi. 10.

Trajan's column.

Temple of Trajan.

- Other temples.

ARCH AOLOGY. |

side was occupied by the Basilica Ulpia (Jordan, For. Ur. Rom.), part of which, with the column of Trajan, is now visible ; none of the columns, which are of grey granite, are in situ, and the whole restoration is misleading. Part of the rich paving in Oriental marble is genuine. This basilica contained two large libraries (Dion Cass., lxviii. 16; Aul. Gell., xi. 17).

The Columna Cochlis (so called from its spiral stairs) is, includ- ing capital and base, 97 feet 9 inches high, z.c., 100 Roman feet ; its pedestal has reliefs of trophies of Dacian arms, and winged Victories, with an inscription recording the enormous mass of hill which was removed to*

form the site (comp. Dion Cass., Ixviii. 16). On the shaft are reliefs arranged spirally in twenty-three tiers, scenes of Trajan's victories, containing about 2500 figures. Trajan's ashes were buried in a gold urn under this column (Dion Cass., Ixviii. 16) ; and on the summit was a colossal gilt bronze statue of the emperor, now replaced by a poor figure of St Peter, set there by Sixtus V.2_ Beyond the column stood the temple of Trajan completed by Hadrian ; its foundations exist under the buildings at the north-east side of the modern piazza, and many of its granite columns have been found. This temple is shown on coins of Hadrian.? The architect of this magnificent group of buildings was Apollodorus of Damascus (Dion Cass., lxix. 4), who also de- signed many buildings in Rome during Hadrian's reign. In addi- tion to the five imperial fora, and the Forum Magnum, Olitorium, and Boarium, mentioned above, there were also smaller markets for pigs (Forum Suarium), bread (Forum Pistorium), and fish (Forum Piscarium), all of which, with some others, popularly but wrongly called fora, are given in the regionary catalogues.*

Other Temples, &c.

Besides the temples mentioned in previous sections remains of many others still exist in Rome. The circular temple by the Tiber in the Forum Boarium, formerly thought to be that of Vesta, may be the temple of Hercules mentioned by Macrobius (Saturn., iii. 6), Solinus (Colleet., i. 11), and Livy (x. 23). Its design is similar to that of the temple of Vesta in the Forum (fig. 15), and, except the entablature and upper part of the cella, which are gone, it is well preserved (see Piale, Yempio di Vesta, 1817). The neigh- bouring Ionic temple, popularly called of Fortuna Virilis, is of special interest from its early date, probably the end of the 2d century B.c. The complete absence of marble and the very sparing use of travertine, combined with the simple purity of its design, are all proofs of its great antiquity. It has a prostyle tetrastyle portico of travertine, and a short cella of tufa with engaged columns; the bases of these and of the angle columns are of travertine. The frieze has relicfs of ox skulls and garlands.

The whole was originally stuccoed and painted so that the different

stones used ; would not show. Fig. 21 gives the plan,

“ea the PSEUDO— PERIPTERAL PRO: ST YER ard = traver- CELLA. PORTICO. tine used at ‘mar

‘ the points of \ H greatest pres- sure, while the main walls

with the half sum. columus are of Fic. 21.—So-called temple of Fortuna Virilis. the weakerand shows tufa; the shading travertinc.

softer tufa. The dedication of this temple is doubtful ; on the whole it appears most probable that it is the temple to Fortuna (without any affix) founded by Servius Tullius (Dionys., iv. 27) in the Forum Boarium, not the one to Téxy ’Avdpela (Fors Fortuna ?) mentioned as being by the river (comp. Plut., De Fort. Rom., 5). Ten columns of what is probably the temple of Ceres, Liber, and Libera exist i situ, built up in the end and side walls of the church of S. Maria in Cosmedin. These have well sculptured composite capitals and wide intercolumniation, —probably a survival of the original design of this temple, which was Tuscan in style (Vitr., iii. 3, 5; Plin., H.N., xxxv. 45). It was founded by Aulus Postumius, dictator in 497 B.c., and dedicated by Spurius Cassius, consul in 494 B.C. SSE SS a ae 1 Its pedestal is inscribed, “ Senatus Populusqne Romanus Imp. Cesari Divi Nerve F. Nerve Trajano Aug. Germ. Dacico Pontif. Maximo Trib. Pot. XVIL [i.e., 114 a.p.] Imp. VI. P. P. ad declarandum quant altitudinis mons et locus tant(is operi)bus sit egestus.” This cannot be taken literally, as the ridge which was cut away never approached 100 feet in height, but possibly means that the cliff of the Quirinal was cut back to a slope reaching to a point 100 feet high (sce Brocchi, Suolo di Roma, p. 133 ; Becker, Handb., note 737). 2 See Fabretti, Columna Trajana (1683), who gives drawings of all the reliefs’; also De Rossi, Col. Traj. designata. The reliefs, from their lofty position, are now difficult to see, but originally must have been very fairly visible from the galleries on the eolonnades which once surrounded the column. 3 See Aul. Gell., xi. 17, 1; Spart., Hist. Aug.: Hadr., 19; and compare Pau- sanias (v. 12, 6; x. 5, 11), who mentions the gilt bronze roofs of Trajan’s forum. 4 See Fea, Foro Trajano, 1832; Richter, Ristauro del Foro Trajano, 1839; Bartoli, Col. Trajana, 1704 ; Pistolesi, Col. Trajana, 1846 ; Froehner, La Colonne

Trajane, Paris, 1865.

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(Dionys., vi. 17, 94). In 31 8.c. it was burnt (Dion Cass., 1. 10), and was rebuilt by Augustus and Tiberius (Tac., Ann., ii. 49) ; but the existing columns belong to a still later restoration. The temple stands close to the carceres of the Circus Maximus, in the Forum Boarium. Within the walls of 8. Niccolo in Carcere (see fig. 22) in the Forum Olitorium are preserved remains of the tufa celle and travertine columns of three small hexastyle peripteral temples, two Ionic and one Tuscan, set close side by side? A fragment of the marble plan in- cludes part of this group, as is indi- cated on fig. 22. Two of these temples were pro- bably those to Spes and Juno Sospita (Liv. , xxi. 62, xxxii. 30); the third may be that of Apollo Medicus (Liv., xl. 51), as suggested by Burn (Rome and Campagna, 1871, note i. p. 306). Near the Forum Olitorium, in the Fic. 22.—Plan of three temples on site of 8. Niccolo in modern Ghetto, Carcere; the part within the line A, A is that shown on are extensive re- ® fragment of the marble plan. The black shows what 4 still exists.

mains of the large

roup of buildings included in the Porticus Octavie, two of which, dedicated to Juno Regina and Jupiter Stator, with part of the en- closing porticus and the adjoining temple of Hercules Musarum, are shown on a fragment of the marble plan.

built in honour of Octavia by her brother Augustus on the site of the Porticus Metelli, founded in 146 n.c. This must not be con- founded with the neighbouring Porticus Octavia founded by Cn. Octavius, the conqueror of Perseus (Liv., xlv. 6, 42), in 168 B.c., and rebuilt under the same name by Augustus, as is recorded in the Ancyrean inscription. The whole group was one of the most magnificent in Rome, and contained a large number of works of art by Phidias and other Greek sculptors. The

existing portico, which was the main entrance into the porticus, is a restoration of the time of Severus in 203. 'The church of S. Michele and the houses be- hind it conceal extensive remains of the porticus and its temples (see Ci Inst., 1868, p. 108 ; and Contigliozzi, I Portici di Ottavia,

1861).

Remains of a large peripteral Corinthian temple are built into Temple Eleven of Nep- marble columns and their rich entablature are still in sitw, with the tune,

the side of the "Dogana di Terra," near Monte Citorio.

corresponding part of the cella wall of peperino ; in 1878 a piece of the end wall of the cella was discovered, and, under the houses near, part of a large peribolus wall, also of peperino, forming an enclosure with columns all round the temple nearly 330 feet square (see Bull. Comm. Arch. Rom., vi., pl. iv., 1878). The dedication of this temple is not known; it has commonly been identified with the temple of Neptune (Dion Cass., lxvi. 24), built by Agrippa, and surrounded by the Porticus Argonautarum (Dion Cass., liii. 27 ; Mart. iii, 20, 11); but its details appear to be later than the reign of Augustus.? Another not improbable theory is that it was the temple of Hadrian, mentioned in the Mirabilia (Uhlrichs, Codex Topogr., Wiirtzburg, 1871, p. 107) as being near this spot.

The temple of Venus Felix and Roma Aiterna on the Velia (sec Temple was the largest in Rome ; it was pseudo-dipteral with ten of Venus Corinthian columns of Greek marble at the ends, and probably and twenty at the sides; it had an outer colonnade round the peribolus Rome.

fig. 23)

of about 180 columns of polished granite and porphyry. Of these only a few fragments now exist; for several centuries the whole area of this building was used as a quarry, while the residue of the marble was burnt into lime on the spot in kilns built of broken fragments of the porphyry columns. A considerable part of the two celle with their apses, set back to back, still exists; in each apse was a colossal seated figure of the deity,

and along the side walls of the celle were rows of porphyry columns and statues in niches. The vault is deeply coffered with stucco enrichments once painted and gilt. The roof was covered with tiles of gilt bronze, which were taken by Pope Honorius I. (625-688) to cover the basilica of St Peter's. 'These were stolen by the Saracens during their sack of the Leonine city in 846. The emperor Hadrian him- self designed this magnificent temple, which was partially completed

5 For drawings of them see Ann. Inst., 1850, p. 347, and Mon. Inst., v. 24; also Labacco, Architettura, 1557.

6 The remains of the Porticus Octavie are now being more completely exposed by the demolition of the Ghetto.

7 This, however, is not conclusive, as the temple of Neptune may have been eompletely rebuilt after the fire which injured it in 80.

The Porticus Octaviz, Porticus a large rectangular space enclosed by a double line of columns, was Octavie.

many of these are recorded in the Notizie degli Scavi and the Bull. Comm. Arch. Rom., 1872-1876. The extensive cutting away of the Tiber bank for the new embankment exposed some very ornate houses near the Villa Farnesina, richly decorated with marble, fine wall-paintings, and stucco reliefs, equal in beauty to any works of the kind that have ever been found. Some of these were cut off the wall, and will be exhibited in a new museum about to be formed to contain all ancient works of art found in Rome; but the houses themselves have been destroyed. The laying out of the new Quirinal and Esquiline quarters also has exposed many fine buildings. One handsome villa, built over the Servian wall, may possibly be the house of Mecenas, A very remarkable vaulted room, decorated with paintings of plants and landscapes, has been shown to be a greenhouse ;? at one end is an apse with a scries of step-like stages for flowers. This one room has been preserved, though the rest of the villa has been destroyed ; it is on the road leading from S. Maria Maggiore to the Lateran. The walls are a very fine specimen of tufa opus reticulatum, unmixed with

brick, evidently earlier than the Christian era. Among the numerous buildings discovered in the Horti Sallustiani near the Quirinal is a very fine house of the 1st century a.p., in concrete faced with brick and opus reticulatum. It has a central circular domed hall, with many rooms and staircases round it, rising several stories high. This house was set in the valley against a cliff of the Quirinal, so that the third floor is level with the upper part of the hill. It is nearly on the line of the Servian wall, which stood here at a higher level on the edge of the cliff This is identified as the house of Sallust, which at his death became crown property, and was used as a residence by Nero (Tac., Ann., xiii. 47) and other emperors till the 4th century. In 1884, near the Porta S.. Lorenzo, a long line of houses was discovered during the making of a new road, Some of these were of opus reticulatum of the Ist century B.C.; others had the finest kind of brick-facing, probably of the time of Nero; all had been richly decorated with marble linings and mosaics. The line of the street was parallel to that of the later Aurelian wall, which at this part was built against the back of this row of houses. At the same time, behind the line of houses, were uncovered fine peperino and tufa piers of the aqueduct rebuilt by Augustus, one arch of which forms the Porta §. Lorenzo. These interesting remains have all been completely destroyed. A fine house of the end of the Ist centu A.D., with richly decorated walls, was exposed in June 1884 against the slope of the Quirinal, near the Palazzo Colonna ; it was immediately destroyed to make room for new buildings.

The pretorian camp was first made permanent and surrounded Pretor- with a strong wall by the emperor Tiberius (Suet., Z%b., 37). iancamp, Owing to the camp being included in the line of the Aurelian wall a great part of it still exists; it isa very interesting specimen of early imperial brick-facing. The wall is only 12 to 14 fect high, and has thinly scattered battlements, at intervals of 20 feet. The north gate (Porta Principalis Dextra) is well preserved; it had a tower on each side, now greatly reduced in height, in which are small windows with arched heads moulded in one slab of terra- cotta. The brick-facing is very neat and regular,—the bricks being about 14 inches thick, with ~~inch joints. On the inside of the wall are rows of small rooms for the guards. Part of the Porta Decumana also remains. This camp was dismantled by Constan~~ tine, who removed its inner walls ; the outer ones were left because they

formed part of the Aurelian circuit. The present wall is nearly three times the height of the original camp wall. The upper part was added when Aurelian included it in his general circuit wall round Rome. The superior ueatness and beauty of Tiberius's brick-facing make it easy to distinguish where his work ends and that of the then emperors begins. Owing to the addition of the later wall it requires some care to trace the rows of battle-ments which belong to the camp.

The Pantheon is the most perfect among existing classical build- Pan-ings in Rome (see fig. 24). It was built by Agrippa in 27 B.c., theon. as is recorded on the frieze of the portico. What its original pur- pose was is not clear ; on the one hand, it forms part of the great therme built by Agrippa, and in position and design closely resembles the great circular calidarium in the thermer of Caracalla ; on the other hand, it has no hypocaust or hot-air flues, and was certainly consecrated as a temple to Mars, Venus, and other sup- posed ancestors of Czsar's family very soon after it was built (Dion Cass., liii. 27); it was used as the meeting-place of the Fratres Arvales before they began to meet in the temple of Concord (see Henzen, Acta Frat. Arval., 1868, No. 71).5 It had the name Pantheum apparently from the first ; Pliny (A.N., xxxvi. 4) men-

in 185; the design was criticized rather severely by the architect Apollodorus (Dion Cass., xix. 4; Spart., Hadr.,19).1_ The temple

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Fig. 23.—Temple of Venus and Rome.

was probably finished by Antoninus Pius ; it was partly burned in the reign of Maxentius, who began its restoration, which was carried on by Constantine (Amm. Marcell., xvi. 10). The existing remains of the two celle are mainly of Hadrian's time, but contain patches of the later restorations. "Between the south angle of this temple and the arch of Constantine stand the remains of a fountain, usually known as the Meta Sudans. This was a tall conical struc. ture ina large circular basin, all lined with marble. From its brick facing it appears to be a work of the Flavian period. ; Build- That part of the Celian Hill which is near the

Colosseum is ings on covered with very extensive remains,—a great peribolus of brick- the faced concrete, apparently of Flavian date, and part of a massive Celian. travertine arcade, somewhat similar to that of the Colosseum ; most of the latter has been removed for the sake of the stone, but a portion still exists under the monastery and campanile of SS. Giovannie Paolo. What this extensive building was remains doubtful till further excavations are made. According to one theory it is the temple of Claudius, built by Vespasian (Suet, Vesp., 9); but Bunsen's suggestion is much more probable (Besch. , iii. p. 476), that it was the house of Vectilius, bought and probably enlarged by Commodus (Hist. Aug.: Comm., 16), and connected with the Colosseum by a subterranean passage. Such a passage actually exists, and has been partly cleared out.

The so-called temple of Minerva Medica on the eastern slope of the Esquiline (so named from a statue found in it) is probably part of some baths. It is a curiously planned building, with ceutral decagonal domed hall, probably of the time of Gallienus 263-268 (see Canina, Ind. To -» p. 161). Somewhat similar ruins beside the neighbouring basilica of S. Croce have been supposed to belong to a nympheum of Severus Alexander, mentioned in the Notitia, Regio v., but are more probably part of the Sessorium, a court of justice on the Esquiline. The remains on the Quirinal in the Colonna gardens of massive marble entablatures richly sculptured were formerly thought to belong to Aurelian's great temple of the Sun, but it now appears certain that they belong to the very extensive therme of Constantine, part of the site of which is now occupied by the Quirinal palace and neighbouring

. , buildings.? Private The excavations of recent years have brought to light, and in

I . . . houses, many cases destroy: ed, a large number of domestic buildings 3 3 Bull. Inst., 1875; see also Bull. Comm. Arch., 1874, where drawings are given.

4 During excavations made here in 1876 lead pipes were found inscribed with the name of the estate, the imperial owner (Severus Alexander), and the plumber who made them—HORTORVM . SALLVSTIAN . IMP. SEV. ALEXANDRI. AVG. NAEVIVS. MANES. FECIT.

5 The demolition of the block of houses which was built against it at the back has exposed the point of junction between the Pantheon and the therm. It is now apparent that the Pantheon originally was an isolated building, and that the union of it and the therm was a later alteration.

1 The existence of some chambers in the podium near the Colosseum and the great platform by which this temple is raised above the Sacra Via make it appear that the criticisms of Apollodorus were made before Hadrian's design

tions of his professional critic.

2 See Palladio (Terme dei Romani, London, 1732), who gives the plan of this enormous building, now wholly hidden or destroyed.

tions the sculpture by the Athenian Diogenes which adorned it, and its capitals and dome covering of Syracusan bronze (exxive 7); the ceiling of the portico too was of bronze, supported by massive tnbular girders,! which remained till Urban VIII. melted them to make cannon for S. Angelo and the baldacchino of St Peter's ; the bronze weighed 450,000 tb. The bronze tiles of the dome were stolen long before by Constans II., in 663, but on their way to Constantinople they were seized by the Saracens. The portico has eight columns on the front and three on the sides, all granite monoliths except the te- stored ones on the east

The

The central depét is buricd under the Palazzo Savorelli; that of the second cohort is on the Esquiline, near the so-called temple of Minerva Medica; that of the third was found in 1873 near the baths of Diocletian (see Bull. Comm. Areh. Rom., 1878). The most perfect is that of the 7th cohort near

S. Crisogono in Tras- tevere, a handsome house of the 2d century, decorated with mosaic floors, wall-paintings, &c.7

The excavations made in exposing the ancient church of 8. Clemente brought to light interesting remains of many different periods ; drawings are given by Mullooly, Sé Clement's Basilica, 1869, and De Rossi, Bull. Areh. Crist., 1870, pt. iv.

Many remains exist of the Golden House ® of Nero, which show Golden that this gorgeous palace covered an almost incredibly large space House of of ground, extending from the Palatine, over the Velia and the site of Nero.

side, —sixteen in all. capitals are Corinthian, of white marble; the tym-

Therme

Agrippa.

GREAT HALL OF THERM OF AGRIPPA

panum (derés) of the pedi- ment was filled with bronze reliefs of the battle of the gods and the giants.? The walls of the circular part, nearly 20 feet thick, are of solid tufa concrete, thinly faced with brick. The enormous dome, 142 feet 6 inches-in span, is cast in concrete made of pumice-stone, pozzolana, and lime; being one solid mass, it covers the building like a shell, free from any lateral thrust at the haunches. Round the central opening or hypethrum still re- mains a ring of enriched mouldings in gilt bronze, the only bit left of the bronze which once covered the whole dome. The lower story of the circular part and the walls of the pro- Fic. 24.—Plan of Pantheon and part of therm

the temple of Venus and Rome, to the Esquiline, filling the great valley between the Ccelian and the Esqniline where the Colos- senm stands, and reaching far over the Esquiline to the great re- servoir now called the "Sette Sale." No other extravagances or cruelties of Nero appear to have offended the Roman people so much as the erection of this enormous palace, which must have blocked up many important roads and occupied

the site of a whole populous quarter. It was no doubt partly to make restitution for this enormous theft of land that Vespasian and Titus destroyed the Golden House and built the Colosseum and public therme of Titus® on part of its site. Under the substructions of the latter building extensive remains of the Golden House still exist ; aud at one point, at a lower level still, pavements and foundations remain of one of the numerous houses destroyed by Nero to clear the site. The great bronze colossus of Nero, 120 feet high (Suet., Nero, 31), which stood in one of the porticus of the Golden House, was moved by Vespasian, with head and attributes altered to those of Apollo (Helios), on to the Velia; and it was moved again by Hadrian, when the temple of Rome was built, on to the base which still exists near the Colosseum. Several coins show this colossus by the side of the Colosseum.

Under the Palazzo Doria, the church of S. Maria in Via Lata, and Septa other neighbouring buildings extensive remains exist of a great Julia.

porticus, with long rows of travertine piers; this building appears to be represented on fragments of the marble plan with the words

*jecting portico were covered * en a Se Regeln ~, SAEPT...LIA. This is probably the Septa Julia, begun by Julins with slabs of Greek marble; eahousll chtlae of Augustus and Agrippa. | C&sar, and completed by Agrippa in 27 B.c., as the voting place a great part of the latter C. Pedestal for statue, and apse added by } for the Comitia Centuriata, divided into compartments, one for*

still remains, enriched with Hadrian.

Corinthian pilasters and bands of sculptured ornament. The two upper stories of the drum were covered outside with hard stucco of pounded marble. Inside the whole was lined with a great variety of rich Oriental marbles. This magnificent interior, divided into two orders by an entablature supported on columns and pilasters, has been much injured by alteration ; but the materials are ancient, and the general effect is probably much the same as it was, not in the time of Apsip De but after the restorations of Hadrian (Spart., Hadr., 181) and Severus, when the magnificently coloured por- phyries and Oriental marbles were so largely

used. About 608 the Pantheon was given by Phocas to Boniface IV., who con- secrated it as the church of S. Maria ad Martyres. In 1881-82 the destruction of a row of houses behind the Pantheon exposed remains of a grand hall with richly sculptured entablature on Corinthian columns, part of the great therme of Agrippa, which extend beyond the Via della Ciambella (fig. 24). A great part of the therme appears from the brick stamps to belong to an exten- sive restoration in the reign of Hadrian, and bricks of his time are even said to have been found in the facing of the Pantheon itself. (See Barus, vol. iii. p. 434 sq.)*

Close by the Pantheon is the church of 8. Maria sopra Minerva, which stands (as its name records) on the site of a temple to Minerva Chalcidica, probably founded by the great Pompey e. 60 B.c.5 Adjoining this were temples to Isis and Serapis, a cult which became very popular in Rome in the time of Hadrian ; large quantities of sculpture, Egypto-Roman in style, have been found on this site at many different times. ®

each century. The building contained rostra, and was also nsed for gladiatorial shows. Under the later empire it became a bazaar and resort of slave-dealers.

That curiously planned building on the Esquiline, in the new Piazza Vit. Emmanuele, where the so-called trophies of Marius once were placed (see drawing by Du Perac in his Vestig/), is one of the numerous castella or reservoirs from which the water of the various aqneducts was distributed in the quarters they were meant to supply. This was built by Severus Alexander at the termination of his Alexandrine aqueduct, opened in 225 (see Lamprid., Hist. Aug.: Sev. Alex., 25). The marble trophies are now set at the top of the Capitoline steps; their quarry mark shows them to be of the time of Domitian : it consists of the following inscription, now not visible, as it is cut on the under part—IMP. DOM. AVG. GERM. PER .CHREZ . LIB. %C<.1°

Places of Amusement.

The Circus Maximus (see vol. v. p. 791) occupied the Vallis Circuses.

Murciz !! between the Palatine and the Aventine. Its first rows ot seats, which were of wood, were made under Tarquin I. (Liv., i. 56 ; Dionys., iii. 68). It was restored in 327 and 174 B.c. (Liv., viii. 20; xli. 27). In the reign of Julius Cesar it was rebuilt with (for the first time) lower seats of stone (Plin., H.N., xxxvi. 24), the upper being still of wood (Suet., Cws., 39) ; Dionysius (iii. 68) describes it as it was after this rebuilding. It was further ornamented with marble by Angustus, Claudius, and other emperors. The wooden part was burnt in the great fire of Nero, and again under Domi- tian, by whom it was restored wholly in stone and marble, and

Fire- Several of the barracks (excubitoria) of the various cohorts of the | lastly it was restored and enlarged by Constantine. Iu its later men's _vigiles or firemen have been discovered in various parts of Rome. | state it had a marble facade with three external tiers of arches 'aracks,. —$— $<$<£2 – —@& ——_— | with engaged columns, and (inside) sloping tiers of marble seats,

1 Drawings of this interesting bronze work by Sallustio Peruzzi are pre- served in the Uffizi at Florence.

2 On the architrave is cut an inscription recording the restoration of the Pantheon by Severus in 202. :

3 The Pantheon still possesses its original doors between fluted pilasters, and over them an open screen, all of bronze. Other ancient bronze doors still exist in the temple of Romulus, the Lateran basilica, and in its baptistery, the latter taken from the thermz of Caracalla. a. ;

4 The plan of the whole group, including the Pantheon, is given by Palladio (op. cit.). The recent discoveries are given by Lanciani, Not. d. Scavi, 1882, p. 357, with a valuable plan. The one given by Canina is worthless. See also Maes, IZ Pantheon, 1881; Geymiiller, Documents inédits sur les Thermes d Agrippa, Lausanne, 1883 ; Nispi-Landi, IZ Pantheon, 1882; Adler, Das Pan- theon, Berlin, 1871; and Hirt, Das Pantheon, Berlin, 1807.

5 Part of the Serapeum is shown on a fragment of the marble plan; see Jordan, For. Ur. Rom. : bee

6 See Marucchi, "Le Scoperte dell' Iséo Campense, in Bull. Comm. Arch. Rom., 1883, and Ann. Inst., 1853 ; Fea, Miscell., ecliv. 112.

supported on concrete raking vaults (Plin., Paneg., 51). A great part of these vaults existed in the 16th century, and is shown by Du Perac. It held a quarter of a million spectators (Plin., H.N.,

a a 7 See De Rossi, " Vigili," in Anz. Inst., 1858 ; Visconti, Coorte VII. de' Vigilt, 1867. 8 See Fea, Casa Aurea, 1832.

9 See Romanis, Terme di Tito, 1822. It should be noted that tlie paintings said in this and other works to have belonged to the baths of Titus really decorated the Golden House, over which the baths were built. The substrue- tures of Titus's building are absolutely without ornament, and were almost devoid of light.

10 See Bruzza, in Ann. Inst., 1870, and Lenormant, Trophées de Marius, Blois, 1842. This once magnificent building, with the marble trophies in their place, is shown with much minuteness on a bronze medallion of Severus Alexander (see Froehner, Médaillons de [Empire, Paris, 1878, p. 169).

11 So called from a prehistoric altar to the Dea Murcia (Venus); Varro, L.L., v. 154.

xxxvi. 24). The end with the carceres was near the church of S. Maria in Cosmedin.! Some of its substructures, with remains of very early tufa structures on the Palatine side, still exist below the ehurch of S. Anastasia (see 58 in fig. 17). The obelisk now in the Piazza del Popolo was set on the spina by Augustus. The Circus Flaminius in the Campus Martius was built by the C. Flaminius Nepos killed at Thrasymene in 217 B.c.;

remains of the structure were found in the 16th eentury under the Palazzo Mattei. In the Middle Ages its long open space was used as a rope-walk, hence the name of the chureh called S. Caterina dei Funari, which oceupies part of its site.2 The circus of Caligula and Nero was at the foot of the Vatican Hill (Plin., 77.N., xxxvi. 15). The modern sacristy of St Peter's stands over part of its site. The obelisk on its spina remained standing in situ till it was moved by Fontana 3 for Sixtus Y. to its present site in the centre of the piazza. Another circus was built by Hadrian near his mausoleum; remains of it were found in 1743, but nothing is now visible (Att? d. Pont. Accad., 1839). The great stadium, foundations of which exist under most of the houses of the Piazza Navona (Agonalis), and especially below S. Agnese, is probably that built by Domitian and restored by Severus Alexander. It was called from the latter emperor the Stadium Alexandrinum. That it was a stadium and not a circus is shown by the fact that its starting end is at right angles to the sides and not set diagonally, as was always the ease with the carceres of a circus ; nor is there any trace of foundations of a spina. The best preserved circus is that built by Maxentius in honour of his deified son Romulus, by the Via Appia, 2 miles outside the walls of Rome. It was attributed to Caracalla til] 1825, when an inscription record- ing its true dedieation was found.4

The first permanent naumachia was that constructed by Augustus between the foot of the Janiculan Hill and the Tiber ; traces of it have recently been discovered near the church of 8. Crisogono. The naumachia of Domitian was pulled down and the materials used to restore the Circus Maximus (Suet., Dom., 5) ; its site is not known.

The first stone® theatre in Rome was that built by Pompey, 56- 52 B.c.; it contained a temple to Venus Victrix, and in front of it was a great porticus ealled Hecatostylum from its hundred columns. This is shown on the marble plan.§ Considerable remains of the foundations exist between the' Via de' Chiavari, which follows the line of the scena, and the Via de' Giubbonari and Via del Paradiso. Adjoining this was the curia of Pompey, where Cesar was murdered, after which it was burnt and the site decreed to be a 'locus sceler. atus."" The eolossal statue, popularly supposed to be that of Pompey at the feet of which Cwsar died,' now in the Palazzo Spada, 'was found in 1553 near the theatre. This theatre was

restored by Angustus (Aon. Ancyr.) ; in the reign of Tiberins it was burnt and its rebuilding was completed by Caligula. The scena was again burnt in 80 4.p., and restored by Titus. According to Pliny (H.N., xxxvi. 24), it held 40,000 spectators. In 1864 the colossal gilt bronze statue of Hercules, now in the Vatican, a work of the 3d eentury, was found near the site of the theatre of Pompey, carefully concealed underground. he theatre of Marcellus is much more perfect ; complete foundations of the eunei exist under the Palazzo Savelli, and part of the external arcade is well preserved. This is built of travertine in two orders, Tuscan and Ionic, with delicate details, very superior to those of the Colosseum, the arcade of which is very similar to this in general design. This theatre was begun by J. Cxsar, and finished by Augnstus in 13 B.c., who dedicated it in the name of his nephew Marcellus.® It was restored by Vespasian (Suet., Vesp., 19). Livy (xl. 51) mentions an earlier theatre on the same spot, built by M. Amilius Lepidus in 179 n.c.

1 Part of it is shown on a fragment of the marble plan (see Jordan, For. Ur. Rom.) ; it is represented on a bronze medallion of Gordian IIL, with an obelisk on the spina and three mets at each end; in front are groups of gladiators wrestling and boxing (see Grueber, Rom. Med., pl. xli., London, 1874),

2 The 16th-century discoveries recorded by Fulvio and Ligorio are quoted by Nardini, Roma Ant. (ed. Nibby, 1818-20), fii. p. 21.

3 See his Trasportazione dell' Obelisco Vat., 1590.

4 Nibby, Circo di Caracalla, 1825; Canina, Rom. Ant., i. p. 447, pl. exxxvii.; see also Panvinius, De Lud. Circens., and Bianconi, Deser. dei Circi, 1789. An interesting relief showing a circus race, with the carceres, spina, and galleries for spectators, is illustrated in Ann. Inst., 1870, pl. LM; and three of the saine subject are preserved in the Sala della Biga in the Vatican; see also the Brescia diptych, Gori (Thesaur. Vet. Dipt., Florence, 1759).

5 A great prejudice existed in republican Rome against the introduction of the Greek custom of having permanent stone theatres, In 154 s.c., owing to the advice of Scipio Nasica, the Senate demolished a half-

finished stone theatre which had been begun by the censor C. Cassius Longinus. Even Pompey had to build a temple to Venus in the upper part of his theatre asa sort of excuse for having seats and steps of stone leading up to it (Tertull., De Spec,, 10).

6 Plut., Pomp., 52; Dion Cass., xxxix. 38; Tac., Ann., xiv. 20.

7 See Fea, Rom. Ant., Ixviii. 57, for an account of its discovery.

§ Suet., Aug., 29. See Aon. Ancyr,—" Theatrvm.ad.aedem. Apollinis.in, solo – Magna . ex. parte. a. [privatis.] empto.feci. qvod. svb. nomine, M. Mar- celli. generi. [mel]i.esset." The temple of Apollo here named was one of the most ancient and highly venerated in Rome; it was dedicated to the Delphic Apollo in 428 B.c. by O. Julius (Liv., iv. 25); meetings of the Senate were held in it; and it contained many fine works of art,—an ancient cedar-wood statue of Apollo (Liv., xxvii, 37), and the celebrated statues of the slaughter of the Niobids by Praxiteles or Scopas (Plin., H.N., xxxvi. 4), of which many ancient copies exist. One almost complete set is in the Uffizi at Florence ; one figure of one of the daughters in the Vatican may be an original.

ROME

[TOPOGRAPHY AND

It stands partly in the Forum Olitorium, a large extent of the tra- vertine paving of which was exposed in 1875 (Bull. Com. Arch. Mun., in. 1875). Foundations also of the theatre of Balbus exist under the Palazzo Cenci; and in the Via di S. Maria in Cacaberis, No. 23, there is a small portion of the external arcade of the por- tieus which belonged to this theatre; the lower story has travertine arches with engaged columns, and the upper has brick-faced pilasters, It was built by Cornelius Balbns in 13 B.0. (Suet., 4ug., 29; Dion Cass., liv. 25). An interesting account of the temporary theatre of Scaurus, erected in 58 B.c., is given by Pliny (7.N., xxxvi. 2, 24), The same writer mentions an almost incredible building, which consisted of two wooden theatres made to revolve on pivots, so that the two together made an amphitheatre; this was erected by C. Curio in 50 B.c.

The first stone amphitheatre in Rome was that built by Statilius Amphi- Its ruins are supposed to form theatres,

Taurus in the reign of Augustus, the elevation called Monte Giordano, but none of it is visible. For the Colosseum see AMPHITHEATRE, vol. i. The Amphitheatrum Castrense is in the line of the wall of Aurelian near the Porta Asinaria ; it is built of concrete, faced with neat brickwork, and was decorated with friezes and other ornaments in moulded 'terra. eotta. Its exterior had two tiers of arches between engaged Corinthian columns, all, even the foliage of the eapitals, very neatly executed in terra- cotta. Only one piece with the upper order still exists on the outside of the Aurelian line. This amphi- theatre is mentioned in the regionary catalogues under Regio y. It is supposed to have been erected for the amusement of the troops in the neighbouring camp, hence its name. From the character of the brick-faeing the building appears to date from the early part of the 2d eentury.

Arches, Columns, Tombs, and Bridges.

The earliest triumphal arches were the two erected by L. Stertinins Arehes,

(196 B.c.) in the Forum Boarinm and in the Circus Maximus, out of spoils gained in Spain.® In the later years of the empire there were nearly forty in Rome. The arch of Titus and Vespasian on the Summa Sacra Via was ereeted by Domitian to commemorate the eonquest of Judea by Titus in his father's reign. Reliefs inside the areh represent the triumphal procession—'l'itus in a chariot, and-on the other side soldiers bearing the golden candlestick, trumpets, and table of prothesis, taken from the Jewish temple. The central part only of this monuiment is original ; the sides were restored in 1823.1? Another arch in honour of Titus had previously been built (80 A.D.) in the Circus Maximus; its inscription is given in the Einsiedeln MS. (Gruter, Inscr., p. 244, No. 6). A plain tra- vertine areh near the supposed palace of Commodns on the Ceelian is inscribed with the names of the consul Publius Corn. Dolabella (10 a.p.) and of the flamen martialis, C. Junius Silanus. In later times Nero's aqueduct was built over it. It may possibly have been an entrance into the Campus Martialis, an enclosure on the Ceelian sacred to Mars, which

was used for games when the Campns Martius was flooded. The so-called arch of Drusus by the Porta Appia also earries the specus of an aqueduct, —that built by Cara- ealla to supply his great therme. Its coarse details show, how- ever, that it is much later than the time of Drusus (Suet., Claud., 1). It was usual to ornament specially the arch of an aqueduct that happened to eross a road, and this arch was probably built by Caracalla with the rest of his branch of the Aqua Marcia. Ad- joining the church of S. Giorgio in Velabro a rich though coarsely decorated marble gateway with flat lintel still exists, — built, as its inscription records, in honour of Severus and his sons by the argentaril (bankers and silversmiths) and other merchants of the Forum Boarium in 204. It formed an entrance from the Forum Boarium into the Velabrum. The figure of Geta in the reliefs and his name have been erased by Caracalla; the sculpture is poor both in design and execution? (see Bull. Inst., 1867, p. 217, and 1871, p. 233). Close by is a quadruple areh, set at the intersection of two roads, such as was called by the Romans an arch of Janus Quadrifons. Though partly built of carlier fragments, it is of the worst style of work ; it eannot be earlier than the time of Constan- tine, and probably is of still later date. The finest existing arch is that by the Colosseum erected by Constantine. It owes, however, little of its beauty to that artistically degraded period. Not only most of its reliefs but its whole design and many of its architectural features were stolen from an earlier arch erected by Trajan as an entrance to his forum (see p. 826 above). The arch of Claudins, built in 43 to commemorate his supposed victories in Britain, stood across the Via Lata (modern Corso) between 8. Francesco Saverio and the Palazzo Sciarra. Its exact position is shown in Bull.

9 Liv., xxxiii. 27, see also xxxvii. 3.

10 This arch is the earliest known example of tle so-called Composite order, a modification of Corinthian in which the capitals combine Ionic volutes with Corinthian acanthus leaves ; in other respects it follows the Corinthian order.

ll The second half of the 2d ecntury was a time of extraordinarily rapid decline in art. The relief of Antinous in the Villa Albani and other

portraits of him made in the reign of Hadrian (117-138) are among the most beautiful ex- isting specimens of Roman or Greco-Roman sculpture ; while after the acces-

sion of Severus in 193 no sculpture of any real artistic merit seems to have been produced.

| Columns.

SET arr.

ARCH ZOLOGY. |

Comm.. Arch. Rom., vi., pl. iv. Its remains wcre removed in the middle of the 16th century,! and nothing now is left but half its inscription, preserved in the garden of the Barberini palace, and two of its reliefs in the porch of the Villa Borghese. 1t is shown on both aurei and denarii of Claudius, with an attic inscribed DE BRITANNIS, and surmounted by a quadriga and trophies. The aveh of Marcus Aurelius, also destroyed in the 16th century, spanned the modern Corso farther north, where the Via Lata had become the Via Flaminia.2 Many of its fine reliefs are preserved in the Capitoline Museum. The central part of the once triple arch of Gallienus still exists on the Esquilinc; it stands against the ancient Porta Esquilina of the Servian wall. It is built of traver- tine, is simple in design, with coarse details, and has a long in- scription on its attic. The two side arches and pediment over the centre existed in the 16th century, and are shown in the Mantuan oil-painting of Rome,? and in several antiquarian works of the 16th century. 'The inscription records that it was erected in 262 in honour of Gallienus and his wife Salonina by M. Aurelius Victor, preefect of the city.+

The column of Antoninus Pius was a monolith of red granite, erected after his death by his adopted sons M. Aurelius and L. Verus. One fragment of it is preserved in the: Vatican with an interesting quarry inscription, recording that it was cut in the ninth year of Trajan's reign, under the supervision of Dioscurus and the architect Aristides. The rest of its fragments were used by Pius VI. to repair the obelisk of Monte Citorio, set up by Augustus in the Campus Martius as the gnomon of a sun-dial

(Plin., H.N., xxxvi. 15). The marble pedestal of the Antonine colunin is now in the Vatican ; it has reliefs of the apotheosis of Faustina and Antoninus Pius, and processions of soldiers. This and the column of M. Aurelius were both surmounted by colossal portrait statues of gilt bronze. The column of M. Aurelius is very similar in size and design to that of Trajan. Its spiral reliefs represent victories in Germany from 167 to 179, arranged in twenty tiers. Like the column of Trajan, it is exactly 100 Roman feet high, without the pedestal. The pedestal was originally much higher than at present, but is now partly buried; it is shown by Gamueei, Du Perac, and other 16th-century writers. This column stood in front of a temple

Greek honeysuckle ornament (see Bull. Comm. Arch. Rom., iv.). This also is of the last years of the republic."

The mausoleum of Augustus, built 28 B.c., stands in the north Mauso- part of the Campus Martius, between the Tiber and the Via lea.

Flaminia. It is a massive cylindrical structure of concrete, faced with opus reticulatum ; over that it was liued with marble slabs ; inside were a series of radiating chambers, in plan like a whieel. On the top was a great mound of carth, planted with trees and flowers (Tac., Ann., ii. 9). As late as the 16th century its external form remained unaltered. Only the bare core exists now, with its fine opus reticulatum, best seen in the court of the Palazzo Valdam- brini. The inside is concealed by modern seats, being used now as a circus (Teatro Correa). The sepulchral inscription in honour of Augustus, engraved on two bronze columns at the entrance, is pre- served tous by its copy at Ancyra. It records an almost incredible amount of building: in addition to the long list of buildings men- tioned by name Augustus says, DVO. ET.OCTAGINTA.TEMPLA. DEVM.IN.VRBE.CONSVL.SEXTVM...REFECI.9 The first burial in the mausoleum of Augustus was that of Marcellus, 22 3.c., and it continucd to be the imperial tomb till the death of Nerva, 98 A.p., after whose interment there was no niore room. It was sacked by Alaric in 409, and in

the 12th century was made into a fortress by the Colonna family, and suffered inuch from constant party struggles.

The mausoleum of Hadrian, begun in 135 as a substitute for that built by Augustus, was a large circular building on a square podium ; its walls, of enormous thickness, are of concrete faced with blocks of peperino, the whole being lined with Parian marble and surrounded by a colonnade with rows of statues,—a work of the greatest magnificence. The bronze pine-cone, now in the Vatican, was (according to Vacca) found near the mausoleum, and probably surmounted its conical dome. The splendour of the whole is de- scribed by Procopius (B. G., i. 22), who mentions its siege by the Goths, when the defenders hurled the statues on to the heads of the encmy. In the 6th century it was made into a papal castle called S. Angelus inter Nubes, and all through the Middle Ages it suffered much from constant attacks. The interior chambers are still well preserved, but its outside has been so often wrecked and refaced that little of the original masonry is visible.

' Several of the grander sepulchral monuments of Rome were built Sepul- in the form of pyramids. One of these still exists, included in the chral Aurelian wall, by the Porta Ostiensis. It isa pyramid of conerete, pyra- 118 feet high, faced with blocks of white marble, and contains a mids.

to M. Aurelius, and within a great peribolus, forming a forum

similar to that of Trajan, though much smaller; the remains of this

temple probably form the elevation now called Monte Citorio.® For the catacombs see that article (vol. v. p. 206) ; for obelisks®

Tombs.

see ARCHITECTURE (vol. ii. p. 390) and Eaypr (vol. vii. pp. 768, 778).

The recent discovery of a cemetery of prehistoric (Etruscan) date is mentioned above, p. 812. Few tombs exist of the Roman period earlier than the Ist century B.c.,—probably owing to the great extension of the city beyond the Servian limits, which thus obliter- ated the earlier burial

places. The tomb of the Cornelian Scipios is the most important of early date which still exists. It is exca- vated in the tufa rock at the side of the Via Appia, outside the Porta Capena. Interments of the Scipio family went on here for about 400 years, additional chambers and passages being excavated from time to time. The peperino sarcophagus of Cornelius Lucius Scipio Barbatus (Liv., x. 12, 18), consul in 298 B.c., is now in the Vatican ; its inscription, in rude Saturnian verse, is perhaps the most important existing specimen of early Latin epigraphy. Many other inscribed slabs were found in the 17th century, covering the "loculi" in which lay the bodies of later members of the family. Those now existing in the tomb are modern copies, with blundered inscriptions. All are given by Mommsen (C.J.L.,i. p. 11 sg.). This burial-place of the Scipios is unlike those of other families, owing to the gens Cornelia keeping up the early custom of interment without burning ; thus stone sarcophagi or loculi (rock-cut recesses) were required instead of mere pigeon-holes to hold the cinerary urns. The tomb of Bibulus, a few yards outside the Porta Ratumena, and remains of two recently discovered during the destruction of the Aurelian towers at the Porta Salara, date from about the middle of the Ist century B.c., as does also the curious tomb of the baker Eurysaces outside the Porta Maggiore. In 1863 an interesting tomb of the Sempronia gens was discovered on the Quirinal, below the royal palace, near the site of the Porta Sanqualis. It is of travertine, with a rich entablature and frieze sculptured with the

1 See Vacca, ap. Fea, Misc., p. 67.

2 The destruction in 1879 of the Aurelian towers flanking the Porta del Popolo brought to light the fact that this gate is exactly on the site of the ancient Porta Flaminia, and not to one side of it, as was formerly believed on the evidence of a vague passage in Procopius (Bell. Goth., i. 23). Thus it appears probable that the northern part of the Corso follows the line of the Via Flaminia, as the southern portion does that of the Via Lata.

3 Reproduced by De Rossi in his valuable Piante di Roma Antertori al Sec. XVI., 1879.

4 See Bellori, Veteres Arcus, 1690, showing some now destroyed ; and Fea, Archi Trionf., 1832. '

5 See Ann. Inst., 1852, p. 338; and Mon. Inst., v., pl. xl.__See also Fabris, Piedestallo d. Col. Anton., 1846; Bartoli, Col. M. Aurelii, 1704; Chausse, Col. ritrovata nel Campo Marzo, Naples, 1704; Pellegrini, Colonne ed Obelischt, 1881.

6 In 1882 a small Egyptian obclisk of red granite was found buried near the Pantheon ; it now lies in the Piazza del Collegio Romano; a translation of its hieroglyphs is given in Bull. Comm. Arch. Rom., 1883. At the same time a very curious granite column was discovered of Egypto-Roman work, the lower part adorned with figures in relief.

small chamber decoratcd with painted stucco. An inscription iu large letters on the marble facing records that it was built as a tomb for C. Cestius, a praetor, tribune of the people, and septemvir of the epulones (officials who supervised banquets in honour of the gods)—an office founded in 196 B.c. (Liv., xxxiii. 42). It was erected, according to Cestius's will, by his exccutors, in the space of 330 days. It dates from the time of Augustus ?° (see Falconieri, in Nardini, Roma Antica, iv. p. 1, ed. 1818-20). Another similar pyramid, popularly known as the tomb of Romulus, stood between the mausoleum of Hadrian and the basilica of St Peter. It was destroyed in the 15th century during the rebuilding of the long bridge which connects the former building with the Vatican.

The earliest bridge was a wooden drawbridge called the Pons Bridges.

Sublicius from the piles (swblice) on which it was built. The river being an important part of the defence of Rome from the Aventine to the Porta Fluminalis (see plan of Servian wall, fig. 8), no permanent bridges were made till the Romans were strong enough not to fear attacks from without. The Pons Sublicius appears to

7 Sce A. F. Gori, Columb. Libert. et Serv. Livise, 1727 ; Bianchini, Camera . Sepolcrali, 1727; Campana, Sepoleri Romani, 1840; Fortunati, Scavi lwngo la Via Latina, 1859; Brizio, Pitture e Sepolcri sull' Esquilino, 1876; Secchi, Sepolero di una Famiglia Greca, 1843 ; Visconti, Sepoicro di Q. Sulpicio Massimo, 1871 ; Stevenson, Cimitero di Zotico, Via Labicana, 1876.

8 Sec Du Perac's Vestigj, which shows the garden on the top.

9 The other greatest building period after the reign of Augustus appears to have been that of Severus and his son Caracalla; the following list of buildings, built or restored between 196 and 211, will give some notion of this :—Marcian aqueduct restored and lengthened to the Therme Severianz in 196; pzeda- gogium puerorum a capite Afric in 198 ; temple of Cybele on the Palatine in 200, rebuilt ; Claudian and Anio Novus aqueducts restored in 201; theatre of Pompey, Pantheon, therme of Agrippa, Amphitheatrum Castrense, and pre- torian camp, all restored in 202 ; Septizonium and great palace on the Palatine, and arches in the Forum Magnuin and Forum Boarium built; Stadium Pala- tinum, Porticus Octavie, and Forum Pacis restored, all in 203. In various years before 211: temple of Vespasian, of Fortuna Muliebris, schola scribarum, halneze near the Porta Septimiana, horti of Geta, a porticus with res geste Divi Severi, the Antonine aqueduct, and (212-215) the great, thermee of Caracalla. The great fire of 191 was one of the causcs of these extensive works (see Lanci- ani, Bull. Comm. Arch. Rom., 1882).

10 Near the tomb of Cestius is that extraordinary mound of potsherds called Monte Testaccio. These are mostly fragments of large amphore, not piled up at random, but carefully stacked, with apertures at intervals for ventilation. Many theories have been advanced to account for this enormous mass of broken pottery ; but by far the most probable explanation is that the broken earthen- ware of Rome was collected and stored here for use in the making of the stucco called opus signinum (Vitr., viii. 6, 14), with which the specus or channels of aqueducts were lined, and also the concrete in which marble and mosaic pavings were bedded (nucleus). This latter is the opus testaceum of Vitruvius (vii. 1, 5); and the universal use of pounded earthenware for floors and aque- ducts must have used up immense quantities of broken pots and bricks (test tunsz). A good account of the potsherds of Monte Testaccio and their stamps is given in Ann. Inst., 1878, p. 118.

Augus- tan regiones.

Aurelian wall.

have been of wood even in the imperial period.!_ Its exact site is doubtful, but some existing foundations near the foot of the Aven- tine, near the Marmoratum, may have been the supports of its wooden piers. The first stone bridge was completed in 142 3.¢., when the conquest of Etruria and the defeat of Hannibal had put an end to fears of invasion; it was called the Pons Amilius, after the pontifex maximus? M. Aimilius Lepidus, its founder. It was also called Pons Lapideus to distinguish it from the wooden Sublician bridge. The modern Ponte Rotto is on the site of this ;

but the existing three arches are medieval. An ancient basalt-paved .

road still exists, leading to the bridge from the Forum Boarium. The Pons Fabricius unites' the city and the island (Insula Tiber- ina); Livy (ii 5) gives the fable of the formation of this island from the Tarquin corn, cut from the Campus Martius and thrown into the river. The bridge derived its name from L. Fabricius, a curator viarum in 62 B.C.; its inscription, twice repeated, is L. FABRICIVS.C.F.CVR. VIAR. FACIVNDVM.COERAVIT. Like the other existing bridges, it is built of great blocks of peperino and tufa, with a massive facing of travertine on both sides. Corbels to support centering were built in near the springing of the arches, so that they could be repaired or even rebuilt without a scaffolding erected in the ss i The well-preserved Pons Cestius, prob- ably named after L. Cestius, prefectus urbi in 46 B.c., unites the island and the Janiculan side ; on the marble parapet is a long in- scription recording its restoration in 870 by Gratian, Valentinian, and Valens. The next bridge, Ponte Sisto, is probably on the site of an ancient bridge called in the Notitia Pons Aurelius. Marliano gives an inscription (now lost) which recorded its restoration in the time of Hadrian. The Pons Allius was built in 185 by Hadrian to connect his mausoleum with the Campus Martius; it is still well preserved, and is now called the Ponte 8. Angelo (see Dante, Znfer., Xvili. 28-33). Its inscription, now lost, is given in the Einsiedeln MS.—IMP. CAESAR. DIVI. TRAIANI. PARTHICI. FILIVS . DIVI. NERVAE. NEPOS. TRAIANVS . HADRIANVS. AVG. PONT. MAX. TRIB. POT. XVIII.COS. II. P. P. FECIT. The Pons Alius is shown on coins of Hadrian. A little below it are the foundations of another bridge,

probably the Pons Neronianus of the Mirabilia, called also Vaticanus, built probably by Nero as a way to his Vatican circus and the Horti Agrippina.'

Regiones of Augustus.

In spite of the extensive growth of the city under the republic no addition was made to the four regiones of Servius till the reign of Augustus, who divided the city and its suburbs into fourteen regiones, the first six of which embraced the original four of Servius. The lists in the WMotitia and Curioswm are the chief aids in deter- mining the limits of each, which in many cases cannot be done with any exactness (see Preller, Die Regionen der Stadt Rom, 1846, and Uhlrichs, Codex Topograph., Wiirzburg, 1871). Each regio was divided into vici or parishes, each of which formed a religious body, with its edicula larium, and had magistri vicorum, the low- est in rank of the Roman magistracy. The smallest regio (No. II.) contained seven vici, the largest (No. XIV.) seventy-eight. The list is as follows :—

I. or Porta Capena, extended to the Aurelian Porta Appia.

IT. or Celimontana, the Coelian Hill.

III. or Isis et Serapis, included the valley of the Colosseum and the adjoining part of the Esquiline.

IV. or Zemplum Pacis ct Sacra Via, included the Velia, most of the Subura, the fora of Nerva and Vespasian, the Sacra Via, and also buildings along the north-east side of the Forum Magnum.

V. or Lsquilina, north part of the Esquiline and the Viminal.

VI. or Alta Semita, the Quirinal as far as the preetorian camp.

VII. or Via Lata, the valley bounded on the west by the Via Lata, and by the neighbouring hills on the east.

VIII. or Forwm Romanum, also included the fora of Julius, Augustus, and Trajan, and the whole Capitoline Hill.

IX. or Circus Flaminius, between the Tiber, the Capitol, and the Via Lata.

X. or Palatium, the Palatine Hill.

XI. or Circus Maximus, the valley between the Palatine and the Aventine, with the Velabrum and Forum Boarium.

XII. or Piscina Publica, between the Celian and the Aventine, and beyond the Via Appia, including the site of Caracalla's therme.

XIII. or Aventinus, the hill, and the bank of the Tiber below it.

XIV. or Pranstiberina, the whole district across the river and the Tiber Island.4

The walls of Aurelian (see Plates VI. and VIII.), more than 12 miles in circuit, were mainly built to enclose the regiones of Augus- tus, the greater part of which were then thickly inhabited. This

1 See Varro, L. L., v. 83; Ov., Fast., v. 622; Tac., Hist., i. 86. 2 The bridges were specially under the care of the pontifex maximus, at least till the later years of the republic (Varro, L. L., v. 88).

3 See Piale, 'Antic. Ponti," in Atti d. Pont. Accad., 1831; and Becker, De Muris et Portis, Leipsic, 1842.

4 See Jordan, For. Urb. Rom., Berlin, 1875. Besides the works of Preller, Jordan, and Uhlrichs, the regionary catalogues of buildings are given by Nardini, Rom. Ant., ed. Nibby, 1818-20, the whole of which valuable work is arranged in accordance with these lists.

enormous work was begun in 271, to defend Rome against sudden attacks of the Germans and other northern races when the great armies of Rome were fighting in distant countries.®> After the death of Aurelian the walls were completed by Probus in 280, and about a century later they were restored and strengthened by the addition of gate-towets under Arcadius and Honorius (395 – 425)

in place of the earlier gateways of Aurelian; this is recorded by existing inscriptions on several of the gates® At many periods these walls suffered much from the attacks of the Goths (Procop., Bell. Goth., iii. 22, 24), and were restored successively by Theodoric (about 500), by Belisarius (about 560), and by various popes during the 8th and 9th centuries, and in fact

all through the Middle Ages, A great part of the Aurelian wall still exists in a more or less perfect state ; but it has wholly vanished where it skirted the river, and a great part of its trans-Tiberine course is gone. The most perfect piece is that in the gardens of the Villa Ludovisi. Other well-preserved pieces are by the Porta Appia, and between the Lateran and the Amphitheatrum Castrense. The wall, of concrete, has the usual brick-facing and is about 12 feet thick, with a guards' passage formed in its thickness. Fig. 25 shows its plan: on the inside the

ARCHED RECESS UNDER STAIRS.

STAIRS TO UPPER FLOORS «

THREE WINDOWS.

SIX OF THESE OPEN ARCHES BETWEEN EACH PAIR OF TOWERS.

25, 30. 40.

SS

50.F%,

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Fic. 25.—Aurelian's wall; plan showing one of the towers and the passage in thickness of wall,

passage has tall open arches, which look like those of an aqueduct, and at regular intervals of about 45 feet massive square towers are built, projecting on the outside of the wall, in three stories, the top story rising above the top of the wall. The height of the wall varies according to the contour of the ground ; in parts it was about 60 feet high outside and 40 inside. Necessaria, supported on two travertine corbels, projected from the top of the wall on the outside beside most of the towers. The Einsiedeln MS. gives a description of the complete circuit, counting all the gates, fourteen in number, as follows :— : Porta 8. Petri (destroyed); P.

Flaminia (in use); P. Pinciana (closed) ; P. Salaria (destroyed in 1870); P. Nomentana (closed) ; P. Tiburtina (in use, now called P. S. Lorenzo); P. Prenestina (in use, now Porta Maggiore); P. Asinaria (closed); P. Metrovia (closed) ; P. Latina (closed); P. Appia (in use, now called P. S. Sebastiano) ; P. Ostieusis (in use, now P. S. Paolo). On the Jani- culan side, P. Portensis (destroyed) ; P. Aurelia (in use). One gate, known as the P. Chiusa, is omitted in this list, owing to its being blocked up in the time of the Einsiedeln writer. Its ancient name is not known. ‘ These existing gates are mostly of the time of Honorius ; each is flanked by a projecting tower, and some are double, with a second pair of towers inside. Several have grooves for a portcullis (cata- racta) in the outer arch. The handsomest gate is the P. Appia, with two massive outer towers, three stages high, the upper semi- circular in plan. Many of the gates of Honorius have Christian symbols or inscriptions. The general design of all these gates 1s much the same,—a central archway, with a row of windows over it and two flanking towers, some square, others semicircular in plan. In many of the gates older materials are used, blocks of tufa, traver- tine, or marble. The doors themselves swung on pivots, the bottom ones let into a hole in the threshold, the upper into projecting corbels. ,

At many points along the line of the Aurelian wall older build- ings form part of the circuit,—near the Porta Asinaria a large piece of the Domus Laterana, a house of the 3d century which gave its name to the Lateran basilica, and a little farther on, by S. Croce In Gerusalemme, the Amphitheatrum Castrense ; the latter, of about the end of the 1st century a.p., has two tiers of arches and cn- gaged columns of moulded brick on the outside. Between the P. Preenestina and the P. Tiburtina comes a large castellum of the _ Tepula, The Pretorian Camp forms a great projection neat = P, Nomentana. Lastly, the angle near the Porta Flaminia, at the

5 i , ; Zosimus, i. 87, 49; Eutrop., ix. 15.

6 The insoriptions run this—8P.Q,R_IMPP, CANSS . D.D. INVIC- TISSIMIS . PRINCIPIBVS. ARCADIO. ET, HONORIO. VICTORIB “4 AC. TRIVMPHATORIBVS. SEMPER. AVGG. OB. INSTAVRATOR . VRBIS . AETERNAE. MVROS. PORTAS. AC. TVRRES . EGESTIS ;

IMMENSIS . RVDERIBVS. .. .—the rest refers to honorary statues erected to commemorate this work.

RO

foot of the Pincian Hill, is formed by remains of a lofty and enor- mously massive building, faced with fine opus reticulatum of the Ist century B.c. Owing to the sinking of the foundation this is very much out of the perpendicular, and was known as the 'murus tortus" at a very early time.1 What this once important building was is uncertain. It has been supposed to belong to the tomb of the Domitii (Suet., Dom., 2), but on scanty grounds. Two arch- ways which form gates in the Aurelian wall are of much earlier date. The Porta Maggiore consists of a grand triple arch of the Claudian aqueduct built in travertine. The P. 8. Lorenzo is a single travertine arch, built by Augustus where the aqueduct carrying the Aqua Marcia, Tepula, and Julia crossed the Via Tiburtina. The inner gateway, built of massive travertine blocks by Honorius, was pulled down by Pius IX, in 1868 for the sake of

the material." Literature.—Probably no archeological subject has so copious a literature as that dealing with the topography of Rome ; much of this, however, has been rendered obsolete by subsequent discoveries. The reader who wishes to study the subject in a fairly concise form will find the following books the most use- ful.3 Nardini, Roma Antica, ed. Nibby, 1818-20; Nibby, Antichita di Roma, 1830, and Roma nell' Anno 1838, 1839; Becker, Handbuch der rémischen Alter- thiimer, Leipsic, 1843 (of special value from its numerous references to classical authors); Reber, Die Ruinen Roms, Leipsic, 1863 ; Bunsen and others, Beschreib- ung der Stadt Rom, Stuttgart, 1829-42, and the abridgment of this work by Platner and Uhirichs, 1844; Von Reumont, Geschichte der Stadt Rom, Berlin, 1867-70; Jordan, Topographie der Stadt Rom, Berlin, 1871 (in progress, a work of great value); Burn, Rome and the Campagna, London, 1870 (by far the best work in English, both froin its iNustrations and very able text); Dyer, The City of Rome, London, new ed., 1883 (a compact work, useful for reference). The yery large and magnificently illustrated works by Canina must be used with great caution; they contain imaginative restorations rather than accurate representations of what

really exists ; even those drawings which profess to give the existing remains are rendered of little value by their numerous in- accuracies. The chief of Canina's works are Indicazione di Roma Antica, 1830 , Esposizione topografica, 1842; Hdijfizj di Roma Antica, 1848-56 ; Foro Romano, 1845; and Architettura Antica, 1834-44. The student who wishes to enter into the subject in detail and form inde- pendent opinions will have an enormous mass of literature to wade through. (1) First, of course, come various classical authors, frequently cited above; the Monumentum Ancyranum, ed. Mommsen, Berlin, 1883, and other ancient inscrip- tions, (2) Second in importance come various documents of the decadence and early Middle Ages :—the Notitia and Curiosum Urbis Rome, printed by Preller in his Regionen der Stadt Rom, Jena, 1846; the Mirabilia Rome, ed. Parthey, Berlin, 1869; Graphia Aurew# Urbis, ed. Ozanam in Documents inédits, Paris, 1850; Catalogus Viennensis Imp. Rom., published by Eccard ; Descriptio Regionwm Rome, Kinsiedeln MS., ed. Haenel in Archiv fiir Philologte, v. 115, Berlin, 1887; Ordo Romanus, ed. Fea in Dissertaziont, &¢., 1830; the Codex Topog. Urbis Rome, ed. Uhlrichs, Wiirzburg 1871 (contains these and extracts from other medieval sources); Paulus Diaconus, Hucerpta ex Lib. Pomp. Festi, ed, Miler, Leipsic, 1839; Anastasius Bibliothecarius, De Vitis Rom. Pont., ed. Branchini, 1718. The various commentators on Virgil known under the general name of Servius give many valuable notes on Roman topography ; an excellent edition of these is being produced by Thilo and Hagen, Leipsic, 1881-85. (3) Thirdly we have a large number of works, mostly illustrated, pro- duced from the 15th to the 18th century, the value of which is frequently very great from the fact that they describe a large number of ancient monuments which no longer exist. Some of these, especially those earliest in date, exist only in MS. in the libraries of the Vatican, the Uffizi, Milan, and elsewhere ; a very valuable MS. of Ligorio (16th century) is preserved in the Bodleian at Oxford, Among these MSS. are drawings of ancient buildings by Raphael, Bramante, Bramantino, Baldassare, Sallustio Peruzzi, Andrea Sansovino, Palladio, and in fact by nearly all the great architects of the 16th century. Works of 15th and 16th Centuries. —Biondo, Roma Ristawrata, Venice, 1543 (MS. of 1431-39); Poggio, De Fortune Varietate (MS. of about 1440), Basel, 1538 ; Bramantino, Rovine di Roma (M8., 1503-13, in Bibl. Ambros., Milan), ed. by Mongeri, Milan, 1875; Albertini, Opusc. de Mirab, Urbis

Rome, 1509; Pomp. Leto, De Vetustate Urbis, 1523; And. Fulvius, Antiquaria Urbis, Venice, 1527 ; Calvus, Antiqua Urbis Roma Simulachrum, 1532; Marlianus, Urbis Rome Topog., 1544; Palladio, L'Architettwra, Venice, 1542, and Le Terme dei Romani, printed first in London, 1732; Serlio, Architettwra, Venice, 1545, bk. iii. 5 Fauno, Antichita di Roma, 1548; Labacco, Architettwra ed Antichita, 1557; L. Mauro, Antichité di Roma, Venice, 1558; Ligorio, Efigies Antiq. Rome, 1561 ; Gainucci, Antichita di Roma, Venice, 1565 ; Dosius, Urbis Rome Aidificia, 1569 ; Du Perac, Vestigj di Roma, 1575; Fabricius, Rome Antiq., 1587 ; Vacca, Varie Antichité, 1594, printed in Nardini, ed. Nibby, in Roma Antica, vol. iv., 1818-20; Miintz, Un Plan de Rome au XVme Siecle (Soc. Nat. des Antiquaires), Paris, April 1880. 17th Centwry.— Crechi, Antichita dt Roma, 1601; Laurus, Antig. Urbis Splendor, 1612; Maggius, Avdificia et Ruine Rome, 1618; Felini, Alma Citta di Roma, 1625 ; Secamozzi, L' Antichita di Roma, 1632 ; Franzini, Roma Ant. ¢ Mod., 1653; Desgodetz, Edifices Antiques de Rome, 1682 ; Ciampini, Vetera Monumenta, 1690; Bartoli, Admiranda Rom. Vestigia, 1693 ; De Rubeis, Roma Magnif. Monum., 1699. 18th Century.— Pinarole, Antichita di Roma, 1709, and Vestigi di Roma, 1744; Donatus, Roma Vetus, 1725; Bianchini, Pal. det Cesari, 1788. The magnificent etchings by Piranesi are of great value; the copperplates (in a much damaged state) still exist, and are worked by the Calcografia Camerale. They are grouped in folio vols. entitled La Magnificenza ei Romani, 1761-64; L' Antichita Romana, 1756 ; and other works. See further Bellori, Ichnographia Vet. Rome, 1764; Venuti, Vet. Monwmenta, 1778, and Deseriz. Topog. di Roma, 1824; Guattani, Monwm. Antiq. ined., 1784-89, and Roma descritia, 1805. 19th Century.—Many articles of great value occur in the following periodicals —Annali, Bullettino, and Monwmenti dell Instituto di Corris. Archeo. di Roma, 1829 (in progress); Atti dell' Accad. Rom. di Areh., 1821; Atti della R. Accad. dei Lincei (in progress); Bullettino della Commissione Arch. Mun. di Roma, 1872 (in progress); Notizie degli Scavi, 1876 (in progress). See also Valadier, Le piu insigni Fabbriche di Roma, 1810-26 ; Rossini, Antichita. di Roma, 1817, large plates; Fea, Ragionamento and other works, 1821-33 ; Taylor and Cresy, Archit. Antig. of Rome, London, 1821; Romanis, Vestigie di Rom. Ant., 1832; Gell, Topography of Rome, London, 1834; Donovan, Rome Ancient and Modern, 1842; Becker, Die romische Topographie, Leipsic, 1844;

Zestermann, De Basilicis, Brussels, 1847 ; Braun, Die Ruinen und Museen Roms, Berlin, 1854; Ampere, Histoire Romaine, Paris, 1862-64 ; Zinzow, Das dlteste

1 Procop., Bell. Goth., i. 23.

2 See Becker, De Rom. Muris et Portis, Leipsic, 1842; Nibby and Gell, Le Mura di Roma, 1820; Quarenghi, Le Mura di Roma, 1880; Burn, Rome and the Campagna, 1870, with other general works mentioned above. g

3 In the list given above all books are printed in Rome unless otherwise de- scribed,

ARCH ZOLOGY. |

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Rom, Pyritz, 1866; Parker, Photographs illustrating the Arch. of Rome, Oxford,

1867; Friedlinder, Sittengeschichte Roms, Leipsic, 1869, and Darstellungen aus

der Sittengesch. Roms, Leipsic, 1881; Wey, Description de Rome, Paris, 1871; Gsell-Fels, Rémisehe Ausgrabungen, Hildburghausen, 1870; Jordan, Forma Urbis Rome, Berlin, 1875, with supplement of 1883, and Nove Quastiones Topog., Konigsberg, 1868; Lanciani, I Commentarit di Frontino, 1880, and Dissertazioni Archeo., 1876-85; De Rossi, Note di Topog. Rom., 1882; Duruy, Histoire des Romatns, Paris, 1878-84, well illustrated ; J. H. Middleton, Ancient Rome in 1885 (A. & C. Black, Edinburgh), 1885. Maps.—Nolli's map of ancient Rome, 1748, is largely followed by Canina in his large map in many plates, 1850; Moltke, Carta Topog. di Roma, Berlin, 1852; Rieu, Rom, Vet. Yehnographia, Lyons, 1863; good maps of ancient and modern Rome together are contained in the guides of Gsell-Fels, Baedeker, and Murray; an excellent map of ancient Rome is given by Burn, Rome and the Campagna, London, 1870.

CHRISTIAN ROME.

1. From the 4th to the 12th Century.

The era of church building in Rome may be said to begin with the reign of Constantine and the peace of the church. Before then Christian worship was conducted with various degrees of secrecy either in private houses or in the CATACOMBS (q..), ac- cording as the reigning emperor viewed the sect with tolerance or dislike. The type of church which in the beginning of the 4th century was adopted with certain modifica- tions from the pagan basilica, though varying much in size, had little or no variety in its general form and ar- rangement. One fixed model was strictly ad- hered to for many cen- turies, and, in spite of

numberless alterations and additions, can be traced in nearly all the Poe ; ‘ f — churches 0 eaes

Fig. 26 shows a typical example, omitting all later changes.4 The plan is that of the lower church of 8. Clemente, built in the 4th century, probably in the reign of Constantine; an exist- ing inscription records its restoration by 5S. Siricius (384-398). The fittings, altar, choir- screen, &c., are not now in situ, but were moved into the npper ehureh when that was built, be- tween 1100 and 1118. f They were then rather Ce Se. o

carelessly put together, Fia. 26.—Plan of lower church of 8. Claes } roper positions A. Celebrant’s throne in western apse. B. High and the proper p altar and baldacchino. C. Stairs down to con-

ATRIUM OR QUADRO-PORTICUS

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of | the gospel and the fessio. D,D. Side doors in screen. E. Gos el epistle ambo reversed. gmbo. F. Epistle ambo. G. Lectern. : The figure shows these Paschal candlestick. J, J. Aisles, K. Doors

L. Stairs to upper church. M.

at east end. N. Campanile.

Fountain of ablution.

fittings replaced in the ancient chureh as they originally stood ; they are rather later than the building itself, being made under Pope John, probably the second of that name (532- 535) ; his monogram is sculptured on the marble slabs which form the low walls of the choir. In the 13th century ornaments of mosaic inlay were added on these 6th-century screens by one of the Cos- mati. The baldacchino which now exists in the upper church is of c. 1100, but two of the eolumns of a much older canopy are pre- served by being used in the construction of a fine 15th-century tomb near the high altar. These have richly carved caps of semi-classical style, and, as well as the high altar, have an inscription recording their gift to the church by the priest Mercurius in the pontificate of Hormisdas (514-523). The paintings of the 9th century, and even earlier, which cover the walls of the lower church are among the most important existing specimens of early

Christian art.®

rr 4 The plan of the upper church of 8. Clemente is shown under Basilica, fig. 18, vol. iii. p. 417; other plans of early basilicas are given in the same

article. 5 See Mullooly, S. Clement and his Basilica, Rome, 1869; De Rossi, in Bull.

Arch. Crist., 1863, 1865, 1867, especially 1870, pt, iv.

Plate VII. Early churches.

Typical plan,

Con- struction.

Circular churches,

The typical church was a simple rectangular building, with or without aisles, having a large apse at the west end, and at the east three doors opening from a cloister-like atrium ;! when space was limited three sides of the atrium were omitted, leaving only a long pillared narthex or porch which extended along the whole width of the nave. The apse or presbyterium, which was raised above the nave, contained a central marble throne for the celebrant and a long bench for the rest of the clergy. The high altar stood a little forward from the apse; and over it was a square canopy or baldacchino supported on four marble columns; each of the four arches of the canopy had a curtain, which was drawn close during the consecration of the elements; at other times these curtains were twisted round the four columns of the baldacchino. The celebrant stood with his back to the apse, looking eastwards towards the people over the altar.? The high altar stood over the tomb of some saint or confessor, hence called the "confessio"; this was so arranged as to be at least partly visible, and usually was reached by a few steps descending from the nave. In later times the confessio became frequently a spacious crypt containing a small altar of its own, At this point cancelli or marble screens ran across the whole width of the church, both nave and aisles; and hence the part thus railed off was called the "chancel." The choir occupied inost of the western half of the nave, and was raised one step above it; it was completely surrounded by a low marble wall or screen, along two sides of which a marble bench was fixed. On the right? was the gospel ambo, its marble book-rest usually distinguished by a sculptured eagle, and beside it the tall paschal candlestick. On the left was the epistle ambo.4 The font was frequently an ancient marble or porphyry bath, as in the Lateran baptistery and that of S. Maria Maggiore ; but in early times an ordinary parish church had no font ; baptisms were only performed in one or two of the great basilicas, and then in a separate building, usually octagonal in shape. In the eentre of the open atrium stood a fountain for ablutions performed before entering the church, as in an Oriental mosque.

The walls of these early churches were mostly built of concrete, faced with brick, left structurally quite plain, and decorated only with painted stucco or glass mosaics,—especially (internally) in the apse and on the

face of its arch, and (externally) on the east or entrance wall, the top of which was often built in an overhang- ing curve to keep off the rain. The windows were plain, with semicircular arches, and were filled with pierced marble screens, or in some cases with slabs of translucent alabaster; the latter was the case at 8. Lorenzo fuori le Mura, and examples of the former still exist in the very early church formed in the rooms of some thermz on the Esquiline (possibly those of Trajan), below the 6th- century church of 8, Martino ai Monti. Almost the only bit of external architectural ornament was the eaves cornice, frequently (as at the last-named church) formed of marble cornices stolen from earlier classical buildings. Internally the nave columns, with their capitals and bases, were usually taken from some classical building, and some churches are perfect museums of fine sculptured caps and rich marble shafts of every material and design.®> At first the nave had no arches, the columns supporting a horizontal entablature, as at 8. Clemente, S. Maria Maggiore, and S. Maria in Trastevere, but afterwards, in order to widen the intercolumniation, simple round arches of narrow span were introduced, thus requiring fewer columns. The roof was of the simple tie-beam and kingpost con- struction, left open, but decorated with painting or metal plates. The floor was paved either with coarse mosaie of large tessere (as at S. Pudentiana) or with slabs of marble stripped from ancient buildings. A later development of this plan added a small apse containing an altar at the end of each aisle, as in S. Maria in Cos- medin and §. Pietro in Vincoli.®

The type of church above described was used as a model for by far the majority of early churches not only in Rome but also in England, France, Germany, and other Western countries. Another form was, however, occasionally used in Rome, which appears to have been derived from the round temple of pagan times. This is a circular building usually domed and surrounded with one or more rings of pillared aisles.

1 The complete atrium or quadro-porticus now very rarely exists; the churches of 8. Prassede and 8. Cecilia in Trastevere still have it in a modernized form, and so has the church of the Quattro Santi Incoronati, which also pos- sesses the triforium galleries, like those of 8. Agnese fuori.

2 The custom (adopted some centuries later) of the celebrant standing between the altar and the people necessitated a reversal of orientation, and the high altar was then placed at the east end.

3 “Right” and “left” are here used of one facing the high altar.

4 An analogous arrangement of the choir exists in most of the Spanish cathedrals, in which it occupies a great part of the nave.

5 8. Lorenzo and 8. Agnese fuori, 8. Maria in Trastevere, Ara Cceli, and numberless other churches are very rich in this respect.

6 G. G. Scott (Church Architecture, London, 1881) gives a valuable account of the arrangements of early churches; see also Hiibsch, Altchristlichen Kirchen, Carlsruhe, 1862. The three apses are common in Eastern churches.

ME

Rome; it is a circular domed building, now known as the Torre Pignattara, from the pignatte or amphore built into the concrete dome to lighten it. The mausoleum of 8S. Cos- tanza, close by 8. Agnese fuori, is also domed, with circular aisle, or rather ambulatory, the vault of the latter decorated with mosaic or classical style (see Mosaic, vol. xvi. p. 852). The red porphyry sarcophagi, sculptured richly with reliefs, from these mausolea are now in the Vatican. On a much larger scale is the church of S. Stefano Ro- tondo on the Ceelian, built by Pope Simplicius (468- 483), with a double ring of pillared aisles, the outer one of which was pulled down and a new ww » 9 5D

enclosure wall built by in Se alee ud ; rie

‘ . — ur Mm, . Nicholas V. Other round A. Recess frais, B. Porbhyry aga tee churches are 8. Teodoro Where the tomb stood. C. Modern altar. D, (by the Vicus Tuscus), of D. Slabs of white marble, part of ancient pav- the 8th century, and §, ing. E,E. Recesses with mosaics. F, ¥. Am- Bernardo, which is one of bulatory with mosaic vault. the domed halls of Diocletian’s therme, consecrated as a church in 1598,

Space will not allow any individual description of the very numerous and important churches in Rome which are built on the above-described plan. The principal examples are these:?—8. Puden- tiana, traditionally the oldest in Rome, rebuilt by Adrian I. (772- 795); S. Sabina, 5th century; S. Vitale, 5th century, founded by Innocent I. (402-417) ; S. Martino ai Monti, 500; S. Balbina, 6th century ; church of Ara Cceli, founded in 6th century as 8. Maria in Capitolio ; 8. Giorgio in Velabro, rebuilt by Leo II. (682- 683) ; S. Cesareo, 8th century ; S. Maria in Via Lata, built by Sergius I. (687-701) ; S. Crisogono, rebuilt in 731 by Gregory III.;'S. Maria in Cosmedin and §. Giovanni ad Portam Latinam, both rebuilt «. 772 by Adrian I. ; S. Maria in Domnica, rebuilt by Paschal I. (817-824), who also rebuilt S. Cecilia in Trastevere c. 821 and S. Prassede in 822 ; S. Marco, rebuilt by Gregory IV. in 833 ; S. Maria Nuova, founded by Nicholas I. (858-867), now called S. Francesca Romana; §. Anastasia, founded in the 4th, rebuilt in the 10th century ; S. Bartolomeo in Isola and the church of the Quattro Santi Incoronati, built by Paschal II. about 1118; and 8. Maria in Trastevere, rebuilt by Innocent II. in 1139.8

Though the apscs and classical columns of the naves in these churches were built at the dates indicated, yet in many cases it is difficult to trace the existence of the ancient walls; the alterations and additions of many centuries have frequently almost wholly concealed the original structure. With the exception of S. Clemente, the early choir, placed as shown in fig. 26, has invariably been destroyed ; the side walls have often been broken through by the addition of rows of chapels; and the whole ehurch, both within and withont, has been overlaid with the most incongruous archi- tectural features in stucco or stone. The open roof is usually con- cealed either by a wooden panelled ceiling or by a stucco vault. The throne® and marble benches in the apse have usually given place to more modern wooden fittings, to suit the later position of the choir, which has always been transferred from the nave to the apse. In many cases the mosaics of the apse and the columns of the nave are the only visible remains of the once simple and stately original church,!@

2. From 1200 to 1450; and the Papal Palaces.

[TOPOGRAPHY AND

The 10th and 11th centuries in Rome were extraordinarily barren Era ofthe in the production of all branches of the fine arts, even that of archi- Cosmati.

tecture ; and it was not till the end of the 12th that any important revival began. The 13th century was, however, one of great artistic activity, when an immense number of beautiful works, especially in marble enriched with mosaic, were produced in Rome. This revival, though on different lines, was very similar to the rather later one which took place at Pisa (see Pisano), and, like that, was mainly due to the great artistic talents of one family,—the

7 For the carly church of SS. Cosmo e Damiano, see above, fig. 19.

8 This list does not include the great basilicas of Rome, for which see Basiwioa, vol. iii. p. 412. ‘

9 Some of these marble thrones which still exist are very interesting relics of Hellenic art, much resembling the existing seats in the theatre of Dionysius at Athens, whence probably some of those in Rome were brought in classical times. Examples of these Greek thrones exist at 8. Pietro in Vincoli, 8. Stefano Rotondo, and in the Lateran cloister. :

10 See Nesbitt, “Churches in Rome earlier than 1150,” in Archeologia, vol. xl, 1866. :

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Cosmati,’ seven members of which, for four generations, were-skilful architects, sculptors, and mosaicists. The following are the names and dates known from existing

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architecture in Rome during the 13th and 14th centuries. Tufa+ Domestic or brick was used for the main walls, the lowest story being often

architect- supported on an arcade of pointed arches and marble columns. The ure.

Cam-

panili,

inscriptions :— Lorenzo (boru in the second half of the 12th centw

Jacopo (dated works 1205 and 1210).

windows were usually formed of large marble slabs with trefoil- shaped heads or cusped arches. As a rule the upper stories pro- Jected slightly over the lower wall, and were supported on small ornamental machicolations. The top story frequently had an open loggia, with rows of pointed arches. When vaulting was used it

Cosimo (,, 1210-35). also was of the pointed form, usually in simple quadripartite bays, with slightly moulded groin-ribs. "The finest existing specimen of

| l | this style is the palace built about 1300 by Boniface VIII. (Gaetano Bites Jacopo Naeoanee Covaaiin family), enclosing the tomb of Cecilia Metella on the Via Appia,

(1231 and 1235). (1281-1298). (1294), (1296 and 1308). Their principal works in Rome are :—ambones of 8. Maria in Ara Coeli (Lorenzo); door of S. Saba, 1205, and door with mosaics of S. Tommaso in Formis (Jacopo) ; chapel of the Sancta Sanctorum, by the Lateran (Cosimo) ; pavement of S. Jacopo alla Lungara, and (probably) the magnificent episcopal throne and choir-screen in 8. Lorenzo fuori le Mura, of 1254 (Jacopo the younger) ;? baldacchino of the Lateran and of 8. Maria in Cosmedin, c. 1294 (Adeodato) ; tombs in 8. Maria sopra Minerva (c. 1296), in S. Maria Maggiore, and in 8. Balbina (Giovanni). A large number of other works by members and pupils of the same family, but unsigned, exist in Rome. These are mainly altars and baldacchini, choir-screens, paschal candlesticks, ambones, tombs, and the like, all enriched with sculpture and glass inosaic of great brilliance and decorative effect.

Besides the more mechanical sort of work, such as mosaic patterns and architectural decoration, they also produced mosaic pictures and sculpture of very high merit, especially the recumbent effigies, with angels standing at the head and foot, in the tombs of Ara Celi, S. Maria Maggiore, and elsewhere. One of their finest works is in S. Cesareo ; this is a marble altar richly decorated with mosaic in sculptured panels, and (below) two angels drawing back a curtain (all in marble) so as to expose the open grating of the confessio. The magnificent cloisters of S. Paolo fuori le. Mura, built about 1285 by Giovanni, the youngest of the Cosmati, are one of the niost beautiful works of this school. The baldacchino of the same basilica is a signed work of the Florentine Arnolfo del Cambio, 1285, "cum suo socio Petro," probably a pupil of the Cosmati. Other works of Arnolfo, such as the Braye tomb at ORVIETO (q.0.), show an intimate artistic alliance between him and the Cosmati. The equally magnificent cloisters of the Lateran, of about the same date, are very similar in design ; both these triumphs of the sculptor- architect's and mosaicist's work have slendcr marble columns, twisted or straight, richly inlaid with bands of glass mosaic in delicate and brilliant patterns. The shrine of the Confessor at Westminster is a work of this school, executed about 1268 (see Mosatc). The general style of works of the Cosmati school is Gothic in its main lines, especially in the elaborate altar-canopies, with their pierced geometrical tracery. In detail, however, they differ widely from the purer Gothic of northern countries. The richness of effect which the English or French architect obtained by elaborate and carefully worked mouldings was produced in Italy by the beauty of polished marbles and jewel-like mosaics,—the details being mostly rather coarse and often carelessly cxecuted. Chiefly to the 13th century belong the large number of beautiful campanili, which are the most conspicuous relics of the medieval period in Rome. The finest of these are attached to the churches of S. Maria Nuova, SS. Giovanni e Paolo, and 8. Maria Maggiore. Others belong to the basilicas of S. Lorenzo fuori and 8. Croce in Gerusalemme, and to S. Giorgio in Velabro, 8S. Maria in Cosmedin, 8. Alessio, S. Giovanni ad Portam Latinam, 8. Cecilia, S. Crisogono, and S. Pudentiana. They occupy various positions with regard to the church, being all later additions ; that of SS. Giovanni e Paolo stands at some distance from it. In design they are very similar, consisting of many stages, divided by brick and marble

cornices ; in the upper stories are from two to four windows on each side, with round arches supported on slendcr marble columns. They are decorated with brilliantly coloured ciotole or disks of earthen- ware, enamelled and painted in green or turquoise blue, among the carliest existing specimens of the so-called majolica (see Porrery, vol. xix. p. 624 sg.). Sometimes disks or crosses made of red or green porphyry are inlaid in the walls. In most cases on one face of the top story is a projecting canopied niche, which once contained a statue or mosaic picture. The walls are built of fine neat brick- work. One campanile (that of S. Maria Maggiore), the largest and once the handsomest of all, has string-courses of enamelled and coloured terra-cotta. The slender columns of the windows have often proved insufficient to support the weight, and so many of the arches are built up.® m4… Though but little used for churches, the Gothic style, in its modified Italian form, was almost universally employed for domestic 1 An excellent account of the Cosmati is given by Boito, Architettura del Medio Evo, Milan, 1880, pp. 117-182. ‘ 2 The chief signed works of Jacopo and his brother Luca are at Anagni and

Subiaco. 3 See De Montault, Les Cloches de Rome, Arras, 1874.

with a graceful little chapel within the precincts of the castle. This building is very worthy of study ; the remaining part is well pre- served. Many houses of this period, though generally much injured by alterations, still exist in Rome. They are mostly in out-of-the- way alleys, and, not being mentioned in any books, are seldom ex- amined. The Ghetto and the quarter near the Ponte Rotto contain many of these interesting buildings, as well as some of the most crowded parts of the Trastevere district ; all are rapidly disappear- ing under the wholesale destruction of old streets now in progress. Among those which may possibly escape for a while is the 13th- century house where Giulio Romano lived, near the Palazzo di Venezia, and the Albergo del Orso, at the end of the Via di Tordi- nona, of the same period, which was an inn in the 16th century and is one still ; this has remains of a fine upper loggia, with rich cornices in moulded terra-cotta ; the lowest story has pointed vault- ing resting on many pillars. Another graceful but less stately house exists, though sadly mutilated, opposite the entrance to the atrium of S.

Cecilia in Trastevere. Very few now remain of the ouce numerous lofty towers built by the turbulent Roman barons for purposes of defence. he finest, the Torre della Milizia on the Viminal, was built in the 18th century by the sons of Petrus Alexius ; of about the same date is the Torre dei Conti, near the forum of Augustus, built by Marchione of Arezzo; both these were once much higher than they are now ; they are very simple and noble in design, with massive walls faced with neat brickwork, much resembling that of the 2d century.

Till the 14th century the Lateran was the usual residence of the Laterau pope ; this was once a very extensive building, covering four times palace.

its present area. The original house is said to have belonged to the senator Plautius Lateranus in the reign of Nero ; but the existing part on the line of the Aurelian wall is of the 8d century. This house, which had become the property of the emperors, was given by Constantine as a residence for S. Sylvester ; it was very much enlarged at many periods during the next ten centuries ; in 1308 a great part was burnt, and in 1586 the ancient palace was completely destroyed by Sixtus V., and the present palace built by Domenico Fontana. The Cappella Sancta Sanctorum (see list of Cosinati works) is the only relic of the older palace. The present palace has never been used as a papal residence; in the 18th century it was an orphan asylum, and is now a museum of classical sculpture and early Christian remains.

The Vatican palace also appears to have originated in a house The This was rebuilt by Vatican.

which existed in the time of Constantine. Innocent ILI. (c. 1200) and enlarged by Nicholas III. (1277-80). It did not, however, become the fixed residence of the popes till after the return from Avignon in 1377. In 1415 John XXIII. connected the Vatican and the castle of S. Angelo by a covered passage carried on arches. But little of the existing palace is older than the 15th century ; Nicholas V. in 1447 began its reconstrue- tion on a magnificent scale, and this was carried on by Sixtus IV. (Sistine chapel), Alexander VI. (Appartamenti Borgia), Julius II. and Leo X. (Bramante's cortile and paintings by Raphael), and Paul III. (Sala Regia and Cappella Paolina by Antonio da Sangallo). Sixtus V. and his successors built the

lofty part of the palace ou the east of Bramante's cortile. The Scala Regia was built by Bernini for Urban VIII., the Museo Pio-Clementino under Clement XIV. and Pius VI., the Braccio Nuovo under Pius VII., and lastly the grand stairs up to the cortile were added by Pius IX.

The Quirinal palace, now occupied by the king of Italy, is devoid The It stands on the highest part of the hill, Quirinal.

of architectural merit. on the site of part of the baths of Constantine. This palace was begun in 1574, under Gregory XIII., by Flaminio Ponzio, and was completed by Fontana and Maderna under subsequent popes.

4 For many centuries wall-facing of small tufa stones was used, e.g., in the medieval part of the Capitol; this was called "opera saracinesca" from its supposed adoption from the Saracens; it is largely employed in the walls and towers of the Leonine city, built by Leo IV. (848-852) to defend the Vatican basilica and palace against the inroads of the Moslem invaders. The greater part of this wall is now destroyed and built over, but a long piece with massive circular towers well preserved exists in the gardens of the Vatican.

5 The house of Crescentius, popularly called the " house of Rienzi," near tlic Ponte Rotto, is perhaps the sole relic of the domestic architecture of an earlier period,—the 11th century. Its architectural decorations are an extraordinary mixture of marble fragments of the most miscellaneous sort, all taken from classical buildings; it has a long but somewhat unintelligible inscription over the doorway. . . ;

6 The great mosaic in the adjacent apse is a modern copy of that which once decorated the triclinium of Leo ITI. (795-816).

Eeelesi- astical Gothic.

Mino da Fiesole,

Bra- mante.

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The only important church in Rome which is wholly Gothic in style is S. Maria sopra Minerva, the chief church of the Dominican order. This was not the work of a Roman architect, but was de- signed by two Dominican friars from Florence—Fra Ristoro and Fra Sisto—about 1289, who were also the architects of their own church of S. Maria Novella. It much resembles the contemporary churches of the same order in Florence, having wide-spanned pointed arches on clustered piers and simple quadripartite vaulting. Its details resemble the early French in character! It contains a large number of fine tombs ; among them that of Durandus, bishop of Mende (the author of the celebrated Rationale divinorum officiorwn), by Giovanni Cosmas, c. 1300, and the tomb of Fra Angelico, the great Dominican painter, who died in Rome, 1455. The most elaborate specimen of ecclesiastical Gothic in Rome is that part of S. Maria in Ara Celi which was rebuilt about 1300, probably by one of the Cosmati, namely, the south aisle and transept. For at least two centuries after the death of Giovanni Cosmas no native Roman appears to have excelled in any branch of the fine arts, The sculptured effigy and reredos of Cardinal Alengon in S. Maria in Trastevere, executed about 1400 by a certain Paulus Romanus, is a fair example of the decadence which took place during this period ; the cfligy is a very elumsy and feeble copy of the fine recumbent figures of the Cosmati.

3. Hlorentine Period, c. 1450-1550.

The long period of almost complete artistic inactivity in Rome was broken in the 15th century by the introduction of a number of foreign artists, chiefly Florentines, who during this and the succeeding eentury enriched Rome with an immense number of magnificent works of art. The dawn of this brilliant epoch may be said to have begun with the arrival of Fra Angelico (see Firsour) in 1447, invited by Nicholas V. to paint the walls of his small private chapel in the Vatican dedicated to S. Lorenzo.

To Mino da Fiesole (see Mino pi GIOVANNI, vol. xvi. p. 477), who spent several years in Rome between 1470 and 1484, and other Florentine sculptors are due almost all the very beautiful sculptured tombs which were made for a large number of the Roman churches during the last thirty years of the 15th century, as well as many altar frontals, reredoses,

tabernacles, and the like. Though varied in details, most of these tombs are designed after one types that employed by Mino in his fine monuments in the Badia at Florence. A life-sized recuinbent effigy lies on a richly ornamented sarcophagus, over which is an arched canopy decorated with relicfs ; the piers which support this (usually) have statuettes in two or more tiers. For grace and refined beauty no type of sepulchral monument has ever equalled this Florentine design. The peaceful attitude and calm face of the effigy are frequently of the most perfect beauty, and the minute statuettes and reliefs are finished with ivory-like delicacy. Though the influence of Mino, very strongly marked, may be traced in all these numerous works (there are in Rome more than a hundred tombs of this class), yet a very small proportion can be actually by his hand. Mino created and trained a large school of sculptor-pupils in Rome, some of whom appear almost to have equalled their master in skill ; and it is to them that most of these works must be referred. A very long list of churches contain- ing sculpture of this class might be given; perhaps the richest are S. Maria in Monserrato (the cloisters) and 8S. Maria del Popolo.?

The architecture no less than the sculpture of the latter part of the 15th century was mainly the work of Florentines, especially of Baccio Pintelli, who partly rebuilt S. Maria del Popolo, S. Agostino,? and S. Cosimato in Trastevere. He also was the architect of S. Pictro in Montorio, erected in 1500 for Ferdinand and Isabella of Spain, and probably designed the Sistine chapel for Sixtus IV. in 1473. Other buildings were carried out by another Florentine, vluliano da Majano (see Ferrerio, Palazzi di Roma, 1825). The Palazzo di Venezia, begun for Cardinal Barbo, afterwards Paul II., about 1455, a very massive and stately building of medieval char- acter, was designed by Francesco di Borgo San Sepolcro,

During the latter part of the 15th and the first few years of the succeeding century Rome was enriched with a number of buildings by BRAMANTE (q.v.), one of the greatest architects the world has ever seen. With the most consummate skill, he combined the delicacy of detail and the graceful lightness of the Gothic style with the ineasured stateliness and rhythmical proportions of classic architecture. Though he invariably used the round arch and took his mouldings from antique sources, his beautiful cloisters

and loggie are Gothic in their general conception. Moreover, he never committed the prevalent blunder of the 16th century, which was a fruitless attempt to obtain magnificence by mere size in a build- ing, without multiplying its parts. His principal works in Rome are the magnificent Palazzo della Cancelleria, built for Cardinal a pens ne me a

1 The absence of a triforium is one of the chief reasons why the large Gothic churches of Italy are so inferior in effect to the cathedrals of France and England.

2 It would be easy to double the list given in Perkins's valuable Handbook of Ital. Sculpt., London, 1883, p. 417. Drawings of many of these are published by Tosi, Monwmenti Sacri, &c., 1843.

3 These two churches were the first in Rome built with domes after tlic classical period,

ME [TOPOGRAPHY AND

Riario in 1495, with its stately church of S. Lorenzo in Damaso ; the so-called Palazzo di Bramante in the Governo Vecchio, built in 1500; and the Palazzo Giraud, near St Peter's, once the residence of Cardinal Wolsey, built in 1506. He also built the cortile of 8. Damaso in the Vatican, the toy-like tempietto in the cloister of 8. Pietro in Montorio, and the cloisters of S. Maria della Pace, 1504.4 In 1503 Bramante was appointed architect to St Petcr's, and made complete designs for it, with a plan in the form of a Greek cross, The piers and arches of the central dome were the only parts com- pleted at the time of his death in 1514, and subsequent architects did not carry out his design. For St Peter's, see ARCHITECTURE, vol. ii. p. 488 and plates XXII., XXIII. ; also Basiuica, vol. iii. p. 415 sq.

Baldassare Pervzzi (q.v.) of Sicna was one of the most talented Peruzzi, architects of the first part of the 16th century ; the Villa Farnesina and the Palazzo Vidoni (usually attributed to Raphael) are from his designs.° His later works bear traces of that decadence in taste which so soon began, owing mainly to the rapidly growing love for the dnll magnificence of the pseudo-classic style. This falling off in architectural taste was due

to MICHELANGELO (g.v,) more than to any other one man. His cortile of the Farnese palace, though a work of much stately beauty, was onc of the first stages towards that lifeless scholasticism and blind following of antique forms which were the destruction of architecture as a real living art, and in the sneceeding century produced so much that is almost brutal in its coarseness and neglect of all true canons of proportion and scale. During the earlier stage, however, of this decadence and throughout the 16th century a large number of fine palaces and churches were built in and near Rome by various able artists, such as the Villa Madama by Raphael, part of the Palazzo Farnese by Antonio da Sangallo the younger, S. Giovanni de' Fiorentini by Jac. Sansovino, and many others.®

4. Modern Period.

Under Vignola (1507-1573), Carlo Maderna (1556-1639), Bernini Period of i| (1598-1680), Carlo Fontana (1634-1714), and others architectural degrada- | beauty in Rome steadily declined, till the prevalent style became tion. |

a mere caricature of classical forms, twisted and contorted into every possible incongruous and ridiculous shape, void of all sense of harmony of proportion and unredeemed by any grace or even | decency of detail. Clumsy weightiness and extravagance of out- | line, with the frequent introduction of the most ungraceful curves, i are the main characteristics of this unhappy period, which, un- 1 fortunately, was one of great activity in building, 'The degraded | taste of the 17th and 18th centuries could see no beauty in the

stately simplicity of the early basilicas, in the delicate grace and

rich ornament of the Cosmati period, or even in the refined har-

monious beauty of the Renaissance.' Every church in Rome is

more or less disfigured inside with extravagant stucco pilasters and

reliefs, transfiguring the whole interior, while outside many have j clumsy facades stuck on without the slightest reference to the { structures they are meant to decorate. The Latcran basilica is one] of the most conspicuous instances of this sad treatment of a grand

old building ; and the hideous facades which disfigure the fine cliurches of 8S. Marcello and 8. Maria in Via Lata (both in the Corso) are typical examples of the degradation into which archi- tecture had sunk in its latest stages. In the present century taste Nine- has somewhat improved. Since 1870, when Rome became the teenth capital, an immense amount of building has been carried out, century | mostly innocent in design, though dull and lifeless. The modern build- architects of Rome possess the rare merit of acknowledging their ings. own artistic incapacity, and the more important recent buildings have been copies, fairly faithful in design though not in material,

of fine palaces of the best 15th and 16th century architects. The Cassa di Risparmio in the Corso and some large houses in the new quarter across the Tiber are good copies of the Strozzi and other Florentine palaces; the Hotel Bristol is from a fine palace at Venice; and Bramante's Palazzo Giraud has been imitated in a new house uear the Piazza Nicosia. Unfortunately stucco is mainly

used for the exteriors of these otherwise handsome buildings, a material which, however, lasts fairly well in the mild climate of Rome. The growing rage for the Parisian style of building, with

wide straight boulevards, is rapidly destroying all the picturesque-

ness of the city ; and these broad streets, from their waut of shade,

are not suited to an almost constantly sunny climate.

The chief architectural work of the 19th century has been i 4 The upper story of the latter is varied by having horizontal lintels instead of arches on the columns.

5 There appears now to be some doubt whether the Farnesina may not have been designed by Raphael; an original sketch by Peruzzi's own hand of the Palazzo Vidoni is preserved in the Uffizi.

6 A valuable account of Raphael's architectural works is given by Geymiller, Raffaello come Architetto, Milan, 1882. Drawings of many of the finest palaces of Rome are given by Percier and Fontaine, Edifices modernes & Rome, Paris, 1798 ; and especially in the fine work by Létarouilly, Edijfices de Rome moderne, Brussels, 1856-66.

7 yen the frescos of the chief earlier artists were not spared; those by Pinturicchio in the 8d chapel (south) of S. Maria del Popolo were covered by

wretched stucco ornaments, only removed in 1850; and numberless works of art by Giotto and other early painters were wilfully destroyed.

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Museums and gal- \eries.

Private collec- tions of pictures ;

of seulp- ture,

Libraries,

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the rebuilding of the nave of the great basilica of 8. Paolo fuori le Mura, burnt in 1828, in a style of great splendour, though some- what cold in effect. Its columns are enormous monoliths of grey granite from the Alps; the confessio and transepts are lined with rosso and verde antico from the recently rediscovered quarries in Greece, and with Egyptian alabaster. The reconsecration of this magnificent edifice took place in 1854, after thirty years had been spent in the rebuilding; the east facade, with its new gaudy mosaics, and the atrium are not yet complete. Another great work still in progress is the extension of the sanctuary of the Lateran basilica,

which unhappily has involved the destruction of the ancient apse and its ambulatory, the only part of the church which had escaped complete distigurement. 'he priceless mosaics of the apse (1290), among the most beautiful in Rome, have been refixed in the new apse, but of course in a sadly modernized and restored form." Some large blocks of Government offices on the Esquiline Hill are the most important in size among the recent constructions, They have little architectural merit either in design, materials, or solidity of workmanship. :

The Vatican contains the largest collection in the world of Greco-Roman and Roman sculpture, with a few specimens of truc Hellenie art. It is also very rich in Greek vases and in objects from Etruscan tombs; this latter division is called the Museo Gregoriano. There is also an Egyptian museyn. In the great library are preserved a number of early glass chalices? and other rare objects from the catacombs, as well as many fine specimens of later Christian art,—church plate and jewels. The picture gallery, though not as large as some of the private collections in Rome, contains few inferior pictures. The Lateran palace, still, like the Vatican, in the possession of the pope, contains a fine collection of classical sculpture, but is most remarkable as a museum of Christian antiquities. The two Capitoline museums are very rich in classical sculpture, bronzes, coins, pottery, and the contents of early Etruscan and Latin tombs. A large hall has lately been added, and is filled with sculpture found on the Esquiline since 1870. The picture gallery contains a few masterpieces and a large number of inferior works. A new museum is now (1886) being formed in the great cloister of 8S. Maria degli Angeli to hold the numerous fine examples of classical painting and sculpture found along the Tiber during the excavations for the new embankment, and in other places in Rome. The university of Rome possesses fine collections of minerals, fossils, and other geological specimens, and examples of ancient marbles used in the buildings of Rome. A new Museo Artistico has recently been formed in a monastery in the Capo le Case, to contain medieval works of art ; it will prob- ably be rapidly increased. The Museo Kircheriano is in some respects unique of its kind. It contains an unrivalled collection of prehistoric objects found in ltaly and its islands, in stone, bronze, iron, and pottery. The collection of es grave is the finest yet made; and the museum also contains a large quantity of inter- esting

classical antiquities of various kinds. Another branch is the Ethnological Museum, as yet of no great importance. Un- fortunately all these muscums are badly adapted for purposes of study, being neither well arranged nor catalogued.

Among the private collections of pictures the Borghese is quite unrivalled. The next in importance is that in the Dora palace, which, however, like most Italian collections, contains a large proportion of very inferior works. The Corsini picture gallery, lately bought by the municipality of Rome, is chiefly rich in the works of the Bolognese and other third-rate painters. The Bar- berini and Sciarra-Colonna palaces contain a few fine paintings ; those in the latter collection are now arranged in the owne1's private apartments, and are not visible to the public.

The largest private collection of sculptnre is that of the Villa Albani, which, among a large mass of inferior Roman sculpture, contains a few gems of Greek art. The original Albani collection was stolen and brought to Paris by Napoleon I., and was there dispersed ; one relief, the celebrated Antinous, is the only piece of sculpture from the original collection which was sent back from Paris. The owner of this is now Prince Torlonia, who also possesses a very large collection of classical sculpture formed by himself ; it contains several very fine works, but unfortunately the greater number are much injured and falsified by restorations, The casino in the Borghese gardens possesses a great quantity of sculpture, mostly third-rate Roman works. The small collection of the Villa Ludovisi contains a few works of Greek sculpture of the highest importance, of which the chief are the Pergamean group of the suicide of the Gaulish chief, a relief of Medusa's head, and a male terminal figure. Many other palaces, such as that of the Colonna family, contain less important collections of sculpture and painting.*

For an account of the ehief public libraries, see L1BrAR1Es, vol. xiv. pp. 529-530, 548.

1 Fea, La Basilica Ostiense, 1826-33.

2 For the interesting discoveries made in exeavating for the new apse, see Amn. Inst., 1877, p. 332.

3 See Garrucci, Vetri Ornati in Oro, 1858.

4 The beautiful gardens of the Villa Ludovisi are now (1886) being destroyed and built over, and the fate of the sculpture gallery is as yet undecided.

ARCHEOLOGY. |

ME 837

_ Population, Climate, &e.°—-In the sixteen years which have elapsed Popula- since Rome became the capital of Italy (1870-1886) the population tion.

has largely increased, ehiefly owing to the introduction of a great number of Government officials with their families from Northern Italy. Under the last papal census the number of inhabitants was 216,000; in 1881 it had increased to 276,463. Education of the working classes has much improved in these years, and there are now nearly 170 parochial schools. The streets are remarkable for their cleanliness, and are mostly well paved with hard lava and well lighted with gas. For municipal purposes Rome is still divided into the fourteen medieval "rioni"; these, thongh corre- sponding in number with the fourteen regiones of Augustus, include very ditferent areas. averaging 10° Fahr. above the tempcrature of London ; but the variation between day and night is very great. The coldest months are December and February (average temp. 47°); the hottest are July and August (average 75°). The raintall is slight, averaging 165th inches annually, and the rainy days are few proportionally. On the whole Rome is a healthy city, in spite of some malaria, usually confined to its more open parts.® Campagna is in parts almost uninhabitable during the summer from this cause; but the malaria is much checked by the planting of eucalyptus trees, which grow rapidly in and about the city.

Works on Christian Rome,—CHURCHES.—16th and 17th Century Books: Pan- vinius, De Precipwis Basilicis, 1570; De Albericis, Ifist. S. Virginis de Pojnilo, 1599; De Angelis, Bas. S. Marie# Major., 1621; Severano, Le Sette Chicse di Rome, 1630; Landucci, 8. Maria del Popolo,

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Tempi, 1870; Rio, L'Art Chrétien, Paris, 1861, and Epilogue aU Art Chrétien, 1872; Dohine, Kunst wnd Kiinstler Italiens, Leipsic, 1878; Wey, Description de Rome (well illustrated), 1871. Inscriptions. — Foreella, Inscriziont nelle Chiese di Roma, 1869-84; Galetti, Inscriptiones Rom. Infimi Asvi, 1760, A nuinber of medieval wall-paintings in Rome, such as those in the Vatican library and in S. Martino ai Monti, though worthless as works of art, are very valuable for their representations of buildings now destroyed or altered. The great oil-painting, now in the museum at Mantua, which gives a bird's-eyc view of Rome as it was in the 16th century, is published in the valu- able work by De Rossi, Piante di Roma anteriori al Sec. XVI., 1879, which cou- tains also other early plans and drawings of the city. Museums anp Scutp- TuRE.— Pistolesi, I2 Vaticano, 1829-38; Visconti, Mus. Chiaramonti and Pio- Clementino, and Museo Gregoriano, 1803-43 ; Wolff, Bildwerke des Vaticans, dc, Berlin, 1870; E. Q. Visconti, Sculéwre della Villa Borghese, 1196, and Sculd. del Pal. Giustiniani, 1811; Winckelmann, Opere, best edition by Fea, Prato, 1830 ; Vitale, Marmi nel Pal. Torlonia, n.d. ; Benndorf, Die Bildwerke des Lateran. Mus., Leipsic, 1867; Schreiber, Antike Bildwerke der Villa Ludovisi, Leipsic, 1880; Bottari, Museo Capttolino, Milan, 1821-22 ; Matz and Von Duhn, Antike Bildwerke in Rom, Leipsic, 1881; De Montault, Musées et Galeries de Rome, 1880 ; Bernoulli, Rémische Ikonographie, Stuttgart, 1881. (J. H. M.)

5 See Taussig, The Roman Climate, Health, and Disease, 1870. The Monografia di Ron (1878) contains valuable articles on the population, climate, health, and public institutions of Rome. ; ;

6 See Balestra, L'Igiene di Roma, 1880; Vitelleschi and others, Atti della Giunta per la Inchiesta Agraria, vol. xi., 1884 (see also their map showing the malarious districts, 1888); Tournon, Ktudes Statistiques sur Rome, Paris, 1831.

7 The numberless fountains and jets of water which abound in the streets of Rome are one of its chief beauties; these are all fed with pure hill water brought in aqueducts or pipes, and flow in apparently undiminished voluine during the dry months of summer. The Trevi fountain (Aqua

Virgo) and the Fontana Paolina on the Janieulum are the grandest of these; see Falda, Le Fontane di Roma, 1691.

The climate is mild and sunny, in winter Climate.

The neighbouring Health.

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Plate VI. is a Plan of Ancient Rome ; Plate VII. shows the Forum and tts Surroundings ; Plate VILL. is the Modern City ; and Plate [X. is w Map of the Empire in the Third Century of our Era.

ROME, a city of the United States, the capital of Oneida county, New York, 110 miles by rail west-north- west of Albany, occupies a level site at the head of Mohawk valley, near the watershed between the Atlantic and the western lakes. Itisan important railway junction, lies on the line of the Erie Canal, and is the terminus of the Black River Canal. Besides being the centre of a great cheese- making district, Rome has large railroad shops, rolling- mills, and lumber-yards. The population Was 11,000 in 1870 and 12,194 in 1880.

ROMFORD, an old market-town of Essex, is situated on the small river Rom, and on the Great Eastern Railway about 12 miles east-north-east of London. The ancient church of St Edward the Confessor was replaced in 1850 by a structure in the Late Decorated style. The large brewery of Inde, Coope, & Co. is situated in the town, and there are extensive market gardens in thé neighbourhood. A grant of a market was obtained in 1247, and this is still of importance as regards both cattle and corn. The population of the urban sanitary district (area 1159 acres) in 1871 was 6512, and in 1881 it was 7176.

ROMILLY, Sir Samuen (1757-1818), the great legal reformer who first attempted to relax the barbarity of the English penal code, was the second son of Peter Romilly, a watchmaker and jeweller in London, whose father had emigrated from Montpellier after the revocation of the edict of Nantes, and who had married a Miss Garnault, a

Huguenot refugee like himself, but of a far wealthier family. Samuel Romilly was born in Frith Street, Soho, on Ist March 1757, and was named after Sir Samuel Fludyer, M.P. for the city of London and alderman, who was in partnership with two of his uncles. He served for a time in his father's shop; but his education was not neglected, and he became a good classical scholar and particularly conversant with French literature. A legacy of £2000 from one of his mother's relations led to his being articled to a solicitor and clerk in Chancery with the idea of qualifying himself to purchase the office of one of the six clerks in Chancery. In

1778, however, he determined to go to the bar, and entered himself at Gray's Inn. He went to Geneva in 1781, where he made the acquaintance of the chief demo- cratic leaders, including Etienne Dumont. Called to the bar in 1783, he went the midland circuit, but was chiefly occu- pied with Chancery practice. On the publication of Madan's Thoughts on Hxecutwe Justice, advocating the increase of capital punishments, he at once wrote and published in 1786 Observations on Madan's book. Of more general interest is his intimacy with the great Mirabcau, to whom he was introduced in 1784 (see MrraBEAv). Mirabeau saw him daily for a long time and introduced him to Lord Lans- downe, who highly appreciated him, and, when Mirabeau became a political leader, it was to Romilly that he applied for an account of the procedure used in the English House of Commons. He visited Paris in 1789, and studied the

| |

course of the Revolution there ; and in 1790 he published his Thoughts on the Probable Influence of the Late Revolu- tion in France upon Great Britain, a work of great power. His practice at the Chancery bar continued largely to in- crease, and in 1800 he was made a K.C. In 1798 he married the daughter of Francis Garbett of Knill Court, Herefordshire ; and in 1805 he was appointed chancellor of the county palatine of Durham. His great abilities were thoroughly recognized by the Whig party, to which he attached himself; and in 1806, on the accession of the ministry of "All the Talents" to office, he was offered the post of solicitor-general, although he had never sat in the House of Commons. He accepted the office, and was knighted and brought into parliament for Queenborough. He went out of office with the Government, but remained in the House of Commons, sitting successively for Horsham, Wareham, and Arundel. It was now that Sir Samuel Romilly commenced the greatest labour of his life, his attempt to reform the criminal law of England, which. was at once cruel and illogical. By statute law innumerable offences were punished by death, but, as such wholesale executions would be impossible, the larger number of those convicted and sentenced to death at every assizes were respited, after having heard the sen- tence of

death solemnly passed upon them. 'This led to many acts of injustice, as the lives of the convicts depended on the caprice of the judges, while at the same time it made the whole system of punishments and of the criminal law ridiculous. Romilly saw this, and in 1808 he managed to repeal the statute 8 Eliz. ¢. 4, which made it a capital offence to steal from the person. This success, however, raised opposition, and in the following year three bills repealing equally sanguinary statutes were thrown out by the House of Lords under the influence of Lord Ellenborough. Year after year the same influence prevailed, and Romilly saw his bills rejected; but his patient efforts and his eloquence ensured victory eventually for his cause by opening the eyes of Englishmen to the barbarity of their criminal law. The only success he had was in securing the repeal, in 1812, of the statute 39 Eliz. ce. 17, making it a capital offence for a soldier or a mariner to beg without a pass from a magistrate or his command- ing officer. Sir Samuel Romilly's efforts made his name famous not only in England but all over Europe, and on 4th July 1818 he had the honour of being returned at the head of the poll for the city of Westminster. He did not long survive his triumph. On the 29th of October 1818 Lady Romilly died in the Isle of Wight. Her husband's grief was intense, and he committed suicide in a fit of temporary insanity on the 2d November. No man of his time was more loved than Sir Samuel Romilly ; his singularly sweet nature, his upright manliness, his elo- quence, and his great efforts on behalf of humanity secured him permanent fame. His second son John rivalled his reputation as a lawyer, and after being appointed master of the rolls in 1851, an office which he held for twenty-two years, was raised to the peerage as Lord Romilly in 1866.

See the Memoirs of the Life of Sir Samuel Romilly writien by himself, with a selection from his Correspondence, edited by his Sons,

3 vols., 1840; and The Speeches of Sir Samuel Romilly in the House of Commons, 2 vols., 1820.

ROMNEY, Grorex (1734-1802), historical and portrait painter, was born at Dalton-le-Furness, Lancashire, on December 26,1734. His father was a builder and cabinet- maker of the place, and the son, having manifested a turn for mechanics, was instructed in the latter craft, showing

considerable dexterity with his fingers, executing carvings of figures in wood, and constructing a violin, which he spent much time in playing. He was also busy with his pencil; and, some of his sketches of the neighbouring

rustics having attracted the attention of his father, he was at length induced to apprentice the boy, at the age of nineteen, to an itinerant painter of portraits and domestic subjects named Steele, an artist who had studied in Paris under Vanloo; but the erratic habits of his instructor prevented Romney from making great progress in his art. In 1756 he impulsively married a young woman who had nursed him through a fever, and started as a portrait painter on his own account, travelling through the northern counties, executing likenesses at a couple of guineas, and producing a series of some twenty figure compositions, which were exhibited in Kendal, and afterwards disposed of by means of a lottery.

Having, at the age of twenty-seven, saved about £100, he left a portion of the sum with his wife and family, and started to seek his fortune in London, never returning, except for two brief visits, till he came, a broken-down and aged man, todie. In London he rapidly rose into popular favour. His Death of General Wolfe was judged worthy of the second prize at the Society of Arts, but a word from Reynolds in praise of Mortimer's Edward the Confessor led to the premium being awarded to that painter, while Romney had to content himself with a donation of £50, an incident which led to the subsequent coldness between him and the president which prevented him from exhibit- ing at the Academy or presenting himself for its honours.

'In 1764 he paid a brief visit to Paris, where he was befriended by Joseph Vernet; and his portrait of Sir Joseph Yates, painted on his return, bears distinct traces of his study of the works of Rubens then in the Luxembourg Gallery. In 1766 he became a member of the Incorporated Society of Artists, and three years later he seems to have studied in their schools. Soon he was in the full tide of prosperity. He removed to Great Newport Street, near the residence of Sir Joshua, whose fame in portraiture he began to rival in such works as Sir George and Lady

Warren, and Mrs Yates as the Tragic Muse; and his professional income rose to £1200 a year.

But he was seized with a longing to study in Italy ; and in the beginning of 1773 he started for Rome in company with Ozias Humphrey the miniature painter. On his arrival he separated himself from his fellow traveller and his countrymen, and devoted himself to solitary study, raising a scaffold to examine the paintings in the Vatican, and giving much time to work from the undraped model, of which his painting of a Wood Nymph was a fine and grace- ful result. At Parma he concentrated himself upon the productions of Correggio, which powerfully fascinated him, and greatly influenced his practice.

In 1775 Romney returned to London, establishing himself in Cavendish Square, and resuming his extensive and lucrative employinent as a portrait-painter, which in 1785, according to the estimate of his pupil Robinson, yielded him an ineome of over £3600. The admiration of the town was divided between him and Reynolds, 'There are two factions in art," said Lord Thurlow, 'and I am of the Romney faction,'—and the remark, and the rivalry which it implied, causcd much annoyance to Sir Joshua, who was accustonied to refer contemptuously to the younger painter as 'the man in Cavendish Square." After his return from Italy Romney formed two friendships which powerfully influenced his life. He became acquainted with Hayley, his future biographer, then in the zenith of his little-merited popularity as a poet. His influence on the painter seems to have been far from salutary. Weak himself, he flattercd the weaknesses of Romney, cncouraged his excessive and morbid sensibility, disturbed him with amateurish fancies and suggestions, and tempted him to expend on slight rapid sketches, and ill-considered, seldom-completed paintings of ideal and poetical subjects, talents which would have found fitter exer- cise in the steady pursuit of portraiture. About 1783 Romney was introduced to Emma Hart, afterwards celebrated as Lady Hamilton, and she beeame the modcl from whom he worked incessantly. Her bewitching face smiles from innumerable can- vases ; he painted her as a Magdalene and as a Joan of Arc, asa Ciree, a Bacchante, a Cassandra, and he has himself confessed that she was the inspirer of what was most beautiful in his art. But

her fascinations seem to have been too much for the more than middle-aged painter, and they had their own share in aggravating that nervous restlessness and instability, inherent in his nature, which finally ruined both health and mind.

In 1786 Alderman Boydell started his great scheme of the Shakespeare Gallery,—it would appear at the suggestion of Romney. The painter at least entered heartily into the plan, and contributed his scene from the Tempest, and his Infant Shakespeare attended by the Passions, the latter characterized by the Redgraves as one of the best of his subject pictures. Gradually he began to withdraw from portrait-painting, to limit the hours devoted to sitters, and to turn his thoughts to mighty schemes of thc ideal subjects which he would execute. Already, in 1792, he had painted Milton and his Daughters, which was followed by Newton making Experiments with the Prism. Hc was to paint the Seven Ages, Visions of Adam with the Angel, "six other subjects from Milton—three where Satan is the hero, and three from Adam and Eve,—perliaps six of each." Having planned and erected a large studio in Hampstead, he removed thither in 1797, with the fine collection of casts from the antique which his friend Flaxman had gathered for him in Italy. But his health was now irremediably shattered, and the man was near hisend. In the summer of 1799, suffcring from great weakness of body and the profoundest depres- sion of mind, he returned to the north, to Kendal, where his deserted but faithful and long-suffering wife received and tended him. He died November 15, 1802.

The art of Romney, and especially his figure subjects, suffered greatly from the waywardness aud instability of the painter's disposi- tion, from his want of fixed purpose and sustained energy. He lacked the steadfast perseverance needful to the accomplishment of a great picture. His imagination was no "constant angel ever by his side" ; it flashed and flickered fitfully upon him, like April sun- shine. His fancy would be captivated by a subject, which was presently embodied in a sketch, but the toil of elaborating it into the finished completeness of a painting too frequently overtaxed his powers ; he became embarrassed by technical difficulties which, through defective early training, he was unable to

surmount, and the half-covered canvas would be turned to the wall. It is in the best of his portraits that we feel the painter's true greatness. These, and especially his female portraits, are full of grace, distinc- tion, and sweetness. When we examine his heads of Cowper and Wilkes, his delicate and dignified full length of William Beckford, his Parson's Daughter iu the National Gallery, and his group of the Duchess of Gordon and her Son, we are ready to admit his claim to rank as the third of the great portrait painters of 18th- century England.

See the Afemotrs by William Hayley, 1809, and the artist's son, the Rev. John Romney, 1830; also Cunningham's Lives of the Painter's.

ROMNY, a district town of Russia, on the Sula river, 112 miles to the north-west of Poltava, and in the govern- ment of that name. It acquired commercial importance during last century, especially on account of its fairs. The chief of these—that in wool—was removed to Poltava in 1852, but the prices established by the remaining three still determine to a great extent those at the greater fair of Poltava. Of the local industries, the manufacture of agricultural implements is the only one worthy of mention, but the petty trades, both in town and district, are of considerable importance. The population in 1881 was

12,300.

ROMULUS, the mythical eponym founder and first king of Rome, is represented in legend as the son of Mars. His mother, the Vestal Silvia or Dia, was daughter of Numitor, who had been dispossessed of the throne of Alba by his younger brother Amulius; Silvia's twin sons, Romulus and Remus, were placed in a trough and cast into the Tiber by their cruel granduncle. The trough grounded in the marshes where Rome afterwards stood, under the wild fig- tree (jicus ruminalis) which was still holy in later days. The babes were suckled by a she-wolf and fed by a wood-pecker, and then fostered by Acca Laurentia, wife of the shepherd Faustulus. Growing up they became leaders of a warlike band of shepherds on the Palatine, and in course of time were recognized by their grandfather, whom they restored to his throne, slaying the usurper Amulius. They now proposed to found a city on the site where they had been nurtured ; but a quarrel broke out between the brothers, and Remus

was slain. The story goes on to tell how Romulus strengthened his band by receiving outlaws, found wives

for them by capture, and waged war with the indignant parents. The most formidable foe was Titus Tatius, king of the Sabines, but after an obstinate struggle he and Romulus united their forces and reigned side by side till Tatius fell in a blood feud with Laurentum. Romulus now reigned alone till le suddenly one day disappeared from earth in darkness and storm, and was thereafter worshipped as a god under the name of Quirinus, which, however, is really a Sabine form of Mars. This legend, best preserved in Livy (book i.), belongs througliout to mytho- logy, not to history. See also Plutarch's Romulus, and Dionysius, books i., 11.

ROMULUS AUGUSTULUS. See Onoacer, vol. xvii. p. 726, and Roms, supra, p. 781.

RONDA, a town of Spain, in the province of Malaga, and about 43 miles to the west of that city. It occupies a site of singular picturesqueness on a high rock nearly surrounded by the Guadalvin (afterwards the Guadiaro), which flows through a deep and abrupt chasm (or " Tajo") by which the old town is separated from the new. Of the two bridges the more modern (1761) spans the stream in a single arch at a height of about 255 feet. On the edge of the Tajo is the alameda or public promenade, commanding a wide and beautiful prospect of the fertile valley or vega and the sierra beyond. The old part of the town has a Moorish aspect, with narrow, steep, and crooked lanes, and still retains some Moorish towers and other buildings. The Ronda bull-ring is one of the finest in Spain, and can accommodate 10,000 spectators. Ronda is the seat of a considerable trade in leather, saddlery, and horses, and has an important fair (May 20). The population within the limits of the municipality was 19,181 in 1877. .

Some inconsiderable remains of an aqueduct and theatre, about 7 miles to the north of Ronda, are supposed to represent the Acintpo or Arunda of ancient geographers. Ronda was taken from the Moors in 1485. It was the birthplace of Espinel.

RONDEAU or Ronpet (Ital. Rondo). In poetry the rondeau is a short metrical structure which in its perfect form is divided into three strophes of unequal length, knit together by rapidly recurrent rhymes and a refrain. The laws of the rondeau have varied at different periods, and even with different poets of the same period—varied so fundamentally that some critics have found a generic dif- ference between the "rondeaw" and the "'rondel" or "ron- det." Rondeau, however, seems to be merely the modern spelling of the word rondel, as marteau is the modern spell- ing of martel, chdteau of chdtel, &c. When the rondeau was called the rondel it was mostly written in fourteen octosyllabic lines of two rhymes as in the rondels of Charles @Orleans. In this variability of structure it contrasts with the stability of the Sonnet (¢.v.). While the proper sonnet of octave and sestet has always been a struciure of fourteen verses (whatever may be the arrangement of the rhymes), the structure under consideration, whether called rondeau or rondel or rondet, may, it seems, consist of any number of verses from eight to thirteen. But when we find that the kind of triolet used by Froissart is a '"'rondel" we are compelled to admit that the names given to this form are very elastic. In Clement Marot's time, however, the laws of the rondeau became more settled, and, according to Voiture, in the 17th century the approved form of the rondeau was a structure of thirteen verses and a refrain.

Ma foy, c'est fait de moy, car Isabeau M'a conjuré de luy faire un Rondeau :

Cela me met en une peine extréime.

Quoy treize vers, huit en caw, cing en éme, Je luy ferois aussi-t6t un bateau !

En voila cing pourtant en un monceau : Faisons en huict, en invoquant Brodeau, En puis mettons, par quelque stratageme, Ma foy, c'est fait!

RON—RON

Si je pouvois encore de mon cerveau Tirer cing vers, 'ouvrage seroit beau ; Mais cependant, je suis dedans l'onzieme, Et si je croy que je fais le douzieme En voila treize ajustez au niveau. Ma foy, c'est fait !

All forms of the rondeau, or rondel, however, are alike in this that the distinguishing metrical emphasis is achieved by a peculiar use of the refrain. Though we have the Eng- lish rondels of Occleve and a set of rondeaus in the Rolliad (written by Dr Lawrence the friend of Burke, according to Mr Gosse, who has given us an admirable essay upon exotic forms of verse), it was not till our own day that the form had any real vogue in England. Considerable attention, however, has lately been given in England to the form. Some of the rondeaus of our own contemporary poets are as bright and graceful as Voiture's own. Mr Swinburne, who in his Century of Roundels was perhaps the first to make the refrain rhyme with the second verse of the first strophe, has brought the form into high poetry.

Although the origin of the refrain in all poetry was no doubt the improvisatore's need of a rest, a time in which to focus his forces and recover breath for future flights, the refrain has a distinct metrical value of its own ; it knits the structure together, and so intensifies the emotional energy, aS we see in the Border ballads, in the Oriana of Lord Tennyson, and in the Sister Helen of Rossetti, The suggestion of extreme artificiality —of "difficulty over- come"—which is one great fault of the rondeau as a vehicle for deep emotion, does not therefore spring from the use of the refrain, but from the too frequent recur- rence of the rhymes in the strophes—for which there is no metrical necessity as in the case of the Petrarchan sonnet. "Dificulty overcome," though a legitimate source of plea- sure in French poetry even of the most serious kind (for the French language is essentially the most unpoetic in Europe), finds no place in the serious poetry of England.

In music the "rondo" seeks much the same effect as in poetry, the melodic emphasis of the refrain. The Italian composer Buononcini seems to have been the inventor of the rondo as thus understood.

RONSARD, Prerri pe (1524-1585), "Prince of Poets" (as his own generation in France called him, and as after much change of criticism there is reason for calling him still in reference to that generation and country), was born at the Ch&teau de la Poissonniére, near the village of Couture in the province of Vendémois (department of Loir-et-Cher) on

September 11, 1524. His family are said to have come from the Slav provinces to the south of the Danube (provinces with which the crusades had given France much intercourse) in the first half of the 14th century. Baudouin de Ronsard or Rossart was the founder of the French branch of the house, and made his mark in the early stages of the Hundred Years' War. The poet's father was named Loys, and his mother was Jeanne de Chaudrier, of a family not only noble in itself but well connected. Pierre was the youngest son. Loys de Ronsard was maitre @hétel du rot to Francis I., whose captivity after Pavia had just been softened by treaty, and he had to quit his home shortly after Pierre's birth. The future Prince of Poets was educated at home for some years and sent to the Collége de Navarre at Paris when he was nine years old. It is said that the rough life of a medizval school did not suit him. He had, however, no long experience of it, being quickly appointed page to the duke of Orleans. When Marguerite of France was married to James V. of Scotland Ronsard was attached to the king's service, and he spent three years in Great Britain. The latter part of this time seems to have been passed in England, though he had, strictly speaking, no business there. On returning to France in 1540 he was

again taken into the service of the duke of Orleans. In this service he had other opportunities of travel, being sent to Flanders and again to Scotland. After a time a more important employment fell to his lot, and he was attached as secretary to the suite of Lazare de Baif, the father of his future colleague in the Pléiade and his com- panion on this occasion, Antoine de Baif, at the diet of Spires. Afterwards he was attached in the same way to the suite of the Cardinal du Bellay-Langey, and his mythical quarrel with Rabelais dates mythically from this period. His apparently promising diplomatic career was, however, cut short by an attack of deafness which no physician could cure, and he determined to devote himself to study. The institution which he chose for the purpose among the numerous schools aud colleges of Paris was the Collége Coqueret, the principal of which was Daurat—afterwards the "dark star" (as he has been called from his silence in France) of the Pléiade, Baif accompanied Ronsard ; Belleau shortly followed; Joachim du Bellay, the second of the

seven, joined not much Jater. Muretus, a great scholar and by means of his Latin plays a great influence in the creation of French tragedy, was also a student here.

Ronsard's period of study occupied seven years, and the first manifesto of the new literary movement, which was to apply to the vernacular the principles of criticism and scholarship learnt from the classics, came not from him but from Du Bellay. The Défense et Lilustration de la Langue Francaise of the latter appeared in 1549, and the Pléiade may be said to have been then launched. It con- sisted, as its name implies, of seven writers whose names are some- times differently enumerated, though the orthodox canon is beyond doubt composed of Ronsard, Du Bellay, Baif, Belleau, Pontus de Tyard (a man of rank and position who had exemplified the prin- ciples of the friends earlier), Jodelle the dramatist, and Daurat. Ronsard's own work came a little later, and a rather idle story is told of a trick of Du Bellay's which at last determined him to publish. Some single and minor pieces, an epithalamium on Antoine de Bourbon and Jeanne de Navarre, a "Hymne de la France," an "Ode & la Paix," preceded the publication in 1550 of the four first books ("first " is characteristic and noteworthy) of the Odes of Pierre de Ronsard. This was followed in 1552 by the publication of his Amowrs with the fifth book of Odes. These books excited a violent literary quarrel. Marot was dead, but he left a numerous school, some of whom saw in the stricter literary critique of the Pléiade, in its outspoken contempt of merely ver- nacular and medieval forms and so forth, an insult to the author of the Adolesecnce Clémentine and his followers. The French court, and indeed all French society, was just then much interested in literary questions, and a curious story is told of the rivalry that ensued. Mcllin de St Gelais, it is said, the chief of the "Heole Marotique" and a poet of no small merit, took up Ronsard's book and read part of it in a more or less designedly burlesqne fashion before the king. It may be observed that if he did so it was a dis- tinctly rash and uncourtier-like act, inasmuch as from Ronsard's father's position in the royal household the poet was personally known and liked both by Henry and by his family. At any rate Marguerite the king's sister, who afterwards became duchess of Savoy, is said to have snatched the book from St Gelais and insisted on reading it herself, with the result of general applause. Hence- forward, if not before, his

acceptance as a poet was not doubtful, and indeed the tradition of his having to fight his way against cabals is almost entirely unsupported. It is quite true that he more than any other poet has had to suffer detraction from a remarkably different series of opposing forces. But none of these interfered with his popularity in his own time, which was over- whelming and immediate, or with his prosperity, which was unbroken. He published his Hymns, dedicated to Marguerite de Savoie, in 1555, the conclusion of the Amowrs in 1556, and then a collection of Guvres Completes said to be due to the invitation of Mary Stuart, queen of Francis II., in 1560.

The rapid change of sovereigns did Ronsard no harm, Charles IX., who succeeded his brother after a very short time, was even better inclined to him than Henry and Francis. He gave him rooms in the palace; he bestowed upon him divers abbacies and priories ; and he called him and regarded him constantly as his master in poetry. Neither was Charles IX. a bad poet. This royal patronage, however, had its disagreeable side. It excited violent dislike to Ronsard on the part of the Huguenots, who wrote constant pasquinades against him, strove (by a ridiculous exaggera- tion of the Dionysiac festival at Arcueil, in which the friends had indulged to celebrate the success of the first French tragedy, Jodelle's Cléopatre) to represent him as a libertine and an atheist,

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and (which seems to have annoyed him more than anything else) set up his follower Du Bartas as his rival. According to some words of his own which are quite credible considering the ways of the time, they were not contented with this variety of argument, but attempted to have him assassinated. During this period Ronsard's work was considerable but mostly occasional, and the one work of magnitude upon which Charles put him, the Franciade, has never been ranked, even by his most devoted admirers, as a chief title to fame. The metre (the decasyllable) which the king chose could not but contrast unfavourably with the magnificent alexandrines which Du Bartas and Agrippa d'Aubigné were shortly to produce; the general plan is feebly classical, and the very language has little or nothing of that racy mixture of scholarliness and love of natural

beauty which distinguishes the best work of the Pléiade. The poem could never have had an abiding success, but at its appearance it had the singular bad luck almost to coincide with the massacre of St Bartholomew, which had occurred about a fortnight before its publication. One party in the state were certain to look coldly on the work of a minion of the court at such a juncture, the other had something elsc to think of. The death of Charles made, indeed, little difference in the court favour which Ronsard enjoyed, but, combined with his increasing infirmities, it seems to have determined him to quit court life. During his last year he lived chiefly at a house which he possessed in Vendéme, the capital of his native province, at his abbey at Croix Val in the same neighbourhood, or else at Paris, where he was usually the guest of Jean Galland, well known as a scholar, at the Collége de Boncourt. It seems also that he had a town house of his own in the Faubourg Saint Marcel. At any rate his preferments made him in perfectly easy circumstances, and he seems neither to have derived nor wished for any profit from his books. A half-jocular suggestion that his publisher should give him money to buy "du bois pour se chauffer" in return for his last revision of his Huwvres Completes is the only trace of any desire of the kind. On the other Rand he received not merely gifts and endowments from his own sovereign but presents from many others, including Elizabeth of England. His last years were, however, saddened not merely by the death of many of his most intimate friends, but by constant and increasing ill health. This did not interfere with his literary work in point of quality, for he was rarely idle, and some of his latest work is among his best. But he indulged (what few poets have wisely indulged) the tempta- tion of constantly altering his work, and many of his later altera- tions are by no means for the better. Towards the end of 1585 his condition of health grew worse and worse, and he seems to have moved restlessly from one of his houses to another for some months. When the end came, which, though in great pain, he met in a resolute and religious manner, he was at his priory of Saint Cosme at Tours, and he was buried in the church of that name on Friday, December 27.

The character and fortunes of Ronsard's works are among the most remarkable in literary history, and supply in themselves a kind of illustration of the progress of French literature during the last three

centuries. It was his fortune to be almost always extra- vagautly admired or violently attacked, and it is only recently that he has been setin his proper place. At first, as has been said, the enmity, not altogether unprovoked, of the friends and followers of Marot fell to his lot, then the still fiercer antagonism of the Huguenot faction, who, happening to possess a poet of great merit in Du Bartas, were able to attack Ronsard in his tenderest point, that of his reputation as the greatest living French poet. But fate had by no means done its worst with him in his lifetime. After his death the classical reaction set in under the auspices of Malherbe, a man of correct and narrow spirit who seems to have been animated with a sort of personal hatred of Ronsard, though it is not clear that they ever met. After Malherbe (who by no means himself produced the effect which some well-known but quite unhistorical lines of Boileau would convey) the rising glory of Corneille and his contemporaries obscured the tentative and equal work of the Pléiade, which was, moreover, directly attacked by Boileau himself, the dictator of French criticism in the last half of the 17th century. Then Ronsard was, except by a few men of taste, like La Bruyére and Fénelon, forgotten when he was not sneered at. In this con- dition he remained during the whole 18th century and the first quarter of the 19th. The romantic revival, seeing in him a victim of its special béie noire Boileau, and attracted by his splendid diction, rich metrical faculty, and combination of classical and medieval peculiarities, adopted his name as a kind of battle cry, and for the inoment exaggerated his merits somewhat. The critical work, however, first of Sainte-Beuve in his Tableaw dela Littératwre Francaise aw 16éme Siecle, and since of others, has established Ronsard pretty securely in his right place, a place which may be defined in a few sentences.

For the general position of the Pléiade reference may be made to the article on the literature of France (vol. ix. p. 650). Ronsard, its acknowledged chief and its most voluminous poet, was probably also its best, though a few isolated picces of Belleau excel him in

airy lightness of touch. Several sonnets of Du Bellay exhibit what may be called the intense and voluptuous melancholy of the Renaissance more

perfectly than anything of his, and the finest passages of the Tragiques and the Divine Sepmaine surpass his work in command of the alexandrine and in power of turning it to the purposes of satirical invective and descriptive narration. But that work is, as has been said, very extensive (we possess at a rough guess not much short of a hundyed thousand lines of his), and it is extraordinarily varied in form. He did not introduce the sonnet into France, but he practised it very soon after its introduction aud with admirable skill—the famous "Quand vous serez bien vieille" being one of the acknowledged gems of French literature. His odes, which are very numerous, are also very in- teresting and in their best shape very perfect compositions. He began by imitating the strophic arrangement of the ancients, but very soon had the wisdom to desert this for a kind of adjustment of the Horatian ode to rhyme, instead of exact quantitative metre. In this latter kind he devised some exquisitely melodious rhythms of which, till our own day, the secret died with the 17th century. His more sustained work sometimes displays a bad selection of metre; and his occasional poetry—epistles, eclogues, elegies, &c.—is injured by its vast volume. But the preface to the Franciade is a very fine piece of verse, far superior (it is in alexandrines) to the poem itself. Generally speaking, Ronsard is best in his amatory verse (the long series of sonnets and odes to Cassandre, Marie, Genevre, Heléne, &c.), and in his descriptions of the country (the famous " Mignonne allons voir si la rose," the " Fontaine Bellerie," the "Forét de Gastine," and so forth), which have an extraordinary grace and freshness. No one used with more art than he the grace- ful diminutives which his school set in fashion. He knew well too how to manage the gorgeous adjectives ("marbrine," "cinabrine," "ivoirine," and the like) which were another fancy of the Pléiade, and in his hands they rarely become stiff or cumbrous. In short, Ronsard shows eminently the two great attractions of French 17th-century poetry as compared with that of the two following ages,—magnificence of language and imagery and graceful variety of metre. The chief separately published works of Ronsard are noted above. He pro- duced, however, during his life a vast number of separate publications, some of them mere pamphlets or broadsheets which from time to time he collected, often striking out others at the same time, in the successive editions of his works. Of these he himsclf published seven—the first in 1560, the last in 1584, Betwcen his death and the year 1630 ten more

complete editions were published, the most famous of which is the folio of 1609. A copy of this presented by Sainte-Beuve to Victor Hugo, and now in the possession of M. Maxime du Camp, has a place of its own in French litcrary history. From 1630 Ronsard was not again reprinted for more than two centuries, Just before the close of the second, howevcr, Sainte-Beuve printed a selection of his poems at the end of the above-mentioned Tableau. There are also selections by M. Noel (in the Collection Didot) and Becq de Fouquitres. 1n1857 M. Prosper Blanchemain, who had previously pub- lished a volume of Guvres Inédites de Ronsard, undertook a complete edition for the Bibliotheque Elzévirienne. 'The eighth and last volume of this appeared ten years later. It is practically complete; a few pieces of a somewhat free character which are ascribed with some certainty to the poet are, however, excluded, The chief separate volume of criticism on Ronsard is that of M. Gandar (Mctz, 1854), which considers him chiefly in his rclation to the ancients. (G. SA.)

RONSDORF, a town in north-western Prussia, on the Morsbach, a small affluent of the Rhine, 18 miles west of Diisseldorf, contains considerable iron and brass works, foundries, and wire-works, besides carrying on extensive manufactures of ribbons, trimmings, and similar goods. The population in 1880 was 10,100.

Founded in 1737 by the followers of Elias Eller, a religious en- thusiast, Ronsdorf received town-rights in 1745. The Ronsdort sect, the members of which called themselves Zionites, is now extinct.

ROOF. See Burtpine and Dome.

ROOK (Anglo-Saxon Hréc, Icelandic Hrékr,' Swedish Rdka, Dutch Rock, Gaelic Rocas), the Corvus frugilegus of ornithology, and throughout a great part of Europe the commonest and best-known of the Crow-tribe. Besides its pre-eminently gregarious habits, which did not escape the notice of Virgil (Georg. i. 382)? and are so unlike those of nearly every other member of the Corvidz, the Rook is at once distinguishable from the rest by commonly losing at an early age the feathers from its face, leaving a bare, scabrous, and greyish-white skin that is sufficiently visible at some distance. In the comparatively rare cases " 1 The bird, however, does not

inhabit Iceland, and the language to which the name belongs would perhaps be more correctly termed Old Teutonic. From this word is said to come the French Prewm. There are many local German names of the same origin, such as Rooke, Rouch, Ruch, and others, but the bird is generally known in Germany as the Saat-Krihe, i.e., Seed- (=Corn-) Crow.

2 This is the more noteworthy as the.district in which he was born and educated is almost the only part of lialy in whichthe Rook breeds. Shelley also very truly speaks of the "legioned Rooks" to which he stood listening " mid the mountains Euganean."

in which these feathers persist, the Rook may be readily known from the black form of Crow (vol. vi. p. 618) by the rich purple gloss of its black plumage, especially on the head and neck, the feathers of which are soft and not pointed. Ina general way the appearance and manners of the Rook are so well known, to most inhabitants of the British Islands especially, that it is needless here to dwell upon them, and particularly its habit of forming com- munities in the breeding-season, which it possesses in a measure beyond that of any other land bird of the northern hemisphere. Yet each of these communities, or rookeries, seems to have some custom intrinsically its own, the details of which want of space forbids any attempt to set before the reader. In a general way the least-known part of the Rook's mode of life are facts relating to its migration and geographical distribution. Though the great majority of Rooks in Britain are sedentary or only change their abode to a very limited extent, it is now certain that a very considerable number visit this country in or towards autumn, not necessarily to abide here, but merely to pass onward, like most other kinds of birds, to winter further southwards ; and, at the same season or even a little earlier, it cannot be doubted that a large proportion of the young of the year emigrate in the same direction. As a species the Rook on the European continent only resides during the whole year through- out the middle tract of its ordinary range. Further to the northward, as in Sweden and northern Russia, it is a regular summer-immigrant, while further to the southward, as in southern France, Spain,

and most parts of Italy, it is, on the contrary, a regular winter-immigrant. The same is found to be the case in Asia, where it extends eastward as far as the upper Irtish and the Ob. It breeds through- out Turkestan, in the cold weather visiting Afghanistan, Cashmere, and the Punjab, and Sir Oliver St John found a rookery of considerable size at Casbin in Persia. In Palestine and in Lower Egypt it is only a winter-visitant, and Canon Tristram noticed that it congregates in great numbers about the mosque of Omar in Jerusalem.!

There are several moot points in the natural history of the Rook which it is impossible here to do more than mention, One is the cause of the curious shedding on reaching maturity of the feathers of its face, and another the burning question whether Rooks are on the whole beneficial or detrimental to agriculture. In England the former opinion seems to be generally entertained, but in Scotland the latter has long been popular. The absence of suffi- cient observations made by persons at once competent and without bias compels the naturalist to withhold his judgment on the matter,

but the absence of such observations is eminently discreditable to the numerous Agricultural Societies of the United Kingdom. (A.N.)

ROOKE, Sir Gzorcr (1650-1709), naval commander, was born near Canterbury in 1650. Entering the navy as a volunteer, he became post-captain in 1680, and vice- admiral in 1692. In May of this year he greatly dis- tinguished himself in a night attack on the French fleet off Cape La Hogue, when he succeeded in burning six of their ships. Shortly afterwards he received the honour of knighthood and a reward of £1000. In 1702 he com- manded the expedition against Cadiz, and on the passage home captured the Plate fleet off Vigo. Along with Sir Cloudesley Shovel he took part in the capture of Gibraltar, 21st July 1704. On 13th August of the same year he attacked the French fleet off Malaga, the battle being drawn. On account of the dissatisfaction expressed indirectly at the result of the contest, he retired from the service in February 1705. He died 24th January 1709.

See The Life and Glorious Actions of Sir George Rooke, 1707.

1 It is right to mention that the Canon considers the Rook of Palestine entitled to specific distinction as Corvus agricola (Proe. Zool. Society, 1864, p. 444; Ibis, 1866, pp. 68, 69), In like manner the Rook of China has been described as forming a distinct species,

under the name of C. pastinator (Proe. Zool. Society, 1845, p. 1), from having the feathers of its face only partially deciduous.

ROPE. All varieties of cordage having a circumference of an inch or more are known by the general name of rope. 'Twisted cordages of smaller dimensions are called cords, twines, and lines, and when the dimensions are still smaller the article becomes thread or doubled yarn. All these varieties of cordage are composed of at least two, and in most cases of very many separate yarns, which are textile fibres drawn out and twisted into a uniform compact line. From thread and fine twine upwards the whole art of manufacture is simply that of twisting together fibres and yarns, but the comparative heaviness and coarse- ness of the materials operated on in rope-making render necessary the adoption of strong machinery and modified processes which clearly define this manufacture as a distinct calling. The modern trade of rope-making is again divided into two branches dealing respectively with certain vegetable fibres and with metallic wire. Silk cords and hair lines and ropes do not come within the scope of rope-making proper.

Vegetable fibres fit for rope-making are numerous, but ordinarily not many are employed. Speaking generally, for the prime requisites of strength, suppleness, flexi- bility, and durability, none can compete with the common Hump (9.v.), which consequently is the staple of the rope-maker. Manita Hemp (q.v.) is a fibre of the most remarkable tenacity, of unapproached value for heavy cordage, but too stiff and woody for small cords and twines. After these in utility come sisal hemp of South America (Agave sisalana), phormium hemp of New Zealand (Phormium tena, see vol. xviii. p. 812), and the sunn hemp of the East Indies (Crotalaria juncea, see vol. xi. p. 647)—all fibres of great strength, and largely used by rope- makers. Among fibres more rarely seen in rope-works are Jubbulpore hemp (Crotalaria tenuifolia), bowstring hemp (Sanseviera zeylanica), and other "hemps" of the East Indies, and plantain fibre

(Afusa paradisica) and agave fibre (Agave americana) of America. Ropes and twine of cotton are extensively made, especially for driving-bands for machinery. JUTE (q.v.) is now in considerable use by

rope-makers, on account of its cheapness, but it is very

deficient in strength and durability. Corr (see vol. vi. p. 917) is also largely employed, and many other fibres are used, principally in the localities of their production.

A rope is composed of a certain number of " strands," the strand being itself made up of many "yarns." Three strands laid or twisted together form a "hawser- laid" rope, and three such hawsers similarly laid make a '"cable-laid rope" or "cable."

The primary object of twisting fibres together in a rope is that by mutual friction they may be held together when a strain is applied to the whole. Eard twisting has the further advantage of compacting the fibres and _pre- venting the penetration of moisture when the ropes are exposed to water. The proper degree of twist is a matter of considerable importance, as all twisting injuri- ously affects the strength of the individual fibres, and indeed it is possible to twist a cord so hard that it will break under the action. The degree of twist given to ropes is generally such that the rope is from three- fourths to two-thirds the length of the yarn composing it, and the lighter the twist the greater in proportion is

the strength of the rope. In a bundle of fibres, equal in length and strength, fastened at the ends, each fibre will, upon a strain being applied to the bundle, bear its proper share of the stress; and the strength of the bundle will evidently be measured by adding together the strength of the separate fibres. But if this bundle is twisted so as to form a thread, the strain will no longer be equally distributed among the fibres, for, by the tor- sion, the external fibres of the bundle will be wound round those that lie nearest to the centre, and, in proportion to their distance from the heart of the bundle and the amount of twist given, will form spirals more or less inclined from the axis of the thread. The external fibres will in

consequence be longer than the internal ones, and the greatest share of the strain will be borne by the latter. The depreciation in strength from twist- ing of hard woody fibres is greater than is the case with fine soft flexible fibres, such as common hemp of good quality.

To prevent the decay of ropes which are frequently exposed to water, the yarns of which they are composed are soaked in hot Archangel tar before they are formed into strands. Tarring, it is found, also seriously diminishes the strength of the rope, but no other means of preventing water from penetrating and rotting the fibre has yet been found. M. Duhamel, from a series of investigations made in 1741-46, came to the conclusion that, apart from exposure to wet, untarred cordage in constant service was about one-third more durable than tarred, that it retained its strength for a longer period when kept in store, and that it resisted the ordinary influences of the weather better than when it was tarred. Subsequent experience has fully borne out these conclusions, and now that Manila hemp, which withstands the influence of water well, is so extensively used for heavy cordage, tarring is no longer so generally practised in rope-making as was at one time the case.

Ropewalk Spinning.—The sequence of operations in this ancient but still greatly used method of working is—(1) heckling the fibre ; (2) spinning the yarn ; (8) tarring the yarn (when neces- sary); (4) forming the strands ; (5) laying the strands into ropes.

Heckling differs in no way from the hand-heckling process used in the preparation of flax (see vol. xiv. p. 604-5). The heckle- board consists of a wooden plank, studded with strong tapered and sharp-pointed steel prongs. A series of such heckle-boards is used in the progressive heckling operation, the prongs diminishing in size and being closely set together. In drawing his "stricks" of fibre through these gradually diminishing heckles the workman not only combs out and disentangles the material, separating ' tow" from "'line," but he also splits up and makes finer the fibres upon which he operates. A little oil is sprinkled on the heckles in course of the process. The spinning is done in a covered dnd enclosed walk from 800 to 400 yards in length, at both ends of which the machines are placed. These (one variety of which is shown in fig, 1) consist of a

series of " whirls" d, d, generally twelve in number, set ina semicircular framee. The whirls are set in rapid rotation by a belt which passes over them from a wheel 6); or, what is now more usual, they are driven by the direct friction of the wheel itself pressed hard against them. The point of the prolonged axis of the whirl is bent into a hook, on which the ends of the fibre are hung for spinning. Each spinner carries around his waist a quan- tity of heckled fibre, and, fasten- ing an end on the whirl hook, he walks backward down the walk giving out even proportions of fibre all the while and regulating his pace so that the amount of

twist communicated to the yarn is uniform.

a ee

Fig. 1.

He draws the fibre from his waist with the left hand and lets it slip between the thumb and finger of the right, which, protected by a piece of woollen cloth, compresses and moulds into

ROPE

cylindrical form the yarn as it is spun. At intervals im the length of the walk there are posts and rails supplied with hooks into which the spinner throws the yarn to keep it off the ground, The spinners commonly work from both ends in sets of six, and as each set arrives at the end of the walk the yarns spun by them are unhooked from the whirls, tied together at the ends, and collected in large hooks along the side of the walk till a haul of about four hundred yarns is accumulated. When tarred rope is to be made the haul of yarn is at this stage passed through a kettle of tar heated to about 212° Fahr., from which it is drawn through a nipping apparatus which squeezes out superfluous tar, leaving the yarn a bright brown colour soaked with about one-fourth its weight of tar.

For "forming" strands the spun yarn is wound, each yarn separately, on bobbins and placed in a bobbin frame. From their bobbins the yarns are conducted through a concentric circle of holes in a steel register plate, behind which they come together and are pressed through a trumpet-

mouthed tube, which varies in diameter according to the diameter of the strand being formed ; and they are attached to the hooks of the forming machine or traveller. This machine travels down the ropewalk on rails moved by an endless rope passing over a grooved pulley, the hooks being at the same time set in rotation by gearing connected with the pulley. When the machine has reached the end of the walk and sufficient "twist" is given to the three strands, they are un- hooked and hung together on the centre hook of the machine. A grooved conical block of wood called a "top" is inserted between the strands, one of which lies in each of the three equidistant con- centric grooves. The strands at the fore-end are cut away and attached separately to three other hooks. The laying of the three strands into a hawser is now proceeded with by giving a reverse rotation to the central hook on which at the lower end they are hung. As twist is communicated to the strand between the top and the machine, the former is forced away towards the fore-end, and on the uniform motion outwards of the top depends the even and regular character of the lay. While the hook at the lower end is rotating in one direction to lay the strands, the three hooks holding the strands at the upper end are correspondingly revolved in the opposite direction to keep up the amount of twist in them which they would otherwise lose by the unwinding effect of the revolution of the laying hook. As the laying pro- ceeds, the forming machine is gradually dragged up the rails owing to the shortening of the strands caused by twisting them into a hawser. The formation of a cable from three hawsers is effected ina similar manner; but the great weight of material dealt with necessitates some modified operations to ensure uniformity of laying. In many rope-works distinct machinery is used for the strand lay- ing and rope-forming operations.

Machine or Factory Rope-Making.—The ropewalk system of manufacture has several inconveniences, among which, in towns, the most serious is the difficulty and expense of obtaining the long narrow strips of ground it requires. Hand-made ropes are also subject to certain irregularities of twist, and the yarns are less uniform than can be obtained from the operations of automatic machinery. Moreover in machine-spinning it is possible so to form the strands and lay the finished rope that any strain can be more equally distributed over all the fibres than can be done with hand-spinning and twisting. The essential feature

of the factory system consists in having yarns, strands, and ropes wound upon bobbins or drums in each successive stage, the material being drawn direct from the reel to be twisted and immediately wound up again. The length of rope made is only limited by the carrying capacity of the drum on which it is finally wound. —

The carliest practical attempt to introduce machine rope-spinning was made by Cartwright, the famous inventor of the power loom, — who, in 1792, obtained a patent for a machine called by him a "Cordelier." Cartwright's cordelier, as improved in 1805 by Captain Huddart, became the basis of modern laying and forming machines. Numerous modifications and improved combinations have been introduced, but the principle on which they are worked is essentially the same. A complete set of rope and twine making machinery includes heckling machines, spreading and drawing frames for line yarns, and carding engines and drawing frames for tow. These machines do not differ from the ordinary preparing machinery in flax manufactures, nor is there any essential difference in the spinning frames for the smaller counts of yarns. The heavier yarns for rope-making are spun upon a gill-spinning frame, such as Goode's automatic spinner, which is fitted with a self-feeding motion by which when the sliver is presented in large quantity the rate of motion and spinning is proportionally increased, when the sliver becomes attenuated the motion is correspondingly slow, and when the sliver is broken the spinner stops. Thus a yarn well laid and uniform in thickness is secured by automatic machinery. For spinning heckled yarn such as is used in the ropewalk a machine of simple construction, Ronald's patent (fig. 2), 1s DOW extensively used. The yarn in this machine has the advantage of being hand-spun, as the spinner draws out, compresses, and feeds the fibre from a supply round his or her waist just as on the rope-

walk. In this way the strength, evenness, and other good qualities of hand-spun yarn are secured.

Twine Manufacture.—The making of twines and small cords forms a distinct branch of the rope trade, the whole of the opera- tions being carried out on a series of machines in which a large number of twines

and eords are twisted and otherwise prepared simultaneously, while in rope-making the machines deal only in general with the material of one rope at a time. Common twines are twisted from prepared yarns on a twine-twisting frame, the same in principle as the doubling spindle frames of the ordinary textile trade. The bobbins of yarn are placed on pegs in the creel above the twisting spindles, from two to five bobbins being placed over each spindle according to the number of yarns which go to make up the twine. These yarns are passed round a pair of rollers, which pull them off the bobbins and deliver them evenly and with regularity to the flyer of the spindle, by which they are twisted and wound on the bobbin round which they rotate. By a recent improvement the required number of yarns, instead of being drawn from separate bobbins, are first wound together upon one bobbin in a "doubling winding frame."

flyers and spindles by which they are twisted and wound upon a large bobbin. Twines and cords at this stage are rough and bristly in appearance, and for finishing them they undergo a dressing, sizing, and polishing operation in a special polishing machine. From the bobbins they are unwound and passed through a trough of hot water, thence in parallel order over the surface of a set of rubbing rollers eovered with strong card cloth revolving at high speed in a eontrary direction to that in which the twine is travel- ling. The friction of the strong card wires shaves and smooths the twine, which then passes through the sizing trough contain- ing a hot paste, usually of potato farina. The superfluous paste is squeezed out by passing the twine between rollers, and it is next passed over rollers covered with rough coir, which presses in all fibres yet protruding from the twine, and finally it is dried by passing round a range of steam-heated cylinders, running parallel with which are coir-covered polishing rollers which smooth the twine while it is being dried. The finished twine is wound into balls of a definite weight on a balling machine.

hope-Spinning.—The machines required for making ropes from spun yarn eonsist of a forming flyer for forming the strands and a laying machine for twisting the strands into rope. A eabling machine for uniting three-strand hawsers into a cable is only a second, laying machine of larger and heavier dimensions ; but it is still a common practice to lay the

heavy cable on the ropewalk. The two operations of forming strands and laying rope may be per- formed on one combined machine, especially in dealing with light ropes composed of a few yarns; but as a rule separate machines are preferred for each operation. In a simple machine designed only for a single twisting operation there must be one fixed and one revolving section. If the section which contains the bobbins of yarn to be twisted is fixed, then the section in which is placed the bobbin for receiving the twisted product must be made to revolve. A machine in which the two operations of forming strands and laying rope are combined is of necessity eumbrous in proportion and complex in gearing. It must embrace three form-

ing flyers, to form simultaneously three strands which in another part of the machine are laid into one rope. The forming flyers re- volve in one direction to twist the strands, while they move in the opposite direction as a whole with the revolution of the laying section which gives the finishing twist to the rope, and such com- plex inter-revolutions within one frame are somewhat unwieldy. Finally, the machincs may be made with their axis of revolution either vertical or horizontal. With all these alternatives there is eonsiderable room for modification in the twisting arrangements. The ordinary form of strand-laying machine is a vertical flyer (fig. 3). It consists of two ormore upright frames or creels a, a, capable of holding ranged above each other a eertain number of bobbins, from which the yarn may be easily run off and carried upward to be formed into a strand. The ereels are fixed above and below ina stout eircular plate and framework 0b, to which motion of rotation is given by gearing ¢, placed on the under side. At the upper end of the revolving framework the yarns from the various bobbins are passed through a register plate d, a circular A of metal pierced with concentric oles corresponding in number with the bobbins which the crecls are fitted to hold. Beyond the register plate d the yarns come together in the trumpet- shaped mouth of the stranding tube. The stranding tube itself varies in gauge according to the diameter of the strand | \ being made, and in it the yarns are \ caught, rounded, compressed, twisted, and

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SMILLE A, Fig. 3.

smoothed, and, passing out, the new-formed strand is drawn over a pulley ¢ around "' drawing-off" gear f, and wound on a large bobbin or drum g. The speed at which the drawing-off gear revolves regu- lates the hardness or softness of twist given to the strand, and its rotation can be varied at pleasure by the use of change wheels.

In fig. 4 is illustrated a different form of stranding machine, of American origin. In this apparatus the bobbin creel is stationary

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Fig. 4.

and the yarns are drawn through the register plate and twisted in the stranding tube by the revolution of tho entire framework in whieh are placed the drawing-off gear and the large drum or spool on which the finished strand is wound. The advantages elaimed for this apparatus are facility of replacing bobbins as the yarns run out, and increased production owing to the rapid and uninter- rupted rotation of the flyer.

In the ordinary laying machine there are only three bobbins of strand to deal with ; but, from the fact that it is necessary to give a certain amount of "forehard" or twisting to the strands them- selves while they are being twisted together in an opposite direction for laying, the machine is not without complexity. The three bobbins revolve together within a strong iron frame, and that motion forms the strand into a rope. But each bobbin is at the same time revolving in a contrary direction on its own axis at the rate tempered to the amount of forehard it is desired to put on the rope in laying. Moreover, in order to deliver evenly and in equal quantities the heavy and intractable strands from each bobbin to the laying top, it is

necessary to have within each bobbin frame a drawing-off motion, and thus we have three dis-

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tinct sets of motions in an ordinary laying machine. Fig. 5, in which only one bobbin frame is shown, will make plain one method of communicating these three motions,

which in this case are controlled by a

series of three shafts, placed one within

the other. The external shaft gives

motion to the entire apparatus, and its

revolution in one direction forms the

rope, which passcs away over a pulley.

The second shaft controls the spur wheel

a, which, geared into the spur-wheel a'

attached to tho bobbin frame, turns it

in a direction contrary to the motion of the whole. The internal shaft gears into

aspur-wheel 6, which again is centred

on a tubular shaft ¢ passing into the. bobbin frame, and by a pair of bevel

wheels controlling the rate of motion of the "drawing-off" pulley d, around

which the strand is once wound, and

from which it is conveyed by the tubu-

lar shaft to a small guide pulley on the

upper part of the revolving frame.

An American rope-laying machine is in use, similar in principle to the form- ing machine fig. 4, from which it differs only in having the strand bobbins mounted in flyers to give the strand the necessary amount of forehard in laying.

Wire Rope.—Ropes made of wire have only come into use in the course of the present century, but now their employ- ment is very extensive, and they play an important part in connexion with trac- tion railways, mines, collieries, hoists, steam ploughing, and many other modern developments of industry. In the year 1822a suspen- sion bridge of wire was erected at Geneva. The wire used in this case, however, was not twisted, but consisted of parallel bundles bound with wire and other coverings wrapped spirally around them to compact and keep the whole together. A bundle of small wires so treated presents the maximum of strain-resisting power combined with great rigidity, but it is obviously unsuited for most of the uses to which rope is put. Formed wire rope, consisting of strands laid in the manner of ordinary rope, began to be made about 1837; and now wire ropesof many kinds and dimensions are made from char- coal iron wire of fine quality, from mild steel, and from fine crucible steel. Copper wire and brass wire are also used for rope-making.

Wire ropes are stranded and laid or closed in machines which do not differ in essential features from the ordinary rope-making machinery. Both vertical and horizontal forms of revolving machines are used ; but, as the rope-closing machine has sometimes to carry as many as nine bobbins of strand, each with about two tons of wire, a vertical machine is best for enormous weights. An ingenious wire-rope machine has been invented by Mr Archibald Smith, in which the bobbins of wire are suspended, and only the framework around them and the wire drawn off are rotated for the forming and laying operations, and thus the necessity for rotat- ing these enormous weights at a high specd is obviated.

The number of wires in a wire-rope strand are few—generally from six to nine, and never more than cighteen. They are lightly twisted in the stranding machine, and they receive no forctwist in the rope-closing apparatus. The strands, on the other hand,

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which go to form a rope are numerous—from six to nine and up- wards ; and they are always wound round a core, which is generally of hemp, but sometimes a wire core is used. A wire rope thus_ forms a series of gentle spirals arranged continuously round a core. A large proportion of the wire is galvanized, to protect it from rusting. The following table shows the relative circumference, weight, and strength of hemp, charcoal iron wire, and steel wire round ropes :—

Crucible Steel.

Charcoal Iron.

Hemp.

: i Breaking | Workin Circum- | Weight) cireum-| Weight | circum- J

Weight Strain Load. fer { per se, per ; ‘ per ~ iit Fathom. sas Fathom. seas Fathom.

Inches. Ibs. Inches. lbs. Inches. Ibs Tons. Cwt.

30 4 14 32 100

10 26 34 9 24 85

9 20 if 18 67 16 54 | 616 50

12 4 11 36

9 3 8 28

6 12 5 18

RORQUAL. See WHALE.

ROSA, Satvator (1615-1673), a renowned painter of the Neapolitan school, was born in Arenella, in the out- skirts of Naples, in 1615: the precise day is given as 20th June, and also as 21st July. His father, Vito Antonio de Rosa, a land surveyor, was bent upon making the youth a lawyer, and sent him to study in the convent of the Somaschi fathers. Here Salvator began showing a turn for art: he went in secret to his maternal uncle Paolo Greco to learn the practice of painting, but soon found that Greco had little pictorial lore to impart, so he trans- ferred himself to his own brother-in-law Francesco Fracan- zaro, a pupil of Ribera, and afterwards had some practice under Ribera himself. Above all he went to nature, fre- quenting the Neapolitan coast, and keeping his eyes open and his hand busy. At the age of seventeen he lost his father ; the widow was left unprovided for, with at least five children, and Salvator found himself immersed in a sea of troubles and perplexities, with nothing for the while to stem them except a buoyant and adventurous temperament. He obtained some instruction under the battle-painter Aniello Falcone, but chiefly painted in solitude, haunting romantic and desolate spots, beaches, mountains, caverns, verdure-clad recesses. Hence he became in process of time the initiator of romantic land- scape, with a special turn for scenes of strange or pictur- esque aspect—often turbulent and rugged, at times grand, and with suggestions of the sublime. He picked up scanty doles when he could get them, and his early landscapes sold for a few pence to petty dealers. The first person to discover that Rosa's work was not as trumpery as it was cheap was the painter Lanfranco, who bought some of the paintings, and advised the youth to go to Rome. Hither in 1635, at the age of twenty, Rosa betook himself; he studied with enthusiasm, but, catching fever, he returned to Naples and Falcone, and for a while painted nothing but battle-pieces, and these without exciting any atten- tion. This class of work was succeeded by the

landscape art peculiarly characteristic of him—wild scenes wildly peopled with shepherds, seamen, or especially soldiers. He then revisited Rome, and was housed by Cardinal Brancaccio; this prelate being made bishop of Viterbo, Rosa painted for the Chiesa della Morte a large and noticeable picture of the Incredulity of Thomas—the first work of sacred art which we find recorded from his hand. At Viterbo he made acquaintance with a mediocre poet named Abati, and was hence incited to try his own faculty in verse. He then returned to Naples. Here the mono- polizing triumvirate —Ribera, Caracciolo, and Corenzio— were still powerful. Rosa was as yet too obscure to sufier from their machinations ; but, having painted a picture of Tityus Torn by the Vulture, which went to Rome and there produced a great sensation, he found it politic to follow in the footsteps of his fame, and once more, in 1638, resought the papal city.

Rosa was a man of facile and versatile genius, and had by this time several strings to his bow. It is said that, still keeping painting steadily in view as his real objective, he resolved to secure attention first as a musician, poet, improvisatore, and actor—his mother-wit and broad Neapolitan dialect (which appears to have stuck to him through life) standing him powerfully in stead. In the carnival he masqued as Formica and Capitan Coviello, and bustled about Rome distributing satirical prescriptions for diseases of the body and more particularly of the mind. As Formica he inveighed against the farcical comedies acted in the Trastevere under the direction of the celebrated Bernini. Some of the actors, in one of their performances, retaliated by insulting Rosa, but the public was with him, and he now enjoyed every form of

success,—social prestige, abundant commissions, and any amount of money, which he was wont to throw about broadcast to the populace. In 1646 he returned to Naples, and is said to have taken an active part in the insurrection of Masaniello; certain it is that he sympathized with and admired the fisherman autocrat, for a passage in one of his satires proves this. His actual share in the insurrection is, however, dubious; it appears only in recent narratives, and the same is the case with the well- known story that at one time he herded with a band of brigands in the Abruzzi—

an incident which cannot be conveniently dove-tailed into any of the known dates of his career. As regards the popular revolt against Spanish tyranny, it is alleged that Rosa, along with other painters —Coppola, Porpora, Micco Spadaro, Dal Po, Masturzo, the two Vaccari, and Cadogna—all under the captaincy of Aniello Falcone, formed the Compagnia della Morte, whose mission it was to hunt up Spaniards in the streets and despatch them, not sparing even those who had sought some place of religious asylum. He painted a portrait of Masaniello—probably from reminiscence rather than from life : indeed it is said that he painted him several times over in less than life size. On the approach of Don John of Austria the blood-stained Compagnia dispersed, Rosa escaping or at any rate returning to Rome. Here he painted some important subjects, showing the uncommon bent of his mind as it passed from landscape into history ~~—Democritus amid Tombs, the Death of Socrates, Regulus in the Spiked Cask (these two are now in England), Justice Quitting the Earth, and the Wheel of Fortune. This last work, the tendency of which was bitingly sati~~ rical, raised a storm of ire and remonstrance. Rosa, endeavouring at conciliation, published a description of its meaning (probably softened down not a little from the real facts); none the less an order for his imprisonment was issued, but ultimately withheld at the instance of some powerful friends. It was about this time that Rosa wrote his satire named Babylon, under which name Rome was of course indicated.

Cardinal Giancarlo de' Medici now invited the painter to leave Rome—which had indeed become too hot to hold him—for Florence. Salvator gladly assented, and remained in the Tuscan capital for the better part of nine years, introducing there the new style of landscape; he had no pupils, but various imitators. Lorenzo Lippi the painter poet, Baldovini, and other beaux esprits shared with Rosa the hospitalities of the cardinal, and they formed an academy named I Percossi (the Stricken), indulging in a deal of ingenious jollity—Rosa being alike applauded as painter, poet, and musician. His chief intimate at this time was Lippi, whom he encouraged to proceed with the poem // Malmantile Racqustato. He was well acquainted also with Ugo and Giulio Maffei, and housed with them more than once in Volterra, where he wrote other four satires—Music, Poetry, Painting, and War. About the same time he painted his own

portrait, now in the Uffizi Gallery of Florence. Finally he reverted once more to Rome, and hardly left that city again. Much enmity still brooded there against him, taking the form more especially of an allegation that the satires which he zealously read and diffused in MS. were not his own pro- duction, but filched from some one else. Rosa indignantly repelled this charge, which remains indeed quite unsub- stantiated, although it is true that the satires deal so extensively and with such ready manipulation in classical names, allusions, and anecdotes that one is rather at a loss to fix upon the period of his busy career at which Rosa could possibly have imbued his mind with such a multitude of semi-erudite details. It may perhaps be legitimate to suppose that his literary friends in Florence

and Volterra had coached him up to a large extent—the satires, as compositions, remaining none the less strictly and fully his own. To confute his detractors he now wrote the last of the series, entitled Hnvy. Among the pictures of his closing years were the admired Battlepiece now in the Louvre, painted in the short space of forty days, full of long-drawn carnage, with ships burning in the offing ; Pythagoras and the Fishermen; the Oath of Catiline (Pitti Gallery); and the very celebrated Saul and the Witch of Endor (Louvre), which is perhaps his latest work. He undertook a series of satirical portraits, to be closed by one of himself, but while occupied with this pro- ject he was assailed by dropsy, which, after lasting fully half a year, brought his life to a close on 15th March 1673. In his last moments he married a Florentine named Lucrezia, who kept his house and had borne him two sons, one of them surviving him, and he died in a contrite frame of mind. He lies buried in the Chiesa degli Angeli, where a protrait of him has been set up. Salvator Rosa, after the hard struggles of his early youth, had always been a successful man, and he left a handsome fortune.

Rosa was indisputably a great leader in that modern tendency of fine art towards the romantic and picturesque which, developing in various directions and by diversified processes, has at last almost totally differentiated modern from olden art. He saw appearances with a new eye, and presented new images of them on his canvases, and deserves

therefore all the credit due to a vigorous innovator, even if we contest the absolute value of his product. He himself courted reputation for his historical works, laying comparatively little stress on his landscapes ; in portraits he was forcible. In ehiaroscuro he is simple and effective ; his design has energy and a certain grandeur, without any high type of form or any superior measure of correctness. His colour is too constantly of a sandy or yellowish-grey tone. Personally he was a man of high spirit, and he sold his pictures at large prices, more (it is said) to assert the honour of his art than from love of money; rather than sell them quod he destroyed them. In his later Florentine period he etched severa of his works, subjects of mythology, soldiering, &c. He was choleric, but kind and generous. Though a man of gaiety and pleasure, aud a jovial boon-companion, he does not appear to have been vicious in any serious degree. He was talkative, very sharp- tongued, and an unblushing encomiast of his own performances. Among his pictures not already mentioned we may name, in the London National Gallery, Mercury and the Dishonest Woodman, and two others; in Raynham Hall, Belisarius; in the Grosvenor Gallery, Diogenes ; in the Pitti Gallery, a grand portrait of a man in armour, and the Temptation of St Anthony, which contains his own portrait. This last subject appears also in St Petersburg, and in the Berlin Gallery.

The satires of Salvator Rosa deserve more attention than they have generally received. Though considerably spread abroad during his lifetime, they were not published until 1719. They are all in terza rima, written without much literary correctness, but remarkably spirited, pointed, and even brilliant. They are slashingly denunciatory, and from this point of view too monotonous in treatment. Rosa here appears as a very severe castigator of all ranks and conditions of men, not sparing the highest, and as a champion of the poor and down-trodden, and of moral virtue and Catholic faith. It seems odd that aman who took so free a part in the pleasures and diversions of life should be so ruthless to the ministers of these. The satire on A/usic exposes the insolence and profligacy of musicians, and the shame of courts and churches in encouraging them. Poetry dwells on the pedantry, imitativeness, adulation, affectation, and indecency of poets— also their poverty, and the neglect with which they were treated ; and there is a very vigorous

sortie against oppressive governors and aristocrats. 'Tasso's glory is upheld ; Dante is spoken of as obso- lete, and Ariosto as eorrupting. Painting inveighs against the pictorial treatment of squalid subjects, such as beggars (though Rosa must surely himself have been partly responsible for this misdirection of the art), against the ignorance and lewdness of painters, and their tricks of trade, and the gross indecorum of painting sprawling half-naked saints of both sexes. War (which contains the eulogy of Masaniello) derides the folly of hireling soldiers, who fight and perish while kings stay at home; the vile morals of kings and lords, heresy, and unbelief also come in for a flagellation. In Babylon Rosa represents himself as a fisherman, Tirreno, constantly unlucky in his net-hauls on the Euphrates ; he converses with a native of the country, Ergasto. Babylon (Rome) is very severely treated, and Naples inuch the same. Envy (the last of the satires, and generally accountcd the best, although without strong apparent reason) represents Rosa

dreaming that, as he is about to inscribe in all modesty his name upon the threshold of the temple of glory, the goddess or fiend of Envy obstructs him, and a long interchange of reciprocal objur- gations ensucs. Here occurs the highly-charged portrait of the chief Roman detractor of Salvator (we are not aware that he has ever been identified by name); and the painter protests that he would never condescend to do any of the lascivious work in paint- ing so shamefully in vogue.

As authorities for the life of Salvator Rosa, Passeri, Vite de Pittort, may be consulted, and Salvini, Satire e Vita di Salvator Rosa; also Baldinucci and Dominici. The Life by Lady Morgan is a romantic treatment, mingling tradition or mere fiction with fact. (W. M.

ROSAMOND, Farr. Rosamond Clifford, mistress of Henry IL, was the daughter of Sir Walter Clifford, a Berkshire knight (Dugdale, Jonasticon, iv. 366). She appears to have died in or about the year 1177, and was buried in the nunnery at Godstow. At the command of St Hugh, bishop of Lincoln, her body was removed from the church in which it had been buried, and was interred again outside the church. Such are all the facts that are known about Fair Rosamond. She is said to have been the

mother of William Longsword, and of Geoffrey, arch- bishop of York. But this is impossible, for both William and Geoffrey were born before 1155, and Rosamond was still a girl at the time of her death. The story of the labyrinth or maze built by Henry to conceal her from Queen Eleanor occurs first in Brompton (end of 12th century). The legend of her death at Queen Eleanor's hand is variously related, but does not appear to be trace- able beyond the first half of the 14th century. It can hardly be true in any form, for Eleanor was in confinement during the last fifteen years of Henry's reign.

ROSARIO, a river-port on the Parana, and the chief town of a department in the province of Santa Fé in the Argentine Republic, 186 miles by river from Buenos Ayres. In 1853 an insignificant village, with less than four thousand inhabitants, it now ranks in commercial import- ance as the second city in the republic, being the centre of almost the entire trade of the eleven provinces lying between the Parana and the Andes and the terminus of the great railways which since 1863 have gradually been pushed further north and west to Cordoba (1870), Tucuman (1876), Mendoza (1884), and San Juan (1885). The population had increased to 21,000 by 1870 and to 45,000 in 1883, while the imports in the latter year reached the value of £4,560,000 and the exports £3,780,000.

Rosario stands about 65 feet above the level of the river. It is laid out chess-board fashion ; and the streets are paved, and lighted with gas (introduced in 1869). The area, 145 acres in 1870, is now about 2000 acres. Brick is the principal building material, and the houses are mostly of one story. There are no suburbs, the city terminating abruptly on the great plain. The industrial establishments are extensive foundries, a large number of brick kilns, a jam and fruit-preserving factory, breweries, tanneries, soap-works, saw-mills, and flour-mills.

Rosario was founded in 1725 by Don Francisco Godoy as a settlement of "reduced" Calchaqui Indians, and the parish was established in 1731 and dedicated to Our Lady of the Rosary, whose colours, blue and white, were adopted in 1813 as those of the national flag. The prosperity of the town dates from 1854, when it was made a port of entry by General Urquiza. Jn

1867 and 1868 it suffered from a severe cholera plague. The proposal to make Rosario the capital of the republic instcad of Buenos Ayres has morc than once been nearly carried in the legislature.

ROSARY (Rosariwm, Germ. Rosenkranz) is defined in the Roman Breviary as a series of one hundred and fifty repetitions of the 'Ave Maria," with a 'Pater Noster" interpolated after each decade, the whole exercise being accompanied with pious meditation on the mysteries of redemption. This particular method of devotion, though said to have been not altogether unknown previously, first became extensively popular through St Dominic, who was admonished by the Virgin Mary to preach the rosary as

a special defence against heresy and vice. The Feast of the Rosary of the Blessed Virgin (Duplex Majus—first Sunday in October) was instituted by Clement XI. to commemorate the successes of the Christian arms against the Turks in 1716; it has reference also to the battle of Lepanto (Oct. 7, 1571). The word "rosary" or " chaplet " (capellina) is also employed to denote the string of beads of larger and smaller size by the use of which in repeating the rosary the faithful secure the due alternation of Ave Marias with Pater Nosters. In strict language the word chaplet is applied only to the "lesser" rosary, consisting of but fifty Aves and five Pater Nosters. Similar expe- dients to assist the memory in complex repetitions occur among Mohammedans and Buddhists: in the former case the so-called sobha has ninety-nine beads, and is used for the pious repetition of the ninety-nine names which express the attributes of God.

ROSAS, Juan Manvert DE, born at Buenos Ayres March 30, 1793, died in England March 14, 1877 (see ARGENTINE REPUBLIC, vol. ii. p. 491).

ROSCELLINUS (also written RoussELiIn and Rucz- LINUS), often called the founder of nominalism (see ScHOLASTICISM), was born in Armorica or Lower Brittany somewhere about the middle of the 11th century. Our information about his life is scanty, and, as he appears to have written nothing, we are dependent for a knowledge of his doctrine upon the statements of his opponents and the cursory statements of later writers. He studied at Soissons and Rheims, was afterwards attached to

the cathedral of Chartres, and became canon of Compiégne. It seems most probable that Roscellinus was not strictly the first to promulgate nominalistic doctrines; but in his exposition they received more definite expression, and, being applied to the dogma of the Trinity, attracted universal attention. The chief opponent of Roscellinus was Anselm of Canterbury, who defended at once the realistic doctrine of universals and the orthodox tradition of the church. It appears from the polemic of Anselm that "the heretics in dialectic" whom he combats denied the substantial reality of universals, asserting, for example, that colour has no real existence except as coloured body. There is no reason, however, to suppose that Roscellinus meant thereby to deny the real existence of attributive differences in things, though Anselm endeavours to involve him in that consequence. But we may conclude from the censure of his pupil Abelard that his reaction against realism had led Roscellinus into rashness of expression. In conformity with his general nominalistic position, Roscellinus taught that whatever exists as a real thing or substance exists as one self-identical whole, and is not susceptible of division into parts. This was the part of his teaching which created so much scandal when applied to the doctrine of the Trinity. Roscellinus maintained that it is merely a habit of speech which prevents our speaking of the three persons as three substances or three Gods. If it were otherwise, and the three persons were really one substance or thing (una res), we should be forced to admit that the Father and the Holy Spirit became incarnate along with the Son. Roscellinus seems to have put forward this doctrine in perfect good faith, and to have claimed for it at first the authority of Lanfranc and Anselm. In 1092, however, a council convoked by the archbishop of Rheims condemned his interpretation, and Roscellinus, who was in danger of being lynched by the orthodox populace, recanted hiserror. As his enforced penitence did not prove lasting, his opinions were con- demned by a second council (1094), and he himself fled to England. Forced by a fresh persecution to return to France at a later date, he taught at Tours and Loc-menach in Brittany (where he had Abelard asa pupil), and resided

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latterly as canon at Besancon. He is heard of as late as 1121, when he came forward to oppose Abelard's views on the Trinity.

ROSCOE, Winr1Am (1753-1831), historian and miscel- laneous writer, was born March 8, 1753, at Liverpool, where his father, who was a market gardener, kept the public house known as the Bowling Green at Mount Pleasant. Young Roscoe showed an early eagerness in the acquisition of knowledge, and at twelve he left school, havjng learned all that his schoolmaster could teach. He now assisted his father in the work of the garden, and gave his leisure hours to reading and study. 'This mode of life," he says, "gave health and vigour to my body, and amusement and instruction to my mind; and to this day I well remember the delicious sleep which succeeded my labours, from which I was again called at an early hour. If I were now asked whom I consider to be the happiest of the human race, I should answer, those who cultivate the earth by their own hands." At fifteen it was necessary to decide upona path in life. A month's trial of bookselling sufficed to disgust him, and in 1769 he was articled to a solicitor, on whose death he was transferred to the office of Peter Ellames, who had more than a local reputation. Although a diligent student of law, he did not bid farewell to the Muses, but continued to read the classics, and made that acquaintance with the language and literature of Italy which became the instrument of his distinction in after life. He wrote many verses: his Mount Pleasant was composed when he was sixteen, and this and similar compositions, though now forgotten, won the esteem of good critics. In 1774 he commenced business as an attorney, and as soon as his professional gains warranted he married (1781). His sympathies were attracted to the miseries of the victims of the African slave trade, and he had the courage to denounce it in his native town, where not a little of the wealth came from this source. He wrote the Wrongs of Africa (1787-88), and entered into a controversy with an apostate Roman Catholic priest, who undertook to prove the "'licitness of the slave trade" from the Bible. Roscoe was also a political pamphleteer, and like many other Liberals of the day hailed the promise of liberty in the French Revolution.

Meanwhile he had steadily pursued his Italian studies, and had made extensive collections relating to the great ruler of Florence. The result

was his Life of Lorenzo de' Medicr, called the Magnificent, which appeared in 1796, and at once placed him in the front rank of contemporary historians. The first edition was produced at Liverpool by Jolin M'Creery, an elegant printer who had settled there by Roscoe's encouragement. Soon after the ap- pearance of the book, Cadell & Davis bought the copy- right for £1200. The work has often been reprinted, and translations in French, German, and other languages show that its popularity was not confined to its author's native land. Perhaps the most gratifying testimony was that of Fabroni, who had intended to translate his own Latin life of Lorenzo, but abandoned the design and in- duced Gaetano Mecherini to undertake an Italian version of Roscoe instead. In 1796 Roscoe gave up practice as an attorney, and had some thought of going to the bay, but abandoned the idea after keeping a single term. Between 1793 and 1800 he gave much attention to agriculture, and was one of those who helped to reclaim Chat Moss, near Manchester. He also succeeded in re- storing to good order the affairs of a banking house in which his friend William Clark, then resident in Italy, was a partner. This task led to his introduction to the business, which eventually proved disastrous. His trans- lation of Tansillo's WVurse appeared in 1798, and went through several editions. It is dedicated in a sonnet to

his wife, who had practised the precepts of the Italian poet.

The Infe and Pontificate of Leo the Tenth appeared in 1805, and was a natural sequel to that by which he had made his reputation. For one half of the copyright he received £2000 from Cadell & Davis. The work, whilst it maintained its author's fame, did not, on the whole, meet with so favourable a reception as the Life of Lorenzo. It has been frequently reprinted, and the insertion of the Italian translation in the Jndex did not prevent its circula- tion even in the papal states. Roscoe was elected member of parhament for Liverpool in 1806, but the House of Commons was not a congenial place, and at the dissolution in the following year he declined to be again a candidate. The commercial troubles of 1816 brought into difficulties the banking house with which he was connected, and forced the sale of his collection of books and pictures. It was on this occasion that he wrote the fine Sonnet on Parting with his Books. After a five years' struggle to discharge the liabilities of the bank, the action of a

small number of creditors forced the partners into bankruptcy in 1820. For a time Roscoe was in danger of arrest, but ultimately he received an honourable discharge. On the dispersal of his library, the volumes most useful to him were secured by friends and placed in the Liverpool Athenzeum, where they still remain. The sum of £2500 was also invested for his benefit. The independent and sensitive nature of Roscoe made both these operations difficult. Having now resigned commercial pursuits entirely, he found a pleasant task in the arrangement of the great library at Holkham, the property of his friend Coke. In 1822 he issued an appendix of illustrations to his Lorenzo and also a Memoir of Richard Robert Jones of Aberdaron, a remarkable self-taught linguist. The year 1824 was memorable for the death of his wife and the publication of his edition of the works of Pope, which in- volved him in a controversy with Bowles. His versatility was shown by the appearance of a folio monograph on the Monandrian Plants, which was published in 1828. It appeared first in numbers, and the last part came out after his recovery from a paralytic attack. He died on the 30th June 1831.

Roscoe's character was a fine one. Under circumstances uncon- genial and discouraging he steadfastly maintained the ideal of the intellectual life. Sensitive and conscientious, he sacrificed his possessions to a punctilious sense of duty. He had the courage of unpopular opinions, and, whilst promoting every good object in his native town, did not hesitate to speak out where plain dealing, as in the matter of slavery, was required. Nor was his public life more meritorious than his private career, for hc was a sincere friend and exemplary in his domestic relations. Posterity is not likely to endorse the verdict of Horace Walpole, who thonght Roscoe " by far the best of our historians," but in spite of newer lights and of some changes of fashion in the world of lctters, his books on Lorenzo de' Medici and Leo X. remain important contributions to historical literature. a

1n addition to the writings already named, Roscoe wrote tracts on penal juris- prudence, and contributed to the Transactions of the Royal Society of Literature and of the Linnean Socicty. The first collected edition of his Poetical Works was published in 1857, and is sadly incomplete, omitting, with other verses known to be from his pen, the Butterfly's Ball, a fantasy,

which has charmed thousands of children since it appeared in 1820-21 in Poems for Youth, by a Family Cirele.

The Life by his son Henry Roscoe (2 vols., London, 1833) contains full details of Roscoe's career. Fuller bibliographical details are given in Allibone's Dictionary of English Literature. (W. E. A. A.)

ROSCOMMON, an inland county of Ireland, in the province of Connaught, is bounded N.E. by Leitrim, N.W. by Sligo, W. by Mayo, W. and §. by Galway, E. by Longford, and E. and 8. by Westmeath and King's County. The total area is 607,691 acres or nearly 950 square miles. The greater part of the county belongs to the great lime- stone plain, and is either flat or very slightly undulating. In the north-east, on the Leitrim border, the Braulieve Mountains, consisting of rugged and precipitous ridges of limestone gravel with flattened summits, attain an eleva- tion at their highest point of 1377 feet ; and in the north-

west the Curlew Mountains, of similar formation, between Roscommon and Sligo rise abruptly to a height of over 800 feet. In the east the Slievebawn range, formed of sand- stone, have a somewhat similar elevation. The Connaught coal field, which embraces the mountainous district round Lough Allen, touches on Roscommon, but the mineral is not much wrought within the limits of the county. Iron- stone is also found in the same district, but mining is no longer prosecuted. The Shannon with its expansions forms nearly the whole eastern boundary of the county, and on the west the Suck from Mayo forms for over 50 miles the boundary with Galway till it unites with the Shannon at Shannon Bridge. The other tributaries of the Shannon within the county are the Arigna, the Feorish, and the Boyle. The lakes formed by expansions of the Shannon on the borders of Roscommon are Loughs Allen, Boderg, Boffin, Forbes, and Ree. Of the numerous other lakes within the county the most important are Lough Key in the north, very picturesquely situated with finely wooded banks, and Lough Gara in the west.

Agriculture.—The subsoil is principally limestone, but there is some light sandy soil in the south. In the level parts the land when drained and properly cultivated is very fertile, especially in the district known as the plains of Boyle, which includes some of the ricliest grazing land in Ireland. Along the banks of the Suck and Shannon there is, however, a large extent of bog and marsh. Of the 130,426 acres in crop in 1884 only 61,055 acres were under tillage, while 69,371 acres were under meadow and clover. Corn crops occupied 26,931 acres, of which 26,246 were under oats ; and green crops occupied 33,448 acres, of which 26,178 were under potatoes and 5236 under turnips. Horses and mules in 1884 numbered 11,134, cattle 106,546 (of which 27,084 were milch cows), asses 8801, sheep 147,077, pigs 35,493, and goats 10,822. Accord- ing to the latest return the county was divided among 707 proprietors possessing 577,999 acres at an annual valuation of £294,698. The following possessed upwards of 20,000 acres :— Colonel King-Harman, 29,242 acres; H. S. P. Mahon, 26,980; Lord De Freyne, 25,437; and Thos. Wills-Sandford, 24,411.

Railways.—A branch of the Midland Great Western Railway traverses the north-eastern boundary of the county to Sligo, and another the south-western boundary to Westport, whilst a third crosses the southern corner to Galway.

Administration and Population.—The county is divided into 10 baronies, and contains 58 parishes, 7 parts of parishes, and 1995 townlands. The population in 1881 was 132,490—a decrease of nearly one-half since 1841, when it was 258,591. The number of persons who could read and write in 1881 was 66,858, the number who could read only was 18,373, while 47,259 were unable to read or write. The number who spoke Irish and English was 21,494, and 95 were able to speak Irish only. The towns containing over 1000 inhabitants are Roscommon, the county town (2117), Boyle (2994), and Castlerea (1229). Within the county are also included a part (3683) of Athlone, the remainder being in Westmeath, a part (947) of Ballinasloe, the larger part being in Galway, and a very small portion (100) of Carrick-on-Shannon, which is situated chiefly in Leitrim. LEcclesiastically the county belongs to the Elphin diocese, with small portions in those of Tuam, Clonfert, and Ardagh. It is in the

Connaught circuit. Assizes are held at Roscommon and quarter sessions at Athlone, Boyle, Castlerea, and Roscommon, There are nine petty sessions districts within the county and parts of fonrothers. Itisin the Dublin military district, and there are barrack stations at Athlone, Boyle, Castlerea, and Roscommon.

History.—The district was granted by Henry III. to Richard de Burgo, bunt remained almost wholly in the possession of the native septs. Until the time of Elizabeth Connaught was included in the two districts of Roscommon and Clare, and when these were sub- divided Roscommon was assigned its present limits. It takes its name (Irish Los-Comain, Comain's wood) from the county town, at which a monastery was founded by St Coman in the 6th century. All the old proprietors were dispossessed at the Cromwellian set- tlement, except the O'Conor family, now headed by the O'Conor Don, The most interesting antiquarian remains within the county are the ruins of Crogan, the ancient palace of the kings of Connaught. The principal ancient castles are the old stronghold of the M'Der- motts on Castle Island, Lough Key, the dismantled castle of the M'Donoughs at Ballinafad, the extensive fortress at Roscommon rebuilt by John D'Ufford, justiciary of Ireland in 1268, and the keep of Athlone, now used as barracks. The abbey of Boyle is in remarkably good preservation, and exhibits good specimens of the Norman arch. The other monastic remains within the county are of comparatively small importance.

ROS—ROS

ROSCOMMON, Wentwortrn Ditton, Eart or (1634— 1684), one of the pioneers of the so-called " classical " school in English poetry, owed his burial in Westminster Abbey more to his rank than to his achievements in poetry. But his Essay on Translated Verse (1684), though feeble in thought, has a certain distinction in the history of our literature as being the first definite enunciation of the principles of the " poetic diction" of our Augustan age. He is very refined and fastidious in his notions of dignified writing, and intimates, though with a genteel affectation of humility, that the "railing heroes" and "wounded gods" of Homer are too vulgar for a correct taste. He himself wrote in the finest of diction, but he

wrote little. On Fenton's remark that his imagination might have been more fertile if his judgment had been less severe Johnson makes the comment that his judgment might have been less severe if his imagination had been more fertile' The subjects of his half-dozen of original poems range from the death of a pet dog to the day of judgment, both treated in the same elevated and conventional style. Roscommon, a nephew of the great earl of Strafford, was born in Ireland, and educated partly under a tutor at his uncle's seat in Yorkshire, partly at Caen in Normandy, and partly at Rome He published a translation of Horace's Art of Poetry in 1680.

ROSE (Rosa). The rose has for all ages been the favourite flower, and as such it has a place in general literature that no other plant can rival. In most cases the rose of the poets and the rose of the botanist are one and the same in kind, but popular usage has attached the name rose to a variety of plants whose kinship to the true plant no botanist would for a moment admit. In this place we shall employ the word in its strict botanical significance, and in commenting on it treat it solely from the botanical point of view (see also HorticuLrurg, vol. xii. p. 260). The rose gives its name to the order Rosacez, of which it may be considered the type. The genus con- sists of species varying in number, according to the diverse opinions of botanists of opposite schools, from thirty to one hundred and eighty, or even two hundred and fifty, exclusive of the many hundreds of mere garden varieties. While the lowest estimate is doubtless too low, the highest is enormously too large, but in any case the wide dis- crepancies above alluded to illustrate very forcibly the extreme variability of the plants, their adaptibility to various conditions, and consequently their wide dispersion over the globe, the facility with which they are cultivated, and the readiness with which new varieties are continually being produced in gardens by the art of the hybridizer or the careful selection of the raiser. The species are natives of all parts of the northern hemisphere, but are scantily represented in the tropics unless at considerable elevations.

They are erect or climbing shrubs, never herbs or trees, gene- rally more or less copiously provided with thorns of various shapes and with glandular hairs, as in the sweet brier or in the moss rose of gardens. The

thorns serve the purpose of enabling the shrub to sustain itself amid other vegetation, and perhaps in some sort serve as a protection against marauders. The viscid hairs which are specially frequent on the flower stalks or in the neighbourhood of the flower serve to arrest the progress of undesirable visitants, while the perfume emitted by the glands in question may co-operate with the fragrance and colour of the flower to attract those insects whose presence is desirable. The leaves are invariably alternate, provided with stipules, and unequally pinnate, the stipules them: selves being in this case perhaps merely the lowest pair of ‘‘ pinn or leaflets less perfectly developed than the others. The flowers are solitary or in loose cymes (chuster-roses) produced on the ends of the shoots. The flower-stalk expands into a vase- or urn-shaped dilatation, called the receptacle or receptacular tube, which ulti- mately becomes fleshy and encloses in its cavity the numerous carpels or fruits, From the edge of the urn or “hip” proceed five sepals, often more or less compounded like the leaves and over- lapping in the bud. Within the sepals are five petals, generally

broad or roundish in outline, with a very short stalk or none at all, and of all hues except blue. The very numerous stamens originate from about the same spot as the sepals and petals; each has a slender filament and a small two-celled anther. The inner portion of the reccptacular tube whence the stamens spring is thick and fleshy, and is occasionally spoken of as the “disk”; but, as in this case it does not represent any separate organ, it is better to avoid the use of the term. The carpels are very numerous, ulti- mately hard in texture, covered with hairs, and each provided with a long style and button-like stigma. The carpels are concealed within the receptacular tube and only the stigmas as a rule pro- trude from its mouth. Each carpel contains one ovule without perisperm. The so-called fruit is merely the receptacular tube, which, as previously mentioned, becomes fleshy and brightly coloured as an attraction to birds, which devour the hips and thus secure the dispersion of the seed. The stamens are in whorls, and, according to Payer, they originate in pairs

one on each side of the base of each petal (parapetalous), so that there are ten in each row ; a sccond row of ten alternates with the first, a third with the second, and soon. By repeated radial and tangential branching a vast number of stamens are ultimately produced, and when these stamens assume a petaloid aspect we have as a consequence the double flowers which are so much admired. The carpels are much less subject to this petaloid change, and, as it denetally happens in the most double of roses that some few at least of the anthers are formed with pollen, the production of seed and the possibility of cross-breeding become intelligible. Under natural circumstances rose flowers do not secrete honey, the attraction for insects being provided, according to Miiller, by the colour and perfume and the abundance of pollen for food. The stigmas and anthers come to maturity at the same time, and thus, while cross-fertilization by insect agency is doubtless most common, close fertilization is not prevented.

In The Student's Flora Sir Joseph Hooker recognizes seven species of Rosa as British, Among them may be inentioned 2. spinosissima, the Scotch Rose, much less variable than the others, £. rubiginosa, the Sweet Brier, represented by several varieties, FR. canina, the Dog Rose, of which no fewer than twenty-nine varieties are described, and &. arvensis. Cultivated roses are frequently ""budded" or worked upon the stems of the brier or R. cantina, or upon young seedling plants of the same species. Other species also are used for stocks (see HorTIcULTURE). Roses have been grown for so many centuries and have been crossed and recrossed so often that it is difficult to refer the cultivated forms to their wild proto-types. The older roses doubtless originated from R. gallica, a native of central and southern Europe. J. centifolia (the Cabbage Rose), a native of the Caucasus, contributed its share. A cross between the two species named may have been the source whence originated the Bourbon Roses. The yellow-flowered Austrian and Persian Brier originated from R. cglantcria, a native of Austria. The Monthly or China Roses sprang from the Chinese &. ¢ndica, and these crossed with others of the &. centifolia or gallica type are the source of the hybrid perpetuals so commonly grown nowadays, because, in addition to their other attractions, their blooming season is relatively prolonged, and, moreover, is repeated in the autumn. Tea Roses and Noisettes, it is to be presumed, also acknowledge Rosa

indica as one of their progenitors. The Banksian Rose is a Chinese climbing specics, with small white or fawn-coloured flowers of great beauty; the Macartney Rose (KR. bracteata) is also of Chinese origin. Its nearly evergreen deep green leaves and large whitc flowers are very striking. The Japanese &. rugosa is also a remark- able species, notable for its bold rugose foliage, its large white or pink flowers, and its conspicuous globular fruit. R. damascene is cultivated in some parts of Roumelia for the purpose of making attar of roses (see O1LS and PERFUMERY). According to Hanbury, the flowers are gathered before sunrise and distilled the same day. The distilled liquid is allowed to remain fora day or two, by which time most of the oil will have risen to the surface, from which it is skimmed off. The percentage yielded is very small, not more than 0°04.

In India #. damasccna is grown largely near Ghazipur for the purpose of procuring attar of roses and rose water. The roses are distilled with double their weight of water. The attar is skimmed offin the Turkish method. Colonel Drury mentions that it takes 200,000 roses to yield the weight of arupee in attar. This quantity sells on the spot for 100 rupees.

Rose water is chicfly produced in Europe from the Provence or cabbage rose, R. centifolia, grown for the purpose at Mitcham and much more abundantly in the south of France. Conserve of roses and infusion of roses, two medicinal preparations retained for their agreeable qualities rather than for any special virtue, are prepared from the petals of Rosa gallica, one variety of which was formerly grown for the purpose near the town of Provins. Conserve of dog rose is made from the ripe hips of the dog rose, Rosa canina. Its only use is in the manufacture of pills.

The name Ros oF JERtcHo is popularly applied to a small Cruciferous wecd, Anastatica hicrochuutina, a native of the desert

regions of Egyyt, Arabia, Palestine, and Persia. In the dry season the dead branches are strongly incnrved, and thus serve to protect the still living seed in the pods. In the wet season the branches absorb the moisture to a large extent, unfold, resume the direction they had in life, and facilitate the dispersion of the seed under circumstances favourable to germination. The plant is frequently carried off as a curiosity,

inasmuch as immersion in a basin of water enables it to resume the original form and to create the impression that the plant "comes to life again," but the pro- cess is purely a physical one.

ROSSELLINI, Ippotrro (1800-1843), a native of Pisa and subsequently professor there of Oriental languages, in which Mezzofanti was his teacher, is best known as the associate of J. I'. CHAMPOLLION (q.v.), whose studies he shared and whom he accompanied in his Egyptian explorations (1828). On the death of Champollion the publication of the results of their expedition fell to Rosellini (Monwmenti dell' Egitto e della Nubia, Florence, 1832-1840, 10 vols. fol.).

ROSEMARY (Rosmarinus), a well-known Labiate plant, the only representative of the genus and a native of the Mediterranean region. It is a low shrub with linear

| leaves, dark green above, white beneath, and with margins

rolled back on to the under surface. The flowers are in small axillary clusters. Each has a two-lipped calyx, from which projects a bluish two-lipped corolla enclosing two stamens, the other two being deficient. The fruit con- sists of four smooth nutlets. Botanically the genus is near to Salvia, but it differs in the shorter connective to the anther. Rosemary was highly esteemed by the ancients for its aromatic fragrance and medicinal uses. In modern times it is valued mainly as a perfume, for which purpose the oil is obtained by distillation. It doubtless has slight stimulant properties, which may account for the general belief in the efficacy of the plant in promoting the growth of the hair. Rosemary plays no unimportant part in literature and folk-lore, being esteemed as an emblem of remembrance. 'There's rosemary, that's for remem- brance," says Ophelia. Its use in connexion with funeral ceremonies is not extinct in country places to this day, and it was formerly as much valued at wedding festivities. The name "ros marinus" or "ros maris" was probably given in allusion to its native habitat in the neighbour- hood of the sea.

ROSETTA (see Eoypt, vol. vii. p. 768). The cele- brated Rosetta Stone, a basalt stele containing a decree of Ptolemy V. Epiphanes in hieroglyphics, demotic, and Greek, which supplied the key for the decipherment of the

ancient monuments of Egypt, was found near Fort St Julien, 4 miles north of the town, in 1799, by Boussard, a French officer. It is now in the British Museum.

ROSEWOOD. Under this name several distinct kinds of ornamental timber are more or less known. That, however, so called in the United Kingdom is Brazilian rosewood, the palissandre of the French, the finest quali- ties of which, coming from the provinces of Rio de Janeiro and Bahia, are believed to be the produce principally of Dalbergia nigra, a Leguminous tree of large dimensions, called cabiuna and jacaranda by the Brazilians. The same name, jacaranda, is applied to several species of Macherium, also trees belonging to the natural order Legu- minose ; and there can be no doubt that a certain proper- tion of the rosewood of commerce is drawn from these sources. Formerly Brazilian rosewood was said, on the authority of the French botanist and traveller Guillemin, to be the produce of a species of Z'riptolomexa, but that genus has now been constituted a section of Dalberguu. Rosewood comes to the United Kingdom from Rio, Bahia, Jamaica, and Honduras. The heartwood attains large dimensions, but as it begins to decay before the tree arrives at maturity it is always faulty and hollow in the centre. On this account squared logs or planks of rose-

wood are never seen, the wood being imported in half round flitches 10 to 20 feet in length and from 5 to 12 inches in their thickest part. Owing to its irregular form the wood is sold by weight, and its value varies within wide limits according to the richness of colour. Rosewood has a deep ruddy brown colour, richly streaked and grained with black resinous layers. It takes a fine polish, but on account of its resinous nature it is some- what difficult to work. The wood is very much in demand both by cabinetmakers and pianoforte-makers, by whom it is used both solid and in veneer.

The wood of Dalbergia latifolia, a native of the East Indies used for ornamental furniture and carvings under the name of black wood, is frequently termed East Indian Rosewood, as is also the allied tree of Madras, Dalbergia sissoides. the French, the Portuguese Pao de Rosa,

and the German Rosenholz, is a Brazilian wood, the produce of Physoealymma floribunda, called in the United Kingdom tulip wood, and very highly esteemed on account of its beautiful rose colour and grain. African rosewood is from Pterocarpus erinaeeus, Dominican from Cordia Gerascanthus, and in New South Wales the wood of Synowm glanduloswim locally receives the same name.

ROSH, also Harosh (we, wen, te, "chief," "the chief"), stands by contraction for Rabbenu Asher, or Harab Rabbenu Asher (b. Yehiel), chief rabbi of all Castile. the 13th century and died at Toledo on the 25th of October 1327.1

Rosh enjoys a sixfold celebrity. (1) He was a descendant of a

long line of distinguished ancestors, among whom RABAN (q.v.) may be specially named. (2) He was "the distinguished of the

most distinguished disciples"? of the foremost rabbi of his age in

Germany, viz., Rabbenu Meir b. Barukh, better known under the name of R. Mcir of Rothenburg, whose tragic fate? even more than his learning and piety has endeared him to all Jews down to this very day. (3) He was the father of eight great Rabbinic scholars.4 (4) He was in his own right, after 1298 in Germany

j Schiller-Szinessy, Catal. Heb, MSS., &e., ib 385 66, note 3, and ii. p. hil note 3,

2 R. Meir of Rothenburg (see next note) had among his many disciples four

more distinguished than the rest :—(1) R: Mordekhai b. Hillel, who was slain with his wife and children at Nuremberg in 1310,—a fine Latin and general scholar and author of the Afordekhai, now an integral part of the Ripg (g.v.); (2) R. Mcir llakkohen, the author of the Haggahoth Matmoniyyoth, now an integral part of the Afishneh Torah of MAIMONIDES (q.v.); (8) R. Shimshon b.

Sadok, who wrote his master's Zashbes in prison, &c. (see Catal, Arab, MSS. of

Trin, Coll,, Cambr., App. p. 229) ; (4) Rosh,

3 The persecutions and massacres of the Jews in many parts of Germany in the 13th century made life so unendurable that the wealthier of them determined to quit the land of their birth and to emigrate to that of their ancient fathers. Rt. Meir of Rothenburg, being at the head of the emigration, had in the spring of 1286, with his whole family and several other families, already arrived in Lombardy. But one Kinppa, or Knippa, or Konpil, z.e., Koppel (=Jacobd), a con- verted Jew, recognized and betrayed him to his master, the bishop (? {4) of Basel, who had him arrested by Captain Meinert (Meinhard) of Gorz, who handed him over to the emperor, Rudolph of Hapsburg, who had only a dozen years before or so (to speak in the great Geran poet's language) " made an end,

- after the long destructive strife, to the emperorless, terrible time," was, though very rich in dignities, as yet comparatively poor in purse. He therefore, in the midsummer of the same year (to extort money from the Jews), caused the poor rabbi to be imprisoned in the tower of Ensisheim (in Alsace) and subsequently in other places, —e.g., Weissenburg, or Wasserburg (PVAY)). Considerable sums were offered by the Jews for their revered chief, but the negotiations were brought to nought by the command of the rabbi himself, who would not permit more than a trifling sum to be given for his release (RESHAL (q.v.), Fam shel Shelomoh, on Gittin, iv. 66). He died in prison in 1293. Rudolph's successors, Adolph of Nassau (1291-1298) and Albrecht of Austria (1298-1308), were so heartless as not to deliver up for nearly fourteen years the poor rabbi's corpse for burial, hoping to extort from the Jews even greater sums than they had origin- ally offered to Rudolph for the rabbi alive. In 1307, however, a rich and pious but childless man, Alexander Stisskind Wimpfen of Frankfort, offered an enor- mous sum on the condition that the congregation of Worms should bury the rabbi's corpse and should allow at his own dcath his body to rest near it (see Lewysohn, Sechzig Epitaphien… zu Worms, Frankfort-on-Main, 1855, 8vo, pp. 35-41), R. Meir of Rothenburg was not merely a fine Biblical and Rabbinic Scholar

but also a great Cabbalist, as R. David b, Yehudah Hasid testifies in his Maroth Ifassobeoth (Camb, Univ. MS. Add. 664, leaf 72a). Most of his literary productious are incorporated with works of his disciples and the disciples of these disciples, For instance, some of his massoretico-ethical explanations are to be found in R. Ya‘akob b. Asher’s so-called Ba‘al Hatturim, and part of his commentary on the Mishnah is to be found in R. Yomtob Lipmann Hecller’s Tosephoth Yomtob (see Misunan). Other Rabbinic work of his is to be found in Rosh, Mordekhai, &c. But there exists also independent literature of his as (1) Tosaphoth on Yoma (in the editions of the Babylonian Talmud); (2) Responsa, in three volumes (i., Cremona, 1557, 4to; ii., Prague, 1608, fol., which contains, however, matter by other authors also, as Rabbcnu Gershom, Rabbenu Tham, the Takkanoth Shum, Rules of Penitence, by R. El‘azar of Worms, é&c. ; iii., Lemberg, 1860, 4to); (3) Tashbes (sce last note); (4) Birekhoth Maharam (Riva di Trento, 1558, 8vo) ; (5) religious poems of considerable value, which are to be found in the Ashkenazic Mahzor,

aor these we will only mention two. (1) R. Yehudah, his successor in the rabbinate, is the author of the Zikhron Yehudah (Responsa, Berlin, 1846, 4to). (2) Rabbenu Ya‘akob, is the anthor of (a) the Turim, printed times innumerable (ed. princeps, Pieve di Sacco, 1475, fol.), a code of laws for a long time normative, but now almost superseded by the Shulhan ‘“Arukh of R. Yoseph Caro (see

The Bots de Rose of

He was born in Germany about the middle of

and after 1310 cverywhere, the greatest Talmudist.5 (5) He was the first rabbi of the Ashkenazic school who possessed powers of systematization. (6) He was a man not merely of the deepest piety but of the sternest and, if we may say so, the most savage 6 morality. Rosh, in despair at the state of affairs in Germany (some, however, say through his being involved in negotiations with the emperor for the delivery of the body of his master, which he could not bring to a successful issue),” left his home and travelled aimlessly about with his numerous family till he arrived in Provence. There he would have remained gladly had not the Maimonidcan controversy broken out. He went therefore to Castile,

where Toledo, jealous of Barcelona possessing such a great rabbi as R. Shelomoh Ibn Addereth was,® received him with open arms and great respect and elected him their rabbi. Under his eyes the celebrated astronomical work Yesod 'Olam, by R. Yishak b. Yoseph Yisracli, was composed. !°

Of the numerous works by Rosh, which have been printed times innumerable, we can only mention the most important :—

(1) Commentary on the Pentateuch (sce Madar Zekenim, Leghorn, 1840, folio). (2) Commentary on the Mishnic treatises of the orders Zera'im and Tohoroth (sce editions of the Babylonian Talmud). (8) Commentary on the whole Babylonian Talmud (¢bid.; the Aissur Piseke Harosh is by Rabbenu Ya'akob, the author's son, see note 4). (4) Yosephe Harosh on several treatises (see Schiller- Szinessy, Catalogue, ii. pp. 76-94). (5) Responsa (Constantinople, 1517, folio, and reprints). (6) Halakhoth Ketannoth (see Talmud editions), (7) Manhagah, Sevaah, &c, (Testament, &c., Venice, 1578, 16mo, and reprints), (S. M. §,-S.)

ROSICRUCIANS (Rosenxrevzer), a celebrated but entirely fabulous secret society. . In 1614 there appeared at Cassel an anonymous German work, Allgemeine und General-Reformation der ganzen Welt beneben der Fama Fraternitatis des léblichen Ordens des Rosenkreuzes, inviting the scholars of Europe to test the pretensions and join the ranks of a secret society, said to have been founded two hundred years before by a certain Christian Rosen- kreuz, who had acquired on a pilgrimage the hidden wisdom of the East. The society, according to this account, possessed many secret gifts of knowledge, of which goldmaking was one of the least. Its character was Christian and of Protestant type; its chief aim was the gratuitous healing of the sick. Though the origin of the fama and some subsequent tracts in supplement to it has never been made quite clear, it has generally been held that Arnold, in his Xtrchen- und Ketzer-Historte, renders it highly probable that the author was the talented theo- logian and polymath Johann Valentin Andree (1586- 1654), and that the book was originally a sort of elaborate joke composed in the stift at Tiibingen. But the marvel- lous elements in the account of Rosenkreuz and his society ouly served in that age to draw serious attention to the supposed

order. A large controversial literature sprang up, and, while some violently condemned the Rosicrucians as heretics in theology and medicine, others, and among them R. Frupp (g.v.), defended them and hoped great things from the enlarged activity which was proposed for them in the Fama and its companion tracts. Gradually it came to be generally seen that the whole thing was a mystification. The name and fable of the Rosicrucians have, however, from time to time been made use of by such impostors as Cagliostro,

ROSIN, or CotopHony, is the resinous constituent of the oleo-resin exuded by various species of pine, known in commerce as crude turpentine (see TURPENTINE). The separation of the oleo-resin into the essential oil-spirit of turpentine and common rosin is effected by distillation in large copper stills. The essential oil is carried off ata heat of between 212° and 316°, leaving fluid rosin, which is run off through a tap at the bottom of the still, purified by passing through a straining wadding, and received into

RusuAL, note 1); (6) the commentary on the Pentateuch mentioned in the fore- going note, a portion of which forms now an integral part of cyery Rabbinic Bible (it was first issued at Constantinople in 1514, 4to); and © the Késsur Piseke Harosh (Constantinople, 1515, fol.).

° .e., after the death of his master and that of R. Shelomoh b. Abraham Ibn Addereth (see Rasuza III.).

6 See Schiller-Szincessy, Cafal., ii. p. 78, note 2

7 See Ibn Yalya's Shalsheleth ifakkabbalah.

8 See Schiller-Szinessy, Catal., i. p. 188 seg. 5 Sec RasuBa III.

10 Printed in 1777, and from an ancicnt MS. again in 1848, both times at Berlin and in 4to, The library of Cambridge university possesses a most valuable MS. of it (Oo. 6. 65)

a vat, whence it is ladled into barrels ready for the market. Rosin varies in colour, according to the age of the tree whence the turpentine is drawn and the amount of heat applied in distillation, from an opaque almost pitchy black substance through grades of brown and yellow to an almost perfectly transparent colourless glassy mass. The commercial grades are numerous, ranging by letters from A, the darkest, to N, extra pale,—superior to which are W, "window glass," and WW, "water white" varieties, the latter having about three times the value of the common qualities. Rosin is a very brittle and friable resin, with a faint piny odour, softening at about 176° and melting completely at the temperature of boiling water. It dis- solves freely in ether, benzol, and chloroform, and to some extent in alcohol and fatty oils. When exposed to the action of hot dilute alcohol or when boiled with alkaline solutions it takes up a molecule of water and becomes converted into abietic acid, a change which also takes place slowly in the air when the resin is yet mixed with the essential oil as it flows from the trees. Rosin is thus regarded as an anhydride of abietic acid, and its use in yellow soaps is due to the fact that this acid itself com- bines with caustic alkalies to form a kind of soap. In addition to its extensive use in soap-making, rosin is largely employed in making inferior varnishes, sealing wax, and various cements. It is also used for preparing shoemaker's wax, for soldering metals, for pitching lager beer casks, for rosining the bows of musical instruments, and numerous minor purposes. In pharmacy it forms an ingredient in several plasters and ointments. On a large scale it is treated by destructive distillation for the production of an oily complex hydrocarbon, having a tarry odour and a whitish opalescent colour, which under the name of rosin oil is much used as a lubricant. Rosin oil also enters extensively into the common kinds of fatty oils as an adulterant.

The chief region of rosin production is the southern coast States of the American Union,—the ports of Wilmington, Charleston, Savannah, and Brunswick being the principal centres of the trade. American rosin is obtained from the turpentine of the swamp pine, Pinus australis, and of the loblolly pine, P. Tada. The main source of supply in Europe is the "landes" of the departments of Gironde and Landes in France, where the sea pine, P. maritima, is extensively cultivated. In thenorth of Europe rosin is obtained from the Scotch fir, P. sylvestris, and throughout

Huropean countries local supplies are obtained from other species of pine. The imports into the United Kingdom average about 1,250,000 ewts. annually, nearly the whole of which comes from America. In 1883 the amount imported was 1,377,368 cwts. (1,387,848 ewts. from the United States and 16,242 cwts. from France), the total estimated value of the imports being £400,938.

ROSMINI-SERBATI, Antonio (1797-1855), perhaps the most important figure in modern Italian philosophy, was born at Rovereto in the Italian Tyrol in 1797, and died in 1855. With every worldly advantage as the eldest son of a noble and wealthy family, from an early age he resolved to devote himself to God's service in the Catholic priest- hood. He became the founder of a new religious order, named the Institute of Charity, but known in Italy gene- rally as the Rosminians. The members may be priests or laymen. Allare prepared to do any works of charity— corporal, intellectual, or spiritual—to which they may be directed by divine providence, under obedience to their superior, to the bishops, and to the pope. They have branches in Italy, England, Ireland, France, and America. In London they are attached to the ancient church of St Etheldreda, Ely Place, Holborn, where the English transla- tions of Rosmini's works are edited.

Rosmini's Sistema Filosofico set forth the conception of a complete encyclopedia of the human knowable, synthet- ically conjoined, according to the order of ideas, in a perfectly harmonious whole. This conception Rosmini developed in more than forty volumes. Here a brief

notice of the characteristic principle of his philosophy must suffice.

Rosmini, contemplating the position of recent philosophy from Locke to Hegel, and having his eye directed to the ancient and fundamental problem of the origin, truth, and certainty of our ideas, wrote :—'"'If philosophy is to be restored to love and respect, I think it will be necessary, in part, to return to the teachings of the ancients, and in part to give those teachings the benefit of modern methods" (Theodicy, n. 148). Pursuing therefore the now generally approved method of the observation of facts, he most carefully examined and analysed the fact of human know- ledge, and obtained the following results:—(1) that the notion or

idea of being or existence in general enters into, and is presupposed by, all our acquired cognitions, so that, without it, they would be impossible ; (2) that this idea is essentially objective, inasmuch as what is seen in it is as distinct from and opposed to the mind that sees it as the light is from the eye that looks at it; (3) that it is essentially true, because " being" and " truth" are conver- tible terms, and because in the vision of it the mind cannot err, since error could only be committed by a judgment, and here there is no judgment, but a pure intuition affirming nothing and denying nothing; (4) that by the application of this essentially objective and true idea the human being intellectually perceives, first, the animal body individually conjoined with him, and then, on occasion of the sensations produced in him not by himself, the causes of those sensations, that is, from the action felt he per- ceives and affirms an agent, a being, and therefore a true thing, that acts on him, and he thus gets at the external world,—these are the true primitive judgments, contain- ing () the subsistence of the particular being (subject), and (0) its essence or species as determined by the quality of the action felt from it (predicate); (5) that reflexion, by separating the essence or species from the subsistence, obtains the full specific idea (universalization), and then from this, by leaving aside some of its elements, the abstract specific idea (abstraction); (6) that the mind, having reached this stage of development, can proceed to further and further abstracts, including the first principles of reasoning, the principles of the several sciences, complex ideas, groups of ideas, and so on without end; (7) finally, that the same most universal idea of being, this generator and formal element of all acquired cognitions, cannot itself be acquired, but must be innate in us, implanted by God in our nature. Being, as naturally shining to our mind, must therefore be what men call the light of reason. Hence the name Rosmini gives it of ideal being; and this he laid down as the one true fundamental principle of all philosophy, and the supreme criterion of truth and certainty. This he firmly believed to be the teaching of St Augustine, as well as of St Thomas, of whom he was an ardent admirer and defender. The above seven points could only be hinted at here. A complete and exhaustive treatment of them will be found in Rosmini's Vew Lssay on the Origin of Ideas, which has lately been rendered into English (London, 1883-84).

Rosmini's Sistema Filosofico has been translated into English by Davidson (Rosmini's Philosophical System, London, 1882). The volume contains also a biographical sketch of the author, with a complete catalogue of his writings, ninety-nine in all, on philo- sophical, religious, and miscellaneous subjects, and a copious list of works relating to his life and philosophy.

ROSS, a county in the north of Scotland. Cromarty (q.v.) consists of detached portions scattered throughout Ross, and for most administrative purposes the two coun- ties are regarded as one. Theunited area of their mainland portion lies between 57° 8' and 58° 6' N. lat., and o ai and 5° 52' W. long., and is bounded N. by the Dornoch Firth and Sutherlandshire, E. by the Moray Firth, 8. by

Inverness-shire, and W. by the Atlantic. It comprehends 2,003,065 acres, of which only about 220,280 acres are included in Cromarty. Its length from east to west is 67 miles, and from north to south 58 miles. The area of the islands is 437,221 acres. Ross includes the northern part of Lewis (see vol. xiv. p. 492), and other ten islands of the Hebrides, of which eight only were inhabited in 1881 (nine in 1871). The outline of Ross and Cromarty is very irregular, and both east and west coasts are much indented by bays and inland lochs, but except in the more inland recesses of these inlets the coast scenery is comparatively tame and uninteresting. The Moray Firth, an extension of Loch Beauly, separates the county from Nairn; the northern shore of the peninsula of the Black Isle is washed by Cromarty Firth, including the Bay of Nigg and extending from Dingwall to the headlands known as the Sutors of Cromarty ; and the extreme northern coast is bounded by the Dornoch Firth, an extension of the river Oykel, On the west coast the inlets are for the most part long, narrow, and irregular, the principal being Loch Broom, Little Loch Broom, Lochs Gruinard, Ewe, Torridon, Carron, and Alsh.

Surface and Geology.—In the north-west of Ross the Archean series of rocks, consisting of gneisses, schists, and other crystalline rocks, are well developed. Above them: rest uuconformably red conglomerates and sandstones of Cambrian age, rising into the picturesque mountains which

form such a striking feature of the seenery of western Ross. Farther east they are overlaid uucon- formably by the quartzites and limestones belonging to the Lower Silurian division. Over these, by enormous terrestrial displace- ment, the Archean and Cambrian rocks have been pushed, some- times for a horizontal distance of ten miles. New crystalline structures have been superinduced upon all the rocks affected by these movements, and the resulting crystalline schists may consist of what originally were Archean, Cambrian, or Silurian rocks of ordinary types. In their present condition, however, these eastern schists are certainly later thom the older part of the Silurian system. They cover by far the larger part of the two counties, Along the east coast they are uneonformably covered by the Old Red Sand- stone formation. Rocks of Jurassic (Oolitic) age fringe the eastern shores. In the Black Isle peninsula they include a thin coal scam. Near the Sutors of Cromarty they abound in ammonites, belemnites, and other shells, and in the remains of various woods and ferns. Ironstone, chiefly in the form of bog iron ore, is found in considerable quantities. Of the various mineral springs the best known is that of Strathpeffer, characterized chiefly by sul- phuretted hydrogen gas and various salts. The surface consists principally of lofty mountain groups, intersected by comparatively narrow valleys, oceupied partly by lakesand rivers ; but in the east there is a considerable extent of comparatively level ground.

Soil and Agricultwre.—The most fertile part of the counties is the eastern district, especially that included in the peninsulas of the Black Isle and Easter Ross, the soil varying from a light sandy gravel toa rich deep loam. In this district agriculture is quite as advanced as in any other part of Scotland. In the valleys and along the shores of the western coast there are many patches of good soil, but, partly on account of the excessive rainfall, tillage is uot prosecuted with the same enterprise as in the eastern districts, On the higher grounds there is a large extent of good pasturage for sheep. According to the agricultural statisties for 1885 the total area in Ross and Cromarty under crops, bare fallow, and grass was 134,399 aeres, of which 47,639 acres were under grain crops, 26,496 under green crops, 40,819 rotation grasses, 19,075 permanent pasture, and 370 fallow. The area under wheat has

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been gradually diminishing, being 9715 acres in 1857 and only 1185 in 1885, while that under barley on the other hand has in- creased from 6435 acres to 18,681, and that under oats from 16,256 to 81,685, The area under potatoes has also doubled, in the earlier year being only 4471, while in 1885 it was 8982. The area under turnips has increased from 12,228 to 16,557 and that under rota- tion grasses from 20,869 to 40,819. Horses, principally half-breeds between the old "garrons" and Clydesdales, numbered 7365 in 1885, of which 5874 were uscd solely for purposes of agriculture ; eattle numbered 42,976, of which 17,811 were cows and heifers in milk or in calf, and 17,561 under two years old. They are principally the native Highland breed or crosses. Sheep in 1885 numbered 309, 590, of which 213,522 were one year oldand above. Besides black-faced, crosses with Leicesters and crosses between Leicesters and Cheviots are notuncommon. There is still in Ross and Cromarty a con- siderable extent of native woodland, the trees being principally firs, oaks, ash, and alder. The area under woods in 1881 was 43,201 aeres, The red aud roc deer have free scope on the extensive

-Inountain regions, the area under deer forests being 719,305 aeres,

Toxes, badgers, wild cats, alpine hares, and other wild animals abound. The usual varieties of winged game are plentiful. The golden eagle and osprey are both common, as well as many other birds of prey. Waterfowl of all kinds abound in the extensive sea lochs, and the rivers and inland lochs are specially abundant in trout and salmon. The pearl mussel is found in the bed of the river Conan, According to the latest Landowners' Return, 2043 proprietors possessed 1,971,682 acres in the county of Ross, of a gross annual value of £269,342. The owners of less than one acre numbered 1719. The following owned more than 100,000 acres :—Sir James Matheson, 406,070; Alex. Matheson, 220,433 ; Sir Kenneth S. Mackenzie, 164,680; the duchess of Sutherland, 149,879 ; and Sir C. W. A. Ross, 110,445. For Cromarty separately the Return gives 231 owners, possessing 18,206 aeres, of £11,966 annual value. Manufactures and Trade.—With the exception of distillation, there are no important manufactures within le counties, although home-made woollen cloth is

woven in the country districts. The counties depend chiefly on their agriculture and their fishing, which within recent years has greatly developed through improved means of communication with the south. Stornoway and the west coast have regular communication by steamers with Glasgow, and on the east coast a steamer leaves Cromarty and Invergordon for Aberdeen and Leith once a week. Fish, cattle, and sheep are the principal exports. The Highland Railway skirts the Firth of Cromarty by Dingwall and Tain to Bonar Bridge, a branch passing from Ding- wall south-westwards to Strome Ferry, whence there is communi- cation with Skye by steamer. Salmon fishing is extensively carried on in the bays and inouths of the rivers, and the deep-sea fishings for herring, and for cod and other large fish, are amoug the most important in Scotland. They include the districts of Cromarty on the east coast, of Stornoway in Lewis, of Loch Broom and part of Loch Carron on the west coast, the remainder of the Loch Carron district being in Inverness-shire. The Broad Bay of Stornoway is famed for its founders. Administration and Population.—The two counties of Ross and Cromarty form one sheriffdom, and return one member to parlia- ment. The burghs of Cromarty, Dingwall, Fortrose, and Tain are included in the Wick district of burghs, which returns oue member. From 56,318 in 1801 the population of Ross and Cromarty had increased in 1841 to 78,685, and in 1871 to 80,955 ; in 1881 it was 78,547 (37,027 males and 41,520 females), of whom 56,086 were Gaelic-speaking, It is the fourth most thinly populated county in Scotland, the nuniber of persons to the square mile being 25. The island population amounted to 23,960, of whom 23,149 were in Lewis. The town and village population amounted to 28,665, and the rural to 49,882. The police burghs are Cromarty (population 1352), Dingwall, which is also a royal burgh (1921), Fortrose (869), Invergordon (1092), Stornoway (2627), and Tain (1742). There are thirty-one entire parishes, and parts of two others. fTistory and Antiquitics.—Ross proper, possessed by the Rosses, originally only included the district adjoining the Dornoch and Moray Firths. The first who bore the title of earl of Ross was Malcolm Macbeth, upon whom it was bestowed by Malcolm IY. After his rebellion in 1179 there was a period of chronic insur- rection. By Alexander II. the carldom was bestowed on Fearehar Mac an t-Sagairt (the son of the priest), who being abbot of Apple- cross had already possession of the western district. William, fourth earl, was present with

his clan at the battle of Bannockburn. The earldom reverted to the crown in 1424, and James I. restored it to the heiress of the line, the mother of Alexander, Lord of the Isles (see HEBRIDES, vol. xi. 607). The lands of the earldom were in 1481 conferred on Prince James, second son of James TIL, who in 1478 had been created duke of Ross. Ross was constituted a county in 1661, but the sheriffdom of Cromarty is of more ancient date. At Invercarron Montrose was totally defeated by Colonel Strachan, 27th April 1650; and at Glenshiel, 11th June 1718, General Wight- man defeated the Jacobites. So-called Druidical circles and eaims are very common. Among ancient sculptured stones may be men-

tioned the three according to tradition marking the burial-places of the three sons of a Danishking. The largest, at Shandwick, Clach- a-charridh, or the "Stone of Lamentation," was blown down in a storm in 1847 and broken into three pieces ; a smaller one at Nigg churchyard, struck down by the fall of the belfry in 1725, has been re-erected and fenced round ; and the third, which formerly stood at Cadboll of Hilltown has been removed for preservation to the grounds of Invergordon Castle. An ancient vitrified fort, 420 feet by 120, erowns the hill of Knockfarre] in Fodderty parish. Among old castles are those of Lochslin, in the parish of Fearn, said to date from the 13th century, which, though very ruinous, still pos- sesses two square towers in good preservation; Balone, in the pavish of Tarbat, said to have been built by the earls of Ross; and the remains of Dingwall Castle, the earls of Ross's original seat. Of the abbey of Fearn, transferred from Edderton in 1388, and interesting as having had for its tenth abbot the Reformer Patrick Hamilton, the abbey chureh, much altered, is still used as the parish church. There are a very large number of fine modern mansions.

ROSS, Sir James Cxiark (1800-1862), arctic voyager, was born in London 15th April 1800. He entered the navy in 1812 under his uncle Sir John Ross (see below), whom he accompanied in his first voyage in search of a north-west passage. From 1819 to 1825, and again in 1827, he was engaged with Captain Parry in his voyages. He served under his uncle from 1829 to 1833, discovering the position of the north magnetic pole on

Ist June 1831 (see PoLAR Recions, vol. xix. p. 320). He commanded the expedition in the "Erebus" and "Terror" to the Antarctic seas from 1839 to 1843, and after his return he received in 1844 the honour of knighthood. In 1847 he published 4 Narrative of a Voyage in the Antarctic Regions, 2 vols. His last expedition was in 1848 in the ' Enter- prise" to Baffin's Bay in search of Sir John Franklin. Ife died at Aylesbury, 3d April 1862.

ROSS, Sir Joun (1777-1856), arctic voyager, was the fourth son of the Rev. Andrew Ross, minister of Inch, Wigtonshire, where he was born in 1777. He entered the navy in 1786. In 1818 he sailed in command of an Arctic expedition (see Potar Recions, vol. xix. p. 319), an account of which he published, under the title Voyage of Discovery for the Purpose of Exploring Baffin's Bay, in 1819. In 1829, through the munificence of his friend Sir Felix Booth, he was able to undertake a second expedition (see vol. xix. p. 320). Shortly after his return in 1833 he was knighted, made C.B., and elected a member of many learned societies. In accordance with a promise made to Sir John Franklin, he undertook a third expedition in 1850 and remained one winter on the ice, but accomplished nothing. His own account of the causes of his failure is given in a pamphlet published in 1855. He died 31st August 1856.

Ross also wrote A Treatise on Navigation by Steam, 1828; Me- motrs and Correspondence of Admiral Lord De Sawmarez, 1838; Arctie Expedition, 1850; and several other minor works.

ROSSANO, a city of Italy, in the province of Cosenza, most picturesquely situated on a precipitous spur of the great mountain mass of Sila (geologically the oldest part of Italy) overlooking the Gulf of Taranto. The railway station, 93 miles from Taranto, is about an hour from the town. Rossano is the seat of an archbishop and the centre of a circondario; marble and alabaster quarries are worked in the neighbourhood; and the inhabitants num- bered 14,688 in 1881 (17,979 in the commune). In the cathedral is preserved the Codex Rossanensis, an uncial MS. of the Gospels of Matthew and Mark (6th century) in silver characters on purple vellum, with twelve minia- tures, of great interest in the history of Byzantine art.

Mentioned in the Itineraries, Rossano (Roscianwnr) anpears under the Latin empire as one of the important fortresses of Calabria. Totila took it in 548. The people showed great attach- ment to the Byzantine empire, and the Greek rite was maintained in the cathedral till the time of the Angevins. In the 14th eentury Rossano was made a principality for the great family of De Baux. Passing to the Sforza, and thus to Sigismund of Poland, it was ultimately in 1558 united to the erown of Naples by Philip II. of Spain in virtue of a doubtful will by Bona of Poland in

favour of Giovanni Lorenzo Pappacoda, Under Isabella of Aragon and Bona of Poland the town had been a centre of literary eulture ; but under the Spaniards it rapidly declined eveu in the matter of population (2256 households in 1561, 1177 in 1669). The crown sold the lordship in 1612 to the Aldobrandini, and from them it passed to the Borghesi and the Caraffa. LRossano is best known as the birthplace of St Nilus the younger, whose life is the most valuable source of information extant in regard to the state of matters in southern Italy in the 10th century. Pope John VII. (705-707) was also a native of the town. See Lenormant, La Grande-Gréce, vol. i.

ROSSE, Wittram Parsons, THIRD Earn or (1800- 1867), the distinguished constructor of reflecting telescopes, was born at York on June 17, 1800, a son of the second earl, who as Sir Lawrence Parsons, Bart., had been a pro- minent member of the Irish Parliament. Until his father's death (1841) he was known as Lord Oxmantown. He was M.P. for King's County from 1821 to 1834, Irish represen- tative peer from 1845, president of the Royal Society from 1848 to 1854, and chancellor of the university of Dublin from 1862. From 1827 he devoted himself to the improvement of reflecting telescopes ; in 1839 he mounted a telescope of 3 feet aperture at his seat, Birr Castle, Parsonstown ; and in 1845 his celebrated 6-foot reflector was finished. Owing to the famine and the disturbed state of the country, which demanded his attention as a large landowner and lieutenant of King's County, the instrument remained unused for nearly three years, but since 1848 it has been in constant use, chiefly for observa- tions of nebule, for which it was particularly suited on

account of its immense optical power. Lord Rosse died on October 31, 1867.

The first coustructor of reflecting telescopes on a large scale, . William Herschel, never published auything about his methods of casting aud polishing specula, and he does not appear to have been very suecessful beyond specula of 18 inclies diameter, his 4- foot speculum ("the 40-foot telescope") having been very little used by him (about this question see an interesting discussion between Sir J, Herschel and Robinson in The Athcnwwm, Nos. 881-86, 1848, which deserves to be rescued from oblivion). Lord Rosse had therefore no help whatever in working his way from a small beginning to the brilliant results he achieved. His speculum metal is composed of four equivalents of eopper and one of tin, a very brilliant alloy, which resists tarnish better than any other compound tried. Chiefly owing to the extreine brittleness of this material, Lord Rosse's first larger specula were composed of a number of thin plates of speculum metal (sixteen for a 38-foot mirror) soldered on the back of a strong but light framework made of a peculiar kind of brass (2°75 of eopper to 1 of zinc), which has the same expansion as his speculum metal. In Brewster's Edinburgh Journal of Science for 1828 he described his machine for polishing the speculum, which in all essential points remained unaltered afterwards. It imitates the motions made in polishing a speculum by hand by giving both a rectilinear and a lateral motion to the polisher, while the speculum revolves slowly; by shifting two eccentric pins the eourse of the polisher ean be varied at will from a straight line to an ellipse of very small eccentricity, and a true parabolic figure ean thus be obtained. The speculum lies face upwards in a shallow bath of water (to preserve a uniform tempera- ture), and the polisher fits loosely in a ring, so that the rotation of the speculum makes it revolve also, but more slowly. Both the grinding and polishing tools are grooved, to obtain a uniform dis- tribution of the emery used in the grinding process and of the rouge employed in polishing, as also to provide for the lateral expansion of the pitch with which the polisher is coated. In September 18389 a 3-foot speculum was finished and mounted on an altazimuth stand similar to Herschel's; but, though the definition of the images was good (except that the diffraction at the joints of the speculum caused minute rays in the case of a very bright star), and its peculiar skeleton form allowed the

speculuin to follow atmospheric changes of temperature very quickly, Lord Rosse decided to cast a solid 8-foot speculum. Hitherto it had been felt as a great difficulty in casting specula that the solidification did not begin at one surface and proceed gradually to the other, the common sand mould allowing the edges to coo] first, so that the central parts were subject to great straining when their time of cooling came, and in large castings this generally caused cracking. By forming the bottom of the mould of hoop iron placed on edge and closely packed, and the sides of saud, while the top was left open, Lord Rosse overcame this difficulty, and the hoop iron had the further advantage of allowing the gas developed during the cooling to escape, thus preventing the speculum from being full of

pores and cavities. This happy invention secured the success of the casting of a solid 3-foot speculum in 1840, and encouraged Lord Rosse to make a speculum of 6 feet diameter, which he also succeeded in doing in 1842. In the beginning of 1845 this great reflector (which up to the present time has remained without a rival) was mounted and ready for work. The instrument has a focal length of 54 fect and the tube is about 7 feet in diameter ; owing to these large dimensions it cannot be pointed to every part of the heavens, but can only be moved a short distance from the meridian and very little to the north of the zenith; these restric- tions have, however, hardly been felt, as there is almost at any moment a sufficient number of objects within its reach. From 1848 to 1878 it was with but few interruptions employed for observations of nebule; and many previously unknown features in these objects were revealed by it, especially the remarkable spiral configuration prevailing in many of the brighter nebula. A special study was made of the nebula of Orion, and the resulting large drawing gives an extremely good representation of this complicated object. Since 1845 others have followed in Lord Rosse's footsteps and several 3- and 4-foot mirrors have been made, while the develop- nient of refracting telescopes has been so rapid that, whereas twenty- five years ago there were no object glasses larger than 15 inches in existence, a 30-inch glass has now actually been completed. But, though the refractors surpass the large reflectors in general con-

venience of use and are very much better adapted to work of pre- cision (micrometer measures), Lord Rosse's great reflector is still unapproached in light-grasping power, and remains a noble monument of 'its maker, who (as beautifully expressed on a memorial tablet in the parish church of Birr) "revealed to mankind by the unrivalled creation of his genius a wider vision of the glory of God."

Lord Rosse gave a detailed account of the experiments which step by step had led to the construetion of the 8-foot speeulum in the Philosophical Transactions for 1840. In the same publication for 1844 and 1850 he communicated short descriptions and drawings of some of the more interesting nebule, and in the volume for 1861 he published a paper On the Construction of Specula of 6 feet aperture, and a Selection from the Observations of Nebule made with them, with numerous engravings. The accounts of the observations given in these papers were, however, of a very fragmentary character; but in 1879-80 a eomplete account of them was published by the present earl (" Observations of nebulee and clusters of stars made with the 6-foot and 3-foot reflectors at Birr Castle from 1848 to 1878")in the Scient. Trans. R. Dublin Soe., vol. ii. The drawing of the nebula of Orion was published in the Phi. Trans. for 1868.

ROSSELLLI, Cosimo (1439-c. 1507), a Florentine painter, was born in 1439. At the age of fourteen he became a pupil of Neri di Bicci, and in 1460 he worked as assistant to his cousin Bernardo di Stefano Rosselli. The first work of Cosimo mentioned by Vasari still existsin 8, Ambrogio, in Florence, over the third altar on the left. It is an Assumption of the Virgin, a youthful and feeble work of but little merit. In the same church, on the wall of one of the chapels, is a fresco by Cosimo which Vasari praises highly, especially for a portrait of the young scholar Pico of Mirandola, The scene, a procession bearing a miracle- working chalice, is painted with much vigour and less mannerism than most of this artist's work. A picture painted by Rosselli for the church of the Annunziata, with figures of SS. Barbara, Matthew, and the Baptist, is now in the Academy of Florence. Rosselli also spent some time in Lucca, where he painted several altar- pieces for various churches, none of any great importance. A picture attributed to him, taken from the church of S. Girolamo at Fiesole, is now in the National Gallery of London. It is a large retable,

with, in the centre, St Jerome in the wilderness kneeling before a crucifix, and at the sides standing figures of St Damasus and St Eusebius, St Paolo and St Eustachia; below is a predella with small subjects. Though dry and hard in treatment, the figures are designed with much dignity. The Berlin Gallery possesses three pictures by Rosselli, the Virgin in Glory, the Entombment of Christ, and the Massacre of the Innocents. In 1480 Rosselli, together with the chief painters of Florence, was invited by Sixtus IV. to Rome to assist in the painting of the frescos in the Sistine Chapel. Three of these were executed by him—the Destruction of Pharaoh's Army in the Red Sea, Christ Preaching by the Lake of Tiberias, and the Last Supper. The last of these is still well preserved, but is a very mediocre work. Vasari's story about the pope admiring his paintings more than those of his abler brother painters

has probably but little foundation. frescos were partly painted by his assistant Piero di Cosimo, who was so called after Cosimo Rosselli. His chief pupil was Fra Bartolommeo, Rosselli died in 1484, but this is evidently a mistake, as his will still exists dated November 25, 1506 (see Gaye,

Beschreibung der Stadt Rom, ii. Forschwngen, ii. 265.

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Rosselli's Sistine According to Vasari,

Car. ined., ii. 457, note). For an account of Rosselli's Sistine frescos, see Platner and Bunsen, pt. i.; and Rumohr, Jtalien.

ROSSELLINO, Awnronto (1427-c. 1479), one of the

most skilful of Florentine sculptors, was the son of Matteo di Domenico Gamberelli, and had four brothers, who all practised some branch of the fine arts,

Almost nothing is known about the life of Antonio, but many of his works

Marble Relief by Antonio Rossellino.

still exist, and are of the highest beauty, full of strong religious sentiment, and executed with the utmost delicacy of touch and technical skill. The style of Antonio and his brother (see below) is a development of that of Donatello and Ghiberti ; it possesses all the refinement and soft sweetness of the earlier masters, but is not equal to them either in vigour or originality. Antonio's chief work, still in perfect preservation, is the very lovely tomb of a young cardinal prince of Portugal, who died in 1459, aged only twenty-six. It occupies one side of a small chapel on the north of the nave of San Miniato.! The recumbent effigy of the cardinal is very remarkable for the grace of its pose and the beauty of the portrait face. It rests on a handsome sarcophagus, and over it, under the arch which frames the whole, is a beautiful relief of the Madonna between two flying angels. The tomb was begun in 1461 and finished in 1466; Antonio received four hundred and twenty-five gold florins for it. A repro- duction of this tomb with slight alterations, and of course a different effigy, was made by Antonio for the wife of Antonio Piccolomini, duke of Amalfi, in the church of 8. Maria del Monte at Naples, where it still exists. For the same church he also executed some delicate reliefs, which perhaps err in being too pictorial in style, especially in the treatment of the backgrounds. A fine medallion relief by him is preserved in the Bargello at Florence (see fig.), and the original terra cotta model for this is in the pos- session of Mr Drury Fortnum; in some small matters of

- *Tlustrated by Gonnelli, Afon. Sepol. della Toscana, Florence, 1819, plate xxiii.*

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detail the original terra cotta is superior to the finished marble, especially in the treatment of the infant Christ.

ROSSELLINO, Bernarpo (1409-1464), was no less able asa sculptor than his younger brother (see above), and was also a very distinguished architect. His finest piece of sculpture is the tomb, in the Florentine Santa Croce, of Leonardo Bruni of Arezzo, the historian of Florence ; the recumbent effigy is a work of great merit. The inner cathedral pulpit at

Prato, circular in form ona tall slender stem, was partly the work of Mino da Fiesole and partly by Bernardo Rossellino. The latter executed the very minute reliefs of St Stephen and the Assumption of the Virgin. For his part in the work he received sixty-six gold florins. The South Kensington Museum possesses a relief by Bernardo, signed and dated (1456). It is a fine por- trait of the physician Giovannida§. Miniato.! Bernardo's works as an architect were very numerous and important, and he was also very skilful as a military engineer. He restored the church of §. Francis at Assisi, and designed several fine buildings at Civita Vecchia, Orvieto, and elsewhere. He also built fortresses and city walls at Spoleto, Orvieto, and Civita Castellana. He was largely employed by Nicholas V. and Pius II. for restorations in nearly all the great basilicas of Rome, but at present little trace of his work remains, owing to the sweeping altera- tions which were made during the tasteless 17th and 18th centuries. Between the years 1461 and 1464 (the date of his death) he occupied the important post of capo-maestro to the Florentine duomo. A number of buildings at Pienza, executed for Pius IL, are attributed to him; the Vatican registers mention the architect of these as M° Bernardo di Fiorenza, but this indication is too slight to make it certain that the elder Rossellino is referred to (see Vasari, ed. Milanesi, iii. 93 sq.).

ROSSETTI, Dante Gapriet (1828-1882), poet and painter, whose full baptismal name was Gabriel Charles Dante, was born May 12, 1828, at 38 Charlotte Street, Portland Place, London. He was the first of the two sons and the second of the four children of Gabriele Rossetti, the Italian poet and patriot, whose career was at one period as turbulent as that of his illustrious son was (as far as mere outward incidents went) uneventful.

About 1824 Gabriele Rossetti, the father, after many vicissitudes, reached England, where he married in 1826 Frances Polidori, sister of Byron's Dr Polidori and daughter of a Tuscan who had in early youth been Alfieri's secretary and who had married an English lady. From his mother the subject of this notice inherited as many English traits as Italian, or indeed more. In 1831 Gabriele became professor of Italian in King's College, London, and afterwards achieved a recognized position as a subtle and original, if eccentric, commentator on Dante.

Dante Rossetti's education was begun at a private school in Foley Street, Portland Place, where he remained, however, only nine months, from the autumn of 1835 to the summer of 1836. He next went (in the autumn of 1836) to King's College School, where he remained till the summer of 1843, having reached the fourth class. From early childhood he had displayed a marked pro- pensity for drawing and painting. It had therefore from the first been tacitly assumed that his future career would be an artistic one, and he left school early. In Latin, however, he was already fairly proficient for his age; French he knew well; Italian he had spoken from childhood, and he had some German lessons about 1844-45. But, although he learned enough German to be able to translate the Arme Heinrich of Hartmann von

1 See Perkins, Italian Sculptors, 1864, i. p. 207 ; also Id., Tuscan Sculptors, p. 202, and Historical Handbook of Italian Sculpture, 1883, p. 121.

Aue, and some portions of the Nibelungenlied, he after- wards forgot the language almost entirely. His Greek too, such as it had been, he lost. On leaving school he went to Cary's Art Academy (previously called Sass's), near Bedford Square, and thence obtained admission to the Royal Academy Antique School towards 1846. He did not attend the Royal Academy Life School, and uo doubt his defective knowledge of anatomy was some obstacle to him in after life. The truth is, however, that Rossetti's occasionally defective drawing (which, as regards the throat, is most striking) did not arise mainly from ignorance ; it was the result of a peculiar mannerism. Admiring long and slender necks, and drawing them admirably in such masterpieces as Beata Beatrix and Monna Vanna, he refused to see that in art as in ethics the point of virtue lies midway between two opposite vices. Admiring large hands and massive arms in a woman, and drawing them admirably in such designs as Proserpine, Reverie, &c., he refused to see that hands can be too large, arms too massive. As a colourist, however, Rossetti may be said to have required no teaching, Mastery over colour seemed to have come to him by instinct.

Of the artistic education of foreign travel Rossetti had very little. But in early life he made a short tour in Belgium, where he was indubitably

much impressed and influenced by the works of Van Eyck at Ghent and Memling at Bruges. In the spring of 1848 he took an active part in forming the so-called pre-Raphaelite brother- hood, the members of which believed that the time had come for the artist to confront again Nature herself— imitating no longer man's imitations of her—even though the imitations be those splendid works of the great Raphaelite or post-Raphaelite masters which had hitherto been the inspiration of modern art. The revolution was to be one of motives no less than of methods. Of motive Rossetti was from the first a master. His struggle with methods we have already indicated.

To "paint nature as it is around them, with the help of modern science," was the object of the pre-Raphaelites according to Mr Ruskin, but to do so artists require something more than that "earnestness of the men of the 13th and 14th centuries" which Mr Ruskin speaks of : they require knowledge. Without knowledge, as we see in even such a marvellous design as Christ at the Door of Simon the Pharisee (1859), the artistic camel has to be drawn from the artist's inner consciousness, and the result is rarely a satisfactory quadruped. Intensity of seeing does not necessarily imply truth of seeing ; otherwise what phe- nomenon can be more real than Blake's Ghost of a Flea?

. But Rossetti's genius absorbed from pre-Raphaelitism all that it had to give, and then passed on its way towards its own special goal. Often and indeed mostly an artist's true and best education is unlearning rather than learning. It was so in Rossetti's case, though he had the most vivid personality and the rarest imagination of any man of his time. Plastic as molten wax, the mind from the dawn of consciousness begins learning, for good or ill. Youth, therefore, how rich soever in individual force, can no more help being imitative than a river, even though it be the Amazon itself, can help reflecting the scenery through which it flows. The goal before the young Rossetti's eyes (as we see in such designs as Taurello's First Sight of Fortune, 1848, and Cassandra) was to reach through art the forgotten world of old romance—that world of wonder and mystery and spiritual beauty which the old masters knew and could have painted had not lack of science, combined with slavery to monkish traditions of asceticism, crippled their strength. And he reached it—he reached early

that world which not all the pseudo-classicism that arose in the 15th century, ripened in the 16th, and rotted

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in the 18th could banish from the dreams of man, as we see in even such juvenile work as the pen and ink drawings of Gretchen in the Chapel, and Genevieve. In that great rebellion against the renascence of classicism which (after working much good and much harm) resulted in 18th-century materialism,—in that great movement of man's soul which may be appropriately named '"'the Renascence of the Spirit of Wonder in Poetry and Art" —he became the acknowledged protagonist before ever the pre-Raphaelite brotherhood was founded and down to his last breath at Birchington.

And it was by inevitable instinct that Rossetti turned to that mysterious side of nature and man's life which to other painters of his time had been a mere fancy-land, to be visited, if at all, on the wings of sport. It is not only in such masterpieces of his maturity as Dante's Dream, La Pia, &c., but in such early designs as How they Met Themselves, La Belle Dame Sans Merci, Cassandra, &c., that Rossetti shows how important a figure he is in the history of modern art, if modern art claims to be anything more than a mechanical imitation of the facts of nature.

For if there is any permanent vitality in the Renascence of Wonder in modern Europe—if it is not a mere passing mood—if it is really the inevitable expression of the soul of man in a certain stage of civilization (when the sanc- tions which have made and moulded society are found to be not absolute and eternal, but relative, mundane, ephemeral, and subject to the higher sanctions of unseen powers that work behind "the shows of things"), then perhaps one of the first questions to ask in regard to any imaginative painter of the 19th century is, In what relation does he stand to the newly awakened spirit of romance? Had he a genuine and independent sympathy with that temper of wonder and mystery which all over Europe had preceded and now followed the temper of imi- tation, prosaic acceptance, pseudo-classicism, and domestic materialism ? or was

his apparent sympathy with the temper of wonder, reverence, and awe the result of artistic en- vironment dictated to him by other and more powerful and original souls around him ?

We do not say that the mere fact of a painter's or a poet's showing but an imperfect sympathy with the Renascence of Wonder is sufficient to place him below a poet in whom that sympathy is more nearly complete, because we should then be driven to place some of the disciples of Rossetti above our great realistic painters, and we should be driven to place a poet like the author of The Excursion and The Prelude beneath a poet like the author of The Queen's Wake; but we do say that, other things being equal or anything like equal, a painter or poet of our time is to be judged very much by his sym- pathy with that great movement which we call the Renas- cence of Wonder—call it so because the word romanticism never did express it even before it had been vulgarized by French poets, dramatists, doctrinaires, and literary harle- quins. To struggle against the prim traditions of the 18th century, the unities of Aristotle, the delineation of types instead of characters, as Chateaubriand, Madame de Staél, Balzac, and Hugo struggled, was well. But in studying Rossetti's works we reach the very key of those "high palaces of romance" which the English mind had never, even in the 18th century, wholly forgotten, but whose mystic gates no Frenchman ever yet unlocked. Not all the romantic feeling to be found in all the French romanticists (with their theory that not earnestness but the grotesque is the life-blood of romance) could equal the romantic spirit expressed in a single picture or drawing of Rossetti's, such, for instance, as Beata Beatrix or Pandora. For, while the French romanticists—inspired by the theories (drawn from English exemplars) of Novalis,

Tieck, and Herder—cleverly simulated the old romantic feeling, the "beautifully devotional feeling" which Holman Hunt speaks of, Rossetti was steeped in it: he was so full of the old frank childlike wonder and awe which pre ceded the great renascence of materialism that he might have lived and worked amidst the old masters. Hence, in point of design, so original is he that to match such ideas as are expressed in Lilith,

Hesterna Rosa, Michael Scott's Wooing, the Sea Spell, &c., we have to turn to the sister art of poetry, where only we can find an equally powerful artistic representation of the idea at. the core of the old romanticism—the idea of the evil forces of nature assailing man through his sense of beauty. We must turn, we say, not to art—not even to the old masters themselves—but to the most perfect efflorescence of the poetry of wonder and mystery—to such ballads as the ""Demon Lover," to Coleridge's " Christa- bel" and "Kubla Khan," to Keats's "La Belle Dame sans Merci," for parallels to Rossetti's most characteristic designs. Now, although the idea at the heart of the highest romantic poetry (allied perhaps to that apprehen- sion of the warring of man's soul with the appetites of the flesh which is the basis of the Christian idea) may not belong exclusively to what we call the romantic temper (the Greeks, and also most Asiatic peoples, were more or less familiar with it, as we see in the Saldémdn and Absal of Jami), yet it became peculiarly a romantic note, as is seen from the fact that in the old masters it resulted in that asceticism which is its logical expression and which was once an inseparable incident of all romantic art. But, in order to express this stupendous idea as fully as the poets have expressed it, how is it possible to adopt the asceticism of the old masters? This is the question that Rossetti asked himself, and answered by his own progress in art. Not that it is possible here to give a chronological catalogue of Rossetti's pictures. Moreover this has been already done in great measure by Mr William Sharp, Mr W. M. Rossetti, and others. We shall only dwell upon a few of those which most strongly indicate the course his genius took.

In all of them, however, the poorest and the best, is displayed that power which Blake calls vision—the power which, as he finely says, is 'surrounded by the daughters of inspiration," the power, that is, of seeing imaginary objects and dramatic actions—physically seeing them as well as mentally—and flashing them upon the imagina- tions (even upon the corporeal senses) of others.

It was as early as 1849 that Rossetti exhibited in the so-called Free Exhibition the Girlhood of the Virgin, one of the most beautiful and characteristic of all his works. He scarcely ever exhibited again in

London, though just before his death his largest and most ambitious picture, Dante's Dream, was exhibited at Liverpool.

Then came, in 1850, Zhe Germ, that short-lived maga- zine of four numbers upon which so much has of late been written. If Zhe Germ was really "an official manifesto or apologia of pre-Raphaelitism," all that it had to preach was the noble doctrine of the sacredness, the saving grace, of conscience in art. In it appeared Rossetti's poem the "Blessed Damozel," the prose poem "Hand and Soul" (written as early as 1848), six sonnets, and four lyrics, but none of his designs, though two illustrations had been prepared and discarded on account of their unsatisfactory condition when reproduced. Like the other contributors to The Germ Rossetti had a belief that can only be called passionate in the value of subject in art. For some years his fecundity as a designer was called into astonishing activity, but not always in the field of wonder and poetic mystery. The artist who had had the strongest influence upon Rossetti's early tastes was Madox Brown, whose genius, dramatic and historic, has at length obtained

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universal recognition through the magnificent frescos at Manchester. Though not one of the pre-Raphaelite brotherhood, he had been a contributor to The Germ. Rossetti was deeply impressed with the power and fecun- dity of design displayed by Mr Brown's cartoons exhibited in Westminster Hall, and when he himself began serious work as a painter he thought of Brown as the one man from whom he would willingly receive practical guidance, and wrote to him at random. He became Brown's pupil ; but only once or twice, as in Found and Dr Johnson at the Mitre, did Rossetti try his hand at such realistic subjects as Brown loved, and then with a success that is very surprising if we consider how entirely his artistic energy had worked in very different lines. Found, begun in 1853, still remains unfinished. A countryman entering London in the early morning is accidentally or fatally encountered at the foot of the bridge by his rustic sweetheart, who, having gone to London, has been, in the most pathetic and terrible sense of the word, "lost." At sight of her lover the girl falls fainting at his feet. The expression of shame and

horror on her still beautiful face as she cowers against the wall, and the expression of pity and grief on the man's as he clasps her hands and tries to raise her are unsurpassed and perhaps for sheer power unequalled in modern dramatic art.

Many circumstances—for instance, the beginning of such grand designs as Magdalene at the Door of Simon the Pharisee, " Aspecté Medusa," the Boat of Love, &c.,—inter- fered with the completion of Found. With the exception of the Boat of Love, Dante's Dream (1870) was perhaps Rossetti's most ambitious design in purely imaginative art. From the painting of this picture to his death Rossetti never satisfactorily completed a large and elaborate design —not because his faculty of invention was ever exhausted ; in the very year of his death his brain was teeming with ideas as restlessly as when he designed Found and the Boat of Love. But the truth is that he wanted to write more poetry ; and those wonderful half-lengths of women for which, late in life, he became so famous were not only beautiful and satisfying but comparatively easy of achieve- ment; moreover purchasers were keen to commission them. Among those half-lengths, however, will be found some of his greatest works. Chief among them (if it is not Proserpine) is the marvellous crayon design Pandora in the possession of the present writer. its highest Rossetti's unique faculty of treating classical legend in the true romantic spirit. beauty of Pandora's face, the mysterious haunting sadness in her deep blue-grey eyes as she tries in vain to reclose the fatal box from which are still escaping the smoke and flames that shape themselves as they curl over her head into shadowy spirit faces, grey with agony, between tortured wings of sullen fire, are in the highest romantic mood. And if the Proserpine does not equal this design in elaborate allegorical richness it has perhaps the still higher merit of suggesting lofty tragedy by the simplest means. By sheer force of facial expression, a woman clasping a pomegranate renders a tragic situation as fully as though the canvas had been crowded with figures.

But we must turn to his poetry. "The Blessed Damozel " was written so early as 1848. "Sister Helen" was produced in its original form in 1850 or 1851. The translations from the carly Italian poets also began as far back as 1845 or 1846, and may have been mainly com- pleted by 1849,

Materials for the volume of original poetry (1870) accumulated slowly, and these having been somewhat widely read in manuscript had a very great influence upon our poetic literature long before their appearance in print; but this is not the place for criticiz- ing them in detail. All that we can here say is that in

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poetry no less than in art what makes Rossetti so import- ant a figure is the position he took up with regard to the Renascence of Wonder—-to that modern revival of what is called the "romantic" spirit, that spirit without which English poetry, as the present writer has on a former occasion said when discussing the romantic movement, can searcely hold an original place at all when challenged in a court of universal criticism. The Renascence of Wonder culminates in Rossetti's poetry as it culminates in his paint- ing. The poet who should go beyond Rossetti would pass out of the realm of poetry into pure mysticism, as certain of his sonnets show. Fine as are these sonnets, it is in his romantic ballads that Rossetti (notwithstanding a certain ruggedness of movement) shows his greatest strength. In this opinion (which is not the general one) we agree with Dr Hueffer. "Sister Helen," "The Blessed Damozel," "Staff and Scrip,' "Eden Bower," "Troy Town," " Rose Mary," as representing the modern revival of the true romantic spirit, take a place quite apart from the other poetry of our time.

By the modern revival of the romantic spirit in English poetry we mean something much more than the revival, at the close of the last century, of natural language, the change discussed by Wordsworth in his famous Pre- face, and by Coleridge in his comments thereon—that change of diction and of poetic methods which is com- monly supposed to have arisen with Cowper, or, if not with Cowper, with Burns. The truth is that Wordsworth and Coleridge were too near the great changes in question, and they themselves took too active a part in those changes, to hold the historical view of what the changes really were. Important as was the

change in poetic methods which they so admirably practised and discussed, important as was the revival of natural language, which then set in, it was not nearly so important as that other revival which had begun earlier and of which it was the outeome—the revival of the romantic spirit, the Renas- cence of Wonder, even beneath the weight of 18th- century diction, the first movement of which no one has yet been able clearly and decisively to point out, but which is certainly English, and neither German nor French in its origin, and can be traced through Chatterton, Macpherson, and the Percy Ballads. .

Asa mere question of methods, a reaction against the poetic diction of Pope and his followers was inevitable. But, in discussing the romantic temper in relation to the overthrow of the bastard classicism and didactic materialism of the 18th century, we must, as we have just seen in discussing Rossetti's pictures, go deeper than mere artistic methods in poetry. When closely examined it is in method only that the poetry of Cowper is different from the ratiocinative and unromantic poetry of Dryden and Pope and their followers. Pope treated prose subjects in the ratiocinative—that is to say, the prose—temper, but in a highly artificial diction which people agreed to call poetic. Cowper treated prose subjects too—treated them in the same prose temper, but used natural language, a noble thing to do, no doubt— but this was only a part (and by no means the chief part) of the great work achieved by English poetry at the close of last century. That period, to be sure, freed us from the poetic diction of Pope ; but it gave us something more precious still—it gave us entire freedom from the hard rhetorical materialism imported from France; it gave a new seeing to our eyes, which were opened once more to the mystery and the wonder of the universe and the romance of man's destiny ; it revived in short the romantic spirit, but the romantic spirit enriched by all the clarity and sanity that the renascence of classicism was able to lend,

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The greatest movement that has occurred in later times was that which substituted for the didactic materialism of the 18th century the new romanticism of the 19th, the leaders of which movement, Coleridge and

Scott, were admirably followed by Byron, Shelley, and Keats. Not that Wordsworth was a stranger to the romantic temper. The magnificent image of Time and Death

under the yew tree is worthy of any romantic poet that

ever lived, yet it cannot be said that he escaped save at moments from the comfortable 18th-century didactics, or that he was a spiritual writer in the sense that Coleridge, Blake, and Shelley were spiritual writers.

Of the true romantic feeling, the ever present apprehen- sion of the spiritual world and of that struggle of the soul with earthly conditions which we have before spoken of, Rossetti's poetry is as full as his pictures —so full indeed that it was misunderstood by certain critics, who found in the most spiritualistic of poets and painters the founder of a "fleshly school." Although it cannot be said that '""The Blessed Damozel" or "Sister Helen" or 'Rose Mary" reaches to the height of the masterpieces of Coleridge, the purely romantic temper was with Rossetti a more per- manent and even a more natural temper than with any other 19th-century poet, even including the authorof "'Christabel" himself. As to the other 19th-century poets, though the Ettrick Shepherd in The Queen's Wake shows plenty of the true feeling, Hogg's verbosity is too great to allow of really successful work in the field of romantic ballad, where concentrated energy is one of the first requisites. And even Dobell's " Keith of Ravelston " has hardly been fused in the fine atmosphere of fairy land. Byron's "'footlight bogies" and Shelley's metaphysical abstractions had of course but very little to do with the inner core of romance, and we have only to consider Keats, to whose "La Belle Dame sans Merci" and "Eve of St Mark" Rossetti always acknowledged himself to be deeply in- debted. In the famous close of the seventh stanza of the "Ode to a Nightingale "—

Charmed magic casements opening on the foam Of perilous seas in faery lands forlorn— there is of course the true thrill of the poetry of wonder, and it is expressed with a music, a startling magic, above the highest reaches of Rossetti's poetry. But, with- out the evidence of Keats's two late poems, "La Belle Dame sans Merci" and the " Eve of St Mark," who could have said that Keats showed more than a passing appre- hension of

that which is the basis of the romantic temper —the supernatural? In contrasting Keats with Rossetti it must always be remembered that Keats's power over the poetry of wonder came to him at one flash, and that it was not (as we have.said elsewhere) " till late in his brief life that his bark was running full sail for the enchanted isle where the old ballad writers once sang and where now sate the wizard Coleridge alone." Though outside Coleridge's work there had been nothing in the poetry of wonder comparable with Keats's "La Belle Dame sans Merci," he had previously in "Lamia" entirely failed in rendering the romantic idea of beauty as a malefi- cent power. The reader, owing to the atmosphere sur- rounding the dramatic action being entirely classic, does not believe for a moment in the serpent woman. The classic accessories suggested by Burton's brief narra- tive hampered Keats where to Rossetti (as we see in "Pandora," "Cassandra," and "Troy Town") they would simply have given birth to romantic ideas. It is perhaps with Coleridge alone that Rossetti can be compared as a worker in the Renascence of Wonder. Although his apparent lack of rhythmic spontaneity places him below the great master as a singer (for in these miracles of Coleridge's genius poetry ceases to appear as a fine art at all

—it is the inspired song of the changeling child "singing, dancing to itself"), in permanence of the romantic feeling, in vitality of belief in the power of the unseen, Rossetti stands alone. Even the finest portions of his historical ballad "The King's Tragedy" are those which deal with the supernatural.

In the spring of 1860 Rossetti married Elizabeth Eleanor Siddall, who being very beautiful was constantly painted and drawn by him. She had one still-born child in 1861, and died in February 1862. Mrs Rossetti's own water-colour designs show an extraordinary genius for invention and a rare instinct for colour. He felt her death so acutely that in the first paroxysm of his grief he insisted upon his poems (then in manuscript) being buried with her. These were ata later period recovered, how- ever, and from this time to his death he continued to write poems and produce pictures,—in the latter relying more and more upon his manipulative skill

but exercising less and less,—for the reasons above mentioned,—his exhaustless faculty of invention.

About 1868 the curse of the artistic and poetic tempera- ment, insomnia, attacked him. One of the most distress- ing effects of this malady is a nervous shrinking from personal contact with any save a few intimate and con- stantly seen friends. This peculiar kind of nervousness may be aggravated by the use of narcotics, and in his case was aggravated to a very painful degree; at one time he saw scarcely any one save his own family and imme- diate family connexions and the present writer. During the time that his second volume of original poetry, Ballads and Sonnets, was passing through the press (in 1881) his health began to give way, and he left London for Cumber- land. A stay of a few weeks in the Vale of St John, how- ever, did nothing to improve his health, and he returned much shattered. He then went to Birchington-on-Sea, but received no benefit from the change, and, gradually sinking from a complication of disorders, he died on Sunday the 9th April 1882.

In all matters of taste Rossetti's influence has been im- mense. The purely decorative arts he may be said to have rejuvenated directly or indirectly. And it is doubtful whether any other Victorian poet has left so deep an im- pression upon the poetic methods of his time.

One of the most wonderful of Rossetti's endowments, however, was neither of a literary nor an artistic kind: it was that of a rare and most winning personality which attracted towards itself, as if by an unconscious magnetism, the love of all his friends, the love, indeed, of all who knew him.

See T. Hall Caine, Recollections of Dante Gabriel Rossetti, 1882; and William Sharp, Dante Gabriel Rossetti, a Record and a Study, 1882. (T. W.)

ROSSINI, Groacntvo Anronro (1792-1868), Italian dramatic composer, was born at Pesaro, February 29, 1792. He first studied music under Angelo Tesei, and that so successfully that he was able to sing solos in church when only ten years old, and three years later to appear at the opera house as Adolfo, in Paer's Camilla. He was next placed under a

retired tenor, named Babbini, and on the breaking of his voice he entered the Liceo at Bologna for the purpose of studying counterpoint under Mattei. On his departure from the school, Mattei, who was not pleased. with his progress, told him that he knew enough counter- point to enable him to write in the free style, but that he was quite unfit for the composition of church music. 'Do I know enough to write operas?" asked Rossini. ' Quite enough," was the reply. " Then," said the boy, "TI care to know no more." But in truth his wonderful instinct had taught him a great deal more than either he or Mattei suspected. Rossini's first opera, Za Cambiale di Matri-

monio, was produced with success at the Teatro San Mosé at Venice in 1810. In 1811 he produced L'Hqwivoco stravagante, at Bologna; but his first real triumph was achieved at Venice in 1812, in L'Inganno felice, a work in which his genius unmistakably asserted itself. In the same year he produced La Pietra del Paragone, with equal applause, at Milan, besides four other operas in other places. These pieces were all successful, but Tancredi, written for the Teatro San Fenice at Venice, in 1813, produced a veritable furore. The name of the young maestro was now famous ; yet, strange to say, his greatest comic opera was hissed on its first performance at Rome in 1816. This delightful inspiration, first entitled Alma- viva, but now known as Jl Barbiere di Siviglia, was founded on a libretto which Paisiello had already treated with success, and hence the refusal of the Roman audience to tolerate it. But the beauty of the music overcaine the scruples of the most prejudiced listeners, and, by the time the Barbiere reached its third representation, Rossini was openly accepted as the greatest dramatic composer in Italy. Between 1815 and 1823 Rossini composed no less than twenty operas, including his masterpieces Elcsabetta (1815), 22 Barbiere (1816), Otello (1816), La Cenerentola (1817), La Gaza Ladra (1817), Mose in Egitto (1818), Le Donna del Lago (1819), and Semiramide (1823), the last of which has lately been revived, with so great success, by Madame Adelina Patti.

Rossini visited England in 1823, and in 1824 accepted an engagement as musical director of the Théatre Italien in Paris, where, in 1829, he

produced his last great masterpiece, Guillaume Tell. After completing this beauti- ful work, he composed no more until 1832, when he wrote the first six movements of the Stabat Mater for private performance only. He completed this lovely composition in 1839, and it was first publicly performed at the Salle Ventadour in 1842. In 1855 he settled permanently in Paris, at 2 Rue Chaussée d'Antin, where he composed his last work, the Petite Messe Solennelle, which was first privately performed at the house of M. Pillet Will, March 16, 1864, and posthumously produced at the ThéAtre Italien February 28, 1869. Rossini was twice married—to Isabella Colbran in 1821, and in 1847 to Olympe Pelissier. After his final return to Paris he spent a part of every year in a suburban villa in the Avenue Ingres, at Passy, and here he died of a very pain- ful illness, November 13, 1868. He was buried at the church of the Trinité, November 21, with every possible honour. He was a foreign associate of the Institute, " orand officer of the Legion of Honour," the recipient of innumerable orders, and a member of innumerable musical institutions. Honour was justly lavished upon him ; and, though his career was not free from temporary misfortunes, probably no man of genius ever lived a happier life, or enjoyed more fully the appreciation both of brother artists and the general public.

Rossini effected a complete revolution in the style of Italian opera. His accompaniments were richer than any that had ever been previously heard in Italy, and in their masterly instrumen- tation rivalled some of the most notable achievements of German art. His use of the crescendo and the "cabaletta," though some- times carried to excess, gave a brilliancy to his music which added greatly to the excellence of its effect. Hc first accompanied his recitatives with the stringed orchestra in Elisabetta, and with stringed and wind instruments combined in Otello. And his

overtures are by far the most masterly and complete composi- tions of the kind that the Italian school has ever produced.

ROSTOCK, the largest town of Mecklenburg-Schwerin, and one of the most important commercial cities on the Baltic, is situated on the left bank of the estuary of the Warnow, about eight miles from the sea. It lies

177 miles north-west of Berlin by railway, 80 miles north-east of Liibeck, and 106 miles south of Copenhagen. The city

consists of three parts—the old town to the east, and the middle and new towns to the west—of which the first retains some of the antique features of an old Hanse town, while the last two are for the most part regularly and even hand- somely built. There are several fine squares in Rostock, among them the Bliicher Platz, with a statue of Field-marshal Bliicher, who was born in the town in 1742. Rostock was at one time a fortress of some strength, but the old fortifications have been razed, and their site is now occu- pied by a promenade. Within the last twenty years the suburbs have considerably extended themselves. Rostock has five old parochial churches :—St Mary's, dating from 1398-1472, one of the most imposing Gothic buildings in Mecklenburg ; St Nicholas's, begun about 1250 and re- stored in-1450 ; St Peter's, with a lofty tower built in 1400, which serves as a landmark to ships 20 miles at sea; St James's, completed in 1588; and the church of the Holy Rood, begun in 1270, but now no longer used for service. St Mary's church contains a monument marking the original tomb of Grotius, who died in Rostock in 1645, though his remains were afterwards removed to Delft. Among the other interesting buildings are the curious 14th-century Gothic town-house, the fagade of which is concealed by a Renaissance addition ; the palace of the grand duke of Mecklenburg-Schwerin, built in 1702; the law courts, built in 1878-79; and the new university buildings, erected in 1867-70. The university of Rostock was founded in 1418 by the dukes Johann III. and Albrecht V. From 1437 till 1443 it had its seat at Greifswald in consequence of commotions at Rostock ; and in 1760 it was again removed—on this occasion to Biitzow. 'The professors appointed by the city, however, still taught there, so that there were practically two universities in the duchy until 1789, when they were reunited at the original seat. In winter 1884-5 the uni- versity had a teaching staff of 39, with 265 students ; and it possesses a library of 145,000 volumes, various collections and museums, and a number of scientific and literary auxiliary institutions. Rostock is the seat of the supreme court for both the duchies of Mecklenburg, and is well equipped with schools, hospitals, and other institutions. The population in 1810 was 10,979; in 1880 it was

36,967, of whom only 224 were Roman Catholics, and only 221 were Jews; in 1885 it was 39,212.

Although the population, commerce, and wealth of Rostock have all declined since its palmy days as a flourishing Hanse town in the Middle Ages, it has still a very considerable trade, and no Baltic port possesses so large a merchant fleet. In 1882 314 ships, with a total burden of 97,447 tons, were registered as belonging to Rostock ; and in 1882 730 ships, with a total burden of 80,578 tons entered, and 724 ships, with a total burden of 82,537 tons, cleared, the port. Ships of more than 200 tons burden must discharge part of their cargo at Warnemiinde, at the mouth of the Warnow, the port of Rostock, a fishing village and watering place. with 1766 inhabitants, who are distinguished by a peculiar dialect and costume. By far the most important export of Rostock is grain, which goes almost entirely to British ports ; but wool, flax, and cattle are also shipped. _The chief imports arc coal from Great Britain, herrings from Sweden, petroleum from America, timber, wine, and colonial goods. Rostock has an important fair at Whitsuntide, lasting for fourteen days, and also a frequented wool and cattle market. The industries of the town are very varicd. One of the chief is shipbuilding, which, however, has declined of late years. Cotton, straw hats, tobaeco, carpets, soap, cards, chocolate, and dye-stuffs are among the manufactures of the town, which also contains distilleries, saw-mills, oil-mills, tanneries, and

breweries. ; ;

Local historians assert that a village existed on the site of Rostock as early as 329 a.p., but no certain proofs have been traced of any earlier community than that founded here by Pribislaw II. in the 12th century, which is said to have received town rights in 1218. The earliest signs of commercial prosperity date from about 1260. For a time Rostock was under the dominion of the kings of Den- mark. Soon after returning into the protection of Mecklenburg in 1317, it joined the Hanseatic League ; and in fact was one of the

original members of the powerful and prosperous Wendish Hansa, in

whieh it exereised an influenee seeond only to that of Liibeek. The most prosperous epoeh of its eommereial history began in the latter half of the 15th eentury, preeiselyat the period when its political power began to wane. Rostock, however, never entirely lost the independenee whieh it enjoyed as a Hanse town; and in 1788, as the result of long contentions with the rulers of Mecklenburg, it seeured for itself a peeuliar and liberal munieipal eonstitution, administered by three burgomasters and three ehambers. In 1880 this constitution was somewhat modified, and the eity beeame less like a state within a state. The badge of Rostoek is the figure'7; and a loeal rhyme explains that there are 7 doors to St Mary's ehureh, 7 streets from the market plaee, 7 gates on the landward side and 7 wharves on the seaward side of the town, 7 turrets on the town-house, whieh has 7 bells, and 7 linden trees in the park.

ROSTOFF, on the Don, is one of those modern towns which have grown up with such remarkable rapidity in South Russia since the definite occupation by the Russians of the Black Sea coast. In 1731 a small fort was erected on an island in the Don, near its mouth. Thirty years later the fortifications were transferred to the site now occupied by Rostoff, 5 miles above the head of the first branch of the delta of the Don (Mertvyi Donets), and 13 miles above the real head of the delta, the fort being called Dmitri Rostovskiy. Settlers of all nationalities immediately gathered around it, and here within less than a century a city, which in 1881 had 70,700 inhabitants, sprung up, having a mixed population of Great Russians, Ukrainians, Greeks, Germans, Jews, &c. Rostoff stands on the elevated right bank of the Don, and, viewed from the river, looks fairly imposing ; but the interior still retains the aspect of a large village.

The Don, which here has a breadth of no more than 230 to 250 yards, with a hardly pereeptible current, offers an exeellent road- stead. The navigation, however, is considerably impeded by the shallowness of the branehes of the river, which are thirty in number at its entranee to the sea, but of which only three (Mertvyi Donets, Kolonteha, and the Don proper) are navigable. During the east winds, however, there is only 4 feet depth of water on the bars of the delta ; and ships formerly were often eompelled to stay outside for several weeks, waiting for a south-west wind. Recent dredging operations have but partially remedied this evil, and the

goods have to be earried on lighters to Taganrog and Mariupol, where they are shipped. In 1882 only forty-one ships of small size eoming from foreign countries under the Russian and Turkish flags entered the port, but no fewer than 3175 vessels (349,500 tons), engaged in eabotage or lighter traffie, left the roadstead. The export of eorn, oil-seeds, wool, tallow, butter, iron, hides, ropes, eoarse linen, piteh, &e., from 12,311,000 roubles in 1865, had risen to 41,634,252 roubles in 1882, while the imports were valued at only 886,120 roubles. The agrieultural produee thus exported is drawn from the entire basin of the Don in eentral Russia, while ores and metals are brought from the Urals. The commereial importance of

Rostoff is further inereased by its iis ee on the great highway from Kharkoff and Voronezh to Caueasus, on whieh traftie has greatly inereased sinee Rostoff beeame eonneeted by rail with Kharkoff and Voronezh on the one side and Vladikavkaz on the other. Two fairs, one of whieh has eonsiderable importanee for the whole of south-eastern Russia, are yearly held here, with an estimated turnover of about 5,000,000 roubles. Rostoff has also exeellent fisheries, and in summer it beeomes the gathering plaee of many thousands of labourers on their way to assist in harvesting operations in the provinees of the Don and in northern Caueasia. The population then exeeeds 100,000. The administrative position of Rostoffis quite unique. Along with a territory of 2520 square miles it belongs to the government of Ekaterinoslaff, of which it is a distriet town; but this territory is quite separated from the government, being enelosed by the territory of the Don Cossacks.

ROSTOFF, on Lake Nero, a district town of Russia, in the government of Yaroslavl, and 35 miles by rail south- west of Yaroslavl, is probably the oldest town of north- eastern Russia. Its present importance is due to its fair, which rapidly developed towards the close of last century, and still remains a market where prices of cotton wares are established preliminary to the great fair of Nijni-Nov- gorod, and where a brisk exchange in various kinds of raw materials and unmanufactured articles is carried on. The specialty of Rostoff is the production of a variety of kitchen- garden produce and apothecary's herbs. Chicory and dried sweet peas are the principal objects of trade; in 1880 350,000 cwts., chiefly of

kitchen-garden produce, were exported. Another industry formerly developed in con- sequence of the great influx of pilgrims—that of painting sacred pictures on a kind of enamel—still continues to flourish, The saddlery and linen manufactures, and the fishing, may likewise be mentioned. The population of Rostoff in 1883 was 12,500.

Rostoff was founded by the Slavonians in territory formerly oeeupied by the (Finnish) Meres, and it played so prominent a part in the history of that part of Russia that it used to be known as Rostoff the Great. From the beginning of the 11th century to the 18th it was the ehief town of the great Rostoff territory, which ineluded large parts of the present governments of Yaroslavl, Vladimir, and Novgorod, and seems to have been a populous eity. After the Mongolian invasion it rapidly deelined, and in 1474 it was purehased by Ivan III. and annexed to the growing Moseow prineipality. It was repeatedly plundered by Tartars, Lithuanians, and Poles in the 15th, 16th, and 17th centuries. Its eathedral, built in 1231, still stands, notwithstanding numerous conflagra- tions ; some of the relies it contains are more than eight centuries old. Another ehurch is of still older date, having been built in 1216. Eaeh of its five monasteries has venerated relies of renowned Christian missionaries or Russian prinees.

ROSWITHA. See Hrosvirua.

END OF VOLUME TWENTIETH.

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PRUSSIA PLATE I.

Piares, Vou. XX.—DrIRECTIONS TO BINDER,

oughout the text ts desired, the Plates to be placed opposite the following pages -—

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Plate | < ; : ; page 3 ~ fF ; : ‘ » 165

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which it exercised an influence sccond only to that of Liibeck. The most prosperous epoch of its commercial history began in the latter half of the 15th century, preciselyat the period when its political power began to wane. Rostock, however, never entirely lost the independence which it enjoyed as a Hanse town; and in 1788, as the result of long contentions with the rulers of Mecklenburg, it secured for itself a peculiar and liberal municipal constitution, administered by three burgomasters and three chambers. In 1880 this constitution was somewhat modified, and the city became less like a state within a state. The badge of Rostock is the figure’7 ; and a local rhyme explains that there are 7 doors to St Mary’s church, 7 streets from the market place, 7 gates on the landward side and 7 wharves on the seaward side of the town, 7 turrets on the town-house, which has 7 bells, and 7 linden trees in the park. ROSTOFF, on the Don, is one of those modern towns which have grown up with such remarkable rapidity in South Russia since the definite occupation by the Russians of the Black Sea coast. In 1731 a small fort was erected on an island in the Don, near its mouth. Thirty years later the fortifications were transferred

to the site now occupied by Rostoff, 5 miles above the head of the first branch of the delta of the Don (Mertvyi Donets), and 13 miles above the real head of the delta, the fort being called Dmitri Rostovskiy. Settlers of all nationalities immediately gathered around it, and here within less than a century a city, which in 1881 had 70,700 inhabitants, sprung up, having a mixed population of Great Russians, Ukrainians, Greeks, Germans, Jews, &c. Rostoff stands on —— 2 . aut M+ and wiawed fram the

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Rostoff is further increased by its position on the great highway from Kharkoff and Voronezh to Caucasus, on which traffic has greatly increased since Rostoff became connected by rail with Kharkoff and Voronezh on the one side and Vladikavkaz on the other. Two fairs, one of which has considerable importance for the whole of south-eastern Russia, are yearly held here, with an estimated turnover of about 5,000,000 roubles. Rostoff has also excellent fisheries, and in summer it becomes the gathering place of many thousands of labourers on their way to assist in harvesting operations in the provinces of the Don and in northern Caucasia. The population then exceeds 100,000. The administrative position of Rostoff is quite unique. Along with a territory of 2520 square miles it belongs to the government of Ekaterinoslaff, of which it is a district town; but this territory is quite separated from the

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END OF VOLUME TWENTIETH.

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PRUSSIA PLATE T.

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VOD. XX. QUEENSLAND PLATE IIL

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| High Water Ordinary Spr, Tides _ w Wate medi my Sp Diddle FIG. 14 i i f : . JETTY CHANNEL — ‘io Se i eres WE OU ee PO =a ie a ee = [a } == High Water Ordinary Spr. Tides \ | 4 HOLLAND ny bat nee Lae Mater Ordinary Spr. Tides | iy | a ORI: ©, Dy a a as | | – 3 pos -—~ ar Datum Line 35 Feet below Low Water —__ : ee eee = ie oe | | | . 1, Seale to Plan & Horizontal Seale to Section ry Vertical Scale to Section : | 19000 2000 4000 $000 8000 10,000 Feet BOS Qe ae ae ee ee | a eT = oe a – | SECTION OF OVERFALL WEIR ON THE SEVERN FIG.7 DRUM WEIR HYDRAULIC SHUTTER WEIR 30 Feet | I Fic TUES | fi | | { = ewe = J

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*FIG: 16 FIG. 17 SULLIVANS Le . | ISLAND & FIG. 18 MOUTH OF RIVER ADOUR Rea Saw Weiter: Pome Seearierenta ls Seale. – se { 8 \ “° = =€6=6ho ~ 1000 ~~ 2600 Feet t *

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PLATE VI.

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VOL. XX.

*exe Reference to Antiquities 1 Arch of Constantine 7 = 2 Dolabella \} / e oe Janis f \ 4 Septimius Severus in the Forum (i ‘ ‘ oe ott the Velabrum. 6 Atrium of Vesta. if Basilica. Ulpia 8 Mamertine Prison # Palace of Caligula. JO Column of M. Aurelius il i » Phocas : oe R F oo Drajan UnpuaD cy 13 Colossus of Nero = ‘) I4 Forum Palladian E : Ce Ld, Meta. Sudans , “2] 1G… Obelisk of the Lateran eae | AZ wimg ame OF §. M Maggiore hry 18 * of the Minerva \ f © 3 U4 ‘ it mnie ae Papele ‘ oe 20 . noe. Plogea Navona Pare ; al . pr ons ems Qaaeriretl ~ a RR a sone . Lantheon Porta S.Pancrazio\ 23 : on. Mt Cltorio (Porta Aurelia) \ a4 4 of Trinita, de Monti 26 ‘ on the Pinelan 26 5 of the Vatican. a7 A “ on Villa, Matted 28… Porticus of Octavia RG inen Tomb of Bibulus BO. Site of the Septizoniam. 31 Temple of Faustina 32 o* 1 nn Concora, es – » the Di Consentes JA. ‘ * Saturn = 35 * . _. Fortune = 36 a ». Mars Uleor 37. “ oo, Romulus 38 Torre de Conti 39 van Gella Milixia MODERN ROME showing the Municipal Scheme for the ENLARGEMENT OF THE CITY,*

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SCALES . Engi sh Feet oS 1000 20007 3000 4000 French Metres

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al The Municipal. Scheme for new Houses, Streets Picea and. River Embankment

Gardens and Meadows

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NINTH EDITION

THE

ENCYCLOPEDIA BRITANNICA

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XxXI

EDINBURGH: ADAM AND CHARLES BLACK

MDCCCLXXXVI

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ENCYCLOPADIA BRITANNICA.

ROTHE

oe RicHarp (1799-1867), theologian, was born at Posen, January 28, 1799, of parents in a good position. After passing through the grammar schools of Stettin and Breslau, he studied theology in the universities of Heidelberg and Berlin (1817-20) under Daub, Schleier- macher, and Neander, the philosophers and _ historians Hegel, Creuzer, and Schlosser, exercising a considerable influence in shaping his thought. Fron: 1820 to 1822 he was in the clerical seminary at Wittenberg, and spent the next year in private study under his father's roof at Breslau. In the autumn of 1823 he was appointed chaplain to the Prussian embassy in Rome, of which Baron Bunsen was the head. This post he exchanged in 1828 for a professorship in the Wittenberg seminary, and hence in 1837 he removed to Heidelberg as professor and director of a new clerical seminary; in 1849 he accepted an invitation to Bonn as professor and university preacher, but in 1854 he returned to Heidelberg as pro- fessor of theology and member of the Oberkirchenrath, a position he held until his death, August 20, 1867. Rothe's mental and religious development was one of continuous progress, Asa youth he was the subject of deep religious feeling, with a decided bent towards a supernatural mysticism ; his chosen authors were those of the romantic school, and Novalis remained his life through a special favourite. In Berlin and Wittenberg he came under the influence of Pietism as represented by such men as Stier and Tholuck, though the latter pro- nounced him a "very modern Christian." He afterwards himself confessed that, though he had been a sincere, he was never a happy Pietist. In Rome, where he enjoyed the intimate friendship of Bunsen, and studied church history under the broadening influence of classical and ecclesiastical art, his mind broke loose from the straitened life and narrow views of Pietism and he learned to look at Christianity in its human and universalistic aspects. From that time he began to develop and work out his great idea, the inseparable relation of religion and morals, finding in the latter the necessary sphere and the realiza- tion of the idea of the former. He began then, and particularly after the revolution of J uly 1830, likewise to give a more definite form to his peculiar view of the relations of church and state. In consequence of this

enlargement of his ideas of the world, religion, morals, Christianity, the church and the state, Rothe gradually found himself out of harmony with the Pietistic thought and life of Wittenberg, and his removal to Heidelberg in 1837 and the publication of his first important work (Anfinge der

christlichen Kirche) in that year coincide with the attainment of the principal theological positions with which his name is associated. During the middle period of his career (1837-61) he led the life of a scholastic recluse, taking no active public part in ecclesiastical affairs in any way. During the last six years of his life (1861-67), partly owing to his liberation from great domestic cares and partly to the special circumstances of the church in Baden, he came forward publicly and actively as the advocate of a free theology and of the PRoresTANTENVEREIN (g.v.). This important change in Rothe's practice was preceded by the publication of a valuable series of theological essays (in the Studien und Kritiken for 1860), afterwards published in a separate volume (Zur Dogmatik, Gotha, Ist ed. 1863, 2d ed. 1869), on revelation and inspiration more particularly. These essays were a very searching examina- tion of the relation of revelation to Scripture, and pro- voked much hostile criticism in quarters previously friendly to Rothe, where the relation was usually treated as almost one of identity. In consequence of this publica- tion, and his advocacy of the programme of the Pro- testantenverein, he was classed at the end of his life amongst the more decided theological liberals rather than with the moderate orthodox party, amongst whom so many of his personal friends were to be found.

_ Rothe was one of the most if not the most profound and influential of modern German theologians next to Schleiermacher. Like the latter he combined with the keenest logical faculty an intensely religious spirit, while his philosophical tendencies were rather in sympathy with Hegel than Schleiermacher, and theosophic mysticism was more congenial to him than the abstractions of Spinoza, to whom Schleiermacher owed so much. He classed him- self amongst the theosophists, and energetically claimed to be a convinced and happy supernaturalist in a scientific

-age. A peculiarity of his thought was its systematic

completeness and consistency ; aphoristic, unsystematic, XXI. — 1

timidly halting speculation was to him intolerable. Though his own system may seem to contain extremely doubtful or even fantastic elements, it is

allowed by all that it is in its general outlines a noble massive whole, constructed by a profound, comprehensive, fearless, and logical mind. Another peculiarity of his thought was the realistic nature of his spiritualism: his abstractions are all real existences; his spiritual entities are real and corporeal ; his truth is actual being. Hence Rothe, un- like Schleiermacher, lays great stress, for instance, on the personality of God, on the reality of the worlds of good and evil spirits, and on the visible second coming of Christ. Hence his religious feeling and theological specu- lation demanded their realization in a kingdom of God coextensive with man's nature, terrestrial history, and human society ; aud thus his theological system became a Theologische Ethik. It is on the work published under this title that Rothe's permanent reputation as a theo- logian and ethical writer will rest. The first edition, in three volumes, was published in 1845-48, and remained twelve years out of print before the second (1867-71, in five volumes) appeared. It was the author's purpose to rewrite the whole, but he had completed the first two volumes only of the new edition when death overtook him, The remainder was reprinted from the first edition by Prof. Holtzmann, with the addition of some notes and emendations left by the author.

This work begins with a general sketch of the author's system of speculative theology in its two divisions, theology proper and cosmology, the latter falling into the two subdivisions of Physik (the world of nature) and Zthik (the world of spirit). It is the last subdivision with which the body of the work is occupied. After an analysis of the religious consciousness, which yields the doctrine of an absolute personal and spiritual God, Rothc proceeds to deduce from his idea of God the process and history of creative development, which is eternally proceeding and bringing forth, as its unending purpose, worlds of spirits, partially self-creative and sharing the absolute personality of the Creator. As a thorough-going evolu- tionist Rothe regards the natural man as the consummation of the development of physical nature, and obtains spirit as the personal attainment, with divine help, of those beings In whom the further creative process of moral development is carried on. His theory leaves the natural man, without hesitation, to be developed by the natural processes of animal evolution. The attainment of the higher stage of devclopment is the moral and religious vocation of man; this higher stage is self-determination, the

performance of every human function as a voluntary and intelligent agent, or asa person, having as its cosmical effect the subjection of all material to spiritual existences. This personal process of spiritualization is the continuation of the eternal divinc work of creation. Thus the moral life and the religious life coincide, and when normal are identical ; both have the same aim and are occupied with the same task, the accomplishment of the spiritualization of the world. “ Piety, that it may become truth and reality, demands morality as its fulfilment, as the only conercte element in which the idea of fellowship with God is realized; morality, that it may find its perfect unfolding, requires the aid of piety, in the light of which alone it can comprehend its own idea in all its breadth and depth.” Rothe follows Schleiermacher in dividing his ethical system into the threc parts of the doctrine of moral ends (Giéiterlehre), or the products of moral action, the doctrine of virtue (Tugendlehre), or of the power producing moral good, and the doctrine of duty (Pflichtenlehre), or the specific form and manner in which that power obtains its results. The process of human development Rothe regards as necessarily taking an abnormal form and passing through the phase of sin. This abnormal condition necessitates a fresh creative act, that of salvation, which was, however, from the first part of the divine plan of devclopment. As a preparation for this salvation supernatural revelation was required for the purifying aud revivification of the religious consciousness, and the Saviour Himsclf had to appear in human history as a fresh miraculous creation, born of a woman but not begotten by a man. In consequence of His supernatural birth the Saviour, or the seeond Adam, was free from original sin. By His own moral and religious development He made possible a relation of perfect fellowship between God and man, which was the new and highest stage of the divine creationof mankind. This stage of development inaugurated by the Saviour is attained by means of His kingdom or the community of salvation, which is both moral and religious, and in the first instance and temporarily only rcligious—that is, a

church. As men reach the full devclopment of their nature, and appropriate the perfection of the Saviour, the separation between the religious and the moral life will vanish, and the Christian state, as the highest sphere of human life representing all human functions, will displace the chureh. ‘‘In proportion as the Saviour Christianizes the state by means of the church must the progres- sive completion of the structure of the church prove the

cause of its abolition." The decline of the church is therefore not to be deplored, but recognized as the consequence of the independence and completeness of the Christian life. It is the third section of his work—the Pflichtenlehre—whieh is generally most highly valued, and where his full strength as an ethieal thinker is displayed, without any mixture of theosophic speculation.

Since Rothe's death several volumes of his sermons and of his leetures (on dogmaties, the history of homileties) and a eolleetion of brief essays and religious meditations under the title of Stille Stunden (Wittenberg, 1872) have been published. See F. Nippold, Richard Rothe, ein christliches Lebensbild (2 vols., Wittenberg, 1873-74); Schenkel, "Zur Erinnerung an Dr R. Rothe," in the Allgemeine kirchliche Zeitschrift, 1867-68 ; Holtzmann, '' Richard Rothe," in the Jahrbuchdes Protestantenvereins, 1869; Schwarz, Zur Geschichte der neuesten Theologie (4th ed., Leipsic, 1869, pp. 417-444); Pfleiderer, Religionsphilosophie auf geschichtlicher Grundlage (2d ed., Berlin, 1884, vol. i. pp. 611-615). (J. F. S.)

ROTHERHAM, a market-town and municipal borough in the West Riding of Yorkshire, is situated at the junc- tion of the Rother with the Don navigation, on several railway lines, 5 miles north-east of Sheffield. The parish church of All Saints, occupying the site of a building dating from Anglo-Saxon times, was erected in the reign. of Edward IV., and is a good specimen of Perpendicular. Among the other principal public buildings are the new market-hall, the post office, the court-house, the temper. ance hall, St George's Hall, the council hall, and the cor- poration offices. There are a large number of educational and literary institutions, including the grammar school founded in 1483, the people's charity school, the Indc- pendent college, the mechanics' institute, the free library, and the literary and scientific society. There is a large hospital, besides almshouses and various other charities. The town possesses extensive iron, steel, and brass works, potteries, glass works, breweries, saw mills, and rope yards. The population of the municipal borough (area 5995 acres) in 1881 was 34,782.

The town is of Roman origin, and was of some importance in Anglo-Saxon times. In the time of Edward the Confessor it possessed a market and a church. Mary queen of Scots stayed a night at Rotherham while a prisoner,

as did also Charles I. when in the hands of the Scots. During the Civil War it sided with the Parliament. It was taken possession of by the Royalists in 1643, but after the victory of Marston Moor was yielded up toa detachment of the Parliamentary forces. The townships of Rother- ham and Kimberworth were incorporated as a municipal borough in August 1871, the adjacent suburbs being included in 1879. The corporation act as the sanitary authority, and own the water- works, gasworks, and markets. ‘They have introduccd a system of main drainage, and have also provided a public park and a free library.

ROTHESAY, a royal burgh, and the principal town of the county of Bute, Scotland, is situated in the island of Bute, at the head of a well-sheltered and spacious bay in

‘the Firth of Clyde, 40 miles W. of Glasgow and 18 8.W. of

Greenock, with which there is frequent communication by steamers. The bay affords good anchorage in any wind, and there are also a good harbour and pier. The town is the headquarters of an extensive fishing district, and is much frequented as a watering place. Besides two hydropathic establishments, it has several hotels and numerous lodging houses. Facing the bay there is an extensive esplanade. In the centre of the town are the ruins of the ancient castle, supposed by some to have been erected in 1098 by Magnus Barefoot, and by others at the same date by the Scots to defend themselves against the Norwegians. The village which grew up round the castle was made a royal burgh by Robert ITI., who created his eldest son David duke of Rothsay. During the Commonwealth the castle was garrisoned by Cromwell’s troops. It was burned by the followers of Argyll in 1685, and remained neglected till the rubbish was cleared away by the marquis of Bute in 1816. The principal

modern buildings are the aquarium, the town-hall and county buildings, the public halls, the academy, and the Thomson institute. The corporation consists of a provost, three bailies, a dean of guild, a treasurer, and twelve councillors. The population of the royal burgh in 1871 was 8027 and in 1881 it was 8291. ROTHSCHILD, the name of a Jewish family which has

acquired an unexampled position from the magnitude of its financial transactions. The original name was Bauer, the founder of the house being MayErr ANSELM (17438-1812), the son of Anselm Moses Bauer, a small Jewish merchant of Frankfort-on-the-Main. His father wished him to become a rabbi, but he preferred business, and ultimately set up asa money lender at the sign of the “Red Shield” (othschild) in the Frankfort Juden-gasse. He had already acquired some standing as a banker when his numismatic tastes obtained for him the friendship of William, ninth landgrave and after- wards elector of Hesse-Cassel, who in 1801 made him his agent. In the following year Rothschild negotiated his first great Government loan, ten million thalers for the Danish Government. When the landgrave was compelled to flee from his capital on the entry of the French, he placed his silver and other bulky treasures in the hands of Rothschild, who, not without considerable risk, took charge of them and buried them, it is said in a corner of his garden, whence he dug them up as opportunity arose for disposing of them. This he did to such advantage as to be able afterwards to return their value to the elector at 5 per cent. interest. He died at Frankfort 19th September 1812, leaving ten children, five sons and five daughters. Branches of the business were established at Vienna, London, Paris, and Naples, each being in charge of one of the sons, the chief of the firm always residing at Frankfort, where, in accordance with the wish of the founder, all important consultations are held. By a system of cooperation and joint counsels, aided by the skilful employment of subordinate agents, they obtained unexampled opportunities of acquiring an accurate know-ledge of the condition of the financial market, and practically embraced the whole of Europe within their financial network. The unity of the interests of the several members of the firm has been preserved by the system of intermarriages which has been the general practice of the descendants of the five brothers, and the house has thus grown in solidity and influence with every succeeding generation. Each of the brothers received in 1815 from Austria the privilege of hereditary landowners, and in 1822 they were created barons by the same country. The charge of the Frankfort house de-volved on the eldest, ANSELM Mayer (1773-1855), born 12th June 1773, who was chosen a member of the royal Prussian privy council of commerce, and, in 1820, Bavarian consul and court banker. The Vienna branch was under- taken by Sonomon (1774-1826), born 9th December 1774, who entered into intimate relations with Prince Metter- nich, which

contributed in no small degree to bring about the connexion of the firm with the allied powers. The third brother, Naruan Mayer (1777-1836), born 16th September 1777, has, however, generally been regarded as the financial genius of the family, and the chief originator of the transactions which have created for the house its unexampled position in the financial world. He came to Manchester about 1800 to act as a purchaser for his father of manufactured goods; but at the end of five years he removed to London, where he found full scope for his financial genius. The boldness and skill of his transactions, which caused him at first to be regarded as rash and unsafe by the leading banking firms and financial merchants, latterly awakened their admiration

and envy. By the employment of carrier pigeons and of

_fast-sailing boats of his own for the transmission of news

he was able to utilize to the best advantage his special sources of information, while no one was a greater adept in the art of promoting the rise and fall of the stocks. The colossal influence of the house dates from an operation of his in 1810. In that year Wellington made some drafts which the English Government could not meet; these were purchased by Rothschild at a liberal discount, and renewed to the Government, which finally redeemed at par. From this time the house became associated with the allied powers in the struggle against Napoleon, it being chiefly through it that they were able to negotiate loans to carry on the war. Rothschild never lost faith in the ultimate overthrow of Napoleon, his all being virtually staked on the issue of the contest. He is said to have been present at the battle of Waterloo, and to have watched the varying fortunes of the day with feverish eagerness. Being able to transmit to London private information of the allied success several hours before it reached the public, he effected an immense profit by the purchase of stock, which had been greatly depressed on account of the news of Blucher’s defeat two days previously. Rothschild was the first to popularize foreign loans in Britain by fixing the rate in sterling money and making the dividends pay- able in London and not in foreign capitals. Latterly he became the financial agent of nearly every civilized Govern- ment, although persistently declining

contracts for Spain or the American States. He did not confine himself to operations on a large scale, but on the contrary made it a principle to despise or neglect no feasible opportunity of transacting business, while at the same time his operations gradually extended to every quarter of the globe. He died 28th July 1836, and was succeeded in the manage- ment of the London house by his son Lionzt (1808-1879), born 22d November 1808, whose name will always be associated with the removal of the civil disabilities of the Jews. He was elected a member for the City of London in 1847, and again in 1849 and 1852, but it was not till 1858 that the joint operation of an Act of Parliament and a resolution of the House of Commons, allowing the omission from the oath of the words to which as a Jew he conscientiously objected, rendered it possible for him to take his seat. He continued to represent the city of London till 1874. Jacop (1792-1868), the youngest of the original brothers, was intrusted with the important mission of starting the business in Paris after the restora- tion of the Bourbons, for whom he negotiated large loans. At the Revolution of 1848 he was a heavy loser, and had also to be protected for a time by a special guard. It was by his capital that the earliest railroads were con- structed in France; the profits he obtained from the speculation were very large. He died 15th November 1868. The Naples branch was superintended by an- other of the brothers, Karn (1780-1855). It was always the least important of the five, and after the annexation of Naples to Italy in 1860 it was discontinued.

See Das Haus Rothschild, 1858 ; Picciotto, Sketches of Anglo-Jewish History, 1875; Francis, Chronicles and Characters of the Stock Exchange, 1853; Treskow, Biographische Notizen tiber Nathan Meyer

Rothschild nebst seinem Testament, 1887 ; Roqueplan, Le Baron James de Rothschild, 1868.

ROTHWELL, an urban sanitary district in the West Riding of Yorkshire, situated in a pleasant valley four miles south of Leeds. It is of great antiquity, and soon after the Conquest was granted as a dependency of the castle of Pontefract to the Lacys, who erected at it a baronial residence of which there are still some remains. The church of the Holy Trinity is an old structure in

the Later English style with embattled parapet. There are a mechanics' institute and a working men's club. Coal and stone are obtained in the neighbourhood, and the town possesses match works and rope and twine factories. The population of the urban sanitary district (area 3302 acres) in 1871 was 3733, and in 1881 it was

5105.

ROTIFERA. The Rotifera (or Rotatoria) form a small, in many respects well-defined, but somewhat isolated class of the animal kingdom. They are here treated of sepa- rately, partly on account of the difficulty of placing them in one of the large phyla, partly on account of their special interest to microscopists.

Now familiarly known as "wheel animalcules" from the wheel-like motion produced by the rings of cilia which generally occur in the head region, the so-called rotatory organs, they were first discovered by Leeuwenhoek (1),} to whom we also owe the discovery of Bacteria and ciliate Infusoria. Leeuwenhoek described the Rotifer vulgaris in 1702, and he subsequently described Melicerta ringens and other species. A great variety of forms were described by other observers, but they were not separated as a class from the unicellular organisms (Protozoa) with which they usually occur until the appearance of Ehrenberg's great monograph (2), which contained a mass of detail regarding their structure. The classification there put forward by Ehrenberg is still widely adopted, but numer- ous observers have since added to our knowledge of the anatomy of the group (8). At the present day few groups of the animal kingdom are so well known to the micro- scopist, few groups present more interesting affinities to the morphologist, and few multicellular animals such a low physiological condition.

General Anatomy.—The Rotifera are multicellular animals of microscopic size which present a ccelom. They are bilaterally symmetrical and present no true metameric segmentation. A head region is generally well marked, and most forms present a definite tail region. This tail region has been termed the "pseudopodium." It varies very much in the extent to which it is developed. It attains its highest development in forms like Philodina, which

affect a leech-like method of progression and use it as a means of attachment. We may pass from this through a series of forms where it becomes less and less highly developed. In such forms as Brachionus it serves as a directive organ in swimming, while in a large number of other forms it is only represented by a pair of terminal styles or flaps. In the sessile forms it becomes a con- tractile pedicle with a suctorial extremity. A pseudo- podium is entirely absent in Asplanchna, T'riarthra, Polyarthra, and a few other genera. The pseudopodium, when well developed, is a very muscular organ, and it may contain a pair of glands (fig. 2, a, gl) which secrete an ad- hesive material.

The surface of the body is covered by a firm homogeneous structureless cuticle. This cuticle may become hardened by a further development of chitin, but no calcareous deposits ever take place in it. The cuticle remains softest in those forms which live in tubes. Among the free-living forms the degree of hardening varies considerably. In some cases contraction of the body merely throws the cuticle into wrinkles (Notommata, Asplanchna) ; in others definite ring-like joints are produced which telescope into one another during contraction; while in others again it becomes quite firm and rigid and resembles the carapace of one of the Entomostraca ; it is then termed a "lorica." The lorica may be prolonged at various points into spines, which may attain a considerable length. The surface may be variously modified, being in some cases smooth, in others

1 These numbers refer to the bibliography at p. 8.

marked, dotted, ridged, or sculptured in various ways (fig. 1, Kx). The curved spines of Philodina aculeata (fig: 1, 2) and the long rigid spines of Zriarthra are further develop- ments in this direction. The so-called sete of Polyarthra on the other hand are more complex in nature, and are moved by muscles, and thus approach the "limbs" of Pedalion.

Fig. 1.—A, Floscularia, campanulata, an adult male, drawn from a dead specimen (after Hudson): ¢, testis; oc, eye-spots. B, Floscularia

appendiculata, an adult female (after Gegenbaur): a, the ciliated flexible proboscis. C, Stephano- ceros eichhornii: a, the urceolus. D, Microcodon clavus, ventral view (after Grenacher): m, mouth; a, bristles ; x, architroch ; s, lateral sense-organs. E, Polyarthra plaiyptera : oc, eye-spot; 2” isolated tufts representing a cephalo- troch ; x, branchiotroch; a, 6, and c, three pairs of appendages which are moved bythe muscles m. F, another figure of Polyarthra, to show the position which the appendages may take up. G, Philodina aculeata: oc, eye-spot; s, calear. H, Actinurus neptunius. oc, eye-spot; s, calear. I, Asplanchna sie- boldit, male, viewed from the abdominal surface : a, anterior short arms; b, posterior longer arms; m, mouth; 2’, cephalotrochic tufts; a, branchiotroch, J, Asplanchna sieboldii, female; letters as before, K, Noteus quadvicornis, to show the extent to which the lorica may become sculptured. (All, except where otherwise stated, from Pritchard.)

Several genera present an external casing or sheath or tube which is termed an “urceolus.” In Floscularia and Stephanoceros the urceolus is gelatinous and perfectly hyaline ; in Conochtlus numerous individuals live in such a hyaline urceolus arranged in a radiating manner. The urceolus, which is secreted by the animal itself, may become covered with foreign particles, and in one species, the well-known Melicerta ringens, the animal builds up its urceolus with pellets which it manufactures from foreign

particles, and deposits in a regular oblique or spiral series, and which are cemented together by a special secretion. The urceolus serves as a defence, as the animal can by con- tracting its stalk withdraw itself entirely within the tube.

Locomotor Organs.—While, as mentioned above, several genera or individual species present long spines, these become movable, and may be spoken of as appendages, in two genera only. In Polyarthra (fig. 1, £, F) there are

four groups of processes or plumes placed at the sides of .

Fig. 2,—Floscularia appendicuiata. A and B represent the same animal, some of the organs being shown in one figure and some in the other. oc, eye-spots; g, nerve ganglion ; p, pharynx (the mouth should be shown opening opposite the letter); ma, the mastax ; €, esophagus; st, stomach; a, anus, opening the cloaca; gl, mucous glands in the pseudopodium; 2, nephridia; /, flame-eells; bi, contractile vesicle ; m, m, muscles.

the body, each of which groups can be separately moved

up and down by means of muscular fibres attached to their

bases, which project into the body. The processes them-

selves are unjointed and rigid. In Pedalion (fig. 3), a

remarkable form discovered by Dr ©. J. Hudson in 1871

(12, 18, 14, and 15), and found in numbers several times

since, these appendages have acquired a new and quite

special development. They are six innumber. The largest is placed ventrally at some distance below the mouth. Its

free extremity is a plumose fan-like expansion (fig. 3,

A, a, and H). It is (in common with the others) a hollow

process into which run two pairs of broad, coarsely trans-

versely striated muscles. Each pair has a single insertion on the inner wall—the one pair near the free extremity of the limb, the other near its attachment ; the bands run up, one of each pair on each side and run right round the body forming an incomplete muscular girdle, the ends approximating in the median dorsal line. Below this point springs the large median dorsal limb, which termin- ates in groups of long sete. It presents a single pair of muscles attached along its inner wall which run up and form a muscular girdle round the body in its posterior third. On each side is attached a superior dorso-lateral and an inferior ventro-lateral appendage, each with a

fan- like plumose termination consisting of compound hairs, found elsewhere only among the Crustacea 3 each of these

is moved by muscles running upwards towards the neck and arising immediately under the trochal disk, the inferior ventro-lateral pair also presenting muscles which form a girdle in the hind region of the body. Various other muscles are present: there are two complete girdles in the neck region immediately behind the mouth; there are also muscles which move the hinder region of the body. In addition to these the body presents various processes which are perhaps some of them unrepresented in other Rotifers. In the median dorsal line immediately below the trochal disk there is a short conical process presenting a pair of muscles which render it capable of slight move- ment. From a recess at the extremity of this process spring a group of long setose hairs the bases of which are connected with a filament probably nervous in nature. This doubtless represents a structure found in many Rotifers, and variously known as the “calcar,” “siphon,” “tentaculum,” or “antenna.” This calcar is double in Tubicolaria and Melicerta. It is very well developed in the genera Rotifer, Philodina, and others, and is, when so developed, slightly retractile. It appears to be repre- sented in many forms by a pit or depression set with hairs. The calcar has been considered both as an intromittent organ and a respiratory tube for the admission of water. It is now, however, universally considered to be sensory in nature. Various forms present processes in other parts

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Fig. 3.—Pedalion mira. A, Lateral surface view of an adult female: a, median ventral appendage; 6, median dorsal appendage; c, inferior ventro-lateral appendage : d, superior dorso-lateral appendage ; 7, dorsal sensc-organ (calcar) ; g, “chin;” x, cephalotroch. B, lateral view, showing the viscera: oc, eye- spots ; , nephridia; e, eiliated processes, probably serving for attachment ; other letters as above. C, ventral view: 2x‘, cephalotroch; 2, branchiotroch; other letters as above. D, ventral view, showing the musculature (cf. text). E, dorsal view of:a male: a, lateral appendages ; 6, dorsal appendage. F, lateral view of a male. G, enlarged view of the sense-organ marked 7. Il, enlarged view of the median ventral appendage. (All after Hudsun.)

of the body which have doubtless a similar function, ¢.g., Microcodon (fig. 1, D, s) with its pair of lateral organs. Pedalion presents a pair of ciliated processes in the posterior region of the body (fig. 3, B, c, and p, e), which it can apparently use as a means of attachment; Dr Hudson states that he has seen it anchored by these and swimming round and round in a circle. They possibly re-

present the flaps found on the tail of other forms. Pedalion also has a small ciliated muscular process (fig. 3, a, g) placed immediately below the mouth, and termed a “ chin,” which appears to be merely a greater development of a sort of lower lip which occurs in many Rotifers.

Muscular System.—All the Rotifera present a muscular system which is generally very well developed. Transverse striation occurs among the fibres to a varying extent, being well marked in cases where the muscle is much used. The muscles which move the body as a whole are arranged as circular and longitudinal series, but they are arranged in special groups and do not form a com- plete layer of the body-wall as in the various worms. Some of the longitudinal muscles are specially developed in connexion with the tail or pedicle. Other muscles are developed in connexion with special systems of organs,—the trochal disks, the jaw apparatus, and the reproductive system. The muscles in connexion with the trochal disk serve to protrude or withdraw it, and to move it about, when extruded, in various directions. The protrusion is probably, however, generally effected by the elasticity of the

integument coming into play during the relaxation of the retractor muscles, and by a general contraction of the body wall. The tentaculiferous apparatus of Polyzoa and Gephyrea is protruded in the same manner.

Trochal Disk.—This structure is the peculiar characteristic of the class. It is homologous with the ciliated bands of the larvee of Echinoderms, Chetopods, Molluses, &c., and with the tenta- culiferous apparatus of Polyzoa and Gephyrea, and has been termed in common with these a “velum.” This velum presents itself in various stages of complexity. It is found asa single circum-oral ring (piliduwm), as a single pre-oral ring (Chetopod larve), or as a Single pre-oral ring coexisting with one or more post-oral rings (Cheetopod larvae, Holothurian Jarve). We may here assume that the ancestral condition was a single circum-oral ring associated with a terminal mouth and the absence of an anus, and that the exist- ence of other rings posterior to this is an expression of metameric segmentation, 7.¢., a repetition of similar parts. With the develop- ment of a prostomiate condition a certain change necessarily takes place in the position of this band: a portion of it comes to lie longitudinally; but it may still remain a single band, as in the larva of many Echinoderms. How have the other above-mentioned conditions of the velum come about? How has the pre-oral band been developed? Two views have been held with regard to this question. According to the one view, the fact whether the single band is a pra:-oral or a post-oral one depends upon the position in which the anus is about to develop. If the anus develops in such a position that mouth and anus lie on one and the same side of the band, the latter becomes pre-oral ; if, however, the anus develops so that the mouth and anus lie upon opposite sides of the band, the band becomes post-oral. If we hold this view we must consider any second band, whether pre- or post-oral, to arise as a new development. The other view premises that the anus always forms so as to leave the primitive ring or “architroch” post-oral, 7.2., between mouth and anus. Concurrently with the development of a prostomium this architroch somewhat changes its position and the two lateral portions come to lie longitudinally ; these may be supposed to have met in the median dorsal line and to have coalesced so as to leave two rings—the one pre-oral (a “ cephalo- troch”), the other post-oral (a “ branchiotroch”); this latter may atrophy, leaving the single pre-oral ring, or it may become further developed and thrown into more or less elaborate folds. The exist- ing

condition of the trochal disk or velum in the Rotifera seems to the writer of this article to bear out the latter view as to the way in which modifications of the velum may have come about.

In its simplest condition it forms a single circum-oral ring, as in Microcodon (fig. 1, p). The structures at the sides of the mouth in this form are stated to be bristles, and have therefore nothing to do with the velum (fig. 4, a, y). This simple ring may beeome thrown into folds, so forming a series of processes standing up around the mouth; this is the condition in Stephanoceros (fig. 4, B, p). There are, however, but few forms presenting this simple condi- tion ; and it must be remembered that the evidence for the assump- tion here made, that this is a persistent architroch and not a bran- chiotroel persisting where a cephalotroch has vanished, is not at present conclusive. This band, may, while remaining single and perfectly continuous, become prolonged around a lobe overhanging the mouth—a prostomium. This condition occurs in Philodina (fig. 4, E, F, »); the two sides of the post-oral ring do not meet dorsally, but are carried up and are continuous with the row of cilia lining the “wheels.” There is thus one continuous ciliated band, a portion of which runs up in front of the mouth. This condition corresponds to that of the Auricularian larva. The fold- ing of the band has become already somewhat complicated ; a hypothetical intermediate condition is shown in fig. 4, c, p. The next stage in the advancing complexity is that the prostomial por- tion of the band (fig. 4, G, H, p’) becomes separated as a distinct ring, a cephalotroch ; we find such a stage in Lacinularia (fig. 4,

FERA

G, H), where both cephalotroch and branchiotroch remain fairly simple in shape. In Melicerta (fig. 4, 1, 3) both cephalotroch and branchiotroch are thrown into folds. Lastly, we find that in such forms as Brachionus the cephalotroch becomes first convoluted and

f

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Fre. 4—Diagrams of the Trochal Disk. A, Microcodon, B, Stephanoceros; the mouth lies in the centre of a group of tentacles. C, hypothetical intermediate form between Aficrocodon and Philodina, showing the development of a pro- stomial portion of the velum. D, dorsal view of the same. E, Philodina. F, dorsal view of the same. G, Lacinularia; the dotted line represents the por- tion of the velum which has become separated as a special ring—a cephalotroch. H, dorsal view of the same. I, Melicerta; the dotted line represents the cephalotroch; both this and the branchiotroch have become thrown into folds, J, dorsal view of the same. K,' Brachionus; there is a large pree-oral lobe with three ciliated regions, shown by the dotted lines ¢, c, a discontinuous cephalotroch. L, dorsal view of the same.

m, mouth; p, p', velum ; 7, architroch ; py', portion of the architroch which becomes carried forward to line the prostomial region, but does not become separated ; c, cephalotroch. (Original.)

then discontinuous (fig. 4, K, L, c), and further it may become so reduced as to be represented only by a few isolated tufts, as in Asplanchna (fig. 1, 1, «and a'); in such a form as Lindia (fig. 6, C) the branchiotroch has vanished and the cephalotroch has become reduced to the two small patches at the sides of the head.

The trochal apparatus serves the Rotifera as a locomotive organ and to bring the food particles to the mouth ; the cilia work so as to produce currents towards the mouth.

Digestive System.—This consists of the following regions :—(1) the oral cavity; (2) the pharynx; (3) the cesophagus; (4) the stomach ; (5) the intestine, which terminates in an anus. The anus is absent in one group.

The pharynx contains the mastax with its teeth; these are calcareous structures, and are known as the trophi. In a typical mastax (8, 9) (Bra-] chionus, fig. 5, a) &~ there are a median anvil or inews and two hammer-like portions, mailet. The incus consists of two rami (e) resting upon a cen- tral fulerum (f); each malleus con- sists of a handle or manubrium (e) and a head or wneus (@), pee a comb-

ike structure. Fig. 5 shows some of the most important Fig. 5.-Trophi of various forms: A, Brachionus; B, modifications which Digiena forcipata; C, Asplanchna; D, Philodina. f, the apparatus may fulcrum, and e, e, rami, forming the incus; c, manubrium, exhibit. The parts and d, uncus, forming the malleus, (After Hudson.)

may become very slender, as in Diglena foreipata (fig. 5, B); the mallei may be absent, as in Asplanehna (fig. 5, c), the rami being highly developed into curved forceps aud movable one on the other ; or, the manubria being absent and the fulerum rudimentary, the rami may become massive and subquadratic, as in Philodina (fig. 5, D). All the true Rotifers possess a mastax. HEhrenberg's group of the Agomphia consisted of a heterogeneous collection of forms, —Ichthydium and Chetonotus being Gastrotricha, and Cyphonautes

which often

a Polyzoan larva, while Znteroplea is probably a male Rotifer, and, like the other males, in a reduced condition. There is no reason for

eonsidering this mastax as the homologue of either the gastrie mill of

Crustaceans on the one hand or the teeth in the Cheetopods' pharynx on the other; it is merely homoplastie with these struetures, but has attained a specialized degrec of development. Both the pharynx and the cesophagus which follows it are lined with chitin. The cesophagus varies in length and in some genera is absent (Philo- dinadz), the stomach following immediately upon the pharynx. The stomach is generally large ; its wall consists of a layer of very large eiliated eells, whieh often contain fat globules and yellowish- green or brown partieles, and outside these a connective tissue membrane ; museular fibrille have also been deseribed. Very eonstantly a pair of glands open into the stomach, and probably represent the hepato-panereatie glands of other Invertebrates. Following upon the stomach there isa longer or shorter intestine, which ends in the eloaea. The intestine is lined by eiliated eells. In forms living in an ureeolus the intestine turns round and runs forward, the eloaea being placed so as to

debouch over the margin of the ureeolus. The eloaea is often very large ; the nephridia and oviduets may open into it, and the eggs lodge there on their way outwards; they are thrown out, as are the fieal masses, by an eversion of the eloaca.’ Asplanchna, Notommata sieboldti, and eer- tain species of Ascomorpha are said to be devoid of intestine or anus, exerementitious matters being ejeeted through the mouth yy, Nephridia.—The ecelom contains a fluid in whieh very minute corpuseles have been deteeted. There is no trace of a true vaseular system. The nephridia (fig. 2, 8,) present a very interesting stage of development. They consist of a pair of tubules with an intraeellular lumen running up the sides of the body, at times merely sinuous, at others considerably eonvoluted. From these

are given off at irregular intervals short lateral branehes, eaeh of

whieh terminates in a flame-cel] preeisely similar in strueture to the flame-eells found in Planarians, Trematodes, and Cestodes g here as there the question whether they are open to the ecelom or not must remain at present undeeided. At the base these tubes open either intoa permanent bladder whieh communieates with the eloaea or into a structure presenting apparently no advanee in its development upon the contractile vacuole of a ciliate Infusorian. Nervous System and Sense-Organs.—Various struetures have been spoken of as nervous whieh are now aeknowledged to have been erroneously so deseribed (18). There is a supra-cesophageal gang- lion which often attains considerable dimensions, and presents a lobed appearanee (fig. 2, A and p, g). Connected with this are the eye-spots, whieh are seldom absent. Where these are most highly developed a lens-like strueture is present, produeed by a thieken- ing of the cuticle. In the genus Liotifer and other forms these are plaeed upon the protrusible portion of the head, and so appear to have different positions at different moments. The number of eye- spots varies from one to twelve or more. They are usually red, red- dish-brown, violet, or blaek in colour. Other structures are found which doubtless act as sense-organs. The ealear above-mentioned generally bears at its extremity stiff hairs which have been demon- strated to be in eonnexion with a nerve fibril. On the ventral sur- face of the body just below the mouth a somewhat similar strueture is often developed—the ehin. There are besides at times speeial organs, like the two lateral organs in Microcodon (fig. 1, D, s), which no doubt in eommon with the ealcar and

ehin have a tactile funetion. Reproductive Organs and Development.—The Rotifera were formerly considered to be hermaphrodite, but, while the ovary was always elear and distinet, there was always some diffieulty about the testis, and various structures were put forward as representing that organ. One by one, however, small organisms have been dis- eovered and deseribed as the males of eertain species of Rotifers, until at the present time degenerated males are known to occur in all the families except that of the Philodinade. The male Rotifers are provided with a single cirelet of cilia (a eritroch), a nerve ganglion, eye-spots, muscles, and nephridial tubules all in a some- what redueed condition, but there is usually no traee of mouth or stomaeh, the main portion of the body being oeeupied by the testi- eular sae. There is an aperture eorres onding with the eloaea of the female, where the testis opens into he base of an eversible penis. The males of Floscularia are shown in fig. 1. The male of Pedalion mira possesses rudimentary appendages. The ovary is usually a large gland lying beside the stomach eonnected with a short oviduct whieh opens into the cloaea. The ova often present a reddish hue (Philodina roseola, Brachionus rubens), due doubtless, like the red eolour of many Crustacean ova, to the presence of tetronerythrin. Up to the present our embryologieal knowledge of the group is very incomplete. Many Rotifers are known to lay winter and summer eggs of different character. The winter eggs are provided with a thick shell and probably require fertilization. Two or three of them are often carried about attached to the parent (Brachionus, Notommata), but they are usually laid and fall into the mud, there to remain till the following spring. The summer eggs are of two kinds, the so-ealled male and female ova, both of whieh are stated to develop parthenogenetically. They may be carried about in

large numbers in the eloaea or oviduct or attached to the body of the parent. The female ova give rise to female and the male ova to male individuals, Male individuals are only formed in the autumn in time to fertilize the winter ova.

Habitat and Mode of Life.—The Rotifera are distri- buted all over the earth’s surface, inhabiting both fresh and salt water. The greater number of species inhabit fresh water, occurring in pools, ditches, and streams. A few species will appear in countless numbers in infusions of leaves, &e., but

their appearance is generally delayed until the putrefaction is nearly over. Species of Rotifer and Philodina appear in this way. A few marine forms only have been described—Brachionus millert, B. hepta- tonus, Syncheta baltica, and others.

A few forms are parasitic. Albertia lives in the intestine of the earthworm ; a form has been described as occurring in the body-cavity of Synapta; a small form was also observed to constantly occur in the velar and radial canals of the freshwater jelly-fish, Zimnocodium. Notommata parasitica leads a parasitic existence within the hollow spheres of Volvox globator, sufficient oxygen being given off by the Volvox for its respiration.

Many Rotifers exhibit an extraordinary power of resist- ing drought. Various observers have dried certain Species upon the slide, kept them dry for a certain length of time, and then watched them come to life very shortly after the addition of a drop of water. The animal draws itself to- gether, so that the cuticle completely protects all the softer parts and prevents the animal itself from being thoroughly dried. This process is not without parallel in higher groups ; e.g., many land snails will draw themselves far into the shell, and secrete a complete operculum, and can remain in this condition for an almost indefinite amount of time. The eggs are also able to withstand drying, and are pro- bably blown about from place to place. The fotifera can bear great variations of temperature without injury.

Since their removal from among the Protozoa various attempts have been made to associate the Rotifera with one or other large phylum of the animal kingdom. Huxley, insisting upon the importance of the trochal disk, put forward the view that they were “permanent Echino. derm larve,” and formed the connecting link between the Memertidz and the Nematoid worms. Ray Lankester proposed to associate them with the Chetopoda and Arthropoda in a group Appendiculata, the peculiarities in the structure of Pedalion forming the chief reason for such a classification. There is, however, no proof that we thus express any genetic relationship. The well-developed ccelom, absence of metameric segmentation, persistence of the trochal disk in varying stages of development, and the structure of the nephridia are all characters which point to the Rotifera as very near representatives of the common ancestors of at any rate the J€ollusca,

Arthropoda, and Chetopoda. But the high development of the mastax, the specialized character of the lorica in many forms, the movable spines of Polyarthra, the limbs of Pedalion, and the lateral appendages of Asplanchna, the existence of a diminutive male, the formation of two varieties of ova, all point to a specialization in the direction of one or other of the above mentioned groups. Such specialization is at most a slight one, and does not justify the definite associa- tion of the Rotifera in a single phylum with any of them.

Classification.—The following classification has been recently put forward by Dr C. T. Hudson (19).

Crass ROTIFERA. Order I.—Rhizota.,

Fixed forms ; footattached, transversely wrinkled, non-retractile. truneate. Fam. 1. FLoscunariapgZ. Floscularia, Stephanoceros. Fam. 2. MeicerTapa. Melicerta, Cephalosiphon, Megalo- trocha, Limnias, cistes, Lacinularia, Conochilus.

Order I1.—Bdelloida. Forms which swim and ereep like a leech; foot retractile, jointed, telescopie, termination fureate. Fam. 3. PHILopInaD&. TPhilodina, Rotifer, Callidina.

Order III.—Ploima. Forms which swim only.

Grade A. ILLoRIcATA. Fam. 4. Hypatinapa. Hydatina, Rhinops. Fam. 5. SyncoamTapm. Synchexta, Polyarthra. Fam. 6. NoromMaTaAps. Notommatia, Diglena, Furcularia, Scaridium, Pleurotrocha, Distemma. Fam. 7. TriartHraps. Triarthra. Fam. 8, ASPLANCHNADE. Asplanchna.,

Grade B. Loricara.

Fam. 9. BracuionipZ. Brachionus, Notcus, Anurea, Sac- culus.

Fam. 10. Preropinapz. Pterodina, Pompholyz.

Fam. 11, Evcutanipa, Lchlanis, Salpina, Diplax, Mono- styla, Colurus, Monura, Metopodia, Stephanops, Monocerca, Mastigocerca, Dinocharis.

Order 1V.—Scirtopoda,

Forms which swim with their ciliary wreath, and skip by means of hollow limbs with internal locomotor muscles.

Fam. 12. Pepationipa. Pedalion.

The above list includes only the principal genera. There are, however, a number of forms which could not be placed in any of the above families.

ABERRANT Forms.

Trochosphera xquatorialis (fig. 6, G), found by Semper in the

Philippine Islands, closely resembles a monotrochal polychetous

Fig. 6.—Various aberrant forms. A, Balatro calvus (after Claparéde) : a, mastax. B, Seison nebaliz# (after Claus): m. mouth ; vd, position of the aperture of the vas deferens. C, Lindia torulosa: a, ciliated proeesses at the sides of the head representing eephalotroeh; oc, eye-spots. D, E, and F, Apsilus lentiformis (after Mecznikow). D, adult female with expanded proboscis: m, position of the mouth ; s, lateral sense-organs. E, young free-swimming female. F, adult male. G, Trochosphxra xquatorialis (after Semper): m, mouth; g, ganglion; a, anus; 6, velum; oc, eye-spot; c, museles.

larva while possessing nndoubted|y Rotiferal characters. Meeznikow has deseribed a remarkable form, Apsilus lentiformis (fig. 6, D, B, and F), the adult female of which is entirely devoid of cilia but possesses a sort of retractile hood ; the young female and the males are not thus modified. Claparéde discovered fixed to the bodies of small Oligochetes a curious non-eiliated form, Balatro calvus (fig. 6, A), which has a worm-like very contractile body and a well- developed mastax. As mentioned above, the ciliation is reduced to aminiinum in the curious worm-like form Linda (fig. 6, c). Seison nebalie (fig. 6, B), living on the surface of Nebaliw, which was deseribed originally by Grube, is the same form as the Saccoddella nebali#,

which was supposed by Van Beneden and Hesse to be a leech. It has been shown by Claus to be merely an aberrant Rotifer.

Of the curious aquatie forms Icthydiwm, Chetonotus, Turbanella, Dasyditis, Cephalidium, Chetura, and Hemidasys, which Mecznikow and Claparéde ineluded under the name Gastrotricha, no further account can be given here. They are possibly allied to the Rotifera, but are devoid of mastax and trochal disk.

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formis,” Zeit. f. w. Zool., 1872. (17) C. Semper, “On Trochosphera,’ Zeit. f. w. Zool., xxii.. 1872, (18) K. Eckstein, “ Die Rotatorien der Umgegend von Giessen, *’ Zeit. f.w. Zool., 1883. (19) C. T. Hudson, “On an Attempt to reclassify Rotifers,” Quart. Jour. Mier. Sci., 1884. (&. GaB,)

ROTROU, JEAN DE (1609-1650), the greatest tragic poet of France before Corneille, was born on August 21, 1609 at Dreux in Normandy, and died of the plague at the same place on the 28th June 1650. His family was of small means but of not inconsiderable station, and seems to have had a kind of hereditary connexion with the magistracy of the town of Dreux. He himself was “lieutenant particulier et civil,” a post not easy to trans- late, but apparently possessing some affinity to a Scotch sherifiship substitute.

Rotrou, however, went very early to Paris, and, though three years younger than Corneille, with whom he was intimately acquainted, began play-writing before him. With few exceptions the only events recorded of his life are the successive appearances of his plays and his enrolment in the band of five poets who had the not very honourable or congenial duty of turning Richelieu's dramatic ideas into shape. Rotrou's own first picce, L' Hypocondriaque, appeared when he was only seventeen. His second, La Bague de ''Oubli, an adaptation in part from Lope de Vega, was much better, much more sugges- tive, and much more characteristic. It is the first of several plays in which Rotrou, following or striking out for himself a way which did not lead to much for the time but which was again entered at the Romantic revival, endeavoured to naturalize in France the romantic comedy which had flourished in Spain and England instead of the classical tragedy of Seneca and the classical comedy of Terence. Corneille, as is known to readers of his early work, had considerable leanings in the same direction, and yielded but slowly and unwillingly to the pressure of critical opmion and the public taste. Rotrou's brilliant but hasty and unequal work showed throughout marks of a stronger adhesion to the Spanish (it is needless to say that neither writer is likely to have known the English) model. Cleagénor et Doristée, Diane, Les Occasions Per- dues, L'Heureuse Constance, pieces which succeeded each other very rapidly, were all in the Spanish style. Then the author changed his school, and, in 1632, imitated very closely the Menzchmi of Plautus and the Hercules Hitxus of Seneca. A crowd of comedies and _ tragi-comedies followed, and by the time he was twenty-eight (when documents exist showing the sale of two batches of them to the bookseller Quinet for the sum of 220 livres tour- nois) Rotrou had written nearly a score of plays. He was married in 1640, and had three children, a son and two daughters (none of whom, however, continued the name), and it seems that he went to live at Dreux. Pre- viously, vague and anecdotic tradition describes him as having led rather a wild life in Paris, and especially as having been much addicted to gambling. Among his pieces written before his marriage were a translation of the Amphitryon under the title of Les Deux Sosies, which was not useless to Moliére, Antigone, which was not useless to Racine, and Laure Persecutée (in the opposite style to these classical pieces), which has much merit. These were followed by others until, in 1646 and 1647, Rotrou pro- duced his three masterpieces, Saint Genest, a story of Christian martyrdom containing some

amusing by-play, one noble speech, and a good deal of dignified action ; Don Bertrand de Cabrére, a comedy of merit; and Ven- ceslas, which is considered in France his masterpiece, and which in a manner kept the stage till our own timgs. The subject (in which a father, being constrained to choose between his duty as king and his parental affection, pardons his son for a murder he has committed, but immediately abdicates as feeling himself unworthy to reign) was taken from Francisco de Rojas; the execution,

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though unequal, is in parts very fine. Rotrou's death and its circumstances are known to many who never read a line of his plays.) He was in Paris when the plague broke out at Dreux; the mayor fled, and all was con- fusion. Rotrou, reversing the conduct of Montaigne in somewhat similar circumstances, at once went to his post, caught the disease, and died in a few hours,

Rotrou's great fertility (he has left thirty-five collected plays besides others lost, strayed, or uncollected), and perhaps the uncertainty of dramatic plan shown by his hesitation almost to the last between the classical and the romantic style, have injured his work, He has no thoroughly good play, hardly one thoroughly good act. But his situations are often pathetic and noble, and as a tragic poet properly so called he is at his best almost the equal of Corneille and perhaps the superior of Racine. His single lines and single phrases have a brilliancy and force not to be found in French drama between Cornejlle and Hugo.

A complete edition of Rotrou was edited in five volumes by Viollet le Duc in 1820. In 1882 M. de Ronchaud published a handsome edition of six plays —Saint Genest, Venceslas, Don Bertrand de Cabrére, Antigone, Hercule Mourant, and Cosroes,—the latter Rotrou's last play and a remarkable one. Venceslas and Saint

Genest are also to be found in the Chefs-@euvre Tragiques of the Collection Didot.

ROTTERDAM, a city of the Netherlands in the pro- vince of South Holland, situated in 51° 55’ 19” N. lat. and 4° 29’ 7” E. long., on the right bank of the Nieuwe Maas at the point where it is joined by the Rotte, a small

Plan of Rotterdam.

1. Groote Markt and Statue of Erasmus. 3. Post Office,

2. Bourse. 4, Boymans Museum.

Stream rising near Moerkapelle. By rail it is 14% miles south-east of The Hague and 443 south of Amsterdam. As defined by its I/th-century fortifications the town was an isosceles triangle with a base of 14 miles along the river, but in modern times it has spread out in all direc- tions beyond the limits of its own commune (which was Increased in 1869 by the island of Fijenoord and part of

the south bank of the river) into those of Delfshaven, Kralingen, and Hillegersberg. A huge dyke on which stands Hoog Straat or High Street divides the triangular portion into nearly equal parts—the inner and the outer town ; and the latter is cut up into a series of peninsulas and islands by the admirable system of harbours to which Rotterdam owes so much of its prosperity. The central part of the river frontage is lined by a broad quay called the Boompjes from the trees with which it is planted. From the apex of the triangle the town is bisected by a great railway viaduct (erected about 1870, and mainly con- structed of iron), which is continued across the river to Fijenoord and the south bank by a bridge on a similarly grand scale, the line being the Great Southern Railway which connects Belgium and Holland and crosses the Hollandsch Diep by the Moerdijk bridge. Parallel with

of the Maas

NORTH SEA

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the railway bridge the municipality, in 1873, built a road- bridge, and apart from their ordinary function these con- structions have proved a sufficient barrier to prevent the ice-blocks of the upper part of the river from descending so as to interfere with the seaward navigation. Tram- ways, introduced in 1880, are being gradually extended to various suburbs. While some nine or ten Protestant sects, the Roman Catholics, the Old Roman Catholics, and the Jews are all represented in Rotterdam, none of the ecclesiastical buildings are of primary architectural interest. The Groote Kerk or Laurenskerk is a Gothic brick structure of the fifteenth century with a tower 297 feet high; it has a fine rood screen and an excellent organ, and contains the monuments of Lambert Hendriks- zoon, Egbert Meeuweszoon Kortenaar, Witte Corneliszoon de Witt, Johan van Brakel, Johan van Liefde, and other Dutch naval heroes. Among the more conspicuous secular buildings are the Boymans Museum, the town-house (restored in 1823-1827), the exchange (1723), the Delft Gate (1766), the court-house, the post and telegraph office (1875), the corn exchange, the seamen’s home (1855), the hospital (1846), and the theatres. The Boymans Museum is mainly a picture gallery, which became the property of the town in 1847. When the building, originally erected in 1662-63 as the assembly house of Schieland, was burned down in 1864, most of the pictures perished, but the museum was restored by 1867, and the collection, steadily recruited, is again rich in the works of Dutch artists. The ground floor also contains the city archives and the city library. The maritime museum, established in 1874 by the Yacht Club, is a remarkable collection of ship models, and the Society of Experimental Philosophy has a considerable collection of instruments, books, and specimens. At the north-west corner of the town an area of several acres is occupied by the zoological garden, which dates from 1857. Besides the Erasmus Gymnasium the XXI. — 2

educational institutions comprise an academy of art and technical science, a naval school, an industrial school, a deaf and dumb asylum, &. In the Groote Markt (to the south of the Hoog Straat) stands the bronze statue of Erasmus (Gerrit Gerrits), erected by his fellow-citizens in 1662 ; and his birth-house, now a tavern in Wijde Kerk- straat, is distinguished by a Latin inscription. The statue by Grefs of Gijsbert Karel van Hogendorp (1762—1834), a great Dutch statesman, gives his name to the Hogendorpsplein, formerly Boymansplein, behind the museum; in the "Park," which extends west along the bank of the Maas, is a marble statue by Strackée of Hen- drik Tollens, the Dutch poet; and the Nieuwmarkt is adorned with a fountain in memory of the jubilee (1863) of the restoration of Dutch independence (1813). Exten- sive works for supplying the town with filtered water were constructed between 1870 and 1875, the water in the river and canals being rendered unwholesome by the sewerage, the treatment of which naturally presents great difficulties in a city lying in great part below high-water level. The most important industrial establishment is that of the Netherlands Steamboat Company, who are ship- owners, shipbuilders, and engineers ; there are also exten- sive sugar-refineries and a great variety of smaller factories for the production of lead, iron, and copper wares, white lead, varnishes, tobacco and cigars, beer and vinegar, chocolate and confectionery, &c. Rotterdam is, however, not so much a manufacturing as a commercial city, and its commercial progress has been very striking since the middle of the century. While in 1846 it had only 321,764 tons out of the total of 1,024,705 tons which then represented the export trade of the Netherlands, in 1883 it had 1,940,026 tons out of a total of 3,953,009 tons. In 1850 it had only 27:9 per cent. of the outgoing vessels, and 35°77 per cent. of the tonnage; by 1870 it had 35°60 per cent. of the vessels and 50°37 of the tonnage, and by 1883 43°75 per cent. of the vessels, and 49-08 of the tonnage. Rotterdam has thus become what Amsterdam formerly was—the principal port in the country. For steamers it is now, since the opening of the new waterway through the Hoek van Holland in 1872, only two hours distant from the sea, and the channel is deep enough for vessels drawing 22 feet of water.1 From 4471 vessels with a register tonnage of 1,688,700 tons in 1873, the shipping clearing from the Netherlands by the new waterway had increased by 1884 to 8177 vessels with register tonnage of 4,382,100 tons. Up- wards of 18,000 emigrants left Europe by Rotterdam in 1881. Besides its maritime trade Rotterdam

commands a most extensive river traffic, not only with the towns of the Netherlands, but with those of Belgium and Ger- many. With Germany alone its Rhine traffic amounted in 1883 to 1,706,587 tons, against 2,021,644 for all the other ports of the Netherlands. On January 1, 1885, Rotterdam owned 43 sailing vessels and 50 steam-ships with a united aggregate burden of 99,018 tons. Owing

1 Previously the only direct way to the sea was by the Brielle (Brill) Channel, where in 1856 the fairway had gradually diminished in depth to 5 feet at low water and 11 or 12 feet at high water. In 1866 the works for the new waterway were commenced, and by November 1868 the canal from the Scheur (or northern arm of the Maas) across the Hoek had been dug. The seaward piers were com- pleted to the originally proposed length of (together) 2800 metres, but in 1874 they were prolonged to a total of 4300 metres, thus jutting out into the sea for more than a mile. Contrary to expecta- tions the scour was not strong enough to widen the fairway; and works for this purpose were commenced in 1877, and at a later period the width of 900 metres between the piers was reduced to 700 metres by constructing an inner pier north of the south pier. The whole work has cost upwards of 23,000,000 guilders (£1,750,000)—154 millions expended up to 1879, and 7# between 1881 and 1884. With

the exception of a contribution of not more than 3,000,000 from the city of Rotterdam, the entire sum has been paid by the state.

to the great increase of navigation and commerce the berthing accommodation of the port frequently proves too small, though by the works at Fijenoord the length of the quays has of late years been extended by about 8000 metres. This island, two-thirds of which was purchased by the town in 1591 and the remaining third in 1658, was dyked in 1795, and became the seat of a building which has been in succession a pest-house, a military hospital, a naval college, and a private industrial school. The Netherlands Steamboat Company established its work- shops there in 1825 ; and in 1873 the Rotterdam Trading Company began to construct the harbours and warehouses which have been purchased by the city. The population of the commune of Rotterdam, which did not much exceed

20,000 in 1632, was 53,212 in 1796, 72,294 in 1830, 88,812 in 1850, 105,858 in 1860, 132,054 in 1876, and 148,102 in 1879-80. In 1870 the city contained 111,256 inhabitants, the suburbs 3341, and the ships 2478, and in 1884 the total, exclusive of the shipping, was 169,477.

Rotterdam probably owes its origin to the castles of Wena and Bulgerstein, of which the former was laid in ruins by the Hoek party in 1426. In 1299 Count John I. granted the “ good people of Rotterdam” the same rights as the burghers of Beverwijk, and freedom from toll in all his lands. In 1597 a sixth extension of the town’s area took place, and a seventh followed in 1609. Francis of Brederode seized the place in 1488, but had to surrender it to the emperor Maximilian in 1489, The Spaniards were in possession from April 9th to July 31st 1572, having gained entrance partly by treachery and partly by force (see Motley, Dutch Republic, ii.). It was at a meeting of the states held at Rotterdam in June 1574 that the relief of Leyden was determined on, though it was not till 1580 that the town obtained a vote in the assembly.

ROUBAIX, a manufacturing town of France, the second in population in the department of Nord, lies to the north-east of Lille on the Ghent Railway and on the canal connecting the lower Deule with Scheldt by the Marg and Espierre. Several tramway lines traverse the town and connect it with various manufacturing centres in the neighbourhood. The population of Roubaix, which in 1881 was 79,700 (the commune 91,757), is almost entirely manufacturing, and the trading firms of the town gave employment besides to an equally large number of hands in the vicinity. The weaving establishments number 300 (250 for woollen or woollen and cotton goods), the leading products being fancy and figured stuffs for waistcoats, trousers, overcoats, and dresses, velvet, barége, orleans, furniture coverings, and the like. The yearly production is estimated at £6,000,000, but the annual turnover ex- ceeds £8,000,000, if all the industries of the place are taken into account. These include 70 wool-spinning mills, 12 cotton mills, silk-works, wool-combing establishments, carpet manufactories, dye-houses, soap-works, machine- works, and foundries. Roubaix possesses several interest- ing churches, a library and art museum, a most interesting museum of local industries, communal schools of art and music, an industrial school for weaving, founded in 1857, a chamber of commerce dating from 1871, a

chamber of arts and manufactures, a board of prud'hommes, and an agricultural and horticultural society.

The prosperity of Roubaix has its origin in the first factory franchise, granted in 1469 by Charles the Bold to Peter of Rou- baix, a descendant of the royal house of Britanny ; but the great development of the manufacturing industries of the town and the growth of its population date from the French Revolution. The population, which in 1804 was only 8700, had risen in 1861 to 40,274, in 1866 to 65,091, and in 1876 to 83,000.

ROUBILIAC, Lovis Francois (1695-1762), an able French sculptor. Born at Lyons in 1695, he became a pupil of Balthasar of Dresden and of N. Coustou. About the year 1720 he settled in London, and soon became the most popular sculptor of the time in England, quite super- seding the established success of the Flemish Rysbracck.

He died on January 11, 1762, and was buried in the church of St Martin-in-the-Fields. Roubiliac was very largely employed for portrait statues and busts, and especially for sepulchral monuments in Westminster Abbey and else- where. His chief works in the abbey are the monuments of Handel, Admiral Warren, Marshal Wade, Mrs Night- ingale, and the duke of Argyll, the last of these being the first work which established Roubiliac's fame as a sculptor. The statues of George I., Sir Isaac Newton, and the duke of Somerset at Cambridge, and of George II. in Golden Square, London, were also his work, as well as many other important pieces of portrait sculpture. 'Trinity College, Cambridge, possesses a series of busts of distinguished members of the college by him.

Roubiliac possessed much skill in portraiture, and was technically a real master of his art, but unhappily he lived at a time when it had reached a very low ebb. His figures are uneasy, devoid of dignity and sculpturesque breadth, and his draperies are treated in a manner more suited to painting than sculpture. His excessive striving after dramatic effect takes away from that repose of atti- tude which is so necessary for a portrait in marble. His most celebrated work, the Nightingale monument, in the north transept of Westminster Abbey, a marvel of technical skill, is only saved from being

ludicrous by its ghastly hideousness. On this the dying wife is represented as sinking in the arms of her husband, who in vain strives to ward off a dart which Death is aiming at her. The lower part of the monument, on which the two portrait figures stand, is shaped like a tomb, out of the opening door of which Death, as a half-veiled skeleton, is bursting forth. Wonderful patience and anatomical realism are lavished on the marble bones of this hideous figure, and the whole of the grim conception is carried out with much skill, but in the worst possible taste. The statue of Handel in the south transept is well modelled, but the attitude is affected and the face void of any real expres- sion. Itisa striking proof of the degraded taste of the age that these painful works when first set up were enthusi- astically admired.

ROUCHER, Jean Antoine (1745-1794), a French poet, to whom a melancholy fate and some descriptive verse equal to anything written during at least three- quarters of a century by any of his countrymen except André Chénier, gave some reputation, was born on February 17, 1745 at Montpellier, and perished by the guillotine at Paris on July 25, 1794. He wrote an epithalamium on Louis XVI. and Marie Antoinette, gained the favour of Turgot, and obtained a salt-tax collector- ship. His main poem was entitled Les Mois; it appeared in 1779, was praised in MS., damned in print, and restored to a just appreciation by the students of literature of the present century. It has the drawbacks of merely didactic- descriptive poetry on the great scale, but much grace and spirit in parts. Roucher was by no means anti- revolutionary, but ill-luck and perhaps his unpopular em- ployment made him a victim of the Revolution. He lay in prison for nearly a year before his death, and went to it on the same tumbril with Chénier. The malicious wit of Rivarol’s mot on the ill-success of Les Mois, “C’est le plus beau naufrage du siécle,” is not intelligible unless it is said that one of the most elaborate passages describes a shipwreck.

ROUEN, a city of France, the ancient capital of

Normandy, and now the administrative centre of the |

department of Seine Inférieure, the seat of an arch- bishopric and a court of appeal, and the headquarters of the third corps d’armée, stands on a level site on the right bank of the Seine in 49° 26’ N. lat. and 1° 6’ E. long. at the point where it is joined by the Aubette and

the small Riviere de Robec ; it has also crept some dis- tance up the hills which enclose the valley on the right, and has an extension on the plain on the left bank. The faubourgs by which it is surrounded are, reckoning from the east, Martainville (on the left bank of the Robec), St Hilaire, Beauvoisine, Bouvreuil, and Cauchoise ; and the portion which lies on the left bank of the Seine is known as the Faubourg St Sever. Between the old town and the faubourgs runs a line of boulevards. Communication between the two banks of the river is maintained by ferry- boats and by two bridges; the upper bridge, a stone struc- ture, is divided into two parts by the Lacroix island and decorated by a statue of Corneille; the lower is an iron suspension bridge which opens in the middle to let masted vessels pass. The railway from Havre to Paris crosses the Seine a little above Rouen, and having passed by a tunnel under the higher quarters of the city reaches a station on the north ata distance of 87 miles from Paris and 55 from Havre. Another station at Martainville is the terminus of the line from Rouen to Amiens; and at St Sever are those of the lines to Paris and to Orleans by Elbeuf. Since about 1860 wide streets have been driven through the old town, and tramway lines now traverse the whole city and its environs. Rouen, which is 78 miles from the sea, stands fourth in the list of French ports, coming next to Marseilles, Havre, and Bordeaux. Em- bankments constructed along the lower Seine have forced the river to deepen its own channel, and the land thus reclaimed has more than repaid the expenses incurred. The port is now accessible to vessels drawing 21 feet of water, and by means of easy dredgings this will be increased to from 25 feet to 28 according to the tide. The expansion of the traffic as the improvements have advanced is shown by the following returns: whereas in 1856 the number of vessels entered and cleared was 6220, with an aggregate burden of 570,314 tons, the corresponding figures were 4511 and 748,076 in 1876, and 5189 and 1,438,055 in 1880. What is now wanted is an increased amount of quay accom- modation, the old line of quays scarcely exceeding J mile in length. The building of new quays and repairing-docks for large vessels is in active progress; the port is being dredged and deepened; and schemes are under considera- tion for a slip, a petroleum dock, and corn elevators.! Rouen has regular steamboat communication with Bor- deaux, Spain, Algeria, London,

Hull, Goole, Plymouth, Bristol, and Canada. A sunken chain allows boats to be towed up to Paris and beyond.

The population of the six cantons of Rouen in 1881 was 105,906, but if the suburbs are included the figure may be stated at about 150,000.

The imports landed at Rouen include cottons, wheat, maize, and petroleum from America; coal and iron from England ; marble, oils, wines, and dried fruits from Italy; wines, wools, ores, and metals from Spain; grain and wool from the Black Sea; grapes from the Levant; rice from India; coffee from the French colonies; oil seeds, timber, dyewoods, foreign textile fabrics, Dutch cheese, &e. The articles of export comprise grain, table fruits, oil-seeds and oilcake, sugar, olive oil, palm oil, timber, hemp, linen, and wool, marble, granite, hewn stone, plaster and building materials, sulphur, coal, pig-iron, steel, copper, lead, zinc, salt, dyestuffs and other chemical products, wines, brandy, ciders, earthenware and glass- ware, machinery, packing-paper, &c.

Cotton spinning and weaving are carried on in the town, and especially the manufacture of rowennerics (cotton fabrics woven with

dyed yarn). In this connexion the department of Seine Inférieure gives employment to 200,000 workmen, most of them in Rouen and

1 See De Coene, Congrés de l' Association Francaise pour lV avance- ment des sciences, Rouen, 1883.

its neighbourhood, and makes use of 30,000 tons of cotton annually. In 1876 there were in the Rouen district 1,099,261 spindles engaged in cotton-spinning, and 9251 power-looms. Hand-loom weaving is prosecuted (mainly in the country districts) by 13,000 workmen. In the rowennerie department 190 manufacturers were engaged, producing annually to the value of £2,400,000. In the manufacture of printed cotton and woollen goods 22 establishments and 5000 workmen are employed. The annual production of printed calico amounts to 1,000,000 pieces, each 105 metres (about 115 yards) long ; 22 establishments with 700 workmen are devoted

to the dyeing of eotton cloth, and 32 establishments with 1200 workmen to the dyeing of cotton thread, the industry being specially favoured by the quality of the water of Rouen. There are also 3 soap works, 7 chemical works, manufacturing soda, vitriol, and dyestuffs, and 10 iron foundries. Engineering works manufacture steam-engines, spinning-machines, and weaving-looms, agricultural maehines, sewing-maehines, &c., which are sold throughout Franee and exported to other countries to a total value of £360,000. There is an establishment at Déville for refining copper and manu- facturing copper pipes. Other works at Rouen are distilleries, oil mills, bleacheries and cloth-dressing establishinents, tanneries, and ship-building yards. The town is also famous for its confectionery, especially sucres de pomme. Among the public institutions are extensive poorhouses (1800 beds in the hospice général), several theatres, a public library (118,000 volumes and 2500 MSS.), a theo- logieal faculty, a preparatory =

school of medieine and phar- macy, a preparatory school for higher instruction in science and literature, and schools of agriculture, botany, and forestry, painting and drawing schools, &c. Besides the Grand Cours, whieh runs along the bank of the Seine above the town and is lined with magnificent elms, the publie promenades comprise the Cours Boieldieu, with the composer's statue, the Solfer- ino garden in the heart of the |x; town, and the botanical gar- densatSt Sever. (G. ME.)

- History.—Ratuma or Ratn- macos, the original name of Rouen, was modified by the Romans into Rotomagus, and by the writers of medieval Latin into Rodomum, of which the present name is a corrup-

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tion. Under Cesar and the

early emperors the town was ,

the capital of the Veliocas- g ry sians, a people of secondary ny "a oie

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rank, and it did not attain to any eminence till it was made the centre of Lugdunensis Secunda at the close of the 3d eentury, and a little later the see of an arch-

A bishop. Rouen was largely indebted to its first bishops—

from St Mello, the apostle of the region, who flourished about 260, to St Remigius, who died in 772. Ten or twelve of those prelates have the title of saints; they built in their city many churches, and their tombs became in turn the origin of new sanctuaries, so that Rouen was already, at that early period, what it has remained to the present time, and in spite of its political character—a religious city full of ecclesiastical monuments. From this period there has been preserved the precious erypt of St Gervais, which contains the tomb of the second bishop of Rouen, St Avitiau. Under Louis “le Debonnaire” and his successors Normans several times sacked the city, but the conversion of Rollo in 912 made Rouen the capital of Normandy, and raised it to a greater degree of prosperity than ever. The first Norman kings of England rather neglected Rouen in favour first of Caen aud afterwards of Poitiers, Le Mans, or Angers ; but the monas- teries, the local trade and manufactures, and the eommunal organization, which the people of Rouen had exacted from their sovereigns in 1145, maintained a most flourishing state of affairs, indicated by the rebuilding of several sumptuous churches, and notably of the great abbey which had been erected in the 5th century by St Victrix, and afterwards took the name of St Ouen from the bishop whose tomb it contained. Of this restora- tion there remains in the present building a small apse of two stories, the only Norman fragment of any importance preserved by the ancient capital of Normandy. The union of this province to

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France by Philip Augustus in 1204 did no dainage to the prosperity of Rouen, although its inhabitants submitted to their new master only after a siege of nearly three months. ‘To this period belong, if not the commencement, at least the rapid erection of the most important building in the town, the cathedral of Notre Dame, whose vast pile, ereeted between 1200 and 1220 by an architect ealled Ingelram or Enguerrand, underwent so many alterations, restorations, and extensions that it took its final form only in the 16th century. It isin plan a Latin cross 427 feet in length, with aisles completely surrounding it and giving access to the three great chapels of the choir. The west facade and those of the. transept are of extreme richness. Eaeh was surmounted by two towers, of which only one—the Butter Tower (Tour de Beurre)— was completed. The western fagade, frequently enlarged, embel- lished, or restored from its first construction to the present time, has two charming side doorways of the close of the 12th century, a great central doorway, a rose window, and countless arcades and Gothic pinnacles and turrets of the close of the 15th and the beginning of the 16th century. The width of the front is increased by the pro- jection of the two towers: that on the left hand, the Tour Saint- Romain, was commenced about 1200, and raised to a greater height in 1465-1477 ; that on the right hand, the finer, has a height of 260 feet, and takes its name of Butter Tower from the fact that it was erected between 1485 and 1507 by means of the moneys paid by the faithful for permission to eat butter in Lent. On the north

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side of the cathedral are various accessory buildings dating from the Middle Ages, and the Booksellers' Portal, corresponding to the Portail de la Calende in the south transept. Both portals are adorned with statues, and both, as well as the towers which flank them, date from the reigns of St Louis and Philip the Fair. Above the transept rises the central tower, which was rebuilt in the 15th and 16th centuries, and had before its destruction by fire in 1822 a height of 480 feet. The iron spire added in 1876, though unfortunately much too slender, has raised it to a height of 485 feet, and thus made it the highest erection in Europe after the spires of Cologne cathedral. While more harmonious in its style than the exterior, the interior of Notre Dame de Rouen presents nothing peculiar in its architecture, with the exception of the false gallery along the nave with passages running round the pillars; but the artistic curiosities are numerous and varied. In the choir may be noted a fine series of 18th-century stained-glass windows, carved stalls of the 15th century, the tombs of the English kings Henry Ii. and Riehard I., that of Bishop Maurille, who built the larger part of the present structure, an elegant Gothic stairease, and various tombs of archbishops and nobles.

Philip Augustus built a castle at Rouen, but it was rather a fortress than a palace, and the kings of France never treated it as a residence; around keep called Joan of Arc's Tower still stands. On the other hand, nothing remains of the castle erected by Henry V. of England when he took possession of Rouen in 1418 after a san-

guinary siege ; he proposed making it one of his Continental resi- dences, but it was never completed. It was in Philip Augustus's eastle that Joan of Arc was imprisoned and tried, and one of the public squares was the place where she was burned alive in 1431. From that year began a series of attempts on the part of the French to recapture the town. Ricardville in 1432 and Xaintrailles in 1436 failed in spite of the secret connivance of the inhabitants. In 1449 a stronger and better-planned expedition was

successful, and Somer- set, the English commander, was obliged, in order to secure an honourable capitulation, to surrender the principal fortified places in Normandy. The English rule, though badly supported by the citizens, had not becn without its influence on the prosperity of Rouen. It was then that the present church of St Ouen was con- tinued and almost completed ; the foundation was laid in 1311, but the choir alone had been constructed in the 14th century. In spite of the juxtaposition of the sccond and third or "radiant" and "flamboyant" styles of Gothic, the building taken altogether pre- sents in its general lines the most perfect unity—a unity which even the modern addition of a facade with two bell towers has failed to mar, though no regard was had to the original plans. St Onen is the largest church erected in France during the War of the Hundred Years ; in length (450 feet) it exceeds the cathedral. The central tower, not unlike the Butter Tower, with which it is contemporary, is 265 feet high ; the two new towers with their spires are some- what lower. Apart from its enormous dimensions and the richness of its southern portal, St Ouen has nothing that need long de- tain the visitor; its style is cold and formal ; the interior, bare and stripped of its ancient stained glass, was further despoiled in 1562 and in 1791 of its artistic treasures and of almost all its old church-furniture. The organ dates from 1630, and the rather handsome roodscreen from the 18th century. The close of the 15th century and the first half of the 16th—the reigns of Charles VIII, Lonis XII., Francis I., and Henry IL, and the episcopates of Cardinal Estoutteville (1453-1483), Cardinal Georges d' Am boise (1494-1510), and his nephew of the same name (1511-50)—rendered Rouen for nearly a hundred years the metropolis of art and taste in France ; and it was one of the first towns where the splendours of the Renaissance burst forth. At this time the church of St Maclou was erected, a building that can hardly be brought into comparison with the cathedral and St Ouen, but is justly cele- brated for the value and variety of its artistic treasures, such as the carved work of the principal doors, partly execntcd by Jean Goujon, the beautiful stained glass, and an organ-loft reached by an open-work staircase. The spire, 285 feet high, is a structure of the present century. Beside the church is the old parish cemetery, called the Aitre of Saint Maclou, surrounded by charming Renaissance galleries and famous for its danse maeabre formed by a series of sculptured groups, Other churches of the same period—St Godard, St Patrice, St Vincent—are no less interesting from the pro- fusion of their architectural details than from their

magnificent 16th- century stained-glass windows. There are two glass windows in St Godard, and a regular collection in St Patrice ; but the latter, though the most famous, are in the eyes of connoisseurs of less worth than the stained glass in St Vincent, due to two incomparable artists of Beauvais, Engrand and Jean Le Prince,—the two principal subjects treated by them being the Gifts of Mercy and the Glorification of the Virgin. St Godard contains, besides, old frescos worthy of note. ‘The church of St Laurent, no longer used for worship, and the tower of St André are both of 16th-century origin. At the same period the cathedral received great embellishnients, the central fléche was erccted, and the portals were decorated with new sculptures. Georges d’Amboise, the virtuous minister of Louis XII., chose the chapel of the Virgin for his placc of burial ; he caused his mausoleum, constructed after the plans of the architect Roland le Roux, to be composed entirely of marble, as well as his statue, which he ordered from Jean Goujon. Georges d’Amboise the second was, according to his desire, interred in his nncle’s tomb, but his statue is of much less value. Near this tomb are two others erected for the lords of Brézé ; both are very remarkable ; the oldest belongs to the Gothic style; the other, the tomb of Diana of Poitiers’s husband, is a Renaissance structure of the time of Henry IL, but, contrary to what was long believed, contains nothing from the hand of Jean Goujon. Under Louis XII. the archbishops of Rouen also rebuilt their palace at the side of the cathedral ; but in spite of the rich- ness of its architecture this lordly mansion cannot compete with the “palace of justice” begun in the same year, 1499, when the exchequer of Normandy, which had been established at Rouen in 1302, was erected intoa parlement, though the title was not adopted till 1515, This sumptuous building is in the Gothic style; but the Hétel de Bourgtheroulde, which dates from the time of Francis I., is undisguisedly of the Renaissance, and is justly celebrated for its bas-reliefs, the snbjects of which are borrowed from two quite different orders of things—the allegories from Petrarch’s Triumphs, and _the interview of the Ficld of the Cloth of Gold between Henry VIII. and Francis I. Many other secular Renais- sance buildings in Rouen bear witness to the great commercial prosperity of its citizens and to their keen appreciation of the

arts :—numerous private houses in stone and especially in wood ; the gate of the great clock; and a unique structure, the “ fierte ” of St Romain, a sort of pulpit from which every ycar a person condemned to death raised before the people the shrine or fierte (feretrum) of St Romain, and then reccived pardon and liberty. This splendour of the arts began to decline during the wars of religion ; in 1562 the town was sacked by the Protestants, which did not prevent the League from obtaining so firm a footing there that Henry IV., after having vainly besieged it, did not obtain entrance till long after his abjuration. To the 18th century belong the exchange and the claustral buildings of the abbey of St Ouen, transformed into an hétel de ville. Much more important works have been executed in recent times, but in great part at the expense of the historic and picturesque features of the town. On the other hand, handsome structures of various kinds have been erected in the interests of public utility or embellishment—churches, civil and military establishments, fountains, statues, &e.; and many old buildings have been carefully restored or completed. Rouen, more- over, has recently been provided with museums of antiquities, of fine arts, of ceramic art, of natural history, and of industry, —the first two being very important. During the Franco-German War the city was occupied by the invaders from 5th December 1870 to 22d July 1871, and had to submit to heavy requisitions. Among the famous men born at Rouen are the brothers Corneille, Fon- tenelle, the journalists Armand Carrel and De Villemessant, the composer Boieldieu, the painters Jouvenet, Restout, and Géricault, the architect Blondel, Dulong the physicist, and La Salle the American explorer. (A. 8.-P.)

ROUGE. This name is applied to various colouring substances of a brilliant carmine tint, especially when used as cosmetics. The least harmful of these preparations are such as have for their basis carthamine, obtained from the safllower (Carthamus tinctorius). The Chinese prepare a rouge, said to be from safflower, which, spread on the cards on which it is sold, has a brilliant metallic green lustre, but when moistened and applied to the skin assumes a delicate carmine tint. Jeweller’s rouge for polishing gold and silver plate is a fine red oxide of iron prepared by calcination from sulphate of iron (green vitriol).

ROUGET DE LISLE, Craupz Josmpn (1760-1836), one of the most noteworthy of those authors whom a single short piece of work has made famous, was born on 10th May 1760, at Lons-leSaunier. He entered the army as an engineer and attained the rank of captain. He wrote complimentary verses pretty early, and appears to have been a good musician. The song which has immor- talized him, the Marseillaise, was composed at Strasburg, where Rouget de Lisle was quartered in April 1792, and he is said to have composed both the words and the music in a fit of patriotic excitement after a public dinner. The piece was at first called Chant de Varmée du Rhin, and only received its name of Marseillaise from its adoption by the Provengal volunteers whom Barbaroux introduced into Paris, and who were prominent in the storming of the Tuileries. The author himself was unfavourably affected by that very event. He was a moderate republican, and was cashiered and thrown into prison; but the counter-revolution set him at liberty. Little is recorded of his later years, and he received no pension or other mark of favour till the accession of Louis Philippe. He died at Choisy on the 26th June 1836.

The Marseillaise (of which as usually given six-sevenths only are Rouget's) is so well known that no elaborate criticism of it is necessary. The extraordinarily stirring character of the air and its ingenious adaptation to the wordsserve to disguise the alternate poverty and bombast of the words themselves, As poetry the sixth stanza alone has much merit. Ronget de Lisle wrote a few other songs of the same kind, and set a good many of others' writing to music. He also produced a play or two and some translations. But his chief literary monument is a slender and rather rare little volume entitled Zssais en Vers et en Prose (Paris, 1796). This contains the Marseillaise, a prose tale of the sentimental kind called Adelaide et Monviile, and a collection of occasional poems of various styles and dates, from which the author's poetic faculty can be fairly judged. It is humble enough. Rouget was a mere follower of standard models, imitating by turns J. B. Rousseau, La Fontaine, and Voltaire, and exaggerating the artificial language of his time. In Yom et Lucey, which turns on a romantic story of

Plate I.

the English army in America, he has contrived without in the least knowing it to make a pathetic subject supremely Indicrous. But he seems to have been a very well meaning and harmless person, and he had one moment of remarkable inspiration.

ROULERS, or RovsseLaERE, a town of Belgium, in the province of West Flanders, on the Mandelbeke, a tributary of the Lys, 22} miles south of Ostend on the railway to Courtrai. From time immemorial it has been the seat of a great weaving industry, which now produces both cotton, union, and linen goods; and it also manufac- tures in various other departments. The principal build- ings are the town-house, the college, and the church of St Michel with its conspicuous Gothic tower. The popula- tion was 16,345 in 1874, and 17,219 in 1884,

Roulers is mentioned in 822 as Roslar and in 847 as Rollare. Baldwin VIII., count of Flanders, died in a house in the principal square of the town in 1120 on his return from the battle of Angers. In 1794 Roulers was the scence of a conflict between the Austrians and the French.

ROUM (Rvtm) is the name by which the Arabs call the Romans, 2.¢., all subjects of the Roman power. Bildd al- fitim, “the lands of the Romans,” accordingly nieans the Roman empire. The parts of the old empire conquered by the Arabs were regarded as having ceased to be Roman, but the Western Christian lands were still called lands of the Rum, without reference to the fact that they had in great part ceased to pay any allegiance to the “king of the Rum,” z.e., the Byzantine emperor. When Ibn Jobair takes a passage in a Genoese vessel he speaks of the crew as Romans; and in Spain a “ Rumitya” meant a “ Christian slave-girl.” Sometimes all Europe is included in the lands of the Rim; at other times the northern nations are excluded ; sometimes again the word means the Byzantine empire ; and, finally, the kingdom founded by the Seljuks, in lands won by them from Byzantium, is the kingdom of the Seljuks of Rum, so that Rum comes to take the restricted sense of Asia Minor. So Abulfeda uses the term. Roumelia and Roumania in like manner mean no more than the “ Roman country” in a special limitation.

ROUMANIA, a kingdom in the south-east of Europe between the Carpathians, the Pruth, the Black Sea, and the Danube. The Pruth and the

Kilia mouth of the Danube now form the frontier with Russia. West of Silistria the Danube is the boundary between Roumania and Bulgaria, while to the east of that point the boundary is formed by an irregular line passing east by south to the coast about ten miles to the south of Mangalia. The territory thus shut off between the Danube and the Black Sea is known as the Dosprupsa (q.v.), and differs in its physical features and products from the rest of the kingdom. It was given to Roumania at the close of the last Russo-Turkish War as a compensation for the territory of Bessarabia, east of the Pruth, which was then restored to Russia. The area of the kingdom is estimated at about 49,250 square miles, which is rather less than that of England without Wales. The greatest length of the kingdom is from east to west near the parallel of 45°, along which the length is about 350 miles. The line stretching from north-west to south-east between the extreme points of the kingdom is about fifteen miles shorter.

The crescent-shaped portion of the kingdom lying between the Danube and Pruth and the Carpathians is tolerably uniform in its physical features. The southern part of the area is a plain continuous with that of southern Russia. Towards the interior the surface rises gradually but slowly until we come to the spurs of the Carpathians. The Roumanian frontier on this side runs for the most part along the very crest of the mountains, which have peaks rising to from 6000 to 8000 feet and upwards. The lowest part of this plain is that which stretches along the left bank of the Danube, and this also

is the dreariest and least productive. Large tracts of it are marshy and subject to inundation, and even beyond the marshy districts the aspect of the country remains extremely uninviting. Agriculture is neglected; coarse grasses occupy large areas; and the most conspicuous feature in the landscape is probably a rude well, such as is seen in the pusstas of Hungary and some parts of southern Russia, where the general aspect of the country is so like what we find here. Farther inland, however, the appearance of the surface improves: agriculture becomes more general, trees (willows, alders, and poplars) more abundant; on the still higher ground nearer the Carpathians the outward signs of comfort and prosperity become more and

more apparent; the vine clothes the hill slopes ; plums, peaches, and southern fruits are grown in profusion; large forests of oak, beech, and elm reach to the hill tops, and various minerals form an important addition to the present and prospective resources of the country. At elevations too high for the foliage trees just mentioned these are succeeded by pines and firs, birches and larches, which crown the mountains to a height of 5000 or 6000 feet. Extensive as the plains of Roumania are, 40 per cent. of the entire surface is more than a thousand feet above sea-level, while the greater part of the northern (or Moldavian) half of the crescent varies from 300 to 1000 feet, almost all the rest of Moldavia being still more elevated.

The superficial geology of Roumania, so far as it iy Geology,

known, is extremely simple, at least on the left bank of the Danube. Quaternary deposits are spread over all the plains. Among these the most important is the yellow loess, which covers such large areas in Hungary also, and which in Roumania attains in places a depth of 150 to 300 feet. In certain parts the black soil of southern Russia extends into Roumania, and is important on account of its richness, though its depth is nowhere above 3 feet. Advancing inland one meets next with Miocene and Eocene deposits, until, in ascending the slopes of the Carpathians, Secondary, Primary, and crystalline rocks are seen to crop out in succession. The desolate plateau of the Dobrudja contrasts with the region on the left of the Danube in its geology as in other respects. Its basis consists of crystalline rocks, but these are covered with sedimentary formations of various ages. On the north this plateau, which is hilly and even mountainous, sinks down rathcr abruptly to the delta of the Danube, a congeries of alluvial marshes occupied chiefly by aquatic and marsh-loving birds.

Of the rivers of Roumania by far the most important Rivers.

is the Danube, which is navigable for large vessels throughout its Roumanian reach, the first obstruction to navigation, the celebrated Iron Gates, occurring just where it enters Roumanian territory. The breadth of the river is of some consequence in view of the fact that it is a frontier stream, and the marshes on the left bank have at least this advantage that they enable it to serve all the more effectually as a natural boundary. The plains on the left are traversed by numerous winding tributaries of the

Danube, but of these the only one of importance as a means of communication is the Pruth, which is navigable for small grain-carrying vessels. The others—the Sereth, Jalomitza, Dambovitza, Olta—are sluggish streams, often half-dry, but yet at certain seasons subject to inundations, which unfortunately occur at a time when the crops are so far advanced as to be liable to be much damaged. In consequence of this the Government has bestowed much pains on the regulation of these streams, and the works for this purpose are rendered further serviceable by the fact that the Roumanian rivers can be turned to account for irrigation.

Wlimate.

ROUMANIA

The climate of Roumania is one of extremes as regards temperature. Winter and summer are almost equally trying. In the former season the thermometer may sink to — 15° Fahr., while in the latter it may rise to from 90° to 95°. The mean temperature of spring at Bucharest is 53°, summer 724°, autumn 65°, winter 273°. Spring, how- ever, scarcely exists except in name, the interval between the cold winter and hot summer being very short. The autumn, on the other hand, is long and is the most genial season of the year. It lasts to the end of November. Being continuous with the Russian plain, Roumania is exposed to the bitterly cold wind from the north-east by which southern Russia is also scourged. In Roumania this wind, known as crivets, blows on an average 155 days in the year, while a west or south-west wind, called the austru, equally disagreeable for its scorching heat, blows on an average 126 days. The rainfall is not excessive. The number of rainy days in the year is about 74, or only about two-fifths of the number round London. The summer nionths are those in which the rains are most abundant. Snow is unfrequent (12 days in the year). As regards salubrity the low-lying plains near the Danube are the worst part of the kingdom. Marsh fever is there prevalent, and the tendency to suffer from disease is increased by the miserable character of the dwellings occupied by the peasantry of that district. The houses are mere pits dug out in the ground and covered over with sloping roofs formed of branches and twigs.

Three-fourths of the population are dependent upon agriculture. The plains covered by loess and black soil are admirably adapted for the growth of eereals, and of these the most important are niaize, wheat, and barley. The methods of eultivation are to a large extent primitive and imperfect, but great improvements are taking place through the application of foreign capital to the development of the native resources. Improved agricultural im- plements of all kinds have been introduced of late years in great numbers, The old plough, which has a share resembling a lance head, which enters the ground horizontally and thus merely scratches the surface, is being rapidly superseded by ploughs of English and Austrian manufacture. These improvements, which have been greatly stimulated by the alteration in the status of the Roumanian peasantry brought about by the law of 1864, and like- wise by the introduction of railways, have resulted in an enormous increase in the amount of the production of cereals. Roumania is one of the principal grain-exporting countries in Europe, and the increase in the production just alluded to is sufficiently well indi- cated by the figures given below relative to the exports of grain to the United Kingdom. The great variations in these figures, though obviously due in part to political causes, likewise serve to illustrate the ehief drawback under which Roumanian agriculture labours— nainely, the liability to drought.

Besides forming a valuable article of export maize furnishes the chief food of the people. The great body of Roumanians seldom eat meat exccpt on feast days, and the favourite food is a dish called mamaliga, made by boiling maize-meal and flavouring it with a little salt. {t thus resembles the hominy of the Americans. In addition to eercals many kinds of vegetables, including garlic, melons, and cueumbers, are grown. Hemp and eolza are also important products, and tobacco furnished a considerable article of export until it was made a monopoly of the state in 1872. As already mentioned, wine and numerous fruits are produced on the foot-hills of the Carpathians, but owing to neglect the products are greatly inferior to what they ought to be. Nothing, it is said, but eare in the cultivation of the vine and the preparation and pre- servation of tlie wine is necessary to make Roumania a wine- growing country of the first rank. As it is, vines are estimated to cover only about 250,000 acres, or about 735 of the entire surface. From plums the Roumanians extract a strong spirit known as tsuica, and it is chiefly for this that the plum-tree is eultivated.

The rearing of domestic animals is likewise an important industry, but it has not advanced so much of late years as the growth of cereals. The exports of eattle are almost stationary. Oxen are of much more importance than horses, being chiefly used in field labours. Buffaloes also are reared for the purpose, and are much valued for their strength. Sheep and cattle rearing forms the chief occupation of the sparse population of the Dobrudja.

About one-sixth of the total surface of Roumania is estimated to be eovcred with forests produeing valuable timber trees. Oaks, firs, and beeches are said to be met with having a diameter of more than 8 feet at the height of 33 feet above the ground. The warm

summers and eold winters are favourable to the quality of the wood, which is hard and lasting. Unfortunately there is a good deal of recklessness in the way in which the forests are utilized, and they are said to be fast disappearing ; but it is to be hoped that the influence of the College of Agriculture and Sylviculture at Ferestreu, 2 miles from Bucharest, will help to put a check upon this improyvidence, as it is without doubt contributing greatly to the promotion of Roumanian agriculture.

The mineral wealth on the Roumanian side of the Carpathians is considerable, but at present there are only three minerals that have any great industrial importance. These are rock-salt, petroleum, and lignite. The salt mines are a state niouopoly, and two of them, at Ocna-Mare and Telega, are partly worked by convicts. The depth from which the salt is extracted nowhere exceeds 300 feet. The average quantity of salt sold annually is about 62,000 tons. Lignite is important inasmuch as it is used along with wood on the railways, as well as in brick and lime kilns, Coal is also found, in some places even at the surface, but, though one or two mines have been opened, the total production is insignificant. Ozocerite, or fossil wax, is frequently found in association with lignite, but is used only in small quantity by the peasantry. Among other minerals are antlivacite, iron, gold, copper, lead, sulphur, cobalt, and arsenic ; and there is little doubt that some of tliese at least might be made economically valuable if the resources of the country were adequately developed.

Minerals,

So far tle manufacturing industries of Roumania are hardly Manu-

worthy of mention. sugar refineries, numerous steam-mills for grinding flour, besides large numbers of floating maize-mills on the Danube; but in addition to these there are only a few manufactories at Galatz.

There are petroleum refineries, one or two factures.

From the account just given of the products of Roumania it Trade.

follows that the exports of the kingdom consist ehiefly of raw produce, and above all of cereals, while the imports are mainly composed of manufactured articles. The countries with which the trade is chiefly earried on are Austria (with about 40 per cent. of the whole trade in 1883), Great Britain (about 80 per cent.), France (about 10 per cent.), Germany (about 8 per cent.), Turkey, and Russia. The foreign eommerce of Roumania is centred in Galatz, which is situated at the bend of the Danube where the river once more turns eastward on reaching the northern extremity of the Dobrudja plateau. From this centre there is one line of rail- way leading into Russia, while others pass through the interior of Roumania and connect with the Austrian lines in the north and south of Hungary. The first Roumanian railway was that from Giurgevo to Bucharest, opened in 1869. In 1884 there were about 1000 miles of railway in the kingdom. The internal trade of Roumania is almost entirely in the hands of the Jews. It is greatly hampered by the existence of the octroi in all the large towns, almost all the necessaries of life as well as luxuries being taxed when introduced within the municipal boundaries.

See Samuelson, Roumania, Past and Present (London, 1882); Ozanne, Three

Years in Roumania (London, 1878); Kanitz, Donau-Bulgarien und der Balkan (1875); and R. Roesler, Romdnische Studien. (G. G.

Statistics.

The approximate proportion of cultivated and uncultivated land Produce.

in Roumania is given in pogones (= 14 acres) as follows :—

Ceorealem@oandens) vines). ...2….0-.c-ssonssess- 4,945,708 PPASUULCHAMUMIAN AG. ccsec sas sce vsessseceenseruces 7,698,910 jest success cence atest ad snmnnnecaniras 4,029,947 Thai isiganucedl, sanpaseoscotonncduoseosseonsdodceone 7,574,386

The annual yield of cereals of all kinds is roughly estimated at 15,000,000 quarters. is about 3,000,000.

In 18838 the following were the values of the principal articles of import and export :—

The number of horned cattle in the country

Imports.| Exports.

Imports.

——

ee

£ “3 £ £ Textiles…….| 4,706,063 | 248,504 || Minerals, pottery..) 455,510 12,760 WetalShec ce. ~~ers << 2,926,576 | 73,196 || Oils, fat, &e vee] 874,337 ' Skins, leather.....| 1,749,674 281,377 | 6,902,280 Wood and manu~~ Animals…….) 159,420 | 465,692 PACTUTES. 0,-2.2: 754,754 | 323,372 || Fruits, vegetables..| 62,846 | 171,381 Exotie products…) 713,000 ; 24,080

The total imports of British home produce, mostly cotton goods, &e,, and iron, into Roumania in 1883 amounted to £1,344,619, and the total exports, mostly barley and maize, of Roumania to Great Britain to £3,516,442. ; There were in 1884 about 1000 miles of railway complete in the kingdom, and 3000 miles of telegraph lines. ; The estimated population of the country is 5,876,000, including Popula-

about 400,000 Jews and 200,000 Gipsies. millions of the population belong to the Roumanian branch of the Orthodox Greek Church, and there are 114,000 Roman Catholics and 18,800 Protestants.

Imports and exports.

About four and a half tion.

Eduea- tion,

Learned institu- tions.

Army.

Radul Negru.

16

An official analysis of the occupations of the people gives the following results (the figures representing heads of families) :—

SOUT MAIS SS oe oy y continua dSiuvvvsdenses ace 684,168 Artisans and labourer… .....cccccseceees $3,061 TE RO 2 Jc rec 30,417 C1 cll CN am ~~Oa 22 Silla Provessors GWU tCACWSTS 0… .0:c0000~~..~~csooreee 6,066 Medical and legal professions and. druggists. 995 Artists, musicians, and publicists…..... 2,156 Priests, nron kon andsnwns……~~. 00 ces esnese es ones 18,452 NERC GPS gece ncaa TOR oot ge ke ek 125,815

BOG rns teeters ses vain sae ae eae 973,941

Of the larger cities Bucharest (Bucurest) numbered in 1876 221,805 inhabitants, Jassy 90,125, and Galatz 80,763.

In 1883 there were 2742 primary schools with 124,130 pupils, 8 normal schools with 830 pupils, and 54 high schools with 7993 pupils, besides the two universitics of Bucharest and Jassy, con- taining 97 professors and readers and 705 students. It is estimated that about 1000 young men receive their university education abroad, mostly at Paris. There is also a ladies' college, called the Asyle Héléne from its founder in its present form, the

Princess Helena Cuza, and accommodating 230 girls, niany of whom are orphans. Amongst lcarned institutions the Roumanian Academy claims the first place, and excellent contributions on subjects of national and scicntifie interest will be found amongst its proceed- ings (Analele Academiet Romane, 1878 sq.). The academy building at Bucharest contains the national library of over 30,000 volumes and a fine archzological museum containing many Old Dacian antiquities.

The peace strength of the permanent army consists of 1200 officers and 18,532 men, with 180 guns, Besides this, there are the territorial army, consisting of 120,000 men and 84 guns ; the inilitia, consisting of thirty-two regiments of infantry; and finally the levée en masse. Every Roumanian, from his twenty-first to his forty-sixth year, is obliged to serve his time in one of the above categories. The total of the Roumanian forces, exclusive of the levée en masse, amounts to about 150,000 men and 288 guns.

Medieval and Modern History of Walachia and Moldavia,

Roumnania is the name officially adopted by the united kingdom that comprises the former principalities of Walachia and Moldavia, In its native form it appears simply as “Romania,” representing the claim to Roman descent put forward by its inhabitants. These call themselves “ Romani” or “ Rumeni, ” but by their neighbours, Slavonic, Greek, Magyar, and German, they are universally known by one or other form of the word “Vlach.” As, however, this Vlach or Rouman race occupies a far wider area than that included in the present Roumanian kingdom, it may be convenient to post- pone the vexed questions connected with its origin, migrations, and distribution for more general treatment under the heading VLACHs, and to confine ourselves on this occasion to Roumania proper—the country between the Carpathians, the Lower Danube, and the Black Sea. It may be sufficient here to observe that, according to the concurrent accounts from various sources, the great plains of the later Walachian and Moldavian principalities were first occupied by an immigrant Rouman population coming from the Carpathian lands and the present Transylvania in the early Middle Ages. According to the Russian Nestor and the earliest Hungarian chroniclers, the Carpathian region, including tracts of eastcrn Hungary, were occupied by a Rouman (‘‘ Roman”) population at the time of the

Magyar invasion in the 9th century. On the other hand, the meagre annals of the plains that lie on the left bank of the Lower Danube are exclusively occupied till at least the 11th century with Slovenes, Petchenegs, Cumans, and Bulgarians. Whatever title the Carpathian Roumans may have to be considered the descendants in situ of the Romanized pro- vincials of Trajan's Dacia, it scems fairly ascertained that the present extension of this easternmost branch of the Latin peoples over the Walachian and Moldavian plains is duc to a colonizing movement from the Alpine regions to the west, effected for the most part in the 12th and succeeding centurics.

Walachia,—For the early history of the Walachian (Valachian, or Wallachian) principality the native sources are late and untrust- worthy. These sources really reduce themselves to a single chron- icle, a part of which appears to have been drawn up in the 16th eentury in Bulgaro-Slovene, and of which two Rouman translations have scen the light. This "' History of the Rouman land since the arrival of the Roumans" (Istoria téered Romaneset de chnd& au descilicata Romanit) gives a precise account of the founding of the Walachian state by Radul Negru, voivode of the Roumians of Fogaras in Transylvania, who in 1290 descended with a numerous people into the Transalpine plain and established his capital first at Cimpulungit and then at Argish. Radul dies in 1314 and is succeeded by a series of voivodes whose names and dates are duly given; but this early chapter of Walachian history has been

rudely handled by Rocsler in his essay on the oldest history of the Walachian voivodeship (Roménisehe Studien, p. 261 sg.). The so- called "Chronicle of Hurul" is a modern forgery, and our only real authorities for the beginnings of Roumanian history are Hungarian, Polish, and Byzantine.

In 1830 the voivode Alexander Bazarad or Bassaraba succeeded Hun- King Charles of garian Hungary, and for fourteen years Wallachia enjoyed complete inde: supre-

in inflicting a crushing defeat on his suzerain

pendence. Louis the Great succeeded for a while in restoring the Hungarian supremacy, but in 1367 the voivode Vlad or Vladislav inflicted another severe defeat on the Hungarians, and sueceeded for a time in ousting the Magyar ban of Severin and thus incor- porating Little Walachia, the country west of the Aluta, in his dominions. Subsequently, in order to retain a hold on the loyalty of the Walachian voivode, the king of Hungary invested him with the title of duke of Fogaras and Omlas, Rouman districts situate in Transylvania, and this investiture scems to have left its impress on the traditional account of Radul Negru. ‘

Under the voivode Mircea (1383-1419), whose prowess is still Mircea.

celebrated in the national folk-songs, Walachia played for a while a more ambitious part. This prince, during the earlier part of his reign, songht a coumterpoise to Hungarian influence in the close alliance with King Vladislav Jagietto of Poland. He added to his other titles that of “count of Severin, despot of the Dobrudja, and lord of Silistria,” and both Widin and Sistov appear in his pos- session. A Walachian contingent, apparently Mircea’s, aided the Servian Kuiaz Lazar on the fatal field of Kosovo ; later he was led by the force of circumstances to ally himself with his former enemy Sigismund of Hungary against Bajazet, and in 1396 shared with him the disaster of Nikopolis. Bajazet subsequently invaded and laid waste a large part of Walachia, but the voivode succeeded in inflicting considerable loss on the retiring Turks, and the capture of Bajazet by Timur in 1402 gave the country a reprieve. In the internecine struggle that followed amongst the sons of Bajazet, Mircea espoused the cause of Musa; but, though he thus obtained for a while considerable influence in the Turkish councils, this policy eventually drew on him the vengeance of Sultan Mahomet I., who succeeded in reducing him to a tributary position.

During the succceding period the Walachian princes appear alternately as the allies of Hungary or the creatures of the Turk. In the later battle of Kosovo of 1448, between Hunyadiand Sultan’ Murad, the Walachian contingent treacherously surrendered to the Turks, but this did uot hinder the victorious sultan from massacring the prisoners and adding to the tribute a yearly contribution of 3000 javelins and 4000 shields. In 1453

Constantinople fell; in 1454 Hunyadi died; and two years later the sultan invaded Walachia to set up Vlad IV., the son of a former voivode,

but his son, during his Turkish sojourn, had improved on his father's example. He was known in Walachia as " Dracul," or the Devil, and has left a name in history as Vlad the Impaler. The stories of his ferocious savagery exceed belief. He is said to have feasted amongst his impaled victims. When the sultan Mahomet, infuriated at the impalement of his envoy, the pasha of Widin, who had been charged with Vlad's deposition, invaded Walachia in person with an immense host, he is said to have found at one spot a forest of pales on which were the bodies of men, women, and children. The voivode Radul, who was now substituted for this monster by Turkish influence, was constrained to pay a tribute , of 12,000 ducats.

The shifting policy of the Walachian princes at this time is State of well described in a letter of the Hungarian king Matthias to Walachia "The voivodes," he writes, "of Walachia and circ. Moldavia fawn alternately upon the Turks, the Tatars, the Poles, 1500.

Casimir of Poland.

and the Hungarians, that among so many masters their perfidy may remain unpunished." The prevalent laxity of marriage, the frequency of divorce, and the fact that illegitimate children could succeed as well as those born in lawful wedlock, by multiplying the candidates for the voivodeship and preventing any regular system of succession, contributed much to the internal confusion of the country. The elections, though often controlled by the Divan, were still constitutionally in the hands of the boiars, who were split up into various factions, cach with its own pretender to the throne. The princes followed one another in rapid succession, and a large proportion met with violent ends, A large part of the population led a pastoral life, and at the time of Veran tius's visit to Walachia in the early part of the 16th century the towns and villages were built of wood and wattle and daub.. Tirgovist alone, at this time the capital of the country, was a considerable town, with two stone castles, Nagul Bassaraba, who succeeded in TNs was a great builder of monasteries, and, besides erecting a monastic church at Argish, which he coated with white marble, and a new cathedral at Tirgovist, adorned Mount Athos with his pious works, He transferred the

direct allegiance of the Walachian Church to Constantinople. On Nagul's death, however, in 1521, the brief period of comparative prosperity which his architectural works attest was tragically interrupted, and it seemed for a timc

The Vlad the father of this Vlad had himself been notorious for his ferocity, Impaler.

urkish

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that Walachia was doomed to sink into a Turkish pashalic. The Turkish commander Mahmoud Bey became treacherously possessed of Nagul's young sou and successor, and, sending him a prisoner to Stamboul, proceeded to nominate Turkish governors in the towns and villages of Walachia. The Walachians resisted desperately, elected Radul, a kinsman of Nagul, voivode, and succeeded with Hungarian help in defeating Mahmoud Bey at Grumatz in 1522.

The conflict was prolonged with varying fortunes, but in 1524 the

dogged opposition of the Walachians finally triumphed in the sultan's recognition of Radul.

But, though Walachia thus escaped conversion into a Turkish pashalic, the battle of Mohacs in 1526 decided the long pre- ponderance of Turkish control. The unfortunate province served as a transit route for Turkish expeditions against Hungary and Transylvania, and was exhausted by continual requisitions. Turkish scttlers were gradually making good their footing on Walachian soil, and mosques were rising in the towns and villages, The voivode Alexander, who succeeded in 1591, and who like his predecessors had bought his post of the Divan, carried the oppres- sion still further by introducing agaiust the capitulations a janizary

BINT A 17

of his returning prosperity Basta, who had quarrelled with him about the supreme command of the imperial forees, procured his murder (August 19, 1601). Thus perished Michael the Brave in the forty-third year of his age, after performing in the course of his short reign achievements which, considering the small resources at his disposal, must place his name beside those of Hunyadi and Sobieski in the annals of castern Europe. Not only did he succeed in rolling back for a time the tide of Turkish conquest, but for the first and last time in modern history he united what once had been Trajan's Dacia, in its widest extent, and with it the whole Rouman race north of the Danube, under a single sceptre.

Michael's wife Florika and his son Petrushko were carried off Turkish into Tatar captivity, and Serban, of the Bassaraba family, was domina- raised to the voivodeship of Walachia by imperialist influences. tion.

On his deposition by the Porte in 1610, there followed a succession of princes who, though still for the most part of Rouman origin, bought their appointment at Stamboul. Walachian contingents were continually employed by the Turks in their Polish wars; and the settlement of Greeks in an official or mcreantile capacity in the principality provoked grave discontent, which on one occasion took the form of a massacre.

The reign of the voivode Matthias Matthias Bassaraba, who succeeded in 1633, was an interval of comparative Bassa- prosperity, and its length, twenty-one years, forms itself a panegyric, raba.

guard, and farming out his possessions to his Turkish supporters, Meanwhile the Turkish governors on the Bulgarian bank never ceased to ravage the country, and again it seemed as if Walachia

was favourable.

must share the fate of the Balkan states and succumb to the direct government of the Ottoman. In the depth of the national distress the ehoice of the people fell on Michael, the son of Petrushko, ban of Krajova, the first dignitary of the realm, who had fled to Transylvania to escape Alexander's machinations, Supported at Constantinople by twoat that time influential personages, Sigmund Bathori and the English ambassador, Edward Barton,

and aided by a loan of 200,000 florins, Michael succeeded in procuring from the Diwan the deposition of his enemy and his own nomination,

The genius of Michael “the Brave ” (1593-1601) secured Walachia for a time a place in universal history. The moment for action The emperor Rudolph II. had gained some successes over the Turks, and Sigmund Biathori, prince of Transylvania, had been driven by Turkish extortions to throw off the allegiance to the sultan, But the first obstacle to be dealt

- with was the presence of the enemy within the walls, and Michael

had recourse to the same desperate expedient as the Montenegrins ata later date. By previous concert with the Moldavian voivode Aaron, on November 18, 1594, the Turkish guards and settlers in the two principalities were massacred at a given signal, Michael followed up these ‘ Walachian Vespers ” by an actual invasion of Turkish territory, and, aided by Sigmund Bathori, succeeded in carrying by assault Rustchuk, Silistria, and other places on the right bank of the lower Danube. A simultaneous invasion of Walachia by a large Turkish and Crim-Tatar host was successfully defeated ; the Tatar khan withdrew with the loss of his bravest followers, and, in the great victory of Mantin on the Danube (1595), the Turkish army was annihilated, and its leader Mustafa slain. The sultan now sent Sinan Pasha “the Renegade” to invade Walachia with 100,000 men. Michael withdrew to the mountains before this overwhelming force, but, being joined by Bathori with a Transylvanian contingent, the voivode resumed the offensive, stormed Bucharest, where Sinan had entrenched a Turkish detach- ment, and, pursuing the main body of his forces to the Danube, overtook the rearguard and cut it to pieces, capturing enormous -booty. Sinan Pasha returned to Constantinople to die, it is said, of vexation, and in 1597 the ‘sultan, weary of a disastrous contest, sent Michaela red flag in token of reconciliation, reinvested him for life in an office of which he had been unable to deprive him, and granted the succession to his son.

and defeated his successor Andreas Bathori near Hermannstadt, and, seizing himself the reins of government, secured his proclama- tion as prince of Transylvania. The emperor consented to appoint him his ‘locum tenens per Transylvaniam,” and the sultan ratified his election. As prince of Transylvania he summoned dicts in 1599 and 1600, and, having expelled

the voivode of Moldavia, united under his sceptre three principalities. The partiality that he showed for the Rouman and Szekler parts of the population alicnated, however, the Transylvanian Saxons, who preferred the direct government of the emperor, The imperial commissioner General Basta lent his support to the disaffected party, and Michael was driven out of Transylvania by a successful revolt, while a Polish army under Zamoyski invaded .Walachia from the Moldavian side. for a moment deserted him. He resolved to throw himself on the emperor, rode to Prague, won over Rudolph by his singular address, and, richly supplied with funds, reappeared in Transylvania a3 imperial governor. In conjunction with Basta he defeated the superior Transylvanian forces at Goroslé, expelling Sigmund Bathori, who had again aspired to the erown, and taking one hundred and fifty flags and forty-five cannon. But at the moment

Michael's coolness and resource, however, never

He defended himself successfully against his powerful rival Vasilje Lupul, the voivode of Moldavia, and his Tatar and Cossack allies, and found a golden key to Turkish tolerance. He appears as a lawgiver, translating the Basilica of Jo. Comnenus, and founded many churches and monasteries. His last days were embittered, however, by an outbreak of military anarchy. On his death the Turkish yoke again weighed heavier on Walachia. The old capital Tirgovist was considered by the Divan to be too near the Transyl-vanian frontier, and the voivodes were accordingly compelled to transfer their residence to Bucharest. The mechanical skill of the Walachians was found useful by the Turks, who employed them as carpenters and pontonniers ; and during the siege of Vienna by Kara Mustafa in 1683 the Walachian contingent, which, under the

voivode Serban Cantacuzene, had been forced to co-operate with Serban the Turks, was entrusted with the construction of the two bridges Canta- The Walachian as cuzene.

over the Danube above and below Vienna, well as the Moldavian prince, who had been also forced to bring his contingent, maintained a secret intelligence with the besieged, an intelligence continued by the voivode Serban after his return to Walachia. The emperor granted him a diploma creating him count of the empire and recognizing his descent from the

imperial house of Cantacuzene, Serban meanwhile collecting his forces for an open breach with the Porte. His prudence, however, per- petually postponed the occasion, and Walachia enjoyed peace to his death in 1688. This peaceful state of the country gave the voivode leisure to promote its internal culture, and in the year of. his death he had the satisfaction of seeing the first part of a Walachian Bible issue from the first printing-press of the country, which he had established at Bucharest. He had also caused to be compiled a history of Walachia, and had called to the country many teachers of the Greek language, whose business it was to instruct the sons of the boiars in ‘‘ grammar, rhetoric, and philosophy.”

Immediately on Serban’s death the boiars, to prevent the Porte Constan- from handing over the office to the Greek adventurer who bid the tine | highest, proceeded to elect his sister’s son Constantine Brancovan. Bran- persuaded to put eovan:

The Turkish capidji pasha, then in Bucharest, was the caftan on his head in token of Turkish approval, and the . patriarch of Constantinople, who was also present, and the arch- bishop of Walachia, Theodosius, consecrated him together at the . high altar of the cathedral, where he took the coronation oath to

quest In 1599, on the definitive abdication of Sigmund Bathori in | devote his whole strength to the good of his country and received offran- Transylvania, Michael, in league with the imperialist forces under | the boiars’ oath of subniission. Brancovan, it is true, found it syania. General Basta, and in connivance with the Saxon burghers, attacked | expedient to devote his predecessor’s treasure to purchasing: the

confirmation of his title from the Divan, but the acconnt of his coronation ceremony remains an intcresting landmark in the constitutional history of the country. In his foreign relations with the Hapsburg power he displayed the.same caution as the voivode Serban. In spite of. the vietories of the margrave of Baden at Pojarevatz, Nish, and Widin.in 1689, it was only by an exercise of force that the imperial troops secured winter quarters in Walachia, and, though after the battle of Pultava in 1709 Brancovan con. cluded a secret treaty with Czar Peter, he avoided giving open effect to it. The tranquillity. which he thus obtained was employed by Brancovan as by

his predecessor in furthering the internal well- being of the country, with what success is best apparent from the

description of Walachia left by the Florentine Del Chiaro, who Del

He Chiaro's with its rich pastures, its descrip- so symmetrically planted tion of and carefully kept by Brancovan's orders that hiding in them was Walachia.

visited the country in 1709 describes the stoneless Walachian plain, crops of maize and millet, and woods

and spent seven years there.

out of the question. Butter and honey were exported to supply the Grand Signor's kitchen at Stamboul ; wax and cattle to Venice 5 and the red and white wine of Walachia, notably that of Pitesti, to Transylvania, The Walachian horses were in demand amongst

the Turks and Poles. Near Ribnik and elsewhere were salt-mines which supplied all the wants of the Transdanubian provinces ; there were considerable copper mines at Maidan ; and iron was worked near Tirgovist. The Gipsy community was bound to bring fifteen pounds weight of gold from the washings of the Argish. The boiars were many of them wealthy, but the common people were so ground down with taxation that "of their ancient Roman valour only the name remained." 'To avoid the extortion of their rulers numbers had emigrated to Transylvania and even to the Turkish provinces. The principal Walachian city was Bucharest (Bucurest), containing a population of about 50,000; but, except for two large "hans " or merchants' halls built by Brancovan and his predecessor, and the recently-erected palace, which had a marble staircase and a fine garden, the houses were of wood. The other principal towns were Tirgovist, the old capital, Cernetz, Fokshani, supplied by Brancovan with an aqueduct, Ploiesti, Ghierghitza, Rusi di Vede, and Krajova, the capital of the banat of

that name, where a fine han had also been built. At Cimpulungu was a great annual fair. The dress of the men was thoroughly Turkish except for their lambskin caps, that of the women half-Greek half-Turkish. The houses were scrupulously clean and strewn with sweet herbs. Del Chiaro notices the great imitative capacity of the race, both artistic and mechanical. A Walachian in Venice had copied several of the pictures there with great skill; the copper-plates and wood engravings for the new press were executed by native hands. The Walachians imitated every kind of Turkish and European manufacture ; and, though the boiars imported finer glass from Venice and Bohemia, a glass manufactory had been established near Tirgovist which produced a better quality than the Polish. From the Bucharest press, besides a variety of ecclesiastical books, there were issued in the Rouman tongue a translation of a French work entitled “The Maxims of the Orientals” and “‘The Romance of Alexander the Great.” In 1700 Brancovan had a map of the country made and a copper- plate engraving of it executed at Padua.

the new system could uot but be productive of grinding oppression, and the swarms of ‘‘hungry Greeklings” who aceompanied the Fanariote rulers from Stamboul made their rule doubly hateful. Numbers of the peasantry emigrated, and the population rapidly diminished. In 1745 the number of tax-paying families, which a few years before had amounted to 147,000, had sunk to 70,000. Yet the taxes were continually on the increase, and the hospodar Scarlatti Ghika (1758-61), though he tried to win some popularity by the removal of Turkish settlers and the abolition of the ‘vakarit,” or tax on cattle and horses, whieh was peculiarly hateful to the peasantry, raised the total amount of taxation to 25,000,000 lion-dollars. The Turks meantime maintained their iron grip on the country by holding on the Walachian bank of the Danube the fortresses of Giurgevo, Turnul, and Orsova, with the surrounding districts.

But the tide of Ottoman dominion was ebbing fast. Already, by the peace of Passarovitz (Pojarevatz) in 1718, the banat of Krajova had been ceded to the emperor, though by the peace of Belgrade in 1739 it was recovered by the Porte for its Walachian vassal. In 1769 the Russian general Romanzoff

occupied the principality, the bishops and clergy took an oath of fidelity to the empress Catherine, and a deputation of boiars followed. The liberties of the country were guaranteed, taxation reformed, and in 1772 the negotiations at Fokshani between Russia and the Porte broke down because the czarina's representatives insisted on the sultan's recognition of the independence of Walachia and Moldavia under an European guarantee.

of the Walachians and Moldavians. palities were to enjoy all the privileges that they had possessed under Mahomet IV.; they were to be freed from tribute for two years, as some compensation for the ruinous effects of the last war ; they were to pay a moderate tribute; the agents of Walachia and

Fall of The prosperity of Walachia, however, under its ''Golden Bey," | Moldavia at Constantinople were to enjoy the rights of nations, and Bran- as Brancovan was known at Stamboul, only increased the Turkish | the Russian minister at the Porte should on occasion watch over the eovan. exactions. In 1701 the tribute was increased to 80,500 purses of | interests of the principalities. The stipulations of the treaty of 500 florins each. In 1708 the voivode was summoned in person to | Kutshuk Kaimardji, though deficient in precision (the Walachians, Adrianople, and again must resort to extraordinary mieans to for instance, had no authentic record of the privileges enjoyed under mollify the Divan. Shortly after, the Walachians were called on to Mahomet IV.), formed the basis of the future liberties in both prin- supply masons, carpenters, and other workmen for the fortification cipalities ; and, as from this period onwards Walachian history is of Bender, and, though these and other demands were punctually | closely connected with that of Moldavia, it may be convenient met and the increased tribute regularly paid, the sultan finally | before continuing this review to turn to the earlier history of the resolyed on the removal of his too prosperous vassal. Brancovan | sister principality. was accused of secret correspondence with the empcror, the czar, Moldavia.—The mention of Vlachs on the borders of Galicia in Early the king of Poland, and the Venetian republic, of betraying the | 1160 (Nic. Chon., p. 171) gives just ground for believing that a Mol- Porte's secrets, of preferring Tirgovist to Bucharest as a residence, of | Rouman population existed in Moldavia at least as early as the first davian acquiring lands and palaces in Transylvania, of keeping agents at half of the 12th century. Under the successive

domination, how- history. Venice and Vienna, in both of which cities he had invested large | ever, of Petchenegs, Cumans, and Tatars, it occupied as yet a sub- sums, and of striking gold coins with his effigy, one of which, with | ordinate position. It was not till 1352 that the Tatars, already the legend CONSTANTINVS BASSARABA DE BRANCOVAN D. G. VOEVODA weakened by Polish assaults on the Podolian side, were expelled from ET PRINCEPS VALACHIM TRANSALPIN#, and having on the reverse | this Cumanian region by the Transylvanian voivode Andreas the crowned shield of Walachia containing a raven holding a cross | Laszkovich. It is in fact to the period immediately succeeding this in its beak between a moon and a star, is engraved by Del Chiaro. | event that the first establishment of an independent Rouman state They were of 2, 8, and 10 ducats weight. A capidji pasha arrived in Moldavia is referred by the concurrent testimony of Moldavian, at Bucharest on April 4, 1714, and proclaimed Brancovan "'mazil," Russian, and Hungarian sources, i.e, deposed. He was conducted to Constantinople and beheaded, According to the native traditional account, as first given by the together with his four sons. A scion of the rival Cantacuzenian Moldavian chroniclers of the 17th and 18th centuries (Grigorie family was elected by the pashia's orders, and he, after exhausting Urechie and Miron Costin), Dragosh the son of Bogdan, the founder the principality for the benefit of the Divan, was in turn deposed | of the new principality, emigrated with his followers towards the and executed in 1716. end of the 14th century from the Hungarian distriet of Marmaros The From this period onwards the Porte introduced a new system with | in the North Carpathians. The story is related with various Fan- regard to its Walachian vassals. The line of national princes ceases. fabulous accompaniments. From the aurochs (zimbrw), in pursuit ariote The office of voivode or hospodar was sold to the highest bidder at | of which Dragosh first arrived on the banks of the Molda, is derived regime. Stamboul, to be farmed out from a purely mercenary point of view. | the ox-head of the Moldavian national arms, and from his favourite

The princes who now succeeded one another in rapid suceession were mostly Greeks from the Fanar quarter of Constantinople who had served the palace in the quality of dragoman, or held some other court appointment. They were nominated by imperial firman without a shadow of free election, and were deposed and transferred from one principality to another, executed

or reappointed, like so many pashas. Like pashas they rarely held their office more than three years, it being the natural policy of the Porte to multiply such lucrative nominations. The same hospodar was often reappointed again and again as he succeeded in raising the sum necessary to buy back his title. Constantine Mavroeordato was in this way hospodar of Walachia at six different times, and paid on one occasion as much asa million lion-dollars for the office. The princes thus imposed on the country were generally men of intelli- gence and culture. Nicholas Mavrocordato, the first of the series, was himself the author of a Greek work on duties, and main- tained at his court Demeter Prokopios of Moschopolis, who wrote a raview of Greek literature during the 17th and beginning of the 18th centuries. Constantine Mavrocordato was the author of really liberal reforms. He introduced an ‘‘urbarium” for the peasants, limiting the days of ‘‘ angaria,” or forced labour for the landlord, to twenty-four, and in 1747 decreed the abolition of serfdom. But

hound who perished in the waters the name of the river. From the Hungarian and Russian sources, which are somewhat more precise, the date of the arrival of Dragosh, who otherwise appears as Bogdan, in Moldavia appears to have been 1359, and his de- parture from Marmaros was carried out in defiance of his Hungarian suzerain.

In the agreement arrived at between King Louis of Hungary and Rival the emperor Charles IV. in 1872, the voivodate of Moldavia was claims of recognized as a dependency of the crown of St Stephen. The over- Poland lordship over the country was, however, contested by the king of and Poland, and their rival claims were a continual source of dispute Hungary.

between the two kingdoms. In 1412 a remarkable agreement was arrived at between Sigismund, in his quality of king of Hungary, and King Jagietto of Poland, by which both parties consented to postpone the question of suzerainship in Moldavia. Should, however, the Turks invade the country, the Polish and Hungarian forces were to unite in expelling them, the voivode was to be deposed, and the Moldavian territories divided between the allies. During the first half of the 15th eentury Polish influence was preponderant, and it was customary for the voivodes of Moldavia to do homage to the king of Poland at Kamenice or Snyatin.

In 1456 the voivode Peter, alarmed at the progress of the Turks,

By the treaty of Kutshuk Kaimardji, coneluded in Treaty of 1774, Russia consented to hand back the principalities to the Kutshuk sultan, but by Art. xvi. several stipulations were made in favour Kaim- The people of the prinei- ardji.

ROUMANIA

who were now dominant in Servia and Walachia, offered Sultan Mahomet a yearly tribute of 2000 ducats. On his deposition, how- ever, in 1458 by Stephen, known as “ the Great,” Moldavia became a power formidable alike to Turk, Pole, and Hungarian. Through- out the long reign of this voivode, which lasted forty-six years, from 1458 to 1504, his courage and resources never failed him. In the early part of his reign le appears, in agreement with the Turkish sultan and the king of Poland, turning out the Hungarian vassal, the ferocious Vlad, from the Walachian throne, and annexing the coast cities of Kilia and Cetatea Alba or Bielogorod, the Turkish Akicrman, In the autumn of 1474 the sultan Mahomet entered Moldavia at the head of an army estimated by the Polish historian Dlugoss at 120,000 men. Voivode Stephen withdrew into the interior at the approach of this overwhelming host, but on J anuary 17, 1475, turned at bay on the banks of Lake Rakovietz and gained a complete victory over the Turks. Four pashas were among the slain ; over a hundred banners fell into the Moldavian hands; and only a few survivors succceded in reaching the Danube. In 1476 Mahomet again entered Moldavia, thirsting for vengeance, but, though successful in the open field, the Turks were sorely harassed by Stephen’s guerilla onslaughts, and, being thinned by pestilence, were again constrained to retire. In 1484 the same tactics proved successful against an invasion of Bajazet. Three years later a Polish invasion of Moldavia under John Albert with 80,000 men ended in disaster, and shortly afterwards the voivode Stephen, aided by a Turkish and Tatar contingent, laid waste the Polish territories to the upper waters of the Vistula, and succeeded in annexing for a time the Polish province of Pokutia that lay between the Car- pathians and the Dniester.

Exclusive of this temporary acquisition, the Moldavian territory

. at this period extended from the river Milcov, which formed the

boundary of Walachia, to the Dniester. It included the Carpathian region of the Bukovina, literally “the beechwood,” where lay Sereth and Suciava, the earliest residences of the voivodes, the maritime district of Budzak (the later Bessarabia), with Kilia and Bielogorod, and the left bank of the lower Danube from Galatz to the Sulina mouth, The government, civil and ecclesiastical, was practically the same as that described in the case of Walachia, the officials bearing for the most part Slavonic titles derived from the practice of the Bulgaro-Vlachian czardom. The church was Orthodox Oriental, and depended from the patriarch of Ohrida. In official documents the language used was the old Slovene, the style of a Moldavian ruler being Natchalnik ¢ Voievoda Moldovlasi, prince and duke (= Germ. “Fiirst” and “Herzog”) of the Moldovlachs, The election of the voivodes, though in the hands of the boiars, was strictly regulated by hereditary principles, and Cantemir de- scribes the extinction of the house of Dragosh in the 16th century as one of the unsettling causes that most contributed to the ruin of the country. The Moldavian army was reckoned 40,000 strong, and the cavalry arm was especially formidable. Verantius of Sebenico, an eye-witness of the state of Moldavia at the beginning of the 16th century, mentions three towns of the interior provided with stone walls—Suciava, Chotim, and N jamtz; the people were barbarous, but more warlike than the Walachians and more tena- cious of their national costume, punishing with death any who adopted the Turkish,

In 1504 Stephen the Great died, and was succeeded by his son, Bogdan “the One-eyed.” At feud with Poland about Pokutia, despairing of efficacious support from hard-pressed Hungary, the new voivode saw no hope of safety except in a dependent alliance with the advancing Ottoman Power, which already hemmed Moldavia in on the Walachian and Crimean sides. In 1513 he agreed to pay an annual tribute to Sultan Selim in return for the sultan’s guarantce to preserve the national constitution and religion of Moldavia, to which country the Turks now gave the name of Kara Bogdan, from their first vassal. The terms of Moldavian sub- mission were further regulated by a firman signed by Sultan Suleiman at Buda in 1529 by which the yearly present or ‘‘ back- shish,” as the tribute was euphoniously called, was fixed

at 4000 ducats, 40 horses, and 25 falcons, and the voivode was bound at necd to supply the Turkish army with a contingent of a thousand

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historical works which he dedicated to Philip II. of Spain, Basilicus, finding that his Aigean sovereignty in partibus was of little practical value beyond the crowning of poet laureates, fixed his roving ambi- tion on a more substantial dominion. He published an astounding pedigree, in which, starting from ‘Hercules Triptolemus” he wound his way through the royal Servian line to the kinship of Moldavian voivodes, and, having won the emperor Ferdinand and Albert Lasky to his financial and military support, succeeded, though at the head of only 1600 cavalry, in routing by a bold dash the vastly superior forces of the voivode, and even in purchasing the Turkish confirmation of his usurped title. He assumed the style of BaotAcds MoAdaBias, and elnded the Turkish stipulation that he should dismiss his foreign guards. In Moldavia he appeared as a moral reformer, endeavouring to put down the preva- lent vices of bigamy and divorce. He erected a school, placed it under a Gerinan master, and collected children from every part of the country to be maintained and educated at his expense, He also busied himself with the collection of a library. But his taxes —a ducat for each family—were considered heavy; his orthodoxy was suspected, his foreign counsellors detested. In 1563 the people rose, massacred the Hungarian guards, the foreign settlers, and finally Jacob himself.

The expelled voivode Alexander was now restored by the Porte, the schools were destroyed, and the country relapsed into its normal state of barbarism. His successor Ivonia was provoked by the Porte’s demand for 120,000 ducats as tribute instead of 60,000 as heretofore to rise against the oppressor, but after gaining three victories he was finally defeated and slain (1574), and the country was left more than ever at the mercy of the Ottoman. Voivodes were now created and deposed in rapid succession by the Divan, but the victories of Michael the Brave in Walachia infused a more independent spirit into the Moldavians. The Moldavian dominion was now disputed by the Transylvanians and Poles, and in 1600 Michael succeeded in annexing it to his “‘Great Dacian” realm. On Michael’s murder the Poles under Zamoyski again asserted their supremacy, but in

1618 the Porte once more recovered its dominion and sct up successively two crcatures of its own as voivodes—Gratiani, an Italian who had been court jeweller, and a Greek custom-house official, Alexander,

As in Walachia at a somewhat later date the seemed now thorouglily established in Moldavia,

tion by a large backshish, and every year by a smaller one. The prince Vasilje Lupul, however, an Albanian, who succeeded in 1634, showed great abilities, and for twenty years succeeded in maintaining his position on the Moldavian throne. He introduced several internal reforms, codified the written and unwritten laws of the country, established a printing press, Greek monastic schools, and also a Latin school. He brought the Moldavian Church into more direct relation with the patriarch of Constantinople, but also showed considerable favour to the Latins, allowing them to erect churches at Suciava, Jassy, and Galatz.

During the wars between Sobieski and the Turks Moldavia found itself between hammer and anvil, and suffered frightfully moreover from Tatar devastations. The voivode Duka was forced like hig Walachian contemporary to supply a contingent for the siege of Vienna in 1683. After Sobieski's death in 1696, the hopes of Moldavia turned to the advancing Muscovite power. In 1711 the

voivode Demetriu Cantemir, rendered desperate by the Turkish Demetriu exactions, concluded an agreement with the czar Peter by which Cantemir.

Moldavia was to become a protected and vassal state of Russia, with the enjoyment of its traditional liberties, the voivodeship to be hereditary in the family of Cantemir. On the approach of the Russian army the prince issued a proclamation coutaining the terms of the Russian protectorate and calling on the boiars and people to aid their Orthodox deliverers. But the iron had entered into the people's soul. The long Turkish terrorism had done its work, and at the approach of a Turkish and Tatar host the greater part of the Moldavians deserted their voivode. The Russian campaign was unsuccessful, and all that Czar Peter could offer Cantemir and the

Fanariote regime The and it became the Fanariote rule that every three years the voivode should procure his confirma- regime.

boiars who had stood by him was an asylum on Russian soil,

In his Russian exile Cantemir eomposed in a fair Latin style Cante- his Descriptio Moldaviz, the counterpart so far as Moldavia is mir's concerned to Del Chiaro's contemporary description of Walachia, descrip- The capital of the country was now J. assy, to which city Stephen the tion of Great had transferred his court from Suciava, the earlier residence Moldavia. of the voivodes. It had at this time forty churches—some of stone, some of wood. Fifty years before it had contained 12,000 houses, but Tatar devastations had reduced it to a third of its former size. The most important commercial emporium was the Danubian port of Galatz, which was frequented by vessels from the whole of the Levant from Trebizond to Barbary. The cargoes which they here took in consisted of Moldavian timber (oak, deal, and cornel), grain, butter, honey and wax, salt, and nitre ; Kilia at the north mouth of the Danube was also frequented by trading vessels, including Venetian and Ragusan. Moldavian wine was exported to Poland, Russia, Transylvania, and Hungary ; that of Cotnar was

incn. The Turks pursued much the same policy as in Walachia. The tribute was gradually increased. A hold was obtained on the country by the occupation of various strongholds on Moldavian soil with the surrounding territory,—in 1538 Cetatea Alba (Akierman), in 1592 Bender, in 1702 Chotim (Khotin). Already by the middle of the 16th century the yoke was so heavy that the voivode Elias (1546-1551) became Mohammedan to avoid the sultan's anger.

At this period occurs a curious interlude in Moldavian history. In 1561 the adventurer and impostor Jacob Basilicus succeeded with Hungarian help in turning out the voivode Alexander and 8. seizing on the reins of government, A Greek by birth, adopted son of Jacob Heraklides, despot of Paros, Samos, and other figean islands, acquainted with Greek and Latin literature, and master of most European languages, appearing alternately as a student of astronomy at Wittenberg, whither he had been invited by Count Mansfeld, as a correspondent of Melanchthon and as a writer of

Officers of state.

Continua-

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in Cantemir’s opinion superior to Tokay. The excellence of the Moldavian horses is attested by a Turkish proverb; and annual droves of as many as 40,000 Moldavian oxen were sent across Poland to Dantzic. Moldavia proper was divided into the upper country or Z’erra de sus, and the lower country, or J’erra de josw. Bessarabia had been detached from the rest of the principality and placed under the direct control of the seraskier. It was divided into four provinces :—that of Budzak, inhabited by the Nogai Tatars; that of Akierman or Cetatea Alba, the Greek Monkastron, a strongly fortified place ; and those of Ismaila and Kilia. The voivodes owed their nomination entirely to the Porte, and the great officers of the realm were appointed at their discretion. These were the Great Logothete (Aarele Logofetw) or chancellor ; the governor of Lower Moldavia—Vorniculw de Cerra de josw; the governor of Upper Moldavia—Vorniculu de Cerra de sus; the Hatman or commander in chief; the high chamberlain—Jfarele Postelnicu ; the great Spathar, or swordbcarer; the great cupbearer—Jfarele Paharnicu ; and the treasurer, or Vistiernicu, who together formed the prince’s council and were known as Boiari de Svatu. Below these were a number of subordinate officers who acted as their assessors and were knownas boiars of the Divan (Botart de Divanit). The high conrt of justice was formed by the prince, metropolitan, and boiars: the Botari de Svatu decided on the verdict ; the metro- politan declared the law; and the prince pronounced sentence. The boiars were able to try minor cases in their own residences, but subject to the right cf appeal to the prince’s tribunal. Of the character of the Moldavian people Cantemir does not give a very favourable account. Their best points were their hospitality and, in Lower Moldavia, their valour. They cared little for letters and were generally indolent, and their prejudice against mercantile pursuits left the commerce of the country in the hands of Armenians, Jews, Greeks, and Turks. The pure-blood Rouman population, noble and plebeian, inhabited the cities and towns or larger villages ; the peasantry were mostly of Little Russian and Hungarian

race and were in a servile condition. There was a considerable Gipsy population, almost evcry boiar having several Zingar families in his possession ; these were mostly smiths.

From this period onwards the character of the Ottoman domina- tion in Moldavia is in every respect analogous to that of Walachia.

Fanariote The office of voivode or hospodar was farmed out by the Porte to

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a succession of wealthy Greeks from the Fanar quarter of Con- stantinople. All formality of election by the boiars was now dispensed with, and the princes received their caftan of office at Constantinople, where they were consecrated by the Greek patriarch. The system favoured Turkish extortion in two ways: the presence of the voivode's family connexions at Stamboul gave the Porte so many hostages for his obedience; on the other hand the prinees themselves could not rely on any support due to family inflnence in Moldavia itself. They were thus mere puppets of the Divan, and could be deposed and shifted with the same facility as so many pashas—an object of Turkish policy, as each change was a pretext for a new levy of ''backshish." The chief families that shared the office during this period were those of Mavrocordato, Ghika, Callimachi, Ypsilanti, and Murusi. Although from the very conditions of their creation they regarded the country as a field for exploitations, they were themselves often men of education and ability, and unquestionably made some praiseworthy attempts to promote the general culture and wellbeing of their subjects. In this respect, even the Fanariote regime was preferable to merc pasha rule, while it had the further consequence of preserving intact the national form of administration and the historic offices of Moldavia. Gregory Ghika (1774-1777), who himself

spoke French and Italian, founded a school or “gymnasium” at Jassy, where Greek, Latin, and theology were taught in a fashion. He encouraged the settlement of German protestant colonists in the country, some of whom set np as watchmakers in Jassy, where they were further allowed to build an evangelical church. Carra, a Swiss who had been tutor to Prince Ghika’s children, and who published in 1781 an account of the actual state of the principalities, speaks of some of the boiars as possessing a taste for French literature and even for the works of Voltaire, a tendency actively combated by the patriarch of Constantinople.

The Russo-Turkish War, which ended in the peace of Kutshuk Kaimardji, was fatal to the integrity of Moldavian territory. The house of Austria, which had already annexed Galicia in 1772, pro- fited by the situation to arrange with both contending parties for the peaceful cession of the Bukovina to the Hapsburg monarchy. This richly-wooded Moldavian province, containing Suciava, the earliest seat of the voivodes, and Cernautii or Czernovitz, was in 1774 oceupied by Hapsburg troops with Russian connivance, and in 1777 Baron Thugut procured its formal cession from the sultan. The Bukovina is still an Austrian province.

Walachian and Moldavian History from the Treaty of Kutshuk Kaimardjt in 1774 to the Establishment of the Roumanian Kingdom. —The treaty of Kutshuk Kaimardji was hardly concluded when it was violated by the Porte, which refused to recognize the right of the Walaehian boiars to elect their voivode, and nominated

Alexander Ypsilanti, a creature of its own. In 1777 Constantine Murusi was made voivode of Moldavia in the same high-handed fashion. ‘The Divan seemed intent on restoring the old system of government in its entirety, but in 1783 the Russian representative extracted from the sultan a hattisherif defining more precisely the liberties of the principalities and fixing the amount of the annual tribute—for Walachia 619 purses exclusive of the bairam and other presents amounting to 130,000 piasters, and for Moldavia 135 purses and further gifts to the extent of 115,000 piasters. By the peace of Jassy in 1792 the Dniester was recognized as the Russian frontier, and the privileges of the principalities as specified in the hattishcrif confirmed.

In defiance of treaties, however, the Porte continued to change the hospodars almost yearly and to exact extraordinary installation presents. The revolt of Pasvan Oglu in Bulgaria was the cause of great injury to Walachia. The rebels ravaged Little Walachia in 1801-2, and their ravages were succeeded by those of the Turkish troops, who now swarmed over the country. Exaction followed exaction, and in 1802 Russia resolved to assert her treaty rights in favour of the oppressed inhabitants of the principalities. On the accession of Constantine Ypsilanti the Porte was constrained to issué a new hattisherif by which every prince was to hold his office for at least seven years, unless the Porte satisfied the Russian minister that there were good and sufficient grounds for his deposi- tion. All irregular contributions were to cease, and all citizens, with the exception of the boiars and clergy, were to pay their share of the tribute. The Turkish troops then employed in the princi- palities were to be paid off, and one year's tribute remitted for the purpose. The boiars were to be responsible for the maintenance of schools, hospitals, and roads ; they and the prince together for the militia. The number of Turkish merchants resident in the country was limited. Finally, the hospodars were to be amenable to repre- sentations made to them by the Russian envoy at Constantinople, to whom was entrusted the task of watching over the Walaehian and Moldavian liberties. This, it will be seen, wasa veiled Russian protectorate.

In 1804 the Serbs under Karageorge rose against the Turkish dominion, and were secretly aided by the Walachian voivode Ypsilanti. The Porte, instigated by Napoleon's ambassador Sebastiani, resolved on Ypsilanti's deposition, but the hospodar succeeded in escaping to St Petersburg. In the war that now ensued between the Russians and the Turks, the former were for a time successful, and even demanded that the Russian territory should extend to the Danube. In 1808 the Russians, then in occupation of the principalities, formed a governing committee consisting of the metropolitan, another bishop, and four or five boiars under the presidency of General Kusnikoff. The seat of the president was at Jassy, and General Engelhart was appointed as vice-president at Bucharest. By the peace of Bucharest, however, in 1812, the principalities were restored to the sultan under the former condi- tions, with the exception of Bessarabia, which was ceded to the ezar. The Pruth thus became the Russian boundary.

The growing solidarity between the two Rouman principalities received a striking illustration in 1816, when the Walachian and Moldavian hospodars published together a code applicable to both countries, and which had been elaborated by a joint commission. The Greek movement was now beginning, and in 1821 Alexander Ypsilanti entered Moldavia at the head of the Heterists, and pre- vailed on the hospodar Michael Sutzu to aid him in invading the Ottoman dominions. Tosecure Walachian help, Ypsilanti advanced on Bucharest, but the prince, Theodore Vladimirescu, who repre- sented the national Rouman reaction against the Fanariotes, repulsed his overtures with the remark "that his business was not to march against the Turks, but to clear the country of Fanariotes." Viadimirescu was slain by a Greek revolutionary agent, but Ypsilanti's legion was totally routed by the Turks at Dragashani, and the result of his enterprise was a Turkish oecupation of the principalities. In 1822 the Turkish troops, who had committed great excesses, were withdrawn on the combined representations of Russia, Austria, and Great Britain. The country, however, was again ravaged by the retiring troops, quarters of Jassy and Bucharest burnt, and the complete evacuation delayed till 1824, when the British Government again remonstrated with the Porte. By the convention of Akierman betwecn the Russians and the Turks in 1826 the privileges of the principalities were once more confirmed, and they were again ratified in 1829, under Russian guarantce, by

" Hetar- ists move- ment.

the peace of Adrianople. By this peace all the towns on the left bank Peace of of the Danube were restored to the principalities, and the Porte Adrian- undertook to refrain from fortifying any position on the Walachian ople, side of the river. The principalities were to enjoy commercial free- 1829.

dom, and the right of establishing a quarantine cordon along the Danube orelsewhere. The internal constitution of the countries was to be regulated by an 'Organic Law," which was drawn up by assem- blies of bishops and boiars at Jassy and Bucharest, aeting, however, under Russian control, The Organic Law thus elaborated was by no means of a liberal character, and amongst other abuses maintained the feudal privileges of the boiars. It was

ratified by the Porte in 1834, and the Russian army of occupation thereupon withdrew.

ROU—

The revolutionary movement of 1848 extended from the Roumans | according to

of Hungary and Transylvania to their kinsmen of the Transalpine regions. In Moldavia the agitation was mostly confined to the boiars, and the hospodar Michael Sturdza succeeded in arresting the ringleaders. In Walachia, however, the outbreak took a more violent form, The people assembled at Bucharest, and demanded a constitution, The prince Bibescu, after setting his signature to the constitution submitted to him, fled to Transylvania, and a provisional government was formed. The Turks, however, urged thereto by Russian diplomacy, crossed the Danube, and a joint Russo-Turkish dictatorship restored the “ Organic Law.” By the Balta-Liman convention of 1849 the two Governments agreed to the appointment of Barbi Stirbeiti as prince of Walacliia, and Gregoriti Ghika for Moldavia.

On the entry of the Russian troops into the principalities in 1858, the hospodars fled to Vienna, leaving the government in the hands of their ministers, During the Danubian campaign that how ensued great suffering was inflicted on the inhabitauts, but in 1854 the eabinet of Vienna induced the Russians to withdraw,

. Austrian troops occupied the principalities, and the hospodars

returned to their posts.

By the treaty of Paris in 1856 the principalities with their exist- ing privileges were plaeed under the holleedve guarantee of the contracting powers, while remaining under the suzerainty of the Porte,—the Porte on its part engaging to respect the complete in- dependence of their internal administration. A strip of southern Bessarabia was restored to Moldavia, so as to push baek the Russian frontier from the Danube mouth. The existing laws and statutes of both principalities were to be revised by a European commission sitting at Bucharest, and their work was to be assisted by a

Divan or national council which the Porte was to convoke ad hoc in each of the two provinces, and in which all classes of Walachian and Moldavian society were to be represented. The European com- mission, in arriving at its conclusions, was to take into considera- tion the opinion expressed by the representative councils; the Powers were to come to terms with the Porte as to the recommen- dations of the commission ; and the final result was to be embodied in a hattisherif of the sultan, which was to lay down the definitive organization of the two principalities. In 1857 the commission arrived, and the representative councils of the two peoples were con- voked. On their meeting in September they at once proceeded to vote with unanimity the nnion of the two principalities into a single state under the name of Romania (Ronmania), to be governed by a foreign prinee elected from one of the reigning dynasties of Europe, and having a single representative assembly. The Powers decided to undo the work of national union. By the convention concluded by the European congress at Paris in 1858, it was decided that the principalities should continue as heretofore to be governed each by its own prince. Walachia and Moldavia were to have separate assemblies, but a central comniission was to be established at Fokshani for the preparation of laws of common interest, which were afterwards to be submitted to the respective assemblies, Moldavia and Walachia met in Separate assemblies at Bucharest and Jassy, but the choice of both fell unanimously on Prince Alexander John Cuza, thus ensuring the personal union of the two prineipali- ties (January 1859). A new conference was now summoned to

Paris to discuss the affairs of the principalities, and the election of

Prince Cuza finally ratified by the Powers and the Porte. The two assemblies and the central commission were preserved till 1862, when a single assembly met at Bucharest and a single ministry was formed for the two countries. The central commission was at the same time abolished, and a council of state charged with preparing bills substituted for it. In May 1864, owing to difficulties between the Government and the gencral assembly, the latter was dissolved, and a statute was submitted to universal suffrage giving greater authority to the prince, and creating two chambers (of senators aud of deputies). The franchise was now extended to all

citizens, a cumulative voting power being reserved, however, for property, and the peasantry were emancipated from forced labour,

In 1865 a eonflict broke out between the Government and the people in Bucharest, and in February 1866 Prince Cuza, whose personal viees had rendered him detestable, was forced to abdicate. The chambers chose first as his suceessor the count of Flanders, but on his declining the office proceeded to elect Prince Charles of Hohenzollern-Sigmaringen, who was proclaimed hospodar or Domnu of Roumania April 29, 1866. A new constitution was at the same time introduced. Its provisions secure the universal suffrage of tax-paying citizens, ministerial responsibility, trial by jury, freedom of meeting and petition, of speeeh and of the press (except as regards breaches of the criminal eode), gratuitous and compulsory primary education, and the right of asylum for political exiles. Legislative power is shared between the prince aud chambers, but bills relating to the budget and army must originate with the ehamber of deputies. There are two chanibers — the senate and the chamber of deputies. Both houses are eleetive, and the election is carricd out by means of electoral colleges classified

Jorce majeure the Government of Prince Charles conse passage of Russian troops across Roumanian territory, on the under- War,

jurisdiction of the

In aecordanee with this convention the deputies of

ROU 21 property and professional qualifications. For the house of deputies each constituency is divided in this way into four colleges, each of which elects a member. The two highest of these colleges also elect the senators, each senator being eleeted for a term of eight years, The senate also includes ex officio certain high officials and ecclesiastics, and members for the universities. The senate consists at present of 120 members, the chamber of deputies of 178. The sovereign has a right of veto reserved to him onall measures. The judicial system is based on the Code Napoléon, with some modifieations.

On the outbreak of the Russo-Turkish war in 1877 Roumania Roumania Yielding to in Russo- nted to the Turkish

found herself once more between hammer and anvil.

standing that the scene of hostilities was as far as possible to be removed outside the limits of the principality. The Porte, how- ever, refusing to recognize that Roumania had acted under constraint, proclaimed the Roumanians rebels, and the prince's Governinent accordingly resolved to offer active assistance to the

Russians. A Roumanian division of 32,000 men under General Rou-

Cernat, took part in the siege of Plevna, and the Roumanian manian soldiers distinguished themselves in the opinion of the most com- feats at The snceessful Plevna,

petent judges alike for their heroism and endurance. assault by the Roumanian troops on the ''indomitable redoubt" of Grivitza formed in fact the turning point of the siege and of the war. In the peace of St Stefano, however, Russia insisted on the retroces- sion of the strip of Bessarabia that had been restored to Moldavia by the treaty of Paris, giving Roumania "in exchange " the islands of the Danubian delta, and the Dobrudja, which had been ceded by the sultan. of Berlin (1878). consented by Art. xliii. to reeognize the independence of the prin- cipality subject to the provision (Art. xliv.) that all the inhabitants should enjoy complete religious freedom, a clause inserted on aceount of the Jewish persecutions that had previously taken place, and that foreigners in the country should be treated on a footing of perfect equality. All Danubian fortresses were to be razed, and the European commission to regulate the Danubian navigation, on which Roumania now acquired the right of repre- sentation, was extended from the mouth to the Iron Gates. The

coping-stone to Roumanian independence was set by the proclama- Prinee 1881, of Prince Charles as king of Roumania, Charles year his coronation took place with the erowned head was king.

tion on March 26, and on May 22 of the same European sanction. The crown placed on King Carol's made from the captured cannon of the Plevna redoubts.

Authorities.—As the questions regarding the first appearance of the Roumans north of the Danube are reserved for the article VLAcHS, it may be sufficient here to refer the reader to the works of Roesler, especially Romdnische Studien; J. Jung, Anjfinge der Romdnen, and Roemer und Romdnen ; Lad. Pit, Abstam- mung der Rumdnen: A. D. Xenopol, Les Roumains au Moyen Age. For the history of the principalities down to the end of the last century J. C. Engel's works, Die Geschichte der Walachet and Geschichte der Moldau, are still the most trustworthy authoritics. J. A. Vaillant, La Romainte: Histoire, Langue, &c., and A, T. Laurianu, Jstoria Romaniloru, &e., may be consulted for the later his. tory, but a really critical history of the principalities has yet to be written. The materials for it are, howcver, being rapidly amassed—thanks to the publica- tions of the Roumanian Academy and the documents collected by native scholars; ¢f. especially Hurmuzaki, Documente privitore la Istorta Romanitor,

and Hasdcu, Publicationt istorico-filologice, &c. For a uscful account of the Roumania Past and Present,

present state of Roumania, see James Samuelson, 1882. For views of Walachia and Moldavia, as they existed from the 15th ecutury onwards, reference has already been made to the works of Verantius and Del Chiaro, and Cantemir's Descriptio Moldaviz, (A. J. E.)

ROUMANITAN LITERATURE. See Vuacus.

ROUMELIA. The name of Roumili, "the land of the Romans," was applied from the 15th century downwards to all that portion of the Balkan peninsula westwards from the Black Sea which was subject to Turkey. More precisely it was the country bounded N, by Bulgaria, W. by Albania, and §. by the Morea, or in other words the ancient provinces, including Constantinople and Salonica, of Thrace, Thessaly, and Macedonia. The name was ulti- mately applied more especially to an eyalet or province composed of Central Albania 'and Western Macedonia, having Monastir for its chief town and including Kesrie (Castoria), Ocri (Ochrida), and Scodra (Scutari) ; and at length it disappeared altogether in the administrative alterations effected between 1870 and 1875, Eastern Roumelia was constituted an autonomous province of the Turkish empire by the Berlin treaty of 1878, to be governed by a Christian governor-general appointed by tlie sultan for a

term of five years. In 1879, in obedience to an international commission, it was divided into six departments and twenty-eight cantons, the departments being Philippopolis (187,095), Tatarbazarjik (117,063),

This territorial readjustment was ratified by the treaty Berlin The high contracting powers at the same time treaty.

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Hasskdi (134,268), Eski-Zagra (158,905) Kazanlik, Slivno or Sliven (130,136), and Burgas (88,046). On the N. and N.W. East Roumelia was bounded by Bulgaria, the frontier running along the line of the Balkans though not keeping to the watershed ; on the S.W. and S. lay the vilayets of Salonika and Adrianople, the borderlands form- ing part of the Rhodope or Despoto mountain system. The direct distance between the northmost and southmost point on the Black Sea is only 40 miles, but the actual coast-line is lengthened by the ramifications of the Bay of Burgas, which is the only part of the Black Sea affording several good anchorages. The great bulk of the country belongs to the basin of the Maritza and its tributary the Tunja (confluence at Adrianople, to the south of Roumelia), though a certain part drains north-eastwards by several small streams. The whole area is estimated at 14,858 square miles, and the population in 1880 was 815,513, of whom 573,231 were Bulgarians, 176,759 Turks, 42,526 Greeks, 19,524 Gipsies, 4177 Jews, and 1306 Armenians. This preponderance of Bulgarians led in September 1885 to the Philippopolis revolution, which resulted in the princi- pality of Bulgaria declaring East Roumelia part and parcel of United Bulgaria ; and the United Bulgarians have since been successful in a war with the Servians, who invaded their territory.

ROUND TOWERS. A peculiar class of round tower exists scattered throughout Ireland; about one hundred and twenty examples still remain, mostly in a ruined state, but eighteen or twenty are almost perfect. These towers were built either near or adjoining a church ; they are of various dates from perhaps the 8th to the 13th century; though varying in size and detail, they have many characteristics which are common to all. They are built with walls slightly battermg inwards, so that the tower tapers towards the top. The lower part is formed of solid masonry, the one doorway being raised from 6 to 20 feet above the ground, and so only accessible by means

of a ladder. The towers within are divided into several stories by two or more floors, usually of wood, but in some cases, as at Keneith, of stone slightly arched. The access from floor to floor was by ladders, no stone staircase being provided. The windows, which are always high up, are single lights, mostly arched or with a flat stone lintel. In some of the oldest towers they have triangular tops, formed by two stones leaning together, like the windows at Deerhurst and other pre-Norman buildings in England. One peculiarity of the door and window openings in the Trish round towers is that the jambs are frequently set sloping, so that the opening grows narrower towards the top, as in the temples of ancient Egypt. The later examples of these towers, dating from the 12th and 13th centuries are often decorated with chevron, billet, and other Norman enrichments round the jambs and arches. The roof is of stone, usually conical in shape, and some of the later towers are crowned by a circle of battlements. The height of the round towers varies from about 60 feet to 132; that at Kilcullen is the highest. The masonry differs according to its date,—the oldest examples being built of almost uncut rubble work, and the later ones of neatly-jointed ashlar. .

Much has been written as to the use of these towers, and the most conflicting theories as to their origin have been propounded. It is, however, fairly certain that they were constructed by Christian builders, both from the fact that they always are or once were near to a church, and also because crosses and other Christian emblems frequently occur among the sculptured decorations of their doors and windows. The original purpose of these towers was pro- bably for places of refuge, for which the solid base and the door high above the ground seem specially adapted. They

may also have been watch-towers, and in later times often contained bells. Their circular form was probably for the sake of strength, angles which could be attacked by a battering ram being thus avoided, and also because no quoins or dressed stones were needed, except for the open- ings—an important point at a time when tools for working stone were scarce and imperfect. Both these reasons may also account for the Norman round towers which are so common at the west end of churches in Norfolk,

Suffolk, and Essex, though these have little resemblance to those of Ireland except in the use of a circular plan. One example exactly like those of Ireland still exists in the Isle of Man, within the precincts of Peel Castle adjacent to the cathedral of St German ; it was probably the work of Irish builders. There are also three in Scotland, viz. at Egilshay in Ork- ney, and at Abernethy and Brechin.

Round towers wider and lower in proportion than those of Ireland appear to have been built by many prehistoric races at different parts of Europe. Many examples exist in Scotland, and in the islands of Corsica and Sardinia. The towers of this class in Scotland are called “ brochs ” ; they average about 50 feet high and 30 feet in internal diameter. Their walls, which are usually about 15 feet thick at the bottom, are built hollow, of rubble masonry, with series of passages one over the other running all round the tower. As in the Irish towers, the entrance is placed at some distance from the ground; and the whole structure is designed as a stronghold. The brochs appear to have been the work of a pre-Christian Celtic race. Many objects in bronze and iron and fragments of hand- made pottery have been found in and near these towers, all bearing witness of a very early date. See Anderson, Scotland in Pagan Times, 1883, and Scotland in Early Christian Times, 1881. During the 6th century church towers at and near Ravenna were usually built round in plan, and not unlike those of Ireland in their proportions. The finest existing example is that which stands by the church of S. Apollinare in Classe, the old port of the city of Ravenna (see Bastzica, vol. iii. p. 415, fig. 5). It is of brick, divided into nine stories, with single-light windows below, three-light windows in the upper stories, and two-lights in the intermediate ones. The most magnificent example of a round tower is the well-known leaning tower of Pisa, begun in the year 1174, It is richly decorated with tiers of open marble arcades, supported on free columns. The circular plan was much used by Moslem races for their minarets. The finest of these is the 13th- century minar of Kootub at Old Delhi, built of limestone with bands of marble. It is richly fluted on plan, and when complete was at least 250 feet high.

The best account of the Irish round towers is that given by Petrie, in his Ecclesiastical Architecture of Ireland (Dublin, 1845). See also Keane, Towers and Temples of Ancient Ireland (Dublin, 1850); Brash,

Ecclesiastical Architecture of Ireland (Dublin, 1875); and Stokes, Early Architecture in Ireland (Dublin, 1878).

ROUNDEL. See RonDEAv.

ROUS, or Rouse, Francis (1579-1659), known by his translation of the Psalms; see vol. xii. p. 590. His works appeared at London in 1657.

ROUSSEAU, Jacquzs (1630-1693), painter, a member of a Huguenot family, was born at Paris in 1630. He was remarkable as a painter of decorative landscapes and classic ruins, somewhat in the style of Canaletto, but without his delicacy of touch; he appears also to have been influenced by Nicolas Poussin. While quite young Rousseau went to Rome, where he was fascinated by the noble picturesqueness of the ancient ruins, and spent some years in painting them, together with the surrounding landscapes. He thus formed his style, which was highly artificial and conventionally decorative. His colouring for the most part is unpleasing, partly owing to his violent

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ROUS

treatment of skies with crude blues and orange, and his chiaroscuro usually is much exaggerated. On his return to Paris he soon became distinguished as a painter, and was employed by Louis XIV. to decorate the walls of his palaces at St Germain and Marly. He was soon admitted a member of the French Academy of the Fine Arts, but on the revocation of the edict of Nantes he was obliged to take refuge in Holland, and his name was struck off the Academy roll. From Holland he was invited to Eng- land by the duke of Montague, who employed him, together with other French painters, to paint the walls of his palace, Montague House.! Rousseau was also employed to paint architectural subjects and landscapes in the palace of Hampton Court, where many of his decorative panels still exist. He spent the latter part of his life in London, where he died in 1693.

Besides being a painter in oil and fresco Rousseau was an etcher of some ability ; many etchings by his hand from the works of the Caracci and from

his own designs still exist ; they are vigorous, though too coarse in execution.

ROUSSEAU, Jzan Baptiste (1670-1741), a poet of some merit and a wit of considerable dexterity, was born at Paris on the 10th April 1670; he died at Brussels on the 17th March 1741. The son of a shoemaker, he is said to have been ashamed of his parentage and relations when he acquired a certain popularity, but the abundance of literary quarrels in which he spent his life, and the malicious inventiveness of his chief enemy, Voltaire, make any such stories of small account. He was certainly well educated and early gained favour with Boileau, who did not regard many people favourably ; but authentic intelli- gence as to his youth is very scarce. He does not seem to have attempted literature very young, and when he began he began with the theatre, for which at no part of his life does he seem to have had any aptitude. A one-act comedy, Le Café, failed in 1694, and he was not much happier with a more ambitious play, Les Flatteurs, or with the opera of Venus and Advnis. He would not take these warnings, and tried in 1700 another comedy, Le Capricieux, which had the same fate. By this time he had already (it is not quite clear how) obtained influential patrons, such as Breteuil and Tallard, had gone with Tallard as an attaché to London, and, in days when litera- ture still led to high position, seemed likely to achieve success. ‘To tell the whole story of his misfortunes would take far more space than can be spared him here. They began with what may be called a club squabble at a certain Café Laurent, which was much frequented by literary men, and where Rousseau indulged in lampoons on his companions. A shower of libellous and sometimes obscene verses was written by or attributed to him, and at last he was practically turned out of the café. At the same time his poems, as yet only singly printed or in manuscript, acquired him a great reputation, and not unjustly, for Rousseau is certainly the best French writer of serious lyrics between Racine and Chénier. He had in 1701 been made a member of the Académie des Inscrip- tions ; he had been offered, though he had not accepted, profitable places in the revenue department; he had become a favourite of the libertine but not uninfiuential coterie of the Temple; and in 1710 he presented himself as a candidate for the Académie Francaise. Then began the second chapter (the first had lasted ten years) of a history of the animosities of authors which is almost the strangest though not the most important on record. A copy of verses, more

offensive than ever, was handed to the original object of Rousseau's jealousy, and, getting wind, occasioned the bastinadoing of the reputed author by a certain La Faye or La Faille, a soldier who was reflected

1 Montague House stood on the site of the British Museum.

on. Legal proceedings of various kinds followed, and Rousseau either had or thought he had ground for ascrib- ing the lampoon to Joseph Saurin. More law ensued, and the end of it was that in 1712 Rousseau, not appear- ing, was condemned par contumace to perpetual exile. He actually suffered it, remaining for the rest of his life in foreign countries except for a short time in 1738, when he returned clandestinely to Paris to try for a recall. It should be said that he might have had this if he had not steadfastly protested his innocence and refused to accept a mere pardon. No one has ever completely cleared up the story, and it must be admitted that, except as exhibiting very strikingly the strange idiosyncrasies of the 18th century in France, and as having affected the fortunes of a man of letters of some eminence, it is not worth much attention.

Rousseau's good and ill luck did not cease with his exile. First Prince Eugene and then other persons of dis- tinction took him under their protection, and he printed at Soleure the first edition of his poetical works. But by fault or misfortune he still continued to quarrel. Voltaire and he met at Brussels in 1722, and, though Voltaire had hitherto pretended or felt a great admiration for him, something happened which turned this admiration into hatred. Voltaire's Le Pour et Le Contre is said to have shocked Rousseau, who expressed his sentiments freely. At any rate the latter had thenceforward no fiercer enemy than Voltaire. Rousseau, however, was not much affected by Voltaire's enmity, and pursued for nearly twenty years a life of literary work, of courtiership, and of rather obscure speculation and business. Although he never made his fortune, it does not seem that he was ever in want. When he died his death had the singular result of eliciting from a poetaster, Lefranc de Pompignan, an ode of real excellence and perhaps better than anything of Rousseau's own work. That work, however, has high merits, and is divided, roughly speaking, into two strangely contrasted divisions. One consists of formal and partly sacred odes and

cantates of the stiffest character, the other of brief epigrams, sometimes licentious and always or almost always ill-natured. In the latter class of work Rousseau is only inferior to his friend Piron. In the former he stands almost alone. The frigidity of conven- tional diction and the disuse of all really lyrical rhythm which characterize his period do not prevent his odes and cantates from showing true poetical faculty, grievously cramped no doubt, but still existing.

Besides the Soleure edition mentioned above, Rousseau published (visiting England for the purpose) another issue of his work at London in 1723. The chief edition since is that of Amar in 1820. M. A. de Latour has published (Paris, Garnier, 1869) a useful though not complete edition, with notes of merit and a biographical

introduction which would have becn better if the facts had been more punctually and precisely stated.

ROUSSEAU, Jzan Jacques (1712-1778), was born at Geneva on the 28th June 1712. His family had estab- lished themselves in that city at the time of the religious wars, but they were of pure French origin. Rousseau's father Isaac was a watchmaker; his mother, Suzanne Bernard, was the daughter of a minister; she died in childbirth, and Rousseau, who was the second son, was brought up in a very haphazard fashion, his father being a dissipated, violent-tempered, and foolish person. He, however, taught him to read early, and seems to have laid the foundation of the flighty sentimentalism in morals and politics which Rousseau afterwards illustrated with his genius. When the boy was ten years old his father got entangled in a disgraceful brawl and fled from Geneva, apparently without troubling himself about Jean Jacques. The father and son had little more to do with each other and rarely met. Rousseau was, however, taken charge of

by his mother's relations and was in the first place com- mitted by them to the tutorship of a M. Lambercier, pastor at Bossey. Of these times as of the greater part of his life there are ample details in the Confessions, but it may be as well to remark at once that this famous book, however charming as literature, is to be used as docu- mentary evidence only with great reserve.

In 1724 he was removed from this school and taken into the house of his uncle Bernard, by whom he was shortly afterwards apprenticed to a notary. His master, however, found or thought him quite incapable and sent him back. After a short time (April 25, 1725) he was apprenticed afresh, this time to an engraver. He did not dislike the work, but was or thought himself cruelly treated by his master. At last in 1728, when he was sixteen, he ran away, the truancy being by his own account unintentional in the first instance, and due to the fact of the city gates ‘being shut earlier than usual. Then began a very extraordinary series of wanderings and adventures, for much of which there is no authority but his own. He first fell in with some proselytizers of the Roman faith at Confignon in Savoy, and by them he was sent to Madame de Warens at Annecy, a young and pretty widow who was herself a convert. Her influence, however, which was to be so great, was not immediately exercised, and he was, so to speak, passed on to Turin, where there was an institution specially devoted to the reception of neophytes. His experiences here were (accordiug to his own account, it must always be understood) sufficiently unsatisfactory, but he abjured duly and was rewarded by being presented with twenty francs and sent about his business. He wandered about in Turin for some time, and at last established himself as footman to a Madame de Vercellis. Here occurred the famous incident of the theft of a ribbon, of which he accused a fellow servant—a girl too. But, though he kept his place by this piece of cowardice, Madame de Vercellis died not long afterwards and he was turned off. He found, however, another place with the Comte de Gouvon, but lost this also through coxcombry. Then he resolved to return to Madame de Warens at Annecy. The chronology of all these events is somewhat obscure, but they seem to have occupied about three years.

Even then Rousseau did not settle at once in the anomalous but to him charming position of domestic lover to this lady, who, nominally a converted Protestant, was in reality, as many women of her time were, a kind of deist, with a theory of noble sentinient and a practice of libertinism tempered by good nature. It used to be held that in her conjugal relations she was even more sinned against than sinning. But recent investigations seem to show that M. de Vuarrens (which is said to be the correct spelling of the name) was a very unfortunate hus- band, and was deserted and robbed by his wife. However, she welcomed Rousseau kindly, thought it

necessary to complete his education, and he was sent to the semin- arists of St Lazare to be improved in classics, and also to a music master. In one of his incomprehensible freaks he set off for Lyons, and, after abandoning his companion in an epileptic fit, returned to Annecy to find Madame de Warens gone no one knew whither. Then for some months he relapsed into the life of vagabondage, varied by improbable adventures, which (according to his own statement) he so often pursued. Hardly knowing anything of music, he attempted to give lessons and a concert at Lausanne; and he actually taught at Neuchatel. Then he became or says he became secretary to a Greek archimandrite who was travelling in Switzerland to collect subscriptions for the rebuilding of the Holy Sepulchre; then he went to Paris, and, with recommendations from the French ambas-

sador at Soleure, saw something of good society; then he returned on foot through Lyons to Savoy, hearing that Madame de Warens was at Chambéry. This was in 1732, and Rousseau, who for a time had unimportant employ- ments in the service of the Sardinian crown, was shortly installed by Madame de Warens, whom he still called Maman, as amant en titre in her singular household, wherein she diverted herself with him, with music, and with chemistry. In 1736 Madame de Warens, partly for Rousseau's health, took a country house, Les Charmettes, a short distance from Chambéry. Here in summer, and in the town during winter, Rousseau led a delightful life, which he has delightfully described. In a desultory way he did a good deal of reading, but in 1738 his health again became bad, and he was recommended to go to Montpellier. By his own account this journey to Montpel- lier was in reality a voyage & Cythére in company with a certain Madame de Larnage. This being so, he could hardly complain when on returning he found that his official position in Madame de Warens's household had been taken by a person named Vintzenried. He was, however, less likely than most men to endure the position of second in command, and in 1740 he became tutor at Lyons to the children of M. de Mably, not the well-known writer of that name, but his and Condillac's elder brother. But Rousseau did not like teaching and was a bad teacher, and after a visit to Les Charmettes, finding that his place there was finally occupied, he once more went to Paris in 1741. He was not without recommendations. But a new system of musical notation which he thought he had discovered was unfavourably received by the Académie des

Sciences, where it was read in August 1742, and he was unable to obtain pupils. Madame Dupin, however, to whose house he had obtained the entry, procured him the honourable if not very lucrative post of secretary to M. de Montaigu, ambassador at Venice. With him he stayed for about eighteen months, and has as usual infinite complaints to make of his employer and some strange stories to tell. At length he threw up his situation and returned to Paris

1745).

Up A this time—that is to say, till his thirty-third year— Rousseau's life, though continuously described by himself, was of the kind called subterranean, and the account of it must be taken with considerable allowances. There are, to say the least, grave improbabilities in it ; there are some chronological difficulties ; and in one or two instances his accounts have been flatly denied by persons more or less entitled to be heard. He had written nothing, and if he was known at all it was as an eccentric vagabond. From this time, however, he is more or less in view; and, though at least two events of his life—his quarrel with Diderot and his death—are and are likely long to be subjects of dispute, its general history can be checked and followed with reasonable confidence. On his return to Paris he renewed his relations with the Dupin family and with the literary group of Diderot, to which he had already been introduced by M. de Mably's letters. He had an opera, Les Muses Galantes, privately represented ; he copied music for money, and received from Madame Dupin and her son- inlaw M. de Francueil a small but regular salary as secretary. He lived at the Hotel St Quentin for a tinie, and once more arranged for himself an equivocal domestic establishment. His mistress, whom towards the close of his life he married after a fashion, was Thérése le Vasseur, a servant at the inn. She had little beauty, no education or understanding, and few cliarms of any kind that his friends could discover, besides which she had a detestable mother, who was the bane of Rousseau's life. But he made himself at any rate for a time quite happy with her, and (according to Rousseau's account, the accuracy of

which has been questioned) five children were born to them, who were all consigned to the foundling hospital. This dis- regard of responsibility was

partly punished by the use his critics made of it when he became celebrated as a writer on education and a preacher of the domestic affections. Diderot, with whom he became more and more familiar, admitted him as a contributor to the Hncyclopédie. He formed new musical projects, and he was introduced by degrees to many people of rank and influence, among whom his warmest patron for a time was Madame dEpinay. It was not, however, till 1749 that Rousseau made his mark. The academy of Dijon offered a prize for an essay on the effect of the progress of civilization on morals. Rousseau took up the subject, developed his famous paradox of the superiority of the savage state, won the prize, and, publishing his essay next year, became famous. The anecdotage as to the origin of this famous essay is voluminous. It is agreed that the idea was suggested when Rousseau went to pay a visit to Diderot, who was in prison at Vincennes for his Lettre sur les Aveugles. Rousseau says he thought of the paradox on his way down; Morellet and others say that he thought of treating the subject in the ordinary fashion and was laughed at by Diderot, who showed him the advantages of the less obvious treatment. Diderot himself, who in such matters is almost absolutely trustworthy, does not claim the suggestion, but uses words which imply that it was at least partly his. It is very likehim. The essay, however, took the artificial and crotchety society of the day by storm. Francueil gave Rousseau a valuable post as cashier in the receiver general's office. But he resigned it either from conscientiousness, or crotchet, or nervousness at responsibility, or indolence, or more probably from a mixture of all four. He went back to his music copying, but the salons of the day were determined to have his society, and for a time they had it. In 1752 he brought out at Fontainebleau an operetta, the Devindu Village, which was very successful. He received a hundred louis for it, and he was ordered to come to court next day. This meant the certainty of a pension. But Rousseau's shyness or his perversity (as before, probably both) made him disobey the command. His comedy Warcisse, written long before, was also acted, but unsuccessfully. In the same year, however, a letter Sur la Musique Francaise again had a great vogue. Finally, for this was an important

1 Rousseau's influence on French music was greater than might have been expected from his very imperfect education; in truth, he was a musician by natural instinct only, but his feeling for art was very

| good and beautiful. The system of notation (by figures) concerning

which he read a paper before the Académie des Sciences, August 22,

1742, was ingenious, but practically worse than useless, and failed) to attract attention, though the paper was published in 1743 under the) title of Dissertation sur la musique moderne. In the famous "' guerre

des buffons," he took the part of the " buffonists," so named in conse-

quence of their attachment to the Italian "opera buffa," as opposed to

the true French opera; and, in his Lettre sur la musique Francatse,

published in 1753, he indulged in a violent tirade against French | music, which he declared to be so contemptible as to lead to the con-

clusion ''that the French neither have, nor ever will have, any music)) of their own, or at least that, if they ever do have any, it will be so)) much the worse for then." This silly libel so enraged the performers y at the Opera that they hanged and burned its author in effigy.) Rousseau revenged himself by printing his clever satire entitled | Lettre d'un symphoniste de 0 Académie Royale de Musique @ ses cama- | rades de Vorchestre. Hig Lettre a M. Burney is of a very different | type, and does full justice to the genius of Gluck. His articles on es in the Hncyclopédie deal very superficially with the subject ; jand his Dictionnaire de Musique (Geneva, 1767), though admirably written, is not trustworthy, either as a record of facts or as a col- jlection of critical essays. In all these works the imperfection of his musical education is painfully apparent, and his compositions | betray an equal lack of knowledge, though his refined taste is as clearly displayed there ag is his literary power in the Letters and Dic-tionary. His first opera, Les Muses Galantes, privately prepared at

strong, and, though capricious, based upon true perceptions of the:

year with him, the Dijon academy, which had founded his fame, announced the subject of “The Origin of In- equality,” on which he wrote a discourse which was un- successful, but at least equal to the former in merit. During a visit to Geneva in 1754 Rousseau saw his old friend and love Madame de Warens (now reduced in cir- cumstances and having lost all her charms), while after abjuring his abjuration of Protestantism he was enabled to take up his freedom as citizen of Geneva, to which his birth entitled him and of which he was proud. Some time afterwards, returning to Paris, he accepted a cottage near Montmorency (the celebrated Hermitage) which Madame d’Kpinay had fitted up for him, and established him- self there in April 1756. He spent little more than a year there, but it was a very important year. Here he wrote La Nouvelle Héloise; here he indulged in the passion which that novel partly represents, his love for Madame d’Houdetot, sister-in-law of Madame d’Epinay, a lady still young and extremely amiable but very plain, who had a husband and a lover (St Lambert), and whom Rousseau’s burning devotion seems to have partly pleased and partly annoyed. Here too arose the incomprehensible triangular quarrel between Diderot, Rousseau, and Grimm which ended Rousseau’s sojourn at the Hermitage. It is impossible to discuss this at length here. The supposition least favourable to Rousseau is that it was due to one of his numerous fits of half-insane petulance and indignation at the obligations which he was nevertheless always ready to incur. That most favourable to him is that he was expected to lend himself in a more or less complaisant manner to assist and cover Madame d’Epinay’s adulterous affection for Grimm. It need only be said that Madame d’Epinay’s morals and Rousseau’s temper are equally indefensible by anyone who knows anything about either, but that the evidence as to the exact influence of both on this particular transaction is hopelessly inconclusive. Diderot seems to have been guilty of nothing but thought- lessness (if of that) in lending himself to a scheme of the Le Vasseurs, mother and daughter, for getting Rousseau out of the solitude of

the Hermitage. At any rate Rous- seau quitted the Hermitage in the winter, and established himself at Montlouis in the neighbourhood.

Hitherto Rousseau's behaviour had frequently made him enemies, but his writings had for the most part made him friends. The quarrel with Madame d'Epinay, with Diderot, and through them with the philosophe party reversed this. In 1758 appeared his Lettre a d' Alembert contre les Spectacles, written in the winter of the previous year at Montlouis. This was at once an attack on Voltaire, who was giving theatrical representations at Les Délices, on D'Alembert, who had condemned the prejudice against the stage in the Encyclopédie, and on one of the favourite amuse- ments of the society of the day. Diderot personally would have been forgiving enough. But Voltaire's strong point was not forgiveness, and, though Rousseau no doubt exaggerated the efforts of his "enemies," he was certainly henceforward as obnoxious to the philo-

the house of La Popeliniére, attracted very little attention ; but Le Devin du Village, given at Fontainebleau in 1752, and at the Académie in 1753, achieved a great and well-deserved success, Though very unequal, and exceedingly simple both in style and con- struction, it contains some charming melodies, and is written through- out in the most refined taste. His Pygmalion (1775) is a melodrama without singing. Some posthumous fragments of another opera, Daphwis et Chloé, were printed in 1780; and in 1781 appeared Les Consolations des Miséres de ma Vie, a collection of about one hundred songs and other fugitive pieces of very unequal merit. Thc popular air known as Rousseau's Dream is not contained in this collection, and cannot be traced back farther than J. B. Cramer's celebrated " Variations." M. Castil-Blaze has accused Rousseau of extensive plagiarisms (or worse) in Le Devin du Village and Pygmalion, but apparently without sufficient cause. ~ GWie anti) XXI. — 4

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Sophe coterie as to the orthodox party. He still, how- ever, had no lack of patrons—he never had—though his unsurpassable perversity made him quarrel with all. an. turn.

he was eagerly industrious in his literary work—indeed most of his best books were produced during his stay in the neighbourhood of Montmorency. A letter to Voltaire on his poem about the Lisbon earthquake embittered the dislike between the two, being surreptitiously published. La Nouvelle Héloise appeared in the game year (1760), and it was immensely popular. In 1§62 appeared the Contrat Social at Amsterdam, and Hmilé, which was pub- lished both in the Low Countries and at Paris. For the latter the author received 6000 livres, for the Conérat

1000.

Julie, ou La Nouvelle Héloise, is a novel written in letters describing the loves of a man of low position and a girl of rank, her subsequent marriage to a respectable freethinker of her own station, the mental agonies of her lover, and the partial appeasing of the distresses of the lovers by the influence of noble sentiment and the good offices of a philanthropic Englishman. It is too long, the sentiment is overstrained, and severe moralists have accused it of a certain complaisance in dealing with amatory errors; but it is full of pathos and knowledge of the human heart. The

Contrat Social, as its title implies, endeavours to base all

government on the consent, direct or implied, of the governed, and indulges in much ingenious argument to get rid of the practical inconveniences of such a suggestion. mile, the second title of which is De ?Hducation, is much more of a treatise than of a novel, though a certain amount of narrative interest is kept up throughout. Rousseau’s reputation was now higher than ever, but the term of the comparative prosperity which he had enjoyed for nearly ten years was at hand. The Contrat Social was obviously anti-monarchic; the Mowvelle Héloise was said to be immoral ; the sentimental deism of the “ Profes- sion du vicaire Savoyard” in Emile irritated equally, the philosophe party and the church. On June 11, 1 62, mile was condemned by the parlement of Paris, and two days previously Madame de Luxembourg and the Prince de Conti gave the author information that he would be arrested if he did not fly. They also furnished him with means of flight, and he made for Yverdun in the territory of Bern, whence he transferred himself to Motiers in Neuchatel, which then belonged to Prussia. Frederick II. was not indisposed to protect the persecuted when it

cost him nothing and might bring him fame, and in Marshal Keith, the governor of N euchatel, Rousseau found a true and firm friend. He was, however, unable to be quiet or to practise any of those more or less pious frauds which were customary at the time with the unor- thodox. The archbishop of Paris had published a pastoral against him, and Rousseau did not let the year pass without a Lettre & M. de Beaumont. The council of Geneva had joined in the condemnation of Emile, and Rousseau first solemnly renounced his citizenship, and then, in the Lettres de la Montagne (1763), attacked the council and the Genevan constitution unsparingly. All this excited public opinion against him, and gradually he grew unpopular in his own neighbourhood. This unpopularity is said on very uncertain authority to have culminated in a nocturnal attack on his house, which reminds the reader remarkably of an incident in the life of the greatest French man of letters of the present century. At any rate he thought he was menaced if he was not, and migrated to the fle St Pierre in the Lake of Bienne, where he once more for a short, and the last, time enjoyed that idyllic existence

ROUS

The amiable duke and duchess of Luxem- bourg, who were his neighbours at Montlouis, made his acquaintance, or rather forced theirs upon him, and

SEAU

which he loved. But the Bernese Government ordered him to quit its territory. He was for some time uncertain where to go, and thought of Corsica (to join Paoli) and Berlin, But finally David Hume offered him, late in 1765, an asylum in England, and he accepted. He passed through Paris, where his presence was tolerated for a time, and landed in England on January 13, 1766. Thérése travelled separately, and was entrusted to the charge of James Boswell, who had already made Rousseau’s acquaintance, Here he had once more a chance of settling peaceably. Severe English moralists like Johnson thought but ill of him, but the public generally was not unwilling to testify against French intolerance, and regarded his sentimental- ism with favour. He was lionized in London to his heart’s content and discontent, for it may truly be said of Rousseau that he was equally indignant at neglect and intolerant of attention. When, after not a

few displays of his strange humour, he professed himself tired of the capital, Hume procured him a country abode in the house of Mr Davenport at Wootton in Derbyshire. Here, though the place was bleak and lonely, he might have been happy enough, and he actually employed himself in writing the greater part of his Confessions. But his habit of self-tormenting and tormenting others never left him. His own caprices interposed some delay in the con- ferring of a pension which George III. was induced to grant him, and he took this as a crime of Hume's. The publication of a spiteful letter (really by Horace Walpole, one of whose worst deeds it was) in the name of the king of Prussia made Rousseau believe that plots of the most terrible kind were on foot against him. Finally he quarrelled with Hume because the latter would not acknowledge all his own friends and Rousseau's supposed enemies of the philosophe circle to be rascals. He re- mained, however, at Wootton during the year and through the winter. In May 1767 he fled to France, addressing letters to the lord chancellor and to General Conway, which can only be described as the letters of a lunatic, He was received in France by the Marquis de Mirabeau (father of the great Mirabeau), of whom he soon had enough, then by the Prince de Conti at Trye. From this place he again fled and wandered about for some time in a wretched fashion, still writing the Confessions, constantly receiving generous help, and always quarrelling with, or at least suspecting, the helpers. In the summer of 1770 he returned to Paris, resumed music copying, and was on the whole happier than he had been since he had to leave Montlouis. He had by this time married Thérase le Vasseur, or had at least gone through some form of marriage with her.

Many of the best-known stories of Rousseau's life date from this last time, when he was tolerably accessible to visitors, though clearly half-insane. He finished his Con- Sessions, wrote his Dialogues (the interest of which is not quite equal to the promise of their curious sub-title Rousseau juge de Jean Jacques), and began his Réveries du Promeneur Solitaire, intended as a sequel and complement to the Confessions, and one of the best of all his books, It should be said that besides these, which complete the list of his principal works, he has left a very large number of minor works and a considerable correspondence, During this time he lived in the Rue Platiére, which is now named after him. But his suspicions of secret enemies grew stronger rather than weaker, and at the beginning of 1778 he was glad to

accept the offer of M. de Girardin, a rich financier, and occupy a cottage at Ermenonville. The country was beautiful ; but his old terrors revived, and his woes were complicated by the alleged inclination of Thérése for one of M. de Girardin's stable boys. On July 2d he died in a manner which has been much discussed, sus-

picions of suicide having at the time and since been fre- quent. On the whole the theory of a natural death due to a fit of apoplexy and perhaps to injuries inflicted accident- ally during that fit seems most probable. He had always suffered from internal and constitutional ailments not unlikely to bring about such an end.

Rousseau's character, the history of his reputation, and the intrinsic value of his literary work are all subjects of much interest. There is little doubt that for the last ten or fifteen years of his life, if not from the time of his quarrel] with Diderot and Madame d'Hpinay, he was not wholly sane—the combined influence of late and unexpected litcrary fame and of constant solitude and discomfort acting upon his excitable temperament so as to overthrow the balance, never very stable, of his fine and acute but unrobust intellect. He was by no means the only man of letters of his time who had to submit to something like persecution. Fréron on the orthodox side had his share of it, as well as Voltaire, Helvétius, Diderot, and Montesquieu on that of the innovators. But Rousseau had uot, like Montesquieu, a position which guaranteed him from scrious danger ; he was not wealthy like Helvétius; he had not the wonderful suppleness and trickiness whieh even without his wealth would probably have defended Voltaire himself; and he laeked entirely the ''bottom" of Fréron and Diderot. When he was molested he could only shriek at his enemies and suspect his friends, and, being more given than any man whom history mentions to this latter weakness, he suffcred intensely from it. His moral character was undoubtedly weak in other ways than this, but it is fair to remember that but for his astounding Confessions the more disgusting parts of it would not have been known, and that these Confessions were written, if not under hallucination, at any rate in cireumstances entitling the self-condemned criminal to the benefit of very considerable doubt. If Rousseau had held his tongue, he might have

stood lower as a man of letters; he would pretty certainly have stood higher as a man. He was, moreover, really |) sinned against, if still more sinning. The conduct cf Grimm to

‘ him was certainly very bad; and, though Walpole was not his personal friend, a worse action than his famous letter, considering the well-known idiosyncrasy of the subject, would be difficult to find. It was his own fault that he saddled himself with the Le Vasseurs, but their conduct was probably if not certainly ungrateful in the extreme. Only excuses can be nade for him; but the excuses fora man born, as Hume after the quarrel said of him, “ without a skin” are numerous and strong.

It was to be expected that his peculiar reputation would increase rather than diminish after his death; and it did so. During his life his personal peculiarities and the fact that his opinions were nearly as obnoxious to the one party as to the other worked against him, but it was not so after his dcath. The men of the Revolution regarded him with something like idolatry, and his literary merits

_ eonciliated many who were very far from idolizing him as a revolutionist. His style was taken up by Bernardin de Saint _ Pierre and by Chateaubriand. It was. employed for purposes quite different from those to which he had himself applied it, and the reaction triumphed by the very arms which had been most powerful _in the hands of the Revolution. Byron’s fervid panegyric en- , listed on his side all who admired Byron—that is to say, the _ majority of the younger men and women of Europe between 1820 and 1850—and thus different sides of his tradition were continued for a full century after the publication of his chief books. His religious unorthodoxy was eondoned because he nevér scoffed ; his | political heresies, after their first effect was over, seemed harmless | from the very want of logic and practical spirit in them, while part at least of his literary secret was the common property of almost everyone who attempted literature. At the present day persons as

_ different as M. Renan and Mr Ruskin are children of Rousseau.

It is therefore important to characterize this influence which was and is so powerful, and there are three points of view—those of religion, politics, and

literature—which it is necessary to take in

|} doing this. In religion Rousseau was undoubtedly what he has been called above—a sentimental deist ; but no one who reads him | with the smallest attention can fail to see that sentimentalism was | the essence, deism the accident of his creed. In his time ortho- | doxy at once generous and intelligent hardly existed in France.), There were ignorant persons who were sinccrely orthodox; there were | intelligent persons who pretended to be so. But between the time | of Massillon and D'Aguesseau and the time of Lamennais and Joseph | de Maistre the class of men of whom in England Berkeley, Butler, iz Johnson were represcntatives simply did not exist in France. Little inclined by nature to any but the emotional side of religion, and utterly undisciplined in any other by education, course of life, jor the general tendency of public opinion, Rousseau naturally took | refuge in the nebulous kind of natural religion which was at once | fashionable and convenient. If his practice fell very far short even) of his own very arbitrary standard of morality asmuch may be said) of persons far more doginatically orthodox.

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In politics, on the other hand, there is no doubt that Rousseau was a sincere and, as faras in him lay, a convinced republican. He had no great tincture of learning, he was by no means a profound logician, and he was impulsive and cmotional in the extreme— charaeteristics which in political matters undoubtedly predispose the subject to the preference of equality above all political requisites. He saw that under the French monarchy the actual result was the greatest misery of the greatest number, and he did not look much further. The Contrat Social is for the political student one of the most curious and interesting books existing. Historically it is null; logically it is full of gaping flaws; practically its manipulations of the volonté de tous and the volonté générale are clearly insufficient to obviate anarchy. But its mixture of real eloquence and apparent cogency is exactly such as always carries a multitude with it, if only for a time. Moreover, in some minor branches of politics and economics Rousseau was a real reformer. Visionary as his educational sehemes (chiefly promulgated in Emile) are in parts, they are admirable in others, and his protest against mothers refusing to nurse

their children hit a blot in French life which is not removed yet, and has always been a source of weakness to the nation.

But it is as a literary man pure and simple—that is to say, as an exponent rather than as an originator of ideas—that Rousseau is most noteworthy, and that he has exercised most influence. The first thing noticeable about him is that he defies all customary and mechanieal classification. He is nota dramatist—his work as such is insignificant—nor a novelist, for, though his two chief works except the Confessions are called novels, Emile is one only in name, and La Nouvelle {léloise is as a story diffuse, prosy, and awkward to a degree. He was perfeetly without command of poetic form, and he could only be called a philosopher in an age when the term was used with sueh meaningless laxity as was eustomary in the 18th century. If he must be classed, he was before all things a describer —a describer of the passions of the human heart and of the beauties of nature. In the first part of his vocation the novelists of his own youth, such as Marivaux, Richardson, and Prévost, may be said to have shown him the way, though he improved greatly upon them; in the second he was almost a creator. In combining the two and expressing the effect of nature on the feelings and of the feelings on the aspect of nature he was absolutely without a forerunner or a model. And, as literature since his time has bcen chiefly differentiated from literature before it by the colour and tone resulting from this combination, Rousseau may be said to hold, as an influenee, a place almost unrivalled in literary history. The defects of all sentimental writing—occasional triviality and exag- geration of trivial things, diffuseness, overstrained emotion, false sentiment, disregard of the intellectual and the practical—are of course noticeable in him, but they are excused and palliated by his wonderful feeling, and by what may be called the passionate sincerity even of his insincere passages. Some cavils have been made against his French, but none of much weight or importance. And in sueh passages as the famous “Voilé de la pervenche” of the Confessions, as the description of the isle of St Pierre in the éveries, as some of the letters in the Nowvelle Héloise and others, he has achieved the greatest success possible—that of absolute perfection in doing what he intended to do. The reader, as it has been said, may think he might have done something else with advantage, but he can hardly think that he could have done this thing better.

The dates of most of Rousseau's works published during his lifetime have bcen given above. The Confessions and Révertes, which, read in private, had given much umbrage to persons concerned, and which the author did not intend to be published until the end of the century, appeared at Geneva in 1782. In the same year and the following appeared a complete edition in forty-seven small volumes. There have been many since, the most important of them being that of Musset- Pathay (Paris, 1823). Some unpublished works, chiefly letters, were added by Bosscha (Paris, 1858) and Streckeisen Moultou (Paris, 1861). The most con- venient edition is perhaps that of Didot in 4 vols. large 8vo, but a handsome and well-edited collection is still something of a desideratum. Works on Rousseau are innumerable. The chief are—in French that of Saint Mare Girardin (1874), in English the excellent book of Mr John Morley. – (G. SA.)

ROUSSEAU, TutoporE (1812-1867), a distinguished landscape painter, was born at Paris, and studied in the Ecole des Beaux-Arts, after which he spent some time in

. travelling and making studies of landscape and sky effects.

He first exhibited at the Salon in 1834, obtained gold medals in 1849 and 1854, and in 1852 received the Legion of Honour. His paintings became very popular in France, and Rousseau grew to be the acknowledged founder of the modern realistic school of landscape. He was largely influenced in style by Constable and Turner, the former of whom was perhaps more thoroughly appreci- ated in France than in England. The influence of Turner is clearly seen in some of Rousseau's pictures, with striking effects of cloud or storm,—as, for example, in his Effet de Soleil and Aprés la Pluie (1852), in the Matinée

Orageuse (1857), the Coucher de Soleil (1866), and one of his last works, the Soleil par un Temps Orageux, which appeared in the exhibition of 1867. Rousseau's study of Constable is more especially apparent in some of his fine forest scenes near Fontainebleau, and in some magnificently painted views on the banks of the Loire and other French rivers. His execution was of extraordinary brilliance, and he was a thorough master of atmospheric

Though in some re- spects a realistic painter, he treated nature in a strongly dramatic way and showed great imaginative power. His style is broad and dashing, with rapid and at times appa- rently careless handling. His fame has increased rather than diminished since his death in 1867 ; and one of his paintings has recently received the high distinction of being transferred from the Luxembourg Palace to the Louvre, an

effect and glowing sunset colours.

honour which is but rarely conferred. It is not, however,

one of the best specimens of his work. Most of Théodore Rousseau's pictures are in private collections in Paris and

elsewhere in France.

ROUSSILLON, a province of France, which now forms department of Pyruintzs ORIENTALES (g.v.). It was bounded on the south by the Pyrenees, on the west by the county of Foix, on the north by Languedoc, and on the east by the Mediterranean. The province derived its name from a small bourg near Perpignan, the capital, called Ruscino (Rosceliona, Castel Rossello), where the Gallic chieftains met to consider

the greater part of the

Hannibal's request for a conference. The district formed

part of the Roman province of Gallia Narbonensis from 121 B.c. to 462 a.p., when it was ceded with the rest of Septimania to Theodoric IL, king of the Visigoths. His

successor, Amalaric, on his defeat by Clovis in 531 retired

to Spain, leaving a governor in Septimania. In 719 the

Saracens crossed the Pyrenees, and Septimania was held by them until their defeat by Pippin in 756. On the invasion of Spain by Charlemagne in 778 he found the

borderlands wasted by the Saracenic wars, and the inhabit-

ants hiding among the mountains. He accordingly made grants of land to Visigothic refugees from Spain, and founded several monasteries, round which the people gathered for protection. In 792 the Saracens again invaded France, but were repulsed by Louis, king of Aquitaine, whose rule extended over all Catalonia as far as Barcelona. The different portions of his kingdom in time grew into allodial fiefs, and in 893 Suniaire JO became the first hereditary count of Roussillon. But his rule only extended over the eastern part of what became the later province. The western part, or Cerdagne, was ruled in 900 by Miron as first count, and one of his grandsons, Bernard, was the first hereditary count of the middle portion, or Bésalu. In 1111 Raymond-Bérenger IIL, count of Barcelona, inherited the fief of Bésalu, to which was added in 1117 that of Cerdagne ; and in 1172 his grandson, Alphonso ITI.,, king of Aragon, united Rous- sillon to his other states on the death of the last count, Gerard II. The counts of Roussillon, Cerdagne, and Bésalu were not sufficiently powerful to indulge in any wars of ambition. Their energies had been accordingly devoted to furthering the welfare of their people, who enjoyed both peace and prosperity under their rule. Under the Aragonese monarchs the progress of the united province still continued, and Collioure, the port of Perpignan, became a centre of Mediterranean trade. But the country was in time destined to pay the penalty of its position on the frontiers of France and Spain in the long struggle for ascendency between these two powers. James I. of Aragon had wrested the Balearic Isles from the Moors and left them with Roussillon to his son James (1276), with the title of king of Majorca. The consequent

disputes of this monarch with his brother Pedro ITT. of Aragon were not lost sight of by Philip ITI. of France in his quarrel with the latter about the crown of the Two Nicilies. Philip espoused James’s cause and led his army into Spain, but retreating died at Perpignan in 1285, James then became reconciled to his brother, and in 1311 was succeeded by his son Sancho, who founded the cathedral of Perpignan shortly before his death in 1324. His successor James II. refused to do homage to Philip VI. of France for the seigniory of Montpellier, and applied to Pedro IV. of Aragon for aid. Pedro not only refused it, but on various pretexts declared war against him, and seized Majorca and Roussillon in 1344, The province was now again united

to Aragon, and enjoyed peace until 1462. In this year the disputes between John IL. and his son about the crown of Navarre gave Louis XI. of France an excuse to support John against his subjects, who had risen in revolt. Louis at the fitting time turned traitor, and the province having been pawned to him for 300,000 crowns was occupied by the French troops until 1493, when Charles VIII. restored it to Ferdinand and Isabella. During the war between France and Spain (1496-98) the people suffered equally from the Spanish garrisons and the French invaders. But dislike of the Spaniards was soon effaced in the pride of sharing in the glory of Charles V., and in 1542, when Perpignan was besieged by the dauphin, the Roussillonnais remained true to their allegiance. Afterwards the decay of Spain was France's opportunity, and, on the revolt of the Catalans against the Castilians in 1641, Louis XIIL espoused the cause of the former, and by the treaty of 1659 secured Roussillon to the French crown.

ROVEREDO (in German sometimes Rofreit), one of the chief industrial cities in South Tyrol, and, after Trent, the chief seat of the Tyrolese silk industry, is situated on the left bank of the Adige (Etsch), in the fertile Val Lagarina, 35 miles north of Verona and 100 miles south of Innsbruck. Though there are several open places within the town, the streets, except in the newer quarters, are narrow, crooked, and uneven. Of the two parish churches, §. Marco dates from the 15th century and Sta Maria del Carmine from 1678. The only other interesting building is the quaint old castle known as Castell Junk. As an active trading town and administra- tive centre Roveredo is well equipped with commercial, judicial, educational, and benevolent institutions. Though the district between Trent and Verona yields about 120,000 ib of silk annually, the silk industry of Roveredo, introduced in the 16th century, has declined during the last fifty years. The establishments in which the cocoons are unwound (jilande) are distinct from those in which the silk is spun (jfilatoje). The silk is not woven at Roveredo. Paper and leather are the other chief manu- factures of the place ; and a brisk trade in southern fruits and red wine is carried on. The population is 8864.

The origin of Roveredo is probably to be traced to the founding of the castle by William of Castelbarco-Lizzana about 1300. Later it passed to the emperor Frederick of the Empty Pockets, who sold it to Venice in 1413. The

treaty of Cambray transferred it from Venice to the emperor Maximilian in 1510, since which time it has shared the fate of southern Tyrol, finally passing to Austria in 1814. In September 1709 the French under Masséna won a victory over the Austrians near Roveredo. Near the neighbouring village of St Marco are the traces of a destructive

landslip in 888, described in the Inferno (xii. 4-9) by Dante, who spent part of his exile in 1302 in a castle near Lizzana.

ROVIGNO, a city of Austria, in the province of Istria, is picturesquely situated on the coast of the Adriatic, about 12 miles south of Parenzo, and 10 miles by rail from Canfanaro, a junction on the railway between Divazza (Trieste) and Pola. It has two harbours, with ship- building yards ; and it carries on several industries and a

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good export trade, especially in olive-oil and a cement manufactured in the little island of Sant' Andrea. The population was 9564 in 1869 and 9522 in 1880.

Aceording to tradition Rovigno was originally built on an island, Cissa by name, which disappeared during the earthquakes about 737. In the 6th century, as the local legend hasit, the body of St Euphemia of Chalcedon was miraculously conveyed to the island ; and ata later date it was transported to the summit of the promontory, Monte di Sant' Kufemia, whither it was restored by the Venetians in 1410 after being in the possession of the Genoese from 1380. The diocese of Rovigno was merged in 1008 in the bishopric of Parenzo ; but its church continued to have the title of cathedral. Rovigno passed definitively into the hands of the Venetians in 1330, and it remained true to the republic till the treaty of Campo Formio (1797).

ROVIGO, a city of Italy, the chief town of a province, and the seat of the bishop of Adria, lies between the Po and the Adige, and is traversed by the Adigetto, a navig- able branch of the Adige. By rail it is 27 miles south-south-west of Padua. ‘The architecture bears the stamp both of Venetian and Ferrarese influence. The cathedral church of Santo Stefano (1696) is of less interest than La Madonna del Soccorso, an octagon (with a fine campa-nile), begun in 1594. The town-hall contains a library of 80,000 volumes belonging to the Accademia de’ Concordi, founded in 1580, and a picture gallery enriched with the spoils of the monasteries. Wool, silk, linen, and leather are among the local manufactures. The population of the city proper was 7452 in 1871 and 7272 in 1881; the commune in 1881 had 11,460 inhabitants.

Rovigo (Neo-Latin Rhodigiwm) appears to be mentioned as Rudigo in 838. It was selected as his residence by the bishop of Adria on the destruction of his city by the Huns, From the 11th to the 14th century the Este family was usually in authority ; but the Venetians who obtained the town and castle in pledge between 1390 and 1400 took the place by siege in 1482, and, though the Este more than once recovered it, the Venetians, returning in 1514, retained possession till the French Revolution. Jn 1806 the city was made a duehy in favour of General Savary. The Austrians in 1815 created it a royal city.

ROVIGO, DUKE oF. See SAVARY,

ROWE, Nicnotas (1674-1718), the descendant of a family long resident at Lamerton in Devon, was born at Little Barford in Bedfordshire, June 30, 1674. The house in which he was born is close to the Great North Road, and a small stone to his memory has been erected in the centre of the garden. His father, John Rowe, took to the law as his profession, and at his death in 1692 (by which time he had attained to the dignity of being a serjeant at law) had amassed sufficient property to leave to his son an income of £300 a year. Nicholas Rowe passed some time in a private school at Highgate, and then proceeded to Westminster School, at that time under the charge of the celebrated master Dr Busby. In 1688 he became a king’s scholar in this foundation, but three years later he was called away from school and entered as a student at the Middle Temple. The study of the law had little

attraction for a young man of good person and lively manners, and at his father's death in the following year he devoted himself to society and to literature. His first play, Zhe Ambitious Stepmother, was produced when he was twenty-five years old. It was followed by Tamerlane, a patriotic composition in which the virtues of Willian ITI. were lauded under the disguise of Tamerlane and the vices of the French king, Louis XIV., were denounced in the person of Bajazet. The popularity of this production soon declined, but for many years it was acted once every year, on the anniversary of the landing at Torbay of the Dutch prince. His next play, The Fair Penitent, long retained the favourable reception which marked its first appearance, and was pronounced by the great critic of the 18th century one of the most pleasing tragedies which had ever been written. Through its suc-

cess the name of the principal male character Lothario became identified in popular language as the embodiment of the manners and habits of a fashionable rake. After the production of two more tragedies, Ulysses and The Royal Convert, of slight account at the time and long since forgotten, Rowe tried, his hand on a comedy, Zhe Biter. Much to the author's surprise his attempt in this new direction proved a failure, but Rowe recognized the justice of the verdict of the audience sufficiently to abstain from risking a second disappointment. His two last dramatic works were entitled Jane Shore and Lady Jane Grey, and the former of them, from the popularity of its subject and the elegance of its language, kept its position on the stage longer than any other of his works.

Rowe excelled most of his contemporaries in the knowledge of languages. He was acquainted more or less thoroughly with Greek, Latin, French, Italian, and Spanish. The latter tongue he is said to have acquired on the recommendation of Harley and with the expecta- tion that he would afterwards be rewarded by some high office. When, however, he reported his new acquisition to the new minister he was met with the dry remark from Harley—" How I envy you the pleasure of reading Don Quixote in the original!" Notwithstanding this dis- appointment, Rowe enjoyed many lucrative posts during his short life. When the duke of Queensberry was

principal secretary of state for Scotland (1708-10), Rowe acted as his under-secretary. On the accession of George I, he was madea surveyor of customs, and on the death of Tate he became poet laureate. He was also appointed clerk of the council to the prince of Wales, and the list of preferments was closed by his nomination by Lord- Chancellor Parker (5th May 1718) as secretary of presenta- tions in Chancery. He died 6th December 1718, and was buried in the south cross of Westminster Abbey. By his first wife, a daughter of Mr Parsons, one of the auditors of the revenue, he left a son John; and by his second wife, Anne, the daughter of Joseph Devenish of a Dorsetshire family, he had an only daughter, Charlotte, born in 1718, who married Henry Fane, a younger brother of Thomas, eighth earl of Westmoreland. The burials of mother and daughter are recorded in Colonel Chester's Registers of Westminster Abbey.

Rowe's tragedies were marked by passionate feeling set off by a graceful diction, and were well adapted for stage effect. If The Fair Penitent and Jane Shore have been expelled from the stage, their historic reputation and their style will repay perusal.

Among Rowe's other literary efforts may be mentioned an edition of the works of Shakespeare (1709), for which he received from Lintot the bookseller the sum of £36, 10s., a rate of pay not out of proportion to the labour which was bestowed upon the task. At the time of his death he had also finished a translation of Lucan's Pharsalia, a work then much praised and not yet superseded by any competitor. Rowe's minor poems were beneath the level of his age. An edition of his works was published in 1720 under the

care of Mr (afterwards Bishop) Newton. His translation of Lucan was edited by Dr Welwood.

ROWING is the act of driving forward or propelling a boat along the surface of the water by means of oars. It is remarkable how scanty, until quite recent times, are the records of this art, which at certain epochs has played no insignificant part in the world's history. It was the oar that brought Phoenician letters and civilization to Greece ; it was the oar that propelled the Hellenic fleet to Troy ; it was the oar that saved Europe from Persian despotism ; it was the skilful use of the oar by free citizens which

was the glory of Athens in her prime. It is to be regretted that so little is known of the details connected with it, or of the disposal of the rowers on board the splendid fleet which started in its pride for Sicily, when 17,000 oars at a given signal smote the brine, and 100 long ships raced as far as Algina. The vessels of the ancient Greeks and

Romans—the biremes, quadriremes, quinquiremes, and hexiremes—owed their pace to the exertions of men who plied the oar rather than to the sails with which they were fitted, and which were only used when the wind was favourable. Professor Gardner has shown that boat racing was not uncommon among the Greeks ;! and that it was practised among the Romans Virgil testifies in the well- known passage in the fifth book of the Zeid. And the Venetian galleys which were subsequently used on the shores of the Mediterranean in medieval times were only a modified form of the older kind of craft. These were for the most part manned by slaves and criminals, and were in constant employment in most European countries.

Rowing was understood by the ancient Britons, as they trusted themselves to thé mercy of the waves in coracles composed of wicker-work covered with leather, similar no doubt in many respects to those now used in Wales ; but these frail vessels were propelled by paddles and not by oars. The Saxons seem to have been expert in the management of the oar, as well as the Danes and Norwe- gians, as it is recorded that the highest nobles in the land devoted themselves to it, Alfred the Great introduced long galleys from the Mediterranean, which were propelled by forty or sixty oars on each side, and for some time these vessels were used for war purposes. It is stated by William of Malmesbury that Edgar the Peaceable was rowed in state on the river Dee from his palace, in the city of West Chester, to the church of St John and back again, by eight tributary kings, himself acting as coxswail.

Boat quintain, or tilting at one another on the water, was first brought into England by the Normans as an amusement for the spring and summer season, and prob- ably much of the success of the champions depended upon the skill of those who managed the boats. Before the beginning of the 12th century the rivers were commonly used for conveying passengers and

merchandise on board barges and boats, and until the introduction of coaches they were almost the only means of transit for royalty, and for the nobility and gentry who had mansions and watergates on the banks of the Thames. It is, how- ever, impossible to trace the first employment of bargemen, wherrymen, or watermen, but they seem to have been well established by that time, and were engaged in ferrying and other waterside duties. During the long frosts of the early part of the 13th century, frequent mention is made in the chronicles of the distress among the watermen, from which we may assume that their numbers were large. They were employed in conveying the nobles and their retinues to Runnymede, where they met King John and where Magna Charta was signed. Towards the close of this century the watermen of Greenwich were frequently fined for over-charging at the established ferries, and about the same time some of the city companies established barges for water processions. We learn from Fabian and Middleton that in 1454 “Sir John Norman, then lord mayor of London, built a noble barge at his own expense, and was rowed by watermen with silver oars, attended by such of the city companies as possessed barges, in a splendid manner,” and further “that he made the barge he sat in burn on the water”; but there is no explanation of this statement. Sir John Norman was highly commended for this action by the members of the craft, as no doubt it helped to popularize the fashion then coming into vogue of being rowed on the Thames by the watermen who plied for hire in their wherries. The lord mayor’s procession by water to Westminster, which figures on the front page of the Llustrated London News, was made annually until the -year 1856, when it was discontinued, The lord

_1 Journal of Hellenic Studies, 1881.

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mayor’s state barge was a magnificent species of shallop rowed by watermen ; and the city companies had for the most part barges of their own, all rowed double-banked with oars in the fore half, the after part consisting of a cabin something like that of a gondola. The watermen became by degrees so large and numerous a body that in the sixth year of the reign of Henry VIII. (1514) an Act was passed making regulations for

them. This Act has from time to time been amended by various statutes, and the last was passed in 1858. Much time seems to have been spent in pleasuring on the water in the 15th and 16th centuries, and no doubt competitions among the watermen were not uncommon, though there is no record of them. The principal occupation of watermen, who were obliged to serve an apprenticeship, used to be ferrying and rowing fares on the Thames, but in process of time the introduction of bridges and steamers drove them from this employment, and the majority of them now work as bargemen, lightermen, and steamboat hands, having still to serve an apprenticeship. For many years matches for money stakes were frequent (1831 to 1880), but the old race of watermen, of which Phelps, the senior Kelley, Campbell, Coombes, Newell, the MacKinneys, Messenger, Pocock, and Ifenry Kelley were prominent members, has almost died out, and some of the best English scullers during the last fifteen years have been landsmen. Apart from the reference already made to the ancients, we do not find any records of boat-racing before the establishment in England of the coat and badge, insti- tuted by the celebrated comedian Thomas Doggett in 1715, in honour of the house of Hanover, to commemo- rate the anniversary of “King George I.’s happy accession to the throne of Great Britain.” The prize was a red coat with a large silver badge on the arm, bearing the white horse of Hanover, and the race had to be rowed on the Ist of August annually on the Thames, by six young watermen who were not to have exceeded the time of their apprentice- ship by twelve months. Although the first contest took place in the year above mentioned, the names of the winners have only been preserved since 1791. The race continues at the present day, but under slight modifica- tions. The first. regatta appears to have occurred about sixty years later, for we learn from the Annual feegister of the year 1775 that an entertainment called by that name (Ital., regata), introduced from Venice into England, was exhibited on the Thames off Ranelagh Gardens, and a lengthy account of it is given at the end of the work. The lord mayor’s and several-of the city companies’ pleasure barges were conspicuous, and, although we learn very little indeed of the competing wager boats, it seems clear they were rowed by watermen. We find from Strutt’s Sports and Pastimes (first published in 1801) that the proprietor of Vauxhall Gardens had for some years given a new wherry to be rowed for by watermen, two in a boat, which igs perhaps the first pair-oared race on record. Similar prizes were also given by Astley, the

celebrated horseman and circus proprietor of the Westminster Bridge Road, about the same period ; but thus far rowing was apparently viewed as a laborious exercise, and the rowers were paid. At the commencement of the present century, however, rowing as- sociations were formed, and the " Star," " Arrow," « Shark," and "Siren" Clubs had races amongst themselves, gene- rally over long courses and in heavy six-oared boats. The Star and Arrow Clubs ceased to exist in the early years of this century, and were merged in the newly formed Leander Club. The date of its establishment cannot be fixed exactly, but it was probably about 1818 or 1819. It ranked high, because the majority of its members had frequently distinguished themselves in matches with the oar and sculls. They were the first to patronize and lend

a helping hand to young watermen who showed promise of aquatic fame, and they likewise instituted a coat and badge for scullers.

The first record of public-school racing which ean now be seen is the Water Ledger of Westminster School, whieh commenees in the year 1813 with a list of the crew of the six-oared Fly. This craft continued for some time to be the only boat of the school, and in 1816 beat the Temple six-oar in a race from Johnson's Dock to Westminster Bridge by half a length. Eton possessed a fleet of boats in 1811, if not at an earlier date, consisting of a ten-oar and three boats with eight oars. In those days some of the crews had a waterman to pull stroke and drill the crew, but this practice was abolished in 1828, as the waterman frequently rowed a bad stroke and the erew were obliged to subseribe for his day's pay, beer, and clothes ; thenceforward the captain of each crew rowed the stroke- oar. The earliest record of a race at Eton is when Mr Carter's four rowed against the watermen and beat them in 1817; but the pro- fessionals had a boat too small for them. In1818 Eton challenged Westminster School to row from Westminster to Kew Bridge against the tide, but the match was stopped by the authorities ; and it was not until 1829 that the first contest between the two schools was brought to an issue.

Rowing appears to have commenced at the universities soon after the beginning of the century, but earlier at Oxford than at Cam- bridge. There

were college boats on the river for some time before there were any races. Those first recorded at Oxford were in 1815, said to be college eights, but the boats uscd are more likely to have becn fours, when Brasenose was ‘‘ head of the river” and Jesus their, chief opponent. These two clubs were constantly rowing races, but they were not very particular about the oarsmen in the boats, as the Brasenose crew in 1824 was composed of two members of tlie eollege, a Worcester man, and a waterman, The first authentic records commence in 1836, and the Oxford University Boat Club was established in 1839. At Cambridge eight-oared rowing was not in fashion so soon as at Oxford, the first eight (belonging to St John’s College) not having been launched until 1826 ; and between that year and 1829 the Cambridge University Boat Club was formed. Eight-oared races were established on the Cam in 1827, when First Trinity was “head of the river,” and in 1828 the first Oxford and Cambridge University boat race was proposed and fixed for June 10, 1829, on the Thames, from Hambledon Lock to Henley Bridge. The race was rowed at intermittent periods up to 1856, since whieh year it has been annual, In 1830 the amateur championship of the Thames was instituted by Mr Henry C. Wingfield, who presented a pair of silver sculls to be rowed for annually by the amateur scullers of the Thames on the 10th August from Westminster to Putney at half flood, but the course and date of the race have been changed since then. The first scullers’ race for the professional ehampionship of the Thames was rowed from Westminster to Putney on the 8th September 1831, Charles Campbell of West- minster defeating John Williams of Waterloo Bridge. During the next cight years rowing increased in favour among amateurs, and, as it had taken its proper place among the national pastimes, and the want of a eentral spot for a regatta was much felt, Henley- on-Thames was chosen, and it was decided that a regatta should be held there in 1839, and the Grand Challenge cup for eight oars was established. This has been an annual fixture ever since, prizes being given for four oars, pair oars, and scullers, as well as for eight oars. In 1843 the Royal Thames Regatta was started at Putney, and it gave a gold challenge cup for eight oars and a silver challenge eup for four oars, to be rowed by amateurs. In 1844 Oxford beat Cambridge at this regatta, and in the same year the eommittce added a champion prize for watermen. About this time the Old Thames Club was established, and they carried off the gold challenge cup by winning it for three years in succession, viz., 1846 to 1848. In 1852 the Argonauts Club

first appeared at Henley and won the Visitors' cup, and in 1853 the Royal Chester Rowing Club were successful in the Stewards' cup for four oars, and won the Grand Challenge cup for eight oars the next year. In 1856 the London Rowing Club was established, but those members of it who rowed at Henley were obliged to enter under the name of the Argonauts Club, as, not having been in existence a year, its crew eould not eompete under its name. The next year, however, they carried off the Grand Challenge cup from Oxford University, and were successful in the Stewards' cup as well. Many more clubs, such as the Kingston, Radley, West London, Twickenham, Thames, Moulsey, and other metropolitan and provincial elubs were subse- quently established, and have met with varied success.

Boats. —The boats of the present day differ very much from those formerly used, and the heavy lumbering craft which alone were known to our forefathers have been superseded by a lighter descrip- tion,—skiffs, gigs, and racing outriggers. The old Thames wherry with its long projecting bow is now seldom seen, and a roomy skiff, often used with a sail when the wind is favourable, has taken its

laee. The gig isan open boat with several strakes, having the row- ocks, or picces of wood between which the oar works, fixed upon the

gunwalc, which is level all round. The skiff is wider and longer than the gig and of greater depth, and, rising higher fore and aft, with rowlocks placed on a curved and elevated gunwale, has greater earrying power and rows lighter than the gig. The wherry rises high at the bows with a long nose pointed upwards and a very low stern, being eonsequently unsuited for rough water. The modern racing boat differs much from the foregoing, as its width has been decreased so as to offer as little resistanee to the water as possible, while it is propelled by oars working between rowlocks fixed on projecting iron rods and cross pieces which arc made fast to the timbers. These rods and cross pieces are rigged out from the side of the boats, and hence the term outriggers. These boats are constructed for single scullers, for pairs, for fours, for eights, and occasionally for twelve oars. The outrigger was first brought to perfection by the late Henry Clasper of Neweastle-on-Tyne, who is generally believed to have been its inventor ;

but the first outriggers, which were cnly rude pieces of wood fastened on the boat's sides, were used in 1828, and were fixed to a boat at Ouseburn-ou-Tyne. The first iron outriggers were affixed to a boat in 1830 at Dents' Hole on Tyne. In 1844 Clasper, who had been improving upon these inventions, made his first boat of the kind and brought her to London; but her outriggers were only 8 inches in length, and she was built of several strakes, with a small keel. In process of time keels were dispensed with, the outriggers were lengthencd, and the skin of the boat is now composed of a single strake of cedar planed very thin and bent by means of hot water to take the form of the timbers of the boat. It is fastened by copper nails to curved timbers of ash, one extremity of which is fixed into the keelson while the other is made fast to long pieces of deal that run from end to end of the boat and are called inwales. The timbers in the middle are thicker than the rest, so as to support the iron outriggers which are fastened to them, and the thwart, which is wider than it used to be in order to carry the sliding seat, which works backward and forward with the oarsman, is screwed to the inwales. This seat moves toand fro on rollers made of steel, wood, or brass, and travels over a distance varying from 12 to 6 inches according to the judgment of the instructor. The sliding seat seems to have been the invention of an American oarsman, who fixed one to asculling boat in 1857, but it was not until 1870 that he had mastered the principles sufficiently to discover how much was gained mechanically and physically. The value of the improve- ment is now universally recognized, but it was some little time before it was understood and came into general use. The members of the London Rowing Club, who defeated the representatives of the New York Atalanta Club at Putney in June 1872, used sliding seats, and the club also had them fitted to their eight, which easily carried off the Grand Challenge eup at Henley a few days after- wards. In 1873 the sliding seat was adopted by the crews rowing in the University boat race. The Americans have also the ercdit of two other inventions, viz., the steering apparatus, which enables a erew to dispense with a coxswain, and the swivel rowlock ; but, though the former is now fitted to the majority of non-coxswain pairs and fours, the use of the latter is confined for the most part to sculling boats. In outrigged eights, fours, and pairs the outriggers are placed, one for each thwart, at each side alternately, but in gigs, skiffs, wherries, and funnies they are placed opposite one another, so as to be used

on either side at discretion. The oars generally used are about 12 feet long, varying with the width of the boat, and sculls are as much as 10 feet long.

Directions for Rowing.—In modern rowing the oarsman, grasping the handle of the oar with both hands, sits forward on the edge of his seat, stretches out his arms until they arc fully extended—the blade of the oar being, just previous to entering the water, at right angles to its surface. It is then dipped into the water just so far as to cover it, and the handle pulled towards the oarsman's body, the weight 'of the latter being thrown backward at the same time, so as to make one movement, and the legs pressed hard against the stretcher, and the handle finally pulled home to the chest with the arms, the elbows being allowed to pass the sides until the handle of the oar just touches the lower extremity of the breast. The blade of the oar thus appears to be forced through the water, but in reality this is very slightly the case, as the water, which is the fulcrum, remains almost immovable. In sculling, the operation is the same except that the sculler has a scull in each hand and drives the boat himself, whereas a man rowing an oar must have one or more com- rades to assist him. Rowing is made up of two parts, the stroke and the feather. Feathering is turning the oar at the end of the stroke by lowering the hands and dropping'the wrists, thus bringing the flat blade of the oar parallel with the surface of the water, and is generally considered to include the driving forward of the handle of the oar and the consequent carrying back of the blade previous to the beginning of a new stroke.

When prepared to embark, the pupil should lay his oar on the water if an outside or upon the land if a shoreside oar, and step into the boat with his face to the stern, when he should at once seat himself and ship his oar, and then try the length of his stretcher to sec that it suits his length of leg. This arranged, he should

back being kept quite straight. On eatehing hold of the water, the knees must be gradually straightened and the body thrown baek, the two aetions going on simultaneously, so that the legs are straight out by the time the stroke is finished and not before, the body and shoulders at the end of the stroke being thrown well baek. The bodyis then reeovered to the upright

position from the hips, the hands thrown forward, and by the time they are just past the knees the body is being drawn forward, and the knees bent, The motion then begins the same as before. (E. D. B.)

Boat-Racing in America. —This pastime ean be traeed baek to the beginning of the present century. The earliest important affair was in 1811, —a sectional match, New York City against all Long Island, four-oared barges, with eoxswains, from Harsimus, New Jersey, to the flag-staff on the Battery. New York won easily, and such was the popular enthusiasm over the raee that its boat, the “ Knickerboeker,” was suspended in a public museum, where it remained for fifty-four years, a eoustant reeipient of publie admira- tion until destroyed by fire in July 1865. Sinee this historie con- test no year has been without boat races, At that time the words amateur and professional were unknown on the water; the Castle Garden Amateur Boat Club Association—Ameriea’s first avowedly amateur club—was founded in 1834,

There had been informal clubs and desultory racing at Yale College as early as 1833, but the first regular organization wag in March 1843. Harvard followed in September 1844, and Yale and Harvard first met on the water at Lake Winnepiseogee, New Hampshire, August 8, 1852; sinee 1878 they have met annually at New London, Conn. In 1865 Harvard, Yale, Trinity, and Brown formed the Union College Regatta Assoeiation, whieh lasted three years. The Raeing Association: of American Colleges, which at one time included sixteen colleges, died in 1876. In 1883 Bowdoin, Columbia, Cornell, Prineeton, Rutgers, University of Pennsylvania, and Wesleyan formed the Intercollegiate Raeing Association, which still flourishes and gives annual regattas,

The control of amateur racing in Ameriea belongs to the National Assoeiation of Amateur Oarsmen, founded in 1873, whose member- ship ineludes all the better class of amateur boat clubs. Its management is vested in an Exeeutive Committee of nine members, three of whom are eleeted at each annual meeting of the association, The rulings of this eommittee are subjeet to review, approval, or reversal, at each annual meeting of the full association. This association gives an annual open amateur regatta, similar to the Royal Henley Regatta in being the ehief aquatic event of the year, but

unlike it in not being rowed always on the same course, but moving about from year to year—having, sinee 1873, been rowed at Philadelphia, N ewark, Troy, and Watkins (N.Y.), Detroit, Washington, and Boston. There are in the United States eleven regularly organized amateur rowing associations, formed by the union of amateur rowing clubs and giving each year one or more regattas. These associations are the National Association of Amateur Oarsmen, the North- Western Amateur Rowing Assoeiation, the Mississippi Valley Amateur Rowing Association, the Passaic River Amateur Rowing Assoeiation, the Intereollegiate Rowing Association, the Harlem Regatta Association, the Louisiana State Amateur Rowing Association, the Virginia State Rowing Associa- tion, the Schuylkill N. avy, the Upper Hudson Navy, and the Kill von Kull Regatta Association, At English regattas it is usual to start three boats in a heat, sometimes four, five being the utmost limit, whereas at Saratoga, in the great regattas of 1874 and 1875, there were started abreast, in four separate races, eleven singles (twiee), thirteen coxswainless fours, and thirteen eoxswainless sixes,

The primary division of American racing eraft is into (a) lap- streaks or elinkers, built of wood in narrow streaks with overlapping edges at eaeh joint, and (b) smooth bottoms, made of wood or paper, and having a fair surfaee, without projeeting joint or seam. Lap- streak boats are, however, now rarely used save in barge raees. Then follows the subdivision into barges, whieh are open inrigged boats, gigs, which are open outrigged boats, and shells, which are covered outrigged boats. These three elasses of boats are further subdivided, in aecordanee with the means of propulsion, into single, double, and quadruple seulling boats, and pair-, four-, six-, and eight- oared boats. In Ameriea the double-seull is more frequent than the pair, and the six-oar mueh more eommon than the eight-oar.

The sliding seat is now being gradually superseded by various styles of rolling seats, in whieh the actual seat travels backward and forward on frietionless wheels or balls, The best of these de- vices run more easily, are cleaner, and less liable to aecident than the ordinary sliding seat. English oarsmen use the sliding scat as a means of making their old aecustomed stroke longer and more powerful. Ameriean oarsmen hold that what is needed by an oars- man is not the addition of the long slide to the old-

fashioned long swing, but the almost total substitution of slide for swing, the transfer of the labour from back to legs—in fact, a totally new style.

ROWLANDSON, Txomas (1756-1827), caricaturist, was born in Old Jewry, London, in J uly 1756, the son of a tradesman or city merchant. It is recorded that “he could

stretcher, and the two heels elose together with the toes wide apart, so as to keep the knees Open and separate. Of eourse if the pupil sits fair and square, and immediately opposite the handle of his oar, he will be at one side and not in the eentre of the boat. The stretcher, it may be added, should be as short as possible eon- veniently for elearing the knees and for exereising eomplete eontro] over the oar. The body should be upright, not bent forward and sunk down upon the trunk; the shoulders should be thrown baek, the ehest out, and the elbows down elose alongside the flanks, The oar should be held firmly, but withal lightly, in both hands, not clutched and cramped asin a viee—the outside hand elose to the

an ineh and a half to 2 inehes away from its fellow, but grasping the oar more eonvexly than the latter, the thumb being kept under- neath. The forearms should be below the level of the handle, and

fault in rowing. In taking the stroke the body should be inelined forwards with the baekbone straight, the stomach well out and down between the legs, the ehest forward and elevated as much as possible. The knees must be pressed slightly outwards; and the shoulders should eome moderately forward, but perfeetly level, and at an equal height. The arms should play freely in the shonlder joints, and should be perfeetly straight from the shoulders to the wrists ; the action of the hips also should be free. The inside wrist, however, must be somewhat raised, and the outside one be

body without the least pause, and as soon as the oar has passed the knees the wrists should be raised to bring the blade at right angles

upon it, by whieh the beginning of the stroke ig eaught, and the stroke itself pulled through ; in a word, the pupil should, as it were, knit himself up, and then spring baek like a bow when the string

make sketches before he learned to write," and that he covered his lesson-books with caricatures of his masters and fellow-pupils. On leaving school he became a student in the Royal Academy. At the age of sixteen he resided and studied for a time in Paris, and he afterwards made frequent tours on the Continent, enriching his portfolios with numerous jottings of life and character. In 1775 he exhibited at the Royal Academy a drawing of Delilah visiting Samson in Prison, and in the following years he was represented by various portraits and landscapes. Possessed of much facility of execution and a ready com- mand of the figure, he was spoken of as a promising student; and had he continued his early application he would have made his mark as a painter. But he was the victim of a disastrous piece of good fortune. By the death of his aunt, a French lady, he fell heir to a sum of £7000, and presently he plunged into the dissipations of the town. Gambling became a passion with him, and he has been known to sit at the gaming-table for thirty- six hours at a stretch. In time poverty overtook him ; and the friendship and example of Gillray and Bunbury seem to have suggested that his early aptitude for carica- ture might furnish a ready means of filling an empty purse. His drawing of Vauxhall, shown in the Royal Academy exhibition of 1784, had been engraved by Pollard, and the print was a success. Rowlandson was largely employed by Rudolph Ackermann, the art publisher, who in 1809- 1811 issued in his Poetical Magazine 'The Schoolmaster's Tour"—a series of plates with illustrative verses by Dr William Coombe. They were the most popular of the artist's works. Again engraved by Rowlandson himself in 1812, and issued under the title of the Tour of Dr Syntax in Search of the Picturesque, they had attained a fifth edition by 1813, and were followed in 1820 by Dr Syntax in Search of Consolation, andin 1821 by the Third Tour of Dr Syntax, in Search of a Wife. The same collaboration of designer, author, and publisher appeared in the English Dance of Death, issued in 1814-16, one of the most admirable of Rowlandson's series, and in the Dance of Life, 1822. Rowlandson also illustrated Smollett, Goldsmith, and Sterne, and his designs will be found in The Spirit of the Public Journals (1825), The English Spy (1825), and The Humourist (1831). He died in London, after a pro- longed illness, on the 22d April 1827.

Rowlandson’s designs were usually executed in outline with the reed-pen, and delieately washed with eolour. They were then etched by the artist on the copper, and afterwards aqua-tinted— usually by a professional engraver, the impressions being finally coloured by hand. As a designer he was characterized by the utmost facility and ease of draunghtsmanship. He poured forth his designs in ill-considered profusion, and the quality of his art suffered from this haste and over-production. He was a true if not a very refined humorist, dealing less frequently than his fierce contemporary Gillray with politics, but commonly touching, in a rather gentle spirit, the various aspects and incidents of social life. His most artistic work is to be found among the more careful drawings of his carlier period ; but even among the gross forms and exaggerated caricature of his later time we find, here and there, in the graceful lines of a figure or the sweet features of some maiden’s

face, sufficient hints that this master of the humorous might have attained to the beautiful had he so willed.

See J. Grego, Rowlandson the Caricaturist, a Selection from his Works, &c. (2 vols., 1880).

ROWLEY, Witt, actor and dramatist, collaborated with several of the celebrated dramatists of the Elizabethan period—Dekker, Middleton, Heywood, Fletcher, Webster, Massinger, and Ford. Nothing is known of his life except that he was an actor in various companies, and married in 1637. There was another Rowley, an actor and playright in the same generation, Samuel, and probably a third, Ralph. Four plays by W. Rowley are extant, —A Woman never Veat (printed 1632), A Match at Midnight (1633), All ’s Lost by Lust (1633), and A Shoemaker a

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Gentleman (1638). From these an opinion may be formed of his individual style. Effectiveness of situation and in- genuity of plot are more marked in them than any special literary faculty, from which we may conjecture why he was in such request as an associate in play-making. ‘There are significant quotations from two of his plays in Lamb’s Specimens. It is recorded by Langbaine that he “was beloved of those great men

Shakespeare, Fletcher, and Jonson”; and the tradition of his personal amiability is supported by the fact of his partnerships with so many different writers.

ROWLEY REGIS, an urban sanitary district of Staf- fordshire, is situated on the Birmingham Canal, and on the Stourbridge branch of the Great Western Railway, 6 miles west of Birmingham. The original village surrounds the parish church, dating from the 13th century, but rebuilt in 1840 with the exception of the tower, which was also rebuilt in 1858. The village is situated in a rich coal and iron- stone district, and round it numerous hamlets have grown up within recent years. Lately the parish has been erected into an urban sanitary district, governed by a local board of fifteen members. Besides collieries, iron works, and ex- tensive quarries for “Rowley rag” (a basaltic intrusion), there are potteries, rivet, chain, and anchor works, breweries, and agricultural implement works, the district being one of the most important manufacturing centres of Staffordshire. The population of the urban sanitary district (area 3670 acres) in 1871 was 23,534 and in 1881 it was 27,385.

ROXANA, or Roxane, daughter of the Bactrian Oxy- artes and wife of Alexander the Great (see ALEXANDER, vol. i. p. 484, and Maceponran Empire, vol. xv. p. 142).

ROXBURGH, a border county of Scotland, occupying the greater part of the border line with England, is bounded E. and 8.E. by Northumberland, 8.E. by Cumberland, S.W. by Dumfriesshire, W. by Selkirkshire, N.W. by Midlothian, and N.E. by Berwickshire. It lies between 55° 6’ 30” and 55° 42’ 30” N. lat., and between 2° 10’ and 3° 7’ W. long. Its greatest length from north to south is 43 miles, and its greatest breadth about 30 miles. The area is 428,464 acres, or about 670 square miles.

Surface and Geology.—The greater part of Roxburgh is included in Teviotdale. The whole course of the Teviot, 40 miles in length, is included within the county. It rises in the ranges of greywacke hills which separate the county from Dumfriesshire and Selkirk, and runs north-eastwards, following the deposition of the greywacke rocks to the Tweed at Kelso, and dividing the county into two unequal parts. On the north a high range of land runs parallel with its banks and slopes to its margin. South-west be-

tween Dumfries and Cumberland the greywacke formation constitutes an almost continuous succession of eminences, through which the Liddel finds its way southwards. The highest summits of the greywacke ranges exceed 1800 feet. Although occasionally rocky and rugged, the hills are for the most part rounded in outline and clothed with grass to their summits. This Silurian formation occupies nearly the whole of the western half of the county, but along with the greywacke rocks is associated clay slate of a bluish colour, glimmering with minute scales of mica and fre- quently traversed by veins of calcareous spar. The forma- tion is succeeded to the eastward by an extensive deposit of Old Red Sandstone, forming an irregular quadrangular area, towards the centre of the county, emitting two irregu- lar projections from its southern extremity, and interrupted towards the north by an intrusion of trap rocks. Owing to the sandstone formation the transverse valleys formed by various affluents of the Teviot present features of great interest. The action of the water has scooped deep channels in the rock, and thus formed picturesque narrow defiles, of which the high sandstone scaurs are a pro-

minent characteristic, their dark red colour blending finely with the bright green woods and sparkling streams. The best example of this species of scenery is on the Jed near Jedburgh. From the left the Teviot receives the Borth- wick and the Ale, both rising in Selkirkshire, and from the right the Allan, the Slitrig, the Rule, the Jed, the Oxnam, and the Kale, which rise in the high grounds towards the English border. As the Teviot approaches Hawick the county becomes more cultivated, although frequent irrup- tions of igneous rocks in the shape of isolated hills lend to it picturesqueness and variety. Towards the Tweed, where the lower division of the coal formation prevails, it expands into a fine champaign country, richly cultivated and finely wooded. The Tweed, which enters the county about two miles north of Selkirk, crosses its northern corner, east- wards by Abbotsford, Melrose, and Kelso to Coldstream, Its tributaries within the county are, besides the Teviot, the Gala, the Leader, and the Eden. One of the principal features of the Tweed district is the beautiful group of the Hildon Hills near Melrose,

consisting of felspathic porphyry, the highest of the three peaks reaching 1385 feet. The ex- tensive range of the Cheviots running along the Northum- berland border is of similar formation, Within Roxburgh- shire they reach a height of over 2400 feet. The lochs are comparatively few, the principal being Yetholm or Primside Loch, and Hoselaw in Linton parish,

The principal minerals are calcareous Spar and quartz. The spar is frequently of a red or rose character indicating the presence of hematite. In the greywacke strata fossils are very rare, but in the Old Red Sandstone fossil fishes of the genus Pterichthys and Holoptychius are very numer- ous, and a great variety of plant impressions have been found, especially fucoids, but also vegetables of a higher origin, including distinct petrifactions of Calamites.

Climate and Agriculture.—The mean annual temperature ap- proximates to that of Scotland generally, but it is much warmer in the low and arable portions, where also the rainfall is much less than in the hilly regions. The soil varies much in different dis- tricts, being chiefly loam in the low and level tracts along the banks of the river, where it is also very fertile. In other parts a mixture of elay and gravel prevails, but there is also a considerable extent of mossy land. The hilly district is everywhere covered by a thick green pasturage admirably suited for sheep. Both in the pastoral and in the arable districts agriculture is in a very advanced con- dition. The chief attention is devoted to cattle and sheep rearing.

Of the total area of 428,464 acres, 184,196 were in erops in 1885, 48,506 being under eorn crops, 28,385 green crops, 59,937 clover, 47,058 permanent pasture, and 310 fallow. Of the area under corn crops, 32,624 acres, or fully two-thirds, were occupied by oats, and 13,355 acres by barley. Turnips and swedes were the principal green crops, oceupying 25,143 acres, while potatoes occupied only 2118. The total number of horses was 4420, of which 3697 were used solely for purposes of agriculture ; of cattle 17,831, of which 5154 were eows and heifers in milk or in calf ; of sheep 502,721 ; and of pigs 4783. The valued rental in 1674 was £314,633 Scots, or £26,219 sterling, while that in 1883-84 was £420,403 ineluding railways. According to the parliamentary return of lands and heritages, the total number of owners was 2455, of whom 1880

possessed less that one acre. The duke of Buceleuch possessed 104,461 acres, or nearly a fourth of the whole ; the duke of Rox- burghe, 50,459; the countess of Home, 25,380; marquis of Lothian, 19,740; and Sir William F. Elliot of Stobs, 16,475.

Manufactures.—Though essentially an agricultural county, Roxburghshire possesses woollen manufactures of some importance, including tweeds, blankets, shawls, and hosiery, the principal seats being Hawiek, Jedburgh, and Kelso.

Railways.—The county is intersected by one of the lines of rail- way from Edinburgh to London (the “ Waverley” route), which passes Melrose and Hawick. At Riccarton a branch passes south- eastwards to Newcastle. The northern district is erossed by the border railway from St Boswells to Kelso, Coldstream, and Berwiek, a branch passing south from near Kelso to J edburgh.

Population.—Between 1831 and 1881 the population increased from 43,663 to 53,442 (25,436 males, 28,006 females), but from 1861 to 1871 there was a decrease from 54,119 to 49,407. The town population numbered 24,273 in 1881, the village 6627, and the rural 22,542. Jedburgh (population 2432) is a royal burgh ; it is also a police and parliamentary burgh, as is likewise Hawick

(16,184) ; Kelso (4687) is a police burgh. The most important villages are Melrose (1550), Neweastleton (924), and Yetholm (746).

History and Antiquities.—Among the more important relics of the early inhabitants of the eounty are the so-called Druidical re- mains at Tinnishill between the parishes of Castleton and Canonbie, at Ninestanerigg near Hermitage Castle, and at Plenderleath between the Oxnam and the Kale. Of old forts there are two of great size on the summits of Caerby and Tinnishill in Liddesdale, and a number of smaller ones in different parts of the county. On the north- west of the Eildon Hills are two fosse or ramparts forming a eircuit of more than a mile. On Caldshiels Hill there was another British fort, and between them a ditch with rampart of earth defend- ing the country

from the east. The famous Catrail, ‘partition of the fence,” the most important of the British remains in the king- dom, extended a distance of 45 miles from near Galashiels in Sel- kirkshire through Roxburgh to Peel Fell on the border. The Roman Watling Street touehed on Roxburgh at Broomhartlaw, whence pass- ing along the mountains now forming the boundary of the county for a mile and a half, until it entered Scotland at Blackhall, it turned northward by Bonjedward, Mount Teviot, Newton, Eildon, and Newstead to Channelkirk in the Lammermuirs. Cu its line there were important stations at Chewgreen in the Cheviots (? Ad Fines), Bonjedward (Gadanica), and Eildon Hill (? Trimontium). Another Roman road called the Maidenway from Maiden Castle in Westmoreland entered Roxburgh at Deadwater, and under the name of the Wheelcauseway traversed the north-east corner of Liddesdale into Teviotdale. “From Watling Street a braneh ealled

the Devil’s Causeway passed to the Tweed. After forming part of

the kingdom of Northumberland for several eenturies, Roxburgh was relinquished along with Lothian to the Scottish king about 1020 (see Loruran, vol. xv. p. 10). It is supposed to have been formed into a shire in the reign of David I. , its aneient county town of Roxburgh forming, along with Edinburgh, Berwiek, and Stirling, the court of the four burghs of Scotland, whose laws were collected by that king. Roxburgh Castle, between the Tweed and Teviot near Kelso, was a royal residence of the Saxon kings of Northumbria and afterwards of the Scottish monarchs, It was frequently taken by the English, and James II. was killed there by the bursting of a cannon. After this it remained in rnins till it was repaired by Protector Somerset, shortly after which it was demolished. Hermitage, in Liddesdale, the scene of Leyden’s ballad of Lord Soulis, was probably built by Nicholas de Sules in the beginning of the 13th eentury. On the forfeiture of the Soulis family in 1320, it was granted by Robert the Bruce to Sir John Graham of Aber- corn, and passed by the marriage of his heiress Mary to her

husband William Douglas, knight of Liddesdale, who starved Sir

Alexander Ramsay of Dalhousie to death in it in 1342 in revenge for Ramsay’s appointment as sheriff of Roxburgh by David I]. In 1492

Archibald Douglas, fifth earl of Angus, exchanged the Hermitage for Bothwell Castle, on the Clyde, with Patrick Hep- burn, first earl of Bothwell ; and it was there that his descendant, the fourth earl, was visited in 1566 by Mary queen of Seots. The principal of the other old castles are Branxholm on the Teviot, long the residence of the Buccleuchs and the scene of Sir Walter Scott's Lay of the Last Minstrel ; Cessford, on a ridge inclining towards the Kale, formerly of great strength, besieged in 1520 by Surrey, to whom it surrendered; and Ferniehirst, the mansion of the Kers, on the Jed, occupying the site of a baronial fortress erected in 1410, and the scene of manya fray. The district was fora long time the scene of continual border conflicts, the leaders in which were the Armstrongs and other chiefs occupying the fortresses or peels, chiefly in Liddesdale, as at Gilknockie, Castleton, Whitehaugh, Copshaw, Syde, Mangerton, Goranberty, Hartsgarth, and Newcastleton. Among many fine modern mansions mention may be made of Floors Castle, the seat of the duke of Roxburghe ; Minto House, the seat of the earl of Minto; and Abbotsford, built by Sir Walter Scott. Few counties can boast of such important ecclesiastical remains as those of the abbeys of Melrose, J edburgh, and Kelso. There are several ancient crosses in the county, the principal being those at Ancruin, Bowden, Maxton, and Melrose. Aniong numer- ous enlinent men connected with Roxburgh mention may be made of Samuel Rutherfurd the theologian, James Thomson, author of Z'he

Seasons, John Leyden the poet, and Sir Gilbert Elliot of Minto. See Jeffrey, History of Roxburghshire, 4 vols., 1857-64; Armstrong's Iistory of Liddesdale, 1884. T. FW)

ROXBURY, formerly a city of Norfolk county, Massa- chusetts, U.S., now incorporated in Boston (g.v.).

ROY, RAmmonun (1772-1833), Raja Rammohun Roy (or Ray), the founder of the Brahma Samaj or Theistic Church of India, was born at Radhanagar, Bengal, in May 1772, of an ancient and honourable Brahman family. His father gave him a good education ; he learnt Persian at home, Arabic at Patna (where he studied Euclid, Aris- totle, and the Koran), and Sanskrit at Benares. Although a devout idolater in boyhood, he early began to doubt and

speculate, and at fifteen left home to study Buddhism in Tibet, where his criticisms on the Lama-worship gave much offence. After some years' travel he returned, but, his anti- idolatrous sentiments obliging him to leave home, he lived at Benares until his father's death in 1803. After this, he spent about ten years in the East India Company's service, latterly as dewan or head officer in the collection of revenues.

During this period he first began to assemble his friends together for evening discussions on the absurdities of idolatry, and he also issued his first work, Z'uhfat-al Muwahhiddin (" A Gift to Monotheists ») This treatise was in Persian, with an Arabic preface, and was a bold protest against superstition and priestcraft. These pro- ecedings brought on him much hostility, and even perse- cution, and in 1814 he retired to Calcutta for greater safcty. Here he soon established a little Friendly Society (Atmiya Sabhd), which met weekly to read the Hindu Scriptures and to chant monotheistic hymns. In 1816 he translated the Vedanta into Bengali and Hindustani, following this by a series of translations from the Upani- shads into Bengali, Hindustani, and English, with intro- ductions and comments of his own. These works he pub- lished at his own expeuse and disseminated widely among his countrymen. His writings excited much opposition and gave rise to numerous controversies, in which his ability, tact, and learning rendered him fully a match for his antagonists. But the deadliest blow which he inflicted upon Hindu superstition was his effective agitation against the rite of suttee, the burning of living widows on the funcral piles of their deceased husbands. In 1811 he had been a horrified witness of this sacrifice in his elder prother's family, and had vowed never to rest until he had uprooted the custom. He exposed the hollow pre- tences of its advocates in elaborate pamphlets, both in Bengali and English, and pressed the matter in every possible way, till at last the tide of public feeling turned, and on December 4, 1829, Lord William Bentinck issued a regulation abolishing suttee throughout all the terri- tories subject to Fort William. Rammohun was an active politician and philanthropist. He built schoolhouses and established schools in which useful knowledge was gratu- itously taught through the medium both of the English and the native languages. He wrote a suggestive Bengali gram- mar, of which he published

one version in English (1826) and one in Bengali (1833). He wrote valuable pamphlets on Hindu law, and made strenuous exertions for the freedom of the native press; he also established (1822) and mainly conducted two native newspapers, the Sambad Kaumudi in Bengali, and (if rightly identified) the Mfirdt- al-Akhbér in Persian, and made them the means of diffusing much useful political information. Becoming interested in Christianity, he learned Hebrew and Greek in order to read the Bible in the original languages; and in 1820 he issued a selection from the four Gospels entitled The Precepts of Jesus, the Guide to Peace and Happiness. This was attacked by the Baptist missionaries of Serampur, and a long controversy ensued, in which he published three remarkable Appeals to the Christian Public in Defence of the " Precepts of Jesus." He also wrote other theological tracts (sometimes under assumed names) in which he attacked both Hindu and Christian orthodoxy with a strong hand. But his personal relations with orthodox Christians were never unfriendly, and he rendered valuable assistance to Dr Duff in the latter's educational schemes. He also warmly befriended a Unitarian Christian Mission which was started in Calcutta (1824) by Mr William Adam, formerly a Baptist missionary, who, in attempting to convert RAmmohun to Trinitarianism; had himself been converted to the opposite view. This Unitarian Mission,

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though not a theological success, attracted considerable sympathy among the Hindu monotheists, whose Atmiya Sabha had then become extinct. At last Rammohun felt able to re-embody his cherished ideal, and on August 20, 1828, he opened the first "Bréhmya Association" (Brahma Sabha) at a hired house. A suitable church building was then erected and placed in the hands of trustees, with a small endowment and a remarkable trust-deed by which the building was set apart 'for the worship and adoration of the Eternal, Unsearchable, and Immutable Being who is the Author and Preserver of the universe." The new church was formally opened on the 11th Magh (January 23) 1830, from which day the Brahma Samaj dates its existence. Having now succeeded in his chief projects, RAmmohun resolved to visit England, and the king of Delhi appointed him his envoy thither on special business, and gave him the title of raja. He arrived in England on April 8, 1831, and was received with universal cordiality and

respect. He watched with special anxiety the parlia- mentary discussions on the renewal of the East India Company's charter, and gave much valuable evidence before the Board of Control on the condition of India. This he republished with additional suggestions (Exposition of the Practical Operation of the Juticial and Revenue Systems of India), and also reissued his important Lssay on the Light of Hindus over Ancestral Property (1832). He visited France, and wished to visit America, but died unexpectedly of brain fever at Bristol, September 27, 1833.

His Bengali and Sanskrit works were lately reissued in one volume, by Rajnarain Bose and A. C. Vedantabagish (Calcutta, 1880), and his English works will shortly be published in two volumes by Eshanchandra Bose. Nagendranath Chattopadhaya's Bengali memoir of him (1881) is the fullest yet published.

ROY, Witrstam (c. 1726-1790), a famous geodesist, was employed in some of the great national trigonometrical measurements which were made during last century. In 1746, at the age of twenty, when an assistant in the office of Colonel Watson, deputy quartermaster-general in North Britain, he began the survey of the mainland of Scotland, the results of which were embodied in what is known as the "duke of Cumberland's map." In 1756 he obtained a lieutenancy in the 51st regiment, and proceeded with it to Germany, where his talents as a military draughtsman brought him to notice, and procured him rapid promotion. He ultimately reached the rank of maj or-general. In 1784, while deputy quartermaster-general at the Horse Guards, his services were called into request for conducting the observations for determining the relative positions of the French and English royal observatories. His measure- ment of a base line for that purpose on Hounslow Heath in 1784, which was destined to be the germ of all subse- quent surveys of the United Kingdom, gained him the gold medal of the Royal Society of London. Owing to unfore- seen delays, the triangulation for connecting the meridians of the two observatories was not carried out until 1787. He had completed his undertaking, and was finishing an account of it for the Phil. Trans. when he died in 1790.

Besides several papers in Phil. Trans., Roy was author of the work entitled Military Antiquities of the Romans in North Britain, published in 1793.

ROYAL HOUSEHOLD. In all the medisval mon- archies of western Europe the general system of govern- ment sprang from, and centred in, the royal household. The sovercign's domestics were his officers of state, and the leading dignitaries of the palace were the principal admin- istrators of the kingdom. The royal household itself had, in its turn, grown out of an earlier and more primitive 'nstitution. It took its rise in the comitatus described by Tacitus, the chosen band of comites or companions who, when the Roman historian wrote, constituted the personal following, in peace as well as in war, of the Teutonic

princeps or chieftain, In England before the Conquest the comitatus had developed or degenerated into the thegnhood, and among the most eminent and powerful of the king's thegns, were his dishthegn, his bowerthegn, and his horsethegn or staller. In Normandy at the time of the Conquest a similar arrangement, imitated from the French court, had long been established, and the Norman dukes, like their overlords the kings of France, had their seneschal or steward, their chamberlain, and their con- stable. After the Conquest the ducal household of Normandy was reproduced in the royal household of England ; and since, in obedience to the spirit of feudalism, the great offices of the first had been made hereditary, the great offices of the second were made hereditary also, and were thenceforth held by the grantees and their descend- ants as grand-serjeanties of the crown. The consequeuce was that they passed out of immediate relation to the practical conduct of affairs either in both state and court or in the one or the other of them. The steward and chamberlain of England were superseded in their political functions by the justiciar and treasurer of England, and in their domestic functions by the steward and chamber- lain of the household. The marshal of England took the place of the constable of England in the royal palace, and was associated with him in the command of the royal armies. In due course, however, the marshalship as well as the constableship became hereditary, and, although the constable and marshal of England retained their military authority until a comparatively late period, the duties they had successively performed about the palace had been long before transferred to the master of the horse. Under these circumstances the holders of the original great offices of state and the household ceased to attend the court

except on occasions of extraordinary ceremony, and their representatives either by inheritance or by special appointment have ever since continued to appear at corona- tions and some other public solemnities, such as the Open- ing of the parliament or trials by the House of Lords.! The materials available for a history of the royal house- hold are somewhat scanty and obscure. The earliest record relating to it is of the reign of Henry II., and is contained in the Black Book of the Huchequer. It enumer- ates the various inmates of the king's palace and the daily allowances made to them' at the period at which it was compiled. Hence it affords valuable evidence of the antiquity and relative importance of the court offices to which it refers, notwithstanding that it is silent as to the functions and formal subordination of the persons who filled them.? In addition to this record we have a series of far later, but for the most part equally meagre, docu- ments bearing more or less directly on the constitution of the royal household, and extending, with long intervals, from the reign of Edward IIL to the reign of William and Mary. Among them, however, are what are known as the

' The great officers of state and the household whom we have particularly mentioned do not of course exhaust the catalogue of them. We have named those only whose representatives are still dignitaries of the court and functionaries of the palace. If the reader consults Hallam (Middle Ages, vol. i. p. 181 sq.), Freeman (Vorman Conquest, vol. i, p. 91 sg., and vol. y. p. 426 sq.), and Stubbs (Const. List., vol. i. p. 343, sg.), he will be able himself to fill in the details of the outline we have given above.

2 The record in question is entitled Constitutio Domus Regis de Procurationibus, and is printed by Hearne (Liber Niger Scaecarit, vol. ie 1D) ~ sq.). It is analysed by Stubbs (Consé. 4ist., vol. i, note 2, p. 345).

King William and Queen Mary, printed for the Society of Antiquaries, London, 1790. See also Pegge's Curialia, published partly before and partly after this volume; and Carlisle's Gentlemen of the Privy Chamber, published in 1829, Pegge and Carlisle, however, deal with small and insignificant portions of the royal establishment.

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Black Book of the Household compiled the first in the reign of Edward IV. and the second in the reign of Henry VIII., from which a good deal of detailed information may be gathered concerning the arrangements of the court in the 15th and 16th centuries.

and the Statutes of Liltham,

The Statutes of Eltham were meant for the practical guid-

ance merely of those who were responsible for the good _order and the sufficient supply of the sovereign's household at the time they were issued. But the Black Book of the Household, besides being a sort of treatise on princely mag-

nificence generally, professes to be based on the regulations established for the governance of the court by Edward III., who, it affirms, was "the first setter of certeynties among upon a grounded rule" and whose palace it describes as "the house of very policie and flowre of England ;" and it may therefore possibly, and even probably, take us back to a period much more remote than that at which it was actually put together.4 Various orders, returns, and accounts of the reigns of Elizabeth, James ie Charles I., Charles IL, and William and Mary throw con- siderable light on the organization of particular sections of the royal household in times nearer to our own.) Moreover, there were several parliamentary inquiries into the expenses of the royal household in connexion with the settlement or reform of the civil list during the reigns of George III, George IV., and William IV.6 But they add hittle or nothing to our knowledge of the subject in what was then its historical as distinguished from its contem- porary aspects. So much, indeed, is this the case that, on the accession of Queen Victoria, Chamberlayne's Present State of England, which contains a, catalogue of the officials at the court of Queen Anne, was described by Lord Melbourne the prime minister as the " only authority " which the advisers of the crown could find for their assistance in determining the appropriate constitution and dimensions of the domestic establishment of a queen regnant.?"

In its main outlines the existing organization of the royal household is essentially the same as it was under the Tudors or the Plantagenets. It is now, as it was then, divided into three principal departments, at the head of

which are severally the lord steward, the lord chamber- lain, and the master of the horse, and the respective pro- vinces of which may be generally described as “below stairs,” “above stairs,” and “out of doors.” But at present, the sovereign being a queen, the royal household is in some other respects rather differently arranged from what it would be if there were a king and a queen consort. When there is a king and a queen consort there is a

- Liber Niger Domus Regis Edward FV. and Ordinances Sor the fousehold made at Eltham in the seventeenth year of King Henry | VILI., 4.D. 1526, ave the titles of these two documents. The earlier documents printed in the same collection are Household of King Edward 11f. in Peace and War Jrom the eighteenth to the twenty-first year of his reign; Ordinances of the Household of K: ing Uenry IV, in the thirty-third year of his reign, A.D. L455, and Articles ordained by King Henry VII. for the Regulation of his Household, A.D. 1494.

5 The Book of the Household of Queen Elizabeth as it was ordained in the forty-third year of her Reign delivered to our Sovereign Lord King James, &c., is simply a list of officers’ names and allowances. It seems to have been drawn up under the curious circumstances referred to in Archxologia (vol. xii, pp, 80-85), For the rest of these docn- ments see Ordinances and Regulations, dc, pp. 299, 340, 847, 352, 368, and 380.

§ Burke’s celebrated Act “for enabling His Majesty to discharge the debt contracted upon the civil list, and for preventing the same from being in arrear for the future, &c.,” 22 Geo. III. ¢. 82, was passed in 1782. But it was foreshadowed in his great speech on ‘‘ Economical Reform” delivered two years before. Since the beginning of the current century select committees of the House of Commons have reported on the civil list and royal household in 1808, 1804, 1815, and 18381.

7 Torrens’s Memoirs of ii. p. 803,

William, second Viscount Melbourne, vol.

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separate establishment “above stairs ” and “out of doors” for the queen consort. She has a lord chamberlain’s department and a department of the master of the horse of her own, and all the ladies of the court from the mistress of the robes to the maids of honour are in her service. At the commencement of the reign of Queen Victoria the two establishments were combined, and on the whole considerably reduced. Hence the royal house- hold, although it is of course much larger than that of a queen consort would be, is also appreciably smaller than that of a king and queen consort together has been since the reigning family acceded to the throne.!

I. Department of the Lord Steward of the Houschold.—The hall; the kitchen, ewry, and pantry; the wine, beer, and coal cellars ; and the almonry are in the lord steward’s department. The lord steward is the first dignitary of the court, and presides at the Board of Green Cloth, where all the aecounts of the household are examined and passed.? He is always a member of the Govern- ment of the day, a peer, and a privy couneillor. He receives his appointment from the sovereign in person, and bears a white stalf as the emblem and warrant of his authority.? In his department the treasurer and comptroller of the household are the officers next in rank to him. They also sit at the Board of Green Cloth, earry white staves, and belong to the ministry. They are always peers or the sons of pecrs, and privy councillors. But the duties which in theory belong to the lord steward, treasurcr, and comp- troller of the household are in practice performed by the master of the houschold, who is a permanent officer and resides in the palace. It is he who really investigates the accounts and main- tains discipline among the ordinary servants of the royal establish- ment. He is a white-staff officer and a member of the Board of Green Cloth but not of the ministry, and among other things

he presides at the daily dinners of the suite in waiting on the |

sovereign.4 In the lord steward’s department are the secretary and three clerks of the Board of Green Cloth; the coroner and paymaster of the household ; and the officers of the almonry, namely, the hereditary grand almoncr,? the lord high almoner, the sub-alinoner, the groom of the almonry, and the secretary to the lord high almoner.®

Il. Department of the Lord Chamberlain of the Household. —The bedchamber, privy chamber, and presence chamber, the wardrobe, the housekeeper's room, and the guardroom, the metropolitan theatres, and the chapels royal are in the lord chamberlain's depart- ment. The lord chamberlain is the second dignitary of the court, and is always a member of the Government of the day, a peer, and a privy councillor. He carries a white staff, and wears a golden or jewclled key, typical of the key of the palace, which is supposed to be in his charge, as the ensigns of his office. He is responsible for the necessary arrangements connected with state ceremonies, sueh as eoronations aud royal marriages, christenings, and funerals. All invitations to court are sent out in his name by command of the sovercign, and at drawing roonts and levecs he stands next to the sovereign and announces the persons who are approaching the throne. It is also part of his duty to conduct the sovereign to and from his or her earriage.? The vice-ehamberlain of the household is the lord ehaniberlain's assistant and deputy. He also is one of the ministry, a whitc-staff officer, and the bearer of akey; and he is always a peer or the son of a peer as well as a privy councillor.

1 llansard, Parl, Debates, vol. xxxix. pp. 146 sg., 1942 sg.

2 Inthe Statutes of Eltham he is called 'the lord great master," but in the Household Book of Queen Elizabeth 'the lord steward," as before and since. In 31 Hen. VILL. c. 10, "for placing of the lords," he is described as " the grand master or lord steward of the king's most honourable household." The whole business of purveyance and pre-emption was anciently managed by the Board of Green Cloth. Sec under heading ''The counting house of the king's household, Domus Compotus Hospitti Regis," in Coke, Institutes, iv, cap. 19. It is designated "the court of the virge or green eloth 'in 22 Geo. IlI. c. 82, § 5.

3 In the old time the lord steward had three courts besides the board of grecn cloth under him, namely, the lord steward's court, the court of the Marshalscy, and the palace court (Coke, Just, iv. caps. 20 and 21; Reeves, Hist. of the Law of England, vol. ii. pp. 188 and 297; Stephen, Commentaries on the Law of England, vol. iv. p. 222). The lord steward or his deputies formerly administer. d the oaths to the members of the House of Commons, and frequent inconveniences were the consequence (see

Hatsell, Precedents of Proceedings in the House of Commons, London, 1818, vol. ii. pp. 84-91). In certain cases now “the lords with white staves’ are the proper persons to bear communications between the sovereign and the Houses ot Parliament.

4 {nthe case of the master of the household we sce history repeating itself. lie is not named in the Black Book of Edward IV. or in the Statutes of Henry VI1IL,, and is entered as “‘master of the household and clerk of the green cloth” in the Household Book of Quecn Elizabeth. But practically he has superseded the lord steward of the houschold, as the lord steward of the household at one time superseded the lord high steward of England.

5 The marquess of Exeter.

6 In the lord steward’s department the offices of cofferer of the household, treasurer of the chamber, paymaster of pensions, and six clerks of the Board of Green Cloth were abolished by 22 Geo. II]. e. 82.

7 The lord chamberlain of the household at one time discharged some import- ant politieal funetions, which are described by Sir Harris Nicolas (Proceedings of the Privy Council, vol. vi., Preface, p. xxiii).

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Wheu there is a king the groom of the stole comes next to the vice-chamberlain in rank and authority. At present, however, the mistress of the robes in some measure occupies the position of the groom of the stole. She is the only lady of the eourt who comes into office aud goes out with the administration, and the duties she performs are merely occasional and formal. She is always a duchess, and attends the queen at all state ceremonies and enter- tainments, but is never in permanent residence at the palace.? On the eontrary the ladies of the bedchamber share the function of personal attendance on the sovereign throughout the year. Of these there are eight, always peeresses, and each is in waiting for about a fortnight or three weeks at a time. But the women of the bedchamber, of whom there are also eight, appear only at court ceremonies and entertainments according to a roster annually issued under the authority of the lord chamberlain. They are usually the daughters of peers or the wives of the sons of peers, and in the

old time, like the mistress of the robes and the ladies of the bedchamber, habitually assisted the queen at her daily toilette. But this has long ceased to be done by any of them. The maids of honour, whose situations are by no means sinecures, are like- wise eight in number and have the same terms of waiting as the ladies of the bedechamber. They are commonly if not always the daughters or granddaughters of peers, and when they have no superior title and precedence by birth are called “ honourable” and placed next after the daughters of barons. The queen as a special mark of her favour nominates ‘‘extra” ladies and women of the bed-chamber and maids of honour. But their position is altogether honorary and involves no charge on the civil list. There arc cight lords and eight grooms, who are properly described as “of the bed- chamber ” or “in waiting,” according as the reigning sovereign is a king or a queen, and whose terms of attendance are of similar duration to those of the ladies of the bedchamber and the maids of honour. Oceasionally ‘‘extra” lords and grooms in waiting are nominated by the quecn, who, however, are unpaid and have no regular duties. The master, assistant master, and marshal of the ceremonies are the officers whose special function it is to enforce the observance of the etiquette of the court. The reception of foreign potentates and ambassadors is under their particular care, and they assist in the ordering of all entertainments and festivities at the palace.® The gentleman usher of the black rod—the black rod which he carrics being the ensign of his office—is the principal usher of the court and kingdom. He is one of the original functionaries of the order of the Garter, and is in constant attendance on the House of Lords, from whom, either personally or by his deputy the yeoman usher of the black rod, it is part of his duty to carry messages and summonses to the House of Commons. The gentlemen ushers of the privy chamber and the gentlemen ushers daily waiters, of whom there are four eaeh, and the gentlemen ushers quarterly waiters and the sergeants-at- aris, of whom there are eight each, are in waiting only at drawing rooms and levees and state balls and concerts. But of the sovereign’s sergeants-at-arms there are two others to whom special duties are assigned, the one attending the speaker in the House of Commons, and the other attending the lord chancellor in the House of Lords, carrying their maces and executing their orders. The ycomen of the guard date from the reign of Henry VIL, and the gentlemen-at-arms from the reign of Henry VIII. The captain of each corps is always a member of the ministry and a peer. Besides the captains, the former, now

called the queen’s bodyguard, eonsists of a lieutenant, ensign, clerk of the cheque and adjutant, four exons, and a hundred yeomen; and the latter, onee ealled the gentlemen pensioners, consists of a lieutenant, standard-bearer, elerk of the cheque and adjutant, a sub-officer, and forty gentlemen. The comptroller and examiner of accounts, the licenser of plays, the dean and subdean of the ehapel royal, the clerk of the closet, the groom of the robes, the pages of the backstairs, of the chamber, and of the presence, the poet laureate, the royal physicians and surgeons, chaplains, painters and sculptors, librarians and musicians, &e., are all under the superiutendence of the lord chamberlain of the household.”

III. Department of the Master of the Horsc.—The stables and coachhouses, the stud, mews, and kennels, are in the master of the horse’s department. The master of the horse is the third

8 In the reign of Queen Anne, Sarah duchess of Marlborough from 1704, and Elizabeth duchess of Somerset from 1710, held the combined offiecs of mistress of the robes and groom of the stole.

9 Since the great ‘“‘bcdchamber question” of 1839 the settled practice has been for all the ladies of the court except the mistress of the robcs to receive and continue in their appointments independently of the political connexions of their husbands, fathers, and brothers (see Mr Gladstone’s Gleanings of Past Years, vol. i. p. 40; and Torrens’s Memoirs of Lord Melbourne, vol. ii. p. 304).

10 The office of master of the eeremonies was created by James{. The master of the ceremonies wears a medal attached to a gold chain round his neck, on one side being an emblem of peace with the motto ‘“¢ Beati pacifici,”’ and on the other an emblem of war with the motto ‘Dien ct mon droit” (see Finetti Philoxensis, by Sir John Finett, master of the ceremonies to James I. and Charles I., 1656; and D’lsraeli’s Curtosities of Literature, 10th ed., p. 242 sq.).

il See May, Parliamentary Practice, pp. 236, 244. ,

12 The offices of master of the great wardrobe and master of the jewel house in the lord chamberlain’s department were abolished by 22 Geo. Iii.

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dignitary of the court, and is always a member of the Govern- meut of the day, a peer, and a privy eouncillor. All matters connected with the horses and hounds of the sovereign are within his jurisdiction. The master of the buekhounds, who is also one of the ministry, ranks next to him, and it is his duty to attend the royal hunt and to head the procession of royal equipages on the racecourse at Ascot, where he presents himself on horseback in a green and gold uniform wearing the couples of a hound as the badge of his office. The hereditary grand falconer! is also sub- ordinated to the master of the horse. But the practical manage- ment of the royal stables and stud in fact devolves on the chief or crown equerry, formerly called the gentleman of the horse, who is hever in personal attendance on the sovereign, and whose appoint- mient is permanent. The clerk marshal has the supervision of the aceounts of the department before they are submitted to the Board of Green Cloth, and is in waiting on the sovereign on state oceasions only. LExelusive of the crown equerry there are seven regular equerries, besides extra and honorary equerries, one of whom is always in attendance the royal earriage. They are always officers of the army, and each of them is ‘fon duty” for about the same time as the lords and grooms in waiting. There are also three pages of honour in the naster of the horse’s department, who must not be confounded with the pages of various kinds who are in the department of the lord chamberlain. They are youths aged from twelve to sixteen, selected by the sovereign in person, to attend on her at state ceremonies, when two of them arrayed in an antique costume assist the groom of the robes in carrying the royal train,

It remains to be said that to the three ancient departments of

the royal household which we have already noticed two others have been added in comparatively recent times, The departments of the private secretary and the keeper of the privy purse to the sovereign, which are for the present combined, originated no longer ago than the earlier part of the current century. Very great doubts were at one time entertained as to whether such an office as that of private secretary to the sovereign could constitntionally exist, and the privy purse itself was unknown until after the

passing of Burke’s Act of 1782. As at present organized these branches of the royal household consist of the private secretary and keeper of the privy purse, two assistant private secretaries and keepers of the privy purse, and a secretary and two clerks of the privy purse. By the statute which settled the civil list at the beginning of the current reign (1 & 2 Vict. c 2) the privy purse was fixed at £60,000 a year, and the salaries, allowances, and other expenses of the royal house- hold were fixed at £303,760 a year. (F. DR.)

ROYAL SOCIETY, THE, or, more fully, The Royal Society of London for Improving Natural Knowledge, is an association of men interested in the advancement of mathematical and physical science. tific society in Great Britain, and Europe.

The Royal Society is usually considered to have been founded in the year 1660, but a nucleus had in fact been in existence for some years before that date. Wallis informs us that as early as the year 1645 weekly meetings were held of “divers worthy persons, inquisitive into natural philosophy, and other parts of human learning, and particularly of what hath been called the New Philo- sophy or Experimental Philosophy,” and there can be little doubt that this gathering of philosophers is identical with the “ Invisible College” of which Boyle speaks in sundry letters written in 1646 and 1647. ‘These weekly meet- ings, according to Wallis, were first suggested by Theodore Haak, “a German of the Palatinate then resident in London,” and they were held sometimes in Dr Goddard’s lodgings in Wood Street, sometimes at the Bull-Head Tavern in Cheapside, but more often at Gresham College.

On November 28, 1660, the first journal book of the society was opened with a “ memorandum,” from which the following is an extract :—“ Memorandum that Novemb. 28. 1660, These persons following, according to the usuall custom of most of them, mett together at Gresham Colledge to heare Mr Wren’s lecture, viz., The Lord Brouncker, Mr Boyle, Mr Bruce, Sir Robert Moray, Sir Paul Neile, Dr Wilkins, Dr Goddard, Dr Petty, Mr Ball, Mr Rooke, Mr Wren, Mr Hill. And after the lecture was ended, they did, according to the usuall manner withdrawe for mutual]

one of the oldest in

1 The duke of St Albans.

on the sovereign and rides at the side of

It is the oldest scien-

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converse. Where amongst other matters that were dis- coursed of, something was offered about a designe of founding a Colledge for the promoting of Physico-Mathe- maticall Experimentall Learning.” It was agreed at this meeting that the company should continue to assemble on Wednesdays at 3 o’clock; an admission fee of ten shillings with a subscription of one shilling a week was instituted : Dr Wilkins was appointed chairman ; and a list of forty-one persons judged likely and fit to join the design was drawn up. On the following Wednesday Sir Robert Moray brought word that the king (Charles II.) approved the design of the meetings; a form of obligation was framcd, and was signed by all the persons enumerated in the memorandum of November 28, and by seventy-three others. On December 12 another meeting was held at which fifty-five was fixed as the number of the society,—persons of the degree of baron, fellows of the College of Physicians, and public professors of mathematics, physic, and natural

philosophy of both universities being supernumeraries.

Gresham College was now appointed to be the regular meeting-place of the society. Sir Robert Moray was chosen president (March 6, 1661), and continued in that office until the incorporation of the society, when he was suc- ceeded by Lord Brouncker. In October 1661 the king offered to be entered one of the society, and next year the society was incorporated under the name of “The Royal Society,” the charter of incorporation passing the great seal on the 15th July 1662, to be niodified, however, by a second charter in the following year. The council of the Royal Society met for the first time on May 13, 1663, when resolutions were passed that debate concerning those to be admitted should be secret, and that fellows should pay ls. a week to defray expenses.

At this early stage of the society's history one main part of their labours was the "correspondence" which was actively maintained with Continental philosophers, and it was from this that the Philosophical Transactions (a publication now of world-wide celebrity) took its rise. At first the Transactions was entirely the work of the secretary, except that it was ordered (March 1, 1664-5) "that the tract be licensed by the Council of the Society, being first reviewed by some of the members of the same." The first number, consisting of sixteen quarto pages, appeared on Monday 6th March 1664—5. In 1750 four hundred and ninety-six numbers or forty-six volumes had been published by the secretaries. After this date the work was issued under the superintendence of a committee, and the division into numbers disappeared. At present (1885) one hundred and seventy-five volumes have been completed.

Another matter to which the society turned their atten- tion was the formation of a museum, the nucleus being ''the collection of rarities formerly belonging to Mr Hubbard," which, by a resolution of council passed February 21, 1666, was purchased for the sum of £100. This museum, at one time the most famous in London, was presented to the trustees of the British Museum in 1781, upon the removal of the society to Somerset House.

After the Great Fire of London in September 1666 the apartments of the Royal Society in Gresham College were required for the use of the city authorities, and the society were therefore invited by Henry Howard of Norfolk to meet in Arundel House. At the same time he presented them with the library purchased by his grandfather Thomas, earl of Arundel, and thus the foundation was laid of the magnificent collection of scientific works, pro- bably not far short of 45,000 volumes, which the society at the present time possesses. Of the Arundel MSS. the bulk was sold to the trustees of the British Museum in 1830 for the sum of £3559, the proceeds being devoted

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to the purchase of scientific books. These MSS. are still kept in the museum as a separate collection.

Under date December 21, 1671, the journal-book records that “the lord bishop of Sarum proposed for candidate Mr Isaac Newton, professor of the mathematicks at Cam- bridge.” Newton was elected a fellow January 11, 1671-2, and in 1703 he was appointed president, a post which he held till his death in 1727. During his pre- sidency the society moved to Crane Court, their first meeting in the new quarters being held November 8, 1710. Inthe same year they were appointed visitors and directors of the Royal Observatory at Greenwich, a func- tion which they ccntinued to perform until the accession of William IV., when by the new warrant then issued the president and six of the fellows of the Royal Astrono- mical Society were added to the list of visitors.

In 1780, under the presidency of Sir Joseph Banks, the Royal Society removed from Crane Court to the apart- ments assigned to them by the Government in the new Somerset House, where they remained until they removed to Burlington House in 1857. The policy of Sir Joseph Banks was to render the fellowship more difficult of attainment than it had been, and the measures which he took for this purpose, combined with other circum- stances, led to the rise of a faction headed by Dr Horsley. Throughout the years 1783 and 1784 feeling ran exceed- ingly high, but in the end the president was supported by the majority of the society. An account of the contro- versy will be found in a tract entitled An Authentic Narra- tive of the Dissensions and Debates tn the Royal Soctety. In connexion with this policy of Sir Joseph Banks may be mentioned a further step in the same direction taken in the year 1847, when the number of candidates recom- mended for election by the council was limited to fifteen, and the election was made annual. Concurrently, how- ever, with this gradual narrowing of the Royal Society’s boundaries was the successive establishment of other scientific bodies. The founding of the Linnean Society in 1788 under the auspices of several fellows of the Royal Society was the first instance of the establishment of a distinct scientific association under royal charter. The Geological Society followed in 1807, and the Royal Astronomical Society in 1820. The Chemical, the Royal Geographical, and the Entomological are the remaining chartered scientific societies existing in London at the present

time. ‘The Royal Society continues, however, to hold the foremost place among the scientific bodies of England, not only from the number of eminent men in- cluded in its fellowship, but also from its close official con- nexion with the Government.

The following will serve as some indication of the variety and importance of the scientific matters upon which they have been consulted by or have memorialized the Government during the last seventy years :—1816, standard measures of length ; 1817, expedition in search of North-West Passage ; 1822, use of coal-tar in vessels of war; best manner of measuring tonnage of ships; 1823, eorrosion of copper sheathing by sea-water ; Babbage’s cal- culating-machine ; lightning-conductors for vessels of war ; 1825, supervision of gas-works ; 1826, Parry’s North Polar expedition ; 1832, tidal observations ; 1835, instruments and tables for testing the strength of spirits; 1839, Antarctic expedition ; magnetic observatories in the colonies ; 1845, Franklin’s Arctic expedition ; 1849-55, Government grant for scientific research ; 1862, the great Melbourne telescope ; 1865, pendulum observations in India ; 1866, reorganization of the meteorological department ; 1868, deep sea research ; 1872, “Challenger” expedition ; 1874, Arctic expedi- tion; 1875, eclipse expedition; 1876, Vivisection Bill; 1877, transit of Venus expedition; 1879, prevention of accidents in mines; 1881, pendulum observations; 1882, transit of Venus; cruise of the “Triton” in Faroe Channel ; 1883, borings in delta of Nile; 1884, Bureau des Poids et Mesures ; prime meridian eonfer- ence, &c. One of the most important duties which the Royal Society performs on behalf of the Government is the administra-

tion of the annual grant of £4000 for the promotion of scientific research. This grant originated in a proposal by Lord John

Russell in 1849 that at the close of the year the president and council should point out to the first lord of the treasury a limited number of persons to whom the grant of a reward or of a sum to defray tho eost of experiments might be of essential service. This grant of £1000 afterwards became

annual, and was continued until 1876. In that year an additional sum of £4000 for similar pur- poses was granted, and the two funds of £1000 and £4000 were administered concurrently until 1881, in which year the two were combined in a single annual grant of £4000 under new regulations. One of the most useful of the society's undertakings of late years is the great catalogue of scientific papers, —an index, in eight quarto volumes, under authors' names, of all the memoirs of importance in the ehief English and foreign scientific serials from the year 1800 to the year 1873. 'The work was prepared under the direc- tion and at the expense of the Royal Society, and was printed by H. M. Stationery Office.

'A statement of the trust funds administered by the Royal Society will be found in their published Procecdings under date November 30th of each year, and the origin and history of these funds will be found in Weld's History of the Royal Society, and in the late William Spottiswoode's '' Anniversary Address for 1874" (Proc. Roy. Soc, xxiii. p. 49). The income of the society is derived from the annual contributions and composition fees of the fellows, from rents, and from interest on various investments. The bpalance-sheet and an account of the estates and property are pub- lished in the Proceedings at each anniversary. Four medals (a Copley, two Royal, and a Davy) are awarded by the society every year, and the Rumford medal in alternate years. The first of these originated ina bequest by Sir Godfrey Soe (1709), and is awarded 'to the living author of such philosophical research, either pub- lished or communicated to the society, as may appear to the council to be deserving of that honour"; the author may be an Englishman or a foreigner. The Rumford medal originated in a gift from Count Rumford in 1796 of £1000 8 per eent. consols, for the most important discoveries in heat or light made during the preceding two years. The Royal medals were instituted by George IV., and are awarded annually for the two most important contributions to science published in the British dominions not more than ten ycars nor less than one year from the date of the award. The Davy medal was founded by the will of Dr John Davy, F.R.S., the brother of Sir Humphry Davy, and is given annually for the most important discovery in chemistry made in Europe or Anglo-America. 'An enumeration of the awards of each of the medals will be found at the end of the list of fellows which is published annually by the society.

Under the existing statutes of the Royal Society every candidate for election must be recommended by a certificate in writing signed by six or more fellows, of whom three at least must sign from personal knowledge. From the candidates so recommended the council annually select fifteen by ballot, and on the first Thursday in June the namies so selected are submitted to the society in the form of a printed balloting-sheet with space left for erasure and substitution of names. Princes of the blood may, however, be proposed at any ordinary meeting and put to the vote on the same day, and any member of H. M. privy council may be balloted for on the third ordinary meeting from the day upon which his certificate is read. Foreign members, not exceeding fifty, may be selected by the council from among men of the greatest scientifie eminence, and proposed to the society for election. Every member of the privileged class is liable to an admission fee of £10 and an annual payment of £4; other fellows pay £3 per annum. The composition for annual payments is £60.

The anniversary meeting for the election of the council and oftieers is held on St Andrew's Day. 'The council for the ensuing year, out of which are chosen the president, treasurer, principal secretaries, and foreign secretary, must consist of eleven members of the existing council and ten fellows who are not members of the existing council. These are nominated by the president and council previously to the anniversary meeting. The session of the society is from November to June ; the ordinary meetings are held every Thursday during the session, at 4.30 P.M. The selection for publication from the papers read before the society is made by the ''Committee of Papers," which consists of the members of the council for the time being aided by referees. The papers so selected are published either in the Philosophical Transactions (4to) or the Proceedings of the Royal Society (8vo), and one copy of each of these publications is presented gratis to every fellow of the society and to the ehief scientific societies throughout the world.

The making and repealing of laws is vested in the council, and in every case the question must be put to the vote on two several days of their meeting.

The text of the charters of the Royal Society is given in the appendix to Weld's History of the Royal Society, and in the same work will be found lists of the pre- gidents, treasurers, secretaries, and assistant-secretaries

from the foundation to the year 1845. Appendix IV. to Thomson’s History of the Royal Society (1812)

gives a chronological list of all the fellows down to the year 1812 with dates of birth, election, admission, and death, and an alphabetical index to the same,

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Other histories are Bishop Sprat’s (1667), whieh consists largely of a defence of the society against the attacks of @ priori philosophers, and Dr Birch’s (1756), which treats mainly of the society’s scientifie work. al

ROYAN, a town of France, in the department of Charente Inférieure, is situated on the right bank of the Gironde, where it joins the ocean; a branch line of 54 miles connects it with Saujon, on the Seudre Railway, which joins the Bordeaux-Nantes line at Pons. Royan, which in 1881 had a population of only 4573 (5445 asa commune), is one of the most frequented bathing resorts on the Atlantic seaboard, the visitors numbering about 80,000 annually. Royan owes this popularity to its charming neighbourhood, pleasantly watered by brooks and shaded by fine trees down to the steep rocky shore. The coast is divided into a number of small bays or “‘conches,” forming so many distinct beaches: to the east of the town is the “Grande Conche”; to the south the “Conche de Foncillon,” separated from the first-named by a quay which forms a fine terraced esplanade ; beyond the fort of Royan, which protects the entrance of the river, follow in succession the conches “du Chay” and “de Grand Robinson,” and the most fashionable of all, that of Pontaillac. In the Avenue de Pontaillac stand a large new casino, a theatre, and a hydropathic establishment. Royan also has a race-course and a museum of natural history.

Royan, whose inhabitants were Protestants, had to sustain in 1622 an eight days’ siege by the troops of Louis XIII. As late as the end of last century it was but a “ bourg” of about one thousand inhabitants, noticeable only for its priory, where Brantéme wrote a portion of his Chronicles. The prosperity of the place dates from the Restoration, when steamboat communication was established with Bordeaux. The question of making of Royan the seaport for Bordeaux has often been mooted, but as yet the harbour is still

a merely tidal one and is dry at low water. The sardine, here known by the name of royan, is caught by the local fishermen.

ROYER-COLLARD, Prerre Pavt (1763-1 845), French statesman and philosopher, was born on the 21st June 1763 at Sompuis near Vitry-le-Francais. At an early age he became a member of the bar, and pleaded several times in the old parlement of Paris. On the breaking out of the Revolution he took the popular side, and was elected to a seat in the municipal council of Paris. He was secretary to this body from 1790 to 1792, but separated himself from the later excesses of the Revolution. During the Reign of Terror he lived in retirement at Sompuis, and after vainly endeavouring in 1797, as member of the Council of Five Hundred, to bring about the restoration of the monarchy, he retired altogether from publie life till the fall of Napoleon in 1814. During the interval he devoted himself mainly to philosophical studies. Animated by a profound distrust of the negative sensationalism and materialism which had characterized the French philo- sophy of the 18th century, he found a master whom he could follow in Thomas Reid. The study of Reid's Inquiry, which he picked up on a book-stall, first gave a definite form and direction to his thinking. Royer-Collard may be said to have introduced Reid to France, and the works of the Scottish philosopher were translated not long afterwards by his pupil Jouffroy. In 1810 Royer-Collard became professor of philosophy, and taught with success in Paris, till the Restoration recalled him to political life. In 1815 he was elected to represent his native department of the Marne in the chamber of deputies; he was also made councillor of state and appointed president of the commission of public instruction. A royalist of moderate views, he helped to restrain the extreme members of his own party, opposing alike the reactionary laws against the press and the proposal to give the clergy control of public instruction. In 1827 he was so popular as to be elected in seven departments, and shortly afterwards he became a member of the French Academy ; in the following year he

was nade president of the chamber. In this capacity he had the unpleasant duty of presenting to Charles X. the address in which the majority of the

chamber refused their further support to the Government (March 1830). Royer-Collard retained his position as deputy under the new régime of Louis Philippe, but no longer took a pro- minent part in public affairs. In 1842 he withdrew com- pletely from active life and spent most of his remaining time at his country seat of Chateauvieux near Sainte. Aignan. He died there on the 2d September 1845,

As a philosopher, Royer-Collard is not distinguished either by originality or profundity ; but he possesses a certain importance as having transplanted to France the philosophy of common sense. He has himself left no philosophical writings except some frag- ments which appear in Jouffroy's edition of Reid ; but by his example and teaching he founded the school which has been variously named the Scoto-French, the eclectic, the spiritualistic, or the psychological. Maine de Biran, Cousin to some extent, and Jouffroy in a closer way, as well as Janet and others at the present day, are the chief representatives of the school. The name "*Spiritualisme," which is perhaps the commonest designation, expresses the tenacity with which, in opposition to the dominant sensationalistic materialism of France, it upholds the doctrine of a spiritual Ego as a fact of consciousness. The title psychological, however, would be preferred by the philosophers themselves as describing their method, and the basis on which they claim to have erected their philosophy. Philosophy tends for them, as for Reid and Stewart, to become a classification of isolated facts of consciousness.

Several biographies of Royer-Collard have been published. Barante, Vie politique de M. Royer-Collard, ses discours, et ses écrits, 1861, is the fullest. Others are by Philippe and Lacombe. In addition May be mentioned Mémoires sur Royer-Collard, by his nephew Genty de Bussy.

ROYLE, Joun Forzrs (1800-1858), a distinguished botanist and teacher of materia medica. His reputation is especially founded upon the results of personal in vesti- gations in the Himalaya Mountains and in other parts of Hindustan. He was born in Cawnpore in 1800. His medical education was obtained in London, and on its completion he entered the service of the East India Com- pany, and was sent to India in 1822 in the grade of assistant surgeon. In this service he devoted himself to studying in the field the botany and geology of the regions within his reach, and made large

collections among the Himalaya Mountains. He also made special investiga- tions of the medical properties of the plants of Hindustan and of the history of their uses among the native races. The results of these investigations appeared in 1837 in the form of a valuable work On the Antiquity of Hindoo Medicine. For nearly ten years he held the post of super- intendent of the East India Company's botanic garden in the Himalayas at Saharanpur. He returned to London on furlough in 1831, and in 1837 he was appointed to the professorship of materia medica in King's College, London, a position which he held till 1856. From 1838 onwards he conducted a special department of correspondence, relating to vegetable products, at the East India House, and at the time of his death he had just completed there the forma- tion and arrangement of an extensive and valuable museum of technical products from the East Indies. In 1851 he superintended the Indian department of the Great Ex- hibition. He died at Acton near London on 2d January

1858.

The work on which his reputation chiefly rests is the [Zustrations of the Botany and other branehes of Natural History of the Himalaya Mountains, and of the Flora of Cashmere, in 2 vols, 4to, begun in 1839. It contains much information on the natural products of India, especially on such as are useful in the arts or as drugs. In addition to this work, however, he wrote several others of repute, viz., An Essay on the Produetive Resources of India (1840), A Manual af Materia Medica (1845), An Essay on the Cultivation of Cotton . (1857), and on The Cordage Plants and Vegetable Fibres of India (1855). He also published a number of papers, between 1832 and 1855, upon subjects akin to those of his larger works, in scientific journals, for the most part published in India. Among these papers are included three on geological subjects. A list of the whole will be found in the Royal Society's Catalogue of Scientific Papers.

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whose aspect of energy is well known through Van Dyck's beautiful etching, was the highly esteemed master of num- erous painters,—among them Van Balen, Sebastian Vrancx, and Jordaens, later his son-in-law. His pictures are almost exclusively to be found in Antwerp churches.

RSHEFF. See R2vErFF.

RUBBER. See Inpia-RUBBER.

RUBENS, Perer Paut (1577-1640), the most eminent representative of Flemish art, and one of the greatest painters of any school, was born very probably at Siegen, in Westphalia, on the 29th of June 1577. Till some thirty years ago Cologne might still claim the honour of having been the master's birthplace ; the Rhenish city is mentioned by Rubens himself, in one of his letters, as closely connected with his childhood, and through his father's epitaph we learn that for more than nineteen years Cologne was the family's place of refuge amid the disturbances prevailing in the Low Countries. This, however, has been proved to be but part of the truth, and, if Rubens's parents certainly during several years did live at Cologne, they also resided elsewhere, and that for reasons so strong that both wife and husband might well desire to see them for ever buried in secrecy.

Although of humble descent,—his father was a druggist, John Rubens was a man of learning. He had studied Jaw at home and abroad, and became councillor and alder- man in his native town (1562). A Catholic by birth, it was not long before he became, like many of his countrymen, a zealous upholder of the Reformation, and we even find him spoken of by a contemporary as "le plus docte Calviniste qui fust pour lors au Bas Pays." After the plundering of the Antwerp churches in 1566, the magistrates were called upon for a justification. While openly they declared themselves devoted sons of the church, a list of the followers of the Reformed creed, headed by the name of Anthony Van Stralen, the burgomaster, got into the hands of the duke of Alva. This was a sentence of death for the magistrates, and John Rubens lost no time in quitting Spanish soil, ultimately settling at Cologne (October 1568), with his wife and four children.

In his new residence he became legal adviser to Anne of Saxony, the second wife of the prince of Orange, William the Silent. Before long it was discovered that their relations were not purely of a business kind. Thrown into the dungeons of Dillenburg, Rubens lingered there for many months, his wife, Maria Pypelincx, never relaxing her endeavours to get the undutiful husband restored to freedom. 'Two years elapsed before the prisoner was released, and then only to be confined to the small town of

Siegen. Here he lived with his family, from 1573 to 1578, and here most probably Maria Pypelinex gave birth to Philip, afterwards town-clerk of Antwerp, and Peter Paul.

Rubens went to Antwerp with his mother when he was scarcely ten years of age, and made good progress in his classical studies, which he had begun with the Jesuits at Cologne. An excellent Latin scholar, he was also pro- ficient in French, Italian, English, German, and Dutch. Part of his boyhood he spent as a page in the household of the countess of Lalaing, in Brussels; but, tradition adds, and we may well believe, the youth's disposition was such as to induce his mother to allow him to follow his proper vocation, choosing as his master Tobias Verhaecht, who was in some way connected with the family. Not the slightest trace of this first master's influence can be detected in Rubens's works. Not so with Adam Van Noort, to whom the young man was next apprenticed. Van Noort,

richest decoration. palace, the Louvre, and the royal galleries of England owe

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Rubens remained with Van Noort for the usual period

of four years, thereafter studying under Otto Voenius or Van Veen, a gentleman by birth, a most distinguished Latin scholar, and a painter of very high repute. a native of Leyden, and only recently settled in Antwerp, but the town gave him numerous commissions of import- ance. Though Rubens never adopted his style of painting, the tastes of master and pupil had much in common, and some pictures by Otto Voenius can be pointed out as having inspired Rubens at a more advanced period. For example, the Magdalene anointing Christ's Feet, painted for the

He was

cathedral at Malaga, and now at the Hermitage in st

Petersburg, closely resembles in composition the very im- portant work of Otto Veenius in the church at Bergues near Dunkirk.

In 1598, Adam Van Noort acting as dean of the Ant- werp guild of painters, Rubens was officially recognized as “ master,”—that is, was allowed to work independently and receive pupils) We have no means of forming an idea of his style at this early period, two years before his

journey to Italy, but even the somewhat later works found

at Genoa, Mantua, and Rome differ considerably from what may be termed the Rubenesque.

From 1600 to the latter part of 1608 Rubens belonged to the household of Vincenzo Gonzaga, duke of Mantua. Few princes in Italy surpassed the Gonzagas in splendour. For them Mantegna, Giulio Romano, Titian, and Prima- ticcio had produced some of their most admired works, and their now deserted palaces still bear traces of the To the Mantuan collection the Pitti

some of their noblest specimens of Italian art. How Rubens came to be engaged at Mantua has not been explained. The duke, it is known, spent some time at Venice in July 1600, and is supposed there to have met his future painter, but it is also to be remembered that another Fleming, Francis Pourbus the younger, was at the time employed by him in taking the likeness of the prettiest women of the day; and Rubens, much against his will, was also, at first, it seems, intrusted with a similar task. The influence of the master’s stay at Mantua was of extreme importance, and cannot be too constantly kept in view in the study of his later works.

Sent to Rome in 1601, to take copies from Raphael for his master, he was also commissioned to paint several pictures for the church of Santa Croce, by the archduke ‘Albert of Austria, sovereign of the Spanish Netherlands, and once, when he was a cardinal, the titular of that see. A copy of Mercury and Psyche after Raphael is preserved in the museum at Pesth. The religious paintings—the Invention of the Cross, the Crowning with Thorns, and the Crucifixion—are to be found in the hospital at Grasse in Provence.

At the beginning of 1603 “The Fleming,” as he was termed at Mantua, was sent to Spain with a variety of presents for Philip III. and his minister the

duke of Lerma, and thus had opportunity to spend a whole year at Madrid and become acquainted with some of Titian's masterpieces. Two of his own works, known to belong to the same period, are in the Madrid Gallery, Heraclitus and Democritus, Of Rubens's abilities so far back as 1604 we get a more complete idea from an immense picture now in the Antwerp Gallery, the Baptism of Our Lord, originally painted for the Jesuits at Mantua. Here it may be seen to what degree Italian surroundings had

influenced the painter of Vincenzo Gonzaga. Vigorous to the extreme in design, he reminds us of Michelangelo as much as any of the degenerate masters of the Roman school, while in decorative skill he seems to be descended from Titian and in colouring from Giulio Romano. Equally with this picture the Transfiguration, now in the museum at Nancy, and the portraits of Vincenzo and his consort, kneeling before the Trinity, in the library at Mantua, claim a large share of attention, apart from the interest awakened by the name of their author.

Two years later we meet a very large altarpiece of the Circumcision at St Ambrogio at Genoa, the Virgin in a glory of Angels, and two groups of Saints, painted on the wall, at both sides of the high altar in the church of Santa Maria in Valicella, in Rome. Undoubtedly these works give an impression of grandeur and effectiveness, but, in the immediate vicinity of the finest productions of the Italian school, they rank higher as documentary evi- dence than in intrinsic value, and remind us of a saying of Baglione, who was acquainted with Rubens in Italy, '"'Apprese egli buon gusto, e diede in una maniera buona Italiana."

While employed at Rome in 1608, Rubens received most alarming news as to the state of his mother's health. The duke of Gonzaga was then absent from Italy, but the dutiful son, without awaiting his return, at once set out for the Netherlands, though with the full intention of shortly resuming his post at court, as we gather from a letter to Annibale Chieppio, the Mantuan minister. When he arrived in Antwerp, Maria Pypelincx was no more. However strong his wish might now be to return to Italy, his purpose was

overruled by the express desire of his sovereigns, Albert and Isabella, to see him take up @ permanent residence in the Belgian provinces. Scarcely a year before, the archduke had unsuccessfully attempted to free the painter from his engagement at Mantua, and he could not fail to take advantage of the opportunity now presented for the fulfilment of his wishes. On August 3, 1609, Rubens was named painter in ordinary to their High- nesses, with a salary of 500 livres, and “the rights, honours, privileges, exemptions,” &c., belonging to persons of the royal’ household, not to speak of the gift of a gold chain. Not least in importance for the painter was his complete exemption from all the regulations of the guild of St Luke, entitling him to engage any scholars or fellow- workers, without being obliged to have them enrolled,—a favour, it must be added, which has been the source of considerable trouble to the historians of Flemish art.

Although so recently returned to his native land, Rubens seems to have been, with one accord, accepted by his countrymen as the head of their school, and the municipality was foremost in giving him the means of proving his acquirements. The first in date among the numerous repetitions of the Adoration of the Magi is a picture in the Madrid Gallery, measuring 12 feet by 17, and containing no fewer than eight-and-twenty life size figures, many in gorgeous attire, warriors in steel armour, horsemen, slaves, camels, &c. This picture, painted in Antwerp, at the town’s expense in 1609, had scarcely re- mained three years in the town-hall when it went to Spain as a present to Don Rodrigo Calderon, count of Oliva. The painter has represented himself among the horscmen, bareheaded, and wearing his gold chain. Cumberland speaks of this picture as the standard work of its author, and certainly it was well calculated to bring Rubens to the front rank in his profession. From a letter written in May 1611 we know that more than a hundred young men were desirous to become his pupils, and that many had, “for several years,” been waiting with other masters, until he could admit them to his studio. It was thus from the

beginning regarded as a great favour to be admitted pupil of Rubens.

Apart from the success of his works, another powerful motive had helped to detain the master in Antwerp,—his marriage with Isabella Brant (October

1609). Many pictures have made us familiar with the graceful young woman who was for seventeen years to share the master's destinies. We meet her at The Hague, St Petersburg, Florence, at Grosvenor House, but more especially at Munich, where Rubens and his wife are depicted at full length on the same canvass. "His wife is very hand- some," observes Sir Joshua Reynolds, '"'and has an agree- able countenance ;" but the picture, he adds, "is rather hard in manner." This, it must be noted, is the case with all those pictures known to have immediately followed Rubens's return, when he was still dependent on the assistance of painters trained by others than him- self. Even in the Raising of the Cross, now in the Antwerp cathedral, and painted for the church of St Walburg in 1610, the dryness in outline is very striking.

According to the taste still at that time prevailing, the picture is tripartite, but the wings only serve to develop the central composition, and add to the general effect. In Witdoeck's beautiful engraving the partitions even disappear. Thus, from the first, we see Rubens quite determined upon having his own way, and it is recorded that, when he painted the Descent from the Cross, St Christopher, the subject chosen by the Arquebusiers, was altered so as to bring the artistic expressions into better accordance with his views. Although the subject was frequently repeated by the great painter, this first Descent from the Cross has not ceased to be looked upon as his masterpiece. Begun in 1611, the celebrated work was placed in 1614, and certainly no more striking evidence could be given of the rapid growth of the author's abili- ties. Rubens received 2400 florins for this picture.

Although it is chance that has brought the Raising of the Cross and the Descent from the Cross into their present close juxtaposition, it is not improbable that their uniformity in size may have been designed. In many respects, Italian influence remains conspicuous in the Descent. Rubens had seen Ricciarelli's fresco at the Trinita de' Monti, and was also acquainted with the grandiose picture of Baroccio in the cathedral of Perugia, and no one conversant with these works can mistake their influence. But in Rubens strength of personality could not be overpowered by reminiscence; and in type, as well as in colouring, the Descent from the Cross may be termed thoroughly Flemish and Rubenesque. As Waagen justly observes : "the boldness of the composition, the energy in the characters, the striking

attitudes, and the effects of the grouping, together with the glowing vigorous colouring, belong to his later style, whereas a few of the heads, par- ticularly that of the Virgin, display the careful execution of his earlier period. The interior of the wings, on which are painted the Visitation and the Presentation in the Temple, exhibit, on the other hand, a greater resemblance to the conjugal picture already alluded to, owing to a certain repose in action, a more elevated expression of delicacy and feeling in the characters, and a less glowing though still admirable colouring."

Legend, in some way, connects Van Dyck with the Descent from the Cross, and ascribes to the great portrait painter an arm and shoulder of Mary Magdalene, which had been damaged by a pupil's carelessness. Plain truth here, once more, seems to contradict romance. ' Van Dyck was a pupil of Van Balen's in 1609, and most probably remained with him several years before coming to Rubens.

If Sir Dudley Carleton could speak of Antwerp in 1616 as "Magna civitas, magna solitudo," there was no place

nevertheless which could give a wider scope to artistic Spain and the United Provinces were for a time at peace; almost all the churches had been stripped monastic orders were powerful and richly endowed, guilds and corporations eager to show the fervour of their Catholic faith, now that the "monster of

enterprise.

of their adornments ;

heresy " scemed for ever quelled. Here were opportunities without number for painters as well as sculptors and

architects. Gothic churches began to be decorated accord-

ing to the new fashion adopted in Italy. Altars magnified to monuments, sometimes reaching the full height of the vaulted roof, displayed, between

their twisted colunms, pictures of a size hitherto unknown. No master seemed better fitted to be associated with this kind of painting than Rubens, whose works we have already met with in churches newly erected at Rome, Genoa, and Mantua, by the Jesuits, in the gorgeous style which bears their name, and which Rubens commends in the preface to his Palazzi di Genova (Antwerp, 1622). The temple erected by the reverend fathers in Antwerp was almost entirely the painter's work, and if he did not, as we often find asserted, design the front, he certainly was the inspirer of the whole building, which, after all, was but a reminiscence of the churches in Genoa. And the temple of the J esuits in Antwerp remained for a century the only example of its kind in Belgium. Hitherto no Fleming had undertaken to paint ceilings with foreshortened figures, and blend the religious with the decorative art after the style of those buildings which are met with in Italy, and owe their decora- tions to masters like Titian, Veronese, and Tintoretto. No less than forty ceilings were composed by Rubens, and painted under his direction in the space of two years. All were destroyed by fire in 1718. Sketches in water- colour were taken some time before the disaster by De Wit, and from these were made the etchings by Punt which alone enable us to form a judgment of the grandiose under- taking. In the Madrid Gallery we find a general view of the church in all its splendour. The present church of St Charles in Antwerp is, externally, with some alteration,

the building here alluded to. '

Rubens delighted in undertakings of the vastest kind. "The large size of a picture," he writes to W. Trumbull in 1621, "gives us painters more courage to represent our ideas with the utmost freedom and semblance of reality. a I confess myself to be, by a natural instinct, better fitted to execute works of the largest size." The correctness of this appreciation he was very soon called upon to demonstrate most strikingly by a series of twenty- four pictures, illustrating the life of Mary de' Medici, queen-mother of France. The gallery at the Luxembourg Palace, which these paintings once adorned, has long since disappeared, and the complete work is now exhibited in the Louvre. Drawings, it seems, had been asked from Quentin Varin, the French master who incited Poussin to become a painter, but Rubens was ultimately preferred. This preference may in some degree be ascribed to his former connexion with the court at Mantua, Mary de' Medici and the duchess of

Gonzaga being sisters. The story of Mary de’ Medici may be regarded as a poem in painting, and no person conversant with the literature of the time can fail to recognize that strange mixture of the sacred and the mythological in which the most admired authors of the 17th century, beginning with Malherbe, delight. Absolutely speaking, Mrs Jameson may be right in criticizing Rubens’s “ coarse allegories, historical impro- pricties, &c.”; but a man belongs to his time, and uses its language in order to make himself understood. From the cradle to the day of her reconciliation with Louis XL, we follow Mary de’ Medici after the manner in which it was customary in those days to consider personages of

superior rank. The Fates for her have spun the silken and golden thread; Juno watches over her birth and intrusts her to the town of Florence; Minerva, the Graces, and Apollo take charge of her education ; Love exhibits her image to the king, and Neptune conveys her across the seas ; Justice, Health, and Plenty endow her son ; Prudence and Generosity are at her sides during the regency ; and, when she resigns the helm of the state to the prince, Justice, Strength, Religion, and Fidelity hold the oars. The sketches of all these paintings—now in the Munich Gallery—were painted in Antwerp, a numerous staff of distinguished collaborators being intrusted with the final execution. But the master himself spent much time in Paris, retouching the whole work, which was completed within less than four years. On May 138, 1625, Rubens writes from Paris to his friend Peiresc that both the queen and her son are highly satisfied with his paintings, and that Louis XIII. came on purpose to the Luxembourg, “where he never has set foot since the palace was begun sixteen or eighteen years ago.” We also gather from this letter that the picture representing the Felicity of the Regency was painted to replace another, the Departure of the Queen, which had caused some offence. “If I had been let alone,” he says, “the other subjects would have been better accepted by the court, and without scandal or murmur.” ‘And I fear,” he adds, ‘far greater difficulties will be found with the subjects of the next gallery.” Richelieu gave himself some trouble to get this part of the work, intended to represent the life of Henry IV., bestowed upon Cavalier d’Arpina, but did not succeed in his endea- vours. The queen’s exile, however, prevented the under- taking from going beyond

a few sketches, and two or three panels, one of which, the Triumph of Henry IV., now in the Palazzo Pitti, is one of the noblest works of Rubens or of any master. Most undoubtedly the painter here calls to his aid his vivid recollections of the Triumph of Cesar by Mantegna, now at Hampton Court, but in his day adorning the palace at Mantua ; of this he made a copy, inscribed No. 315 in the catalogue of his effects sold in 1640, and now in the National Gallery.

On the 11th of May 1625 Rubens was present at the nuptials of Henrietta Maria at Notre Dame in Paris, when the scaffolding on which he stood gave way, and he tells us he was just able to catch an adjoining tribune.

No painter in Europe could now pretend to equal Rubens either in talent or in renown. Month after month productions of amazing size left the Antwerp studio ; and to those unacquainted with the master's pictures mag- nificent engravings by Vorsterman, Pontius, and others had conveyed singularly striking interpretations. " What- ever work of his I may require," writes Moretus, the cele- brated Antwerp printer, "I have to ask him six months before, so as that he may think of it at leisure, and do the work on Sundays or holidays; no week days of his could I pretend to get under a hundred florins."

Of the numerous creations of his pencil, none, perhaps, will more thoroughby disclose to us his comprehension of religious decorative art than the Assumption of the Virgin at the high altar of the Antwerp cathedral, finished in 1625. It is, of twenty repetitions of this subject, the only example still preserved at the place it was intended by the painter to occupy. In spirit we are here reminded of Titian's Assunta in the cathedral at Verona, but Rubens's proves perhaps a higher conception of the subject. The work is seen a considerable way off, and every outline is bathed in light, so that the Virgin is elevated to dazzling glory with a power of ascension, scarcely, if ever, attained by any master.

Able to rely so greatly on his power as a colourist, Rubens is uot a mere decorator. He penetrates into the

spirit of his subjects more deeply than, at first sight, seems |

consistent with his prodigious facility in execution. The Massacre of the Innocents, in the Munich Gallery, is a composition that can leave no person unmoved,—mothers defending their children with nails and teeth. If Mrs Jameson terms this picture atrocious, it ought to be recol- lected how atrocious is the subject. When St Francis attempts to shelter the universe from the Saviour's wrath (Brussels Gallery), Rubens, drawing his inspiration from a passage of St Germain, "Ostendit mater filio pectus et ubera," recalls to our memory that most dramatic passage of the Jliad when Hecuba, from the walls of Troy, entreats her son Hector to spare his life. The subject is inconsistent with the spirit of Christianity, says Waagen, evidently forgetting that to Catholic eyes nothing could be more impressive than the Virgin's intervention at this supreme moment, when Christ, like another Jupiter, brandishes his thunderbolt against mankind. Rubens was a man of his time; his studies of Italian art in no way led him back to the Quattrocentisti nor the Raffae- leschi; their power was at an end. The influence of Michelangelo, Titian, Tintoretto, more especially Baroccio, Polydoro, and even Parmigiano, is no less visible with him than with those masters who, like Spranger, Chr. Schwartz, and Goltzius, stood high in public estimation immediately before his advent.

In the midst of the rarest activity as a painter, Rubens was now called upon to give proofs of a very different kind of ability. The truce concluded between Spain and the Netherlands in 1609 ended in 1621 ; archduke Albert died the same year. His widow sincerely wished to prolong the arrangement, still hoping to see the United Provinces return to the Spanish dominion, and in her eyes Rubens was the fittest person to bring about this conclusion. The painter's comings and goings, however, did not remain unheeded, for the French ambassador writes from Brussels in 1624,—" Rubens is here to take the likeness of the prince of Poland, by order of the infanta. I am persuaded he will succeed better in this than in his negotiations for the truce." But, if Rubens was to fail in his efforts to bring about an arrangement with the Netherlands, other events enabled him to render great service to the state.

Rubens and Buckingham met in Paris in 1625; a corre- spondence of some importance had been going on between the painter and the Brussels court, and before long it was proposed that he should endeavour to bring about a final arrangement between the crowns of England and Spain. The infanta willingly consented, and King Philip, who much objected to the interference of an artist, gave way on hearing, through his aunt, that the negotiator on the English side, B. Gerbier—a Fleming by birth—was like- Wise a painter. Rubens and Gerbier very soon met in Holland. “Rubens is come hither to Holland, where he now is, and Gerbier in his coinpany, walking from town to town, upon their pretence of pictures,” writes Sir Dudley Carleton to Lord Conway i July 1627, “which may serve him for a few days if he dispatch and be gone ; but yf he entertayne tyme here long, he will infallibly be layd hold of, or sent with disgrace out of the country ad: This I have made known to Rubens least he should meet with a skorne what may in some sort reflect upon others.” Matters, however, went on very well, and Rubens volunteered to go to Spain and lay before the council the result of his negotiations (1628). Nine months were thus spent at Madrid; they rank among the most important in Rubens’s career. He had brought with him eight pictures of various sizes and subjects as presents from the infanta, and he was also commissioned to take several portraits of the king and royal family. An

equestrian picture of Philip IV., destroyed by fire in last century, became the subject of a poem by Lope de Vega, and the description enables us to identify the composition with that of a painting now in the Palazzo Pitti, ascribed to Velazquez.

Through a letter to Peirese we hear of the familiar intercourse kept up between the painter and the king, Philip delighted to see Rubens at work in the studio pre- pared for him in the palace, where he not only left many original pictures, but copied for his own pleasure and pro- fit the best of Titian’s. No less than forty works were thus produced, and, says the author of the Annals of the Artists of Spain, “the unwearied activity of his well-stored mind is exemplified by the fact that amid his many occupations he was seeking in the libraries materials for

an edition of Marcus Aurelius, on which his friend Gaspard

Gevaerts was then engaged." An artistic event of some importance connected with the sojourn in Spain is the meeting of Rubens and Velazquez, to the delight, and we venture to add, advantage of both.

Great as was the king's admiration of Rubens as a painter, it seems to have been scarcely above the value attached to his political services. Far from looking upon

Rubens as a man of inferior calling, unworthy to meddle

with matters of state, he now commissioned the painter to go to London as bearer of his views to Charles I. Giving up his long cherished hope of revisiting Italy on his return from Spain, Rubens, honoured with the title of secretary of the king's privy council in the N etherlands, started at once on his new mission. Although he stopped but four days in Antwerp, he arrived in London just as peace had been concluded with France. In this conjuncture of affairs, it can hardly be doubted that the eminent position of Rubens as a painter greatly contributed to his ultimate success as an envoy. Received by Charles with genuine pleasure, he very soon was able to ingratiate himself so far as to induce the king to pledge his royal word to take part in no undertakings against Spain so long as the negotiations remained unconcluded, and all the subsequent endeavours of France, Venice, and the States found him immovable in this resolution. Although the privy council in Madrid, as well they might, passed several votes of thanks to Rubens, the tardiness of the Spanish court in sending a regular ambassador involved the unfortunate painter in distressing anxieties, and the tone of his dispatches is very bitter. But he speaks with the greatest admiration of England and the English, regretting that he should enly have come to know the country so late. His popularity must have been very great, for on September 23, 1629, the university of Cam- bridge conferred upon him the honorary degree of master of arts, and on February 21, 1630, he was knighted, the king presenting him with the sword used at the ceremony, which is still preserved by the descendants of the artist. When the council at Madrid had to deliberate as to recognition of the title conferred upon Rubens in England, they remembered that Titian had been made a knight by the emperor Charles V., and the matter was settled without difficulty ; but,

the painter’s name having been mentioned as a possible envoy to the British court, Olivares objected that it was quite out of the question to make an ambas- sador of one who lived by the work of his hands. Although, it seems, less actively employed as an artist in England than in Spain, Rubens, besides his sketches for the decoration of the Banqueting House at Whitehall, painted the admirable picture of the Blessings of Peace, now in the National Gallery. There is ‘no reason to doubt, with Smith, that “His Majesty sat to him for his portrait, yet it is not a little remarkable that no notice occurs in any of the royal catalogues, or the writers of the

period, of the existence of such a portrait.” While in England, Rubens very narrowly escaped drowning while soing to Greenwich in a boat. The fact is reported by Lord Dorchester in a letter to Sir Isaac Wake (Sainsbury, exvi.). At the beginning of March the painter’s mission came to a close.

Rubens was now fifty-three years of age; he had been four years a widower, and before the end of the year (December 1630) he entered into a second marriage with the beautiful girl of sixteen, named Helena Fourment, with whom his pictures have made the world so well ac- quainted. More than twenty portraits of her are described by Smith, and she also figures in perhaps twice as many of the master’s creations. Whether Rubens was more powerfully led in the choice of his second wife by her per- sonal beauty or by the strength of a certain resemblance to his feminine ideal is questionable. Anyhow, she was an admirable model, and none of her husband’s works may be more justly termed masterpieces than those in which she is represented (Munich, St Petersburg, Blenheim, Liechtenstein, the Louvre, &c.).

Although the long months of absence could not be termed blanks in Rubens’s artistic career, his return was followed by an almost incredible activity. Inspired more than ever by the glorious works of Titian, he now pro- duced some of his best creations. Brightness in colouring, breadth of touch and pictorial conception, are specially striking in those works we know to have been painted in the latter part of his lifetime. Could anything give a higher degree of Rubens’s genius than, for example, the Feast of Venus, the portrait of Helena Fourment ready to enter the bath, or the St

Ildefonso. This last picture— now, as well as the two others just alluded to, in the Vienna Gallery—was painted for the church of the convent of St Jacques, in Brussels. On the wings are represented the archdukes in royal attire, under the protection of their patron saints. The presence of these figures has led to some mistake regarding the date of the production, but it has been proved beyond doubt, through a document pub- lished by Mr Castan (1884), that the St Ildefonso belongs to the series of works executed after the journeys to Spain and England. Archduke Albert had been dead ten years. ‘The picture was engraved by Witdoeck in 1638.

Isabella died in 1633, and we know that to the end Rubens remained in high favour with her, alike as an artist and as a political agent. The painter was even one of the gentlemen she deputed to meet Mary de’ Medici at the frontier in 1631, after her escape from France.

Spain and the Netherlands went to war again, the king never ceasing to look upon the Dutch as rebels. The sub- ject need not be dwelt upon; suffice it to say that much useless trouble and suspicion came upon the great artist. As to the real nature of his communings with Frederick Henry of Orange, whom he is known to have interviewed, nothing as yet has been discovered.

Ferdinand of Austria, the cardinal-infant of Spain, was called to the government of the Netherlands on the death of his aunt. He was the king’s younger brother, and arrived at Antwerp in May 1635. The streets had been decorated with triumphal arches and “ spectacula,” arranged by Rubens, and certainly never equalled by any other works of the kind! Several of the paintings detached from the arches were offered as presents to the new governor-general, a scarcely known fact, which accounts for the presence of many of these works in public galleries

; 1 Many sketches of the arches. are still preserved in the museums in Antwerp, St Petersburg, Cambridge, Windsor, &e.

(Vienna, Dresden, Brussels, &c.). Rubens was at the time laid up with gout, but Prince Ferdinand was desirous of expressing his satisfaction, and called upon the painter, remaining a long time at his house. Rubens and Ferdinand

had met at Madrid, and only a short time elapsed before the painter was confirmed in his official standing,—a matter of small importance, if we consider that the last years of his life were almost exclusively employed in working much more for the king than for his brother. About a hundred and twenty paintings of considerable size left Antwerp for Madrid in 1637, 1638, and 1639; they were intended to decorate the pavilion erected at the Pardo, and known under the name of Torre de la Parada. Another series had been begun, when Ferdinand wrote to Madrid that the painter was no more, and J ordaens would finish the work. Rubens breathed his last on the 30th of

May 1640.

More fortunate than many artists, Rubens left the world in the midst of his glory. _ Not the remotest trace of approaching old age, not the slighcst failing of mind or skill, can be detected even in his latest works, such as the Martyrdom of St Peter at Cologne, the Martyrdom of St Thomas at Prague, or the Judgment of Paris at Madrid, where his young wife appears for the last time. ‘‘She is the handsomest person in Antwerp,” writes Ferdinand to his brother, in announcing the completion of what he terms ‘‘ the best painting Rubens has done.”

If Rubens was something of a diplomatist, it cannot be denied that alike in body as in mind he is portrayed in his own works with the utmost straightforwardness. His productions are what they are, as if they could not have becn otherwise, and the fact is that, in reply to any observations he may happen to receive, we con- stautly find him asserting the necessities of his subjects, thus confirming a remark made by Sir Joshua Reynolds that his subjects always seem to suit his style.

Rubens is so well known that it hardly seems necessary to dwell upon his outward appearance. From his own letters and those in which he is referred to we become acquainted with a man of

vast erudition, great good sense, dignity, and kindness, none more

worthy of being called a gentleman ; and Sir Dudley Carleton, we know, termed him not only the prince of painters but of gentlc- men.

Those with whom he dealt in questions of lcarning proclaim his artistic excellence to be second only to his other qualifications, and even such critics as Winckelmann, who are least likely to sympathize with his style, do homage to his superior genius. “ Rubens,” he writes to Count Cobenzl, ‘‘is the glory of art, of his school, of his country, and of all coming centuries; the fertility of his imagination cannot be overrated ; he is correct in his design, magnificent in his drapery ; and he must be looked upon as the great model for chiaroscuro, although in this branch he may be termed fanciful, but he has not sacrificed to the goddesses of beauty (Horz) and the Graces.”

Rubens, indeed, although his type of feminine beauty is generally most pleasing, has little of the ltalian grace and refinement, but then he was a Fleming throughout, notwithstanding his frequent recollections of those Italian masters whom he most admired, and who themselves have little, if anything, in common with Raphael. But it must be borne in mind how completely his predecessors were frozen into stiffness through Italianization, and how necessary it was to bring back the Flemish school to life and nature. Critics have spoken of Rubens’s historical improprieties. Ofcourse nobody could suppose that his classical learning did not go far enough to know that the heroines of the Old Testament or of Roman history were not dressed out as ladies of his time; but in this respect he only follows the example of Titian, Paul Veronese, and many others. In no other school do we find these animated hunts of lions, tigers, and even the hippopotamus and the crocodile, which may be reckoned among the finest specimens of art, and here again are life and nature displayed with the utmost power. ‘© His horses are perfect in their kind,” says Reynolds ; his dogs are of the strong Flemish breed, and his landscapes the most charming pictures of Braban- tine scenery, in the midst of which lay his seat of Steen. Asa portrait painter, although less refined than Van Dyck, he shows that eminent master the way, and his pure fancy subjects, as the Garden of Love (Madrid and Dresden) and the Village Feast (Louvre), have never been equalled. As Mrs Jameson so justly remarks, “ Rubens is the most popular because the most intelligible of painters.”

For nearly one hundred years the Flemish school may be said to have been but areflexion of the Rubenesque principles. Although Jordaens and

Erasmus Quellin lived till 1678, the school might be termed a body without soul.

Some etchings have been ascribed to Rubens, but except a head

of Seneea, the only eopy of whieh is in the Print Room at the British Museum, and a beautiful figure of St Catherine, we ean admit none of the other plates, said to proceed from Rubens, as authentie. Rubens nevertheless exereised an immense influence on the art of engraving. Under his direct guidanee Soutman, Vorsterman, Pontius, Witdoeek, the two Bolswerts, Peter de Jode, N. Lauwers, and many others of less note left an immense number of beautiful plates, reproducing the most eelebrated of his paint- ings. To give an idea of what his influenee was capable of aeeom-plishing, pietorially spcaking, it might be sufficient to notice the transformation undergone by the Antwerp sehool of engraving under Rubens; even the modern school of engraving, in more than one respeet, is a continuation of the style first practised in Antwerp. His influenee is seareely less apparent in seulpture, and the celebrated Luke Fayd'herbe was his pupil.

Neithcr in name nor in faet did the Flemish school ever find a seeond Rubens. None of his four sons beeame a painter, nor did any of his three daughters marry an artist. Aeeording to Rubens's will, his drawings were to belong to that one of his sons who might become a painter, or in the event of one of his daughters marrying a eelebrated artist they were to be her portion. The valuable eolleetion was dispersed only in 1659, and of the pietures sold in 1640 thirty-two beeame the property of the king of Spain. The Madrid Gallery alone possesses a hundred of his works. Four years after her husband's death Helena Fourment married J. B. Van Brouekhoven de Bergheyck, knight of St James, member of the privy eouneil, &e. She died in 1678. In 1746 the male line of Rubens's deseendants was completely extinet. In the female line more than a hundred families of name in Europe trace their deseent from him.

The paintings of Rubens are found in all the prineipal galleries in Europe: Antwerp and Brussels, Madrid, Paris, Lille, Dresden, Berlin, Munieh,

Vienna, St Petersburg, London, Florenee, Milan, Turin exhibit several hundreds of his works. J. Smith's Catalogue gives deseriptions of more than thirteen hundred eom positions.

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Rubens, Brussels, 1879; C. G. Voorhelm Schneevoogt, Catalogue des Estampes gravées d'aprés Rubens, Haarlem, 1873. (H. H.) RUBIDIUM. See Porasstum Meats.

RUBRUQUIS, the name which has most commonly been given to William of Rubruk, a Franciscan friar and the author of a remarkable narrative of Asiatic travel in the 13th century. Nothing is known of him save what can be gathered from his own narrative, with the exception of a word from the pen of Roger Bacon, his contemporary and brother Franciscan, indicating personal acquaintance, The name of Rubruquis has adhered to him, owing to this form ("Willielmus de Rubruquis") being found in the imperfect copy of the Latin original printed by Hakluyt in his collection, and followed in his English translation, as well as in the completer issue of the English by Purchas. Writers, again, of the 16th and 17th centuries have called the traveller Risbroucke and Rysbrokius, for which there is no authority,—an error founded on the too hasty identification of his name of origin with

Ruysbroeck in Brabant (a few miles south of Brussels). This error was probably promoted by the fame of John of Ruysbroeck or Rysbroeck (1294-1381), a Belgian mystic theologian, whose treatises have been reprinted as late as 1848 (see vol. xvii. p. 133). Our traveller is styled “(Guillaume de Rysbroeck” and “ Ruysbroek ” in the Biographie Universelle and in the Nouv. Diog. Générale. It is only within the last twenty years that attention has been called to the fact that Rubrouck is the name of a village and commune in what was formerly called French Flanders, belonging to the canton of Cassel in the department du Nord, and lying some 84 miles north-east of St Omer. In the library of the latter city many medieval documents exist referring expressly to

Rubrouck, and to persons in the 12th and 13th centuries styled as “de Rubrouck.”! It may be fairly assumed. that Friar William came from this place ; indeed, if attention had been paid to the title of the MS. belonging to Lord Luniley, which was published by Hakluyt (Ltinerarium Sratris Willielmi de Rubruquis de Ordine fratrum Minorum, Galli, Anno Gratiz 1258, ad partes Orientales), there need have. been no question as to the traveller’s quasi-French nationality ;* but this (erroneously) has always been treated as if it were an arbitrary gloss of Hakluyt’s own.

Friar William went to Tartary under orders from Louis IX. (St Louis). That king, at an earlier date, viz., December 1248, when in Cyprus, had been visited by certain persons representing themselves to be envoys from a great Tartar chief Elchigaday (Ilchikadai), who com- manded the Mongol hosts in Armenia and Persia. The king then despatched a return mission consisting of Friar Andrew of Lonjumel and other ecclesiastics, who carried presents and letters for both Ilchikadai and the Great Khan. They reached the court of the latter in the winter of 1249-50, when there was in fact no actual khan on the throne ; but in any case they returned, along with Tartar envoys, bearing a letter to Louis, which was couched in terms so arrogant and offensive that the king repented sorely of having sent such a mission (li rois se repenti fort quant uy envoia, Joinville, § 492). These returned envoys reached the king when he was at Czsarea, therefore be-. tween March 1251

and May 1252. It was, however, not very long after that the zealous king, hearing that a great Tartar prince called Sartak was a baptized Christian, felt strongly moved to open communication with him, and for this purpose deputed Friar William of Rubruk with com- panions. But it is evident that the former rebuff had made the king chary as to giving these emissaries the character of his royal envoys, and Friar William on every occasion, beginning with a sermon delivered in St Sophia's (on Palm Sunday, z.e., April 13, 1253), formally disclaimed that character, alleging that, though he was the bearer of the king's letters and presents, he went simply in fulfilment of his duty as a Franciscan and preacher of the gospel.

Various histories of St Louis, and other documents which have come down to us, give particulars of the despatch of the mission of Friar Andrew from Cyprus, but none mention that of Friar William; and the first dates given by the latter are those of his sermon at Constanti- nople, and of his embarkation from Sinope (May 7, 1253). He must therefore have received his commission at Acre, where the king was residing from May 1252 to June 29, 1253; but he had travelled by way of Constantinople, as has just been indicated, and there received letters to some of the Tartar chiefs from the emperor, who was at this time Baldwin de Courtenay, the last of the Latin dynasty.

The narrative of the journey is everywhere full of life and interest, but we eannot follow its details. The vast eonquests of Jenghiz Khan were still in nominal dependence on his sueeessors, at this time represented by Mangu Khan, reigning on the Mongo- lian steppes, but praetieally those conquests were splitting up into several great monarehies. Of these the Ultis of Jaji, the eldest son of Jenghiz, formed the most westerly, and its ruler was Batt Khan, established on the Volga. Sartak is known in the history of the Mongols as Batti's eldest son, and was appointed his sue- cessor, though he died immediately after his father (1255). The

story of Sartak's profession of Christianity may have had some kind of foundation ; it was eurrently believed among the Asiatic

1 A detailed notice of such documents was published by M. Edm. Coussemaker of Lille. See remarks by M. D'Avezac in Bull. de la Soc. de Géog., 2d vol. for 1868, pp. 569-570.

2 The country of Flanders was at this time a fiet of the French crown (see Natalis de Wailly, Noles on Joinville, p. 576). William's mother-tongue may probably have been Flemish. But this cannot be proved by his representation to Mangu Khan (p. 361) that certain Teutonict who had been carried away as slaves by a Tartar chief were nostrae linguae, as Dr Franz Schmidt inclines to think.

Christians, and it is alleged by Armenian writers that he had been brought up and baptized among the Russians.

Rubruk and his party landed at Soldaia, or Sfidak, on the Crimean coast, a port which was then the chief seat of the com- munication between the Mediterranean states and what is now southern Russia. Equipped with horses and carts for the steppe, they travelled suceessively to the courts of Sartak and of Batt, respectively on the hither and further banks of the Volga, bandied from one to the other, and then referred to the Great Khan him- self, an order involving the enormous journey to Mongolia. The actual travelling of the party from the Crimea to the khan's court near Karakorum cannot have been, on a rough calculation, less than 5000 miles, and the return journey to Ayas in Cilicia would be longer by 500 to 700 miles. The chief dates to be gathered from the narrative are as follows -—embark on the Euxine, May 7, 1258 ; reach Soldaia, 21; set out thence, June 1; reach camp of Sartak, July 31; begin journey from camp of Bata eastward across steppe, September 16 , turn south-east, November 1; reach Talas river, 8; leave Cailac? (south of Lake Balkash), 30; reach camp of Great Khan, December 27; leave camp of Great Khan on or about July 10, 1254; reach camp of Bata again, Scptember 16 ; leave Sartak's camp, November 1; at the Iron Gate (Derbend) 13; Christmas spent at Nakhshivan (under Ararat); reach An- tioch (from Ayas, via Cyprus), June 29, 1255; reach Tripoli, August 15.

The camp of Batu was reached ncar the northernmost point of his summer marches, thercfore about Ukck near Saratoff (see Marco Polo, Prol., chap. iii. note 4). Before the camp was left they had marched with it five weeks down the Volga. The point of departure would lie on that river somewhere between 48° and 50° N. lat. The route taken lay eastward by a line running

north of the Caspian and Aral basins ; then from about 70° E. long. south (with some easting) to the basin of the Talas river ; thence across the passes of the Kirghiz Ala-tau and south of the Balkash Lake to the Ala-kul and the Baratula Lake (Ebi-niir). From this the travellers struck north across the Barluk, or the Orkochuk Mountains, and thence, passing south of the modern Kobdo, to the valley of the Jabkan river, whence they emerged on the plain of Mongolia, coming upon the Great Khan's camp at a spot ten days' journcy from Karakorum and bearing in the main south from that place, with the Khangai Mountains between.

This route is of course not thus defined in the narrative, but is a laborions deduction from the facts stated therein. The key to the whole is the description given of that central portion inter- yening between the basin of the Talas and the Lake Ala-kul, which enables the topography of that region, including the passage of the Ili, the plain south of the Balkash, and the Ala-kul itself, to be identified past question."

The return journey, being made in summer, after retraversing the Jabkan vallcy,? lay much farther to the north, and passed north of the Balkash, with a tolcrably straight course probably, to the mouths of the Volga. 'hence the party travelled south by Derbend, and so by Shamakhi to the Araxes, Nakhshivan, Erzingan, Sivas, and Iconium, to the coast of Cilicia, and eventually to the port of Ayas, where they embarked for Cyprus and Syria. St Louis had returned to France a ycar before.

We have alluded to Roger Bacon's mention of Friar William of Rubruk. Indeed, in the geographical section of the Opus Majus (c. 1262) he cites the traveller repeatedly and copiously, describing him as "frater Wilhelmus quem dominus rex Franciae misit ad Tartaros, Anno Domini 1253 . ... qui perlustravit regiones oricntis ct aquilonis et loca in medio his annexa, et scripsit haec praedicta illustri regi; quem librum diligenter vidi et cum ejus auctore contuli" (Opus Majus, ed. Jebb, 1733, pp. 190-191). Add to this William's own incidental particular as to his being (like his precursor, Friar John of Pian Carpine, see vol. v. p. 132) a very heavy man (ponderosus valde), and we know no more of his personality except the abundant indications of character afforded by the story itself. These paint for us an honest, pious, stout- hearted, acute, and most intelligent observer, keen in

the acquisi- tion of knowledge, the author in fact of onc of the best narratives of travel in existence. His language indeed is Latin of the most un-Ciceronian quality,—dog-Latin we fear it must be called; but,

call it what we may, it is in his hands a pithy and transparent |

medium of expression. In spite of all the diffieulties of communi-

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3 Cailac, where Rubruk halted twelve days, is undoubtedly the Kayalik of the historians of the Mongols, the position of which is somewhat indefinite. The narrative of Rubruk shows that it must have been near the modern Kopal.

2 Sce details in Cathay and the Way Thither, pp. ecxi.-cexiv., and Schuyler's Turkistan, i. 402-405. Mr Schuyler points out the true identification of Rubruk's river with the 1li, instead of the Chu, which is a much smaller stream ; and other amendments haye been derived from Dr F, M. Schmidt (see below).

y So the present writer interprets what Rubruk says :—"Our going was in winter, our return in summer, and that by a way lying very much farther north, only that for a space of fifteen days' journey in going and coming we followed a certain riyer betwcen mountains, and on these there was no grass to be found except close to the river," The position of the Chagan Takoi or upper Jabkan sccms to suit these facts best ; but Mr Schuyler refers them to the upper Irtish, and Dr F, Schmidt to the Uliungur.

ie UG AT

cation, and of the badness of his twrgemannus or dragoman,* he gathered a mass of particulars, wonderfully true or near the truth, not only as to Asiatic nature, geography, ethnography, and manners, but as to religion and language. Of his geography a good example occurs in his account of the Caspian (eagerly caught up by Roger Bacon), which is perfectly accurate, except that he places the hill country occupied by the Mulahids, or Assassins, on the eastern instcad of the southern shore. He explicitly

corrects the allegation of Isidore that it isa gulf of the occan : “non est verum quod dicit Ysidorus. . . . . nusquam enim tangit oceanum, sed undique circumdatur terra ” (265).° Of his interest and acumen in matters of language we may cite examples. The language of the Pascatir (or Bashkirds) and of the Hungarians is the same, as he had learned from Dominicans who had been among them (274).° The language of the Ruthenians, Poles, Bohemians, and Slavonians is one, and is the same with that of the Wandals, or Wends (275). In the town of Equius (immediately beyond the Ili, perhaps Aspara)? the people were Mohammedans speaking Persian, though so far remote from Persia (281). The Yugurs (or Uigurs) of the country about Cailac (see note above) had formed a language and character of their own, and in that language and character the Nestorians of that tract used to perform their office and write their books (281-2). The Yugurs are those among whom are found the fountain and root of the Turkish and Comanian tongne (289). Their character has becn adopted by the Moghals. In using it they begin writing from the top and write downwards, whilst lme follows line from left to right (286). The Nestorians say their service, and have their holy books, in Syriac, but know nothing of the language, just as some of our monks sing the mass without knowing Latin (293). The Tibet people write as we do, and their letters have a strong resemblance to ours. The Tangut people write from right to left like the Arabs, and their lines advance upwards (329). The current money of Cathay is of cotton paper, a palm in length and breadth, and on this they print lines like those of Mangu Khan’s seal :—“imprimuwnt lineas sicut est sigillum Mangu ”—a remarkable expression. They write with a painter’s pencil and combine in one character several letters, form- ing one expression : —“faciunt in una figura plures literas compre- hendentes unam dictionem,”—a still more remarkable utterance, showing an approximate apprehension of the nature of Chinese writing (329).

Yet this sagacious and honest observer is denounced ag an ignorant and untruthful blunderer by Isaac Jacob Schmidt (a man no doubt of uscful learning, of a kind rare in his day, but narrow and wrong-headed, and in natural acumen and candour far infcrior to the 13th-century friar whom he maligns), simply because the evidence of the latter as to the Turkish dialect of the Uigurs traversed a pct heresy, long since exploded, which Schmidt enter- tained, viz., that the Uigurs were by race and language Tibetan.®

The narrative of Rubruk, after Roger Bacon's copious use of it, seems to have dropped out of sight. 1t has no place in the famous collections of the 14th century, nor in the earlicr Speculum Historiale of Vincent of Beauvais, which gives so many others of the Tartarian ecclesiastical itineraries. It first appeared imperfectly in laklnyt (1600), as we have mentioned. But it was not till 1839 that any proper edition of the text was published. In that year the Recueil de Voyages of the Paris Geographical Society, vol. iv., contained a thorough edition of the Latin text, and a collation of the few existing MSS., put forth by M. D'Avezac, with the assistance of two young scholars, since of high distinction, viz., Francisque-Michel and Thomas Wright. But there is no commentary, such as M. D'Avczac attached, in his own incomparable fashion, to the edition of Friar John of Pian Carpine in the same volume ; hor has there ever been any properly annotated edition of a traveller so worthy of honour. Richthofen in his China, i, 602-604, has briefly but justly noticed the narrative of Rubruk. A French version with some notes, issued at Paris in 1877, in the Bibliotheque Orient ale Elzévirienne, if named at all, can only be mentioned as beneath contempt. The task is one which the present writer has long contemplated, but now with but slender hope of accomplishment. (Since this was in type the writer has received from Dr. Franz Max Schmidt an admirable monograph by him, Ueber Rubruk's Reise (Berlin, p. 93), extracted from vol. xx. of the Ztschr. Geog. Soc. Berl., and has greatly profited by it in the revision of the article in proof.) IRS)

RUBY. This name is applied by lapidaries and jewellers to two distinct minerals, which may be distinguished as the true or Oriental ruby and the spinel ruby. The former is a red variety of corundum or native alumina, of

4 "Ego enim percepi postea, quando incepi aliquantulum intelligere idioma, quod quando diccbam unum ipse totum aliud dicebat, secundum quod ei occurrebat. Tum, videns pericnlum loquendi per ipsum, elegi magis tacere'

248-249),

' 5 The — references in the text are to D'Avezac's edition of the Latin (sce below).

6 oe Bashkirds now speak a Turkish dialect ; but they are of Finnish race, and it is quite possible that they then spoke a language akin to Magyar. There is no doubt that the Mussulman historians of that age identified the Hungarians and the Bashkirds (e.g., see extracts from Juvaini and Rashiduddin in App. to D'Ohsson's Hist. des Mongols, ii. 620-623). The Bashkirds are also constantly coupled with the Majar by Abulghazi. See Fr. tr. by Desmaisons, pp. 19, 140,

180, 189.

7 Asp == Equus. Aspara is "often mentioned by the historians of Timur and his successors ; its exact place is uncertain, but it lay somewhere on the Ili frontier. Dr F. Schmidt thinks this identification impossible ; but one of his reasons— viz., that Equius was only one day from Cailac—appears to be a misapprehension of the text.

8 Sec Forschungen im Gebiete . Petersburg, 1824, pp. 90-93.

. der Vélker Mittel-Asiens, St.

great rarity and value, while the latter is an aluminate of Inagnesium, inferior to the true ruby in hardness and much less esteemed as a gem stone. With ancient writers the confusion was even greater, for they appear to have classed together under a common name, such as the car- bunculus of Pliny or the av@paé of Greek writers, not only our two kinds of ruby but also garnets and other inferior stones of a brilliant fiery colour. By modern mineral- ogists it has come to be understood that when the word ruby is used without any qualifying prefix the true or Oriental stone is invariably indicated.

The Oriental ruby, like all other varieties of corundum, crystallizes in the rhoinbohedral system; but, as it usually occurs as small pebbles or rounded fragments, the crystal- line form can rarely be traced. Its colour varies from deep cochincal to pale rose red, in some cases inclining to purple, the most valued tint being that known to experts as pigeon's blood colour. On cxposure to a high tempera- ture the ruby becomes green, but regains its

original colour on cooling—a behaviour which is consistent with the sup- position that the stone owes its colour to the presence of oxide of chromium, and indeed in artificial rubies the required tint is always obtained by the use of some com- pound of chromium. When a ruby of the most esteemed colour is properly viewed through a dichroiscope, the colour is resolved into a carminc and an aurora red, or red inclining to orange. By this test the true ruby may be distinguished from spinel and garnet, since these minerals crystallize in the cubic system and therefore are not di- chroic. Another mode of distinction is suggested by the high density of corundum: the specific gravity of the true ruby reaches or even rises slightly above 4, and thus greatly excecds that of either spinel or garnet. But perhaps the simplest test is afforded by its great hard- ness (H=9): the sharp edge of a corundum crystal will readily scratch either a spinel or a garnet, but has no effect ona ruby. The true ruby has a very high index of refraction (4=1:78), and to this character is due the remarkable lustre of the polished stone. Mr Crookes has shown that the ruby is brilliantly phosphorescent when subjected to radiant discharge in a properly ex- hausted vessel, and curiously enough the red light emitted is equally vivid whatever be the colour of the corundum under experiment. The microscopic structure of the ruby has been studied by Mr Sorby, who finds that the stone contains fluid cavities and numerous crystallized enclosures of other minerals (Proc. Roy. Soc., xvii.. 1869, p- 291). ,

The Oriental ruby is a mineral of very limited distribution, its prineipal localities being confined to the kingdom of Burmah. The most important ruby mines are situated at Kyat Pyen, about 70 miles to the north-east of Mandalay; there are also mines at Mookop, a little farther north, and others in the Sagyin Hills, within 16 miles of Mandalay. In all these localities the rubies oecur in association with sapphires and other precions stones, forming a gem-bearing gravel which is dug up and washed in very primitive fashion. By far the larger number of the rubies are of small size, and the larger stones are generally flawed. All rubies exceeding a certain weight were the property of the king of Burmah. The mines were jealously watched, and it was diffienlt for Europeans to obtain access to them ; but some of the Ava workings were visited and described many years ago by Pére Giuseppe d’Amiato, and more recently those near Mandalay have been deseribed by Mr Bredmeyer, who was offieially connected with them

(Ball). It is stated in the older works on mineralogy that rubies oceur in the Capelan Mountains near Syrian, in Pegu. In peninsular India there are but few localities that yield rubies, but they have been reported from the corundum mines of the Salem distriet in Madras and from Mysore. In Ceylon they oecur with sapphires, but are rarer than those gems, and the Ceylon rubies are not usually of good colour. Rubies have been brought from Gandamak, in Afghanistan, but most of the stones reputed to be Afghan rubies are merely spiuels.

In 1871 some remarkable deposits of corundum were discovered by Col. C. W. Jenks in Maeon co., North Carolina. Rubics,

sapphires, and large pebbles of coarse corundum were found in the bed of a river near a large mass of serpentine which afterwards became known as Corundum Hill, and these pebbles were eventually traced to certain veins in the serpentine. The corundum oecurred crystallized in situ, but was rarely of such a colour as would entitle it to be called ruby. Mr G. F. Kunz, who has lately written an article on American precious stones, states that rubies and sapphires have also been found at Vernon, New Jersey ; near Helena, Montana ; at Santa Fé, New Mexico; in southern Colorado ; and in Arizona.

Anstralia has oceasionally yielded true rubies, but mostly of smal] size and inferior quality. In Victoria they have been found in the drifts of the Beechworth gold fields and at the Berwiek tin mine, Wallace’s Creek ; while in New South Wales they oecur at Mudgee, in the Cudgegong and some of its tributaries, and at Tumberumba, co. Wynyard. A magenta-coloured turbid ruby from Vietoria is known under the name of ‘‘ barklyite.”

The “star ruby” is a rather cloudy variety from Ceylon, exhibit- ing when cut en cabochon a luminous star of six rays, reflected from the convex surface of the stone.

The largest ruby known in Europe is said to be one of the size of a small hen’s egg, whieh was presented by Gustavus III. of Sweden to the empress of Russia on the occasion of his visit to St Petersburg. Rubies of larger size

have been deseribed by Tavernier and other Oriental travellers, but it is probable that in many cases spinels have been mistaken for true rubies. There seems no doubt that the great historic ruby set in the Maltese cross in front of the imperial state crown of England is a spinel. This stone was given to Edward the Black Prince by Pedro the Cruel, king of Castile, on the victory of Najera,in 1367, and it was afterwards worn by Henry V. at the battle of Agincourt, when it narrowly escaped destruction.

The spinel ruby has been described in the article MINERALOGY (vol. xvi. p. 386, sp. 93). The spinels nsed for jewellery are mostly obtained in Burmah, where they oeeur as octahedral erystals or as water-worn pebbles in assoeiation with the true ruby, for which they are often mistaken. They are also found in the gem-bearing gravels of Ceylon, Victoria, and New South Wales. ‘The delicate rose-pink variety known as balas ruby was worked for centuries in Badakhshan, but the operations appear to have been suspended of late years. The mines are situated on the river Shighnan, a tributary of the Oxus. It is commonly said that the name ‘*balas ” or ‘‘ balash” is.a corruption of Badakhshan, while others derive it from Balkh.

The Oriental ruby has always been esteemed of far higher value than any other precious stone. A ruby of perfect colour, weighing five carats, is worth at the present day ten times as mueh as a diamond of equal weight (Streeter). As the weight of the stone inereases, its value rapidly rises, so that rubies of exceptional size eommaud enormous prices. There is consequently inuch tempta- tion to replace the true stone by spinel or garnet or even paste. By means of oxide of ehromium an excellent imitation of the colour of the ruby is obtained ; and, though the ordinary “ strass,’’ or fine lead-glass, is very soft, and therefore soon loses its lustre, it is yet possible to produce a paste consisting of silicate of alumina which is almost as hard as roek crystal.

It is an interesting fact that the chemist has frequently suc- ceeded in causing alumina to assume artificially many of the physical characteristics of the native ruby. As far baek as 1837 M. Gaudin reproduced the ruby on a small scale by exposing ammonia-alum to the heat of the oxyhydrogen blowpipe, whereby he obtained fused alumina whieh was readily colourcd by the addition of oxide of chromium. A different method was followed by

Ebelmen. He dissolved alumina in boric acid at a high temperature, and on the cooling of the mass obtained the alumina in a crystallized form; while if ehromate of ammonium was present the crystals became veritable ruby. MM. Saiute-Claire Deville and Caron heated a mixture of fluoride of aluminium, fluoride of chromium, and boric acid, and thus obtained a fluoride of boron, which, being volatile, readily escaped, and left a solid residue of alumina coloured by the chrome. These, however, were only laboratory experiments, and it was reserved for MM. Frémy and Feil, in 1878, to reproduce the ruby and sapphire ona seale sng- gestive of some commereial importance. By heating a mixture of artificial alumina and red lead in a fireelay crucible, they obtained a vitreous silieate of lead (the siliea being derived from the crueible) and erystallized alumina, while the addition of bichromate of potas- sium caused this alumina to assume the coveted tint of the ruby.

For a general description of the ruby see E. Jannettaz, Diamant et Pierres Précieuses (1881); Kluge, Handbuch der Edelsteinkunde (1860); Schrauf, Edelsteinkunde (1869); Church, Precious Stones (1883); Streeter, Precious Stones and Gems (Ath cd., 1884). For Indian localities see Ball's Economie Geology, being vol. iii. of the Manual of the Geology of India (1881); for Australian localities, Liversidge's Minerals of New South Wales (2U ed., 1882); for United States rubies, Quart. Jour. Geol. Soc. Lond., vol. xxx. 1874, p. 303, and American Jour. Science, ser. ili. vol. iv. 1872, pp. 109, 175, and Kunz's article in Mineral Resources of the United States, by A. Williams, jun. (1883). For the history of the stone consult King's Natural IHist. of Precious Stones (1865), and

for artificial rubies, Comptes Rendus, vol. 1xxxv. 1877, p. 1029. (F. W. BR.)

of the various tints and shades of flowers in his poems flatly contradict the customary legend of the "blind min- strel." In his eighth year he knew the whole Koran by heart and had begun to write verses. He had besides a wonderful voice which enraptured all hearers, and he played in a masterly way on the lute. The fame of these accom- plishments at last reached the ear of the SAmanid Nasr II. bin Ahmad, the ruler of Khord4s4n and

Transoxiana (913- 942), who drew the poet to his court and distinguished him by his personal favour. Rudagi became his daily companion, rose to the highest honours, and grew rich in worldly wealth. He received so many costly presents that he could allow himself the extravagance of keeping two hundred pages, and that four hundred camels were neces- sary to carry all his property. In spite of various pre- decessors he well deserves the title of "father of Persian literature," since he was the first who impressed upon every form of epic, lyric, and didactic poetry its peculiar stamp and its individual character. He is also said to have been the founder of the "diwan," that is, the typical form of the complete collection of a poet's lyrical compositions in a more or less alphabetical order which prevails to the present day among all Mohammedan writers. His poems filled, according to all statements, one hundred volumes and consisted of one million three hundred thousand verses ; but of this there remain only fifty-two kasidas, ghazals, and ruba'is; of his epic masterpieces we have nothing beyond a few stray lines found here and there as illus- trations of ancient Persian words and phrases in native dictionaries. But the most serious loss is that of his translation of Ibn Mukaffa's Arabic version of the old Indian fable book Kalilah and Dimnah, which he put into Persian verse at the request of his royal patron, and for which he received the handsome reward of 40,000 dirhems. In his kasfdas, which are all devoted to the praise of his sovereign and friend, Rudagi has left us unequalled models of a refined and delicate taste, very different from the often bombastic compositions of later Persian encomiasts, and these alone would entitle him to a foremost rank among the poets of his country ; but his renown is considerably enhanced by his odes and epi- grams. Those of a didactic tendency express in well-measured lines a sort of Epicurean philosophy—in the loftiest sense of the word—on human life and human happiness; more charming still are the purely lyrical pieces, sweet and fascinating songs, which glorify the two everlast- ing delights of glowing hearts and cheerful minds—love and wine. Rudagi survived his royal friend, and died long after the splendid days of Nasr's patronage, the time of wealth and luxury, had passed away—poor and forgotten by the world, as one of his poems, a beautiful elegy, seems to indicate—in 954.

A complete edition of all the extant poems of Ridagi, in Persian text and metrical German translation, together with a biographi- cal account, based

on forty-six Persian MSS., is found in Dr Ethé's "Ridagi der Samanidendichter " (Géttinger Nachrichten, 1878, pp-

663-742).

RUDD, or Rev-Eve (Leuciscus erythrophthalmus), a fish of the family of Carps, generally spread over Europe, north and south of the Alps, also found in Asia Minor, and extremely common in suitable localities, viz., still and deep waters with muddy bottom. When adult, it is readily recognized by its deep, short body, golden-coppery tint of the whole surface, red eyes, and scarlet lower fins ; the young are often confounded with those of the roach, but the pharyngeal teeth of the rudd stand in a double row, and not in a single one, as in the roach; also the first dorsal rays are inserted distinctly behind the vertical line from the root of the ventral fin. The anal rays are from thirteen to fifteen in number, and the scales in the lateral line from thirty-nine to forty-two. The rudd is a

XXI. — 7

RUCKERT, Frrepricn (1788-1866), an eminent German poet, was born at Schweinfurt on the 16th May 1788. He was educated at the gymnasium of his native place and at the universities of Wiirzburg and Heidelberg, where he studied law and philology. Having taken his degree, he went to the university of Jena as a " privat- docent" ; but this position hesoon abandoned. For some time he worked in connexion with the Morgenblati at Stuttgart. Nearly the whole of the year 1818 he spent in Rome, where he devoted himself to study, especially to the study of the popular poetry of Italy ; and afterwards he lived for several years at Coburg. He was appointed a professor of Oriental languages at the university of Erlangen in 1826, and in 1841 he was called to a similar position in Berlin, where he was also made a privy councillor. In 1849 he resigned his professorship at Berlin, and went to live on his estate near Coburg. He died on the 31st January 1866. When Riickert began his literary career, Germany was engaged in her life-and-death struggle with Napoleon; and in his first volume, Deutsche Gtedtchte, published in 1814 under the name of Freimund Raimar, he gave vigorous expression to the prevailing sentiment of his countrymen. In 1816 appeared Napoleon, eine politische Komidie in drei Stiicken, and in 1817 the Kranz der Zeit. He issued a collection of

poems, Oestliche Rosen, in 1822; and in 1834-38 his Gesammelte Gedichte were published in six volumes, a selection from which has passed through many editions. Rickert, who was master of thirty lan- guages, made his mark chiefly as a translator of Oriental poetry, and as a writer of poems conceived in the spirit of Oriental masters. Much attention was attracted by Die Verwandlungen des Abu Seid, a translation of Hariri's Makamen (1826), Nal und Damajanti, an Indian tale (1828), Amrilkais, der Dichter und Konig (1843), and Hamasa, oder die diltesten arabischen Volkslieder (1846). Among his original poems dealing with Oriental subjects are Morgenldndische Sagen wnd Geschichten (1837), Erbau- liches und Beschauliches aus dem Morgenland (1836-38), Rostem und Suhrab, cine Heldengeschachte (1838), and Brahmanische Erzdhlungen (1839). The most elaborate of his works is Die Wesshet des Brahmanen, published in six volumes in 1836-39. In 1843-45 he issued several dramas, all of which are greatly inferior to the work to which he owes his distinctive place in German literature. At the time of the Danish war in 1864 he wrote Ein Dutzend Kampf-Lieder fir Schleswig-Holstein, which, al- though published anonymously, produced a considerable impression. After his death many poetical translations and original poems were found among his papers, and several collections of them were published. Riickert lacked the simple and natural feeling which is character- istic of all the greatest lyrical poets of Germany. But he had a certain splendour of imagination which made Oriental poetry congenial to him, and he has seldom been surpassed in his power of giving rhythmic expression to ideas on the conduct of life. As a master of poetical style he ranks with German writers of the highest class. 'Thereare hardly any lyrical forms which are not represented among his works, and in all of them, the simplest and the most complex, he wrote with equal ease and grace.

A complete cdition of Riickert's poetical works appeared in Frankfort in 1868-69. Sce Fortlage, Rickert und seine Werke (1867); Beyer, Friedrich Riickert, ein biographisches Denkmal (1868); Neue Mitthcilungen tiber Rickert (1878); and Nachgelasscne Gedichte Riickerts und neue Beitrage zu dessen Leben wnd Schriften (1877) ; Boxberger, Riickert-Studien (1878).

RUDAGL (d. 954). Hakim Mohammed Farfd-eddin 'Abdallah, the first great genius of modern Persia, was born in Riidag, a village in Transoxiana,

about 870-900, —totally blind, as most of his biographers assert, although the fine distinction of colours and the minute description

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fine fish, but little esteemed for food, and very rarely ex- ceeds a length of 12 inches or a weight of 2 Ib. It feeds on small freshwater animals and soft vegetable matter, and spawns in April or May. It readily crosses with the white bream, more rarely with the roach and bleak.

RUDDIMAN, Tuomas (1674-1758), an eminent Scot- tish scholar, was born in October 1674, at Raggal, in the parish of Boyndie, Banffshire, where his father was a farmer. He studied Latin eagerly at the school of his native parish, and when sixteen started off to walk to Aberdeen, there to compete for a college bursary. On the way he was attacked by Gipsies, robbed of a guinea, which was all he had, and otherwise very cruelly treated; but he persevered in his journey, reached Aberdeen, and competed for and won the bursary. He then entered the university, and four years afterwards—on 21st June 1694—received the degree of M.A. For some time he acted as school- master at Laurencekirk in Kincardine. There he chanced to make the acquaintance of Dr Pitcairne, of Edinburgh, who persuaded him to remove to the Scottish capital, where he obtained the post of assistant in the Advocates' Library. As his salary was only £8, 6s. 8d. per annum, he was forced to undertake additional employment. He engaged in miscellaneous literary work, took pupils, and for some time acted as an auctioneer. His chief writings at this period were editions of Wilson's De Animi Tran- quillitate Dialogus (1707), and the Cantici Solomonis Para- phrasis Poetica (1709) of Arthur Johnstone (0d. 1641), editor of the Delicize Poetarum Scotorum.

In 1714 he published Rudiments of the Latin Tongue, which is even yet his best known work. This was intended to be an easy introduction to Latin grammar, and was so successful that it at once superseded all others. Under various forms it has been in use, down to our own day, in the schools of Scotland. In 1715 he edited, with notes and annotations, the works of George Buchanan in two volumes folio. As Ruddiman was a Jacobite, the liberal views of Buchanan seemed to him to call for frequent censure. That censure is often rather implied than openly expressed ; but it excited much

opposition. scholars was formed in Edinburgh to “vindicate that in- comparably learned and pious author from the calumnies of Mr Thomas Ruddiman” by publishing a correct edition of his works, This they never did; but a number of ob- scure writers from this time attacked Ruddiman with great vehemence. He replied; and it was not till the year before his death that he said his “last word” in the con- troversy.

His worldly affairs, meanwhile, grew more and more prosperous. He founded (1715) a successful printing business, and after some time was appointed printer to the university. He acquired the Caledonian Mercury in 1729, and in 1730 was appointed keeper of the Advocates’ Library, which post, owing to failing health, he resigned in 1752. He died at Edinburgh, 19th January 1758, and was interred in Greyfriars churchyard, where in 1806 a tablet was erected to his memory.

Besides the works mentioned, the following writings of Ruddiman deserve notice :—an edition of Gavin Douglas’s Mneid of Virgil (1710) ; the editing and completion of Anderson’s Selectus Diplo- matum et Numismatum Scotie Thesaurus (1739) ; Catalogue of the Advocates’ Iibrary (1733-42); an edition of Livy, famed for its “immaculate purity,” in 4 vols. (1751). Ruddiman was for many years the representative scholar of Scotland. Writing in 1766, Dr Johnson, after reproving Boswell for some bad Latin, significantly adds—“ Ruddiman is dead.” When Boswell proposed to write

Ruddiman’s life, “I should take pleasure in helping you to do honour to him,” said Johuson.

See Chalmers’s Life of Ruddiman (1794) ; Scots Magazine, January 7, 1757; Boswell’s Life of Johnson.

RUDE, Frango1s(1784—1855),a French sculptor of great natural talent and force of character, but of an ignorance

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as to all that did not immediately concern his art which can best be described as out of date. He was born at Dijon, 4th January 1784, and came therefore in his youth under the influence of the democratic and N. apoleonic ideals in their full force. Till the age of sixteen he worked at his father's trade as a stovemaker, amusing himself with modelling in his free hours only; but in 1809 he went up to Paris from the Dijon school of art, and became a pupil of Castellier, obtaining the Great Prize in 1812. After the second restoration of the Bourbons he retired to Brussels, where he got some work under the architect Van der Stracten, who employed him to execute nine bas reliefs in the palace of Tervueren, which he was then engaged in building. At Brussels Rude married Sophie Fremiet, the daughter of a Bonapartist compatriot, to whom he had many obligations, but, obtaining with difficulty work so ill-paid that it but just enabled him to live, he gladly availed himself of the opportunity of return to Paris, where in 1827 a statue of the Virgin for St Gervais and a Mercury Fastening his Sandals obtained much attention. His great success dates, however, from 1833, when he received the cross of the Legion of Honour for his statue of a Neapolitan Fisher Boy playing with a Tortoise, which also procured for him the important com- mission for all the ornament and one bas relief of the Arc de Etoile. This relief, a work full of energy and fire, immortalizes the name of Rude. Amongst other produc- tions, we may mention the statue of Monge, 1848, Jeanne d'Arc (in garden of Luxembourg), 1852, a Calvary in bronze for the high altar of St Vincent de Paul, 1855, as well as Hebe and the Eagle of Jupiter, Love Triumphant, and Christ on the Cross, all of which appeared at the Salon of 1857 after his death. He had worked all his life long with the most extraordinary energy and given himself no rest in spite of the signs of failing health, and at last, on the 3d November 1855, he died suddenly with scarcely time to cry out. One of his noblest works, and easily accessible, is the tomb of Cavaignac, on which he placed beside his own the name of his favourite pupil Christophe. Although executed in 1840, this was not erected at Mont- martre till the year after Rude's own death. His Louis XIII, a life size statue, cast in silver, is to be seen at the Duc de Luynes's chateau at Dampierre. Cato of Utica stands in the gardens of the Tuileries, and his Baptism of Christ decorates a chapel of the Madeleine.

RUDE STONE MONUMENTS. The raising of com- memorative monuments of such an enduring material as stone is a practice that may be traced in all countries to the remotest times. The highly sculptured statues, obelisks, and other monumental erections of modern civi- lization are but the lineal representatives of the unhewn monoliths, dolmens, cromlechis, &c., of prehistoric times. Judging from the large number of the latter that have still survived the destructive agencies (notably those of — man himself) to which they have been exposed during so many ages, it would seem that the ideas which led to their erection had as great a hold on humanity in its earlier stages of development as at the present time. In giving some idea of these rude monuments in Britain and else- where, it will be convenient to classify them as follows (see vol. ii. p. 383, figs. 1-4). (1) Isolated pillars or inono- liths of unhewn stones raised on end are called Menhirs (maen, a stone, and hir, long). (2) When these monoliths are arranged in lines they become Alignments. (3) But if their linear arrangement is stich as to form an enclosure (enceinte), whether circular, oval, or irregular, the group is designated by the name of Cromlech (see CromLEcH). (4) Instead of the monoliths remaining separate, they are sometimes placed together and covered over by one or more capstones so as to form a rude chamber ; in this case

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the monument is called a Dolmen (daul, a table, and maen, a stone). This megalithic chamber is sometimes partially or wholly imbedded in a mound of earth or stones so as to form a tumulus or cairn. As, however, there are many tumuli and cairns which do not contain megalithic cham- bers, we have only partially to deal with them under the category of rude stone monuments.

Menhirs.—Rude monoliths fixed on end (see vol. ii. p. 388, fig. 1) have been used in all ages for a variety of purposes, commem- orative and religious. Stone pillars were also used ceremonially on the accession of kings and chiefs. In Scotland, when stones were thus used, they were called

Tanist Stones, the most celebrated of which was the Lia Fail, formerly at Scone (now at Westminster Abbey), on which the kings of Scotland used to be crowned. We read also of Hare or Hoer Stones, Cambus or Camus Stones, Cat (cath, battle) Stones, "' Witch Stanes, " ''Druid Stanes," &c. The Hawk's Stane, or Saaum Falconis, at St Madoes, Perthshire, was erected in memory of the defeat of the Danes at Lunearty, and a monolith now standing on the field of Flodden is said to mark the place where King James fell. When menhirs were grouped together their number was often significant, ¢g., twelve (Josh. iv. 5) or seven (Herod., iii. 8). Some standing stones are found to have been artificially perforated, and these superstition has invested with some curious functions. As examples of this class may be mentioned the famous Stone of Odin, near the circle of Stennis, the Clach-Charra, or Stone of Vengeance, at Onich near Balachu- lish in Argyllshire, and Men-en-tol in Cornwall. Two rude mono- liths in Scotland bear inscriptions,—the famous Newton Stone in the district of Garioch, and the Cat Stane near Edinburgh. Many others have eup-marks and spirals or concentric circles. In Ireland, Wales, and the north of Scotland, they are occasionally found with ogam inscriptions, and in the north-east of Scotland (Pictland) with symbolical figures, which were subsequently continued on the beautifully sculptured stones of early Christian date which are peculiar to that locality.

Menhirs are found in all megalithic countries. In the British Isles they are very abundant, more especially in the less cultivated districts. In France ovcr 1600 isolated examples have been recorded, of which about the half, and by far the most remarkable, are within the five departments which constitute Brittany. In the rest of France they are generally small, and not to be compared in grandeur to those of Brittany. At Locinariaquer (Morbihan) is the largest menhir in the world. It isin the form of a rude but smooth-sided obelisk, and lies on the ground broken into four portions, the aggregate length of which amounts to 20°50 metres (about 67 feet). It was made of granite, foreign to the neighbour- hood, and its weight, according to the most recent calculations, amounted to 347,531 kilogrammes or 342 tons (L'Homme, 1885, p- 193). The next largest menhir is at Plésidy (Cétes-du-Nord), measuring about 87 feet in height. Then follows a list of sixty-seven gradually diminishing to 16 feet in height, of which the first ten (all above 26 feet) are in Brittany. As regards form, these menhirs vary greatly.

Some are cylindrical, as the well-known ‘nierre du champ Dolent” at Dol (height 30 fcet), and that of Cadiou in Finistére (28 feet); while that of Penmarch (26 feet) takes the shape of a partially expanded fan. On the introduction of Christianity into France its adherents appear to have made use

-of these menhirs at an early period; many of them at present support a cross, and some a Madonna. The scattered positions of some monoliths and the no less singular grouping of others show that, although they were sometimes used as landmarks, this was only a secondary function. It is not uncommon to find a monolith overtopping a tumulus, thus simulating the Bauta (grave or battle) Stones of Scandinavia. In England, monoliths are often associated with the stone circles, as the King’s Stone at Stanton Drew, Long Meg at Little Salkeld, the Ring Stone at Avebury, &c. One of the finest British monoliths stands in the churchyard of Rudston, Yorkshire. Examples of a large size are met with in Algeria, Morocco, India, Central Asia, &c.

_ Alignments.—The most celebrated monuments of this class are in the vicinity of Carnac in Brittany. They are situated in groups at Ménec, Kermario, Kerlescant, Erdeven, and St Barbe—all within a few miles of each other, and in the centre of a district containing the most remarkable megalithic remains in the world. The first three groups are supposed by some archeologists to be merely portions of one original and continuous series of alignments, which extended nearly 2 miles in length in a uniform direction from south-west to north-east. Commencing at the village of Ménec, the menhirs are arranged in eleven rows. At first they stand from 10 to 18 feet above the ground, but, as we advanee, they become gradually smaller till they attain only 8 or 4 feet, when they cease altogether. After a vacant space of about 350 yards we come to the Kermario group, which contains only ten lines, but they are nearly of the same magnitude as at the begin- ning of the former group. After a still greater interval the menhirs

again appear, but this time in thirteen rows, at the village of Kerlescant. In 1881 M. Felix Gaillard, Plouharnel, made a plan of the alignments at Erdeven, which shows that, out of a total of 1120 menhirs which originally

constituted the group, 290 are still standing, 740 fallen, and 90 removed. The menhirs here may be traced for nearly a mile, but their linear arrangement is not so distinct, nor are the stones so large as those at Carnac. About fifty alignments are known in France. At Penmarch there is one containing over two hundred menhirs arranged in four rows. Others, however, are formed of only a single row of stones, as at Kerdouadec, Leuré, and Camaret. The first is 480 m. in length, and terminates at its southern extremity in a kind of eroix gammée. At Leuré three short lines meet at right angles. The third is situated on the rising ground between the town of Camaret and the point of Toulinguet. It consists of. base line, some 600 yards long, with forty-one stones (others have apparently been removed), and two perpendicular lines as short offsets. Close to itare a dolmen and a prostrate menhir. These monoliths are all of coarse quartz and of small size, only one, at Leuré, reaching a height of 9 feet. Alignments are also found in other countries. In the Pyrenees they are generally in single file,—mostly straight, but sometimes reptiliform. Onc at Peyrelade (Billitre) runs in a straight line from north to south for nearly 300 yards, and contains ninety-three stones, some of which are of great size. At St Columb in Cornwall, there is one called the Nine Maidens, which is formed of eight quartz stones, extending in a perfectly straight line for 262 feet. In Britain they are more frequently arranged in. double file, or in avenues, leading to or from other megalithic monuments, such as still exist, or formerly existed, at the circles of Avebury, Stonehenge, Shap, Callernish, &. The only example in England comparable to the great alignments of Carnac is in the Vale of the White Horse in Berkshire. Here the stones, numbering about eight hundred, are grouped in three divisions, and extend over an irregular parallelogram whieh measures from 500 to 600 yards in length and from 250 to 300 yards in breadth. Sir Henry Dryden describes groups ofa similar character in Caithness, as at Garry- Whin, Camster, Yarhouse, and the ‘‘many stones” at Clyth. Alignments in single and multiple rows have also been observed in Shetland, India, Algeria, &c.

Cromlechs.—Enclosures (enceintes) formed of rude monoliths, placed at intervals of a few yards, have generally a circular or oval shape. Rectangular forms are, however, not unknown, examples of which may be seen at Curcunno (Morbihan), near the eelebrated dolmen of that name, and at Saint Just (Illc-et- Vilaine). The former measures 37 by 27 yards, and is

now com- posed of twenty-two meuhirs, all of whieh are standing (some fallen ones having been recently restored by the Government). About a dozen menhirs would appear to be wanting. A donkey- shoe-shaped enclosure has been described by Sir Henry Dryden, in the parish of Latheron, Caithness. It is 226 feet long and 110 feet wide in the middle, and the two extremities are 85 feet apart. Stone eircles are frequently arranged ‘concentrieally, as may be geen in the circle at Kenmore, near Aberfeldy, Perthshire, as well as in many other Scotch, Irish, and Scandinavian examples. More rarely one large circle surrounds secondary groups, without having a common ceutre, as was the case at Avebury, where the outer circle, 1200 feet in diameter, included two others, each of which contained an inner concentric circle. At Boscawen, in Cornwall, there is a group of cireles confusedly attached, and, as it were, partially overlapping each other. Circles may also be connected by an alignment or avenue, as at Stanton Drew, Dart- moor, &c. Cromlechs are often associated with other megalithic monuments ; thus at the head of the great Carnac alignments are the remains of a large circle which can be readily traced, notwith- standing that some houses are constructed within its area. In the British Isles and the north of Europe cromlechs frequently surround the dolmens, tumuli, or cairns. A few examples of a dolmen surrounded by one or more concentrie circles have also been recorded by M. Cartailhac, in the department of Aveyron in France. Outside the cromlech there is also frequently to be

found a circular ditch or vallum, as at Avebury, Stonehenge,

Arbor Low, Brogar, &c. The most remarkable megalithic monu- ment of this class now extant is Stonehenge, which differs, how- ever, from its congeners in having the stones of its second inner circle partially hewn and attached by large transverse lintels. The largest cromlech in France stands on the Jle-aux-Moines (Morbihan), in the village of Kergonan. About half of it is destroyed by the encroachment of the houses. The remaining semi-circumference (slightly elliptical) contains thirty-six menhirs from 6 to 10 feet high, and its diamcter is about 100 metres (328 feet). Only a few of the British eromlechs exceed these dimen- sions, among which may be mentioned Avebury (1260 by 1170 feet), Stonehenge (outer circle 300 feet, inner 106 feet), Stanton Drew (360 feet), Brogar (845 feet), Long Meg and her Daughters (330 feet). One near Dumfries, called the Twelve Apostles,

also closely approaches the 100-metre size; but, generally speaking, the Scotch and Irish examples are of smaller proportions, rarely

exceeding 100 feet in diameter. That most of the smaller circles have been used as sepulchres has been repeatedly proved by actual excavations, which showed that interments had taken place within their area. It is difficult, however, to believe that this could have been the main object of the larger ones. At May- borough, near Penrith, there is a circle entirely composed of an immense aggregation of small stones in the form of a gigantic ring enclosing a flat area, about 300 feet in diameter. Near the centre there is a fine monolith, one of several known to have formerly stood there. Of the same type is the Giant's Ring near Belfast, only the ring in this instance is made of earth, and it is consider. ably larger in diameter (580 feet); the central object is a fine dolmen. It is more probable that such enclosures were used, like many of our modern churches, for the double purpose of burying the dead and addressing the living.

Dolmens.—In its simplest form a dolmen consists of three, four, or five stone supports, covered over with one selected megalith called a capstone or table. A well-known example of this kind in England is Kit's Cotty House, between Rochester and Maidstone, which is formed of three large supports, with a capstone measuring 11 by 8 feet. From this simple form there is an endless varicty of upward gradations till we reach the so-called Gaint Graves and Grottes aux Fées, which are constructed of numerous supports and several capstones. A dolmen (allée couverte) situated in a plant- ation at the outskirts of the town of Saumur is composed of four flat supports on each side, with one at the end, and four capstones. The largest capstone measures 7°5 metres in length, 7 in breadth, and 1 in thickness. The chamber is 18 metres long, 6°5 broad, and 3 high. Another near Essé, called '"'la Roche aux Fées," is cqually long, and is constructed of thirty supports, with eight capstones, including the vestibule. Dolmens of this kind are extremely rare in the British Isles, the only one approaching thein being Calliagh Birra's House in Ireland. "These (generally known as allées couvertes) and many other examples of the simple dolmen show no evidence of having been covered over witha mound. When there was a

mound it necessitated, in the larger ones, an entrance passage, which was constructed, like the chamber, of a series of side stones or supports and capstones. Some archeologists maintain that all dolmens were formerly covered with a cairn or tumulus, —a theory which undoubtcdly derives some favour from the condition of many examples ‘still extant, especially in France, where all stages of degradation are seen, from a partial to a com- plete state of denudation. The allécs couvertes of France, Ger- many, and the Channel Islands had their entrance at the end “buts on the other hand, the Hunnebedden of Holland had both ends closed and the entrance was on the side facing the sun. The covered dolmens are extremely variable in shape,—circular, oval, quadrangular, or irregular. The entrance gallery may be attached to the end, as in the Grotte de Gavr’inis, or to the side, as in the Gaint’s Grave (Jettestuer) at Oem near Roskilde. In other instances there is no distinct chamber, buta long passage gradually widening from the entrance ; and this may be bent at an angle, as in the dolmen du Rocher (Morbihan). Again, there may be several chambers cummunicating with one entrance, or two or three separate chambers having separate entrances, and all imbedded in the same tumulus. An excellent example of this kind is the partially destroyed tumulus of Rondosec, near Plouharnal railway station, which contains three separate dolmens. That such varia- tions are not due to altered customs, in consequence of wideness of geographical range, is shown by M. de Mortillet, who gives plans of no less than sixteen differently shaped dolmens (Musée préhis- torique, pl. 58), all within a confined district in Morbihan.

No dolmens exist in eastern Europe beyond Saxony. They reappear, however, in the Crimea and Circassia, whence they have been traced through Central Asia to India, where they are widely distributed. Similar megalithic structures have also been recog- nized and described by travellers in Palestine, Arabia, Persia, Australia, the Penrhyn Islands, Madagascar, Peru, &c. The irregular manner in which dolmens are distributed along the western parts cf Europe has led to the theory that all these megalithic structures were erected by a special pcople, but as to the when, whence, and whither of this singular race there is no knowledge whatever. Though the European dolmens have a strong family likeness, however widely apart, they present some characteristic differences in the various countries in which they arc found. In Scandinavia they are confined

to the Danish lands and a few provinces in the south of Sweden. Here the exposed dolmens are often on artificial mounds, and surrounded by cromlechs which are either circular (rwnddysser) or oval (langdysser). In Sweden the sepulture a galerie is very rarely entirely covered up as in the giant graves of Denmark.

Hanover, Oldenburg, and Meckleuburg are very rich in the remains of thesemonuments. At Riestedt, near Uelzen in Hanover, there is, on the summit of a tumulus, a very singular dolmen of oblong form, which measures about 40 feet long and over 6 fect in breadth. Another at Naschendorf, near Wismar, consists of a mound surrounded by a large circle of stones and a

covered chamber on its summit. Remains of a megalithic structure at Rudenbeck, in Mecklenburg, though now imperfect, show that originally it was constructed like an allée couverte, It had four supports on each side, two at one end (the other end forming the entrance), and two large capstones.. The length had been about 20 feet, breadth 74 feet, and height from the floor to the under-surface of roof about 8 fect. According to Bonstetten, no less than two hundred of these monuments are found distributed over the three provinces of Liineburg, Osnabriick, and Stade ; and the most gigantic examples in Germany are in the duchy of Oldenburg.

In Holland, with one or two exceptions, they are confined to the province of Drenthe, where between fifty and sixty still exist. Here they get the name of Hunnebedden (Huns’ beds). The Borger Hunnebed, the largest of this group, is 70 feet long and 14 feet wide. In its original condition it contained forty-five stones, ten of which were capstones. They are all now denuded, but some show evidence of having been surrounded with a mound containing an entrance passage. Only one dolmen has been recorded in Belgium ; but in France thcir number amounts to 3410. They are irregularly distributed over seventy-eight departments, six hundred and eighteen being in Brittany. In the centre of the country they are also numerous, no less than four hundred and thirty-five being recorded in Aveyron, but they are of much smaller proportions than in the former locality. From the Pyrenees the dolmens are sparsely traced along the north coast of Spain and through

Portugal to Andalusia, where they occur in considerable numbers, Crossing into Africa they are found in large groups in Morocco, Algeria, and Tunis. General Faidherbe writes of having examined five or six thousand at the cemeteries of Bou Merzoug, Wady Berda, Tebessa, Gastal, &c.1 In the Channel Islands every species of megalithic monument is met with. At Mont Cochon, near St Helier, there was lately discovered in a mound of blown sand an allée couverte, and close to it a stone circle surrounding a dolmen.? In the British Isles they are met with in many localities, particularly in the west of England, Anglesey, the Isle of Man, Ireland, and Scot- land. In the country last named, however, they are not the most striking feature among its rude stone monuments—the stone circles and cisted cairns having largely superseded them.

In the absence of historical knowledge all these megalithic structures were formerly regarded as of Celtic origin. By some they were supposed to have been constructed by the Druids, the so-called priests of the Celts ; and hence they were often described, especially since the time of Aubrey and Stukely, under the name of Celtic or Druidical monuments. ‘But this theory is disproved by the fact that the ethnographical range of the Celtic races does not correspond with the geographical distribution of these rude stone monuments. Thus, for example, in Europe, not to speak of their localization in non-Celtic countries, the megaliths occupy an elon- gated stretch of territory on its western seaboard extending from Pomerania to North Africa. This area crosses at right angles the lands supposed to have been occupied by the Celtic or Aryan races on théir westward waves of migration. There can be no doubt from investigations of the contents of dolmens that their primary object was sepulchral, and that the megalithic chambers, with entrance passages, were used as family vaults. Against the theory that any of them were ever uscd as altars there is prima

facie evidence in the care taken to have the smoothest and flattest

surface of the stones composing the chamber always turued inwards. Moreover, cup marks, and other primitive markings when found on the capstones or supports, are almost invariably on their inside, as, for example, at the dolmens of Keriaval, Kercado, Dol au Marchant, Gavr’inis (Morbihan), and the great tumulus at New Grange (Ireland). From its

position in the centre of a large circular enclosure no dolmen could be more suggestive of public sacrifices than that within the Giant's Ring near Belfast; yet nothing could be more inappropriate for such a purpose than its capstone, which is in fact a large granite boulder presenting on its upper side an unusually rounded surface.

No chronological sequence can be detected in the evolution of the rude stone monuments, with perhaps the exception of the primitive cist which gave origin to the allées couvertes, giant graves, &c., and these again to the tumuli with microlithic built chambers. Much less can their appearance in different countries be said to indicate contemporaneity. The dolmens of Africa are often found to contain objects peculiar to the Iron Age, and it is said that in some parts of India the people are still in the habit of erecting dolmens and other megalithic monuments. Scandinavian archeologists assign their dolmens exclusively to the Stone Age. It would therefore appear as if a subsequent stage of degradation occurred, when a tamer style of interment ensued, and the Bronze Age barrows replaced the dolmens, and these again gave way to the Iron Age burials—the ship-barrows and large tumuli of the vikings, as manifested in the three tumuli of Thor, Odin, and Freya at ee eee a ee

1 Compte Rendu du Congrés International d'Anth. et @ Arch., Bruxelles, p. 408. 2 Socicté Jerséaise, 9¢ Bulletin, 1884,

Gamla Upsala, and the Gokstad mound on the Sandefiord, the

scene of the recent discovery of the viking ship. Literature.—Fergusson, Rude Stone Monuments; Compte Rendu du Congrés International @ Anthropologie et d' Archéologie Préhistoriques; by G. de Mortillet, Les Eiudes Préhistoriques; Lubbock, Prehistoric Times; Inventatre des Monuments Mégalithiques de France; Bonstetten, Essai sur les Dolmens ; Proceedings, &c., of the various antiquarian societies. (R. MU.)

RUDOLPH I. (1218-1291), German king, eldest son of Albert IV., count of Hapsburg, was born on the Ist May 1218. By marriage and in other ways he greatly ex- tended his hereditary dominions, so that when he became king

he was lord not only of Hapsburg but of the counties of Kyburg and Lenzburg and of the landgraviate of Alsace. At different times he carried on war with the bishop of Strasburg, the abbot of St Gall, and the city of Basel. THe was engaged in his second struggle with Basel in 1273 when Frederick, burgrave of Nuremberg, brought the in- telligence that he had been elected to the German crown. Basel at once submitted, and Rudolph went to Aix-la- Chapelle, where he was crowned on the 28th October 1273. The princes had become so independent during the Great Interregnum that they would have preferred to have no supreme ruler; but Pope Gregory X. had threatened that if they did not elect a king he would himself appoint one. The pope now cordially supported Rudolph, who proved to be much more energetic than the electors had antici- pated. Having secured the friendship of the palsgrave Louis and Duke Albert of Saxony by allowing them to marry his daughters, he advanced against Ottocar, king of Bohemia, and Henry, duke of Bavaria, both of whom had refused to do him homage. Henry was soon won over to the new king's side, and then Ottocar had to sue for peace. His request was granted only on condition that he should cede Austria, Styria, Carinthia, and Carniola. By and by Ottocar again rebelled, and was slain in 1278 in a battle fought on the Marchfield. Rudolph gave Bohemia and Moravia to Wenceslaus, Ottocar's son; but Austria, Styria, and Carniola he granted to his own sons, Albert and Rudolph. Carinthia was given to Meinhard, count of Tyrol, who agreed that if his descendants in the male line died out the land should pass to Rudolph's family. Rudolph compelled Otho, count of Upper Burgundy, and other nobles, who tried to make themselves independent of the German crown, to acknowledge his supremacy ; and he recovered certain fiefs in what is now Switzerland, which had been seized by the count of Savoy. He also restored peace in Bohemia, and gave his daughter in marriage to the young king, Wences- laus. He often visited troubled parts of the kingdom, settling local disputes, and destroying the towers of robber barons. On the whole, his rule was a beneficent one, but he did not succeed in re-establishing the authority of the crown, nor did he see how great an element of strength he might have found in an alliance with the cities. The electors he was forced to confirm in the possession of important rights, which were maintained under his suc- cessors. His reign is memorable chiefly because he was the founder of the greatness of the house of Hapsburg. In 1281 his

first wife died, and in 1284 he married Elizabeth, daughter of Hugo IV., duke of Burgundy. He died at Germersheim on the 15th July 1291.

See Lorenz, Deutsche Geschichte im 13 und 14 Jahrh. (1867) ; Huber, Rudolf vor seiner Thronbesteigung (in the Almanach der kaiserlichen Akademie, 1873); Hirn, Rudolf von Habsburg (1874).

RUDOLPH II. (1552-1612), Holy Roman emperor, was the son of the emperor Maximilian IL, and was born on the 18th July 1552. In 1572 he obtained the crown of Hungary, in 1575 that of Bohemia, with the title ‘‘ King of the Romans”; and in 1576, after his father’s death, he became emperor. He was of an indolent and melan- choly disposition, and preferred the study of astrology and alchemy to the responsibilities of government. He

surrendered himself absolutely to the control of the Jesuits, under whose influence he had been brought up at the gloomy court of Spain; and in his hereditary lands they laboured assiduously to destroy Protestantism. The Protestants were deprived of the right of public worship in Vienna and other towns; their schools were closed, and many of their preachers banished. Almost all public offices, too, were placed in the hands of Roman Catholics. In the lands which Rudolph ruled, not by hereditary right, but as emperor, his advisers could exercise less authority ; but there also they did what they could to foster the Catholic reaction. In 1607 Maximilian, duke of Bavaria, was allowed to seize the imperial city Donau- worth, the Protestant inhabitants of which had quarrelled with the abbot. This and other high-handed proceedings alarmed the Protestants of Germany, and in 1608, under the leadership of Frederick IV., elector of the Palatinate, they formed a confederation called the Union for the pro- tection of their interests. The Catholic princes, guided by Duke Maximilian of Bavaria, responded by forming the League. Civil war seemed inevitable, but it was postponed by the murder of Henry IV. of France, who had promised to support the Union, and by the death of the elector Frederick IV. Meanwhile, the greatest con- fusion prevailed in Hungary, due in part to, religious oppression, in part to a war with the Turks. In 1604 the Hungarians rebelled, and peace was not restored until 1606, when Matthias, the

emperor’s brother, with the sanction of his younger brothers, who acknowledged him as head of the family, came to terms both with the Hungarians and with the sultan. Matthias allied him- self with the Protestants, and compelled Rudolph to give up to him Hungary, Moravia, and the greater part of Austria. The emperor then tried to strengthen his position by granting to the nobles, knights, and towns of Bohemia perfect religious freedom, with the right to build Protestant churches and schools on their own and on the royal lands. Even after they had obtained the letter of majesty in which these concessions were embodied, the Bohemians did not trust Rudolph; and, when at his request the archduke Leopold appeared in their country with an army, they invited Matthias to come to their aid. Matthias went, and the emperor had no alternative but to resign to him in 1611 the remainder of his hereditary territories. Rudolph died on the 20th January 1612.

See Kurz, Geschichte Oecsterreichs unter Kaiser Rudolf (1821) ; Gindely, Rudolf II. und seine Zeit (1863-65).

RUDOLSTADT, capital of the German principality of Schwarzburg-Rudolstadt, and chief residence of the prince, is situated on the left bank of the Saale, 18 miles due south of Weimar, in one of the most beautiful districts of Thuringia. The picturesque little town is a favourite summer watering-place, with pine baths, as well as a fre- quented tourist resort. Besides containing the Govern- ment buildings of the little principality, Rudolstadt is fairly well provided with schools and other institutions, including a library of 60,000 volumes. The residence of the prince is in the Heidecksburg, a palace on an eminence 200 feet above the Saale, rebuilt after a fire in 1735, and containing various show apartments. The Ludwigsburg, another palace within the town built in 1742, accommodates the natural history collections be- longing to the prince. The principal church dates from the end of the 15th century. In the Anger, a tree-shaded public park between the town and the river, is the theatre. Various memorials in and near the town commemorate the visits of Schiller to the neighbourhood in 1787 and 1788. The industries of the district include the manufacture of porcelain and of dyestuffs, wool-spinning, and bell-found- ing. The population (4100 in 1817) was 8747 in 1880.

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The name of Rudolstadt occurs in an inventory of the possessions of the abbey of Hersfeld in the year 800. After passing through the possession of the German emperor and of the rulers of Orlamtinde and Weimar, it came into the hands of the dukes of Schwarzburg in 1355. Its town rights were confirmed in 1404; and since 1599 it has been the residence of the ruling house.

RUEDA, Lope pz. See Drama, vol. vii. p. 420.

RUFF, a bird so called from the very beautiful and remarkable frill of elongated feathers that, just before the breeding-season, grow thickly round the neck of the male, who is considerably larger than the female, known as the Reeve. In many respects this species, the T'ringa pugnax of Linnzeus and the Machetes pugnax of the majority of modern ornithologists, is one of the most singular in existence, and yet its singularities have been very ill appreciated by zoological writers in general,! These singularities would require almost a volume to

Ruff.

describe properly. The best account of them is unques- tionably that given in 1813 by Montagu (Suppl. Orn. Dictionary), who seems to have been particularly struck by the extraordinary peculiarities of the species, and, to investigate them, expressly visited the fens of Lincolnshire, possibly excited thereto by the example of Pennant, whose information, personally collected there in 1769, was of a kind to provoke further inquiry, while Daniel (Rural Sports, iii. p. 234) had added some other particulars, and subsequently Graves in 1816 repeated in the same district the experience of his predecessors. Since that time the great changes produced by the drainage of the fen-country have banished this species from nearly the whole of it, so that Lubbock (Obs. Fauna of Norfolk, pp. 68-73) and Mr Stevenson (Birds of Norfolk, ii. pp. 261—271) can alone be cited as modern witnesses of its habits in England,

1 Mr Darwin, though frequently citing (Descent of Man and Sexual Selection, i. pp. 270, 306 ; ii. pp. 41, 42, 48, 81, 84, 100, 111) the Ruff as a witness in various capacities, most unfortunately seems never to have had its peculiarities presented to him in such a form that he conld fully perceive their bearings. However, the significance of the lesson that the Ruff may teach was hardly conceivable before he began to write ; but the fact is not the less to be regretted that he never elucidated its importance, not only in regard to " Sexual Selection," but more especially with respect to " Polymorphism." He appears not to have consulted Montagu's original account of this bird, and seems to have known it only by the excerpt given by Macgillivray, in which were not included the important passages on the extreme diversity of plumage exhibited by the males—that author passing over this wonderful peculiarity in a paragraph of less than a score of lines,

grey, or gold-colour.

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while the trade of netting or snaring Ruffs, and fattening them for the table has for many years practically ceased, The cock-bird, when out of his nuptial attire, or, to use the fenman's expression, when he has not "his show on," and the hen at all seasons, offer no very remarkable deviation from ordinary Sandpipers, and outwardly? there is nothing, except the unequal size of the two sexes, to rouse suspicion of any abnormal peculiarity. But when spring comes all is changed. Ina surprisingly short time the feathers clothing the face of the male are shed, and their place is taken by papillx or small caruncles of bright yellow or pale pink. From each side of his head sprouts a tuft of stiff curled feathers, giving the appearance of long ears, while the feathers of the throat change colour, and beneath and around it sprouts the frill or ruff already mentioned as giving the bird his name. The feathers which form this remarkable adornment, quite unique among birds, are, like those of the "ear-tufts," stiff and incurved at the end, but much longer—measuring more than two inches. They are closely arrayed, capable of depression or elevation, and form a shield to the front of the breast impenetrable by the bill of a rival.3 More extraordinary than this, from one point of view, is the great variety of coloration that obtains in these temporary outgrowths. It has often been said that no one ever saw

| two Ruffs alike. That is perhaps an over-statement ; but,

considering the really few colours that the birds exhibit, the variation is something marvellous, so that fifty examples or more may be compared without finding a very close resemblance between any two of them, while the individual variation is increased by the “ ear-tufts,” which generally differ in colour from the frill, and thus produce a combination of diversity. The colours range from deep black to pure white, passing through chestnut or bay, and many tints of brown or ashy-grey, while often the feathers are more or less closely barred with some darker shade, and the black is very frequently glossed with violet, blue, or green—or, in addition, spangled with white, The white, on the other hand, is not rarely freckled, streaked, or barred with grey, rufous- brown, or black. In some examples the barring is most regularly concentric, in others more or less broken-up or undulating, and the latter may be said of the streaks, It was ascertained by Montagu, and has since been confirmed by the still wider experience and if possible more carefully conducted observation of Mr Bartlett, that every Ruff in each successive year assumes tufts and frill exactly the same in colour and markings as those he wore in the preceding season ; and thus, polymorphic as is the male as a species, as an individual he is unchangeable in his wedding-garment —a lesson that might possibly be applied to many other birds. The white frill is said to be the rarest.

That all this wonderful “show” is the consequence of the polygamous habit of the Ruff can scarcely be doubted. No other species of Limicoline bird has, so far as is known, any tendency to it. Indced, in many species of Limicole, as the Dotterel, the Gopwirs (vol. x. p. 720), Phalaropes, and perhaps some others, the female is larger and more brightly coloured than the male, who in such cases seems to take upon himself some at least of the domestic duties, Both Montagu and Graves, to say nothing of other writers, state that the Ruffs, in England, were far more numerous than the Reeves; and their testimony can hardly be doubted; though in Germany Naumann (Vog. Deutschland’s, vii. p.

- Internally there is a great difference in the form of the posterior margin of the sternum, as long ago remarked by Nitzsch,

- This “ruff” has been compared to that of Elizabethan or Jacobean costume, but it is essentially different, since that was open in front and widest and most projecting behind, whereas the bird’s

decorative apparel is most developed in front and at the sides and scarcely exists behind.

544) considers that this is only the case in the earlier part of the season, and that later the females greatly out- number the males. It remains to say that the moral characteristics of the Ruff exceed even anything that might be inferred from what has been already stated. By no one have they been more happily described than by Wolley, in a communication to Hewitson (Zggs of Brit. Birds, 3d ed., p. 346), as follows :—

«(The Ruff, like other fine gentlemen, takes much more trouble with his courtship than with his duties as a husband. Whilst the Reeves are sitting on their eggs, scattered about the swamps, he is to be seen far away flitting about in flocks, and on the ground dancing and sparring with his companions. Before they are con- fined to their nests, it is wonderful with what devotion the females arc attended by their gay followers, who seem to be each trying to be more attentive than the rest. Nothing can be more expressive of humility and ardent love than some of the actions of the Ruff. He throws himself prostrate on the ground, with every feather on his body standing up and quivering; but he seems as if he were afraid of coming too near his mistress. If she flies off, he starts up in an instant to arrive before her at the next place of alighting, and all his actions are full of life and spirit. But none of his spirit is expended in care for his family. He never comes to see afteran enemy. In the[Lapland] marshes, a Reeve now and then flies near with a scarcely audible ka-ka-kuk ; but she seems a dull bird, and makes no noisy attack on an invader.”

Want of space forbids a fuller account of this extremely interesting species. Its breeding-grounds extend from Great Britain! across northern Europe and Asia; but the birds become less numerous towards the east. They winter in India, reaching even Ceylon, and Africa as far as the Cape of Good Hope. The Ruff also occasionally visits Iceland, and there are several well-

authenticated records of its occurrence on the eastern coast of the United States, while an example is stated (bis, 1875, p. 332) to have been received from the northern part of South America. (A. N.)

RUFINUS, Tyrannivs (Turranius, Toranvs), the well-known contemporary of Jerome, was born at or near Aquileia about the year 345. In early life he studied rhetoric, and while still comparatively young he entered the cloister as a catechumen, receiving baptism about 370, About the same time a casual visit of Jerome to Aquileia led to the formation of a close and intimate friendship between the two students, and shortly after Jerome's departure for the East Rufinus also was drawn thither (in 372 or 373) by his interest in its theology and monasticism. He first settled in Egypt, hearing the lectures of Didymus, the Origenistic teacher at Alexandria, and also cultivating frieudly relations with Macarius and other ascetics in the desert. In Egypt, if not even before leaving Italy, he had become intimately acquainted with Melania, a wealthy and devout Roman matron, who since the death of her husband had devoted all her means to religious and charitable works ; and when she removed to Palestine, taking with her a number of clergy and monks on whom the persecu- tions of Valens had borne heavily, Rufinus ultimately (about 378) followed her. While his patroness lived in a convent of her own in Jerusalem, Rufinus, in close co-operation with her and at her expense, gathered togetlier a number of monks in a monastery on the Mount of Olives, devoting himself at the same time with much ardour to the study of Greek theology. When Jerome came to reside at Bethlehem in 386 the friendship formed at Aquileia was renewed. Another of the intimates of Rufinus was John, bishop of Jerusalem, and formerly a Nitrian monk, by whom he was ordained to the priesthood in 390. In 394, in consequence of the attack upon the doctrines of Origen made by Epiphanius of Salamis during a visit to Jerusalem, a fierce quarrel broke out, which found Rufinus and Jerome ranged on different sides; and, though three

u In England of late years it has been known to breed only in one locality, the name or situation of which it is not desirable to publish.

years afterwards a formal reconciliation was brought about between Jerome and John through the intervention of third parties, the breach between Jerome and Rufinus re- mained unhealed.

In the autumn of 397 Rufinus embarked for Rome, where, finding that the theological controversies of the East were exciting much interest and curiosity, he published a Latin translation of the Apology of Pamphilus for Origen, and also (398-399) a somewhat free rendering of the wept dpxav of that author himself. In the preface to the latter work he had referred to Jerome as an admirer of Origen, and as having already translated some of his works ; this allusion proved very annoying to the subject of it, who was now exceedingly sensitive as to his reputation for orthodoxy, and the consequence was a bitter pamphlet war, very wonderful to the modern onlooker, who finds it difficult to see anything discreditable in the accusation against a Biblical scholar that he had once thought well of Origen, or in the countercharge against a translator that he had avowedly exercised editorial functions as well. Some time during the pontificate of Anastasius (398-402) Rufinus was summoned from Aquileia to Rome to vindicate his orthodoxy, but he excused himself from personal attendance ina written Apologia pro fide sua; the pope in his reply expressly condemned Origen, but leniently left the question of Rufinus's orthodoxy to his own conscience. In 408 we find Rufinus at the monastery of Pinetum (in the Campagna ?); thence he was driven by the arrival of Alaric to Sicily, being accompanied by Melania in his flight. In Sicily he was engaged in translating the Homilies of Origen when he died in 410.

The original works of Rufinus are—(1) De Aduitcratione Inbrorum Origenis—an appendix to his translation of the Apology of Pamphilus, and intended to show that many of tho features in Origen's teaching which were then held to be objectionable arise from interpolations and falsifications of the genuine text; (2) De Benedictionibus XII Patriarcharwm Libri II,—an exposition of Gen. xlix.; (3) Apologia s. Invectivarum in Hieronymum Libri IT; (4) Apologia pro Fide Sua ad Anastasium Pontificem ; (5) Mistoria Eremitica—consisting of the lives of thirty-three monks of the Nitrian desert; (6) Lxpositio Symbolt. The Historie Lcclesiastice Libri XI of Rufinus consist partly of a free translation of Eusebius (10 books in 9) and partly of a continuation (bks. x. and xi.) down to the time of Theodosius the

Great. Thc other translations of Rufinus are—(1) the Jnstituta Monachorum and some of the Homilies of Basil ; (2) the Apology of Pamphilus, referred to above ; (3) Origen's Principia ; (4) Origen's Homilies (Gen.—Kings, also Cant. and Rom.) ; (5) Oguscula of Gregory of Nazianzus ; (6) the Sententiz# of Sixtus, an unknown Greek philosopher ; (7) the Sententiz# of Evagrius ; (8) the Clementine Recognitions (the only

form in which that work is now extant); (9) the Canon Paschalis of Anatolius Alexandrinus.

Vallarsi's uncompleted edition of Rufinus (vol. i., fol., Verona, 1745) contains the De Benedictionibus, the Apologies, the Expositio Symboli, the Historia Eremitica, and the two original books of the Hisé. Eccl. See also Migne, Patrol. (vol. xxi. of the Latin series), For the translations, see the various editions of Origen, Euscbius, &c.

RUGBY, a market-town of Warwickshire, is finely situated on a table-land rising from the southern bank of the Avon, at the junction of several railway lines, and near the Grand Junction Canal, 30 miles E.S.E. of Birmingham, and 20 §.8.W. of Leicester. It is a well- built town, with a large number of modern houses erected for private residences. It occupies a gravel site, is well drained, and has a good supply of water. It owes its importance to the grammar school, built and endowed by Laurence Sheriff, a merchant grocer and servant to Queen Elizabeth, and a native of the neighbouring village of Brownsover. The endowment consisted of the parsonage of Brownsover, Sheriff's mansion house in Rugby, and one- third (8 acres) of his estate in Middlesex, near the Found- ling Hospital, London, which, being let on building leases, gradually increased to about £5000 a year. The full endowment was obtained in 1653. The school originally stood opposite the parish church, and was removed to its

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present site on the south side of the town between 1740 and 1750. In 1809 it was rebuilt from designs by Hake- will; the chapel, dedicated to St Lawrence, was added in 1820. At the tercentenary of the school in 1867 subscrip- tions were set on foot for founding scholarships, building additional schoolrooms, rebuilding or enlarging the chapel, and other

objects. The chapel was rebuilt and recon- secrated in 1872. A swimming bath was erected in 1876; the Temple observatory, containing a fine equatorial refrac- tor by Alvan Clark, was built in 1877, and the Temple read- ing room with the art museum in 1878. The workshops underneath the gymnasium were opened in 1880, anda new big school and class rooms were erected in 1885. There are three major and four minor exhibitions for students to any university in the United Kingdom. From about 70 in 1777 the numbers attending the school have increased to over 400. A great impulse was given to the progress of the school during the headmastership of Dr Arnold, 1827-1842. The best known of Arnold's successors are Tait, afterwards archbishop of Canterbury, and Temple, the present bishop of London. The parish church of St Andrew's is, with the exception of the tower and the north arcade in the nave, entirely modern, having been built from designs by Mr Butterfield at a cost of £22,000, and reconsecrated in 1879. The daughter church of the Holy Trinity, a handsome building by Sir Gilbert Scott, in close proximity to St Andrew's, was erected in 1853, St Marie's Catholic Church is in the Early English style. A town-hall was erected in 1858, at a cost of £7000. There are a number of charities, including Laurence Sheriff's almshouses (founded 1567), Elborow's almshouses (1707), Miss Butlin's almshouses (1851), and the hospital of St Cross, opened in 1884, at a cost of £20,000. A public recreation ground was provided by the local government board in 1877. The town has an import- ant cattle market. The population of the urban sanitary district (area 1617 acres) in 1871 was 8385, and in 1881 it was 9891.

Rugby was originally a hamlet of the adjoining parish of Clifton- on-Dunsmore, and is separately treated of as such in Domesday Book. Ernaldus de Bosco (Ernald de Bois), lord of the manor of Clifton, seems to have erected the first chapel in Rugby, in the reign of Stephen, about 1140. It was afterwards granted by him, with certain lands, to endow the abbey of St Mary, Leicester, which grant was confirmed by his successors and by royal charter of Henry II. In the second year of King John (1200) a suit took place between Henry de Rokeby, lord of the manor of Rugby, and Paul, abbot of St Mary, Leicester, which resulted in the former obtaining possession of the advowson of Rugby, on condition of homage and service to the abbot of Leicester. By virtue of this agreement the chapel was converted into a parish church, and the vicarage into a rectory. In 1350

Ralph, Lord Stafford, became possessed of the manor and advowson of Rugby, and considerably enlarged the parish church. Subsequent alterations, notably in 1814 and 1831, left little of this structure remaining except the tower and north arcade in the nave. The advowson of Rugby is now the property of the earl of Craven; and the late rector was widely known and honoured as ‘the poet pastor,” John Moultrie.

RUGE, Arnotp (1803-1880), German philosophical and political writer, was born at Bergen, in the island of Riigen, on the 13th September 1803. He studied at Halle, Jena, and Heidelberg, and became an enthusiastic adherent of the party which sought to create a free and united Germany. For his zeal in this cause he had to spend five years in the fortress of Kolberg, where he devoted himself to the study of classical writers, especially Plato and the Greek poets. On his release in 1830, he published Schill und die Seinen, a tragedy, and a transla- tion of Qidipus in Colonus. Ruge settled in Halle, where in 1838, in association with his friend Echtermayer, he founded the Hallesche Jahrbiicher fiir deutsche Kunst und Wissenschaft. In this periodical, which soon took a very high place, he discussed all the great questions which were then agitating the best minds in Europe, dealing

with them from the point of view of the Hegelian philo. sophy, interpreted in the most liberal sense. The Jahr. bticher was detested by the orthodox party in Prussia ; bug as it was published in Leipsic, the editors fancied that it was beyond the reach of the Prussian Government. Tp 1840, however, soon after the accession of King Frederick William IV., they were ordered, on account of the name of the periodical, to have it printed in Halle, subject to the censorship there. Thereupon Ruge went to Dresden, and the Jahrbticher (with which Echtermayer was no longer connected) continued to appear in Leipsic, but with the title Deutsche Jahrbiicher, and without the names of the editors. It now became more liberal than ever, and in 1843 was suppressed by the Saxon Government. In Paris Ruge tried to act with Karl Marx as co-editor of the Deutsch-Franzsische Jahrbiicher, but the two friends soon parted, Ruge having little sympathy with Marx’s socialist theories. Ruge next associated himself with a publishing firm in Ziirich, and when it was put down he attempted to establish a firm of his own in

Leipsic, but his scheme was thwarted by the Saxon Government. In the revolu- tionary movement of 1848 Ruge played a prominent part. He organized the Extreme Left in the Frankfort parlia- ment, and for some time he lived in Berlin as the editor of the Reform, in which he advocated the opinions of the Left in the Prussian National Assembly. The career of the Keform being cut short by the Prussian Government, Ruge soon afterwards visited Paris, hoping to establish, through his friend Ledru-Rollin, some relations between German and French republicans; but in 1849 both Ledru-Rollin and Ruge had to take refuge in London. Here, in company with Mazzini and other advanced poli- ticians, they formed a " European Democratic Committee." From this committee Ruge soon withdrew, and in 1850 he went to Brighton, where he supported himself by working both as a teacher in schools and as a writer. He took a passionate interest in the events of 1866 and 1870, and as a publicist vigorously supported the cause of Prussia against Austria, and that of Germany against France. In his last years he received from the German Government a pension of 3000 marks. He died on the 31st December 1880.

Ruge was a man of generous sympathies and an able writer, but he did not produce any work of enduring importance. In 1846-48 his Gesammelte Schriften were published in ten volumes. After this time he wrote, among other books, Unser System, Revolutions- novellen, Die Loge des Humanismus, and Aus friiherer Zeit (his memoirs). He also wrote many poems, and several dramas and romances, and translated into German various English works, in- cluding the Letters of Junius and Buckle's History of Civilization.

RUGEN, the largest island belonging to Germany, is situated in the Baltic Sea, immediately opposite the town of Stralsund, 14 miles off the north-west coast of Pomerania in Prussia, from which it is separated by the narrow Strelsasund. Its shape is exceedingly irregular, and its coast-line is broken by very numerous bays and peninsulas, sometimes of considerable size. The general name is applied by the natives only to the roughly trian- gular main trunk of the island, while the larger peninsulas, the landward extremities of which taper to very narrow necks of land, are considered to be as distinct from Riigen as the various adjacent smaller islands which are also statistically included under the name. The chief penin- sulas are those

of Jasmund and Wittow on the north, and Monchgut, at one time the property of the monastery of Eldena, on the south-east; and the chief neighbouring islands are Unmanz and Hiddensoe, both off the north- west coast. The greatest length of Riigen from north to south is 32 miles ; its greatest breadth is 254 miles; and its area is 377 square miles. The surface gradually rises towards the west to Rugard (335 feet), the “eye of

Riigen,” near Bergen, but the highest point is the Hertha- burg (505 fect) in Jasmund. Erratic blocks are scattered throughout the island, and the roads are made with granite, Though much of Rigen is flat and sandy, the fine beech-woods which cover great part of it and the northern coast scenery combine with the convenient sea- bathing offered by the various villages round the coast to attract large numbers of visitors annually. The most beautiful and attractive part of the island is the peninsula of Jasmund, which terminates to the north in the Stuben- kammer (from two Slavonic words meaning “rock steps 2) a sheer chalk cliff by the sea, the summit of which, known as the Konigsstuhl, is 420 fect above sea-level. The east of Jasmund is clothed with an extensive beech-wood called the Stubbenitz, in which lies the Burg or Hertha Lake. Connected with Jasmund only by the narrow isthmus of Schabe to the west is the peninsula of Wittow, the most fertile part of the island. At its north-west extremity rises the height of Arcona, with a lighthousc.

The official capital of the island is Bergen (3662 inhabitants), connected since 1883 with Stralsund by a railway and ferry. The other chief places are Garz (2014), Sagard (1447), Gingst (1285), and Putbus (1752). The last is the old capital of a barony of the princes of Putbus. Sassuitz, Gohren, and Putbus are among the favourite bathing resorts. Schoritz was the birthplace of the patriot and poet, Arndt (1769-1860). Ecclesiastically, Riigen is divided into 27 parishes, in which the pastoral succession is said to be almost hereditary. The inhabitants are distinguished from those of the main-land by peculiarities of dialect, costume, and habits ; and even the various peninsulas differ from each other in these particulars. ‘The peninsula of Monchgut has best preserved its peculiarities ; but there too primitive simplicity is yield- ing to the influence .of the annual stream of summer

visitors. The inhabitants rear some cattle, and Riigen has long been fainous for its geese; but the only really con- siderable industry is fishing,—the herring-fishery being especially important. Riigen, with the neighbouring islands, forms a governmental department, with a popula- tion (1880) of 46,115.

The original Germanic inhabitants of Riigen were dispossessed by Slavs ; and there are still various relics of the long reign of paganism that ensucd. In the Stubbenitz and elsewhere Huns' or giants' graves (see p. 52, supra) are common; and near the Hertha Lake are the ruins of an ancient edifice which some have sought (though perhaps erroncously) to identify with the shrine of the heathen deity Hertha or Nerthus, referred to by Tacitus. On Arcona in Wittow are the remains of an ancient fortress, enclosing a temple of the four-headed god Svantevit, which was destroyed in 1168 by the Danish king Waldemar I., when he made himself master of the island. From that date until 1825 Riigen was ruled by a suc- cession of native princes, at first under Danish supremacy; and, after being for a century and a half the possession of a branch of the ruling family in Pomerania, it was finally united with that provinee in 1478, and passed with it into the possession of Sweden in 1648. With the rest of Western Pomerania Riigen has belonged to Prussia sinee 1815.

RUHNKEN, Davin (1723-1798), one of the most illustrious scholars of the Netherlands, was of German origin, having been born in Pomerania in 1723. His parents had him educated for the church, but after a residence of two years at the university of Wittenberg, he determined to live the life of a scholar. His biographer (Wyttenbach) somewhat quaintly exhorts all studious youths who feel the inner call as Ruhnken did to show the same boldness in crossing the wishes of their parents. At Wittenberg, Ruhnken lived in close intimacy with the two most distinguished professors, Ritter and Berger, who fired his passion for things ancient, and guided his studies. To them he owed a thorough grounding in ancient history and Roman antiquities and literature; and from them he learned what distinguished him among the scholars of his

time, a pure and at the same time a vivid Latin style. At Wittenberg, too, Ruhnken derived valuable mental training from study in mathematics and Roman law. Probably nothing would have severed him from his. surroundings there but a desire which daily grew upon him to explore the inmost recesses of Greek literature. Neither at Wittenberg nor at any other German university was Greek in that age seriously studied. Jt was taught in the main to students in divinity for the sake of the Greek Testament and the early fathers of the church,—taught as a necessary appendage to Hebrew and Syriac, and generally by the same professors. F. A. Wolf is the real creator of Greek scholarship in modern Germany, and Porson's gibe that ''the Germans in Greek are sadly to seek" was barbed with truth. It is significant of the state of Hellenic studies in Germany in 1743 that their leading exponents were Gesner and Ernesti. Ruhnken was well advised by his friends at Wittenberg to seek the university of Leyden, where, stimulated by the influence of Bentley, the great scholar Tiberius Hemsterhuis had founded the only real school of Greek learning which had existed on the Continent since the days of Joseph Scaliger and Isaac Casaubon.

Perhaps no two men of letters ever lived in closer friendship than Hemsterhuis and Ruhnken during the twenty-three years which passed from Ruhnken's arrival in the Netherlands in 1743 to the death of Hemsterhuis in 1766. A few years made it clear that Ruhnken and Valckenaer were the two pupils of the great master on whoni his inheritance must devolve. As his reputation spread, many efforts were made to attract Ruhnken back to Germany, but the air of freedom which he drew in the Netherlands was more to him than all the flesh-pots his native land could offer. Indeed, after settling in Leyden, he only left the country once, when he spent a year in Paris, ransacking the public libraries (1755). For work achieved, this year of Ruhnken may compare even with the famous year which Ritschl spent in Italy. In 1757 Ruhnken was appointed lecturer in Greek, to assist Hemsterhuis, and in 1761 he succeeded Oudendorp, with the title of "ordinary professor of history and eloquence," but practically as Latin professor. This promotion drew on him the enmity of some native Netherlanders, who deemed themselves (not: without some show of reason) to possess stronger claims for a chair of Latin. The only defence made by Ruhnken was to publish works on Latin literature which eclipsed and

silenced his rivals. In 1766 Valckenaer succeeded Hemsterhuis in the Greek chair. The intimacy between the two colleagues was only broken by Valckenaer's death in 1785, and stood without strain the test of common candidature for the office (an import- ant one at Leyden) of university librarian, in which Ruhnken was successful. Ruhnken's later years were clouded by severe domestic misfortune, and by the poli- tical commotions which, after the outbreak of the war with England in 1780, troubled the Netherlands without ceasing, and threatened to extinguish the university of Leyden. The year of Ruhnken's death was 1798.

Personally, he was as far as possible removed from being a recluse or a pedant. He had a well-knit and even handsome frame, attractive manners (though some- times tinged with irony), and a nature simple and healthy, and open to impressions from all sides. Fond of society, he cared little to what rank his associates belonged, if they were genuine men in whom he might find something to learn. His biographer even says of him in his early days that he knew how to sacrifice to the Sirens without proving traitor to the Muses. Life in the open air had a great attraction for him ; he was fond of sport, and would sometimes devote to it two or three days in the week. In

his bearing towards other scholars Ruhnken was generous and dignified, distributing literary aid with a free hand, and meeting onslaughts for the most part witha smile. It would be difficult to point out in the history of scholarsbip the name of another man who so thoroughly possessed the savour vivre.

Jn the records of learning Ruhnken occupies an im- portant position. He forms a principal link in the chain which connects Bentley with the modern scholarship of the Continent. The spirit and the aims of Hemsterhuis, the great reviver of Continental learning, were committed to his trust, and were faithfully maintained. He greatly widened the circle of those who valued taste and precision in classical scholarship. He powerfully aided the eman- cipation of Greek studies from theology; nor must it be forgotten that he first in modern times dared to think of rescuing Plato from the hands of the

professed philo- sophers—men presumptuous enough to interpret the ancient sage with little or no knowledge of the language in which he wrote.

Ruhnken's principal works are editions of (1) Timeus's Lexicon of Platonie Words, (2) Thaleleus and other Greek commentators on Roman law, (3) Rutilius Lupus and other grammarians, (4) Velleius Paterculus, (5) the works of Muretus. He also occupied himself much with the history of Greek literature, particularly the oratorical literature, with the Homeric hymns, the scholia on Plato, and the Greek and Roman grammarians and rhetoricians. A dis- covery famous in its time was that in the text of the work of Apsines on rhetoric a large piece of a work by Longinus was embedded. Recent vicws of the writings attributed to Longinus have lessened the interest of this discovery without lessening its merit. The biography of Ruhnken was written by his great pupil Wyttenbach, soon after his death. (J. 5. BR.)

RUHRORT, a busy trading town in Prussia, is situated at the junction of the Ruhr and Rhine, in the midst of a productive coal district, 15 miles north of Diisseldorf. tuhrort has the largest river harbour in Germany, with very extensive quays ; and most of the 14 million tons of coal which are annually exported from the neighbourhood are despatched in the fleet of steam-tugs and barges which belong to the port. About one half of the coal goes to Holland, and the rest to towns on the upper Rhine. Grain and timber are also exported. In 1881 11,282 craft, carrying 1,791,213 tons, left the harbour. The goods traffic between Ruhrort and Homberg on the opposite bank of the Rhine is carried on by large steam ferry boats, in which the railway waggons are placed with the help of towers, 128 feet high, on each side of the river. The industries of the town include active shipbuilding, iron and tin working, and the making of cordage and machinery. The inhabitants numbered 1443 in 1816, and 9130 in 1880. Ruhrort formerly belonged to Cleves: it received town rights in 1587,

RULHIERE, or Rutuiires, CLaupE CARLOMAN DE (1735-1791), poet and historian, was born at Bondy in 1735, and died at Paris in 1791. He was for a time a soldier, and served under Richelieu in'Germany. But at twenty-five he accompanied Breteuil to St Petersburg as secretary of legation. Here he actually saw the revolu- tion which seated Catherine II. on the throne, and thus obtained the facts of his best-known and best work, the short

sketch called Anecdotes sur la Revolution de Russie en 1762. It was not published till after the empress's death. The later years of Rulhitre's life were spent either in Paris, where he held an appointment in the foreign office and went much into society, or else in travelling over Germany and Poland. The distracted affairs of this latter country gave him the subject of his longest work, Histoire de ?Anarchie de Pologne (1807), which was never finished, and which the patriotism of its latest editor, M. Ostrowski, has rather unjustifiably rebaptized Révolutions de Pologne. Rulhiére was made an Academician in 1787.

RU H—

RUM

Besides the historical works mentioned, he wrote one on the Revocation of the Edict of Nantes (1788).

Rulhiére as an historian has much merit of style and arrangement, and the short sketch of the Russian revolution is justly ranked among the masterpieces of the kind in French. Of the larger Poland Carlyle, as justly, complains that its allowance of fact ig too small in proportion to its bulk. The author was also a fertile writer of vers de société, short satires, epigrams, &c., which show much point and polish, and he had a considerable reputation among the witty andill-natured group also containing Chamfort, Rivarol, Champcenetz, &c. On the other hand he has the credit of being long and disinterestedly assiduous in caring for J. J. Rousseau in his morose old age, until Rousseau as usual quarrelled with him,

Rulhitre's works were published by Anguis in 1819 (Paris, 6 vols. Svo). The

Russian Revolution may be found in the Chefs-d'euvre Historiques of the Collee- tion Didot, and the Poland, with title altered as above, in the same Collection,

RUM is a spirituous liquor, prepared from molasses, skimmings of the boiling house, and other saccharine bye- products, and the refuse juice of the cane-sugar manufac. ture. Its distillation, which is a simple process, may be conducted in connexion with any cane-sugar establish- ment, but the rum which comes to the American and European markets is chiefly the produce of the West India Islands and Guiana. The ordinary method of working in the West Indies is the following. A wash is prepared consisting of sugar skimmings 4 parts, lees of still or dunder 5 parts, and molasses 1 part, the quantity prepared being equal to the capacity of the still in use. Dunder consists of the residue of the still from previous distillations, and it takes the place of a ferment, besides which the acetic acid it contains, derived from the fer- menting wash of previous operations, has a favourable influence on the progress of attenuation. The wash pre- pared as above is placed in the fermenting vat, where, according to weather and other conditions, the fermenta- tion proceeds more or less briskly ; but usually a week or ten days is the period required for attenuation, during which time the scum formed is removed from the surface of the vat twice daily. When sufficiently attenuated, the wash is run into the still, which is generally of a

simple construction, and distilled off, the first product being “low wines,” which on redistillation come over as “high wines” or strong rum. When a Pontefex still is used, which contains two intermediate “retorts” between the still and the worm, a strong spirit is obtained at the first distillation. The charge of wash yields from 10 to 12 per cent. of rum, of an average strength of 25° over proof. Pure distilled rum is an entirely colourless liquid, but as imported and sold it generally has a deep brown colour imparted by caramel or by storage in sherry casks. It has a peculiar aroma, derived principally from the pre- sence of a minute proportion of butyric ether. Rum varies very considerably in quality, the finest being known as Jamaica rum, whether it is the product of that island or not. An inferior quality of rum is known among the French as tafia ; and the lowest quality, into the wash for which debris of sugar cane enters, is called negro rum, and is mostly consumed by the coloured workers in the sugar houses and distilleries. The planters sometimes put rinds and slices of pine-apple into the barrels in which rum is matured, to improve and add to its flavour, and occasion- ally anise and other flavouring ingredients are also used. The spirit prepared from molasses of beet-sugar factories cannot be classed with rum. The product has a highly disagreeable odour and taste, and it can only be rendered fit for consumption by repeated distillation and concentra- tion toa high degree of strength, whereby the spirit is rendered “silent,” or has only a faint rum flavour. In this condition it is used for mixing with strongly flavoured rum, and for the preparation of a fictitious rum, the flavour of which is due to “rum essence,”—a mixture of artificial ether, birch bark oil, and other substances. Cane- sugar molasses enters largely into the materials from which

Arrack (q.v.), the spirit of Java and the Indian Archi- pelago, is prepared, but its flavour depends more on palm- trcc toddy, which also is a constituent of the wash. The imports of rum into the United Kingdom and the home consumption have been decreasing for a number of years.’ RUMFORD, Count. See Tuompson, Sir BENJAMIN. RUMI. Mohammed b. Mohammed b. Husain albalkhi, better known as Maulana Jal4l-uddin Rumi, the greatest Stific poet of Persia, was born on the 30th of September 1207 (604 au. 6th of Rab 1) at Balkh, in Khorasdn, where his family had

resided from time immemorial, rich in property and public renown. He claimed descent from the caliph Abtbckr, and from the Khwarism shah Sultan “Alé-uddin b. Tukush (1199-1220), whose only daughter, Malika-i-Jahan, had been married to Jalal-uddin’s grand- father. Her son, Mohammed, commonly called Baha- uddin Walad, was a famous doctor of Balkh, who, to escape the jealousy with which the sultan viewed his influence, emigrated to Asia Minor in 1212. Young Jalal-uddin was only five years old at that time, but the signs of lis future greatness in spiritual matters began already to mani- fest themselves in precocious knowledge and in ecstasies and visions. After residing for some time at Malatiyah and afterwards at Erzinjan in Armenia, Bahd-uddin was ealled to Larindah in Asia Minor, as principal of the local college, and there young Jalél-uddin, who had meanwhile grown under the careful tuition of his father in wisdom and holiness, attained his maturity, and married in 1226 Jauhar Khatun, the daughter of Lal4 Sharaf-uddin of Samarkand. Finally, Bahd-uddin was invited to Iconium by “Al4-uddin Kaikubad (1219-1236), the sultan of Asia Minor, or, as it is commonly called in the East, Rim,—whence Jalal-uddin’s surname (takhallus) Rumi. After Baha-uddin’s death in 1231, Jalal-uddin went to Aleppo and Damascus for a short time to study, but, as the mere positive sciences in which he had been particu- larly trained failed to satisfy him, on his return to Iconium, whcre he became by and by professor of four separate colleges, he took for nine years as his spiritual guide Sayyid Burhan-uddin Husaini of Tirmidh, one of his father’s disciples, and later on the wandering Sufi Shams- uddin of Tabriz, who arrived in Iconium on the 29th of November 1244, and soon acquired the most powerful influence over Jaldl-uddin, who even adopted his name as takhallus in his ghazals or mystic odes. Shams- uddin’s rather aggressive character, however, roused the indignation of the people of Iconium against him, and during a riot in which Jalal-uddin’s eldest son, “Alé-uddin, was killed, he was arrested and probably executed; at least he was no more seen. This fate of his teacher and friend, together with the untimely death of his son, threw Jalal-uddin into deep melancholy, and in remembrance of these victims of popular wrath he founded the order of the Maulawi or (in Turkish pronunciation) Mewlewi der- vishes, famous for their piety as well as for their peculiar garb of mourning, their music and their mystic dance (sania), which is the outward representation of the circling inovement of the spheres, and the inward symbol of the circling movement of the soul caused by the

vibrations of Rum Shrub is a kind of liqueur, or cold punch, the basis of which is rum, lemon juice, and sugar. It is prepared by adding to 34 gallons of proof rum 2 oz. of the essential oil of orange and an equal quantity of essential oil of lemon dissolved in one quart of spirit, and 300 ib of refined sugar dissolved in 20 gallons of water. This combination is thoroughly mixed together, after which there is added sufficient orange Juice or solution of tartaric acid to produce a slight pleasant acidity. After agitating the mixture again for some time, 20 gallons of water ave added, bringing the quantity up to 100 gallons, and the agitation of the whole is continued for half an hour. In about a fortnight's time the shrub should be brilliant and ready for bottling. Other flavouring

ingredients are occasionally added, and the eompound may be varied according to taste.

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a Suff's fervent love to God. The establishment of this order, which still possesses numerous cloisters throughout the Turkish empirc, and the leadership of which has been kept in Jalal-uddin's family in Iconium uninterruptedly for the last six hundred years, gave a new stimulus both to the zeal and energy and the poetical inspiration of the great shaikh. Most of his matchless odes, in which he soars on the wings of a genuine enthusiasm, high over earth and heaven up to the throne of Almighty God, were composed in honour of the Maulawi dervishes, and even his opus magnum, the Mathnawi or, as it is usually called, The Spiritual Mathnawi (mathnawi-i-ma'nawl), a production of the highest poetical and religious intuition in six books or daftars, with 30,000 to 40,000 double-rhymed verses, can be traced to the same source. The idea of this immense collection of ethical and moral precepts, interwoven with numerous anecdotes and comments on verses of the Koran and sayings of the Prophet, which the Eastern world reveres as the greatest devotional work, the study of which securcs eternal bliss, was first suggested to the poet by his favourite disciple Hasan, better known as Hus4m-uddin, who became in 1258 Jaldl-uddin's chief assistant. He had frequently observed that the members of the Maulawi fraternity read with great delight the mystic mathnawis of Sanda'i and Farid-uddin 'Attdr, and induced his master to compose a similar poem on a larger scale. Jaldl-

uddin readily fell in with this suggestion and dictated to him, with a short interruption, the whole work during the remaining years of his life. Soon after the completion of this masterpiece Jalal-uddin died on the 17th of December 1273 (672 a.u. 5th of Jumada IT.), worshipped as a saint by high and low. His first successor in the rectorship of the Maulawi fraternity was Husim-uddin himself, after whose death in 1284 Jalal-uddin's younger and only surviving son, Shaikh Bahaudd-in Ahmed, commonly called Sultan Walad, and favourably known as author of the mystical mathnawi, Rabdbndma, or the Book of the Guitar (died 1312), was duly installed as grand-master of the order.

Jalal-uddin's life is fully described in Shams-uddin Ahmed Aflaki's Mandkib-ul 'drifin (written between 718 and 754 4.u.), the most important portions of which have been translated by J. W. Redliouse in the preface to his English metrieal version of The Mesnevi, Book the First (London, 1881 ; Triibner's Oriental series). Complete editions have been printed in Bombay, Lucknow, Tabriz, Constantinople, and in Bulak (with a Turkish transla- tion, 1268 A.H.), at the end of whieh a seventh daftar is added, the genuineness of which is refuted by a remark of Jalal-uddin himself in one of the Bodleian copies of the poem, Ouseley, 294 (f. 828a sqg.). The revised edition by 'Abd-ullatif (made between 1024 and 1032 a.H.) is still unpublished, but the same author's eommentary on the Mathnawt, Latd'if-ulma'nawwt, and his glossary, Latd@'if-allughdt, have been lithographed in Cawnpore (1876) and Lueknow (1877) respectively, the latter under the title Farhang- i-mathnawt. For the other numerous eommentaries and for further biographical and literary particulars of Jalal-uddin see Rieu's Cat. of the Persian MSS. of the Brit. Mus., vol. ii. p. 584 sg.3 A. Sprenger's Oudh Cat., p. 489; Sir Gore Ouseley, Nottees of Persian Poets, p. 112 sq.; and H. Ethé, in Morgenldndische Studien, Leipsie, 1870, p. 95 sg. Seleet poems from Jaldl-uddin's diwan (often styled Diwdn-i-Shams-i-Tabriz) have been translated in German verse by V. von Rosenzweig, Vienna, 1838. (H. E.)

RUMINANTS. See Mamata, vol. xv. p. 431.

RUMKER, Cart Lupwie Curistian (1788-1862), German astronomer, was born in Mecklenburg on May 28, 1788. He served in the British navy for some years until 1817 ; in 1821 he went to New South Wales as astronomer

at the observatory built at Parramatta by Sir Thomas Brisbane (see OBSERVATORY, vol. xvii. p. 716). He re- turned to Europe in 1831, and took charge of the school of navigation at Hamburg and the observatory attached to it. His principal work is a Catalogue of 12,000 fixed stars from meridian observations made at Hamburg, published in 1843. In 1857 he retired and went to reside in Lisbon, where he died on December 21, 1862.

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RUNCIMAN, Atexanper (1736-1785), historical painter, was born in Edinburgh in 1736. He studied at the Foulis's Academy, Glasgow, and at the age of thirty proceeded to Rome where he spent five years. It was at this time that he became acquainted with Fuseli, a kindred spirit, between whose productions and those of Runciman there is a marked similarity. The painter's earliest efforts had been in landscape; "other artists," it was said of him, "talked meat and drink, but he talked landscape." He soon, however, turned to historical and imaginative subjects, exhibiting his Nausicaa at Play with her Maidens in 1767 at the Free Society of British Artists, Edinburgh. On his return from Italy, after a brief residence in London, where in 1772 he exhibited in the Royal Academy, he settled in Edinburgh, and was appointed master of the Trustees' Academy. He was patronized by Sir James Clerk, whose hall at Penicuik House he decorated with a series of subjects from Ossian. He also executed various religious paintings and an altarpiece in the Cowgate Episcopal Church, Edinburgh, and easel pictures of Cymon and Iphigenia, Sigismunda Weeping over the Heart of Tancred, and Agrippina Landing with the Ashes of Germanicus. He died in Edinburgh on October 4, 1785. His works, while they show high intention and considerable imagination, are frequently defective in form and extravagant in gesture.

RUNCIMAN, Joun (1744-1766), historical painter, a younger brother of the above, accompanied him to Rome, and died at Naples in 1766. He was an artist of great promise. His Flight into Egypt, in the National Gallery of Scotland, is remarkable for the precision of its execution and the mellow richness of its colouring.

RUNCORN, a market-town and seaport of Cheshire, is pleasantly situated on the south side of the Mersey and near the terminus in that river of the

Bridgewater, the Mersey and Irwell, and the Trent and Mersey Canals, 15 miles §.E. of Liverpool and 15 N.E. of Chester. The Mersey, which here contracts to 400 yards at high water, is crossed by a wrought-iron railway bridge 1500 feet in length. The modern prosperity of the town dates from the completion in 1773 of the Bridgewater Canal, which here descends into the Mersey by a succession of locks. The town was made an independent landing port in 1847, and within recent years large additions have been made to the docks and warehouses. The town possesses ship- building yards, iron foundries, rope works, tanneries, and soap and alkali works. The population of the urban sani- tary district (area 1490 acres) in 1871 was 12,443, and in 1881 it was 15,126.

Owing to the Mersey being here fordable at low water, the place was in early times of considerable military importance. On a rock which formerly jutted some distance farther into the Mersey Ethelfleda erected a castle in 916, but of the building there are now no remains. She is also said to have founded a town, but probably it soon afterwards fell into decay, as it is not noticed in Domesday. The ferry is noticed in a charter in the 12th century.

RUNE. See Atpuaset, vol. i. pp. 607, 612, and SCANDINAVIAN LANGUAGES.

RUNEBERG, Jouan Lupwie (1804-1877), Swedish poet, was born at Jakobstad, in Finland, on the 5th of February 1804. Brought up by an uncle at Uleaborg, he entered the university of Abo in the autumn term of 1822, and in 1826 began to contribute verses to the local news- papers. In the spring of 1827 he received the degree of doctor of philosophy, and shared in the calamity which, in September of the same year, destroyed the city and uni- versity of Abo with fire. Runeberg accepted a tutorship at Saarijairvi, in the interior of Finland, where he remained for three years, studying hard and writing actively. The university had been removed after the great fire to Hel- singfors, and in 1830 the young poct returned thither, as

amanuensis to the council of the university. In the same year he published his first volume of Dikter (Poems), anda collection of Servian folksongs translated into Swedish. In 1831 his verse romance Grafven « Perrho (The Grave in Perrho) received the small gold medal of the Swedish Academy, and the poet married the daughter of Dr Teng- strom, archbishop of Finland. For a tractate on the Medea of Euripides he was in the same year appointed university lecturer on Roman literature. In 1832 he leaped at one bound to the foremost place among Swedish poets with his beautiful little epic Elgskyttarne (The Elk-Hunters) ; and in 1833 he published a second collection of lyrical poems. His comedy Friaren frén Landet (The Country Lover) was not a success in 1834. He returned to more characteristic fields in 1836, when he published the charming idyl in hexameters called Janna. In 1837 Runeberg accepted the chair of Latin at Borg& College, and resided in that little town for the rest of his life.

From Borgaé he continued to pour forth volumes of verse, and he was now recognized in his remote Finland retirement as second only to Tegnér among the poets of Sweden. In 1841 he published Wadeschda, a romance of Russian life, and Jedqudllen (Christmas Eve), an idyl. The third volume of his lyrical pieces bears the date 1843, and the noble cycle of unrhymed verse romances called Kung Rjalar was published in 1844, Finally, in 1848, he achieved a great popular success by his splendid series of poems about the war of independence in 1808, a series which bears the name of Ménrik Stals Stgner (Ensign Steel’s Stories); a second series of these appeared in 1860. From 1847 to 1850 the poet was rector of Borg’ College, a post which he laid down to take the only journey out of Finland which he ever accomplished, a visit to Sweden in 1851. His later writings may be briefly mentioned. In 1853 he collected his prose essays into a volume entitled Smdrre Berdittelser. In the same year he was made president of a committee for the preparation of a national Psalter, which issued, in 1857, a Psalm-Book largely contributed by Runeberg for public use. He once more attempted comedy in his Kan e¢ (Can’t) in 1862, and tragedy, with infinitely more success, in his stately Kungarne pa Salamis (The Kings at Salamis) in 1863. He collected his writings in six volumes in 1873-74, Runeberg died at Borga on the 6th of May 1877.

The poems of Runeberg show the influence of the Greeks and of Goethe upon his mind ; but he possesses a great originality. In an age of convcntionality he was boldly realistic, yet never to the sacrifice of artistic beauty. Less known to the rest of Europe than Tegnér, he yet is now generally considered to excel him asa poet, and to mark the highest attainment hitherto reached by imaginative literature in Sweden.

The life of Johan Ludvig Runeberg has not yet been written in detail, although it is said to be in preparation. The fullest aceount of his life and works is that whieh forms the introduction to the Samlade Skrifter of 1873. It was written by Prof. Nyblom. A minute critieism of Runeberg's prineipal poems, with translations, oeeupies pp. 98-133 of Gosse's Studies in the Literature of Northern

Europe, 1879. A selection of his lyrical pieees was published in an English translation by Messrs Magnusson and Palmer in 1878.

RUNNING. In this mode of progression the step is lighter and gait more rapid than in walking, from which it differs in consisting of a succession of springs from toe to toe, instead of a series of steps from toe to heel. As an athletic exercise, it has been in vogue from the earliest times, and the simple foot race, dpéqos, run straight from starting point to goal, was'a game of the Greek pent- athlon. It was diversified with the diavAodpspos, in which a distance mark was rounded and the starting and winning points were the same, and also by the Spduos SaArray, which might be compared to the modern heavy marching order race. In ancient Italy running was practised in circus exhibitions, as described by Virgil (dn. v. 286 sq.). In modern times it has been developed almost into a science by the Anglo-Saxon race in Great Britain and North America, till the distances recently covered appear almost

fabulous compared with the performances up to the end of the first half of the century. In all kinds of run- ning the entire weight of the body is thrown on the toes, from which light strides are taken with all possible free- dom of action from the hips. At starting the feet are placed about a foot apart, the body being inclined slightly forward, with the weight of it on the right or

hindermost foot. A bent double position with the feet wide apart is on no account advisable. The start cannot be made too quickly on the signal being given. Two or three short steps are taken to get fairly into stride, after which the runner should look straight before him, set his eyes steadfastly on the goal, and run towards it at his longest and quickest stride, care being taken not to swerve or get out of stride.

Running is usually thns classified :—(1) sprinting includes all distances up to 400 yards ; (2) medium distances range from one quarter to three qnarters of a mile; (3) long distances are those | of one mile and upwards. The first-named is the most popular, and is much practised in the north of England, especially at Sheffield, which may be termed the home of sprint running. It is less fatiguing than long distances and requires less arduous training, while strength to a certain extent replaces wind. A great point in sprinting is to obtain a good start, for which purpose incessant pmctice is required. A first-class sprinter when at full speed will clear from 8 to 9 feet in each stride, and his toes leave the ground with inconceivable rapidity. When in good condition he will run 100 yards at top speed in one breath, and probably 150 yards with- out drawing a second one. The quickest authenticated times in which short distances have been run on perfectly level ground are as follows:—120 yards, 11} sec.; 150 yards, 15 sec.; 200 yards, 194 sec.; 300 yards, 30 sec.; and 400 yards, 43% sec.

Of medium distances the qnarter mile race is by far the most difficult to run, as a combination of speed and endurance is requi- site. In facta runner shonld be able to sprint the whole way. Six hundred yards and half a mile are the other chief distances in this class of running. ‘he stride is slower than in sprinting, and a – man cannot maintain the same speed throughout as is possible up to 800 yards. ‘The best authenticated times are—quarter mile, 484 sec.; 600 yards, 1 min. 113 sec. ; half mile, 1 min. 584 sec.; 1000 yards, 2 min. 18 sec. ; three quarter mile, 8 min. 7 sec.

Light wiry men are best fitted for long-distance running, where stamina and wind are more useful than speed. The strides must be long and light. After some miles a runner is unable to keep the weight of the body on his toes any longer owing to fatigue, puts his heels down, and runs flat-footed. The times accomplished of late years by long-distance runners are most

remarkable. Those for the chief distances are as follows :—1 mile, 4 min. 16% sec. ; 2 miles, 9 min. 114 sec.; 8 miles, 14 min. 86 sec.; 4 miles, 19 min. 36 sec. ; 5 miles, 24 min. 40 sec. ; 10 miles, 51 min. 63 sec. ; 20 miles, 1 h. 56 min. 38 sec.; 30 miles, 3 h. 15 min. 9 sec. 5 40 miles, 4 h. 84 min. 27 sec. ; 50 miles, 6 h. 8 min.; 100 miles, 13 h. 26 min. 30 sec. ; 200 miles, 35 h. 9 min. 28 sec. ; 300 miles, 58 h. 17 min. 6 sec. ; 400 miles, 85 h. 52 min.; 500 miles, 109 Ihe 18 min. 20 sec.; 600 miles, 187 h. 25 min. 10 sec. ; 610 miles, 140 h. 34 min. 10 sec.

Nearly all running contests now take place on prepared cinder paths, which from their springiness assist speed considerably. A runner's dress should be as light as possible, and consist merely of a thin jersey, a pair of drawers covering the waist and loins and extending downwards to the top of the knee caps, and heelless run- ning shoes with a few short spikes in the soles just under the tread of the foot. The spikes are longer for sprinting. Chamois leather socks for the toes and ball of the foot may be added, since they diminish concussion as each foot reaches the ground. Since the introduction of ATHLETIC Sports (see vol. iii. p. 12) into England and America commenced in 1860 the popularity of amateur run- ning races has vastly increased. These contests are governed by the rules of the Amateur Athletic Association. At Sheffield a code of rules has been drawn up for the regulation of the more important professional handicaps.

RUPERT (Hropserr), St, a kinsman of the Merovingian house, and bishop of Worms, was invited (696) to Regens- burg (Ratisbon) by Theodo of Bavaria, but finally settled in Salzburg, the bishopric of which was his foundation. He is regarded as the apostle of the Bavarians, not that the land was up to that time altogether heathen, but because of his services in the promotion and consolidation of its Christianity.

The Gesta Sancti Hrodberti Confessoris have been printed in the Archiv fiir Oesterreich. Geschichte, 1882, from a 10th-century MS.

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RUPERT (1619-1682), prince of Bavaria, the third son of Frederick V., elector palatine and king of Bohemia, and of Elizabeth, sister of Charles I. of England, was born at Prague on December 18, 1619. In 1630 he was

placed at the university of Leyden, where he showed particular readiness in languages and in military discipline. In 1653 he was with the prince of Orange at the siege of Rhyn- berg, and served against the Spaniards as a volunteer in the prince's life-guard. In December 1635 he was at the English court, and was named as leader of the proposed expedition to Madagascar. In 1636 he visited Oxford, when he was made master of arts. Returning to The Hague in 1638, he made the first display of his reckless bravery at the siege of Breda, and shortly afterwards was taken prisoner by the Austrians in the battle before Lemgo. For three years he was confined at Linz, where he withstood the endeavours made to induce him to change his religion and to take service with the emperor. Upon his release in 1642 he returned to The Hague, and from thence went to Dover, but, the Civil War not having yet begun, he returned immediately to Holland. Charles now named Rupert general of the horse, and he joined the king at Leicester in August 1642, being present at the raising of the standard at Nottingham. He was also made a knight of the Garter. It is particularly to be noticed that he brought with him several military inven- tions, and, especially, introduced the " German discipline" in his cavalry operations. He at once displayed the most astonishing activity, fought his first action with success at Worcester in September, and was at Edgehill on October 23. At Aylesbury and Windsor, on the march to London, he received severe checks, but after desperate fighting took Brentford. In 1643 he captured Ciren- cester, but failed before Gloucester, and in February issued his declaration denying the various charges of inhumanity which had been brought against him. At the end of March he set out from Oxford to join the queen at York, took Birmingham, and, after a desperate resistance, Lichfield, but was there suddenly recalled to the court at Oxford to meet Essex's expected attack. Chalgrove fight, at which during one of his incessant raids he met Hampden, was fought on June 18. On July 11 he joined the queen at Stratford-on-Avon, and escorted her to the king at Edgehill. He then began the siege of Bristol, which he took on July 26, and he took part in the futile attempt on Gloucester, where he failed to repulse Essex's relieving force. In the skirmish previous to the first battle of Newbury he checked the enemy's advance, and in the battle itself displayed desperate courage, following up the day's work by a night attack on the retiring army. In the beginning of 1644 he was rewarded by being made earl of Holderness, duke of Cumberland, and president of Wales. In February he was at Shrewsbury,

from whence he administered the affairs of Wales; in March he went to relieve Newark, and was back at Shrewsbury by the end of the month. He then marched north, relieving Lathom and taking Bolton, and finally relieving York in July. At Marston Moor he charged and routed the Scots, but was in turn completely beaten by Crom- well's Ironsides. He escaped to York, and thence to Richmond, and finally by great skill reached Shrewsbury on July 20. On November 21 he was repulsed at Abing- don, and on 23d he entered Oxford with Charles. He had meanwhile been made generalissimo of the armies and master of the horse. Against him, however, was a large party of courtiers, with Digby at their head. The in- fluence of the queen, too, was uniformly exerted against him. In May 1645 he took Newark by storm. His advice to march northwards was overruled, and on June 14 the experiences of Marston Moor were repeated at

Naseby. Rupert fled to Bristol, whence he counselled the king to come to terms with the parliament. In his con- duct of the defence of the town, this "boldest attaquer in the world for personal courage" showed how much he "wanted the patience and seasoned head to consult and advise for defence" (Pepys). His surrender of the town after only a three weeks' siege, though he had promised Charles to keep it four months, caused his disgrace with the king, who revoked all his commissions by an order dated September 14, and in a cold letter ordered him to seek his subsistence beyond seas, for which purpose a pass was sent him. Rupert, however, broke through the enemy, reached the king at Oxford, and was there reconciled to him. He challenged an investigation of his conduct, and was triumphantly acquitted by the council of war. He appears, too, to have remonstrated personally with Charles in terms of indecent violence. He then applied to the parliament for a pass. This, however, was offered only on unacceptable conditions. On June 24 Rupert was taken prisoner by Fairfax at Oxford, and on July 5, at the demand of the parliament, sailed from Dover for France. He was immediately made a marshal in the French service, with the command of the English there. He received a wound in the head at Armentidres during 1647. The greater part of the English fleet having adhered to Charles, and having sailed to Holland, Rupert went with the prince of Wales to The Hague, where the charge of it was put into his hand. He immediately set out

in January 1649 upon an expedition of organized piracy. In February, after passing without molestation through the Parliamentary ships, he was at Kinsale, of which he took the fort. He relieved John Grenville at the Scilly Isles, and practically crippled the English trade. Attacked by Blake, he sailed to Portugal, and was received with kindness by the king; Blake, however, blockaded him in the Tagus, and demanded his surrender. Rupert broke through the blockade and sailed to che Mediter- ranean, landing at Barbary, and refitting at Toulon; thence he proceeded to Madeira, the Canaries (in 1652), the

Azores, Cape de Verd, and the West Indies, sweeping the |

ocean between the latter places for a considerable time. Finding it impossible, however, to escape the indefatigable pursuit of Blake, he returned to France in 1653. He was now invited to Paris by Louis XIV., who made him master of the horse; he had also an offer from the emperor to command his forces. He travelled for some while, and was again in Paris in 1655. His movements, however, at this time are very uncertain, but he appears to have devoted his enforced leisure to engraving, chemistry, the perfection of gunpowder, and other arts, especially those of military science. Whether he was the actual discoverer of mezzotinto engraving, in which he was skilful, is un- certain, but this seems probable.

At the end of September 1660 Rupert returned to England ; he was abroad during 1661, was placed on the privy council in April 1662, and in October was one of the commissioners for Tangiers; in December he became a member of the Royal Society. In August 1664 he was appointed to command the Guinea fleet against the Dutch, and set sail in October. On June 5, 1665, he gained with Monk a great victory over the Dutch, and on his return had his portrait painted by Lely along with the other admirals present at the battle. He again put to sea in May 1666, to hinder the junction of the Dutch and French, and returned in the beginning of June after a heavy defeat, his ship having stuck on the Galloper Sands during the fight. He was obliged to justify himself before the council. In January 1667 he was very ill, but recovered after the operation of trepanning. At this time he is mentioned as one of the best tennis players in the

nation. On October 22, 1667, he received with Monk the thanks of the House of Commons for his exertions against the Dutch at Chatham, and he was again at sea in April 1668. He was always staunch in his Pro. testant principles, and was carefully kept in ignorance of Charles's Catholic plot in 1670. In August of that year he was constable of Windsor, and busied himself with the fitting up of the Round Tower, a turret of which he converted into a workshop. He shared in the prevail- ing immorality of the time, his favourite mistress being the celebrated actress, Mrs Hughes. In 1673 he was appointed lord high admiral, and fought two battles with the Dutch Fleet on May 28 and August 11, but could do little through the backwardness of the French in coming to his assistance. This appears to have so annoyed him that he henceforward eagerly helped the anti-French party. He was an active member of the Board of Trade, and governor of the Hudson's Bay Company. Till his death, on November 29, 1682, he lived in complete retirement at Windsor. (0. A.)

RUPERT'S LAND. See Hupson's Bay Company and Norru-West Terrrrory.

RUPTURE. See Hernza.

RUSH. Under the name of rush or rushes, the stalks or fistular stem-like leaves of several plants have minor industrial applications. The common rushes (species of Juncus) are used in many parts of the world for chair-bottoms, mats, and basket work, and the pith they ; contain serves as wicks in open oil-lamps and for tallow- candles,—whence rushlight. The bulrush, Zypha elephan- tina, is used in Sindh for mats and baskets. Under the name of rushes, species of Scirpus and other Cyperacee are used for chair-bottoms, mats, and thatch. The elegant rush mats of Madras are made from Papyrus pangorei. The sweet rush, yielding essential oil, is Andropogon Scheenanthus, known also as lemon grass. Large quantities of the "horse tail," Equisetum liemale, are used under the name of the Dutch or scouring rush, for scouring metal and other hard surfaces on account of the large proportion of silica the plant contains.

RUSH, Bensamin (17 45-1813), the Sydenham of America, was born near Bristol (12 miles from Phila- delphia), on a homestead founded by his grandfather, who had followed Penn from England in 1683, being of the Quaker persuasion, and a gunsmith by trade. After a careful education at

school and college, and an appren- ticeship of six years with a doctor in Philadelphia, Rush went for two years to Edinburgh, where he attached himself chiefly to Cullen. He took his M.D. degree there in 1768, spent a year more in the hospitals of London and Paris, and began practice in Philadelphia at the age of twenty-four, undertaking at the same time the chemistry class at the new medical school. He at once became a leading spirit in the political and * social movements of the day. He was a friend of Franklin's, a member of Congress for the State of Pennsylvania in 1776, and one of those who signed the Declaration of Independence the same year. He had already written on the Test Laws, "Sermons to the Rich," and on Negro Slavery, having taken up the last-named subjectiat the instance of Anthony Benezet, whose Historical Account of Guinea was the inspiration of Clarkson's celebrated college essay twelve years after. In 1774 he started along with James Pemberton the first anti-slavery society in America, and was its secretary for many years. When the political crisis ended in 1787 with the convention for drawing up a federal constitution, of which he was a member, he retired from public life, and gave himself up wholly to medical practice. In 1789 he exchanged his chemistry lectureship for that of the theory and practice of physic;

and when the medical college, which he had helped to found, was absorbed by the university of Pennsylvania in 1791 he became professor of the institutes of medicine and of clinical practice, succeeding in 1805 to the chair of the theory and practice of physic. He was the central figure in the medical world of Philadelphia, as Cullen was at Edinburgh and Boerhaave at Leyden. Much of his influence and success was due to his method and regularity of life on the Franklin model. During the thirty years that he attended the Pennsylvania Hospital as physician, | he is said to have never missed his daily visit and never to have been more than ten minutes late. Notwithstanding | a weak chest, which troubled him the greater part of his life, he got through an enormous amount of work, literary | and other ; he was a systematic early riser, and his leisure) at the end of the day was spent in reading poetry, history, the moral sciences, and the like, with his pen always in his hand. His temperament was of the gentle sort, and his conversation and correspondence abounding in ideas. It is stated by his

friend Dr Hosack of New York, that Rush | was successively a Quaker, an Anabaptist, a Presbyterian, and an Anglican. He gained great credit when the) yellow fever devastated Philadelphia, in 1793, by his | assiduity in visiting the sick (as many as one hundred and | twenty in a day), and by his bold and apparently success- ful treatment of the disease by bloodletting. When he began to prosper in practice, he gave a seventh part of his income in charity. He died in 1813, after a five days' illness from typhus fever. Nine out of a family of thirteen children survived him, all prosperously settled.

Rush's writings eover an immense range of subjects, including langnage, the study of Latin and Greek, the moral faculty, capital punishment, medicine among the American Indians, – maple sugar, the blackness of the negro, the cause of animal life, tobaceo smoking, spirit drinking, as well as a long list of more strietly professional topics. His last work was an elaborate treatise on the Diseases of the Mind (1812). Heis best known now by the five volumes of Medical Inquiries and Observations, which he brought out at intervals from 1789 to 1798 (two later editions revised by the author). Epidemiology, and yellow fever in parti- cular, was the subject on which he wrote to most purpose. His treatment of yellow fever by bloodletting helped more than any- thing else to make him famous, although the practice would now | be condemned. His views as to the origin and diffusion of yellow ' fever have a more permanent interest. He stoutly maintained, as

against the doctrine of importation from the West Indies, that the | yellow fever of Philadelphia was generated on the spot by noxious | exhalations, although he does not appear to have suspected that | there was something special or specific in the filthy conditions of soil or harbour mud which gave rise to the miasmata. For a number of years he expressed the opinion that yellow fever might become catching from person to person, under ccrtain aggravated circumstances ; but in the end he professed the doctrine of absolute non-eontagiousness. He bceame well known in Europe as an anthority on the epidemics of fever, and was elcctcd an honorary member of several foreign socicties.

See eulogy by Hosaek (Zssays, i., New York, 1824), with biographical details taken from a letter of Rush to President John Adams; also referenees

in the works of Thacker, Gross, and Bowditch on the history of medicine in America. lis part in the yellow fever controversies is indicated by La Roche (Yellow Fever in Philadelphia from 1699 to 1854, 2 vols., Philadelphia, 1855) and by Bancroft (Essay on the Yellow Fever, London, 1811). His serviees as an aboli- a are recorded in Clarkson's History of the Abolition of the African

ave Trade,

RUSHWORTH, Joun (c. 1607-1690), the compiler of the Historical Collections commonly described by his name, | was born in Northumberland about the year 1607. After | @ period of study at Oxford, but not, it appears, as a | member of the university, he came to London, was entered | at Lincoln's Inn, and was in due course called to the bar. | As early as 1630 he seems to have commenced attendance at the courts, especially the Star Chamber and the | Exchequer Chamber, not for the purpose of practising his | profession, but in order that he might observe and record _ the more remarkable of their proceedings. On the meeting | of the Long Parliament in 1640 he was appointed assistant clerk to the House of Commons, and was in the habit of

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making short-hand notes of the speeches he heard de- livered in debate. He himself states that it was from his report that the words used by Charles I. during his memorable attempt to seize the 'five members" were printed for public distribution under the king's orders. Being an expert horseman, it seems that Rushworth was frequently employed by the House as their messenger as well as in the capacity of clerk. When the king left London, and while the earl of Essex was general, he was often the bearer of communications from the parliament to one or the other of them. In 1645 Sir Thomas Fairfax, to whom he was distantly related, and who was then in command of the Parliamentary forces, made him his secretary, and he reniained with the army almost continuously until 1650. In 1649 he was at Oxford, and the degree of master of arts was conferred on him by the university. In 1652 he was nominated one of the commissioners for the reform of the common law, and in 1658 he was elected member for Berwick in the parliament of the commonwealth. Almost immediately before the

Restoration he published the first volume of his Historical Collections, which had been sub- mitted in manuscript to Oliver Cromwell, with a very laudatory dedication to Richard Cromwell, then Lord Protector. But the turn of events induced hin to with- draw this dedication, and he subsequently endeavoured without success to conciliate Charles II. by presenting him with some of the registers of the privy council which had come into his possession. In the convention of 1660, which recalled the king, he sat again as member for Berwick. In 1677 he was made secretary to Sir Orlando Bridgeman, then lord keeper, and he was returned for Berwick a third and a fourth time to the parliaments of 1679 and 1681. Soon after this he appears to have fallen into straitened circumstances. In 1684 he was arrested for debt, and cast into the King's Bench prison, where he died, after lingering for some time in a condition of mental infirmity, the result of excessive drinking, in 1690. Rushworth's Historical Collections of Private Passages of State, Weighty Matters in Law, and Remarkable Proceedings in Parlia- ment was reprinted in eight folio volumes in 1721. The eighth volume of this edition is an account of the trial of the carl of Strafford, the other scven volumes being coneerned with the miscellaneous transactions of the period from 1618 to 1648. Only the first three volumes and the trial of Strafford were originally published in Rushworth's lifetime; but the manuscript of the other volumes was left by him ready for the press. The extreme value of the work is well known to all inquirers into the history of the Civil War, and much of the information it contains is to be found nowhere else. Its impartiality, however, can hardly be

seriously maintained, and hence it is necessary to consult it with some caution.

RUSSELL, Jonn Russert, Earn (1792-1878), a statesman who for nearly half a century faithfully repre- sented the traditions of Whig politics, was the third son of John, sixth duke of Bedford, and was born in Hertford Street, Mayfair, London, 18th August 1792, one of the most terrible months in the annals of the French Revolu- tion. Whilst still a child he was sent to a private school at Sunbury, and for a short time he was at Westminster School. Long and severe illness led to his being placed, with many other young men sprung from Whig parents, with a private tutor at Woodnesborough in Kent. Following in the footsteps of Lord Henry Petty,

Brougham, and Horner, he went to the university of Edinburgh, then the academic centre of Liberalism, and dwelt in the house of Prof. Playfair, whom he afterwards described as “one of the best and noblest, the most upright, the most bene- volent, and the most liberal of all philosophers.” On leaving the university, he determined upon taking a foreign tour, and, as the greater part of Europe was overrun by French troops, he landed at Lisbon with the intention of exploring the countries of Portugal and Spain. Lord John

Russell had previously arrived at the conclusion that the continuance of the war with France was necessary for the restoration of the peace of Europe, and his convictions were deepened by the experience of travel. On the 4th May 1813, ere he was of age, he was returned for the ducal borough of Tavistock, and in this he resembled Lord Chesterfield and other aristocratic legislators, who were entrusted with the duty of law-making before they had arrived at years of discretion. After the battle of Water- loo the Whig representatives in parliament concentrated their efforts in promoting financial reform, and in resisting those arbitrary settlements of the Continental countries which found favour in the eyes of Metternich and Castle- reagh. In foreign politics Lord John Russell’s oratorical talents were especially shown in his struggles to prevent the union of Norway and Sweden, In domestic questions he cast in his lot with those who opposed the repressive measures of 1817, and protested that the causes of the discontent at home should be removed by remedial legisla- tion. When failure attended all his efforts he resigned his seat for Tavistock, and meditated permanent withdrawal from public life, but was dissuaded from this step by the arguments of his friends, and especially by a poetic appeal from Tom Moore. In the parliament of 1818~20 he again represented the family borough in Devon, and in May 1819 began his long advocacy of parliamentary reform by moving for an inquiry into the corruption which prevailed in the Cornish constituency of Grampound. During the first parliament (1820-26) of George IV. the county of Huntingdon accepted Lord John Russell’s services as its representative, and it was his good fortune to secure in 1821 the disfranchisement of Grampound, but his satis- faction at this triumph was diminished by the fact that the seats were not

transferred to the constituency which he desired. This was the sole parliamentary victory which the advocates of a reform of the representation obtained before 1832, but they found cause for congratulation in other triumphs. Lord John Russell paid the penalty for his advocacy of Catholic emancipation with the loss in 1826 of his seat for Huntingdon county, but he found a shelter in the Irish borough of Bandon Bridge. He led the attack against the Test Acts by carrying in February 1828 with a majority of forty-four a motion for a committee to inquire into their operations, and after this decisive victory they were repealed. He warmly supported the Wellington ministry when it realized that the king's government could only be carried on by the passing of a Catholic Relief Act. For the greater part of the short-lived parliament of 1830-31 he served his old constituency of Tavistock, having been beaten in a contest for Bedford county at the general election by one vote; and, when Lord Grey's Reform ministry was formed, Lord John Russell accepted the office of payniaster-general, though, strange to say, he was not admitted into the sacred precincts of the cabinet. This exclusion from the official hierarchy was rendered the more remarkable by the circumstance that he was selected (1st March 1831) to explain the provisions of the Reform Bill, to which the cabinet had given its formal sanction. The Whig ministry were soon met by defeat, but an appeal to the country increased the number of their adherents, and Lord John Russell himself had the satisfaction of being chosen by the freeholders of Devon as their member. After many a period of doubt and defeat, "the bill, the whole bill, and nothing but the bill" passed into law, and Lord John stood forth in the mind of the people as its champion. Although it was not till some years later that he became the leader of the Liberal party, the height of his fame was attained in 1832. After the passing of the Reform Bill he sat for the southern division of Devon, and continued to retain

the place of paymaster-general in the ministries of Lord Grey and Lord Melbourne. The former of these cabinets was broken up by the withdrawal of Mr Stanley, after. wards Lord Derby, on the proposal for reforming the Irish Church, when he emphasized Lord John Russell's part in the movements by the saying "' Johnny 's upset the coach a the latter was abruptly, if not rudely, dismissed by William IV. when the death of Lord

Spencer promoted the leader of the House of Commons, Lord Althorp, to the peerage, and Lord John Russell was proposed as the spokesman of the ministry in the Commons. At the general election which ensued the Tories received a considerable accession of strength, but not sufficient to ensure their continuance in office, and the adoption by the House of Commons of the proposition of the Whig leader, that the surplus funds of the Irish Church should be applied to general education, necessitated the resignation of Sir Robert Peel's ministry, In Lord Melbourne's new administration Lord John Russell became home secretary and leader of the House of Commons, but on his seeking a renewal of confidence from the electors of South Devon, he was defeated and driven to Stroud. Although the course of the Whig ministry was not attended by uniform prosperity, it succeeded in passing a Municipal Reform Bill, and in carrying 4 settle. ment of the tithe question in England and Ireland. At the close of its career the troubles in Canada threatened a severance of that dependency from the home country, whereupon Lord Johu Russell, with a courage which never deserted him, took charge of the department, at that time a dual department, of war and the colonies. In May 1839, on an adverse motion concerning the administration of Jamaica, the ministry was left with a majority of five only, and promptly resigned the seals of office. Sir Robert Peel's attempt to form a ministry was, however, frustrated by the refusal of the queen to dismiss the ladies of the bedchamber, and the Whigs resumed their places. Their prospects brightened when Sir John Yarde Buller's motion of "no confidence" was defeated by twenty-one, but the glimpse of sunlight soon faded, and a similar vote was some months later carried by a majority of one, whereupon the Whig leader announced a dissolution of parliament (1841). At the polling booth his friends were smitten hip and thigh ; the return of Lord John Russell for the City of London was almost their solitary triumph. On Sir Robert Peel's resignation (1846) the task of forming an administra- tion was entrusted to Lord John Russell, and he remained at the head of affairs from 1846 to 1852, but his tenure of office was not marked by any great legislative enactments. His celebrated Durham letter on the threatened assump- tion of ecclesiastical titles by the Roman Catholic bishops weakened the attachment of the "'Peelites" and alienated his Irish supporters. The impotence of their opponents, rather than the strength of their friends, kept the Whig ministry in power, and, although beaten by a majority of nearly two to one on Mr Locke King's County Franchise Bill in

February 1851, it could not divest itself of office. Lord Palmerston’s unauthorized recognition of the French coup Wétat was followed by his dismissal, but he had his revenge in the ejectment of his old colleagues a few months later. During Lord Aberdeen’s administration Lord John Russell led the Lower House, at first as foreign secretary, then without portfolio, and lastly as_presi- dent of the council. In 1854 he brought in a Reform Bill, but in consequence of the war with Russia the bill was allowed, much to its author’s mortification, to drop. His popularity was diminished by this failure, and although he resigned in January 1855, on Mr Roebuck’s Crimea motion, he did not regain his old position in the country. At the Vienna conference (1855) Lord John Russell was England’s representative, and immediately on his returi

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| they earried him to the highest places in the state.

| 9th January 1876.

) of the infamous countess of Somerset, was born September

that about 1654 he was sent to Cambridge with his elder brother Francis. | brothers travelled abroad, visiting Lyons and Geneva, and residing for some while at Augsburg. His account of his

in 1658, but had returned to Woburn in December 1659.

forced him to retire. “stormy petrel ” of politics. ‘in defeating Lord Palmerston in 1857. on the Tory Reform Bill of 1859.

Lord Palmerston’s ministry, and to accept an earldom.

the North restrained his country from embarking in the contest, but he was not equally successful in his desire to prevent the spoliation of Denmark. On Lord Palmerston’s death (October 1865) Earl Russell was once more sum- moned to form a cabinet, but the defeat of his ministry Jin the following June on the Reform Bill which they had introduced was followed by his retirement from public life. His leisure hours were spent after this

event in the preparation of numberless letters and speeches, and in the composition of his Lecollections and Suggestions, but every-

‘thing he wrote was marked by the belief that all philo-

sophy, political or social, was summed up in the Whig creed

| of fifty years previously. Earl Russell died at Pembroke | Lodge, Richmond Park, 28th May 1878.

For more than half a century Earl Russell lived in the exeitement of political life. He participated in the troubles of Whiggism before 1832, and shared in its triumph after that event. He expounded the prineiples of the first Reform Bill and lived to see a seeond earried into law by the Conservative ministry of Lord Derby. Un- limited confidence in his own resourees exposed him to many jests from both friend and foe, but he rightly estimated his powers, and His tragedies and his essays are forgotten, but his works on Fox are among the ehief authorities on Whig polities. Earl Russell was twice married, —first, in 1835, to Adelaide, daughter of Mr Thomas Lister, and ‘widow of Thomas, second Lord Ribblesdale, and seeondly, in 1841,

By the former he had two daughters, by the latter three sons and one daughter. His eldest son, Lord Amberley, predeceased him (Ww. BP. C.)

RUSSELL, Witi1am Russet, Lorp (1639-1683), the third son of Lord Russell, afterwards fifth earl and still later first duke of Bedford, and Lady Anne Carr, daughter

29, 1639. Nothing is known of his early youth, except

On leaving the university, the two

impressions is spirited and interesting. He was at Paris

At the Restoration he was elected for the family borough of Tavistock. For a long while he appears to have taken no part in public affairs, but rather to have indulged in the follies of court life and intrigue ; for both in 1663 and 1664 he was engaged in duels, in the latter of which he was wounded. In

1669 he married the second daughter of the earl of Southampton, the widow of Lord Vaughan, thus becoming connected with Shaftesbury, who had married Southampton's niece. With his wife Russell always lived on terms of the greatest affection and confidence. _ It was not until the formation of the "country party," in opposition to the policy of the Cabal and Charles's French-Catholic plots, that Russell began to take an active part in affairs. He then joined Cavendish, Birch, Hamp- den, Powell, Lyttleton, and others in vehement antagonism to the court. With a passionate hatred and distrust of the Catholics, and an intense love of political liberty, he united the desire for ease to Protestant Dissenters. His first speech appears to have been on January 22, 1673, in which he inveighed against the stop of the exchequer, the attack on the Smyrna fleet, the corruption of courtiers with French money, and "the ill ministers about the king."

Ke soe. ih 1 a

he became secretary of the colonies; but the errors in his negotiations at the Austrian capital followed him and For some years after this he was the He was the chief instrument He led the attack A reconciliation was then cffected between the rival Whig leaders, and Lord 'John Russell consented to become foreign secretary in

| During the American War Earl Russell's sympathies with

to Lady Franees Ann Maria, daughter of the second earl of Minto. —

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He also supported the proceedings against the duke of Buckingham. In 1675 he moved an address to the king for the removal of Danby from the royal councils, and for his impeachment. On February 15, 1677, in the debate on the fifteen months' prorogation, he moved the dissolu- tion of parliament ; and in March 1678 he seconded the address praying the king to declare war against France. The enmity of the country party against Danby and James, and their desire for a dissolution and the disbanding of the army, were greater than their enmity to Louis. The French king therefore found it easy to form a temporary alliance with Russell, Hollis, and the opposition leaders, by which they engaged to cripple the king's power of hurting

France, and to compel him to seek Louis's friendship,— that friendship, however, to be given only on the condition that they in their turn should have Louis's support for their cherished objects. Russell in particular entered into close communication with Rouvigny, who came over with money for distribution among members of parliament. By the tes- timony of Barillon, however, it is clear that Russell himself utterly refused to take any part in the intended corruption.

By the wild alarms which culminated in the Popish Terror Russell appears to have been affected more com- pletely than his otherwise sober character would have led people to expect. He threw himself into the party which looked to Monmouth as the representative of Protestant interests, a grave political blunder, though he afterwards was in confidential communication with Orange. On November 4, 1678, he moved an address to the king to re- move the duke of York from his person and councils. At the dissolution of the pensionary parliament, he was, in the new elections, returned for Bedfordshire. Danby was at once overthrown, and in April 1679 Russell was one of the new privy council formed by Charles on the advice of Temple. Only six days after this we find him moving for a committee to draw up a bill to secure religion and pro- perty in case of a Popish successor. He does not, how- ever, appear to have taken part in the exclusion debates at this time. In June, on the occasion of the Covenanters' rising in Scotland, he attacked Lauderdale personally in full council.

In January 1680 Russell, along with Cavendish, Capell, Powell, Essex, and Lyttleton, tendered his resignation to the king, which was received by Charles "with all my heart?' On June 16 he accompanied Shaftesbury, when the latter indicted James at Westminster as a Popish re- cusant; and on October 26 he took the extreme step of moving "how to suppress Popery, and prevent a Popish successor"; while on November 2, now at the height of his influence, he went still further by seconding the motion for exclusion in its most emphatic shape, and on the 19th carried the bill to the House of Lords for their concurrence. The limitation scheme he opposed, on the ground that monarchy under the conditions expressed in it would be an absurdity. The statement, made by Echard alone, that he joined in opposing the indulgence shown to Lord Straf- ford by Charles in dispensing with the more horrible parts of the sentence of death—an indulgence afterwards

shown to Russell himself—is entirely unworthy of credence. On December 18 he moved to refuse supplies until the king passed the Exclusion Bill. The Prince of Orange having come over at this time, there was a tendency on the part of the opposition leaders to accept his endeavours to secure a compromise on the exclusion question. Russell, however, refused to give way a hair's breadth.

On March 26, 1681, in the parliament held at Oxford, Russell again seconded the Exclusion Bill. Upon the dissolution he retired into privacy at his country seat of Stratton in Hampshire. It was, however, no doubt at his wish that his chaplain wrote the Life of Julian the Apos-

tate, in reply to Dr Hickes's sermons, in which the lawful- ness of resistance in extreme cases was defended. In the wild schemes of Shaftesbury after the election of Tory sheriffs for London in 1682 he had no share ; upon the viola- tion of the charters, however, in 1683, he began seriously to consider as to the best means of resisting the Government, and on one occasion attended a meeting at which treason, or what might be construed as treason, was talked. Mon- mouth, Essex, Hampden, Sidney, and Howard of Escrick were the principal of those who met to consult. On the breaking out of the Rye Plot, of which neither he, Essex, uor Sidney had the slightest knowledge, he was accused by informers of promising his assistance to raise an insurrection and compass the death of the king. Refusing tovattempt to escape, he was brought before the council, when his attendance at the meeting referred to was charged against him. He was sent on June 26, 1683, to the Tower, and, looking upon himself as a dying man, betook himself wholly to preparation for death. Monmouth offered to appear to take his trial, if thereby he could help Russell, and Essex refused to abscond for fear of injuring his friend's chance of escape. Before a committee of the council Russell, on June 28, acknowledged his presence at the meeting, but denied all knowledge of the proposed insurrection. He reserved his defence, however, until his trial. He would probably have saved his life but for the perjury of Lord Howard. The suicide of Essex, the news of which was brought into court during the trial, was quoted as

additional evidence against him, as pointing to the cer- tainty of Essex's guilt. On July 19 he was tried at the Old Bailey, his wife assisting him in his defence. Evidence was given by an informer that, while at Shaftesbury's hiding-place in Wapping, Russell had joined in the pro- posal to seize the king's guard, a charge indignantly denied by him in his farewell paper, and that he was one of a committee of six appointed to prepare the scheme for an insurrection. Howard, too, expressly declared that Russell had urged the entering into communications with Argyll in Scotland. Howard's perjury is clear from other wit- nesses, but the evidence was accepted. Russell spoke with spirit and dignity in his own defence, and, in especial, vehemently denied that he had ever been party toa design so wicked and so foolish as those of the murder of the king and of rebellion. It will be observed that the legality of the trial, in so far as the jurors were not properly "quali- fied and the law of treason was shamefully strained, was denied in the Act of 1 William and Mary which annulled the attainder. Hallam maintains that the only overt act of treason proved against Russell was his concurrence in the project of a rising at Taunton, which he denied, and which, Ramsay being the only witness, was not sufficient to warrant a conviction.

Russell was sentenced to die. Many attempts were made to save his life. The old earl of Bedford offered £50,000 or £100,000, and Monmouth, Legge, Lady Ranelagh, and Rochester added their intercessions. Russell himself, in petitions to Charles and J ames, offered to live abroad if his life were spared, and never again to meddle in the affairs of England. He refused, however, to yield to the influence of Burnet and Tillotson, who endeavoured to make him grant the unlawfulness of resistance, although it is more than probable that compliance in this would have saved his life. He drew up, with Burnet's assist- ance, a paper containing his apology, and he wrote to the king a letter, to be delivered after his death, in which he asked Charles's pardon for any wrong he had done him. A suggestion of escape from Lord Cavendish he refused. He behaved with his usual quiet cheerfulness during his stay in the Tower, spending his last day on earth as he had intended to spend the following Sunday if he had reached it, He

received the sacrament from Tillotson, and Burnet twice preached tohim. Having supped with his wife, the parting from whom was his only great trial, he slept peacefully, and spent the last morning in devotion with Burnet, He went to the place of execution in Lincoln's Inn Fields with perfect calmness, which was preserved to the last, He died on July 21, 1683, in the forty-fourth year of his age,

A true and moderate summing up of his character will be found in his Life, by Lord John Russell. (0. A.)

RUSSELL, Joun Scorr (1808-1882), was born in 1808 near Glasgow, a "son of the manse," and was at first destined for the ministry. But this intention on his father's part was changed in consequence of the boy's early lean- ings towards practical science. He attended in succession the universities of St Andrews, Edinburgh, and Glasgow,— taking his degree in the last-named at the age of sixteen,

- After spending a couple of years in workshops, he settled

in Edinburgh as a lecturer on science, and soon collected large classes. In 1832-33 he was engaged to give the natural philosophy course at the university, the chair having' become vacant by the death of Leslie, In the following year he began that remarkable series of obser- vations on waves whose results, besides being of very great scientific importance, were the chief determining factor of his subsequent practical career. Having been consulted as to the possibility of applying steam-naviga- tion to the Edinburgh and Glasgow Canal, he replied that the question could not be answered without experi- ments, and that he was willing to undertake such if a portion of the canal were placed at his disposal. The results of this inquiry are to be found in the Transactions of the Royal Society of Edinburgh (vol. Xiv.), and in the British Association Reports (seventh meeting). We need not say more than that the existence of the long wave, Or wave of translation, as well as many of its most important features, were here first recognized, and (to give one very simple idea of the value of the investigation) that it was clearly pointed out why there is a special rate, depending on the depth of the water, at which a canal-boat can be towed at the least expenditure of effort by the horse. The elementary mathematical theory of the long wave is very simple, and was soon supplied by

commentators on Scott Russell’s work ; a more complete investigation has been since given by Stokes; and the subject may be considered as certainly devoid of any special mystery. Russell held an opposite opinion, and it led him to many extraordinary and groundless speculations, some of which have been pub- lished in a posthumous volume, Zhe Wave of Translation (1885). His observations led him to propose and experi- ment on a new system of shaping vessels, which is known as the wave system. This culminated in the building of the enormous and unique “Great Eastern,” of which it has been recently remarked by a competent authority that “it is probable that, if a new ‘Great Eastern’ were now to be built, the system of construction employed by Mr Scott Russell would be followed exactly.”

Though his fame will rest chiefly on the two great steps we have just mentioned, Scott Russell’s activity and ingenuity displayed themselves in many other fields, — steam-coaches for roads, improvements in boilers and in marine engines, the immense iron dome of the Vienna exhi- bition, cellular double bottoms for iron ships, &e. Along with Mr Stafford Northcote (now Lord Iddesleigh), he was

joint secretary of the Great Exhibition of 1851; and he

was one of the chief founders of the Institution of Naval Architects, from the twenty-third volume of whose Trans- actions we have extracted much of what is stated above. Russell contributed the articles STEAM, STEAM-ENGINE, STEAM NavicaTION, &c., to the 7th edition of the Ency- clopxdia Britannica. He died at Ventnor. June 8, 1882.

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Part I.—GENERAL SURVEY OF THE RusstAN EMPIRE.

HE Russian empire is a very extensive territory in {! eastern Europe and northern Asia, with an area exceeding 8,500,000 square miles, or one-sixth of the land jsurface of the globe (one twenty-third of its whole super- ficies). It is, however, but thinly peopled on the average, including only one-fourteenth of the inhabitants of the jearth. It is almost entirely confined

to the cold and tem- | pcrate zones, In Nova Zembla (Novaya Zemlya) and the ‘Taimyr peninsula, it projects within the Arctic Circle as far as 77° 2’ and 77° 40’ N. lat.; while its southern ex- tremities rcach 38° 50’ in Armenia, about 35° on the Afghan \frontier, and 42° 30’ on the coasts of the Pacific. To the west it advances as far as 20° 40’ E. long. in Lapland, 18° 32’ in Poland, and 29° 42’ on the Black Sea; and its eastern limit—East Cape in the Behring Strait—extends |to 191° E. longitude.

The Arctic Ocean—comprising the White, Barents, and) Kara Seas—and the northern Pacific, that is, the Seas of | Behring, Okhotsk, and Japan, bound it in the north and cast. The Baltic, with its two deep indentations, the Gulfs of Bothnia and Finland, limits it on the north-west ; and two sinuous lines of frontier separate it respectively from Sweden and Norway on the north-west and from Prussia, Austria, and Roumania on the west. The southern frontier is still unsettled, and has never remained unaltered for so many as twenty consecutive years. Quite recently it has ‘been pushed southwards, on both the western and the eastern shores of the Black Sea, parts of Roumania and Asia Minor having been annexed in 1878. In Asia, beyond the Caspian, the southern boundary of the empire remains vague; the advance into the Turcoman Steppes and Afghan Turkestan and on the Pamir plateau is still in progress. Bokhara and Khiva, though represented as vassal khanates, are in reality mere dependencies of Russia.

} An approximately settled frontier-line begins only farther

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east, where the Russian and the Chinese empires meet on

_ the borders of Eastern Turkestan, Mongolia, and Manchuria.

| But even there, the province of Kuldja has recently been _ occupied by Russia, and again restored to China; while in

‘ eastern Mongolia, the great overland route from Kiakhta

to Peking, wa Urga, is in fact in the hands of Russia, and it is difficult to predict how far Russian influence may extend should circumstances lead it

to seek a footing on the thinly-pcopled plateaus of Central Asia.

| Russia has no oceanic possessions, and has abandoned those she owned in last century; her islands are mere appendages of the mainland to which they belong. Such are the Aland archipelago, Hochland, Tiitters, Dagé, and Osel in the Baltic Sea; Nova Zembla, with Kolgueff and Vaigatch, in the Barents Sea ; the Sotovetsky Islands in the White Sca; the New Siberian archipelago, and the small group of the Medvyezhii Islands off the Siberian coast; the Commandor Islands off Kamchatka; the Shantar Islands and Saghalin in the Sea of Okhotsk. The Aleutian archi- pelago was sold to the United States in 1867, together with Alaska, and in 1874 the Kurile Islands were ceded to Japan.

A vast variety of physical features is obviously to be

| expected in a territory like this, which comprises on the } one side the cotton and silk regions of Turkestan and i Transcaucasia, and on the other the moss and lichen-clothed _ Arctic tundras and the Verkhoyansk Siberian pole of cold | —the dry Transcaspian deserts and the regions watered by

the monsoons on the coasts of the Sea of Japan. Still, if

| the border regions, that is, two narrow belts in the north

and south, be left out of account, a striking uniformity of physical feature prevails. High plateaus, like those of Pamir (the “Roof of the World”) or of Armenia, and high mountain chains like the snow-clad summits of the Caucasus, the Alay, the Thian-Shan, the Sayan, are met with only on the outskirts of the empire.

Viewed broadly by the physical geographer, it appears Plateau

as occupying the territories to the north-west of that great, belt of plateau-belt of the old continent—the backbone of Asia —which spreads with

decreasing height and width from the high tableland of Tibet and Pamir to the lower plateaus of Mongolia, and thence north-eastwards through the Vitim region to the furthest extremity of Asia. It may be said to consist of the immense plains and flat lands which extend between the plateau-belt and the Arctic Ocean, including also the series of parallel chains and hilly spurs which skirt

the plateau-belt on the north-west. It extends over the plateau itself, and crosses it, beyond Lake Baikal only.

This belt—the oldest geological continent of Asia— being unfit for agriculture and for the most part unsuited for permanent settlement, while the oceanic slopes of it have from the dawn of history been occupied by a dense population, has long prevented Slavonian colonization from reaching the Pacific. Russians happened to cross it in the 17th century, only in its narrowest and most northerly part, thus reaching the Pacific on the foggy and frozen coasts of the Sea of Okhotsk ; and two centuries elapsed ere, after colonizing the depressions of the plateau around Lake Baikal, the Russians crossed the plateau in a more genial zone and descended to the Pacific by the Amur, rapidly spreading farther south, up the nearly uninhabited Usuri, to what is now the Gulf of Peter the Great. In the south-western higher portions of the plateau-belt the empire has only recently planted its foot on the Pamir ; as we write, it is endeavouring to get command of the lower passages which give an easy access to the Afghan portion of the plateau ; while already, within the present century, it has established itself firmly on the plateaus of Armenia.

A broad belt of hilly tracts—in every respect alpine in The character, and displaying the same variety of climate and alpine organic life as alpine tracts usually do—skirts the plateau- pet belt throughout its length on the north and north-west, forming an intermediate region between the plateaus and the plains. The Caucasus, the Elburz, the Kopet-dagh, and Paropamisus, the intricate and imperfectly known net- work of mountains west of the Pamir, the Thian-Shan and Ala-tau mountain regions, and farther north-east the Altai, the still unnamcd complex of Minusinsk mountains, the intricate mountain-chains of Sayan, with those of the Olekma, Vitim, and Aidan, all of which are ranged en échelon—the former from north-west to south-east,

and the others from south-west to north-east—all of these belong to one immense alpine belt bordering that of the plateaus. These have long been known to Russian colonists, who, seeking to escape religious prosecutions and exactions by the state, early penetrated into and rapidly pushed their small settlements up the better valleys of these tracts, and continued to spread everywhere as long as they found no obstacles in the shape of a former population or in unfavour- able climatic conditions.

As for the flat-lands which extend from the Alpine hill- The

foots to the shores of the Arctic Ocean, and assume the ‘lat-lands.

character either of dry deserts in the Aral-Caspian de- pression, or of low table-lands in central Russia and eastern Siberia, of lake-regions in north-west Russia and Finland, or of marshy prairies in western Siberia, and of

Caucasus, in the Aral-Caspian region, and in the basin of the Usuri on the Pacific coast. Favoured by these con- ditions, the Russians not only conquered northern Asia— they colonized it.

The total population of the Russian empire was stated Poy at 102,000,000 by estimates made in 1878-82 ; but it ig tior multiplying rapidly, and, as the surplus of births over deaths reaches nearly 1,250,000 every year, it must now be somewhat more than 106 millions,

Within the empire a very great diversity of nationalities is comprised, due to the amalgamation or absorption by the Slavonian race of a variety of Ural-Altaic stems, of Turco-Tartars, Turco-Mongolians, and various Caucasian stems. Statistics as to their relative Strength are still very imperfect, and their ethnical relations have not as yet been completely determined ; but, considered broadly, they may be classified as follows :—

A. The Letto-Slavonians comprise (a) the Lithuanians and Letts on the lower Niemen and Diina, and (>) the Slavonians, that is, the Poles on the Vistula and N iemen and the Russians—Great, Little, and White—whose

tundras in the far north,—their monotonous surfaces are diversified by only a few, and these for most part low, hilly tracts. Recently emerged from the Post-Pliocene sea, or cleared of their ice-sheet coverings, they preserve the very same features over immense stretches; and the few portions that rise above the general elevation have more the character of broad and gentle swellings than of mountain-chains. Of this class are the swampy plateaus of the Kola peninsula, gently sloping southwards to the lake-regions of Finland and north-west Russia; the Valdai table-lands, where all the great rivers of Russia take their rise; the broad and gently-sloping meridional belt of the Ural Mountains; and lastly, the Taimyr, Tunguska, and Verkhoyansk ridges in Siberia, which do not reach the snow-line, notwithstanding their sub-Arctic position. As to the picturesque Bureya mountains on the Amur, the forest-clothed Sikhota-alin on the Pacific, and the volcanic chains of Kamchatka, they belong to quite another orographical world; they are the border-ridges of the terraces by which the great plateau-belt descends to the depths of the Pacific Ocean.

Rivers, It is owing to these leading orographical features— proper abodes are in European Russia, south of a line divined by Carl Ritter, but only within the present day | drawn from the Gulf of Finland to the middle Volga. revealed by geographical research—that so many of the Spreading from this region towards the north-east, east, great rivers of the old continent are comprised within the | and south-east, they have colonized north-east Russia, the limits of the Russian empire. Taking rise on the plateau- | Ural region, Caucasus, Siberia, and large parts of the belt, or in its Alpine outskirts, they flow: first, like the Kirghiz Steppe,—the leading feature of their colonization upper Rhone and Rhine, along high longitudinal valleys | having always been penetration in compact masses among formerly filled up with great lakes; next they find their | the original inhabitants. Thus, on northern Caucasus way through the rocky walls; and finally they enter the | the Russians (chiefly Little Russians) already

constitute a lowlands, where they become navigable, and, describing | compact rural population of nearly 1,500,000, that is, great curves to avoid here and there the minor plateaus | about a quarter of the total population of Caucasia. In and hilly tracts, they bring into water-communication | Western Siberia the Great Russians already number with one another places thousands of miles apart. The | more than 2,300,000 agriculturists, constituting four- double river-systems of the Volga and Kama, the Obi and | fifths of the entire population; in Eastern Siberia they Irtish, the Angara and Yenisei, the Lena and Vitim on number more than 1,000,000, that is, probably more than the Arctic slope, the Amur and Sungari on the Pacific | the original inhabitants ; and the Kirghiz Steppe has also slope, are instances. They were the true channels of begun rapidly to be colonized within the last twenty years. Russian colonization. It is only in the more densely peopled Turkestan, and in

A broad depression,—the Aral-Caspian desert—has | the recently annexed Transcaspian region, that Russian arisen where the plateau-belt has reached its greatest | settlers continue to bear but a small proportion to the height and suddenly changes its direction from a north- | natives (who are more than 4,600,000 strong). The western into a north-eastern one; this desert is now filled Slavonians altogether number more than 7 5,000,000, of only to a small extent by the salt waters of the Caspian, | which number 5,600,000 are Poles.

Aral, and Balkash inland seas; but it bears unmistakable Swedes (310,000), Germans (1,240,000), Roumanians, traces of having been during Post- Pliocene times an im- Serbs, &e., may number altogether about 2,500,000.

mense inland basin. There the Volga, the Ural, the Sir B. A great variety of populations belonging to the Daria, and the Oxus discharge their waters without reaching | Caucasian race, but not yet well classified, some of which the ocean, but continue to bring life to the rapidly drying | are considered to be remainders of formerly larger nation- Transcaspian Steppes, or connect by their river network, as | alities pushed aside into the mountain tracts during their the Volga does, the most remote parts of European Russia. | migrations, are met with on Caucasus. Such are the

The ex- The above-described features of the physical geography | Georgians, Ossetes, Lesghians, who fall little short of

ee of of the empire explain the relative uniformity of this wide a territory, in conjunction with the variety of physical features on its outskirts. They explain also the rapidity of the expansion of Slavonic colonization over these thinly peopled regions; and they also throw light upon the internal cohesion of the empire, which cannot fail to strike the traveller as he crosses this immense territory, and finds everywhere the same dominating race, the same features of life. In fact, in their advance from the basins of the

2,500,000, and the Armenians, about 1,000,000.

C. The Iranian branch is represented by some 130,000 Persians and Kurds in Caucasia and Transcaucasia, and by Tajiks in Turkestan, mixed with Turco-Tartar Sarts. The nomad Tsigans, or Gipsies, numbering nearly 12,000, may be mentioned under this head,

D. The Semitic branch consists of upwards of 3,000,000 Jews in Poland, in west and south-west Russia, and on Caucasus and in the towns of Central Asia, and of a few

Volkhoff and Dnieper to the foot of the Altai and Sayan Mountains, that is, along nearly a quarter of the earth’s circumference, the Russian colonizers could always find the same physical conditions, the same forests and prairies as they had left at home, the same facilities for agriculture, only modified somewhat by minor topographical features. New conditions of climate and soil, and consequently new cultures and civilizations, the Russians met with, in their expansion towards the south and east, only beyond the

thousand Karaite Jews.

E. The Ural-Altaic branch comprises two great sub- divisions—the Finnish and the Turco-Tartarian stems, mixed to some extent with Mongolians. The former (see below) occupy, broadly speaking, a wide stretch of territory to the north of the Slavonians, from the Baltic to the Yenisei, and include the

Baltic Finns, the Northern Finns, the Volga Finns, and the Ugrians. The Russians have already spread among the last two in compact masses,

and, while some stems, like the Ostiaks, are rapidly disappearing, others, like the Mordvinians, Permians, &c., are losing their national character, and becoming assimi- lated to the Russians. The West Finns alone have fully maintained their national features, and happen to have constituted a nationality developing into a separate state.

The Turco-Tartars (nearly 10,000,000) comprise the Tartars, the Bashkirs, the Kirghizcs, the Uzbegs, and the Turcomans of the Aral-Caspian region, the Yakuts on the Lena, and a variety of smaller stems in East Russia and Caucasia. They occupy another broad belt which extends from the Aral-Caspian depression to the eastern parts of the Arctic coast.

F. The Mongol-Manchurian stems of the Tunguses, and the Golds, and the Manchus proper, come next, occupying the castern parts of the mountain-belt and the plateau itself in Siberia, the Tunguses also projecting north-west- wards, so as to separate the Yakuts from their southern Turkish brethren. Small stems of the same family also pass a nomad existence in the basin of the Amur. They are rapidly diminishing in number, and can hardly be estimated at more than 50,000.

(. The Mongolian branch is represented by nearly half a million of Kalmucks on the Altai outskirts of the great plateau and around the Caspian, and by nearly 250,000 Buriats in and around the Baikal depression.

H. A variety of stems, not yet well classified, are met with on the Pacific coasts. Such are the Tchuktchies, the Kamchadales, the Koryaks in the north-east, the Ghilyaks ou the Amur, and the Ainos in Saghalin.

Statistics of the relative strength of different nationalities in the Russian empire; which, however, must be con- sidered only as rough estimates, are given (in millions) in the following table (I.) :—

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=) C4 i 0 Mae n a Russians ….....+006 63°316 | 0°790 | 0-017 |1:530| 0°640?|73°380 | 69°673 ROLES scotctrccvsssxees 1°020 | 4°550 ae aes BG 5°570 Other Slavonians….} O°118] ... 0-118 IBGUBS ete seeressssascosis Loe) eae 1°254 Lithnanians…..... 1:380 | 0°370 1°750 ISECESe cecevorcssseees 0°017 } + 0-293 ae 0°310 GeTMIANIS:,.....-..... 0:780 | 0-460 ; 0-001 0-003 1°243 Other Europeans….) 0°910 Se 0-911 Persians and Kurds.| ... 07130 07130 Armenians ….....068 0:050 0-905 0°955 Tsigans and other

PANIOMNS, ...cc0c00 OH0S)) ae 0-015 Caucasians ….....00. 2°450 2-450 ISEMINEES! s<..sc0s0ese0s5- 2-203 | 0°913 i 0°007 37123 Finns, Karelians…..| 0°316 1°750 2:066 Esthonians, Lives.,.| 0-903 S 0-903 Other West Finns…) 0°101 : 07101 Lapps, Samoyedes,.| 0-014 0°025 0:039 Volga Finns and REGIS es cecse ees 1:°731 0:047 1778

PEANGATS’. cesosescc0e sees 1°510 1°520 0-100 Bashkirs…..... 0-906 500 Kirghizes…..... 07194 ee r Turcomans. 0-002 + 4-298? ae + 9°750? BYEKtS…..—2. nee Other Turco-T:

Kalmucks SVITINES, ..cesecccccscees

Tunguses and other Mongol-Manchu-

LEWIN vote ea ccesssice ce 0-050 0:050 Tchuktchies, Kor- a

yaks, Kamchadales 0-012 0-012

Total….....| 77°878 | 7°083 | 2°061 | 6°535} 5°238?| 4-094 | 102-889

RUS Ss I &

69

The area and population of the various divisions of the Russian empire are given in the following table :—

TABLE II.—Area and Population of the Russian Empire.’

Area, Area,

Provinces. sume a Provinces. — 7 oe 1.£uropean Russia 4, Russia in Asia. Avrelmngel…....- 831,505 315,367 | Kubafi2…....0006 36,497 | 1,107,922 Astrakhan…..... 91,327 790,338 | Stavropol….....| 26,531 637,893 Bessarabia…....- 17,619 | 1,419,762 | Terek?.....06. 23,548 615,660 Courands…2---..- 10,535 642,570 ————————|— Don Cossacks…..| 61,886] 1,474,183] Northern Cau- ; Ekatcrinoslaif….. 26,148 | 1,697,061 AST nagaadpacnacood 86,576 | 2,361,475 Esthonia…....++ 7,818 379,875 — Grodno…. 6 14,931 | 1,226,946} Baku….....0-| 15,516 669,992 Kaluga.. 11,942 | 1,140,337] Daghestan 2…..... 17,048 529,271 USAIN be aceepar 24,601 | 1,955,590] Elizabethpol…....| 11,469 636,316 Kharkoff….. 21,041 | 2,160,263 | Evivafi…..... | 10,705 583,957 Kerson:..——- 27,523 | 1,865,164) Kars2… 7,175 162,979 TGS ocnrmospnepeccod) USL IL | Ca etri shl Kutais#.....---(14,005 863,195 Kostroma…..... 32,702 | 1,278,856 | Telicrnomorsk 2… 2,824 25,983 GO ANO) coeseesdccocoud 15,692 | 1,444,614] Tiflis….....e0eee. 15,578 726,685 Kas Kehes vovsensss se 17,937 | 2,314,300 | Zakataly3…..... 1,609 75,000 Livonia. 18,158 | 1,178,951 —_— Minsk… 35,293 | 1.569,342 | Transcaucasia….. 95,929 | 4,173,378 Moghileff…....+. 18,551 | 1,146,470 eee Moscow… 000e0000e1 12,859} 2,187,179 | Caucasus, 1882-83} 182,505 6,534,855 Nijni-Novgorod…| 19,797 | 1,427,893 = |_-———— ee See 47,236 | 1,127,881 JONCLZ.....000006..) 57,439 327,323 × 3 rors Ge a 18,042 |

1,892/982 | Se ea rene 3 agra Tene Z acces 3 wy Orenburg.. 73,816 | 1,196,133] Manghishlak 3… 80,260 34,500 Penza… 14,997 | 1,882,732) Merv3…... eles 90:000 PCE ssicsesecesssree 128,210 2,539,874 Tedjefi [ARCA ee red about =) 5.000 IR@dOlid…J.:..0ssess 16,224 2,276,518 Taleo. ese 97,000 = 10.000 IROPEAWA-cocccn0ss0-00 19,265 ae rarer heres ‘ 3 (12/000 17,069 94,712 | Caspian Sea…....- ; Rye 16 255 L TASS Caspian Sea. eee jee t Petersburg….. A 1,622,768 Transeaspian SAMMATA:.c.c25 «sce: 2,224,093 ane : ewan 9113.07 region,’ about..| 390,000 206,000 Simbirsk.. 1,471,164 ei Dee Akmolinsk?.....| 210,564] 463,347 Tada 964.329 Semipalatinsk 2,,.1 188,299 538,385 Tenetnioniie. cw. 1.970.094 Turgai, with Lake 8 ea 202,192 | 326,706 TN eiSecencssceases 1,840,866 141.474 Or 9 Tver… 1,617,685 eee 525,332 Ce ee Kirghiz Steppes..| 742,529 | 1,853,770 A ge 1,170,067 | Amu-daria…....| 39,976 | 222,200 ir…. 352,140 | Perganah 2 98,045} 808,00 Volhynia. 2,062,270 gana. sapc0dau9 ; 8, 0 Semiryetchensk?.| 155,297 685,945 Vologda. woeee 1,161,551 Sir-daria 2 166. 03 1.109.542 Voroneehc. 9‘433,657 ir- i ae 0 109,542 Vista… 2,740,953 Zerafshan?..... 19,665 351,897 Yaroslavl… 1,082,782 3 a hae a at joe 082782 | purkestan…....| 408,986 | 3,177,584 Total, Russian | CentralAsia,about|1,541,500 | 5,237,354 provinces, 1882,|1,902,092 | 77,879,521 SS | 2. Poland. aligzece eros ecs- 4,392| 774,759 | Tobolsk | 531,982 | 1,283,168 Kielce… 3,897 643,629 PROMS Kemercererecs <2 $29,039 | 1,134,748 Lomza 4,667 559,316} . | ae Lublin 6.499 882,616 | Western Siberia.. 861,021] 2,417,916 Piotrkéw. 4,729 865,777 oes aaa Plock…... 4,200 538,141 Irkutsk.. seterseseees 309,190 398,873 Radom 4,769 644,827 Transbaikalia 2,...| 240,781 497,760 Siedlce 5,535 630,238 Y akutsk See oere 1,517,127 243,443 Simiiit..-...0| | 4fe) cepa pUCmment saree 992,870 | 421,010 HESS Wiss-cossesoes y i) ae sik cela 5,623 | 940,998 | + astern Siberia…|3,059,968 | 1,561,086 Total, Poland…... 49,157 | 7,083,475 ARR E ce Mc 173,559 40,538

, 8. Finland, Maritime, or Pric

9,335] 844,649) morskaya?.....| 730,022 74,000 16,499 | 256,420 apes noes en 4,586 | 202,806| Amur region…... 903,581 | 114,538 8,819| 167,310

221,360

Totul, Siberia…... 4,824,570

207,782

4,098,535

wef 16,627] 858,480! potay ‘Awdeee

WIDOTG.....2c000- 16,084 301,975 Russia, about. ..(6,548,600 | 15,865,742

Total, Finland….. 144,255 | 2,060,782) ¢ rand total =| nae ———————— Sa)

Russian empire,

Total, European BDOW s.crcccccsaxesse

RuSSia…seseeee 2,095,504 8,644,100 /102,889,520

87,023,778

1 The figures are taken, for the areas, from Strelbitzky’s Super sicies de Europe, and, for the population, from the Sbornik Svedeniy o Evropeiskot Rossii for 1882, the Zzvestia of the Caucasus Geographical Society, the Russkiy Kalendar, &c. The arenas have been reduced, taking the square kilometre as equal to 0°3861167 English square mile.

2 Oblasts, or provinces.

3 Okrugs, or otdyels (territories) under military government, the remainder being governments (gubernii) under civil governors.

4 Including Batum and Sukhum.

5 According to General Meyer, in Izvestia of the Russian Geogr. Society, 1885, 4, The areas for the first three districts are given according to M. Seidlitz in Russische Revue, 1885, 4; for the remainder, according to General Meyer. The oasis of Merv proper extends to about 2100 square miles. The populations are given without the Russian military. M. Scidlitz

estimates them as follows :— Akhal Tckke, 42,000; Krasnovodsk, 15,300; Manghishlak, 34,500; Merv, 160,000; Tedjefi, 7500; total, 260,000. The total population, excluding military, is estimated by military authorities at 214,000.

Bubdi- visions of the empire,

Cities.

Govern- ment,

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Of the areas given in the table, the following (298,636 square miles) are occupied by internal waters (larger lakes and estuaries) :— JETER CEN TRS Fee ae ee “as square miles.

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ELOUAM Lester ss Sentence eccrine a cee 1 3 HEGita aes (Meee yee eva cesee sted cea Secccs eee oes Sucesssedesscc 18,471 – (CSTOE ST SERS eer errs ear 1,628 € SH ET etemeerenerett ee scse tte Ones cnc Se choca, ok Se 18,864 a PRUE ORD AM ee eeetiag: «sees te Seeieeiex. 2s GMI Z SUED PENE: oh o:< . caer sacesadedeesencsocencssee es 14,888 es BRAS CASPRRNVECE ION ..<:s55sse0:-ceecescaccdsnce+0656e05s 455 rs Sea of Azoff, Caspian Sea, Lake Aral……. 213,874 ee

The islands included in the above statement have the following areas (total 91,182 square miles) :— PIU Re WHIM SOR recess — snore secs ceomemnersse ence

Oe LOBUGIES S@Aleeerscccecseceese ones tee oe eee 38,5 A 3) poalble Sear (itmssinn)s..c,sscssersersreoreeeee eee 1,579 05 uy es (Binnish) <5... s.csecsssecestecseeresees 2,000 D Ae Ebel Ser ee 5a 21 D », Sea of Azoff..... 41 . », Caspian Sea..... so EL aH »> Siberian Arctic Ocean……....0…ccc-ccccsceses 16,496 53. SBOHICH .ccstsesc verteerer esse en 31,763 3

The Russian empire falls into two great subdivisions, the European and the Asiatic, the latter of which, representing an aggregate of nearly 6,500,000 square miles, with a population of only 16 million inhabitants, may be considered as held by colonies. The European dominions comprise European Russia, Finland, which is in fact a separate nationality treated to some extent as an allied state, and Poland, whose very name has been erased from official documents, but which nevertheless continues to pursue its own development. The Asiatic dominions comprise the following great subdivisions :—Cavcasta (q.v.), under a separate governor-general; the Transcaspian region, which is under the governor-general of Caucasus ; the Kirghiz Steppes; TurKustTan (g.v.), under separate governors-general ; Western Siberia and Eastern Siberia (see SrBeRra); and the Amur region, which last comprises also the Pacific coast region and Kamchatka (see KAMCHATKA and Maritime Province). The administrative sub- divisions, with their populations, as estimated for 1882 for European Russia, Poland, and Caucasus, 1881 for Finland, and 1878-82 for the remainder (no regular census having been taken since 1858), are shown above in Table IT.

The enipire contains only twelve cities with a population exceeding 100,000:—St Petersburg, 929,090 (1881); Mos- cow, 753,469 (1884); Warsaw, 406,260 (1882) ; Odessa, 217,000 (1882); Riga, 169,330 (1881); Kharkoff, 159,660 (1883); Kazai, 140,730 (1883); Kishineff, 130,000 ; Kieff, 127,250 (1874); Lodz, 113,146, in Poland (1884); Saratoff, 112,428 (1882); Tiflis, 104,020 (1883) ; and Tashkend, 100,000. According to the most recent returns Vilna, Orel, Rostoff, Astrakhan, Nikolaieff, Dinaburg, Tula, Samara, Taganrog, Kherson, N ini-Novgorod, Berditcheff, Bobruisk, Zhitomir, Minsk, Vitebsk, Elisabetgrad, Reval, and Voronezh had from 94,000 to 50,000 inhabitants, while 61 towns more in European Russia, Finland, and Poland, and 20 in the Asiatic dominions, had from 50,000 to 20,000 inhabitants. The number of towns above 10,000 is con- siderable, but they are mostly mere administrative centres : many villages have greater importance.

Only 9,263,000 (or 9 per cent.) of the aggregate popu- lation of Russia inhabit towns, the number of which is 601 in the 50 Russian governments. The great number of the Russian towns are mere villages; their inhabitants depend on agriculture, and the houses are mostly built of wood, only

127,000 out of about 787,000 houses in towns being built of stone. Of the 68,600,000 who in 1882 formed the rural population of European Russia the greater part were settled in 555,278 villages, almost entirely built of wood ; nearly one-seventieth of the houses are destroyed by fire yearly (164,400 out of 10,649,000 in 1882).

Russia is an absolute and strongly centralized monarchy. The primary unit of state organization is the village com- munity, or mir. A number of such communities are united

into volosts, whose peasant inhabitants clect an elder (volost- noy starshana) and a peasants' tribunal (volostnoy sud), Placed, however, under the uncontrolled rule of a state official—the mirovoy posrednik—and of the police, the elder of the volost and his clerk have become mere organs of the local police and tax-gatherers, while the tribunal of the volost is at the mercy both of influential land-proprietors and of the wealthier peasants or merchants. The system of local self-government is continued in the elective district and provincial assemblies—the zemstvo—on the one hand, and on the other in the elective justices of the peace (miro- voy sudia), whose periodical gatherings (mirovoy syezd) are courts of appeal against the decisions of the individual justices. But neither of these institutions—and least of al] the zemstvo—is capable of acquiring the necessary inde- pendence. The zemstvos—one for each district, and an- other for the province—consist of a representative assembly (zemskoye sobraniye) and an executive (zemskaya uprava) nominated by the former. The sobraniye consists of three classes of delegates :—the landed proprietors (all nobles possessing more than 590 acres, and delegates from the remainder, along with delegates from the clergy in their capacity of landed proprietors); representatives of the mer- chants, artisans, and urban population ; and representatives of the peasants, indirectly elected,—matters being usually so adjusted that this class is less numerous than the agere- gate of the other two. In theory the zemstvos have large powers in relation to the incidence of taxation, as well as in matters affecting education, public health, roads, &e, But in reality they are for the most part compelled to limit themselves

to the adjustment of the state taxation, which is so high that new taxes for education, sanitary purposes, and so on, must necessarily be very limited, Moreover, the decisions of the zemstvos are jealously con- trolled by the representative of the central Government,— the governor,—and promptly annulled whenever they manifest a different spirit from that prevailing for the time at the court. Disobedience is punished by dissolution, sometimes by administrative exile. These circumstances have helped to eliminate from the zemstvos the better elements which at first entered into their composition. The greater number of them are inspired now with the same red-tapeism as the ministerial chancelleries, or are refuges for proprietors in search of a salary. Still, in several provinces a good deal of most useful work has been done, especially educational, by those zemstvos in which the peasants are in a majority or the proprietors are inspired with a more liberal spirit; while several other zemstvos have recently made extensive and most valuable inquiries into the condition of agriculture, industry, é&e.

Since 1870 the municipalities have had institutions like those of the zemstvos. All owners of houses, and tax-paying merchants, artisans, and workmen, are enrolled on lists in a descending order according to their assessed wealth. The total valuation is then divided into three equal parts, each of which elects an equal number of repre- sentatives to the duma. The executive is in the hands of an elective mayor and an wprava which consists of several members elected by the duma. Both are, in fact, function- aries under the governor, and the municipal institutions have no real independent life.2

The organs of the central government in the provinces are the uryadniks (a kind of gardes-champétres) in the villages, the stanovoys and isprauniks (chiefs of the police) in the districts, and the governors (a kind of Napoleonic prefect) in each government—all invested, the uryadmks

oS eee

1 See* Golovatchoff, Zen Years of Reforms in Russia; The Finances of: the Zemsivos (official publication) ; Dityatin, Municipal Self-Government in Russia, 2 vols.; and very numerous and valuable papers in the reviews Vyestnik Evropy, Otetchestvennyya Zapiski, Russkaya Mys!, &e.

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finances, army, and representative institutions, with limited rights, but its ministers of war and the exterior are thoso of the empire, and its institutions are not always respected by the emperor,

The emperor is not the head of the church, all decisions in theo- logical matters having to be given by the Synod. His influence, however, is very great, as the nomination of the bishops rests with him. In 1882 there were in Russia 40,569 Orthodox churches and about 14,000 chapels, with 37,318 priests, 7009 deacons, and 45,395 singers. There were also 6752 monks and 3957 aspirants, 4945 nuns and 13,803 female aspirants. The church budget was 18,974,887 roubles in 1884. The monasteries and churches are possessed of great wealth, including 2950 square miles of land (a territory greater than that of Oldenburg), an invested capital of 22,634,000 roubles, an annual subsidy of 408,000 roubles from Government, and a very great number of inns, shops, printing establishments, burial grounds, &c., with whole towns eovering an aggregate area of 104 square miles, Their total annual revenue is estimated at 9,000,000 roubles.

RUSSLAN EMPIRE. |

included, with powers which are the more extensive as they are totally undefined. ‘There is also in each ‘government a special gendarmerie under the “chief of gendarmes,” who usually is also the head of the “ third section” of the Imperial Chancery. The name of the third section has been recently abolished, but the institution still continues. It has charge of the secret police of the state, and has most varied functions, such as the arrest of supposed political offenders, their exile to Siberia, the delivery of separation papers to spouses desiring divorce, and so on. Several governments are placed under special governors- seneral, whom the recent law on the “state of siege” invests with almost dictatorial powers. The higher administration is represented by the emperor,

who unites the supreme legislative, executive, and judicial powers, and is surrounded by four distinct councils—the committee of ministers, the

council of the empire, the senate, and the Holy Synod. The ministers, who are con- sidered as executing tho will of the czar, and are nominated by him, are invested with very extensive powers; their circulars for the interpretation of laws have greater weight than the laws themselves. The council of the empire, which consisted in 1884 of 64 members, nominated by the emperor, besides the ministers and several members of the imperial family, is a consultative body for matters of legis- lation. ‘The senate, also nominated by the emperor, has two distinct functions. Seven “departments” of it are administrative ; they promulgate the laws, examine the acts of governors, adjudicate in their conflicts with zemstvos, and, in theory, can make remonstrances to the emperor,— in fact they merely register and promulgate laws. Two other “departments” are courts of cassation. A special department, reinforced by representatives of nobility, pro- nounces judgment in political cases. The Holy Synod, consisting of metropolitans and bishops who sit there in turn, has the superintendence of religious affairs.

The judicial system introduced in 1864 was conceived in a very liberal spirit, which, unfortunately, has not been main- tained. Thus a ‘‘ preliminary instruction,” made by the ** third section” in political cases, or by the police, has been subse- quently introduced. The ‘‘ judges of instruction, ” irremovable by law, have not yet been nominated, their functions being discharged by substitutes entircly dependent upon the ministry. Elective justices of the peace decide in all eases involving less than 500 roubles, or less than six months’ imprisonment. Their decisions can be brought by appeal before the district gathering of the jus- tices of tho peace, and thence before the senate. All criminal cases involving severer penalties are tried by juries, whose verdicts can be set aside only by a court of cassation, but are not respected in cases having a so-called “political” aspect. Political offences are tried by tribunals composed ad hoc. Civil cases in which more than 500 roubles are involved are tried by courts of justice, with appeal to chambers of justice.

In 1879 in European Russia,—exclusive of six Lithuanian and White Russian governments,—42,530 persons were tried before the courts, and 59,600 before the justices of the peace, the convictions being respectively 27,397 and 36,742. The aggregate number of eondemnations pronounced in

1882 was 46,018 in European Russia, that is, 5-9 condemned in each 10,000; only 4836 of them were women, On January 1, 1882, 93,108 persons were in jail; 530,307 men and 66,073 women (the latter with 30,769 children) were imprisoned during the year, while 625,280 prisoners were liberated or exiled, and on January 1, 1883, the number of prisoners in jail (excluding those of Saghalin and Caucasus) was 97,337. More than 20,000 are annually transported to Siberia.

The empire is divided for administrative purposes into govern- ments (guberniya) or territories (oblast), of which there are 50 in European Russia and 10 in Poland. Each government, or territory, is divided into cight to fifteen districts (uyezd). The Asiatic dominions are divided' into onc licutcnancy (namyestnitchestvo), that of Caucasia, and four general governments—Turkestan, Stepnoye (Kirghiz Steppes), East Siberia, and Amur. They com- prise thirty-three governments and territories, besides a few dis- tricts (okrug, otdyel) in Transcaucasia and the Transcaspian region, regarded almost as separate governments. In Siberia the governors and governors-general are assisted by councils which have a consultative voice. The Baltic provinces have some peculiar institutions. Finland is a separate state, having its own

Much still remains to be done for the diffusion of the first Educa-

elements of a sound education throughout the empire; unhappily tion, the endeavours of private persons in this field and of the zemstvos

are for political reasons discouraged by the Government. There

are seven universities—Dorpat, Kazan, Kharkoff, Kieff, Moscow, Odessa, and St Petersburg—to which may be added thoso of Warsaw and Helsingfors. had 605 professors and 10,528 students, fessors and 1228 students at Warsaw. on the whole is high, and may be compared to that of tho German universities. intelligent. Mostly sons of poor parents, they live in extreme poverty, supporting themselves chiefly by translating and by tutorial work. universities. Explicit regulations for the interpretation of science have been issued, and restrictions laid upon the teaching of philo- sophy and natural science generally ; comparativo legislation has been excluded from the programmes ; teaching in Russian (instead of German)

has been ordered at Dorpat. under rigorous regulations in regard to their life outside the uni- versity. About 950 studeuts in theological academies and 2500 in higher teclinical schools must be added to the above.

In 1883 the seven Russian universities and there were 81 pro- The standard of teaching

The students are hardworking, and generally very

Severe measures have been taken in 1885 in regard to the

The students are placed

The state of secondary education still leaves very much to be desired. There were in 1883 180 gymnasiums and progymnasiums for boys in European Russia, and 24 in the Asiatic dominions, and 27 and 10 respectively for girls; there were also 73 “eal” schools in European Russia and 8 in the Asiatic dominions, and 48 normal schools in Russia and 10 in the Asiatic dominions. To these must be added the 14,800 pupils in 58 theological seminaries, and about 3000 in varioussecondary schools, The steady tendency of Russian society towards increasing the number of secondary schools, where instruction would be based on the study of the natural sciences, is checked by Government in favour of the classical gymnasiums. The aggregate number of schools for second- ary instruction in European Russia in 1882 was 456 for boys and 384 for girls, with 107,980 male and 79,625 female scholars. Of these, 355 schools (45,3803 boys and 3199 girls) give professional edueation.

For primary instruction there were in 1882 in European Russia proper 28,329 schools, with 1,177,504 male and 362,471 female pupils. Of the 6,231,160 roubles expended on primary schools only 747,772 roubles were contributed by Government, the remainder being supplied by the zemstvos (2,512,118 roubles), by municipalities, or by private persons. Sunday schools and public lectures are virtually prohibited.

‘A characteristie feature of the intellectual movement in Russia is its tendency to extend to women the means of receiving higher instruction. “The gymnasiums for girls are both numerous and good. In addition to

these, notwithstanding Government opposi- tion, a series of higher schools, where careful instruction in natural and social sciences is given, have been opened in the chief citics under the name of ‘‘ Pedagogical Courscs.” At St Petersburg a women’s medical academy, the examinations of which were even more searching than those of the ordinary academy (especially as regards diseases of women and children), was opened, but after about one hundred women had received the degree of M.D., it has been suppressed by Government. In several university towns there are also free teaching establishments for women, supported by subscription, with programmes and examinations equal to those of the universities. In 1882 the students numbered 914 at St Petersburg, about 500 at Moscow, and 389 at Kazan.

The natural sciences arc much cultivated in Russia, especially Scientifie during the last twenty years. Besides the Academy of Science, the societies. Moscow Society of Naturalists, the Mineralogical Society, the Geographical Society, with its Caucasian and Siberian branches, the archeological societies and the scientific societies of the Baltic pro- vinces, all of which are of old and recognized standing, there have lately sprung up a series of new societies in connexion with each university, and their serials are yearly growing in importance, as

Finance.

Army.

Navy.

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also are those of the recently founded Moscow Society of Friends of Natural Science, the Chemico-Physical Society, and various medical, educational, and other societies. The work achieved by Russian savants, especially in biology, physiology, and chemistry, and in the seiences descriptive of the vast territory of Russia, are well known to Europe.

The finances of the empire are in a most unsatisfactory condition. Although the revenue has doubled since 1856, and had reached 697,980,983 roubles (£69, 798,098)! in 1883, the expenditure, which was estimated at 721,337,844 roubles the same year, is always in excess of the income. The national debt is rapidly augmented both by loans and by issues of papcr money so depreciated as to be worth only about 60 to 63 per cent. of its nominal value. On January 1, 1884, no less than 1,085,000,000 paper roubles were in circulation g and the national debt, the paper-mnoney ineluded, reached about £578,000,000, inclusive of the railway debt. Russian finance is that its direct taxes are chiefly paid by the peasantry (91 per cént. of the whole), and the revenue is chiefly based on excise duties (direct taxes, 136,105,320 roubles ; excise duties on spirits, 250,291,380; duties on tobacco and sugar, 28,569,500 ; import duties, 101,053,000). Of the yearly revenue no less than 436,000,000 roubles are spent in interest and sinking fund on the debt, and for war purposes.?

The zemstvos, which have an ageregate yearly income of about

thirty million roubles, have also a yearly deficit of from three to | The municipalities had in 1882 an income of

five million roubles. only 40,076,748 roubles, there being only nine cities which had a budget of more than 500,000 roubles, and five above one million.

The Russian army has been completely reorganized since the Crimean War, and compulsory military service was introduced in 1874. In 1884 the strength of the army on a peace footing was 532,764 men serving with the colours, 68,786 reserve troops, 55,599 Cossacks and irregulars, 72,626 local, depét, and instruction troops, 27,468 officers, 129,736 horses, and 1844 guns. On a war footing there were 986,000 in the active army, 563,373 in the reserve, 148,057 Cossacks and irregulars, 178,450 local, depét, and instruction troops, 41,551 officers, 366,354 horses, and 3778 guns; that is, about 1,300,000 men in field, to which number 1,000,000 untrained militia could be added in case of need. These high figures, ought, however, to be much reduced on account of the deficiencies of mobilization.

The irregular troops consist of ten voiskos—Don, Kubafi, Terek, Astrakhan, Orenburg, Ural, West Siberia, Semiryetchensk, Trans- baikalia, and Amur. All the men of these voiskos between sixteen and forty-one years of age are bound to be ready for service in turn in time of peace, and to equip themselves at their own expense, train and artillery being provided by Government. In their twofold capacity as peasant settlers and a military force, these men have contributed much to the conquest of Asia.

Since 1878 compulsory military service has been introduced in Finland. The Finnish troops (nine battalions of 4833 riflemen) must be employed, as a rule, for the defence of their own country.

Notwithstanding large recent outlays, the Russian navy is by no means adapted to the exigencies of modern warfare ; much stress is therefore laid on the good organization of the torpedo flotilla. The navy consists of 358 vessels, of 196,575 tons, carrying 24,500 men and 671 guns. Only 40 of these are armoured ships, the remainder being unarmoured frigates, corvettes, and cruisers, or torpedo boats (119), while a great number are mere transports and small craft.

The extensive frontier is defended by many fortresses, chiefly on the west. Poland to the west of the Vistula remains quite unpro- tected, fortifications being only now in course of construction in the south-west ; but the Vistula is defended by the first-class fortresses of Modlin (Novogeorgievsk), Warsaw, and Ivangorod, with Brest- Litovsk in the rear. For protecting this line in rear new fortifica- tions are being erected. ‘The space between Poland and the Diina is protected only by the citadel of Vilna and the inarshes of the Pripet. The second line of fortresses has been erected on the Diina and Dnieper,—Riga, Diinaburg, Vitebsk, Bobruisk, and Kieff. The south-western frontier is under the protection of the advanced works of Bendery and Akerman, while the Black Sea coast is defended by Kinburn and Otchakoff at the entrances of the Dnieper and the Bug, Sebastopol in the Crimea, batteries at Odessa and Nikolaieff, and a series of minor fortifications. Formidable defen- sive works have been erected on the Baltic at Diinamiinde, Reval, Narva, Cronstadt, Wib g, Frederikshamn, Rohtensalm, Sveaborg, Hangéudd, and in the Neca Islands. A great number of minor forts are scattered throughout Caucasia, Transcaucasia, and

Turkestan ; but the Pacific coast has only earth-works at Vladi- vostok and Nikolaievsk.

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The administrative boundaries of European Russia, apart from Finland and Poland, broadly coincide on the whole with the 1 natural limits of the East-European plains, where they suddenly take, eastward of the Baltic Sea, a great extension towards the north. In the north it is bounded by the Arctic Ocean ; the islands of Nova Zembla, Kolgueff, and Vaigatch also belong to it, but the Kara Sea is reckoned to Siberia. ‘To the cast it has the Asiatic dominions of the empire, Siberia and the Kirghiz Steppe, from both of which it is separated by the Ural Mountains, the Ural river, and the Caspian —the administrative boundary, how- ever, partly extending into Asia on the Siberian slope of the Urals, To the south it has the Black Sea and Caucasia, being separated from the latter by the double valley of the two Manytches —a channel which in Post-Pliocene times connected the Sea of Azotf with

the Caspian. The western boundary is purely conventional: it crosses first the peninsula of Kola from the Varanger Fiord to the northern extremity of the Gulf of Bothnia, making an arbitrary deflexion towards the west ; thence it runs to the Kurische Haif in the sonthern Baltic, and thence to the mouth of the Danube, taking a great circular sweep to the west to embrace Poland, and separating Russia from Prussia, Austrian Galicia, and Roumania.

Of this immense frontier line less than one-half is bordered by seas—nearly all of them inland seas. For it isa special feature of Russia—a feature which has impressed a special character on its history—that she has no free outlet to the high seas except on the ice-bound shores of the Arctic Occan. Even the White Sea is merely a ramified gulf of that ocean. Another warmer guif, of the Arctic Ocean—the Varanger Fiord—separated from Russia by the uninhabitable plateaus of the peninsula of Kola, has been abandoned to Norway. The deep indentations of the Gulf of Bothnia and Finland wash the shores of Finnish territory, and it is only at the very head of the latter gulf that the Russians happen to have taken a firm foothold by erecting their capital on the marshes at the mouth of the Neva. ‘The Gulf of Riga and the south-eastern Baltic belong also to territory which is not inhabited by Slavonians, but by Finnish stems, and by Germans. It is only very recently, within the last hundred years, that the Russians definitively took possession of the northern shores of the Black Sea and the Sea of Azoff. The eastern coast of the Black Sea belongs properly to Transcaucasia, a great chain of mountains separating it from Russia. But even this sea is an inland one, the only outlet of which, the Bosphorus, is in foreign hands, while the Caspian is but an immense shallow lake, bordered mostly by deserts, and possessing more importance as a link between Russia and her colonies than as a channel for intercourse with other countries.

The great territory occupied by European Russia—1600 miles in Cor length from north to south, and nearly as much from west to east rati —is on the whole a broad elevated plain, ranging between 500 and 900 feet above sea-level, deeply eut into by river-valleys, and bounded on all sides by broad hilly swellings or mountains :—the lake plateaus of Finland and the Maanselkii heights in the north- west; the Baltic coast-ridge and spurs of the Carpathians in the west, with a broad depression between the two,

oceupied by Poland; the Crimean and Caucasian mountains in the south ; and the broad but ‘moderately high swelling of the Ural Mountains in the east,

From a central plateau which comprises Tver, Moscow, Smolensk, and Kursk, and projects eastwards towards Samara, attaining an average height of 800 to 900 feet above the sea, the surface gently slopes in all directions to a level of from 300 to 500 fect. Then it again gently rises as it approaches the hilly tracts cnclosing the great plain. This central swelling may be considered a continua- tion towards the east-north-east of the great line of upheavals of western Europe; the heights of Finland would then appear as continnations of the Scanian plateaus, and the northern mountains of Finland as continuations of the Kjélen, while the other great line of upheaval of the old continent, which runs north-west and south-east, would be represented in Russia by the Caucasus in the south and the Timan ridge of the Petchora basin in the north,

The hilly aspects of several parts of the central plateau are not due to foldings of the strata, which for the most part appear to be horizontal, but chiefly to the excavating action of rivers, whose valleys are deeply dug out in the plateau, especially on its borders. The round flattened summits of the Valdai plateau do not rise above 1100 feet, and they present the appearance of mountains only in consequence of the depth of the valleys—the levels of the rivers which flow towards the depression of Lake Peipus being only from 200 to 250 feet above the sca. The ease is similar with the plateaus of Livonia, ‘‘ Wendish Switzerland,” and Kovno, which do not exceed 1000 feet at their highest points ; so also with the eastern spurs of the Baltic coast-ridge between Grodno and Minsk. The same elevation is reached by a very few flat summits of the plateau about Kursk, and farther east on the Volga about Kamyshin, where the valleys are excavated in the plateau to a depth of from 800 to 900 feet, giving quite a hilly aspect to the country. It is only in the south-west, where spurs

of the Carpathians enter Volhynia, Podolia, and Bessarabia, that ridges reaching 1100 feet are met with, intersected by deep ravines.

The depressions on the borders of the central plateau thus ac- quire a greater importance than the small differences in its height. Such is the broad depression of the middle Volga and lower Kama, bounded on the north by the faint swelling of the Uvaty, which is the watershed between the Arctic Ocean and the Volga basin. Another broad depression, from 250 to 500 feet above the sea, still filled by Lakes Peipus, Ladoga, Onega, Bieto-ozero, Latche, Vozhe, and many thousands of smaller ones, borders the central plateau on the north, and follows the same east-north-east direction. Only a few low swellings penetrate into it from the north-west, about Lake Onega, and reach 900 feet, while in the north-east it is enclosed by the high Timanskiy ridge (1000 fect). A third depression ofa similar character, occupied by the Pripet and the middle Dnieper, extends to the west of the central plateau of Russia, and penetrates into Poland. The immense lacustrine basin is now broken up into numberless ponds, lakes, and extensive marshes (see Minsk). Itis bounded on the south by the broad plateaus spreading east of the Carpathians. South of 50° N. lat. the central plateau gently slopes towards the south, and we find there a fourth depression spreading west and east through Poltava and Kharkoff, but still reaching in its higher parts 500 to 700 feet. It is separated from the Black Sea by a gentle swelling which may be traced from Kremenetz to the lower Don, and perhaps farther south-east. This low swelling includes the Donetz coal-measures and the middle granitic ridges which cause the rapids of the Dnieper. Finally a fifth immense depression, which descends below the level of the ocean, extends for more than 200 tiles to the north of the Caspian, comprising the lower Volga and the Ural and Emba rivers, and establishing a link between Russia and the Aral-Caspian region. The depression is continued farther north by plains below 300 feet which join the depression of the middle Volga, and extend as far as the mouth of the Oka.

The Ural Mountains present the aspect of a broad swelling whose strata no longer exhibit the horizontality we see in Russia, and moreover are deeply cut into by rivers. It is connected in the west with broad plateaus joining those of central Russia, but its orographical relations to other upheavals must be more closely studied before they can be definitely pronounced oun.

The rhomboidal peninsula of the Crimea, connected by only a narrow isthmus with the continent, is occupied by a dry plateau gently sloping north and east, and bordered in the south-east by the Yaita Mountains, the summits of which range between 4000 and 5118 feet (see CRIMEA and TAURIDA),.

Owing to the orographieal structure of the East-European plains, which has just been described, the river-system has attained a very high development. Taking their origin from a series of great lacustrine basins scattered over the surface of the plateaus and differing slightly in elevation, the Russian rivers describe im- mense curves before reaching the sea, and flow with a very gentle gradient, receiving numerous large tributaries, which collect their waters from vast areas. Thus the Volga, the Dnieper, and the -Don attain respectively a length of 2110, 1330, and 1125 miles, and their basins cover 645,000, 244,600, and about 115,000 square miles respectively. Moreover the chiefrivers of Russia—the Volga, the Diina, the Dnieper, and even the Lovat and the Oka—take their rise in the north-western part of the central plateau, so close to one another that they may be said to radiate from the same marshes. The sources of the Don are ramified among the tribu- taries of the Oka, while the upper tributaries of the Kama join those of the Dwina and Petchora. In consequence of this, the rivers of Russia have been from remote antiquity the true channels of trade and migration, and have contributed much more to the elaboration of the national unity than any political institutions. Boats could be conveyed over flat and easy portages, from one river- basin to another, and these portages were subsequently transformed with a relatively small amount of labour into navigable canals, and even at the present day these canals have more importance for the traffic of the country than most railways. By their means the plains of the central plateau—the very heart of Russia, whose natural outlet was the Caspian—were brought into water-communication with the Baltic, and the Volga basin connected with the Gulf of Finland. The White Sea has also been brought into connexion with the central Volga basin, while the sister-river of the Volga —the Kama—became the main artery of communication with Siberia.

_ It must be observed, however, that, though ranking before the rivers of western Europe in respect of length, the rivers of Russia are far behind as

regards the amount of water discharged. They freeze in winter and dry up in summer, and most of them are navigable only during the spring-floods ; even the great Volga becomes so shallow during the hot season that only light boats can pass its shoals.

Russia has a very large number of lakes. The ageregate area of the largest ones is stated at 25,800 square miles.

The following is a descriptive list of the principal rivers of Euro- pean Russia.

A. Arctic Ocean Basin. —(1) The Petchora (1025 miles) rises in the

northern Urals, and enters the ocean by a large estuary at the Gulf of Petchora. Its basin, thinly peopled and available only for cattle- breeding and for hunting, is quite isolated from Russia by the Timan ridge. The river is navigable for 770 miles; grain and a variety of goods conveyed from the upper Kama are floated down, while furs, fish, and other products of the sea are shipped up the river to be transported to Tcherdyn on the Kama. (2) The Kara (139 miles) enters the Kara Sea. (3) The Mezefi (510 miles) enters the Bay of Mezeii; it is navigable for 450 miles, and is the channel of a considerable export of timber. (4) The northern Dwina, or Dvina (950 miles), with a basin of about 150,000 square miles, is formed by the union of two great rivers, the Yug (270 miles) and the Sukhona (330 miles). The Sukhona has its origin in Lake Kubenskoye, in north-west Vologda, and flows rapidly southwards and eastwards, having a great number of rapids. It is navigable throughout its length, and, as Lake Kubenskoye commu- nicates by the Alexander of Wiirtemberg Canal with Lake Bietoye, it is connected with the Caspian and Baltic. The Vytchegda (685 miles), which flows west-south-west to join the Sukhona, through a woody region, thinly peopled, is navigable for 500 miles and in its upper portion is connected by a canal with the upper Kama. The Dwina flows with a very slight gradient through a broad valley, receiving many tributaries, and reaches the White Sea at Arch- angel by a number of branches. Notwithstanding serious

obstacles offered by shallows, corn, fish, salt, and timber are largely shipped to and from Archangel. (5) The Onega (245 miles) rises in Lake Latche in the south of Otonetz, and flows into Onega Bay ; it has rapids ; timber is floated down in spring, and fishing and some navigation are carried on in the lower portion.

B. Baltic Basin.—(6) The Neva (46 miles) flows from Lake. Ladoga into the Gulf of Finland (see St PETeRspuRG). (7) The Volkhoff (135 miles), discharging into Lake Ladoga (see Lapoea), and forming part of the Vyshnevolotsk system of canals, is an important channel for navigation; it flows from Lake Ilmen (867 square miles), which receives the Msta (250 miles), connected with the Volga, the Lovat (310 miles), and many smaller tributaries. (8) The Svir (135 miles), also discharging into Lake Ladoga, flows from Lake Onega (4925 square miles), and, being part of the Mariinsk canal system, is of great importance for navigation (see Vouea). (9) The Narova (46 miles) flows out of Lake Peipus into the Gulf of Finland at Narva; it has remarkable rapids, notwith- standing which an active navigation is carried on by means of its waters. Lake Peipus, or Tchudskoye (136 square miles), receives —(10) the Velikaya (210 miles), a channel of traffic with southern Russia from a remote antiquity, but now navigable only in its lower portion, and (11) the Embach (83 miles), navigated by steamers to Dorpat. (12) The Diina, or West Dwina (577 miles), with a basin area of about 75,000 square miles, rises in the Ostashkoff district of Tver, and falls into the sea below Riga, after having described a great curve to the south. It is shallow above the rapids of Jacob- stadt, but navigation is carried on as far as Vitebsk, —corn, timber for shipbuilding, potash, flax, &c., being the principal shipments of its navigable tributaries (the Obsha, Ulla, and Kasplya); the Ulla is connected by the Berezina canals with the Dnieper. (13) The Niemen (Memel), with a course of 470 miles in Russia, rises in the north of Minsk, leaves Russia at Yurburg, and enters the Kurische Haff ; rafts are floated upon it almost from its sources, and steamers ply as far as to Kovno ; the export of corn and timber to Prussia, and import of fish, grocery, and manufactured ware are consider- able ; it is connected by the Oginski Canal with the Dnieper. The chief tributaries are the Viliya and the Shara. For (14) the Vistula, with the Bug and Narew, see PoLAND.

C. Black Sea Basin.—(15) The Pruth (505 miles) rises in Austrian Bukovina, and separates Russia from Roumania ; it enters (16) the Danube, which flows along the Russian frontier for 100 miles below Reni, touching it with its Kilia branch. (17) The Dniester (530 miles within Russia and about 330 miles in Austria) rises in Galicia. Light boats and rafts are floated at all points, and steamers ply on its lower portion ; its estuary has important fisheries. (18) The Dnieper (1330 miles), with a basin of about 245,000 square miles, with tributaries, waters thirteen governments, of which the aggregate population numbers about 15,000,000. It also originates in the north-western parts of the central plateau, in the same marshy lakes which give rise to the Volga and Diina. It flows west, south, south-east, and south-west, and enters a bay in the north-western part of the Black Sea. In the middle navigable part of its course, from Dorogobuzh to Ekate- rinoslaff, it is an active channel for traffic. It receives several large tributaries :—on the right, the Berezina (285 miles), con- nected with the Diina, and the Pripet (400 miles), both most important for navigation,—as well as several smaller tributaries on which rafts are floated; on the left the Sozh (830 miles), the Desna (590 miles), one of the most important rivers of Russia, navigated by steamers as far as Bryansk, the Suta (252 miles), the Psiot (415 miles), and the Vorskta (268 miles). Below Ekaterinoslaff the Dnieper flows for 46 miles through a series of thirteen rapids. At Kherson it enters its long (40 miles) but

shallow estuary, which receives the West Bug (450 mules) and the Ingut (220 iniles). The traffic of the Dnieper and its tributaries reached in 1882 an aggregate of 12:9 million cwts. shipped and 6°7 discharged, the principal items being corn, salt, and timber. (19) The Don (1125 miles), with a basin of about 120,000 square iniles, and navigable for 880 miles, rises in south-eastern Tula and enters the Sea of Azoff at Rostoff by thirty mouths, after describing a great curve to the east at Tsaritsyn, approaching the Volga, with which it is connected by a railway (40 miles). Its navigation is of great importance (5°4 million cwts. shipped, and 5°1 discharged), es -cially for

goods brought from the Volga, and its fisheries are extensive. The chief tributaries are the Sosna (175 miles) and North Donetz (615 milcs) on the right, and _ the Voronezh (305 miles), Khoper (565 miles), Medvyeditsa (410 miles), and Manytch (295 miles), on the left. (20) The Ylya (192 iniles), (21) the Kubaii (510 miles), and (22) the Rion belong to Caueasia.

D. The Caspian Basin.—(23) The Volga, the chief river of Russia, has a length of 2110 miles, and its basin, about 648,000 square miles in area, contains a population of more than 40,000,000. It is connected with the Baltic by three systems of canals (see Vouea). (24) The Great and the Little Uzci no longer reach the Caspian but lose themselves in the Babinskoyc Lakes. (25) The Ural (1475 miles), in its lower part, constitutes the frontier between European Russia and the Kirghiz Steppe; it receives the Sakmara on the right and the Ilek on the left. (26) The East Manytch (175 miles) is on the Caucasian boundary. (27) The Kuma (405 miles), (28) the Terek (360 miles), and (29) the Kura (about 650 miles), with the Arax (about 650 miles), which receives the waters of Lake Goktcha, belong to Caucasia.!

Almost every geological formation, from the oldest up to the most recent, is met with in Russia; but, as they are almost horizontal, they for the most part cover one another over immense spaces, so that the lower ones appear only at the bottom of the deeper valleys, and the oldest are seen only on the borders of the great Russian plain.

At the beginning of the Paleozoic period only a very few portions of what is now Russia—Finland, namely, and parts of Olonetz— rose above the surface of the sea; but, as the result of a gradual upheaval continued through Paleozoic times, it is supposed that at the end of this epoch Russia was a continent not greatly differ- ing from the present one. In Mesozoic times the sea began again to invade it, but, while in the preceding period the oscillations resolved themselves into a gradual upheaval extending from west to east, in Mesozoic times the upheaval went on from north-west to south-east. The Mesozoic sea, however, did not extend beyond what is now central Russia, and did not cover the “Devonian plateau” of western Russia, which remained a continent from the Carboniferous epoch. A gradual rising of the continent followed, and was continued through Neozoic times, with perhaps a limited subsidence in the Post-Glacial period, when the actual

seas extended their narrow gulfs up the valleys now occupied by the great rivers. During the first part of the Glacial period, Russia seems to have been covered by an immense ice-sheet, which extended also over central Germany, and of which the eastern limits cannot yet be determined.

The Archean gneisses have a broad extension in Finland, northern Russia, the Ural Mountains, and the Caucasus; they form also the back-bone of the ridge which extends from the Carpathians through southern Russia. They consist for the most part of red and grey gneisses and granulites, with subordinate layers of granite and granitite. The Finland rappa-kivi, the Serdobol gneiss, and the Pargas and Rustiala marble (with the so-called Hozoon cana- dense) yield good building stone ; while iron, copper, and zinc-ore are common in Finland and in the Urals. Rocks regarded as representing the Huronian system appear also in Finland, in north- western Russia, as a narrow strip on the Urals, and in the Dnieper ridge. They consist of a series of unfossiliferous crystalline slates. The Cambrian is represented by blue clays, ungulite sandstones, and bituminous slates in Esthonia and St Petersburg.

The Silurian system is widely developed, and it is most probable that, with the exception of the Archean continents of Finland and the Urals, the Silurian sea covered the whole of Russia. Being con- cealed by more recent deposits, Silurian rocks appear on the surface

1 Bibliography.—The lengths of the rivers of European Russia as ascertained by accurate mcasurements are

See also Stuckenberg, M7ydr. des R. Reichs ; Semenoff, Geogr. Statist, Dictionary (the most reliable source for all the

Russian rivers, separate govcrnments, a great variety of inonographs dealing with separate

was published in 1878; sce also Tillo, Orogr. Map of Russia; the ordinance maps of Russia; and Tillo, “ Magnctical of Geogr. Soc., 1884 and 1885,

only in north-western Russia (Esthonia, Livonia, St Petersburg, and on the Volkhoff), where all European subdivisions of the system have been found, in the Timan ridge, on the western slo e of the Urals, in the Pai-kho ridge, and in the islands of the Aretic Ocean. In Poland it is met with in the Kielce Inountains, and in Podolia in the deeper ravines.

The Devonian -dolomites, limestones, and red sandstones cover immense tracts and appcar on the surface over a much wider area, From Esthonia these rocks extend north-east to Lake Onega, and south-east to Moghileff; they form the central plateau, as algo the slopes of the Urals and the Petchora region. In north-western and middle Russia they contain a special fauna, and it appears that the Lower Devonian series of western Europe, represented in Poland and in the Urals, is missing in north-western and central Russia, where only the Middle and Upper Devonian divisions are found.

Carboniferous deposits cover nearly all eastern Russia, their west boundary being a line drawn from Archangel to the upper Dnieper, thence to the upper Don, and south to the mouth of the last-named river, with a long narrow gulf extending west to encircle the plateau of the Donetz. They are visible, however, only on the western borders of this region, being covered towards the east by thick Permian and Triassic strata. Russia has three large coal-bearing regions—the Moscow basin, the Donetz region, and the Urals. In the Valdai plateau there are only a few beds of mediocre coal. In the Moscow basin, which was a broad gulf of the Carboniferous sea, coal appears as isolated inconstant seams amidst littoral deposits, the formation of which was fayoured by frequent minor subsidences of the sea-coast. The Donetz coal-measures, containing abundant remains of a rich land-flora, cover nearly 16,000 square miles, and comprise a valuable stock of excellent anthracite and coal, togethcr with iron-mines. Several smaller coal-fields on the slopes of the Urals and on the Timan ridge may be added to the above. The Polish coal-fields belong to another Carboniferous area of deposit, which extended over Silesia, _

The Permian limestones and marls occupy a strip in eastern Russia of much less extent than that assigned to them on geological maps a few years ago.

The variegated marls of eastern Russia, rich in salt-springs, but very poor in fossils, are now held by most Russian geologists to be Triassic. Indisputably Triassic deposits have been found only in the two Bogdo mountains in the Kirghiz Steppe (Campiler-Schichten) and in south-western Poland.

During the Jurassic period the sea began again to invade Russia from south-eastand north-west. The limits of the Russian Jurassic system may be represented by a line drawn from the double valley of the Sukhona and Vytchegda to that of the upper Volga, and thence to Kieff, with a wide gulf penetrating towards the north- west. Within this space three depressions, all running south-west to north-east, are filled up with Upper Jurassic deposits. They are much denuded in the higher parts of this region, and appear but as isolated islands in central Russia. In the south-east all the older subdivisions arc represented, the deposits having the characters of a deep-sea deposit in the Aral-Caspian region and on the Caucasus.

The Cretaceous deposits—sands, loose sandstones, marls, and white chalk —cover the region south of a line drawn from the Niemen to the upper Oka and Don, and thence north-east to Simbirsk, with the exception of the Dnieper and Don ridge, the Yaita Mountains, and the upper Caucasus. They are rich in grind- ing stone, and especially in secondary layers of phosphorites.

The Tertiary formations occupy Jarge areas in southern Russia. The Eocene covers wide tracts from Lithuania to Tsaritsyn, and is represented in the Crimea and Caucasus by thick deposits belong- ing to the same ocean, which left its deposits on the Alps and the Himalayas. Oligocene, quite similar to that of North Germany, and containing brown coal and amber, has been met with only in Poland, Courland, and Lithuania. The Miocene (Sarmatian stage) occupics extensive tracts in southern Russia, south of a line drawn through Lublin to Ekaterinoslaff and Saratoff. Not only the higher chains of Caucasus and Yaita, but also the Donetz ridge, rose above the level of the Miocene sea, which was very shallow to the north of this last ridge, while farther south it was connected both with the Vienna basin and with the Aral-Caspian. The Pliocene appears only in the coast region of the Black and Azoff Seas, but it is widely developed in the Aral-Caspian

region, where, however, the Ust-Urt and the Obshchiy Syrt rose above the sea.

The thick Quaternary, or Post-Pliocene, deposits which cover nearly all Russia were for a long time a puzzle to geologists. They consist of a boulder clay in the north and of loess in the south. The former presents an intimate mixture of boulders brought from Finland and Olonetz (with an addition of local boulders) with small gravel, coarse sand, and the finest glacial mud, —the whole bearing no trace of ever having been washed up and sorted by water in motion, except in subordinate layers of glacial sand and gravel; the size of the boulders decreases on the whole from north to south, and the boulder clay, especially in northern and central Russia, often takes the shape of ridges parallel to the direction of the

RUS motion of the boulders. Its southern limits, roughly correspond- ing with those established by Murchison, but not yet settled in the south-east and east, are, according to M. Nikitin, the following :— from the southern frontier of Poland to Ovrutch, Umah, Kremen- tchug, Pottava, and Razdornaya (50° N. latitude), with a curve northwards to Kozelsk'(?); thence due north to Vetluga (58° north latitude), east to Glazova in Vyatka, and from this place towards the north and west along the watershed of the Volga and Petchora (?). South of the 50th parallel appears the loess, with all its usual characters (land fossils, want of stratification, &c.), showing a re- markable uniformity of composition over very large surfaces; it covers both watersheds and valleys, but chiefly the former. Such being the characters of the Quaternary deposits in Russia, the majority of Russian geologists now adopt the opinion that Russia was covered, as far as the above limits, with an immense ice-sheet which crept over central Russia and central Germany from Scandi- navia and north Russia. Another ice-covering was probably ad- vancing at the same time from the north-east, that is, from the northern part of the Urals, but the question as to the glaciation of the Urals still remains open. As to the loess, the view is more and more gaining ground which considers it as a steppe-deposit due to the drifting of fine sand and dust during a dry episode in the Pleistocene period.

The deposits of the Post-Glacial period are represented through- out Russia, Poland, and Finland, as also throughout Siberia and central Asia, by very

thick lacustrine deposits, which show that, after the melting of the ice-sheet, the country was covered with immense lakes, connected by broad channels (the fjdrden of the Swedes), which later on gave rise to the actual rivers. outskirts of the lacustrine region, closely resembling the area of the actual continent, traces of marine deposits, not higher than 200 or perhaps even 150 feet above present sea-level, are found alike on the Arctic Sea and on the Baltic and Black Sea coasts. A deep gulf of the Arctic Sea advanced up the valley of the Dwina; and the Caspian, connected by the Manytch with the Black Sea, and by the Uzboy valley with Lake Aral, penetrated north up the Volga valley, as far as its Samara bend. Unmistakable traces show that, while during the Glacial period Russia had an arctic flora and fauna, the climate of the Lacustrine period was more genial than it is now, and a dense human population at that time peopled the shores of the numberless lakes.

The Lacustrine period has not yet reached its close in Russia. Finland and the north-west hilly plateaus are stil] in the same geological phase, and are dotted with numberless lakes and ponds, while the rivers continue to dig out their yet undetermined chan- nels. But the great lakes which covered the country during the Lacustrine period have disappeared, leaving behind them immense marshes like those of the Pripet and in the north-east. The disappearance of what still remains of them is accclerated not only by the general decrease of moisture, but also by the gradual up- heaval of northern Russia, which is going on from Esthonia and Finland to the Kola peninsula and Nova Zembla, at an average rate of about two feet per century. This upheaval,—the consequences of which have been felt even within the historic period, by the drain- age of the formerly impracticable marshes of Novgorod and at the head of the Gulf of Finland,—together with the destruction of forests, which must be considered, however, as a quite secondary and subordinate cause, contributes towards a decrease of precipi- tation over Russia and towards increased shallowness of her rivers. At the same time, as the gradients of the rivers are gradually in- creasing on account of the upheaval of the continent, the rivers dig their channels deeper and deeper. Consequently central and especially southern Russia witness the formation of numerous miniature cafions, or ovraghi (deep ravines), the summits of which rapidly advance and ramify in the loose surface deposits. As for the southern steppes, their desiccation, the consequence of the above causes, is in rapid progress.+

The soil of Russia depends chiefly on the distribution of the boulder-clay and loess coverings described above, on the progress made by the rivers in the excavation of their valleys, and on the moistness of climate. Vast areas in Russia are quite unfit for cultivation, 27 per cent. of the aggregate surface of European Russia (apart from Poland and Finland) being occupied by lakes, marshes, sands, &c., 38 per cent. by forests, 14 per eent. by prairies, and only 21 per cent. being under culture. The distri- bution of all these is, however, very unequal, and the five follow- ing subdivisions may be established :—(1) the twndras ; (2) the forest region ; (3) the middle region, comprising the surface avail- able for agriculture and partly covered with forests ; (4) the black- earth (tchernoziom) region; and (5) the Steppes. Of these the black-carth region, —about 150,000,000 acres, —which reaches from the Carpathians to the Urals, extending to the Pinsk marshes and

1 Bibliography.—Memoirs, Izvestia, and Geological Maps of the Committee for the Geological Survey of Russia; Memoirs and Sborniks of the Mineralogical Society, of the Academy of Science, and of the Societies of Naturalists at the Universities; Mining Journal; Murchison's Geology of Russta; Helmersen's and

Méller's Geological Maps of Russia and the Urals; Inostrantseff in Appendix to Russian translation of Reclus's Géogr. Univ., and Manual of Geology (Russian).

SOIL AND CLIMATE.]

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the upper Oka in the north, is the most important. It is covered with a thick sheet of black earth, a kind of locss, mixed with 5 to 15 per cent. of humus, due to the decomposition of an herba- ceous vegetation, which developed richly during the Lacustrine period on a continent relatively dry even at that epoch. On the three-fields system corn has been grown upon it for fifty to seventy consecutive years without manure. Isolated black-earth islands, less fertile of course, occur also in Courland and Kovno, in the Oka, Volga, and Kama depression, on the slopes of the Urals, and in a few patches in the

north. Towards the Black Sea coast its thickness diminishes, and it disappears in the valleys. In the extensive region covered with boulder-clay the black earth appears only in isolated places, and the soil consists for the most part of a sandy clay, containing a much smaller admixture of humus. There culture is possible only with the aid of a considerable quantity of manure. Drainage finding no outlet through the thick clay cover-

| ing, the soil of the forest region is often covered with extensive

marshes, and the forests themselves are often mere thickets spread- ing over marshy ground ; large tracts covered with sand appear in the west, and the admixture of boulders with the clay in the north-west renders agriculture increasingly difficult. On the Arctic coast the forests disappear, giving place to the tundras. Finally, in the south-east, towards the Caspian, ou the slopes of the southern Urals and the Obshchiy Syrt, as also in the interior of the Crimea, and in several parts of Bessarabia, there are large tracts of real desert, covered with coarse sand and devoid of vegetation."

Notwithstanding the fact that Russia extends from north to

south through 26 degrees of latitude, the climate of its different Climate.

portions, apart from the Crimea and the Caucasus, presents a striking uniformity. The aerial currents—cyclones, anti-cyclones, and dry south-east winds—extend over wide surfaces and cross the flat plains freely. Everywhere we find a cold winter and a hot summer, both varying in their duration, but differing rela- tively little in the extremes of temperature recorded. From Table ILI. (page 76) it will be seen that there is no place in Russia, Archangel and Astrakhan included, where the thermometer does not rise in summer nearly to 86° Fahr. and descend in winter to — 13° and – 22°. It is only on the Black Sea coast that we find the absolute range of temperature reduced to 108°, while in the remainder of Russia it reaches 126° to 144°, the oscillations being between — 22° to – 31°, occasionally — 54°, and 86° to 104°, occasion- ally, 109°. Everywhere the rainfall is small : if Finland and Poland on the one hand and Caucasus with the Caspian depression on the other be excluded, the avcrage yearly rainfall varies between the limits of 16 and 28 inches. Everywhere, too, we find that the maximum rainfall does not take place in winter (as in western Europe)

but in summer, and that the months of advanced spring are warmer than the corresponding months of autumn.

Though thus exhibiting all the distinctive features of a con- tinental climate, Russia is not altogether exempt from the moder- ating influence of the ocean. The Atlantic cyclones also reach the Russian plains, mitigating to some extent the cold of the winter, and in summer bringing with them their moist winds and thunderstorms ; their influence is chiefly felt in western Russia, but extends also towards and beyond the Urals. They thus check the extension and limit the duration of the cold anticyclones.

Throughout Russia the winter is of long continuance. The last days of frost are experienced for the most part in April, but also in May to the north of 55°. The spring is exceptionally beautiful in' central Russia ; late as it usually is, it sets in with vigour, and vegetation develops with a rapidity which gives to this season in Russia a special charm, unknown in warmer climates ; the rapid melting of snow at the same time raises the rivers, and renders a great many minor streams navigable for a few weeks. Buta return of cold weather, injurious to vegetation, is observed throughout central and eastern Russia between May 18 and 24, so that it is only in June that warm weather sets in definitely, reaching its maximum in the first half of July (or of August on the Black Sea coast). The summer is much warmer than might be supposed; in south-eastern Russia it is much warmer than in the corresponding latitudes of France, and really hot weather is experienced everywhere. It does not, however, prevail for long, and in the first half of September the first frosts begin to be experienced on the middle Urals; they reach western and southern Russia in the first days of October, and are felt on the Caucasus about the middle of November. The temperature descends so rapidly that a month later, about October 10 on the middle Urals and November 15 throughout Russia, the thermometer ceases to rise above the freezing-point. The rivers rapidly freeze ; towards November 20 all the streams of the White Sea basin are covered with ice, and so remain for an average of 167 days; those of the Baltic, Black Sca, and Caspian basins freeze later, but about December 20 nearly all the rivers of the (Ge ERO E N e eee | eEeeEEeeeeee

2 Bibliography.—Ruprecht, Geo.~~Botanical Researches on the Tchernoziom; Dokutchaeff, Russian Tchernoziom, 1880; Id., Phys. Chem. Researches ; Materials for Statistics of Russia, published by the Minister of Domains, v., 1871; Wasil~~ tchikoff, ‘‘ Tchernoziom and its Future,” in Afem. Moscow Soc. of Agr., 1877.

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country are highways for sledges. The Volga remains frozen for a period varying between 150 days in the north and 90 days at Astrakhan, the Don for 100 to 110 days, and the Dnieper for 83 to 122 days. On the Diina ice prevents navigation for 125 days, and even the Vistula at Warsaw remains frozen for 77 days. The lowest temperatures are experienced in January, in which month the average is as low as 20° to 5° Fahr. throughout Russia ; in the west only does it rise above 22°. On the whole, February and March continue to be cold, and their average temperatures rise above zero only on the Blaek Sea coast. Even at Kieff and Lugait the average of March is below 30°, while in central Russia it is 25° to 22°, and as low as 20° and 16° at Samara and Orenburg. Isotherms.—All Russia is comprised between the isotherms of 32° and 54°. On the whole, they are more remote from one another than even on the plains of North America, those of 46° to 32° being distributed over 20 degrees of latitude. They are, on the whole, inclined towards the south in eastern Russia; thus the isotherm of 39° runs from St Petersburg to Orenburg, and that of 35° from Torneé to Uralsk. The inflexion is still greater for the winter isotherms. Closely following one another, they run almost north and south ; thus Odessa and Kénigsberg are situated on the same winter isotherm of 28°; so also St Petersburg, Orel, and the mouth of the Ural river (about 20°) ; Mezen and Ufa (9°). The summer isotherms cross the above nearly at right angles, so that Kieff and Ufa, Warsaw and Tobolsk, Riga and the npper Kama have the same average summer temperatures of 64°, 624°, and 61°.

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Winds, Moisture, Rainfall.—The investigation of the cyclones and antieyclones in Russia eannot as yet be regarded as completed, It appears,

however, that in January the cyclones mostly cross north-west Russia (north of 55° and west of 40° E. long.), following directions which vary between north-east and south-east. In July they are displaced towards the north, and cross the Gulf of Bothnia, while another series of eyclones crosses middle Russia, between 50° and 55° N. lat. The laws of the anticyclones are not yet estah- lished. The winds closely depend on the routes followed by both. Generally, however, it may be said that alike in January and in July west and south-west winds prevail in western Russia, while eastern ones are most common in south-eastern Russia; northern winds are most common on the Black Sea coast. The strength of the wind is greater, on the whole, than in the continental parts of western Europe, and it attains its maximum in winter. Terrible gales blow from October to March, especially on the southern steppes and on the tundras. Gales with snow (burans, myatels), lasting from two to three days, or northerly gales without show, are especially dangerous to man and beast. The average relative moisture reaches 80 to 85 per cent. in the north, and only 70 to 8} per cent. in southern and eastern Russia. In the steppes it is only 60 per cent. during summer, and still less (57) at Astrakhan. The average amount of cloud reaches 73 to 75 per cent. on the White Sea and in Lithuania, 68 to 64 in central Russia, and only 59 to 538 in the south and south-east. The amount of rainfall is shown in the subjoined table (III.):—+ :

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Teh . : Number of Days Average Rainfall

ace oo Average Temperatures. Average a sill Gee _ per Year, in iene Latitude. | Sea in Ther- Frosts. Frosts.

Feet. | year January.} July. | Minimum. | Maximum,| ™ometer. Bright. | Cloudy.| Year, | November

to Mareh. Arehangel…... 64 34 30 | 32:7 76 | 60°6 — 33 $4 147 =| 26 Sept.| 20 May} 23 199 | 16-2 4°3 Petrozavodsk ..| 61 47 160 | 386°4 |° 11°8 | 6271 —24 8&6 135 2e me ep 8 ot Fos Helsingfors….. 60 10 40 | 39:0 UG ey |) Las ~17 80 ele ee 2 ay Pe es AE St Petersburg..| 59 57 20; 38°4 | 15°0 |;

64:0; -20 88 135 15 Oct. | 8 May | 35 148 | 18°3 5°3 Bogoslovsk….. 59 45 6302} 29°4 | —3°8 |62°5| -47 87 150 =| 20 Sept.| 14 May | 43 94 | 15°8 3’l ID Kaya al Geoacoodee 56) 22 220 | 39°5 17°6 | 63°1 -14 85 124 7 Oct. | 3 May | 40 145 | 24:9 WES Kostroma…..... 57 46 860 | 37°83 9°4 | 66°3 ~— 27 88 140 2 nS aM aon 19°4 ae Kkaterinburg..| 56 49 890 | 32:8 Pa || 183) ~ 33 87 142 21 Oet.|14 May | 40 185 Wasi 1°6 JAVA Soper eoeece 5on47 260 | 37:2 7:0 | 67°3 —25 89 129 1 @et. (2px)... Mee 18-0 5°4 Moscow……..... 5545 520 | 89°0 | 12:1 | 65-0 — 22 88 144 7 Oct. | 26 April} 35 142 | 23:0 (a3 WMalltta scocsee coe 54 41 890 | 43°8 22°1 | 65°6 -10 85 110 17 Oct. (27 Api) gs 175 ua = Warsaw …..... 52 14 3860 | 44°9 23°8 | 65:4 – 2 86 123 18 Oct. | 7 April] 40 5a 22-8 67 Orenburg…..... 51 45 3860 | 37°9 4‘7 | 70°9 — 28 96 147 Ss si ae ; i7eu 5°8 Ktinslogee eee 51 44 690 | 41°0 BEY | Oe -—19 91 139 st ah *, a 19°9 5°6 STC tiie. cee ee BY)) Wer 590) || 44°2°|| 21-0 6653 -13 89 122 19 Oct. | 17 April} 34 Hse || 20rd! 6°0 Tsaritsyn…..... 48 42 100 ; 44-4 | 18:4 | 74°6 es ee ae se ce sae me Bre wag (CSI seaagenene 48 27 200 | 45°6 TAO) Be ~18 95 146 11 Oct. |11 April] 64 124; 14:3 4°3 Odessa……..... 46 29 270 | 49°0 Pees | 7/2B} – 38 89 108 10 Nov. |} 31 Mar.| 67 1D |) 56 5-4 Astrakhan…... 46 21 | -—70] 49:0] 19:2 | 77-9 -14 97 185 27 Oct. | 5 April | 69 114 Sag 15 Sebastopol…... 44 37 130 | S87) Soe Ween sare . 93 105 Bee ee ee 15°4 7:2 MOU ccc ses ces 42 9 0] 58°4 390M fears +25 93 88 12 Jan. | 1 Mar. 64°9 | 23-4 SMS et ase oer 41 42 | 1440 | 54:5 83°0 | 75°7 +10 96 100 18 Nov..| 15 Mar. 19°3 4°3

The flora of Russia, which represents an intermediate link between those of Germany and Siberia, is strikingly uniform over a very large area. Though not poor at any given place, it appears so if the space occupied by Russia be taken into account, only 3300 species of phanerogams and ferns being known. Four great regions may be distinguished :—the Arctic, the Forest, the Steppe, and the Cireum-Mediterranean,

The Arctic Region comprises the tundras of the Arctic littoral beyond the northern limit of forests, which last closely follows the coast-line, with bends towards the north in the river valleys (70° N. lat. in Finland, on the Arctic Circle about Archangel, 68° N. lat. on the Urals, 71° on West Siberia). The shortness of the summer, the deficiency of drainage, and the thickness of the layer of soil which is frozen through in winter are the elements which go to the making of the characteristic features of the

tundras. Their flora is far nearer those of northern Siberia and North America than that of central Europe. Mosses and lichens cover them, as also the birch, the dwarf willow, and a variety of shrubs ; but where the soil is drier, and humus has been able to accumulate, a varicty of herbaceous flowering plants, some of which are familiar also in western Europe, make their appearance. Only from 275 to 280 phanerogams are found within this region.

The forest Region of the Russian botanists occupies the greater part of the country, from the Arctic tundras to the Steppes, and it maintains over this immense surface a remarkable uniformity of character. M. Beketoff subdivides it into two portions—the forest region proper, and the " Ante-Steppe" (predstepie). The northern limit of the Ante-Steppe would be represented by a line drawn from the South Pruth through Zhitomir, Kursk, Tamboff, and Stavropol-on-Volga to the sources of the Ural. But the

forest region proper itself presents a certain variety of aspect in its northern and southern parts, and must in turn be again sub- divided into two parts—the coniferous region and that of the oak forests, —these being separated by a line drawn through Pskoff, Kostroma, Kazafi, and Ufa. Of course, the oak occurs farther north than this, and conifer forests extend farther south, advancing even to the border-region of the Steppes; but this line must still be considered as important. To the north of it we have dense forests, covering very large areas, and interrupted oftener by marshes than by meadows or cultivated fields. Vast and impene- trable forests, unpassable marshes and thickets, frequent lakes, swampy meadows, with cleared and dry spaces here and there occu- pied by villages, are the leading features of the region. Fishing and hunting are the important sources of livelihood. The characteristies of what may be described as the oak region, which comprises all central Russia, are totally different. The surface is undulatory ; marshy meadow lands no longer exist on the flat watersheds, and only a few shelter themselves in the much deeper and broader river valleys. Forests are still numerous where not destroyed by man, but their character has changed. Conifers are rare, and the Scotch pine, which covers the sandy plains, has taken the place of the Abies ; birch, oak, and other deeiduous trees 1 Bibliography.—Memoirs of the Central Physical Observatory; Kepertorium Jiir Meteorologie and Meteorological Sbornik, published by

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compose the forests, the soil of which is dry, and the extension of which is interrupted by green prairies. Viewed from a rising ground, the landscape presents a pleasing variety of corn-field and forest, while the horizon is broken by the bell-towers of numerous villages along the banks of the streams.

Viewed as a whole, the flora of the forest region must be regarded as European-Siberian ; and, th ough certain species disappear towards the cast, while new ones make their appearance, it maintains, on the whole, the same characters throughout from Poland to Kam- chatka. 'Thus the beech (Fagus sylvatica), a characteristic tree of western Europe, is unable to face the continental climate of Russia, and does not penetrate beyond Poland and the south- western provinces, reappearing again in the Crimea. The silver fir (pichta) does not extend over Russia, and the oak does not cross the Urals. On the other hand, several Asiatic species (Siberian pine, Jarch, cedar) grow freely in the north-east, while several shrubs and herbaceous plants, originally from the Asiatic steppes, have spread into the south-east. But all these do not greatly alter the general characters of the vegetation. The coniferous forests of the north contain, besides conifers, the birch (Betula alba, B. pub- escens, B. fruticosa, and B. verrucosa, which extend from the Petchora to the Caucasus), the aspen, two species of alder, the mountain-ash (Sorbus aweuparia), the wild cherry-tree, and three species of willow. South of 62° — 64° north latitude appears the lime-tree, which multiplies rapidly and, notwithstanding the rapidity with which it is being exterminated,

constitutes entire forests in the east (central Volga, Ufa). Farther south the ash (Frawinus exeelsior) and the oak make their appearance, the latter (Quereus pedunculata) reaching in isolated groups and trees as far as to St Petersburg and South Finland (Q. Robw appears only in the south-west). The hornbeam is prevalent in the Ukraine, and the maple begins to appear in the south part of the coniferous region. In the forest region no fewer than 772 flowering species are found, of which 568 dicotyledons occur in the Archangel government (only 436 to the east of the White Sea, which is a botanical limit for many species). In central Russia the species become still more numerous, and, though the local floras cannot yet be considered complete, they number from 850 to 1050 species in the separate governments, and about 1600 in the best explored parts of the south-west. Corn is cultivated throughout this region. Its northern limits—which are sure to advance still farther as the population increases—almost reach the Arctic coast at the Varanger Fiord ; farther east they hardly extend to the north of Archangel, and the limit is still lower towards the Urals. The northern frontier of rye closely corre- sponds to that of barley. Wheat is cultivated in South Finland, but in western Russia it hardly passes 58° N. lat. Its true domains are the oak region and the Steppes. Fruit-trees are cultivated as far as 62° N. in Finland, and as far as 58° in the east, Apricots and walnuts flourish at Warsaw, but in Russia they do not extend beyond 50°. Apples, pears, and cherries are grown throughout the oak region.

The Region of the Steppes, which covers all southern Russia, may be subdivided into two zones—an intermediate zone and that of the Steppes proper. The Ante-Steppe of the preceding region and the intermediate zone of the Steppes include those tracts where the West-European climate struggles with the Asiatic, and where a struggle is being carried ou between the forest and the Steppe. It is comprised between the summer isotherms of 59° and 63°, being bounded on the south by a lino which runs through Ekaterinoslaff and Lugaii. South of this line begin the Steppes proper, which extend to the sea and penetrate to the foot of Mount Caucasus.

The Steppes proper are very fertile elevated plains, slightly undulated, and intersected by numerous ravines which are dry in summer. The undulations are scarcely apparent to the eye as it takes in a wide prospect under a blazing sun and with a deep-blue sky overhead, Not a tree is to be seen, the

few woods and thickets being hidden in the depressions and deep valleys of the rivers. On the thick sheet of black earth by which the Steppe is covered a luxuriant vegetation develops in spring ; after the old grass has been burned a bright green covers immense stretches, but this rapidly disappears under the burning rays of the sun and the hot easterly winds, The colouring of the Steppe changes as if by magic, and only the silvery plumes of the kovyl (Stipa pennata) wave under the wind, giving the Steppe the aspect of a bright yellow sea. For days together the traveller sees no other vegetation ; even this, however, disappears as he nears the regions recently left dry from the Caspian, where salted clays covered with a few Salsolacce, or mere sands, take the place of the black-earth. Here begins the Aral-Caspian desert, The Steppe, however, is not so devoid of trees as at first sight appears. Innumerable clusters of wild cherries (Prunus Chamxeerasus), wild apricots (Amygdalus nana), tehilizhnik (Caragana frutescens), and other deep-rooted shrubs grow in the depressions of the surface and on the slopes of the ravines, giving the Steppe that charm which manifests itself in the popular poetry. Unfortunately the spread of cultivation is fatal to these oases (they are often called “islands” by the inhabitants) ; the axe and the plough ruthlessly destroy them.

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The vegetation of the poimy and zaimischas in the marshy bottoms of the ravines, and in the valleys of streams and rivers, is totally different. The moist soil gives free development to thickets of various willows (Sadicinex), bordered with dense walls of worm- wood and needle-bearing Composita, and interspersed with rich but not extensive prairies harbouring a great variety of herbaceous

plants ; while in the deltas of the Black Sea rivers impenetrable masses of rush (Arundo Phragmites) shelter a forest fauna. But cultivation rapidly changes the physiognomy of the Steppe. The

prairies are superseded by wheat-fields, and flocks of sheep destroy the true steppe-grass (Stipa pennata), which retires farther cast.

A great many species unknown in the forest region make their appearance in the Steppes. The Scotch pine still covers sandy spaces, and maple (Acer tatarica and A. eampestre), the hornbean, and the white and black poplar become quitecommon. The number of species of herbaceous plants rapidly increases, while beyond the Volga a variety of Asiatic species join the West-European flora.

The Circwm-Mediterranean Region is represented by a narrow strip of land on the south coast of the Crimea, where a climate siinilar to that of the Mediterranean coast las permitted the development of a flora closely resembling that of the valley of the Arno. Of course, human cultivation has not yet acclimatized there the same variety of plants as that imported into Italy since the Romans. It has even destroyed the rich forests which sixty years ago made deer-hunting possible at Khersones. The olive and the chestnut are rare; but the beach reappears, and the Pinus Pinaster recalls the Italian pines. At a few points, such as the Nikitsky garden and Alupka, where plants have been accli- matized by human agency, the Californian /Wellingtonia, the Lebanon cedar, many evergreen trees, the laurel, the cypress, and even the Anatolian palm (Chamwrops excels) flourish. The grass vegetation is very rich, and, according to lists still incom- plete, no fewer than 1654 flowering plants are known. On the whole, the Crimean flora has little in common with that of the Caucasus, where only 244 Crimean species have as yet been found.’

The fauna of European Russia does not very materially differ Fanna.

from that of western Europe. In the forests not many animals which have disappeared from western Europe have held their ground ; while in the Urals only a few—now Siberian, but formerly also European—are met with. On the whole, Russia belongs to the same zoo-geographical region as central Europe and northern Asia, the same fauna extending in Siberia as far as the Yenisci and Lena. In south-eastern Russia, however, towards the Caspian, we find a notable admixture of Asiatic species, the descrts of that part of Russia belonging in reality rather to the Aral-Caspian depression than to Europe.

For the zoo-geographer only three separate sub-regions appear on the East-European plains—the tundras, including the Arctic islands, the forest

region, especially the coniferous part of it, and the Ante-Steppe and Steppes of the black-earth region. The Ural mountains might be distinguished as a fourth sub-region, while the south coast of the Crimca and Caucasus, as well as the Caspian deserts, have their own individuality.

As for the adjoining seas, the fauna of the Arctic Ocean off the Norwegian coast corresponds, in its western parts at least, to that of the North Atlantic Gulf Stream. The White Sea and the Arctic Ocean to the east of Svyatoi Nos belong to a separate zoological region connected with, and hardly separable from, that part of the Aretic Ocean which extends along the Siberian coast as far as to about the Lena. The Black Sea, of which the fauna was formerly little known but now appears to be very rich, belongs to the Medi- terrancan region, slightly modified, while the Caspian partakes of the characteristic fauna inhabiting the lakes and scas of the Aral- Caspian depression.

In the region of the tundras life has to contend with such un- favourable conditions that it cannot be abundant. Still, the rein- deer frequents it for its lichens, and on the drier slopes of the moraine deposits four species of lemming, hunted by the Canis lagopus, find quarters. Two species of the white partridge (Lagopus albus, L. alpinus), the lark, one Pleetrophanes, two or three specics of Sylvia, one Phylloscopus, and the Motacilla must be added. Nuniberless aquatic birds, however, visit it for breeding purposes. Ducks, divers, geese, gulls, all the Russian species of snipes and sandpipers (Limicula, Tringa), &c., cover the marshes of the tundras, or the crags of the Lapland coast.

The forest region, and especially its coniferous portion, though it has lost some of its representatives within historic times, is still rich. The reindeer, rapidly disappearing, is now met with only in Olonetz and Vologda; the Cervus pygargus is found everywhere, and reaches Novgorod, The weasel, the fox, and the hare are exceed- ee

1 Bibléography,—Beketoff, Appendix to Russian translation of Griesebach and Reclus's Géogr. Univ.; Ledebour, Flora Rossica; Trautvetter, Rossix Arctice Plantz, 1880; 1d., Flore Rossice Fontes; for flora of the tundras, Beketoff's " Flora of Archangel," in Mem. Soc. Natur, at St Petersburg university, xv., 1884 ; Regel, Flora Rossica, 1884; floras of separate

governments in several scientific periodicals ; Brown, Forestry in the Mining Districts of the Urals, 1885; Reports by Commissioners of Woods and Forests in Russia, 1884; Forestry Almanac (Lyesnoi Kalendar) for 1885.

Ethno- graphy.

ingly common, as also the wolf and the bear in the north ; but the glutton (Gulo borealis), the lynx, and even the elk (C. alces) are rapidly disappearing. The wild boar is confined to the basin of the Diina, and the Bison ewropea to the Bielovyezha forests. The sable has quite disappeared, being found only on the Urals ; the beaver is found at a few places in Minsk, and the otter is very rare. On the other hand, the hare (roussak), and also the grey partridge (Perdix cinerea), the hedgehog, the quail, the lark, the rook (Trypanocorax frugilega), and the stork find their way into the coniferous region as the forests are cleared (Bogdanoff). The avifauna of this region is very rich; it includes all the forest and garden birds which are known in western Europe, as well as a very great variety of aquatic birds. A list, still incomplete, of the birds of St Petersburg shows 251 species. Hunting and shoot- ing give occupation to a great number of persons. The reptiles are few. As for fishes, all those of western Europe, except the Carp, are met with in the lakes and rivers in immense quantities, the characteristic feature of the region being its wealth in Coregont and in Salmonidx generally.

In the Ante-Steppe the forest species proper, such as Pteromys volans and Tamias striatus, disappear, but the eommon squirrel (Sciurus vulgaris), the weasel, and the bear are still met with in the forests. The hare is increasing rapidly, as well as the fox. The avifauna, of course, becomes poorer; nevertheless the woods of the Steppe, and still more the forests of the Ante-Steppe, give refuge to many birds, even to the hazel-hen (Tetrao bonasia), the woodcock, and the black grouse (Tetrao tetrix, T. urogallus). The fauna of the thickets at the bottom of the river valleys is decidedly rich, and includes aquatic birds. The destruction of the forests and the advance of wheat into the prairies are rapidly impoverishing the Steppe fauna. The various species of rapacious animals are disappearing, together with the

colonies of marmots ; the insectivores are also becoming scarce in consequence of the destruction of insects, while vermin, such as the suslik (Spermo- philus, see MArMmor), become a real plague, as also the destructive insects which have been a scourge to agriculture during recent years. The absence of Coregoni is a characteristic feature of the fish-fauna of the Steppes; the carp, on the contrary, reappears, and the rivers are rich in sturgcons (Acipenserides). On the Volga below Nijni Novgorod the sturgeon (Acipenser ruthenus), and others of the same family, as also a very great varicty of ganoids and Telcostei, appear in such quantities that they give occupation to nearly 100,000 people. The mouths of the Caspian rivers are especially celebrated for their wealth of fish.2

Prehistoric anthropology is a science of very recent growth in Russia; and, notwithstanding the energy displayed within that field during the last twenty years, the task of reconstructing the early history of man on the plains of eastern Europe is daily becom- ing more complicated as new data are brought to light. Remains of Paleolithic man, contemporary with the large Quaternary mammals, are few in Russia ; they are known only in Poland, Pottava, and Voronezh, and perhaps also on the Oka. Those of the later portions of the Lacustrine period, on the contrary, are so numerous that scarcely one old lacustrine basin in the regions of the Oka, the Kama, the Dnieper, not to speak of the lake-region itself, and even the White Sea coasts, can be mentioned where remains of Neolithic man have not been discovered, showing an unexpected variety of minor anthropological features, even at that remote period. The Russian plains have been, however, the scene of so mally migrations of various races of mankind, the dwelling-places of prehistoric man and the routes followed during his migrations were so clearly indicated by natural conditions, and so often re-occupied, or again covered by new waves of colonization and migra- tion, that at many placcs a series of deposits belonging to widely distant epochs are found superposed. Settlements belonging to the Stone age, and manufactories of stone implements, burial grounds (kostishchas) of the Bronze epoch, earthen forts (gorodishchas), and

grave mounds (kurgans)—of which last four different types are known, the earliest belonging to the Bronze period—are superposed upou and obliterate

one another, so that a long series of researches is necessary in order that sound generalizations may be reached,

Two different races—a brachycephalic and a dolichocephalic—can be distinguished among the remains of the earlier Stone period (Lacustrine period) as having inhabited the plains of eastern Europe. But they are separated by so many generations from the earliest historic times that sure conclusions regarding them are impossible: at all events, as yet Russian archeologists are not agreed as to whether the ancestors of the Slavonians were Sarmatians only or Scythians also (Samokvasoff, Lemiére), whose skulls have nothing in common with those of the Mongolian race. The earliest points that can, comparatively speaking, be regarded as settled must thus be taken from the Ist century, when the Northern Finns migrated from the North Dwina region towards the west, and the Sarmatiang were compelled to leave the region of the Don, and to cross the Russian steppes from east to west, under the pressure of the Aorzes (the Mordvinian Erzya 2) and Siraks, who in their turn were soon followed by the Huns and the Ugur-Turkish stem of Avars.

It appears certain, moreover, that in the 7th century southern Russia was occupied by the empire of the KHAzARs (q.v.), who drove the Bulgarians, descendants of the Huns, from the Don, one section of them migrating up the Volga to found there the Bul. garian empire, and the remainder migrating towards the Danube. This migration compelled the Northern Finns to advance farther west, and a mixture of Tavasts and Karelians penetrated to the south of the Gulf of Finland.

Finally, it is certain that as early as the 8th century, and probably still earlier, a stream of Slavonian colonization, advancing eastward from the Danube, was thrown on the plains of south- western Russia. It is also most probable that another similar stream—the northern, conting from the Elbe, through the basin of the Vistula—ought to be distinguished. In the 9th century the Slavonians already occupied the Upper Vistula, the southern part of the lake region, and the central plateau in its western parts, | They had Lithuanians to the west ; various Finnish stems, mixed towards the south-east with Turkish stems (the present Bashkirs) ; the Bulgars, whose origin still remains doubtful, on the middle Volga and Kama: and to the

south-east the Turkish-Mongolian world of the Petchenegs, Potovtsi, Uzes, &c.; while in the sonth, along the Black Sea, extended the empire of the Khazars, who kept under their rule several Slavonian stems, and perhaps also some of Finnish origin. In the 9th century also the Ugrians are supposed to have left their Ural abodes and to have crossed south-eastern and southern Russia on their way to the basin of the Danube.

If these numerous migrations on the plains of Russia be taken into account, and if we add to them the Mongolian invasion, the migration of South Slavonians towards the Oka, the North Slavonian colonization extending north-east towards the Urals and thence to Siberia, the slow advance of Slavonians into Finnish territory on the Volga, and at a later period their advance into the prairies on the Black Sea, driving back the Turkish stems which occupied them,—if we consider the manifold mutual influences of these three races on one another, we shall be able to form a faint idea of the present population of European Russia.

If the Slavonians be subdivided into three branches—the western (Poles, Czechs, and Wends), the southern (Serbs, Bulgarians, Croa- tians, &c.), and the eastern (Great, Little, and White Russians), it will be seen that, with the exccption of some 3,000,000 Ukrainians or Little Russians, in East Galicia and in Poland, and a few on the south slope of the Carpathians, the whole of the East Slavonians occupy, as a compact body, western, central, and southern Russia.

Like other races of mankind, the Russian race is not a pure one. The Russians have taken in and assimilated in the course of their history a variety of Finnish and Turco-Finnish elements. Still, craniological researches show that, notwithstanding this fact, the Slavonian type has maintained itself with remarkable persistency— Slavonian skulls ten and thirteen centuries old exhibiting the same anthropological features as are seen in those of our own day. This may be explained by a variety of causes, of which the chicf is the maintenance by the Slavonians down to a very late period of gentile organization and gentile nialriages, a fact vouched for, not only in the pages of Nestor, but still more by decp traces still visible in the face of society, the gens later on passing into the village community, and the colonization being carried on by great compact bodies. This has all along

maintained the saine characters. The Russians do not emigrate as isolated individuals ; they migrate in whole villages. The overwhelming numbers of the Slavonians, and the very great differences in ethnical type, belief, mythology, between the Aryans and Turanians, may have contributed in the same direction, and throughout the written history of the Slavonians we see that, while a Russian man, far away from his home among Sibcrians, readily marries a native, the Russian woman seldont docs the like. All these causes, and especially the first-mentioned, have enabled the Slavonians to maintain their ethnical features in a

1 The Year 1884 with regard to Agriculture, St Petersburg, 1885, gives nearly eomplcte lists of them.

danoff, Birds and Mammals of the Black-Earth Region of the Volga Basin: Kare- lin for the southern Urals; Kessler for fishes; Strauch, Die Schlangen des Russ. Tes, for reptiles generally; Rodoszkowski and the publications of the Entomologieal Soeiety generally for insects; Czerniaysky for the marine fauna of the Black Sea; Kessler for that of Lakes Onega and Zadoga; Grimm for the Caspian; and the publications of the seientific soeieties for a very great number of monographs

Zoology, though dealing more especially with Siberia, is an invaluable source of information for the Russian fauna generally. Vega-expeditionens Vetenskapliga

and make them reinforce or improve the ethnical type, without giving rise to half-brecd races. ‘The maintenance of the very same North-Russian type from Novgorod to the Pacific, with but minor differentiations on the outskirts—and this notwithstanding the great variety of races with which the Russians came in contact— cannot but strike the observer. But a closer observation of what is going on even now on the recently colonized confines of the empire here whole villages live, and will continue to live, without mixing with natives, but very slowly bringing them over to the Russian manner of life, and then very slowly taking in a few female

elements from them—gives the key to this prominent feature of Russian life, which is a colonization on an immense scale, and assimilation of foreigners, without in turn losing the primary etlinical features.

Not so with the national customs. There are features—the wooden house, the oven, the bath—which the Russian never abandons though lost amidst alien populations. But when settled among these the Russian—the North-Russian—readily adapts him- sclf to many other differences. He speaks Finnish with Finns, Mongolian with Buriats, Ostiak with Ostiaks ; he shows remarkable facility in adapting his agricultural practices to new conditions, without, however, abandoning the village community ; he becomes hunter, cattle-breeder, or fisherman, and carries on these occupa- tions according to local usage ; he modifies his dress and adapts his religious belicfs to the locality he inhabits. In consequence of all this, the Russian peasant (not, be it noted, the trader) must be recognized as the best colonizer among the Aryans ; he lives on the best terms with Ostiaks, Tartars, Buriats, and even with Red Indians when lost in the prairies of the American Far- West.

Three different branches, which may become three separate nationalities, can be distinguished among the Russians since the dawn of their history :—the Great Russians, the Little Russians (Malorusses or Ukrainians), and the White Russians (the Bielo- russes). These correspond to the two currents of immigration mentioned above, the northern and southern, with perhaps an inter- mediate one, the proper place of the White Russians not having as yet been exactly determined. The primary distinctions between these branches have been increased during the last nine centuries by their contact with different nationalities,—the Great Russians taking in Finnish elements, the Little Russians undergoing an admixture of Turkish blood, and the White Russians submitting to Lithuanian influence. Moreover, notwithstanding the unity of lan- guage, it is easy to detect among the Great Russians themselves two separate branches, differing from one another by slight divergences of language and type and deep diversities of national character, — the Central Russians and the Novgorodians; the latter extend throughout northern Russia into Siberia. They correspond, perhaps, to subdivisions mentioned by Nestor. Itis worthy of notice, more- over, that many minor anthropological features can be distinguished both among the Great and

Little Russians, depending probably on the assimilation of various minor subdivisions of the Ural-Altaians.

The Grcat Russians number about 42,000,000, and occupy in one block the space enclosed by a line drawn from the White Sea to the sources of the western Diina, the Dueiper, and the Donetz, and thence, through the mouth of the Sura, by the Vettuga, to Mezefi. To the east of this boundary they are mixed with Turco- Finns, but in the Ural Mountains they reappear in a compact body, and extend thence through southern Siberia and along the courses of the Lena and Ainur. Great Russian nonconformists are disseminated among Little Russians in Tchernigoff and Moghileff, and they reappear in greater masses in Novorossia, as also in northern Caucasia. ~

The Little Russians, who number about 17,000,000, occupy the Steppes of southern Russia, the south-western slopes of the central plateau and those of the Carpathian and Lublin mountains, and the Carpathian plateau. The Sitch of the Zaporog Cossacks colonized the Steppes farther east, towards the Don, where they mct with a large population of Great Russian runaways, constituting the present Don Cossacks. The Zaporog Cossacks, sent by Catherine Il. to colonize the east coast of the Sea of Azoff, constituted there the Black Sea and later the Kubafi Cossacks (part of whom, the Nekrasovtsy, migrated to Turkey). They have also peopled large parts of Stavropol and northern Caucasia.

The White Russians, mixed to some extent with Great and Little Russians, Poles, and Lithuanians, now oceupy the upper parts of the western slope of the central plateau. They number about 4,300,000.

The Finnish stems, which in prehistoric times extended from the Obi all over northern Russia, even then were subdivided into Ugrians, Permians, Bulgarians, and Finns proper, who drove back the previous Lapp population from what is now Finland, and about the 7th century penetrated to the south of the Gulf of Finland, in the region of the Livesand Kurs, where they mixed to some exteut with Lithuanians and Letts.

At present the stems of Finnish origin are represented in Russia by the following :—(a) the Western Finns; the Tavasts in central Finland; the Kvanes, in north-western Finland; the Karelians,

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| relatively high degree of purity, so as to assimilate foreign elements

in the east, who also occupy the lake-regions of Olonetz and Archangel, and have settlements in separate villages in Novgorod and Tver ; the Izhora and Vod, which are local names for the Finns on the Neva and the south-eastern coast of the Gulf of Finland ; the Esthes in Esthonia and northern portion of Livonia; the Lives on the Gulf of Riga; and the Kors, mixed with the Letts ; (b) the Northern Finns, or Lapps, in northern Finland and on the Kola peninsula, and the Samoyedes in Archangel ; (c) the Volga Finns, or rather the old Bulgarian branch, to which belong the Morpvinians (g.v.) and perhaps the Tcheremisses in Kazafi, Kostroma, and Vyatka, who are also classified by some authors with the following ; (d) the Permians, or Cis-Uralian Finns, in- cluding the Votiaks on the east of Vyatka, the Permians in Perm, the Zyrians in Vologda, Archangel, Vyatka, and Perm, and the Tcheremisses ; (¢) the Ugrians, or Trans-Uralian Finns, including the Voguls on both slopes of the Urals, the Ostiaks in Tobolsk and partly in Tomsk, and the Madjares, or Ugrians.

The Turco-Tartars in European Russia number about 3,600,000. The following arc their chief subdivisions. (1) The Tartars, of whom three different stems must be distinguished :—(a) the Kazafi Tartars on both banks of the Volga, below the mouth of the Oka, and on the lower Kama, penetrating also farther south in Ryazaii, Tamboff, Samara, Simbirsk, and Penza ; (0) the Tartars of Astrakhan at the mouth of the Volga; and © those of the Crimea, a great many of whoni have recently emigrated to Turkey. There are, besides, a certain number of Tartars from the south-east in Minsk, Groduo, and Vilna. (2) The Bashkirs, who inhabit the slopes of the southern Urals, that is, the Steppes of Ufaand Orenburg, extending also into Perm and Samara. (8) The Tchuvashes, on the right bank of the Volga, in Kazai and Simbirsk. (4) The Mescheriaks, a tribe of Finnish origin which formerly inhabited the basin of the Oka, and, driven thence during the 15th century by the Russian colonizers, immigrated into Ufa and Perm, where they now live among Bash- kirs, having adopted their religion and customs. (5) The Tepters, also of Finnish origin, settled among Tartars and Bashkirs,

together with the Mescheriaks, also in Samara and Vyatka. They have adopted the religion and customs of the Bashkirs, from whom they can hardly be distinguished. The Bashkirs, Mescheriaks, and Tepters have rendered able service to the Russian Government against the Kirghizes, and until 1863 they constituted a separate Bashkir and Mescheriak Cossacks army, employed for service in the Kirghiz Steppe. (6) The Kirghizes, whose true abodes were in Asia, in the Ishim and Kirghiz Steppe; but one section of them crossed the Urals and occupied the Steppes between the Urals and the Volga. Only the Horde of Bukeeff inhabits European Russia, north-east of Astrakhan, the remainder belonging to Turkestan and Siberia.

The Mongolian race is represented in Russia by the Lamaite Kalmuks, who inhabit the Steppes of Astrakhan between the Volga, the Don, and the Kuma. They immigrated to the mouth of the Volga from Dzungaria, in the 17th century, driving out the Tartars and Nogais, and after many wars with the Don Cossacks, followed by treaties of mutual assistance for military excursions, one part of them was taken in by the Don Cossacks, so that even now there are among these Cossacks several Kalmuk sotnias or squadrons. They live for the most part in tents, supporting themselves by cattle-breeding, and partly by agriculture.

The Semitic race is represented in Russia by upwards of 3,000,000 Jews and 3000 Karaitcs. The Jews first entered Poland from Ger- many during the crusades, and soon spread through Lithuania, Courland, the Ukraine, and, in the 18th century, Bessarabia. The rapidity with which they peopled certain towns and whole pro- vinces was really prodigious. ‘Thus, from having been but a few dozens at Odessa some eighty years since, they make now one-third of its population (73,400, out of 207,000). The law of Russia prohibits them from entering Great Russia, only the wealthiest and most educated enjoying this privilege ; nevertheless they are met with everywhere, even on the Urals. Their chief abodes, however, continue to be Poland, the western provinces of Lithuania, White and Little Russia, and Bessarabia. In Russian Poland they are in the proportion of 1 to 7 inhabitants. In Kovno, Vilna, Moghileff, Grodno, Volhynia, Podolia, and probably also in Bessarabia and Kherson, they constitute, on the average, 10 to 16 per cent. of the population, while in separate districts the proportion reaches 30 to 36 per cent. (50°5 in Tchaussy). Organized as they

are into a kind of community for mutual protection and mutual help (the Kahal), they soon become masters of the trade wherever they penetrate. In the villages they are mostly innkeepers, interme- diaries in trade, and pawnbrokers. In many towns most of the skilled labourers and a great many of the unskilled (for instance, the grain-portcrs at Odessa and elsewhere) are Jews. In the 16 western provinces of Russia they numbered 2,848,400 in 1888, and about 432,000 in five Polish provinces. Less than 600,000 of them inhabit villages, the remainder being concentrated in towns.

The Karaites differ entirely from the Jews both in worship and in mode of life. They, too, are inclined to trade, but also success-

fully carry on agriculture. Those inhabiting the Crimea speak Tartar, and the few who arc settled in western Russia speak Polish. They are on good terms with the Russians.

Of West Europcans, only the Germans attain considerable num- bers (upwards of a million) in European Russia. In the Baltic provinces they constitute the ennobled landlord class, and that of tradesmen and artisans in towns. Considerable numbers of Germans, also tradesmen and artisans, were scattered throughout many of the larger towns of Russia as early as the 16th century, aud to a much greater extent in the 18th century, German artisans having been invited by the Government to settle in Russia, and their numbers having steadily increased since. Finally, numbers of Germans were invited in 1762 to settle in southern Russia, as separate agricultnral colonies, which gradually extended in the Don region and in northern Caucasia. Protected as they were by the right of self-government, exempted from military service, aud endowed with considerable allotments of good land, these colonies are much wealthier than the neighbouring Russian peasants, from whom they have adopted the slowly modified village community. They are chiefly Lutherans, but many of them belong to other reli- gious sects, —Anabaptists, Moravians, Mennonites (about 40,000). In certain districts (Akkerman, Odessa, Berdiansk, Kamyshin, Novouzensk) they constitute from 10 to 40 per cent. of the total population. The Swedes, who number about 300,000 in Finland, hardly reach 12,000 in European Russia, mostly in the Baltic pro- vinces,

The Roumanians (Moldavians) number not less than 800,000, and are still increasing. Thcy inhabit the governments of Bess- arabia, Podolia, Kherson, and Ekaterinoslaff, In Bessarabia they

number of Great Russians respectively to 72, 67, and 32 per cent, of the aggregate population of these three provinces,

Of the Turco-Tartars of eastern Russia, the Baslikirs often revolted against Russian rule, and the traffic in Bashkir lands, recent] carried on by the Orenburg administration, certainly does not tend to reconcile them. The Tcheremisses have often joined the Bashkirs in their revolts, but are rapidly losing their nationality, As regards the other Turco- and Finno-Tartars, the Mordvinians really have been assimilated to the Russians ; the Moslem Tartarg of Kazan lived till recently on excellent terms with their Russian neighbours and would have continued to do so had no attempts been made to interfere with their land-laws.

In western Russia, while an antipathy exists between Ukrainians and Poles, the Russian Government, by its harassing interference in religious, educational, and economical matters, has become antag. onistic, not only to the Poles, but also to the Ukrainians; printing in Ukrainian is prohibited, and “ Russification”’ is being carried on among Ukrainians by the same means as those employed in Poland, The same is true with the Esthes and Letts, whom the Govern- ment, while countenancing them to some extent in their antipathy to the German aristocracy, has not yet found means to conciliate.

The relative strength of the different ethnical elements of which Their the population of European Russia and Poland is composed may relative be seen from the following figures (Table 1V.). They must be strength, regarded, however, as rough estimates only. They were original] computed by M. Rittich for an aggregate population of 69,788,240, aud in the following table they have merely been increased in vro- portion to the actual population of 84,495,000.

constitute from one-fourth to three-fourths of the population of ‘ Tasue IV. certain districts. On the whole, the Novorossian governments Great Russians sin}0jn/e\0:6 sin,‘eie(4) e(elaceraisiatais/eleleiaieletsictel=teleairet

41,994,000 (Bessarabia, Kherson, Ekaterinoslaff, and Taurida) exhibit the | Little Russians ara ane ecaUEHERHeraeaceeeeoneneaeile 17,241,000 greatest variety of population. Little and Great Russians, Rouma- | White Russians…0.000…..00c.ccccccs 4,330,000 nians, Bulgarians, Serbs, Germans, Greeks, Frenchmen, Poles, ; —= Tartars, and Jews are mixed together and scattered about in small Russiansisi2. 8. 0.0, 63,565,000 colonies, especially in Bessarabia. Of course, the Greeks inhabit LE kas 5,750,000 chiefly the towns, where they carry on trade, as also do the Ar- ee en On oe | 110,000 menians, scattered through the towns of southern Teter, “fai || Celis oo… .2 50. 000e00cccet cama een 9,500 appearing in larger numbers only in the district of Rostoff (10 per PROG 5.2.0. +25.200; ee ee 9,500 cent. of population). — Geo- However great the variety of nationalities inhabiting European Total Slavonians…..... 69,444,000 graphical Russia, its ethnological composition is much Simpler than maiglst-at | Lithwatiians. 0.0.0.0. 5.ecsevesseseeeee cscs. 987,000 distribu- first sight be supposed. The Russians—Great, Little, and White | Zhmuds….....-... eh gsemreec eects 771,000 tion of | —largely prevail over all others, both numerically and as respects | Letts…....ccs-csseccssscssesesesseeeceses,, 1,243,000 races. the territories they occupy in compact bodies. Central Russia is —_——_ ——— almost purely Great Russian, and represents a compact body of Letto-Lithuanians…..... 3,001,000 more than 30,000,000 inhabitants with but 1 to 5 pie eerie WE | Gareelee. i isiacc. ce ccaeeers dank toy. 84,000 admixture of other nationalities. The governments on the Dnicper | Roumanians, and French (about 2000)..... 795,000 (Kieff, Volhynia, Tchernigoff, Podolia, and Pottava), as also the —_——_— adjoining districts of Kharkoff, Voronezh, Kursk, and Don, are Greeco- Romans…..... 879,000 Little-Russian, or Ukrainian, with but a slight admixture of White | Germans and English ….....6..cccc0000 0 1,165,000 and Great Russians, and some 12 per cent. of Jews. The Poles | Swede…...cccccueee 12,000 there number only 8 to 6 per cent. of the population—chiefly land- holders—and are hated by the Ukrainians. Same, 00) ck, aoe 1,177,000 Moghileff, Vitebsk, and Minsk are White Russian, the Poles con- | Armenians and Georgians. ..... 43,000 stituting only 8 per cent. of the population (16simn Minek).. Invether”| ‘Tsigams..... ...0cssveaitiwiiies..sscesecccacsscoce, 16,000 Bielorussian provinees, the White Russians are mixed either with Sa Lithuanians (Vilna), or Ukrainians

(Grodno), or Great Russians Total AvVaMs.....-00bes 74,560,000 (Smolensk), and their relations to Polish landlords are no better than in the Ukraine. The Lithuanians prevail in Rowno,cvwhiowe | Jewi,...cisdecssosdsceatteeviasesdssaceceee sess 3,120,000 they are 80 per cent. of the population, the remainder wos ohuelly | Weraites sis:scaies «10550. 0s oeesseraccaseosneceees 3,000 Jews (10 per cent.), Poles (3 per cent.), Great Russians (8 per cent.), =— Germans, &c. Total Semiteay……..0.<...00:042 3,128,000 In the Baltic provinces (Esthonia, Livonia, and Courland) the — prevailing population is Esthonian, Curonian, or Lettish, the | Kaveliams', ...s0cc0…...0000i0ssscccecceacceoesc ss 235,000 Germans (landlords, or tradesmen and artisans in towns) being | Esthes…..... dina eRe sels eceeRe eee 891,000 respectively only 3°5, 6°8, and 7°6 per cent. of the POpUIAeen, Mit) TNMRE oo. snc. i caeiiedsn0- oes ee ee 2,000 the three provinces, Riga mucaet they hardly reach 120,000 out | Various….....ccccssscscecesseccecescceccescw. 175,000 of 1,800,000 inhabitants. The relations of the Esthes and Letts ed to their landlords are anything but friendly. Baltio PWS»... ....5……...0002. 1,803,000 The northern governments of St Petersburg (apatt from the | Lappsis……...cassvs.ssscecsevvesseddeecec ccc… 7,500 capital), Olonetz, and Archangel contain an admixture of 12 to 28 ei) eer a. an 6,500 percent. of Karelians, Samoyedes, and Zyrians, the remainder being — Great Russians. In the east and south-east provinces of the Northern Pinte… 20.0.54:;,., 14,000 Volga (Nijni, Simbirsk, Samara, Penza, and waratait) tle Groat | Mordve…..0.00…..s00000sescciees BOARS. 0 555.:5003sccse0e enc 1,563,000 Russians number less than one half of the aggregate population | Zyrians….....s00c:sssssescecccaveesooece.,, 102,000 (42-43 per eent.). In the Ural provinces of Perm and Me ee oe 80,000 Great Russians are again in the majority (92 and 81 je OR RS a 2,000 remainder being a variety of Finno-Tartars. It is only in the —- southern Ural governments (Uralsk, Orenburg, Ufa) that the ad- UGSERIRY.. .»...:. 2. 184,000 mixture of a variety of Turco-Tartars—of Kirghizes in Uralsk (23 aan per cent.), Bashkirs in Orenburg and Ufa (22 and 23 per cent.), Total Ural-Altaians…..,..... 3,064,000

——$—=

and less important stems—becomes considerable, reducing the

VITAL STATISTICS.] kU Ss Tt A 81

TABLE 1V.—continued.

SPPEIVAETES 6… 2-c------snceccecscnccee coesernvece 697,000 IT? MIBURS: « cqpenecoo0G0 000 BROE REEDED OEDE eos ou SeeoOEaEnE 1,500,000 “oP ER co. pan ostonseneneonpec0e spdedenereeneeceeeee 908,000 PIES EH CRIGIGS. 0… .cc0— 5c ecccne eee ccecereraereceress 167,000 Tepters. .....ccseeeeeseceeesecesenereeeeeeeeeeeseeans 159,000 Kirghizes …...0.:ccsessessseessseeseeeeeeeeeeeneeees 197,000 ivy OLS, coennoeonpepnne gBOseEBe05ae6s SnOSeHOEOOEORcE 6,000 PTINGONAMEATS|s. 5.52 c+. ~~m0cesersecc 8,629,000 Talia, noo oondehodgneeBeseDeSBoEe sean Ua seBancnce 119,000 “tae! ULDRNTEN OSES cassacpanesopaE 8,748,000 Gramdelotaler…cc..2+.>-~~ 84,495,0001

Part II]. EuROPEAN RussIA—STATISTICS.?

Russia is on the whole a thinly-peopled country, the average population being but 42 to the square mile. The density of population varies, however, very much in European Russia—from one inhabitant per square mile in the government of Archangel to 102 in that of Moscow (exclusive of the capital) and 188 in Podolia. Two-thirds of the whole population are concentrated upon less than one-third of the whole surface. The most thickly- peopled parts form a strip of territory which extends from Galicia through Kieff to Moscow, and comprises partly the most fertile governments of Russia and partly the manufacturing ones ; next come a strip of fertile country to the south of the above and the manufacturing provinces of the upper Volga. The black-earth region has an average of 90 inhabitants per square mile ; the central manufacturing region, 85; the western provinces, 79 ; the black-earth and clay region, 88; the black-earth Steppes, 33 ; the hilly tracts of the Crimea and Caucasus, 31; the forest-region proper, 26; the Steppes, 9; the far north, less than 2.

The rate at which the population is increasing throughout the empire is very considerable. It varies, however, very much in different parts, and even in European Russia, being almost twice as high in the fertile tracts of the south as it isin the north (1°8 to 1:0). ‘he rapid increase is chiefly due to early marriages, the peasants for the most part marrying their sons at eighteen and their daughters at sixteen. The resulting high birth-rate eompensates for the great mortality, and the Russian population is increasing more quickly than the Polish, Lithuanian, Finnish, or Tartar. In 1880 the marriages, births, and deaths were returned as follows (Table V.) :~

Exeess of Births

Marriages.} Births. Deaths. over Deaths.

European Russia ..| 725,427 |3,678,071 |2,684,828 | 993,243

Poland…….....00… 62,771 | 294,021| 189,514] 104,507 Finland (1881)..... 14,283| 74,469] 53,777| 20,692 Siberia 0… 32,952 | 180,802] 131,793 49,009

885,433 |4,227,363 [3,059,912 | 1,167,451

These figures agree pretty nearly with those for a series of years (1871-78), which gave an annual surplus of 945,000 for European Russia alone. In 1882, throughout the empire—leaving out of account Caucasus and Turgai —the births numbered 4,408,555 and the deaths 8,464,404, tor an estimated population of 95,565,100. But the birth-rate and death-rate were very different in Russia proper and in the Asiatic dominions ; in the former they reached respectively 4°88 and 3°77, and in the latter only 8°75 and 2°84. The low birth-rate in Asia counterbalances the low mortality. So also within Russia proper: in the central provinces the high mortality (85 per thousand) is compensated by a high birth-rate (49), while in the western provinees, where the

mortality is relatively small (27), the number of births is also the lowest (37).

On the whole, the mortality in Russia is greater than anywhere else in Europe. The lowest figures are found in Courland (20),

| Bibliography.—Rittich, Ethnographical Map of Russia, and Ethnogr, Com-Position (Plemennoi Sostav) of Russia; Venukoff, Outskirts of Russia (Russ.); Works of the Expedition to the Western Provinces; Mem. of the Geogr. Society (Ethnography) ; Mem. of the Moscow Soc. of Friends of Nat. Science (Anthro- pology); Pauli, The Peoples of Russia; Narody Rosit, popular edition by M. lliin. For prehistoric anthropology, see Count Uvaroif, Archwology, i.; Inos- trantseff, Prehistoric Man on Lake Ladoga; Budiloviteh, Primitive Slavonians, 1879; A. Bogdanotf's extensive and most valuable researches in Mem. of Moscow Soc, of Friends of Nat. Sc.; the researches of Polyakoff and many others in various scientific periodicals (St Petersburg, Kazan universities); and Reports of the Archeol. Congresses. For subsequent periods, see numerous papers in Afe- moirs of Archxol. Soc., Mem, Ac. of Sciences, &e.,and the works of Russian histo-rians. Mezhoff's Bibltogr. Indexes, published yearly by the Russian Geographical Soeiety, contain complete information about works and papers published.

2 For all statistics for European Russia, see ‘‘ Recueil of Information" for European Russia in 1882 (Sbornik Svedeniy), published in 1884 by the Central

_— Committee, and the publieations mentioned below under different

the Baltic provinces (22), and Poland (30). Within Russia itself the rate varies between 29 and 49 (80 to 38 in towns). In 1882 the average mortality in the 18 central governments reached the exceptional figure of 62, so that there was a decrease of 1‘7 per cent. in the aggregate population. The mortality is highest among children, only one-half of those born reaching their seventh year. From military registers it appears that of 1000 males born only 480 to 490 reach their twenty-first year, and of these only 375 are able-bodied ; of the remainder, who are unfit for military service, 50 per cent. suffer from chronic diseases. Misery, insani- tary dwellings, and want of food account for this high mortality, which is further increased by the want of medical help, there being in Russia with Poland only 15,348 males and 66 female surgeons, 7679 assistants, and one bed in hospital for every

1270 inhabitants. The hospitals are, however so unequally distributed, that in 63 governments having an aggregate country population of about 76,000,000 there were only 657 hospitals with 8273 beds, and an average of two surgeons to 100,000 inhabitants.

The rate of emigration from the Russian empire is not high. In Emigra- 1871-80 the average number was 280,700 yearly, and the immigra- tion, tion 245,500. But within the empire itself migration to South Ural, Siberia, and Caucasus goes on extensively ; figures, however, even approximate, are wanting. During the ten years 1872-81 no less than 406,180 Germans and 235,600 Austrians immigrated into Russia, chiefly to Poland and the south-western provinces.

A very great diversity of religions, including (besides numerous Religion. varieties of Christianity) Mohammedanism, Shamanism, and Buddhism, are found in European Russia, corresponding for the most part with the separate ethnological subdivisions. All Russians, with the exception of a number of White Russians who belong to the Union, profess the Greek Orthodox faith or one or other of the numberless varieties of nonconformity. The Poles and most of the Lithuanians are Roman Catholics. The Esthes and all other Western Finns, the Germans, and the Swedes are Protestant. The Tartars, the Bashkirs, and Kirghizes are Mohammedans; but the last-named have to a _ great extent maintained along with Mohammedanism their old Shamanism. The same holds good of the Mescheriaks, both Moslem and Christian. The Mordvinians are nearly all Greek Orthodox, as also are the Votiaks, Voguls, Tcheremisses, and Tchuvashes, but their religions are, in reality, very interesting modifications of Shamanism, under the influence of some Christian and Moslem beliefs. The Voguls, though baptized, are in fact fetichists, as much as the unconverted Samoyedes. Finally, the Kalmucks are Buddhist Lamaites.

All these religions are met with in close proximity to one another, and their places of worship often stand side by side in the same town or village without giving rise to religious disturbances. The recent outbreaks against the Jews were directed, not against the Talmudist creed, but against the trading and exploiting community of the ‘‘Kahal.” In his relations with Moslems, Buddhists, and even fetichists, the Russian peasant looks rather to

conduct than to creed, the latter being in his view simply a matter of nationality. Indeed, towards paganism, at least, he is perhaps even more thau tolerant, preferring on the whole to keep on good terms with pagan divinities, and in difficult circumstances— especially on travel and in hunting—not failing to present to them his offering. Any idea of proselytism is quite foreign to the ordinary Russian mind, and the outbursts of proselytizing zeal occasionally manifested by the clergy are really due to the desire

for “Russification,” and traceable to the influence of the higher clergy and of the Government.

The various creeds of European Russia were estimated in 1879 as follows : —Greek Orthodox and Raskolniks, 638,835,000 (about 12,000,000 being Raskolniks); United Greeks and Armenio- Gregorians, 55,000; Roman Catholics, 8,800,000 ; Protestants,

2,950,000 ; Jews, 3,000,000 ; Moslems, 2,600,000 ; Pagans, 26,000. In 1881 the number of Greek Orthodox throughout the empire, excluding two foreign bishoprics, was estimated at 61,941,000.

Nonconformity (Raskot) is a most important feature of Russian Noncon- popular life, and its influence and prevalence have rapidly grown formists. during the last tweuty-five years.

When, towards the beginning of the 17th century, the Moscow principality fell under the rule of the Moseow botars (one of whom, Godunoff, reached the throne), they took advantage of the power thus acquired to increase their wealth bya series of measures affect- ing land-holding and trade ; they sanctioned and enforced by law the serfdom which had already from economical causes found its way into Russian life. The great outbreak of 1608-12 weakened their power in favour of that of the ezar, but without breaking it ; and throughout the reigns of Michael and Alexis the wkazes were issued in the name of “the czar and boiars.” Serfdom was rein- forced by a series of laws, and the whole of the 17th century is char- acterized by a rapid accumulation of wealth in the hands of boiars, by the development of luxury, imported from Poland, and by the struggle of a number of families to acquire the political power

| already enjoyed by their Polish neighbours. The same tendency XXI. —
11

pervaded the church, which was also accused by the people of having introduced “Polish luxury,” “ Polish creed,” and the tendencies towards supremacy of the Polish clergy. The patriarch Nikon was a perfect representative of these tendencies. Opposition resulted, and the revision of the sacred books, which was undertaken by Nikon, gave the opposition acute character. “splitting” or “schism ”) made its appearance, and gathered under its banner, not only those who accused Nikon of ‘‘ Polish” and ‘* Latin ” tendencies, but also all those who were for the old customs, for federative and communist principles of social organization, and who revolted against serfdom, centralization, and the suppres- sion of municipal life. A series of insurrections broke out under the banner of the “eight-ends” cross of the Raskolniks. Barbarous persecutions by Alexis, Peter I., and their followers did not kill out an opposition which inspired with fanatical enthusiasm the best elements among the Great Russians, and induced its supporters to submit to the fire by thousands at a time, while others rather than submit went to colonize the forests of the Arctic littoral, or betook themselves to Siberia. Profound modifications have taken place in Russian nonconformity since its first appearance. It would be impossible to enumerate them all here, but the following points of primary importance must be mentioned. (1) The mere protest against Nikon’s ‘‘innovations” (novshestvas) led, in the course of two centuries, to a mere servile adherence to the letter of the ver- nacular Scriptures—even to obvious errors of earlier translators— and to interminable discussions about minor points of ritual and about unintelligible words. (2) Another eurrent which now per- vades the whole of Russian nonconformity is that proceeding from rationalist sects which had already spread in north-west Russia in the 16th century, and even in the 14th. These have given rise to several sects which deny the divinity of Christ or explain away various dogmas and prescriptions of orthodoxy. (3) Protestantism, with its more or less rationalistic tendencies, has made itself in- creasingly felt, especially during the present century and in southern Russia. (4) Hostile critics of the Government, and especially of the autocracy, with its army of officials and

its system of con- scriptions, passports, and various restrictions on religious liberty, are found more or less in all the nonconforming bodies, which see in these manifestations of authority the appearance of the Anti- christ. Several of them refuse accordingly to have any dealings whatever with the official world. (5) Another tendency pervading the whole of Russian nonconformity is that which seeks a return to what are supposed to have been the old communist principles of Christianity in its earlier days. All new sects start with applying these principles to practical life ; but in the course of their develop- ment they modify them more or less, though always maintaining the principle at lcast of mutual help. (6) Finally, all sects deal more or less with the question of marriage and the position of woman. A few of them solve it by encouraging,—at least during their "' love-feasts,"—absolutely free relations between all "brethren and sisters," while others only admit the dissolubility of marriage or prohibit it altogether. On the whole, leaving the extremer views out of account, the position of woman is undoubtedly higher among the dissenters than among the Orthodox.

These various currents, combining with and counteracting one another in the most complicated ways, have played and continue to play a most important part in Russian history. The mutual assist- ance found in dissenting sects has preserved many millions of peasants from falling into abject misery, the nonconformists enjoy- ing, as a rule, a greater degree of prosperity than their Orthodox neighbours. 'he leading feature of Russian history, the spread of the Great Russians over the immense territory they now occupy, cannot be rightly understood without taking into account the colonization of the most inaccessible wildernesses by Raskolniks, and the organization of this by their communities, who send dele- gates for the choice of land and sometimes clear it in common by the united labours of all the young men and cattle of the community. On the other hand, the noneonforming sects, while helping to preserve several advantageous features of Russian life, have had a powerful influence in maintaining, especially among the " Staroobr- yadtsy," the old system of the Moscovite family, subject to the despotic yoke of its chief, aud hermetically sealed against instruc- tion.

It is worthy of notice that since the emancipation of the serfs nonconformity has again made a sudden advance, the more radical sects preponderating

over the scholastic ones, and the influence of Protestantism bcing increasingly felt. Nonconformity, whieh formerly had no hold upon Little Russia (though it had penetrated ainong Protestant Esthonians and Letts, and even among Moslem ‘Tartars), has suddenly begun to make progress there in the shape of the “Stunda,” a mixture of Protestant and rationalistic teaching, with tendencies towards a social but rarely socialistie reforma- tion.

The Russian dissenting sects may be subdivided into (1) the “ Popovtsy ” (who have priests), (2) the “ Bezpopovtsy ” (who have none), and (3) numerous spiritualist sects, “ Dukhovnyie Khris- tiane.” The Popovtsy (5 to 6 millions) arc again subdivided into

BUS Si &

The Raskot (lit.

[NONCONFoRMISTs,

two classes, —those who recognize the Austrian hierarchy, and those who have only Orthodox ‘‘ runaway priests” (“ Byeglopopovtsy”), The latter have recently received unexpected help in the aceession of three Orthodox priests of great learning and energy. Morcover, there are among the Popovtsy abont a million of “ Edinovyertsy,” who have received Orthodox priests on the condition of their keeping to the unrevised books. They are patronized by Government.

The Bezpopovtsy embody three large sects—the Pomory, Fedo- seevtsy, and Filipovtsy—and a variety of minor ones. They reeog- nize no priests, and repudiate the Orthodox ritual and the sacm. ments, They avoid all contact with the state, and do not allow prayer for the czar, who is regarded as the Antichrist. They may niunber about 5,000,000 in west, north, and north-east Russia, and represet, on the whole, an intellectually developed and wealthy population. Of the very numerous smaller sects of Bezpopovtsy, the “Stranniki” (Errants) are worthy of notice. They prefer to lead the life of hunted outcasts rather than hold any relation with the state.

The spiritualists, very numerous in central and sonthern Russia, are subdivided into a great variety of schools. The “ Khlysty,” who have their “love-feasts,” their “ Virgins,” sometimes flagellation, and so on, represent a numerous and strong organization in central Russia. The “Skoptsy” (“Men of God,” “ Castrati ”) occur every- where, even among the Finns, but ehiefly in Orel and Kursk, and in towns as money-brokers. The “Dukhobortsy ” communities (warriors of the Spirit), chiefly found in the sonth-east, are renowned as colonizers. They are spreading rapidly in Caucasia and Siberia, The “ Molokany” (a kind of Baptists), numbering perhaps about one million, are spread also in the south-east, and are excellent gardeners and tradesmen. Both are quite open to instruction, and have come under the influence of Protestantism, like the “Stunda” in Little Russia and Bessarabia. The “Sabbathers” and the “Ska- kuny” (a kind of Shakers) are also worthy of notiee; whilea great variety of new sects, such as the ‘ Nemolyaki” (“who do not pray’’), the ‘‘ Vozdykhateli” (“who sigh ”), the “N eplatelshchiki ” (“who do not pay taxes”), the “ Ne-Nashi” (the “ Not-ours ”) van so on, spring up every year.

The aggregate number of Raskolniks is officially stated at nearly one million, but this is quite misleading. The ministry of interior estimated them at 9,000,000 in 1850 and 9,500,000 in 1859. In reality the nuinber is still higher. In Perm alone they were recently computed at a million, and there would be no exaggeration in esti- mating them at a total of from twelve to fifteen millions.1

The old subdivisions of the population into orders possessed of Class unequal rights is still maintained. The great mass of the people, divisions,

81°6 per cent., belong to the peasant order, the others being—

nobility, 1°3 per cent.; clergy, 0°9; the “meschane” or burghers

and merchants, 9°3; military, 6°1; foreigners, 0°2; unclassified,

0°5. Thus more than 63 millions of the Russians are peasants.

Half of them were formerly serfs (10,447,149 males in 1858),—

the remainder being “state peasants” (9,194,891 males in 1858,

exclusive of the Archangel government) and “domain peasants” — (842,740 males the samc year).

The serfdom which had sprung up in Russia in the 16th century, and became consecrated by law in 1609, taking, however, nearly one hundred and fifty years to attain its full growth and assume the forms under which it appeared in the present century, was abolished by law in 1861. ‘This law liberated the serfs from a yoke which was really terrible, even under the best landlords, and from this point of view it was obviously an immense benefit, the results of which are apparent now. But it was far from securing corresponding economic results. Along with the enrichment of the few, a general impoverishment of the great mass followed, and took proportions so alarming as to arouse public attention and to result in a great number of serious investigations conducted by the state, the provincial assemblies, scientific societies, and private statisticians. he general results of these inquiries may be summed np in the subjoined statement.

The former “dvorovyie,” attached to the personal service of their masters, were merely set free ; and they entirely went to reinforce the town proletariat. The peasants proper received their houses and orchards, and also allotments of arable land. These allotments were given over to the rural commune (mir), which was made responsible, as a whole, for the payment of taxes for the allot- ments. The size of the allotments was determined by a maximum and by a minimum, which last, however, could be still further reduced if the amount of land remaining in the landlord’s hands was less than one half of what was allotted to the peasants, For these allotments the peasants had to pay, as before, cither by per- sonal labour (twenty to forty men’s days and fifteen to thirty women’s days per year), or bya fixed rent (“ obrok ”), which varied from 8 to 12 roubles per allotment. As long as these relations subsisted, the peasants were considered as “ temporarily obliged ” (vremenno obyazannyic). On January 1, 1882, they still numbered

1 See Schapoff on Russian Raskol; Sbornik of State Regulations against the

Raskolntks ; and very many papers printed in reviews, chiefly in Otetch. Zapiskt, Dyeto, Vyestnik Lvropt, &e., by Schapoff, Yuzoff, Prugavin,

1,422,012 males; but this category is now disappearing in conse- quence of a recent law (December 28, 1881).

The allotinents could be redeemed by the peasants with the help of the crown, and then the peasants were freed from all obliga- tions to the landlord. The crown paid the landlord in obligations representing the eapitalized “ obrok,” and the peasants had to pay the crown, for forty-nine ycars, 6 per cent. interest on this capital, that is, 9 to 12 roubles per allotment. If the redemption was made without the consent of the peasants —on a mere demand of the landlord, or in consequence of his being in arrear for the pay- ment of his debts to the nobility hypothec the redemption was reduced by one-fifth. The redemption was not calculated on the value of the allotments, but was considered as a eompensation for the loss of the compulsory labour of the serfs; so that throughout Russia, with the exception of a few pro- vinees in the south-east, it was—and still remains notwithstanding a very great increase of the value of land—much higher than the market value of the allotment. the maximum law, many proprietors eut away large parts of the allotments the peasants possessed under serfdom, and precisely the parts the peasants were most in need of, namely, pasture lands around their houses, and forests. On the whole, the tendency was to give the allotments so as to deprive the peasants of grazing land and thus to compel them to rent pasture lands from the landlord at any price.

The present condition of the peasants—according to official docu- ments—appears to be as follows. In the twelve central governments the peasants, on the average, have their own rye-bread for only 200 days per year,—often for only 180 and 100 days. One quarter of thei have received allotments of only 2°9 acres per male, and one half less than 8°5 to 11°4 aercs,—the normal size of the allotment necessary to the subsistence of a family under the three- fields system being estimated at 28 to 42 acres. Land must be thus rented from the landlords at fabulous prices. Cattle-breeding is diminishing to an alarming degree. ‘The average redemption is 8°56 roubles (about 17s.) for such allotments, and the smaller the allotment the heavier the payment, its first “ dessiatina ” (2°86 acres) costing twice as much as the second, and

four times as much as the third. In all these governments,,the state commission testifies, there are whole distriets where one-third of tlic peasants have received allotments of only 2°9 to 5:8 aeres. The aggregate value of the redemption and land-taxes often reaches from 185 to 275 per cent. of the normal rental value of the allotments, not to speak of taxes for recruiting purposes, the church, roads, local administration, and so on, chiefly levied from peasants. The arrears increase every year; one-fifth of the inhabitants have left their houses ; cattle are disappearing. Every year more than half the adult males (in some districts three-fourths of the men and one-third of the women) leave their homes and wander throughout Russia in search of labour. The state peasants are ouly a little better off.

Such is the state of affairs in central Russia, and it would be use- less to multiply figures, repeating nearly the same details. In the eight governments of the black-earth region the state of matters is hardly better. Many peasants took the “gratuitous allotments,” whose amount was about one-eighth of the normal ones.

The average allotment in Kherson is now only 0:90 acre, and for allotments from 2°9 to 5°8 acres they pay from 5 to 10 roubles of redemption tax. The state peasants are better off, but still they are emigrating in masses. It is only in the Steppe govern- ments that the situation is more hopeful. In Little Russia, where the allotments were personal (the mir existing only among state peasants), the state of affairs does not differ for the better on account of the high redemption taxes. In the western provinces, where the land was valued cheaper and the allotments somewhat increased after the Polish insurrection, the general situation might be better were it not for the former misery of peasants. Finally, in the Baltic provinces nearly all the land belongs to German landlords, who either carry on agriculture themselves, with hired labourers, or rent their land as small farms. Only one-fourth of the peasants are farmers, the remainder being mere labourers, who are emigrating in great numbers.

The situation of the former serf-proprietors is also unsatisfactory. Accustomed to the use of compulsory labour, they have failed to accommodate themselves to the new conditions. The 700,000,000 roubles of redemption money reccived from the crown down to 1877 by 71,000

landed proprietors in Russia have been spent without accomplishing any agricultural improvement. The forests have been sold, and only those landlords are prospering who exact rack- rents for the land without which the peasants could not live upon their allotments.

As showing a better aspect of the situation it must be added that in eighty-five districts of Russia the peasants have bought 5,349,000 acres of land since 1861. But these are mostly village- traders and grain-lenders (kulaks). A real exception can be made only for Tver, where 53,474 householders united in communities have bought 633,240 acres of land. There has been an increase of

bank—the value of

Moreover, taking advantage of

wealth among the few, but along with this a gencral impoverish- ment of the inass of the people.'

The ancient Scandinavians described Russia as Gardariki,—the The country of towns,—and until now Great Russia has maintained village this character. The dwellings of the peasantry are not seattered commun- over the face of the country, but aggregated in villages, where they ity.

are built in a street or streets. This grouping in villages has its origin in the bonds which unite the peasants in the village com- munity—the mir, or the obshehina.

When Haxthausen first described the Great Russian mir, it was considered a peculiarity of the Slavonian race,—a view which is no longer tenable. The mir is the Great Russian equivalent for the German, Dutch, and Swiss " mark" or "allmend," the English "township," the French "commune," the Polish "gmina," the South Slavonian "zadruga," the Finnish " pittiy#," &c.; and it very nearly approaches, though differing from them in some esscn-

tial features, the forms of possession of land prevailing among the Moslem Turco-Tartars, while the same principle is found even among the Mongol Buriat shepherds and the Tungus hunters.

The following are the leading features of the organization of the mir among the Great Russians.

The whole of the land occupied by a village—whoever be the landlord recognized by law—the state, a private person, or a juridical unity, such as the voisko of the Cossacks—is considered as belonging to the village eommunity as a whole, the separate members of the community having only the right of temporary possession of such part of the common property as will be allowed to them by the mir in proportion to their working power. To this right corresponds the obligation of bearing an adequate part of the charges which may fall upon the community. If any produee results from the common work of the community, each member has a right to an equal part of it.

According to these general principles, the arable land is divided into as many lots as there are working units in the community, and each family receives as many lots as it has working units. The unit is usually one male adult; but, when the working power of a large family is inereased by its containing a number of adult women, or boys approaching adult age, this eireumstance is taken into account, as well as the diminution from any cause of working power in other households.

For dividing the arable land into lots, the whole is parted first into three “fields,” according to the three-field rotation of erops. As each field, however, contains land of various qualities, it is in its turn subdivided into, say, three parts—of good, average, and poor quality ; and each of these parts is subdivided into as many lots as there are working units. Each household receives its lots in each of the subdivisions of the ‘‘field,” a carefully minute equalization as to the minor differences between the lots being aimed at; and the partition is nearly always made so as to permit each householder to reach his allotment without passing through that of another.

To facilitate this division, the community divides, first, into smaller groups (vyt, zherebyevka, a ‘‘ten, an “eight,” &e.), each of which is composed, by

free selection, of a number of householders —the community only taking care that each shall not be eomposed of rich, of poor, or of “turbulents” exelusively. The division of the land is first made among such groups, and the subdivision goes on within these. The division into groups facilitates also the dis- tribution of such work as the community may have to accomplish— as when a bridge or a ditch has to be repaired, or a meadow mowed —and the work cannot be done by the community as a whole.

As sickness, death, removal, and other incidents bring about changes in the distribution of working power among the diffcrent households, or when the number of working units in the eom- munity has increased or decreased, a redistribution of land (peredyel) follows. Whether the land be a burden (the taxes exceeding its rental value) or a benefit, its division is equalized ; the households whose working power has increased receive ad- ditional lots, and vice versa. The peredyel may be ‘partial’ or ‘¢general.” In most cases a mere equalization of lots among several families will serve, and a general redistribution is resorted to only when greater incqualities have arisen. On the whole, these redistributions are rare, and the preeariousness of land-holding which has been supposed to be a eonsequenee of the mir proves to have been exaggerated. More detailed inquiries have

1 See Yanson’s Researches on Allotments and Payments (2d ed., 1881) and Com- parative Statistics of Russia (vol. ii.); Statistics of Landed Property, published by Central Statistical Committee ; works of the Committee on Taxation, and those of the Committee of Inquiry into Petty Trades (12 vols.); Reports of the Com- mission on Agriculture; Collection of Materials on the Village Community (vol.i.); Collection of Materials on Landholding, and Statistical Descriptions of Separate Governments, published by several zemstvos (Moscow, Tver, Nijni, Tula, Ryazafi, Tamboff, Pottava, Saratotf, &e.); Kawelin, The Peasant Question; Vasiltchi- koff, Land Property and Agriculture (2 vols.), and Village‘Life and Agriculture; Ivanukoff, The Fall of Serfdom in Russia; Shashkoff, ‘“Peasantry in the Baltic Provinees,” in Russkaya Mysl, 1883, iii. and ix.; V. V., Agric. Sketches of Russia; Golovatchoff, Capital and Peasant Farming; Engelhardat’s Letters from the Country; many elaborate papers in reviews (all Russian); and Appendix to Russian translation of Reelus’s Géogr. Univ.

“ Artels.”

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shown that no redistribution is made without urgent neeessity.

Thus, to qnote but one instance, in 4442 village communities of Moscow, the average number of redistributions has been 2°1 in twenty years (1858-78), and in more than two-thirds of these

communities the redistribution took place only once. On the

other hand, a regular rotation of all households over all lots, in order to eqnalize the remaining minor inequalities, is very often

practised in the black-earth region, where no manure is needed. . s ? Besides the arable mark, there is usually a vygon (or “ eommon ”

for grazing, to whieh all honseholders send their eattle, whatever The meadows are either divided on the above principles, or mowed in common, and the hay divided The forests, when consisting of small wood in snfficient quantity, are laid under no regnlations ; when this is scarce, every trunk is counted, and valued according to its age, number of branches, &c., and the whole is divided accord.

the number they possess.

according to the number of lots.

ing to the number of lots.

The houses and the orchards behind them belong also, in prin- ciple, to the eommnuity ; but no peredyel is made, except after a fire or when the necessity arises of building the houses at greater The orchards usually remain for years in the

distances apart. same hands, with but slow equalizations of the lots in width. All decisions in the village community are given by the mir,

that is, by the general assembly of all householders, —women being admitted on an equal footing with men, when widows, or when their For the decisions unanimity is neces- sary ; and, though in some difficult cases of a general peredyel the discussions may last for two or three days, no decision is reached

male guardians are absent.

until the minority has declared its agreement with the majority.

Each eommune elects an elder (starosta); he is the executive, but has no authority apart from that of the mir whose decisions he carries ont. All attempts on the part of the Government to make him a functionary have failed.

Opinion as to the advantages and disadvantages of the village community being much divided in Russia, it has been within the last twenty years the subject of extensive inquiry, both private and official, and of an ever-growing literature and polemic. The supporters of the mir are found chiefly among those who have made more or less extensive inquiries into its actual organization and con- sequences, while their opponents draw their arguments principally from theoretical considerations of political eeonomy. The main

reproach that it checks individual development and is a source of

immobility has been shaken of late by a better knowledge of the institution, which has bronght to light its remarkable plasticity and power of adaptation to new circumstances. The free settlers in Siberia have voluntarily introduced the same organization. In uorth and north-east Russia, where arable land is scattered in small patches among forests, communities of several villages, or “volost” com- munities, have arisen ; and in the “ voisko” of the Ural Cossacks we find commmnity of the whole territory as regards both land and fish- eriesand work in common. Nay, the German colonists of southern Russia, who set out with the principle of personal property, have snb- sequently introduced that of the village eommunity, adapted to their special needs (Clauss). In some localities, where there was no great, scarcity of land and the authorities did not interfere, joint cultiva-

tion of a common area for filling the storehouses has reeently been developed (in Penza 974 commmnes have introduced this system and cultivate an aggregate of 26,910 acres). The renting of land in common, or even purchase of land by wealthy communes, has become quite usual, as also the purchase in common of agricultural imple- ments.

Since the emancipation of the serfs, however, the mir has been undergoing profound modifications. The differences of wealth whieh ensued, —the impoverishment of the mass, the rapid increase of the rmral proletariat, and the enrichment of a few “knlaks” and “miroyedes” (“mir-eaters’’),—are certainly operating un- favourably for the mir. The miroyedes steadily strive to break up the organization of the commune as an obstacle to the extension of their power over the moderately well-to-do peasants ; while the proletariat cares little about the mir. Fears on the one side and hopes on the other have been thns entertained as to the likelihood of the mir resisting these disintegrating influences, favonred, more- over, by those landowners and manufacturers who foresee in the creation of a rural proletariat the certainty of cheap labonr. But the village community does not appear as yet to have lost the power of adaptation which it has exhibited throughout its history. If, indeed, the impoverishment of the peasants continues to go on, and legislation also interferes with the mir, it must of course disap- pear, but not without a corresponding disturbance in Russian life.!

The co-operative spirit of the Great Russians shows itself further

1 See Collection of Materials on Village Communities, published by the Geogra- phical and Economieal Soeieties, vol. i. {containing a complete bibliography up to 1880), Of more recent works the following are worthy of notice :—Lutchitsky, Collection of Materials for the History of the Village Community in the Ukraine, Kieff, 1884; Efimenko, Researches into Popular Life, 1884; Hantower, On the Origin of the Czinsz Possession, 1884 ; Samokvasoff, History of Russian Law, 1884; Keussler, Zur Geschichte und Kritik des bduerlichen Gemeinde-Besitzes in Russland, 2 vols., 1884; and papers in publications of Gcographieal Society.

in another sphere in the artels, which have also been &@ prominen; feature of Russian life since the dawn of history. The artel very much resembles the co-operative society of western Europe, with this difference that it makes its appearance without any impulse from theory, simply as a natnral form of popular life. When workmen from any province come, for instance, to St Petersburg to engage in the textile industries, or to work as carpenters, masons, &e,

they immediately unite in groups of from ten to fifty persons, settle in a house together, keep a common table, and pay each his part of the expense to the elected elder of the artel. All Russia is covered with such artels,—in the cities, in the forests, on the banks of rivers, on journeys, and even in the prisons.

The industrial artel is almost as frequent as the preceding, in all those trades which admit of it. A soeial history of the inost funda- mental state of Russian society would bea history of their huntin fishing, shipping, trading, building, exploring artels. or two hundred carpenters, bricklayers, &c., are common wherever new bnildings have to be erected, or railways or bridges made; the contractors always prefer to deal with an artel, rather than with separate workmen. The same principles are often put into practice in the domestic trades. It is needless to add that the wages divided by the artels are higher than those earned by isolated workmen.

Finally, a great number of artels on the stock exehange, in the seaports, in the great cities (commissionaires), during the great fairs, and on railways have grown up of late, and have acquired the confidence of tradespeople to such an extent that considerable sums of money and complieated banking operations are frequently handed over to an artelshik (member of an artel) without any receipt, his number or his name being accepted as sufficient guarantee. These artels are recruited only on personal acqnaint- ance with the candidates for membership, and security reaching £80 to £100 is exacted in the exchange artels. These last have a tendeney to beeome mere joint-stock companies employing salaried servants. Co-operative societies have lately been organized by several zemstvos. They have achieved good results, but do not exhibit, on the whole, the same unity of organization as those which have arisen in a natural way among peasants and artisans. 2

Artels of one

The chief occupation of the population of Russia is agriculture. Agri- Only in a few parts of Moscow, Vladimir, and Nijni has it been culture,

abandoned for manufacturing pursuits. Cattle-breeding is the leading industry in the Steppe region, the timber-trade in the north-east, and fishing on the White and Caspian Seas. Of the total surface of Russia, 1,237,360,000 acres (excluding Finland), 1,018,737,000 acres are registered, and it appears that 39°9 per cent. of these belongs to the crown, 1°9 to the domains (udel), 31°2 to peasants, 24°7 to landed proprietors or to private com- panies, and 2°3 to the towns and monasteries. Of the acres registered only 592,650,000 can be considered as "* good," that is, capable of paying the land tax; and of these 248,630,000 acres were under erops in 1884.3 The crops of 1883 were those of au average year, that is, 2°9 to 1 in central Rnssia, and 4 to 1 in south Russia, and were estimated as follows (seed corn being left out of account) :—Rye, 49,185,000 quarters ; wheat, 21,605,000; oats, 50,403,000 ; barley, 13,476,000; other grains, 18,808,000. Those of 1884 (a very good year) reached an average of 18 per cent. higher, except oats. The crops are, however, very unequally distributed. In an average year there are 8 governments which are sone 6,930,000 quarters short of their requirements, 35 which have an exeess of 33,770,000 quarters, and 17 which have neither excess nor deficiency. The export of corn from Russia is steadily increasing, having risen from 6,560,000 quarters in 1856-60 to an average of 23,700,000 quarters in 1876-83 and 26,623,700 quarters in 1884. This increase does not prove, however, an excess of corn, for even when one-third of Russia was famine-stricken, during the last years of scarcity, the export trade did not decline ; even Samara exported during the last famine there, the peasants being compelled to sell their corn in autumn to pay their taxes, Scarcity is quite usual, the food supply of some ten provinces being exhansted every year by the end of the spring. Orach, and even bark, are then mixed with flonr for making bread.

Flax, both for yarn and seed, is extensively grown in the north- west and west, and the annual production is estimated at 6, 400,000 ewts. of fibre and

2,900,000 quarters of linseed. Hemp is largely cultivated in the central governments, the yearly production being

2 See Isaeff on Artels in Russia, and in Appendix to Russian translation of Reelus; Kalatehoff, The Artels of Old and New Russia ; Recuetl of Materials on Artels (2 vols.); Seherbina, South Russian Artels; Nemiroff, Stock Exchange Artels (all Russian).

3 The division of the registered land is as follows, the figures being pereentages of the whole :—

Arable Meadows,

sari. Forests. Baeentel Unproduetive. Peasants' holdings….....0. 53°8 10°1 26°6 9:5 IBLivatewHOldiesstscr..ccssssc ccc. 22 37°6 23°1 11°9 Crown and domains….....0666 ey 64°3 1°6 32°4 ROHAN ee: eve ccetsosces eevee 26°3 38°7 15°9 19°1

INDUSTRIES. |

1,800,000 ewts. of fibre and 1,800,000 quarters of seed. The export of both (which along with other oil-bearing plants reached

jn the foreign trade of Russia.

The culture of the beet is increasing, and in 1884 785,700 acres were under this root, chiefly in Little Russia and the neighbouring overnments ; 68,900,000 ewts. of beetroot were worked up, yield- ing 5,119,000 cwts. of sugar, while fifty-five refineries (twenty-six of them in Poland) showed a production valued at 118,888,530 roubles in 1882. Tobacco is cultivated everywhere, but good qua- lities are obtained only in the south. In 1876-80 an average area of 101,600 aercs was under this steadily increasing culture, and the erop of 1884 yielded 86,400,000 cwts. The vine, which might be grown much farther north than at present, is cultivated only ou Mount Caucasus, in Bessarabia, in the Crimea, and on the lower Don for wine, and in Ekaterinoslaff, Podolia, and Astrakhan for raisins. The yearly produce is 10-8 million gallous in Russia, 10°0 in the Caucasus, and 24 in Transcaucasia.

Market gardening is extensively earricd on in Yaroslavl for a variety of vegetables for exportation, in Moscow and Ryazafi for hops, and in the south for sunflowers, poppies, melons, &c. Gardening is also widely spread in Little Russia and in the more fertile central governments. Madder and indigo are cultivated on Caucasus, and the silk-worm in Taurida, Kherson, and Caucasia. Bee-keeping is widely spread.

The breeding of live stock is largely carried on in the east and south, but the breeds are usually inferior. Good breeds of cattle are met with only in the Baltic provinees, and excellent breeds of horses on the Don, in Tamboff, and in Voronezh. Since the emancipation, the peasants have been compelled to reduce the number of their cattle, so that the increase in this department does not correspond to the increase of population, as is shown by the following figures :—

1851. 1882.

seen ese 20,962,000 23,845,100 ee 37,527,000 47,508,970 on 8,836,000 9,207,670

Ir ee

A more thorough registration of horses for nvlitary purposes gives a return of 21,203,900 horses in Russia and Poland, that is, 255 horses per 1000 inhabitants—a proportion which is elsewhere approached only in the United States. They are kept in largest numbers in the thrce Steppe governments and on the Urals (550 and 384 per 1000 inhabitants), while the smallest proportion occurs in the manufacturing region (155 per 1000 inhabitants). 90 per cent. of the total number of horses belong to peasants ; these are mostly of a very poor description. Infectious diseases make great ravages every year. In 1882 no less than 121,500 cattle and 14,110 horses perished from that cause.?

Fishing is a most important source of income for whole com- munities in Russia. No less than 2000 to 3000 inhabitants of Archangel are eugaged in fishing on the Norwegian coast and in the White Sea, the aggregatc yield of this industry being estimated at 200,000 ewts., including 150 million herrings. These fisheries are, however, declining. Fishing in the Baltic is not

of much importance. In the estuaries of the Dnieper, Dniestcr, and Bug it gives occupation to about 4000 men, and may be valued at less than 1,000,000 roubles. The fisheries in the Sea of Azoff, which oceupy about 15,000 men, are much more important, as are also those of the lower Don, which last alone are valued at over 1,000,000 roubles a year. The chief fisherics of Russia are, how- ever, on the Caspian and in its feeders: those of the Volga cover no less than 6000 square miles, and those of the Ural extend for over 100 miles on the sea-coast and 400 miles up the river. The lowest estimates give no less than 4 million cwts., valued at 15 million roubles, of fish taken every year in the Caspian and its affluents. The fisherics on the lakes of the lake region are also worthy of notice.

Ilunting is an important source of income in north and north- east Russia, no less than 400,000 squirrels and 800,000 grouse, to mention no other game, being killed in different governments, while sea-hunting is still productive on the shores of the Arctic Occan.?

Notwithstanding the wealth of the country in minerals and mctals of all kinds, and the endeavours made by Government to encourage mining, ineluding the imposition of protective tariffs even against Finland (in 1885), this and the related industries are still at a low stage of development. The remoteness of the mining from the industrial eentres, the want of technical instruc- tion and also of capital, and the existence of a variety of vexatious

1 See The Year 1884 with regard to Agriculture, published by the Ministry of

Interior (so also preceding years); the publications of the Minister of Finance; Yanson's Comparative Statistics of Russia, 1880; Appendix to Russian translation of Reelus; and Suvorin's Russkiy Kalendar. 2 Bibliography.— Baer and Danilevskiy, Fishery Researches in Russia, published by Minister of Domains, 9 vols.; Veniaminoff, Fishing in Russia, 1876; Sidoroff, Northern Russia, and Contributions to the Knowledge of Northern Russia, 1882; Grimm, The Work of the Aral-Caspian Expedition.

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the value of 136,816,000 roubles in 1882) holds the second place

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regulations may be given as the chief reasons for this state of matters. The imports of foreign metals in the rough and of coal are steadily increasing, while the exports, never otherwise than insignificant, show no advance. The chief mining districts of Russia are the Ural Mountains and Olonetz for all kinds of metals ; the Moscow and Donetz basins for coal and iron; Poland and Finland; Caucasus; and the Altai, the Nertchiusk, and the Amur mountains.

Gold is obtained from gold-washings in Siberia (63,194 fb in 1882), the Urals (16,850 ib), Central Asia (325 Tb in 1881), and Finland (42 tb); silver in Siberia (16,128 tb), and partly on Cau- casus (1232 tb), the quantity steadily decreasing ; platinum in the Urals (3600 to 4600 tb every year). Lead is extracted along with silver (19,416 ewts. in 1881 ; 357,260 cwts. imported); zinc only in Poland (89,650 cwts. ; half as much is imported); tin in Finland (194 ewts.; 40,000 cwts. imported). Copper is worked in several govern- ments of the Ural region, in Kazafi, Vyatka, Caucasus, Siberia, and Finland, but the industry is a languishing one, and the crown mincs show a deficit (65,000 cwts. ; double this amount is imported). Iron-ores are found at many places. Excellent mines are worked on the Urals; and iron mines occur also in large numbers throughout the Moscow and Donetz basins, as also in the western provinces, not to speak of those of the Asiatic dominions, of Poland, and of Fin- land (bog-iron). In 1881 the annual production of pig-iron (which covered only two-thirds of the consumption) was stated as follows, (in thousands of ewts.):—Urals, 6153; central Russia, 1092; Olonctz, 42; south and south-west Russia, 501; Poland, 951; Finland, 413; Siberia, 85. The iron and steel throughout the empire amounted to 10,720,000 cwts. in 1882. European Russia alone produced in 1882 31,520 ewts. of copper, 7,703,000 cwts. of pig-iron, 4,981,300 ewts. of iron, and 3,799,600 cwts. of steel.

The production of coal is rapidly increasing and in 1882 reached 46,270,000 cwts., three-fourths being produced by the Donetz basin, and one-fifth by that of Moscow. Poland, moreover, yielded 27,950,000 ewts. of coal in 1882, and the Asiatic dominions about 800,000 ewts. Nearly 34,000,000 ewts. are imported annually. The extraction of naphtha on the

Apsheron peninsula of the Caspian has been greatly stimulated of late, reaching about 20,000,000 cwts. in 1883 (4,600,000 ewts. of kerosene, 1,000,000 ewts. of lubricating oils, and 300,000 ewts. of asphalt).

Russia and Siberia are very rich in rock-salt, salt springs, and salt lakes (16,360,000 cwts. extracted ; 3,746,000 imported). Excel- lent graphite is found in the deserts of the Sayan Mountains and Turukhansk. Sulphur is obtained in Caucasia, Kazaii, and Poland (2000 to 5000 ewts. extracted ; 70,000 tc 170,000 cwts. imported). The mining and related industries occupy altogether about an ageregate motive force (steam and water) of 73,500 horse-power and 305,000 hands.

Since the time of Peter I. the Russian Government has becn Mannfac- unceasing in its efforts for the creation and development of home tures manufactures. Important monopolies in last century, and heavy and petty protective, or rather prohibitive, import duties, as well as large industries. money bounties, in the present, have contributed towards the accumulation of immense private fortunes, but manufactures have developed but slowly. A great upward movement has, however, been observable since 1868. About that time a thorough reform of the machinery in use was effected, whereby the number of hands employed was reduced, but the yearly production doubled or trebled. In some branches the production suddenly rose at a yet higher rate (cottons from 12 million roubles in 1865 to 209 million in 1882). The following figures for European Russia, without Poland and Finland, will give some idea of this progress :—

Workmen Employed.

Number of

Yearly Production | Produetion per Establishments.

in Roubles. Workman.

157,372,000

1851 9,256 | 456,596 317 1861 14,060 | 559,538 | 295,560,000 528 1870 18,892 | 463,093 | 452,660,000 977 1882 56,905 | 954,971 | 1,126,083,000

1,187

These figures lose, however, some of their significance if the corre- sponding rate of progress in manufacturing productivity in westeru Europe be taken into account. Besides, since the great improve- ments of 1861-70 the industrial progress of Russia has been but slow. The manufactories of rails and railway plant, aud even the Ural iron- works, are ina precarious condition. The textile industries, though undoubtedly they have made great advances, are subject to great fluctuations in connexion with those of the home erops, and are thus in an abnormal state. The artisans labour for twelve, fourteen, and sometimes sixteen hours a day, and their condition, as revealed by recent inquiries, is very unsatisfactory. Many causes contribute to this, the want of technical instruction, the want of capital, and

3 See the yearly accounts in Mining Journal; Dobronizskiy, Mining in the Russian Exhibition of 1883 (detailed account); publieutions of the Minister of Finanee ; Képpen's "' Mining Industry of Russia," in Mining Journal, 1880, and Iznvestia Geog. Soc., 1880; Marvin's Petroleum Industry of Russia, 1885.

Tnland trade.

above all the want of markets. Russia has not, and cannot have, such foreign markets as the countries which first attained an indus- trial development. Her eolonies are deserts, and in the home markets the manufacturer only finds 80 millions of poverty-strieken people, whose wants are nearly all supplied by their petty domestic industries.

These, that is, the domestic industries which are earried on by the peasants in conjunction with their agricultural pursuits during the long days of idleness imposed by the climate and by the re- dueed allotments of land, continue, not only to hold their ground side by side with the large manufactures, but to develop and to compete with these by the cheapness of their products. Extensive inquiries are now being made into these domestic industries (kustar- noyie proizvodstvo). 855,000 persons engaged in them along with agrieulture (£ustari) have already been registered, and an

unexpected variety of industries, and a still more unexpected teehnical develop- ment in several of them, have been disclosed by these researches. The yearly production of the 855,000 kustari who have been regis- tered reaches 218,444,000 roubles; while the total number of peasants engaged in the industries, mostly in Great Russia and northern Caucasia, is estimated at a minimum of 7,500,000 persons, with a yearly production of at least 1,800,000,000 roubles, or more than double the aggregate production of the manufactures proper.

Of course the machinery they use is very primitive, and the wages for a day of twelve to sixteen hours exceedingly low. But the industries are capable of being improved, and it has been brought out that “Paris” silk hats and “ Vienna” house furniture sold by substantial foreign firms at Moseow are really manufactured in the neighbourhood of the capital by peasants who still eontinue to till their fields. All these industries suffer very much from want of credit, and the producers become the prey of intermediaries. But their continued existence and their progress under most unfavour- able conditions show that they meet a real want, which is itself the consequence of the peculiar conditions under which Russia, the last to come into the international market, has to develop.

In those very governments where two-thirds of the textile manu- factories of Russia are concentrated domestic weaving (for the market, not for domestic use) employs about 200,000 hands, whose yearly produetion is valued at 45,000,000 roubles. In Stavropol on Caueasus it has so rapidly developed that 42,400 looms are now at work, with a yearly production of 2,007,700 roubles. But no ade- quate idea could be given of the petty industries of Russia without entering into greater detail than the scope of the present article per- mits. Suffice it to say that there is no branch of the industries in textiles, leather, woodwork, or inetal work, provided it needs no heavy machinery, which is not suceessfully carried on in the villages. Nearly all the requirements of nine-tenths of the popula- tion of Russia are met in this way.

The aggregate production of industries within the empire, in- clusive ot mining, was stated in 1882 as follows :—European Russia, 1,126,033,000 roubles ; Poland, 147,309,000 ; Finland, 15,130,000. The chief

manufactures in European Russia (apart from Poland and Finland), aud their yearly production in 1882 in millions of roubles, were as follows :— cotton yarn and cottons, 208°6; other textile industrics, 103°5; metal wares and machinery, 107°9 ; chemicals, 6°6 ; candles, soap, glue, leather, and other animal products, 61:4 ; distillery products, 156-0 ; other liquors, 39°0; sugar, 140-9 ; flour, 74:0. The remainder are of minor importance. It must be observed, however, that these figures are much below those given for 1879, when the aggregate production of Russian manufactures was computed at 1,102,949,000 roubles, without the mining and related industries, the distillery products, and the flour.

The geographical distribution of manufactures in Russia is very unequal. The governments of Moscow and St Petersburg, with a yearly production of 173 and 134 million roubles respectively, repre- sent together two-fifths of the ageregate production of Russia, If we add Vladimir (91,766,000 roubles), Kieff (73,300,000), Perm (56,500,000), Livonia, Esthonia, Kharkoff, and Kherson (from 30 to 35 millions each), we have all the prineipal manufacturing centres. In fact, Moscow, with portions of the neighbouring governments, contains half the Russian manufactures exempted froin excise duties, while the south-west governments of Kieff, Podolia, and Kherson contain two-thirds of those not so exempted. 1}

The main wealth of Russia consisting in raw produce, the trade of the country turns chiefly on the purchase of this for export, and the sale of manufactured and imported goods in exchange. This

1 See Orloff's Index of Russian Manufactures, 1881; Timiryazeff's Development of Industry in Russia, and Industrial Atlas of Russia ; Materials for Statistics of Steam-Engines, published by Central Statistical Committee, 1882; LWistorical and Statistical Sketch of Russian Industry, vol. ii., 1883 ; Annuaire of the Ministry of Finance; Russische Revue, published monthly at St Petersburg by Roettger. On the petty trades, see Memoztrs of the Committee for Investigation of Petty Trades, vols. i. to xii., 1879-84; Recueil of Statistical Information for Moscow Govern- ment, published by the Zemstvo, vols. vi. and vii.; Isaeff's Trades of Moscow; several papers in reviews; and an appendix to the Russian translation of Reclus's Géographie Universelie; Resumé of Materials on Russtan Peity

Trades, 1874 (all Russian); also Thun, Russlands Gewerbe. For the position of workmen in manu- factories see the extensive inquiries of the Moseow Zemstvo in its Recueil, and

the reports of the recently nominated inspectors of manufactures, especially Yanjul, Sketches and Researches, 2 vols., 1884.

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traffic is in the hands of a great number of middlemen, —in the west Jews, and elsewhere Russians,—to whom the peasants are for the most part in debt, as they purchase in advance on security of sub. sequent payments in corn, tar, wooden wares, &c. A good deal of the internal trade is carried on by travelling merchants (ofent).

The fairs are very numerous ; the minor ones numbered 6500 in 1878, and showed sales amounting to an aggregate of 305 million roubles. Those of Nijni-Novgorod, with a return of 400 inillion roubles, of Irbit and Kharkoff (above 100 million roubles each), of Romny, Krestovskoye in Perm, and Menzelinsk in Ufa (55 to 12 million roubles), have considerable importance both for trade and for home manufactures. The total value of the internal trade, which is in the hands of 681,116 licensed dealers, is roughly estimated at more than seven milliards of roubles,

The development of the external trade of Russia is scen from the following figures (millions of roubles):—

[TRADB,

1861-65,| 1866-70. 1871-75.] 1876-80.

1881. 1882,

Exports, Articles of food…... Raw and half-manu- faetured produce. Manufactured wares

66°1 | 116°9 | 200°1 | 326-2 | 261-9 | 350-6

102°8 | 180-1 | 164-6 12°7| 15°6

197°4 | 219°5 | 232-9 11°0|| 13°25) ies

Wattles… ee 11°8 | 19a Ho tally eee 181°6 | 262°7 | 374-9 | 534°6 | 506-4 »» in metallic roubles? | 158-4 | 214°4 342°3 | 336°8 Inwports. Articles of food…... 60°4] 68°5 AH Raw and half-manu- factured produce.| 66°4 | 116°9 278°5 Manufactured wares| 36‘1| 96:4 iSsG HOGA cee eee 162°9 | 281-8 517°8 », in metallic

142°5 | 229°3

roubles… 344°3

The chief artiele of export is grain—wheat, oats, (24,870,000 quarters, 321,042,000 roubles in 1882), to which the inerease of exports is mainly due. This increase, however, does not correspond to an increase of crops, only 10 per cent. of which were exported in 1870 and about 20 per cent. in 1882. Next to grain come flax, hemp, linseed, and hempseed (129,370,000 roubles in 1882) ; oil-yielding grains (441,000 quarters) ; wool, tallow, hides, bristles, and bone (31,120,000 roubles). If we add to these timber (35,044,000 roubles) and furs (4,147,000 roubles), 95 per cent. of all Russian exports are aceounted for, the remainder consisting of linen, ropes, and some woollen stuffs and metallic wares (7,172,000 roubles to western Europe, 2,888,000 to Finland, and 5,763,000 to Asia).

The chief imports from Europe were in 1882 as follows :—Tea (48,091,000 roubles), liquors (16,124,000 roubles), salt, fish, riee, fruits, and colonial wares (38,446,000 roubles), various raw tex- tile wares (127,986,000 roubles—cotton 72,417,000), raw metals (32,630,000 roubles), chemicals (57,894,000 roubles), and stuffs (22,428,000 roubles). The imports from Asia—chiefly tea—in the same year reached 32,853,000 roubles. The chief imports were from Germany (214,000,000 roubles) and Great Britain (124,700,000), the chief exports to Great Britain (210,000,000), Germany (178,000,000), and France (54,000,000). Even in her trade with Finland Russia imports more than she exports,—the chicf imports being paper, cotton, iron, and butter ; prohibitory tariffs were im- posed on Finnish wares in 1885.

During 1882 the ports of the empire were visited by 18,638 foreign ships (5,337,000 tons), of which number 1436 were to Asiatic ports (391,200 tons). Of the above total only 2489 vessels (628,000 tons) were under the Russian flag (mostly Finnish), while the British alone showed a tonnage of 2,258,000 and the German 639,000. The coasting trade was represented by 35,083 vessels (6,040,000 tons) entering the ports, chiefly those of the Black Sea.

The mercantile marine of Russia in 1882 numbered 6383 vessels (727,000 tons), including 604 steamers ; of the total number 1593 (254,000 tons) were Finnish. The chief ports are St Petersburg, Odessa, Riga, Taganrog, Libau, and Reval. Baku has recently acquired some importance in consequence of the naphtha trade.

The rivers of the empire, mostly connected by canals, play a very Commun important part in the inland traffic. The ageregate length of cation. navigable waters reaches 21,510 miles (458 miles of canals), and 12,600 miles more are available for floating rafts. In 1882 51,407 boats, with cargoes amounting to 153,250,000 cwts., valued at 186,480,000 roubles, left the ports on Russian rivers and canals, ——_—__ ee eee

and rye—

2aSee note lepers 3 See Obzor of the Foreign Trade of Russia in 1882, published b y the Minister of Finance, and the same for trade with Europe in 1888 and 1884,

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firewood, and timber constitute two-thirds of the whole es. Pact Within Russia proper, from 5740 to 7400 boats, larger and smaller, worth from four to seven niillions of roubles, have been built annually during the last five years (7415 boats, valued at 6,758,000 roubles, in 1882,—18 of them being steamers) ; most of them are light flat-bottomed structures, which are broken up as soon as they have reached their destination. The number of steamers plying on ‘nland waters, chiefly on the Volga, was esti- mated in 1879 at 1056 (80,890 lhorse-power). ‘Twenty-five years ago Russia had only 992 miles of railways ; on January 1, 1888, the totals were 13,428

miles for Russia and Caueasia, 888 for Poland, 734 for Finland, and 141 for the Transcaspian region, and two years later they had reached an aggre- gate length of 16,155 miles. The railways ehicfly conncet the Baltic ports with the granaries of Russia In the south-east, and the western frontier with Moscow, whence s1x trunk lines radiate in all directions. Several military lines run along the western frontier, while two trunk lines, starting from St Petersburg, follow the two shores of the Gulf of Finland. of the projected Siberian railway one main line (444 miles), connecting Perm and Berezniki on the Kama with Ekaterinburg and the chief iron-works of the Urals, has been constructed. It has been extended east to Kamyshkoff, and is to be continued to Tiumen, 100 miles farther east, whence steamers Tomsk. Dy iy 738 miles of the railways of Russia belong to the state, but most of them have been constructed under Government guar- antecs, involving payment of from 11 to 21 million roubles yearly. On the other hand the yearly increasing debt of the railways to the state amounted to 781,888,800 roubles in 1883. Of the aggregate value of the Russian railways, estimated at 2210 million roubles, no less than 1971 million roubles were held by Government in shares and bounds. ‘Che cost of construction has been altogether out of proportion to what it ought to be; for, whereas the average rate per verst (0°663 milc) in Finland was only 20,000 silver roubles, in Russia it reached 60,000, 75,000, 90,000, and even 100,000 roubles. In 1882 21,322 versts (14,136 miles) represented an expenditure of 2,210,047,632 roubles, and their net revenue was only 3°18 per cent. on the capital invested (4982 roubles per English mile in 1882). In 1884 34,674,858 passengers, 2,287,955 military, and 834,500,000 cwts. of merchandise were conveyed by 5808 locomo- tives and 120,940 carriages and waggons. Fully one-half of the merchandise carried consisted of corn (24 per cent.), coal (13 per cent.), firewood (12.per cent.), and timber (8 per cent.).1 : For the conveyance of correspondence and travellers along ordi- nary routes the state maintains an extensive organization of post- horses between all towns of the empire, that 1s, over an ageregate length of 110,170 miles. In 1882 4355 stations, with a staff of 15,560 men and 446,460 horses, were kept up for that purpose. In 1883 242,193,470 letters, newspapers (93,520,000), registered letters, and parcels were carried, of which 29,808,100 belonged to international correspondence. The telegraph system had in the same year an aggregate length of 65,394 miles, with

2,957 telegraph- offices, and 10,222,139 telegrams were transmitted.2 (P. A. K.)

HISTORY. |

Part LV. Russtan HisTory.

The Russians, properly so called, belong to the Slavonic race, itself a division of the great Aryan faimily. It can- not be denicd that in the northern and eastern parts of Russia large Finnish elements have become mixed with the Slavs, and Mongolian in the south, but this is far from justifying the prejudiced attempts of Duchinski and others to challenge the right of the Russians to be called an Aryan people. The derivation of the words Russia, Russians (Rous, Hossia, Rossiane), has been much disputed. The old-fashioned view was to identify them with the Rhozxolani, who are now generally believed to have been a Medish tribe. he later and probably correct one is to derive the name from the Finnish Ruotsi applied to the Swedes, and considered by Professor Thomsen of Copen- hagen to be itself a corruption of the Swedish word rothsmenn, rowers or seafarers. They are Scandinavian

1 See the Statistical Sbornik of the Ministry of Roads and Commu- nications, vols. viii., ix., and x. (roads, canals, railways, and traffie thereon, with maps and graphic representation of traffic); Golovatchoff, “Russian Railways,” in Bezobrazoff’s Sbornik Gosudarstvennykh Znaniy, vols. iv., v., vii, viii.; Rybakoff and Bieloff, Our Ways of Communication, 1884; Tehuproff, Tovarnyie Sklady, &e. (trade in corn), 1884.

2 See Postal Statistics for 1883 (St Petersburg, Russkiy Kalendar.

1885), and the

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vikings with whom we first become acquainted in northern Russia, and who in a way founded the empire, although from Arabian and Jewish writers we have dim records of a Slavonic race inhabiting the basin of the Dnieper about the close of the 9th century. In recent times Hovaiski and Gedeonoff

have again attacked the view of the Swedish origin of the invaders. They see in them only Slavs, but they are not considered to have shaken the theory which derives the name from Ruotsi. As the story goes, threc brothers, Rurik, Sineus, and Truvor, were invited to Russia from the north and settled at Novgorod in 862. Nestor calls them Varangians, a name in which most people are willing to see Norsemen. Fora long time the Russians and Scandinavians are considered, as we shall find, to be separate races, but at length they are fuscd, as the Saxons and Normans in England under Henry I. Concerning the origin of the town of Novgorod, which bears a purely Slavonic name, nothing is known; it has been supposed that at first a Finnish settlement existed on its site. According to the legend the three brothers were invited over by a leading citizen named Gostomisl. There is, however, no mention of such a person in the Chronicle of Nestor. There is another story that Rurik was the son of the Swedish king, Ludbrat, a person met with in Scandinavian legend, and his queen Umila, the daughter of Gostomisl, and was born at Upsala in 830. Whatever the variants of the legend may be, we seem to learn one thing,—that a successful Scandinavian invasion occurred in the north of Russia. The three brothers finally settled in the country,—Rurik at Ladoga, where the river Volkhoff flows into the lake, Sineus at Bielo-ozero, and Truvor at Izborsk on Lake Peipus. On the death of his two brothers without heirs, we are told that Runk annexed their dominions to his own, and took the title of veliki kniaz, or grand-prince. These three brothers are said to have brought two other adventurers with them, Askold and Dir, who, having had a quarrel with Rurik, set out with some companions to Constantinople to try their fortune. On their way they saw Kieff, situated on a rich and grassy plain, in the occupation of the Khazars. Of this city they made themselves masters, and permanently established themselves on the Dnieper. The origin of Kieff itself is involved in mystery. It is first mentioned about the 9th century. Constantine Porphyrogenitus speaks of 13 Kaotpov Td KuodBa 7d érovopalopevov SapBaras. This last word has given much labour to scholars ; some are disposed to see in it the Norse sandbakhi, the bank of sand. It is at Kieff that, according to the legend, St Andrew preached the gospel to the Russians. From this place Askold and Dir sallied forth two years afterwards, with an armament of two hundred vessels, sailed up the Bosphorus, and plundered the capital of the Byzantine empire. The Greek writers give 851 as the date of this enter- prise, thus making it precede the

arrival of Rurik by eleven years. The emperor at the time of their invasion was Michael TIT.

Having greatly extended his dominions by subduing the surrounding Slavonic tribes, Rurik died at an advanced age in 879, leaving the regency of the principality and the guardianship of his son Igor to the renowned Oleg? This chief subdued Smolensk, a city of the Krivitchi, in 882. Allured by its wealth and advantageous situation, Oleg now resolved to attempt Kieff, which was held by Askold and Dir. The story goes that he took young Igor with him, and disguised himsclf and his companions as Slavonic merchants. The unsuspecting Askold and Dir were invited to a conference and slain on the spot. Thus was Kieff added to the dominions of Igor, who was recognized as the

3 Both these names are Scandinavian, the original forms being Ingvar and Helgi.

Rurik and his brothers.

Igor and Oleg.

Jord of the town.1 In 903 Oleg chose a wife for Igor, named Olga,' said to have been a native of Pskoff, the origin of which place, now mentioned for the first time, is unknown. We are told that it was a city of importance before the arrival of Rurik. The derivation of the name is disputed, some deriving it from a Finnish, others from a Slavonic root. Oleg next resolved to make an attack upon Byzantium, and his preparations were great both by sea and land. Leo the Philosopher, then emperor, was ill able to resist these barbarians. He attempted to block the passage of the Bosphorus, but Oleg dragged his ships across the land and arrived before the gates of Constantinople. The Greeks begged for peace and offered tribute. Oleg is said to have hung his shield in derision on the gates of the city. We may believe this without going so far as to give credence to Stryikowski, the Polish writer, who says it was to be seen there in his time (16th century). The atrocities committed by Oleg and his followers are described by Karamzin, the Russian historian; they are just such as the other Norsemen

of their race were committing at the same time in northern and western Europe. ‘The Byzantines paid a large sum of money that their city might be exempted from injury, and soon after Oleg sent ambassadors 3 to the emperor to arrange the terms. The treaty was ratified by oaths: the Byzantines swore by the Gospels, and the Russians by their gods Perun and Volos. In 911 Oleg made another treaty with the Byzantines, the terms of which, as of the preceding one, are preserved in Nestor. The authenticity of these two treaties has been called in question by some writers, but Miklosich truly observes that it would have been impossible at the time Nestor wrote to forge the Scandinavian names. Soon after this Oleg died ; he had exercised supreme power till the time of his death to the exclusion of Igor, and seems to have been regarded by the people as a wizard. He is said to have been killed by the bite of a serpent, which had coiled itself in the skull of his horse, as he was gazing at the animal’s unburied bones. The story is in reality a Scandinavian saga, as has been shown by Bielowski and Rafn. It is also found in other countries. In the reign of Igor the Petchenegs first make their appearance in Russian history. In 941 he undertook an expedition against Constantinople and entered the Bosphorus after devastating the provinces of Pontus, Paphlagonia, and Bithynia. Nestor has not concealed the atrocities com- mitted by the Russians on this occasion ; he tells us of the churches and monasteries which they burned, and of their cruelty to the captives. They were, however, attacked by the Byzantine fleet, and overpowered by the aid of Greek fire ; many were drowned, and many of those who swam to land were slaughtered by the infuriated peasants ; only one of their number escaped. Thirsting to avenge his loss, Igor fitted out another expedition in the spring of the following year. The Greeks were unwilling to run arisk again; they renewed the treaty which had been signed with Oleg, and were only too glad to purchase deliverance from their adversaries. The Russian at first demanded too much, but was finally persuaded by his more prudent attendants: “If Cesar speaks thus,” said they, ‘““what more do we want than to have gold and silver and silks without fighting? Who knows which will

survive, we or they? Who has ever been able to conclude |

a treaty with the sea? We do not go on the dry land, but on the waves of the sea; death is common to all.”

1 This story is considered by the historian Bestuzheff Riumin to be a mere legend invented to explain the connexion between Novgorod and Kieff.

2 Here again we have a Norse name. which in its older form is Holga.

3 It has been observed that the names of the ambassadors in this treaty are purely Scandinavian.

Olga is equivalent to Helga,

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A treaty of peace was accordingly concluded, which js given at full length by Nestor ; of the fifty names attached to it we find three were Slavonic and the rest N orse. The two races are beginning to be fused. From this expedi- tion Igor returned triumphant. He was, however, unfor- tunate in a subsequent attack on the Drevlians, a Slavonic tribe whose territory is now partly occupied by the government of Tchernigoff. The Drevlians had long suffered from his exactions. They resolved to encounter him under the command of their prince Male ; for they saw, as a chronicler says, that it was necessary to kill the wolf, or the whole flock would become his prey. They accordingly laid an ambuscade near their town Korosten, now called Iskorost, in the government of Volhynia, and slew him and all his company. According to Leo the Deacon, he was tied to two trees bent together, and when they were let go the unhappy chief was torn to pieces,

Igor was succeeded by his son Sviatoslaff, Russian prince with a Slavonic name. Olga, however, the spirited wife of Igor, was now regent, owing to her son’s minority. Fearful was the punishment she inflicted upon the Drevlians for the death of her husband, and the story lacks no dramatic interest as it has been handed down by the old chronicler. Some of the Drevlians were buried alive in pits which she had caused to be dug for the purpose previously ; some were burned alive ; and others murdered at a trizna, or funeral feast, which she had appointed to be held in her husband’s

honour. The town Iskorost was afterwards set on fire by tying lighted matches to the tails of sparrows and pigeons, and letting them fly on the roofs of the houses. Here we certainly have a piece of a bélina, as the old Russian legendary poems are called. Geoffrey of Monmouth and Layamon give the same account of the capture of the city of Cirencester by Gurmund at the head of the Saxons, and something similar is also told about Harold Hardrada in Sicily. Finally, at the close of her life, Olga became a Christian. She herself visited the capital of the Greek empire, and was instructed in the mysteries of her new faith by the patriarch. There she was baptized by him in 955, and the emperor Constantine Porphyrogenitus became her god-father. She did not, however, succeed in persuading her

son Sviatoslaff to embrace the same faith, although he Sviato- took no measures to impede its progress among his gub-Slafl.

jects. This son was as celebrated a warrior as Oleg ; his victories were chiefly over the Petchenegs previously men- tioned, a people of Mongol origin inhabiting the basin of the Don. He began, however, the fatal custom of break- ing up Russia into apanages, which he distributed among his sons. The effects of this injudicious policy, subse- quently pursued by other grand princes, were soon felt. Thus was paved the way for the invasion of Russia by the Mongols, who held it for two hundred years, and com- municated that semi-Asiatic character to the dress and customs of the country which the ukazes of Peter the Great could hardly eradicate, and which perhaps have not entirely disappeared even in our own times. In his division of the country, Sviatoslaff gave Kieff to his son Yaropolk ; to another son, Oleg, the conquered land of the Drevlians ; to another, Vladimir, he assigned Novgorod.

| It would be impossible to interest the reader in the petty

wars of these princes. After having gained several victories over the Petchenegs, Sviatoslaff set out on an expedition against the Bulgarians, a Ugro-Finnish tribe, dwelling on the banks of the Volga, the remains of whose ancient capital can still be seen. He made himself master of their country, but his victorious career was cut short at the cataracts of the Dnieper, where he and his soldiers were slain by the Petchenegs. According to the barbarous custom of the times, their prince Kurya made his skull

the first Regency

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. Russia, so Yaroslaff his son was the first legislator.

‘ of heroic men, for the second division of our subject.

903-1174.]

. into a drinking-cup. Vladimir, the son of Sviatoslafi, was

for some time a monster of cruelty and debauchery. He killed his brother Yaropolk, and seized his dominions ; and, Yaropolk having some time before murdered his brother Oleg, Vladimir now became sole ruler. To his hereditary dominions he added Galicia or Red Russia, and subjugated some Lithuanian and Livonian tribes. Suddenly he seems to have been troubled with religious difficulties. Accord- ing to the chronicler, he sent ambassadors to bring him reports of the different religions—Catholic, Jewish, Mus- sulman, and Greek. The last of these beliefs seemed the most satisfactory. Vladimir marched south, took the city of Chersonesus in the Crimea, which at that time belonged to the Byzantine emperors, and then sent to demand the hand of the daughter of that potentate. After some deliberation his request was granted on condition that he was baptized. Accordingly he went to Constantinople in 988, and was admitted into the church, and at the same time received the hand of Anne, the Byzantine princess, although he seems to have already had a great number of wives. On his return to Kieff, he caused the image of Perun, the Slavonic god of thunder, which had been erected on an eminence, to be cast into the river, after having been belaboured by the cudgels of his soldiers. After this Vladimir issued a proclamation ordering all the inhabitants to proceed on the following day to the banks of the river to receive baptism. This extraordinary com- mand met with universal obedience, and Russia was Christianized. As Vladimir introduced Christianity into He was prince of Novgorod, aud died in 1054. Vladimir on his death divided his dominions among his sons :—to Yaroslaff, Novgorod; to Iziaslaff, Polotsk ; to Boris, Rostoff ; to Gleb, Murom ; to Sviatoslaff, the Drevlians ; and a few other provinces to others of his sons. Kieff, his capital, was seized by his nephew

Sviatopolk, who murdered Boris and Gleb, now canonized among the martyrs of the Russian Church. Yaroslaff at length drove Sviatopolk from Kieff, and was temporarily restored by the Poles, but only to be driven out again, and he ended his life as an exile. Yaroslaff was successful against the Petchenegs, but failed in an attack on Constantinople. His great claim to be remembered lies in his publishing the first recension of the Russkaia Pravda, the earliest Russian code, which was handed down in the chronicles of Novgorod.

We now leave the earliest period of Russian history, with its romantic stories and embedded sagas, telling us The death of Yaroslaff was followed by the dreariest portion of the Russian annals—the period of the apanages (wdvel?), lasting from 1054 to 1238. The country was now broken up into petty principalities, and we shall understand its condition more clearly if we remember that the chief divisions of Russia from the 11th century to the 13th were as follows! :—

(1) The principality of Smolensk, formerly of great importance, as including in its territories the sources of three of the great Russian rivers—the Volga, the Dnieper, and the Diina.

(2) The principality of Russia, in the carly and restricted scnse, the original element of the country. The first form of the name is Rous. The word appears to have been a collective appellation of the people ; it was under the influcnce of the Byzantine writers that in the 17th century the form Rossia sprang up, which in time spread over the whole land. We must not forget, however, that to the majority of Englishmen, till the beginning of the 18th cen- tury, its name was Muscovy. Itssitnation on the Dniepcr was very advantageous; and the soil was fertile, the black-carth region being at the prescnt time the great wheat-growing district of Russia. Besides, the Byzantine territory was not far off. On the princi- pality of Kieff depended that of Pereiaslavl ; and Vishgorod, Biel-

gorod, and Tortchesk were made apanages for princes of the same dynasty.

1See Rambaud, Histoire de la Russie, p. 76.

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(3) On the affluents of the right bank of the Dnieper, especially the Sozha, the Desna, and the Seim, stretched the principalities of Tchernigoff with Starodub and Lubech, and Novgorod Severski with Putivl, Kursk, and Briansk.

(4) The double principality of Ryazan and Murom.

(5) The principality of Suzdal.

(6) The republics of Novgorod and Pskoff, and the daughter-city of the latter, Vyatka.

Tziaslaff, the son of Yaroslaff, seems to have had a troubled reign of twenty-four years, constantly disturbed by civil wars. On his death in 1078, although he had two sons, he left the principality of Kieff to his brother Vsevolod, apparently on a principle common among the Slavs to bequeath the crown to the oldest male of the family; but, on the death of Vsevolod, Sviatopolk, the son of Iziaslaff, succeeded in 1093. At his deatli Vladimir Monomakh came to the throne, and ruled from 1113 +0 1125. He was the son of Vsevolod, and was called after his maternal grandfather, the Byzantine emperor Constantine Monomachus. The reign of this prince was a very prosperous one. He left a curious treatise called ‘Instruction ” (Pouchenie), addressed to his sons, in which we get a picture of the simple life in Russia at that period (see below, p. 103). He also founded on the river Kliazma a town which bears his name. There were con- tinual quarrels among his descendants, but it is impossible to go into these minutely here. George Dolgoruki, one of the sons of Vladimir Monomakh, gained possession of Kieff in 1157, but the city soon began to pale before the growing power of Suzdal, and ceased to be the capital. He died the same year, just while a league was being formed to drive him out of it. The confederates entered the city, and their chief made himself prince. In 1169 Andrew Bogolioubski, son of George Dolgoruki, formed a coali- tion against Mstislaff, who was reigning in Kieff, and a large army was sent against the city. It was taken and pillaged; and the sacred pictures, sacerdotal ornaments, and even bells were carried off. It is on this occasion

that the head of St Clement, the Slavonic apostle, which is known to have been preserved at Kieff, was lost.

After the fall of this city Russia ceased for some time to have any political centre. During the fifty-four years previous to the arrival of the Mongols, our chief interest is drawn to Suzdal and Galicia, and the republics of Novgorod and Pskoff. George Dolgoruki had founded the principality of Suzdal; his great anxiety, however, was to make himself master of Kieff. The chief aim of his son Andrew Bogoliubski was to extend his authority in another direction, and to cause it to be recognized at Novgorod the Great, where he had established his nephew as a kind of lieutenant. He attacked the city in 1170, but was completely repulsed from its walls, a panic having seized his army. The Novgorodians put to death many of their prisoners, and sold others as slaves, so that, to quote the words of their chronicler, ‘six Suzdalians could be bought for a grivna,” an old piece of money. In 1173 Andrew was also defeated by Mstislaff the Brave at Smolensk, and in 1174 he was assassinated by his own nobles. The reign of Andrew was in all respects an im- portant one. From his refusing to divide his dominions among his brothers and nephews, it is plain that he saw the evil effect of the system of apanages and could conceive the idea of a united state. He was a man of iron will, and an astute diplomatist rather than a great soldier. He thus had something of the spirit of the Ivans, and anticipated their policy. He may be said with truth to have been the last of the conspicuous rulers of Russia before the Mongol invasions. As yet we have had but few worthy of the attention of the historian. They are Rurik, the founder of the empire, Oleg the warrior, and Olga the

first Christian sovereign. ‘To these succeed the warlike Pe 2

The Mongol supre- macy.

Sviatoslaff, slain by the Petchenegs; Vladimir, who caused the country to be Christianized; and Yaroslaff his son, the legislator. During the second period, in which we find Russia weakened and divided into apanages, we have only two noteworthy princes among a score of unimportant persons,—Vladimir Monomakh and Andrew.

The death of Andrew, whose murderers were not brought to justice, was followed by many petty wars. The only event, however, of any importance for a con- siderable time is the battle of Lipetsk (near Pereiaslavl Zaliesski) in 1215, in which George, son of Vsevolod, brother of Andrew, was defeated by the combined troops of Novgorod, Pskoff, and Smolensk. In 1220 we hear of Nijni-Novgorod being founded. A prince of consider- able importance was Roman of Volhynia, to whom the inhabitants of Galicia offered the government of their principality, but he was superseded by another Vladimir, and did not get the crown till after a great deal of hard fighting. He is said by Kadlubek, the Polish historian, to have acted with ferocious cruelty. In 1205 he was killed in a battle with the Poles. In 1224 we have the first invasion of Russia by the Mongols. Daniel of Galicia was one of the last of the Russian princes to make his submission to Batu (1238). He died in 1264. In the 14th century the principality of Galicia was lost in the Polish republic, having been annexed to Lithuania. It joined the fortunes of that state in its union with Poland at the time of the marriage of Jagictto with Jadwiga.

We now come to the third division of our subject— tussia under the yoke of the Mongols, viz., from 1238 to 1462. This is indeed a dreary period, in which the political and material development of the country was delayed by its complete enslavement. The first occasion on which the Russians came into contact with their Mongolian invaders was in 1224, when, in company with their allies, the Polovtzes, they suffered a complete defeat on the banks of the Kalka, near where it flows into the sea of Azoff, and adjoining the site of the present town of Mariupol. On this occasion, however, the Mongols only marched a little way up the river Dnieper, and retired after devastating the country. In 1238 they reappeared, and after destroying Bolgari, the capital of the Finnish Bulgarians on the Volga, advanced against Ryazan, which was plundered and burned, with adjoining cities. They then defeated the army of Suzdal, at. Kolomna, on the Oka; after which they burned Moscow, Suzdal, Yaroslavl, and other important towns. The grand- duke Yuri of Suzdal had encamped on the river Sit, almost on the frontiers of the territory of Novgorod. He was there defeated and was decapitated on the field of battle, while his nephew Vasilko had his throat cut for refusing to serve Batu. After taking Tver and advancing within fifty leagues of Novgorod, the Mongols turned south and occupied the two

following years (1239-1240) in ravaging southern Russia. They then burned Pereiaslavl and Tchernigoff, and Mangu, the grandson of Jenghiz Khan, directed his march against Kieff. The noise of the great host proceeding to the capture of the fated city is graphic- ally described by the chronicler. The city was taken and given up to pillage, not even the graves being respected. Volhynia and Galicia followed the fate of the other prin- cipalities, and all Russia was now under the yoke of the Mongols, except the territory of Novgorod.

The subsequent movements of these barbarians in Hungary and Moravia cannot be described here. It will suffice to say that soon afterwards Batu turned eastwards. He next founded on the Volga the city of Sarai (the Palace), which became the capital of the powerful Mon- golian empire, the Golden Horde. Here also congregated the remains of the Petchenegs, the Polovtzes, and other

tribes, and to these barbarians Russia was for a long time tributary. In 1272 the Mongolian hordes embraced Islam. Yaroslaff, who entered into his territory of Suzda] after the death of his brother Yuri, found his hereditary domains completely devastated. He had commenced re. building the ruined town, when he was summoned by Batu to do him homage in his new capital of Sarai. This, however, was not considered sufficient, and the poor prince was obliged to betake himself to the court of the great khan, which was at the further end of Asia, on the banks of the river Amur. His title was confirmed, but on his return he died of the fatigues of the journey. He was succeeded in Suzdal by his son Andrew (1246-1252), His other son Alexander reigned at Novgorod the Great, and gained the surname of Nevski from his celebrated victory over the Swedes in 1240. He and Dmitri Donskoi are the only great figures of this period of national abase- ment. Alexander Nevski has become consecrated in the memories of the people, and is now one of the leading Russian saints. In spite, however, of his services to the people of Novgorod, he afterwards quarrelled with them and retired to Pereiaslavl Zaliesski. But the citizens were soon glad to betake themselves to his help. On being invaded by the German Sword-bearing

Knights, who had established themselves in Livonia in the year 1201, and an army of Finns, Alexander was summoned, like another Camillus, and defeated the enemy on Lake Peipus in what was called the “Battle of the Ice” in 1242. He entered Novgorod in triumph with his prisoners. In spite of all this brilliant success, Alexander was unable to resist the power of the Golden Horde, and was obliged to go to Sarai to do homage to the khan. He was accompanied by his brother Andrew. The ceremony was always attended by many degrading acts of submission on the part of the tributary prince. In 1260 the Novgorodians, who had so long preserved the liberty of their republic uninjured, consented to submit to the khan and pay tribute ; Alexander died before reaching Vladimir on his return from one of these humiliating journeys. A great part of western Russia was now consolidated by the Lithuanian princes into a state, the capital of which was Vilna and the language White Russian. To this many of the western provinces of Russia gravitated, and by the marriage of the Polish heiress Jadwiga with Jagietto of Lithuania these provinces went to Poland and were not reannexed to Russia till a much later period. The eastern portion of Russia grouped itself round Moscow, which is first heard of in the chronicles in 1147. We find four con- siderable eastern states—Ryazan, Suzdal, Tver, and Moscow. For a century after its foundation we hear nothing of this city, the name of which is certainly Finnish. We are told that it was burned by the Mongols in 1237, and thata brother of Alexander Nevski was killed there in 1248, in a battle against the Lithuanians. We have seen that the political centre of the country has constantly changed. From Novgorod it went to Kieff, from Kieff to Vladimir, the capital of Suzdal, and from Vladimir to Moscow; we shall soon find that owing to the vigorous policy of its rulers this principality became the nucleus of the great Russian empire, and gathered round it the adjacent states Its true founder was Daniel, a son of Alexander Nevski, who added to it the cities of Pereiaslav! Zaliesski and Kolomna. At his death in 1303 he was the first. to be buried in the church of St Michael the Archangel, where all the Russian sovereigns were laid till the days of Peter the Great. Since that time, with the exception of Peter IL, they have been interred in the church of the Petro- pavlovski fortress at St Petersburg. Daniel was followed on the throne by his sons Yuri and Ivan in succession. Yuri Danilovich (1303-1326) took possession of Mozhaisk. The

yeign of Ivan Kalita, or the Purse (1328-1340), still | further strengthened the new principality. Tver was ‘ added, and the pre-eminence of Moscow was assured by the metropolitan coming to reside there. After Kalita came in succession his two sons, Simeon the Proud (1340- 1353) and Ivan IL. (1353-1359). Simeon first took the title of grand-duke of all the Russias. He died of the Black Death, which was then devastating Europe. In spite of the efforts of these princes to maintain the supremacy of Moscow, on their death the hegemony of the Russian states went again for a time to Suzdal. It was Dmitri, surnamed Donskoi, the son of Ivan II., who won the battle of Kulikovo (lit. “the field of woodcocks ”) over Mamai, the Mongolian chief, in 1380. In spite of this, however, Toktamish their general invaded Russia, burned Moscow to the ground, and put to death a great number of the inhabitants. To Dmitri succeeded his son Vasilii or Basil (1889-1425), who was prince both of Moscow and Viadimir. He in turn was followed by Vasilii the Blind (1425-1462).

We begin to touch firmer ground when we approach the reign of Ivan III, the son of Vasilii, who may be con- sidered the founder of the autocracy. We may take, there- fore, as our fourth division the period from 1462 to 1613, which will include the consolidation of the empire under the vigorous rule of Ivan IIL, Basil V., and Ivan IV., the usurpation of Boris Godunoff, the reign of the false Demetrius, and the troubles following upon it till the accession of the house of Romanoff in the person of Michael in the year 1613. Ivan IIL reigned forty-three years, and had as much influence in the consolidation of Russia as Louis XJ. had in that of France. It was the great age when throughout Europe absolute monarchies were being created on the ruins of feudalism. On his accession Tvan found himself surrounded by powerful neighbours—to the east the great principality of Lithuania, to the south the Mongols; Ryazan and Tver had not been annexed to the territory of Muscovy ; Novgorod and Pskoff were still republics. It was against Novgorod, a wealthy city and a member of the Hanseatic league, that his efforts were first directed. In consequence of its situation, and by its paying the tribute demanded, it had escaped from the ravages which other parts of Russia had under- gone. Taking advantage of the factions which harassed this city, he succeeded in creating a party subservient to his own interests, and as early as 1470 had got the con- trol of the government of the city, which a rival faction was anxious to transfer to the Poles. In 1478 the

republic of Novgorod ceased to exist ; the chief opponents of Ivan were transported to Moscow, and their goods confiscated. The veche, as the public assembly was called, was terminated for ever, and the bell which had summoned the mutinous citizens carried off triumphantly to Moscow. In 1495 the tyrant was so foolish as to confiscate the goods of many of the German merchants who traded at Novgorod. In consequence of this nearly all the foreigners left the city, and its prosperity rapidly declined. It is now a decayed provincial town, interesting only to the antiquary. In 1489 Vyatka, a daughter city of Pskoff, was annexed and lost thereby its republican constitution. In 1464 by giving the hand of his sister to the prince of Ryazan Ivan made sure of the proximate annexation of that apanage. He seized Tver and joined it to his dominions, when the grand-prince Michael had allied him- self with Lithuania. The system of apanages in Russia had now to come to an end. But Ivan, who had married the niece of the Byzantine emperor, and assumed as his cognizance the two-headed eagle, was also to come into col- lision with the hereditary enemies of Russia, the Mongols.

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The great power of the Golden Horde had been broken up;_

on its ruins had arisen the empires of Kazan and of Sarai or Astrakhan, the horde of the Nogais, and the khanate of the Crimea. In 1478, when Ahmed, the khan of the Great Horde, whose capital was Sarai, sent his ambassadors with his portrait, to which the Russian was to do homage, Ivan trampled it under foot, and put to death all the envoys, except one, who was deputed to take back the news to the khan. The reply of Ahmed to this outrage was a declara- tion of war; and the two armies met on the banks of the Oka. Ivan, who, like Louis XL, was much more of a dip- lomatist than a soldier, according to the accounts of the chroniclers, was in great terror, and could not be induced to fight by the persuasions of his soldiers or the benedictions of his ecclesiastics. He had already, after the armies had been for some time encamped opposite to each other, given the signal of retreat, when, in consequence of a sudden panic the Mongols also retreated, and the armies fled from each other in mutual fear. This invasion, which occurred in the year 1480, was the last great inroad of the Asiatic enemies of Russia, but

we shall find some even later than the days of Ivan the Terrible, in whose time Moscow was burned by these barbarians. Meanwhile Ivan went on in his career of annexation. In 1472 he conquered Permia, in 1489 Vyatka. ‘Ten years afterwards he had extended his authority as far north as the Petchora. His good fortune seemed ever on the increase; by a war with Alexander, king of Poland, he gained an accession of territory to the west as far as the river Desna. Upon peace being concluded, Alexander married Helen, the daughter of Ivan, but that monarch, on pretence that no regard had been paid to his daughter’s religious scruples, declared war against his new son-in-law. The Polish monarch could not rely upon the fidelity of many of his vassals, as we find so often the case in Polish history, and suffered a complete defeat at the battle of the Vedrosha. On the other hand, in 1501 the Russians were routed at the battle of the Siritza, near Isborsk, by the grand-master of the Teutonic order, Hermann von Plettenberg. The order had been established in Lithuania as early as 1225; the Sword-bearers amalgamated with them in 1237.

In 1472 Ivan had married a Byzantine princess, Sophia, daughter of Thomas, brother of the emperor Constantine Paleologus. This Thomas had fied to Rome after the fall of Constantinople in 1453. In consequence of this mar- riage, a great many Greeks came to Moscow, bringing Byzantine culture, such as it was, to Russia, and among other things a quantity of valuable manuscripts, which formed the nucleus of the synodal library. Italians also made their appearance in Russia, among others the cele- brated Aristotle Fioraventi of Bologna, the architect of so many buildings at Moscow. Ivan not only welcomed foreigners in his dominions, but entered into relations with many European powers, among others the Germans, the Venetians, and the Pope. His reign is remarkable, not only for the consolidation of the Russian autocracy, but also for legislation. In 1497 he issued his Sudebnik, or Book of Laws, the second Russian code after the Russkaia Pravda of Yaroslaff. Comparison of the two codes will show how much had been done by the Mongols to lower the Russian character. It is in the reign of Ivan that we first hear of the use of the knout: an archimandrite and some noblemen were publicly knouted for being concerned in forging a will. throne to his second son Vasilii or Basil, passing over his grandson, the child of his eldest son Ivan, who had pre- deceased him; he was evidently unwilling to commit his growing empire to the perils of a minority. Vasilii

Ivan- ovich (1505-1533) fully carried out the programme of his father. He destroyed the independence of Pskoff in 1510, put an end to the veche or popular assembly, and carried

At his death Ivan bequeathed his Basil.

Ivan IV. (the Terrible),

off the bell which summoned the citizens. Thus fell the last of the Slavonic republics. Ryazan was next added to the Muscovite territory. The prince, being accused of having contracted an alliance with the khan of the Crimea, fled to Lithuania, where he died in obscurity. Nov- gorod Severski was annexed soon after, and by a war with Sigismund J. Basil got back Smolensk. He was doomed, however, to suffer from an invasion of the Mongols of the Crimea, and is said to have signed a humiliating treaty to save his capital, whereby he acknowledged himself the tributary of the khan. ;

Meanwhile at home Basil exercised absolute authority ; Russia now exhibited the spectacle of an Asiatic despotism. He entered into negotiations with many foreign princes. Herberstein, the German ambassador, who has left us such an interesting account of the Russia of this time, has told us of the great splendour of his court. We now come to the reign of the terrible Ivan, who has left his name written in blood upon the annals of Russia, and ruled for the long period of fifty-one years (1533-1584). It was a fortunate thing for the aggrandizement of the empire that, instead of having a succession of weak sovereigns, who only ruled a short time, it had three such vigorous potentates as Ivan ITI., Basil, and Ivan IV., whose united reigns extended over a hundred and twenty-two years, The grand-duke Basil at his death left two sons, Ivan and Yuri, under the guardianship of his second wife Helen Glinska. She had come into Russia from Lithuania, her family having been proscribed by the Polish king Alexander on the accusation of having plotted against his life. The grand-duchess ruled with great ability, but died in 1538, having been, as is supposed, poisoned. The two young princes then became the victims of the intrigues of the chief families, especially those of Shuiski and Belski. Ivan

early gave proof of a vigorous understanding, whereas his younger brother Yuri appears to have been half-witted. In 1543, when only in his thirteenth year, Ivan determined to emancipate himself from the galling yoke of the boiars, and by a kind of coup détat threw off their tutelage, and caused Shuiski to be torn to pieces by dogs. After this, for some time, he was under the influence of his maternal relations. In January 1547 Ivan was crowned by the metropolitan Macarius, and took the title of czar, or tsar, a Slavonic form of the Latin Cesar. He soon afterwards celebrated his marriage with Anastasia Romanova. The same year a great conflagration took place at Moscow. The mob affected to believe that this had been caused by the Glinskis, who were very unpopular, and massacred a member of that family.

After this time Ivan seems to have committed himself very much to the guidance of the priest Silvester and Alexis Adasheff. This was the happiest portion of his reign, for he was also greatly under the influence of his amiable wife. To this period also belongs a recension of the Sudebnik of his grandfather Ivan IIT. (1550), and the Stoglaf, or Book of the Hundred Chapters, by Which the affairs of the church were regulated (1551). In the following year Ivan became master of Kazan, and two years later of Astrakhan. The power of the Mongols was now almost broken. ‘Triumphant in the south and the east, he then turned his attention to the north, being anxious to open up a means of communication with the west. He anticipated the plans which Peter the Great was destined to carry out long afterwards. He was thus brought into collision with the Swedes and the Teutonic Knights. When Ivan sent a German named Schlitt to procure the assistance of some foreign artisans, they were stopped by the Germans and prevented from entering Russian territory. In consequence of this, war afterwards broke out between Ivan and the Order. In 1558 the

Russian army invaded Livonia, and took several towns, whereupon the Order made an alliance with Sigismund Augustus of Poland. But, while Russia was busy with this war, a great change was taking place in the home policy of Ivan. He threw off the influence of Silvester and Adasheff, who were both banished. From this time may be said to date the commencement

of the atrocities of this czar which have earned him the epithet constantly added to his name. He was especially moved by the treason of Prince Andrew Kurbski, who, having lost a battle with the Poles, was too much afraid of the wrath of his imperial master to venture again into his clutches He accordingly fled to the king of Poland, by whom he was well received, and from his safe retreat he commenced an angry correspondence with the czar, reproaching him with his cruelties (see below, p. 104). The answer of Ivan has been preserved. In it he dwells upon the degrad- ing subjection in which he had been kept by his early advisers, and attempts to justify his cruelties by saying that they were only his slaves whom he had killed, over whom God had given him power of life and death.

In December 1564 Ivan retired with a few personal friends to his retreat at Alexandrovskoe, near Moscow, where he passed his time pretty much as Louis XI. did at Plessy-les-Tours, for he resembled the French monarch both in his cruelty and his superstition. The boiars, afraid that the monarch was about to quit them for ever, went in crowds to Alexandrovskoe to supplicate him to return to Moscow. This he finally consented to do, and on his return established his bodyguard of oprichniks, who were the chief agents of his cruelty. In the year in which he retired to Alexandrovskoe we have the establish- ment of a printing-press at Moscow. Ivan now commenced a long series of cruelties. To this period belong the deposi- tion and perhaps murder of Philip, the archbishop of Mos- cow ; the execution of Alexandra, the widow of his brother Yuri; the atrocities committed at Novgorod, which seems to have fallen under the tyrant’s vengeance for having meditated opening its gates to the king of Poland; and, lastly, the terrible butcheries on the Red Square (Krasnaia Plostchad).

It was in the reign of Ivan that the English first had dealings with Russia. In 1553, while Edward VI. was on the throne, three ships were sent out under Willoughby and Chancellor to look for a north-east passage to China and India. Willoughby and the crews of two of the ships were frozen to death, but Chancellor arrived safely in the White Sea, and thence proceeded to the court of Ivan, by whom he was favourably received. The English secured great trading privileges from Ivan, and established fac- tories in the country. In one of his mad sallies, Ivan actually wrote to Queen Elizabeth (1570)

asking for a safe retreat in her dominions if he should be driven out by his own subjects.

Ivan was continually waging war in the Baltic territory with the Teutonic Knights, in which, although on the whole unsuccessful, he committed great cruelties. But in 1571 he was obliged to suffer another invasion of the Mongols of the Crimea, who, to quote the quaint language of an English resident, burned “the Mosco every stick” (Hakluyt’s Voyages, i. 402). On the death of Sigismund Augustus of Poland in 1572, when the crown of that country had become elective, the family of the Jagiettos being now extinct, Ivan declared himself one of the com- petitors. The successful candidate was the French prince Henry of Valois, but he soon fled from his new kingdom, and, on the throne again becoming vacant, the redoubtable Stephen Batory was chosen, who proved a formidable foe to the tyrant now growing old. In consequence of the successes of Stephen, Ivan was obliged to abandon all his

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~ conquests in Livonia ; and the attempt to open up a

passage for Russia into the Baltic failed till carried out by the efforts of Peter the Great.

One of the chief events of this reign was the conquest of Siberia by a Cossack named Yermak, who had formerly been a robber, but was pardoned by the czar on laying his conquests at the imperial feet. Among many points in which Tvan resembled Henry VIII. was the number of his wives. On the death of the seventh, he was anxious to procure an eighth from the court of his friend Elizabeth of Eng- land, and the daughter of the Earl of Huntingdon was offered to the inspection of the Russian ambassador, Feodor Pisemski, at her own desire and the queen’s. She was presented to him in the gardens of York House. The ambassador prostrated himself before her, and pro- fessed to be dazzled by her beauty. Before, however, the negotiations for the marriage were concluded, the young lady, of whom a very favourable account had been trans- initted to the court of Moscow,

became alarmed. Rumours had reached her about the former wives of the czar and his habits. She therefore declined the brilliant prospect of an alliance associated with so many dangers. Full details of the adventures of the Englishmen who resided at Tvan's court will be found in Hakluyt's Voyages. In 1567 Anthony Jenkinson was commissioned by the czar to convey a special message to Queen Elizabeth, "that the Queen's Majestie and he might be to all their enemyes joyned as one, and that England and Russland might be 'nall manners asone." In fact Ivan wanted the assistance of the English in his wars against the Swedes and the Poles; he could appreciate the superiority of their weapons and military tactics ; but Elizabeth only cared to secure a monopoly of trade, which the English for a long time enjoyed, and, according to the historian Ustrialoff, the Russians were but little benefited by it.

The declining days of Ivan were embittered by the death of his eldest son, whom he had stricken in a fit of passion with his iron staff. When the paroxysm of his anger was over, his grief was boundless. Full of remorse and continually afraid of conspiracies which might be concocted by his subjects, and harassed by superstitious dread, in which he betook himself to the divination of witches,! he expired in the year 1584. .

Ivan was succeeded by his eldest surviving son Feodor (Theodore), at that time twenty-seven years ofage. He was feeble both in mind and body, and very superstitious. Fletcher calls him "very simple, and almost a natural," and Solomon Henning, author of a Chronicle of Lwwonia, says that he was so weak-minded that he could find no greater amusement than tolling the church bells before service. In consequence, the chief power in the empire fell into the hands of Boris Godunoff,? the brother-in-law of Feodor, a man of boundless ambition and great capacity. His inordinate lust of rule he concealed under the guise of piety; his commanding presence extorted respect wherever he went. Between him and the throne were only the sickly Feodor and his brother Dmitri, still a child, who had been previously removed to the town of Uglich in the government of Yaroslavl. For a while Boris had nourished the idea of proclaiming Dmitri illegitimate, on the ground that he was the son of Ivan's seventh wife, a marriage forbidden by the canons of the church. Finally, as there seems every reason to believe, he caused the child to be assassinated at Uglich on the 15th of May 1591. The

circumstances of the death of the young prince are involved in mystery ; so much, however,

1 Horsey’s Diary, edited for the Hakluyt Society, 1856, p. 199. F a was of Mongol descent,—his ancestor being a certain Murza chet.

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ness Vasilissa Volokhova, his nurse, and a servant-maid were in attendance. Whether from accident or design they all for a time lost sight of him. According to their testimony while under examination, the young prince had a knife in his hand when last seen; he amused himself with sticking it into the ground and cutting pieces of wood. Suddenly the nurse, on looking round, saw him prostrate and covered with blood. He died almost immediately from a large wound in his throat. The account of how the news was brought to Moscow is described in a highly dramatic manner by Horsey. We have no direct evi- dence of the complicity of Godunoff in this murder ; but there seems little doubt of it. A secret inquiry was con- ducted ; the body, however, was not examined, and the commissioners reported that Dmitri had died of a wound accidentally inflicted by himself in a fit of epilepsy. On account of the riot which had taken place at Uglich, Boris proceeded to punish the town. More than two hundred of the inhabitants were put to death and many sent to Siberia. The church bell of Uglich was banished with them and placed in the capital of Siberia ; it was not brought back till the earlier part of the present century. The remains of Dmitri, who was afterwards canonized, were deposited in the cathedral of St Michael, the burial- place of the czars. Soon afterwards a great fire broke out in Moscow, and Boris caused many streets to be rebuilt at his own expense, distributed aid, and exempted the sufferers from taxes; but still the people murmured secretly ; they felt that the stain of blood was upon him, and ungratefully accused him of having caused the city to be set on fire. In the same year (1591) the khan of the Crimea made one of his periodical raids against Moscow. He set out from Perekop, and marched in a straight line, everywhere plun- dering and devastating. In these circumstances, Feodor displayed nothing but imbecility. He merely remarked that the saints who protected Russia would fight for her, and again betook himself to his

favourite amusement of bell-ringing. Boris, however, showed vigour. In a few days he caused Moscow to be surrounded with palisades, redoubts, and artillery. ‘The Mongols were repulsed with great slaughter; but, although Boris saved his country, he could not secure the goodwill of the people. Indeed, they accused him of having invited the Mongols that the general danger might make them forget the death of Dmitri. The czarina, Irene, wife of Feodor and sister of Boris, about this time gave birth to a female child, which lived but a few days, and Boris was of course accused of having poisoned it. In reality the princess suffered from continual ill-health, and on one occasion we find Elizabeth of England sending her a physician. Boris, however, still persevered in his energetic measures for strengthening the empire. Smolensk was fortified, Archangel built; and a strong cordon was drawn round the territories occupied by the Mongols. The Swedes were driven into Narva, and dip- lomatic relations were opened with the European powers.

About this time the imbecile Feodor died, and with him became extinct the dynasty of Scandinavian Rurik.

This event occurred in 1598, and Boris was elected to Boris.

succeed him. Godunoff, however, who felt sure of the crown, at first affected to be unwilling to receive it. He retired to a monastery and was followed by the people, supplicating him to be their emperor. He kept Russia in this state of suspense for six weeks, and then relented. As soon as he ascended the throne, the traces of his vigorous hand could be found everywhere. One of his first plans was the abridgment of the power of the nobility, which had been begun by Ivan III. and continued by Tvan IV. By this a benefit was conferred upon Russia; but Boris also served his own ambition. He was particularly severe to

3 Diary, ed. Bond, p. 254.

The “ false ” Dmitri.

all members of the Romanoff family, because they were allied to the house of Rurik, and troubled his dreams of sovereignty. The head of this house was compelled to become a monk; his son, however, was destined to ascend the throne. A famine broke out in 1601, which Boris was unsparing in his efforts to allay. In the midst of all this suffering a rumour spread that Dmitri, the youngest son of Ivan the Terrible, was not dead.

One day in the year 1603 Prince Adam Wisniowiecki, of Bragin in Lithuania, happening to be very angry with a servant, struck him and used an insulting epithet. The young man, with tears in his eyes, said, “If you knew who I am, you would not treat me so nor call me by that name.” “Who then are you, and whence do you come?” replied the astonished prince. ‘I am the prince Dmitri, son of Ivan Vasilievich.” He then recounted a well-concocted tale of his miraculous escape from the assassin whom Boris had employed. This was his physi- cian, who feigned compliance with the usurper’s designs, but only to frustrate them. On the night appointed for the murder, the man, whose name was Simon, put the son of a serf into his young master’s bed (who was accordingly killed), and immediately fled with Dmitri from Uglich. He was then committed to the care of a loyal gentleman, who thought it better for the sake of protection that he should entera monastery. This gentleman and the physician were dead, but in confirmation of his story the false Dmitri exhibited a seal, bearing the arms and name of the prince, and a golden cross set with jewels which he said was the baptismal gift of his godfather, Prince Ivan Mstislavski. Wisniowiecki believed his tale. There were also other supposed signs. The Polish nobles thronged around the young man, whose manners, as we read in the case of Perkin Warbeck, seemed to bear out his pretensions. Meanwhile Dmitri remained in Poland, enjoying all the lavish attentions of the Polish nobility. Boris was soon made acquainted with his appearance on the scene, and offered the brothers Wisniowiecki money and lands if they would surrender the impostor to him. Without, however, replying to these overtures, they removed him into the interior of Poland, and he was received with royal honours by George Mniszek, the palatine of Sandomir. Here he is said to have entered into a secret understanding with the Jesuits to bring over Russia to the Latin faith, on condition of being supported by the papal nuncio.? The pretender privately abjured the Greek faith, and signed a contract of marriage with Marina, the youngest daughter

of Mniszek, by which he settled upon her the towns of Novgorod and Pskoff, and engaged to pay her father a million of florins as soon as he had ascended the throne. Afterwards he executed another treaty ceding Smolensk and the surrounding territory to Mniszek and

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1 The present writer doubts the genuineness of this claimant ; inany authors, however, some of them contemporaries, were con- vinced that he was the real son of Ivan, and aniong these the first place must be assigned to the French mercenary captain Margeret, whose intimate relations with the man point him out as a valuable authority. This clever adventurer had entered the Russian service in the time of Boris Godunoff, and was a witness of the whole struggle. At first he led the troops of the latter against Dmitri, but when the pretender had established his authority he accepted a post in his service. He has given us an interesting portrait of Dmitri, of whom he speaks very favourably, in his work on Russia published at Paris in 1669.

2 According to some authors, the whole plot had been concocted by the Jesuits for this purpose. For the contrary view, however, see Rome et Demétrius daprés des documents nouveaux avec pieces Justificatives et facsimile, by Pére Pierling, 8. J., Paris, 1878. Gerard Miller tells us that the pretender “conversed in Latin and Polish with fluency ;” if this had been the case his knowledge of the former would be easily explained by his Jesuitical training. Margeret, however, denies it altogether. “TI est trés certain qu’il ne parloit nullement Latin, j’en puis temoigner, moins le scavoit-il lire et écrire ” (p. 163).

really the man who personated Dmitri,

army of fifty thousand men.

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the king of Poland. These proceedings recommend him to his Russian subjects. they were concealed, and Dmitri publicly professed the Greek ritual. Soon after this Sigismund of Poland saluted him as czar of Moscow, and assigned him a pension of 40,000 florins. All this time Boris affected to

regard the pretender with contempt, and issued-a manifesto setting forth that his real name was Grishka (or Gregory) Otrepieff, a renegade monk. Whether this individual wag the son of Ivan, cannot be known for certain; but it seems very probable, Karamzin has adopted this view. Boris soon issued a proclamation against him, calling him an apostate monk, who wished to introduce the Latin heresy into Russia, and to build Romish churches in the Orthodox land. Dmitri entered that country on the 31st of October 1604, and marched on Moravsk in Tchernigoff. He met with uninter. rupted success, large numbers joining his expedition, and the authorities of the chief towns on his route offering him bread and salt till he came to N. ovgorod Severski on the 23d of November. This well-fortified place was defended by Basmanoff, a veteran captain, with five hundred streltzi. On the arrival of the pretender he was summoned to capitulate, but, standing on the ramparts with a lighted

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were not likely to For the present

| Match, he replied: ‘The grand-prince and czar is at Mos.

cow ; as for your Dmitri he is a robber, who shall be im- paled, along with his accomplices.” After three months the invaders abandoned the siege, but they had the good fortune soon afterwards to seizea large sum of money which Boris was sending to some of the towns. Shortly after this the important fortresses of Putivl, Sievsk, and Voronezh surrendered to Dmitri. Boris was too ill to go in person against the impostor ; he, however, raised an A great battle took place near Novgorod, and the supporters of the czar would have suffered a most ignominious defeat had it not been for Basmanoff. This captain was recalled to Moscow and loaded with honours by Boris, who, from motives not very evident, unless he had begun to have suspicions of his

| fidelity, detained him in the city, and committed the care

of the new army which he had formed to Shuiski, who was probably only half-hearted in his cause. A great battle took place on the 2d of January 1605, on the plain of Dobrinichi, not far from Orel; here Dmitri was

defeated, chiefly through the bravery of the foreign legion. He would have been captured had it not been for the fidelity of his Cossack infantry—for at this time the Cossacks were subject to Poland—who were killed to a man, and probably not a fugitive would have reached Sievsk had not Shuiski acted with duplicity. Meanwhile, the pretender rode as fast as his horse would carry him to Putivl, a strong town on the frontier, from which he could easily beat a retreat into Poland. The followers of Boris remained at Dobrinichi, putting to death their prisoners. The conduct of Shuiski showed with what apathy he viewed the cause of his master ; he soon drew off his troops into winter quarters, alleging that nothing more could be done that season, and also wasted time before Kromi, an insignificant place. Meanwhile Dmitri corrupted some of the chief generals of Boris. An attempt to poison him soon afterwards failed, and the pretender sent a message to Boris, recommending him to descend from the throne which he had usurped. But the days of the latter were numbered. On the 13th of April 1605 he presided as usual at the council-board, and received some distinguished foreigners. A grand banquet was given, but suddenly after dinner he was seized with illness ; blood burst from his nose, ears, and mouth, and in the brief period before his death, according to the Russian custom, the dress of a monk was thrust upon him, and he was

consecrated under the name of Bogolep (“acceptable to God”). He expired in the fifty-third year of his age, after a reign of six years. Whether he committed suicide or was poisoned cannot now be ascertained ; his death could hardly have been natural. Boris was a man of great energy of character, with views singularly in advance of his age. In some respects he anticipated the plans of Peter the Great ; thus he caused several young Russians to be sent abroad to be educated, some of whom came to England. By a ukaze, however, binding the peasant to the soil, he began the system which reduced him by degrees to a con- dition of abject serfdom.

Boris had left a sufficient number of partisans at Moscow to proclaim his son Feodor, a youth of sixteen, and all classes took the oath of allegiance to him. Shuiski and Mstislavski returned to Moscow to assist the young czar in the government. Basmanoff was sent to take the command of the army, but,

probably feeling the cause of Feodor to be desperate, on the 7th of May he proclaimed Dmitri. He was now ordered to march on the capital. Feodor, however, and his adherents still held the Kremlin with a large garrison. Accordingly it was resolved to make an attempt on Krasnoe Selo, a large town near Moscow, where many wealthy merchants resided. This was easily taken, whereupon many of its citizens marched to Moscow, and convoking the people called upon them to acknowledge Dmitri as their sovereign. Feodor and his ¥- mother were murdered, and buried in a cemetery out- side the city walls, whither also the remains of Boris were carried, for they were not allowed sepulture among the tombs of the czars. Pctreius, the Swedish envoy, who has left us an interesting account of these times, tells us that the rumour was circulated that these unhappy people had poisoned themselves, but he himself saw their bodies, and the marks on their necks of the cords with which they had been strangled. According to some authorities, Xenia, the daughter of Boris, described as beautiful by the old Russian chronicler Kubasoff, was forced to retire into a convent, but Petreius declares that she was compelled to become the mistress of the conqueror. The usurper now hearing that every obstacle was removed, marched upon the capital, which he entered on June 20, 1605. We have not space to detail the splendours of his retinue, nor the ceremonics and feastings which attended his arrival. He acted at first with prudence and concilia- tion towards his new subjects, and even promised to pay the debts of his father Ivan. He received his mother with transports of joy; she professed to identify him, although she afterwards denied that he was her son. She was probably, however, glad enough to get out of the convent into which she had been thrust by Boris. But Dmitri soon gave offence on account of his neglect of Russian etiquette and superstitious observances. It was plain that he held the Greek Orthodox religion very cheap, and his subjects could see that he had a propensity for the Latin heresy. In the following year Marina Mniszek, his bride, made her appearance in Moscow, and the marriage took place on the 18th of May. It was followed by continued banquets. But a rebellion broke out on the 29th, at the head of which was Vasilii Shuiski, whom Dmitri had spared when about to be executed. The czar, hearing a noise in the night, and finding himself surrounded by enemies, opened a window 30 feet from the ground, leapt down, and broke his leg. He was soon afterwards found and killed. Basmanoff was slain while attempting to defend his master. The corpse of

the impostor was afterwards burned. Marina was not killed, although there was a great massacre of the Poles In cvery quarter of Moscow; she and the ladies of her suite were kept as prisoners. Thus ended this remarkable

episode of Russian history. The whole period has been aptly termed by the national historians “the Period of Troubles” (Smutnoye Vremya).

The boiars, on being convoked after the murder Basil of Dmitri, elected Vasilii Ivanovich Shuiski for their Shuiski. sovereign, but he found himself in every way disadvan- tageously situated, without an army and without money. He was, moreover, troubled by an announcement which gained credence among the people that Dmitri was not really dead. To put an end to these rumours, Shuiski, entirely changing his policy, and contradicting his pre- vious assertions, sent to Uglich for the body of the un- fortunate pririce, and caused him to be canonized. Two subsequent impostors, who gave themselves out to be Dmitri, were taken and executed. To complete the mis- fortunes of Russia, the country was invaded by the Poles in 1609, who laid siege to Smolensk. Shuiski was defeated at Klushino (a village situated to the north-east of Moscow), was taken prisoner, and was set free, to become a monk,—a favourite way of treating troublesome persons in Russia. He was afterwards delivered over to Sigismund, who kept him in prison during the rest of his life. The crown was finally offered to Ladislaus, the Ladis- son of Sigismund, who in reality for two years was laus. sovereign of Russia, and caused money to be coined in his name at Moscow. Everything seemed to portend the ruin of the country, when it was saved by the bravery of Minin, the butcher of Nijni-Novgorod, who roused the citizens to arms by his patriotic appeal, and was joined by Prince Pozharski. The latter took the command of the army; the administrative department was handed over to the former. The brave prince succeeded in driving the Poles from Russia. In 1612 the boiars resolved to elect a new czar, but they did not actually meet till 1613, and many debates ensued. The sufferings of the country had been great; a considerable part of the city of Moscow. (with the exception of the Kremlin and the churches built of stone) was laid in ashes. The treasury was plundered, and its contents sent

to Poland. Among other things Olearius, the traveller of the 17th century, quaintly adds, “the Russians lost the horn.of a unicorn of great value, set with precious stones,” which was also carried off to Poland; and he tells us that even up to his time the Muscovites bitterly regretted that they had been robbed * of it. Princes Mstislavski and Pozharski refused the crown, and finally the name of Michael Romanoff, a youth Michael of sixteen, was put forward as a candidate, chiefly on Romanoff. account of the virtues of his father Philarete. The Romanoffs were connected on the female side with the house of Rurik, Anastasia Romanova having been the first wife of Ivan the Terrible. Before being allowed to ascend the throne, the youthful sovereign, according to some authors, took a constitutional oath. The condi- tion of the country all this time was most critical ; large portions of its territory were in the hands of the Swedes and Poles, and the villages were plun- dered by wandering bands of Cossacks. Ladislaus the son of Sigismund had not yet renounced the title of ezar ; in 1617 he appeared with an invading army under the walls of Moscow, but was repulsed, and on December 1, 1618, consented to abandon his claims, and conclude an armistice for fourteen years. In 1617 a treaty had been made at Stolbovo, a town near Lake Ladoga, by which the Russians had been compelled to give up a large portion of their territory to the Swedes. Philarete, the father of Michael, who had been for some time imprisoned at Warsaw, was now allowed to return; he entered Moscow in 1619, and was elected patriarch, an office which had been vacant since the death of Hermogenes. Michacl associated his father with himself in his power ; all ukazes

were published in their joint names; the patriarch held a separate court, and always sat at the right hand of the sove- reign. The patriarchate was suppressed in 1721 by Peter the Great, who had formed the idea of making himself head of the church from what he saw in England and other Protestant countries. The reign of Michael was not very eventful ; he employed it wisely in ameliorating the condi- tion of the country, which had recently suffered so much, and in improving the condition of his army. Foreigners began to visit the country in great numbers, and Russia was

gradually opening itself to Western civilization. Gustavus Adolphus of Sweden induced the czar to sign a treaty offensive and defensive, and a Swedish ambassador appeared at the Russian court. The sufferings which had been inflicted upon them by the Poles made the Russians eager to join an alliance which was directed against the Roman Catholic religion. In 1629 a French ambassador appeared at Moscow. Dutch and German artisans were taken into the Russian service to assist in the iron-

foundries, with special view to the manufacture of cannon.

The country swarmed with English merchants who had obtained valuable privileges. Scottish adventurers were to be met with in the Russian army in great numbers. We find them as early as the reign of Ivan the Terrible, to judge from Horsey's Diary. The false Demetrius, like Louis XI., had a Scottish guard. In Russian documents we find the names of Carmichaels, Hamiltons (frequently in the corrupted Russified form of Khomutoff), Bruces, Gordons, and Dalziels. From Scottish settlers in Russia sprang the celebrated poet Lermontoff, the first two syllables of whose name fully show his Caledonian origin. The following are the leading events of the reign of Alexis, who succeeded to the throne on the death of his father Michael in 1645. (1) First comes his codification

of the Russian laws (called Ulozhenie), which was based on | .the preceding codes of Ivans III. and IV. By the order of

the czar, a commission of ecclesiastical and lay members was appointed to examine the existing laws, and make any necessary additions, or to adapt to present needs any which had become obsolete. The work was chiefly carried on by Princes Odoievski and Volkonski, with the assistance of two secretaries. They were engaged over it two months and a half, and the original code is still preserved in the Oruzhennaia Palata at Moscow. Ustrialoff boasts that, by recognizing the equality of all men in the eyes of the law, it anticipated a principle which was not generally acknowledged in western Europe till the 18th century. This doctrine, however, may be considered as only a natural consequence of autocracy. We are told that Alexis allowed access to all petitioners, and at his favourite village of Kolomenskoe, opposite his bed-room window, was placed a tin box ; assoon as the czar rose and appeared at the window the suppliants came

forward with their complaints, and, making an obeisance, placed them in the box, which was afterwards taken to him. (2) The second great event of his reign was the incorporation of the Ukraine and country of the Cossacks with Russia. For a description of the causes of this war, see PoLAND. (3) By the treaty of Andruszowo the Russians gained Smolensk, Tchernigoff, and finally Kieff, the Dnieper being the new boundary, and thus the towns which had been taken by the Lithuanians and annexed to Poland by the treaty of Lublin (1569) became Russian again. The only other events of the reign of Alexis of any importance are the great riot at Moscow, on account of the depreciation of the coinage in 1648, and the rebellion of Stenka Razin, a Cossack. The riot is fully described in the interesting letter of an eyewitness which is pre- served in the Ashmolean Collection at Oxford. Razin devastated the country round the Volga, and continued his

depredations for three years. Alexis, however, captured him, and pardoned him on condition of his taking the oath of allegiance. He soon, however, broke out into rebellion again, and proclaimed himself the enemy of the nobles, and the restorer of the liberty of the people. By various arti- fices he succeeded in alluring two hundred thousand men to his standard. Astrakhan was surrendered to hin, and he ruled from Nijni-Novgorod to Kazan. He was, however, like Pugatcheff in the reign of Catherine II, a vulgar robber aud nothing more. His atrocities disgusted the more respectable of his adherents; his forces were gradually dispersed, and in 1671 he was taken to Moscow and executed. The czar Alexis died in 1676 in his forty- eighth year. One of the most eminent men of his reign was Ordin-Nastchokin, who negotiated the peace of Andruszowo. Alexis was a man of broad views, and made many efforts to raise Russia to the level of a European power, by sending competent men as ambassadors to foreign parts, and developing the trade of the country. In these respects he resembled Boris Godunoff. Altogether his reign was one of distinct progress for Russia.

He was succeeded by his eldest son Feodor, by his first wife Maria Miloslavskaia. prince of weak health, and his reign was uneventful. A notable occurrence was the destruction of the rozriadnie knigi, or books of

pedigrees. According to the miestni- chestvo no man could take any office which was inferior to any which his ancestors had held, or could be subordinate to any man who reckoned fewer ancestors than himself. Feodor, however, finding to what interminable quarrels these pedigrees gave rise, both at court and in the camp, hit upon a bold plan, said to have been suggested by his minister Vasilii Golitzin. He caused all the families to deliver their pedigrees into court that they might be examined, under pretext of ridding them of any errors which might have crept in. The nobles were convoked ‘ and the czar, assisted by the clergy, caused their books to be burned before their eyes.

On the death of Feodor, there seemed every probability that the empire would fall into a complete state of anarchy. The czar Alexis had been twice married: his first wife Maria Miloslavskaia bore him two sons, Feodor and Ivan, and several daughters; his second, Natalia Narishkina, was the mother of Peter and a daughter Natalia. The court was rent by the rival factions of the Miloslavskis and the Narishkins. Ivan was even more infirm than Feodor and the Narishkins strove to bring it about that he should be set aside and Peter should be elected. Sophia, however, the daughter of Alexis by his first wife, was a woman of singular energy of character, the more remarkable on account of the little attention paid to the education of women in Russia and the cloistered and spiritless lives they were compelled to lead. According to some accounts she was a woman altogether wanting in personal at- tractions. Perry, however, the engineer employed by Peter the Great, speaks of her as good-looking. But the position of the women of the imperial family was even worse than that of the generality ; they were not allowed to marry subjects, and in consequence the majority of them led a life of enforced celibacy. Sophia was the favourite daughter of her father, and was assiduous.in her attentions to him during his last illness. One of her brothers being an imbecile and the other a child, she hoped to wield the sceptre. She fomented a revolt of the streltzt, and, instigated by her harangues, they murdered some of the family and partisans of the Narishkins. Not content with slaying one of the czarina’s brothers at the beginning of the rebellion, they afterwards dragged another from his hiding-place and cut him to pieces.

The result of all these disturbances was that Ivan and

Feodor

Feodor (1676-1682) was a lll

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a Peter were declared joint-sovereigns, and Sophia was to be

regent during their minority. She appointed Vasilii Golitzin to be commander-in-chief of the forces. He marched against the Mongols of the Crimea, but owing to the length of the journey and sufferings of the troops was able to effect but little. In 1689 Peter married Eudokia Lopukhina; but the union was by no means a happy one. Two sons were born to Peter, Alexander and Alexis; the first lived six months only, the latter survived to make a sad figure in Russian history. Next we have another revolt of the streltzi, said to have been instigated by Sophia and Golitzin. It is even alleged that the object of this conspiracy was to put Peter to death. His cause, however, prevailed, and the rebels were punished with great severity. Golitzin's life was spared, but all his property was taken from him. Sophia was now permanently incarcerated in a convent under the name of Susanna, where she remained till her death fifteen years afterwards, at the age of forty-six. Thus from 1689 dates the actual rule of Peter. His brother Ivan, infirm both in body and mind, had but little share in the government ; his faculties both of sight and speech are said to have been very imperfect. He took a wife, however, and had three daughters, concerning one of whom, at least, we have much more to hear. Ivan led a retired life, and died in 1696 at the age of thirty.

Want of space compels us to deal here only with the Jeading facts of the reign of Peter the Great (1689-1725) ; for more minute details the reader

must consult the special article (vol. xviii. p. 698). The great object of the new ezar was to give Russia ports in some other direction than the White Sea, constantly blocked with ice. He had already trained an army which was officered by foreigners in his pay. The Turks were the first objects of his attack. At first he was unsuccessful in his attempt to get possession of Azoff at the mouth of the Don,—partly on account of the treason of the Dutch engineer Jansen, who, in consequence of some slight put upon him, went over to the enemy. In 1696, however, he took the fort and soon afterwards made his triumphant entry into Moscow. In the following year Peter, accompanied by Lefort and Generals Golovin and Vosnitzin, set out on his travels. J'or some time he worked at the docks of Saardam in Holland, and then he went to England, where he remained three months. The story of his stay at Deptford is too well known to need descrip- tion here. He left England, taking with him a great number of ingenious men, who were appointed to teach the arts to the barbarous Russians. He was getting ready to go to Venice when he heard of the great revolt of the streltzi. Before his arrival their insurrection had been quelled by Gordon and others, and many of them lay in prison await- ing the sentences to be given by Peter. When he reached Moscow, a series of terrible executions took place, which have been described with only too much accuracy by some eyewitnesses, the chief being Korb, the secretary of the German embassy. In 1706 broke out the revolt of the Cossacks of the Don, and in 1709 that of Mazeppa, the hetman of the Little-Russian Cossacks, who eagerly joined Charles XII. in his struggle with Peter. As early as 1700 the Russian czar had carried on war with this last of the vikings, as he had been called. In that year Charles defeated Peter at the battle of Narva, but the latter, although humbled, was not disheartened. He gathered all his strength for another encounter. In the following year Sheremetreff defeated the Swedish general Schlippenbach in Livonia, and again in 1702. The great object of Peter was to gain possession of the Neva; this he attained, but the Russian arms were disgraced by many cruelties and robberies in the unfortunate Baltic provinces, which had already suffered so much in the wars of Ivan the Terrible.

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Charles XII. now abandoned his attacks on the Polish king and invaded Russia. "I will treat with the czar at Moscow," he said, Peter replied, '"'My

brother Charles wishes to play the part of Alexander, but he will not find me Darius.” At Lesna the Swedish general Lowenhaupt fought a desperate battle with the Russians, in which, although nominally victorious, his losses were terrible. On June 15 (x.s.) was fought the battle of Poltava, which resulted in the complete defeat of Charles. He had brought it on by his recklessness, and, it may be added, complete ignorance of his duties as a general.

With the fall of Mazeppa and the coalition of the Little Russians in aid of Charles fell also the independence oi the Cossacks and their sech or republic. They now became entirely dependent upon the Muscovite czar. The hetmanship, which had long been a mere empty title, lasted till the year 1789. In 1712 Peter married Martha Skavronska, a Livonian or Lithuanian peasant who had been taken prisoner at the siege of Marienburg in 1702. But little is known of her previous history ; she received the name of Catherine on being baptized as a member of the Greek Church. Peter had previously divorced his wife Eudokia, who was distasteful to him on account of her sympathies with the conservative party in Russia. He now set about his great plan of civilizing the country ou the model of the nations of the West. In this he was assisted by many foreigners in his pay. He abolished the patriarchate, probably from dislike of its great power, based nobility entirely upon service either civil or military, and divided the merchants into guilds, but left serfdom still existing in Russia, or perhaps we may say with truth even augmented it, by doing away with the privileges which the odnodvortz, and polouniki had and confounding all in a common category of serfdom. His attempt to introduce

primogeniture into Russia did not succeed. He put an

end to the Oriental seclusion of women and the Oriental dress of men; for the beard and long caftan were sub-

stituted the cleanly-shaved face and the dress in vogue in the West. flagellation of defaulting debtors. pletely remodelled on the European system.

He abolished also the pravezhe or public The army was com- During the exile of Charles XII. at Bender Peter drove Stanis-

laus Leszczynski out of Poland, and Augustus II. re- entered Warsaw. Peter conquered Esthonia and Livonia.

He was not able to annex Courland, which was a

feudatory of Poland, but he negotiated a marriage between

the duke and his niece Anna, daughter of the late czar Ivan, who was afterwards empress. A foolish expedition undertaken against Turkey was not successful. Peter found himself but ill-supported by the inhabitants through whose territory he marched, and was compelled to sign the treaty of the Pruth in 1711, whereby he gave back Azoff, one of his most valuable conquests, to the Turks. The story of his having been rescued by the dexterity of Catherine seems to lack confirmation ; under any circum-stances, he shortly afterwards acknowledged her as his wife. In May 1713 Peter gained some fresh victories over the Swedes. In 1717 he made another European tour, visiting, among other places, Paris. On this occasion he was accompanied by his wife ; concerning both strange stories were told, but perhaps we must be cautious how we receive too credulously, as Carlyle has done, the malicious gossip of the margravine of Baireuth. In 17 21, by the treaty of Nystad with Sweden, Peter was left master of Livonia, Esthonia, Ingria, and part of Finland. He had begun building St Petersburg, “the window by which Russia looks” at Europe, as early as 1703.

In 1722 we find Peter descending the Volga from Nijni to Astrakhan, and gaining some important points on that river. Previous to this had occurred the sad death

of his son Alexis, in which it must be said with sorrow Peter seemed lost to all the feelings of a father. Alexis had undoubtedly given him great cause for dislike by identifying himself in every way with the retrogressive party. The unfortunate young man probably died under the infliction of torture. In 1721 Peter promulgated the celebrated ukaze (afterwards abrogated by Paul) that the sovereign had the right of naming his successor. On January

28, 1725, the great reformer was dead. An attempt to estimate his character has been made in the separate article assigned to him.

On the death of Peter the country was divided into two factions. The old reactionary party, the Golitzins, Dolgo- rukis, and others, were eager to proclaim Peter the son of Alexis, but those who had identified themselves with the

Catherine reforms of the late sovereign were anxious that Catherine

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Peter II. others.

Anna.

his widow, who had been crowned empress, should succeed. Menshikoff, the favourite of the late czar, who is said when a boy to have sold cakes in the streets of Moscow, became all-powerful at this period, and the reforms of Peter con- tinued to be carried out. Catherine died in 1727; she appears to have been an indolent, good-natured woman, with but little capacity for government, and accordingly, throughout her short reign, was entirely controlled by She designated as her successor Peter the son of Alexis, and, in default of Peter and his issue, Anna, who had married the duke of Holstein, and Elizabeth, her daughters. The regency was exercised by a council consist- ing of the two daughters, the duke of Holstein, Menshikoff, and seven or eight of the chief dignitaries of the empire. Menshikoff was still all-important; he had obtained from Catherine her consent to a marriage between his daughter and the youthful czar. But his authority was gradually undermined by the Dolgorukis. The favourite of Peter the Great was first banished to his estates, and afterwards to Berezoff in Siberia, where he died in 1729. The Dol- gorukis were now in the ascendency, and the czar was betrothed to Natalia, one of that family. He showed every inclination to undo his grandfather’s work, and the court was removed to Moscow. Soon afterwards, how- ever, in January 1730, the young prince died of small-pox. His last words as he lay on his death-bed were, “Get ready the sledge; I want to go to my sister,”— alluding to the Princess Natalia, the other child of Alexis, who had died three years previously. The only foreign event of

importance in this reign was the attempt of Maurice of Saxony to get possession of Courland, by marrying the duchess Anna, then a widow. She con- sented to the union, and the states of the province elected him, but Menshikoff sent a body of troops who forced him to quit it. On the death of Peter at the age of fifteen, various claimants of the throne were put for- ward. The great czar had left two daughters, Elizabeth, and Anna, duchess of Holstein, who had a son, afterwards Peter III. Two daughters were also surviving of his eldest brother Ivan, Anna, the duchess of Courland, and Catherine, duchess of Mecklenburg. Alexis Dolgoruki even had an idea of claiming the crown for his daughter, because she had been betrothed to the young emperor. This proposal, however, was treated with derision, and the High Secret Council resolved to call to the throne Anna of Courland, thinking that, as she was so much more remote by birth than the daughters of Peter, she would more willingly submit to their terms. In fact, they had pre- pared for her signature something like the pacta conventa of Poland. The following were the terms :—(1) the High Council was always to be composed of eight members, to be renewed by co-option, and the czarina must consult it on state affairs ; (2) without its consent she could neither make peace nor declare war, could not impose any tax,

alienate any crown lands, or appoint to any office above that of a colonel ; (3) she could not cause to be condemned or executed any member of the nobility, nor confiscate the goods of any noble before he had a regular trial; (4) she could not marry nor choose a successor without the con- sent of the council. In case she broke any of these stipu- lations she was to forfeit the crown (see Rambaud, p. 425), Anna assented to these terms and made her entry into Moscow, which was now to be the capital. But the em- press was soon informed how universally unpopular these pacta conventa were, which in reality put Russia into the hands of a few powerful families, chiefly the Dolgorukis and Golitzins. She accordingly convened her supporters, and publicly tore the document to pieces, and thus ended the last attempt to give Russia a constitution. The new empress was a cold, repulsive woman, whose temper had been soured by indignities endured in her youth; she took

vengeance upon her opponents, and threw herself almost entirely into the hands of German advisers, espe- cially Biren, a Courlander of low origin. This is the period called by the Russians the Bironovstchina. The country was now thoroughly exploited by the Germans; some of the leading Russians were executed, and others banished to Siberia. Among the former was the able minister Volinski, beheaded with two others in 1740. He had fallen under the wrath of the implacable Biren. One of the most important enactments of this reign was the abolition of the right of primogeniture introduced by Peter the Great, which had never been popular in the country. On the crown of Poland falling vacant in 1733, an attempt was again made to place Stanislaus Leszczynski on the throne, but it failed through the opposition of Russia, and Stanislaus escaped with difficulty from Dantzic. Upon this followed a war with Turkey, which lasted four years (1735-1739), in conjunction with Austria. This was not very successful, but the Russian generals gained possession of a few towns, and were indignant when the Austrians signed the treaty of Belgrade with the Turks (1739), and the campaign came to an end. In 1740 the empress Anna died; she had reigned exactly ten years. She left the crown to Ivan, the son of her niece Anna, daughter of her sister Catherine, duchess of Mecklenburg. During the minority of this child Biren was to be regent. By a revolution de palais, however, the German adventurer was hurled from power and sent to Pelim in Siberia. But matters did not rest here; taking advantage of the general unpopularity of the German faction, the partisans of Elizabeth, the daughter of Peter the Great, were resolved to work their overthrow, and place her upon the throne. They consisted of Alexander and Peter Shuvaloff, Michael Vorontzoff, Razumovski, Schwarz, and a French surgeon named Lestocq. Elizabeth ingratiated herself into the favour of the soldiers, by whom the name of Peter the Great was still so much cherished. Anna Leopold- ovna, as she was called, her husband Anthony Ulrich, the infant emperor, Munich, Ostermann, and the whole

German faction were arrested in the night, and Elizabeth Blizbetl

ascended the throne. Ivan VI. was imprisoned in the fortress of Schliisselburg; Anna, with her husband and children, was banished to Kholmogort near Archangel, where she died in 1746. Ostermann was banished to Bere- zoff, and Munich to Pelim; they had both been previously

sentenced to death. Biren and his family were now recalled and allowed to live at Yaroslavl. Elizabeth Petrovna (1741-1762) inaugurated the return of Russian influence in opposition to the Germans, from whom the country had suffered so much during the reign of Anna. The people were weary of them, yet they were, as we shall see, to have one German emperor more. On ascending the throne she summoned to her court the son of her sister

1721-1775.]

Anna and the duke of Holstein, who took the name of Peter Feodorovich on assuming the Greek religion, and was declared heir to the throne. In 1744 he married the Princess Sophia of Anhalt-Zerbst, who by her baptism in the Orthodox Church became Catherine. Thus the line of descent was secured to the direct heirs of Peter the Great. In 1743, the armies of Elizabeth having gained some victories over the Swedes, the treaty of Abo was signed, by whieh Russia acquired the southern part of Finland, as far as the river Kiumen. The next event of importance is the war between Russia and Frederick the Great (1756- 1762). In 1757 Apraksin crossed the frontier with 85,000 Russians, occupied Eastern Prussia, and defeated Lewald at Gross-Jagersdorf; but, instead of taking advantage of the victory, he soon afterwards retired behind the Niemen, having been tampered with by the grand-duchess Catherine and the chancellor Bestuzhefi-Riumin. In 1758 Fermor, the Russian general, was completely defeated by Frederick at Zorndorf, but he was allowed to retreat without molesta- tion. In 1759 Saltikoff beat the Prussians at Paltzig, and in the same year Frederick was obliged to submit to a greater defeat at Kiinersdorf, where he lost eight thousand men and one hundred and seventy-two cannon. It was on the loss of this battle that he meditated committing suicide. In 1760 the Russians entered Berlin, where they committed great havoc.and destruction. ‘‘ We have to do,” said Frederick, “‘ with barbarians, who are digging the grave of humanity.” In the following year they took Pomerania. The cause of Frederick seemed on the verge of ruin; he was saved by the death of Elizabeth in Decem- ber 1761. The empress was an idle, superstitious woman of lax morals, who was greatly under the influence of favourites. Since the reign of Peter I. no successor had appeared worthy of him. Still Russia made more progress under Elizabeth than it had made under Anna. In 1755 the university of Moscow, the oldest in the country, was founded

through the influence of Ivan Shuvaloff. Litera- ture made great advances, as will be seen below. Elizabeth was succeeded by her nephew Peter, son of her sister Anna and Charles Frederick, duke of Holstein- Gottorp. He was suspected of German leanings, but his first measures made him very popular. In February 1762 he published an ukaze by which the nobility were freed from the neeessity of entering upon any state employment, and he abolished the secret chancery. On the other hand he acted in some matters injudiciously, and offended the prejudices of the Russians, as the false Demetrius had done a century and a half previously. He ridiculed some of the ceremonies of the Orthodox Church, and showed a fondness for the Lutheran. He introduced many German tactics into the army, and evinced a great preference for his German corps of Holsteiners. His personal habits were very coarse: he was constantly seen drunk. Moreover he sent out of the country many of the talented Frenchmen who had during the reign of Elizabeth been helping Russia to get rid of her barbarism. Frederick II. of Prussia, who was at his lowest depths after the battle of Kiinersdorf, now saw to his delight a complete change in the Russian policy. Peter was an ardent admirer of the Prussian sovereign ; in order to ensure peace, Frederick would have ceded Eastern Prussia; but Peter dreamed of nothing of the kind; he restored all the Russian conquests and formed an alliance with him, offensive and defensive. He lived very unhappily with his wife Catherine, and meditated divoreing her and imprisoning her for the rest of her life ina convent. The condition in which she passed her time may be seen from her memoirs, first published by Herzen, the authenticity of which there seems to be no reason to doubt. She, however, quietly waited her time, and a conspiracy was concocted in which she was assisted by the

Orloffs, Potemkin, the princess Dashkoff, and others (see Peter III.). Leaving her residence at Peterhof, Catherine boldly put herself at the head of twenty thousand men. The miserable emperor abdicated without a struggle, and was soon afterwards secretly assassinated at Ropcha, near St Petersburg. Many of the details of this catastrophe are given in the interesting memoirs of the Princess Dashkoff, which were published by an

English lady, Mrs W. Brad- ford, in 1840, having been taken down from her dictation.

Thus had a German woman, by adroitly flattering the Catherine prejudices of the Russians, succeeded in making herself

head of this vast empire. Two years afterwards Ivan VL., who is said to have become an idiot from his long confine- ment at Schliisselburg, was murdered by his guards on account of the attempt of a certain Lieutenant Mirovich to set him free. Whether Mirovich was incited to this adven- ture by secret promises of the Government, so that there might be an excuse for the murder of Ivan, has never been clearly shown. He expiated his crime by public execution, and is said to have expected a reprieve till the last moment.

The Seven Years' War was now over, and the next great European complications were to be concerned with the partition of Poland, throughout the struggles of which country the Russians were constantly interfering; but for a fuller discussion of this subject the reader must be referred to the article Potanp. In 1767 Turkey, urged on by France, declared war against Russia ; the object was to aid the Poles by creating a diversion. The Russian general Golitzin attacked the grand vizier, took the town of Khotin (1769), and in the following year Rumantzofi defeated the khan of the Crimea, the Turkish feudatory and ally, and in 1770 won the great victory of Kagul. In 1771 Dolgoruki overran the Crimea, and Alexis Orloff defeated the Turks in a naval engagement at Chesme, on the coast of Asia Minor. In their naval expeditions the Russians were at this time greatly assisted by the number of Englishmen in their service. In 1774 was signed the peace of Kutchuk-Kainardji, whereby the sultan acknow- ledged the independence of the Mongols of the Crimea. The Russians thus detached this province from the sultan's dominions, and after exercising a kind of protectorate over it added it to their own. He also ceded Azoff on the Don, Kinburn at the mouth of the Dniester, and all the fortified places of the Crimea. The Greeks, who had been induced to rise, were abandoned to the vengeance of the Turks.

In 1771 the plague broke out at Moscow, and many of the inhabitants perished. The archbishop Ambrose was massacred in a popular tumult, while endeavouring to carry out some measures which were necessary for

the preservation of the public health. Soon afterwards occurred the rebellion of Pugatcheff, a Cossack of the Don, who declared himself to be the emperor Peter III. The czar, he alleged, had escaped from the hands of his would- be murderers, and would soon regain his throne. A large band of disaffected peasants and Raskolniks gathered round him, and he was joined by many of the Mongol races, who were inimical to the Russian rule. At first the generals sent against him were defeated. The rebel's path was everywhere marked with bloodshed and pillage ; he even got possession of several towns, including Kazan. Had he been something more than a vulgar assassin he might have made Catherine tremble on her throne, but his cruelties estranged his more moderate followers. He was after- wards beaten by Bibikoff and others, and finally surrendered by his accomplices to Suwaroff. He was taken to Moscow in an iron cage and there publicly executed in 1775, together with four of his principal followers. In the same year the empress put an end to the republic, as it was called, of the Zaporogian Cossacks. A great codification of the laws took place under Catherine, which may be

styled the sixth great period of Russian legislation. The serfs, however, were not benefited by these changes. In

1767 an ukaze forbade them to bring any complaints against their masters. The latter had the power of send- ing their serfs to Siberia as a punishment, or handing them over to be enlisted in the army. The public sale of serfs was not put an end to till the reign of Alexander I. The country was now divided into governments for the better administration of justice, each government being subdivided into wiezdi or districts. Catherine also took away from the monasteries their lands and serfs, and allotted them payments according to their importance from the state revenues. The plans of Peter I. were thus fully carried out, and the church became entirely dependent upon the state. In 1783 the Crimea was annexed to Russia. A second war with Turkey broke out in 1787; the Ottoman power had many grounds of complaint, but its suspicions were particularly aroused by the tour of Catherine through the southern provinces of Russia and her

interviews with the emperor Joseph II. ‘Turkey declared war that same year; and, to increase the em- barrassed position of the empress, Sweden did the same, requiring from Russia the cession of the southern part of Finland which had been taken from her. But King Gustavus ITI., in spite of some petty successes, was unable to carry on the war, and soon signed the peace of Verela on the footing of status quo ante bellum. The empress met with equal good fortune in the south; Potemkin took Otchakoff and Suwaroff Khotin, In 1789 the latter gene- ral won the battles of Fokshani and Kimnik; and in 1790 after a sanguinary engagement he took Ismail. By the treaty of Jassy in 1792 Catherine kept possession of Otch- akoff, and the shore between the Bug and Dniester. She was next occupied with the affairs of Poland, which

have been described under that heading. In consequence of |

the demands of the confederates of Targovica,—men who were prepared to ruin their country for their own private ends,—eighty thousand Russians and twenty thousand Cossacks entered the Ukraine to undo the work of the confederates of Bar. In 1794 Suwaroff stormed Warsaw, and the inhabitants were massacred. In the following year Stanislaus Poniatowski laid down his crown, the third division of Poland took place, and the independence of that country was at an end. In spite of her correspond- ence and affected sympathies with Voltaire, Diderot, and

many of the advanced French thinkers, Catherine showed

great opposition to the principles of the French Revolu- tion, and the policy of the latter part of her reign was reactionary. She died suddenly on November 7, Ugo: Her character has been amply discussed by foreign writers. It may suffice to say here that, whatever her private vices may have been, she was unquestionably a woman of great genius, and the only sovereign worthy of Russia who had appeared since the days of Peter the Great. Hence the veneration with which her memory is regarded by the Russians to this day.

Paul, who had lived in retirement during the life of his mother, was an object of aversion to her. We are told that she had prepared a will by which he would be disinherited, and the succession conferred upon his son

Alexander, but his friend Kurakin got hold of it immediately upon the death of the empress and destroyed it. The events of the reign of Paun (q.v.) can be only briefly discussed here. He concluded an alliance with Turkey, and entered into a coalition against the French republic, which he regarded with horror. Suwaroff took the command of the united Russian and Austrian troops at Verona. In 1799 he defeated the French general Moreau on the banks of the Adda, and made a triumphant entry into Milan. After this he won another victory over Macdonald on the Trebbia

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and later the same year that of Novi over Joubert. He then crossed the Alps for the purpose of driving the French out of Switzerland, but he was everywhere hampered by the Austrians, and, after fighting his way over the Alps and suffering great losses, he reached his winter quarters between the Iler and the Lech, and soon afterwards he was recalled in disgrace. Paul now completely changed his tactics. Ac. cusing England and Austria of having acted treacherously towards him, he threw himself into the arms of Bonaparte, who had won him over by skilful diplomacy, and, among other pieces of flattery, sent back the Russian prisoners newly clothed and armed. Paul then meditated joining him in a plan for conquering India; but in the night: between the 23d and 24th of March 1801 he was assassinated. The chief agents in this catastrophe were Plato Zuboff, Benning- sen, and Pahlen. The rule of Paul had become intolerable, and he was fast bringing on a national bankruptcy.

He was succeeded by his eldest son, Alexander I, Alexander

(1801-1825). One of the first acts of the new emperor lL was to make peace with England and France. He, how- ever, soon changed his policy, and in 1805 joined the third

coalition against France, to which Austria and England

were parties. Events which belong to general European history, and are well known, need only be described briefly here. On December 2d of that year

took place the battle of Austerlitz, in which the Russians lost 21,000 men, 133 guns, and 30 flags. They accused their Austrian allies of treachery. The war was soon ended by the treaty of Pressburg. We now come to the fourth coalition against France (1806-7). In 1807 Napoleon engaged the Russian general Benningsen at Eylau. The battle was protracted and sanguinary, but not decisive ; both parties abandoned the field and retired into winter quarters. A defeat at Friedland in the same year was followed by the peace of Tilsit. By this treaty the Prussian king, Frederick William III., lost half his dominions. Nearly all his Polish posses- sions were to go to the king of Saxony under the name of the grand-duchy of Warsaw. Bya secret treaty, it seemed as if Alexander and Napoleon almost aspired to divide the world, or at least Europe, between them. The terms, how- ever, were received by a large party in Russia with disgust. The next important event in the reign of Alexander was the conquest of Finland. By the treaty of F rederikshamn, September 17, 1809, Sweden surrendered Finland, with the whole of East Bothnia, and a part of West Bothnia lying eastward of the river Tornea. The Finns were allowed a kind of autonomy, which they have preserved to this day. The annexation of Georgia to Russia was consolidated at the beginning of this reign, having been long in prepara- tion. It led to a war with Persia, which resulted in the incorporation of the province of Shirvan with the Russian empire in 1806,

In 1809 commenced the fifth coalition against Napoleon. Alexander, who was obliged by treaty to furnish assistance to the French emperor, did all that he could to prevent the war. A quarrel with Turkey led to its invasion by a Russian army under Michelsen. This war was terminated by a congress held at Bucharest in 1812. Russia gave up Moldavia and Wallachia, which she had occupied, but kept Bessarabia, with the fortresses of Khotin and Bender. Gradually an estrangement took place between Alexander and Napoleon, not only on account of the creation of the grand-duchy of Warsaw, but because Russia was suffering greatly from the Continental blockade, to which Alexander had been forced to give his adhesion. This led to the great invasion of Russia by Napoleon in 1812.1

1 This has been fully described in the pages of Eugéne Labaume and Sir Robert Wilson. In the recent volumes of the excellent review, Russki Arkhiv, edited by M. Bartenieff, will be found some most in-

» | teresting details based upon Russian family papers and traditions.

1767-1831.]

On May 9, 1812, Napoleon Icft Paris for Dresden, and the Russian and French ambassadors received their passports. The grand army comprised 678,000 men, 356,000 of them being French ; and, to oppose them, the Russians assembled 372,000 mcn. Napoleon crossed the Niemen and advanced by forced marches to Smolensk. Here he defeated the Russians, and again at the terrible yattle of Borodino, and then entered Moscow, which had been abandoned by most of the inhabitants; soon after- wards a fire broke out (probably caused by the order of Rostopchin the governor), which raged six days and destroyed the greater part of the city. Notwithstanding this disaster, Napoleon lingered five weeks among the ruins, endeavouring to negotiate a peace, which he seemed to think Alexandcr would be sure to grant; but he had mistaken the spirit of the emperor and his people. On the 18th of October Napoleon reluctantly commenced his backward march. The weather was unusually severe, and the country all round had been devastated by the French on their march. With their ranks continually thinned by cold, hunger, and the skirmishes of the Cossacks who hung upon their rear, the French reached the Beresina, which they crossed near Studianka on the 26th—29th of N ovember with great loss. The struggle on the banks of this river forms one of the most terrible pictures in history. At Smorgoni, between Vilna and Minsk, Napoleon left the army and hurried to Paris. [Finally the wreck of the grande armée under Ney crossed the Niemen. Not more than eighty thousand of the whole army are said to have returned. .

Frederick William III. of Prussia now issued a mani- festo, and concluded an alliance with Russia for the re- establishment of the Prussian monarchy. In 1813 took place the battle of Dresden, and the so-called Battle of the Nations at Leipsic on October 16 and the two fol- lowing days. In 1814 the Russians invaded France with the allies, and lost many men in the assault upon Paris. After the battle of Waterloo, and the conveyance of Napoleon to the island of St Helena, it fell to the Russian forces to occupy Champagne and Lorraine. In the same year Poland was re-established in a mutilated form, with a constitution which Alexander, who was crowned king, swore

to observe. In 1825 the emperor died suddenly at Taganrog at the mouth of the Don, while visiting the southern provinces of his empire. He had added to the Russian dominions Finland, Poland, Bessarabia, and that part of the Caucasus which includes Daghestan, Shirvan, Mingrelia, and Imeretia. Much was done in this reign to improve the condition of the serfs. The Raskolniks were better treated; many efforts were made to improve public education, and the universities of Kazan, Kharkoff, and St Petersburg were founded. One of the chief agents of these reforms was tlie minister Speranski, who for some time enjoyed the favour of the emperor, but he attacked so many interests by his measures that a coalition was formed against him. He was denounced as a traitor, and his enemies succeeded in getting him removed and sent as governor to Nijni- Novgorod. In 1819, when the storm raised against him had somewhat abated, he was appointed to the important post of governor of Siberia. In 1821 he returned to St Petersburg, but he never regained his former power. To the mild influence of Speranski succeeded that of Shishkoff, Novosiltzeff, and Arakcheeff. The last of these men made himself universally detested in Russia. He rose to great influence in the time of Paul, and managed to continue in favour under his son. Besides many other pernicious measures, it was to him that Russia owed the military colonics which were so unpopular and led to serious riots. The censorship of the press became much stricter, and

many professors of liberal tendencies were dismissed from their chairs in the universities. ‘The country was now filled with secret societies, and the emperor became gloomy and suspicious. In this condition of mind he died, a man thoroughly disenchanted and weary of life. He has been judged harshly by some authors; readers will remember that Napoleon said of him that he was false as a Byzantine Greek. To us he appears as a well-intentioned man, utterly unable to cope with the discordant elements around him. He had discovered that his life was a failure.

The heir to the throne according to the principles of succession recognized in Russia was Constantine, the second son of the emperor Paul, since Alexander left no children. But he had of his own free will secretly

renounced his claim in 1822, having espoused a Roman Catholic, the Polish princess Julia Grudzinska. In consequence of this change in the devolution of the sovereign's authority, the conspiracy of the Dekabrists! broke out at the end of the year, their object being to take advantage of the confusion caused by the alteration of the succession to get consti- tutional government in Russia. Their efforts failed, but the rebellion was not put down without great bloodshed. Five of the conspirators were executed, and a great many sent to Siberia. Some of the men implicated were among the most remarkable of their time in Russia, but the whole country had been long honeycombed with secret societies, and many of the Russian officers had learned liberal ideas while engaged in the campaign against Napo- leon. So ignorant, however, were the common people of the most ordinary political terms that when told to shout for Constantine and the constitution (constitutzia) they naively asked if the latter was Constantine's wife. 'The new emperor, Nicholas, the next brother in succession, showed throughout his reign reactionary tendencies ; all liberalism was sternly repressed. In 1830 appeared the Complete Collection of the Laws of the Russian Empire, which Nicholas had caused to be codified. He partly restored the right of primogeniture which had been taken away by the empress Anna as contrary to Russian usages, allowing a father to make his eldest son his sole heir. In spite of the increased severity of the censorship of the press, literature made great progress in his reign. From 1826 to 1828 Nicholas was engaged in a war with Persia, in which the Russians were completely victorious, having beaten theenemyat Elizabetpol, and again under Paskewitch at Javan Bulak. The war was terminated by the peace of Turkmantchai (February 22, 1828), by which Persia ceded to Russia the provinces of Erivan and Nakhitchevan, and paid twenty millions of roubles as an indemnity. The next foreign enemy was Turkey. Nicholas had sympa- thized with the Greeks in their struggle for independence, in opposition to the policy of Alexander ; he had also a part to play as protector of the Orthodox Christians, who formed a large number of the sultan's subjects. In con- scquence of the sanguinary war which the Turks were carrying on against the Greeks and the utter collapse of the latter, England, France, and Russia signed the treaty of London in 1827, by which they forced themselves upon the belligerents as mediators. From this union resulted the battle of Navarino (October 20, 1827), in which the Turkish fleet was annihilated by that of the allies Nicholas now pursued the war with Turkey on his own account; in Asia

Paskewitch defeated two Turkish armies, and conquered Erzeroum, and in Europe Diebitsch defeated the grand vizier. The Russians crossed the Balkans and advanced to Adrianople, where a treaty was signed in 1829 very disadvantageous to Turkey.

In 1831 broke out the Polish insurrection, of which a

1 Literally, the men of December, the month in which Alexander died.

description has already been given (see PoLAND, vol. xix. p. 298). Paskewitch took Warsaw in 1831. The cholera which was then raging had already carried off Diebitsch and the grand-duke Constantine. Poland was now entirely at the mercy of Nicholas. The constitution which had been granted by Alexander was annulled; there were to be no more diets; and for the ancient palatinates, familiar to the historical student, were substituted the governments of Warsaw, Radom, Lublin, Plock, and Modlin. The university of Vilna, rendered celebrated by Mickiewicz and Lelewel, was suppressed. By another treaty with Turkey, that of Unkiar-Skelessi (1833), Russia acquired additional rights to meddle with the internal politics of that country. Soon after the revolution of 1848, the emperor Nicholas, who became even more reactionary in consequence of the disturbed state of Europe, answered the appeal of the emperor Francis Joseph, and sent an army under Paskewitch to suppress the Hungarian revolt. After the capitulation of Gorgei in 1849, the war was at an end, and the Magyars cruelly expiated their attempts to procure constitutional government. In 1853 broke out the Crimean War. The emperor was anxious to distribute the possessions of the ‘‘sick man,” but found enemies instead of allies in England and France. The chief events of this memorable struggle were the battles of the Alma, Balaklava, Inkermann, and Tchernaya, and the siege of Sebastopol; this had been skilfully fortified by Todleben, who appears to have been the only man of genius who came to the front on either side during the war. In 1855 the Russians destroyed the southern side of the city,

and retreated to the northern. In the same year, on March 14th, died the emperor Nicholas, after a short illness. Finding all his plans frustrated he had grown weary of life, and rashly exposed himself to the severe temperature of the northern spring.

Alexander He was succeeded by his son Alexander II. (1855-1881),

Il.

at the age of thirty-seven. One of the first objects of the new czar was to put an end to the war, and the treaty of Paris was signed in 1856, by which Russia consented to keep no vessels of war in the Black Sea, and to give up her protectorate of the Eastern Christians; the former, it must be added, she has recently recovered. A portion of Russian Bessarabia was also cut off and added to the Danubian principalities, which were shortly to be united under the name of Roumania. This was afterwards given back to Russia by the treaty of Berlin. Sebastopol also has been rebuilt, so that it is difficult to see what the practical results of the Crimean War were, in spite of the vast bloodshed and expenditure of treasure which attended it. The next important measure was the emanci- pation of the serfs in 1861. This great reform had long been meditated by Nicholas, but he was unable to ac- complish it, and left it to be carried out by his son. The landlords, on receiving an indemnity, now released the serfs from their seigniorial rights, and the village commune became the actual property of the serf. This great revolution was not, however, carried out without great difficulty. The Polish insurrection of 1863 has already been described, as well as its fatal effects upon that part of Poland which had been incorporated with Russia. On the other hand Finland has seen her privileges confirmed. Among important foreign events of this reign must be mentioned the capture of Schamyl in 1859 by Prince Bariatinski, and the pacification of the Caucasus 3; many of the Circassians, unable to endure the peaceful life of cultivators of the soil under the new regime, migrated to Turkey, where they have formed one of the most turbulent elements of the population. Turkestan also has been gradually subjugated. In 1865 the city of Tashkend was taken, and in 1867 Alexander II. created the government of Turkestan. In 1858 General Muravieff signed a treaty

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with the Chinese, by which Russia acquired all the left bank of the river Amur. A new port has been created in Eastern Asia (Vladivostok), which promises to be a great centre of trade. In 1877 Russia came to the assistance of the Slavonic Christians against the Turks. After the terrible siege of Plevna, nothing stood between them and the gates of Constantinople. In 1878 the treaty of San Stefano was signed, by which Roumania became independent, Servia was enlarged, and a free Bulgaria, but under Turkish suzerainty, was created. But these arrangements were subsequently modified by the treaty of Berlin. Russia got back the portion of Bessarabia which she had lost, and advanced her Caucasian frontier. The new province of Bulgaria was cut into two, the southern portion being entitled Eastern Roumelia, with a Christian governor, to be appointed by the Porte, and self-govern- ment. Austria acquired a protectorate over Bosnia and Herzegovina. The latter part of the reign of Alexander II. was a period of great internal commotion, on account of the spread of Nihilism, and the attempts upon the emperor's life, which unfortunately were at last successful. In the cities in which his despotic father had walked about fearless, without a single attendant, the mild and amiable Alexander was in daily peril of 'his life. On April 16, 1866, Karakozoff shot at the emperor at St Petersburg; in the following year another attempt was made by a Pole, Berezowski, while Alexander was at Paris on a visit to Napoleon III.; on April 14, 1879, Solovioff shot at him. The same year saw the attempt to blow up the Winter Palace and to wreck the train by which the czar was travelling from Moscow to St Petersburg. A similar conspiracy in 1881 (March 13) was successful. Five of the conspirators, including a woman, Sophia Perovskaia, were publicly executed. Thus terminated the reign of Alexander IL, which had lasted nearly twenty-six years. He died leaving Russia exhausted by foreign wars and honeycombed by plots. His wife and eldest son Nicholas had predeceased him, the latter at Nice.

acterized by conspiracies and constant deportations of suspected persons. It was long before he ventured to be crowned in his ancient capital of Moscow (1883), and the chief event since then has been the disturbed relations with England, which for a time threatened war. (Ww. R. M.)

Part V.—Russian LirerRature.

To get a clear idea of Russian literature, it will be most convenient for us to divide it into oral and written. The

first of these sections includes the interesting bélint, or Bilin,

“tales of old time,” as the word may be translated, which have come down to us in great numbers, as they have been sung by wandering minstrels all over the country. The scholars who during the last forty years have given their attention to these compositions have made the following division of them into cycles:—(1) that of the older heroes ; (2) that of Vladimir, prince of Kieff; (3) that of Novgorod ; (4) that of Moscow; (5) that of the Cos- sacks; (6) that of Peter the Great; (7) the modern period. These poems, if they may be so styled, are not in rhyme ; the ear is satisfied with a certain cadence which is observed throughout. For a long time they were neglected, and the collection of them only began at the commencement of the present century. The style of Russian literature which prevailed from the time of Lomonosoff was wholly based upon the French or pseudo- classical school. It was, therefore, hardly likely that these peasant songs would attract attention. But when the gospel of romanticism was preached and the //istory of Karamzin appeared, which presented to the Russians a

He was succeeded by his second Alexander son Alexander, born in 1845, whose reign has been char- HI

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past of which they had known but little, described in poetical and ornate phraseology, a new impulse was given to the collection of all the remains of popular literature. In 1804 appeared a volume based upon those which had been gathered together by Cyril or Kirsha Daniloff, a Cos- sack, at the beginning of the 18th century. They were received with much enthusiasm, and a second edition was published in 1818. In the following year there appeared at Leipsic a translation of many of these pieces into Ger- man, in consequence of which they became known much more widely. his little book of 160 pages is important in many ways, and not the least so because the originals of some of the bilint translated in it arc now lost. Since that

time large collections of these poems have been published, edited by Ribnikoff, Hilferding, Sreznevski, Avenarius, and others.

These curious productions have all the characteristics of popular poetry in the endless repetitions of certain con- ventional phrases—the “green wine,” “the bright sun” (applied to a hero), “the damp earth,” and others. The heroes of the first cycle are monstrous beings, and seem to be merely impersonifications of the powers of nature ; such are Volga Vseslavich, Mikula Selianinovich, and Svia- togor. They are called the bogatiri starshe. Sometimes we have the giants of the mountain, as Sviatogor, and the serpent Gorinich, the root of part of both names being gora (mountain). The serpent Gorinich lives in caves, and has the care of the precious metals. Sometimes animal natures are mixed up with them, as zmev-bogatir, who unites the qualities of the serpent and the giant, and bears the name of Tugarin Zmievich. There is the Pagan Idol (Idolistche Poganskoe), a great glutton, and Nightingale the Robber (Solovet Razboinik), who terrifies travellers and lives in a nest built upon six oaks.

In the second cycle the legends group themselves round the celebrated prince Vladimir of Kieff, in whose time the Christian religion was introduced into Russia, as previously mentioned. The chief hero is Ilya Murometz, who performs prodigies of valour, and is of gigantic stature and superhuman strength. The cycle of Novgorod deals with the stories of Vasilii Buslaevich and Sadko, the rich merchant. The great commercial prosperity of Novgorod has been already described. The fourth cycle deals with the autocracy ; already Moscow has become the capital of the future empire. We are told of the taking of Kazan, of the conquest of Siberia by Yermak, of Ivan the Terrible and his confidant Maliuta Skuvlatovich. It is observable that in the popular tradition Ivan, in spite of his cruelties, is not spoken of with any hatred. As early as 1619 some of these bilini were committed to writing by Richard James, an Oxford graduate who was in Russia about that time as chaplain of the embassy. The most pathetic of these is that relating to the unfortunate Xenia, the daughter of Boris Godunoff. Yermak, the conqueror of Siberia, forms the subject of a very spirited lay, and there is another on the death of Ivan the Terrible. Considering the relation in which she stood to the Russians, we cannot wonder that Marina, the wife of the false Demetrius, appears as a magician.

Many spirited poems are consecrated to the achievements of Stenka Razia, the bold robber of the Volga, who was a long time a popular hero. The cycle of Peter the Great is a very interesting one. We have songs in abundance on the various achievements of the wonderful ezar, as the taking of Azoff in 1696. Thereis also a poem on the execution of the streltzi, and another on the death of Peter. In the more modern period there are many songs on Napoleon. The Cossack songs, written in the Little Russian language, dwell upon the glories of the sech, the sufferings of the people from the invasions of the Turks and Mongols, the exploits of the Haidamaks and lastly the

fall of the Cossack republic. Besides these, the Russians can boast of large collections of religious poems, many of them containing very curious legends. In them we have a complete store of the beliefs of the Middle Ages. A rich field may be found here for the study of comparative mythology and folk-lore. Many of them are of considerable antiquity, and some seem to have been derived from the Midrash. Some of the more important of these have been collected by Beszonoff. Besides the bilint or legendary poems, the Russians have large collections of skazki or folk-tales, which have been gathered together by Sakharoff, Afanasieff, and others. They also are full of valuable materials for the study of comparative mythology.

Leaving the popular and oral literature, we come to Earliest

what has been committed to writing. specimen of Russian, properly so-called, must be considere the Ostromir Codex, written by the diak Gregory at the order of Ostromir, the posadnik or governor of Novgorod. This isa Russian recension of the Slavonic Gospels, of the date 1056-57. Of the year 1073 we have the Zzbornik or “ Miscellany” of Sviatoslaff. It was written by John the diak or deacon for that prince, and is a kind of Russian encyclopedia, drawn from Greek sources. The date is 1076. The style is praised by DBuslaeff as clear and simple. The next monument of the language is the Discourse concerning the Old and New Testament by Ilarion, metropolitan of Kieff. In this work there is a panegyric on Prince

Vladimir of Kieff, the hero of so much of the Russian popular poetry. Other writers are Theodo- sius, a monk of the Pestcherski cloister, who wrote on the Latin faith and some Pouchenia or “ Instructions,” and Luke Zhidiata, bishop of Novgorod, who has left us a curious Discourse to the Brethren. From the writings of Theodosius we see that many pagan habits were still in vogue among the people. He finds fault with them for allowing these to continue, and also for their drunkenness ; nor do the monks escape his censures. Zhidiata writes in a more vernacular style than many of his contemporaries ; he eschews the declamatory tone of the Byzantine authors.

With the so-called Chronicle of Nustor (q.v.) begins the long series of the Russian annalists. There is a regular catena of these chronicles, extending with only two breaks to the time of Alexis Mikhailovich, the father of Peter the Great. Besides the work attributed to Nestor, we have chronicles of Novgorod, Kieff, Volhynia, and many others. Every town of any importance could boast of its annalists, Pskoff and Suzdal among others. In some respects these compilations, the productions of monks in their cloisters, remind us of the Anglo-Saxon Chronicle, dry details alternating with here and there a picturesque incident ; but the Anglo-Saxon Chronicle has nothing of the saga

about it, and many of these annals abound with the

quaintest stories. There are also works of early travellers, as the igumen Daniel, who visited the Holy Land at the

end of the 11th and beginning of the 12th century. A

later traveller was Athanasius Nikitin, a merchant of Tver, who visited India in 1470.

account written by the two merchants, Korobeinikoff and Grekoff. ‘They were sent with a sum of money to the Holy Sepulchre to entreat the monks to pray without ceasing for the soul of the son of Ivan the Terrible, whom his father had killed. A curious monument of old Slavonic times is the Pouchenie (“Instruction”) written by Vladimir Monomakh for the benefit of his sons. This composition is generally found inserted in the Chronicle of Nestor ; it gives a quaint picture of the daily life of a Slavonic prince.

He has left a record of his adventures, which has been translated into English and published for the Hakluyt Society. Later also is the

The earliest written d literature,

Annalists and travellers.

In the 12th century we have the sermons of Cyril, the Religious bishop of Turoff, which are attempts to imitate in Russian literature.

The Story

of Igor.

Other popular tales.

Codes of laws.

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the florid Byzantine style. He is very fond of allegorical representations ; thus, in his sermon on Holy Week, Christianity is represented under the form of spring, Paganism and Judaism under that of winter, and evil thoughts are spoken of as boisterous winds. An attempt to carry this symbolism through other portions of his writings leads him to many fantastic conceits which are far from being in good taste. And here may be mentioned the many lives of the saints and the Fathers to be found in early Russian literature. Some of these have been edited by Count Bezborodko in his Pametniki Starinnoi Russkoi Interaturt (“ Memorials of Ancient Russian Literature”).

We now come to the story of the expedition of Prince Igor, which is a kind of bilina in prose, and narrates the expedition of Igor, prince of Novgorod-Severski, against the Polovtzes. The manuscript was at one time preserved in a monastery at Yaroslavl, but was burnt in the great fire at Moscow in the year 1812. Luckily the story had been edited (after a fashion) by Count Musin-Pushkin, and a transcript was also found among the papers of the empress Catherine. The authenticity of this production has been disputed by

some modern scholars, but without solid grounds. The original was seen by several men of letters in Russia, Karamzin among the number. ‘There is a mixture of Christian and heathen allusions, but there are parallels to this style of writing in such a piece as the “Discourse of a Lover of Christ and Advocate of the True Faith,” from which an extract has been given by Buslaeff in his Chrestomathy. Unlike most of the productions of this period, which are tedious, and interesting only to the philologist and antiquary, there is a great deal of poetical spirit in the story of Igor, and the metaphors are fre- quently very vigorous. Mention is made in it of another bard named Boyan, but none of his inspirations have come down to us. A strange legend is that of the czar Solomon and Kitovras, but the story occurs in the popular literatures of many countries. Some similar productions among the Russians are merely adaptations of old Bulgarian tales, especially the so-called apocryphal writings. The Zadon- stchina is a sort of prose-poem much in the style of the “Story of Igor,” and the resemblance of the latter to this piece and to many other of the skazania included in or attached to the Russian chronicle, furnishes an additional proof of its genuineness. The account of the battle of the “Field of Woodcocks,” which was gained by Dmitri Donskoi over the Mongols in 1380, has come down in three important versions. The first bears the title “Story of the Fight of the Prince Dmitri Ivanovich with Mamai”; it is rather meagre in details but full of expressions showing the patriotism of the writer. The second version is more complete in its historical details, but still is not without anachronisms. The third is altogether poetical. The Poviest 0 Drakule (“Story of Drakula”) is a collection of anecdotes relating to a cruel prince of Moldavia, who lived at the beginning of the 15th century. Several of the bar- barities described in it have also been assigned to Ivan the Terrible.

The early Russian laws present many features of interest, such as the Russkaia Pravda of Yaroslaff, which is preserved in the chronicle of Novgorod; the date is between 1018 and 1054. Large additions were made to it by subsequent princes. It has many points in common with the Scandinavian codes, e.g., trial by wager of battle, the wergild, and the circuits of the judges. The laws show Russia at that time to have been in civilization quite on a level with the rest of Europe. But the evil influence of the Mongols was soon to make itself felt. The next important code is the

Sudebnik of Ivan IIL, the date of which is 1497; this was followed by that of Ivan IV., of tho year 1550, in which we have a republi-

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cation by the czar of his grandfather's laws, with additions, In the time of this emperor also was issued the Stoglay (1551), a body of ecclesiastical regulations. Mention must also be nade of the Ulozhenie or '* Ordinance" of the czar Alexis. This abounds with enactments of sanguinary punishment: women are buried alive for murdering their husbands ; torture is recognized as a means of procuring evidence ; and the knout and mutilation are mentioned on almost every page. Some of the penalties are whimsical: for instance, the man who uses tobacco is to have his nose cut off ; this, however, was to be altered by Peter the Great, who himself practised the habit and encouraged it in others.

In 1553 a printing press was established at Moscow, and in 1564 the first book was printed, an " Apostol,"

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and the Epistles. The printers were Ivan Feodoroff and Peter Mstislavetz ; a monument was erected a year or two ago tothe memory of the former. As early as 1548 Ivan had invited printers to Russia, but they were detained on their journey. Feodoroff and his companions were soon, however, compelled to leave Russia, and found a protector in Sigismund III. The cause of their failure appears to have been the enmity which they had stirred up among the copyists of books, who felt that their means of gaining a livelihood were lessened. They succeeded accordingly in drawing over to their side the more fanatical priests, who thought it degrading that the sacred books should be multiplied by such an art, just as at the present day the Arabs refuse to allow the Koran to be printed. The first Slavonic Bible was printed at Ostrog in Volhynia in 1581, Another press, however, was soon established at Moscow ; up to 1600 sixteen books had been issued there.

A curious work of the time of Ivan the Terrible is the Time of Domostror, or " Book of Houschold Management," which is Ivan the said to have been

written by the monk Sylvester, although tos

this statement has been disputed. This priest was at one time very influential with Ivan, but ultimately offended him and was banished to the Solovetzkoi monastery on the White Sea. The work was originally intended by Sylvester for his son Anthemius and his daughter-in-law Pelagia, but it soon became very popular and in general use. We have a faithful picture of the Russia of the time, with all its barbarisms and ignorance. We see the unbounded authority of the husband in his own house- hold: he may inflict personal chastisement upon his wife; and her chief duty lies in ministering to his wants, The Mongols had introduced into Russia the Oriental seclusion of women ; those of the older time knew nothing of these restrictions. Sylvester, or whoever wrote the book, was a complete conservative, as indeed the clergy of Russia almost universally were.1 To the reign of Ivan the Ter- rible must also be assigned the Chetii-Minei or "Book of Monthly Readings," containing extracts from the Greek fathers, arranged for every day of the week. The work was compiled by the metropolitan Macarius, and was the labour of twelve years. An important writer of the same period was Prince Alexander Kurbski, de- scended from the sovereigns of Yaroslavl, who was born about 1528. In his early days Kurbski saw a great deal of service, having fought at Kazan and in Livonia, But he quarrelled with Ivan, who had begun to perse- cute the followers of Sylvester and Adasheff, and fled to Lithuania in 1563, where he was well received by

1 In a curious letter of the date of 1698, and now among the manu- scripts of the Bodleian, Bishop Burnet writes thus of a priest who accompanied Peter the Great to England : ‘‘ The ezar's pricst is come over, who is a truly holy man, and more learned than I should have imagined, but thinks it a great piece of religion to be no wiser than

his fathers, and therefore cannot bear the thought of imagining that anything among them can want amendment."

as tion of it is called, ¢.e., a book containing the Acts of the Apostles Printing,

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Sigismund Augustus. From his retreat he commenced a correspondence with Ivan, in which he reproached him for his many cruelties. Ivan in his answer declared that he was quite justified in taking the lives of his slaves, if he thought it right to do so, While living in Lithuania, Kurbski appeared as the defender of the Greek faith, which was being undermined by the Jesuits. He died in exile in 1583. Kurbski was a fluent writer, but Bestu-zheff Riumin thinks that his hatred of Ivan led him to exaggerate, and he regrets that Karamzin should have followed him so closely. Besides the answers of Ivan to Kurbski, there is his letter to Cosmas, and the brother-hood of the Cyrillian monastery on the White Lake (Bielo Ozero), in which he reproaches them for the self-indulgent lives they are leading. Other works of the 16th century are the Stepennaya Kniga, or "Book of Degrees " (" or Pedi- grees"), in which historical events are grouped under the reigns of the grand-dukes, whose pedigrees are also given ; and the Life of the Czar Feodor Ivanovich (1584-1598), written by the patriarch Job. To the beginning of the 17th century belongs the Chronograph of Sergius Kubasoff of Tobolsk. His work extends from the creation of the world to the accession of Michael Romanoff, and contains interesting accounts of such of the members of the Russian royal family as Kubasoff had himself seen. Something of the same kind must have been the journal of Prince Mstislavski, which he showed the English ambassador Jerome Horsey, but which is now lost.!

To the time of the first Romanofis belongs the story of the siege of Azoff, a prose poem, which tells us, in an inflated style, how in 1637 a body of Cossacks trium- phantly repelled the attacks of the Turks. They had seized this town, which they were anxious to hand over to the czar Michael, but circumstances were not ripe for it. There is also an account of the siege of the Troitza monastery by the Poles during the '"""Smutnoye Vremya," or Period of Troubles, as it is called,—that which deals with the adventures of the false Demetrius and the Polish invasion which followed. But all these are surpassed by the work on Russia of Gregory Karpoff Kotoshikhin. He served in the ambassador's office (posolski prikaz), and when called upon to give information against his col- leagues fled to Poland about 1664. Thence he passed into Sweden and wrote his account of Russia at the request of Count Delagardie, the chancellor of that country. He was executed about 1669 for slaying in a quarrel the master of the house in

which he lived. The manuscript was found by Prof. Solovieff (not the eminent historian lately deceased) at Upsala and printed in 1840. A new edition has recently appeared, and Prof. Grote has col- lected some fresh facts about the author's life, but we have no space here for a minute examination of them. The picture which Kotoshikhin draws of his native country is a sad one: ignorance, cruelty, and superstition are seen everywhere rampant. His work is of great import- ance, since it is from his description, and the facts we gather from the Domostroi, that we can reconstruct the Old Russia of the time before Peter the Great, as in our days the valuable labours of M. Zabielin have done in his work on Russian domestic life. Perhaps, as an exile from his country, Kotoshikhin has allowed himself to write too bitterly. A curious work is the Uriaduk Sokol- michia Puti (" Directions for Falconry"), which was written for the use of the emperor Alexis, who, like many Russians

1 Horsey says: 'I read in their cronickells written and kept in secreat by a great priem prince of that country named Knez Ivan Fedorowich Mistisloskoie, who, owt of his love and favour, imparted unto me many secreats observed in the memory and procis of his tyme, which was fowerscore years, of the state, natur, and government of that comonweelth."—Bond, Russia at the Close of the Sixteenth Century (Hakluyt Society), 1856.

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was defended by Stephen Yavorski.

of old time, was much addicted to this pastime. The Serb, Yuri Krizhanich, who wrote in Russian, was the first Pan- slavist, anticipating Kollar by one hundred and fifty years or more. He wrote a critical Servian grammar (with comparison of the Russian, Polish, Croatian, and White Russian), which was edited from the manuscripts by Bodianski in 1848. For his time he had a very good insight into Slavonic philology. His Panslavism, how- ever, sometimes took a form by no means practical. He went so far as to maintain that a common Slavonic language might be made for all the peoples of that race,— an impossible project which has been the dream of many

enthusiasts. From some unexplained cause he was ban- ished to Siberia, and finished his grammar at Tobolsk. He also wrote a work on the Russian empire, which was edited by Beszonoff in 1860. In it he shows him- self a widely-read man, aud with very extensive Western culture. The picture drawn, as in the corresponding production of Kotoshikhin, is a very gloomy one. The great remedy suggested by the Serb is education. To this period belongs the life of the patriarch Nikon by Shusherin. The struggles of Nikon with the czar, and his emendations of the sacred books, which led to a great schism in Russia, are well known. They have been made familiar to Englishmen by the eloquent pages of Dean Stanley.2, At Moscow may be seen the portrait of this celebrated divine and his tomb; his robes, which have been preserved, show him to have been a man of 7 feet in stature. The mistakes which had crept into the translation of the Scriptures, from the blunders of genera- tions of copyists, were frequently of a ludicrous character ; still, a large number of the people preferred retaining them, and from this revision may be dated the rise of the Raskolniks (Dissenters) or Staro-obriadtzi (those who adhere to the old ritual), With the name of Simeon Polotzki (1628-1680) the old period of Russian literature may be closed. He was tutor to the czar Feodor, son of Alexis, and may be said in a way to have helped to introduce the culture of the West into Russia, as he was educated at Kieff, then a portion of Polish territory. Polotzki came to Moscow about 1664. He wrote religious works (Vienetz Viert, “The Garland of Faith,”) and composed poems and religious dramas (The Prodigal Son, Nebuchadnezzar, &c.). He has left us some droll verses on the czar’s new palace of Kolomenskoe, which are very curious doggerel. ‘The artificial lions that roared, moved their eyes, and walked especially delighted him. Alexis had probably ordered something to be constructed resem- bling the machinery we find mentioned in the Byzantine writers. There does not seem to be any ground for the assertion (often met with even in Russian writers) that Sophia, the sister of Peter the Great, was acquainted with French, and translated some of the plays of Moliére.

And now all things were to be changed as if by an enchanter’s wand. Russia was to leave her martyrologies and historical stories and fragmentary chronicles, and to adopt the forms of literature in use in the West. One of the chief helpers of Peter the Great in the education of the people was Feofane (Theophanes) Procopovich, who advocated the cause of science,

and attacked unsparingly the superstitions then prevalent ; the cause of conservatism The Rock of Faith of the latter was written to refute the Lutherans and Calvinists. Another remarkable writer of the times of Peter the Great was Pososhkoff, who produced a valuable work on Poverty and Riches, a kind of treatise on political economy. Antiokh Kantemir (1708-1744), son of a former hospodar of Moldavia, wrote some clever satires still read; they are imitated from Boileau. He also

2 Lectures on the Kastern Church.

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Krizha- nich,

Polotzki.

The modern period.

Lomono- soff,

Tatis- tcheff.

Tredia- kovski,

Sumaro- koff.

Kniazh- nin,

Khera- skoff.

Bogdan- ovich.

Khem- nitzer.

Visin.

translated parts of Horace. Besides his satires, he pub- lished versions of Fontenelle's Pluralité des Mondes and the histories of Justin and Cornelius Nepos. He was for some time Russian ambassador at the courts of London and Paris. But more celebrated than these men was MicHaEL Lomonosorr (q.v.). He was an indefatigable writer of verse and prose, and has left odes, tragedies, didactic poetry, essays, and fragments of epics; without being a man of great genius he did much to advance the education of his country. He also made many valu- able contributions to science. Basil Tatistcheff (1686- 1750), a statesman of eminence, was the author of a Rus- sian history which, although written in a confused style and hardly superior to a chronicle, is interesting as the first attempt in that field, which was afterwards so successfully cultivated by Karamzin, Solovieff, and Kosto- maroff. His work was not given to the world till after his death. There had been a slight sketch published before by Khilkoff, entitled the Marrow of Russian History. Basil Trediakovski (1703-1769) was but a poor poetaster, in spite of his many productions. He was born at Astrakhan, and we are told that Peter, passing through that city at the time of his Persian expedition, had Trediakovski pointed out to him as one of the most promising boys of the school there. Whereupon, having questioned him, the czar said, with truly prophetic insight, "A busy worker, but master of nothing." His Zelemakhida, a poem in which he versified the Télémaque of Fénelon, drew upon him the derision of the wits of the time. He had frequently to endure the rough horse-play of the courtiers, for the position of a literary man at that time in Russia was not altogether a cheerful one.

From the commencement of the reign of Elizabeth Russian literature made great progress, the French furnishing models. Alexander Sumarokoff (1718-1777) wrote prose and verse in abundance—comedies, tragedies, idyls, satires, and epigrams. He is, perhaps, best entitled to remembrance for his plays, which are rhymed, and in the French style. It took the Russians some time to find out that their language was capable of the unrhymed iambic line, which is the most suitable for tragedy. His Dmitri Samozanetz ("Demetrius the Pretender") is certainly not without merit. Some of the pieces of Kniazhnin had great success in their time, such as The Chat- terbox, The Originals, and especially The Fatal Carriage. He is now, however, almost forgotten. In 1756 the first theatre was opened at St Petersburg, the director being Sumarokoff. Up to this time the Russians had

acted only religious plays, such as those written by Simeon Polotzki. The reign of Catherine IL. (1762-96) saw the rise of a whole generation of court poets, many of whom were at best but poor writers. Everything in Russia was to be forced like plants in a hot-house; she was to have Homers, Pindars, Horaces, and Virgils. Michael Kheraskoff (1733-1807) wrote besides other poems two enormous epics—the Rossiada in twelve books, and Vladimir in eighteen ; they are now but little read. Although they are tedious poems on the whole, yet we occasionally find spirited passages. Bogdanovich (1743-1803) wrote a pretty lyric piece, Dushenka, based upon La Fontaine, and telling the old story of the loves of Cupid and Psyche. Perhaps the elegance of the versification is the best thing to be found in it. With Ivan Khemnitzer begins the long list of fabulists ; this half-Oriental form of literature, so common in countries ruled absolutely, has been very popular in Russia. Khemnitzer (1744-1784), whose name seems to imply a German origin, began by translating the fables of Gellert, but afterwards produced original specimens of this kind of literature. A writer of real national comedy appeared in Denis von Visin, probably of

German extraction, but born at Moscow (1745-1792), His best production is Vedorosl (‘‘The Minor”), in which he satirizes the coarse features of Russian society, the ill- treatment of the serfs, and other matters. The colouring of the piece is truly national. He has also left some very good letters describing his travels. He saw France on the eve of the great Revolution, and has well described what he did see. Russian as he was, and accustomed to serfdom, he was yet astonished at the wretched condi- tion of the French peasants. The great poet of the age of Catherine, the laureate of her glories, was Gabriel Der- Derzhavin (1743-1816). He essayed many styles of zhavin, composition, and was a great master of his native language, Many of his lyric pieces are full of fire. No one can deny the poet a vigorous imagination and a great power of expressing his ideas. There is something grandiose and organ-like in his high-sounding verses; unfortunately he occasionally degenerates into bombast. His versification is perfect ; and he had the courage, rare at the time, to write satirically of many persons of high rank. His Ode to God is the best known of his poems in Western countries, We can see from some of his pieces that he was a student of Edward Young, the author of the Night Thoughts, Tawdry rhetoric, containing, however, occasionally fine and original thoughts,

rendered this writer popular throughout Europe. Other celebrated poems of Derzhavin are the Odes on the Death of Prince Mestcherski, The Nobleman, The Taking of Ismail, and The Taking of Warsaw.

An unfortunate author of the days of Catherine was Radis- Alexander Radistcheff, who, having, in a small work, A teheft Journey to Moscow, spoken too severely of the miserable condition of the serfs, was punished by banishment to Siberia, from which he was afterwards allowed to return, but not till his health had been permanently injured by his sufferings. An equally sad fate befell the spirited writer Novikoff, who, after having worked hard as a Novikoft journalist, and done much for education in Russia, fell under the suspicion of the Government, and was imprisoned by Catherine. On her death he was released by her successor. The short reign of Paul was not favour- able to literary production; the censorship of the press was extremely severe, and many foreign books were excluded from Russia. Authors and lovers of literature were liable to get into trouble, as we see by the experiences of the poet Kotzebue and pastor Seidler.

But a better state of things came with the reign of Alexander, one of the glories of whose days was Nicwonas Karamuin, KaRaMZzIn (q.v.). His chief work is his History of the Russian Empire, but he appeared in the fourfold aspect of historian, novelist, essayist, and poet. Nor need we do more than mention the celebrated Archbishop PiaTon Platon. (q.v.). Ivan Dmitrieff (1760-1837) wrote some pleasing Dmitrief lyrics and epistles, but without much force. He is like some feeble British poets towards the close of last cen- tury, in whom the elegance of the diction will not atone for the feebleness of the ideas. He appears from his translations to have been well acquainted with the English poets. Ozeroff wrote a great many tragedies, which are Ozerofi. but little read now. ‘They are in rhyming alexandrines.

His form belongs to the false classical school, but he occasionally handled native subjects with success, as in his Dmitri Donskoi and Yaropolk and Oleg. In Ivan Kriloft Kriloff (1768-1844) the Russians found their most genial fabulist, His pieces abound with vigorous pictures of Russian national life, and many of his lines are standard quotations with the Russians, just as Hudibras is with our- selves. Long before his death Kriloff had become the most popular man in Russia. He resembled La Fontaine not

only in the style of his verse but in his manner of life. He was the same careless, unpractical sort of person, and

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ie- the novel, and many others.

showed the same simplicity of character. As Derzhavin was the poet of the age of Catherine, so Zhukovski (1783- 1852) may be said to have been that of the age of Alexander. He is more remarkable, however, as a trans- lator than as an original poet. With him Romanticism began in Russia. The pseudo-classical school, led by the

French, was now dead throughout Europe. In 1802 he published his version of Gray's Elegy, which at once became a highly popular poem in Russia. Zhukovski

translated many pieces from the German (Goethe, Schiller, Uhland) and English (Byron, Moore, Southey). One of his original productions, "The Poet in the Camp of the Russian Warriors," was on the lips of every one at the time of the war of the fatherland (Otechestvennaia Voina) 'n 1812. He attempted to familiarize the Russians with all the most striking specimens of foreign poetical litera- ture. He produced versions of the episode of Nala and Damayanti from the Mahabharata, of Rustam and Zohrab from the Shah-Namah, and of a part of the Odyssey. In the case of these three

masterpieces, however, he was obliged to work from literal translations (mostly German), as he was unacquainted with the original languages. The

Iliad was translated during this period by Gnedich, who

was familiar with Greek. He has produced a faithful and spirited version, and has naturalized the hexameter in the Russian language with much skill. Constantine Batiushkoff

- (1787-1855) was the author of many elegant poems, and

at the outset of his career promised much, but sank into imbecility, and lived in this condition to an advanced age. Merzliakoff and Tziganoff deserve a passing notice as the writers of songs some of which still keep their popularity. As the poet of the age of Catherine was Derzhavin, and of that of Alexander Zhukovski, so the next reign, that of Nicholas, was to have its representative poet, by the common consent of his critics the greatest whom Russia had yet seen. During his short life (1799-1837) Alexander Pushkin produced many celebrated poems, which will be found enumerated in the article devoted to him (see Pousuxin). It may suffice to say here that he tried almost all styles of composition—the drama, lyric poetry, In Alexander Griboiedoff (1794-1829) the Russians saw the writer of one of their most clever comedies (Gore ot Uma), which may perhaps be translated “The Misfortune of being too Clever” (lit. “Grief out of Wit”). The fate of Griboiedoff was sad ; he was murdered in a riot at Teheran, where he was residing as Russian minister at the court of Persia. The poet is said to have had a presentiment of his fate and to have been unwilling to go. Pushkin, while travelling in the Caucasus, in the track of the army of Paskewitch, met the body of his friend, which was being carried to Tiflis for burial. The satirical powers of Griboiedoff come out in every line of his play; he was unquestionably a man of genius. A few words may be allowed to Ivan Kozloff (1774-1838), the author of some pretty original lyrics, and some translations from the English, among others Burns’s Cotter’s Saturday Night. He became a cripple and blind, and his misfortunes elicited some cheering and sympathetic lines from Pushkin, which will always be read with pleasure.

Since the death of Pushkin, the most eminent Russian

‘ poet is Lermontoff (1814-41); his life terminated, like

that of his predecessor, ina duel. He has left us many exquisite lyrics, mostly written in a morbid and melan- choly spirit. In quite a different vein is his clever imita- tion of a Russian bilina, “Song about the Czar Ivan Vasilievich, the Young Oprichnik, and the Bold Mer- chant Kalashnikoff.” The poet was of Scotch extrac- tion (Learmont), the termination being added to Russify his name. In one of his pieces he has alluded to his

Caledonian ancestors. His chief poems are “The Demon,” “The Novice” (‘Mtziri,” a Georgian word), and “ Hadji Abrek.” He also wrote a novel, A Zero of our Time. He has faithfully reproduced in his poems the wild and varied scenery of the Caucasus and Georgia; from them he has drawn his inspiration—feeling, no doubt, that the flat grey landscapes of northern Russia offered no attractions to the poet. people, and one of their most truly national authors, was Koltzoff (1809-1842), the son of a tallow merchant of Voronezh. He has left usa few exquisite lyrics, which are to be found in all the collections of Russian poetry. He died of consumption after a protracted illness. Another

poet who much resembled Koltzoff was Nikitin, born Nikitin.

in the same town, Voronezh. His life was spent in poverty; his father was an incurable drunkard, and brought his family to the greatest distress. Nikitin, to support his relations, was obliged to keep an inn; this he was afterwards enabled to change for the more congenial occupation of a bookseller. He died in 1861. The novel in Russia has had its cultivators in Zagoskin and Lazhechnikoff, who imitated Sir Walter Scott. The most

celebrated of the romances of Zagoskin was Yurt Mzlo- Zagoskin.

slavski, a tale of the expulsion of the Poles from Russia in 1612. The book may even yet be read with interest ; it gives a very spirited picture of the times ; unfortunately, as is but too often the case with the writings of Sir

Walter Scott himself, a gloss is put upon the barbarity of the manners of the period, and the persons of the novel have sentiments and miodes of expressing them which could only have existed about two centuries afterwards. There is also too much of the sentimentalism which was prevalent at the time when the author wrote. Aniong the better known productions of Lazhechnikoff are The Heretic and The Palace of Ice. A flashy but now forgotten writer of novels was Bulgarin, author of Ivan Vishigin, a work which once enjoyed considerable popular-

ity. The first Russian novelist of great and original talent Gogol.

was Nicholas Gogol (1809-1852). In his Dead Souls he satirized all classes of society, some of the portraits being wonderfully vivid; take, for example, that of Pliush- kin, the miser. Being a native of Little Russia, he is very fond of introducing descriptions of its scenery and the habits of the people, especially in such stories as the Old-fashioned Household, or in the more powerful Taras Bulba. This last is a highly-wrought story, giving us a picture of the savage warfare carried on between thie Cossacks and Poles. Taras is brave, but perhaps too much of a barbarian to be made interesting to Western readers. He reminds us of some of the heroes of the Cossack poet Shevchenko. Gogol was also the author of a good comedy, The Reviser, wherein the petty pilferings of Russian muni- cipal authorities are satirized. In his Memoirs of a Mad- man and Portrait, he shows a weird and fantastic power which proves him to have been a man of strong imagina- tion. The same may be said of Zhe Cloak, and the curious tale Vii ("The Demon"), where he gives us a picture of Kieff in the old days. He has very dexterously interwoven his tales with the traditions and superstitions of Little Russia. The fate of Gogol was sad; he sank into religious melancholy, and ultimately into imbecility. He made great efforts to destroy all his writings, and indeed burnt most of the second part of his Dead Souls; only fragments have been preserved. His Confessions of an Author is the production of a mind verging on insanity. He died in 1852, aged forty-two. Since his time the novel has been very much cultivated in Russia, the school culminating in Ivan Turgenieff, but it is the school of Thackeray and Dickens, not that of Balzac and George Sand. The Russians seem to affect especially the realistic

A genuine bard of the Koltzoff.

Herzen.

Turgen- ieff.

Belinski.

His- torians. Polevoi.

novels of England. Among the most conspicuous of these writers was the celebrated Alexander Herzen, author of a striking romance, Kto Vinovat ? (“Who is to Blame ?”), which he published under the assumed name of Iskander. The public career of Herzen is well known. The freedom of his opinions soon embroiled him with the authorities. He was exiled to Perm, and, seizing the first opportunity which offered itself of passing the Russian frontiers, he spent the remainder of his life chiefly in France and England, and died at Geneva in 1869. His celebrated journal Kolokol (‘The Bell”) had a great circulation. A novelist of repute was Goncharoff, his two chief works being A Common-place Story and Oblomof Grigorovich has written The /isherman and The Emigrants. Pisemski, another novelist of the realistic type, is the author of The Man of St Petersburg and Liesht (“ The Wood Demons”). Other novelists of celebrity are Salttkoff, who writes under the name of Stchedrin, and whose Provincial Sketches pub- lished a few years ago made a great sensation and have been followed by Letters to My Aunt and other works; Dostoievski (d. 1881), author of Poor People, Letters from the fTouse of the Dead (describing his impressions of Siberia, whither he was banished in consequence of a political offence), a powerful writer; and Ostrovski. We may also add Ryeshetnikoff, who takes his characters from the humbler classes ; he died at the early age of thirty-nine. All these are disciples of the school of Dickens and Thackeray. Count

On September 4, 1883, died Ivan Turgenieff, aged sixty-four, the most eminent Russian novelist, and perhaps the only Russian man of letters universally known. His celebrity dates from his Memoirs of a Sportsman, in which he appears as the advocate of the Russian muzhth or pea- sant. He

had witnessed in his youth many sad scenes at his own home, where his mother, a wealthy lady of the old school, treated her serfs with great cruelty. The poet devoted all his energies to procure their emancipation. This work was followed by a long array of tales, too well known to need recapitulation here, which have gained their author a European reputation, such as Dvorianskoe Gnezdo ("A Nest of Gentle People"), one of the most pathetic tales in any language, Vou ("Virgin Soil"), and others ; nor can the minor tales of Turgenieff be forgotten, especially Mumu, a story based upon real life, for the dumb door- keeper was a serf of his mother's, and experienced her ill- treatment. His last two works were Poetry in Prose and Clara Milich.

In Belinski the Russians produced their best critic. For thirteen years (1834-1847) he was the Aristarchus of Russian literature and exercised a healthy influence. In his latter days he addressed a withering epistle to a on the newly-adopted reactionary views of the atter.

Since the time of Karamzin the study of Russian history has made great strides. He was followed by Nicholas Polevoi, who wrote what he called the LTistory of the Russian People, but his work was not received with much favour and has now fallen into oblivion. Polevoi was a self-educated man, the son of a Siberian merchant re besides editing a well-known Russian journal The Telegraph, he was also the author of many plays, among others a translation of Hamlet. Since his time, however, the English dramatist has been produced in a more

perfect dress by Kroneberg, Druzhinin, and others. In

the year 1879 died Sergius Solovieff, whose story Of Solovieg

fussia had reached its twenty-eighth volume, and fragments of the twenty-ninth were published after his death. This stupendous labour lacks something of the critical faculty, and perhaps may be described rather as a quarry of materials for future historians of Russia than an actual history. During 1885 the Russians have had to

mourn the loss of Kostomaroff, the writer of many valuable Kosto. monographs on the history of their country, of which those marol,

on Bogdan Khmelnitzki and the False Demetrius deserve special mention. From 1847 to 1854 Kostomaroff, who had become obnoxious to the Russian Government, wrote nothing, having been banished to Saratoff, and forbidden to teach or publish. But after this time his literary activity begins again, and, besides separate works, the leading Russian reviews, such as Old and New Russia, The His- torical Messenger, and The Messenger of Europe, contain many contributions from his pen of the highest value, In 1885 also died Constantine Kavelin, the author of many valuable works on Russian law, and Kalatcheff, who published a classical edition of the old Russian codes, Tlovaiski and Gedeonoff have attempted to upset the general belief that the founders of the Russian empire were Scandinavians. Their opinions have been alluded to above (p. 87). A good history of Russia was published by

Ustrialoff (1855), but his most celebrated work was his Ustris Tzarstvovame Petra Velikago (“ Reign of Peter the Great”); loft.

in this many important documents first saw the light, and the circumstances of the death of the unfortunate Alexis were made clear. Russian writers of history have not generally occupied themselves with any other subject than that of their own country, but an exception may be found in the writings of Granovski, such as Abbé Suger (1849) and Hour Historical Portraits (1850). So also Kudriay- tzoff, who died in 1850, wrote on “The Fortunes of Italy, from the Fall of the Roman Empire of the West till its Reconstruction by Charlemagne.” He also wrote on “The Roman Women as described by Tacitus.” We may add Kareyeff, now professor at Warsaw, who has written on the condition of the French peasantry before the Revolu- tion. Other writers on Russian history have been Pogo- dine, who compiled a History of Russia till the invasion of the Mongols, 1871, and especially Zabielin, who has written a Ilistory of Russian Life from the most Remote Times (1876), and the Private Lives of the Ozarinas and Cars (1869 and 1872). Leshkoff has written a History of Rus- stan Law to the 18th Century, and Tchitcherin a Listory of Provincial Institutions in Russia in the 17th Century (1 856). To these must be added the work of Zagoskin, LMistory of Law in

the State of Muscovy (Kazan, 1877). Prof. Michael Kovalevski, of the university of Moscow, is now publish- ing an excellent work on Communal Land Tenure, in which he investigates the remains of this custom throughout the world. Of the valuable history of Russia by Prof. Bestuzhefi-Riumin (1872) one volume only has appeared ; the introductory chapters giving an account of the sources and authorities of Russian history are of the highest value. It is the most critical history of Russia which has yet appeared. In 1885 Dubrovin published an excellent his- tory of the revolt of Pugatcheff. The valuable work by Messrs Pipin and Spasovich, History of Slavonic Litera- tures, is the most complete account of the subject, and has been made more generally accessible to Western stu- dents by the German translation of Pech. The Llistory of Slavonic Literature by Schafarik, published in 1826, has long been antiquated. Previous. to this, a history of Russian literature by Paul Polevoi had appeared, which has gone through two editions. It is modelled upon Cham- bers's Cyclopxdia of English Literature. The account of

the Polish rebellion of 1863 by Berg, published in 1873, which gave many startling and picturesque episodes of this celebrated struggle, has now been withdrawn from circulation. It appeared originally in the pages of the Russian magazine, Starina.

Since the death of Lermontoff the chief Russian poet who has appeared is Nicholas Nekrasoff, who died in 1877. He has left six volumes of poetry, which in many respects remind us of the writings of Crabbe; the poet dwells mainly upon the melancholy features of Russian life. He is of that realistic school in which Russian authors so much resemble English. Another writer of poetry deserving mention is Ogarieff, for a long time the companion in exile of Herzen in England; many of his compositions appeared in the Polar Star of the latter, a medley of prose and verse, which contains some very important papers, including the interesting autobiographical sketches of Herzen, entitled Béloe ¢ Dumi ("The Past and my Thoughts"). Maikoff at one time enjoyed great popu- larity as a poet; he is a kind of link between the present generation and that of Pushkin, of whose elegance of versification he is somewhat of an imitator. Another poet of a past

generation was Prince Viazemski, whose works are now being collected. Graceful lyrics have also becn written by Mei, Fet (whose name would apparently prove Dutch extraction, Veth), Stcherbina, and, going a little farther back, Yazikoff, the friend of Pushkin, and Khomi- akoff, celebrated for his Slavophile propensities. To these may be added Mdlle Zhadovskaia, who died a short time ago, Benediktoff, Podolinski, and Tiutcheff. It will be seen that in Russia (as in England) lyrical poetry is almost the only form now cultivated. It is becoming more and more coloured with imitations of the bilini and reproduc- tions of the old Russian past, which is perhaps getting treated somewhat fantastically, as was the old Irish life in the Irish melodies of Moore. Occasionally Polonski con- tributes one of his exquisite lyrics to the Veestnik Yevropi ("European Messenger ").

Excellent works on subjects connected with Slavonic philology have been published by Vostokoff, who edited the Ostromir Codex, mentioned above (p. 103), and Sreznevski and Bodianski, who put forth an edition of the celebrated codex used at Rheims for the coronation of the French kings. Since their deaths their work has been carried on by Prof. Grote (Philological Investigations, also many critical editions of Russian classics). Budilovich, now a professor at Warsaw, Potebnya of Kharkoff, and Baudoin de Courtenay, who, among other services to philology, has described the Slavonic dialect spoken by the Resanians, a tribe living in Italy, in two villages of the Julian Alps. The songs (bilini) of the Russians have been collected by Zakrevski, Ribnikoff, Hilferding, Barsoff, and others, and their national tales by Sakharoff, Afanasieff, and Hrlen- vein. Kotliarevski, Tereshenko, and others have treated of their customs and superstitions, but it is to be regretted that no one as yet has made a complete study of the vexed question of Slavonic mythology. At the present

Language"), by Dahl, has gone into a second edition. Alexander Hilferding published some valuable works on ethnology and philology, among others on the Polabes, an extinct Slavonic tribe who once dwelt on the banks of the Elbe. Although they have produced some good Sla- vonic scholars, the Russians have not exhibited many works in the field of classical or other

branches of philo- logy. Exception, however, must be made in favour of the studies of Tchubinoff in Georgian, Minayeff in the Indian, and Tzvetayeff in the old languages of Italy.

In moral and mental philosophy the Russians have pro- duced but few authors. We meet with some good mathe- maticians, Ostrogradski among others, and in natural science the publications of the Society for Natural History at Moscow have attracted considerable attention.

Since the Boris Godunoff of Pushkin, which was the Recent first attempt in Russia to produce a play on the Shake- drama.

spearian model, many others have appeared in the same style. A fine trilogy was composed by Count A. Tolstoi on the thrce subjects, Zhe Death of Ivan the Terrible (1866), Zhe Czar Feodor (1868), and The Czar Boris (1869). Other plays of merit have been written by Ostrovski and Potiekhin.

Many excellent literary journals and magazines make Serials.

their appearance in the country; among these may especially be mentioned the time-honoured Viestnik Yevropt (‘Messenger of Europe”), which contains some of the most brilliant writing produced in the Russian empire. The Zstoricheski Viestnek (‘‘ Historical Messenger”) is full of curious matter, and does not confine itself merely to Russian subjects. It is edited by M. Shubinski, the author of some pleasant sketches on the manners of Russia in the old time. On the contrary Stara (the “Antiquary,” if we may so freely translate the original name) is entirely Russian, and is a valuable repertory of documents concerning the history of the country, and memoirs, especially relating to the latter part of the 17th century. The highly interesting magazine Drevnaia + Novaia Rossia did not protract its existence beyond six years, having come to an end in 1881. Many of the best Russian writers contributed to it; it contains much valuable material for the student of history. The Russkiz Arkhiv is edited by M. Bartenieff, and has long been celebrated ; some of the most important notes on Russian history of the 18th and 19th century have appeared in this journal. During the last few years extensive excava- tions have been made in many parts of Russia, and much has been done to throw light upon the prehistoric period of the country. A large “ kurgan,” called Cherna Mogila, or the Black

Grave, was opened by Samokvasoff in the government of Tchernigoff and described in the pages of Old and New Russia. Explorations have been carried on on the site of Bolgari, the ancient capital of the Ugrian Bolgars on the Volga. One of the most active workers in this field was the late Count Uvaroff (d. 1884), who pub- lished a valuable monograph on the Stone Age in Russia, and many other important works.

A few words must be said on the literature of the Russian The Little dialects, the Little and White Russian, The Little Russian is Russian rich in skazki (tales) and songs. Peculiar to them is the dwma, dialcct,

a narrative poem which corresponds in many particulars with the or Malo-

time Stanislaus Mikutzki, professor at the university of Warsaw, is publishing his Materials for a Dictionary of the Roots of the Russian and all Slavonic Dialects, but,

unfortunately, it represents a somewhat obsolete school of philology. The Early Russian Text Society continues its useful labours, and has edited many interesting monu- ments of the older Slavonic literature. Quite recently two valuable codices have been printed in Russia, Zogra- phus and Marianus, interesting versions of the Gospels in Palxeoslavonic. They were edited by the learned Croat Jagié, who now occupies the chair of Sreznevski in St Petersburg. An excellent Tolkovi Slovar Velikorusskago Yazika (“Explanatory Dictionary of the Great Russian

Russian bilina. when curiosity was first aroused on the subject of national poetry, the Little Russian dwmt have been repeatedly edited, as by Maksimovich Metlinski and others. An elaborate edition (far surpassing the earlier ones) was commenced by Dragomanoff and Antonovich, but as yet only one volume and a portion of a second have made their appearanee. Just as the bilini of the Great Russians, so also these dumi of the Little Russians admit of classification, and they have been divided by their latest editors as follows :—(1) the songs of the druzhina, treating of the early princes and their followers ; (2) the Cossack period (Kozachestvo), in which the Cossacks are found in continual warfare with the

Since the commencement of the present century, russian.

Shev- chenko.

Polish pans and the attempts of the Jesuits to introduce the Roman Catholic religion ; (3) the period of the Haidamaks, who formed the nucleus of the national party, and prolonged the struggle. The gradual break up of the military republic of these sturdy freebooters has already been described. :

The foundation of the Little Russian literature (written, as opposed to the oral) was laid by Ivan Kotliarevski (1769-1838), whose travesty of part of the dneid enjoys great popularity among some of his countrymen. Others, however, object to it as tending to bring the language or dialect into ridicule. A truly national poet appeared in Taras Shevehenko, born at the village of Kirilovka in the government of Kieff, in the condition of aserf. The strange adventures of his early life he has told us in his autobiography. He did not get his frecdom till some time after he had reached manhood, when he was purchased from his master by the gener- ous efforts of the poet Zhukovski and others. Besides poetry, he occupied himself with painting with considerable success. He unfortunately became obnoxious to the Government, and was punished with exile to Siberia from 1847 to 1857. He did not long survive his return, dying in 1861, aged forty-six. No one has described with greater vigour than Shevchenko the old days of the Ukraine. In his youth he listened to the village traditions handed down by the priests, and he has faithfully reproduced them. The old times of Nalivaiko, Doroshenko, and others live over again. Like Gogol he is too fond of describing scenes of bloodshed. In the powerful poem entitled Haidamak we have a graphic picture of the horrors enacted by Gonta and his followers at Uman. The sketches are almost too realistic. Like Burns with the old Scottish songs, so Shevchenko has reproduced admirably the spirit of the lays of the Ukraine. All those familiar with his works will remember the charming little lyrics with which they are interspersed. The funeral of the poet was a vast public procession ; a great cairn, surmounted with a cross, was raised over his remains, where he lies buried near Kanioff on the banks

South Russian Revolutionists.” He is the great national poct of the Sonthern Russians. A complete edition of his works, with interesting biographical notices—one contributed by the novelist Turgenieti—appeared at Praguc in

1876. Besides the nationa] songs, excellent eollections of the South Russian folk-tales have appeared, edited by Dragomanoff, Rudchenko, and others. Many of these are still recited by the “tchumaki” or wandering pedlars, A valuable work is the Zapiski o Yuzhnoi Rossii (“Papers on Southern Russia”), published atSt Petersburg in 1857 by Panteleimon Kulish, After he got into trouble (with Kostomaroff and Shevchenko) for his political views, the late works of this author show him to have undergone a complete change. Other writers using the Little Russian language are Marko-Vovchok (that is, Madame Eugenia Markovich), and Yuri Fedkovich, who employs a dialeet of Buko- vina. Fedkovich, like Shevchenko, sprang from a peasant family, and served as a soldier in the Austrian army against the French during the Italian campaign. Naturally we find his poems filled with descriptions of life in the camp. Like the Croat Preradovié, he began writing poetry in the German language, till he was turned into more natural paths by some patriotie friends. A eollection of songs of Bukovina was published at Kieff in 1875 by Lona- chevski. At the present time Eugene Zelechowski continues his valuable Dictionary of Little Russian, of which about one half has appeared. This promises to be a very useful book, for up to the present time students have been obliged to rest satisfied with the scanty publications of Levchenko, Piskunoff, and Verchratzki, There is a good grammar by Osadtza, a pupil of Miklosich.

In the White Russian dialect are to be found only a few songs, White with the exception of portions of the Scriptures and some legal Russian documents. A valuable dictionary was published a short time ago dialect, by Nosovich, but this is one of the most neglected of the Russian dialects, as the part in which it is spoken is one of the dreariest of the empire. Collections of White Russian songs have been published by Shein and others. For details regarding this and the

of the Dnieper. His grave has been styled the ‘‘ Mecca of the | other Russian dialects see SLAVS. (W. R. M.) INDEX.

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RUSTCHUK (Rus¢évx), a city of Bulgaria, Turkey in Europe, on the south bank of the Danube, opposite Giurgevo, at the point where the river receives the waters of the Lom, a fine stream from the northern slopes of the Balkans. Since 1867 it has been connected by rail (139 miles) with Varna. The town was nearly destroyed by the Russian bombardment from Giurgevo in 1877, and the military works have since been dismantled in terms of the treaty of Berlin. Its position on the river frontier of Turkey long made it a place of strategic importance. In 1871 the population was about 23,000 (10,800 Turks, 7700 Bulgarians, 1000 Jews, 800 Armenians, 500 Gipsies,

800 Wallachians and Serbs, 400 Western Europeans), and in 1881 it was returned as 26,163. :

In the time of the Romans Rustchuk was one of the fortified points along the line of the Danube. Inthe Tabula Peutingeriana it appears as Prisca, in the Antonine Itinerary as Scrantaprista, in the Notitia as Scragintaprista, and in Ptolemy as Priste Polis. Destroyed by the barbarian invasion, the town recovered its importance only in comparatively modern times. In 1810 it was eaptured by the Russians, and on his departure next year Kutusoff destroyed the fortifications. In 1828-29 and again in 1853-54 it played a part in the Russo-Turkish War, and in 1877, as already mentioned, it was nearly destroyed.

RUTH, Book or. The story of Ruth, the Moabitess, great-grandmother of David, one of the Old Testament

et

BUT

Hagiographa, is usually reckoned as the second of the five Megilloth or Festal Rolls. This position corresponds to the Jewish practice of reading the book at the Feast of Pentecost; Spanish MSS., however, place Ruth at the head of the Megilloth (see CanricLEs); and the Talmud, in a well-known passage of Baba Bathra, gives it the first place among all the Hagiographa. On the other hand the Septuagint, the Vulgate, and the English version make Ruth follow Judges. It has sometimes been held that this was its original place in the Hebrew Bible also, or rather that Ruth was originally reckoned as an appen- dix to Judges, since it is only by doing this, and also by reckoning Lamentations to Jeremiah, that all the books of the Hebrew canon can be reduced to twenty-two, the number assigned by Josephus and other ancient authori- ties. But it has been shown in the article LAMENTATIONS (q.v.) that the argument for the superior antiquity of this way of reckoning breaks down on closer examination, and, while it was very natural that a later rearrangement should transfer Ruth from the Hagiographa to the histor- ical books, and place it between Judges and Samuel, no motive can be suggested for the opposite change. That the book of Ruth did not originally form part of the series of Prophetx priores (Judges—Kings) is further probable from the fact that it is quite untouched by the process of “prophetic” or “Deuteronomistic” editing, which gave that series its present shape at a time soon after the fall of the kingdom of Judah; the narrative has no affinity with the point of view which looks on the.whole history of Israel as a series of examples of divine justice and mercy in the successive rebellions and repentances of the people of God.!_ But if the book had been known at the time when the history from Judges to Kings was edited, it could hardly have been excluded from the collection ; the ancestry of David was of greater interest than that of Saul, which is given in 1 Sam. ix. 1, whereas the old history names no ancestor of David beyond his father Jesse. In truth the book of Ruth does not offer itself as a document written soon after the period to which it refers; it presents itself as dealing with times far back (Ruth i. 1), and takes obvious delight in depicting details of antique life and obsolete usages; it views the rude and stormy period before the institution of the kingship through the softening atmosphere of time, which imparts to the scene a gentle sweetness very different from the harsher colours of the old narratives of the book of Judges. In the language, too, there is a good deal that makes for and nothing that makes against a date sub- sequent to the captivity, and the very

designation of a period of Hebrew history as “the days of the judges” is based on the Deuteronomistic additions to the book of Judges (ii, 16 sg.) and does not occur till the period of the exile. An inferior limit for the date of the book cannot be assigned with precision. It has been argued that, as the author seems to take no offence at the marriage of Israelites with Moabite women, he must have lived before the time of Ezra and Nehemiah (Ezra ix. ; Neh. xiii.) ; but the same argument would prove that the book of Esther was written before Ezra, and indeed ‘‘a disposi- tion to derive prominent Jewish families from proselytes prevailed to a much later date,” and finds expression in the Talmud (see Wellhausen-Bleek, p. 205). The lan- guage of Ruth, however, though post-classical, does not seem to place it among the very latest Old Testament books, and the manner in which the story is told is as remote from the legal pragmatism of Chronicles as from the prophetic pragmatism of .the editor of the older histories. The tone of simple piety and graciousness

1 The religious pragmatism lacking in the original is in part supplied by the Targum (i. 5, 6).

which runs through the narrative, unencumbered by the pedantry of Jewish legality, seems to indicate that the book was written before all the living impulses of Jewish literature were choked by the growing influence of the doctors of the law. In this respect it holds in Hebrew prose writing a position analogous to that of the older Chokma in Hebrew poetry. But the triumph of the scribes in literature as well as in law was not accomplished till long after the time of Ezra.

Wellhausen in Bleek, 4th edition, p. 204 sq., finds the clearest indication of the date of Ruth in the appended genealogy, Ruth iv. 18-22; compare his remarks in Prol. Gesch. Israels, p. 227 (Eng. tr., pp. 217 sq.). Salma (Salmon), father of Boaz, is a tribe foreign to old Judah, which was not “father” of Bethlehem till after the exile, and the names of Salma’s ancestors are also open to criti- cism. But this genealogy is also found in Chronicles, and is quite in the manner of other genealogies in the same book. That it was borrowed from Chronicles and added to Ruth by a later hand seems certain, for the author of Ruth clearly recognizes that Obed was

legally the son of Mahlon, not of Boaz (iv. 5, 10), so that from his standpoint the appended genealogy is all wrong.

The design of the book of Ruth has been much dis- cussed and often in too narrow a spirit; for the author is an artist who takes manifest delight in the touching and graceful details of his picture, and is not simply guided by a design to impart historical information about David's ancestors, or enforce some particular lesson. Now the interest of the story, as a work of art, culminates in the marriage of Boaz and Ruth, not in the fact that their son was David's ancestor, which, if the book originally ended with iv. 17, is only mentioned in a cursory way at the close of the story. Had the author's main design been to illustrate the history of the house of David, as many critics think, or to make the point that the noblest stock in Israel was sprung from an alien mother (Wellhausen), this design would certainly have been brought into more prominence. The marriage acquires an additional interest when we know that Ruth was David's great-grandmother, but the main interest is independent of that, and lies in the happy issue of Ruth and Naomi from their troubles through the loyal performance of the kinsman's part by Boaz. Doubtless the writer meant his story to be an example to his own age, as well as an interesting sketch of the past; but this is effected simply by describing the exemplary conduct of Naomi, Ruth, Boaz, and even Boaz's harvesters. All these act as simple, kindly, God-fearing people ought to act in Israel.

There is one antique custom which the writer follows with peculiar interest and describes with archeological detail as a_thing which had evidently gone out of use in his own day. By old Hebrew law, as by the old law of Arabia, a wife who had been brought into her husband's house by contract and payment of a price to her father was not set free by the death of her husband to marry again at will. The right to her hand lay with the nearest heir of the dead. Originally we must suppose, among the Hebrews as among the Arabs, this law was all to the disadvantage of the widow, whose hand was simply part of the dead man's estate; but, while this remained so in Arabia to the time of Mohammed, among the Hebrews the law early took quite an opposite turn ; the widow of a man who died childless was held to have a right to have a son begotten on her by the next kinsman, and this son was regarded as the son of the dead and succeeded to his inheritance so that his

name might not be cut off from Israel. The duty of raising up a son to the dead lay upon his brother, and in Deut. xxv. 5 is restricted to the case when brothers live together. In old times, as appears from Gen. xxxviii., this was not so, and the law as put in the book of Ruth appears to be that the nearest kinsman of the dead in general had a right to “redeem for himself” the dead man’s estate, but at the same time was bound to marry the widow. The son of this marriage was reckoned as the dead man’s son and succeeded to his property, so that the “redeemer” had only a temporary usufruct in it. Naomi was too old to be married in this way, but

she had certain rights over her husbaud’s cstate which the next kinsman had to buy up before he could enter on the property. And this he was willing to do, but he was not willing also to marry Ruth and beget on her a son who would take the name and estate of the dead and leave him out of pocket. He therefore withdraws and Boaz comes in in his plaee. That this is the sense of the transaction is clear; there is, however, a little obseurity in iv. 5, where one lettcr seems to have fallen out and we must read on FATS Ds, and translate “What day thou buyest the field from Naomi thou must also buy Ruth,” &c. Comp. vv. 9, 10.

Among older commentaries speeial mention may be made of J. B. Carpzov, Collegium rabbinico-biblicum tn libellum Ruth, Leipsie, 1703. In recent times.Ruth has usually been taken up by commentators along with Jupcxs

(g.v.).

RUTHENIANS. See Stavs. For Ruthenian (Little Russian) literature, see Russta.

RUTHENIUM. See PLatTinum.

RUTHERFURD, or Rutuerrorp, Samuet (1600- 1661), Scottish divine, was born about 1600 at the village of Nisbet in Roxburghshire. He is supposed to have received his early education at Jedburgh, and he entered the university of Edinburgh in 1617. He graduated M.A. in 1621, and two years afterwards was elected professor of humanity. On account of some alleged

indiscretion or irregularity connected with his marriage in 1625, he resigned his professorship in that year, but, after study- ing theology, he was in 1627 appointed minister of An- woth, Kirkcudbrightshire, where he displayed remarkable diligence and zeal, alike as preacher, pastor, and student, and soon took a leading place among the clergy of Galloway. In 1636 his first book, entitled Hrercitationes de Gratia —an elaborate treatise against Arminianism—appeared at Amsterdam, and attracted some attention both in Great Britain and on the Continent. Combined with his strict and non-conforming presbyterianism, the severe Calvinism set forth in this work led to a prosecution by the new bishop of the diocese, Sydserff, in the High Commission Court, first at Wigtown and afterwards at Edinburgh, with the result that Rutherfurd was deposed from his pastoral office, and sentenced to confinement in Aberdeen during the king's pleasure. His banishment lasted from September 1636 to February 1638, and was chiefly remarkable for the epistolary activity he displayed, the greater number of his published Letters belonging to this period of his life. He was present at the signing of the Covenant in Edin- burgh in 1638, and afterwards at the meeting of the Glasgow Assembly the same year, which restored him to his parish. In 1639 he was appointed professor of divin- ity in St Mary's College, St Andrews, and shortly after- wards became colleague to Robert Blair in the church of St Andrews. He was sent up to London in 1643 as one of the eight commissioners from Scotland to the West- minster Assembly. Arriving along with Baillie in Novem- ber, and remaining at his post over three years, he did great service to the cause of his party. In 1642 he had pub- lished his Peaceable and Temperate Plea for Paul's Presby- terve in Scotland, and the sequel to it in 1644 on The Due fight of Presbyteries provoked Milton's contemptuous reference to "mere A. S. and Rutherfurd" in his sonnet On the New Forcers of Conscience under the Long Parliament. In 1644 also appeared Rutherfurd's Lea Rex, a Dispute for the Just Prerogative of King and People, which gives him a recognized place among the early writers on constitutional law; it was followed by Zhe Divine Right of Church Government (1646), and Free Disputation against Pretended Liberty of Conscience (1649), Among his other works are the Tryal and Triumph of Faith (1645), Christ Dying and Drawing Sinners to ITimself (1647), and Survey of the Spiritual Antichrist (1648). In 1647 he returned to St Andrews to become principal of the New College there, and in 1648 and 1651 he declined successive invitations to theological chairs at Harderwijk

and Utrecht. His last days were assailed by the persecution which followed the

Restoration in 1660. His Lex Rex was ordered to be burned at the cross of Edinburgh, and also at the gate of the college. He was deprived of all his offices, and on a charge of high treason was cited to appear before the ensuing parliament. His health, however, now utterly broke down, and knowing that he had not long to live he drew up, on 26th February 1661, a Testimony, which was posthumously published. He died on the 20th of the following March.

The fame of Rutherfurd now rests principally upon his remark- able Letters, on which Wodrow thus comments:—‘ He seems to have outdone cven himsclf as well as everybody else in his admir- able and every way singular lettcrs, which, though jested upon by profane wits because of some familiar expressions, yet will be owned of all who have any relish of picty to contain such sublime flights of devotion and to be fraughted with such massy thoughts as loudly speak a soul united to Jesus Christ in the closest embraces, and must needs at once ravish and edify every serious reader.” In addition to the other works already mentioned, Rutherfurd published in 1651 a treatise De Divina Providentia, against Molinvism, Socinianism, and Arminianism, of which Richard Baxter, not without justice, remarked that “as the Letters were the best piece so this was the worst he had ever read.”

The Letters, to the number of 215, were first published anonymously by M‘Ward, an amanuensis, at Rotterdam, in 1664. They have been frequently reprinted, the best edition (365 letters) being that by Rey. A. A. Bonar, 1848, with a sketch of his life. See also a short Life by Rev. Dr Andrew Thomson, 1884,

RUTHERGLEN, an ancient royal burgh of Lanark- shire, Scotland, is situated near the left bank of the Clyde, 2 miles south-east of Glasgow. It consists chiefly of one long wide irregular street, with narrow streets, wynds, and alleys branching from it at intervals. The parish church is situated near the centre of the town, a little distance from the tower of the old church where the treaty was made in 1297 with Edward I., by which Sir John Mon- teith agreed with the English to betray the Scottish hero Wallace. The most important public building is the town- hall, a handsome

structure with a large square tower. In the vicinity there are extensive collieries and ironworks, and the town possesses chemical works, a paper mill, a pottery, and a shipbuilding yard. The corporation consists of a provost, two bailies, a dean of guild, a treasurer, and fifteen councillors. The population of the royal burgh in 1871 was 9239, and in 1881 it was 11,473.

Rutherglen was crected into a royal burgh by King David in 1126. At this time it ineluded a portion of Glasgow, but in 1226 the boundaries were rectificd so as to exclude the whole of that city. In early times it had a castle, which was taken by Bruce from the English in 1313. It was kept in good repair till after the battle of Langside it was burnt by order of the regent Murray. After this the town for a time gradually decayed, the trade being absorbed by Glasgow. Rutherglen is included in the Kilmarnock district of parliamentary burghs.

RUTILIUS CLAUDIUS NAMATIANUS is known to us as the author of a Latin poem in elegiac metre, describ- ing a coast voyage from Rome to Gaul in 416 ap. The literary excellence of the work and the flashes of light which it throws across a momentous but dark epoch of history combine to give it exceptional importance among the relics of late Roman literature. The poem was in two books ; the exordium of the first and the greater part of the second have been lost. What remains consists of about 700 lines.

The poet's voyage took place in the late autumn of 416 (i. 135 sqg.), and the verses as we have them were evi- dently written at or very near the time. The author is a native of southern Gaul, and belonged, like Sidonius, to one of the great governing families of the Gaulish pro- vinces. His father, whom he calls Lachanius, had held high offices in Italy and at the imperial court, had been governor of Etruria and Umbria (consularis Tusciae) pro- bably in 389, when a Claudius is named in the Theodosian Code (2, 4, 5) as having held the office, then imperial treasurer (comes sacrarum largitionum), imperial recorder (quaestor), and governor of the capital itself (praefectus

urbis). Rutilius boasts his career to have been no less distinguished than his father's, and particularly indicates that he had been secretary of state

(magzster officiorum) and governor of the capital (i. 157, 427, 467, 561). It is

probable that a certain Namatius named in the Theodosian Code (6, 27, 15) as magzster officiorum of the year 412 is no other than our poet. ‘The true literary man is apt to be inordinately proud of political distinction, and Rutilius celebrates his own praises in a style worthy of Cicero or Pliny. At all events, he had lived long in the great world of the Western empire, and knew much of the inner history of his time. After reaching manhood, he had passed through the tempestuous period that stretches between the death of Theodosius (395) and the fall of the usurper Attalus, which occurred near the date when our poem was written. He had witnessed the chequered career of Stilicho as actual, though not titular, emperor of the West ; he had seen the hosts of Radagaisus rolled back from Italy, only to sweep over the helpless provinces of Gaul and Spain, the defeats and triumphs of Alaric, the three sieges and final sack of Rome, followed by the marvellous recovery of the city, Heraclian’s vast armament dissipated by a breath, and the fall of seven pretenders to the Western diadem. Undoubtedly the sympathies of Rutilius were with those who during this period dissented from, and, when they could, opposed, the general tendencies of the imperial policy. We know from himself that he was the intimate of dis- tinguished men who belonged to the circle of the great orator Symmachus,—men who had scouted Stilicho’s com- pact with the Goths, and had led the Roman senate to support the pretenders Eugenius and Attalus in the vain hope of reinstating the gods whom Julian had failed to save.

While making but few direct assertions about historical characters or events, the poem, by its very texture and spirit and assumptions, forces on us important conclusions concerning the politics and religion of the time, which are not brought home to us with the same directness by any other authority. The attitude of the writer towards paganism is remarkable. The whole poem is intensely pagan, and is penetrated by the feeling that the world of literature and culture is and must remain pagan, that outside paganism lies a realm of barbarism. The poet wears an air of exalted superiority ovcr the religious innovators of his day, and entertains a buoyant confidence that the future of the ancient gods of Rome will not belie their glorious past. Invective and apology he scorns alike, nor troubles himself to

show, with Claudian, even a suppressed grief at the indignities put upon the old religion by the new. Asa statesman, he is at pains to avoid offending those jeune Christian senators over whom pride in their country had at east as great power as attachment to their new religion. Only once or twice does Rutilius speak directly of Christianity, and then only to attack the monks, whom the temporal authorities had hardly as yet recognized, and whom, indeed, only a short time before, a Christian emperor had forced by thousands into the ranks of his army. Judaism Rutilius could assail without wounding either pagans or Christians, but he intimates, not obseurely, that he hates it chiefly as the evil root whence the rank plant of Christianity had sprung.

We read in Gibbon that ‘‘Honorius excluded all persons who were adverse to the catholic church from holding any office in the state,” that he ‘‘obstinately rejected the service of all those who dissented from his religion,” and that ‘‘the law was applied in the utmost latitude and rigorously executed.” Far different is the pieture of political life impressed upon us by Rutilius. His Voiee is assuredly not that of a partisan of a discredited and over- borne faction. We see by the aid of his poem a senate at Rome composed of past office-holders, the majority of whom were certainly pagan still. We discern a Christian section whose Christianity was political rather than religious, who wcre Romans first and Christians afterwards, whom a new breeze in politics inight easily have wafted back to the old religion. Between these two sections the broad old Roman toleration reigns. Some eeclesiastical historians have fondly imagined that after the sack of Rome the bishop Innocent returned to a position of practical predominance. No one who fairly reads Rutilius can cherish this idea. The air of the capital, perhaps cven of Italy, was still charged with paganism. The court was far in advance of

the people, and the persecuting laws were in large part incapable of execution.

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Perhaps the most interesting lines in the whole poem are those in which Rutilius assails the memory of ‘‘dire Stilicho,” as he names him. Stilicho, “fearing to suffer all that had caused himself to be feared,” annihilated those

defences of Alps and Apennines which the provident gods had interposed between the barbarians and the Eternal City, and planted the cruel Goths, his ‘“skin-clad”” minions, in the very sanctuary of the empire. His wile was wickeder than the wile of the Trojan horse, than the wile of Althza or of Scylla. May Nero rest from all the torments of the damned, that they may seize on Stilicho, for Nero smote his own mother, but Stilicho, the mother of the world !

We shall not err in supposing that we have here (what we find nowhere else) an authentic expression of the feeling entertained by a majority of the Roman senate concerning Stilicho, He had but imitated the policy of Theodosius with regard to the barbarians, but even that great emperor had met with passive opposition from the old Roman familics. The relations, however, between Alaric and Stilicho had bcen closer and more mysterious than those between Alaric and Theodosius, and men who had seen Stilicho surrounded by his bodyguard of Goths not unnaturally looked on the Goths who assailed Rome as Stilicho’s avengers. It is noteworthy that Rutilius speaks of the crime of Stilicho in terms far different from those used by Orosius and the historians of the lower empire. They believed that Stilicho was plotting to make his son emperor, and that he called in the Goths in order to climb higher. Rutilius holds that he used the barbarians merely to save himself from impending ruin, The Christian historians assert that Stilicho designed to restore paganism. To Rutilius he is the most uncompromising foe of paganism. His crowning sin (recorded by our poct alone) was the destruction of the Sibylline books—-a sin worthy of one who had decked his wife in the spoils of Victory, the goddess who had for centuries presided over the deliberations of the senate. This crime of Stilicho alone is sufficient in the eyes of Rutilius to aceount for the disasters that afterwards befell the city, just as Merobaudes, a generation or two later, traced the miseries of his own day to the overthrow of the ancicnt rites of Vesta.

With regard to the form of the poem, Rutilius handles the elegiac couplet with great metrical purity and freedom, and betrays many signs of long study in the clegiac poetry of the Augustan era. The Latin is unusually clean for the times, and is generally fairly classieal both iu vocabulary and construction, The taste of Rutilius too is comparatively pure. If he lacks the

genius of Claudian, he also lacks his overloaded gaudiness and his large exaggeration, and the directness of Rutilius shines by comparison with the laboured complexity of Ausonius. It is common to call Claudian the last of the Roman poets. That title might fairly be claimed for Rutilius, unless it be reserved for Merobaudes. At any rate in passing from Rutilius to Sidonius no reader can fail to feel that he has left the region of Latin poetry for the region of Latin verse.

Of the many interesting details of the poem we can only mention afew. At the outset we have an almost dithyrambic address to the goddess Roma, whose glory has ever shone the brighter for disaster, and who will rise once more in her might and confound her barbarian foes. The poet shows as deep a consciousness as any modern historian that the grandest achievement of Rome was the spread of law. Next we get incidental but not unimportant references to the destruction of roads and property wrought by the Goths, to the state of the havens at the mouths of the Tiber and the general decay of nearly all the old commercial ports on the coast. Most of thesewere as dcsolate then as now. Rutilius even exaggerates the desolation of the once important city of Cosa in Etruria, whose walls have scarcely changed from that day to ours. The port that served Pisee, almost alone of all those visited by Rutilius, seems to have retained its prosperity, and to have foreshadowed the subsequent greatness of that city. At one point on the coast the villagers everywhere were “soothing their wearied hearts with holy merriment,” aud were celebrating the festival of Osiris.

All existing MSS. of Rutilius are later than 1494, and are copies from a lost copy of an ancient MS. once at the monastery of Bobio, which disappeared about 1700. The editio princeps is that by J. B. Pius (Bologna, 1520), and the princi- pal editions since have been those by Barth (1623), P. Burman (1731, in his edition of the minor Latin poets), Wernsdorf (1778, part of a similar collection), Zumpt (1840), and the critical edition by Lucian Miller (Teubner, Leipsic, 1870). Miller writes the poet’s name as Claudius Rutilius Namatianus, instead of the usual Rutilius Claudius Namatianus; but if the identification of the poet’s father with the Claudius mentioned in the Theodosian Code be correct, Miiller is probably wrong. Rutilius receives more or less attention from all writers on the history or literature of the times, but a lucid chapter in Beugnot, Histoire dela Destruc- tion du

Paganisme en Occident (1835), may be especially mentioned. It should be noted that in using the passage concerning Stilicho we have ventured to read the line at ii. 45 thus—Jliacae cladis deteriore dolo; the change from the MSS. reading /ilatae cladis liberiore dolo (preserved in all editions) seems demanded by the context, as well as by the sense. (J. S. R.)

RUTLAND, the smallest county in England, is bounded See

N. and N.E. by Lincolnshire, §.E. by Northamptonshire, S a

and W. by Leicestershire. Its shape is extremely irregular. The greatest length from north-east to south-west is about = XXL — 15

ol, xiv.

114

20 miles, and the greatest breadth from east to west about 16 miles. The area is 94,889 acres, or about 148 square miles. The surface is pleasantly undulating, ridges of high ground running east and west, separated by rich and luxu- riant valleys, generally about half a mile in breadth. The principal valley is that of Catmoss to the south of Oakham, having to the north of it a tract of table-land commanding an extensive prospect into Leicestershire.

The Welland, which is navigable to Stamford, flows north-east, forming the greater part of the boundary of the county with Northamptonshire. The Gwash or Wash, which rises in Leicestershire, flows eastwards through the centre of the county, and just beyond its borders, enters the Welland in Lincolnshire. The Chater, also rising in Leicestershire and flowing eastwards enters the Welland about two miles from Stamford. The Eye flows south- eastwards along the borders of Leicestershire. The county belongs almost entirely to the Jurassic formation, consist- ing of Liassic and Oolitic strata—the harder strata, chiefly limestone containing iron, forming the hills and escarp- ments, and the clay-beds the slopes of the valleys. The oldest rocks are those belonging to the Lower Lias in the north-west. The bottom of the vale of Catmoss is formed of marlstone rock belonging to the Middle Lias, and its sides are composed of long slopes of Upper Lias clay. The Upper Lias also covers a large area in the west of the county. The

lowest series of the Oolitic formation is the Northampton sands bordering Northamptonshire. The Lincolnshire Oolitic limestone prevails in the east of the county north of Stamford. It is largely quarried for building purposes, the quarry at Ketton being famous beyond the boundaries of the county. The Great Oolite prevails towards the south-east. Formerly the iron was largely dug and smelted by means of the wood in the extensive forests, and the industry is again reviving.

Agriculture.—In the castern and south-eastern districts the soil is light and shallow. a tenacious but fertile loam, and in the fertile vale of Catmoss the soil is either clay or loam, or a mixture of the two. The prevailing redness, which colours even the streams, is owing to the ferruginous limestone carried down from the slopes of the hills. The name of the county is by some authorities derived from this characteristic of the soil, but the explanation is doubtful. The eastern portions of the county are chiefly under tillage and the western in grass. Out of 94,889 acres no fewer than 86,477 acres in 1885 were under cultivation, corn crops occupying 22,820 acres, green crops 7520 acres, rotation grasses 6558 acres, and permanent pasture 47,816 acres. Over 3000 acres were under woodland. The prineipal corn crop is barley, which occupied 9484 acres, but wheat and oats are also largely grown. Turnips and swedes occupy about five-sixths of the area under green crops. The rearing of sheep and cattle occupies the chief attention of the farmer. Large quantities of cheese are manufactured and sold as Stilton. Cattle, principally shorthorns, numbered 19,810, of which 3054 were cows and heifers in milk and in calf. Sheep—Leicesters and South Downs—numbered 80,881, horses 3062, pigs 3054, and poultry 27,376. According to the parliamentary return of 1873 the number of proprietors was 1425, of whom 861 possessed less than one acre. The largest proprietors were the earl of Gainsborough 15,076, Lord Aveland 13,634, marquis of Exeter 10,718, and George H. Finch 9182.

failways.—The main line of the Great Northern intersects the north-eastern corner of the county, and branches of that system, of the London and North-Western, and of the Midland connect it with all parts of the country.

Administration and Population.—Rutland comprises five hun- dreds and contains fifty-seven civil parishes, and part of the parish of Stoke-Dry,

which extends into Leicestershire, F ormerly repre- sented by two members of parliament, since 1885 it returns one only. There is no municipal or parliamentary borough. The county has one court of quarter sessions, but is not subdivided for petty sessional purposes. Kcclesiastically it is entirely in the diocese of Peterborough. The population was 21,861 in 1861, 22,078 in 1871, and 21,484 in 1881. The average number of per- sons to an acre in 1881 was 0°28, and of acres to a person 4°48.

History and Antiquities.—In the time of the Romans the district now included in Rutlandshire was probably inhabited by the Coritani, and was included in Flavia Cesaricnsis. Ermyn

In the other districts it consists chiefly of

Street traversed it in the north-east, and there was an important station at Great Casterton. As a shire it is later than Domesday, when a portion of it was included in Northamptonshire but the greater part in Nottingham. It is referred to as com. Roteland in the fifth year of King John, in the document assigning a dowry to Queen Isabella, but for a long time previous to this the name Roteland was applied to Oakham and the country round it, Edward, eldest son of Edmund of Langley, fifth son of Edward OL, was created earl of Rutland, but the title became extinet in the royal house when Edward earl of Rutland was stabbed to death at the battle of Clifford. In 1525 the title was revived in the person of Lord Ros, and the tenth earl was created duke in 1703. At the battle of Stamford in 1470 Lancaster was defeated by Edward IV. The only old castle of which there are important remains is Oakham, dating from the time of Henry II., and remarkable for its Norman hall.

RUTLAND, a township and village of the United States, capital of Rutland county, Vermont, 117 miles north-north- west of Boston. It is an important railway junction, being the terminus of several minor lines and the seat of machine-shops and engine-houses; but its name is even better known through its quarries of white marble. The population of the township was 12,149 and that of the village 7502 in 1880.

Chartered by New Hampshire in 1761 and again chartered as Socialborough in 1772 by New York, Rutland became in 1775 a fortified post on the great northern military road, and in 1781

was made the chief town of Rutland county. Between 1784 and 1804 it was one of the capitals of the State.

RUYSBROECK, or RuysprogEK, Jonny, mystic, was born at Ruysbroek, near Brussels, about 1293, and died as first prior of the convent of Groenendael, near Waterloo, in 1381. See Mysricism, vol. xvii. p. 133.

RUYSCH, Freperix (1638-1731), anatomist, was born at The Hague in 1638, and died at Amsterdam on February 22, 1731. See Anatomy, vol. i. p. 812.

RUYSDAEL, or Rutspaat, Jacos (c. 1625-1682), the most celebrated of the Dutch landscapists, was born at Haarlem about 1625. The accounts of his life are very conflicting, and recent criticism and research have discredited much that was previously received as fact regarding his career. He appears to have studied under his father Izaac Ruysdael, a landscape-painter, though other authorities make him the pupil of Berghem and of Albert van Everdingen. The earliest date that appears on his paintings and etchings is 1645. Three years later he was admitted a member of the guild of St Luke in Haarlem ; in 1659 he obtained the freedom of the city of Amsterdam, and we know that he was resident there in 1668, for in that year his name appears as a witness to the marriage of Hobbema. During his lifetime his works were little appreciated, and he seems to have suffered from poverty. In 1681] the sect of the Mennonites, with whom he was connected, petitioned the council of Haarlem for his admission into the almshouse of the town, and there the artist died on the 14th of March 1682.

The works of Ruysdael may be studied in the Louvre and the National Gallery, London, and in the collections at The Hague, Amsterdam, Berlin, and Dresden. His favourite subjects are simple woodland scenes, similar to those of Everdingen and Hobbema, or views of picturesque mills and cottages, or of ruined towers and temples, set upon broken ground, beside streams or waterfalls. He is especially noted as a painter of trees, and his rendering of foliage, particularly of oak leafage, is characterized by the

greatest spirit and precision. His views of distant cities, such as that of Haarlem in the possession of the marquis of Bute, and that of Katwijk in the Glaseow Corporation Galleries, clearly indieate the influence of Rembrandt. He frequently paints coast- scenes, and sea-pieces with breaking waves and stormy skies filled with wind-driven clouds, but it is in his rendering of lonely forest glades that we find him at his best. The subjects of certain of his mountain seenes, with bold rocks, waterfalls, and fir-trees, seem to be taken from Norway, and have led to the supposition that he had travelled in that country. We have, however, no record of such a journey, and the works in question are probably

merely adaptations from the landscapes of Van Everdingen, whose manner he copied at one period. Only a single architectural sub-

| Ryazafi is an intermediate link between the central Great

ject from his brush is known—an admirable interior of the New Church, Amsterdam, in the possession of the marquis of Bute. The prevailing hue of his landscapes is a full rich green, which, how- ever, has darkened with time, while a clear grey tone is character- istie of his sea-picces. aa The art of Ruysdael, while it shows little of the scientific know- ledge of later landscapists, is sensitive and poetic in sentiment, and direct and skilful in technique. Figures are sparingly introduced into his compositions, and such as oceur are believed to be from the pencils of Adrian Vandevelde, Philip Wouwerman, and Jan Lingel- bach. In his love of landscape for itself, in his delight in the quiet and solitude of nature, the painter is thoroughly modern in feeling. Ruysdael etched a few plates, which were reproduced by Amand Durand in 1878, with text by M. Georges Duplessis. The «Champ de Blé” and the ‘‘ Voyageurs ” are characterized by M. Duplessis as ‘‘ estampes de haute valeur qui peuvent étre regardées comme les spécimens Jes plus significatifs de l’art du paysagiste dans les Pays-Bas.” RUYSSELEDE, or Rurssetkpz, a market-town of Belgium, in the province of West Flanders, 15 miles south- east of Bruges. It is best known as the seat of a great reformatory for boys, founded by the Government in 1849. The population was 6663 in 1874, and 6670 in 1881. — RUYTER, Micnary Aprian DE (1607-1676), a dis- tinguished Dutch naval officer, was born at Flushing,

24th March 1607. He began his seafaring life at the age of eleven as a cabin boy, and in 1636 was entrusted by the merchants of Flushing with the command of a cruiser against the French pirates. service of the States, and, being appointed rear-admiral of a flect fitted out to assist Portugal against Spain, specially distinguished himself at Cape St Vincent, 3d November 1641. In the following year he left the service of the States, and, until the outbreak of war with England in

In 1640 he entered the

1652, held command of a merchant vessel. In 1653 a |

squadron of seventy vessels was despatched against the English, under the command of Admiral Tromp. Ruyter, who accompanied the admiral in this expedition, seconded him with great skill and bravery in the three battles which were fought with the English. He was afterwards stationed in the Mediterranean, where he captured several Turkish vessels. In 1659 he received a commission to join the king of Denmark in his war with the Swedes. ‘As a reward of his services, the king of Denmark ennobled him and gave him a pension. In 1661 he grounded a vessel belonging to Tunis, released forty Christian slaves, made a treaty with the Tunisians, and reduced the Algerine corsairs to submission. From his achievements on the west coast of Africa he was recalled in 1665 to take command of a large fleet which had been organized against England, and in May of the following year, after a long contest off the North Foreland, he compelled the English to take refuge in the Thames. On June 7, 1672, he fought a drawn battle with the combined fleets of England and France, in Southwold or Sole Bay, and after the fight he convoyed safely home a fleet of merchantmen. His valour was displayed to equal advantage in several engage- ments with the French and English in the following year. In 1676 he was despatched to the assistance of Spain against France in the Mediterranean, and, receiving a mortal wound in the battle on the 21st April off Messina, died on the 29th at Syracuse. A patent by the king of Spain, investing him with the dignity of duke, did not reach the fleet till after his death. His body was carried to Amsterdam, where a magnificent monu- ment to his memory was erected by command of the states-general.

See Li fie ye er one.” Brandt, Amsterdam, 1687, and by Klopp,

RYAZAN, a government of Central Russia, is bounded by Moscow and Tula on the W., by Vladimir on the N., and by Tamboff on the E. and S., with an area of 16,255 square miles, and a population of 1,713,581 in 1882.

Russian governments and the Steppe governments of the south-east,—the wide and deep valley of the Oka, by which it is traversed from west to east, with a broad curve to the south, being the natural boundary between the two. On the left of the Oka the surface often consists of sands, marshes, and forests; while on the right the fertile black- earth prairies begin, occupying especially the southern part of the government (the districts of Ranenburg, Sapojok, and Dankoff). The whole of Ryazafi isa plateau about 700 feet above the sea, but deeply cut by the river valleys and numerous ravines. The geological formations represented are the Devonian, the Carboniferous, the Jurassic, and the Quaternary. The Devonian appears in the deeper valleys in the south, and belongs to the well- known “ Malevka-Muraevnya horizon,” now considered as equivalent to the Cypridina serrato-striata Upper Devonian deposits of the Eifel. The Carboniferous deposits are widely spread, and appear at the surface in the bottoms of the ravines and valleys. They contain strata of excellent coal between plastic blue clays, which are worked at several places. Upper Carboniferous lime- stones, as also sandstones, the age of which has not yet been determined, but which seem to be Lower Jurassic, cover the Carboniferous clays. The Upper Jurassic de- posits are widely spread, but they have been much destroyed and now appear as separate insular tracts. They belong to the Oxford and Callovian horizons, the former contain- ing corals, which are very rare on the whole in the Russian Jurassic deposits. The Quaternary deposits are represented by the Glacial boulder clay and more recent alluvial deposits, which occupy wide areas in the valley of the Oka. Iron-ores, limestone, grindstone grits, potters’ clays, and thick beds of peat are worked, besides coal. The northern parts of Ryazafi belong to the forest regions of Russia, and, notwithstanding the wholesale destruction of forests in that part of the country, these (chiefly Coni- ferous) still cover one-third of the surface in several dis- tricts. In the south, where the proximity of the Steppes is felt, they are much less extensive, the prevailing species being oak, birch, and

other deciduous trees. They cover an aggregate area of more than 2 million acres.

The Oka is the chief river; it is navigable throughout, and receives the navigable Pronya, Pra, and Tsna, besides a great many smaller streams utilized for floating timber. Steamers ply on the Oka to Kasimoff and Nijni Novgorod. The Don and the Lyesnoi Voronezh belong to Ryazaii in their upper courses only. On the whole, the south dis- tricts are not well watered. Small lakes are numerous in the broad depression of the Oka and elsewhere, while extensive marshes cover the north-east districts; a few attempts at draining several of these on the banks of the Oka have resulted in the reclamation of excellent pasture lands. ‘The climate is a little warmer than at Moscow, the average temperature at Ryazaii being 41°.

The territory of Ryazafi was occupied in the 9th century by Finnish stems (Mordvinians, Mers, Muroms, and Meschers), which for the most part have either given way before or disappeared amongst the Slavonian colonizers. The population is now Great Russian throughout, and contains only a trifling admixture of some 6000 Tartars, 1500 Poles, and 500 Jews in towns. Some Tartars immigrated into the Kasimoff region in the 15th century, and are noted for their honesty of character as well as for their agricultural prosperity. The people of the Pra river are described as Mescheriaks, but their manners and customs do not differ from those of the Russians.

The chief occupation in Ryazaii isagriculture. Out of 10,100,000 acres only 838,000 are unfit for tillage. 5,482,000 acres are under crops, and the annual produce is estimated at about 4,248,000

quarters of corn and 972,000 quarters of potatoes. The area under cultivation and the crops themselves are increasing, as also is the export of corn. But cven here, in one of the wealthiest govern- ments of Russia, the situation of the peasants is far from satis- factory. Cattle-breeding is rapidly falling off on account of want of pasture lands, but hay, which is abundant, especially on the rich meadow lands of the Oka, is exported. In 1882 there were 283,500 horses, 262,200 cattle, and 839,600 sheep, the figures having been 446,000, 297,000, and 847,000 respectively in 1858. In the northern

part of the government various industries are carried on, such as boatbuilding, the preparation of pitch and tar, the manufacture of wooden vessels, sledges, &c. Various other petty trades, such as weaving, lace-making, and boot-making, are combined with agriculture. Manufactures also have lately begun to make progress, aud in 1882 their agercgate production reached 13,000,000 roubles (cotton and flax-spinning mills, glass-works and metal-ware works, and distilleries, the last-named producing to the value of 1,850,000 roubles). Trade, especially in corn and other agricultural produce and in merchandise manufactured in the villages, is very active. The railway from Ryazah to Moscow is one of the most important in Russia, from the amount of goods carried from the south-east Steppe governments. The Oka is another artery of traffic, the aggregate amount shipped to or sent from its ports within Ryazafi reaching 3,634,000 cwts. in 1880. The government is divided into twelve districts, the chief towns of which, with thcir populations in 1883, are subjoined : Ryazafi (30,325 inhabitants), Dankoff (2475), Egoricvsk (6055), Kasimoff (15,260), Mikhailoff (2720), Pronsk (1740), Ranenburg (4500), Ryazhsk (4265), Sapojok (2670), Skopin (10,260), Spassk (4820), and Zaraisk (5870). Ranenburg, Skopin, and Zaraisk are important markets for corn and hemp. Several villages, such as Muracvuya, Dyedinovo (6600) and Lovtsy (loading places on the Oka), and Ukolovo (market for corn), have more commerce and industry than the district towns. Large villages are numcrous, about sixty having cach from 2500 to 7000 inhabitants.

The Slavonians began to colonize the region of Ryazafi as early as the 9th century, penetrating thither both from the north-west (Great Russians) and from the Dnieper (Little Russians). As early as the 10th century the principality of Murom and Ryazafi is mentioned in the chronicles. During the following centuries this principality increased both in extent and in wealth and included parts of what are now the governments of Kaluga and Moscow. Owing to the fertility of the soil, its Russian popnila- tion rapidly increased, while the Finnish stems which formerly inhabited it migrated farther east, or became merged among the Slavonians. A dozen towns, all fortificd and commercial, are mentioned as belonging to the principality towards the end of the 12th century. The Mongolian invasion stopped all this develop- ment. The horsemen of Batu burned and destroyed several towns in 1237, and killed many people, desolating the country. The

principality, however, still continued to exist; its great princes strongly opposed the annexation plans of Moscow, making alliance with the Mongols and with Lithuania, but they succumbed, and, the last of them, Ivan, having been imprisoned in Moscow, his principality was definitively annexed in 1517.

RYAZAN, capital of the above government, lies 119 miles to the south-east of Moscow, on the elevated right bank of the Trubej, a mile above its junction with the Oka. A wide prairie dotted with large villages, being the bottom of a former lake, spreads out from the base of the crag on which Ryazafi stands, and has the aspect of an immense lake when it is inundated in the spring. Except one or two streets, the town is badly built, chiefly of wood, and ill-paved. It has often suffered from fire, and has few remains of former days. The large church of Uspensk dates from 1770. Those of Arkhangelsk and Kresto- vozdvijensk have preserved, however, their old archi- tecture, though obliterated to some extent by subsequent repairs, as also the archiepiscopal palace, formerly the ““terem” of the great princes. The industries are un. developed, and the trade has less importance than might be expected from the position of the town inso rich a region. It is, however, an important railway centre, no less than 15,000,000 ewts., chiefly of corn, being brought from the south-east and sent on to Moscow, while nearly 3,390,000 ewts. of various manufactured and grocery wares are con- veyed in the opposite direction. The loading place on the Oka also has some importance. The population, 30,325 in 1883, is increasing but slowly.

The capital of Rvazah principality was Ryazatii—now Old Ryazaft, a village close to Spassk, also on the Oka. It is mentioned in

aunals as early as 1097, but continucd to be the chief town of the principality only until the 14th century. In the 11th century one of the Kieff princes—probably Yaroslaff Svyatoslavitch in 1095—founded, on the banks of a small lake, a fort which received the name of Pereyaslaff-Ryazanskiy. In 1294 (or in 1335) the bishop of Murom, compelled to leave his own town and probably following the usual policy of that epoch,—that

of selecting a new town with no municipal traditions, as the nucleus of a new state, —settled in Pereyaslaff-Ryazanskiy, and thus gave new importance to this formerly insignificant settlement. The great princes of Ryazan followed his example and by-and-by completely abandoned the old republican town of Ryazai, transferring also its name to Pereyaslafi-Ryazanskiy. In 1300 a congress of Russian princes was held there, and in the following year the town was taken by the Moscow prince. It continued, however, to be the residence of the Ryazafi princes until 1517. In 1365 and 1377 it was plundered and burned by Tartars, but in the two following centuries (in 1460, 1518, 1521, and 1564) it was strong enough to repel them. Earthen walls with towers were erected after 1301 ; and in the 17th century a ‘‘kreml” still stood on the high crag above the Trubej. Ryazafi became chief town of the Ryazati lieutenancy in 1778.

RYBINSK, or Ruzprnsk, though but a district town of the government of Yaroslavl, with a permanent population (1883) of only 18,900, is, as being virtually the port of St Petersburg on the Volga, one of the most important towns of the northern part of Central Russia. It lies 54 miles to the north-west of Yaroslavl, and is connected by rail (186 miles) with Bologoye, on the line between St Petersburg and Moscow. It derives its importance from its situation on the Volga, opposite the mouth of the Sheksna,—one of those tributaries which, flowing from the north-west, have since the dawn of Russian history connected the Volga with the regions around Lake Ladoga. Russians settled there as early as the 12th century, or perhaps earlier; subsequently it seems to have become a mere fishing station under Moscow, with perhaps some shipbuilding. It became a considerable centre for traffic when the Vyshnevolotsk, Tikhvinsk, and Mariinsk canal systems, connecting St Petersburg with the Volga, were opened. The cargoes of the larger boats from the lower Volga, consisting mainly of corn and flour, as also of salt, spirits, potash, and tallow, are here trans- ferred to smaller boats capable of accomplishing the navigation to St Petersburg, and wice versa. The amount of goods thus transhipped is estimated at 16,000,000 cwts., worth 32,800,000 roubles. Since the opening of the line to Bologoye, a large proportion of this merchandise is sent to St Petersburg by rail (9,293,000 cwts. in 1880), The total number of boats visiting Rybinsk annually is estimated at 5000 to 7000, their aggregate cargoes amounting to nearly 20,000,000 cwts. (about 40,000,000 roubles). Upwards of 100,000

labourers (male and female) assemble at Rybinsk during the navigation, and the num- ber of vessels is so great as to cover the Volga and the Sheksna like a bridge. Besides the business of tranship- ment, Rybinsk has an active trade in corn, hemp, é&c., from the neighbouring districts. The town is but poorly built, and its sanitary condition leaves very much to be desired, especially in summer,

RYCAUT, or Ricavt, Sm Pav (d. 1700), traveller and diplomatist, was the tenth son of Sir Peter Ricaut, a Royalist who on account of his support of King Charles had to pay a composition of £1500. The son was admitted a scholar of Trinity College, Cambridge, in 1647, and took his B.A. degree in 1650. After travelling in Europe and in various parts of Asia and Africa, he in 1661 accom- panied as secretary the earl of Winchelsea, ambassador extraordinary to Turkey. During a residence there of eight years he wrote Zhe Present State of the Ottoman Empire, in three books ; containing the Maxims of the Turkish Politie, their Religion and Military Discipline (1670; 4th ed. 1686; Fr. transl. by Briot, 1670; and another with notes by Bespier, 1677). In 1663 he pub-

lished at Constantinople The Capitulation, Articles of Peace, &c., concluded between the King of England and the Sultan of the Ottoman Empire. Subsequently he was for eleven years consul at Smyrna, and at the command of Charles II. wrote The Present State of the Greek and Armenian Churches, Anno Christi 1678, which on his return to England he presented to the king and published in 1679. In 1685 Lord Clarendon, lord lieutenant of Treland, made him principal secretary for the provinces of Leinster and Connaught. He at the same time received from James I. the honour of knighthood, was made a member of the privy council of Ireland, and named judge of the high court of admiralty, which office he retained till 1688. From 1690 to 1700 he was employed by King William as English resident at the Hanse towns, and shortly after his return to England, worn out with age and infirmities, he died on the 16th December 17 00.

Rycaut was a fellow of the Royal Society, and wrote an article on Sable Mice which was published in their Transactions. In addition to the works already mentioned he was the author of A Continuation of Knolles’ History

of the Turks from 1623 to 1677 (1680), and from 1679 to 1699 (1700); A Translation of Platina's Lives of the Popes, with a Continuation from 1471 to the Present Time (1685); Lhe Critick, from the Spanish of Gracian (1686) ; and the Royal Commentaries of Peru, from the Spanish of Garcilasso (1688).

RYDE, a municipal borough and watering place of the Isle of Wight, is finely situated on a sloping eminence above the Solent, 5 miles south by west of Portsmouth, and 7 (12 by rail) from West Cowes. It occupies the site of a village called La Rye or La Riche, which was destroyed by the French in the reign of Edward IT. About the close of the 18th century it was a small fishing hamlet, but when the beauty of its site attracted attention it rapidly grew into favour as a watering-place. The streets are wide, regular, and well-paved, and there are a large number of fine villas on the slopes of the hill. It is connected by rail with the principal other towns in the island, and there is also steamboat communication with Portsmouth, Southampton, Southsea, Portsea, and Stoke's Bay. The pier, built originally in 1812, but since then greatly ex- tended, forms a delightful promenade half a mile in length. The principal buildings are All Saints church, erected in 1870 from the designs of Sir Gilbert Scott, and other churches, the market-house and town hall, the Royal Vic- toria Yacht club-house, the theatre, and the Royal Isle of Wight Infirmary. The town was incorporated in 1868, and is governed by a mayor, six aldermen, and eighteen councillors. The population of the municipal borough (area 792 acres) in 1871 was 11,260 and in 1881 it was 11,461.

RYE. As in the case of other cereals, it is doubtful if rye (Secale cereale) exists at the present time in a truly wild state. The best evidence on this point goes to show that the plant is a native of the regions between the Black and Caspian Seas. It is also recorded from Afghanistan and Turkestan ; but botanists are very chary about admitting the validity of the evidence hitherto adduced. Aitchison, the latest investigator of the flora of Afghanistan, mentions it as growing in wheat-fields, where it is considered as a weed, not being intentionally sown. In some fields "it almost eradicates the wheat crop." But this merely shows that the conditions are more favourable to the growth of rye than to that of wheat. In spite of the uncertainty as to the precise origin of the cultivated plant, its cultivation

does not appear to have been practised at a very early date, relatively speaking. Alphonse de Candolle, who has collected the evidence on this point, draws attention to the fact that no traces of this cereal have hitherto been found in Egyptian monuments or in the earlier Swiss dwellings, though seeds have been found in association with weapons of the Bronze period at

ey Olmiitz. The absence of any special name for it in the Semitic, Chinese, and Sanskrit languages is also adduced as an indication of its comparatively recent culture. On the other hand, the general occurrence of the name in the more modern languages of northern Europe, under various modifications, points to the cultivation of the plant then, as now, in those regions. The origin of the Latin name secale, which exists in a modified form among the Basques and Bretons, is not explained. The circumstances that the cultivation of rye is relatively not of great antiquity and that it is confined to a relatively restricted area must be taken into account, in connexion with the fact that the variations of*this cereal are much fewer than are noted in the case of other plants of like character.

The fact stated by Miiller that the anthers and stigmas of the flowers come to maturity at the same time would tend to ‘close fertilization” and a consequent constancy of “characters” in the offspring, and, as a matter of fact, the varieties of this grass are not numerous. Rye isa tall-crowing annual grass, with fibrous roots, flat, narrow, ribbon-like bluish-green leaves, and erect or decurved cylindrical slender spikes like those of barley. The spike- lets contain two or three flowers, of which the uppermost is usually imperfect. The outer glumes are acute glabrous, the flowering glumes lance-shaped, with a comb-like keel at the back, and the outer or lower one prolonged at the apex into a very long bristly awn. Within these are three stamens surrounding a compressed ovary, with two feathery stigmas. When ripe, the grain is of an elongated oval form, with a few hairs at the summit.

In the southern parts of Great Britain rye is chiefly or solely cultivated as a forage-plant for cattle and horses, being usually sown in autumn for spring use, after the crop of roots, turnips, &c., is exhausted, and before the clover and lucerne are ready. For forage purposes it is best to cut early, before the

leaves and haulms have been exhausted of their supplies to benefit the grain. In the northern parts of Europe, and more especially in Scan- dinavia, Russia, and parts of northern Germany, rye is the principal cereal ; and in nutritive value, as measured by the amount of gluten it contains, it stands next to wheat, a fact which furnishes the explanation of its culture in northern latitudes ill-suited for the growth of wheat. Rye- bread or black-bread is in general use in northern Europe, but finds little favour with those unaccustomed to its use, owing to its sour taste, the sugar it contains rapidly passing into the acetous fermentation.

When the ovaries of the plant become affected with a peculiar fungus (Cordyceps), they become blackened and distorted, constituting Ercor (¢.v.).

RYE, a municipal town and seaport at the eastern extremity of the county of Sussex, 63 miles south-south- east of London, is built upon a rocky eminence which two or three centuries ago was washed on all sides by the influx of the tide, but now, in consequence of the gradual recession of the sea, lies two miles inland. It is sur- rounded by rich marsh land through which flows the river Rother, uniting at the south-east foot of the rock with two rivulets to form a small serpentine estuary, Rye harbour, the mouth of which is connected with the town by means of a branch line of railway. In bygone years, when the adjacent marshes were flooded with tidal water, the efflux was so powerful as to effectually maintain safe and free entrance into Rye harbour; and in the reign of Charles II. a frigate of 50 guns could enter and ride at anchor. Now the harbour suffers seriously from the shifting sand and shingle, and considerable sums of money have been expended by the harbour commissioners with the view of overcoming these impediments, with but partial success. The trade is chiefly in coal, timber,

and bark, and shipbuilding is carried on as well as fish- | ing. There is a large market every alternate Wednesday, |

and considerable business in cattle, sheep, corn, wool, and hops is transacted. Rye is a quaint, compactly-built town perched upon the rock to which for centuries it was restricted, but in the course of the last half-

century it has gradually extended itself over the northern slopes beyond the town wall. It is excellently drained, abundantly supphed with clear spring water, and very healthy.

The church, said to be the largest parish church in Eng- |

land, is of very mixed architecture, chiefly Transitional, Norman, and Early English ; the nave and high chancel

were judiciously restored in 1882, according to designs by |

the late Mr G. E. Street. Of the old fortifications there still remain portions of the town wall, much hidden by newer buildings, a strong quadrangular tower built by William of Ypres, earl of Kent, and lord warden in the time of Stephen, and now forming part of the police station,

and a handsome gate with a round tower on each side,

known as the Sandgate, at the entrance into Rye from the London road. Rye ceased in 1885 to be a parliamentary borough, but gives its name to the eastern division of the county. The population in 1881 was 4224.

Of the early history of Rye little is known. In the medieval Freneh chronicles it is always mentioned as ‘La Rie.” Having been conferred upon the abbey of Féeamp by Edward the Confessor, it was taken baek by King Henry III. into his own hands, ‘‘ for the better defenee of his realm,” and received from that sovereign the full rights and privileges of a Cinque Port under the title of “Aneient Town.” In eonsequenee of the frequent incursions of the French, by whom it was sacked and burnt three times in the 14th century, it was fortified by order of Edward III. on the land- ward side, the steep precipitous sides of the rock affording ample protection towards the sea. In addition to the naval services rendered by Rye as a Cinque Port under the Plantagenet and Tudor sovereigns, it was a principal port of communication with Franee in times of peace,—for whieh reason successive bands of Huguenots fled thither between 1562 and 1685, many of whom settled at Rye and have left representatives now living.

RYEZHITZA, a town of European Russia at the head of a district in the Vitebsk government, in 56° 30’ N. lat. and 27° 21’ E. long., 198 miles north-west from Vitebsk on the railway between St Petersburg and Warsaw, near the Ryezhitza, which falls into Lake Iuban. Its popu- lation increased from 7306 (2902 Jews) in 1867 to about 9000 in 1881 ; but its importance is mainly histori- cal. The cathedral is a modern building (1846).

Ryezhitza, or, as it is ealled in the Livonian chronicles, Roziten, was founded in 1285 by Wilhelm von Harburg to keep in subjee- tion the Lithuanians and Letts. The eastle was continually the object of hostile attacks. In 1559 the Livouian order, exhausted by the war with Russia, gave it in pawn to Poland, and, though it was eaptured by the Russians in 1567 and 1577, and had its fortifications dismantled by the Swedes during the war of 1656- 1660, it eontinued Polish till 1772, when White Russia was united with the Russian empire. In early times Ryezhitza was a large and beautiful town.

RYLAND, Wittiam Wynne (1738-1783), engraver, was born in London in July 1738, the son of an engraver and copper-plate printer. He studied under Ravenet, and in Paris under Boucher and J. P. le Bas. After spending five years on the Continent he returned to England, and having engraved portraits of George III. and Lord Bute after Ramsay (a commission declined by Strange), anda portrait of Queen Charlotte and the Princess Royal after Francis Cotes, R.A., he was appointed engraver to the king. In 1766 he became a member of the Incorporated Society of Artists, and he exhibited with them and in the Royal Academy. _ In his later life Ryland abandoned line- engraving, and introduced “chalk-engraving,” in which the line is composed of stippled dots, a method by means of which he attained great excellence, and in which he transcribed Mortimer’s King John Signing Magna Charta, and copied the drawings of the old masters and the works

of Angelica Kauffman. He traded largely in prints, but in consequence of his extravagant habits his affairs became involved ; he was convicted of forging bills upon the East India Company, and, after attempting to commit

suicide, was executed at Tyburn on the 29th of August 1783. A short memoir of Ryland was published the year after his death.

RYMER, Tomas (1641-1713), historiographer royal, was the younger son of Ralph Rymer, lord of the manor of Brafferton in Yorkshire, described by Clarendon as “possessed of a good estate” and executed for his share in the “ Presbyterian rising” of 1663. Thomas was probably born at Yafforth Hall early in 1641, and was educated at a private school kept by Thomas Smelt, a noted Royalist, with whom Rymer was “a great favourite,” and “ well known for his great critical skill in human learning, especially in poetry and history.”

He was admitted as pensionarius minor at Sidney Sussex College, Cambridge, on April 29, 1658, but left the university without taking a degree. On May 2, 1666, he became a member of Gray’s Inn, and was called to the bar on June 16, 1673. His first appearance in print was as translator of Cicero’s Prince (1668), from the Latin treatise (1608) drawn up for Prince Henry. He also translated Rapin’s Lejlections on Aristotles Treatise of Poesie (1674), and followed the principles there set forth

| in a tragedy in verse, licensed September 13, 167 7, called

Edgar, or the English Monarch, which was not, however, very successful. The printed editions of 1678, 1691, and 1693 belong to the same issue, with new title-pages, Rymer’s views on the drama were again given to the world in the shape of a printed letter to Fleetwood Shep- heard, the friend of Prior, under the title of The Tragedies of the Last Age Considered (1678). To Ovid’s Epistles Translated by Several Hands (1680), with preface by Dry- den, ‘‘ Penelope to Ulysses” was contributed by Rymer, who was also one of the “hands” who Englished the Plutarch of 1683-86. ‘The life of Nicias fell to his share. He furnished a preface to Whitelocke’s Memorials of Eing- lish Affairs (1682), and wrote in 1681 A General Draught and Prospect of the Government of Europe, reprinted in 1689 and 1714 as Of the Antiquity, Power, and Decay of Parliaments, where, ignorant of his future dignity, the critic had the misfortune to observe, “You are not to expect truth from an historiographer royal.” He con- tributed three pieces to the collection of Poems to the Memory of Edmund Waller (1688), afterwards reprinted in Dryden’s Miscellany Poems, and is said to have written the Latin

inscription on Waller's monument in Beaconsfield churchyard. He produced a congratulatory poem upon the arrival of Queen Mary in 1689. His next piece of author- ship was to translate the sixth elegy of the third book of Ovid's Tristia for Dryden's Miscellany Poems (1692, p. 148). On the death of Thomas Shadwell in 1692 Rymer received the appointment of historiographer royal, at a yearly salary of £200. Immediately afterwards appeared his Short View of Tragedy (1693), criticizing Shakespeare and Ben Jonson, which produced The Impartial Critick (1693) of Dennis, the epigram of Dryden,? and the judgment of Macaulay that Rymer was "the worst critic that ever lived" Within eight months of his official appointment Rymer was directed (August 26, 1693) to carry

1 See Hickes, Memoirs of John Kettlewell, 1718, pp. 10-14.

2 "The eorruption of a poet is the generation of a eritie" (Ded. of the Third Miscellany, in Works, 1821, xii. p. 49), whieh is much more pointed than Beaeonsfield's referenee to eritics as "men who have failed in literature and art" (Lothatr, chap. xxxv.) or Balzac's sly hit at Mérimée in similar terms. The poet's remarks on the Tragedies of the Last Age have been reprinted in his Works, 1821, xv. pp. 383-96, and in Johnson's Life of Dryden. See also Dryden's Works, i. 377, vi. 251, xi. 60, xiii. 20.

out that great national undertaking with which his name will always be honourably connected, and of which there is reason to believe that Lords Somers and Halifax were the original promoters. The Codex Juris Gentium Diplo- maticus of Leibnitz was taken by the editor as the model of the Federa. The plan was to publish all records of alliances and other transactions in which England was concerned with foreign powers from 1101 to the time of publication, limiting the collection to original documents in the royal archives and the great national libraries. Unfortunately, this was not uniformly carried out, and the work tontains some extracts from printed chronicles. From 1694 he corresponded with Leibnitz, by whom he was greatly influenced with respect to the plan and forma- tion of the Fadera. While collecting materials, Rymer unwisely engraved a spurious charter of King Malcolm, acknowledging that Scotland was held in homage from Edward the Confessor. When this came to be

known, the Scottish antiquaries were extremely indignant. G. Redpath published a MS. on the independence of the Scottish crown, by Sir T. Craig, entitled Scotland's Sover- eignty Asserted (1695), and the subject was referred to by Bishop Nicolson in his Scottish Historical Library (1702). This led Rymer to address three Letters to the Bishop of Carlisle (1702), explaining his action, and discussing other antiquarian matters. The first and second letters are usually found together ; the third is extremely rare. Rymer had now been for some years working with great industry, but was constantly obliged to petition the crown for money to carry on the undertaking. Up to August 1698 he had expended £1253, and had only received £500 on account,

At last, on November 20, 1704, was issued the first folio volume of the adera, Conventiones, Litteree et cujuscun- que generis Acta Publica inter reges Angliz et alios quosvis imperatores, reges, de, ab AD. 1101 ad nostra usque tempora habita aut tractata. The publication proceeded with great rapidity, and fifteen volumes were brought out by Rymer in nine years. Two hundred and fifty copies were printed ; but, as nearly all of them were presented to persons of distinction, the work soon became so scarce that it was priced by booksellers at one hundred guineas. A hundred and twenty sheets of the fifteenth volume and the copy for the remainder were burnt at a fire at William Bowyer's, the printer, on January 30, 1712-13. Rymer died shortly after the appearance of this voluine, but he had prepared materials for carrying the work down to the end of the reign of James I. These were placed in the hands of Robert Sanderson, his assistant. For the greater part of his life Rymer derived his chief subsistence from a mortgage assigned to him by his father. His miscel- laneous literary work could not have been very profitable. At one time he was reduced to offer his MSS. for a new edition for sale to the earl of Oxford. About 1703 his affairs became more settled, and he afterwards regularly received his salary as historiographer, besides an addi- tional £200 a year as editor of the Medera. Twenty- five copies of each volume were also allotted to him. He died at Arundel Street, Strand, December 14, 1713, and was buried in the church of St Clement Danes. His will was dated July 10, 1713. 'Tonson issued an edition of Rochester's Works (1714), with a short preface by the late historiographer. Another posthumous publication was in a miscellaneous collection called Curious Amuse- ments, by M. B. (1714), which included "some transla-

tions from Greek, Latin, and Italian poets, by T. Rymer.” Some of his poetical pieces were also inserted in J. Nichols’s Select Collection (1780-86, 8 vols.).

_Two more volumes of the Federa were issued by Sanderson in 1715 and 1717, and the last three volumes (xviii., xix., and xx.) by

| pape a new and improved edition of the Federa.

‘ lished between 1816 and 1830.

‘of reports, orders, &c., on the Fodera, 1808-11.

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the same editor, but upon a slightly different plan, in 1726-35. The latter volumes were published by Tonson, all the former by Churchill. Under Rymer it was carried down to 1586, and con- tinued by Sanderson to 1654. The rarity and importance of the work induced Tonson to obtain a licence for a second edition, and George Holmes, deputy keeper of the Tower records, was appointed editor. The new edition appeared between 1727 and 1735. The last three volumes are the same in both issues. There are sonie corrections, enumerated in a volume, The Emendations in the new edition of Mr Rymer’s Federa, printed by Tonson in 1730, but in other respects the second is inferior to the first edition. A third edition, embodying Holmes’s collation, was commenced at The Hague in 1737 and finished in 1745. It is in smaller type than the others, and is compressed within ten folio volumes. The arrangement is rather more convenient ; there issome additional matter; the index is better ; and on the whole it is to be preferred to either of the previous editions. When the volumes of the Federa first appeared they were analysed by Leclere and Rapin in the Bibliotheque Choisie and Bibliothéque Aneienne et Moderne. Rapin’s articles were collected together, and appended, under the title of Abregé historique des aetes publiques de U Angleterre, to the Hague edition. A translation, called Acta Regia, was published by Stephen Whatley, 1726-7, 4 vols. 8vo, reprinted both in 8vo and folio, the latter edition containing an analysis of the caneelled shects, relating to the journals of the first Parliament of Charles I., of the 18th volume of the Federa.

In 1808 the Record Commissioners appointed Dr Adam Clarke to Six parts, arge folio, edited by Clarke, Caley, and Holbrooke, were pub- Considerable additions were made, but the editing was performed in so unsatisfaetory a manner that the publication was suspended in the middle of printing a seventh part. The latter portion, bringing the work down to 1388, was ultimately issued in 1869.

The wide learning and untiring labours of Rymer have received the warmest praise from historians. Sir T. D. Hardy styles the

| Federa “a work of which this nation has every reason to be proud,

for with all its blemishes—and what work is faultless ?—it has no rival in its class’ (Syllabus, vol. ii., xxxvi.), and Mr J. B. Mullinger calls it ‘‘a collection of the highest value and authority a (Gardiner and Mullinger’s Introduction to English History, p. 224).

The best account of Rymer is to be found in the prefaccs to Sir T. D. Hardy’s Syllabus, 1869-86, 3 vols. 8vo. There is an unpublished life by Des Maizeaux (Brit. Mus. Add. MS, No. 4223), and a few memoranda in Bishop Kennct’s collections (Lansd. MS. No. 987). 1n Caulfield’s Portraits, &c., 1819, i. 50, may be secn an engraving of Rymer, with a description of a satirical print. Rymer’s two critical works on the drama are discussed by Sir T. N. Talfourd in the Retrospective Review, 1820, vol. i. p. 1-15.

Sir T. D. Hardy’s Syllabus gives in English a condensed notice of each instru- ment in the several editions of the Federa, arranged in chronological order. The third volume contains a complete index of names and places, with a catalogue of the volumes of transcripts collected for the Record edition of the Fwdera. In 1869 the Record Office printed, for private distribution, Appendices A to E ‘‘toa report on the Federa intended to have becn submitted by C. Purton Cooper to the Late Commissioners of Public Records,” 3 vols. 8vo (incluaing accounts of MSS. in forcign archives relating to Great Britain, with facsimiles). In the British Museum is preserved (Add. MS, 24,699) a folio volume of reports and papers relating to the Record edition. Rymer left extensive materials for a new edition of the Federa, bound in 59 vols. folio, and embracing the period from 11165 to 1698. This was the collection offered to the earl of Oxford. It was

purchased by the Treasury for £215 and is now in the British Museum (Add. MSS. Nos. 4573 to 4630, and 18,911). A catalogue and index may be consulted in the 17th volume of Tonson's edition of the Fodera, The Public Record Office possesses a MS. volume, compiled by Robert Lemon about 1800, containing instruments in the Patent Rolls omitted by Rymcr. In the same place may be a a eT) Bhs aU

RZHEFF, RsuerF, Rsxv, or RzHorr, a town of European Russia at the head of a district in the Tver government, in 56° 16' N. lat. and 34° 21' E. long., 89 miles south- west of Tver, occupies the bluffs on both banks of the Volga (here 350 feet wide) near the confluence of the river Bazuza. It is the terminus of a branch line from the St Petersburg and Moscow Railway, has a population of 18,569 (1880; 19,660 in 1866), carries on a variety of manufactures—hemp-spinning, malting, brewing, ship- building, é&c.—and is the centre of a great transit trade between the provinces of the lower Volga, Orel, Kaluga, and Smolensk, and the ports of St Petersburg and Riga.

Rzheff was already in existence in the 12th century, when it belonged to the principality of Smolensk and stood on the highway between Novgorod and Kieff. Under the rulers of Novgorod it become from 1225 a subordinate principality, and in the 15th century the two portions of the town were held by two independent

| princes, whose names are still preserved in the designations Knyaz

Fedorovskii and Knyaz Dimitrievskii, given respeetively to the left and the right bank of the Volga. In 1368 Rzheff was eaptured by Vladimir Andreevitch, and in 1875 it stood a three weeks' seige aud had its suburb burned by the same prince. It was made a district town in 1775.

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{ represents the hard open (or fricative) sound produced S by bringing the blade of the tongue close to the front palate, immediately behind the gums, or rather, this is the normal position for S, as slight varieties can be

produced by bringing the tongue farther back. By the “blade” is meant the pointed end of the tongue, not the mere point, which at the same part of the palate produces R. This position differs little from that for TH, into which 8 passes in a lisping pronunciation ; a larger part of the surface of the tongue is brought near to the palate for TH than for 8. The symbol which represents the soft open sound corresponding to 8 is Z, though in practice S often stands for both.

The history of our symbol S is easy up to a certain point. It is the rounded form of $, rounded at a very early period for convenience of writing, for the change is apparent in the old Italian alphabet of Cere, and still more on the recently discovered vase of Formello; and even in the scribbling of the Greeks at Abu Simbel—the oldest, or nearly the oldest, bit of Greek epigraphy—per- fectly rounded forms stand side by side with the angular ones. The common Greek form 2 was obtained by adding a fourth stroke, and gradually making the top and bottom ones horizontal. When, however, we wish to identify the Greek symbol of three strokes with its Phoenician counter- part, the difficulty begins. The Phoenicians had four symbols for sibilants, known in Hebrew as Zayin, Samekh, Sade, and Shin; the last of these at a very early date represented two sounds, the English sh, and another sound which resembled that of Samekh and ultimately became indistinguishable from it, both being pronounced as the English s. The Greeks did not want all these symbols, consequently in different parts of Greece one or other— not the same—Phcenician symbol fell into disuse. One of these, M or Vy, called San, though lost in Ionic, appears

in old Doric inscriptions, as those of Thera, Melos, and |

Crete, Argos, Corinth, and Corcyra; but the later Doric form is the usual Sigma; probably San was too like the nasal M. There is no doubt that in form Zeta represents Zayin, and that Xi represents Samekh. Moreover, Zeta and Zayin stand seventh in the Greek and Phcenician alphabets respectively, and Xi and Sainekh each fifteenth. Again, the form of San with three strokes corresponds fairly with Sade, and Sigma is moderately like Shin ; but here the evidence of position comes in again to strengthen a somewhat weak case, for in the old Italian alphabets San has the place of Sade, the simpler form occurring in the Ceere alphabet, the fuller in that of the

Formello vase ; in both Sigma (rounded in form) has the place of Shin. These identifications would be certain if the names cor- responded as well as the forms; but they clearly do not: Zeta and Sade (not Zayin) seem to hold together in sound, and Sigma (as has often been suggested) looks like a “ popu- lar etymology” for Samekh. But the objection from difference of names is not fatal. All names which are thought of habitually in rows or sets tend to be modified under the influence of analogy ; and analogy has certainly been at work here, for Xi, which is a purely Greek name, is, like Psi, and like Chi and Phi, due to the older Fi. Sunilarly Eta and Theta have probably made Zeta; but it must be allowed that the metamorphosis of Sade is more intelligible (as a matter of sound-change) than that of Zayin. Probably we must have recourse to a different principle to explain at least some part of our difficulty. We may suppose that in some part of Greece the sounds

denoted originally by Sade and Zayin became indis- tinguishable ; there would then exist for a time one sound but two names. It would be a matter of little moment which name should survive; thus Sade (or Zeta) might supersede Zayin, or one name might survive in one district—as San in the Doric, but Sigma in the rest of Greece. This suggestion is made by Dr Taylor (The Alphabet, ii. 100). The history of the sounds, as well ag of the forms, of the Greek sibilants is difficult. Probably Sigma was generally hard —our s in sign. But Zeta did not originally denote the corresponding z: rather it was dz; some say dj, as in “John,” but this is not likely. Xi was probably a strong sibilant with a weak guttural, as X was in Latin. If the sound z existed in Greek, as is prob- able, it was denoted by Sigma. In Italy, also, we must infer that the soft sibilant was heard too little to need a special symbol, because z, which exists in the old alphabets of Cxre and Formello, was lost early enough to leave a place for the newly-made Italian symbol G. When Z was restored, it was placed at the end of the alphabet and doubt- less with the value of Greek Z in the Greek words in which alone it was used. One Latin s—probably z—became the trilled + between two vowels,—eg., in ‘“Papirius” for “Papisius,” “arboris ” for “ arbosis.”

In English the symbol s alone existed till z was intro- duced from France with words of French origin, as “zeal,” “zone.” Anattempt was made to employ it at the end of plural nouns, where the sound is regularly heard

except when the last sound of the noun is hard, eg., “bedz” (beds), but “hops”; but this was not maintained, nor even consistently done, for the symbol was used even when the sound must have been s. We regularly write s for both sounds,—e.g., in “lose” and “loose,” “curs” and “curse,” “hers” and “hearse.” When there is a distinc- tion in spelling the s commonly has the value of z—eqg., “vies” and “vice,” “pays ” and “ pace,” “his” and ‘“limeam S has the sound of sh in “sure,” “sugar,” and some other words ; this is due to the palatal sound heard before the wu. Sh, in spite of its spelling, is a single sound, the position of which differs from that for s only in a slight retraction of the point of the tongue; it is commonly found in English words which originally had sk,—e.g., shall,” O.E. sceal ; “‘shabby,” a doublet of “scabby ” ; “fish,” O.E. fish. The sound is the same as that of French ch in “ chAteau,” “chef,” “sécher,” where it is due to assibilation of original &.

SAADI. See Sa‘pi.

SAADIA, or Saapras (Heb. Se‘adyah, Arab. Sa‘td?), was the most accomplished, learned, and noble gaon (head of the academy) of Siira (see Ras). Mar Rab Se‘adyah b. Yoseph? was born in the Fayytim, Upper Egypt, in 892 and died at Stra in 942. Of his teachers only the Jew Abt: Kethir is positively known by name,? but he must have had at least three more teachers of considerable learning, one a Karaite,4 one a Mohammedan, and one a Christian, as his acquaintance with the literature of these four religious bodies testifies. His pre-eminence over his

1 He signs himself S”YD acrostically in his Azharoth (Kobes, pp. 52, 53; see note 4 on next page).

? Mas‘tdi, a contemporary, calls the father Ya‘akob ; but see Fiirst, Literaturblatt d. Orients, vi. col. 140.

3 Mas‘tdi (De Sacy, Chrest. Ar., 2d ed., i. 350, 351).

4 The late learned and ingenious Rabbi 8. L. Rapoport rolled here, as in many other places, the stone of Sisyphus (“Toledoth Rabbenu Se‘adyah Gaon,” in Bikkure Ha‘ittim, Vienna, 1828, note BIR Par haps, after all, the

Karaites may be right in asserting that Salmon b: Yeruham was Rab Se‘adyah’s teacher.

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contemporaries is indicated in the fact that he was the only gaon who had not been educated and then advanced by degrees in the academy, to the highest dignity of which he was called from a far-off country, but best appears in the excellence of his many works, which extend over most branches of learning known in his time. And his learning was exceeded by his manifold virtues. His love of truth and justice was made more conspicuous by the darkness of the corruption amid which he lived. When the résh galutha (“prince of the captivity,” the highest dignitary of the Jews in Babylonia, and to some extent of those of the whole world) attempted to wrest judgmient in a certain case, and first asked, then requested, and finally demanded the signature! of the gaon of Siira in a threaten- ing manner, Se‘adyah refused it, fearless of consequences. David b. Zakkai, the résh galutha, deposed him and chose another gaon in his stead. A reconciliation took place some years afterwards, and Se’adyah was reinstated in his old dignity. And, although his health had been fatally undermined by the behaviour of the résh galutha and his son, Se‘adyah, when his former opponent died, was indefatigable in his endeavours to have this very son of his once mortal enemy placed on the throne of his fathers. But the new prince of the captivity enjoyed his dignity for little more than half a year. He left behind him a boy, twelve years of age, whom Se‘adyah took into his own house and treated in every respect as his own child. This learning and these virtues endeared Se‘adyah not merely to his contemporaries but also to the best men of succeeding ages. Behayye b. Yoseph (the author of the Hoboth Hallebaboth), Rashi, Se‘adyah (the author of the commentary on Daniel in the Rabbinic Bible), David Kimhi, Behayye b. Asher (the author of Kad Hakkemah), all appeal to him as an authority not to be questioned. Even Ibn ‘Ezra defers more to him than to any other authority. To this day Jewish and Christian scholars alike express for him the highest admiration.

The numerous works which are ascribed to him may be con- veniently divided into four classes.

I. Genuine and still extant Works.—(1) Arabic translations of, and in part commentaries? on, books of the Bible: (a) the Penta- teuch (printed in Hebrew characters, Constantinople, 1546, oll -and in Arabic characters in the Paris and London polyglotts) ; (0) Isaiah (printed in Arabic characters from Hebrew letters of the Bodleian MS. Uri 156,3 by Paulus, Jena, 1790-91, 8vo) ; (e) Psalms (Ewald, Ueber die arabiseh geschriebenen Werke jiidiseher Sprach- gelehrten, Stuttgart, 1844, 8vo); (d) Proverbs (Bodleian MS. Uri 15); (e) Job (Uri 45) ; (f) Canticles (Merx, Die Saadjanische Ueber- setzung des Hohen Liedes ins Arabische, Heidelberg, 1882, 8vo). (2) Hebrew Lexicography : Seventy (90 or 91) drat Neybueva to be found in the Bible, published from the Bodl. MS. Hunt. 573, by Dukes (7. K. M., v. 6) and by Benjacob (Debarim

1 To make the legal decisions of the résh gilutha more respected, the signatures of the geonim of Stra and Pumbaditha were desirable. A specimen of a legal decision by David b. Zakkai signed on the authority of Rab Se‘adyah Gaon is to be found in Frankel-Gratz, Monatsschrift, xxxi. pp. 167-170.

2 If we may argue from the known to the unknown, Seadyah’s translations, whether they were called tafsir or sharh, contained more than a mere translation. From Ibn ‘Ezra’s preface to his com- mentary on the Pentateuch and from the Arabic comm. on the Psalms published in excerpt by Ewald we see that Rab Séadyah was in the habit of explaining in addition to translating. Compare also Munk,

Notice sur Saadia,” in Cahen, La Bible (Isaie), Paris, 1838, 8vo, p. 77, note 1.

3 Tn the copyist’s subscription to this MS. the actual reading is not my (Rapoport), but MINDY; this should be AINAY, as Munk prints it (“ Notice,” p. 108). The Bodleian MSS. are referred to in this article from personal inspection.

e The original codex on brownish paper, in square characters of Babylonian handwriting (14th cent.), is defective at beginning and end. The supplement at the beginning, containing also later matter,

zu den Zehn Geboten, in Hebrew lettcrs (MS. Jellinek of Vienna, with Hebrew and German translation by W. Hisenstadter, Vienna, 1868, 8vo). (5) Religious Philosophy: (#) Comimentary on the Sepher Yesirah, MS. Uri 370 (Opp. Add., 4to, 89), contains the ear- lier part of a Heb. trans. in a modern hand ; (0) Kitdb al-Amdndt wa' l-I'tigdddt (Landauer, Leyden, 1880, 8vo), translated into Hebrew by Yehudah Ibn Tibbon (edztio prineeps, Constantinople, 1562, 4to), and by R. Berekhyah Hannakdan, author of the Mishele Shu'alim (printed only in part; see Dukes, Beitrige, pp. 20, 22); nine chapters have been translated into German (Fiirst, Leipsic, 1845, 12mo), and parts into English (7'wo Treatises, by P. Allix, London, 1707, 8vo).

Il. Works now lost, but the existenee of whieh is testified to by contemporary and later authors.—(1) An Arabic translation of, and in part commentary on, most, if uot all, the other books of the Bible.® (2) Lexical Treatises: Book of Interpretations (Sepher Pithronim, or Collection (Iggeron).® (3) Grammatical Treatises : (a) Elegancy of the Hebrew Tongue—(a) Treatise on the Changes, () Treatise on the Combinations, (y) Treatise on Dagesh and Lapheh, (5) Treatise on the Letters Y,M,1,87; (b) Treatise on Punctuation 8; (ec) Treatise on Right Reading® ;—it is not impossible that the first four constituted one work and the last two another work. (4) Talmudic Literature: (a) Translation of the Mishnah; (b) Meth- odology of the (Babylonian) Talmud?!; (e) Treatise on Bills"; (d) Treatise on Deposits; (¢) Treatise on Oaths'; (f) Treatise on Prohibited Degrees; (g) Treatise on Jmpura et Pura, including Hilekhoth Niddah 8 ;—it is very possible that thosc marked e¢ to f constituted one book, just as the treatise marked g constituted one book. (5) Calendaric Literature: Sepher Ha''ibbur (Treatise on Intercalation).!" (6) Apologetics : Treatise on Investigations."® (7) Polemics : (a) against Karaism—(a) 'Anan, (8) Ibn Sakkawiyyah," (y) Ibn Zitta (or Zutta)"; (5) against the Rabbanite Hivvi al- Balkhi" ; (e) against the Karaite Ben Asher (the completer of tlic Massoreth ; see L.-B. d.

Or., x. 684). (8) The nature of the Sepher Haggalui cited by Rabad II. and Ab. b. Hiyya in his Sepher Ha’ibbur is not clear.

Ill. Works ascribed to Se‘adyah the authorship of whieh is not sufficiently proven.1) The commentary on Canticles edited by Yishak Ibn ‘Akrish (Constantinople, 1577, 4to), and that published by L. Margaliyyoth at Frankfort-on-Oder, 177778, (2) The well- known piece of didactic poetry which gives account of all the letters of the Bible, how many times they occur, &c. (editio prineeps, Venice, 1538, at the end of Elias Levita’s Massoreth Hammass.).

IV. Works ascribed to Se‘adyah by mistake.—(1) The Commentary on Daniel commonly found in the Rabbinic Bibles belongs to an- other Rab Seadyah, who lived at least two hundred years later, and was a native either of France or the south of Germany. (2) The Commentary on the Sepher Yesirah, printed with the text and three other commentaries at Mantua in 1562, 4to. (3) The Book on Lots (Sepher Haggoraloth), often printed separately aud in con- junction with similar works. (4) Eben Happilosophim (Lapis Philo- sophorum), ascribed to him by R. Mosheh Butrial (Mantua edition of the Sepher Yesirah as above). (S. M. §.-8.)

is in §. Arabian handwriting. The well-known “Ten reasons for Sounding the Trumpet on the Day of Memorial” are not found in this Siddur (against Rapoport, ut supra, note 21). The three poetical pieces published as five by Rosenberg (Kobes, ii., Berlin, 1856) form an integral part of the Siddur, but bear on the surface marks of having been taken from a second-hand, if not a third-hand, copy, as the editor admits with regard to the “second petition.” The “Two Petitions” must have served Ibn Gebirol (AVICEBRON) as a model for the latter

or liturgical part of his m2>p “N53, just as he and others after him silently utilized Se‘adyah’s philosophy.

5 See Hoboth Hallebaboth (preface) and Sibbub (Travels) of R. Peth- ahyah of Ratisbon (London, 1861, 8vo, p. 22).

6 [.-B. d. Orients, x. coll. 516, 541, 684.

7 Tbid., coll. 516, 518. 8 See Rashi on Psalm xlv. 10.

9 L.-B. d. Or., x. 518. 10 Sibbud (as in note 5 above).

1l See Shem Haggedolim (Vilna, 1852, 8vo), ii. leaf 16a, col. 2.

2. See Sha‘are Sedek (ut supra), leaf 17b.

13 See R. Menahem b. Shelomoh lebeth Meir (commonly called Meiri) on Aboth (Vienna, 1854, 8vo, Introduction, p. 17).

14 See Rapoport, /.¢., note 20.

1 See Pinsker, Likkute Kadmoniyyoth (Vienna, 1860, p. 174, note 1, in Nispahim). 16 See Rapoport, l.¢., note 19.

YW See L.-B. d. Or., xii. coll. 101, 102.

18 See Sion (Frankfort-on-Main, 1842-43, 8vo), ii. p. 187.

19 See Pinsker (wt supra), p. 103. 20 Sion (as before).

21 On this commentator see Ibn ‘Ezra on Exodus xxi. 24. From this passage we learn that Se‘adyah and Ben Zitta were contemporaries, and even had oral controversies with one another.

22 See Halikhoth Kedem, Amsterdam, 1846, p.71. Wivvi ai-Balkhi had raised strong objections against the truth of Scripture in his Two Hundred Questions, or Objections to the Bible.

23 The editions ‘Prag”, 1782 (Steinschneider), and Nowydwor, 1783 (Zedner), are probably the same as that of Frankfort with different titles.

SAALFELD, a busy little town of Germany, in the eastern horn of the crescent-shaped duchy of Saxe-Meiningen, is picturesquely situated on the

left bank of the Saale (here spanned by a bridge), 24 miles south of Weimar and 77 miles south-west of Leipsic. One of the most ancient towns in Thuringia, Saalfeld was the capital of the now extinct duchy of Saxe-Saalfeld, and contains some interest- ing old buildings. Among these are the former residential palace, built in 1679 on the site of the Benedictine monas- tery of St Peter, destroyed during the Peasants' War ; the Gothic church of St John, dating from the 13th century ; the quaint town-house, built in 1533-37 ; and the Kitzer- stein, a shooting-lodge said to have been originally erected by the emperor Henry I., though the present building is not older than the 16th century. But perhaps the most interesting relic of the past in Saalfeld is the striking ruin of the Sorbenburg or Hoher Schwarm, a strong castle said to have been built by Charlemagne to protect his borders from the Slavonic hordes. Its destruction took place in 1290, under Rudolf of Hapsburg. Saalfeld is situated in one of the busiest parts of Meiningen, and carries on a number of brisk industries, including the manufacture of sewing-machines, colours, wax-cloth and wire-cloth, brewing, and iron-founding. It has an active trade in iron, slate, wood, and wooden goods, and there are ochre and iron mines in the neighbourhood. The population in 1880 was

7458.

Springing up under the wing of the Sorbenburg, Saalfeld early became an imperial demesne, and received various benefits at the hands of successive emperors. After asomewhat chequercd carcer, the town became the capital of the duchy of Saxe-Saalfeld, founded in 1680 by the youngest son of the duke of Gotha; but in 1735, when the succession to the duchy of Coburg was assigned to the dukes of Saalfeld, their residence was removed to Coburg. In 1826 the united duchies merged by inheritance in the duchy of Saxe-Meiningen.

SAARBRUCKEN, an important industrial and com- mercial town in Prussia, on the left bank of the Saar, a navigable tributary of the Moselle, is situated 49 miles east of Metz, at the south end of one of the most extensive coal- fields in Europe, to which it has given itsname. With the town of St Johann, immediately opposite on the right bank of the river, here spanned by two bridges, Saarbriicken forms in reality a single community, with a

united popu- lation of nearly 22,000. St Johann, though now the larger, is the more recent town, being in fact the creation of the important railways whose junction is fixed there. Saar- briicken itself is not directly on any main line. The industries of St Johann-Saarbriicken include wool-spinning, brewing, and the manufacture of tobacco, chemicals, tin, and stoneware. The trade is chiefly connected with the produce of the neighbouring coal-mines and that of the numerous important iron and glass works of the district. The Saarbriicken coal-field extends over 70 square miles ; and its annual output is about 6 million tons. Of this total the Prussian state mines yield about 5,200,000 tons, Prussian private mines 100,000 tons, the mines in Lorraine 500,000 tons, and mines in Rhenish Bavaria 200,000 tons. In 1880 the population of Saarbriicken alone was 9514, and of St Johann 12,346.

Till 1283 Saarbriicken was in the possession of the old counts of Ardennes ; from 1381 till 1793 it was the residence of the princes of Nassau-Saarbriicken ; from 1793 till 1815 it was in the possession of the French ; and since 1815 it has been Prussian. St Johann is said to have been founded as an outwork to Saarbriicken in 1046, and to have received town-rights in 1321. In the Franco- Prussian War of 1870-71 Saarbriicken was seized by the French on

ad August 1870, but the first German victory, on the heights of Spicheren, 3 miles to the sonth, relieved it four days later.

SAARDAM. See Zaanpam.

SAARGEMUND (Fr. Sarreguemines), an industrial town and railway junction of Germany, in the imperial province of Alsace-Lorraine, is situated at the confluence

of the Blies and the Saar, 40 miles east of Metz. It carries on considerable manufactures of silk, plush, porcelain, and earthenware, and is a chief depdt for the papier-maché boxes (mostly snuff-boxes) which are made in great quan- tity in the neighbourhood. To the south lies the district lunatic asylum

of Steinbacherhof. The town, which is garrisoned by four squadrons of cavalry, in 1880 had a population of 9573, chiefly Roman Catholics.

SAAVEDRA, Ancet pr, DuKE or Rivas (1791-1865), Spanish poet and politician, was born at Cordova in 1791, and fought with bravery in the Spanish War of Independ- ence. From 1813 to 1820 he lived in retirement in An- dalucia, but in the latter year he sided actively with the revolutionary party, and in consequence had to go into exile in 1823. He lived successively in England, Malta, and France until 1834, when he received permission to return to Spain, shortly afterwards succeeding his brother as duke of Rivas. In 1836 he became minister of the interior under Isturiz, and along with his chief had again to leave the country. Having returned with Maria Chris- tina in 1844, he again held a portfolio for a short time in 1854; and during the last two decades of his life he was ambassador at Naples, Paris, and Florence for consider- able periods. He died in 1865.

In 1813 he published Ensayos poeticos, and between that date and his first exile several tragedies of his composition (Aliatar, 1814; Hl Duque d' Aquitania, 1814 ; Lanuza, 1822) were put upon the stage. Z'anto vales quanto tienes, a comedy, appeared in 1884, Don Alvaro, a tragedy, in 1835, and two other dramatic composi-

tions in 1842. Saavedra was also the author of Hi Moro Hxposito, a narrative poem in ballad metre (two volumes), and Florinda, an

epic romance. SAAVEDRA, MicvEeL pE Crrvantses. See CzEr-

VANTES,

SAAVEDRA FAXARDO, Dinco pz (1584-1648), diplomatist and man of letters, was born of a noble family at Algezares in the Spanish province of Murcia in 1584, Having been educated for the church at Salamanca, and admitted to the priesthood, he accompanied Cardinal Borgia, the Spanish ambassador, to Rome in the capacity of secretary. Ultimately he rose to high rank in the diplo- matic service, and was Spanish plenipotentiary at Ratisbon in 1636 and at Miinster in 1645. He was nominated to the supreme council of the Indies in 1646, but not long afterwards retired to a monastery, where he died in 1648.

In 1640 he published a treatise entitled Hmpresas politicas, 6 idea de un principe politico cristiano representado en cien empresas, a hundred short essays, in which he discusses the education of 4 prince, his relation and duties to those around him, and so forth, primarily intended for and dedicated to the son of Philip IV. It is sententious in style and characterized by the curious learning of the time, and is still read and admired in Spain. It passed through a number of editions and was translated into several languages, the English version being by Astry (2 vols., 8vo, London, 1700). An unfinished historical work entitled Corona Gotica, Castellana, y Austriaca politicamente ilustrada, appeared in 1646, Another work by Saavedra, only second iu popularity to the Hmpresas, his Republica Literaria, was published posthumously in 1670 ; it dis- cusses in a somewhat mocking tone some of the leading characters in the ancient and modern world of letters. Collected cditions of his works appeared at Antwerp in 1677-78, and again at Madrid im 1789-90 ; see also vol. xxv. of the Bibl. de Aut. Esp. (1858).

SAAZ (Bohemian Zatec), a manufacturing and com- mercial town in the north of Bohemia, is situated on thie right bank of the Eger, 42 miles north-west of Prague. The suspension bridge, 210 feet long, which here spans the river was constructed in 1826 and is one of the oldest of the kind in Bohemia. Saaz, which claims to have ex- isted as early as the 8th century, contains a number of ancient churches, of which one is said to date from 1206, and five others from before the close of the 14th century. The town-house was built in 1559. A technical school was added in 1878 to the already fairly numerous educa- tional institutions. Nails, leather, beetroot-sugar, and pasteboard are among the chief manufactures of Saaz,

which, however, owes its main importance to being the centre of the extensive hop-trade of the neiglibourhood.

The hops of Saaz are said to have been renowned for the

last five hundred years; and nearly 800 tons are annually raised in the district to which the town gives its name. The population of Saaz was 12,425 in 1880.

SABAA. See YEMEN.

SABAH, or British NortH Bornxo, is all that portion of the island of Bornxo (q.v.) which was formally recog- nized by the charter of incorporation granted in Novem- ber 1881 as the territory of the British North Borneo Company. Tt has a coast-line of over 600 miles, and its area, still to a great extent unexplored,! is estimated at 30,000 square miles. Leaving out of account the deep indentations of the coast-line, it may be said to form a pentagon, of which three sides, the north-west, north-east, and south-east, are washed by the sea, while the remaining two sides are purely conventional lines drawn from Gura Peak (3° 50’ N. lat., 116° 10’ E. long.), the one almost due east to the Sibuco river, the other north-north-west to the mouth of the Sipitong on Brunei Bay. The latter separates the Company’s territory from the independent sultanate of Brunei; the former is the frontier towards the Dutch possessions.

The great central feature of Sabah is the magnificent mountain of Kinabalu (compare Bornxo) or Nabalu, built up of porphyritic granite and igneous rocks to a height of 13,698 feet, and dominating the whole northern part of the island, with all its profusion of lesser mountains and hills. Kinabalu, which has the appearance of two mountains, unites towards the east by a low ridge with “Nonohan t’ agaioh (the great Nonohan) and the terminal cone Tumboyonkon (Tamboyukon).” These two summits are respectively 8000 and 7000 feet high, and there are others of considerable elevation in the same neighbour- hood. At some 15 or 20 miles to the north rises Mount Madalon (5000 feet), separated from Kinabalu and the other igneous and metamorphic hills by a wide valley, and consisting of those aqueous rocks, limestones, sandstones, and clays which appear to occupy the whole country to the north. Westward from Kinabalu are hills between 1000 and 2000 feet in height, and about 40 or 50 miles south-east is an important group on the north side of the Labuk valley known as the Mentapok Mountains (3000- 8000 feet). The whole surface of the country is channelled by countless streams whose precipitous ravines, boulder- strewn

rapids, and enormous beds of rolled pebbles bespeak the denuding energy of tropical rains. The coasts are generally low and flat, and to a great extent lined with casuarina trees, with here and there a stretch of mangrove, a low sandstone or limestone cliff, or a patch of that great forest which in the interior still covers so large a portion of the territory. In the low grounds along the coast and also inland among the hills are vast swamps and watery plains, which in the rainy season, when the rivers rise 20 or 30 fect above their usual level, are transformed into lakes. On the west side of Sabah the principal rivers are the Padas and the Klias, debouching opposite Labuan, but quite unexplored in their upper courses; the Papar (Pappar or Pappal), which passes the village of that name and enters the sea at Papar Point; the Tampassuk, one of the first to be explored (see St John's Life im the Forests of the Far East) and remarkable for the waterfall of Pandassan or Tampassuk (1500 feet high, and thus one of the highest in the world), formed by its headwater the Kalupis. The Sekwati, a comparatively small river

1 But the officers of the company are very active in exploration. L. B. von Donop, F. Witti (killed 1882), W. B. Pryer, Frank Hatton (killed 1883), and Henry Walker are or have been among the more energetic.

farther north, is well known for its oil-springs. At the northern extremity of the island the deep inlet of Marudu Bay receives the waters of the Marudu or Maludu river, which rises on the west side of Mount Madalon. On the

east coast are the Sugut, which has its headwaters in the

hills to the east of Kinabalu, and forms its delta in the neighbourhood of Torongohok or Purpura Island ; the Labuk, debouching in Labuk Bay, and having its sources in the highlands about 70 miles inland ; the Kinabatangan, with a longer course than any yet mentioned, rising prob- ably betwecn 116° and 117° E. long., and forming at: its mouth a very extensive delta to the south of Sandakan Harbour; and finally the Segama, the scene of Frank Hatton's death (1883). Farther south, and inland from Darvel Bay and Sibuco (or St Lucia) Bay, there are no doubt other rivers of equal, it may be superior, import- ance; such, to judge by its delta, is the

Kalabakong, debouching opposite Sebattik Island. Most of the rivers mentioned are navigable for steam launches of light draught, but their value is frequently impaired by a bar near the mouth. Several of the natural harbours of North Borneo, on the other hand, are at once accessible, safe, and commodious. Sandakan Harbour, on the north-east coast (5° 40’ N. lat. and 118° 10’ E. long.), runs inland some 17 miles, with a very irregular outline broken by the mouths of numerous creeks and streams. The mouth, only 24 miles across, is split into two channels by the little island of Balhalla. The depth in the main entrance varies from 10 to 17 fathoms, and vessels drawing 20 feet can advance half-way up the bay. Just within the mouth, on the north side, lies Elopura (see below). At Silam, on Darvel Bay, farther south, there is good anchor- age. Kudat (discovered by Commander Johnstone, of H.M.S. “Egeria,” in 1881) is a small but valuable harbour in Marudu Bay running inland for 2 or 3 miles, but rapidly shoaling after the first mile to 1 and 2 fathoms. It affords anchorage for vessels of any draught, but the frontage available for wharves is limited to some 1500 feet. In Gaya Bay, on the west coast, any number of vessels may lie in safety during either monsoon, the depths varying from 6 to 16 and 17 fathoms.

The climate of North Borneo is of course tropical, with a very equable temperature. The lowest minimum of the thermometer recorded in 1883 at Sandakan was 68°°5in December. The greatest interval without rain was eight days in March. The rainfall was 344 inches (157 in 1880) at Sandakan, 129 at Papar, and 120 at Kudat. In the interior it must often be much above these figures.

That North Borneo should prove rich in minerals was supposed probable from the character of some other parts of the island ; but hitherto investigations have not in this matter proved very suc- cessful. Coal or lignite exists, but most frequently in thin seams and insignificant pockets ; the petroleum springs cannot come into any true competition with those worked elsewhere ; gold has been discovered (1885) in the Segama river and may prove a stimulus to immigration ; iron-ores appear both abundant and at times produc- tive ; and there are indications of the existence of copper, antimony, tin, and zinc ores. As yet the wealth of the country lies in its timber and jungle products (camphor and gutta-percha in grcat

quantities), and in its edible nuts, guano, sago, sugar, tobacco, coffee, pepper, and gambier. Tobacco is most successfully grown by the natives in the inland districts of Mansalut, Kandassang, Koporin- gan, Gana-Gana, Tomborongo, Karnahan, Penusak, Tiong-Tuhan, &e. ; and its cultivation has been taken up by several foreign com- panies. The birds'-nest caves of Gomanton (Gormanton) near the village of Malape on the Kinabatangan yield the Government a revenue of from $6000 to $7000 ; and other caves of the same kind are still unworked. As the natives (Dusuns, Tagaas-Bajaus, Idaan, &e.) are scattered, mostly in small villages, throughout the unex- plored as well as the explored districts, their number can only be guessed, but it is usually stated at 150,000. Since the formation of the company there has been a steady immigration, especially of Chinese from Singapore. At Elopura, the capital of the territory and of its East Coast residency, the inhabitants in 1883 numbered 3770 (1500 being Chinese and 1085 Sulus). Hong-Kong and Singa- pore steamers now call regularly at Sandakan, Gaya, and Kudat. In 1885 the territory was divided into Alcock province (in the north), Keppel province (along the west coast as far north as

Kimanis Bay), the East Coast residency (to the south-east of

Alcock and Keppel provinces), and Dent province (to the south-west of the East Coast residency with the coast from Kimanis Bay to Brunei Bay).

In 1865 an American company started by Mr Torrey obtained from the sultan of Brunei certain concessions of territory in North Borneo ; but this enterprise proved a financial failure and the

settlement formed on the Kimanis river broke up. The rights of

the Amcrican company were bought up by the Austrian Baron von Overbeck and the English merchant Mr Alfred Dent, who further obtained from the sultan of Brunei and the sultan of Sulu a series of charters conferring on them the sovereign authority in North Borneo under the titles of maharajah of Sabah, rajah of Gaya and Sandakan and Data Bandahara. Spain, which claimed that the sultan of Sulu being a Spanish vassal could not dispose of his territory without her consent, the English company

organized by.Mr Dent succecded in obtaining a charter of incorporation under Act of Parliament, Ist November 1881, as the “British North Borneo Company,” with right to acquire other interests in, over, or affecting the territories or propcrty comprised

in the several grants.

The text of the charter will be found in the London Gazette, 8th November 1881 and in the appendix to Mr Joseph Hatton’s New Ceylon (1881); see also Frank Hatton, North Borneo, 1885; the Century Magazine, 1885; the Edinburgh Review, 1882; and the English Illustrated Magazine, 1885.

SABAS, or Sappas, Sr (Syr. Mar Sabha), one of the early leaders of monasticism in Palestine, was a native of Cappadocia, born about 439. While still a child he accompanied his parents to Alexandria, whence in his eighteenth year, having made choice of the ascetic life, he removed to Palestine, settling at the desolate spot now occupied by the convent called by his name, about two hours from the north-west shore of the Dead Sea. As his reputation for holiness increased he was joined by others, who ultimately constituted a “laura” under the rule of St Basil. He took some part in the doctrinal controversies of the day, being a zealous defender of the decrees of Chalcedon. He died about 532 and is commemorated on 5th December. Another saint of this name, surnamed “the Goth,” suffered martyrdom at the hands of Athanaric, the Visigothic king, in the reign of Valentinian; he is commemorated on 15th (or 18th) April. See also Hoff-mann, Syr. Acten Persischer Méartyrer (1880), Nos. iv. and xi., for lives of two martyrs named Sabha.

SABBATH (navy), the day of sacred rest which among the

Hebrews followed six days of labour and closed the week.

1. Observance of the Sabbath.—The later Jewish Sab- bath, observed in accordance with the rules of the Scribes, was a very peculiar institution, and formed one of the most marked distinctions between the Hebrews and other nations, as appears in a striking way from the fact that on this account alone the Romans found themselves com- pelled to exempt the Jews from all military service. The rules of the Scribes enumerated thirty-nine main kinds of work forbidden on the Sabbath, and each of these prohibi- tions gave rise to new subtilties. Jesus's disciples, for example, who plucked ears of corn in passing through a field on the holy day, had, according to Rabbinical casuis- try, violated the third of the thirty-nine rules, which for- bade harvesting ; and in healing the sick Jesus Himself broke the rule that a sick man should not receive medical aid on the Sabbath unless his life was in danger. In fact, as our Lord puts it, the Rabbinical theory seemed to be that the Sabbath was not made for man but man for the Sabbath, the observance of which was so much an end in itself that the rules prescribed for it did not require to be justified by appeal to any larger principle of religion or humanity. The precepts of the law were valuable in the eyes of the Scribes because they were the seal of Jewish particularism, the barrier erected between the world at large and the exclusive community of Jehovah's grace. For this purpose the most arbitrary precepts were the most effective, and none were more so than the complicated rules of Sabbath observance. The ideal of the Sabbath which all these rules aimed at realizing was absolute rest

In spite of the opposition of

from everything that could be called work ; and even the exercise of those offices of humanity which the strictest Christian Sabbatarians regard as a service to God, and therefore as specially appropriate to His day, was looked on as work. To save life was allowed, but only because danger to life "superseded the Sabbath." In like manner the special ritual at the temple prescribed for the Sabbath by the Pentateuchal law was not regarded as any part of the hallowing of the sacred day; on the contrary, the rule was that, in this regard, "Sabbath was not kept in the sanctuary." Strictly speaking, therefore, the Sabbath was neither a day of relief to toiling humanity nor a

day appointed for public worship; the positive duties of its observance were to wear one's best clothes, eat, drink, and be glad (justified from Isa. lviii. 13). A more directly religious element, it is true, was introduced by the prac- tice of attending the synagogue service; but it is to be

remembered that this service was primarily regarded not

as an act of worship but asa meeting for instruction in the law. So far, therefore, as the Sabbath existed for any end outside itself it was an institution to help every Jew to learn the law, and from this point of view it is regarded by Philo and Josephus, who are accustomed to seek a philosophical justification for the peculiar institutions of their religion. But this certainly was not the leading point of view with the mass of the Rabbins ;! and at any rate it is quite certain that the synagogue is a post-exilic institution, and therefore that the Sabbath in old Israel must either have been entirely different from the Sabbath of the Scribes, or else must have been a mere day of idle- ness and feasting, not accompanied by any properly reli- gious observances or having any properly religious mean- ing. The second of these alternatives may be dismissed as quite inconceivable, for, though many of the religious ideas of the old Hebrews were crude, their institutions were never arbitrary and meaningless, and when they spoke of consecrating the Sabbath they must have had in view some religious exercise of an intelligible kind by which they paid worship to Jehovah.

Indeed, that the old Hebrew Sabbath was quite differ- ent from the Rabbinical Sabbath is demonstrated in the trenchant criticism which Jesus directed against the latter (Matt. xii. 1-14; Mark ii. 27). The general position which He takes up, that "the Sabbath is made for man and not man for the Sabbath," is only a special application of the wider principle that the law is not an end in itself but a help towards the realization in life of the great ideal of love to God and man, which is the sum of all true religion, But Jesus further maintains that this view of the law asa whole, and the interpretation of the Sabbath law which it involves, can be historically justified from the Old Testa- ment. And in this connexion He introduces two of the main methods to which historical criticism of the Old Testament has recurred in modern times: He appeals to the oldest history rather than to the Pentateuchal code as proving that the later conception of the law was

unknown in ancient times (Matt. xii. 3, 4), and to the exceptions to the Sabbath law which the Scribes themselves allowed in the interests of worship (ver. 5) or humanity (ver. 11), as showing that the Sabbath must originally have been de- voted to purposes of worship and humanity, and was not always the purposeless arbitrary thing which the schoolmen made it to be. Modern criticism of the history of Sabbath observance among the Hebrews has done nothing more than follow out these arguments in detail, and show that the result is in agreement with what is known as to the dates of the several component parts of the Pentateuch.

1 See the Mishnah, tr. “Shabbath,” and B. of Jubilees, ch. 1. 3 and

compare Schiirer, Gesch. d. jiid. Volkes, ii. 357, 376, 393 sq., where the Rabbinical Sabbath is well explained and illustrated in detail.

Of the legal passages that speak of the Sabbath all those which show affinity with the doctrine of the Scribes— regarding the Sabbath as an arbitrary sign between Jehovah and Israel, entering into details as to particular acts that are forbidden, and enforcing the observance by severe penalties, so that it no longer has any religious value, but appears as a mere legal constraint—are post-exilic (Exod. xvi. 23-30, xxxi. 12-17, xxxv. 1-3; Num. xv. 32-36); while the older laws only demand such cessation from daily toil, and especially from agricultural labour, as among all ancient peoples naturally accompanied a day set apart as a religious festival, and in particular lay weight on the fact that the Sabbath is a humane institution, a holiday for the labouring classes (Exod. xxiii. 12; Deut. v. 13-15). As it stands in these ancient laws, the Sabbath is not at all the unique thing which it was made to be by the Scribes. “The Greeks and the barbarians,” says Strabo (x. 3, 9), “have this in common, that they accompany their sacred rites by a festal remission of labour.” So it was in old Israel: the Sabbath was one of the stated religious feasts, like the new moon and the three great agricultural sacri- ficial celebrations (Hosea ii. 11); the new moons and the Sab- baths alike called men to the sanctuary to do sacrifice (Isa. i, 14); the remission of ordinary business belonged to both alike (Amos viii. 5), and for precisely the same reason. Hosea even takes it for granted that in

captivity the Sab- bath will be suspended, like all the other feasts, because in his day a feast implied a sanctuary.

This conception of the Sabbath, however, necessarily underwent an important modification in the 7th century B.¢., when the local sanctuaries were abolished, and those sacrificial rites and feasts which in Hosea's time formed the essence of every act of religion were limited to the central altar, which most men could visit only at rare intervals. From this time forward the new moons, which till then had been at least as important as the Sabbath and were celebrated by sacrificial feasts as occasions of religious gladness, fall into insignificance, except in the conservative temple ritual. The Sabbath did not share the same fate, but with the abolition of local sacrifices it became for most Israelites an institution of humanity divorced from ritual. So it appears in the Deuteronomic decalogue, and presumably also in Jer. xvii. 19 sg. In this form the institution was able to survive the fall of the state and the temple, and the seventh day's rest was clung to in exile as one of the few outward ordinances by which the Israelite could still show his fidelity to Jehovah and mark his separation from the heathen. Hence we understand the importance attached to it in the exilic literature (Isa. lvi. 2 sq., lviii. 13), and the character of a sign between Jehovah and Israel ascribed to it in the post-exilic law. This attachment to the Sabbath, beautiful and touching so long as it was a spontaneous expression of continual devotion to Jehovah, acquired a less pleasing character when, after the exile, it came to be enforced by the civil arm (Neli. xiii.), and when the later law even declared Sabbath-breaking a capital offence. But it is just to remember that without the stern discipline of the law the community of the second temple could hardly have escaped dissolution, and that Judaism alone preserved for Chris- tianity the hard-won achievements of the prophets.

The Sabbath exercised a twofold influence on the early Christian church. On the one hand, the weekly celebration of the resurrection on the Lord's day could not have arisen except in a circle that already knew the week as a sacred division of time ; and, moreover, the manner in which the Lord's day was observed was directly influenced by the Synagogue service. On the other hand, the Jewish Chris- tlans continued to keep the Sabbath, like other points of the old law. Eusebius (HW. H,, iti. 27) remarks that the

Ebionites observed both the Sabbath and the Lord's day ; and this practice obtained to some extent in much wider circles, for the Apostolical Constitutions recommend that the Sabbath shall be kept as a memorial feast of the crea- tion as well as the Lord's day as a memorial of the resur- rection. The festal character of the Sabbath was long recognized in a modified form in the Eastern Church by a prohibition of fasting on that day, which was also a point in the Jewish Sabbath law (comp. Judith viii. 6).

On the other hand, Paul had quite distinctly laid down from the first days of Gentile Christianity that the Jewish Sabbath was not binding on Christians (Rom. xiv. 5 sq. ; Gal. iv. 10; Col. ii. 16), and controversy with Judaizers led in process of time to direct condemnation of those who still kept the Jewish day (¢.g., Co. of Laodicea, 363 .D.). Nay, in the Roman Church a practice of fasting on Satur- day as well as on Friday was current before the time of Tertullian. The steps by which the practice of resting from labour on the Lord's day instead of on the Sabbath was established in Christendom and received civil as well as ecclesiastical sanction will be spoken of in SuNDAY; it is enough to observe here that this practice is naturally and even necessarily connected with the religious observance of the Lord's day as a day of worship and religious glad- ness, and is in full accordance with the principles laid down by Jesus in His criticism of the Sabbath of the Scribes. But of course the complete observance of Sunday rest was not generally possible to the early Christians before Christendom obtained civil recognition. For the theological discussions whether and in what sense the fourth commandment is binding on Christians, see DEca- LOGUE, Vol. vil. p. 17.

2. Origin of the Sabbath—As the Sabbath was origin- ally a religious feast, the question of the origin of the Sabbath resolves itself into an inquiry why and in what circle a festal cycle of seven days was first established. In Gen. ii. 1-3 and in Exod. xx. 11 the Sabbath is declared to be a memorial of the completion of the work of creation in six days. But it appears certain that the decalogue as it lay before the Deuteronomist did not contain any allusion to the creation (see DrcaLocus, vol. vii. p. 16), and it is generally believed that this reference was added by the same post-exilic hand that wrote Gen. i. 1-ii. 4a. The older account of the creation in Gen. ti. 4b sg. does not recognize the hexaemeron, and it is even doubtful whether the

original sketch of Gen i. distributed creation over six days. The connexion, therefore, between the seven days' week and the work of creation is now generally recognized as secondary. The week and the Sabbath were already known to the writer of Gen. i., and he used them to give the framework for his picture of the creation, which in the nature of things could not be literal and required some framework. At the same time, there was a peculiar appropriateness in associating the Sabbath with the doctrine that Jehovah is the Creator of all things ; for we see from Isa. xl.-lxvi. that this doctrine was a mainstay of Jewish faith in those very days of exile which gave the Sabbath a new importance for the faithful.

But, if the week as a religious cycle is older than the idea of the week of creation, we cannot hope to find more than probable evidence of the origin of the Sabbath. At the time of the exile the Sabbath was already an institution peculiarly Jewish, otherwise it could not have served as a mark of distinction from heathenism. This, however, does not necessarily imply that in its origin it was specifically Hebrew, but only that it had acquired distinguishing features of a marked kind. What is cer- tain is that the origin of the Sabbath must be sought within a circle that used the week as a division of time. Here again we must distinguish between the week as

such and the astrological week, ¢.e., the week in which the seven days are named each after the planet which is held to preside over its first hour. If the day is divided into twenty-four hours and the planets preside in turn over each hour of the week in the order of their periodic times (Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon), we get the order of days of the week with which we are familiar. For, if the Sun presides over the first hour of Sunday, and therefore also over the eighth, the fifteenth, and the twenty-second, Venus will have the twenty-third hour, Mercury the twenty-fourth, and the Moon, as the third in order from the sun, will preside over the first hour of Monday. Mars, again, as third from the Moon, will preside over Tuesday (Dies Martis, Mardi), and so forth. This astrological week became very current in the Roman empire, but was still a novelty in the time of Dio Cassius (xxxvii. 18). This writer believed that it came from Egypt; but the old Egyptians had a week of ten, not of seven days, and the original home

of astrology and of the division of the day into twenty-four hours is Chaldea, It is plain, however, that there is a long step between the astrological assigna- tion of each hour of the week to a planet and the recog- nition of the week as an ordinary division of time by people at large. Astrology is in its nature an occult science, and there is not the slightest trace of a day of twenty-four hours among the ancient Hebrews, who had the week and the Sabbath long before they had any acquaintance with the planetary science of the Babylonian priests. Moreover, it is quite clear from extant remains of Assyrian calendars that our astrological week did not prevail in civil life even among the Babylonians and Assyrians: they did not dedicate each day in turn to its astrological planet. These facts make it safe to reject one often-repeated explanation of the Sabbath, viz., that it was in its origin what it is in the astrological week, the day sacred to Saturn, and that its observance is to be derived from an ancient Hebrew worship of that planet. In truth there is no evidence of the worship of Saturn among the oldest Hebrews; Amos v. 26, where Chiun (Kaiwan) is taken by many to mean Saturn, is of uncer- tain interpretation, and, when the tenses are rightly rendered, refers not to idolatry of the Israelites in the wilderness but to the time of the prophet.

The week, however, is found in various parts of the world in a form that has nothing to do with astrology or the seven planets, and with such a distribution as to make it pretty certain that it had no artificial origin, but suggested itself independently, and for natural reasons, to different races. In fact the four quarters of the moon supply an obvious division of the month; and, wherever new moon and full moon are religious occasions, we get in the most natural way a sacred cycle of fourteen or fifteen days, of which the week of seven or eight days (determined by half moon) is the half. Thus the old Hindus chose the new and the full moon as days of sacrifice ; the eve of the sacrifice was called upavasatha, and in Buddhism the same word (updsatha) has come to denote a Sabbath observed on the full moon, on the day when there is no moon, and on the two days which are eighth from the full and the new moon respectively, with fasting and other religious exercises.!

From this point of view it is most significant that in the older parts of the Hebrew Scriptures the new moon and the Sabbath are almost invariably

mentioned together. The month is beyond question an old sacred division of time common to all the Semites ; even the Arabs, who re- ceived the week at quite a late period from the Syrians

1 Childers, Pali Dict., p. 585; Kern, Buddhismus (Cae tie), p. 8; Mahdvagga, ii. 1, 1 (Eng. tr., i. 239, 291).

(Birini, Chronology, Eng. tr., p. 58), greeted the new nioon with religious acclamations. And this must have been an old Semitic usage, for the word which properly means “to greet the new moon” (ahalla) is, as Lagarde (Orientalia, ii. 19) has shown, etymologically connected with the Hebrew words used of any festal joy. Among the Hebrews, or rather perhaps among the Canaanites, whose speech they borrowed, the joy at the new moon be- came the type of religious festivity in general. Nor are other traces wanting of the connexion of sacrificial occa- sions—.e., religious feasts—with the phases of the moon among the Semites. The Harranians had four sacrificial days in every month, and of these two at least were deter- mined by the conjunction and opposition of the moon.?

That full moon as well as new moon had a religious significance among the ancient Hebrews seems to follow from the fact that, when the great agricultural feasts were fixed to set days, the full moon was chosen. In older times these feast-days appear to have been Sabbaths (Lev. xxiii. 11; comp. Passover, vol. xviii. p. 344).

A week determined by the phases of the moon has an average length of 294+4=72 days, 7.e., three weeks out of eight would have eight days. But there seems to be in 1 Sam. xx. 27, compared with vv. 18, 24, an indication that in old times the feast of the new moon lasted two days—a very natural institution, since it appears that the feast was fixed in advance, while the Hebrews of Saul’s time cannot have been good enough astronomers to know beforehand on which of two successive days the new moon would actually be observed.? In that case a week of seven working days would occur only once in two months. We cannot tell when the Sabbath became dissociated from the month; but the change seems to have been made before the Book of the Covenant, which already regards the Sabbath simply as an

institution of humanity and ignores the new moon. In both points it is followed by Deuteronomy.

The Babylonian and Assyrian Sabbath.—The word “Sabbath” (sabattuv), with the explanation “day of rest of the heart,” is claimed as Assyrian on the basis of a textual emendation made by F. Delitzsch in II. Rawl., 32, 16. The value of this isolated and uncertain testimony cannot be placcd very high, and it seems to prove too much, for it is practically certain that the Babylonians at the time of the Hebrew exile cannot have had a Sabbath exaetly corresponding in conception to what the Hebrew Sabbath had be- come under very special historical circumstances. What we do know from a calendar of the intercalary month Elul II. is that in that month the 7th, 14th, 19th, 21st, and 28th days had a pecu- liar character, and that certain acts were forbidden on them to the king and others. There is the greatest uncertainty as to the details (compare the very divergent renderings in Records of the Past, vii. 160 sq. ; Schrader, K.A.7., 2d ed., p. 19; Lotz, Qu. de historia Sabbati, 39 sq.); but these days, which are taken to be Assyrian Sabbaths, are certainly not ‘days of rest of the heart,” and to all appearance are unlucky days, and expressly designated as such.‘ If, therefore, they are “ Assyrian Sabbaths” at all, they are exaetly opposite in character to the Hebrew Sabbath, which Hosea deseribes as a day of gladness, and which never ceased to be a day of feasting and good cheer.

Etymology of the word “ Sabbath.” —The grammatical inflexions of the word “Sabbath” show that it is a feminine form, properly shab- bat-t for shabbat-t, from NW I. The root has nothing to do with resting in the sense of enjoying repose; in transitive forms and applications it means to ‘‘sever,” to ‘‘ put an end to,” and intran- sitively it mcans to ‘‘ desist,” to ‘‘come to an end.” ‘The gram- matical form of shabbath suggests a transitive sense, “the divider,” and apparently indicates the Sabbath as dividing the month. It may mean the day which puts a stop to the week’s work, but this is less likely. It certainly cannot be translated “the day of rest.”

Sabbatical Year.—The Jews under the sccond temple observed every scventh year as a Sabbath according to the (post-exilic) law of Lev. xxv. 1-7. It was a year in which all agrieulture was re-

2 The others—aceording to the Fihrist, 319, 14—are the 17th and the 28th.

3 It appears from Judith viii. 6 that even in later times there were two days at the new moon on whieh it was improper to fast.

4 Lotz says they are lucky days; but the expression which he renders “dies faustus” is applied to every day in the ealendar. The rest of his book does not rise above this example of acumen.

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mitted, in which the fields lay unsown, the vines grew unpruned, and even the natural produce was not gathered in, That this law was not observed before the captivity we learn from Lev. xxvi. 34 sq.; indeed so long as the Hebrews were an agricultural people with little trade, in a land often ravaged by severe famines, such a law could not have been observed. Even in later times it was occasion- ally productive of great distress (1 Mac. vi. 49, 53 ; Jos., Anit., xiv. 16, 2). In the older legislation, however, we already meet with a seven years’ period in more than one connexion. The release of a Hebrew servant after six years’ labour (Exod. xxi. 2 sg.; Deut. xv. 12 sg.) has only a remote analogy to the Sabbatical year. But in

| Exod. xxiii. 10, 11 it is prescribed that the crop of every seventh | year (apparently the self-sown crop) shall be left for the poor, and

after them for the beasts. The difference between this and the later law is that the seventh year is not called a Sabbath, and that there is no indication that all land was to lie fallow on the same year. In this form a law prescribing one year’s fallow in seven may have been anciently observed. It is extended in ver. 11 to the vineyard and the olive oil, but here the culture necessary to keep the vines and olive trees in order is not forbidden ; the precept is only that the produce is to be left to the poor. In Deuteronomy

this law is not repeated, but a fixed seven years' period is ordained for the benefit of poor debtors, apparently in the sense that in the seventh year no interest is to be exacted by the creditor from a Hebrew, or that no proceedings are to be taken against the debtor in that year (Deut. xv. 1 sq.). (W. R. 8.)

SABELLIUS. Even after the elimination of Gnosti- cism the church remained without any uniform Christology ; the Trinitarians and the Unitarians continued to confront each other, the latter at the beginning of the 3d century still forming the large majority. These in turn split into two principal groups—the Adoptianists and the Modalists —the former holding Christ to be the man chosen of God, on whom the Holy Spirit rested in a quite unique sense, and who after toil and suffering, through His oneness of will with God, became divine, the latter maintaining Christ to be a manifestation of God Himself. Both groups had their scientific theologians who sought to vindicate their characteristic doctrines, the Adoptianist divines holding by the Aristotelian philosophy, and the Modalists by that of the Stoics; while the Trinitarians (Tertullian, Hippo- lytus, Origen, Novatian), on the other hand, appealed to Plato.

In Rome Modalism was the doctrine which prevailed from Victor to Calixtus (c. 190-220). The bishops just named protected within the city the schools of Epigonus and Cleomenes, where it was taught that the Son is identical with the Father. But the presbyter Hippolytus was successful in convincing the leaders of that church that the Modalistic doctrine taken in its strictness was contrary to Scripture. Bishop Calixtus saw himself under the necessity of abandoning his friends and setting up a mediating formula designed to harmonize the Trinitarian and the Modalistic positions. But, while excommunicating the strict Unitarians (Monarchians), he also took the same course with Hippolytus and his followers, declaring their teaching to be ditheism. The mediation formula, how- ever, proposed by Calixtus became the bridge by which, in the course of the decades immediately following, the doctrine of the Trinity made its way into the Roman Church. In the year 250, when the Roman presbyter Novatian wrote his book De T'rinitate, the doctrine of Hippolytus, once discredited as ditheism, had already become official there. At the same time Rome and most of the other churches of the West still retained a certain leaning towards Modalistic

monarchianism. This appears, on the one hand, in the use of expressions having a Modalistic ring about them—see especially the poems of Commodian, written about the time of Valerian—and, on the other hand, in the rejection of the doctrine that the Son is subordinate to the Father and is a creature (wit- ness the controversy between Dionysius of Alexandria and Dionysius of Rome), as well as in the readiness of the West to accept the formula of Athanasius, that the Father and the Son are one and the same in substance (6po0o0vcev01).

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The strict Modalists, whom Calixtus had excommuni- cated along with their most zealous opponent Hippolytus, were led by Sabellius, who was perhaps a Libyan by birth. His party continued to subsist in Rome for a considerable time afterwards,! and withstood Calixtus as an unscrupu- lous apostate. In the West, however, the influence of Sabellius seems never to have been important; in the East, on the other hand, after the middle of the 3d cen- tury his doctrine found much acceptance, first in the Pentapolis and afterwards in other provinces.? It was violently controverted by the bishops, notably by Dionysius of Alexandria, and the development in the East of the philosophical doctrine of the Trinity after Origen (from 260 to 320) was very powerfully influenced by the opposition to Sabellianism. Thus, for example, at the great synod held in Antioch in 268 the word opootva.os was rejected, as seeming to favour Unitarianism. The Sabellian doc- trine itself, however, during the decades above mentioned underwent many changes in the East and received a philo- sophical dress. In the 4th century this and the allied doctrine of Marcellus of Ancyra were frequently con- founded, so that it is exceedingly difficult to arrive at a clear account of it in its genuine form. Sabellianism, in fact, became a collective name for all those Unitarian doctrines in which the divine nature of Christ was acknowledged. The teaching of Sabellius himself was indubitably very closely allied to the older Modalism (“ Patripassianism”) of Noetus and Praxeas, but was distinguished from it by its more careful theological elaboration and by the account it took of the Holy Spirit. His central proposition was to the effect that Father, Son, and Holy Spirit are the same person, three names thus being attached to one and the same being. What weighed most with Sabellius was the monotheistic interest. The One Being was also named by

him viordrwp,—an expression purposely chosen to obviate ambiguity. To explain how one and the same being could have various forms of manifestation, he pointed to the tripartite nature of man (body, soul, spirit), and to the sun, which manifests itself as a heavenly body, as a source of light, and also as a source of warmth. He further maintained that God is not at one and the same time Father, Son, and Spirit, but, on the contrary, has been active in three consecutive energies,—first in the prosopon of the Father as Creator, then in the prosopon of the Son as Redeemer, and lastly in the prosopon of the Spirit as the Giver of Life. It is by this doctrine of the succession of the prosopa that Sabellius is essentially distinguished from the older Modalists. In particular it is significant, in conjunction with the reference to the Holy Spirit, that Sabellius re- gards the Father also as merely a form of manifestation of the one God,—in other words, has formally put Him in a position of complete equality with the other Persons. This view prepares the way for Augustine's doctrine of the Trinity. Sabellius himself appears to have made use of Stoical formulas (7Aativer Oar, cveréA Aco Gat), but he chiefly relied upon Scripture, especially such passages as Deut. vi. 4, Exod. xx. 3, Isa. xliv. 6, John x. 38. Of his later history nothing is known ; his followers died out in the course of the 4th century.

The sources of our knowledge of Sabellianism are Hippolytus (Philos., bk. ix.), Epiphanius (H#r., lxii.), and Dionys. Alex. (Epp.); also various passages in Athanasius and the other fathers of the 4th century. For modern discussions of the subject seo Schleiermacher (Theol. Ztschr., 1822, hft. 3), Lange (Zéschr. f. hist. Theol., 1832, ii. 2), Dollinger (Hippolyt u. Kallist, 1853), Zahn (Marcell v. Ancyra, 1867), and Harnack (s.v. ' Monarchianismus," in Herzog-Plitt, Encykl. f. Prot. Theol., x. 199 sq.). (A. HA.)

1 In the 18th century there was discovered in one of the catacombs of Rome an inscription containing the words "qui et Filius diceris et Pater inveniris."" This can only have come from a Sabellian.

2 Whether Sabellius himself ever visited the East is unknown.

SABIANS. In three passages of the Koran Mohammed mentions between the Jews and the Christians a sect whom he calls Sabians (Sabi'éina). He distinguishes them from the Magians and polytheists (xxii. 17), and appears to say that they believed in God and in the day of resurrection and judgment. It has commonly been supposed that the sect referred to is the MANDZANS (¢.v.); but it is more probable that they were some obscure half-Christian body (Elkesaites 1), which had representatives in Arabia itself (see MoHAMMEDANISM, vol. xvi. p. 547). The name is derived from the Aramaic Y2¥, with a softening of Y to &, such as took place in certain dialects of that speech, and means ‘‘ Baptists.” The older Mohammedan theologians were agreed that the Sabians possessed a written revela- tion, and were entitled accordingly to enjoy a toleration not granted to mere heathen, and it appears that the Man- dans got the benefit of this, whether they were the sect Mohammed had in view or not. But under Al-Mamtn (830) a body that had certainly no claim to be deemed other than polytheists began to shield themselves under the same name, viz., the Harranians, or remnant of the old heathen of Mesopotamia. Star-worship had a chief place in the religion of the Harranians, as it had had in the older Babylonian and Syrian faiths, but they had partly disguised their polytheism in a fantastic philosophy, so that they were able on occasion to pose as people of enlightened beliefs. Accounts of these false Sabians reached the West through Maimonides, and then through Arabic sources, long before it was understood that, in this application, the name was only a disguise. Hence the greatest confusion prevailed in all European accounts of them till Chwolsohn published in 1856 his Ssabier und Ssabismus, in which the authorities for the history and belief of the Harranians in the Middle Ages are collected and discussed. See also Dozy and De Goeje in the Actes of the sixth Oriental congress, ii. 1, 185 sg., Leyden, 1885. It is quite inappropriate to call star-worshippers in general Sabians or Zabians or to speak of a distinct Sabian religion, as older writers do. The religion of the Harranians is simply a modernized form of the old Syrian polytheism.

SABICU WOOD is the produce of a large leguminous tree, Lysiloma Sabicu, a native of Cuba, where alone it appears to be found. The wood has a rich mahogany colour; it is exceedingly heavy, hard, and durable, and therefore most valuable for shipbuilding. Sabicu, on account of its durability, was selected for the stairs of the Great Exhibition (London) of

1851, and, notwithstanding the enormous traffic which passed over them, the wood at the end was found to be little affected by wear.

SABINE, Str Epwarp (1788-1883), astronomer, was born in Dublin on 14th October 1788, a scion of a family said to be of Italian origin. He was educated at Wool- wich and obtained a commission in the Royal Artillery at the age of fifteen. He attained the rank of major-general in 1859. His only experience of actual warfare seems to have been at the siege of Fort Erie in 1814; but few men have seen more than he of active and sometimes perilous service. In early life he devoted himself to astronomy and physical geography, and in consequence he was appointed astronomer to various expeditions, among others that of Sir J. Ross (1818) in search of the North-West Passage, and that of Sir E. Parry soon afterwards. Later, he spent long periods on the inter-tropical coasts of Africa and America, and again among the snows of Spitzbergen. Sir Edward Sabine died at East Sheen, Surrey, on 26th May 1883.

Of Sabine's scientific work two branches in particular deserve very high credit—his determination of pendulum data for the investigation of the figure of the earth and his extensive researches connected with terrestrial magnetism. His pendulum observations were the first to show the altogether unexpected amount of accuracy attainable in a matter which, under the most favourable conditions,

is one of great delicacy, but which had to be pursued by him under cireumstanees often of peculiar difficulty. The establishment of a system of magnetic observatories in various parts of British territory all over the globe was accomplished mainly on his representations « and to the direction of these observatories and to the reduetion and discussion of the observations a great part of his life was devoted. His published papers, as shown by the Royal Soeiety's Catalogue, amounted in 1872 to 101. While the majority bear on one or other of the subjects just mentioned, others deal with such widely different topics as the birds of Greenland, ocean tempera- tures, the Gulf Stream, barometric measurement of heights, ares of meridian, glacier transport of rocks, the volcanoes of the Sandwich Islands, and various points of meteorology. Sabine occupied for ten years (1861-71) the president's chair of the Royal Society, and was made K.C.B. in 1869.

Though he cannot be said to have been a man of striking originality, his unflagging devotion to his work deservedly won him an honourable position among the foremost scientific men of the present century.

SABINES. The Sabines (Sabini) were a people of Cen- tral Italy, who played an important part in the early history of Rome. According to all old writers they were one of the most ancient nations of Italy, and the parent stock from which many of the other tribes that occupied the central and southern regions of the peninsula derived their origin, Of their own origin and affinities we know very little. Strabo calls them a very ancient race and " autochthonous," which may be taken as signifying that there was no authen- tic tradition of their immigration, or of the quarter from whence they came. 'The story of their Laconian. descent may be safely rejected as one of those fictions by which a certain class of the later Greek writers sought to derive every people in Italy from a Greek origin. But the evi- dence concerning their language, seanty as it is, is sufficient to prove that they were a cognate race with the neighbour- ing Umbrians and Oscans, as well as, more remotely, with the Latins. Cato, the best authority among the Roman writers with respect to the different races of Italy, affirmed that the Sabines originally occupied the country about Amiternum, in the upper valley of the Aternus, at the foot of the loftiest group of the Apennines. From thence they gradually extended themselves into the fertile valleys about Reate, where we find them established in historical times, and occupied the tract from thence to the Tiber and the Anio. But even in its widest extension the region held by the Sabines was of small dimensions, and for the most part of a rugged and mountainous character. Hence it was natural that they should seek a place for their super- fluous population by repeated emigrations into the neigh- bouring districts, and the general tradition among Roman writers ascribed the origin of several of the more powerful and populous nations of the peninsula to such emigrations. This result was especially promoted by a custom which, though not unknown to the other nations of Italy, appears to have been peculiarly characteristic of the Sabines—that of a Ver Sacrum, or ''sacred spring," when everything born in that year was consecrated to some local divinity, most frequently to Mamers or Mars. All the cattle were duly sacrificed, while the young men were allowed to grow up to manhood, and then sent forth in a body to seek for themselves new abodes beyond the limits of their native land. To such

colonies is ascribed the foundation of the Picentes or people of Picenum, the Samnites, and the Hirpini. Of these the last-mentioned derived their name from hirpus, the Sabine name for a wolf, an animal of that description being supposed to have been divinely sent as the leader of the colony, as a woodpecker (picus), also sacred to Mars, became that of the Piceni. The Peligni also, as we learn from Ovid, himself a native of the dis- trict, claimed a Sabine origin, and the same was probably the case with the smaller kindred tribes of the Marsi, Marrucini, and Vestini. The Samnites, again, in their turn sent forth the Frentani and the Lucanians, who extended their dominion throughout the mountainous regions of

outhern Italy and carried their arms from the Adriatic o the Sicilian Straits.

Meanwhile the Sabines themselves were confined within omparatively narrow limits, and their extension towards he south was checked by the growing power of the Latins. ‘Here their power appears to have attained its highest point ‘,bout the time of the foundation of Rome, and the legend-

ry history, familiar to every schoolboy, of the contests bc fmcen Romulus and Tatius, the divided sovereignty at one time established between them, and the peaceful reign and legislation of the Sabine king Numa may be taken as representing the historical fact that the population of ‘Rome really contained an important Sabine element, and that Sabine influences were largely intermixed with those f Latin origin, both in the civil institutions and still ore in the religious rites and: ceremonies of the rising epublic. Beyond this it is impossible to pronounce with ‘certainty as to the real value and significance of the tradi- tions preserved to us in the poetical legends transmitted in the garb of history; and it is impossible in an article like the present to give even an outline of the various theories that have been devised by modern writers to put an historical interpretation upon the records thus preserved tous. It is clear, however, that the power of the Sabines was by no means broken, even by the establishment of the more powerful monarchy at Rome under the Tarquins, and for a period of more than fifty years after the fall of the ‘monarchy we find the Romans engaged in almost perpetual hostilities against the Sabines on the one side and the ‘Aquians and Volscians on the other. At length in the ‘year 449 z.c, the Sabines were defeated by the consul -M. Horatius, in an action which

appears to have been of so decisive a character that we do not find them again _appearing in arms against the Romans for a period of more ‘than 160 years. Their quiescence is the more singular as

during this interval the republic was engaged in the long ‘series of the Samnite Wars, in which their adversaries were the direct descendants of the Sabines, and had therefore every claim on their support. Still more unaccountable _is it that, after looking on with apparent neutrality for so ‘long, we find the Sabines in the year 290 B.c. once more in arms against Rome, and that at a period when the

Third Samnite War had for a time crushed all the hopes of their natural allies. The result was, as might have been expected, that they found themselves wholly unequal to contend single-handed against the power of Rome, and the consul M’. Curius Dentatus reduced them to submission in a single campaign. They were severely punished for this ‘defection ; and henceforth their national existence was at ‘an end. Those who survived the slaughter of the war were admitted to the position of Roman citizens, though ‘at first without the right of suffrage, but twenty years after this also was granted them, and they were to all intents and purposes incorporated in the Roman state. Thus separated from all the tribes of kindred origin, they jnever again appear in history, and, like the Campanians ‘and Latins, were content to swell the ranks of the Roman ‘legions even in the fierce struggle of the Social War (91- . 88 B.c.). Under the arrangements of the Roman empire jtheir very name was lost as a territorial designation, but It always continued in popular use, and was revived in the Middle Ages as that of an ecclesiastical province. Even at the present day every peasant in the neighbourhood of /Rome will point to La Sabina as the familiar appellation of the lofty mountain tract to the north of the city. | The limits of the territory occupied by the Sabines do ‘not appear to have varied much from a very early period (till the days of Strabo. That geographer describes them as extending as far south as Eretum near the Tiber, on the road to Rome, and a few miles only from Cures, the

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reputed birthplace of Tatius and Numa, but which in his time had become a mere village. The principal town of the Sabines was Reate (still called Rieti), in the midst of the beautiful and fertile valley of the Velino, and from thence they occupied the upper valley of that river to its sources in the Monte della Sibilla and the rugged mountain valleys which connected it with that of the Aternus. Here was found Amiternum, the original capital of the tribe, near the modern Aquila, and between that and Reate lay Interocrea (Antrodoco), in a pass that has always formed one of the leading lines of communication through the central Apennines. In the extreme north was Nursia (Norcia), noted for the coldness of its climate, and cele- brated in ecclesiastical history as the birthplace of St Bene- dict. These were the only towns of any importance in the territory of the Sabines; but they lived for the most part scattered in villages about the mountains, a circum- stance absurdly alleged by some Roman writers as a proof of their Laconian origin. It was doubtless owing to this habit, as well as to the rugged mountainous character of the country in which they dwelt, that the Sabines owed the primitive simplicity of their manners and the frugal and severe character which distinguished them even in the days of Augustus. All readers of Horace must be familiar with his frequent allusions to the moral purity and frugal manners of the people that surrounded his Sabine villa, which was situated on the reverse of Mount Lucretilis, only about 15 miles from the rich and luxurious Tibur (Tivoli). The small town of Varia (Vicovaro), in its immediate neighbourhood, seems to have marked the frontier on this side.

No remains of the Sabine language are extant in the form of inscriptions, but coins struck during the Social War with the inscription ‘‘Safinim” show that the native appellation was the same as that in use among the Latins. The form “Sabellus” is frequently found in Latin writers as an ethnic adjective equivalent to Sabine; but the practice adopted by modern writers, of employing the term “ Sabel- lian ” to designate all the tribes of Sabine origin, including Samnites, Lucanians, &c., was first introduced by Niebuhr, and is not supported by any ancient authority. (E. H. B.)

SABLE (Mustela zibellina). See MAARTEN, vol. xv. p. 577, and Four, vol. ix. p. 838.

SABLES D'OLONNE, a seaport town of France, the chef-lieu of an arrondissement of the department of La Vendée, is situated on the Atlantic seaboard in 46° 30' N. lat., 300 miles south-west of Paris by the railway for Tours and La-Roche-sur-Yon. The town stands between the sea on the south and the port on the north, while on the west. it is separated by a channel from the suburb of La Chaume, built at the foot of a range of dunes 65 feet high, which terminates southwards in the rocky peninsula of L'Aiguille (the Needle), defended by Fort St Nicholas. To the north of Sables extend salt-marshes and oyster-parks, stocked from Auray or Cape Breton, and yielding 6,000,000 to 8,000,000 oysters perannum. The port of Sables, consisting of a tidal basin and a wet-dock, is accessible only to vessels of from 350 to 400 tons, and is dangerous when the winds are from the south-west. The entrance is shown by six lights ; a seventh lighthouse, that of the Barges, a mile out at sea to the west, has a height of 80 feet and is visible for 17 to 18 nautical miles. In 1882 145 vessels (62,073 tons) entered and 146 vessels (61,037 tons) cleared. The staple articles of trade are grain, wine, cattle, timber, salt, tar, fish, building stone, manures ; 400 boats are engaged in the sardine fishery. The beautiful smoothly sloping' beach, a mile in length, is much frequented by bathers. It is lined by an embankment which serves as a promenade and drive, and is bordered by hotels, villas, and cafés. The population in 1881 was 9769, that of the commune 10,420.

Founded by Basque or Spanish sailors, Sables was the first place in Poitou invaded by the Normans in 817. Louis XI., who went there in 1472, granted the inhabitants various privileges, improved the harbour, and fortified the entrance. Captured and recaptured during the Wars of Religion, the town afterwards became a nursery of hardy sailors and privateers, who harassed the Spaniards and afterwards the English. In 1696 Sables was bombarded by the combined fleets of England and Holland. Hurricanes have more than once caused grievous damage to town and harbour.

SACCATOO. See Soxora.

SACCHETTI, Franco (c. 1335-c. 1400), Italian novel- ist, was the son of Benci di Uguccione, surnamed “Buono,” of the noble and ancient Florentine family of the Sacchetti (comp. Dante, Par., c. xvi.), and was born at Florence about the year 1335. While still a young man he achieved repute as a poet, and he appears to have travelled on affairs of more or less importance as far as to Genoa, Milan, and “ Is- chiavonia.” When a sentence of banishment was passed upon the rest of the house of Sacchetti by the Florentine authorities in 1380 it appears that Franco was expressly exempted, “per esser tanto uomo buono,” and in 1383 he was one of the “eight,” discharging the office of “prior” for the months of March and April. In 1385 he was chosen ambassador to Genoa, but preferred to go as podest& to Bibbiena in Casentino. In 1392 he was podesta of San Miniato, and in 1396 he held a similar office at Faenza. In 1398 he received from his fellow-citizens the post of captain of their then province of Romagna, having his residence at Portico. The date of his death is un- known; most probably it occurred about 1400, though some writers place it as late as 1410.

Sacchetti left a considerable number of sonnetti, canzoni, ballate, madrigalt, &c., which have never been printed, but which are still extant in at least one MS. in the Laurentian library of Florence. His Novelle were first printed in 1724, from the MS. in the same collection, which, however, is far from complete. They were ori- ginally 300 in number, but only 258 in whole or in part now sur- vive. They are written in pure and elegant Tuscan, and, based as they are for the most part on real incidents in the public and domestic life of Florence, they are valuable for the light they throw on the manuers of that age, and occasionally also for the biograph- ical facts preserved in them. But in no other respect do they come up to the corresponding compositions of his friend Boccaccio. Some of them, it need hardly be said, are very coarse—a feature not con- pensated for by the moralizings almost invariably appended—and many more are dull and pointless, leaving the impression, as Sis- mondi has remarked, that in that century of artistic advance the art of conversation had remained far behind the others.

SACCHI, Anprea (c. 1600-1661), a leading painter of the later Roman school, was born in Rome in 1600, or perhaps as early as 1598. His father, Benedetto, a painter of undistinguished position, gave him his earliest instruc- tion in the art; Andrea then passed into the studio of Albani, of whom he was the last and the most eminent pupil, and under Albani he made his reputation early. The painter of Sacchi's predilection was Raphael; he was the jealous opponent of Pietro da Cortona, and more especially of Bernini. In process of time he became one of the most learned designers and one of the soundest colour- ists of the Roman school. He went to Venice and to Lom- bardy to study Venetian colour and the style of Correggio ; but he found the last-named master unadaptable for his own proper methods in art, and he returned to Rome. Sacchi was strong in artistic theory, and in practice slow and fasti- dious; it was his axiom that the merit of a painter consists in producing, not many middling pictures, but a few and perfect ones. His works have dignity, repose, elevated yet natural forms, severe but not the less pleasing colour, a learned treatment of architecture and perspective; he is thus a painter of the correct and laudable academic order, admired by connoisseurs rather than by ambitious students or the large public. His principal painting, often spoken of as the fourth best easel-picture in Rome— in the Vatican Gallery—is St Romuald relating his Vision to Five Monks of his Order. The pictorial crux of dealing

with these figures, who are all in the white garb of their order, has often been remarked upon; and as often the ingenuity and judgment of Sacchi have been praised in varying the tints of these habits according to the light and shade cast by a neighbouring tree. The Vatican Gallery contains also an early painting of the master,—the Miracle of St Gregory, executed in 1624; a mosaic of it was made in 1771 and placed in St Peter's. Other leading examples are the Death of St Anna, in S. Carlo ai Catinari; St Andrew, in the Quirinal ; St Joseph, at Capo alle Case; also, in fresco, a ceiling in the Palazzo Barberini—Divine Wisdom—reckoned superior in expression and selection to the rival work of Pietro da Cortona. There are likewise altar-pieces in Perugia, Foligno, and Camerino. Sacchi, who worked almost always in Rome, left few pictures visible in private galleries: one, of St Bruno, is in Gros. venor House. He had a flourishing school: Nicholas

Poussin and Carlo Maratta were his most eminent scholars ; Luigi Garzi and Francesco Lauri were others, and Sacchi's own son Giuseppe, who died young, after giving very high hopes. This must have been an illegitimate son, for Andrea died unmarried. This event took place in Rome in 1661.
SACCHINI, Antonio Marra Gaspare (1734-1786), musical composer, of the Italian school, was born at Pozzuoli, 23d July 1734, and educated under Durante at the Conser- vatorio di San Onofrio at Naples. His first serious opera was produced at Rome in 1762, and was followed by man others, nearly all of which were successful. In 1769 he removed to Venice; and in 1772 he visited London, where, notwithstanding a cruel cabal formed against him, he achieved a brilliant success, especially in his four new operas, Zamerlano, Lucio Vero, Nitetti e Perseo, and Il Gran Cid. Ten years later he met with an equally enthu- siastic reception in Paris, where his Rinaldo was produced under the immediate patronage of Queen Marie Antoinette, to whom he had been recommended by the emperor Joseph IJ. But neither in England nor in France did his reputation continue to the end of his visit. He seems to have been everywhere the victim of bitter jealousy. Even Marie Antoinette was not able to support his cause in the face of the general outcry against the favour shown to foreigners; and by her command, most unwill- ingly given, his last opera and undoubted masterpiece, Gidipe & Colone, was set aside in 1786 to make room for Lemoine's Phédre,—a circumstance which so preyed upon his mind that he died of chagrin, 7th October 1786. Sacchini's style was rather graceful than elevated, and he was deficient both in creative power and originality. But the dramatic truth of his operas, more especially the later ones, is above all praise, and he never fails to write with the care and finish of a thorough and accomplished musician. Cdipe was extremely successful after his death, and has since been performed at the Académie nearly

600 times. The last performance of which any record has reached us took place in 1844,

SACHEVERELL, Henry (1674-1724), an English church and state politician of extreme views, was born im 1674, the son of Joshua Sacheverell, rector of St Peter's, Marlborough, who at his death left a large family iu poverty. Henry Sacheverell matriculated at Magdalen College,

Oxford, 28th August 1689, and was demy of his college from 1689 to 1701 and fellow from 1701 to 1713.

_Addison, another Wiltshire lad, entered at the same college

two years earlier, but was also elected a demy in 1689; he inscribed to Sacheverell in 1694 his account of the greatest English poets. Sacheverell took his degree of B.A. in 1693, and became M.A. in 1696 and D.D. in 1708. His first preferment was the small vicarage of Cannock in Staffordshire ; but he leapt into notice when holding a preachership at St Saviour's, Southwark, His famous sermons on the church in danger from the neglect of the Whig ministry to keep guard over its interests

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'not include them in his own collection of his works.

were preached, the one at Derby, 14th August, the other at St Paul's Cathedral, 5th November 1709. They were immediately reprinted, the latter being dedicated to the lord mayor and the former to the author's kinsman, George Sacheverell, high sheriff of Derby for the year; and, as the passions of the whole British population were at this period keenly exercised between the rival factions of Whig and Tory, the vehement invectives of this furious divine on behalf of an ecclesiastical institution which supplied the bulk of the adherents of the Tories made him their idol. The Whig ministry, then slowly but surely losing the sup- port of the country, were divided in opinion as to the pro- priety of prosecuting this zealous parson. Somers was against such a measure ; but Godolphin, who was believed to be personally alluded to in one of these harangues under the nickname of '" Volpone," urged the necessity of a prosecution, and gained the day. The trial lasted from 97th February to 23d March 1710, and the verdict was that Sacheverell should be suspended for three years and that the two sermons should be burnt at the Royal Ex- change. 'This was the decree of the state, and it had the effect of making him a martyr in the eyes of the populace and of bringing about the downfall of the ministry. Im- mediately on the expiration of his sentence (13th April 1713) he was instituted to the valuable rectory of St Andrew's, Holborn, by the new Tory ministry, who

despised the author of the sermons, although they dreaded his in- fluence over the mob. He died at the Grove, Highgate, on 5th June 1724.

Ample information about his life and trial will be found in Hearne's Diaries, Bloxam's Register of Magdalen, iii. 98-110, and Hill Burton's Queen Anne, vol. ii. Mr Madan of the Bodleian Library has compiled a Sacheverell bibliography.

SACHS, Hans (1494-1576), the most eminent German poet of the 16th century, was born at Nuremberg on 5th November 1494. His father was a shoemaker, and Hans was trained to the same calling. Before beginning his apprenticeship, however, he was educated at the Latin school of Nuremberg. Having finished his ' Lehrjahre" as a shoemaker, he began his ''Wanderjahre" in 1511, and worked at his craft in many towns, including Ratisbon, Passau, Salzburg, Leipsic, Liibeck, and Osnabriick, In 1516 he returned to Nuremberg, where he remained during the rest of his life, working steadily at his business, and devoting his leisure time to literature. He married in 1519, and after his wife's death he married again in 1561, He died on 19th January 1576.

Sachs was much respected by his fellow-citizens, and acquired great fame as a poet. Early in life he reccived instruction in the principles and rules of the '' Meistergesang," and at Munich in 1513 he completed his study of 'the charming art." Afterwards he Wrote many poems in the formal manner of the '' Meistersivger," but to these efforts he attributed so little importance that he did nt Among his hest writings are his hymns, in which he gave expression to the highest spiritual aspirations of the age of the Reformation. He was one of the most ardent adherents of Luther, and in 1523 wrote in his honour the poem beginning, '' Die wittenbergisch Nachtigall, Die man jetz héret tiberall." This poem attracted much attention and was of great service to Luther. Sachs also wrote in verse many fables, parables, tales, and dialogues. Of his dramatic poems, the most remarkable are his Shrove Tuesday Plays, in each of which he offers a lively representation of an action without any attempt at exact portraiture or at a profound appreciation of motives. Works of this kind were popular before Sachs's time, but he gave them fresh vitality by his humour and fancy. Sachs had extra- ordinary fertility of imagination, and none of his German contem- portaries

approached him in his mastery of the forms of literary expression which were then known. He wrote thousands of poems, and in his lifetime a large number of them were printed, in three volumes 3 after his death two additional volumes appeared ; and in et times many volumes of his works in manuscript have been po From about the middle of the 17th century, when bog seieies of verse became as a rule mere imitators of foreign y ue | achs was almost forgotten, until interest in his work was

evived by Goethe ; and many selections from his writings have

since been published. A complete edition, prepared by A. von Keller, has been issued by the Literary Society of Stuttgart. A biography of Sachs by M. Solomon Ranisch was published in 1765, and there are later biographies by J. L. Hoffmann (1847), Weller (1868), and Liitzelberger (1874).

SACKING anp SACK MANUFACTURE. Sacking is a stout close-woven fabric, properly of flax, but now very largely made of jute. The chief centres of the manufacture are Dundee and ~~Forfar in Scotland. Sacks, however, are made of many qualities and from different fibres, according to the purposes to which they are devoted. A large pro~~ portion of flour sacks, those particularly of American origin, are made of stout cotton. Numerous attempts have been made to manufacture seamless sacks ; but none have met with success. The invention of a sewing-machine for the “overhead” seaming of sacks has been successfully solved in the machine of Laing and other inventors.

SACO, a city of the United States, in York county, Maine, on the left or north bank of the Saco river, opposite Biddeford, 9 miles from the sea and 100 from Boston by the Boston and Maine Railroad. The water- power furnished by the river, which here falls 55 feet, is utilized by various cotton-factories, machine-shops, lumber- mills, &c. Originally included in Biddeford, but sepa- rately incorporated in 1762 as Pepperellborough, Saco re- ceived its present name in 1805 and was made a city in 1867, The population was 5755 in 1870 and 6389 in 1880.

SACRAMENT. The Latin word sacramentum, mean- ing “an oath,” is. most commonly used by classical writers to denote the military oath of allegiance ; for its technical application in legal phraseology see Roman Law, vol. xx. p. 682. In the earliest ecclesiastical Latin traces of the old military meaning are still present; thus Tertullian (Ad Mart., 3) writes, “We were called to the warfare of the living God in our very response to the sacramental words [in baptism]”; but the main import of the word has entirely changed, it being used simply as the equiva- lent of the Greek puorjpiov. Thus even in the Vulgate we still have the “sacrament of godliness” (1 Tim. iii. 16), “‘of the seven stars” (Rev. i. 20), “‘of the woman and the beast” (Rev. xvii. 7); but in earlier Latin versions the word also occurred in numerous other places where ‘“‘mysterium ” is now found (e.g., Rom. xvi. 25; 1 Cor. xiii. 2). In addition to its general sense the word pvoripiov not unnaturally soon came to have for Christians a more special meaning as denoting those external rites of their religion, solemn, instructive, and more or less secret, which had most analogy with the Mysrmrixs (q.v.) of paganism. No attempt, however, was at first made to enumerate or to define these. ‘Tertullian speaks of the sacrament of baptism and the Eucharist, Cyprian of “either sacrament,” meaning baptism and confirmation, and many others, fol- lowing Eph. v. 22 (see Vulgate), of the sacrament of marriage, but all with the utmost vagueness. Augustine’s definition of the word was little more explicit, but for cen- turies it was all the Western Church had, and for even a longer period it continued to be a sufficiently adequate expression of the Oriental view also. According to him a sacrament is “the visible form of invisible grace,” or “a sign of a sacred thing.” The sacraments he principally has in view are those of baptism and the Lord’s Supper, but with so wide a definition there was nothing to prevent him from using the word (as he freely does) in many other applications. The old Sacramentaries or liturgical books, which can in some cases be carried back as far as to the 8th century, in like manner contain prayers and benedic- tions, not only for the administration of the Eucharist and of baptism, but also for a variety of other rites, such as the blessing of holy water and the dedication of churches. In the De sacramentis Christiane fidei of Hugh of St

Victor (d. 1141), no fewer than thirty sacraments are enumerated, divided into three classes, baptism and the Lord's Supper occupying a first place. What proved to be an important new departure was taken by Peter Lombard (d. 1164), in the 4th book of his Sentences, which treats "of sacraments and sacramental signs." There for the first time are enumerated the seven sacraments (baptism, confirmation, the Eucharist, penance, extreme unction, order, matrimony), which were afterwards formally recognized by the Church of Rome at the councils of Florence (1439) and of Trent ; and there also for the first time it was expressly recognized that not all signs of sacred things can be regarded as sacraments, but only those which are the form of invisible grace in such a sense as to represent it and bring it about ("ut ipsius imaginem gerat et causa existat"). This "differentia" of the sacra- ment, properly so called, became the basis of all subse- quent scholastic discussion and authoritative decree in the Western church, and even, though of course indirectly, in the Eastern also. The main points in the Tridentine doctrine are these: the sacraments have the power of con- ferring grace ex opere operato on the recipients who do not resist it ('non ponentibus obicem"); for their validity, however, there must be in the minister the intention of doing that which the church does. Though all are in a sense necessary, they are not so with equal directness for each individual, nor are they alike in dignity. The two principal sacraments are baptism and the Lord's Supper. All were instituted by Christ. Three of them (baptism, confirmation, order) impart an indelible "character," and therefore cannot be repeated. For the teaching of the Greek Church compare vol. xi. pp. 158, 159. The churches of the Reformation, while retaining the current doctrine that sacraments were "effectual signs of grace and God's good will" 'ordained by Christ," reduced their number to two, the remaining five being excluded partly because direct evidence of their institution by Christ was wanting, and partly because "they have not any visible sign or ceremony ordained of God." For further details on the individual sacraments the reader is referred to the separate articles (BAPTISM, EUCHARIST, &c.).

SACRAMENTO, a city of the United States, the capital of California and the county seat of Sacramento county, 135 miles by rail north-east of San Francisco on the east bank of the Sacramento river, which at this point receives the American river and becomes navigable for large steam- boats. The site is only 15 feet above low water of the river, or 30 above sea-level,

and as the river sometimes rises 20 feet the city was originally subject to destructive floods. Those of 1850, 1852, and 1853, however, led to the raising of the level of the principal streets and build- ings in the business quarter by 5 feet, and to the construc- tion of strong levees or embankments, from 4 to 20 feet high for 2 miles along the Sacramento and 3 along the American river. Further measures of the same kind were adopted after the disaster of 1861, which almost rendered the city bankrupt ; and the level of the principal districts is now 8 feet above the river. The shops and stores in the city are mostly of brick, but the dwelling-houses gener- ally only of wood. The State capitol, commenced in 1861 and completed at a cost of $2,500,000, is one of the finest buildings of its kind in the States; it stands in the heart of the city in the midst of a park of 50 acres. The other public buildings—the State printing-office and armoury, the agricultural hall, the Oddfellows' hall, the hospital, the grammar-school, &c.—are comparatively unimportant. Besides the State library (36,000 volumes) there are two other public libraries in the city, The number of industrial establishments has recently been rapidly increasing ; they comprise the extensive workshops of the Central Pacific

Railroad, a woollen-mill, carriage-factories, plough-factories, marble-works, breweries, potteries, glue-works, &c. The population was 6820 in 1850, 13,785 in 1860, 16,283 in 1870 (6202 foreigners, 1370 Chinese), and 21,420 in 1880 (7048 foreigners, 1781 Chinese).

In 1841 John Augustus Sutter (b. 1803), a Swiss military officer, obtained a grant of land at the junction of the Sacramento and Amcrican rivers, and made a settlement which he called New Hel- vetia. The discovery of gold on his property in 1848 changed the whole history of California. Sutter's Fort, as the spot was popu- larly called, became the site of a mining town, which was made the capital of the State in 1854, and obtained a city charter in 1863, The name of Sacramento was first applicd to the place in the adver- tisement for the sale of ground-lots in 1848.

SACRIFICE. The Latin word sacrificium, from which we have the English "sacrifice," properly means an action within the sphere of things sacred to the gods, so that "sacrificial" and "hierurgic" are synonymous, and, strictly

speaking, cover the whole field of sacred ritual. By the Romans, as by all ancient or primitive nations, the gods were habitually approached with gifts, and the presentation of the gift, being the central feature in every ordinary act of worship, is regarded as the sacrifice proper. In all parts of the world, moreover, for reasons which will appear by and by, the stated gifts by which the gods are honoured in private worship or public feasts are drawn from the stores on which human life is supported,—fruits, grain, wine, oil, the flesh of animals, and the like. All gifts of this kind, which are not merely presented to the god but consumed in his service, fall under the notion of sacrifice, while permanent votive offerings of treasure, lands, temples, images, or the like, not forming part of any stated ritual, are excluded. But again, where we find a practice of sacrificing honorific gifts to the gods, we usually find also certain other sacrifices which resemble those already characterized inasmuch as something is given up by the wor- shippers to be consumed in sacred ceremony, but differ from them inasmuch as the sacrifice—usually a living victim— is not regarded as a tribute of honour to the god, but has a special atoning or mystic significance. The most familiar case of this second species of sacrifice is that which the Romans distinguished from the hostea honoraria by the name of hostia piacularis. In the former case the deity accepts a gift; in the latter he demands a life. The former kind of sacrifice is offered by the worshipper on the basis of an established relation of friendly dependence on his divine lord; the latter is directed to appease the divine anger, or to conciliate the favour of a deity on whom the worshipper has no right to count. The precise scope of sacrifices not merely honorific will appear more clearly in the sequel ; for the history of religion this second kind of sacrifice has a very peculiar importance, as may be judged from the fact that the ordinary metaphorical use of '"sacrifice" in English answers not to the notion of a "gift" but to that of "reluctant surrender." +

Honorvfic Sacrifices naturally hold the chief place in all natural (as opposed to positive) religions that have reached the stage in which orthodox ritual is differentiated from sorcery (comp. Prixst, vol. xix. p. 724), and in which the relations between the gods and their worshippers are con- ceived as being of a fixed and habitually friendly character, so that the acts by which a continuance of divine favour can be secured are known by well-established

tradition and regularly practised with full confidence in their efficacy. Religions of this type unite the god to a definite circle of

1 Apart from this metaphorical use the word “sacrifice” in English is often taken as.synonymous with “victim,” bloodless oblations being called rather by the vague word “offering.” This usage corresponds to the practice of the Authorised Version, which commonly renders MAID) 713}, z.e., “victim and cereal oblation,” by the words “ sacrifice and offering,” and uses the verb “to sacrifice” for the Hebrew M2}, “to slaughter a victim.”

worshippers forming a natural unity, so that every man’s birth or political and social status determines at once what god he is called upon to worship and may confidently look to for help. Religions of this sort, therefore, are mainly tribal or national, and the deity is regarded as a king, or, ‘f there are several gods worshipped by the same circle, they are lords and ladies and are naturally to be honoured in the same way as earthly grandees. Thus among the Hebrews, whose early institutions afford a typical example of a national religion, the fundamental rule is that no one is to appear before Jehovah empty-handed (Exod. xxiii. 15), just as it would be indecent (and in the East is still indecent) to approach a king or great man without some present, however trifling. In like manner Homer teaches that gods and kings alike are persuaded by gifts. A special request will naturally be accompanied by a special gift proportioned to the occasion or by a vow to be fulfilled when the prayer is heard ; but apart from this the general goodwill whether of god or king falls to be acknowledged and secured by offerings renewed from time to time by way of tribute or homage. Thus in Hebrew the word minha means alike “ gift,” “tribute,” and “sacrificial oblation,” especially an oblation of agricultural produce. For in a simple agricultural society payments in kind, whether to a divine or to a human lord, would naturally consist for the most part of the fruits of the soil; and with this it agrees that not only in Canaan but among the Greeks there is evidence that cereal oblations had a great place in early ritual, though they afterwards became second in importance to animal sacrifices, which yielded a more luxurious sacrificial banquet, and also, as we shall see, derived a

peculiar significance from the shedding of the victim's blood. In almost all nations we find that the chief sacrificial feasts are associated with the harvest and the vintage, or, where pastoral life predominates, are re- gulated by the time at which the flocks bear their young (comp. Passover) ; at these seasons tribute of firstfruits and firstlings is paid to the gods of the good things which they themselves have given to the inhabitants of their land, This conception of sacrifice may go with very various views of the nature of the gods and of religion. It may go with the idea that the god has need of the worshipper and his gifts just as the worshipper has need of the god and his help, and thus with a matter-of-fact business-like people like the Romans religion may become very much a sort of bargain struck with the gods. But, on the other hand, it Is quite possible that sacrifices may continue to be offered by men who have ceased to believe that the deity has any need of what man can give, simply because such gifts are in ordinary life the natural expression of respect and homage and no fitter and more expressive way of giving utterance to the same feelings towards the gods has been devised. Thus the Hebrews continued to offer sacrifices to Jehovah long after they knew that "if He were hungry He would not tell man, for the world was His and the fulness thereof." But when this standpoint is reached sacrifice becomes a merely conventional way of expressing religious feeling; the ritual becomes a simple affair of tradition, which may, as in the Levitical legislation, be based on an express divine command ; and those who are not content with the authority of tradition as a sufficient proof that the gods love to be honoured in this way take refuge in some allegorical explanation of the ceremonial. In general, however, we find an extraordinary persistence of the notion that sacrifices do in some way afford a phy- sical satisfaction to the deity. If they do not feed him, he 18 at least gratified by their odour. Neither the Greek oi nor the Jewish rabbins ever quite got rid of idea.

But in fact the notion that the more ethereal elements

of the sacrifice rise to heaven, the seat of the gods, in the savoury smoke that ascends from the sacrificial flame can in certain instances be shown to be connected with a later development of sacrifice. Among the Semites, for

ex- ample, sacrifices were not originally burned. The god was not seated aloft, but was present at the place of sacri- fice, inhabiting a sacred stone (a baetylium, beth-el, or “house of god”), which answered at once to the later idol and the later altar. That the god was thought by the heathen Semites to inhabit the sacred stone, or in other cases a sacred tree, is expressly recorded of several Arabian sanctuaries, and it cannot be doubted that this was the general view wherever there was a masséba (sacred cippus) or an ashera (sacred pole or tree). And in these cases the gift of the worshipper was not, in the more primitive cults, consumed by fire, but the sacred stone was daubed with oil or blood, libations of milk, of blood, or of wine were poured forth beside it, cereal gifts were presented by being simply laid on the sacred ground, and slaughtered victims were left there to be devoured by wild beasts (Sprenger, Leb. Moh., iii. 457), or even a human sacrifice was offered by burying the victim under the cippus. Sacrifices of this type are found not only throughout the Semitic field but in all parts of the world ; they belong to the same category with the Hebrew showbread and the Roman lectisternia. In later times the food spread on the tables of the god is eaten by his ministers, the priests, to whom he is supposed to make over the enjoyment of the banquet; but this is a refinement on the original usage. In older times the gods themselves were held to partake of these gifts of food, just as the venerable dead were fed by the meat and drink placed or poured out upon their tombs. In the religions of savages both gods and the dead have very material needs, among which the need of nourishment has the first place ; and just as we learn from the story of Periander and Melissa (Herod., v. 92) that among the Greeks of the 7th century B.C. it was a new idea that the dead could make no use of the gifts buried with them unless they were etherealized by fire, so also the fact that among the Greeks, especially in old times, sacrifices to water-gods were simply flung into the river or the sea, and sacrifices to underground gods were buried, indicates that it is a secondary idea that the gods were too ethereal to enjoy a sacrifice through any other sense than that of smell. Even the highest antique religions show by unmistakable signs that in their origin sacrifices were literally ‘the food of the gods.” In Israel the conception against which the author of Psalm 1. protests so strongly was uever eliminated from the ancient technical language of the priestly ritual, in which the sacri- fices are called D‘nDN nnd, “food of the deity” (Lev. xxi. 8, 17, 21); and among the Greeks we find not only such general expressions as that the gods “feast on

hecatombs ” (i1., ix. 531) but even that particular gods bear special surnames, such as “‘the goat-eater,” the “ram-eater,” “Dionysus the eater of raw (human) flesh” (a’yodayos, Kpiopayos, @unarys).

A sacrifice, therefore, is primarily a meal offered to the deity. In some of the cases already noticed, and in the case of holocausts or whole burnt-offerings, the sacrificial gift is entirely made over to the god; but ordinarily the sacrifice is a feast of which gods and worshippers partake together. If all sacrifices are not convivial entertainments, at least the tendency is to give to all feasts, nay to all meals, a sacrificial character by inviting the gods to partake of them (Atheneus, v. 19). Thus the Roman family never rose from supper till a portion of the food had been laid on the burning hearth as an offering to the Lares (Serv., Ad n., i. 730; Ovid, Fast., ii. 633); and a similar practice was probably followed in early Greece.! At all events

1 See the discussion in Buchholz, Homer. Realien, Il. ii. 213 sq.

the slaughter of an animal (which gave the meal a more luxurious and festal character, animal food being not in daily use with the mass of the agricultural populations of the Mediterranean lands) seems to have been always sacrificial in early Greece, and even in later times St Paul assumes that the flesh sold in the shambles would often consist of eiSwAd@ura. Among the Semites sacrifice and slaughter for food are still more clearly identified; the Hebrews use the same word for both, and the Arabian invocation of the name of Allah over every beast killed for food is but the relic of a sacrificial formula. The part of the gods in such sacrificial meals was often very small, the blood alone (Arabia), or the fat and the thighs (I1., i. 460), or small parts of each joint (Od., xiv. 427), or the blood, the fat, and the kidneys (Lev. iii.). When the sacrifice was offered by a priest, he also naturally received a portion, which, properly speaking, belonged to the deity and was surrendered by him to his minister, as is brought out in the Hebrew ritual by the ceremonial act of waving it towards the altar (Lev. vii. 29 sqg.). The thigh, which in Homeric sacrifice is burned on the altar, belongs in the Levitical ritual to the priest, who was naturally the first to profit by the growth of a conviction that the deity himself did not require to be fed by man’s food.

The conception of the sacrifice as a banquet in which gods and men share together may be traced also in the accessories of sacred ritual. Music, song, garlands, the sweet odour of incense, accompany sacrifice because they are suitable to an occasion of mirth and luxurious enjoy- ment. Wine, too, ‘ which cheereth gods and men” (Judges ix. 13), was seldom lacking in the vine-growing countries ; but the most notable case where the sacrificial feast has the use of an intoxicant (or narcotic) as its chief feature is the ancient soma sacrifice of the old Aryans, where the gods are honoured by bowls of the precious draught which heals the sick, inspires the poet, and makes the poor believe that he is rich.

The sacrificial meal, with the general features that have been described, may be regarded as common to all the so- called nature-religions of the civilized races of antiquity, —religions which had a predominantly joyous character, and in which the relations of man to the gods were not troubled by any habitual and oppressive sense of human guilt, because the divine standard of man’s duty corre- sponded broadly with the accepted standard of civil con- duct, and therefore, though the god might be angry with his people for a time, or even irreconcilably wroth with individuals, the idea was hardly conceivable that he could be permanently alienated from the whole circle of his worshippers,—that is, from all who participated in a certain local (tribal or national) cult. But when this type of religion began to break down the sacrificial ritual under- went corresponding modifications. Thus we find a decline of faith in the old gods accompanied, not only by a grow- ing neglect of the temples and their service, but also by a disposition to attenuate the gifts that were still offered, or to take every opportunity to cheat the gods out of part of their due,—a disposition of which Arabia before Mohammed affords a classical example. But, again, the decline of faith itself was not a mere product of indiffer- ence, but was partly due to a feeling that the traditional ritual involved too material a conception of the gods, and this cause, too, tended to produce modifications in sacri- ficial service. The Persians, for example (Herod: ai: 132); Strabo, xv. p. 732), consecrated their sacrifices with liturgical prayers, but gave no part of the victim to the deity, who “desired nothing but the life (or soul) of the victim.” This, indeed, is the Roman formula of placular as distinct from honorific offerings (Macrob., iii. 5, 1),

and might be taken as implying that the Persians had ceased to look on sacrifices as gifts of homage; but such an explanation can hardly be extended to the parallel case of the Arab sacrifices, in which the share of the deity wag the blood of the victim, which according to antique belief contained the life. For among the Arabs blood was a recognized article of food, and the polemic of Ps. lL. 138 is expressly directed against the idea that the deity " drinks the blood of goats." And the details given in Strabo make it tolerably clear that Persian sacrifice is simply an example of the way in which the material gift offered to the deity is first attenuated and then allegorized away as the conception of the godhead becomes less crassly mate- rial. But on the other hand it is undoubtedly true that under certain conditions the notion of piacular sacrifice shows much greater vitality than that of sacrificial gifts of homage. When a national religion is not left to slow decay, but shares the catastrophe of the nation itself, as was the case with the religions of the small western Asiatic states in the period of Assyrian conquest, the old joyous confidence in the gods gives way to a sombre sense of divine wrath, and the acts by which this wrath can be conjured become much more important than the ordinary traditional gifts of homage. To this point we must return by and by.

It appears, then, that in the old national nature-religions the ordinary exercises of worship take the form of meals offered to the gods, and usually of banquets at which gods and worshippers sit down together, so that the natural bond of unity between the deity and his subjects or children is cemented by the bond of ''bread and salt "— salt is a standing feature in the sacrifices of many races (comp. Lev. ii. 13)—to which ancient and unsophisticated peoples attach so much importance. That the god is habitually willing to partake of the banquet offered to him is taken for granted ; but, if anything has occurred to alienate his favour, he will show it by his conduct at the feast, by certain signs known to experts, that indicate his refusal of the offered gift. Hence the custom of inspect- ing the exta of the victim, watching the behaviour of the sacrificial flame, or otherwise seeking an omen which proves that the sacrifice is accepted, and so that the deity may be expected to favour the requests with which the gift is associated.}

In the religions which we have been characterizing all the ordinary functions of worship are summed up in these sacrificial meals ; the stated and normal intercourse between gods and men has no other form. God and worshippers make up together a society of commensals, and every other point in their reciprocal relations is included in what this involves. Now, with this we must take the no less certain fact that throughout the sphere of the purely sacrificial religions the circle of common worship is also the circle of social duty and reciprocal moral obligations. And thus the origin of sacrificial worship must be sought in a stage of society when the circle of commensals and the circle of persons united to each other by sacred social bonds were identical. But all social bonds are certainly de- veloped out of the bond of kindred, and it will be generally admitted that all national religions are develop- ments or combinations of the worship of particular kins. It would seem, therefore, that the world-wide prevalence of sacrificial worship points to a time when the kindred group and the group of commensals were identical, and when, conversely, people of different kins did not eat and drink together.

At first sight it might appear that this amounts to the

z Hence in Roman ritual there is no inspection of the exta where an sacrifice is piacular, and so does not involve a meal offered to the eity.

proposition that all religious and civil societies of antiquity have the family as their type, and that the type of sacri- fice is such a family meal as is found among the Romans. And this view would seem to be favoured by the frequent occurrence among ancient peoples of the conception that the deity is the father (progenitor and lord) of his worshippers, who in turn owe filial obedience to him and brotherly duty to one another. But in the present stage of research into the history of early society it is by no means legitimate to assume that the family, with a father at its head, is the original type of the circle of com- mensals. It is impossible to separate the idea of com- mensality from the fact so constantly observed in primitive nations, that each kindred has certain rules about for- bidden food which mark it off from all other kindreds. And in a very large proportion of cases kindred obliga- tions, religion, and laws of forbidden food combine to divide a child from

his father’s and unite him to his mother’s kin, so that father and sons are not commensals. It is noteworthy that family meals are by no means so universal an institution as might be imagined a@ priori. At Sparta, for example, men took their regular meals not with their wives and children but in sysstea or pheiditia ; and a similar organization of nations in groups of com- mensals which are not family groups is found in other places (Crete, Carthage, &c.). The marked and funda- mental similarity between sacrificial worships in all parts of the globe makes it very difficult to doubt that they are all to be traced back to one type of society, common to primitive man as a whole. But the nearest approximation to a primitive type of society yet known is that based not on the family but on the system of totem stocks ; and as this system not only fulfils all the conditions for the formation of a sacrificial worship, but presents the con- ception of the god and his worshippers as a circle of commensals in its simplest and most intelligible form, it seems reasonable to look to it for additional light on the whole subject. In totemism and in no other system laws of forbidden food have a direct religious interpretation and form the principal criterion by which the members of one stock and religion are marked off from all their neigh- bours. For the totem is usually an animal (less often a plant); the kindred is of the stock of its totem; and to kill or eat the sacred animal is an impiety of the same kind with that of killing and eating a tribesman. To eat the totem of a strange stock, on the other hand, is legitimate, and for one totem group to feast on the carcase of a hostile totem is to express their social and religious particularism in the most effective and laudable way, to honour their own totem and to cast scorn on that of the enemy. The importance attached to the religious feast of those who have the same laws about food, and are there- fore habitual commensals, is more intelligible on this system than on any other.

Though the subject has not been completely worked out, there is a good deal of evidence, both from social and from religious phenomena, that the civilized nations of antiquity once passed through the totem stage (see Famity and MyTHoLoey) ; it is at least not doubtful that even in the historical] period sacred animals and laws of forbidden food based on the sacredness of animals, in a way quite analo- gous to what is found in totemism, were known among all these nations. Among the Egyptians the whole organiza- tion of the local populations ran on totem lines, the

different villages or districts being kept permanently apart by the fact that each had its own sacred animal or herb, and that one group worshipped what another ate. And the sacri- ficial feast on the carcase of a hostile totem persisted down ee a late date, as we know from Plutarch (Js. e¢ Osir., p. 330; comp. Alex. Polyh., ap. Eus., Prep. Ev., lx. p. 432;

Diod. Sic., i. 89). Among the Semites there are many relics of totem religion; and, as regards the Greeks, so acute an observer as Herodotus could hardly have imagined that a great part of Hellenic religion was borrowed from Egypt if the visible features of the popular worship in the two countries had really belonged to entirely different types. To suppose that the numerous associations between particular deities and corresponding sacred animals which are found in Greece and other advanced countries are merely symbolical is a most unscientific assumption; especi- ally as the symbolic interpretation could not fail to be introduced as a harmonizing expedient where, through the fusion of older deities under a common name (in connexion with the political union of kindreds), one god came to have several sacred animals. But originally even in Greece each kin had its own god or in later language its hero; so in Attica the Crioeis have their hero Crius (Ram), the Butadez have Butas (Bullman), the Aigide have Aigeus (Goat), and the Cynide Cynus (Dog). Such heroes are real totem ancestors ; Lycus, for example, had his statue in wolf form at the Lyceum. The feuds of clans are repre- sented as contests between rival totems: Lycus the wolf flees the country before AZgeus the goat, and at Argos, where the wolf-god (Apollo Lycius) was introduced by Danaus, the struggle by which the sovereignty of the Danaids was established was set forth in legend and picture as following on the victory of a wolf (representing Danaus) over a bull (representing the older sovereignty of Gelanor) ; see Paus., 11. 19, 3 sg. That Apollo’s sacrifices were bulls and rams is therefore natural enough; at the sanctuary of the wolf-Apollo at Sicyon indeed legend pre- served the memory of a time when flesh was actually set forth for the wolves, as totem-worshippers habitually set forth food for their sacred animals,—though by a touch of the later rationalism which changed the wolf-god into Apollo the wolf-slayer (Lycoctonus) the flesh was said to have been poisoned by Apollo’s direction in a way that even theological experts did

not understand (Paus,, ii. 9, 7). Such clear traces of the oldest form of sacrifice are neces- sarily rare, but the general facts that certain animals might not be sacrificed to certain gods, while on the other hand each deity demanded particular victims, which the ancients themselves explained in certain cases to be hostile animals, find their natural explanation in such a stage of religion as has just been characterized. The details are difficult to follow out, partly because most worships of which we know much were syncretistic, partly because the animals which the gods loved and protected were in later times often confused with the victims they desired, and partly because piacular and mystical sacrifices were on principle (as we shall see by and by) chosen from the class of victims that might not be used for the feasts of the gods. A single example, therefore, must here suffice to close this part of the subject. At Athens the goat might not be offered to the Athena on the Acropolis. Now according to legend Athena's worship was made Panathenaic by the Aigide or goat clan,and Athena herself was represented clad in the zgis or goat-skin, an attribute which denotes that she too was of the goat kin or rather had been taken into that kin when her worship was introduced among them.? Generally speaking, then, the original principle on which a sacrificial meal is chosen is that men may not eat what cannot be offered to their god (generalized in later syn- cretism to the rule that men may not eat things that can be offered to no god; Julian, Orat., v. p. 176 C.); and that,

1 The religious meaning of wearing the skin of an animal is identi- fication with the animal. Hxamples will appear below ; compare also the were-wolf superstitions (vol. xv. p. 90), where the same symbolism occurs. So too Pausanias (x. 31, 10) describes a representation of the bear-heroine Callisto reclining on a bear-skin couch.

conversely, acceptable offerings are the things which are eaten by predilection by that divine animal which in later times became the sacred symbol of the anthropomorphic god, or else victims are to be chosen which are sacred among a hostile tribe. The two principles may often co- incide. Fierce mountain tribes who live mainly by harry- ing their neighbours in the plain will be wolves, lions, bears, while their enemies will naturally

worship bulls, sheep, goats, like the Troglodytes on the Red Sea, who “gave the name of parent to no human being but to the bull and the cow, the ram and the ewe, because from them they had their daily nourishment ” (Strabo, xvi. 4); and thus in cases like that of Argos the ultimate shape of the ritual may throw important light on the character of the early population. When by conquest or otherwise two such originally hostile nations are fused the opposing animal symbols will ultimately be found in friendly asso- ciation: e.g., Artemis (in her various forms) is associated both with carnivora and with stags or domestic animals. The former is the original conception, as her sacrifices show. She is therefore, like the wolf-Apollo, originally the deity of a wild hunting tribe, or rather various carnivorous deities of such tribes have coalesced in her.

Human Sacrifices —From these observations the tran- sition is easy to those human sacrifices which are not piacular. It is perfectly clear in many cases that such sacrifices are associated with cannibalism, a practice which always means eating the flesh of men of alien and hostile kin. The human wolves would no more eat a brother than they would eat a wolf; but to eat an enemy is another matter. Naturally enough traces of cannibalism persist in religion after they have disappeared from ordinary life, and especially in the religion of carnivorous gods.1 Thus it may be conjectured that the human sacrifices offered to the wolf-Zeus (Lyczeus) in Arcadia were originally can- nibal feasts of a wolf tribe. The first participants in the rite were according to later legend changed into wolves (Lycaon and his sons); and in later times, as appears by comparing Plato (Rep., viii. 15) with Pausanias (vili. 2), at least one fragment of the human flesh was placed among the sacrificial portions derived from other victims, and the man who ate it was believed to become a were-wolf. All human sacrifices where the victim is a captive or other foreigner may be presumed to be derived from cannibal feasts ; but a quite different explanation is required for the cases, which are by far more numerous among people no longer mere savages, in which a father sacrifices his child or a tribe its fellow-tribesman. This case belongs to the head of piacular sacrifices.

Piacular Sacrifices—Among all primitive peoples there are certain offences against piety (especially bloodshed within the kin) which are regarded as properly inexpiable ; the offender must die or become an outlaw. Where the

god of the kin appears as vindicator of this law he demands the life of the culprit; if the kinsmen refuse this they share the guilt. Thus the execution of a criminal assumes the character of a religious action. If now it appears in any way that the god is offended and refuses to help his people, it is concluded that a crime has been committed and not expiated. This neglect must be repaired, and, if the true culprit cannot be found or cannot be spared, the worshippers as a whole bear the guilt until they or the

guilty man himself find a substitute. The idea of substitu-

tion is widespread through all early religions, and is found in honorific as well as in piacular rites; the Romans, for example, substituted models in wax or dough for victims ee

a Tn the Roman empire human sacrifice was practised at not a few shrines down to the time of Hadrian ; for examples the reader may

refer to Porphyry, De Abstin., ii. 27, 54 sq., and to Clem. Alex., Coh. ad Gentes, p. 27.

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that could not be procured according to the ritual, or else

feigned that a sheep was a stag (cervaria ovis) and the like. In all such cases the idea is that the substitute shall imitate as closely as is possible or convenient the victim whose place it supplies; and so in piacular ceremonies the god may indeed accept one life for another, or certain select lives to atone for the guilt of a whole community, but these lives ought to be of the guilty kin, just as in blood-revenge the death of any kinsman of the manslayer satisfies justice. Hence such rites as the Semitic sacrifices of children by their fathers (see Monocn), the sacrifice of Iphigeneia and similar cases among the Greeks, or the offering up of boys to the goddess Mania at Rome pro familiarium sospitate (Macrob., 1. 7, 34). In the oldest Semitic cases it is only under extreme manifestations of divine wrath that such offerings are made (comp. Porph., De Abst., ii. 56), and so it was probably among other races also; but under the pressure of long-continued calamity, or other circumstances which made men doubtful of the steady

favour of the gods, piacular offerings might easily become more frequent and ultimately assume a stated character, and be made at regular intervals by way of precaution without waiting for an actual outbreak of divine anger. Thus the Carthaginians, as Theophrastus relates, annually sprinkled their altars with “a tribesman’s blood” (Porph., De Abst., ii. 28). But in advanced societies the tendency is to modify the horrors of the ritual either by accepting an effusion of blood without actually slaying the victim, e.g., in the flagellation of the Spartan lads at the altar of Artemis Orthia (Paus., iii. 16, 7; comp. Eurip., [ph. Taur., 1470 sq. ; 1 Kings xviii. 28), or by a further extension of the doctrine of substitution ; the Romans, for example, substituted puppets for the human sacrifices to Mania, and cast rush dolls into the Tiber at the yearly atoning sacrifice on the Sublician bridge. More usually, however, the life of an animal is accepted by the god in place of a human life. This explanation of the origin of piacular animal sacrifices has often been disputed, mainly on dogmatic grounds and in connexion with the Hebrew sin-offerings ; but it is quite clearly brought out wherever we have an ancient account of the origin of such a rite (e.g., for the Hebrews, Gen. xxii. 13 ; the Pheenicians, Porph., De Abst., iv. 15; the Greeks and many others, ebid., 1. 54 sq. ; the Romans, Ovid, Fastz, vi. 162). Among the Egyptians the victim was marked with a seal bearing the image of a man bound, and kneeling with a sword at his throat (Plut., [s. e¢ Os., chap. xxxi.) And often we find a ceremonial laying of the sin to be expiated on the head of the victim (Herod., 11. 39; Lev. iv. 4 compared with xiv. 21).

In such piacular rites the god demands only the life of the victim, which is sometimes indicated by a special ritual with the blood (as among the Hebrews the blood of the sin-offering was applied to the horns of the altar, or to the mercy-seat within the vail), and there is no sacrificial meal. Thus among the Greeks the carcase of the victim was buried or cast into the sea, and among the Hebrews the most important sin-offerings were burnt not on the altar but outside the camp (city), as was also the case with the children sacrificed to ‘‘Moloch.” Sometimes, however, the sacrifice is a holocaust on the altar (2 Kings iii. 27), or the flesh is consumed by the priests. The latter was the case with certain Roman piacula, and with those Hebrew sin-offerings in which the blood was not brought within the vail (Lev. vi. 25 sq.). Here the sacrificial flesh is seemingly a gift accepted by the deity and assigned by him to the priests, so that the distinction between @ honorific

and a piacular sacrifice is partly obliterated. But this is not hard to understand ; for just as a blood- rite takes the place of blood-revenge in human justice, soan _

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offence against the gods may in certain cases be redeemed

by a fine (e.g., Herod., il. 65) or a sacrificial gift. This seems to be the original meaning of the Hebrew dshaém (trespass-offering), which was a kind of atonement made partly in money (Lev. v. 15 sq.), but accompanied (at least in later times) by a sacrifice which differed from the sin-offering, inasmuch as the ritual did not involve any exceptional use of the blood. The ordinary sin-offerings in which the priests ate the flesh may be a compound of the dsham and the properly piacular substitution of life for life. ‘The two kinds of atonement are mixed up also in Micah vi. 6 sg., and ultimately all bloody sacrifices, especially the whole burnt-offering (which in early times was very rare but is prominent in the ritual of the second temple), are held to have an atoning efficacy (Lev. i. 4, xvii. 11). There is, however, another and mystical sense sometimes associated with the eating of sin-offerings, as we shall see presently.

The most curious developments of piacular sacrifice take place in the worship of deities of totem type. Here the natural substitute for the death of a criminal of the tribe is an animal of the kind with which the worshippers and their god alike count kindred; an animal, that is, which must not be offered in a sacrificial feast, and which indeed it is impious to kill. Thus Hecate was invoked as a dog (Porph., De Abst., iii. 17), and dogs were her pia- cular sacrifices (Plut., Qu. Rom., iii.), Andin like manner in Egypt the piacular sacrifice of the cow-goddess Isis- Hathor was a bull, and the sacrifice was accompanied by lamentations as at the funeral of a kinsman (Herod., 11. 39, 40). This lamentation at a piacular sacrifice is met with in other cases, ¢.g., at the Argean festival at Rome (Marquardt, Rém. Staatsverw., iii. 192), and is parallel to the marks of indignation which in various atoning rituals it is proper to display towards the priest who performs the sacrifice. At Tenedos, for example, the priest was attacked with stones who sacrificed to Bacchus a bull-calf, the affinity of which with man was indicated by the mother-cow being treated like a woman in

childbed and the victim itself wearing the cothurnus. As the cothurnus was proper to Bacchus, who also was often addressed in worship and represented in images as a bull, the victim here is of the same race with the god (El., H.W., xii. 34; Plut., Qu. Gr, xxxy.) as well as with the worshippers. In such rites a double meaning was suggested : the victim was an animal kindred to the sacrificers, so that his death was strictly speaking a murder, for which, in the Attic Diipolia, the sacrificial axe cast away by the priest was tried and condemned (Paus., i. 24, 4), but it was also a sacred animal sharing the nature of the god, who thus in a sense died for his people. The last point comes out clearly in the annual sacrifice at Thebes, where a ram was slain and the ram-god Amen clothed in his skin. The worshippers then bewailed the ram and buried him ina sacred coffin (Herod., ii. 42). Thus the piacular sacrifice in such cases is merged in the class of offerings which may be called sacramental or mystical.

M. ystwal or Sacramental Sacrifices.—That the mysteries of races like the Greeks and Egyptians are sprung from the same circle of ideas with the totem mysteries of savage tribes has been suggested in Myruonoey, vol. xvii. p: tol, with which the reader may compare Mr Lang's book on Custom and Myth ; and examples of sacramental sacrifices ce been adduced in the same article (p. 150) and in

BXICO, vol. xvi. p. 212. In Mexico the worshippers ate sacramentally paste idols of the god, or slew and feasted i a human victim who was feigned to be a representative of the deity. The Mexican gods are unquestionably developed out of totems, and these sacraments are on one line with the totem mysteries of the ruder Indian tribes

in which once a year the sacred animal is eaten, body and blood. Now according to Julian (Orat., v. p. 175) the mystical sacrifices of the cities of the Roman empire were in like manner offered once or twice a year and consisted of such victims as the dog of Hecate, which might not be ordinarily eaten or used to furnish forth the tables of the gods. The general agreement with the American mysteries is therefore complete, and in many cases the resemblance extends to details which leave no doubt of the totem origin of the ritual. The mystic sacrifices seem always to have had an

atoning efficacy ; their special feature is that the victim is not simply slain and burned or cast away but that the worshippers partake of the body and blood of the sacred animal, and that so his life passes as it were into their lives and knits them to the deity in living commu- nion. Thus in the orgiastic cult of the bull-Bacchus the worshippers tore the bull to pieces and devoured the raw flesh. These orgies are connected on the one hand with older practices, in which the victim was human (Orpheus legend, Dionysus ’Quycrys), and on the other hand with the myth of the murder of the god by his kinsmen the Titans, who made a meal of his flesh (Clem. Al., Cok. ad Gentes, p. 12). Similar legends of fratricide occur in connexion with other orgies (the Corybantes ; see Clement, ut supra) ; and all these various elements can only be reduced to unity by referring their origin to those totem habits of thought in which the god has not yet been differentiated from the plurality of sacred animals and the tribesmen are of one kin with their totem, so that the sacrifice of a fellow- tribesman and the sacrifice of the totem animal are equally fratricides, and the death of the animal is the death of the mysterious protector of the totem kin. In the Diipolia at Athens we have seen that the slaughter of the sacred bull

was viewed as a murder, but “the dead was raised again

in the same sacrifice,” as the mystic text had it: the skin was sewed up and stuffed and all tasted the sacrificial flesh, so that the life of the victim was renewed in the lives of those who ate of it! (Theophr., in Porph., De Abst., ii, 29 sq.).

Mystic sacrifices of this sacramental type prevailed also among the heathen Semites, and are alluded to in Isa. Ixv. 4 sq., Ixvi. 3, 17; Zech. ix. 7; Lev. xix. 26, &c.,? from which passages we gather that the victim was eaten with the blood. This feature reappears elsewhere, as in the pia- cular swine-offerings of the Fratres Arvales at Rome, and possesses a special significance inasmuch as common blood means in antiquity a share in common life. In the Old Testament the heathen mysteries seem to appear as cere- monies of initiation by which a man was introduced into a new worship, 7.e., primarily made of one blood with a new religious kinship, and they therefore come into promi- nence just at the time when in the 7th century B.c. political convulsions had shaken men’s faith in their old gods

and led them to seek on all sides for new and stronger pro- tectors. The Greek mysteries too create a close bond between the mystzx, and the chief ethical significance of the Eleusinia was that they were open to all Hellenes and so represented a brotherhood wider than the political limits of individual states. But originally the initiation must have been introduction into a particular social community ; Theophrastus's legend of the origin of the Diipolia is ex- pressly connected with the adoption of the house of Sopa- trus into the position of Athenian citizens. From this point of view the sacramental rites of mystical sacrifice are a form of blood-covenant, and serve the same purpose

1 Tn the same way the Issedones honoured their parents by eating their dead bodies (Herod., iv. 26). The life was not allowed to go out of the family.

2 For details see W. R. Smith, Kinship and Marriage in Early

Arabia, p. 309. XXT, — 18

as the mixing of blood or tasting of each other's blood by which in ancient times two men or two clans created a sacred covenant bond. In all the forms of blood-covenant, whether a sacrifice is offered or the veins of the parties opened and their own blood used, the idea is the same: the bond created is a bond of kindred, because one blood ig now in the veins of all who have shared the ceremony. The details in which this kind of symbolism may be carried out are of course very various, but where there is a covenant sacrifice we usually find that the parties eat and drink together (Gen. xxxi. 54), and that the sacrificial blood, if not actually tasted, is at least touched by both parties (Xen., Anab., li. 2, 9), or sprinkled on both and on the altar or image of the deity who presides over the con- tract (Exod., xxiv. 6,7). A peculiar form which meets us in various places is to cut the animal in twain and make those who swear pass between the parts (Gen. xiii. 9 sg.; Jer. xxiv. 18 sg.; Plut., Qu. Hom., iii, &c.). This is generally taken as a formula of imprecation, as if the parties prayed that he who proved unfaithful might be similarly cut in twain ; but, as the case cited from Plutarch shows that the

victim chosen was a mystic one, it is more likely that the original sense was that the worshippers were taken within the mystic life.

Even the highest forms of sacrificial worship present much that is repulsive to modern ideas, and in particular it requires an effort to reconcile our imagination to the bloody ritual which is prominent in almost every religion which has a strong sense of sin. But we must not forget that from the beginning this ritual expressed, however crudely, certain ideas which lie at the very root of true religion, the fellowship of the worshippers with one another in their fellowship with the deity, and the consecration of the bonds of kinship as the type of all right ethical relation between man and man. And the piacular forms, though these were particularly liable to distortions disgraceful to man and dishonouring to the godhead, yet contained from the first germs of eternal truths, not only expressing the idea of divine justice, but mingling it with a feeling of divine and human pity. The dreadful sacrifice is per- formed not with savage joy but with awful sorrow, and in the mystic sacrifices the deity himself suffers with and for the sins of his people and lives again in their new life. (Ww. R. 8.)

The Idea of Sacrifice in the Christian Church.

There can be no doubt that the idea of sacrifice occupied an important place in early Christianity. It had been a fundamental element of both Jewish and Gentile religions, and Christianity tended rather to absorb and modify such elements than to abolish them. To a great extent the idea had been modified already. Among the Jews the preaching of the prophets had been a constant protest against the grosser forms of sacrifice, and there are indica- tions that when Christianity arose bloody sacrifices were already beginning to fall into disuse ; a saying which was attributed by the Ebionites to our Lord repeats this protest in a strong form, “I have come to abolish the sacrifices ; and if ye do not cease from sacrificing the wrath of God will not cease from you” (Epiph., xxx. 16). Among the Greeks the philosophers had come to use both argument and ridicule against the idea that the offering of material things could be needed by or acceptable to the Maker of them all. Among both Jews and Greeks the earlier forms of the idea had been rationalized into the belief that the most appropriate offering to God is that of a pure and penitent heart, and among them both was the idea that

Tin Greek ritual the identity of the covenant sacrifice with mystico- piacular rites is clearly brought out by the animals chosen and by other features in the ritual. See Schoemann, Gr. Alt., p. 248 sq.

the vocal expression of contrition in prayer or of gratitude in praise is also acceptable. The best instances of these ideas in the Old Testament are in Psalms 1. and li, and in Greek literature the striking words which Porphyry quotes from an earlier writer, "' We ought, then, having been united and made like to God, to offer our own conduct as a holy sacrifice to Him, the same being also a hymn and our sgal- vation in passionless excellence of soul" (Euseb., Dem, Ev., 3). The ideas are also found both in the New Testa. ment and in early Christian literature: 'Let us offer u a sacrifice of praise to God continually, that is, the fruit of lips which make confession to His name" (Heb. xiii. 15); "That prayers and thanksgivings, made by worthy persons, are the only perfect and acceptable sacrifices I also admit" (Just. Mart., Zrypho, c. 117); "We honour God in prayer, and offer this as the best and holiest sacrifice with righteousness to the righteous Word" (Clem. Alex., Strom., vii. 6).

But among the Jews two other forms of the idea ex- pressed themselves in usages which have been perpetuated in Christianity, and one of which has had a singular im- portance for the Christian world. The one form, which probably arose from the conception of Jehovah as in an especial sense the protector of the poor, was that gifts to God may properly be bestowed on the needy, and that consequently alms have the virtue of a sacrifice. Biblical instances of this idea are—" He who doeth alms is offering a sacrifice of praise" (Ecclus. xxxii. 2); "To do good and to communicate forget not, for with such sacrifices God is well pleased" (Heb. xiii. 16); so the offerings sent by the Philippians to Paul when a prisoner at Rome are "an odour of a sweet smell, a sacrifice acceptable, well pleasing to God" (Phil. iv. 18). The other form, which was prob- ably a relic of the conception of Jehovah as the author of natural fertility, was that part of the fruits of the earth should be offered to God in acknowledgment of His bounty, and that what was so offered was especially blessed and brought a blessing upon both those who offered it and those who afterwards partook of it. The persistence of this

form of the idea of sacrifice constitutes so marked a feature of the history of Christianity as to require a detailed account of it.

In the first instance it is probable that among Christians, as among Jews, every meal, and especially every social meal, was regarded as being in some sense a thank-offering. Thanksgiving, blessing, and offering were co-ordinate terms. Hence the Talmudic rule, “A man shall not taste anything before blessing it” (Tosephta Berachoth, c. 4), and hence St Paul’s words, “He that eateth, eateth unto the Lord, for he giveth God thanks” (Rom. xiv. 6 ; comp. 1 Tim. iy. 4). But the most important offering was the solemn obla- tion in the assembly on the Lord’s day. A precedent for making such oblations elsewhere than in the temple had been afforded by the Essenes, who had endeavoured m that way to avoid the contact with unclean persons and things which a resort to the temple might have involved (Jos., Antig., xviii. 1, 5), and a justification for it was found in the prophecy of Malachi, “In every place incense is offered unto My name and a pure offering; for My name is great among the Gentiles, saith the Lord of hosts” (Mal. i. 11, repeatedly quoted in early Christian writings, e.g., Teaching of the Twelve Apostles, c. 14; Just. Mart, Trypho, c. 28, 41, 116; Irenzus, iv. 17, 5).

The points in relation to this offering which are clearly demonstrable from the Christian writers of the first two centuries, but which subsequent theories have tended to confuse, are these. (1) It was regarded as a true offering or sacrifice ; for in the Teaching of the Twelve Apostles, Justin Martyr, and in Irenxus it is designated by each of the terms which are used to designate sacrifices in the

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Old Testament. (2) It was primarily an offering of the fruits of the earth to the Creator ; this is clear from both Justin Martyr and Ireneus, the latter of whom not only explicitly states that such oblations are continued among Christians but also meets the current objection to them by arguing that they are offered to God not as though He needed anything but to show the gratitude of the offerer (Iren., iv. 17, 18). (3) It was offered as a thanksgiving partly for creation and preservation and partly for re-

demption: the latter is the special purpose mentioned (e.g.) in the Teaching of the Twelve Apostles ; the former 1s that upon which Irenzus chiefly dwells; both are men- tioned together in Justin Martyr (Trypho, c. 41). (4) Those who offered it were required to be not only baptized Christians but also ‘‘in love and charity one with another ”; there is an indication of this latter requirement in the Ser- mon on the Mount (Matt. v. 23, 24, where the word trans- lated “gift” is the usual LXX. word for a sacrificial offer- ing, and is so used elsewhere in the same Gospel, viz., Matt. viii. 4, xxiii. 19), and still more explicitly in the Teaching, c. 14, “Let not any one who has a dispute with his fellow come together with you (z.¢., on the Lord’s day) until they have been reconciled, that your sacrifice be not defiled.” ‘This brotherly unity was symbolized by the kiss of peace. (5) It was offered in the assembly by the hands of the president ; this is stated by Justin Martyr (Apol., i. 65, 67), and implied by Clement of Rome (Ep., 1. 44, 4). Combined with this sacrifice of the fruits of the earth to the Creator in memory of creation and redemption, and probably always immediately following it, was the sacred meal at which part of the offerings was eaten. Such a sacred meal had always, or almost always, formed part of the rites of sacrifice. There was the idea that what had been solemnly offered to God was especially hallowed by Him, and that the partaking of it united the partakers in a special bond both to Him and to one another. In the case of the bread and wine of the Christian sacrifice, it was believed that, after having been offered and blessed, they became to those who partook of them the body and blood of Christ. This “ communion of the body and blood of Christ,” which in early writings is clearly distinguished from the thank-offering which preceded it, and which fur- nished the materials for it, gradually came to supersede the thank-offering in importance, and to exercise a reflex influence upon it. In the time of Cyprian, though not before, we begin to find the idea that the body and blood of Christ were not merely partaken of by the worshippers but also offered in sacrifice, and that the Eucharist was not so much a thank-offering for creation and redemption as a repetition or a showing forth anew of the self-sacrifice of Christ. This idea is repeated in Ambrose and Augus- tine, and has since been a dominant idea of both Eastern and Western Christendom. But, though dominant, it has not been universal; nor did it become dominant until several centuries after its first promulgation. The history of it has yet to be written. For, in spite of the important controversies to which it has given birth, no one has been at

the pains to distinguish between (i.) the theories which have been from time to time put forth by eminent writers, and which, though they have in some cases ultimately won a general acceptance, have for a long period remained as merely individual opinions, and (ii.) the current beliefs of the great body of Christians which are expressed in recog- nized formularies. A catena of opinions may be produced in favour of almost any theory; but formularies express the collective or average belief of any given period, and changes in them are a sure indication that there has been a general change in ideas. _It is clear from the evidence of the early Western litur- gles that, for at least six centuries, the primitive conception

of the nature of the Christian sacrifice remained. There is a clear distinction between the sacrifice and the com- munion which followed it, and that which is offered con- sists of the fruits of the earth and not of the body and blood of Christ. Other ideas no doubt attached themselves to the primitive conception, of which there is no certain evidence in primitive times, ¢e.g., the idea of the propitiatory character of the offering, but these ideas rather confirm than disprove the persistence of those primitive conceptions themselves.

All Eastern liturgies, in their present form, are of later date than the surviving fragments of the earlier Western liturgies, and cannot form the basis of so sure an induction ; but they entirely confirm the conclusions to which the Western liturgies lead. The main points in which the pre-medieval formularies of both the Eastern and the Western Churches agree in relation to the Christian sacri- fice are the following. (1) It was an offering of the fruits of the earth to the Creator, in the belief that a special blessing would descend upon the offerers, and sometimes also in the belief that God would be propitiated by the offerings. The bread and wine are designated by all the names by which sacrifices are designated (sacrvjicia, hostie, libamina, and at least once sacrificium placationis), and the act of offering them by the ordinary term for offering a sacrifice (¢mmolatio). (2) The offering of bread and wine was originally brought to the altar by the person who offered it, and placed by him in the hands of the presiding officer. In course of time there were two im- portant changes in this respect : (a) the

offerings of bread and wine were commuted for money, with which bread and wine were purchased by the church-officers ; (b) the offerings were sometimes handed to the deacons and by them taken to the bishop at the altar, and sometimes, as at Rome, the bishop and deacons went round the church to collect them.! (3) In offering the bread and wine the offerer offered, as in the ancient sacrifices, primarily for himself, but inasmuch as the offering was regarded as having a general propitiatory value he mentioned also the names of others in whom he was interested, and especially the departed, that they might rest in peace. Hence, after all the offerings had been collected, and before they were solemnly offered to God, it became a custom to recite the names both of the offerers and of those for whom they offered, the names being arranged in two lists, which were known as diptychs. Almost all the old rituals have prayers to be said "before the names," "after the names." Tt was a further and perhaps much later development of the same idea that the good works of those who had pre- viously enjoyed the favour of God were invoked to give additional weight to the prayer of the offerer. In the later series of Western rituals, beginning with that which is known as the Leonine Sacramentary, this practice is almost universal. (4) The placing of the bread and wine upon the altar was followed by the kiss of peace. (5) Then followed the actual offering of the gifts to God (immolatio missx). It was an act of adoration or thanks- giving, much longer in Eastern than in Western rituals, but in both classes of rituals beginning with the form "Lift up your hearts," and ending with the Ter Sanctus or Trisagion.2 The early MSS. of Western rituals indi- cate the importance which was attached to this part of the liturgy by the fact of its being written in a much more ornate way than the other parts, e.g., in gold uncial letters 0 ee eS ee

1 Of this proceeding an elaborate account exists in the very inter- esting document printed by Mabillon in his Musewm Italicum as * Ordo Romanus I."; the small phials of wine which were brought were emptied into a large bowl, and the loaves of bread were collected in a bag.

2 The elements of the form are preserved exactly in the liturgy of the Church of England.

upon a purple ground, as distinguished from the vermilion cursive letters of the rest of the MS. With this the sacrifice proper was concluded. (6) But, since the divine injunction had been “ Do this in remembrance of Me,” the sacrifice was immediately followed by a commemoration of the passion of Christ, and that again by an invocation of the Holy Spirit (epiclests) that He would make the bread and wine to become the body and blood of Christ. Of this invocation, which is constant in all Eastern rituals, there are few, though sufficient, surviving traces in Western rituals! Then after a prayer for sanctification, or for worthy reception, followed the Lord’s Prayer, and after the Lord’s Prayer the communion.

In the course of the 8th and 9th centuries, by the opera- tion of causes which have not yet been fully investigated, the theory which is first found in Cyprian became the dominant belief of Western Christendom. The central point of the sacrificial idea was shifted from the offering of the fruits of the earth to the offering of the body and blood of Christ. The change is marked in the rituals by the duplication of the liturgical forms. The prayers of in- tercession and oblation, which in earlier times are found only in connexion with the former offering, are repeated in the course of the same service in connexion with the latter. The designations and epithets which are in earlier times applied to the fruits of the earth are applied to the body and blood. From that time until the Reformation the Christian sacrifice was all but universally regarded as the offering of the body and blood of Christ. The in- numerable theories which were framed as to the precise nature of the offering and as to the precise change in the elements all implied that conception of it. It still remains as the accepted doctrine of the Church of Rome. For, although the council of Trent recognized fully the dis- tinction which has been mentioned above between the Eucharist and the sacrifice of the mass, and treated of them in separate sessions (the former in Session xiii., the latter in Session xxii.), it continued the medieval theory of the nature of the latter. The reaction against the medizval theory at the time of the Reformation took the form of a return to what had no doubt been an early belief, —the idea that the Christian sacrifice consists in the offer- ing of a pure heart and of vocal thanksgiving. Luther at one period (in his treatise De Captivitate Babylonica) main- tained, though not on historical grounds, that the offering of the oblations of the people was the real origin of the con- ception of the sacrifice of the mass; but he directed all the force

of his vehement polemic against the idea that any other sacrifice could be efficacious besides the sacrifice of Christ. In the majority of Protestant communities the idea of a sacrifice has almost lapsed. That which among Catholics is most commonly regarded in its aspect as an offering and spoken of as the “mass” is usually regarded in 1ts aspect as a participation in the symbols of Christ’s death and spoken of as the “communion.” But it may be inferred from the considerable progress of the Anglo- Catholic revival in most English-speaking countries that the idea of sacrifice has not yet ceased to be an important element in the general conception of religion. (E. HA.)

SACRILEGE. The robbery of churches was in Roman law punishable with death. There are early instances of persons having suffered death for this offence in Scotland. In England at common law benefit of clergy was denied to robbers of churches. The tendency of the later law has been to put the offence of sacrilege in the same position as if the offence had not been committed in a sacred build-

It is found, ¢.g., in the second of Mone’s masses from the Reichenau palimpsest, and in Mabillon’s Missale Gothicum, No. 12; it is ex- pressly mentioned by Isidore of Seville as the sixth element in the Eucharistic service, De Offic. Eceles., i. 15,

ing. Thus breaking into a place of worship at night, says Lord Coke, is burglary, for the church is the mansion. house of Almighty God. The Larceny Act of 1861 punishes the breaking into or out of a place of divine worship in the same way as burglary, and the theft of things sacred in the same way as larceny. The breaking or defacing of an altar, crucifix, or cross in any church, chapel, or church- yard is an offence punishable with three months’ imprison- ment on conviction before two justices, the imprisonment to be continued unless the offender enter into surety for good behaviour at quarter sessions (1 Mary, sess. 2, c. 3).

SACRO BOSCO, JoHANNES DE, or JoHN Hotywoop, astronomical author, died 1244 (or 1256) as professor of mathematics at the university of Paris. Nothing else is known about his life. He wrote a treatise on spherical

astronomy, Z’ractatus de Sphera Mundi, first printed at Ferrara in 1472, and reprinted, generally with copious notes and commentaries, about sixty times until the end of the 17th century. About the year 1232 he wrote De anni ratione seu ut vocatur vulgo computus ecclesiasticus, in which he points out the increasing error of the Julian calendar, and suggests a remedy which is nearly the same as that actually used under Gregory XIII. three hundred and fifty years later.

SACY, Anvorne Isaac, Baron Sunvesrru? DE (1758- – 1838), the greatest of French Orientalists and the founder of the modern school of Arabic scholarship, was the second son of a Parisian notary, and was born at Paris on 21st September 1758. From the age of seven years, when he lost his father, he was educated in more than monastic seclusion in the house of his pious and tender mother, Designed for the civil service, he studied jurisprudence, and in 1781 got a place as counsellor in the cour des monnares, in which he continued till, in 1791, he was advanced to be a commissary-general in the same depart- ment. De Sacy had a natural turn for business and liked variety of work, while he seems to have had little or no need of absolute repose. He had successively acquired all the Semitic languages while he was following the usual course of school and professional training, and while he was engaged in the civil service he found time to make himself a great name as an Orientalist by a series of pub- lications which, beginning with those Biblical subjects to which his education and sympathies naturally directed his first Semitic studies, gradually extended in range, and already displayed the comprehensive scholar who had chosen the whole Semitic and Iranian East for his domain.? The works of these early years do not show the full maturity of his powers; his chief triumph was an effect- ive commencement of the decipherment of the Pahlavi inscriptions of the Sasanian kings (1787-91). It was the French Revolution which gained De Sacy wholly for letters. As a good Catholic and a staunch royalist he felt con- strained in 1792 to retire from the public service, and lived in close seclusion in a cottage near Paris till in 1795 he was called to be professor of Arabic in the newly founded school of living Eastern languages. The years of retire- ment had not been fruitless; they were in part devoted to the study of the religion of the Druses, which continued to occupy him throughout life and was the subject

of his last and unfinished work, the Exposé de la Religion des Druzes (2 vols., 1838). Nevertheless, when called to be a

His father’s name was Silvestre, the addition De Sacy he took asa younger son after a fashion then conimon with the Parisian bourgeoisie.

- A communication to Eichhorn on the Paris MS. of the Syro- Hexaplar version of IV. Kings formed the basis of a paper in the latter’s Repertorium, vol. vii. (1780). This was De Sacy’s literary début. It was followed by text and translation of the letters of the Samaritans to Jos. Sealiger (bid., vol. xiii., 1783) and by a series of essays on Arabian and Persian history in the Recueil of the Academy of Inscriptions and in the Notices et Extraits.

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teacher, he felt that he had himself much to learn. Since the death of Reiske Arabic learning had been in a back- ward state, the standard of philological knowledge was low, and the books for students extremely defective. De Sacy set himself with characteristic thoroughness to com- plete his own knowledge and supply the lacking helps to others, and he accomplished this task on such a scale, with such width of range, precision of thought, and scrupulous attention to details, that he became the founder of a wholly new school and the father of all subsequent Arabists. His great text-books, the Grammaire Arabe (2 vols., 1st ed. 1810, 2d ed. 1831) and the Chrestomathie (3 vols., Ist ed. 1806, 2d ed. 1826-31), together with its supplement, the Anthologie Grammaticale (1829), are works that can never become obsolete; the luminous exposition of the grammar and the happy choice of the pieces in the chres- tomathy—all inedita—with the admirable notes, drawn from an enormous reading in MS. sources, make them altogether different from ordinary text-books. The whole powers of a great teacher, the whole wealth of knowledge of an unrivalled scholar, are spent with absolute single- ness of purpose for the benefit of the learner, and the result is that the books are equally delightful and instruc- tive to the student and to the advanced scholar. A com- parison of the first and second editions shows how much toil and research it cost the author to raise his own

scholar- ship to the level which, thanks to his work, has become the starting-place for all subsequent ascents of the Arabian Parnassus.

De Sacy’s place as a teacher was threatened at the outset by his conscientious refusal to take an oath of hatred to royalty. He tendered his resignation both as professor and as member of the Institute; but he was allowed to continue to teach, and rejoined the Institute on its re-organization in 1803. In 1805 he made the only con- siderable journey of his life, being sent to Genoa on a vain search for Arabic documents supposed to lie in the archives of that city. In 1806 he added the duties of Persian pro- fessor to his old chair, and from this time onwards—as, in spite of his royalist opinions, he was ready to do public service under any stable government—his life, divided between his teaching, his literary work, and a variety of public duties, was one of increasing honour and success, broken only by a brief period of retreat during the Hundred Days. He found time for everything: while his pen was ever at work on subjects of abstruse research, he was one of the most active leaders in all the business which the French system throws on the savans of the capital, especi- ally as perpetual secretary of the Academy of Inscriptions (from 1832); in 1808 he entered the corps législatif ; and mm 1832, when quite an old man, he became a peer of France and was regular in the duties of the chamber.! In 1815 he became rector of the university of Paris, and after the second restoration he was active on the commission of public instruction. Of the Société Asiatique he was one of the founders, and when he was inspector of Oriental types at the royal printing press he thought it his duty to read a proof of every book printed in Arabic and Persian. With this he maintained a vast correspondence and was accessible not only to every one who sought his advice on matters of learning and business but to all the poor of ai Nh Ee came to him as a member of the bureau do os y. 4 he was neither monk nor hermit: he ee eee f and was happy in forty-eight years of =. Pec and in the care of a large family. Though ase: : appearance of delicate frame, De Sacy enjoyed en ealth and worked on without sign of failing melee 1 La days before his death (21st February 1838), ee su idenly fell down in the street and never rallied.

The title of baron he received from Napoleon in 1813.

De Sacy wrote so much that a list even of his larger essays, mostly communicated to the Academy or in the Notices et Hxtraits, is im- possible in this place, while his lesser papers and reviews in the Allg. Bib. f. biblische Litteratur, the Mines de 0 Orient, the Magasin Eneyelopédique, the Journal des Savants (of which he was an editor), and the Journal Asiatique are almost innumerable. Among the works which he designed mainly for students may be classed his edition of Hariri (1822, 2d edition by Reinaud, 1847, 1855), with a selected Arabic commentary, and of the Alftya (1833), and his Calila et Dimna (1816),—the Arabic version of that famous collec- tion of Buddhist animal tales which has bcen in various forms one of the most popular books of the world. De Sacy's enquiry into the wonderful history of these tales forms one of his best services to letters and a good example of the way in which he always made his work for the benefit of learners go hand in hand with profound research. Of his continued interest in Biblical subjects he gave evidence in his memoir on the Samaritan Arabic version of the Pentateuch (Mém. Acad. des Inser., vol. xlix.), and in the Arabic and Syriac New Testaments edited for the British and Foreign Bible Society ; among works important for Eastern history, besides that on the Druses already named, may be cited his version of Abd-Allatif, Relation Arabe sur 0 Egypte, and his essays on the History of the Law of Property in Egypt since the Arab conquest (1805-18). And, in conclusion, it must not be forgotten that his oral teaching was not less influential than his writings, and that, except Ewald, almost all Arabists of chief note in the first half of this century, in Germany as well as in France, were his personal pupils. Of the brilliant series of teachers who went out from his lecture-room one or two veterans still survive, and Professor Fleischer's elaborate notes and corrections to the Grammaire Arabe (Kleinere Schriften, vol. i., 1885) may be regarded as the latest tribute to the memory of the great master by a disciple who is now the patriarch of living Arabists. (W. R. 8.)

SACY, Isaac Louis Lz Mairre pE (1613-1684), a figure of some prominence in the literary annals of Port Roya (g.v.), and after the death of St Cyran (1643) and Singlin (1664) the leading confessor and "director" of the Jan- senists in France, was born in Paris on 29th March 1613. He was

closely connected with the Arnauld family, his true surname being Le Maitre and that of Saci or Sacy which he afterwards assumed a mere anagram of Isaac, his Christian name. He studied philosophy and belles lettres at the Collége de Calvi-Sorbonne, and afterwards, under the influence of St Cyran (see DUVERGIER DE HavURANNE), his spiritual director, joined his eldest brother Antoine Le Maitre at Port Royal des Champs. Here he threw himself heartily into the life of the place, devoting himself specially to teaching and the preparation of school-books, his chief productions in this class being expurgated edi- tions of Martial and Terence and a translation of Phzedrus. In 1650 he was ordained to the priesthood, and in 1654 he entered the field of theological controversy with a brochure entitled Hnluminures de ’ Almanach des Jésuites intitulé la Déroute et la Confusion des Jansénistes, of which it is enough to say that, if the Jesuit attack was in exe- crable taste, neither was the reply in keeping with the finer ethical tone of Port Royal. From 1661, after the breaking up of the Petites Ecoles, he lived more or less in concealment in Paris until May 1666, when he was thrown into the Bastille, where he remained till November 1668. During his imprisonment he occupied himself with the completion of a new version of the New Testament, known as the Vouveau Testament de Mons (1667), and the re- mainder of his life was largely devoted to a similar trans- lation of the Old Testament, based chiefly on the Vulgate, with Zclaircissements. These began to appear in 1672 and were continued down to the end of the minor prophets. As De Sacy knew nothing of Hebrew, this version is of no value as a contribution to scholarship, and in style it is more artificial and laboured than those which had pre- ceded it. From 1668 till his death on 4th January 1684 he lived partly in Paris, partly at Port Royal des Champs, and partly at Pomponne, the seat of his cousin, the marquis de Pomponne. He was buried at Port Royal des Champs.

In addition to the works already mentioned, he published, under

the pseudonym of the “Sieur de Beuil,” a French translation of the De Imitatione Christi (1662). He also translated Chrysostom’s Homilies on Matthew. See Sainte-Beuve, Port Royal, bk. ii. chaps. 17, 18 (ed. 1878).

SADDLERY embraces the industries connected with the harnessing and controlling of all beasts of draught and burden. The materials used in harnessing the various creatures so employed and the modifications of harness necessary to suit their structure, temperament, and duties are, of course, exceedingly varied. In a restricted sense saddlery is principally a leather trade, and has to do with the harnessing of the horse. The craft has been recognized and established in England as a separate trade since the 13th century, when the London Saddlers' Company received its charter of incorporation from Edward I. There is evi- dence also of its early prosperity at Birmingham, where it grew to an importance which it still retains, the princi- pal seat of the saddlery trade being now at Walsall near Birmingham, which is practically a saddlers' town. The trade divides itself into two branches, brown saddlery and black saddlery. The former is concerned with saddle- making and the cutting and sewing of bridles, reins, and all other uncoloured leather-work. The saddle is the most important article on the brown saddler's list. It consists of the tree or skeleton, on which the leather is stretched, the seat, the skirts, and the flaps. The tree is commonly made of beech strengthened with iron plates. The whole leather-work ought to be of pig-skin, but often

the seat alone is of that material, the other parts being

imitation, cleverly grained by means of electro-deposit copper casts from the surface of real pig-skin. There are many varieties of saddles, such as racing, military, hunting, and ladies' saddles, &c. A racing saddle may weigh not more than two or three pounds, while a cavalry saddle will be four times heavier. The saddle-maker has to con- sider the ease and comfort of both horse and rider. The saddle must fit closely and evenly to the curvature of the horse's back without tendency to shift, and it ought to offer as far as possible a soft and elastic seat for the rider. The black saddler is concerned with the harness of carriage, cart, and draught horses generally. The skill of the tradesman in this department is displayed in designing and arranging harness most favourable for the proper dis- tribution of the load, and for bringing into use the muscles of the animal without chafing or fraying the skin. Much of the usefulness and comfort of a horse depends on the accu- rate and proper fit of itsharness. The collar and traces and the saddle are the important features of draught harness, the former being the

pieces through which the draught is effected, while dead weight is borne through the saddle. The portions of saddlery by which the horseman controls and guides the horse are the bridle and bit and the reins. Into the many devices connected with these and other parts of harness for curbing horses, for breaking them of evil habits, and for adding to the security of the equestrian and carriage traveller, we cannot here enter (compare HorsEeMansuip, vol. xii, p. 198). Saddler's ironmongery forms an important feature of the trade. It embraces the making of buckles, chains, cart-gearing, stirrups, spurs, bits, hanes, &c. The ornamental metal-work of carriage- i?! is either electro-plated in silver or of solid polished rass.

SADDUCEES (o'pyy, ae. Zadokites), the party of the priestly aristocracy under the later Hasmoneans. The Sadducees were essentially a political party opposed to the Pharisees or party of the Scribes, and their position and history have therefore already been discussed in IsRAEL, vol. xili. p. 424 sg. The common view that Sadducieism was essentially a philosophico-religious school is due partly to Josephus but mainly to later Jewish tradition, which

never could realize the difference between a nation and a sect, and fancied that the whole history of Israel was made up of such scholastic controversies as engrossed the attention of later times. The theological tenets of the Sadducees as they appear in the New Testament and in Josephus had a purely political basis. They detested the doctrine of the resurrection and the fatalism of the Phari- sees because these opinions were used by their adversaries to thwart their political aims. The aristocracy suffered a great loss of position through the subjection of Judea to a foreign power; but it was useless to urge political schemes of emancipation on those who believed with the Pharisees that Israel's task was to endure in patience till Jehovah redeemed the nation, and the resurrection rewarded those who had lived and died in bondage. In matters of ritual the Sadducees were naturally conservative, and their opposition to the unwritten traditions, from which they appealed to Scripture, is simply one phase of their opposi- tion to Pharisaic innovations ; for the traditions were the invention of the Pharisees and the written law represented old practice. When the Sadducees

had lost all political importance their opposition to Pharisaism necessarily be- came more and more an affair of the schools rather than of practical life, but the Sadducees of the schools are only the last survival of what had once been a great political party. SA DE MIRANDA, Franctsco px (1495-1558), Portu- guese poet, was born of noble family on 27th October 1495, at Coimbra, where also he received his education. He after- wards travelled in Spain and Italy, and held for some time a post at the court of John III. of Portugal. He died on his own property at Tapada near Ponte do Lima on 15th March 1558. Besides eight eclogues (six in Spanish and two in Portuguese), he wrote two comedies in Portuguese, —Os Estrangeiros and Os Vilhalpandos. See PorTuGaL (Literature), vol. xix. p. 556, and Spary (Literature). SA‘DI, generally called Mustig-uppin, but more cor- rectly MusHARRIF-UDDIN B. MusLin-uppin, the greatest didactic poet and the most popular writer of Persia, was born about 1184 (580 a.H.) in Shiraz, where his father, ‘Abdallah, a man of practical religion and good common sense, who impressed upon his son from early childhood the great maxims of doing good and fearing nobody, was in the service of the Turkoman race of the Salgharides or Atabegs of Fars. The fifth ruler of this dynasty, Sad b. Zengi, who ascended the throne in 1195 (591 a.n.), con- ceived a great affection for young Musharrif-uddin and enabled him, after the premature death of his father, to pursue lis studies in the famous medreseh of Baghdad, the Nizamiyyah, where he remained about thirty years (1196-1224). Strict college discipline and severe theo- logical studies repressed for a long time the inborn cheer- fulness and joviality of his nature; but his poetical genius, which rapidly developed, kept alive in him, amid all the privations of an austere life, the elasticity of youth, and some of his “‘early odes,” in which he praises the pleasures of life and the sweetness of love, were no doubt composed during his stay in Baghdéd. At any rate his literary fame had already spread about 1210 (606 a.H.) as far as Kash- gar in Turkistén, which the young poet (who in honour of his patron had assumed the name of Sa‘df) visited in his twenty-sixth or twenty-seventh year. After mastering all the dogmatic disciplines of the Islamitic faith he turned his attention first to practical philosophy, and later on to the more ideal tenets of Suific pantheism, under the spirit- ual guidance of the famous sheikh Shihdb-uddin “Umar Suhrawardi (died 1234; 632 a.u.). Between 1220 and 1225 he paid a visit to a friend in Ispahén, went from there to Damascus,

and returned to Ispahan just at the time of the inroads of the Mongols, when the Atabeg Sad had been deposed by the victorious ruler of Kirman,

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GhiyAth-uddin (1223). Sadly grieved by the misfortune of his generous patron and disgusted with the miserable state to which Persia had been reduced, Sa‘di started in 1224 or 1225 on his way to India, thus entering on the second period of his life—that of his wanderings (1225- a5). He proceeded wa Balkh, Ghazni, and the Punjab to Gujrat, on the western coast of which he visited the famous shrine of Siwa in Pattan-Sumanat, and met with a remarkable adventure. Having seen the statue of the god lifting up its hands to heaven every morning at sun- rise, he discovered that a priest, hidden behind the image, wrought the miracle by means of a cord; but, being caught in the very act of watching the performance, he had no alternative but to hurl his pursuer into a deep well and to escape at full speed,—not, however, until he had smashed the detested statue. Aftera prolonged stay in Delhi, where he acquired the knowledge of Hindustanf which he afterwards turned to account in several of his poems—just as a number of excellent Arabic kasidas bear witness to his fluency in that idiom which he had learnt in Baghd4d—he sailed for Yemen. In San‘d, the capital of Yemen, the loss of a beloved child (when he had married is not known) threw him into deep melancholy, from which only a new adventurous expedition into Abys- sinia on the opposite African shore and a pilgrimage to Mecca and Medina could again rouse him. Thence he directed his steps towards Syria and lived as a renowned sheikh for a considerable time in Damascus, which he had once already visited. There and in Baalbec he added to his literary renown that of a first-rate pulpit orator. Specimens of his spiritual addresses are preserved in the five homilies (on the fugitiveness of human life, on faith and fear of God, on love towards God, on rest in God, and on the search for God) which usually form the second risdlah or prose treatise in Sa‘di’s complete works. At last weary of Damascus he withdrew into the desert near Jerusalem and led a solitary wandering life, till one day he was taken captive by a troop of Frankish soldiers, brought to Tripoli, and condemned to forced labour in the trenches of the fortress.

After enduring countless hard- ships, he was eventually rescued by a rich friend in Aleppo, who paid his ransom, and moreover gave him his daughter in marriage. But Sa‘di, unable to live with his quarrel- some wife, set out on new travels, first to North Africa and then through the length and breadth of Asia Minor and the adjoining countries. Not until he had passed his seventieth year did he return to Shiraz (about 1255; 653 A.H.). Finding the place of his birth tranquil and pros- perous under the wise rule of Abubakr b. Sa‘d, the son of his old patron (1226-1260; 623-658 a.H.), the aged poet took up his permanent abode, interrupted only by repeated pilgrimages to Mecca, in a little hermitage out- side the town, in the midst of a charming garden, and devoted the remainder of his life to Sufic contemplation and poetical composition. Sa‘di died at Shiraz in 1292 (691 a.u.) according to Hamdall4h Mustaufi (who wrote only forty years later), or in December 1291 (690 ..), at the age of 110 lunar years.

The experience of the world gained during his travels, his intimate acquaintance with the various countries he had visited, his insight into human character, its grandeur and its littleness, which a thirty years intercourse with men of all ranks and of many nationalities had fully matured, together with an inborn loftiness of thought and the purest moral standard, made it easy for Sadi to compose in the short Space of three years his two masterpieces, which have immortalized his name, the Bustdn or ‘‘ Fruit-garden ” (1257) and the Gulistdn or “ Rose-garden ” (1258), both dedicated to the reign- ing Atabeg Abubakr. The former, also called Sa’dindma, is a kind of didactic epopee in ten chapters and double-rhymed verses, which

passes in review the highest philosophical and religious questions, |

not seldom in the very spirit of Christianity, and abounds with pect ethical maxims and matchless gems of transcendental specu- ation. The latter is a prose work of a similar tendency in eight

chapters, interspersed with numerous verses and illustrated, like the Bustdn, by a rich store of clever tales and charming anecdotes ; it discusses more or less the same topics as the larger work, but has acquired a much greater

popularity in both the East and the West, owing to its easier and more varied style, its attractive lessons of practical wisdom, and its numerous bon-mots. But Sadi's Diwédn, or collection of lyrical poetry, far surpasses the Bustin and Gulistan, at any rate in quantity, whether in quality also is a matter of taste. Other minor works are the Arabic kasidas, the first of which laments the destruction of the Arabian caliphate by the Mongols in 1258 (656 a.u.); the Persian kasidas, partly panegyrical, partly didactical ; the marathi, or elegies, beginning with one on the death of Abubakr and ending with one on the defeat and demise of the last caliph, Musta'sim ; the mulammadt, or poems with alternate Persian and Arabic verses, of a rather artificial character; the tarjédt, or refrain-poems; the ghazals, or odes; the sdhibiyyah and mukatta'dt, or moral aphorisms and epigrams ; the rubdiyydé, or quatrains ; and the mufraddt, or distichs. Sadi's lyrical poems possess neither the easy grace and melodious charm of Hafiz's songs nor the overpowering grandeur of Jelal-uddin Rumi's divine hymns, but they are nevertheless full of deep pathos and show such a fearless love of truth as is seldom met with in Eastern poetry. Even his panegyrics, although addressed in turn to almost all the rulers who in those days of continually changing dynasties presided over the fate of Persia, are free from that cringing servility so com- mon in the effusions of Oriental encontiasts.

The first who collected and arranged his works was 'Ali b. Ahmad b. Bisutun (1326-1334 ; 726-734 a.H.). The most exact information about Sa'di's life and works is found in the introduction to Dr W. Bacher's Sa'di's Aphoris- men und Sinngedichte, Strasburg, 1879 (a complete metrical translation of the epigrammatic poems), and in the same author's ''Sa'di Studien," in 7.D.M.G., XXX. pp. 81-106. Sa'di's Kulliyyat or complete works have been edited by Harington, Calcutta, 1791-95 (with an English translation of some of the prose treatises and of Daulat Shah's notice on the poet, of which a German version is found in Graf's Rosengarten, Leipsic, 1846, p. 229 sqg.); for the numerous litho- graphed editions, see Rieu's Pers. Cat. of the Brit. Mus., ii. p. 596. The Busta has been printed in Calcutta (1810 and 1828), as well as in Lahore, Cawnpore, Tabriz, &c. ; a critical edition with Persian commentary was published by K. H. Graf at Vienna in 1850 (German metrical translations by the same, Jena, 1850, and by Schlechta-Wssehrd, Vienna, 1852; English translation by W. Clarke, London, 1879; French translation by Barbier de Meynard, Paris, 1880). The

best editions of the Gulistén are by A. Sprenger (Calcutta, 1851) and by Platts (London, 1874); the best translations into English by Eastwick (1852) and by Platts (1873); into French by Defremery (1858); into German by Graf (1846) ; see also 8. Robinson's Persian Poetry for English Readers, 1883, pp. 245- 366. Select kasidas, ghazals, elegies, quatrains, and distichs have been edited, with a German metrical translation, by Graf, in the Z.D.M.G., ix. p. 92 sq., xii. p. 82 sq., xiii. p. 445 sq., xv. p. 541 sg., and xviii. p. 570 sq. On the Sufic character of Sa'di in contrast to Hafiz and Jeldl-uddin Rumi, comp. Ethé, '' Der Stfismus und seine drei Hauptvertreter," in Morgenlandische Studien, Leipsic, 1870, pp. 95-124. (H. E.)

SADLER, Sir Ratpu (1507-1587), English statesman, was the son of Henry Sadler, steward to the proprietor of the manor of Gillney, near Great Hadham, Hertford- shire, and was born at Hackney in Middlesex in 1507. While a mere child he obtained a situation in the family of Thomas Cromwell, earl of Essex. Through him he was introduced to Henry VIII., who conferred on him various appointments and employed him in connexion with the dissolution of the monasteries, in the rich spoils of which he was a large sharer. So much was the king impressed by Sadler's ability and address that he made choice of him for his subsequent important negotiations with Scotland. In 1537 he was sent thither to strengthen the English interest ; in 1539-40 he was commissioned to persuade the Scottish king James V. to cast off the supremacy of the pope; in 1541 he went back to enforce the same counsel; and in 1542 he was appointed to settle the proposed match be- tween Edward prince of Wales and Mary the infant queen of Scots. Although not successful in any of these missions, he continued to retain the full confidence of the king, who, in recognition of his zealous services, conferred on him in 1543 the honour of knighthood. On Henry's death in 1547 Sadler's name was found in the royal will as one of the councillors to the sixteen nobles who were entrusted with the guardianship of the young king. In the same year he was appointed treasurer to the army sent against Scotland, and for his great services in rallying the repulsed cavalry he was created a knight-banneret on the battlefield of Pinkie. During the reign of Mary he lived in retirement on his estate near Hackney ; but on the accession of Eliza- beth in 1558 he came once more

into a sphere of active employment. He immediately became a member of parlia- ment for the county of Hertford and a privy councillor.

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Not long afterwards his strong Protestant sympathies and his acquaintance with Scottish affairs recommended him as a fit person to be employed by Elizabeth in her intrigues with the Scottish lords of the congregation against Queen Mary. In 1584 he was appointed keeper of Mary queen of Scots in the castle of Tutbury ; but on account of “age and infirmity ” he was permitted to resign his charge some time before the death of the queen. His last service was to repair to Scotland to pacify the king’s indignation on account of Mary’s death. He died after his return home at Standon in Hertfordshire, 30th March 1587.

The Letters and Negotiations of Sir Ralph Sadler were published at Edinburgh in 1720, and a more complete collection under the title State Papers and Letters of Sir Ralph Sadler, with a life by Sir Walter Scott, in 1809. The Memoir of the Life and Times of Sir Ralph Sadleir, by his Descendant Major F. Sadleir Stoncy, appeared in 1877.

SADOLETO, Jacopo (1477-1547), Italian humanist and churchman, was born at Modena in 1477, and, being the son of a noted jurist, was designed for the same profession. He gave himself, therefore, to humanistic studies and acquired reputation as a Latin poet, his best-known piece being one on the group of Laocoon. Passing to Rome, he obtained the patronage of Cardinal Carafa and adopted the ecclesiastical career. Leo X. chose him as his secretary along with Peter Bembo, and in 1517 made him bishop of Carpentras. Sadoleto had a remarkable talent for affairs and approved himself a faithful servant of the papacy in many difficult negotiations under successive popes, especi- ally as a peacemaker ; but he was no bigoted advocate of papal authority, and the great aim of his life was to win back the Protestants by peaceful persuasion—he would never countenance persecution—and by putting Catholic doctrine in a conciliatory form. Indeed his chief work, a Commentary on Romans, though meant as a prophylactic against the new doctrines, gave great offence at Rome and Paris. Sadoleto was a diligent and devoted bishop and always left his diocese with reluctance even after he was made cardinal (1536). His piety

and tolerant spirit, combined with his reputation for scholarship and eloquence and his diplomatic abilities, give him a somewhat unique place among the churchmen of his time. He died in 1547. His collected works appeared at Mainz in 1607, and in- clude, besides his theologico-irenical pieces, a collection of Epistles, a treatise on education (first published in 1533), and the Phedrus, a defence of philosophy, written in 1538.

SMMUND. See Eppa, vol. vii. p. 650, and Icrnanp, vol. xii. p. 624.

SAFES. A safe is any repository in which valuable property is guarded against risk of loss by fire or from the attacks of thieves. The protection of valuable documents and possessions was only imperfectly effected in the charter- rooms of old mansions and in the iron-bound oaken chests and iron coffers of the Middle Ages ; but these in their day represented the strong rooms and safes of modern times. The vast increase in realized wealth and the complication of financial and banking operations necessitate in our days the greatest attention to the safeguarding of securities and property. The ingenuity of inventors has, within practicable limits, effected much in safe-making ; but the cunning of thieves has increased in proportion to the obstacles to be overcome and to the value of the booty at which they aim. No safe can be held to be invulnerable ; for, whatever human ingenuity can put together and close, the same ingenuity can tear down and open. An impreg- nable safe would indeed be a source of greater danger than of security to its owner, for, were the key or other means of access lost or rendered unworkable, the contents of the safe would of necessity be irrecoverable. The efficiency of a safe, therefore, does not depend on absolute impregna- bility, but on the nature of the obstacles it presents to

successful attack, and to the generally unfavourable con- ditions under which such attacks are made. It is common to make safes both thief- and fire-resisting, and the condi tions necessary for the one object to a certain extent con- duce to the attainment of both; but for many purposes security from the one danger alone is requisite.

The devices for baffling thieves are numerous. The safe must in the first place be made heavy and unwieldy, or otherwise it must be so fixed that it

can only be carried away with the utmost difficulty. Next, the greatest obstacles to obtaining illegitimate access must be presented, To prevent fracturing a tough metal must be used in the construction, and to resist penetration by drilling metal of great hardness must be interposed. These conditions are commonly met by making the outer casing of the safe of boiler plate, backed by a lining of hard steel, over which is an inner lining of thin boiler plate, the three layers being securely bolted together by screws from within. By some makers a layer of hard metal is poured, in a fluid state, between the outer and inner casing; others case- harden one surface ; and there are numerous additional de- vices for securing the combination of hardness and tough- ness. To prevent wrenching of joints, the two sides with top and bottom of the outer shell are sometimes made out of a single plate welded at the joint, and the back and front are then attached to that shell by angle irons screwed from within. The frame upon which the door hangs and into which the bolts shoot is made of great strength, with special precautions to prevent the wrenching off of the door by means of crowbars or wedges. In an ordinary safe the massive bolts, three or more in number, shoot only at the front, and fixed dogs or sham bolts fit into slots at the back or hinged side. This arrangement is sufficient to keep the door closed independent of hinges, which are merely the pivot on which the door turns. In all Chubb’s safes bolts shoot both to front and back; and in the higher quality of that and of every other good maker bolts shoot on every side,—front, back, top, and bottom. Ordinarily the bolts shoot straight into the slot as in an ordinary lock ; but, to defy wrenching, additional grip is secured by Chatwood, who makes a bolt with a clutch or projection, which falls into a recess in the slot and thus holds against any direct wrench. In Chubb’s finer safes the bolts shoot diagonally all round, so that in each face of the door they go in two different directions. Safe bolts are shot not by the key, as in an ordinary lock, but by the door handle, and the key simply secures them in their position. By this arrangement, patented by Mr Charles Chubb in 1835, a series of the most ponderous bolts can be secured in locked position by a small key which can be carried in the vest pocket. The lock of a safe must be a careful piece of mechanism, not subject to derangement, unpickable, and gunpowder-proof. The portion of the door on which it is fastened is generally provided with extra precautions against drillmg. A safe being well made and securely locked remains vulnerable through the medium of the key, which may be surreptitiously obtained

either for direct use or to form a mould by which false keys can be cut. On this account, keyless locks and time locks are coming into great favour in America. In keyless permutation locks, such as those of Hall, Sargent, Yale, and Dalton, the bolts can be withdrawn only after an indicator has been successively set against a combination of numbers arranged before the closing of the door; and in the time lock of these inventors the safe can only be opened at any hour to which the time controller is set before closing. Electrical arrangements have also been attached to safes by which signals are conveyed to any spot when a safe so guarded is unlawfully interfered with.

It is much easier to render a safe fire-proof than to

It requires nothing more than | second solution is neutralized with acid, carthamine in a

guard it against burglary. 3, calculation of the intensity and duration of any fire to which it is likely to be exposed, and the provision of a sufficient lining of fire-resisting material. What is princi- pally used is a mixture of some absorbent medium—such as sawdust, powdered gypsum or cement, or infusorial earth—with ground alum. Asbestos, silicate cotton, mica, and other non-conductors are also used; and by some makers sealed tubcs of alkaline salts are distributed through the absorbent material. These burst when exposed to high heat and their contents saturate the surrounding substance. A carefully packed shell of not less than 3} inches of the fire-resisting medium should line the interior of every fire-proof safe; but in many chcap safes a quantity of brick dust is the only fire-resisting medium.

Where an ordinary safe provides insufficient accommoda- tion the strong room takes its place. Such an apartment, being generally in the basement of a building, presents no special difficulties to make it proof against fire and thieves. Thickness of walls, built by preference of hard brick laid in cement, and liberal use of cement within the walls, as well as at the floor and over the arched roof, give strength against both fire and burglars. The interior of a strong room is gencrally lined with boiler-plate, and, in addition to the massive steel and iron door, it has an inner wrought-iron grill-door, which

secures the vault during business hours and permits the ventilation of the apartment. Within such a strong room extra strong chambers or separate safes may be placed, and in this way precautions may be indefinitely multiplied.

The most complete examples of safe and strong-room arrange- ments are afforded by the public safes or safe-deposits crected in most of the great cities of America and in Loudon. The premises of the National Safe Deposit Company in London consist of a large isolated building in Queen Victoria Street. The building, which is fire-proof, covers and surrounds the great safe vault or citadel, which is sunk in the ground to a depth of 45 feet. The vault itself, founded on a bed of concrete 20 feet in thickness, has walls, 3 feet thick, of hard blue brick laid in cement, with an external lining of fire-brick, and is lined internally with cast-iron plates 44 inches thiek chilled on one side, the plates having embedded in them a network of strong interlaced wrought-iron bars. The vault is divided into four tiers or stories with eight separate conipart- ments in each, which, aftcr business hours, are closed with doors raised and lowered by hydraulic power. These doors, which each weigh four tons, are built up, 12 inches thick, of combinations of hard and tough metal to resist fracture and drilling, and when they are raised for business purposes the entrance to each compartment is protected by a massive wrought-iron grill. Within the thirty- two compartments there is space for about 20,000 safes of various sizes, whieh are let to owners of valuables, each renter having the sole control of the safe hired by him. Additional security is obtained by the patrol of armed watclimen, and generally it may be said that in the institution precautions have been carried almost to the pitch of perfection, if indeed they have not been pushed to needless excess. (J. PA.)

SAFETY LAMP. See Coat, vol. vi. p. 72 sg.

SAFFARIDS, a Persian dynasty of the 9th century. See MoHAMMEDANISM, vol. xvi. p. 586.

_SAFFT (Asafi), a seaport of Morocco, with 6000 inha- bitants, some commerce, and a famous shrine, the House of the Seven Sleepers, frequented by Moslem and Jewish pilgrims. See vol. xvi. p. 831.

SAFFLOWER, or Basrarp Sarrron (Carthamus tinc- tortus), belongs to the natural order Composite ; its flowers form the basis of the safflower dye of commerce. The plant 1s a native of the East Indies, but is cultivated in Egypt and to some extent in southern Europe. To obtain the dyeing principle—carthamine—the flowers are first washed to free them from a soluble yellow colouring matter they contain; they are then dried and powdered, and digested im an alkaline solution in which pieces of clean white cotton are immersed. The alkaline solution having been neutralized with weak acetic acid, the cotton is removed and washed in another alkaline solution. When this

pure condition is precipitated. Dried carthamine has a rich metallic green colour ; it forms a brilliant but fugitive scarlet dye for silk, but is principally used for preparing toilet rouge. In 1884 there were imported into the United Kingdom 1794 tons of safflower, valued at £7109, almost the whole of which came from the East Indies.

SAFFRON (Arab. za‘faran) is manufactured from the dried stigmas and part of the style of the saffron crocus, a cultivated form of Crocus sativus, L., the precise origin of which is unknown ; for, though some of the wild forms (var. Thomasn, Cartwrightianus) are also employed for the manufacture of saffron, they differ in character from the cultivated type and are somewhat restricted in geographical range, while the cultivated form extends with little or no change through nearly ninety degrees of longitude (Spain to Kashmir) and twenty-five degrecs of latitude (England to Persia). It is invariably sterile, unless artificially fertilized with the pollen of some of the wild varieties. The purple flower, which blooms late in autumn, is very similar to that of the common spring crocus, and the stigmas, which are protruded from the perianth, are of a characteristic orange-red colour. The Egyptians, though acquainted with the bastard safflower (see preceding article), do not seem to have possessed saffron ; but it is named in Canticles iv. 14 among other sweet-smelling herbs. It is also repeatedly mentioned (xpoxos) by Homer, Hippocrates, and other Greek writers; and the word “crocodile” was long supposed to have been derived from xpdxos and detAds, whenee we have such stories as that ‘the croco- dile’s tears are

never true save when he is forced where saffron groweth” (Fuller’s Worthies). It has long been cultivated in Persia and Kashmir, and is supposed to have been introduced into China by the Mongol invasion. It is mentioned in the Chinese materia medica (Pun tsaou, 1552-78). The chief seat of cultivation in early times, however, was the town of Corycus (modern Korghoz) in Cilicia, and from this central point of distribution it may not improbably have spread east and west. According to Hehn, the town derived its name from the crocus; Rey- mond, on the other hand, with more probability, holds that the name of the drug arose from that of the town. It was cultivated by the Arabs in Spain about 961, and is mentioned in an English leech-book of the 10th century, but seems to have disappeared from western Europe till reintroduced by the crusaders. According to Hakluyt, it was brought into England from Tripoli by a pilgrim, who hid a stolen corm in the hollow of his staff. It was especi- ally cultivated near Hinton in Cambridgeshire and in Essex at Saffron Walden (7.e., Saffron Woods, not Saffron Walled-in, as the canting crest of the town would imply), its cultivators being called “crokers.” This industry, though very important in the 15th century, when English saffron commanded the highest prices on the Continent, appears to have died out about 1768.

Saffron was used as an ingredient in many of the com- plicated medicines of early times. According to Gerard ““the moderate use of it is good for the head and maketh the sences more quicke and lively. It shaketh off heavie and drowsy sleep and maketh a man mery.” It appears to be really a stimulant and antispasmodic, though its powers are slight. It is scarcely ever employed by modern pharmacists unless for the mere coloration of other tinc- turcs, or at most as a cordial adjunct to other medicines. That it was very largely used in cookery is evidenced by many writers; thus Laurenbergius (Apparatus Plantarum, 1632) makes the large assertion “In re familiare vix ullus

-est telluris habitatus angulus ubi non sit croci quotidiana

usurpatio aspersi vel incocti cibis.” The Chinese used also to employ it largely, and the Persians and Spaniards XXI. — 19

still mix it with their rice. As a perfume it was strewn in Greek halls, courts, and theatres, and in the Roman baths. The streets of Rome were sprinkled with saffron when Nero made his entry into the city.

It was, however, mainly used as a dye. It was a royal colour in early Greek times, though afterwards perhaps from its abundant use in the baths, and as a scented salve, it was especially appropriated by the hetaire. In ancient Ireland a king's mantle was dyed with saffron, and even down to the 17th century the "lein-croich," or saffron-dyed shirt, was worn by persons of rank in the Hebrides. In medizval illumination it furnished, as a glaze upon bur- nished tinfoil, a cheap and effective substitute for gold. The sacred spot on the forehead of a Hindu pundit is also partly composed of it. Its main use in England was to colour pastry and confectionery,—hence "I must have saffron to colour the Warden pies" (Winter's Tale, act iv. sc. i.),—and it is still often added to butter and cheese. One grain of saffron rubbed to powder with sugar and a little water imparts a distinctly yellow tint to ten gallons of water. This colouring power is due to the presence of polychlorite, a substance whose chemical formula appears to be C,gH,)0,,, and which may be obtained by treating saffron with ether, and afterwards exhausting with water. Under acids it yields the following reaction—

CygH 90 yg + HzO = 2(CygH gg) + CyoH 40 + CgH20¢. Polychlorite. Crocin. Essential oil. Sugar. Crocin, according to Watts, Dict. of Chem., has a composi- fion of C,H,,0,. or C..H,.0,,. "Dhismerocitigisea red colouring matter, and it is surmised that the red colour of the stigmas is due to this reaction taking place in nature.

At present saffron is chicfly cultivated in Spain, France, Sicily, on the lower spurs of the Apennines, and in Persia and Kashmir. The ground has to be thoroughly cleared of stones, manured, and trenched, and the corms are planted in ridges. The flowers are gathered at the end of Octobcr, in the early morning, just when they are beginning to open after the night. The stigmnas and a part of the style are carefully picked out, and the wet saffron is then scattered on sheets of paper to a depth of 2 or 3 inches; over thisa cloth is laid, and next a board with a heavy weight. A strong heat is applied for about two hours so as to make the saffron "sweat," and a gentler tenperature for a further period of twenty-four hours, the cake being turned

every hour so that every part is thoroughly dried. It is calculated that the stigmas of about 4300 flowers are required to give an ounce of saffron ; but the experiments of Chappellicr indicate a possibility of greatly increasing the yield by the cultivation of monstrous forms.

The drug has naturally always been liable to great adulteration in spite of penalties, the severity of which suggests the surviving tradition of its sacred character. Thus in Nuremberg a regular saffron inspection was held, and in the 15th century we read of men being burned in the market-place along with their adulterated saffron, while on another occasion three persons convicted of the same crime were buried alive. Grease and butter are still very frequently mixed with the cake and shreds of beef dipped in saffron water are also used. Good saffron is distinguished by its deep orange-red colour ; if it is light yellow or blackish, it is bad or too old. It should also have a peculiar and rather powerful odour, and

a bitter pungent taste. If oily it is probably adulterated with butter or grease.

See Fliickiger and Hanbury, Pharmacographia, and Maw, Monograph of the genus Crocus, upon which the preceding account is essentially based; also Pereira, Materia Medica, and the pharmacoperias.

SAFFRON WALDEN, a market-town and municipal borough of Essex, England, is finely situated near the Cam in a valley surrounded by hills, on a branch of the Great Eastern Railway, 44 miles north-north-east of London and 14 south of Cambridge. It has a somewhat ancient ap- pearance and possesses good streets and a spacious market- place. Of the old castle, dating probably from before the Conquest, the keep and a few other portions still remain. The church of St Mary the Virgin, a beautiful specimen of the Perpendicular style, dating from the reign of Henry VII., but frequently repaired and restored, contains the tomb of Lord Audley, chancellor to Henry VIII. There is an Edward VI. grammar-school, for which new buildings have recently been erected. Amongst the modern public

buildings are the corn exchange (1848) and the new town. hall (1879). The town possesses a museum, a literary institute, and a horticultural society. The benevolent institutions include the hospital and the Edward VI. alms-houses. In the neighbourhood is the fine mansion of Audley End, built by Thomas, first earl of Suffolk, in 1603 on the ruins of the abbey, converted in 1190 from a Benedictine priory founded by Geoffrey de Mandeville in 1136. The town is an important centre of agricultural industry and has large corn, cattle, and sheep markets, Brewing and malting are carried on. The population of the municipal borough (area, 7416 acres) in 1871 was 5718, and in 1881 it was 6060.

The original name of the town was Wealdenberg, and when it received a grant of a market in the time of Geoffrey de Mandeville it was called Cheping Walden. The substitution of the prefix Saffron is accounted for by the former culture of SArrron (q.v.) in the neighbourhood. The town has existed for more than 500 ycars as a guild, and the government is now vested in a mayor, four aldermen, and twelve councillors.

SAGAN, a manufacturing town in Prussian Silesia, situated on the Bober, a tributary of the Oder, lies 60 miles south-south-east of Frankfort-on-the-Oder and 102 miles south-east of Berlin. It contains the handsome palace of the dukes of Sagan, several interesting churches, a Roman Catholic gymnasium, and a large Gothic hospital, named after its founder, the duchess Dorothea (1793-1862), The leading industry of the town is cloth-weaving, with wool and flax spinning; it has also some trade in wool and grain. The population in 1880 was 11,373.

The mediate principality of Sagan, formed in 1397 out ofa por- tion of the duchy of Glogau, has several times changed hands by purchase as well as by inheritance. One of its most famous pos- sessors was Wallenstein, who held it for seven years before his death in 16384. Bought by Prince Lobkowitz in 1646, the principality remained in his family until 1786, when it was sold to Peter, duke of Courland, whose descendant, the duke of Talleyrand-Périgord and Valengay in France, now ownsit. The area of the principality is about 467 square miles, and its population is about 65,000.

SAGAR, or Satcor, a British district of India, situated in the extreme north-west of the Central Provinces, and comprised between 23° 4’ and 24° 27’ N. lat., and between 78° 6’ and 79° 12’ E. long., with a total area of 4005 square miles. It is bounded on the N. by the Lalitpur district of the North-Western Provinces and the native states of Bijawar, Panna, and Charkhari; on the E. by Panna and Damoh district ; on the S. by Narsinhpur dis- trict and the native state of Bhopal; and on the W. also by Bhopal. Sd4gar district is an extensive, elevated, and in parts tolerably level plain, broken in-places by low hills of the Vindhyan sandstone. It is traversed by numerous streams, chief of which are the Sunar, Beds, Dhupan, and Bina, all flowing in a northerly direction towards the valley of the Ganges. In the southern and central parts the soil is black, formed by decaying trap; to the north and east it is a reddish-brown alluvium. Iron ore of excellent quality is found and worked at Hira- pur, a small village in the extreme north-east. The dis- trict contains several densely wooded tracts, the largest of which is the Ramna teak forest preserve in the north. Roads are the only means of communication ; of these the total length is 134 miles, 50 being returned as first class. The climate is moderate ; the average temperature is 75, and the average rainfall is about 46 inches.

By the census of 1881 the population numbered 564,950 (294,795 males and 270,155 females). Hindus numbcred 498,071, Moham- medans 25,396, Buddhists and Jains 16,482, Christians 1034, and aboriginals 19,144. Thc only town except the capital (see below) with a population exceeding 10,000 is Garhakota, which contains 11,414 inhabitants. Of the total arca only 1396 square miles are cultivated, and of the portion lying waste 1220 are returned as cultivable, Wheat forms the principal crop, which is produced m large quantities all over the district; other products are food grains, rice, oil-seeds, cotton, and sugar-cane. Cattle and buffaloes are bred to a large extent both for draught and carriage, and alse

‘ry purposes, especially for the manufacture of ghee. The eect) chrar ‘strict in 1883-84 amounted to £68,376, of which the land-tax contributed £44,429.

By a treaty concluded with Baji Rao in 1818, the greater part of the present district was made over to the British. During the mutiny of 1857 the whole district was in the possession of the rebels, excepting the town aud fort, in which the Europeans were shut up for eight months, till relieved early in the following year by Sir Hugh Rose. The rebels were totally defeated and order was

again restored by March 1858. Sagar was formed into a separatc

district of the Central Provinces in 1861. SAGAR, principal town and headquarters of the above

district, situated in 23° 50’ N. lat. and 78° 49’ E. long,, is well built with wide streets and stands on the borders of a small but beautiful lake, and has military canton- ments. Sagar is the entrepdt of the salt trade with Rajputéna, and carries on a large trade with Mirzdpur district in the North-Western Provinces, importing sugar and other grocery, besides English cloth. The population of the town in 1881 was 44,416 (males 22,556, females

21,860).

SAGE, Lr. See Lz Sace.

SAGHALIN, or SakHALtn, is the name improperly given to a large elongated island in the North Pacific, lying between 45° 57’ and 54° 24’ N. lat. and 141° 30’ and 144° 50’ E. long., off the coast of Russian Manchuria. Its proper name is Karaftu, or Karafuto. It is separated from the mainland by the narrow and shallow Strait of Tartary, which often freezes in winter in its narrower part, and from Yezo (Japan) by the Strait of La Pérouse. This island (670 miles long, 20 to 150 broad, with an area of 24,560 square miles), about equal in size to Belgium and Holland together, must be considered as a continua- tion of the mountains bordering the Manchurian littoral. Its orography is still imperfectly known. The present maps represent it as formed of two parallel ridges, running north and south and reaching from 2000 to 4000 or 5000 feet (Mounts Berniget and Ktéus-pal) high, with two or more wide depressions, not exceeding 600 feet above the sea. The general configuration of the littoral and the island, however, renders it more

probable that there are three chains running south-west to north-east, forming continuations of those of the mainland. The geological structure of the island is also imperfectly known. A few crystalline rocks are found at several capes; Cretaceous limestones containing a rich and specific fauna of gigantic ammonites occur at Dui; and Tertiary conglomerates, sandstones, marls, and clays, folded by subsequent up- heavals, are widely spread. The clays, which contain layers of good coal and a rich fossil vegetation, show that during the Miocene period Saghalin was part of a continent which comprised both north Asia, Alaska, and Japan, and enjoyed a much warmer climate than now. The Pliocene deposits contain a mollusc fauna more arctic than the present, and probably indicating that the connexion be- tween the Pacific and Arctic Oceans was broader than now. Only two rivers, the Tym and the Poronai, are worthy of mention. The former, 250 miles long, and navigable by rafts and light boats for 50 miles from its mouth, flows north and north-east with numerous (about 100) tapids and shallows, in a wild valley suitable only for fishing or hunting settlements, and enters the Sea of Okhotsk at the Bay of N yi. The Poronai flows north and then south to the Gulf of Patience, a wide bay on the south-east coast. Three other small streams enter the Wide semicircular Gulf of Aniva at the southern extremity of the island.

Owing to the cooling influence of the Sea of Okhotsk, the climate is very cold. At Dui the average yearly tem- perature is only 33°-0 Fahr. (January, 3°-4; July, 61°-0), 35°°0 at Kusunai, and 37°-6 at Aniva (January, 9°°5 ; July, 60°2). A dense covering of clouds for the most

part shuts out the rays of the sun; while the cold current issuing from the Sea of Okhotsk, aided by north-east winds, in summer brings immense ice- floes to the east coast. The whole of the island is covered with dense forests (mostly coniferous). The Ayan fir (Abzes ayanensis), the Saghalin pichta, and the Daurian larch are the chief trees; and the upper parts of the mountains have the Siberian rampant cedar (Cembra pumila) and the Curilian bamboo (Arundinaria kurilense), 4 feet high and half an inch thick. Birch, both European and Kamchatkan (2. alba and B. Ermani), elder, poplar, elm,wild cherry (Prunus padus), Taxus baccata, and several willows

are mixed with the Conifers ; while farther south the maple, the ash, and the oak, as also the Japanese Panax ricinifolium and the Amur cork (Philodendron amurense), make their appear- ance. The number of phanerogamous species known reaches 590 and may reach 700, of which only 20 are peculiar to Saghalin, the remainder belonging to the Amur and partly to the Japanese flora. The fauna of Saghalin closely resembles that of the Amur region, and in fact the Siberian. Bears, foxes, and sables are still numerous, as also the reindeer in the north and the antelope; and tigers are occasionally met with in the south. The avi- fauna is the commion Siberian; and the rivers are ex- ceedingly rich in fish, especially species of salmon (Onco- rhynchus), which make their way up the rivers in vast numbers to spawn. The lower marine fauna, explored by Schrenck, is also rich, while numerous whales, not in high esteem with whalers, are met with on the sea-coast. Otarias, seals, and dolphins are a source of profit.

Saghalin has been inhabited since at least the Neolithic Stone Age. Flint implements, exactly like those of Siberia and Russia, have been found at Dui and Kusunai in great numbers, as well as polished hatchets (of trap, diorite, and argillaceous schists)—also like the European oues—primitive pottery with decorations like those of Olonetz, and stone weights for nets. Afterwards came a population to whom bronze was known ; they have left their traces in earthen walls and kitchen-middens (in the Bay of Aniva). The present inhabitants consist of some 2000 Gilyaks, 2500 Ainos, 500 Oroks, as many Japanese, and about 6000 Russians. The Gilyaks, who do not differ from those of the Amur, inhabit the northern part of the island. They support themselves by fishing and partly by hunting, but suffer from competition with the Japanese, who take possession of the best fishing-grounds. The Oroks, of Tungus origin, resemble the Orotchons of the Amur; they live by hunting. The Ainos, who are still the subject of so much discussion among ethno- logists, are the aborigines of the island ; they are closely akin to the

Curilians, and, like these, differ from all other Mongolian races by their luxuriance of hair and beard. They now inhabit only the

_ south part of the island, and have been brought into a condition of

slavery by the Japanese, by whom they have been driven out of Yezo and Nippon, in both of which they were the aborigines. The Japanese have several colonies on Saghalin and force the Ainos to fish and to collect seaweed for exportation. They send their ships to the south part of the island and have colonies there, and also on the east coast, at the mouth of the Tym. The Russians began to settle permanently on Saghalin in 1857 ; and, though next year posts were established in the southern part of the island, it still continued to belong to Japan, which definitely ceded it to Russia in 1875. A scheme having been latcly formed for colonizing the island with convicts, several thousands have becn transported thither, especially to Dui (Alexandrovsk), where they are employed in coal-mining (annual output from 3000 to 30,000 cwts.), or make some attempt at agriculture; they are either kept in the Alex- androvsk prison, or permitted to build houses and to settle with their families. These efforts towards colonization, however, en- counter great difficulties from the quality of the soil, the cultivable patches occurring here and there in the marshy valley of the Duika river, on the upper course of the Tym, and in the bays of Patience and Aniva. The only crops that thrive are various kinds of kitchen produce. The Russian settlements are at Dui on the west coast, Malo-Tymovsk and Rykovsk on the upper Tym, Korsakoff and Muravieff on the Bay of Aniva.

History.—Saghalin, which was under Chinese dominion until the present century, became known to Europeans from the travels of Martin Gerrits in the 17th century, and still better from those of La Pérouse (1787) and Krusenstern (1805), who described large parts of its coasts. Both, however, regarded it as a mere appendage of the continent, and were unaware of the existcnce of the Strait of

Tartary, which was discovered a few years later by a Japanese, Mamia Rinso, whose discovery is embodied in Siebold’s A ippon. The Russian navigator Nevelskoi, in 1849, definitively established the existence and navigability of this strait; sinee that time the Russian expeditions of Boshnyak (1851) and Rimskiy- Korsakoff (1853) continued the explorations, and in the latter year a Russian post was temporarily established at Aniva Bay. L. Schrenek in 1855-56, and MM. Schmidt,

Glehn, Brylkin, and Shebunin in 1860, explored the geology, fauna, flora, and ethnology of the island ; M. Lopatin in 1867 explored, on foot, the east coast ; MM. Dobrot- vorsky published (1869 and onwards) interesting data as to the inhabitants, and M. Polyakoff was entrusted in 1881-82 with a detailed exploration, and returned with rich ethnological and zoo- logieal collections, with regard to which only preliminary reports have as yet been published. P. A. K.)

SAGINAW, a city of the United States, capital of Saginaw county, Michigan, lies on an elevated plateau about 30 feet above the water on the left bank of the Saginaw river, which falls into Saginaw Bay on Lake Huron, about 18 miles lower down. It is a railway Junc- tion of some importance, 100 miles north-west of Detroit, is connected with East Saginaw by a street railway, and can be reached by the largest vessels that ply on the lake. The upper branches of the river are also available for boat traffic throughout a considerable district. Saw-muills, planing-mills, and salt-works are the principal industrial establishments. The population was 7460 in 1870 and 10,525 in 1880. The city charter dates from 1859, the first settlement from 1822.

SAGITTA. The name “Sagitta” was given by Martin Slabber in 1775 to a small marine worm which is now known as the type of a distinct group, the Chetognatha (Leuckart). The group comprises two genera (Sagitta and Spadella) and a considerable number of species ; they are small transparent pelagic animals, varying in length from a few lines up to two inches, and are universally dis- tributed. The body (see fig.) is elongated and furnished with a tail and lateral fins, which are prolongations of the chitinous cuticle; the head is provided with a great number of variously shaped chitinous sete. The body is divided by transverse septa into three distinct segments: the first septum is placed just behind the head (st), the second (sf) about the middle of the body, separating the ovaries and testes. The body-cavity is likewise separated into right and left halves by a continuous vertical mesentery, which suspends the gut. The alimentary canal is a simple straight tube of uniform structure passing from the mouth to the anus, which is placed ventrally and at the second ‘transverse septum ; the alimentary tube is ciliated and is unprovided with glands of any kind. The body-wall is composed of (1) an outer layer of epidermis, which secretes the chitinous

cuticle already referred to,—the thickness of the epidermis varying from five or six cells in the region of the head to a single layer of cells in the “fins”; (2) a deli- cate structureless supporting lamella ; (3) a layer of longi- tudinal muscles. These last have a peculiar arrangement and structure: they are disposed in four bands, two dorsal and two ventral, the action of which is evidently favour- able to producing the onward movements of the creature. The muscular fibres, which are transversely striated, are arranged in a series of lamelle whose direction is per- pendicular to the longitudinal axis of the body. Projec- tions inward of the supporting lamella bear on either side a single row of muscular fibres ; a similar muscular struc- ture occurs in the Wematoidea and in many Oligocheta. In the anterior region of the body the muscular layer is differentiated into special muscles for the movement of the sete. (4) The body-cavity is lined by a delicate peritoneal epithelium closely applied to the muscular layer of the body-wall and to the gut. The nervous system consists of a cerebral ganglion and a large ventral ganglion—the two united by commissures which pass round the gut; both ganglia are embedded in the epidermis. This primi-

tive condition of the nervous system is retained in other lowly organized worms (eg., Poly- gordius). The ventral ganglion is connected with an intra- epidermic nervous plexus which surrounds the whole body. Eyes are present, be- sides a number of tactile cells upon the outer surface of the body; an- teriorly is a ring-shaped structure (r) which is supposed to be olfac- tory in function. The generative organs consist of ovaries and testes, which are united in the same indi- vidual; the ovaries (e), placed an- terior to the testes, are furnished with oviducts, which appear to ter- minate in a cecal extremity. The testes (ho) are placed behind the second septum; they are each fur- nished with a vas deferens opening on to the exterior and into the body-cavity by a ciliated funnel. For embryology, see Balfour, Com- parative Embryology, vol. i. p. 303.

In spite of the detailed knowledge whieh we now possess of the structure and development of the Chetognatha, the systematie position of the group remains a matter of the greatest uneertainty. That they are an arehaie group is shown by their hermaphroditism, by the primitive eondition of the

nervous system, and by the persistence of the vertical mesentery among other eharaeters; in all these points and in others they agree with such primitive Annelida as Protodrilus and Polygordius. On the other hand, their similarity to the Nematoidea has been dwelt upon; the disposition of the museles is the same in both groups, and the Gor- diacex have the gut suspended by a dorsal and ventral mesentery in the same fashion as has been described above in Sagitta ;

Spadella cephaloptera (Busch). the Chetognatha differ, however, froin the St, septa dividing body-cavity

Nematoidea in the important fact of their transversely ; 9°, cerebral ganglia ; ni, commissure

So DD, ‘On the whole, it appears uniting this with ventral that the Chetognatha are best regarded as_ ganglion (uot shown in a special phylum equivalent to such groups fig.); ®, nerve uniting as Annelida, Platyhelminthes, Nematoidea, cerebral ganglia with small

5 3 ° li head; nr, ol- pa no special relation to any one fae ory me alien of them.

ary canal; 1, olfactory SAGO is a food-starch prepared one peels he from a deposit in the trunk of several pase i am palms, the principal source being vas deferens ; /2, /3, lateral the sago palm, Metrorylon Rumphi and ae (Mart.), and AY. lve (Mart.). These cated as black dots belli palms are natives of the East Indian “° “™D* 8N8™™ Archipelago, the sago forests being especially extensive in the island of Ceram. The trees flourish only in low marshy situations, seldom attaining a height of thirty feet, with a thick-set trunk. They attain maturity as starch-yielding plants at the age of about fifteen years, when the stem 1s gorged with an enormous mass of spongy medullary matter, around which is an outer rind consisting of a hard dense woody wall about two inches thick. When the fruit 1s allowed to form and ripen, the whole of this starchy core disappears, leaving the stem a mere hollow shell ; and the tree immediately after ripening its fruit dies. When ripe the palms are cut down, the stems divided into sections and split up, and the starchy pith extracted and grated to a powder. The powder is then kneaded with water over a strainer, through which the starch passes, leaving

the woody fibre behind. The starch settles in the bottom of a trough, in which it is floated, and after one or two

washings is fit for use by the natives for their cakes and

soups. That intended for exportation is mixed into a paste with water and rubbed through sieves into small grains, from the size of a coriander seed and larger, whence + ig known according to size as pearl sago, bullet sago, &e, A large proportion of the sago imported into Europe comes from Borneo, and the increasing demand has led toa large extension of sago-palm planting along the marshy river banks of Sarawak.

Various palms, in addition to the two above named, yield sago, but of an inferior quality. Among them may be mentioned the Gomuti palm (Arenga saccharifera), the Kittul palm (Caryota wrens), the cabbage palm (Corypha winbraculifera), besides Corypha Gebanga, Raphia flabelliformis, Phenix farinifera, and Metroxylon filare—all East Indian palms—and MMawritia flexuosa and Guilielma speciosa, two South-American species. The imports of sago into the United Kingdom for 1884 amounted to 346,188 cwt., valued at £195,680, the whole of which, excepting less than 300 tons, is entered as coming from the Straits Settlements.

SAGUNTUM, an ancient city of Hispania Tarraco- nensis, was situated near the mouth of the river Pallantias (Palancia). It was the centre of a fertile district and was a rich trading place in early times, but owes its celebrity to the desperate resistance it made to Hannibal (see vol. xi, p. 441). The Romans restored the city and made it a colony; later writers speak of its figs, which were esteemed at Rome, and of its earthenware, which enjoyed a certain reputation. The most important remains are those of the theatre.

The modern Sagunto or Murviedro (muri veteres), 18 miles by rail from Valencia on the line to Tarragona, is now about 3 miles from the sea; the population within the municipal boundaries was 6287 in 1877.

SAHARA is the great desert region which stretches across the continent of Africa eastwards from the Atlantic

‘ for a considerable distance on both sides of the Tropic of

Cancer, and is generally distinguished by aridity of soil, absence of running water, dryness of atmosphere, and comparative scarcity of vegetable and animal life. The physical limits of this region are in some directions marked with great precision, as in part of Morocco and Algeria, where the southern edge of the Atlas range looks out on what has almost the appearance of a boundless sea, and forms, as it were, a bold coast-line, whose sheltered bays and commanding promontories are occupied by a series of towns and villages—Tizgi, Figig, Laghouat, &c. In other directions the boundaries are vague, conventional, and dis- puted. This is especially the case towards the south, where the desert sometimes comes to a close as suddenly as if it had been cut off with a knife, but at other times merges gradually and irregularly into the well-watered and fertile lands of the Sudan (Soudan). While towards the east the valley of the Nile at first sight seems to afford a natural frontier, the characteristics of what is usually called the Nubian or Arabian desert are so identical in most respects with those of the Sahara proper that some authorities extend this designation over the whole country to the shores of the Red Sea. The desert, indeed, does not end with Africa, but is prolonged eastwards through Arabia towards the desert of Sind. As the Nubian region has been described under the heading Nusra (vol. xvii. p. 610), attention will in the present article be confined to the desert country west of the Nile valley. Even as thus defined the Sahara is estimated to have an area of 3,965,565 square miles, or nearly as much as all Europe minus the Scandinavian peninsula and Iceland ; but, while Europe supports a population of 327,000,000, the Sahara probably does not contain more than 2,500,000,—a figure, however, which is sufficiently startling to those who think of it as an uninhabitable expanse of sand. The sea-like aspect of certain portions of the Sahara has given rise to much popular

misconception, and has even affected the ideas and phraseology of scientific writers. Instead of

being a boundless plain broken only by wave-like mounds of sand hardly more stable and little less dangerous than the waves of ocean, the Sahara is a region of the most varied surface and irregular relief, ranging in altitude from 100 feet below to some 5000 or 6000 or even it may be 8000 feet above the sea-level, and, besides sand-dunes and oases, containing rocky plateaus, vast tracts of loose stones and pebbles, ranges of hills of the most dissimilar types, and valleys through which abundant watercourses must once have flowed.

The culminating points of the Sahara are probably the summits of the Ahaggar (Hoggar), a great mountain plateau, not inferior to the Alps in the area which it covers, crossing the Tropic of Cancer about 5° and 6° E. long., almost midway between the Atlantic and the valley of the Nile. In its central mass rise with red steep cliffs two peaks, Watellen and Hikena, which Duveyrier believes to be volcanic like those of Auvergne. The height of this country has not been ascertained by direct European observation, but may be gathered from the fact that according to the Tuareg the snow lies for three months of the year, from December to March. To the north- west, and separated from the Atakor-’n-Ahaggar by a wide plain, rises the Muydir plateau, lying nearly east and west for a distance of about 200 miles. Its north- eastern extremity is extended towards Timassinin by the Jrawen Mountains, which in their turn are separated by a narrow valley from the Tasili plateau (strictly Tasili of the Asjer or Asgar). This great plateau stretches soutli- east for 300 miles parallel with the Atakor-’n-Ahaggar (from which it is separated by the Amadghor and Adamar plains), and then the line of elevation is continued by low ridges to the Tummo or War Mountains, and so onwards to the highland country of Tibesti or Tu, whose highest point, Tusidde, is 7880 feet above the sea-level, while its south-eastern eminences gradually die away in the direction of Wadai and Darfor (Darfur). About midway between Tibesti and the Niger rises the isolated mountain mass of Air or Asben, in which Dr Erwin von Bary! discovered the distinct volcanic crater of Teginjir with a vast lava-bed down its eastern

side. By some this country is assigned to the Sudan, as it lies within the limit of the tropical rains ; but the districts farther south have all the character- istics of the desert. The low but extensive plateau of Adghagh lies between Air and the Niger. Away to the north-east, in the country of Frzzan (q.v.), are the dark mountains of Jebel es-Séda, which are continued south-east towards Kufra by the similar range of the Haruj; and in the extreme south-west at no great distance from the Atlantic is the hilly country of Adrar (Aderer).

Nearly all the rest of the Sahara consists in the main of undulating surfaces of rock (distinguished as hammada), vast tracts of water-worn pebbles (serir), and regions of sandy dunes (variously called maghter, erg or areg, wid and in the east vhart), which, according to M. Pomel, occupy about one-ninth or one-tenth of the total area. The following is the general distribution of the dunes. From the Atlantic coast to the south of Cape Blanco a broad belt extends north-east for a distance of about 1300 miles, with a breadth varying from 50 to 300 miles. This is usually called the Igidi or Gidi, from the Berber word for dunes. Eastward it is continued to the south of Algeria and Tunis by the Western Erg and the Eastern Erg, separated by a narrow belt at Golea. To the south of the Eastern Erg (which extends as far north as the neighbourhood of the Lesser Syrtis) the continuity of the sandy tract is completely broken by the Hammada al-Homra (or Red Rock Plateau), but to the south of this region lie the dunes of Edeyen, which, with slight inter-

1 Zeitschrift fir Erdkunde, 1880.

ruptions, extend to Murzuk (Morztk). To the south of the hammada of Murzuk the dunes of Murzuk stretch away south-east. Looked at in its entirety, this series of tracts may be called the northern zone; it forms a kind of bow, with its extremities respectively at the Atlantic and the Libyan Desert and its apex in the south of Tunis. In the south are the Juf,! covering a vast area to the south-east of the middle portion of the Igidi, another area between the Adghagh plateau and the Tasili wan Ahaggar, and a third between Air and Tibesti. Away to the east in the Libyan Desert is a vast region of dunes of unascer- tained limits. It must be borne in mind that the

sands do not entirely cover the areas assigned to them in the ordinary maps, which are of too small a scale to show the interchange of different kinds of surface. In the Eastern Erg especially the dunes lie in long lines in a north-north- west and south-south-east direction, presenting a gradual slope to windward and an abrupt descent to leeward. There they are generally about 60 or 70 feet high, but in other parts of the Sahara they are said to attain a height of upwards of 300 feet. The true dune sand is remarkable for the uniformity of its composition and the geometrical regularity of its grains, whi h measure less than ‘03937 inch.2 While individually these appear crystalline or reddish yellow (from the presence of iron), they have in the mass a rich golden hue. According to M. Tissandier’s examination, animal organisms, such as the microscopic shells of Rhizopoda, so abundant in sea-sand, are strik- ingly absent. Under the influence of the wind the surface of the dunes is subject to continual change, but in the mass they have attained such a state of comparative equilibrium that their topographic distribution may be considered as permanent, and some of them, such as Gern (Peak) al-Shuf and Gern Abd-al-Kader, to the . § of Golea, have names of their own. The popular Stories about caravans and armies being engulfed in the moving sands are quite apocryphal, but there is abundant evidence against the theory of M. Vatonne as to the dunes having been formed in site. To understand their origin it is necessary to glance at the general geology of the Sahara, which, however, in this aspect, is only known in detail to the south of Algeria and along the routes of the Rohlfs ex- pedition (1873-74, Dr Zittel) and that of Dr Lenz (1880).

Granite, whieh, along with gneiss and mica schists, seems to be the prevailing rock in the highlands of Air (Von Bary), comes to the surface more or less sporadieally in the neighbourhood of Al- Eglab and in the Adrar distriets in the south-west. Gneiss and mica schists are probably the main materials of the Ahaggar plateau. Volcanic rocks (basalt, &c.) form the mountain masses of Jebel es-Sdda and the Haruj; in Air they break through the granite and other roeks in a very erratic fashion. Slates and quartz- ite (possibly Silurian, according to Lenz), which play so great a part in Senegambia, appear to the north of the Senegal, along the edge of the desert, and crop out again in Adrar, on the castern borders of the Juf, and to the east of Wady Sus. An immense tract from Adrar north-east to the borders of Algeria seems to be occupied by Devonian and Carboniferous

formations, the character- istic fossils of whieh frequently show on the surface; farther east these rocks are covered by Cretaceous and Quaternary deposits, though they again appear in the Muydir and Tasili plateaus (M. Roche's report). The development of the Cretaceous system is altogether one of the most striking features of Saharan gcology, its extreme limits being the coasts of the Atlantic and the Red Sea, and the area occupicd by it in the Algerian Sahara alone being equal to the whole of France. In the Algerian Sahara the Cretaceous rocks are covered by no later sediments, with the exception of certain Quaternary deposits, but in the Libyan Descrt Tertiary deposits: are abundant, though, aceording to Zittel, there is no sharp distinction between Cretaceous and Tertiary, the one seem-

1 This name, meaning the ''depression," has long been in use, but appears to be a misnomer; the lowest point in Lenz's route, which, ye only erossed the east end of the Juf, was 400 feet above

he sea,

4 See Rolland, in Bull. de la Soe. géol. de France, 1881, and Revue Scientifique, 1881.

3 Comptes Rendus, Acad. des Sciences.

ing (certain paleological charactcristics apart) to pass gradually into the other. Eocene limestones, rich in nummulites and oper. culines, stretch south and east from the oasis of Siwa and are well seen in the cliffs enclosing the depressed oasal areas which sink down to the Cretaceous rocks. To the south of Farafreh extends a vast tract of Nubian sandstone.

In all parts of the Sahara there is evidence of denudation carried out on ascale of unusual magnitude. The present surface of the desert has been exposed to the protracted wear and tear of the elements. But to determine the exact method by which the ele- ments have done their work has hitherto proved beyond the power of science. The superficial observer is at once tempted to accept the theory of submarine denudation: the Sahara is still the '' dried bed of a sea" in even such text-books as Professor Huxley's Physio-

graphy and Stanford's Compendium of Geography. The sand-dunes, the salt efflorescence and deposits, and the local occurrence of certain modern marine molluscs all go to help the hypothesis of a diluvial sea. But a more extensive acquaintance with Saharan character- istics shows that such a sea for the Sahara as a whole is impossible. The denudation must probably be explained as duc to the combined action of fresh water and atmospheric agencies. Even at present the Sahara is not so destitute as has been supposed of fresh water. Though rain is one of the rarest phenomena of the lowlands, the mountains on its northern borders and the central highlands are both regions of precipitation, and discharge their surplus waters into the hollows. A glance at a good physical map of the Sahara shows in fact the skeleton of a regular river-system. From the north side of the Ataker-'n-Ahaggar, for instance, begins Wady Igharghar, which, running northwards between the Tasili plateau and the Irawen Mountains, appears to lose itself in the sands of the Eastern Erg, but can be distinctly traced northwards for hundreds of miles. Its bed contains rolled fragments of lava and freshwater shells (Cyrena and Planorbis). In a linc almost parallel to Wady Igharghar Wady Mya descends from the plateau of Tademayt, and shows the importance of its ancient current by deep erosion of the Cretaceous rocks, in which a large number of left- hand tributaries have also left their mark. Away in the far cast of the Libyan Desert Dr Zittel discovered page caves in the: limestone. The question arises, What has be¢ome of the abundant water-supply which filled the wadies and hollowed out the caves? Recent discoveries in the Algerian Sahara suggest that part of the water circulation has become subterranean. The streams from the Atlas which seem to be absorbed in the sands of the desert evidently find a series of underground rescrvoirs or basins capable of being tapped by artesian wells over very extensive areas. As Olympio- dorus (quoted by Photius) mentions that the inhabitants of the Sahara used to make excavations from 100 to 120 feet deep, out of which jets of pure water rose in columns, it is clear that this state of matters is (historically) of ancient date. Since 1856 the French engineers have carried on a series of borings which have resulted in the fertilizing of extensive tracts; between 1856 and 1879 155 wells were bored in the province of Constantine alone. In Wady Rir', which runs for 80 miles towards the south-west of the Shott Melrir (comp. infra), the water-bearing stratum is among permeable sands, which are covered to a depth of 200 feet by impermeable marls, by which the water is kept under pressure. The

wells, varying much in their discharge and ‘‘head,” give a total of 3°5 cubic metres per second at an average temperature of 25°‘1 Fahr.

Everything considered, it may therefore be assumed that the desert formerly possessed a surface circulation of water capable of aiding in the processes of disintegration, removal, and deposition. Since the water disappeared other agencies have been at work. The surface of the rocks, heated by the sun and suddenly chilled by rapid radiation over night, gets fractured and crumbled ; elsewhere the cliffs have been scored and the sand thus formed is at once turned by the wind into an active instrument of abrasion. In many places it has planed the flat rocks of the hammada as smooth as ice. Elsewhere it has scored the vertical faces of the clifis with curious imitations of glacial striation, and helped to undercut the pillar- or table-like eminences which, under the name of gurs or “witnesses,” are among the most familiar products of Saharan erosion. The softer quartz rocks of the Quaternary and Cretaceous pinata

4 See Rolland, “Le régime des eaux artésiennes de l’Oued Rir et du Bas Sahara,” in Comp. Rend., Acad. des Se., Sept. 1885.

‘es(and according to Zittel especially the Nubian sandstone) have ee to yield ‘the sand which, drifted and sifted by the winds, has taken on the form of dunes. The slightest breeze is enough to make the surface ‘‘smoke” with dust ; and at times the weird singing of the sands, waxing louder and louder, tells the scientific traveller that the niotion is not confined to the superficial particles.! How important a part the winds may play in the redistribution of the lighter particles is probably shown by the clouds of red dust which were noticed by Edrisi as frequently obscuring the Atlantic sky between Cape Verd and the American coast, and which have recently been referred by Dr Gustav Hellemann to the African Sahara, whence Professor Tacchini also derives the similar clouds of dust observed in many parts of Italy (comp. Tchihatchef).

But even such a river-system as that supposed combined with all conceivable atmospheric agencies would only account for the minor

henomena of erosion. Dr Zittel in dealing with the Libyan Desert finds it necessary to assume violent freshwater floods proceeding from the south, though, as he confesses, this only shifts the diffi- culty a stage further back, as it involves an enormous change of

climate. To render such a change of climate a probable hypothesis “various recent speculations combine ; and Dr Theobald Fischer and Dr Oscar Fraas agree in believing that the desiccation has markedly increased in historic times. Evidence derived from ancient monu- ments combined with the statements of Herodotus and Pliny are held to prove that the elephant, the rhinoceros, and the crocodile existed in North African regions where the environment is now utterly alien, and on the other hand that the camel is a late intro- duction. Humboldt sought to attribute the desiccation of the desert region of Asia and Africa to the effects of the north-east trade-wind ; but Dr Lenz, who points out that in North Africa the wind seldom blows from the north-east but generally from the north or north- west? (the latter of course from the Atlantic, in the western parts, but farther east from the European regions of precipitation), argues that one of the principal causes has been the destruction of the forests on the highlands. The dry winds from the Sahara are known in Europe as the Scirocco and the Fohn or Fon.

Botanieally the Sahara is the mceting-ground of representatives of the ‘‘ Mediterranean” and the “Tropical” floras which have man- aged to accommodate themselves to the peculiar climatic conditions. The linc of demarcation between the two floral areas, almost coin- ciding in the west with the Tropic of Cancer and in the east dipping south towards the meridian of Lake Tchad, assigns by far the greater portion of the area to ‘‘ Mediterranean” influences. Uniformity, in spite of differences of altitude and soil, is a general characteristic of the vegetation, which outside of the oases consists mainly of plants with a tufty dry stiff habit of growth. The oases are the special home of the date-palm, of which there are about 4,000,000 in the Algerian oases alone. In company with this tree, without whieh life in the Sahara would be practically impossible, are grown apples, peaches, oranges, citrons, figs, grapes, pomegranates, &c. During the months from December to March wheat, barley, and other northern grain crops are successfully cultivated and in the hotter season rice, dukhn, durra, and other tropical products. Altogether the oasal flora has considerable

variety ; thirty-nine specics are known from the Kufra group, forty-eight from the Aujila group.

Zoologically the Sahara is also a debatable territory, partly Mediterranean, partly Tropical. Apart from the domestic animals (camels, asses, &., and very noticeably a black breed of cattle in Adrar), the list of fifteen mammals comprises the jerboa, the fennek or fox, the jackal, the sand rat (Psammomys obesus), the hare, the wild ass, and threc species of antelope. In Borku, Air, &c., baboons, hyenas, and mountain sheep are not uncommon. Without count- ing migratory visitants, about eighty species of birds have been registered—the ostrich, the Certhilawda deserti or desert-lark (which often surprises the traveller with its song), Emberiza Sahare, three species of Dromolea, &c. Tortoises, lizards, chame- leons, geckos, skinks, &c., of fifteen different species were collected by the single Rohlfs expedition of 1878-74; the serpents comprise the horned viper, Psammophis sibilans, Colopeltis lacertina, the python, and several other species. The edible frog also occurs. Cyprinodon dispar, a fish not unlike Cyprinodon ealaritanus, is found in all the brackish waters of north Sahara and swarms in the lake of the Siwa oasis. The brine-shrimp has been described in the article Frzzan,

The present population of the Sahara consists almost exclusively of Arabs, Berbers, and Negro tribes. The Berbers (Tuareg or Tuarik, &c.) occupy the west central region almost exclusively, appear sporadically in the western, and stretch northwards into Moroeco and Algeria ; the Negro tribes form a compact block in the east central region northwards and north-eastwards from Lake

’ See Lenz’s chapter on this phenomenon. Comp. Derrécagaix, “Le sud de la province d’Oran,” in Bull. de la Soc. de Géogr., Paris, 1873.

: Com Drude, Florenreiche der Erde, 1884; and Cosson, Com- pendium Flore Atluntice, 1881, &c.

Tchad ; and the Arabs are in possession of all the rest of the country. Politically the Sahara belongs partly to Morocco (Tafilet, &c.), partly to

Algeria and Tunis (and thus to France), and partly to the Turkish empire (Tripolis, Egypt, &c.). France especially has been steadily pushing south with the purpose of forming a junction ultimately with her colony on the Senegal. The spirit of independ- ence among the Mohammedan populations las been crystallized and stimulated by the remarkable confraternity of Sidi Mohammed ben ‘Ali es-Senusi, founded about 1837, and now possessing about 120 convents or zawiga (mostly in the Saharan region), with its headquarters at Jerabub.+ With this organization the French have already come into conflict in their southward progress. To estab- lish their influence they propose the construction of a trans-Saharan railway and the opening up of the region to the south of Algeria and Tunis by the construction of an inland sea, According to M. Roudaire, the author and protagonist of this scheme, which is familiarly but deceptively styled the ‘‘ flooding of the Sahara,” 5

‘it is possible by proper engineering works to create an inland sea

to the south of Algeria and Tunis with an average depth of 78 feet and an area of 3100 square miles, or about fourteen times the size of the Lake of Geneva. A Government commission decided that the excavation of the necessary canal would not be difficult, and that, in spite of silting-up processes, the work would at least last 1000 to 1500 years. M. de Lesseps, M. Roudaire’s principal sup- porter, visited the distriet in 1883 and reported that the canal would cost five years’ labour and 150,000,000 francs. The scheme, which has met with persistent hostility on the part of M. Cosson and others, is based on the following facts. The Gulf of Gabes is separated by a ridge 13 miles across and 150 feet high from Shott al-Fejej, a depression which extends south-west into the Shott Jerid, which in its turn is separated from the Shott Rharsa only by a still narrower ridge. Shott Rharsa is succeeded westwards by a series of smaller depressions and beyond them lies the Shott Melrir, whose north-west end is not far from the town of Biskra. What we know about such inland seas as the Caspian and the Aral seems to cast serious doubt on the probability of any increase of the rainfall in the Sahara by the formation of Roudaire’s sea.

The commerce of the Sahara is not inconsiderable. Among the more important trade routes are—(1) from Morocco to Cairo by Insalah and

Ghadames, which' is followed by the pilgrims of Western Africa bound for Mecca; (2) from Kuka to Murzuk and Tripolis; (3) from the Sudan to Tripolis by Air and Ghat; (4) from Timbuktu to Insalah, Ghadames, and Tripolis ; (5) from Timbuktu to Insalah and thence to Algeria and Tunis; (6) from Timbuktu to Morocco. The two great products are dates and salt. Full details of the date trade will be found in Fischer's Die Dattelpaline, 1881. The principal sources of salt are the rock-salt deposits of the Juf (especially Taudeni), the lakes of Kufra, and the rock-salt and brine of Kawar (Bilma).

See, besides the works already quoted, Vatonne, Mission de Ghadames, 1863 ; Duveyrier, Les Touaregs du Nord, 1864; Ville, Explor. géologique du Mzab, &c., 1867 ; Pomel, Le Sahara, 1872; Rohlfs, Quer durch Afrika (1874), Drei Monate im libyschen Wiiste (1875), and Kufra (i881); Largeau, Le pays de Rirha-Ouargla, 1879 ; Nachtigal, Sdhard und Stiddn, 2 vols., 1879; Rolland, "Le Crétacé du Sahara Septentrional" (with geological map of the Central Sahara), in Bull. de la Soc. Géol. de France, 1881; Roudaire, Rapport sur la derniére exped. des Chotts, 1881 (and other reports by the same author); Tchihatchef, ''The Deserts of Africa and Asia," in British Association Reports (Southampton, 1882); Derré- cagaix, '' Explor. du Sahara: Les deux missions du Licut.~~Colonel Flatters," in Bull. de la Soc. de Géogr., 1882; Lenz, Timbuktu: Reise durch Marokko, &c., 1884; and Reclus, Nouv. Géographie Univ., xi., 1886, which contains an admir~~ able résumé. (H. A. W.)

SAHARANPUR, or SEHARUNPOOR, a British district of India, in the Meerut division of the lheutenant-governor- ship of the North-Western Provinces. It lies between 29° 35' and 30° 21' N. lat., and between 77° 9' and 78° 15' E. long., and is bounded on the N. by the Siwélik Hills, separating it from the district of Dehra Dun, on the 8. by the district of Muzaffarnagar, on the E. by the Ganges, and on the W. by the Jumna. Saharanpur forms the most northerly portion of the Doab, or alluvial tableland, which stretches between the valleys of the Ganges and the Jumna. The Siwdlik Hills rise precipitously on its northern fron- tier ; at their base stretches a wild submontane tract, with much forest and jungle. Cultivation generally in this part is backward, the surface of the country being broken by wild and magnificent ravines. South of this tract, flanked on the east and west by broad alluvial plains, lies the Dodb, with fertile soil

and good natural water-supply. This portion of the country is divided into parallel tracts

4 See list in Duveyrier’s paper, Bull. de lu Soe. de Géogr., 1884.

5 Tn this connexion it is enough to mention Mr Mackenzie’s scheme for flooding the Western Sahara; see Mlooding Sahara, 1877, and Ravenstein, “The Western Sahara,” in Geog. Mag., 1876.

by numerous streams from the Siwdliks, while the Eastern Jumna and the Ganges Canals, which traverse the district from north to south and issue from its north-west and north-east corners, cover the district with a network of irrigation channels. The only large rivers are the Ganges, which enters Saharanpur 180 miles from its source, by a well-marked gorge formed in the rock at Hardwar ; and the Jumna, which debouches into the plain about 123 miles from its source, at a place called Khara. The district has abundant means of communication : the Sind, Punjab, and Delhi Railway traverses 1t for a dis- tance of 42 miles, with stations at Deoband, Saharanpur, and Sars4wa; and it has numerous roads, both metalled and unmetalled.. The climate of Saharanpur is that of the North-Western Provinces in general; at one season 1t is tropical, at another partially European. Its average annual rainfall is about 37 inches. Wild animals are plentiful, including the tiger, leopard, wild cat, lynx, hyena, and wolf.

By the census of 1881 the population of Saharanpur numbered 979,544 (530,427 males and 449,117 females). By religion there were 653,272 Hindus, 317,535 Mohammedans, and 1793 Christians, Five towns had populations exceeding 10,000 each, namely, Sandr- ANPUR (q.v.), Hardwar Union (28,106), Deoband (22,116), Rurki (12,818), and Gangoh (12,089). Rurki (Roorkee) is a town of con- siderable importance, situated in 29° 52’ 25” N. lat. and 77° 55’ 40” E. long. It is the headquarters of the Ganges Canal workshops and iron-foundry, with the Thomason Civil Engineering College, for the instruction of natives and others in practical engincering ; it contains also an excellent meteorological observatory. Hard- war municipality, which lics 39 miles north-cast of Saharanpur town, on the right bank of the Ganges, is the most frequented of all Hindu places of

pilgrimage, and is largely used for the bathing festivals. Every twelfth year, when Jupiter is in Aquarius, a great fair or kumbh-mela is held, which attraets an immense number of people ; as many as 3,000,000 attended in 1882.

Of a total area of 2221 square miles 1256 are cultivated and 331 are cultivable waste. Cereals form the principal products. The chief spring crops are wheat, barley, pulses, and oil-seeds, and the staples of the rain crops are rice, joar, bajra, and vegetables; the cultivation of cotton and indigo is also carried on, the latter in much greater quantities since the introduction of canal irrigation has rendered its out-turn less precarious than formerly. The commer- cial importance of the district depends mostly on its raw materials. It manufactures broad-cloth, jewellery, and sweetmeats; among the articles produced at the Rurki workshops are steam-engines, pumps, printing presses, lathes, and mathematicalinstruments. The gross revenue of Saharanpur in 1883-84 amounted to £172,960, of which the land-tax contributed £118,067.

During the later years of the Mogul empire Saharanpur was the scene of much strife and suffering on account of the perpetual raids of the Sikhs, but in 1785 the district under Ghulam Kadir enjoyed comparative tranquillity. On his death the country fell into the hands of the Mahrattas, but it was for a time occupied by the adventurer George Thomas, until his death in 1802. It was afterwards overrun by Sikhs and Mahrattas, remaining practically in the hands of the former until their final defeat in November 1804, when it passed under British rule. Several disturbances subsequently took place among the native chiefs; but from 1824 to 1857 nothing occurred to disturb the peace of the district. The mutiny in this part was soon quelled.

SAHARANPUR, principal town and administrative headquarters of the above district, is situated in 29° 58’ 15” N. lat. and 77° 35’ 15” EH. long., on a small stream

(the Damaula Nadi) in an open level country. Its height’

above the sea is over 900 feet. The town possesses a fine botanic garden, where early experiments were made in tea and cinchona culture. Amongst its buildings are an old Rohilla fort, used as a court-house, and a handsome

Mo- hammedan mosque. A considerable trade is carried on in grain, sugar, molasses, and country cloth. The population in 1881 was 59,194 (31,506 males and 27,688 females).

SAIDA. See Sipon.

SAIGA. See ANTELOPE, vol. ii. p. 102.

_ SAIGON, the capital of French Cochin China, occupies an area of 1000 acres, on the right bank of the Saigon river or Don-nai (one of the streams that inosculate with the deltaic branches of the Me-kong), about 60 miles from

the China Sea. In 1884 it was connected by rail with Mytho, 37 miles south-west on one of the branches of the Me-kong, with which it had obtained direct water-communi. cation in 1877 by the opening of the Canal de Cho-gon The present city has : been practically created since 1861, and its fine streets, boulevards, squares, and public buildings make it one of the most attractive towns in the East, as it was well planned and the plan not un- | worthily carried out. The town possesses a

governor’s palace or cit- EAS : adel (cost 12,000,000 aN \

francs) with a grand Fig. 1.—Map of Saigon District,

facade, a cathedral (1877; cost 2,500,000 francs), a palace of justice (1882), a chamber of commerce, a large military hospital, nunicipal gardens, and botanical gardens with collections of wild beasts. Among the educational insti- tutions are the Collége Chasseloup-Laubat and the Col- lége d’Adran, the latter in memory of Bishop Piqueaux dé Behaigne, whose tomb is in the vicinity of the town. There is a large arsenal with upwards of 100 European employés and a special establishment for the artillery with machine-shops and foundries.

Fig. 2. £2,000,000, were exported. In 1884, leaving out the Messageries Maritimes, 503 vessels (568,077 tons), of which

239 (253,871 tons) were British, cleared from Saigon. Fig. 2 shows the relative positions of Saigon and Singapore.

Saigon was the native capital of Lower Cochin China and the residence of the governor of the southern provinces. In 1836 it was fortified for the emperor Gia Long by Colonel Ollivier. The French under Admiral Rigault de Genouilly captured it in 1858, and it was part of the territory eeded in 1861. The importance of the old town may be judged by the vast mounds of brick and stone which still crowd the ancient necropolis on one of the two roads between Saigon and Cholon. 5

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SAIL, SAILCLOTH, SAILMAKING. A sail is a sheet of canvas (or other material of the requisite flexi- bility and strength) by the action of the wind on which, when spread out or extended, a vessel is moved through the water. Sails are supported and extended by means of masts, yards, gaffs, booms, bowsprit—all technically termed “spars ”—and stays or slanting ropes. In the first experiments for impelling vessels by sails the least com- plicated form, that of a single square sail erected on a single mast, was no doubt adopted. To the quadrangular the triangular sail would soon be added ; and single sails of both these forms are known to have been used at very early periods. Subsequently the trapeziform and trape- zoidal sails also came into use. As vessels increased in size, thereby requiring a greater surface of canvas to impel them, it became necessary to use not only more sails but also an increased number of masts; and the number and disposition of the several kinds of sails could be almost indefinitely varied according to the ideas of navigators, the services required of the vessels, the places in which they were employed, and the size of the crews. Thus a great variety of rig naturally arose. Leaving out of account the many nondescript styles adopted in the case of boats and small craft, all modern vessels may, for general purposes, be considered as belonging to one or other of the following categories—cutter, schooner, three-masted schooner, brig- antine, brig, barquetine, barque, or full square-rigged ship ; but the cardinal distinction is that by which they are classified as square-rigged or fore-and- aft-rigged (compare SEAMANSHIP and Sup). These expressions can be easily explained by reference to any three-masted ship. The mast nearest the

bow or head is known as the fore-mast, the next abaft or nearest the middle of the ship as the main-mast, and the third or that nearest the stern as the mizzen-mast. Hach mast consists of several sections, that attached to the hull being called the lower or standing- mast, the next above that the top-mast, the next the top- gallant-mast, above which may rise a pole or royal-mast. On each of these masts, and at right angles with it, is a yard denominated “square,” which is hung (slung) by the middle and balanced. These yards are named according to their situation, those placed on the fore and main standing-masts being called respectively the fore and main lower-yards, that on the mizzen the cross-jack-yard ; the yards on the top-masts are called the top-sail-yards, those on the top-gallant-masts the top-gallant-yards, and those on the royal-masts the royal-yards. To each of these yards a sail is bent or attached, taking its name from the yard; thus the principal sail upon the fore-lower-yard is called the fore-course or fore-sail; the next above, upon the fore-top-sail-yard, is the fore-top-sail; above which, upon the fore-top-gallant-yard, is the fore-top-gallant-sail ; and above all, upon the fore-royal-yard, is the fore-royal. Tn like manner on the main-mast we have the main-course or main-sail, main-top-sail, main-top-gallant-sail, and the main-royal, Similar appellations are given to those on the mizzen-mast ; in large merchant-ships, by means of a sky-sail-pole, a sail termed “‘sky-seraper” is sometimes set above the royals, but not so frequently as formerly. Such square sails can be placed at right angles to the direction of the keel of the ship, a position given to them when going before the wind ; the same sails can also, by means of braces, be placed obliquely to the keel with a side wind, commonly termed by seamen “on a wind” or “by the wind.” In addition to these there are sails between the masts, set either on gaffs (unbalanced) or on stays, also others beyond the extremities of the ship, extended prin- clpally by means of the bowsprit, which, in addition to Supporting the fore-mast by a stay, also supports the jib and flying-jib-booms for extending the sails still farther

forwards ; the means for extending thie after-sail are the driver or spanker-boom and the gaff. Sails extended or set on gaffs and on stays are called “fore-and-aft,” and are generally or approximately in a vertical plane passing through the keel; but a certain degree of obliquity can be given

them by easing off the sheet or aft lower corner of the sail. A ship fitted as above described would be termed “square-rigged,” the square sails predominating both in importance and in number. A square-rigged line- of-battle ship would be supplied with the following de- scriptions of sails 1 :—

Square. Pore-and-Aft.

Fore-course or fore-sail. Flying-jib.

», top-sail. Jib.

», top-gallant-sail. Second jib.

», Toyal. Fore-gaff-sail. Main-course or main-sail. », try-sail (storm-sail).

», top-sail. Main-gaff-sail.

», top-gallant-sail. » try-sail (storm-sail).

>, royal. Mizzen-try-sail (storm-sail), Mizzen-top-sail. Spanker.

», top-gallant-sail. Stay-sail-fore (storm-sail).

3, royal. Studding-sail-fore.

23 he

3? 33 top.

top. 35 – top-gallant. »» sail-main-top-gallant.

In the fore-and-aft-rig the principal sails are of course fore-and-aft ; a cutter (vessel with one mast) when fully equipped carries the following :—

Fore-and-Aft. Jib-top-sail, Jib. Fore-sail. Boom-main-sail. Gaff-top-sail.

The several sides of a sail have separate names applied to them, the upper part or side being known as the “ head,” the lower part as the “foot”; the sides in general are called “leeches,” but the weather or side edge where the

wind enters the sail, of any but a square-sail, is called the “luff,” and the other edge the “‘after-leech.” The two top corners are “earings,” but the top corner of a jib, &c. (triangular, one corner only), is the “head”; the two bottom corners are in general “clews”; and the weather clew of a fore and-aft-sail or of a course while set is the “ tack.”

The relative importance of particular sails in the working of a ship varies according to conditions of weather, and is a matter for the judgment of the officer incommand. The following table, however, shows approximately what sails are commonly set “by the wind,” presuming that the effect on the ship in relation to her stability is safe :—

Square. Square-sail (set flying).

Winds as commonly

distinguished. Sails commonly set ‘‘ by the wind.”

iehtairs 2… 5.2

Light winds …...

Light breezes …|

| Moderate breezes |

Fresh breezes …| Royals and flying-jib taken in, in a sea way, to two reefs in the top-sails.

Single-reefed top-sails, and top- gallant -sails, in mueh sea, two reefs in the top-sails to taking in top-gallant-sails.

Courses, top-sails, top-gallant-sails, royals, spanker, jib, flying-jib, and all light sails.

Strong breezes …

Moderate gales …; Double-reefed top-sails to treble-reefed top- sails, reefed spanker, and jib. Fresh gales …... Close-reefed top-sails, reefed

courses, to tak-

ing in spanker, jib, fore and mizzen top- sail,

Reefed courses, elose-reefed main-top-sail, fore-stay-sail, mizzen-try-sail, to taking in the main-sail.

Strong gales…...

Heavy gales …... Close-reefed main-top-sail, storm stay-sails, to storm stay-sails or close-reefed main-top- sail only.

| Storms.

1 Some ships (merchant-liners) have two jibs, inner and outer, and

XX]. — 20

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To the casual observer sails when spread and in use appear merely as so many large pieces of cloth ; but some of them are of very considerable size: it is not at all un- usual in full square-rigged ships for a main-course or main-sail to contain 1000 yards of canvas (24 inches wide), and a main-top-sail nearly as much,—the single suit for such a vessel comprising upwards of 10,000 yards. Courses and top-sails are made reducible ; in the British navy they are reduced by means of reefs (two in courses, four in top-sails), each fitted with spilling, slab, and reef lines and becket, and toggles on the yard (reef-points throughout being now obsolete). In the merchant service double top-sails—upper and lower—are much in use on account of handiness in reducing sail ; there is also “ patent reefing gear,” such as Cunningham’s, which allows reefing to be done as much as possible from deck. The dimensions of masts and yards, quantity of canvas or area of sail, centre of gravity of each sail (from which the moment of sail is obtained and compared with the moment of stability), centre of effort of the sails, and other important calcula- tions necessary in relation to the body of the vessel are made by constructors and naval architects.

Sailcloth is obtainable from any description of fibrous material capable of being woven into cloth, having sufficient compactness and closeness of texture, and possessing the requisite strength for sustaining the heavy pressure which sails often have to bear in severe weather. Several descriptions of fibre might be enumerated which would to a certain extent serve for sailcloth but for the absence of quality of endurance or resistance ; hemp has been and is now occasionally used, as also a mixture of cotton and linen yarn, or cotton only,—especially in America ; but in the United Kingdom FLax (q.v.) is the usual staple material, since, when well manufactured, it possesses the qualities of flexibility and lightness, and, what is still more important, the element of strength in a very large degree.

The following points may be regarded as of primary importance for securing sailcloth or canvas of a superior quality and durability. Whatever flax is uscd, it is absolutely necessary that the “warp” and “weft” of the canvas be spun wholly from the “longs,” be free from blacks and any mixture of short flax, well dressed or heckled, aud that the yarn be well and evenly spun and properly twisted. Both warp and weft yarn should be twice boiled with the best American pot and pearl ashes, aud carefully and thoroughly washed and cleansed. No acid chloride of lime or other preparation of chlorine, nor any deletcrious substance, should be uscd in any stage of the process, otherwise the integrity of the fibre will most probably be interfered with ; the only advantage got is that the cloth looks much whiter, which for yachts and pleasure-boats is perhaps desirable, but for naval and mercantile uses is not at all necessary. The yarns are first boiled a sufficient length of time in a solution of the best American potash, in fixed proportions of ashes, green yarn, and water, then mill-washed (beating process), and subse- quently carefully washed in a considerable stream of clear running water, and wrung. They are again boiled for a sufficient length of time in a solution of American pearl ashes, in due proportions of ashes, green yarn, and water, then carefully rinsed, or washed in a clear stream of water, carefully dried, and frequently shaken in the course of drying, so that the fibres of the flax may be equally stretched. These repeated boilings, &c., have the effect of cleans- ing, bleaching, softening, and removing all vegetable impurities which may be hanging about ; no starch, tallow, paste, or weaver’s dressing of any description should be used, otherwise the fabric will tend to mildew if allowed to remain damp

for any time. Sail- cloth is made in bolts, mostly 24 inches wide, but also 18 inches wide, and for yachting purposes frequently still less wide, upon the ground that the narrower the cloth the flatter and better will the sail stand to its work. It is generally made of eight different qualities in respect of thickness, numbered 1 to 8 accordingly ; the heavier numbers—Nos. 1, 2, and 3—are used for storm and other sails that have to do heavy work, the remaining numbers for the lighter descriptions of sail. The weight of each bolt of canvas 24 inches wide, from Nos. 1 to 6 inclusive for 39 yards in length and

their top-sails also in two parts, upper and lower or eap-top-sails, an arrangement which makes it easier to reduce or shorten sail; they also

have a mizzen eourse (eross-jack), and carry several light stay-sails so as to cateh every breath of wind.

Sp A Lae

for Nos. 7 and 8 for 40 yards in length, is about as follows, viz, No. 1, 46 1b; No. 2, 43; No. 3, 40; No. 4, 36; No. 5, 33; No,

canvas is in proportion.

6, 30; No. 7,27; No. 8, 25 1b. The weight of each bolt of narrower The warp (or lengthwise) should consist of the following proportions of elean unstarched yarn, viz. :—

No. 1 not less than 26 ib…... 163 score reed 2 ie We 163 = 3 Ks Te 164 * 4 a lee. eee 17 ss 5 ee a1) ene 17 BF 6 a IDS apps: 17 a a – Tape ae0 as 8 oe Tee 20 is

As a rule about 40 yards in length may be considered as the average content of each bolt. Particular attention should be paid to the weaving, that the texture be struck sufficiently close, and the selvages be evenly and well manufactured ; what is termed a slack selvage (that is, one selvage longer than the other) is not only awkward for the sailmaker but unsatisfactory both in wear and appearance, the slack side showing itself puckered. Sailcloth made upon these conditions is very likely to be a good article ;

tests, however, can be applicd, generally to strips 1 inch wide from Nos. 1 to 6 inclusive, and 14 inch wide from Nos. 7 and 8. Weft and warp (24 inches in length) in each case are placed ina small testing machine, which has a dial plate with a spring under- neath ; vices are attached to grip the strips, one vice to the spring, the other in connexion with a long screw with a handle; by turning this handle the vices are drawn asunder until the strip breaks, and the hands on the dial-plate indicate the strain in pounds. The following is a fair test of strength for the various numbers of good sailcloth :—

Weft. i Weft. Warp.

Noy USaoqasace A ileegboone 340 Ib INGE sca Si OND). «etree 260 ib Zep eqnedc 200) epoeeoce 320 Go oogooer 350 creme 250 aldnotocan Gu) secescan 300 Uodnoecsc 390) [eee 330 4 o20) acooneon 280 Raccoon 380) Ceeeemen 310

Tt is not at all unusual, however, to find some sailcloth stand a strain considerably in excess of this. Freedom from blacks, twist and spun of the yarn, stiffening, calendering, &c., can be discovered by observation and a magnifying glass, excessive dressing by a little tincture of iodine.

Sailmaking is a very old branch of industry in connexion with the navy and commerce, and it still continues to be important notwithstanding the enormous extent to which steam is now employed in navigation.

The operations of the sailmaker may be stated as follows. The dimensions of mast and yards and sail plan being supplied, the master sailmaker is enabled to determine the dimensions of each sail—after due allowance for stretching—in terms of cloths and depth in yards—if a square sail, the number of cloths in the head, number in the foot, and the depth in yards ; if a fore-and-aft sail (triangular), the number of cloths in the foot, and the depth in yards of the luff or stay and of leech or after-leech ; if a fore-and-aft sail (trapezium form), the number of cloths in the head, number in foot, and the depth of mast or luff and of after-leech. These particulars obtained, there is got out what is technically termed a ‘‘casting,” which simply means the shape, length, &c., of each in- dividual cloth in the sail. These figures are given to the cutter, who proceeds to cut out the sail cloth by cloth in

consecutive order, numbering them 1, 2, 3, 4, &c. ; the series of cloths thus eut out are handed over to the workman, who joins them together by carefully made double flat seams, sewn with twine specially prepared for the purpose, with about 120 stitches in a yard. In the heavy sails the seam is about an inch and a half in width and in the British navy stuck or stitched in the middle of the seam to give additional strength; the seams in the lighter sails are about an inch wide. The whole of the cloths are then brought together, and spread out, and the tabling (or hemming, so to speak) is turned in and finished off with about 72 stitches toa yard. Strengthen- ing pieces or ‘‘ linings” are affixed where considered necessary, m courses and top-sails such pieces as reef-bands, middle-bands, foot bands, leech-linings, bunt-line cloths; in top-sails (only) @ top- lining or brim ; in other and lighter sails such pieces as mast-lining clew and head, tack, and corner pieccs ; holes, such as head, rect, stay (luff), mast, cringle, bunt-line, &c., are also made where re- quired, a grommet of line of suitable size being worked in them to prevent their being cut through. The next thing to be done is to secure the cdges of the sail,—an important operation, as much depends upon this whether the sail will stand well and do its work efficiently. Bolt-rope, a comparatively soft laid rope made from the finer hemp yarn (Italian) is used for this purpose ; im the British navy it ranges from 1 inch (increasing in size by quarter inches) up to 8 inches inclusive, the size selected for each part 0 a sail being determined by the amount of strain it will have to bear; it is then neatly sewn on with roping twine specially pre pared, the needle and twine passing between and clear of evety two strands of the rope in roping. Where slack sail has to be taken in, it is the practice to leave it to the judgment of the sail-

ae

maker; but where possible it is better to set up the rope by means of a tackle to a strain approximate to what it will have to bear when in use, and whilst on the stretch mark it off in yards, as also the edge of the sail in yards, so that by bringing the marks to-

gether in roping the sail will stand flat. In the British navy the largest size of rope sewn on toa sail is 6 inches ; sizes above this fo)

are used for foot and clew ropes of top-sails and courses, being first svormed, parcelled (that is, wound round with strips of worn canvas), tarred, and served over with spun yarn ; the foot of the sail is then secured to it by being marled in. Where two sizes of bolt-rope used in roping a sail have to be connccted, it is effected by a tapered splice. Cringles (similar to the handle of a maund) formed by a strand of bolt-rope, mostly having a galvanized iron thimble in them as a protection, are then stuck where necessary, as at the corners, sides or leeches, mast or luff; they are required either for making stationary or hauling “taut” by tackle or otherwise certain parts of the sail when in use. Fore-and-aft sails, such as spankers, gaff-sails, and storm try-sails, are reduced in size by reef-

oints made of stout line (4 to 20 Ib), crow-footed in the middle, a hole being pierced through every seam ; one-half of the point is passed through and the crowfoot sewn firmly to the sail; the number of reefs depends upon the size of the sail, and the reefs are placed parallel to the foot. The sails—now finished in respect of making—have to be fitted, that is, such ropes have to be attached to cach of them as are necessary for proper use; such ropes may be summarily stated as follows :—head-earings, robands, reef-car- ings, reef-lines, spilling and slab lines, reef-tackle pendant, reef- points, bow-line bridles, bunt-line toggles, bunt-becket, leech-line strops and toggles, toggles in clews, sheet ropes, down-haul, lacings,

head and stay, tack-rope (gaff top-sail), tack lashing, bending strops,

matting, and gaskets.

The tools and appliances of a sailmaker are not very numerous :— a bench about 7 feet long and 15 inches high, upon which he sits to perform the greater part of his work ; palms for seaming and roping to fit the hand, made of hide lined with Icather, a plate properly tempered being fixed in it having chambers to catch the head of the needle, thus acting as a thimble in forcing it through the several parts of canvas in seaming, and between the strands and through the canvas in roping ; needles of various sizes, that for seaming being the smallest ; and fids, splicing, serving, and stretch- ing knife, rubber, sail-hook, bobbin for twine, and sundry small articles. (E. JE.)

SAINFOIN (Onobrychis sativa) is a low-growing per- ennial plant with a woody root-stock, whence proceed the stems, which are covered with fine hairs and bear numerous long pinnate leaves, the segments of which are elliptic. The flowers are borne in close pyramidal or cylindrical clusters on the end of long stalks. Each flower is about

half an inch in length with lanceolate calyx-teeth shorter

| it is considered as an escape from cultivation.

than the corolla, which latter is papilionaceous, pink, with darker stripes of the same colour. The indehiscent pods or legumes are flattened from side to side, wrinkled, some- what sickle-shaped and crested, and contain only a single seed. In Great Britain the plant is a native of the calcareous districts of the southern counties, but elsewhere It is native throughout the whole of central Europe and Siberia; but it does not seem to have been cultivated in Great Britain till 1651, when it was introduced from France or French Flanders, its French name being retained. It is grown as a forage plant, being especially well adapted for dry Innestone soils. It has about the same nutritive value

| as lucerne, and is esteemed for milch cattle and for sheep

in winter. Sinclair speaks in high terms of its value for this latter purpose.

SAINT. The New Testament writers have much to say

: about the relations of the “saints” (as members of the various churches are usually called) with their living con-

temporaries, but are comparatively reticent on their duties and privileges with regard to their departed brethren. Long before the close of the 4th century, however, certain very definite practices in the way of commemoration and invocation had sprung up, which ultimately found doc- trmal expression in the authoritative documents alike of the Eastern aud of the Western Church. (1) Commemo- ration.— Under Funerau Rives, MaNEs, &c., allusion has already been made to the ancient custom of visiting the tombs of deceased relatives at certain periods and there

offering various gifts. With certain modifications, this practice was retained by the early Christians; they cele- brated the Eucharist at or near the grave, laid oblations on the altar in the name of the departed, and in the pre-communion prayer made supplication for the peace of their souls. Thus among the usages “ originated by tradition, strengthened by custom, observed by faith,” Tertullian (De Cor. Mil., 3; comp. De Exh. Cast., 11) mentions “the offerings we make for the dead as often as the anniversary comes round” (comp. Sacriricg, p. 139). If such com- memoration was usual in domestic circles, it was little likely to be omitted by Christian congregations in the case of those who had “spoken to them the word of God,” least of all when the bishop had also been, as was so often the case, a martyr. In the very instructive document of the 2d century, preserved by Eusebius (H. #., iv. 15), in which the martyrdom of PoLycarp (¢.v.) is described, we are told that the followers of the martyr, having taken up the bones, deposited them ‘where it was proper that they should be.” ‘There also, as far as we can, the Lord will grant us to assemble and celebrate the natal day of his martyrdom in joy and gladness.” Cyprian (Hp., 36) ex- horts that the days of death of those who have died in prison should be carefully noted for the purpose of celebrat- ing their memory annually; and all the earliest extant liturgies contain commemorations of the departed. The names to be commemorated were written on the diptychs (see Diptycn). (2) Jnvocation.—It is not difficult to under- stand how a belief in the efficacy of the prayers of departed saints—especially of martyrs—should at an early date have taken a practical form. Martyrs were believed to pass into the immediate presence of God, and the supposed nature of their claims there is not dimly indicated in the docu- ment already referred to, which once and again speaks of Polycarp as “a noble victim selected from the flock,” “a rich and acceptable sacrifice to God.” The readers of Cyprian are familiar with the use made of the intercession of living “martyrs” by the lapsed to secure their recon- ciliation with the church ; but positive evidence of the inter- cession of the dead being invoked for obtaining favour with God is not forthcoming so soon. Perhaps, indeed, Cyril of Jerusalem (c. 350) is the earliest author to make express allusion to the practice (Cat. Afyst., v. 9):

“we commemo- rate … patriarchs, prophets, apostles, martyrs, . . . that God at their prayers and intercessions (zpeoPetats) would receive our supplications.” In the liturgies, however, the oblation still continued to be offered “for all martyrs and confessors” as well as for others, and Augustine was the first to declare (Zn Joann., Tract. 84) that “at the table of the Lord we do not commemorate martyrs in the same way that we do others who rest in peace so as to pray for them, but rather that they may pray for us that we may follow in their footsteps.”

For the subsequent development of Catholic practice see the various church historics; compare also CANONIZATION, LiTAny, Retics, IMAGE WorsHipP, &c. Previous to the Reformation ecclesi- astical legislation mainly sought to check the popular tendency towards something like polytheism. The Tridcntine doctrine is ‘that the saints who reign along with Christ are to be honoured and invoked, that they offer prayers for us, and that their relics are to be venerated.”’ All the churches of the Reformation, on the other hand, while in one form or another commemorating “all thy servants departed this life in thy faith and fear,” practically concur in the teaching of the Church of England (Art. xxii.), that “the Romish doctrine concerning . . . invocation of saints” is ‘‘a fond thing, vainly invented, and grounded upon no warranty of Scripture, but rather repugnant to the word of God.”

ST ALBANS, a city, municipal borough, and market town of Hertfordshire, England, is finely situated on an eminence above the river Ver, on the main line of the Mid- land Railway and on branches of the London and North-Western and the Great Northern lines, about 24 miles

north-west of London and 5 miles west from Hatfield. The abbey or cathedral church, in some respects one of the most remarkable ecclesiastical buildings in England, is described below. St Michael’s church to the west of the town, within the site of the ancient Verulamium, was originally constructed in the 10th century partly out of the ruins of the town. Considerable portions of the Norman building remain ; the church contains the tomb of Lord Chancellor Bacon. St Stephen’s church, dating from the same period, contains soe good examples of Norman architecture. St Peter’s

church has been in great part rebuilt, but the nave of Early Perpendicular remains. The (restored) clock-house in the market-place was built by one of the abbots in the reign of Henry VIII. There is an Edward VI. grammar-school. The principal modern buildings are the corn exchange, the court-house, the prison, the public baths, and the public library. There are a number of charities and benevolent institutions, 1n- cluding the hospital and dispensary, and the almshouses founded in 1734 by Sarah duchess of Marlborough. The principal industries are the manufacture of silk and straw- plaiting. There are also breweries and ironfoundries. The population of the municipal borough (area, 997 acres, extended in 1879) in 1881 was 10,931; the population of the same area in 1871 was estimated at 8239. ; Not only is the cathedral ‘‘a text-book of medieval architec- ture from its beginning to its ending,” but it ‘is still in style, material, and feeling that onc among our great churches which most thoroughly carries us back to Old English and even to earlier days” (Freeman). Shortly after the execution of Britain’s proto- martyr, St Alban, probably in 303, a church was built on the spot. In 793 Offa of Mercia, who professed to have discovered the relics of the martyr, founded in his honour a monastery for Benedictines, which became one of the richest and most important houses of that order in the kingdom. The abbots Ealdred and Ealmer at the close of the 10th century began to break up the ruins of the old Roman city of Verulamium for materials to construct a new abbcy church ; but on account of the unsettled character of the times its erection was delayed till the time of William the Conqueror, when Paul of Caen, a relative of Archbishop Lanfranc, was in 1077 appointed abbot. Canterbury as built by Lanfranc was almost a reproduction of St Stephen’s, Caen ; but Paul, while adopting the same model for St Albans, built it on an immensely larger scale. The church was consecrated in 1115, but had been finished some years before. Of the original Norman church the principal portions now remaining are the eastern bays of the nave, the tower, and the transepts, but the main outlines of the building are still those planned by Paul. It is thus one of the most important specimens of Norman architecture in England, with the special characteristic

that, owing to the use of the flat broad Roman tile, the Norman —

portions are peculiarly bare and stern. The western towers were pulled down in the 13th century. About 1155 Robert de Gorham repaired and beautificd the early shrine and rebuilt the chapter- house and part of the eloister; but nothing of his work now re- mains except part of a very beautiful doorway lately discovered. Abbot John de Cella (1195-1214) pulled down the west front and portions of the north and south aisles. He began the erection of the west front in a new and enriched form, and his work was con- tinued by his successor William de Trumpyngtone (1214-35) in a plainer manner. In 1257 the eastern portion was pulled down, and between the middle of the 13th and the beginning of the 14th century a sanctuary, ante-chapel, and lady chapel were added, all remarkably fine specimens of the architecture of the period. In 1828 two great columns on the south side suddenly fell, which necessitated the rebuilding of five bays of the south aisle and the Norman cloisters. Various incongruous additions were made during the Perpendicular period, and much damage was also done during the dissolution of the abbeys to the finer work in the in- terior. The building within recent years has undergone extensive renovation, first under the direction of Sir Gilbert Scott, and latterly to a much greater cxtent under Sir Edmund Beckett. Its extreme length outside is 550 fect, which is exceeded by Winchester by 6 feet. ‘The nave (284 feet) is the longest Gothic nave in the world and exceeds that of Winchester by about 20 feet. The length of the transepts is 175 feet inside. The monastic buildings have all disappeared with the exception of the great gateway.

To the south-west of the present city of St Albans stood the ancient Verulamium, one of the oldest towns in Britain, on Wat- ling Street. It was the chief station of Cassivellaunus at the time of Cesar’s invasion, and under the Romans became a municipiwm. The ancicnt town which grew up around St Albans church was

completely destroyed by the Saxons betwcen 500 and 560. During Wat Tyler’s insurrection the monastery was besieged by the towns. people, many of whom were executed in consequence. At St Albans the Lancastrians were defeated on 21st May 1455, their leader, the duke of Somerset, being killed, and Henry VI. taken prisoncr; there too Queen Margarct defeated the earl of Warwick on 17th Februa 1461. During the civil wars the town was garrisoned for the Parliament. On a printing press, one of the earliest in the

king. dom, set up in the abbey the first English translation of the Bible was printed. A charter of incorporation was granted to the town by Edward VI. It returned two members to parliament unti] 1852, when it was disfranchised. It becamea bishop's see in 1877 Nicholas Breakspear, the only English pope (Adrian IY.), was born near St Albans, and was elected its abbot in 1187.

See Matthew Paris, Historia Major; H. T. Riley, Chronicle of the Monastery of St Albans, 11 vols., 1863-73 ; Nicholson, History of St Albans; Buckler, Norman Church of St Albans; Neale, Abbey Church of St Albans, 1879; Sir E. Beckett, St Albans Cathedral and its Restoration, 1885. :

ST ALBANS, a township and village of the United States, the capital of Franklin county, Vermont, at the junction of several divisions of the Central Vermont Railroad. The village lies on an elevated plain about 3 niles east of Lake Champlain, and has its principal buildings arranged round a public park. Besides being the seat of the extensive workshops of the railroad company, St Albans is the great cheese and butter market of the eastern States. In the neighbourhood, which is cele- brated for the beauty of its scenery, are quarries of calico stone and variegated marble. The population of the township was 1814 in 1850, 3637 in 1860, 7014 in 1870, and 7193 in 1880. Being only 14 miles distant from the Canadian frontier, the village has more than once been the scene of political disturbances. In 1866 a band of 1200 Fenians, on their return from a frnitless invasion of Canada, were disarmed there by the United States troops,

ST AMAND-LES-EAUX, a town of France, in the department of Nord, at the junction of the Elnon with the Scarpe (a left-hand tributary of the Scheldt), 74 miles by rail north-west of Valenciennes and 22 south-east of Lille. It has numerous industrial establishments, but is better known from the mineral waters in the vicinity. Though from Roman coins found in the mud it is evi dent that these must have been frequented during the Roman period, it is only two centuries since they began to be again turned to account. There are four distinct springs ; the water (75° Fahr.) contains sulphates of lime and sulphur, and deposits white gelatinous threads without smell or taste. The black mud, which constantly gives out sulphuretted hydrogen, is composed of thiree strata—(1) a clayey peat, (2) clay, and (3) a

composition of silica, carbonate of lime, oxide of iron, and aluminium. Numerous small sulphurous springs ooze through the lowest stratum and, soaking those above, form a slough in which patients suffering from rheumatism, gout, and certam affections of liver and skin remain for hours at a time. The population in 1881 was 7881 (commune, 11,184).

St Amand owes its name to St Amand, bishop of Tongres, who founded a monastery here in the reign of Dagobert. The abbey was laid waste by the Normans in $82 and by the count of Hainault in 1340. The town was captured by Mary of Burgundy in 1447, by the count of Ligne, Charles V.'s lieutenant, in 1521, and finally in 1667 by the French. The abbey has been destroyed, with the exception of the gateway flanked by two octagonal pavilions, now occupied by municipal offices ; and of the abbey church there re- mains only the 17th-century facade.

SAINT-AMANT, Marc ANTOINE GERARD, SIEUR DE (1594-1661), the most eminent of a curious bacchanalian school of poets in France during the 17th century, Was born at Rouen in the year 1594. Very little is known of his family except that it was of some position at Rouen, and the mysterious description which all his French bio graphers give of his father—that he was a sailor "qu commanda pendant 22 ans un escadre de la reine Kliza- beth" —does not greatly assist an English imagination. It appears that Saint-Amant himself haunted taverns and

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'other resorts of gay society a good deal during his youth 'and manhood, that he attached himself at different times 'to different great noblemen— Retz (the duke, not the car- 'dinal), Créqui, Harcourt, &c. that he saw some military service, and sojourned at different times in Italy, in England

a sojourn which provoked from him a violent poetical attack on the country, only printed within the last thirty years), in Poland (where he held a court appointment for

_two years), and elsewhere. But details on all these points are both few and vague. Saint-Amant’s later years were spent in France ; and he died at Paris in 1661.

~ Saint-Amant has left a not inconsiderable body of poetry as various in style as Herrick’s, and exhibiting a decided poetical faculty, hardly at all assisted by education. Of one class of his poetry the chief monument is the Moise Sauvé, published in 1653. The author calls this by the odd title of ‘‘idylle héroique”; but | it is to all intents and purposes an epic of the school of Tasso. It is not by any means without merit, and the alexandrine couplet is managed in it with much vigour and ease. The second and larger | part of Saint-Amant’s works consists of short miscellaneous poems ona great variety of subjects. The best of these are Bacchanalian,

| the oft-quoted La Débauche being one of the most remarkable

convivial poems of its kind. All through his work flashes of strength and true poetical imagination occur ; but he was rarely happy in his choice of subjects, and his execution is constantly

marred by want of polish and form. The standard edition of Saint-Amant, with life, notes, &c., is that in the

| « Bibliotheque Elzévirienne ” by M. C. L. Livet (2 vols., Paris, 1855).

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ST ANDREWS, a city, royal burgh, university town, and seaport of Scotland, in the county of Fife, is situated on a bay of the German Ocean and on a branch of the North British Railway, 9 miles east of Cupar and 11 south-south-east of Dundee. It occupies a platform of sandstone rock about 50 feet in height, running east and west and presenting to the sea a precipitous wall, which has been much encroached on by its action within recent years. The principal streets (North Street, Market Street, and South Street) diverge from the cathedral and run east and west, and Queen Street

runs south from the centre of South Street. Many new houses and villas have been

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Plan of St Andrews.

recently erected towards the south, north, and west. The prosperity of the city depends primarily on its educational institutions, especially the university. The golf links, which are considered the best in Scotland, and sea-bathing attract many residents and visitors. In the 16th century

St Andrews was one of the most important ports north of the Forth, and is said to have numbered 14,000 inha-

bitants ; but it fell into decay after the Civil War, and,

_ although it has much increased in the present century, its

trade has not revived to any extent. The harbour, pro- tected by a pier 630 feet in length, affords entrance to vessels of 100 tons burden. The principal imports are wood and coals and the principal exports agricultural pro-

duce. The herring and deep-sea fishing is carried on by about 170 fishermen. ‘The evidences of antiquity in the dwelling-houses are comparatively few. The city was never surrounded by walls, but had several gates, of which that called the West Port still remains. The most pro- minent ruins are those of the cathedral and the castle (see below). Among the modern public buildings are the town- hall (1858) in the Scottish baronial style, the golf club- house, the Gibson and fever hospitals, and the recreation hall (1884). The population of St Andrews in 1801 was only

3263, but by 1881 it had nearly doubled, being 6406. The parliamentary burgh in 1881 numbered 6458.

The cathedral originated partly in the priory of Canons Regular founded to the south-east of the town by Bishop Robert (1122-1159). Martine, who wrote in the end of the 17th century, states that in his time some of the buildings were entire and that considerable remains of others existed, but nearly all traces have now disappeared, with the exception of portions of the abbey wall and the archways, now known as the "' Pends," forming the main entrance from the city. The wall is about three-quarters of a mile long and bears turrets at intervals. The cathedral was founded by Bishop Arnold (1159-1162), to supply more ample accommodation for the canons and for the celebration of the worship of the see than was afforded by the church of St Regulus. Of this older building in the Roman- esque style, probably dating from the 10th century, there remain the square tower, 108 feet in height, and the choir, of very diminu- tive proportions. On a plan of the town c. 1530 a chance. appears beyond, and on seals affixed to the city and college charters there are representations of other buildings attached. The cathedral which succeeded the church of St Regulus is represented in full outline in the plan of the town of 1530. It was constructed in the form of a Latin cross, the total length of the building inside the walls being 355 feet, the length of the nave 200, of the choir and lateral aisles 62, and of the lady chapel at the eastern extremity 50. The width at the transepts was 166 feet and of the nave and choir 62. According to Fordun the building was founded in 1159 ; but before it was finished the see witnessed the succession of eleven bishops, the consecration taking place in the time of Bishop Lamberton (1297-1328) in 1318, when the ceremony was witnessed by Robert the Bruce. When entire it had, besides a central tower, six turrets, of which two at the castern and one of the two at the western ex- tremity rising to a height of 100 feet still remain. The building was partly destroyed by fire in 1378, and the restoration and further embellishment were completed in 1440. It was stripped of its altars and images in 1559 by the magistrates and inhabitants of the city. It is believed that about the end of the 16th century the central tower gave way, carrying with it the north wall. Since then large portions of the ruins have been taken away for building purposes, and nothing was done to preserve them till 1826. The principal portions now remaining, partly Norman and partly Early English, are the

eastern and western gables, the greater part of the southern wall of the nave, and the western wall of the south transept.

Closely connected with the fortunes of the cathedral are those of the castle, the picturesque ruins of which are situated about 250 yards north-west of the cathedral, on a rocky promontory now much worn away by the sea. It is supposed to have been erected by Bishop Roger about the beginning of the 13th century as an episcopal residence, and was strongly fortified. It was frequently taken by the English, and after it had been captured by the Scottish regent in 1336-37 was destroyed lest it should fall into their hands. Towards the close of the century it was rebuilt by Bishop Trail in the form of a massive fortification with a moat on the south and west sides. James I. spent some of his early years within it under the care of Bishop Wardlaw, and it is supposed to have been the birthplace of James III. From a window in the. castle Cardinal David Beaton witnessed the burning of Wishart in front of the gate, and shortly afterwards he was murdered within it in his bedroom by a party of Reformers. The castle was taken from the conspirators by the French, among the prisoners captured. being John Knox. Some ycars afterwards it was repaired by Arch- bishop Hamilton, but in a less massive and substantial form. It had in 1656 fallen into such disrepair that the town council ordered its "'sleatts and timmer, redd and lumps" to be devoted to the repair of the pier at the harbour. The principal remains are a por- tion of the south wall enclosing a square tower, the bottle dungeon below the north-west tower, the kitchen tower, and a curious sub- terranean passage.

The town church, formerly the church of the Holy Trinity, was originally founded in 1112 by Bishop Turgot. The early building was a beautiful Norman structure, but at the close of the 18th eentury the whole, with the exception of little else than the square tower and spire, was re-erected in a plain and ungainly style. Within the church Knox preached the sermon which led to the stripping of the cathedral and the destruction of the monastie

buildings. It contains an elaborate monument to Archbishop Sharp. Near the south-west of the town is the ruined northern transept of the chapel of the

Dominican monastery founded by Bishop Wishart in 1274; but all traces of the Observantine mon- astery founded about 1450 by Bishop Kennedy have disappeared, except the well. The church of St Mary on the rock erected by the Culdees is supposed to have stood on the Lady's Craig now covered by the sea; and the foundations of another, also dedicated to the Virgin, to the west of the harbour were discovered in 1860, giving the full outline of the ground-plan of the building.

The university was possibly a development of the ''schools" which were in existence as early as the beginning of the 12th century, and were endowed by certain ''rents and kune" payable to them from lands in the neighbourhood. Its immediate origin was due to a society formed in 1410 by Lawrence of Lindores, abbot of Scone, Richard Cornwall, archdeacon of Lothian, William Stephen, afterwards archbishop of Dunblane, and a few others, for the instruction of all who chose to attend their lectures. A charter was granted in 1411 by Bishop Wardlaw, who attracted the most learned men in Scotland as professors, and bulls were obtained from the pope in 1413 confirming the charter and constituting it a studiwm generale or university. The lectures were delivered in various parts of the town until 1430, when a building called the ''nedagogy" to the Faculty of Arts was granted by the founder of the university. St Salvator's College was founded and richly endowed by Bishop Kennedy in 1456; twelve years later it was granted the power to confer degrees in theology and philosophy, and by the end of the century was regarded as a constituent part of the university. In 1512 the university received a further addition by the foundation of St Leonard's College by Prior John Hepburn and Archbishop Alexander Stuart on the site of buildings which at one time were used as a hospital for pilgrims. In the same year Archbishop Stuart nominally changed the original " pedagogy " into a college and annexed to it the parish church of St Michael of Tarvet ; but its actual crection into a college did not take place until 1537. By a bull obtained from Paul III. it was dedicated to the Blessed Virgin Mary of the Assumption. The outline of the ancient structure is preserved, but the general character of the buildings has been much altered by various restorations. They form two sides of a quadrangle, the library and principal's residence being on the north and the lecture-rooms and old dining-hall on the west. The university library, whieh now includes the older college libraries, was founded about the middle of the 17th

century, rebuilt in 1764, and improved in 1829. The lower hall in the older part of the building has been used as a provincial meeting-place for the Seottish parliament. When the constitution of the colleges was remodelled in 1579 St Mary's was set apart to theology; and in 1747 the colleges of St Salvator and St Leonard were formed into the United College. The buildings of St Leonard's are now occupied as a high class school for girls. The college chapel is in ruins. The United College occupies the site of St Salvator's Col- lege, but the old buildings have been removed, with the exception of the college chapel, now used as the university chapel and the parish church of St Leonard's, a fine Gothic structure containing an elaborate tomb of Bishop Kennedy ; the entrance gateway with the square clock tower rising to a height of 152 feet; and the janitor's house, with some class-rooms above. The imodern build- ing, in the Elizabethan style, forming two sides of a quadrangle, was erected between the years 1827 and 1847. The Madras College was founded and endowed by Dr Andrew Bell. It is attended by about 700 pupils. There are also several large boarding and day schools.

St Andrews (see ScorLAND) is said to have been made a bishopric in the 9th century, and when in 908 the Pictish and Scottish Churches were united the primacy was transferred to it from Dun- keld, its bishops being henceforth known as bishops of Alban. Turgot, who was appointed in 1109, was the first bishop who really filled the see. It became an archbishopric during the primacy of Patrick Graham (1466-78). This ceased in 1688. It was created a royal burgh by David I. in 1124. The St Andrews district of burghs returns onc member to the House of Commons.

Martine, History and Antiquities of St Rule's Chapel, St Andrews, 1787 ; Grier- son, Delineations of St Andrews, 1807, 3d ed. 1838; Reliquiw Divi Andrex, 1797 ; Liber Cartarum Sancti Andrew, Bannatyne Club, 1841 ; Skene, ' Ecclesiastical

Scttlements in Scotland," in Proc. Soc. Antig. Scot., 1862-63 ; Histories of St Andrews by Lyon (1843) and Rogers (1849); Skene, Celtic Scotland. (T. F. H.)

ST ASAPH, a city and parliamentary borough of North Wales, in the county of Flint, is situated on an eminence in the Vale of Clwyd, near the junction

of the Clwyd and Elwy, about 6 miles south-south-east of Rhyl and 6 north-north-west of Denbigh. It is somewhat irre- gularly built and has an antique appearance. On the brow of the hill is an encampment, Bron-y-Wylva, supposed to have been occupied by the Roman forces under Suetonius Paulinus. According to tradition the cathedral occupies the site of a church and monastery founded by St Kenti-

gern about 560, when he fled from Strathclyde. It wag originally called Llan-Elwy, the church on the Elwy. J is uncertain whether the first bishop was Kentigern or Asaph, to whom Kentigern committed the charge of the church and monastery when he returned to Scotland. The ancient wooden structure was burnt down by the English in 1245; and again in 1278 the same fate befell the building. A third edifice was in great part destroyed during the wars of Owen Glendower in 1402. The

greater part of the present building was constructed by

Bishop Redman about 1480 ; the choir and chancel under- went restoration from the designs of Sir Gilbert Scott in 1867-68, and the nave in 1875, when a new roof was added. It is one of the smallest cathedrals in Britain, its total length being 182 feet, while the breadth across the transepts is 108 feet. It is a plain cruciform structure, chiefly Decorated, but with some Early English portions, with an embattled tower, 97 feet in height, rising from the intersection of the nave and the transept. In the south transept there is a library of nearly 2000 volumes, inelud- ing some rare and valuable books. The bishop’s palace isa comparatively modern structure. The town has a grammar- school (1882), county court offices, the union workhouse, and almshouses. The population of the borough (area, 1155 acres) in 1881 was 1901 and of the parish 3177. ST AUGUSTINE, a city of the United States, capital of St John’s county, Florida, has the distinction of being the oldest city in the States built by Europeans, and has re- cently become a popular winter watering-place. By rail it is 36 miles south-east from Jacksonville. It stands ona narrow sandy peninsula, not more than 12 feet above the sea, formed by the Matanzas and San Sebastian rivers, and is separated from the ocean by the northern end of Anastasia Island. The streets are very narrow, the principal thorough- fares being only 12 or 15 feet wide, and the balconies of the old houses often project so as almost to

meet overhead. Along the sea-front for nearly a mile extends a granite. coped sea-wall (1837-43), which forms a fine promenade, At its northern end stands the old fort of San Marco (now Fort Marion), a well-preserved specimen of Spanish military architecture (finished 1756), with moat and outworks, walls 21 feet high, bastions at the corners, heavy casemates, dungeons, and subterranean passages. It is in the form of a trapezium, and covers about 4 acres. Like most of the Spanish buildings, it is constructed of coquina, a curious shelly conglomerate from Anastasia Island, which was easily quarried, but grew very hard on exposure to the atmosphere. The same material was used for paving the streets, which were thus kept extremely clean and firm. At the southern end of the sea-wall is the old Franciscan monastery, now used as United States barracks. Of the Spanish wall which ran across the peninsula and defended the city on the north side there only remains the so-called city gate. In the centre of St Augustine is the Plaza de la Constitucion, which takes its name from the monument in the middle, erected in 1812 in memory of the Liberal Spanish Constitution. On this square stand the cathedral (1793), with a Moorish belfry, the old governor’s palace, now used as a post-office and public library, and an Episco- pal church in modern Gothic. Other buildings of note in the town are the convent of St Mary and the convent of the sisters of St Joseph. Modern villas and hotels have recently been erected in various parts. Palmetto straw goods are largely manufactured in St Augustine, the palmetto being one of the characteristic features of the surrounding landscape, to which orange and lemon trees also contribute. The climate is remarkably equable, the mean temperature for winter being 58°, and for the other seasons 68°, 80°, and 71° respectively. Frosts seldom occur, though that of 1835 killed many of the orange-

| trees.

In 1880 the total population of the city was 9293, but in winter northern visitors swell the number to

7000 or 8000.

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Menendez de Aviles arrived off the coast of Florida on 28th August (St Augustine's day) 1565, and accordingly he gave the name of that saint to the city which he shortly afterwards founded. His first act was to attack the French settlement on St John's river, and two years later the French retaliated on St Augustine (see FLoripa,

vol. ix. 340, and Ripautt). In 1586 Drake attacked and plundered

the town, and throughout the 17th century it frequently suffered from the raids of Indians, pirates, and the English settlers of South Carolina and Georgia. Occupied by the British from 1763 to 1783, it ultimately passed to the United States in 1821. During the Civil War it changed hands three times.

ST BARTHOLOMEW, or St Bartuettemy, a French island of the West Indies, in the archipelago of the Antilles, is situated in 17° 55' 35" N. lat. and 63° 60' 15" W. long., 108 miles north-north-west of Guadaloupe, of which, poli- tically, it is a dependency. In form it is very irregular and the surface is mountainous. The soil, in spite of a scarcity of moisture, is not unfertile ; and in some of the valleys the growing of vegetables is an important industry. Bananas, cassia, tamarinds, and sassafras are exported. In modern times zine and lead ores have been found in the island, but they are not worked. Rocks and shallows make St Bartholomew difficult of access, and its port (Le Carénage), though safe during the greater part of the year,

is capable of receiving only the larger class of coasting

the left bank of the Gouet, serves as its seaport.

in considerable quantities to Paris.

vessels. The chief town is Gustavia, near the port. The population was 2942 in 1883.

St Bartholomew, occupied by the French in 1648, was ceded to Sweden in 1784 ; but it was restored to France by the treaty signed at Paris, August 1877, with the full approval of the inhabitants, who had remained French in

language and manners. Universal suffrage was introduced in 1830 and slavery abolished in 1848.

ST BRIEUC, a town of France, chef-lieu of the depart- ment of Cotes du Nord, 295 miles west of Paris by the railway from Brest, at the junction of a branch to Vannes by Pontivy. It stands 290 feet above the sea, between 1] and 2 miles from the English Channel, where Légué, on About 600 vessels, with an aggregate of 27,600 tons, enter or clear per annum; the local shipowners take part especi- ally in the Newfoundland and Iceland fisheries. St Brieuc is an old town with a considerable number of curious houses. The principal articles of trade are grain, flax, hemp, vegetables, honey, cider, butter, and eggs, which are despatched to England, and fish and game, which are sent At the fairs in bygone

days the Breton women sold their hair for trifling sums.

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Nurseries of some size exist at St Brieuc, and in the neigh- bourhood are quarries of blue granite, giving employment to 300 workmen. St Brieuc is the seat of a bishopric in the province of Rennes, and has a cathedral dating from the 13th century, but partially rebuilt in the 18th, and extensively restored recently. The tombs of the bishops, the modern but delicately carved organ-loft, the tapestries, aud the stained-glass windows deserve mention. The old monastery of the Capuchins is occupied by the civil hos- pital, The monastery of the Cordeliers contains the lycée, a library of 30,000 volumes, and a museum of archzology

, and natural history, and the convent of the Ursulines has

_ been turned into barracks.

The episcopal palace, the pre- fecture, and the town-house were formerly private mansions, a class of old buildings which is steadily being reduced in number by the opening of new streets. A colossal image of the Virgin looks down upon the town, and the Dugues- clin boulevard, on the site of the ramparts, has a statue of that hero. The population in 1881 was 14,869 (com- mune 17,833),

z St Brieuc owes its origin and its name to the missionary St tiocus, who came from Wales in the 5th century, and whose tomb afterwards attracted crowds of pilgrims, The place was defended in

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1375 by Olivier de Clisson against the duke of Brittany, and again attaeked by the same Clisson in 1394, the cathedral suffering greatly in both sieges. In 1592 the town was pillaged by the Spaniards, in 1601 ravaged by the plague, and in 1628 surrounded by walls, of which no traces remain. Between 1602 and 1708 the states of Brittany several times met at St Brieuc, and during the Reign

‘of Terror Chouans and Blues carried on a ruthless conflict with

each other.

ST CATHARINES, a city and port of entry of Ontario, Canada, and the capital of Lincoln county, is situated 12 miles north-west of Niagara Falls and 35 south of Toronto (by water), on the Welland Canal and the Grand Trunk and Welland branch of the Grand Trunk Railway. It is celebrated for its artesian mineral wells, and contains a convent and a marine hospital. The manu- facture of flour has long been a staple industry, and the abundant water-power is also utilized in cotton-mills, machine-shops, agricultural implement works, &c. In- corporated as a town in 1845, St Catharines had in 1861 a population of 6284, in 1871 of 7864, and in 1881 of 9631.

ST CHAMOND, a manufacturing town of France, in the department of Loire, 74 miles east-north-east of St Etienne, at the confluence of the Janon with the Gier (an affluent of the Rhone), and on the railway from St Etienne to Lyons. Besides working a considerable number of coal-mines, St Chamond employs twelve mills in the silk manufacture, and from 12,000 to 15,000 looms (mostly driven by hydraulic machinery) in lace-making, and has a variety of other manufactures. The population was 14,149 in 1881.

St Chamond, founded in the 7th century by St Ennemond or Chamond, arehbishop of Lyons, became the chief town of the Jarret, a little principality formed by the valley of the Gier. Silk- milling was introduced

in the town in the middle of the 16th cen- tury by Gayotti, a native of Bologna, and perfected towards the beginning of the 19th by Richard Chambovet. Remains are found at St Chamond of a Roman aqueduct, which eonveyed the waters of the Janon along the valley of the Gier to Lyons.

ST CHARLES, a city of the United States, the county seat of St Charles county, Missouri, is situated on the left or north bank of the Missouri 20 miles from its mouth, and 23 from St Louis by the St Louis and Omaha line of the Wabash, St Louis, and Pacific Railway, which crosses the river by a great iron bridge 6535 feet long, erected in 1871 at a cost of $1,750,000. Besides one of the largest car-factories in the United States, the industrial establishments of St Charles comprise tobacco- factories, flour-mills, hominy-mills, creameries, woollen- factories, and breweries. St Charles College (Methodist Episcopal), chartered in 1838, the Lindenwood Female College (Presbyterian), the Convent of the Sacred Heart, and the Roman Catholic public library are the principal institutions. In 1850 the inhabitants numbered only 1498; by 1870 they were 5570, and in 1880 5014 (in the township 8417).

A Spanish post was established at St Charles in 1769. As a town it dates from 1809 and asa city from 1849. The first State legislature of Missouri met in the town in 1821 and St Charles continued to be the State capital till 1826.

ST CHRISTOPHER, or St Kirts, one of the Leeward Islands, West Indies, situated in 17° 18’ N. lat. and 62° 48’ W. long. Its length is 23 miles, its greatest breadth 5 miles, and the total area 68 square miles. Mountains traverse the central part from south-east to north-west, the greatest height, Mount Misery, being about 4100 feet above sea-level. On the seaboard is Basseterre, the capital, the outlet of a fertile plain, which contains the cultivated land. The thermometer ranges from 78° to 84° Fahr. St Christopher is united with Nevis (q.v.) as one colony, with one executive and one legislative council (official and nominated) for the united presidency. In 1883 the revenue and expenditure were £34,000 and £33,000 respectively,

and the public debt was £2500. The tonnage entering and clearing was 307,000, and the imports and exports were valucd at £190,000 and £240,000 respectively per annum. The sugar exports amounted to 10,000 tons. The population of the island was about 30,000.

ST CLAIR, a borough of the United States, in Schuyl- kill county, Pennsylvania, 3 miles east of Pottsville on the Reading and Philadelphia Railroad. It mainly depends on its coal-mines. The population was 5726 in 1870 and 4149 in 1880.

ST CLOUD, a village of France, on the left bank of the Seine, 7 miles west from the centre of Paris and 94 by the railroad from Paris to Versailles, forming part of the canton of Sévres and of the arrondissement of Ver- sailles (Seine-et-Oise). Picturesquely built on a hill-slope, it overlooks the river, the Bois de Boulogne, and Paris ; and, lying amid the foliage of its magnificent park and numerous villa gardens, it is one of the favourite resorts of the Parisians. The palace of St Cloud, which had been asummer residence for Napoleon I., Louis X VIII., Charles X., Louis Philippe, and Napoleon III., was burned by the Prussians in 1870 along with part of the village. In spite of the damage inflicted on the park at the same period, magnificent avenues still make it one of the finest rural haunts in the neighbourhood of Paris. It occupies a varied tract of 960 acres, and abounds in picturesque views. Every year in September a great fair, lasting three weeks, is held in the park ; and within its precincts are situated the new national Sévres porcelain manufac- ture and the Breteuil pavilion, the seat of the interna- tional metre commission. St Cloud possesses a church, erccted about 1865, in the style of the 12th century, with an elegant stone spire; and here too has been established the upper normal school (science and letters) for the training of teachers (male) for the provincial normal schools of primary instruction. The population in 1881 was 4081, and 4126 in the commune.

Clodoald or Cloud, grandson of Clovis, adopted the monastic life and left his name to the spot where his tomb was discovered after the lapse of 1200 years, in a crypt near the present church. He had granted the domain to the church of Paris, which possessed it as a fief till the 18th century. At St Cloud Henry III. and the king of Navarre (Henry IV.) established their camp

during the League for the siege of Paris ; and there the former was assassinated by Jacques Clément. The castle was at that time only a plain country house belonging to Pierre de Gondi, archbishop of Paris. Louis XIV. bought it for his brother, the duke of Orleans, who was the originator of the palace which perished in 1870. Peter the Great of Russia was received there in 1717 by the regent, whose grandson sold the palace to Marie Antoinette. It was in the orangery at St Cloud that Bonaparte executed the coup d'état of 18th Brumaire ; and after he became emperor the palace was his favourite residence, and there he celebrated his marriage with Marie Louise. In 1815 it was the scene of the signing of the capitulation of Paris ; and in 1830 from St Cloud Charles X. issued the orders which brought about his fall. Napoleon III. was there when he received the senatusconsult which restored the empire in his favour {1st December 1852). Seized by the Prussians at the commence- ment of the investment of Paris in 1870, St Cloud was sacked during the siege.

ST CROIX, or SaintE Crorx, one of the Danish West India Islands, is situated between 17° and 18° N. lat., about 40 miles south-south-east of St Thomas. Twenty- three miles long, and with a maximum width of 6 miles, it has an area estimated at 51,168 acres. Blue Mountain, the highest peak (1100 feet), lies in the range of hills running parallel with the coast in the western half of the island. The narrower eastern end is also hilly. In the centre and towards the west the surface is undulating, and towards the south flat with brackish lagoons. With the exception of about 4000 acres, the soil is everywhere productive ; but only about one-third of the area is de- voted to sugar-growing and one-sixth to pasture-land, the greater part of the remainder being either worthless brush-

wood (the haunt of small deer) or scanty timber. Besides little Negro hamlets there are two garrison towns—Chrig. tiansted (or popularly Bassin) on the north coast, with a small harbour 15 to 16 feet deep at the entrance, and Frederiksted (popularly West End) on the west coast, with an open roadstead. The population of the island was 23,194 in 1860, 22,760 in 1870, and 18,430 in 1880, This decrease is due to the comparative failure of the sugar-crops. Destruction of the forests (or some unsus- pected cause) has

brought diminished rainfall (from 20 to 34 inches per annum); and the belt of abandoned cane. ground has been steadily increasing. To help in checking this decay the Government constructed (1876) a great central factory, to which the juice is conveyed from the plantations by a system of pipes. Apart from the official element (mostly Danish), the white inhabitants of St Croix are almost wholly British either by birth or descent.

St Croix was discovered by Columbus on his second voyage. In 1651 France entrusted it to the Knights of Malta, and in 1733 it was purchased by Denmark for 750,000 livres (167,000 rixdollars), See was abolished in 1848, and coolies began to be employed in °

ST CYR, Marsuat (1764-1830). See Gouvion Sr Cyr.

ST CYR-L'ECOLE, a village of France (Seine-et-Oise), 24 miles west of Versailles at the end of the old park of Louis XIV. It had only 2712 inhabitants in 188], and its importance is solely due to the famous military school now established in the convent which Madame de Maintenon founded for the education of noble young ladies in indigent circumstances. It was here that Racine's Hsther and Athalie were first acted, having been written expressly for the pupils. Madame de Maintenon's tomb is still preserved in the chapel. The convent was suppressed at the Revolution, and the gardens are now partly trans- formed into parade-grounds. Two advanced forts of the new enceinte round Paris are situated at St Cyr.

ST DAVID', a village of Pembrokeshire, South Wales, and the seat of a bishopric, is situated in the valley of the Alan, 16 miles north-west of Haverfordwest, the nearest railway station, and 14 miles east from the most westerly point of Wales. By some it is supposed to be the Roman Menapia. It consists of straggling and somewhat mean houses, occupying the crest of the hill above the cathedral. It was the birthplace of St David, the patron saint of Wales. 'The see, which includes nearly the whole of South Wales, was founded at least not later than the 7th century. Till the middle of the 12th century the bishops had archiepiscopal powers. The existing cathedral was begun in 1180. Its tower fell in 1220, crashing through the choir and transepts; when it was rebuilt the old western arch was retained. About the time the choir and tram septs were repaired St Thomas's chapel was added. In 1248 an earthquake caused the walls of the nave to bulge. The chapels

east of the presbytery were begun about this period, and the lady chapel between 1296 and 1328. The aisles of the nave and of the presbytery were raised by Bishop Gower (1328-1347), who set up the beautiful stone rood screen. The great window in the south tran- sept in the Perpendicular style was erected in 1384, and the roofs renewed in the Late Perpendicular between 1461 and 1522. The west front was rebuilt by Nash about the end of the 18th century, and in 1862 extensive restorations, including the rebuilding of the two western piers of the tower and of the west front, were begut under the direction of Sir G. G. Scott. The cathedral contains the tomb of Edmund Tudor, father of Henry VIL, and the shrine of St David. The total internal length of the building is 298 feet, the breadth of the nave (with aisles) 70 feet, and the breadth of the transepts 2 feet 3 inches. Parts of the rich interior decoration of the

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nave are particularly worthy of notice. To the north of she cathedral are the picturesque ruins of the chapel of 3t Mary’s College, founded in 1377. On the other side yf the Alan are the remains of the bishop’s palace, a masterpiece of Bishop Gower, particularly noteworthy for she beautiful arcade and parapet running round the whole ouilding. It was partly unroofed by Bishop Barlow in 1536. In the centre of the village stands the ancient sross, 28 feet high, the steps of which were restored by Bishop Thirlwall in 1873. The place is without municipal yovernment, its mayor being the officer of the bishop’s manorial court. The population of the parish in 188] was 2003.

ST DENIS, a town of France, in the department of Seine, 44 miles north of Paris by the Northern Railway, which there divides into two branches leading respectively so Pontoise and Creil, is now a great manufacturing centre “or machinery, boats, railway carriages, chemical products, orinted goods, candles, beer, leather, and flour. Many of che works are supplied with water from the Crould and she Rouillon, which there fall into the Seine ; and a canal extends from the Seine to La Villette, the great inner harbour of Paris. In 1881 the population was 43,127. The name and fame of the town are derived from the ibbey founded by Dagobert on the spot where St Denis, the apostle of Paris, was interred (see below). The west ‘ront was built between 1137 and 1140. The right-hand cower is almost pure Romanesque; that on the left was sothic, and its spire was carried to a height of 280 feet, out it was struck by lightning in 1837 and its reconstruc-ion effected in so clumsy a manner that it had to be ‘aken down till it was on a level with the roof of the 1ave, The rose window, now occupied by a clock face, lates from the 13th century. Under one of the three ~~ows of arches above the main entrance runs an inscrip~~ ion recording the erection of the church by Suger with vbbatial funds and its consecration in 1140. The porch ‘ormed by the first three bays of the church contains some remains of the basilica of Pippin the Short. The nave proper (235 feet long and 57 wide) has seven bays, and lates, as well as most of the choir and transepts, from the ‘eign of St Louis. The gallery of the triforium is of open vork and is filled in with glass. The secondary apse (rond- sont) and its semicircular chapels (consecrated on 11th June 1144) are considered as the first perfected attempt t Gothic. The transepts have fine 13th-century facades, tach with two unfinished towers; if the plan had been jully carried out there would have been six towers besides . central fleche in lead. In the chapels of the nave are ‘he tombs of Louis XII. and Anne of Brittany (1591) of fenry IL. and Catherine de’ Medici, a masterpiece by yermain Pilon; of Louis of Orleans and Valentine of ‘flan, from the old church of the Celestines at Paris; of ‘rancis I. and Claude of France, one of the most splendid ombs of the Renaissance, executed under the direction of Vhilibert Delorme; and that of Dagobert, which, though \onsiderably dilapidated, ranks as one of the most curious iif medieval (13th-century) works of art. In the apse Ome stained glass of the time of Suger still remains. che crypt dates partly from Charlemagne and partly from vuger. In the centre is the vault where the coffin of the ead king used to le until, to make room for that

of his Jccessor, It was removed to its final resting-place. It is t present occupied by the coffin of Louis XVIII, the last overeign whose body was borne to St Denis and the only te whose ashes have been respected. Besides some fine “atues, the crypt contains the Bourbon vault, in which ere deposited the remains of Louis XVI. and Marie toinette, or at least whatever of them was recoverable “om the cemetery of La Madeleine, where the Chapelle

Expiatoire now stands. The treasury of St Denis has been despoiled of its richest possessions, including the books. now in the National Library ; but it still contains crosses, altar-pieces, and reliquaries, notably those of St Denis and his two companions, Rusticus and Eleutherius, the three patrons of the basilica. The chapter of St Denis is usually composed of emeritus bishops with the title of canons; but the institution is about to be abolished (1886). St Denis possesses a fine town-house and a poor- house (300 beds). Its three forts formed part of the Parisian enceinte in 1870-71, and from 23d to 26th January 1871 the place was bombarded by the Prussians, who did considerable damage to the basilica.

St Denis, the ancient Catulliacum, was a town of no pretensions till the founding of its abbey. The process of rebuilding begun in the 12th century by Abbé Suger was completed under Philip: the Bold. In the meantime St Louis caused mausoleums to be erected with figures of the princes already buried in the abbey ;. and from his time onwards to Henry II. every monarch in suc- cession had his monument. Louis XIV. reduced the abbcy to the rank of a priory; and at the Revolution it was suppressed, the tombs being violated and the church sacked (1793). Two years later all the remains and fragments that could be recovered were collected in the museum of the Petits Augustines at Paris ; but the bronze tombs had been melted down, the stained-glass windows shattered, and large numbers of interesting objects stolen or lost. Napoleon established in the monastery a school for daughters of the members of the Legion of Honour, which has continued to flourish. Louis XVIII. caused all the articles belonging to St Denis to be brought back from the museums to their original site, and added numerous other

monuments from the suppressed abbeys. But it was not till after 1848 that, under the intelligent direction of Viollet le Duc, the damage inflicted by revolutionist and unskil- ful restorer was repaired and the basilica recovered its original appearance. Charles the Bold instituted the famous fair of Landit, which was transferred from the ncighbouring plain to St Denis itself in 1552, and is still held inthe town. Sheep and parchment were formerly the staples. The abbey was pillaged by Charles the Bad, king of Navarre, in 1358, by the Burgundians and Flemings. in 1411, and by the English in 1430. A sanguinary battle, in which the Catholic leader Constable Anne de Montmorency found victory and death, was fought between Huguenots and Catholics in the neighbourhood on 10th November 1567.

ST DENIS, the capital of RKuNIoN (9.v.).

ST DIE, a town of France, chef-lieu of an arrondisse- ment and a bishop's see in the department of Vosges, is situated on the right bank of the Meurthe, 1030 feet above the sea, on the railway from Lunéville (32 miles north- west) to Epinal (38 miles south-west). One portion of the town was rebuilt after the fire of 1757 in the regular and monumental style of Nancy; the other has a somewhat mean appearance. Several Alsatian manufacturers having emigrated to St Dié on the annexation of their country to Germany, the town has made great progress since: 1871, and now possesses weaving factories, bleacheries, hosiery factories, engineering works, a tile work, and an extensive brewery. The cathedral has a Romanesque nave (10th century) and a Gothic choir; the portal, in red sandstone, dates from the 18th century. A fine cloister, recently restored and containing a beautifully executed stone pulpit, leads to the Petite Eglise or Notre Dame, a well-preserved specimen of early Romanesque. Other points of interest are the library, the museum, belonging to the Société Philomathique Vosgienne, the large schools, and the public fountains. The town commands an exten- sive view of the Vosges and is a convenient centre for ex- cursions. The population in 1881 was 12,677 (15,312 in the commune).

St Dié (Deodatum, Theodata, S. Deodati Fanwm) grew up round a monastery founded in the 6th century by St Deodatus of Nevers, who gave up his episcopal functions in order to retire to this place. In the 10th century the community became a chapter of canons ; and among those who

subsequently held the rank of provost or dean were Giovanni de’ Medici (afterwards Pope Leo X.) and several princes of the house of Lorraine. Among the extensive privileges enjoyed by them was that of coining money. Though they co- operated in building the town walls, the canons and the dukes of

Lorraine soon became rival competitors for the authority over St Dié. The institution of a town council in 1628, and the establish- ment under King Stanislaus of a bishopric which appropriated part of their spiritual jurisdiction, contributed greatly to diminish the influence of the canons; and with the Revolution they were completely swept away. During the 17th century the town was repeatedly sacked by the Burgundians under Charles the Bold, by the French, and by the Swedes. It was also partially destroyed by fire in 1065, 1155, 1554, and 1757. St Dié was the seat of a very early printing press.

SAINTE-BEUVE, Cuartes Avcustin (1804-1869), ‘

the most notable critic of our time, was born at Boulogne- sur-Mer on 23d December 1804. He was a posthumous child,—his father, a native of Picardy, and controller of town-dues at Boulogne, having married in this same year, at the age of fifty-two, and died before the birth of his son. The father was a man of literary tastes, and used to read, like his son, pencil in hand ; his copy of the Elzevir edition of Virgil, covered with his notes, was in his son’s possession, and is mentioned by him in one of his poems. Sainte- Beuve’s mother was half English,—her father, a mariner of Boulogne, having married an Englishwoman. The little Charles Augustin was brought up by his mother, who never remarried, and an aunt, his father’s sister, who lived with her. They were poor, but the boy, having learnt all he could at his first school at Boulogne, per- suaded his mother to send him, when he was near the age of fourteen, to finish his education at Paris. He boarded with a M. Landry, and had for a fellow-boarder and inti- mate friend Charles Neate, afterwards fellow of Oriel College and member of parliament for the city of Oxford. From M. Landry’s boarding-house he

attended the classes, first of the Collége Charlemagne, and then of the Collége Bourbon, winning the head prize for history at the first, and for Latin verse at the second. In 1823 he began to study medicine, and continued the study with diligence and interest for nearly four years, attending lectures on anatomy and physiology and walking the hospitals. But meanwhile a Liberal newspaper, the Globe, was founded in 1827 by M. Dubois, one of Sainte-Beuve's old teachers at the Collége Charlemagne. M. Dubois called to his aid his former pupil, who, now quitting the study of medicine, contributed historical and literary articles to the Globe, among them two, which attracted the notice of Goethe, on Victor Hugo's Odes and Ballads. These articles led to a friendship with Victor Hugo and to Sainte-Beuve's con- nexion with the romantic school of poets, a school never entirely suited to his nature. In the Globe appeared also his interesting articles on the French poetry of the 16th century, which in 1828 were collected and published in a volume, and followed by a second volume contain- ing selections from Ronsard. In 1829 he made his first venture as a poet with the Vie, Poésies, et Pensées de Joseph Delorme. His own name did not appear; but Joseph Delorme, that "Werther in the shape of Jacobin and medical student," as Guizot called him, was the Sainte- Beuve of those days himself. About the same time was founded the Revue de Paris, and Sainte-Beuve contributed the opening article, with Boileau for its subject. In 1830 came his second volume of poems, the Consolations, a work on which Sainte-Beuve looked back in later life with a special affection. To himself it marked and ex- pressed, he said, that epoch of his life to which he could with most pleasure return, and at which he could like best that others should see him. But the critic in him grew to prevail more and more and pushed out the poet. In 1831 the Revue des Deux Mondes was founded in rivalry with the Revue de Paris, and from the first Sainte-Beuve was one of the most active and important contributors. He brought out his novel of Volupté in 1834, his third and last volume of poetry, the Pensées d Aotit, in 1837.

from his lycée no great store.

He himself thought that the activity which he had in the meanwhile exercised as a critic, and the offence which jn some quarters his criticism had given, were the cause of the less favourable reception which this volume received,

He had long meditated a book on Port Royal. At the end of 1837 he quitted France, accepting an invitation

from the academy of Lausanne, where in a series of lectures

his work on Port Royal came into its first form of being. In the summer of the next year he returned to Paris to revise and give the final shape to his work, which, hoy. ever, was not completed for twenty years. In 1840 i. Cousin, then minister of public instruction, appointed him one of the keepers of the Mazarin Library, an appointment which gave him rooms at the library, and, with the money earned by his pen, made him for the first time in his life easy in his circumstances, so that, as he afterwards used

to say, he had to buy rare books in order to spend his in- come.

A more important consequence of his easier cir cumstances was that he could study freely and largely, He returned to Greek, of which a French schoolboy brings With a Greek teacher, M. Pantasides, he read and re-read the poets in the original,

and thus acquired, not, perhaps, a philological scholar’s knowledge of them, but a genuine and invaluable acquaint-

ance with them as literature. His activity in the Revue des Deux Mondes continued, and articles on Homer, Theo- critus, Apollonius of Rhodes, and Meleager were fruits of his new Greek studies. He wrote also a very good article in 1844 on the Italian poet Leopardi; but in general his subjects were taken from the great literature which he knew best, that of his own country, —its literature both in the past and in the contemporary present. Seven volumes of “Portraits,” contributed to the Revue de Paris and the Revue des Deux Mondes, exhibit his work in the years from 1832 to 1848, a work constantly increasing in range and value. In 1844 he was elected to the

French Academy as successor to Casimir Delavigne, and was received there at the beginning of 1845 by Victor Hugo.

From this settled and prosperous condition the revolu- tion of February 1848 dislodged him. In March of that year was published an account of secret-service money distributed in the late reign, and Sainte-Beuve was put down as having received the sum of one hundred franes. The smallness of the sum would hardly seem to suggest cor ruption ; it appears probable that the money was given to cure a smoky chimney in his room at the Mazarin Library, and was wrongly entered as secret-service money. But

on a punctilious delicacy in money matters, was indignant at the entry, and thought the proceedings of the minister of public instruction and his officials, when he demanded to have the matter sifted, tardy and equivocal. He resigned his post at the Mazarin and accepted an offer from the Belgian Government of a chair of French literature in the university of Liége. There he gave the series of lectures on Chateaubriand and his contemporaries which was after- wards (in 1861) published in two volumes. He liked Liége, and the Belgians would have been glad to keep him; put the attraction of Paris carried him back there in the autumn of 1849. Louis Napoleon was then president. Disturbance was ceasing; a time of settled government, which lasted twenty years and corresponds with the second stage of Sainte-Beuve’s literary activity, was beginning. Dr Véron, the editor of the Constitutconnel, proposed to him that he should supply that newspaper with a literaty article for every Monday; and thus the Causeris du Lundi were started. They at once succeeded, and “gav’ the signal,” as Sainte-Beuve himself says with truth, “for the return of letters.” Sainte-Beuve now lived in the sma

house in the Rue Mont-Parnasse (No. 11) which he oc®

Sainte-Beuve, who piqued himself on his independence and

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the remainder of his life, and where in 1850 his mother, from whom he seems to have inherited his good -gense, tact, and finesse, died at the age of eighty-six. For three years he continued writing every Monday for the Constitutionnel ; then he passed, with a similar engage- ment, to the Moniteur. In 1857 his Monday articles began to be published in volumes, and by 1862 formed a collection in fifteen volumes; they afterwards were resumed under the title of Nouveaux Lundis, which now make a collection of thirteen volumes more. In 1854 M. Fortoul nominated him to the chair of Latin poetry at the College of France. His first lecture there was received with inter- ruptions and marks of disapprobation by many of the students, displeased at his adherence to the empire ; at a second lecture the interruption was renewed. Sainte- Beuve had no taste for public speaking and lecturing ; his frontis mollities, he said, unfitted him for it. He was not going to carry on @ war with a party of turbulent students; he proposed to resign, and when the minister would not accept his resignation of his professorship he resigned its emoluments. The Etude sur Virgile, a volume published in 1857, contains what he had meant to be his first course of lectures. He was still a titular official of public instruction ; and in 1858 his services were called for by M. Rouland, then minister of public instruction, as a lecturer (maitre de conférences) on French literature at the Keole Normale Supérieure. This work he discharged with assiduity and success for four years. In 1859 he was made commander of the Legion of Honour, having twice previously to 1848 refused the cross. During the years of his official engagement his Monday contributions to the Moniteur had no longer been continuous ; but in 1862 an arrangement was proposed by which he was to return to the Constitationnel and again supply an article there every Monday. He consented, at the age of fifty-seven, to try tlris last pull, as he called it, this ‘“dernier coup de collier”; he resigned his office at the Ecole Normale and began the series of his Vouveaue Lundis. They show no falling off in vigour and resource from the Causeries. But the strain upon him of his weekly labour was great. “Tam not a monsieur nor a gentleman,” he writes in 1864, “but a workman by the piece and by the hour.” “I look upon myself as a player forced to go on acting at an age when he ought to retire, and who can see no term to , his engagement.” He had reason to hope for relief. Ex- 1 cept himself, the foremost literary men in France had stood | aloof from the empire and treated it with a hostility more | or less bitter. He had not been hostile to it: he had accepted it with satisfaction, and had

bestowed on its official journal, the Joniteur, the lustre of his literature. The prince Napoleon and the princess Mathilde were his warm friends. A senatorship was mentioned ; its income of £1600 a year would give him opulence and freedom. But its coming was delayed, and the strain upon him con- tinued for some time longer. When at last in April 1865 | he was made senator, his health was already seriously com- promised. The disease of which he died, but of which the doctors did not ascertain the presence until his body was opened after his death—the stone—began to distress and disable him. He could seldom attend the meetings of the senate; the part he took there, however, on two famous occasions, when the nomination of M. Renan to _ the College of France came under discussion in 1867 and the law on the press in the year following, provoked the indignation of the great majority in that conservative assembly. It delighted, however, all who “belonged,” to use his own phrase, “to the diocese of free thought”; and he gave further pleasure in this diocese by leaying at the beginning of 1869 the Moniteur, injudiciously managed

pied for

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| by the Government and M. Rouher, and contributing to a

Liberal journal, the Zemps. His literary activity suffered little abatement, but the attacks of his malady, though borne with courage and cheerfulness, became more and more severe. Pain made him at last unable to sit to write ; he could only stand or lie. He died in his house in the Rue Mont Parnasse on the 13th of October 1869. He had inherited an income of four thousand francs a year from his mother, and he left it six thousand ; to the extent of eighty pounds a year and no further had literature and the senatorship enriched him. By his will he left directions that his funeral was to be without religious rites, quite simple, and with no speeches at the grave except a few words of thanks from one of his secretaries to those present. There was a great concourse ; the Paris students, who had formerly

interrupted him, came now to do honour to him as a Liberal and a champion of free thought—a senator they could not but admit—undeniably, alas, a senator, but oh, st peu/ Yet his own account of himself is the best and truest, —an account which lays no stress on his Liberalism, no stress on his championship of free thought, but says simply: ‘Devoted to my profession as critic, 1 have tried to be more and more a good, and, if possible, an able workman.”

The work of Sainte-Beuve divides itself into three portions—his poetry, his criticism before 1848, and his criticism after that year. His novel of Volupté may properly go with his poetry.

We have seen his tender feeling for his poetry, and he always maintained that, when the ‘integrating molecule,” the foundation of him as a man of letters, was reached, it would be found to have a poetic character. And yet he declares, too, that it is never without a sort of surprise and confusion that he sees his verses detached from their context and quoted in public and in open day. They do not seem made for it, he says. This admirable critic knew, indeed, what a Frenchman may be pardoned for not willingly perceiving, and what even some Englishmen try to imagine that they do not perceive, the radical in- adequacy of French poetry. For us it is extremely interesting to hear Sainte-Beuve on this point, since it is to English poetry that he resorts in order to find his term of comparison, and to award the praise which to French poetry he refuses. ‘Since you are fond of the poets,” he writes to a friend, “I should like to see you read and look for poets in another language, in English for instance. There you will find the most rich, the most dulcet, and the most new poetical literature. Our French poets are too soon read; they are: too slight, too mixed, too corrupted for the most part, too poor in ideas even when they have the talent for strophe and line, to hold and occupy for long a serious mind.” And again: “If you knew English you would have treasures to draw upon. They have a poetical literature far superior to ours, and, above all, sounder, more full. Wordsworth is not translated ; these things are not to be translated ; you must go to the fountain-head for them. Let me give you this advice: learn English.”

But, even as French poetry, Sainte-Beuve's poetry had faults of its own. Critics who found much in it to praise yet pronounced it a poetry "narrow, puny, and stifled," and its style "slowly dragging and laborious." Here we touch on a want which must no doubt be recognized in him, which he recognized in himself, and whereby he is separated from the spirits who succeed in uttering their most highly inspired note and in giving their full measure,—some want of flame, of breath, of pinion. Perhaps we may look for the cause in a confession of his own: "I have my weaknesses ; they are those which gave to King Solomon his disgust with everything and his satiety with life. I may have regretted sometimes that

I was thus extinguishing my fire, but I did not ever pervert my heart." It is enough for us to take his con- fession that he extinguished or impaired his fire.

Yet his poetry is characterized by merits which make it readable still and readable by foreigners. So far as it exhibits the endeavour of the romantic school in France to enlarge the vocabulary of poetry and to give greater freedom and variety to the alexandrine, it has interest chiefly for readers of his own nation. But it exhibits more than this. It exhibits already the genuine Sainte- Beuve, the author who, as M. Duvergier de Hauranne said in the Globe at the time, 'sent & sa maniére et écrit comme il sent," the man who, even in the forms of an artificial poetry, remains always "un penseur et un homme @esprit." That his Joseph Delorme was not the Werther of romance, but a Werther in the shape of Jacobin and medical student, the only Werther whom Sainte-Beuve by his own practical experience really knew, was a novelty in French poetical literature, but was entirely characteristic of Sainte-Beuve. All his poetry has this stamp of direct dealing with common things, of plain unpretending reality and sincerity; and this stamp at that time made it, as Béranger said, ''a kind of poetry absolutely new in France." It found, therefore, with all its shortcomings, friends in men so diverse as Béranger, Lamartine, Jouffroy, Beyle. Whoever is interested in Sainte-Beuve should turn to it, and will be glad that he has done so.

It has been the fashion to disparage the criticism of the Critiques et Portraits Littéraires, the criticism anterior to 1848, and to saerifice it, in fact, to the criticism posterior to that date. Sainte-Beuve has himself indicated what considerations ought to be present with us in reading the Critiques et Portraits, with what reserves we should read them. They are to be considered, he says, ‘‘ rather asa de- pendency of the elegiac and romanesque part of my work than as express criticisms.” “‘ The Revue des Deux Mondes,” he adds, which published them, was young in those days, “mixed a good deal of its wishes and its hopes with its criticism, sought to explain and to stimulate rather than to judge. The portraits there of contemporary poets and romance-writers can in general be considered, whether as respects the painter or as respects the models, as youth- ful portraits only; juvenis juvenem pinxit.” They have the copiousness and enthusiasm of youth; they have also its exuberance. He judged in later life Chateaubriand, Lamartine, Victor Hugo, more coolly, judged them differ- ently. But the Critiques et Portraits contain a number of articles on personages, other than contemporary French poets and romance-writers, which have much of the sound- ness of his later work, and, in addition, an abundance and fervour of their own which are not without their attraction. Many of these are delightful reading. The articles on the Greek poets and on Leopardi have been already mentioned. Those on Boileau, Moliére, Daunou, and Fauriel, on Madame de la Fayette and Mademoiselle Aissé, may be taken as samples of a whole group which will be found to support perfectly the test of reading, even after we have accustomed ourselves to the later work of the master. Nay, his sober- ness and tact show themselves even in this earlier stage of his criticism, and even in treating the objects of his too fervid youthful enthusiasm. A special object of this was Victor Hugo, and in the first article on him in the Portraits Contemporains we have certainly plenty of en- thusiasm, plenty of exuberance. We have the epithets “adorable,” “sublime,” “supreme,” given to Victor Hugo’s poetry; we are told of “the majesty of its high and sombre philosophy.” All this is in the vein of Mr George Gilfillan. But the article next following this, and written only four years later, in 1835, is the article of a critic, and takes the points of objection, seizes the weak side of

Victor Hugo’s poetry, how much it has of what is “ creyy» “sonore,” “artificiel,” “voulu,” “ théatral,” “ violent,” z distinctly as the author of the Cawseries could seize it, “The Frank, energetic and subtle, who has mastered to perfection the technical and rhetorical resources of the Latin literature of the decadence,” is a description never to be forgotten of Victor Hugo asa poet, and Sainte-Beuye launches it in this article, written when he was but thirty years old, and still a painter of “portraits de jeunesse” only.

He had thus been steadily working and growing ; never. theless, 1848 is an epoch which divides two critics in him of very unequal value. When, after that year of revolution and his stage of seclusion and labour at Liége, he came back to Paris in the autumn of 1849 and commenced in the Constitutionnel the Causeries du Lundi, he was astonish- ingly matured. Something of fervour, enthusiasm, poetry, he may have lost, but he had become a perfect critic—a critic of measure, not exuberant ; of the centre, not pro- vincial ; of keen industry and curiosity, with “Truth” (the word engraved in English on his seal) for his motto; more- over, with gay and amiable temper, his manner as good as his matter,—the “critique souriant,” as, in Charles Mon- selet’s dedication to him, he is called.

Merely to say that he was all this is less convincing than to show, if possible, by words of his own, in what fashion he was all this. The root of everything in his criticism is his single-hearted devotion to truth. What he called ‘fictions ” in literature, in politics, in religion, were not allowed to influence him. Some one had talked of his being tenacious of a certain set of literary opinions. “I hold very little,” he answers, “ to literary opinions ; literary opinions occupy very little place in my life and in my thoughts. What does occupy me seriously is life itself and the object of it.” ‘I am accustomed incessantly to call my judgments in question anew, and to re-cast my opinions the moment I suspect them to be without validity.” “ What I have wished” (in Port Royal) “is to say not a word more than I thought, to stop even a little short of what I believed in certain cases, in order that my words might acquire more weight as historical testimony.” To all exaggeration and untruth, from whatever side it proceeded, he had an antipathy. ‘I turn my back upon the Michelets and Quinets, but I cannot hold out my hand to the Veuillots.” When he was writing for the Joniteur he was asked by the manager of the paper to review a book by an important

personage, a contributor ; his answer is a lesson for critics and paints him exactly. “TI should like to say yes, but I have an insurmountable difficulty as to this author ; he appears to me to compromise whatever he touches; he is violent, and has not the tradition of the things he talks about. Thus his article on Condorcet, which the Moniteur inserted, is odious and false ; one may be severe upon Condorcet, but not in that tone or in that note. The man has no insight—a defect which does not prevent him from having a pen with which at a given moment he can flourish marvellously. But, of himself, he is a gladiator and a desperado. I must tell you, my dear sir, that to have once named him with compliment in some article of mine or other is one of my self-reproaches as @ man of letters. Let me say that he has not attacked me in any way; it is a case of natural repulsion.” a

But Sainte-Beuve could not have been the great eriti¢ he was had he not had, at the service of this his love of truth and measure, the conscientious industry of a Bene dictine. “I never have a holiday. On Monday towards noon I lift up my head, and breathe for about an hour; after that the wicket shuts again and I am in my prison cell for seven days.” The Cauwseries were at this price They came once a week, and to write one of them as he

” wrote it was indeed a week’s work. The “irresponsible

) provider with

‘ndolent reviewer ” should read his notes to his friend and books, M. Paul Chéron of the National Library. Here is a note dated the 2d of January 1853: “ @ood-day and a happy New Year. To-day I set to work on Grimm. A little dry ; but after St Frangois de Sales” (his Monday article just finished) “‘one requires a little relief from roses. I have of Grimm the edition of his

- Correspondence by M. Taschereau. I have also the Memozrs – of Madame @’Epinay, where there are many letters of his.

But it is possible that there may be notzces of him men- tioned in the bibliographical book of that German whose name I have forgotten. I should like, too, to have the jirst editions of his Correspondence ; they came out in successive parts.” Thus he prepared himself, not for a grand review article once a quarter, but for a newspaper review once a week.

His adhesion to the empire caused him to be habitually represented by the Orleanists and the Republicans as without character and patriotism, and to be charged with baseness and corruption. The Orleanists had, in a great degree, possession of the higher press in France and of

_ English opinion,—of Liberal English opinion more especi-

ally. And with English Liberals his indifference to parlia- mentary government was indeed a grievous fault in him ; “you Whigs,” as Croker happily says, “are like quack

- doctors, who have but one specific for all constitutions.”

To him either the doctrine of English Liberals, or the doctrine of Republicanism, applied absolutely, was what he called a “fiction,” one of those fictions which “always end by obscuring the truth.” Not even on M. de Tocque- ville’s authority would he consent to receive “‘les hypothéses

_ dites les plus honorables,”—“‘ the suppositions which pass

for the most respectable.” All suppositions he demanded to sift, to see them at work, to know the place and time and men to which they were to be applied. For the France before his eyes in 1849 he thought that something “solid and stable”—un mur, ‘‘a wall,” as he said—was requisite, and that the government of Louis Napoleon sup- plied this wall. But no one judged the empire more inde- pendently than he did, no one saw and enounced its faults more clearly ; he described himself as being, in his own

_ single person, “‘ the gauche of the empire,” and the descrip- _ tion was just.

_ temper and disposition.

To these merits of mental independence, industry, measure, lucidity, his criticism adds the merit of happy Goethe long ago noticed that,

‘ whereas Germans reviewed one another as enemies whom they hated, the critics of the Globe reviewed one another

as gentlemen. This arose from the higher social develop- meut of France and from the closer relations of literature with life there. But Sainte-Beuve has more, as a critic,

| than the external politeness which once at any rate dis- | tinguished his countrymen: he has a personal charm of

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, attracted him and he always sought to extricate it.

manner due to a sweet and humane temper. He com- plained of un peu de dureté, “a certain dose of hardness,” in the new generation of writers. The personality of an

_ author had a peculiar importance for him; the poetical

side of his subjects, however latent it might be, always This was because he had in himself the moderate, gracious, amlably human instincts of the true poetic nature. “Let me beg of you,” he says in thanking a reviewer who praised him, “to alter one or two expressions at any rate. I can- not bear to have it said that Iam the jirst in anything whatever, as a writer least of all; it is not a thing which can be admitted, and these ways of classing people give offence.” Literary man and loyal to the French Academy as he was, he can yet write to an old friend after his election: “All these academies, between you and me, are

pieces of childishness; at any rate the French Academy is. Our least quarter of an hour of solitary reverie or of serious talk, yours and mine, in our

youth, was better em- ployed ; but, as one gets old, one falls back into the power of these nothings ; only it is well to know that nothings they are.”

Perhaps the best way to get a sense of the value and extent of the work done in the last twenty years of his life by the critic thus excellently endowed is to take a single volume of the Cawseries du Lundi, to look through its list of subjects, and to remember that with the quali- ties above mentioned all these subjects are treated. Any volume will serve; let us take the fourth. This volume consists of articles on twenty-four subjects. Twenty of these are the following :—Mirabeau and Sophie, Montaigne, Mirabeau and Comte de la Marck, Mademoiselle de Scudéry, André Chénier as politician, Saint-Evremond and Ninon, Joseph de Maistre, Madame de Lambert, Madame Necker, the Abbé Maury, the Duc de Lauzun of Louis XVI.’s reign, Marie Antoinette, Buffon, Madame de Maintenon, De Bonald, Amyot, Mallet du Pan, Marmontel, Chamfort, Ruhliére. Almost every personage is French, it is true; Sainte-Beuve had a maxim that the critic should prefer subjects which he possesses familiarly. But we should re- cognize more fully than we do the immense importance and interest of French literature. Certain productions of this literature Mr Saintsbury may misjudge and over- praise ; but he is entirely right in insisting on its immense importance. More than any modern literature it has been in the most intimate correspondence with the social life and development of the nation producing it. Now it so happens that the great place of France in the world is very much due to her eminent gift for social life and development; and this gift French literature has accom- panied, fashioned, perfected, and continues to reflect. This gives a special interest to French literature, and an interest independent even of the excellence of individual French writers, high as that often is. And nowhere shall we find such interest more completely and charmingly brought out than in the Causeries du Lundi and the Nouveaux Lundis of the consummate critic of whom we have been speaking. As a guide to bring us to a knowledge of the French genius and literature he is unrivalled,—perfect, so far as a poor mortal critic can be perfect, in knowledge of his subject, in judgment, in tact, and tone. Certain spirits are of an excellence almost ideal in certain lines; the human race might willingly adopt them as its spokesmen, recognizing that on these lines their style and utterance may stand as those, not of bounded individuals, but of the human race. So Homer speaks for the human race,

and with an excellence which is ideal, in epic narration ; Plato in the treatment at once beautiful and profound of philosophical questions; Shakespeare in the present- ation of human character; Voltaire in light verse and ironical discussion. A list of perfect ones, indeed, each in his own line! and we may almost venture to add to their number, in his line of literary criticism, Sainte- Beuve. M, A.

SAINTE-CLAIRE DEVILLE, Ertenne Heyrt (1818- 1881), French chemist, was born on 11th March 1818 in the island of St Thomas, West Indies, where his father was French consul. He was educated in Paris along with his elder brother Charles at the Collége Rollin. In 1844, having graduated as doctor of medicine and doctor of science, he was appointed dean of the new faculty of science at Besancon by Thenard. In 1851 he succeeded Balard in the Ecole Normale and in the Sorbonne. He died at Boulogne-sur-Seine on Ist July 1881.

Sainte-Claire Deville began his experimental work in 1841 with investigations on oil of turpentine and balsam of tolu, in the course

of which he discovered the hydro-carbon toluene. But he soon abandoned organic chemistry, and his most important work was in inorganic and thermal chemistry. In 1850 he discovered anhy- drous nitric acid, a substance interesting not only in itself but as the first obtained of an important group, the so-called ‘fanhy- drides” of the monobasic acids. In 1855 he succeeded in obtaining aluminium in mass. This metal, of which elay is the hydrated silicate, is of course one of the most abundant of metals, but was not obtaincd in the metallic state until Wohler in 1827 decomposed its chloride by means of potassium. The aluminium thus prepared was in the form of a fine powder, and, although the isolation of the metal was of great theoretical importance, there did not seem much prospect of a practical application of the discovery. In 1845 Wohler returned to the subject and by using large quantities of material obtained small globules of an obviously metallic character. Deville, who knew only Wohler’s paper of 1827, set to work to prepare aluminium, not for the sake of the metal itself, but with the view of procuring by the action of aluminium on eliloride of aluminium a lower chloride from which a series

of new compounds corresponding to the ferrous salts might be obtained. He did not succeed in this, but he did succeed in producing globules of aluminium of considerable size. This led him to perfect the process, and ultimately he devised a method by which aluminium could be pre- pared on a large scale. The first use to which he put the metal was to make a medal with the name of Wohler and the date 1827. In connexion with the preparation of aluminium may be mentioned Deville's investigations, partly with Wohler, into the allotropic forms of silicon and: boron.

Along with Debray, Deville studied the platinum metals ; their object was on the one hand to prepare the six metals in a state of purity and on the other to obtain a suitable inetal for the standard métre. In the course of these investigations large quantities of platinum and of the alloys of platinum and iridium were fused and east, and the methods used for obtaining the necessary high temperatures were applied to the fusion of other refractory metals, such as eobalt, nickel, chromium, and manganese.

Along with Troost, Deville devised a method for determining the density of vapours at very high temperatures and applied it to the cases of sulphur, selenium, tellurium, zine, cadmium, and many other substances boiling at temperatures up to 1400°C. The interesting and important results have been already described (see CHEMIstry and Morrcuue). Deville made a large number of ingenious experiments on the artificial production of minerals. Among these may be specially mentioned the formation of apatite and isomorphous minerals and of crystallized oxides. Deville and Caron found that when the vapour of a metallic fluoride acts on fused boracie acid the fluorine and the oxygen change places, a metallic oxide remains in erystals, while the gaseous fluoride of boron escapes. In this way they prepared corundum (crystallized oxide of aluminium) and sapphire, rnby and emerald ; coloured forms of corundum were obtained by mixing small quantities of fluoride of chromium with the fluoride of aluminium. Another method discovered by Deville for the preparation of crystallized oxides is of great interest. When an amorphous oxide—such as amorphous ferric oxide —is heated to redness and exposed toa slow current of hydrochloric acid gas, it gradually changes into a crystal- line oxide of the same composition. In this way Deville obtained hematite, tinstone, periclase, and other crystalline oxides. This eonversion of an amorphous into a crystalline

substanee without change of composition, by the action of a gas (in this case hydro- chloric acid) which itself undergoes no change, is one of those mysterious processes which used to be referred to a ‘‘ catalytic force” or called ‘‘actions by contact”; like many such actions, this has been shown by Deville to belong to the same class of phenomena as dissociation.

This leads us to Deville’s greatest contribution to general chemistry. Many chemical actions have been long known which take place either in the one or the other sense according to certain conditions. For instance, if a tube containing metallic iron is heated to redness and steam passed through it, water is decomposed, black oxide of iron is formed, and hydrogen escapes. If, on the other hand, the tube is filled with black oxide of iron and hydrogen passed through, the oxide is reduced and water is formed. Both of these opposite changes occur at the very same temperature. Again, a solution of sulph-hydrate of potassium is completely decomposed by passing a eurrent of earbonie acid gas through it for a sufficient time, sulphuretted hydrogen being given off and bicarbonate re- maining in solution. But exactly the opposite happens if we begin with bicarbonate and pass sulphuretted hydrogen gas through it : carbonic acid gas escapes and the solution ultimately contains nothing but sulph-hydrate. An imperfect, unsatisfactory ex- planation of some of the phenomena of which these are examples was given by Berthollet ; it remained for Deville to give a general theory and show their relation to such physical phenomena as

1 The métre commission fused a quarter of a ton of the alloy at a single operation. ‘

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evaporation and condensation. work on “ Dissociation” and his theoretical discussion of the facts in papers published in the Comptes Rendus. plete and elear account of the whole subject in a lecture delivered before the Chemical Society of Paris in 1866.

This he did by his experimenta]

He gave a very com.

As illustrations we shall take a few cases as different from one

another as possible.

It has long been known that carbonate of lime—limestone—

when heated is decomposed into quicklime and carbonic acid gag and that this decomposition takes place the more quickly the more

thoroughly the carbonic acid produced is removed. Sir James Hall showed that, if the carbonate of lime is heated in a closed vessel strong enough to resist the pressure of the carbonic acid gas, it can be fused, only a small part undergoing decomposition. Deville examined this relation quantitatively and showed that, if in a closed vessel we have quicklime, carbonate of lime, and carbonic acid gas the pressure of the carbonic acid gas depends on the temperature only, and is quite independent of the quantity of the quicklime or of the carbonate of lime, as long as there is some, however little, of both, and is also qnite uninflueneed by the presence of other gases. It will be seen that this case exactly resembles that of the evaporation of water. Ina closed vessel containing liquid water and water-vapour the pressure of the water-vapowr depends on the temperature only and is independent of the quantity of liquid water, as long as there is any, and is not influenced by the presence of © other gases. In both cases, if we disturb the equilibrium and then leave things to themselves the equilibrium is restored. If in the first case we diminish the pressure of the earbonic acid gas, some carbonate of lime decomposes, yielding carbonic acid gas until the pressure is raised to what it was; if we increase the pressure, some of the carbonic acid combines with quicklime until the pressure is reduced to what it was before. In the second case, if we diminish the pressure, some of the liquid water evaporates ; if we increase it, some of the water-vapour condenses, and so the pressure is restored. Rise of temperature eauses in the one case evaporation of water, in the other decomposition of carbonate of lime,—in both increase of pressure. Lowering of temperature causes in the one case condensa- tion of water-vapour, in the other combination of quicklime and carbonic acid gas,—in both diminution of pressure.

As asecond instance we may take the dissociation of water. Just as water-vapour condenses into liquid water under certain condi- tions, but always

with the evolution of heat (latent heat of vapour), so the mixture of oxygen and hydrogen in the proper proportion to form water combines, under certain conditions, to form water-vapour, but always with the evolution of heat (heat of eombination). In both cases we have change of state but no change of composition, and in both we have evolution of leat. In the first case we can reverse the process: heat the liquid water, heat becomes latent, liquid water changes into water-vapour. There isa certain definite pressure of water-vapour corresponding to the temperature: raise the temperature, more water evaporates, the pressure of water- vapour increases. It occurred to Deville, to whom both changes were equally physical, that in the second case the process should be reversible also,—that on heating the water-vapour it ought to decompose into oxygen and hydrogen, heat disappearing here also, and that, as there is a definite pressure of water-vapour correspond: ing to the tenrperature (often called the tension of water-vapour), s0 there should be a definite ratio of the pressure of hydrogen and oxygen to that of water-vapour (the tension of dissociation). Deville showed in the most conclusive manner that this is the case and devised ingenious arrangements for proving the actual occurrence of dissociation.

Another case very fully investigated by Deville is that already mentioned,—viz., the action of water-vapour on iron, and of hydrogen on oxide of iron. He showed that, for a fixed temper ature, water-vapour and hydrogen are in equilibrium in presence of iron and oxide of iron when the pressures of the two gases, hydrogen and water-vapour, are in a certain ratio quite independent of the quantity of the iron or of the oxide of iron, as long as there is some ofeach. Ifthe ratio is changed, say by increasing the pressure of the water-vapour, chemical action takes place : water is decomposed, oxide of iron is formed, and hydrogen set free. Again, if the pressure of the water-vapour is diminished, part of the hydrogen acts on oxide of iron, reducing it and forming water. In both cases the ratio of pressures is restored. This gives an easy explanation of the appa rently anomalous results mentioned above. When a current of hydrogen is passed over oxide of iron the water- vapour produced is swept away as fast as it is formed ; the ratio of the pressure of hydrogen to that of watcr-vapour is therefore always greater than that required for equilibrium and reduction of iron, and formation of water goes on continuously until all the oxide of iron is reduced. In the same way, a current of water-vapour carries away the

hydrogen as fast as it is produced; the ratio of the pressure of hydrogen to that of water-vapour is always less than that required for equili- brium, and the oxidation of iron and production of hydrogen go% on until no metallic iron remains. Exactly the same explanation applies to the action ‘of carbonic acid gas on solution of sulph-

hydrate of potassium, and of sulphuretted hydrogen on solution of

| bicarbonate of potassium. Equilibrium results when the pressures

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_ divided and

of the gases are in a certain ratio; if the equilibrium is disturbed chemical action takes place in the direction which tends to restore the equilibrium by reproducing the ratio of pressures. :

The apparatus devised by Deville for detecting and measuring dissociation illustrates his remarkable ingenuity. We shall instance only one example in addition to those already mentioned.

One of the great difficulties in observing dissociation depends on its reversible character. A compound may indeed decompose when raised to a high temperature ; but, if, as we cool it again, reunion oceurs, it is not easy to prove that any chemical change took place. One of the ways in which Deville got over this difficulty was by the use of his “hot and cold tube.” Inside a porcelain tube he placed a metal tube of smaller diameter, so that their axes coincided, leaving an annular space between them. This annular space was closed at both ends, but, by means of side tubes near the ends, could be filled with any gas, or a current of gas could be passed through it. The porcelain tube was raised to a high tempcrature by being placed in a furnace, while the internal metal tube was kept cold by running water through it. By this means he proved the dissociation of carbonic acid gas,

carbonic oxide, and sulphurous acid gas,—the carbon or sulphur being deposited on the outer wall of the cold internal tube, and thus kept at a temperature below that at which recombination could take place.

Deville's observations on dissociation and his generalizations from them have a very direct bearing on the kinetic theory of gases, and it is a fact of interest in the history of science that Deville did not recognize the validity of that theory. Our estimate of the inge- nuity, skill, and patience shown in his experimental work, and of the genius and sound judgment which directed his theoretical conclusions, is perhaps raised when we recollect that he was neither led in the first nor biassed in the second by ideas derived from the kinetic theory, and his hostile or at least neutral attitude towards it gives perhaps greater value to the evidence that his work has contributed to its soundness.

Deville's works were published in the Annales de Chimie et de Physique and in the Comptes Rendus. He further published a volume, entitled De 1' Alumi- nium ; i Propriétés, &., Paris, 1859, and the lecture On Dissociation already referred to.

STE MARIE-AUX-MINES. See Marxircn.

SAINTES, a town of France, the chef-lieu of an arron- dissement in the department of Charente-Inférieure, on the left bank of the Charente, 88 feet above the sea and 45 miles south-east of La Rochelle by the railway from Nantes to Bordeaux. It occupies a delightful position and is of interest for its Roman remains. Of these the best preserved is the triumphal arch of Germanicus, although it has been removed and rebuilt stone by stone. The amphitheatre is larger than those of Nimes, Bordeaux, and Pompeii, and in area (~~89 of an acre) is surpassed only by the Colosseum. The external ellipse was 436 feet long and 354 broad. Rubble embedded in cement is the material of the building, which dates probably from the close of the Ist or the beginning of the 2d century. Measures have been taken to keep the ruins, now made picturesque by trees, from further injury or decay. The capitol was destroyed after the capture of the town from the English by Charles of Alengon, brother of Philip of Valois, in 1330. An ancient hypogeeum is still preserved, as well as numer~~ ous traces of the channels by which water was conveyed to private houses. The antiquarian museum

contains 7000 medals and numerous sculptured pieces. Saintes was a bishop’s see till 1790; the cathedral of St Peter, rebuilt at the close of the 12th century, was almost destroyed by the Huguenots in 1568, As rebuilt between 1582 and

_ 1585 the interior of the church has an unattractive appear- | ance,

| Eutropius (which was founded in the close of the 6th

The tower is 236 feet high. The church of St

century, rebuilt in the 11th, and had its nave destroyed in the Wars of Religion) stands above a very interesting well- lighted crypt, the largest in France after that of Chartres, adorned with richly sculptured capitals and containing the tomb of St Eutropius (4th or 5th century). Notre Dame,

| splendid example of the architecture of the 11th and

12th centuries, with a noble round clock-tower, is unfortu- nately occupied _by the military authorities, who have mutilated the interior. The town, which was

at one time at the head of the department, is still the seat of the courts of assize and has a court-house. Other public buildings are a town-house (Renaissance), a hospital, and a library. Small vessels ascend the river as far as Saintes, which has an advantageous situation between Angouléme and Cognac higher up and Taillebourg and Rochefort farther down, and is the seat of iron and copper foundries, factories for agricultural instruments, cooperages, and skin- dressing establishments. The population in 1881 was 13,341 (15,763 in the commune).

Saintes (Mediolanum or Mediolanium), the capital of theSantones, was a flourishing town before Cexsar’s conquest of Gaul. Chris- tianity was introduced by St Eutropius, its first bishop, in the middle of the 3d century.

Charlemagne rebuilt its cathedral. The Normans burned the town in 845 and 854. Richard Cceur de Lion fortified himself within its walls against his father Henry II., who captured it after a destructive siege. It was not till the reign of

Charles V. that Saintes was permanently recovered from the English. The Protestants did great damage during the Wars of Religion.

ST ETIENNE, an industrial and manufacturing town of France, chef-lieu of the department of Loire, 312 miles south-south-east of Paris and 36 miles south-south-west of Lyons by rail, with a branch line to Le Puy. The coalfield of St Etienne is the richest in France after that of Valenciennes and Pas de Calais, giving employment to 12,000 miners and 5000 workmen at the pit-heads. There are 64 concessions worked by 28 companies, extending over an area 20 miles long by 5 in width; the mineral is of two kinds,—smelting coal (said to be the best in France) and gas coal; the yearly output is between 3,000,000 and 4,000,000 tons, but with a tendency to decrease. In the metallurgic establishments of the arrondissement, which extend all the way along the railway from Firminy to Rive-de-Gier, 5540 workmen are employed, and in 1882 61,127 tons of cast metal, 58,445 tons of iron, 10,815 tons of sheet-iron, and 131,56 kinds were manu- [— : ZS factured. The last- named industry, carried on accord- ing to the Besse- mer and Martin processes, yields } nearly a third of the whole French production of steel. Military and naval material, railway plant, and articles of general mer- chandise are all madeat St Etienne, and its name is especially associ- ated with large castings, bomb- } proof plates, ship- armour, masts, and Jf pieces of machin- ery. The national : ; gun-factory, under Plan of St Etienne. the direction of artillery officers and employing 4300 workmen, is almost exclusively devoted to the produc- tion of rifles and revolvers for the army. A certain number of gun-makers not engaged in the factory turn out from 80,000 to 90,000 firearms (hunting-pieces, revolvers, &c.) per annum. Hardware is manufactured by 60 firms, employing 7000 workmen (who are not, how- ever, exclusively occupied with this department) ; leading articles are locks (known as Forez locks), common cutlery, files, nails, bolts, anvils, vices. Hemp cables for mines,

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hats, pottery, and lime are among the miscellaneous manu-

factured products of the town, which is besides a great

centre of the ribbon trade, with a testing-house (condition) for examining the silk, From 500 to 600 tons of silk, valued at £1,200,000 to £1,400,000, are used per annum, and the manufactured articles reach a value ranging from £2,800,000 to £3,200,000. The ribbons, laces, trimmings (in silk, cotton, and india-rubber) produced in the arron- dissement of St Etienne are valued at £4,000,000, and form four-fifths of the total French production. With the exception of a few factories where machinery is employed, the whole manufacture is carried on by persons with small means. About 5C00 looms (Jacquard's permitting thirty- six pieces to be woven at once) and 40,000 workmen are employed. Besides the old abbey church of Valbenoite (outside of the town) with its nave dating from the 13th century, the public buildings comprise a Protestant church, a synagogue, a town-house (finished under the second empire and decorated with statues of the ribbon trade and metallurgy), a school of mines (1816), with a mineralogical and geological collection, and a "palace of the arts," with a museum and library rich in old MSS. and collections in connexion with artillery and natural history. Near Valbenoite in the wooded gorge of the Furens is the reservoir of Gouffre d'Enfer, formed by a dam (1861-1866) 328 feet long, 131 high, and 131 wide at the base, and capable of storing about 70,000,000 cubic feet of water. The population of the town was 28,000 in 1764; by 1876 it was 126,019, but it had decreased to 114,962 (123,813 in the commune) in 1881.

At the close of the 12th century St Eticnne was only a parish of the Pays de Gier belonging to the abbey of Valbenoite. By the middle of the 14th century the coal trade had reached a certain development, and by the close of the eentury the town was sur- rounded with walls and had consuls. A hundred years later it had three growing suburbs. The Wars of Religion stimulated the manufacture of arms, and about the same period the ribbon trade sprang into existence. It was not till the 18th century, however, that

the town entered on its era of prosperity. The royal manu- factory of arms was established in 1764. In 1789 they were pro- ducing at the rate of 12,000 muskets per annum ; between September 1794 and May 1796 they delivered 170,858 ; and 100,000 was the annual average throughout the whole period of the empire, The first railways opened in France were the line between St Etienne and Andrezieu on the Loire in 1828 and that between St Etienne and Lyons in 1831. In 1856 St Etienne became the administrative centre of the department instead of Montbrison. Among the local celebrities are Francis Garnier, who conquered Tongking in 1873,

and several engravers who have given cminence to the St Etienne school of engraving.

ST EUSTATIUS, or St Evstacue, one of the Dutch West India Islands, a dependency of Curagao, lying north- west of St Kitts in 17° 50’ N. lat. and 62° 40’ W. long., consists of two volcanic cones and an intervening valley, and contains the small town of Orangetown and two forts. The population, which from 7600 in 1786 had decreased to 1741 (about 1000 Negroes), was again 2247 in 1882. Between 300 and 400 vessels visit the island annually. Yams and sweet potatoes are exported (5187 and 3010 tons in 1882). The Dutch occupied St Eustatius in 1635, and, after frequent French and English irruptions, were confirmed in their possession of it in 1814.

SAINT-EVREMOND, CHarLes DE MARGUETEL DE SAINT-DENIS, SEIGNEUR DE (1613-1703), was born at Saint- Denis-le-Guast near Coutances, the seat of his family in Normandy, on 1st April 1613. He was a younger son, but took his designation from one of the smaller estates of the family and appears to have had a sufficient portion. He was a pupil of the Jesuits at the Collége de Clermont, Paris, then a student at Caen. For a time he followed the law at the Collége d’Harcourt. He soon, however, took to arms and in 1629 went with Bassompierre to Italy. He served through great part of the Thirty Years’ War, chiefly in Germany, and, meeting Gassendi at Paris, became

strongly imbued with his doctrines. He was present at Rocroy, at Nordlingen, and at Lens. For a time he was attached to Condé, but is said to

have offended him b

some satirical speech or speeches. During the Fronde Saint-Evremond, unlike most of his contemporaries, never changed sides, but was a steady royalist. The duke of Candale (of whom he has left a very severe portrait) gave him some appointments in Guienne, and Saint-Kvremond is said to have saved 50,000 livres in less than three years, He was one of the numerous victims of the fate of Fouquet, His letter to Créqui on the peace of the Pyrenees, which is said to have been discovered by Colbert's agents at the seizure of the superintendent's papers, seems a very in- adequate cause for exile, and it has been supposed that there was more behind ; but nothing is known certainly. Saint-Evremond went to Holland and England, where he was received with open arms by Charles II., and was pen- sioned, He found himself very much at home in England, and though after James II.'s flight to France Saint- Evremond was invited to return he declined. Hortense Mancini, the most attractive of Mazarin's strangely attrac- tive group of nieces, came to England and set up a salon for love-making, gambling, and witty conversation, and here Saint-Evremond was for many years at home. He died on Michaelmas Day 1703, and was buried in West- minster Abbey, where his monument still is in Poet's Corner close to that of Prior.

Saint-Evremond is perhaps the most remarkable instance of the curious 17th-century fancy for circulating literary work in manu- script or clandestinely. He never himself authorized the printing of any of his works during his long lifetime, though Barbin in 1668 published an unauthorized collection. But he empowered Des Maizeaux to publish his works after his death, and they duly appeared, the earliest form and date being 3 vols. 4to, 1705. They were often reprinted in various forms during the first half of the 18th century. Saint-Evremond, however, had made his mark and estab- lished his influence long before the earliest of these books appeared. He was an older man than Pascal, a very much older man than Anthony Hamilton, and he probably preceded the first, as he certainly long preceded the second, in the employment for literary purposes of a singularly light, polished, and_graceful irony, which taught a great deal to Voltaire, but which Voltaire was never able to imitate with quite the air of good company which distinguishes his teacher. The masterpiece of Saint-Kvremond's style

in this respect is the so-called Conversation du Maréchal ad' Hocquincourt avec le Pere Canaye (the latter a Jesuit and Saint- Evremond's master at school), which has been frequently classed with the Lettres Provinciales, but which with less of moral purpose and of cutting reproof even excels those famous compositions in dramatic power and in subtle good-humoured irony. The remainder of Saint-Evremond's works are desultory in the extreme. Some ela- borate letters contain the exposition of an Epicurean philosophy of life which had a very great influence on the polite soeiety of his day. Others, and the most important of all, exhibit the writer as a literary critic of singular discrimination and taste. His com- parisons of Corneille and Racine, his remarks on English drama (ehicfly that of Ben Jonson), his sketches of criticism on Roman character and literature, all show a remarkable union of acute and orderly generalization with freedom from the merely academic spirit which had in his time already begun to beset France. Altogether, Saint-Evremond may be said with greater right to deserve the phrase which used to be applied to Sir William Temple. He 1s the first master of the genteel style in French literature, and the lively poignancy of his irony prevents this gentility from ever becoming insipid. His influence indeed was hardly less in his adopted than in his native country, and it may be traced in the Queen Anne essayists to a not much less degree than in Hamilton and Voltaire.

Saint-Evremond's complete works have not recently been reprinted, but there are selections by Hippeau, Giraud, and others.

ST GALL, in area the sixth (789 square miles), i actual population the fourth (210,491), and in relative density of population the tenth of the Swiss cantons, was formed in 1803 out of the two independent communities of the "town" and the "abbey " (including Toggenburg); Rapperswyl, Uznach, Gaster, Sargans, Gams, Rheinthal, Sax (with Forsteck), which belonged to Zurich, and Wer- denberg, which belonged to Glarus. It encloses the canton

of Appenzell, extending between the Lake of Constance and the Lake of Zurich on the west, and being bounded by the Rhine on the east, while in

the south-west lies the valley occupied by the Wallenstatt Lake and the Linth Canal. The Rhine separates St Gall from Tyrol, and the rest of its frontier is conterminous in succession with Grisons, Glarus, Schwyz, Zurich, and Thurgau. In alti- tude the canton ranges from 1306 feet above the sea (the height of the Lake of Constance) to 10,660 feet in the Ringelspitz of the Sardona group. The arable area is not sufficient to supply the local demand for grain; but the stock-breeding and especially the manufacturing indus- tries, to which a large part of the population is devoted, make up for any agricultural deficiency. Rorschach and Rapperswyl are lake ports; Wyl, Lichtensteig, Altstatten, and Uznach markets of some importance for local pro- jucts. Ironstone is worked in the Gonzen district, and chere are quarries at Rorschach and Bolligen, Mels and Degersheim. Ragatz, the well-known watering-place, is supplied with mineral water from Pfaffers. The people of 3t Gall are three-fifths Roman Catholic and two-fifths Protestant (126,164 and 83,441 in 1880), but, in spite of this and considerable diversities of culture and character ‘rom district to district, a fair degree of harmony has ulti- nately been secured even in the treatment of educational ‘yuestions. The constitution dates from 1861 and was vartially revised in 1875. After being abolished for many years, the death-penalty was re-enacted in 1882. Besides the city of St Gall there were in the canton in 1880 three communes with upwards of 5000 inhabitants each,—Tablat 8092), Wattwyl (a seat of the cotton manufacture, 5283), ud Straubenzell (5026).

ST GALL (German Sankt Gallen), capital of the above anton, occupies along with its suburbs St Fiden, Neudorf, ind Langgasse (to the east), and Lachen and Vonwil (to she west), an area 4 miles long by 1 broad in the high- and valley of the Steinach, which descends north-east .0 the Lake of Constance. On a pillar in the market- olace are the following details :—Lat. 47° 25’ 36” N.; long. (° 2° 27″ KE, from Paris (9° 22’ 41” Green.) ; height above he sea, 2196°6 feet ; mean annual temperature, 45°6; an- ual rainfall, 50 inches ; air-distance from Zurich 39 miles, rom Geneva 174, The only town—not village—in Europe vhich has a higher position than St Gall is Madrid. The Jhief building in St Gall is the abbey, of which (as it ‘vas. originally arranged) a ground plan and description jre given in vol. i. pp. 12, 13. The abbey church, since /846 the Roman Catholic cathedral, was entirely rebuilt n the latter part of the 18th century in the rococo style.

Partly from the desire to include within the choir the jpmbs of the two founders and partly from the hostility vhich long existed between town and tonsure, both the owers (217 feet) are placed at the east end and the main ntrance is in the north side. The whole church has a pngth of 400 feet (with the sacristy 454 feet), and a ‘readth in the nave of 95 feet, a disproportion which is onsiderably disguised by the arrangement of the interior. mong the internal decorations are two colossal statues f St Desiderius and St Mauritius, the original patrons ‘f the church, whose relics were brought from Scotland. ther buildings of importance are the (Protestant) church {St Lawrence, partially rebuilt (1851-53) according to _lans by the Swiss poet Johann G. Miiller, the Government fices on the east side of the abbey-court (where Schéll’s nous relief of the cantons of St Gall and Appenzell is to 8 seen), the town-house, the offices of the Mercantile irectorium (a, 17th-century institution to which the town wes much of its commercial prosperity), the great cantonal :hool—comprising a gymnasium, a technical school (pre- ‘uatory to the polytechnicum at Zurich), and a mercantile

school—the cantonal reformatory of St Jacob, the hospitals, and the infantry and cavalry barracks. In the town park, part of which is occupied by the botanic gardens, stands the public museum, containing natural history collections, the industrial collections and industrial drawing-school of the Mercantile Directorium, the picture gallery of the Art Society, and the antiquarian collections of the Historical Society. The museum of the East Swiss Geographical Commercial Society is located in the cantonal school. – Besides the abbey library, famous for its ancient MSS. (original of the Miebelungenlied, &c.), there is a town library (Bibliotheca Vadiana), founded by the reformer Joachim de Watt or Vadianus. In spite of its position and climate, St Gall is the seat of extensive industries and trades. About 45,000 persons in the surrounding cantons are engaged in the manufacture of embroidered goods, mainly muslins, for the St Gall capitalists, who also em- ‘ploy some 6000 or 7000 women in chain-stitch and hand embroidery. In 1872 6384 machines were at work in this department in the town and vicinity, and in 1882 14,883. The value of textile fabrics and embroidered goods annu- ally exported from St Gall is £3,600,000 to £4,000,000. All round the town the meadows are used as

bleaching- grounds for the webs. In 1870 the population was 16,675, in 1880 21,438.

The abbey of St Gall was named after its founder, a follower of St Columba, who along with Columban left Ireland on the destruc- tion of Bangor and finally settled down in the midst of the great forest which then stretched from the Lake of Constance to the Santis Mountains, for the purpose of converting the Alemanns. On his death on 16th October 625 this apostle of Celtic Christianity was buried in his oratory, and in the 9th century the spot thus con- secrated became the site of the monastic buildings erected by Abbots Gozbert and Grimoald. The foundation was already a wealthy one, and it soon became a great centre of literary and artistic culture, attracting numerous pupils and receiving the homage of dukes and emperors. In the 10th century the abbey and its cluster of houses were surrounded with a wall, which in 954 had to defend the settlc- ment against an attack by a band of Saracens. In the reign of Rudolph of Hapsburg the town obtained a recognition of its com- munal independence from Abbot Ulrich and from the emperor ‘him- self a variety of important privileges. An alliance defensive and offensive was formed in 1312 with Zurich, Constance, and Schaff- hausen ; and, although the prosperity of the town received a severe check by a great conflagration in 1314, the vigour with which the burghers prosecuted the newly introduced linen manufacture soon made it one of the most flourishing towns of Switzerland. About the middle of the 14th century the burghers began to share in the government of the town; and in 1457 they bought up all the claims of the abbots to territorial jurisdiction. In 1454 St Gall joined the confederation of the Swiss towns, Zurich, &. Abbot Ulrich VIIT. determined to remove the abbey to Rorschach ; but the inhabitants of St Gall, Appenzell, &c., combined to destroy his new buildings, and, though St Gall was besieged by the abbot’s supporters and had to pay grievous damages (1490), the treaty which it signed bound the abbots never to attempt to remove the relics of the founder. The abbey, which had purchased the countship of Toggenburg, passed at the Reformation into the hands of the town (1529), but it was restored to the abbots in 1530; and, when in 1712 in the ‘‘Toggenburg War” Zurich and Bern devastated the abbey and its possessions, the townsfolk remained neutral. The final dissolution of the abbey occurred in 1798. Under the French, St Gall was the chief town of the canton of Santis.

SAINT-GERMAIN, Comre bE (d. 1780), a celebrated adventurer of the 18th century who by the assertion of his discovery of some extraordinary secrets of nature exercised considerable influence at several European courts. Of his parentage and place of birth nothing is definitely known ; the common version is that he was a Portuguese Jew. It was also commonly stated that he obtained his money from discharging the functions of spy to one of the Euro- pean courts. He knew nearly all the European languages, spoke good German and English, excellent Italian, French (with a Piedmontese accent), and Portuguese and Spanish with perfect purity. Grimm affirms him to have been the man of the best parts he had ever known. His knowledge of history was comprehensive and minute, and his accom-

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plishments as a chemist, on which he based his reputation, were undoubtedly real and considerable. The most re- markable of his professed discoveries was of a liquid which could prolong life, and by which he asserted he had lived 2000 years. At the court of Louis XV., where he ap- peared about 1748, he exercised for a time extraordinary influence, but, having interfered in the dispute between the houses of Austria and France, he was compelled in June 1760, on account of the hostility of the duke of Choiseul, to remove to England. He appears to have resided in London for one or two years, but was at St Petersburg in 1762, and is asserted to have played an important part in connexion with the conspiracy against the emperor Peter IIl. in July of that year. He then went to Germany, where, according to the Mémoires authentiques of Cagliostro, he was the founder of freemasonry, and initiated Cagliostro into that rite. After frequenting several of the German courts he finally took up his residence in Schleswig-Holstein, where he and the landgrave Charles of Hesse pursued together the study of the “secret” sciences. He died at Schleswig in 1780.

Saint-Germain figures prominently in the correspondence of Grimm and of Voltaire. Sec also Oettinger, Graf Saint-Germain, 1846; Biilau, Geheime Geschichten und rathselhafte Menschen, vol. 1. cap. X11.

Sp GERMAIN-EN-LAYE, a town of France, in the department of Seine-et-Oise, 8 miles north of Versailles and 13 west of Paris by rail. Built on a hill on the left bank of the Seine, nearly 200 feet above the river, and on the edge of a forest 10,000 to 11,000 acres in extent, St Germain has a healthy and bracing air, which makes it a favourite place of summer residence with the Parisians. It had 15,545 inhabitants in 1881 (15,790 in the commune). The terrace of St Germain, constructed by Lenétre in 1672, is 7900 feet long and 100 feet wide, is planted with lime trees upwards of a hundred years old, and affords an extensive view over the valley of the Seine as far as Paris and the surrounding hills; hence it ranks as one of the finest promenades in Europe. It was also after Lendtre's plans that the "parterre" promenade was laid out between the castle and the forest and the "English garden" (by which it is approached). The history of St Germain centres in the castle, now occupied by a museum of national antiquities.

A monastery in honour of St Germain, bishop of Paris, was built in the forest of Laye by King Robert. Louis VI. erected a castle close by. Burned by the English, rebuilt by Louis IX., and again by Charles V., this castle did not reach its full development till the time of Francis I., who may be almost regarded as the real founder of the building. A new castle was erected by Henry IL. ; but it was demolished by the count of Artois, and there remains only the so-called Henry IV. pavilion, now used as an_ hotel, and known as the place where Thiers died, 3d September 1877. The old castle, on the contrary, is being completely restored to the state in which it was under Francis I. The chapel, dating from 1240, is older than the Sainte Chapelle at Paris, and is worthy of note for its rose and other windows. The museum, which will occupy forty rooms, contains a chronological series of artistic and industrial products from the earliest prehistoric times. In the church of St Germain is a mausoleum erected by Queen Victoria to the memory of James II. of England, who found in the old castle (now demolished) an asylum after the Revolution of 1688. In one of the public squares is a statue of Thiers. The town is the scat of one of the cavalry garrisons which surround Paris. At no great distance in the forest is the Couvent des Loges, a branch of the educational establishment of the Legion of Honour (St Denis). The féte des Loges is one of the most popular in the neighbourhood of Paris. Henry II., Charles IX., and Margaret of Navarre were born at St

Germain, as well as Louis XIV., who is said to have removed from this place to Versailles to get away from

the sight of the clock-tower of St Denis, the church where he was to be buried.

ST HELENA, an island in the Atlantic in 15° 55’ 26” S. lat. and 5° 42’ 30” W. long. (Ladder Hill Observa- tory), lies 1140 miles from Africa, 1800 from America, 700 south-east of the island of Ascension (the nearest land), and 4000 from Great Britain, of which it has been

a dependency since 1651. The area is about 45 square miles, the extreme length from south-west to north-east being 104 miles and the extreme breadth 84. The island is a very ancient volcano, greatly changed by oceanic abrasion and atmospheric denudation. The northern rim of the great crater still forms the principal ridge, with the culminating summits of Diana’s Peak (2704 feet) and High Peak (2635); the southern rim has been altogether washed away, though its débris apparently keeps the sea shallow (from 20 to 50 fathoms) for some 2 miles south-east of Sandy Bay, which hypothetically forms the centre of the ring. From the crater wall outwards water-cut gorges stretch in all directions, widening as they approach the sea into valleys, some of which are 1000 feet deep, and measure one-eighth of a mile across at bottom and three- eighths across the top (Melliss). Along the enclosing hill- gides caves have been formed by the washing out of the

Map of St Helena.

softer rocks. High Hill (2823 feet) and High Knoll (1903) are lateral cones. Many dykes and masses of basaltic rock seem to have been injected “subsequently to the last vol canic eruptions from the central crater.” Among the more remarkable instances are the Ass’s Ears and Lot’s Wile, picturesque pinnacles standing out on the south-east part of the crater ridge, and the Chimney on the coast to the south of Sandy Bay. In the neighbourhood of Man and Horse (south-west corner of the island), throughout an area of about 40 acres, scarcely 50 square yards exist not crossed by a dyke. On the leeward side of St Helena the sea-face is

generally formed by cliffs from 600 to 1000 ° feet high, and on the windward side these heights often increase to full 2000 feet, as at Holdfast Tom, Stone Top, and Old Joan Point. Limited deposits of calcareous sand-stones and stalagmitic limestones occur at certain points, as on Sugar-Loaf Hill; they probably consist of particles of shells blown by the wind from some primeval beach, long since destroyed.

As regards its vegetation, St Helena is divided into three 20m', —(1) the coast zone, extending inland for a mile toa mile and 4 half, formerly clothed with a luxuriant vegetation, but now "dry, barren, soilless, lichen-coated, and rocky," with little save prickly pears, wire grass, and Mesembryanthemum ; (2) the middle zone (400- 1800 feet), extending about three-quarters of a mile inland, not so rocky, with shallower valleys and grassier slopes,—the English broom and gorse, brambles, willows, poplars, Scotch pines, &c., being the prevailing forms; and (3) the central zone, about 3 miles long and 2 wide, the last refuge for the most part of that marvellous

hich has been for enerations the admiration and sorrow of ia Aeeenist. We iis: to Mr W. B. Helmsley (who has sum- marized all that is known on the matter in his report on the botany of the Atlantic Islands)," the certainly indigenous species of plants are 65, the probably indigenous 24, and the doubtfully indigenous 5 ; total 94. Of the 38 flowering plants 20 are shrubs

ll trees. ane pgenliar to the island ; and the same is true of 12 of the 27 vascular cryptogams (a remarkable proportion). Since the flora began to be studied, two species—Melhania melanoxylon and Acalypha rubra—are known to have become extinct 5 and at least two others have probably shared the same fate — Heliotropium pennifolium and Demazeria obliterata. Melhania melanoxylon, or ''native ebony," once abounded in parts of the island now barren ; but the local legislation decided that goats were of more value than ebony. Its beautiful congencr Melhania erythroxylon (''red- wood") was still tolerably plentiful in 1810, but is now reduced to a few specimens. Very rare, too, has become Pelargoniwm eotyledonis, called " Old Father Live-for-ever," from its retaining vitality for months without soil or water. Commidendron robustum ("'gumwood "),

a tree about 20 fect high, once the most abundant in the island, was represented in 1868 by about 1300 or 1400 examples ; and Commidendron rugosum (‘‘scrubwood”’) is confined to somewhat limited regions. Both these plants are characterized by a daisy- or aster-like blossom, which looks very strange on a tree. In general the affinities of the indigenous flora of St Helena were described by Sir Joseph Hooker as African, but Mr Bentham points out that the important element of the Compositz shows, at least in its older forms, a connexion rather with South America. The exotic flora introduced from all parts of the world gives the island almost the aspect of a botanic garden. The oak, thoroughly naturalized, grows alongside of the bamboo and banana. As con- tributing largely to the general physiognomy of the vegetation must be mentioned—the common English gorse ; Rubus pinnatus, probably introduced from Africa about 1775 ; Hypochzxris radieata, which above 1500 feet forms the dandelion of the country ; the beautiful but aggressive Buddleia madagascariensis ; Physalis peru- viana ; the common castor-oil plant ; and the pride of India. The peepul is the principal shade tree in Jamestown, and in Jamestown valley the date-palm grows freely. Orange and lemon trees, once common, are now scarce. The attempt (1869-71) to introduce cinchona cultivation failed. Potatoes are probably the staple pro- duction of the St Helena farmers, and as many as three crops per annum are sometimes obtained.

The fauna of St Helena is only second in interest to its flora. Besides domestic animals the only land mammals are rabbits, rats, and mice, the rats being especially abundant and building their nests in the highest trees. Probably the only endemic land bird is the wire bird, Zgialitis sanctz helene ; the averdevat, Java sparrow, cardinal, ground-dove, partridge (possibly the Indian ehukar), pheasant, and guinea-fowl are allcommon. The pea-fowl, at one time not uncommon in a wild state, is long since extermi- nated. Though fresh water abounds in the island in the form of springs, rivulets, and streams, there are no freshwater fish, beetles, orshells. Ofsixty-five species of sea-fish caught off the island seven- teen are peculiar to St Helena ; economically the more important kinds are guard, eel, cod, mackerel, tunny, bullseye, cavalley, flounder, hog-fish, mullet, and skulpin. Mr Wollaston, in Coleoptera Sancte Helene, 1877, shows that out of a total list of 203 species of beetles 129 are probably aboriginal and 128 peculiar to the island, —an individuality perhaps unequalled in the world. More than

two-thirds are weevils and a vast majority wood-borers, a fact which bears out the tradition of forests having once covered the island. The Hemiptera and the land-shells also show a strong residuum of peculiar genera and species. A South-American white ant (Termes tenuis, Hagen.), introduced from a slave-ship in 1840, soon became a real plague at Jamestown, where a considerable portion of the public library fell a prey to its voracity. The honey- bee, which throve for some time after its introduction, again died out. (Comp. Wallace, Island Life.)

The population of St Helena was 6444 in 1871 and 5059 (2617 males, 2442 females) in 1881; it consists of Government officials, of old-established residents (“ yamstalks”) of somewhat composite origin, European and Asiatic, and of the descendants of Negroes landed from the West African slave-ships subsequent to 1840. The only town—Jamestown (3000 inhabitants)—lies in a deep valley on the north-west coast, and there is a village in the neighbouring he 8 Valley. Ladder Hill, the seat of the garrison, is so called rom the almost precipitous ladder-like wooden stair by which its height of 600 feet can be scaled. Longwood, where Napoleon died in 1821, is a farmhouse in an elevated plain (2000 feet high), about 3 miles inland from Jamestown.

d St Helena was discovered by the Portuguese navigator Jodo Be Nova on the 21st of May 1501. The island received its first nown inhabitant in 1513 in the person of Fernandez Lopez, a

1 Voyage of H.M.S. Challenger, Botany, vol. i.

With the cxception of Scirpus nodosus, all the 38 |

Portuguese of good family, who preferred being marooned to re- turning to Europe after the barbarous mutilation to which he had been subjected for some misdemeanour. Cavendish (1588), Kendall (1591), and Lancaster (1593) were the earliest English visitors. The Dutch, who had for some time been in possession of the island, withdrew in 1651, but on two occasions (1665 and 1673) managed to expel the forces of the English East India Company, which had at once seized the abandoned prize. The company,

having procured a second charter of possession on 16th December 1673, remained the governing authority till 22d April 1834, when St Helena passed into the hands of the British crown. In 1832 it had purchased the freedom of the slaves (614) for £28,062. Asa port of call the island continued to prosper till the opening of the Suez Canal, which, by altering the route to the East Indies, deprived the people of their means of subsistence. The revenue has decreased from £13,931 in 1874 to £10,421 in 1884, the expenditure from £14,521 to £10,806, the value of imports from £53,874 to £41,816, and of exports from £4006 to £1436. Halley the astronomer in 1676 left his name to Halley's Mount; and Maskelyne and Waddington

visited the island in 1761.

See Seale, Geognosy of Saint Helena (folio plates), 1834; Brooke, History of Saint Helena, 1808 and 1824; Beatson, Tracts, &c., 1816; Darwin, Geological Observations on Volcanic Islands, 1844; Melliss, Saint Helena, 1875.

ST HELEN'S, a market-town and municipal and parlia- mentary borough of south-west Lancashire, England, is situated on a branch of the London and North-Western Railway, 21 miles west by south of Manchester and 10 east-north-east of Liverpool. It is the principal seat in England for the manufacture of crown, plate, and sheet glass, and has extensive copper smelting and refining works, as well as chemical works, iron and brass foundries, and potteries. There are collieries in the neighbourhood. The town, which is entirely of modern origin, obtained a charter of incorporation in 1868. A town-hall was erected in 1873, and there are also a public library and various institutes for affording instruction and amusement to the working-class population. Extensive drainage works have been carried out under a local Act. The corporation are the owners of the waterworks and gasworks. Enfranchised in 1885, St Helen's returns one member to the House of Commons. The population of the borough (area, 6586 acres) in 1871 was 45,134, and in 1881] it was 57,403.

ST HELIER. See Jersey, vol. xiii. p. 635.

SAINT-HILAIRE. See Grorrroy Saint-HILAIRE,

SAINT-HILAIRE, Aucuste DE (1799-1853), French botanist and traveller, was born at Orleans on 4th October 1799. He began to publish memoirs on botanical subjects at an early age. In 1816-22 and in 1830 he travelled in South America, especially in south and central Brazil, and the results of his personal study of the rich flora of the regions through which he passed appeared in several books and numerous articles in scientific journals. These works are most valuable from the copious information they afford not only about the plants and other natural products but also about the native races he encountered. Those by which he is best known are the Flora Brasiliz Meridionalis (3 vols. folio, with 192 coloured plates, 1825-32), published in conjunction with A. de Jussieu and Cambesséde, Mstozre des plantes les plus remarquables du Brésil et de Paraguay (1 vol. 4to, 30 plates, 1824), Plantes usuelles des Brésilvens (1 vol. 4to, 70 plates, 1827-28), also in conjunction with De Jussieu and Cambesséde, Voyage dans le district des Diamants et sur le littoral du Brésil (2 vols. 8vo, 1833). His numerous articles in journals deal largely with the plants of Brazil and the general characters of its vegetation ; but Saint-Hilaire also aided much in establishing the natural system of classification on the firm basis of structural characters in the flowers and fruits; and that he recognized the importance of the study of anomalies in this view is shown in more than one of his writings. His Lecons de Botanique, comprenant principalement la Morphologie Vége- tale, published in 1840, is a very comprehensive and clear exposition of botanical morphology up to 1840 and of its application to systematic botany. He died at Orleans on 30th September 1853.

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ST IVES, a seaport and borough of west Cornwall, England, is situated at the west entrance of the beautiful St Ives Bay on the Bristol Channel, 7 miles north of Penzance. The older streets are narrow and irregular, but on the slopes above there are modern terraces with good houses. ‘The town takes its name from St Hya or Ia, an Irish virgin who is said to have arrived in the bay in the 5th century. The parish church of St Andrew is in the Early Perpendicular style of the 15th century. In the churchyard is an ancient cross recently restored. A town-hall was erected in 1832. The town is the head- quarters of the pilchard fishery. The port has suffered greatly from the accumulation of sand. A stone pier was built by Smeaton in 1767 ; a

breakwater was commenced in 1816 but abandoned ; and a wooden pier, which was commenced in 1865, is still unfinished. Formerly the town was called Pendenis or Pendunes. Its charter of incorporation, granted by Charles I. in 1639, was forfeited in 1685, but was renewed by James II. in 1686. From the reign of Jolin until 1832 it sent two members to par- liament, and one from 1832 until 1885, when it was merged in the St Ives division of the county. The popu- lation of the municipal borough (area, 1890 acres) in 1871 was 6965, and in 1881 it was 6445.

ST JEAN BAPTISTE, a suburb of Montreal, Canada, under a separate municipality. It Hes north-north-east of Mount Royal Park and is hardly a mile from the centre of the city. The population in 1881 was 5874.

ST JEAN D'ACRE. See Acre.

ST JEAN D'ANGELY, a town of France, the chef-lieu of an arrondissement in the department of Charente-Infé- rieure, on the right bank of the Boutonne (a right-hand affluent of the Charente) and on the railway from Taille- bourg (12 miles south-west) to Niort (30 miles north). The town, which is badly planned and built, contains the remains of a Benedictine abbey, destroyed in 1568; the existing church corresponds to but a part of the large old abbey church erected in the 13th century. The harbour admits vessels of 30 to 40 tons burden, and wine and brandy are exported. The population was 6538 in 1881 (7279 in the commune).

St Jean owes its origin to a castle of the 7th century, which the dukes of Aquitaine used as a lodge for boar-hunting in the neigh- bouring forest of Angeri. Pippin, son of Louis le Debonnaire, turned it into a monastery, where he deposited the head of John Baptist. This relic attracted hosts of pilgrims ; a town grew up, took the name St Jean d'Angeri, afterwards d'Angély, was fortified in 1131, and in 1204 received from Philip Augustus a communal charter. The possession of the place was disputed between French and English in the Hundred Years' War, and between Catholics and Protestants ata later date. Louis XIII. took it from the Protestants in 1629 and deprived it of its fortifications, its privileges, and its very name, which he wished to change into Bourg-Louis.

ST JOHN, capital of St John county and the largest city of the province of New Brunswick, is strikingly situated at the mouth of the river of the same name, in 45° 146” N. lat. and 66° 3’ 30” W. long (see vol. xvii., plate IV.). It stands on an elevated rocky peninsula which projects into the harbour for a considerable distance. The latter, which is protected by batteries and never freezes, is well equipped with wharves and docks, and is capable of accommodating ships of the largest size. Its entrance is guarded by Partridge Island, lying 2 miles south of the city, and containing the quarantine hospital and light- house. About 1} miles north of the lighthouse is situated the Beacon, and below the town east of the channel is the breakwater, 2250 feet long: The St John river enters the harbour through a rocky and sharply defined gorge, 100 yards wide and about 400 long, having a total fall of about 17 feet, which is passable to ships for forty-five minutes during each ebb and flow of the tide. The river has alternately an inward and an outward fall twice

every twenty-four hours, the high-water tide level imme. diately below the gorge being 6 to 8 feet higher than the average level above the gorge. The river is here spanned by a stanch suspension bridge 640 feet long and 100 fee; above low-water level, and a cantilever railway bridge, 2260 feet long, with a river span of 825 feet, was opened

Plan of St John, New Brunswick.

in 1885. The city, approached from the sea, presents a bold and picturesque appearance, and, next to Quebec,

| possesses more natural beauty than any other town in

Canada. There are three large public squares, and the streets (lighted with gas and the electric light) are regularly laid out. The water supply is derived from Little river, 5 miles distant, and brought to the city by three separate mains with an aggregate capacity estimated at 10,000,000 gallons daily ; the present daily consumption (including that of the city of Portland)-is 5,000,000 gallons. The works, which are owned by the city, cost $992,326. The water supply of St John (West) is derived from Spruce Lake. St John

(East) has also an admirable sewerage system. On the 20th of June 1877 two-fifths of St John (about 200 acres) were destroyed by a fire, which in nine hours burned over $27,000,000 worth of property. The city was quickly rebuilt, and on a much grander scale, many brick and stone edifices taking the place of the old land- marks, which were principally composed of wood, The chief buildings are—the Roman Catholic cathedral, Trinity, St Andrew's, the Stone, St David's, the Centenary, Ger- main Street Baptist, and Leinster Street Baptist churches, the custom-house, post-office, city-hall, savings bank, Wiggins's Orphan Asylum, Victoria skating-rink, lunatic asylum, Victoria and Madras schools, the Masonic and Oddfellows' halls, the young men's Christian association building, the general public, the epidemic, and the marine hospitals, the court-house, jail, police office, and mechanics institute (with a reading-room, library, and museum). There are thirty-three places of worship (Church of England 6, Roman Catholic 3, Presbyterian 7, Wesleyan Methodist 5, Baptist 6, Congregationalist 1, Methodist Episcopal 1, Christian Brethren 1, Disciples of Christ 2, and Christ- adelphians 1); the educational institutions consist of a grammar-school, a Madras school, Baptist seminary, and

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several public and private schools and academies. St John has also a free public library, numerous religious, charitable, scientific, and literary societies, and three daily newspapers. Carleton, on the opposite side of the river, and connected with the east side by ferry, is included within the corpora- tion limits, and is represented in the common council. The population in 1871 was 28,805, in 1881 it was 26,127 (males 12,263, females 13,864), the decrease being caused

by the great fire of 1877, when many persons left the city:

St John is the entrepot of a large extent of country, rich in minerals, agrieultural produee, and timber. It is the seat of an extensive business connexion, and possesses first-class means of communication both by

steamships and sailing vessels and by rail- ways. Of late years its maritime and manufacturing interests have been greatly extended. The chief articles of manufacture are iron- castings, steam engines and locomotives, railway cars, coaches and carriages, machinery, edge-tools, nails and tacks, cotton and woollen goods, furniture, wooden ware, leather, boots and shoes, soap and candles, agricultural implements, lumber, sugar-boxes, paper, boats, sails, &. The fisheries afford employment to about 1000 men, and shad, salmon, holibut, cod, herrings, alewives, sturgeons, and haddock eomprise the chief varieties taken. The exports ($4,310,576 in 1884) consist of fish, lumber, woollen and cotton goods, manu- factured articles, &c. ; the imports ($4,621,691 in 1884) are tobaccos, sugar and molasses, spirits and malt liquors, dried fruits, coffee, tea, silks, velvets, &c. The following figures represent the move- ment of the coasting trade in 1884 :—vessels arrived 1864, tonnage 117,566, men 7340; vessels departed 1941, tonnage 105,050, men 6875. The number of entrances from foreign ports was 1904 (486,471 tons), of clearances 1961 (517,415 tons). The vessels on the re- gistry books (31st December 1884) numbered 677, with a tonnage of 251,136; 58 vessels were built in that year with a tonnage of 18,989. The taxable property in 1885 was—real estate $9,122,000, personal $9,153,300, income $2,833,900, total $21,109,200. The corporation affairs are managed by a mayor, elected by the people annually, and a city council of eighteen members. St John city and county return three members to the House of Commons of Canada, and six members to the House of Assembly of New Brunswick. The climate, though healthy, is changeable, the pleasantest season being the autumn. The highest temperature observed since 1860 was 87° Fahr., and the lowest — 22° Fahr., the mean temperature for spring, summer, autumn, and winter respect- ively being 36°°9, 58°, 45°, and 20° °6. The number of schools is 81, with 4171 pupils (average daily attendance 2722). Besides the libraries belonging to the city and the mechanics' institute, there are large collections of books open to members of the young men's Christian association and the Church of England institute. Navi- gation on St John river opens on 15th April and closes on 26th November.

De Monts visited St John in 1604, but it was not until 1635 that a regular settlement of the place was made, when Charles de la Tour founded a colony, which existed under French rule, with varying fortunes, until 1758, when it finally passed under British control. In 1764 the first Scottish

settlers arrived in New Bruns- wick, and in 1783 the Loyalists landed at St John and established the city. It was called Parr Town, in honour of Governor Parr, until 1785, when it was ineorporated with Conway (Carleton) under royal charter, as the city of St John.

ST JOHN, CHARLES WILLIAM GuorcE (1809-1856), naturalist and sportsman, was the son of General the Hon. Frederick St John, second son of Frederick, second viscount Bolingbroke, and was born 3d December 1809. He was educated at Midhurst School, Sussex, and about 1828 obtained a clerkship in the treasury, but, after joining some friends in various expeditions to the Highlands of Scotland, he found his duties so irksome that he resigned in 1834; The same year he married a lady with some fortune, and was thus enabled to gratify his taste for the life of a sportsman and naturalist. He ultimately settled in the “Laigh ” of Moray, ‘‘ within easy distance of mountain sport, in the midst of the game and wild animals of a low country, and with the coast indented by bays of the sea, and studded with freshwater lakes, the haunt of all the common wild fowl and many of the rarer —_ In 1853 a paralytic seizure permanently deprived a of the use of his limbs, and for the benefit of his

ealth he removed to the south of England. He died at Wooston near Southampton on 22d July 1856.

He wrote several books on sport, whieh record the results of accurate observations on the habits and peculiarities of the birds

and wild animals of the Highlands. They are written in a pleasant and graphic style, and illustrated with engravings, many of them from pen-and-ink sketches of his own, in which the traits and features of the animals are depicted, though in rough outline, yet with almost the vividness of life. His works are Wild Sports and Natural History of the Highlands (1846, 2d ed. 1848, 3d ed. 1861) ; Tour in Sutherland (1849, 2d ed., with recollections by Captain H. St John, 1884); Notes of Natural History and Sport in Morayshire, with Memoir by C. Innes (1863, 2d ed. 1884).

SAINT-JOHN, Henry. See BoLIncBRoKE.

ST JOHN, James Avcustus (1801-1875), traveller and author, was born in Carmarthenshire, Wales, on 24th September 1801. After attending a village grammar-school he received private instruction from a clergyman in thie classics, and also acquired proficiency in French, Italian, Spanish, Arabic, and Persian. At the age of seventeen he went to London, where he obtained a connexion with a Plymouth newspaper, and, along with James Silk Buckingham, became editor of the Oriental Herald. In 1827, along with D. L. Richardson, he founded the London Weekly Review, which was subsequently purchased by Colburn and transformed into the Court Journal. About 1829 he left London for Normandy, and in 1830 published an account of his experiences there under the title Journal of a Residence in Normandy (2 vols.). After spending some time in Paris and Switzerland he set out for Nubia and Egypt, visiting the second cataract in a small vessel. He made important discoveries in regard to volcanic agencies on both sides of the Nile, and found traces of volcanic agency in the Libyan Desert. He also explored the antiquities connected with the religion of ancient Egypt. The results of his journey were published under the titles Zyypt and Mohammed Ali, or Travels in the Valley of the Nile (2 vols., 1834), Egypt and Nubia, (1844), and Isis, an Egyptian Pilgrimage (2 vols., 1853). He died on 22d September 1875.

St John was also the author of Lives of Celebrated Travellers (1830), Anatomy of Society (1831), History, Manners, and Customs of the Hindus (1831), Margaret Ravenscroft, or Second Love (3 vols., 1835), The Hellenes, or Manners and Customs of Ancient Greece (1842), Sir Cosmo Digby, a novel (1844), Views in Borneo (1847), There and Back Again in Search of Beauty (1853), The Nemesis of Power (1854), Philosophy at the Foot of the Cross (1854), The Preach- ing of Christ (1855), The Ring and the Veil, a novel (1856), Life of Louis Napoleon (1857), History of the Four Conquests of England (1862), Weighed in the Balanee, a novel (1864), and Life of Sir oh alter Raleigh (1868). He also edited, with notes, various English classics.

Of his four sons, all of some literary distinction—Percy Boling- broke, Bayle, Spenser, and Horace Roscoe—the second, BAYLE ST JOHN (1822-1869), predeceased him. He was educated privately, and began contributing to the periodicals when only thirteen. At the age of twenty he wrote a series

of papers for Fraser under the title ‘De Re Vehiculari.” To the same magazine he contributed a series of essays on Montaigne, and, after continuing his studies on the same subject for some time, he published in 1857 Montaigne the Essayist, a Biography, in 4 volumes. In 1846 he passed through France and Italy on his way to Egypt, where, during a residence of two years, he wrote The Libyan Desert (1849). On his return he settled for some time in Paris and published Two Years in a Levantine Family (1850) and Views in the Oasis of Siwah (1850). After a second visit to the East he published Village Life in Egypt (1852), From this time he continued until twelve months of his death to reside in France, and as the result of his residence there published Purple Tints of Paris: Characters and Manners in the New Empire (1854), The Louvre, or Biography of a Musewm (1855), and the Subalpine Kingdom, or Experiences and Studies in Savoy (1856). He was also the author of Yravels of an Arab Merchant in the Soudan (1854), Maretimo, a Story of Adventure (1856), and Memoirs of the Duke of Saint-Simon in the Reign of Lowis XIV. (4 vols., 1857). 5

SAINT JOHN OF JERUSALEM, KNicHTs oF THE OrDER oF (see KnicutHoop). In the year 1023 certain merchants of Amalfi obtained permission from the caliph of Egypt to establish a hospital in Jerusalem for the use of “poor and sick Latin pilgrims.” The hospice prospered far beyond the hopes of its founders, and grateful travellers spread its fame throughout Europe and sent offerings to

its funds, while others voluntarily remained behind to assist actively in its pious purposes. With its increased utility organization became necessary, and in this organiza- tion is to be found the origin of the Order of Saint John. When Jerusalem was taken by Godfrey de Bouillon (see Crusapgs), his wounded soldiers were tended by Peter Gerard, rector of the Amalfi hospital of St John, and the more wealthy of the crusaders eagerly followed the example of their leader in endowing so useful and so practical an institution. Many of the Christian warriors sought per- mission to join the ranks of the fraternity. At the pro- posal of Gerard a regularly constituted religious body was formed; the patriarch of Jerusalem invested every approved candidate with a black robe bearing on the breast an eight-pointed white cross and received in return a vow of poverty, obedience, and chastity. In 1113 Pope Paschal II. formally sanctioned the establishment of the order by a bull. Five years later Gerard was succeeded by Raymond du Puy, and under his auspices the monastic knights took a fresh oath to become militant defenders of the cause of the Cross. During the first century of its existence the fraternity thus acquired a religious, republican, military, and aristocratic charactcr. The rules introduced by Raymond du Puy became the basis of all subsequent regulations ; the lead- ing members of the hospital or master’s assistants were formed into an all-powerful council, which divided the order into knights of justice, chaplains, and serving brethren. There was also an affiliation of religious ladies (dames) and of donats or honorary members. The income of the body corporate was derived from landed property in all parts of Europe. To facilitate the collection of rents, commanderies (first called preceptories) were formed. These gradually acquired the character of branch establish- ments where candidates were received and the same obser- vances practised as in the

parent convent. Raymond du Puy twice repulsed the advancing Turks; and Hugh de Payens, fired by the successes of the Hospitallers, founded the sister order of the Temple. In 1160 Raymond du Puy died. The rule of his immediate successors was unevent- ful; Gilbert d'Ascali greatly weakened the influence of the order by joining (1168) in an ill-fated expedition to Egypt. Roger Desmoulins, the eighth master, was killed fighting against Saladin before Jerusalem, while his suc- cessor, Garnier de Napoli, died of the wounds he received in the decisive battle of Tiberias, which led to the surrender of Jerusalem to the Moslems in 1187. The seat of the order was now transferred to Margat, a town which still remained in the possession of the Christians, and it becomes difficult to trace the frequent changes of the mastership. The dangerous enmity which arose between the Hospitallers and the Templars necessitated the energetic intervention of the pope. In 1216 Andrew, king of Hungary, was received into the order. The brief occupations of Jeru- salem by the emperor Frederick IT. (1228) and by Richard of Cornwall (1234) had little appreciable effect on the waning fortunes of the Hospitallers. A savage horde from the borders of the Caspian advanced against the Christians, and in the final struggle with the Chorasmians the masters of both orders—united before the common enemy—fell with nearly the whole of their followers (1244), William de Chateauneuf, elected to the mastership by the few sur- vivors, repaired to Acre only to take part in the fruitless crusade of Louis of France. The truce between the rival orders was doomed to be of short duration. In 1259 their armies met in a general engagement, and victory rested with the Hospitallers. A brief period of success in 1281 was powerless to avert the fall of Margat, and in 1289 Acre alone remained in the hands of the Christians. John de Villiers, a man of singular ability, became at this criti- cal juncture master of the order. An overwhelming force

was sent from Egypt to besiege Acre, which only fell after a desperate resistance. Under cover of the arrows of their archers the knights sailed for Cyprus (1291). Repeated acts of prowess by sea still served to remind the Moslem corsairs of the survival of their implacable foes. De Villiers died three years later and was succeeded by Odon de Pins, who tried

ineffectually to restore the purely con- ventual character of the order. William de Villaret

‘(elected in 1300) shared the dangers of an expedition to

Palestine and prepared for the conquest of Rhodes, which was effected in 1310 by his brother and successor. The revenues of the Hospitallers were now augmented from the confiscated estates of their old rivals the Templars, Fulk de Villaret was attacked at Rhodes by Osman, ruler of Bithynia, but with the assistance of Amadeus of Savoy he defeated the invaders. A serious difference which aroge between De Villaret and his subordinate knights enabled Pope John XXII. to appoint his nominee John de Villa- nova (1319). It was at this period that the order was divided into the seven langues of France, Provence, Au- vergne, Italy, Germany, England, and Aragon. In 1346 De Gozon became grand-master. His administration and that of his immediate successors are only remarkable for a perpetual struggle for supremacy with the papal court. In 1365 Raymond Beranger captured Alexandria in con- cert with the king of Cyprus, but the victors contented themselves with burning the city. Philibert de Naillae had no sooner been elected grand-master than he was sum- moned to join the European crusade against the sultan Bajazet, and took part in the disastrous battle of Nicopolis The Greek emperor unfortunately invoked the aid of Timur, who overthrew Bajazet, but followed up his success by an attack on Smyrna, the defence of which had been entrusted to the knights. Smyrna was taken and its brave garrison put to the sword. In 1440 and 1444 De Lastic defeated two expeditions sent against him from Egypt. Nine years later Constantinople fell at last into the hands of the Turks. It was evident to the knights that an attack on their sanctuary would follow the triumph of Islam, but it was not till 1480 that the long-dreaded descent on Rhodes took place. Fortunately for the order, Peter d’Aubusson was grand-master, and the skilfully planned attack of the three renegades was valorously repulsed. The heroic D’Aubusson recovered from his wounds, restored the shattered fortifications, and survived till 1503. Nearly twenty years passed away before the sultan Solyman de- termined to crush the knights, who had just elected L’Isle d’Adam as their chief. After a glorious resistance, D’Adam capitulated and withdrew with all the honours of war to Candia (Crete). Charles V., when the news of the disaster reached him, exclaimed, “

Nothing in the world has been so well lost as Rhodes,” and five years later (1530), with the approval of the pope, ceded the island of Malta and the fortress of Tripoli in Africa to the homeless knights. Peter Dupont succeeded D’Adam in 1534, and in the following year took a prominent part in the emperor’ famous expedition against Tunis. The position in Tripoli was from the first precarious, and it was surrendered to the corsair Dragut in 1551. In 1557 John La Valette was chosen grand-master. The construction of fresh fortt- fications was hastened and every precaution taken against a surprise. On the 18th May 1565 the Turkish fleet under the redoubtable Dragut appeared in sight and one of the most celebrated sieges in history began. It was finally raised on the 8th September after the death of Dragut and 25,000 of his followers. The city of Valetta afterwards rose on the scene of this desperate struggle. La Valette died in 1568, and no events of importance mark the grand-masterships of De Monte (1568), De la Cassiére (1572), and Verdala (1581). During their terms

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, sent to the grand-master in vain.

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of office the cathedral, the auberges, the hospital, and many remarkable edifices were built. Another city gradu- ally arose on the opposite shores of the grand harbour, and the once barren island became almost imperceptibly the site of one of the strongest fortresses and most flourishing commercial communities in the Mediterranean. Verdala was succeeded by Martin Garces (1595), but it was reserved for Alof de Vignacourt to revive for a time the military reputation of the order. Vasconcellos, De Paula, and Lascaris were all aged men when, one after another, they were called to the supreme power, and their election (with a view to secure frequent vacancies) contributed to weaken the vitality of the fraternity. Lascaris lived till the age of ninety-seven, built the fortifications of Floriana, en- dowed Valetta with a public library, and resisted the grow- ing encroachments of the Jesuits. Martin de Redin and Raphael Cottoner ruled each for three years. Nicholas Cottoner was elected in 1663, and the knights of St John

once again distinguished themselves in the siege of Candia. The losses which the order sustained in the repulse of the allies before Negropont (1689) was the indirect cause of the death of Caraffa, who was succeeded by Adrian de Vignacourt (1690), Raymond Perellos (1697), Zondodari 1720), De Vilhena (1722), Despuig (1736), and Pinto tray Emmanuel Pinto was a man of no mean ability and of considerable force of character. He steadily resisted all papal encroachments on his authority, expelled the Jesuits from Malta, and declined to hold a chapter-general. After the brief rule of Francis Ximines, Emmanuel de Rohan became grand-master (1775). He assembled a chapter-general, erected the Anglo-Bavarian langue, and sent his galleys to relieve the sufferers from the great earth- quake in Sicily. The order never perhaps seemed to all outward appearances more prosperous than when the storm of the French Revolution broke suddenly upon it. In 1792 the Directory decreed the abolition of the order in France and the forfeiture of its possessions. Five years afterwards De Rohan died. He had taken no pains to conceal his sympathy for the losing cause in France and his court had become an asylum and home for many French refugees. His successor Ferdinand Hompesch was perhaps the weakest mau ever elected to fill a responsible position in critical times. On the 12th April 1798 the French Government resolved on the forcible seizure of Malta. Warnings were Within two months

from that date the island was in the hands of Bonaparte,

and Hompesch was permitted to retire to Trieste with some of the most cherished relics of the order.

Subsequent to the departure of Hompesch a number of the knights who had taken refuge at St Petersburg elected the emperor Paul grand-master. Notwithstanding the patent illegality of the pro- ceeding the proffered honour was eagerly accepted and duly an- nounced to all the courts of Europe (October 1798). Hompesch was induced to resign in the following year. On the death of Paul an arrangement was arrived at which vested the actual nomination in the pope. From 1805 to 1879 only lieutenants of the order were appointed, who resided first at Catania, then at Ferrara, and finally at Rome. In 1879 Leo XIII. made Giovanni Battista Ceschi grand-

master, and he actually rules over portions of the Italian and German langwes and some other scattered groups of the ancient fraternity.

Two other associations also trace their origin from the same parent stock — the Brandenburg branch and the English langue. The former can claim an unbroken existence since its establishment in 1160. In 1853 the king of Prussia (in whom the right of nomina- ao had been vested since 1812) restored the original bailiwick of

pe and the assembled commanders elected Prince Charles of Prussia Herrn Meister, who notified his election to the lieutenant of the grand-master at Rome. The ‘‘ Johanniter” did good service a the German campaigns of 1866 and 1870. As regards the English i 1 Elizabeth c, 24 annexed to the crown all the property of e order in England. After the restoration of the Bourbons the

F i F — knights met once more in chapter-general and elected a _ permanent capitular commission, which was officially recognized

y both Louis

XVIII. i iati those. and the pope. After certain negotiations,

ch langues, acting in accord with those of Aragon

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and Castile, agreed to the resuscitation of the dormant langue of England (1827-1831), and Sir Robert Peat was appointed lord prior, taking the customary oath de jidelt administratione in the Court of King’s Bench. During the past half century the good work done by the modern knights—now (1886) once more located in St John’s Gate, Clerkenwell—can honourably compare with the memorable deeds of their predecessors. The establishment of the hospice at Jerusalem is due to the energy and zeal of Sir Edmund Lechmere, who has been mainly instrumental in collecting at St John’s Gate the unrivalled historical literature of which the order can boast. There are few subjects of study which present so rich and so varied materials as the annals of the knights of St John. The archives still

preserved in Malta are almost unique in their value and completeness, and each grand-master patronized and encouraged the industrious historiographers who sought to perpetuate the faine of the order to which they belonged. The work of Giacomo Bosio is an elaborate and generally trustworthy record of events from the time of Gerard down to the year 1571. Bartolomeo del Pozzo treats with equal care the period between 1571 and 1636. Editions of these volumes were published in Rome, Naples, Verona, and Venice. The Abbé Vertot concludes his elaborate history with the year 1726. His book enjoyed a considerable popularity, was published in English with the original plates in 1728, but can hardly claim the confidence to which Bosio and Del Pozzo are both entitled. From the 16th century down to the appearance of the famous Codice of De Rohan (1782) we have a series of publications on the subject of the statutes of the order. A fresh compilation seenis generally to have followed each assembly of the chapter- general. Before the time of De Rohan the best-known edition was that of Borgofante (1676), but Bosio produced a translation from the Latin in 1589 when residing at Rome as agent of the grand-master, and another was printed at the press of the order in Malta in 1718. The Memorie de' Gran Maestri by Bodoni (Parma, 1780) may also be consulted with advantage. For information con- cerning the archeology of the order and the antiquities of Malta itself reference should be made to Abela and Ciantar's Malta Illustrata, dedicated to Em. Pinto in 1772; to Raphael Caruana's Collezione di monumenti e lapidi sepolcrali di militi Gerosolimitant nelle chiesa di San Giovanni (Malta, 1838-40) ; to De Bois- gelin's Malia (8 vols.); and to Les Monwmens des Grands Mattres, by Villeneuve-Bargemont (Paris, 1829). The last-named writer has, however, drawn largely on his own imagination for the earlier part of the information he professes to give. In English the most noteworthy treatises concerning the knights are John Taaffe's History of the Order of Malia (London, 1852, 4 vols.) and General Porter's History of the Knights of Malta of the Order of St John of Jerusalem (London, 1883). The Rev. W. R. Bedford has recently published a valuable account uf the great hospital at Valetta. A useful guide to the contents of the Malta Record Office is to be found in M. Delaville Le Roulx's Archives de VOrdre de St Jean de Jerusalem (Paris, 1883). (A. M. B.) ST JOHN'S, the capital of Newfoundland, is situated on the eastern shore of the island, 60 miles north of Cape Race, in 47° 33' 33" N. lat. and 52° 45' 10" W. long. (see vol. xvil., plate V.). It is 10° 52' east of Halifax,

and stands on what is nearly the most eastern point of America, —Cape Spear, 5 miles south of St. John's, alone projecting a little farther towards the Old World. It is 1000 miles nearer than New York to England, and but 1640 from the coast of Ireland. The approach to the harbour of St John's presents one of the most picturesque views along the coast of America. In a lofty iron-bound coast a narrow open- ing occurs in the rocky wall, guarded on one side by Signal Hill (520 feet) and on the other by South Side Hill (620 feet), with Fort Amherst lighthouse on a rocky promontory at its base. The entrance of the Narrows is about 1400 feet in width, and at the narrowest point, between Pancake and Chain Rocks, the channel is not more than 600 feet wide. The Narrows are half a mile in length, and at their termination the harbour trends suddenly to the west, thus completely shutting out the swell from the ocean. Vessels of the largest tonnage can enter at all periods of the tide. The harbour is a mile in length and nearly half a mile in width. At its head is a dry dock, recently completed at a cost of $550,000 ; it is 600 feet in length, 83 in breadth, and 26 in depth, capable of admitting the largest steamers afloat. The city is built on sloping ground on the northern side of the harbour, on the southern side of which the hills rise so abruptly from the water that there is only room for a range of warehouses and oil-factories. Three principal streets, winding and irregular, follow the sinuosities of the harbour and of one another the whole length of the city, and these are intersected by a number of cross-streets. Water Street, the principal business locality, presents a very substantial, though not handsome, appearance, the houses being of stone or brick. Shops, stores, and counting-houses occupy the ground floor, while many of the merchants and shop- keepers live in the upper stories. Fish-stores, warehouses, and wharves project from behind on the side next the

harbour. The city, three-fourths of which are still of

wood, is rapidly extending in several directions, and in recent years many dwelling-houses of an improved descrip- tion have been erected. There is an abundant supply of

excellent water, brought in pipes from a lake 5 miles off.

Epidemics are rare, and the city is very healthy. Of the public buildings the most important are Government House, a substantial and spacious building erected in 1828 by the Imperial Government ; the colonial building (1847), con- taining the chambers of the legislature and Government offices; the atheneum (1877), containing a public hall, library, reading-room, savings bank, museum, &c. The foundation of a new post-office was laid in the same year. The churches are—the Church of England and Roman Catholic cathedrals, St Thomas's and St Mary's (Church of England), St Patrick's, three Methodist churches, St Andrew's Presbyterian church, and the Congregational church. The manufacture of seal and cod oils has long been carried on upon an extensive scale. Of late years other manufactures have been introduced, and have made considerable progress. There are three iron-foundries, two large machine-shops, two boot and shoe factories, a nail-factory, three furniture-factories, two tobacco- factories, soap-works, two tanneries, and a large and well-equipped factory for the manufacture of cables, ropes, twines, nets, seines, &c. The export trade in fish of various kinds, fish oils, seal oil, and seal skins is very large ; the greater part of all the imports into Newfound- land also arrives at St John's. The city is not yet (1886) incorporated, the Colonial Board of Works having charge of all civil affairs. The population, which in 1780 was 1605, had in 1801 increased to 3420, in 1812 to 7075, in 1835 to 15,000, and in 1874 to 23,890, and in 1884 it was 28,610 (Roman Catholics, 17,693; Episcopalians, 5741; Methodists, 3715; Presbyterians, 973; Congrega- tionalists, 465; other denominations, 23). The census last mentioned also shows the population of the whole island and Labrador to be 197,589, being an increase of 36,209 since 1874, or at the rate of about 22 per cent. in ten years. The population of the Atlantic coast of Labrador, which is under the jurisdiction of Newfound- land, was 4211,—1347 being Eskimo.

ST JOHNSBURY, a township of the United States, capital of Caledonia county, Vermont, on the Passumpsic river (a tributary of the river Connecticut), about 50 miles south of the Canadian frontier, and on the railway between Boston (205 miles) and Quebec. St Johnsbury is the seat of perhaps the largest scale-factory in the world, which employs about 600 hands and works up 4000 tons of iron per annum. The township contains an atheneum, public library (10,000 vols.), and art gallery. The popu- lation has increased from 2758 in 1850 to 4665 in 1870 and 5800 in 1880. The

three villages are distinguished as St Johnsbury (3360 in 1880), St Johnsbury Centre, and St Johnsbury East. Founded in 1786, the township received its name in honour of St John de Crévecceur, French consul at New York, and a benefactor of Vermont.

ST JOSEPH, a city of the United States, capital of Buchanan county, Missouri, on the right bank of the Missouri, 260 miles west by north of St Louis. It is an important railway junction, possessing since 1873 a great road and railway bridge over the river constructed of iron; in the extent of its wholesale business it ranks as the second city in the State; and among its manufac- turing establishments are flour-mills, starch-works, boot and shoe factories, pork-packing establishments, waggon-fac- tories, a distillery, &c. Besides a city-hall and market-house, it contains a court-house (1875), an opera-house, a State lunatic asylum (1874), an agricultural and mechanical ex- position association, a Roman Catholic cathedral, and five public libraries. The population was 8932 in 1860, 19,565

(1512 coloured) in 1870, and 32,431 (3227 coloured) in

1880.

Founded in 1843 by Joseph Robidoux, a French Roman Catholic who had settled in the district some years previously as a trader, St Joseph in 1846 was made the county seat, and before 1857, when it received its first city charter, became well known as ile great point of departure for emigrants bound for California and the West. During the Civil War, when it was fortified by the Federals, its natural development was considerably checked, but this revived as soon as tlie struggle was over.

SAINT-JUST, Anrorne (1767-1794), French revoly. tionary leader, was born at Decize in the Nivernais on 25th August 1767. He was educated at Soissons, and showed his character at school as ringleader of a plot to set the school buildings on fire. Saint-Just was caught red- handed in the act of incendiarism, and, refusing to exhibit any tokens of submission, was ignominiously expelled, His education, however, does not appear to have been neglected ; and the reports and speeches of his short and stormy

political career exhibit not a little scholarship, and in particular considerable acquaintance with ancient history. Intoxicated with republican ideas, Saint-Just threw himself with enthusiasm into the political troubles of his time, had himself appointed an officer in the National Guard, and by fraud—he being yet under age—admitted as a member of the electoral assembly of his district, Ambitious of fame, he in 1789 published twenty cantos of licentious verses under the title of Organt, and this work was afterwards reissued under the title of J/y Pastimes; or The New Organt. From that year onwards, however, the open turbulence of his youth gave place to a rigor- ously stoical demeanour, which, united to a policy tyran- nical, uncompromisingly thorough, and pitilessly severe, became the marked and startling characteristic of his life. He now entered into correspondence with Robespierre, who thenceforward became his hero and ideal. Robes- pierre invited him to Paris, felt flattered by his worship,

saw that he suited his purpose, and in a short time the

two became hand and glove. Thus supported, Saint- Just became deputy of the department of Aisne to the national convention, where he made his first speech— gloomy, fanatical, remorseless in tone—on 19th November 1792. He had but twenty months to live; but into these he seemed to crowd the life of twenty years. In the convention, in the Jacobin Club, and among the popu- lace his relations with Robespierre became known, and he was dubbed the “St John of the Messiah of the People.” Hardly a week passed without the attention of France being arrested by his attitude or his utterances. Both were anxiously watched, as the unfailing indication of the trend of Robespierre’s designs. His appointment as a member of the committee of public safety now placed him at the very height and centre of the political fever-heat. In the name of this committee he was charged with the drawing up of reports to the convention upon the absorbing themes of the overthrow of the party of the Gironde, thereafter, when even the “ Mountain” seemed to have fallen in pieces, of the Hébertists, and finally, as the tragic sequel to the rupture between Robes pierre and Danton, of that denunciation of the latter which consigned him and his followers to the guillotine. What were then called reports were far less statements of fact than appeals to the passions; in Saint-Just’s hands they furnished the occasion for a display of fanatical dar- ing, of gloomy eloquence, and of

undoubted genius ; and —wwith the shadow of Robespierre behind them—they served their turn. Once a flash of cruel humour lighted up his angry retorts, and it became memorable. Des moulins, in jest and mockery, said of Saint-J ust—the youth with the beautiful cast of countenance and the long fair locks—‘“ He carries his head like a Holy Sacrament.”

“And J,” savagely replied Saint-Just, ‘‘ will make him carry his like a Saint-Denis.” The threat was not vain: -Desmoulins accompanied Danton to the scaffold. The same ferocious inflexibility animated Saint-Just with reference to the external policy of France. He proposed that the national convention should itself, through its com- mittees, direct all military movements. This was agreed to, and Saint-Just was despatched to Strasburg, in com- any with Lebas, to superintend operations. It was suspected that the enemy without was being aided by treason within. Saint-Just’s remedy was direct and terrible: he followed his experience in Paris, “organized the Terror,” and soon the heads of all suspects were falling under the guillotine. The conspiracy was defeated, and the armies of the Rhine and the Moselle having been inspirited by suc- cess —Saint-Just himself taking a fearless part in the actual fighting—and having effected a junction, the frontier was delivered. Later, with the army of the North, he wrought similar magical changes in the aspect of affairs. Before the generals he placed the terrible dilemma of victory over the enemies of France or trial by the dreaded revolution- ary tribunal ; and before the eyes of the army itself he organized a force which was specially charged with the slaughter of those who should seek refuge from the enemy by flight. Success again crowned his terrible efforts, and Belgium was gained for France. Meanwhile affairs in Paris looked gloomier than ever, and. Robespierre recalled Saint Just to the capital. As the storm was gathering Saint-Just gave it direction by mooting the dictatorship of his master as the only remedy for the convulsions of society. At last, at the famous sitting of the 9th Ther- midor, he ventured to present as the report of the com- mittees of general security and public safety a document expressing his own views, a sight of which, however, had been refused to the other members of committee on the previous evening. Then the storm broke. He was vehemently interrupted, and the sitting ended with an order for Robespierre’s arrest (see RoBESPIERRE). On the follow- ing day, 28th July 1794,

twenty-two men, nearly all young, were guillotined. Robespierre was one, aged thirty-six ; SaintJust another, aged twenty-six.

In 1800 there was published at Strasburg a work from the pen of Saint-Just entitled Fragments on Republican Institutions. It isa crude mixture of his opinions on social and political topics.

ST KILDA, the largest islet of a small group of the

” Outer Hebrides, Scotland, 40 miles west of North Uist, in

| 07° 48° 35” N, lat. and 8° 35’ 30” W. long. It measures 3 miles from east to west and 2 from north to south, and has an area of 3000 to 4000 acres. Except at the landing- place on the south-east, the cliffs rise sheer out of deep water, and on the north-east side the highest eminence in the island, Conagher or Conna-Ghair, forms a gigantic precipice, 1220 feet high from sea to summit. According to Professor Judd, St Kilda is probably the core of a Tertiary voleano ; but, besides volcanic rocks, it is said to contain hills of sandstone in which the stratification is very distinct.t While the general relief is peculiarly bold and picturesque, a certain softness of scenery is produced by the richness of the verdure. The inhabitants are an

industrious Gaelic-speaking community (110 in 1851, and

77 in 1881). They cultivate about 40 acres of land (potatoes, oats, barley), keep about 1000 sheep and 50 West Highland cows, and catch puffins and other sea-fowl. Coarse tweeds and blanketing are manufactured for home use. The houses are collected in a little village at the

head of the East Bay, which contains a Free church, a

manse, and the factor’s house. The island is practically inaccessible for eight months of the year. eee othe yer,

| 1 No trained geologist seems to have visited the island subsequent | to Maeculloch.

St Kilda, or, as it was originally called, Hirt (Hirth, Hyrtha), seems to have been in the possession of the Macleods for 400 or even 500 years. In 1779 it changed hands along with Harris, and again in 1804 and in 1871 (to Macleod of Macleod). The fendal superior is Lord Dunmore, who receives one shilling of feu-duty. From 1734 to 1742 Lady Grange was confined on St Kilda by com- mand of her high-handed husband (see Proceed. Soc. Scot. Antiq., x. aud xi.). David Mallet makes the island the scene of his Amyntor and Theodore, or the Hermit. See works on St Kilda by Rev. K. Macaulay (1764), L. MacLean (1838), J. Sands (1876 and 1877), and George Seton (1878).

ST KILDA, a watering-place in Victoria, Australia, on the east shore of Hobson's Bay, 34 miles south of Mel- bourne, with which it is connected by a railway. The borough had an area of 1886 acres and a population of 11,662 in 1881. The sea-beach is bordered by an esplan- ade; there is a large public park ; and portions of the sea have been fenced-in to protect bathers from sharks. A town-hall, an assembly hall, a library, and the large Episco- pal church of All Saints are among the public buildings.

ST KITTS. See St CuRisTopHER.

SAINT-LAMBERT, Jean Francois DE (1716-1803), French poet, was born at Nancy in 1716, and died at Paris in 1803. During great part of his long life he held various employments at the court of Stanislaus of Poland, when that prince was established in Lorraine. He also served in the French army, and then betook himself to literature, producing among other things a volume of de- scriptive verse, Les Saisons (wildly overpraised at the time, and now never read), many articles for the Encyclopédie, and some miscellaneous works in verse and prose. Saint- Lambert's chief fame, however, comes from the strange fate which made him the successful rival in love of the two most famous men of letters in France, not to say in Europe, during the 18th century. The infatuation of the marquise du Chatelet for him and its fatal termination are known to all readers of the life of Voltaire. His subse- quent courtship of Madame d'Houdetot, Rousseau's Sophie,

‘though hardly less disastrous to his rival, was less dis-

astrous to the lady, and continued for the whole lives of himself and his mistress. They survived till the present century as a kind of irregular Baucis and Philemon, illus- trating the manners of the vanished régime, which had been not unjustly celebrated, and vindicating its constancy from a very general opinion.

ST LAWRENCE. The river St Lawrence? in North Plate America, taken in connexion with the great lakes, offers to lV-

trading vessels the most magnificent system of inland

navigation in the world. Its total length from the source Length.

of the St Louis river, which discharges into Fond du Lac at the head of Lake Superior, to Cape Gaspé is 2100 miles. The river St Louis springs from the same spacious plateau in Minnesota that gives birth to the Mississippi and the Red River of the North. The intermediate distances be- tween the source of the St Lawrence and its mouths are shown in Table I. According to the most recent surveys the approximate area of the basin of the St Lawrence is 510,000 square miles, of which 322,560 belong to Canada and 187,440 to the United States.

Lake Superior, the most westerly of the lakes, is the Lake In addition to Superior.

largest body of fresh water in the world. the river Nipigon, which may be regarded as the chief source of the upper St Lawrence, and the St Louis and Pigeon rivers, which constitute the international boundary, it receives its waters from 200 rivers, draining an aggregate of 85,000 square miles,* including its own area of 32,000.

2 The name given by Jacques Cartier, who ascended the river in 1535 as far as Montreal.

3 The magnitudes and altitudes of the great lakes are derived from the Report of the Canadian Canal Commission, February 1871; the engineering

data relating to canals have been mainly obtained from other annual reports published by the Canadian Government and from the annual reports of the chief of engineers, United States army.

TasiE I.—Distances of Sections of St Lawrence. widened and deepened, and a new lock constructed, 515 feet lon and 80 wide,—the width of the gates being 60 fect, the lift of the

lock 18, and the depth of water on the mitre sills17. There jg now everywhere a navigable depth of 16 feet from Lake Superior Local T Sections of Navi- 3 Bs – through St Mary’s Falls Canal and St Mary’s river to Lake Huron Name. aon ‘ gation. £%|£95| | In 1888 the registered tonnage passing the canal was 2,049,995 ay 3S =,3| | tons,—the annual increase of tounage during the previous fifteen # |2ax%| | years having averaged 107,313 tons. The United States Govern. |] | | ment enginecrs have already presented a project for still further Source of St| Fond du Lac | St Louisriver …... 152} 152 | improvements, namely, to replace the old locks by one only with Louis river } a a “ Fond du Lac | Pointe aux) Lake Superior …... 390 | 542 alae? 700 feet and a width of 70, and with a depth of 21 feet Pins : x : Saulte St Pane aux | St Joseph’s I.) St Mary’sriver …... Sp |p Beye Lake Huron is 270 miles long and 105 broad and le Bs M ins 5 5 3 ma a ee Lake Huron …....| 270} 867] | an area of 23,000 square miles (the area of its basin, Hur, St Mary | Sarnia …... oe [Sear and Detroit) 76 | 943 including the lake, being Fg 4,000), 4 mean depth variously river es . – Amerherst- | Port Golborne, Lake Erie …..... 232 } 1175 | | stated at from 700 to 1000 feet, and an altitude above the bur : Niagara Port Coliiernd Port Dalhousie, Welland Canal …... 27 | 1202 her = oe ee ge a i Ae eS lies river entirely within the region of Canada, whilst ee Port Dalhousie Kingston ….! Lake Ontario …..... 170 | 1372 y é & 4 under Bay Kingston… | Prescott |... Head of canal section | 59 | 1481 | | and Saginaw Bay on the west and south-west are in the Prescott …. | Montreal +9 gal eee Canal! 119 | 1550 State of Michigan. The north and north-east shores 6t Montreal…. | Three Rivers Head of econ navi- 86 | 1686 | | Lake Huron are mostly composed of sandstones and lime. Paenes ate. 2. stones, and where metamorphic rocks

are found the surface Three Rivers | Quebec …... a tidal flow to| 74 | 1710 | | is broken and hilly, rising to elevations of 600 feet or more Quebee ….|Cape Chat .. os 266 | 1976 | | above the lake, unlike in this respect the southern shores Cape Chat ..| Cape Gaspé ..) Mouth of river St) 124) 2100) | skirting the peninsulas of Michigan and south-western Cape Gaspé .. Belle Isle} ..] Mouth of the Gulf of| 486 | 2586 Ontario, which are comparatively flat and of great fertility, H wrence

As in Lake Superior, regular terraces corresponding to

Its leneth is 390 miles, its greatest breadth 160, and its former water-levels of the lake run for miles along the mean breadth 80. Its mean depth is 900 feet and its altitude shores of Lake Huron at heights of 120, 150, and 200 feet; above the sea-level 600 feet. Its coast is generally rock- and deposits of fine sand and clay containing freshwater bound. Numerous islands are scattered about the north shells rise to a height of 40 feet or more above the present side of the lake, many rising precipitously to great heights level of the water. At several places these deposits extend from deep water,—some presenting castellated walls of to a distance of 20 miles inland. ‘The chief tributaries of

1 ins + eat : leva- | the lake on the Canadian side are the French river from ie ee A ‘ a oe Lake Nipissing, the Severn from Lake Simcoe, the Muskoka, |

and Huronian rocks to the north along the shore abound in and the Nottawasaga, all emptying into Georgian Bay; | silver, copper, and iron ores. The United States side is ce United States side the Thunder Bay river, the | generally lower and more sandy than the opposite shore, | “70’s and the Saginaw. _ , and is also especially rich in deposits of native copper and Lake Michigan is entirely in the territory of the United Late bads of red hematite iron ores. Both these minerals-are | tes. It has a maximum breadth of 64 uals and its a extensively worked. Unfossiliferous terraces occur abun- length is 345 miles from the north-west corner of Indiana dantly on the margin of the lake; at one point no fewer and the north part of Illinois to Mackinaw, where it com- ; : : 3 : Z

than seven occur at intervals up to a height of 33 feet ree hese with Lake Huron by a strait 4 miles wide above the present level of the water. Lake

Superior is its narrowest part. Its depth is variously stated fe i subject to severe storms and the effect of the waves upon 700 to I 80 0 feet. Its altitude above sea-level 3s (oi the sandstone of the “picture rocks” of Grand Island pre- Its basin is 70,040 square miles in area, of which the lake sents innumerable fantastic and very remarkable forms. pees n> : ee . its tributaries a ee iy The lake never freezes, but cannot be navigated in winter | > . miles in length. The country =. wal ” mi on account of the shore ice. At the west end of the lake, | 1S *°T the most part low ee a ae — at the mouth of the St Louis, is situated the city of Duluth, Siena 7 ae i Dab iy ma ea a place of considerable importance as the eastern terminus lying in horizontal strata and never rising mto bold ¢ 4 of the Northern Pacific Railway, and of the St Paul and Along the south shore are Post-tertiary beds of clay an Duluth Railway, which runs to St Paul on the Mississippi, sand lying a few feet above the level of the lake, the wile 155 miles couthef Duluahi2 of which probably at one time found their way by the

= St Mary’s river, 55 miles long, is the only outlet from valleys of the Illinois and the Mississippi into the Gulf of

Mary’s Lake Superior, and its course to Lake Huron is but a Mexico.

: : ; ‘ : : i i i is si at the south- je succession of expansions into lakes and contractions into Pes: mh ie ee pate Se hs ee am et ‘rivers. St Mary’s rapids, which in a distance of half a | pork it is the largest markct in the world. In 1883 12,015 vessels

mile absorb 18 feet out of the total fall of 22 feet between | with a tonnage of 3,980,837 tons cleared from the harbour. Com the two lakes, are avoided by a ship canal, constructed | P&™™g the decades of 1864-73 and 1874-88 the total export m

iW 1955 quarters of wheat and corn from Chicago was as follows :— As originally built, the canal was 1 mile long, had a width of 100 Lake. Rail. Total feet at the water line and a depth of 12 feet. The locks were two 1864-73 ….....++43,884,196 6,328,337 50,212,533 in number, combined, each 350 feet in length, 70 in width, with 1874-83 ……... 66,265,175 27,342,140 93,607,315 a lift of 9 feet. At the time the canal was made these dimensions 110,149,371 33,670,477 143,819,848″

were suflicient to pass any vessel on the lakes fully laden, but by . : 799 1870 it became necessary to provide for more rapid lockage and In 1883 the export of grain by the lakes amounted to 6, 850, 7 for the passage of larger vessels. Accordingly the old canal was quarters (of which 68-1 per cent. were shipped direct to Buffalo an only 6-3 per cent. to Kingston and Montreal) as against 8, 146,000 sent by rail. The first appropriation for the harbour of Chicago, 1 The distance from Belle Isle to Liverpool is 2234 statute or 1942. | $$ _____—_———_——___ geographical miles. is 313 feet above the level of Lake Superior, and in some parts 18 UP 2 Lake Nipigon is situated 50 miles to the north of Lake Superior, | wards of 500 feet in depth. The lake is thickly studded with islands ; into which it drains by the river Nipigon ; it is still very little known | its shores are undulating and sometimes hilly ; and owing to its numer except from the report of Professor Bell of the Geological Survey. It ‘ ous indentations its coast-line measures 580 miles.

ik |

i in 1883, was expended in cutting a straight outlet from the ee river into He lake. The available depth was only 2 feet, but since then the harbour accommodation has been extended, by

| means of piers, dredging, and a breakwater, to accommodate vessels

t draught. ‘ Of Ee rocks at Chicago, as well as at othcr lake and river

j f cribs or boxes, composed of logs 12 ar eee icith atone, and Joined to each anes ae hey have finally settled down, by a continuous timber superstructure

raised a few feet above the level of the water. On this plan break-

waters, piers at the mouths of rivers, and wharves have been built within the last sixty years at the most important points along the shores of the St Lawrence lakes, as well as at most of the river harbours communicating with the Atlantic; and experience has proved that no cheaper and better system could have been devised for such localities. i, The St Lawrence leaves Lake Huron by the St Clair lrjver at Sarnia, and after a course of 33

miles enters – | Lake St Clair, 25 miles long, and terminating at the head of the Detroit river, near the city of Detroit in Michigan. Eighteen miles farther on the St Lawrence, with a descent of 11 feet, enters Lake Erie. The navigation through the St Clair river is easy throughout, but in Lake St Clair there are extensive sandbanks covered with a depth of water varying from 6 to 10 feet. Previous to , 1858 much inconvenience was experienced in navigating the lake owing to its insufficient depth; but at the end of that year the Governments of the United States and Canada dredged a canal through the bed of the lake, which is of soft material, to a minimum depth of 12 feet, with a width of 800 feet. This channel has since been deepened to 16 feet over a width of 200 feet, and works are now in progress to deepen the rocky shoal called the "Time-Kiln Crossing" in the Detroit river to 18 feet, to enable vessels drawing 15 feet to pass with safety from lake to lake in stormy weather.

The peculiar features of Lake Erie are its shallowness and the clayey nature of its shores, which are generally low. The south shore is bordered by an elevated plateau, through which the rivers, which are without importance as regards Lake Erie, have cut deep channels. The mean depth of the lake is only 90 feet and its maximum depth 204. Owing to its shallowness it is easily disturbed by the wind, and is therefore the most dangerous to navigate of all the great lakes, Its length is 250 miles and its greatest breadth 60. The area of the basin of Lake Erie is 39,680 square miles, including 10,000 square miles, the area \ of the lake. Its waters are 564 feet above the sea and 330 above Lake Ontario. The extreme difference observed ' in the level of the lake between 1819 and 1838 was 5 feet

2 inches, but the average annual rise and fall (taken on

a mean of twelve years) is only 1 foot 14 inches. The

mean annual rainfall is 34 inches. The navigation of

Lake Erie usually opens about the middle of April and

closes early in December. Besides the Erie and the _ Welland Canals, the lake has two other great canal systems

on its south shore,—the Ohio and Erie Canal, from Cleve- land to Portsmouth, and the Miami and Erie Canal, from

Toledo to Cincinnati.

| Buffalo (population, 171,500 in 1883) is situated at the north- _ east angle of Lake Erie, and is therefore much exposed to the violence of south-west winds, in which direction the lake has a

\) fetch” of 200 miles. Thus more than ordinary care has been _ taken to provide safe harbour accommodation for the large fleets of — constantly arriving at Buffalo from the upper lakes. The Buffalo river, which has been made navigable for more than a mile, A ee at its mouth by a breakwater, 4000 feet long, built at wad half a mile from the shore. The harbour thus formed allows the entrance of vessels of 17 feet draught as against 18 in 1853.

| ot only is the port situated at the head of the Erie Canal and within an hour’s sail of the Welland Canal, but it is the western | ae of the New York Central, Eric, and several other railways. || The possession of these exceptional advantages has constituted | Buffalo the great commercial centre of the inland seas of North America. For the six years ending 1883 the yearly average ship- ments of wheat and corn received by lake at Buffalo, by the Erie

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Canal, and by rail from elevators was 5,555,000 quarters by canal and 2,320,000 by rail, or 70°20 and 29°80 per cent. respectively. There are 38 elevators in the city, comprising storage, transfer, and floating elevators, with a combined storage capacity of 1,125,000 quarters and a daily transfer capacity of 333,000 quarters. During the ten years ending 1883 the annual average number of lake vessels arriving and departing from Buffalo Creek numbered 7488, the aggregate tonnage was 4,165,098 tons, and the average size of eraft 560 tons,

In 1883 the enrolled tonnage of the United States vessels for the northern lakes, and the enrolled registered tonnage of steam and sailing vessels in the province of Ontario, including tugs and barges on the Ottawa river and barges at Kingston, were as follows (Table II.) :—

United States. Canada, < Aggregate Aggregate ee Tonnage. Ib Tonnage. Sailing vessels …..... 1373 310,454 452 44,000 Steam vessels …..... 1149 304,649 Alay 64,000 Doe 615,103 804 108,000

Freight propellers are now rapidly doing away with sailing vessels, or causing them to be converted into barges or consorts. The rapid increase in their tonnage capacity has been remarkable. In 1841 there was only 1 freight propeller with a tonnage of 128 tons; in 1850 there were 50 with an average of 215 tons, in 1860 there were 197 with an average of 340 tons, and in 1880 there were 202 with an average of 689 tons.

The Erie Canal connects Lake Erie with the Hudson river at Erie Troy and Albany and with Lake Ontario at Oswego. The move- Canal. ment of freight of all kinds by the canal was 3,602,535 tons in 1878, and 3,587,102 in 1883, and the average annual movcment from 1874 to 1883 was 3,447,464 tons. This canal was constructed in 1825 by the State of New York, for the passage of vessels of 60 tons ; but by the year 1862 it was sufficiently enlarged to allow of the passage of vessels of 240 tons. The dimensions and capacity

of the canal and its two principal feeders are given in Table III. :—

Size of Canal. No. & Size of Locks, ; $2 \8sléel% ’ Sh . fs go Ss Bl) os 4 : Locality. mo | ae | ais a8 Ss 8 ct = ax lsh | ce || Se |e oe =I = me) “7)eS | Ro]

OF | zy o = a Balen) 4 Feet. | Feet. | Feet Feet. | Feet. | Feet Buffalo to Albany ….| 351 70 56 7 iy 110 18 655 Oswego to Syracuse ..| 38 70 56 if 18 110 18 155 Lake Champlain to Al-| 66 50 35 5 20 100 18 180 bany

455

Albany to New York | 145 by the Hudson river

The cost of construction, maintenance, and management of the 455 miles of canal up to 30th September 1873 amounted to £17,460,000. A project has for some time been under serious consideration for the enlargement of one tier of the present locks and the deepening of the canal so that between Buffalo and Albany there would no- where be a less depth than 8 feet. The estimated cost of this work is about £1,600, 000.

The Welland Canal flanks the Niagara river and is 27 miles in Welland

length from Port Colborne on Lake Erie to Port Dalhousie on Lake Canal. Ontario. It was opened in 1833 for the navigation of small vessels and was first enlarged in 1844. Vessels, however, continucd to increase in size until in 1860 there were 341 with an aggregate tonnage of 143,918 tons which were unable to pass through the enlarged canal. In 1870 the number that could not pass had increased to 384, with an aggregate tonnage of 194,685 tons; in 1880 to 460, with an aggregate tonnage of 287,342 tons; and in 1883 (notwithstanding the completion of the second enlargement in 1882) to 557, with an aggregate tonnage of 398,808 tons. The cost of the canal including its maintenance up to 30th June 1883 was $20,859,605. Its dimensions are now as follows :—number of lift locks, 25 ; dimensions, 270 by 45 feet ; total rise of lockage, 8263 feet ; depth of water on sills, 12 feet. The movement of freight of all kinds by the canal was 1,330,629 tons in 1878 and 827,196 in 1883, and the average annual movement for the decade ending 1883 was 986,441 tons. This serious falling off in traffic is partly due to the numerous competitors by lake and rail which have sprung up during the last ten years for the transportation of products to the east, but principally to the deepening of the channels and harbours of the upper lakes, a work that has encouraged the construction of

River Niagara.

a class of vessels that cannot make use of the Welland Canal even after its last enlargement. In order to meet this strong competition the Government of the Dominion of Canada was called upon still further to deepen the canal so as to allow the passage of the largest existing lake vessels without lightering ; and in 1886 contracts were concluded for deepening it to 14 feet.

The Niagara river flows from Lake Erie to Lake Ontario in a northerly direction, Its width between Buffalo and Fort Erie (the site of the international iron-trussed rail- way bridge ; see sketch map of Niagara river in vol. xvii. p. 472) is 1900 feet and its greatest depth 48. At this point the normal current is 53 miles an hour,—the ex- treme variation in the level of the river when uninflu- enced by the wind being only 2 feet. During south-west gales, however, the water occasionally rises as much as 4 feet in a few hours, and at such times the current attains a maximum velocity of 12 miles an hour. Two miles below the bridge the river is divided into two arms by Grand Island, at the foot of which they reunite and spread over a width of 2 or 3 miles. The river then becomes studded with islands, until about 16 miles from Lake Erie, after a total fall of 20 feet, it narrows again and begins to descend with great velocity. This is the com- mencement of the rapids, which continue for about a mile with a total descent of 52 feet. The rapids terminate in the great cataract of Niagara, the fall of which on the American side is 164 feet and on the Canadian side 150 feet. The falls are divided by Goat Island, which rises 40 feet above the water and extends to the very verge of the precipice, where the total width of the river, including the island, is 4750 feet. The Horse-Shoe Fall on the Canadian shore is 2000 feet long, and the depth of water on the crest of the fall is about 20 feet. The American fall is only one-half that length, and discharges less than one-fourth the volume of the Horse-Shoe Fall. United, they discharge nearly 400,000 cubic feet per second or 41,000,000 tons per hour. The upper layer of the escarp- ment down which this enormous mass of water leaps con-sists of hard limestone about 90 feet thick, beneath which lie soft shales of equal thickness, which are continually being undermined by the action of the spray, driven violently by gusts of wind against the base of the preci-pice. In consequence of this action and that of the frost, portions of the

incumbent rock overhang 40 feet, and often, when unsupported, tumble down, so that the falls do not remain absolutely stationary in the same spot. Sir C. Lyell in 1842 came to the conclusion that the cataract was receding at an average rate of 1 foot annually, “in which case it would have required 35,000 years for the retreat of the falls from the escarpment at Queens-town to their present site.” From the foot of the falls to Queenstown, a distance of about 7 miles, the river descends 104 feet through a gorge from 200 to 300 feet deep and from 600 to 1200 feet wide. Midway in this deep defile the turbulent waters strike against the cliff on the Canadian side with great violence, and, being thus deflected from west to north, give rise to the dangerous eddy called the “Whirlpool.” The escarpments end abruptly at Queens- town, where the waters suddenly expand to a great width, and finally, 7 miles farther on, tranquilly flow into Lake Ontario.

About one-third of a mile below the cataract a carriage- road suspension bridge (built in 1869 by Mr Samuel Keefer) spans the river with a single opening of 1190 feet, at a height of 190 feet above the water; and 2 miles lower down Roebling’s celebrated railway and road suspension bridge (completed in 1855) crosses the river at a height of 245 feet above the water with a single span of 800 feet. In November 1883 a double-track railway three-span iron and stcel cantilever bridge, situated about 100 yards above Roebling’s bridge, was completed for the

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New York Central and Michigan Central Railways. The total length of the bridge is 910 feet and that of the centre span 470 feet. The height from the water to the level of the rails is 239 feet.

Lake Ontario is the easternmost and smallest of the Lay great lakes of the St Lawrence system. Its basin draing Ontariy 29,760 square miles, including the lake surface of 6700 square miles. The length of the lake is 190 miles, its greatest width 52 miles, its mean depth 412 feet, and its elevation above the sea 234 feet. It never freezes except near the shore. Its chief tributaries are the Trent on the north shore and the Genesee and the Oswego on the south shore, and its chief ports, Toronto, the capital of Ontario, 32 miles north of Port Dalhousie, at the foot of the Welland Canal; Oswego, at the

south-east angle of the lake; and Kingston, at its north-east extremity, 52 miles north of Oswego. .

Trent river navigation is a term applied to a series of reaches which do not, however, form a connected system of navigation, and which in their present condition are efficient only for local use. The series is composed of a chain of lakes and rivers extending from Trenton, at the mouth of the Trent on the Bay of Quinte, north shore of Lake Ontario, to Lake Huron. The new works (which will have locks 134 feet by 83 feet with a depth of 5 fect on sill) will give communication between Lakefield, 94 miles from Peter- boro, and Balsam Lake, the headwaters of the system, opening up a total of about 150 miles of direct and lateral navigation.

The port of Oswego has been in direct communication with the

Hudson river since 1822, by means of a canal of small capacity as far as Syracuse, and thence by the Erie Canal to Troy and Albany. It is now proposed by the United States Government to enlarge this route under the name of the Oneida Ship Canal, so that vessels arriving from the Welland Canal with cargoes of 50,000 bushels of wheat may be able to tranship them at Oswego into steam barges holding 25,000 bushels, or into barges to be towed with a capacity of 28,000 bushels. The length of the proposed route by the Oneida Lake and Durhamville is 200 miles, with a lockage of 609 feet; and its estimated cost, including 20 ascending and 47 descending locks (each 170 by 28 by 84 feet), is $25,218,857. The Government of the Dominion of Canada has also under consideration the follow- ing projects to connect the St Lawrence with Lake Huron :—(1) the Ottawa and Georgian Bay Canal, from Montreal, by the Ottawa and Lake Nipissing, to French river ; (2) the Toronto and Georgian Bay Canal, by way of Lake Simcoe ; (3) the Hur -Ontario Canal, from Hamilton to Lake Huron, near Port Franks.

Kingston, being the port of transhipment for Montreal Kingsto: of three-fourths of the grain that arrives from the upper to Mont lakes, is a place of some commercial importance. Formerly lake vessels were sent from Chicago to Montreal through the St Lawrence canals without breaking bulk. But it was afterwards found cheaper to transfer grain at Kingston, and to send it down the St Lawrence in barges, the cost of such transfer being only

half a cent per bushel. Kings- ton is also at the south terminus of the Rideau Canal, which connects it with the city of Ottawa.

This canal, 126 miles long, has 33 locks ascending 292 feet and 14 descending 165, and admits vessels 130 by 30 feet drawing 43 feet of water. It was constructed in 1826-82 by the British Govern- ment ata cost of about $4,000,000, chiefly with a view to the defence of the province, but since the opening of the St Lawrence canals it has become of comparatively little importance as a means of transport,—the distance from Montreal to Kingston being 68 miles longer by the Rideau and Ottawa Canals than by the St Lawrence.

Almost immediately aftcr leaving Kingston that part of the St Lawrence commences which is called the Lake of a Thousand Islands. In reality they number 1692, and extend for 40 miles below Lake Ontario. At this point the Laurentian rocks break through the Silurian, am reach across the St Lawrence, in this belt of islands, to unite with the Laurentian Adirondack region in the State of New York. Near Prescott, a town on the Canadian side about 60 miles below Kingston, begins the chain of the St Lawrence canals proper, which were constructed to overcome a total rise of 2064 feet,—the number of locks being 27 and the total length of the six canals 434 miles,

The canals are called, in the order of their descent, the “Galops, “Rapid Plat,” and “ Farran’s Point,” with an aggregate length 0

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5 oc (the three forming with their intervening 15 miles of Ee ation what is called the Williamsburg Canals), the é¢ Cornwall,” 114 miles long, the fas Beauharnois,” connecting Lakes St Louis and St Francis, 112 miles long, and the ‘‘ Lachine,” 83 miles long. The locks of the first five canals, constructed in 1845-48, are 200 feet in length, with a depth of from 7 to 10 feet on their sills at exceptionally low water, and, with the exception of the “Galops” and “Cornwall,” which are 55 feet wide, their width is 45 feet. The Lachine Canal was begun in 1821 and com- pleted in 1824 for the navigation of vessels drawing 43 feet, but it was not until 1843-48 that it was widened and deepened to the dimensions of the upper canals. It has lately been still further enlarged, and is already provided with locks 270 by

40 feet, with an available depth of 14 feet. The canal was closed on 1st December 1882 and opened on 1st May 1883,—the navigation having been interrupted as usual by the ice for a period of five months. The cost to the provincial and Dominion Government of tl.e six canals, including their maintenance to 30th June 1883, was $14,454,508. The five upper canals are now being enlarged to the dimensions of

the jmproved Lachine Canal.

Near Cornwall, on the left bank, 50 miles below Pres- cott, the intersection of the parallel of 45° determines the point where the St Lawrence and its lakes (Lake Michigan excepted), having been an international boundary from the head of Lake Superior, become exclusively Canadian. Immediately below Cornwall the river flows through Lake St Francis, which has a length of about 30 miles and a width varying from 2 to 5 miles. In the long reach of the river below the lake it has been calculated by the Canadian canal commissioners that the mean volume of water discharged is 510,000 cubic feet per second. Ten miles below the foot of Lake St Francis, near the head of the island of Montreal, the river flows into Lake St Louis, which receives the main body of the Ottawa river, a small fraction of whose waters is delivered into the St Lawrence at the foot of the island 35 miles lower down the stream.

The Ottawa river, which is 600 miles long, drains 60,000 square miles, and contributes a volume of 90,000 cubic feet per second to the St Lawrence, of which it is the largest tributary. Between Lake St Louis and the city of Ottawa, the capital of the Dominion, and perhaps the largest market for lumber in the world, the St Anne’s lock (234 miles from Montreal), Carillon Canal, Chute-a- Blondeau Canal, and the Grenville Canal (633 miles from Montreal) have been constructed, and are now enlarged to 200 by 45 feet, with a depth of 9 feet on their sills, except the Chute-’-Blondeau Canal, whose single lock has still its original dimensions of 130 by 32 feet with only 6 feet on its sill. The total lockage between the Lachine Canal and Kingston by the Rideau Canal (the entrance to which is 1194 miles from Montreal) is 509 feet (345 rise, 164 fall) and the number of locks is 55. On the upper Ottawa—the Culbute Canal and L’Islet rapids—there are two locks 200 feet long, 45 wide, and 6 deep, with a lift of 18 to 20 feet. The

cost of the Ottawa canals, including the Rideau Canal, to 30th June 1883 was $9,126,125.

After leaving Lake St Louis the St Lawrence dashes wildly down the Lachine rapids, a descent of 42 feet in 2 miles, and 8 miles farther on, after passing beneath the 25 spans of the Victoria Tubular Railway Bridge, which has a length of 9144 feet, reaches the quays of Montreal, 198 miles below Kingston. In the beginning of the pre- sent century vessels of over 300 tons burden were unable to reach the city, but by deepening Lake St Peter and the shoals in the St Lawrence between Quebec and Montreal the latter las been made accessible to vessels of 4000 tons burden and drawing 25 feet of water. Work is being steadily continued and will not cease until a depth of 274 feet is attained, so as to enable the largest vessels afloat to reach the long stretch of new deep-water quays. In 1883 the tonnage of the 660 sea-going vessels which visited

the port was 664,263 tons, of which 605,805 belonged to 264 steamships, so that only 9 per cent. of the freight arriving from sea was carried in sailing vessels. The St Lawrence has an average width of 1? miles for 46 miles from Montreal down to Sorel on the right bank, at which point it is joined by the Richelieu river, a tributary that drains 9000 square miles.

The Richelieu river is made navigable from its mouth to Lake Richelieu Champlain, a distance of 81 miles to the United States boundary, river and by a dam and lock at St Ours, half a mile long (14 miles above canal.

Sorel), and a canal of 12 miles in length 32 miles farther up the river, known as the Chambly Canal. These give a navigable depth of 7 feet, allowing vessels 114 feet long, 23 broad, and drawing 64 feet of water, to pass through the canal from end to end. The cost of the works to 80th June 1867 was $756,249. The total length of navigation between Montreal and New York by the Richelieu Canal, Lake Champlain, the Champlain and Erie Canal, Albany, and the Hudson river is 456 miles. The Richelieu Canal, which already carries a freight of 350,000 tons annually, is to be enlarged, and a canal is to be constructed from Lake St Louis at Chaugh-nawaga, above Lachine, to St Johns on the Richelieu river, in con- uexion

with the Chambly Canal, to connect the St Lawrence with Lake Champlain by a new channel, which it is proposed should have the same dimensions as the improved Welland Canal. The cost of the proposed Chaughnawaga Canal, which would have a length of 32 miles and a lockage of only 29 feet, is estimated at

$5,500,000.

Iinmediately below Sorel the river flows into Lake St Sorel to Peter, 20 miles in length by 9 in width, through which Quebec.

prior to 1851 no vessel drawing more than 11 feet could pass. Since then a cutting 300 feet wide has been dredged to a depth of 25 feet. At Three Rivers, 86 miles below Montreal, the St Lawrence first meets the tide and receives from the north the waters from the St Maurice, which drains about 16,000 square miles. Nearing Quebec, the river, which maintains an average width of 14 miles from Lake St Peter, narrows into a width of three-quarters of a mile at Cape Diamond, on the left bank, 160 miles below Mont- real. The depth here is 128 feet and the rise of spring tides 18 feet.

The lower town of Quebec, which has extensive harbour accommodation, is built on reclaimed land around the base of the cape, one of its sides being washed by the river St Charles, which here flows into the St Lawrence. At the mouth of the St Charles the Princess Louise embankment, 4000 feet long by 300 wide, encloses a tidal area of 20 acres, having 24 feet of depth at low water. Connected with it is a wet dock, which is to have a permanent depth of 27 feet with an area of 40 acres. On the opposite side, at Pointe Levis, the Lorne graving-dock is nearly completed. Its dimensions are 500 feet in length, 100 in width, and 254 feet depth of water on its sill, During the year ending June 1884 the departures for sea of vessels from Quebec were 698, with an aggregate burthen of 686,790 tons.

The Canadian Government have sanctioned the proposal to con- struct a railway bridge across the St Lawrence within a few miles of Quebec, at a point where the river narrows to a width of 2400 feet at high water. The area of the waterway at high water is 200,000 square feet and at low water 160,000. For a width of about 1400 fect in the centre of the channel the water shelves rapidly from either shore into deep water, until it attains a

maxi- mum depth of nearly 200 feet. The proposed bridge, as designed by Messrs Brunlees, Light, & Claxton Fidler, will consist of three principal spans, entirely of steel, resting on masonry piers founded on therock. The central span will have a clear width of 1442 feet, the underside of the superstructure being 150 feet above high water.

Seven miles below Quebec the St Lawrence is 4 miles Below wide and divides into two channels at the head of the Quebec.

Island of Orleans, nearly opposite which, on the north shore, are the celebrated falls of Montmorency, with a perpendicular descent of 240 feet and a width of 50 feet. At the foot of the island, which is 22 miles long, the river expands to a width of 11 miles. This width increases to 16 miles 90 miles farther on, at the mouth of the river Saguenay, which drains an area of 23,716 square miles.

About 260 miles below Quebec, between Pointe des Monts on the north and Cape Chat on the south, the St Lawrence has a width of 30 miles, and, as this expanse is doubled 30 miles farther seaward, Cape Chat has been considered by many geographers as the southern extremity of an imaginary line of demarcation between the St Lawrence river and the gulf of the same name. It may, however, be assumed, with more propriety perhaps, taking the con- figuration of the gulf into special account, that Cape Gaspé, about 400 miles below Quebec and 430 miles from the Atlantic at the east end of the Straits of Belle Isle, is the true mouth of the St Lawrence river.

It has been calculated by Darby, the American hydro- grapher, that the mean discharge from the St Lawrence river and gulf, from an area rather largely estimated at 565,000 square miles, must be upwards of 1,000,000 cubic feet per second, taking into account the mean discharge at Niagara, which is 389,000 cubic feet per second from a drainage area of 237,000 square miles, and bearing in mind the well-ascertained fact that the tributaries of the lower St Lawrence, coming from mountainous woody regions where snow falls from 4 to 8 feet in depth, deliver more water per square mile than its upper tributaries.

The great prosperity and growth of Canada are owing no doubt to its unrivalled system of intercommunication by canal and river with the vast territories through

which the St Lawrence finds its way from the far-off

regions of the Minnesota to the seaboard. This great auxiliary of the railways (by means of which trade is now carried on at all seasons) must therefore be prominently taken into account in considering the transport routes of the future, their chief use being, as far as the conveyance of traffic over long distances is concerned, to augment, in the shape of feeders, the trade of the river, as long as it keeps open, and when it closes to continue the circulation of commerce by sledges until the ice breaks up and restores the river to its former activity. By the published statistics of the harbour commissioners of Montreal it appears that during the ten years 1870-79 the opening of the navigation at Montreal varied between 30th March and Ist May, and the close of the navigation between 26th November and 2d January, and that, whilst the first arrival from sea varied from 20th April to 11th May, the last departure to sea only varied from 21st November to 29th November during the ten years. (co. A. H.) According to the chief geographer of the United States Geological Survey, the following were the principal data for the St Lawrence lakes in 1886. Area of basin of St Lawrence 457,000 square miles, of which 330,000 belong to Canada and 127,000 to the United States. Lake Superior—area 31,200 square miles, length 412 miles, maximum breadth 167 miles, maximum depth 1008 feet, altitude above sea-level 602 feet. Lake Huron—area 21,000 square miles, 263 miles long, 101 broad, maximum depth 702 feet, altitude 581 feet. Lake Michigan—area 22,450 square miles, maximum breadth 84 miles, length 345 miles, maximum depth 870 feet, altitude 581 feet. Lake St Clair—29 miles long. Lake Erie—area 9960 square miles, length 250 miles, maximum breadth 60 miles, maximum depth | 210 feet, height above sea-level 578 feet and above Lake Ontario 326 feet. Lake Ontario—area 7240 square miles, length 190 miles, breadth 54 miles, maximum depth 738 feet, elevation 247 feet. In 1885 the enrolled vessels on the St Lawrence lakes belonging to the United States numbered 2497 (steam 1175, sailing

1322) with an aggregate burthen of 648,988 tons (steam 335,859 tons, sailing 313,129 tons).

ST LEONARDS is the name given to the western and more modern part of Hasrines (¢.v.), a watering-place on the coast of Sussex, England. St Leonards proper, which formed only a small part of the district now included under that name, was at one time a separate township. The population of St Leonards in 1881 was 7165.

ST LEONARDS, Epwarp Burtrensnaw SucpEn, Lorp (1781-1875), lord chancellor of England, was the son of a hairdresser in Duke Street, Westminster, and was born in

February 1781. After practising for some years as a cop. veyancer, he was called to the bar at Lincoln's Inn in 1807 having already published his well-known treatise on the Law of Vendors and Purchasers. In 1822 he was made king's counsel and chosen a bencher of Lincoln's Inn, He was returned at different times for various boroughs to the House of Commons, where he made himself pro. minent by his opposition to the Reform Bill of 1839. He was appointed solicitor-general in 1829, was named lord chancellor of Ireland in 1834, and again filled the same office from 1841 to 1846. Under Lord Derby's first administration in 1852 he became lord chancellor and was raised to the peerage as Lord St Leonards. In this posi- tion he devoted himself with energy and vigour to the reform of the law; Lord Derby on his return to power in 1858 again offered him the same office, which from con-siderations of health he declined. He continued, however, to take an active interest especially in the legal matters that came before the House of Lords, and bestowed his particular attention on the reform of the law of property. He died at Boyle Farm, Thames Ditton, 29th January 1875,

Lord St Leonards was the author of various important legal publications, many of which have passed through several editions, Besides the treatise on purchasers already mentioned, they include

Powers, Cases deeided by the House of Lords, Gilbert on Uses, New Real Property Laws, and Handybook of Property Law.

ST LO, a town of France, chef-lieu of the department of Manche, on the right bank of the Vire, 195 miles west by north of Paris by the railway which here breaks up into two branches for Coutances and Vire respectively. The old town stands on a rocky hill (110 feet high) commanding the river; the modern town spreads out below, Notre Dame is a Gothic building of the 14th century, with portal and two towers of the 15th. In the town- house is the Torigny marble, commemorating the assem- blies held in Gaul under the Romans and now serving as a pedestal for the bust of Leverrier the astronomer, who was born at St L6. The museum has some good pictures, and in the abbey of St Croix there are windows of the 14th century. The Champs de Mars isa fine tree-planted place. Horse-breeding, cloth and calico weaving, wool spinning, currying and tanning, are the local industries. The population in 1881 was 9889 (10,121 in the commune).

St Lé, founded in the Gallo-Roman period, was originally called Briovira (bridge on the Vire), and afterwards St Etienne, the present name being from one of its bishops (Lo, Laudus), who lived in the 6th century. By the time of Charlemagne the town was already surrounded with walls and contained the abbey, which was sacked by the Normans. In 1141 it fell into the hands of Geoffrey Planta- genet. But in 1203 the castle opened its gates to Philip Augustus, and, weaving being introduced, St L6 soon became a flourishing industrial centre. In the middle of the 14th century Edward II. of England captured the town and according to Froissart obtained immense booty. It was again taken by the English in 1417, but the victory of Formigny (1450) restored it permanently to France. The hearty welcome it gave to the Reformation brought upon St L6 new disasters and new sieges. The revocation of the Edict of Nantes led to the emigration ofa part of the inhabitants. In 1800 the town was made the centre of the department, but by Napoleon’s orders it was deprived of its fortifications.

ST LOUIS, the capital of Senegambia or Senegal, West Africa, and known to the natives as far as Timbuktu as N’dar, is built on an island 10 sea-miles above the mouth of the Senegal river, near the right bank, which is there a narrow strip of sand—the Langue de Barbarie— occupied by the villages of N’dar Toute and Guet N’dar. Two bridges on piles connect the town with the villages; and the Pont Faidherbe, 2132 feet long and constructed in 1863, affords communication with Bouetville, a suburb and the terminus of

the railway, on the left bank. The houses of the European portion of St Louis have for the most part flat roofs, balconies, and terraces. Besides the governor’s residence the most prominent buildings are the cathedral, the great mosque, the court-house, and the

er LOUIS

various barracks and offices connected with the army. The town also contains the Senegal bank (1855), a Govern-

_ ment printing-office (1855), a chamber of commerce (1869), _ a public library, and an agricultural society (1874). The round beehive huts of Guet N’dar are mainly inhabited

by native fishermen. N’dar Toute consists of villas with | gardens, and is frequented as a summer watering-place.

There is a pleasant public garden in the town, and the neighbourhood is rendered attractive by alleys of date- palms. As there are no natural wells on the island, and the artesian well at the north side of the town gives only brackish water, St Louis used to be dependent on rain-

tanks and the river (and except during the rainy season

the water in the lower part of the river is salt); but in 1879 1,600,000 francs were appropriated to the construc-

tion of a reservoir at a height of 300 feet above the sea,

_ 734 miles from the town.

The mouth of the Senegal being

closed by a bar of sand with extremely shifting entrances – for small vessels, the steamships of the great European — lines do not come up to St Louis, and passengers, in order to meet them, are obliged to proceed by rail to Dakar, on _ the other side of Cape Verd. Ordinary vessels have often

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to wait outside or inside the bar for days or weeks and

partial unloading is often necessary. It is proposed to construct a pier opposite Guet N’dar. The population of St Louis was 15,980 in 1876 and 18,924 in 1883. Though founded in 1662, the town did not receive a municipal government till August 1872. See SENEGAL. ST LOUIS, a city of the United States, chief city of the State of Missouri, is situated on the west bank of the Mississippi river, 20 miles below its confluence with the Missouri river and 200 miles above the influx of the Ohio, in 38° 38’ 36 N. lat. and 90° 12’ 17” W. long. It is distant by river about 1200 miles from New Orleans, and 729 from St Paul at the head of navigation on the Missis- sippl, and occupies a position near the centre of the great basin through which the mingled flood of the Mississippi and Missouri and their extensive system of tributaries is carried to the Gulf of Mexico. The site embraces a series of undulations extending westwards with a general direction nearly parallel to the river, which at this point makes a wide curve to the east. The extreme length in a straight line is 17 miles, the greatest width 6°60 miles, the length of river front 19°15 miles, and the area (including con- siderable territory at present suburban in character) 624 square miles. The elevation of the city directrix above the waters of the Gulf of Mexico is 428 feet, that of the highest point of ground in the city above the directrix is 203 feet ; the extreme high-water mark above the directrix is 7 feet 7 inches, and the extreme low-water mark below

_ the same is 33 feet 9% inches. The elevated site of the

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_ the blocks follow in numerical order.

city prevents any serious interruption of business by high water, even in seasons of unusual floods.

The plan of the city is rectilinear, the ground being laid out in blocks about 300 feet square, with the general direc- tion of street lines north-south and east-west. The wharf or river front is known as the Levee or Front Street,

the next street west is Main Street, and the next Second, and thence the streets going north-south are, with few excep- tions, in numerical order (Third, Fourth, &e.). Fifth Street has recently been named Broadway. The east-west streets bear regular names (Chestnut, Pine, Washington, Franklin, and the like). Market Street is regarded as the middle of the city, and the numbering on the intersecting streets Commences at that line, north and south respectively. One hundred house numbers are allotted to each block, and The total length of paved streets in St Louis is 316 miles, of unpaved streets and. roads 427, total 743 miles. In the central streets, subject to heavy traffic, the pavement is of granite blocks ;

wood, asphalt, and limestone blocks and Telford pave- ments are also used. There are nearly 300 miles of mac-

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1, Four Courts. 7. Union Depét.

2. City Hall. – 8. First Presbyterian Church.

3. Exposition Building. 9. Temple of the Gates of Truth. 4. Custom House. 10. St Peter and Paul Church.

5. Washington University. 11. Lindell Hotel.

6. Court House. {| 12. Southern Hotel.

adamized streets, including the roadways in the new limits. The length of paved alleys is about 66 miles. The city has an extensive sewer system (total length 223 miles), and, owing to the elevation of the residence and business dis- tricts above the river, the drainage is admirable. The largest sewer, Mill Creek (20 feet wide and 15 feet high), runs through the middle of the city, from west to east, following the course of a stream that existed in earlier days. The water-supply is derived from the Mississippi; the water

is pumped into settling basins at Bissell's Point, and thence into the distributing pipes, the surplus flowing to the storage reservoir on Compton Hill, which has a capacity of 60,000,000 gallons. The length of water-pipe is nearly 250 miles; the capacity of the low-service engines which pump the water into the settling basins is 56,000,000 gallons in twenty-four hours, and that of the high-service engines which supply the distributing system 70,000,000 gallons. The average daily consumption in twenty-four hours is nearly 28,000,000 gallons. The works, which are owned by the city, cost over $6,000,000. Among the more

important public buildings are the new custom-house and post-office, erected at a cost of over $5,000,000 ; the mer- chants' exchange, which contains a grand hall 221 feet 10 inches in length by 62 feet 10 inches in width and 60 feet in height ; the court-house, where the civil courts hold their sessions ; the four courts and jail, in which building are the headquarters of the police department and the chambers of the criminal courts; the cotton exchange ; the new ex- position and music-hal] building on Olive Street, erected by public subscription ; and the Crow Museum of Fine Arts. The present city-hall is a large but hardly orna- mental edifice. The mercantile library, on Fifth and Locust Streets, contains nearly 65,000 volumes and also a valuable art collection. The public school library in the polytechnic building has about 55,000 volumes. There are six handsome theatres and various other smaller places of amusement. The public school system of St Louis includes the kindergarten (for which St Louis has become somewhat celebrated), the grammar-schools (including eight grades, of a year each), and a high school, besides the normal school and a school for deaf mutes. The public schools naturally absorb much the largest number of pupils; but the parochial schools and the private schools gathered about the Washington university are also much frequented. The number of pupils in 1883-84 was in the normal school 64, high school 783, grammar-schools 52,280, total in day schools 53,127 ; total in day and evening schools 56,366. The total number of public school buildings is 104, and the value of property used for school purposes $3,229,148; all the school edifices are substantial and convenient, and many architecturally attractive. The receipts of the public school system for 1884 were $941,332, and the

total ex- penditure $934,609, the amount paid to teachers being $632,873. Of parochial schools there are about 75. The Washington and St Louis universities are old and well- established institutions. There are also the Mary Institute and the manual training school, both connected with Wash- ington university, the college of the Christian Brothers, convent seminaries, and numerous medical colleges. In addition there are art schools, singing and gymnastic societies, and other similar organizations and establish- ments. There are published in St Louis four daily news- papers in English and four in German, and also a number of weekly publications.

There are 16 Baptist churches, 8 Congregational, 13 Episcopal, 25 German Evangelical and Lutheran, 6 Hebrew congregations, 18 Methodist Episcopal, 8 Methodist Episcopal Church (South), 25 Presbyterian, 45 Roman Catholic, and 3 Unitarian. Many of the buildings are of imposing proportions, built of stone, massive in character, and with lofty spires. The Roman Catholic cathedral, built in 1830, is the oldest church now in use. On the high ground in the central-western portion of the city (Stoddard's Addition) will be found most of the costly church build- ings, whilst in the northern and southern portions of the city there are very few indeed.

The parks and squares of St Louis number 19, covering nearly 2100 acres. Tower Grove Park, in the south-western suburbs, containing about 266 acres, was presented by Mr Henry Shaw. The smaller parks are situated to the east of Grand Avenue, and the driving parks in the suburbs, —O'Fallon Park (158 acres) at the northern extremity of the city, Forest Park (1372 acres) west of the central portion, Tower Grove in the south-west, and Carondelet (180 acres) in the south. In the immediate vicinity of Tower Grove Park are the Missouri Botanical Gardens, established by Mr Henry Shaw, and containing the most extensive botanical collection in the United States. In addition to the parks, the Fair Grounds in the north-west should be mentioned, where the annual fair is held, and

where there is a permanent zoological department, An aniphitheatre, capable of seating between 20,000 ang 30,000 spectators, and a race-course with a most elabo. rate grand stand, are among the other features. There are

various beer-gardens in the city, largely frequented as pleasure-resorts. There are about 120 miles of street raij. ways in operation.

The following table shows the population of St Louis at different periods :—

DOD cierto see eee 925: | 1856. .c.n0seeeeeee 125,200 WSUOos. ses aoaceenee ees 1,400 | 1866)... .cccceeeee 204,327 TS 20s eee 4,928 | 1870 (United States

S80 cocicdteeen coeiokes 5,862 CeHSUS) ..a0.2 ee 310,864 DCRR set onsee concn 16,469 | 1880 ence 350,518 UG15) Usmemeeted saan orocone 74,489

The figures of the United States census are strictly con- – fined to municipal limits, and do not include the residents of East St Louis and of various suburban localities, pro- perly a part of the city population. In 1880 the popula. tion (179,520 males, 170,998 females) was divided as follows :— native, 245,505; foreign-born, 105,013. Of the latter 36,309 came from Great Britain (28,536 Irish) and 54,901 from Germany. The death-rate per thousand in 1882 was 19°6, in 1883 it was 20°4, and in 1885 (population being estimated at 400,000) it was 19-7.

The police force, including detectives and employés, numbers about 500 men. The fire brigade numbers 250 men, with 22 engine. — houses. The city has three public hospitals, an asylum for the insane, a poorhouse, a workhouse for the confinement and employ- ment of prisoners charged with petty offences, and a house of refuge which is a reformatory institution for juvenile offenders and for the education of children thrown upon the care of the city by abandonment or otherwise. The number of asylums, hospitals, and other institutions supported by private charity is very large,

Government and Finance.—St Louis is not included in any county of the State, but exists as a separate municipality. It was formerly embraced in St Louis county, and was within the jurisdiction and taxing power of a city and county government. The State con- stitution was revised in 1875 and two years later the separation of the city and the county government was effected, the former being reorganized under the present charter. The city

levies and collects municipal and State revenues within its limits, and manages its own affairs, free from all outside control, except that of the legis- lature of the State. The voters of the city have the right to amend the charter at intervals of two years at a general or special election, —provided the proposed amendments have been duly sanctioned and submitted to the people by the municipal assem- bly. The legisla- tive power of the city is in the hands of acouncil and a house of delegates, styled collectively the municipal assem- bly. The council is composed of thirteen mem- bers, elected for four years by the voters of the F city generally, lo" and the house of delegates con- sists of one mem- ber from each of the twenty-eight wards, elected for two years, The following officers are elected for a term of four years : — mayor, comptroller, au- ditor, treasurer, | registrar, col- lector, recorder of deeds, inspector of weights and measures, sheriff, coroner, marshal, public administrator, president of the board of assessors, and pre

Fia. 2.—St Louis and environs.

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sident of the board of public improvements. The elective officers, including the members of the board of public improvements, are nominated by the mayor and approved by the council, and the appointments are made at the beginning of the third year of the mayor's term, so as to remove the distribution of municipal patron- age from the: influences of a general city election. The power of the mayor and council touching appointments to office and removals js subject to certain reciprocal checks.

The bonded debt of St Louis at the close of the fiscal year, 13th April 1885, was $22,016, 000. This debt is reduced each year by the operation of the sinking fund. The city has no floating debt. 'The receipts for the fiscal year ending 13th April 1885, deducting proceeds of revenue bonds and special deposits, were $5,659,086, or 'with balance in treasury at opening of year $6,514,877. The total expenditure was $5,681,557. The city tax rate for the year 1884 was $1°75 on the $100. During the last few years the rate of in- terest on the bonded debt has been reduced from 6 and 7 per cent. to 5 per

cent., and more recently to 4 per cent. Most of the out- standing bonds are held in England and Germany. All appropria- tions are rigidly limited to the available means, and the increase

‘of the bonded debt is forbidden by law. In 1860 the taxable ‘valuation was $69,846,845, in 1870 it was $147,969,660, in 1880 $160,493,000, and in 1885 $207,910, 350.

Commerce.—Subjoined are a few of the more important facts and figures respecting the commerce of St Louis. In 1884 there were 6,440,787 tons of freight received by rail and 520,350 by river, making a total of 6,961,137 tons. In the same year there were shipped by rail 3,611,419 tons and by river 514,910 tons (total 4,126,829). The total receipts of grain for 1884, including wheat reduced to flour, were 52,776,832 bushels, as against 51,983,494 bushels in the previous year. During 1884 the amount of flour manufactured was 1,960,737 barrels, and the amount that changed hands 4,757,079 barrels ; 302,534 bales of cotton, 19,426 hogsheads of tobacco, and 118,484,220 Ib of sugar were received ; and 193,875,479 Tb of pork in various forms were shipped. There are thirteen tobacco manufactories, with a production in 1884 of 22,631,104 fb. In live stock, lumber, hides, wool, salt, lead, and a long list of other com- moditics the business is largc and increasing. Extensive stock- yards arc established in the northern part of the city, and also in East St Louis, where they are known as the national stock-yards, and cover a space of over 600 acres. In 1884 there were imported—cattle, 450,717 ; sheep, 380,822 ; pigs, 1,474,475 ; horses and mules, 41,870. ‘The shipments in the same year were—cattle, 315,433 ; sheep, 248,545 ; pigs, 678,874 ; horses and mules, 39,544. There are twelve grain elevators, with a total capacity for bulk grain of 10,950,000 bushels and 415,000 sacks. The coal received during the year amounted to 52,349,600 bushels. The foreign value of imports for the year was $2,586,876, and the collections at the custom-house were $1,468,495.

__ Among the more important manufactures may be mentioned those of iron and steel, glass, flour, sugar, beer, bagging, prepared foods, tobacco, boots and shoes, furniture, planed and sawed lumber, wire and wire-work, carriages and waggons, foundry and machine- shop products, hardware, agricultural implements, &c. Meat pack- ing is also an important industry.

The summary of manufactures _in the United States census of 1880 shows 2924 establishments, ‘having a capital of $50,832,885; amount paid in wages during the year, $17,748,532 ; value of materials, $75,379,867 ; value of pro- ducts, $114,333,375. These figures ought probably to be largely increased now (1886). In the wholesale grocery trade St Louis is ‘ahead of nearly all the inland cities of the Union. There are be- tween twenty and thirty wholesale houses, and it is estimated that the annual salcs exceed $30,000,000. The Belcher sugar -refinery is able to turn out 1200 barrels a day. The capital employed in the wholesale and retail dry goods establishments is estimated at between $10,000,000 and $12,000,000, and the annual amount of business at $35,000,000 to $40,000,000. The brewing business of St Louis has had an astonishing development, and its product is shipped to all parts of the world. It employs over $8,000,000 of capital, and pays out in wages over $2,000,000 per annum. The ale and beer shipments during 1884 numbered 1,834,545 packages. The brick-making industry has recently become important, and the hard red brick for building and the fire brick produced in St Louis are among the best to be found in the United States. In 1884 | there were eighteen State banks and six national banks represent- mg—capital and surplus, $14,742,123 ; savings and time deposits, $9,102,021 ; current deposits, $29,000,691 ; circulation, $674,150 ; total, $53,518,985. The clearings for 1884 amount to $785,202,177, and the balances to $125, 260,945, making a total of $910, 463,122. | Raiheays. —St Louis is one of the most important railroad Dom In the United States ; the nineteen lines which run traius ri 0. the Union depét represent nearly 20,000 miles of railway. ec Union passenger depot, contiguous to the business centre of the city, is connected with ‘the bridge over the Mississippi by a jtunnel. The buildings are of a tem orar h a : hd _temporary character, and are not \? cquate to the enormous business transacted; a new depét of ‘Mposing proportions is now in contemplation. Over 150 passen-

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ger trains arrive and depart daily. The tunnel already referred to commences a few hundred yards east of the Union depét. It has double tracks throughout its length, which is about 1 mile, and is supplied with electric lights, ventilating shafts, and the best ap- pliances for safety and convenience. It is leased by the Wabash, St Louis, and Pacific and the Missouri Pacific Railroad Companies, which are also the lessees of the bridge. The bridge across the Mississippi river at St Louis is one of the most remarkable struc- tures in the world in character and magnitude. It consists of three arches, the two side spans being 502 feet in the clear and the centre span 520 feet, and carries a roadway for ordinary traffic 54 feet wide and below this two lines of rail. The dimensions of the abutments and piers are as follows :—

Dimensions at Dimensions at Height } Founda- foundation. top. from foun- |tion below Say nea a | NN Suen | CUUOMNLO mexizenic Length.|Thickness.| Length. Thickness | top of M. | low water. tte fuer 1.) Wetted. | fb. ns fia in: ft. in. East abutment; 83 70 6 64 3h | 47 6 192 9 93 3} East pier…... 82 60 0 63 0 24 0 197 1} 86 2} | West pier ….] 82 48 0 63 0 24 0 172 14) 61 2 West abutment) 94 62 8% | 64 3h 47 6 112 8} 13 3}

The foundations of abutments and piers rest on solid rock. The two piers and the east abutment were sunk by means of pneumatic eaissons. The greatest depth below the surface at which work was done was 110 feet, the air-pressure in the caisson being 49 fb. Each arch consists of four equal ribs ; each rib is composed of two circular members, 12 feet apart, which are connected by a singlo system of diagonal braces. The circular members consist of steel tubes, which are 12 feet long and 18 inches in diameter ; each tube is composed of 6 steel staves, varying in thickness between 1,3, and

‘2% inches. These staves are held together by a steel envelope,

a quarter of aninch thick. The tubes are joined together by coup- lings, and the end tubes are rigidly connected with wrought-iron skewbacks, which are fixed to the masonry by long bolts. The arches were erected without using any false work. Work on the bridge was commenced March 1868, and it wasopened for traffic on 4th July 1874. The total cost of bridge and approachcs was $6,536, 730. The traffic across the bridge is rapidly

developing. In 1876 the gross earnings were $448,447 (loaded waggons, 45,027; railway passengers, 496,686); in 1884 the gross earnings were $1,520,483 (loaded waggons, 172,730; railway passengers, 1,333,360); a total of 2,225,994 tons was carried ; and the total number of cars which crossed the bridge was 472,324.

History.—The first permanent settlement on the site of St Louis was made in February 1764, and was in the nature of a trading post, established by Pierre Laclede Lignest. Long prior to this event there had been some exploration of the vast regions of the Mississippi and its tributaries by Marquette, Joliet, La Salle, Hennepin, and others ; but, although a few widely separated mili- tary and trading posts had been established, there was no accurate knowledge of the character and resources of the country. Laclede's expedition was nearly contemporaneous with the treaty of Paris, 1768, by which the title of France to the regions in the valley of the Mississippi was practically extinguished, Spain becoming owner of all Louisiana west of the Mississippi, and England of all territory east of that river, exccpting New Orleans. The few French forts north of the Ohio were nominally surrendered to the English, in- cluding Vincennes, Cahokia, Kaskaskia, and Fort de Chartres ; but there was no immediate formal assertion of English control, and French sentiments and manners and customs remained undis- turbed. In 1771 St Louis was formally occupied by a small body of Spanish troops, commanded by Don Pedro Piernas, and a period of somewhat over thirty years of Spanish rule followed, during which few local events of noteworthy character occurred. On 25th May 1780—the festival of Corpus Christi—the post, or village, was attacked by Indians, and about thirty of the citizens were killed ; but the savages were beaten off and did not renew the attack. In 1800 Spain ceded back to France all her territory of Louisiana, and three years later—30th April 1803—France ceded to the United States all her right, title, and interest in the territory for eighty million francs. At this time St Louis and the adjacent districts had a population of not over 3000, and the total population of Upper Louisiana was between 8000 and 9000, including 1300 Negroes. There were not over 200 houses in the embryo city, which con- sisted mainly of two streets parallel to the river. For fifty or sixty years after the landing of Laclede the progress of the town was necessarily slow. In 1810 the population was less than 1500, and in 1830 it had not reached 6000.

From the latter date progress became steady and rapid, and the real growth of the city was com- pressed within half a century. An extensive conflagration occurred in 1849, which destroyed most of the business houses on the Levee and Main Street. During the Civil War the commercial advance- ment of St Louis was seriously retarded ; but the city continued to expand in population owing to its advantageous geographical position. (D. H. M‘A,)

ST LUCIA, a West India island, discovered by Colum- bus in 1502, is situated in 13° 50’ N. lat. and 60° 58’ W. long., and has a length of 42 miles and a maximum breadth of 21. Pigeon Island, formerly an important military post, lies at its northern extremity. Originally inhabited by Caribs, St Lucia was settled by the English in 1639, and, after many alternations of English and French possession, surrendered to the British arms in 1794. Sir John Moore was governor till1797. St Lucia was subsequently in French possession, but was finally restored to Great Britain in 1803. The scenery consists of mountain, valley, and forest; two cone-shaped rocks rise out of the sea to a height of 3000 feet, and near them are craters of extinct volcanoes and a solfatara. The island is considered a good coaling station for mail-steamers and war-ships ; there is a good harbour on the west coast, below Castries, the capital (population, 5000). The total population was 40,532 in 1883, of whom 1000 were white, mostly French. St Lucia forms part of the general government of the Windward Islands (from which Barba- dos is excluded) ; it has a legislative council composed of officials and crown nominees. The annual revenue and ex- penditure were £43,026 and £36,652 respectively in 1883, the debt (principally for Central Sugar Factory) being £32,400. The tonnage of vessels entered and cleared was 438,688 ; the total imports were valued at £191,191 and the exports (sugar, 7600 tons; cocoa, 307,120 ib) at £213,823. The Usine or Central Factory system has been established with Government assistance.

ST MALO, a seaport town of France, on the English Channel, on the right bank of the estuary of the Rance, is situated in 48° 39’ N. lat., 51 miles by rail north-north- west of Rennes. It is the administrative centre of an

arrondissement in the department of Ille-et-Vilaine and a first-class garrison town, surrounded by ramparts of the 13th, 16th, and 17th centuries, which are strengthened with great towers at the principal gates. The granite island on which St Malo stands communicates with the mainland only on the north-east by a causeway known as the “Sillon ” (furrow), 650 feet long, and at one time only 46 feet broad, though now three times that breadth. This causeway forms part of the site of Rocabey, an in- dustrial suburb more extensive, though less populous, than the town itself. In the sea round about lie other granite rocks, which have been turned to account in the defences of the coast; on the islet of the Grand Bey is the tomb (1848) of Chateaubriand. The rocks and beach in the circuit of St Malo are continually changing their appear- ance, owing to the violence of the tides. Equinoctial spring-tides sometimes rise 50 feet above low-water level, and during storms the sea sometimes washes over the ramparts. The harbour of St Malo lies south of the town in the creek separating it from the neighbouring town of St Servan. It has a wet dock with from 20 to 25 feet of water (30 feet in spring-tides), and a mile of quays. Additional works are projected, to make the area of the dock 42 acres and the length of quays 14 miles. Among French seaports St Malo stands twelfth in commercial importance, but first in the number of seamen on its register. The annual imports and exports together amount to 184,000 tons, and 3000 tons of shipping are built yearly. Besides fitting out fishing-boats for Newfound-land, St Malo exports grain, colza-seed, cider, butter, tobacco, and various kinds of provisions to the Channel Islands, with which it is connected by a regular steamboat service. The coasting vessels have a tonnage of about 30,000. Communication between St Malo and St Servan is maintained by a revolving bridge. St Malo is largely frequented for sea-bathing, but not so much as Dinard, on the opposite side of the Rance. Paramé, to the east of

St Malo, has recently sprung into importance. The interjop of St Malo presents a tortuous maze of narrow streets and of small squares lined with high and sometiines quaint buildings. The old house in which Duguay-Trouin wags born deserves to be noted. Above all rises the stone spire which since 1859 terminates the central tower of the cathedral. The castle, which defends the town towards the “‘Sillon,” is flanked with four towers,

and in the centre rises the great keep, an older and loftier structure which was breached in 1378 by the duke of Lancaster, St Malo has statues to Chateaubriand and Duguay-Trouin, The museum contains remains of the ship “La Petite Her. mine,” in which Jacques Cartier sailed for the discovery of Canada; and the natural history museum possesses a remarkable collection of from 6000 to 7000 European birds. The population of St Malo in 1881 was 10,89] (commune, 11,212).

In the 6th century the granite island on which St Malo now stands was the retreat of Abbot Aaron, who gave asylum in his monastery to Malo (Maclovius or Malovius), a Cambrian priest, who came hither to escape the episcopal dignity, but afterwards became bishop of Aleth (now St Servan); the see was transferred to St Malo only in the 12th century. Jealous of their independence, the inhabitants of St Malo played off against each other the dukes of Brittany and the kings of France, who alternately sought to bring them under subjection. During the troubles of the League they hoped to establish a republican government in their city, and on the night of 11th March 1590 they extcrminated the royal garrison and imprisoned their bishop and the canons. But four years later they surrendered to Henry IV. of France. During the following century the maritime power of St Malo attained some importance. In November 1693 the English vainly bombarded St Malo for four consecutive days. In July 1695 they renewed the attempt, but were equally unsuccessful. The people of St Malo had in the course of a single war captured upwards of 1500 vessels (several of them laden with gold and other treasure) and burned a considerable number more. Enriched by these successes and by the wealth they drew from Peru, the shipowners of the town not only supplied the king with the means necessary for the famous Rio de Janeiro expedition conducted by Duguay-Trouin in 1711, but also lent him £1,200,000 for carrying on the War of the Spanish Sue- cession. In June 1758 the English sent a third expedition against St Malo under the command of Marlborough, and inflicted a loss of £480,000 in the harbour. But another expedition undertaken in the following September received a complete check. In 1/78 and during the wars of the empire the St Malo privateers resumed their activity. In 1789 St Servan was scparated from St Malo and in 1790 St Malo lost its bishopric. During the Reign of Terror the town was the scence of sanguinary executions, Among the celebrities born in St Malo are Jacques Cartier,

Duguay-Trouin, Surcouf, and Mahé de la Bourdonnais—all four of naval fame— Maupertuis, Chateaubriand, the Abbé de Lamennais, and Broussais.

ST MARTIN, one of the Lesser Antilles (West Indies), part of which (20 square miles) belongs to France and forms a dependency of Guadeloupe, while the remainder (18 square miles) belongs to Holland and along with Saba, &c., is a dependency of Curacao. Situated in 18° N. lat. and 63° W. long., it ascends to a height of 1380 feet above the sea, and has a comparatively small cultivable arca. The great saltpans of the Dutch portion produced in 1882 276,434 tons of salt, and there are similar saltpans in the French portion. Sugar and live-stock (horses, cattle, sheep, goats, and pigs) are also exported. The chief settlement and anchorage in the French portion is Marigot, in the Dutch Philippsburg. The population in 1882 was 7083 (French portion 3724, Dutch 3359). Occupied by French freebooters in 1638 and by the Spaniards between 1640 and 1648, St Martin was divided between the French and Dutch in this latter year.

SAINT-MARTIN, Lovis Craupe ps (1743-1803), known as “le philosophe inconnu” from the fact that all his works were published under that name, was born ab Amboise of a poor but noble family, on the 18th January 1743. By his father’s desire he tried first law and then the army as a profession. While in garrison at Bordeaux, he came under the influence of Martinez Pasqualis, a Port

_ by water and 40 by rail.

» less than 13.

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guese Jew, who taught a species of mysticism drawn from cabbalistic sources, and endeavoured to found thereon a secret cult with magical or theurgical rites. In 1771 Saint-Martin left the army in order to become a social preacher of mysticism. His conversational powers made him welcome in the most aristocratic and polished Parisian salons ; but his missionary zeal led him to England, Italy, and Switzerland, as well as to the chief towns of France. At Strasburg in 1788 he met Charlotte de Boecklin, who ‘nitiated him in the writings of Jacob Boehme, and at the same time

inspired in his breast a semi-romantic attach- His later years were devoted almost entirely to the chief works and to the translation of He died at Aunay, near Paris, on the

ment. ; composition of his those of Boehme.

93d October 1803.

His chief works are—Letére a un ami sur la Révolution Francaise ; Eclair sur Vassociation humaine ; De Vesprit des choses ; AMinistére de Vhomme-esprit. Other treatises appeared in his Guvres post- humes (1807). Saint-Martin regarded the French Revolution as a sermon in action, if not indeed a miniature of the last judgment ; its result was to be the regeneration of society by a destruction of its abuses. His ideal society was ‘‘a natural and spiritual theo- cracy,” in which God would raise up men of mark and endowment, who would regard themselves strictly as ** divine commissioners ”

} to guide the people through the crises of their history. This mystical dictatorship was to rest entirely upon persuasion. In like manner all ecclesiastical organization was to disappear, giving place to a purely spiritual Christianity, the doctrines of which constitute a species of theosophy. Their philosophical basis in Saint-Martin is the assertion of a faculty superior to the reason, which he calls the moral sense, and from which we derive our knowledge of God. In man, and not elsewhere, is to be found the key to the divine nature. God exists as an eternal personality, and the creation is an overflowing of the divine love, which was unable to contain itself. The human soul, the human intellect or spirit, the spirit of the mniverse, and the elements or matter are the four stages of this divine emanation, man being the immediate reflexion of God, and nature in turn a reflexion of man. Man, however, has fallen from his high estate, and matter is one of the consequences of his fall. But the divine love, united to humanity in Christ, will work the final regeneration or restoration of all things.

Comp. Gence, Notice biographique (1824); Caro, Essai sur la vie et les doctrines de Saint-Martin (1852) ; Sainte-Beuve, Causeries de Lundi, vol.

x. p. 190; Matter, Saint-Martin, le philosophe inconnu (1862); Franck, La philosophie mystique en France @ la fin du dix-huitiéme siécle (1866).

ST MAUR-SUR-LOIRE, founded by St Maurus (see Mavrus), was the first Benedictine monastery in Gaul. It was situated on the left bank of the Loire about 15 miles below Saumur. About the middle of the 9th century it was reduced to ruins by the Normans; shortly before

_ the event and in anticipation of it the relics of the saint

were transferred to St Maur-les-Fossés near Paris. St | Maur-sur-Loire was afterwards restored and fortified, but the only extant remains consist of a part of the church and a few shattered columns.

ST MICHAEL'S. See Azores, vol. iii. p. 171.

ST NAZAIRE, a town of France, in the department of Loire Inférieure, and a port on the right bank of the Loire near its mouth. It has rapidly grown since the new docks rendered it the outport or detached harbour of Nanres (q.v.), from which it is distant 29 miles west-north-west

Begun in 1845 and opened in 1857, the first basin has an area of 26 acres and 1 mile of quays ; and the depth varies from 20 to 25 feet. To the north of the first basin a new dock (Penhouet), 56 acres

| in extent and with 14 miles of quay, was constructed be-

tween 1864 and 1881, at a cost of nearly £1,000,000. It communicates with the older basin by a passage 82 feet wide and 673 long. The harbour can admit vessels of 23 feet draught at every tide, the depth of water on the sill varying from 26 to 30 feet at high tide, and never being The town is the terminus of the General Transatlantic Company, whose steamers connect France

with Mexico, the Antilles, and the Isthmus of Panama. | The total imports and exports amount to about 1,600,000 tons annually, valued at £24,000,000. The staple articles

imported are coals from Great Britain (500,000 tons), grain, sugar, coffee, rice, timber (from the North), phos- phates, and guano. Pit-props, salt, and preserved foods are exported. The town being of recent origin, its indus- tries are only in process of development; but it already contains shipbuilding yards, large ironworks, artificial fuel factories, sawmills, a flour-mill, and extensive commercial warehouses. There are no edifices of historical or architect- ural note with the exception of a granite dolmen, 10 feet long and 5 broad, resting horizontally on two other stones sunk in the soil, above which they rise 64 feet. The population was 16,314 in 1881 (19,626 in the commune).

According to certain remains discovered on excavating the docks, St Nazaire seems to occupy the site of the ancient Corbilo, placed by Strabo among the more important maritime towns of Gaul, and probably fonnded by the Pheenicians. It was in the harbour of Corbilo that Crassus by Czsar's order built the fleet by which, in 56 B.c., Brutus routed the 220 vessels of the Venetian insurgents. At the close of the 4th century the site of Corbilo was occupied by Saxons, and, their conversion to Christianity being effected one or two hundred years later by St Felix of Nantes, the place took the name of St Nazaire. It was still only a little '"bonrg" of 3000 inhabitants when it was chosen as the site of the new harbour for Nantes, because the ascent of the Loire was becoming more and

more difficult. In 1868 the sub-prefecture was transferred to St Nazaire from Savenay.

ST NICOLAS, a town of Belgium, in the district of Dendermonde, in the province of East Flanders, 19} miles from Ghent by the railway to Antwerp. It is a well-built, modern-looking place, with a very spacious market-place, famous as the spot where Philip the Fair swore in 1497 to maintain the privileges of Waesland, of which St Nicolas was the capital. From a comparatively small village, with only 5000 inhabitants in 1661, it has grown into a large manufacturing centre, with wool and cotton mills, needle-factories, &c., and a population (in 1876) of 24,729. The more conspicuous buildings are the town-hall and two of the churches.

ST OMER, a town and fortress of France, chef-lieu of the department of Pas-de-Calais, situated.on the Aa (which flows into the North Sea), 177 miles north of Paris by the railway to Arras, Hazebrouck, and Calais, at the junction of a line to Boulogne. Before the modifications made in the defensive system of the frontier the place was a fortress of the first class. At St Omer begins the canalized portion of the Aa, which reaches the sea at Gravelines, and under its walls it connects with the Neuffossé, which ends at the Lys. There are two harbours outside and one within the city. St Omer has wide streets and spacious squares, but little stir of life. The old cathedral is the most curious church in Artois; it belongs almost entirely to the 13th, 14th, and 15th centuries. Of its four portals the finest, dating from the 13th and 14th centuries, was decorated with statuettes, unfortunately mutilated during the Revolu- tion. In spite of the spoliations of the 18th century, the contents of the church still comprise interesting paintings, a Virgin in wood of the 12th century (the object of numer- ous pilgrimages, and solemnly crowned in 1875), a colossal statue of Christ seated between the Virgin and St Jolin (13th century, originally belonging to the cathedral of Thérouanne and presented by Charles V.), fine stained glass and mosaics, interesting tombstones, the cenotaph of St Omer, and numerous ex-votos, distinguished by their an- tiquity, originality, and delicacy of workmanship. The clearing of the church from the encroachments of other buildings has led to the reconstruction of the apsidial chapel of the Sacred Heart in the purest Gothic style. Of St Bertin, the church of the abbey (built between 1326 and 1520 on the site of previous churches), where Childeric III. retired to end his days, nothing now remains but some arches and a tower, 190 feet high, which serves to adorn the public gardens (once possessed by the monks). Several

other churches or convent chapels are of interest, but it is enough to mention St Sepulchre’s (14th century) for the sake of its beautiful stone spire and stained-glass windows. A fine collection of records, a picture gallery, and a theatre are all accommodated in the town-hall, built of the materials of the abbey of St Bertin. Among the five hospitals the military hospital is of note as occupying the college opened by the English Jesuits in 1592 and known as the place where O’Connell received his education. The

old episcopal palace is used as a court-house. Several learned societies exist in the town; the public library contains 20,000 volumes and 1000 MSS. The arsenal is an extensive series of buildings. Besides 30,000,000 to 40,000,000 tobacco- pipes exported to America and the colonies, St Omer manufactures cloth, hosiery, and tulle, cambric, and muslin embroideries. Its trade (and it is the seat not only of a tribunal but also of a chamber of commerce) is mainly in provisions for England, the products of the local industry, and those of the paper-mills, flour-mills, distilleries, and sugar-factories in the vicinity, especially along the banks of the Aa. The suburb of Haut Pont to the north of St Omer is inhabited by a special stock, which has remained faithful to the Flemish tongue, its original costume, and its peculiar customs, and is distinguished by honesty and industry. The ground which these people cultivate has been reclaimed from the marsh, and the légres (¢.e., the square blocks of land) communicate with each other only by boats floated on the ditches and canals that divide them. At the end of the marsh, on the borders of the forest of Clairmarais, are the ruins of the abbey founded in 1140 by Thierri d'Alsace, to which Thomas a Becket betook himself in 1165. To the south of St Omer on a hill commanding the Aa lies the camp of Helfaut, often called the camp of St Omer. On 15th June 1884 a statue was erected to Jacqueline Robin, a heroine who in the time of Louis XIV. saved St Omer from foreign occupation. The population of the town was 20,479 in 1881 (21,556 in the commune).

Near a castle named Sithiu, Omer, bishop of Thérouanne, erected churches and the monks of Luxeuil established monasteries in the 7th century; and in the 9th century the village thus originated took the name of its founder St Omer. The Normans laid the place waste in 861 and 881, but ten years later found town and monastery surrounded by walls and safe from their attack. Situ- ated on the borders of territories frequently disputed by French, Flemish, English, and Spaniards, St Omer long continued subject to siege and military disaster. In 1071 Philip I. put all to sword and flame. Burned in 1136, captured in 1198 by Richard and Baldwin IX., attacked in 1214 by Ferrand of Portugal, in 1302 and 1803 by the Flemish, in 1337 and 1339 by the English, and in 1477 by Louis XI., St Omer at last fell in 1487 into the hands of Charles VIII. 'Two years later it was recovered by the arch- duke Maximilian ; and Charles V. strengthened its ramparts with bastions. The French made five futile attempts against it between 1551 and 1596, and had

no better success in 1638 (under Richelieu) or in 1647. But on 26th April 1677, after seventeen days' siege, Louis XIV. forced the town to capitulate; and the peace of Nimeguen permanently confirmed the conquest. From time to time the people of St Omer (Audomarois) still celebrate the entrance into the town of William Cliton, count of Flanders, from whom in 1127 they obtained a cominunal charter granting them numerous privileges. St Omer ceased to be a bishopric in 1790.

SAINTONGE (Santonia, Santonensis tractus), an old province of France, of which SAINnTEs (q.v.) was the capital, was bounded on the N.W. by Aunis, on the N.E. by Poitou, on the E. by Angoumois, on the 8. by Guienne, and on the W. by Guienne and the Atlantic. It now forms a small portion of the department of Charente and the greater part of that of Charente Inférieure.

ST OUEN, an industrial district in the outskirts of Paris, on the right bank of the Seine, 1 mile above St Denis. It had 17,718 inhabitants in 1881. The docks (6 acres in area), where the boats from the lower Seine discharge, are connected by rail with the Northern and Eastern lines at Paris and with the circular railway near Batignolles.

The importance of St Ouen is mainly due to its industria} establishments,—foundries and forges, steam-engine fac. tories, dyeworks, waxcloth works, potteries, &c. ; it has also the steam-pumps for supplying the upper quarters of Paris with water from the river, a racecourse, and a fine cast] occupying the site of the building in which Louis XV]qj. signed (2d May 1814) the declaration by which he pro. mised a charter to France.

ST PAUL, a city of the United States, second city of Minnesota, a port of entry and the capital of the State and of Ramsey county, is situated in 44° 52' 46" N. lat. and

.93° 5' W. long., on the Mississippi river, 2150 miles from

its mouth, 10 below the falls of St Anthony, the natural head of navigation, and 360 north-west of Chicago. The ground on which the city is built rises

from the river in a series of terraces, the ascent being in many places pre. cipitous and not easily adapted to urban uses. The city is mainly confined to the second and third terraces, but ig gradually spreading over the elevated plateau beyond. The difficulties of the situation have much increased the cost of erecting large business structures, circumscribed the busi- ness quarter, and impeded the railway companies in secur. ing convenient and adequate facilities. The city site is underlaid with a thick stratum of bluish limestone, which comes near the surface, and which, while it renders excava- tion expensive, furnishes unlimited supplies of building material of a fair quality. The streets of the older portions

SAS

Plan of St Paul.

1. State Capitol. 6. Chamber of Commerce.

2. U.S. Custom-House and 7. Rice Park. Post-Office. 8. Smith Park.

laid out. The chief public buildings are the State capitol (built in 1882), the United States custom-house and post- office, the city-hall, and the city-market. A handsome opera house and a chamber of commerce building are conspicuous features. In 1885 there were seventy-one church orgamiza- tions,—9 Episcopal, 7 Presbyterian, 4 Congregational, 12 Methodist, 12 Lutheran, 2 Jewish, 7 Baptist, 11 Roman Catholic, 1 Unitarian, 4 Evangelical, 1 Swedenborgian, and 1 Disciples of Christ. Besides the charitable institu tions connected with the church organizations there are an orphan asylum, a home for the friendless, a Swedish hospital, a women's Christian home, and a Magdalen home. Of periodical publications there were issued in 188) 5 dailies, 17 weeklies, and 7 monthlies. The city has (1886) eleven banks, of which six are national with an aggregate paid-up capital of $5,200,000, and five State institutions with a paid-up capital of $1,150,000. St Paul is an m- portant railway centre, dividing with Minneapolis the ter- minal and distributing business of no less than fifteen lines owned by six different corporations and having an aggre gate length of 15,818 miles. The navigation of the uppe Mississippi acts as a check upon the rates charged by the

3. City-Hall. 4, City-Market. 5. Opera-House.

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ailway companies. The traffic at the port of St Paul in

884 was—tons landed, 45,800 ; tons shipped, 13,300 ; ‘assengers carried, 34,625. ‘T’wo lines of steamers ply vetween St Paul and St Louis and intermediate points. “he average season of navigation lasts six and a half jonths. The city has within its corporate limits, but re- aoved some miles from the city proper, two colleges— {acalester (Presbyterian) and Hamline (Methodist)—both nly partially endowed or supplied with buildings. There _re twenty-two public school buildings, built at an aggre- -ate cost of $663,000. There are also several academies and eminaries under private or denominational management. *he public park system of St Paul is as yet undeveloped, out an area of 250 acres has been secured near Lake Como ‘o be laid out as pleasure-grounds. Rice Park and Smith ark are public squares in the central portion of the city, astefully adorned with walks and shrubbery. ‘The popula- ion of St Paul, according to the United States census, was 340 in 1850, 10,600 in 1860, 20,300 in 1870, and 41,473 n 1880 (males 22,483, females 18,990). According to he State census, it was 111,334 in 1889.

St Paul is a commercial rather than a manufacturing city. The jobbing trade for the year 1884 reached a total of about $65,000,000, in increase of 50 per cent. in four years. In the same year manu- actures valued at $20,000,000 were produced, the principal items eing agricultural implements, boots and shoes, machinery, sash, loors, and blinds, waggons and carriages. There is a large flour- nill, capable of producing 700 barrels daily. The lack of water-ower and the high cost of fuel are drawbacks to the growth of nanufactures. The main thoroughfares have recently been paved, or the most part with blocks of white cedar, and stone sidewalks

re rapidly replacing wooden ones. The water-supply is obtained rom a group of small lakes lying north of the city limits, and the yorks are owned and managed by the city. The drainage is xcellent. For governmental

purposes the eity consists of eight vards, each of which elects three members of council. The chief of ‘olice and all subordinate members of the force are appointed by he mayor, who is elected by popular vote in May of each alternate rear. The aggregate assessed valuation of real and personal pro- erty in St Paul was $60,463,000 in 1884. The total bonded debt if the city on 81st March 1885 was officially stated at $3,027,141. – The first settlement on the site of St Paul was in 1838, when an inimportant trading-post was established there by adventurers. In 1841 a Jesuit missionary built a log chapel and dedicated it to jt Paul (whence the name of the hamlet). The site of the future ity was surveyed and laid out in 1849-50. About this time (1851) fhe Sioux Indians ceded to the United States all lands held by hem between the Mississippi and Big Sioux rivers. Prior to this ession the white population in the then Territory of Minnesota jad not reached a total of 6000, but the removal of the aborigines ‘vas promptly followed by a notable influx of white settlers. With | Popa of some 2800 in 1854 the town obtained a fully organ- zed city government. Upon the admission of Minnesota to the Jnion in 1858 St Paul was designated as the capital. The city vas originally confined to the east bank of the river, but in 1874 ‘y popular vote a portion of Dakota county was transferred to tamsey county, and West St Paul on the west bank of the Missis- aye then containing some 3000 inhabitants, became a part of St aul proper. In 1884 an Act of the State legislature extended the jeographical boundaries of the city so as to embrace all territory n Ramsey county westward to the line of Hennepin county, and

‘irtually to the corporate limits of the “sister” city Minneapolis, 0 miles distant.

oe PAUL, a remarkable volcanic island which, along ivith the island of New Amsterdam, is situated in the ndian Ocean about midway between Africa and Australia, F little to the north of the ordinary route of the steamers rom Plymouth (via Cape Town) to Adelaide. Its exact osition as determined by the Transit of Venus Expedition a 1874 is 38° 42’ 50” 8, Lat. and 77° 32’ 29” E, Long. ~~hough the distance between the two islands St Paul and New Amsterdam is only 50 miles, they belong to two eparate eruptive areas characterized by quite different vroducts; and the comparative bareness of St Paul is in triking contrast to the dense vegetation of New Amster~~ lam. St Paul is 14 miles long from north-west to south- ast and its coast-line is

estimated at 5 nautical miles. In hape it is almost an isosceles triangle with a circle inscribed

tangentially to the north-east side,—the circle (3940 feet in diameter) being the volcanic crater which previous to 1780 formed an inland lake, but which, since the sea broke down its eastern barrier, has become practically a land-locked bay entered by a narrow but gradually widening passage not quite 6 feet deep. The highest ridge of the island is not more than 820 feet above the sea. On the south-west side the coasts are inaccessible. According to M. Vélain, the island originally rose above the ocean as a mass of rhyolithic trachyte similar to that which still forms the Nine Pin rock to the north of the entrance to the crater. Next followed a period of activity in which basic rocks were produced by submarine eruptions—lavas and scorie of anorthitic character, palagonitic tuffs, and basaltic ashes ; and finally from the crater, which must have been a vast lake of fire like those in the Sandwich Islands, poured forth quiet streams of basaltic lavas. The island has been rapidly cooling down in historic times. Dr Gillian (Lord Macartney's visit, 1793) mentions spots still too warm to walk on where no trace of heat is now perceptible; and the remarkable zone of hot subsoil extending westwards from the crater has lost most of the more striking characteristics recorded by Hochstetter in 1857, though it is still easily distinguished by its warmth-loving vegetation, —Sphagnum lacteolum and Lycopodium cernuum.

The general flora of the island is exceedingly meagre. If we leave out of view the potato, carrot, parsley, eabbage, &e., intro- duced by temporary inhabitants, the list comprises Umbcllifere, 1; Composite, 2; Plantaginacexr, 2; Cyperacce, 2; Graminacce, 2; Lycopodiacex, 1; ferns, 2; and from 35 to 40 species of mosses and lichens. The only plants really abundant are an Jsolepsis nodosa (Cyperacew) and one or two grasses. None of the trees (oak, apple, mulberry, pine, &c.) introduced at different periods have succeeded. The cabbage, which grows pretty freely in some parts, shows a tendency to become like the Jersey variety. The

“pigs mentioned by Hochstetter have died out; but goats, cats,

rats, and mice continue to flourish,—the cats, which feed mainly on birds and fish, living in apparent amity and in the same holes with the rats. House-flies, bluebottles, slaters, &c., literally swarm. But nothing is so characteristic of St Paul as the multitude of its sea-fowl,—albatrosses, petrels of many kinds, puffins, penguins, &c. The neighbouring waters teem with life, and, while the various genera of the seal family are no longer a source of wealth, a number of vessels (50 to 80 tons) from the Mascarene Islands still yearly carry on the fisheries off the coasts, where Chetlodactylus fasciatus (in shoals), Latris hecateta (cabot or poisson de fond), and Mcndosoma elongatwm afford a rich harvest. The stories told about gigantic sea creatures were curiously confirmed by the Venus Expedition finding on the shore a Cephalopod (since named JMouchczis sancti pault) which measured upwards of 22 feet from the end of its body to the tip of its longest arm.

The island now known as New Amsterdam was probably that sighted on 18th March 1522 by the companions of Magellan as they sailed back to Europe under the command of Sebastian del Cano; and in 1617 the Dutch ship ‘‘ Zeewolf” from Texel to Bantam discovered the island which, instead of the name “ Zeewolf” then bestowed on it, soon after began to be called on the charts St Paul. The designation ‘‘New Amsterdam” is derived from the vessel in which Van Diemen sailed between the islands in 1633. The first navigator to set foot on St Paul was Willem van Vlaming in 1696. Lord Macartney spent a day exploring it in 17938, his guide being a marooned Frenchman, Captain Péron, whose narrative of his sojourn from 1st September 1792 to 16th December 1795 is a document of great value (Jfémoires du Capitaine Péron, vol. i., Paris, 1824). In 1843 the governor of Réunion took possession of the islands with a detachment of marines,—seal-catehing and the fisheries having attracted to them a considerable floating popula- tion. In June 1871 the British frigate ‘‘ Megera ” was wreeked at the mouth of the crater and most of the 400 souls on board had to reside on the island for upwards of three months. Landing on 23rd September 1874, a French Transit of Venus expedition remained on St Paul till 8th January 1875, and a visit of much

importance was paid to New Amsterdam.

See Vélain, Description géol. de la presqu’tle d’ Aden, desiles de la Réunion, de St Paul, &c. (Paris, 1878), and his papers in Archives de la zoologie experimentale, 1877, and in Comptes Rendus, Acad. des Sc., 1875; Sauvage on the fishes in Arch. Zool. Exp., 1879-80.

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ST PAUL DE LOANDA. See Loanpa. ST PAUL’S ROCKS, not to be confounded with the island of St Paul in the Indian Ocean, are a number of small islands in the Atlantic, nearly 1° north of the equator and

540 miles from South America, in 29° 15’ W. long. Their outline is irregular, and as they are only separated by narrow but deep chasms they have the appearance of being one island. ‘The whole space occupied does not exceed 1400 feet in length by about half as much in breadth. Besides sea-fowl—two species of noddy (Anous stolidus and Anous melanogenys) and a booby or gannet (Sula leucogaster)— the only terrestrial inhabitants are insects and spiders. Fish are abundant, seven species (one, Holocentrum sancti pauli, peculiar to the locality) being collected by the “Challenger” during a brief stay. Darwin (On Volcanic Islands, p. 32) decided that St Paul’s Rocks were not of volcanic origin; more modern investigators—Renard, A. Geikie, and Wadsworth—maintain that they probably are eruptive. See Reports of the Voyage of H.M.S. Chal- lenger- Narrative of the Cruise, vol. 1.

ST PETER PORT, the capital of the island of GUERNSEY (g.v.) ; its population was 16,658 in 1881.

ST PETERSBURG, a government of north-western Russia, at the head of the Gulf of Finland, stretching along its south-eastern shore and the southern shore of Lake Ladoga. It is bounded by Finland and Olonetz on the N., Novgorod and Pskoff on the E. and S., Esthonia and Livonia on the W., and has an area of 20,750 square miles. It is hilly only on its Finland border, the re- mainder being flat and covered with marshy forests, with the

exception of a plateau of about 350 feet high in the south, the Duderhof hills at Krasnoye Selo reaching 550 feet. A great number of parallel ridges of glacier origin intersect the government towards Lake Peipus and northwards of the Neva. Silurian and Devonian rocks appear in the south, the whole covered by a thick glacial deposit with boulders (bottom moraine) and by thick alluvial de- posits in the valley of the Neva. The government skirts the Gulf of Finland for 130 miles. The bays of Cronstadt, Koporye, Luga, and Narva afford good anchorage, but the coast is for the most part lined with reefs and sandbanks ; to the east of Cronstadt the water becomes very shallow (18 to 20 feet). The chief river is the Neva, which receives only a few small tributaries; the Luga and the Narova also enter the Gulf of Finland. The feeders of Lake Ladoga—the Volkhoff, the Syass, and the Svir, the last two forming part of the system of canals connecting the Neva with the Volga—are important channels of com- merce, as also is the Narova (see PskorF). Marshes and forests cover about 40 per cent. of the surface (70 per cent. at the end of the 18th century).

The population (apart from the capital) was 635,780 in 1882, 82-7 per cent. being Russians, 15°0 Finns, 0°5 Esthonians, and 1°8 per cent. German colonists who have immigrated since 1765. Twenty per cent. are Protestants ; the remainder mostly belong to the Greek Church ; but there are also more than 20,000 Nonconformists, about 6000 Catholics, and 1500 Jews. Agriculture is at a low stage and very unproductive ; the Germans, however, get advantage from it. The Finns rear cattle to some extent. Manufactures are especially developed in the districts of Tsarskoye Selo and Yamburg,—cottons, silks, paper, ironware, and machinery (at Kolpino) being the chief products. Several large manufacturing establishments—especially at Cronstadt—are maintained by the state for military purposes. The government is subdivided into eight districts, the chief towns of which are St Petersburg (see below), Gdoff (3150 inhabitants), Luga (1650), Novaya Ladoga (4100), Peterhof (7950), Schliisselburg (10,400), and Yamburg (3250). Gatchina (10,100), Narva (8610), Oranienbaum (3600), and Pavlovsk (3400) have no districts. Cron- stadt and the capital form separate governorships. Okhta, Kolpino,

Pulkova, and Krasnoye Sclo, though without municipal institutions, are worthy of mention.

ST PETERSBURG, capital of the Russian empire, is situated in a thinly-peopled region at the head of the Gulf of Finland, at the mouth of the Neva, in 59° 56’ N. lat. and 30° 40’ E. long., 400 miles from Moscow, 696 from Warsaw, 1138 from Odessa, and 1338 from Astrakhan. The city covers an area of 21,195 acres, of which 12,820

belong to the delta proper of the Neva; 1330 acres ape under water. The Neva, which leaves Lake Ladoga at its south-west angle, flows in a wide and deep stream for 36 miles south-west and north-west, describing a curve to the south. Before entering the Gulf of Finland, it takes for 24 miles a northerly direction ; then it suddenly tums and flows south-west and west, forming a peninsula oy

which the main part of St Petersburg stands, dividing into several branches. It discharges remarkably pure water at the rate of 1,750,000

itself sub. a body of cubic feet

per second, by a channel from 400 to 650 yards in width and so deep (maximum depth, 59 feet) that large vessels approach its banks. The chief branch is the Great Neva, which flows south-west with a width of from 400 to 709

yards and a maximum depth of 49 feet (discharge, cubic feet per second). The other branches are

1,267,000

the Little

Neva, which along with the Great Neva forms Vasilyevskiy

Fic. 1.—Environs of St Petersburg.

(Basil’s) Island, and the Great Nevka, which with the

Little Neva forms Peterburgskiy Island and

sends out

three other branches, the Little Nevka, the Middle Nevka, and the narrow Karpovka, enclosing the islands Elaghin, Krestovskiy, Kamennyi, and Aptekarskiy (Apothecaries'

Island). Smaller branches of the Great and

the Little

Nevas form the islands Petrovskiy, Goloday, and numerous smaller ones ; while a broader navigable channel forms the Gutueff and several islands of less size in the south-west. Two narrow canalized channels or rivers—the Moika and the Fontanka—as also the Catherine, Ligovskiy, and Obvodnyi Canals (the last with basins for receiving the

surplus of water during inundations), intersect

the main-

land. All the islands of alluvial origin are very low, their highest points rising only 10 or 11 feet above the average

level of the water. Their areas are rapidly

increasing

(572 acres having been added between 1718 and 1864), and the wide banks which continue them towards the sea

are gradually disappearing. The mainland is higher than the islands. At a height of from 7

not much to 20 feet

(seldom so much as 29) the low marsh land stretches back to the hills of the Forestry Institute (45 to 70 feet) on the right and to the Pulkova and Tsarskoye Selo hills on the left. The river level being subject to wide oscillations

and rising several feet during westerly gales,

extensive

portions of the islands, as also of the mainland, are flooded every winter ; water in the streets of Vasilyevskiy Island

is a common occurrence. In 1777, when the 10-7 feet, and in 1824, when it rose 13°8 feet,

Neva rose nearly the

whole of the city was inundated. But, owing to the com

struction of canals to receive a large amount

of surplus

water, and still more to the secular rising of the sea-coast

no similar occurrence has since been witnessed.

Broad sandbanks at the mouth of the river, leaving but

a narrow channel 7 to 20 feet deep, prevent th

of larger ships; their cargoes are discharged at

e entrance

Cronstadt

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snd brought to St Petersburg in smaller vessels. A ship ranal, completed in 1885 at a cost of 10,265,400 roubles ‘£1,026,500), is intended to make the capital a seaport. Beginning at Cronstadt, it terminates at Gutueff Island in , harbour capable of accommodating fifty sea-going ships ata time. It is 22 feet deep, 174 miles in length, and from 70 to 120 yards broad at the bottom, and is pro- tected by huge submarine dams.

Communication between the banks of the Neva is main- tained by only two permanent bridges,—the Nicholas and the Alexander or Liteinyi, the latter 467 yards long; both are fine specimens of architecture. Two other bridges — the Palace and the Troitskiy (720 yards)—across the Creat Neva connect the left bank of the mainland with Vasilyevskiy Island and the fortress of St Peter and St Paul; but, being built on boats, they are removed during the autumn and spring, and intercourse with the islands then becomies very difficult. Several wooden or floating bridges connect the islands, while a number of stone bridges span the smaller channels; their aggregate number is ninety. In winter, when the Neva is covered with ice 2 to 3 feet thick, temporary roadways for carriages and pedestrians are made, and artificially lighted. Numerous iboats also maintain conimunication, and smiall steamers ply in summer between the more distant parts of the capital. A network of tramways (about 80 miles) inter- sects the city in all directions, reaching also the remoter islands and suburbs, and carrying about 45,000,000 pass- engers yearly. Omnibuses and public sledges maintain the traffic in winter. In 1882 hackney carriages numbered 7930 in summer and rose to 14,780 in winter, when thou- sands of peasants come in from the neighbouring villages with their small Finnish horses and plain sledges.

The Neva continues frozen for an average of 147 days in the year (25th November to 21st April). It is unnavigable, however, for some time longer on account of the ice from Lake Ladoga, which is sometimes driven by easterly winds into the Neva during several days at the end of April or in the beginning of May. The climate of St Petersburg is very changeable and unhealthy. Frosts are made much more trying by the wind which accompanies them ; ind westerly gales in winter bring with them oceanic moisture and warmth, and so melt the snow before and after hard frosts. The summer is hot, but short, lasting hardly more than five or six weeks; a hot day, however, is often followed by cold weather : changes of temperature amounting to 35° Fahr. within twenty-four hours are not uncommon. In autumn a cold dampness continues for several weeks, and in spring cold and wet weather alternates

with a few warm days. The following figures will give a more ‘complete idea of the climate :—

January. July The Year

Mean temperature, Fahr…..... 15°°4 64°°0 38°°6 Row, aces Goa 0°9 2°6 18°8 Amount of cloud, percentage…..... 80 53 67

Ee eMIP ONIN Se)... 6. oo ote eee n eee ee es S.W. W. W. Numbenloft rainy days …....+.— 12-5 12°7 150°6 Average daily range of temperature, Fahr. 2°-2 10°-2 Ore IBEUNci@ INGE Gy oper 89 7 81

. The bulk of St Petersburg is situated on the mainland, on the eft bank of the Neva, including the best and busiest streets, the “ichest shops, the great bazaars and markets, the palaces, cathedrals, und theatres, as well as all the railway stations, except that of the ‘Finland Railway. From the Liteinyi bridge to that of Nicholas ‘I. a granite embankment runs along the left bank of the Neva, pr by palaces and large private houses. About midway, sehind a range of fine houses, stands the admiralty, the very centre of the capital. Formerly a wharf, on which Peter I. caused his arst Baltic ship to be built in 1706, it is now the seat of the “ministry of marine and of the hydrographical department, the new ulmiralty standing farther down the Neva on the same bank. A ie ee how partly a garden, surrounds the admiralty on the |e ame : and east. ‘To the west, opposite the senate, stands – pa to Peter I., ereeted in 1782, and now backed by ‘alma ire, of St Isaac. A bronze statue, a masterpiece by vallo let, represents the founder of the city on horseback, at full P y ascending a rock and pointing to the Neva; the pedestal é a ae granite monolith, 44 feet long, 22 wide, and 27 high, a te rom Lakhta, a village on the shore of the Gulf of Finland. is a ln of the admiralty are several buildings of the ministry ; ee and to the east the Winter Palace, the work of Rastrelli 764), a fine building of mixed style; but its admirable proportions

hide its huge dimensions. It communicates by a gallery with the Hermitage Fine Arts Gallery. A broad semicircular square, adorned by the Alexander I. column, separates the palace from the general staff and foreign ministry buildings; the column, the work of Montferrant, is a red granite monolith,

84 feet high, supported by a huge pedestal. Being of Finnish rappa-kivi (from Piterlaks), it disintegrates rapidly, and has had to be bound with massive iron rings concealed by painting. The range of palaces and private houses facing the embankment above the admiralty is interrupted by the large macadamized ‘‘ Field of Mars,” formerly a marsh, but transformed at incredible expense into a parade-ground, and the Lyetniy Sad (summer-garden) of Peter I. The Neva embankment is continued to the west toa little below the Nicholas bridge under the name of ‘‘ English embankment,” and farther down by the new admiralty buildings.

The topography of St Petersburg is very simple. Three long streets, the main arteries of the capital, radiate from the admiralty, —the Prospekt Nevskiy (Neva Prospect), the Gorokhovaya (Peas’ Street), and the Prospekt Voznesenskiy (Ascension Prospect). Three girdles of canals, roughly speaking concentric, cross these three streets,—the Moika, the Catherine, and the Fontanka; to these a number of streets run parallel,—the Great and the Little Morskaya, the Kazanskaya, the Sadovaya (Garden Street), and the Liteinaya, continued west by Prospekts Zagorodnyi and Rizh- skiy (Riga). The Prospekt Nevskiy is a very broad street running straight east-south-east for 3200 yards from the admiralty to the Moscow railway station, and thence 1650 yards farther, bending a little to the south, to the Smolnyi convent, again reaching the Neva at Kalashnikoff harbour. The part first mentioned owes its picturesque aspect to its width, its rich shops, and still more its animation. But the houses which border it architecturally leave very much to be desired. And neither the cathedral of the Virgin of Kazan (an ugly imitation on a small scale of St Peter’s in Rome), nor the still uglier Gostinyi Dvor (a two-storied quadrilateral building filled with second-rate shops), nor the Anitchkoff Palace (which looks like immense barracks), nor even the Catholic and Dutch churches do anything to embellish it. About midway between the public library and the Anitchkoff Palace an elegant square conceals the old-fashioned Alexandra theatre ; a profusely adorned memorial to Catherine II. does not beautify it much. The Gorokhovaya is a narrow and badly paved street between gloomy houses occupied mostly by artisans. The Voznesenskiy, on the contrary, though as narrow as the last, has better houses. In its north part it passes into a series of large squares connected with that on which the monument of Peter I. stands. One of them is oecupied by the cathedral of St Isaac (of Dalmatia)

and another by the memorial to Nicholas I., the gorgeousness and bad taste of which strangely contrast with the simplicity and significance of that of Peter I. The general aspcct of the cathedral is undoubtedly imposing both without and within ; its red granite colonnades are not devoid of a certain grandiose character ; but on the whole this architectural monument, built between 1818 and 1858 aecording to a plan of Montferrant, under the personal direction of Nicholas I., does not correspond either with its costliness (23,000,000 roubles) or with the efforts put forth in its decoration by the best Russian artists. The pictures of Briiloff, Bruni, and many others whieh eover its walls are deteriorating rapidly and their place is being taken by mosaics. The entire building, notwithstanding its vast foundations and pile-work, is subsiding unequally in the marshy ground,, and the walls threaten soon to give way.

The eastern extremity of Vasilyevskiy Island is the centre of commercial activity ; the stock exchange is situated there as well as the quays and storehouses. The remainder of the island is occu- pied chiefly by scientific and educational institutions,—the academy of science, with a small observatory (where some astronomical ob- servations are carried on, notwithstanding the tremors of the earth), the university, the philological institute, the academy of the first corps of cadets, the academy of arts, the marine academy, the min- ing institute, and the central physical observatory, all facing the Neva. Peterburgskiy Island contains the fortress of St Peter and St Paul, opposite the Winter Palace, scparated by a channel from its ‘‘kronverk,” the glacis of which is used asa park. The fortress is now merely a state prison. A cathedral which stands within the fortress is the burial-place of the emperors and the imperial family. The mint is also situated within the fortress. The remainder of the island is meanly built, and is the refuge of the poorer officials (tchinovniks) and of the intellectual proletariat. Its northern part, separated from the main island by a narrow channel, bears the name of Apothecaries’ Island, and is occupied by a botanical garden of great scientific value and several fine private gardens and parks. Krestovskiy, Elaghin, and Kamennyi Islands, as also the opposite right bank of the Great Nevka (Staraya and Novaya Derevnya), are occupied by public gardens and parks and by summer houses (datchis). Owing to the heat and dust during the short summer the middle-class inhabitants and the numerous officials and clerks emigrate to the datchis,

the wealthier families to the islands, and the poorer to Staraya and Novaya Derevnya Polustrovo, Kushe-

leva, and as far as the first two or three railway stations of the principal railways, especially that of Finland. The mainland on the right bank of the Neva above its delta is known as Vyborg- skaya Storona (Viborg Side), and is connected with the main city by the Liteinyi bridge, closely adjoining which are the buildings of the military academy of medicine and spacious hospitals. The small streets (many of them unpaved), with numerous wooden houses, are inhabited by students and workmen ; farther north are great textile and iron factories. Vast orchards and the yards of the artillery laboratory stretch north-eastwards, while the railway and the highroad to Finland, running north, lead to the park of the Forestry Institute. The two villages of Okhta, on the right

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Fic. 2.—Plan of St Petersburg.

. Stock Exchange. 7. Physieal Observatory. Academy of Sciences. 8. Winter Palace. . University. 9. Statue of Peter I.

ao woot

. Academy of First Corps of | 10. Senate and Synod. Cadets. 11. Cathedral of St Isaac.

. Academy of Arts. 12. General Staff Buildings.

. Mining Institute. 13. Hermitage Gallery of Art.

parts are squares and streets, the aggregate length of the latter being 283 miles. More than half of them are lighted by gas, the remainder with kerosene. Except in a few principal streets, which are paved with wood or asphalt, the pavement is usually of granite boulders, and is bad and very difficult to keep in order. Many streets and embankments in the suburbs are unpaved. Nearly all the more populous parts have water led into the houses (4733 houses in 1883), and the same begins to extend also to the right bank of the Neva. In 1883 7,091,500,000 gallons of water, mostly from the Neva, very pure on the whole,! were supplied by seven- teen steam-engines to the left-bank portion of the city (9423 gallons per inhabitant). The number of houses in 1881 was 22,229 inhabited and 16,983 uninhabited. Of the former 18,816 belonged to private persons and 3148 to societies or the crown. The houses are mostly very large: of the private houses no fewer than 169 had from 400 to 2000 inhabitants each; the contrary holds good

1 For analyses, see Journ. Russ. Chemical Soc., vol. xv. 567.

bank, are suburbs ; higher up, on the left bank, are several factopioe (Alexandrovsk) which formerly belonged to the crown, where playing-cards, cottons, glass, china, ironware, and so on are ma; The true boundary of St Petersburg on the south is the Obvodny} Canal; but wide tracts covered with orchards, cemeteries, and factories, or even unoccupied spaces, are included in the city in that direction, though they are being rapidly covered with buildings, Of the 21,195 acres covered by St Petersburg 1160 remain un- occupied. The gardens and parks, public and private, take up 798 acres, to which must be added Aptekarskiy, Petrovskiy, Elaghi and Krestovskiy Islands, which are almost quite covered with Nearly 30 per cent. of the total area of the most densely populated

vende

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Scale of 1 English Milo~ “ ”

. Cathedral of Virgin of Kazan.

. Military Storerooms. . Town-house.

. Theatres (Great and Mariinski).

16. Gostinyi Dvor. 23. Moscow Railway Station. 17. Public Library. 24. Medical Academy.

18. Anitchkoff Palace. 25. Hospital.

19. Orphanage. 26. Courts of Justice.

20. General Post-Office. 27. House of Detention.

of the out-lying parts, where 2005 houses had fewer than 20 inha- bitants each. On 27th December 1881 the population of St Petersburg was 861,303, exclusive of the suburbs, and 929,100 including them, thus showing an increase of 29 per cent. since 1869. The census of 1881 having been made with great accuracy, the following interest- ing results may be relied upon.? The density of population varies from 1 inhabitant per 93 square feet to 1 per 17,346 square feet (on Peterburgskiy Island) ; the average is 1 per 1068 square feet. Less than a third of the aggregate population (29°8 per cent.) were born in the capital, the remainder coming from all parts of Russi or being foreigners. The males are to the females in the proportion of 122 to 100; at the same time the married men and women corr stitute respectively 49 and 39 per cent. of the population, the numbers of the unmarried or widowed being respectively 48 and 4 per cent. for men, and 56 and 5 for women. The proportion

a 2 See St Petersburg according to the Census of 1881, and the Statistical Yearbook of St Petersburg for 1883, St Petersburg, 1884.

| 7) PETERSBURG

uildren issmall. The distribution of the population according to

ze is as follows:—

Under 5 years ….+.— 7-9 per cent. | From 16 to 20 years ..12°2 per cent. ‘From 6tol0 years .. 5°7 5, 5 MZ IGtCIGO st .255°2;, 55 fil dole op ge Seen Above 50 years…..... fo

rtality at St Petersburg beine very high (34:2 in 1883, Mes in 1868-82), af the number of births only 31:1 er 1000, the deaths are in excess of the births by 2500 to 3000 in yerage years ; in 1883 there were 26,320 births (1151 still-born) ind 30,150 deaths. It must not be inferred, however, from these ‘gures that the population of St Petersburg would die out if not scruited from without. The larger number of the workmen who me every year to the capital leave their families in the provinces, nd the births which occur do not appear among the births of the ipital, while the deaths very oftendo. The chief mortality is due) chest diseases, which prove fatal on the average to 9000 persons nnually; diseases of the digestive organs also prevail largely ; ‘uropeau and perhaps also Asiatic cholera is almost endemic, an verage of 8700 deaths annually being due to this cause. Infectious iseases such as typhus (from 4280 to 5100 deaths during the last ‘Ww years), diphtheria, and scarlet fever (3500 deaths) are common. iwing to a notable increase of these three infectious diseases the aortality figures for the last few years are above the average. Of 8,212 deaths nearly two-fifths (12,369) were among children under ve. Another critical age seems to be that between 21 and 25. The umber of marriages in 1883 was 6183 (only 7°1 per 1000 inhabit- nts) ; out of a total of 26,320 births 7977 (30 per cent.) were illegiti- nate; and no fewer than 31 per cent. of all children, both legitimate ‘nd illegitimate, born at St Petersburg are nursed in the foundlings’ ome, which sends most of them to be brought up in villages. More aan 100,000 persons enter the public hospitals annually.? ; ‘ An interesting feature of the Russian capital is the very high roportion of people living on their own earnings or income (““‘in- ependent”), as compared with those who live on the earnings or

icome of some one else (‘‘dependent”). Whereas at Paris and erlin only 34 and 50 per cent. respectively belong to the former utegory, the proportion is reversed at St Petersburg: only 33 per ont., 282,678 persons in all, have not thcir own means of support 18 per cent. of the men and 51 of the women). The proportion of mployers to employed, as also the extent of their respective families, re as follows :—

Various Trade. industries. Hous’ IMPIGUGEEIee lee eisssssc++e 8,858 19,508 28,366 Theimimmlies os… 5.5… 20,857 38,153 59,010 Clerksieiisctieriascsis. 2.065 > Soot 5,581 9,178 Their families . 4,163 7,491 11,654 NV OF KMS Uaioe «es «= « 37,559 195, 850 233,409 THELBRMMIINIES Te. cs eee 11,997 56,856 68,853 Independent workers …..... 8,336 28,954 37,290 THEMBEOMMICS! occ… eee 4,470 17,806 22,276

Only a few industrial cstablishments employ more than twenty ‘orkmen, the average being less than ten and the figure seldom illing below five. The great factories are beyond the limits of St ,etersburg, which contains a busy population of artisans grouped ‘1 small workshops. The proportions of various professions to the « population are as follows :—workmen, 1 in 3; servants, 1 in

; Scholars, 1 in 12; soldiers, 1 in 25; officials, 1 in 61; reutiers,” 1 in 76 ; female teachers, 1 in 186 ; male teachers, 1 in 31; policemen, 1 in 208 ; surgeons, 1 in 608 ; advocates, 1 in 1261; dothecaries, 1 in 1588; pawnbrokers, 1 in 1846; savants or litté- ueurs, 1 in 2121; lawyers, 1 in 2700. In respect of classes, 40°7 er cent. of the aggregate population belong to the “peasants,” JO are myeshchane (burgesses) and artisans, 12°38 are ‘‘ nobles,” ‘4 “merchants,” and 3°1 foreigners. The various religions are »presented by 84°9 per cent. Orthodox Greeks, 9°9 Protestants, 3°3 ‘oman Catholics, and 1°9 various (16,826 Jews). On the whole, te Orthodox population are not great frequenters of the churches, | hich are far less numerous than in Moscow. pS Petersburg is well provided with scicntific and educational istitutions, as also with libraries and museums. The intellectual ‘fe of the educated classes is vigorous, and, although 36 per cent. ‘ the population above six ycars old are unable to read, the work- en. tust be counted among the most intelligent classes in Russia.

_otwithstanding the hardships and prosecutions it is periodically ‘tbjeeted to, the university exercises a pronounced influence on the fe of St Petersburg. In 1882 it had eighty professors and 2165 ‘udents (968 in physics and mathematics, 776 in law). The medi- ul faeulty forms a scparate academy, under military jurisdiction, ith about 1500 students. There are, moreover, a philological insti- ite, a technological institute, a forestry academy, an engineering ademy, two theological academies (Greek and Roman Catholic), ee

oe mortality tables according to the Separate diseases are given in the uistical Yearbook. Very careful researches into the sanitary conditions of

€ city are given in the now suppressed Sbornik Sudebnoit Meditsi Mag vod. Jurisprudence) and Zaorovje (Eealth). ileal

an academy of arts, five military academies, a high school of law aud a lyceum. Higher instruction for women is represented by a medical academy (now ordered to be closed), by a frec university with 914 students in 1882, the standards of instruction and cxami- nation in both being equal to those of the other universities, and by higher pedagogical courses. For secondary education there are twelve classical gymnasia for boys and nine for girls, with four private gymnasia and three progymnasia, eight ‘‘real schools,”’ five seminaries for teachers, ten military schools, three German gym- nasia, and five other schools. For primary education there are 156 niunicipality schools (7225 scholars in 1883), 16 schools of the zemstvo, and about 450 others maintained either by public institu- tions or by private persons ; 19,400 boys and girls received instruc- tion in 431 public schools in 1884, the aggregate cost being £24,765 ; about 70 institutions for receiving the younger children of the poorer classes and several private ‘‘ kindergartens’ must be added to the above. The scientific institutions are numerous. The academy of sciences, opened in 1726, has rendered immense service in the exploration of Russia.2 The oft-repeated reproach that it keeps its doors shut to Russian savants, while opening them too widely to German ones, is not without foundation ; but the services rendered to science by the Germans in connexion with the academy are undoubtedly very great. The Pulkova astronomical observa- tory, the chief physical (meteorological)

observatory (with branches throughout Russia and Siberia), the astronomical observatory at Vilna, the astronomical and magnetical observatory at Peking, and the botanical garden,? all attached to the academy of sciences, issuc every year publications of the highest scientific value. The Society of Naturalists and the Physical and Chemical Society, though less than twenty years old, have already issued most valuable publica- tions, which are not so well known abroad as they deserve to be. The still more recently founded geological committee is ably push- ing forward the gcological survey of the country; the Mineralogical Society was founded in 1817. The Geographical Society, with four sections (923 members) aud branch societies for West and East Sibcria, Caucasus, Orenburg, the north-western and south-western provinces of European Russia, all liberally aided by the state, is well known for its valuable work, as is also the Entomological Society. There are four medical societies, and an Archeological Society (since 1846), an Historical Society, an Economical Society (120 years old), Gardening, Forestry, Technical, Navigation Socie- ties, and others, as also several scientific committees appointed at the ministries. The scientific work of the hydrographical depart- ment and of the general staff is well known. On the whole, there is access to all these societies, as well as to their museums and libraries. At St Petersburg classical music always finds first-rate performers and attentive hearers. The conservatory of music gives a superior musical instruction. The Musical Socicty is also worthy of notice. Art, on the other hand, has not freed itself from the old scholastic methods at the academy. Several independent artistic societies seek to remedy this drawback, and are the true cradle of the Russian genre painters.

The imperial public library, open free for 347 days in the year, though far behind the British Museum and the Bibliothéque Nationale in the number of volumes, nevertheless contains rich collections of books and MSS. Its first nucleus was the library of the Polish republic seized in 1795 (262,640 volumes and 24,574 prints), collected mostly by Archbishop Zalusski of Kieff. It has been much enriched since then by purchases and donations, and now (1886) contains more than 1,000,000 volumes, a remarkable collection of 50,000 “‘ Rossica” (everything published in Russia), and 40,000 MSS., some of which are very valuable and unique. The library of the academy of sciences, also open every day, contains more than 500,000

volumes, 13,000 MSS., rich collections of works on Oriental languages, and valuable collections of periodical publica- tions from scientific societies throughout the world. The library of the council of state is also open to the public ; while several libraries of scientific societies and departments of the ministries, very rich in their special branches, are easily accessible. Those of the hydro- graphical department, the academy of art, the musical conserva- tory, the university (150,000 vols.), are especially valuable to the student. Nearly thirty private circulating libraries, which have to contend with many restrictions, supply the students for a small fee with everything printed in Russia, if not prohibited by Govern- ment. The museums of the Russian capital have a marked place among those of Europe. That of the academy of science, witli more than 100,000 systematically classified natural history speci- mens; that of the Mineralogical Society, giving a full picture of the geology of Russia ; the Asiatic museum, with its rich collections of Asiatic MSS. and coins ; and several others are of great scientific value. The Hermitage Art Gallery contains a first-rate collection of the Flemish school, some pictures of the Russian school (the re- mainder being at the academy of arts), some good specimens of the

2 Sukhomlinoff, ‘‘ History of the Academy of Sciences,” in its Memoirs

(Russian), vol. xxvi., 1876, and the same year in its Mémoires in German. 3 Trautvetter, ‘‘ History of the Botanical Garden,” in Memoirs of the same,

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Italian, Spanish, and old French schools, and especially invaluable treasures of Greek and Scythian antiquities, as also a good collection of 200,000 engravings. ‘The old Christian and old Russian arts are well represented at the museum of the academy of arts. Besides these there are many other museums—pedagogical, medical, engin- eering, agricultural, forestry, marine, technical. ‘ ;

The press is represented by about 120 periodicals, including those of the scientific societies ; the right of publishing political papers is a monopoly in the hands of the very few editors who are able to procure the necessary

authorization. The publication of literary and scientific works, after having developed rapidly in 1859-69, is now greatly on the decrease owing to the oppressive measures of the censorship. In the development of the Russian drama St Petersburg has played a far less important part than Moscow, and the stage at St Petersburg has never reached the same standard of excellence as that of the older capital. On the other hand, St Petersburg is the cradle of Russian opera and Russian music. There are only four theatres of importance at St Petersburg—all imperial —two for the opera and ballet, one for the native drama, and one for the French and German drama.

St Petersburg is much less of a manufacturing city than Moscow or Berlin. The annual production of all the manufactures in the government of St Petersburg, chiefly concentrated in or around the capital, was in 1879 valued at £16,768, 600 out of £110,294,900 for the empire, against £19,500,000 in the government of Moscow. The chief manufactured goods are cottons (£8,073,000) and other textile fabrics (altogether £3,762,500), machinery (£2,355,800), rails (£1,342,300), tobacco and spirits (about £1,200,000 each), leather, sugar, stearine candles, copper and gum wares (from £850,000 to £450,000 cach), and a variety of smaller articles. The minor trades are greatly developed. No exact statistics of the internal trade can be given, except for the import and export of articles of food. In 1883 31,176,000 cwts. of grain and flour were imported by rail or river, of which 18,680,450 were re-exported and 2,809,900 sent to the interior. The exports in 1882 were valued at £1,864,980 from St Petersburg and at £6,557,017 from Cronstadt, the aggregate thus being £8, 421,997, in which articles of food, chiefly corn, represented £4,214,312, raw and half raw produce £4,009,446, and manufactured wares £197,520. The value of the imports was—to St Petersburg £8,616,383 and to Cronstadt £116,316. Among the total imports articles of food were valued at £1,941,393, raw and half raw produce at £4,009,090 (chiefly coal), and manufactured wares at £1,082,698. Cronstadt and St Petersburg were visited in the same year by 2195 ships of 951,000 tons (780 ships, 152,730 tons, from Great Britain). The coasting trade was represented by 702 vessels (119,300 tons) entered. The commercial fleet numbered only 43 steamers (14,000 tons) and 49 sailing vessels (8200 tons).

Six railways meet at St Petersburg. Two run westwards along both banks ‘of the Gulf of Finland to Hangéudd and to Port Baltic ; two short lines connect Oranienbaum, opposite Cronstadt, and Tsarskoye Selo (with Pavlovsk) with the capital; and two great trunk-lines run south-west and south-east to Warsaw (with branches to Riga and Smolensk) and to Moscow (with branches to Novgorod and Rybinsk). All are connected in the capital, except the Finland Railway, which has its station on the right bank of the Neva. Moreover, the Neva is the great channel for the trade of St Petersburg with the rest of Russia, by means of the Volga and its tributaries. The importance of the traffic may best be seen from the following figures, showing in cwts, the amount imported by different channels :— ‘

| | : All kinds

Corn and flour. Firewood. A aoe

PR ns eine Fosgate 11,061,000 20,891,000 59,331,000 BaltictRallwaye 22.0 0.— << 311,000 301,000 3,532,000 Moscow Railway …..... 12,558,000 482,000 21,056,000 Warsaw Railway …....- 312,000 157,000 2,353,000

No less than 1,162,230 pieces together with 7,337,000 cwts of timber were supplied in the same year via the Neva. The aggre- gate exports by rail and the Neva amounted to 11,382,000 cwts.

The average income of the St Petersburg municipality was £581,425 in 1880-82 (£577,856 in 1884),—that is, 13°7s. (6°84 roubles) per inhabitant, as against 35°8s. at Berlin and 98°2s. at Paris. The indirect taxes yield but 1s. per inhabitant (57s. at Paris). The average expenses for the same years reached £574,479 (£572,162 in 1884), distributed as follows :—20 per cent. of the whole for the police (10 at Paris and 27°5 at Berlin), 8 for administration, 16 for paving, 7 for lighting, 5 for public instruction, 2°6 for charity, and 8 for the debt (7 at Berlin and 37 at Paris). The municipal affairs are in the hands of a municipality, elected by three categories of electors (see Russta), and is practically a department of the chief of the police. The city is under a separate governor-general, whose authority, like that of the chief of police, is all the more unlimited since it has not been accurately defined by law.

St Petersburg is surrounded by several fine residences, mostly im- perial palaces with large and beautiful parks. Tsarskoye Selo, 16

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miles to the south-east, and Peterhof, on the Gulf of Finland

summer residences of the emperor. Pavlovsk has a fine palace a parks, open to the public, where summer concerts attract thousand of people. Oranienbaum is now a rather neglected place. Pulkoy j on a hill 5 miles from St Petersburg, is well known for its der vatory; while several villages north of the capital, such as Pargoloyo, Murino, &c., are visited in summer by the less wealthy inhabitant :

History. —The region between Lake Ladoga and the Gulf of Finland was inhabited in the 9th century by Finns and gom, Slavonians. Novgorod and Pskoff made efforts to retain their dominion over this region, so important for their trade, and iu the 13th and 14th centuries they built the forts of Koporye (j

.. porye (in the present district of Peterhof), Yam (now Yamburg), and Oryeshek (now Schliisselburg) at the point where the Neva issues from Lake Ladoga. They found, however, powerful opponents in the Swedes, who erected the fort of Landskroua at the junction of the Okhta and the Neva, and in the Livonians, who had their fortress at Narva. Novgorod and Moscow successively were able by con. tinuous fighting to maintain their supremacy over the region south of the Neva throughout the 16th century ; but early in the 17th century Moscow was compelled to cede it to Sweden, which erected a fortress (Nyénschanz) on the Neva at the mouth of the Okhta, In 1700 Peter I. began his wars with Sweden. Orycshek was taken in 1702, and next year Nyénschanz. Two months later (29th June 1708) Peter I. laid the foundations of a cathedral to St Peter and St Paul, and of a fort which received his own name (in its Dutch transcription, ‘‘Piterburgh’’). Next year the fort of Cronslott was erected on the island of Kotlin, as also the admiralty on the Neva, opposite the fortress. The emperor took most severe and almost barbarous measures for increasing his newborn city. Thousands of people from all parts of Russia were removed thither and died in erecting the fortress and building the houses. Great numbers of artisans

and workmen were brouglit to St Petersburg to form the Myeshchanskaya villages, which raised the population to 100,000 inhabitants. All proprietors of more than ‘500 souls” were ordered to build a house at St Petersburg and to stay there in the winter. The construction of stone-houses throughout the rest of Russia was prohibited, all masous having to be sent to St Peters. burg. After Peter I.’s death the population of the capital rapidly decreased ; but foreigners continued to settle there. Under Eliz. beth a new series of compulsory measures raised the population to 150,000, which figure was nearly doubled during the reign of Catherine II. Since the beginning of the present century the population has steadily increased (364,000 in 1817, 468,600 in 1837, 491,000 in 1856, and 667,000 in 1869). The chief embellish- ments of St Petersburg were effected during the reigns of Alexander I. (1801-25) and Nicholas I. (1825-55).

When Peter I., desirous of giving a ‘‘ European” capital to his empire, laid the first foundations of St Petersburg on the marshy islands of the Neva, in land not fully conquered and remote from the centres of Russian life, it is hardly possible that he could have foreseen the rapid development it has since undergone: it has now a population approaching a million and commands more than one- sixth of the foreign trade and manufactures of Russia. In point of fact, there is no capital in Europe so disadvantageously situated with regard to its own country as St Petersburg. Desolate wilder- nesses begin at its very gates and extend for hundreds of miles to the north and east. ‘To the south it has the very thinly peopled regions of Pskoff and Novgorod,—the marshy and woody tracts of the Valdai Heights. For 400 miles in each of these three directions there is not a single city of any importance; and towards the west, on both shores of the Gulf of Finland, are foreign peoples who have their own centres of gravitation in cities on or nearer t0 the Baltic. With the provinces of Russia the capital is connected only by canals and railways, which have to traverse vast tracts of inhospitable country before reaching them. But St Petersburg possesses, on the other hand, one immense advantage in its site, which has proved of great moment, especially in the present cet: tury of development of international traffic. Ruled by the idea of creating a new Amsterdam—that is, a meeting-place for traders nationalities—and a great export market for Russia, Peter I. could have selected no better place. St Petersburg has been for nearly 150 years the chief place of export for raw produce from the most

productive parts of Russia. The great central plateau which forms the upper basins of all the chief Russian rivers had no other outlet to the sea than the estuary of the Neva. The natural outlet might indeed have been the Black Sea; but the rivers to the southwar are either interrupted by rapids like the Dnieper, or are shallow like the Don ; while their mouths and the entire coast-region remained till the end of the 18th century in the hands of Turkey. _ As for the Caspian, it faced Asia, and not Europe. The commercial outlet of the central plateau was thus the reverse of the physical. From the earliest years of Russian history trade had taken this northem direction. Novgorod owed its wealth to this fact ; and as far bac as the 12th century the Russians had their forts on Lake Ladoga and the Neva. In the 14th and 15th centuries they already eX changed their wares with the Dantzic merchants at Nu or AU

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for what is now Vasilyevskiy Island. By founding + Petersburg Peter I. only restored the trade to its old but dis- arded channels. ‘The system of canals for connecting the upper ‘olea and the Dnieper with the great lakes of the north completed che work ; the commercial mouth of the Volga was transferred to he Gulf of Finland, and St Petersburg became the export harbour or more than half Russia. Foreigners hastened thither to take ‘ossession of the growing export trade, to the exclusion of the >yssians ; and to this circumstance the Russian capital is indebted yr its cosmopolitan character. But its present extensive and west- turopean aspect has not been achieved, nor is it maintained, without “vast expenditure of the national resources. — It cost hundreds of ‘housands of human lives before the marshy islands at the mouth f the Neva could be rendered fit to receive a million inhabitants nd be brought into connexion with the remainder of Russia ; and ery many mote are annually sacrificed for the maintenance of this apital on its unhealthy site, under the 60th parallel, hundreds of riles distant from the centres of Russian life. ~ The development of the railway system and the rapid coloniza- ion of southern Russia now operate, however, adversely to St otersburg. Its foreign trade is not actually decreasing, but the ery rapid growth in the exports of Russia within the twenty years efore 1886 was entirely to the benefit of other ports more highly avoured by nature, such as Riga and especially Libau, while the apid

inerease of population in the Black Sea region is tending to hift the Russian centre of gravity: new centres of commercial, ndustrial, and intellectual lifc are being developed at Odessa and »ostoff, The revival of Little Russia is another influence operating i the same direction.

Another important factor in the growth of the influence of St etersburg on Russian life was the concentration of all political ower in the hands of an absolute Government and in the narrow jreles surrounding the chief of the state. As Yuriy Dolgorukiy alt the neeessity of creating for a new phase of national history— hat of a centralized state—a new capital, Moscow, free from the nunieipal and republican traditions of the old Russian towns, so eter 1. felt the necessity of again creating a fresh capital for a hird phase of the country's progress,—a capital where the rising mperial power would be free from the control of the old boyar amilies. St Petersburg fully answers to this need. For more than .eentury and a half it was the real centre of political life and of oolitieal thought, impregnated with the conception of a powerful entral Government. In so strongly centralized a state as Russia yas, and still is, and for the phase of life which the empire has vassed through during the last two centuries, it mattered little vhether the capital was some hundred miles away from the natural entres of life and without the support of a dense and active sur- ounding population. Bureaucracy, its leading feature, was simply 'einforeed by the remoteness of the capital. But these circumstances \re at present undergoing a change. Since the abolition of serfdom nd in eonsequence of the impulse given. to Russian thought by his reform, the provinces are coming more and more to dispute he right of St Petersburg to guide the political life of the country. t has been often said that St Petersburg is the head of Russia and foscow its heart. The first part at least of this saying is true. jn the development of thought and in naturalizing in Russia the "esults of west European reflection St Petersburg has played through ut the present century a prominent part. Attracting to itself from he provinees the best intellects of the country, it has powerfully 'ontributed towards familiarizing the reading public with the eachings of west European science and philosophy, and towards jving to Russian literature that liberality of mind and freedom rom the trammels of tradition that have so often been noticed by vest Europeans. St Petersburg has no traditions, no history beyond hat of the palace conspiracies, and nothing in its past can attract he writer or the thinker. But, as new centres of

intellectual novement and new currents of thought develop again at Moscow nd Kieff or arise anew at Odessa and in the eastern provinces, hese plaees claim the right to their own share in the further de- velopment of intellectual life in Russia ; and it would not be sur- prising if the administrative and intellectual centre of the empire, ‘fter Its migrations successively from Kieff, Novgorod, and Pskoff 0 Moseow, and thence to St Petersburg, were again to follow a new “hovement towards the south. (P. AL K,)

ST PIERRE. See Rtunion, vol. xx. p. 493. ST PIERRE. See Martiniqvg, vol. xv. p. 586.

_ SAINT-PIERRE, Cuartes Intniz Caster, Appt DE | 1658-1743), a French writer of much ingenuity and influ- “nce, who is not unfrequently confounded with the author if Paul et Virginie, was born near Barfleur on the 18th of February 1658. His father was bailli of the Cotentin, snd Saint-Pierre, who was educated by the Jesuits, appears 0 have had an easy entrance to the best literary and olitical society of the capital. He was presented to the

‘he then name

abbacy of Tours, which a century before the poet Des- portes had held, and was elected to the Academy in 1699. But in 1718, in consequence of the political offence given by his Polysynodie, he suffered the very rare penalty of expulsion from that body. He died at Paris in 1743.

Saint-Pierre’s works (collected shortly before his death in eighteen volumes and originally published chiefly in the second and third decades of the 18th cettury) are almost entirely occupied with an acute and inventive, though generally visionary, criticism of politics, law, and social institutions. They had a great influence on Rousseau, who has left elaborate examinations of some of them, and has repro- duced not a few of their ideas in his own work. The titles are almost sufficient to show their nature. The chief are

Projet de Paix Perpetuelle (appositely published at Utrecht in 1718) and Poly- synodie (a severe stricture on the Government of Louis XIV., with projects for the adininistration of France by a system of councils for each department of government), together with a crowd of memorials and projects for stopping duelling, for equalizing taxa- tion, for treating mendicancy, for reforming education and spelling, &c. Unlike the later reforming abbés of the phdlosophe period, Saint-Pierre was a man of very unworldly character and quite destitute of the Frondeur spirit. He was also a nan of not a little intellectual power, and, as in the case of every such man who gives his fancy free course in the construction of political Utopias, not a few of his wishes and ideas have been realized in course of time. But it is difficult to give him much credit for practical grasp of politics.

SAINT-PIERRE, Jacques Hunri BERNARDIN DE (1737- 1814), French man-of-letters, was born at Havre on 19th January 1737 and was educated at Caen. After a fashion commoner with English than with French boys, he took an early fancy to the sea, and his uncle, a ship captain, gave him the opportunity of gratifying it. But a single voyage to Martinique was enough for him and he went back to school. He next wanted to be a missionary ; but his parents, who had probably taken the measure of his enthusiasms from his sea experiences, objected, and he became an engineer. He served in the army, but was dismissed for insubordination, and, after quarrelling with his family, was in some difficulty. But in 1761 he obtained an appointment at Malta, which also he did not hold long. The most rolling of stones, he appears at St Petersburg, at Warsaw, at Dresden, at Berlin, holding brief commis- sions as an engineer and rejoicing in romantic adventures, But he came back to Paris at the age of thirty even poorer than he set out. He then passed two years in literary work, supporting himself in an unknown fashion, and in 1768 (for he seems to have been as successful in obtaining appointments as in losing them) he set out for the Isle of France (Mauritius) with a Government commission and reniained there three years, returning home in 1771. These wanderings supplied Bernardin with the whole of what may be called his stock-in-trade, for, though he lived more than forty years longer, he never again quitted France. He was very poor, and indeed it is not easy to discover from his biographers what he lived upon, for, though he was an unwearied solicitor of employments and “ gratifications,” he received but little, and his touchy and sensitive tempera- ment frequently

caused him to quarrel with what little he did receive. On his return from Mauritius he was intro- duced to the society of D'Alembert and his friends, and continued to frequent it. But he took no great pleasure in the company of any literary man except Rousseau, of whom in Jean Jacques's last years he saw much, and on whom he formed both his own character and still more his style to a considerable degree. His first work of any im- portance, the Voyage & [Ile de France, appeared in 1773 and gained him some reputation. It is the soberest and therefore the least characteristic of his books. The Etudes de la Nature, which made his fame and assured him of literary success, did not appear till ten years later, his masterpiece Paul et Virginie not till 1787, and his other masterpiece (which, as much less sentimental and showing not a little humour, some persons may be allowed to prefer), the Chaumiére Indienne, not till 1790. In 1792 he married

a very young girl, Félicité Didot. For a short time in 1792 he was superintendent of the Jardin des Plantes and again for a short time professor of morals at the Ecole Normale in 1794. Next year he became a member of the Institute. After his first wife's death he married, in 1800, when he was sixty-three, another young girl, Désirée de Pelleport, and is said to have been very happy with her. He still continued to publish, and was something of a favourite with Napoleon. On the 21st of January 1814 he died at Eragny near Pontoise, where he had in his last years chiefly lived and where he had a house, so that he cannot have been ill off.

It has been hinted that Bernardin de Saint-Pierre's personal character was not entirely amiable; it may be added that his literary character has not in all English eyes sufficed to atone for it. Englishmen, and not Englishmen only, have been found to pro- nounce Paul et Virginie gaudy in style and unhealthy, not to say unwholesome, in tone. Perhaps Bernardin is not fairly to be judged by this famous story, in which the exuberant sensibility of the time finds cqually exuberant expression. The Chawmiére and some passages in the Etudes de la Natwre proper may be thought to exhibit the real merits of his style to greater advantage. The historic estimate (the sole estimate that is of much worth in com- parative literary criticism) at once disengages the question from its difficulties. Where Bernardin is of merit

and importance is in his breaking away from the dull and arid vocabulary and phrase which more than a century of classical writing had brought upon France, in his genuine and vigorous preference of the beauties of nature to the mere charms of drawing-room society, and in the attempt which he made, with as much sincerity as could fairly be expected from a man of his day, to reproduce the aspects of the natural world faithfully. After Rousseau, and even more than Rousseau, Ber- nardin was in French literature the apostle of the return to nature, and, though in him and his immediate follower, Chateaubriand, there is stil! much manncrism and unreality, he should not and will not lack the credit due.

Aimé Martin, disciple of Bernardin and the second husband of his second wife, published a complete edition of his works in 18 volumes (Paris, 1818-20), afterwards increased by additional correspondence, &c. Paul et Virginie, the Chaumiére Indienne, &c., have been separately reprinted in innumerable forms.

ST PIERRE anp MIQUELON, two islands 10 miles off the south coast of Newfoundland (see vol. xvii. pl. V.), at the entrance of Fortune Bay, are, with five lesser islets, the last remnant of the North American colonies of France. Both are rugged masses of granite, with a few small streams and lakelets, a thin covering of soil, and scanty vegetation. Miquelon (area, 45,542 acres) consists of Great Miquelon in the north and Little Miquelon, Langlade, or Langley in the south; previous to 1783 they were separate islands divided by a navigable channel, but they have since become connected by a dangerous sandbar. St Pierre (6420 acres) has a good harbour and roadstead, the latter, protected by fle aux Chiens, affording shelter, except in north-east storms, to the largest vessels. The small but busy town of St Pierre climbing the steep hill above the harbour is mainly built of wood; but it has a cathedral (of wood), an English chapel, a governor’s resi- dence, and various administrative offices, including the American terminus of the French Atlantic cable. Cod- fishing, to which the settlement owes its prosperity, was prosecuted in the five years 1878-82, on an average, by 4560 fishermen (mainly from Dunkirk and other French ports), and produced 3876 tons of dried and 157,754 tons of undried cod, with 450 tons of cod-liver oil. The total exports and imports were valued, respectively, at 9,218,278 and 4,441,817 francs in 1865, and 17,164,153

and 11,062,617 francs in 1883. The foreign trade in 1883 was valued at 10,218,473 francs. The population of the islands was 5564 (town of St Pierre 4365) in 1883; but the number is often above 10,000 in the fishing-season.

St Pierre and Miquelon, with 3000 inhabitants, were ceded to England along with Newfoundland in 1713; but on the English conquest of Canada they were assigned to France as a fishery depot. Destroyed by the English in 1778, restored to France in 1783, again depopulated by the English in 1793, recovered by France in 1802 and lost in 1803, the islands have remained an undisputed French possession since 1816.

ST PIERRE-LES-CALAIS, a suburb of Cazats (gn) with a population of 30,786 in 1881. a

ST POL DE LEON, a town of France, in the arrond. issement of Morlaix and department of Finistére, not fay from the shores of the English Channel, 132 miles north. west of Morlaix by the railway to Roscoff. This quiet episcopal city, old but modernized, is mainly of interest on account of its cathedral and the church of Notre Dame though it also contains an episcopal palace (1712-50), seminary (1691), and a hospital (1711). The cathedral, classed as an historical monument, belongs largely to the 13th century. Besides the west front, with its portico and its two towers with granite spires 180 feet high, the principal points of architectural interest are the traceried window of the south transept (with its glass) and the rect. angular apse, and in the interior the stalls of the choir (16th century) and the fascicled pillars and vault-archeg of the nave. On the right of the high altar is a wooden shrine containing the bell of St Pol de Léon (6 b 10 oz, in weight), which has the repute of curing headache and diseases of the ear, and at the side of the main entrance js a huge baptismal font, popularly regarded as the stone coffin of Conan Meériadec, king of the Bretons. Notre Dame de Creizker has a 15th-century spire, 252 feet high, which crowns the central tower. The north poreh is a fine specimen of the flamboyant style. The population of the town in 1881 was 3739 and of the commune 6659,

St Pol de Léon, or Fanum Saneti Pauli Leonini, was formerly a place of considerable importance. The barony of Léon, in the possession of the dukes of Rohan, gave them the right of presiding

in the provincial states alternatively with the duke of La Tremouille, baron of Vitré.

ST QUENTIN, a manufacturing town of France, the chef-lieu of an arrondissement and in population (45,697 in 1881) the largest town in the department of Aisne, stands on the right bank of the Somme, at the junction of the Somme Canal with the St Quentin Canal (which

‘unites the Somme Canal with the Scheldt), 954 miles north-

east of Paris by the railway to Brussels and Cologne, with branch lines to Guise (on the Oise) and Epéhy on the Flanders and Picardy railway. Built on a slope, with a southern exposure, the town is crowned by the collegiate church of St Quentin, one of the finest Gothic buildings of the north of France, which was erected between 1114 and 1477, and has, like some English cathedrals, the somewhat rare peculiarity of double transepts. The length of the church is 436 feet and the height of the nave 131. The magnificent clerestory windows are supported by a very elegant triforium. The baptismal chapel contains a fine stone retable. The choir has a great resemblance to that of Rheims, and, like the chapels of the apse, has been decorated with polychromic paintings. Under the choir is a crypt occupying the site of an older crypt constructed in the 9th century, of which only the three vaults with the tombs of St Quentin and his fellow-martyrs remain. ‘The town-house of St Quentin is a splendid building of the 15th and 16th centuries, with a flamboyant facade, adomed with curious sculptures. Behind the central gable rises bell-tower with chimes. ‘The council-room is a fine hall with a double wooden ceiling and a huge chimneyplece half Gothic half Renaissance. The old buildings of the Bernardines of Fervaques now provide accommodation for the courts, the learned societies, the school of design, the museum, and the library, and contain a large hall for public meetings. St Quentin is the centre of an indus- trial district which employs 130,000 workmen in 800 factories, and manufactures the fortieth part of the cotton imported into France, producing goods to the value 0 about £3, 500,000, mainly calicoes, percales(glazed cottons), cretonnes, jaconas,

twills, piqués, muslins, cambrics, gaUz wool-muslins, Scotch cashmeres, and merinos. Other

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ustries are the making of embroideries by machinery and by hand, turning billiard-balls, and engine-building.

“gt Quentin, the Augusta Veromanduorum of the Romans, stood ‘at the meeting-place of five roads of military importance. In the 3d century it was the scene of the martyrdom of Caius Quintinus, who had come as a preacher of Christianity, and in the reign of Dagobert the martyr’s tomb became under the influence of St Eloi a place of pilgrimage. After it had been thrice ravaged by the Normans the town was surrounded by walls in 883. It became under Pippin, grandson of Charlemagne, one of the principal domains ‘of the county of Vermandois, and in 1103 was constituted a commune. In 1195 it was incorporated with the royal domain and about the same time received an increase of its privileges. From 1420 to 1471 St Quentin was occupied by the Burgundians. Its capture by the Spaniards on the day of St Lawrence, 1557, was the success which Philip II. of Spain commemorated by building the Escorial. Two years later the town was restored to the French, and in 1560 it was assigned as the dowry of Mary Stuart. The forti- fications erected under Louis XIV. were demolished between 1810 and 1820. During the Franco-Prussiau War St Quentin repulsed the German attacks of 8th October 1870; and on 19th January 1871 it was the centre of the great battle fought by General Faid- herbe, one of the last episodes of the campaign.

ST SEBASTIAN. See SAN SEBASTIAN.

ST SERVAN, a cantonal town of France, in the depart- ment of Ille-et-Vilaine, on the right bank of the Rance to the south of St Malo, from which it is separated by a creek lt least a mile wide (see St Mato). In population (10,691 inhabitants in 1881; 12,867 in the commune) St Servan is slightly the smaller town of the two. It is not enclosed by walls, and with its new houses, straight wide streets, and numerous gardens forms quite a contrast

to its neigh- bour. In summer it attracts a number of seaside visitors. The floating dock will when finished have an area of 27 acres and one mile of quays. The creek on which it opens is dry at low water, but at high water is 30 to 40 feet deep. Another port on the Rance, to the south-west of the town ‘at the foot of the tower of Solidor, is used by the local guard-ship. This tower, erected in the close of the 14th century by Duke John IV. for the purpose of contesting the claims of Josselin de Rohan, bishop of St Malo, to the temporal sovereignty of the town, consists of three distinct towers formed into a triangle by loop-holed and machico- lated curtains. At the north-west point of St Servan stands the “city fort” and near by are the ruins of the cathedral of St Peter of Aleth, the seat of a bishopric from the 6th to the 12th century. The church is modern

(1742-1842),

: The northern quarter of St Servan, called ‘‘the City,” occupies the site of the city of Aleth, which at the close of the Roman empire \supplanted Corseul as the capital of the Curiosolites. Aleth was a bulwark of Druidism in those regions and was not Christianized till the 6th century, when St Malo became its first bishop. On the removal of the bishopric to St Malo Aleth declined; but the houses that remained standing became the nucleus of a new com- munity, which placed itself under the patronage of St Servan, apostle of the Orkneys. In 1758 the place was occupied by Marl- borough. It was not till 1789 that St Servan became a separate \ one from St Malo with a municipality and police of its own. | SAINT-SIMON, Craupe Henri, Comte pe (1760- 1825), the founder of French socialism, was born at Paris on 17th October 1760. He belonged to a younger branch (of the family of the celebrated duke of that name. His education, he tells us, was directed by D’Alembert. At the age of nineteen he went as volunteer to assist the | American colonies in their revolt against Britain. From his youth Saint-Simon felt the promptings of an eager ambition, His valet had orders to awake him every morn- ing with the words, “Remember, nionsieur le comte, that you have great things to do”; and his ancestor Charle- —— appeared to him in a dream foretelling a remarkable | uture for him. Among his early schemes was one to | unite the Atlantic and the Pacific by a canal, and another | to coustruct a canal from Madrid to the sea. He took no ee of

any importance in the Revolution, but amassed a little fortune by land speculation,—not on his own account,

however, as he said, but to facilitate his future projects. Accordingly, when he was nearly forty years of age he went through a varied course of study and experiment, in order to enlarge and clarify his view of things. One of these experiments was an unhappy marriage, which, after a year's duration, was dissolved by the mutual consent of the parties. Another result of his experiments was that he found himself completely impoverished, and lived in penury for the remainder of his life. The first of his numer- ous writings, Lettres un Habitant de Genéve, appeared in 1803; but his early writings were mostly scientific and political. It was not till 1817 that he began in a treatise entitled LZ' Industrie to propound his socialistic views, which he further developed in L'Organisateur (1819), Du Systéme Industriel (1821), Catéchisme des Industriels (1823). The last and most important expression of his views is the Nouveau Christianisme (1825). For many years before his death in 1825 (at Paris on 19th May) Saint-Simon had been reduced to the greatest straits. He was obliged to accept a laborious post for a salary of £40 a year, to live on the generosity of a former valet, and finally to solicit a small pension from his family. In 1823 he attempted suicide in despair. It was not till very late in his career that he attached to himself a few ardent disciples.

As a thinker Saint-Simon was entirely deficient in system, clearness, and consecutive strength. But his great influence on modern thought is undeniable, both as the historic founder of French socialism and as suggest- ing much of what was afterwards elaborated into Comtism. Apart from the details of his socialistic teaching, which are vague, inconsistent, and unsystematic, we find that the ideas of Saint-Simon as to the reconstruction of society are very simple. His opinions were conditioned by the French Revolution and by the feudal and military system still prevalent in France. In opposition to the destructive liberalism of the Revolution he insisted on the necessity of a new and positive reorganization of society. So far was he from advocating fresh social revolt that he appealed to Louis XVIII. to

inaugurate the new order of things. In opposition, however, to the feudal and military system, the former aspect of which had been strengthened by the restoration, he advocated an arrangement by which the industrial chiefs should control society. In place of the medieval church the spiritual direction of society should fall to the men of science. What Saint-Simon desired, therefore, was an industrialist state directed by modern science. In short, the men who are fitted to organize society for productive labour are entitled to bear rule in it. The social aim is to produce things useful to life ; the final end of social activity is "'the exploitation of the globe by association." The contrast between labour and capital so much emphasized by later socialism is not present to Saint-Simon, but it is assumed that the industrial chiefs, to whom the control of production is to be committed, shall rule in the interest of society. Later on the cause of the poor receives greater attention, till in his greatest work, The New Christianity, it becomes the central point of his teaching and takes the form of a religion. It was this religious development of his teach- ing that occasioned his final quarrel with Comte. Previous to the publication of the Wouveau Christianisme, Saint- Simon had not concerned himself with theology. Here he starts from a belief in God, and his object in the treatise is to reduce Christianity to its simple and essential elements. He does this by clearing it of the dogmas and other excrescences and defects which have gathered round both the Catholic and Protestant forms of it, which he subjects to a searching and ingenious criticism. "The new Christian organization will deduce the temporal insti- tutions as well as the spiritual from the principle that all

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men should act towards 'one another as brethren." Ex- pressing the same idea in modern language, Saint-Simon propounds as the comprehensive formula of the new Christianity this precept—"The whole of society ought to strive towards the amelioration of the moral and physical existence of the poorest class; society ought to organize itself in the way best adapted for attaining this end." This principle became the watchword of the entire school of Saint-Simon ; for them it was alike the essence of religion and the programme of social reform.

During his lifetime the views of Saint-Simon had very little influence; and he left only a very few devoted disciples, who continued to advocate the doctrines of their master, whom they revered as a prophet. An important departure was made in 1828 by Bazard, who gave a “complete exposition of the Saint-Simonian faith ” in a long course of lectures at Paris in the Rue Taranne. In 1830 Bazard and Enfantin were acknowledged as the heads of the school; and the fermentation caused by the revolu- tion of July of the same year brought the whole movement prominently before the attention of France. Early next year the school obtained possession of the Globe through Pierre Leroux, who had joined the school, which now numbered some of the ablest and most promising young men of France, many of the pupils of the Ecole Poly- technique having caught its enthusiasm. The members formed themselves into an association arranged in three grades, and constituting a society or family, which lived out of a common purse in the Rue Monsigny. Before long, however, dissensions began to arise in the sect. Bazard, a man of logical and more solid temperament, could no longer work in harmony with Enfantin, who desired to establish an arrogant and fantastic sacerdotalism with lax notions as to marriage and the relation of the sexes. After a time Bazard seceded and many of the strongest supporters of the school followed his example. A series of extravagant entertainments given by the society during the winter of 1832 reduced its financial resources aud greatly discredited it in character. They finally re- moved to Menilmontant, to a property of Enfantin, where they lived in a communistic society, distinguished by a peculiar dress. Shortly after the chiefs were tried and condemned for proceedings prejudicial to the social order ; and the sect was entirely broken up (1832). Many of its members became famous as engineers, economists, and men of business. The idea of constructing the Suez Canal, as carried out by Lesseps, proceeded from the school.

In the school of Saint-Simon we find a great advance both in the breadth and firmness with which the vague and confused views of the master are developed ; and this progress is due chiefly to Bazard. In the philosophy of history they recognize epochs of two kinds, the critical or negative and the organic or constructive. The former, in which philosophy is the dominating force, is charac- terized by war, egotism, and anarchy ; the latter, which is controlled by religion, is marked by the spirit of obedience, devotion, associa-

“tion. The two spirits of antagonism and association are the two great social principles, and on the degree of prevalence of the two depends the character of an epoch. The spirit of association, how- ever, tends more and more to prevail over its opponent, extending from the family to the city, from the city to the nation, and from the nation to the federation. This principle of association is to be the keynote of the social development of the future. Hitherto the law of humanity has been the “exploitation of man by man” in its three stages, slavery, serfdom, the proletariat ; in the future the aim must be “the exploitation of the globe by man associated to man.” Under the present system the industrial chief still exploits the proletariat, the members of which, though nominally free, must accept his terms under pain of starvation. This state of things is consolidated by the law of inheritance, whereby the insttuments of production, which are private property, and all the attendant social advantages are transmitted without regard to personal merit. The social disadvantages being also transmitted, misery becomes here- ditary. The only remedy for this is the abolition of the law of

inheritance, and the union of all the instruments of labour in a social fund, which shall be exploited by association. Society thus

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becomes sole proprietor, intrusting to social groups and social fune- tionaries the management of the various properties. The right of succession is transferred from the family to the state. The school of Saint-Simon insists strongly on the claims of merit; the

advocate a social hierarchy in which each man shall ho placed according to his capacity and rewarded according to his works

This is, indeed, a most special and pronounced feature of the Saint. Simon socialism, whose theory of government is a kind of spiritual or scientific autocracy, degenerating into the fantastic sacerdotalism of Enfantin. With regard to the family and the relation of the sexes the school of Saint-Simon advocated the complete emancipa. tion of woman and her entire cquality with man. The socia) individual” is man and woman, who are associated in

the eXercise of the triple function of religion, the state, and the family. In its official declarations the school maintained the sanctity of the Chris. tian law of marriage. On this point Enfantin fell into a prurient and fantastic latitudinarianism, which made the school a scandal to France, but many of the most prominent members besides Bazard refused to follow him. Connected with these doctrines was their famous theory of the "rehabilitation of the flesh," deduced from the philosophic theory of the school, which was a species of Pan- theism, though they repudiated the name. On this theory they rejected the dualism so much emphasized by Catholic Christianity in its penances and mortifications, and held that the body should be restored to its due place of honour. It is a vague principle of which the ethical character depends on the intcrpretation ; and it was variously interpreted in the school of Saint-Simon. 1¢ was certainly immoral as held by Enfantin, by whom it was developed into a kind of sensual mysticism, a system of free love with a reli- gious sanction.

An excellent edition of the works of Saint-Simon and Enfantin was begun by survivors of the sect in Paris (1865), and now numbers forty vols. See Reybaud, Etudes sur les Réformateurs modernes (7th edition, Paris, 1864); Janet, Saind- Simon et le Saint-Simonisme (Paris, 1878); A. J. Booth, Saint-Simon and Saint Simonism (London, 1871).

SAINT-SIMON, Lovis pE Rovuvray (or Rovvroy), Duc pe (1675-1755), was born at Versailles on 16th January 1675. He was the son of Claude de Saint-Simon, who represented a family which had been established for many centuries at La Ferté Vidame, between Mortagne and Dreux, and which claimed descent from Charlemagne. Claude de Saint-Simon had been a page of Louis XHI, and, gaining the king's favour as a sportsman, had received various preferments and was finally created due et pair. This peerage is the central fact in Saint-Simon's history, and it is impossible to understand him without under- standing it. To speak, as one of his few biographers in English has spoken, of ''a young duke of recent creation," and of the apparent absurdity of such a young duke taking the aristocratic views which characterized Saint-Simon through life, is to show the most deplorable ignorance of the facts. The French peerage under the old régime was a very peculiar thing, difficnlt to comprehend at all, but quite certain to be miscomprehended if any analogy of the English peerage, such as is

implied in the observation just quoted, is imported into the consideration. No two things could be more different in France than ennobling a man and making him a peer. No one was made a peer who was not ennobled, but men of tle noblest blood in France and representing their houses might not be, and in most cases were not, peers. Derived at least traditionally and imaginatively from the douze pairs of Charlemagne, the peers were supposed to represent the chosen of the noblesse, and gradually, in an indefinite and constantly disputed fashion, became associated with the parlement of Paris as a quasi-legislative (or at least law-registering) and directly judicial body. But the peerage was further com- plicated by the fact that not persons but the holders of certain fiefs were made peers. Strictly speaking, neither Saint-Simon nor any one else in the same case was made a peer, but his estate was raised to the rank of a duché pairié or a comté patrie as the case might be. If all analogies were not deceptive, the nearest idea of a French peerage © the old kind may be obtained by an English reader if he takes the dignity of a Scotch or Irish representative peel then supposes that dignity to be made hereditary, and then limits the heritableness of it not merely to descent

‘ q sut to the tenure in direct succession of certain estates. “+ must of course be understood that the peers were not slected but nominated. Still they were in a way a stand- ng committee representative of the entire body of nobles, and it was Saint-Simon’s lifelong ideal and at times his sractical effort to convert them into a sort of great council yf the nation. These remarks are almost indispensable -o illustrate his life, to which we may now return. His mother, Claude de Saint-Simon’s second wife, was Charlotte je PAubespine, who belonged to a family not of the yidest nobility but which had been distinguished in the sublic service at least since the time of Francis I. Her son Louis was well educated, to a great extent by her- self, and he had had for godfather and godmother no ess persons than Louis XIV. and the queen. After some cuition by the Jesuits (especially by Sanadon, the editor of

Horace), he betook himself in 1692, at the age of seventeen, |

so the career of arms, entering the mousquetaires gris. He was present at the siege of Namur, and next year his ther died. He still continued in the army and was present at the battle of Neerwinden. But it was at this very time

that he chose to begin the crusade of his life by instigating, if not bringing, an action on the part of the

eers of France against Luxembourg, his victorious general, ona point of precedence. He fought, however, another ampaign or two (not under Luxembourg), and in 1695 married Gabrielle de Durfort, daughter of the maréchal be Lorges, under whom he latterly served. He seems to have regarded her with a respect and affection not very usual between husband and wife at the time; and she sometimes succeeded in modifying his aristocratic crotchets. But as he did not receive the promotion he desired he flung up his commission in 1702. Louis, who was already becoming sensitive on the point of military ill-success, and who was not likely to approve Saint-Simon's ltigiousness on points of privilege, took a dislike to him, and it was only indirectly and by means of establishing interest with the dukes of Burgundy and Orleans that he was able to keep something of a footing at court. He was, however, intensely interested in all the transactions of Versailles, and by dint of a most heterogeneous collection of instru- ments, ranging from dukes to servants, he managed to obtain the extraordinary secret information which he has handed down to us about almost every event and every per- onage of the last twenty years of the "grand monarque." ee own part appears to have been entirely subordinate. He was appointed ambassador to Rome in 1705, but the Appointment was cancelled before he started. At last he attached himself to the duke of Orleans and, though this 'was hardly likely to conciliate Louis's good will to him, .t gave him at least (what was of the first importance in shat intriguing court) the status of belonging to a definite oarty, and it eventually placed him in the position of tried 'rend to the acting chief of the state. He was able, more- ver, to combine attachment to the duke of Burgundy with chat to the duke of Orleans. Both attachments were no Hloubt all the more sincere because of his undying hatred 0 "the bastards," that is to say, the illegitimate sons of Louis XIV. It does not appear that this hatred was 'ounded on moral reasons or on any real fear that these astards would be intruded into the succession. The true vause of his wrath was that they had precedence of the peers.

The death of Louis seemed to give Saint-Simon a chance of realizing his hopes. The duke of Orleans was at once vcknowledged regent and Saint-

Simon was of the council of regency, but no steps were taken to carry out his avourite vision of a France ruled by the nobles for its 3ood (it must always be understood that Saint-Simon's 'deal was in no respect an aristocratic tyranny except of jhe beneficent kind), and he had little real influence with

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the regent. He was indeed gratified by the degradation of "the bastards," and in 1721 he was appointed ambassador to Spain to arrange for the marriage (not destined to take place) of Louis XV. and the infanta. His visit was splendid ; he received the grandeeship, and, though he also caught the smallpox, he was quite satisfied with the business. After his return he had little to do with public affairs. His own account of the cessation of his intimacy with Orleans and Dubois, the latter of whom had never been his friend, is, like his own account of some other events of his life, obscure and rather suspicious. But there can be little doubt that he was practically ousted by the favourite. He survived for more than thirty years; but little is known of his life. His wife died in 1743, his eldest son a little later ; he had other family troubles, and he was loaded with debt. When he died, at Paris on 2d March 1755, he had almost entirely outlived his own generation (among whom he had been one of the youngest) and the prosperity of his house, though not its notoriety. This last was in strange fashion revived by a distant rela- tion born five years after his own death, Claude Henri, Comte de Saint-Simon, the subject of the preceding article.

It will have been observed that the actual events of Saint-Simon's life, long as it was and high as was his position, are neither very numerous nor very noteworthy. If nothing more had been known about him than was known at the time of his death he would certainly not have deserved mention at length here. Saint-Simon is, however, an almost unique example of a man who has acquired great literary fame entirely by posthumous publications. He was an indefatigable writer, and not merely from the time he left the army but much earlier he began to set down in black and white all the gossip he collected, all his interminable legal disputes of precedence, and a vast mass of unclassified and almost unclassifi- able matter. Most of his

manuscripts came into the possession of the Government, and it was long before their contents were pub- lished in anything like fulness. Extracts and abstracts, however, leaked out and parts of the manuscript were sometimes lent to privileged persons, so that some notion of the unique value of Saint-Simon got abroad within twenty or thirty years of his death. Partly in the form of notes on Dangeau's Journal, partly in that of original and independent memoirs, partly in scattered and multi- farious tracts and disquisitions, he had committed to paper an amount of matter which has probably never been exceeded by any one except a professional journalist, if indeed the parallel will hold even there. The new edition now publishing of the Memoirs with the notes on Dangeau is estimated to eontain thirty large octavo volumes. Besides this, M. Drumont, M. Faugére, and other in- dependent workers are bringing out series of Guvres Inédites of a less gossiping and more technical character found in different re- ceptacles of the public archives. But the mere mass of these pro- ductions is their least noteworthy feature, or rather it is most remarkable as contrasting with their character and style. The voluminous writer is usually thought of as least likely to be eharacterized by an original and sparkling style. Saint-Simon, though careless and sometimes even ungrammatical, ranks among the most striking memoir writers of France, the eountry richest in memoirs of any in the world. His pettiness, his absolute injustice to his private enemies and to those who espoused publie parties with which he did not agree, the bitterness which allows him to give favourable portraits of hardly any one, his omnivorous appetite for gossip, his lack of proportion and perspective, are all lost sight of in admiration of his extraordinary genius for historical narrative and character-drawing of a certain sort. He has been compared to Tacitus, and for once the comparison, so often made aud generally so ludicrously out of place, is just. In the midst of his enormous mass of writing phrases scarcely inferior to the Roman's occur frequently, and here and there passages of sustained description equal for intense concentration of light and life to those of Tacitus or of any other historian. As may be expected from the vast extent of his work, it is in the highest degree unequal. But he is at the same time not a writer who ean be ''sampled" easily, inasmuch as his most characteristic phrases sometimes occur in the midst of long stretches of quite uninteresting matter. Hence he has been even since his discovery more praised than read, and better liked by critics than by the general reader. A few eritical studies of him, especially those of

Sainte-Beuve, are in fact the basis of much, if not most, that has been written about him. Yet no one is so little to be taken at second-hand. Even his most famous passages, such as the account of the death of the dauphin or of the bed of justice where his enemy the duke of Maine was degraded, will not give a fair idea of his talent. These are his gallery pieces,

his great ‘‘ machines,” as French art slang calls them. Much more noteworthy as well as more frequent are the sudden touches which he gives. The bishops are ‘‘cuistres violcts” ; M. de Caumartin “porte sous son manteau toute la fatuité que M. de Villeroy étale

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sur son baudrier ”; another politician has a ‘‘ mine de chat faché 3 a third is hit off as ‘‘comptant faire” (‘‘he would still be doing,” though Saint-Simon certainly did not know that phrase). In short, the interest of the Jemoirs, independent of the large addition of positive knowledge which they make, is one of constant surprise at the novel and adroit use of word and plhiase. It is not super- fluous to inform the English reader that some of Macaulay’s most brilliant portraits and sketches of incident are adapted and some-

times almost literally translated from Saint-Simon.

The 1st edition of Saint-Simon (some scattered pieces may have been printed before) appeared in 1788. It was a merc selection in three volumes and was much cut down before it was allowed toappear. Next year four more volumes made their appearance, and in 1791 a new edition, still further increased. The whole, or rather not the whole, was printed in 1829-30 and reprinted some ten years later. The real creator of Saint-Simon, as far as a full and exact text is concerned, was M. Chéruel, whose edition in 20 volumes dates from 1856 and was reissued again revised in 1872. So immense, however, is the mass of Saint- Simon's MSS. that still another recension has been found necessary, and is now being published by M. de Boislisle in the series of Grands Ecrivains, but with M. Chéruel's sanction and assistance. Even this, as above noted, will not ex- haust available Saint-Simoniana, and it may be doubted whether it will be possible for many years to place a complete edition on the shelves. It must, however, be admitted that the matter other than the Memoirs is of altogether inferior interest and may be pretty safely neglected by any one but professed antiquarian and historical students. For criticism on Saint-Simon there is nothing better than Sainte-Beuve's two sketches in the 3d and 15th volumes of the Causeries du Lundi. The latter was written to accompany M. Chéruel's 1st edition. In English by far the most accurate treatment is in a recent Lothian prize essay by H. Cannan (Oxford and London, 1885). (G. SA.)

ST THOMAS, one of the Danish West India Islands, lies 36 miles east of Porto Rico (Spanish) and 40 north- north-west of St Croix (Danish), with its principal town (Charlotte Amalie) in 18° 20' 27" N. lat. and 64° 55' 40" W. long. It is 13 miles long from east to west, with an average breadth of 3, and is estimated to have an area of 33 square miles. The highest point, West Mountain, is 1586 feet above the sea. Previous to the abolition of slavery in 1848 the island was covered with sugar planta- tions and dotted with substantial mansions; but now a few vegetables, a little fruit, and some guinea grass are all that it produces. Greengroceries are imported from the United States, poultry and eggs from the neighbouring islands. Nor is the exceptional position which St Thomas has hitherto enjoyed as a commercial depét any longer secure ; the value of the imports in 1880 was less than one-half of what it was in 1870, and the merchants of Venezuela, Porto

Rico, San Domingo, Hayti, &c., who used to purchase in St Thomas, now go direct to the markets of the United States and Europe. The Royal Mail Com- pany, which at an early date chose the island as the princi- pal rendezvous for its steam-packets in that part of the world, and whose example was followed by other important lines, removed its headquarters to Barbados in 1885. The harbour lies about the middle of the south coast and is nearly landlocked ; its depth varies from 36 to 18 feet. A floating dock, 250 feet in length, was completed in 1875 ; there is in addition a steam-slip capable of taking up a vessel of 1200 tons. Along the north side of the harbour lies Charlotte Amalie, popularly known as St Thomas, the only town on the island. In 1880 the inhabitants of the island numbered 14,389 (males 5757, females 8632), of whom about a sixth are white, of various nationalities ; the rest have nearly all more or less of Negro blood. English has gradually become almost the exclusive lan- guage of the educated classes, and is used in the schools and churches of all the various communities. The curious Creole speech of the Negroes, which contained a mixture of broken Dutch, Danish, English, &c., though it wag re- duced to writing by the Moravian missionaries subsequent to 1770, is rapidly dying out.!_ About a third of the popu- lation are Roman Catholics, and the rest mainly Protestants of the Lutheran, Dutch Reformed, Moravian, and English Episcopal Churches. The Jewish community, 500 or 600 strong, has a synagogue. There are in the town two

? See specimens and analysis by Dr E. Pontoppidan, in Zéschr. Ee Ethnol., Berlin, 1881.

hospitals, a public reading-room and library, a Government college (1877), a Roman Catholic college (St Thomas), a Moravian school, and a small theatre. A quarantine lazq. retto is maintained on Lighthouse or Muhlenfeldt Point, The general health of the town is good. The climate varies little all the year round, the thermometer seldom falling below 70° or rising above 90°. In the “hurricane” months—August, September, and October—south winds, accompanied by sultry heat, rain, and thunder, are not yp. common ; throughout the rest of the year the wind blows between

east and north, Earthquakes are not unfrequent, but they do little damage in comparison with cyclones, which sometimes sweep over the island.

St Thomas was discovered by Columbus in 1498, and at that time was inhabited by two tribes, the Caribs and the Arrowauks, In 1657 it was colonized by the Dutch, and after their departure for New York it was held by the English in 1667. The Danish West India and Guinea Company took possession in 1671, and some eight years later began the introduction of slave labour,]f was succeeded in 1685 by the so-called Brandenburgh Company, the principal shareholders of which were Dutch. The colony was strengthened by French refugees from St Christopher's after the revocation of the edict of Nantes. The neutrality of Denmark led to the prizes of the various belligcrents being brought to its port for sale. In 1754 the king of Denmark took the management of the colony into his own hands, and in 1764 he threw open the port to vessels of all nations. The neutrality of Denmark again favoured it in the war of 1792; and it became the only market in the West Indies from which the products of the colonies could be conveyed to the north of Europe. In 1801 the island was held by the British for ten months, and it was again in their possession from the latter part of 1807 to 1815. At that time the harbour was three or four times a year the rendezvous for homeward-bound English ships, from 200 to 400, as the case might be, which waited there for their convoys. The South American War of Independence led a number of Spaniards to settle at St Thomas. A great but temporary stimulus was given to its commerce during the American Civil War. In 1871 the Danish Government removed the headquarters of their West India possessions from St Croix to St Thomas.

ST THOMAS (Portuguese, Séo Thomé), a volcanic island in the Gulf of Guinea (West Africa), lies immediately north of the equator and in 6° 40' E. long. From the Gaboon, the nearest point of the mainland, the distance is 166 miles, and from the Cameroons 297. The extreme length of the island is 32 miles and the breadth from west to east 21; the area is estimated at 355 square miles. From the coast it rises pretty uniformly towards the lofty and verdant mountains, in the midst of which the peak of St Thomas towers to a height of 6000 feet. At leasta hundred streams great and small rush down the mountain- sides through deep-cut ravines, many of them forming beautiful waterfalls, such as those of Blu-blu, &e., on the Agua Grande. The

bi-seasonal climate of the tropics ob- tains a comparatively normal development on the island, which, however, has a very evil repute of unhealthiness, probably owing to the fact that the chief town occupies 4 peculiarly malarial site on the coast. The first object of European cultivation in St Thomas was sugar, and to this the colony owed its prosperity in the 16th century; but now it is quite displaced by coffee and cocoa, introduced in the beginning of the 19th century. In 1879-80 the export of coffee was 3,778,580 Ib and of cocoa 1,026,746 Tb. Vanilla and cinchona bark both succeed well, the latter between 1800 and 3300 feet of altitude. Though nearly the whole surface of the island is fitted for cultivation, only about a fifth part is really turned to account. Along with Principe, St Thomas forms a Portuguese province, to which are attached the little island of Rolas and the petty fort of Ajuda on the Guinea coast.

The town of St Thomas, the capital of the province, is situated on the north-east coast of the island, and the neighbouring distncts form the only well-peopled region. In 1878 the population in the island was 18,266, of whom 1200 were white. The great bulk con sisted of a mixture of Negroes from various parts of the West Coast, mainly introduced as slaves, and now all using @ Negro Portuguese—“‘ lingua de 8. Thomé.” On the south-west coast até

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r 00 Angolares, descendants of a shipload of Angola slaves ie at Sete Pedras in 1544, who still retain their Bunda speech

: iar customs.

ed was discovered about the close of 1470 by the Portu- ‘yese navigators Jodo de Santarem and Pero de Escobar, who in ‘re beginning of the following year discovered Annobom (“Good ear i bney found St Thomas uninhabited. The first attempts + colonization were Jodo de Paiva’s in 1485; but nothing perma- ‘ent was accomplished till 1493, when a body of criminals and of ‘oung Jews torn from their parents to be baptized were sent to the Hands and the present capital was founded by Alvaro de Carminha. onsiderable progress had been made by the 16th century ; but in ‘567 the settlement was attacked by the French, and in 1574 the ngolares began those raids which only ended with their subjuga- ‘on in 1693. In 1595 there was a slave revolt; and from 1641 to 844 the Dutch, who had plundered the capital in 1600, held pos- sssion of the island. The French did great damage in 1709; and the course of the century internal anarchy reduced St Thomas

) a deplorable state.

See Dr Greeff’s papers in Petermann’s Mitteilungen, 1884, and Globus, 1882, ol. xlii,

SAINT-VICTOR, Pav bE (1827-1883), one of the hief masters of a very ornate style in recent French litera- ure, was born at Paris in 1827 and died there in 1883. {e was of noble birth and inherited the title of count, but arely used it, his political principles being democratic. vaint-Victor began as a dramatic critic on the Pays in 851 and subsequently wrote in many journals. In 1870, -uring the last days of the second empire, he was made aspector-general of fine arts. Almost all Saint-Victor’s vork consists of reprinted articles, the best known, and on he whole the best, being the collection entitled Hommes t Dieux (1867). His death interrupted the publication f an elaborate work, partly reprinted, partly developed rom formerly printed papers, entitled Les Deux Masques, 1 which the author intended to survey the whole dramatic terature of ancient and modern times. Saint-Victor’s ictual critical faculty was considerable, though rather one-ided; but his position in French literature is likely to e, in an inferior degree, something like that of Mr Ruskin a English. He owed a good deal to Théophile Gautier, ut he carried ornateness to a pitch far beyond Gautier’s, —a pitch which may sometimes deserve the epithet “barbaric,”

ST VINCENT, an island in the West Indies, discovered |

y Columbus in 1498, is situated in 13° 10’‘N. lat. and 0° 57’ W. long., 100 miles to the west of Barbados; it 3 18 miles in length, 11 in breadth, and has an area of (32 square miles, Volcanic hills cross the island from orth to south, intersected by beautiful and fertile valleys. n the north-west is the Souffriere, a volcanic mountain 3000 feet), of which the last violent eruption was in 812; the crater is 3 miles in circumference and 500 feet 1 depth. The climate is humid and tolerably healthy iverage rainfall nearly 80 inches), In 1627, when Charles granted St Vincent to the earl of Carlisle, it was peopled y Caribs ; in 1672 it was given to Lord Willoughby, and 1 1722 was granted, along with other islands, to the Juke of Montagu by George I. After hostilities with the ‘rench and Caribs, it passed definitively to Great Britain t 1783, Immigrants were afterwards introduced and antations cultivated ; the chief products are sugar, rum, Olasses, and arrowroot. ‘The capital is Kingstown (popu- ‘tion, 5993), the total population of the island being 7,200, including 2700 Europeans and 30,000 Africans. he island was formerly under the general government of 1e Windward Islands, Barbados being headquarters ; but . 1885 Barbados was made a separate government, and renada, St Vincent, Tobago, and St Lucia were placed ider a governor. The legislative council of St Vincent | Composed. of official members and others nominated by © crown. In 1883 the revenue and expenditure were Spectively £34,509 and £32,962, the debt being £2840. je tonnage entered and cleared was 172,989, the imports

and exports being valued at £148,286 and £166,752 re- spectively (sugar exports, 9250 tons).

ST VINCENT, Siz Joun Jervis, Eart (1734-1823), a distinguished naval officer, was born at Meaford, Stafford- shire, on 9th January 1734, His father was counsel and solicitor to the admiralty and treasurer of Greenwich hos- pital. Young Jervis was destined for the law, but early showed such a strong predilection for the sea that he ran away from school in order to become a sailor. Accordingly in 1748 he was placed on board the “

Gloucester” under Commodore Townsend. Six years later he rose to be lieutenant, and in 1759 he distinguished himself so much at the siege and capture of Quebec that he was promoted to the rank of commander. In the following year he was made a post-captain. He commanded the “ Foudroyant” in July 1778, when the memorable rencontre took place between Admiral Keppel and Count d’Orvilliers, and bore a very distinguished part in that action. In 1782, while in command of the same vessel, he captured the French ship “ Pégase,” of 74 guns and 700 men, off Brest Harbour, and was rewarded for his exploit by being made Knight Com- panion of the Bath. In 1784 he entered parliament as member for Launceston, and he afterwards sat for Yar- mouth. Conjointly with Sir Charles Grey, Jervis was appointed to command an expedition sent out in 1793 against the French Caribbee islands, and, though the rainy season and the yellow fever prevented the full success of the British, they were able to obtain possession of Mar- tinique and St Lucia, and to hold Guadaloupe for a short time. In 1795 Jervis became full admiral and succeeded Lord Wood in command of the British fleet in the Medi- terranean, where he rendered important service in blockad- ing the French fieet in Toulon, and protecting English trade in the Levant. On 14th February 1797 he won his most. celebrated victory. With only fifteen ships of the line, seven frigates, and two sloops he encountered off Cape St Vincent a Spanish fleet of twenty-six sail of the line, twelve frigates, and a brig, and completely defeated it, capturing four of the enemy’s largest ships. For this great triumph, which had a most important effect on the prosecution of the war, Jervis was created a peer by the title of Earl St Vincent. He still further distinguished himself some months later by his resolute and sagacious conduct in re- pressing a mutiny in his fleet when off Cadiz. In June 1799 he resigned his command in consequence of ill-health, but was shortly afterwards placed at the head of the: Channel fleet. On the formation of the Addington ministry in 1801 he was made first lord of the admiralty, and in that important office, which he held for three years, the great capacity for business with which he was endowed by nature shone forth in all its lustre. By means of the cele- brated commission of naval inquiry he was enabled to ex- pose a vast extent of corruption in the public service and to lay the foundation of a system of economical administration. He grappled boldly with the monstrous and deep-rooted abuses brought to light, and by his vigour, honesty, and energy succeeded in rectifying them. In 1806, at the age of seventy-two, Lord St

Vincent was again called upon to take the command of the Channel fleet and to head an expedition to the court of Portugal, in which he displayed great talents and address. Advanced age and impaired health led to his final retirement from public life in 1807, but he survived till 13th March 1823, when he died in his ninetieth year.

See Brenton, Life of Earl St Vincent ; Lord Brougham, States- men of the Times of George ILI.

ST VITUS'S DANCE! or CHorza, a disorder of the

1 This name was originally employed in connexion with those remarkable epidemic outbursts of combined mental and physical ex- citement which for a time prevailed among the inhabitants of some parts of Germany in the Middle Ages. It is stated that sufferers from

nervous system occurring for the most part in children, and characterized mainly by involuntary jerking move- ments of the muscles throughout almost the entire body. It is to be regarded as a functional nervous disorder of wide extent, the manifestations of which appear not merely in disturbance affecting the motor apparatus but in various associated morbid phenomena of cerebral origin. Among the predisposing causes age is important, chorea being essentially an ailment of childhood and more par- ticularly of the period in which the second dentition is taking place. The greater number of the cases occur between the ages of nine and twelve. It is not often seen in very young children nor after puberty; but there are many exceptions to this rule. It is twice as frequent with girls as with boys. Hereditary predisposition to nervous troubles is apt to find expression in this malady in youth, more especially if the general health becomes lowered. Of exciting causes strong emotions, such as fright, ill-usage or hardship of any kind, insufficient feeding, overwork or anxiety, are among the most common ; while, again, some distant source of irritation, such as teething or intestinal worms, appears capable of giving rise to an attack. It is an occasional but rare complication of pregnancy. The connexion of chorea

with rheumatism is now universally recognized, and is shown not merely by its frequent occur- rence before, after, or during the course of attacks of rheumatic fever in young persons, but even independently of this by the liability of the heart to suffer in a similar way in the two diseases.

The symptoms of St Vitus's dance are in some instances developed suddenly as the result of fright, but much more frequently they come on insidiously. They are usually preceded by changes in the temper and disposition, the child becoming sad, irritable, and emotional, while at the same time the general health is somewhat impaired. The first thing indicative of the disease is a certain awkward- ness or fidgetiness of manner together with restlessness, the child being evidently unable to continue quiet, but frequently moving the limbs into different positions. In walking, too, slight dragging of one limb may be noticed. The convulsive muscular movements usually first show themselves in one part, such as an arm or a leg, and in some instances they may remain localized to that limited extent, while in all cases there is a tendency for the dis- orderly symptoms to be more marked on one side than on the other. When fully developed the phenomena of the disease are very characteristic. The child when standing or sitting is never still, but is constantly changing the position of the body or limbs in consequence of the sudden and incoordinate action of muscles or groups of them. The shoulder is jerked up, the head and trunk twisted about, the limbs crossed suddenly and changed again, the fingers keep moving restlessly, while the face is distorted with grimaces, frowning and smiling irregularly. These Symptoms are aggravated when purposive movements are attempted or when the child is watched. Speech is affected both from the incoordinate movements of the tongue and from phonation sometimes taking place during an act of inspiration. The taking of food becomes a matter of difficulty, since much of it is lost in the attempts to convey it to the mouth, while swallowing is also inter- fered with owing to the irregular action of the pharyngeal muscles. When the tongue is protruded it comes out in a jerky manner and is immediately withdrawn, the jaws at the saine time closing suddenly and sometimes with con- this dancing mania were wont to resort to the chapels of St Vitus (more than one in Swabia), the saint being believed to possess the power of curing them. The transference of the name to the disease now under consideration was a manifest error, but so closely has the association

now become that the original application of the term has been comparatively obscured.

ST VITUS’s Bees

siderable force. In locomotion the muscles of the limbs act incoordinately and there is a marked alteration of the gait, which is now halting and now leaping, and the chilg may be tripped by one limb being suddenly jerked jy front of the other. In short, whether at rest or in motion the whole muscular system is seen to be deranged jn its operations, and the term “insanity of the muscles” not inaptly expresses the condition, for they no longer act jn harmony or with purpose, but seem, as Trousseau ey. presses it, each to have a will of its own and to be exergjs. ing this for different objects at one time. The muscles of organic life (involuntary muscles) appear scarcely, if at all, affected in this disease, as, for example, the heart, the rhythmic movements of which are not as a rule impaired, But the heart may suffer in other ways, especially from inflammatory conditions similar to those which attend upon rheumatism and which frequently lay the foundation of permanent heart-disease. In severe cases of St Vitus’s dance the child comes to present a distressing appearance from the constant restlessness and disorderly movement, and the physical health declines. Usually, however, there is a remission of the symptoms during sleep. The mental condition of the patient is more or less affected, as shown in emotional tendencies, irritability, and a somewhat fatuous expression and bearing, but this change is in general of transient character and ceases with convalescence.

This disease occasionally assumes a very acute and aggravated form, in which the disorderly movements are so violent as to render the patient liable to be injured and to necessitate forcible control of the limbs or the employ- ment of anesthetics to produce unconsciousness. Such cases are of very grave character, if, as 1s common, they are accompanied with sleeplessness, and they may prove rapidly fatal by exhaustion. In the great majority of cases of St Vitus’s dance, however, complete recovery is to be anticipated sooner or later, the symptoms usually con- tinuing for from one to two months, or even sometimes much longer.

The nature of this disease has given rise to much dis- cussion and there still remains considerable difference of opinion as to its true pathology. The fact

that the vast Majority of cases recover would seem to show that there could have been no profound change in the structural integrity of the nerve-centres, while in those instances where a fatal result takes place post-mortem examination reveals no constant morbid condition. A theory supported by high authority has referred the cause of the malady to the plugging up of minute blood-vessels in the motor centres of the brain (a condition not unlikely to occur im rheumatic inflammation affecting the lining membrane of the heart), and such a change has been seen in a few instances. Ina still larger number, however, no appear ances of this kind have been observed, but simply vascular changes of a congestive character widely diffused through out the central nervous system, accompanied with evidences of slight inflammatory action. Dr Dickinson, whose views, founded upon carefully conducted investigations, are those most widely accepted, concludes as follows: “We see 2 chorea a widely distributed hyperemia [i.c., congestion] of the nervous centres, not due to any mechanical imischane but produced mainly by causes of two kinds,—one @ morbid, probably a humoral influence, which may affect the nervous centres as it affects other organs and tissues, the other, irritation in some mode usually mental but some times what is called reflex, which especially belongs to am disturbs the nervous system, and affects persons differently, according to the inherent mobility of their nature.”

For the treatment of St Vitus’s dance the remedies pro posed have been innumerable, but it is doubtful whether any of them have much control over the disease, whl

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r suitable hygienic conditions tends to recover of self. These conditions, however, are all-important, and cabrace the proper feeding of the child with nutritious tht diet, the absence of all sources of excitement and |noyance, such as being laughed at or mocked by other jildren, and the rectification of any causes of irritation 4d of irregularities in the general health. For a time, ad especially if the symptoms are severe, confinement to .e house or even to bed may be necessary, but as soon as yssible the child should be taken out into the open air id gently exercised by walking. Of medicinal remedies ue

most serviceable appear to be zine, arsenic, and iron, pecially the last two, which act as tonics to the system

id improve the condition of the blood. They should be yntinued during the whole course of the disease and con- ilescence, if they do not disagree. As sedatives in cases sleeplessness, bromide of potassium and chloral are of se. Many other agents, such as conium, belladonna, rychnia, the salts of silver, &c., have been recommended, it they do not seem to possess any special advantages. 1 long-continued cases of the disease- much benefit will > obtained by a change of air as well as by the employ- ‘ent of moderate gymnastic exercises. Bearing in mind 1e weakened condition of the muscles as the result of the horeic movements, the employment of friction and of ectricity is also likely to be beneficial. After recovery ie general health of the child should for a long time sceive attention, and care should be taken to guard yainst excitement, excessive study, or any exhausting ondition, physical or mental, from the fact that the ‘sease is apt to recur and that other nervous disorders -ill more serious may be developed from it.

In the rare instances of the acute form of this malady, ‘here the convulsive movements are unceasing and violent, ie only measures available are the use of chloral or aloroform inhalation to produce insensibility and muscular slaxation, but the effect is only palliative and does not event the fatal result which in most such cases quickly ipervenes. (50,5)

ST UBES. See SzruBat. |. SAIS. See Eeyrr, vol. vii. p. 768. ; |. SALADIN. See Eeyprt, vol. vii. pp. 753-754. | SALAMANCA, a province of Spain, which until 1833

_ rmed part of that of Leon, is bounded on the N. by Amora and Valladolid, on the E. by Avila, on the S. by aceres, and on the W. by Portugal. It has an area of 40 square miles. The population in 1877 was 285,500 ; it by the year 1886 it was estimated that it had decreased » about 270,000. Salamanca belongs almost entirely to e basin of the Douro, its principal rivers being the srmes, which follows the general slope of the province wards the north-west, and after a course of 135 miles dws into the Douro, which forms part of the north-west oundary ; the Yeltes and the Agueda, also tributaries of ‘e Douro; and the Alagon, an affluent of the Tagus. The brthern part of the province is flat, and at its lowest pint (on the Douro) is 488 feet above sea-

level. The ‘ghest point (in the Sierra de Peiia de Francia) is 5692 et above the sea. The rainfall is irregular ; but where 1s plentiful the soil is productive and there are good irvests of wine, oil, hemp, and cereals of all kinds. The Tn harvest is always good, rain or norain. The principal salth of the province consists in the forests of oak and (estuut, which cover the hills in its southern part. Sheep id cattle also find good pasturage there; and wool and erino of medium quality are grown. Gold is found in © streams, and iron, lead, copper, zinc, coal, and rock {ystal in the hills, but owing to the difficulties of trans- rt and other causes the mines are only partially de- “oped. The manufactures of the province are few and

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mostly of a low class, intended for home consumption, such as frieze, coarse cloth, hats, and pottery. The cloth manufactories of Bejar turn out a material of superior quality. The tanning of hides is carried on pretty extensively, and cork and flour are exported via Santander and Barcelona. The province is traversed by a railway line to Portugal, passing Medina del Campo and Ciudad Rodrigo to Figueira da Foz. Administratively the province is divided into eight partidos judiciales, and it has 388 ayuntamientos; of these last only two besides Salamanca, the capital, have a population exceeding 5000,—Bejar (11,099) and Ciudad Rodrigo (6856). It is represented in the cortes by three senators and seven deputies. Apart from that of Leon the province has little history till the Peninsular War, when the battles of Ciudad Rodrigo, Fuentes de Ofioro, and Salamanca were fought on its soil.

SALAMANCA (Salmantica, Elmantica), the capital of the above province, lies on the banks of the Tormes, 172 miles north-west of Madrid by rail. The river is here crossed by a bridge 500 feet in length built on twenty-six arches, fifteen of which are of Roman origin, while the remainder date from the 16th century. The town was of importance in times as remote as 222

B.c., when it was captured by Hannibal from the Vettones; and it afterwards became under the Romans the ninth station on the Via Lata from Merida to Zaragoza. It passed successively under the rule of the Goths and the Moors, till the latter were finally driven out about 1055. The city is still much the same in outward appearance as when its tortuous streets were thronged with students. The university was naturally the chief source of wealth to the town, the popu- lation of which in the 16th century numbered 50,000. Its decay of course reacted on the townsfolk, but it fortunately also arrested the process of modernization, so that the city retains most of its old features and is now one of the most picturesque in Spain. The ravages of war alone have wrought serious damage, for the French in their defensive operations at the siege almost destroyed the western quarter. The ruins still remain, and give an air of desolation which is not borne out by the real condi- tion of the inhabitants, however poverty-stricken they may appear. The magnificent Plaza Mayor, built by Andres Garcia de Quifiones at the beginning of the 18th century, and capable of holding 20,000 people to witness a bull- fight, is one of the finest squares in Europe. It is surrounded by an arcade of ninety arches on Corinthian columns, one side of the square being occupied by the municipal buildings. The decorations of the facades are in the Renaissance style, and the plaza as a whole is a fine sample of plateresque architecture. But the old and new cathedrals (see below) are the chief objects of interest in the city.

In the Middle Ages the trade of Salamanca was not insignificant, and the stamped leather-work produced there is still sought after. Its manufactures are now of little consequence, and consist of china, cloth, and leather. The transport trade of the town is, however, of more import- ance, and shows signs of increasing. But any great revival can only take place when communication with the coast is considerably improved, a result which will no doubt be promoted by the recent opening of the line to the coast of Portugal. The population within the municipal boundaries in 1877 was 18,007, and in 1886 was estimated at about

20,000.

The old cathedral is a cruciform building of the 12th century, begun by Bishop Gerdnimo, the confessor of the Cid. Its style of architecture is that

Late Romanesque which prevailed in the south of France, but the builder showed much originality in the construc- tion of the dome, which covers the crossing of the nave and tran-

septs. The inner dome is made to spring, not from immediately above the arches, but from a higher stage of a double arcade pierced.

with windows. The thrust of the vaulting is borne by four massive pinnacles, and over the inner dome is an outer pointed one covered with tiles. The whole forms a most effective and graceful group. On the vault of the apse is a fresco of Our Lord in Judgment by Nicolas Florentino. ‘The reredos, which has the peculiarity of fitting the curve of the apse, contains fifty-five panels with paint- ings mostly by the same artist. There are many fine monuments in the south transept and cloister chapels. An adjoining building, the Capilla de Talavera, is used as a chapel for service according to the Mozarabic rite, which is celebrated there six times a year. On the north of and adjoining the old church stands the new cathedral, built from designs by Juan Gil de Ontation. Begun in 1513 under Bishop Francisco de Bobadilla, but not finished until 1734, itisa notable example of the late Gothic and Plateresque styles. Its length is 340 feet and its breadth 160 feet. The intcrior is fairly Gothic in character, but on the outside the Renaissance spirit shows itself more clearly, and is fully developed in the dome. Everywhere the attempt at mere novelty or richness results in feebleness. The main arch of the great portal consists of a simple trefoil, but the label above takes an ogee line, and the inner arches are elliptical. Above the doors are bas-reliefs, foliage, &c., which in exuberance of design and quality of workmanship are good examples of the latest efforts of Spanish Gothic. The church contains paintings by Navar- rete, Becerra, and Morales, and some overrated statues by Juan de Juni. The treasury is very rich, and amongst other articles pos- sesses a custodia which is a masterpiece of goldsmith’s work, and a bronze crucifix, of undoubted authenticity, which was borne before the Cid in battle. The tower is too unsafe to allow of the ring- ing of its great bell, which weighs over 23 tons. The intcrest of Salamanca centred in its university, founded by Alfonso IX. about 1200 and for four centuries one of the chief seats of European

learning. Of the university buildings the facade of the library (80,000 volumes, exclusive of MSS.) is a peculiarly rich example of late 15th-century Gothic. The cloisters are light and elegant ; the grand staircase ascending from them has a fine balustrade of foliage and figures. The Colegio de Nobles Irlandeses, formerly Colegio de Santiago Apostol, was built in 1521 from designs by Ibarra. best period of the Renaissance. The Jesuit College is an immense and ugly Renaissance building begun in 1614 by Juan Gomez de Mora. The Colegio Viejo, also called San Bartolomé, was rebuilt in the 18th century, and now serves as the governor's palace. The convent of Santo Domingo, sometimes called San Esteban, shows a mixture of styles from the 13th century onwards. The church is Gothic with a plateresque facade of great lightness and delicacy. It is of purer design than that of the cathedral ; nevertheless it shows the tendency of the period. The reredos, one of the finest Renaissance works in Spain, contains statues by Salvador Carmona, and a curious bronze statuette of the Virgin and Child on a throne of champlevé enamel of the 12th century. The chapter-house, built by Juan Moreno in 1637, and the staircase and sacristy are good examples of later work. The convent of the Augustinas Recoletas, begun by Fontana in 1616, is in better taste than any other Renaissance building in the city. The church is rich in marble fittings and contains several fine pictures of the Neapolitan school, especially the Conception by Ribera over the altar. The convent of the Sancti Spiritu has a good door by Berruguete. There is also a rather effective portal to the convent of Las Duefias. The church of S. Marcos is a curious circular building with three eastern apses ; and the churches of S. Martin and S. Matteo have good early doorways. Many of the private houses are untouched ex- amples of the domestic architecture of the prosperous times in which they were built. Such are the Casa de las Conchas, the finest example of its period in Spain; the Casa de la Sal, with a magnificent courtyard and sculptured gallery ; and the palaces of Maldonado, Monterey, and Espinosa. (Si 183, 183.)

SALAMANDRA. In the nomenclature of zoology this name designates a genus of animals belonging to the verte- brate class Amphibia. The genus was first defined under this name by Laurenti.) It will be seen on referring to the taxonomic synopsis of the class given at the end of the article Ampuipia that the genus Salamandra belongs to the first tribe Mecodonta of the fifth division Salaman- drida, The diagnosis of the genus is as follows :

—no fronto-squamosal arch in the skull; tongue large, adherent below, free at the sides and slightly so behind 3 toes five ; tail cylindrical. There are three species, distinguished as follows :—(1) S. maculosa, Laurenti, tail not so long as rest of body, colour black with yellow spots 3; (2) 8. atra, Laurenti, tail not so long as rest of body, colour uniform black ; (3) S. caucasica, Waga, tail longer than rest of

1 Synopsis reptilium emendata, &c., Vienna, 1768.

The double arcaded cloister is a fine piece of work of the –

body. In all the species the body is plump and rounded, and there is no dorsal crest or fin; the head is depressed, its greatest width being at the angle of the jaws; the snout is rounded. The vent is a longitudinal slit, the borders of which in the male are slightly swollen. The skin is smooth and shining ; at the junction of the head and neck is a pronounced fold of skin called the gular fold. The swollen patches of skin behind the tympana, caused by the presence of large cutaneous glands, and known as parotids, are well developed and exhibit the openings of the glands as distinct pores. Similar gland-openings form a series along either side of the body. In the first two species there is also a longitudinal series of warts on each side; these are wanting in S. caucasica. Depressions of the skin between the vertebree are present, and are known as costal grooves. The palatine teeth-series are S-shaped, and the anterior ends of the two series do not meet.?_ 88. maculosa is the largest of the three species, attaining a length of 7 to 84 inches, SS. atrais about 44 and S. caucasica about 6 inches in length.

The genus is confined to the western sub-region of the palzarctic region, extending over almost the whole of Europe, especially the central and southern parts, and occurring also in Algiers and Syria. The spotted species is the commonest and most widely distributed, being found in nearly all parts of Germany, France, Italy, and Spain. The genus is entirely absent from the British Islands. The black salamander, S. ara, is confined to the Alps of Central Europe, and there only occurs between the limits of 2500 to 10,000 feet of altitude; it is found in the mountains of South Germany, France, Switzerland, and Austria. S. caucasica is only known from one

specimen, which was obtained from the Caucasus and was sent to the Paris Museum by Dr Waga.?

The food of Salamandra consists of worms and insects, and, like British frogs and toads, the animals can only exist in damp shady localities. As in all Salamandrida, the process of reproduction is commenced by a true copulation, which takes place in spring and summer. The seminal fluid is passed into the female cloaca, where it is received into a tube-shaped receptaculum seminis. The eggs are thus fertilized in the oviduct, but the development takes place under somewhat different conditions in the two species S, maculosa and S. atra. Both species are vivipar- ous; in the former thirty to forty eggs undergo develop- ment in the oviducts at one time, and they are brought forth and deposited in stagnant or sluggishly-flowing water when they have reached a stage similar to that of adult Perennibranchiata, the newly-born larve having long feather-like external gills and a length of 12 to 15 mm. (one-third to one-half an inch). After a period of aquatic life, the larvee pass through a metamorphosis: the limbs appear; the gill slits close up; and the young animals, having reached the adult condition, leave the water for a terrestrial life. In S. atra only the two lowest eggs which pass into the oviducts, one in the duct of each side, under- go development. The rest of the eggs fuse into a mass of yolk material and are devoured by the two developing larvee. In this way the larve are provided with nutriment during the later stages of development, for in this species they are retained within the body of the mother until they have reached the air-breathing condition and are in all respects similar to the parents. This peculiarity in the process of reproduction bears an obvious relation to the physical conditions of the habitat of S. atra. In the elevated regions that the species inhabits stagnant and

2 For a figure of S. maculosa, see Latreille, ist. Nat. des Sal. de France, Paris, 1800, pl. i.; Daudin, Hist. Nat. d. Reptiles, pl. xevii. f. 1. For S. atra, see Laur., op. cit., pl: ake. 2:

3 See Waga, Rev. Mag. Zool., 1876, p. 826.

sluggish waters are wanting, and therefore the process of reproduction that occurs in S. maculosa is rendered im- possible. The black Salamandra has become adapted to its environment (1) by the slight changes in colour and structure which distinguish it from the spotted, and (2) by a modification in its reproductive processes, which elimi- nates the aquatic stage of existence from the life-history of the individual. It is to be noted that the stage character- ized by the presence of pinnate external gills is exhibited by the larva during its development in the oviduct, and the gills doubtless there perform their function. Fraulein von Chauvin! made the experiment of taking the larvee of S. atra from the pregnant female when they were in the branchiate condition, and placing them in water to see if they would survive and pass through their metamorphosis under these circumstances. On one occasion the experi- ment was perfectly successful in the case of one specimen ; the rest of the larvze died.

The tailed Amphibia of Europe have from the very earliest times down to the present day been almost universally known in popular language as salamanders, and identified in the popular mind with the salamander of myth and fable.? Besides the species of Sala- mandra there are, according to Boulanger (Brit. Mus. Cat., 1881), eighteen other species of Urodela in Europe, of which fourteen belong to the genus TRITON (q.v.). Chioglossa lusitaniea, Bocage, is distinguished by having a tongue supported anteriorly by a pro- tractile median pedicle and free everywhere else, and by having its tail cylindrical at the base but compressed at the end. It occurs in Spain and Portugal. Salamandrina perspicillata, Tschudi, occurs in Italy ; like Chioglossa, it belongs to the Mecodonta and is distin- guished by the following characters :—tougue large, subtriangular, free everywhere except on anterior median line; toes four; tail slightly compressed ; a strong bony fronto-squamosal arch. Spelerpes fuseus, Strauch, occurs in Italy and in France in the Alpes Maritimes.

SALAMIS, in modern times called by the people KoAotp: (a ring-shaped cake), and by purists ZaAapis, is an island in the Saronic Gulf, off the coast of Attica, Greece. It is said to have been called in ancient times by other names,—Sciras, which associates it with the worship of Athena Sciras ; Cychreia, which connects it with the Eleusinian cultus and the sacred serpent (Kvyxpeidys o¢is) of Demeter; and Pityussa. There was a small

stream, Bocarus or Bocalia, in the island. The city, which bore the same name as the island, was originally situated on the south coast opposite Aagina, but was afterwards trans- ferred to a promontory on the east side nearer Athens. The transference corresponds to a total change in the

1 See Zeitschr. f. wiss. Zoologie, vol. xxvii. p. 534, and C. von Siebold, ibid., p. 536; M. v. Chauvin, zbid., vol. xxiv.

2 Aristotle (7. A., v. 19) cites the salamander, which " when it walks through fire extinguishes it," as a proof that some animal frames are incombustible, and A®lian (Naé. An., ii. 31) will have it that those who work with forges are familiar with this fact and when their bellows fail to quicken the flame know to look for a salamander and put things right by killing it. According to this form of the fable the salamander, as Alian expressly says, is not born of fire, nor does it live therein. On the contrary, according to Pliny (H. W., x. 67 sq., xxix. 4) it is of a cold complexion and emits a cold venom like aconite, but so virulent that even bread baked with wood of a tree on which a salamander has crept is poisonous. The touch of its saliva even on the foot, says Pliny, causes the hair to fall out. So Dioscorides speaks of salamander prepared in oil as a depilatory ; comp. Petronius, c. 107, and Burman's notes, and for late survivals in Europe of the belief in a deadly lizard, identified with the salamander, Bochart, Hierozoicon, bk. iv. c. 1. That the salamander extinguishes fire appears also in the PHYSIOLOGUS (g.v.), and so became a common part of medizval animal lore; but the Arabic Physiologus (Land, Anec. Syr., iv. 166) speaks instead of a stone that quells fire. This stone is asbestos, the salamander of Marco Polo (i. 215, Yule), of whose fibres a sort of incombustible cloth was made, which was represented in the East as made of the hair of the salamander or of its plumage ; for the Arabs mixed up the sala- mander fable with that of the PHa@nrx (g.v.) and were not sure whether it was beast or bird. In later story the salamander is represented as born and living in fire and so the name is used by cabbalistic moderns for the spirits of that element. Salamander's wool or hair as a name for asbestos occurs in Bacon and other English writers. Francis I. chose as his emblem a salamander with the motto, "J'y vis et je l'éteins."'

political relations of Salamis. It was originally connected, not with Attica, but with Augina and with Megara, the competitors of Athens in the struggle for supremacy in the Saronic Gulf. The most prominent heroes of the island, Telamon, Ajax, and Teucer, were Atacide from figina. But about the end of the 7th century B.c. the war between Athens and Megara for the possession of Salamis was, under the guidance of Solon, determined in favour of Athens. A line of the Ziad (ii. 558) is said to have been interpolated by the Athenians in support of their claim to the island, while the Megarian version of the passage was quite different. The priestess of Athena Polias might not eat Attic cheese, but it was lawful for her to eat foreign or Salaminian cheese. Salamis, having come so late into the hands of the Athenians, retained, like Eleusis, more local independence than the other demes. The island remained subject to Athens in later history, except during the period 318 to 232 B.c., when it was abandoned to the Macedonian rule. The name of Salamis is famous chiefly on account of the great sea-fight, 480 B.c., in which the allied Greeks defeated the Persians under Xerxes. The battle took place beside the town of Salamis and the island of Psyttaleia, at the south-eastern end of the straits.

A city on the east coast of Cyprus, near the river Pedizus, said to have been founded by the Salaminian Teucer, son of Telamon, was also called Salamis.

SAL AMMONIAC. See Ammontac, vol. i. p. 741.

SALDANHA, JoXo Cartos SALDANHA DE OLIVEIRA E Daun (1791-1876). See Portuaat, vol. xix. pp. 553-554.

SALE, an urban sanitary district of Cheshire, England, on the Bridgewater Canal and the Mersey, about 5 miles south of Manchester. At the beginning of the 19th cen- tury the greater part of the township was still waste and unenclosed. It owes its increase in population to the neighbourhood of Manchester and contains a number of handsome villas belonging to the wealthier classes. The Moorsland pleasure-grounds in the neighbourhood cover 104 acres. There are national and British schools and a literary institute. Market gardening is extensively carried on. The population of the urban sanitary district (area, 2006 acres) in 1871 was 5573, and in 1881 it was 7915.

SALE is one of the forms of Conrract (¢.v.). The law of contract is accordingly applicable as a whole to the law of sale. But the importance of the contract of sale demands a fuller treatment. The law of the United Kingdom and of the United States is based upon the Roman law in its later stage, as modified by the pretors and by legislation. But there are some considerable dif- ferences. In Roman law sale originally meant nothing more than barter; but the introduction of coined money converted the contribution of one of the contracting parties into price (pretium), as distinguished from article of sale (merx) contributed by the other (see Roman Law, vol. xx. pp. 700-701). Sale fell under the head of consensual contracts, 7.e., those in which the causa or that which made the contract enforcible was consent. In all con- tracts of this class (except mandatum) consent really de- noted valuable consideration. The law in the case of movables and immovables was as far as might be the same. The price must be definite. Reduction of the terms to writing was optional; if a writing was used, either party was at liberty to withdraw before the com- pletion of the writing. If earnest or deposit (arrha)— often a ring, sometimes a part of the price—was given, it was by the legislation of Justinian made the measure of forfeit on rescission, the buyer losing what he had given as arrha, the seller restoring double its value. The seller did not warrant title ; his contract was not rem dare, to give the thing, but prestare emptorc rem habere lacere, to

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guarantee the buyer possession ; the transfer was of vacua | a sale appears to be the Statute of Enrolments (27 Hen.

possessio, not of property. The buyer was secured by a covenant duple stipulatio against eviction by a superior title, limited to double the price where there was no fraud by the seller. There was a warranty of quality by the seller. He was bound to suffer rescission or to give com- pensation at the option of the buyer if the thing sold had undisclosed faults which hindered the free possession of it. The damages to which he was liable differed according as he was guilty of bad faith (dolus) or not. If guilty he was liable for all consequential damage, if innocent only for the diminution in the value of the thing sold by reason of its unsoundness. Thus, if a seller

knowingly sold an infected sheep and the whole flock caught the disease and died, he would be liable for the value of the flock; if he was ignorant of the defect, he would be liable only for the difference in value between a sound and an unsound sheep. Mere overpraise did not amount to dolus ; nor was inade- quacy of price in itself a ground of rescission. When the agreement was complete it was the duty of the seller to deliver the thing sold (rem tradere). In case of a sale on credit, the delivery must be made at the time appointed. Prior to delivery the seller must take due care of the thing sold, the care which a reasonably prudent householder (bonus paterfamilias) was expectcd to exercise. Delivery did not pass property in the full sense of the word, but rather vacua possessio secured by duple stipulatio. Risk of loss (periculum rei venditex) after agreement but before delivery fell upon the buyer. On the other hand, he was entitled to any advantage accruing to the thing sold be- tween those dates. It was the duty of some one to pay the price ; the obligation was discharged if payment were made by the debtor or by any other person, whether authorized or not by the debtor, and even against his*will. The duties of buyer and seller might be varied by agree- ment, the only restriction being that the seller could not by any agreement be relieved from liability for dolus.

Sale in English law may be defined to be “a transfer of the absolute or general property in a thing for a price in money ” (Benjamin, On Sales, p. 1). The words “absolute or general” are inserted because there may be both a general and a special property in certain cases, and a transfer of the special property would not be a sale. The above definition, though applied in the work cited only to sales of personalty, seems to be fully applicable to sales of any kind of property. The rules as to legality, capacity of parties, assent, and fraud depend upon the law of Con- TRACT (q.v.), of which sale is a particular instance. In- capacity is either absolute or relative, the latter being a bar only in the individual case, ¢.g., the incapacity of a person in a fiduciary position (see Trust), The capacity of parties tends to become more extended as law advances ; thus in England the Roman Catholic, the alien, and the married woman have all been relieved within a compara- tively recent period from certain disabilities in sale and purchase which formerly attached to them.

In England, for historical reasons (see Reax Estate), there is a considerable difference in the law as it affects real and personal estate. The main principles of law are perhaps the same, but the sale of real estate is a matter of greater expense and intricacy than the sale of personal estate, and depends to a large extent upon legislation inapplicable to the latter. It appears, therefore, better to treat the two kinds of sale separately.

Real Estate.—At common law it was not necessary that there should be written evidence of a contract of sale. The publicity of the feoffment obviated the necessity of writing, which was not essential to the validity of a feoff- ment until the Statute of Frauds (see FEOFFMENT). The earliest statute making a written instrument essential] to

VIII. c. 16). The bargain and sale operating under the Statute of Uses, and enrolled under the Statute of Enrol- ments in the High Court of Justice or with the custos rotulorum of the county, is no longer in use; a bargain and sale at common law is a mode of conveyance some- times used by executors exercising a power of sale. Such a bargain and sale must be by deed since 8 and 9 Vict. c. 106, but need not be enrolled. There was no compre- hensive legislative enactment dealing with all cases of sale of real estate until section 4 of the Statute of Frauds. Since that date a contract for the sale of real estate must be in writing (see Fraup, where the provisions of the Act are set out). Sales by auction are within the statute, the auctioneer being the agent of both parties (see AUCTION). In an ordinary case of the sale of real estate the contract is formally drawn up on the basis of particulars and con- ditions of sale, which ought fairly to represent the actual state of the property. The statute, however, is satisfied by informal agreements, such as letters, if they contain the means of determining the property, the parties, and _ the price. The price must be a sum of money. If it is another estate, the contract is one of exchange ; if no con- sideration passes, it is a gift. The price may be left to be determined by a third person, as by arbitration. For the way in which payment of the price may be made, see PayMENntT. The formation of a binding contract of sale is the most important stage in the transfer of real estate. From the moment at which the parties are bound by the contract the sale is made ; the purchaser has the equitable estate in the subject-matter of the contract (see Equity), the vendor holding in trust for him, subject to the pay- ment of the purchase

money, for which the vendor! has alien. The price becomes personal estate of the vendor and the land real estate of the purchaser. ‘The latter has the right to accidental benefits and the burden of accidental losses accruing before completion of the purchase. The rights defined by the contract descend to the representa- tives of a deceased vendor or purchaser. In most cases the personal representative of a deceased vendor may convey the property under 44 and 45 Vict. c. 41, s. 4. After the contract it becomes the duty of the vendor to deliver an abstract of title, to satisfy the purchaser’s reasonable requisitions as to any question arising on the title of the purchaser, and to pay a deposit, usually ten per cent. of the price fixed, within a certain time, the remainder being paid on completion,—that is, the execution of the conveyance and payment of the balance of the price. He also prepares the conveyance, which since 8 and 9 Vict. c. 106 must be by deed. The costs of execution of the conveyance are paid by the vendor. Any of these duties may be varied by special agreement. ‘The sale is not in ordinary cases avoided because the purchaser is in default in payment of the purchase money on the day appointed. The purchaser does not forfeit his rights if he be ready to complete within a reasonable time after the day fixed for completion and to pay interest on the sum overdue. This rule is an old doctrine of equity, and is generally expressed by saying that time is not of the essence of the contract. As a general rule, any real estate is capable of sale, unless it is altogether extra commercium, as a church or public building. There are, however, a few exceptions introduced by the legislature, such as estates tail not barred, estates which by Act of Parliament are inalienable (see Reax Estate), and crown lands, of which all grants for more than thirty-one years are in general void by 1 Anne st.1,c.7. Sales of pretended titles to land are void by 32

the parties to a contract of sale of real estate. Where the sale is of personal estate, “buyer” and “seller” may be used as well.

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Hen. VIII. c. 9. The sale of land to be held in mortmain would be void as contrary to the policy of the Mortmain Acts (see CHARITIES, CORPORATION). The rights and liabilities of vendors and purchasers have been considerably affected by recent legislation, the principal Acts dealing

with the subject being the Vendor and Purchaser Act, 1874, and the Conveyancing Act, 1881. A period of forty years has been substituted for the period of sixty years previously necessary as the root of title,—that is to say, in most cases an abstract showing title for forty years is sufficient. In an abstract of title to leaseholds, the title is to commence with the lease or underlease, in an abstract of title to enfranchised lands, under a contract to sell the freehold, with the deed of enfranchisement. Recitals twenty years old are evidence, except so far as they can be proved to be inaccurate, and recitals of documents dated prior to the commencement of the abstract are to be taken as correct, and their production is not to be required. The expenses of evidence required in support of the abstract and not in the vendor's possession are thrown upon the purchaser. The Conveyancing Act, 1881, further protects the purchaser by implying in a conveyance by a beneficial owner on sale for valuable consideration covenants for right to convey, quiet enjoyment, freedom from encum- brances, and further assurance. In a conveyance of lease- holds a covenant for the validity of the lease is implied. These covenants protect the purchaser much in the same way as the implied warranty in the sale of personalty. The Act also gives the mortgagee, where the mortgage is by deed, the power of sale generally inserted in mortgage deeds (see Mortcace). .

The remedies of the vendor are an action for the price or for specific performance according to circumstances. There is also a remedy by mandamus against public com- panies refusing to complete. Specific performance is a remedy introduced by the Court of Chancery to enforce contracts for the sale or purchase of real estate, it being considered that in such cases the common law action for damages was an insufficient remedy. Strictly, it is only an exercise by the court of its jurisdiction over trustees, the vendor being after the contract, as has been said, a trustee for the purchaser. By the Judicature Act, 1873, actions of specific performance are specially assigned to the Chancery Division. A county court has jurisdiction where the purchase money does not exceed £500. In spite of the Statute of Frauds, specific performance may in some cases be decreed where a parol contract has been followed by part performance and where the position of the parties has been materially altered on the faith ofthe contract. Actions for the price or for specific performance are subject to the purchaser's right to compensation for deficiency of quality or quantity or of the vendor's

interest in the property. The question whether in a particular case the purchaser is entitled to rescind the contract or only to compensation is often a very difficult one. The remedies of the purchaser are an action for specific perform- ance, for rescission of the contract or for damages (in case of fraud), for a return of the deposit, or for expenses. On the principle of caveat emptor, the sale is not avoided by mere commendatory statements, statements of opinion, or non-disclosure of patent defects. Non-disclosure of latent defects or material misrepresentation of facts, on the faith of which the purchaser entered into the contract, will as a rule be a ground for rescission or for damages, and this irrespective of fraud, as a contract for the sale of land is a contract wbherrimex fidei. Where the sale goes off or the vendor without fraud fails to make a good title, the pur- chaser can only recover the deposit, if any, and any ex- penses to which he may have been put; he cannot recover damages for the loss of his bargain. Certain frauds by a

vendor or his solicitor or agent in order to induce the pur- chaser to accept a title render the offender guilty of a misdemeanour, as well as liable to an action for damages (22 and 23 Vict. c. 35, s. 24). By the Vendor and Pur- chaser Act, 1874, either a vendor or a purchaser of real or leasehold estate in England may obtain on a summary application the decision of a judge of the Chancery Division on any question connected with the contract, not being a question affecting its existence or validity. (See Sugden, Vendors and Purchasers; Dart, Vendors and Purchasers ; Fry, Specific Performance.)

Personal Estate—At common law, as in the case of real estate, writing was not essential to the validity of a contract of sale. The common law is thus stated by Blackstone: “A contract of sale implies a bargain, or mutual understanding and agreement between the parties as to terms; and the law as to the transmutation of property under such contracts may be stated generally as follows. If the vendor says the price of the goods is £4 and the vendee says he will give £4, the bargain is struck ; and, if the goods be thereon delivered or tendered, or any part of the price be paid down and accepted (if it be but a penny), the property in the goods is thereupon trans- muted and vests immediately in the bargainee; so that in the event of their

being subsequently damaged or de- stroyed he and not the vendor must stand to the loss. This supposes (it will be observed) the case of a sale for ready money ; but, if it be a sale of goods to be delivered forthwith, but to be paid for afterwards, the property passes to the vendee immediately upon the striking of the bargain without either delivery on the one hand or payment on the other" (Stephen, Commentaries, vol. ii. bk. ii. pt. 11. ch. v.). Earnest may have been originally the same as the Roman arrha; it was never, however, part payment, as arrha might have been,—in fact, the Statute of Frauds specially distinguishes it from part payment. The giving of earnest has now fallen into disuse. The price need not be fixed ; if not fixed, a reasonable price will be presumed. Though writing was in no case necessary at common law, it has become so under the provisions of various Acts of Parliament, prominent among which is the Statute of Frauds, ss. 4 and 17 (see Conrract, Fraup). Section 17 of the Statute of Frauds was extended to execu- tory contracts of sale by Lord Tenterden's Act, 9 Geo. IV. c. 14, The sale of horses in market overt must be entered in a book kept by the toll-keeper (2 and 3 Ph. and M. c. 7, 31 Eliz. c. 12). The sale of ships must by the Merchant Shipping Act, 1854, be made by bill of sale in a certain form. Contracts for the sale of shares in a joint-stock banking company are void unless the contract sets forth in writing the numbers of the shares on the register of the company or (where the shares are not distinguished by numbers) the names of the registered proprietors (29 and 30 Vict. c. 29). Bills of sale of goods must be in writing in a certain form and registered under the Bills of Sale Acts, 1878 and 1882.1 Asa general rule the property in goods passes by the contract of sale. This general rule is subject to the following important exceptions: (1) where the vendor is to do anything to the goods for the purpose of putting them into that state in which the purchaser is bound to accept them, the property does not pass until performance of the necessary acts; (2) the same is the case where the goods are to be weighed, tested, or measured ; (3) where the purchaser is bound to do anything as a condition on which the passing of the property depends, the property does not pass until the condition is fulfilled, even though the goods may be actually in the possession of the buyer; (4) where an executory contract for the

1 Bills of sale have been included here solely on account of their name ; they are in reality mortgages.

sale of goods is made, the property does not pass until appropriation of specific goods by the vendor in completion of the contract; (5) where the vendor reserves to himself the jus disponendi or future power of dealing with the goods, as by making a bill of lading deliverable to his order, the property does not pass until the jus disponendi is exercised in favour of the purchaser; (6) where there is fraud on the part of the vendor or purchaser, the sale is voidable, not void; it may be affirmed and enforced or rescinded. In sales of personalty, unlike sales of real estate, time is usually of the essence of the contract. A sale of goods may be accompanied by an express warranty or collateral contract as to the title to or quality of the goods. No special form of words is necessary to create a warranty, nor need it be in writing. An implied warranty of title—that is, an affirmation that the vendor has a right to sell—exists certainly in executory contracts of sale. It most probably exists in executed contracts,! the exceptions to the rule having in recent times become by judicial decision more numerous than the cases falling under the old rule, that there was no such warranty. Warranty of quality exists either by statute or at common law. The Merchandise Marks Act, 1862, implies a warranty from the existence of trade-marks on chattels that the trade- mark is genuine, and from the existence of any statement respecting number, quantity, weight, place, or country that such statement is not in any material respect false. The rules as to warranty of quality at common law cannot be better stated than in the language of the clear and full judgment of the Court of Queen’s Bench in Jones v. Just (Law Reports, 3 Queen’s Bench, 197).

‘* First, where goods are in esse and may be inspected by the buyer, and there is no fraud on the part of the seller, the maxim caveat emptor applies, even though the defect which exists in them is latent and not discoverable on examination, at least where the seller is neither the grower nor the manufacturer. The buyer in such case has the opportunity of exercising his judgment upon the matter, and if the result of the inspection be unsatisfactory, or if he distrusts his own judgment, he may if he chooses require a warranty. In such a case it is not an implied term of the contract of sale that the goods are of any particular quality or are merchant- able. So in the case of the sale in a market of meat which the buyer had inspected, but

which was in fact diseased and unfit for food, although that fact was not apparent on examination and the seller was not aware of it, it was held that there was no implied warranty that it was fit for food, and that the maxim caveat emptor applied. Secondly, where there is a sale of a definite existing chattel specifically described, the actual condition of which is capable of being ascertained by either party, there is no implied warranty. Thirdly, where a known described and defined article is ordered of a manufacturer, although it is stated to be required by the purchaser for a particular purpose, still if the known de- scribed and defined thing he actually supplied there is no warranty that it shall answer for the particular purpose intended by the buyer. Fourthly, where a manufacturer or dealer contracts to supply an article which he manufactures or produces, or in which he deals, to be applicd to a particular purpose, so that the buyer necessarily trusts to the judgment or skill of the manufacturer or dealer, there is in that case an implied warranty that it shall be reasonably fit for the purpose to which it is to be applied. In such a case the buyer trusts to the manufacturer or dealer, and relies upon his judgment and not upon his own. Fifthly, where a manufacturer undertakes to supply goods manufactured by him- self or in which he deals, but which the vendee has not had the opportunity of inspecting, it is an implied term in the contract that he shall supply a merchantable article. And this doctrine has been held to apply to the sale of an existing barge by the dealer which was afloat but not completely rigged and furnished ; there, inasmuch as the buyer had only seen it when built and not during the course of the building, he was considered as having re- lied on the judgment and skill of the builder that the barge was reasonably fit for use.”

The case of sale by sample is peculiar to personalty.

1 An executed contract passes title, an executory gives a right. A purchase for ready money in a shop is an executed contract, an order for a certain chattel to be made is an executory contract. The con-

sideration for such a contract is the express or implied i for the chattel on completion. ” – aor

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In such a sale the vendor warrants the quality of the bulk to be equal to that of the sample. There are certain kinds of sale which are governed by special legislation, chiefly on grounds of public policy. A sale contrary to the pro- visions of any of the Acts is generally void in the same way as though it were illegal at common law, on the principle of the maxim Lx turpi causa non oritur actio. The sale of certain public offices is forbidden by 5 and 6 Edw. VI. c. 16, 49 Geo. III. c. 126, and other Acts dealing with special offices. A sale by a tradesman in the way of his ordinary business upon Sunday is illegal under 29 Car. II. c. 7. The same is the case with the sale of intoxicating liquors during prohibited hours, whether on Sundays or week days (31 and 38 Vict. c. 49, s. 6). No action can be brought to recover any debt alleged to be due in respect of the sale of any ale, &c., consumed on the premises where sold (30 and 31 Vict. c. 142). The sale of game in the close season or by an unlicensed person is forbidden by 1 and 2 Will. IV. c. 32. The sale of spirits to a person apparently under the age of sixteen is made penal by 35 and 36 Vict. c. 94,8. 7. These cases are only given as examples; there are numerous other enactments dealing with, inter alia, sales of anchors and chain cables, adulterated food and drugs, explosives, and poisons. Every sale by weight or measure must be accord- ing to one of the imperial weights or measures ascertained by the Weights and Measures Act, 1878; if not so made, the sale is void (41 and 42 Vict. c. 49, s. 19).

The remedies of the vendor are of two kinds, judicial against the purchaser, extra-judicial against the goods. Judicial remedies are either by action for non-acceptance where the property has not passed or by action for the price where it has passed. The extra-judicial are (1) a lien for the price, so that, in the absence of agreement to the contrary or assent to a sub-sale, the vendor need not deliver the goods until the price is paid; (2) the right of stoppage 7m transitu. This right is universally acknow- ledged by the commercial law of civilized nations. It arises on the insolvency of the purchaser before the goods have reached his possession, and is defeasible only by transfer, whether by way of sale or pledge, of the bill of lading or other document of title to a bona fide indorsee for value. The protection afforded at common law to the bona fide transferee has been extended by the Bills of Lading Act, 1855, and by the Factors Act, 1877. There is no general right of resale by the vendor on default of the purchaser. The remedies of the buyer are an action for damages for non-delivery, for conversion, for breach of warranty,

for misrepresentation, &c., according to cir- cumstances. He has also a remedy analogous to specific performance under the Mercantile Law Amendment Act, 1856. The.Act gives power to the court or a judge, in an action for breach of contract to deliver specific goods, to order execution to issue for the delivery of the goods with- out giving the defendant the option of retaining them upon paying the damages assessed. The buyer has further a right to reject goods where they are different in kind or quality from those which he had a right to expect. He is entitled to keep them for a sufficient time to give them a fair trial. It should be noticed that the effect of mis- representation in the sale of real and personal property is not the same. As a rule innocent misrepresentation of facts does not give a right to rescind the sale, since a representation is, like an express warranty, not an integral part of the contract. A representation may, however, if so intended by the parties, become a condition a breach of which will avoid the sale. See Story's, Blackburn's, and Benjamin's treatises on the sale of personal property, especially Benjamin's, which is now the recognized text- book on the subject.

SALE

It may be useful to recapitulate shortly the main points of difference between Roman and English law. They have all been noticed in the preceding part of this article. (1) Arrha was not the same as earnest. (2) Written contracts were not necessary in Roman law under any circumstances, (8) There was no warranty of title in Roman law: the transfer was of vacua possessio, not of ownership ; in Eng- land there is a warranty of title (unless the parties other- wise intend) on sales of personalty, but not on sales of real property, though the covenants for title practically amount to a warranty. (4) There was a warranty of quality extending to undisclosed defects in Roman law beyond anything recognized by English law. (5) By Roman law the property did not pass until traditio; even then it was only property in a modified sense; it was rather vacua possessio secured by duplex stipulatio; by English law the property in specific ascertained goods vests by the contract in the buyer. (6) A sale by a person who was not the owner was not good in Roman law; it is good in certain cases in English law (see below).

There are certain kinds of sale which it is proposed to consider separatcly on account of the exceptional circumstances in which they stand.

Compulsory Sale.—As a general rule sale is a matter of contract between the parties, and no one can be forced to sell against his will, But in this, as in other matters, the right of the state comes in. Under the powers of the Lands Clauses and other Acts the state, cxercising its right of eminent domain, may force an owner to sell for the purpose of public improvements, —such as railways. The power of compulsory sale is less common where the interests of the state are not involved; an example occurs in the Partition Act, 1868, under which the court may order a sale instead of a division, even though some of the parties interested dissent.

Judicial Sale.—Under this head may be grouped all those sales which are made under the authority and by the direction of a court of justice. In regard to real property the most important example is the sale by order of the Chancery Division. Such a sale may be ordercd either under the original jurisdiction of the court or under the provisions of certain Acts of Parliament, such as the Lunacy Regulation Act, 1853, the Partition Act, 1868, the Settled Estates Act, 1877, or the Settled Land Act, 1882 (see Serrun- MENT). The Conveyancing Act, 1881, provides for freeing any land from encumbrances on sale by the court, on payment into court of a sum to meet the encumbrance. The Act also makes the order for sale conclusive in favour of a purchaser in almost every case. The abstract of title in a sale by the court is submitted to one of the conveyancing counsel of the Chancery Division, and the particulars and conditions are settled in judges' chambers. The sale is generally by public auction, the auctioneer being appointed by the judge. The regulations for the conduct of sales by the court will be found in the Rules of the Supreme Court, 1883, Ord. hi. r. 1-13.

The Bankruptcy Act, 1883, gives power toa trustee acting under the authority of a court of bankruptcy to sell all or any part of the property of a bankrupt by public anction or private contract. Simi- lar rights are given by the Scotch Bankruptcy Act, 1856. Judicial sales of the property of a debtor in Scotland are regulated by 19 and 20 Vict. c. 92. The term "judicial sale" does not seem to be used asa technical term in English as it is in Scotch law.

In admiralty actions a vessel may be sold under a commission of ap- praisement and sale issued by the court. The practice is now regulated by Ord. li. r. 14-16. Similar powers may be exercised in an action of sett in Scotland. A common instance ofa judicial sale is the sale by a sheriff of an execution debtor's goods under a writ of fiert facias or venditiont exponas. Where the execution is for a sum above £20 the sale is, unless the court otherwise orders, to be by public auction. Where the sheriff has seized and a claim by interpleader is set up, the court may order a sale of the whole or part of the goods (Rules of the Supreme Court, 1883, Ord. lvii. r. 12), The same rules (Ord. 1. r. 2) give a valuable power to the court or a judge of ordering a sale of any goods of a perishable nature, or such as for any reason it may be desirable to have sold at once.

Sale by Persons not Owners.—English law in general agrees with the rule in Dig. 1. 17, 54, 'Nemo plus juris ad alium transferre potest quam ipse haberet," and a purchaser takes his purchase subject to informalities in the title. To this rule there are several excep- tions, in which title may be given by persons who are limited Owners or not owners at all. An example of sale by a limited owner is a sale by a tenant for life under the powers given by the Settled Land Act, 1882. Under the same head would fall sales by persons having a qualified right of sale under particular circum- stances, such as a sheriff, the master of a ship in a foreign port, or

a pawnee in default of payment (see Puepcx). Sales by persons not owners at all must as a rule, in order to be valid, be made to purchasers ignorant of the defect of title on the part of the vendor, In the case of real estate a bona fide purchaser for valuable con- sideration without notice, actual or implied, of any adverse title is protected. This ison the principle that equity assists the person in possession of the legal estate. In the case of personal property title may be passed by a person not owner under the Factors Acts and in the case of stolen goods. The effect of the Factors Acts is to enable title to be given by the vendor or vendee or any person on his behalf while he is in possession of the documents of title (see Factors). The lawas to the sale of stolen goods will be found under THEFT.

Pre-emption.—This is a right of purchasing some particular property given to some particular person in priority to the public. It is conferred either by agreement between parties or by law. Thus by the Lands Clauses Act, 1845, before the promoters of an undertaking dispose of superfluous lands not required for the pur- poses of the undertaking they must (with certain exceptions) first. offer to sell the same to the person then entitled to the lands from which the same were originally severed. In the United States pre- emption is very important in its connexion with the homestead law (see HomEsTEaD). In international law the right is exercisable by a belligerent nation over property not strictly contraband, but which would still be of advantage to the enemy. The goods are not seized and condemned, but purchased by the capturing nation at a reasonable compensation. The right of pre-emption is given to. the admiralty by 27 and 28 Vict. c. 25, s. 38 (see CONTRABAND). The old crown prerogative of purveyance and pre-emption was a right of buying up provisions and other necessaries for the royal household at a valuation even without the eonsent of the owner, and also of impressing horses and carriages for the king's service on the public roads upon paying a settled price to the proprietor. The right was relinquished by the Act abolishing the feudal tenures

.(12'Car. IT. c. 24),

Scotland.—The law of Scotland follows the Roman law more closely than does English law. Thus in Scotch as in Roman law the contract of sale is called a consensual contract ; the sale is not complete until delivery, and market overt does not afford any pro- tection. Writing is essential to the sale of heritable property, not by any statnte, as in England, but by the ancient unwritten law. fei interventus may, however, in some cases, like part performance in England, supply the place of writings. The vendor is bound on eompletion to supply a sufficient progress of titles. In addition to the protection afforded to the purchaser by the progress of titles the statutory form of warrandice in 31 and 32 Vict, ec. 101, s. 8 implies, unless specially qualified, absolute warrandice as regards the lands and writs and evidents, and warrandice from fact and deed as regards the rents,—that is to say, that a good title to the land has been conveyed, and that the granter has not done and will not do anything contrary to the writ as regards the rents (see Watson, Law Diet., s.v. ''Warrandice"). In the case of movables writing is

not necessary for a good contract of sale, except where the sale is of a ship, or the parties agree to reduce the terms to writing. The Mercantile Law Amendment (Scotland) Act, 1856 (19 and 20 Vict. c. 60), has made important changes in the law of Scotland. ‘‘The statute was passed for the purpose of assimilating the law of Scotland to that of England” (Lord Watson, in M‘Bain v. Wallace, Law Reports, 6 Appeal Cases, 588). By section 1 goods after sale but before delivery are not attachable by the creditors of the seller. By section 2 the sub-purchaser may demand that delivery be made to him instead of to the original purchaser, without pre- judice to the right of retention of the seller. By section 3 the seller of goods may attach the goods while in his own possession at any time prior to the date when the sale of such goods shall have been intimated to him. By section 5 the English principle of caveat emptor is introduced: ‘‘ where goods shall be sold the seller, if at the time of the sale he was without knowledge that the same were of defective or of bad quality, shall not be held to have warranted their quality or sufficiency, but the goods, with all faults, shall be at the risk of the purchaser, unless the seller shall have given an express warranty of the quality or sufficiency of such goods, or unless the goods have been expressly sold for a specified and par- ticular purpose, in which case the seller shall be considered, with- out such warranty, to warrant that the same are fit for such pur- pose.” The right of retention corresponds closely to the right of lien in England, but rests upon the simpler ground of undivested property (see Watson, Law Dict., s.v. “Sale”). Criminal liability for fraud seems to be carried farther in Scotland than in England (see FRAuD).

United States.—The law as to the sale of real estate agrees gener- ally with English law. It is considerably simplified by the system of REGISTRATION (¢.v.). The covenant of warranty, unknown in England, is the principal covenant for title in the United States. It corresponds generally to the English covenant for quiet enjoy- ment. The right of judicial sale of buildings under a mechanic’s lien for labour and materials is given by the law of many States.

The sale of public lands is regulated by Act of Congress (Revised Statutes, 2358-2379). In the law of sale of personal property American law is also based upon English law. The principal dif- ferences are that the law of market overt (see THEFT) is not recog- nized by the United States, and that an unpaid vendor is the agent of the vendee to resell on non-payment, and is entitled to recover the difference between the contract price and the price of resale. The law of Louisiana (Civil Code, § 3194) gives the unpaid vendor a still greater right in his preferential claim for the price against the creditors of the purchaser, if the property still remains in the latter's possession. Warranty of title is not carried as far as in England. United States decisions draw a distinction between goods in the possession and goods not in the possession of the vendor at the time of sale. Thcre is no warranty of title of the latter. The Statute of Frauds has been construed in some respects differently from the English decisious. The differences will be found in Mr Benjamin's work. As to unlawful sales, it has been held that a sale in a State where the sale is lawful is valid in a State where it is unlawful by statute, even though the goods are ee,

tate. , SALEIYER (in Mancassarese Sildyara, in Buginese Sildja), also called T'ana-dowang ("Land of Shrimps "), is a Dutch island separated from the south coast of Celebes (East Indies) by a strait 8 miles wide, which in the west monsoon is used by vessels bound for the Moluccas, the Philippines, and China. With a length of 46 miles and general breadth of 9, the area is estimated at 315 square miles. Along the east side of the island is a belt of voleanic rock ; the west side is of limestone or coralline formation. The highest point seems to be Haru on the east coast, but estimates of its altitude vary from 1000 to 3000 feet. 'There are no navigable rivers, and many of the streams dry up in the west monsoon. Besides most of the ordinary tropical fruits, the cultivated plants comprise Indian corn, barley, potatoes, tobacco, coffee, and indigo, and among the trees are cocoanut and areng palms, kanari, ebony, and teak (the last considered the property of the Dutch Government). Horses, buffaloes, goats, and sheep are kept, and pigs and deer exist in a wild state. The population of Saleiyer and dependencies, mainly a mixed race of Mancassars, Buginese, and natives of Luvu and Buton, was in 1869 55,147, and in 1880 66,276. They use the Mancassar language, are for the most part nominally Mahommedans (though many heathen customs survive), and support themselves by agriculture, fishing,

seafaring, trade, the preparation of salt (on the south coast), and the weaving of clothing materials. Field work is largely performed by a servile class. Raw and prepared cotton, tobacco, trepang, tortoise-shell, cocoanuts and cocoanut oil, and salt are the principal articles of export.

The island is divided into nine regencies :—Tanette, Batammata

(Batangmata; including the former regency of Onto), Buki, Mare- Mare, Bonéya—all five in the north—Bontobangung, Balla-bulo,

Layolo, and Barambarang—in thesouth. Panggiliyang or Benteng ~

on the west coast, often called also Saleiyer, is the capital of the island. It stands in 6° 3’ 3”S. lat. and 120° 31’ 48” E. long., and possesses the best harbour on the whole coast, being protectcd by Pulo Pasi or Hog Island (also Sariwa or Pulo Babi). To the Salciyer group belong a variety of small islands, for the most part uninhabited—Tana Jampéya (the largest of all with a good anchor- age at Maringi Bay), Gowang, Malimbu, &c. Previous to the Dutch occupation the Saleiyers were subject to the king of Ternate.

SALEM, a British district of India, in Madras presi- dency, lying between 11° 1’ and 12° 57’ N. lat. and 77° 32’ and 79° 5’ E. long. It embraces an area of 7653 square miles, and is bounded on the N. by Mysore and North Arcot, on the 8. by Coimbatore and Trichinopoly, on the E. by Trichinopoly and South and North Arcot, and on the W. by Coimbatore and Mysore. Except towards the south, the district is very hilly, with large plains lying between the several ranges. Salem is described as consisting of three distinct tracts of country, known as the Talaghat, the Béramahdl, and the Balaghat. The Talaghat is situated below the Eastern Ghats on the level of the Carnatic gencr- ally ; the Béramahdl includes the whole Salem face of the Ghats and a wide tract of country at their base; and the

Balaghat is situated above the Ghats on the tableland of Mysore. The western part of the district is very mountain- ous, some of the ranges attaining an elevation of between 5000 and 6000 feet. Amongst the chief ranges are the Shevaroys, the Kalrayans, the Melagiris, the Kollimalais, the

Pachamalais, and the Yelagiris. The chief rivers are the Cauvery with its numerous tributaries, and the Pennar and Palar; the last, however, only flows through a few miles of the Tirupatur tdluk, situated in the north-western corner of the district. The forests are of considerable value and their area is roughly estimated at 2251 square miles. The geological structure of the district is mostly gneissic, with a few irruptive rocks in the form of trap dykes and granite veins. Magnetic iron ore is common in the hill regions, and corundum and chromate of iron are also obtainable. The qualities of the soil differ very much ; in the country immediately surrounding the town of Salem a thin layer of calcareous and red loam generally prevails, through which quartz rocks appear on the surface in many places. The climate, owing to the great difference of elevation, varies considerably ; on the hills it is cool and bracing, and for a great part of the year very salubrious ; the average rainfall is about 38 inches. Salem has about 1400 miles of road, and the length of railway line within the district is 134 miles.

In 1881 the population was 1,599,595 (males 778,483, females 821,112); Hindus numbered 1,531,855, Mohammedans 51,092, and Christians 16,567. Besides Salem (see below), the capital, the district contains three other towns with a population exceeding 10,000 each, viz., Daringambadi (15,426), Tirupatur (14,278), and Shendamangalam (12,575). Of the total area of the district only 1,283,190 acres were under cultivation in 1883-84; but of these 187,408 acres were twice cropped. The staple crops are rice and ragi; other important crops are pulscs and seeds. The chief industry is weaving, which is carried on in almost every large town aud village. Carpets of great beauty and superior workmanship are made in the Salem jail. Good iron and steel arc made, but only ona small scale. The gross revenue of the district in 1883-84 was, £260,364, the land-tax contributing £211,062 of the amount. Though Salem has no connected history, there are few parts of Southern India that contain more spots of interest for English students. As at present composed it was acquired by the treaty of peace with Tipu Sultan in 1792 and the partition treaty of Mysore in 1799. By the former the Talaghat and Baramahal were ceded, and by the latter the Balaghat, or what is now the Osur ¢dluk.

SALEM, chief town of the above district, situated in 11° 39’ 10” N. lat. and 78° 11’ 47° E. long., is @ buy trading place, with a considerable weaving

industry. It is tolerably well built and is prettily situated on the river Tirumanimuttar, 900 feet above sea-level, in a long valley enclosed by the Shevaroy hills, which are 6 miles distant. The population of the town in 1881 was 50,667 (malcs 24,584, females 26,083).

SALEM, a city of the United States, capital of Essex county, Massachusetts, is built on a peninsula between two inlets of the sea (North river and South river), in 42° 31′ 18” N. lat. and 70° 53’ 53” W. long., 16 miles north by east of Boston, on the Eastern Railroad. In the latter part of the 18th and the early part of the 19th century Salem was the seat of a flourishing foreign commerce, especially with the East Indies; but, its comparatively shal- low harbour failing to accommodate the larger vessels of modern times, it has been supplanted by Boston and has to content itself with a good share of the coasting trade. Its industrial activity has, on the other hand, increased, and it now possesses steam cotton-mills, jute-factories, extensive tanneries, and various minor manufactories. The main interest, however, of Salem consists in its historical and literary associations and the institutions by which they are represented. Best known of these institutions is the Peabody Academy, founded in 1867 with funds provided by the well-known philanthropist. The academy at once purchased and refitted the East India Marine Hall, origin-

ally built in 1824 by the East India Marine Society (1799), which consisted of captains and supercargoes who had doubled either Cape Horn or the Cape of Good Hope; and .the building now contains under the trusteeship of the academy the collections of the old East India Museum and those of the Essex Institute, illustrating the zoology, natural history, and archeology of the county. The ethno- graphical collections, such as that dealing with Corea, are especially valuable. The American Naturalist has been the organ of the academy since 1867. The Peabody Institute, not to be confounded with the academy, is in the village of Peabody (Danvers), about 2 miles distant from Salem and about midway between the house in which the philanthropist was born and the grave, in Harmony Grove cemetery, in which he was buried. The institute contains various personal relics of the founder, such as the famous portrait of Queen Victoria. Plummer Hall, a fine building in Essex Street, erected out of funds left to the Salem

Atheneum by Miss Plummer, contains the libraries of the Athenzeum, the Essex Institute, and the South Essex Medical Society, making an aggregate of 50,000 volumes. Behind this hall is the frame of the oldest church edifice in New Eng- land, erected in 1634 for Roger Williams. Other buildings of note in Salem are a State normal school, the city hall, the court-house, St Peter's Episcopal church, the custom- house, in which Nathaniel Hawthorne once acted as clerk, and several of the private houses (such as ‘‘ Dr Grimshawe's house," the dwelling really occupied by Dr Peabody, Mrs Hawthorne's father) which, while not exactly prototypes, have lent much of their verisimilitude to the localities of Hawthorne's fiction. The house in which the novelist was born is 21 Union Street. Salem had 24,117 inha- bitants in 1870, 26,063 in 1875, and 27,563 in 1880.

Naumkeag (Eel Land) was the Indian name of the district in which Salem stands, and is still used familiarly by the inhabitants. The first house was built by Roger Conants from Cape Ann in 1626, and two years later a settlement was formed by John Endicott and called Salem, "from the peace they had and hoped in it." In 1630 Governor Jolin Winthrop introduced a large body of colonists from England, including the brave and beautiful Arabella Johnson, daughter of the earl of Lincoln, who died shortly afterwards. In 1661 the Quakers were persecuted at Salem, and in 1692 the town was the scene of Cotton Mather's terrible proceedings against witch- craft: nineteen persons were hanged on Gallows Hilland Giles Cory was pressed to death. It was in Salem that in 1774 the house of representatives of Massacliusetts resolved themselves into a sovereign political power. The town obtained a city charter in 1836. Few cities of the United States have given more eminent men to the world—Timothy Pickering, secretary of state (1795-1880), General Israel Putnam, F. T. Ward of China celebrity, John Rogers the sculptor, Bowditch the astronomer and mathematician, Maria S. Cummins the novelist, W. H. Prescott the historian, and Nathaniel Hawthorne.

SALEM, a city of the United States, the county seat of Salem county, New Jersey, on a small stream of the same name, by which it has steam communication with Phil- adelphia (on the Delaware), 44 miles distant to the north- north-east by rail. While Salem depends mainly on the agricultural prosperity of the surrounding district, it also contains foundries

and machine-shops, fruit-canning estab- lishments, glass-ware factories, oil-cloth factories, &c. The population was 3052 in 1850, 4555 in 1870, and 5056 in

1880,

A colony settled on the site of Salem in 1641 was replaced by a Swedish fort, and this passed through the Dutch to the English. One of the Quakers who in 1673 bought Lord Berkeley's half of New Jersey gave the place its present name and restored the settle- ment, which in 1682 was declared a port of entry. In 1778 the town was plundered by Colonel Manhood.

SALEM, a city of the United States, the capital of Oregon, in Marion county, on the east bank of Willamette river, 53 miles south of Portland by the Oregon and California Railroad. It lies in a fertile prairie district, adorned with copses, and possesses a good source of water- power in Mill Creek. The capitol, a rather imposing edifice

with a tower 180 feet high, erected in 1875-76, occupies a fine site above the city; other public buildings are the Willamette University (Methodist), which grants degrees in medicine, science, and general literature, the opera-house, the Roman Catholic school for girls, the State penitentiary, and State schools for the deaf and dumb and the blind. Lumber, woollen goods, flour, leather, brass castings, furni- ture, linseed oil, and building materials are the chief articles of manufacture and trade. The population was 2538 in 1881. Settled in 1834, incorporated in 1853, Salem be- came the State capital in 1860.

SALEP (Arab. sahleb, Gr. épxis), a drug extensively used in the East as a nervine restorative and fattener, and also much prescribed in paralytic affections, probably owed its original popularity to the belief in the so-called "' doctrine of signatures." In Europe it is chiefly used as a demulcent drink, but is also supposed to possess nutrient properties ; it may be employed with advantage in inflammatory condi- tions of the mucous membrane, as in bronchitis, diarrhcea, cystitis, and other urinary disorders. It consists of the tuberous roots of various species of Orchis and Hulophia,

which are decorticated, washed, heated until horny in ap- pearance, and then carefully dried. The most important constituent of salep is a kind of mucilage which it yields to cold water to the extent of 48 per cent. This mucilage in its chemical reactions is more nearly allied to cellulose than to gum, since when dry it is readily soluble in ammoniacal solution of copper; when boiled with nitric acid it yields oxalic but not mucic acid. Salep also con- tains sugar and albumen, and when fresh traces of a volatile oil; dried at 100° C. it yields 2 per cent. of ash, chiefly the phosphates and chlorides of potassium and calcium.

Salep was formerly imported into Europe from the Levant, but in 1760 the French chemist Geoffroy discovered its true nature and showed how it might be prepared from the species of Orchis indi- genous to France. That used in Germany is obtained from plants growing wild in the Taunus Mountains, the Westerwald, the Rhon, the Odenwald, and Franconia. Grecian salep is chiefly collected in Macedonia. In Asia Minor the tubers are collected near Melassa and Mughla, and about 330 tons are annually exported from Smyrna. The salep of the Bombay market, which is imported principally from Persia, Cabul, and northern India, occurs in three forms, palmate, large ovoid, and small ovoid tubers on strings, all more or less horny and translucent. Salep is also produced on the Nilgiri (Neilgherry) Hills and in Ceylon. Besides the above-men- tioned forms, elongated cylindrical tubers, usually in pairs and undecorticated, are occasionally met with. The palmate tubers are the most highly esteemed, being valued at ten rupees per pound. This variety is known in the Bombay market.as Persian salep. It is probably derived chiefly from 0. latifolia, L., although O. macu- lata, L., O. saccifera, Brongn., and O. conopsea, L., also afford pal- mate tubers. The species known to yield ovate salep are O. mascula, 0. Morio, O. pyramidalis, O. ustulata, O. militaris, O. coriophora, L., and O. longicruris, Link. All these species are natives of the greater part of central and southern Europe, Turkey, the Caucasus, and Asia Minor, O. latifolia extending to western India and Tibet and Q. conopsca to the Amur, in the extreme east of Asia. Salep is not easily reduced to powder, being both hard and tough, and is therefore usually ground between millstones. This difficulty is said to belessened if the salepis first soaked in cold water until soft and then rapidly dricd. As the powdcr does not mix readily with water, the authors of Pharmacographia (2d ed. p. 656) recommend that it should be first mixed

with 13 parts of rectified spirits of wine (brandy or other strong spirit would answer equally well), 40 parts of cold water being then added quickly and the mixture boiled. In these proportions salep affords a thick jelly.

SALERNO, a city of Italy and the chief town of a pro- vince of its own name (formerly Principato Citeriore), is beautifully situated on the west coast 34 miles south-east of Naples, and presents a fine appearance with the ruins of its old Norman castle on an eminence 905 feet above the sea and its background of graceful limestone hills. The town walls were destroyed in the beginning of the 19th cen- tury; the seaward portion has given place to the Corso Garibaldi, the principal promenade. Among the con- spicuous buildings are the theatre, the prefecture, and the

cathedral of St Matthew (whose bones were brought from Pestum to Salerno in 954), begun in 1076 by Robert Guis- card and consecrated in 1084 by Gregory VII. In front is a beautiful quadrangular court (112 by 102 feet), sur- rounded by arcades formed of twenty-eight ancient pillars mostly of granite ; and the middle entrance into the church is closed by a remarkable bronze door of 11th or 12th century Byzantine work. The nave and two aisles end in apses. Two magnificent marble ambos, the larger dating from 1175, several specimens of ancient mosaic, and the tombs of Gregory VII. and Queen Margaret of Durazzo deserve to be mentioned. In the crypt is a bronze statue of St Matthew. The lofty aqueduct, one of whose arches is now used by the railway, is a building of 1320; the present water-supply is provided by a canal formed in 1865. A fine port constructed by Giovanni da Procida in 1260 was destroyed when Naples became the capital of the king- dom, and remained blocked with sand till after the unifica- tion of Italy. A series of works, especially those decreed in 1880, have provided an inner harbour of 40 acres (depth 12 to 22 feet), an outer harbour (22 to 25 feet), and wharves to the extent of £468 feet. In 1884 180 vessels (29,078 tons) entered and 173 (28,069) cleared. Silk and cotton spinning are the principal industries. The population was 19,905 in 1870 and 22,328 (commune, 31,245) in 1881. A Roman colony was founded at Salerno (Salernum) in 194 B.c. to keep the Picentines in check, but the city makes no figure in history till after the Lombard conquest. Dismantled by

order of Charle- magne, it became in the 9th century the capital of an independent principality, the rival of that of Benevento, and was surrounded by strong fortifications. The Lombard princes, who had frequently defended their city against the Saracens, succumbed before Robert Guiscard, who took the castle after an eight months' siege and made Salerno the capital of his new territory. The removal of the court to Palermo and the sack of the city by the emperor Henry VI. in 1194 put a stop toits development. The position which the medical school of the Civitas Hippocratica (as it called itself on its seals) held in medieval times has been described under MEDICINE, vol. xv. pp. 806-807. Salerno university, founded in 1150, and long one of the great seats of learning in Italy, was closed in 1817, SALES, Frangors DE (1567-1622), see vol. ix. p. 695. SALFORD. See Mancuzsrer, vol. xv. p. 459 sq. SALICIN, the bitter principle of willow bark, was dis- covered by Leroux in 1831. It exists in most species of Salix and Populus, and has been obtained to the extent of 3 or 4 per cent. from the bark of S. helix and S. pentandra. According to Herberger, the bark of the young branches affords salicin in larger proportion than that of the trunk and contains less of the other ingredients which interfere with its extraction. Salicin is prepared from a decoction of the bark by first precipitating the tannin by milk of lime, then evaporating the filtrate to a soft extract, and dissolving out the salicin by alcohol.

As met with in commerce it is usually in the form of | It is neutral to test paper, |

glossy white scales or needles. inodorous, unaltered by exposure to the air, and has a persistently bitter taste.. It is soluble in about 30 parts of alcohol or water at the ordinary temperature, and in 0°7 of boiling water or in 2 parts of boiling alcohol, and more freely in alkaline liquids. It is also soluble in acetic acid without alteration, but is insoluble in chloroform and benzol. From phloridzin it is distinguished by its ammoniacal solution not becoming coloured when exposed to the air. Cold sulphuric acid dissolves salicin, forming a bright red solution. When salicin is heated with sul- phuric acid and potassium bichromate, salicylic aldehyde (C;H,O,) is formed, which possesses the odour of meadow- Sweet flowers (Spirza Ulmaria, I.)

Salicin is chiefly used in medicine as an antipyretic in acute rheumatism, for which it is given in doses of 5 to 30 grains. Its action is less powerful than that of Sat CYLIC AcrD (9.v.), and its depressing effect on the circulation is less marked. It is also given for headache and for ague,

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Salicin is a glucoside, having the composition C\3H,,0,, and is uot precipitated by the alkaloidal reagents. It has been prepared artificially from helicin, synthesized from sodium, salicyl-aldehyde, and aceto-chlorhydrose, being the first glucoside that has been arti. ficially prepared (Journ. Chem. Soc., 1884, p. 489). According to Binz, it may be split up by digestion with emulsin or saliva into salicylic alcohol (saligenol, C,H,O.) and glucose ; heating it gently with dilute sulphuric acid produces a similar effect, Salicylic alcohol is converted by oxidizing agents into salicylic acid. This acid is formed when salicin is taken internally, since salicin is eliminated from the system partly in the form of salicylic and salicyluric acids, and partly as saligenin.

SALIC LAW, anp orner Barpartan Laws. The (1) Lex Salica is one of those Teutonic laws of the early Middle Ages which are known as leges barbarorum, among which we also reckon the (2) Lex Ripuariorum or Ribuart- orum, (3) Ewa (Lex) Francorum Chamavorum, (4) Lex Alamannorum, (5) Lex Bajuvariorum, (6) Lex Frisionum, (7) Lee Angliorum et Werinorum, h.e., Lhuringorum, (8) Lex Saxonum, (9) Leges Anglo-Saxonum, (10) Lea Bur- gundionum, (10a).Lea Romana Burgundionum, (11) Lex Wesigothorum, (lla) Breviarium Alarici, (11b) dictum Theodorict, (12) Leges Langobardorum, and to a certain extent (13) Leges Wallix. All these laws may in general be described as codes of procedure and of rights, which regulated for some indefinite period the internal affairs of the several Teutonic tribes whose names they bear.

(1) The Sadie Law originated with the Salian Franks, often simply called Salians, the chief tribe of that con: glomeration of Teutonic peoples known as FRANKS (q.v.).

Aurel., c. 7), after which date we find them carrying on an almost uninterrupted struggle with the Roman empire, till 486, when they finally

established a kingdom of their own in provinces which had previously been considered Roman. The Salian Franks first appear under their specific name in 358, when they had penetrated westwards as far as Toxandria (Texandria, now Tessenderloo, in Limburg, the region to the south and west of the lower Meuse), where they were subdued by the emperor Julian (Ammian., xvii. 8). As regards their previous history nothing is known with certainty, though it seems probable that the Franks who occupied the Batavian island c. 290, and were there conquered in 292 by Constantius Chlorus (Paneg. imcerti auth. c. 4), and thence transplanted into Gaul, were the Salian Franks. We find, moreover, such un-

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mistakable evidence of a connexion between the Sigambri

and the Salii! that the latter are by some regarded as the descendants of the Sigambri whom Tiberius removed in 8 z.c. from their home on the right bank of the Rhine ; and it is argued that he did not transform them into the Gugerni, nor place them on the Merwede, a stream and locality near Dordrecht and Zwijndrecht, but transplanted them into the region now called the Veluwe, between the Utrecht Vecht and the Eastern Yssel, where the Romans probably made of them what the Batavi had been for years past —their allies—perhaps on the same condition as the latter, who merely furnished the Romans with men and arms. This accounts for the Sigambrian cohort in the Thracian War in 26 4.p. Some think, however, that the Salians were a separate tribe of the Franks who merely coalesced with the Sigambri (comp. Watterich, Die Ger- manen des Rheins; Waitz, Verfass., ii. 24). In 431 the Frankish (Salic) king Chlodio (Chlojo, Chlogio), said to have been a son (or the father) of Merovech, the founder of the Merovingian dynasty (Greg. Tur., 11. 9), took Cam- brai and advanced his dominion as far as the Somme (Greg., 7b. ; Sid. Apoll., v. 211 sg.), though still acknow- ledging Roman supremacy. Childerich reigned from 457 to 481, and resided at Tournai, where his grave was dis- covered in 1653. His son Clovis (Chlovis, Chlodovech) in 486 extended his empire to the Seine (Greg. Tur., il. 43, 27). For an account of him, see vol. ix. pp. 528, 529.

We have very few means of ascertaining when the Salic Law? was compiled, and how long it remained in force. Our knowledge of the code is

derived—(i.) from ten texts, preserved in a comparatively large number of manuscripts, chiefly written in the 8th and 9th centuries ; (ii.) from allusions to a Salic Law in various charters and other documents. But the Latin texts do not contain the original Salic Law. This is clear (a) from the allusions we find in them to a “Lex Salica” and “Antiqua Lex,” which can hardly be anything but references to another and earlier Lex Salica ; (6) from a certain peculiarity and awkwardness in the construction of the Latin, which, though it is so-called Merovingian, and therefore very corrupt, would have been different if the texts were original compilations ; (c) from a number of words, found in nearly every paragraph of certain groups of the MSS., and now known as “ Malberg glosses,” which are evidently the re- mains of a vernacular Salic Law, and appear to have been retained in the Latin versions, in some cases because the translators seemed doubtful as to whether their Latin terms correctly rendered the meaning of the original, in other cases because these words had become legal terms, and indicated a certain fine. We do not know whether the original Frankish law-book was ever reduced to writing, or merely retained in, and handed down to posterity from, the memory of some persons charged with the preservation of the law. All that we know of such an original is con- tained in a couple of prologues (apparently later than the texts themselves) found in certain MSS. of the existing

1 “Detonsus Vachalim [the river Waal] bibat Sicamber” (Sid. Apoll., Carm., xiii. 31). “ Ut Salius jam rura colat flexosque Sicambri In falcem curvent gladios’” (Claudian, De Laude Stilic., i. 222). According to the Gesta Franc., c. 1, the Franks at one time inhabited the town of Sicambria. The earliest Frankish kings, who were undoubtedly kings of the Salian Franks, are often called Sigambri, and always with the object of honouring them. St Remigius, when he baptized Clovis, exhorted him, ‘‘Mitis depone colla Sicamber ” (Greg. Tur., ii. 31). Venantius Fortunatus (vi. 4) says to King Chari- bert, “Cum sis progenitus clara de gente Sygamber.” For further evidence, comp. Waitz, Verfass., ii. 22 sq.

2 The origin of the name Salicus, Salius, is uncertain. It is not improbable that it was derived from the river Yssel, called in the Middle Ages Isloa, Hisloa, Isla, Isela, Isalia. The region about Deventer, in the east of Holland,

is still called Salland, though it is nowhere expressly said that the Salians ever lived there.

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Latin versions. One of them states that four men ‘in villis que ultra Renum sunt per tres mallos (judicial as- semblies) convenientes, omnes causarum origines sollicite discutiendo tractantes, judicium decreverunt,” which must refer to a period before 358, as in that year the Salian Franks had already crossed the Rhine and occupied the Batavian island and Toxandria. Another prologue says that the Salic Law was compiled (dictare) while the Franks were still heathens (therefore before 496), and afterwards emended by Clovis, Childebert, and Chlotar. Nor can it be stated with certainty when the Latin translations which we now possess were made, but it must have been after Clovis had extended his power as far as the Loire (486-507), as in chapter 47 the boundaries of the Frankish empire are stated to be the Carbonaria Silva (in southern Belgium between Tournai and Liége) and the Loire.®

There exist five Latin recensions, more or less different. (i.) The earliest of the code (handed down in four MSS. with little difference, and very likely compiled shortly after Clovis extended his empire to the Loire) consists of sixty- five chapters (with the Malberg glosses). In the course of the 6th century a considerable number of chapters appear to have been added (under the title of ‘‘ edicts” or “decrees”), some of which are ascribed to Clovis, and the remainder to his successors before the end of the cen- tury. One of them (chap. 78) may with some certainty be ascribed to Hilperic (c. 574). Some others seem to have originated with Childebert I. and Chlotar I. (whose joint reign lasted from 511 to 558), and are known collectively as ‘“Pactus Childeberti et Chlotharii.” From internal evi- dence we may infer that this first version dates from a time when Christianity had not yet become general among the Franks. (ii.) Two MSS. contain a second recension, having the same sixty-five chapters (with the Malberg glosses) as the first, but with numerous interpolations and additions, which point to a later period. Especially may this be said of the paragraph (in chap. 13) which pronounces fines on marriages between near relatives, and which is presumed to have been embodied in the Lex Salica from an edict of

Childebert IT. issued in 596. In chapter 55 paragraphs six and seven speak of a “basilica,” of a “basilica sancti- ficata,” and of a “basilica ubi requiescunt reliquiz,” but it is more than doubtful whether we have here any evi- dences of Christianity, though a later recension (the fourth) altered “basilica” into “ecclesia,” the “‘reliquiz” into “‘reliquize sanctorum,” and thereby gave a decidedly Chris- tian aspect to the clause. (iii.) A third recension is con- tained in a group of nine MSS. (divided into two classes), three of which have the same text (with the Malberg glosses) as the MSS. of the first and second recensions, divided, however, systematically into ninety-nine chapters, while the other six MSS. have the same ninety-nine chapters, with very little difference, but without the Mal- berg glosses. This text seems to have been arranged in Pippin’s or Charlemagne’s reign (c. 765-779). The clause on marriages between near relatives mentioned above is not found in this recension. On the other hand, we find in chapter 55 (=77) fines pronounced on the murder of a presbyter and deacon (no bishop yet mentioned), while the six MSS. of the second class do not contain chapter 99 (“De Chrenecruda”), but merely say that the symbolism described in that chapter had been observed in heathen times, and was to be no longer in force. (iv.) The fourth version (handed down in a great number of MSS., and embodying in seventy chapters substantially the whole of the previous versions) is usually called Lex Salica Emen- data, as the text bears traces of having been emended (by Charlemagne), which operation seems to have consisted in

3 Some explain Ligeris to be the river Leye, a branch of the Scheldt, in which case the compilation would fall between c. 453 and 486.

eliminating the Malberg glosses from the text, correcting the Latin, omitting a certain number of paragraphs, and inserting some new ones. In chapter 55 the bishop is mentioned with the presbyter and the deacon. (v.) Finally, we have a fifth text, which seems an amalgamation of the previous recensions, more especially of the second, third, and fourth, but here and there with considerable differences. It was published in 1557, at Basel, by Bas. Joh. Herold (Originum ac Germanicarum Antiguitatum Libri) ; but no trace of

the Fulda and other MSS. which the editor says that he used has hitherto been found.

The Salic code consists of enactments regarding procedure in lawsuits (chaps. 1, 18, 26, 37, 46-53, 56, 57, 60), judicial fines and penalties for various kinds of theft and kidnapping (2-8, 10-12, 21- 93, 27, 28, 33-35, 38-40, 55, 61), for offences, injuries, &c., to per- sons, animais, and property (9, 15-17, 19, 20, 24, 25, 29-32, 36, 41-48, 64, 65); it regulates the ‘‘wergeld” (a word found only in the text published by Herold; all the other texts have Jeodis, leudis= people, associate of the people) of all classes of persons living under the Salic Law (41-43, 54, 63), the share of the kindred in the composition for homicide (58-62), the devolution of property and inheritance (59), migration from one village to another (45), &c.

The Salic Law speaks of (a) freeborn persons (ingenwus Francus, Salicus Francus), with a wergeld of 200 solidi, which was tripled when such a person served in the army, and the latter amount again tripled when the person killed was an officer of the king ; (6) serfs (Zett or litt), who enjoyed personal freedom though belonging to some master, and © puert regis (probably serfs in the service of the king), both with a wergeld of 100 solidi; (@) the Roman popu- lation, not yet placed on the same footing with the Francus (yos- sessores with a wergeld of 100 solidi; éributariz, perhaps=eolont, with a wergeld of 624 solidi); (¢) slaves (servz), with a wergeld of 30 solidi ; and a variety of other persons belonging to one or other of these classes (puer crinitus, class a ; poredrius, faber ferrarius, aurifex, &c., class ¢). An aristoeraey is not mentioned. The people lived together in villages (ehap. 45) ; they cxercised agri- culture and reared cattle (2-5, 27, &c.); they hunted and fished (6, 33); vineyards and gardens were known to them (27, 6, &c.) ; and gold work and iron work are mentioned (10). The chief of the state was a king ; his officers included the grajfio, who was chief of a pagus (shirc); sacebaro, chief of a hundred (both with a wergeld of 600 solidi; the latter could also be a puer regis, in which case he had a wergeld of 300 solidi) ; thunginus or centen- erius, chief of a hundred, but probably elected by the people from among themselves, as his wergeld seems to have been the ordinary one. The judicial assembly was called mallus, the place where it as- sembled matlloverg, the party in a suit gamallus, the councillor of the assembly rachineburgus, an officer who had

to advise upon the sen- tence to be pronounced, and to value the property in question.

The famous clause in the Salic Law by which, it is commonly said, women are precluded from succession to the throne, and which alone has become known in course of time as the Salic Law, is the fifth paragraph of chapter 59 (with the rubric “De Alodis”), in which the succession to private property is regulated. The chapter opens with four (five) paragraphs in which it is enacted that—(1) if a man died without male issue, his mother (so in first recension ; the second to fifth have “pater aut mater”) would succeed to the inheritance (in hereditatem succedat) ; (2 failing her (the father and mother), his brother (brothers) or sister (sisters); (3) failing these, the sister of the mother : (4) when there was no sister of the mother, the sisters (sister) of the father ; and (5), failing these, the nearest relative. After this the fifth paragraph reads as follows :—

First Second Third Fourth Fifth recension. recension. recension. recension. recension. Deterravero| De terra] De terra | De terra De terra vero

nulla in muli-} vero Salica| vero Salica | vero Salica | Salica, in muliere[portioaut] | in mulicre | nulla in mu- nullaportio | rem nulla portio hereditas non | nulla per- | licre heredi- hereditatis | hereditatis transpertinebit, sed | tinet portio, | tatis transeat mulieri it, sed hoe virilis ad virilem sex- | sed qui fra- porcio, sed ad | veniat sed | sexus acquirit, um qui fratres | tres fuerint, | virilis sexus | ad virilem | hoc est, filii in fuerint tota | et ad virile} tota terral | sexum tota | ipsa hereditate terra perti- | sexu —_— tota proprietatis terres here-|succedunt. Sed neat. terra per-} sux possede- | ditas per- | ubi inter nepotes

tineat. ant. veniat. aut pro nepotes post longum tem- pus de alode ter- re contentio sus- citatur, non per stirpes sed per ca-

X __’ pita dividantur.

1 Text B reads: “ proprietas perveniat.” an ial

It seems clear that the first four paragraphs of the chapter, which admit women to a share in the inheritance, refer to private, movable property, and that, by the fifth paragraph, the inheritance of land was exclusively confined to males. We know that this exclusion of women from landed property was hardly a rule anywhere in the Frankish empire, and certainly not in the 6th century, but it obtained more or less afterwards, especially during the feudal period, when all the owners of landed property (¢.e., the tenants of fiefs) were lable to military service. We do not know when this exclusion of women from landed property began first to be applied and extended to an exclusion from the succession of thrones, as we do not read of such a notion until the middle of the 14th century during the controversy between Edward III. and Philip of Valois, when it was alleged to be derived from the Salic Law. It will be observed that the word Salica is not found in the oldest existing recension, but appears first in the second text, which some would ascribe to the end of the 6th century. Nor is the word found in the corresponding paragraph (56,4) of the Lex Ripuaria, which was based on the Salic Law. This addition (retained in all the other recensions, also in the so-called Lex Emen- data) was no doubt made for some purpose, but we do not know whether it was made by a scribe, nor what parti- cular notion it was intended to convey, nor whether it was this special word which gave rise to the idea of women being precluded from the succession of thrones.

The various texts of the Lex Salica, arranged in parallel columns, with a commentary on the Malberg glosses, were published in 1880, under the title Lex Saliea: the Ten Texts with the Glosses, and the Lex Emendata, ed. J. H. Hessels, with notes on the Frankish words in the Lex Salica by H. Kern, 4to, London, 1880; comp. also Gco. Waitz, Das alte Recht der salischen Franken, 8vo, Kiel,

1846 ; Rud. Sohm, Die frank. Reiehs- und Gerichts-Vi erfassung, 8Vvo, Weimar, 1871; Pardessus, Loi Salique, 4to, Paris, 1843.

Having treated of the Salic Law somewhat minutely, we need only say a few words about each of the other leges barbarorum, as they all present somewhat similar features, and hardly differ except in the time of their compilation, the amount of fines, the number and nature of the crimes, the number, rank, duties, and titles of the officers, &c.

(2) The Ripuarian Law, or Law of the Ripuarian Franks (Lex Ripuaria or Riboaria, L. Ripuariorum or fibuariorum, L. Ripu- ariensis or Ribuariensis), or inhabitants of the river-banks, was in foree among the East or Rhenish Franks in the Provincia Ribuaria, also called Ducatus or Pagus Ribuarius (see vol. ix. yp: 723), of which Cologne was the chief town. It has much in common with the Salie Law ; in fact, chapters 32-64 are, with the exception of some necessary modifications and additions, merely a repetition of the corresponding chapters of the Salie Law, and even follow the same arrangement, so that this part of the code is hardly anything but the Salic Law revised by order of the kings of Austrasia. Professor Sohm (whose edition, published in 1883 in Alon. Germ. Hist., Legg., vol. v. part 2, is based on nearly forty MSS., written between the 8th and the 11th eentury) divides the eighty-nine chapters of this code into four distinct portions, ascrib- ing the first portion (chaps. 1-31), which contains enactments not met with in the Salic Law, to the first part of the 6th century, the second (chaps. 32-64) to the second part of the same eentury (c. 575), the third (chaps. 65-79) to the 7th century, and the fourth (chaps. 80-89) to the beginning of the 8th century. This result practically agrees with the statements found in a prologue in certain MSS. (which contain some of the barbarian eodes), where it is said that the ‘‘ Leges Francorum (=Lex Ripuariorum), Alamannorum, ct Bajuvariorum ” were compiled at ChAlons-sur-Marne at the dicta- tion of Thierry I. (511-534), by wise men learned in the law of his kingdom, and that the codes werc afterwards revised and amended by Childebert I., Chlotar I., and Dagobert. Charlemagne promul- gated some additional ehapters to the Ripuarian Law in 803 (fon. Germ. Hist., Lege., i. 117). We may here observe that the Salic and Ripuarian Laws were to some extent introduced into England by the Norman Conquest, as appears from the Laws of Henry I., where we find enactments ‘‘secundum Legem Salicam ” and “ secun- dum Legem Ripuariam” ; comp. Leg. Hen. I., capp. 87, $$ 9, 10, 11 (word for word =L. Sal., tit. 43), 89, 90 § 4 (Sy ipso) and 83 § 5 (=L, Sal., tit. 55 § 4).

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(3) With the Ripuarian Law the Lex Franeorum Chamavorum is intimately connected. The two MSS. in which it is preserved call it ‘‘ Notitia vel commemoratio de illa ewa (law) que se ad Amorem habet.” Amor is the district called Hamarlant, Hamalant, Ham- melant, Hamuland, in the 9th century. This name was derived from the Chamavi, a German state mentioned by Tacitus (Anz, xiii, 55; Germ.,c. 33, 34), which aftcrwards constituted a part of the Frankish empire. In the 9th century Hamalant was a part of the Pagus Ribuariorum. The whole code consists of only forty- eight short paragraphs, which are apparently nothing but state- ments made in answer to the ‘‘ missi dominici”” whom Charlemagne despatched to the various nations of his empire to inquire into their condition and to codify their respective laws. It may therefore be ascribed to the beginning of the 9th century (802 or 803). Professor Sohm has published it as an appendix to the Lex Ripuaria (Mon. Germ. Hist., Legg., vol. v. part 2, p. 269).

(4) The Lex Alamannorwm was (according to the prologue men- tioned above) first compiled by the East-Frankish king Thierry (511-584), and afterwards improved and renewed by Childebert I. (511-558), Chlotar I. (558), and Dagobert I. (622-638). Although not much reliance can be placed on this statement, the researclies of Professor Merkel, who edited the code from forty-eight MSS. (Mon. Germ. Hist., Legg., vol. iii.), show that some kind of code called Pactus (of which he published three fragments) was com- piled for the Alamanni in the reign of Chlotar I. (537-561). Under Chlotar II. (613-622) a more complete code, consisting of seventy- five chapters, was compiled, which was revised under Dagobert (628) and augmented with chapters 76-97; it was again altered and angmented under the Alamannic duke Landfrid (d. 730), whose work Merkel calls Lex Alamannorum Lantfridana, and finally aug- mented in the Carolingian period (hence called Lex Alamannorum Karolina sive reformata), perhaps early in the 9th century. The code consists of 97 (in some MSS. 98, 99, 105, and 107) chapters.

(5) The Lex Bajuvariorum, or Pactus Bawarorum, had the same origin as the Lex Alamannorum, if we accept the somewhat un- reliable statement of the prologue spoken of above. It seems probable that some kind of code was compiled for the Bavarians during the reigns of Clovis’s sons. Those paragraphs which treat of ecclesiastical affairs and the position of the

Bavarian dukes to- wards the Frankish kings (tit. il. chap. xx. § 3) have clearly been inserted in Dagobcrt's time, if not later. There is a great similarity between certain provisions of the Bavarian and the Alamannic codes, and also some paragraphs of the former have been derived from the earliest recension of the Lex Wisigothorum. Some addi- tions were made by Duke Thassilo II. (763-775), some by Charle- magne (803), some by King Louis (c. 906), and, finally, some by Duke Henry II. (end of 10th ccntury). The emperor Henry III. is alleged to lave granted the law of the Bavarians to the Hunga- rians in 1044. It consists of twenty-one chapters, each containing several paragraphs. Professor Merkel distinguishes three different recensions of the code and various additions, which he edited in 1863 from thirty-five MSS. for the Mon. Germ. Hist., Legg., iti. p. 188 sq.

: (6) For the Lex Frisionwm, see vol. ix. p. 789.

(7) The Lex Angliorum et Werinorum, hoc est, Thuringorum, con- sists of seventeen chapters. Early editions of this code contained some legal decisions identical with those of Judge Wlemarus in the appendix to the Lex Frisionum (L. Angl. Jud. Wlem., 1, 2, 6, 7=L. Fris., 22, §§ 54, 55, 86; Addit., i. 18), from which circum- stance it was inferred that the compilation, or at least the revision, of both codes took place at one and the same time (802-808). But Richthofen, who edited the work in Mon. Germ. Hist. (Legg., y. p. 103), and who rejects these legal decisions of Wlemarus as not 'belonging to this code at all, is of opinion (p. 115) that the code was not written even at the end of the 9th century. Opinions have differed also as to the region where the law originated. Some ascribe it to the Angli and Werini, who inhabited the Holstein and Schleswig regions ; others attribute it to Thuringia propcr; and in more recent times it has been ascribed to Thuringia on the left bank of the Rhine (=South Holland, Brabant, &c.). It was also argued that the code must havc originated in a region where Frisian and Frankish elements had become mixed, both in language and in law, and where the Frankish preponderated. That the code originated in South Holland was inferred from its agreement in some respects with the Lex Chamavorum, which originated in the region of the lower Rhine and the Yssel. And the law may have come to be in force among the allied tribes on the Elbe in northern Thuringia, even though it originated in South Holland. If it originated in Thuringia, it must have been transplanted to the

Holstein and Schleswig regions; and it was used by the Danes, as is clear from Canute bringing it over to England when he con- quered the country in 1013.1 But in England the code was simply called “ Lex Werinorum, h.e., Thuringorum,” but no longer “ Anglorum,” as the Danes called the whole Anglo-Saxon popula-

1 Comp. Canuti Consttt. de Foresta, c. 33, *“*Emendet secundum pretium

hominis mediocris, quod secundum Legem Werinorum, 7.e., Thuringorum [=L. Angl. and Werin., i, 2] est 200 solidorum.”

tion which they had conquered “Angli,” and the law which they found in force Lex Anglorum ” (Legg. Edw. Conf., c. 30). Hence it has been concluded that what was called in England Lex Danornm is nothing but the Lex Werinorum. When the Normans conquered England in 1066 they soon recognized that this Lex Danorum and the Law of the Norwegians (Lex Noricoruin or Norwegensium), who had migrated to England in earlier times, were practically one and the same. Hence William I., declaring that the population which he had brought over with him from Normandy werc also originally Norwegians, resolved to abrogate the Anglo-Saxon laws and to leave only that of the Danes in force (Legg. Edw. Conf., c. 30),—a plan which only the most persevering entreaties of the Anglo-Saxon barons could induce him to abandon. The latest edition of this code (1875) is by K. F. von Richthofen, who is decidedly against the South Holland origin of the law.

(8) The Lea Saxonwm consists of nineteen chapters or sixty-six articles or paragraphs, and appears to be composed of three essential parts, the oldest of which (arts. 1-28) seems to have existed before the later additions known as the Capitulare Paderbornense (de partibus Saxoniz) of 785 (or 777) and the Capitulare Saxonicum of 797 (in which a ‘‘Lex Saxonum” and ‘‘Kwa Saxonum” are referred to; comp. chaps. 38 and 7, 8, 10); the second part (arts. 24-60) must have bcen compiled after that date; and the third (arts. 61-66) was eaeey added in 798, when Charlemagne had removed a part of the Saxon nobility as hostages from their own country ; while the whole was united into one code at the diet of Aix-la-Chapelle in 802-803 (Merkel,

Zea Saxonwm, Berlin, 1853). The enactments of this code are far more severe than those of any other of the barbarian laws, and it often inflicts capital punish- ment for crimes which the other laws punish with mere pecuniary fines, as, for instance, theft and incendiarism. This rigour Charle- magne softened by reserving to himself the right of asylum and pardon, but it was cxpressly retained and granted anew by Conrad II, (1024-1089). The code was edited in 1875 by Von Richthofen in Mon. Germ. Hist., Legg., v. p. 1 sq.

(9) The Leges Anglo-Saxonwm are for a great part written in Anglo-Saxon, and as such may be reckoned among the most ancient monuments of the Teutonic language. They appeared mostly in the form of constitutions promulgated by the various kings (some- what like the Frankish capitularies), with the co-opcration of an assembly of leading men (‘‘sapientes,” Beda, H. Z., ii. 5), and fre- quently also of the clergy (coneiliwm, synodus). They may be divided into two classes,—secular and ecclesiastical laws. Some- times they are mere judicial sentences (dém) or treaties of peace (frid). The earliest laws we have are those of Athelbert, king of Kent (c. 561) ; then follow those of Hlodhaer (c. 678) and Eadric (c. 685), Wihtraed (c. 691), Ine (after 688), Alfred (after 871), Eadward (after 901), Atthelstan (after 924), Eadmund (after 941), Edgar (after 959), Aithelred II. (after 978), the Danish Canute (after 1017), William the Conqueror (after 1066). Then follow two collections of laws, the so-called “ Leges Edwardi Confessoris” and ‘‘Leges Henrici I.,” which, drawing from the Anglo-Saxon Law, represent the modifications which had been made in the earliest laws during the Norman period, and the introduction of new elements derived from the Salic and Ripuarian Laws. Besides these there are a good many canons and other ecclesiastical ordi- nances enacted under the archbishops Theodore and Ecgbert and King Edgar, &c. ; comp. ENGLAND, vol. viii. pp. 285, 303. There is an edition of these laws by B. Thorpe (fol., London, 1840), another by Dr Reinh. Schmid (Die Gesetze der Angel- Sachsen, 2d ed., 8vo, Leipsic, 1858).

(10) The compilation of the Lex Burgundionwm is usually as- cribed to Gundobald (d. 516), whence it is also called Lea Gundo- bada (corrupted Gombata, Fr. Loi Gombette). It consists, according to its first prologue, of a collection of constitutions cnacted partly by the earlier kings of Burgundy,

partly by Gundobald, and revised by a general Burgundian diet. This agrees with the statements contained in its second prologue, which itself may be 1egarded as an independent constitution or edict to the counts and judges re- garding the introduction of the law. In the rubric which it bears in the MSS. it is said that it was promulgated at Lyons on 29th March in the second ycar of Gundobald (some MSS. read Sigis- mund). As the year of Gundobald's accession is supposed to be 465, the promulgation must have taken place in 467, or, if we assume that the year is meant in which Gundobald became sole king of Burgundy (478), the date of the law would be 480, while it would be 517 if we adopt the reading ''Sigismnnd " of some of the MSS. But as the law in its present state contains decrees both of Gundobald and of Sigismund we can only regard the whole as a compilation effected by the latter. In early editions the law was divided into eighty-nine chapters, with two additamenta, the first of which (consisting of twenty chapters) was ascribed to Sigismund, the second (of thirteen chapters) to his brother and successor, the last king of the Burgundians, Godomar. But Professor Bluhme (who published the law in 1863, in Mon. Germ. Hist., Legg., iii. 497) places chap. i. (De causis itineribus et aliis servitutibus) and chap. xix. (De liberali causa) of the first additamentum as chaps.

xvii. and xliv. in ''Papianus" ; chap. xx. as chap. evi. (extrava- gant) and its remaining chapters as chapters Ixxxix. tocv. The second additamentum is placed as chap. cvii., the old chap. lxxxix. as chap. cviii., and a new ehapter cix. (a decree of Sigismund De collectis" of 516) added. It was Gundobald's intention that his law should decide all cases between Burgundians and between them and Romans ; in all other cases the latter would only use Roman law (comp. second preface), of which the Lex Burgundionum con- tains many traces, and even the Burgundians were allowed to use Roman law (comp. L. Burg., titt. 43, 60, 55 § 2). { the Burgundian Law is purer than that of all the preceding bar- barian codcs, and we find in it a distinct tendency to treat Romans with greater leniency and to make.them equal to the Burgundians in the eye of the law. Through Gundobald's political relations with Alaric II., the Lex Burgundionum influenced the West-Gothic legislation, of which traces are found in the Lex Wisigothorum and the

interpretatio to Alaric's Breviarium. Charlemagne promul- gated in 813 a Capitulare Aquisgranum (A/on., Legg., i. 817) re- garding the Lex Burgundionum, though the text was not altered. Agobart, bishop of Lyons, complained to Louis the Pious respecting certain abuses caused by the Burgundian Law (Bouquet, vi. 356), but no remedy was effected. On the other hand, towards the end of the 9th century the law had gradually fallen into disuse like all the other barbarian laws, thongh it is said that the emperor Conrad II. revived and confirmed it. See, besides Professor Bluhme's edition, Hubé, Hist. de la formation de la lot Bowrguignonne, Paris, 1867.

(10a) In the second preface to the Lex Burgundionum (published in 502) the Roman subjects of the Burgundian king were promised a codification of their own laws. This work appears to have been promptly executed and was published under the title Lex Romana Lurgundionum, perhaps before the compilation of the Breviarium Alarici (506). This colleetion is also known as Papianus, of which uame (found already in MSS. of the 9th century) no satisfactory explanation has hitherto been offered, some, perhaps wrongly, sup- posing that it is a corruption of the name of Papinianus, the Roman jurist. It was published by Professor Bluhme as an appendix to the Lex Burgundionum (Mon. Germ. Hist., Legg., iii. p. 579).

(11) As regards the Lex Wisigothorum (also called Forum Judi- cum, Judicum Liber, Forum Judiciale, &c.), we know with certainty from Isidore of Seville (Hist. Goth. Hisp., 504) that Eurie (466-483) was the first Gothic king who gave written laws to the West Goths. It would therefore be erroneous to ascribe (with Mariana, Hist. de Espafa, v. 6) their first written laws to Euric's son, Alaric Te, though it seems probable that the latter, by adding his own laws to those of his father, was really the first author of a West-Gothic codification. Isidore refers to the collection of laws (as it had been preserved up to the end of the 5th and the beginning of the 6th century) as the Laws of Euric, though we must assume that the statutes of the kings who succeeded Euric had already been added to his collection. Isidore also tells us (Hist. Goth. Hisp., 606-624) that Leovigild (d. 586) revised Euric's Laws. As Isidore was bishop of Seville from 599 to 636, and may therefore be said to have been a contemporary of Leovigild, his testimony may be accepted as conclusive, though a much later but

untrustworthy tradition would have it that the revision was executed by Leovi- gild's son, Reccared I. (the first Catholic king of the Goths), who died in 601, whereby the whole population of Spain was equalized in point of law. According to Spanish traditions of the 12th century, the West-Gothic collection of laws was again revised, under Sisenand, by the fourth council of Toledo (633), a revision on which Isidore seems to have exercised some influence. It is un- certain, however, whether the code was then systematically arranged and divided into twelve books, as we now have it, or whether this was done under Chindaswinth (d. 652) or under his son Receswinth (d. 672). The several books of the code are divided (in imitation of the codes of Theodosius and Justinianus) into tituli, and those again into ehapters or constitutions. From Leovigild down to Egica (d. 701) and his son and coregent Witiza (d. ¢. 701, the last king of the Goths before the invasion of the Moors) every constitu- tion bears the name of the king who promulgated it, while those dating from before Leovigild have the word "antiqua" prefixed to them instead of the name of a king. This designation is said to have been commenced by Erwig (680-687), who thereby wished to prevent the clergy from claiming the code as their work. Of the texts which existed before the fourth council of Toledo only one small fragment has come down to us, the Paris National Library (No. 1278). Somme regard this as the remainder of the supposed recension of Reccared I. ; others regard it as a fragment of the Laws of Euric, though it could in no case be the Laws of Euric themselves, but at most their codification by Alaric ir The fragment was known to the Benedictines (Nouv. Traité de Diplom., i. 483, iii. 52, 152, note 1), and was published in 1847 by Professor Bluhme (Die Westgoth. Antiqua oder das Gesetzbuch Reecared's I, Halle). The text is undoubtedly older than those enactments which we find designated as ‘‘ antiqua," so that it could hardly be placed Iater than the commencement of the

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6th century, z.¢c., shortly after the compilation of the Breviarium Alarici (506). Hence the text called "antiqua" may be regarded as a modification of

that of the Paris palimpsest, and was probably not made before the end of thé 6th or the beginning of the 7th century. Roman law, which is so conspicuous in the later text, may already be traced in that of the palimpsest (taken from the Breviarium Alarici), and also in the ‘‘antiqua” constitutions, in which we find even traces of Justinian’s law. The Lex Wisi- gothorum (the first code in which Roman law and Teutonic law were systematically combined) was no doubt regarded, after Leovigild and Receared I., as a code for the Goths as well as for the Romans, without abolishing the Breviarium among the Romans. But King Chindaswinth ordained that the Lex Wisigothorum should be the sole code for both nations, prohibiting at the same time the use of the Roman law, thereby materially promoting the ainalgamation of the two nations. It remained in force in Spain throughout the Middle Ages, and was translated into Spanish (Castilian) under Ferdinand III. (1229-1234, or 1241) under the title Fuero Juzgo, or Fuero de Cordova.

Editions: (1) Fuero Judzgo en Latin e Castellano cotejado con los mas antiguos y preciosos Codices por la Real Academia Espaiiola, Madrid, 1815, fol. ; (2) in Portugalie Monumenta Historica, vol. i., Lisbon, 1856, fol.

(lla) Here also we may mention a Lex Romana compiled for the Roman population, just as in Burgundy. It is also known as Liber Legum, Liber Legum Romanorum, and as Lex Theodostt or Corpus Theodosianum. It received the latter name because the Codex Theodosianus served as its basis. It imcludes also excerpts from novellz of Theodosius, Valentinian, Marcian, Majorian, Severus, and from the Jnstitutiones of Gaius, the Sententix of Paulus, the Codices Gregorianus and Hermogenianus, &e. Ina MS. of the 10th century it is called Breviarium, and the title Breviarium Alariei or Alaricianwm has become general since the 16th century. The com- pilers of the Breviarium are not known, but it was published in

the twenty-second year of Alaric II., ¢.e., on 5th February 506, at

Aire (Atures) in Gascony. It was also used in other western pro- vinces of the Roman empire, and was imitated, excerpted, and altered in other places. One recension, probably dating from the 9th eentury, is known (from the

place where the MS. was found) as the Lex Romana Utinensis. The best edition is that of G. Haenel, Lea Romana Wisigothorum, Berlin, 1847.

(11b) We have also a code for the Eastern Goths compiled by command of Theodoric after 506, but before 526, and known as Ldictwm Theodoriei. It consists of 155 chapters (with a few addi- tions), which are in reality an epitome of Roman law. It was published in 1875, in Aon. Germ. Hist., Legg., v. p. 145 sq., ed. by Professor Bluhme.

(12) Leges Langobardorwm.—The first trace of Lombardic law is an edict of Rothar, consisting of 388 chapters, and promulgated at a diet held at Pavia on 22d November 643. This was followed by laws of Grimoald (668), nine chapters ; Liutprand (713-735), six books ; Ratchis (746), nine chapters ; Aistulphus (e. 755), fourteen chapters. Additions were also made by Charlemagne and _ his successors down to Lothair II. In the manuscripts the texts are arranged, some in a chronological, some in a systematical order. The latter arrangement is already found in a MS. of the 9th century. The systematic collection, which was used chiefly in Bologna at lectures and for quotations and was known as Lombarda (Liber Langobardz s. Lombardz), appears to have been made in the 11th century. The text as it exists at present is very corrupt, as a number of glosses (some of great antiquity) and formule, added in the first instance by those who had to use the code to explain certain enactments of the law, afterwards found their way into the’ text. Towards the end of the 12th and down to the beginning of the 16th century, various glosses and commentaries on the Lom- bard made their appearance. The first commentaries were those of Ariprand and of Albertus (second half of 12th century). The later commentators (Carolus de Tocco, ¢. 1200; Andreas of Barulo, é. 1230; Blasius de Morcone of Naples, before 1338 ; Boherius and Johannes Nenna of Bari, ¢. 1540) refer frequently to Roman law. Of the Edictum Rotharis a Greek translation was made, of which only fragments have been preserved (comp. C. E. Zacharia, Frag- menta versionis Greee Legum Rotharis, Langob. regis, ex. cod. Paris. Gree., No. 1348, Heidelberg, 1835).

Editions: (1) C. Baudus a Vesme, Edicta regum Langobardorum, Turin, 1855, reprinted by J. F. Neigebaur, Munich, 1855, 1856; (2) Mon. Germ. Hist., Lege., iv. (1868), by Friedr. Bluhme and Alfr. Boretius; (3) Fr.

Bluhine, Edictus cetereque Langobardorum leges, Hanover, 1870; comp. Merkel, Geschichte des Lombardenrechts, Berlin, 1850.

(13) The Leges Wallix do not belong to the Teutonic family of codes ; but it is not out of place to mention them here. There is, comparatively speaking, no great distance of time between the leges barbarorum and the Laws of ‘Wales, while the contents of the latter show a similar, nay alinost the same, idea of law as the former ; and, apart from the fact that Wales became permanently connected at the end of the 13th century with a Teutonic people, the Anglo-Saxons, it has been noticed that in Wales Roman and Germanic, but no traces of a specific Welsh, law are found. King Howel Dda (i.c., the Good), who died in 948, is the originator of

the Welsh code. In the preface it is stated that Howel, ‘‘ seeing the laws and customs of the country violated with impunity, sum- moned the archbishop Menevia, other bishops and the chief of the clergy, the nobles of Wales, and six persons (four laymen and two clerks) from each coniot, to meet at a place called Y Ty Gwyn ar Dav, or the white house.on the river Tav, repaired thither in person, selected from the whole assembly twelve of the most experienced persous, added to their number a clerk or doctor of laws, named Bligywryd, and to these thirteen confided the task of examining, retaining, expounding, and abrogating. Their compilation was, when completed, read to the assembly, and, after having been con- firmed, proclaimed. Howel caused three copies of them to be written, one of which was to accompany the court for daily use, another was deposited in the court at Aberfraw, and a tlurd at Dinevwr. The bishops denounced sentence of excommunication against all transgressors, and soon after Howel himself went to Rome attended by the archbishop of St David’s, the bishops of Bangor and St Asaph, and thirteen other personages. The laws were recited before the pope and confirmed by his authority, upon which Howel and his companions returned home.” All this conld not have been effected before Howel had subjected Wales to his own rule, therefore uot before 948. We have three different recen- sions of the code, one for Venedotia or North Wales, another for Dimetia or South Wales, a third for Gwent or North-East Wales. We do not know liow far these recensions were uniform in the

beginning ; but a variance must have occurred shortly after, for the manuscripts in which the codes are preserved differ greatly from each other. The code was originally compiled in Welsh, but we have no older MSS. than the 12th century, and even the earliest ones (especially tlose of the Venedotia recension) contain many interpolations. The Latin translations of the code would seem to be very old, though even here we have no earlier MSS. (belonging to the Dimetia recension) than the 13th eentury. The Latin text is much shorter than the Welsh, but we do not know whether this abridgment was made on purpose, or whether the translation is an imitation of an earlier text. The texts preseut only a few traces of Roman law, which, however, are evidently additions of a later period. The whole body of Welsh laws was published in one volume by An. Owen under the direction of the commissioners on the public records (fol., London, 1841).

For further information on the barbarian codes, see Heinr. Zoepfl, Deutsche Rechtsgeschichte, 8vo, Brunswick, 1860, vol. i. p. 8 sg., whose clear and able treatment of the subject has been taken as the basis of paragraphs 4-13 above ; comp. also Stobbe, Geschichte der deutschen Rechtsquellen, 8vo, Gis,”

1860.

SALICYLIC ACID, an organic acid found in nature, in the free state, in the flowers of the meadow-sweet (Spirea Ulmaria, L.) and, combined with methylic ether, in the leaves of the wintergreen (Gaultheria procumbens, L.) and Andromeda Leschenaultit, in the bark of the sweet birch (Betula lenta, L.), and in several species of Viola, It was discovered in 1838 by Piria, who prepared it artificially by the decomposition of Satctn (q.v.). It is remarkable as being the first organic compound occurring in nature which has been prepared artificially on the large scale as a commercial article. During the last few years it has been extensively used in medicine as a remedy for acute rheuniatism, either alone or in the form of its sodium salt. Possessing powerful antiseptic properties and being poisonous only in large doses (the medicinal dose being from 5 to 30 grains), it is capable of manifold uses in the arts and manufactures. In the proportion of from 1 to 10 per cent. it prevents the development of bacteria in fluids containing them, and if added to the extent of 1 part in 60 it will destroy their life. It

also kills Zorula, and prevents the souring of beerand milk. It hinders the chemical changes brought about by the action of vegetable ferments or enzymes such as amygdalin and sinnigrin, and consequently can prevent the formation of essential oil of almonds or of oil of mustard, &c. Plants watered with its solution speedily die. The addition of a little of the acid to glue renders it more tenacious ; skins to be used for making leather do not undergo decomposition if steeped in a dilute

1 There is no historical foundation for the legendary laws of a prince Dymal (or Dyvnwal) Moel Mud, nor for the Laws of Marsia, which are said to belong to a period before the Roman invasion, even so early as 400 years before Christ. An English translation by the side of the Welsh text of the so-called triads of Dyvnwal Moel Mud is given by Owen, The Ancient Laws of Wales, London, 1841, p. 680.

solution ; butter containing a small quantity of it may be kept sweet for months even in the hottest weather. It also prevents the mouldiness of preserved fruits and .has been found useful in the manufacture of vinegar. Unless the perfectly pure acid be employed the addition of salicylic acid to articles of food must be considered dangerous, some persons being peculiarly susceptible to its action.

Salicylie acid is met with in commerce in two forms, ‘natural ”

and “artificial.” The former occurs as handsome prismatie crystals resembling those of strychnin, but considerably larger, usually about half an inch in length ; the latter is met with as light minute crystals bearing some resemblance to sulphate of quinine, but smaller. The natural acid is prepared by decomposing the volatile oil of wintergreen or of the sweet birch by a strong solution of potassiun hydrate, and treating the resulting potassium salicylate with hydro- chloric acid, which liberates the salicylie acid. The artificial acid is prepared according to Robbe’s patent process by passing carbonic anhydride through sodium phenoxide (carbolate) heated in a retort, with certain precautions respecting temperature to prevent the for- mation of para-hydroxybenzoie acid. It is subsequently purified and recrystallized. An improvement has recently been made on this process by substituting

sodium phenol for sodium phenoxide, the whole of the phenol being in this case converted into salicylic acid. Formerly this acid was met with in commerce contaminated with phenol, rosolic, and para-oxybenzoie acids, but is now prepared in a perfectly pure condition. The presence of the first-named impurity may be detected by its odour and by the melting-point being lower than when pure, the second by the pink tinge it com- miunicates to the acid, and the third by its comparative insoluhility in boiling chloroform, by the greater solubility of its calcium salt, and by its giving a yellow precipitate with ferric chloride. Sali- ceylic acid when pure should be free from odour and should dissolve completely in alcohol, and its solution, when spontaneously evapo- rated without contact with air, should yield crystals having colour- less points. It has a specific gravity of 1:45 and fuses at 155° C. (311° Fahr.); above that temperature it is converted into phenol and carbonic anhydride. Its chemical formula is C,H, (OH)CO,H. It is soluble in 760 parts of cold water, in 4 of rectified spirits of wine, and in 200 of glycerin, also in olive and castor oils, in melted fats and vaseline. Alkaline salts of citric, acetie, and phosphoric acids render it more soluble in water, possibly from the base com- bining with it. An aqueous solution of salicylie acid gives a deep violet colour with ferric salts. The methyl, ethyl, and amy] ethers of the acid are used in perfumery, and the calcium salt if kept for some time and then distilled with water yiclds a liquid which has a strong odonr of roses (Dingler, Polytechn. Journ., ccexvii. ». 136). : When administered internally salicylic acid rapidly lowers the bodily temperature and reduces the pulse rate, blood pressure, and rapidity of respiration, causing death when given iu excessive doses by paralysis of the respiratory organs. It is excreted in the urine partly as salicylic and partly as salicyluric acid, communicating to it a brown colour by reflected and a grecu one by transmitted light. When taken for some time it produces deafness, giddiness, headache, and noises in the ears, like quinine. Taken internally in medicinal doses it possesses the same properties as salicin and sodium salicylate (see below), but is much less used in medicine. Applied externally, it has a marked action on thickened epidermis, and is hence used for the cure of eorns and warts, to relieve pain and destroy fetor in ulcerated cancer, and also in certain skin diseases in which an antiseptic is useful, as in psoriasis, eczema, intertrigo, lupus, and ringworm. Taken as snuff it relieves hay fever.

Salicylate of sodium (NaC,H;0,) is more frequently used in medi- cine than salicylie acid because less irritating to the mucous mem- branes. Itis prepared by neutralizing a solution of sodium carbonate with salicylic acid. It occurs in commerce as small white crystalline plates with a slight pearly lustre, having a sweetisli saline taste and mildly alkaline reaction. It is soluble in 1‘5 parts of water and 6 of alcohol at 15° C. (59° Fahr.), but much more so in boiling water and alcohol. It is chiefly employed medicinally as a remedy for acute rheumatism, in which it lowers the temperature and allays pain. It is also useful in headache and in phlegmasia alba; its cholagogic action and its power of rendering the bile more fluid indicate its usefulness in the treatment of gall stones. It has been found of service in Meniére’s disease. Alcohol or other stimulants are often given with it to prevent the depressing influence on the heart’s action which is eaused by large doses. Ammonia is, how- ever, unfit for this purpose (Martindale, Extra Pharmacopeia, 3:1 ed., p. 57). Like salicylic acid, it produces when given in full doses subjective auditory phenomena, but these symptoms are relieved by the use of ergot and hydrobromie acid. In a few persons it causes most disagreeable visions whenever the eyes are shut, and in others it has even produced delirium. In its action on bacteria it is about one-third less powerful than salicylic acid.

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SALIERI, Anronto (1750-1825), dramatic composer, was born at Legnano, Italy, August 19, 1750. In 1766 he was taken to Vienna by a former ‘ Kapellmeister ” named Gassmann, who introduced him to the emperor Joseph, and fairly prepared the way for his subsequent success. His first opera, Le Donne Letterate, was produced at the Burg-Theater in 1770. On Gassmann’s death in 1774, he received the appointment of Kapellmeister and com- poser to the court; and on the death of Bonno in 1788 he was advanced to the dignity of ‘‘ Hofkapellmeister.” He held his offices with honour for fifty years, though he made frequent visits to Italy and Paris, and composed for many important European theatres. His chef euvre was Zarare (afterwards called Axur, Re Ormus), a work which was preferred by the public of Vienna to Mozart’s Don Giovanni, though it is, in

reality, quite unworthy of comparison with that marvellous inspiration. It was first produced at Vienna, June 8, 1787, and strangely enough, considering the poverty of its style, it was revived at Leipsic in 1846, though only for a single representation. His last opera was Die Neger, produced in 1804. After this he devoted himself to the composi- tion of church music, for which he had a very decided talent. Salieri lived on friendly terms with Haydn, but was a bitter enemy to Mozart, whose death he was sus- pected of having produced by poison ; but no particle of evidence was ever forthcoming to give colour to the odious accusation. He retired from office, on his full salary, in 1824, and died at Vienna May 7, 1825. None of Salieri's works have survived the change of fashion. He gave lessons In composition both to Cherubini and Beethoven ; the latter dedicated to him his Three Sonatas for Piano- forte and Violin, Op. 12.

SALIT. See Mars.

SALISBURY, or New Sarum, a city and municipal and parliamentary borough, the county town of Wiltshire, Eng- land, is situated in a valley at the confluence of the Upper Avon, the Wily, the Bourne, and the Nadder, on the Great Western and South Western Railways, 80 miles west-south- west of London. The city at the beginning was regularly laid out by Bishop Poore and still retains substantially its original plan. In the centre is the market-place, a large and handsome square, from which the streets branch off at right angles, forming a series of quadrangles facing a thoroughfare on each side, and enclosing in the interior a space for courts and gardens. The streams flowed un- covered through the streets till the visitation of cholera in 1849 led to their being arched over. The cathedral of St Mary was originally founded on the hill fortress of Old Sarum by Bishop Herman, when he removed the see from Sherborne between 1075 and 1078. The severe drought in 1834 caused the old foundations to be dis- covered. Its total length was 270 feet ; the nave was 150 feet by 72, the transept 150 feet by 70; and the choir was 60 feet in length. In 1218 Bishop Poore procured a papal bull for the removal of the cathedral to New Sarum, For this various reasons have been given,—the despotism of the governor, the exposure to high winds which drowned the voice of the officiating priest, the narrow space for houses, and the difficulty of procuring water. Until the Reforma- tion service still continued to be performed in the old church. A wooden

chapel of St Mary was commenced at New Sarum in the Easter-tide of 1219, and the founda- tions of the new cathedral were laid by Bishop Poore, 28th April 1220. It was dedicated at Michaelmas 1258, the whole cost having amounted to 40,000 marks, or £26,666. The cloisters, of great beauty, and the late Early English chapter-house were added by Bishop Walter de la Wyle (1263-74). The tower from near the ridge was built in the Decorated style by Bishop Wyville about 1331,

and the spire was added between 1335 and 1375. It is the highest in England (404 feet), and is remarkable both for its beauty of proportion and the impression it conveys of lightness and slenderness. The chapel built by Bishop Beauchamp (1450-82), that built by Lord Hungerford in 1476, and the fine campanile were all ruthlessly demolished by the architect James Wyatt, 1782-1791. The cathedral as a whole is a unique specimen of Early English, having the advantage of being practically completed as it now stands within a remarkably short period. For lightness, simplicity, grace, and unity of design it is not surpassed in England. It is in the form of a Greek or double cross, and comprises a nave of ten bays with aisles and a lofty northern porch ; two transepts, one of three and the other of two bays, while both have eastern aisles for chapels ; a choir of three bays with aisles; a presbytery of three bays with aisles ; and a lady-chapel of two bays. The total length of the building is 449 feet, the length of the nave being 229 feet 6 inches, of the choir 151 feet, and of the lady-chapel 68 feet 6 inches, while the principal transept has a length of 203 feet 10 inches, and the eastern transept of 143 feet. The width of the nave is 34 feet 4 inches, and of the principal transept 50 feet 4 inches. The library, built by Bishop Jewel (1560-71), contains about 5000 volumes and several MSS. of great interest. In the close, occupying an area of half a square mile, and possessing a finely-shaded mall, are the episcopal palace, an irregular structure begun by Bishop Poore but of various dates, the deanery house, and other buildings. The three parish churches are St Martin’s, with square tower and spire, and possessing a Norman font and portions of Early English in the choir ; St Thomas’s (of Canterbury), founded in 1240 as a chapel to the cathedral, and rebuilt in the 15th century, a handsome building in the Perpendicular style; and St Edmund’s, founded as the collegiate church of secular canons in

1268, but subse- quently rebuilt in the Perpendicular style and lately restored at a cost of £6000. The residence of the college of secular priests is now occupied by the modern ecclesiastical college of St Edmund's, founded in 1873. St John's chapel, founded by Bishop Bingham (1228-46), is now occupied by a dwelling-house. There is a beauti- ful chapel attached to the St Nicholas hospital, founded in the reign of Richard II. The poultry cross, or high cross, an open hexagon with six arches and a central pillar, was erected by Lord Montacute before 1335. In the market-place is Marochetti's statue to Lord Herbert of Lea. The principal secular buildings are the court-house, the market-house, the Hamilton Hall, the county jail, and the theatre. Among the specimens of ancient domestic architecture still remaining may be mentioned the banqueting hall of J. Halle, wool merchant, built in 1470, and Audley House, belonging also to the 15th cen- tury, and repaired in 1881 as a diocesan church house. There are a large number of educational and other charities, including the bishop's grammar school, Queen Elizabeth's grammar school, Talman's girls' school, the St Nicholas hospital, founded in the reign of Richard II., and Trinity hospital, founded by Agnes Bottenham in 1379. At one time the city possessed woollen and cutlery manufactures, but these have now declined ; and, although the manufac- ture of hardware and of boots and shoes is still carried on, it is on its shops for the supply of the neighbouring villages and its agricultural trade that it now principally depends. The population of the city and municipal borough (area 616 acres) in 1871 was 12,903, and that of the parliamentary borough (area 676 acres) 13,839; in 1881 the numbers were 14,792 and 15,680.

Salisbury and its neighbourhood are remarkably rich in relics of antiquity. To say nothing of Old Sarum and the scanty ruins of

the royal ag of Clarendon, Milford Hill and Fisherton are two of the richest fields in the country for paleolithic implements. In the Blackmore Museum Salisbury possesses one of the finest colleetions of prehistorie antiquities in England; its splendid gathering of objeets from the mounds in the New World is pro- bably unsurpassed. The fortress of Old Sarum (Searobyrig, t. ¢., Sear-borough, probably ‘“‘the dry eity”; Sarisberie in Domesday) is of

very early date, and was undoubtedly held by the Belge before it beeame an important fortress of the Romans (Sorbiodunum). It 6eeupied a conical mound rising abruptly from the valley, and its fossee and ramparts, whieh still remain, are about a mile in eirenm- ference. Various Roman roads branehed out from it in different directions. Near it Cynric won a great vietory over the Britons in 552. It was burned and saeked by Swend in 1003. In the great plain beneath William the Conqueror in 1070 reviewed his army after his victories ; and it was here that he took the oath of fealty from all English landholders ou the completion of Domesday in 1086. Old Sarum eontiunued to have the privilege of returning two members to parliament until 1832, although latterly not a single house remained within its limits. New Sarum grew up round the new eathedral founded in the 13th century. In 1227 it reeeived from Henry III. a eharter conferring on it the same freedom and liberties as Winchester. The duke of Buekingham was exeeuted at Salisbury in 1484. During the Civil War it was held alternately by both parties. Salisbury first sent members to parliament in 1295, and various parliaments have been held there. The Redistribution Aet of 1885 deprived it of one of its two vepreseutatives.

See Description of Salisbury Cathedral, 1719 and 1787; Rawlin, Salisbury, 1718; M. E. Walcott, Memorials of Salisbury, 1865; W. Henry Jones, Fasti Ec- clesiw Sarisberiensis, 1879; W. Henry Jones, Diocesan History of Salisbury, 1880.

SALISBURY, Rozpert, Earn or. See CEcIx. SALIVA, SALIVARY GLANDS. See Nutrition. SALLEE. See Rasir.

SALLUST (86-34 B.c.). Sallust is the generally accepted modern form of the name of the Roman his- torilan Caius Sallustius Crispus. 86 B.c. was the year of his birth, and the old Sabine town of Amiternum at the foot of the Apennines was his birthplace. of a good plebeian family, and entered public life at a comparatively early age, obtaining first the questorship, and then being elected tribune of the people in 52 B.c., that year of political turbulence in which Clodius was killed by Milo. Sallust was opposed to Milo and to Pompey’s party and to the old aristocracy of Rome. From the first he was a decided partisan of Czesar’s, and to Cesar he owed such political advancement as he attained. Unless he was the victim of violent

party misrepresentation, he seems to have been morally worth- less. In 50 B.c. the censors exercised their power of removing him from the senate on the ground of gross immorality. A few years afterwards, however, no doubt through Czesar's influence, he was restored to his position, and in 46, in which year Cesar was for the third time consul, he was pretor, and was with Ceesar in his African campaign, which ended in the decisive victory of Thapsus over the remains of the Pompeian party and in the suicide of Cato. Sallust remained for a time in Africa as governor of the province of Numidia, which, it would seem, Cesar gave him as a reward for good service. It was said that he enriched himself at the expense of the provincials, but the charge, as far as we know, was never substantiated, though it was rendered highly probable by the fact that he returned to Rome the following year a very rich man, able to purchase and lay out in great splendour those famous gardens on the Quirinal known as the "horti Sallustiani,' which became subsequently an imperial residence. He now retired from public life and devoted his leisure to letters, for which he had always had a taste, and certainly considerable ability. The fruits of his industry have come down to us in the shape of a history of the famous Catiline conspiracy, of an account of the war with Jugurtha, and of some fragments of a larger work— '' histories," as the Romans called them, "' memoirs," as we should style them. His history of the Catiline conspiracy

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was his first published work; it is the history of tlic memorable year 63, when Cicero as consul bafiled and confounded Catiline by making all men believe that he was an arch-conspirator against the liberties of his country, who, under specious pretexts of relieving poverty and distress, was really aiming at making himself a tyrant and a despot. Sallust adopts the view whicli was no doubt the usually accepted one, and he writes accordingly as a political partisan, without giving us a clear insight into the causes and circumstances which gave Catiline a consider- able following, and led many to think that his schemes were more respectable than those of a mere wild revolu- tionist. He does not explain to us at all adequately what Catiline's plans and views were, but simply paints the man as the deliberate foe of all

law, order, and morality. Catiline, it must be remembered, had been of Sulla's party, to which Sallust was opposed. There may be truth in Mommsen's suggestion that he was particularly anxious to clear his patron Cesar of all complicity in the conspiracy. Anyhow, the subject was quite one to his taste, as it gave him the opportunity of showing off his rhetoric at the expense of the old Roman aristocracy, whose degeneracy he dehghted to paint in the blackest colours. His history, again, of the war with Jugurtha, though a valuable and interesting monograph, is not a satisfactory performance. We may assume that he had collected materials and put together notes for it during his governorship of Numidia. Here too we find him dwelling on the feebleness of the senate and of the aristocracy, and dropping too often into a tiresome moralizing and philosophizing vein, his besetting weakness, but altogether failing us in those really im- portant details of geography and even chronology which we naturally look for in the historians of military opera- tions and campaigns. In all this Sallust is no better than Livy. Of his Histories, said to have been in five books, and to have commenced with the year 78 B.c. (the year of Sulla's death), and to have concluded with the year 66, we have but fragments, which are, however, enough to show the political partisan, who took a keen pleasure in describ- ing the reaction which followed on the dictator's death against his policy and legislation. It is unfortunate that the work has not come down to us entire, as it must have thrown much light on a very eventful period, embracing the war against Sertorius, the campaigns of Lucullus against Mithradates of Pontus, and the victories of the great Pompey in the East. A few fragments of his works were published for the first time from a manuscript in the Vatican early in the present century. We have also two letters (Duae epistolae de Republica ordinanda) addressed to Cesar, letters of political counsel and advice, which have been cominonly attributed to Sallust, but as to the authenticity of which we must suspend our judgment.

The verdiet of antiquity was on the whole favourable to Sallust as an historian and as a man of letters. In certain quarters he was deeried ; his brevity was said to be obscurity, and his fondness for old words and phrases, in whieh he is said to have imitated his contemporary Cato, was ridieuled as an affectation. Tacitus, however, speaks highly of him (Anz., iii. 30); and, to do hini justice, we must remember that he struck out for himself almost a new line in literature, as up to his time nothing of mueli

value had been done for Roman history, and his predeeessors had been little better than elironielers and annalists of the ‘‘dry-as-dust” type. Sallust aimed at being something like a Roman Thueydides, and, though he falls far short of the great Greek historian, and drifts now and again into mere rhetoric and pedantry, we may at least congratulate ourselves on the possession of his Catiline and Jugurtha, and we must feel that fortune has been unkind in depriving us of his larger work, his Histories.

SALMASIUS, Ctauprus (1588-1653), in the verna- cular SAUMAISE, the most distinguished classical scholar of his day, was born at Semur-en-Auxois in Burgundy, April 15, 1588. His father, a counsellor of the parle-

ment of Dijon, gave him an excellent education, and sent

him at the age of sixteen to Paris, where his promise excited the especial interest of Casaubon. After hardly overcoming his father's opposition, he proceeded in 1606 to the university of Heidelberg, nominally to be initiated into jurisprudence under Godefroy, but in fact entirely devoted to classical studies. The atmosphere of the place probably had its influence in inducing him to embrace Protestantism, the religion of his mother; and his first publication was an edition of a work by Nilus Cabasilas, archbishop of Thessalonica, against the primacy of the pope, with a similar tract by Barlaam. The Latin trans- lation of these works, although apparently assigned to Salmasius on the title page, is not by him. In 1609 he edited Florus, with notes compiled in ten days. In the following year he returned to France, and nominally pur- sued the study of jurisprudence to qualify himself for the succession to his father's post, which he eventually lost on account of his religion. Nothing important proceeded from his pen until 1620, when he published Casaubon's notes on the Augustan History, with copious additions of his own, equally remarkable for learning and acumen. In 1623 he married Anna Mercier, a Protestant lady of a distinguished family; and in 1629 he produced his magnum opus as a critic, his commentary on Solinus's Polyhzstor, or rather on Pliny, to whom Solinus is indebted for most of his materials. Greatly as this work may have been overrated by his contemporaries, it is still a monument of stupendous learning and conscientious industry. Salmasius learned Arabic to qualify himself for the botanical part of his task, and was so unwilling to go to press without having con- sulted a rare treatise by Didymus that the third part: of his commentary, De Herbis et Plantis, did not appear in his lifetime. He was now ostensibly as well as actually devoted to philology, and foreign universities vied with each other in endeavouring to secure his services. After declining overtures from Oxford, Padua, and Bologna, he closed in 1631 with a proposal from Leyden, offering an entirely honorary professorship, with a stipend of two thousand (afterwards raised to three thousand) livres a year, merely to live in Holland and refute the Annals of Baronius. This latter stipulation he never fulfilled. Shortly after his removal to Holland, he composed, at the request of Prince Frederick of Nassau, his treatise on the military system of the Romans, which was not published until 1657. Other works followed, mostly philological, but including a denunciation of wigs and hair-powder, and a vindication of moderate and

lawful interest for money, which drew down upon him many expostulations from | lawyers and theologians. It prevailed, however, with the Dutch Church to admit money-lenders to the sacrament. His treatise De Primatu Pape (1645), accompanying a republication of the tract of Nilus Cabasilas, excited a warm controversy in France, but the Government declined to suppress it. Notwithstanding his Protestantism and the opposition of the papal nuncio, he had already been made a royal counsellor and a knight of St Michael, and great | offers had been made to induce him to return, which, sus- pecting that he was to be charged with the composition of a panegyric on Richelieu, he honourably declined.

In November 1649 appeared the work by which Salmasius is best remembered, his Defensio Regia pro Carolo I. His advice had already been sought on English and Scotch affairs, and, inclining to Presbyterianism or a modified Episcopacy, he had written against the Independ- ents. It does not appear by whose influence he was induced to undertake the Defensio Legia, but Charles IL, low as his exchequer was, defrayed the expense of printing, aud presented the author with £100. The first edition was anonymous, but the author was universally known. A French translation which speedily appeared under the |

| Salmasius,

name of Le Gros was the work of Salmasius himself. This celebrated work, in our day principally famous for the reply it provoked from Milton, even in its own added little to the reputation of the author. Salmasius injured his character for consistency by defending absolute monarchy, and knew too little of English history and politics to argue his cause with effect. He deals chiefly in generalities, and most inappropriate illustrations from Biblical and classical history. Not caring sufficiently for his theme to rise to the heights of moral indignation, he is as inferior to Milton in earnestness as in eloquence and the power of invective. Milton had, no doubt, a great advantage in encountering a personality, at whose head vituperation could be launched, while Salmasius is fighting abstractions and indicting a people. But the reply to Milton, which he left unfinished at his death, and which was published by his son in 1660, is insipid as well as abusive. Until

the appearance of Milton's rejoinder in March 1651 the effect of Salmasius's work was no doubt considerable ; and it probably helped to procure him the flattering invitation from Queen Christina which induced him to visit Sweden in 1650. Christina loaded him with gifts and distinctions, but upon the appearance of Milton's book was unable to conceal her conviction that he had been worsted by his antagonist. Milton, addressing Christina herself, ascribes Salmasius's withdrawal from Sweden in 1651 to mortification at this affront, but this appears to be negatived by the warmth of Christina's subsequent letters and her pressing invitation to return. The claims of the university of Leyden and dread of a second Swedish winter seem fully adequate motives. Nor is there any foundation for the belief that Milton's invectives hastened his death, which took place on September 3, 1653, from an injudicious use of the Spa waters. He was at the time engaged upon his reply to Milton ; this he does not seem to have reckoned among the MSS. which, feeling that he had expressed himself with undue asperity, he directed his wife to burn after his decease. He left several sons, but his posterity did not attain the third generation.

Nothing, to modern ideas, can scem more singular than the literary dictatorship exercised by a mere classical scholar, who shone principally as a commentator, and whose independent works, though highly respectable, evince no especial powers of mind. Salmasius was far enough from being a Grotius, a Leibnitz, or even a Casaubon. As a commentator and verbal critic, however, he is entitled to very high rank. His notes on the Augustan

History and Solinus display not only massive erudition but massive good sense as well; his perception of the meaning of his

_ author is commonly very acute, and his corrections of the text are

frequently highly felicitous. His manly independence was shown in many circumstances of his life, and the general bias of his mind was liberal and sensible. He was accused of sourness and sullenness of temper; but the charge, if it had any foundation, is extenuated by the wretched condition of his health. His biographer Clément enumerates seven classes of disorders which pursued him throughout his life, and which render his industry and productiveness the more extraordinary. Papillon catalogues eighty books published by Salmasius himself, or from his MSS., or to which he

contributed notes; eighteen manuscripts which he himself saw in the library of M. de la Mare ; forty-three more mentioned by others; ninety-three works with MS. notes by which should now be in the National Library of France ; and fifty-nine books projected or contemplated.

The life of Salmasius was written at great length by Philibert de la Marc, counsellor of the parlement of Dijon, who inherited his MSS. from his son. Papillon says that this biography left nothing to desire, but it has the capital fault of never having been printed. It was, however, used by Papillon himself, whose account of Salmasius in lis Bibliotheque des Auteurs de Bourgogne (Dijon, 1745) is by far the best extant. There is an éloge by Clément prefixed to his edition of Salmasius's Letters (1656), and another by Morisot, inserted in his own Letters. Clément's notice contains many interesting facts, but it is marred by an extravagant admiration for its subject, perhaps excusable if he really believed that his hero was born in 1596, and edited Florus at thirteen. It 1s remarkable, however, that Clément passes over the Defensio Regia almost without notice, whether from feeling that it was unworthy of Salmasius, or because discussion

of the subject was discouraged in Holland during the existenee of the English Commonwealth. R. G.

SALMON. It will be convenient to consider this in connexion with the other members of the great family of fishes to which it belongs. See SALMoNIDZ.

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SALMONID. The distinguishing features of this family of fishes are described in technical language in the article IcuTHyoLocy (vol. xii. p. 693), and it is un- necessary to repeat the definition. The most conspicuous of the external characteristics is the presence of two dorsal fins, of which the anterior is well developed and supported by the usual jointed bones known as fin-rays, while the posterior is thick and fleshy, rounded in outline, and desti- tute of rays. 'The posterior fin is thus a rudimentary organ, and it is commonly called the adipose fin. There are two other families of fishes which resemble the Salmonide in the arrangement of the dorsal fins—the Percopside and Haplochitonidz ; but the former consists of

only one species, found in the United States, and the latter is confined to the southern hemisphere. Aiongst British fishes a Salmonoid can be always recognized by its dorsal fins.}

The Salmonide retain the open communication of the air-bladder with the intestine, and the original posterior position of the pelvic fins,—features which characterize the division of Yeleoster known as Physostomi. In the great assemblage of bony fishes known as Physoclisti, these features are lost in the adult condition. It is known that in all cases the air-bladder develops in the young fish as an outgrowth or diverticulum from the intestine; and it is obvious from a survey of Vertebrates in general that the posterior limbs belong originally to the neighbourhood of the anus. It follows therefore that in these features the Salmomdz, and all the Physostomi, are more similar to the early ancestors of the bony fishes than are those species in which the air-bladder is closed and the pelvic fins have an anterior position.

In the Salmonide the characteristic Teleostean pseudo- branchia is present. This organ is the diminished remnant of the series of gill-lamellze belonging to the posterior face of the hyoid arch, as the pseudobranchia in Elasmobranchs is the rudiment of the series of gill-lamellz belonging to the posterior face of the mandibular arch.2 The bones known as maxille form portion of the boundary of the upper jaw in Salmonidez ; in many fishes they are excluded from the jaw margin by the backward prolongation of the premaxille. There are no scales on the head in this family, and there are no fleshy filaments or “‘barbels” in the neighbourhood of the mouth as there are in many bony fishes—for example, the Cod, in which a single short barbel is attached beneath the lower jaw. The pyloric append- ages, cecal diverticula of the intestinal tube immediately behind the stomach, are nearly always present in consider- able numbers. In the female Salmon the oviduct, the tube connecting the ovary with the exterior, is wanting ; the eggs when ripe escape from the surface of the ovary into the abdominal cavity and pass thence to the exterior through a pair of apertures in the body wall situated one on each side of the anus; these apertures are the abdominal pores. In the male salmon there is a duct to the testis, and the semen is extruded through it in the usual way. Fertilization takes place outside the body, the spermatozoa and eggs uniting in the water.

Distribution.—Salmonide are found both in the sea and in fresh water. Most of the marine species inhabit the deeper parts of the ccean. Many of the freshwater forms pass a portion of their lives in the littoral parts of the sea, ascending rivers when adult every year in order to deposit

1 It is interesting to observe that a peculiarity of the dorsal fins is often a family eharaeter among the bony fishes. Thus the speeies of the Cod family (Gadidz) have usually three separate dorsal fins similar in shape and size. The Blenniidaw are characterized by the presence of a continuous dorsal fin extending almost the whole length of the baek. The Clupeida or Herrings all have a single triangular dorsal fin in the middle of the baek.

This at least is the view till recently aeeepted by most morpho- logists ; its correctness is questioned by Anton Dohrn.

their spawn ; that is to say, many species are anadromous. Some are confined entirely to fresh water. The Salmonide are, with the exception of one species indigenous to New Zealand, peculiar to the temperate and arctic regions of the northern hemisphere. Fossils belonging to the family are found in strata of Mesozoic age. Osmerus occurs in the greensand of Ibbenbiiren, and the schists of Glarus and Licata. Mallotus villosus, indistinguishable from the living Capelin, occurs abundantly in clay in Greenland, the geological age of the bed being unknown. Osmeroides acrognathus and Aulolepis are fossil genera occurring in the chalk near Lewes in Sussex, and were probably deep-sea Salmonoids. The introduction of certain species into new areas by human agency, which has been effected recently, and is still going on, will be described in another section.

Synopsis of Genera.

The following five genera include British species :—

1. Salmo, Artedi (Salmon and Trout). Scales small. Cleft of mouth wide; maxilla extending backward to below or behind the eye. Dentition well developed ; conical teeth on the jaw bones, on the vomer and palatines, and on the tongue; none on the pterygoid bones. Anal fin short, with fourteen or

fewer rays. Pyloric appendages numerous. Ova large. Dark transverse bands, known as “parr marks,” present on the sides of the body in the young stages of life.

2. Osmerus, Cuv. (Smelts). Scales of moderate size. Cleft of the mouth wide; maxilla long, extending to or nearly to the hind margin of the orbit. Dentition well developed; teeth on the maxilla and premaxilla smaller than those on the mandible; transverse series of teeth on the vomer, several of whieh are large and fang-like ; a series of conical teeth along the palatine and pterygoid bones; strong fang-like teeth on the front of the tongue, several longitudinal series of smaller ones on its posterior part. Pyloric appendages short and few in number. Ova small.

3. Coregonus. Scales of moderate size. Cleft of mouth small; maxilla rather short, not extending back beyond the orbit. Teeth minute, or absent altogether. Anterior dorsal fin with few rays. Pyloric appendages numerous. Ova small.

4. Thymallus, Cuv. (Graylings). Similar to Coregonus, but having a long anterior dorsal with many rays. Small teeth on jaws, vomer, aud palatine bones.

5. Argentina, Cuv. Scalesrather large. Cleft of mouth small; maxilla not extending to below the orbit. Teeth wanting on jaws; minute teeth on the head of the vomer and fore part of the palatines; series of small curved teeth on each side of the tongue. Dorsal fin short, in advance of the pelvic. Pylorie appendages few or in moderate numbers. Ova small. The most conspicuous peculiarity of this genus is the flattening of the sides to plane surfaces bordered by keeled ridges, so that the transverse section of the fish is hexagonal.

The following eleven genera include no British species :—

6. Oncorhynchus, Suckley (Ann. Lyc. Nat. Hist., 1861). Simi- lar to Salmo, except that the anal fin has more than fourteen rays.?

7. Brachymystax, Giinther. Intermediate between Salmo and Coregonus.

8. Luciotrutta, Giinther. Migratory trout from North America.

9. Plecoglossus, Schlegel. Body covered with very small scales. Cleft of mouth wide; maxilla long. Dentition feeble ; premaxilla with few small conical teeth. Ends of mandibles separate at the chin, the mucous membrane between them forming folds and pouches. Tongue very small, with minute teeth.

10. Retropinna, Gill. Similar to Osmerus.

11 and 12. Hypomesus, Gill, and Thaleichthys, Girard, are allied genera.

13, Mallotus, Cuv. (Capelin). Scales minute, somewhat larger along the lateral line and along each side of the belly. In mature males those scales become elongate, lanceolate with projecting points. Cleft of mouth wide ; maxilla very thin, lamelliform, extending to below middle of eye. Dentition very feeble ; teeth in single series. Pyloric appendages very short, few. Ova small.

14. Salanx, Cuv. Body elongate, compressed, naked, or with smal], exceedingly fine deciduous scales. Head elongate and much depressed, terminating in a long, flat, pointed snout. Cleft of mouth wide. Jaws and palatine bones with conical teeth, some of those on premaxilla and mandibles being enlarged ; no teeth on vomer ; tongue with single series of curved teeth. Antcrior dorsal fin far behind ventral, in front of anal ; adipose small. Pseudo- branchie well developed; air-bladder none. Alimentary canal quite straight ; pyloric appendages none. Ova small.

3 This is the generic distinetion adopted by Dr Giinther. Suekley's original diagnosis was the prolongation of both jaws in the males.

15. Microstoma, Cuv. Body elongate, cylindrical, covered with large thin silvery scales. Cleft of mouth very small; premaxilla very small; maxille very short and broad. Eye very large. Narrow series of very small teeth in the lower jaw and across the head of the vomer ; no other teeth. Dorsal fin short, inserted behind the ventrals, but before the anal; adipose fin present

in most young specimens, frequently absent in old ones. Pseudo- branchiz well developed; air-bladder large. Pyloric appendages absent ; mucous membrane of stomach with numerous large papille. The genus is allied to Argentina. ; :

16. Bathylagus, a genus of deep sea Salmonoids discovered by the “Challenger” in the Atlantic and Antarctic Oceans at depths of 1950 and 2040 fathoms.

Speetes.

1. Genus Salmo. The difficulty of defining and distinguishing the species of this genus is considerable, and much diversity of opinion on the subject exists among ichthyologists. Many of the species are extremely variable, so that some individuals of one resemble the more aberrant individuals of another; the species are seldom separated by conspicuous differences. The individuals of a given species vary considerably with age and sex, and also with habitat and external conditions. Many of the species are capable of breeding together and producing fertile offspring. The characters which are most constant, and on whose differences the distinction of species chiefly rests, are as follows :—(1) the form of the preoperculum (the horizontal breadth of this bone at its lower portion is always small in the young, but in the adult it is greater in some species than in others; (2) width and strength of maxillary in adult); (8) size of tecth; (4) arrangement and per- manence of vomerine teeth ; (5) form of caudal fin; (6) pectoral fins ; (7) size of scales; (8) number of vertebra ; (9) number of pyloric appendages.

In all the species of Salmo there are tecth in the vomer. In the Salmons proper and in the Trouts there are, in the young, tecth both on the head and body of that bone, but in some spccies on the body only; some of the teeth on the body arc deciduous, and are in most of the speeies shed at an early age. In the Charrs there are teeth on the head of the vomer but none on the body of the bone at any period of life, and nonc of the vomerine teeth are deciduous. The species of true Trout are confined to fresh water, and are not migratory. In accordance with these peculiarities some zoologists have divided the genus Salmo into three subgenera,—Salmo sensu restricto, Fario, and Salvelinus. But modern authorities retain only two subdivisions,

—the subgenera Salmo, including inigratory Salmon and non-migratory Trout, and Salvelinus, the Charrs.

A. Subgenus Sarmo.—A vast number of species of Salmo have been described ; in the Brit. Mus. Cat. Dr Giinther distingnishes fifty-two, of which seven are confined to the British Islands and four are found both in the British Islands and other parts of the world. Myr Day on the other hand considers that all the indi- genous Salmon and Trout of the British Islands belong to two species, Salmo salar and Salmo trutta,—Salmo levenensis and Salmo fario being varieties of the latter ; the rest of the described ao speeies he considers as local varicties or subvarieties of

ese.

(1) Salmo salar, L. (the Salmon). B. dhe e ak, 1a P. 14; V. 9; L. lat. 120; L. transverse 22-28; Vert. 59-60; Cee.

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pyl. 58-77.) Attains to a length of 4 to 5 feet ; female mature ata length of about 15 inches, Preoperculum with a distinct lower limb and with the angle rounded. Head of vomer subpentagonal, as long as broad, toothless ; the body of the bone with single series of small teeth which are gradually lost from behind forwards so that older examples only have from one to four left. Hind part of body elongate and covered with relatively large scales. Young with about eleven dusky transverse bars on the sides ; half-grown and old specimens silvery, with small black spots in small number ; spawning males with numerous large black and red spots, some of the red spots confluent into more or less extensive patches, especi- ally on the belly. An anadromous species, inhabiting temperate Europe southwards to 43° N. lat.; not found in Mediterranean ; in Asia and America southwards to 41° N. lat.

No varieties of Salmo salar are recognized in Europe, but in North America there occurs one Salmonoid which is considered by different authorities either as a variety or a sub-species, viz., Salmo salar, var. sebago, L. lat. 115. Body and dorsal and caudal fins with subquadrangular or subcircular black spots. Is non-migra- tory and occurs in some of the lakes of Maine

and New York in the United States ; these lakes have no communication with the

sea. This form is called variously the Landlocked Salmon or the Schoodic Salmon.

1 In the formula usually preeedin i i ipti i g the diagnosis or deseription of as eeies of fish, B= umber of branehiostegal rays; D=number of ova in dorsal ah § IPS peli Beka me ive in anal fin; V=ditto in ventral] fin; L lat = n eales along the lateral line ; L. transverse= . ‘in tl oblique transverse row of the widest part of t Wied pMtheupie ee

below the line in the fraction being those of the seales above and below the

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The true Salmo salar on the American shore of the Atlantic is sometimes called the Penobscot Salmon.

(2) Salmo trutta, Fleming; Salmo eriox, Parnell (Fishes of Firth of Forth) (Sea-Trout, Salmon-Trout, Bull-Trout). B. 11; D. 13; A. 11; P. 15; V. 9; L. lat. 120; L. transverse 24-26; Vert, 59- 60; Cec. pyl. 49-61. Attains to a length of about 3 feet; female mature at a length of 10 to 12 inches. Head of vomer triangular, as broad as long, toothless, body of the bone with a longitudinal ridge armed with a single series of teeth, which are deciduous ; generally only the two or three anterior ones found in examples of more than 20 inches in length. Silvery, sometimes immaculate, usually with more or less numerous X-shaped spots; spots on the head and dorsal fin round and readily disappearing. Young (parr) with nine or ten dusky cross bars ; grilse with top of dorsal and pectoral and with hind margin of caudal black. A migratory species, occurring in the rivers falling into the Baltic and German Ocean; numerous in Scotland, less frequent in English and Irish rivers.

(8) Salmo eambricus, Donov. (Brit. Fishes) (the Sewen of Couch, Salmon Peal). B. 10-11; D. 14; A. 11-12; P. 16; V. O°. iaie 120-125; L. transverse -? %—; Vert. 59; Czc. pyl. 39-47. Attain- ing to a length of 3 feet; female mature at a length of from 12 to 13 inches. Preoperculum with a distinct

lower limb, with the angle rounded aud with the hind margin convex or undulated, subvertical. Head of vomer triangular, broader than long, toothless in adult examples, armed with a few teeth across its hinder margin in young ones; body of the bone with a sharp longitudinal ridge, in the sides of which the teeth are inserted, forming a single series, and alternately pointing to right and left. In pure-bred specimens these teeth are lost in the grilse state, so that only the two or three anterior remain in specimens more than 12 or 18 incheslong. Fins of moderate length ; caudal fin forked in parr stage, slightly emarginate in grilse, truncate in mature specimens. ‘This specics loses the parr marks very early, when only 5 to 6 inches long ; itis then bright silvery. Greenish on the back, with few small round black spots on the head and sides. This coloration remains nearly unaltcred during the further growth of the fish, but the spots become more irregular, indistinctly X-shaped. An anadromous species, occurring in rivers of Norway, Denmark, Wales, and Ireland. Mr Day (Fishes of Great Brituin) considers this form as merely a variety of Salmo trutta.

(4) Salmo fario, L. (Trout). varieties :—

(a) Salmo fario gaimardi; Salmo gaimardi, Cuv. and Val.; Salmo trutta, Gaimard (Voy. Isl. and Groenl., Atl. Poiss., pl. 15,

Dr Giinther distinguishes two

fig. A). D. 18-14; A. 11-12; P.14; V. 9; L. lat. 120; L. trans- verse 3%; Cee. pyl. 33-46; Vert. 59-60. Largest specimen

observed, 15 inches; female mature at a length of 7 or 8 inches. Head of vomer triangular, small, broader than long ; vomerine tecth in a double series sometimes disposed in a zigzag line, persistent throughout life. Sides with numerous round or X-shaped black spots ; upper surface and sides of the head and the dorsal, adipose, and caudal fins usually with crowded round black spots ; dorsal, anal, and ventral with a black and white outer edge. Found in Iceland, North Britain, Ireland, Scandinavia.

(6) Salmo fario ausonit; Salmo ausonit, Cuv. and Val. (the common River-Trout). Formulaas ina, but Vert. 57-58. Attains to a length of 30 inches; female mature at a length of 8 inches. A non-migratory species, inhabiting

numerous fresh waters of Central Europe, Sweden, and England, and rivers of the Maritime Alps.

The following forms are peculiar to the British Islands :—

(5) Salmo levenensis, Walker (Wern. Mem., i. p. 541) (Loch Leven Trout). D.18; A. 11; P. 14; V. 9; L. lat. 118; 1. tee verse $5; Cac. pyl. 68-80; Vert. 59. Maximum length 21 inches. Teeth moderately strong ; the head of the vomer triangular with a transverse series of two or three teeth across its base; the teeth of the body of the vomer form a single series and are persistent throughout life. Upper parts brownish or greenish olive ; sides of the head with round black spots; sides of the body with X-shaped, sometimes rounded, brown spots. Dorsal and adipose fins with numerous small brown spots. A non-migratory species, inhabiting Loch Leven and other lakes of southern Scotland and northern England. This species is considered by Mr Day as a variety of S. trutta. s

(6) S. brachypoma, Giinther; S. eriox, Parnell (Fish. Firth of Forth). D. 18; A. 10-11; P. 14; V. 9; L. lat. 118-128; L. trans- verse $$; Cac. pyl. 45-47; Vert. 59. Preoperculum with scarcely a trace of lower limb. Teeth rather strong; those of the vomer in double sevies, but in zigzag line. Most of them are lost in specimens 17 inches long, only a few of the antcrior remaining, Sides of the body with X-shaped or ocellated black spots, some red spots along and below the lateral line ; dorsal fin with ronnd black spots. Dorsal, anal, and ventral fins with a white and black outer margin in young examples. A migratory species, from the rivers Forth, Tweed, and Ouse. According to Mr Day, itis identical with the White Salmon of Pennant and Salmo albus of Ouv. and Val.,

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all of them being considered by Day as a variety, S. albus, of Salmo trutta,

(7) S. gallivensis, Giinther. An anadromous spccies from Galway, distinguished by the aeutely pointed but not elongate snout, broad convex head, small eye, feeble teeth, feeble maxillary and mandible, and by extremely thin and short pyloric appendages, which are not longer than one

inch nor thicker than a pigeon’s quill. According to Day a varicty of §. fario.

(8) S. ferox, Jard. and Selby (Edinb. New Philos. Journal, 1835, xvili.). A non-migratory species inhabiting the large lochs of the north of Scotland and several lakes of the north of England, Wales, and Ireland. Preoperculum crescent-shaped, the hinder and lower margins passing into each other without forming an angle. According to Day a varicty of 8. fario.

(9) S. oreadensis, Giinther, from Loch Stennis in Orkney.

(10) S. stomachieus, Giinther (the Gillaroo). From lakes of Ireland. Thick stomach. Feeds on shells (Limneus, Ancylus).

(11) S. nigripinnis, Giinther. Non-migratory species inhabiting mountain pools of Wales, also Lough Melvin, Ireland.

Day mentions also the following varieties of S. fario:—

S. cornubiensis, Walb., Artedi ;

Swaledale trout, from Swaledale, Yorkshire ; and

Crassapuill trout, from Loch Crassapuill, Sutherlandshire.

Many species of Salmo exist which are confined to limited areas in the continent of Europe. An account of these is given in the Brit. Mus. Catalogue, which also contains references to the litera- ture. One of these, S. maerostigma, Duméril, is a non-migratory form occurring in Algeria, and is the southernmost species of the Old World. Three non-migratory species exist in the rivers belonging to the basin of the Adriatic. In the Alpine lakes of central Europe five species are known, which resemble in habits the forms found in British lakes, ascending the streams which feed the lakes, in order to spawn. Two of these species inhabit the Lake of Constanee, one the Lake of Geneva. Fuarto argenteus, Cuy. and Val., found in the Atlantie rivers of France, is con- sidered by Dr Gtinther a distinct species, by Mr Day as a synonym of S. trutta. One niigratory specics is known from the

Kidfjord river in Norway; two land-locked species from Lake Wener in Sweden.

The species of Salmo belonging to the Pacific Coast of North America have been described by Richards in Fawn. Bor. Amer, by Suckley in Nat. Hist. Washington Territory, and by Girard in Proc. Acad. Nat. Se. Philad. Only one species need be mentioned here, and that on account of the importance it has acquired in connexion with the work of the United States Fish Commission :-—

Salmo trideus, Gibbons (Proe. Cal. Ac. Nat. Se., 1855, p. 36); Salar tridea, Givard (Proc. Acad. Nat. Sc. Philad., 1856, p. 220 and U.S, Pae. Rk. h. Hxplor.—Fish, p. 321, pl. 73, f. 5, and pl. 74) (the Californian, Mountain, or Rainbow Trout). B. 10; D. 14; A. 14; L. lat. 140. Caudal deeply emarginate. Body and dorsal and caudal fins with numerous small black spots. A non-migratory specics in rivers of Upper California.

For the same reason as in the preceding easc, the following species of the eastern slope of the North American continent is introduced :—

Salmo namayeush, Penn (Aret. Zool., ii. p. 189), Cuv. and Val. (xxi. p. 348) (Lake Trout). B. 11-12; D. 13-14; A. 12; V.9; L. lat. 220. Praoperculum very short, without lower limb; head very large. out life, and in single series. Inhabits all the great lakes of the northern part of North America.

B. Subgenus SALvELINUS :—

Salmo alpinus, L. (the Charr, Yarrell, Brit. Fishes, 3d ed.). Deis; Aw 12; P, 13; VY. 10; L. lat. 195-200; Vert. 59-62; Cee. pyl. 86-42. Body slightly compressed and elongate. Length of head equal to height of body in mature specimens and two- ninths or one-fifth of total length ; maxillary extends but little beyond the orbit in the fully adult fish. Eye one-half, or less than one-half, of the width of the interorbital space. Teeth of moderate sizc. Inhabits lakes of Scandinavia, Scotland (Helier Lake, Hoy Island, Orkneys; Sutherlandshire ; Loch Roy, Inver- ness-shire), and probably Iceland.

S, killinensis, Giinther (Proe. Zool. Soe., 1865, p. 699). D. 14- fee io; PF 13, V.9; L. lat. 180; Vert, 62; Cee. pyl. 44— 52. Head, upper parts, and fins

brownish black ; lower parts with an orange-coloured tinge in the male; sides with very small, light, inconspicuous.spots. Anterior margins of the lower fins white or light-orange-coloured. Loch Killin, Inverness-shire. Considered by Mr Day as a variety of S. alpinus.

S. willughbii, Giinther (Proe. Zool. Soc., 1862, p. 46, pl. 5); Charr, Willughby (Hist. Pise., p. 196), Penn (Brit. Zool.), and Yarrell (Brit. Fish., 3d ed.) (the Charr of Windermere). D. 12- 13; A. 12; P. 18-14; V. 9-10; L. lat. 165; Vert. 59-62; Cee. pyl. 32-44. Sides with red dots; belly red; pectoral, ventral, and anal with white margins. Lake of Windermere ; Loch Bruiaeh (Scotland). Considered by Mr Day as a variety of S. alpinus,

S. perisit, Gtinther (Ann. and Mag. Nat. Hist., 1865, p. 75);

Tecth strong ; those on the vomer persistent through-

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Torgoch, Willughby (Hist. Pise.) and Penn (Brit. Zool.) (the Horoch or RedCharr), 3D) igeeA, 12> P12: V. 9; LL. lat. 170; Vert. 61; Cac. pyl. 36. Sides with numerous red dots ; belly red in the mature fish; pectoral, ventral, and anal with white margins. Lakes of North Wales (Llauberris). Considered by Mr Day asa variety of S. alpinus.

S. grayi, Giinther (Proc. Zool. Soe., 1862, p. 51). D. 13; A. 12; P, 138-14; V. 9; L lat. 125; Vert. 60; Cee. pyl. 37. Sides with scattered light-orange-eoloured dots; belly uniform silvery whitish, or with a light-red shade ; fins blackish. Lough Melvin, Ireland. Considered by Mr Day as a variety of S. alpinus.

S. eolii, Giinther (Proc. Zool. Soe., 1863) (Cole’s Charr, Couch, iis, Brit, ies). Wadd: A Awe P. 18s V.. OF Laie 160 ; Vert. 63; Cec. pyl. 42. Blnish black above; sides silvery with seattered light-salmon-coloured dots; belly reddish ; fins black, the anal and the paired fins with a reddish tinge, the anal ond ventrals with a narrow whitish margin. A small spceies 7 to 8 inches long from Loughs Eske and Dan, Ireland. Considered by Mr Day as a variety of 8. alpinus.

The above are all the British species.

S. wmbla, L. (Syst. Nat.), Cuv. and Val. D. 12; A. 12-13; P. 14; V.9; L. lat. 200; Vert. 65; Cec. pyl. 36. Commonly called in French Ombre Chevalier. Lower parts whitish or but slightly tinged with red. Lakes of Constance, Neuch4tel, and Geneva. Considered by Mr Day as identical with 8. alpinus. Other species have been described from lakes in Europe and Asia, but are imper- fectly known ; for an aceount of them sce Giinther's Catalogue.

The following American species of Charr is one of those cultivated by the Amerieau Fish Commission :—

S. (Salvelinus) fontinalis, Miteh. (Trans. Lit. and Phil. Soe., New York, i. p. 435), Cuv. and Val. (xxi. p. 266) (Brook Trout). B. 12; D. 12; A. 10; L. lat. 200; Cec. pyl. 34. No median series of teeth along the hyoid bone. Propereulum short in longitudinal direetion, with the lower limb very indistinct. Rivers and lakes of British North America, and of the northern parts of the United States. Introdueed in Britain.

2. Of the genus Osmerus only three species are described in the Brit. Mus. Cat., one of which is British :—

Osmerus eperlanus, Laeép., Linn. (the Smelt; Fr., Eperlan ; Scotch, Sparling or Spirling). B.8; D.11; A. 13-16; P.11; V. 8; L. lat. 60-62; L. transverse 74; Cec. pyl. 2-6; Vert. 60-62. Height of body much less than length of the head, which is a quarter or two-ninths of the total length to base of caudal fin. Snout pro- duced. Vomerine teeth and anterior lingual teeth large, fang-like ; posterior mandibular teeth larger than the anterior ones, which form a double series, the inner series containing stronger teeth than the outer one. Back transparent, greenish ; sides silvery. Adult size 10 or 12 inches. Coasts and numerous fresh waters of northern and central Europe.

Osmerus viridescens, Lesueur, another species scareely distinct from O. eperlanus, but with scales a little smaller, occurring on the Atlantic side of the United States.

Osmerus thaleichthys, Ayres, oeeurs abundantly in the Bay of San Francisco.

3. Of Coregonus forty-one species are described in the Brit. Mus. Cat. Your species are found in Britain :—

C. oxyrhynchus, Kroyer, Linn., Cuv. and Val. (xxi.). Called the Houting in Holland. B. 9; D. 14; A. 14-15; L. lat. 75-81; L. transverse 24°; Vert. 58. Snout produced, with the upper jaw protruding beyond the lower, and in adult specimens produced into a fleshy cone. Length of the lower limb of operculum 13 to 1} times that of the upper. Pectoral as long as the head without snout. Found on coasts and in estuaries of Holland, Germany, Denmark, and Sweden. Captured recently (three speeimens only) in Lineolnshire, near Chichester, and at the mouth of the Medway.

C. elupeoides, Lacépede ; C. pennantii, Cuv. and Val. (the Gwy- niad of Lake Bala, Schelly of Ullswater, Powan of Loch Lomond; somctimes called the Freshwater Herring). B.9; D. 14-15; A. 13- 16; L. lat. 73-90; L. transverse 7%; Cae. pyl. 120; Vert. 38/20. Snout with upper jaw not produced. Pectoral larger than the head. Fins black or nearly so. Lakes of Great Britain.

C. vandesius, Riehards (Faun. Bor. Amer.); C. albwla, Cuv. and Val. (the Vendace), D. 11; A. 18; V. 11; L. lat. 68-71; L. transverse ;8;; Vert. 56. Castle Loch, Lochmaben in Dumfries- shire.

C. pollan, Thompson (Proc. Zool. Soe., 1835), Cuv. and Val. (the Pollan), D. 18-14; A. 12-18; V. 12; L. lat. 80-86; L. transverse #3 Vert. 60-61. Two jaws of same length. Teeth if present very minute. Bluish along the baek, silvery along the sides and beneath. Usual length ot adults 10 to 11 inches, maximum 13 inehes. Ireland, in Loughs Neagh, Erne, Derg, Corrib, and the Shannon.

Thirty-seven species of Coregonus have bcen distinguished besides these four. Some are migratory ; but the greater number are inhabitants of large lakes. The anadromous species are confined to the Arctic Sea, and the greater number belong to the coast and

rivers of Siberia. Several distinct species occur in the lakes of Sweden; a few are found in the lakes of Switzerland and central Europe. C. hiemalis is peculiar to the Lake of Constance. Several species inhabit the great freshwater lakes connected with the river St Lawrence of North America, and the lakes farther to the north. One of these is cultivated by the American Fish Commission :—

Coregonus clupeiformis, Mitchell, Dekay (New York Fauna, Fish), Cuv. and Val., Agassiz (Lake Superior) (the Shad Salmon, Freshwater Herring, Whitefish). D. TOR Aas: L. Tat: 76-77; L. transverse 38; The snout is pointed, and there is an appendage to the ventral fin which is half as long as the fin itself. Length of adult 11 to 18 inches. Lakes Erie and Ontario.

4, Only one species of Thymallus occurs in the British Islands :-—

Thymallus vulgaris, Nilsson; Thymallus vewillifer, Cuv. and Val. (the Grayling; French, Z'Ombre; Italian, Temelo). B. 7-8; D. 20-23; A. 18-16; P. 16; V. 10-11; L. lat. 75-85; L. transverse ,2-°, ; Cec. pyl. 22; Vert. 39/22, Length of head two- ninths or one-fifth of total length to base of caudal ; posterior dorsal rays somewhat produced in adult. Grows to 15 inches in length. A freshwater fish, common in many of the rivers of England, introduced into some of those of southern Scotland ; absent from Ireland. It is widely distributed in central and northern Europe, occurring in Lapland, Sweden, Lake of Constance, the Isar, and the Danube. Adult size about 15 inches.

Thymallus eliani, Cuv. and Val. (@duaddos, A., xiv. 22), occurs in Lago Maggiore. One species has been described from Siberia, and two are known inhabiting Lake Michigan and the waters of British North America.

5. Of Argentina four species are described in the Brit. Mus. Cat., namely : —Argentina stlus, Nilsson, occurring off the north-west coast of Norway, Argentina sphyrena, L., from the Mediterranean, Argentina hebridica, Nilsson, found on the coasts of Norway and Scotland, and Argentina lioglossa, Cuy.and Val. According to Mr Day, two of these, 4. sphyrena and A. hebridica are identical, the species ranging from the coast of Norway and east and west shores of Scotland to the Mediterranean. The following is the formula of A. hebridica, Nilsson, according to Giinther :—D. 9-11; A. 18

(12) ; P. 18-14; V. 11; L. lat. 52-53; Cee. pyl. 14-20; Vert. 52. scales with minute spines.

6. The species of Oncorhynchus are all anadromous, and are con- fined to American and Asiatic rivers flowing into the Pacific. O. quinnat, Richardson = 0. ehowteha occurs in the river Sacra- mento, and is cultivated by the American Fish Commission.

7, 8. For Brachymystax and Luciotrutta, see p. 221 above.

9. Plecoglossus comprises small aberrant freshwater species abundant in Japan and the island of Formosa.

10. Retropinna contains but one species, R. rtehardsonit, which is known as the New Zealand Smelt. It is common on the coasts of New Zealand, ascending estuaries. Like Osmerus eperlanus, it is landlocked in fresh water in some localities.

11, 12. The species of Hypomesus and Thaleichthys occur on the Pacific coast of North America. Thaleichthys pacifieus, Girard, is caught in vast numbers in the neighbourhood of Vancouver Island; it is extremely fat, and is used as a torch when dried, and also as food. It is called locally the Eulachan or Oulachan.

13. Of Mallotus only one species is described by Giinther :—

Mallotus villosus, Cuv. and Val., Miill. (the Capelin ; French, Capelan). B. 8-10; D. 18-14; A. 21-23; P. 18-20; V. 8; Cee. pyl. 6; Vert. 68. Brownish on the back, silvery on the sides. Operculum silvery with minute brown dots. Shores of Arctic North America and of Kamchatka.

14. Of the genus Salanx two species are known:—Salanx chinensis, Giinther, Osbeck, which is common on the coast of China aud called “ Whitebait” at Macao, and Salanz microdon, Bleeker, from the rivers of Jeddo.

_ 15. Microstoma.—ZJf, rotundatum, Risso, is marine and occurs in the Mediterranean ; it is not anadromous. It is the only species of the genus

known, unless the Microstomus grinlandicus,

escribed by Reinhardt, from the Sea of Greenland, really belongs to this genus, ss

16. For Bathylagus, see p. 222 above.

Life History of the Salmon and Allied Species.

Up to a period not many years past, when our knowledge of the breeding and life history of the salmon and kindred species was based entirely on desultory observations of the fish in their natural conditions, there existed a great deal of uncertainty and diversity of opinion on the subject. Within the last twenty or thirty years the extensive practice of salmon-culture has removed nearly all obscurity from the phenomena, and the history of Salmonoids 1s now more accurately known than that of most other fishes.

The salmon proper, Salmo salar, breeds in thé shallow running waters of the upper streams of the rivers it ascends. The female when about to deposit her eggs, scoops out a trough in the gravel of the bed of the stream. This she effects by lying on her side and ploughing into the gravel by energetic motions of her body. She

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then deposits her eggs in the trough ; while she is engaged in these operations she is attended by a male, whio sheds milt over the eggs as the female extrudes them, fertilization being, as in the great majority of Zeleostei, external. The parent fish then fill up the trough and heap up the gravel over the eggs until these are covered to a depth of some feet. The gravel heap thus formed is called a ‘‘redd.” The period of the year at which spawning takes place in the British Isles, and in similar latitudes of the northern hemi- sphere, varies to a certain extent with the locality, and in a given locality may vary in different years; but, with rare exceptions, spawning is confined to the period between the beginning of September and the middle of January.

The eggs of Salmo salar are spherical and non-adhesive ; they are heavier than water, and are moderately tough and elastic. The size varies slightly with the age of the parent fish, those from full- sized females being slightly larger than those from very young fish. According to rough calculations made at salmou-breeding establish- ments, there are 25,000 eggs to a gallon; the diameter is about a quarter of an inch. It is usually estimated that a female salmon produces about 900 eggs for each pound of her own weight; but this average is often exceeded.

The time between fertilization and hatching, or tle escape of the young fish from the egg-membrane, varies considerably with the temperature to which the eggs are exposed. It has been found that at a constant temperature of 41° F. the period is 97 days; but the period may be as short as 70 days and as long as 150 days without injury to the health of the embryo. I+ follows therefore that in the natural conditions eggs deposited in the autumn are hatched in the early spring. The newly hatched fish, or ‘‘alevin,” is provided with a very large yolk-sac, and by the absorption of the yolk contained in this the young creature is nourished for some time ; although its mouth is fully formed and open, it takes no food. The alevin stage lasts for about six weeks, and at the end of it the young fish is about 14 inches long. During the next period of its life the young salmon is called a “ parr,” and is dis-

| tinguished by the possession of a number of dark transverse marks

along the sides, known as “parr marks.” These marks occur in the young stage of many species ainong the Salmontdx. The parr doubles its lengtli in about four months.

The great majority of parr remain in fresh water for two years after hatching, at the end of which time tliey are about 8 inches in length. The second spring after they are hatched they develop a coating of bright silvery scales which completely conceals the pur marks, and they pass into a stage in which they are known as “smolts.” The smolt is similar to the adult salmon in all respects except size, and the young salmon, as soon as the smolt stage is reached, migrates down the rivers to the sea.

The above facts have been established within recent years by accurate observation and experiment. Not very long ago it was a disputed question

whether the parr was the young salmon or a distinct species of fish. That the former view was correct was first experimentally proved by Mr John Shaw, gamekeeper to the duke of Buccleuch, Drumlanrig, Dumfriesshire, who in 1833 isolated

| several parrs in a pond, and found that in April 1834 they changed

into smolts ; an account of this experiment was published in the Transactions of the Royal Society of Edinburgh. The question is now of merely historical interest, for at the present time large num- bers of parr are hatched at various fish-hatching establishments every season. By observation at these establishments, the know- ledge of the history of the parr and the migration of tlie smolt which had been gained by the study of the fish in their natural conditions has been rendered more accurate and complete.! It has been conclusively ascertained that some parr become smolts and migrate to the sea in the spring following that in which they were hatched, while the great majority remain in the parr stage until the second spring, and a few do not attain to the smolt condition until the third year. The male parr when only 7 or 8 inches in length is often sexually mature, the milt being capable of fertilizing the ova of an adult female salmon.

The migration of smolts to the sea takes place in all rivers at about the same time of the year, viz., between March and June. Sometimes the smolts are observed descending in large shoals. Formerly angling for the descending smolts was a recognized sport, but their capture is now illegal. It is the opinion of the most competent authorities that the smolts increase with wonderful rapidity in size and weight when they reach the sea, and then return to the rivers after a few months, during the same year, as ‘“grilse,” which name is given to sexually mature salmon up to a little over 5 Ib in weight. It is surprising that a smolt weighing only a few ounces should increase to 3 or 4 or even 6 Ib in about three months. Nevertheless it has been proved by actual experi- ment that this is the fact. At Stormontfield, in May 1855, 1300 snlolts were marked by cutting off the adipose fin, and 22 of these

1 The first important series of experlments on the growth and life history of the salmon was made at the salmon-hatehery of Stormontfield near Perth in

1862 and some previous years. The results are detailed in a work entitled Stormont- Jeld Experiments, 1862.

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were recaptured the same summer as grilse, weighing from 8 1b upwards. It might be supposed that some smolts do not return as grilse till the summer following the year of their descent, the time of their stay in the sea being variable, as is the period spent by parr in the rivers. But all the evidence is against this supposi- tion; grilse never commence ascending till late in summer; if they had been morc than a year in the sea, some would probably ascend early in the season, as do the larger salmion. At the same time it must be borne in mind that a fish which remained in the sea a year after descending as a smolt might not be recognized as a grilse, having reached the size of a small salmon,

The grilse, after spawning in autumn, return again to the sea in the winter or following spring, and reascend the rivers as mature spawning salmon in the following year. Both salmon and grilse after spawning are called “kelts.” The following recorded experi- ment illustrates the growth of grilse into salmon :—a grilse-kelt of 2 tb was marked on March 31, 1858, and recaptured on August 2 of the same year as a salmon of 8 ib.

The ascent of rivers by adult salmon is not so regular as that of grilse, and the knowledge of the subject is not at the present time complete. Although salmon scarcely ever spawn before the month of September, they do not ascend in shoals just before that season ; the time of ascent extends throughout the spring and suinmer. A salmon newly arrived in fresh water from the sea is ealled a clean salmon, on account of its bright, well-fed appearance ; during their stay in the rivers the fish lose the brilliancy of their scales and detcriorate in condition. The time of year at which clean salmon ascend from the sca varies greatly in different rivers ; and rivers are, in relation to this subject, usually denominated early or late. The Scottish rivers flowing into the German Ocean and Pentland Firth are almost all early, while those of the Atlantic slope are late. The Thurso in Caithness and the Naver in Suther- Tandshire contain fresh-run salmon in December and January ; the same is the case with the Tay. In Yorkshire salmon commence their ascent in July, August, or September if the season is wet,

but if it is dry their migration is delayed till the autumn rains set in, In all rivers more salmon ascend immediately after a spate or flood than when the river is low, aud more with the flood tide than during the ebb.

In their ascent salmon are able to pass obstructions, such as water- falls and weirs of considerable height, and the leaps they make in surmounting such impediments and the persistence of their efforts are very remarkable. In a great many rivers anadromous Salmon- oids have been excluded from the upper reaches by artificial obstructions, such as dams and weirs, constructed for the purpose of utilizing the water of the stream, or to obtain water power, or simply to facilitate the capture of the fish. Other rivers have been rendered uninhabitable to salmon by pollutions. The state of the Thames within the boundaries of London has since the beginning of the present century exeluded Salmonoids entirely from the river; but every season salmon and grilse arc taken in or near the Thames estuary, and there is no doubt that if the water could again be rendered moderately elear, and if fish-ways were provided at the impassable weirs, the upper waters of the Thames would again be frequented by salmon and migratory trout.

The life history of Salmo trutta and S. eambrieus is very similar to that of Salmo salar. The river trout, 8. fario, makes a redd in the shallower parts of streams in the same manner as the salmon, the only difference being that the mound of gravel forming the redd is smaller, the egg lying from one to two feet below the surface. The breeding period of the trout varies in different rivers, within the limits of September and March.1_ ‘The number of eggs pro- duced by each female is about 800 for every pound of the parent’s weight ; about 40,000 of the eggs make a gallon, so that they are considerably smaller than those of S. salar. The trout of Loch Leven, S. levenensis, ascend the streams feeding the loch, in order to spawn, at the end of September and beginning of October. The habits of other species of lake trout are similar to those of S. levenensis.

The charrs differ from lake trout in the fact that they do not ascend streams in order to spawn, but form their redds in the gravelly shallows of the lakes they inhabit. The spawning period of the eharr of the Cumberland lake district is from the beginning of November to the beginning of December. The eggs of the charr have been found to hatch in from 60 to 90 days, the

great majority in 70 days, at an average temperature of 40° F. The American species, 8. fontinalis, breeds at about the samc time as S. fario; its eggs are only half the size of those of the latter.

The smelt, O. eperlanus, is a gregarious fish and exhibits regular migrations in mostestuaries. It is common in the Solway, the Firth of Forth, the rivers of Norfolk, and the estuary of the Thames. In most places where it is found it remains in the fresh and brackish water from August until May, spawning about the month of April, and afterwards deseending to the sea for the

Tlowietonn, is at 44°1—Salmo fario, 71 days; S. levenensis, 72; S. fontinalis, 73; S. salar, 77.

summer. At Alloa on the Forth smelts are taken in large numbers by seine nets in spring, before and during the spawning period. There is a regular fishery for them at the same season on the Solway Firth and in Norfolk. The food of the smelt consists chiefly of young fish, especially young herrings, and crustaceans. The eggs are small, yellowish in colour, and adhesive, not adhering by the surface merely as is the case with those of the herring, but each egg posscssing a short thread the end of which becomes attached to planks, stones, or other solid objects in the water. According to Mr Day the eggs are deposited near the high-water mark of spring-tides, so that they must be exposed to the air during the ebb. ‘The smelt when in the sea is largely eaten by the picked dog-fish (Acanthias vulgaris). The species is absent from the southern coast of England and from Ireland, the smelt recorded as occurring on those coasts being probably the atherine (Atherina), often called the sand-smelt. 0. eperlanus is abundant ou the coast of Finland, and also iscommon there in freshwater lakes, in whieh it remains all the year round. It isalso common on the Atlantic coast of France. It is of intcrest to note that the smelt in Britain and on other coasts, when not confined to fresh water, is, in its migration, intermediate between anadromous Salmonide, which ascend to near the sources of rivers, and such fish as the herring, whieh approach the shore to spawn but do not usually enter rivers. The smelt as a rule ascends estuaries only as far as the region of brackish water.

The various species of Coregonus resemble the charr in their habits, spawning in the autumn in the shallows of the lakes they inhabit ; their ova are small, and, as mentioned in PiscicuLTURE (q.v.), are non-adhesive and of almost the same specific gravity as fresh water, so that they are semi-buoyant.

The grayling, Thymallus vulgaris, is in Britain exclusively fluviatile ; in Scandinavia it is found also in lakes. It is met with chiefly in clear streams with sandy gravels or loamy beds. It was introduced not many years ago into the Tweed by the marquis of Lothian, and thrives there. It is absent from the Thames, but.is common in most of the rivers of England and Wales —e.g., the rivers of Yorkshire, the Severn, and the Wye. It is absent from Ireland. It feeds on insects and their larvae, crustaceans, and small molluscs. It breeds in April and May, depositing its ova on the surface of the gravel in the shallows, not in aredd. The ova are smaller than those of the trout, and vary in colour from white to deep orange, and they hatch from the twelfth to the fourteenth day after extrusion. The fry grow to 4 or 5 inches in length by August, and by the following autumn to 9 or 10 inches.

Salmon Fishery Legislation.

In England and Wales the common law is that every person has an equal right to fish for salmon in the sea and in navigable tidal rivers, while the proprietors of the soil on the banks of rivers which are not navigable have the exclusive right of fishing in them. The erection of stake-nets, or other fixed engines for the capture of salmon in estuaries or on the sea-coast is necessarily incompatible with the maintenance of the publie right of fishing, and has therefore from very early times been regarded as illegiti- mate. There has consequently been a eonstant conflict between legislation and private interest over this point. By Magna Charta all fishing weirs were abolished except on the sea-coast, but the object of this seems to have been rather the protection of the freedom of navigation than the advantage of the salinon fisheries or the maintenance of a public right. In later times fixed engines were repeatedly declared illegal and their erection prohibited by statute. Finally in 1861 they were definitively abolished in all cases except where legal right to maintain them could be conelusively proved. ‘The Salmon Fishery Act of 1861, of which the prohibition Just referred to was

one of the clauses, was based upon the report of a royal commission appointed in 1860 to inquire into the condition of the salmon fisheries, and it forms the basis of the regulations at present in force, all previous legislation being by it expressly abolished and superseded. It prohibited the capture of unclean and unseasonable salmon, made a uniform close season for England and Wales, ordained a weekly close season of forty- two hours, provided for the erection of fish-passes and regulated the use of fishing weirs on non-navigable rivers, vested the eentral authority of the salmon fisheries in the Home Office, and provided for the appointment of inspcetors. In 1863 an Act was passed prohibiting the exportation of salmon during the elose time. In 1865, as it was found useless to legislate without machinery to enforee the law, an Act was passed to constitute fishery districts under the control of local boards of conservators appointed by the magistrates in quarter-sessions. These boards were empowered to enforce a licenee duty on fishing implements used in public waters. One or two minor salmon fishery Acts were passed in succeeding years, but the next important piece of legislation on the subject was the Act of 1878, the two most im- portant provisions of which are (1) that fishermen in public waters for every £50 of licence duty which they pay elect a member of the

local board of conservators, and (2) that each board of conservators may make bye-laws for the regulation and improvement of the fisheries within its own district. The annual close time for salmon in England and Wales at present for nets commences Aug. 14-Sept. 30 and closes Feb. 2-April 1, varying in different districts within the limits given; for rods the close time is Sept. 30—Novy. 29 to Feb, 1-May 1. The law as regards close time for fixed engines was amended in 1879. The mcthod of fishing followed in the English and Welsh estuarics is in consequence of the above course of legislation that of sweep-nets worked from shore by boats; a licence duty has to be paid for each net, and stake-nets along the coast are very rare. An inspector of salmon fisheries appointed by the Home Office reports annually. ;

In Scotland the salmon fishery customs in one respect differ much from those of England: stake nets are the common and universal means of salmon capture in estuaries, although sweep nets are also employed. The reason of this is that originally all the salmon fishings belong to the crown or the grantees of the crown. The principal Acts regulating Scottish salmon fisherics are those of 1862 and 1868, but, as the previous statutes have never bcen repealed, the law on the subject is somewhat confused. Scotland has been divided into fishery districts managed by district boards. An annual close time of 168 days is enforced, lasting for nets from August 26 to September 14 until February 5 to February 25, and for rods from September 14 to November 20 until January 11 to February 25. The weekly close time lasts thirty-six hours, from Saturday night till Monday morning. The construction of eruives, mill-ladcs, dams, and water wheels and the size of the meshes of nets are all regulated. In 1882 the management of the salmon fisherics was placed together with that of the sea fisheries under the control of the reconstituted Scottish Fishery Board, to which power was given to appoint an inspector of salmon fisheries ; by this official an annual report of the condition of the fisheries is presented through the Fishery Board to the Home Office.

The principal Act relating to Irish fisheries is that of 1863. Special Fishery Commissioners are responsible for the carrying out of the legal regulations. The country is divided like England and Scotland into fishery districts under the jurisdiction of boards of conservators, by whom clerks and water bailiffs are appointed.

Introduction of Species to New Areas by Human Agency.

Within the past few years, since great activity has been ex- hibited in pisciculture generally, and especially in the culture of Salmonidz, various experiments have been made in the trans- portation of eggs or young fry of valuable species from their native habitats to distant parts of the world. The Amierican so- called brook trout, S. fontinalis, has been imported somewhat largely into Britain by various salmon fishery proprietors. It thrives well in various places in England, Scotland, and Wales where it has been set free, —for example, in Norfolk rivers, near Guildford in Surrey, and in the stock ponds at Howietoun.

_ In Nature, July 16, 1885, an account was given of the introduc- tion of the fry of the American landlocked salmon (S. salar, var. sebago) to the upper watcrsof the Thames. Eggs of S. namayeush, S. sebago, 8. fontinalis, and Coregonus albus have becn successfully forwarded from the hatcheries of the American Fish Commission to the Deutsche Fischerei-Verein in Berlin, and to the Société d'Acclimatation at Paris.

The common trout of Britain, S. fario, was introduced with complete success into Tasmania nearly twenty years ago by Frank Buckland, and is now abundant in the Tasmanian streams, although it is reported to be much less valucd as food there than at home. From Tasmania the eggs were transported to the rivers in Otago, New Zealand, where they also thrive and breed (see Trans, of Otago Institute, 1878). In 1866 Mr Francis Day introduced the fry of the same species into the rivers of the table-land of the Nilgiris in the neighbourhood of Madras. The experiment on this occasion failed, but two years later the establishment of the species in the district in question was successfully accomplished by Mr M'Ivor, who imported the fry from Scotland.

Salmon Culture.

For the artificial culture of Salmonoids the reader is referred to the article PIscIouLTURE. The following account of the salmon and trout hatcheries in Scotland is abridged from a paper read before the Scottish Fisheries Improvement Association in Edin-

burgh, 26th November 1884, by J. Barker Duncan, the honorary secretary to the Association ;

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The principal institution of its kind in Scotland at present is the Howietoun Fishery, belouging to Sir J. Gibson Maitland, who commenced it in 1873, Howie- toun is about four miles from Stirling. The establishment contains thirty-two fish ponds and a large hatching-house; there are also four ponds at Craigend, and one of 9 acres at Goldenhove, where fish are reared to their adult condition, The hatching-boxes are of wood, and the eggs are kept during development on glass grilles. 'The water supply is abundant, about a

million gallons of spring water flowing through the ponds every twenty-four hours, The eggs hatched in greatest numbers are those of the Loch Leven trout, but Salmo salar and the common trout (Salmo fario) are also extensively rcared. The American brook trout, S. fontinalis, is also cultivated. More than ten millions of ova are annually treated at thishatchery. In 1884 ninety thousand young fish were distributed to various parts of Great Britain and Ireland, and two consignments of trout and one of salmon ova were successfully sent to New Zealand.

The Solway Fishery, belonging to Mr Joseph J. Armistead, was established in 1881, to supersede the Trentdale Fishery near Keswick, Cumberland. It is sitn- ated near the Solway in Kirkcudbrightshire. Various kinds of trout and charr, salmon and sea-trout, grayling, and other freshwater fish are bred. The hatching- house is fitted to hatch about a million ova. Small and large quantities of ova are supplied to applicants for purposes of stocking or for experiments in fish culture.

The Stormontfield Ponds were establishcd in 1853 by proprictors of Tay fisheries, They are situated about 5 miles above Perth on the Tay and occupy about 2 acres of ground. The Stormontfield experiments above referred to were carried out at these ponds undcr the direction of Mr Robert Buist. The establishment is now almost superseded by the Dupplin Hatchery, but is still used tosome extent. The hatching-boxes, 360 in number, are in the open air, and the eggs are placed on gravel at the bottom of the boxes ; a larger percentage of loss occurs with this system than when glass grilles arc used. ‘Two of the ponds at Stormontfield are stocked with parr from the Dupplin Hatchery, about 20,000 being placed in them in 1884; the parr are fed with ground liver, and are liber- ated in the river and its tribntaries when two years old.

The Dupplin Hatchery was instituted in 1882 by the Tay district board at Newmill, Dupplin Castle, on the river Earn, a tributary of the Tay. The hatching-house is supplied with spring water, and contains about 300,000 ova, The glass grille system is adopted here, and the fry are liberated in the Tay and its tributaries when about forty days old.

There is a hatchery for Loch Leven trout erected in 1883 by the Loch Leven Angling Association, situated about 800 yards from the loch, beside a small

stream. Inthe season of 1884-85 about 220,000 eggs were laid down. The fry are turned into the feeders of the loch five or six weeks after hatching. Before the erection of this hatchery Loch Leven was several times stocked with fry from the Howietoun Fishery. The great effect of stocking on the produce of Loch Leven is shown by the following figures :—in 1884 over [5,000 trout were taken in the loch during the season from April to September; during the preceding ten years the lake had been supplied with some thousands of fry in five several seasons; previous to 1874 no attempt at stocking had bcen made, and in that year the total catch was about 5000.

In May 1884 the Linlithgow Palace Loch Hatchery was opened by its proprietor, Mr A. G. Anderson, fish merchant, Edinburgh, who holds a lease of the loch tor angling purposes from the crown. The hatchery is intended chiefly to stock the loch, and is capable of containing about 600,000 ova. Experiments on the cultiva- tion of Salmo salar, var. sebago, from America, arc also to be made here.

A private hatchery belonging to the marquis of Ailsa, capable of hatching about 250,000 ova, is situated at Culzean in Ayrshire. Salmon ova are obtained from the rivers Doon, Stinchar, and Minnock, and the fry turned again into those rivers when about six weeks old. Charr, S. fontinalis, and Loch Leven trout are also hatched to stock the hill lochs of the estate of Culzean. Accord- ing to Mr Young the number of salmon in the Doon has been considerably increased by the artificial stocking from this establishment.

Another private hatchery, with a capacity of 50,000, is maintained on the Loch- buy estate, Isle of Mull, for the purpose of stocking the rivers and lakes on the property.

The Aberdeen Hatchery was established in Aberdeen by the district boards of the rivers Dee and Don. From 15,000 to 20,000 fry are hatched here every ycar and are conveyed 10 to 40 miles up the rivers Dee and Don and then liberated.

Various proprietors in Scotland have at various times erected small hatching- houses on the rivers of their estates for the purpose of stocking, but these have not been inaintained. The above-mentioned are the only

salmon-rearing estab- lishments of any importance at present in operation in Scotland.

Salmon Disease.

During the last few years salmon in a great many rivers have been observed to be suffering from an epidemic cutaneous discase from which large numbers have died. So faras is known this disease in its epidemic form is quite a new phenomenon ; there can be little doubt that it must have occurred as a sporadic affection in former times, but it seems on the other hand probable that such mor- tality among salmon as has taken place in some recent seasons must have attracted attention if it occurred, even when accurate observation was rare. ‘The disease was first noticed in 1877 in the Esk and the Nith, flowing into the Solway Firth, and since then it has destroyed very large numbers of salmon in almost every river in Britain. The disease consists in ulcerations of the skin, which begin at one or several spots on the head and body, and ultimately extend to the whole surtace of the fish. The diseased parts of the skin are found when examined to be covered with a fungoid growth, with the mycelium of a fungus consisting of plaited lyphe which extend into and ramify through the tissue of the derma and cpidermis, causing the cells to die, until the super- ficial tissues decay and slough off, and inflammation and bleeding are produced in the deeper and surrounding parts. It is certain that the injury to the skin and flesh of the salmon is caused by the fungus. If a section of the edge of an affected spot be made, and examined microscopically, the cells are seen to be perfectly normal and healthy beyond the region to which the hyphe extend, and the growing points of the hyphe are seen to be penetrating between and distorting these uninjured cells. It is evident therefore that the morbid alteration of the tissues follows the attack of the hyphe and does not precede it. The external superficial part of the mycclium covering a diseased spot of the skin bears the fructification of the fungus. This consists of zoosporangia, which are the enlarged blind terminal parts of certain of the hyphe,

that stand out perpendicular to the surface of the mycelium. Each zoosporangium contains a multitude of spherical spores. These spores are of

the kind technically called zoospores, each on its escape from the sporangium moving about actively by means of two vibratile cilia. The zoosporangium emits the zoospores by an aperture at its end, and when it has emptied itself the hypha begins to grow again at the base of the cmpty membrane and sends up through the cavity of the old zoosporangium a new sprout which becomes a second spore capsule. This feature is characteristic of the genus Saprolegnia, belonging to the Oosporee, various kinds of which are well known to botanists; they usually occur in dead insects or other invertebrate animals in water: the dead bodies of the common house-fly when in a sufliciently moist place almost invariably produce a luxuriant crop of Sapro- legnia. ‘ The commonest species of Saprolegnia is S. ferax, and the salmon fungus has usually received the samc name, as though it were a proved fact that it was identical with that species. But the species of a Saprolegnia can only be ascertained from the characters of its oosporangia, which are quite different from the zoosporangia and are produced much more rarely, and whose contents, the oospores, are fertilized by the contents of simultaneously produced autheridia. Mr Stirling has observed the oosporangia of salmon fungus (sce his papers in Proc. Roy. Soc. Hd., 1878 and 1879), but his description is not sufficient to put the identification of the species beyond a doubt. From Prof. Huxley’s experiments it is evident that the salmon fungus may reproduce for very many gencrations without the appearance of oospores. The salmon fungus grows with great luxuriance on other animal substances. Ina diseased salmon the fungus seems to be confined to the skin and not to give rise to bacteria-like bodies in the internal organs. What are the condi- tions which favour the infection of salmon in a river is a question to which at present no answer can be given. Until it is known under what conditions the Saprolegnia exists in a river before infecting the salinon, the conditions which favour or prevent salmon disease cannot be ascertained. The fungus may have its permanent nidus in decaying vegetable substances, but at present it has not been determined whether it is possible to cultivate the salmon Saprolegnia on vegetable matter; or the disease may be propagated sporadically among the fish, Salmonoids and others, which are permanent residents of the rivers ; or its abundance may depend on the amount of dead animal matter that is available for its nutrition. There is probably always some Saprolcgnia in every river ; the secondary conditions which determine

whether or not the fungus shall multiply on the anadromous salmon to such an

extent as to cause an epidemic have yet to be ascertained. Literature.—Albert Giinther, Catalogue of Fishes in Brit. Mus., London, 1866, yol. vi.; Id., Introduction to Study of Fishes, Edinburgh, 1880; Francis Day, Fishes of Great Britain and Ireland, London and Edinburgh, 1880 to 1884, vol. ii. The following papers of the Conferences of the International Fisheries Exhibition, London, 1883, also contain valuable information :—“ Fish Culture,” by Francis Day; ‘‘Salmon Fisheries,” by Charles 8. Folger; ‘‘ Culture of Salmonidx,” by Sir James Maitland; ‘‘Salmon and Salmon Fisheries,” by David Mine Home. For a most complete and valuable memoir on the salmon discase sce the paper by Prof. Huxley, Quart. Jour. Mic. Sci., 1882. (Geis CD)

SALOME, widow of Alexander Jannzeus, and queen of Judea from 79 to 69 B.c. (see IsRAEL, vol xiii. p. 424). Another Salome is the daughter of Herodias mentioned in Matt. xiv. 6. Her father was Herod, son of Herod the Great and Mariamme, and she became successively wife of her father’s brother the tetrarch Philip (son of Herod the Great by Cleopatra; see Hrrop Purttp), and of Aristobulus.

SALONICA, or Satonrgr (Ital. Salonicco, Turkish Selanik, Slav. Solun, the ancient Thessalonica), during the Roman empire the capital of the province of Macedonia, and still one of the most important cities of European Turkey, the chief town of an extensive vilayet which includes the sanjaks of Salonica, Serres, Drama, and Monastir, and has an aggregate population of 1,500,000. Salonica lies on the west side of the Chalcidic peninsula, at the head of the Gulf of Salonica (Sinus Thermaicus), on a fine bay whose southern edge is formed by the Calamerian heights, while its northern and western side is the broad alluvial plain produced by the discharge of the Vardar and the Inje-Karasu, the principal rivers of western Macedonia. Built partly on the low ground along the edge of the bay and partly on the hill to the north (a compact mass of mica schist), the city with its white houses enclosed by white walls runs up along natural ravines to the castle of the Seven Towers (Heptapyrgion), and is rendered pictur- esque by numerous

domes and minarets and the foliage of elms, cypresses, and mulberry trees. The hill of the

Heptapyrgion is dominated by a second and that by a third eminence towards the north. The commercial quarter of the town, lying naturally to the north-west, towards the great valleys by which the inland traffic is conveyed, is now pierced by broad and straight streets paved with lava; and the quay extends from the north-west of the city for four-fifths of a mile to the Kauli-Kule (Tower of Blood), or as it is now called Ak-Kule (White Tower). The old Via Egnatia traverses the city from what is now the Vardar Gate to the Calamerian Gate. The houses are for the most part insignificant wooden erections covered with lime or mud. Two Roman triumphal arches used to span the Via Egnatia. The arch near the Vardar Gate—a massive stone structure probably erected after the time of Vespasian— was destroyed about 1867 to furnish material for repairing the city walls; an imperfect inscription from it is now preserved in the British Museum.! The other arch, popu- larly called the arch of Constantine, but by Leake assigned to the reign of Theodosius, consisted of three archways built of brick and faced with marble. It is now in q very dilapidated state.? A third example of Roman architecture —the remains of a white marble portico supposed to have formed the entrance to the hippodrome—is known by the Judzeo-Spanish designation of Las Incantadas, from the eight Caryatides in the upper part of the structure. The conspicuous mosques of Salonica have nearly all an early Christian origin; the remarkable preservation of their mural decorations makes them very important for the history of Byzantine architecture. The principal are those dedicated to St Sophia, St George, and St Demetrius.

St Sophia (Aya Sofia), formerly the cathedral, and probably erected by Justinian’s architect Anthemius, was converted into a mosque in 1589. It is cased with slabs of white marble. The whole length of the interior is 110 feet. The nave, forming a Greek cross, is surmounted by a hemispherical dome, the 600 square yards of which are covered with a rich mosaic representing the Ascension. St Demetrius, which is probably older than the time of Justinian, consists of a long nave (divided into three bays by

massive square piers) and two side aisles, each terminating eastward in an atrium the full height of the nave, in a style not known to occur in any other church. The columns of the aisles are half the height of those in the nave. The internal decoration is all produced by slabs of different-coloured marbles. St George's, conjecturally assigned by Messrs Pullan and Texier to the reign of Constantine, is circular in plan, measuring internally 80 feet in diameter. The external wall is 18 feet thick, and at the angles of an inscribed octagon are chapels formed in the thickness of the wall, and roofed with waggon-headed vaults visible on the exterior; the eastern chapel, however, is enlarged and developed into a bema and apse projecting beyond the circle, and the western and southern chapels constitute the two entrances of the building. The dome, 72 yards in circumference, is covered throughout its entire surface of 800 square yards with what is the largest work in ancient mosaic that has come down to us, representing a series of fourteen saints standing in the act of adoration in front of temples and colonnades, The Eski Juma, or Old Mosque, is another interesting basilica, evidently later than Constantine, with side aisles and an apse without side chapels. The church of the Holy Apostles and that of St Elias also deserve mention. Of the secular buildings, the Caravanserai, usually attributed to Amurath II., probably dates from Byzantine times.

The prosperity of Salonica has all along been largely that of a commercial city. During the Christian centuries before the Mohammedan conquest the patron saint of the city was also the saint of a great market or fair to which merchants came from all parts of the Mediterranean, and even from countries beyond the Alps. At the beginning of the present century a large export trade was carried on in woollen and cotton fabrics, white and red yarns, grain, wool, tobacco, yellow berries, silk fabrics, sponges, &c. ; and silk gauze was manufactured in the city. Direct British trade with Salonica began after the Greek war of independence. Woven fabrics are at present imported from England, Austria, Germany, Switzerland, and Italy; sugar mainly from Austria ; coffee from South America (partly direct); petroleum from America and Russia ; soap from Greece and Crete; metal goods from England, France, and Austria; and coal from England. The exports com-

1 See Trans. Roy. Soc. Lit., vol. viii., new series, 1878. 2 See Newton's Travels, &c., in the Levant, vol. i. p. 122. 3 See Stuart's Athens, vol, iii, pl.

45, for engraving.

prise cereals (wheat, barley, oats, maize, rye), tobacco, wool, Lorton, poppy = opium, cocoons, prunes, and timber. In 1884 the industrial establishments were steam flour-inills, a cotton- spinning factory (employing 500 hands and sending its goods to Constantinople, Smyrna, and Beyrout), a distillery, several large soap-works, a nail factory, an iron-bedstead factory, and a number of brick and tile works. :

In Salonica the several nationalities have schools of their own: the Grecks, for example, lave a normal school, a gymnasium, and ninc other schools (one for girls) ; and even the Bulgarians, though their members are comparatively small, have two normal schools. The Jewish community (about 50,000) is of Spanish origin, and still preserves its Judeo-Spanish written in Hebrew characters. Besides their own schools they have the advantage of a large school supported by the Jewish Mission of the Established Churcli of Scotland (instituted about 1860). The total population of Salonica was estimated by Tozer about 1865 as 60,000. It has since in- creased probably to 90,000 or 100,000. The railway opencd to Kiuprili (1862 miles) in 1873 is now extended 75 miles to Mitrovitza. : ;

History.—The older name of Thessalonica was Therma (in allu- sion to the hot-springs of the neighbourhood). It was a military and commercial station on a main line of communication between Rome and the East, and had reached its zenith before the seat of empire was transferred to Constantinople. It became a Roman colonia in the middle of the 3d century, and in the later defence of the ancicnt civilization against the barbarian inroads it played a considerable part. In 390 Thessalonica was the scene of the dreadful massacre perpetrated by command of Theodosius. Constantine re- paired the port, and probably enriched the town with some of its buildings, During the iconoclastic reigns of terror it stood on the defensive, and succeeded in saving the artistic treasures of its churches: in the 9th century Joseph, one of its bishops, dicd in chains for his defence of image-worship. In the 7th century the Slavonic tribes strove to capture the city, but in vain even when it was thrown into confusion by a terrible earthquake which lasted several days. It was the attempt made to transfer the whole

Bul- garian trade to Thessalonica that in the close of the 9th century caused the invasion of the empire by Simeon of Bulgaria. In 904 the Saracens from the Cyrenaica took the place by storm; the public buildings were grievously injured, and the inhabitants to the number of 22,000 were carried off and sold as slaves through- out the countries of the Mediterranean. In 1185 the Normans of Sicily, having landed at Dyrrhachium and marched across country, took Thessalonica after a ten days' siege, and perpetrated endless barbarities, of which Eustathius, then bishop of the see, has left us an account. In 1204 Baldwin, conqueror of Constantinople, con- ferred the kingdom of Thessalonica on Boniface, marquis of Mont- ferrat ; but eighteen years later Theodore, despot of Epirus, one of the natural enemies of the new kingdom, took the city and had himself there crowned by the patriarch of Macedonian Bulgaria. On the death of Demetrius (who had been supported in his endea- vour to recover his father's throne by Pope Honorins III.) the empty title of king of Salonica was adopted by several claimants. In 1266 the house of Burgundy received a grant of the titular kingdom from Baldwin II. when he was titular emperor, and it was sold by Eudes IV. to Philip of Tarentum, titular emperor of Romania in 1320. The Venetians, to whom the city was transferred by one of the Paleologi, were in power when Sultan Amurath appeared, and on the Ist of May 1430, in spite of the desperate resistance of the inhabitants, took the city, which had thrice previ- ously been in the hands of the Turks. The body of St Demetrius, the patron saint, who from the time of his death under Maximian in the 4th century had exercised a marvellous influence on the popu- lar imagination, was hacked to pieccs, though even the Moham- medans attributed virtue to the famous oil from which the saint obtained the title of Myroblete. In 1876 the F rench and German cousuls at Thessalonica were massacred by the Turkish populace,

Besides Tafel's monograph, Dtssertatio de Thessalonica (Berlin, 1889), see Holland's Travels (1815); Grisebach, Rumelien und Brussa, 1889; Bowen's Mount Athos, Thessaly, and Epirus (1852); Boeckh, ¢. I. G., vol. ii.; Texier and Pullan, Byzantine Architecture (1864); Tozer, Highlands of Turkey, 1869.

SALOP. See Suropsutre, .

SALSETTE, a large island to the north of Bombay, with an area of 241 square miles. It lies between 19° 2’ 30” and 19° 18’ 30” N. lat. and between 72° 51’ 30” and 73° 3’ E. long.; it is connected with Bombay Island by bridge and causeway. Salsette is a beautiful, picturesque, and well-wooded tract, its surface bemg well diversified by hills and mountains, some of .considerable elevation, while it 1s rich in rice fields. In various parts of the island are romantic views, embellished by the ruins of Portuguese churches, convents, and villas > its cave antiquities still form a subject of interest.

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At the ccnsus of 1881 Salsette had a population of 108,149 (males 58,540, females 49,609); Hindus numbered 74,736 and Mohammedans 7,036. The island was taken from the Portuguese by the Mahrattas in 1789, and from them the British captured it in 1774; it was formally annexed to the East India Company’s dominions in 1782 by the treaty of Salbai.

SALT. Common salt, or simply salt, is the name given to the native and industrial forms of sodium chloride (NaCl). The consideration of this important substance naturally falls under two heads, relating respectively to sea salt or “bay” salt and “rock” salt or mineral salt. As actually found, however, the one is probably derived from the other, most rock salt deposits bearing evidence of having been formed by the evaporation of Jakes or seas at former (often remote) geological periods. ‘This is seen from their stratified nature, with their interposed beds of clay, which could only have been deposited from solution. The crystals of selenite (hydrated calcium sulphate), moreover, which they contain can only have been formed in water and can never since have been subjected to any considerable amount – of heat, otherwise their water of crystallization would have been driven off. The beds also of potassium and magnesium salts found at Stassfurt and other places, interposed be- tween or overlying the rock salt deposits, are in just the position in which one would naturally expect to find them if deposited from salt water. Finally, the marine shells often occurring abundantly in the surrounding rocks of contemporary periods also testify to the former existence of large neighbouring masses of salt water.

Sea Salt.— Assuming a degree of concentration such that each gallon of sea water contains 0°2547 bb. of salt, and allowing an average density of 2°24 for rock salt, it has been computed that the entire ocean if dried up would yield no less than 4,419,360 cubic miles of rock salt, or about four- teen and a half times the bulk of the entire continent of Europe above high-water mark, mountain masses and all. The proportion of sodium chloride in the water of the ocean, where it is mixed with small quantities of other salts, is on the average about 33°3 per 1000 parts, ranging from 29 per 1000 for the polar seas to 35°5 per 1000 or more at the equator. Enclosed seas, such as the Mediterranean, the Red Sea, the Black Sea, the Dead Sea, the Caspian, and others, are dependent of course for the proportion and qual- ity of their saline matter on local circumstances. Forch- hammer found the following quantities of solid matter in the water of various seas :—

MORE Seay… mekauneeeneee 32°80 grammes per litre, Cattegat and Sound……..... 15°12 .

1) ee AA 4°81 as Mediterranean ….....66 37°50 40 Aculanibicec eee ee 34°30 a

BIRGER (Sede eec vcr ta eee 15‘89 5 Caribbean Sea ….....0..0.c00. 36°10

At one time almost the whole of the salt in commerce was produced from the evaporation of sea water, and in- deed salt so made still forms a staple commodity in many countries possessing a seaboard, especially those where the climate is dry and the summer of long duration. In Portugal a total of over 250,000 tons is annually made in the salt works of St Ubes (Setubal), Alcacer do Sal, Oporto, Aneyro, and Figueras. Spain, with the salt works of the Bay of Cadiz, the Balearic Islands, &c., makes 300,000 tons. Italy has salt works in Sicily, Naples, Tuscany, and Sar- dinia, producing 165,000 tons. In France, between the “‘marais salants du midi” and those on the Atlantic, 250,000 to 300,000 tons are annually produced, besides those of Corsica. The “Salzgirten” of Austria produce collectively from 70,000 to 100,000 tons annually at various places on the Adriatic (Sabioncello, Trieste, Pirano, Capo d’Istria, &c.). In England and Scotland the industry has of late

SALT

years greatly fallen off under the competition of the rock- salt works of Cheshire, but some small manufactories still exist, at North Shields and elsewhere, where salt is made by dissolving rock-salt in sea water, and evaporating the solution to crystallization by artificial heat.

The process of the spontaneous evaporation of sea water has been very carefully studied by Usiglio on Mediterranean water at Cette. The density at first was 1:02. Primarily but a slight deposit is formed (none until the concentration arrives at specific gravity 1:0509), this deposit consisting for the most part of calcic carbonate and ferric oxide. This goes on till a density of 1°1315 is attained, when hydrated calcium sulphate begins to deposit, and continues till specific gravity 1°2646 is reached. At a density of 1°218 the volume of the sea water has become reduced to +255ths of what it was at first, and from this moment the deposit becomes augmented by sodium chloride, which goes down mixed with a little magnesium chloride and sulphate. At-specific gravity 1°2461 a little sodium bromide has begun also to deposit. At specific gravity 1°311 the volume of the water is only ;}$%yths of what it was at first, and it is thus composed :—

Magnesium sulphate ….....~~: ». 11°45 per cent. Magnesitim) CHIOKIAG socccacoccccccccoccsers 1DcDSe 5, otlwum CHIGHAEC se. occcenccss css oscccaeneinn 15°98 $5 OMIM DROME Gy: oc. c.cscceteossseg cise: 2°04 . Potassium: chloride:.....24).c.cs:0~~ - 00.005 3°30 sy;

Up to the time then that the water became concentrated to specific gravity 1°218 only 0°150 of deposit had formed, and that chiefly composed of lime and iron, but between specific gravity 1:218 and 1°313 there is deposited a mixture of—

Callen SUPHAbE oo. ssncssaenees seoeaca=s 0°0283 per ceut.

Magmesinnr sulphate …... 00.0.0… 00.008 00624 _—,,

Magnesium chloride…..... 0°0153 35

SOCUM CHLOTAG:. 6 6.00005, s.asseccoace ens ZHAOT ys

OGM POMC 5 cc acsicecisies vere esecinins’s 0°0222 Pe 2°8389

Ie

And of this we see that about 95 per cent. is sodium chloride. Up to this point the separation of the salts has taken place in a fairly regular manner, but now the temperature begins to exert an influence, and some of the salts deposited in the cold of the night dissolve again partially in the heat of the day. By night the liquor gives nearly pure magnesium sulphate ; in the day the same sulphate mixed with sodium and potassium chlorides is deposited. The mother-liquor now falls a little in density to a specific gravity of 1°3082 to 1°2965, and yields a very mixed deposit of magnesium bromide and chloride, potassium chloride, and magnesium sulphate, with the double magnesium and potassium sulphate, corresponding to the kainite of Stassfurt. There is also deposited a double mag- nesium and potassium chloride, similar to the carnallite of Stassfurt, and finally the mother-liquor, which has now again risen to specific gravity 1°3374, contains only pure magnesium chloride.

The application of these results to the production of salt from sea water is obvious. A large piece of land, varying from one or two to several acres, barely above high-water mark, is levelled, and if necessary fore with clay so as to prevent the water from perco- lating and sinking away. In tidal seas a “jas” (as the storage reservoir is called) is constructed alongside, similarly rendered im- pervious, in which the water is stored and allowed to settle and concentrate to a certain extent. In non-tidal seas this storage basin is not required. The prepared land is partitioned off into large basins (adernes or muants) and others (called in France aires, ewutllets, or tables salantes) which get smaller and more shallow in proportion as they are intended to receive the water as it becomes more and more concentrated, just sufficient fall being allowed from one set of basins to the other to cause the water to flow slowly through them. The flow is often assisted by pumping. The sea salt thus made is collected into small heaps on the paths around the basins or the floors of the basins themselves, and here it under- goes a first partial purification, the more deliquescent salts (espe- cially the magnesium chloride) being allowed to drain away. From these heaps it is collected into

larger oncs, where it drains further, and becomes more purified. Here it is protected by thatch till required for sale.

The salt is collected from the surface by means of a sort of wooden scoop or scraper which the workman pushes before him, but in spite of every precaution some of the soil on which it is pro- duced is inevitably taken up with it, communicating a red or grey tint. Sea salt is thence known in many of the French markets as sel gris, and frequently contains as much as 15 per cent. of impurity. Yet such is the ignorance and prejudice of many people that they will buy it in preference to the purer article from the evaporation of rock-salt brine, asserting its action to be milder and more even. Even if this were true they forget that mud ought to be cheaper than salt. The salt made on the coast of Brittany possesses the following composition :—

229

Sodium, ein omit eee ee eeee easton ses 87°97 per cent. Magnesimmm cliloridien ss… «4… 2eseee0 sos 1°58 e Magnesium sulphate ….....0.005 0°50 FA Cateriin, Sal WAG iaiseccnss gtiaiceneaweareinn 1°65 59 ImSo leet, Oe: ee Mean an eee 0°80 5 WPAILGT Yo. tae eet ont Ne ee ny eben 2 7°50 i

Generally speaking this salt goes into commerce just as it is, but in some cases it is taken first to the refinery, where it either is simply washed and then stove-dried before being sent out or is dis- solved in fresh water and then boiled down and crystallized like white salt from rock-salt brine. The salt of the “salines du midi” of the south-east of France is far purer than the above, however, its composition being as follows :—

; Dodie CHLONGS. A ces o. 60. dese ere c00.ceee 95°11 per cent. Mages ChIG I. 505 si05 shes siecucee. 0°23 . Magnesiony sul pliate….0..cecncoooeenee f.. 1°30 if Calornat SNPs scsi. ons csesdtels Sons 0°91 “3 S Wnk70) [bil 0) (Nae, Mee or oe ee nee een 0°10 #3 Pec ee ee ion ag 2°35 5

This is perhaps partly owing to the fact that of late years, by way of obviating the above-mentioned cause of impurity, a species of moss has been introduced there with some success from Portugal and forms a bed on

which the salt is deposited. The mother- liquors from the crystallization of the common salt contain still a little sodium chloride and most of the bromine and iodine of the sea water, all the potassium salts, much magnesium sulphate, and a large quantity of magnesium chloride. They are often thrown away as useless, but lately, in the south of France, in the “salines du midi,” they have been used for the production of certain chemicals by a system of ulterior treatment introduced by M. Merle and still continued by his successor M. Pechinet.

As soon as the water arrives at specific gravity 1:2407 and has deposited most of its salt, it is drawn off and stored in large tanks of 50,000 or 60,000 cubic metres capacity. From these it is withdrawn in successive portions, and artificially cooled to 0°4° Fahr. Under these circumstances, indeed at any temperature below 26° Fahr., a double decomposition takes place between the sodium chloride and the magnesium sulphate—crystallized sodium sulphate being thus separated. After being withdrawn and freed from the mother-liquor by a hydro-extractor, this sulphate, which contains two atoms of water, is then rendered anhydrous by heating in a reverberatory furnace. From the refrigerating vessel the water now passes to an ordinary evaporating pan, where the remaining salt is precipitated by boiling, collected, and purified by the hydro- extractor. Here the water attains a specific gravity 1:2680, and, being spread out in a thin layer on a smooth level bed of cement or concrete, deposits on cooling all its potassium as the double chloride of potassium and magnesium, the same as the carnallite of Stassfurt.

Fig. 1 represents the usual form of an Austrian “ Salzgarten” at Capo d’Istria. It is a parallelogram of 2 to 3 acres in extent

— = = —— = = = a

Fie. 1.—Plan of Austrian Salzgarten.

surrounded by a dyke or sea-wall a, The sea water enters by the sluice 6, and passes into the wide fosse c, where, clarifying by settlement, it passes by the openings f into a sextuple series of large basins divided by the scparations d, first-of all entering the

largest ones g,h,z, and then passing by the canals 7 into the other basins &,%, 1,7. The flow of the water from one set of basins to the other is regulated by the sluices ¢,e¢,¢. As it passes from one set of basins to another it becomes more and more concentrated, till at last in the basins m, m the salt deposits. The mother-liquor or

» AE T

“bittern” is then run off into », and thence into the sea. In France it is often stored as already stated for future treatment. In case of heavy rain, the already concentrated water is rnn into the covered cisterns s, s, which serve to hold it till the return of fine weather.

TABLE I.—Pereentage Analyses of Sea Salts from Well-known Localities.

Marais .

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l’Ouest.

IAUIPHOTIDY sssessccsenss llenry. Berthier. Karsten Henry. g Rs Henry. Ree Watts. | Schrétter and Pohl. Sodium chloride….} 96°00 | 95°19| 89°19] 95°86! 92°46] 96°50} 95:95 87°97 96°40 95°11 92°11] 95°91] 96-05 Magnesium chloride| 0°50 apes oe 0°24 0°55 0°32 0°35 i Bye) 0°20 0°23 ee 0°46 0°50 Magnesitumsulphate| 0°45 1°69 6°20 0°35 0°66 0°25 0°60 0°50 0°45 1°30 0°99 0°40 Osyil Sodium sulphate….} ... mer nee so sae 20¢ oF fee es soe as 2s ose Calcium sulphate… G35 0°56 0°81 1°30 2°28 0°88 1°90 1°65 0°91 0°33 0°49 0°45 uenbOle «cu sveesncieee «ce Aee = 0°20 2°10 3°10 1°95 a 50 2°35 6°30 2°58 DE Insoluble matters…| 0°90 2°45 3°60 0°15 0°95; 0:10 0) 0°80 0°10 O27 0°16 0°07 LORE 5 apeeemenerarc wen a eT) ope ee nee WS Besse mes 5c8 a ieee : ae

Rock-Salt.—This appears to occur in almost every formation, except in the Primary rocks, strictly so called. The oldest deposit of which the age may

be considered to have been anything like precisely determined may be said to be the great salt range of the Punjab, which is regarded as belonging to the Permian; and that lately discovered at Middlesbrough in Yorkshire, immediately overlying the magnesian limestone, may be probably referred to the same period. In the northern counties of England there are frequent instances of brine springs rising from the Carboniferous and contiguous formations. The Cheshire and Worcestershire salt-beds are by some attributed to the Permian ; more generally, however, they are referred to the Trias. Those of West New York and Gooderich (Canada) are said to belong to the Salina period of the Upper Silurian. The deposits of the Vosges, Salzburg, and others of central Germany and Austria are considered to belong to the Trias; that of Bex in Switzerland to the Lias. Those of Wieliczka in Poland, Cardona in Spain, and some Algerian formations are admitted to be Creta- ceous. Those of Bayonne, Dax, and Camarade, in the Pyrenees, are probably Tertiary, while the Dead Sea, Lake Elton in Astrakhan, the Bitter Lakes of the Isthmus of Suez, the Kara Boghaz on the shores of the Caspian, the Limans of Bessarabia south of Odessa, the Runn of Cutch, and certain formations of the Sea of Azoff, &c., are instances of salt formations now in actual progress, The frequent association of bitumen and petroleum with rock-salt and brine is one of the most noticeable features in the geology of those substances, and seems to point to some unknown condition of the formation of the two first named. The Dax salt is close to the bitumen deposits of Bastenés and Gaujac. Borings made at Dax, as well as at Salies about 20 miles distant (where also salt exists), gave vent to an efflux of inflammable gas which continued for several weeks, and the water of several springs in that neighbour- hood is tainted with petroleum. Bitumen and petroleum occur near Volterra in Tuscany, where a large deposit of salt is being worked. In Walachia the two occur in the same formation. In the United States of America and in the south of Russia petroleum and brine are found in many places either actually associated or in near proximity ; petroleum has recently been discovered not far from the salt deposits of Hanover, and one of the beds of rock-salt at Nancy is strongly coloured by bitumen, while almost all rock-salt has a more or less perceptible bituminous odour when struck or rubbed. In the province of Sze- chuen, China, are some remarkable salt springs, where the brine is accompanied by such an efflux of inflammable gas that the latter serves as fuel for its evaporation ; and

other springs accompanied by the same phenomenon exist |

in the same region. In fact, instances without end might be cited of the two occurring together, and it would appear that petroleum for some mysterious reason can only be formed in presence of salt.

The chief rock-salt districts of Europe may be classified as follows :—(1) the Carpathians ; (2) Austrian and Bava- rian Alps ; (3) West Germany ; (4) Vosges; (5) Jura; (6) Swiss Alps; (7) Pyrenees and the Spanish or Celtiberian Mountains ; (8) the British salt deposits; (9) isolated deposits and springs in Russia, Turkey, Italy, é&c.

The Carpathian district may be subdivided into the Moldo- Walachian, Transylvanian, Galician, and Hungarian sections. They form probably the richest and most extensive of the European salt fields and by them alone the entire continent might be supplied for ages. The Transylvanian and Walachian mines are specially numerous and rich. Thousands of tons of salt, in the form of brine from the springs which are common throughout the country, are allowed to run to waste, no important factory existing in the country for its evaporation. The rock is in fact in itself so pure that simply ground it meets all requirements of public consumption. In Galicia the principal mines and those of most historical interest are at Wieliczka and Bochnia. The former, which is justly the most celebrated in the world, is situated 9 miles from Cracow and has been worked continuously for six hundred years. The mass of salt is calculated to be 500 miles long, 20 miles broad, and 1200 feet thick. It is on the north-west side of a ridge of hills, an offset of the Carpathians. The salt is stoped out in longitudinal and transverse galleries, and large vaulted chambers, supported by massive pillars. Explosives are not used in this or any of the other mines of the district. The salt is sold just as it comes from the mine, or else finely ground and packed in casks or sacks. The mine is divided into four levels, and is 284 yards deep and 1 mile 1279 yards long by 830 yards wide. All the grinding and packing is done within it. It is stated that the collective length of the galleries and chambers is no less than 30 English miles and the total yield 55,067 tons per annum. These mines employ from eight hundred to one thousand persons, many of whom live permanently under ground ; the lower levels contain streets and houses and constitute a complete village. Travellers have given glowing descriptions of the crystal vaults, sparkling

aisles, and fairy palaces of this mince. The salt is greyish, and somewhat resembles granite in appearance.

In the well-known district of the Austrian and Bavarian Alps the mine of Salzburg (Salzkammergut) is perhaps the most familiar. The Austrian portion of the district includes the towns of Aussee, Ischl, Hallstadt, and Hallein, and the Bavarian includes Berchtesgaden, Reichenhall, Traunstein, and Rosenheim. In the last-named salt is made from brine conveyed in pipes from Berchtesgaden, passing by Reichenhall, 15 miles in all, with a total fall of 1552 feet. There are also large salt works at Hall near Innsbruck. Here, as in the Carpathian region, most of the rock- salt is sold merely ground, or in lumps, and the trade is, as in other parts of Austria-Hungary, a strict Government monopoly, producing an annual revenue of two and a quarter to two and a half milHious sterling.

The German mines are numerous ; they extend north and south from Segeberg in Holstein to Sulz on the Neckar, and east and west from Kreuznach to Halle. Brine springs and small workings lie scattered all over the country. But two formations of special importance are Stassfurt in Saxony and the Liineburg Heath in

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Hanover. Fig. 2 represents a section of the Stassfurt beds, and will give an idea of their formation. It appears less than most others to have been subjected to denudation since being formed,

voweee and consequently better than many

ao «others illustrates the formation of such iy acne deposits. Overlying the salt properly

so ealled (¢) is a thin band of anhydrite, and above this b, c, d, beds of variously – col- oured clay, red and grey, eon- taining highly deliquescent salts, forming

= three distinct

~ ¢ 27 i ¥ aha Meets A fs 7 layers. The EE ae as lowest,d, called

7 fu 7p 62 LEE i

- polyhalite, ” contains ‘some

Fig. 2.—Seetion of Stassfurt Salt-Beds. watem éhlo- ride and. with it other deliquescent chlorides. Next to this comes c, the “kieserite” region, about 304 yards thick—here are chiefly potassium and magnesium sulphates; and lastly we have 6, the upper layer or “carnallite” region, 23 yards thick, containing almost exclusively the double potassium and magnesium chlorides, together with other deliquescent salts, nodules of boracite, &c. 1 has been computed that a sea depth of 124 miles would be required for the production of such a series as this.

The Vosges, which is a very important district, supplied a large part of the east of France with salt, till lost by the war of. 1870- 1871, since which time Nancy has gained considerably in import- ance. Geologically speaking, Nancy is included in this basin.

In Switzerland the chief salt district lies on the right bank of the Rhone, near the Lake of Geneva. The principal centres are Aigle, Roche, and Bex, the last being the most important.

The Pyrenees are rich on both sides in brine springs and rock- salt formations. In the south-west of France we have the rock- salt of Dax and Villefranche, and the brine springs of Salies and Briscous, as well as that of Camarade. In Spain both rock-salt and brine are plentiful, as is indicated by the frequent recurrence of the syllable “Sal” in the names of towns (Salinas, Salinillas, Poza de la Sal, &c.).

The Celtiberian or exclusively Spanish district includes various towns scattered over Spain—Salinas de Saelices (Guadalajara), Villafafila (Zamora), Torreximeno, Cazorla, and Hinojares (Jaen), &c.; but perhaps the most remarkable deposit of salt in Spain is that of Cardona in the province of Barcelona, 45 miles north-west of that city. Here is a veritable mountain composed of a bed of remarkably pure salt 142 to 164 yards thick, and forming two masses, each about a mile in circumference. ‘The salt is as

usual stratified, and bears very strong evidence of denudation. It is chiefly pure white, but in parts varies from light-blue to brick-red. It is extracted by an open-air working like stone from a quarry.

There are some brine and rock-salt deposits which can hardly be classified as belonging to any particular district. Such are—in France, at the foot of the Alps, the brine springs of Moutiers and Castellane ; in Italy, Volterra; in Sicily, Nicosia and Mussomeli ; in Croatia, Szambor; in Bosnia, Tusia; in Russia, Bachmutz on the Donetz, Balachna on the Volga, Staraya-Russa near Lake Ilmen, Eupatoria and other places in the Crimea; in Prussia, Walters- dorff, Sperenberg, &c.

The chief centres of manufacture in England are at Northwich, Middlewich, Winsford, and Sandbach in Cheshire, Weston-on-Trent in Staffordshire, Stoke Prior and Droitwich in Worcestershire, and Middlesbrough in Yorkshire! Dunecrne near Carrickfergus in Ireland also possesses a large deposit of salt. The Cheshire and Worcestershire salt deposits are up to the present time by far the most important, the Duncrue deposit being only partially worked. Although brine springs have been known to exist in both these counties ever since the Roman occupation, and salt had been made there from time immemorial, it was not till 1670 that rock-salt about 30 yards thick was discovered at Marbury near Northwich by some men exploring for coal, at a depth of 34 yards. In 1779 three beds of rock-salt were discovered at Lawton, separated from one another by layers of indurated clay. The Marston mine, the property of Messrs Rigby and Fletcher of Northwich, is the largest and perhaps the oldest (there are twenty-five in England altogether where rock-salt is raised). It was worked for abont a hundred years in only its upper bed, but in 1781 its owners decided on sinking farther, and, after traversing a layer of indurated clay intersected with small veins of salt 104 yards thick, they came on another of

1 The termination ‘‘ wich” in English place-names often points to ancient salt manufacture,—the word “wich” (creek, bay; Icel. vik) having acquired a special sense in English usage. In Germany the various forms of the non-Teutonic words Hall, Halle occurring iu place-names point in the same way to ancient salt-works.

rock-salt. This—the bed which has continued to be worked ever sinee—is 38 to 37 yards thick. Bencath it are others, but they are thin and impure. The total depth of the mine to the bottom of the lower level is 120 yards. At Winsford, where the same formation seems to recur, it is 159 yards from the surface. The Marston mine covers an area of about 40 acres. The salt is first reached at 85-40 yards in the Northwich district, and the upper layer is 25-50 yards in thickness (Marston 23-26 yards); it has above it, apparently lying in the recesses of its surface, a layer of saturated brine. This is the brine which is raised at the various pumping stations in Northwich and elsewhere around, and which serves when evaporated to produce white salt. The beds are reached by sinking through the clays and variegated marls typieal of this formation. The salt is blasted out with gunpowder. The Middlesbrough deposit bids fair soon to become of very great importance. It was discovered by Messrs Bolekow and Vaughan in boring for water in 1862 at a depth of 400 yards, but was not utilized, and was again found by Messrs Bell Bros. at Port Clarence at a depth of 376 yards, and is being now worked by them, the heat used for evaporation being the waste gases of their blast furnaces. Encouraged by their suecess the Newcastle Chemical Company have also bored on the opposite side of the river. They failed at first to find the salt, but ultimately succeeded by a fresh boring. The extent of the bed is not yet ascertained, but evidently by the failure of the Newcastle Chemical Company at first it cannot extend far to the north. Its thickness has been proved in so far as the spot where Messrs Bell Bros. made their boring is concerned. These gentlemen have introduced the method employed at Nancy of raising the salt in the form of brine without the trouble or expense of sinking a shaft. In Cheshire the surfaee-water trickling through the overlying strata dissolves the salt, which is subsequently pumped as brine, but here the great depth aud imper- meability of the strata precludes this, so another method has been resorted to. A bore is made into the salt, and lined with tubing in the usual manner, and this tube where it traverses the salt is pierced with holes. Within this is hung loosely a second tube of much smaller dimensions so as to leave an annular space between the two. Through this space the fresh surface water finds its way, and dissolving the salt below rises in the inner tube as brine, but only to such a level that the two columns bear to one another the relation of ten to twelve, this being the inverse ratio of the respec- tive weights of saturated brine and fresh water. For the remaining distance the brine is raised by a

pump. At first, while the cavity remains small, there is some difficulty in getting a continuous supply of brine of full strength, but this ceases to be the case as the solution chamber (as it is called) becomes enlarged. The fresh water, however, as it descends rises to the surface of the salt, tending rather to dissolve its upper layers and extend superficially, so that after a time the superineumbent soil, being without support, falls in. These interior landslips, besides choking the pipes and breaking the communication, often produce sinkings at the surface, such as occurred some time ago at Dieuze (Lorraine). The same inconvenience is beginning to make itself felt in the environs of Nancy, and a similar one produces on a larger scale the sinking and subsidences at Winsford and Northwich so much complained of. The deposits of salt in the United States are unimportant. The country possesses no really considerable salt industry, but is supplied so far as interior consumption is coneerned to a small extent by brine springs. The principal supplies, however, are derived from England and the shores of Spain and Portugal. The same remark applies to Canada. South Ameriea possesses several salt deposits and brine springs, but also takes all its supplies from Europe. Asiatic Russia is very abundantly supplied with salt, as likewise is China; and Persia is perhaps one of the countries most abundantly endowed with this natural and useful product. British India cannot be said to be similarly favoured. In the north, it is true, is the great salt range of the Punjab, as well as the Sambhur Lake, and salt is obtained from sea-water at many places along its extensive seaboard ; but India is not well supplied in many parts, and is dependent largely for this article on the Cheshire salt works. In fact this export is one of the most im- portant branches of their trade.

Table Il. (see next page) is from Spon’s Encyclopedia of the In- dustrial Arts, &c. The clay and insoluble matters given for the Stassfurt salt seem to be somewhat abnormally large.

Rock-salt is probably the origin of more than half the salt manu- factured in the world. It oceurs in all degrees of purity, from that of mere salty clay to that of the most transparent crystals. In the former case it is often diffieult to obtain the brine at a density even approaching saturation, and, as at Moutiers in Savoy and in several of the German salt works, chambers and galleries are excavated within the saliferous bed to increase the dissolving

surface, and water let down fresh is pumped up as brine. Many brine springs also occur in a more or less saturated condition. In such cases the water is sometimes caused to trickle over faggots arranged under large open sheds called “ graduation houses ” (Gradirhéduser), whereby a more extensive surface of evaporation is obtained, and

pA DL T

Tape II.—Percentage Composition of Roek-Salt from Well-known Localities.

(SOc on gee eee Germany. France. _|Stassfurt,) ong Wie- White Marston : Schwabisch-Hall, ou ee “Salins, Vic, Lorraine. Dax. Hall, cake, roel es ae aks alata Wiirtemberg. | Bavaria. roc Lorraine. Galicia. Fe Mee —— Mathie , Authority… Fehling. Bischof. oy dp bene Berthier. Cordier. | M@xwell-| pischof. | Bischof. Lc eeuee sie sre ; | oe ’ ee Se a | ee ee Sodium chloride …... 99°97 | 98°81| 99:85| 94°57] 97-05} 99°30| 97°80] 97:45} 96°97] 99°43 | 100-00 96°70 Calcium chloride…... . 0°02 traee oe = =. ms, ame is 0°25 a 0°68 Magnesium ehloride… trace 0°15 0°97 0°45 : 0°51 0°12 trace Potassium chloride…. — a = = oe nS =a ve trace #e trace Calcium sulphate …... O-O2t)” (Orta 0°89 1°50 0°50 0°30 0°25 0°23] 10F20 0°25 Magnesium sulphate.. eis im trace 2°30 Fos ee Magnesium carbonate 0°15 Calcium carbonate…. 0°16 ahs Ferric chloride …..... 0°01 Clay or insoluble MOSULETS: vec.0.ccne ee dle WO 0°80 3°35 an3 0°20 2°28 Water or loss……..... 0°22 1:00 wm

the brine becomes rapidly concentrated. Fig. 3 shows one of these “Gradirhauser.” It consists of a long shed, the floor of which is a shallow cistern kept filled with the brine to be concentrated, the body of the house being occupied by a single or double row of

Fie. 3.—Gradirhaus,

faggots of blackthorn ¢, and above these a trough or troughs 3, into which the brine is pumped; escaping from these into the channel é, it is allowed to flow or drip slowly over the faggots, and finds its way back to the basin beneath. The shed has its sides open and exposed to the prevailing winds, and, the brine being thus spread over a large surface, there is much scope

for evaporation, and it becomes rapidly concentrated. Several such sheds are often built in series, and the brine, being conveyed from one to the other as it becomes denser, attains at last a specitie gravity of about 1°18, when it is stored in large cisterns till required for evaporation. This is done in large iron pans by the method to be hereafter de- scribed when speaking of rock-salt brine. The usc, however, of the “graduation houses” is dying out, except in particular localities where competition from sea salt or purer rock-salt is difficult, as both their construction and their maintenanec are expensive. The purer rock-salt is often simply ground for use, as we have seen to be the ease at Wieliczka and elsewhere, but it is more frequently pumped as brine, produced either by artificial solution as at Middlesborough and other places, or by natural means as in Cheshire and Worcestershire. One great drawback to the use of even the purest rock-salt simply ground is its tendency to revert to a hard unwieldy mass, when kept any length of time in sacks. This is partly but not wholly obviated by packing in casks, which, however, are dear and not always obtainable. As usually made, white salt from rock-salt may be classified into two groups :—(1) boiled: known as fine, table, lump, stoved lump, superfine, basket, butter, and ehcese salt (Fr. sel fin-fin, sel & la minute, &c.); (2) unboiled : common, chemical, fishery, Scotch fishery, extra fishery, double extra fishery, and bay salt (Fr. sel de 12, 24, 48, 60, and 72 heures). All these names are derived from the size and appear- ance of the crystals, their uses, and the modes of their production, The boiled salts, the crystals of which are small, are formed in a medinm constantly agitated by boiling. The fine or stoved table salts are those white masses with which we are all familiar. Basket

salt takes its name from the conical baskets from which it is allowed to drain when first it is “drawn” from the pan. Butter and cheese salts are not stove-dried, but left in their more or less moist condition, as being thus more easily applied to their respec- tive uses. Of the unboiled salts the first two, corresponding to the Fr. sel de 12 hewres and sel de 24 heures, show by their English names the uses to which they are applied, and the others, the applications of which are equally shown by their names, increly | depend for their quality on the length of time which elapscs between successive “drawings,” and the temperature of the evapora- tiou. The time varies for the unboiled salts from twelve hours to three or fonr weeks, the

larger crystals being allowed a longer time to form, and the smaller ones being formed more quickly. The temperature varies from 55° to 180° Fahr.

One striking difference between the manufaeture of salt from rock-salt brine as carried on in Britain and on the Continent lies in the almost exclusive use in the latter case of closed or covered pans, except in the making of fine salt, whercas in Britain open ones are employed. With open pans the vapour is free to diffuse itself into the surrounding atmosphere, and the evaporation is perhaps more rapid. When covered pans are used, the loss of heat by radiation is less, and the salt made is also elcaner. In works published in France and Germany the statement is frequently made that it would be impossible to sell there a grain of salt manufactured by English methods, but one is fairly justified in doubting this assertion, seeing the ease with which the publie are induced to purchase the sed gris of the marais salants. In fact, it is eustomary in some places to make a special article, which is sold in competition with sea salt, by mixing with the purer one 10 or 12 per cent. of mud or earth. The most advantageous mode of evaporation would evidently be to cause the heated gases from the furnace to pass over the surface of the liquid itself. No wearing- out of the pans need thus be feared, no lowering of the conductive power by incrustation, but the vapour as fast as formed would diffuse itself into heated air in rapid motion, this air being far from its point of saturation and greedy of moisture. The plan, however, which was tricd in Britain by Otto Pohl and in Germany by Born has hitherto been a failure, the salt being for one thing very much soiled with the soot and other products of combustion. Again, this mode of evaporation hardly consorts with the slow progress and perfect stillness required for the prodnction of the larger-grained salts, and gives only fine salt.

Figs. 4 and 5 represent a French pan, while fig. 6 is a British pan, only diffcring from the Continental ones in not being covered in, and in usually having three or four fires in place of two or three, and a separate chamber beyond the pan in which the salt is stoved, heated by the flues conveying the furnaee gases to the chimney after leaving the pan. The first two represent a pan of 64 feet long by 214 feet wide filled with brine, &c., and with circulating fiues beneath for economy of heat. This pan, a, is supported all round its lower edges on a wall and on the pillars }, 6, and heated by two fires ¢, e. The flame and the heated gases of each fire circulate in the

flues p, », p, in which are holes at various convenient points for cleaning ; thus then these gases are made to traverse the length of the pan three times before arriving at the chimneys n, ” or the drying floors 0, 0. The channels ¢, ¢ beneath the fiues (fig. 5) serve to warm the air which feeds the fires, and, entering at the further end of the pan, traverses them and issues warm into the ash pit g, which is of course otherwise closed by the door h. The steam, collecting beneath the cover m, of which the upper portion ¢ is attached to the timbers of the roof,

mae LT

issues by the chimney &, while below a series of shutters allow access for the various manipulations. The two drying floors 0, 0 are each heated by three flues q, 9, q,

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SSSR NY S SS S S

Fic. 4. Drawing in transverse section of a Fishery Salt Pan, with all the latest improvements, as used in France.

continuations of those below the pan, within which circulate the heated gases on their way to the main chimney, and on this floor is spread the salt to be dried. The floor of a pan is generally at first slightly arched towards the centre, so that when new a pan

Fic. 5.—The same in longitudinal seetion.

is rather deeper at the sides than in the middle, but they soon flatten out and warp in all directions on being fired. This warp- ing is a great inconvenience, opening communications between the flues and in- terfering sadly with the ar- rangenients of these _— latter just described, somuch so that some makers prefer simple iron or brick supports placed here and there, without any de- . finite arrange- On the Continent the pan is often suspended by iron rods from the beams of the roof. The warping or buckling, the scaling, and the formation of “cats,” as the workmen call the sort of stalactites of salt which form in the flues, arising from leaks in the pan, are perhaps among the worst annoyances of the saltmakers, The pans are of ordinary

Fic. 6.— British Salt Pan. whieh the salt is drawn.

H, H, hurdles into

233

boiler plates riveted together. The plates vary in size, but usually are 2 feet by 4 feet, and rather smaller over tlie fire. The grate, which should be such as to produce a moderate and diffused heat, is of the ordinary kind, and the firing is usually done from a pit below the end of the pan. In England they use “slack” sometimes called ‘‘ burgey”; abroad they use all kinds of fuel— wood, coal, lignite, and turf; and they also in many places are in the habit of protecting the pan from the more intense heat immediately over the fire ¢ by a guard ¢ at that particular part. As a means of pro- ducing a diffused

and gentle heat without smoke, water gas will probably come to be used by and by. On the Continent the flues are often 2 or 2} feet high, and in Britain they are usually half that height. As, however, a slow and regular draught is to be aimed at, on the principle enunciated by Mr Fredk. Siemens, the Continental plan seems the more rational. Space does not here admit of a description of the so-called machine pans—the clay paus of the Cheshire Amalgamated Salt Company or Otto Pohl's system. !

In Britain the brine is so pure that, keeping a small stream of it running into the pan to replace the losses by evaporation and the removal of the salt, it is only necessary occasionally (not often) to reject the mother-liquor when at last it becomes too impure with magnesium chloride ; but in some of the works on the Con- tinent, especially those of North Germany, the mother-liquor not only contains more of this impurity but becomes quite brown from organic matter on concentration, and totally unfit for further service after yielding but two or three crops of salt crystals. Some- times, to get rid of these impurities, the brine is treated in a large tub (bessoir) with lime; on settling it becomes clear and colourless, but the dissolved lime forms a skin on its surface in the pan, retards the evaporation, and impedes the crystallization. At times sodium sulphate is added to the brine, producing sodium chloride and magnesium sulphate by double decomposition with the magnesium chloride. A slight degree of acidity seems more favourable to the crystallization of salt than alkalinity ; thus it is a practice to add a certain amount of alum, 2 to 12 fb. per pan of brine, especially when, asin fishery salt, fine crystals are required. The salt is ''drawn" from the pan and placed (in the case of boiled salts) in small conical baskets hung round the pan to drain, and thence moulded in square boxes, and afterwards stove-dried, or (in case of unboiled salts) ''drawn" in a heap on to the **hurdles," on which it drains, and thence is carried to the store.

In most Continental countries a heavy tax is laid on salt; and the coarser as well as the finer crystals are therefore often dried so as not to pay duty on more water than can be helped.

The brine used in the salt manufacture in England is very nearly saturated, containing 25 or 26 per cent. of sodium chloride, the utmost water can take up being 27 per cent.; and it ranges from 38 to 42 ounces of salt per gallon.

In some other countries, as has been explained, the brine has to be concentrated before use, and every ounce per gallon by which the brine is below saturation indicates a difference of cost in the production from it of salt of about 43d. to 44d. per ton. Subjoined are four analyses of brine taken from Messrs Richardson and Watts's Chemistry applied to the Arts and Manufactures :—

Cheshire. Worcestershire. Constituents in 100 Parts

Bae Marston. | Wheelock. | Droitwich.| Stoke. Chloride of sodium…..... 25°322 | 25°333 | 22°452 | 25:492

Chloride of potassium….. As ee das 3 Bromide of sodium…..... '011 020 trace trace Iodide of sodium…. .....| trace trace trace trace

Chloride of magnesium…) ... 7y ass = Sulphate of potash…..... trace trace trace trace Sulphate of soda…..... "146 390 594

Sulphate of magnesia….. eis oe oe tes Sulphate of limes. ...5….. 391 "418 387 261 Carbonate of soda…. ..... 036 re 115 016 Carbonate of magnesia….| +107 '107 034 034

Carbonate of manganese..| trace trace So re Carbonate of lime…..... trace trace trace trace Phosphate of lime…..... trace | trace trace trace Phosphate of ferric oxide.| trace trace trace trace

AMMMUINAS of. .cie cus ces otee trace trace oa es UNGRES, jcecsae deanveda «cee awe trace trace 26'013 | 26°049 | 23°378 | 26°397

The price of salt at the works may be said to range froin 4s. 6d. to 6s. per ton, the former being less than the cost price as given before the British parliamentary commission in 1881. It is there stated to be—brine, 6d.; labour, 10d.; fuel 3s. ; rent, intcrest, &c., 1s. ; total, 5s. 4d. Thus the margin for profit is but small, almost the only gain being said to accrue from the lightering, most of the salt manufacturers doing the carriage in their own " flats."

1 See Spon''s Encyclopedia of the Industrial Arts, &c. XI. — 30

Saltmaking is by no means an unhealthy trade, some slight sore- | and believed that the presence of salt in the soil invested a district

ness of the eyes being the only affection sometimes complained of ; indeed, the atmosphere of steam saturated with salt in which the workmen live seems specially preservative agaist colds, rheumatism, neuralgia, &c. It is said that wages are rather better and employment more regular in Worcestershire than in Cheshire. ; ;

The parliamentary commission above referred to was appointed with a view to the investigation of the causes of the disastrous subsidences which are constantly taking place in all the salt districts, and the provision of a remedy. It led to no legislative action ; but the evil is recognized as a grave one. At Northwich and Winsford scarcely a house or a chimney stack remains straight. Houses are keyed up with “shaps,” “ face plates,” and ‘‘ bolts, and only kept from falling by leaning on one another. The doors and windows have become lozenge-shaped, the walls bulged, and the floors crooked. Buildings have sunk,—some of them dis- appearing altogether. Lakes have been formed whiere there was solid ground before, and incalculable damage done to property in all quarters. At the same time it is difficult to sce how this gricvance can be remedied without inflicting serious injury, almost ruin, upon the salt trade. The workings in Great Britain represent the abstraction of rather more than a cubic mile of rock every five years, and of this by far the larger part is in Cheshire. :

Manley gives the following statistics of the production of salt in England for 1881 :—

Northwich……. oeoets PR ec neanc en ca 500,000 tons,

: WHOL a.c..c0cc ccvecoesee caveceneve 1,000,000 ,, Cheshire…….. IMBUIVEGITED: «<6 ossecc-scasieceveccs-s 30,000 2. Wheelock and Lawton…..... 100,000 ,,

Staffordshire… Shirleywick and Weston-on-Treut 4,000 _,, Ver ditesteaihie ID SRO AW AiG) tsa cscnaseonosonmcscdanpastmec 115,000 ,, OE PPS VORTEC Deen BRIO... o/c eer nteek laa 105,000 _,, MGA eee peeesec sence 1,854,000 ,,

He also gives the following details of the salt exported for years ending Dec. 31, 1881 to 1883 inclusive, quoted from the archives of the Salt Chamber of Commerce, whence the importance of the salt trade in England may be judged :—

1881. | 1882. 1883.

From Liverpool :— Tons Tons. Tons. To United States 228,891 223,602 239,459 », British North America… anor 80,784 81,716 99,352 3, West Indies and South America 15,556 23,953 25,413 spU MUDNIGR eres scecegeresensacsdasesceseiev ees 25,181 34,287 36,896 Fe UUSHMIN IER ss. ccsss ersestare stseccesere 324,109 274,866 316,327 PsP MUS LIUILAES os Scoaicesssseccesceureevecses 23,872 17,232 10,860 3, Baltic and North Europe…..... 100,957 116,509 107,978

», France and Mediterranean…..... 1,187 5,001 a

», Holland and Belgium…..... 67,780 67,334 72,353 COWsEWisteresseouteressscsescsersssseee ses cs 41,653 32,462 46,753 Total from Liverpool…..... —| 909,970 876,962 958,194 From Runcorn …..... 148,122 146,716 141,021 », Western Dock…. 85,545 68,147 87,954 Grand! Lobale «..c.02.csvcscerssesenne 1,143,637 1,091,825 1,187,169

F. M. L.

Ancient History and Religious Symbolism. Taare as _ use of salt appears to us, it must have been quite unattainable to primitive man in many parts of the world. Thus the Odyssey (xi. 122 sq.) speaks of inlanders (in Epirus?) who do not know the sea and use no salt with their food. In some parts of America, aud even of India (among the Todas), salt was first introduced by Europeans ; and there are still parts of central Africa where the use of it is a luxury confined to the rich. Indeed, where men live mainly on milk and

flesh, consuming the latter raw or roasted, so that its salts are not lost, it is not necessary to add sodium chloride, and thus we understand how the Numidian nomads in the time of Sallust and the Bedouins of Hadramaut at the present day never eat salt with their food. On the other hand, cereal or vegetable diet calls fora supplement of salt, and so does boiled meat. The important part played by the mineral in the history of commerce and religion depends on this fact; at a very carly stage of progress salt became a necessary of life to most nations, and in many cases they could procure it only from abroad, from the sea-coast, or from districts like that of Palmyra where salty incrustations are found on the surface of the soil. Sometimes indeed a kind of salt was got from the ashes of saline plants (eg., by the Umbrians, Aristotle, Met., ii. p. 459), or by pouring the water of a brackish stream over a fire of (saline) wood and collecting the ashes, as was done in ancient Germany (Tac., Ann, xiii. 57), in Gaul, and in Spain (Plin., H. W., xxxi. 7, 82 sq.); but these were imperfect surrogates. Among inland peoples a salt spring was regarded as a special gift of the gods. The Chaonians in Epirus had one which flowed into a stream where there were no fish ; and the legend was that Heracles had allowed their forefathers to have salt instead of fish (Arist., wt supra). The Germans waged war for saline streams,

with peculiar sanctity and made it a place where prayers were most readily heard (Tac., ut sup.). That a religious significance was attached to a substance so highly prized and which was often obtained with difficulty is no more than natural. And it must also be remembered that the habitual use of salt is intimately con- nected with the advance from nomadic to agricultural life, i.c., with precisely that step in civilization which had most influence on the cults of almost all ancient nations. The gods were worshipped as the givers of the kindly fruits of the earth, and, as all over the world ‘‘bread and salt” go together in common use and common phrase, salt was habitually associated with offerings, at least with all offerings which consisted in whole or in part of cereal clements. This practice is found alike among the Greeks and Romans and among the Semitic peoples (Lev. ii. 138); Homer calls salt ‘‘ divine,” and Plato names it ‘‘a substance dear to the gods” (Timeus, p. 60; comp. Plutarch, Sympos., v. 10). As covenants were ordinarily made over a sacrificial meal, in which salt was a necessary element, the expression ‘‘a covenant of salt” (Numb. xviii. 19) is easily

understood ; it is probable, however, that the preservative qualities of salt were held to make it a peculiarly fitting symbol of an enduring compact, and influenced the choice of this particular clement of the covenant meal as that which was regarded as sealing an obligation to fidelity. Among the ancients, as among Orientals down to the present day, every meal that included salt had a certain sacred character and created a bond of piety and guest friendship between the participants. Hence the Greek phrase Gaas kal TpameCay mapaBalvery, the Arab phrase ‘‘there is salt between us,” the expression ‘‘to eat the salt of the palace” (Ezra iv. 14, Rev. Ver.), the modern Persian phrase namak harém, “ untrue to salt,” z.¢., disloyal or ungrateful, and many others.

It has been plausibly conjectured that the oldest trade routes were created for traffic in salt ; at any rate salt and incense, the chief economic and religious necessaries of the ancient world, play a great part in all that we know of the ancient highways of commerce. Thus one of the oldest roads in Italy is the Via Salaria, by which the produce of the salt pans of Ostia was carried up into the Sabine country. Herodotus’s account of the caravan route uniting the salt-oases of the Libyan desert (iv. 181 sq.) makes it plain that this was mainly a salt-road, and to the present day the caravan trade of the Sahara is largely a trade in salt. The salt of Palmyra was an important element in the vast trade between the Syrian ports and the Persian Gulf (see PALMYRA, vol. xviii. p. 200), and long after the glory of the great merchant city was past “the salt of Tadmor” retained its reputation (Mas‘idi, viii. 398). In like manner the ancient trade between the Hgean and the coasts of southern Russia was largely dependent on the salt pans at the mouth of the Dnieper and on the salt fish brought from this district (Herod., iv. 58; Dio Chrys., p. 487). In Pheenician commerce salt and salt fish—the latter a valued delicacy in the ancient world—always formed an important item. The vast salt mines of northern India were worked before the time of Alexander (Strabo, v. 2, 6, xv. 1, 830)and must have been the centre of a wide- spread trade. The economic importance of salt is further indi- cated by the almost universal prevalence in ancient and medizval times, and indeed in most countries down to the present day, of salt taxes or of Government monopolies, which have not often been directed, as they were in ancient Rome, to enable every one to pro- cure so necessary a condiment at a moderate price. In Oriental systems of taxation high imposts on salt are

never lacking and are often carried out in a very oppressive way, one result of this being that the article is apt to reach the consumer in a very impure state largely mixed with earth. “The salt which has lost its savour” (Mat. v. 18) is simply the earthy residuum of such an impure salt after the sodium chloride has been washed out.

Cakes of salt have been used as money in more than one part of the world, —for example, in Abyssinia and elsewhere in Africa, and in Tibet and adjoining parts. See the testimony of Marco Polo (bk. ii. ch. 48) and Col. Yule’s note upon analogous customs elsewhere and on the use of saltas a medium of exchange in the Shan markets down to our own time, in his translation of Polo, ii. 48 sq. In the same work interesting details are given as to the importance of salt in the financial system of the Mongol emperors (ii. 200 Sq.). (W. Ras)

SALTA, capital of a province of the same name in the Argentine Republic, with a population of about 20,000 (1881), is a well-built town occupying a somewhat in- salubrious situation, 3780 feet above the sea, at the con- fluence of the Rio de la Sillata and Rio de Arias, head streams of the Rio Salado (there called Rio Pasaje or Juramanto), about 820 miles north-west of Buenos Ayres. The town, founded by Abreu in 1582, was originally known as San Clemente de Nueva Castilla, took the name of San Felipe de Lerma when Hernando de Lerma removed it to

its present site, and began to be called Salta in the 17th century. A large trade is carried on with Bolivia.

SALTCOATS, a seaport and watering-place of Ayr- shire, Scotland, contiguous to Ardrossan, and 19 miles north of Ayr. It possesses a good sea-beach, and of late years has become a favourite watering-place. The town received a charter as a burgh of barony in 1528, but afterwards lost its privileges and fell into decay. At a very early period marine salt was manufactured, and salt- pans were erected by Sir Robert Cunningham in 1656, but that industry has now ceased. A harbour was also constructed and for a considerable time there was a large shipment of coal, but the trade has now passed to Ardrossan. The population, 4624 in 1871, in 1881 was

5096.

SALTILLO, the capital of the state of Coahuila in Mexico, 65 miles south-west of Monterey by the Mexican National Railway, on the slope of a hill overlooking a fertile valley. It has well-paved streets, several good public buildings, and cotton factories and other industrial establishments. The population is about 17,000.

SALT LAKE CITY (originally Great Salt Lake City), a city of the United States, the capital of Utah Territory and the metropolis of Mormonism, stands nearly in 41° N. lat. and 112° W. long., at a height of 4250 feet above the sea, on the brow of a slight decline at the western base of the Wahsatch range, and on the right bank of the Jordan, a stream which flows from Utah Lake into Great Salt

Lake.’ By the Utah Central Railroad the city is 36 milessouth of Ogden fx 3 Ti Junction on the — = wo Centreville

Union and Central = Pacific Railroad, and F

it is the terminus of F the Southern and E Western Utah Rail- SALT LAKE C roads. The city is PRedke Tarp yorata t* laid out chessboard fashion, with all the streets 137 feet wide and all the blocks 40 rods square. Shade and fruit trees have

Environs of Salt Lake City.

been freely planted, and on each side of every north and south street flows a stream of pure water in an open channel. With the exception of some modern erections, the houses

are nearly all of sun-dried bricks. The largest and ugliest public building is the tabernacle, with its huge oval wooden dome. It is said to accommodate 8000 to 10,000 persons, and has the second largest organ in America. Within the same enclosure as the tabernacle are the endowment house, where the initiation ceremonies of Mormonism are performed, and the new Mormon temple (1874-5) erected at a cost of $10,000,000. Other conspicuous buildings are the city-hall, used as the Territorial capitol, the

theatre, Walker’s opera house, the Salt Lake pavilion, the museum, the Deseret. university, several hospitals, and the city prison. The population was 5000 in 1850, 8230 in 1860, 12,813 in 1870, and 20,768 in 1880 (86 coloured).

When Great Salt Lake City was founded in July 1847 (cf. MormonisM, vol. xvi. p. 827) the whole region lay far beyond the

advancing wave of western civilization. But the city did not long remain the isolated oasis in the desert which its first settlers made

1 This lake, about 10 miles from the city, the principal body of water in the Great Fremont basin, is 70 miles long by 45 miles broad, has an area of 1900 square miles, and lies 4200 feet above the sea. The water of the lake contains about 64 times more than the average solid constituents of sea water, being almost as heavily impregnated (22°4 per cent.) as that of the Dead Sea (24°5 per cent.). The salt is used in the city without artificial refining.

it; and it now has a considerable non-Mormon population, a United States garrison at Camp Douglas (between 2 and 3 miles distant), and United States judges.

SALTPETRE, or Nirrate or Potash (KNO,), is a salt obtained as a commercial product in three different ways. (1) It occurs as an efflorescence on the surface or in the superficial stratum of the soil in many parts of the world, but specially to a great extent in the Ganges valley and other parts of India. (2) It is obtained in a semi-artificial manner in nitraries or saltpetre plantations. These consist of heaps of decomposing animal matter mixed with lime ashes, road scrapings, and other rubbish covered over from rain, and from time to time damped with the runnings from stables and other urine. Such heaps develop within them small proportions of the salt and other nitrates, and are, in effect, artificial imitations of the saltpetre-bearing soil of India. They were formerly very common in Switzerland, France, Germany, and Sweden. (3) A large quantity of saltpetre is now

prepared from Chili saltpetre, the nitrate of soda, by

double decomposition of the soda salt with another salt of potash. See Nurrrocen, vol. xvii. p. 518, and GUNPOWDER, vol. xi. pp. 319, 323. Saltpetre is of importance in numerous industries, among the most prominent of which are gunpowder manufacture and pyrotechny. It is also used as an oxidizing agent in glass- making and in metallurgical operations. In the curing of meat it is extensively employed with common salt and sugar, and it also occupies an important place in pharmacy.

In the year 1884 337,708 ewt. of saltpetre was imported into the United Kingdom, the estimated value being £306,113. Of this amount 200,065 cwt. came from Bengal and British Burmah alone, and 78,545 cwt. of converted saltpetre came from Germany. During each of the two years 1883 and 1884 the imports of Chili saltpetre, under the name of cubic nitre, excecded 2,000,000 cwt., nearly the whole supply coming from Bolivia and Peru.

SALUS (Safety), a goddess worshipped in various parts of ancient Italy. At Rome a temple adorned with paintings by Fabius surnamed the Painter (Pictor) was dedicated to her in 302 B.c.; and public prayers were offered to her on behalf of the Roman people and the emperor. In 180 B.0., on the occasion of a plague, vows were made to Apollo, Asculapius, and Salus. Here the special attribute of the goddess appears to be “health”; and in later times she was identified with the Greek goddess of health, Hygeia, On coins of Tiberius, Nero, &c., she is represented as a young maiden with the symbol of Hygeia, a serpent drinking out of a goblet.

SALUTATIONS, or greetings, are customary forms of kindly or respectful address, especially on meeting or parting or on occasions of ceremonious approach. Ety- mologically the word salutation (Lat. salutatio, “ wishing health”) refers to words spoken, but the conventional gestures are even more purposeful, and both should be considered together. The principal modes of saluting, when classified, fall into a few groups, with well-defined meanings, the examination of which explains the practice of any particular tribe or nation.

Forms of salutation frequent among savages and _bar- barians may last on almost unchanged in civilized custom, or may be found in modified shapes,

while in other cases they may have disappeared altogether and been replaced by new greetings. The habit of affectionate clasping or embracing is seen at the meetings of the rude Andamaners and Australians, or where the Fuegians in friendly salute hug “like the grip of a bear.”1 This natural gesture appears in old Semitic and Aryan custom :— ‘‘ Esau. ran to meet him (Jacob) and embraced him, and fell on his neck, and kissed him, and they wept” (Gen. xxxiii. 4); so, when Ulysses makes himself known, Philcetius and Eumzus epg ere ae ee aie oe ia

1 W. P. Snow, in Trans. Hthnol. Soc., n. s., vol. i. p. 263.

cast their arms round him with kisses on the head, hands, and shoulders (Odyss., xxi. 223) :—

KAatov tp dud ’Odvoqt datpporr xeipe Baddrre,

rs “a ral kbveoy éyamaduevor Kepadrry Te Kal dos. bs 8 abrws OSuceds Kepards kal xetpas Exvocev.

The embrace continues habitual through later ages, and, though in modern times a good deal restricted, it still marks the meetings of near kinsfolk and lovers. But the kiss, associated with it in passages like those just cited, has no such universality. The idea of the kiss being an instinctive gesture is negatived by its being unknown over half the world, where the prevailing salute is that by smelling or sniffing (often called by travellers “rubbing noses”), which belongs to Polynesians, Malays, Burmese and other Indo-Chinese, Mongols, &c., extending thence eastward to the Eskimo and westward to Lapland, where Linnzus saw relatives saluting by putting their noses together.!_ This seems the only appearance of the habit in Europe. On the other hand the kiss, the salute by tasting, appears constantly in Semitic and Aryan antiquity, as in the above cases from the book of Genesis and the Odyssey, or in Herodotus’s description of the Persians of his time kissing one another—if equals on the mouth, if one was somewhat inferior on the cheek (Herod., 1.134). In Greece in the classic period it became customary to kiss the hand, breast, or knee of a superior. In Rome the kisses of inferiors became a burdensome civility (Martial, xii. 59):—

“Te vicinia tota, te pilosus Hircoso premit osculo colonus.”

The early Christians made it the sign of fellowship: “greet all the brethren with an holy kiss” (1 Thess. v. 26; cf. Rom. xvi. 16, &c.); and this may even now be seen among Anabaptists, who make an effort to retain primitive Christian habit. It early passed into more ceremonial form in the kiss of peace given to the newly baptized and in the celebration of the Eucharist?; this is retained by the Oriental Church. After a time, however, its indiscriminate use between the sexes gave rise to scandals, and it was restricted by ecclesiastical regulations—men being only allowed to kiss men, and women women, and eventually in the Roman Church the ceremonial kiss at the communion being only exchanged by the ministers, but a relic or cross called an osculatorvum or pax being’ carried to the people to be kissed.? While the kiss has thus been adopted as a religious rite, its original social use has continued. Among men, however, it has become less effusive, the alteration being marked in England at the end of the 17th century by such passages as the advice to Sir Wilfull by his London- bred brother :—“in the country, where great lubberly brothers slabber and kiss one another when they meet ; . . . “Tis not the fashion here.”£ The kiss on both cheeks between parents and children on Continental railway plat- forms now surprises the undemonstrative Englishman, who, when servants sometimes kiss his hand in southern Europe, 1s even more struck by this relic of servileages. Court cere- nonial keeps up the kiss on the cheek between sovereigns and the kissing of the hand by subjects, and the pope, like a Roman emperor, receives the kiss on his foot, A curious trace which these osculations have left behind is that when ceasing to be performed they are still talked of by way of politeness: Austrians say, “kiiss d’Hand !” and Spaniards, “beso a Vd. las manos!” “TI kiss your hands!”

Strokings, pattings, and other caresses have been turned to use as salutations, but have not a wide enough range to make them important. Weeping for joy, often occurring naturally at meetings, is sometimes affected as a salutation 15. E, Smith, Linnaus’s Tour in Lapland, vol. i. p. 315.

Bingham, Antiquities of the Chr. Church, bk. xii. c. 4, xv. c. 3.

3 The latter term has supplied the Irish language with its term for

a, es pog, Welsh poc ; see Rhys, Revue Celtique, vol. vi. p. 43. Congreve's Way of the World, Act iii.

SALUYTA TRONS

but this seems to be different from the highly ceremonious weeping performed by several rude races when, meeting after absence, they renew the lamentations over those friends who have died in the meantime. The typical case is that of the Australians, where the male nearest of kin presses his breast to the new comer's, and the nearest female relative, with piteous lamentations, embraces his knees with one hand, while with the other she scratches – her face till the blood drops. Obviously this is no joy- weeping, but mourning, and the same is true of the New Zealand tangi, which is performed at the reception of a distinguished visitor, whether he has really dead friends to mourn or not.®

Cowering or crouching is a natural gesture of fear or inability to resist that belongs to the brutes as well as man ; its extreme form is lying prostrate face to ground. In barbaric society, as soon as distinctions are marked between master and slave, chief and commoner, these tokens of submission become salutations. The sculptures of Egypt and Assyria show the lowly prostrations of the ancient East, while in modern Dahomey or Siam subjects crawl. before the king, and even Siberian peasants grovel and kiss the dust before a noble. A later stage is to suggest, but not actually perform, the prostration, as the Arab bends his hand to the ground and puts it to his lips or forehead, or the Tongan would touch the sole of a chief's foot, thus symbolically placing himself under his feet. Kneeling prevails in the middle stages of culture, as in the ceremonial of China; Hebrew custom sets it rather apart as an act of homage to a deity (1 Kings xix. 18; Isa. xlv. 23); medizeval Europe distinguishes between kneeling in worship on both knees and on one knee only in homage, as in the Boke of Curtasye (15th century) :—

" Be curtayse to god, and knele doun On bothe knees with grete deuocioun ; To mon pou shalle knele opon pe toi, pe toper to py self pou halde alon."

Bowing, as a salute of reverence, appears in its extreme in Oriental custom, as among the ancient Israelites: "bowed himself to the ground seven times"

(Gen. xxxiii. 3).7 The Chinese according to the degree of respect implied bow kneeling or standing. The bowing saluta- tion, varying in Europe from something less than the Eastern salaam down to the slightest inclination of the head, is interesting from being given mutually, the two saluters each making the sign of submission to the other, which would have been absurd till the sign passed into mere civility. Uncovering is a common mode of saluta- tion, originally a sign of disarming or defencelessness or destitution in the presence of a superior. Polynesian or African chiefs require more or less stripping, such as the uncovering to the waist which Captain Cook describes in Tahiti.? Taking off the hat by men has for ages been the accepted mode in the Western world, done in a frequent, demonstrative way by such as make a show of politeness, and who by being “free of cappe and full of curtesye” pay cheaply social debts ; but modern society has modcrated this bowing and scraping (the scrape is throwing back the right leg as the body is bent forward), as well as the curtseys (courtotsie) of women. Eastern nations are apt to see disrespect in baring the head, but insist on the feet being uncovered; the importance attached to entering barefoot is well known to English officials in India; Burmah was agitated for years by “the great shoe

° Grey, Journals, vol. ii. p. 255.

8 A. Taylor, New Zealand, p. 221.

7 See the Egyptian bow with one hand to the knee; Wilkinson, Anc, Eg.

8S. Wells Williams, Middle Kingdom, vol. i. p. 801.

® See references to these customs in Tylor, Harly History of Man- kind, ch. iti,

question,” whether Europeans should be called on to conform to native custom, rather than their own, by taking off their shoes to enter the royal presence.) Grasping hands is a gesture which makes its appearance in antiquity as a legal act symbolic of the parties joining in compact, peace, or friendship ; this is well seen in marriage, where the hand grasp was part of

the ancient Hindu ceremony, as was the "'dextrarum junctio" in Rome, which passed on into the Christian rite. In the classic world we see it passing into a mere salutation, as where the tiresome acquaintance met by Horace on his stroll along the Via Sacra seizes his hand (Hor., Sat., i. 9) :— " Arreptaque manu, ' Quid agis, duleissime rerum ?'"

Giving the right hand of fellowship (Gal. ii. 9) passed naturally into a salutation throughout Christendom, and spread, probably from Byzantium, over the Moslem world. The emphatic form of the original gesture in "striking hands" is still used to make the greeting more hearty. The variety called in English "shaking hands" (Germ. Hénde-schiitteln) only appears to have become usual in the . Middle Ages.2_ In the Moslem legal form of joining hands, the parties press their thumbs together. This has been adopted as a salute by African tribes. But it has been especially English traders and missionaries who of late years have introduced shaking hands far and wide in the world, so that even such rude peoples as Australians and Hottentots, Eskimo and Fuegians, unite in practising this modern civilized custom.

As to words of salutation, it is found even among the lower races that certain ordinary phrases have passed into formal greetings. Thus among the Tupis of Brazil, after the stranger's silent arrival in the hut, the master, who for a time had taken no notice of him, would say " Zre- woubé ?" that is, "Art thou come?" to which the proper reply was, ""Yes, I am come!"* Many formulas express difference of rank and consequent respect, as where the Basuto salute their chiefs with "Zama sevata/" i.e., "Greeting, wild beast!" Congo negroes returning from a journey salute their wives with an affectionate Okowe / but they meekly kneeling round him may not repeat the word, but must say Ka/ ka/®> Among cultured nations, saluta- tions are apt to be expressions of peace and goodwill, as in the Biblical instances, "Is it well with thee?" (2 Kings iv. 26); "Peace to thee, and peace to thine house," &c. (1 Sam. xxv. 6; see Ezraiv. 17). Such formulas run on from age to age, and the latter may be traced on to the Moslem greeting, Saldém 'alaikum/ 'The peace be on you," to which the reply is Wa-alaikum as-salém/ 'And on you be the peace (sc. of God)!" This is an example how a greeting may become a pass-word among fellow- believers, for it is usually held that it may not be used by or to an infidel, From an epigram of Meleager (Anth., ed. Jacobs, vii. 119; cf Plautus, Pen., v., passim) we learn

that, while the Syrian salutation was Shelam (‘Peace !”), the Phoenicians greeted by wishing life (378 11n, the sin, &c., of Neo-Punic gravestones). The cognate Babylonian form, “O king, live for ever!” (Dan. iii. 9), represents a series of phrases which continue still in the Vivat rex/ “Long live the king!” The Greeks said xaipe, “Be joyful !” both at meeting and parting; the Pythagorean dycatvew and the Platonic ed rparrew wish health; ata later time dordlomat, “T greet!” came into fashion. The Romans applied Salve / “Be in health!” especially to meeting, and Vale/ “Be well!” to parting. In the modern civilized world, everywhere, the old inquiry after health appears, the “How do you do?” be- coming so formal as often to be said on both sides without

‘Shway Yoe, The Burman, vol. ii. pp. 158, 205.

2 See Tylor in Macmillan’s Mag., May 1882, p. 76.

3 Lane, Mod. Ey., vol. i. p. 219. 4 Jean de Lery, part ii. p. 204. > Magyar, Reise in Sud-A frika. 6 Cf. vol. xvi. p. 5538, note 1.

either waiting for an answer. Hardly less wide in range is the set of phrases “Good day!” “Good night!” &c., varying according to the hour, and translating into every language of Christendom. Among other European phrases, some correspond to our “welcome!” and “farewell!” while the religious element enters into another class, exemplified by our “Good-bye!” (“God be with you!”), and French Adieu/ Attempts have been made to shape European greetings into expressions of orthodoxy, or even tests of belief, but they have had no great success. Examples are a Protestant German salutation “Lobe Jesum Christum /” answered by “In Euigkeit, Amen/” and the formula which in Spain enforces the doctrine of the Immaculate Conception, “Ave Maria purisima /” answered by “Sin pecado concebida !” On the whole, though the half-meaningless forms of salu- tation may often seem ridiculous, society would not carry them on so universally unless it found them useful. In fact, they serve the substantial purpose of keeping up social intercourse, and establishing relations between the parties in an interview, of which their tone may strike the key note. Montaigne, a master of the courtesy of an age more ceremonious than ours,

truly asserts their importance, “C’est au demourant une trés utile science que la science de l’entregent.” (z. B. T.)

SALUZZO, or Satucss, a city of Italy, at the head of a circondario in the province of Cuneo, 424 miles south of Turin (with which it is connected by railway and a steam tramway), is situated 600 to 650 feet above the sea, just where the last hills of the Monte Viso die away into the plain between the Po and its tributary the Vraita. The upper town preserves some part of the fortifications which protected it when, previous to the plague of 1630, the city had upwards of 30,000 inhabitants; and the hill is crowned by the ruins of an ancient castle. The more im- portant castle of the marquises (in which according to the legend the patient Griselda was confined) is in the lower town and now serves as a penitentiary. Besides the cathedral (Gothic, 1480 —1511), with the tombs of the old marquises, other conspicuous buildings are the churches of San Giovanni (formerly San Domenico) and San Bernardo (the former the finest architectural monument of the marquisate), the old town-house (1462), the new town-house (formerly belonging to the Jesuits), and the theatre (1829). To the north of the city lies the abbey of Staffarda (1130— 1737). The population of the city was 10,145 (commune 16,237) in 1880.

By some authorities Saluzzo is identified with Augusta Vagien- norum. The line of its marquises began (1142) with Manfred, son of Boniface, marquis of Savoua, aud continued till 1548, when the death of Gabriel, imprisoned by Henry II. of France in the eastle of Pinerolo, allowed city and territory to be seized by the French. The marquises of Saluzzo being great opponents of the house of Savoy, and frequently taking part in the struggles between France and the empire, the eity often had to suffer severely from the fortunes of war. Henry IV. restored the marquisate to Charles Emmanuel I. of Savoy at the peace of Lyons in 1601. Among the eelebrities of Saluzzo are Silvio Pellico (whose statue, 1868, gives name to the Piazza del Statuto), Bodoni the famous printer, and Casalis the historian of Sardinia. The history of the marquisate was written by Delfino Muletti, 5 vols., 1829-1833.

SALVADOR. See San Satvapor..

SALVAGE is “the reward which is earned by those who have voluntarily saved or assisted in saving a ship or boat, or their apparel, or any part thereof; or the lives of persons at sea; or a ship’s cargo or any part thereof from peril; or a wreck from total loss” (Roscoe, Admiralty Law and Practice, p. 13). The word salvage is indiffer- ently used to denote the claim, the reward, or the property saved. Salvage is interesting as being perhaps the one case in Iinglish law in which a person may become liable to a claim upon him for services rendered to him without his request, express or implied. Salvage may be either military or civil. Claims for military salvage, 2.c., salvage

on recapture (for which see Prize), are decided by a prize court. The tribunal for determining cases of civil salvage, the usual kind, is a court having admiralty jurisdiction. In England or Ireland the High Court of Justice (Admiralty Division), in Scotland the Court of Session, have cognizance of salvage claims to any amount. The Merchant Shipping Act, 1854, confers jurisdiction on justices of the peace to arbitrate on claims not exceeding £200, or where the value of the property saved does not exceed £1000. Certain county courts named by order in council have by the County Courts Admiralty Jurisdiction Act, 1868, jurisdiction in any claim in which the value of the property saved does not exceed £1000, or in which the amount claimed does not exceed £300. The jurisdiction of the inferior courts is protected by provisions depriving the suitor in the High Court of his costs without a certificate from the judge in cases where the claim might have been made before justices or in a county court. In addition there are various local tribunals exercising a more or less limited jurisdiction in sal- vage claims. Such are the Commissioners within the Cinque Ports, the Court of Passage of the city of Liverpool, and the Royal Courts of Jersey and Guernsey, besides the various Vice-Admiralty Courts throughout the British empire.

The rules which guide the courts in the award of salvage are reducible to a few simple principles, depending partly upon the general maritime law, partly upon the Merchant Shipping Acts, 1854 and 1862. (1) The salvage services must have been rendered within the jurisdiction of the

ADMIRALTY (¢.v.). (2) There must be no legal duty on the part of the salvors to render assist- ance. Therefore there must be very meritorious and exceptional services on the part of the crew, or even of a pilot, a passenger, or the crew of a tug, to entitle any of them to salvage. The same is the case with the officers and crew of a queen's ship, coastguardsmen, &c., who are bound by their position to assist. (3) The property must have been in peril, and rescued by the salvors. (4) The services must have been successful. Of course where a request for help has actually been made, and the property perishes, the right of remuneration nevertheless survives, on the ordinary principles of contract. The basis of salvage proper is service independently of contract.

If these conditions be satisfied, salvage claims take priority of all others against the property saved, and give the salvorsa maritime lien upon such property, enforceable by an action im rem. Salvage of life from a British ship or a foreign ship in British waters ranks before salvage of goods. In distributing the salvage reward the court considers (1) the extent of the peril of the property saved, (2) its value, (3) the nature of the services. This is subject to any contract, not inequitable, made between the parties. Seamen cannot abandon their right to salvage unless they specially engage themselves on a ship to be employed on salvage duty. Salvage of life is rewarded at a higher rate than salvage of property. Misconduct of salvors may operate as a bar to their claim. Salvage reward is commonly apportioned between the officers and crew of the salving ship, its owners, and other persons assisting. The amount is at the discretion of the distri- buting authority. It seldom exceeds in the whole one- half the value of the property saved. Apportionment for salvage services rendered within. the United Kingdom, where the sum does not exceed £200, due by agreement or the order of justices, may be made by the receiver of wreck on application of the parties liable to pay it.

Salvage is a term also applicd by analogy to property not saved at sea, but from fire on land, and also to property recovered from destruction by the aid of voluntary payments. The person making the last advance is entitled to priority in the nature of quasi-

forfeiture of a policy of insurance. Charges in favour of a solicitor upon property recovered or preserved by his means have been several times declared by the courts to be in the nature of salvage of this kind.

The law of the United States is in general agreement with that of England. The court of admiralty jurisdiction is the district court. The area in which salvage services may be rendered is much wider than in England, as it includes the great freshwater navigable rivers and lakes. This difference arises from the greater importance of inland navigation in the United States. See RIPARIAN Laws.

SALVIAN, a Christian writer of the 5th century, was born in Gaul, and most probably in the neighbourhood of Treves or Cologne (De Gub. Dei, vi. 8, 13). His birth has been conjecturally assigned to the period from 390 to 420. He was probably brought up as a Christian, though of this there is no absolute proof. Zschimmer considers his writings to show that he had made a special study of the law; and this is the more likely as he appears to have been of noble birth and could describe one of his relations as being “of no small account in her own district and not obscure in family” (£p, i.). He was already a Christian when he married Palladia, the daughter of heathen parents, Hypatius and Quieta, whose displeasure he incurred by persuading his wife to retire with him to a distant monastery, which is almost certainly to be identified with that so lately founded by St Honora- tus at Lerins. For seven years there was no communica- tion between the two branches of the family, till at last, when Hypatius had become a Christian, Salvian wrote him a most touching letter in his own name, his wife’s, and that of his little daughter Auspiciola, begging for the renewal of the old affection (Zp. iv.). This whole letter is a most curious illustration of Salvian’s reproach against his age that the noblest man at once forfeited all esteem if he became a monk (De Gub., iv. 7; of. viii, 4),

It was presumably at Lerins that Salvian made the acquaintance of St Honoratus (0d. 429), St Hilary of Arles (0b. 449), and St Eucher of Lyons (0b, 449), That he was a friend of the former and wrote an account of his life we learn from St Hilary (Vita Hon., ap. Migne, 1.1260), To St Eucher’s two sons, Salonius and Veranus, he acted as tutor in consort with St Vincent of Lerins. As he succeeded St Honoratus and St Hilary in this office, this

date cannot well be later than the year 426 or 427, when the former was called to Arles, whither he seems to have summoned Hilary before his death in 429 (Lucherw Instructio ad Salonium, ap. Migne, 1. 773; Salv., Ep. ii.). Salvian continued his friendly intercourse with both father and sons long after the latter had left his care ; it was to Salonius (then a bishop) that he wrote his explana- tory letter just after the publication of his treatise Ad Licclesiam ; and to the same prelate a few years later he dedicated his great work, the De Gubernatione Dei. The above facts, as will be seen, render it almost certain that he must have been born a good deal before 420. If French scholars are right in assigning Hilary's Vita Honorati to 430, Salvian, who is there called a priest, had probably already left Lyons for Marseilles, where he is known to have spent the last years of his life (Genn., ap. Migne, lviii. 1099). It was probably from Marseilles that he wrote his first letter—presumably to Lerins—begging the comniunity there to receive his kinsman, the son of a widow of Cologne, who had been reduced to poverty by the barbarian in- vasions. It seems a fair inference from this letter that Salvian, acting up to the precepts of his own treatise Ad Ecclesiam, had divested himself of all his property in favour of that society and, having no longer any possessions of his own, sent his relative to Lerins for assistance (Zp. i., with which compare Ad Eccles., ii. 9, 10; iii. 5). It has been

salvage, as the continued existence of the property at all may be | conjectured that Salvian paid a visit to Carthage ; but this

due to him, e.9.,

the case of a payment made to prevent the | is a mere inference based on the minute details he gives of

the state of this city just before its fall (De Gub., vii., viii.). He seems to have been still living at Marseilles when Gen- nadius wrote under the papacy of Gelasius (492-496).

Of Salvian's writings there are still extant two treatises, entitled respectively De Gubernatione Dei and Ad Ecclesiam, and a series of nine letters. 'The

De Gubernatione, Salvian's greatest work, was published after the capture of Litorius at Toulouse (489), to which he plainly alludes in vii. 10, and after the Vandal conquest of Car- thage in the same year (vi. 12), but before Attila's invasion (450), as Salvian speaks of the Huns, not as enemies of the empire, but as serving in the Roman armies (vii. 9). The words '" proximum bellum " seem to denote a year very soon after 439. In this work Salvian deals with the same problem that had moved the eloquence of St Augustine and Orosius. Why were these miseries falling on the empire? Could it be, as the pagans said, because the age had forsaken its old gods? or, as the semi-pagan creed of some Chris- tians taught, that God did not constantly overrule the world he had created (i. 1)? With the former Salvian will not argue (iii. 1). To the latter he replies by asserting that, "just as the navigating steersman never looses the helm, so does God never remove his care from the world." Hence the title of the treatise. In books i. and ii, Salvian sets himself to prove God's constant guidance, first by the facts of Scripture history, and secondly by the enumeration of special texts declaring this truth. Having thus "laid the founda- tions" of his work, he declares in book iii. that the miscry of the Roman world is all due to the neglect of God's commandments aud the terrible sins of every class of society. It is not merely that the slaves are thieves and runaways, wine-bibbers and gluttons,—the rich are worse (iv. 8). It is their harshness and greed that drive the poor to join the Bagaude and fly for shelter to the barbarian invaders (v. 5 and 6). Mverywhcere the taxes arc heaped upon the needy, while the rich, who have the apportioning of the impost, escape comparatively free (v. 7). The great towns are wholly given up to the abominations of the circus and the theatre, where decency is wholly set at nought, and Minerva, Mars, Neptune, and the old gods are still worshipped (vi. 11; ¢f. vi. 2 and viii. 2). Treves was almost destroyed by the barbarians; yet the first petition of its few surviving nobles was that the emperor would re-establish the circus games as a remedy for the ruined city (vi. 15). And this was the prayer of Christians, whose baptismal oath pledged them to renounce ''the devil and his works. . . the pomps and shows (spectacula) '? of this wicked world (vi. 6). Darker still were the iniquities of Carthage, surpassing even the unconcealed liceutious- ness of Gaul and Spain (iv. 5); and more fearful to Salvian than all clse was it to hear men swear '' by Christ" that they would commit a crime (iv. 15). It would be the atheist's

strongest argument if God left such a state of society unpunished (iv. 12),—especially among Christians, whose sin, since they alone had the

Scriptures, was worse than that of barbarians, even if equally | But, as a matter of fact, the latter had |

wicked, would be (v. 2). at least some shining virtues mingled with their vices, whereas the Romans were wholly corrupt (vii. 15, iv. 14). With this iniquity of the Romans Salvian contrasts the chastity of the Vandals, the piety of the Goths, and the ruder virtues of the Franks, the Saxons, and the othcr tribes to whom, though heretic Arians or unbelievers, God is giving in reward the inheritance of the empire (vii. 9, 11,

21).

dox barbarians as was rife in Gaul seventy years later.

Ad Keclesiam is sufficiently explained by its common title, Contra Avaritiam. It is quoted more than once in the De Gubernatione. Salvian published it under the name of Timothy, and explained his motives for so doing in a letter to his old pupil, Bishop Salonius (Zp. ix.). This work is chiefly remarkable because in some places it seems to recommend parents not to bequeath anything to their children, on the plea that it is better for the children to suffer want in this world than that their parents should be damned in the next (iii. 4). Salvian is very clear on the duty of absolute self-denial in the case of sacred virgins, priests, and monks (ii. 8-10). Several works mentioned by Gennadius, notably a poem “in morem Grecorum”’ on the six days of creation (hexacmeron), and certain homilies composed for bishops, are now lost (Genn., 67).

The Ad Ecclesiam was first printed in Sichard’s Antidoton (Basel, 1528); the De Gubernatione by Brassican (Basel, 1530), The two appeared in onc volume at Paris in 1575. Pithceus added variz lectioncs and the first scven letters (Paris, 1580); Ritterhusius made various conjectural emendations (Altorf, 1611), and Baluze many more based on MS, authority (Paris, 1663-1669). Numcrous other editions appeared from the 16th to the 18th century, all of which are now superseded by the excellent ones of C. Halm (Berlin, 1877) and F. Pauly (Vienna, 1883). The two oldest MSS. of the De

Gubernatione belong to the 10th century (Cod. Paris, No. 13,385) and the 13th (Brussels, 10,628); of the Ad Ecclesiam to the 10th (Paris, 2172) and the 11th (Paris, 2785); of Epistle LX. to the 9th (Paris, 2785); of Epistle VIII. to the 7th or 8th century (Paris, 95,959) and to the 9th or 10th century (Paris, 12,237, 12,236). Of the first seven epistles there is only one MS. extant, of which one part is now at Bern (No. 219), the other at Paris(No. 3791). See Histoire Littéraire de France, vol. ii,; Zschim- mer's Salvianus (Halle, 1875). Salvian's works are reprinted (after Baluze) in Migne's Cursus Patrologiz, vol.liii. For bibliography see T. G. Schoencmann's Bibliotheca Patrum (ii. 823) and the prefaces to the editions of Halm and Pauly. Gennadius, St Hilary, and St Eucher may be consulted in Migne, vols. lviii. and 1. (CurATrea-)

It is curious that Salvian shows no such hatred of the hetero- |

SALWIN HILL TRACTS, a district in the Tenasserim division of British Burmah, extending from the northern portion of the province southwards to Kaw-ka-rit on the Salwin river, and occupying the whole of the country between that river on the east and the Poung-loung mountains on the west. The district contains an area of about 4646 square miles, and is bounded on the north by the Kareng-ni state, on the east by Zeng-mai, on the south by Amherst and Shwe-gyeng and on the west by Shwe- gyeng and Toung-gni. From the annexation of Pegu until 1872 the Hill Tracts formed a subdivision of the Shwe-gyeng district, but in that year it was constituted into a separate jurisdiction. Nearly the whole district is a mass of mountains intersected by deep ravines, the only level land of any considerable extent being found in the valley of the Rwon-za-leng, while every part of the country is covered with dense forest.

The Hill Tracts are drained by three principal rivers, the Salwin, Rwon-za-leng, and Bhi-leng, fed by numerous mountain torrents which rush down narrow ravines. 'The Salwin is the largest river in the Tenasserim division. Its source has never been explored, but it appears to take its rise far north in the Himalayas or in the mountains which form their extension eastward. After traversing the Chinese province of Yunnan and the Shan and Kareng-ni states to the south, it enters British Burmah at its extreme north- eastern

corner, and for some distance marks the eastern limits of the province. It has a known course of about 700 miles, but its breadth seldom exceeds 100 yards, and in some parts the bed does not occupy more than 30 yards. The Salwin is greatly obstructed by rapids, and is not navigable by large craft for more than 100 miles from its mouth. The Rwon-za-leng, which rises in the extreme north, is navigable with some difficulty in the dry season as far as Pa-pwon, the administrative headquarters ; the Bhi-leng is not navigable within the limits of the district except by small boats and rafts.

Of the total area of the district only 21 square miles are culti- vated ; the chief crops are rice and betel-nuts. The revenue of Salwin amounted in 1883-84 to only £1964, of which £940 were raised from the land-tax. The population in 1881 was returned at 30,009 (males 15,509, females 14,500).

SALZA, HERMANN Von (c. 1180-1239), one of the most illustrious knights of the Teutonic order, was a scion of the house of Langensalza in Thuringia, where he was born about 1180. He was a faithful and influential councillor of the emperor Frederick IL., and took a prominent part in the contemporary affairs of the German empire. The events of his life are involved in the history of the TEUTONIC ORDER (g.v.), of which he was elected master in 1210 or 1211.

SALZBRUNN, a small German watering-place, visited annually by about 4000 patients, is situated in Silesia, 30 miles to the south-west of Breslau. Its alkalo-saline springs, which are especially efficacious in pulmonary complaints, were known as early as 1316, but afterwards fell into disuse until their merits were once more dis- covered at the beginning of this century. The resident population in 1880 numbered 5777.

SALZBURG, capital of the present Austrian crownland and formerly of the archbishopric of the same name, occu- pies a position of singular beauty on the Salzach, 87 miles south-east of Munich, and 154 miles west by south of Vienna. The river, flowing north-west from the glaciers of the Salz- burg Alps to the Bavarian plain, passes at this point between two isolated hills, the Ménchsberg (1732 feet) on the left and the Capuzinerberg (2132 feet) on the right; in the lovely valley so formed, and stretching into the plain beyond, lies Salzburg. The picturesque and wooded con- fining hills, the lofty citadel of Hohen-Salzburg, rising like a Greek acropolis above the

towers and spires of the city at its foot, and the magnificent background of the Salzburg Alps, overhanging the broad plain, make Salzburg the most beautifully situated town in Austria or Germany. The older and main part of the city lies on the left bank of the Salzach, in a narrow semicircular plain at the base of the

Ménchsberg ; the newer town is on the right bank at the foot of the Capuzinerberg, which is separated from the river by the narrow suburb of Stein. At the south end of the old town, below the Nonnberg, or south-east spur of the Ménchsberg, is the suburb of Nonnthal ; and at the north end is Miilln. The steep sides of the Ménchsberg rise directly from amidst the houses of the town, some of which have cellars and rooms hewn out of the rock ; and the ancient cemetery of St Peter, the oldest in Salzburg, is bounded by a row of vaults cut in the side of the hill. The narrowest part of the ridge, which has a length of above two miles, is pierced by the Neu Thor, a tunnel 436 feet long and 23 feet broad, completed in 1767, to form a convenient passage from the town to the open plain. The south end of the Ménchsberg is occupied by the imposing Hohen-Salzburg, a citadel originally founded in the 9th century, though the present buildings, the towers of which rise 400 feet above the town, date chiefly from 1496- 1519. The streets in the older quarters are narrow,

crooked, and gloomy ; but the newer parts of the city, especially those laid out since the removal of the fortifica- tions about 1861, are handsome and spacious.

Owing to

Plan of Salzburg.

the frequent fires the private buildings of Salzburg are comparatively modern ; and the present flat-roofed houses, lavishly adorned with marble, are, like many of the public buildings, monuments of the gorgeous taste of the prince archbishops of the 17th and 18th centuries. The style of the houses, the numerous open squares, and the abundant fountains give an Italian air to the town. Both sides of the river are bordered by fine

promenades, planted with trees; and a public park has been laid out to the north of the new town. The Salzach is spanned by four bridges, including a railway bridge.

Salzburg is full of objects and buildings of interest. The cathedral, one of the largest and most perfect specimens of the Renaissance style in Germany, was built in 1614-28 by the Italian architect Santino Solari, in imitation of St Peter's at Rome. On three sides it is bounded by the Dom-Platz, the Capitel-Platz, and the Residenz-Platz; and opening on the north-east and north-west of the last are the Mozart-Platz and the Markt-Platz. In the Mozart-Platz is a statue of Mozart, who was born in Salzburg in 1756. On one side of the Residenz-Platz is the palace, an irregular though imposing building in the Italian style, begun in 1592 and finished in 1725. It is now oecupied by the grand-duke of Tus- eany. Opposite is the Neu Bau, begun in 1588, in which are the Government offices and the law courts. The palace of the present archbishops is in the Capitel-Platz. Across the river, with its

French garden adjoining the public park, is the Mirabell palace, formerly the summer residence of the prince arehbishops. Built in 1607, and restored after a fire in 1818, it was presented to the town in 1867 by the emperor Franeis Joseph. The building elose to the Neu Thor, now the cavalry barracks, was formerly the sumptuous stables of the archbishops, built in 1607 to accom- modate 130 horses. Beside it is an amphitheatre, partly hewn out of the rock of the Ménchsberg in 1698, known as the Summer Riding School. The Winter Riding School, in the adjacent build- ing, has its ceiling decorated with the painting of a tournament, dating from 1690. The town-house of Salzburg was built in 1407 and restored in 1675. Other interesting secular buildings are the Chiemseehof, founded in 1305 and rebuilt in 1697, formerly the palace of the suffragan bishop of Chiemsee, and now the meeting- place of the Salzburg diet ; the united school-building, erected in 1873 ; St John's hospital ; the Carolino-Augusteum museum ; and the handsome Curhaus, erected in the public park in 1868.

Of the twenty-four churches the majority are interesting from their antiquity, their architecture, or thcir associations. Next to the cathedral, the

chief is perhaps the abbey church of St Peter, a Romanesque basilica of 1127, tastelessly restored in 1745. It con- tains monuments to St Rupert, and to the “ Monk of Salzburg,” a religious poet of the latter half of the 14th century. St Margaret’s, in the midst of St Peter’s churchyard, built in 1485, and restored in 1865, is situated near the cave in the side of the Ménchsberg, said to have been the hermitage of St Maximus, who was martyred by the pagan Heruli in 477. The Franciscan chureh, with an

| elegant tower built in 1866, is an interesting example of the trans- _ ition style of the 13th century, with later baroque additions.

St Sebastian’s, on the right bank, built in 1505-12 and restored in 1812, contains the tomb of Paracelsus, whose house stood in the

| Platzl, or square at the north end of the chief bridge. The oldest

and most important of the eight convents (four for each sex) at Salzburg is the Benedictine abbey of St Peter, founded about 582 by St Rupert as the nucleus of the city. It contains a library of 40,000 volumes, besides MSS. The Capuchin monastery, dating from 1599, gives name to the Capuzinerberg. The oldest nunnery is that founded on the Nonnberg by St Rupert in 585. The single Protestant church in Salzburg was not built until 1865,

A theological seminary is the only relic now left of the univer- sity of Salzburg, founded in 1623 and suppressed in 1810. A con- siderable number of other educational institutions, lay and clerical, have their seat in the town. The public library contains 62,000 voluines and a collection of MSS., and the museum library contains 10,000 volumes. The number of benevolent and charitable insti- tutions is large. Salzburg carries on a variety of small manufac- tures, including musical instruments, iron-wares, marble ornaments, cement, artificial wool, &c. Its trade has become more important since direct railway communication has been opened with Munich and Vienna. A large number of tourists visit Salzburg annually; and its baths also attract many visitors. Itis the seat of important judicial and administrative departments, and also of an archbishop, with a cathedral chapter and a consistory. In 1880 the population (including the suburbs) was 20,336.

The origin and development of Salzburg were alike ecclesiastical, and its history is involved with that of the archbishopric to which it gave its name. The old Roman town of Juvavum was laid in ruins, and the incipient Christianity of the district overwhelmed, by the pagan Goths and Huns. The nucleus of the present city was the monastery and bishopric founded here about 700 (some say about 582) by St Rupert of Worms, who had been invited by Duke Theodo of Bavaria to preach Christianity in his land. The modern name of the town, due like several others in the district to the abundance of salt found there, appears before the end of the 8th century. When Charlemagne took possession of Bavaria in 798 he made Bishop Arno of Salzburg an archbishop. Thenceforward the dignity and power of the see steadily increased. Before the end of the 11th century Arno's successors had been named primates of Germany and perpetual papal legates ; in the course of time they obtained high secular honours also ; and in 1278 Rudolph of Haps- burg made the archbishops imperial princes. The able and ambi- tious line of prince archbishops, chosen from the noblest families of Germany, eagerly enlarged their possessions by purchase, exchange, and gift, and did not hesitate to come into warlike collision with the rulers of Bavaria and Austria, or even with the emperor himself. They took an active share in the affairs of the empire, and held au influential position in the electoral college. As a constituent of the German empire, Salzburg embraced an area of 3700 square miles, with a population of 250,000. The last independent archbishop was Hieronymus, count of Colleredo, elected in 1772, who ruled with energy and justice but without poprlarity. The see was secularized by the peace of Lunéville in 1802.

The strife between lord and people had always been keen ia Salzburg ; and in 1511 the archbishop, Leonhard, was besieged in Hohen-Salzburg by the inhabitants. The Peasants' War also raged within the see. From the beginning an orthodox stronghold of the Roman Catholic faith, Salzburg expelled the Jews in 1498,

and energetically opposed the Protestant Reformation. Under Wolfgang Dietrich many Protestant citizens were driven from the town and their houses demolished. In spite, however, of rigorous persecution the new faith

spread in sccret, especially among the landward subjects of the archbishop, and a new and more searching edict of expulsion was issued by Arch- bishop Von Firmian in 1727. The Protestants invoked the aid of Frederick William I. of Prussia, who procured for them permission to sell their goods and to emigrate ; and in 1731 and 1732 Salzburg parted to Prussia with about 30,000 industrious and peaceful citizens. About 6000 of these came from the capital.

By the peace of Lunéville Salzburg was given to the archduke of Austria and grand-duke of Tuscany in exchange for Tuscany ; and its new owner was enrolled among the electoral princes. In the re- distribution following the pcace of Pressburg in 1805, Salzburg fell to Austria. Four years later it passed to Bavaria, but the peace of Paris in 1814 restored it to Austria, to which it has since belonged. Under the designation of a duchy the territory formed the depart- ment of Salzach in Upper Austria until 1849, when it was made a separate crown-land, with the four departments of Salzburg, Zell, Tamsweg, and St Johann. In 1861 the management of its affairs was cntrusted to a local diet, consisting of the governor, the arch- bishop, and twenty-five representatives. The area of the duchy is 2762 square miles and the population in 1880 was 163,570, almost exclusively Roman Catholic and of German stock. (F. MU.)

SALZKAMMERGUT, a district in the south-west angle of Upper Austria, between Salzburg and Styria, famous for its fine scenery, forms a separate imperial domain about 250 square miles in area, and with a population of over 18,000. The beauty of its lofty mountains, sequestered lakes, and green valleys has made it one of the favourite tourist resorts of Europe, and has gained for it the title of the “ Austrian Switzerland”; but it owes its name (literally “salt-exchequer property”) and its economic importance to its extensive and valuable salt mines. The chief lakes are the Traunsee or Lake of Gmunden, the Lake of Hallstatt, the Attersee or Kam- mersee (the largest lake in Austria), the Mondsee, and the St Wolfgang Lake. The principal mountains are the Dachstein (9849 feet), Thorstein (9659 feet), the Todte Gebirge with the summits of Priel (8238 feet) and others, and the Hollengebirge (6371 feet). The Schafberg (5840 feet) or “ Austrian Rigi” and the Traunstein (5548 feet), isolated peaks among the lakes, are well-known tourist points. In the very heart of the salt-yielding district lies the

fashionable spa of Ischl; but the capital of the Salzkammergut is Gmunden, situated on the Traunsee at the exit of the Traun, the chief river of the district. Cattle-rearing and forestry are carried on to a certain extent by the people, but between 6000 and 7000 of them are engaged in the salt-mines and evaporating works, which yield annually about 60,000 tons of salt. The sale of the salt is an Austrian crown-monopoly. The most important salt-works are at Ischl, Hallstatt, Ebensee, and Aussee. See Sarr.

SALZWEDEL, an ancient town of Prussian Saxony, lies on the Jeetze, a tributary of the Elbe, 32 miles to the north-west of Stendal. It is an industrial place of some importance, with linen, cotton, and woollen manufactures, carries on a brisk river trade in grain, and possesses a fine Gothic church of the 13th century. But its chief claim to notice lies in the fact that it was for about a century (c. 1070-1170) the capital of the Old or North Mark (also for a time called the “Mark of Soltwedel”), the kernel of the Prussian state. The old castle, perhaps founded by Charlemagne, was purchased in 1864 by the king of Prussia, anxious to preserve this interesting relic. Salzwedel was also a member of the Hanseatic League, and at the beginning of the 16th century seems to have engrossed great part of the inland commerce of North Germany, The population in 1880 was 8780.

SAMANID DYNASTY, the name of the third among those native dynasties which sprang up in the 9th and 10th centuries in the eastern portions of Persia, and, although

nominally provincial governors under the suzerainty of the caliphs of Baghdad, succeeded in a very short time in estab- lishing an almost independent rule over the vast territories round the Oxus and Jaxartes. The Ma’mun, Harin-al- rash{d’s son, to whose patronage the Tahirid family owed their supremacy in Khorasin and Transoxiana (820-872, 205-259 a.H.) appointed three sons of Saman, originally a Tartar chief who claimed descent from the old Sdésdnian kings, governors of Herdt and some districts beyond the Oxus ; and these soon gained such an ascendency over all rival clanships that in 872, when the Tdhirids were over- thrown by the Saffarids under the leadership of Ya‘kub b. Laith (868-878), they were strong enough to retain in their family the governorship of Transoxiana,

with the official sanction of the caliph Mo‘tamid (870-892), and to establish a semi-royal court in Bokhard, the séat of the new Samanid government. During the reign of Ya‘kub’s brother ‘Amr b. Laith (878-900) Isma‘il b. Ahmad, SAman’s great-grandson (892-907, 279-295 a.H.), crossed the Oxus with a powerful army, invaded the territory of the Saffarids, sent “Amr as prisoner to Baghdad, and gradually extended his rule over Khorasin, Khwarizm, Jurjan, and the neigh- bouring countries. His successors, all renowned by the high impulse they gave both to the patriotic feelings and the national poetry of modern Persia (see Persia, vol. xviii. p. 655 sg.), were Ahmad b. Isma‘il (907-913, 295-301 A.H.); Nasr II. b. Ahmad, the patron and friend of the great poet Rudagi (913-942, 301-331 a.n.); Nuh L. b. Nasr (942-954, 331-343 a.m.) ; ‘Abd al-Malik I. b. Nuh (954-961, 343-350 a.4.); Manstir I. b. Nuh, whose vizier Bal’amt translated Tabari’s universal history into Persian (961-976, 350-366 a.u.); Nth IL b. Mansur, whose court-poet Dakiki commenced the Shdéhndma (976-997, 366-387 a.H.); Mansur IT. b. Nuh (997-998, 387-389 A.H.); and ‘Abd al-Malik II. b. Nuh (999), with whom the Samanid dynasty came to a rather abrupt end. The rulers of this powerful house, whose silver dirhems had an extensive currency during the 10th century all over the northern part of Asia, and were brought, through Rus- sian caravans, even so far as to Pomerania, Sweden, and Norway, where Samdanid coins have lately been found in great number, suffered in their turn the fate they had pre- pared for their predecessors ; they were overthrown by a more youthful and vigorous race, that of Sabuktagin, which founded the illustrious Ghaznawid dynasty and the Mussul- man empire of India. Under ‘Abd al-Malik I. a Turkish slave, Alptagin, had been entrusted with the government of Bokhara, but, showing himself hostile to ‘Abd al-malik’s successor Mansur I., he was compelled to fly and to take refuge in the mountainous regions of Ghazna, where he soon established a semi-independent rule, to which, after his death in 977 (367 a.u.), his son-in-law Sabuktagin, like- wise a former Turkish slave, succeeded. Nuh II., in order to retain at least a nominal sway over those Afghan territories, confirmed him in-his high position and even invested Sabuktagin’s son Mahmud with the governorship of Khorasan, in reward for the powerful help they had given him in his desperate struggles with a confederation of disaffected nobles of Bokhdéré under the leadership of Féik and the troops of the Dailamites, a dynasty that had arisen on the shores of the Caspian Sea and wrested already from the hands of the

S4mdanids all their western provinces. Unfortunately, Sabuktagin died in the same year as Nuh IT. (997, 387 a.u.), and Mahmid, confronted with an internal contest against his own brother Isma‘il, had to withdraw his attention for a short time from the affairs in Khordsén and Transoxiana. This interval sufficed for the old rebel leader Fa’ik, supported by a strong Tartar army under Iekkhan, to turn Nuh’s successor Manstr II. into a mere puppet, to concentrate all the XXI. — 31

power in his own hand, and to induce even his nominal master to reject Mahmud’s application for a continuance of his governorship in Khordsin. Mahmud refrained for the moment from vindicating his right; but, as soon as, through court intrigues, Mansur IU. had been dethroned, he took possession of Khorasan, deposed Manstir’s suc- cessor ‘Abd al-Malik IJ., and assumed as an independent monarch for the first time in Asiatic history the title of “sultan.” The last descendant of the house of Samdan, Prince Muntasir, a bold warrior and a poet of no mean talent, carried on for some years a kind of guerilla warfare against both Mahmud and Ilekkhan, who had occupied Transoxiana, till he was assassinated in 1005 (395 a.H.). Transoxiana itself was annexed to the Ghaznawid realm eleven years later, 1016 (407 a.H.).

SAMAR. See PuiLipprne Istanps, vol. xviii. p. 752.

SAMARA, a government of south-eastern Russia, on the left bank of the lower Volga, bounded on the north by Kazaii, on the west by Simbirsk and Saratoff, on the east by Ufa and Orenburg, and on the south by Astrakhan, the Kirghiz Steppes, and the territory of the Ural Cossacks. The area is 58,320 square miles, and the population in 1882 was 2,224,093.

The geology of Samara is not yet fully known. Carboniferous limestones (Upper ?) occupy large tracts in the north-east and east. When approaching the Volga the zechstein appears in wide islands surrounded by the (probably Triassic) variegated marls and sands. Some Jurassic deposits are mentioned about the Samarsk- aya Luka. Cretaceous deposits, which cover large tracts on the right bank of the Volga, appear on the left bank only in the south-east of Samara. Older Tertiary deposits appear also in the very south of Samara ;

while Pliocene limestones and sandy clays, whieh cover the Obshchiy Syrt and Ust-Urt, protrude north as a narrow strip, reaching the bend of the Volga. The Glacial bouldcr-clay of middle Russia does not extend as far south-east as Samara, and the Post-Glacial deposits, not yet fully investigated, are represented by loess, black earth, and lacustrine formations. It is now established that during Post-Glacial times the Aral-Caspian sea extended in a wide gulf oceupying the broad depression of the Volga as far north as the Samarskaya Luka, Caspian mussels having been traced as far as Samara. The soil is on thie whole very fertile. All the northern part of the government is covered with a thick sheet of black earth; this becomes thinner towards the south, clays—mostly fertile—appearing from beneath ; salt clays appear in the south-east.

Samara is inadequately watered, especially in the south. The Volga flows for 550 miles along its western border. Its tributaries the Great Tcheremshan (220 miles), the Sok (195 miles), the Samara (340 miles), with its sub-tributaries, and the smaller tributaries the Motcha, Elan-Irghiz or Tchagra, and Little Irghiz are not navigable, partly on aceount of their shallowness, and partly because of water-mills. When the water is high, boats can

enter some of them to a distance of 15 to 30 miles. The Great Irghiz alone, which has an exceedingly winding course of 335 miles, is navigated to Kutchum, and rafts are floated from Nikolaevsk. The banks of both Karamans are densely peopled. The Great and Little Uzefi water south-eastern Samara and lose themselves in the Kamysh sands before reaching the Caspian. A few lakes and marshes occur in the river-valleys, and salt marshes in the south-east.

The whole of the region is rapidly drying up. The forests, which are disappearing, are extensive only inthenorth. Altogether they still eover an area of 3,048,000 acres, or 8 per cent. of the . whole surface ; prairie and grazing land occupies 11,495,000 acres, and only 4,193,000 acres are uncultivable.

The climate is one of extremes, especially in the steppes, where the depressing heat and drought of summer are followed in the winter by severe

frosts, often accompanicd by snow-storms, The average temperature at Samara (53° 11’ N. lat.) is only 39°-2 (January, 9°3; July, 70°°4).

The population, which was only 1,388,500 in 1853, has almost doubled since then, mostly in consequence of immigration ; it reached 2,224,093 in 1882, and must now (1886) be about 2,250,000. Only 139,300 of these live in towns, the remainder being distri- buted over 4,470 villages, which are often very large, no fewer than 150 ranging in population from 2000 to 6000. The Great Russians, who have immigrated in compact masses, now constitute 65 per cent. of the population ; the Little Russians, who were settled by the Government about the salt lakes, number about 30,000; and the White Russians, also sent to Samara from West Russia, may number about 15,000. A special feature of Samara is its popula- tion of German colonists, from Wiirtemberg, Baden, Switzerland, and partly also from Holland and the Palatinate, whose immigration dates from the invitation of Catherine II. in 1762. Protected as they were by free and extensive grants of land, by exemption from military service, and by self-government, they have developed rich colonies of Catholics, Protestants, Unitarians, Anabaptists, Moravians, and Mennonites, most of which have adopted the Russian village- community system, slowly modified by the existence of a special capital reserved for the purchase of land for the increasing popula- tion.! They now constitute 40 per cent. of the population of the district of Novo-Uzeii, and 9 per cent. of that of Nikolaevsk, their aggregate number reaching 150,000. The Moksha and Erzya Mord- vinians, now nearly quite Russified, gathered in Samara during the reign of Peter I., when they abandoned in great numbers the left bank of the Volga; they constitute about 10 per cent. of the popu- lation. ‘Some 70,000 Tehuvashes and 1500 Votyaks may be added to the above. The Turkish stem is represented by some 100,000 Tartars, 70,000 Bashkirs, and a few Kirghizes. Some baptized Kal- mucks were settled in 1730 at Stavropol; and about 600 Adyghe Circassians, settled at Novo-Uze, may still be found there, All these varied elements, living in close juxtaposition, nevertheless continue to maintain their own ethuographical features; the Mord- vinians alone have lost their ethnological individuality and rapidly undergo a modification of type as they adopt the life of Russian peasants. As regards religion, the great bulk of the population are Orthodox Greeks; the Nonconformists, who still retain their numerous and widely celebrated communities and

monasteries on both the rivers Uzefi, number several hundred thousands (officially 100,000); next come Mohammedans, 12 per cent.; a variety of Protestant sects, 5 per cent.; Roman Catholics, about 2 per cent. ; and, lastly, some 4000 pagans.

The chief occupation is agriculture,—summer wheat, rye, oats, millet, oil-yielding plants, and tobacco being the principal crops. Owing to its great fertility, Samara usually has a surplus of grain for export, varying from 14 to 4 million quarters (cxelusive of oats) annually. In 1883, which was an average year for summer wheat, but under the average for winter rye, the total crops were—wheat, 3,219,600 quarters; rye, 717,800; oats, 1,800,000; barley, 127,300; and other grains, 1,310,000. Notwithstanding this production, varying from 5,000,000 to 9,000,000 quarters of grain (exclusive of oats) for a population of only 2} millions, Samara is periodi- cally liable to famine to such an extent that men die by thousands of hunger-typhus, are compelled to send (as in 1879) to adjoining provinces to purchase orach as food, or are forced to go by hundreds of thousands in search: of employment on the Volga, while millions of quarters of corn are nevertheless exported. The population have no store of corn, or reserve capital for years of scarcity (there were in 1882 only 245,100 quarters of corn in the public granaries, and 503,022 roubles of capital for that purpose), and some 210,000 males have in all only 845,000 acres of arable and pasture land. But even this soil, although all taxed as arable, is often of such quality that only 50 to 55 per cent. of it is under crops, while the peasants are compelled to rent from two to two and a half million aeres for tillage from large proprietors. At present 8,549,000 acres, or about one-quarter of the total area of

1 See the interesting work of M. Clauss on “Our Colonies” (Russian),

Samara, purchased from the crown or from the Bashkirs at nomi- nal prices —very often a few copecks per acre—are in the hands of no more than 1704 persons. The aggregate taxes exacted from the peasants amounting to 5,782,870 roubles (1879), that is to say, from 8 to 10 roubles per male, they are, when account is taken of the advances received during scarcity, reduced to absolute destitu- tion whenever the crops are short, so as to be compelled

to sell their last horse and cow. In 1880 the arrears reached 7,000,000 roubles, to which must be added about 8,000,000 roubles of advances, and in 1882, out of the 1,196,646 roubles proposed to be levied by the zemstvos, 376,643 remained in arrears. The general impoverish- ment may be judged from the death-rate, which for several years has ranged from 46 to 48 per thousand. In 1879 61,488 families were compelled to abandon their homes and disperse throughout Russia in search of employment; while 100,000 families were left wholly destitute of cattle in 1880. Notwithstanding an increase of population by nearly one-third during the last twenty years the numbers of sheep and cattle decreased by about one-half from 1863 to 1882.

The manufactures of Samara are unimportant, the aggregate production (chiefly from tanneries, flour-mills, tallow-melting houses, and distilleries) in 1882 reaching only 7,671,000 roubles (£767,100). Petty trades, especially the weaving of woollen cloth, are making progress in the south. The culture of oil-yielding plants is developed in several districts, as is also that of tobacco (10,690 acres, yielding 101,980 cwts., in 1884). Trade is very active—corn, tallow, potash, salt, and some woollen cloth being exported ; the imports of raw cotton from Central Asia by the Orenburg railway to be forwarded to the interior of Russia are increasing. The aggregate value of merchandise shipped on the Volga and its tributaries within the government reached 27,025,000 roubles in 1882; while 9,100,000 cwts. of merchandise were carried in both directions on the Orenburg railway. The chief loading places are Samara, Stavropol, Batakova, and Pokrovsk on the Volga, Staro- Mainsk on the Maina, and Ekaterininsk on the Bezentchuk.

The government is divided into seven districts, the chief towns of which, with population as estimated in 1879, are—Samara (63, 400 inhabitants), Bugulma (13,000), Bugurustan (18,000), Buzutuk (10,500), Nikolaevsk (9,900), Novo-Uzefi (9700), and Stavropol (4265). Serghievsk (1000) also has municipal institutions ; its mineral waters are becoming more and more frequented. Pokrov- skaya Stoboda (20,000), Ekaterinenstadt, Gtushitza, and Alexan- droff Gay, each with more than 5000 inhabitants, the loading place of Batakova (2500), and several others, although still but villages, liave more importance than most of the above towns.

The territory now occupied by Samara was until last century the abode of nomads. The Bulgarians who occupied it until the 13th century were followed by Mongols of the Golden Horde. The Russians penetrated thus far in the 16th century, after the defeat of the principalities of Kazaii and Astrakhan. ‘To secure com- munication between these two cities, the fort of Samara was erected in 1586, as well as Saratoff, Tsaritsyn, and the first line of Russian forts, which extended from Byetyi Yar to the neighbour- hood of Menzelinsk near the Kama. A few settlers began to gather under its protection. In 1670 it was takeu by the insur- gent leader Stenka Razin, whose name is still remembered in the province. In 1782 the line of forts was removed a little farther east, so as toinclude Krasnyi Yar and parts of what is now the district of Bugurustan, The Russian colonists also advanced eastwards as the forts were pushed forwards and increased in number. The southern part of the territory, however, remained still exposed to the raids of the nomads. In 1762 Catherine II. invited foreigners, especially Germans, and Nonconformists who had left Russia, to settle within the newly-annexed territory. Emigrants from various parts of Germany responded to the call, as also did the Raskolniks, whose communities on the Irghiz soon became the centre of a formidable insurrection of the peasantry which broke out in 1775 under Pugatcheff and was supported by the Kalmucks and the Bashkirs. After the insurrection, in 1787, a new line of forts from Uzei to the Volga and the Urals was erected to protect the southern part of the territory. At the end of the 18th century Samara became an important centre for trade. As soon as the southern part of the territory became quict, great numbers of Great and Little Russians began to settle there—the latter by order of Government for the transport of salt obtained in the salt lakes. In the first half of the present century the region was rapidly colonized. In 1847-50 the Government introduced about 120 Polish families; in 1857-59 Mennonites from Dantzic also founded settlements; and in 1859 a few Circassians were brought hither by Government; while an influx of Great Russian peasants continued and still goes on. The territory of Samara remained long under Kazaii, or Astrakhan, or Simbirsk and Oren- burg. The separate government dates from 1851. (GEOG ES)

SAMARA, capital of the above government, is situated on the slopes of the left bank of the Volga, 743 miles to the south-east of Moscow, at the mouth of the Samara

and opposite the hills of Zheguleff. It is one of the most important towns of the lower Volga for its trade, and its importance cannot fail to increase as the railway to Central Asia advances eastwards. Its population rose from 34,500 in 1869 to 63,400 in 1879. Samara is built mostly of wood, and large spaces remain vacant on both sides of its broad unpaved streets. Its few public buildings are insignificant. A number of the inhabitants support them- selves by agriculture and gardening, for which they rent large areas in the vicinity of the town. The remainder are engaged at the harbour, one of the most important on the Volga. Three fairs are held annually, with aggregate returns exceeding 2,000,000 roubles. Samara is becoming more and more a resort for consumptives on account of its koumiss establishments (see vol. xvi. pp. 305-6).

SAMARANG. See Java, vol. xiii. p. 606.

SAMARCAND. See SAMARKAND.

SAMARIA (Heb. pnw, Shdmérin; LXX. Sapdpeta, except in 1 Kings xvi. 241), the capital of Northern Israel from the time of Omri to the fall of the kingdom, which was consummated in the long siege of the royal city by Shalmaneser (2 Kings xvii. 5) and its capture by his successor Sargon (c. 721 3B.c.). The choice of Samaria as his capital by the warlike and energetic prince to whom the kingdom of Ephraim mainly owed its greatness is easily understood. It stands in the very centre of Palestine and of the country of the dominating tribe of Joseph, and, built on a steep and almost isolated hill, with a long and spacious plateau for its summit, was naturally a position of much strength, commanding two of the most important roads—the great north and south road which passes immediately under the eastern wall, and the road from Shechem to the maritime plain which runs a little to the west of Omri’s capital. The hill of Samaria is separated from the surrounding mountains (Amos iii. 9) by a rich and well-watered plain, from which it rises in successive terraces of fertile soil to a height of 400 or 500 feet. Only on the east a narrow saddle, some 200 feet beneath the plateau, runs across the plain towards the mountains ; it is at this point that the traveller coming from Shechem now ascends the hill to the village of Sebastiya (now pronounced Sebastfya), which occupies only

the extreme east of a terrace beneath the hill top, behind the crusading church of John the Baptist, which is the first thing that draws the eye as one approaches the town. The hill-top, the longer axis of which runs westward from the village, rises 1450 feet above the sea, and commands a superb view towards the Mediterranean, the mountains of Shechem, and Mount Hermon. The situation as a whole is far more beautiful than that of Jerusalem, though not so grand and wild. The line of the ancient walls has not been determined, the chief visible ruins being of the time of Herod ; but, if they followed the natural lines of defence, the city may have been almost a mile in length from east to west. ;

The foundation of the new capital was speedily followed by the wars with Damascus, in which repeated ineffectual sieges by the Syrians proved the value of the stronghold; and even the Assyrians, as has been mentioned, reduced the place with difficulty. During part of the struggle with Damascus the kings of Israel often resided at Jezreel, which was nearer the seat of war; but Omri's city never lost its pre-eminence. While it stood, Samaria and not Jerusalem was the centre of Hebrew life, and the prophets

sometimes speak of it as also the centre of corrupt Jehovah- worship and idolatry (Hos. viii. 5, Mic. i. 5, Isa. x. 10). The

1 The first 6 in Shémerén can hardly represent the old pronunciation. In 1 Kings xvi. 24, the name of the city is derived from that of Shemer, from whom Omri bought the site, and here LXX. seems to have origin- ally had Zaywepdy or Zewepdy (Cod. Vat. Saeunpwv), afterwards corrected to Souopéy (as in Lagarde's edition of Lucian's text) from the Hebrew tradition (compare Field's Hexapla on the passage). The Assyrian monuments have Samirina.

ashera of Samaria, which was not removed by the house of Jehu, is mentioned in 2 Kings xiii. 6 ; and Hos. viil. 5 seems to speak of ealf-idols there, unless the prophet is already using the name of Samaria for the kingdom as a whole, as later writers often do. Ultimately, in the Greek period, the name of Samaria or Samaritis was applied to the whole tract of whieh it is the centre—the region between Judea and Galilee, the country of

the SAMARITANS (9.v.) ; and the New Testament uses Samaria in this sense. The city of Samaria was Hellenized by Alexander, who settled Macedonian colonists in it. It beeame a fortress and was twice taken by siege in the wars of the Diadoehi (by Ptolemy I. in 312 and by Demetrius Poliorcetes about 296). Under the Ptolemies Samaria was the head of a separate provinee, and it continued to bea strong city till Johu Hyrcanus took and utterly destroyed it after a ycar's siege (c. 110 B.C.; see Jos,, Ant., xiii. 10, 2 sg.). Taken from the Jews by Pompey, Samaria was one of the ruined cities which Gabinius ordered to be restored (Jos., Ant., xiv. 5,3); then given by Augustus to Herod the Great, it was refounded by him on a splendid seale probably in 27 B.c., the autumu of which year, according to Sehiirer's calculations, is the probable epoch of the new eity of Sebaste, as it was now called in honour of Augustus. Many remains of Herod's buildings, described by Josephus (Aznt., xv. 8,5; B. J., i, 21, 2), still remain; the most notable belong to a long colonnade just above the line of Herod's wall and those of the great temple of Cesar. The tombs of John the Baptist, Elisha, and Obadiah were visited at Samaria in the time of Jerome (see OBADIAH), and that of St John must have been shown there still earlier, for it was violated by Julian. The old crusading church, now a mosque, was built over the tomb of the Baptist, who is revercnced as a prophet by the Moslems, A view and plan of the church, with details, are given in the Survey of W. Pal. (Memoirs, vol. ii. p. 211 sq.), where also there is a plan of the city. (W. R. 8.) SAMARITANS. This term, which primarily means "inhabitants of Samaritis or the region of Samaria," is specially used, as in the New Testament and in Josephus, as the name of a peculiar religious community which had its headquarters in the Samaritan country, and is still represented by a few families (about 150 souls) at Nabulus, the ancient Shechem.~ They regard themselves as Israelites, descendants of the ten tribes, and claim to possess the orthodox religion of Moses, accepting the Pentateuch and transmitting it in a text which for the most part has only microscopic variations from the Torah of the Jews. But they regard the Jewish temple and priesthood as schismati- cal, and declare that the true sanctuary of God's choice is not Zion but Mount Gerizim, overhanging Shechem (John iv. 20); here they had a temple which was destroyed by John Hyrcanus about 128 z.c. (Jos., Ant., xiii. 9, 1), and on the top of the mountain they still celebrate the pass- over. The sanctity of this site they prove from their Pentateuch, reading Gerizim for Ebal in Deut. xxvii. 4.

With this change the chapter of Deuteronomy can be interpreted with a little straining as a command to select Gerizim as the legitimate sanctuary (comp. ver. 7); and accordingly in Exod. xx. and Deut. v. a commandment taken from Deut. xxvii. is inserted at the close of the decalogue. Thus on their reckoning the tenth command- ment is the direction to build an altar and do sacrifice on Gerizim,—from which of course it follows that not only the temple of Zion but the earlier temple of Shiloh and the priesthood of Eli were schismatical. Such at least is the express statement of the later Samaritans; the older Samaritans, as they had no sacred books except the Penta- teuch, probably ignored the whole history between Joshua and the captivity, and so escaped a great many difficulties, The contention that the Pentateuch is a law given by Moses for a community worshipping on Mount Gerizim is of course glaringly unhistorical. By the (unnamed) sanc- tuary of God's choice the Deuteronomist certainly designed the temple of Zion ; and the priestly law, which is through- out based on the practice of the priests of Jerusalem before the captivity, was reduced to form after the exile, and was first published by Ezra as the law of the rebuilt temple of Zion. The Samaritans must therefore have derived their Pentateuch from the J ews after Ezra's reforms, i.e., after 444 Bc. Before that time Samaritanism cannot have

existed in a form at all similar to that which we know; but there must have been a community ready to accept the Pentateuch. In point of fact the district of Mount Ephraim was not entirely stripped of its old Hebrew popu- lation by the Assyrian captivity, and the worship of Jehovah went on at the old shrines of Northern Israel side by side, or even interfused, with the old heathenish rites of the new settlers whom the Assyrians brought to fill up the lands desolated by war. The account of the religious condition of the country given in 2 Kings xvii. 24 sg. dwells only on the partial adoption of Jehovah-worship by the foreigners who had come into the land, but by no means implies that the foreigners constituted the whole population. Josiah extended his reforms beyond the limits of Judea proper to Bethel and other Samaritan cities (2 Kinys xxiii. 19), and the narrative shows that at that date things were going on at the Northern sanctuaries much as they had done in the time. of Amos and Hosea. Toa considerable extent his efforts to make

Jerusalem the sanctuary of Samaria as well as of Judea must have been successful, for in Jer. xli, 5 we find fourscore men from Shechem, Shiloh, and Samaria making a pilgrimage to “the house of Jehovah,” after the catastrophe of Zedekiah. And so it is not surprising to find that the people of this district came to Zerub- babel and Joshua after the restoration, claiming to be of the same religion with the Jews and asking to be asso- ciated with them in the rebuilding of the temple. Their overtures were rejected by the leaders of the new theocracy, who could not but fear the results of interfusion with so large a mass of men of mixed blood and very questionable orthodoxy ; and so the Jehovah-worshippers of Samaria were thrown into the ranks of “the adversaries of Judah and Benjamin ” (Ezra iv.). Nevertheless, down to the time of Nehemiah, the breach was not absolute ; but the expul- sion from Jerusalem in 432 z.c. of a man of high-priestly family who had married a daughter of Sanballat made it so; and it is more than probable, as has been explained in IsRAEL, vol. xiii. p. 419, that this priest is the Manasseh of Josephus, who carried the Pentateuch to Shechem, and for whom the temple of Gerizim was built. For, though the story in Josephus (Ant., xi. 8) is falsely dated and mixed with fable, it agrees with Neh. xiii. in too many essential points to be wholly rejected, and supplies exactly what is wanted to explain the existence in Shechem of a community bitterly hostile to the Jews, and yet constituted in obedience to Ezra’s Pentateuch.

When we consider what difficulties were met with in the introduction of Pentateuchal orthodoxy even at Jerusalem, the foundation of a community of the Law in the Samaritan country, among the mixed populations whom the Judean leaders did not venture to receive into fellowship, must appear a very remarkable exploit. The Samaritan religion was built on the Pentateuch alone; and the fact that they did not receive even those prophetic books and historical narratives which originated in Northern Israel (all which have been preserved to us only by the Jews) shows that, before they received the Pentateuch, their Jehovah-worship was a mere affair of traditional practice, uninspired by prophetic ideas and unsupported by written record of the great deeds of Jehovah in time past. Jt can hardly in any respect have risen above the level of the popular religion of North Israel as described and condemned by Hosea and Amos. In Judea the duty of conformity to the Pentateuch was enforced by appeal to the prophets and to the history of the

nation’s sins and chastisements, and the acceptance of a vast and rigid body of ordinances was more easy because they came as the consolidation and logical develop- ment of a movement that had been in progress from the days of Isaiah. Among the Samaritans, on the other hand, the acceptance of the Pentateuch implied a tremendous

breach of continuity. They must indeed have felt that they had fallen behind the Judzans in religious matters, and the opportunity of putting themselves on a par with them by securing a copy of the institutes of Moses and the services of a Judean priest would naturally be grasped at. But what is remarkable is that, having got the Pentateuch, they followed it with a fidelity as loyal and exact as the Jews themselves, save in the one matter of the change of the sanctuary. No concessions were made to heathenism or to the old lax Jehovah-worship ; the text of the sacred book was transmitted with as much conscientiousness as was practised by Jewish scribes in the first centuries after Ezra;! and even from the unwilling witness of their enemies the Jews we can gather that they fulfilled all righteousness with scrupulous punctiliousness so far as the letter of the written law was concerned, though of course they did not share in the later developments of the oral law, and so were heretics in the eyes of the Pharisees.”

That it was possible to establish such a community on such a soil is a remarkable evidence that in that age the tendency to a legal religion was favoured by general causes, not confined to Judea alone ; it must be remembered that elaborate hierocracies sprang up after the fall of the old nationalities in many parts of western Asia (comp. PRIEST, vol. xix. p. 729). At the same time it must be remembered that, as Ezra could not have succeeded without Nehemiah, Manasseh had Sanballat’s civil authority to back him. It is probable, too, that Josephus is right in assuming that he was strengthened by a considerable secession of Judzeans, and it is not to be supposed that the “Samaritans” ever embraced anything like the whole population of the Samaritan country. Samaria itself was Hellenized in the time of Alexander ; and in Ecclus. 1. 26 the foolish people that dwell at Shechem are distinguished from the inhab- itants of the Samaritan hill-

country in general. The Samaritans, like the Jews, throve and multiplied under the discipline of the law, but at no time in their history do they appear to have had the political importance that would have accrued to so closely knit a religious body if it had held all the fertile Samaritan district.

Jews and Samaritans were separated by bitter jealousies and open feuds (Jos., Ant., xii. 4, 1), but their internal development and external history ran closely parallel courses till the Jewish state took a new departure under the

1 This appears especially by comparison of the Samaritan Pentateuch with the Septuagint. It is not of course to be wondered at that the Judean text is on the whole superior to the Samaritan, for the Samaritans had no opportunity of revising their text by Judean copies. The Samaritan character is an independent development of the old Hebrew writing as it was about the time when they first got the Pentateuch. This in itself is an indication that from the first their text ran a separate course, and that there was no opportunity of checking corruptions that had got into it by reference to different recensions. In Judza also there were important variations between MSS. down to the time of the Septuagint and even later, and in many cases the Septuagint readings agree with the Samaritan Pentateuch, showing an affinity between the sources of these two texts. But ultimately the Jewish scribes were able to constitute or rather to select an authoritative text, and whether by good luck or by judgment the text they chose was on the whole one of a singularly good type. The Samaritans never had opportunity to do anything of this kind.

2 Compare, for details and references, Nutt, Fragments of a Samaritan Targum, p. 87 sq., 42 sg., and Schiirer, Gesch. des Jiidischen Volkes, p. 7 ~~ Josephus (Ant., xi. 8, 7) says they received Judszeans who were accused of ritual irregularities, but, as he adds that the fugitives pro- fessed that they were falsely accused, it is plain that even this partisan writer did not venture to represent them as indifferent to ritual orthodoxy. No doubt, in addition to the legal ordinances, the Samaritans retained some ancient traditional practices, as they certainly introduced some new observances. Their passover, for example, has some peculiar features, one of which, viz., the application of the sacrificial blood to the faces of the children, has an exact parallel in the old Arabic ‘akika. See the account of an eye-witness (Prof. Socin) in Badeker’s Palestine.

® So all Greek MSS. The old Latin substitutes Mount Edom ; the Syriac has ‘‘Gbel,” which may mean Ebal or the Edomite country.

Maccabees. The religious resemblance between the two bodies was increased by the adoption of the institution of the synagogue, and from the synagogue there certainly grew up a Samaritan theology and an exegetical tradition. The latter is embodied in the Samaritan Targum or Aramaic version of the Pentateuch, which in its present form is, according to Néldeke’s investigations, not earlier than the fourth Christian century, but in general agrees with the readings of Origen’s 75 Sapaperixdv. For the dogmatic views of the Samaritans our sources are all late; they embrace hymns and other books of little general interest, and mainly at least of medieval origin. Like the Jews, too, the Samaritans had a haggada; indeed the Arabic books they still possess under the name of chronicles are almost entirely haggadic fable with very little admixture of true tradition, The recent date of all this literature seems to show that the old Samaritans had not nearly so vigorous an intellectual life as the Jews, though what life they had moved in similar lines; indeed, having no sacred book but the Pentateuch, and having passed through no such national revival as that of the Maccabees, they lacked two of the most potent influences that shaped the development of Judaism. On the other hand, they shared with the Jews the influence of a third great intellectual stimulus, that of Hellenism.

Samaritans as well as Jews were carried to Egypt by Ptolemy Lagi; the rivalry of the two sects was continued in Alexandria (Jos., Ant., xii. 1, 1), and Hellen- ized Samaritans wrote histories and epic poems in Greek with exactly the same patriotic mendacity which charac- terizes Jewish Hellenism. Of this, the oldest surviving Samaritan literature, some fragments have been preserved in the remains of Alexander Polyhistor.*

The troubles that fell on the Jews for their fidelity to the law, under Antiochus Epiphanes, were not escaped by the Samaritans (2 Mac. v. 23, vi. 2); the account in Josephus (Ant., xii. 5, 5) which makes them voluntarily exchange their religion for the worship of the Grecian Zeus is certainly a malignant falsehood.®

Under the Maccabees their relations with Judza. became very bitter, and they were severely chastised by Hyrcanus, who destroyed their temple. Hostilities between the two nations recurred from time to time; and in the New Testa- ment, in Josephus, and in Jewish tradition we see how deep-seated was their mutual abhorrence. But, with all this, the sects were too nearly alike not to have much in common. The Roman yoke galled both in the same way ; the Samaritan false prophet whose movement Pilate put down with cruel slaughter (Jos., Ant., xviii. 4, 1), and pro- bably also Simon Magus and Dositheus (Orig., Cont. Cels., i. p. 44), are parallel phenomena to the false Messiahs that arose among the Jews. The original views of the Samaritans were like those of the Sadducees, and they did not believe in a resurrection or a Messiah; but it was impossible for their faith to survive under the cruel pres- sure of foreign bondage without absorbing something from Jewish eschatology. And so too, in the struggle of the Jews with Vespasian, perhaps also in that with Hadrian, the Samaritans forgot their old feud, and took part against the Romans. They seem also to have shared in great measure in the subsequent dispersion, for in later times we hear of Samaritans and Samaritan synagogues not only in Egypt but in Rome, and in other parts of the empire.

4 See especially Friedlinder, Hellenistische Studien (1875), p. 82 sq. An Egyptio-Samaritan fragment has also been suspected by Ewald to be imbedded in the Sibyllina, xi. 289-244.

5 See Appel, Questiones de Rebus Samaritanorum, 1874, p. 87 sq.

§ Josephus calls them Cuthzans (from 2 Kings xvii. 30), and will not admit that they are of Hebrew blood at all; the Rabbins use the same name, but are not always so positive in calling them pure Gen- tiles. The groundless accusation of dove-worship (which makes their religion that of the Syrian Aphrodite) arose in post-Mishnic times,

The Christian emperors made hard edicts against them as well as the Jews, and at length excluded them from the public service. Under these circumstances they naturally came to be mainly traders and merchants' clerks ; in Con- stantinople "a Samaritan" meant ''a banker's clerk." In their old homes they still remained numerous enough to make a serious insurrection under Justinian (529 a.D.). Its suppression was followed by very stern decrees against the whole sect, and Europe heard little more of the Samaritans till, towards the close of the 16th century, Western scholars took an interest in the few congregations that still remained in the East, at Cairo and Damascus as well as at Nabulus. It was found that during the Middle Ages they had formed an Arabic literature of considerable size but of little intrinsic worth, and had continued faith- fully to preserve their scriptures. Since then their num- bers have been constantly on the wane, and they have almost lost their old learning, which was never very

considerable.

Samaritan Literature.—Of this a full account is given, along with a sketch of Samaritan history, in the introduction to Nutt's Fragments of a Samaritan Targum (1874). The following list confines itself to what has been printed. (a) The; Hebrew- Samaritan Pentateuch, z.e., the Hebrew text in Samaritan reccn- sion and character, was first printed in the Paris polyglott. On the nature of this recension, see Gesenius, De Pent. Sam. origine, &c. (1815). A list of variations from the Massoretic text is given by Petermann, Hebr. Formenlchre nach der Ausspraehe der Samaritaner (1868). (6) Targum, also in the Paris and London polyglotts, but in very corrupt form. A critical edition of the whole is still lacking ; the best text of part is that given by Nutt from a Bodleian MS. The dialect, apart from the corruptions of the text, differs little from other Palestinian Aramaic. (e) Aramaic having been supplanted in Palestine by Arabic, an Arabic version of the Pentateuch was

made by Abfi Said about 1100 a.p. The first three books have been edited by Kuenen (1851-54). On this version, see especially De Sacy in Mém. Acad. Inscr. et Belles-Lettres, vol. xlix. (d) The so-called Samaritan book of Joshua is an Arabic chronicle going down to Roman times, but of almost no historical use. It may date from the 13th century. Juynboll edited it in 1848 from a Leyden MS.; there are other MSS. in the British Museum and in Trinity College, Cambridge. (e) Another short chronicle, El-Tolidoth, published by Neubauer in Jour. As. (1869), seems to have used the Jewish Book of Jubilees. Both (d) and (e) with some other sources were used by— (f) The Chronicle of Abulfath, written in 1355, and continued by later hands ; edited by Vilmar (Gotha, 1865). (g) A collection of hymns was published by Gesenius (Carmina Samaritana, 1824). Other liturgical pieces have been published by Heidenheim. (h) Specimens of Samaritan writings on Hebrew grammar were published by Noldeke in the Géttinger Nachrichten (1862).

For the Samaritans in general, see Nutt, op. cit.; Juynboll, Comm. in Hist. Gentis Samar., Leyden, 1846; Appel, De Rebus Samaritanorum sub imperto Romano peractis, De Sacy published inthe Wotices et Extraits, xii. (1831), all the correspondence of the Samaritans with European scholars, and other matcrial about the modern Samaritans. For the modern Samaritans see also Petermann's Reisen, vol. i. (1860). For Makrizi's account of the Samaritans, see De Sacy, Chrest, Ar., vol.i. Other literature in Nutt and very fully in Kautzsch's article in Herzog-Plitt, vol. xifi. cw. R.S.)

SAMARKAND, a city of Central Asia, anciently Mar- canda, the capital of Sogdiana, then the residence of the Sdémanids, and subsequently the capital of Timur, is now chief town of the Zerafshan district of the Russian dominions. It lies in a richly cultivated region, 185 miles south- west of Tashkend, and 145 miles east of Bokhara, in 39° 39' N. lat. and 67° 17' E. long., 2150 feet above the sea, in the valley of the Zerafshan, at the point where it issues from the extreme western spurs of the Tian-Shan before entering the steppes of Bokhara. The Zerafshan now flows about three or four miles to the north of the city, supplying its extensive gardens with water.

Marcanda, a great city, whose walls had a compass of 90 stadia, was destroyed by Alexander the Great. It re- appears as Samarkand at the time of the conquests of the Arabs, when it was finally reduced by Kotaiba ibn

Moslim in 93 a.H. (711-712 a.p.). Under the Sdmanids it became a brilliant seat of Arabian civilization. Its schools, its savants, were widely renowned ; it was so populous that, when besieged by Jenghiz Khan in 121 9, it is reported to

have been defended by an army of 110,000 men. De- stroyed and pillaged by the great conqueror, its population was reduced to one-quarter of what it had been, but it still reckoned 25,000 families within its walls. The great conqueror Timur made it his residence, and the inhab-

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J Bartholomew, Eaint Plan of Samarkand. 1, Governor's house; 2, Burying-place of Russian soldiers who fell in the defence of 1868; 3, College of Ulug-beg; 4, College of Shir-dar;

5, College of Tilla-kari; 6, Grave of Timur; 7, Grave of Timur's wives.

itants rose to 150,000. The magnificent buildings of the epoch of the successors of Timur, which still remain, testify to its former wealth. But new invaders again re- duced it to ruin, so that at the beginning of last century it is reported to have been almost without inhabitants. It fell under Chinese dominion, and subsequently under that of the emir of Bokhara, suffering again and again from wars which were fought for it and around it. But no follower of Islam enters it without feeling that he is on holy ground, although the venerated mosques and beautiful colleges of Samarkand are falling into ruins, its high influ- ence as a seat of learning has vanished, and its very soil is profaned by infidels. It was not without a struggle that the Mohammedans permitted the Russians to take posses- sion of their holy city ; and, while other cities of Central Asia submitted almost without striking a blow, Samarkand revolted in 1868, the Russian garrison shut up in the citadel being rescued only by the timely arrival of a corps despatched from Tashkend.

The present city, which is but a wreck of its former self, is quadrangular in shape and is enclosed by a low. wall 9 miles long. The citadel rises in the west, and to the west- ward of this again the Russians have laid out their

new town, with broad streets and boulevards radiating from the citadel, while a pretty public garden, carefully irrigated, occupies the centre.

The central part of Samarkand is the Righistan—a square limited by the three madrasahs (colleges) of Ulug-beg, Shir-dar, and Tilla- kari; in its architectural symmetry and beauty this is rivalled only by some of the squares of Italian cities. Though differing in detail, thegreat lines of the three colleges are the same. An immense doorway decorates the front of each of these large quadri- lateral buildings. A high and deep-pointed porch, whose summit almost reaches the top of the lofty louis, is flanked on each side by a broad quadrilateral pillar of the same height, subdivided into three sections, each of which has its own style of decoration. Two fine columns, profusely decorated, in turn flank these broad pillars. On each side of the high doorway are two lower archways connect- ing it with two elegant towers, narrowing towards their tops and slightly inclined. The whole of the fagade and also the interior courts are profusely decorated with enamelled bricks, whose colours —blue, green, pink, or golden, but chiefly turquoise-blue—are wrought into the most fascinating designs, in striking harmony with the whole and with each part of the building. In the recess of the deep doorway is the wide door, with proportions of remark- able elegance, and above it are the broad decorations filling up the upper part of the arch. Over the interior are bulbed or melon-like domes, perhaps too heavy for the facade. The cool and shady

courts are surrounded by three stories of small rooms, each having ouly one opening—the door. The majestic buildings are now merely the dwellings of mollahs, who live ou the revenues of the Wakf lands at Katty-kurgan.

The college of Shir-dar (built in 1601) takes its name from the two lions, or rather tigers, figured on the top of its doorway, which is richly decorated with green, blue, red, and white enamelled bricks. It is the most spacious of the three, and 128 mollahs inhabit its 64 apartments. The Tilla-kari (“dressed in gold”), built in 1618, has 56 rooms. But the most renowned of the three madrasahs is that of Ulug-beg, built in 1420 or 1434, by Timur, the grandson of the great conqueror. It is smaller than the others, but it was

to its school of mathematics and astronomy that Samar- kand owed its wide renown in the 15th century.

A winding street running north-east from the Righistan leads to a much larger square having the college of Bibi-khanym on the west, the graves of Timur's wives on the south, and a clean bazaar on the east. The college was crected in 1888 by a Chinese wife of Timur, and is said to have once sheltered as many as a thousand students. It covers a large arca, and has three mosques connected by a quadrangular building containing the students' rooms. The archway and towers of its fagade are considered by Vambéry as a model for such buildings, and its decorations resist the destructive influences alike of time and of man. One of its imosques still raises its high bulbed donie above the outer walls, which are falling into ruins, and now give accommodation to the carts and the bazaar of traders in cotton. The lofty ruins of the grave of Timut's wives are really grand.

To the north, outside the walls of Samarkand, but close at hand, is the Hazreti Shah-Zindeh—the summer-palace of Timur; and near this is the grave of Shah-Zindeh, or, more precisely, Kotham ibn al-Abbas ibn 'Abd al-Mottalib, a famous companion of the Prophet. This was already a famous shrine in the 14th century (Ibn Batuta, ili. 52); it is believed that the saint still lives in the mosque, and will one day rise for the defence of his religion. The Hazreti Shah-Zindeh covers a wide arca oma terrace reached by forty marble steps. A series of galleries and rooms lead to the hall containing the relics of the saint. The decoration of the interior halls is marvellous.

Another street running south-west from the Righistan leads to the Gur-Emir —the grave of Timur. This consists of a chapel crowned with an elegant dome, enclosed by a wall and fronted by an archway. Time and earthquakes have greatly injured this fine building ; one of the minarets is already in ruins. The interior consists of two apartments paved with white marble, the walls being covered with elegant turquoise arabesques and inscriptions in gold. The chief room is of great beauty, and its decorations, of a bolder style than the others, are in strict harmony with the im- pression it is designed to produce. A large pyramidal piece of jade broken into two covers the grave of Timur, which has by its side that of his teacher, Mir Seid Berke, and

those of several members of his family, all enclosed bya marble railing. A dark and narrow flight of steps leads down to the crypt, also ornamented with arabesques, where the graves are placed in the same order as in the upper hall.

The citadel is situated on the west of the city, upon a hill whose steep slopes render it one of the strongest in Central Asia. Its walls, 8000 yards in circuit and about 10 feet high, enclose a space of about 4 square miles. It contained the palace of the emir of Bokhara,—a vulgar modern building now transformed into a hos- pital, —and the audience hall of Timur,—a long narrow court, sur- rounded by a colounade, and containing the Keuk-tash, a grey stone 10 feet long, 4 feet broad, and 43 feet high, reported to have been brought from Brussa. On it Timur used to take his seat, surrounded by his numerous vassals; from it more recently the emirs of Bokhara also were wont to dispense their terrible justice.

Ruins of former buildings—heaps of plain and enamelled bricks, among which Greco-Bactrian coins have been found—cover a wide area all around the present city, and especially on the west and north. The name of Aphrosiab is usually given to these ruins, which extend for nearly three miles to the westward of the prescnt Russian town; this suburb of Samarkand was enclosed by a wall, the ruins of which can be traced for seven or eight miles. Five miles to the south-west of Samarkand is the college Khodja Akrar ; its flower ornamentation in enamelled brick is one of the most beautiful of Samarkand. Rye is now grown in its courts, and its artistic ornamentation is going to ruin. To the north-north-east are the Tchupan-ata Hills, the chief of which has on its summit the grave of Daniar Polvan. On the right bank of the Zerafshan stands the village of Dehbid, peopled by descendants of Mahkdum Aazam (died in 1542), who possess a beautiful khanka (monastery), with pretty avenues of trees planted by Nezr Divabeghi in 1632. As for the famous Baghitchi-naran (the garden of plane trees), only the ruins of its palace now mark its former position ; the trces have disappeared. Of the Greco-Armenian library said to have been brought to Samarkand by Timur no traces have been discovered, and Vambery regards the whole legend as a fable invented by Armenians. Every trace of the renowned high school Kalinder- khany has also disappeared.

The present Moslem city is an intricate labyrinth of narrow winding streets, having on both sides clay walls conccaling dirty court-yards and miserable houses. The population was estimated at 36,000 in 1879; it consists of Tajiks (Iranians) and Sarts or Uzbegs. The Europeans numbered 5380. Some 300 Jews occupy a separate quarter, remarkable for its filth. Numbers of Arabs, Persians, Afghans, Hindus, Kiptchaks, and Tsigans (Gipsies) may be met with in the streets. The chief occupation of the inhabitants is gardening; the gardens beyond the walls are extensive and very well kept. There is also a certain amount of manufacturing in- dustry ; the workshops, which are small, are thus enumerated by M. Kostenko :—for metallic wares, 12; for tallow and soap, 34; tanneries, 30; potteries, 37; for various tissues 246. Those for dycing and the manufacture of harness, boots, and silver and gold wares are also numerous. The best harness, ornamented with turquoises, and the finer products of the goldsmith's art, are imported from Bokhara or Afghanistan. The products of local potteries are very fine.

The bazaars of Samarkand, the chief of which is in the centre of the town, close by the Righistan, are more animated and kept with much greater cleanliness than those of Tashkend or Namangan. The trade carried on by local or Bokhara merchants is very brisk, the chief items being cotton, silk, wheat and rice, horses, asses, fruits, and cutlery. Wheat, rice, and silk are exported chiefly to Bokhara ; cotton to Russia, via Tashkend. Silk-wares and excel- lent fruits are imported from Shahri-Syabs, and rock-salt from Hissar. (ES AN, UG)

SAMBALPOR, or Sumpvtpoor, a British district in the chief-commissionership of the Central Provinces of India, between 21° 2' and 21° 57' N. lat. and between 83° 16' and 84° 21' E. long. Exclusive of attached native states by which it is surrounded, Sambalpur contains an area of 4521 square miles. Including the native states, it is bounded on the north by Chutia Nagpur, on the east and south by Cuttack district, Bengal, and on the west by the Bilaspur and Raipur districts. The Mahdnadi, which is the only important river in the district, flows through it, dividing it into unequal parts. The greater portion of Sambalpur is an undulating plain, with ranges of rugged hills running in every direction, the largest of which is the Bard

Pahaér, a mountain chain covering an area of 350 square miles, and attaining at Dibrigarh a height of 2267 feet above the plain. The Mahdnadi affords means of water cominuuication for 90 miles ; its principal tributaries in Sambalpur are the Ib, Keli, and Jhird. To the west of the Mahanadi the district is well cultivated. The soil of the district is generally light and sandy. It is occupied for the greater part by crystalline metamorphic rocks ; but part of the north-west corner is composed of sandstone, limestone, and shale. Gold dust and diamonds have been found near Hirakhuda or Diamond Island, at the junction of the Ib and Mahanadi. The climate of Sambalpur is considered very unhealthy ; its average temperature is 79”, and its average annual rainfall is 584 inches.

The census of 1881 disclosed a population of 693,499 (346,549 males and 846,950 females). Hindus numbcred 632,747 and Mohammedans 2966. The only town in the district with a population exceeding 5000 is SAMBALPUR, the administrative headquarters, with 13,939 inhabitants, situated in 21° 27’ 10” N. lat. and 84° 1’ E. long., on the north bank of the Mahanadi. It has much improved since 1864, when a cart could only with great ditficulty pass through the main street. Of the total area of the district 1125 square iniles are cultivated, and of the portion lying waste 888 are cultivable. Rice forms the staple crop; other pro- ducts are food grains, oil-seeds, cotton, and sugar-cane. The manu- factures are few and of no great value. The gross revenue in 1883- 84 was £22,445, of which the land contributed £11,388.

Sambalpur lapsed to the British in 1849, who immediately adopted a system of exaction and confiscation by raising the revenue assessments one-fourth and resuming the land grants, religious and others. Great dissatisfaction was the consequence, and the Brahmans, who form a numerous and powerful community, made an appeal, but obtained no redress. In 1854 a second land settlement again raised the assessments everywhere one-fourth. This system of exaction produced its natural results. On the outbreak of the mutiny in 1857 a general rising of the chiefs took place, and it was not until the final arrest of Surandra 8a, a chief who for some years had been the cause of great disturbances, in

1864 that tranquillity was restored; since then the district has enjoyed profound peace.

SAMNITES, a people of ancient Italy, whose name figures conspicuously in the early history of Rome. — They occupied an extensive tract in the centre of the peninsula, which derived from them the name of Samnium. The territory thus designated was a wholly inland district, bounded on the north by the Marsi, Peligni, and Fren- tani, who separated them from the Adriatic, on the east by Apulia, on the south by Lucania, and on the west by Campania and Latium. But the Samnites were from an early period a numerous and powerful nation, and formed rather a confederacy of tribes than a single people. Hence the name is sometimes used in a wider sometimes in a more limited sense,—the Hirpini, espe- cially, who occupied the southernmost portion of their territory, being sometimes included amongst them, some- times distinguished from them. But according to the usual acceptation of the term—excluding the Frentani, who, though unquestionably of Samnite origin, were not usually regarded as belonging to the Samnite nation— they consisted of three principal tribes :—the Caraceni in the north, the Pentri, who may be termed the Samnites proper, in the centre, and the Hirpini in the south. Almost the whole of Samnium, as thus defined, was a rugged, mountainous country, and, though the Apennines do not in this part of their range attain to so great an elevation as farther north, they form irregular masses and groups, filling up almost the whole territory, and in great part covered with extensive forests. On the side of Campania alone the valley of the Vulturnus was richer and more fertile, and opened a natural access from the south into the northern regions of Samnium, while the Calor, a tributary of the same river, which flows from the east past Benevento, afforded in all ages a similar route into the upland districts of the Hirpini. Between the two, occupying the centre of the Pentrian territory and the very heart of Samnium, was the great mountain mass now known as the Monte Matese, of which the highest summit attains to an elevation of 6600 feet, and which must in all ages have been a region presenting peculiar difficulties of access.

All ancient writers agree in representing the Samnites as a people of Sabine origin, who migrated at an early period to the region of which we find them in the occupa- tion when they first appear in history. The period of this emigration is wholly unknown, but, if we can trust the tradition reported by Strabo, that it was the result of a vow to send forth the produce of a “sacred spring” (see SABINES), it could hardly have been in the first instance very humerous, and it is probable that the invaders estab- lished themselves in the midst of an Oscan population, with whom they gradually coalesced. It is certain that no very long interval elapsed before the Samnites in their turn found themselves exceeding the resources of their barren and rugged territory, and extending their dominion over the more fertile and accessible regions by which they were surrounded. ‘The first of these movements was pro- bably that by which they occupied the land of the Frentani, a fertile district along the shores of the Adriatic, between the northern part of Samnium and the sea. The Hirpini also were in the first instance almost certainly a later offshoot of the central Samnite people, though they continued always in such close connexion with them that they were generally reckoned as forming part of the Samnite confederacy, and almost uniformly took part with the more central tribes in their wars against Rome. The Frentani, on the contrary, generally either stood aloof from the contest or secured their own safety by an alliance with Rome.

To a later period belong the emigrations that gave rise to the two powerful nations of the Lucanians and Cam-

panians. At the time when the Greek colonies were established in southern Italy the native tribes that occu- pied the regions to the south of Samnium were the (Enotrians and other Pelasgic races, and it was not till after the middle of the 5th century 3.c. that the pressure of the Lucanians from the interior began to make itself felt in this quarter. From this time they gradually extended their power throughout the whole country to the Gulf of Tarentum and the Sicilian Straits. It was pro- bably at a somewhat earlier period (about 440 to 420 B.c.) that they effected the conquest of the fertile country to the west, intervening between the mountain regions of Samnium

and the sea. Here they found an Oscan popula- tion, with whom they seem to have speedily coalesced, and thus gave rise to the people known thenceforth as Campanians, or ‘inhabitants of the plain.” But in this case also the new nationality thus constituted had no political connexion with the parent state, and retained its independent action both for peace and war. The first mention of the Samnites themselves in Roman history occurs in 354, when they concluded a treaty of alliance with the rising republic.

But it was not long before the course of events brought the two rival powers into collision. The Samnites, who appear to have been still actuated by aggressive tenden- cies, had attacked the Sidicini, a petty tribe to the north of Campania, and the latter, feeling unable to cope with so powerful an adversary, invoked the assistance of the Campanians. These, however, were in their turn attacked by the Samnites, and sustained so crushing a defeat, under the very walls of Capua, that they were compelled to implore the aid of Rome. Their request was granted, though not without hesitation, and thus began (in 343) the first of the long series of the Samnite Wars, which ultimately led to the establishment of the Roman domination over the whole of southern Italy. The events of these wars, which are related in all histories of Rome, can only be very briefly noticed here. ‘The first contest was of short duration; and after two campaigns the Romans were willing not only to conclude peace with Samnium but to renew the previously existing alliance, to which the Samnites continued faithful throughout the great struggle which ensued between the Romans and thie allied Campanians and Latins. The Second Samnite War was of a very different character. Both nations felt that it was a struggle for supremacy, and, instead of being brought toa close within three years, it lasted for more than twenty years (326-304), and was marked with considerable vicissitudes of fortune, among which the celebrated disaster of the Caudine Forks (321) stands most conspicuous. Nor was the struggle confined to the two leading powers, many of the neighbouring nations espousing the cause of the one side or the other, and often with fluctuating faith, in accordance with the varying fortunes of the war. The result, however, was on the whole favourable to the Roman arms, notwithstanding which they were willing to conclude peace in 304, on con- dition of the renewal of the previously existing alliance. This interval of tranquillity was of short duration, and little more than five years elapsed between the end of the Second Samnite War and the

commencement of the Third (298). In this fresh contest they received a formidable auxiliary in a large body of Gauls, who had recently crossed the Alps, and, together with their countrymen the Senones, espoused the cause of the Samnites against Rome. Their combined forces were, however, defeated in the great battle of Sentinum (294), and after several successive cam- paigns the consul M. Curius Dentatus was able to boast of having put an end to the Samnite Wars (290), after they had lasted more than fifty years. It is true that a few

years later the Samnites again appear in arms, though rather as auxiliaries than: principals, and the name of Fourth Samnite War is given by some historians to the memorable contest which, commenced in 282 by the Lu- canians, assumed a wholly different aspect when Pyrrhus, king of Epirus, appeared in Italy as their auxiliary. But the power of the Samnites was evidently broken, and after the final defeat of Pyrrhus they appear to have offered little resistance. Their final submission was made in 272, and according to the usual Roman policy was secured by the establishment in their territory of the two important colonies of Ausernia and Beneventum.

During the Second Punic War, Samninm became the frequent theatre of hostilities. The Hirpini were among the first of the ltalian tribes to declare in favour of Hannibal after the battle of Canne (216); but their example was not followed by the more

owerful tribe of the Pentri, and when Hannibal was finally Liven out of Central Italy the Samnites were speedily reduced to submission. From this time we hear no more of them till the great outbreak of the Italian nations, commonly known as the Social War (90), in which they bore a prominent part. Two of the most distinguished of the Italian leaders, C. Papius Mutilus and C. Pontius Telcsinus, were of Samnite birth, and after the fall of Corfinium the Samnite town of Bovianum became the temporary capital of the confederates. Their submission had not indeed been completed when the civil war between Marius and Sulla gave a fresh character to the contest. The Samnites warinly espoused the cause of the former, and it was the defeat of their leader C. Pontius Telesinus at the Colline Gate of Rome that secured the victory of Sulla and sealed the fate of the Samnite nation (82).

Not content with putting all his Samnite prisoners to the sword, the ruthless conqucror organized a systematic devas- tation of the whole country, with the avowed object of extirpating the very name of the Samnites, as the eternal enemies of Rome. To such an extent was this cruel purpose carried into effect that more than a hundred years afterwards, in the time of Strabo, the whole country is described as being in a state of utter desolation, flourishing towns being reduced to mere villages, while others had altogether ceased to exist. Nor does it appear probable that it ever recovered this severe blow; and, though some attempt was made to revive its prosperity by the establishment of Roman colonies within its limits, none of these attained to any importance. The name of Samnium was indeed retained as that of a distinct province throughout the greater part of the Roman empire, and is still found in Cassiodorus. But under the Lombard rule the whole of this part of Italy was included in the duchy of Benevento, which continued to subsist as an independent state long after the fall of the Lombard kingdom in the north of Italy. During the revolutions of the Middle Ages all trace of the name is lost ; and, though it was revived in the last century as the official designation ofa part of the region comprised within the ancient limits, pre- viously known as the Contado di Molise, this was a mere piece of official pedantry, and the namc has again disappeared from the modern maps of Italy.

Very few towns of importance existed at any period within the limits of Samnium, and many of those mentioned in history had disappeared in the continual wars with which the country was ravaged. The only names that are worthy of special notice are— Aufidena, in the north, the capital of the Caraceni, the ruins of which still exist a few miles from Castel di Sangro; Bovianum (stil called Bojano), the ancient capital of the Pentri, in the heart of Monte Matese ; Seepinum (Sepino), in the same neighbourhood ; Misernia, in the valley of the Vulturnus, still known as Isernia ; Aquilonia (Lacedogna), in the land of the Hirpini, near the frontier of Apulia ; and Compsa (Conza), on the borders of Lucania, near the sources of the Aufidus. Beneventum alone has retained its ancient consideration as well as name, an advantage which it derives from its position on the Via Appia, commanding the entrance to the mountain district of the Hirpini.

The language of the Samnites, like that of their parents the Sabines, must clearly have been closely related to that of the Oscans, and the two nationalities appear to have amalgamated so readily that before the historical period there was probably little difference in this respect. Several of the most important of the inscriptions that remain to us have been found within the limits of the Samnite territory, and may be considered as Sabello-Oscan in their character, rather than purely Oscan. See for these the articles Iraty and Latin LANGUAGE. (EK. H. B.)

SAMOA. See Navicators' Isuanps.

SAMOS, one of the principal and most fertile of the islands in the Algean Sea that cfésely adjoin the mainland of Asia Minor, from which it is separated by a strait of

only about a mile in width. It is about 27 miles in length, by about 14 in its greatest breadth, and is occupied throughout the greater part of its extent by a range of mountains, of which the highest summit, near its western extremity, called Mount Kerkis, attains to the height of 4725 feet. This range is in fact a continuation of that of Mount Mycale on the mainland, of which the promontory of Trogilium, immediately opposite to the city of Samos, formed the extreme point. Various mythical legends were current to account for the original settlement of the city of Samos, and to connect its founders with the Greek heroic genealogies ; but the earliest record that has any claim to an historical character is that of the occupation of the island by a colony of Ionian settlers under a leader named Procles, at the time of the great Ionian emigration to Asia Minor (about 1050 B.c.). In the historical period Samos figures as a purely Ionic city, and was one of the most influential members of the Ionic confederacy. In the five centuries that intervened from its first settlement to the reign of Polycrates, Samos had rapidly attained to a great height of power and prosperity, had founded colonies at Perinthus and other places on the Propontis, as well as at Nagidus and Celenderis in Cilicia, and possessed a powerful navy, including, according to Thucydides (i. 13), the first triremes that ever were constructed. It was a Samian named Colzus also who was the first Greek that ventured to penetrate between the Pillars of Hercules into the ocean

beyond, and brought back a vast amount of wealth from these previously unknown regions (Herod., iv. 152). Samos was doubtless protected by its insular position from conquest by the Persian general Harpagus; nor did it follow the example of the two other great islands of Chios and Lesbos by voluntary submission to the Persian monarch. On the contrary, it not only preserved its independence for a period of more than twenty years longer, but it was precisely in this interval that it rose to the highest pitch of power and prosperity under the enlightened and able, though tyrannical, government of the despot PoLycratxs (¢.v.). Under his government Samos became “the first of all cities Hellenic or barbaric,” and was adorned with three of the greatest public works that had ever been executed by Greeks—an aqueduct tunnelled through a mountain for a length of 7 stadia, a mole of more than 2 stadia in length for the protection of the harbour, and a temple (that of Hera) exceeding all others in size. How far these great works belong to the time of Polycrates cannot be determined with certainty ; but there is little doubt that they were enlarged and com- pleted, if not commenced, under his government. He was

‘also the first to lay claim to the sovereignty of the Augean

Sea, or thalassocraty, which at that time there was none to dispute with him.

After the death of Polycrates (522 B.c.) Samos fell under the power of his brother Syloson, who established himself in the sovereignty with the support of a Persian army, but this revolution was not accomplished without a massacre of the citizens, which must have given a heavy blow to the prosperity of the island. Henceforth it con- tinued to be tributary to Persia till the great battle of Mycale (480), which not only freed the Samians from the Persian yoke, but became the beginning of a fresh era of great prosperity, during which they, like the neighbouring Chians and Lesbians, were admitted as members of the Athenian confederacy, on free and equal terms, without payment of tribute. An abrupt termination was, however, put to this state of things in 439, when, the Samians having given offence to the Athenians, their city was besieged and taken by Pericles, who compelled them to raze their fortifications, to give up their ships of war, to furnish hostages, and to pay the expenses of the war. From

this time therefore Samos became a mere dependency of Athens, and continued in this subordinate condition throughout the Peloponnesian War ; but after the victory of the Spartans at Aigospotami, the city was besieged and taken by Lysander (404), and as usual an oligarchy was set up under Spartan control. Other revolutions, however, quickly followed. The victory of Conon at Cnidus in 394 restored the democracy, but the peace of Antalcidas shortly afterwards (387) placed the island under the government of a Persian satrap, and thus exposed it to the attacks of the Athenians, who sent an expedition against it under Timotheus, one of their ablest generals, who after a siege of eleven months reduced the whole island and took the capital city. A large part of the inhabitants were expelled, and their place supplied by Athenian emigrants (366). From this time we hear but little of Samos. It passed without resistance under the yoke of Alexander the Great, and retained a position of nominal autonomy under his successors, though practically dependent, sometimes on the kings of Egypt, sometimes on those of Syria. After the defeat of Antiochus the Great at the battle of Magnesia (190), it passed with the rest of Ionia to the kings of Per- gamum, but, having in an evil hour espoused the cause of the pretender Aristonicus, it was deprived of its freedom, and was united with the Roman province of Asia (129). Henceforth it of course held only a subordinate position, but it seems to have always continued to be a flourishing and opulent city. We find it selected by Antony as the headquarters of his fleet, and the place where he spent his last winter with Cleopatra, and a few years later it became the winter quarters of Augustus (21-20), who in return restored its nominal freedom. Its autonomy, however, as in many other cases under the Roman empire, was of a very fluctuating and uncertain character, and after 70 A.D. it lapsed into the ordinary condition of a Roman provincial town. Its coins, however, attest its continued importance during more than two centuries, and it was even able to contest with Smyrna and Ephesus the proud title of the “first city of Ionia.” It still figures prominently in the de- scription of the Byzantine empire by Constantine Porphyro- genitus, but little is known of it during the Middle Ages. During the Greck War of Independence Samos bore a conspicu- ous part, and it was in the strait between the island and Mount Myeale that Canaris achieved one of his most celebrated exploits by setting fire to and blowing up a Turkish frigate,

in the presence of the army that had been assembled for the invasion of the island, a sueeess that led to the abandoninent of the enterprise, and Samos held its own to the very end of the war. On the conclusion of peace the island was indeed again handed over to the Turks, but since 1835 has held an exceptionally advantageous position, being in faet self-governed, though tributary to the Turkish empire, and ruled by a Greek governor nominated by the Porte, who bears the title of "Prince of Samos," but is supported and controlled by a Greck eouncil and assembly. The prosperity of the island bears witness to the wisdom of this arrangement. It now contains a population of above 40,000 inhabitants, and its trade has rapidly in- creased. Its principal article of export is its wine, which was celebrated in aneient times, and still enjoys a high reputation in the Levant. It exports also silk, oil, raisins, and other dried fruits. The ancient capital, which bore the name of the island, was situated on the south coast, directly opposite to the promontory of Mycale, the town itself adjoining the sca and having a large artificial port, the remains of which are still visible, as are the ancient walls that surrounded the summit of a hill which rises immediately above it, and now bears the name of Astypalea. This formed the acropolis of the ancient city, which in its flourishing times occupied a wide extent, covering the slopes of Mount Ampelus down to the shore. From thence a road led direct to the far-famed temple of Hera (Juno), which was situated close to the shore, where its site is still marked by a single column, but even that bereft of its eapital. This miserable fragment, which has given to the neighbouring headland the name of Capo Colonna, is all that remains of the temple that was extolled by Herodotus as the largest he had ever seen, and which vied in splendour as well as in celebrity with that of Diana at Ephesus. But, like the Ephesian Artemis, the goddess worshipped at Samos was really a very

purely Greek cities, and was unquestionably in the first instance a native Asiatic deity, who was identified, on what grounds we know not, with the Hera of the Olympic mythology. Her image, as we learn from coins, much resembled that of the Ephesian goddess, and was equally remote from any Greek coneeption of the beautiful and stately Hera. Though so little of the temple remains, the plan of it has been ascertained, and its dimensions found fully to verify the assertion of Herodotus, as compared with all other

Greek tem- ples existing in his time, though it was afterwards surpassed by the later temple at Ephesus.

The modern capital of the island was, until a recent period, at a place called Khora, about two miles from the sea, and the same distance from the site of the ancient city ; but since the change in the political condition of Samos the capital has becn transferred to Vathy, situated at the head of a deep bay on the north coast, which has become the residence of the prince and the scat of government. Here a new town has grown up, well built and paved, with a con- venient harbour, and already numbers a population of 6000.

Samos was celebrated in ancient times as the birth-place of Pythagoras, who, however, spent the greater part of his life ata distance from his native country. His name and figure are found on coins of the city of imperial date. It was also conspicuous in the history of art, having produced in early times a school of sculptors, commencing with Rhecus and Theodorus, who are said to have invented the art of casting statucs in bronze, and to have introduced many other technical improvements. The architeet Rhecus also, who built the temple of Hera, was a native of the island. At a later period Samos was noted for the manufaeture of a particular kind of red earthenware, so much valued by the Romans for domestic purposes that specimens of it generally occur wherever there are remains of Roman settlements.

All the particulars that are recorded concerning Samos in ancicnt times are collected by Panofka (Res Samiorum, Berlin, 1822). A full description of the island, as it existed In his time, will be found in Tournefort (Voyage du Levant, 4to, Paris, 1717), and more recent accounts in the works of Ross (Reisen auf den

Griechischen Insein, vol. ii., Stuttgart, 1848) and Guérin (Patmos et Samos, Paris, 1856), (E. H

SAMOTHRACE was the ancient name of an island in the northern part of the Augean Sea, nearly opposite to the mouth of the Hebrus, and lying north of Imbros and north-east of Lemnos. It is still called Samothraki, and though of small extent is, next to Mount Athos, by far the most important natural feature in this part of the Augean, from its great elevation—the

group of mountains which occupies almost the whole island rising to the height of 5240 feet. The highest summit, named by Pliny Saoce, is estimated by him at an elevation of 10 Roman miles. Its conspicuous character is attested by a well-known passage in the Jdiad (xiii. 12), where the poet represents Poseidon as taking post on this lofty summit to survey from thence the plain of Troy and the contest between the Greeks and the Trojans. This mountainous character and the absence of any tolerable harbour—Pliny, in enumerating the islands of the Augean, calls it ‘ importuos- issima omnium”—prevented it from ever attaining to any political importance, but it enjoyed great celebrity from its connexion with the worship of the CaBrri (q.v.), a mysterious triad of divinities, concerning whom very little is really known, but who appear, like all the similar deities venerated in different parts of Greece, to have been a remnant of a previously existing Pelasgic mythology, wholly distinct from that of the Greeks. Herodotus expressly tells us that the “ orgies” which were celebrated at Samothrace were derived from the Pelasgians (ii. 51). These mysteries, and the other sacred rites connected there- with, appear to have attracted a large number of visitors, and thus imparted to the island a degree of importance which it would not otherwise have attained. The only occasion on which its name is mentioned in history is during the expedition of Xerxes (B.c. 480), when the Samo- thracians sent a contingent to the Persian fleet, one ship of which bore a conspicuous part in the battle of Salamis (Herod., viii. 90). But the island appears to have always enjoyed the advantage of autonomy, probably on account of its sacred character, and even in the time of Pliny it ranked as a free state. Such was still the reputation of its mysteries that Germanicus endeavoured to visit the island,

different divinity from the one that presided over Argos and othcr | but was driven off by adverse winds (Tac., Ann., ii, 54).

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No modern traveller appears to have visited Samothrace till the year 1858, when it was fully explored by Conze, who published an account of it, as well as the larger neighbouring islands, in 1860. The ancient eity, of which the ruins are ealled Paleopoli, was situ- ated on the north side of the island close to the sea; its site is clearly marked, and considerable remains still

exist of the ancient walls, which were built in massive Cyclopean style, but no vestiges are found of temples or other public buildings. The modern village is on the hill above. The island is at the present day very poor and thinly peopled, and has scarcely any trade; but a con- siderable sponge fishery is carried on around its coasts by traders from Smyrna (Conze, Seise auf den Inseln des Thrakischen Meeres, Hanover, 1860).

The similarity of name naturally led to the supposition that Samothrace was peopled by a colony from Samos in Ionia, and this is stated as an historical fact by some Greek writers, but is rejected by Strabo, who considers that in both cases the name was derived from the physical conformation of the islands, Samos being an old word for any lofty height (Strabo, x. 2, p. 457). The same charaeteristic is found in Cephallenia, which was also called Samos in the time of Homer.

SAMOYEDES, a Ural-Altaic stock, scattered in small groups over an immense area, from the Altai Mountains down the basins of the Obi and Yenisei, and along the shores of the Arctic Ocean from the mouth of the latter river to the White Sea. They may be subdivided into two main groups. (A) Those inhabiting the southern parts of the governments of Tomsk and Yeniseisk have been so much under Tartar influence as to be with difficulty separated from the Tartars; their sub-groups are the Kamasin Tartars, the Kaibals, the Motors, the Beltirs, the Karagasses, and the Samoyedes of the middle Obi. (B) Those inhabiting the subarctic region form three separate sub-groups :—(a) the Yuraks in the coast-region from the Yenisei to the White Sea; (b) the Tavghi Samoyedes, between the Yenisei and the Khatanga; (c) the Ostiak Samoyedes, intermingled with Ostiaks, to the south of the others, in the forest regions of Tobolsk and Yeniseisk. Their whole number may be estimated at from 20,000 to 25,000.

The proper place of the Samoyedes among the Ural-Altaians is very difficult to determine. As to their present name, signifying in its present Russian spelling ‘‘self-eaters,” many ingenious theories have been advanced, but the current one, proposed by Schrenk, who derived the name ‘‘Samo-yedes” from ‘‘Syroyadtsy, ” or “raw-eaters,” leaves much to be desired. Perhaps the etymology ought to be sought in quite auother direction, namely, in the like- ness to Suomi. The names assumed by the

Samoyedes themselves are Hazovo and Nyéinyiiz. The Ostiaks know them under the names of Orghoy, or Workho, both of which recall the Ugrians ; the name of Hui is also in use among the Ostiaks, and that of Yaron among the Zyrians.

The language now spoken by the Samoyedes is, like the Finnish languages, agglutinative, but in both lexicon and grammar it differs so widely from these that Prof. Ahlqvist does not regard the simi- larity as greater than, for instance, that between Swedish and Persian. Much remains to be done for the study of Samoyedic, but it may be regarded as the most remote cousin of the Ugrian. It is a sonorous speech, pleasant to the ear. No fewer than three separate dialects and a dozen sub-dialects are known in it.

The conclusions deducible from their anthropological features— apart from the general difficulty of arriving at safe conclusions on this ground alone, on account of the variability of the ethnological type under various conditions of life—are also rather indefinite. The Samoyedes are reeognized as having the face morc flattened than undoubtedly Finnish stocks; their eyes are narrower, their complexion and hair darker. Zuyeff describes them as like the Tunguscs, with flattened nose, thick lips, little beard, and black, hard hair. At first sight they may be mistaken for Ostiaks, — especially on the Obi; but they are undoubtedly different. Castrén considers them as a mixture of Ugrians with Mongolians, and M. Zograf as brachycephalic Mongolians. Quatrefages classes them, together with the Voguls, as two families of the Ugrian sub-branch, this last, together with the Sabmis (Laponians), forming part of the Ugrian or Boreal braneh of the yellow or Mongolic race.

It is certain that formerly the Samoyedes oceupied the Altai Mountains, whence they were driven northwards by Turco-Tartars —probably at the time of the rise of the empire of the Huns, that is, before the present era. Their further and later migration towards the north may be said to be going on still. Thus, the Kaibals left the Sayan Mountains and took possession of the Abakan steppe (Minusinsk region), abandoned by the Kirghizes,

in the earlier years of last century, and in north-eastern Russia the Zyrians are still driving the Samoyedes farther north, towards the Arctic coast. Since the researches of Sehrenk it may be con- sidered as settled that in historical timcs the Samoyedes were inhabitants of the so-called Ugria in the Northern Urals, while it would result from M. Radloft's extensive researehes that the numberless graves containing remains of the Bronze Period which are scattered throughout West Siberia, on the Altai, and on the Yenisei in the Minusinsk region, are relies of a nation which he considers as Ugro-Samoyedes. This nation, very numerous at that epoch,—which preceded the Iron-Period civilization of the Tureo- Tartars,—were pretty well acquainted with mining; the remains of their mines, sometimes 50 fect deep, and of the furnaces where they melted copper, tin, and gold, are very numerous; their weapons of a hard bronze, their pots (one of which weighs 75 tb), and their melted and polished bronze and golden decorations testify toa high development of artistie feeling and industrial skill, strangely eontrasting with the low level reached by their earthen- ware. 'They were not nomads, but husbandmen, and their irriga- tion canals are still to be seen. They kept horses (though in small

"numbers), sheep, and goats, but no traces of their rearing horned

cattle have yet been found. The Turkish invasion of southern Siberia by the Tukus, Khagases, and Uigurs, which took place in the 5th century, drove them farther north and probably reduced most of them to slavery,—these slaves seeming to have taught mining to their masters,

At present they are disappearing, and have almost entirely lost their earlier civilization. M. Polyakoff quite rightly observes that the Samoyedes, who now maintain themselves by hunting and fishing on the lower Obi, partly mixed in the south with Ostiaks, recall the condition of the inhabitants of France and Germany at the epoch of the reindcer. Clothed in skins, like the troglodytes of the Weser, they make use of the same implements in bone and stone, eat carnivorous animals—the wolf included—and cherish the same superstitions (of which those regarding the teeth of the bear are perhaps the most characteristic) as were eurrent among the Stone-Period inhabitants of western Europe. Their heaps of reindeer horns and skulls—memorials of religious ceremonies—are exactly similar to those dating

from the similar period of civiliza- tion in northern Germany. Their huts often resemble the well- known stone huts of the Esquimaux; their graves are mere boxes leftinthe tundra. The religion is fetichism mixed with Shamanism, the shaman (¢adji-bet) being a representative of the great divinity, the Num. The Yalmal peninsula, where they find so great facilities for hunting, is especially venerated by the Obi Ostiak Samoyedes, and there they have one of their chief idols, Khese. They are more independent than the Ostiaks, less yielding in character, although as hospitable as their neighbours. Reduced almost to slavery by Russian merchants, and brought to the extreme of inisery by the use of ardent spirits, they are disappearing rapidly, small-pox complet- ing the work of destruction. They still maintain the high standard of honesty mentioned by historical documents; and, while the Russians plunder even the stores of their shamans, the Samoyedes never will take anything left in the tundra or about the houses by their “civilized” neighbours. The Yurak Samoyedes are courag- eous and warlike ; they offered armed resistance to the Russian invaders, and it is only since the beginning of the century that they have paid tribute. The exact number of the Ostiak Samoyedes is not known; the Tavghi Samoyedes may number about 1000, and the Yuraks, mixed with the former, are estimated at 6000 in Obdorsk (about 150 settled), 5000 in European Russia in the tundras of the Mezefi, and about 350 in Yeniseisk.

Of the sonthern Samoyedes, who are completely Tartarized, the Beltirs (8070 in 1859) live by agrieulture and cattle-breeding in thie Abakan steppe. They profess Christianity, and speak a language elosely resembling that of the Sagai Tartars. The Kaibals, or Koibals, can hardly be distinguished from the Minusinsk Tartars, and support themselves by rearing cattle. Castrén considers that three of their stems are of Ostiak origin, the remaindcr being Samoyedic. The Kamasins, in the Kansk distriet of Yeniseisk, are either herdsmen or agriculturists. They speak the Samoyede language, with an admixture of Tartar words, and some of their stems contain a large Tartar element. The very interesting nomadic tribe of Karagasses, in the Sayan Mountains, is quite dis- appearing ; the few representatives of this formerly much more numerous stem are rapidly losing their anthropological features, their Turkish language, and their distinctive dress. The Motors are now little more than a memory. One portion of the tribe emi- grated to China and was there exterminated ; the

remainder have disappeared among the Tuba Tartars and the Soyotes. The Samoyedes on the Obi in Tomsk may number about 7000; they have adopted the Russian manner of life, but have difficulty in carrying on agriculture, and are a poverty-stricken population with little prospect of holding their own.

SAMPIERDARENA (population in 1881, 19,501). See Genoa, vol. x. p. 157.

SAMSON (Hebrew, Shimshon), the great enemy of the Philistines, is reckoned as one of the judges of Israel in two editorial notes which belong to the chronological scheme of the book of Judges (xv. 20, xvi. 31); but his story itself, which is a self-contained narrative by a single hand (Jud. xiii. 2-16, 31a), represents him not as a judge but as a popular hero of vast strength and sarcastic humour, who has indeed been consecrated from his birth as the deliverer of Israel, and is not unaware of his voca- tion, but who yet is inspired by no serious religious or patriotic purpose, and becomes the enemy of the Philistines only from personal motives of revenge, the one passion which is stronger in him than the love of women. In his life, and still more in his death, he inflicts great injury on the oppressors of Israel, but he is never the head of a national uprising against them, nor do the Israelites receive any real deliverance at his hands. his exploits is plainly taken from the mouths of the people, and one is tempted to conjecture that originally his Nazarite vow was conceived simply as a vow of revenge, which is the meaning it would have in an Arab story. Our narrator, however, conceives his life as a sort of prelude to the work of Saul (xiii. 5), and brings out its religious and national significance in this respect in the opening scene (ch. xili.), which is closely parallel to the story of Gideon, and in the tragic close (ch. xvi.) ; while yet the character of Samson, who generally is quite for- getful of his mission, remains much as it had been shaped in rude popular tale in a circle which, like Samson him- self, was but dimly conscious of the national and religious vocation of Israel.

The name of Samson (Shamshon, of which the Masso- retic Shimshén is a more modern pronunciation, and later than the LXX., who write Sapyov) means “solar,” but neither the name nor the story lends any solid support to

Steinthal’s fantastic idea that the hero is a solar myth (compare Wellhausen-Bleek, p. 196). He is a member of an undoubtedly historical family of those Danites who had their standing camp near Zorah, not far from the Philistine border, before they moved north and seized Laish (compare xill, 25 with xviii. 8, 11,12). The family of Manoah had an hereditary sepulchre at Zorah, where Samson was said to lie (xvi. 31), and their name continued to be associated with Zorah even after the exile, when it appears that the Manahethites of Zorah were reckoned as Calibbites. The name had remained though the race changed (1 Chron. il. 52, 54). One of Samson’s chief exploits is associated with a rock called from its shape “the Ass’s Jawbone,” from which sprung a fountain called En-hakkore, “ the spring of the partridge,” and these names have influenced the form in which the exploit is told. The narrative of Samson’s marriage and riddle is of peculiar interest as a record of manners ; specially noteworthy is the custom of the wife remaining with, her parents after marriage (cf. Gen. ii. 24).

SAMUEL (°$19%, Shémiél),! a seer and “judge” of Israel in the time of the Philistine oppression. His history, as told in the first book of Samuel (compare Psalm xcix. 5; Kcclus. xlvi. 13 sq.), is too familiar to call for repetition here, and a critical estimate of his place in Hebrew history has been given in IsRAzEL, vol. xiii. p. 403. There remain, however, one or two points of detail which may be noticed here. His birthplace was Ramah, or, as it is called in the Hebrew text of 1 Sam. i. 1, Ha-Ramathaim (Ramathem, 1 Macc. xi. 34; Arimatheea, Mat. xxvii. 57); the identity

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1 This is one of an obscure class of proper names (Syyop, Syeyy, &c.), the analogy of which seems to exclude the idea that it is softened from ONY, “‘heard of God.” It seems rather to mean “ name of El,” z.e., ‘“ manifestation of God’s power or will.” Compare the title

The story of

of the two names is supported by the Septuagint, which has Arimathaim for Ramah in several passages. Ramah, which appears in 1 Kings xy. 17 as a

stronghold on the frontier of the kingdoms of Ephraim and Judah, is probably identical with the modern El-Raém, about 5 miles north of Jerusalem, on a hill on the east side of the main road to Shechem and the north. Ramah was also the place where Samuel usually resided in his later days, and from which he made a yearly circuit through a very limited district in the immediate neighbourhood, “judging Israel” (1 Sam. vii. 16). None of the cities which he visited is more than a few miles from Ramah. Ramah, according to 1 Sam. i. 1 (where the text is to be corrected by the Septuagint), was a town in the district of Zuph, belonging to the tribe of Ephraim (comp. 1 Sam. ix. 5 and 1 Sam. x. 2, where the grave of Rachel lies on the frontier between Ephraim and Benjamin ; a different localization is given in Gen. xxxv. 19, 20, unless the identification of Bethlehem and Ephrath there is a later gloss).

The original text of 1 Sam. i. 1 does not seem to say explicitly that Samuel’s father was an Ephrathite (ze., of the tribe of Ephraim), though his city was Ephrathite ; and 1 Chron. vi. 28, 33 [vi. 13, 18] makes him a Levite, apparently because a post-exile family of singers traced their stock from him. The old accounts certainly repre- sent Samuel even as a child as doing priestly service at Shiloh, girt with the ephod and wearing the priestly robe (métl, E. V. “coat,” 1 Sam. ii. 18 sg.), but at that early date priesthood was by no means confined to Levites, and the story certainly implies that it was not by birth but only by his mother’s vow that he was dedicated to the service of the sanctuary. On Samuel’s relation to the prophets, see vol. xix. p. 815. Compare also SAMUEL, Books oF.

SAMUEL, Booxs or. The Hebrew Book of Samuel, like the Hebrew Book of Kings, is in modern Bibles divided into two books, after the Septuagint and Vulgate, whose four books of “kingdoms” answer to the Hebrew books of Samuel and Kings. The connexion between the books of Samuel and Kings has been spoken of in the article Kines (q.v.). These two books, together with Judges, are made up of a series of extracts and abstracts from various sources worked over from time to time by successive editors, and freely handled by copyists down to a comparatively late date, as the variations between the Hebrew text and the Septuagint show. The main redac- tion of Judges and Kings has plainly been made under the influence of the ideas of the book of Deuteronomy, and 1t was in connexion with this

redaction that the history from the accession of Solomon onwards was marked off as a separate book (see Kines). In Samuel the Deuteronomistic hand is much less prominent, but in 1 Sam. vii. 2-4, and in the speech of Samuel, ch. xii., its characteristic pragmatism is clearly recognizable; the nature of the old narrative did not invite frequent inser- tions of this kind throughout the story. So, too, the chronological system which runs through Judges and Kings is not completely carried out in Samuel, though its influence can be traced (1 Sam. iv. 18, vii. 2, xiii. 1 s¢., xxvil. 7, 2 Sam. ii. 10 sg., v. 4 sg.). In 1 Sam. xii. 1, in the note “Saul was —— years old when he became king and reigned [two] years over Israel” (lacking in LXX.), one of the numbers has been left blank and the other has been falsely filled up by a mere error of the text ; the similar note in 2 Sam. ii. 10 seems also to have been filled up at random ; it contradicts and disturbs the context. But, though the book of Samuel has been much less systematically edited than Kings, unsystematic addi-

Shem Baal, “‘name of Baal,” given to Astarte on the epitaph of | tions to and modifications of the oldest narratives were

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made from time to time on a very considerable scale, and

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in this book, as in Judges, we not seldom find two accounts of the same events which not only differ in detail but plainly are of very different date.

The book as a whole may be divided into three main sections :—(1) Samuel and Saul, 1 Sam. i—xiv.; (2) The rise and kingdom of David, 1 Sam. xv.-2 Sam. viil.; (3) The personal history of David’s court at Jerusalem (mainly from a single source, which also includes 1 Kings i, ii.), 2 Sam. ix.xx. Finally, the appendix, 2 Sam. xxi.~~xxiv., must have been added after the book of Kings had been separated from the context to which 1 Kings i.,, ii. origin~~ ally belonged. As the greater part of the book of Samuel is oceupied with the lustory of David, which has been dis- cussed at length in his article, and with that of Samuel and Saul, the chief points of which have been critically examined in tlie article IsRaxEL, a very brief resumé of the

contents of each of the main sections must here suffice.

I. The story ofSamuel’s birth, consecration to the serviee of the sanetuary at Shiloh, and prophetie calling (1 Sam. i.-iii.) connects itself through the propheey of the rejection of the house of Eli (iii, 11 sg.) with the history of the disaster of Ebenezer and the capture and restoration of the ark (iv. 1-vii. 1). But the seeond of these two seetions does not seem to have been originally written as the sequel to ehaps. i.-ili. ; in it we lose sight of Samuel and his propheey altogether. The song of Hannah (ii. 1-10) and the propheey of the nameless man of God (ii. 27-36) are later insertions (see Wellhausen-Bleek, Hini., p. 207).

Chap. vii., with its Deuteronomistie introduetion (verses 2-4) and its aceount of a vietory at Ebenezer (the counterpart of the defeat in chap. iv.) whieh delivered Israel from the Philistines during all the days of Samuel, is inconsistent with the position of the Philistine power at the aceession of Saul. The chapter in its present form must be late, though hardly post-exilic, and it is the neeessary introduetion to the later and less authentie account of the way in whieh Saul eame to the kingdom (chaps. viii., x. 17- 27, xil.). Itshould be noted, however, that, though Samuel is taken by the late narrator to have a widespread authority, inconsistent with the faets diselosed in the older narrative of the ehoice of Saul, the sphere assigned to him in vii. 16, 17 is very narrow and agrees with chap. ix.

Of the beginnings of the kingship of Saul we have a twofold aeeount, the older being that in ix. 1-x. 16, xi. The relative value of the two aeeounts has been already diseussed in IsRAEL, vol. xiii. p. 403. The older history is eontinued in ehaps. xiii., xiv., but here xiii. 7-15—a doublette of the account of the rejection of Saul in ehap. xiv.—is eertainly foreign to the original eontext. The summary of Saul’s exploits in xiv. 47 sg. is written by an admirer, who appears to ascribe to him some of David’s vietories. But this does not affeet the value of the preceding more detailed narrative, which is plainly based on a full and authentie tradition.

I]. The account of the eampaign against Amalek (chap. xv.) does not merely supply details supplementary to xiv. 48 but puts the war with Agag in quite a different light by laying the chief weight on Saul’s disobedienee to Samuel and rejection by the prophet. This passage is closely allied to 1

Sam. xxviii. 3-25, which, however, is no part of the original story of Saul's defeat and death, as appears by comparing the position of the two armies in xxviii. 4 and xxix. 1. Chap. xv., in like manner, is probably no original part of the narrative of David's rise, to whieh it now forms the introduetion, and both passages, though relatively ancient addi- tions, represent a type of religious thought and a view of propheey whieh ean hardly be older than the epoch of Elisha (comp. Propuet, vol. xix. p. 816). The anointing of David (xvi. 1-13) presupposes ehap. xv., and is consistent with what follows only if we suppose that the meaning of Samuel's aet was not understood at the time. The older history repeatedly indieates that David's kingship was predieted by a divine oracle, but would hardly lead us to place the prediction so early (1 Sam. xxv. 30, 2 Sam. iii. oF v. 2 compared with 1 Sam. xvii. 28, xviii. 23).

The story of David's introduction to Saul is told in two forms (xvi. 14-23; xvii. 1-xviii.5). In the former David is already a man of approved courage and parts when he is attracted to the eourt; in the latter he is an obseure and untried shepherd lad (as in ehap. Xvi.) when he volunteers to meet Goliath. In the Hebrew text the eontradietion between the two aeeounts is absolute, but the Septuagint omits xvii. 12-31, xvii. 55-xviii. 5, which greatly lessens if it does not entirely remove the diffieulty.1_ The rise of Saul's jealousy against David (xviii. 6-30) and the open breach between them, with David's flight from the eourt (xix., Xx.), are very confused in the Hebrew text. Some serious difficulties are eseapeil

1 A further difficulty is caused by 2 Sam. xxi. 19, which makes Elhanan the Bethlehemite slayer of Goliath.

by following the Septuagint recension, but others remain, and there is a good deal of eonfusion also in the accounts of David's life as an outlaw (xxi.—xxvi.)and with Achish (xxvii.). For details see DAvip, vol. vi. p. 838 sg. The narrative is largely made up of detached aneedotes, and sometimes there were two divergent aneedotes based on a single incident. This is elear as regards the two stories of David's generosity to Saul (xxiv., xxvi.) and still more clear where the LXX. omits one of two parallel aneedotes (see Davin, ut supra), while the same account may perhaps be given of the

twofold narrative of David's flight from Saul and of his betaking himself to Aehish. At the same time there is sufficient eonnexion to show that the doublettes and additions are strung on an original thread of eontinuous history—a history of David, whieh becomes more free from foreign aeeretions at the point when the outlaw and refugee acquires, through the death of Saul, a position of eom- manding importanee. Saul's defeat and death (1 Sam. xxviii. 1, 2, xxx.) are related as part of the history of David, which runs on from this point with little evidence of editorial additions to the elose of 2 Sam. vy. The summary deecount of David's war and governnient in 2 Sam. viii. appears to be the continuation of the same doeument ; ehaps. vi. and vii., on the other hand, seem to have an independent source.

III. The history of David's court, a vivid pieture of eveuts whieh must be referred in substanee if not in form toa contem- porary observer, is in its origin a distinet book from the life of David that eloses with 2 Sam. viii. It extends over 2 Sam. ix.- 1 Kings ii. with very little appearance of interpolation except the great appendix, 2 Sam. xxi.-xxiv., and is throughout one of the most admirable remains of aneient history.

The appendix is made up of various pieces, —chap. xxiv. appearing to attach itself directly to xxi. 1-14, while xxi. 15 sg. is akin in subject to xxiii. 8sg.; the two poems, chap. xxii. (Psalm xviii.) and xxilil. 1-7, have no relation to the context, so that we can only say of them that they were aeeepted as Davidie at the time—posterior to the Deuteronomistie redaetion —when the miscellaneous matter of the appendix was ineorporated with our book.

In this rapid sketch it has not been attempted to notice all the minor marks of editorial retouching found in one or both of the two great recensions of the text. For all details the reader must refer principally to Wellhausen's repeated studies of the book, first in his Text der Biicher Samuelis, 1871, then in the fourth edition of Bleek's Hinleitung, 1878, and finally in his Prolegomena to the History of Israel (Eng. tr., 1885). Of earlier works on the subject the relative parts of Ewald's Geschichte are the most important. The commentaries of Thenius (ist ed. 1842, 2d ed. 1864) and Keil (1864,

Eng. tr. 1866) are not very satis- factory. In English Prof. Kirkpatrick's short commentary (in the Cambridge

Bible for Schools) will be found useful. See also F. H. Woods in Studia Biblica, Oxford, 1885.

SANAA (San'4), the capital of Yemen in Arabia, and seat of the Turkish governor of that province, is situated in 15° 22' N. lat. and 44° 31' E. long., in a well-watered upland valley, 4000 feet above the sea and six to nine miles broad, running north and south between two table- lands. The western table-land, over which lies the road to the port of Hodaida on the Red Sea, rises 1200 feet above the town, the eastern (J. Nokom) is some 300 feet higher, and crowned by the ruins of the fortress Birdsh, which local tradition connects with the name of Shem, son of Noah, to whom the foundation of the city is attri- buted by Hamdant, Jazirat, p. 55. Under Mount Nokom in the valley is the hill Ghomdan with the citadel, which Halévy in 1870 found in ruins. The ancient fortress of Ghomdan, which is often referred to by poets, and is described in extravagant terms by later writers, is said to have been destroyed by the caliph "Othman. The city proper, which is walled, extends from the citadel on the east to the garden and ruined palace of the imam Motawakkil on the west. Beyond this is the quarter known as Bir al"Azab, where the imams had their pleasure gardens, adjoining which, to the south, is the ancient Jewish settle- ment (Ka' al-Yahtd). In Niebuhr's time (1763) the two last were open suburbs, but they have since been walled in. Though Sanaa isa very old town, the earliest buildings now standing are perhaps those which date from the Turkish occupation (1570-1630)—some mosques, parts of the fortifications, the aqueduct. In last century, under the independent imams of Yemen, as the capital of the coffee country and the most fertile region of Arabia, it was, with its palaces and gardens, its mosques, caravanserais, and good private houses, by much the first city of the peninsula. The Wahhab{ movement and Turko-Egyptian intervention in the affairs of Yemen shook the power of

the imdms and diminished the prosperity of their capital, but Cruttenden in 1836 still estimated the population at 40,000, or, with the three neighbouring towns of Rauda, Jiraf, and Wady Dahr, at not less than

70,000. In 1870, when the imamate had been extinct for twenty years, and the town was governed by an elected sheikh and had lost its provinces, Halévy found it much decayed, with many of the palaces and public buildings demolished or used as quarries, but still presenting a comely aspect, with good streets, houses, and mosques. In 1872, having been hard pressed by the Bedouins for several years, Sanaa opened its gates to the Turks, who were then engaged in the reconquest of Yemen. In the following year Millingen estimated the population at only 20,000.

The climate is good, though the extreme dryness of the air is trying. Rain usually falls in January and June, and more copiously in the end of July; the markets are well supplied with grain and fruit; vineyards were formerly numerous, but were largely given up after an attack of vine disease some thirty years ago.

Arabic writers give many discordant and fabulous traditions about the oldest history of Sanaa and its connexion with the ancient kingdom of Himyar. But most agree that its oldest name was Azal, which seems to be the same word with Uzal in Gen. x. 27. A Himyarite nation of Auzalites occurs in a Syriac writer of the 6th century. The better-informed Arab writers knew also that the later name is due to the Abyssinian conquerors of Yemen, and that it meant in their language “fortified” (Bakri, p. 606 ; Noldeke, Gesch. d. Pers. u. Arab., p. 187). Sanaa became the capital of ‘the Abyssinian Abraha (c. 580 A.D.) who built here the famous church (Kalés), of whose splendour the Arabs give exag- gerated pictures, and which was destroyed two centurics later by order of the caliph Mansur (Azraki, p. 91).

SANA’L Abulmajd Majdid b. Adam, commonly known as the hakim or philosopher Sané’i, the earliest among the great Stfic poets of Persia, was a native of Ghazna or Ghaznin (in the present Afghanistan), and flourished in the reigns of the Ghaznawid sultans Ibrahim (1059— 1099, 451-492 a.n.), his son Mas‘ud (1099-1114), and his grandson Bahramshah, who, after some years of desperate struggle among members of his own family, ascended the throne in 1118 (512 a.u.) and died after a long and prosperous reign in 1152 (547 a.u.). The exact dates of the poet’s birth and death are uncertain, Persian autho- rities giving the most conflicting statements. At any rate, he must have been born in the beginning of the second half of the

11th century and have died between 1131 and 1150 (525 and 545 a.n.). He gained already at an carly age the reputation of a very learned and pious man and of an accomplished minstrel. Like his con- temporaries Mas‘ud b. Sa‘d b. Salman (died 1131), Hasan of Ghazna (died 1179), and Uthman Mukhtari (died 1149 or 1159), who was his master in the poetical art, he com- posed chiefly kasidas in honour of his sovereign and the great men of the realm, but a peculiar incident made him for cver abandon the highly remunerative although often perilous career of a court-panegyrist, and turn his poctical aspirations to higher and less worldly aims. One day, when he was proceeding to the royal palace to pre- sent an encomiastic song to Sultan Ibrdhim, he was taunted by a half-mad but witty jester, who proposed a toast to the poet’s blindness, because with all his learning and picty he had as yet only succeeded in flattering kings and princes, who were mere mortals like himself, and entirely misinterpreted God’s motive in creating him. Sandi was so struck with the appropriateness of this satirical remark that he forthwith gave up all the luxuries of court-life, retired from the world, and devoted himself after the due performance of the pilgrimage exclusively to devotional exercises, pious meditations, and the com- position of Stific poctry in praise of the Godhead and the divine unity. Tor forty ycars he led a life of retirement

| and poverty, and, although Sultan Bahramshah offered him not only a high position at court, but also his own sister in marriage, he remained faithful to the austere and solitary life he had chosen. But, partly to show his gratitude to the king, partly to leave a lasting monu- ment of his genius behind him, that might act as a stimulus to all disciples of the pantheistic creed, he began to write his great doublerhymed poem on ethics and religious life, which has served as model to Farid-uddin ‘Attar’s and Jaldl-uddin Rémi’s Sufic masterpieces, the Hadikat-ulhakikat, or “Garden of Truth” (also called Alkitdb alfakhri), in ten cantos, dealing with the following topics :—unity of the Godhead, the divine word, the excellence of the prophet, reason, knowledge and faith, love, the soul, worldly occupation and inattention to higher dutics, stars and spheres and their symbolic lore, friends and foes, separation from the world, &c. One of Sana’f’s earliest disciples, who wrote a preface to this work, ‘Ali al-Raff4, alias Muhammed b. “Ali

Rakkam, assigns to its composition the date 1131 (525 a.#.), which in a consider- able number of copies appears as 1140 (535 a.u.), and states besides that the poet died immediately after the completion of his task. Now, Sandi cannot possibly have died in 1131, as another of his mathnawis, the Tarik-1-tahkik, or " Path to the Verification of Truth," was composed, according to a chronogram in its last verses, in 1134 (528 a.u.), nor even in 1140, if he really wrote, as the Atashkada says, an elegy on the death of Amir Mu'izzi; for this court-poet of Sultan Sanjar lived till 1147 or 1148 (542 a.u.). It seems, therefore, that Taki Kashi, the most accurate among Persian biographers, is right after all in fixing Sana'f's death in 1150 (545 a.n.), the more so as 'Alf al-Raff4 himself distinctly says in his preface that the poet breathed his last on the 11th of Sha'ban, "which was a Sunday," and it is only in 1150 that this day happened to be the first of the week. Sandi left, besides the Z/adikah and the Tarik 7-tahkik, several other Sufic mathnawis of similar purport :—for instance, the Sair ul'ibdéd ild@'lma dd, or " Man's Journey towards the Other- World" (also called Kundz-urrumiz, "The Treasures of Mysteries") ; the 'Ishkndma, or " Book of Love;" the 'A&dlndma, or "Book of Intellect ;" the Kérndéma, or "Record of Stirring Deeds," &c.; and an extensive diwan or collection of lyrical poetry. His tomb, called the " Mecca" of Ghazna, is still visited by numerous pilgrims.

Sana'i's Hadikah still lacks a critical edition, for which 'Abd- ullatif al-"Abbasi's commentary (completed 1632 and preserved in a somewhat abridged form in several copies of the India Office Library) would form an excellent basis. See, on the poet's life and works, Ouseley, Biogr. Notices, pp. 184-187 ; Rieu's and Fliigel's Catalogues, &c.

SAN ANTONIO, a city of the United States, incor- porated in 1873, the county-seat of Bexar (Bejar) county and the principal centre of western Texas, is situated in the fertile plain watered by the head-streams of the San Antonio river, which, after a course of 200 miles, falls into the Gulf of Mexico at Espiritu Santo Bay. It is an im- portant junction for several of the Texan railways, lying on the main routes from the States to Mexico, 153 miles north of the frontier at Laredo. San Antonio proper, or the business part of the city, lies between the San Autonio and the San Pedro, and has been nearly all rebuilt since 1860. Chihuahua (formerly San Antonio de

Valero), west of the San Pedro, is still almost exclusively Mexican ; and Alamo, on somewhat higher ground to the east of the San Antonio, is largely inhabited by Germans. The total popu- lation of the city was in 1870 12,256 (1957 coloured) and 20,550 (3036) in 1880. Newspapers are published in English, German, and Spanish. Flour, beer, meat- extract, icc, candles, and soap are the local manufactures.

SA N—

On the site of Chihuahua a fort, San Fernando, was erected by the Spaniards in 1714, and four years later the mission of the Alamo (poplar tree) was established in its vicinity. Both fort and mission were afterwards transferred to the other side of the San Pedro,—the fort taking the name of the mission, which was thus destined to become famous in the Texan war, when in 1836 a garrison attacked by a superior Mexican force perished rather than surrender. German immigration began about 1845.

SANCHEZ. Three persons of this name once enjoyed considerable literary celebrity :—(1) Francisco SANCHEZ

(Sanctius) (1523-1601), successively professor of Greek

and of rhetoric at Salamanca, whose Mznerva, first printed at that town in 1587, was long the standard work on Latin grammar ; (2) Francisco SancHEz, a Portuguese physician of Jewish parentage, professor of philosophy and physic at Toulouse, where he died at the age of seventy in 1632, whose ingenious but sophistical writings (Quod nihil scitur, 1581) mark the high-water of reaction against the dogmatism of the traditional schools of his time; (3) Toomas Sancwez of Cordova (1551-1610), Jesuit and casuist, whose treatise De Matrimonio (Genoa, 1592) is more notorious for its repulsive features than celebrated for its real learning and ability.

SANCHO I. (1154-1211) and SANCHO II. (1208- 1248), kings of Portugal from 1185 and 1223 respectively. See PorTUGAL, vol. xix. p. 541-2.

SANCHUNIATHON, (that is, jmp, “the god Sak- kun hath given”) is the name of the pretended author of the Pheenician writings said to have been used by PHILo Bysiius (g.v.). See also Puanicta, vol. xviii. p. 802.

SAN CRISTOBAL DE LOS LLANOS, otherwise known as CrupAD Real, chief town of the Mexican state of Chiapas, stands in a fertile valley on the eastern slope of the central mountain range 450 nuiles east-south-east from the city of Mexico. It was founded in 1528 under the name of Villa Real, and received its present name in 1829. Its inhabitants, variously estimated as numbering from 8000 to 12,000, are chiefly employed in rearing cattle. Coarse woollen and cotton stuffs, and also common earthenware, are manufactured.

SANCROFT, Wituiam (1616-1693), archbishop of Canterbury, was born at Fressingfield in Suffolk 30th January 1616, and entered Emmanuel College, Cambridge, in July 1634. He became M.A. in 1641 and fellow in 1642, but was ejected in 1649 for refusing to accept the "Engagement." He then remained abroad till the Resto- ration, after which he was chosen one of the university preachers, and in 1663 he was nominated to the deanery of York. In 1664 he was installed dean of St Paul's. In this situation he set himself with unwearied diligence to repair the cathedral, till the fire of London in 1666 necessitated the rebuilding of it, towards which he gave £1400. He also rebuilt the deanery, and improved its revenue. In 1668 he was admitted archdeacon of Canterbury upon the king's presentation, but he resigned the post in 1670. In 1677, being now prolocutor of the Convocation, he was unexpectedly advanced to the archbishopric of Canterbury. He attended Charles II. upon his deathbed, and " made to him a very weighty exhortation, in which he used a good degree of freedom." He wrote with his own hand the petition presented in 1687 against the reading of the Declaration of Indulgence, which was signed by himself and six of his suffragans. For this they were all committed to the Tower, but after a trial for misdemeanour they were acquitted. Upon the withdrawal of James II. he concurred with the Lords in a declaration to the prince of Orange for a free parliament, and due indulgence to the Protestant dissenters. But, when that prince and his consort were declared king and queen, he refused to take the oath to them, and was accordingly suspended and deprived. From 5th August 1691 till his death on Novem-

ber 24, 1693, he lived a very retired life in his native place. He was buried in the churchyard of Fressingfield, where there is a Latin epitaph to his memory.

He published Fur Predestinatus (1651), Modern Polities (1652), and Three Sermons (1694). Nineteen Familiar Letters to Mr North (afterwards Sir Henry North) appearedin 1757. He is characterized by Macaulay as ‘‘an honest, pious, narrow-minded inan.”

SANCTUARY is the Christian representative of the classical AsyLum (q.v.), and was no doubt suggested in the first instance by the cities of refuge of the Levitical law. Originally every church or churchyard was a sanctu- ary for criminals. In England about thirty churches, from a real or pretended antiquity of the privilege, acquired special reputation as sanctuaries, ¢.g., Westminster Abbey and Beverley Minster. ‘‘The precincts of the Abbey,” says Dean Stanley, “were a vast cave of Adullam for all the distressed and discontented in the metropolis who desired, according to the phrase of the time, to take West- minster.” The sanctuary seats at Hexham and Beverley and the sanctuary knocker at Durham are still in exist- ence. The protection afforded by a sanctuary at common law was this:—a person accused of felony might fly for the safeguard of his life to sanctuary, and there before the coro- ner, within forty days, confess the felony and take an oath of abjuration entailing perpetual banishment into a foreign Christian country. The sanctuary being the privilege of the church, it is not surprising to find that it did not ex- tend to the crime of sacrilege, nor was it held to extend to high or petit treason. The law of abjuration and sanctuary was regulated by numerous and intricate statutes. A list of them will be found in Coke, Jnstztutes, vol. ili. p. 115. Finally it was enacted by 21 Jac. Ic. 28, § 7, that no sanctuary or privilege of sanctuary should be admitted or allowed in any case. The privilege of sanctuary as pro- tecting from civil process extended to certain places, parts or supposed parts of royal palaces, such as White Friars or Alsatia, the Savoy, and the Mint. The privilege of these places was abolished by 8 and 9 Will. IIT c. 27, and 9 Geo. I. c. 28. (See Stephen, Mist. of the Crim. eae vol, i, C. Xail.),

In Scotland religious sanctuaries were abolished at the Reforma- tion. But the debtor still finds sanctuary from diligence in Holyrood House and its

precincts. The sanctuary docs not protect criminals, or even all debtors, e.g., not crown debtors or fraudulent bankrupts; and a meditatio fugxe warraut may be executed within the sanctuary. After twenty-four hours' residence the debtor must enter his name in the record of the Abbey Court in order to entitle him to further protection. Under the Act 1696, c. 5, insolvency concurring with retreat to the sanctuary constitutes notour bank- ruptcy (see Bell, Commentaries, vol. ii. p. 461).

SAND, GEorcr. See DUDEVANT.

SANDALWOOD, a fragrant wood obtained from various trees of the natural order Santalacex and from the genera Santalum and Fusanus. The principal commercial source of sandalwood is Santalum album, L., a native of India, but it is also yielded by S. Freycinetianum, Gaud., and S. pyrularium, A. Gray, in the Hawaiian Islands, S. Zomei, Seem., and S. austro-caledonicum, Viell., in New Caledonia, and §. insulare, Bert., in Tahiti. The wood of S. lati folium, Benth., and also that of Fusanus spicatus, R. Br., have been exported from south-west Australia, and that of Eremophila Mitchell, of the natural order Myoporineex, from Queensland, but these have little odour and are chiefly used for cabinet work. Sandalwood is also said to be pro- duced in Nossi-Bé, and has been imported into London from Zanzibar, and into Germany from Venezuela, but of the botanical source of these varieties little is at present known. The use of sandalwood dates as far back at least as the 5th century B.c., for the wood is mentioned under its Sanskrit name " chandana" in the Nirukta, the earliest extant Vedic commentary. It is still extensively used in India and China, wherever Buddhism prevails, being em-

ployed in funeral rites and religious ceremonies ; compara- tively poor people often spend as much as 50 rupees on sandalwood for a single cremation. Until the middle of the 18th century India was the only source of sandal- wood. The discovery of a sandalwood in the islands of the Pacific led to a considerable trade of a somewhat piratical nature, resulting in difficulties with the natives, often ending in bloodshed, the celebrated missionary John Williams, amongst others, having fallen a victim to an indiscriminate retaliation by the natives on white men visiting the islands.

The loss of life in this trade was at one time even greater than in that of whaling, with which it ranked as one of the most adventurous of callings. About the year 1810 as much as 400,000 dollars is said to have been received annually for sandalwood by Kame- hameha, king of Hawaii. The trees consequently have become almost extinct in all the well-known islands, except New Caledonia, where the wood is now cultivated. Sandal-wood of inferior quality derived from Pusanus acuminatus was exported from south-west Australia in 1884 to the extent of 2620 tons, valued at an average of about £8 per ton, genuine sandalwood being worth in China from £12 to £40 per ton.

In India sandalwood is largely used in the manufacture of boxes, fans, and other ornamental articles of inlaid work, and to a limited extent in medicine as a domestic remedy for all kinds of pains and aches. The oil is largely used as a perfume, few native Indian attars or essential oils being free from admixture with it. In the form of powder or paste the wood is employed in the pigments used by the Brahmans for their distinguishing caste-marks.

During the last few years oil of sandalwood has largely replaced copaiba, both in the United Kingdom and on the Continent, in the treatment of various diseases of the mucous membrane. Three varieties are distinguished in trade—East-Indian, Macassar, and West-Indian. The first- named is derived from S. album, the second probably from another species of Santalum, and the third from a wood imported from Puerto Cabello in Venezuela. Bucida capttata, a Combretaceous plant, is known in the West Indies as sandalwood ; but the odour of the wood as well as of the oil, which is quite distinct from that of the true sandalwood, has more resemblance to that of a Myrorylon. Inferior qualities of the oil are said to be adulterated in Germany with the oil of red cedar wood (Juniperus virginiana).

In India sandalwood is produced in the dry tracts of country in Mysore and Coimbatore, north and north-west of the Nilgiri Hills, also farther eastward in the districts of Salem and North Arcot, where the tree grows from the sea-level up to an elevation of 3000 feet. In the first-named district the wood is a Government monopoly and can only be felled by the proper officers, this privilege having been retained since 1770, when it was

conferred by treaty with Hyder Ali on the East India Company. The Mysore sandalwood is shipped from Mangalore to the extent of about 700 tons annually, valued at £27,000. In the Madras Presidency—although there is now no monopoly—sandalwood, by the careful management of the forest department, has been made to yield an increasing revenue to the Government, as much as 5474 tons having beeu furnished by the reserved forests in 1872-8. The tree is propagated by seeds, which, however, must be placed where they are intended to grow, since the secdlings will not bear trans- plantation, probably on account of deriving their nourishment parasitically by means of tuberous swellings attached to the roots of other plants. The trees are cut down when between eighteen and twenty-five years old, at which period they have attained their maturity, the trunks being then about one foot in diameter. The felling takes place at the end of the year, and the trunk is allowed to remain on the ground for several months, during which time the white ants eat away the valueless sapwood but lIcave the fragrant heartwood untouched. The heartwood is then sawn into billets about 2 or 24 feetlong. These are afterwards more carefully trimmed at the forest depéts, and left to dry slowly in a close warehouse for some weeks, by which the odour is improved and

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the tendency of the wood to split obviated. An annual auction of the wood takes place, at which merchants from all parts of India congregate. The largest pieces are chiefly exported to China, the small pieces to Arabia; and those of medium size are retained for use in India. China imported into the treaty ports 66,287 piculs (of 1834 tb) of sandalwood in 1872. As much as 700 tons are annu- ally imported into Bombay from the Malabar coast, of which about 450 tons are again exported. The oil, which is distilled chiefly at Mangalore from the roots and chips, is also imported into Bombay to the extent of 12,000 tb annually.

Red Sandalwood, known also as Red Sanders Wood, is the pro- duct of a small Leguminous tree, Pterocarpus santalinus, native of Southern India, Ceylon, and the Philippine Islands. The wood is obtained principally from Madras, in ccrtain parts of which province it is regularly cultivated, coming

into the market in the form of irregular billets of heartwood, 8 or 4 feet in length. A fresh surface of the wood has a rich deep red colour, which on exposure, however, assumes a dark brownish tint. Under the influence of alkaline solutions, alcohol, or strong acctic acid, red sandalwood yields up to 16 per cent. of a resinoid body, santalin or santalic acid C,;H,,0; (?), which substance is the tinctorial principle of the wood. Santalin is quite insoluble in cold water; it neutralizes alkalies, and with them forms uncrystallizable salts. In its pure condition santalin forms minute prismatic crystals of a beautiful ruby colour. The wood also contains small proportions of colourless crystalline principles—santal, CgH,O3, and pterocarpin, C,7H,,0;—and of an amorphous body having the formula CyAj,0,. In medizval times red sandalwood possessed a high reputation in medicine, and it was valued as a colouring ingredient in many dishes. Now it isa little used as a colouring agent in pharmacy, its principal application being in wool-dyeing and calico-printing. Several other species of Plerocarpus, notably P. indicus, contain the same dyeing principle and can be used as substitutes for red sandal- wood. The barwood and camwood of the Guinea Coast of Africa, presumably the produce of one tree, Baphia nitida (Pterocarpus angolensis of De Candolle), called santal rouge d'Afrique by the French, are also in all respects closely allied to the red sandalwood

of Oriental countries.

See Seemann, Flora Vitiensis, pp. 210-215 ; Pharm. Journ.and Trans., 1885-86; Pharmacographia, 24 ed., p. 599; Dymock, Materia Medica of Western India, p. 617; Jour. Soc. Arts, 1875, p. 641; Seemann, Voyage of the ‘‘ Herald,” 1853, p. 83; Seemann, Jour. Botany, 1864, p. 218; Erskine, Jslands of the W. Pacific, 1853, p. 143, 326, 390, and Appendix, p. 478, 486; Martin, Natives of the Tonga Islands, 1817, pp. 319-333; Birdwood, Bombay Products, p. 306; Madras Jury Reports, 1857; Hawkes, Report on Oils of India, p. 38.

SANDARACH is a resinous body obtained from the small Coniferous tree Callitris quadrivalvis, native of the north-west regions of Africa, and especially characteristic of the Atlas Mountains. The resin, which is procured as a natural exudation on the stems, and also obtained by making

incisions in the bark of the trees, comes into commerce in the form of small round balls or elongated tears, transparent, and having a delicate yellow tinge. It isa little harder than mastic, for which it is sometimes substituted, and does not soften in the mouth like that resin; but, being very brittle, it breaks with a clean glassy fracture. Sandarach has a faintly bitter resinous taste, and a pleasant balsamic odour. It consists of a mixture of three distinct resins, the first readily soluble in alcohol, constituting 67 per cent. of the mass, while the second dis- solves with more difficulty, and the third is soluble only in hot alcohol. Sandarach is imported chiefly from Mogador, and is an important ingredient in spirit varnishes. It is also used as incense, and by the Arabs medicinally asa remedy for diarrhcea. An analogous resin is procured in China from Callitris sinensis, and in South Australia, under the name of pine gum, from C. Fezssvz.

SANDBACH, a town and urban sanitary district of Cheshire, is situated on the Trent and Mersey Canal, and on the London and North-Western Railway, at the junc. . tion for Northwich, 25 miles east-south-east of Chester and 5 north-east of Crewe. In the market-place are two ancient obelisks, dating, according to some, from the 7th century. The principal public buildings are the parish church of St Mary, in the Perpendicular style, with a tower rebuilt 1847-9, the grammar school, the public reading rooms, and the town-hall. Anciently the town was celebrated for its ale. The principal industry was formerly silk throwsting, but this is now discontinued, and the inhabitants are chiefly employed in the salt-works and

alkali-works. The population of the urban sanitary district (area 2694 acres) in 1871 was 5259, and in 1881 it was

5493.

SAND-BLAST. The erosive influence of driven sand is turned to useful account for several industrial purposes by means of an apparatus devised, about 1870, by Mr B. C. Tilghman of Philadelphia. Tilghman’s sand-blast con- sists of a contrivance for impelling, with graduated degrees of velocity, a jet or column of sand, by means of com- pressed air or steam, against the object or surface to be acted on. The apparatus is principally adapted for

obscuring, engraving, and ornamenting glass, but accord- ing to the velocity with which the sand is impelled it may be used to carve deep patterns in granite, marble, and other hard stones, to bite into steel, &c., and even to cut aud perforate holes through these and other most refrac- tory materials. Sheets of glass 4 feet wide are obscured at the rate of 3 feet per minute, with a blast of air having a pressure of 1 ib per inch. With the aid of tough elastic stencils, patterns and letters are engraved on flashed glass, globes for lamps and gaslights are ornamented, druggists' bottles are lettered, &c.! Driven with moderate velocity against a metal surface, the sand produces by its impact a fine uniform pitted appearance without removing the metal; and in this way it is used for "frosting" plated goods. A strong blast is largely used for sharpen- ing files, which, as they leave the cutter, have always a shght backward curve or "burr" on their cutting edges which blunts their biting effect. By directing a blast of very fine sand, mixed with water into a thin mud, with steam pressure of 70 ib, at an angle against the back of the teeth, this burr is ground off, the shape of the teeth is improved, and the file is rendered very keen. While the use of steam for impelling the sand-blast is most simple and economical, many practical difficulties have hitherto been found in the way of its employment, and conse- quently for obtaining high pressure of air costly apparatus was required, thus limiting the applications of the agency. In 1884 Mr Mathewson patented an apparatus in which, by an ingenious exhaust arrangement, the impelling steam is swept away, leaving only cool, dry sand to strike against the object acted on; and the success of this device has already opened up a wider field for the employment of the sand-blast.

SANDBY, Paur (1725-1809), founder of the English school of water-colour painting, was descended from a branch of the Sandbys of Babworth, and was born at Nottingham in 1725. After commencing his artistic studies in London, in 1746 he was appointed by the duke of Cumberland draughtsman to the survey of the Highlands. In 1752 he quitted this post, and retired to Windsor, where he occupied himself with the production of water- colour drawings of scenery and picturesque architecture, which brought him under the notice of Sir Joseph Banks, who gave him his patronage, and subsequently commis- sioned him to bring out in aquatinta (a method of engrav- ing then peculiar to Sandby) forty-eight plates drawn during a tour in Wales. Sandby displayed considerable power as a caricaturist in his

attempt to ridicule the opposition of Hogarth to the plan for creating a public academy for the arts. He was chosen a foundation- member of the Royal Academy in 1768, and the same year was appointed chief drawing-master to the Royal Military Academy at Woolwich. He held this situation till 1799, and during that time he trained many artists

- In 1875 inscriptions were cut by means of the blast on 150,000 tombstones of soldiers killed in the American Civil War. Cast-iron letters were fastened by shellac on the marble, the sand was driven by steam pressure of 90 Ib, and the stone was cut, in four minutes, to a depth of a quarter of an inch, leaving the letters in relief.

Zo

who afterwards gained a name in their profession. Sandby will be best remembered, however, by his water-colour paintings. They are topographical in character, and, while they want the richness and brilliancy of modern water- colour, he nevertheless impressed upon them the originality of his mind. In his later pieces, in particular, decided progress is observable in richness and in harmony of tinting, and they also show a measure of poetic feeling, due, in great part, to the influence of Cozens. His etchings, such as the Cries of London and the illustrations to Ramsay's Gentle Shepherd, and his plates, such as those to Tasso's Jerusalem Delivered, are both numerous and carefully executed. He died in London on the 9th

November 1809.

SANDEAU, Lionarp Syrvarw Jutes (1811-1882), a French novelist of much grace and not a little power, was born at Aubusson (Creuse) on February 9, 1811. He made acquaintance as an art student with Madame Dudevant (George Sand), who had just taken to an unrestrained literary life at Paris. The intimacy did not last long, but it produced Mose et Blanche (1831), a novel written in common, and from it George Sand took the idea of the famous nom de guerre by which she is and always will be known. Sandeau's subsequent work showed that he could run alone, and for nearly fifty years he continued to produce novels and to collaborate in plays. His best works are Marianna (1839), Le Docteur Herbeau (1841), Cathérine

(1845), Mademoiselle de la Seigligre and Made- leine (1848), La Chasse au Roman (1849), Sacs et Parche- mins (1851), La Maison de Penarvan (1858), La Roche aux Mouettes (1871). The famous play of Le Gendre de M. Poirier is only one of several which he wrote with

mile Angier,—the novelist usually contributing the story and the dramatist the theatrical working up. Meanwhile Sandeau, who had accepted the empire, but who never took any active part in politics, had been made conserva- teur of the Mazarin library in 1853, elected to the Academy in 1858, and next year appointed librarian of St Cloud. At the suppression of this latter office, after the fall of the empire, he was pensioned. He died on the 24th of April 1882. He was never a very popular novelist, judging by the sale of his works; and the peculiar quiet grace of his style, as well as his abstinence from sensational incident, and his refusal to pander to the French taste in fictitious morals, may be thought to have disqualified him for popularity. But his literary ability has always been recognized by competent judges. His skill in construc- tion was very great ; his character-drawing, though pure, is eminently free from feebleness and commonplace ; and of one particular situation—the tragical clashing of aristo- cratic feeling with modern tendencies—he had an extra- ordinary mastery, which he showed without any mere repetition, but in many different studies.

SANDEC. See Nrv-SanpEc.

SAND-EEL or Sanp-Launez. The fishes known under these names form a small isolated group (Ammo- dytina), distantly related to the cod-fishes. Their body is of an elongate-cylindrical shape, with the head terminat- ing in a long conical snout, the projecting lower jaw form- ing the pointed end. A low long dorsal fin, in which no distinction between spines and rays can be observed, occupies nearly the whole length of the back, and a long anal, composed of similar short and delicate rays, com- mences immediately behind the vent, which is placed about midway between the head and caudal fin. The caudal is forked and the pectorals are short. The total absence of ventral fins indicates the burrowing habits of these fishes. The scales, when present, are very small; but generally the development of scales has only proceeded to the formation of oblique folds of the integuments.

The eyes are lateral and of moderate size ; the dentition is quite rudimentary.

Sand-eels are small littoral marine fishes, only one species attaining a length of 18 inches (Ammodytes lanceo- latus). They live in shoals at various depths on a sandy bottom, and bury themselves in the sand on the slightest alarm. They are able to do this with the greatest ease and rapidity whilst the bottom is covered with water. Many of those which live close inshore are left by the receding tide buried in the sand, and are then frequently dug out froma depth of one or two feet. Other shoals live in deeper water ; when they are surprised by fish of prey or porpoises, tlicy are frequently driven to the surface in such dense masses that numbers of them can be scooped out of the water with a bucket or hand-net. In fact, this used to be, in the Channel Islands, the common practice of the fishermen to provide themselves with bait. Some species descend to a depth of 100 fathoms and more ; and the greater sand-eel is not rarely taken on the mackerel line far out at sea near the surface. Sand-eels are very rapacious, destroying a great quantity of fry and other small creatures, such as the lancelet (Branchiostoma), which lives in similar localities. They are excellent eating, and are much sought after for bait.

Sand-eels are common in all suitable localities of the North Atlantic ; a species scarcely distinct from the European common sand-launce occurs on the Pacific side of North America, another on the cast coast of South Africa. On the British coasts three species are found :—the Greater Sand-Eel (Ammodytes lanceolatus), distinguished by a tooth-like bicuspid prominence on the vomer ; the Common Sand-Launce (A. tobianws), from five to seven inches long, with unarmed vomer, even dorsal fin, and with the integu- ments folded ; and the Southern Sand-Launce (A. siculus), with unarmed vomer, smooth skin, and with the margins of the dorsal and anal fins undulated. The last species is common in the Mediterranean, but local farther northwards. It has been found near the Shetlands at depths from 80 to 100 fathoms, and is generally distinguished from the common species by

the fishermen of the Channel Islands, who have a tradition that it appeared suddenly on their coasts some fifty years ago.

637.

SANDEMANIANS. See Guas, vol. x.

SANDERSON, Rozsert (1587-1663), bishop of Lin- coln, and one of the worthies celebrated by Izaak Walton, was born at Rotherham, Yorkshire, in 1587. He was edu- cated at the grammar school of his native town and at Lincoln College, Oxford, took orders in 1611, and was promoted successively to several benefices. On the recom- mendation of Laud he was appointed one of the royal chaplains in1631, and as a preacher was a great favourite with the king. In 1642 Charles created him regius pro- fessor of divinity at Oxford, with a canonry of Christ Church annexed. But the civil war prevented him until 1646 from entering on the office; and in 1648 he was ejected by the visitors whom the parliament had com- missioned, He recovered these preferments at the Restora- tion, and was promoted to the bishopric of Lincoln, but lived only two years to enjoy his new dignities, dying in his seventy-sixth year in 1663. His most celebrated work is his Cases of Conscience, deliberate judgments upon points of morality submitted to him. Some of these cases, notably that of Sabbath observance, and that of signing the " En- gagement" to the Commonwealth, were printed surrepti- tiously during his lifetime, though drawn up in answer to private spiritual clients; and a collection, gradually enlarged in successive editions, was published after his death. They are extremely interesting specimens of English casuistry, distinguished not less by moral integrity than good sense, learning, and close, comprehensive, and subtle reasoning. His practice as a college lecturer in logic is better evidenced by these "cases" than by his Compendium of Logic published in 1615. A complete edition of Sanderson's works was edited by Dr Jacobson in 1854 (Oxford Press). To this the reader may be referred

for his sermons and his occasional tracts on public affairs during the troubled period of his middle life and old age.

SAND-GROUSE, the name! by which are commonly known tle members of a small but remarkable group of birds frequenting sandy tracts, and having their feet more or less clothed with feathers after the fashion of Grouss (vol. xi. p. 221), to which they were originally thought to be closely allied, and the species first described were by the earlier systematists invariably referred to the genus Tetrao. Their separation therefrom is due to Temminck, who made for them a distinct genus which he called Pterocles,? and his view, as Lesson tells us (Z'raité, p. 515), was subsequently corroborated by De Blainville ; while in 1831 Bonaparte (Saggio, p. 54) recognized the group as a good Family, Pediophali or Pteroclidx. Further investiga- tion of the osteology and pterylosis of the Sand-Grouse revealed still greater divergence from the normal Gallinz (to which the true Grouse belong), as well as several curious resemblances to the Pigeons ; and in the Zoological Society's Proceedings for 1868 (p. 303) Prof. Huxley pro- posed to regard them, under the name of Pteroclomorphe, as forming a group equivalent to the Alectoromorphe and Peristeromorphx, for reasons already briefly stated (ORNITHOLOGY, vol. xviii. p. 46). The Pteroclidz consist of two genera—VPrterocles, with about fifteen species, and Syrrhaptes, with two. Of the former, two species inhabit Europe, P. arenarius, the Sand-Grouse proper, and that which is usually called P. alchata, the Pin-tailed Sand- Grouse. The European range of the first is practically limited to Portugal, Spain, and the southern parts of Russia, while the second inhabits also the south of France, where it is generally known by its Catalan name of ‘‘ Ganga," or locally as ‘‘ Grandaulo," or, strange to say, " Perdrix d' Angleterre." Both species are also abundant in Barbary, and have been believed to extend eastwards through Asia to India, in most parts of which country they seem to be only winter-visitants; but in 1880 Herr Bogdanow pointed out to the Academy of St Petersburg (Bulletin, xxvii. p. 164) a slight difference of coloration between eastern and western examples of what had hith- erto passed as P. alchata; and the difference, if found to be constant, may require the specific recognition of each, while analogy would suggest that a similar difference might be found in examples of P. arenarius. India, more- over, possesses five other species of Pterocles, of which however only one, P. fasctatus, is peculiar to Asia, while the others inhabit Africa as well, and all the remaining species belong to the Ethiopian region —one, P. personatus, being peculiar to Madagascar, and four occurring in or on the borders of the Cape Colony.

The genus Syrrhaptes, though in general appearance resembling Pterocles, has a conformation of foot quite unique among birds, the three anterior toes being encased in a common “podotheca,” which is clothed to the claws with hairy feathers, so as to look much like a fingerless glove. The hind toe is wanting. The two species of Syr- rhaptes are S. tibetanus—the largest Sand-Grouse known— inhabiting the country whence its trivial name is derived, and S. paradoxus, ranging from Northern China across Central Asia to the confines of Europe, which it occa-

1 It seems to have been first used by Latham in 1783 (Synopsis,

iv. p. 751) as the direct translation of the name Tetrao arenarius given by Pallas,

- He states that he published this name in 1809; but hitherto re- search has failed to find it used until 1815.

3 Some more recent writers, recognizing the group as a distinct Order, have applied to it the name ‘‘ Pterocletes,” while another calls it Heteroclite, The former of these words is based on a grammatical misconception, while the use of the latter has long since been other- wise preoccupied in zoology. If there be need to set aside Prof. Huxley’s term, Bonaparte’s Pediophili (as above mentioned) may be accepted, and indeed has priority of all others.

sionally, and in a marvellous manner, invades, as has been already briefly described (Birps, vol. ili. p. 770).1 Though its attempts at colonization in the extreme west have failed, it would seem to have established itself of late years in the neighbourhood of Astrakhan (Zdis, 1882, p. 220). It appears to be the “ Barguerlac ” of Marco Polo (ed. Yule, i. p. 239); and the ‘ Loung-Kio” or “ Dragon’s Foot,” so unscientifically described by the Abbé Huc (Souvenirs dun Voyage dans la Tartarie, i. p. 244), can scarcely be anything else than this bird.

Externally all Sand-Grouse present an appearance so distinctive that nobody who has seen onc of them can be in doubt as to any of the rest. Their plumage assimilates in general colour to that of the ground they frequent,

being above of a dull ochreous hue, more or less barred or mottled by darker shades, while bencath it is frequently varied by belts of deep brown intensifying into black. Lighter tints are, however, exhibited by some species,—the drab merging into a pale grey, the buff brightcning into a lively orange, and streaks or edgings of an almost pure white relieve the pre- vailing sandy or fawn-coloured hues that especially characterize the group. The sexcs seem always to differ in plumage, that of the male being the brightcst and most diversified. The expression is decidedly Dove-like, and so is the form of the body, the long wings contributing also to that effect, so that among Anglo-Indians these birds are commonly known as " Rock-Pigeons." The long wings, the outermost primary of which in Syrrhaptes has its shaft produced into an attenuated filament, are in all the species worked by exceedingly powerful muscles, and in several forms the middle rectriccs are likewise protracted and pointed, so as to give to their wearers the name of Pin-tailed Sand-Grouse.? The nest is a shallow hole in the sand. Three seems to be the regular ule ment of eggs laid in each nest, but there are writers who dcclar (most likely in error) that the full number in some species is four. These eggs are of peculiar shape, being almost cylindrical in the middle and nearly alike at each end, and are of a pale earthy colour, spotted, blotched, or marbled with darker shades, the markings being of two kinds, one superficial and the other more deeply seated in the shell. The young are hatched fully clothed in down (P. Z. S. 1866, pl. ix. fig. 2), and though not very active would appear to be capable of locomotion soon after birth. Morphologically generalized as the Sand-Grouse undoubtedly are, no one can contest the extreme specialization of many of their features, and thus they form one of the most instructive groups of birds with which ornithologists are acquainted. The remains of an extinct species of Pterocles, P. scpultus, intermediate apparently between P. alchata and P. guttwralis, have been recognized in the Miocene caves of the Allier by Prof. A. Milne-Kdwards (Ois. foss. dela France, p. 294, pl. clxi. figs. 1-9); and, in addition to the other authorities on this very interesting group of birds already cited, reference may be madc to Mr Elliot's "Study" of the Family (P. Z. S., 1878, pp. 233-264) and Dr Gadow, "On certain points in the Anatomy of Pterocles" (op, cit., 1882, pp. 312-332). (A. N.)

SANDHURST, a city of Victoria, Australia, in the county of Bendigo, is situated in 36° 46' S. lat. and 144° 17' E. long., at a height of 758 feet

above the sea, on Bendigo Creek (a sub-tributary of the Murray), 10032 miles north-north-west of Melbourne by the railway to Echuca. Built on an exhausted part of old goldfields of Bendigo (1851), and long better known by that name, Sandhurst, which became a municipality in 1855, a borough in 1863, and a city in 1871, has been gradually working itself clear of the irregularity and disorder characteristic of abandoned mines and quartz-crushing enterprises. Pall Mall, the principal street, consists of good houses of two and three stories; and, besides banks, insurance offices, hotels, and churches (many of which are

1 Some slight additions to and corrections of that account may here be given. A sixth example is stated (Jbis, 1871, p. 223) to have been killed in Europe in 1859, namely, at Perpignan in France. One is believed to have been obtained at or near Archangel (Zbis, 1873, p. 66); but the report of one in Sicily proves to have been a mistake, and Rimini, on the Adriatic, remains the most southern Italian locality reached in 1863. Sinee 1872 a male obtained near Modena in May 1876 (Zbis, 1881, p. 206), and a pair, one of which was shewn to the writer, in the county of Kildare in Ireland, the following October (Zoologist, 1877, p. 24), are all that are known to have occurred in Western Europe.

2 These were separated by Bonaparte (Comptes Rendus, xlii. p. 880) as a distinct genus, Pteroclurus, which later authors have justly seen no Treason to adopt.

substantial buildings), there are in Sandhurst Govern- ment and municipal offices, a hospital, a benevolent asylum, a mechanics' institute and school of mines, a theatre, and several halls. Rosalind Park, opposite Pall Mall, the Camp Reserve, and the Botanical Gardens are the principal pleasure grounds. A good supply of water has been secured by the construction of five large reser- voirs capable of storing in the aggregate upwards of 622,600,000 gallons. Besides gold-mining, which in the Sandhurst district employs 6800 miners, the local indus- tries are brewing, iron-casting, coach-building, the working of bricks and tiles and earthenware, and tanning. The population of the city (which is divided into three wards —

Sutton, Darling, and Barkly) was 28,662 in 1881. The value of rateable property is £1,663,910.

SAN DIEGO, a city and port of entry of the United States, chief town of San Diego county, California, 15 miles north of the Mexican frontier. It has a land-locked harbour 5} miles long and next to San Francisco the best on the Pacific coast of the States, is the selected terminus of the Texas and Pacific Railroad, and has recently become a fashionable winter resort owing to the remarkable steadi- ness of its winter climate (mean anoual temperature 62°). San Diego was founded by Roman Catholic missionaries in 1769. In 1880 it had only 2637 inhabitants, but they have since increased to upwards of 5000. In the county is a lake of boiling mud half a mile long by 500 yards wide.

SAN DOMINGO, or Santo Dominco. See Hayrt.

SANDOMIR, or SEpomIERz, a town of Russian Poland, in the province of Radom, is one of the oldest towns of Poland, being mentioned in annals as early as 1079 ; from 1139 to 1332 it was the chief town of the principality. Under Casimir ITI. it received extensive privileges and reached a high degree of prosperity and strength. In 1429 it was the seat of a congress for the establishment of peace with Lithuania, and in 1570 the well-known ‘“Con- sensus Sandomiriensis” was held there for uniting the Lutherans, Calvinists, and Moravian Brethren. Subse- quent wars, and especially the Swedish, ruined the town still more than numerous conflagrations, and in the second part of the 18th century it had only 2060 inhabitants. It is now a quite unimportant place, but retains a few remark- able monuments of its past. The beautiful cathedral, rising on a high hill above the Vistula, and facing the plains of Galicia, was built between 1120 and 1191; it was rebuilt in stone in 1360, and is thus one of the oldest monuments of old Polish architecture. The churches of St Paul and St James are fine relics of the 13th century. In 1881 the population was 6265, or, including the suburbs, 14,710.

SANDOWAY, a district in the south of the Arakan division of British Burmah, ceded to the British by treaty in 1826, embracing an area of 3667 square miles, and bounded on the north by the Ma-i river, on the west by the Bay of Bengal, on the east by the Arakan Mountains, and on the south by the Khwa river. The whole face of the country is mountainous, the

Arakan range sending out spurs which reach down to the coast. Some of the peaks in the north attain an elevation of over 4000 feet. Not more than one-eighteenth part of the surface can be called plain ; and, except there, where rice cultivation is carried on, and on the hill-sides, where clearings are made for toungya or nomadic cultivation, the country is covered with dense forest. There is nothing in the district that can be called a river, the streams draining it being but mountain torrents to within a few miles of the coast; the mouth of the Khwa forms a good anchorage for vessels of from 9 to 10 feet draught. So far as is known of the geology of the district, the rocks in the Yoma range and its spurs are metamorphic, and comprise clay, slates, ironstone, and in- durated sandstone ; towards the south, ironstone, trap, and

rocks of basaltic character are common ; veins of steatite and white fibrous quartz are also found in the district.

Only 135 square miles of the total area are cultivable, and of these but 75 are cultivated. The chief crops are rice, sesamum, tobacco, cotton, sugar-cane, dhant palms, and yams. The revenue in 1883-84 was £13,978, the land tax realizing £6749 of that amount. — This mountainous and forest-clad country, with such a small cultivable area, is sparscly inhabited, the population as returned by the census of 1881 being only 64,010 (males 32,706, females 31,304); of this number 56,458 were Buddhists. There are no towns with a popula- tion exceeding 2000. Sandoway, the chief town and headquarters, on the river of the same name, in 18° 27’ 35” N. lat. and 94° 24’ 36” E. long.,-is a very ancient town, and is said to have been at one time the capital of a kingdom, or more probably of a petty chieftainship.

SANDPIPER (Germ. Sandpfeifer), according to Willughby in 1676 the name given by Yorkshiremen to the bird now most popularly known in England as the “ Summer-Snipe,”—the Zringa hypoleucos of Linnzus and the Zotanus, Actitis, or Tringoides hypoleucus of later writers,—but probably even in Willughby’s time of much wider signification, as for more than a century it has certainly been applied to nearly all the smaller kinds of the group termed by modern ornithologists Lamicolz which are not Provers (vol. xix, p. 227), or SNIPES (q.v.), but may be said to be intermediate between them. Placed by most systematists in the family Scolopacede, the

birds commonly called Sandpipers seem to form three sections, which have been often regarded as Subfamilies— Totanine, Tringine, and Phalaropodine, the last indeed in ‘some classifications taking the higher rank of a Family— Phalaropodidz. This section comprehends three species only, known as Phalaropes or swimming Sandpipers, which are at once distinguished by the membranes that fringe their toes, in two of the species forming marginal lobes,! and by the character of their lower plumage, which is as close as that of a Duck, and is obviously connected with their natatory habits. The distinctions between Jotaninz and Tringine, though believed to be real, are not so easily drawn, and space is wanting here to describe them minutely. The most obvious may be said to lie in the acute or blunt form of the tip of the bill (with which is associated a less or greater development of the sensitive nerves running almost if not quite to its extremity, and therefore greatly influencing the mode of feeding) and in the style of plumage—the Tringine, with blunt and flexible bills, mostly assuming a summer-dress in which some tint of chestnut or reddish-brown is very prevalent, while the Zotaninex, with acute and stiffer bills, display no such lively colours. Furthermore, the 7’ringinz, except when actually breeding, frequent the sea-shore much more than do the Zotanine.? To the latter belong the GREEN- SHANK (vol. xi. p. 173) and RepsHanx (vol. xx. p. 317), as well as the Common Sandpiper of English books, the ‘‘Summer-Snipe” above-mentioned, a bird hardly exceed- ing a Skylark in size, and of very general distribution throughout the British Islands, but chiefly frequenting clear streams, especially those with a gravelly or rocky bottom, and most generally breeding on the beds of sand or shingle on their banks. It usually makes its appearance in May, and from thence during the summer-months may be seen in pairs skimming gracefully over the water from one bend of the stream to another, uttering occasionally a

1 These are Phalaropus fulicarius and P. (or Lobipes) hyperboreus, and on that account were thought by some of the older writers to be allied to the Coors (vol. vi. p. 841). The third species is P. (or

Sleganopus) wilsont. All are natives of the higher parts of the northern hemisphere, and the last is especially American, though perhaps a straggler to Europe. 7

2 There are unfortunately no English words adequate to express these two sections. By some British writers the Tringing have been indicated as ‘‘Stints,” a term cognate with Stunt and wholly inapplic- able to nay, of them, while recent American writers restrict to them the name of Sandpiper,” and call the Totaning, to which that name is especially appropriate, “ Willets.” ‘

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shrill but plaintive whistle, or running nimbly along the margin, the mouse-coloured plumage of its back and wings making indeed but little show, though the pure white of its lower parts often renders it conspicuous. ‘The nest, in which four eggs are laid with their pointed ends meeting in its centre (as is usual among Limicoline birds), is seldom far from the water’s edge, and the eggs, as well as the newly-hatched and down-covered young, so closely resemble the surrounding pebbles that it takes a sharp eye to discriminate them, Later in the season family-parties may be seen about the larger waters, whence, as autumn advances, they depart for their winter-quarters. The Common Sandpiper is found over the greater part of the Old World, In summer it is the most abundant bird of its kind in the extreme north of Europe, and it extends across Asia to Japan. In winter it makes its way to India, Australia, and the Cape of Good Hope. In America its place is taken by a closely kindred species, which is said to have also occurred in England—7. macularzus, the “ Peetweet,” or Spotted Sandpiper, so called from its usual cry, or from the almost circular marks which spot its lower plumage. In habits it is very similar to its congener of the Old World, and in winter it migrates to the Antilles and to Central and South America. Of other Zotanine, one of the most remarkable is that to which the inappro-priate name of Green Sandpiper has been assigned, the Totanus or Helodromas ochropus of ornithologists, which most curiously differs (so far as is known) from all others of the group both in its osteology® and mode of nidifica- tion, the hen laying her eggs in the deserted nests of other birds, —Jays, Thrushes, or Pigeons,—but nearly always at some height (from 3 to 30 feet) from the ground (Proc. Zool, Society, 1863, pp. 529-532). This species occurs in England the whole year round, and is pre- sumed to have

bred here, though the fact has never been satisfactorily proved, and our knowledge of its erratic habits comes from naturalists in Pomerania and Sweden ; yet in the breeding-season, even in England, the cock-bird has been seen to rise high in air and perform a variety of evolutions on the wing, all the while piping what, without any violence of language, may be called a song. ‘This Sandpiper is characterized by its dark upper plumage, which contrasts strongly with the white of the lower part of the back and gives the bird as it flies away from its dis- turber much the look of a very large House-Martin. The so-called Wood-Sandpiper, 7’. glareola, which, though mucli less common, is known to have bred in England, has a considerable resemblance to the species last mentioned, but can at once be distinguished, and often as it flies, by the feathers of the axillary plume being white barred with greyish-black, while in the Green Sandpiper they are greyish-black barred with white. It is an abundant bird in most parts of northern Europe, migrating in winter very far to the southward.

Of the section Zringine the best known are the KNor (vol. xiv. p. 129) and the Dunlin, 7. alpina. The latter, often also called Ox-bird, Plover’s-Page, Purre, and Stint,— names which it shares with some other species,—not only breeds commonly on many of the elevated moors of Britain, but in autumn resorts in countless flocks to the shores, where indeed a few may be seen at almost any time of year. In seasonal diversity of plumage it is scarcely excelled by any bird of its kind, being in winter of a nearly uniform ash- grey above and white beneath, while in summer the feathers of the back are black, with deep rust-coloured edges, and a broad black belt occupies the breast. The

3 It possesses only a single pair of posterior ‘‘emarginations” on its sternum, in this respect resembling the RuFF (supra, p. 54). Among the PLOVERS (vol. xix. p. 227) and Syipzs (q.v.) other similarly ex- ceptional eases may be found.

Dunlin varies considerably in size, and to some extent |

according to locality, examples from North America being almost always recognizable from their greater bulk, while in Europe, besides the ordinary

form, there appears to be a smaller race which has received the name of T'. schinzt, but no other difference is perceptible. In the breeding- season, while performing the amatory flights in which like all Sandpipers he indulges, the male Dunlin utters a most peculiar and far-sounding whistle, quite impossible to syllable, and somewhat resembling the continued ringing of a high-toned but yet musical bell. Next to the Dunlin and Knot the commonest British Tringine are the Sander- ling, Calidris arenaria (to be distinguished from every other bird of the group by wanting a hind toe), the Purple Sandpiper, 7'. striata or maritima, the Curlew-Sandpiper, T. subarquata, and the Little and Temminck's Stints, 7' minuta and 7'. temmincki, but want of space forbids more than the record of their names; and for the same reason no noticecan here be taken of the many other species, chiefly American,! belonging to this group. Two other birds, however, must be mentioned. These are the Broad-billed Sandpiper, 7, platyrhyncha, of the Old World, which seems to be more Snipe-like than any that are usually kept in this section, and the marvellous Spoon-billed Sandpiper, Hurinorhynchus pygmzus, whose true home has still to be discovered, according to the experience of Baron Nordenskjold in the memorable voyage of the " Vega." i, H.)

SANDROCOTTUS (Cuanpracupta), founder of the Maurya kingdom in India. See Iyp1a, vol. xii. p. 787, and Persia, vol. xviil. p. 586.

SANDUSKY, a city of the United States, the capital of Erie county, Ohio, lies at the mouth of Sandusky river, 210 miles by rail north-east of Cincinnati, and is hand- somely built of limestone from the subjacent strata on ground rising gradually from the shore of Lake Erie. The court-house and the high school are both of considerable architectural note. Besides being the centre of a great vine-growing district, Sandusky has the largest freshwater fish market in the United States, is the seat of the State fish-hatchery (which annually puts about 3,000,000 young whitefish into the lake), and has attained a reputation for the manufacture of such wooden articles as handles, spokes, "bent work" for carriages, carpenters' tools, &c. The city is coextensive with Portland township. Its population was 13,000 in 1870 and 15,838 in 1880.

SANDWICH, an English borough, market-town, and Cinque Port, is situated in the east of Kent, opposite the Downs, on a branch of the South-Eastern Railway, and on the Stour, 2 miles from the sea, 12 miles east of Canter- bury, and 4 north-west of Deal. The streets are narrow and the houses irregularly built. The old line of the walls on the land side is marked by a public walk. The Fishers' Gate and a gateway called the Barbican are interesting ; but the four principal gates were pulled down in thie last century. St Clement's church has a fine Norman central tower, and St Peter's, said to date from the reign of King John, has interesting medieval monuments. The grammar school founded by Sir Roger Manwood in 1564 is now in abeyance. There are three ancient hospitals; St Bar- tholomew's has a fine Early English chapel of the 12th

1 A "Monograph of the Tringew of North Ameriea" by Prof. Coues was published in the Proceedings of the Philadelphia Aeademy for 1861 (pp. 190-205), but is of eourse new out of date. Schlegel's list of '* Seolopaces" in the Muséum des Pays-Bas is the best general description we have, but that is only a few years later (1864), and requires much modifieation to be put on a level with the knowledge of the present day. The very rare Tinga leueoptera of the older systematists, figured by Latham (Synopsis, pl. 82), the type of the genus Prosobonia of Bonaparte, seems to be really a Ralline form (Comptes Rendus, xxxi, p. 562 and xliii. p. 598).

century. Until the beginning of the 16th century Sand- wich was of considerable importance as a port, but after the filling up of the harbour with sand about the begin- ning of the 16th century it fell into decay. The principal industries of the town are market-gardening, tanning, wool-sorting, and brewing. Coal, timber, and iron are imported. Sandwich returned two members to parliament till 1880, and was merged in the St Augustine's division of the county in 1885. The parliamentary borough, which included Deal and Walmer (area 2684 acres), had in 1881 a population of 15,655, while that of the municipal borough (area 706 acres) was 2846.

In the Norman survey Sandwich is deseribed asa borough. It rose into importance on the deeline of the Portus Rutupensis, its name denoting the

situation on the sands. The Danes frequently attacked it in the 10th and 11th centuries; and it was repeatedly plundered by the French in the 15th century. It was fortified by Edward VI. Sandwich was ineorporated by Edward the Confessor, and received its last charter from Charles II.

SANDWICH, Epwarp Monrtacv, Earn oF (1625— 1672), general and admiral, was the son of Sir Sidney Montagu, youngest brother of Edward Lord Montagu of Boughton, and was born 27th July 1625. In August 1643 he raised a regiment in the service of the Parliament, with which he specially distinguished himself at Marston Moor, Naseby, and the siege of Bristol. He was a member of the ‘Little Parliament” (1653), and one of the committee for regulating the customs. In November he was elected to the council of state. In the first Pro- tectorate parliament he sat for Huntingdonshire. In January 1656 he succeeded Penn as admiral, and he was associated with Blake in his expedition to the Mediter- ranean in the same year. After the treaty with France against Spain in 1657 he held command of the fleet sent to prevent the relief of the three coast towns—Gravelines, Mardike, and Dunkirk—besieged by the French, and was successful in defeating an attempt by a great Spanish force to retake Mardike. After the death of Cromwell he was sent with a fleet to the North Sea to enter into negotiations with the Northern powers, but, communi- cations having been opened with him on behalf of Charles II., he returned to England only to find that the conspiracy of Sir George Booth had miscarried, where- upon, after a lame explanation, he was dismissed from his command. At the Restoration, having commanded the fleet which conveyed the king to England, he was made Knight of the Garter, and soon afterwards elevated to the peerage as Baron Montagu of St Neots, Viscount Hin- chinbroke, and Earl of Sandwich, During the war with the Dutch in 1664-65 he commanded the Blue squadron under the duke of York, and specially distinguished him- self in the great battle of 3d June 1665. After his return to England he was sent to negotiate a peace between Spain and Portugal, and also a treaty of commerce with Spain. Ona renewal of the war in 1672 he again com- manded the Blue squadron under the duke of York, and during the fight in Southwold Bay, on the 28th May, his ship, the Royal James, was set on fire by the Dutch, when he leaped overboard and was drowned. His body was found a fortnight afterwards, and was interred in Henry VII.’s Chapel, Westminster Abbey,

Lord Sandwich’s translation of a Spanish work on the Art of Metals by Alvaro Alonso Barba (1640) appeared in 1674, Several of his letters during the Spanish negotiations have been published in Arlington’s Letters, and various letters to him by Cromwell will be found in Carlyle’s Cromwell. See also Original Letters and Negotiations of Sir Richard Fanshawe, the Earl of Sandwieh, the Earl of Sunderland, and Sir William Godolphin, wherein Diverse Matters between the Three Crowns of England, Spain, and Portugal from 1608 to 1678 are set in a elear light.

SANDWICH, Joun Montacu, Fourta Eari oF (1718-1792), was born 3d November 1718, and succeeded

his grandfather in the earldom, 20th October 1729. He was educated at Eton and at Trinity College, Cambridge, which he entered in 1735. After a voyage round the Medi- terranean, he returned to England and began to take an active interest in politics as a supporter of Sir Robert Walpole. A clear and lucid rather than a brilliant debater, his style of address always won the attention of his audience, and his accurate knowledge secured their respect. The high opinion the Government entertained of his judgment and his diplomatic abilities was evidenced by his appointment in 1746 as plenipotentiary to the congress at Breda, which was continued till peace was negotiated at Aix-la-Chapelle in 1748. On his return he became first lord of the admiralty, retaining the post until June 1751. He held the same office from 1763 to 1765, and again from 1771 till the dissolution of Lord North’s administration in 1782. He died 30th April 1792. His Voyage Round the Mediterranean was pub- lished posthumously in 1799, accompanied with a memoir.

SANDWICH ISLANDS. See Hawaran IsLanps.

SANDYS, Gzorez (1577-1644), famous in the reigns of James I. and Charles I. as a traveller and a metrical translator. He was born in 1577, the youngest son of an archbishop of York, studied at St Mary Hall, Oxford, and afterwards probably at Corpus Christi, and began his travels in 1610. The record of them was a substantial contribu- tion to geography and

ethnology, written in a style always interesting and often eloquent, interspersed with versified scraps of quotations from classical authors.

by way of Mount Sinai to Palestine, and back to Venice by way of Cyprus, Sicily, Naples, and Rome. Later on

in his life he published translations of Ovid's Metamor- | phoses, the first book of the #neid, and various books of

Scripture. His verse was praised by Dryden, and de-

servedly so, for it has vitality as well as a clearly marked |

rhythm. He died in 1644. Selections from his poetry were published by the Rev. H. J. Todd in 1839.

SAN FERNANDO, formerly Ista pz Lzon, a fortified city of Spain, in the province of Cadiz, near the head of the inner bay, and 94 miles by rail from the city of Cadiz (see vol. iv. p. 627), is a modern town with straight and level streets, two churches, two hospitals, several barracks, and a school of navigation, with an observatory. It has considerable trade in the salt produced in the neighbouring "salinas." The population within the municipal limits (which include the " poblacion" of San Carlos and the naval arsenal of La Carraca) was returned as 26,346 in 1877.

SAN FRANCISCO, a city of the United States, the largest commercial city of California and of the Pacific coast, is situated in 37° 47' 22-55 N. lat. and 122° 25' 40"°76 W. long., on the end of a peninsula which has the Pacific Ocean on one side and the Bay of San Francisco on the other. The width of this tongue of land within the city limits is about 6 miles, and its whole length about 26. The original site of San Francisco was so uninviting that many of the pioneers doubted if a place of much importance could ever spring up there. The hills (Russian Hill, 360 feet; Telegraph Hill, 294 feet; and a number of others, ranging from 75 to 120 feet) were barren and precipitous, and the interspaces, especially on the westerly side, were made up largely of shifting sand-dunes ; on the east side, however, the land sloped gently towards the bay, and there was the further advantage of a small cove extending inland nearly to the present line of Montgomery Street. This cove

has since been filled up and built over. After an attempt to found the commercial metropolis at Benicia, 30 miles north on the Straits of Carquinez, it was evident that no other place within easy distance from the ocean possessed so many advantages for the site of a city as this barren

He travelled | from Venice to Constantinople, thence to Egypt, thence |

peninsula. The Bay of San Francisco is reached from the ocean through the Golden Gate, a strait about 5 miles long and averaging 1 mile in width, with a depth of 30 feet on the bar at the entrance and from 60 to 100 feet within. The bay, which extends past the city in a south- south-east direction for about 40 miles, is about seven miles wide in front of the city, while its greatest width is 12. Connected with the Bay of San Francisco on the north by a strait 3 miles wide is San Pablo Bay, about 10 miles in length and the same in breadth, having at its extreme northerly end Mare Island, the site of the navy yard. This bay, again, is connected by the Straits of Carquinez with Suisun Bay, 8 miles long and 4 wide. The total length of these bays and connecting straits is 65 miles. This great inland water, sheltered and for the most part navigable by the largest craft, receives the two great

Washington Corners \ oltission San Jose

Environs of San Francisco.

rivers of California, the Sacramento and the San Joaquin. In the Bay of San Francisco are Alcatraz Island (30 acres), strongly fortified ; Angel Island (800 acres), fortified; and Yerba Buena, or Goat Island (about 300 acres).

The presidio or fortified settlement of San Francisco was founded on 17th September 1776, and the mission (San Francisco de los Dolores) in the following October. In 1830 the population of the presidio consisted of about fifty Spanish soldiers and officers; these added to the number at the mission made an aggregate population of about 200. Beechy, who visited the harbour and presidio in 1826, has left the following description :—

“The governor’s abode was in a corner of the presidio, and formed one end of a row of which the other was oceupied by a chapel ; the

“opposite side was broken down, and little better than a heap of

rubbish and bones, on which jackals, dogs, and vultures were con- stantly preying. he other two sides of the quadrangle contained stone houses, artificers’ shops, and the jail, all built in the humblest style with badly burned brieks and roofed with tiles. The chapel and the Government house were distinguished by being whitewashed.”

SAN FRANCISCO

The presidio enclosure was about 300 yards square. In 1834, when it was secularized and began to be known by the secular name of Yerba Buena, the mission Dolores had a population of 500. In the summer of 1846 an American man-of-war took possession of the place. In the early part of 1849 the inhabitants numbered about 2000, and the embryo city had already come to be known by its future name of San Francisco. In consequence of the dis- covery of gold in California a strong drift of population set in towards the placer mines, and at the end of 1849 there were 20,000 people in the city. The first legislature of California granted a charter to San Francisco on 1st May 1850. Prior to that date the government of the pueblo had been administered by an alcalde. The pueblo grant originally made by the king of Spain contained four square (Spanish) leagues of land; this grant was subsequently confirmed to San Fran- cisco by an Act of Con-

west, a distance of 3 miles or more. The more important streets are paved for the most part with cobble stones and basalt blocks ; but asphalt on a stone or concrete founda- tion has begun to be used. Among the public buildings and institutions of San Francisco are the mint, appraisers' stores, subtreasury, custom-house, merchants' exchange, stock exchange, city-hall, industrial school, house of correc- tion, almshouse, Masonic Temple, new Oddfellows' building, safe deposit, and seven theatres and opera-houses. The Palace Hotel cost $3,250,000, and can accommodate 1200 guests. The city has eleven public squares. Its greatest attraction is the Golden Gate Park of 1050 acres, 3 miles long and half a mile wide, having the ocean for its extreme westerly boundary. The greater part of this area was for- merly a shifting sand-dune. An extensive glass-house in a central position is filled with the rarest tropical and semi-

& . 5 , Seale of Yards gress. The jurisdiction F1{_| yt : —] as ' ed 24 of the municipality ex- H OO qopoSeaoo = mee tends over the islands in | Government ee oo ae = nen a the bay. The area in- |**"™™ is ?

eluded in the limits of the city exceeds the original

four square leagues con- siderably, including what were originally denomi- nated 'swamp and over- flowed lands" (see Dwi- nelle's Colonial History).

In the first stages of its history the buildings of the city were chiefly of wood,—in many cases the frames and coverings having been brought from the Atlantic States round Cape Horn in sailing vessels. Within a few months of the establish- mentof municipal govern- ment the city suffered severely on more than one occasion from fire. The fire of 4th May 1850 destroyed property to the value of about $3,000,000; another in the following month was still more destructive ($4,000,000); and the damage resulting from a third in September was estimated at $500,000.

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San Francisco (north-eastern part).

These occurrences naturally led to the employment of more substantial building material in some cases, granite being imported from China for some buildings, and iron and brick being used to a considerable extent on others; but to this day nearly all the private dwellings of the city are of wood. Since 1850, however, the damage from fire in the portion of the city occupied by private houses has been remarkably small,—partly because of the use of red- wood instead of pine. In the business houses erected recently the increase of solidity and costliness has been very marked.

Throughout a considerable part of the city the streets are laid out in rectangular form, and nowhere with any reference to the natural elevations. The most important business thoroughfare is Market Street, extending from the water front at the ferry landings to the hills on the

tropical plants and shrubs; a large part of the area is planted with forest trees, or is laid down in grass; the walks and drives are well planned and well kept.

San Francisco is traversed in various directions by horse railroads, which extend from the water front to the suburbs. There are also‘50 miles of wire cable roads, which are yearly increasing, These cable tramways extend 2 miles on Clay Street, overcoming an elevation of 120 feet. The cost of their construction and equip- ment has ranged from $100,000 to $125,000 per

mile. The speed is usually about 5 miles an hour. San Fran- cisco is the terminus of two continental railways, viz., the Union and Central Pacific and the Southern Pacific ; while a third, the Atlantic and Pacific, enters the city over a leased line from Mohave. Two narrow-gauge lines and one broad-gauge, each less than a hundred miles long, to

important points in the State, are connected with the city

by means of ferries. ;

The population of San Francisco, as shown by the census returns, was 34,000 in 1850; in 1860, 56,802 ; in 1870, 149,473; and in 1880, 233,959 (182,608 males, 101,351 females) ; in 1885 it was estimated, on the basis of the school census, at 275,000 (Chinese, 30,000). At the last presidential election (1884) the total vote cast in the city was 50,167, the total foreign vote being 25,254; of these 12,837 were British (10,206 of them Irish) and 7052 Germans. Of the 90,468 children in the city under seventeen reported for the fiscal year 1884-85, 50,973 had foreign-born parents, and 15,460 more had one parent of foreign origin. In social customs, trade usages, amuse- ments, and religious observances, the large foreign popu- lation of San Francisco contributes materially to the formation of its liberal and cosmopolitan character.

Administration, &c.—In July 1856 the city and county, which until then had maintained separate governments, were consolidated in one organization. The government is administered by a mayor and a board of twelve supervisors, with the usual officers common to municipal and county organizations. There is also a superior court having twelve departments, with one judge for each, a police court, and justices' courts. The supreme court of the State holds a number of terms each year in San Fraricisco. The U.S. district and eircuit courts also hold regular terms in the city. There is a well-organized and efficient police force of 400 men. On 1st July 1884 the fire department had 315 men. The city is supplied with gas by two companies. Water is supplied by the Spring Valley Company, principally from San Mateo county. The water is brought in three lines of wrought-iron pipe; the largest, which connects the Crystal Springs reservoir

with the city, is 44 inches in diameter and 23 miles in length. The daily consumption of water is about 18,000,000 gallons. The company is able to supply 25,000,000 gallons daily.

Finance.—The assessment roll of personal property in 1885 showed a value of $56,634, 860,—that of real estate and improve- ments being returned at $171,433,126. The actual value is not less than $350,000,000. The debt of the municipality is 34 million dollars. There are twelve incorporated commercial or discount banks, with an aggregate paid-up capital of $21,047,965, and a surplus (1st July 1885) of $8,945,647. The total assets are set down at $50,894,972. There are alsoa number of private banks. There are eight savings banks, all but one of these having some paid-up capital, the aggregate of which is $1,651,200. These banks on the 1st of July 1885 held deposits to the amount of $52,577,746 ; they had also a surplus beyond the paid-up capital of $2,067,209. ‘The banks having a subscribed and paid-up capital pay regular dividends on the entire amount of nominal capital aud about 44 per cent. per annum to depositors.

Commerce.—The exports by water for the fiscal year 1884-85 amounted to $37,170,800, and the imports to $37,171,100; the items of import and export by rail bring the total up to $80,000,000, The duties collected on imports were $6,610,400. The treasure shipped amounted to $17,540,000 ; and the exports of quicksilver were 14,900 flasks, valued at $438,800. The receipts of treasure from all productive sources west of the Missouri, including Mexico, reached a total of $40,253,635, and the coinage at the mint in San Franciseo was of the value of $23,750,000, with an addition of $1,500,000 on foreign account. The sailing ships entering the port numbered 619 (604,200 tons) ; the steamers were 225. Among the imports were—coffee, 19,505,800 ib; sugar, 152,374,870 ib; eoal, 900,000 tons ; lumber, 297,234,000 feet (92,754,000 feet red- wood, 177,305,000 feet pine, the remainder miscellaneous). The exports of wheat were 1,001,900 tons, valued at $26,791,500; this quantity was exported in 366 ships, the freights to Europe ranging from 25s. to 48s. 6d. per ton. British iron sailing vessels have the preference for wheat exportation, and obtain the highest rates. A much larger class of vessels is employed in this trade than formerly, the cargoes now averaging about 3000 tons. There are regular steamship lines connecting San Francisco with Mexican, Central American,

Australian, Hawaiian, Japanese, and Chinese ports, and with the chief port of British Columbia. The Pacific Whaling Company owus five or six ships, principally steamers, employed in the Arctic whale fishery. The same company has also extensive works for refining the oil in San Francisco. There is one stone dry dock admitting vessels of 6000 tons, and two or more floating docks which ean take on vessels from 500 to 800 tons burthen. A sea-wall is in process of construction by State authority round the deep-water front to prevent the shoaling of the water in the slips resulting in part from the gradual washing down of debris from the hills and steep slopes of the city. =

Manufoctures.—For many years manufactures made slow pro-

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SAN FRAN G@ESCO

gress, The city was remote from the great centres of population, and labour was very costly. But these disadvantages have been gradually overcome. In 1875 there were 18,000 persons employed in manufacturing cstablishments, and the value produced was $40,000,000. In 1885 38,919 persons were so employed, and the estimated value for the business year ending lst July was $86,417,200. Subjoined are some of the leading manufactures, with the number of persons employed and the annual value of their production :—bags, 300, $1,500,000 ; boots and shoes, 3500, $5,300,000; cigar-boxes, 260, $5,000,000; wooden boxes, 350, $1,000,000 ; brass-foundries, 350, $535,000; breweries, 450, $2,450,000 ; cigars, 8000, $4,850,000 ; clothing, 1900, $3,750,000 ; coffee and spices, $900,000; cordage and ropes, 150, $600,000 ; crackers, 150, $620,000; dry docks (stone), 6, $675,000 ; flour, 175, $2,230,000; foundries, 2000, $5,500,000; furs, 170, $500,000 ; furniture, 1000, $2,000,000; gas-works, 460, $12,000,000; harness, 440, $1,150,000; jewellery, 165, $600,000; linseed oil, 55, $600,000; picklesand fruits, 2000, $1,700,000 ; provision-packing, 250, $1,900,000; rolling-mills, 550, $1,880,000 ; sashes, doors, &c., 1550, $5,010,000; ship-yards, 200, $503,000; shirts, 2550, $1,000,000 ; soap, 190, $715,100 ; sugar-refineries, 360, $8,700,000 ; tanneries, 835, $1,700,000; tinwares, 180, $525,000; woollen- mills, 1500, $1,900,000. In the laundries, it may be added, 985 whites and 1300 Chinese were employed.

Churches and Charities.—There are 70 Protestant churches in the city, representing nearly all the denominations of the country. Besides these there are 19 Roman Catholic churches and a number of chapels connected with the various hospitals and schools. There are 7 synagogues aud 1 Greek church (Russian), Including the chapels, the total number of places of worship may be set down at 100. With few exceptions, the church edifices are not imposing. In consequence of the rapid growth of tlie city wood has been employed in a majority of cases, but this is now being discarded for stone. The asylums and beuevolent associations are numerous and well-supported. The more prominent of these institutions are the Protestant Orphan Asylum (214 children), Catholic Orphan Asylum, Pacific Hebrew Orphan Asylum, Magdalen Asylum, Old People's Home, Ladies' Protection and Relief Society, Little Sisters' Infant Shelter, Seamen's Friends Society, San Francisco Benevolent Society, Ladies' United Hebrew Benevolent Society, San Francisco Fruit and Flower Mission, Young Men's Christian Association, Pacific Homeopathic Dispensary, Lying-in Hospital. Besides these there are a great number of associations which care for their members, and in some instances provide the best medical attend- ance in private hospitals. Nearly all classes of forcign nativity have established benevolent associations; British, French, and German institutions have large resources, and are managed with great efficiency. Nearly all the secret orders (Masonic, Oddfellows, &c.) devoted in whole or in part to works of benevolence are strongly represented.

Public Schools.—The first public school was established in April 1849. There are now sixty-one free schools, with 43,265 pupils and an average daily attendance of 32,188. The number of children in the city between the ages of five and seventeen years according to the census report of 1880 was 69,000. The number of teachers, male and female, employed in the public school department was 7834, the number of schoolhouses 65, and the expenditure for the fiscal year $817,168. The public schools are graded, the highest grades being two high schools for boys and girls respectively. Besides the day schools a number of evening schools are provided. There are upwards of 25,000 children who are to a large extent provided with instruction in public and private schools other than those belonging to the free-school department. There are about 100 schools in the city, of all grades, which are supported wholly by fees and voluntary contributions. Of

these the Roman Catholies have the greatest number, the latter includ- ing two colleges and a number of convent schools, The Protestant denominations also have a number of classical and secondary schools of great excellence. The public-school system of the State culminates in the university of California, which has an aggregate endowment equal to about $3,000,000. The institution is situated in the beautiful suburban town of Berkeley, on the opposite side of the bay (named in honour of Bishop Berkeley). Instruction is furnished free to all pupils who comply with the terms of admis- sion. There are also a number of professional schools in the city, chief among which are the law, medical, and dental departments of the university, the Cooper Medical College, the Hahnemann Medical College, the San Francisco Theological Seminary, and an art school with an average attendance of about 75 students. The late James Lick left a bequest of $540,000 for the endowment of a School of Mechanic Arts, and among other bequests a large one for the Academy of Sciences, founded in the early pcriod of the city. The public-school department of San Francisco is under the immediate supervision of a superintendent and twelve school directors, one for each ward of the city. There are eighteen public libraries, including the free library with 52,970 volumes. The Mercantile Library Association has 52,000 volumes, the Mcchanics'

Institute 35,000, the Oddfellows' Library Association* 39,000, and the Law Library 23,355. There is also a rich and extensive State mincralogical collection. (W. C. B.)

SANGALLO, the surname of a Florentine family, several members of which became distinguished in the fine arts.

I. Grunrano pi Sancatto (1443-1517) was a dis- tinguished Florentine architect, sculptor, tarsiatore, and inilitary engineer. His father, Francesco di Paolo Giam- berti, was also an able architect, much employed by Cosimo de' Medici. During the early part of his life Giuliano worked chiefly for Lorenzo the Magnificent, for whom he built a fine palace at Poggio-a-Cajano, between Florence and Pistoia, and strengthened the fortifications of Flor- ence, Castellana, and other places. Lorenzo also employed him to build a monastery of Austin Friars outside the Florentine gate of San Gallo,

a nobly designed structure, which was destroyed during the siege of Florence in 1530. It was from this building that Giuliano received the name of Sangallo, which was afterwards used by so many Italian architects. While still in the pay of Lorenzo, Giuliano visited Naples, and worked there for the king, who highly appreciated his services and sent him back to Florence with many handsome presents of money, plate, and antique sculpture, the last of which Giuliano presented to his patron Lorenzo, who was an enthusiastic collector of works of classic art. After Lorenzo's death in 1492, Giuliano visited Loreto, and with great constructive skill built the dome of the church of the Madonna, in spite of serious difficulties arising from its defective piers, which were already built. In order to gain strength by means of a strong cement, Giuliano built his dome with pozzolana brought from Rome. Soon after this, at the invitation of Pope Alexander VI., Giuliano went to Rome, and designed the fine panelled ceiling of 8. Maria Maggiore. He was also largely employed by Julius II., both for fortification walls round the castle of 8. Angelo, and also to build a palace adjoining the church of S. Pietro in Vincoli, of which Julius had been titular cardinal. Giuliano was much disappointed that Bramante was preferred to him- self as architect for the new basilica of St Peter, and this led to his returning to Florence, where he was warmly received by the gonfaloniere Pier Soderini, and did much service to his native state by his able help as a military engineer and builder of fortresses during the war between Florence and Pisa. Soon after this Giuliano was recalled to Rome by Julius [L, who had much need for his military talents both in Rome itself and also during his attack upon Bologna. For about eighteen months in 1514-1515 Giuliano acted as joint-architect to St Peter's together with Raphael, but owing to age and ill-health he resigned this office about two years before his death in 1517. But little remains to enable one to judge of Giuliano's talents in the artistic side of his profession; the greater part of his life was spent on military works, in which he evidently showed great skill and practical knowledge of construction.

II. Antonio pr Sancatto (14487-1534) was the younger brother of Giuliano, and took from him the name of Sangallo. Toa great extent he worked in partnership with his brother, but he also executed a number of inde- pendent works. As a military engineer he was as skilful as Giuliano, and carried out important works of walling and building fortresses at Arezzo,

Montefiascone, Florence, and Rome. His finest existing work as an architect is the church of S. Biagio at Montepulciano, in plan a Greek cross with central dome and two towers, much resembling, on a small scale, Bramante's design for St Peter's. He also built a palace in the same city, various churches and palaces at Monte Sansavino, and at Florence a range of monastic buildings for the Servite monks,

Antonio retired early from the practice of his profession, and spent his latter years in farming.

III Francesco pi SANGALLO (1493-1570), the son of Giuliano di Sangallo, was a pupil of Andrea Sansovino, and worked chiefly as a sculptor. His works have for the most part but little merit,—the finest being his noble effigy of Bishop Leonardo Bonafede, which lies on the pavement of the church of the Certosa, near Florence. It is simply treated, with many traces of the better taste of the 15th century. His other chief existing work is the group of the Virgin and Child and St Anne, executed in 1526 for the altar of Or San Michele, where it still stands.

IV. Bastrano pi Saneatto (1481-1551), Florentine sculptor and painter, was a nephew of Giuliano and Antonio. He is usually known as Aristotile, a nickname he received from his air of sententious gravity. He was

_at first a pupil of Perugino, but afterwards became a

follower of Michelangelo. His life is given at great length by Vasari, in spite of his being an artist of very mediocre powers.

V. ANTONIO DI SANGALLO, the younger (?~~1546), another nephew of Giuliano, went while very young to Rome, and became a pupil of Bramante, of whose style he was after~~ wards a close follower. He lived and worked in Rome during the greater part of his life, and was much employed by several of the popes. His most perfect existing work is the brick and travertine church of S. Maria di Loreto, close by Trajan's column, a building remarkable for the great beauty of its proportions, and its noble effect pro- duced with much simplicity. The lower order is square in plan,

the next octagonal ; and the whole is surmounted by a fine dome and lofty lantern. The lantern is, however, a later addition. The interior is very impressive, considering its very moderate size. Antonio also carried out the lofty and well-designed church of 8. Giovanni dei Fiorentini, which had been begun by Jacobo Sansovino. The east end of this church rises in a very stately way out of the bed of the Tiber, near the bridge of 8S. Angelo; the west end has been ruined by the addition of a later facade, but the interior is a noble example of a somewhat dull style. Great skill has been shown in successfully building this large church, partly on the solid ground of the bank and partly on the shifting sand of the river bed. Antonio also built the Cappella Paolina and other parts of the Vatican, together with additions to the walls and forts of the Leonine City. His most ornate work is the lower part of the cortile of the Farnese palace, afterwards completed by Michelangelo, a very rich and well-proportioned specimen of the then favourite design, a series of arches between engaged columns supporting an entablature, an arrangement taken from the outside of the Colosseum. A palace in the Via Giulia built for himself still exists under the name of the Palazzo Sacchetti, but is much injured by alterations. Antonio also constructed the very deep and ingenious rock-cut well at Orvieto, formed with a double spira! staircase, like the well of Saladin in the citadel of Cairo.

For other architects called Sangallo who lived during the 16th century see Ravioli, Notizie sui lavori….. dei nove Da San Gallo, Rome, 1860. (J. H. M.)

SANGERHAUSEN, an ancient town of Prussian Saxony, is situated on the Gonna, near the south base of the Harz Mountains, and 30 miles to the west of Halle. In 1880 it contained 9136 inhabitants, chiefly occupied in the manufacture of beetroot sugar, machinery, buttons, &c., in agriculture, and in the coal and copper mines of the neighbourhood. Sangerhausen is one of the oldest towns in Thuringia, being mentioned in a document of the 10th century. The Romanesque church of St Ulrich is said to have been founded by Louis the “Springer,” margrave of Thuringia, in 1079.

SANHEDRIN. See SYNEDRIUM.

SANITATION. See Hycienz and Sewace.

SAN JOSE, the capital of Costa Rica, Central America, stands 3900 feet above the sea, in a beautiful valley sur- rounded by mountains, on the west side of the main range about 15 miles north-west of Cartago (the ancient capital), with which it is connected by a railway (1884). Since 1870 the cathedral has been restored, a handsome market- place with offices for the municipality erected, the barracks rebuilt and fortified, and several of the streets macadam-

ized. San José is the seat of the national bank (founded |

in 1873) and of a university, to which a medical school and a museum are attached. The population is estimated at from 20,000 to 25,000. As a city it dates from the

latter half of the 18th century ; it became the capital after |

the destruction of Cartago by earthquake in 1841.

SAN JOSE, a city of the United States, capital of Santa Clara county, California, lies 40 miles south-east of San Francisco and 8 miles from the southern end of San

“ranci in the heart of the beautiful Santa Clara | j Se ee ed | in a bare, sandy, and undulating country, on the left bank

Valley. It is at this point that the railways from the two sides of the bay meet. The main part of the city occupies a gently rising plateau between the Coyote and Guadalupe rivers. Among the principal buildings are a fine court- house, a theatre, a city-hall, two markets, a music-hall, the State normal school, the Methodist ‘university of the Pacific,” and a number of large colleges and schools. Besides three public parks in the city San José possesses a tract of 400 acres in Penitencia Cafion, 7 miles east, reserved for a similar purpose. (founded in 1884 on the top of Mount Hamilton) is 12 miles distant, and the Almaden quicksilver mines about 14 miles. The

population of the city was 9089 in 1870, and 12,567 (township 18,103) in 1880.

Founded by the Spanish missionaries in 1777, San José remained a small village of adobe huts till the annexation of the country to the United States. The first session of the legislature of California was held in the town in 1849-50.

SAN JUAN BAUTISTA. See Porro Rico.

SAN JUAN DE LA FRONTERA, the capital of a province of the Argentine Republic, is situated 2310 feet above the sea in a great bend of the Rio de San Juan, 95 miles north of Mendoza and 730 miles from Buenos Ayres, with which it is about to be connected by rail (1886). It is mostly built of sun-dried bricks, has a cathedral, several churches and schools, two banks, and a botanical garden, and carries on a considerable trade with Chili by the Patos and Uspallata passes. Population estimated at 20,000

1881).

San – was founded in 1561 by Captain Castillo on a site 4 miles to the north, which had to be abandoned owing to inundations and is now called Pueblo Viejo. From 1776 to 1820 the city was in the government of Mendoza. President Sarmiento bestowed special attention on this his native town and gave his name to its

principal school, famous throughout the republic for its excellent equipment.

SAN JUAN DEL NORTE. See Greytown.

SAN JUAN (or HARO) ISLANDS, an archipelago (San Juan, Orcas, Shaw, Lopez, Blakely, Cypress, &c.) lying between Vancouver Island and the mainland of North America, which were’ for many years the subject of dispute between the British and the United States Governments, aud were finally assigned to the latter country by the arbitration of the emperor of Germany (21st October 1872). Geographically the cluster certainly belongs to the mainland, from which it is separated by Rosario Channel, generally

much under 50 fathoms in depth, while Haro Strait, separating it from Vancouver Island, has depths ranging from 100 to 190 fathoms. In 1873 the islands, formerly considered Territory, were made the separate county of San Juan. Of the total area of 200 square miles, about 60 are in San

 Juan, 60 in Orcas, and 30 in Lopez.

The population was 554 in 1870 and 948 in 1880.

See Papers relating to the Treaty of Washington, vol. v., 1872, and the map in Petermann's Afttiheilungen, 1873.

SANKT JOHANN. See SaaRBrRvcKen.

SANKT POLTEN, a small town, and the seat of a bishop, in Lower Austria, is situated on the Treisen, a tributary of the Danube, 61 miles west of Vienna by rail, It contains an interesting old abbey church, founded in 1030 and restored in 1266 and again at the beginning of the 18th century. There are several religious educational

institutions in the town, and a military academy for

engineers. The inhabitants, 10,015 in number, carry on some trade, and the manufacture of iron: wire, paper, weapons, &c. The name is said to be a corruption of Traisma ad S. Hippolytum, from a convent that formerly stood here. The history of the bishopric has been written in two volumes by Kerschbaumer (Vienna, 1875-6).

SAN LUCAR DE BARRAMEDA, a town of Spain, in the province of Cadiz, and 27 miles by sea from that city,

of the Guadalquivir, not far from its mouth. It stands

partly on the flat bank of the river and partly on the

rising ground behind, the summit of which is crowned by an old Moorish castle. There is an old parish church dating from the 14th century. The other

buildings have

no special interest, and the place as a whole is dull and _ lifeless, having lost much of the commercial importance it

formerly possessed. It is now chiefly dependent on the trade in its wines, which is still considerable. Many of the inhabitants are employed in agriculture and fishing, The population within the municipal boundaries was 21,918 in 1877.

SAN LUIS POTOSI, a city of Mexico, capital of the state of the same name, is situated at a height of 6200

| feet on the eastern edge of the great plain of Anahuac, in

part of Whatcom county, Washington |

a valley running north and south, 160 miles north-west of Queretaro. It is a great centre for the “ diligence” traffic, and in 1885 was connected by rail with Tampico, a pro- mising harbour on the Gulf of Mexico. The city proper, which has a rather imposing Oriental appearance, is laid out with great regularity ; the streets are well-paved, and the houses, usually two stories in height, are frequently fine specimens of old Spanish architecture. But suburbs of wretched hovels spread over a considerable area. Among the conspicuous buildings are the cathedral, the Government house, with a front in rose-coloured stone, the city-hall, the mint, the churches of El Carmen, San Fran- cisco, &c., and the recently erected “American” hotel, which, with tramways, telephones, and electric light, is a symptom of the Occidentalizing that is rapidly taking place in the inland cities of Mexico. The Instituto Cientifico is a kind of university for the teaching of law, medicine, and the exact sciences. Plaza Hidalgo takes its name from the statue to the martyr of Mexican independence. A considerable trade is carried on in cattle, hides, and tallow. The population is stated at 30,000, or with the suburbs 60,000.

Founded in 1586, San Luis Potosi has played an important part in the Mexican civil wars. In 1863 it was the seat of the national

government under Juarez, and after being occupied by Bazaine was recovered by Juarez in 1867.

SAN MARINO, the smallest independent republic in Europe, has an area of 33 square miles (Strelbitsky), lies between the provinces of Forli and Pesaro-Urbino, and consists of part of the eastern spurs of the Apennines. Monte Titano, the central and culminating summit, has three peaks (M. Guaita, Cucco, and Gista), the three Penne of San Marino—a name evidently identical with the Celtic Penn or Benn, but translated by the canting heraldry of the republic's coat of arms as three " feathers." The two

streams (Marecchia and Ausa) which pass through Rimini to the sea have their head-waters partly in the north and west of San Marino, while its south-eastern valleys are drained by the sources of the Marano. Farming and stock-raising occupy the bulk of the population (total, 5700 in 1850, 7816 in 1874), and their wines and oxen are botli highly prized. The city of San Marino (1600 inhabitants), formerly reached only by a mule-track but since 1875 by a good carriage-road, is a quaint little place with steep and narrow streets and picturesque but gloomy houses of undressed stone, and containing five churches, a council- hall, an audience chamber, a law court, a little theatre, a museum, and a library. square (Pianello) stands a white marble statue of Liberty, presented by the duchess of Acquaviva. At the foot of the city-hill lies the Borgo di San Marino (the commercial centre of the republic); and other municipal villages are Serravalle, Faetano, and Montegiardino, each with remains of its castle and fortifications.

The republic is governed by a great council (Generale-Consiglio- Principe) of 60 members (20 nobles, 20 burgesses, 20 rural land- owners) named for life by the council itself. From this body is elected the Council of Twelve, which with the assistance of a legal adviser decides in the third and last resort. Two captains-regent elected every six months (one from the nobles, one from the other two classes) represent the state, which also has its home secretary, its minister of foreign affairs, its chancellor of the exchequer, an army of 950 men, and a regular budget. By treaty with Italy (1872) San Marino, instead of maintaining a customs line of its own, receives a certain proportion of the Italian customs revenue, and, agreeing not to grow

tobacco, is allowed to purchase foreign tobacco duty free. To avoid any difficulty about copyright there is no printing press in the republic.

San Marino derives its name from a certain Dalmatian mason who, along with a comrade immortalized by the neighbouring castle and cathedral of San Leo, settled in this region in the 3d century. The bones of Marinus are said to have been removed to Pavia by the Lombard king Astolphus and restored to the little city on

Mount Titanus by Pippin; but the first authentic document proving |

the existence of the community dates from 885. Situated as a bulwark between the hostile honses of Montefeltro and Malatesta, San Marino fortunately attached itself to the stronger party, which in the 15th century placed its representative on the ducal throne of Yrbino. The assistance which it rendered Duke Fedcrigo and his allies, the king of Naples and the pope, against Sigismondo Malatesta was rewarded in 1463 with the castles and territories of Serravalle, Factano, and Montegiardino. On the annexation of Urbino to the States of the Church (1631), the independence of San Marino was acknowledged; and the unauthorized assertion of papal jurisdiction by Alberoni in 1739 was disallowed by Clement XII. on February 5th 1740. In 1797 Napoleon I. decided to preserve this “échantillon de république;” and in 1854 it was protected from the designs of Pius IX. by the interference of Napoleon III. At the unification of Italy, Cibrario, a citizen in the service of the house of Savoy, helped to secure excellent terms for San Marino.

See Melchiorre Deltico, Memorie storiche . . . di San Marino; Marino Fattori,

Ricordi storict . . . . 1869; Count Bruc, St Marin, Paris, 1876; Bent, A Freak of Freedom, 1879 ; Casati, La repubblica di San Marino, Milan, 1881.

SAN MARTIN DE JOSE (1778-1850), Chilian gene- ral, was born at Yapeyu, on the Uruguay river, February 25, 1778. Inhis eighth or ninth year he accompanied his own family to Spain for his education, and being intended for the military profession was admitted into the college of nobles at Madrid. He saw active service and gained dis- tinction in the war of

independence, and had risen to the rank of lieutenant-colonel when in 1811 he returned to La Plata. Entering the service of the insurgents there he was

entrusted with raising a troop of cavalry, and afterwards |

was appointed to the chief command of the army acting in Upper Peru against the forces of the viceroy of Lima.

After re-establishing his health at Cordova in 1814, he |

proceeded in 1815 to take command of Cuyo, where he organized an expedition for the liberation of Chili (see vol. v. p. 618). He crossed tha mountains early in 1817, and, after gaining a brilliant victory at Chacabuco on 12th February, was pressed by the people of Chili to take the supreme command, and gained a still more brilliant victory at Maypé, 5th April 1818. After organizing the govern-

In the centre of the principal |

ment of Chili he sailed with the squadron under Lord Cochrane for Peru, 21st August 1820, and, capturing Lima, drove the Spaniards from the coast and assumed the title of “Protector” of Peru in 1821, but resigned it a year afterwards, and, sailing secretly for Europe, spent the remainder of his life in absolute seclusion near Paris. He died at Boulogne, 17th August 1850.

See Biographical Sketch of General San Martin attached to

Peruvian Pamphlet, being an exposition of the Administrative Labours of the Peruvian Government, 1828.

SAN MICHELE, MicuEte (1484-1559), oneof the ablest architects of his time, learnt the elements of his profession from his father Giovanni and his uncle Bartolommeo, who both practised as architects at Verona with much success. Like almost all the enthusiastic students of that time he went at an early age to Rome to study classic sculp- ture and architecture. His great talents soon became known, and he designed and carried out a very large

number of works at Verona, Venice, and other places. Among his earliest are the duomo of Montefiascone (an octagonal building surmounted with a cupola), the church of San Domenico at Orvieto, and several palaces at both places. He also executed a fine tomb in S. Domenico.} He was no less distinguished as a military architect, and was much employed by the signoria of Venice, not only at home, but also in strengthening the fortifications of Corfu, Cyprus, and Candia.2_ One of Sanmichele's most graceful designs is the Cappella de' Peregrini in the church of S. Bernardino at Verona—square outside and circular within, of the Corinthian order. He built a great number of fine palaces at Verona, five of which still exist, as well as the graceful Ponte Nuovo. His last work, begun in 1559, was the round church of the Madonna di Campagna, a mile and a half from Verona on the road to Venice. Like most other distinguished architects of his time he wrote a work on classic architecture, Zi Cinque Ordine del? Architettura, printed at Verona in 1735. Sanmichele to some extent followed the earlier style of Brunelleschi; his work is always refined and his detail delicate. His chief pupil was his nephew Bernardino.

See Ronzani and Luciolli, Fabbriche. .. . di M. Sammichele, Venice, 1832 ; and Selva, Elogio di Sanmichele, Rome, 1814. See

SAN MIGUEL (8. Satvapor), or St MicHaE's. AzorEs, vol. i. p. 171.

SANNAZARO, Jacopo (1458-1530), one of the poets of the Renaissance in Italy, was born in 1458 at Naples of a noble family, said to have been of Spanish origin, which had its seat at San Nazaro near Pavia. His father died during the boyhood of Jacopo, who was accordingly brought up in a very plain way at Nocera Inferiore. He afterwards studied at Naples under Pontanus, when, according to the fashion of the time, he assumed the name Actius Syncerus, by which he is occasionally referred to. After the death of his mother he went abroad,—driven, we are told, by the pangs of despised love for a certain Carmosina, whom he has celebrated in his verse under various names ; but of the details of his travels nothing is recorded. On his return he speedily achieved fame as a poet and place as a courtier, receiving from Frederick III. as a country residence the Villa Mergillina near Naples. When his patron was compelled to take refuge in France in 1501 he was accompanied by Sannazaro, who did not return to Italy till after his death

(1504). The later years of the poet seem to have been spent at Naples without interruption or memorable incident. He died on April 27,

1530.

The Areadia of Sannazaro, begun in early life and published in 1504, is a somewhat affected and insipid Italian pastoral, in which

1 See Della Valle, Storia del Duomo di Orvieto, Rome, 1791. 2 See Bartoldi, Sanmichele al servizio della repubblica Veneta. 3 See Giuliari, Cap. de' Peregrini, Verona, 1816.

See vol. xi. Plate III.

in alternate prosc and verse the scenes and occupations of pastoral life arc described. His now seldom read Latin poem De Partu Virginis, which gained for him the name of the "' Christian Virgil," appeared in 1526, and his collected Sonetti e Canzoni in 1530.

SAN REMO, a town and seaport of northern Italy, at the head of a circondario in the province of Porto Maurizio on the Western Riviera, 16? miles by rail east of Mentone and 84} south-west of Genoa. Climbing the slope of a steep hill, it looks south over a small bay of the Gulf of Genoa, and, protected towards the north by hills rising gradually from 500 to 8000 feet, has the reputation of being in climate one of the most favoured places on the whole coast. The narrow stair-like streets of the old town, with their lofty houses, arched gateways, and flying buttresses, form a fine contrast to the modern districts of villas and hotels which have sprung up since about 1860. Besides the Gothic cathedral of San Siro, the buildings of most interest are the Madonna della Costa, crowning the highest part of the old town, the town-house, and the hospital for cutaneous diseases founded by Charles Albert. The port, formed by two moles, both lengthened since 1880, was at one time much more important, its annual movement having sunk from about 1000 in 1866 to 388 small vessels in 1884. The population of the commune (10,012 in 1861) was 16,055 in 1881,—12,285 in the city proper, and 1717 in the suburbs Poggio and Verezzo.

San Remo, identified by Girolamo Rossi (Storia della Citta) with a Greek Leucothea and a Roman Matistra, was Christianized by St Ormisdas and his pupil St Sirus. Rebuilt after the expulsion of the Saracens from Liguria, it took the name of San Romolo from its 6th-century bishop whose death-day, 13th October, is stil] a local féte. In what way Romulus was supplanted by Remus is not clearly ascertained. In 1544 the town was attacked by Barbarossa, and in 1625 by the French and Savoyards. The Genoese, against whose encroachments it had long defended its independence, sub-

jugated it in 1753 ; and in 1797 it was incorporated in the district of Palms of the Ligurian republic.

SAN SALVADOR, or Satvapor (Repidblica del Sal- vador), the smallest but most densely peopled of the republics of Central America, has a coast-line of 160 miles along the Pacific from the mouth of Rio de la Paz to that of the Goascoran in the Gulf of F onseca, and is bounded inland by Guatemala on the west and Honduras on the north and east. Its length from east to west is 140 miles, and its average breadth about 60 miles, Its area is estimated at 7225 square miles, and in 1883 it contained 613,273 inhabitants (290,870 males, 322,403 females). With the exception of a comparatively narrow seaboard of low alluvial plains, the country consists mainly of a plateau about 2000 feet above the sea, broken by a large number of volcanic cones, geologically of more recent origin than the main chain of the Cordillera which lies farther to the north. The principal river of the republic is the Rio Lempa, which, rising near Esquipulas in Guate- mala and crossing a corner of Honduras, enters Salvador north of Cital4. After receiving from the right the surplus waters of the Laguna de Cuija, a vast lake belonging partly to Guatemala and partly to Salvador, it flows for nearly a degree of longitude eastward through a magnificent and luxuriant valley between the plateau and the Cordillera, and then turning somewhat abruptly south skirts the base of the volcano of Siguatepeque and reaches the Pacific in 88° 40’ W. long. Among its numerous tributaries are the Rio Santa Ana, rising near the city of that name, the Asalguate, which passes the capital San Salvador, the Sumpul, which forces its way like the Lempa itself athwart the mountains from Honduras, and the Torola, draining the north-eastern corner of Salvador and part of Honduras. The Lempa is even in the dry season a considerable river with a rapid current, and for

two-thirds of its course it could easily be made navigable for steamers. The Rio

San Miguel drains the country |

between the Gulf of Fonseca and the basin of the Lempa. The volcanic mountains do not form a chain but a series of clusters :—the Izalco group in the west—including Izaleo (formed in 1770), Marcelino, Santa Ana, Naranjos, Aguila, San Juan de Dios, Apaneca, Tamajaso, and Lagunita; the San Salvador group, about 30 miles to the east ; Cojute- peque to the north-east and the San Vicente group to the east of the great volcanic lake of Ilopango; the Siguate- peque summits to the north-east of San Vicente; and the great south-eastern or San Miguel group—San Miguel, Chinameca, Buenapa, Usulatan, Tecapa, Taburete. Caca- guateque and Sociedad volcanoes in the north-east belong to the inland Cordillera.

The volcanic forces in Salvador have not as yet spent themselves. The Izalco vent still acts as a safety valve, and the neighbourhood of the capital is so subject to tremblings and rockings of the earth as to have acquired the name of the swinging mat or ham- mock. The city itself has been destroyed by earthquake in 1594, 1658, in 1719, and in 1854. San Miguel is described as one of the most treacherous burning mountains in America, sometimes several years in complete repose and then all at once bursting out with terrific fury (Scherzer). “In 1879-1880 the Lake of Tlopango was the scene of a remarkable series of phenomena. With a length of

3 miles and a breadth of 44, it forms a rough parallelogram with deeply indented sides, and is surrounded in all directions by steep mouutains except at the points where the villages of Asino and Apulo occupy little patches of level ground. Between 31st Decem- ber 1879 and 11th January 1880 the lake rose four feet above its level. The Jiboa, which flows out at the south-east corner, became, instead of a very shallow stream 20 feet broad, a raging torrent which soon scooped out for itself in the volcanic rocks a channel 30 to 35 feet deep. A rapid subsidence of ‘the lake was thus pro- duced, and by the 6th of March the level was 342 feet below its maximum. Towards the centre of the lake a volcanic centre about 500 feet

in diameter rose 150 feet above the water, surrounded by a number of small islands. A number of villages were ruined by the accompanying earthquakes. The lake, originally stocked by the early Spanish settlers, had become the great fish-pond of the republic, On the outbreak of the volcanic forces, the fish fled towards the sides, and on the receding of the waters their dead bodies were left behind in such quantitics that at Asino several hundred men were employed for days burying them to avoid a pestilence.

It is less to these natural catastrophes than to political instability that the comparative backwardness of Salvador to develop its resources of soil and minerals must be ascribed ; and considerable progress has in many respects been made since the middle of the century. Coffee is now the principal export (to the value of $1,056,000 in 1873, $3,416,104 in 1883). Indigo, for a long time the staple of the country and exported to the annual value of $20,000,000, is still extensively cultivated (exports in 1883 $1,812,594). As this indigo is generally quoted in the market as Guatemalan, so another valuable product of Salvador is always designated Balsam of Peru (see vol, iii. p. 293), though the tree from which it is obtained grows naturally nowhere else in the world except in a limited part of the Salvadorian seaboard known as the Balsam coast. It was exported in 1883 to the value of $538,612. Other productions of less importance are tobacco, sarsaparilla, india-rubber, and sugar. The silver mines have been and may again be of some account ; and coal has been discovered inland. On the whole the trade of the country has greatly in- creased : the imports and exports, $1,306,378 and $1,991,650 respectively in 1859, were $2,401,463 and $5,861,053 in 1883. At the time of Dr Scherzer’s visit, there was not a bridge in the country ; there are nowa considerable number of good iron bridges on the new roads between the principal citics. The first railway, that from Acajutla to Sonsonate (15 miles) was opened in 1882, and has since been continued in the direction of Santa Ana, the chief commercial town. Telegraphic communication has been estab- lished between the more important towns, and in J uly 1882 the Central and North American Company landed its cable at La Libertad. Acajutla, La Libertad, and La Union or San Carlos de la Union (in the Gulf of Fonseca) are the principal harbours. Besides the capital San Salvador, with 14,059inhabitants, there were in 1878, according to the census, 68 places in the republic with over 2000 each—Santa Ana (29,908), Nahuizalco (9988), San Vicente (9957), San Miguel (9842),

Metapan (9782), Chalchuapa (8171), Ahuachapan (7930), Nuevo San Salvador (7337), &c. There are three universities—San Salvador, Santa Ana, and San Miguel, with funds partly provided by a quarter of the customs,— a girls' college at Santa Ana, and a fair number of secondary and primary schools. Salvador received this name from Pedro Alvaredo, who, when he conquered it for Spain in 1525-26, found it arich and populous country. Its independence of the Spanish

crown dates from 1842; in 1853 it obtained the eonstitution under which (in a modified form) it now exists as a sovereign state. General Barrios, having in 1858 obliged the president Santin del Castillo to abdicate, secured his own permanent appointment to the office in 1860; but in 1863-4 he failed in his endeavour to defend his capital against the Guatemalans, and when he returnedin 1864 to attack Ducfias, the Guatemalan protégé, he was defeated and put to death. "Pronunciamientos " have since been the too general preliminaries of presidential elections ; but there has been no serious war, and the finances of the republic have usually a balance on the right side.

See Scherzer, Travels in Central America (1857); Sonnenstern, Descripcion del estado del Salvador (New York, 1859, with a good map reproduced in Berlin Zeitsch. fiir Geographie, 1860); Dollfus and Montserrat, Voy. géologique dans les republiques de Guatémala et de Salvador (1868); Blairet, Le Sa/vador (1872); Frantzius's translation of De Palacio, San Salvador and Honduras in 1576 (1873); Guzman, Apuntamtentos sobre la geogr. fisica de la rep. del Salvador, 1883.

SANSANDING, or Sansanpvic, a town in the interior of Western Africa, on the north bank of the Niger, in 13° 40' N. lat. and 6° 25' W. long., and included in the "empire" of Segu. It was visited by Mungo Park in 1796, and in 1865 by Mage and Quintin, who witnessed the stand it made against a siege by Ahmedu, sultan of Segu, from whom it had revolted. The population is esti- mated at 30,000 to 40,000.

SAN SEBASTIAN, a seaport of Spain, capital of the province of Guipuzcoa, 42 miles north-north-west of Pamplona, and 402 miles by rail from Madrid. It occupies a narrow isthmus, terminated towards the north by

a lofty conical rock called Urgull or Orgullo, and flanked on its eastern side by the river Urumea, here crossed by a bridge, and on the other by a bay (La Concha), which forms the harbour. The summit of ‘the hill is crowned by a fort (Castillo de la Mota), and the landward side of the town was formerly defended by solid ramparts.

The houses are almost all modern, built uniformly in straight streets and regular squares, so as to present an appearance quite unlike most Spanish towns. There are two large churches, a court-house, a theatre, hospitals, barracks, &c. The manufactures of the place are insigni- ficant ; and the harbour is small, and not easily accessible, though well protected by a mole and small island. There is a considerable trade in English and French goods, —corn and other articles being exported. During summer the town is much frequented, especially by the wealthier inhabitants of Madrid, for sea-bathing, and tent-like huts are set up for the purpose on the shore of the bay. From its position and strength San Sebastian has been long a place of much importance, and has sustained several sieges. The most memorable of these was in August 1813, when the British, under Wellington, took it by storm. The population within the municipal boundaries was 21,355 in 1877,

SAN SEVERO, a city of Italy, in the province of Foggia, and at one time the chief town of the Capitanata, lies at the foot of the spurs of Monte Gargano, and has a station on the railway to Brindisi, 36 miles south-east of Termoli and 17 north of Foggia. It is the see of a bishop (since 1580), and has a handsome cathedral and some re- mains of its old fortifications. In 1880 the population was 19,756 (20,382 in commune).

San Severo dates from the Middle Ages. It was laid in ruins by Frederick II., and in 1053 was the scene of a victory by Robert Guiscard over the papal troops under Leo IX. The overlordship was held in succession by the Benedictines of Torre Maggiore abbey, the Knights Templars, the crown of Naples, and the Sangro

family (commendatories of Torre Maggiore). In 1627, and again in 1828 and 1851, the town suffered from earthquakes.

SANSKRIT LANGUAGE AND LITERATURE

PART IL—SANSKRIT LANGUAGE.

a is the name applied by Hindu scholars to the ancient literary language of India. The word samskyita is the past participle of the verb kar, “to make” (cognate with Latin creo), with the preposition sam, “together” (cog. dua, duds, Eng. “same”), and has probably to be taken here in the sense of ‘“ completely formed” or “accurately made, polished,”—-some noun meaning “speech” (esp. bhdshd) being either expressed or understood with it. The term was, doubtless, origin- ally adopted by native grammarians to distinguish the literary language of the educated classes from the uncul- tivated popular dialects—the forerunners of the modern vernaculars of northern India—which had, from an early period, developed side by side with it, and which were called (from the same root kar, but with different preposi- tions) Prdkrita, 7.e., either “derived” or “natural, common” forms of speech. But this designation of the literary idiom, being evidently intended to imply a language regulated by conventional rules, also involves a distinction between the grammatically fixed language of Brahmanical India and an earlier, less settled, phase of the same language exhibited in the Vedic writings. For greater convenience the Vedic language is, however, usually included in the term, and scholars generally distinguish between the Vedic and the classical Sanskrit. The Sanskrit language, with its old and modern descendants, represents the easternmost branch of the great Indo-Germanic, or Aryan, stock of speech. – Philological research has clearly established the fact that the Indo- Aryans must originally have immigrated into India from the north-west. In the oldest literary documents handed down by them their gradual advance can indeed be traced

from the slopes of eastern Kabulistan down to the land of the five rivers (Punjab), and thence to the plains of the Yamuna (Jumna) and Gang& (Ganges). Numerous special coincidences, both of language and mythology, be- tween the Vedic Aryans and the peoples of Iran also show that these two members of the Indo-Germanic family must have remained in close connexion for some considerable period after the others had separated from them.

The origin of comparative philology dates from the time when European scholars became accurately acquainted with the ancient language of India. Before that time classical scholars had been unable, through centuries of learned research, to determine the true relations between the then known languages of our stock. This fact alone shows the importance of Sanskrit for comparative re- search. Though its value in this respect has perhaps at times been overrated, it may still be considered as the eldest daughter of the old mother-tongue. Indeed, so far as direct documentary evidence goes, it may rather be said to be the only surviving daughter ; for none of the other six principal members of the family have left any literary monunients, and their original features have to be reproduced, as best they can, from the materials supplied by their own daughter languages: such is the case as regards the Iranic, Hellenic, Italic, Celtic, Teutonic, and Letto-Slavic languages. To the Sanskrit the antiquity and extent of its literary documents, the transparency of its grammatical structure, the comparatively primitive state of its accent system, and the thorough grammatical treatment it has early received at the hand of native scholars must ever secure the foremost place in the com- parative study of Indo-Germanic speech.

The Sanskrit alphabet consists of the following sounds :— (a) Fourtcen vowels, viz.:— | i Ten simple vowels: a 4, 17, ud, 77, 1 (f) ; and Four diphthongs : é dt, 6 au. (b) Thirty-three consonants, viz. :— Five series of mutes and nasals : guttural: kkhg gh n palatal: c eh j jh ih lingual: tthd dhn dental: tthd dhn labial: p ph b bh m ; Four semivowels: y 7 Z v (w) ; Three sibilants : palatal §, lingual sh, dental s; and A soft aspirate: 4. (c) Three unoriginal sounds, viz.:— __ or visarga (h), a hard aspirate, standing mostly for original sor7r; and two nasal sounds of less close contact than the mute-nasals, viz., anusvdra (m) and anundsika (m).

Alphabet.

Os Vowls. | As regards the vowels, a prominent feature of the language is the

‘S prevalence of a-sounds, these being about twice as frequent as all the others, including diphthongs, taken together (Whitney).

The absence of the short vowels @ and ¢ from the Sanskrit alpha- bet, and the fact that Sanskrit shows the a-vowel where other vowels appear in other languages,—e.g., bharantam = $é€povra, ferentem ; janas = yévos, genus, —were formerly eonsidered as strong evidence in favour of the more primitive state of the Sanskrit vowel system as compared with that of the sister languages. Recent research has, however, shown pretty con- clusively from certain indications in the Sanskrit language itself that the latter must at one time have possessed the same, or very nearly the same, three vowel-sounds, and that the differentiation of the original a-sound must, therefore, have taken place before the separation of the languages.

The vowels é and 6, though apparently simple sounds, are classed as diphthongs, being contracted from original dz and dw respectively, and liable to be treated as such in the phonetic modifications they have to undergo before any vowel except d.

As regards the consonants, two of the five scries of mutes, the palatal and lingual series, are of secondary (the one of Indo-Iranian, the other of purely Indian) growth.

The palatals are, as a rule, derived from original gutturals, the modification being generally due to the influence of a neighbouring palatal sound 7 or y, or (a): g., carati=Lat. eurrit; janu= yévu, genu, knee. The surd aspirate ch, in words of Indo-Germanic origin, almost invariably goes back to original sk: ¢.g., chid- (chind-)=scindo, oxi€w ; chéyad=orid.

The palatal sibilant § (pronounced sh) likewise originated from a guttural mute &, but one of somewhat different phonetic value from that represented by Sanskrit & orc. The latter, usually designated by #? (or q), is frequently liable to labialization (or dentalization) in Greek, probably owing to an original pronunciation kw (qu): €.g., katara=nérepos, uter ; while the former (x1) shows invariably « in Greek, and a sibilant in the Letto-Slavic and the Indo-lranian languages: c.g., Svan (Sun)=xéwv (xv), canis, Germ. hund; dasan=Séxa, decom, Goth. tathun.

The non-original nature of the palatals betrays itself even in Sanskrit by their inability to occur at the end of a word,—e.9., acc. vdcam = Lat.

vocem, but nom. vdék = vox,—and by otherwise frequently reverting to the guttural state.

The linguals differ in pronunciation from the dentals in their being uttered with the tip of the tongue turned up to the dome of the palate, while in the utterance of the dentals it is pressed against the upper teeth, not against the upper guins as is done in the English dentals, whieh to Hindus sound more like their own linguals. The latter, when occurring in words of Aryan origin, are, as a rule, modifications of original dentals, usually accom- panied by the loss of an 7 or other adjoining eonsonant ; but more commonly they occur in words of foreign, probably non-Aryan, origin. Of regular occurrence in the language, however, is the change of dental n into lingual , and of dental s into lingual sh, when preceded in the same word by certain other letters.

The sonant aspirate 4 is likewise non-original, being usually derived from original sonant aspirated mutes, especially gh: ¢.9., hamsa—=xhy (for xayvs), anser, Germ. gans; aham = eéydv, cgo, Goth. 7k.

Phonetic The contact of final and initial letters of words in the same sen- changes, tence is often attended in Sanskrit with considerable euphonic modifications ; and we have no means of knowing how far the prac- tice of the vernacular language may have corresponded to these phonetic theories. There can be no doubt, however, that a good deal in this respect has to be placed to the account of grammatical reflexion ; and the very facilities which the primitive structure of the language offered for grammatical analysis and an insight into the principles of internal modification may have given the first

impulsc to external modifications of a similar kind. None of the cognate languages exhibits in so transparent a

Conson- ants.

Ke aT

manner as the Sanskrit the cardinal principle of Indo-Germanie word- formation by the addition of inflexional endings—either case- endings or

personal terminations (themselves probably original roots)—to stems obtained, mainly by means of suffixes, from mono- syllabie roots, with or without internal modifications.

There are in Sanskrit declension three numbers and seven cases, Declen._ not counting the voeative, viz., nominative, ‘accusative, instru- gion, mental, dative, ablative, genitive and locative. As a matter of fact, all these seven cases appear, however, only in the singular of a-stems and of the pronominal declension. Other noun-stemis have only one case-form for the ablative and genitive singular. In the plural, the ablative everywhere shares its form with the dative (except in the personal pronoun, where it has the same ending as in the singular), whilst the dual shows only three different case- forms—one for the nominative and accusative, another for the instruniental, dative, and ablative, and a third for the genitive and locative.

The declension of a-stems, corresponding to the first and second Latin declensions, is of especial interest, not so much on account of its being predominant from the earliest time, and becoming more and more so with the development of the language, but because it presents the greatest number of alternative forms, which supply a kind of test for determining the age of literary productions, a test which indeed has already been applied to some extent by Professor Lanman, in luis exeellent Statistical Account of Noun Inflexion in the Veda. These alternative case-forms are :—

(1) dsas and ds for the nominative plural masc. and fem.: «¢g., asvdsas and asvds=cqut (eque). The forms in dsas,—explained by Bopp as the sign of the plural as applied twice, and by Schleicher as the sign of the plural as added to the nominative singular, — occur to those in 4s (¢.e., the ordinary plural sign as added to the a-stem) in the Rigveda in the proportion of 1 to 2, and in the peculiar parts of the Atharvaveda in that of 1 to 25, whilst the ending 4s alone remains in the later language.

(2) 4 and dni for the nominative and accusative plural of neuters : as yugd, yugdni=Cuyd, juga. The proportion of the former ending to the latter in the Rik is 11 to 7, in the Atharvan 2 to 3, whilst the classical Sanskrit knows only the second form.

(8) ébhts and dis for the instrumental plural masc. and neuter: €.g., devébhis, devdis. In the Rik the former forms are to the latter in the proportion of 5 to 6, in the Atharvan of 1 to 5, while in the later language only the contracted form is used. The same contraction is found in other languages ; but it is doubtful whether it did not originate independently in them.

(4) 4 and du for the nominative and accusative dual masc.: c¢.g., ubhd, ubhdu=&ugdw. In the Rik forms in 4 outnumber those in du more than eight times; whilst in the Atharvan, on the contrary, those in du (the only ending used .in the classical language) occur five times as often as those in 4. :

(5) @ and ena (end) for the instrumental singular masc. and neut.: as ddnd, ddénena=dono. The ending ena is the one invariably used in the later language. It is likewise the usual form in the Veda; but in a number of cases it shows a final long vowel which, though it may be entirely due to metrical requirements, is more probablya relic of the normal instrumental ending 4, preserved for prosodic reasons. For the simple ending 4, as compared with that in ena, Prof. Lanman makes out a proportion of about 1 to 9 in the Rigveda (altogether 114 cases); while in the peculiar parts of the Atharvan he finds only 11 cases.

(6) dm and dnaém for the genitive plural: ¢.g., (asvdm), asvdndm =tnrav, cquum (equorum). The form with inserted nasal (donbt- less for andm, as in Zend aspandm), which is exclusively used in the later language, is also the prevailing one in the Rik. There are, however, a few genitives of a-stems in original 4m (for a-dm), which also appear in Zend, Prof. Lanman enumerating a dozen instances, some of which are, however, doubtful, while others are merely eonjectural.

The Sanskrit verb system resembles that of the Greck in variety Verh and completeness. While the Greek exccls in nicety and definite- system. ness of modal distinction, the Sanskrit surpasses it in primitiveness and transparency of formation. In this part of the grammatical system there is, however, an even greater differenee than in the noun inflexion between the Vedic and the classical Sanskrit. While the former shows, upon the whole, the full complement of modal forms exhibited by the Greek, the later

language has prac- tically discarded the subjunctive mood. The Indo-Aryans never succeeded in working out a clear formative distinction between the subjunctive and indicative moods; and, their syntactic requirements becoming morc and more limited, they at last contented themselves, for modal expression, with a present optative and imperative, in addition to the indicative tense-forms, and a little-used aorist optative with a special “precative” or “benedictive” meaning attached to it.

Another part of the verb in which the later language differs widely from Vedic nsage is the infinitive. The language of the old hymns shows a considerable variety of case-forms of verbal abstract nouns with the function of infinitives, a eertain number of which

can still be traced back to the pareut language, as, for instance, such dative forms as jfv-dse=viv-ere; sGh-adhydi=ztxeoba ; dd’- mane=Sdpnevar; dd’-vane=Sodva. Further, ji-shé, “to conquer, ” for ji-sé, apparently an aorist infinitive with the dative ending (parallel to the radical forms, such as yudh-é, “to fight,” dris’-é, “to see”), thus corresponding to the Greek aorist infinitive Adoa (but ef. also Latin da-re, for dase, es-se, &c.). The classical Sanskrit, on the other hand, practically uses only one infinitive form, viz., the accusative of a verbal noun in tu, ¢.g., sthatum, etum, correspond- ing to the Latin supinum datum, itwm. But, as in Latin another ease, the ablative (dati), of the same abstract noun is utilized for a similar purpose, so the Vedic language makes two other cases do duty as infinitives, viz., the dative in tave (e.g., ddtave, and the anomalous éavdi), and the gen.-abl. in tos (datos). A prominent feature of the later Sanskrit syntax is the so-called gerund or inde- clinable participle in tv@, apparently the instrumental of a stem in tva (probably a derivative from that in tw), as well as the gerund in yc (or tya aftcr a final short radical vowel) made front compound verbs. The old language knows not only such gcrunds in tvd, using them, however, very sparingly, but also corresponding dative forms in tvaya (yuktvdya), and the eurious contracted forms in tvi’ (kritvt, “to do”). And, besides those in ya and tya, it frequently uses forms with a final long vowel, as bhid-yd, i-

tyd, thus show- ing the former to be shortened instrumentals of abstract nouns in 7 and ¢i.

The Sanskrit verb, like the Greek, has two voices, active and middle, called, after their primary functions, parasmai-pada, “word for another,” and aétmane-pada, “ word for one’s self.” While in Greek the middle forms have to do duty also for the passive in all tenses except the aorist and future, the Sanskrit, on the other hand, has developed for the passive a special present-stem in ya, the other tenses being supplied by the corresponding middle forms, ‘with the exception of the third person singular aorist, for which a special form in ¢ is usually assigned to the passive.

The present-stem system is by far the most important part of the whole verb system, both on account of frequency of actual occur- rence and of its excellent state of preservation. It is with regard to the different ways of present-stem formation that the entire stock of assumed roots has been grouped by the native grammarians under ten different classes. These classes again naturally fall under two divisions or “ conjugations,” with this characteristic difference that the one (the second) retains the same stem (ending in a) through- out the present and imperfect, only lengthening the final vowel before terminations beginning with v or m (not final); while the other shows two different forms of the stem, a strong and a weak form, according as the accent falls on the stem-syllable or on the personal ending: ¢.g., 3 sing. bhdra-ti, pépe:—2 pl. bhdra-tha, pépete ; but é-ti, elo.—i-thd, tre (for iré) ; 1 sing. strné-mi, ordp- vipi—l pl. strmu-mds (ordpyvpes).

As several of the personal endings show a decided similarity to personal or demonstrative pronouns, it is highly probable that, as might indeed be a priori expected, all or most of them are of pronominal origin,—though, owing to their exposed position and consequent decay, their original form and identity cannot now be determined with certainty. The active singular terminations, with the exception of the second person of the imperative, are unaccented and of comparatively light appearance ; while those of the dual and plural, as well as the middle terminations, have the accent, being apparently too heavy to be supported by the stem-accent, either because, as Schleicher supposed, they are composed of two different pronominal elements, or otherwise. The treatment of the personal endings in the first,

and presumably older, conjuga- en may thus be said somewhat to resemble that of enclitics in

teek,

In the imperfect, the present-stem is increased by the augment, consisting of a prefixed &. Here, as in the other tenses in which it appears, it has invariably the accent, as being the distinctive element (originally probably an independent demonstrative adverb “then ”) for the expression of past time. This shifting of the

Paws K RT

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sydm=—Lat. siem, stm; while in the second conjugation and throughout the middle it is 4, probably a contraction of ya: ¢. Gre bhares = pépars.

Besides the ordinary perfect, made from a reduplicated stem, with distinction between strong (active singular) and weak forms, and a partly peculiar set of endings, the later language makes large use of a periphrastic perfect, consisting of the accusative of a feminine abstract noun in 4 (-ém) with the reduplicated perfect forms of the auxiliary verbs kar, “to do,” or as (and occasionally bha), “to be.” Though more particularly resorted to for the derivative forms of conjugation—viz., the causative (including the so-called tenth conjugational class), the desiderative, intensive, and denominative—this perfect-form is also commonly used with roots beginning with prosodically long vowels, as well as with a few other isolated roots. In the Rigveda this formation is quite unknown, and the Atharvan offers a single instance of it, from a causative verb, with the auxiliary kar. In the Vedic prose, on the other hand, it is rather frequent,! and it is quite common in the later language.

In addition to the ordinary participles, active and middle, of the rednplicated perfect,—e.g., jajan-van, yeyouv-ws ; bubudh-énd, menvo-evo,—there is a secondary participial formation, obtained by affixing the possessive suffix vat (vant) to the passive past participle: ¢.9., krita-vant, lit. “having (that which is) done.” A secondary participle of this kind occurs once in the

Atharvaveda, and it is occasionally met with in the Braéhmanas. In the later langnage, however, it not only is of rather frequent occurrence, but has assumed quite a new function, viz., that of a finite perfect- form; thus kritavdén, kritavantas, without any auxiliary verb, meau, not “having done, but “he has done,” “they have done.”

The original Indo-Germanic future-stem formation in sya, with primary endings,—e. g., ddsydti = 8éce: (for 5écer1), —is the ordinary tense-form both in Vedic and classical Sanskrit,—a preterite of it, with a conditional force attached to it (dddsyat), being also common to all periods of the language.

Side by side with this future, however, an analytic tense-form makes its appearance in the Brahmanas, obtaining wider currency in the later language. This periphrastic future is made by means of the nominative singular of a nomen agentis in tar (ddtar, nom. ddtd=Lat. dator), followed by the corresponding present forms of as, “to be” (ddtd-’smi, as it were, datwrus swm), with the excep- tion of the third persons, which need no auxiliary, but take the respective nominative of the noun.

The aorist system is somewhat complicated, including as it does augment-preterites of various formations, viz., a radical aorist, sometimes with reduplicated stem,—e.9., dsthéim = éorny ; srudht =Karv0:; ddudrot; an a-aorist (or thematic aorist) with or without reduplication, —e.g., drieas =%aures ; dpaptam, ef. repvov; and several diffcrent forms of a sibilant-aorist. In the older Vedic language the radical aorist is far more common than the a-aorist, which becomes more frequently used later on. Of the different kinds of sibilant-aorists, the most common is the one which makes its stem by the addition of s to the root, either with or without a connecting vowel 7 in different roots: ¢g., root ji— 1 sing. djdisham, 1 pl. Gjdishma ; dkramisham, dkramishma.

As regards the syntactic functions of the three preterites,—the imperfect, perfect, and aorist,—the classical writers make virtually no distinction between them, but use them quite indiscriminately, In the older language, on the other hand, the imperfect is chiefly used as a narrative tense, while the other two generally refer to a. past action which is now complete,—the aorist, however, more frequently to that which is only just done or

completed. The perfect, owing donbtless to its reduplicative form, has also not infrequently the force of an iterative, or intensive, present.

The Sanskrit, like the Greek, shows at all times a considerable Word power and facility of noun-composition. But, while in the older forma- language, as well as in the earlier literary products of the classical tion.

word-accent seems to have contributed to the further reduction of the personal endings, and thus caused the formation of a new, or secondary, set of terminations which came to be appropriated for

Secondary tenses and moods generally. As in Greek poetry, the augment is frequently omitted in Sanskrit.

The mood-sign of the subjuuctive is &, added to (the strong form of) the tense-stem. Ifthe stem ends already in &, the latter be- comes lengthened. As regard the personal terminations, some persons take the primary, others the secondary forms, while others again may take either the one or the other. The first singular active, however, takes ni instead of mi, to distinguish it from the indicative. Bunt besides these forms, showing the mood-sign 4, the subjunctive (both present and aorist) may take another form, without any distinctive modal sign, and with the secondary endings, being thus identical with the augmentless form of the preterite.

The optative invariably takes the secondary endings, with some peculiar variations. In the active of the first conjugation, its mood- sign is yd, affixed to the weak form of the stem: e. g., root as, —

period, such combinations rarely exceed the limits compatible with the general economy of inflexional speech, during the later, arti- ficial period of the language they gradually become more and more excessive, both in size and frequency of use, till at last they absorb almost the entire range of syntactic construction.

One of the most striking features of Sanskrit word-formation is that regular interchange of light and strong vowel-sounds, usually designated by the native terms of guna (quality) and vriddht (increase). The phonetic process implied in these terms consists in the raising, under certain conditions, of a

radical or thematic light vowel 7z, u, 7, /, by means of an inserted a-sound, to the diphthongal (guna) sounds di (Sanskr. é), dw (Sanskr. 6), and the

a

1 Tt also shows occasionally other tense-forms than the perfect of the same periphrastic formation with kar.

Accentua- tion.

combination ar and al respectively, and, by arepetition of the same process, to the (vriddhi) sounds dz, du, ar, and al respectively. ‘Thus from root vid, “to know,” we have véda, “ knowledge,” and therefrom vdtdika ; from yug, yéga, yddgika. While the inter- change of the former kind, due mainly to accentual causes, was un- doubtedly a common feature of Indo-Germanic speech, the latter, or vriddhi-change, which chiefly occurs in secondary stems, is pro- bably a later development. Moreover, there can be no doubt that the vriddhi-vowels are really due to what the term implics, viz., to a process of “increment,” or vowel-raising. The same was univer- sally assumed by comparative philologists till a few years ago, as regards the relation between the guna-sounds a (2) and du (6) and the respective simple 7- and u-sounds. According to a recent theory, however, which has already received a considerable amount of acceptance, we are henceforth to look upon the heavier vowels as the original, and upon the lighter vowels as the later sounds, produced through the absence of stress and pitch. The grounds on which this theory is recommended are those of logical consist- ency. In the analogous cases of interchange between r and ar, as well as / and al, most scholars have indeed becn wont to regard the syllabic 7 and } as weakened from original ar and al, while the native grammarians represent the latter as produced from the former by increment. Similarly the verb as (és), “to be,” loses its vowel wherever the radical syllable is unaccented: ¢.g., dsti, Lat. est —smds, s(w)mus ; opt. sydm, Lat. siém (stm). For other analo- gous cases of vowel-change, see Purtonoey, vol. xviii. p. 783 sq. On the strength of these analogous eases of vowcl-modification we are, therefore, to accept some such equation as this :— dsmi: smds=Sépxoua : %p(a)kov=Aclrw : Arweiv

=émi (eft): imds (tuev for ivév)

=evyw: puyeiv

=déhmi (1 milk) : duhmds.

Acquiescence in this equation would sccm to involve at least one important admission, viz., that original root-syllables contained no simple z- and 2-vowels, except as the second element of the diphthongs at, et, ot; au, eu, ou. We ought no longer to speak of the roots vid, “to know,” dik, “to show, to bid,” dhugh, “to milk,” yug, “to join,” but of veid, deik, dhaugh or dheugh, yeug, &c. Nay, as the same law would apply with equal force to suffixal vowels, the suffix nw would have to be called naw or new; and, in explaining, for instance, the irregularly formed delevipi, Sefeviper, we might say that, by the affixion of vev to the root Sei, the present-stem d:cved was obtained (d:cvedur), which, as the stress was shifted forward, became 1 plur. dicvuyéo(s),—the subsequent modifications in the radical and formative syllables being due to the effects of “analogy” (cf. G. Meyer, Gricch. Gramm., § 487). Now, if there be any truth in the “agglutination” theory, accord- ing to which the radical and formative elements of Indo-Germanic speech were at one time independent words, we would have to be prepared for a pretty liberal allowance, to the parent language, of diphthongal monosylables such as detk ned, while simple com- binations such as dik nu could only spring up after separate syllable-words had beeome united by the force of a common accent. But, whether the agglutinationists be right or wrong, a theory in- volving the priority of the diphthongal over the simple sounds can hardly be said to be one of great prima facie probability ; and one may well ask whether the requirements of logical consistency might not be satisfied in some other, less improbable, way.

Now, the analogous cases which have called forth this theory turn upon the loss of a radical or suffixal a (2), occasioned by the shifting of the word-accent to some other syllable: ¢9., acc. matdram, instr. mdtra; wéropat, émrduny; dépxopat, 23p(a)koy ; dsmi, smds. Might we not then assume that at an early stage of noun and verb inflexion, through the giving way, under certain conditions, of the stem a (2), the habit of stem-gradation, as an clement of inflexion, came to establish itself and ultimately to extend its

sphere over stems with 7- and w-vowels, but that, on meeting here with more resistance! than in the a (2)-vowel, the stem-gradation then took the shape of a raising of the simple vowel, in the “strong” cases and verb-forms, by that saie a- element which constituted the distinctive element of those cases in the other variable stems? In this way the above equation would still hold good, and the corresponding vowel-grades, though of somewhat different genesis, would yet be strictly analogous.

The accent of Sanskrit words is marked only in the more import- ant Vedic texts, different systems of notation being used in different works. Our knowledge of the later accentuation of words is entirely derived from the statements of grammarians. As in Greek, there are three accents, the uddtta (“raised,” é.¢., acute), the anuddita (“not raised,” ¢.¢., grave), and the svarita (“sounded, modulated,” t.é., circumflex). ‘The last is a combination of the two others,

1 We might compare the different treatment in Sanskrit of an and in bases (mirdhdni-mardhna; vaddini-vadind); for, though the latter are doubtless of later origin, their inflexion might have been influenced by that of the former. Also a comparison of such forms as (devd) devandm, (agni) agnindm, and (dhentt) dheniinam, tells in favour of the 7- and u-vowels, as regards power of resistance inasmuch as it does not require the accent in order to remain intact. i

K kat

its proper use being confincd almost entirely to a vowel preceded by a semivowcl y or v, representing an original acuted vowel. Hindu scholars, however, also include in this term the accent ofa grave syllable preceded by an acuted syllable, and itself followed by a grave.

The Sanskrit and Greek accentuations present numerous coin- cidences. Although the Greek rule, confining the accent within the last three syllables, has frequently obliterated the original likeness, the old features may often be traced through the later forms. Thus, though augmented verb-forms in Greek cannot always have the accent on the augment as in Sanskrit, they have it invariably as little removed from it as the accentual restrictions will

allow: ¢.g., dbharam, @pepov; dbhardma, édépoper ; dbharé- mahi, épepducba.

The most striking coincidence in noun declension is the accentual distinction made by both languages between the ‘‘ strong” and ‘‘weak”’ cases of monosyllabic nouns, —the only difference in this respect being that in Sanskrit the accusative plural, as a rule, has the accent on the case-ending, and consequently slows the weak form of the stem: ¢.g., stem pad, 70d; padam, 1é5a; padas, wodds ; padt, wodl; pddas, wédes; padds, wédas; paddim, roddéy ; patsti, woot. In Sanskrit a few othcr classes of stems (especially present participles in ant, at), accented on the last syllable, are apt to yield their accent to heavy vowel (not consonantal) termina- tions; compare the analogous accentuation of Sanskrit and Greck stems in tér: pitéram, warépa ; pitré, warpéds ; pitdras, marépes ; pitrshu, marp(d)or.

Tlie vocative, when heading a sentence (or verse-division), has invariably the accent on the first syllable; otherwise it is not accented.

Finite verb-forms also, as a rule, lose their accent, except when standing at the beginning of a sentence or verse-division (a vocative not being taken into account), or in dependent (mostly relative) clauses, or in conjunction with certain particles. Of two or more co-ordinate verb-forms, however, only the first is nnaccented.

In writing Sanskrit the natives, in different parts of India, generally employ the particular character used for writing their own vernacular. The character, however, most widely understood and employed by Hindu scholars, and used invariably in European editions of Sanskrit works (unless printed in Roman letters) is the so-called Devandgart, or ndgart (‘‘town”-script) of the gods.

The origin of the Indian alphabets is still enveloped in doubt. The oldest hitherto known specimens of Indian writing are five rock-inscriptions, containing religious edicts in Pali (the Prakrit used in the Buddhist scriptures), issued by the emperor Asoka (Piyadasi) of the Maurya dynasty, in 253-251 B.c., and scattered over the area of northern India from the vicinity of Peshawar, on the north-west frontier, and Girnar in Guzerat, to Jaugada and Dhauli in Katak, on the eastern coast. The most western of

these inscriptions—called, from villages near it, the Kapurdagarhi or Shahbaz-garhi inscription—is executed in a different alphabet from the others. It reads from right to left, and is usually called the Arian P4li alphabet, it being also used on the coins of the Greek and Indo-Scythian princes of Ariana; while the other, which reads from left to right, is called the Indian Pali alphabet. The former, which is manifestly derived from a Semitic (probably Aramean) source, has left no traces on the subsequent development of Indian writing. The Indo-Péli alphabet, on the other hand, from which the modern Indian alphabets are derived, is of uncertain origin. The similarity, however, which several of its letters present to those of the old Phenician alphabet (itself probably derived from the Egyptian hieroglyphics) suggests for this alphabet also—or at least for the germ of it—the probability of a Semitic origin, though, already at Asoka's time, the Indians had worked it up to a high degree of perfection and wonderfully adapted it to their peculiar scientific ends. As to the probable time and channel of its introduction, no satisfactory theory has yet been proposed. Considering, however, the high state of perfection it exhibits in the Maurya and Andhra inscriptions, as well as the wide area over which these are scattered, it can hardly be doubted that the art of writing must have been known to and practised by the Indians for various purposes long before the time of Agoka. The fact that no reference to it is found in the contemporary literature has probably to be accounted for by a strong reluctance on the part of the Brahmans to commit their sacred works to writing.

The invention of the nnmeral figures, which used to be generally ascribed to the Indians, has also been rendered doubtful by more recent research.

An excellent Sanskrit grammar, dealing with the language historically, has been published by Prof. W. D. Whitney. Of other English grammars, dealing almost exclusively with the classical Sanskrit, those of Profs. Max Miiller, Monier Williams, and F. Kiethorn are now most widely used.

The best dictionary is the great Sanskrit-German Worterbuch, published at St Petersburg, in 7 vols., by Profs. Béhtlingk and Roth. Largely based on this

great thesaurus are the Sanskrit-English dictionaries by Prof. M. Williams and the late Prof. Th. Benfey.

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PART IL—SANSKRIT LITERATURE.

The history of Sanskrit literature labours under the same disadvantage as the political history of ancient India, from the total want of anything like a fixed chronology. As there are extremely few well-ascertained political facts until comparatively recent times, so in that whole vast range of literary development there is scarcely a work of importance the date of which scholars have succeeded in fixing with absolute certainty. The original composition of most Sanskrit works can indeed be confidently assigned to certain general periods of literature, but as to many of them, and these among the most important, scholars have but too much reason to doubt whether they have come down to us in their original shape, or whether they have not rather, in course of time, undergone alterations and additions so serious as to make it impossible to regard them as genuine witnesses of any one phase of the development of the Indian mind. Nor can we expect many important chronological data from the new materials which will doubtless yet be brought to light in India. Though by such discoveries a few isolated spots may

indeed be lighted up here and there, the real task of |

clearing away the mist which at present obscures our view, if ever it can be cleared away, will have to be performed by patient research—by a more

minute critical examina- tion of the multitudinous writings which have been handed down from the remote past. In the following sketch it is intended to take a rapid view of the more important works and writers in the several departments of literature.

In accordance with the two great phases of linguistic development above referred to, the history of Sanskrit literature readily divides itself into two principal periods, the Vedic and the classical. It should, however, be noted that these periods partly overlap each other, and that some of the later Vedic works are included in that period on account of the subjects with which they deal, and for their archaic style, rather than for any just claim to a higher antiquity than may have to be assigned to the oldest works of the classical Sanskrit.

I. Tue Vepic Periop.!

The term veda—+.e., “knowledge,” (sacred) “lore ”— embraces a body of writings the origin of which is ascribed to divine revelation (sruti, literally “hearing ”), and which forms the foundation of the Brdhmanical system of religious belief. This sacred canon is divided into three or (according toa later scheme) four coordinate colleetions, likewise called Veda:—(1) the Rig-veda, or lore of praise (or hymns); (2) the Sdma-veda, or lore of tunes (or chants); (3) the Yajur-veda, or lore of prayer ; and (4) the Atharva-veda, or lore of the Atharvans. Each of these four Vedas consists primarily of a collection (samhitd) of sacred, mostly poetical, texts of a devotional nature, called mantra. This entire body of texts (and particularly the first three collections) is also frequently referred to as the tray? vidyd, or threefold wisdom, of hymn (rich), tune or chant (sdman), and prayer (yajus),—the fourth Veda, if at all included, being in that case classed together with the Rik.

The Brahmanical religion finds its practical expression chiefly in sacrificial performances. The Vedic sacrifice requires for its proper performance the attendance of four officiating priests, each of whom is assisted by one or

J. Muir’s Original Sanskrit Tects, 5 vols., 2d ed., forms the most complete general survey of the results of Vedic research.

2 The combiuation ch, used (in conformity with the usual English

practice) in this sketch of the literature, corresponds to the simple c in the scheme of the alphabet, p. 270.

more (usually three) subordinate priests, viz.:—(1) the Hotar (i.e. either “sacrificer,” or “invoker”), whose chief business is to invoke the gods, either in short prayers pronounced over the several oblations, or in liturgical recitations (sastra), made up of various hymns and detached verses ; (2) the Udgdtar, or chorister, who has to perform chants (stotra) in connexion with the hotar’s recitations ; (3) the Adhvaryu, or offering priest par excel- lence, who performs all the material duties of the sacrifice, such as the kindling of the fires, the preparation of the sacrificial ground and the offerings, the making of obla- tions, &c.; (4) the Brahman, or chief “ priest,” who has to superintend the performance and to rectify any mistakes that may be coinmitted. Now, the first three of these priests stand in special relation to three of the Vedic Samhitas in this way, that the Samhitas of the SAdmaveda and Yajurveda form special song and prayer books, arranged for the practical use of the udgatar and adhvaryu respectively; whilst the Rik-samhita, though not arranged for any such practical purpose, contains the entire body of sacred lyrics whence the hotar draws the material for hig recitations. The brahman, on the other hand, had no special text-book assigned to him, but was expected to be familiar with all the Samhitds as well as with the practical details of the sacrificial performance. In point of fact, however, the brahmans, though their attendance at Vedic sacrifices was required, can scarcely be said to have formed a separate class of priests: their office was probably one which might be held by any priest of the three other classes who had acquired the necessary qualification by additional study of the other Samhitds and manuals of ritual. In later times, when the votaries of the fourth Veda pressed for recognition of their Samhita as part of the sacred canon, the brahman priest was claimed by them as specially connected with the Atharva- veda. It is perhaps for this reason that the latter is also called the Lrahmaveda,—though this designation may also be taken to mean the Veda of spells or secret doctrines (6rahman). It sometimes happens that verses not found in our version of the Rik-samhité, but in the Atharva- veda-samhita, are used by the hotar; but such texts, if they did not actually form part of some other version of the Rik,—as Sayana in the

introduction to his commentary on the Rik-samhita assures us that they did, —were prob- ably inserted in the liturgy subsequent to the recogni- tion of the fourth Veda.

The several Samhitas have attached to them certain Brah- theological prose works, called Brdhmana, which, though ™?4s-

subordinate in authority to the Mantras or Samhitas, are like them held to be divinely revealed and to form part of the canon. The chief works of this class are of an exegetic nature,—their purport being to supply a dogmatic exposi- tion of the sacrificial ceremonial in so far as the particular class of priests for whose enlightenment the Brahmana is intended is concerned in it. Notwithstanding the un- interesting character of no small part of their contents, the Br&hmanas are of considerable importance, both as regards the history of Indian institutions and as " the oldest body of Indo-European prose, of a generally free, vigorous, simple form, affording valuable glimpses backward at the primitive condition of unfettered Indo-European talk" (Whitney).

More or less closely connected with the Brahmanas (and Aran-

in a few exceptional cases with Sambhitas) are two classes ¥

of treatises, called Arapyaka and Upanishad. The Aran- V

yakas, z.e., works "relating to the forest," being intended

to be read by those who have retired from the world and XXI. — 35

shads.

Different

recen- sions.

Vedin-

gas,

lead the life of anchorites, do not greatly differ in char- acter and style from the Brahmanas, but like them are chiefly ritualistic, treating of special ceremonies not dealt with, or dealt with only imperfectly, in the latter works, to which they thus stand in the relation of supplements. The Upanishads, on the other hand, are of a purely specu- lative nature, and must be looked upon as the first attempts at a systematic treatment of metaphysical ques- tions. The number of Upanishads hitherto known is very considerable (about 170); but, though they nearly all pro- fess to belong to the Atharvaveda, they have to be assigned to very different periods of Sanskrit literature,—some of them being evidently quite modern productions. The oldest treatises of this kind are doubtless those which form part of Vedic Samhités, Brahmanas, and Aranyakas, though not a few others which have no such special con- nexion have to be classed with the later products of the Vedic age.

As the sacred texts were not committed to writing till a much later period, but were handed down orally in the Brahmanical schouls, it was inevitable that local differences of reading should spring up, which in course of time gave rise to a number of independent versions, more or less differing from one another. Such different text-recen- sions, called sakhd (7.e., branch), were at one time very numerous, but only a limited number of them have sur- vived. As regards the Samhitds, the poetical form of the hymns, as well as the concise style of the sacrificial formulas, would render these texts less liable to change, and the discrepancies of different versions would chiefly consist in various readings of single words or in the different arrangement of the textual matter. The diffuse ritualistic discussions and loosely connected legendary illustrations of the Brahmanas, on the other hand, offered scope for very considerable modifications in the traditional matter, either through the ordinary processes of oral transmission or through the special influence of indi- vidual teachers.

An original Brahmana, then, may be characterized as a series of theoretic discourses, composed by recognized authorities on ritualistic matters, such as might be delivered or referred to in connexion with practical instruction in the sacrificial art. The growing intricacy of the ceremonial, however,

could not fail, in course of time, to create a demand for treatises of a more practical tendency, setting forth, in concise and methodical form, the duties of the several priests in the sacrificial perform- ances. But, besides the purely ceremonial matter, the Brahmanas also contained a considerable amount of matter bearing on the correct interpretation of the Vedic texts ; and, indeed, the sacred obligation incumbent on the Brahmans of handing down correctly the letter and sense of those texts necessarily involved a good deal of serious grammatical and etymological study in the Brahmanical schools. These literary pursuits could not but result in the accumulation of much learned material, which it would become more and more desirable to throw into a system- atic form, serving at the same time as a guide for future research. These practical requirements were met by a class of treatises, grouped under six different heads or subjects, called Veddngas, 7.e., members, or limbs, of the (body of the) Veda. None of the works, however, which have come down to us under this designation can lay any just claim to being considered as the original treatises on their several subjects; but they evidently represent a more or less advanced stage of scientific development.

to a class of writings called sdra, «.¢., “string,” consisting Sttras,

as they do of strings of rules in the shape of tersely expressed aphorisms, intended to be committed to memory. The Satras form a connecting link between the Vedic and the classical periods of literature. But, although these treatises, so far as they deal with Vedic subjects, are included by the native authorities among the Vedic writ- ings, and in point of language may, generally speaking, be considered as the latest products of the Vedic age, they have no share in the sacred title of srute or revelation. They are of human, not of divine, origin. And yet, as the production of men of the highest standing, and pro- foundly versed in Vedic lore, the Sftras are naturally regarded as works of great authority, second only to that of the revealed scriptures themselves ; and their relation to the latter is expressed in the generic title of Smriti, or Tradition, usually applied to them.

The six branches of Vedic science, included under the term Vedanga, are as follows :—

(1) Stkshd, or Phonetics. representing this subject is assigned to a small treatise ascribed to the great grammarian Panini, viz., the Pdniniyd Sikshd, extant in two different (Rik and Yajus) recensions. But neither this treatise nor any other of the numerous siksh4s which have recently come to light can lay claim to any very high age. Scholars, however, usually include under this head certain works, called Prdtisdkhya, we., “belonging to a certain sdkhdé or recension,” which deal minutely with the phonetic peculiarities of the several Samhités, and are of great importance for the textual criticism of the Vedic Samhitas.

(2) Chhandas, or Metre. dah-sttra of Pingala the starting-point of prosody. The Vedic metres, however, occupy but a small part of this treatise, and they are evidently dealt with in a more original manner in the Nidana-sitra of the Samaveda, and in a chapter of the Rik-pratisakhya. For profane prosody, on the other hand, Pingala’s treatise is rather valuable, no less than 160 metres being described by him.

3) Vydkarana, or Grammar. is said to be the Vedanga; but it marks the culminating point of grammatical research rather than the beginning, and besides treats chiefly of the post-Vedic language.

(4) Nirukta, or Etymology. Yaska’s Nirukta is the Ety- traditional representative of this subject, and this important ™0!08y.

work certainly deals entirely with Vedic etymology or ex- planation. It consists, in the first place, of strings of words in three chapters:—(1) synonymous words; (2) such as are purely or chiefly Vedic ; and (3) names of deities. These lists are followed by YAska’s commentary, interspersed with numerous illustrations. Ydska, again, quotes several pre- decessors in the same branch of science ; and it is probable that the original works on this subject consisted merely of lists of words similar to those handed down by him. (5) Jyotisha, or Astronomy.

connexion with the performance of sacrifices, the metrical treatise which has come down to us in two different recen- sions under the title of

Jyotisha, ascribed to one Lagadha, or Lagata, seems indeed to be the oldest existing systematic treatise on astronomical subjects. With the exception of some apparently spurious verses of one of the recensions, it betrays no sign of the Greek influence which shows itself in Hindu astronomical works from about the third century of our era; and its date may therefore be set down as probably not later than the early centuries after Christ.

The privileged position of Phonetic

Tradition makes the Chhan- Metre.

Panini’s famous grammar Gramma

Although astronomical Astro- calculations are frequently referred to in older works in 7°”!

Though a few of them are composed in metrical form— (6) Kalpa, or Ceremonial. ‘Tradition does not single Cere- especially in the ordinary epic couplet, the anushtubh | out any special work as the Vedanga in this branch of monial. sloka, consisting of two lines of sixteen syllables, or of | Vedic science; but the sacrificial practice gave rise to a

two octosyllabic pAdas, each—the majority of them belong | large number of systematic sfitra-manuals for the several

igveda- mhita,

LITERATURE. |

classes of priests. The most important of these works have come down to us, and they occupy by far the most prominent place among the literary productions of the sfitra-period. The Kalpa-sftras, or rules of ceremonial, are of two kinds:—(1) the Srauta-stitras, which are based on the Sruti, and teach the performance of the great sacri- fices, requiring three sacrificial fires; and (2) the Smérta- stitras, or rules based on the smriti or tradition. The latter class again includes two kinds of treatises :—(1) the Grihya-siitras, or domestic rules, treating of ordinary family rites, such as marriage, birth, name-giving, &c., connected with simple offerings in the domestic

fire ; and (2) the Sdmaydcharika- (or Dharma-) stitras, which treat of customs and temporal duties, and are supposed to have formed the chief sources of the later law-books. Besides, the Srauta-sitras of the Yajurveda have usually attached to them a set of so-called Sulva-sitras, ve, “rules of the cord,” which treat of the measurement by means of cords, and the construction, of different kinds of altars required for sacrifices. These treatises (the study of which has been successfully taken up by Prof. Thibaut of Benares) are of considerable interest as supplying import- ant information regarding the earliest geometrical opera- tions in India. Along with the Sftras may be classed a large number of supplementary treatises, usually called Parisishta (wapadiropeva), on various subjects connected with the sacred texts and Vedic religion generally.

After this brief characterization of the various branches of Vedic literature, we proceed to take a rapid survey of the several Vedic collections.

A. Rigveda.1—The Rigveda-samhita has come down to us in the recension of the Sakala school. Mention is made of several other versions ; and regarding one of them, that of the Bashkalas, we have some further information, according to which it seems, how- ever, to have differed but little from the Sakala text. The latter consists of 1028 hymns, including eleven so-called Vélakhilyas, which were probably introduced into the collection subsequently to its completion. The hymns are composed in a great variety of metres, and consist, on an average, of rather more than 10 verses each, or about 10,600 verses altogether. This body of sacred lyrics has been subdivided by ancient authorities in a twofold way, viz., either from a purely artificial point of view, into eight ashtakas of about equal length, or, on a more natural principle, based on the origin of the hymns, and invariably adopted by European scholars, into ten books, or mandalas, of unequal length. Tradition (not, however, always tiustworthy in this respect) has handed down the names of the reputed authors, or rather inspired “seers” (7ishi), of most hymns. ‘These indications have enabled scholars to form some idea as to the probable way in which the Rik-samhita originated, though much still remains to be cleared up by future research.

In the first place, mandalas ii.—vii. are evidently arranged on a uniform plan. Each of them is ascribed to a different family of rishis, whence they

are usually called the six ‘‘family-books ”:— il., the Gritsamadas; iii., the Visvamitras or Kusgikas; iv., the Vama- devyas; v., the Atris; vi., the Bharadvajas; and vii., the Vasishthas. Further, each of these books begins with the hymns addressed to Agni, the god of fire, which are followed by those to Indra, the Jupiter Pluvius, whereupon follow those addressed to minor deities— the Visve Devah (“all-gods ”), the Maruts (storm-gods), &c. Again, the hymns addressed to each deity are arranged (as Prof. Delbriick has shown) in a descending order, according to the number of verses of which they consist.

The first mandala, the longest in the whole Samhita, contains 191 hymns, ascribed, with the exception of a few isolated ones, to sixteen poets of different families. Here again the hymns of each author are arranged on precisely the same principle as the

1 The Rigveda has been edited, together with the eommentary of Sayana (of the 14th eentury), by Max Miiller, 6 vols., London, 1849-74. The same seholar has published an edition of the hymns, both in the eonnected (samhit4) and the disjoined (pada) texts, 1873. An edition in Roman transliteration was published by Th. Aufrecht, Berlin, 1861-3 (2d ed. 1877). Part of an English translation (ehiefly based on Sayana’s interpretation) was brought out by the late Prof. H. H. Wilson (vols. i.-iii., 1850-1857) and continued by Prof. E. B. Cowell (vol. iv., 1866, bringing up the work to mandala viii. hymn 20). We have also the first volume of a translation, with a running commentary, by M. Miiller, containing the hynins to the Maruts or storm-gods. Complete German translations have been published by Hi. Grassmann (1876-7) and A. Ludwig (1876).

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“family-books.” The eighth and ninth books, on the other hand, have a special character of their own. To the SAmaveda-samhita, whieh, as we shall see, consists almost entirely of verses chosen from the Rik for chanting purposes, these two mandalas have contributed a mueh larger proportion of verses than any of the others. Now, the hymns of the eighth book are ascribed to a number of different rishis, mostly belonging to the

Kanva family. The productions of each poet are usually, though not always, grouped together, but no other principle of arrangement has yet been discovered. The chief peculiarity of this mandala, however, consists in its metres. Many of the hymns are composed in the form of stanzas, called pragdtha (from ga, ‘‘to sing”), consisting of two verses in the brihatt and satobrihatt metres ; whence this book is usually known under the designation of Pragéthah. The other metres met with in this book are likewise such as were evidently considered peculiarly adapted for singing, viz., the gdyatrt (from gd, “to sing ”) and other chiefly octosyllabic metres. It is not yet clear how to account for these peculiarities ; but further research may perhaps show that either the Kanvas were a family of udg4tars, or chanters, or that, before the establishment of a common system of worship for the Brahmanical community, they were accustomed to carry on their liturgical service exclusively by means of chants, instead of using the later form of mixed recitation and chant. Oue of the rishis of this family is called Pragatha Kanva ; possibly this sur- name ‘‘pragatha” may be an old, or local, synonym of udgatar, or perhaps of the chief chanter, the so-called Prastotar, or pre- centor. The ninth mandala, on the other hand, consists entirely of hymns (114) addressed to Soma, the deified juice of the so-called “moon-plant” (Sarcostemma viminale, or Asclepias acida), and ascribed to poets of different families. They are called pavamdnt, “purificational,” because they were to be recited by the hotar while the juice expressed from the soma plants was clarifying. The first sixty of these hymns are arranged strictly according to their length, ranging from ten down to four verses; but as to the remaining hymns no such principle of arrangement is observable, except perhaps in smaller groups of hymns. One might, therefore, feel inclined to look upon that first section as the body of soma hymns set apart, at the time of the first redaction of the Samhita, for the special purpose of being used as pavamdnyah,—the remain- ing hymns having been added at subsequent redactions. It would not, however, by any means follow that all, or even any, of the latter hymns were actually later productions, as they might previously have formed part of the family collections, or might have been overlooked when the hymns were first collected. Other mandalas (viz., i., vili., and x.) still contain four entire hymns addressed to Soma, consisting together of 58 verses, of which only a single one (x. 25, 1) is found in the Samaveda-samhité, as also some 28

isolated verses to Soma, and four hymns addressed to Soma in conjunction with some other deity, which are entirely unrepresented in that collection.

The tenth mandala contains the same number of hymns (191) as the first, which it nearly equals in actual length. ‘The hymns are ascribed to many rishis, of various families, some of whom appear already in the preceding mandalas. The traditional reeord is, however, less to be depended upon as regards this book, many names of gods and fictitious personages appearing in the list of its rishis. In the latter half of the book the hymns are clearly arranged according to the number of verses, in decreasing order,—occasional exceptions to this rule being easily adjusted by the removal of a few additional verses. A similar arrangement seems also to suggest itself in other portions of the book. This mandala stands somewhat apart from the preceding books, both its lan- guage and the general character of many of its hymns betraying a comparatively modern origin. In this respect it stands about on a level with the Atharvaveda-samhité, with which it is otherwise closely connected. Of some 1350 Rik-verses found in the Atharvan, about 550, or rather more than 40 per cent., occur in the tenth mandala. In the latter we meet with the same tendencies as in the Atharvan to metaphysical speculation and abstraet conceptions of the deity on the one hand, and to superstitious practices on the other. But, although in its general appearance the tenth mandala is decidedly more modern than the other books, it contains not a few hymns which are little, if at all, inferior, both in respect of age and poetic quality, to the generality of Vedic hymns.

It has become the custom, after Roth’s example, to call the Rik-samhita (as well as the Atharvan) an historical collection, as compared with the Samhitas put together for purely ritualistic pur- poses. And indeed, though the several family collections which make up the earlier mandalas may originally have served ritual ends, as the hymnals of eertain clans or tribal confederacies, and although the Samhita itself, in its oldest form, may have been intended as a common prayer-book, so to spcak, for the whole of the Brahmanieal community, it is certain that in the stage in which it has been finally handed down it includes a certain portion of hymn material (and even some secular poetry) which could never have been used for purposes of religious service. It may, therefore, be assumed that the Rik-samhita contains all of the nature of popu-

lar lyrics that was accessible to the collectors, or seemed to them worthy of being preserved. The question as to the exact period when the hymns were collected cannot be answered with any approach to accuracy. For many reasons, however, which cannot be detailed herc, scholars have come to fix on the year 1000 B.C. as an approximate date for the collection of the Vedic hymns, From that time every means that human ingenuity could suggest was adopted to secure the sacred texts against the risks connected with oral transmission. But, as there is abundant evidence to show that even then not only had the text of the hymns suffered corruption, but their language had become antiquated to a considerable extent, and was only partly understood, the period during which the great mass of the hymns were composed must have lain considerably further back, and may very likely have extended over the earlier half of the second millenary, or from about 2000 to 1500 B.c.

As regards the people which raised for itself this imposing monu- ment, the hymns exhibit it as settled in the regions watered by the inighty Sindhu (Indus), with its eastern and western tributaries. The land of the five rivers forms the central home of the Vedic people ; but, while its advanced guard has already debouched upon the plains of the upper Ganga and Yamuna, those who bring up the rear are still found loitering far behind in the narrow glens of the Kubha (Cabul) and Gomat! (Gomal). Scattered over this tract of land, in hamlets and villages, the Vedie Aryas are leading chiefly the life of herdsmen and husbandinen. The numerous clans and tribes, ruled over by chiefs and kings, have still constantly to vindicate their right to the land but lately wrung from an inferior race of darker hue; just as in these latter days their kinsmen in the Far West are everon their guard against the fierce attacks of the dispossessed red-skin. Not unfrequently, too, the light-coloured Aryas rage internecine war with one another,—as when the Bharatas, with allied tribes of the Panjab, goaded on by the royal sage Visvamitra, invade the country of the Tritsu king Sudas, to be defeated in the “ten kings’ battle,” through the inspired power of the priestly singer Vasishtha. The priestly office has already become one of high social

importance by the side of the political rulers, and to a large extent an hereditary profession; but it does not yet present the baneful features of an exclusive caste. The Aryan housewife shares with her husband the daily toil and joy, the privilege of worshipping the national gods, and even the triumphs of song-craft, some of the finest hymns being attributed to female seers,

The religious belief of the people consists in a system of natural symbolism, a worship of the elementary forces of nature, regarded as beings endowed with reason and power superior to those of man. In giving utterance to this simple belief, the priestly spokesman has, however, frequently worked into it his own speculative and mystic notions. Indra, the stout-hearted ruler of the cloud-region, receives by far the largest share of the devout attentions of the Vedic singer. His ever-renewed battle with the malicious demons of darkness and drought, for the recovery of the heavenly light and the rain-spending cows of the sky, forms an inexhaustible theme of spirited song. Next to him, in the affections of the people, stands Agni (ignis), the god of fire, invoked as the genial inmate of the Aryan household, and as the bearer of oblations, and mediator between gods and men. Indra and Agni are thus, as it were, the divine representatives of the king (or chief) and the priest of the Aryan community ; and if, in the arrangement of the Samhita, the Brahmanical collectors gave precedence to Agni, it was but one of many avowals of their own hierarchical pretensions. Hence also the hymns to Indra are mostly followed, in the family collections, by those addressed to the Viéve Devah (the ‘‘all-gods”’) or to the Maruts (Mavors, Mars), the warlike storm-gods and faithful com- panions of Indra, as the divine impersonation of the Aryan free- men, the vi or clan. But, while Indra and Agni are undoubtedly the favourite figures of the Vedic pantheon, there is reason to believe that these gods had but latcly supplanted another group of deities who play a less prominent part in the hymns, viz., Father Heaven (Dyaus Pitar, Zebs warhp, Jupiter); Varuna (odpavos), the all- embracing firmament; Mitra (Zend. Mitlra), the genial light of day; and Savitar (Saturnus) or Sfirya (4éA10s), the vivifying sun.

Of the Brahmanas that were handed down in the schools of the

manas of Bahvrichas (i.e., “ possessed of many verses”), as the followers of Rigveda. the Rigveda are called, two have come down to us, viz., those of

the Aitareyins and the Kaushitakins. The Aitareya-bréhmana} and the Kaushitaki- (or Sénkhdyana-) brdhmana evidently have for their groundwork the same stock of traditional exegetic matter. They differ, however, considerably as regards both the arrange- ment of this matter and their stylistic handling of it, with the exception of the numerous legends common to both, in which the discrepancy is comparatively slight. There is also a certain amount of material peculiar to each of them. The Kaushitaka is, upon the whole, far more concise in its style and more systematic in its arrangement—merits which would lead one to infer that it

eae een a Bert translation, by M. Haug, 2 vols., Bombay, 1863. An ic man transliteration, with extracts from the comment: h published by Th. Aufrecht, Bonn, 1879, ee

is probably the more modern work of the two. It consists of thirty chapters (adhydya); while the Aitareya has forty, divided into eight books (or pentads, panchakd, of five chapters each). The last ten adhydyas of the latter work are, however, clearly a later addition,—though they must have already formed part of it at the time of Panini (c. 400 B.c. %), if, as seems probable, one of his grammatical sitras, regulating the formation of the names of Brahinanas, consisting of thirty and forty adhydyas, refers to these two works. In this last portion occurs the well-known legend (also found in the Sankhayana-siitra, but not in the Kaushitaki- bréhmana) of Sunahsepa, whom his father Ajigarta sells and offers to slay, the recital of which formed part of the inauguration of kings. While the Aitareya deals almost exclusively with the Soma sacrifice, the Kaushitaka, in its first six chapters, treats of the several kinds of haviryajiia, or offerings of rice, milk, ghee, &c., whereupon follows the Soma sacrifice in this way, that chapters 7-10 contain the practical ceremonial and 11-30 the recitations (Sastra) of the hotar. Sayana, in the introduction to his com- mentary on the work, ascribes the Aitareya to the sage Mahiddsa Aitareya (son of Itara), also mentioned

elsewhere as a philosopher ; and it seems likely enough that this person arranged the Brahmana and founded the school of the Aitareyins. Regarding the author- ship of the sister work we have no information, except that the opinion of the sage Kaushttaki is frequently referred to in it as authoritative, and generally in opposition to the Paingya—the Braéhmana, it would seem, of a rival school, the Paingins.

Each of these two Braéhmanas is supplemented by a “ forest- portion,” or Aranyaka. The Attareydranyaka? is not a uniform production. It consists of five books (dranyaka), three of which, the first and the last two, are of a liturgical nature, treating of the eeremony called mahdévrata or great vow. The sccond and third books, on the other hand, are purely speculative, and are also styled the Bahvricha-bréhmana-upanishad, Again, the last four chapters of the second book are usually singled out as the Aitareyopanishad,? ascribed, like its Brahmana (and the first book), to Mahidasa Aitareya ; and the third book is also referred to as the Samhitd-upanished. The fourth and fifth books are doubtless of later origin, being composed in siitra-form. Even native authorities exclude them from the sacred canon, and ascribe them to Aéva layana and Saunaka respectively, of whom more further on. As regards the Kaushitaki-dranyaka, our MS. material is not yct sufficient to enable us to determine its exact extent and arrange- ment. It would, however, seem that there are two different recensions of this treatise, a shorter one, consisting of nine, and a longer one of fifteen, adhydyas. Four of these, variously placed at the beginning or end, or after the second adhydya, constitute the highly interesting Kaushitaki- (brdhmana-) upanishad,* of which we possess two different recensions. The remaining portions of the Aranyaka seein to correspond, to some extent, to the cere- monial sections of the Aitareya-dranyaka.

Of Kalpa-sdtras, or manuals of sacrificial ceremonial, composed Sfitras of for the use of the hotar priest, two different sets are in existence, Rigveda.

the Asvaldyana- and the Sénkhdyana-sttra. Each of these works follows one of the two Brahmanas of the Rik as its chief authority, viz., the Aitareya and Kaushitaka respectively. Both consist of a Srauta- anda Grthya-sdtra. Asvalayana seems to have lived about the same time as Panini,—his own teacher, Saunaka, who com- pleted the Rik-pratisakhya, being probably

intermediate between the great grammarian and Y4dska, the author of the Nirukta. Saunaka himself is said to have been the author of a Srauta-sfltra (which was, however, more of the nature of a Brahmana) and to have destroyed it on seeing his pupil's work. A Grihya-siitra is still quoted under his name by later writers. The Aévalfyana Srauta-sitra > consists of twelve, the Grihya® of four, adhyayas. Regarding Sankhayana still less is known; but he, too, was doubtless a comparatively modern writer, who, like Agvaléyana, founded a new school of ritualists. Hence the Kaushitaki-brahmana, adopted (and perhaps improved) by him, also goes under his name, just as the Aitareya is sometimes called Aévaliyana-bréhmana. The Sankhayana Srauta-siitra consists of eighteen adhyayas. The last two chapters of the work are, however, a later addition,® while the two preceding chapters, on the contrary, present a com- paratively archaic, brahmana-like appearance. The Grihya-siitra' consists of six chapters, the last two of which are likewise later appendages. The Sdmbavya Grihya-sitra, of which a single MS.

2 Edited, with SAéyana's commentary, by Rajendralala Mitra, in the Bibliotheca Indica, 1875-76. The first three books have been translated by F. Max Miiller in Sacred Books of the East, vol. i.

3 Edited and translated by Dr Réer, in the Bibl. Ind. The last chapter of the second book, not being commented upon by SAéyana, is probably a latcr addition.

4 Text, commentary, and translation published by E. B. Cowell, in the Bibl. Ind. Also a translation by F. Max Miiller in Sacred Books of the East, vol. i.

5 Both works have been published with the commentary of Gargya Narayana, by native scholars, in the Bibl. Ind. Also the text of the Grihya, with a German translation by A. Stenzler.

6 See A. Weber's analysis, Ind. Studien, ii. p. 288 sq. This work, with its commentaries, is only accessible in manuscript.

7 Edited, with a German translation, by H. Oldenberg (Jnd. Stud., vol. XV-), who also gives an account of the Simbavya Grihya.

is at present known, secms to be closely connected with the preceding work. Prof. Biihler also refers to the Rigveda the Vasishtha-dharmasdstra,' composed of mixed stitras and couplets. A few works remain to be noticed, bearing chiefly on the textual form and traditionary records of the Rik-samhité. In our remarks on the Vedangas, the Pratisakhyas have already been referred to as the chief repositories of siksha or Vedic phonetics. Among these works the Rik-prdatisdkhya? occupies the first place. The original composition of this important work is ascribed to the same Sékalya from whom the vulgate recension of the (Sakala) Samhita takes its name. He is also said to be the author of the existing Pada-patha (i.e., the text-form in which each word is given uncon- nected with those that precede and follow it),—which report may well be credited, since the pada-text was doubtless prepared with a view to an examination, such as is presented in the Pratisakhya, of the phonetic modifications undergone by words in their syntactic combination. In the Pratisakhya itself, Sdkalya's father (or Sakalya the elder) is also several times referred to as an authority on phonetics, thongh the younger Sakalya is evidently regarded as having improved on his father's theories. Thus both father and son probably had a share in the formulation of the rules of pronunciation and modification of Vedic sounds. The completion or final arrangement of the Rik-pratisakhya, in its present form, is ascribed to Saunaka, the reputed teacher of Agvalayana. _Saunaka, however, is merely a family name ("descendant of Sunaka"), which is given even to the rishi Gritsamada, to whom nearly the whole of the second mandala of the Rik is attributed. How long after Sakalya this particular Saunaka lived we do not know; but some generations at all events would seem to lie between them, considering that in the meantime the Sakalas, owing doubtless to minor differences on phonetic points in the Samhita text, had split into several branches, to one of which, the Saisira (or Saisiriya) school, Saunaka belonged. While Sakalya is referred to both by Yaska and Panini, neither of these writers mentions Saunaka. It

-seems nevertheless likely, for several reasons, that Panini was

acquainted with Saunaka’s work, though the point has by no means been definitively settled. The Rik-pratisikhya is composed in mixed glokas, or couplets of various metres, a form of composi- tion for which Saunaka seems to have had a special predilection. Besides the Pratisakhya, and the Grihya-stitra mentioned above, eight other works are ascribed to Saunaka, viz., the Brihad- devatd, an account, in epic élokas, of the deities of the hymns, which supplies much valuable mythological information; the Rig-vidhdna, a treatise, likewise in epic metre, on the magic effects

of some seventy-five verses, some of which have been taken from Khila hymns, whilst others which also occur in the Atharvan or Yajurveda, as well as such not otherwise found, may perhaps have formed part of some other recension of the Rik. The Sdéimaveda- samhitd* is divided into two chief parts, the pérva- (first) and the uttara- (second) arehika. The second part contains the texts of the saman-hymns, arranged in the order in which they are actually required for the stotras or chants of the various Soma sacrificcs. The first part, on the other hand, contains the body of tune-verses, or verses used for practising the several s’mans or tunes upon,—the tunes themselves being given in the Grdma-geya-gdna (1.e., songs to be sing in the village), the tune-book specially belonging to the Pirvarchika. Hence the latter includes all the first verses of those triplets of the second part which had special tunes peculiar to them, besides the texts of detached sdmans occasionally used outside the regular ceremonial, as well as such as were perhaps no longer required but had been so used at one time or other. The verses of the Pfirvarchika are arranged on much the same plan as the family-books of the Rik-samhité, viz., in three sections containing the verses addressed to Agni, Indra, and Soma (pava- médna) respectively,—each section (consisting of one, three, and one adhyayas respectively) being again arranged according to the metres, Hence this part is also called Chhandas- (metre) drehika. Over and above this natural arrangement of the two Archikas, there is a purely formal division of the texts into six and nine prapathakas respectively, each of which, in the first part, consists of ten decades (dasat) of verses. We have two recensions of the Samhita, belonging to the Randyantya and Kauthuma schools, and differing but slightly from each other. Besides the six prapathakas (or five adhyayas) of

the Pfirvarchika, some schools have an addi- tional “forest” chapter, called the Aranyaka-samhitd, the tunes of which—along with others apparently intended for being chanted by anchorites—are contained in the Aranya-géna. Besides the two tune-books belonging to the Pfirvarchika, there are two others, the Vha-géna (“ modification-songs”)and Uhya-gdna, which follow the order of the Uttararchika, giving the several saman- hymns chanted at the Soma sacrifice, with the modifications the tunes undergo when applied to texts other than those for which they were originally composed. The Saman hymnal, as it has come down to ns, has evidently passed through a long course of develop- ment. The practice of chanting probably goes back to very early times ; but the question whether any of the tunes, as given in the Ganas, and which of them, can lay claim to an exceptionally high antiquity will perhaps never receive a satisfactory answer.

The title of Bréhmana is bestowed by the Chhandogas, or Sama- followers of the Samaveda, on a considerable number of treatises. veda- In accordance with the statements of some later writers, their brah-

of Vedic hymns and verses; the Pdda-vidhdna, a similar treatise, apparently no longer in existence ; and five different indexes or catalogues (anukramant) of the rishis, metres, deities, sections

Samhita,

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(anuvdka), and hymns of the Rigveda. It is, however, doubtful whether the existing version of the Brihaddevata is the original one; and the Rigvidhdéna would seem to be much more modern than Saunaka’s time. As regards the Anukramanis, they seem all to have been composed in mixed glokas; but, with the exception of the Anuvakanukramant, they are only known from quotations, having been superseded by the Sarvénukrama, or complete index, of Kdiydyana. Both these indexes have been commented upon by Shadgurusishya, towards the end of the 12th century of our era.

B. Séma-veda.—The term séman, of uncertain derivation, denotes a solemn tune or melody to be sung or chanted to a rzeh or verse. The set chants

(stotra) of the Soma sacrifice are as a rule performed in triplets, either actually consisting of three different verses, or of two verses which, by the repetition of certain parts, are made, as it were, to form three. The three verses are usually sung to the same tune ; but in certain cases two verses sung to the same tune had a different siman enclosed between them. One and the same saman or tune may thus be snng to many different verses ; but, as in teaching and practising the tunes the same verse was invariably used for a certain tune, the term “saman,” as well as the special technical names of sémans, are not unfrequently applied to the verses themselves with which they were most commonly con- nected, just as one would quote the beginning of the text of an English hymn, when the tune usually sung to that hymn is meant. The Indian chant somewhat resembles the Gregorian or Plain Chant.3 Each siman is divided into five parts or phrascs (prastéva or prelude, &c.), the first four of which are distributed between the several chanters, while the finale (nidhana) is sung in unison by all of them.

In accordance with the distinction between rieh or text and séman or tune, the siman-hymnal consists of two parts, viz., the Sdmaveda-samhitd, or collection of texts (rich) used for making up siman-hymns, and the Gdna, or tune-books, song-books. The textual matter of the Samhita consists of somewhat under 1600 different verses, selected from the Rik-samhita, with the exception

1 Text with Krishnapandita’s commentary, published at Benares ; translation by G. Bithler in Sacred Books, vol. xiv.

2 Edited, with a French translation, by A. Regnier, in the Journal Asiatique, 1856-8; also, with a German translation, by M. Miiller, 1869.

3 Burnell, Arsheyabrahmana, p. xli.

number was usually fixed at eight; but within the last few years manas.

one new Brahmana has been recovered, while at least two others which are found quoted may yet be brought to light in India. The majority of the Samaveda-brahmanas present, however, none of the characteristic features of other works of that class; but they are rather of the nature of sfitras and kindred _ treatises, with which they probably belong to the same period of

literature. Moreover, the contents of these works—as might indeed be expected from the nature of the duties of the priests for whom they were intended—are of an extremcly arid and technical character, though they all are doubtless of some importance, either for the textual criticism of the Samhita or on account of the legendary and other information they supply. These works arc as follows: —(1) the Téndya-mahd- (or Praudha-) brdhmana,® or " great" Brahmana,—usually called Panchavimsa-brdhmana from its ''con- sisting of twenty-five" adhyayas—which treats of the duties of the udgatars generally, and especially of the various kinds of chants ; (2) the Shadvimsa, or "twenty-sixth," being a supplement to the preceding work,—its last chapter, which also bears the title of Adbhuta-bréhmana,® or "book of marvels,' is rather interesting, as it treats of all manner of portents and evil influences, which it teaches how to avert by certain rites and charms; (8) the Sémavt- dhdna,'? analogous to the Rigvidhana, descanting on the magic effects of the various sAmans; (4) the Arsheya-bréhmana, a mere catalogue of the technical names of the samans in the order of the Pirvarchika, known in two different recensions ; (5) the Devatd- dhydya, which treats of the deities of the simans ; (6) the Chhdndo-gya-brdhmana, the last eight adhyayas (3-10) of which constitute the important Chhandogyopanishad ;° (7) the Samhitopanishad- bréhmana, treating of various subjects connected with chants ; (8)

4 Edited and translated by J. Stevenson, 1843 ; a critical edition, with Gcrman translation and glossary, was published by Th. Benfey, 1848; also an edition, with the Ganas and Sayana's commentary, by Satyavrata Simasrami, in the Bibl. Ind., in 5 vols.

5 Edited with S&yana's commentary, by Anandachandra Vedantavagisa, in the Bibl. Ind., 1870-74.

6 A, Weber, "Omina et Portenta," Abhandlungen of Berlin Royal Academy of Sciences, 1858.

7 The works enumerated under 3, 4, 5,7, 8 have been edited by A. Burnell; 8 also previously by A. Weber, ind. St., iv.

8 Edited and translated by Dr Roer, Bibl. Ind.; also translated by M. Miiller, Sacred Books of the East, i.

Sama- veda- sfitras.

Samhitds of Black Yajur- veda,

the Vaméa-brdéhmana, a mere list of the Sdmaveda teachers. To these works has to be added the Jaimintya- or Talavakéra- brdhmana, discovered by the late Dr A. Burnell, but as yet only known by a few extracts. From Prof. Whitney's account of it,! the work stands much on a level with the Brahmanas of the Rik and Yajurveda. A portion of it is the well-known Kena- (or Talavakdra-) upanishad, on the nature of Brahman, as the supreme of deities. ; J ;

If the Sdmaveda has thus its ample share of Brahmana-literature, though in part of a somewhat questionable character, it is not less richly supplied with sfitra-treatises, some of which probably belong to the oldest works of that class. There are three Srauta- stitras, which attach themselves more or less closely to the Panchaviméga-brahmana:—Maégaka's Arsheya-kalpa, which gives the beginnings of the sAmans in their sacrificial order, thus supplement- ing the Arsheya-brihmana, which enumerates their technical names ; and the Srauta-stitras of Ldtydyana? and Drdhydyana, of the Kauthuma and RA&nayaniya schools respectively, which differ but little from each other, and form complete manuals of the duties of the udgatars. Another siitra, of an exegetic character, the Anupada-sdira, likewise follows the Panchavimésa, the difficult passages of which it explains. Besides these, there are a con- siderable number of sitras and kindred technical treatises bearing on the prosody and phonetics of the sdma-texts. The more important of them are—the Riktantra, apparently intended to serve as a Pratisakhya of the Samaveda; the Niddna-sdtra,' a

treatise on prosody ; the Pushpa- or Phutlla-sétra, ascribed either |

to Gobhila or to Vararuchi, and treating of the phonetic modi- fications of the rich in the samans ; and the Sématantra, a treatise on chants, of a very technical nature. Further, two Grihya-sitras, belonging to the Samaveda, are hitherto known, viz., the Dréhyé- yana-grihya, ascribed to Khadira, and that of Gobhila* (who is also said to have composed a Srauta-stitra), with a

supplement, entitled Karmapradipa, by Katyayana. To the SAmavcda seems further to belong the Gautama-dharmasdstra,> composed in siitras, and apparently the oldest existing compendium of Hindu law.

C. Yajur-veda.—This, the sacrificial Veda of the Adhvaryu priests, divides itself into an older and a younger branch, or, as they are usually called, the Black (Zrishna) and the White (swkla) Yajurveda. Tradition ascribes the foundation of the Yajurveda to the sage Vaigampayana. Of his disciples three are specially named, viz., Katha, Kalapin, and Yaska Paingi, the last of whom again is stated to have communicated the sacrificial science to Tittiri. How far this genealogy of teachers may be authentic cannot now be determined ; but certain it is that in accordance therewith we have three old collections of Yajus-texts, viz., the Kdthaka, the Kdlépaka or Maitrdyanit Samhitd,' and the Taittirtya-samhité.? The Kathaka and Kalapaka are frequently mentioned together ; and the author of the " great commentary "' on Panini once remarks that these works were taught in every village. The Kathas and Kalapas are often referred to under the collective name of Charakas, which apparently means '' wayfarers" or itincrant scholars ; but according to a later writer (Hemachandra) Charaka is no other than Vaigampayauna himself, after whom his followers would have been thus called. From the Kathas proper two schools seem early to have branched off, the Prachya- (eastern) and Kapishthala- Kathas, the text-recension of the latter of whom has recently been discovered in the Kapishthala-katha-samhitd. The Kalapas also soon became subdivided into numerous different schools. Thus from one of Kalapin's immediate disciples, Haridru, the Haridraviyas took their origin, whose text-recension, the Héri- dravika, is quoted together with the Kathaka as carly asin Yaska's Nirukta ; but we do not know whether it differed much from the original Kalapa texts. As regards the Taittiriya-samhita, that collection, too, in course of time gave rise to a number of different schools, the text handed down being that of the Apastambas; while the contents of another recension, that of the Atreyas, are known from their Anukramani, which has been preserved.

_The four collections of old Yajus texts, so far known to us, while differing more or less considerably in arrangement and verbal points, have the main mass of their textual matter in common. This common matter consists of both sacrificial prayers (yajus) in verse and prose and exegetic or

illustrative prose portions (brah- mana). A prominent feature of the old Yajus texts, as compared with the other Vedas, is the constant intermixture of textual and exegetic portions. The Charakas and Taittiriyas thus do not recognize the distinction between Samhitd and Brahmana in the sense of two separate collections of texts, but they have only a Samhita, or collection, which includes likewise the exegetic or

1 Proceedings of Am. Or. Soc., May 1883.

oe Edited with Agnisvamin's commentary, and the v. ll. of the Drahyayana-sitra, by Anandachandra Vedantavagisa, Bibl. Ind., 1872. : : 'Two chapters published by A. Weber, Ind. St., viii. P Edited with a commentary, by Chandrakanta Tarkalankara, Bibl. Ind. Edited by A. Stenzler ; translated by G. Biihler, Sacred Books, vol. ii. 6 In process of publication by L. v. Schroeder. 7 Partly published, with Sayana's commentary,

in Bibl. Ind. by E. Récr, E, B. Cowell, &¢.,

Brahmana portions. The Taittiriyas seem at last to have been impressed with their want of a separate Brahmana and to have set about supplying the deficiency in rather an awkward fashion: instead of separating from each other the textual and exegetic portions of their Samhita, they merely added to the latter a supplement (in three books), which shows the same mixed con- dition, and applied to it the title of Taittirtya-brdhmana.® But, though the main body of this work is manifestly of a supple- mentary nature, a portion of it may perhaps be old, and may once have formed part of the Samhita, considering that the latter con- sists of seven ashtakas, instead of eight, as this term requires, and that certain essential parts of the ceremonial handled in the Brahmana are entirely wanting in the Samhita. Attached to this work is the Taittiriya-dranyaka,? in ten books, the first six of which are of a ritualistic nature, while of the remaining books the first three (7-9) form the Tatttirtyopanishad (consisting of three parts, viz., the Sikshavalli or Samhitopanishad, and the Anandavalli and Bhriguvalli, also called

together the Varuni- upanishad), and the last book forms the Narayaniya- (or Yajfiki-) upanishad.

The Mattrayani Samhitd, the identity of which with the original Kalapaka has been proved pretty conelusively by Dr L. v. Schroder, who attributes the change of name of the K4lapa- Maitrayaniyas to Buddhist influences, consists of four books, attached to which is the Maztri- (or Mattrdyant) upanishad.? The Kéthaka, on the other hand, consists of five parts, the last two of which, however, are perhaps later additions, containing merely the prayers of the hotar priest, and those used at the horse-sacrifice. There is, moreover, the beautiful Katha- or Kdthaka-upanishad," which is also ascribed to the Atharvaveda, and in which Dr Réer would detect allusions to the Sankhya philosophy, and even to Buddhist doctrines.

The defective arrangement of the Yajus texts was at last remedied by a different school of Adhvaryus, the Vajasaneyius. The reputed originator of this school and its text-recension is YAajfiavalkya Vajasaneya (son of Vajasani). The result of the re- arrangement of the texts was a collection of,sacrificial mantras, the Véjasaneyi-samhitd, and a Brahmana, the Satapatha. On account of the greater lucidity of this arrangement, the VAjasaneyins called their texts the White (or clear) Yajurveda,—the name of Black (or obscure) Yajus being for opposite reasons applied to the Charaka texts. Both the Samhita and Brahmana of the Vajasaneyins have come down to us in two different recensions, viz., those of the Madhyandina and Kdnva schools ; and we find besides a consider- able number of quotations from a Vajasaneyaka, from which we cannot doubt that there must have been at least one other recension of the Satapatha-brahmana. The difference between the two extaut recensions is, on the whole, but slight as regards the subject-matter ; but in point of diction it is quite sufficient to make a comparison especially interesting from a philological point of view. Which of the two versions may be the more original cannot as yct be determined ; but the phonetic and grammatical differences will probably have to be accounted for by a geographical separation of the two schools rather than by a difference of age. In several points of difference the Kanva recension agrees with the practice of the Rik-samhita, and there probably was some connexion between the Yajus school

of Kanvas and the famous family of rishis of that name to which the eighth mandala of the Rik is attributed.

The Vdjasaneyi-samhité™ consists of forty adhydyas, the first eighteen of which contain the formulas of the ordinary sacrifices. The last fifteen adhydyas are doubtless a later addition,—as may also be the case as regards the preceding seven chapters. The last adhyaya iscommonly known under the title of Vajasaneyi-samhita- (or Isavasya-) upanishad.!? Its object seems to be to point out the fruitlessness of mcre works, and to insist on the necessity of man's acquiring a knowledge of the supreme spirit. The sacrificial texts of the Adhvaryus consist, in about equal parts, of verses (rich) and prose formulas (yajus). The majority of the former occur likewise in the Rik-samhita, from which they were doubtless extracted. Not unfrequently, however, they show considerable discrepancies of reading, which may be explained partly from a difference of recen- sion and partly as the result of the adaptation of these verses to their special sacrificial purpose. As regards the prose formulas, though only a few of them are actually referred to in the Rik, it is quite possible that many of them may be of high antiquity.

The Satapatha-bréhmana,™ or Brahmana of a hundred paths, derives its name from the fact of its consisting of 100 lectures (adhyaya), which are divided by the Madhyandinas into fourtcen, by

8 Edited, with Sayana's commentary, by Rajendralala Mitra, Bibl. Ind.

® Text and translation published by E. B. Cowell, Bibi. Ind.

10 Text, commentary, and translation published by E. Rier, Bibl. Ind.

11 Edited, in the Madhyandina recension, with the commentary of Mahidhara, and the v. ll. of the Kanva text, by A. Weber, 1849. a Translation by E. Récr, Bibl. Ind.; by F. M. Miiller, Sacred Books of the

'ast, i.

13 Edited by A. Weber, who also translated the first chapter into German. In Sacred Books of the East, a translation, by J. Eggeling, is being published,

—2 vols., containing the first four books, having appeared.

Samhita

of White

Yajur- veda,

Brah- mana of White Yajur- veda,

va NS

the Kanvas into seventeen books (kinda). The first nine books of the former, corresponding to the first eleven of the Kanvas, and consist- ing of sixty adhyayas, form a kind of running commentary on the first eightcen books of the Vaj.~~Samhita; and it has been plausibly suggested by Prof. Weber that this portion of the Bralhmana may be referred to in the Mahabhashya on Pan. iv. 2, 60, where a Sata~~ patha anda Shashti-patha (7.e., ‘‘ consisting of 60 paths”) are men-

ioned together as objects of study, and that consequently it may at one time have formed an independent work. This view is also supportcd by the circumstance that of the remaining five books (10-14) of the Madhyandinas the third is called the middle one (madhyama); while the Kanvas apply the same epithet to the middlemost of the five books (12-16) preceding their last one. This last book would thus seem to be treated by them as a second supplement, and not without reason, as it is of the Upanishad order, and bears the special title of Brihad- (great) dranyaka.} Except in books 6-10 (M.), which treat of the construction of fire-altars, and recognize the sage Sandilya as their chief authority, Yajnavalkya’s opinion is frequently referred to in the Satapatha as authoritative. This is especially the case in the later books, part of the Brihad-aranyaka being even called Yajfiavalkiya-kanda. As regards the age of the Satapatha, the probability is that the main body of the work is considerably older than the time of Panini, but that some of its latter parts were considered by Panini’s critic Katyayana to be of about the same age as, or not much older than, Panini. Even those portions had probably been long in existence before they obtained recognition as part of the canon of the White Yajus.

The contemptuous manner in which the doctrines of the Charaka-adhvaryus are repeatedly animadverted upon in the Satapatha betrays not a little of the odiwm theologicwm on the part of the divines of the Vajasaneyins towards their brethren of the older schools. Nor was their animosity confined to mere literary war- fare, but they seem to have striven by every means to gain ascendency over their rivals. The consolidation of the Brahmanical hicrarchy and the institution of a common system of ritual worship, which called forth the liturgical Vedic collections, were doubtless consummated in the so-called Madhya-deéga, or '* middle country," lying between thc Sarasvati and the confluence of the Yamuna and Ganga ; and more espccially in its western part, the Kuru-kshetra, or land of the Kurus, with the adjoining territory of the PanchAlas, between the Yamuna and Gangd. From thence the original schools of Vaidik ritualism gradually extended their sphere over the adja- cent parts. The Charakas seem for a long time to have held sway

in the western and north-western regions ; while the Taittiriyas .

in course of time spread over the whole of the peninsula south of the Narmada (Nerbudda), where their ritual has remained pre- eminently the object of study till comparatively recent times. The Vajasaneyins, on the other hand, having first gained a footing in the lands on the lower Ganges, chiefly, it would seem, through the patronage of King Janaka of Videha, thence gradually worked their way westwards, and eventually succceded in superseding the older schools north of the Vindhya, with the exception of some isolated places where even now families of Brahmans are met with which profess to follow the old Samhitas.

In Kalpa-sdtras the Black Yajurveda is particularly rich ; but, owing to the circumstances just indicated, they are almost entirely confined to the Taittiriya schools. The only Srauta-sfitra of a Charaka sehool which has hitherto been recovercd is that of the Manavas, a subdivision of the Maitrayantyas. The Ménava-srauta- sdtra® seems to consist of eleven books, the first nine of which treat of the saerificial ritual, while the tenth contains the Sulva-stitra ; and the eleventh is made up of a number of supplements (pari- sishia). The Mdnava-grihya-sitra is likewise in existence

; but so far nothing is known, save one or two quotations, of a Médnava-dharma-sitra, the discovery of which ought to solve some important questions regarding the development of Indian law. Of stitra- works belonging to the Kathas, a single treatise, the Kéthaka- grihya-stitra, isknown; while Dr Jolly considers the Vishnu-smriti,® a compendium of law, composed in mixed stitras and slokas, to be nothing but a Vaishnava recast of the Kathaka-dharma-stitra, which seems no longer to exist. As regards the Taittirlyas, the Kal- pa-stitra most widcly accepted among them was that of Apastamba, to whose school, as we have seen, was also due our existing rcecen- sion of the Taittirlya-samhitéa. The. pastamba-kalpa-sitra consists of thirty yrasna (questious); the first twenty-five of these consti-tute the Srauta-siitra*; 26 and 27 the Grihya-sfitra ; 28 and 29 the Dharma-stitra®; and the last the Sulva-siitra. Prof. Biihler has tried to fix the date of this work somewhere between the 5th and 8rd

1 The text, with Sankara's commentary, and an English translation, published by E. Réer, Bibl. Ind.

2 Sec P. v. Bradke, Z. D. M. G., vol. xxxvi. A MS. of a portion of the Srauta- sfitra, with the commentary of the famous Mimamsist Kumiarila, has been photo- lithographed by the India Office, under Goldstiicker's supervision.

3 Edited and translated by J. Jolly.

'4 In course of publication, by R. Garbe, in Bibl. Ind.

5 G. Biihler has published the text with extracts from Haradatta's eommentary, also a translation in Sacred Books of the East,

centurics B.c.; but it can hardly yet be considercd as definitcly settled. Considerably more ancient than this work arc the Baudhd- yana-kalpa-sitra,® which consists of the same principal divisions, and the Bhdradvdja-stttra, of which, however, only a few portions have as yet been discovered. The Hiranyakesi-sitra, which is more modern than that of Apastamba, from which it differs but little, is likewise fragmentary ; and several other Kalpa-

sfitras, especially that of Laugakshi, are found quoted. ‚The recognized compendium of the White Yajus ritual is the Srawta-sitra of Katyfyana,’ in twenty-six adhydyas. This work is supplemented by a large number of secondary treatises, likewise attributed to Katydyana, among which may be mentioned the Charana-vytha,® a statistical account of the Vedic schools, which unfortunatcly has come down to us in a very unsatisfactory state of preservation. A manual of domestic rites, closely connected with Katy4yana’s work, is the Kdliya-grihya-sitra,® ascribed to Paraskara. To Katydyaua Ewe further owe the Vdjasancyi-prdtisdkhya,” and a catalogue (anukra- mant) of the White Yajus texts. As regards the former work, it is still doubtful whether (with Weber) we have to consider it as older than Panini, or whether (with Goldstiicker and M. Miiller) we are to identify its author with Panini’s critic. The only cxisting Pratisakhya! of the Black Yajus belongs to the Taittiriyas. Its author is unknown, and it confines itself entirely to the Taittiriya- samhita, to the exclusion of the Brahmana and Aranyaka.

D. Atharva-veda.—The Atharvan was the latest of Vedic col- lections to be recognized as part of the sacred canon. That it is also the youngest Veda is proved by its language, which, both from a lexical and a grammatical point of view, marks an inter- mediate stage between the main body of the Rik and the Brah- mana period. It is not less manifest from the spirit of its contents, which shows that the childlike trust of the early singer in the willingness of the divine agents to comply with the earnest request of their pious worshipper had passcd away, and in its place had sprung up a superstitious fear of a host of malevolent powers, whose baleful wrath had to be deprecated or turned asidc by incantations and magic contrivances. How far some lower form of worship, practised by the conquered race, may have helped to bring about this change of religious belief it would be idle to inquire ; but it is far from improbable that the hymns of the Rik reflect chiefly the religious notions of the more intelligent and educated minority of the community, and that superstitious practices like those disclosed by the greater part of the Atharvan and a portion of the tenth book of the Rik had long obtained among the people, and became the more prevalent the more the spiritual leaders of the people gave themselves up to theosophic and metaphysical specula- tions, Hence also verses of the Atharvaveda are not unfrequently used in domestic (grihya) rites, but very seldom in the

Srauta ceremonial. But, even if these or such like spells and incantations had long been in popular use, there can be no doubt that by the time they were collected they must have adapted themselves to the modifications which the vernacular language itself had under- gone in the mouths of the people.

This body of spells aud hymns is traditionally connected with two old mythic priestly families, the Angiras and Atharvans, their names, in the plural, serving either singly or combined (Atharvangirasas) as the oldest appellation of the collection. Instead of the Atharvans, another mythic family, the Bhrigus, are similarly connected with the Angiras (Bhrigvangirasas) as the depositaries of this mystic science. The current text of the Atharva-samhitd'*—apparently the recension of the Sannaka school —consists of some 750 different pieces, about five-sixths of which is in various metres, the remaining portion being in prose. The whole mass is divided into twenty books. The principle of dis- tribution is for the most part a merely formal one, in books i.—xiii. pieces of the same or about the same number of verses being placed together in the same book. The next five books, xiv.— xviii., have each its own special subject :—xiv. treats of marriage and sexual union; xv., in prose, of the Vratya, or religious vagrant ; xvi. consists of prose formulas of conjuration ; xvii. of a lengthy mystic hymn; and xviii. contains all that relates to death and funeral rites. Of the last two books uo account is taken in the Atharva-pratisikhya, and they indeed stand clearly in the relation of supplements to the original collection. The eighteenth book evidently was the result of a subsequent gleaning of pieces similar and a translation by G. Thibaut, in the Benares Pandit, 1875. The Dharma-sitra has been translated by G. Biihler, Sacred Books, xiv.

7 Edited by A. Weber. 8 Weber, Ind. Stud., iii.

®° Text and German translation by A. Stenzler. :

10 Edited, with Uvata's commentary, and a German translation, by A. Webcr, Ind. Stud., iv.

11 The work has been published by W. D. Whitney, with a translation and a com- mentary by an unknown author, called Tribhashyaratna, 7.e., "' jewel

of the three commentaries," it being founded on three older commentaries by Vararuchi, (?Katyayana), Mahisheya, and Atreya.

12 Edited by Profs. Roth and Whitney, 1856. The second vol., which was to contain the Varize Lectiones, remains still unpublished. Prof. Whitney, how- ever, has lately brought out an Index Verborum to the work. The first three books have been translated into German by Prof. Weber, Ind. Stud., vols. iv., xiii, xvii.

Atharva- veda-

samhita,

Atharva- The only Brahmana of the Atharvan, the Gopatha-bréhmana,? is language over the whole breadth of northern India. Such, veda- probably one of the most modern works of its class. It consists of | however, has been the case in the history of all nations; brah- two parts, the first of which contains cosmogonic speculations, | and there is no reason 'why, even with the existence of mana, interspersed with legends, apparently taken from other Brah- | joa) dialects, the literary language should not have kept manas, and general instructions on religious duties and observ- | . ee 2 1 lan : h b ¥ ances ; while the second part treats, in a very desultory manner, | 12 touc with the ages = India, as elsewhere, ut for the of various points of the sacrificial ceremonial. fact that from a certain time that language remained alto- Atharva- The Kalpa-sfitras belonging to this Veda comprise both a manual | gether stationary, allowing the vernacular dialects more veda- of Srauta rites, the Vaiténa-sdtra,? and a manual of domestic rites, and more to diverge from it. Although lincuistic research sfitras, the Kausika-sitra.+ The latter treatise is not only the more inter- 8 Fall : oe : esting of the two, but also the more ancient, being actually quoted | had been successfully carried on in India for centuries, the in the other. The teacher Kausika is repeatedly referred to in the | actual grammatical fixation of Sanskrit seems to have taken work on points of ceremonial doctrine. Connected with this Sitra place about contemporaneously with the first spread of are upwards of seventy Parisish{as, or supplementary treatises, | Buddhism; and indeed that popular religious movement mostly in metrical form, on various subjects bearing on the per- y : : : Pe formance of grihya rites. The last, sfitra-work to be noticed in undoubtedly exercised a powerful influence on the

linguistic connexion with this Veda is the Saunaktya Chaturddhydyikd,® | development of India. being a Pratisakhya of the Atharva-samhita, so called from its con- oe of we gerees eer Although Saunaka can hardly A. Poetical Literature. e credited with being the actual author of the work, considerin : : : that his opinion is B dudisd in the only rule where his aoe 1, Epie Poems. —The Hindus, like the Greeks, possess two The appears, there is no reason to doubt that it chiefly embodies the | great national epics, the Raémdyana and the Mahdbhdrata. national et ee of Cay a — were afterwards perfected | The Rdmdyana, ee. poem “ relating to Rima,” is ascribed “i y members of his school. ether this Saunaka is identical with Alaaes . i the writer of that name to whom the final redaction of the SAkala- e the poet Valmiki; and, allowance being made for later pratisakhya of the Rik is ascribed is not known ; but it is worthy additions here and there, the poem indeed presents the of note that on at least two points where Sakalya is quoted by | appearance of being the work of an individual genius. In eet a to – referred le seas than | its present form it consists of some 24,000 Slokas, or é€ Klk- pratisakhya, Saunaka is quoted once in the VAjasaneyi- ; : +s . pritigslehya bart oa pomitle ome tyivans Tait the Chater. | 452000 lines of sixteen syllables, divided into seven books. Adhyayika in view, though his reference does not quite tally with (I.) King Dagaratha of Koégala, reigning at Ayodhy4 (Oudh), _ the respective rule of that work. has four sons born him by three wives, viz., Rama, Bharata, and bes Another class of writings already alluded to as traditionally | the twins Lakshmana and Satrughna. RAma, by being able to

to those of the earlier books, which had probably escaped the collectors’ attention; while the last book, consisting almost entirely of hymns to Indra, taken from the Rik-samhita, is nothing more than a liturgical manual of the recitations and chants required at the Soma sacrifice. ;

The Atharvan has come down to us in a much less satisfactory state of preservation than any of the other Samhitas, and its interpretation, which offers considerable difficulties on account of numerous popular and out-of-the-way expressions, has so far received comparatively little aid from native sources. A com- mentary by the famous Vedic exegete Sdyana, which has

lately come to light in India, may, however, be expected to throw light on some obscure passages. Even more important is the discovery, some years ago, through the exertions of Sir William Muir, of an entircly different recension of the Atharva-samhita, preserved in Kashmir. This new recension,! suppesed to be that of the Paippalida school, consists likewise of twenty books (kanda), but both in textual matter and in its arrangement it differs very much from the current text. A considerable portion of the latter, including unfortunately the whole of the eighteenth book, is wanting; while the hymns of the nineteenth book are for the most part found also in this text, though not as a separate book, but scattered over the whole collection. Possibly, therefore, this recension may have formed one of the sources whence the nineteenth book was compiled. The twentieth book is wanting, with the exception of a few of the verses not taken from the Rik. As a set-off to these shortcomings the new version offers, however, a good deal of fresh inatter, amounting to about one-sixth of the whole. From the Mahabhashya and other works quoting as the beginning of the Atharva-samhita a verse that coincides with the first verse of the sixth hymn of the current text, it has long been known that at least one other recension must have existed; but owing to the defective state of the Kashmir MS. it cannot be determined whether the new recension (as seems likely) corresponds to the one referred to in those works.

connected with the Atharvaveda are the numerous Upanishads § which do not specially attach themselves to one or other of the Samhitas or Brahmanas of the other Vedas. The Atharvana- upanishads, mostly composed in glokas, may be roughly divided into two classes, viz., those of a purely speculative or general pantheistic character, treating chiefly of the nature of the supreme spirit, and the means of attaining to union therewith, and those of a sectarian tendency. Of the former category, a limited number —such as the Pragna, Mundaka, and Mandtkya-upanishads—have

1 It is in the hands of Prof. R. v. Roth, who has given an account of it in his academic dissertation, ‘‘ Der Atharvaveda in Kaschmir,’’ 1875. * Edited, in the Bibl. Ind., by Rajendralala Mitra.

2 Text and a German translation published by R. Garbe.

4 This difficult treatise is about to be published by Prof. Bloomfield. Two sections of it have been printed and translated by A. Weber

Omina et Portenta," 1859. ,

5 Edited and translated by W. D. Whitney.

§ For a full list of existing translations of and

essays on the Upani- shads, sce Introd. to Max Miiller's Upanishads, : '

Sacred Books, i.

Kei ?®

probably to be assigned to the later period of Vedic literature ; whilst the others presuppose more or less distinctly the existence of some fully developed system of philosophy, especially the Vedanta or the Yoga. The sectarian Upanishads, on the other hand—identifying the supreme spirit either with one of the forms of Vishnu (such as the Nardyana, Nrisimha-taépantya, Rama- tapantya, Gopala-tapaniya), or with Siva (e.g. the Rudropanishad), or with some other deity—belong to post- Vedic times.

[LITERATURE,

Il. THe Crassicat Periop.

The classical literature of India is almost entirely a pro- duct of artificial growth, in the sense that its vehicle was not the language of the general body of the people, but of a small and educated class. It would scarcely be possible, even approximately, to fix the time wlien tle literary idiom ceased to be understood by the common people. We only know that in the 3d century B.c. there existed several dialects in different parts of northern India which differed considerably from the Sanskrit; and Buddhist tradition, moreover, tells us that Gautama Sakyamuni himself, in the 6th century B.c., made use of the local dialect of Magadha (Behar) for preaching his new doctrine. Not unlikely, indeed, popular dialects, differing perhaps but slightly from one another, may have existed as early as the time of the Vedic

hymns, when the Indo-Aryans, divided into clans and tribes, occupied the Land of the Seven Rivers; but such dialects must, at any rate, have sprung up after the extension of the Aryan sway and

bend an enormous bow, formerly the dreaded weapon of the god Rudra, wins for a wife Sita, danghter of Janaka, king of Vidcha (Tirhut). (II.) On his return to Ayodhya he is to be appointed heir-apparent (yuva-raja, ¢.e., juvenis rex); but Bharata's mother persuades the king to banish his eldest son for fourteen years to the wilderness, and appoint her son instead. Separation from his favourite son soon breaks the king's heart; whereupon the ministers call on Bharata to assume the reins of government. He refuses, however, and, betaking himself to Rama's retreat on the Chitraktita mountain (in Bundelkhund), implores him to return ; but, unable to shake Rama's resolve to complete his term of exile, he consents to take charge of the kingdom in the meantime. (III.) After a ten years' residence in the forest, Rama attracts the attention of a female demon (Rakshasf) ; and, infuriated by the rejection of her advances, and by the wounds inflicted on her by Lakshmana, who kecps Rama company, she inspires her brother Ravana, demon- king of Ceylon, with love for Sita, in consequence of which the latter is carried off by him to his capital Lank&. While she resolutely rejects the Rakshasa's addresses, Rama sets out with his brother to her rescue. (1V.) After numerous adventures they

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enter into an alliance with Sugriva, king of the monkeys; and, with the assistance of the monkey-general Hanuman, and Ravana's own brother Vibhishana, they prepare to assault Lanka. (V.) The monkeys, tearing up rocks and trees, construct a passage across the straits— the so-called Adam's Bridge, still designated RAama's Bridge in India. (VI.) Having crossed over with his allies, Rama, after many hot encounters and miraculous deeds, slays the demon and captures the stronghold ; whereupon he places Vibhishana on the throne of Lanka. To allay Rama's misgivings as to any taint she might have incurred through contact with the demon, Sita now undergoes an ordeal by fire; after which they return to Ayodhya, where, after a triumphal entry, Rama is installed. (VII.) In the last book—probably a later addition—Rama, seeing that the people are not yet satisfied

of Sita’s purity, resolves to put her away ; whereupon, in the forest, she falls in with Valmiki himself, and at his hermitage gives birth to two sons. While growing up there, they are taught by the sage the use of the bow, as well as the Vedas, and the Ramayana as far as the capture of Lanka and the royal entry into Ayodhya. Ultimately Rama discovers and recognizes them by their wonderful deeds and their likeness to himself, and takes his wife and sons back with him.

The Mahdbhdrata, we, “the great (poem or feud) of the Bharatas,” on the other hand, is not so much a uni- form epic poem as a miscellaneous collection of epic poetry, consisting of a heterogeneous mass of legendary and didactic matter, worked into and round a central heroic narrative. The authorship of this work is aptly attributed to Vydsa, “the arranger,” the personification of Indian diaskeuasis. Only the bare outline of the leading story can here be given.

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In the royal line of Hastinapura (the ancient Delhi)—claiming descent from the moon, and hence called the Lunar race (somavamésa), and counting among its ancestors King Bharata, after whoni India is called Bharata-varsha (land of the Bharatas)—the succession lay between two brothers, when Dhritarashtra, the elder, being blind, had to make way for his brother Pandu. After a time the latter retired to the forest to pass the remainder of his life in hunting ; and Dhritarashtra assumed the government, assisted by his uncle Bhishma, the Nestor of the poem. After some years Pandu died, leaving five sons, viz., Yudhishthira, Bhima, and Arjuna by his ehief wife Kunti, and the twins Nakula and Sahadeva by Madri. The latter having burnt herself along with her dead husband, Kunti returned with the five princes to Hastinapura, and was well received by the king, who offered to have his nephews brought up together with his own sons, of whom he had a hundred, Duryodhana being the eldest. From their great-grandfather Kuru both families are called Kauravas; but for distinction that name is more usually applied to the sons of Dhritarashtra, while their cousins, as the younger line, are named, after their father, Pandavas. The rivalry and varying fortunes of these two houses form the main plot of the great epopee. The Pandu prinees soon proved themselves greatly superior to their

cousins ; and Yudhishthira, the eldest of them all, was to be appointed heir-apparent. But, by his son's advice, the king, good-natured but weak, induced his nephews for a time to retire from court and reside at a house where the unserupulous Duryodhana meant to destroy them. They escaped, however, and passed some time in the forest with their mother. Here Draupadi, daughter of King Drupada, won by Arjuna in open contest, became the wife of the five brothers. On that occasion they also met their cousin, Kunti's nephew, the famous Yadava prince Krishna of Dvaraka, who ever afterwards remained their faithful friend and confidential adviser. Dhrita- rashtra now resolved to divide the kingdom between the two houses ; whereupon the Pandavas built for themselves the city of Indraprastha (on the site of the modern Delhi). After a time of great prosperity, Yndhishthira, in a game of dice, lost everything to Duryodhana, when it was settled that the Pandavas shonld retire to the forest for twelve years, but should afterwards be restored to their kingdom if they suceeeded in passing an additional year in disguise, without being recognized by anyone. During their forest-life they met with many adventures, among which may be mentioned their encounter with King Jayadratha of Chedi, who had carried off Draupadi from their hermitage. After the twelfth year has expired they leave the forest, and, assuming various disguises, take serviec at the court of king Virata of Matsya. Here all goes well for a time till the queen's brother Kiehaka, a great warrior and commander of the royal forces, falls in love with

1 There are several eomplete editions published in India, the handiest in 4 vols., Calcutta, 1834-9. Numerous episodes from it have been printed and translated by European scholars. There is a Freneh translation, by H. Fauehe, of about one half of the work; but it must be used with caution. An English translation is being brought out at Calcutta by Pratap Chundra Roy.

Draupadi, and is slain by Bhima. The Kauravas, profiting by Kichaka's death, now invade the Matsyan kingdom, when the Pandavas side with king Virata, and there ensues, on the field of Kurukshetra, a series of fierce battles, ending in the annihilation of the Kauravas. Yudhishthira now at last becomes yuva-raja, and eventually king,—Dhritarashtra having resigned

and retired with his wife and Kuntti to the forest, where they soon after perish in a conflagration. Learning also the death of Krishna, Yudhishthira himself at last becomes tired of life and resigns his crown ; and the five princes, with their faithful wife, and a dog that joins them, set out for Mount Meru, to seek admission to Indra's heaven. On the way one by one drops off, till Yudhishthira alone, with the dog, reaches the gate of heaven; but, the dog being refused admittauee, the king declines entering without him, when the dog turns out to be no other than the god of Justice himself, having assumed that form to test Yudhishthira's constancy. But, finding neither his wife nor his brothers in heaven, and being told that they are in the nether world to expiate their sins, the king insists on sharing their fate, when this, too, proves a trial, and they are all reunited to enjoy perpetual bliss.

Whether this story is partly based, as Lassen sug- gested, on historical events,—perhaps a destructive war between the neighbouring tribes of the Kurus and Pan- chalas,—or whether, as Dr A. Holtzmann thinks, its prin- cipal features go back to Indo-Germanic times, will pro- bably never be decided. The complete work consists of upwards of 100,000 couplets,—its contents thus being nearly eight times the bulk of the Ziad and Odyssey com- bined. It is divided into eighteen books, and a supple- ment, entitled Harivamsa, or genealogy of the god Hari (Krishna-Vishnu). In the introduction, Vy4sa, being about to dictate the poem, is made to say (i. 81) that so far he and some of his disciples knew 8800 couplets ; and further on (i. 101) he is said to have composed the collection relating to the Bharatas (bhArata-samhita), and called the Bhdratam, which, not including the episodes, consisted of 24,000 slokas. Now, as a matter of fact, the portion relating to the feud of the rival houses constitutes somewhere between a fourth and a fifth of the work; and it is highly probable that this portion once formed a separate poem, called the Lhdrata. But, whether the former statement is to be understood as implying the existence, at a still earlier time, of a yet shorter version of about one-third of the present extent of the leading narra- tive cannot now be determined. While some of the episodes are so loosely connected with the story as to be readily severed from it, others are so closely interwoven with it that their removal would seriously injure the very texture of the work. This, however, only shows that the original poem must have undergone some kind of revision, or perhaps

repeated revisions. Thatsuch has indeed taken place, at the hand of Brahmans, for sectarian and caste purposes, cannot be doubted.

The earliest direct information regarding the existence of epic poetry in India is contained in a passage of Dion Chrysostom (c. 80 4.D.), according to which “even among the Indians, they say, Homer’s poetry is sung, having been translated by them into their own dialect and tongue ;” and “the Indians are well acquainted with the sufferings of Priam, the lamentations and wails of Andro- mache and Hecuba, and the prowess of Achilles and Hector.” Now, although these allusions would suit either poem, they seem on the whole to correspond best to certain incidents in the Mahdbhédrata, especially as no direct mention is made of a warlike expedition to a remote island for the rescue of an abducted woman, the resem- blance of which to the Trojan expedition would naturally have struck a Greek becoming acquainted with the general outline of the Rdmdyana. Whence Dion derived his information is not known ; but as many leading names of the Mahabharata and even the name of the poem itself 2 are already mentioned in Paénini’s grammatical rules, it is

2 Viz., as an adj., apparently with “war” or “poem” understood.

not ouly certain that the Bharata legend must have been current in his time (?¢. 400 B.c.), but most probable that it existed already in poetical form, as undoubtedly it did at the time of Patanjali, the author of the “great comment- ary” on Panini (c. 150 B.c.). The great epic is also mentioned, both as Bhdrata and Mahdbhdrata, in the Grihya-sitra of A&valayana, whom Lassen supposes to have lived about 350 8.c. Nevertheless it must remain uncertain whether the poem was then already in the form in which we now have it, at least as far as the leading story and perhaps some of the episodes are concerned, a large portion of the episodical matter being clearly of later origin. It cannot, however, be doubted, for many reasons, that long before that time heroic song had been diligently cultivated in India at the courts of princes and among Kshatriyas, the knightly order, generally. In tlie Mahdbhdrata itself the transmission of epic legend is in some way

connected with the Satas, a social class which, in the caste-system, is defined as resulting from the union of Kshatriya men with Braéhmana women, and which supplied the office of charioteers and heralds, as well as (along with the Magadhas) that of professional minstrels. Be this as it may, there is reason to believe that, as Hellas had her dowdoé who sang the xAéa dvdpaév, and Iceland her skalds who recited favourite sagas, so India had from olden times her professional bards, who delighted to sing the praises of kings and inspire the knights with warlike feelings. But if in this way a stock of heroic poetry had gradually accumulated which reflected an earlier state of society and manners, we can well understand why, after the Bréhmanical order of things had been definitely established, the priests should have deemed it desirable to subject these traditional memorials of Kshatriya chivalry and prestige to their own censorship, and adapt them to their own canons of religious and civil law. Such a revision would doubtless require considerable skill and tact; and if in the present version of the work mucli remains that seems contrary to the Brahmanical code and pretensions —e.g., the polyandric union of Draupadi and the Pandu princes—the reason probably is that such legendary, or it may be historical, events were too firmly rooted in the minds of the people to be tampered with ; and all the clerical revisers could do was to explain them away as best they could. Thus the special point alluded to was represented as an act of duty and filial obedience, in this way, that, when Arjuna brings home his fair prize, and announces it to his mother, she, before seeing what it is, bids him share it with his brothers. Nay, it has even been suggested, with some plausibility, that the Brah- manical editors have completely changed the traditional relations of the leading characters of the story. For, although the Pandavas and their cousin Krishna are con- stantly extolled as models of virtue and goodness, while the Kauravas and their friend Karna—a son of the sun-god, born by Kuntt before her marriage with Pandu, and brought up secretly as the son of a Sita—are decried as monsters of depravity, these estimates of the heroes' characters are not unfrequently belied by their actions,—especially the honest Karna and the brave Duryodhana contrasting not unfavourably with the wily Krishna and the cautious and somewhat effeminate Yudlishthira. These considerations, coupled with certain peculiarities on the part of the Kauravas, suggestive of an original con-nexion of the latter with Buddhist institutions, have led Dr Holtzmann to devise an ingenious theory, viz. that the traditional stock of legends was

first worked up into its present shape by some Buddhist poet, and that this version, showing a decided predilection for the Kuru party, as the representatives of Buddhist principles, was after- wards revised in a contrary sense, at the time of the

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Brahmanical reaction, by votaries of Vishnu, when the Buddhist features were generally modified into Saivite tendencies, and prominence was given to the divine nature of Krishna, as an incarnation of Vishnu. The chief objec- tion to this theory probably is that it would seem to make such portions as the Bhagavad-gitd ("song of the holy one")—the famous theosophic episode, in which Krishna, in lofty and highly poetical language, expounds the doctrine of faith (bhakti) and claims adoration as the incarnation of the supreme spirit—even more modern than many scholars may be inclined to admit as at all necessary, considering that at the time of Patanjali's Mahdbhdshya the Krishna worship, as was shown by Prof. Bhandarkar, had already attained some degree of develop- ment. Of the purely legendary matter incorporated with the leading story not a little, doubtless, is at least as old as the latter itself. Some of these episodes—especially the well-known story of Nala and Damayanti, and the touching legend of Savitri—form themselves little epic gems, of which any nation might be proud. There can be no doubt, however, that this great storehouse of legendary lore has received considerable additions down to comparatively recent times, and that, while its main portion is considerably older, it also contains no small amount of matter which is decidedly more modern than the Raémédyana.

As regards the leading narrative of the Rdmdyana, while it is generally supposed that the chief object which the poet had in view was to depict the spread of Aryan civilization towards the south, Mr T. Wheeler has tried to show that the demons of Lanka against whom Réauia's expedition is directed are intended for the Buddhists of Ceylon. Prof. Weber, moreover, from a comparison of Rama's story with cognate Buddhist legends in which the expedition to Lanka is not even referred to, has endeavoured to prove that this feature, having been added by Valmiki to the original legend, was probably derived by him from some general acquaintance with the Trojan

cycle of legends, the composition of the poem itself being placed by the same scholar somewhere about the beginning of the Christian era. Though, in the absence of positive proof, this theory, however ably supported, can scarcely be assented to, it will hardly be possible to put the date of the work farther back than about a century before our era; while the loose connexion of certain passages in which the divine character of Rama, as an avatar of Vishnu, is especially accentuated, raises a strong sus- picion of this feature of Rama's nature having been intro- duced at a later time.

A remarkable feature of this poem is the great variation of its text in different parts of the country, amounting in fact to several distinct recensions. The so-called Gauda recension, current in Bengal, which differs most of all, has been edited, with an Italian translation, by G. Gorresio ; while the version prevalent in western India, and pub- lished at Bombay, has been made the basis for a beautiful poetical translation by Mr R. Griffith. This diversity has never been explained in a quite satisfactory way; but it was probably due to the very popularity and wide oral diffusion of the poem, Yet another version of the same story, with, however, many important variations of details, forms an episode of the Mahdbhdrata, the relation of which to Valmiki's work is still a matter of uncertainty. To characterize the Indian epics in a single word :— though often disfigured by grotesque fancies and wild exaggerations, they are yet noble works, abounding in passages of remarkable descriptive power, intense pathos, and high poetic grace and beauty; and, while, as works of art, they are far inferior to the Greek epics, in some respects they appeal far more strongly to the romantic

mind of Europe, namely, by their loving appreciation of natural beauty, their exquisite delineation of womanly love and devotion, and their tender sentiment of mercy and forgiveness.

2. Purdnas and Tantras.—The Purdnas are partly legendary partly speculative histories of the universe, compiled for the purpose of promoting some special, locally prevalent form of Brahmanical belief. sometimes

styled a fifth Veda, and may indeed in a certain sense be looked upon as the scriptures of Brah- manical India. The term purdna, signifying “old,” applied originally to prehistoric, especially cosmogonic, legends, and then to collections of ancient traditions generally. The existing works of this class, though recog- nizing the Brahmanical doctrine of the Trimarti, or triple manifestation of the deity (in its creative, preservative, and destructive activity), are all of a sectarian tendency, being intended to establish, on quasi-historic grounds, the claims of some special god, or holy place, on the devotion of the people. have pressed into their service a mass of extraneous didac- tic matter on all manner of subjects, whereby these works have become a kind of popular encyclopedias of useful knowledge. It is evident, however, from a comparatively early definition given of the typical Purana, as well as from numerous coincidences of the existing works, that they are based on, or enlarged from, older works of this kind, more limited in their scope, and probably of a more decidedly tritheistic tendency of belief, Thus none of the

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They are |

For this purpose the compilers |

Puranas, as now extant, is probably much above a

thousand years old, though a considerable proportion of their materials is doubtless much older, and may perhaps in part go back to several centuries before our era.

In legendary matter the Puranas have a good deal in common with the epics, especially the Mahdbhdérata,—the compilers or revisers of both classes of works having evidently drawn their materials from the same fluctuating mass of popular traditions, They are almost entirely composed in epic couplets, and indeed in much the same easy flowing style as the epic poems, to which they are, however, geatly inferior in poetic value.

According to the traditional classification of these works, there are said to be eightcen (mahd-, or great) Purdnas, and as many Upa-purdnas, or

subordinate Puranas. The former are by some authorities divided into three groups of six, according as one or other of the three primary qualities of external existence—goodness, darkness (ignorance), and passion—is supposed to prevail in them, viz., the Vishnu, Néradtya, Bhdgavata, Garuda, Padma, Varéha,— Matsya, Karma, Linga, Siva, Skanda, Agni, — Brahmdénda, Brahma- vawaria, Mérkandeya, Bhavishya, Vamana, and Brahma-Purénas. In accordance with the nature of the several forms of the Trimtirti, the first two groups chiefly devote themselves to the commenda- tion of Vishnu and Siva respectively, whilst the third group, which would properly belong to Brahman, has been largely appro- priated for the promotion of the claims of other deities, viz., Vishnu in his sensuous form of Krishna, Devi, Ganega, and Strya. As Prof. Banerjea has shown in his preface to the Mdr- kandeya, this seems to have been chiefly effected by later additions and interpolations. The insufficiency of the above classification, however, appears from the fact that it omits the Véyu-purdna, probably one of the oldest of all, though some MSS. substitute it for one or other name of the second group. The eighteen principal Puranas are said to consist of together 400,000 couplets. In Northern India the Vaishnava Puranas, especially the Bhdgavata and Vishpu,' are by far the most popular. The Bhagavata was formerly supposed to have been composed by Vopadeva, the grammarian, who lived in the 18th century. It has, however, been shown? that what he wrote was a synopsis of the Purana,

} There are several Indian editions of these two works. The Bhagavata has been partly printed, in an édition de luxe, at Paris, in 3 vols., by E. Burnouf, and a fourth by M. Hlauvette-Besnault. Of the Vishnup. there is a translation by H. H. Wilson, 2d ed. enriched with valuable notes by F. Hall. Several other Puranas have been printed in India; the Markandeya and Agni Puranas, in the Bidl. Ind., by Prof. Banerjea and Rajendralala Mitra respectively.

Rajendralala Mitra, Votices of Sansk. MSS., ii. 47.

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and that the latter is already quoted in a work by Balléla Sena of Bengal, in the 11th century.

From the little we know regarding the Upa-puranas, their char- acter does not seem to differ very much from that of the principal Puranas. One of them, the Brahménda-purdna, contains, as an episode, the well-known Adhydima-Ramdyana, a kind of spiritual- ized version of Valmiki's poem. Besides these two classes of works there is a large number of so-called Sthala-purdnas, or chronicles recounting the history and merits of some holy 'place " or shrine, where their recitation usually forms an important part of the daily service. Of much the same nature are the numerous Méhdimyas (literally '' relating to the great spirit "), which usually profess to be sections of one or othcr Purana. Thus the Devi- mahdtmya, which cclebrates the victories of the great goddess Durga over the Asuras, and is daily read at the temples of that deity, forms a section, though doubtless an interpolated one, of the Markandeya-purana.

The Yantras, which have to be considered as a later Tantras,

development of the sectarian Puranas, are the sacred writings of the numerous Sédtas, or worshippers of the female energy (Sakti) of some god, especially the wife of iva, in one of her many forms (Parvati, Devi, Kali, Bhavani, Durga, &c.). This worship of a female repre- sentation of the divine power appears already in some of the Puranas; but in the Tantras it assumes quite a peculiar character, being largely intermixed with magic perform- ances and mystic rites, partly, it would seem, of a grossly immoral nature. This class of writings does not appear to have been in existence at the time of Amarasimha (6th century); but they are mentioned in some of the Puranas. They are usually in the form of a dialogue between Siva and his wife. Their number is very large; but they still await a critical examination at the hands of western scholars. Among the best known may be mentioned the Rudra yamala, Kuldrnava, Syamd-rahasya, and Kalikd-tantra.

3. Modern Epics.—A new class of epic poems begin to Modern make their appearance about the 5th or 6th century of epics.

our era, during a period of renewed literary activity which has been fitly called? the Renaissance of Indian literature. These works differ widely in character from those that had preceded them. The great national epics, composed though they were in a language different from the ordin- ary

vernaculars, had at least been drawn from the living stream of popular traditions, and were doubtless readily understood and enjoyed by the majority of the people. The later productions, on the other hand, are of a decidedly artificial character, and must necessarily have been beyond

| the reach of any but the highly cultivated. They are, on

the whole, singularly deficient in incident and invention, their subject matter being almost entirely derived from the old epics. Nevertheless, these works are by no means devoid of merit and interest; and a number of them display considerable descriptive power and a wealth of genuine poetic sentiment, though unfortunately often clothed in language that deprives it of half its value. The simple heroic couplet has mostly been discarded for various more or less elaborate metres ; and in accordance with this change of form the diction becomes gradually more complicated,—a growing taste for unwieldy com- pounds, a jingling kind of alliteration, or rather agnomina- tion, and an abuse of similes marking the increasing artificiality of these productions.

The generic appellation of such works is kévya, which, meaning “poem,” or the work of an individual poet (4avi), is already applied to the Rémdyana. Six poems of this kind are singled out by native rhetoricians as standard works, under the title of Mahd- kévya, or great poems. Two of these are ascribed to the famous dramatist Kélidasa, the most prominent figure of the Indian Renaissance, and truly a master of the poetic art. He is said to have been one of the nine literary “ gems” at the court of Vikrama- ditya, now generally identified with King Vikramaditya Harsha of Ujjayini (Ujjain or Oujein), who reigned about the middle of the 6th eentury, and seems to have originated the Vikramaditya cra, reckoned from 56 B.c. Of the poets whose works have come down

3M. Miiller, India: What can it teach us? note G.

to us Kalidasa appcars to be one of the carliest; but there can be little doubt that he was preceded in this as in other departments of poetic composition by many lesser lights, eclipsed by the sun of his fame, and forgotten. Of the

six ‘‘great poems named below the first two are those attributed to Kalidisa. (1) The Raghu- vamésa,! or “race of Raghu,” celebrates the ancestry and decds of Rama. The work, consisting of nineteen cantos, is manifestly incomplete; but hitherto no copy has been discovered of the six additional cantos which are supposed to have completed it. (2) The Kuméra-sambhava? or “the birth of (the war-god) Kumara” (or Skanda), the son of Siva and Parvati, consists of eight cantos, the last of which has only recently becn made public, being usually omitted in the MSS., probably on account of its amorous character rendering it unsuitable for educational purposes, for which the works of KAliddsa are extensively used in India. Nine additional cantos, which were published at the same time, have been proved to be spurious. Another poem of this class, the Nalodaya,® or “vise of Nala,”—describing the restoration of that king, after having lost his kingdom through gambling, —is wrongly ascribed to Kalidasa, being far inferior to the other works, and of a much more artificial character. (3) The Kirdtdrjuniya,*, or combat between the Pandava prince Arjuna and the god Siva, in the guise of a Kirata or wild mountaineer, is a poem in eighteen cantos, by Bharavi, probably a contemporary of Kalidasa, being mentioned, together with him in an inscription dated 634 A.D. (4) The Sisupdla-badha, or slaying of Sisupala, who, being a prince of Chedi, reviled Krishna, who had carried off his intended wife, and was killed by him at the inauguration sacrifice of Yu- dhishthira, is a poem consisting of twenty cantos, attributed to Magha,® whence it is also called Maghakdvya. (5) The Rdvana- badha, or “slaying of Ravana,” more commonly called Bhatti- kdvya, to distinguish it from other poems (especially one by Pravarasena), likewise bearing the former title, was composed for the practical purpose of illustrating the less common gram- matical forms and the figures of rhetoric and poetry. In its closing couplet it professes to have been written at Vallabhi, under Sridharasena, but, several princes of that name being mentioned in inscriptions as having ruled there in the 6th and 7th cen- turies, its exact date is still uncertain. Bhatti, apparently the author’s name, is usually identified with the well-known gram- marian Bhartrihari, whose death Prof. M. Miiller, from a Chinese statement, fixes at 650 A.D., while others make him Bhartrihari’s son. (6) The Naishadhiya, or Naishadha-charita, the life of Nala, king of Nishadha, is ascribed to Sri-Harsha (son of Hira), who is supposed to have lived in the latter part of the 12th century. A small portion of the simple and noble episode of the Mahdbhd- rata is here

retold in highly elaborate and polished stanzas, and with a degree of lasciviousness which (unless it be ehiefly due to the poct's exuberance of fancy) gives a truly appalling picture of social corruption. Another highly esteemed poem, the Aéghava- pandaviya, composed by Kavirdja ("king of poets"),—whose date is uncertain, though some scholars place him later than the 10th century,—is characteristic of the trifling uses to which the poet's art was put. The well-turned stanzas are so ambiguously worded that the poem may be interpreted as relating to the leading story of either the Rémdyana or the Mahdbhdrata.

A still more modern popular development of these artificial poems are 'the numerous so-called Champds, being compositions of mixed verse and prose. As specimens of such works may be men- tioned the Champé-bhdrata in twelve cantos, by Ananta Bhatta, and the Champi-rdmdyana or Bhoja-champa, in five books, by Bhojaraja (or Vidarbharaja) Pandita, being popular abstracts of the two great epics.

Very similar in character to the artificial epics are the panegyrics, composed by court pocts in honour of their patrons. Such pro- ductions were probably very numerous; but only two of any special interest are hitherto known, viz., the Srt-Harsha-charita, composed in ornate prose, by Bana, in honour of Siladitya Harshavardhana (ec. 610-650 a.p.) of Kanyakubja (Kanauj), and the Vikramdnka- charita,® written by the Kashmir poet Bilhana, about 1085, in honour of his patron, the Chalukya king Vikramaditya of Kalyana, regarding the history of whose dynasty the work supplies much valuable information. In this place may also be mentioned, as composed in accordance with the Hindu poetic canon, the Rdja- tarangint,' or chronicle of the kings of Kashmir, the only important

1 Edited, with a Latin transl., by F. Stenzler; also text, and com- mente, by 8. P. Pandit. Text and Latin transl. published by F. Stenzler ; Engli transl, by R. T. H. Guiffith, e me ae 3 Text, with comm, and Latin transl., edited by F. Benary; Engl. ee in verse, by Dr Taylor. ditions of this and the three following e cine ie ollowing poems have been pub 5 sige ae = paper on Kalidasa, calls Magha "a contem- porary of the Bhoja of the 11th century." 6 Hdited by G. Biihl ? Published at Calcutta; also, S never

historical work in the Sanskrit language, though even here con- siderable allowance has to be nade for poetic licence and fancy. The work was composed by the Kashmirian poet Kalhana, about 1150, and was afterwards continued by three successive supple- ments, bringing down the history of Kashmir to the time of the emperor Akbar. Unfortunately the two existing editions were prepared from very imperfect MS. materials; but Dr Bihler's discovery of new MSS., as well as of some of the works on which Kalhana's poem is based, ought to enable the native scholar (Prof. Bhandarkar) who has undertaken a new edition to put the text in a more satisfactory condition.

4, The Drama.—The early history of the Indian drama Drama,

is enveloped in obscurity. The Hindus themselves ascribe the origin of dramatic representation to the sage Bharata, who is fabled to have lived in remote antiquity, and to have received this science directly from the god Brahman, by whom it was extracted from the Veda. The term bharata—(?) 2.e., one who is kept, or one who sustains (a part)—also signifies "an actor"; but it is doubtful which of the two is the earlier,—the appellative use of the word, or the notion of an old teacher of the dramatic art bearing that name. On the other hand, there still exists an extensive work, in epic verse, on rhetoric and dramaturgy, entitled MWdtya-sdstra, and ascribed to Bharata. But, though this is probably the oldest theoretic work on the subject that has come down to us, it can hardly be referred to an earlier period than several centuries after the Chris- tian era. Not improbably, however, this work, which pre- supposes a fully developed scenic art, had an origin similar to that of some of the metrical law-books, which are generally supposed to be popular and improved editions of older sitra-works. We know that such treatises existed at the time of Panini, as he mentions two authors of Vata-sitras, or "rules for actors," viz., Silélin and Kriségva. Now, the words nata and ndtya—as well as ndtaka, the common term for "drama "-——being derived from the root nat (nart) "to dance," seem to point to a pantomimic or choral origin of the dramatic art. It might appear doubtful, therefore, in the absence of any clearer definition in Panini's grammar, whether the " actors' rules" he mentions did not refer to

mere pantomimic performances. Fortun- ately, however, Patanjali, in his “great commentary,” speaks of the actor as singing, and of people going “to hear the actor.” Nay, he even mentions two subjects, taken from the cycle of Vishnu legends—viz., the slaying of Kamsa (by Krishna) and the binding of Bali (by Vishnu)—which were represented on the stage both by mimic action and declamation. Judging from these allu- sions, theatrical entertainments in those days seem to have been very much on a level with our old religious spectacles or mysteries, though there may already have been some simple kinds of secular plays which Patanjali had no occa- sion to mention. It is not, however, till some five or six centuries later that we meet with the first real dramas, which mark at the same time the very culminating point of Indian dramatic composition. In this, as in other depart- ments of literature, the earlier works have had to make way for later and more perfect productions ; and no trace now remains of the intermediate phases of development.

Here, however, the problem presents itself as to whether the existing dramatic literature has naturally grown out of such popular religious performances as are alluded to by Patanjali, or whether some foreign influence has intervened at some time or other and given a different direction to dramatic composition. The question has been argued both for and against the probability of Greek influence ; but it must still be considered as sub judice. There are doubtless some curious points of resemblance between the Indian drama and the Modern Attic (and Roman) comedy, viz., the prologue, the occasional occurrence of a token of recognition, and a certain corre-

with a French transl., by A. Troyer, | spondence of characteristic stage figures (especially the

Viddshaka, or jocose companion of the hero, presenting a certain analogy to the servus of the Roman stage, as does the Vita of some plays to the Roman parasite)—for which the assumption of some acquaintance with the Greek comedy on the part of the earlier Hindu writers would afford a ready explanation. On the other hand, the differences between the Indian and Greek plays are perhaps even greater than their coincidences, which,

moreover, are scarcely close enough to warrant our calling in question the originality of the Hindus in this respect. Certain, however, it is that, if the Indian poets were indebted to Greek playwrights for the first impulse in dramatic composition, in the higher sense, they have known admirably how to adapt the Hellenic muse to the national genius, and have produced a dramatic literature worthy to be ranked side by side with both the classical and our own romantic drama. It is to the latter especially that the general character of the Indian play presents a striking resemblance, much more so than to the classical drama. The Hindu dramatist has little regard for the "'unities " of the classical stage, though he is hardly ever guilty of extravagance in his disregard of them. The dialogue is invariably carried on in prose, plentifully interspersed with those neatly turned lyrical stanzas in which the Indian poet delights to depict some natural scene, or some temporary physical or mental con- dition. The most striking feature of the Hindu play, however, is the mixed nature of its language. While the hero and leading male characters speak Sanskrit, women and inferior male characters use various Prakrit dialects. As regards these dialectic varieties, it can hardly be doubted that at the time when they were first employed in this way they were local vernacular dialects; but in the course of the development of the scenic art they became permanently fixed for special dramatic purposes, just as the Sanskrit had, long before that time, become fixed for general literary purposes. Thus it would happen that these Prakrit dialects, having once become stationary, soon diverged from the spoken vernaculars, until the difference between them was as great as between the Sanskrit and the Prakrits. As regards the general character of the dramatic Prakrits, they are somewhat more removed from the Sanskrit type than the Pali, the language of the Buddhist canon, which again is in a rather more advanced state than the language of the Asoka inscriptions (c. 250 B.c.). And, as the Buddhist sacred books were committed to writing about 80 B.c., the state of their language is attested for that period at latest; while the grammatical fixation of the scenic Prakrits has probably to be referred to the early centuries of our era.

The existing dramatic literature is not very extensive. The uumber of plays of all kinds of any literary value will scarcely amount to fifty. The reason for this paucity of dramatic produc- tions doubtless is that they appealed to the tastes of only a limited class of highly cultivated persons, and were in

consequence but seldom acted. As regards the theatrical entcrtainments of the common people, their standard seems never to have risen much above the level of the religious spectacles mentioned by Patanjali. Such at least is evidently the case as regards the modern Bengali juras—described by Wilson as exhibitions of some incidents in the youthful life of Krishna, maintained in extempore dialogue, interspersed with popular ‘songs—as well as the similar rdsas of the western provinces, and the rough and ready performances of the bhanrs, or professional buffoous. Of the religious drama Sanskrit literature offers but one example, viz., the famous Gitagovinda,! composed by Jayadeva in the 12th century. It is rather a mytho-lyrical poem, which, however, in the opinion of Lassen, may be considered as a modern and refined specimen of the early form of dramatic composition. The subject of the pocm is as follows:—Krishna, while leading a cowherd’s life in Vrin- davana, is in love with Radha, the milkmaid, but has been faith- less to her for a while. Presently, however, he returns to her

1 Ed., with a Latin transl., by C. Lassen; Engl. transl. by E. Arnold.

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“whose image has all the while lingered in his breast,” and after much earnest entreaty obtains her forgiveness. The emotions appropriate to these situations are expressed by the two lovers anda friend of Radha in melodious and passionate stanzas of great poetic beauty. Like the Song of Solomon, the Gitagovinda, moreover, is supposed by the Hindu commentators to admit of a mystic inter- pretation ; for, ‘‘as Krishna, faithless for a time, discovers the vanity of all other loves, aud returns with sorrow and longing to his own darling Radha, so the human soul, after a brief and frantic attachment to objects of sense, burns to return to the God from whence it came” (Griffith).

The Mrichchhakatikd,? or “earthen toy-cart,” is by tradition placed at the head of the existing dramas; and a certain clumsiness of construction seems

indeed to justify this distinction. Accord- ing to several stanzas in the prologue, the play was composed by a king Sfidraka, who is there stated to have, through Siva's favour, recovered his eyesight, and, after seeing his son as king, to have died at the ripe age of a hundred years and ten days. Accord- ing to the same stanzas, the piece was enacted after the king's death ; but it is probable that they were added for a subsequent performance. In Bana's novel Kddambart (c. 630 A.p.), a king Siidraka, probably the same, is represented as having resided at Bidis& (Bhilsa)—some 130 miles east of Ujjayint (Ujjain), where the scene of the play is laid. Charudatta, a Brahman merchant, reduced to poverty, and Vasantasen4, an accomplished courtezan, meet and fall in love with each other. This forms the main story, which is interwoven with a political underplot, resulting in a change of dynasty. The connexion between the two plots is effected by means of the king's rascally brother-in-law, who pur- sues Vasantasena with his addresses, as well as by the part of the rebellious cowherd Aryaka, who, having escaped from prison, finds shelter in the hero's house. The wicked prince, on being rejected, strangles Vasantasena, and accuses Charudatta of having murdered her; but, just as the latter is about to be executed, his lady love appears again on the scene. Meanwhile Aryaka has succeeded in deposing the king, and, having himself mounted the throne of Ujjain, he raises Vasantasena to the position of an honest woman, to enable her to become the wife of Charudatta. The play is one of the longest, consisting of not less than ten acts, some of which, however, are very short. The interest of the action is, on the whole, well sustained; and, altogether, the piece presents a vivid picture of the social manners of the time.

Sddraka.

In Kalidasa (? c. 550 A.D.) the dramatic art attained its highest KAliddsa,

point of perfection. From this accomplished poet we have three well-constructed plays, abounding in stanzas of exquisite tenderness and fine descriptive passages, viz., the two well-known mytho- pastoral dramas, Sakuntalé in seven and Vikramorvast? in five acts, and a piece of court intrigue, distinctly inferior to the other two, entitled Mélavikdgnimitra,* in five acts. King Agnimitra, who has two wives, falls in love with Malavik4, maid to the first queen. His wives endeavour to frustrate their affection for

each other, but in the end Malavika turns out to be a princess by birth, and is accepted by the queens as their sister.

In the prologue to this play, Kalidasa mentions Bhasa and Saumilla as his predecessors in dramatic composition. Of the former poet some six or seven stanzas have been gathered from anthologies by Prof. Aufrecht, who has also brought to light one fine stanza ascribed to Ramila and Saumila.

Sri Harsha-deva—whom Dr F. Hall has proved to be identical with King Siladitya Harshavardhana of Kanyakubja (Kanauj), who reigned in the first half of the 7th century—has three plays attributed to him. Most likely, however, he did not write any of them himself, but they were only dedicated to him as the patron of their authors. Such at least seems to have been the case as regards the Ratndévali,> which was probably composed by Bana. It is a graceful drama of genteel domestic manners, in four acts, of no very great originality, the author having been largely indebted to Kalidasa's plays. Ratnavali, a Ceylon princess, is sent by her father to the court of King Vatsa to become his second wife. She suffers shipwreck, but is rescued and received into Vatsa's palace as one of queen Vasavadatta's attendants. The king falls in love

2 Edited by F. Stenzler, translated by H. H. Wilson; German by O. Bohtlingk and L. Fritze; French by P. Regnand.

3 Both these plays are known in different, recensions in different parts of India. The Bengali recension of the Sakuntald was translated by Sir W. Jones, and into French, with the text, by Chézy, and again edited critically by R. Pischel, who has also advocated its greater antiquity. Editions and translations of the western (Devanagari) re- cension have been published by O. Bohtlingk and Mon. Williams. The Vikramorvast has been edited critically by 8, P. Pandit, and the southern text by R. Pischel. It has been translated by H. H. Wilson and E. B. Cowell.

4 Edited critically by S. P. Pandit; transl. by C. H. Tawney, and previously into German by A. Weber.

5 Edited by Taéranatha Tarkavdchaspati, and by ©. Cappeller in Bohtlingk's Sanskrit-Chrestomathie ; translated by H. H. Wilson.

Harsha- deva.

Bhava- bhiti.

Bhatta Nara- yana,

with her, and the queen tries to keep them apart from each other ; but, on learning the maiden's origin, she becomes reconciled, and recognizes her as a "sister." According to H. H. Wilson, "the manners depictured are not influenced by lofty principle or pro- found reflexion, but they are mild, affectionate, and elegant. MG may be doubted whether the harams of other eastern nations, either in ancient or moderu times, would afford materials for as favourable a delineation." Very similar in construction, but.distinctly in- ferior, is the Priyadarsikd, in four acts, lately published in India, having for its plot another amour of the same king. The scene of the third play, the Vdagdénanda,! or "joy of the serpents" (in five acts), on the other hand, is laid in semi-divine regions, Jimiitavahana, a prince of the Vidyaddharas, imbued with Buddhist principles, weds Malayavati, daughter of the king of the Siddhas, a votary of Gauri (Siva's wife). But, learning that Garuda, the mythic bird, is in the habit of consuming one snake daily, he resolves to offer himself to the bird as a victim, and finally succeeds in converting Garuda to the principle of ahimsa, or abstention from doing injury to living beings; but he himself is about to succumb from the wounds he has received, when, through the timely intervention of the goddess Gauri, he is restored to his former condition. The piece seems to have been intended as a compromise between Brahmanical (Saiva) and Buddhist doctrines, being thus in keeping with the religious views of king Harsha, who, as we know from Hwen-tsang, favoured Buddhism, but was very tolerant to Brahmans. It begins with a benedictory stanza to Buddha, and concludes with one to Gauri. The author is gene-

rally believed to have been a Buddhist, but it is more likely that |

he was a Saiva Brahman, possibly Bana himself. Nay, one might almost feel inclined to take the hero's self-sacrifice in favour of a Naga as a travesty of Buddhist principles.

Bhavabhfiti, surnamed Sri-kantha, “whose throat is beauty (eloquence),” was a native of Padmapura in the Vidarbha country (the Berars), being the son of the Brahman Nilakantha, and his wife Jatikarni. He is said to have passed his literary life at the court of Yasovarman of Kanauj, who is supposed to have reigned in the latter part of the 7th and beginning of the 8th century. Bhavabhiti was the author of three plays, two of which, the Mahdviracharita? (“life of the great hero”) and the Uttarardma- charita? (“later life of Rama”), in seven acts each, form together a dramatized version of the story of the Rémdyana. The third, the Mdlati-mddhava,* is a domestic drama in ten acts, representing the fortunes of Madhava and MAlati, the son and daughter of two ministers of neighbouring kings, who from childhood have been destined for each other, but, by the resolution of the maiden’s royal master to marry her to an old-and ugly favourite of his, are for a while threatened with permanent separation. The action of the play is full of life, and abounds in stirring, though some- times improbable, incidents. The poet is considered by native pandits to be not only not inferior to Kaliddsa, but even to have surpassed him in his Uttarardmacharita. But, though he ranks deservedly high as a lyric poet, he is far inferior to KAlid4sa as a dramatic artist. Whilst the latter delights in depicting the gentler feelings and tender emotions of the human heart and the peaceful scenes of rural life, the younger poet finds a peculiar attraction in the sterner and more imposing aspects of nature and the human character. Bhavabhiti’s language, though polished and felicitous, is elaborate and artificial compared with that of Kalidasa, and his genius is sorely shackled by a slavish adherence to the arbitrary rules of dramatic theorists.

Bhatta Narayana, surnamed Mrigaraja or Simha, “the lion,” the author of the Ventsamhdra® (“the seizing by the braid of hair”), is a poet of uncertain date.

the five Kanauj Brahmans whom king Adistira of Bengal, desirous |

of establishing the pure Vaishnava doctrine, invited to his court, and from whom the modern Bengali Brahmans are supposed to be descended. The date of that event, however, is itself doubtful; while a modern genealogical work fixes it at 1077, Lassen refers it to the beginning of the 7th century and Grill to the latter part of the 6th. If it could be proved that the poet is

identical with the Narayana whom Bana (c. 630) mentions as being his friend, the question would be settled in favour of the earlier calculations. The play, consisting of six acts, is founded on the story of the Mahdbhd-rata, and takes its title from the insult offered to Draupadi by one of the Kaurava princes, who, when she had been lost at dice by Yudhishthira, dragged her by the hair into the assembly. The piece 1s composed in a style similar to that of Bhavabhiti's plays, though less polished, and inferior to them in dramatic construction and poetic merit. ee

1 Edited by MAdhava Chandra Ghosha, and translated by P. Boyd, with a preface by E. B. Cowell.

? Edited by F. H. Trithen (1848), lated by J. Piekford.

3 Edited at Calcutta; transl. by H. H. Wilson and C. H. Tawney.

= Edited by R. G. Bhandarkar, 1876; translated by H. H. Wilson. > Edited by J. Grill, 1871.

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The Hanuman-ndétaka is a dramatized version of the story of Rama, interspersed with numerous purely descriptive poetic pas- sages. It consists of fourteen acts, and on account of its length is also called the Alahd-ndtaka, or great drama. Tradition relates that it was composed by Hanuman, the monkey general, and inscribed on rocks; but, Valmiki, the author of the Rémdyana, being afraid lest it might throw his own poem into the shade, Hanuman allowed him to cast his verses into the sea. Thence fragments were ultimately picked up by a merchant, and brought

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| to King Bhoja, who directed the poet Damodara Misra to put them

together, and fill up the lacune ; whence the present composition originated. Whatever particle of truth there may be in this story, the “great drama” seems certainly to be the production of different hands. “The language,” as Wilson remarks, “is in general very harmonious, but the work is after all a most disjointed and non- descript composition, and the patchwork is very glaringly and clumsily put together.” It is nevertheless a work of some interest, as compositions of mixed dramatic and declamatory passages of this kind may have been common in the early stages of the dramatic The connexion of the poet with King Bhoja, also confirmed

| by the Bhoja-prabandha, would bring the composition, or final redac-

| tion, down to about the 10th or 11th century.

There are, however,

_ two different recensions of the work, a shorter one commented upon

by Mohanadasa, and a longer one arranged by Madhustfidana. A Damodara Gupta is mentioned as having lived under JayApida of Kashmir (755-86); but this can scarcely be the same author.

The JIfudradrdkshasa,® or " Rakshasa (the minister) with the signet," is a drama of political intrigue, in seven acts, partly based on historical events, the plot turning on the reconciliation of Rakshasa, the minister of the murdered king Nanda, with the hostile party, consisting of prince Chandragupta (the Greek Sandrocotius, 315-291 B.c.), who succeeded Nanda, and his minister Chanakya. The plot is developed with considerable dramatic skill, in vigorous, if not particularly elegant, language. The play was composed by Visikhadatta, prior, at any rate, to the 11th century, but perhaps as early as the 7th or 8th century, as Buddhism is referred to in it in rather complimentary terms.

The Prabodha-chandrodaya,' or "the moon-rise of intelligence," composed by Krishnamisra about the 12th century, is an allegorical, play, in six acts, the dramatis persone of which consist entirely of abstract ideas, divided into two conflicting hosts.

Of numerous inferior dramatic compositions we may mention as the best—the Anarghya-rdghava, by Murari; the Béla-rémdyana, one of six plays (three of which are known) by Rajagekhara; and the Prasanna-rdghava, by Jayadeva, the author of the rhetorical treatise Chandrdéloka, Abstracts of a number of other pieces are given in H. H. Wilson's Hindu Theatre, the standard work on this subject. The dramatic genius of the Hindus may be said to have exhausted itself about the 14th century.

5. Lyrical, Descriptive, and Didactic Poetry.—We have Lyric already alluded to the marked predilection of the mediaeval Poet'y-

Indian poet for depicting in a single stanza some peculiar physical or mental situation. The profane lyrical poetry consists chiefly of such little poetic pictures, which form a prominent feature of dramatic compositions.

Numerous poets and poetesses are only known to us through such de- tached stanzas, preserved in native anthologies or manuals of rhetoric, Thus the Saduktikarndmrita,' or " ear- ambrosia of good sayings," an anthology compiled by Sridhara Dasa in 1205, contains verses by four hundred and forty-six different writers; while the Sérngadhara- paddhati, another anthology, of the 14th century, contains some 6000 verses culled from two hundred and sixty-four different writers and works. These verses are either of a purely descriptive or of an erotic character; or they have a didactic tendency, being intended to convey, in an attractive and easily remembered form, some moral truth or useful counsel. An excellent specimen of a longer poem, of a partly descriptive partly erotic character, is Kalidasa's Megha-dita,® or "cloud messenger," in which a banished Yaksha (demi-god) sends a love-message across India to his wife in the Himalaya, and describes, in verse-pictures, the various places and objects over which the messenger, a

6 Edited (Bombay, 1884) by K. T. Telang, who discusses the date of the work in his preface. .

? Translated by J. Taylor, 1810; by T. Goldstiicker into German, 1842. Edited by H. Brockhaus, 1845.

8 Rajendralala Mitra, Notices, iii. p. 184.

° Text and transl., by H. H. Wilson; with vocabulary by &. Johnson.

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cloud, will have to sail in his airy voyage. This little masterpiece has called forth a number of more or less suc- cessful imitations, such as Lakshmid4sa's Suka-sandega, or '*parrot-message," lately edited by the maharaja of Travan- core. Another much admired descriptive poem by Kalidasa is the Mitu-samhdra,! or "collection of the seasons," in which the attractive features of the six seasons are suc- cessively set forth.

As regards religious lyrics, the fruit of sectarian fervour, a large collection of hymns and detached stanzas, extolling some special deity, might be made from Puranas and other works. Of independent productions of this kind

only a few of the more important can be mentioned here. Sankardcharya, the great VedAntist, who probably lived in the 7th century, is credited with several devo- tional poems, especially the Ananda-lahari, or “ wave of joy,” a hymn of 103 stanzas, in praise of the goddess Par- vati. The Strya-sataka, or century of stanzas in praise of Sarya, the sun, is ascribed to Maydra, the contemporary (and, according to a tradition, the father-in-law) of Bana (in the early part of the 7th century). The latter poet himself composed the Chandikdstotra, a hymn of 102 stanzas, extolling Siva’s consort. The Khandapragasti, a poem celebrating the ten avatdras of Vishnu, is ascribed to no other than Hanumf&n, the monkey general, himself. Jayadeva’s beautiful poem Gitagovinda, which, like most productions concerning Krishna, is of a very sensuous character, has already been referred to.

The particular branch of didactic poetry in which India is especially rich is that of moral maxims, expressed in single stanzas or couplets, and forming the chief vehicle of the Niti-sdstra or ethic science. Excellent collections of such aphorisms have been published,—in Sanskrit and German by Dr v. Boéhtlingk, and in English by Dr J. Muir. Probably the oldest original collection of this kind is that ascribed to Chanakya,—and entitled Rdjanitisa- muchchaya, “collection on the conduct of kings ”—tradi- tionally connected with the Machiavellian minister of Chandragupta, but (in its present form) doubtless much later—of which there are several recensions, especially a shorter one of one hundred couplets, and a larger one of some three hundred. Another old collection is the Kadmandakiya-Nitisdra,? ascribed to Kamandaki, who is said to have been the disciple of Chanakya. Under the name of Bhartrihari have been handed down three centuries of sententious couplets, one of which, the niti-sataka, relates to ethics, whilst the other two, the sringéra- and vairdgya-satakas, consist of amatory and devotional verses respectively. The WViti-pradipa, or “lamp of conduct,” consisting of sixteen stanzas, is ascribed to Vetdlabhatta who is mentioned as one of nine gems at Vikramaditya’s court (c. 550 a.p.). The Amard-sataka, consisting of a hundred stanzas, ascribed to a King Amaru (sometimes wrongly to Sankara), and the Chaura-suratapanchdsikd, by Bilhana (11th century), are of an entirely erotic character.

6. Fables and Narratives.—For purposes of popular in- struction stanzas of an ethical import were early worked up with existing prose fables and

popular stories, pro- bably in imitation of the Buddhist jdtakas, or birth-stories. A collection of this kind, intended as a manual for the guidance of princes (in usum delphint), was trans- lated into Pahlavi in the reign of the Persian king Chosru Nushirvan, 5381-579 a.p.; but neither this translation nor the original is any longer extant. A Syriac transla- tion, however, made from the Pahlavi in the same century, under the title of “Qualilag and Dimnag”—from the

1 The first Sanskrit book published (by Sir W. Joncs), 1792. Text and Latin transl. by P. v. Bohlen. Partly transl., in verse, by R, T. H. Griffith, Specimens of Old Indian Poetry.

2 Idited by Rajendralila Mitra, Bibl. Ind.

Sanskrit ‘‘Karataka and Damanaka,” two jackals who play an important part as the lion’s counsellors—has been discovered and published. The Sanskrit original, which probably consisted of fourteen chapters, was after- wards recast,—the result being the existing Panchatantra,? or “five books” (or headings). A popular summary of this work, in four books, the Hitopadega,* or “ Salutary counsel,” is ascribed to the Brdhman Vishnusarman. Other highly popular collections of stories and fairy tales, interspersed with moral maxims, are—the Vetdla-pan- chavimsati or ‘ twenty-five (stories) of the Vetala” (the original of the Baital Pachisi), ascribed either to Jambhala Datta, or to Sivadésa (while Prof. Weber suggests that Vetala-bhatta may have been the author), and at all events older than the 12th century, since Somadeva has used it ; the Suka-saptati, or “seventy (stories related) by the parrot,” the author and age of which are unknown; and the Simhdsana-dvdtrimsikd, or “thirty-two (tales) of the throne,” being laudatory stories regarding VikramAditya, related by thirty-two statues, standing round the old throne of that famous monarch, to King Bhoja of Dhara to dis- courage him from sitting down onit. This work is ascribed to Kshemankara, and was probably composed in the time of Bhoja (who died in 1053) from older stories in the Maharashtra dialect. The original text has, however, undergone many modifications, and is now

known in several different recensions. Of about the same date are two great storehouses of fairy tales, composed entirely in lokas, viz., the Vrihat-kathé, or ‘‘ great story,” by Kshemendra, also called Kshemankara, who wrote c. 1020-40, under King Ananta, and the Kathd-sarit-sdgara,® or ‘‘the ocean of the streams of story,” composed by Somadeva, in the beginning of the 12th century, to console the mother of King Harshadeva on her son’s death. Both these works are based on a work in the Paisdchi dialect, of the 6th century, viz., Gunddhya’s Vrihat-kathd.

In higher class prose works of fiction the Sanskrit literature is extremely poor; and the few productions of this kind of which it can boast are of a highly artificial and pedantic character. These include the Dasakumdra-charita,® or ‘‘ the adventures of the ten princes,” composed by Dandin, about the 6th century, and the Vdsavadatta,’ by Subandhu, the contemporary of the poet Bana (c. 620), who himself wrote the first part of a novel, the Kédambari,§ afterwards completed by his son.

B. Screnriric LITERATURE.

J. Law (Dharma).—Among the technical treatises of the later Law.

Vedic period, certain portions of the Kalpa-sitras, or manuals of ceremonial, peculiar to particular schools, were referred to as the earliest attempts at a systematic treatment of law subjects. These are the Dharma-sitras, or ‘‘rules of (religious) law,” also called Sdmaydchérika-sitras, or ‘‘rules of conventional usage (samaya- Achara).” It is doubtful whether such treatises were at any time quite as numerous as the Grihyasitras, or rules of domestic or family rites, to which they are closely allied, and of which indeed they may originally have been an outgrowth. That the number of those actually extant is comparatively small is, however, chiefly due to the fact that this class of works was supplanted by another of a more popular kind, which covered the same ground. The Dharmasitras consist chiefly of strings of terse rules, containing the essentials of the science, and intended to be committed to memory, and to be expounded orally by the teacher—thus forming, as it were, epitomes of class lectures. These rules are interspersed with couplets or ‘‘githas,” in various metres, either composed by the author himself or quoted from elsewhere, which generally give the substance of

the preceding rules. One can well understand why such couplets should gradually have become more popular, and

3 Edited by Kosegarten, G. Biihler, and F. Kielhorn; transl. by Th. Benfey, E. Lancereau, L. Fritze.

4 Edited and transl. by F. Johnson.

5 Edited by H. Brockhaus; transl. by C. H. Tawney.

6 Edited by H. H. Wilson ; freely translated by P. W. Jacob.

7 Edited by F. Hall, Bibl. Ind.

8 Edited by Madana Mohana Sarman, and by P. Peterson.

should ultimately have led to the appearance of works entirely composed in verse. Such metrical law-books did spring up in large numbers, not all at once, but over a long period of time, extending probably from about the beginning of our era, or even earlier, down to well-nigh the Mohammedan conquest ; and, as at the timc of their first appearance the epic impulse was particularly strong, other metres were entirely discarded for the epic Ssloka. These works are the metrical Dharma-Sdstras, or, as they are usually called, the Smriti, ‘‘recollection, tradition,” —a term which, as we have seen, belonged to the whole body of Sitras (as opposed to the Srwéz, or revelation), but which has become the almost exclusive title of the versified institutes of law (and the few Dharmasitras still extant). Of metrical Smritis about forty are hitherto known to exist, but their total number probably amounted to at least double that figure, though some of these, it is true, are but short and insignificant tracts, while others are ouly different recensions of one and the same work,

With the exception of a few of these works—such as the Agni-, Yama-, and Vishnu-Smritis—which are ascribed to the respective gods, the authorship

of the Smritis is attributed to old rishis, such as Atri, Kanva, Vydsa, Sandilya, Bharadvaja. It is, how- ever, extremely doubtful whether in most cases this attribution is not altogether fanciful, or whether, asa rule, there really existed a traditional connexion between these works and their alleged authors or schools named after them. The idea, which early sug- gested itself to Sanskrit scholars, that Smritis which passed by the names of old Vedic teachers and their schools might simply be metrical recasts of the Dharma- (or Grihya-) sfitras of these schools, was a very natural one, and, indeed, is still a very probable one, though the loss of the original Stitras, and the modifications and additions which the Smritis doubtless underwent in eourse of time, make it very difficult to prove this point. One could, how- ever, scarcely account for the disappearance of the Dharmasitras of some of the most important schools except on the ground that they were given up in favour of other works; and is it likely that this should have been done, unless there was some guarantee that the new works, upon the whole, embodied the doctrines of the old authorities of the respective schools? Thus, as regards the most important of the Smritis, the Mdnava-DharmaSsastra,' there exist both a Srauta- and a Grihya-sfitra of the Manava school of the Black Yajus, but no such Dharmasiitra has hitherto been discovered, though the former existence of such a work has been made all but certain by Prof. Biihler's discovery of quotations from a Manavam, consisting partly of prose rules, and partly of couplets, some of which occur literally in the Manusmriti, whilst others have been slightly altered there to suit later doctrines, or have been changed from the original trishtubh into the epic metre. The idea of an old law-giver Manu Sv4yambhuva,—" sprung from the self-exist- ent (svayam-bhil)" god Brahman,—reaches far back into Vedic antiquity: he is mentioned as such in early texts; and in Yaska's Nirukta a $loka occurs giving his opinion on a point of inheritance. But whether or not the Manava-Dharmasiitra embodied what were supposed to be the authoritative precepts of this sage on questions of sacred law we do not know; nor can it as yet be shown that the Manusmriti, which seems itself to have undergone considerable modifications, is the lineal descendant of that Dharmasttra. It is, however, worthy of note that a very close connexion exists between the Manusmriti and the Vishnusdstra; and, as the latter is most likely a modern, only partially remodelled, edition of the Sfitras of the Black Yajus school of the Kathas, the close relation between the two works would be easily understood, if it could be shown

that the Manusmriti is a modern development of the Sfitras of another school of the Charaka division of the Black Yajurveda.

The Manava Dharmagastra consists of twelve books, the first and last of which, treating of creation, transmigration, and final beatitude, are, however, generally regarded as later additions. In them the legendary sage Bhrigu, here called a MAanava, is intro- duced as Manu's disciple, through whom the great teacher has his work promulgated. Why this intermediate agent should have been considered necessary is by no means clear. Except in these two books the work shows uo special relation to Manu, for, though he is occasionally referred to in it, the same ig done in other Smritis. The question as to the probable date of the final redaction of the work cannot as yet be answered. Dr Burnell has tried to show that it was probably composed under the Chalukya king Pulakesi, about 500 a.p., but his argumentation is anything but convincing, From several glokas quoted from Manu by Varahamihira, in the 6th century, it would appear that the text which the great astronomer had before him differed very considerably from our Manusmriti. It is, however, possible that he referred eithor to the Brihat-Manu (Great M.) or the Vriddha-

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1 The standard edition is by G. C. Haughton, with Sir W. Jones's translation, 1825; the latest translations by A. Bumell and G. Biihler. There is also a critical essay on the work by F. Johantgen. On the relation between the

Dharmasiitras and Smritis see especially West iihler, Di i 8d ed., i. p. 87 39. Pp y West and Biihler, Digest ef Mindu Law,

K RIF

Manu (Old M.), who are often found quoted, and apparently represent one, if not two, larger recensions of the Smriti. The oldest existing commentary on the Mdnava-Dharmasistra is by Medhatithi, who is first quoted in 1200, and is usually supposed to have lived in the 9th or 10th century. He had, however, several predecessors to whom he refers as pérve, "the former ones."

Next in importance among Smritis ranks the Ydjravalkya Yajita-Dharmaséstra.* Its origin and date are not less uncertain,—except valkya,

that, in the opinion of Prof. Stenzler, which has never been ques- tioned, it is based on the Manusmriti, and represcuts a more advanced stage of legal theory and definition than that work. Yajiavalkya, as we have seen, is looked upon as the founder of the Vajasaneyins or White Yajus, and the author of the Satapatha- brahmana. In the latter work he is represented as having passed some time at the court of King Janaka of Videha (Tirhut); and in accordance therewith he is stated, in the introductory couplets of the Dharmasastra, to have propounded his legal doctrines to the sages, while staying at Mithila (the capital of Videha). Hence, if the con- nexion between the metrical Smritis and the old Vedic schools be areal one and not one of name merely, we should expect to find in the Ya- jfiavalkya-smriti special coincidences of doctrine with the Katiya- sitra, the principal Siitra of the Vajasaneyins. Now, somesufficiently striking coincidences between this Simriti and Paraskara's Kédtiya- Grihyasttra have indeed been pointed out; and if there ever existed a Dharmasfitra belonging to the same school, of which no trace has hitherto been found, the points of agreement between this and the Dharmagastra might be expected to be even more numerous. As in the case of Manu, glokas are quoted in various works from a Brihat- and a Vriddha-Ydéjiavalkya. The YAajtavalkya-smriti consists of three books, corresponding to the three great divisions of the Indian theory of law :—échéra, rule of conduct (social and caste duties); vyavahdra, civil and criminal law; and prdyaschitta, penance or expiation. There are two important commentaries ou the work :—the famous Mitdékshard,? by Vijhanesvara, who lived under the Chalukya king Vikramaditya of Kalyana (1076-1127); and another by Apararka or Aparaditya, a petty Silara prince of the latter half of the 12th century.

The Pardsara-smriti eontains no ehapter on jurisprudence, but Pardsara.

treats only of religious duties and expiations in 12 adhyayas. The deficiency was, however, supplied by the famous exegete Madhava (in the latter half of the 14th century), who made use of Paragara's text for the compilation of a large digest of religious law, usually called Pardsara-mddhaviyam, to

which he added a third chapter on vyavahara,4 or law proper. Besides the ordinary text of the Parasara-smriti, consisting of rather less than 600 couplets, there is also extant a Brihat-Pardsarasmriti, probably an amplification of the former, containing not less than 2980 (according to others even 3300) glokas, The Néradiya-Dharmaséstra, or Néradasmriti, is a work of a more practical kind; indeed, it is probably the most systematic and business-like of all the Smritis. It does not con- cern itself with religious and moral precepts, but is strictly con- fined to law. Of this work again there are at least two diiferent recensions. Besides the text translated by Dr Jolly, a portion of a larger recension has come to light in India. This version has been commented upon by Asahaya, “the peerless”—a very esteemed writer on law who is supposed to have lived before Me- dhatithi (? 9th century)—and it may therefore be considered as the older recension of the two. But, as it has been found to contain the word dindra, an adaptation of the Roman denarius, it cannot, at any rate, be older than the 2d century; indeed, its date is prob- ably several centuries later.

Whether any of the Dharmasgastras were ever used in India as actual “codes of law” for the practical administration of justice is very doubtful ; indeed, so far as the most prominent works of this class are concerned, it is highly improbable. No doubt these works were held to be of the highest authority as laying down the principles of religious aud civil duty; but it was not so much any single text as the whole body of the Smriti that was looked upon as the embodiment of the divine law. Hence, the moment the actual work of codification begins in the 11th cen- tury, we find the jurists engaged in practically showing how the Smritis confirm and supplement each other, and in reconciling seenling contradictions between them. This new phase of Indian jurisprudence commences with Vijfianegvara’s Mitdkshard, which, though primarily a commentary on Y4jfiavalkya, is so rich in original matter and illustrations from other Smritis that it is far more adapted to serve as a code of law than the work it professes to explain. This treatise is held in high esteem all over India, with the exception of the Bengal or Gaudiya school of law, which recognizes as its chief authority the digest of its founder, Jimfita- vahana, especially the chapter on succession, entitled Déyabhdga.®

2 Edited, with a German transl., by F. Stenzler.

3 Transl. by H. T. Colebrooke.

4 The seetion of this chapter on inheritance (dfya-vibhfga) has been translated by A. C. Burnell, 1868.

® See West and Biihler, Digest, i.p.55. A different view is expressed by A. Burnell, Déyavibhdga, p. xiii. 6 Transl. by H. C. Colebrooke, 1810.

LITERATURE. |

Based on the Mitékshara are the Snvritt-chandrikd,! a work of great common-sense, written by Devanda Bhatta, in the 13th cen- tury, and highly esteemed in Southern India; and the Véra- mitrodaya, a compilation eonsisting of two chapters, on Achdra and vyavahara, made in the first half of the 17th century by Mitramisra, for R&ja Virasimha, or Birsinh Deo of Orchha, who murdered Abul Fazl, the minister of the emperor Akbar, and author of the Ain2 Akbari. There is no need here to enumerate any more of the vast number of treatises on special points of law, of greater or less merit, the more important of which will be found mentioned in English digests of Hindu law.

IJ, PurtosopHy.—The Indian mind shows at all times a strong disposition for metaphysical speculation. In the old religious lyrics this may be detected from the very first. Not to speak of the abstract nature of some even of the oldest Vedic deities, this propensity betrays itself in a certain mystic symbolism, tending to refine and spiritualize the original purely physical character and activity of some of the more prominent gods, and to impart a deep and subtle import to the rites of the sacrifice. The primitive worship of more or less isolated elementary forces and phenomena had evidently ceased to satisfy the religious wants of the more thoughtful minds. Various syncretist tendeneies show the drift of religious thought to be towards some kind of unity of the divine powers, be it in the direction of the pantheistic idea, or in that of an organized polytheism, or even towards monothcism. In the latter age of the hymns the pantheistic idea is rapidly gaining ground, and finds vent in various cosmogonic speculations ; and in the Brahmana period we see it fully developed. The fundamental conception of this doctrine finds its expression in the two synonymous terms brahman (neutr.),

originally “power of growth,” then “devotional impulse, prayer,” and diman (masc.), “breath, self, soul.”

The recognition of the essential sameness of the individual souls, emanating all alike (whether really or imaginarily) from the ultimate spiritual essence (parama-brahman) “as sparks issue from the fire,” and destined to return thither, involved some important problems. Considering the infinite diversity of individual souls of the animal and vegetable world, exhibiting various degrees of perfection, is it conceivable that each of them is the immediate efflux of the Supreme Being, the All-perfect, and that each, from the lowest to the highest, could re-unite therewith directly at the close of its mundane existence? The difficulty implied in the latter question was at first met by the assumption of an iuter- mediate state of expiation and purification, a kind of purgatory ; but the whole problem found at last a more comprehensive solu- tion in the doctrine of transmigration (samsdra). Some scholars have suggested ? that mctempsychosis may have been the prevalent belief among the aboriginal tribes of India, and may have been taken over from them by the Indo-Aryans. This no doubt is quite possible; but even in that case we can only assume that speculative minds seized upon it as offering the most satisfactory Gf not the only possible) explanation of the great problem of phenomenal existence. It is certainly a significant fact that, once established in Indian thought, the doctrine of metempsychosis is never again called in question, —that, like the fundamental idea on which it rests, viz., the essential sameness of the immaterial element of all sentient beings, the notion of samsdra has become an axiom, a universally conceded principle of Indian philosophy. Thus the latter has never quite risen to the heights of pure thought ; its object is indeed jadsd, the search for knowledge ; but it is an inquiry (mimdmsd@) into the nature of things undertaken not solely for the attainment of the truth, but with a view to a specific object,—the discontinuance of samsira, the cessation of mundane existence after the present life. Every sentient being, through ignorance, being liable to sin, and destined after each ex- istence to be born again in some new form, dependent on the actions committed during the immediately preceding life, all mundane existence thus is the source of ever-renewed suffering; and the task of the philosopher is to discover the means of attaining moksha, ‘‘release” from the bondage of material existence, and yoga, “union” with the Supreme Self,—in fact,

salvation. It is with a view to this, and this only, that the Indian metaphysician takes up the great problems of life,—the origin of man and the universe, and the relation between mind and matter.

It is not likely that these speculations were viewed with much favour by the great body of Brahmans engaged in ritualistic practices. Not that the metaphysicians actually discountenanced the ceremonial worship of the old mythological gods as vain and nugatory. On the contrary, they expressly admitted the propriety of sacrifices, and commended them as the most meritorious of human acts, by whieh man could raise himself to the highest degrees of mundane existence, to the worlds of the Fathers and the Devas. Nevertheless, the facet that these were only higher grades from which the individual self would still be liable to relapse into the vortex of material existence,—that the final goal

1 The section on inheritance has been transl. by T. Kristnasawmy Iyer, 1866. 2 See, eg., A. E. Gough, The Philosophy of the Upanishads, p. 24.

lay beyond even those worlds, unattainable through aught but a perfect knowledge of the soul's nature and its identity with the Supreme Self,—this faet of itself was sufficient to depreciate the merit of the sacrificial cult, and to undermine the authority of the saered rituals, ‘‘Know ye that Self,” exhorts one of those old idealists,? “and have done with other words ; for that (knowledge) is the bridge to immortality!” Intense self-contemplation being, morcover, the only way of attaining the all-important knowledge, this doctrine left little or no room for those mediatorial offices of the priest, so indispensable in ceremonial worship ; and indeed we actually read of Brahman sages resorting to Kshatriya princes to hear them expound this, the true doctrine of salvation. But, in spite of their anti-hierarchical tendency, these speculations con- tinued to gain ground; and in the end the body of treatises pro- pounding the pantheistic doctrine, the Upanishads, were admitted into the sacred canon, as appendages to the ceremonial writings, the Brahmanas. The Upanishads thus form literally ‘‘the end of the Veda,” the Vedanta; but their adherents claim this title for their doctrines in

a metaphorical rather than in a material sense, as “the ultimate aim and consummation of the Veda.” In later times the radical distinction between these speculative appendages and the bulk of the Vedic writings was strongly accent- uated ina new classification of the sacred scriptures. According to this scheme they were supposed to consist of two great divisions, —the Karma-kdnda, i.e., ‘the work-section,” or practical ecere- monial (exoteric) part, consisting of the Samhitas and Bréahmanas (including the ritual portions of the Aranyakas), and the Jidna- kdnda, ‘‘the knowledge-section,” or speculative (esoteric). part. These two divisions are also called respectively the Pérva- (‘‘former’’) and Uttara- (‘‘latter,” or higher+) kdnda; and when the speculative tenets of the Upanishads came to be formulated into a regular system it was deemed desirable that there should also be a special system corresponding to the older and larger portion of the Vedic writings. Thus arose the two systems—the Pirva- (or Karma-) mimémsd, or ‘former (practical) speculation,” and the Uitara- (or Brahma-) mimdmséd, usually called the Vedanta philo- sophy.

It is not yet possible to determine, even approximately, the Philo- time when the so-called Darsanas (literally ‘‘demonstrations”), sophical And, though system.

or systems of philosophy, were first formulated. they have certainly developed from the tenets enunciated in the Upanishads, there is considerable doubt as to the exact order in which these systems succeeded each other. The authoritative exposés of the systems have apparently passed through several redactions ; and, in their present form, these sfitra-works® evi- dently belong to a comparatively recent period, being probably not older than the early centuries of our era. Dy far the ablest general review of the philosophical systems (except the Vedanta) produeed by a native scholar is the Sarva-darsana-sangraha® (‘‘ summary of all the Darganas”), composed in the 14th century, from a Vedantist point of view, by the great exegete Madhava Aeharya.

Among the different systems, six are generally recognized as orthodox, as being (either wholly or for the most part) consistent with the Vedic religion, —two and two of which are again more closely related to each other than to thie rest, viz. :—

(1) Pérva-mimémsd (IMlimdmsd), and (2) Uttara-mimdmsd

(Vedanta) ; (8) Saénkhya, and (4) Yoga ; (5) Nydya, and (6) Vatseshika.

(1) The (Parva-) Mimdmsd is not a system of philosophy in the Mi- proper sense of the word, but rather a system of dogmatic criticism m4msa.

and scriptural interpretation. It maintains the eternal existenee of the Veda, the different parts of which are minutely classified. Its principal object, however, is to ascertain the religious (chiefly ceremonial) duties enjoined in the Veda, and to show how these duties must be performed, and what arc the special merits and rewards attached to them. Hence arises the necessity of determin- ing the principles for rightly interpreting the Vedic texts, as also of what forms its only claim to being classed among speculative systems, viz., a philosophical examination of the means of, and the proper method for arriving at, accurate knowledge. The founda- tion of this school, as well as the composition of the Stitras or aphorisms which constitute its chief doctrinal authority, is ascribed to Jaimini. The Stitras were commented on by Sabara Svamin ; and further annotations (vérttika) thereon were supplied by the great theologian Kumarila Bhatta, who is supposed to have lived in the (6th or) 7th century, and to have worked hard for the re- establishment of Brahmanism. According to a popular tradition his self-immolation was witnessed by Sankaraicharya. The most

3 Mundaka-upanishad, ii. 2, 5.

4 Cf. Mundaka-upanishad, i. 4, 5, where these two divisions are ealled ‘‘the lower (apara) and the higher (para) knowledge.”

5 These works have all been printed with commentaries in India; and they have been partly translated by J. Ballantyne, and by K. M. Banerjea. The best general view of the systems is to be obtained from H. C. Colebrooke’s account, Misc. Essays, i., 2d ed., with Prof. Cowell’s notes. Compare alsothe brief abstract given in Goldstiieker’s Literary Remains, vol.i. A very useful classified index

of philosophical works was published by F. Hall, 1859. 6 Edited in the Bibl. Ind.; translated by E. B. Cowell and A. E. Gough, 1882.

approved general introduction to the study of the Mimamsé is the inetrical Jaimintya-Nydya-malé-vistara,* with a prose commentary, both by Madhava Acharya. This distinguished writer, who has already been mentioned several times, was formerly supposed, from frequent statements in MSS., to have been the brother of Sayana, the well-known interpreter of the Vedas. The late Dr Burnell? has, however, made it very probable that these two are one and the same person, Sdyana being his Telugu, and MAdhavaicharya his Brahmanical name. In 1331 he became the jagadguru, or spiritual head, of the Smartas (a Vedantist sect founded by Sankaracharya) at the Math of Sringer!, where, under the patronage of Bukka, king of Vidyanagara, he composed his numerous works. He sometimes passes under a third name, Vidyaranya-svamin, adopted by him on becoming a sannydsin, or religious mendicant. , i

(2) The Vedénta philosophy, in the comparatively primitive form in which it presents itself in most of the Upanishads, con- stitutes the earliest phase of systematie metaphysical speculation. In its essential features it remains to this day the prevalent belief of Indian thinkers, and enters largely into the religious life and convictions of the people. Itis an idealistic monism, which derives the universe from an ultimate conscious spiritual principle, the one and only existent from eternity—the Aman, the Sclf, or the Purusha, the Person, the Brahman. It is this primordial essence or Self that pervades all things, and gives life and light to them, “without being sullied by the visible outward impurities or the miscries of the world, being itself apart,”—and into which all things will, through knowledge, ultimately resolve themselves. ‘The wise who perceive him as being within their own Self, to them belongs cternal peace, not to others.”? But, while the com- mentators never hesitate to interpret the Upanishads as being in perfect agreement with the Vedantic system, as claborated in latcr times, there is often considerable difficulty in accepting their explanations. In these treatises

only the leading features of the pantheistic theory find utterance, generally in vague and mystic though often in singularly powerful and poetical language, from which it is not always possible to extract the author's real idea on fundamental points, such as the relation between the Supreme Spirit and the phenomenal world,—whether the latter was actually evolved from the former by a power inherent in him, or whether the process is altogether a fiction, an illusion of the individual self. Thus the Katha-upanishad? offers the following summary :— ''Beyond the senses [there are the objects; beyond the objects] there is the mind (manas) ; beyond the mind there is the intellect (buddhi) ; beyond the intellect there is the Great Self. Beyond the Great One there is the Highest Undeveloped (avyaktam) ; beyond the Undeveloped there is the Person (purusha), the all-pervading, characterless (alinga). Whatsoever knows him is liberated, and attains immortality." Here the Vedantist commentator assures us that the Great Undeveloped, which the Sankhyas would claim as their own primary material principle (pradhana, prakriti), is in reality Mfdyd, illusion (otherwise called Avidya, ignorance, or Sakti, power), the fictitious energy which in conjunction with the Highest Self (Atman, Purusha) produees or constitutes the lsvara, the Lord, or Cosmic Soul, the first emanation of the Atman, and himself the (fictitious) cause of all that seems to exist. It must remain doubtful, however, whether the author of the Upanishad really meant this, or whether he regarded the Great Undeveloped as an actual material principle or substratum evolved from out of the Purusha, though not, as the Sankhyas hold, coexisting with him from eternity. Besides passages such as these which seem to indicate realistic or materialistie tendencies of thought, which may well have developed into the dualistic Sankhya and kindred systems, there are others which indicate the existence even of nihilist theories, such as the Bauddhas—the Sinya-vddins, or affirmers of a void or primordial nothingness— profess. Thus we read in the Chhandogya-upanishad > :—' The existent alone, my son, was here in the beginning, one only, with- out a second. Others say, there was the non-existent alone here in the beginning, one only, without a second,—and from the non- existent the existent was born. But how could this be, my son ? How could the existent be born from the non-existent? No, my son, only the existent was here in the beginning, one only, with- out a second,"

The foundation of the Vedanta system, as “the completion of the Veda,” is naturally ascribed to Vyasa, the mythic arranger of the Vedas, who is said to be identical with Badardyana, the reputed author of the Brahma- (or Sértraka-) sitra, the authorita- tive, though highly obscure, summary of the system. The most distinguished interpreter of these aphorisms is the famous Malabar theologian Sankara Acharya (7th or 8th century), who also eommented on the principal Upanishads and the Bhagavadgita, and is said to have spent the greater part of his life in wandering all over India, as far as Kashmir, and engaging in disputations

1 Edited by Th, Goldstiickcr, completed by E. B. Cowell.

2 Vamsa-brahmana, Introd. 3 Katha- i ii £013,101 1687. – wo ii. 5, 11-13

KRI® (LITERATURE, with teachers—whether of the Saiva, or Vaishnava, or less orthodox persuasions—with the view of rooting ont heresy and re-establishing the doctrine of the Upanishads. His controversial triumphs (doubtless largely mythical) are related in a number of treatises current in South India, the two most important of which are the Sankara-dig-vijaya (“Sankara’s world-conquest”), ascribed to his own disciple Anandagiri, and the Sankara-vijaya, by Ma- dhavacharya. In Sankara’s philosophy® the theory that the material world has no real existence, but isa mere illusion of the individual sonl wrapt in ignorancc,—that, therefore, it has only a practical or conventional (vydvahdrika) but not a transcendental or true (pdramarthika) reality, —is strictly enforced. To the question why the Supreme Self (or rather his fictitious development, the Highest Lord, or cosmic soul) should have sent forth this phantasma- gory this great thinker (with the author of the Siitras’) can return no better answer than that it must have been done for sport (/i7d), without any special motive—since to ascribe such a motive to the Supreme Lord would be limiting his self-sufficiency, —and, that the process of creation has been going on from all eternity. Sankara’s Sdriraka-mimdmsd-bhdshya has given rise to a large number of exegetic treatises, of which Vachaspati-misra’s § exposition, entitled Bhématt,? is the most esteemed. Of numerous other commentaries

on the Brahma-siitras, the Sri-bhdshya, by Ramanuja, the founder Rama- of the Sri-Vaishnava sect, is the most noteworthy. This religious nuja,

teacher, who probably flourished during the first half of the 12th century, caused a schism in the Vedanta school. Instead of adher- ing to Sankara's orthodox advaita, or non-duality doctrine, he put forth the theory of visishtddvaita, i.e., non-duality of the (two) distinct (principles), or, as it is more commonly cxplained, non-duality of that which is qualificd (by attributes). According to this thcory the Brahman (which is identical with Vishnu) is neither devoid of form and quality, nor is it all things ; but it is endowed with all good qualities, and matter is distinct from it; bodies consist of souls (chi) and matter (achit) ; and God is the soul. With this theory is combined the ordinary Vaishnava doctrine of periodical descents (avatéra) of the deity, in various forms, for the benefit of creatures. In Ramanuja's system con-

siderable play is also allowed to the doctrine of faith (bhakti). Bhakti,

This phase of Indian religious belief, which has attached itself to the Vedanta theory more closely than to any other, and the origin of whieh some scholars are inclined to attribute to Christian influence, seems first to make its appearance very prominently in the Bhagavadgitd, the episode of the AMahdbhdrata, alrcady referred to, and is even more fully developed in some of the Puranas, especially the Bhagavata. In the Séndilya- (Bhakti-) sdtra," the author and date of which are unknown, the doctrine is systematically propounded in one hundred aphorisms. According to this doctrine mundane existence is due to want of faith, not to ignorance; and the final liberation of the individual soul can only be effected by faith. Knowledge only contributes to this end by removing the mind's foulness, unbelief. Its highest phase of development this doctrine probably reached in the religious creed of the Bhaktas, a Vaishnava sect founded, towards the end of the 15th century, by Chaitanya, whose followers subsequently grafted the Vedanta speculations on his doctrine. A popular summary of the Vedanta doctrine is the Veddnia-sdra_ by Sadananda, which has been frequently printed and translated."

(3) The Sénkhya,™ or "enumerative " system, probably derives Sankhya,

its name from its systematic cnumeration of the twenty-five principles (¢attva) it recognizes, —consisting of twenty-four material and an independent immaterial principle. In opposition to the Vedanta school,

which maintains the eternal cocxistence of a spiritual principle of reality and an unspiritual principle of unreality, the Sankhya assumes the eternal cocxistence of a material first cause, which it calls either mdla-Prakriti (fem.), “chief Originant” (Nature), or Pradhdna, “the principal” cause, and a plurality of spiritual elements or Selves, Purusha, The system recognizes no intelligent creator (such as the Fsvara, or demiurgus, of the Vcdénta)—whence it is called nirisvara, godless; but it conceives the Material First Cause, itself unin- telligent, to have become developed, by a gradual process of evolution, into all the actual forms of the phenomenal universe, excepting the souls. Its first emanation is buddhi, intelligence ; whence springs akamkédra, consciousness ; thence five elementary particles (tanmdtra) and eleven organs of sense ; and finally, from the elementary particles, five elements. The souls have from all eternity been connected with Nature,—having in the first place become invested with a subtile frame (Jinga-, or sikshma-, sartra), consisting of seventeen principles, viz., intelligence, eonsciousness, elementary particles, and organs of sense and action, including oe EE a ee

6 P. Deussen, Das System des Vedanta, 1883, A. E. Gough, The Philosophy of the Upanishads, also follows chiefly Sankara’s interpretation.

7 Brahmasfitra, iii, 1, 32-34.

8 Prof. Cowell assigns him to about the 10th century. 9 Bibl. Ind.

10 Text, with Svapnegvara’s commentary, edited by J. R. Ballantyne; transl. by E. B. Cowell. H Last by G. A. Jacob.

12 E, Roer, Lecture on the Sdnkhya Philosophy, Calentta, 1854; B. St Hilaire, Mémoire sur le Sankhya, 1852.

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mind. Invested with this subtile frame, they, for the sake of fruition, connect themselves ever anew with Nature, thus, as it were, creating for themselves ever new forms of material existence ; and it is only on his attaining perfect knowledge, whereby the ever-changing modes of intelligence cease to be reflected on him, that the Purusha is liberated from the miseries of Samsiira.

The reputed founder of this school is the sage Kapila, to whom tradition ascribes the composition of the fundamental text-book, the (Sdnkhya-stira, or) Sdnkhya-pravachana,' as well as the Tativa-samdésa, a mere catalogue of the principles. That the Sitras have undergone subsequent modifications might be inferred from the fact that they twice refer to the opinion of Pafichagikha, who elsewhere is stated to have received his instruction from Asuri, the disciple of Kapila, as well as from the sage himself. Of the eommentaries on the Stitras, that by Vijfidna Bhikshu,? a writer probably of the 16th century, is the most approved. An independent treatise by the same author, the Sdnkhya-séra,? consisting of a prose and a verse part, is probably the most valuable compendium of Sinkhya doctrines. Another admirable and highly-estcemed treatise is [évara-krishna's Sénkhya-kdrikd,3 which gives, in the narrow eompass of seventy-five slokas, a lucid and eomplete sketch of the system. Though nothing certain is known regarding its authoy* this work must be of tolerable antiquity, considering that it was commented upon by Gaudapada,® the preceptor of Govinda, who, on his part, is said to have been the teacher of SankarAchérya.

(4) The Yoga system is merely a schismatic branch of the preceding school, holding the same opinions on most points treated in common in their Stitras, with the exeeption of one important point, the existence of God. To the twenty-five principles (éaétva) of the Nirigvara Sankhya, the last of which was the Purusha, the Yoga adds, as the twenty-sixth, the Nirguna Purusha, or Self devoid of qualities, the Supreme God of the system. Hence the Yoga is called the Sesvara (theistical) Sdnkhya. But over and: above the purely speculative part of its doctrine, which it shares with the sister school, the theistic Sankhya has developed a complete system of mortification of the senses—by means of prolonged apathy and abstraction, protracted rigidity of posture, and similar practices, many of which are already alluded to in the Upanishads, —with the view of attaining to an ecstatic vision of, and reunion (yoga) with, the Supreme Spirit. It is from this portion of the system that the school derives the name by which it is more generally known. The authoritative Stitras of the Yoga, bearing the same title as those of the sister school, viz., Sinkhya-pravachana, but more commonly called Yoga-sdstra, are ascribed to Patafijali, who is perhaps identical with the author of the "great commentary" on Panini. The oldest commentary on the Sitras, the Pétattjala-bhdshya, is attributed to no other than Vyasa, the

mythic arranger of the Veda and founder of the Vedanta. Both works have again been commented upon by Vachaspati-migra, Vijfiana-bhikshu, and other writers.

(5) (6) The Nydya® and Vaiseshika are but separate branches of one and the same school, which supplemeut each other and the doctrines of which have virtually become amalgamated into a single system of philosophy. The special part taken by each of the two branches in the elaboration of the'system may be briefly stated in Dr técr's words :—"'To the Nydya belong the logical doctrines of the forms of syllogisms, terms, and propositions; to the Vai

The followers of these schools generally recognize seven categories (paddrtha) :—substance (dravya), quality (guna), action (karma), generality (sémdnya), particularity (viscsha), intimate relation (sumavdya), and non-existence or negation (abhdva). Substances, forming the substrata of qualities and actions, are of two kinds :— eternal (without a cause), viz., space, time, ether, soul, and the atoms of mind, earth, water, fire, and air; and non-eternal, com-

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I Transl. by J. R. Ballantyne ; 2d ed. by F. Hall. 2 Edited by F. Hall.

3 Edited by C. Lassen, 1832, Translations by H. T. Colebrooke and J. Davies.

4 One writer makes him the pupil of Panehasikha, whilst another even Identifies him with Kalidasa; cf. F. Hall, Sdnkhyasdra, p. 29.

5 Transl. by Il. H. Wilson. A Chinese translation of a eommentary resembling that of Gaudapfda is said to have been made during the Ch'en dynasty, 557-583 A.D. (M. Miiller, Zndia, p. 360).

§ Besides Colebrooke's Zssay, with Cowell's notes, see Ballantyne's translation of the Tarka-Sangraha and the introduetion to Rver's translation of the Bhashdparichheda, und his artiele, Z. D. M. ey RRs

prising all compounds, or the things we perceive, and which must have a cause of their existence. Causality is of three kinds :— that of intimate relation (material cause); that of non-intimate relation (between parts of a compound); and instrumental causality (effecting the union of component parts). Material things are thus composed of atoms (anw), .c., ultimate simple substances, or units of space, eternal, unchangeable, and without dimension, character- ized only by “ particularity (visesha).” It is from this predication of ultimate “ particulars” that the Vaiéeshikas, the originators of the atomistic doctrine, derive their name. The Nydya draws a clear line between matter and spirit, and has worked out a careful and ingenious system of psyehology. It distinguishes between individual or living souls (jivétman), which are numerous, infinite, and eternal, and the Supreme Soul (Paramétman), which is one only, the seat of eternal knowledge, and the maker and ruler (fsvara) of all things. Itis by his will and agency that the un- conscious living souls (soul-atoms, in fact) enter into union with the (material) atoms of mind, &c., and thus partake of the pleasures and sufferings of mundane existence. On the Hindu syllogism compare Prof. Cowell’s notes to Colebrooke’s Essays, i. p. 314.

The original collection of Nydya-sdtras is ascribed to Gotama, and that of the Vaiseshika-sdtras to Kanada. The etymological meaning of the latter name seems to be “little-eater, particle- eater,” whence in works of hostile critics the synonymous terms Kana-bhuj or Kana-bhaksha are sometimes derisively applied to him, doubtless in allusion to his theory of atoms. He is also occasionally referred to under the name of KAsyapa. Both stitra-works have been interpreted and supplemented by a number of writers, the commentary of Viévandtha on the Nydya and that of Sankara-migra on the Vaiscshika Stitras being most gencrally used, There are, moreover, a vast number of separate works on the doctrines of these schools, especially ou logic. Of favourite elementary treatises on the subject may be mentioned Kegava- misra’s Tarka-bhdshd, the Tarka-sangraha,’? and the Bhdshd-parichheda.® A large and important book on logic is Gangesga’s Chintémani, which formed the text-book of the celebrated Nuddea school of Bengal, founded by Raghun4tha-siromani about the beginning of the 16th century. An interesting little treatise is the Kusumdijali,® in which the

author, Udayana Acharya (about the 12th century, according to Prof. Cowell) attempts, in 72 couplets, to prove the existence of a Supreme Being on the principles of the Nydya system.

As regards the different heretical systems of Hindu philosophy, there is no occasion, in a sketch of Sanskrit literature, to enter into the tenets of the two great anti-Brahmanical sects, the Jainas and Buddhists. While the original works of the former are written entirely in a popular (the Ardha-magadht) dialect, the northern Buddhists, it is true, have produced,a considerable body of litera- ture,!° composed in a kind of hybrid Sanskrit, but only a few of their sacred books have as yet been published; and it is, more- over, admitted on all hands that for the pure and authentic Bauddha doctrines we have rather to look to the Pali scriptures of the southern branch. Nor ean we do more here than briefly allude to the theories of a few of the less prominent heterodox systems, however interesting they may be for a history of human thought.

The Chdrvékas, an ancient seet of undisguised materialism, who deny the existence of the soul, and consider the human person (purusha) to be an organic body endowed with sensibility and with thought, resulting from a modification of the eomponent material elements, ascribe their origin to Brihaspati; but their authoritative text-book, the Barhaspatya-sdtra, is only known so far from a few quotations.

The Pdichardtras, or Bhagavatas, are an early Vaishnava sect, in which the doctrine of faith, already alluded to, is strongly developed. Hence their tenets are defended by Ramanuja, though they are partly eondemned as heretical in the Brahma-sitras. Their recognized text-book is the Nérada-Patchardtra. Aecording to their theory the Supreme Being (Bhagavat, Vasudeva, Vishnu) became four separate persons by successive production. While the Supreme Being himself is indued with the six qualities of know- ledge, power, strength, absolute sway, vigour, and encrgy, the three divine persons successively emanating from him and from one another represent the living soul, mind, and conscionsness respectively.

The Pasupatas, one of several Saiva (M&heSvara) sects, hold the Supreme Being (févara), whom they identify with Siva, to be the creator and ruler of the world, but not its material cause. With the Sinkhyas they admit the

notion of a plastie material cause, the Pradhdna; while they follow Pataijali in maintaining the exist- ence of a Supreme God.

7 Edited and translated by J. R. Ballantyne.

8 Edited and translated, with eommentary, by E. Réer.

9 Edited and translated, with eommentary, by E. B. Cowell.

10 See B, H. Hodgson, The Languages, Literature, and Religton of Nepal and Tibet.

ll Lalita-vistara, edited and partly translated by Rajendralala Mitra; Maha-vastu, edited E. Senart; Vajra-parichheda, edited M. Miiller; Saddharma-pundarika, translated by E. Burnouf (‘‘ Lotus de la bonne loi”); and H. Kern, Sacred Books of the East, 12 Edited by K. M. Banerjea.

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Ill. Grammar (Vydkarana).—We found this subject enumcr- ated as one of the six “limbs of the Veda,” or auxiliary sciences, the study of which was deemed necessary for a correct interpreta- tion of the sacred Mantras, and the proper performance of Vedic rites. Linguistic inquiry, phonetic as well as grammatical, was indeed early resorted to both for the purpose of elucidating the meaning of the Veda, and with the view of settling its textual form. ‘he particular work which came ultimately to be looked upon as the “veddnga” representative of grammatical science, and las ever since remaincd the standard authority for Sanskrit grammar in India, is Panini’s Ashtédhydyt,) so called from its “consisting of cight lectures (adhydya),” of four pddas each, For a comprehensive grasp of linguistic facts, and a penetrating insight into the structure of the vernacular language, this work stands probably unrivalled in the literature of any nation, —thougli few

other languages, it is true, afford such facilities as the Sans- krit for a scientific analysis. Panini's system of arrangement differs entirely from that usually adopted in our grammars, Viz., according to the so-called parts of speech. As the work is eom- posed in aphorisms intended to be learnt by heart, economy of inemory-matter was the author's paramount consideration. His object was chiefly attained by the grouping together of all eases exhibiting the same phonetic or formative feature, no matter whether or not they belonged to the same part of speech. For this purpose he also makes use of a highly artificial and ingenious system of algebraic symbols, consisting of technical letters (ana- bandha), used chiefly with suffixes, and indieative of the ehanges which the roots or stems have to undergo in word-formation.

It is self-evident that so eomplicated and eomplete a system of linguistic analysis and nomenclature could not have sprung up all at once and in the infancy of grammatical science, but that many generations of scholars must have helped to bring it to that degree of perfection which it exhibits in Panini's work. Accordingly we find Panini himself making reference in various places to ten dif- ferent grammarians, besides two schools, which he callsthe "eastern (prdfichas)" and "northern (udafchas)" grammarians. Perhaps the most important of his predecessors was Sakatdyana,? also mentioned by YAaska—the author of the Nirukta, who is likewise supposed to have preceded Panini—as the only grammarian (vaiyd- karana) who held with the etymologists (nairwkta) that all nouns are derived from verbal roots. Unfortunately there is little hope of the recovery of his grammar, which would probably have enabled us to determine somewhat more exactly to what extent Panini was indebted to the labours of his predecessors, There exists indeed a grammar in South Indian MSS., entitled Sabddénusdsana, which is ascribed to one Sakatayana ;* but this has been proved * to be the production of a modern Jaina writer, which, however, seems to be

artly based on the original work, and partly on Panini and others. Panini is also called Dakshiputra, after his mother Dakshi. As his birthplace the village Salitura is mentioned, which was situated some few miles north-west of the Indus, in the country of the Gandharas, whence later writers also call him Sélaturiya, the formation of which name he himself explains in his

grammar. Another name sometimes applied to him is Salanki. Inthe Kathé-saritsdgara, a modern collection of popular tales mentioned above, Panini is said to have been the pupil of Varsha, a teacher at Pata- liputra, under the reign of Nanda, the father (?) of Chandragupta (315-291 B.c.). The real date of the great grammarian is, how- ever, still a matter of uncertainty. While Goldstiicker® attempted to put his date back to ante-Buddhist times (about the 7th century B.c.), Prof. Weber holds that Panini's grammar cannot have been composed till some time after the invasion of Alexander the Great. This opinion is chiefly based on the occurrcuce in one of the Sfitras of the word yavandnt, in the sense of "the writing of the Yavanas (Ionians)," thus implying, it would seem, such an acquaintance with the Greek alphabet as it would be impossible to assume for any period prior to Alexander's Indian campaign (326 B.c.). But, as it is by no means certain® that this term really applies to the Greek alphabet, it is scarcely expedient to make the word the corner-stone of the argument regarding Panini's age. If Patafijali's "great commentary" was written, as seems highly probable, about the middle of the 2nd century B.c., it is hardly possible to assign to Panini a later date than about 400 B.c. Though this grammarian registers numerous words and formations as peculiar to the Vedic hymns, his chief concern is with the ordi- nary speech (dhdshé) of his period and its literature; and it is noteworthy, in this respect, that the rules he lays down on some important points of syntax (as pointed out by Profs. Bhandarkar and Kielhorn) are in accord with the practice of the Brahmanas rathcr than with that of the later classical literature. :

1 Printed, with a eommentary, at Calcutta; also, with notes, indexes, and an instructive introduction, by O. Béhtlingk.

2 I.e., son of Sakata, whence he is also called Sakatangaja.

3 Compare G. Biihler's paper, Orient und Occident, p. 691 sq.

4 A. Burnell, On the Aindra School of Sanskrit Grammarians.

: pagsie his ed . Sanskrit Literature, 1861.

ee Lassen, ind. Alt.. i, p. 723; M. Miiller, Zist. o aye Uibeape ;

Weber, Ind. Stud., v. p. 2 sg. : ANS eae Mon

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Panini’s Sitras continued for ages after to form the centre of grammatical activity. But, as his own work had superseded those of his predecessors, so many of the scholars who devoted them- selves to the task of perfecting his system have sunk into oblivion. The earliest of his successors whose work has come

down to us (though perhaps not in a separate form), is Katyayana, Katy4- the author of a large collection of concise critical notes, called yana.

Varttika, intended to supplement and correct the Siitras, or give them greater precision. ‘The exact date of this writer is likewise unknown; but there can be little doubt that he lived at least a century after Panini. During the interval a new body of literature seems to have sprung up,’— accompanied with considerable changes of language,—and the geographical knowledge of India extended over large tracts towards the south. Whether this is the same Katyayana to whom the Vajasaneyi- pratisakhya (as well as the Sarvanukrama) is attributed, is still doubted by some scholars.® Katyayana being properly a family or tribal name, meaning “the descendant of Katya,” later works usually assign a seeond name Vararuchi to the writers (for there are at least two) who bear it. The Kathdsaritsagara makes the author of the Varttikas a fellow-student of Panini, and afterwards the minister of King Nanda; but, though this date might have fitted Katyayana well enough, it is impossible to place any reliance on the statements derived from such a source. Katyayana was succeeded again,

doubtless after a considerable interval, by Patafijali, the author of Patanjali

the (Vydkarana-) Mahd-bhdéshya,? or Great Commentary. For the great varicty of information it incidentally supplies regarding the literature and

manners of the period, this is, from an historical and antiquarian point of view, one of the most important works of the classical Sanskrit literature. Fortunately the author's date has becn settled by synchronisms implied in two passages of his work. In one of them the use of the imperfect—as the tense referring to an event, known to people generally, not witnessed by the speaker, and yet capable of being witnessed by him—is illus- trated by the statement, ''The Yavana besieged Saketa," which there is reason to believe can only refer to the Indo-Bactrian king Menander (144-c. 124 B.c.), who, according to Strabo, extended his rule as far as the Yamuna.!° In the other passage the use of the present is illustrated by the sentence, "We are sacrificing for Push- pamitra,"—this prinee (178-c. 142 3.c.), the founder of the Sunga dynasty, being known to have fought against the Greeks.!° We thus get the years 144-142 B.c. as the probable time when the work, or patt of it, was eomposed. Although Patafijali probably gives not a few traditional grammatical examples mechanically repeated from his predecessors, those here mentioned are fortun- ately such as, from the very nature of the ease, must have becn made by himself. The Mahabhashya is not a continuous com- mentary on P4nini's grammar, but deals only with those Sifitras (some 1720 out of a total of nearly 4000) on which Katyayana had proposed any Varttikas, the eritieal discussion of which, in con- nexion with the respective Sfitras, and with the views of other gram- marians expressed thereon, is the sole object of Patafijali's com- mentatorial remarks. Though doubts have been raised as to the textual condition of the work, Prof. Kielhorn has elearly shown that it has probably been handed down in as good a state of pre- servation as any other classical Sanskrit work. Patafijali is also called Gonardiya,—which name Prof. Bhandarkar takes to mean "a native of Gonarda," a place, according to the same scholar, probably identical with Gonda, a town some 20 miles north-west of Oudh, —and GonikAputra, or son of Gonika. Whether there is any connexion between this writer and the reputed author of the Yogasdstra is doubtful. The Mahabhashya has been commented upon by Kaiyata, in his Bhdshyapradipa, and the latter again by Nagojibhatta, a distinguished grammarian of the earlier part of the last century, in his Bhdshya-pradtpoddyota.

Of running commentaries on Panini's Siitras, the oldest extant Kasika and most important is the Késikad Vritti,™ or ''comment of Kasi vritti.

(Benares),” the joint production of two Jaina writers of probably the first half of the 7th century, viz., JayAditya and Vamana, each of whom composed one half (four adhyayas) of the work. The chief commentaries on this work are Haradatta Misra’s Padamafjart, which also embodies the substance of the Mahabhashya, and Jinendra-buddhi’s Nydsa.”

Educational requirements in eourse of time led to the appearance Modern of grammars, chiefly of an elementary character, constructed on a grammars.

7 F, Kielhorn, Kétydyana und Patanjali, 1876. The Sangraha, a huge mettical work on grammar, by VyAdi, which is frequently referred to, doubtless belongs to this period.

8F.9., A. Weber. Goldstticker and M. Miiller take the opposite view.

9 Part of this work was first printed by Ballantyne; followed by a lithographed edition, by two Benares pandits, 1871; and a photolithographie edition of the text and commentaries, published by the India Office, under Goldstiicker’s supervision, 1874; finally, a critical edition, now in progress, by F. Kielhorn. Fora review of the literary and antiquarian data supplied by the work, sce A. Weber, Ind. Stud., xiii, 298 sg. The author’s date has been frequently dis- cussed, most thoroughly and suecessfully by R. G. Bhandarkar in several papers. See also A. Weber, Hist. of J. L., p. 228. 10 Lassen, Ind. Alt., ii. 341, 362.

1 Edited by Pandit Bala Sastri, Benares, 1876-78. 12 As itis quoted by Vopadeva, it cannot be Jater than the 12th eentury.

» Paribdshendusekhara.?

more practical system of arrangement—the principal heads under which the grammatical matter was distributed usually being— rules of euphony (sandhi); infiexion of nouns (xdéman), gene- rally including composition and secondary derivatives; the verb (akhydta) ; and primary (krid-anta) derivatives. In this way a number of grammatical schools? sprang up at different times, each recognizing a special set of Siitras, round which

gradually gathered a more or less numerous body of commentatorial and subsidiary treatises. As regards the grammatical material itself, these later grammars supply comparatively little that is not already contained in the older works,—the difference being mainly one. of method, and partly of terminology, including modifications of the system of technieal letters (anwbandha). Of the grammars of this descrip- . tion hitherto known the Chdndra-vydkarana is probably the oldest,—its author Chandra Acharya having flourished under King Abhimanyu of Kashmir, who is usually supposed to have lived towards the end of the 2d century,? and in whose reign that grammarian is stated, along with others, to have revived the study of the Mahabhashya in Kashmir. Only portions of this grammar, with a commentary by Anandadatta, have as yet been recovered.

The Kétantra,' or Kdldpa, is ascribed to Kumara, the god of war, whence this school is also sometimes called Kawmdra. The real author probably was Sarva-varman, who also wrote the original commentary (vritti), which was afterwards recast by Durgasimha, and again commented upon by the same writer, and subsequently by Trilochana-dasa. The date of the Katantra is unknown, but it will probably have to be assigned to about the 6th or 7th century. lt is still used in many parts of India, especially in Bengal and Kashmir, Other grammars are—the Sdrasvatt Prakriyd, by Anubhiti Svarfipacharya; the Sankshipta-sdra, composed by Kramadisvara, and corrected by Jumara-nandin, whence it is also called Jawmara; the Haima-vydkarana,* by the Jaina writer Hemachandra (1088-1172, according to Dr Bhao Daji); the Mugdha-bodha,® composed, in the latter part of the 13th century, by Vopadeva, the court pandit of King Mahadeva (Ramaraja) of Devagiri (or Deoghar); the Siddhdnta-kaumudi, the favourite text-book of Indian students, by Bhattoji Dikshita (17th cen- tury); and a clever abridgment of it, the Laghu- (Siddhénta-) kawmudi,® by Varadaraja.

Several subsidiary grammatical treatises remain to be noticed. The Paribhdshds are general maxims of interpretation presupposed by the Sfitras. Those handed down as applicable to Panini's system have been interpreted most ably by Nagojibhatta, in his In the case of rules applying to whole groups of words, the complete lists (gana) of these words are given in the Ganapdtha, and only referred to in the Sfitras. Vardha- mana's Ganaratna-mahodadhi,' a eomparatively modern recension of these lists

(1140 a.p.), is valuable as offering the only available eommentary on the Ganas which contain many words of unknown meaning. The Dhdtupdathas are complete lists of the roots (dhdtz) of the language, with their general meanings. The lists handed down under this title,? as arranged by Panini himself, have been com- mented upon, amongst others, by Madhava. The Unddi-sitras are rules on the formation of irregular derivatives. The oldest work of this kind, commented upon by Ujjvaladatta,!° is by some writers ascribed to Katyayana Vararuchi, by others even to Sdkatdyana. The oldest known treatise on the philosophy of grammar and syntax is the Vékya-padiya,4 composed in verse, by Bhartrihari (?7th century), whence it is also called Harikdrikd. Of later works on this subject, the Vaiydkarana-bhishana, by Konda- bhatta, and the Vaiydkarana-siddhdnta-maijisha, by Nagoji-bhatta, are the most important.

TV. Lexicocrapny.—Sanskrit dictionaries (osha), invariably composed in verse, are eithcr homonymous or synonymous, or partly the one and partly the other. Of those hitherto published, Sasvata's Anekirtha-samuchchaya,' or " collection of homonyms," is probably the oldest. While in the later homonymic vocabu- laries the words are usually arranged according to the alphabetical order of the final (or sometimes the initial) letter, and then accord- ing to the number of syllables, SAsvata's principle of arrangement —viz., the number of meanings assignable to a word—seems to be more primitive. 'The work probably next in time is the famous Amara-kosha (''immortal treasury") by Amara-simha, one of "the nine gems" at the court of King Vikramaditya (¢. 550 A.D.). This dictionary consists of a synonymous and a short homonymous part ; whilst in the former the words are distributed in sections

1 Dr Burnell, in his Aindra School, proposes to apply this term to all grammars arranged on this plan.

2 Prof. Bhandarkar, Early Iistory of the Dekhan, p. 20, proposes to fix him about the end of the 3d century. 3 Ed., with comm., by J. Eggeling.

4 Part ed. and transl. by lt. Pischel. 5 Ed. by O. Buhtlingk, 1847.

6 Ed. and transl. by J. R. Ballantyne. For othcr modern grammars sec Colebrooke, Zssays, ii. p. 44; RAjendralila Mitra, Descriptive Catalogue, i.,

Grammar. 7 Ed. and transl. by F. Kiclhorn.

8 Ed. by J. Eggcling. 9 Ed. by N. L. Westergaard.

10 Text and commentary, cd. by Th. Aufrecht.

11 In course of publication, with commentaries, at Benares.

12 Ed. by Th. Zachariae.

13 Edited by Ii. T, Colebrooke (1808), and by L. Deslongchamps (1839-45).

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according to subjects, as heaven and the gods, time and seasons, &c., in the latter they are arranged according to their final letter, without regard to the number of syllables. This Kosha has found many commentators, the oldest of those known being Kshira- svémin.44 Among the works quoted by commentators as Amara's sourees are the Z'rikdénda and Utpalini-koshas, and the glossaries of Rabhasa, Vyadi, Katyayana, and Vararuchi. A Kosha ascribed to Vararuchi,—whom tradition makes one of the nine literary ''gems," and hence the contemporary of Amara-simha,— consisting of ninety short sections, has been printed at Benares (1865) in a collection of twelve Koshas. The Abhidhéna-ratna- mald,° by Haldyudha; the Visvaprakdsa, by Maheévara (1111); and the Abhidhdna-ehintémani® (or Haima-kosha), by the Jaina Hemachandra, seem all three to belong to the 12th century. Somewhat earlier than these probably is Ajaya Pala, the author of the (homonymous) Néndrtha-sangraha, being quoted by Var-dhamana (1140 A.p.). Of more uncertain date is Purushottama Deva, who wrote the Trikdyda-sesha, a supplement to the Amarakosha, besides the Hérdvalt, a collection of uncommon words, and two other short glossaries. Of numerous other works of this class the most important is the Aedint, a dictionary of homonyms, arranged in the first place according to the finals and the syllabie length, and then alphabetically. Two important dietionaries, compiled by uative scholars of the present cen- tury, are the

Sabdakalpadruma by Radhakanta Deva, and the Véchaspatya, by Tarandtha Tarka-vichaspati.

V. Prosopy (Chhandas).—The oldest treatises on prosody have already been referred to in the account of the technical branches of the later Vedic literature. Among more modern treatises the most important are the Mryita-sanjivant, a commentary on Pingala's Siitra, by Halayudha (perhaps identical with the author of the glossary above referred to); the Vritta-ratndkara, or ''jewel-mine of metres," in six chapters, composed before the 13th century by Kedara Bhatta, with several commentaries ; and the Chhando-maijari, likewise in six chapters, by Gangadasa. The Srutabodha, ascribed, probably wrongly, to the great Kalidasa, is a comparatively insignificant treatise, dealing only with the more common metres, in such a way that each couplet forms a specimen of the metre it describes. The V7ritta-darpana treats chiefly of Prakrit metres. Sanskrit prosody, which is probably not surpassed by any other either in variety of netre or in harmonions- ness of rhythm, recognizes two classes of metres, viz., such as con- sist of a certain number of syllables of fixed quantity, and such as are regulated by groups of breves or metrical instants, this latter class being again of two kinds, according as it is or is not bound by a fixed order of feet. A pleasant account of Sanskrit poetics is given in Colebrooke's Essays, vol. ii. ; a more complete and systematic one by Prof. Weber, Jnd. Stud., vol. viii.

VI. Music (Sangita).—The musical art has been practised in India from early times. The theoretic treatises on profane music now extant are, however, quite modcrn productions. The two most highly esteemed works are the Sangita-ratndkara (" jewel- mine of music"), by Sarngadeva, and the Sangita-darpana (" mirror of musie"), by Damodara, Each of these works consists of seven chapters, treating respectively of—(1) sound and musical notes (svara); (2) melodies (7déga); (8) music in connexion with the human voice (praktrnaka) ; (4) musical conipositions (prabandha) ; (5) time and measure (¢é/a) ; (6) musical instruments and instrn- mental music (vddya); (7) dancing and acting (nritta or nritya). The Indian octave consists like our own of seven chief notes (svara) ; but, while with us it is subdivided into twelve semi-tones, the Hindu theory distinguishes twenty-two intervals (sruti, audible sound). 'There is, however, some doubt as to whether these

srutis are quite equal to one another,—in which case the intervals between the chicf notes would be unequal, since they consist of either two or three or four grwtis,—or whether, if the intervals between the chief notes be equal, the s2tis themselves vary in duration between quarter-, third-, and semi-tones. There are three scales (yrdéma), differing from each other in the nature of the chief intervals (either as regards actual duration, or the number of grutis or sub-tones). Indian music consists almost entirely in melody, instrumental accompaniment being performed in unison, and any attempt at harmony being confined to the continuation of the key-note. A number of papers, by various writers, have been reprinted with additional remarks on the subject, in Sourindro Mohun Tagore's Hindu Music, Calcutta, 1875. Compare also" Hindu Music," reprinted from the Hindoo* Patriot, September 7, 1874.

VIL. Ruertonic (Alankéra-sdstra).—Treatises on the theory of

14 A grammarian of this name is mentioned as the tutor of King JayApida of Kashmir (755-786 A.D.); but Kshira, the commentator on Amara is placed by Prof. Aufrecht between the llth and 12th centuries, because he quotes the Sabdanusdsana ascribed to Bhojaraja.

15 Ed, by Th. Aufrecht (1861) 16 Ed, by 0, Bohtlingk and C. Rieu (1847).

Prosopy.

Music.

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literary composition are very numerous. | Indeed, a subject of this description—involving such nice distinctions as. regards the various kinds of poetic eomposition, the particular subjects and characters adapted for them, and the different sentiments or mental condi- tions eapable of being both depictured and called forth by them— could not but be congenial to the Indian mind. H. H. Wilson, in his Theatre of the Hindus, has given a detailed account of these theoretic distinctions with special reference to the

drama, which, as the most perfect and varied kind of poetic production, usually takes an important place in the theory of literary composition. The Bharata-séstra has already been alluded to as probably the oldest extant work in this department of literaturc. Another comparatively ancient treatise is the Kévyddarsa,' or "mirror of poetry," in three chapters, by Dandin, the author of the novel Dagakumaracharita, who probably flourished not long after KAliddsa (whose Prakrit poem Setubandha he quotes) in the 6th century. The work consists of three chapters, treating—(1) of two different local styles (rit) of poetry, the Gaudi and the Vaidarbhi (to which later critics add four others, the Pdfiehali, Magadht, Latt, and Avantika) ; (2) of the graces and ornaments of style, as tropes, figures, similes ; (8) of alliteration, literary puzzles, and twelve kinds of faults to be avoided in composing poems. Another treatise on rhetoric, in Stitras, with a commentary entitled Kéavydlankdra-vritti, is ascribed to Vamana. Prof. Cappeller, to whom we owe an edition of this work, is inclined to fix it as late as the 12th century ; but it may turn out to be somewhat older.

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(identified by him with Socrates, so often confounded in the Middle Ages with Hippocrates) was probably not composed till after the Mohammedan conquest, and that, so far from the Arabs (as they themselves declare) having derived some of their knowledge of medical science from Indian authorities, the Indian Vaidyasastra was nothing but a poor eopy of Greek medicine, as transmitted by the Arabs. But even though Greck influence may be traced in this asin other branches of Indian seience, there can be no doubt,® at any rate, that both Charaka and Susrnta were known to the Arab Razt (c. 982 A.D.), and to the author of the Fihrist (completed 987 A.D.), and that their works must therefore have cxisted, in some form or other, at least as early as the 9th eentury. Among the numerous later medical works the most important general compendiums are Vagbhata's Ashfdnga-hridaya, 'the heart of the cight-limbed (body of medical science)," and Bhava Miéra's Bhdéva-prakdsa ; while of special treatises may be mentioned MAdhava's system of nosology, the Rugvinischaya, or Médhava-nidéna, and Sarngadhara's compendium of therapentics, the Sdrngadhara-samhitd. Materia medica, with which India is so lavishly endowed by nature, is a favourite subject with Hindu medical writers, —the most valued treatise

being the Rija-nighantu, by the Kashmirian Narahari. The best general view of this branch of Indian science is eontinued in T. A. Wise's Commentary on Hindu Medicine, 1845, and in his History of Medicine, vol. i., 1867; but the whole subject, including the principal original works, still awaits a critical investigation.

[LITERATURE,

IX. AsrRoNoMY AND MATHEMATICS.—Hindu astronomy may Asrpo- be broadly divided into a pre-scientific and a scientific period. yomy While the latter clearly presupposes a knowledge of the researches ayp of Hipparchus and other Greek astronomers, it is still doubtful Marne. whether the earlier astronomical and astrological theories of Indian yarncs,

The Kdavydlankéra, by the Kashmirian Rudrata, must have been composed prior to the 11th century, as a gloss on it (by Nami), which professes to be based on older commentaries, was written in 1068. Dhananjaya, the author of the Dasa- réipa,? or '"'ten forms (of plays)," the favourite compendium of

MeEpI- CINE,

dramaturgy, appears to have flourished in the 10th century. In the concluding stanza he is stated to have composed his work at the court of King Mufija, who is probably identical with the well- known M4lava prince, the uncle and predecessor of King Bhoja of Dhara. The Dasgartipa was early commented upon by Dhanika, possibly the author's own brother, their father's name being the same (Vishnu). Dhanika quotes Rajasekhara, who is supposed to have flourished about 1000 a.p.,3 but may after all have to be put somewhat earlier. The Sarasvatt-kanthdbharana, ''the neck-ornament of Sarasvati (the goddess of eloquence)," a treatise, in five chapters, on poetics generally, remarkable for its wealth of quotations, is ascribed to King Bhoja himself (11th century), pro- bably as a compliment by some writer patronized by him. The Kdvya-prakdsa,* 'the lustre of poetry," another esteemed work of the same elass, in ten sections, was probably eomposed in the 12th century,—the author, Mammata, a Kashniirian, having been the maternal uncle of Sri-Harsha, the author of the Naishadhiya. The Sdhitya-darpana,® or '' mirror of composition," the

standard work on literary criticism, was composed in the 15th century, on the banks of the Brahmaputra, by Visvanatha Kaviraja. The work consists of ten chapters, treating of the following subjects :—(1) the nature of poetry ; (2) the sentence; (3) poetic flavour (rasa); (4) the divisions of poetry ; (5) the functions of literary suggestion ; (6) visible and audible poetry (chiefly on dramatic art); (7) faults of a 7 (8) merits of style ; (9) distinction of styles ; (10) ornaments of style. J

VIII. MEpIcINE (Ayur-veda, Vaidya-sdstra).—Though the early cultivation of the healing art is amply attested by frequent allu- sions in the Vedic writings, it was doubtless not till a much later period that the medical practice advaneed beyond a certain degree of empirical skill and pharmaceutic routine. From the simultaneous mention of the three humours (wind, bile, phlegm) in a varttika to Panini, (v. 1, 38), some kind of humoral pathology would, however, seem to have been prevalent among Indian physicians several centuries before our era. The oldest existing work is supposed to be the Charaka-samhité,§ a bulky cyclopedia in Slokas, mixed with prose sections, which consists of eight ehapters, and was probably composed some centuries after Christ. Of equal authority, but probably somewhat more modern, is the Susruta (-samhitd),”? which Susruta is said to have received from Dhanvantari, the Indian /Esculapius, whose name, however, appears also among the ‘‘nine gems”’ (c. 550 a.p.). It consists of six chapters, and is likewise composed in mixed verse and prose,—-the greater simplicity of arrangement, as well as some slight attention paid in it to surgery, betokening an advance upon Charaka. Both works are, however, characterized by great prolixity, and contain much matter which has little connexion with medicine. The late Prof. E. Haas, in two very suggestive papers,® tried to show that the work of Suéruta

1 Ed. with eommentary, by Premachandra Tarka bt. . 2 Edited by Fitzcdw. Tiel, Bibl. Ind., 1865, sil ointesil 3 R. Pischel, Gétt. Gel. A., 1883; G. Biihler, Ind. Ant., 1884, p. 29. 4 Ed. by Mahesa Chandra Ny4yaratna, 186s. 5 Text and translation in Bibl. Ind. . = Anabel hil nea Cale., 1877. ud, by Madhusfidana Gupta, 1835-37, and by Jiba vi ya, 1875 8 Z. D.M. G., 1876, p. 617 sq°s 1877, p. 647 89. ‘NeeeaesAs alee ee

writers were cntirely of home growth or partly derived from foreign sources. From very ancient (probably Indo-European) times chronological calculations were based on the synodical revolutions of the moon,—the difference between twelve such revolutions (making together 354 days) and the solar year being adjusted by the in- sertion, at the time of the winter solstice, of twelve additional days. Besides this primitive mode the Rigveda also allndes to the method prevalent in post- Vedic times, according to which the year is divided into twelve (sévana or solar) months of thirty days, with a thir- teenth month intercalated every fifth year. This quinquennial cycle (yuga) is explained in the Jyotisha, regarded as the oldest astronomical treatise. An institution which occupies an important part in those early speculations is the theory of the so-called lunar zodiac, or system of lunar mansions, by which the planctary path, in accordance with the duration of the moon's rotation, is divided into twenty-seven or twenty-eight different stations, named after certain constellations (nakshatra) which are found alongside of the ecliptic, and with which the moon (masc.) was supposed to dwell successively during his circuit, The same institution is found in China and Arabia; but it is still doubtful!® whether the Hindus, as some scholars hold, or the Chaldeans, as Prof. Weber thinks, are to be credited with the invention of this theory. The principal works of this period are hitherto known from quotations only, viz., the Gdrgt Samhitd, which Prof. Kern would fix at ¢ 50 B.c., the Néradi Samhitd, and others.

The new era, which the same scholar dates from c. 250 A.D., is marked by the appearance of the five original Siddhantas (partly extant in revised redactions and in quotations), the very names of two of which suggest Western influence, viz., the Paitémaha-, Sirya-," Vasishtha-, Romaka- (t.e., Roman), and Paulisa-sid- dhéntas. Based on these are the works of the most distinguished Indian astronomers, viz., Aryabhata,!? probably born in 476 ; Varaha-mihira,!® probably 505-507; Brahma-gupta, who completed his Brahma-siddhénta in 628; Bhatta Utpala (10th century), distinguished especially as commentator of Vardha-mihira; and Bhaskara Acharya, who finished his great course of astronomy, the Siddhdnta-siromani, in 1150. In the works of several of these writers, from Aryabhata onwards, special attention is paid to mathematical (especially arithmetical and algebraic) computa- tions; and the respective chapters of Bhaskara's eompendium, viz., the Lilévatt and Vija-ganita, still form favourite textbooks of these

subjects. The question whether Aryabhata was acquainted with the researches of the Greek algebraist Diophantus (¢. 360 A.D.) remains still unsettled; but, even if this was the case, algebraic science seems to have been carried by him beyond the point attained by the Greeks. (J. E.)

9 See Prof, Aug. Miiller's paper, 7. D. M. G., 1880, p. 465.

1© See especially Prof. Whitney's essay on the Lunar Zodiae, in his Oriental and Linguistic Studies.

11 The Sérya-siddhdnta, translated by (W. D. Whitney and) E. Burgess, 1860.

12 The Aryabhatiya, edited by H. Kern, 1874.

13 The Brihat-samhitd and Yogaydtrd, editcd and translated by EH. Kern; the Laghu-jadtaka, edited by A. Weber and H. Jacobi.

14 A translation of both treatises, as well as of the respective chapters of Brahma-gupta's work, was published (1817) by H. T. Colebrooke, with an import- ane wee on the Algebra of the Hindus," reprinted in the Misc. Essays,

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SANSON, Nicozas (1600-1667), a French carto- grapher, who, while it is a mistake to call him the creator of French geography, attained a great and well-deserved eminence in his profession. He was born of an old Picardy family of Scottish descent, at Abbeville, on December 20, 1600, and was educated by the Jesuits at Amiens. The mercantile pursuit by which he first sought to make his living proved a failure, but in 1627 he was fortunate enough to attract the attention of Richelieu by a map of Gaul which he had constructed while still in his teens, and through the cardinal's influence he was appointed royal engineer in Picardy and geographer to the king. How

highly his services were appreciated by his royal patrons is shown by the fact that when Louis XIII. came to Abbeville he preferred to become the guest of Sanson (then employed on the fortifications), instead of occupying the sumptuous lodgings provided by the town. Sanson's success was embittered by a quarrel with the Jesuit Labbe, whom he accusedof plagiarizing him in his Pharus Galliz Antique, and by the death of his eldest son Nicolas, killed during the disturbances of the Fronde (1648). He died at Paris July 7, 1667. Two younger sons, Adrien (died 1708) and Guillaume (died 1703), suc- ceeded him as geographers to the king.

Sanson's principal works are Gallizw Antique Descriptio Geo- graphica, 1627; Britannia, 1638, in which he seeks to identify Strabo's Britannia with Abbeville (!) ; Za France, 1644 ; In Pharwm Gallie Antique Philippi Labbe Disquisitiones, 1647-1648; and Geographia Sacra. In 1692 Jarllot collected Sanson's maps in an Atlas Nouveau. His cartography is generally bold and vigorous.

SANSOVINO, AnpRrea Contuccr DEL Monte (1460- 1529), an able Florentine sculptor, who lived during the rapid decline of plastic art which took place from about the beginning of the 16th century; he was the son of a shep- herd called Niccolo di Domenico Contucci, and was born in 1640 at Monte Sansavino near Arezzo, whence he took his name, which is usually softened to Sansovino. He was a pupil of Antonio Pollaiuolo, and during the first part of his life worked in the purer style of 15th-century Florence. Hence his early works are by far the best, such as the terra-cotta altar-piece in Santa Chiara at Monte Sansavino, and the marble reliefs of the Annunciation, the Coronation of the Virgin, a Pieta, the Last Supper, and various statuettes of saints and angels in the Corbinelli chapel of 8. Spirito at Florence, all executed between the years 1488 and 1492. From 1491 to 1500 Andrea worked in Portugal for the king, and some pieces of sculpture by him still exist in the monastic church of Coimbra.1 These early reliefs show strongly the influence of Donatello. The beginning of a later and more pagan style is shown in the statues of St John baptizing Christ which are over the east door of the Florentine baptistery. This group was, however, finished by the weaker hand of Vincenzo Danti. In 1502 he executed the marble font at Volterra, with good reliefs of the Four Virtues and the Baptism of Christ. In 1505 Sansovino was invited to Rome by Julius II. to

make the monuments of Cardinal Ascanio Maria Sforza and Cardinal Girolamo della Rovere for the retro-choir of S. Maria del Popolo. The architectural parts of these monuments and their sculptured foliage are extremely graceful and executed with the most minute delicacy, but the recumbent effigies show the beginning of a serious decline in taste. Though skilfully modelled, they are uneasy in attitude, and have completely lost the calm dignity and simple lines of the earlier effigies, such as those of the school of Mino da Fiesole in the same church. These tombs had a very important influence on the monumental sculpture of the time, and became models

1 See Raczinski, Les Arts en Portugal, Paris, 1846, p. 344.

which for many years were copied by most later sculptors with increasing exaggerations of their defects. In 1512, while still in Rome, Sansovino executed a very beautiful group which shows strongly the influence of Leonardo da Vinci, both in the pose and in the sweet expression of the faces; it isa group of the Madonna and Child with St Anne, now over one of the side altars in the church of S. Agostino. From 1513 to 1528 he was at Loreto, where he cased the outside of the Santa Casa in white marble, covered with reliefs and statuettes in niches between engaged columns; a small part of this gorgeous mass of sculpture was the work of Andrea himself, but the greater part was executed by Montelupo, Tribolo, and others of his numerous school of assistants and pupils. Though the general effect of the whole is very rich and magnificent, the individual pieces of sculpture are both dull and feeble, showing the unhappy results of an attempt to imitate Michelangelo’s grandeur of style. The earlier reliefs, those by Sansovino himself, are the best, still retaining some of the sculpturesque purity of the older Florentines. He died in 1529.

SANSOVINO, Jacoro (1477-1570), was called San- sovino after his master Andrea (see above), his family name being Tatti. Born in 1477, he became a pupil of Andrea in 1500, and in 1510 accompanied him to Rome, devoting himself there to the study of antique sculpture. Julius IT. employed him to restore damaged statues, and while working in the Vatican he made a full-sized copy of the Laocoon group, which was afterwards cast in bronze, and is now in the Uffizi at Florence. In 1511 he returned to Florence, and began

the statue of St James the Elder, which is now in a niche in one of the great piers of the Duomo. Under the influence of his studies in Rome he carved a nude figure of Bacchus and Pan, now in the Bargello, near the Bacchus of Michelangelo, from the contrast with which it suffers much. Soon after the com- pletion of these works, Jacopo returned to Rome, and designed for his fellow-citizens the grand church of 8. Giovanni dei Fiorentini, which was afterwards carried out by Antonio Sangallo the younger. A marble group of the Madonna and Child, now at the west of 8. Agostino, was his next important work. It is heavy in style, and quite with- out the great grace and beauty of the Madonna and St Anne in the same church by his master Andrea. In 1527 Jacopo fled from the sack of Rome to Venice, where he was welcomed by his friends Titian and Pietro Aretino; henceforth till his death in 1570 he was almost incessantly occupied in adorning Venice with a vast number of magnificent build- ings and many second-rate pieces of sculpture. Among the latter Jacopo's poorest works are the colossal statues of Neptune and Mars on the grand staircase of the ducal palace, from which it is usually known as the " Giants' Staircase." His best are the bronze doors of the sacristy of St Mark, cast in 1562; inferior to these are the series of six bronze reliefs round the choir of the same church, attempted imitations of Ghiberti's style, but unquiet in design and unsculpturesque in treatment. In 1565 he completed a small bronze gate with a graceful relief of Christ surrounded by Angels; this gate shuts off the altar of the Reserved Host in the choir of St Mark's.

Jacopo's chief claim to real distinction rests upon the nunierous fine Venetian buildings which he designed, such as the public library, the mint, the Scuola della Miseri- cordia, the Palazzo de' Cornari, and the Palazzo Delfino, with its magnificent staircase,—the last two both on the grand canal; a small loggia which he built at the foot of the great Campanile, richly decorated with sculpture, has recently been pulled down and much damaged, but is being rebuilt. Among his ecclesiastical works the chief are the church of 8. Fantino, that of 8. Martino, near the

arsenal, the Scuola di §. Giovanni degli Schiavoni, and, finest of all, the church of 8. Geminiano, near St Mark's, a very good specimen of the

Tuscan and Composite orders used with the graceful freedom of the Renaissance. —

The otherwise prosperous course of the artist's life was interrupted by one serious misfortune. In 1545 the roof of the public library, which he was then constructing, gave way and fell in; on account of this he was im- prisoned, fined, and disniissed from the office of chief architect of the cathedral, to which he had been appointed by a decree of the signoria on April 7, 1529. Owing, however, to the intervention of his friends, Titian, Pietro Aretino, and others, he was soon set at liberty, and in 1549 he was restored to his post. He did good service to the cathedral of St Mark's by strengthening its failing domes, which he did by encircling them with bands of iron, Sansovino's architectural works have much beauty of proportion and grace of ornament, a little marred in some cases by an excess of sculptured decoration, though the carving itself is always beautiful both in design and execution. He used the classic orders with great freedom and tasteful invention—very different from the dull schol- asticism of most of his contemporaries. His numerous pupils were mostly men of but little talent.

SANTA ANNA, Antonio Lopez pe (1798-1876), for many years a prominent figure in the troubled politics of Mexico, was born at Jdlapa on February 21, 1798, Having entered the army, he joined the party of IruRBIDE (g.v.) in 1821, and gained distinction and promotion by the part he took in the surprise and capture of Vera Cruz. In the following year he quarrelled with his chief and himself became leader of a party, but without in the first instance achieving success. In 1828, however, he sided with Guerrero, who made him war minister, and also commander-in-chief after a successful operation against the Spaniards in 1829. He successively accomplished the overthrow of Guerrero in favour of Bustamante and of Bustamante in favour of Pedraza, and finally in March 1833 was hiniself elected president. In 1836 he was defeated and taken by the Texan revolutionists, but returned to Mexico the following year. In 1844, after considerable vicissitudes, he was deposed and banished, but he was brought back once more to the presidential chair in 1846. This second term of office lasted till the fall of Mexico in 1847, when he resigned. He was niade presi- dent again in 1853, but finally abdicated in 1855. In 1867 he took part in "

pronunciamientos” which led to his banishment. In 1874 he was permitted to return to his native soil, where he died two years afterwards.

SANTA CRUZ. See Samnt Crorx. For Santa Cruz DE SantrIaco see Canary Istanps, vol. iv. p. 799; and for Santa Cruz or Nirenpr Istanp see New HEBRIDES, vol. xvii. p. 395.

SANTA FE, a city of the Argentine Republic, capital of the province of Santa Fé (38,600 square miles; 189,000 inhabitants), occupies an area of 400 acres, 90 miles north of Rosario, on the north-east or left bank of the

Rio Salado at its junction with the Paran4, in a district:

subject to periodical inundations. It is the seat of the governor, the bishop, and the legislature, and contains a cathedral, a Jesuits’ church (1654) and college (the latter an important institution with 400 boarders), a new bishop’s palace, a town-hall (with a fine tower), extensive infantry barracks, and a large market. A foundry, a macaroni-factory, oil-factories, and tile-works are the chief industrial establishments. The population in 1881 was 10,400, a decrease since 1869. Santa Fé was founded in 1573 by Juan de Garay.

SANTA FE, a city of the United States, capital of New Mexico, stands in a wide plain surrounded by moun-

tains about 7000 feet above the sea, in 35° 41’ N. lat. and 105° 46’ W. long., near the Santa Fé Creek, which joins the Rio Grande del Norte 14 or 15 miles farther south- west. It is connected by a branch line (18 miles) with the Atchison, Topeka, and Santa Fé Railroad at Lamy Junction, 835 miles from Atchison. The houses are mainly constructed of adobe, and the irregularity of the plan shows how recently the city has come under the influence of “American” progress. Among the more noteworthy buildings are the new capitol, for which funds were voted in 1883, the Roman Catholic cathedral, erected since 1870, and the old governor’s palace, a long low edifice occupying one side of the principal plaza, which now con- tains a soldiers’ monument in honour of those who fell in the service of the

United States. Santa Fé isan important ceutre of trade, and the development of the mining in- dustries in the vicinity is rapidly increasing its prosperity. The population was 6635 in 188].

Onc of the oldest cities of North America, Santa Fé de San Francisco was the capital of New Mexico from 1640, but reinained in comparative seclusion till the carly part of the present century, when it becaine a main station on what was called the Santa I'é Trail—the trade route between tlfe United States and Mexico, or more especially between St Louis and Chihuahua.

SANTA FE DE BOGOTA. See Bocori.

SANTAL PARGANAS, Tue, a British district in the lieutenant-governorship of Bengal, forming the southern portion of the Bhagalpur division, and lying between 23° 48' and 25° 19' N. lat., and between 86° 30' and 87° 58' E. long. The total area of the district is 5456 square miles; it is bounded on the north by the districts of Bhagalpur and Purniah, on the east by Maldah, Murshi- dabad, and Birbhum, on the south by Bardwdn and Manbhuim, and on the west by Hazdribagh and Bhaégalpur. Three distinct types of country are represented within the area of the Santal Parganas; in the east a sharply defined belt of hills stretches for about a hundred miles from the Ganges to the Naubil River; west of this point a rolling tract of long ridges with intervening depressions covers an area of about 2500 square miles; while the third type is exemplified by a narrow strip of flat alluvial country about 170 miles long, lying for the most part along the loop line of the East Indian Railway. The Rajmahal Hills are the only range of any importance in the district, and occupy an area of 1366 square miles; but they nowhere exceed 2000 feet in height. Several other hill ranges occur, which are with few exceptions covered almost to their summits with dense jungle; they are all difficult of access; there are, however, numerous passes through all the ranges. Coal and iron are found in almost all parts of the country, but the coal is of such inferior quality that all attempts to work it have failed. Wild animals, including tigers, leopards, bears, hyzenas, deer, and wild pig, with a variety of small game, are common almost everywhere. The climate varies: the alluvial tract has the damp heat and moist soil characteristic of Bengal, while the undulating and hilly portions are swept

by the hot westerly winds of Behar, and are very cool in the winter months. The average annual rainfall is over 50 inches. The district is traversed on the east by the loop line, and on the west by the chord line, of the East Indian Railway ; the total length of railway is about 130 miles.

The census of 1881 disclosed a total population in the Santal Parganas of 1,568,093 (males 785,380, females 782,763) ; Hindus numbercd 847,590, Mohammedans 108,899, and Christians 3057.

The total number of persons belonging to the aboriginal tribes was 605,517, of whom the great majority (537,546) were Santals,

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For an account of this interesting tribe, see INDIA, vol. xii. p. 778 The population is almost entirely rural; only two towns contain over 5000 inhabitants each, viz., Deoghar, which is the only municipality, with a population of 8015, and Shahebgunge with 6512. The administrative headquarters are at Naya Dumka.

Rice forms the staple crop of the Santal Parganas, and is largely grown in the alluvial strip of country which runs along the eastern boundary of the district. Other crops are millets, wheat, barlcy, maize, various pulses and oil-seeds, jute, flax, sugar-cane, cotton, and indigo. The district is singularly destitute of any local manufactures: iron is roughly smelted by Kol settlers from Chutia Nagpur; coarse cloth is woven as a domestic manufacture, and bell-metal utensils are made to a small extent ; indigo is also manufactured. ‘The trade is carried on by means of permanent markets. Exports consist chiefly of ricc, Indian corn, oil seeds, tasar-silk cocoons, lac, small-sized timber, and hill bamboos; while European piece goods, salt, and brass or bell-metal utensils for house- hold use compose the bulk of the imports. In 1888-84 the gross revenue of the district amounted to £45,487, of which the land- tax ylelded £22, 556.

The Santals have been known to the British since the latter part of the 18th century. In 1832 two Government officials were deputed to demarcate with

solid masonry pillars the present area of the Daman-i-Koh, or skirts of the Kills. The permission to Santals to settle in the valleys and on the lower slopes of the Daman stimulated Santal. immigration to an enormous extent. The Hindu money-lender soon made his appcarance amongst them, and led to the rebellion of 1855-56. The insurrection was not quelled without bloodshed, but it led to the establishment of a form of administration congenial to the immigrants ; and a land settlement has since been carried out on conditions favourable to the occupants of the soil.

SANTA MARIA. See Capva.

SANTA MAURA, or Levcapia (Aevxdda, ancient Aevkas), one of the Jonian Islands, with an area of 110 square miles and a population (1880) of 25,000 (20,892 in 1870), lies off the coast of Acarnania (Greece), immediately south of the entrance to the Gulf of Arta. It first appears in history as a peninsula (Odyssey, xxiv. 378), and, if the statements of ancient authorities be accepted literally, it owed its existence as an island to the Corinthians, whose canal across the isthmus was again after a long period of disuse opened up by the Romans. But it is probable rather that Leucas was then as now separated from the mainland by a shallow lagoon (two feet or less). During the English occupation a canal for boats of four to five feet draught was formed from Fort Santa Maura to the town, but the 16-feet-deep ship canal which it was proposed (1844) to carry right across the lagoon or subinerged isthmus to Fort Alexander was only partially excavated! Santa Maura, measuring about 20 miles from north to south and 5 to 8 miles in breadth, is a rugged mass of limestone and bituminous shales (partly Tertiary), rising in its principal ridges to heights of 2000 and 3000 feet, and presenting very limited areas of level ground. The grain crop suffices only for a few months' local consumption; but olive oil of good quality is produced to the extent of 30,000 to 50,000 barrels per annum; the vineyards (in the west especially) yield 100,000 barrels of red wine (bought mainly by Rouen, Cette, Trieste, and Venice); the currant, introduced about 1859, has gradually come to be the principal source of wealth (the crop averag- ing 2,500,000 ib); and small quantities of cotton, flax, tobacco, valonia, &c., are also grown. 'The salt trade, for- merly of importance, has suffered from Greek customs regulations. Though to a large extent unlettered and superstitious, the inhabitants are industrious and well-

behaved. The chief town (5000 inhabitants) properly called Amaxikhi, but more usually Santa Maura, after the neighbouring fort, is situated at the north-east end of the island opposite the lagoon. In the south-west is the village of Vasiliki, where a wharf protected by a mole

- As a six hours' shortening of the steam-passage between the Levant and the Adriatic would be effected by such a channel the scheme has again been taken up. According to M. Pyat, the engineer employed to report, the dredging could be done for 1,200,000 francs.

was built in 1877-78 for shipping the currant crop. Re- mains of Cyclopean and polygonal walls exist at Kaligoni (south of Amaxikhi), probably the site of the ancient acropolis of Neritus (or Nericus), and of the later and lower Corinthian settlement of Leucas. From this point a Roman bridge seems to have crossed to the mainland. Between the town and Fort Santa Maura extends a remarkably fine Turkish aqueduct partly destroyed along with the town by the earthquake of 1825. Forts Alex-

'ander and Constantine commanding the bridge are relics

of the Russian occupation ; the other forts are of Turko- Venetian origin. The magnificent cliff, some 2000 feet high, which forms the southern termination of the modern island still bears the substructions of the temple of Apollo Leucatas (hence the modern name Capo Ducato). At the annual festival of Apollo a criminal was obliged to plunge from the summit into the sea, where, however, an effort was made to pick him up; and it was by the same heroic leap that Sappho and Artemisia, daughter of Lygdamis, are said to have ended their lives.

SANTANDER, a province in the north of Spain, on the shores of the Bay of Biscay, bounded on the E. by Biscaya, on the §. by Burgos and Palencia, and on the W. by Leon and Oviedo. 'The area is 2113 square miles. The province is mountainous in character, being traversed from east to west by the Cantabrian chain, which in the Picos de Europa reaches a height of over 8700 feet, and sends off numerous branches to the sea. On the north side of the range the streams are all short, the principal being the Ason, the Miera,

the Pas, the Besaya, the Soja, and the Nansa, which flow into the Bay of Biscay; part of the province lies to the southward of the watershed, and is drained by the upper Ebro. The valleys of Santander are fertile, and produce various kinds of grain, maize, pulse, hemp, flax, and vegetables. Oranges, lemons, grapes, figs, and other fruits flourish, and forests of oak, chestnut, walnut, and fir cover the hills. Ricli pasturage for cattle and swine and a good supply of game are also found among them, and the fisheries along the coast are likewise productive. Foreign capital has been success- fully applied to the development of lead, coal, and iron mines ; and the mountains contain quarries of limestone, marble, and gypsum, and abound with mineral springs. The district was part of the Roman province of Cantabria, which, after passing under the empire of the Goths, became the principality of the Asturias. The portion called Asturia de Santa Juliana, or Santillana, was included in the kingdom of Old Castile, and, on the subdivision of the old provinces of Spain in 1833, became the province of Santander. The people are of a purer race than in parts of Spain subjected by the Moors, and both in mental and physical qualities show their Teutonic ancestry. The industries of the country are consequently in a flourishing condition, and, besides the natural products above men-

‘tioned, there are foundries, breweries, distilleries, tanneries ;

cotton, linen, cloth, and flour mills; brick and tile works; and manufactories of hats, soap, buttons, preserves, and chocolate. The province is traversed from north to south by the railway and high road from Santander by Palencia to Madrid ; the highest point on the railway (Venta de Pazozal) is 3229 feet above the sea. For purposes of administration the province is divided into eleven partidos judiciales, containing 103 ayuntamientos, and returns two senators and five deputies to the cortes. The population in 1877 numbered 235,299. Besides Santander, the capital, the only places having within the municipal boundaries a population exceeding 5000 are Castro-Urdidles (7623), Valle de Pielagos (5500), Torrelavega (7192), and Valderredible (7240). Santofia has 4428, and Laredo 4384. Santillana (1776) has a fine Roman- XX. — 38

esque church and cloister (12th century), and was the birthplace of the architect Juan de Herrera.

SANTANDER (Portus Blendium, Fanum S. Andre), capital of the above province, 316 miles by rail from Madrid, is the seat of a bishopric and one of the chief seaports of Spain. The population in 1877 numbered 41,000, having almost doubled in the preceding quarter of a century, and the trade of the port has increased in an even greater proportion. The town is situated on the inside of a rocky peninsula, which separates it from the Bay of Biscay and forms a magnificent harbour from 2 to 3 miles wide and 4 miles long. The entrance is at the eastern extremity of the promontory, and, though some- what difficult for sailing vessels in certain winds, has depth of water sufficient for the largest ships. The total burthen of the vessels entered in 1882 amounted to 104,449 tons British and 500,342 tons of other nations. The chief exports consisted of iron ore (20,966 tons) to Great Britain, and wine (191,400 galls.) and olive oil (8000 galls.) to France. The city is divided into an upper and a lower town, and contains few buildings of interest. The cathedral was originally a Gothic structure, but has been so altered by later additions that little of the old work remains. In the crypt, or Capilla del Cristo de Abajo, there is a font of Moorish workmanship which has some interest. The castle of S. Felice contains a prison which was probably the first example of the radiating system of construction. Besides these buildings there are the theatre, which was formerly a convent, the hospital, and the Jesuits' church. The city is essentially modern, and its chief features are its well-built houses, its quays, and its factories. In addition to the manufactures of the province mentioned above, Santander has gas-works, phosphorus, sulphuric acid, and sail manufactories, and a large cigar factory, formerly a convent, where over 1000 hands are employed. Besides being a trading port Santander is also a watering-place which enjoys peculiar advantages of climate. The bathing establishment of the Sardinero, on the seaward side of the strip of land the town is built on, offers all the attractions usual to Continental watering-places. There is communication by rail with Madrid and by steamer with Liverpool, London, and Ham- burg, as well as with Havana and the seaports of Spain.

The port was in 1753 made one of the “ puertos habilitados” or ports privileged to trade with America, and in 1755 it was created a ‘‘ciudad.” Charles V. landed here in 1522 when he came to take pos- session of the Spanish crown, and from this portCharlesI. of England embarked on his return from his ill-fated visit ¢xcognito in search of a wife. The city was sacked by the French under Soult in 1808; but so little gratitude did the people show to their English allies that it was with the greatest difficulty supplics were found for the troops.

SANTAREM, a city and bishop’s see of Portugal, in the province of Estremadura, on the declivities of the right bank of the Tagus, 463 miles by rail from Lisbon. It has the ruins of an old castle, well known in Portuguese history as a royal residence, especially in the Middle Ages, and several of its churches are of historic and architectural interest. A considerable trade is carried on, and the popu- lation was 7001 in 1878.

Santarem, so named after a certain St Irene, is identified with the ancient Scallabis Presidium Julium. The death of Diniz Ts and the birth, abdication, and death of Don Henrique the cardinal king, all occurred in the city; it gave its name to Joao de Santarem, one of the 15th-century navigators ; and Fernando I. and Cabral, discoverer of Brazil, were buried within its walls. The Miguelists were completely routed here by Napier and Villaflor in 1834,

SANTAREM, a city of Brazil, at the head of a comarca in the province of Pard, is situated on the right bank near the mouth of the Rio Tapajés, a right-hand tributary of the Amazon. It is a clean and neat-looking place, with rows of whitewashed houses in the European town, clusters of palm-thatched huts in the Indian suburb, a large church, the ruins of a stone fort, and, standing apart,

the municipal buildings with tne court-house. As the Rio Tapajés is navigable for steamers to the rapids, 170 miles above Santarem, and for boats to within a short distance of Diamantino, the town carries on a considerable trade with Matto Grosso and the country along the banks, The population and importance of the place, originally founded by a Jesuit

missionary for his converts in 1661, and made a city in 1848, are steadily increasing. SANTERRE, Jean Baptiste (1650-1717), French painter, born at Magny near Pontoise in 1650, was a pupil of Bon Boulogne. . He began life as a_portrait- painter, but refused to paint any except those who pleased his taste; he was incapable of managing the large com- positions then in vogue, but enjoyed for half a century a great reputation as a painter of the nude. He had opened his studio to a class of young girls, to whom he gave lessons, and who served him as models. Much, however, of Santerre's work of this class was destroyed by himself in a fit of lively repentance after a serious illness which attacked him late in life. He died at Paris on November 21,1717. His paintings, in consequence of his extreme care in choice of vehicles and pigments, have stood well. His Portrait of a Lady in Venetian Costume (Louvre), and his Susanna at the Bath (Louvre, engraved by Porporati), the diploma work executed by him in 1704, when he was received into the Academy, give a good impression of Santerre's taste and of his elaborate and careful method. SAN THIAGO. See Carz Verb Isianps, vol. v. p. 60. SANTIAGO, the capital of Chili, and the chief town of a province of its own name (now 5223 square miles in extent, reduced in 1883 by the formation of the new pro- vince of O'Higgins), is situated in 33° 26' 42" S. lat. and 70° 40' 36" W. long., at a height of about 1830 feet above the sea, in a wide and beautiful plain between the main range of the Andes and the less elevated heights of Cuesta del Prado, 115 miles east of Valparaiso by rail. In the

1 of Santa Lucia, with

Environs of Santiago,

its two fortresses,—recently converted into a pleasure- ground, with theatres, restaurants, and monuments; and immediately to the north-north-west and north-east are those known as Colina, Renca, and San Cristébal. The snow-clad range of the Andes, in which the summits of La Chapa and Los Amarillos are conspicuous, is visible from Santiago, A turbid mountain stream, the Mapocho, flows west through the heart of the city to join the Colina and ultimately the Maipé or Maipo ; its floods were some- times, as in 1609 and 1783, the cause of great damage till the construction of a solid embankment was undertaken

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under the government of Ambrosio O'Higgins; it is now crossed by several handsome bridges, the oldest of which, a structure of eleven arches, dates from 1767-1779, From the very first Santiago was laid out with great regularity in parallelograms ; but owing to the frequency of earth- quakes the dwelling-houses are seldom built of more than a single story in height. The cathedral, situated in the Plaza de la Independencia, is the oldest of the churches. Originally erected by Pedro Valdivia and rebuilt by Garcia Hurtado de Mendoza, it was destroyed by the earthquake of 1647 and rebuilt on a new plan subsequent to 1748. It is 351 feet long by 92 feet wide, but has no very striking features. Among the other ecclesiastical buildings are the church of San Agustin, erected in 1595 by Cristdébal de Vera and in modern times adorned with a pillared portico; the churches of San Francisco, La Merced, and Santo Domingo, dating from the 18th century; the Augustine nunnery founded by Bishop Medellin in 1576; the Carmen Alto, or church of the Carmelite nunnery, an elegant little Gothic building; the stately church of the Reformed Dominicans, rich in marble monolithic columns; and the chapel erected in 1852 to the memory of Pedro Valdivia next to the house in which he is reputed to have lived. The public cemetery, recently secularized, has a large number of marble and bronze monuments,—mostly from Italy. Among the secular buildings the more noteworthy are the palace of the intendency, the old presidential palace (popularly Las Cajas), the congress buildings, the mint, the palace of justice, the municipal theatre. The present university of Santiago dates from 1842,—the older Uni- versidad de San Felipe, which had been established in 1747, having been closed in 1839. It occupies a fine building in the Alameda, and alongside stands the great National Institute of Secondary Education. In 1882 the university was attended by 920 students and the institute by 1059. The city also contains a school of arts and trades (1849), a musical conservatorio (1849), a national museum, a military school established in 1842 and enlarged on the abolition of the naval military school at Valparaiso in 1872 (now re-established), and a school of

agriculture founded by the Agricultural Society chartered in 1869. The National Library is a noble collection of books dating from 1813, especially rich in works relating to America; there is also a good library in the National Institute. Besides the official journal, Santiago has four daily papers, as well as various reviews and other serials. Besides the Alameda, a great tree-planted avenue decorated with statues (the Abbé Molina, Generals San Martin, Carrera, O'Higgins, and Freire, &c.), the principal open spaces in Santiago are the Plaza de la Independencia, the Canadilla, a broad tree-bordered avenue, the Alameda de Yungay, the Campo de Marte (where are the Penitentiary, a prison built and administered according to the most approved modern principles, and the large Artillery Park), the Quinta Normal de Agricultura, which comprises zoological and botanical gardens, and the large area in which the Inter- national Exhibition of 1875 was held. As the Mapocho was unfit for drinking, water was introduced about 1865 by an aqueduct 5 miles long. The prevailing winds at Santiago are from the south and south-west. On an average rain falls for 216 hours in the course of the year, mostly between May and September. Snow and hail are both extremely rare. Earthquakcs are so frequent that as INany as twenty-seven or thirty shocks are sometimes registered in a year. Those which have proved really disastrous are the earthquakes of 17th March 1575, 13th May 1647, 8th July 1730, 19th November 1822, and 20th February 1835. The population of Santiago, which was returned in 1865 as 168,553 (79,920 males and 88,633 females), had increased to 200,000 in 1883.

It was in February 1541 that Pedro de Valdivia, one of Pizarro's captaius, founded the city of Santiago del Nuevo Estremo in accordance with a vow he had made at Cuzco. The place has all along held an important position in Chilian history, but perhaps none of the events with which it is associated sent such a sensation through the world as the burning of the Jesuit church with the loss of more than two thousand lives in the flames (8th December 1868).

SANTIAGO DE COMPOSTELLA, the former capital of Galicia, in the north-west of Spain, situated in 42° 52' 30" N. lat. and 8° 30' 6" W. long., 514 miles west- by-south from Lugo, and 32 miles south-by-west from Corunna, in the province of that name. It lies on the eastern slope of the Monte Pedroso, surrounded by mountains which draw down incessant rain

that gives the granite buildings of its deserted streets an extra tint of melancholy and decay. The city is still the seat of a university and of an archbishopric, which lays claim to the primacy of all Spain, but its former glories have quite departed. In the Middle Ages its shrine, which contained the body of St James the Great, was one of the most famous in Europe, and gathered crowds of pilgrims from all parts. The city became, in fact, the focus of all the art and chivalry of neighbouring Christendom, and a spot where conflicting interests could meet on neutral ground. But the days of pilgrimages are past, and, though the Congregation of Rites declared in 1884 that the cathedral still enshrines the veritable body of the apostle, pilgrims are scarcely more often seen than in any other cathedral town. The trade of Santiago can never have been otherwise than dependent on the crowds of pilgrims who visited the shrine. It now only survives in the silversmiths' shops on the Plaza de los Plateros, which still have a steady sale for artistic pieces of peasant jewellery. Otherwise it consists in mere local traffic in cattle, linen, silk, leather, hats, and paper. There is communication by rail with the little seaport of Carril on the west coast. The population within the municipal boundaries was 23,000 in 1885.

The relics of the saint were said to have been discovered in 835 by Theodomir, bishop of Iria, who was guided to the spot by a star, whence the name (Campus Stellz). A chapel was forthwith erected, and the bishopric was transferred thither by a special bull of Pope Leo II]. A more substantial building was begun in 868, but was totally destroyed in 997 by Almanzor, who, however, respected the sacred relics. On the reconquest of the city by Bermudo Ill. the roads which led to it were improved by that monarch, and pilgrims began to flock to the shrine, which fast grew in reputation. In 1078 the erection of the present cathedral was begun during the episcopate of Diego Pelaez, and was con- tinued until 1188, when the western doorway was completed. It is a cruciform building in the Romanesque style, 280 feet long, 60 feet wide, and 70 feet high, and keeps its original form in the interior, but is disfigured externally by much poor late work. Besides the classic dome and clock-tower, the two western towers have been raised to a height of 220 feet and crowned with cupolas, and between them has been erected a classic portico, above which is a niche containing a statue of St James. The facade was the work of Casas y Noboa in 1738, and the statue was by Ventura Rodriguez in 1764. The design is mediocre, and gains its

chief effect from forming part of an extended architectural composition on the Plaza Mayor, a grand square which is surrounded on all sides by public buildings. The ground rises to the cathedral, which is reached by a magnificent quadruple flight of steps, flanked by statues of David and Solomon. Access to the staircase is given through some fine wrought-iron gates, and in the centre; on the level of the Plaza, is the entrance to a Romancsque chapel, La Iglesia Baja, constructed under the portico and contemporary with the cathedral. To the north and south, and in a line with the west front, are dependent buildings of the 18th century, grouping well with it. Those to the south contain a light and elegant arcade to the upper windows, and serve as a screen to the cloisters, built in 1533 by Fonseca, afterwards archbishop of Toledo. They are said to be the largest in Spain, and are a fair example of the latest Gothic. The dclicate sculpture over the heads of the windows and along the wall of the cloister is very noticeable. On the north of the cathedral is the Plazuela S. Juan, where the peasants collcct to do their marketing. Here is the convent of S. Martin, built in 1636, which, after serving as a barrack, is now used as an ecclesiastical seminary, restored to the church. It has

a tolerable cloister and bell-tower. The north side of the cathedral | 46’S. lat. and 64° 19’ W. long., 520 feet above the sea,

is much overlaid by classieal and Churrigueresque work ; and the same treatment has been applied to the east end, where is the Puerta Santa, which is kept elosed, except in jubilee years, when it is opened by the archbishop. The corner of the south transept on the Plaza de los Plateros has been mutilated by the erection of the elock-tower, but the fagade is fortunately preserved intact. Perhaps the chief beauty of the cathedral, however, is the Portico de la Gloria, behind the western classic portal. Itis a work of the 12th century, and probably the utmost development of which round- arehed Gothie is capable. The shafts, tympana, and archivolts of the three doorways which open on to the nave and aisles are a mass of strong and nervous sculpture. The design is a general repre- sentation of the Last Judgment, and the subjects arc all treated with a quaint grace which shows

the work of a real artist. Faint traees of colour remain and give a tone to the whole work. The cathedral is at such a height from the ground that it is probable that, until the erection of the present grand staircase, the portico conld not be reached from the Plaza, but stood open to the air. There are no marks of doors in the jambs, and the entrance to the chapel beneath would have been blocked by any staircase which differed much in plan from the present one. The interior of the church is one of the purest and best examples of Romanesque work to be met with in Spain. The absence of a clerestory throws an impressive gloom over the barrel-vaulted roof, which makes the building seem larger than it is. A passage leads from the north transept to the Parroquia of San Juan, or La Corticela, a small but interesting portion of the original foundation. Many fine examples of metal work are in the cathedral, as, for instance, the two bronze ambos in the choir by Juan B. Celma of 1563, the gilt chandeliers of 1763, and the enamelled shrines of Sts Cucufato and Fructuoso. In the Capilla del Relicario are a gold crucifix, dated 874, containing a piece of the true cross, and a silver gilt custodia of 1544. The Hospicio de los Reyes, on the north of the Plaza Mayor, for the reception of pilgrims, was begun in 1504 by Enrique de Egas under Ferdinand and Isabella. It consists of two Gothic and two classic court-yards with a chapel in the centre. The gateway is fine, and there is some vigorous carving in the eourt-yards, one of which contains a graceful fountain. The suppressed Colegio de Fonseca and the adjoining convent of S. Gerdnimo have good Renaissance doorways. The university, which was created in 1504 by a bull of Pope Julius II., has fair Renaissance buildings, which date from 1532. Those of the Seminario (1777) have no merit. The chapel of the convent of S. Francisco, the cloisters of the half-ruined S. Augustin, the belfry of S. Domingo, the church of S. Feliz de Celorio, which is a modernized building of the 14th century, and the facades of several houses of the 12th and 13th centuries are also good examples of different arehitectural styles.

SANTIAGO (or ST JAGO) DE CUBA, a city and sea- port of Cuba, at one time the capital of the whole island, and now the chief town of the eastern department, is situated in 19° 57’ 7” N. lat. and 75° 54’ 3” W. long. (lighthouse), on a fine bay on the south coast. The spaci- ous and well-defended harbour is accessible to the largest vessels, but silt near the wharf allows only those drawing less than 14 feet to come alongside. The city,

which climbs a hill-side 150 feet above the bay, has considerably im- proved since 1870, though its streets are still badly paved. It contains the largest cathedral in the island, a theatre, a custom-house, barracks (1858-1880), and hospitals. Foundries, soap-works, tan-yards, and cigar factories are the only industrial establishments. The exports were valued in 1867 at £1,650,000, in 1882 at £1,032,200, and in 1883 at £722,632. Besides sugar, which forms about two- thirds of the whole, the principal articles are cocoa, rum, tobacco and cigars, coffee, honey and wax, mahogany, and copper-ore —this last at one time to the extent of 25,000 tons per annum, but now in greatly diminished quantity. The copper mines Lomas del Cobre lie on the other side of the bay inland from Punta de Sal. The estimated population is between 24,000 and 30,000.

_ Founded by Diego Velazquez in 1514, and incorporated as a city in 1522, Santiago is memorable mainly for the French oecupation and ransom in 1553, and the affair of the ship ‘‘Virginius” in 1873, which resulted in the Spanish Government paying an indemnity

to the United States for the murder of Captain Fry and his companions.

SANTIAGO DEL ESTERO, chief town of the province of Santiago in the Argentine Republic, is situated in 27°

on the banks of the Rio Dulce. It is the residence of the provincial governor and the seat of the legislature, and it ranks as the oldest European city in the republic, having been founded by Aguirre in 1552. The most conspicuous building is the cathedral, whose dome contrasts strangely by its size and evident costliness with the poverty of the rest of the town. The population is about 8000 (most of whom have a great deal of Indian blood in their veins). The railway from Rosario to Santiago (689 miles) was opened in 1884. ; SANTILLANA, INico Lopzz pz Menpoza, Marquis oF (1398-1458), Castilian poet, was born at Carrion de los Condes in Old Castile on August 19, 1398. His father, Don Diego Hurtado de Mendoza, grand admiral of Castile, having died while Iiigo was still quite young, the boy was brought up by his uncle Don Alfonso Enriquez. From his twentieth year onwards he became an increasingly prominent figure at the court of Juan II. of Castile, dis- tinguishing himself both in civil and military service; he was created Marques de Santillana and Conde del Real de Manzanares for the part he

took in the battle of Olmedo in 1445. In the protracted struggle of the Castilian nobles against the preponderating influence of Alvaro de Luna he showed great moderation, but ultimately in 1452 he joined the combination which effected the fall of the favourite in the following year. From the death of Juan II. in 1454 Mendoza took little part in public affairs, devoting himself mainly to the pursuits of literature and to pious meditation. He died at Guadalajara on March 26, 1458.

Mendoza was the first to introduce the Italian sonnet into Castile, but his productions in this class are somewhat conven- tional in style and have little to recommend them beyond the charm of smooth versification. He was much more successful in the serranilla or highland pastoral after the Provengal manner. His long-popular Centilogwio (1494), consisting of oue hundred proverbs, each rendered in an eight-line stanza, was prepared at the request of Juan II. for the instruction of Don Enrique, the heir-apparent. To the same didactic category belong the Didlogo de Bias contra Foriwna (1448) and the Doctrinal de Privados (1453). The Comedieta de Ponza is a Dantesque dream-dialogue, in octave stanzas, founded on the disastrous sea-fight off Ponza in 1435, when the kings of Aragon and Navarre along with the infante of Castile

were taken prisoners by the Genoese. The works of Santillana have been edited with commentaries by Amador de los Rios (Madrid, 1852).

SANTINI, Grovannr (1787-1877), Italian astronomer, born 30th January 1787 at Caprese, in the province of Arezzo, was from 1813 director of the observatory at Padua. He wrote Elementi di Astronomia (2 vols. 1820, 2d ed. 1830), Zeoria degli Stromenti ottict (2 vols. 1828), and a great many scientific memoirs and notices, among which are five catalogues of telescopic stars between +10° and — 15° declination, from observations made at the Padua observatory. He died June 26, 1877.

SANTO DOMINGO. See Hayrt.

SANTORIN. See TuEra.

SANTOS, a city and seaport of Brazil in the province of Sao Paulo, is situated on the north side of the island of Sio Vicente or Engua-Guacu,

which forms the west side of the harbour-bay (an inlet 34 miles deep, with soundings varying from 4 to 10 fathoms). It is a well-built town with wide airy streets, and most of the better classes have their residences at Barra Fort (4 miles out) and other suburban villages. Commercially the town has grown to great importance as the terminus of the whole railway system of this part of Brazil—the Santos and Jundiahy line (1867) running inland 87 miles and connecting with the Sao Paulo and Rio de Janeiro Railway and various other lines. The export of coffee (the great staple) in- creased from 344,800 60-kilogramme bags in 1862-3 to 537,478 in 1872-3 and 1,932,194 in 1883-4. The value of the coffee was estimated at £1,630,275 in 1870—71, and at

£3,632,838 in 1878-79. The export and import trade is estimated to circulate £10,000,000 a year. The popula- tion has increased since 1870 from 9000 to about 15,000.

As the eity of Sao Vicente, the first permanent Portuguese settle- ment in Brazil, began to deeline from its position as eapital of the southern provinees, Santos, founded by Braz Cuba in 1548-46, gradually took its place. In the 17th eentury it was besieged by the Dutch and English. The provineial assembly passed an enaetment by whieh the eity was to be ealled Cidade de Bonifacio in honour of José Bonifacio d'Andrade e Silva, the national patriot, to whom it had given birth, but the older name of Santos held its ground.

SAO LEOPOLDO, a German colony in the province of Rio Grande do Sul, Brazil, founded in 1824. It is connected with Porto Alegre by rail and also by the Rio do Jinos, a small but deep and navigable river. The inhabitants of the town and sixteen neighbouring settle- ments number in all about 20,000, and are engaged in cattle-breeding and in the culture of grain, arrow-root, and

ar. "SAONE. See RHoNE.

SAONE, Haute-, a department in the north-east of France, formed in 1790 from the northern portion of Franche Comté, and traversed by the river

Saéne. Situated between 47° 14’ and 48° 1’ N. lat. and between 5° 21 and 6° 49’ E. long., it is bounded N. by the department of the Vosges, E. by the territory of Belfort, S. by Doubs and Jura, and W. by Céte-d’Or and Haute-Marne. On the north-east, where they are formed by the Vosges, and to the south along the course of the Ognon the limits are natural. The highest point of the depart- ment is the Ballon de Servance (3900 feet), and the lowest the confluence of the Sadne and Ognon (610 feet). The general slope is from north-east to south-west, the direction followed by those two streams. In the north-east the department belongs to the Vosgian formation, consisting of pine-clad mountains of sandstone and granite; but throughout the greater part of its extent it is composed of limestone plateaus 800 to 1000 feet high pierced with crevasses and subterranean caves, into which the rain water disappears to issue again as springs in the valleys 200 feet lower down. In its passage through the depart- ment the Sadne receives from the right the Amance and the Salon from the Langres plateau, and from the left the Coney, the Lanterne (augmented by the Breuchin which passes by Luxeuil), the Durgeon (passing Vesoul), and the Ognon. The north-eastern districts are cold in climate and have an annual rainfall ranging from 36 to 48 inches. ‘Towards the south-west the characteristics become those of the Rhone valley generally. At Vesoul and Gray the rainfall only reaches 24 inches per annum.

Out of a total of 1,319,570 aeres 664,846 are arable, 375,999 under forest, 153,278 natural meadows and orehards, and 31,752 vine- yards. The agricultural population numbers 180,893 out of a total of 295,905. They possess 22,331 horses, 152,609 eattle, 63,000 sheep, 72,678 pigs, 7094 goats, more than 19,000 dogs, and 15,915 beehives (40 tons 15 cwts. of honey in 1881). Wheat is the staple crop—2,727,425 bushels in 1883; next come oats, 3,188,322 bushels ; potatoes, 8,175,673 bushels; wine, mostly of middling quality, 4,887,652 gallons (average vintage for the last ten years 6,086,652 gallons); rye, 449,308 bushels; barley, 396,940 ; meslin, 276,251; buekwheat, 63,945; maize, 64,924; millet, 154; eolza, 456 tons; beetroot, 26,365 tons; pulse, 5662 bushels; hemp, linen, tobaceo, hops. The woods, whieh cover more than a quarter of the department, are eomposed of firs in the Vosges and beeeh trees, oaks, wyeh elms, and aspens in the other districts. Kirsehwasser is manufactured at Fougerolles from the native eherries. The industrial population number 51,477 ; 550 workmen raise

143,842 tons of iron-ore yearly ; eopper, silver, and Manganese exist in the department, and gold oceurs in the bed of the Ognon. Rock-salt mines yield annually 11,000 tons of salt and the materials for a considerable manufacture of sulphurie, hydroehloric, and nitric acids, sulphate of soda, ehloride of lime, and Epsom and Glauber salts. Coal mines, with their principal centre at Ronchamp, give employment to more than 2000 workmen, and in 1883 yielded 212,680 tons of coal. Peat, limestone, plaster,

building-stone, marble, porphyry, granite, syenite, and sandstone are all worked in the department. The green porphyry pedestal of Napoleon's sarcophagus at Les Invalides and the syenite columns of the Grand Opera in Paris were eut at Servanee. Of the many mineral waters of Haute-Saéne the best known are the hot springs of Luxeuil, whieh, with their sixteen saline and two chalybeate sourees, diseharge over 127,000 gallons in the 24 hours and are used for bathing and drinking. Besides forty-seven iron-working establishments (smelting furnaees, foundries, and wire-drawing mills, produeing in 1883 4875 tons of iron smelted by wood-fuel, 286 tons of refined iron and 1040 tons of sheet-iron, &e.), Haute- Sadne possesses eopper-foundries, engineering works, steel-foundries, and faetories for produeing tin plate, nails, pins, files, saws, serews, shot, ehains, agrieultural implements, loeks, spinning machinery, edge tools, &e. Window-glass is manufaetured by 105 workmen and glass wares by 300, pottery and earthenware by 220 to 230. There are also about 100 brick and tile works; the paper-mills employ 329 hands, and the 21 eotton-mills (66,700 spindles and 2518 looms, of which 154 are hand-looms) upwards of 2000. Print-works, fulling mills, hosiery faetories, and straw-hat factories are also of some aeeount ; as well as sugar-works, dye-works, saw-mills, stareh-works, ehemieal works, oil-mills, tanyards, and flour-mills. The department exports wheat (893,000 bushels), eattle, iron, wood, pottery, kirsehwasser, and eooper's wares. The Sadne provides a navigable ehannel of 40 miles, whieh is about to be eonneeted with the Moselle and the Meuse by the Canal de l'Est in eourse of eonstruction along the valley of the Coney. Gray is the great emporium of the water-borne trade, estimated at 200,000 tons per annum. 'The department has 186 miles of national roads, 3313 miles of other roads, and 235 miles of railway—the Paris-Mulhouse and Naney-Gray railways, erossing at Vesoul, and various other lines. There are three

arrondissements,—Vesoul, Gray (7254 in- habitants in the town), Lure (4360),—28 cantons, 583 communes. Haute-Sadne is in the distriet of the 7th eorps d'armée, and in its legal, ecclesiastical, and edueational relations depends on Besangon. Lnxeuil (4376 inhabitants), the most important plaee after the sub- prefeetures, is eelebrated for its abbey, founded by St Columban in 590.

SAONE-ET-LOIRE, a department of the east central region of France formed in 1790 from the. districts of Autunois, Brionnais, Chalonnais, Charollais, and MAconnais previously belonging to Burgundy. Lying between 46° 9' and 47° 9' N. lat., 3° 37' and 5° 27' E. long., it is bounded on the N. by the department of Céte d'Or, E. by that of Jura, 8.E. by Ain, 8. by Rhéne and Loire, W. by Alher and Niévre. The two streams from which it takes its name bound the department on the south-east and on the west respectively. Between these the continental watershed between the Mediterranean and the Atlantic called the Charollais Mountains runs south and north. Its altitude (2500 feet on the south) diminishes to the north in the direction of Céte-d'Or. The culminating point of the department is in the heights of Morvan, on the border of Niévre (2960 feet). The lowest point, where the Sadne leaves the department, is under 550 feet. The Sadne crosses the department from north to south, and receives on its right the Dheune, followed by the Canal du Centre and the Grosne, and on its left the Doubs and the Seille. The Loire only receives one important affluent from the right, the Arroux, which is increased by the Bourbince, whose valley is followed by the Canal du Centre. The average temperature is slightly higher at Macon than at Paris—the winters being colderand the summer hotter. The yearly rainfall (382 inches, increasing towards the hilly districts) is distributed over 135 days; there are 25 days of snow and 27 of storm.

Of a total-area of 2,116,311 aeres (this is one of the largest of the Freneh departments) 1,079,395 are arable, 371,866 forest, 292,287 natural meadows and orehards, and 106,111 vineyards. In 1880 the live-stoek eomprised 26,000 horses, 6000 asses and mules, 75,000 bulls and oxen, 150,000 eows and heifers, 56,000 ealves, 216,000 sheep, 175,000 pigs, 50,000 goats, 35,000 beehives (yielding 214 tons of honey and 52 tons of wax). The white Charollais oxen are one of the finest Freneh breeds, equally suitable for labour and fattening. No fewer than 366,252 of the

inhabitants of the de- partment out of a total of 625,559 depend on agriculture. In 1883 there was produced 3,678,276 bushels of wheat, 22,890 meslin, 1,022,037 rye; in 1880 210,375 bushels of barley, 754,875 buck-wheat, 809,325 maize, 101,970 millet, 2,107,187 oats, 13,359,307 potatoes, 38,500 pulse, 70,936 tons of beetroot, 206 tons hemp, 195

tons hempsced, 135,300 bushels colza-seed, 3177 tons colza oil. In 1883 the vintage yielded 22,636,636 gallons of wine, the average quantity of reeent years being 21,809,018 gallons. The red wines of MAeonnais (especially those of Thorins) are those in highest repute; Pouilly produees the best white wines. The industrial elasses are represented by 150,983 individuals. The coal-basin of Creusot, the sixth in importance in France, produced in 1882 1,269,783 tons. A pit at Epinac is 3937 feet deep. lron-ore was extracted in 1882 to the amount of 28,654 tons. Slate, limestone, pbuilding-stone, millstones, granite, marble, marl, plaster, bitu- minous sehists, peat, kaolin, manganesc (4360 tons per annum), and certain precious stones are also found in the department. The most celebrated mineral waters are those of Bourbon-Laney, six out of the seven springs being thermal. They are strongly saline. Metal-working is principally carried on at Creusot, which, with its 13,000 workmen and its 13 smelting furnaces, 100 puddling ovens, 4 Bessemer apparatuses and 4 Martin’s ovens, &c., produced in 1882 63,989 tons of iron (965 tons of rails, 21,984 tons of sheet-iron) and 99,828 tons of stcel (72,085 tons of rails, 7056 tons of sheet- iron). The engine works produce all sorts of maehincs, including about 100 locomotives. The Chalon braneh works turn out ships, boats, bridges, and boilers. Other foundries and forges in the de- partment produced in 1882 175,113 tons of cast iron and certain quantities of copper and bronze. The cotton manufacture employs 14,000 spindles and 2000 looms, silk 2900 spindles and 2500 hand- looms, wool-spinning 850 spindles. Other industrial establish- ments are potteries, tile-works, glass-works (6,000,000 bottles at Epinac alone), distilleries, oil-works, mineral-oil works, cooperages, tanneries, flour-mills, sugar-works—the total number being 850 with 1872 steam engines of 27,780 horse-power. The commerce of the department, especially as regards its exports, deals mainly with eoal, metals, machinery, wine, cattle, bricks, pottery, glass. It is facilitated by five navigable streams

(181 miles),—Loire, Arroux, Saénc, Doubs, Seille,—the Canal du Centre which unites Chilon-sur-Sadne with Digoin on the Loire, aud the canal from Roanne to Digoin and the lateral Loire Canal, both following the main river valley. The total length of the canals is 90 miles. There are 365 miles of national road, 7098 of other roads, and 487 miles of railway. Sadne-et-Loire forms the dioeese of Autun ; it is part of the district of the 8th corps d'armée (Bourges), and its uni- versity is that of Lyons. It is divided into five arrondissements, —Macon, Chalon-sur-Saéne, Autun, Charolles (8350 inhabitants in the town), Louhans (4280),—50 cantons, and 589 communes; the most populous commune is Creusot (28,000 inhabitants, 16,000 in the town). Montceau-les-Mines (4560) is also a mining centre. Cluny (3500) is celebrated for its abbey, now occupied by the nor- mal sehool of secondary instruction, and Paray-le-Monial (300) for its pilgrimage.

SAO PAULO, a city of Brazil, capital of a province of

the same name, is situated on the north-western slope of the Serra do Mar, on a left-hand tributary of the Tiete, a confluent of the Paranda. It is an old and irregularly built city, with some picturesque old churches and con- vents. The centre of the provincial railway system, 86 miles distant from Sanvros (¢.v.), its seaport on the Atlantic coast, and 143 miles from Rio de Janeiro, the city has developed very rapidly within recent years. One of the two academies of law which Brazil possesses is seated at Sao Paulo. The most important public buildings are the cathedral, the provincial governor's and the bishop's palaces, and the theatre. A new system of water-supply and drainage was constructed in 1879-80 by English engineers under a Brazilian company. The population of the city in 1879 numbered about 35,000. _ Hounded by the Jesuits as a college, Sio Paulo was made a town in 1560 instead of Santo André, destroyed by order of Mendo de Sa. In 1711 it became a city, in 1740 a bishopric, and in 1823 an "imperial eity."

SAO PEDRO DO RIO GRANDE DO SUL. Sce Rio GRANDE Do SUL.

SAPOR (SHAptr or SHAHPUHR), the name of three Sasdnian kings. See Persia, vol. xviii. pp. 608-610.

SAPPAN WOOD is one of several red dyewoods of commerce, all belonging to the Leguminous genus Cexsal- pina, or to the closely allied

genus Peltophorum. It isa native of tropical Asia and the Indian Archipelago, but, as It 1s one of the most esteemed of the red dyewoods, its cultivation has been promoted in the West Indies and Brazil. The wood is somewhat lighter in colour than Brazil wood and its other allies, but the same tinctorial |

principle, brazilm, appears to be common to all. See Brazit Woop, vol. iv. p. 241.

SAPPHIRE, a blue transparent variety of corundum or native alumina. It differs, therefore, from the Oriental ruby mainly in its colour. The colour varies from the palest blue to deep indigo, the most esteemed tint being that of the blue cornflower. It often happens that a crystal of sapphire is particoloured, and hence a fine cut stone may derive its tint from a deep-coloured portion at the back, instead of being uniformly tinted throughout. The sapphire is dichroic, and the colour of a fine velvety stone may be resolved by means of the dichroiscope into an ultramarine blue and a yellowish-green. The origin of the blue colour of the sapphire has not been satis- factorily determined, for, although oxide of cobalt may produce it, and is invariably used for colouring imitations of the stone, yet the presence of cobalt is not always revealed in the analysis of the sapphire. According to lapidaries the hardness of the sapphire slightly exceeds that of the ruby, and it is therefore the hardest known mineral, excepting diamond. In consequence of its great hardness it was generally mounted by the ancients in a partially rough state, the surface being polished but not cut. Notwithstanding its hardness it has been occasion- ally engraved asa gem. There seems no doubt that the ancient ocdmdepos, as well as the sapphire (20) of the Old Testament (Job xxviii. 6), was our lapis lazuli, while the modern sapphire seems to have been known under the name of taxwGos or hyacinthus (King).

The finest sapphires are obtained from Ceylon, where they occur with other gem-stones as pebbles or rolled crystals in the sands of rivers. The sapphires have generally preserved their crystalline form better than the associated rubies. Some of the slightly-cloudy Ceylon sapphires display when cut en cabochon an opalescent star of six rays, whence tliey are called

star-sapphires or asterias. The principal localities in Ceylon yielding sap- phires are Rakewana, Ratnapura, and Satawaka. A few years ago sapphires were discovered in Siam (in the pro- vince of Battambong), but the stones from this locality are mostly dull and of too dark a colour. In Burmah they occur in association with rubies, but are much less numerous. They have also been recently found in Pal- dar, north of the Chandrabagha range. The sapphire is widely distributed through the gold-bearing drifts of Victoria and New South Wales, but the colour of the stones is usually too dark. Some of the finest specimens have come from the Beechworth district in Victoria. Coarse sapphire is found in many parts of the United States, and a few stones fit for jewellery have been obtained from Corundum Hill, Macon county, North Carolina, and from the other localities mentioned under Rusby. The sapphire also occurs in Europe, being found in the basalts of the Rhine valley and of Le Puy in Velay, but not sufficiently fine for purposes of ornament. The sapphire has been artificially reproduced by similar methods to those described in the article Ruby.

SAPPHO (in Attic Greek Sarda, but called by herself Wdrdo, which is necessitated by the metre also in Anthol., ix. 190, though Alczeus, himself an AZolian and her contemporary, calls her Sarda), incomparably the greatest poetess the world has ever seen, was a native of Lesbos, and probably both was born and lived at Mytilene. For the idea that she migrated thither from Eresus is merely a conjecture to explain a perfectly imaginary difli- culty caused by the grammarians who invented another Sappho, a courtesan of Eresus, to whom to ascribe the current scandals about the poetess. She was the daughter of Scamandronymus and Cleis, of whom nothing more is known. The epistle of Sappho to Phaon, ascribed to

Ovid, says that her ‘‘ parent” died when she was six years old; if Frag. 90 refers to Sappho’s own mother, which is very doubtful, this “parent” must be her father. Her date cannot be certainly fixed, but she must have lived about the end of the 7th and beginning of the 6th cen- turies B.c., being contemporary with Alczus, Stesichorus, and Pittacus, in fact with the culminating period of AZolic poetry. But of her life very little else is

known. One of her brothers, Charaxus, who was engaged in the wine- trade between Lesbos and Naucratis in Egypt, fell in love there with a courtesan named Doricha and surnamed for her beauty Rhodopis, whom he freed from slavery and upon whom he squandered his property. Sappho wrote an ode on this, in which she severely satirized and rebuked him. Another brother, Larichus, was public cup-bearer at Mytilene,—a fact for which it was necessary to be evyevyjs, so that we may suppose Sappho to have been of good family. For the rest it is known that she had a daughter, named after her grandmother Cleis, and that she had some personal acquaintance with Alcweus. He addressed her in an ode of which a fragrant is preserved : ‘“ Violet-weav- ing, pure, sweet-smiling Sappho, I wish to say somewhat, but shame hinders me;” and she answered in another ode: ‘“‘Hadst thou had desire of aught good or fair, shame would not have touched thine eycs, but thou wouldst have spoken thereof openly.” Further than this everything is enveloped in doubt and darkness. The well-known story of her love for the disdainful Phaon, and her leap into the sea from the Leucadian promontory, together with that of her flight from Mytilene to Sicily, which has been con- nected with her love for Phaon, rests upon no evidence that will bear examination. Indeed, we are not even told whether she died of the leap or not. All critics again are agreed that Suidas was simply gulled by the comic poets when he tells us of her imaginary husband, Cercolas of Andros. The name of Sappho was by these poets con- sistently dragged in the dirt, and both the aspersions they cast on her character and the embellishments with which they garnished her life passed for centuries as undoubted history. Six comedies entitled Sappho, and two Phaon, were produced by the Middle Comedy ; and, when we consider, for example, the way in which Socrates was caricatured by Aristophanes, we are justified in put- ting no faith whatever in any accounts of Sappho which depend upon such authority, as most of our accounts appear to do.

Welcker! was the first to examine carefully the evidence upon which the current opinion of Sappho’s character rested. He found it easy to disprove, in his opinion, all the common accusations against her moral character, but unfortunately, not content with disproving actual state- ments, went on to uphold Sappho as a model of feminine virtue. Bergk and Mure both combated his views, and in the Mheinisches Museum for 1857 may be found the issucs between him and the latter clearly stated on both sides,

unfortunately with considerable acrimony. It is plain to the impartial reader that both of the controver- sialists have gone decidedly too far, but it can hardly be denicd, however much we should naturally desire to think otherwise, that Mure has very considerably the best of it. We owe thanks to Welcker for clearing the history of Sappho from several fictions, but further than this it is impossible to go; we owe thanks to Mure for preferring truth to sentiment, but we cannot disregard some points of Welcker's argument so completcly as he docs. In fact, the truth appears to be that Sappho was not, as the Attic comedy represented her, a woman uttcrly abandoned to vice, and only distinguished among the corrupt com-

pear von einem herrschenden Vorurtheil befreyt, Gottingen,

munity of Lesbos by exceptional immorality and the gift of song,—that indeed she was not notoriously immoral at all, but no worse and perhaps better than the standard of her age and country required. 'This seems clearly indi- cated by the epithet ayva, with which Alczeus addressed her. On the other hand, not merely tradition but the character of her extant fragments, with the other evidence adduced by Mure, constrain us to resign the pleasant dream of Welcker, K. O. Miiller, and their followers,—an ideal and eminently respectable head of a poetic school, with a matronly regard for her pupils, who meant by her own poems anything but what she said, and was more careful to inculcate virtue than unlimited indulgence in passion.

To leave this disagreeable question, we will next indicate briefly all that is known of her position in Lesbos. She was there the centre of a brilliant society and head of a great poetic school, for poetry in that age and place was cultivated as assiduously and apparently as successfully by women as by men. Her most famous pupils were Erinna of Telos and Damophyla of Pamphylia. Besides them we know the names of Atthis, Telesippa, Megara, Gongyla, Gyrinna, Dica, Mnasidica Eunica, and Anactoria, to whom the second ode, eis épwpevay, is said to have been addressed. The names also of two of her rivals are pre- served—Andromeda and Gorgo; but whether they also presided over similar schools or not is very doubtful, as that idea of them depends on the authority of Maximus Tyrius, which is quite worthless on this point.

In antiquity the fame of Sappho rivalled that of Homer. She was called “the poetess,” as he was called “the poet.” Different writers style her “the tenth Muse,” “the flower of the Graces,” ‘a miracle,” “the beautiful,” the last epithet referring to her Writings, not her person, which is said to have been small and dark. Her poems were arranged in nine books, on whiat principle is uncertain ; she is said to have sung them to the Mixo- Lydian mode, which she herself invented. The few remains which have come down to us amply testify to the justice of the praises lavished upon Sappho by the ancients. The perfection and finish of every line, the correspondence of sense and sound, the incomparable com- mand over all the most delicate resources of verse, and the exquisite symmetry of the complete odes raise her into the very first rank of technical poetry at once, while her direct and fervent painting of passion, which caused Longinus to quote the ode to Anactoria as an example of the sublime, has never been since surpassed, and only approached by Catullus and in the Veta Nuova. Her fragments also bear witness to a profound feeling for the beauty of nature; we know from other sources that she had a peculiar delight in flowers, and especially in the rose. The ancients also attributed to her a considerable power in satire, but in hexameter verse they considered her inferior to her pupil Erinna.

The fragments of Sappho have been all preserved by other authors incidentally. An independent fragment, ascribed to her by Blass but rejected by Bergk and of very doubtful authenticity, has been diseovered on a papyrus in the Egyptian museum at Berlin (see Rhein. Mus. for 1880, p. 287; Bergk, vol. iii. p. 704); but even if really hers it is too fragmentary to be of any value. The best edition of Sappho is to be found in Bergk’s Pociae Lyrtet Graeet, vol. iii., 4th ed., Leipsic, 1882. The only separate edition and the only complete translation in English is that of Mr Wharton

(London, 1885), in which it is unfortunately impossible for the general reader to place much reliance. (J, A. PL.)

SARABAND (Ital. Sarabanda, Zarabanda; Fr. Sara- bande), a slow dance, generally believed to have been imported from Spain in the earlier half of the 16th cen- tury, though attempts have sometimes been made to trace it to an Eastern origin. ‘The etymology of the word is very uncertain. ‘The most

probable account is that the dance was named after its inventor—a cclebrated danccr

of Seville, called Zarabanda. During the 16th and 17th centuries the saraband was exceedingly popular, alike in Spain, France, Italy, and England. Its music was in triple time—generally with three minims in the bar—and almost always consisted of two strains, each beginning upon the first beat, and most frequently ending on the second or third. Many very fine examples of it will be found among the Suites and Partitas of Handel and J. S. Bach; but by far the finest we possess is that which Handel first composed for his overture to Almira, and afterwards adapted to the words " Lascia, ch'lo pianga," in Rinaldo.

SARACENS was the current designation among the Christians of Europe in the Middle Ages for their Moslem enemies, especially for the Moslems in Europe. In earlier times the name of Saraceni was applied by Greeks and Romans to the troublesome nomad Arabs of the Syro- Arabian desert who continually harassed the frontier of the empire from Egypt to the Euphrates. It is easy to understand how, after Islam, the name came to be extended to the Moslem enemies of the empire in general, but no satisfactory explanation has been given of the reason why the Romans called the frontier tribes Saracens. It is most natural to suppose that they adopted some name of a tribe or confederation and used it in an extended sense, just as the Syrians called all these northern nomads by the name of the tribe of Tayyi'. The common derivation from the Arabic shark, " eastern," is quite untenable. Springer suggests that the word may be simply shoraké, " allies."

SARAGOSSA. See Zaracoza.

SARAKHS. See Persta, vol. xviii. p. 618.

SARAN, or Sarvn, a British district in the lieutenant- governorship of Bengal, lying between 25° 40' and 26° 38' N, lat. and 83° 58' and 85° 14' E. long. It forms one of the north-western districts of the Patna division in the Behar province, and comprises an area of 2622 square miles. Sdran is bounded on the north by the district of Gorakhpur in the North-Western

Provinces, on the east by the Bengal districts of Champaran and Tirhut, on the south by the Ganges, separating it from Shdéhdbéd and Patna districts, and on the west by Gorakhpur. It is a vast alluvial plain, possessing no mountains, and scarcely any hill or even undulations, but with a general inclina- tion towards the south-east, as indicated by the flow of the rivers in that direction. The rivers and watercourses are very numerous, few tracts being better supplied in this respect. The principal rivers besides the Ganges are the Gandak and Ghagrd, which are navigable throughout the year. There is little or no waste land, and the district has long been noted for the high state of its cultivation. Saran is beautifully wooded; mango trees are very numerous ; and it yields large crops of rice, besides other cereals, tobacco, opium, indigo, cotton, and sugar-cane. Though possessing no railways or canals, the district is well provided with roads. ‘There is very little jungle; large game is not met with, but snakes are very numerous. Saran is subject to blight, flood, and drought ; its average annual rainfall is 45 inches. The administrative head- quarters are at Chhapra.

_ The eensus of 1881 returned the population at 2,280,382 (1,083,565 males and 1,196,817 females); Hindus numbered De 010,958, Mohammedans 269,142, and Christians 282. The popu- lation is entirely agrieultural ; there are only three towns with more than 10,000 inhabitants, viz., Chhapra (51,670), Sewan (18,319), and Revelganj (12,493). Manufaetures are few and of little aeeount ; the principal are indigo, sugar, brass-work, pottery, saltpetre, and eloth. The eommeree of Saran consists ehiefly in the export of raw produce, of which the chief articles are oil-seeds, indigo, sugar, and grain of all sorts except rice; the imports eonsist prineipally of rice, salt, and European piece-goods. Revelganj is the chief trading

mart. The gross revenue of the distriet in 1883-84 amounted to £203,734, of which the land eontributed £122,612. Saran formerly

constituted one district with Champaran. The revenue areas of the two distriets were not finally separated until 1866, but the magis- terial jurisdictions were first divided in 1837.

SARAPIS. See Serapis.

SARATOFF, a government of south-eastern Russia, on the right bank of the lower Volga, having Penza and Simbirsk on the north, Samara and Astrakhan on the east, and the Don Cossacks, Voronezh, and Tamboff on the west. The area is 32,624 square miles, and the popula tion (1882) 2,113,077. The government has an irregular shape ; and a narrow strip, 140 miles long and from 20 to 45 miles wide, extending along the Volga as far south as its Sarepta bend, separates from the river the territory of the Don Cossacks. Saratoff occupies the eastern part of the great central plateau of Russia, which gently slopes towards the south so as imperceptibly to merge into the steppe region; its eastern slope, deeply cut into by ravines, abruptly falls towards the Volga. As the higher parts of the plateau range from 700 to 900 feet above the sea, while the Volga flows at an elevation of only 20 feet at Khvatynsk in the north, and is 48 feet beneath sea-level at Sarepta, the steep ravine-cut slopes of the plateau give a hilly aspect to the banks of the river. In the south, and especially in the narrow strip above mentioned, the country assumes the characteristics of true elevated steppes, intersected with waterless ravines.

Every geological formation from the Carboniferous up to the Miocene is represented in Saratoff ; the older ones are, however, mostly concealed under the Cretaceous, whose fossiliferous marls, flint-bearing clays, and iron-bearing sandstones cover broad areas. The Jurassic deposits sel- dom make their appearance from beneath them. Eocene sands, sandstones, and marls, rich in marine fossils and in fossil wood, extend over large tracts in the east. The boulder-clay of the Finland and Olonetz ice-sheet penetrates in Saratoff as far south-east as the valleys of the Medvye- ditsa and the Sura; while extensive layers of loess and other deposits of the Lacustrine or Post-Glacial period appear in the south-east and elsewhere above the Glacial deposits. Iron-ore is abundant; chalk, lime, and white pottery clay are extracted to a limited degree. The mineral waters at Sarepta, formerly much visited, have been super- seded in public favour by those of Caucasus.

Saratoff is well watered, especially in the north. The Volga, from 1 to 7 miles in width, separates it from Samara and Astrakhan for a length of 500 miles; its tributaries are but small, except the Sura, which rises in Saratoff and serves for the northward transit of timber. The tributaries of the Don are more important; the upper Medvyeditsa and the Khoper, which both have a

south- ward course parallel to the Volga and water Saratoff each for about 200 miles, are navigated notwithstanding their shallows, ready-made boats being brought in separate pieces from the Volga for that purpose. – The Ilovla, which flows in the same direction into the Don, is separated from the Volga only by a strip of land 15 miles wide; Peter I. proposed to utilize it as a channel for connecting the Don with the Volga, but the idea was never carried out, and the two rivers are now connected by the railway (52 miles) from Tsaritsyn to Kalatch which crosses the southern ex- tremity of Saratoff.

Lakes and marshes occur only in a few river-valleys. The region is rapidly drying up, and the forests diminish- ing. In the south, about Tsaritsyn, where the hills were densely covered with them a few centuries ago, they have almost wholly disappeared. In the north they still cover more than a third of the surface, the aggregate area under wood being reckoned at 2,661,000 acres. The remainder is distributed as follows :—arable land, 11,509,000 acres ; prairies and pasture lands, 3,799,000; uncultivable,

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peasants' houses are made of clay, the corner posts and door and window frames being largely shipped from the wooded districts of the middle Volga. The climate is severe and quite continental. The average yearly tempera- tures are 41°°5 at Saratoff (January, 12°-4; July, 71°:5) and 44°-4 at Tsaritsyn (January, 13°-2; July, 74°-6). The average range of temperature is as much as 119°. The Volga is frozen for an average of 162 days at Saratoff and 153 days at Tsaritsyn. The soil is very fertile, especially in the north, where a thick sheet of black-earth covers the plateaus ; sandy clay and salt clay appear in the south.

The population is very various, emigrants from all parts of Russia being mixed with Finnish and Tartar stems and with German colonists. The Great Russians constitute 75 per cent. of the popu- lation, Little Russians 7 per cent., Germans 7, Mordvinians 6, and Tartars 3°5 per cent. The Tchuvashes

may numbcr about 11,000, Mescheriaks about 3000, and Poles about 5000. All are uncqually distributed, Little Russians being more numerous in the districts of Atkarsk, Batashoff, Tsaritsyn, and Kamyshin (18 to 13 per cent.),

the Mordvinians in Kuznctsk and Petrovsk (16 per cent.), and the

Germans in Kamyshin (40 per cent.). The immigration of the Germans took place in 1763-1765, and their wealthy colonies have the aspect of minor West-European towns (see SAMARA). :

Only 285,140 of the population reside in ten towns, the remainder (1,827,937) being distributed over 5602 villages, of which some have from 5000 to 12,000 inhabitants, and no less than 150 reckon more thau 2000. The annual mortality is 42 per 1000 (1882), but this high figure is more than compensated for by the births, which in the same year were 51 per 1000. The chief occupation is agriculture. More than one half of the arable land (6,210,000 acres) was under crops in 1881. In 1884 the returns were rye, 3,374,000 quarters (1,608,300 in 1883) ; wheat, 850,700 ; barley, 103,400 ; oats, 1,657,700 (2,432,700 in 1883) ; and various, 764,400. Drought, and sometimes also noxious insects, causc great fluctuations in the harvest ; but nevertheless almost every season leaves a considerable balance of corn forexport. Oil-yielding plants arc also cultivated ; linseed in all districts except Tsaritsyn ; mustard, both for grain and oil, extensively about Sarepta and in the Kamyshin district ; and sunflower (140,000 quarters) in the northern districts. Gardening is a considerable source of income around Saratoff, Volsk, Atkarsk, and Kamyshin. The molokandis- senters have great plantations of water-inelons, melons, pumpkins, &c. The peasants of Saratoff are no better off than those of the other governments of south-east Russia (see SAMARA). Years of scarcity are common, and invariably mean ruin for the peasants. Cattle-breeding, formerly a large source of income, is rapidly falling off. Between 1877 and 1882 there was a decrease of 271,000 head, and murrain swept away large numbers of cattle in 1883.

Manufactures are developing but slowly, the chief of them, those dealing with animal produce, being checked by the falling off in cattle-brecding. The 6500 industrial manufacturing establishments of Saratoff employed an aggregate of only 17,500 workmen, with an annual production of but

20,973,500 roubles (£2,097,350) in 1882. The most considerable were—cottons, £17,200 ; woollen cloth, £64,480 ; tanneries, £85,830; tallow, soap, wax-candles, flour, £1,217,800 ; oils, £125,360 ; distilleries, £255,780 ; iron, £15,390 ; and machinery, £37,195. Various petty tradesare rapidly develop- ing among the peasantry. Shipbuilding is carried on in the Volga villages ; wooden vessels and implements are made in the north, and pottery in several villages ; and quite recently the fabrication of lead-pencils has been added at Buturlinovka. Very many peasants have still every year to leave their homes in search of work on the Volga and elsewhere. An active trade is carried on by the mer- chants of the chief towns,—corn, hides, tallow, oils, being exported ; the merchants of Saratoff, morcover, are intermediaries in the trade of south-east Russia with the central provinces. The chief ports are Saratoff, Tsaritsyn, Kamyshin, and Khvatynsk.

Saratoff is divided into 10 districts, the chief towns of which and their populations in 1882 were as follows:—Saratoff (112,430 inhabit- auts); Atkarsk (7610); Batashoff (10,090); Kamyshin (14,460); Khvatynsk (17,650); Knznetsk (17,930); Petrovsk (15,020); Ser- dobsk (10,360); Tsaritsyn (31,220); and Volsk or Voljsk (34,930). The German colony of Sarepta, although without municipal insti- tutions, is a lively little town with 5650 inhabitants, which carries on an active trade in mustard, woollen cloth, and varions manufac- tured wares. Dubovka (13,450 inhabitants) derives its importance from its traffic with the Don ; the villages Samoitovka in the district of Batashoff and Kotoyar in Volsk have each more than 11,000 inhabitants ; Batanda and Arkadak are important grain-markcts.

The district of Saratoff has been inhabited since at least the Neolithic Period ; its inhabitants of a later epoch have left numerons bronze remains in the kurgans, but the question of their ethnological position is still unsettled. In the 8th and 9th centuries the half-

Such is the scarcity of timber that the | nomad Burtases peopled the territory and recognized the authority

of the Khazar princes. Whether the Burtases were the ancestors of the Mordvinians—as some ethnologists are inclined to admit— has not yet been determined. At the time of the Mongolian inva- sion, the Tartars took

possession of the territory, and one of their settlements around the khan's palace at Urek, 10 miles from Sara- toff, seems to have had some importance, as well as those about Tsaritsyn and Dubovka. The incursions of the Crimean Tartars devastated the country about the 15th century, and after the fall of. Kazafi and Astrakhan the territory was annexed to Moscow. Sara- toff and Tsaritsyn, both protected by forts, arose in the second half of the 16th century; but the forests and deep ravines of the terri- tory continued for two centuries more to give shelter to numerous bands of squatters, Raskolniks, aud runaway serfs, who did not recognize the authority of Moscow; they sometimes robbed the caravans of boats on the Volga and were ready to support the insur- rections both of Razin and of the impostors of the 18th century. Dmitrievsk (now Kamyshin) and Petrovsk were founded about thie end of the 17th century, and a palisaded wall was erected between the Volga and the Don, while other lines of military posts were kept in the north and west. A special "voisko" of Volga Cossacks was founded in 1731, but as they also joined the rebellions they were soon transferred to the Terek. Regular colonization may be said to have begun only at the end of the 18th century, when Catherine IJ. called back the runaway dissenters, invited German colonists, and ordered her courtiers to settle here their serfs, deported from central Russia. In this way the population of the lieutenancy, which extended also along the left bank of the Volga, reachcd 640,000 in 1777. It exceeded one million in 1817. In 1851 the territory on the left bank of the Volga was transferred to the new Samara government. ; (P. A. K.)

SARATOFYF, capital of the above government, situated on the right bank of the Volga, 532 miles by rail to the south-east of Moscow, has become one of the most import- ant cities of eastern Russia, and ranks among the very few Russian cities which have more than 100,000 inhabitants. It is picturesquely situated on the side of hills which come close down to the Volga. One of these, the Sokotova Hill (560 feet) is liable to frequent landslips, which are a con- tinual source of danger to the houses of poorer inhabitants at its base. The terrace on which Saratoff is built being intersected by two ravines, the city is divided into three parts ; the outer two may be considered as suburbs. A large village, Pokrovskaya, with about 20,000 inhabitants, situated on the opposite bank of the Volga, though in the government of Samara, is in reality a suburb of Saratoff. Apart from this

suburb, Saratoff had in 1882 a population of 112,430 (49,660 in 1830, and 69,660 in 1859). It is better built than many towns of central Russia. Its old cathedral (1697) is a very plain structure, but the new one, completed in 1825, is fine, and has a striking cam- panile. The theatre and the railway station are also fine buildings. The streets are wide and regular, and there are several broad squares. A new fine-art gallery was erected in 1884 by the Russian painter Bogoluboff, who has be- queathed to the city his collection of modern pictures and of various objects of art. A school of drawing and the public library are in the same building, which has received the name of " Radistcheff's Museum" (in memory of Radis- tcheff, the author prosecuted by Catherine IL).

Agriculture and gardening are still the support of a section of the population, who rent land in the neighbourhood of the city. The culture of the sunflower deserves special mention. The local manufacturing establishments do not keep pace with the rapidly increasing trade, and their aggregate production cannot be esti- mated at more than £450,000. The distilleries are first in import- ance ; next come the manufactures of liqueurs (£160,000), flour- mills (about £40,000), oil-works (£56,000), and tobacco-factories (abont £40,000). The city has not only a trade in corn, oil, hides, tallow, woollen cloth, wool, fruits, and various raw produce exported from Samara, but also a trade in salt from Crimea and Astrakhan, which is in the hands of the Samara merchants, and in iron from the Urals and wooden wares from the upper Volga governments. Saratoff also supplies south-eastern Russia with manufactured articles and grocery wares imported from central Russia. The traffic of the port was estimated at about 5,700,000 roubles in 1882. The shallowness of the Volga opposite the town, and the immense shoals along its right bank are, however, a great drawback. Vast sand-banks, which formerly lay above the city, have gradually shifted their position, and it is supposed that in a

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few years Saratoff will be situated on a shoal about 1 mile wide. In 1882 and 1883 steamers were compelled to discharge cargoes 50 miles below Saratoff or at the Pokrovskaya suburb on the left bank,—so that a branch

railway for conveying the cargoes of the steamers has now been constructed south of the city.

The town of Saratoff was founded at the end of the 16th century, ou the left bank of the Volga, some seven miles above the present site, to which it was removed about 1605. The place it now occupies (Sarytau, or Yellow Mountain) has been inhabited from a remote antiquity. Although founded for the maintenance of order in the Volga region, Saratoff, which was not fortified, was several times pillaged in the 17th and 18th centuries. Razin took it, and his followers kept it until 1671; the insurgent Cossacks of the Don under Butavin and Nekrasoff pillaged it in 1708 and Pugatcheff in 1774. After being placed under Kazaii and later under Astra- khan, it became the chief town of the Saratoff government in 1797.

SARATOGA SPRINGS, a village of the United States, whose mineral waters, apart from any charm of situation, have rendered it one of the most fashionable of summer resorts. It lies in the east of Saratoga county, New York, 186 miles by rail north of New York city, on a level plateau in the valley of the Hudson, not far from the junction of this river with the stream discharging from Saratoga Lake. The number and size of its hotels (some of which are among the largest in the world and can accommodate upwards of 1000 guests) and the large influx of wealthy and fashionable visitors, bringing its

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Plan of Saratoga Springs.

population up to 30,000, render Saratoga Springs anything rather than a “village.” Its resident inhabitants even num- bered 8421 in 1880 and the township contained 10,820. There are Presbyterian, Baptist, Methodist, Episcopal, and Roman Catholic churches, a large town-hall, a high school and other educational institutions, a fire department build- ing, a circular railway, and numerous private mansions. Congress Park was laid out in

1875-6. In J uly and August the racecourse of the Saratoga Racing Association attracts the best patronage of the American turf.

_The Indians seem at an early date to have kuown of the medi- cinal virtues of the High Rock Spring, and in 1767 Sir William Johnson, carried thither by a party of Mohawks, was restored to health by drinking its waters. General Schuyler cut a road through the forest from Schuylerville, and in 1784 erected the first frame house in the neighbourhood of the springs. Hotels began to be built about 1815. _ New springs have from time to time been discovered, and their number has also been increased by boring, so that now there are 28 inall. They rise ina stratum of Potsdam sandstone underlain by Laurentian gneiss, &c., and reach the surface by passing through a bed of blue clay. All are charged with carbonic acid gas. The following are among the most notable:

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—Congress Spring in Congress Park, discovered in 1792 (chloride of sodium, biearbonates of lime and magnesium); Washington or Champagne Spring (1806) ; Columbian Spring (1806); Hathorn Spring (1868) ; Pavilion Spring (1839); Putnam Spring ; Geyser Spring (bored in 1870 to a depth of 140 fect and spouting 25 feet into the air); Glacier, spouting spring (bored in 1871 to 300 feet); Flat Rock Spring, known as early as 1774, but lost, and only recovered in 1884, The water from several of the springs is largely bottled and exported. The Geyser Spring (14 miles S.W.) and White Sulphur Spring and Eureka Spring (14 miles E.) are beyond the limits of the accompanying plan.

SARAWAK, a territory in the north-west of Borneo, which, reclainied from piracy and barbarism by the energy of Sir James Brooks (g.v.), was converted into an inde- pendent and prosperous state. With an area estimated at from 35,000 to 40,000 square miles, it has a population of about 250,000. The coast extends from Tanjong Datu, a prominent cape in 2° 3’ N. lat., northwards to the frontier of Brunei in 3° 10’—a distance in a straight line of about 280 miles, but, following the sinuosities, about 400 miles. Inland tlie boundaries towards the Dutch territory are hypothetically determined by the line of watershed between the streams flowing north-west and those flowing east-south-east and south-west, but the frontier

districts are to a considerable extent unexplored. Towards the coast there are tracts of low alluvial land; and some of the rivers reach the sea by deltas out of all proportion to the length of their course. The surface of the country soon, however, begins to rise and to be diversified with irregular. hills, sometimes of rounded sandstone, some- times of picturesque and rugged limestone. The Bongo Hills, in the residency of Saraéwak, are about 3000 feet high; and along the frontier, where the Seraung Mountains, the Klinkong Mountains, the Batang Lupar Mountains, &c., are supposed to form more or less continuous ranges, there are altitudes of from 4000 to 8000 feet. In some of the limestone mountains there are caves of enormous extent (a detailed account will be found in Boyle, Adven- tures among the Dyaks of Borneo, 1865). The Rejang is the largest river in Sarawak. Its sources are only 120 or 130 miles directly inland near Mount Lawi, Mount Marud (8000 feet), and Gura Peak; but it flows obliquely south- west for 350 miles, and the principal branches of its delta (the Eyan river and the Rejang proper) embrace a territory of 1600 square miles with a coast-line of 60 miles. In their upper course the headwaters have a rapid descent, and none of them are navigable above Balleh where the Rejang is deflected westward by the accession of the Balleh river. Left-hand tributaries from a low line of hills to the south—the Katibas, Nymah, Kanowit, and Kajulan rivers—continue to swell the main stream ; but there are no tributaries of any importance from the right hand, the country in that direction being drained directly seawards by a number of short rivers—the Oya, Mukah, Balinean, Tatau, and Bintulu,—of which the first three rise in the Ulat-Bulu Hills (3600 feet). At the apex of the Rejang delta lies the village and government of Sibu, and at the mouth of the Rejang branch is the important village and shipping-port of Rejang. Passing over the small river basins of the Kalukah and the Saribas we reach the Batang Lupar, which ranks next to the Rejang, and is navigable for large vessels as far as Lingga, about 30 miles from its mouth—the bar having 34 fathoms water at high tide. The value of the navigable portion of the Batang Lupar is, however, greatly lessened by the formidable bores to which it is subject; they begin about three days before full moon and change, and last about three days, rushing up the river with a crest about 6 feet high for a distance of 60 miles. In several of the other rivers a similar phe- nomenon is observed. The broad mouth of the Batang Lupar opens in the angle where the coast, which has run nearly north and south from the delta of the Rejang, turns

abruptly west; and all the rivers which reach the sea between this point and Tanjong Datu—the Sadong, the Samarahan, the Sardwak (with its tributaries the Senna, the Samban, the Poak, &c.), the Lundu, are short.

The mineral wealth of Sarawak is not unimportant. Gold washing has long been carried on in the central residency, though not with more than moderate success ; and more recently a fairly prolific gold-field has been opened in the neighbourhood of Marup, on the Batang Lupar, where there is a flourishing Chinese settle- ment. Of much greater value are the antimony ores which occur more especially in the district of the headstreams of the Sarawak, in the most various localities, occasionally as dykes in situ, but more frequently in boulders deep in the clayey soil, or perched on tower-like summits and craggy pinnacles, accessible ouly by ladders. Those rich deposits have, however, been largely exhausted, and no new ones have been discovered in other parts of the terri- tory, so that the Borneo Company (which has the monopoly of this and other minerals in the country) has been tempted to erect local furnaces to reduce the poorer qualities of ore and the refuse of the mines to regulus on the spot. A deposit of cinnabar was dis-covered by Mr Helms in 1867, at Tegora, at the foot of the Bongo Mountains, but no other occurrence of this ore of quicksilver in the territory has yet been reported. In 1876 quicksilver was exported to the value of 108,050 dollars, and in 1879 to 76,620. Coal has been worked for many years at the government mines of Simunjun, on the banks of a right-hand affluent of the Sadong; and there is known to exist at Silantck up the Lingga river (a left-hand affluent of the Batang Lupar) a very extensive coal-field, whose products, still intact, could be brought down for shipment at Lingga by a railway of some 18 miles in length. Diamonds arc occasionally found, and copper, manganese, and plumbago have been discovered, but not in paying quantitics.

Like the rest of Borneo, Sarawak is largely covered with forest and jungle. The bilian or ironwood is not only used locally but exported, especially from the Batang Lupar district, to China, where it is highly valued as a house-building and furniture timber. Gutta-percha, india-rubber (gztta-

susw), and birds' nests are also exported, but in diminishing quantities ; and their place is being taken by gambier and pepper, the cultivation of which was intro- duced by the rajah. Gambier figured at 20,461 piculs in the exports of 1881 and at 22,432 in 1884, and pepper at 28,807 piculs in 1881 and 43,490 in 1884. 'The territory of Sarawak is said to furnish more than half the sago produce of the world, and most of it is grown on the marshy banks of the Oya, Mukah, and other rivers of the northern residency of Sarawak to the distance of about 20 milesinland. 'The total value of the exports of Sarawak in 1884 was 1,145,248 dollars (1,071,528 from Kuching), that of the imports 1,083,255 dollars. Natuna and Dutch vessels are the most numerous in the shipping returns.

The government is an absolute monarchy—the present rajah being the nephew of Sir James Brooke. The rajah is assisted by a supreme council of six, consisting of two chief European residents and four natives, nominated by himself; there is also a general council of fifty, which meets once every three years or oftener if required. For administrative purposes the country is divided into eight districts corresponding to the number of principal river basins. Threc chief districts are presided over by European officers. The military foree—some 250 men—is under the control of an English commandant. There is also a small police force, and the Government possesses a few small steam vessels, The civil servicc is regularly organized, with pensions, &c. The revenue is in a satisfac- tory state, showing 64,899 dollars to the good in the period between 1875 and 1884. In 1884 the revenuc was 276,269 dollars and the expenditure 289,291. Roman Catholics and Protestants both have missions in Sarawak ; and the English bishop of Singapore and Labuan is also styled bishop of Sarawak. The population consists of Malays, Chinese, Land Dyaks, Sea Dyaks, and Milanows. " With- out the Chinainan," says the rajah (Pall Mall Gazette, 19th Septem- ber, 1883) ''we can do nothing." When not allowed to form secret societies he is easily governed, and this he is forbidden to do on pain of death, The Dyaks within the territory have given up head- hunting. The Milanows, who live in the northern districts, have adopted the Malay dress and in many cases have become Moham- medans; they are a quiet, contented, and laborious people. Slavery still prevails in Sarawak, but arrangements are made for its entire abolition in 1888. Kuching, the capital

of Sarawak, on the Sardwak river, is a place of 12,000 inhabitants and is steadily growing.

History.—In 1839-40 Sarawak, the most southern province of the sultanate of Brunei, was in rebellion against the tyranny of the governor, Pangeran Makota, and Muda Hassim had bcen sent to restore order. The insurgents held out at Balidah or Blidah fort in the Siniawan district, and there James Brooke first took part in the affairs of the territory. By his assistance the insurrection was suppressed, and on September 24th he was appointed chief of Sard- wak, In1843 Captain Keppel and Mr Brooke expelled the pirates

from the Saribas river and in 1844 they defeated those on the Batang Lupar, to whom Makota had attached himself. In 1849 another severe blow was struck by the destruction of Sirib Sahib's fort at Patusan. The Chinese, who had begun to settle in the country about 1850 (at Bau, Bidi, &c.), made a violent attempt to massacre the English and seize the government, but they were promptly and severely crushed after they had done havoc at Kuching. During Sir James Brooke's absence in England (1857— 1860) his nephew Captain J. Johnson (who had taken the name Brooke, and is generally called Captain Brooke) was left in author- ity ; but a quarrel afterwards ensued and Sir James Brooke was in 1868 succeeded by Charles Johnson (or Brooke), a younger nephew. The independence of Sarawak had been recognized after much controversy by England in 1863 and previously by the United States.

Sce Charles Brooke, Ten Years in Sardwak, 1866; Gertrude L. Jacob, The Raja of Sardwak, 1876; Spenser St John, Life in the Forests of the Far East, 1862, and Life of Sir James Brooke, 1879; elms, Pioneering in the Far East, 1882; "Notes on Sardwak," in Proc. Roy. Geogr. Soc., 1881, by W. M. Crocker.

SARDANAPALUS was, according to the account of Ctesias (preserved by Diodorus, 23 sq.), the last king of Nineveh, and he is described in terms that have made his naine proverbial as the type of splendid and luxurious effeminacy. Ctesias's story cannot be called historical ; but the name Sardanapalus seems to be a corruption of Assurbanipal (see vol. iii. p. 188).

SARDINE. SeePitcHarp. Another of the Clupeidx (C. scombrina) is the “oil-sardine” of the eastern coast of the Indian Peninsula.

SARDINIA (Ital. Sardegna, Fr. Sardaigne, Span. Cerdena, called by the ancient Greeks “Iyvotca, from a fancied resemblance to the print of a foot), an island in the Mediterranean, about 140 miles from the west coast of Italy, of which kingdom it forms a part. It is separated from the island of Corsica by the Strait of Bonifacio, which is about 74 miles wide, and only about 50 fathoms deep. Sardinia Hes between 8° 4’ and 9° 49’ E. long., and extends from 38° 55’ to 41° 16’ N. lat. The length from Cape Teulada in the south-west to Cape Longo Sardo in the north is about 160 miles, the breadth from Cape Comino to Cape Caccia about 68 miles. The area of the island is 9187 square miles,—that of the department (com- partumento), including the small islands adjacent, being 9294 square miles. It ranks sixth in point of size among the islands of Europe, coming next after Sicily.

The greater part of the island is mountainous, especially in the east, where the mountains stretch almost continu- ously from north to south, and advance close up to the coast. The elevations, however, are not so high as in the sister island of Corsica. The culminating point is Monte Gennargentu, which rises, about 22 miles from the east coast, almost exactly on the parallel of 40° N., to the height of 6250 feet, and is consequently little more than two-thirds of the height of the chief peaks of Corsica. On the east side the principal breach in the continuity of the mountains occurs in the north, where.a narrow valley opening to the east at the Gulf of Terranova cuts off the mountains of Limpara in the extreme north-east. The western half of the island has more level land. The prin- cipal plain, that of the Campidano, stretches from south- east to north-west, between the Gulf of Cagliari and that of Oristano, and nowhere attains a greater elevation than 250 feet. At both ends it sinks to a much lower level, and has a number of shallow lagoons encroaching on it from the sea. In the corner of the island situated to the south-west of the Campidano there are two small isolated mountains rising to the height of from 3000 to 4000 feet, which are of importance as containing the chief mineral wealth of the island. A small valley runs between them from the southern end of the Campidano to Iglesias, the mining centre of Sardinia. North of the Gulf of Oristano mountains again

appear. The extinct volcano of Monte Ferru there rises to the height of 4400 feet, and the streams of basalt which have issued from it in former

ages form the ridge or saddle, about 2000 feet high, con- | plain of the Campidano, the west coast opposite the island

necting this mountain with the highland area on the east. Still further north a trachytic plateau, intersected by numerous deep river valleys, occupies a considerable tract, advancing up to the plain of Sassari on the north coast.

Scale of English Miles

10 20 0

Asinara |,

Gulf of Asinara

Map of Sardinia.

The rivers are numerous but short. The principal is the Oristano, which enters the gulf of the same name on the west coast.

Geologically the island is composed mainly of granite and other crystalline rocks. Granite predominates espe- cially in the east, and the mountains of that part of the island were apparently at one time continuous with the similarly constituted mountains of Corsica. Granitic spurs likewise extend to the south-west, and appear in the capes of Spartivento and Teulada. Altogether this rock is estimated to cover one-half of the entire surface. In the west of the island the principal crystalline rocks are porphyritic in structure; sedimentary deposits are com- paratively unimportant, and such as are present are mainly either of very ancient or of recent geological date. Silurian formations attain their most considerable development in the south-west round Iglesias, where there occurred the contemporaneous porphyritic outpourings containing the most numerous mineral veins of the island.

Between the deposits of Silurian and those of Cretaceous times there are none of any consequence except a few patches of Devonian round the slopes of Gennargentu, interesting as containing some beds of true coal. The members of the Cretaceous system occupy considerable tracts in the south- west, east (round the Gulf of Orosei), and north-west (in the mountains of Nurra), and a smaller area in the south- west (in the island of San Antioco). Tertiary formations are still more largely developed. They cover the whole

of San Antioco, and the narrow valley in the north-east already mentioned. The basalts of Monte Ferru are also of Tertiary date, and it does not appear to have been till that epoch that Sardinia formed a single island.

In variety of mineral wealth the southern half of Sardinia is the richest province of Italy, and it stands second in the annual value of its mineral products. The chief minerals are sulphates of lead more or less argenti-ferous (galena), sulphates and silicates of zinc, ordinary iron pyrites, sulphates of iron and copper, of antimony, and of arsenic, besides cobalt, nickel, and silver. The coal on the flanks of Gennargentu is of good enough quality to furnish a valuable fuel, and is found in sufficiently thick seams to be workable if only the means of transport were present, but its situation is such as to render it of no economical importance. In the Tertiary deposits of the south-west there are some veins of manganese ore, and also some beds of lignite which are worked as a source of fuel for local use. The mineral wealth of Sardinia- was known in ancient times, and mines were worked both by the Carthaginians and the Romans. During the Middle Ages they were for the most part neglected, but the industry was revived in modern times, and has been greatly developed in recent years. Upwards of 70 mines have now been opened, most of them in the district of which Iglesias is the centre, but a few near the southern part of the east coast, where Muravera is the chief town. The mines are mostly of argentiferous lead, silver, zinc, and iron. The ores are mainly exported in the raw state, only the inferior sorts being smelted in the island. Among other mineral products are building stones (granite, marble, &c.), alabaster, and salt.

The climate of Sardinia is similar to that of the rest of the Mediterranean region, and the southern half of the island shares in the nearly rainless

summers characteristic of the southern portions of the Mediterranean peninsulas. At Cagliari there are on an average only seven days on which rain falls during June, July, and August. Through- out the island these months are the driest in the year, and hence vegetation on the lower ground at least is generally at a standstill during that period, and shrubs with broad leathery leaves fitted to withstand the drought (the so- called maguis) are as characteristic here as in Corsica and on the mainland. Winter is the rainiest season of the year ; but the heat and drought of summer (mean tempera- ture 95° F.) make that the most unpleasant of the seasons, while in the low grounds the prevalence of malaria renders it a most unhealthy one, especially for visitors. Autumn, which is prolonged into December, is the most agreeable season ; there is then neither heat nor cold, nor mist nor fever, and at that period birds of passage begin to immi- grate in large numbers.

The agricultural products of the island are greatly inferior to what might be expected in view of the natural fertility of the soil. Two causes are assigned for this. The first is the minute subdivision of the land, which, as in Corsica, is carried to such an extent that where an owner has as much as 100 acres his property is divided into 25 or 30 lots surrounded by parcels of land belonging to other owners. In such circumstances it is neither possible to apply adequate capital to the cultivation of the ground, nor for the owners to acquire the requisite capital. The second cause is the malaria which renders certain districts possessed of a fertile soil quite uninhabitable; and this second cause can be remedied only when a remedy has been found for the first, for, as the malaria is undoubtedly one cause of diminished cultivation, it is equally certain that want of cultivation is one of the causes of the malaria. In ancient times Sardinia was one of the granaries of Rome ; now cereals take a comparatively unimportant place among the exports, and this export is balanced by a considerable import of the same commodity. The chief products of agriculture are wheat, barley, and beans, the last furnishing an important element of the food of the people. Olives run wild in many places, and are grown in sufficient abundance to meet the local demand.

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Almonds, oranges, and citrons arc also largely cultivated, and the oranges of San Vito, near Muravera, and of Milis, a few miles to the north of Oristano, are noted for their excellence ; the white wines of the banks of the Oristano are of good repute ; and among other products of the island are mulberries, tobacco, madder, and hemp. Forests of oak, cork-oak, firs, and pines, though greatly redueed in extent, still cover, it is said, about one-fifth of the surfaee. The rearing of live-stock reeeives more attention than agriculture proper. No artificial pasture-grasses are grown, but the natural pastures beside the numerous rivers yield abundance of food, except during the dry season, when the horses, asses, cattle, sheep, and goats have to content themselves with straw, some dried beans, and a little barley. Most attention is bestowed on horses. At one time the Sardinian Government endeavoured to keep a stud on the island for rearing horses for the Piedmontese cavalry, but the persons employed (natives of the main- land) were unable to withstand the malaria. There are some large private establishments for the rearing of horses, however, and the tending of live-stock generally forms so important a part of the occupations of the people that animals rank next after minerals among the exports of the island. Of the wild animals, the wild sheep known as the musimon, or European mufflon, formerly an inhabitant of all the mountains of the Mediterranean peninsulas and islands, and now confined to Sardinia and Corsica, is the most interesting. Among the noxious aninials are scorpions and tarantulas.

The lagoons near the coast on the sonth and west abound in mullets, eels, niussels, and crabs, which are caught in great numbers by the natives, while the fisheries round Sardinia, as round Corsica, are in the hands of Italians from the mainland. The anehovy, sardine, and coral fisheries are all lucrative. The coral is said to be of excellent quality, and is exported to the markets of Genoa and Marscilles.

The external commerce of the island has nearly trebled itself in the twenty-five years 1856-81, tle imports and exports each amount- ing in the latter year to about £1,500,000 (about £2, 4s. per head of population). This increase is chiefly owing to the development of the mining industry, orcs

making up nearly one-third of the total valne of the exports. Live animals make up about a fourth of the total value, and cereals, which come next in order, about one- seventh. Thechief imports are cotton and other manufactures and colonial products. The inland trade has been greatly promoted within the last fifty years by the construction of roads and railways. Before 1828 there were no roads at all in the island; the tracks which existed could be traversed only on foot or on horseback. But upwards of 1500 miles of national and provincial roads, all well made and well kept, have since then been con- structed. Of railways, introduced since 1870, there are now 265 miles in all (equal to about 1 mile of railway for every 34 square miles of surface).

For administrative purposes Sardinia, like the rest of Italy, is divided into provinces and circles (circondarii). The following

table gives the names of these divisions with the population accord- |

ing to the last census (end of 1881) :—

Circles. Communes. Population. Cireles. Communes.| Population. Cagiiari…..... a8 158,336 || Sassari…..... 24 88,312 IsleSiAas ….....0 24 17,373 Alghero…..... 20 43,624 LANUSE!.....64 48 64,816 NOKO..,...-<5.. 33 59,794 Oristano …..... 106 125,110 (PATON. veces es 21 41,193

——_—_— |__| Tempio…..... 9 28,444 Prov. Cagliari 257 420,635 ‘ —|—_—_-— Prov. Sassari 107 261,367

The whole population of the department is thus 682,002, equal to about 74 to the square mile, Sardinia being the least populous of all the great divisions of the kingdom, in which the average

density is 255 to the square mile. The population is, however, increasing at a rather more rapid rate than on the mainland. Betwcen 1871 and 1881 it increased by about 46,000, or 7°18 per cent., while the average rate of increase throughout the kingdom was only 6°16 per cent.

The inhabitants of Sardinia are a hardy race, of about middle height, and of dark complexion. They are little accustomed to hard work, but this is one of

the consequences of the backward state of their eivilization and of the impediments already indicated to the development of the resources of the island. Education, as in many other parts of Italy, is very far behind, notwithstanding the law whieh makes elementary education compulsory; but here, as throughout the kingdom, it is rapidly extending. In 1880-81 only 37,197 children, or less than one-eighteenth of the popula- tion, were in attendance at the elementary schools, but this number was double what it had been in 1861-62. At Cagliari there is a university, attended by from 300 to 400 students.

The people are lively in their disposition, fond of music and poetry, remarkably hospitable, and strong in their family attach- ments. With this last trait, however, is connected the chief blot on their charactcr—thcir addiction to the practice of the vendetta,

which prevails here as in Corsica, and according to which an outrage on one's honour is wiped out in blood, and the cause of one member of a family is taken up by the rest, so that the death of one victim leads to the sacrifice of many others. But the practice is said to be becoming every day more rarc, and never to be resorted to except in case of serious offence.

The capital of the island is Cagliari, but Sassari in the north has an equally large population (about 34,000). The other chief towns are Tempio, Alghero, Iglesias, and Oristano. Cagliari, Alghero, and Castel Sardo are fortified.

The antiquities of the island are numerous and of peculiar interest. The most remarkable of these are the monuments called nurhags (variously spelled also nuraghe, nuraght, &c.), of which there are upwards of 3000 seattered over the island. They are round structures having the form of truncated cones, and are generally built of the hardest materials the island supplies (granite, basalt, trachyte, limestone, &c.). The stone is roughly hewn into large blocks, which are laid in regular horizontal courses but not cemented. The blocks in the lower courses are sometimes more than three feet in length. Entrance is obtained by a very low opening at the base to an inner chamber ; and, when there are two or, as in some cases, three stories, these

are connected by means of a spiral staircase. The origin and use of these structures are both matters of speculation. The rarity of human remains in them is against the idea that they were used as tombs, while the absence of any relics pertaining to a religious ceremonial is equally adverse to the supposition that they were used as temples. Next to the nurhags the most interesting of the remains of antiquity are the so-called tombs of the giants, which appear to have been actually used as plaees of burial, although, as the name given to them indi- cates, their dimensions are greatly in excess of those of the human body. Besides these there are tombs the structure of which leads to the belief that they must be relics of an Egyptian colony.

History.—According to Prof. Crespi, of the university of Cagliari, the tombs just referred to are not the only signs of an early Egyptian settlement in the island of Sardinia, Various remains are said to prove beyond doubt that Egyptians must have founded at least two colonies in very remote times —one at the ancient town of Tharrus on the small peninsula of San Marco at the northern extremity of the Gulf of Oristano, and the other at Caralis, the present Cagliari. But even before the Egyptians Prof. Crespi believes that the Phoenicians had established a colony on the small island of San Antioeo, and had built there the town of Sulcis, the ruins of which are still to be seen near the town of San Antioco. Of Pheenicians and Egyptians, however, there are no trustworthy historical records, and the first settlers whose arrival is historically accredited were the Carthaginians, who succeeded in making themselves masters of the island under Hasdrubal in 512 B.c. The island remained in Carthaginian hands for upwards of two hundred and seventy years, and then passed into those of the Romans, who took advantage of the war in which Carthage was involved with her mercenary troops after the close of the First Punic War to seize the island (238 B.c.). Thenceforward the island remained in possession of the Romans till near the fall of the empire of the West, when Sardinia also began to suffer from the ravages of the northern hordes by which Italy was at that time overrun and the empire of the West overthrown. About the middle of the 5th century the island was oecupied by the Vandals under Genseric, but in the first half of the following century these were expelled by Belisarius. Very soon after, however, Goths succeeded the Vandals, and after these had in their turn been driven out by Narses the natives managed to expel the Romans and to achieve their independence (665). The Sardinians thereupon

elected the leader in the revolt against Rome king of the island, and by him the island was divided into the four grand-judicatures of Cagliari, Arborea, Torres, and Gallura, The grand-justices or rulers of these four divisions continued to retain a considerable amount of power during a large part of the Middle Ages. But from the carly part of the 8th century down to the middle of the 11th their influence was greatly impaired by repeated inroads of the Saracens, who landed now on one coast now on another, and kept the inhabitants in a constant state of alarm. This state of matters was at last pnt an end to by the Genoese and Pisans, who, acting under the sanction of the pope, despatched a fleet. against that of the Saracens. A battle ensued in the Bay of Cagliari ; the Saracens were eompletely defeated, and the allies landed on the island (1050). Very soon the Pisans adroitly managed. to rid themselves of the Genoese, and to gain possession of almost the entire island, deposing the grand-justices of Cagliari, Torres, and Gallura. With the Pisans the greater part of the island remained till 1325, when the pope gave Sardinia to the king of Aragon, who combined with the grand-justice of Arborea to drive out the former rulers. But, this being accomplished, war soon broke out betwecn the two, and numerous successes were gained by the grand-justice Marian IV. and his daughter Eleonora acting as regent on behalf of her son Marian V., a minor. The Aragonese seemed to be on the point of being driven out of the island when Eleonora died of

the plague (1403), and soon after the whole island became an Aragonese (after the union of the crowns of Aragon and Castile a Spanish) province. It remained Spanish till the treaty of Utrecht in 1713, when it was ceded to the house of Austria, by which in 1720 it was handed over to Victor Amadeus II., duke of Savoy, in exchange for the island of Sicily. Shortly before the date of this acquisition the duke of Savoy (see Savoy) had had the title of king conferred upon him, and when the cession of Sardinia took place the title was changed to that of king of Sardinia, With this kingdom the island ultimately became merged in the kingdom of a La Marmora, Voyage en Sardaigne (Paris, 2d ed., 1837-57); Roissard de Bellet, La Sardaigne & vol d oiseau (Paris, 1884); Robert Tennant, Sardinia and its Resources (Lond., 1885). (G. G. C.)

SARDIS (ai Sdpdes), the capital of the kingdom of Lydia, the seat of a conventus under the Roman empire, and the metropolis of the province Lydia in later Roman and Byzantine times, was situated in the middle Hermus valley, at the foot of Mount Tmolus, a steep and lofty spur of which formed the citadel. It was about 20 stadia (24 miles) south of the Hermus. The earliest reference to Sardis is in the Perse of Aischylus (472 B.c.); in the Jliad the name Hyde seems to be given to the city of the Meeonian (7.e., Lydian) chiefs, and in later times Hyde was said to be the older name of Sardis, or the name of its citadel. It is, however, more probable that Sardis was not the original capital of the Meonians, but that it be- came so amid the changes which produced a powerful Lydian empire in the 8th century .c. The city, but not the citadel, was destroyed by the Cimmerians in the 7th century, by the Athenians in the 6th, and by Antiochus the Great in the 3d century; once at least, under the emperor Tiberius, it was destroyed by an earthquake ; but it was always rebuilt, and continued to be one of the great cities of western Asia Minor till the later Byzantine time. Its importance was due, first to its military strength, secondly to its situation on an important high- way leading from the interior to the Agean coast, and thirdly to its commanding the wide and fertile plain of the Hermus. ‘The early Lydian kingdom was far advanced in the industrial arts (see Lypra), and Sardis was the chief seat of its manufactures. The most important of these trades was the manufacture and dyeing of delicate woollen stuffs and carpets. The statement that the little stream Pactolus which flowed through the market-place rolled over golden sands is probably little more than a metaphor, due to the wealth of the city to which the Greeks of the 6th century B.c. resorted for supplies of gold; but trade and the practical organization of commerce were the real sources of this wealth. After Constantinople became the capital of the East a new road system grew up connecting the provinces with the capital. Sardis then lay rather apart from the great lines of communication and lost some of its importance. It still, however, retained its titular supremacy, and continued to be the seat of the metro- politan bishop of the province. It is enumerated as third, after Ephesus and Smyrna, in the list of cities of the Thracesian thema given by Constantine Porphyrogenitus in the 10th century ; but in the actual history of the next four centuries it plays a part very inferior to Magnesia ad Sipylum and Philadelphia, which*have to the present day retained their pre-eminence in the district, The Hermus valley began to suffer from the

inroads of the Seljuk Turks about the end of the 11th century ; but the successes of the Greek general Philocales in 1118 relieved the district for the time, and the ability of the Comneni, together with the gradual decay of the Seljuk power, re- tained it in the Byzantine dominions. The country round Sardis was frequently ravaged both by Christians and by Greeks during the 13th century. Soon after 1301 the Seljuk emirs overran the whole of the Hermus and Cayster valleys, and a fort on the citadel of Sardis was handed over to them by treaty. Finally in 1390 Philadelphia, which

had for some time been an independent Christian city, surrendered to Sultan Bayazid's mixed army of Ottoman Turks and Byzantine Christians, and the Seljuk power in the Hermus valley was merged in the Ottoman empire. The latest reference to the city of Sardis relates its capture (and probable destruction) by Timur in 1402. _ Its site is now absolutely deserted, except that a tiny village, Sart, merely a few huts inhabited by semi-nomadic Yuruks, exists beside the Pactolus, and that there isa station of the Smyrna and Cassaba Railway a mile north of the principal ruins.

The ruins of Sardis, so far as they are now visible, are chiefly of the Roman time; but probably few ancient sites would more richly reward the excavator with remains of all periods from the early pre-Hellenic time downwards. On the banks of the Pac- tolus two columns of a temple of the Greek period, probably the great temple of Cybele, are still standing. More than one attempt to excavate this temple, the last by Mr G. Dennis in 1882, have been made and prematurely brought to an end by lack of funds, The necropolis of the old Lydian city, a vast series of mounds, some of enormous size, lies on the north side of the Hermus, four or five miles from Sardis, a little south of the sacred lake Coloe ; here the Mzonian chiefs, sons, according to Homer, of the lake, were brought to sleep beside their mother. The series of mounds is now called Bin Tepe (Thousand Mounds). Several of them have been opened by modern excavators, but in every case it was found that treasure-seekers of an earlier time had removed any articles of value that had been deposited in the sepulchral chambers.

SARDONYX, a name applied to those varieties of onyx, or stratified chalcedony, which exhibit white layers alternating with others of red or

brown colour. The brown chalcedony is known to modern mineralogists as sardand the red as carnelian. The simplest and commonest type of sardonyx contains two strata,—a thin layer of white chalcedony resting upon a ground of either carnelian or sard; but the sardonyx of ancient writers generally presented three layers—a superficial stratum of red, an intermediate band of white, and a base of dark brown chalcedony. The sardonyx has always been a favourite stone with the cameo-engraver, and the finest works have usually been executed on stones of five strata. Such, for instance, is tle famous Carpegna cameo, in the Vatican, representing the triumph of Bacchus and Ceres, and re- puted to be the largest work of its kind ever executed (16 inches by 12). When the component layers of a sardonyx are of fine colour and sharply defined, the stone is known in trade as an “Oriental sardonyx ”—a term which is used without reference to the geographical source whence the stone is obtained. A famous ancient locality for sard was in Babylonia, and the name of the stone appears to be connected with the Persian word sered, ‘yellowish red,” in allusion to the colour of the sard, Pliny, relying on a superficial resemblance, derives the name from Sardis, reputed to be its original locality. The sardonyx is frequently stained, or at least its colour heightened, by chemical processes. Imitations are fabri- cated by cementing two or three layers of chalcedony together, and so building up a sardonyx; while baser counterfeits are formed simply of paste. See Onyx, vol. Vik. p. 00.

SARGASSO SEA. See Atiantic, vol. ili, pp. 20, 26.

SARGON, king of Assyria, 722-705 3.c. (Isa. xx. 1). See Basytonta, vol. iii. p. 187, and Israxt, vol. xiii. p. 412 sq.

SARI. See MazanpaRAn.

SARMATIANS (avpopdrar, Svppdrot, Sarmatee). In the time of Herodotus (iv. 110-117) the steppes between the Don and the Caspian were inhabited by the Sauromate, a nomadic horse-riding people, whose women rode, hunted, and took part in battle like the men, so that legend (pre- sumably the legend of the Greek colonists on the Black Sea) represented the race as descendants of the Amazons by Scythian fathers. It is recounted both by Herodotus

and by Hippocrates (De Aer., 17) that no maiden was | allowed to marry till she had slain a foc (or three foes), after which she laid aside her masculine habits. The Scythians, we are told, called the Amazons Oiéprara, which seems to be an Iranian name and to mean “lords of man,” and it is reasonable to think that the word was applied to the Sarmatian viragos by the Scythians, who themselves kept women in great subjection, and thus expressed their surprise at the dominating position of the female sex among thcir neighbours beyond the Don. But in spite of the difference of their customs in this point Scythians and Sarmatians spoke almost the same language (Herod. iv. 117), and, whatever difficulty still remains as to the race of the Scythians, their language and religion are now gencrally held to have been of Iranian character (see Scyruia). That the Sarmatians, at least, were of Median origin is the express opinion of Diodorus (ii. 43) and Pliny. From their seats east of the Danube the Sarmatians at a later date moved westward into the lands formerly Scythian, one branch, the “transplanted” Iazyges (I. pera- vaotai) being settled between the Danube and the Theiss at the time of the Dacian wars of Rome, while other Sarmatian tribes, such as the Maite on the eastern shores of Lake Meotis and the Roxolani between the Don and the Dnieper, ranged over the steppes of southern Russia. The country of Sarmatia, however, as that term is used for example by Ptolemy, means much more than the lands of the Sarmatians, comprising all the eastern European plain from the Vistula and the Dniester to the Volga, whether inhabited by nomad Sarmatians, by agricultural Slavs and Letts, or even by Finns. This Sarmatia was arbitrarily divided into an Asiatic and a European part, east and west of the Don respectively.

SARNO, a city of Italy, in the province of Salerno, 30 miles east of Naples by rail, lies at the foot of the Apennines uear the sources of the Sarno, a stream con- nected by canal with Pompeii and the sea. Besides the cathedral, a basilica erected in 1625 at some distance from the city, Sarno has several interesting churches and the ruins of a medizeval castle. Paper, cotton, silk, linen, and hemp are manufactured. The population of the town in 1881 was 11,445. Previous to its incorporation with the domains of the

crown of Naples, Sarno gave its name to a countship held in succession by the Orsini, Cappola, Suttavilla, and Colonna families.

SARPI, Pierro (1552-1623), was born at Venice, August 14, 1552, and was the son of a small trader, who left him an orphan at an early age. Quiet, serious, devoted to study, endowed with great tenacity of applica- tion and a prodigious memory, the boy seemed born for a monastic life, and, notwithstanding the opposition of his relatives, entered the order of the Servi di Maria, a minor Augustinian congregation of Florentine origin, at the age of thirteen. He assumed the name of Paolo, by which, with the epithet Servita, he was always known to his con- temporaries. In 1570 he sustained no fewer than three hundred and eighteen theses at a disputation in Mantua, with such applause that the duke attached the youthful divine to his service by making him court theologian. Sarpi spent four years at Mantua, applying himself with the utmost zeal to mathematics and the Oriental languages. He there made the acquaintance of Olivo, formerly secre- tary to a papal legate at the council of Trent, from whom he learned much that he subsequently introduced into his Mistory. After leaving Mantua for some unexplained reason, he repaired to Milan, where he enjoyed the pro- tection of Cardinal Borromeo, another authority in the council, but was soon transferred by his superiors to Venice, as professor of philosophy at the Servite convent. In 1579 he was sent to Rome on business connected with

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the reform of his order, which occupied him several years, and brought him into intimate relations with three successive popes, as well as the grand inquisitor and other persons of influence. The impression which the papal court made upon him may be collected from his sub- sequent history. Having successfully terminated the affairs entrusted to him, he returned to Venice in 1588, and passed the next seventeen years in quiet study, occasionally interrupted by the part he was compelled to take in the internal disputes of his community. In 1601 he was recommended by the Venetian senate for the small bishopric of Caorle, but the papal nuncio, who wished to obtain it for a protégé of his own, informed the pope that Sarpi denied the immortality of the soul, and had controverted the authority of Aristotle. An

attempt to procure another small bishopric in the following year also failed, Clement VIII. professing to have taken umbrage at Sarpi's extensive correspondence with learned heretics, but more probably determined to thwart the desires of the liberal rulers of Venice. The sense of injury, no doubt, contributed to exasperate Sarpi's feelings towards the court of Rome, but a man whose master passions were freedom of thought and love of country could not have played any other part than he did in the great contest which was impending. For the time, however, he tranquilly pursued his studies, writing those notes on Vieta which establish his proficiency in mathematics, and a metaphysical treatise now lost, which, if Foscarini's account of it may be relied upon, anticipated the sensa- tionalism of Locke. His anatomical pursuits probably date from a somewhat earlier period. They illustrate his versatility and thirst for knowledge, but are far from possessing the importance ascribed to them by the affection of his disciples. His claim to have anticipated Harvey's discovery rests on no better authority than a memorandum, probably copied from Czesalpinus' or Harvey himself, with whom, as well as with Bacon and Gilbert, he maintained a correspondence. The only physiological discovery which can be safely attributed to him is that of the contractility of the iris. It must be remembered, however, that his treatises on scientific subjects are lost, and only known from imperfect abstracts.

The prudent Clement died in March 1605; and after one ephemeral succession and two very long conclaves Paul V. assumed the tiara with the resolution to strain papal prerogative to the uttermost. At the same time Venice was adopting measures to restrict it still further. The right of the secular tribunals to take cognizance of the offences of ecclesiastics had been asserted in two remarkable cases; and the scope of two ancient laws of the city of Venice, forbidding the foundation of churches or ecclesiastical congregations without the consent of the state, and the acquisition of property by priests or religious bodies, had been extended over the entire territory of the republic. In January 1606 the papal nuncio delivered a brief demanding the unconditional sub- mission of the Venetians. The senate having promised protection to all ecclesiastics who should in this emergency aid the republic by their counsel, Sarpi presented a memoir, pointing out that the threatened censures might be met in two ways,—de facto, by prohibiting their publication, and de jure, by an appeal to a general

council, The document was received with universal applause, and Sarpi was immediately made canonist and theological counsellor to the republic. When in the following April the last hopes of accommodation were dispelled by Paul's excommunica- tion of the Venetians and his attempt to lay their dominions under an interdict, Sarpi entered with the utmost energy into the controversy. He prudently began by republishing the anti-papal opinions of the famous

canonist Gerson. In an anonynious tract published shortly afterwards (Risposta di un Dottore in Teologia) he laid down principles which struck at the very root of the pope's authority in secular things. This book was promptly put upon the Index, and the republication of Gerson was attacked by Bellarmine with a severity which obliged Sarpi to reply in an Apologia. The Considerazioni sulle Censure and the Z'rattato dell' Interdetto, the latter partly prepared under his direction by other theologians, speedily followed. Numerous other pamphlets appeared, inspired or controlled by Sarpi, who had received the further appointment of censor over all that should be written at Venice in defence of the republic. His activity registers the progress of mankind, and forms an epoch in the history of free discussion. Never before in a religious controversy had the appeal been made so exclusively to reason and history; never before had an ecclesiastic of his eminence maintained the subjection of the clergy to the state, and disputed the pope's right to employ spiritual censures, except under restrictions which virtually abrogated it. In so doing he merely gave expression to the convictions which had long been silently forming in the breasts of enlightened men, and this, even more than his learning and acuteness as a disputant, insured him a moral victory. Material arguments were no longer at the pope's disposal. The Venetian clergy, a few religious orders excepted, disregarded the interdict, and discharged their functions as usual. The Catholic powers refused to be drawn into the quarrel. At length (April 1607) a compromise was arranged through the mediation of the king of France, which, while salving over the pope's dignity, conceded the points at issue. The great victory, however, was not so much the defeat of the papal preten- sions as the demonstration that interdicts and excommuni- cations had lost their force. Even this was not wholly satisfactory to Sarpi, who

longed for the toleration of Protestant worship in Venice, and had hoped for a separa- tion from Rome and the establishment of a Venetian free church by which the decrees of the council of Trent would have been rejected, and in which the Bible would have been an open book. But the controversy had not lasted long enough to prepare men's minds for so bold a measure. The republic rewarded her champion with the further distinction of state counsellor in jurisprudence, and, a unique mark of confidence, the liberty of access to the state archives. These honours exasperated his adversaries to the uttermost; and after citations and blandishments had equally failed to bring him to Rome he began to receive intimations that a stroke against him was preparing in that quarter. On October 5 he was attacked by a band of assassins and left for dead, but the wounds were not mortal. The bravos found a refuge in the papal territories. Their chief, Poma, declared that he had been moved to attempt the murder by his zeal for religion, a degree of piety and self-sacrifice which seems incredible in a bankrupt oil-merchant. * Agnosco stylum Curiz Romane," Sarpi himself pleasantly said, when his surgeon commented upon the ragged and _inartistic character of the wounds, and the justice of the observa- tion is as incontestable as its wit. The only question can be as to the degree of complicity of Pope Paul V., a good man according to his light, but who must have looked upon Sarpi as a revolted subject, and who would find casulsts enough to assure him that a prince is justified in punishing rebels by assassins when they are beyond the reach of executioners,

_The remainder of Sarpi's life was spent peacefully in his cloister, though plots against him continued to be formed, and he occasionally spoke of taking refuge in England. When not engaged in framing state papers, he

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devoted himself to scientific studies, and found time for the composition of several works. A Machiavellian tract on the fundamental maxims of Venetian policy (Opinione come debba governarsi la repubblica di Venezia), used by his adversaries to blacken his memory, though a contemporary production, is undoubtedly not his. It has been attributed to a certain Gradenigo. Nor did he complete a reply which he had been ordered to prepare to the Squttinio della Laberta Veneta, which he perhaps found

unanswerable. In 1610 appeared his Wistory of Ecclesiastical Benefices, “in which,” says Ricci, “he purged the church of the de- filement introduced by spurious decretals.” In the follow- ing year he assailed another abuse by his treatise on the right of asylum claimed for churches, which was immediately placed on the Inde. In 1615 a dispute between the Venetian Government and the Inquisition respecting the prohibition of a book led him to write on the history and procedure of the Venetian Inquisition; and in 1619 his chief literary work, the History of the Council of Trent, was printed at London under the name of Pietro Soave Polano, an anagram of Paolo Sarpi Veneto. The editor, Marco Antonio de Dominis, has been accused of falsifying the text, but a comparison with a MS. corrected by Sarpi himself shows that the alterations are both unnecessary and unimportant. This memorable book, together with the rival and apologetic history by Cardinal Pallavicini, is minutely criticized by Ranke (History of the Popes, appendix No. 3), who tests the veracity of both writers by examining the use they have respectively made of their MS. materials. The result is not highly favourable to either, nor wholly unfavourable ; neither can be taxed with deliberate falsification, but both have coloured and suppressed. They write as advocates rather than historians, Each had access to sources of information denied to the other ; so that, although it may be true ina sense that the truth lies between them, it cannot be attained by taking the middle way between their statements. Ranke rates the literary qualities of Sarpi’s work very highly. “Sarpi is acute, penetrating, and sarcastic; his arrangement is exceedingly skilful, his style pure and unaffected. In power of description he. is without doubt entitled to the second place among the modern historians of Italy. I rank him immediately after Machiavelli.” Sarpi never acknowledged his authorship, and baffled all the efforts of the Prince de Condé to extract the secret from him. He survived the publication four years, dying on January 15, 1623, labouring for his country to the last. The day before his death he had dictated three replies to questions on affairs of state, and his last words were “Esto per- petua.” His posthumous History of the Interdict was printed at Venice the year after his death, with the disguised imprint of Lyons.

Sarpi’s services to mankind are nowacknowledged by all except the most extreme Ultramontane partisans ; and of his general character it is enough to say that even theologieal hatred has been unable to fix the least personal

imputation upon him. To the highest qualities of the scholar, the statesman, and the patriot he added charity, mag- nanimity, and disinterestedness. The only point on which his con- duct may be thought to require apology is the reserve in which he shrouded his religious opinions. Great light has been thrown upon his real belief and the motives of his conduct by the letters of Chris- toph von Dohna, envoy of Christian, prince of Anhalt, to Venice, pub- lished by Moritz Ritter in the Briefe wnd Acten zur Geschichte des dreissigéhrigen Kricges, vol. ii. (Munich, 1874). Sarpi told Dohna that he greatly disliked saying mass, and cclebrated it as seldom as possible, but that he was compelled to do so, as he would other- Wise seem to admit the validity of the papal prohibition, and thus betray the cause of Venice. ‘This supplics the key to his whole behaviour; he was a patriot first and a‘religious reformer after- wards. He was most anxious to obtain liberty of Protestant worship at Venice, but scareely proceeded beyond good wishes, partly from prudence, partly from being “rooted” in what Diodati described to Dohna as “the most dangerous maxim, that God docs not regard cxternals so long as the mind and heart are right before

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Him.” “It is of little avail,” adds Diodati, “to dispute with him,

for all blows fall ineffectually upon the sweetness and maturity of |

affections and spirit whieh raise him above well nigh every emotion.” Sarpi had another maxim, which he thus formulated to Dohna: ‘‘Le falsité non dico mai mat, ma la verita non a ognuno.” It must further be considered that, though Sarpi admired the English prayer-book, he was neither Anglican, Lutheran, nor Calvinist, and might have found it difficult to accommodate

himself to any Protestant church. On the whole, the opinion of Le

Courayer, “qu’ il était Catholique en gros et quelque fois Protestant en détail,” seems not altogether groundless, though it can uo longer be accepted as a satisfactory summing up of the question. His discoveries in

natural seience have been overrated, but his scientific attainments must have been great. Galileo would not have wasted his time in corresponding with a man from whom he could learn nothing ; and, though Sarpi did not, as has been asserted, invent the telescope, he immediately turned it to practical account by eonstructing a map of the moon.

Sarpi's life was written by his enthusiastic disciple, Father Fulgenzio Micanzio, whose work does honour to his heart, but is both meagre and uncritical. Bianchi-Giovini's modern biography (1836) is greatly marred by digressions, but is on the whole the most satisfactory extant, though inferior in some respects to that by Miss Arabella Georgina Campbell (1869), a labour of love, enriched by numerous references to MSS. unknown to Bianchi-Giovini. The numcrous mis- prints which disfigure the English edition of this work have been corrected in an Italian translation, T. A. Trollope's Paul the Pope and Paul the Friar (1861) is in the main a mere abstract of Bianchi-Giovini, but adds a spirited account of the conclave of Paul V. 'Ihe incidents of tlie Venetian dispute from day to day are related in the contemporary diaries published by Enrico Cornet (Vienna, 1859). Giusto Fontanini's Storia Arcana della Vita di Pietro Sarpi (1863), a bitter libel, is nevertheless important for the letters of Sarpi it contains, as Griselini's Memorie Anedote (1760) is from the author's access to Sarpi's un- published writings, afterwards unfortunately destroyed by fire. Foscarini's History of Venetian Literature is important on the same account. Sarpi's memoirs on state affairs remain in the Venetian archives. Portions of his correspondence have been printed at various times, and incdited Icttcrs from him are of frequent occurrence in public libraries. The King's Library in the British Museum has a valuable collection of tracts in the. Interdict controversy, forined by Consul Smith. (R. G.)

SARRAZIN, Jacques (1588-1660), French painter, born at Noyon in 1588, was a pupil of the father of Simon Guillain, but he went to Rome at an early age and worked there under a Frenchman named Anguille. Start- ing thus, Sarrazin speedily obtained employment from Cardinal Aldobrandini at Frascati, where he won the friendship of Domenichino, with whom he afterwards worked on the high altar of St Andrea della Valle. His return to Paris, where he married a niece of Simon Vouet's, was signalized by a series of successes which attracted the notice of Sublet des Noyers, who

entrusted to him the work by which Sarrazin is best known, the decoration of the great portal and dome of the western facade of the interior court of the Louvre. The famous Caryatides of the attic show, especially in the way in which the shadows are made to tell as points of support, the profound and intelligent study of Michelangelo's art to which Sarrazin had devoted all the time he could spare from bread- winning whilst in Rome. He now executed many commis- sions from the queen and from all the chief personages of the day, devoted much time to painting, and was an active promoter of the foundation of the Academy. The mauso- leum for the heart of the Prince de Condé in the Jesuit church of the Rue Saint Antoine was his last considerable work (see Lenoir, Musée des Monuments Francais, v. 5); he died 3d December 1660, whilst it was in progress, and the crucifix of the altar was actually completed by one of his pupils named Gros.

SARSAPARILLA, a popular alterative remedy, prepared from the long fibrous roots of several species of the genus Smilax, indigenous to Central America, and extending from the southern and western coasts of Mexico in the north to Peru in the south. These plants grow in swampy forests seldom visited by European travellers, and, being dicecious and varying much in the form of leaf in different individuals, they are but imperfectly known to botanists, ouly two species having been identified as yet with any degree of certainty. These are Smilax officinalis, Kth., and S. medica, Schlecht. and Cham., which yield respectively the so-called "Jamaica" and the Mexican varieties. The introduction of sarsaparilla into European medicine dates from the middle of the 16th century. Monardes, a physi-

cian of Seville, records that it was brought to that city from New Spain about 1536-45, that a better sort soon afterwards came from Honduras, and that an excellent variety of a darker colour, and consisting of larger roots, was subsequently imported from Guayaquil. Sarsaparilla must have come into extensive use soon afterwards, for Gerard, about the close of the century, states that it was imported into England from Peru in great abundance.

When boiled in water the root affords a dark extractive matter, the exact nature of which has not been determined; the quantity of extract yielded by

the root is used as a criterion of its quality. Boiling alcohol extracts from the root a neutral substance in the form of crystalline prisms, which crystallize in scales from boiling water. This body, which is named parillin, is allied to the saponin of quillaia bark, from which it differs in not exciting sneezing. The presence in the root of starch, resin, and oxalate of lime is revealed by the use of the microscope. Sarsaparilla ig chiefly used in medicine in the form of decoction and fluid extract. It is regarded by many as a valuable alterative and diaphoretic in chronic rheumatism, syphilis, and various skin diseases, but by others as possessing little if any remedial value. It is frequently prescribed in com- bination with powerful medicines, such as iodide of potassium or bichloride of mercury.

The varieties of sarsaparilla met with in commerce at present are the following :—Jamaica, Lima, Honduras, Guatemala, Guayaquil, and Mexican. Of these the first-named is the most highly esteemed, as yielding the largest amount of extract, viz., from 33 to 44 per cent. ; it is the only kind admitted into the British pharmacopeia. On the Continent, and more especially in Italy, the varieties having a white starchy bark, like those of Honduras and Guatemala, are preferred. ‘‘ Jamaica” sarsaparilla is not produced there, but derives its name from the fact that Jamaica was at one time the emporium for sarsaparilla, which was brought thither from Honduras, New Spain, and Peru. Sarsaparilla is grown toa small extent in Jamaiea, and is oecasionally exported thence to the London market in small quantities, but its orange colour and starchy bark are so different in appearance from the thin reddish-brown bark of the genuine drug, that it does not meet with a ready sale. The Jamaica sarsaparilla of trade is collected on the Cordilleras of Chiriqui, in that part of the isthmus of Panama which adjoins Costa Rica, where the plant yielding it grows at an elevation of 4000 to 8000 feet, and is brought down to Boca del Toro on the Atlantie coast for shipment. It is met with in commerce in the form of hanks about 18 inches long and 4 inches in diameter, loosely wound round with a long root of the same drug. Theroot bark is of a reddish-brown colour, thin and shrivelled, and there is an abundance of rootlets, which are technically known by the name of ‘‘beard.” Lima sarsaparilla resembles the Jamaica kind, but the roots are of a paler brown colour, and are formed into cylindrical bundles of similar length, but only about 2} inches in diameter. Honduras sarsaparilla occurs in the form of cylindrical rolls about 80 inches

long and 4 or niore in diameter, closely wound round with a long root so as to form a neat bundle. The roots are less wrinkled, and the bark is whiter and more starchy, than in the Jamaica kind. It is exported from Belize to the extent of about 10,000 fb annually. Guatemala sarsaparilla is very similar to that of Honduras, but has a more decided orange hue, and the bark shows a tendency to split off. Guayaquil sarsaparilla is obtained chiefly in the valley of Alausi, on the western side of the equatorial Andes. The roots are roughly packed in large bales and are not made into separate hanks, and the chump or rootstock is often allowed to remain attached to the roots. The bark is thick and furrowed, and of a pale fawn colour internally ; the rootlets are few, and the root itself is of larger diameter than in the other kinds. Somctimes there is attached to the rootstock a portion of stem, which is round and not prickly, differing in these respeets from that of Smilax officinalis, which is square and prickly. Mexican sarsaparilla also is not made up into hanks, but is packed in straight lengths of about 3 feet into bales, the ehump and por- tions of an angular but not square stem being frequently attached to the roots. The latter are slender, shrivelled, and nearly devoid of rootlets. This kind of sarsaparilla is collected on the eastern slope of the Mexican Andes throughout the year, and is the pro- duee of Smilax medica, Sehlecht. and Cham.

The collection of sarsaparilla root is a very tedious business; a single root takes an Indian half a day or sometimes even a day and a half to unearth it. The roots extend horizontally in the ground on all sides for about 9 feet, and from these the earth has to be carefully scraped away and other roots cut through where such come across them. A plant four years old will yield 16 fb of fresh

root, and a well-grown one from 32 to 64 fb, but more than half the | (average quantity 3,883,330). Fodder was grown to the amount

weight is lost in drying. The more slender roots are generally Icft, and the stem is cut down near to the gronnd, the crown of the root being covered with leaves and earth. Thus treated, the plant con- tinues to grow, and roots may again be cut from it after the lapse of two years, but the yield will be smaller and the roots more slender and less starchy. In some varieties, as the Guayaquil and Mexican, the whole plant, including the rootstock, is pulledup. The Indians are guided in their selection of roots by the number of stems arising from the roots, by the thinness of the leaves, and the close- ness with which the stem is beset with prickles. :

In several species of Smilax the roots become thickened here and there into large tubcrous swellings 4 to 6 inches long, and one or two inches in thickness. These tubers form a considerable article of trade in China, but are used to a limited extent only on the Continent, under the name of China root, althongh introduced into Europe about the same time as sarsaparilla. China root is obtained both in China and India from Smilax glabra and S. laneexfolia, Roxburgh, and S. China, L. A similar root is yielded by &. pseudo-China, L., and S. tamnotdes in the United States from New Jersey southwards ; by S. baldisiana, Kth., in the West Indies, and by S. Japieanga and S. syringoides, Griseb., and S. Brasiliensis, Spreng., in South America. All these are used as an alterative remedy in the localities where they grow. The amount of China root exported to Europe from Canton in 1872 was only 51,200 fb, althongh in the same year as much as 1,367,733 Ib was exported from the city of Hankow to other Chinese ports. In 1882 Bombay imported from China 945 ewts. of the root. The name of Indian sarsaparilla is given to the roots of Hemidesmus indicus, R. Br., an Asclepiadaceous plant indigenous to India. These roots are readily distinguished from those of true sarsaparilla by their loose cracked bark and by their odour and taste, recalling those of melilot.

SARTHE, a department of the north-west region of France, formed in 1790 out of the eastern part of Maine, 29 communes of Anjou, and portions of Perche. Situated between 47° 35’ and 48° 30’ N. lat., and between 0° 25’ W. and 0° 55 E. long., it is bounded N. by the depart- ment of Orne, N.E. by Eure-et-Loir, E. by Loir-et-Cher, 8S. by Indre-et-Loire and Maine-et-Loire, and W. by Mayenne. The Sarthe, a sub-tributary of the Loire, flows in a south- westerly direction through the department ; and the Loir, which

along with the Sarthe joins the Mayenne to form the Maine above Angers, traverses its southern borders. The general slope of the country is from north to south-west. While the highest point (on the boundary towards Orne) is 1115 feet, the lowest, where the Loir leaves the depart- ment, is only 65. The hills that separate the streams rise as they advance north-east into Perche, or north-west into what are magniloquently called the Alpes Mancelles (1080 feet high). The Sarthe flows past Le Mans and Sablé, re- ceiving the Merdereau and the Végre from the right, and the Orne and the Huisne from the left. The Loir passes La Fléche, and along its chalky banks caves have been hollowed out which, like those along the Cher and the Loire, serve as dwelling-houses and stores. The mean annual temperature differs but slightly from that of Paris. There are in the year 145 days of rain (with 12 of snow), 56 of frost, 180 of fogs, 20 of hail, and 14 of storm. The rainfall is about 24 inches, or rather below the average for France.

Ofa total surface of 1,533,760 acres, 982,635 acres in the depart- ment are arable, 198,517 under wood, 190,176 in meadows and grass, 42,000 in moors, and 22,284 in vineyards. In 1881 the live stock comprised 61,400 horses, 6524 asses or mules, 182,195 cattle, 49,373 sheep (wool-clip 83 to 84 tons), 79,737 pigs, 24,369 goats, 12,898 hives (76 tons of honey, 214 tons wax). Poultry (capons, geese, &c.) form one of the most remunerative products of the de- partment, which sends yearly to Paris 250,000 fowls and 100,000 geese, and consumes or disposes of 10,000,000 eggs. The horses are, like those of Perche (percherons), famous for speed combined with strength. There are three distinct districts :—the corn lands to the north of the Sarthe and the Huisne; the moorlands, partly planted with pine, between those two streams and the Loir ; and the wine-growing country to the south of the Loir. In 1883 the grain crop yielded 2,813,387 bushels of wheat, 951,039 of meslin, (14,248 of rye, 2,317,760 of barley, 1,993,049 of oats, 30,880 of maize, and 59,680 of buckwheat; and therc were 9,536,312 bushels of potatoes and 92,521 of beans, pease, &c., 81,664 tons of beetroot, 4794 tons of hemp, and 6 of flax. In 1884 cider was produced to the extent of 15,473,414 gallons (average quantity per annum in previous years 8,628,444 gallons), and wine to 4,347,134 gallons

of 381,110 tons; and there were considerable supplics of chestnuts and hazel nuts—Chateau du Loir being the principal market for the former.

From the forests, which consist mainly of oaks, witch-elms, chestnut-trees, pines, and beeches, material is drawn to the value of £140,000. The agriculture of the district has made great pro- gress through the opening up of roads, improvements, draining, and irrigation. Besides mines of anthracite and coal (21,205 tons in 1882), iron-ore, marble, freestone, slate, millstones, clay, marl, lime, tuffeau (a kind of white chalky tuff), magnesia, and peat are all worked. The staple industry is the weaving of hemp and flax (3395 spindles, 4400 looms, 400 being power-looms). The cotton manufacture ranks next (8700 spindles, 185 looms, of which 100 are power-looms), while the woollen manufacture employs only 350 spindles and 161 looms. In the paper-mills 569 workmen are engaged, and the value of the paper and cardboard produced was £180,880 in 1881. Jron-foundries, copper and bell foundries, potteries, tile-works, glass-works and stained glass manufactorics, currieries, engine and carriage factories, wire-gauze factorics, flour- mills, and distilleries are also carried on; and altogether about 256 steam-engines with 2480 horse-power are employed in those establishments. The commerce of the department is facilitated by 99 miles of navigable river (Sarthe and Loir), 250 miles of national roads, 6707 miles of other roads, and 352 miles of railway.

With its 438,917 inhabitants (1881) Sarthe has exactly the average density of population in France. From 1801 (380, 821) to 1866 (465,615) the number was on the increase, but since that date there has been a decline. The department forms the diocese of Le Mans, has its court of appeal at Angers, and its university authorities at Caen, and constitutes part of the territory of the fourth corps d’armée with its headquarters at Le Mans. ‘he four arrondissements are named from Le Mans, the chief town; LaFléche (9424 inhabitants), famous for its prytanée militaire; Mamers (6070 inhabitants) ; and St Calais (3600). There are 33 cantons and 387 communes. Sablé (6000 inhabitants) contains a castle built for Colbert by Mansart; and hard by was the celebrated Benedictine abbey of Solesmes,

SARTI, Giuseppe (1729-1802), musical theorist and composer, was born at Faenza, Italy, December 1, 1729, educated—according to the best accounts —by Padre Martini, and appointed organist of the cathedral of Faenza before the completion of his nineteenth year. Resigning his appointment in 1750, Sarti devoted himself with ardour to the study of dramatic music, and

in 1751 produced his first opera, Pompeo, with great success. His next works, J7 Ré Pastore, Medonte, Demofoonte, and L'Olimpiade, assured him so brilliant a reputation that in 1753 King Frederick V. of Denmark invited him to Copenhagen, with the appointments of hofkapellmeister and director of the opera. In 1765 he travelled to Italy for the purpose of engaging some new singers; and mean- while the death of King Frederick put an end for the time to his engagement.! He was recalled to Copenhagen in 1768, and for some years enjoyed an extraordinary amount of court favour; but, though he carefully abstained from politics, the disasters from which both court and country so cruelly suffered at this critical period gradually undermined his position, and in 1775 he was banished from Denmark in disgrace. During his residence in Copenhagen Sarti composed a great number of operas, most of which were fairly successful, though few survived the epoch of their production. On his return to Italy in 1775 he was appointed director of the Ospedaletto—the most important music school in Venice ; this post, however, he relinquished in 1779, when, after severe competition, he was elected maestro di cappella at the cathedral of Milan. Here he exercised his true vocation,—composing, in addition to at least twenty of his most successful operas, a vast quantity of sacred music for the cathedral, and educating a number of clever pupils, the most distinguished of whom was Cherubini, who was never weary of singing his praises as the most accomplished musician and first teacher of the age.

In 1784 Sarti was invited by the empress Catherine II. to St Petersburg. On his way thither he stopped at

1 It was probably during this temporary suspension of duty that he made the attempt to establish himself in London, but failed to obtain a hearing at the King's Theatre.

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Vienna, where the emperor Joseph II. received him with marked favour, and where he made the acquaintance of Mozart. He reached St Petersburg in 1785, and at once took the direction of the opera, for which he composed many new piecccs, besides some very striking sacred music, including a Ze Deum for the victory at Otchakoff, in which he introduced the firing of real cannon. He remained in Russia seventeen years; but by the end of that time his health was so broken by the climate that he solicited permission to return. The empress and her successor Paul I. had then been some time dead ; but the emperor Alexander dismissed Sarti with all possible honour, and he quitted the country in 1802 with a liberal pension and letters of nobility granted to him by the empress Catherine. His most successful operas in Russia were Armida and Olega, for the latter of which the empress herself wrote the libretto. Sarti did not live to reach Italy, but died at Berlin, July 28, 1802.

There can be no doubt that Cherubini owed much of his stupen- dous learning to the judicious teaching of Sarti, who was an accomplished mathematician and physicist as well as a musician, and whose works, if they lack the impress of true genius, show

extraordinary talent, and are marked throughout by faultless taste, combined with technical skill of the highest order.

SARTO, ANDREA DEL (1487-1531). This celebrated painter of the Florentine school was born in Gual- fonda, Florence, in 1487, or perhaps 1486, his father Agnolo being a tailor (sarto): hence the nickname by which the son is constantly designated. The family, though of no distinction, can be traced back into the 14th century. Vannucchi has constantly been given as the sur- name,—according to some modern writers, without any authority, but it seems rather difficult to accept this dictum. There were four other children of the marriage. In 1494 Andrea was put to work under a goldsmith. This occupation he disliked. He took to drawing from his master’s models, and was soon transferred to a skilful woodcarver and inferior painter named Gian Barile, with whom he remained until 1498. Barile, though a coarse- grained man enough, would not stand in the way of the advancement of his promising pupil, so he recommended him to Picro di Cosimo as draughtsman and colourist. Piero retained Andrea for some

years, allowing him to study from the famous cartoons of Leonardo da Vinci and Michelangelo. Finally Andrea agreed with his friend Francia Bigio, who was somewhat his senior, that they would open a joint shop; at a date not precisely defined they took a lodging together in the Piazza del Grano. Their first work in partnership may probably have been the Baptism of Christ, done for the Florentine Com- pagnia dello Scalzo, a performance of no great merit, the beginning of a series, all the extant items of which are in monochrome chiaroscuro. Soon afterwards the partnership was dissolved. From 1509 to 1514 the brotherhood of the Servi employed Andrea, as well as Francia Bigio and Andrea Feltrini, the first-named undertaking in the portico of the Annunziata three frescos illustrating the life of the founder of the order, S. Filippo Benizzi. He executed them in a few months, being endowed by nature with remarkable readiness and certainty of hand, and unhesitat- ing firmness in his work, although in the general mould of his mind he was timid and diffident. The subjects are the Saint Sharing his Cloak with a Leper, Cursing some Gamblers, and Restoring a Girl possessed with a Devil. The second and third works excel the first, and are impulsive and able performances.. These paintings met with merited applause, and gained for their author the pre-eminent title “Andrea senza errori” (Andrew the unerring),—the correctness of the contours being parti- cularly admired. After these subjects the painter pro- ceeded with two others—the Death of St Philip, and the

Children Cured by Touching his Garment,—all the five works being completed before the close of 1510. The youth of twenty-three was already in technique about the best fresco-painter of central Italy, barely rivalled by Raphael, who was the elder. by four years. Michelangelo’s Sixtine frescos were then only in a preliminary stage. Andrea always worked in the simplest, most typical, and most trying method of fresco—that of painting the thing once and for all, without any subsequent dry-touching. He now received many commissions. The brotherhood of the Servi engaged him to do two more frescos in the Annunziata at a higher price; he also painted, towards 1512, an Annunciation in the monastery of 8. Gallo.

The’ “ Tailor’s Andrew” appears to have been an easy- going plebeian, to whom a modest position in life and scanty gains were no grievances. As an artist he must have known his own value ; but he probably rested content in

the sense of his superlative powers as an executant, and did not aspire to the rank of a great inventor or leader, for which, indeed, he had no vocation. He leda social sort of life among his compeers of the art, was intimate with the sculptor Rustici, and joined a jolly dining-club at his house named the Company of the Kettle, also a second club named the Trowel. At one time, Francia Bigio being then the chairman of the Kettle-men, Andrea recited, and is by some regarded as having composed, a comic epic, “The Battle of the Mice and Frogs”—a rechauffé, as one may surmise, of the Greek Batrachomyomachia, popularly ascribed to Homer. He fell in love with Lucrezia (del Fede), wife of a hatter named Carlo Recanati; the hatter dying opportunely, the tailor’s son married her on 26th December 1512. She was a very handsome woman, and has come down to us treated with great suavity in many a picture of her lover- husband, who constantly painted her as a Madonna and otherwise; and even in painting other women he made them resemble Lucrezia in general type. She has been much less gently handled by Vasari and other biographers. Vasari, who was at one time a pupil of Andrea, describes her as faithless, jealous, overbearing, and vixenish with the apprentices. She lived to a great age, surviving her second husband 40 years.

By 1514 Andrea had finished his last two frescos in the court of the Servi, than which none of his works was more admired—the Nativity of the Virgin, which shows the influence of Leonardo, Domenico Ghirlandajo, and Fra Bartolommeo, in effective fusion, and the Procession of the Magi, intended as an amplification of a work by Baldovinetti; in this fresco is a portrait of Andrea him- self. He also executed at some date a much-praised Head of Christ over the high altar. By November 1515 he had finished at the Scalzo the allegory of Justice, and the Baptist Preaching in the Desert, —followed in 1517 by John Baptizing, and other subjects. Before the end of 1516 a Pieta of his composition, and afterwards a Madonna, were sent to the French Court. These were received with applause; and the art-loving monarch Francis J. suggested in 1518 that Andrea should come to Paris. He journeyed thither towards June of that year, along with his pupil Andrea Sguazzella, leaving his wife in Florence, and was very cordially received, and for the first and only time in his life was handsomely remunerated. Lucrezia, however, wrote urging his return to Italy. The king assented, but only on the understanding that his absence from France was to be short; and

he entrusted Andrea with a sum of money to be expended in purchas- ing works of art for his royal patron. The temptation of having a goodly amount of pelf in hand proved too much for Andrea's virtue. He spent the king's money and some of kis own in building a house for himself in Flor-

ence. This necessarily brought him into bad odour with Francis, who refused to be appeased by some endeavours which the painter afterwards made to reingratiate him- self. No serious punishment, however, and apparently no grave loss of professional reputation befell the defaulter. In 1520 he resumed work in Florence, and executed the Faith and Charity in the cloister of Lo Scalzo. These were succeeded by the Dance of the Daughter of Herodias, the Beheading of the Baptist, the Presentation of his Head to Herod, an allegory of Hope, the Apparition of the Angel to Zacharias (1523), and the monochrome of the Visitation. This last was painted in the autumn of 1524, after Andrea had returned from Luco in Mugello,—to which place an outbreak of plague in Florence had driven him, his wife, his step-daughter, and other relatives. In 1525 he painted the very famous fresco named the Madonna del Sacco, a lunette in the cloisters of the Servi ; this picture (named after a sack against which Joseph is represented propped) is generally accounted his master- piece. His final work at Lo Scalzo, 1526, was the Birth of the Baptist, executed with some enhanced elevation of

style after Andrea had been diligently studying Michel-

angelo's figures in the sacristy of S. Lorenzo. In the following year he completed at S. Salvi, near Florence, a celebrated Last Supper, in which all the personages seem to be portraits. This also is a very fine example of his style, though the conception of the subject is not exalted. It is the last monumental work of importance which Andrea del Sarto lived to execute. He dwelt in Florence

throughout the memorable siege, which was soon followed

by an infectious pestilence. He caught the malady, struggled against it with little or no tending from his wife,

who held aloof, and died, no one knowing much about it at the moment, on 22d January 1531, at the comparatively He was buried unceremoniously

early age of forty-three. in the church of the Servi.

Various portraits painted by Andrea are regarded as likenesses

of himself, but this is not free from some doubt. One is in the London National Gallery, an admirable half-figure, purchased in 1862. Another is at Alnwick Castle, a young man about twenty years of age, with his elbow onatable. Another at Panshanger may perhaps represent in reality his pupil Domenico Conti. Another youthful portrait is in the Uffizi Gallery, and the Pitti Gallery contains more than one. Among his more renowned works not already specified arc the following. The Virgin and Child, with St Francis and St John the Evangelist and two Angels, now in the Uffizi, painted for the chureh of S. Francesco in Florence ; this is termed the Madonna di S, Francesco, or Madonna delle Arpie, from certain figures of harpies which are decoratively introduced, and is rated as Andrea's masterpiece in oil-painting. The altar- piece in the Uffizi, painted for the monastery of 8. Gallo, the Fathers Disputing on the Doctrine of tho Trinity—Sts Augustine, Dominic, Francis, Lawrence, Sebastian, and Mary Magdalene— & very energetic work. Both these pictures are comparatively early—towards 1517. The Charity now in the Louvre (perhaps the only painting which Andrea executed while in France). The Pieta, in the Belvedere of Vienna; this work, as well as the Charity, shows a strong Michelangelesque influence. At Poggio a Caiano a celebrated fresco (1521) representing Julius Cxsar recciving tribute, various figures bringing animals from foreign lands—a striking perspective arrangement ; it was left unfinished by Andrea, and was completed by Alessandro Allori. Two very remarkable paintings (1523) containing various incidents of the life of the patriarch J oseph, executed for the Borgherini family. In the Pitti Gallery two Separate compositions of the Assump- tion of the Virgin, also a fine Pieth. In the Madrid Museum the Virgin and Child, with J oseph, Elizabeth, the infant Baptist, and an Archangel. In the Louvre the Holy Family, the Baptist pointing upwards. In the Berlin Gallery a portrait of his wife. In Panshanger a fine portrait named Laura. The second picture in the National Gallery ascribed to Andrea, a Holy Family, is by Some critics regarded as the work rather of one of his

seliolars— we hardly know why. A very noticcable incident in the life of Andrea del Sarto relates to the copy, which he produced in 1523, of the portrait group of Leo X. by Raphael; it is now in the Naples Museum, the original being in the Pitti Gallery. Ottaviano de Medici, the owner of the original, was solicited by Duke Frederick II. of Mantua to present it to him. Unwilling to part

with so great a pictorial prize, and unwilling also to disoblige the duke, Ottaviano got Andrea to make the copy, which was con- signed to the duke as being the original. So deceptive was the imitation that even Giulio Romano, who had himself manipulated the original to some extent, was completely taken in; and, on showing the supposed Raphael years afterwards to Vasari, who knew the facts, he could only be undeceived when a private mark on the canvas was named to him by Vasari, and brought under his eye. It was Michelangelo who had introduced Vasari in 1524 to Andrea's studio. He is said to have thought very highly of Andrea's powers, saying on one oecasion to Raphael, ‘‘ There is a little fellow in Florence who will bring sweat to your brow if ever he is engaged in great works.”

Andrea had true pictorial style, a very high standard of correct- ness, and an enviable balance of executive endowments. The point of technique in which he excelled least was perhaps that of dis- criminating the varying textures of different objects and surfaces. There is not much elevation or ideality in his works—much more of reality. His chiaroseuro is not carried out according to strict rule, but is adjusted to his liking for harmony of colour and fused tone and transparence ; in fresco more especially his predilection for varied tints appears excessive. It may be broadly said that his taste in colouring was derived mainly from Fra Bartolommeo, and in form from Michelangelo ; and his style partakes of the Venetian and Lombard, as well as the Florentine and Roman—some of his figures are even adapted from Albert Diirer. In one way or other he continued improving to the last. In drawing from nature, his habit was to sketch very slightly, making only such a memorandum as sufficed to work from. The scholars of Andrea were very numerous ; but, according to Vasari, they were not wont to stay long, being

domiueercd over by his wife ; Pontormo and Domenico Puligo may be mentioned.

In our account of Andrea del Sarto we have followed the main lines of the

narrative of Crowe and Cavaleaselle, supplemented by Vasari, Lanzi, and others, There are biographies by Biadi (1829) and by Von Reumont, (W. M. BR.)

SASANIANS. See Persra.

SASINE. See Srtsmn.

SASSARI, the chief town of the northern province of the island of Sardinia (Italy), is situated in the midst of orange and olive groves at a height of 650 feet above the sea, 125 miles from Porto Torres, on the railway to Chilivani, a junction on the main line from Terranova to Cagliari. Till about 1860-65 it was surrounded by a high wall built in the 14th century and strengthened by twenty- six large square towers from 60 to 80 feet high. The castle dates from 1327-133]. Originally built in the first half of the 15th century, when the see of Turris (Porto Torres) was removed to Sassari, the cathedral was restored in 1531 and received a new facade in the 18th century. The city besides contains a municipal palace, re- built since 1820, an episcopal palace dating originally from the 13th century, and a university (faculties of law and medicine, with 87 students in 1881-2) founded by Philip III. of Spain in 1617, as well as barracks, law courts, hospitals, and asylums. There is a white marble fountain —Fonte di Rosello—on the east side of the town, sur- mounted by a statue of St Gavinus, patron saint of the city, and from this source water is still hawked about the streets, though waterworks have recently been constructed by the municipality at a cost of upwards of £60,000. Most of the streets are narrow and tortuous, and vehicles are generally drawn by oxen. Sassari is separated by a low and swampy stretch of country from its port at Porto Torres—a village on the site of Zurrts Lnbisonis, Colonia Julia, with a basilica of the 11th century (8S. Gavino) and the ruins of a temple of Fortune now called Palazzo del Re Barbaro. The population of the city was 22,945 in 1862, and 31,596 in 1881,

Sassari appears in the archives of the monastery of San Pietro di Silki in 1118 as Tathari, and the local pronunciation is still Tatari. In 1294 the town was declared an independent republic, and a very liberal code of laws was published in 1316 (edited by Don Pasquale Tola, Cagliari, 1850). Sassari was sacked by the French in 1527, and in 1796 the Sardinian popular party seized the city, expelied the viceroy, and dismantled the castle and “ palaces, ”

SASSERAM, a subdivision of the Shahabad district, Bengal, India, between 24° 31’ and 25° 23’ N. lat., and between 83° 33’ and 84° 30’ E, long., with an area of 1493

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square miles, and a population in 1881 of 519,207 (males 253,757, females 265,450). This subdivision consists of four thanahs or stations, viz., Sasseram, Khargar, Dhan- gion, and Dehree. The thanah of Sasseram has an area of 691 square miles, and a population (1881) of 155,760 (75,031 males, 80,729 females). It contains the tomb of the Afghan Sher Shah, who conquered Humayun, and subsequently became emperor of Delhi.

SATALI, Apatta, or ANDALIYEH, one of the principal towns on the south coast of Asia Minor, giving the name of Gulf of Adalia to the great bay which the ancients styled Mare Pamphylicum. Arranged like a Greek theatre round the harbour, it presents an unusually picturesque appearance against its background of mountains; and it is enclosed by a triple wall of modern construction, strengthened by a ditch and square towers. Several of the mosques and churches, seventeen in number, are of interest, and contain remains of Roman work. The population was estimated by Spratt at 13,000, of whom 3000 were Greeks. Though the physical changes produced on this part of the coast by the tufaceous deposits of the rivers render the ancient descriptions quite inapplicable to the present town, there is little doubt that Satali not only

_preserves the name but occupies the site of Attaleia, which

was founded by Attalus IJ. Philadelphus, king of Perga- nium, and became one of the principal cities of Pamphylia. At an early date it was the see of a Christian bishop. SATARA, or SatraRAH, a British district in the central division of the Bombay presidency, India, between 16° 50’ and 18° 10’ N. lat. and 73° 45’ and 75° E. long. It has an area of 4988 square miles,‘and is bounded on the north by the river Nira and the states of Bhor and Phaltan, on the east by Sholapur district, on the south by the Varna river separating it from Kolhapur and Sangli states, and on the west by the SahyAdri mountains, which separate it from the Concan districts of Kolab& and Ratnagiri. The Satara district contains two main systems of hills, the

SahyAdri range and its offshoots, and the Mahadeo range and its offshoots; the former runs through the district from north to south, and the Mahddeo range starts about 10 miles north of Mahdbaleshwar and stretches east and south-east across the whole breadth of the district. ‘The Mahddeo Hills are bold and abrupt, present- ing in many cases bare scarps of black rock and looking at a distance like so many hill fortresses. Within the limits of Sdtéra are two river systems—the Bhima system in a small part of the north and north-east, and the Kistna system throughout the rest of the district. (See Kisrna.) The hill forests have a large store of timber and firewood. The whole of Sdtdra falls within the Deccan trap area; the hills consist of trap intersected by strata of basalt and topped with laterite, while, of the different soils on the plains, the commonest is the black loamy clay con- taining carbonate of lime. This is a very fertile soil, and when well watered is capable of yielding heavy crops. Satara district contains some important irrigation works,— including the Kistna Canal, open for 35 miles. In some of the western parts of the district the average annual rainfall exceeds 200 inches; but on the eastern side water is scanty, the rainfall varying from 40 inches in Satara town to less than 12 inches in some places farther east. There is no railway, but the West Deccan Railway, which is in course of construction, will put the district into com- munication with Poona and Belgaum, and will run through Satara for about 100 miles. The tiger, panther, bear, and sambhar deer are found in the west near the Sahyédris, and the hyzena, wolf, leopard, and smaller game in the east. According to the last census returns (1881) the population of Satira district was 1,062,350 (532,525 males and 529,825 females). Lindus numbered 1,008,918, Mohammedans 36,712, and Christians

886. Four towns had more than 10,000 inhabitants, —Satara (see below), Wai 11,676, Karad 10,778, Tasgaon 10,206. About two- thirds of the Hindus consist of Kunbis and Mahrattas, who during the period of Mahratta ascendency furnished the bulk of the armies; and the Mavlds, who formed Shivaji’s best soldiers, were drawn from the hill tribes of Satara district. Agriculture supports more than three-fourths of the people; the soil is fertile, and joar forms the staple food ; rice is grown in the western valleys, and in the south and east cotton is raiscd. In 1882-83, of 1,384,255 acres

held for tillage, 270,244 were fallow or under grass, while of the remaining 1,114,011 acres 39,757 were twice cropped; cecreals, consisting chicfly of joar and bajra, occupied 898, 206 acres, pulses 159,211 acres, oil-seeds 42,001 acres, and miscellaneous crops the remainder. Besides blankets and coarse cotton cloth the chief exports are grain, tobacco, oil-seeds, chillics, molasses, and a little raw cotton ; the imports are piece-goods, hardware, salt, and dates. The gross revenue of the district in 1883-84 amounted to £268,779, of which the land contributed £228,749.

Ou the overthrow of the Jadhav dynasty in 1312 the district passed to the Mohammedan power, which was consolidated in the reign of the Bahmani kings. On the fall of the Bahmanis towards the end of the 15th century each chief set up for himself until the Bijapur kings finally asserted themselves, and under these kings the Mahrattas arose, and laid the foundation of an independent kingdom with Satara as its capital. Intrigues and dissensions in the palace led to the ascendency of the peshwas, who removed the capital to Poona in 1749, and degraded the raja of Satara into the position of a political prisoner. The war of 1817 closed the career of the peshwas, and the British then restored the titular raja, and assigned to him the principality of Satara. In conse- quence of political intrigues, he was deposed in 1839, and his brother was placed on the throne. This prince dying without male heirs, the state was resumed by the British Government.

SATARA, chief town and headquarters of the above district, is situated in 17° 41’ 25” N. lat. and 74° 2’ 10” E. long., intmediately below a remarkably strong hill fort on the summit of a small, steep, rocky hill. It takes its name from the seventeen walls, towers, and gates whicli the Satara fort was supposed to possess. With a height of 2320 feet above sea-level, Sdtara is about 60 miles from the coast, and 69 miles south of Poona. Since the death of the last raja in 1848 the population has con- siderably decreased; still Satara contained in 1881 some 28,601 inhabitants (14,558 males and 14,043 females).

SATIN-WOOD, a beautiful light-coloured hard wood having a rich silky lustre, sometimes finely mottled or grained, the produce of a large tree, Chloroxylon Swietenia, native of India and Ceylon. A similar wood, known under the same name, is obtained in the West Indies, the tree yielding which

is said to be Maba guianensis. Satin- wood was in request for rich furniture about the end of the 18th century, the fashion then being to ornament panels of it with painted medallions and floral scrolls and borders. Now it is used for inlaying and small veneers, and most largely in covering the backs of hair and clothes-brushes and in making small articles of turnery.

SATIRE. Satire, in its literary aspect, may be defined as the expression in adequate terms of the sense of amuse- ment or disgust excited by the ridiculous or unseemly, provided that humour is a distinctly recognizable element, and that the utterance is invested with literary form. With- out humour, satire is invective ; without literary form, it is mere clownish jeering. It is indeed exceedingly difficult to define the limits between satire and the regions of literary sentiment into which it shades. The lofty ethical feeling of a Johnson or a Carlyle borders it on the one hand, the witty sarcasm of a Talleyrand, rancorous or good-natured, on the other; but, however exalted the satirist's aims, or amiable his temper, a basis of contempt or dislike is the groundwork of his art. This feeling may be diverted from the failings of man individual to the feebleness and imper- fection of man universal, and the composition may still be a satire ; but if the element of scorn or sarcasm were entirely eliminated it would become asermon. That this expression of aversion is of the essence of satire appears from the fact | that the literary power which, the more it is exerted upon

grave and elevatcd subjects, removes them further and further from the domain of satire can confer satiric dig- nity upon the most scurrilous lampoon. The distinction between the intellectual form and the raw material of satire is admirably illustrated by a passage in an accom- plished novelist. The clever young lady happening to compare a keen and bright person to a pair of scissors, her unrefined companion is for the moment unable to under- stand how a human being can resemble a piece of cutlery ; but suddenly a light breaks in upon her, and, taking up a broken pair of scissors from the table, she imitates the halting gait of a lame lady, declaring that Mrs Brown resembles that particular pair of scissors to the life. The first interlocutor could have been satirical if she would ' the second would if she could. The nice and delicate per- ception of the former type of character

may be fairly driven into satire by the vulgarity and obtuseness of the second, as in the case of Miss Austen; and it may be added that the general development of civilization, repressing high- handed wrongs against which ridicule is no defence, and encouraging failings which can be effectually attacked in no other manner, continually tends to make satire more congenial to the amiable and refined, and thus exalt its moral tone and purpose.

The first exercise of satire was no doubt sufficiently coarse and boisterous. It must have consisted in gibing at personal defects ; and Homer's description of Thersites, the earliest example of literary satire that has come down to us, probably conveys an accurate delineation of the first satirists, the carpers and fault-finders of the clan. The character reappears in the heroic romances of Ireland, and elsewhere; and it is everywhere implied that the licensed backbiter is a warped and distorted being, readier with his tongue than his hands. The verdict of unso- phisticated man on satire is clearly that it is the offspring of ill-nature ; to redeem and dignify it by rendering it the instrument of morality or the associate of poetry was a development implying considerable advance in the literary art. The latter is the course adopted in the Old Testa- ment, where the few passages approximating to satire, such as Jotham's parable of the bramble and Job's ironical address to his friends, are embellished either by fancy or by feeling. An intermediate stage between personal ridi- cule and the correction of faults and follies seems to have been represented in Greece by the Margites, attributed to Homer, which, while professedly lampooning an individual, practically rebuked the meddling sciolism impersonated in him. In the accounts that have come down to us of the writings of Archilochus, the first great master of satire (about 700 B.c.), we seem to trace the elevation of the instrument of private animosity to an element in public life. Though a merciless assailant of individuals, Archilochus was also a distinguished statesman, naturally for the most part in Opposition, and his writings seem to have fulfilled many of the functions of a newspaper press. Their extraordinary merit is attested by the infallible judgment of Quintilian eight hundred years after their com- position; and Gorgias's comparison of them with Plato's persiflage of the Sophists proves that their virulence must have been tempered by grace and refinement. Archilochus also gave satiric poetry its accepted form by the invention of the iambic trimeter, slightly

modified into the scazonic metre by his successors. Simonides of Amorgus, about a generation later, and Hipponax, a century later still, were distinguished like Archilochus for the bitterness of their attacks on individuals, with which the former combined a strong ethical feeling, and the latter a bright active fancy. All three were restless and turbulent, aspiring and discon- tented, impatient of abuses and theoretically enamoured

of liberty; and the loss of their writings, which would |

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have thrown great light on the politics as well as the manners of Greece, is exceedingly to be lamented. With Hipponax the direct line of Greek satire is interrupted ; but two new forms of literary composition, exceedingly capable of being rendered the vehicles of satire, almost simultaneously make their appearance. Fable is first heard of in Asiatic Greece about this date ; and, although its original intention does not seem to have been satirical, its adaptability to satiric purposes was soon discovered and turned to account. A far more important step was the elevation of the rude fun of rustic merrymakings to a literary status by the evolution of the drama from the Bacchic festival, The means had now been found of ally- ing the satiric spirit with exalted poetry, and their union was consummated in the person of a poet who combined humour with imagination in a degree never again to be rivalled until Shakespeare. Every variety of satire is exemplified in the comedies of Aristophanes ; and if he does not rank as the first of satirists it is only because he Such affluence of poetical genius could not be perpetual, any nore than the peculiar political and social conditions which for a time made such fearless and uncontrolled satire possible. Through the half-way house of mythological parody the comedy of public life passes into the comedy of manners, metrical still, but approxi- mating more closely to prose, and consequently to satire on its own side of the line which it is convenient if not strictly logical to trace between dramatists and ordinary satiric writers. The step from Menander to Lucilius is not a long one, but it was not destined to be taken by a Greek.

A rude form of satire had existed in Italy from an early date in the shape of the Fescennine verses, the rough and licentious pleasantry of the vintage and harvest, which, lasting down to the 16th century, inspired Tansillo's Vendemmiatore. As in Greece, these eventually, about 364 B.C., were developed into a rude drama, originally intro- duced as a religious expiation. This was at first, Livy tells us (vii. 2), merely pantomimic, as the dialect of the Tuscan actors imported for the occasion was not under- stood at Rome. Verse, "like to the Fescennine verses in point of style and manner," was soon added to accompany the mimetic action, and, with reference to the variety of metres employed, these probably improvised compositions were entitled Saturz, a term denoting miscellany, and derived from the satura lanz, "a charger filled with the first-fruits of the year's produce, anciently offered to Bacchus and Ceres." The Romans thus had originated the name of satire, and, in so far as the Fescennine drama consisted of raillery and ridicule, possessed the thing also; but it had not yet assumed a literary form among them. Livius Andronicus (240 8.c.), the first regular Latin dra- Matic poet, appears to have been little more than a trans- lator from the Greek. Satires are mentioned among the literary productions of Ennius (200 B.c.) and Pacuvius (170 B.C.), but the title rather refers to the variety of metres employed than to the genius of the composition. The real inventor of Roman satire is Caius Lucilius (148-103 3.c.), whose Satirz seem to have been mostly satirical in the modern acceptation of the term, while the subjects of some of them prove that the title continued to be applied to miscellaneous collections of poems, as was the case even to the time of Varro, whose " Sature" included prose as well as verse, and appear to have been only partially satirical, The fragments of Lucilius preserved are un- fortunately very scanty, but the verdict of Horace, Cicero, and Quintilian demonstrates that he was a very consider- able poet. It is needless to dwell on compositions so universally known as the Satires of Lucilius's successor Horace, in whose hands this class of composition received

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SATIRE

an cntirely new development, becoming genial, playful, and persuasive. ‘‘Arch Horace strove to mend.” The didactic element preponderates still more in the philo- sophical satires of Persius, the propagandist of Stoicism, a writer whose intensity, dramatic gift, obscurity, and abruptness render him, like the Browning and Meredith of our own days, the luxury of the few and the despair of the many. Yet another form of satire, the rhetorical, was carried to the utmost limits of excellence by Juvenal, the first example of a great tragic satirist. Nearly at the same time Martial, improving on earlier Roman models now lost, gave that satirical turn to the epigram which it only exceptionally possessed in Greece, but has ever since retained. The brevity, pregnancy, and polish of the Latin tongue were never more felicitously exemplified than by this gifted writer. About the same time another variety of satire came into vogue, destined to become the most important of any. The Milesian tale, a form of entertainment probably of Eastern origin, grew in the hands of Petronius and Apuleius into the satirical romance, immensely widening the satirist’s field and exempting him from the restraints of metre. Petronius’s “Supper of Trimalchio” is the revelation of a new vein, never fully worked till our days. As the novel arose upon the ruins of the epic, so dialogue sprung up upon the wreck of comedy. In Lucian comedy appears adapted to suit the exigencies of an age in which a living drama had become impossible. Lucian’s position as a satirist is something new, and could not, from the nature of the case, have been occupied by any of his predecessors. For the first time since the origin of civilization society felt apprehensive of impending dissolution, and its fears found an interpreter in the Sophist of Samosata, ‘the Voltaire of paganism,” an universal censor and mocker, devoid of the Christian’s hope of general renovation, and unable to foresee the new social order which the barbarian conquest was destined to create. Next to his wit, Lucian’s special note is his sturdy love of truth and demand for genuinencss in all things. With him antique satire expires as a distinct branch of literature,—though mention should be made of the sar- casms and libels with which the population of Egypt were for centuries accustomed to insult the Roman conqueror and his parasites. An exceedingly curious specimen, a denunciation of the apostate poet Hor-Uta—a kind of Egyptian ‘‘ Lost Leader ”—composed under Augustus, has recently been published by M. Revillout from a demotic papyrus.

It is highly interesting to remark how, after the great deluge of barbarism has begun to retire, one form of satire after another peeps forth from the receding flood, the order of development being determined by the circum- stances of time and place. In the Byzantine empire, indeed, the link of continuity is unbroken, and such raillery of abuses as is possible under a despotism finds vent in the pale copies of Lucian published in Ellissen's Analekten. The first really important satire, however, is a product of Western Europe, recurring to the primitive form of fable, upon which, nevertheless, it constitutes a decided advance. Reynard the Fox, a genuine expression of the shrewd and homely Teutonic mind, is a landmark in literature. It gave the beast-epic a development of which the ancients had not dreamed, and showed how cutting ridicule could be conveyed in a form difficult to resent. About the same time, probably, the popular instinct, perhaps deriving a hint from Rabbinical litera- ture, fashioned Morolf, the prototype of Sancho Panza, the incarnation of sublunar mother-wit contrasted with the starry wisdom of Solomon; and the 7%ll Hulenspiegel is a kindred Teutonic creation, but later and less significant. Piers Ploughman, the next great work of the class, adapts

| the apocalyptic machinery of monastic and anchoritic vision to the purposes of satire, as it had often before been adapted to those of ecclesiastical aggrandizement. The clergy were scourged with their own rod bya poet and a Puritan too earnest to be urbane. Satire is a distinct element in Chaucer and Boccaccio, who nevertheless cannot be ranked as satirists. The mock-heroic is successfully revived by Pulci, and the political songs of the 14th and 15th cen- turies attest the diffusion of a sense of humour among the people at large. The Renaissance, restoring the knowledge and encouraging the imitation of classic models, sharpened the weapons and enlarged the armoury of the satirist. Partly, perhaps, because Erasmus was no poet, the Lucianic dialogue was the form in the ascendant of his age. Erasmus not merely employed it against supersti- tion and ignorance with infinite and irresistible pleasantry, but fired by his example a bolder writer, untrammelled by the dignity of an arbiter in the republic of letters. The ridicule of Ulric von Hutten's Epistole Obscurorum Virorum is annihilating, and the art there for the first time fully exemplified though long previously

introduced by Plato, of putting the ridicule into the mouth of the victim, is perhaps the most deadly shaft in the quiver of sarcasm. It was afterwards used with even more pointed wit though with less exuberance of humour by Pascal, the | first modern example, if Dante may not be so classed, of a great tragic satirist. Ethical satire is vigorously represented by Sebastian Brant and his imitator Alexander Barclay ; but in general the metrical satirists of the age seem tame in comparison with Erasmus and Hutten, though including the great name of Machiavelli. Sir Thomas More cannot be accounted a satirist, but his idea of an imaginary common- wealth embodied the germ of much subsequent satire. In the succeeding period politics take the place of literature and religion, producing in France the Satyre Ménippée, elsewhere the satirical romance as represented by the Argems of Barclay, which may be defined as the adaptation of the style of Petronius to state affairs. In Spain, where no freedom of criticism existed, the satiric spirit took refuge in the novela picaresca, the prototype of Le Sage and the ancestor of Fieldmg; Quevedo revived the medi- eval device of the vision as the vehicle of reproof; and Cervantes's immortal work might be classed as a satire were it not so much more, About the same time we notice the appearance of direct imitation of the Roman satirists in English literature in the writings of Donne, Hall, and Marston, the further elaboration of the mock- heroic by Tassoni, and the culmination of classical Italian satire in Salvator Rosa. The prodigious development of the drama at this time absorbed much talent that would otherwise have been devoted to satire proper. Most of the great dramatists of the 17th century were more or less satirists, Moliére perhaps the most consummate that ever existed; but, with an occasional exception like Les Précieuses Ridicules, the range of their works is too wide to admit of their being regarded as satires. The next great example of unadulterated satire is Butler's Hudibras, and perhaps one more truly representative of satiric aims and methods cannot easily be found. At the same period dignified political satire, bordermg on invec- tive, received a great development in Andrew Marvell's Advices to a Painter, and was shortly afterwards carried to perfection in Dryden's Absalom and Achitophel ; while the light literary parody of which Aristophanes had given the pattern in his assaults on Euripides, and which Shakespeare had handled somewhat carelessly in the Midsummer Night's Dream, was effectively revived in the duke of Buckingham's Pehearsal. In

France Boileau was long held to have attained the ne plus ultra of the Horatian style in satire and of the mock-heroic, but Pope was soon

to show that further progress was possible in both. The polish, point, and concentration of Pope remain unsur- passed, as do the amenity of Addison and the daring yet severely logical imagination of Swift; while the History of John Bull and the Pseudologia place their friend Arbuth- not in the first rank of political satirists. The 18th century was, indeed, the age of satire. Serious poetry had for the time worn itself out ; the most original geniuses of the age, Swift, Defoe, and Richardson, are decidedly prosaic, and Pope, though a true poet, is less of a poet than Dryden. In process of time imaginative power revives in Goldsmith and Rousseau ; meanwhile Fielding and Smollett have fitted

the novel to be the vehicle of satire and much beside, and | | indeed transplanted to America by Russell Lowell, whose

the literary stage has for a time been almost wholly en- grossed by a colossal satirist, a man who has dared the universal application of Shaftesbury's maxim that ridicule is the test of truth. The world had never before seen a satirist on the scale of Voltaire, nor had satire ever played such a part asa factor in impending change. The parallel with Lucian is in some respects very close. Toleration was Voltaire's idol, as truth was Lucian's ; and thus, aiming more than his predecessor at the practical reformation of manners and institutions, his work was less purely negative. He was nevertheless a destroyer, and as utterly out of sympathy with the positive spirit of science for which he was preparing the way as Lucian could possibly be with Goths or Christians. As a master of sarcastic mockery he is unsurpassed ; his manner is entirely his own; and he is one of the most intensely national of writers, notwith- standing his vast obligations to English humorists, states- men, and philosophers. English humour also played an important part in the literary regeneration of Germany, where, after Liscow and Rabener, direct imitators of Swift and the essayists, Lessing, imbued with Pope but not mastered by him, showed how powerful an auxiliary satire can be to criticism,—a relation which Pope had somewhat inverted. Another great German writer, Wieland, owes little to

the English, but adapts Lucian and Petronius to the 18th century with playful if somewhat mannered grace. Kortum's Jobsiad, a most humorous poem, innovates suc- cessfully upon established models by making low life, instead of chivalry, the subject of burlesque. Goethe and Schiller, Scott and Wordsworth, are now at hand, and as imagination gains ground satire declines. Byron, who in the 18th century would have been the greatest of satirists, is hurried by the spirit of his age into passion and description, bequeathing, however, a splendid proof of the possibility of allying satire with sublimity in his Vision of Judgment. Moore gives the epigram a lyrical turn; Béranger, not for the first time in French literature, makes the gay chanson the instrument of biting jest; and the classic type receives fresh currency from Auguste Barbier. Courier, and subsequently Cormenin, raise the political pamphlet to literary dignity by their poignant wit. Peacock evolves a new type of novel from the study of Athenian comedy. Miss Edgeworth skirts the confines of satire, and Miss Austen, the most refined and delicate of all observers of manners, seasons her novels with the most exquisite satiric traits. Washington Irving revives the manner of The Spectator, and Tieck brings irony and persiflage to the discussion of critical problems. Two great satiric figures remain,—one representative of his nation, the other most difficult to class. In all the characteristics of his genius Thackeray is thoroughly English, and the faults and follies he chastises are those especially charac- teristic of British society. Good sense and the perception of the ridiculous are amalgamated in him ; his satire is a thoroughly British article, a little over-solid, a little wanting in finish, but honest, weighty, and durable. Posterity will go to him for the humours of the age of Victoria, as they

go to Addison for those of Anne's. But Heine hardly belongs to any nation or country, time or place. He ceased to be a German without becoming a Frenchman, and a Jew without becoming a Christian. Only one portrait really suits him, that in Tieck's allegorical tale, where he is repre- sented as a capricious and mischievous elf; but his song is sweeter and his command over the springs of laughter and tears greater than it suited Tieck's purpose to acknow- ledge. In him the satiric spirit, long confined to established literary forms, seems to obtain unrestrained freedom to wander where it

will, nor have the ancient models been followed since by any considerable satirist except the Italian Giusti. The machinery employed by Moore was

Biglow Papers represent perhaps the highest moral level yet attained by satire. In no age has the spirit of satire been so generally diffused as in the 19th century, but many of its eminent writers, while bordering on the domains of satire, escape the definition of satirist. The term cannot be properly applied to Dickens, the keen observer of the oddities of human life; or to George Eliot, the critic of – its emptiness when not inspired by a worthy purpose; or to Balzac, the painter of French society ; or to Trollope, the mirror of the middle classes of England. If Sartor Ltesartus could be regarded as a satire, Carlyle would rank among the first of satirists; but the satire, though very obvious, rather accompanies than inspires the composition, The number of minor satirists of merit, on the other hand, is legion, and but few can be mentioned here. Poole, in his broadly farcical Little Pedlington, has rung the changes with inexhaustible ingenuity on a single fruitful idea; Jerrold's comedies sparkle with epigrams, and his tales and sketches overflow with quaint humour; Mallock has made the most of personal mimicry, the lowest form of satire ; Samuel Butler holds an inverting mirror to the world's face with imperturbable gravity; Courthope reproduces the airy grace and sonorous melody of the Attic comedy ; and the anonymous writer of the "' Barnum " Christmas number of Truth has resuscitated with equal effect its reckless fun and personality. One remarkable feature of the age is the union of caricature with literature to a degree incon- ceivable before the improvements in wood-engraving. All large capitals now have their comic illustrated journals, destined for the most part to be the marvels and stumbling- blocks of posterity. Punch, however, has become almost a national institution, and has fostered the genius of two pictorial satirists of the first rank, Leech and Tenniel. The present tendencies of the civilized world seem highly favourable to the influence of satire as a factor in human affairs, but unfavourable to the production of satiric masterpieces. Satire is the inevitable concomitant of free- dom of speech, which must continue to prevail and diffuse itself unless checked by military or socialistic despotism. But as the privilege of the many it is less likely to be the resource of the few; and it may happen that the press, dealing with follies of the day as they arise, will more and more forestall the satire that springs from meditation and study. The

principal security is the originality and robust- ness of true satiric genius, which, having defied prisons and scaffolds in the past, may find the means of eluding public impatience and satiety in the future. (R. G.)

SATRAP. See Persia, vol. xviii. pp. 569, 583.

SATURN, an ancient Italian god, whom the Romans, and till recently the moderns, identified with the Greek god Cronus.

1. Cronus was the youngest of the Titans, the children of Sky (Uranus) and Earth (Gea). Besides the Titans, Sky and Earth had other children, the Cyclopes and the Hundred-handers. _ When the Cyclopes and the Hundred-handers proved troublesome, Sky thrust them back into

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the bosom of Earth. This vexed Earth, and she called on | the temple probably formed a portion of a new temple

her sons to avenge her on their father Sky. They all shrank from the deed save Cronus, who waylaid and muti- lated his father with a sickle or curved sword. From the drops of blood which fell to the earth sprang the Furies and the Giants. Cronus now reigned in room of Sky. His wife was Rhea, who was also his sister, being a daughter of Sky and Earth. Sky and Earth had fore- told to Cronus that he would be deposed by one of his own children, so he swallowed them one after another as soon as they were born. Thus he devoured Hestia, Demeter, Hera, Hades, and Poseidon. But when Rhea had brought forth Zeus, the youngest,! she wrapped up a stone in swaddling clothes and gave it to Cronus, who swallowed it instead of the babe. When Zeus, who had been hidden in Crete, grew up, he gave his father a dose which compelled him to disgorge first the stone and then the children whom he had swallowed. The stone was preserved at Delphi; every day it was anointed and on festivals it was crowned with wool. Zeus and his brothers now rebelled against Cronus, and after a ten years’ struggle they were

victorious. Cronus and the Titans were thrust down to Tartarus, where they were guarded by the Hundred-handers. According to others, Cronus was rcinoved to the Islands of the Blest, where he ruled over the departed heroes, judging them in conjunction with Rhadamanthus. Plutarch (De Def. Orac., 18) mentions a story that the dethroned monarch of the gods slept on an island of the northern seas guarded by Briareus and surrounded by a train of attendant divinities. The reign of Cronus was supposed to have been the happiest time of the world, the golden age, when men lived like gods, free from toil and grief and the weakness of old age (for death was like sleep); and the earth too brought forth abundantly without cultivation. There are few traces of the worship of Cronus in Greece. Pausanias, in his descrip- tion of Greece, mentions only one temple of Cronus; it stood at the foot of the Acropolis at Athens and was sacred to Cronus and Rhea jointly. The Athenians cele- brated an annual festival in his honour on the 12th of Hecatombeon. A mountain at Olympia was called after him, and on its top annual sacrifices were offered to him at the spring equinox.

The idea that Cronus was the god of time—an idca which appears in antiquity—seems to have arisen from asimple confusion between the words Cronus and Chronus (“time”). Curtius derives Cronus from the root kra, meaning ‘‘to accomplish.” Cronus may perhaps have been a god of some aboriginal half-savage tribe which the Greeks conquered. Hence the savage traits in his legend, his conquest by Zeus, and the scanty traces of his worship in Greece. The myth of the mutilation of Sky by Cronus may be a particular form of the widespread story of the violent separation of Sky and Earth by one of their children (compare MytTHoLocy). Other forms of this myth are found in New Zealand, India, and China. Parallels to the swallowing and disgorging incident are to be found in the folk-lore of Bushmen, Kaffres, Basutos, Indians of Guiana, and Eskimo.

2. Saturn and his wife Ops were amongst the oldest deities of ancient Italy. He is said to have had an altar at the foot of the Capitol before Rome was founded. Saturn was a god of agriculture, his name being derived from serere, “to sow.” The identification of Saturn with

. Cronus gave rise to the legend that after his deposition by

Zeus (Jupiter) Saturn wandered to Italy, where he ruled as king in the golden age and gave the name Saturnia to the country. Janus, another of the most ancient gods of Italy, is said to have welcomed him to Rome, and here he settled at the foot of the Capitol, which was called after him the Saturnian Hill. His temple stood at the ascent from the Forum to the Capitol and was one of the oldest buildings in Rome, but the eight remaining columns of

1 So Hesiod. But aceording to Homer Zeus was the eldest of the ehildren of Cronus and Rhea,

built in the imperial times. The image of Saturn in this temple had woollen bands fastened round its feet all the year through, except at the festival of the Saturnalia ; the object of the bands was probably to detain the deity: Similarly there was a fettered image of Enyalius (the War God) at Sparta, and at Athens the image of Victory had no wings, lest she might fly away. The mode of sacrifice at this temple was in so far peculiar that the head of the sacrifice was bare as in the Greek ritual, instead of being covered, as was the usual Roman practice. Legend said that the Greek ritual was introduced by Hercules, who at the same time abolished the human sacrifices previously offered to Saturn. Others said that the rule had been observed by the Pelasgians before. Under or behind the temple was the Roman treasury, in which the archives as well as the treasures of the state were preserved. Dionysius Halicarnensis (Ant. om., i. 34) tells that there were many

sanctuaries of Saturn in Italy and that many towns and

places, especially mountains, were called after him. The oldest national form of verse was known as the Saturnian. Like many other figures in Roman mythology, Saturn is said to have vanished at last from earth. His emblem was a sickle. The substitution of a great scythe for the sickle, and the addition of wings and an hour-glass, are modern. Ops (“plenty”), wife of Saturn, was an earth-goddess, as appears from the custom observed by her supplants of sitting and carefully touching the earth while they made their vows to her. As goddess of crops and the harvest she was called Consiva, and under this name had a sanctuary at Rome, to which only the Vestals and the priest were admitted. As Saturn was identified in later times

with Cronus, so was Ops with Rhea. Another goddess mentioned as wife of Saturn was Lua, a goddess of barrenness. She was one of the deities to whom after a victory the spoils of the enemy were sometimes dedicated and burned.

Saturnalia.—This, the great festival of Saturn, was celebrated on the 19th, but after Ceesar's reform of the calendar on the 17th, of Decembcr. Augustus decreed that the 17th should be sacred to Saturn and the 19th to Ops. Henceforward it appears that tlic 17th and 18th were devoted to the Saturnalia, and the 19th and 20th to the Opalia, a festival of Ops. Caligula added a fifth day, "the day of youth" (dies juvenalis), devoted no doubt to the sports of the young. But in popular usage the festival lasted seven days. The time was one of general joy and mirth. The woollen fetters were taken from the feet of the image of Saturn, and each man offered a pig. During the festival schools were closed; no war was declared or battle fought ; no punishment was inflicted. In place of the toga an undress garment was worn. Distinctions of rank were laid aside: slaves sat at table with their masters or were actually waited on by them, and the utmost fircedom of speech was allowed them. Gambling with dice, at other times illegal, was now permitted and practised.? All classes cxchanged gifts, the commonest being wax tapers and clay dolls. These dolls were especially given to children, and the makers of them held a regular fair at this time. Varro thought that these dolls repre- sented original sacrifices of human beings to the infernal god. There certainly was, as we have secn, a tradition that human sacrifices were once offered to Saturn, and the Greeks and Romans gave the name of Cronus and Saturn to a particularly crucl Phe- nician Baal, to whom, e.g., children were sacrificed at Carthage. The Cronus to whom human sacrifices are said to have been offered in Rhodes was most probably a Baal, for there are un- mistakable traces of Pheenician worship in Rhodes. It may be conjectured that the Saturnalia was originally a celebration of the winter solstice. Hence the legend that it was instituted by Romulus under the name of the Brumalia (brwma=winter solstice). The prominence given to candles at the festival points to the custoin of making a new fire at this time. The custom of solemnly kindling fires at the summer solstice (Eve of St John) has prevailed in most parts of Europe, notably in Germany, and there are traces (of which the yule-log is one) of the observance of a similar custom at the winter solstice. In ancient Mexico a

new fire was kindled, amid great rejoicings, at the end of every period of fifty-two years.

The designation of the planets by the names of gods is at Icast as

2 It is curious to find a similar rule with a similar exception in Nepal. Sec H. A. Oldfield, Sketches from Nepal, vol. ii. pp. 358 sq. XXI. — 41

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old as the 4th century B.c. The first certain mention of the star of Cronus (Saturn) is in Aristotle (Afetaphysics, p. 1073b, 35). The name also occurs in the Epinomis (p. 987b), a dialogue of uncertain date, wrongly ascribed to Plato. In Latin, Cicero (1st century B.c.) is the first author who speaks of the planet Saturn. The applica- tion of the name Saturn toa day of the week (Saturni dies, Saturday) is first found in Tibullus (i. 3, 18). (J. G. FR.)
SATYR. In ancient Greek mythology the satyrs were spirits, half-human half-bestial, that hauuted the woods and mountains, companions of Pan and Dionysus. Fancy represented them as strongly built, with flat noses, pointed ears, and the tails of horses or goats. They were a roguish

and wanton but faint-hearted folk, lovers of wine and |

wonien, ever roaming the wild to the music of pipes and cymbals, castanets and bagpipes, dancing with the nymphs or pursuing them, striking terror into men, whose cattle they killed and whose women tliey made love to. In the earlier Greek art they appear as old and ugly, much like wild apes; but in later art, especially in works of the Attic school, this savage character is softened into a more youthful and graceful aspect. There is a famous statue supposed to be a copy of a work of Praxiteles, representing a graceful satyr leaning against a tree with a flute in his hand. In Attica there was a species of drama known as the Satyric drama; it parodied the legends of gods and heroes, and the chorus was composed of satyrs. Euripides’s play of the Cyclops is the only extant exaniple of this kind of drama. The symbol of the shy and timid satyr was the hare. In some districts of modern Greece the spirits known as Calicantsars offer points of resemblance to the ancient satyrs ; they have goats’ ears and the feet of asses or goats, are covered with

hair, and love women and the dance. The herdsmen of Parnassus believe in a demon of the mountain who is lord of hares and goats.

In the Authorized Version of Isa. xiii. 21, xxxiv. 14 the word “satyr” is nsed to render the Hebrew sé‘trim, “hairy ones.” A kind of demon or supernatural being known to Hebrew folk-lore as inhabiting waste places is meant ; a practice of sacrificing to the sé‘irtm is alluded to in Lev. xvii. 7, where E. V. has “ devils.” They correspond to the “shaggy demon of the mountain-pass ” (azabb al-akaba) of old Arab superstition. But the satyrs of the gloomy Semitic deserts, faith in which is not yet extinct, are much more terrible than those of Greece.

SAUL, son of Kish, king of Israel. (See Israzt, vol. xiii. p. 403 sg.) The name of Saul’s father Kish (wp) seems to be identical with the Arabic proper name and god- name Kais.

SAUMAISE. See Sarmasius.

SAUMAREZ, James SaAUMAREZ or SAUSMAREZ, BARON DE (1757-1836), English admiral, was descended from an old family, and was born at St Peter Port, Guernsey, 11th March 1757. Many of his ancestors had distinguished themselves in the naval service, and he entered it as mid-shipman at the age of thirteen. For his bravery at the attack of Charleston in 1775 on board the “ Bristol” he was raised to the rank of lieutenant, and he was pro- moted commander for his gallant services off the Dogger Bank, 5th August 1781, when he was wounded. In com- mand of the “ Russell,” he contributed to Rodney’s victory over De Grasse, 12th April 1782. For the capture of “La Réunion,” a French frigate, in 1793 he received the honour of knighthood. While in command of a small squadron he was on 5th June 1794 attacked by a superior French force on the way from Plymouth to Guernsey, but by his seamanship and coolness succeeded in gaining a safe anchorage in the harbour of that island. After being promoted to the “Orion” of 74 guns in 1795, he took part in the defeat of the French fleet off L’Orient, 22d June, distinguished himself in the battle of Cape St Vincent in February 1797, and was present at the blockade of Cadiz from February 1797 to April 1798, and at the battle of the Nile, Ist August 17 98, where he was wounded. On his return from Egypt he received the

cominand of the ‘‘ Cesar,” 84 guns, with orders to watch the French fleet off Brest during the winters of 1799 and 1800. In 1801 he was raised to the rank of rear-admiral of the blue, was created a baronet, and received the command of a small squadron which was destined to watch the movements of the Spanish fleet at Cadiz. To prevent a fleet of British merchantmen from falling into the hands of the enemy, he engaged the French and Spanish fleets, which outnumbered his own small squadron by two to one, inflicting on them a severe defeat with a loss of 3000 men. Regarding this achievement Lord Nelson remarked that “a greater action was never fought.” For his services Saumarez was rewarded with the order of the Bath, and he also received the freedom of the city of London, together with a magnificent sword. In 1803 he received a pension of £1200 a year. On the outbreak of the war with Russia in 1809 he was entrusted with the command of the Baltic fleet, and in recognition of his services Charles XIII.. of Sweden bestowed on him the grand cross of the military order of the Sword. At the peace of 1814 he attained the rank of admiral; and in 1819 he was made rear- admiral, in 1821 vice-admiral of Great Britain. He was raised to the peerage as Baron de Saumarez in 1831, and died at Guernsey, 9th October 1836.

See Memoirs of Admiral Lord de Saumarez, by Sir John Ross, © 2 vols., 1838.

SAUMUR, a town of France, at the head of an arrondissement in the department of Maine-et-Loire, is situated on an island and on the left bank of the Loire, 38 miles south-west of Tours, and 27 miles south-east of Angers, A large metal bridge connects the Tours-Angers railway with that of Montreuil-Bellay by which Saumur communi- cates with Poitiers and Niort. Two stone bridges (755 and 905 feet long) also unite the town on the island with the two banks of the river. Several of the Saumur churches are interesting. St Pierre, of the 12th century, has a 17th-century fagade and a Renaissance nave; and Notre Dame of Nantilly (often visited by Louis XI.) hasa remarkable though greatly damaged facade, « doorway and choir of the 12th century, and a nave of the 11th. Both these churches contain curious tapestries, and in the latter, fixed in the wall, is the copper cross of

Gilles de Tyr, keeper of the seals to St Louis. St Jean is a charming httle building in the Angevine Gothic style. Notre Dame of Ardiliers, of the 16th century, was enlarged in the following century by Richelieu and Madame de Montespan. The town-house is an elegant 16th-century edifice; and the whole town is rich in graceful and interesting examples of the best period of French domestic architecture. The castle, built between the 11th century and the 13th, and remodelled in the 16th, is used as an arsenal and powder magazine. There is also an interesting almshouse, with its chambers in part dug out in the rock. The cavalry school, founded in 1768, and after various interruptions reorganized in 1824 and 1853, has at the present time (1886) 400 pupils, of whom 125 are officers. Other establishments are a public library, a museum of natural history and local Roman and Celtic antiquities, a horticultural garden, with a school of vines in which eight hundred kinds of grapes are cultivated. Saumur carries on a large trade in sparkhng white wines grown in the neighbourhood, as well as in brandy, grain, flax, and hemp; and it manufactures enamels and rosaries. The population in 1881 was 13,439 (14,186 in the commune).

The Saumur caves along the Loire and on both sides of the valley of the Thouet (a left-hand tributary) must have been occupied at a very remote period. The Tour du Trone (9th century) served as a place of refuge for the inhabitants of the surrounding district during foreign invasions, and became the nucleus of a monastery built by monks escaped from St Florent le Vieil. On the same

site rose the castle of Saumur two hundred years later, The town fell into the hands of Foulques Nerra, duke of Anjou, in 1025, and

passed in the 13th century into the possession of the kings of France, to whom it remained constantly faithful. The English failed to capture it during all the course of the Hundred Years’ War. After the Reformation the town became the metropolis of Protestantism in France and the seat of a theological seminary, illustrated by many distinguished names. The school of Saumur, as opposed to that of Sedan, represented the more liberal side of

French Protestantism (Cameron, Amyraut, &c.). In 1628 the forti- fications were dismantled ; and the revocation of the edict of Nantes reduced the population from 25,000 to 6000.

SAUNDERSON, Nicnozas (1682-1739), mathema- tician, was born at Thurlstone, Yorkshire, in January 1682. When about a year old he lost his sight through small- pox; but this did not prevent him from acquiring, by the help of kind friends, a good knowledge of Latin and Greek, and pursuing with assiduity and success the study of mathematics. In his twenty-fifth year he commenced lecturing in Cambridge on the principles of the Newtonian philosophy, and, though he was not a member of any of the colleges, the university authorities placed no impedi- ment in his way. In November 1711 he was selected to succeed Whiston, the Lucasian professor of mathematics in Cambridge, after having had the degree of master of arts conferred upon him to render him eligible for the appointment. He was created doctor of laws in 1728 by

‘command of George II, and in 1736 was admitted a

member of the Royal Society. He died of scurvy on the 19th of April 1739.

Saunderson possessed the friendship of many of the eminent mathematicians of the time, such as Newton, Halley, De Moivre, Cotes, and for the first of these he entertained a profound venera- tion. Whether from an inflexible love of truth, or from a motive less exalted, he was accustomed to speak his sentiments regarding persons very freely, and friends as well as enemies were criticized without reserve. As is frequently the case with the blind, his senses of hearing and touch were extraordinarily acute, and he could carry on mentally long and intricate arithmetical or algebraical cal- culations. He devised for his own use a palpable arithmetic, an account of which is given in his elaborate Elements of Algebra (2 vols. 4to, Cambridge, 1740), which he did not live to publish. Of his other writings, prepared for the use of his pupils, the only one which has been published is The Method of Fluxions (1 vol. 8vo, London, 1756). At the end of this treatise there is given, in Latin, an explanation of the principal propositions of Sir Isaac Newton’s philosophy.

SAURIANS. See REprTizes.

SAURIN, Jacqurs (1677-1730), one of the group of great French preachers of the 17th century (see FRANCE, vol. ix. p. 662), was born at Nimes on January 6th 1677, studied at Geneva, settled in London in 1701 as one of the pastors of the Walloon church, and died at The Hague, on December 30, 1730, whither he had gone to defend himself before the synod against a trumped-up charge of heterodoxy. Besides collections of Sermons, on miscellaneous texts, he wrote Discours sur les événements les plus mémorables du Vieux et du Nouveau Testament (Amsterdam, 1720-28), a work which, as continued by Beausobre and Roques, became popular under the name of Saurin's Bible.

SAUROPSIDA. This name was introduced by Huxley in his Introduction to the Classification of Animals, 1869, to designate a province of the Vertebrata formed by the union of the Aves with the Reptilia. In his Elements of Comparative Anatomy, 1864, he had used the term "Sauroids" for the same.province. The five divisions of the Vertebrata—Pisces, Amphibia, Reptilia, Aves, and Mammalia—are all distinctly definable, but their relations to one another differ considerably in degree. The Amphibia are more similar to the Pisces than to any of the other divisions, and the Aves are closely allied to the Keptilia, and thus three provinces—Jchthyopsida,

Sauropsida, and Mammalia—are formed.

The characters which distinguish the Sawropsida, that is, which are common to birds and reptiles, and not found combined in

the other classes, have been thus summarized by Huxley :—no |

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branchiz at any period of existence ; a well-developed amuion and allantois present in the embryo; a mandible composed of many bones and articulated to the skull by a quadrate bone ; nucleated blood-corpuscles ; no separate parasphenoid bone in the skull ; and a single occipital condyle. In addition to these principal characters, others exist which are found in all birds and reptiles, but are not exclusively confined to them. The oviduct is always a Miillerian duct separate from the ovary and opening from the body cavity.

The adult kidney is a metanephros with separate ureter ; the mesonephros and mesonephric duct become in the adult male the efferent duct of the testis. The intestine and the repro- ductive and urinary ducts open into a common cloaca. There is usually an exoskeleton in the form of scales ; in the birds the scales take the form of fcathers. There are two aortic arches in reptiles, in birds only one,—the right. The heart is usually trilocular, becoming quadrilocular in erocodiles and birds. In all the eggs are meroblastic and large, possessing a large quantity of yolk; in all the egg is provided in the oviduct with a layer of albumen and outside this with a horny or calcareous shell. In a few cases the egg is hatched in the oviduct, but in these cases there is no intimate connexion between the embryo and the walls of the duct. Fertilization takes place internally, occurring at the upper end of the oviduct previously to the deposition of the albuminous layer and egg shell. ;

Comparative anatomy clearly shows that birds are reptiles which have become specialized in adaptation to the function of flight. This conclusion has been con- firmed in the most surprisingly complete manner by the discovery of fossil forms intermediate between birds and reptiles. Two points of specialization in addition to the transformation of the fore limbs into wings are conspicuous in birds,—the reduction of the tail and the absence of teeth. Archxopteryx is a flying feathered animal with a long reptilian tail. In the Rocky Mountain region numerous toothed birds have been recently discovered, and have been studied and described in a masterly fashion by Prof. O. C. Marsh. These forms belong to the Mesozoic period. For further details see REPTILES and Birps.

SAUSSURE, Horactz Brenepict DE (1740-1799), one of Switzerland’s most celebrated physicists, was born in Geneva on February 17, 1740.1 His youth was passed at his father’s farm, where he early acquired a love for the study of nature. Following the example of his father and of his uncle Charles Bonnet, with whom he was associated in a research on the leaves of plants, he devoted himself at first to botany. Thus he was led to make the acquaintance of Haller, who was not long in discerning and appreciating his rare powers as an observer. In 1762, when only twenty-two years of age, Saussure was elected to the chair of philosophy at Geneva, where, along with another professor, he taught logic and physics alter- nately. But his

natural leanings were all towards the study of external nature; and he took advantage of all available opportunities of travelling to thoroughly explore the mountains, valleys, and lakes of his native land, and to visit those of foreign countries, with the view of widen- ing and deepening his conception of the constitution of the world. The Society of Arts of Geneva was founded by Saussure in 1772,*and in 1774, at the invitation of the Government, he elaborated a plan for the reform of the system of teaching in his native town; but this was too radical in its nature to be adopted. In 1786 he resigned his professorship to his friend and fellow-worker Pictet. While honouring his country by his devotion to laborious scientific investigations, he exhibited his patriotism by

1 His father, Nicolas de Saussure (1709-90), an agriculturist of unusually liberal opinions and wide sympathies, when a young man had applied himself to literary pursuits, and especially to the study of writings bearing on farming. He resided all his life at his farm of Conches, on the Arve, near Geneva. As a memberof the eouncil of Two Hundred he took part in public affairs. Most of his writings were of a practical character, bearing on the growth and diseases of grain and other farm produce. His last work, On Fire, the Principle

| of Fecundity in Plants and of Fertility in the Earth, published in

1782, was more speculative in its nature.

untiring diligence in the exercise of his duties as a mem- ber of the council of Two Hundred, and afterwards of the National Assembly. In consequence of over-exertion in this work his health began to failin 1794; but, although deprived of the use of his limbs, he continued to revise the concluding volumes of his great work on Alpine physio- graphy, which were published in 1796. Latterly his mind became enfeebled, and when he was offered a chair of philosophy by the French Government in 1798 he had lapsed into a condition of partial imbecility. He died on January 22, 1799, at the age of fifty-nine, leaving two sons and a daughter.

The Alps formed the centre of Saussure’s investigations. They forced themselves on his attention as the grand key to the true theory of the earth; but, as year by year his mass of facts assumed ever-growing dimensions, his generalizations became more guarded, until finally he eaine to consider a simple recording of observations as the only justifiable course. As a young man he had roamed in search of plants through many remote valleys and over the ‘‘montagnes maudits” as his unappreciative fellow- dwellers by the lakes called the suow-eapped summits around them. It had been his dream, he says, sinee he was twenty to ascend Mont Blanc ; and he accomplished the feat on 3d August 1787. This was the second time that the ascent of that mouutain, until then deemed inaccessible, was made in that year.

Saussure found among the Alps opportunity for studying geology in a manner never previously attempted. The inclination of the strata, the nature of the rocks, the fossils, and the minerals reecived his closest attention. He acquired a thorough knowledge of the chemistry of the day, watching for the brilliant scries of discoverics and the improvements in processes of analysis that brought the science into such dazzling prominence during the last quarter of the eighteenth century ; and he applicd all to the study of minerals, water, and air. Saussure’s geological observations made him a firm believer in the Neptunian theory: he regarded all roeks and minerals as deposited from aqueous solution or suspeusion, and in view of this lie attached mueh importance to the study of meteorologieal conditions. He earried barometers and boiling-point thermometers to the summits of the highest mountains, and estimated the relative humidity of the atmosphere at different heights, its temperature, the strength of solar radiation, the composition of air and its transparency. Then, following the preeipitated moisture, he investigated the temperature of the carth at all depths to which he could drive his thermometer staves, the course, conditions, and temperature of streams, rivers, glaeicrs, and lakes, even of the sea. He invented a great number of instruments for these purposes, tested them, and investigated the theory of their aetion. The most beautiful and complete of his subsidiary rescarches is deseribed in the Essai sur l’‘Hygrométric, published in 1783. Init he records experiments made with various forms of hygrometer in all elimates and at all temperatures, and supports the claims of his hair-hygrometer against all others. He invented and improved many kinds of apparatus, ineluding the magneto- meter, the cyanometer for

estimating the blueness of the sky, the diaphanometer for judging of the clearness of the atmosphere, the anemometer, and the mountain eudiometer. His modifica- tions of the thermometer adapted that instrument to many purposes: for aseertaining the temperature of the air he used one with a fine bulb hung in the shade or whirled by a string, the latter form being converted into an evaporometer by inserting its bulb into a piece of wet sponge and making it revolve in a eircle of known radius at a known rate; for experiments ou the carth and in deep water he employed large thermometers wrapped in non-conducting coatings so as to render them extremely sluggish, and capable of long retaining the temperature once they had attained it. By the use of these instruments he showed that the bottom water of deep lakes is uniformly eold at all seasons, and that the annual heat wave takes six months to penetrate to a depth of 30 feet in the earth. He reeognized the immense advan- tages to meteorology of high-level observing stations, and when- ever it was practieable he arranged for simultaneous observations being made at different altitudes for as long periods as possible. It is perliaps as a geologist that Saussure worked most; he ex- amined all the formations he met with much eare and exact- ness ; and although his ideas on matters of theory were in many cases very erroneous he was instrumental in greatly advancing that science.

Saussure’s work is collected and summarized in his four large volumes of Voyages dans les Alpes. This book is arranged in the form of a narrative of the author’s various journeys, interspersed with accounts of the observations made and descriptions of the apparatus employed. At the end there isa long list of ‘‘agenda,” or subjects for investigation, which he anticipated would throw light on the theory of the earth. These agenda are of value as

exhibiting not only the scope and definite focussing of Saussure’s mind but his almost prophctie foresight, sinee subsequent seientifie work has advanced. in each departinent very nearly on the lines there laid down.

His life was written by Senebier in 1801, by Cuvier for the Biographie Universelle, and by De Candolle in Decade Philosophique, No. Xv., translated in the Philosophical Magazine, [i.] iv. 96.

SAUSSURE, Nicotas Tutopore pe (1767-1845), eldest son of Horace Benedict de Saussure, was born on October 14, 1767, at Geneva, and is known chiefly for his work on the chemistry of vegetable physiology. He was a shy man, who lived quietly and avoided society ; yet like his ancestors he was a member of the Geneyan representative council, and gave much attention and thought to public affairs. He took a deep interest in the improvement of education, but deprecated the introduc tion of science teaching into schools, on the ground that it would divert the children's minds from the study of the classical languages and mathematics. He latterly became more of a recluse than ever, and died in April 1845.

When a young man Nicolas Théodore accompanied his father in the Alpine journeys and assisted him by the careful determination of many physieal eonstants. He was attracted to chemistry by Lavoisier's brilliant conceptions, but he did not beeome great as an originator. He took a leading share in the rapid succession of improvements which rendered the processes of ultimate organic analysis trustworthy. He fixed the eomposition of ethylic alcohol, ether, and some other commonly oecurring substanees, thereby advancing the knowledge of pure chemistry. He also studied fer-mentation, the conversion of stareh into sugar, and many other processes of minor importance. The greater number of his 36 published papers deal with the chemistry and physiology of plants, the nature of soils, and the conditions of vegctable life. These were published under the title Recherches Chimiques sur la Végéta- tion, and were acknowledged to display remarkable ability.

SAVAGE, Ricuarp (1697-1743), a mediocre poet and notorious literary character of the time of Pope, associated with Pope in the publication of the Dunciad. He had nearly reached the end of his career when Johnson went up to London, made his acquaintance, and was fascinated by his vivacity and knowledge of the world. After his death, Johnson gave his romantic history of himself in one of the most elaborate and best of the Lives of the Poets—a fine example of the great moralist's searching analysis and tolerant judgment of eccentric character. Johnson apparently accepted Savage's account of himself and his strange persecution by his alleged mother, the countess of Macclesfield, without hesitation, describing her as a "wretch who had, without scruple, proclaimed herself an adulteress, and

who had first endeavoured to starve her son, then to transport him, and afterwards to hang him.” Boswell was less credulous, made inquiries after his cautious manner in various quarters, and indi- cated pretty clearly that he considered Savage an impostor, although he could not explain why, if the unnatural story were not true, the countess could have allowed it to be put three times in print unchallenged during her lifetime (see Boswell’s Life, chap. v.). After Boswell, Malone and Bindley nibbled at the paradox, but it was not subjected to thorough examination till 1858, when Mr Moy Thomas discovered the original manuscript depositions in the earl of Macclesfield’s divorce suit at Doctors’ Commons, and also the proceedings in the House of Lords. The results of Mr Thomas’s researches, prosecuted with rare acuteness and industry, appeared in Notes and Queries, November and December 1858. To Johnson’s Infe and these papers the reader may be referred for the strange story and the elaborate and complete exposure of its inconsistencies and improbabilities. The conclusion which Boswell hinted at, but was prevented by his rever- ence for Johnson from expressing, that Savage was an impostor, is irresistible.

SAVANNAH, a city of the United States, the capital

of Chatham county, Georgia, and the largest city in the

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State, is situated on the right or southern bank of the | Savannah river, 12 miles in a straight line and 18 miles by water from the ocean. By rail it is 104 miles south- west of Charleston, 8.C. Stretching about three miles along the river, opposite Hutchinson’s Island, and extend- ing inland 1} miles, Savannah has au area of 34 square iniles. The site is partly formed by a bold bluff of sand about a mile long, which les 40 feet above low-water mark, ending abruptly at either extremity, but ‘slopes inland for several miles with a very gentle and regular declivity.” Though laid out in parallelograms, Savannah has less than usual of the monotony of system, no fewer than twenty-four small public parks or gardens being dis- tributed throughout the city, and most of its streets being well shaded with trees. In the south is Forsyth Park (30 acres), with a fountain after the model of that

in the Place de la Concorde, Paris, and a monument to the memory of the Confederate slain. Johnson Square con- tains a Doric obelisk, in memory of General Nathaniel Greene and Count Pulaski, the corner stone of which was laid by Lafayette in 1825; and in Monterey Square, on the spot where Pulaski fell in 1779, rises a more elaborate inonument—a statue of Liberty displaying the national banner, on the top of a marble shaft 55 feet high. The focus of commercial life in Savannah is the so-called Bay, a narrow street built at the foot of the river bluff, with its top stories opening on the higher level behind. Among the more conspicuous buildings are the custom-house and post office, the city exchange, the court-house, Oglethorpe United States barracks, Chatham academy, St Andrew's hall, the library hall of the Georgia Historical Society, the Savannah medical college, the Roman Catholic cathedral, and St John's Episcopal church. Besides being the second cotton port in the States, Savannah has a large trade in rice, timber, resin, and turpentine, the value of its exports being $29,850,275 in 1873, and $21,527,235 in 1880. Planing mills, foundries, and flour-mills are the chief industrial establishments. The harbour has in Tybee Roads a depth of 31 feet and 38 feet at mean low and high water, and the bar 19 and 26 feet. The population, 5195 in 1810, was 15,312 in 1850, 28,235 in 1870, and 30,709 (15,654 coloured) in 1880.

Savannah was settled in February 1733 under General Ogle- thorpe.

SAVARY, Anne JEAN Marie Rens (1774-1833), duke of Rovigo, was born at Marcq, in the canton of Grandpré and department of Ardennes, on 26th April 1774. He was educated at the college of St Louis in Metz, where he gained a scholarship. When a youth of sixteen he became a volunteer in a cavalry regiment. His first military ex- periences were with the army of the Rhine under Custine ; he distinguished himself under Moreau and Férino, and by 1797 had reached the rank of major. In the next year, under Desaix, he took part in the Egyptian expedition, and he followed the same general in the second Italian campaign, and at the great battle of Marengo (14th June 1800). He had by this time attracted the favourable notice of Napoleon, who detected not only his soldierly powers but his singular gifts in the region of diplomacy and intrigue. For Savary the plans and will of Napoleon formed a law which obliterated every other, and in pre- sence of which political and moral scruple had no place. So early as 1800, while

only twenty-six years of age, he was appointed a colonel and the commander of that legion

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which was afterwards to form the picked bodyguard of the emperor. In 1803 he was general of brigade, and in 1804 he was charged with the execution of the Duc d'Enghien. Savary in his Afemoirs (published in Paris in 1828, 8 vols. 8vo) avows that all he did was to convey to Vincennes a letter whose contents he did not know, and early next morning, in obedience to the orders of a superior officer, to have the duke shot. The other side of the story is that he knew all about it,—that of set purpose, and in order to prevent an appeal to Napoleon's clemency, he hastened the execution ; and it is certain that, unlike a man merely under orders, he himself went straight to Bonaparte to report the death. Savary was the hand which Napoleon employed in the delicate negotiations with the emperor Alexander about the time of the battle of Austerlitz in 1805. At Jena in 1806 he distinguished himself by his successful pursuit of the retreating Prus- sians ; he rendered signal service by the siege of Hameln, which he forced to capitulate on 20th November; and, finally, the severe defeat which he inflicted upon the Russian forces at Ostrolenka, on 16th February 1807, was his crowning victory. Among other honours and rewards, he received a pension of 20,000 francs. After the peace of Tilsit he was despatched to St Petersburg ; but shortly thereafter—the Napoleonic scheme for the crown of Spain being now apparently complete—he was recalled, was created duke of Rovigo, and started for Madrid. His deceitful intrigue was soon successful, and Joseph Bonaparte ascended the Spanish throne. From 1808 to 1810 he was again beside Napoleon in the many and changing scenes of his exploits; but on the 8th of June of the latter year France itself, now fully alive to the vast and mysterious power he had learned to wield, was startled by his appointment as successor to Fouché in the ministry of police. His administration, however, was not a success. After the overthrow of Napoleon, he desired to accompany his master to St Helena, but this was refused, and he was imprisoned at Malta. He escaped thence to Smyrna, thereafter wandered about the east of Europe, and finally embarked for England, which he reached in 1819. Three years before he had been condemned to death by default; and, learning this, he proceeded to Paris to

clear himself of the sentence, in which he succeeded, being also reinvested with his rank and dignities. He retired to Rome, where he remained till 1831, when he was appointed commander-in-chief of the African army, and entrusted with the administration of Algeria. His duties were successfully performed, but he returned in March 1833 in weak health to Paris, where he died on the 2d of June.

SAVIGLIANO, a city of Italy, in the province of Cuneo, 314 miles by rail south of Turin, lies in a plain between the Maira and the Mellea (head-streams of the Po) 1081 feet above the sea. It still retains some traces of its ancient walls, demolished in 1707, and has a fine col- legiate church (Sant' Andrea, dating at least from the 11th century, but in its present form comparatively modern), a triumphal arch erected in honour of the marriage of Victor Amadeus I. with Christine of France, and in the Taffini palace paintings by the 16th-century local artist Giovanni Mollineri (Mulinari, [1 Caraccino). Savigliano has long been a place of considerable industrial activity; its modern manufactures comprise paper, silk, and beer. The population was 9932 in 1881 (commune 17,150).

First mentioned in 981 as Villa Savilliani, Savigliano appears in the 12th century as a member of the Lombard leagne. Its name perpetually erops upin the history of Piedmont and Savoy. It was besieged and taken by the dnke of Savoy in 1347 and again in 1367; and in the 16th and 17th centuries it suffered severely from French

garrisons. Charles Emmanuel I. died in 1630 at Savigliano, where the Piedmontese senate had met to escape the pestilence.

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SAVIGNY, Frieprich Cari von (1779-1861), was born at Frankfort-ou-the-Main on February 21, 1779. He was descended from an ancient family, which figures in the history of Lorraine, and which derived its name from the castle of Savigny near Charmes in the valley of the Moselle. When Lorraine passed into the possession of France, his family attached itself to Ger- many, and his ancestors filled important official posts in Nassau and other German states. His great-grandfather wrote a work, La Dissolution de la Réunion, as a protest against the conquests of Louis XIV. ; his

grandfather was “ Regierungsdirector ” at Zweibriicken, and his father was a noble of the empire and “ Kreisgesandter” of several princes of the diet of the circle of the Upper Rhine. His father, Carl Ludwig von Savigny, died in 1791, his mother in 1792, and he was brought up and educated by his guardian, Herr von Neurath, assessor of the Reichs- kammergericht or imperial chamber at Wetzlar, a master of the “Staatsrecht” of the time.

In 1795 Savigny went to study at Marburg, and derived great advantage, as is gratefully recorded by him, from the teaching and friendship of Professors Weis and Bauer. For six months he studied at Gottingen. It is noted as a curious circumstance that, though Hugo, the great civilian, was there lecturing, Savigny did not attend his course. He suffered much for two or three years from ill-health. Savigny visited, after the fashion cf German students, Jena, Leipsic, and Halle; and he returned to Marburg, where, on December 31, 1800, he took his doctor’s degree. His inaugural dissertation was entitled De Concursu Delictorum Formali.) At Marburg he lectured as privat-docent on criminal law, the pandects, the law of succession, obligations, and the methodology of law. In 1803 he published his famous treatise, Das Recht des Besitzes, or the right of possession. It was at once hailed by Thibaut asa masterpiece ; jurists recognized that the old uncritical study of Roman law was at an end. It quickly obtained a European reputation, and still remains a prominent landmark in the history of jurisprudence. It was the fountain-head of a stream of literature which has not yet ceased to flow. Austin, no partial judge, pro- nounced it to be “of all books upon law, the most con- summate and masterly.” In 1804 Savigny married Kuni- gunde Brentano, the sister of Bettina von Arnim and Clemens Brentano the poet. In that year he visited Paris, chiefly with a view to make researches in the National Library into the life of the jurist Cujas, whom he greatly admired. In a letter to be found in his miscel- laneous works he explains the ground of his admiration. “Dans Vhistoire de la jurisprudence moderne, il n’y a pas d’époque plus brilliante que celle du 16™° sidcle, C’est alors que la science du droit eut véritablement un grand et noble caractére qu’elle n’a pas retrouvé depuis.” A story not without significance as to his character relates to this period of his life. On hig way to Paris, a box containing papers in which were the results of laborious researches was stolen from his carriage. He bore the loss with equanimity,

and managed with the assistance of Jacob Grimm, his wife, and one of her sisters to do much to re- pair the loss,

In 1808 he was appointed by the Bavarian Government ordinary professor of Roman law at Landshut, where he remained a year and a half, and where he left many pleasant memories. In 1810 he was called, chiefly at the instance of William von Humboldt, to Berlin to fill the chair of Roman law, and assist in organizing the new university. One of his services was to create, in con- 1 The object of his investigation is thus described: “Delicta

concurrere dicuntur, ubi de pluribus legum Violationibus, quarum honnisi unus est reus, in eodem judicio puniendis agitur,”

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nexion with the law faculty, a “Spruch-Collegium,” or university court, competent to deal with cases remitted to it by the ordinary courts; and he took an active part in its labours. This was the busiest time of his life, He

| was engaged in lecturing, in the government of the uni-

versity (of which he was the third rector), and as tutor to the crown prince in Roman, criminal, and Prussian law. Not the least important consequence of his residence in Berlin was his friendship with Niebuhr and Eichhorn, In 1814 appeared his pamphlet Vom Beruf unserer Zeit fiir Glesetagebung und Rechtswissenschaft. It was a protest against the demand for codification, and in particular against the extension of the Code Napoléon to Germany. Fired with the hope that a day of resurrection for the national life of Germany was at hand, Thibaut had written a pamphlet urging the necessity of forming a code for Germany. Savigny wrote a reply, in which were laid down some principles with which wise advocates of codi- fication might well agree. ‘TI regard,” he said, “the law of each country as a member of its body, not as a garment merely which has been made to please the fancy, and can be taken off at pleasure and exchanged for another.” He laid stress upon the connexion of the present and the past and the consequent limitations of the power of legis- lation. But in the course of his argument he confounded the errors of codifiers in France, Austria, and Prussia, and especially the defects in the Code Napoléon, with the necessary incidents of codification.

Put at its highest, his argument comes to little more than others had before crudely expressed by saying, “We are not wise enough to compose a code,” 2

In 1815 he founded, with Eichhorn and Géschen, the Zeitschrift fiir geschichtliche Rechtswissenschaft, the organ of the new historical school, of which he was the represen- tative. In 1816, while on his way to Rome as envoy of Prussia, Niebuhr made at Verona the celebrated dis- covery of the lost text of Gaius. He communicated to Savigny the fact, and also his conjecture that it was the work of Ulpian. Savigny made known the discovery to the world in an article in the Zeitschrift, and pointed out Gaius as the real author. Géschen, Bekker, and Holl- weg actually deciphered the manuscript; but there is some truth in Hugo’s saying, “ Without Savigny one would not have had Gaius.”

The record of the remainder of Savigny’s life consists of little else than a list of the merited honours which he received at the hands of his sovereign, and of the works which he published with indefatigable activity.

In 1815 appeared the first volume of his Geschichte des Rémischen Rechts im Mittelalter ; the last did not appear until 1831. This work, to which his early instructor, Weis, had first prompted him, was originally intended to be a literary history of Roman law from Irnerius to the present time. His design was in some respect narrowed ; in others it was widened. He saw fit not to continue the narrative beyond the 16th century, when the separation of nationalities disturbed the foundations of the science of law. His treatment of the subject was not merely that of a bibliographer ; it was philosophical. It revealed the con- tinuity in the history of Roman law ; and it was an emphatic protest against the habit of viewing the law of a nation as an arbitrary creation, not connected with its history and con- dition. It was the parent of many valuable works which continued Savigny’s investigations.3 In 1817 he was ap- pointed a member of the commission for organizing the Prussian provincial estates, and also a member of the department of justice in the Staatsrath, and in 1819 he

2 See Austin’s criticisms in Lectures, ti. 698.

3 See Von Mohl’s Staatswissenschaft, vol. iii. p. 55. For a some- what less favourable view, see Gans’s Vermtschte Schriften.

became a member of the supreme court of cassation and revision for the Rhine Provinces. In 1820 he was made a member of the commission for revising the Prussian code. In 1822 a serious nervous illness attacked Savigny, and compelled lim to seek relief in travel. He always con- sidered that he had benefited much by the homceopathic treatment of Dr Necker, and he remained a firm believer in homeeopathy. In 1835 he began his elaborate work on tle modern system of Roman law. The eighth and last volume appeared in 1849.

In March 1842 he ceased to perform his duties as professor in order to become “Grosskanzler” of Prussia ; and in that position he carried out several important law reforms in regard to bills of exchange and divorce (a subject on which he had meditated much). He held that office until 1848, when he resigned, not altogether to the regret of his friends, who had seen his energies with- drawn from jurisprudence without being able to flatter themselves that he was a great statesman. In 1850, on the occasion of the jubilee of his obtaining his doctor’s degree, appeared in five volumes his Vermischte Schriften, consisting of a collection of his minor works published between 1800 and 1844. This event gave rise to much enthusiasm throughout Germany in honour of “the great master” and founder of modern jurisprudence. Professor Scheurl, in his Hinige Worte ciber Savigny, notes the fact that on the 31st of October Luther first revealed to the world the light of evangelical truth, and Savigny on that day began his work as a law reformer. In 1853 he pub- lished his treatise on Obligations, a supplement to his system of modern Roman law. Savigny died at Berlin on October 25, 1861. His son, Carl Friedrich von Savigny, born September 19, 1814, was Prussian minister of foreign affairs in 1849. He represented Prussia in important diplomatic transactions, especially in 1866, and died February 11, 1875.

In the history of jurisprudence Savigny's great works are the Ticeht des Bestizes and the Beruf unserer Zeit fiir Gesetegebung. The former marked an epoch in jurisprudence. Prof. Ihering says: "With the Recht des Besitzes was the juridical method of the Romans regained, and modern jurisprudence born." It marked a great advance both in results and method, and it rendered obsolete a large literature. Savigny sought to prove that in Roman law possession had always reference to usucapion or to interdicts, that it is not a right to continue in possession, but to immunity from violence, and that possession is based on the consciousness of unlimited power, These and other propositions were maintained with great acuteness: and unequalled ingenuity in interpreting and harmonizing the Roman jurists. The book also seeks to solve the problem of general interest, common to almost evcry system of jurisprudence, why possession, rightful or wrongful, as distin- guished from property, should be protected. This general problem suffers by being almost solely discussed with reference to Roman law. His leading principle, that every "exercise of force" is illegal, is not incontestible, and, if true, it does not clear up the whole problem. The attempt to treat the historical accidents of Roman law as juridical necessities is the weak side of a work in other respects masterly; and there is a difficulty in understanding Austin's eulogy that it was of all books he knew " the least alloyed with error and imperfection." The controversy which has been carried on in Germany by Ihering, Baron, Gans, and Bruns shows that many of Savigny's conclusions have not been accepted. The Beruf unserer Zeit expresses the idea, un- familiar in 1814, that law is part and parcel of national life, and combats the notion, too much assumed by French jurists, espe- cially in last. century, and countenanced in practice by Bentham, that law might be arbitrarily imposed on a country irrespective of its state of civilization and past history. Of even greater value than his services in founding or consolidating "the historical school of jurisprudence " is the emphatic recognition in his works of the fact that the practice and theory of jurisprudence cannot be divorced without injury to both. Writing at a time when the influence of Hegel was in the ascendant, and in a city where he was official philosopher, Savigny was not carried away by meta-physical theories. In all his writings there is not a word betraying acquaintance with the labours of his great contemporary, Bentham, nor had Bentham more than the most superficial knowledge of

‘ See Windscheid, Lehrbuch des Pandektenrechts, i. 489.

him (see Gans’s Riickblicke auf Personen). Perhaps a study of both would do more than anything else to aid in the construction of a true science of jurisprudence, consisting neither of platitudes and logomachies nor of a worthless catalogue of legal curiosities. (J. Mt.)

SAVILE. See Hatrrax, vol. xi. p. 386.

SAVILE, Str Henry (1549-1622), a learned English- man, was the second son of Henry Savile, and was born at Over Bradley, near Halifax, Yorkshire, 30th November 1549. He entered Brasenose College, Oxford, whence he was elected to Merton College in 1561, where he took his degree in Arts and was chosen fellow. After graduating M.A. in 1570, he voluntarily read lectures on mathematics in the university. He was proctor in 1575 and 1576, travelled on the Continent collecting MSS. in 1578, and on his return was tutor to Elizabeth in Greek and mathe- matics. He was warden of Merton College from 1585 until his death, and in 1596 was chosen provost of Eton College. He was offered preferment by James I. after his accession in 1604, but would accept nothing more than the honour of knighthood. After the death of his son Henry he devoted his fortune to the promotion of learn- ing. In 1619 he founded lectures on mathematics and astronomy at Oxford, and he also made various other benefactions to the university, including the foundation of a mathematical library for the professors, and the gift of several rare MSS. and printed books to the Bodleian. He died at Eton College 19th February 1622, and was buried in the chapel there. In recognition of his great services to the university, a public speech and verses were made in his praise, which were soon afterwards published under the title Ultima Linea Savilir.

Savile was held in the highest esteem by all the learned of his time. He published Four Books of the Histories of Cornelius Tacitus, and the Life of Agricola, with Notes, dedicated to Queen Elizabeth (1581); A View of Certain Military Matters, or Com- mentaries concerning Roman Warfare (1598) ; Rerum Anglicarum Seriptores post Bedam (1596) ; an excellent edition of Chrysostom, 8 vols. (1613); Mathematical Lectures on Huclid’s

Elements (1621); and Oratio eoram Elizabetha Regina Oxoniw habita anno 1592 (1658). In 1618 he published, with a Life, Bradwardin's work De Causa Dei contra Pelagium et de Virtute Causarwm; and he translated into Latin King James's Apology for the Oath of Alle- gianee. He also left several manuscripts written by order of King. James, all of which are in the Bodleian library.

SAVINGS BANKS (Fr. caisses @épargne; Germ. Spar- Lassen) are institutions for the purpose of receiving small deposits of money and investing them for the benefit of the depositors at compound interest. They are, in general, managed by benevolent persons, who seek no remunera- tion for their services. They originated in the latter part of the 18th century —a period marked by a great advance in the organization of provident habits in general (see Frrenpty Societies). They had been, however, one of the many excellent projects suggested by Daniel Defoe in 1697. 'The earliest institution of the kind in Europe was one established at Brunswick in 1765 ; it was followed in 1778 by that of Hamburg, which still exists, in 1786 by one at Oldenburg, in 1790 by one at Loire, in 1792 by that of Basel, in 1794 by one at Geneva, which had but a short existence, and in 1796 by one at Kiel in Holstein. In Great Britain, in 1797, Jeremy Bentham revived De- foe's suggestion under the name of "Frugality Banks," and in 1799 the Rev. Joseph Smith put it in action at Wendover. 'This was followed in 1801 by the addition of a savings bank to the friendly society which Mrs Priscilla Wakefield had established in 1798. Savings banks were shortly after established in London, Bath, Ruthwell in Dumfriesshire, Edinburgh, Kelso, Hawick, Southampton, and many other places. By 1817 they had become nunierous enough to claim the attention of the legislature, and Acts of Parliament were passed for their management and control, Their progress in the United Kingdom since that date is shown by the following statement :—

oan Numb f ee | Amount of For Wea j : age of | f ae Eanaon: Dapubitors. Papal. Deposits. Popuinctons 20, tion. | 7 BS fee Se 1821 | 20,893,584 [Not known… 4,740,188 |0 4 6 1831 | 24,028,584 429,400 | 2 | 14,698,685 012 3 1841 | 26,730,929 } 841,204; 38 | 24,536,971 ,018 4 1851 | 27,390,629 |

1,161,838 4 30,445, 568 1 3} 1861 | 28,927,485 | 1,609,102 | 6 41,542,219 | 1 8 9 |

From this date the progress of the post office savings banks has also to be brought into account, statistics of which have already been given under Post Orrice :—

Number of Depositors. |Pereent- 7 : age of Year. | Population, ricemaaie Post Offiee 5 = Popula. Savings Banks. | Savings Banks. ion.

1871 31,845,379, 1,404,078 1,303,492 2,707,570 84

1881 | 35,241,482) 1,532,486 2,607,612 4,140,098 Wy Meksee || oR aage 1,582,474 3,333, 675 4,916,149

Sass nnnUnnennnermmmesnenemnereeeeeeeeeeer UO

Amount of Deposits.

of Popula- | ae Trustee Post Offiee Total, tion. | POSiEor. Savings Banks. | Savings Banks. aé Be ae es ob Gall ds 1871 | 38,820,458 17,025,004 55,845,462 1115 0; 21 1881 | 44,137,855 36,194,495 80,332,350 |2 5 7 19 1884 | 45,840,887 44,773,773 90,614,660 18

On the 24th April 1886 the funds in the hands of the National Debt Commissioners on account of trustee savings banks were £46,162,515, and post office savings banks £49,881,896, a total of £96,044,411.

To these may be added the cash and assets in the hands of the banks and the postmaster-general, which at the beginning of the previous year amounted to £7 64,804, and also the following investments in stock on account of depositors :—trustee savings bank, £729,522 3 post office savings bank, £2,626,928 ; total, £3,356,450 ;—making the aggregate funds belonging to depositors in savings banks more than £100,000,000.

The largest savings bank in the United Kingdom is that at Glasgow, as shown by the following table of the 21 principal banks :—

Deposits on | Deposit | Number of 20th Novem- | Accounts Transactions ber 1884, Open. in the Year, a ee petite 3,686,607 | 127,651] 523,399 Bee i cectes cee 2,080,788 | 80,667] 336,281 ey 1,858,468 | 68,162) 210,898 O peadBoneaobacdsadhrooese 1,412,547 59,970 232,375 1,351,839} 29,999] 38,350 1,263,577 | 65,301 104,311 SOOBCOCHOREO RAO BNA DG BBAR NE REE 1,054,601 | 34,217 35,230 Cee ode an, 957,164 | 32,389 74,150 (eroree 885,195 | 31,880] 97,386 apiesisnecaeceer 776,188 | 21,998 40,952 – AGN RI et 653,875] 19,561 54,871 ee te ei 628,903 | 27,597 82,414 INOLEIMANAMY.. <6. ccesseccess ces 607,708 | 22,811 40,114 LIPS ca ae 572,209 | 24,3929 83,433 econ ce tne wee 539,695 | 14,168 29,286 oe ee, a 523,154} 18,995 23,675 Deane 521,615 | 23,532| 39,438

Banks with less capital but a large number of depositors—

Ni, 3 nia: 396,151] 32,668 sbedcosnEeccesh ay onanconer 474,089} 22,119

caeuErice 301,713} 20,895

Rec eere es cassie ee ee 326 296 | 18,531

20,872,382 | 797,438 | 2,294 463

SAVINGS BAW Re

From this table some interesting conclusions may be drawn as to the operations of savings banks in the larger towns, These 21 banks have together more than 50 per cent. of the depositors, more than 45 per cent. of the deposits, and more than 65 per cent. of the transactions of all the 411 savings banks of the United Kingdom.

The progress of savings banks and the large amount that the deposits have now reached are evidence of the general fitness of the organization for its purpose. So far as regards trustee savings banks, the provisions of the Acts of 1817 are still to a great extent the same as those by which they are now regulated, though the law has been frequently amended in matters of detail, and twice (1828 and 1863) consolidated. Its main feature is the requirement that the whole of the funds should be invested with the Government through the Commissioners for the Reduction of the National Debt. The local

management of the banks has been left entirely to the trustees, who are precluded from receiving any remuneration for their services or making any profit. They are, however, required to furnish the commissioners with periodical] returns of their transactions. This blending of private management with state control has had many advantages in knitting together class and class, and in many places the voluntary trustees and managers have been able to render real service to the depositors in various ways. A new savings bank requires for its establishment. the coll sent of the National Debt Commissioners and the eerie ficate of the registrar of friendly societies to its rules é but since the opening of the post office savings banks in 1861 few have been established, and many old savings banks have been closed, not being able to offer to their depositors the same advantages as the new system. The savings banks, which numbered 640 in 1861, have thus been reduced to 411, and their capital has been maintained rather by the accumulation of interest than by fresh deposits.

The legislation of 1817, among other inducements to thrift, offered that of a bounty to the savings bank depositor in the shape of a rate of interest in excess of that given to the ordinary public creditor, or—which is the same thing—in excess of that which eould be earned by the investment of the deposits in the purchase of Government stock. The interest offered in the first instanee was 3d. per day, or £4, 11s. 3d. per cent. per annum ; and that rate continued to be granted until the passing of the Aet of 1828 (9 Geo. IV. e. 92). That Act reduced the rate of interest allowed to the trustees of savings banks to 24d. per day, or £3, 16s, 0$d. per annum, and prohibited them from allowing more to their depositors than 27d. per day, or £38, 83, 54d. per annum, requiring them to pay the surplus, if any, into a separate fund held by the National Debt Commissioners, but bearing no interest. In 1844 the interest to trustees was further reduced to 2d. per day, or £3, 5s. per cent., the maximum to be allowed to depositors being fixed at £3, 0s. 10d. Finally, in 1880 the interest to trus- tees has been reduced to £3, and that to depositors to £2, 15s.

The result of the bonus on thrift offered by the earlier statutes was a loss to the state, which ought to have been inade good by an annual vote. Between 1817 and 1828 the difference between the interest eredited and that earned amounted to £744,363 ; and this led to the reduction in the rate of interest

effeeted by the Act of the latter year. The deficiency, instead of being paid off, was allowed still to accumulate, and as the price of stoek rose and the deposits increased fresh deficiencies arose, so that by 1844 the deficieney, which would have been 13 millions by the mere accumulation of interest on the previous £744,363, had become £3,179,930. The reduction of interest in 1844 was about enough to make the fund self-supporting, though savings banks are always, as Mr Scratchley clearly shows, liable to loss from the fact that deposits are in excess when the funds are high and withdrawals when they are low; but the past deficiency was still allowed to accumulate, and it was not till 1880 that the plan was adopted of voting the deficiency every year. Had the accumulated defi- ciency been then liquidated, there would have been no necessity for an annual vote. The bad political economy of the legislators of 1817 has left us this legacy of annual deficits. Had they provided the bounty at their own expense instead of that of

their descendants, there would have been little to be said against it.

Organiza tion,

Interest.

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SAVINGS BANKS

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, Limita- The offer of a bonus on thrift was of necessity accompanied by | that these deposits were made with a fraudulent intention. The sion of provisions to guard against its being used by others than the | registrar in Ireland felt bound to act on this determination, and jeposits. classes it was intended to encourage. This was done by limiting | refused to award payment of the deposits. The High Court of the amount that each depositor should be permitted to pay in. | Justiceand the Court of Appeal refused to

grant a mandamus, for In the first instance, in England the limit was fixed at £100 for | the law would not assist a wrongdoer. But parliament itself the first year, and £50 a year afterwards. In 1824 these limits | voted £1000, or half the amount of the forfeiture, the legislature were reduced to £50 for the first year, £30 a year afterwards, and | thus providing a remedy for an injustice it had itself committed. £200 in the whole. In 1828 the limit was adopted which still | Another curious case was that of a young woman, the daughter of remains in force of £30 a year or £150 in the whole, allowed by | a postmaster, who in order that her father might be provided addition of interest to increasc to £200 but no further. Attempts | with funds to meet business claims as they became due, purloined have been frequently made to raise the annual limit to £50, but | money from him and invested it in false names in the post office have always been defeated. This is to be regretted, for the limit | savings bank kept at his house. In this case, the postmaster him- is of doubtful utility, now that the rate of interest has been so | self not being the guilty party, no forfeiture took place. reduced as to prevent loss to the state. It is within the common Among the benefits conferred by the legislature upon depositors Settle- experience of savings banks managers that persons come to deposit | in savings banks has been that of exemption from the jurisdiction ment of an amount exceeding £30 and are disappointed when they find | of the ordinary courts of law in cases of dispute with the trustees. disputes. they cannot do so. The Act of 1882, permitting investment in | By the Acts of 1817 disputes were to be settled by arbitration. Government stock, may diminish the mischief. By that of 1828 the barrister appointed to certify the rules of the “Oceupa- With the view of showing to what extent savings banks are | savings banks (then and until his death in 1870 Mr John Tidd ‘tions of used by the classes for which they were intended, a return was | Pratt) was made umpire in case of difference of opinion between deposi- published for the year 1852, showing (as nearly as could be ascer- the arbitrators. By that of 1844 the arbitrators were abolished, tors. tained) the number of depositors belonging to various occupations, | and an original and final jurisdiction was conferred upon the’ and the amount of their deposits, as follows :— barrister. By an Act of 1876 the functions of the barrister in this respect were conferred upon the registrar of friendly societies. Depositors.| Deposits. | Average.| | This in effect makes no change in the law, for the offices of barrister Sere iad their Asetants, ‘small as and registrar have been always held by the same

persons. As early farmers, clerks, mechanics, and artisans as 1832 it was determined in the case of Crisp v. Sir Henry not described as journeymen, and their Bunbury that the effect of these enactments is to oust the juris- Fe at secvscocesesoeeae renee ces sovcnreneessossersces 296,407 | £8,144,206 £27 diction of all the superior courts of law and equity, and the author- omestic servants, charwomen, nurses, : a ’ and laundresses……ss- ssseesomressseseeere 257,711 | 6,907,388 QT ity of that decision has never been shaken or even doubted. Minors having accounts in their own Since 1876 the registrar of friendly societies has made 147 Jurisdic- i ee cumiepnen 182,636 | 2,426,195 18 awards in cases of disputes with savings banks, in addition to 169 tion of mechanics, and their wives…….....| 152,057 | 4,354,080 29 on disputes with the post office savings bank. As the writer of registrar. Females described only as married the present article is one of the two persons in whom this jurisdic- women, Widows, OF SpinsterS…....++++++.- 138,858 | 4,037,458 29 tion is vested for England, he hopes he may be excused for express- PH coll eae ee este, bud ing the opinion that its exercise has been highly beneficial to CMAIE ALLISANS.....-s0ssceversscenccesscreees 24,859 580,202 23 5 : 2 ane Trust accounts (principally for minors), depositors in savings banks. The costs of the award are limited including all joint accounts……..... 22,347 417,786 19 by treasury warrant to a few shillings, never exceeding £1. The Soldiers, sailors, boatmen, fishermen, procedure is simple and elastic, and the results are believed to be policemen, letter carriers, revenue Saninteeror The central offic ti ist det : officers, pensioners, railway men, and y: ; €, acting as registrar, aetermines ULE? WHE GS one oe 21,525 739,248 34 law and fact, and adjusts all the equities of each case. Reference Persons engaged in education, male and to the index to the registrar’s decisions appended to the chief ais of inaspoudent 10,497 827,795 ae registrar’s report for 1883, or to Mr Forbes’s useful work, will show means, professional men, and their that many interesting questions of law have had to be determined WIVES, -ncon-senssoreseessessrssn ees oo SS: 20,961 579,528 28 with regard to so small a matter as the ownership of a savings oe Sees tle and persons Without any f bank deposit. PE ORCESCENGINON scccvensececsccseusscescsseecce a 1,394,351 | Questions between husband and wife as to property including Other occ0ocCOCOIORE OEE PoE 1,188,147 |£29,908,237 | £25 deposits in savings banks are now, under the Married Women’s provi- : ━━━━

~ | Property Act, settled by the judges of county courts. Where a sions. Not two per cent. of the deposits, therefore, either in number | depositor, as often happens, is of illegitimate birth, a special pro or amount, are made by classes whom it may be supposed it was | vision is made by the Savings Bank Act in favour of his relatives, the intention of the legislature to exclude. to whom the solicitor to the treasury may award his deposits. It Deposi: When a person comes with his first deposit to a savings bank | is open to any depositor to nominate a person to whom the amount tors he is required to sign a declaration, setting forth his name, | due to him at his death shall be payable, provided it does not declara- address, and occupation, that he desires to become a depositor on | exceed £100 and the nominee is not an officer or servant of the tion, _ his own account, and that he has no money in any other savings | bank, unless indeed such officer or servant is related to the bank. If this declaration be not true, the deposits are liable to | depositor. This privilege, derived from the Provident Nomina- be forfeited ; but it is to be feared that few depositors take the | tions and Small Intestacies Act passed in 1883, is not yet | trouble to read what they are signing, or think much about the | sufficiently known to the bulk of depositors, and has not been used } meaning of it. If the depositor cannot write, the actuary of the | to any large extent, but may be expected in time to become very savings bank will usually ask him a few questions, such as his | valuable. It is an extension of a privilege enjoyed by members of age, mother's maiden name, &c., which may tend to identify him, | friendly societies since 1855, and also by industrial and provident i or defeat any attempt to personate him for the purpose of with- | societies and trade unions. drawal. The enactment that deposits are to be forfeited if the A painful chapter in the history of savings banks is that Frauds by declaration be false was qualified in 1863 by a provision that the | occupied by the frauds of actuaries, which have caused losses to actuaries. forfeiture should not be enforced unless in the opinion of the | depositors of not less than £150,000. It too often happens that, appointed barrister (now the solicitor to the treasury) the deposits | where the only supervision is that of honorary officers, a paid) had been made with a fraudulent intention. servant may commit frauds unchecked over a long period of time. | Fraudu- The consequence of the determination by the solicitor to the | In the case of a savings bank at Rochdale, £71,715 was stolen by | lent _ treasury that the deposits have been made with the "fraudulent" | the actuary, and £37,433 of

this loss had to be borne by the ‘ deposits. intention which the Act contemplatcs is out of all proportion to depositors. In one at Dublin the loss was £56,000, and in onc at the nature of the offence committed, being in fact the forfeiture of | Tralee £36,000. These unhappy events must have greatly dis-

| j

all the deposits. The prohibition of double deposits arose when the state was granting a rate of interest greater than that which it earned upon the investment of the money, and it has now ceased to have any real reason whatever, the rate of interest being less than earned. The intention to ‘‘defraud” now means merely the intention to evade a restriction that has ceased to be necessary, not an intention to deprive anybody of anything that belongs to him. Ifit be thought desirable to sanction by the infliction of a penalty the law that these institutions should be used only for the savings of the poorer classes, the loss of interest would be a suflicient if not an extravagant penalty, without forfeiture of the principal. Indeed, the present excessive penalty has, in one re- markable casc, defeated itself. This was the caso of a depositor in an Irish savings bank, who invested in fictitious names the sum of £2000. The solicitor to the treasury felt compelled to declare

couraged the poor, and checked the progress of savings banks. There is, however, the compensating fact that the savings made by the people of Rochdale since 1849, when the savings bank there was closed, have taken the more favourable direction of promoting the great co-operative enterprises of that town. Savings banks, valuable and important as their benefits are, are still only elementary teachers of providence, and it is well for the workman to learn not mercly to save money but to employ his savings to advan- tage. The stringent legislation as to audit of 1863 has diminished frauds on savings banks, and they are now rarely heard of.}

In connexion with savings banks, and as auxiliaries to them, are Penny An ordinary savings bank will not accept a deposit banks.

penny banks.

1 Since the above was written the disclosure of frauds of long standing in the Cardiff savings bank has taken place. toa ge

Army

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of less than 1s. (or in some cases 5s.) on account of the expense

PAVING S BAN KS

in 1878 to 65,735 in 1888,

Their transactions for the year

of management, It seems to have occurred to Dr Chalmers to | 1883 were— deposits, £724,028 ; withdrawals, £842,288, Taking supplement the work of the Edinburgh Old Savings Bank by | the two classes of savings banks together, the number of depositors establishing in a Free Church congregation in Edinburgh a bank, | on 81st December 1888 was 136,089, the amount of capital managed entirely by voluntary agency, in which a deposit of 1d. | £2,818,122, and the average for each depositor £20, 14s. The

or 6d., or any sum not exceeding 10s., would be received. When the deposit amounted to £1, the owner was requested to transfer it to the savings bank, and the funds were invested with the savings bank to the extent of £100 a year or £300 in the whole. Similar banks, called “ territorial savings banks,” were established in other congregations. An organization of penny banks has existed in Glasgow for thirty years, and another has been set on foot in Liverpool by the exertions of Mr T. Banner Newton, the able actuary of the savings bank there. On 20th November 1885 there were 178 such banks open in Liverpool, with 17,492 depositors. When a deposit reaches £1 it is transferred to the depositor’s credit in the Liverpool Savings Bank. The amounts thus transferred were £56,122, and £8432 remained to the credit of depositors in the penny banks. ‘he transactions of the year num- bered 677,686 and amounted to £42,194. Penny banks require no certificate from the registrar or other legal organization, but if they desire to deposit more

than the limit above mentioned the per- mission of the National Debt Commissioners must first be obtained.

Savings banks for the army were established in 1842, and are

andnavy now regulated by Acts of Parliament—22 and 23 Vict. c. 20 (1859),

cent. of the population, depositor, the rate of interest being 44 per cent.

1904 depositors or 6 deposits or £13 each.

number of depositors per cent. of the population was 15. The rate of interest given to depositors is 4 per cent. bank of Melbourne alone had, on the 30th June 1885, deposits amounting to £1,225,758, belonging to 58,129 depositors. transactions averaged 1078 per diem.

The savings The In New South Wales the depositors in June 1883 were 66,604

or 8 per cent of the population, and the deposits £2,805,856 or £42 per depositor, the rate of interest being 4 per cent. in the post office savings bank and 5 and 6 per cent. in other banks.

In Queensland the depositors were 26,642 or 10 per cent. of the

population, and the deposits £1,086,685 or £41 per depositor, the rates of interest being 4 and 5 per cent.

In South Australia the depositors were 46,388 or nearly 16 per and the deposits £1,500,249 or £32 per

In Western Australia, on the 31st December 1882, there were per cent. of the population, having £24,838

In Tasmania the depositors in June 1883 were 17,231 or 14 per

cent. of the population, and their deposits £380,343 or £22 each,

savings 26 and 27 Vict. c. 12 (1863), for the Royal Navy and Marines by | the rate of interest being 34 per cent. in the postal banks, and banks, 29 and 80 Vict. c. 43 (1866), and for seamen generally by 17 and | slightly higher in the general savings bank. 18 Vict. c. 104, § 180 (1854), 18 and 19 Vict. c. 91, § 817 (1855), In New Zealand the depositors were 69,966 or 13 per cent. of and 19 and 20 Vict. ec. 41 (1856). Into these, or indeed into any | the population ; and their deposits £1,687,739 or £24 each. The trustee or post office savings bank, seamen's wages may be paid | rate of interest is from 4 to 5 per cent. : under allotment notes by 48 and 44 Vict. ce. 16, § 3 and sch. 1 The general total for the Australian colonies is 365,828 depositors (1880). The amounts in the hands of the National Debt Commis- | or 12 per cent. of the population, and £10,304,145 deposits sioners belonging to depositors in savings banks of these various | which is £28 on the average for each depositor. i classes at 28d September 1885! were :— In the Dominion of Canada, according to a paper read at the Canada. Military savings banks …….....c.ccceescseseoes £285,631 Montreal meeting of the British Association by Mr J. C. Stewart, Naval savings banks …….....ccccccccceeesessuee 175,445 the old established savings banks in the cities of Montreal and Seamen's savings banks …….....cs0ccccsaee ae 188,816 Quebec have £2,000,000 sterling, belonging to 42,297 depositors ; a the post office savings banks established in 1868 have £2,650,000, Jk a en £599,892 belonging to 66,682 depositors; and the chartered banks also Private Voluntary savings banks, unconnected with the Government, | Teceive deposits on the savings bank system. savings have also been established, the most important of which are the United States. According to the report for 1884 of Mr Henry W. United banks, Yorkshire Penny Bank and the National Penny Bank. The | Cannon, comptroller of thecurrency, there were on the 30th November States, depositors in these rely solely on the character of the persons by 1882 in the United States of America forty-two savings banks, with whom they are managed, and in some institutions of the kind | Capital amounting to £800,000 ($5=£1) and having £8,700,000 have met with severe disappointment in conséquence. As they deposits, and 625 savings banks without capital having £192,000,000 are under no responsibility to the state, these institutions make no | deposits. In the six years 1876-82 the number of savings banks returns to parliament, and no trustworthy information as to the | With capital had increased from twenty-six to forty-two, but their extent of their operations can be given. capital had

diminished 20 per cent., while their deposits had Railway The railway companies, which are private corporations em- | imereased 16 per cent. On the other hand, the number of savings savings powered by special Acts of Parliament, have in several cases banks without capital had diminished from 691 to 625, but their banks. availed themselves of these Acts to take powcr for establishing | “eposits had increased 14 per cent. Of the aggregate deposits, the savings banks for the benefit of their servants. The Manchester, | 422 Savings banks in the New England States held £87,500,000, Sheffield, and Lincolnshire Railway Savings Bank has been estab. | the 179 in the Middle States £98,500,000, the 9 in the Southern lished 25 years, and has 2443 depositors, whose accounts amounted | States £660,000, and the 57 in the Western States and Territories on 31st March 1885 to £249,282 ; its transactions for the year were | £14,000,000. In the latter two groups the banks with and with- — £66,702 deposits, £38,756 withdrawals, in number 26,596, Six | Out capital are nearly equal in number and in the amount of other railway companies have submitted the rules of their savings | deposits ; in the former two groups banks with capital are the banks to the registrar of friendly societies in pursuance of their | ¢XCeption, being only one in sixty of the whole. private Acts, and the aggregate of their annual returns for the | _ Savings banks in the United States differ from those in the year 1884-5 is as follows :_— United Kingdom in the manner in which their funds are invested, Deposits during the year…..... ca . £171,946 not being limited to Government securities, Thus, of the 200 Repayments ….eceec ccs, Og ge £111,399 millions sterling of deposits only 46 millions was invested in Balance due to depositors… £661,177 United States bonds, viz, New England, £6,900,000; Middle Number of depositors… 3.799 States, £35, 800,000; Western States, £400,000; Pacific States and Increase during the year …....ccccccccceseccs ss, “749 Territories, £2,900,000, : Number of transactions (estimate ee ee 61.621 A statement of the aggregate resources and liabilities of 686 Imberemt cremlitediieveis…caisiaiiseiosieks cee. £24,033 savings banks in 1884 (£236,000,000) is furnished, showing :— In addition, five other banks had been established by srettleway || Dep este ts cactinsa.+.,.0iscongegaeene en ee eee seve £215,000, 000 companies without reference to the registrar, and these in 1876 | Surplus fund……....00.. soe 17,000,000 received £72,505 deposits and had 4120 depositors. The total | Undivided) profit, ...cccccecscccsereseseeuesey 3,000,000 deposits in railway savings

banks may therefore be estimated at a | Other liabilities 00… cccsccccsssssceeesscessssseseecs 1,000, 000 million sterling, Provided for as follows :— Austral- British Colonies,—The thirtcen savings banks in the colony of | Loans on real estate…...0.0…cccsccesscscssesesseseeeees 72,000,000 asia. Victoria had on the 3d December 1882 a capital of £1,970,855, | Loans on personal and collateral SOCUNILY =. -cescustueer: 28,000,000 In the following year, however, the withdrawals exceeded the | United States bonds…..... aisiaoe cashes tire ra ee 39,000, 000 deposits, reducing the deposits to £1,785,990. The number of | State, municipal, and other bonds and stocks …..... 44,000,000 depositors, however, has steadily inereased from 24,187 in 1878 to | Railroad bonds and stocks. .....cscssecssssesesssescesees 10,000,000 70,354 in 1888, Of these 39,404 were males aiid 90, 950 Tomales: || AME St0CK vee… cscocaneesee-scenmeeses eee, Het ne 8,000,000 1618 depositors had balances over £200, amounting to £407,932. Se ee REE R ce here se ancc oso 7,000,000 The transactions of the year 1883, weite—deposits, £1,857,678; | Other ags6te.. 0… cc ccscesavesesieee ecsetesveuesen 14,000,000 withdrawals, £1,610,576. The deposits in the post office savings | Due from banks… ..00..0…....ccccscscessssssscceessssseseecescs 11, 000, 000 banks of Victoria also reached their highest amount in TSH2, whon, [OWS .. 0.0… ccusiceestss.s ate 8,000,000

they were £1,150,391, falling in 1883 to £1,0382,132. In them also the number of depositors has steadily increased from 34,360

iF rT RSF aa oa this information we are indebted to the authorities of the National Debt

According to the report of the comptroller for 1885 (which has reached us since the above was written) the deposits have in- creased during the year to £220,000,000, and the total assets to £240, 000,000.

Brazil.

Prussia,

Franee.

In New England the depositors number 36 in every 100 of the population, and the average amount of cach account is £66, or £24 for each individual if distributed over the entire population. In New York State the deposits would give £17 per head if distributed in like manner.

The following table gives for each State the number of depositors, and the amount and average of deposits, in 1885.:—

Deposits.

State. Depositors. Average.

106,000 121,000 39,000 826,000 116,000 252,000 1,165,000 87,000 136,000 78,000 7,000 35,000 9,000 12,000 82,000

£6,500,000

8,700,000 2,200,000 52,500,000 10,200,000 18,100,000 87,400,000 4,800,000 7,000,000 5,700,000 100,000 2,500,000 400,000 600,000 11,700,000

Meinsétis…..... Rhode Islamd: .....5c0:00 New Hey ccc cesses Pennsylvania…....++++ Maryland,.....-.-s00e8 District of Columbia…. PE coc ccsecsccssess FVITMMES OLE: car csoorere esa (Chilitora 00k: pogganeneaoneenee

3,071,000

218,400,000

Brazil.—The savings banks of the empire of Brazil have been made instruments in the gradual extinction of slavery in that country. Since 1871 each slave is allowed certain hours a week to labour for his own benefit, and when his earnings deposited in the savings bank amount to a given sum the remainder of the price of his emancipation is provided by the state out of public funds. The children of slave mothers, who since 1871 have been born free, are also encouraged to place their earnings in schoo] savings

banks. By a law passed on the 14th August 1885, immediate enfranchisement at the cost of the state is conferred upon slaves employed in agricultural establishments, upon condition of their remaining with the master at fixed wages for five years and paying half the wages into the savings bank towards repayment of the price paid for their freedom.

Continent of Europe.—In several of the countries of Europe savings banks have been established and are flourishing. In Prussia the first savings bank was founded by the municipality of Berlin in 1828. In 18388 they were taken under the supervision of the Government. ‘Their formation has been much aided by an association called the “Central Union” for the good of the industrious classes, A great variety of investments is permitted. In 1874 there were 979 banks, having 2,059,000 depositors and £49,315,000 of deposits, being a little over £2 per head of the population. Besides savings banks, there are the credit banks established by the late Herr Schultz-Delitzsch, which perform a similar function.

In France 79 per cent. of the deposits are invested in the public debt, on which interest at the rate of 4 per cent. is guaranteed, but the savings banks are private institutions ; 19 per cent. arc invested in mortgages and 2 per cent. on municipal securities, Post office savings banks also exist. The average amount of each deposit account is smaller than in England, 79 per cent. of the deposits being under £20 as against 63 per cent. The follow- ing statement shows the progress of savings banks in France since their first regulation by law in 1835 :—

Number Per Date, of Banks,, Number of Amount of | Head of

including) Depositors. Deposits. Popula-

Branches. tion.

Bah

430 351,808 7,695,293 4 6

Ab 1850 | 540 565,995 5,572,738 il ,, 1860] 688 | 1,218,122 15,054,184 | 8
8 . 1870 | 1121 j; 2,079,141 25,280,000 on 1320 | 3,173,721 40,646,656 | 22

0

The depositors now number nearly five millions. were greatly affected by the Revolution of 1848 and by the Franco- German War. Previous to the former event, the deposits had risen ou 81st December 1845 to £15,822,164, falling on 31st December

Savings banks

1849 as low as £2,965,802. In the early part of 1870 they had risen to £28,800,000 or 15s. for every individual of the population. The separation of Alsace and Lorraine reduced the deposits. Postal savings banks were established in 1875, but only as auxiliaries of the ordinary savings banks ; school savings banks, mainly through the enlightened cxertions of M. de Malarce, were commenced in 1874. These are now established in 23,222 schools, have 488,674 depositors and £451,402 deposits. A national

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postal savings bank was instituted on 9th April 1881, and was extended to Corsica on 1st March 1882 and to Algeria and Tunis from 1st April 1884. On 81st December 1883 it had already 374,970 depositors and £3,097,200 deposits. The Paris savings bank had on 31st December 1882 440,728 depositors and £8,518, 433 deposits.

In Italy, at the end of 1872, 282 savings banks were in existence, Italy.

of which 142 were principal banks and the rest branches. With two exceptions, all are managed without profit to the promoters or guarantors. In 1825 there were 11 savings banks in which £108,000 had been deposited ; in 1850 the deposits amounted to £1,600,000, and in 1872 to £17,860,000, belonging to 676,327 depositors. Of these funds, 21 per cent. was invested on mortgage, 10 per cent. only in the public debt, 11 per cent. in obligations of local authorities, 12 per cent. in shares and bonds of companies, 16 per cent. in bills of exchange, 15 per cent. in loans on public funds and commercial securities, 11 per cent. in current accounts, and 4 per cent. otherwise. The average rate of interest allowed to depositors is 44 per cent. The transactions of the year were—deposits £7,911,000, withdrawals

£6,514,000. The system of school savings banks has been adopted in many com- munes. In addition, deposits are made in popular banks and other establishments of credit, and post office savings banks have also been established.

In Denmark savings banks are private institutions, but must Denmark.

not be managed for profit, nor invest in foreign securities ; and they are required to make annual returns to Government. In 1860 the amount of deposits was £3,221,000; by 1871 it had increased to £6,651,081, and by 31st March 1881 to EU (OY ot The savings banks have increased in number during the ten years from 188 to 446, and the depositors from 285,991 to 492,296. Twenty-six banks have more than £100,000 deposits. The oldest and largest is that of Copenhagen, established Ist May 1820, having £2,320,892 deposited, which has increased from £832,874 in the ten years. The number of depositors has increased from one in six to one in four of the population, and the deposits from £3, 14s. 8d. to £6, 9s. per head of the population. The transac- tions of the year ending 31st March 1881 were —deposits £8, 141,627; withdrawals £6,702,470. Of the deposit accounts, 74 per cent. are under £23 and 15 per cent. above £23 and under £43. One half of the funds are invested on mortgage. The reserve funds of the banks had increased in ten years from £226,329 to £665,597. The following are statistics of savings banks in other European

Other

countries as published by the Italian Government a few years ago:— European

Number of | Amount of Deposit Deposits on

0

Accounts on : enle. 1st January. ie ara.

Number

Country. Population.

132,000

£2,510,000

5,336,000

Belgium (1874)..... 10

Austria (1874) (Cis-

Leithan provinces)| 21,366,000 | 275 1,269,000 53,931,000 Hungary (1878)..... 15,417,000 | 282 ne 15,209,000 Saxony (1872)..... 2,556,000 | 156 517,000 | 11,445,000 Thuringia (1878)....) 899,000] 7 33,000 | 1,897,000 Mecklenburg (1872)| 557,000] 31 91,000 | 1,072,000 Hamburg (1874)....., 870,000} 8 81,000! 1,616,000 Bremen (1878)..... 135,000; 4 48,000 | 1,404,000 Liibeck (1878)..... 52,000} 2 14,000 138,000 Bavaria (1869)..... 4,824,000 | 260 279,000 2,490,000 Wiirtemberg (1874)| 1,818,000 | 121 ae 2,766,000 Baden (1874)..... 1,461,000 | 99 141,000; 4,142,000 Alsace and Lorraine

RTO See 1,549,000] ... 41,000} 288,000 Holland (1872)..... 8,579,000 | 240 99,000 1,127,000 Sweden (1878)..... 4,297,000 | 271 | 563,000} 6,035,000 Norway (1878) ..... 1,750,000 | 262 | 220,000] 5,201,000 Switzerland (1872)..} 2,669,000 | 312 542,000 | 11,581,000

Russia (1872) (cer- tain governments

56,408,000 1,838,000

126,881,000 |2376

71,000 18,000

735,000 346,000

36

4,159,000 |123, 928,000

countries.

M. de Malarce has obtained for the Dictionnaire des Finances Aggre- some more recent statistics, the details of which have not yet gate.

reached us, but from information he has been so good as to com- municate we infer an increase in deposits during the last 10 years in twelve European states of £123,000,000,—making the aggregate of savings bank deposits for all countries, as far as ascertained, £725 ,000,000. (E. W. B.) SAVOIE, a department of south-eastern France, formed in 1860 of the districts of Upper Savoy, Savoy proper, Tarentaise, and Maurienne, which formed the southern part of the province of Savoy in the kingdom of Sardinia.

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Situated between 45° 5’ and 45° 55’ N. lat. and between 5° 37’ and 7° 5’ E. long., it is bounded N. by the depart- ment of Haute-Savoie, N.W. by Ain, W. by Isére, 8. by Hautes-Alpes, and §.E. and E. by Piedmont (Italy), the limits for the most part consisting of ridges of the Alps, and on the N.W. being determined by the Rhone and its affluents the Fier and the Guier. The highest point in the Vanoise group of mountains is 12,668 feet above the sea, while the Rhone leaves the department at a height of 695 feet, and the Istre about 800. Some details in regard to the orography will be found under Atps (q.v.). The Isére flows east and west through the Tarentaise valley by Bourg St Maurice, Moutiers, Albertville, and Montmelian ; its principal tributary the Arc flows along the Maurienne valley used by the Mont Cenis Railway. The lake of Bourget discharges into the Rhone by the Saviéres canal. The climate of the department varies according to altitude and exposure. At Chambéry and Aix-les-Bains the average temperature is a little lower than that of Paris, but the rainfall is about 65 inches per annum, and this aniount goes on increasing as the higher regions are reached.

With a total area of 1,423,254 acres, Savoy comprises 434,921 acres of uncultivated ground, 239,700 acres of arable, 205,105 in forests, 172,980 in meadows, 27,183 in vineyards. More than the half of the inhabitants (194,704 out of 266,438) are engaged in agriculture. In 1881 there were in the department 97,487 cows, 19,328 oxen, 2570 horses, 3156 asses, 4207 mules, 98,826 shecp, (40 tons of wool), 19,428 pigs, 25,527 goats. About 1,

870,000,000 gallons of milk are produeed and 2463 tons of butter and 5911 tons of cheese are manufactured, of a total value of £500,000. From the 19,600 beehives were obtained in 1881 87 tons of honey and 16 of wax. The grape ripens up to an altitude of 2625 feet, and is cultivated to an altitude of 3940. Several growths of Savoy are in great repute and the vineyards were (before the invasion of the phylloxera) one of the most important products of the department, Tobacco is also cultivated. In 1883 the crops comprised wheat, 404,665 bushels ; meslin, 104,500 ; rye, 679,668 ; barley, 212,883 ; buckwheat, 20,641; maize, 245,245 ; oats, 722,067; potatoes, 1,244,603 ; pulse, 54,120 ; chestnuts, 72,036 ; bectroot, 14,040 tons ; tobaeco, 350 tons ; hemp, 585 tons ; colza-seed, 284 tons; hemp- seed, 195 tons ; wine, 3,895,496 gallons (annual average 4,128,520 gallons) ; cider, 187,258 gallons (average 69,058 gallons). Not-withstanding deplorable clearances, Savoy still possesses consider- able woods of pine, larch, beech, &c. The chestnut, of which the finest specimens are in the neighbourhood of Aix-les-Bains, grows, as do also the walnut and hazel, to a height of 3600 feet, the oak to 3900, the elm and the ash to 4250, the fir to 4900, and the pine to 7200, The department contains one of the richest deposits of spathic iron in Europe, and the Creusot Company employs 700 hands in working it. Argentiferous lead and copper have also been occasionally worked. The Maurienne and the Tarentaise are rich in anthracite, and yielded in 1882 16,687 tons of fuel. Peat covers 1413 acres, with a thickness varying from 8 inches to 8 feet, and there are rich beds of different kinds of marble, fifty-two quarries of building stone, and quarries of limestone, plaster, cement, and slate, as well as deposits of black lead, jet, asbestos, tale, mica, ochre, sulphate of baryta, zine, antimony, arsenie, manganese, titanium, sulphur. The department is particularly rieh in mineral waters, and the most famous, those of Aix-les- Bains (hot sulphurous) were frequented in the time of the Romans. The waters at Marlioz in the neighbourhood are sulphurous or alkaline (iodine, bromine). Those of Challes near Chambéry rank among the most powerful of the natural sulphurous waters. The Salins-Moutiers waters in the Tarentaise are hot, saline, and rich in various minerals ; the hot springs of Brides-les-Bains in the same region are rich in the sulphates of soda and calcium, Silk is the leading object of industry in the department (31 tons of cocoons in 1883). The winding of the cocoons, the milling of the silk (3500 “‘tavalles ” and spindles), and the weaving of the silk-fabrics (808 looms, 55 being hand-

looms) employ more than 1700 workmen, and the goods manufactured are valued at £380,000. Chambéry produces 71,000 yards of high-class gauze, 3000 yards of velvct, 18,000 yards of handkerchiefs, and some 800,000 yards of taffetas and varions other silk stuffs. Linen manufactures employ 400 looms, woollen manufactures 1850 spindles, The peasants manufacture about 125,000 yards of coarse woollen stuffs from their home-grown wool. The blast furnaces and iron-works produced in 1881 176 tons of manufaetured iron. Tanneries, paper-mills, paper- pulp factories, brick-works, saw-mills, flour-mills, &c., are all of some Importanee in the department, which counts altogether sixty- one establishments with steam-engines of (aggregate) 271 horse power. The number of inhabitants engaged in industrial pursuits

is 24,482, in commerce 14,016. are imported ; eattle, cheese, building materials, mineral waters, silk stuffs, tanned leather, and

Coal, skins, cotton, provisions butter, wood, stones, and various

paper are exported. There are 204 miles of national roads, 2518 miles of other roads, and 150 miles of railroad. The population was 266,438 in 1881. The department forms the three dioceses of Chambéry (archbishopric), Moutiers, and St J ean-de-Maunrienne ; the court of appeal and university academy are at Chambéry, and the headquarters of the corps d’armée to which it belongs (the 14th) areatGrenoble. There are four arrondissements, —Chamhé (16,000 inhabitants in the town), Albertville (5000), Moutiers (2000), St Jean-de-Maurienne (3000),—29 cantons, and 828 com- munes, Aix-les-Bains (4741), owing to its hot springs, is the most important place in the department.

SAVOIE, Havrve-, a frontier department of France, formed in 1860 from the old provinces of Genevois, Chablais, and Faucigny, which constituted the northerm half of the duchy of Savoy in the kingdom of Sardinia. Situated between 45° 40’ and 46° 25’ N. lat. and between 5° 50’ and 7° 2’ E. long., it is bounded N. by the Lake of Geneva, E. by the Valais canton, S.E. by the duchy of Aosta (Italy), S. and S.W. by the department of Savoie, W. by the department of Ain, from which it is separated by the Rhone, and

N.W. by the canton of Geneva, Almost everywhere except in the last direction the boundaries are natural. The greater portion of the depart- ment is occupied by mountains usually under 8000 feet in height ; but it includes Mont Blanc (15,781 feet), while the confluence of the Fier with the Rhone is only 950 feet above the sea. The streams are torrential, and they all

join the Rhone either directly or by the Lake of Geneva

or the Isére. Most important is the Arve which crosses the department from south-east to north-west from Mont Blanc to Geneva by Chamonix, Sallanches, and Bonneville, receiving from the right the Giffre and from the left the Borne. The Dranse falls into the Lake of Geneva between Evian and Thonon. Direct tributaries of the Rhone are the Usses and the Fier, the outflow of the Lake of Annecy. Passing Mégéve, to the south-west of Chamonix, the Arly goes to the Isére. A remarkable variety of climate is produced by the differences of altitude and exposure; it is mildest on the banks of the Lake of Geneva. Annecy has a moderate temperature, lower than that of Paris; but some parts of the shores of the lake, well sheltered and having a good exposure, form health resorts even in winter. The rainfall on the Lake of Geneva hardly exceeds 24 inches ; it is three times as heavy in the mountains,

Of the total area of 1,066,229 acres 345,959 acres are arable, 214,990 woodland, 182,206 uncultivated, 95,880 pasturage, 91,432 meadows, 21,252 vineyards. The live stock in 1880 comprised 9774 horses, 98,171 cows or heifers, 11,272 calves, 18,769 pigs, 25,331 goats, 33,000 sheep (wool-clip 41 tons), 21,525 hives (104 tons of honey, 38 of wax). Cheese is produced to the value of £220,000, and butter to £132,000. The harvest in 1888 included —wheat, 1,472,381 bushels; meslin, 196,510; rye, 190,503. For 1880 the returns were—barley, 136,043 bushels ; buckwheat, 88,178; maize, 10,928 ; oats, 793,721; potatoes, 3,730,800; pulse, 42,507; chestnuts, 66,462; besides bectroot, hemp, flax, and colza. In 1883 the vintage was 3,221,834 gallons, the average for 1873- 1882 being 3,199,570, and cider was produced to the amount of 757,922 gallons (average 742,808). Tobacco is successfully grown in a part of the department (Rumilly). Though much of the wood has been cut down, Haute-Savoie still contains fine pine forests below 7200 feet of altitude, and fir, larch, and beech woods below 5000

feet, the limit of the elm and ash being 4250, and that of the oak 4000. Splendid walnuts and chestnuts are to be found as high up as 2950 feet and hazels as high as 3600. Argentiferous lead ores and copper, iron, and manganese ores exist, but are not mueh worked. About 1000 tons of anthracite and lignite were raised in 1882, and 12,405 tons of asphaltic limestone. Jasper and other beautiful marble, freestone largely used in the buildings of Lyons and Chambéry, limestone, and slates are all quarried, Mineral waters of varions kinds abound (Amphion and Evian, chalybcate ; St Gervais at the foot of Mont Blanc, hot, sulphurous, and chaly- beate; Menthon, sulphurous; La Caille, hot, sulphurous). Cotton manufacture is carried on at Annecy, where one establishment has 20,000 spindles, 600 power-looms, and 100 hand-looms, employing

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500 workers. Some 500,000 or 600,000 yards of silk stuffs are woven throughout the department by some 850 workers; and wool-spinning and wool manufactures are also carried on. In the iron industry 1921 tons of cast-iron and 1956 tons of malleable iron were manufactured in 1882. Clock-making, taught in two special schools, employs 2000 hands. Tanneries, paper-mills, tile-works, and flour-mills are numerous. About two-thirds of the cantons have the advantage of belonging to the neutral customs zone—that is, have the right of introducing foreign goods duty free, with the exception of powder and tobacco. Coal, cotton, metals, and provisions are imported; cheese, cattle, timber, leather, asphalt, building stone, and calico are exported. The national roads make a total of 193 miles, other roads 3100 miles, and the railways—Annccy to Aix-les-Bains and to Annemasse, on the line from Bellegarde to Evian—96 miles. With its 274,087 inhabitants (1881), who all speak French and are almost exclusively Roman Catholics, Haute-Savoie is only about one-tenth bclow the average density of France. It forms the diocese of Annecy; the court of appeal and the university academy are at Chambéry, and the department -is included in the 14th corps d’armée district (Grenoble). There are 4

arrondissements—Annecy (population of town 11,000), Bonneville (2270), St Julien (1500), and Thonon (5440),—-28 cantons, and 314 communes.

SAVONA, a city of Italy, in the province of Genoa, 254 miles west of that town, and 91 miles south of Turin by rail, is after Genoa and Nice the most important of the cities of the Riviera. The greater part of the town is now modern, consisting of handsome gardens, boulevards, and well-paved broad streets lined with massive arcades and substantial houses, built in enormous square blocks from four to five stories high. It is surrounded with green-clad hills and luxuriant orange groves. On the Rock of St George stands the castle built by the Genoese in 1542, now used as a military prison. The cathedral (1589-1604) is a late Renaissance building with a dome of modern con- struction. In the Cappella Sistina stands the magnificent tomb erected by Sixtus IV. to his parents. Facing the cathedral is the Della Rovere palace erected by Cardinal Giulio della Rovere (Julius II.) as a kind of university, and now occupied by the prefecture, the post-office, and the courts. San Domenico (or Giovanni Battista) built by the Dominicans, occupies the site of the very ancient church of Sant' Antonio Abate. Several of the churches have paintings of some merit, and there is a municipal picture-gallery occupying part of the extensive buildings of the civil hospital of St Paul. The Teatro Chiabrera, erected in 1853 in honour of the lyric poet Chiabrera, who was born in Savona, and is buried there in the church of San Giacomo, has its facade adorned with statues of Alfieri, Goldoni, Metastasio, and Rossini. The town-house (with the public library founded by the bishop of Savona, Maria di Mari, in 1840), the episcopal palace, and the harbour tower surmounted by a colossal figure of the Virgin also deserve mention. As early as the 12th century, the Savonese built themselves a sufficient harbour ; but in the 16th century their rivals the Genoese, fearing that Francis I. of France intended to make it a great seat of Mediterranean trade, rendered it useless by sinking at its mouth vessels filled with large stones. The modern harbour, dating from 1815, has since 1880 been provided with a dock excavated in the rock, 986 feet long 460 wide and 23 feet deep; and other extensions are in progress. In 1884 1012 vessels (349,462 tons) entered and 988 (346,337 tons) cleared—the steamers being respectively 298 (273,237 tons) and 294 (270,953). The opening of the railway to Bra (1878) at once gave Savona an advantage over Genoa as a port for supplying Turin and Piedmont. A large import

trade has since grown up, especially in coals (300,000 tons from Great Britain and France), which can be loaded directly from the ship into the trucks. The exports are confined to the products of the local industries, fruit, hoop-staves, &c. The potteries which have been long established at Savona export their earthenware to all parts of Italy; and there are glass-

works, soap-works, and one of the largest iron-foundries in North Italy. Shipbuilding is also carried on, The population of the commune, which includes the suburbs of Fornaci, Lavagnola, Legino and Zinola, and San Bernardo, was 19,611 in 1861 and 29,614 in 1881, that of the city at the latter date being 19,120.

Savona ig the Savo where, according to Livy, Mago stored his booty in the Second Punic War. In 1191 it bought up the terri- torial claims of the Marquises Del Carretto. Its whole history is that of a long struggle against the preponderance of Genoa. In 1746 it was captured by the king of Sardinia, but it was restored to Genoa by the treaty of Aix-la-Chapelle. Columbus, whose ancestors came from Savona, gave the name of the city to one of the first islands he discovered in the West Indies.

SAVONAROLA, Grrotamo (1452-1498). The roll of Italian great men contains few grander names than that of Savonarola, and the career of this patriot-priest, re- former, and statesman is one of the strangest pages of Italy’s history. Amid the splendid corruptions of the Italian Renaissance he was the representative of pure Christianity, the founder and ruler of an ideal Christian republic, and, when vanquished by the power of Rome, suffered martyrdom for the cause to which his life had been dedicated. His doctrines have been the theme of interminable controversies and contradictory judgments. He has been alternately declared a fanatic bent on the revival of medieval barbarism and an enlightened pre- cursor of the reformation, a true Catholic prophet and martyr and a shameless impostor and heretic. It is enough to say here that his best biographers and critics. give satisfactory proofs that he was chiefly a reformer of morals, who, while boldly denouncing Papal corruptions, preserved an entire belief in all the dogmas of the Roman Catholic Church.

Girolamo Savonarola was born at Ferrara 21st September 1452, the third child of Michele Savonarola and his wife Elena Bonaccossi of Mantua. His

grandfather, Michele Savonarola, a Paduan physician of much repute and learning, had settled in Ferrara at the invitation of the reigning marquis, Nicholas III. of Este, and gained a large fortune there. The younger Michele was a mere courtier and spendthrift, but Elena Savonarola seems to have been a woman of superior stamp. She was tenderly loved by her famous son, and his letters prove that she retained his fullest confidence through all the vicissitudes of his career.

Girolamo was a grave precocious child, with an early passion for learning. He was guided in his first studies by his wise old grandfather the physician ; and, in the hope of restoring their fallen fortunes, his parents intended him for the same profession. Even as a boy he had in- tense pleasure in reading St Thomas Aquinas and the Arab commentators of Aristotle, was skilled in the subtle- ties of the schools, wrote verses, studied music and design, and, avoiding society, loved solitary rambles on the banks of the Po. Grass-grown Ferrara was then a gay and bustling town of 100,000 inhabitants, its prince Borso d'Este a most magnificent potentate. To the mystic young student all festivities were repulsive, and although reared in a courtier-household he early asserted his individuality by his contempt for the pomp and glitter of court life. At the age of nineteen, however, he had as yet no thought of renouncing the world, for he was then passionately in love with the child of a friendly neighbour, a Strozzi exiled from Florence. His suit was repulsed with disdain ; no Strozzi, he was told, might stoop to wed a Savonarola. This blow probably decided his career, but he endured two years of misery and mental conflict before resolving to abandon his medical studies and devote himself to God's service. He was full of doubt and self-distrust ; disgust for the world did not seem to him a sufficient

qualification for the religious life, and his daily prayer was, "Lord! teach me the way my soul should walk." But in 1474 his doubts were dispelled by a sermon heard at Faenza, and his way was clear. Dreading the pain of bidding farewell to his dear ones, he secretly stole away to Bologna, entered the monastery of St Domenico and then acquainted his father with his reasons for the step. The world's wickedness was intolerable, he wrote; through- out Italy he beheld vice triumphant, virtue despised. Among the

papers he had left behind at Ferrara was a treatise on “Contempt of the World,” inveighing against the prevalent corruption and predicting the speedy vengeance of Heaven. His novitiate was marked by a fervour of humility. He sought the most menial offices, and did penance for his sins by the severest austerities. According to contemporary writers he was worn to a shadow.

All portraits of this extraordinary man are at first sight almost repulsively ugly, but written descriptions tell us that his gaunt features were beautified by an expression of singular force and benevolence. Luminous dark eyes sparkled and flamed beneath his thick, black brows, and his large mouth and prominent nether lip were as capable of gentle sweetness as of power and set resolve. He was of middling stature, dark complexion, had a nervous system of exceeding delicacy and the sanguineo-bilious temperament so often associated with genius. His manners were simple, his speech unadorned and almost homely. His splendid oratorical power was as yet unrevealed; but his intellectual gifts being at once recognized his superiors charged him with the instruction of the novices, instead of the humbler tasks he had wished to fulfil. He passed six quiet years in the convent, but his poems written during that period are expressive of burning indignation against the increasing corruptions of the church and profoundest sorrow for the calamities of his country.

In 1482 he reluctantly accepted a mission to Ferrara, and, regarding earthly affections as snares of the evil one, tried to keep aloof from his family. His preachings attracted slight attention there, no one—as he later remarked—being a prophet in his own land. An outbreak of hostilities between Ferrara and Venice, fomented by Pope Sixtus IV., soon caused his recall to Bologna. Thence he was despatched to St Mark’s in Florence, the scene of his future triumph and downfall.

Lorenzo the Magnificent was then (1482) at the height of his power and popularity, and the Florentines, dazzled by his splendour and devoted to pleasure and luxury, were docile subjects to his rule. At first Savonarola was enchanted with Florence. Fresh from the gloom of Bologna, sickened by the evils wrought on Italy by the scandalous nepotism of the pope, and oppressed by some natural human anxiety as to his reception in a strange

city, the gaiety and charm of his novel surroundings lifted a weight from his soul. His cloister, sanctified by memories of St Antonine and adorned -with the inspired paintings of Fra Angelico, seemed to him a fore-court of heaven. But his content speedily changed to horror. The Florence streets rang with Lorenzo's ribald songs (the "canti carnascialeschi "); the smooth, cultured citizens were dead to all sense of religion or morality ; and the spirit of the fashionable heathen philosophy had even infected the brotherhood of St Mark. In 1483 Savonarola was Lenten preacher in the church of St Lorenzo, but his plain, earnest exhortations attracted few hearers, while all the world thronged to Santo Spirito to enjoy the 'elegant rhetoric of Fra Mariano da Genazzano. Discouraged by this failure in the pulpit, Savonarola now devoted himself to teaching in the convent, but his zeal for the salvation

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of the apathetic townsfolk was soon to stir him to fresh efforts. Convinced of being divinely inspired, he had begun to see visions, and discovered in the Apocalypse symbols of the heavenly vengeance about to overtake this sin-laden people. In a hymn to the Saviour composed at

this time he gave vent to his prophetic dismay. The papal chair was now filled by Innocent VIII, whose rule

was even more infamous than that of his predecessor

Sixtus IV.

Savonarola's first success as a preacher was gained at St Gemignano (1484-85), but it was only at Brescia in the following year that his power as an orator was fully

revealed. Ina sermon on the Apocalypse he shook men's

souls by his terrible threats of the wrath to come, and drew tears from their eyes by the tender pathos of his assurances of divine mercy. A Brescian friar relates that a halo of light was seen to flash round his head, and the

citizens remembered his awful prophecies when in 1512 their town was put to the sack by Gaston de Foix.

Soon, at a Dominican council at Reggio, Savonarola had occasion to display his theological learning and subtlety. The famous Pico della Mirandola was particularly impressed by the friar's attainments, and is said to have urged Lorenzo de' Medici to recall him from Lombardy, When Savonarola returned to Florence in 1490, his fame as an orator had gone there before him. The cloister garden was too small for the crowds attending his lectures, and on the Ist August 1490 he gave his first sermon in the church of St Mark. To quote his own words, it was "a terrible sermon," and legend adds that he foretold he should preach for eight years.

And now, for the better setting forth of his doctrines, to silence pedants, and confute malignant misinterpretation, he published a collection of his writings. These proved his knowledge of the ancient philosophy he so fiercely condemned, and showed that no ignorance of the fathers caused him to seek inspiration from the Bible alone. The Triumph of the Cross is his principal work, but everything he wrote was animated by the ardent spirit of piety evidenced in his life. Savonarola's sole aim was to bring mankind nearer to God.

In 1491 he was invited to preach in the cathedral, Sta Maria del Fiore, and his rule over Florence may be said to begin from that date. The anger and uneasiness of Lorenzo de' Medici gave testimony to his power. Five of the leading men of Florence were sent to urge him to moderate his tone, and in his own interest and that of his convent to show more respect to the head of the state. But Savonarola rejected their advice. "Tell your master," he said in conclusion, " that, albeit Iam a humble stranger, he the lord of Florence, yet I shall remain and he depart." Afterwards, in the presence of many witnesses, he fore- told that stupendous changes impended over Italy,—that Lorenzo, the pope, and the king of Naples were all near unto death.

In the July of the same year he was elected prior of St Mark's. As the convent had been rebuilt by Cosimo, and enriched by the bounty of the Medici, it was considered the duty of the new superior to present his homage to Lorenzo. Savonarola, however, refused to conform to the usage. His election was due to God, not Lorenzo; to God alone would he promise

submission. Upon this the sovereign angrily exclaimed: “This stranger comes to dwell in my house, yet will not stoop to pay me a visit.” Nevertheless, disdaining to recognize the enmity of a mere monk, he tried various conciliatory measures. All were rejected by the unbending prior, who even refused to let his convent profit by Lorenzo’s donations. The Magnifico then sought to undermine his popularity, and Fra Mariano was employed to attack him from the pulpit. But the

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preacher’s scandalous accusations missed their mark, and Savon- arola took up the challenge; his eloquence prevailed, and Fri Mariano was silenced. But the latter, while feigning

disgusted his hearers without hurting his rival.

indifference, was thenceforth his rancorous and determined

foe.

In April 1492 Lorenzo de’ Medici was on his deathi- bed at Careggi. Oppressed by the weight of his crimes, he needed some assurance of divine forgiveness from

trustier lips than those of obsequious courtiers, and

summoned the unyielding prior to shrive his soul. Savonarola reluctantly came, and, after hearing the agitated confession of the dying prince, offered absolution upon three conditions. Lorenzo asked in what they consisted. First, “You must repent and feel true faith in God’s mercy.” Lorenzo assented. Secondly, “You must give up your ill-gotten wealth.” This too Lorenzo promised, after some hesitation ; but upon hearing the third clause, “ You must restore the liberties of Florence,” Lorenzo turned his face to the wall and made no reply. Savonarola waited a few moments and then went away. And shortly after_his penitent died unabsolved.

Savonarola’s influence now rapidly increased. Many adhereuts of the late prince came over to his side, disgusted by the violence and incompetency of Piero de’ Medici’s rule. All state affairs were mismanaged, and Florence was fast losing the power and prestige acquired under Lorenzo. The same year witnessed the fulfilment of Savonarola’s second prediction in the death of Inno- cent VIII. (July 1492); men’s minds were full of anxiety, and the scandalous election of Cardinal Borgia to the papal chair heralded the climax of Italy’s woes. The friar’s utterances became more and more fervent and impassioned. Patriotic solicitude combined with close study of Biblical prophecies had stirred him to a pious frenzy, in which he saw visions and believed himself the recipient of divine revelations. It was during the delivery of one of his forcible Advent sermons that he beheld the celebrated vision, recorded in contemporary medals and engravings, that is almost a symbol of his doctrines. A hand appeared to him bearing a flaming sword inscribed with the words: “Gladius Domini supra terram cito et velociter.” He heard supernatural voices proclaiming mercy to the faithful, vengeance on the guilty, and mighty cries that the wrath of God wasat hand. Then the sword bent towards the earth, the sky darkened, thunder pealed, lightning flashed, and the whole world was wasted by famine, bloodshed, and pestilence. It was probably the noise of these sermons that caused the friar’s temporary removal from Florence at the instance of Piero de’ Medici. He was presently addressing enthusiastic congregations at Prato and Bologna. In the latter city his courage in rebuking the wife of Bentivoglio, the reigning lord, for interrupting divine service by her noisy entrance nearly cost him his life. Assassins were sent to kill him in his cell; but awed, it is said, by Savonarola’s words and demeanour they fled dismayed from his presence. At the close of his last sermon the undaunted friar publicly announced the day and hour of his departure from Bologna ; and his lonely journey on foot over the Apennines was safely accomplished. He was rapturously welcomed by the community of St Mark’s, and at once proceeded to re-establish the discipline of the order and to sweep away all abuses. For this purpose he obtained, after much difficulty, a papal brief emancipating the Dominicans of St Mark from the rule of the Lombard vicars of that order. He thus became an independent author- ity, no longer at the command of distant superiors. Thoroughly reorganizing the convent, he relegated many of the brethren to a quieter retreat outside the city, only

retaining in Florence those best fitted to aid in intellectual labour. To render the convent self-supporting, he opened schools for various branches of art, and promoted the study of Oriental languages. His efforts were completely successful; the brethren's enthusiasm was fired by their superior's example ; religion and learning made equal pro- gress; St Mark's became the most popular monastery in Florence, and many citizens of noble birth flocked thither to take the vows.

Meanwhile Savonarola continued to denounce the abuses of the church and the guilt and corruption of man- kind, and thundered forth predictions of heavenly wrath. The scourge of war was already at hand, for in 1494 the duke of Milan demanded the aid of France, and King Charles VIII. brought an army across the Alps. Piero de' Medici, maddened with fear, and forgetting that hitherto Florence had been the firm friend of France, made alliance with the Neapolitan sovereign whose kingdom was claimed by Charles. Then, repenting this illjudged step, he hurried in person to the French camp at Pietra Santa, and humbled himself before the king. And, not content with agreeing to all the latter's demands, he further promised large sums of money and the surrender of the strongholds of Pisa and Leghorn.

This news drove Florence to revolt, and the worst excesses were feared from the popular fury. But even at this crisis Savonarola's influence was all-powerful, and a bloodless revolution was effected. Piero Capponi's declara- tion that "it was time to put an end to this baby govern- ment" was the sole weapon needed to depose Piero de' Medici. The resuscitated republic instantly sent a fresh embassy to the French king, to arrange the terms of his reception in Florence. Savonarola was one of the envoys, Charles being known to entertain the greatest veneration

for the friar who had so long predicted his coming and

declared it to be divinely ordained. He was most respect- fully received at the camp, but could obtain no definite pledges from the king, who was bent on first coming to Florence. During Savonarola's absence Piero de' Medici had re-entered the city, found his power irretrievably lost, and been contemptuously but peaceably expelled. It is a proof of the high esteem in

which Savonarola's convent was held that, although the headquarters of the victorious popular party, Piero's brother, Cardinal Medici, entrusted to its care a large share of the family treasures.

Returning full of hope from Pietra Santa, Savonarola might well have been dismayed by the distracted state of public affairs. There was no Government, and revolted Pisa was secretly favoured by the monarch who was knocking at the gates of Florence. Nevertheless, with the aid of Capponi, he guided the bewildered city safely through these critical days. Charles entered Florence on the 17th November 1494, and the citizens' fears evaporated in jests on the puny exterior of the "threatened scourge." But the exorbitance of his demands soon showed that he came as a foe. All was agitation; disturbances arose, and serious collision with the French troops seemed inevitable. The signory resolved to be rid of their dangerous guests ; and, when Charles threatened to sound his trumpets unless the sums exacted were paid, Capponi tore up the treaty in his face and made the memorable reply: "Then we will ring our bells." The monarch was cowed, accepted moderate terms, and, yielding to Savonarola's remonstrances, left Florence on the 24th November.

The city was now free but in the utmost disorder, its commerce ruined, its treasury drained. After seventy years' subjection to the Medici it had forgotten the art of self-government, and felt the need of a strong guiding hand. So the citizens turned to the patriot monk whose

words had freed them of King Charles, and Savonarola became the lawgiver of Florence. The first thing done at his instance was to relieve the starving populace within and without the walls; shops were opened to give work to the unemployed ; all taxes, especially those weighing on the lower classes, were reduced; the strictest admini- stration of justice was enforced, and all men were exhorted to place their trust in the Lord. And, after much debate as to the constitution of the new republic, Savonarola's influence carried the day in favour of Soderini's proposal of a universal or general government, with a great council on the Venetian plan, but modified to suit the needs of the city. The Florentines' love for their great preacher was enhanced by gratitude on this triumphant defence of their rights. The great

council consisted of 3200 citizens of blameless reputation and over twenty-five years of age, a third of the number sitting for six months in turn in the hall of the Cinquecento expressly built for the pur- pose. There was also an upper council of eighty, which in conjunction with the signory decided all questions of too important and delicate a nature for discussion in the larger assembly. These institutions were approved by the people, and gave a fair promise of justice. Savonarola's programme of the new government: was comprised in the following formula :—(1) fear of God and purification of manners ; (2) promotion of the public welfare in pre- ference to private interests; (3) a general amnesty to political offenders ; (4) a council on the Venetian model, but with no doge. At first the new machinery acted well; the public mind was tranquil, and the war with Pisa—not as yet of threatening proportions—was enough to occupy the Florentines and prevent internecine feuds. Without holding any official post in the commonwealth he had created the prior of St Mark's was the real head of the state, the dictator of Florence, and guarded the public weal with extraordinary political wisdom. At his instance the tyrannical system of arbitrary imposts and so-called voluntary loans was abolished, and replaced by a tax of ten per cent. (la decima) on all real property. The laws and edicts of this period read like paraphrases of Savonarola's sermons, and indeed his counsels were always given as addenda to the religious exhortations in which he denounced the sins of his country and the pollution of the church, and urged Florence to cast off iniquity and become a truly Christian city, a pattern not only to Rome but to the world at large. His eloquence was now at the flood. Day by day his impassioned words, filled with the spirit of the Old Testament, wrought upon the minds of the Florentines and strung them to a pitch of pious emotion never before—and never since—attained by them. Their fervour was too hot to be lasting, and Savonarola's un- compromising spirit roused the hatred of political adver- saries as well as of the degraded court of Rome. Even now, when his authority was at its highest, when his fame filled the land, and the vast cathedral and its precincts lacked space for the crowds flocking to hear him, his enemies were secretly preparing his downfall. _ Pleasure-loving Florence was completely changed. Ab- Juring pomps and vanities, its citizens observed the ascetic regime of the cloister; half the year was devoted to abstinence and few dared to eat meat on the fasts ordained by Savonarola. Hymns and lauds rang in the streets that had so recently echoed with Lorenzo's dissolute songs. Both sexes dressed with

Puritan plainness ; husbands and Wives quitted their homes for convents ; Marriage became an awful and scarcely permitted rite ; mothers suckled their own babes ; and persons of all ranks—nobles, scholars, and artists—renounced the world to assume the Dominican robe. Still more wonderful was Savonarola's influence over children, and their response to his appeals is a proof

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of the magnetic power of his goodness and purity. He organized the boys of Florence in a species of sacred militia, an inner republic, with its own magistrates and officials charged with the enforcement of his rules for the holy life. It was with the aid of these youthful enthu- siasts that Savonarola arranged the religious carnival of 1496, when the citizens gave their costliest possessions in alms to the poor, and tonsured monks, crowned with flowers, sang lauds and performed wild dances for the glory of God. In the same spirit, and to point the doctrine of renunciation of carnal gauds, he celebrated the carnival of 1497 by the famous "burning of the vanities" in the Piazza della Signoria. A Venetian merchant is known to have bid 22,000 gold florins for the doomed vanities, but the scandalized authorities not only rejected his offer but added his portrait to the pile. Nevertheless the artistic value of the objects consumed has been greatly exaggerated by some writers. There is no proof that any book or painting of real merit was sacrificed, and Savonarola was neither a foe to art nor to learning. On the contrary, so great was his respect for both that, when there was a question of selling the Medici library to pay that family's debts, he saved the collection at the expense of the convent purse.

Meanwhile events were taking a turn hostile to the prior. Alexander VI. had long regretted the enfranchise- ment of St Mark's from the rule of the Lombard Dominicans, and now, having seen a transcript of one of Savonarola's denunciations of his crimes, resolved to silence this daring preacher at any cost. Bribery was the first weapon employed, and a cardinal's hat was held out asa bait. But Savonarola indignantly spurned the offer, replying to it from the pulpit with the prophetic words: "No hat will I have but that of a martyr, reddened with my own blood."

So long as King Charles remained in Italy Alexander’s concern for his own safety prevented all vigorous measures against the friar. But no Borgia ever forgot an enemy. He bided his time, and the transformation of sceptical Florence into an austerely Christian republic claiming the Saviour as its head only increased his resolve to crush the man who had wrought this marvel. The potent duke of Milan, Ludovico Sforza, and other foes were labouring for the same end, and already in July 1495 a papal brief had courteously summoned Savonarola to Rome. In terms of equal courtesy the prior declined the invitation, nor did he obey a second, less softly worded, in September. Then came a third, threatening Florence with an interdict In case of renewed refusal. Savonarola disregarded the command, but suspending his sermons went to preach for a while in other Tuscan cities. But in Lent his celebrated sermons upon Amos were delivered in the duomo, and again he urged the necessity of reforming the church, striving by ingenious arguments to reconcile re- bellion against Alexander with unalterable fidelity to the Holy See. All Italy recognized that a mortal combat was going on between a humble friar and the head of the church. What would be the result? Savonarola’s voice was arousing a storm that might shake even the power of Rome! Alive to the danger, the pope knew that his foe must be crushed, and the religious carnival of 1496 afforded a good pretext for stronger proceedings against him. The threatened anathema was, for some reason, deferred, but a brief uniting St Mark’s to a new Tuscan branch of the Dominicans now deprived Savonarola of his independent power. However, in the beginning of 1497 the Piagnoni were again in office, with the prior’s staunch friend, Francesco Valori, at their head. In March the aspect of affairs changed. The Arrabbiati and the Medicean faction merged political differences in their

common hatred to Savonarola. Piero de’ Medici’s fresh attempt to re-enter Florence failed; nevertheless his followers continued their intrigues, and party spirit in- creased in virulence. The citizens were growing weary of the monastic austcrities imposed on them, and Alexander foresaw that his revenge was at hand.

A signory openly hostile to Savonarola took office in May, and on Ascension Day his enemies ventured on active insult. His pulpit in the duomo was defiled, an ass's skin spread over the cushion, and sharp nails fixed in the board on which he would strike his hand. The outrage was discovered and remedied before the service began ; and, although the Arrabbiati half filled the church and even sought to attempt his life, Savonarola kept his com- posure and delivered a most impressive sermon. But the incident proved the bitterness and energy of his foes, and the signory, in feigned anxiety for the public peace, be- sought him to suspend his discourses. Shortly afterwards the threatened bull of excommunication was launched against him, and Fra Mariano was in Rome stimulating the pope's wrath. Savonarola remained undaunted. The sentence was null and void, he said. His mission was divinely inspired ; and Alexander, elected simoniacally and laden with crimes, was no true pope. Nevertheless the reading of the bull in the duomo with the appropriate, terrifying ceremonial made a deep impression on the Florentines. And now, the Arrabbiati signory putting no check on the Compagnacci, the city returned to the wanton licence of Lorenzo's reign. But in July Savonarola's friends were again in power and did their best to have his excommunication removed. Meanwhile party strife was stilled by an outbreak of the plague. 'The prior of St Mark's used the wisest precautions for the safety of his two hundred and fifty monks, sustained their courage by his own, and sent the younger men to a country retreat out of reach of contagion. During this time Rome was horror-struck by the mysterious murder of the young duke of Gandia, and the bereaved pope mourned his son with the wildest grief. Savonarola addressed to the pontiff a letter of condolence, boldly urging him to bow to the will of Heaven and repent while there was yet time.

The plague ended, Florence was plunged in fresh troubles from Medicean intrigues, and a conspiracy for the restoration of Piero was discovered. Among the five leading citizens concerned in the plot was Bernardo del Nero, a very aged man of lofty talents and position. The gonfalonier, Francesco Valori, used his strongest influence to obtain their condemnation, and all five were put to death. It is said that at least Bernardo del Nero would have been spared had Savonarola raised his voice, but, although refraining from any active part against the prisoners, the prior would not ask mercy for them. This silence proved fatal to his popularity with moderate

men, gave new adherents to the Arrabbiati, and whetted the fury of the pope, Sforza, and all potentates well disposed to the Medici faction. He was now interdicted from preaching even in his own convent and again summoned to Rome. As before, the mandate was disobeyed. He refrained from public preaching, but held conferences in St Mark's with large gatherings of his disciples, and defied the interdict on Christmas Day by publicly celebrating mass and heading a procession through the cloisters.

The year 1498, in which Savonarola was to die a.

martyr's death, opened amid seemingly favourable auspices. The Piagnoni were again at the head of the state, and by their request the prior resumed his sermons in the duomo, while his dearest disciple, Frs Domenico Buonvicini, filled the pulpit of St Lorenzo. Scaffoldings had to be erected to accommodate Savonarola's congregation, and the Arrab- biati could only vent their spite by noisy riots on the

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piazza outside the cathedral. For the last time the carnival was again kept with strange religious festivities, and many valuable books and works of art were sacrificed in a second bonfire of "vanities." But menacing briefs poured in from Rome; the pope had read one of Savonarola's recent sermons on Exodus; the city itself was threatened with interdict, and the Florentine ambas- sador could barely obtain a short delay. Now too the Piagnoni quitted office; the new signory was less friendly, and the prior was persuaded by his adherents to retire to St Mark's. here he continued to preach with unabated zeal; and, since the women of Florence deplored the loss of his teachings, one day in the week was set apart for them. The signory tried to conciliate the pope by relating the wonderful spiritual effects of their preacher's words, but Alexander was obdurate. The Florentines must either silence the man themselves, or send him to be judged by a Roman tribunal.

Undismayed by personal danger, Savonarola resolved to appeal to all Christendom against the unrighteous pontiff, and despatched letters to the

rulers of Europe adjuring them to assemble a council to condemn this antipope. The council of Constance, and the deposition of John XXIIL, were satisfactory precedents still remembered by the world. One of these letters being intercepted and sent to Rome by the duke of Milan (it is said) proved fatal to the friar. The papal threats were now too urgent to be disregarded, and the cowed signory entreated Savonarola to put an end to his sermons. He reluctantly obeyed, and concluded his last discourse with the tenderest and most touching farewell. Perhaps he foresaw that he should never again address his flock from the pulpit.

The Government now hoped that Alexander would be appeased and Florence allowed to breathe freely. But although silenced the prophet was doomed, and the folly of his disciples precipitated his fate. A creature of the Arrabbiati, a Franciscan friar named Francesco di Puglia, challenged Savonarola to prove the truth of his doctrines by the ordeal of fire. At first the prior treated the pro- vocation with merited contempt, but unfortunately his too zealous disciple Fras Domenico accepted the challenge. And, when the Franciscan declared that he would enter the fire with Savonarola alone, Fra Domenico protested his willingness to enter it with any one in defence of his master's cause. So, as Savonarola resolutely declined the trial, the Franciscan deputed a convert, one Giuliano dei Rondinelli, to go through the ordeal with Fra Domenico. There were long preliminary disputes. Savonarola, per- ceiving that a trap was being laid for him, discountenanced the "experiment" until over-persuaded by his disciple's prayers. Perhaps because it was a mere reductio ad absurdum of his dearest beliefs, he was strangely perplexed and vacillating with regard to it. With his firm convic- tion of the divinity of his mission he sometimes felt assured of the triumphant issue of the terrible ordeal. Alternately swayed by impassioned zeal and the prompt- ings of reason, his calmer judgment was at last overborne by the fanaticism of his followers. Aided by the signory, which was playing into the hands of Rome, the Arrabbiati and Compagnacci pressed the matter on, and the way was now clear for Savonarola's destruction.

On the 7th April 1498 an immense throng gathered in the Piazza della Signoria to enjoy the barbarous sight. Two thick banks of combustibles forty yards long, with a narrow space between, had been erected in front of

the palace, and five hundred soldiers kept a wide circle clear of the crowd. Some writers aver that the piles were charged with gunpowder. Not only the square but every window, balcony, or housetop commanding a glimpse of it was filled with eager spectators. The Dominicans

from one side, the Franciscans from the other, marched in solemn procession to the Loggia dei Lanzi, which had been divided by a hoarding into two separate compartments. The Dominicans were led by Savonarola carrying the host, which he reverently deposited on an altar prepared in his portion of the loggia, and when Fra Domenico was seen to kneel before it the Piagnoni burst into a song of praise. The magistrates signalled to the two champions to advance. Fra Domenico stepped forward, but neither Rondinelli nor Fra Francesco appeared. The Franciscans began to urge fantastic objections. The Dominican's vestments might be bewitched, they said. Then, when he promptly changed them for a friar's robe, they pretended that his proximity to Savonarola had probably renewed the charm. He must remove the cross that he wore. He again complied,—was ready to fulfil every condition in order to enter the fire. But fresh obstacles were suggested by the Franciscans, and, when Savonarola insisted that his champion should bear the host, they cried out against the sacrilege of exposing the Redeemer's body to the flames. All was turmoil and confusion, the crowd frantic. And, although MRondinelli had not come, the signory sent angry messages to ask why the Dominicans delayed the trial. Meanwhile the Arrabbiati stirred the public dis- content and threw all the blame on Savonarola. Some Compagnacci assaulted the loggia in order to kill him, but were driven back by Salviati's band. The foreign soldicry, fearing an attack on the palace, charged the excited mob, and the tumult was temporarily checked. It was now late in the day, and a storm shower gave the authorities a pretext for declaring that heaven was against the ordeal. The crafty Franciscans slipped away un- observed, but Savonarola raising the host attempted to lead his monks across the piazza in the same solemn order as before. On this the popular fury burst forth. De

frauded of their bloody diversion, the people were wild :

with rage. Fra Girolamo’s power was suddenly at an end. These Florentines who had worshipped him as a saint turned on him with rabid hate. Neither he nor his brethren would have lived to reach St Mark’s but for the devoted help of Salviati and his men. They were pelted, stoned, and followed with the vilest execrations. Against the real culprits, the dastardly Franciscans, no anger was felt; the zealous prior, the prophet and lawgiver of Florence, was made the popular scapegoat. Notwith- standing the anguish that must have filled his heart, the fallen man preserved his dignity and calm. Mounting his own pulpit in St Mark’s he quietly related the events of the day to the faithful assembled in the church, and then withdrew to his cell, while the mob on the square outside was clamouring for his blood.

The next morning, the signory having decreed the prior’s banishment, Francesco Valori and other leading Piagnoni hurried to him to concert measures for his safety.

Meanwhile the Government decided on his arrest, and no |

sooncr was this made public than the populace rushed to the attack of the convent. The doors of St Mark’s were hastily secured, and Savonarola discovered that his adherents had secretly prepared arms and munitions and were ready to stand a siege. The signory sent to order all laymen to quit the cloister, and a special summons to Valori. After some hesitation the latter obeyed, hoping by his influence to rally all the Piagnoni to the rescue. But he was murdered in the street, and his palace sacked by the mob. The monks and their few remaining friends made a most desperate defence. In vain Savonarola besought them to lay down their arms. Fri Benedetto the painter and others fought like lions, while some hurled tiles on the assailants below. When the church was finally

Domenico, armed with an enormous candlestick, guarding him from the blows of the mob. Profiting by the smoke and confusion a few disciples dragged their beloved master to the inner library and urged him to escape by the window. He hesitated, seemed about to consent, when a cowardly monk, one Malatesta Sacramoro, cried out that the shepherd should lay down his life for his flock. Thereupon Savonarola turned, bade farewell to

the brethren, and, accompanied by the faithful Domenico, quietly surrendered to his enemies. Later, betrayed by the same Malatesta, Fra Silvestro was also seized. Hustled, insulted, and injured by the ferocious crowd, the prisoners were conveyed to the Palazzo Vecchio, and Savonarola was lodged in the tower cell which had once harboured Cosimo de' Medici.

Now came an exultant brief from the pope. His well- beloved Florentines were true sons of the church, but must crown their good deeds by despatching the criminals to Rome. Sforza was equally rejoiced by the news, and the only potentate who could have perhaps saved Savonarola's life, Charles of France, had died on the day of the ordeal by fire. Thus another of the friar's prophecies was verified, and its fulfilment cost him his sole protector.

The result of the trial was a foregone conclusion. The signory refused to send their prisoners to Rome, but they did Rome's behests. Savonarola's judges were chosen from his bitterest foes. Day after day he was cruelly tortured, and in his agony, with a frame weakened by constant austerity and the mental strain of the past months, he made every admission demanded by his tormentors, But directly he was released from the rack he always withdrew the confessions uttered in the delirium of pain. And, these being too incoherent to serve for a legal report, a false account of the friar's avowals was drawn up and published instead of his real words. .

Though physically unable to resist torture, Savonarola's clearness of mind returned whenever he was at peace in his cell. So long as writing materials were allowed him he employed himself in making a commentary on the Psalms, in which he restated all his doctrines. His doom was fixed, but some delay was caused by the pope's unwillingness to permit the exccution in Florence. Alex- ander was frantically eager to see his enemy die in Rome. But the signory remained firm, insisting that the false prophet should suffer death before the Florentines whom he had so long led astray. The matter was finally com- promised. A second mock trial was held by two apostolic commissioners specially appointed by the pope. One of the new judges was a Venetian general of the Dominicans, the other a Spaniard. Meanwhile the trial of Brothers Domenico and Silvestro was still in progress. The former remained nobly faithful to his master and himself. No

extremity of torture could make him recant or extract a syllable to Savonarola's hurt; le steadfastly repeated his belief in the divinity of the prior's mission. Fra Silvestro on the contrary gave way at mere sight of the rack, and this seer of heavenly visions owncd himself and master guilty of every crime laid to their charge.

The two commissioners soon ended their task. They had the pope's orders that Savonarola was to die "even were he a second John the Baptist." On three successive days they "examined" the prior with worse tortures than before. But he now resisted pain better, and, although more than once a promise to recant was extorted from him, he reasserted his innocence when unbound, crying out, "My God, I denicd Thee for fear of pain." On the evening of May 22 sentence of death was pronounced on him and his two disciples. Savonarola listened unmoved to the

awful words, and then quietly resumed his interrupted stormed Savonarola was seen praying at the altar, and Fra |

devotions. Fra Domenico exultcd in the thought of dying

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by his master's side; Fra Silvestro, on the contrary, raved with despair.

The only favour Savonarola craved before death was a short interview with his fellow victims. This, after long debate, the signory unwillingly granted, and meanwhile a monk was sent to shrive all the three. The memorable meeting took place in the hall of the Cinquecento. During their forty days of confinement and torture eacli one had been told that the others had recanted, and the false report of Savonarola's confession had been shown to the two monks. The three were now face to face for the first time. Fra Domenico's-loyalty had never wavered, and the weak Silves- tro's enthusiasm rekindled at sight of his chief. Savonarola prayed with the two men, gave them his blessing, and ex- horted them by the memory of their Saviour's crucifixion to submit meekly to their fate. Midnight was long past when Savonarola was led back to his cell. Jacopo Niccolini, one of a

religious fraternity dedicated to consoling the last hours of condemned men, remained with him. Spent with weakness and fatigue he asked leave to rest his head on his companion's lap, aud quickly fell into a quict sleep. As Niccolini tells us, the martyr's face became serene and smiling asa child's. On awaking he addressed kind words to the compassionate brother, and then prophesied that dire calamities would befall Florence during the reign of a pope named Clement. The carefully recorded prediction was verified by the siege of 1529.

The execution took place the next morning. A scaffold, connected by a wooden bridge with the magistrates' rostrum, had been erected on the spot where the piles of the ordeal had stood. At one end of the platform was a huge cross with faggots heaped at its base. As the prisoners, clad in penitential haircloth, were led across the bridge, wanton boys thrust sharp sticks between the planks to wound their feet. First came the ceremonial of degradation. Sacerdotal robes were thrown over the victims, and then roughly stripped off by two Dominicans, the bishop of Vasona and the prior of Sta Maria Novella. To the bishop's formula, '"'I separate thee from the church militant and the church triumphant," Savonarola replied in firm tones, " Not from the church triumphant; that is beyond thy power." By a refinement of cruelty Savonarola was the last to suffer. His disciples' bodies already dangled from the arms of the cross before he was hung on thé centre beam. Then the pile was fired. For a moment the wind blew the flames aside, leaving the corpses untouched. "A miracle," cried the weeping Piagnoni; but then the fire leapt up and ferocious yells of triumph rang from the mob. At dusk the martyrs' remains were collected in a cart and thrown into the Arno.

Savonarola's party was apparently annihilated by his death, but, when in 1529-30 Florence was exposed to the horrors predicted by him, the most heroic defenders of his beloved if ungrateful city were Piagnoni who ruled their lives by his precepts and revered his memory as that of a saint,

Savonarola's writings may be classed in three categories :—(1) humerous scrmons, collected mainly by Lorenzo Violi, one of his most enthusiastic hearers; (2) an immense number of devotional and moral essays and some theological works, of which Jl T'rionfo della Croce is the chief; (8) a few

short poems and a political treatise on the government of Florence. Although his faith in the dogmas of the Roman Catholic Church never swerved, his strenuous protests against papal corruptions, his reliance on the Bible as his surest guide, and his intense moral carnestness un- doubtedly connect Savonarola with the movement that heralded the Reformation.

Sce Rudelbach, Hieronymus Savonarola und seine Zeit, aus den Quellen dargestellt (1835); Karl Meier, Girolamo Savonarola, aus grossentheils hand- schriftlichen Quellen dargestellt (1836); Padre Vincenzo Marchese, Storia di S. Marco di Firenze (1855); F. T. Perrens, Jéréme Savonarola, sa vie, ses prédi- cations, ses écrits (1858); R. R. Madden, The Life and Martyrdom of Girolamo Savonarola, etc. (1854); Bartolommeo Aquarone, Vita di Fra Gerenimo Savon- arola (1857); Pasquale Villari, Za Storia di Girolamo Suvonarola e dé suot tempi (1882), : (L. V.)

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SAVOY. The history of the house of Savoy shows ina striking manner how the destinies of a nation may depend on the fortunes of a princely family. During eight centu- ries, and through all changes of fortune, the princes of Savoy have kept one end steadily in view, and, in the words of Charles Emmanuel III., have “treated Italy as an artichoke to be eaten leaf by leaf.” The ambitions of princes and the interests of the people have fortunately tended in the same direction, and their work is now per- fected in the glory of their house and the freedom of the state.

The descent of HumpErt the Whitehanded, the founder of the family, is uncertain, but lle was most probably a son of Amadeus, the great-grandson of that Boso of Provence (879) who was father of the emperor Louis the Blind. In reward for services rendered to Rudolph III. of Arles, Humbert obtained from him in 1027 the counties of Savoy and Maurienne, and from the emperor Conrad the Salic Chablais and the Lower Valais. His territories, therefore, all lay on the north-western slopes of the Alps. On his death in 1048 he was succeeded perhaps by his eldest son AmapEus I., but eventually by his fourth son OtHO, who, by his marriage with Adelaide, sole heiress of the marquis of Susa, obtained the counties of Turin and the Val d’Aosta, and so acquired a footing in the valley of the Po. His wife’s

rank, too, as marchioness made the family guardians of the frontier by authority of the king of Italy, as they had been before by possession of territory, and was the foundation of their subsequent power as ‘“‘warders” of the Alps. Otho was succeeded in 1060 by his son AMAbDzEvs IT., who maintained a judicious neutral- ity between his brother-in-law the emperor Henry IV. and the pope. In reward for his mediation between them he obtained from the former after Canossa the province of Bugey. The accession of his son Humperr II. in 1080 brought fresh increase of territory in the valley of the Tarantaise, and in 1091 this prince succeeded to the dig- nities of his grandmother Adelaide, when he assumed the title of prince of Piedmont. Amatzus III. came to the throne in 1103, and in 1111 his states were created counties of the empire by Henry V. On his way home from the crusades in 1149 Amadeus died at Nicosia, and was suc- ceeded by his son Humperr III. This prince did not follow the example of Amadeus II., but took the part of the pope against Barbarossa, who accordingly ravaged his territories until Humbert’s death in 1188. The guardians of his son THomas acted more discreetly, and reconciled their ward and the emperor. He reinained Ghibelline all his life, and received from Henry VI. accessions of territory in Vaud, Bugey, and Valais, with the title of imperial vicar in Piedmont and Lombardy. He was followed in 1233 by AmapEvs IV., whose wife was the beautiful Cecilia of Beaux, surnamed Passe Rose. A campaign against the inhabitants of Valais ended in the annexation of their district, and his support of Frederick II. against the pope caused the erection of Chablais and Aosta into a duchy. In 1253 his son Bontracr succeeded to his states at the age of nine, but, after giving proofs of his valour by defeat- ing the troops of Charles of Anjou before Turin, he was taken prisoner and died of grief (1263).

The Salic law now came into operation for the first time, and Prrer, the uncle of Boniface, was called to the throne. This prince, on the marriage of his nieces Eleanor and Sancha of Provence with Henry III. of England and Richard, earl of Cornwall, had visited England, where he had been created earl of Richmond, and built a palace in London afterwards called Savoy House. His brothers Boniface and William were also appointed, the former to the see of Canterbury, and the latter to the presidency of the council. In return he recognized the claims of Richard to the impe-

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Genealogical Table of the House of Savoy.

HUMBERT = ANCILL the White-handed, 5th in descent from Boson of Provence (879), d. 1048.

| AmADEvs I, (?) ad, 1060.

AmADEvs II., d. 1080. ee | If., the Fat, d. 1103.

| OrHo= Adelaide, dr. and heiress of Oderic Manfred

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marquis of Susa, d. 1091.

| Bertha=emperor Ilenry IV.

| AMADEUS III. =Mathilda, dr. of d, 1149, | Guignes VI. of Albon.

Humbert IIT. =4 wives. the Saint, d. 1188,

THOMAS = Beatrice of Geneva. 1177-1233.=Margarct of Faucigny.

| Alice =Louis VI. of France. or Adclaide

| Mathilda = Affonso Henriques,

Ist king of Portugal.

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AmApeEus IV. =Cécile de Beaux, Thomas=Joan of Flanders. Peter=Agnes of Purp I, = Alice of Boniface, Beatrice =Raymond- 1197-1253, ‘*Passc- Rose.” 1199-1259, =Beatrice di Fieschi. earl of | Faucigny. 1208-1285. Merania. archbishop of Bérenger Richmond, Canterbury, IV. of 1203-1268,

ad. 1270, Provence. |! | BoniIFAcE, Thomas. AMADEUS V.=Sibylla. Beatrice = Guy Eleanor Sancha Margaret Beatrice 1244-1263 the Great, | =Mary of Brabant. Vienne. =Henry III. =Rich., earl =S. Louis = Charles 1249-1323. of England. of Cornwall, of France. of Anjou. | Philip, prince Louis. EpWAR?= Blanche of AyYMon= Yolande of Aune= Andronicus III., of Achaia. the Liberal, | Burgundy. the Peaceful, | Montferrato. emperor of 1284-1329, 1291-1343, Constantinople. Joan=John III. AMADEUS VI.=Bonne de John of Brittany. the Green Count,] Bourbon. Paleologus.

1333-1383, ;

AMADEUS VII.=Bonne de Berry. the Red Count,

1360-1391,

AMADEvS VIII.=Mary of Burgundy. the first duke, after- | wards Pope Felix V.,

1383-1450,

Lovis= Anne of Lusignano.

1402-1465.

AMADEUs IX.=Yolande, dr. of Pixie II.= Margaret of Bourbon=Claudinc de Penthievre. 1436-1472, Charles VII. of Bresse, of France. 1438-1497, | Puitizert, CuARLES I,=Blanche of Pritizert II.= Yolande

1465-1482;

14€8-1489, | Montferrato. 1480-1504. dr. of Chas. I.

| CuAR.eEs IT, Yolande.

1488-1496,

Louisc= Charles of

| Philip, founder of the house of Nemours.

CHARLES III. = Beatrice of the Good, Portugal.

1486-1553, .

Angouléme.

Francis I, of France.

EMMANUEL PHILIBERT= Margaret, dr. of the Iron-headed, Francis I. of France.

1528-1580.

CHARLES EMMANUEL I, =Catherine, dr. of the Great, 1562-1630, | Philip II. of Spain.

Victor Amapets I,=Christina, dr. of 1587-1637, Tfenry IV. of France,

Francis Hyacinth,

CuARLes EmMANvuEL II.= Mary of

1632-1638,

1634-1675. Savoy-Nemours,

Victor AMADews IT. = Mary of Orleans, king of Sardinia, gd. dr, of Chas, I, 1666-1732, abd. 1730. of England.

CnARLES EMMANUEL IIJ.=Annc of Sulzbach, 1701-1773. and two others.

Victor AMADEUS III. =Marie Antoinette 1727-1796, | of Spain.

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Cuartes EMMANUELIV., Victor Emuanvet I.

1741-1820, abd. 1802. 1759-1824, abd. 1820, 1765-1831.

Clotilde = Prince Napoleon.

b. 1845. 6, 1844.

CHARLES FELIX,

Humpenrr I. =Mary of Savoy.

| Thomas Francis=Mary of Bourbon. of Savoy-Carignano,

1596-1656,

| Emmanuel Philibert= Ange Catharina

Eugene Maurice =Olympla 1631-1709, Este.

1633-1708, Mancini.

Victor Amadeus= Victoria Francesca

Prince Engene, 1690-1766. of Savoy.

1663-1736.

Louis Victor = Christina of Hessc. 1721- ? .

Victor Amadeus= Mary Josephine

Mary=Prince de 1743-1780. | of Lorraine-Armagnac.

1749-1792. Lainballe.

Charles Emmanuel=Mary Christina 1770-1800. of Saxony.

CuARLES ALBERT= Maria Theresa 1798-1849, of Tuscany.

Victor EMMANUEL II. = Adelaide, dr. of the first king of Italy, | Archduke Raincr 1820-1878. of Austria,

| Amadcus, 0, 1845.

Maria Pia = Louis, king of Spain, 1870-73.

&, 1847, king of Portugal.

SAVOY ‘ Charles VII.

rial throne, and received from him Kyburg in the diocese of Lausanne, conveniently near to the county of Geneva, which had been willed to him by the last count. But this increase of territory only brought new anxieties, for Peter’s short reign was occupied in reducing refractory vassals to obedience. At his death in 1268 he was succeeded by his brother Puitip I., who died in 1285, when their nephew AmapeEus V. came to the throne. This prince, surnamed the Great, united Baugé and Bresse to his states in right of his wife Sibylla, and later on Lower Faucigny and part of Geneva. For his second wife he inarried Mary of Bra- bant, sister of the emperor Henry VIL, from whom, in reward for his services in North Italy, he received the seigneury of Aosta. His life was passed in continual and victorious warfare, and one of his last exploits was to force the Turks to raise the siege of Rhodes. In commemoration of his victory it is said that he substituted for the eagles in his arms the letters F.E.R.T. (Portitudo ejus Rhodum tenuit), He died in 1323 while making preparations for a campaign in aid of his nephew, the emperor of the East. Hisson EpwarpD succeeded him, and, dying in 1329, was followed by his brother Aymon. This prince died in 1848, when his son Amaprus VI. ascended the throne. His reign was, like his grandfather’s, a series of petty wars, from which he came out victorious and with extended terri- tory, until, accompanying Louis of Anjou on his expedition against Naples, he died there of the plague (1383). The reign of his son AmaprEus VII. promised to be as glorious as those of his ancestors, but it was cut short by a fall from his horse in 1391. Before his death, however, he had received the allegiance of Barcelonnette, Ventimiglia, Villafranca,.and Nice, so gaining access to the Mediter- ranean.

His son AmapEus VIII. now came to the throne, under the guardianship of his grandmother Bonne de Bourbon. On attaining his majority he first directed his efforts to strengthening his power in the outlying provinces, and in this he was particularly successful. The states of Savoy now extended from the Lake of Geneva to the Mediterranean, and from the Sadne to the Sesia. Its prince had therefore considerable power, and Amadeus threw all

the weight of this on the side of the emperor. Sigismund was not ungrateful, and in 1416 erected the counties of Savoy and Piedmont into duchies. At this time too the duke recovered the fief of Piedmont, which had been granted to Philip, prince of Achaia, by Amadeus V.,and his power was thus thoroughly consolidated. The county of Vercelli afterwards rewarded him for joining the league against the duke of Milan, but in 1434 a plot against his life made him put into execution a plan he had long formed of retiring toa monastery. He accordingly made his son Louis lieutenant-general of the dukedom, and assumed the habit of the knights of S. Maurice, a military order he had founded at the priory of Ripaille. But he was not destined to find the repose he sought. The prelates assembled at the council of Basel voted the deposition of Pope Eugenius IV., and elected Amadeus in his place. Felix V., as he was now called, then abdicated his dukedom definitively, but without much gain in tem- poral honours, for the schism continued until the death of Eugenius in 1447, shortly after which it was healed by the honourable submission of Felix to Nicholas V-. The early years of Lovis's reign were under the guidance of his father, and peace and prosperity blessed his people ; but he afterwards made an alliance with the dauphin which brought him into conflict with Charles VII. of France, though a lasting reconciliation was soon effected. His son Amapzus IX. succeeded in 1465, but, though his virtues led to his beatification, his bodily sufferings made him assign the regency to his wife Yolande, a daughter'of

He died in 1472, when his son PHILIBERT I. succeeded to the throne and to his share in the contests of Yolande with her brother and brothers-in-law, who tried to deprive their nephew of his rights. His reign lasted only ten years, when he was succeeded by his brother CHARLES I. This prince raised for a time by his valour the droop- ing fortunes of his house, but he died in 1489 at the age of thirty-one, having inherited from his aunt, Charlotte of Lu- signano, her pretensions to the titular kingdoms of Cyprus, Jerusalem, and Armenia. He was succeeded by his son Cuartes [J., an infant, who, dying in 1496, was followed by Purtip II., brother of Amadeus IX. He died in 1497, leaving Puitipert II., who succeeded him, and CuarLes III, who ascended the throne on his brother's death in 1504. In spite of himself Charles was drawn into the wars of the period, for in the quarrel

between Francis I. and the pope he could not avoid espousing the cause of his nephew. But the decisive victory of Francis at Mari- gnano gave the duke the opportunity of negotiating the conference at Bologna which led to the conclusion of peace in 1516. So far well, but Charles was less fortunate in the part he took in the wars between Francis I. and Charles V., the brother-in-law of his wife. He tried to maintain a strict neutrality, but his attendance at the emperor's coronation at Bologna in 1530 was imperative in his double character of kinsman and vassal. The visit was fatal to him, for he was rewarded with the county of Asti, and this so displeased the French king that, on the revolt of Geneva to Protestantism in 1532, Francis sent help to the citizens. Bern and Freiburg did lhkewise, and so expelled the duke from Lausanne and Vaud. Charles now sided definitely with the emperor, and Francis at once raised some imaginary claims to his states. On their rejection the French army marched into Savoy, and, finding the pass of Susa unfortified, descended on Piedmont and seized Turin (1536). Charles V. came to the aid of his ally, and invested the city, but, being him- self hard pressed, was obliged to make peace. [I'rance kept Savoy, and the emperor occupied Piedmont, so that only Nice remained to the duke. On the resumption of hostilities in 1541 Piedmont again suffered. In 1544 the treaty of Crespy restored his states to Charles, but the terms were not carried out and he died of grief in 1553. His only surviving son EMMANUEL PHILIBERT succeeded to the rights but not the domains of his ancestors. Since 1536 he had attached himself to the service of the emperor, and had already given promise of a brilliant career. On the abdication of Charles V. the duke was appointed governor of the Low Countries, and in 1557 the victory of St Quentin marked him as one of the first generals of his time. Such services could not go unrewarded, and the peace of Cateau-Cambresis restored him his states, with certain exceptions still to be held by France and Spain. One of the conditions of the treaty also provided for the marriage of the duke with the lovely and accomplished Margaret of France, sister of Henry II. The evacuation of the places held by them was faithfully carried out by the contracting powers, and Emmanuel Philibert occupied himself in strengthening his military and naval forces, until his death in 1580 prevented the execution of the ambitious designs he had conceived. His son CHARLES EMMANUEL I., called the Great, being prevented by Henry III. from retaking Geneva, threw in his lot with Spain, and in 1590 invaded Provence and was received by the citizens of Aix. His

intention was doubtless to revive the ancient kingdom of Arles, but his plans were frustrated by the accession of Henry IV. tothe throne of France. After effecting with Henry an exchange of Bresse and Bugey for the marquisate of Saluzzo he kept up an intermittent war with him until 1609, when, disgusted with the

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behaviour of Spain, he made a treaty with France against Philip. But he could not remain faithful for long, and, siding first with one and then with the other, he found himself in almost the same straits as his grandfather, when death put an end to his ambitions and failures in 1630. The first care of his son Victron AMADEUS was to free himself from the double burden of his enemy and his ally, so he concluded peace in 1631. In 1635, however, Richelieu determined to drive the Spaniards out of Italy, and offered the duke the alternatives of war or Milan. He gave but a half-hearted assent to the schemes of France, and, without gaining Milan, died in 1637, leaving by his wife Christina of France Francis Hyacinth, a minor, who only survived till the following year, and Cuartes EMMANUEL II, whose legitimacy was unfortunately rather doubtful. The regency of Christina resembled that of Yolande in the same need for guarding her son’s interests against the pretensions of his uncles, Louis XIII. and the princes of Savoy. But fortune favoured her, and on the duke’s reaching his majority in 1648 the wars of the Fronde occupied all the attention of Mazarin. The brunt of the conflict with Spain consequently fell upon Savoy, and was borne not ingloriously until the conclusion of peace. Charles Emmanuel occupied the remaining part of his reign in repairing the ravages caused by twenty-four years of warfare, and died in 1675, leaving an only son, Victor Amavevs IT., whose minority was as peaceful as his father’s had been the reverse. He married Mary of Orleans, the daughter of Henrietta of England, and consequently the legitimate heiress to the English crown on the death of Anne and on the exclusion of the Pretender. For a time he united with Louis XIV. in persecuting the Protestants, but the overbearing behaviour of his ally made him join the coalition of Augsburg in 1690. His campaign against Louis was carried on with varying results until 1695, when he accepted proposals of peace. This defection led to the peace of Ryswick in 1697, and in reward he received from Louis the territories then occupied by France. In 1700 he

sided with France against Austria, but, an extension of territory in the Milanese not being granted by Louis, he went over to the enemy in 1703. The generalship of his relative Prince Eugene proved too much for the French, and in 1706 they were defeated before Turin and driven across the frontier. The peace of Utrecht afterwards con- firmed the duke in the possession of the places granted on his joining the coalition, including the long-coveted Mont- ferrato, and endowed him besides with the crown of Sicily. Austrian influenc2s now replaced Spanish in the peninsula, and Charles VI. persuaded him to exchange his kingdom for that of Sardinia. This was accordingly effected in 1720 by the treaty of Madrid, and afterwards proved the very salvation of the house of Savoy. In 1730 the king abdicated in favour of his son, in order to marry the countess of San Sebastian, at whose instigation he after- wards tried to regain the crown, but he died in 1732. CuarLes Emmanvet III. continued his father's intrigues to obtain possession of Milan, and joincd the league of France and Spain against Austria in 1732. But he used the victories of the allied forces over the imperialists in such a half-hearted way that it seemed as if he did not wish to break finally with Austria. In the end he only gained from the treaty, which he signed in 1739, the Novarese and Tortona, instead of Milan. The death of Charles VI. in 1740 gave him the chance of expelling the Austrians from Italy, but, though he at first claimed Milan from Maria Theresa, he ended in 1742 by espousing her cause. The complete defeat of the French in 1747 led to the treaty of Aix-la-Chapelle, by which Charles Emmanuel received the Upper Novarese and Vigevano, after which he remained at peace until his death in 1773, His son

Vicror AmapEvs III. succeeded him, and devoted the early years of his reign to the improvement of the admin- istration and the reorganization of his army. The time soon came for him to use the weapon he had created, and on the outbreak of the Revolution in France he headed the coalition of Italian princes against her. The house of Savoy thus assumed the headship of Italy, but for the time without much gain, for Napoleon's brilliant victories of 1796 ended in the peace of Paris, by which Savoy, along with Nice, was given to France. Victor Amadeus died shortly afterwards, and was succecded by his son CHartzs EmmanveL IV. The fever of the

Revolution spread to Piedmont, and in 1798 nothing was left to the king but to retire to Sardinia. In 1802 he abdicated in favour of his brother, Vicror EMMaNvEL I., who, in his island kingdom, protected by the English fleet, became the symbol of the coalition against France. The king returned to Turin in 1814, and in the following year took possession again of Savoy. The anti-revolutionary measures which were adopted by the Italian princes on their return caused a spirit of rebellion to spring up among their subjects. The freedom of the individual and the unity of the nation thus came to be considered objects to be attained at one and the same time. The influence of Austria was paramount in the Peninsula, but an insurrection broke out at Turin in 1820 demanding war with her, and, rather than embroil himself both with his people and with Austria, Victor Emmanuel abdicated in favour of his brother, CHartxs Feurx. The general insurrection was suppressed, and for the next few years Italy suffered everything possible at the hands of various petty princes, whose fears and weakness left them no weapon but persecution. In 1831 Charles Felix died without issue, and in him the elder branch of the family ended. He was succeeded by CHARLES ALBERT, of the line of Savoy-Carignano, which was founded by Thomas Francis, son of Charles Emmanuel the Great, and grandfather of Prince Eugene. The first care of Charles Albert was to reorganize his military and naval forces in readiness for the conflict with Austria which he foresaw. At the same time he put down the conspiracies which would have forced his hand, among which the most famous was that of Mazzini and Ramorino in 1834, The French revolution of 1848 fanned the embers of Italian patriotism, and Charles Albert, without any aid, began the War of Independence. Victory at first followed his arms, but he was defeated at last by the Austrians at Custozza. In the next year he was again driven into war with the Austrians, and, after his defeat at Novara, he abdicated in favour of his son, Vicror Emmanvet II. From this point the history of the house of Savoy has been told in the article Iraty (vol. xiii. pp. 489 sg.). (H. B. B.)

SAVOY. For the French departments of Savoy and Upper Savoy see Savore and Savors, Haute.

SAW. See Saws.

SAWANTWARL or SAWUNTWARRIE, a uative state forniing the southern part of the Concan division of the Bombay presidency, India, and lying between 15° 37’ and 16° 16’ N. lat. and between 73° 36’ and 74° 21’ BE. long. It has a total area of about 900 square miles, and is bounded on the north and west by Ratnagiri district, on the east by the Sahyddri Mountains, and on the south by the Portuguese territory of Goa. The general aspect of the country is strikingly picturesque. Its surface is broken and rugged, interspersed with densely-wooded hills ; in the valleys are gardens and groves of cocoa-nut and betel-nut palms. SAwantwéri has no rivers of any considerable size ; the chief streams are the Karli on the north and the Terekhol on the south, both navigable for small craft. The climate is humid and relaxing, with an average annual rainfall of over 130 inches. The forests and wooded

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slopes of the Sahyadris contain large numbers of wild animals, including the tiger, panther, leopard, bear, hyena, &c. Snakes and other reptiles also abound. The state possesses no railway ; but there is an excellent trunk road through the territory.

The census of 1881 returned the population of Sawantwari at 174,433 (males 86,061, females 88,372) ; Hindus numbered 166,080, Mohammedans 3970, aud Christians 4213. Agriculture supports the greater part of the population. The staple product is Tice, but excepting rice none but the coarsest grains and pulses are raised, both soil, which is stony, and climate being against the cultivation of wheat and other superior grains ; oil seeds, hemp, and pepper are also grown. The gross revenue of the state in 1883-84 amounted to about £84,000. Before the establishment of Portuguese power (1510) Sawantwari was the highway of a great traffic; but during the 16th and 17th centuries trade suffered much from the rivalry of the Portuguese, and in the disturbances of the 18th century it almost cntirely disappeared. Since the establishment of order under the British (1819), trade has con- siderably developed. The present chief being a minor, the ad- ministration has been in the hands of the British since 1869.

SAW-FISH. See Ray, vol. xx. p. 299.

SAW-FLIES (Lenthredinidx). This subdivision of the Hymenoptera is characterized by possessing a sessile abdomen which hides the base of the posterior legs. The antenn vary in their structure and in the number of their joints, The ovipositor is modified to form two saws, which when at rest lie ina sheath formed of two valves. The larvee resemble caterpillars, but may be distinguished

Turnip Saw-Fly (Athalia spinarum). Saw-F ly (magnified, with lines to left showing natural size), caterpillars, pupa, and pupa-case.

by their greater number of legs; usually 9 to 11 pairs are present. When alarmed they have the habit of rolling themselves up in a spiral fashion ; some also dis- charge a thin fluid from lateral pores situated above the spiracles. The females place their eggs in small incisions made by means of their saws in the soft parts of leaves. Usually one egg is placed in each slit. Some species merely attach their eggs in strings to the extcrior of the leaves. With each incision a drop of fluid is usually excreted, which serves to excite a flow of sap to the wounded part. The egg is said to absorb this sap, and so to increase in size. One genus (Nematus) alone forms galls. These occur in the young leaves of the willow, a tree which the true gall-flies do not attack. Mematus ventricosus resembles the bees and wasps in the fact that the parthenogenetic ova produce only males; as a rule in the animal kingdom the absence of fertilization results in the production of females.

The injury which the saw-flies inflict upon crops or young trees is almost entirely brought about by the voracious habits of the larve. These possess well devel- oped mouth-appendages, by means of which they gnaw their way out of the leaf in which they have been hatched, and then eat it. In this way the Turnip Saw-Fly (Athalia spinarum), not to be confused with the Turnip Fly (Phyllo- treta nemorum), attacks the leaves of the turnip, often completely consuming the leafage of acres at a time. The Pine Saw-Fly (Lophyrus pint) causes great damage to

plantations of young Scotch firs, devouring the buds, the leaves, and even the bark of the young shoots. Other species infest currant and gooseberry bushes, consuming the soft parts of the leaves, and leaving only the tough veins. The only effectual remedy in most cases is to col- lect and kill the larvze when they first appear. Syringing the affected parts with hot water or tobacco water is also recommended.

SAWS. Blades of steel with serrated edges have been used from time immemorial to rend or divide substances of various kinds, including metals and stone; but the principal modern use of the saw is tu, divide wood. Modern saws are of the finest steel, but the ancients used bronze saws, and among uncivilized nations saws have been made with flakes of flint imbedded in a wooden blade, and held in place by means of bitumen (see Grimshaw, History, &c., of Saws), while obsidian has been used by the Mexicans, and shark's teeth and even notched shelis form the saws of certain savage islanders. The pyramid-builders in Egypt cut granite and other hard stones by means of bronze saws set with jewels (see vol. xx. p. 124).

Space would fail to describe minutely the various adaptations of the saw to mechanical uses. It is indispens- able to the carpenter, the furniture-manufacturer, the watch- maker, and manipulator of metals. It is one of the most trustworthy tools of the surgeon's case, while without it the dentist would of necessity drop back to the barbarous customs of a past century. Iron, horn, pearl, india-rubber,

'and the thousand and one conveniences of civilized life are

dependent upon this useful instrument, which is but an exaggeration after all of the sharpest of knives, whose edge when examined under the microscope exhibits an array of saw teeth so minute as to present a smooth plane to the unassisted eye. As the chief use of the tool is to saw wood, the enormous timber industry of America has given an impetus to the improvement of the saw and its manufacture, which has no parallel elsewhere.

Saws may be classified as (1) straight (reciprocating in action), having a flat blade and straight edge, making a plane cut, or (2) circular or disk-like,

cutting at right angles to the motion, or (3) cylindrical or barrel-shaped, with a convex edge cutting parallel to its axis, or (4) band-saws, being a continuous ribbon or band running upon an upper and lower pulley, making a plane or curved cut, with a straight edge parallel to the axis of motion. The oldest and commonest, with the widest range of adaptability, is the straight saw, with reciprocating rectilinear blade. In this class is included the ordinary hand-saw with its varying range of uses from fine to coarse and from rip to cross-cut, and with teeth of forms as various as are the different duties which it is calculated to perform. ‘The teeth are long or short, cutting one way or both ways according to the “ pitch ” or ‘‘ set ” which may be given, and which should be adapted to both the kind and character of the timber to be sawn. The “pitch” of a saw-tooth is the angle of the point with reference to the blade, and is found by sub- tracting the back angle from the front, 60° being the generic angle of saw-teeth, which, however, may be variously placed. From the smallest hand-saw to the largest “ mill-saw” the same general rules apply. In the largest saws of this class may be named the “pit-saw,” used in the earliest manufactures of lumber or timber, and worked by one person standing over the log and drawing upward while another in the pit below follows with the downward or cutting thrust. From the pit-saw we advance to the ‘‘ gate-saw ” used in the earlicr adaptation of motive power to the cutting of timber, thence to the ‘‘muley-saw,”! suspended without strain upon a pitman beneath, having its upper end hung in slides pendent from a heavy beam above. These saws must of necessity be thick, to sustain the heavy thrusts which they are expected to endure, and are consequently of ‘‘ heavy gauge,” this being based upon the different sizes of wire, the largest gauge representing the

1 According to some writers the term “muley” (or mulay) is de- rived from the German ‘‘Miihlsige,” mill-saw, but, as this form of saw, when introduced, differed only from the ordinary mill-saws long in use in the manner in which it was hung (free from strain), the name may have been given to signify ‘‘hornless,” indicating the absence of the ponderous gate which was the essential feature of strained saws.

thinner blade ; ¢.g., a 4-gauge saw is much thicker than an 8-gauge, &c. From the necessity for more rapid production grew the "‘ gang- saw," a modification of the gate, differing from it only in length and thickness (less than one-third the thickness of the ordinary gate-saw and but about two-thirds its length). A large number of these, varying from 2 to 40, are strained in a gate or frame, at sueh distances apart as the thickness of lumber demands, and the log is wholly made into boards in one operation. Of the recipro- cating class of saws is the ‘‘ eross-cut," used for eutting across the grain of the timber or wood to be converted into shorter lengths. The length, breadth, "‘piteh," and ‘‘set" of saws vary according to the use which is to be made of them and the kind of timber which is to be manipnlated. _ In a cross-cut saw the eutting edge strikes the fibre at right angles to its length, and while its pitch 1s but slight (if any) it must sever from each side before dislodging the sawdust. ‘‘A slitting or ripping saw has the cutting edge about at aright angle to the fibre of the wood, severing it in one piece,—the throat of the tooth wedging out the piece." In slitting saws the ‘‘rake" is all in front, in the cross-cut on the side.

The circular saw is of comparatively recent origin, its introduc- tion dating from 1790, when Brunel first announecd the principle. At first only circular saws of small diameter were used ; but, from the small "‘ buzz-saw" of the watchmaker and fine metal worker, or the ripping saw of the planing-niill or carpenter shop, where small diameters have to be divided, the circular saw has passed to the saw-mill, where, in diameters of from 12 to 30 inches, it is the needful instrument for edging or ripping the lumber which drops from the log in an imperfect condition, requiring finer manipulation to prepare it for market; or in diameters of from 40 to 84 inches it may be found as the main saw ofthe mill for rending the logs as they come from the forest into shapes and sizes adapted for the various purposes of the builder. It is capable of dividing logs into boards one inch thick or upwards at as high a rate as 60,000 superficial feet in a day of twelve hours, while a straight (muley or gate) saw would give only 5000 to 8000 feet. In the chief lumber sections of the United States saws of 60

inches diameter are in most eommon use ; upon the Pacific eoast

saws of 8 feet diameter arc not unknown, Attempts to work large circular saws in nests or gangs have not hitherto proved successful, but three, four, or five saws of 30 inches diameter hung on a single shaft or “arbor” may be used to trim and divide the boards or planks thrown off from a log.

Barrel saws, for the manufacture of staves for barrels, pails, or tubs, are in tlie form of a straight-sided barrel with both heads removed, and the stave ends of one head serrated.

For the manufacture of veneers, where valuable timber is to be economically manipulated, we have the segment-saw, constructed by bolting segments of saw-blades upon the outer rim of a east- iron centre, forming a eircular saw of the desired diameter, but with a cutting edge of so light a gauge as to waste but little of the valuable timber to be sawed, the cast-iron centre insuring the requisite stiffness and strength. With these saws veneers searcely thicker than a sheet of paper may be cut, the width being accord- ing to the size of the log; such saws are often from 80 to 100 inches in diameter.

Circular saws of the larger size are often eonstrnucted with ‘inserted ” teeth. A disk of stcel of suitable size, having slots cut in its periphery of the exact size and shape of the tooth which is to be inserted, may have these tceth removed as often as the wear upon them may require, without reducing the diameter of the plate. The teeth of lumber saws have to be sharpened with the file at least three or four times in twelve hours’ work, and a saw of five feet in diameter is rapidly reduced in size with a great loss of efficiency. In the insert tooth plate new teeth cost only about three eents (14d.) each, and the saw plate remains of its original diameter. Inserted teeth are of varions forms and shapes, from that of the ordinary saw tooth, held in place by a rivet at the root of the tooth, to a “ehisel point” held by an ingenious system of wedging.

Band-saws have for many years been used for continuous and rapid cutting in the planing mill or other wood-working estab- lishment, where serolls or fancy lines and eurves were to be followed, requiring great flexibility of the saw-blade. Of late, and notakly within the past two years (1884-85), successful endeavours have been made to adapt them to lumber manufacture. The band-saw is a continuous blade or ribbon running over

pulleys above and below, forming a ‘stecl belt” whose serrated edge is always “in the cut.” These saws are usually from a half inch in width (for shop work) to six and eight inches wide for the heavier work of the saw-inill, and in the latter have a eutting capacity of from 30,000 to 40,000 superficial feet in twelve hours. They are extremely thin (usually 16-gauge), and the kerf produced is so much less than that of the upright or the cirenlar that a saving of at least 20 per cent. of timber is claimed in their use.

Saws used by surgeons, butchers, and in all branches of manu- facture are but modifications of one of the varieties above described and do not demand more extended description.

Ws

Saw-Mills are factories for tlie conversion of forest trees Saw- The earliest form of saw-mil] mills.

into lumber and timber. was unquestionably the saw-pit, still found in a modified form in shipbuilders’ yards, the log being raised on trestle horses instead of one of the sawyers being sunk in the pit. Saws were run by windmill-power as early as the 13th century ; and the use of water-power soon followed. The primitive water saw-mill consisted of a wooden pitman attached to the shaft of the water-wheel, the log to be sawed being placed on rollers sustained by a framework over the wheel, and being fed forward on the rollers by means of levers worked by hand. Good authorities mention saw-mills running by water-power in Germany as early as 1322. In 1663 an attempt to establish a mill in England was abandoned owing to the opposition of the sawyers, and no further attempt was made till 1768, when a mill was erected at Limehouse, but was soon destroyed by a mob. North America, with its vast forests, may be aptly termed the home of saw-mills. As early as 1634 a saw-mill was erected at the falls of the Piscataqua, near the line divid- ing Maine from New Hampshire. This was no doubt the pioneer of the vast array of mills which subsequently made Maine famous as a lumber-producing State for many years. from about the same date several mills were erected along the Atlantic coast of America, a description of one being that of all. In these mills the saw was attached by a long pitman from the wheel shaft to a ponderous gate, running in woodeu slides upon two heavy posts, crossed above by a beam connecting the two

sides of the mill-frame. The mill-carriage on which the log lay was pushed towards the saw by a rack and pinion, &c., moved by a feed-wheel. The daily capacity of these mills was from 500 to 1500 superficial feet. The first great improvement upon this class of mills was in the introduc- tion of two or more saws to the gate, the general character of the methods remaining the same. With the demand for more rapid production came improvements in the “gang” feature, and the wonder of the age was the “Yankee gang,” so arranged, by placing half the saws facing in one direction and the other half in the opposite, that two logs were worked up in one movement of the carriage, or, aS in the “slabbing” gang, the outsides or slabs were cut from one log, which was then turned upon its flattened sides to the other set of saws which cut it into boards. The “stock” gang, “pony” gang, “slab- bing” gang, and “Yankee” gang are favourites with saw-mill proprietors, because of the uniform character of the lumber produced, and the saving of timber realized from the use of saws of scarcely one-third the thickness of the gate, muley, or circular.

Gang-saws are seldom thicker than 14-gauge, and are success- fully worked at 18-gange, making a saw-kerf or waste of but 3 inch, whereas the ordinary gate, muley, or circular takes y%y inch, The niuley was introduced later than the gang, and was received with great favour, entering into more general use be- cause of its comparative cheapness and adaptability where the sawyer had not to deal with large qnantities of lumber. The muley mill dispensed with the ponderous gate and heavy posts of the saw-frame. While the lower portion of the mill is arranged much as in the use of the gate-saw, with the addition of necessary slides, the upper end of the saw is guided in a strong iron frame pendent from the weigh-beam overhead. On each side of this frame are slides in which are placed boxes, attached by a noddle pin and strap to the upper end of the saw, keeping the tool in line with the cut, and the cutting is accomplished wholly by the downward thrust, the motion of the crank beneath imparting a forward motion to the blade in its cutting functions and a retreating motion as it rises from the cut. By an ingenious arrangement of the slides an increased oscillation may be imparted, the object being to cause the saw- teeth to hug the timber closer on tle downward or eutting thrust, and to recede and run clear of the timber on the upward motion, thus decreasing the friction. Muley-saws are usually run at

a speed of 300 revolutions of the driving wheel per minute, and the daily eapacity may be stated at about 5000 superficial feet.

SAWS

Water-powcr was used almost exclusively in saw-mills until 1835, after which year steam was rapidly substituted, until at the present time it is as difficult to find a water-power saw-mill as it is to find a gate or muley.

The use of the circular as the main saw of a mill is of compara- tively recent origin, the experimental point in its introduction having been passed only about the year 1855. Since that time it has rapidly reached the highest efficiency. Driven by engines of from 25 to 100 horse-power the circular saw-mill, under proper management, turns out from 20,000 feet per day for smaller to 50,000 and 60,000 feet per day for larger mills, in addition to running the double-edgers and trimming saws, requisite for trimming off the rough edges and bad ends of the lumber produced.

The modern saw-mill stands upon the banks of a river or pond, at an elevation usually of twelve feet from the level of the land to the saw-floor. The logs are floated from the forest (often many hundred miles distant from the mill) down the river, in lengths as desired. Piling driven at convenient distances in the water serves to hold the long pieces of timber, which, secured to the piles by heavy chains, form a strong ‘‘boom,” floating into which the logs are penned or ‘‘ boomed ” until required. From the rear end of the mill, at the second story or saw-floor, a ‘jack ladder ” is constructed of heavy timber, the lower ends resting in the bottom of the stream upon a bed of timber heavily weighted. Upon the sides of the jack ladder are laid ribbons of iron forming a track for the log car, which, strongly constructed and with its top cross sections or ‘‘ bunks” heavily studded with j-headed bolts, is run under the water at a depth to allow the log to float over it in such manner that, as the chain running to the ‘ bull-wheel * in the mill is wound up, the spikes of the car catch upon the under-side of the log or logs, whieh thus load themselves and are hauled up the incline to the mill floor. Here they are rolled upon skids leading to the saw-carriage, and are soon running rapidly their course of manufacture. Loaded upon the “ head-blocks,” by a quick motion of a lever upon the standard, the “setter” inserts an iron ‘‘ dog,” which holds the log firmly in place ready for advancing to

the saw. This is accomplished by one of several methods :—(1) by rack and pinion worked by ‘‘cone feed,” in which a belt is moved upon two parallel cones to impart a more rapid or a slower motion to the pinion shaft ; (2) by ‘‘rope feed,”

a rope, usually of wire, being attached to each end of the mill –

carriage, and passing over pulleys in the floor to a drum bencath, so arranged as to be under control of the sawyer in its feeding movement or in reversal to ‘‘ gig” the earriage back to its first position ; or (3) by “steam feed.” This is the more modern and rapid means employed, and is sometimes termed ‘‘ lightning feed.” A steam cylinder of 8 or 10 inches diameter is laid upon the floor of the mill beneath the saw-carriage, its piston connecting with the carriage. Steam being admitted to the driving end of the cylindcr

(the length of which is according to the length of timber to be,

sawed, sections being added or removed at pleasure) the saw carriage is driven with lightning speed, both in the cutting feed and reversing “gig.” ‘Thirty ordinary cuts per minute, on 12 inches feed to the revolution of the saw, may be attained with this adaptation. As the limit of capacity for work with a circular saw is practically the ability of the operators to remove the lumber, 60,000 to 70,000 feet per day is no unusual cut, while a rate of 100,000 fect per day has been maintained (for a short period) by a single circular. The lumber as it drops from the saw falls upon ‘‘ live rolls,” a series of iron or wooden rollers connected by chain belts, which carry it within reach of the “edger,” who rapidly passes that portion which requires “ edging ” or splitting through the ‘‘double-edger,” to a carriage or truck on which it is pushed to the piling ground, or, in some mills, to another series of live rolls which take it to the front of the ‘‘trimmer,” an ingenious arrangement of table, beneath which are several saws which advance or recede at the operator’s pleasure, cutting the lumber to even and uniform lengths, or, trimming off such defects as may exist in the end of the piece. Ordinary lengths are 12, 14, 16, and 18 feet, and by use of the trimmer all superfluous ends are removed, leaving each piece of uniform length with its fellows. The waste of the log, consisting of the “slabs” and edgings, are carefully gone over, and such as are suitable for that purpose go to the ‘‘ lath” machines, where they are cut into strips four feet in length, 3 inch thick, and 14 inches wide, for lath and plaster work. In the sawing of logs, imperfce- tions are often discovered in the timber, unfitting it for ordinary uses, and in many mills it is customary to saw such timber into ‘Ceants” of usually six inches thickness. These cants are turned over to a ‘‘butting saw,” where they are cut into lengths of 16 inches (in some localities 18 inches) and turned over to the shingle mill to be manufactured into shingles. Shingles are tapering pieces 8 inch thick at one end, and yy inch at the other, and are used as a roof covering in lieu of slating or tiles. They are laid in uniform courses, with 44 to 5 inches of the butt end laid to the weather, and are good for from 20 to 80 years’ wear upon a roof. An

adjunct to the circular saw is often found in a top or upper saw, overhanging the main’ circular a little in advance of its track, for the purpose of enabling

larger logs to be handled than the diameter of an ordinary circular will permit. The upper saw cuts into the top of the log in a line with the cut of the lower or main saw, thus increasing the depth of the cut. In California, where logs of 8 and 10 feet diameter are not unusual (larger logs being quartered by the use of gunpowder or other explosive, timber as mucli as 20 and even 25 feet in diameter being found in the redwood forests), an ingenious arrangement of four saws placed one higher than the other, some horizontal and others vertical, permits the handling of huge trees which until recently were not considered available. A thoroughly modern saw-mill embraces all which has been said regarding the circular, with the addition of the ‘‘gang” feature, for, while a majority of the saw-mills of North America are single “circulars,” many of them have a rotary upon each side of the mill floor, the log-jack being in the centre of the building rolling its logs either to the right hand or the left. The larger mills have in addition to the rotaries from one to four gangs. In these cases the log usually goes first to the circular, where the slabs of two sides are removed, leaving a flat cant, which is then transferred to the gangs. These mills are fully equipped with all the modern patent improvements. The logs are drawn from the water by an endless chain running in a Y-shaped log slide, the chains being provided either with spikes or concave chairs which hold the log from slipping back. One log follows the other in endless succession. On its arrival at the log deck on the mill floor, the manipulation of a lever causes an arm or arms to rise through the floor against the side of the log, which is partially raised and thrown with considerable force upon the skids leading to the saw carriage. When one log has been sawed, another is loaded by the simple touch of a lever in the hands of the sawyer, causiug arms to rise in the skids under the log, which is thrown upon the carriage ready for thesaw. When the first slab has been removed, the sawyer’s touch of a lever brings through the floor the ‘‘ nigger,” a piece of strong timber, iron-bound and with sharp teeth or spikes protruding from its front face. Its motion tends slightly forward as it advances to a height of five or six feet above the floor, its spiked surface catching the side or face of the log, turning it instantly to any desired position. If the log is simply to be “canted” for the gang the two opposite sides or slabs are removed, and as the last cut is complete a hook thrown over the rear end of the cant prevents its return with the saw carriage and it drops upon rolls which move it so far out of the way of the returning carriage with its fresh load as is necessary to start it in an opposite

direction to the gang which is to complete its manu- facture. Until now, and until it shall emerge from the gang, no hand of man has necessarily touched the log. Machinery guided by human intelligence has done all the work. When the log reached the carriage it was dogged, not with the old-fashioned lever dog driven by a mallet, but by the simple movement of a lever. It was brought to its proper position before the saw by nicely adjusted set works, which graduated its position to one- eighth of an inch. After the slab was removed, if another cut was required the same set works moved it forward with lightning quickness, leaving it at the exact point, toa nicety, requisite for the production of just the thickness desired for the next piece. From the water to the pile in the millyard hands have necessarily been employed in actual handling of the product only at the edger and the trimmer, and in assorting the qnalities upon the tram-car which removes it from the mill. Machinery, guided by human intclligence, has done all the heavy work. A mill answering closely to our description was recently burned at Bay City, Michigan, the yearly production of which for several. years past has been 40,000,000 fect of lumber, besides shingles, lath, pickets, &c., cut from the slabs and waste. The total production of the saw-

‘mills of the United States approximates 26,000,000,000 feet

annually.

The “band” saw-mill is rapidly working its way into public favour because of the economy attending its use. The band saw is a long ribbon of steel, six to eight inches in width, running over large pulleys above and below, the upper pulley running almost vertically above the lower, the saw acting as a belt between the two and as the driving power to the upper wheel. These saws are very thin and have a manufacturing capacity of from 80,000 to 40,000 feet per day, with the consumption of 25 to 40 per cent. less power than is required for the ordinary circular saw of the same daily capacity for work. The main advantage found in the use of the band-saw is in the saving of timber (20 per cent.). The set works do not differ from those of rotary mills, and either cone, rope, or steam feed may be used in connexion with it.

A useful adjunct to the many saw-mills, which produce more waste than can be consumed in raising the necessary steam, is the “slab-burner” or

‘‘hell,” a large circular brick furnace often 50 feet in height by 25 feet internal diameter, erected conveniently near the saw-mill, into which by chain carriers leading to an opening at a sufficient height from the bottom, the sawdust,

cdgings, worthless slabs, and debris of the mill are conveyed, to be

destroyed by fire. ; ; ; ; Shingle Mélls.—A standard shingle is four inches wide, and all

computations of quantity are based upon that width, although the individual shingle may be six or eight inches wide oras much as 18 inches, in the latter case counting 44 shingles. A shingle mill differs from a saw-mill in the adaptations of machinery. Saws of 16-gauge, 40 inches in diameter, are most commonly employed. In cases where shingle manufacture is carried on in connexion with the saw-mill, the process of preparing the blocks has already been described. A majority of the shingles manufactured, however, are made in mills built for the special purpose. Logs suitable, usually of a medium quality, are placed before a “bolting” or “drag” saw, which severs them into the required length. The block is then stripped of its bark and sap by splitting off a section of the outer circumference to the heart wood, with axes; it is next quartered, and the inside section of heart, which is never sound, removed; and then it goes to the machine for manufacture. The machines are sometimes horizontal, sometimes vertical, but all work upon the same principle, viz., that of a tilting table, allowing a thick butt anda thin point to be alternately taken. The shingles as they drop from the saw are rough-edged, and require to be ‘*jointed,’”’ generally upon a rapidly revolving wheel, upon the face of which are secured four well-balanced knives, which, as the shingle is pressed against them, eat away the imperfect edge with great rapidity, leaving a straight smooth edge, which when laid upon a roof makes a good joint with its fellows. The edging or jointing process is often performed with small saws in place of the wheel-

jointer. The shingles are usually packed in bunches con- taining the equivalent of one quarter thousand 4-inch pieces, and are more used for roof coveriug than any other material in the United States or Canada. (Ge Wore) SAXE, Maurice, Comte pE (1696-1750), marshal of Franee, was the natural son of Augustus IL. of Saxony and the countess Aurora of Kénigsmark. An entry in the parish registers of Goslar shows that he was born in that town, 28th October 1696. In 1698 the countess sent him to Warsaw to his father, who had been elected king of Poland the previous year, but on aeeount of the unsettled condition of the country the greater part of his youth was spent outside its limits, a yearly ineome being assigned him, This enforced separation from his father made liim more independent of his eontrol than he would otherwise have been, and had an important effect on the character of his future career. At the age of twelve he was present, under the direction of the count of Schulen- burg, in the army of Eugene, at the sieges of Tournay and Mons and tle battle of Malplaquet, but the achievements ascribed to him in this campaign are chiefly fabulous. A proposal to send him at the close of it to a Jesuit college at Brussels was relinquished on aceount of the strong protests of his mother; and, returning to the camp of the allies in the beginning of 1710, he displayed a eourage so impetuous as to call forth from Eugene the friendly admonition not to confound rashness with valour. After receiving in 1711 formal recognition from his father, with the rank of count, he accompanied him to Pomerania, and in 1712 he took part in the siege of Stralsund. As he grew up to manhood he was seen to bear a strong resem- blance to his father, both in person and character. His grasp was so powerful that he could bend a horse-shoe with his hand, and to the last his energy and enduranee were unsubdued by the severe bodily illnesses resulting from his many excesses. The impetuosity noted by Eugene manifested itsclf in his private life in a dissolute- ness only slightly tempered by his generosity and good humour. In his military carecr during his mature years it was indicated only in his blindness to danger and his unmoved calm amidst the blackest lowerings of misfor- tune, for it was tempered by the “vigilance, forethought, Sagacious precaution” which Carlyle notes as ‘singular in so dissolute a man.” In 1714 a marriage was arranged between him and one of the richest of his father’s subjects, the Countess von Loeben, but her immense fortune he dissipated so rapidly that he was soon heavily in debt, and, having given her more serious grounds of complaint

against him, he consented without defenee to an annul- ment of the marriage in 1721. Meantime, after serving in a eampaign against the Turks in 1717, he had in 1719 gone to Paris to study mathematics, and in 1720 obtained the office of “maréchal de camp.” In 1725 negotiations were entered into for his election as duke of Courland, at the instance of the duchcss Anna Ivanovna, who offered him her hand. He was chosen duke in 1726, but declin- ing marriage with the duchess found it impossible to resist her opposition to his claims, although, with the assistance of £30,000 lent him by the French aetress Adrienne Lecouvreur, lis relations with whom form the subject of the drama of that name by Seribe and Legouvé, published in 1849, he raised a force by which he maintained his authority till 1727, when he withdrew and took up his residence in Paris. On the outbreak of the war in 1734 he served under Marshal Berwick, and for a brilliant exploit at the siege at Philippsburg he was in August named lieutenant-general. It was, how- ever, with the opening of the Austrian Succession War in 1741 that he first rose into prominence. In eommand of a division forming the advance guard of an army sent to invade Austria, he on the 19th November surpriscd Prague during the night, and took it by assault before the garrison were aware of the presence of an enemy, a coup de main which at onee made him famous throughout Europe. After capturing on the 19th April 1742 the strong fortress of Eger, he received leave of absence, and went to Russia to push his claims on the duchy of Cour- land, but obtaining no sueeess returned to lis eommand. His exploits had been the sole redeeming feature in an unsuccessful campaign, and on 26th March 1743 his merits were reeognized by lus promotion to be marshal of Franee. In 1744 he was chosen to command the expedition to England in behalf of the Pretender, which assembled at Dunkirk but did not proceed farther. After its abortive issue le reeeived an independent eommand in the Netherlands, and by dexterous manceuvring succeeded in continually harassing the superior forces of the enemy without risking a decisive battle. In the following year he made a rapid march on Tournay, and, when the allies sent an army of 60,000 under the duke of Cumberland to its relief, gave them battle 11th May, without relaxing the siege, from a strongly entrenched position at Fonte- noy. The contest raged from early morning till two o’clock, when, by a eharge at a eritical moment which annihilated a

column of the enemy, fortune was decided in his favour. During the battle he was unable on account of dropsy to sit on horseback exeept for a few minutes, and was carried about in a wicker basket. In recognition of his brilliant achievement the king conferred on him the castle of Chamford for life, and in April 1746 he was naturalized. The eampaign of 1746 was signalized by the eapture of Antwerp on the Ist June, the eapture of Namur in September, and the total rout of Prinee Charles at Rauconx 11th October. Having on the 12th January 1747 been made marshal-general, he in the following campaign won the victory of Lawfeldt over the duke of Cuniberland, and on 16th September he stormed Bergen-op- zoom. In May 1748 he captured Maestrielit after a month's siege. After the peace, he lived in broken health chiefly at Chamford, and he died there 30th November 1750.

Maurice de Saxe was the author of a work on military science, Mes Réveries, described by Carlyle as ''a strange military farrago, dictated, as I should think, under opium," published posthumously in 1757 (last ed., Paris, 1877). His Lettres e¢ Mémoires Choisis appeared in 1794. Many previous crrors in former biographies were corrected and additional information supplicd in Carl von Weber's Moritz, Graf von Sachsen, Marschall von Frankreich, nach archivalischen Quellen (Leipsic, 1863), and in Taillandier's Maurice de Saxe, étude historique @ apres les doewments des Archives de Dresde (1865). Sce also Carlyle's Frederick the Great,

See

SA X—SAX

SAXE-ALTENBURG (Germ. Sachsen-Altenburg), a

Plate V. duchy in Thuringia, and an independent member of the

German empire, consists of two detached and almost equal parts, separated from each other by a portion of Reuss (junior line), and bounded on the 8. and W. by the grand- duchy of Saxe-Weimar-Hisenach, on the N. by Prussia, and on the E. by the kingdom of Saxony. There are in addi- tion 12 small exclaves. The total area is 510 square miles (about half the size of Cheshire in England), of which 254 are in the east or Altenburg division

and 256 in the west or Saal-Hisenberg division. The former district, traversed by the most westerly offshoots of the Erzgebirge and watered by the Pleisse and its tributaries, forms an undu- lating and fertile region, containing some of the richest agricultural soil in Germany. The western district, through which the Saale flows, is rendered hilly by the beginnings of the Thuringian Forest, and in some measure makes up by its fine woods for the comparatively poor soil. The mineral wealth of Saxe-Altenburg is scanty; lignite, the chief mineral, is worked mainly in the eastern district.

According to the returns for 1883, 584 per cent. of the entire duchy was occupied by arable land, and 274 per cent. by forests, of which four-fifths were coniferous. The chief crops were rye (42,317 acres, yiclding 20,412 tons), oats (36,807 acres, 22,996 tons), barley (21,390 acres, 18,912 tons), wheat (17,490 acres, 9724 tons), and potatoes (19,870 acres, 113,209 tons). The cattle- raising and horse-breeding of the duchy are of considerable import- ance. In 1883 the duchy contained 9934 horses, 60,335 cattle, 20,996 sheep, 46,387 pigs, and 12,420 goats. About 35 per cent. of the population are directly supported by agriculture. The manufactures of the duchy are very varied, but none is of any great importance ; woollen goods, gloves, hats, porcelain and carthen- ware, and wooden articles are the chief products. ‘Trade in these, and in horses, cattle, and agricultural produce, is tolerably brisk. The chief scats of trade and manufacture are Altenburg the capital (29,422 inhabitants in 1885), Ronneburg (5485 inhabitants in 1880), Schmélln (6394), Géssnitz (4949), and Meuselwitz (3402) in the Altenburg division; and Eisenburg (6277), Roda (3465), and Kabila (2999) in the Saal-Eisenburg division. Besides these there are the towns of Lucka (1505) and Orlamiinde (1461), and 449 villages, of which Russdorf (1781), in an exclave, is the largest.

Next to the two principalities of Reuss, Saxc-Altenburg is the most densely peopled part of Thuringia. In 1880 the population was 155,036, or 304 per square mile. Of these 154,187 were Protestants, 741 Roman Catholics, 33 Jews, and 75 of other sects. The population in 1885, according to a provisional return of the census of that year, was 161,129. In the west division the popu- lation (49,788) is wholly Teutonic, but in the east (111,341) there is a strong Wendish or Slavonic element, still to be traced in the peculiar manners and costume of the country-people, though these are

gradually being givenup. The farmers and peasant-proprictors of the cast division (Altenburger Bauern) are an industrious and well-to-do class, but like similar classes in other countries they are said to be avaricious and purse-proud. Their holdings are seldom divided ; a custom corresponding to BorovuGH-ENGLisH (q.v.), though not supported by law, obtains among them ; and sometimes the elder brothers are employed by the youngest as servants on the paternal farm. The destitution to which the disinherited children are often reduced by this custom is seriously prejudicial to morality. The Altenburg peasants are pleasure-loving, and in spite of their avarice are said to gamble for very high stakes, especially at the complicated card-game of “skat,” now universal in Germany, which many believe to have been invented here.

Saxe-Altenburg is a limited hereditary monarchy, its constitu- tion resting on a law of 1831, subsequently modified. The diet consists of 30 members, elected for 3 years, of whom 9 are returned by the highest taxpayers, 9 by the towns, and 12 by the country districts. The franchise is enjoyed by all males over 25 years of age who pay taxes. The duke has considerable powers of initiative and veto. The government is carried on by a ministry of three members, of whom two administer justice and finance respectively, aud the third all the other departments of home and foreign affairs. The budget for 1884-86 estimated the yearly income at £127,180 and the yearly expenditure at £125,530. The Altenburg troops are united with the contingents of Schwarzburg, Rudolstadt, and the two Reusses to form the 7th Thuringian infantry regiment of the imperial army. Saxe-Altenburg has onc vote in the Reichstag and one in the federal council.

After the conquest of the Wends, the present Altenburg district became an imperial possession, lying partly in the Pleissengau and

partly in the Voigtland, while the west district was divided among ~

a number of small nobles. The margrave of Saxony obtained permanent possession of Altenburg about 1329, and the west division was also early incorporated with his dominions. Both districts were among the lands assigned to the Ernestine line of the house of Saxony by the convention of

Wittenberg in 1547 (see SAxoNY). From 1603 till 1672 there existed an independent duchy of Altenburg; but in 1826, when the present division into the four Saxon duchies was made, both Altenburg and Lisen- burg belonged to Gotha. Duke Frederick, who exchanged Saxe- Hildburghausen for the present duchy of Saxe-Altenburg in 1826, was the founder of the reigning line. A constitution was granted in 1831 in answer to popular commotion ; and greater concessions were extorted by more threatening disturbances in 1848. The second duke (Joseph) abdicated in 1848 in favour of his brother George. Under Ernest, who succeeded his father as fourth duke in 1853, a period of violent reaction set in, so that even now the constitution is considerably less liberal than it was in 1849. In 1873 the long-disputed question as to the public domains was settled, two-thirds of these being now regarded as belonging to the duke in fidetconmisswm and in lieu of a civil list.

SAXE-COBURG-GOTHA (Germ.

of the German empire, consists of the two formerly separate duchies of Coburg and Gotha, which lie at a distance of 14 miles from each other, and of eight small scattered exclaves, the most northerly of which is 70 miles from the most southerly. The total area is 760 square miles (about 2 square miles more than the county of Surrey in England), of which 217 are in Coburg and 543 in Gotha, The duchy of Coburg is bounded on the S.E., S., and §.W. by Bavaria, and on the other sides by Saxe- Meiningen, which, with part of Prussia, separates it from Gotha. The considerable exclave of Konigsberg in Bavaria, 10 miles south, belongs to Coburg. Lying on the south slope of the Thuringian Forest, and in the Franconian plain, this duchy is an undulating and fertile district, reaching its highest point in the Senichshéhe (1716 feet) near Mirsdorf. Its streams, the chief of which are the Itz, Steinach, and Rodach, all find their way into the Main. The duchy of Gotha, more than twice the size of Coburg, stretches from the south borders of Prussia along the northern slopes of the Thuringian Forest, the highest summits of which (Grosse Beerberg, 3225 feet ; Schneekopf, 3179 feet; Inselberg, 2957 feet) rise within its borders. The more open and level district on the north is spoken of as the ‘‘open country” (“das Land”) in contrast to the wooded hills of the ‘“ forest” (“der Wald”). The Gera,

Hérsel, Unstrut, and other streams of this duchy flow to the Werra or to the Saale.

In both duchies the chief industry is agriculture, whicli employs 38 per cent. of the entire population. According to the returns for 1883, 584 per cent. of the area was occupied by arable land, 10 per cent. by meadow-land and pasture, and 30 per cent. by forest. In the same year the chief crops were oats (43,715 acres, yielding 19,229 tons), barley (37,387 acres, 20,148 tons), rye (29,077 acres, 12,048 tons),' wheat (24,255 acres, 9,272 tons), and potatoes (24,546 acres, 116,695 tons). A small qnantity of hemp and flax is raised (less than 1000 acres of cach), but a considerable quantity of fruit and vegetables is annually produced. Cattle-breeding is an im- portant resource, especially in the valley of the Itz in Coburg. In 1883 the two duchies contained 8187 horses, 58,196 cattle, 73,249 sheep, 51,549 pigs, and 27,015 goats. The mineral wealth of Saxe- Coburg-Gotha is insignificant ; small quantities of coal, lignite, ironstone, millstone, &c., are annually raised. There are also salt- works and some deposits of potter's clay.

The manufactures of the duchies, especially in the mountainous parts less favourable for agriculture, are tolerably brisk, but there is no large industrial centre in the country. Iron goods and machinery, safes, glass, earthenware, chemicals, and wooden articles, including large quantities of toys, are produced; and – various branches of textile industry are carried on. Ruhla (two- fifths of which is situated in Saxe-Weimar-Lisenach) is famous for its meerschaum pipes and cigar-holders, which are exported to all parts of the world; and the maps of Perthes's geographical institute at Gotha mayalso be reckoned among the national products. Coburg (15,791 inhabitants in 1881) and Gotha (28,100 in 1885) are the chief towns of the duchies, to which they respectively give name; the latter is the capital of the united duchy. There are seven other small towns, and 820 villages and hamlets. The villages of Fried-

Sachsen-Koburg- See Gotha), a duchy in Thuringia, and an independent member Plate V.

See Plate V.

riehroda and Ruhla and the Inselberg and Schneckopf and other picturesque points annually attraet an increasing number of sum- mer visitors and tourists. Neudietendorf or Gnadenthal is a Moravian settlement founded in 1742.

The population in 1880 was 194,716, or 256 per square mile, of whom 56,728 (261 per square mile) were in Coburg and 137,988 (254 per square mile) in Gotha. In the former duchy the people be- long to the Franconian and in the latter to the Thuringian branch of the Teutonic family. In 1880 there were 192,025 Lutherans, 2062 Roman Catholics, 490 Jews, and 139 others. In 1885 the population was 198,717,—-57,355 in Coburg and 141,362 in Gotha.

Saxe-Coburg-Gotha is a limited hereditary monarchy, its con- stitution resting on a law of 1852, modified in 1874. For its own immediate affairs each duchy has a separate diet (in Coburg of 11, in Gotha of 19 members); but in more important and general matters a common dict, formed of the members of the separate diets, meeting at Coburg and Gotha alternately, exercises authority. The members are elected for four years; the franchise is extended to all male taxpayers of twenty-five years of age and upwards. The ministry has special departments for each duchy, but is under a common president. In finance the duchies are also separate, the budget in Coburg being voted fora term of six years, and in Gotha for four years. After long disputes between the duke and the Government a compromise was effected in 1855, by which the greater part of the public lands is regarded as a fideicommisswm in the possession of the reigning duke, while the income from the rest is regarded as statc-revenue. There are thus two budgets for each duchy. The annual income of the public lands in Coburg is estimated for the period 1886-92 at £20,700, and the expenditure at £11,900 ; in Gotha (period 1886-90) the same source is estimated to yield £102,621 and to cost £61,996 ;—together producing a surplus of £49,425, of which the duke receives £29,700 and the state-treasury £19,725. The annual state-revenue in the samc periods was estimated for Coburg at £51,520, or £2246 more than the estimated expenditure, and in Gotha at £106,020, or £2244 nore than the cxpenditure. Saxe-Coburg-Gotha enjoys a very large private

fortune, amasscd chiefly by Ernest I., who sold the principality of Lichtenberg to Prussia in 1834 for an annual payment of £12,000. The congress of Vienna had bestowed the principality upon him in recognition of his services in 1818. directly connected with five of the royal houses of Europe, and the

actual rulers or the heirs of three kingdoms trace their descent

from it. The succession is hereditary in the male line; and by the deed of succession of 1855 the heir to the throne is the duke of Edinburgh, nephew of the present duke.

History.—The elder line of Saxe-Coburg was founded in 1680 by Albert, the second son of Ernest the Pious. On his dying child- less in 1699, however, the line became extinct, and his possessions became the subject of vehement contention amongst the other Saxon houses, until they were finally distributed at the end of the 18th century. The John Ernest, the seventh son of Ernest the Pious, who originally ruled in Saxe-Saalfeld. His two sons, ruling in common, acquired possession of Coburg, and, changing their residence, styled them- selves dukes of Saxe-Coburg-Saalfeld. Under the son and successor of the survivor (who introduced the principle of primogeniture), Ernest Frederick I. (1764-1800), the land was plunged into bankruptcy, so that an imperial commission was appointed on his death to manage the finances. The measures adopted to redeem the country's credit were successful, but imposed so much hardship on the people that a rising took place, which had to be quelled with the aid of troops from the electorate of Saxony. The duke Francis Frederick Antony died in December 1806, and was suc- ceeded by his son Ernest III. (1806 -1844), although the country was occupied by the French from 1807 until the peace of Tilsit in 1816. In the redistribution of the Saxon lands in 1826, Ernest resigned Saalfeld to Meiningen, receiving Gotha in exchange and assuming the title of Ernest I. of Saxe-Coburg-Gotha. The linc of Saxe-Gotha had been founded in 1680 by the eldest son of Ernest the Pious, and had become extinct in 1825. When Ernest II. (b. 1818) succeeded in 1844 both the public finances and the private fortune of the ducal family (see above) were flourishing. In his reign various liberal reforms have been achieved, and the union of the duchies has been made closer.

SAXE-MEININGEN (Germ. Sachsen-Meiningen), a duchy in Thuringia, and an independent member of the German empire, consists ehiefly of an irregular crescent- shaped territory, which, with an average breadth of 10 miles, stretches for over 80 miles along the south-west slope of the Thuringian Forest. The convex side rests upon the duchy of Coburg, and is in part bounded by Bavaria, while the concave side, turned towards the north, contains portions of four other Thuringian states and Prussia be-

Besides the civil list the duke of

The house of Saxe-Coburg-Gotha is

present reigning family is the posterity of

tween its horns, which are 46 miles apart. The districts of Kranichfeld, 15 miles north-west, and Kamburg, 22 miles due north of the eastern horn, together with a number of smaller scattered exclaves, comprise 74 of the 953 square miles now belonging to the duchy (about the size of county Down in Ireland). The surface on the whole is hilly, and is partly occupied by offshoots of the Thuringian Forest; the highest summits are the Kieserle (2851 feet) and the Bless (2834 feet). The chief streains are the Werra, which traverses the south and east of the duchy, and various tributaries of the Main and the Saale, so that Saxe-Meiningen belongs to the basins of the three great rivers Weser, Rhine, and Elbe.

The soil is not very productive, although agriculture flourishes in the valleys and on the level ground; grain has to be imported to meet the demand. In 1883 only 41°8 per cent. of the total area (in 1878, 41°6) was devoted to agriculture, while meadow land and pasture occupicd 11 per cent. ‘The chief grain crops in 1883 were rye (44,442 acres, yiclding 16,112 tons), oats (42,447 acres, 17,343 tons), wheat (25,252 acres, 9033 tons), and barley (19,015 acres, 94,456 tons). The cultivation of potatoes is very general (31,006 acres, 143,327 tons). Tobacco, — and flax (in 1888, 997 acres) are also raised. The Werrathal and the other fertile valleys produce large quantities of fruit. Sheep and cattle raising is a tolerably important branch of industry throughout the duchy ; horses are bred in Kamburg. In

1883 Saxe-Meiningen contained 5174 horses, 66,733 cattle, 58,940 sheep, 45,136 pigs, and 26,817 goats. The extensive and valuable forests, of which 75 per cent. are coniferous trees, occupy 41°9 per cent. of the entire area. Nearly one half of the forests belong to the state and about one- third to public bodies and institutions, leaving little more than a sixth for private owners, The mineral wealth of the duchy is not inconsiderable. Iron, coal, and slate are the chief minerals worked. There are salt-works at Salzungen and Sulza, the former the most important in Thuringia; and the mineral water of Friedrichshall is well known. ‘The manufacturing industry of Saxe-Meiningen is very active, especially in the districts of Sonne- berg, Grafenthal, and Saalfeld. Iron goods of various kinds, glass and pottery, school-slates, marbles, &c., are produced ; the abund- ant timber fosters the manufacture of all kinds of wooden articles, especially toys ; and textile industry is also carried on to a slight extent,

The capital of the duchy is Meiningen (in 1881 11,227 inhab- itants), Of the sixteen other towns (Salzungen, Wasungen, Hildburghausen, Kisfeld, Sonneberg, Saalfeld, Péssneck, Kamburg, &c.) none has so many as 10,000 inhabitants. ‘There are 392 villages and hamlets. In 1880 the population was 207,075 (217 per square mile), of whom 30 per cent. lived in communities of more than 2000. Asin the other Saxon duchies the population is almost exclusively Lutheran; in 1888 202,970 belonged to that confession, 2274 were Roman Catholics, 204 of other Christian sccts, and 1627 Jews.

Saxe-Meiningen is a limited monarchy, its constitution resting on a law of 1829, subsequently modified. The diet, elected for six years, consists of 24 members, of whom 4 are elected by the largest landowners, 4 by those who pay the highest personal taxes, and 16 by the other electors. The franchise is enjoyed by all domiciled males over twenty-five years of age who pay at least a minimum of taxes. The government is carried on by a ministry of five, with departments for the ducal house and foreign affairs, home affairs, justice, education and public worship, and finance. The returns of the statc- lands and the ordinary state-revenue are treated in separate budgets. The estimate for the period 1884-86 puts the annual income from the former at £105,340 and the annual ex- penditure at £77,915, while the annual income and expenditure of the latter are balanced at £145,148. Half of the surplus

of £27,425 is credited to each fund. The duke's civil list of £19,714 (394,286 marks) is paid out of the returns from the state-lands, at one time in the possession of the reigning house. Saxe-Meiningen has one vote in the federal council and sends two deputies to the reichstag.

The original territory of the duchy of Saxe-Meiningen, founded in 1680 by Bernhard, third son of Ernest the Pious, consisted of what is now the western horn of the duchy, from Henneberg northwards, Bernhard was succeeded in 1706 by his three sons; but by 1746 the only survivor was the youngest, Antony Ulrich, who reigned alone until his death in 1763, The duchy had mean- while been considerably increased in extent ; but contentions and petty wars with the other Saxon principalities on questions of inheritance, the extravagance of the court, and the hardships of the Seven Years' War plunged it into bankruptcy and distress, A happier time was enjoyed under Charlotte Amalie, Antony's wife, who ruled as regent for her two sons Charles (1775-1782) and George

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see Plate V.

(1782-1803), and also under these princes themselves. George, who had introduced the prineiple of primogeniture, was suceeeded by his infant son Bernhard Erich Freund, born in 1800. The war with Franee at the beginning of the present century, with its attendant quartering of troops, conscription, and levies of money, joined with cattle-disease and seanty harvests in once more plunging the eountry into distress, from whieh it but slowly re-covered. . Bernhard had already spontaneously granted a liberal constitution to his subjeets in 1824, when large additions (530 square miles) consequent upon the redistribution of the Saxon lands in 1826 more than doubled his possessions and rendered re-

organization necessary. Among the additions to Saxe-Meiningen

were the duchy of Hildburghausen (whence the full title of the present duchy is Saxe-Meiningen-Hildburghausen), whieh had been founded in

1680 by Ernest, the sixth son of Ernest the Pious; the prineipality of Saalfeld, which, founded by John Ernest, Ernest's seveuth son, in 1680, had been united to Coburg in 1735 ; and the distriets of Themar, Kranichfeld, Kamburg, and other smaller territories. Saxe-Meiningen, like the other Saxon duchies, entered the Confederation of the Rhine in 1806 ; but in 1866, unlike its neighbours, it declared for Austria in the war against Prussia. The land was at once occupied by Prussian troops, and Bernhard abdieated (September 1866) in favour of his son George, who made peace with Prussia and entered the North German Confederation. In 1871 the dispute which had lasted since 1826 between the duke and the diet as to the respective rights of each to the state-lands was terminated by a compromise.

SAXE-WEIMAR-EISENACH (Germ. Sachsen- Weimar- Eisenach), the largest of the Thuringian states, is a grand- duchy and a member of the German empire. It consists of the three chief detached districts of Weimar, Eisenach, and Neustadt, and twenty-four scattered exclaves, of which Allstedt, Oldisleben, and Ilmenau belonging to Weimar, and Ostheim belonging to Eisenach, are the chief. The first and last named of these exclaves are 70 miles apart; and the most easterly ofthe other exclaves is 100 miles from the most westerly. The total area of the grand-duchy is 1387 square miles (or slightly larger than Wiltshire in England), of which 678 are in Weimar, 465 in Eisenach, and 244 in Neustadt.

The district of Weimar, which is at once the largest division and the geographical and historical kernel of the grand-duchy, is a roughly circular territory, situated on the plateau to the north-east of the Thuringian Forest. It is bounded on the N. and E. by Prussia, on the S. and W. .by the Schwarzburg Oberherrschaft and detached portions of Saxe-Altenburg, and lies 23 miles east of the nearest part of Eisenach, and 7 miles north-west of the nearest part of Neustadt. The exclaves of Allstedt and Oldisleben lie in Prussian territory 10 miles to the north and north-west respectively ; Ilmenau as far to the south- west. The surface is undulating and destitute of any striking natural features, although the valleys of the Saale and Ilm are picturesque. The Kickelhahn (2825 feet) and the Hohe Tanne (2641 feet) rise in Hmenau ; but the Grosser Kalm (1814) near Remda, in the extreme south, is the highest point in the main part of Weimar. The broad-based Ettersburg (1519 feet), a part of which is known as " Herder's Hill" after

the poet, rises on the Ilm plateau, near Ettersburg, where Schiller finished his Maria Stuart. The Saale flows through the east of the district, but, although the chief river hydrographically, it yields in fame to its tributary the Im. The Unstrut joins the Saale from Oldisleben and Allstedt. The chief towns are Weimar, the capital, on the Ilm; Jena, with the common university of the Thuringian states, on the Saale; and Apolda, the ‘‘ Manchester of Weimar,” to the west.

Eisenach, the second district in size, and the first in point of natural beauty, stretches in a narrow strip from north to south on the extreme western boundary of Thuringia, and includes parts of the church lands of Fulda, of Hesse, and of the former countship of Henneberg. It is bounded on the N. and W. by Prussia, on the 8. by Bavaria (which also surrounds the exclave of Ostheim), and on the E. by Saxe-Meiningen and Saxe-Gotha, The

north is occupied by the rounded hills of the Thuringian Forest, while the Rhién Mountains extend into the southern part. The chief summits of the former group, which is more remarkable for its fine forests and picturesque scenery than for its height, are the Wartburg Hill (1355 feet), the north-western termination of the system, Ottowald (2103 feet), Wachstein (1801 feet), Ringberg (2106 feet), Hohe Vogelheid (2378 feet), and the Glockner (2211 feet). Among the Rhén Mountains in Eisenach the loftiest summits are the Elnbogen (2677 feet), Bayer- berg (2359 feet), Hohe Rain (2375), and the Glaserberg (2231 feet). The chief river is the Werra, which flows across the centre of the district from east to west, and then bending suddenly northwards, re-enters from Prussia, and traverses the north-eastern parts in an irregular course. Its chief tributaries in Eisenach are the Horsel and the Ulster. Eisenach is the only town of importance in this division of the grand-duchy.

Neustadt, the third of the larger divisions, is distin- guished neither by picturesque scenery nor historical interest. It forms an oblong territory, about 24 miles long by 16 broad, and belongs rather to the hilly district of the Voigtland than to Thuringia. It is bounded on the N. by Reuss (junior line) and Saxe-Altenburg, on the W. by Saxe-Meiningen and a Prussian exclave, on the 8. by the two Reuss principalities, and on the E. by the

kingdom of Saxony. The Kesselberg (1310 feet) near the town of Neustadt is the chief eminence. This district lies in the basin of the Saale, its chief streams being the White Elster, the Weida, and the Orla. Neustadt, Auma, and Weida are the principal towns.

Agriculture forms the chief oecupation of the inhabitants in all parts of the duchy, though in Hisenach and Ilmenau a large proportion of the area is eovered with forests. According to the returns for 1883, 56°3 per eent. of the entire surface was oceupied by arable land, 25°8 per eent. by forests, 8°8 by pasture and meadow-land, and 4°1 per cent. by buildings, roads, and water. Only 5 per cent. was unproductive soil or moorland. These figures indicate that Saxe-Weimar-Eisenach has nearly as large a pereentage of arable land as Saxe-Altenburg, and, notwithstanding the extensive woods in Eisenaeh and Ilmenau, a lower proportion of forest than any other Thuringian state. In 1888 the chief grain erops were oats (80,682 aeres, yielding 38,271 tons), barley (78,067 aeres, 45,249 tons), rye (72,607 aeres, 29,006 tons), and wheat (47,732 acres, 19,949 tons). About 50,000 acres were planted with potatoes, yielding 287,627 tons, or nearly 4 per cent. per acre less than the average of the five years immediately preceding. Al the grain erops were slightly above the average of the same period. The 79,405 acres devoted to hay produced 98,910 tons. Among the other crops were beetroot for sugar (8602 acres), flax (1300 acres), and oil-yielding plants (4562 acres). Fruit grows in abund- ance, especially in the neighbourhood of Jena, in the valley of the Gleisse, and on the lower I!m; 1070 acres, mostly on the banks of the Saale, were occupied with vines. Of the forests 38°5 per eent. are deeiduous and 61°5 per eent. coniferous trees; fully a half of the former are beeches. The greater part of the forests belong to the Government. Cattle-raising is earried on to a considerable extent, especially in Eisenach and Neustadt, while the sheep- farming centresin Weimar. The grand-ducal stud-farm in Allstedt maintains the breed of horses. In 1883 the duchy contained 17,271 horses, 110,092 cattle, 145,442 sheep, 101,443 pigs, and 41,291 goats. Although iron, copper, cobalt, and lignite are worked, the mineral wealth is trifling. Salt is also worked at different places.

The manufacturing industries in the grand-duehy are consider- able; they employ 37°3 per eent. of the population. The most important is the textile

industry, whieh centres in Apolda, and employs more than 20,000 hands throughout the eountry. The produetion of woollen goods (stockings, cloth, underclothing) forms the leading branch of the industry; but cotton and linen weaving and yarn-spinning are also carried on. Large quantities of earthenware and crockery are made, especially at Ilmenau. The microscopes of Jena, the scientific instruments (thermometers, barometers, &c.) of Ilmenau, and the pipes and cigar-holders of Ruhla (partly in Gotha) are well known. Leather, paper, glass, eork, and tobacco are among the less prominent manufactures. There are numerous breweries in the duchy. The volume of trade is not very great, although some of the productions (chiefly those first mentioned) are exported all over Europe, and in some cases to other continents as well. The chief imports, besides

colonial goods, are wool for the manufactures, hides, coal, meer- schaum (from Smyrna and Vienna), amber, horn, &c. LEisenach and Weimar are tlic chief seats of trade. é

The population in 1880 was 309,577, or 223 per square mile, of whom 297,785 were Lutherans, 10,267 Roman Catholics, 327 Christians of other sects, and 1248 Jews. The Thuringian and Frauconian branches of the Teutonic family are both represented in the duchy. According to the employinent census of 1882, agriculture, forestry, and fishing supported 135,200 or 44 per cent. of the population; industrial pursuits, 114,835 or 87°83 per cent.; trade, 23,939 or 7°8 per cent.; service, 4086 or 1°3 per cent.; official, military, and professional employments, 16,066 or 5-2 per cent.; while 13,597 persons or 4°4 per cent. made no returns.

Saxe-Weimar-Kisenach is a limited hereditary monarchy, and was the first state in Germany to reccive a liberal constitution. This was granted in 1816 by Charles Augustus, the patron of Goethe, and was revised in 1850, The diet consists of one chamber with thirty-one members, of whom one is chosen by the nobility, four by owners of land worth at least £150 a year, five by those who derive as much from other sources, and twenty-one by the rest of the inhabitants. The diet meets every three years; the deputies are elected for six years. The franchise is enjoyed by all domi- ciled citizens over twenty-five years of age. The governincnt is carried on by a ministry

of three, holding the portfolios of finance, of home and foreign affairs, and of religion, education, and justice, with which is combined the ducal household. The budget for the finance-period 1834-86 estimated the yearly income at £308,586 and the yearly expenditure at about £1560 less. ‘he public debt is more than covered by the active capital. The ducal house receives a civil list of £46,500. ‘The Saxe-Weimar family is the oldest branch of the Ernestine line, and hence of the whole Saxon house. By treaties of succession the grand-duke is the next heir to the throne of Saxony, should the present Albertine line become extinct. He is entitled to the predicate of “royal highness.” By a treaty with Prussia in 1867, which afterwards became the model for similar treaties between Prussia and other Thuringian states, the troops of the grand-duchy were incorporated with the Prussian army.

In early times Weimar, with the surrounding district, belonged to the counts of Orlamiinde, and from the end of the 10th century until 1067 it was the seat of a line of counts of its own. It afterwards fell to the landgrave of Thuringia, and in 1440 passed into the possession of Frederick the Mild, elector of Saxony. Involved after the convention of Wittenberg (1547) in the com- plicated and constantly shifting succession arrangements of the Ernestine dukes of Saxony, who delayed the introduction of primogeniture, Weimar does not emerge into an independent historical position until 1640, when the brothers William, Albert, and Ernest the Pious founded the principalities of Weimar, Hisenach, and Gotha. Eisenach fell to Weimar in 1644, and, although the principality was once more temporarily split into the lines Saxe-Weimar, Saxe-Eisenach (1672-1741), and Saxe- Jena (1672-1690), it was again reunited under Ernest Augustus (1728-1748), who secured it against future subdivision by adopting the principle of primogeniture. His son of the same name who succeeded died in 1758, two years after his marriage with Anna Amalia of Brunswick. Next year the duchess Amalia, although not yet twenty years old, was appointed by the emperor regent of the principality and guardian of her infant son Charles Augustus (1758-1828). The reign of the latter, who assumed the govern- ment in 1775, is the most brilliant epoch in the history of Saxe- Weimar. A gifted and intelligent patron of literature and art, Charles Augustus attracted to his court the leading authors and scholars of Germany. Goethe, Schiller, and Herder were members of the illustrious society of the capital, and the

university of Jena became a focus of light and learning, so that the hitherto obscure little state nema the eyes of all Europe.! The war with France was fraught with danger to the continued existence of the priuci- pality, and after the battle of Jena (October 14, 1806) it was mainly the skilful management of the duchess Louise that dissuaded Napoleon from removing her husband from among the reigning princes. In 1807 Saxe-Weimar-Eisenach entered the Confederation of the Rhine, and was promoted from a principality (Fiirstenthum) to a duchy (Herzogthum). In the following campaigns it suffered greatly ; and in 1815 the congress of Vienna recompensed its ruler with an addition to his territory of 660 square miles (includ- ing most of Neustadt) with 77,000 inhabitants, and with the title of grand-duke (Grossherzog). On the restoration of peace Charles Augustus redeemed his promise of granting a liberal constitution (1816). Freedom of the press was also granted, but after the festival of the Wartburg in 1819 it was seriously curtailed. Charles Frederick (1828-1853) continued his father's policy, but his reforms

bs An article on Saxe-Weimar-Eisenach would hardly be complete without Goethe's famous lines :-—

"* Klein ist unter den Fiirsten Germaniens freilich der meine, Kurz und schmal ist sein Land, missig nur was er vermag;

Aber so wende nach innen, so wende nach aussen die Krifte Jeder, da wir' ein Fest Deutscher mit Deutschen zu sein,"

were neither thorough enough nor rapid enough to avert political commotion in 1848. A popular ministry received power, and numerous reforms were carried through. Reaction sect in under Charles Alexander, who succeeded his father in 1853, and the union of the statc-lands and crown-lands was repealed, though both were appointed to remain under the samc public management. In 1866 the grand-duchy joined Prussia against Austria, although its troops were then garrisoning towns in the Austrian interest ; later it entered the North German Confederation. The press restric- tions were removed in 1868 and the tendency of recent legislation has been liberal, (F. MU.)

SAXIFRAGE (Saxifraga), a genus of plants which gives its name to the order of which it is a member. There are nearly 200 species distributed in the teinperate aud arctic parts of the northern hemisphere, frequently at considerable heights on the mountains. They are mostly herbs with perennial rootstocks, leaves in tufts, or, on the flower-stalks, scattered. The arrangement of the flowers is very various, as also are the size and colour of the flowers themselves. They have a calyx with a short tube, five petals, ten (or rarely five) stamens springing, like the petals, from the edge of the tube of the calyx. The pistil is partly adherent to the calyx-tube, and is divided above into two styles. The ovules are numerous, attached to axile placentas. The seed-vessel is capsular. Many species are natives of Britain, some alpine plants of great beauty (S. oppositifolia, S. nivalis, S. atzoides, &c.), and others, like S. granulata, frequenting meadows and low ground, while S. tridactylites may be found on almost any dry wall. Many species are in cultivation, including the Bergenias or Megaseas with their large fleshy leaves and copious panicles of rosy or pink flowers, the numerous alpine species, such as S. pyramidalis, S. Cotyledon, &e., with tall panicles studded with white flowers, and many others. —-

SAXO GRAMMATICUS, the celebrated Danish his- torian and poet, belonged to a family of warriors, his father and grandfather having served under king Valdemar YT' (d. 1182). He himself was brought up for the clerical profession, entered about 1180 the service of Archbishop Absalon as one of his secretaries, and remained with him in that capacity until the death of Absalon in 1201. At the instigation of the latter he began, about 1185, to write the history of the Danish Christian kings from the time of Sven Estridsén, but later Absalon prevailed on him to write also the history of the earlier, heathen times, and to combine both into a great work, Gesta Danorum. The archbishop died before the work was finished, and there- fore the preface, written about 1208, is dedicated to his successor Archbishop Andreas, and to King Valdemar II. Nothing else is known about Saxo's life and person Ba chronicle of 1265 calls him " mire et urbane eloquentix clericus ;" and an epitome of his work from about 1340 de- scribes him as "egregius grammaticus, origine Sialandus sf that he was a native of Zealand is probably correct, inas- much as, whereas he often criticizes the Jutlanders and the Scanians, he frequently praises the Zealanders. The surname of "Grammaticus" is probably of later origin,

scarcely earlier than 1500, apparently owing to a mistake. The title of “ provost (dean) of Réskilde,” given him in the 16th century, is also probably incorrect, the historian being confounded with an older contemporary, the provost of the same hame. Saxo, from his apprenticeship as the archbishop’s secretary, had acquired a brilliant but some- what euphuistic Latin style, and wrote fine Latin verses, but otherwise does not seem to have had any very great learning or extensive reading, His models of style were Valerius Maximus, Justin, and Martianus Capella, especi- ally the last. Occasionally he mentions Bede, Dudo, and Paulus Diaconus, but does not seem to have studied them or any other historical works thoroughly, and he neither understands nor is interested in scientific research, in gene- ral history, or even in chronology. He wrote because he

did not like his countrymen to be behind other nations through the want of an historian, and because he wished to perpetuate the record of the exploits of the Danes. His sources are partly Danish traditions and old songs, partly the statements of Archbishop Absalon, partly the accounts of Icelanders, and, lastly, some few earlier, but scanty, sources, being lists of Danish kings and short chronicles, which furnished him with some reliable chronological dates. He considered traditions as history, and therefore made it his chief business to recount and arrange these, by the help of the lists of the kings, into a connected whole. His work, therefore, is a loosely connected series of biographies of Danish kings and heroes; he dwells with predilection on those periods during which Danish kings were said to have made great conquests, and he represents these con- querors as the paragons of their times.

The first nine books comprise ‘‘Antiquity,” that is, traditions of kings and heroes of the half-mythical time up to about 950. Here we have traditions about Fredfrode, about Amleth (Hamlet) and Fenge, about Rolf Krake, Hadding, the giant Starkather, Harald Hildetann, and Ragnar Lodbrok. In this earlier history Saxo has also embodied myths of national gods who in tradition had become Danish kings, for instance, Balder and Hother, and of foreign heroes, likewise incorporated in Danish history, as the Gothic Jarmunrik (A. S. Eormenric), the Anglian Vermund (A. 8. Gérmund) and

Uffe (A. S. Offa), the German Hedin and Hild, &c. Frequently the narrative is interrupted by translations of poems, which Saxo lias used as authentic sources, although they are often only a few generations older than himself. In the later books (x.-xvi.) of his work he follows to a greater extent historical accounts, and the more he approaches his own time the fuller and the more trustworthy his relation becomes ; especially brilliant is his treatment of the history of King Valdemar and of Absalon. But his patriotism often makes him partial to his countrymen, and his want of critical sense often blinds him to the historical truth.

Saxo's work was widely read during the Middle Ages, and several extracts of it were made for smaller chronicles. It was published for the first time, from a MS. afterwards lost, in Paris, 1514, by the Danish humanist Christiern Pedersen; this edition was reprinted at Basel, 1534, and at Frankfort, 1576. Oflater editions may be mentioned that of Stephen ftephanius, Sord, 1644, that of C. A. Klotz, Leipsic, 1771, and that of P. E. Miiller and J. M. Velsehow, Copenhagen, 1839. No complete MS. any longer exists; yet of late small fragments have been found of three MSS. The most remarkable of these is the fragment found at Angers, in France, written shortly aftcr 1200, perhaps by Saxo himself or under his superintendence ; herc several corrections are found above the lines, showing how the author varied and polished his

_ Latin style.

Plate V.

SAXON DUCHIES. For the four Saxon duchies, SaxeE-ALTENBURG, SAXE-COBURG-GoTHA, SAXE-MEININGEN, and SAxE-WEIMAR-EISENACH, see those headings.

SAXONS, Law or THE. See Saric Law.

SAXONY is the name successively given in German history to a medieval duchy in northern Germany, to a later electorate which afterwards became the present kingdom of Saxony (described below), and to a ducal province of Prussia. The last was formed directly out of part of the second in 1815,

but the connexion between the first and second, as will be seen from the present article, is neither local nor ethnographical but political.

The Saxons (Lat. Saxones, Ger. Sachsen), a tribe of the Teutonic stock, are first mentioned by Ptolemy as occupy- ing the southern part of the Cimbrian peninsula between the Elbe, Eider, and Trave, the district now known as Holstein. The name is most commonly derived from ‘‘sahs,” a short knife, though some authorities explain it as meaning “settled,” in contrast to the Suevi or “ wander- ing” people. By the end of the 3d century, when we hear of a “Saxon Confederation” embracing the Cherusci, Chauci, and Angrivarii, and perhaps corresponding to the group of tribes called Ingzevones by Tacitus, the chief seat of the nation had been transferred south of the Elbe to the lands on both sides of the Weser now occupied by Oldenburg and Hanover. The Saxons were one of the most warlike and adventurous of the Teutonic peoples,

and they not only steadily extended the borders of their home, but made colonizing and piratical excursions by sea far and wide. In 287 they assisted the Menapian Carausius to make himself master of Romanized Britain, where he assumed the title of Augustus; and on the Continent they came into collision with the Roman empire under both Julian and Valentinian, the latter of whom de- feated them in 373 so far south as Deutz, opposite Cologne. Their settlements along the coast of France extended to the mouth of the Loire, and, though these were soon absorbed by the Franks, their expeditions to England finally resulted in the foundation of lasting kingdoms (Hssex, Sussex, Wessex) (see ENGLAND, vol. viii. pp. 268 sq.).1 About the beginning of the 5th century part of the Flemish coast became known as the Litus Saxoniwm, from the settlements of this people. The Saxons who remained in Germany (Alt-Sachsen or Old Saxons) gradually pushed their borders further and further until they approached the Rhine, and touched the Elbe, the North Sea, and the Harz Mountains. In 531 they joined their neighbours the Franks in a suc- cessful expedition against the Thuringians, and received as their spoil the conquered territory between the Harz and the Unstrut. Their settlements here were, however, forced to acknowledge the supremacy of the Franks, and from this period may be

dated the beginning of the long strife between these two peoples which finally resulted in the subjugation of the Saxons. During the reigns of the weak Merovingian kings who succeeded Lothair I. on the Frankish throne, the Saxons pushed into northern Thur- ingia, afterwards known as the Alt-Mark. Pippin the Short obtained a temporary advantage over them in 753 and imposed a tribute of three hundred horses, but their final conquest was reserved for Charlemagne. At this time the Saxons did not form a single state under one ruler, but were divided into the four districts of Westphalia to the west of the Weser, Eastphalia chiefly to the east of that river, Engern or Angria along both banks, and Nordal- bingia in Holstein. The gaus were independent, each having an ealdorman of its own; and they only combined in time of war or other emergency to choose a herzog, or common leader. The people were divided into the ‘“frilinge” or “‘frone,” who possessed the land, the “‘liti” or ‘‘lazzi,” a semi-freed class, and the serfs, who had no rights. The “edilinge” were the chiefs, but had no political advantages over the “frilinge.” Their religion was a simple type of northern heathenism. See GERMANY, vol. x. pp. 473 and 477 sq.

In 772 Charlemagne, induced partly by a desire to protect his kingdom from the incursions of hostile neigh- bours and partly by a proselytizing spirit, began the sub- jugation of the Saxons. The war, waged on both sides with the utmost ferocity, lasted in a series of campaigns with but brief intervals for thirty-one years. Repeatedly conquered and baptized, the Saxons rose again and again in revolt as soon as Charlemagne withdrew his troops, threw off their forced allegiance to Christianity, and under various leaders, of whom Wittekind or Widukind is the most famous, struggled fiercely to regain their independ- ence. Charlemagne was too strong and his measures too relentless. On one occasion he butchered 4500 captives in cold blood, as a revenge and a warning. Wittekind surrendered and was baptized in 785; and after what is called the Second Saxon War, which broke out in 792, resistance died away about 803. The Saxons were allowed

1 Though the Saxons were not the first to effect the foundation of a Teutonie kingdom in England, they were the first to attempt it; and hence their name was applied (as it still is) by the Celtie inhabitants of the British islands to all Teutonie settlers. A similar general use of the name survives in Transylvania, where the German inhabitants

are ealled ‘‘Saxons,” although only a small proportion of them traee their deseent from the Saxon braneli of the Teutonic family.

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a considerable amount of freedom by their sagacious con- queror. The first Capitulare Saxonicum, issued at Pader- born in 788, while very strict in maintaining Christianity and in punishing all rebellion, confirmed a great number of Saxon customs and laws. After 803 the laws were made milder, and no tribute except tithes was demanded. The people lived according to their former laws,’ under grafs appointed by Charlemagne ; various bishoprics were founded, of which Osnabriick (783), Verden (786), and Bremen (787) are the earliest; and tranquillity was still further secured by transplanting colonies of Saxons to other parts of the kingdom, and introducing Frankish colonies to take their place in Saxony. The land now gradually became an integral portion of the kingdom of the Franks.? Under Louis the German, to whom Saxony had fallen at the treaty of Verdun in 843, it was harassed by the inroads of the Normans and Slavs on either side, and, in order to cope with these, herzogs or dukes were appointed about 850 to keep the Saxon Mark, a narrow territory in Nordalbingia, on the west bank of the Elbe. These herzogs, remembering their predecessors or their ancestors (Ludolf, the first duke of Saxony, is said to have been a descendant of Wittekind), rapidly extended their power beyond the mark over the rest of Saxony, and thus founded the powerful duchy of Saxony. Otto the Illus- trious, who succeeded his brother Bruno as duke in 880, added Thuringia to the duchy, and attained such a pitch of power that he was offered the crown of Germany in 911. He refused the honour on the score of old age, but his son Henry the Fowler accepted it in 919, and founded the line of Saxon empcrors which expired with Henry II. the Pious in 1024. Otto the Great, son of Henry L., bestowed the duchy of Saxony upon Hermann Billing or Billung, in whose family it remained till 1106. The power and in- fluence of Saxony during this period depended partly on the favour of the emperors, but chiefly on the sagacity and energy of the successive dukes. The Saxons were hostile to the Franconian emperors who succeeded the Saxon house, and in 1073 they rose in revolt against Henry IV. They were at first successful, but in 1075, at the battle of Langensalza, they were defeated by the emperor. The rebels were severely punished,

though Otto of Nordheim, one of their leaders, was made administrator of the ducliy. Taking advantage of Henry IV.'s troubles with the pope, they again rebelled and espoused the cause of Rudolf of Swabia; but in 1087, on the resignation of Hermann of Luxemburg, whom they had chosen king, they made peace once morc with the emperor. Magnus was the last duke of the Billing line. The emperor Henry V. now (1106) presented the lapsed duchy to Lothair, count of Supplin- burg, who rapidly became the most powerful prince in Germany, and in 1125 was placed on the imperial throne by the influence of the papal party. Two years after his elevation he assigned the duchy of Saxony to his power- ful son-in-law Henry the Proud, who was already duke of Bavaria and had inherited the private possessions of the Billings in Saxony, in right of his mother, who was a daughter of Magnus. Henry had aspired to be emperor in 1138, and his successful rival Conrad IIL, wishing to reduce his power, alleged that it was unlawful for one prince to hold two duchies, and ordered him to resign Saxony. On his refusal, the emperor immediately de- clared both duchies to be forfeited. Henry died before the ensuing war was ended, and Conrad compromised iin: Mei mE een ote

1 The Lez Saxonum, 19 titles of which have survived, was reduced to writing under Charlemagne. See under SALtc Law.

2 The Weliand (Saviour), a religious poem ascribed to an unknown Saxon poet of the 9th century, is often cited as a proof of the rapid

Christianization of the Saxons. It is also almost the only relic of their dialect,

matters by appointing his opponent's young son, after- wards known as Henry the Lion, to the duchy of Saxony, compensating Albert the Bear, the former imperial candi- date, with the independence of the North Mark of Saxony, afterwards called Brandenburg (see Prussia, vol. xx. p. 2). In 1155 Henry received Bavaria from his cousin and per- sonal friend the emperor Frederick Barbarossa, and thus became second only to the emperor in

power. He added considerably to the extent of Saxony by conquest among the Wends, east of the Elbe, where the boundary had always been a fluctuating one. But Henry was not only powerful, he was also arrogant, and incurred the jealousy of the other princes, so that, when he quarrelled with the emperor and his lands were declared forfeited in 1180, he had no allies to assist him in his resistance. Westphalia, the principal part of Saxony, went to the archbishop of Cologne, the Saxon Palatinate to the landgrave of Thur- ingia, and other portions to other princes. A small district round Lauenburg, north of the Elbe, was assigned with the title of duke of Saxony to Bernhard of Ascania, son of Albert the Bear. Henry was reduced to submission in 1181; but his duchies could not be restored, and he was forced to content himself with Brunswick and Liine- burg. The duchy of Saxony was never restored in the old sense, in which it had been one of the four principal duchies of the empire, and embraced the territories now occupied by Westphalia, Oldenburg, Hanover, the Harz, and parts of Mecklenburg and Holstein. The new creation never rose to any importance. Bernhard of Ascania (1181-1212), before his accession as duke of Saxony, had held Anhalt and Wittenberg, to the south- east of Saxony, and separated from it by the Mark of Brandenburg; and when his grandsons John and Albert II. divided their inheritance in 1260 the latter placed his seat at Wittenberg, and two tiny duchies arose—Saxe- Lauenburg and Saxe-Wittenberg. Saxe-Lauenburg was now the only part of the great duchy which retained the name; while Saxe-Wittenberg, the nucleus of the later electorate, transferred the name to entirely new soil. Both duchies claimed the electoral privileges, including the office of grand marshal (Erzmarschall), which had belonged to the original duke of Saxony, but the Golden Bull of 1356 confirmed the claims of Wittenberg. Rudolph IL. (about 1370) is the first duke who formally styles himself elector (princeps elector). The small electorate was made still smaller in 1411 by the formation of Anhalt into a separate principality. In 1422 the Ascanian line became extinct with Albert IIL, and in 1423 the emperor Sigismund conferred their lands and titles upon Frederick, margrave of Meissen, and landgrave of Thur- ingia, to whom he was deeply indebted both for money and assistance in the Hussite wars. The new and more honourable style of elector of Saxony superseded Frede- rick’s other titles, and the term Saxony gradually spread over all his other possessions, which included the country now known under that name. The early history of the electorate and

kingdom of Saxony is thus the early history of the Mark of Mcissen, the name of which now lingers only in a solitary town on the Elbe.®

3 A different and considerably later use of the name Saxony may be conveniently mentioned here, for, though not based upon any political or ethnographical considerations, it is frequently referred to in German history. When Maximilian (1493-1519) formed the ten great im- perial administrative circles, that part of the empire to the east of the Weser and north of the Erzgebirge was divided between the circles of Lower and Upper Saxony. The former, occupying the north-west of this territory, included the Harz principalities, Magdeburg, Brunswick, Mecklenburg, Bremen, and Holstein; the latter, besides Thuringia, the electorate of Saxony and Brandenburg, embraccd the conquered Slavonic lands to the east and north, including Lusatia and Pome-

rania, The lands which still preserve the name of Saxony are thus all within the limits of these circles.

HISTORY. |

Among the mountains of Lusatia, in the south of the Saxon province of Bautzen, there exist to this day about 50,000 Wends, possessing characteristics and spcaking a language of their own. These curious people are the relics of a vast Slavonic horde which, appearing on the borders of the kingdom of the Hermunduri or Thuringians about the 4th century, pressed into their territories on the downfall of that kingdom in the 6th century, and scttled themselves between the Spree and the Saale. They were known as the Sorbs or Sorabi, and the country, which included the whole of the modern kingdom of Saxony, was called Sorabia. Warlike and persistent, their influence has never been obliterated, and, though conquered, their stock has neither been exterminated nor absorbed. They were skilled in agriculture and cattle-brceding, and soon improved the fertile soil of their new settlements. Some writers are disposed to recognize their influence in the strong bent to agricultural and industrial pursuits which has ever since characterized the inhabitants of this part of Germany ; and less doubtful traces have been left in the popular superstitions and legends, and in the local names. For more than a hundred years after their first collision with the German kingdom the Sorbs repulsed all attacks, but in 928 Henry the

Fowler, the first Saxon emperor, crossing the Elbe, devastated the land of the Dalc- minzians, and built the strong castle of Misnia or Meissen, which thenceforward formed the centre of a gradually increasing mark against the heathen. For two hundred years the office of margrave of Meissen was not hereditary, but in 1123 Count Conrad of Wettin obtained the succession for his house, and founded a line of princes whose descendants still occupy the throne. Itis said, though on very doubtful grounds, that Conrad was a scion of the family of the old Saxon hero Wittekind. In 1156, when Conrad abdicated and set the pernicious example of dividing his lands among his sons, his possessions extended from the Neisse and the Erzgebirge to the Harz and the Saale. During these two centuries the state of the country had but slowly improved. The Sorbs had been reduced to a condition of miserable serfdom, and the best land was in the hands of Frankish peasants who had been attracted by its fertility. Agriculture was encouraged by the ecclesiastics, especially by Bishop Benno, who occupied the see of Meissen (founded in 961) about the time of the conquest of England by the Normans. In the reign of Otto the Rich (1157-1190) the first silver mines were discovered, and the famous mining town of Freiberg founded. Trade also received its first encouragement ; the great fairs of Leipsic were protected ; and roads were made and towns fortified with the produce of the mines. Otto’s grandson, Henry the Illustrious (1221-1288), whose mother Jutta was a Thuringian princess, reunited most of Conrad’s lands by inheriting part of Thuringia (the rest went to the duke of Brabant) and the Pleissnerland, as the district on both banks of the upper course of the Pleisse was called. He too lost the chance of founding a magnificent kingdom in the heart of Germany, by sub- dividing his territories, which stretched in a compact mass from the Werra to the Oder and from the mountains of Bolicmia to the Harz. The consequences of this policy of subdivision, which was followed by his successors, were bitter family fcuds and petty wars, seriously hampering the development of the country. Frederick the Grave (1824-1847) was the last prince of the house of Wettin who was sole ruler of all the ancestral lands of his house. The next powerful figure is Frederick the Warlike, who became margrave in 1881. Besides the Mark he possessed the Osterland, the territory to the north-west of the present kingdom, stretching from the Saale at Weissenfels to the Elbe at Torgau, and embracing the plain of Leipsic. Frederick, in whose reign the university of Leipsic was founded, had acquired his surname by his

energetic support of Sigismund, especially in the Hussite wars. As we have seen, that emperor's desire to attach to hiniself so powerful an ally led him to bestow the vacant electoral duchy of Saxe- Wittenberg upon the margrave in 1428. Despite the troublous state of public affairs, the internal prosperity of the land had steadily advanced. Most of the chief towns had by this time been founded, —Leipsic, Erfurt, Zwickau, and Freiberg being the most conspicuous. Chemnitz had begun its textile industry. The condition of the peasants was still far below that of the burghers of the towns; many of them were mere serfs. The church retained the high pitch of power which it had early attained in Meissen, and religious institutions were numerous all over the most fertile districts. In spite of fresh discoveries of silver, the pecuniary wants of the princes had to be occasionally supplied by contributions called "bedes" from the nobles and ecclesiastics, who were summoned from time to time to meet in a kind of diet.

Frederick's new dignities as elector, combined with his personal qualities, now made him one of the most powerful princes in Germany; had the principle of primogeniture been established in the country as he left it, Saxony and not Brandenburg might have been the leading power in the empire to-day. He died in 1428, just in time to

escape the grief of seeing his lands cruelly ravaged by

the Hussites in 1429 and 1430. The division of territory between his two sons, Frederick the Mild (1428-1464) and William, once more called forth destructive internecine wars (the " Briiderkrieg "), in which the former for a time forgot his surname. It was in 1455, during this war, that the knight Kunz von Kaufungen carried into execu- tion his bold, though only momentarily successful, plan of stealing the two young sons of the elector Frederick. Ernest and Albert, the two princes in question, succeeded to their father's possessions in 1464, and for twenty years ruled peacefully in common. The land rapidly prospered during this respite from war. Trade made great advances, encouraged by an improved coinage, which was one of the consequences of the silver discoveries on the Schneeberg. Several of the powerful ecclesiastical principalities were at this time held by members

of the Saxon electoral house, so that the external influence of the electorate corresponded to its internal prosperity. Matters were not suffered to continue thus. The childless death of their uncle William in 1482 bequeathed Thuringia to the two princes, and the younger Albert insisted upon a division of the common possessions. In August 1485 the Partition of Leipsic took place, which resulted in the foundation of two Saxon lines, the Ernestine and the Albertine. The lands were never again united. Ernest divided the lands into two portions, and Albert chose. Apart from the electoral duchy of Wittenberg, which necessarily went to Ernest as the elder brother, the lands were divided into Thuringia, half of the Osterland, and Naumburg and the Voigtland on the one hand, and Meissen and the remaining parts of eastern Saxony on the other. To Ernest's deep chagrin, Albert chose Meissen, the old ancestral lands of the Wettins. The former only survived his vexation a year.

The electorate remained at first with the Ernestine line. Ernest was succeeded by his son Frederick the Wise (1486-1525), one of the most illustrious princes in German history. Under his rule Saxony was perhaps the most influential member of the German empire ; and on the death of Maximilian the imperial crown itself was offered to him, but he vindicated his character by refus- ing it. In this reign Saxony became the cradle of the Reformation. The elector's wise tolerance and subsequent protection and hearty support of Luther are well known to every reader. He is said to have remained unmarried out of love to his brother John, who succeeded him. He died during the horrors of the Peasants' War. John (1525-1532) was an even more enthusiastic favourer of the Reformed doctrines, and shared the leadership of the Schmalkald League with Philip of Hesse. His son, John Frederick the Magnanimous (1532-1547), might with equal propriety have been surnamed the Unfortunate. He took part in the Schmalkald War, but in 1547 was captured at Miihlberg by the emperor Charles V., and forced to sign the capitulation of Wittenberg. This deed transferred the electorate and nearly all the Saxon lands to the Albertine line, whose astute representative had taken the imperial side. Only a few scattered territories in Thuringia were reserved for John Frederick's sons, and on these were afterwards founded the Ernestine duchies of Weimar, Gotha, &. For the second time in the history of the Saxon electorate, the younger line on a division ultimately

secured the highest dignity, for the Wittenberg line had been junior to the Lauenberg line. The Albert- ine line is now the royal line of Saxony.

The Albertine Maurice became elector after the capitula- tion of Wittenberg. He was the grandson of the founder of his house, and had been preceded on the throne of Meissen by his uncle George (1500-1539) and by his father Henry (1539-1541). George was a zealous Roman Catholic, and had vainly endeavoured to stem the Reformation in

his dominions ; Henry was an equally devoted Protestant. Maurice (1541-1553) was also a Protestant, but he was too astute to permit his religion to blind him to his political interests. His ruling motive seems to have been

ambition to increase his personal power and the consequence of his country. He refused to join the Schmalkald League with the other Protestant princes, and made a secret treaty with the emperor instead. By invading the Ernestine lands in John Frederick’s absence during the Schmalkald War, he forced that prince to return hastily from the Danube, and thus weakened the army opposed to the Though he was compelled to retreat before his indignant and surprised kinsman, his fidelity to the emperor was rewarded, as we have seen, at the capitulation

emperor.

of Wittenberg. All the lands torn from the Ernestines

were not, however, assigned to Maurice ; he was forced to acknowledge the suzerainty of Bohemia over the Voigtland

and the Silesian duchy of Sagan, and to renounce his own superiority over the Reuss dominions.

Zeitz. Recognizing as a Protestant sovereign that the

best alliance for securing his new possessions was not with the Roman Catholic emperor but with the other Pro-

testant princes, Maurice now began to withdraw from the former and to conciliate the latter. In 1552, suddenly marching against the emperor at Innsbruck, he extorted from him the peace of Passau, which accorded religious freedom throughout Germany. Thus, at the close of his life (he died of a wound in battle in 1553), Maurice came to be regarded as the champion of German national and religious freedom. Amid the distractions of outward affairs, Maurice had not neglected the internal interests of Saxony. ‘To the already conspicuous educational advant- ages in the country he added the three grammar schools (Fiirstenschulen) at Pforta, Grimma, and Meissen; and for administrative purposes, especially for the collection of the taxes which had now become practically annual, he divided the country into the four “circles” of the Electorate, Thuringia, Leipsic, and Meissen. In 1542 the first coal mine was opened, Over two hundred convents were suppressed in Saxony; Leipsic, Wittenberg, Jena, and Erfurt had each a university; books began to increase, and, the Saxon dialect became the ruling dialect of German in virtue of Luther’s translation of the Bible. Augustus I. (1553-1586), brother of Maurice, was one of the best domestic rulers that Saxony ever had. He increased the area of the country by the “circles” of Neustidt and the Voigtland, and by parts of Henneberg and the silver-yielding Mansfeld, and he devoted his long reign to the development of its resources. He visited all parts of the country himself, and personally encouraged agriculture ; he introduced a more economical mode of mining and smelting silver ; he favoured the importation of finer breeds of sheep and cattle ; and he brought foreign weavers from abroad to teach the Saxons. Under him lace-making began on the Erzgebirge, and cloth-making flourished at Zwickau. He was the first to fortify the Kénigstein, the one fortress in modern Saxony, and he built other castles. With all his virtues, however, Augustus was an intolerant Lutheran, and used very severe means to exterminate the Calvinists ; in his electorate he is said to have expelled one hundred and eleven Calvinist preachers in a single month. Under his son Christian I. (1586-1591) the chief power was wielded by the chancellor Crell, who strongly favoured Calvinism, but, when Christian IT. (1591-1611) came to the throne a mere child, Orell was sacrificed to the Lutheran nobles. The duke of Weimar was made regent,

and continued the persecution of crypto-Calvinism, in spite of the breach with

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The Roman Catholic prelates were moreover reinstated in the three great bishoprics of Meissen, Merseburg, and Naumburg-

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the Reformed imperial diet which this course involved. Christian IT. was succeeded by his brother John George I. (1611-1656), under whom the country was devastated by the Thirty Years' War. John George was an amiable but weak prince, totally unfitted to direct the fortunes of a nation in time of danger. He refused the proffered crown of Bohemia, and, when the Bohemian Protestants elected a Calvinist prince, he assisted the emperor against them with men and money. The Restitution Edict, however, in 1629, opened his eyes to the emperor's projects, and he joined Gustavus Adolphus. Saxony now became the theatre of war. The first battle on Saxon soil was fought in 1631 at Breitenfeld, where the bravery of the Swedes made up for the flight of the Saxons. Wallenstein entered Saxony in 1632, and his lieutenants Holk and Gallas plundered, burned, and murdered through the length and breadth of the land. After the death of Gustavus Adolphus at the battle of Liitzen, not far from Leipsic, in 1632, the elector, who was at heart an imperialist, detached himself from the Swedish alliance, and in 1635 concluded the peace of Prague with the emperor. By this peace he was confirmed in the possession of Upper and Lower Lusatia, a district of 180 square miles and half a million inhabitants, which had already been pledged to him as a reward for his services against the Bohemians. Lusatia had once belonged to Conrad of Meissen, whose descendants, however, had lost it to Brandenburg at the beginning of the 14th century. Saxony had now to suffer from the Swedes a repetition of the devastations of Wallenstein. No other country in Germany was so terribly scourged by this terrible war. Immense tracts were rendered absolutely desolate, and whole villages vanished from the map ; the people were tortured to reveal their treasures, or from wanton brutal- ity; famine was followed by plague; civilization was thrown back and barbarism revived. In eight years the population sank from three to one and a half millions. When

the war was at length ended by the peace of Westphalia in 1648, Saxony found that its influence had begun to decline in Germany. Its alliance with the Catholic party deprived it of its place at the head of the Protestant German states, which was now taken by Brandenburg. John George's will made the decline of the electorate even more inevitable by detaching from it the three subsidiary duchies of Saxe-Weissenfels, Saxe- Merseburg, and Saxe-Zeitz in favour of his younger sons. By 1746, however, these lines were all extinct, and their possessions had returned to the main line. Saxe-Neustidt was a short-lived branch from Saxe-Zeitz, extinct in 1714, The next three electors, who each bore the name of John George, had uneventful reigns. The first made some efforts to heal the wounds of his country ; the second wasted the lives of his people in foreign wars against the Turks ; and the third was the last Protestarit elector of Saxony. John George IV. was succeeded by his brother Frederick Augustus I., or Augustus the Strong (1694— 1733). This prince was elected king of Poland as Augustus IT. in 1697, but any weight which the royal title might have given him in the empire was more than counterbalanced by the fact that he, though the ruler of an almost exclusively Protestant electorate, became a Roman Catholic in order to qualify for the new dignity. The connexion with Poland was disastrous for Saxony. In order to defray the expenses of his wars with Charles XIL, which resulted from his Polish policy, Augustus pawned and sold large districts of Saxon territory, while he drained the electorate of both men and money. Fora year before the peace of Altranstédt in 1706, when Augustus gave up the crown of Poland, Saxony was occupied by a Swedish army, which had to be supported at an expense of twenty-

three million thalers. 'The wars and extravagance of the elector-king, who regained the Polish crown in 1709, are said to have cost Saxony a hundred million thalers. From this reign dates the privy council (Geheimes Kabinet), which lasted till 1830. The caste privileges of the estates (Stéinde) were increased by Augustus, a fact which tended to alienate them more from the people, and so to decrease their power. Boéttger made his famous discovery in 1710, and the manufacture of porcelain was begun at Meissen, and in this reign the Moravian Brethren made their settlement at Herrnhut (1722). Frederick Augustus IT. (1733-1763), who succeeded his father in the

electorate, and was afterwards elected to the throne of Poland as Augustus III., was an indolent prince, wholly under the influence of Graf von Briihl. Briihl was an incompetent statesman and an extravagant financier, who yet contrived to amass large sums for his private purse. Under his ill- omened auspices Saxony sided with Prussia in the First Silesian War, and with Austria in the other two. It gained nothing in the first, lost much in the second, and in the third, the Seven Years' War (1756-1763), again became the scene of war and suffered renewed miseries. The country was deserted by its king and his minister, who retired to Poland. By the end of the war it had lost 90,000 men and a hundred million thalers ; its coinage was debased and its trade ruined ; and the whole country was in a state of frantic disorder. The elector died seven months after his return from Poland ; Briihl died twenty- three days later. The elector's son and successor, Frederick Christian, survived his father only two months, leaving a son, Frederick Augustus III. (1763-1827), a boy of thirteen. Prince Xaver, the elector's uncle, was appointed guardian, and he set himself to the sorely-needed work of healing the wounds of the country. The foundation of the famous school of mining at Freiberg, and the improve- ment of the Saxon breed of sheep by the importation of merino sheep from Spain, were due to his care. Frederick assumed the government in 1768, and in his long and eventful reign, which saw the electorate elevated to the dignity of a kingdom, though deprived of more than half its area, he won the surname of the Just. As he was the first king of Saxony, he is usually styled Frederick Augustus I. The first ten years of his active reign passed in peace and quiet; agriculture, manufactures, and industries were fostered, economical reforms instituted ; and the heavy public debt of forty million thalers was steadily reduced. In 1770 torture was abolished. When the Bavarian succession fell open in 1777, Frederick Augustus joined Prussia in protesting against the absorp- tion of Bavaria by the Austrian emperor, and Saxon troops took part in the bloodless " potato-war." The elector commuted his claims in right of his mother, the Bavarian princess Maria Antonia, for six million florins, which he spent chiefly in redeeming Saxon territory that had been pawned to other German states. When Saxony joined the Fiirstenbund in 1785, it had an area of 15,185 square miles and a population of nearly 2,000,000, but its various parts had not yet been combined into a homogeneous whole, for the two Lusatias, Querfurt, Henneberg, and the ecclesiastical foundations of Naumburg and Merseburg had each a separate diet and government,

independent of the diet of the electorate proper. In 1791 Frederick declined the crown of Poland, although it was now offered as hereditary even in the female line. He remembered how unfortunate for Saxony the former Polish connexion had been, and he mistrusted the attitude of Russia towards the proffered kingdom. Next year saw the beginning of the great struggle between France and Germany. Frederick's conduct throughout was perhaps more pusillanimous than self-seeking, but it entailed its own

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punishment. His first policy was one of selfish abstention, and from 1793 until 1796, when he concluded a definite treaty of neutrality with France, he limited his contribution to the war to the bare contingent due from him as a prince of the cmpire. When war broke out in 1806 against Napoleon, 22,000 Saxon troops shared the defeat of the Prussians at Jena, but the elector immediately afterwards snatched at Napoleon's offer of neutrality, and abandoned his former ally. At the peace of Posen (11th December 1806) Frederick entered the Confederation of the Rhine, assuming the title of king of Saxony, and promising a contingent of 20,000 men to Napoleon.

No change followed in the internal affairs of the new kingdom, except that Roman Catholics were admitted to equal privileges with Protestants. Its foreign policy was dictated by the will of Napoleon, of whose irresistibility the king was too easily convinced. In 1807 his sub- mission was rewarded with the duchy of Warsaw and the district of Cottbus, though he had to surrender some of his former territory to the new kingdom of Westphalia. The king of Saxony's faith in Napoleon was momentarily shaken by the disasters of the Russian campaign, in which 21,000 Saxon troops had shared, and in 1813 he began to lean towards an alliance with Austria. Napoleon's victory at Ltitzen (May 2, 1813), however, suddenly restored all his awe for that great general, and the Saxon king and the Saxon army were once more at the disposal of the French. After the battle of Bautzen, Napoleon's headquarters were successively at Dresden and Leipsic. During the decisive battle at the latter town in October 1813, the popular Saxon feeling was displayed by the desertion of the Saxon troops to the side of the allies. Frederick was taken prisoner in Leipsic, and the government of his

kingdom was assumed for a year by the Russians, who promptly turned its resources against its late French ally. Saxony was now regarded as a conquered country. Nothing but Austria's vehement desire to keep a powerful neighbour at a distance from her boundaries, preserved it from being completely annexed by the Prussians, who had succeeded the Russians in the government. As it was, the congress of Vienna assigned the northern portion, consisting of 7800 square miles, with 864,404 inhabitants to Prussia, leaving 5790 square niiles, with a population of 1,182,744 to Frederick, who was permitted to retain his royal title. He was forced to acquiesce in the dismemberment of his kingdom, and to console himself with the reflexion that his share, though the smaller half, was richer, more populous, and more beautiful than the other.

From the partition in 1815 to the war of 1866 the history of Saxony is mainly a narrative of the slow growth of constitutionalism and popular liberty within its limits. Its influence on the gencral history of Europe ceased when the old German empire was dis- solved. In the new empire it is too completely overshadowed by Prussia to have any objective importance by itself. Frederick lived twelve years after the division of his kingdom. The com- mercial and industrial interests of the country continued to be fostered, but only a few of the most unavoidable political reforms were grantcd. 'The fact that some of these had not been granted before is more significant than that they were granted now. Religious equality was extended to the Reformed Church in 1818, and the separate dict of Upper Lusatia abolished. Frederick Augustus was.succeeded by his septuagenarian brother Antony (1827-1836), to the great disappointment of the people, who had expected a more liberal era under Prince Frederick Augustus, the king's nephew. Antony announced his intention of following the lines laid down by his predecessor. He accorded at first only a few trifling reforms, which were far from removing the popular discontent, while he retained the unpopular minister Hinsiedel and continued the encouragement of the Roman Catholics. The old feudal arrangement of the diet, with its inconvenient divisions, was retained, and the privy council continued to be the depository of power. Anactive opposition began to make itself evident in the diet and in the press, and in 1830 riots in Leipsic and Dresden impresscd the king with the necessity of concession. Einsiedel was cashiered, Prince Frederick Augustus assumed as co-regent, and a

constitution promised. Aftcr consultation with the diet the king promulgated a new constitution on September 4, 1831, which is the basis of the present government. An offer from Metternich of Austrian arms to repress the discontent by force had becn refused. The feudal estates were replaced by two chambers, largely clective, and the privy eouncil bya responsible ministry of six departments. Bernhard von Lindenau was the head of the first responsible eabinet, and the first constitutional assembly sat from January 27, 1838, till October 30, 1834. While Saxony's political liberty was thus enlarged, its commerce and credit were stimulated by the construction of railways. Antony had died in 1836, and Frederick Augustus IT. (1836-1854) became sole king. Growing interest in politics produced dissatisfaction with the compromise of 1831, and the liberal opposition grew in numbers and influence. The burn- ing questions were the publicity of legal proceedings and the freedom of the press ; and on these the Government sustained its first crushing defeat in the lower or second chamber in 1842. Lindenau resigned in 1848.. Religious considerations as to the recognition of the German Catholics and a new constitution for the Protestant Church began to mingle with purely political questions, and Prince John, as the supposed head of the Jesuit party, was insulted at a review of the communal guards at Leipsic in 1845. The military rashly interfered, and several innocent spectators were shot. The bittcrness which this oceurrence provoked was intensified by a political reaction which was initiated about the same time under Von Kénneritz. Warned by the sympathy excited in Saxony by the revolutionary events at Paris in 1848, the king dismissed his reactionary ministry, and a liberal cabinet took its place in March 1848. The disputed points were now conceded to the country. The privileges of the nobles were eurtailed ; the administration of justice was put on a_ better foot- ing ; the press was unshackled ; publicity in legal proceedings was granted ; trial by jury was introduced for some special cases ; and the German Catholics were recognized. The feudal character of the first chamber was abolished, and its members made mainly elective from among the highest tax-payers, while an almost universal suffrage was introduced for the second chamber. The first demand of the overwhelmingly democratic diet returned under this reform bill was that the king should accept the Frankfort constitution. Frederick, alleging the danger

of acting without the coneurrence of Prussia, refused, and dissolved the diet. A public demonstration at Dresden in favour of the Fraukfort constitution was prohibited as illegal on May 2, 1849. This at once awoke the popular fury. The mob seized the town and barricaded the streets ‘ Dresden was almost destitute of troops ; and the king fled to the Konigstein. The rebels then proceeded to appoint a provisional Government, consisting of Tzschirner, Heubner, and Todt, though the true leader of the insurrection was the Russian Bakunin. Meanwhile Prussian troops had arrived to aid the Government, and after two days’ fierce street fighting the rising was quelled. The bond with Prussia now became closer, and Frederick entered with Prussia and Hanover into the temporary “alliance of the- three kings.” He was not sincere, however, in desiring to exclude Austria, and in 1850 accepted the invitation of that power to send deputies to Frankfort. The first chamber immediately protested against this step, and refused to consider the question of a pressing loan. The king retorted by dissolving the diet and summoning the old estates abolished in 1848. When a quorum, with some difficulty, was obtained, another period of retrograde legislation set in. The constitution of the chambers has never been restored to the basis of 1848. The king himsclf was carried away with the reactionary current, and the pcople remained for the time indifferent. Von Beust became ministcr for both home and foreign affairs in 1852, and under his guidance the policy of Saxony became more and more hostile to Prussia and friendly to Austria. Saxony was not, however, able to withdraw from the eustoms union, which indeed eonferred the very highest benefit on its trade and manufactures. The sudden death of the king, by a fall from his carriage in Tyrol, left the throne to his brother John (1854-1873), a learned and accomplished prince, whose name is known in German literature as a translator and annotator of Dante. His brother’s ministers kept their portfolios, but their vicws gradually be- came somewhat liberalized with the spirit of the times. Beust, however, still retained his federalistic and philo-Austrian views. When war was declared between Prussia and Austria in 1866, Saxony declined the former’s offer of neutrality, and, when a Prussian force crossed the border, the Saxon army under the kin g and the crown prince joined the Austrians in Bohemia. The entire kingdom, with the solitary exception of the Konigstein, was Occupied by the Prussians. On the conclusion of peace Saxony lost no territory, but had to pay a war indemnity of teu million thalers, and was compelled to enter the N orth-German Confedera- tion. Its army and its

postal and telegraph system were placed under the eontrol of Prussia, and its representation at foreign courts was entrusted to the Prussian embassics, Beust was forced to resign; and liberal measures in both church and state were actively carricd through. John was succecded in 1873 by his

elder son Albert (born 1828), who had won distinction as a general in the wars of 1866 and 1870. Under this prinee the general course of politics has presented nothing of special importance, except perhaps the stcady spread of the doctrines of social democracy, which has flourished especially in Saxony. As a loyal member of the new German empire, Saxony has gradually transferred its sympathies from its old ally Austria to its new leader Prussia. In 1877 Leipsic was chosen as the seat of the supreme court of law for the empire.

The political history of the parts of Saxony left by the capitula-

_tion of Wittcnberg to the Ernestine line, which occupy the region

now generally styled Thuringia (Thiiringen), is mainly a recital of partitions, reunions, redivisions, and fresh combinations of territory among the various sous of the suecessive dukes. The principle of primogeniture was not introduced until the end of the 17th century, so that the Protestant Saxon dynasty, instead of building up a single compact kingdom for itself, has split into four petty duchies, of no political influence whatever. In 1547 the ex-elector John Frederick the Magnanimous was allowed to retain Weimar, Jena, Hisenach, Gotha, Henneberg, and Saalfeld. Altenburg and a few other districts were added to the Ernestine possessions by the treaty of Naumburg in 1554, and other addi- tions were made from other sources. John Frederick, who had retained and transmittcd to his descendants the title of duke of Saxony, forbade his sons to divide thcir inheritance; but his wishes were respected only until after the death of his eldést son in 1565. The two survivors then founded separate jurisdictions at Weimar and Coburg, though arrangements were made to exchange territories every three years. In 1596 Saxe-Coburg gave off the branch Saxe-Hisenach ; and in

1603 Saxe-Weimar gave off Saxe- Altenburg, the clder Weimar line ending and the younger begin- ning with the latter date. By 1638 Weimar had absorbed both Coburg and Eisenach ; Altenburg remained till 1672. J ohn, duke of Saxe-Weimar, who died in 1605, is regarded as the common ancestor of the present Ernestine lines. In 1640 his three surviving sons ruled the duchies of Weimar, Eisenach, and Gotha. Eiscnach fell in in 1644 and Altenburg in 1672, thus leaving the dukes of Saxe-Weimar and Saxe-Gotha to become the ancestors of the modern ruling houses. Saxe-Weiiar was still repeatedly divided ; in 1668 a Saxe-Marksuhl appears, and about 1672 a Saxe-Jena and a new Saxe-Hisenach. All these, however, were extinct by 1741, and their possessions returned to the main line, which had adopted the principle of primogeniture in 1719. . The present grand-duchy of SAXE-WEIMAR-EISENACH is separately noticed.

Saxe-Gotha was even more subdivided ; and the climax was reached about 1680, when Gotha, Coburg, Meiningen, Romhild, Kisenberg, Hildburghausen, and Saalfeld were each the capital of a duchy. By the beginning of 1825 only the first three of these and Hildburghausen remained, the lands of the others having been divided after much quarrelling. In that year the Gotha line expired, and a general redistribution of the lands of the ‘‘ Nexus Gothanus,” as this group of duchies was called, was arranged on 12th November 1826. The duke of Hildburghausen gave up his lands entirely for Altenburg and became duke of SAXE-ALTENBURG ; the duke of Coburg exchanged Saalfeld for Gotha and became duke of Saxse-Conpure-GoTHA; and the duke of Saxre-Mrinrncen received Hildburghausen, Saalfeld, and some other territories, and added Hildburghausen to his title. These duchies are separatcly noticed. See also THURINGIA.

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The kingdom of Saxony, the history of which has been traced above, is the third constituent of the German empire in point of population, and the fifth in point of area. With the exception of the two small exclaves of Zicgelhein in Saxe-Altenburg and Leibsehwitz on the borders of Reuss, Saxe-Weimar, and Saxe- Altenburg, it forms a compact whole of a triangular shape, its base extending from north-east to south-west, and its apex pointing north-

west. It lies between 50°10’ and 51° 29’ N. lat. and between 11° 53’ and 15° 4’ E. long. The total area is 5789 square miles (about half the size of Belgium), or 2°7 per cent. of the entire empire ; its greatest length is 180 miles, and its greatest breadth 93 miles. Its frontiers have a circuit of 760 miles. On the south it is bounded by Bohemia, on the west by Bavaria and the Thuringian states, and on the remaining sides by Prussia. Except on the south, where the Erzgebirge forms at once the limit of the kingdom and of the empire, the boundaries are entirely political. For administrative purposes the kingdom of Saxony is divided into the four districts of Bautzen in the south-east, Dresden in the north-east, Leipsic in the north-west, and Zwickau in the south-west.

Physical Features. —Saxony belongs almost entirely to the central mountain region of Germany, only the districts along the north border and around Leipsie descending into the great North- European plain. The average clevation of the country is not, however, great; and it is morc properly described as hilly than as mountainous. The ordinary estimates return one-fifth of the area as

plain, two-fifths as hill country, and two-fifths as mountain land. The slope is very regularly from south-east to north-west, in the direc- tion of the shorter axis. The chief mountain range is the Erzgebirge, stretching for 90 miles along the sonth border, and reaching in the Fichtelbergs (3979 fcet and 3953 feet) the highest elevation in the kingdom. The west and south-west half of Saxony is more or less oceupied by the ramifications and subsidiary groups of this range, one of which is known from its position as the Central Saxon chain, and another lower group still farther north as the Oschatz group. The south-east angle of Saxony is occupied by the mountains of Upper Lusatia (highest summit 2600 feet), which form the link between the Erzgebirge and Riesengebirge in the great Sudetic chain. North-west from this group, and along both banks of the Elbe, which divides it from the Erzgebirge, extends the picturesque mountain region known as the Saxon Switzerland. The action of water and ice upon the soft sandstone of which the hills here are chiefly composed has produced remarkable formations of deep gorges and isolated fantastie peaks, which,

however, though both beautiful and interesting, by no means recall the characteristics of Swiss scenery. The highest summit attains a height of 1830 feet ; but the more interesting peaks, as the Lilienstein, Konigstein, and the Bastei, are lower. With the trifling exception of the south-east of Bautzen, which sends its waters by the Neisse to the Oder, Saxony lies wholly in the basin of the Elbe, which has a navigable course of 72 miles from south-east to north-west through the kingdom. Comparatively few of the numerous smaller streams of Saxony flow directly to the Elbe, and the larger tributaries only join it beyond the Saxon borders. The Mulde, formed of two branches, is the second river of Saxony; others are the Black Elster, the White Elster, the Pleisse, and the Spree. There are no lakes of any size, but mineral springs are very abundant. The best known is at Bad Elster in the Voigtland.

Olimate.—The climate of Saxony is generally healthy. It is mildest in the valleys of the Elbe, Mulde, and Pleisse, and severest in the Erzgebirge, where the district near Johanngeorgenstadt is known as Saxon Siberia. The average temperature, like that of central Germany as a whole, varies from 48° to 50° Fahr.; in the Elbe valley the mean in summer is from 62° to 64°, and in winter about 30°; in the Erzgebirge the mean temperature in summer is from 55° to 57°, and in winter 23° or 24°. The Erzgebirge is also the rainiest district, 274 to 334 inches falling per annum; the amount decreases as we proceed northwards, and Leipsic with an annual fall of 153 to 214 inches enjoys the driest climate.

Soil,—Saxony is one of the most fertile parts of Germany; and in regard to the productive occupation of its soil it stands among the most advanced nations of the world. Only 1 per cent. of the total area is waste or unused. According to the returns for 1883, 55-7 per cent. of the area is under agriculture, 11 ‘7 in pasture and meadow, 27‘4 under forest, and 4‘2 occupied by buildings, roads, and water. The lowest lands are the most productive, and fertility diminishes as we ascend towards the south, until on the bleak crest of the Erzgebirge cultivation ceases altogether. Saxon agriculture, though dating its origin from the Wends, has received its full development only in the present century. Long fettered by antiquated customs, the land was subdivided into small parcels and subjected to vexatious rights. But in 1834 a law was passed providing for the union of

the scattered lands belonging to each proprietor, and that may be considered the dawn of modern Saxon agriculture, which has now reached a very high pitch of excellence. It has been fostered both publicly and privately, and a special official secretary assists the minister of the interior in attending to this branch of national prosperity. In 1883 the agricultural lands in Saxony were divided among 192,000 farmers or proprietors, of whom only 758 held 250 acres and upwards, 28,200 between 25

and 250 acres, and the rest less than 25 acres. The small pro-.

prietors held 28°7 per cent. of the total area, the middle class 572, and the large owners 14°1. The richest grain districts are near Meissen, Grimma, Bautzen, Dobeln, and Pirna. The chief crop is rye, but oats are hardly second to it. Wheat and barley are grown in considerably less quantity. Very large quantities of potatoes are grown, especially in the Voigtland. Beet is chiefly grown as fecding stuff for cattle, and not for sugar. Flax (8270 acres in 1888) is grown in the Erzgebirge and Lusatian mountains, where the manufacture of linen was at one time a flourishing domestic industry. Saxony owes its unusual wealth in fruit to the care of the paternal elector Augustus (1553-1586), who is said never to have stirred abroad without fruit seeds for distribution among the peasants and farmers. Enormous quantities of cherries, plums, and apples are annually borne by the trees round Leipsie, Dresden, and Colditz. The cultivation of the vine in Saxony is respectable for its antiquity, though the yield is insig- nificant. Wine is said to have been grown here in the 11th century; the Saxon vineyards, chiefly on the banks of the Elbe near Meissen and Dresden, occupied 2515 acres in 1883.

Live Stock.—According to returns made for 1883 Saxony con- tained 126,886 horses, 651,329 cattle, 149,037 sheep, 355,550 pigs, and 116,547 goats. Thc brecding of horses is carried on to a very

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limited extent in Saxony, more than nine-tenths of the horses required being imported. Cattle-rearing, which has been an industry since the advent of the Wends in the 6th century, has attained very considerable importance on the extensive pastures of the Erzgebirge and in the Voigtland. Sheep-farming

has consider- ably declined within the last few decades, as in most parts of northern Germany. While other classes of domestic animals have retained very much the same proportion to the number of the human population, sheep have decreased from one to every six inhabitants in 1861 to one to every twenty in 18838. In 1765 the regent Prince Xaver imported 300 merino sheep from Spain, and

‘ go improved the native breed by this new strain that Saxon sheep

were eagerly imported by foreign nations to improve their flocks, and “Saxon electoral wool” became one of the best brands in the market. The high level was not long maintained; flock-masters began to pay more attention to quantity than to quality of wool, and the Saxon wool has accordingly deteriorated. In 1868 no less than 1,166,130 lbs. of wool were offered for sale in the wool markets of Saxony, of which Leipsic and Dresden are the chief; in 1884 only 276,843 lbs. were offered. Swine furnish a very large proportion of the flesh-diet of the people. Geese abound particularly round Leipsic and in Upper Lusatia, poultry about Bautzen. Bee-keeping flourishes on the heaths on the right bank of the Elbe; in 1883 there were 53,756 bee-hives in Saxony. Game is not now very abundant; hares and partridges are shot in the plains to the north-west.

Forests.—The forests of Saxony are extensive, and have long been well cared for both by Government and by private proprietors. The famous school of forestry at Tharandt was founded in 1811. The Voigtland is the most densely wooded portion of the kingdom, and next comes the Erzgebirge. About 8,379,200 acres, or 85 per cent. of the whole forest land, were planted with coniferous trees ; and about 1,439,700 acres or 15 per cent. with deciduous trees, ainong which beeches and birches are the commonest. About 30 per cent. of the total belongs to Government.

Minerals. —The mineral wealth of Saxony is very considerable ; and its mines are among the oldest in Germany. Silver was raised in the 12th century, and argentiferous lead is still the most valuable ore mined; tin, iron, and cobalt rank next; and coal is one of the chief exports. Copper, zinc, and bismuth are also worked. Saxon mines now produce about 6 per cent. of the gross quantity, and about 8 per cent. of the aggregate value of metals raised in Germany. ‘The country is divided into four mining districts :—Freiberg,

where silver and lead are the chief products ; Altenberg, where tin is mainly raised; Schneeberg, yielding cobalt, nickel, and ironstone; and J ohanngeorgenstadt, with ironstone and silver mincs. ‘There are in all 236 mines, but in 1888 only 150 of these were in operation, employing 8615 hands. In 1870 253 mines employcd 9132 hands. The total value of metal raised in Saxony in 1883 was £288,200 ; in 1870 it was £314,916, Coal is found principally in two fields,—one near Zwickau, and the other in the circle of Dresden. Brown coal or lignite is found chiefly in the north and north-west, but not in sufficiently large quantities to be exported. The number of coal- mines is steadily decreasing, though the numbers of miners and the gross produce are both on the increase. The following table shows the output in tons sinee the years named :—

Anthraeite. Value.

Hands. Coal. Lignite.

346 | £1,088, 625

345 1,363,780 280 1,510,863

1870 | 242 | 16,811 | 2,608,705 | 506,687 1880 | 189 | 19,625 | 3,622,007 | 590,119 1883 | 166 | 20,136 | 4,088,484 | 648,044

Peat is especially abundant on the Erzgebirge. Immense quantities of brieks are made all over the country. Excellent sandstone for building is found on the hills of the Elbe ; in 1883 266 quarries employed 1848 hands. Fine porcelain clay occurs near Meissen, and coarser varieties elsewhere. A few precious stones are found among the southern mountains. Saxony has no salt-mines. Industries. —The Central-European position of Saxony has fostered its commerce ; and its manufactures have been encouraged by the abundant water-power throughout the kingdom. Nearly one-half of the motive power used in Saxon factories is supplied by the streams, of which the Mulde, in this respect, is the chief. The early foundation of the Leipsic fairs, and the enlightened policy of the rulers of the country, have also done inuch to develop its commercial and industrial resources. Next to agriculture, which supports about 20 per cent. of the population, by far the most important industry is the textile. Saxony carries on 26 per cent. of the

whole textile industry in Germany, a share far in excess of its proportionate population. Prussia, which has more than nine times as many inhabitants, carries on 45 per cent., and no other state more than 8 per cent. Nearly 18} per cent. of the population were engaged in this industry in 1882, by far the largest proportion in any German state except Reuss (alterer L.inie), which had 36 per cent. so engaged. The chief seats of the

manufacture are Zwickau, Chemnitz, Glauchau, Meerane, and Hohenstein in the south of Zwiekau, and Camenz, Pulsnitz, and Bischofswerda in the north of Dresden. The centre of the cotton manufacture (especially of cotton hosiery) is Chemnitz ; cotton-muslins are made throughout the Voigtland, ribbons at Pulsnitz and its neighbourhood. Woollen cloth and buekskin are woven at Camenz, Bischofswerda, and Grossenhain, all in the north-east, woollen and half-woollen underelothing at Chemnitz, Glauchau, Meerane, and Reichenbach ; while Bautzen and Limbach produce woollen stockings. Linen is manufactured chiefly in the mountains of Lusatia, where the looms are still to some extent found in the homes of the weavers. The coarser kinds only are now made, owing to the keen English competition in the finer varieties. Damask is produced at Gross-Schénau and Neu-Schénau. Lace- making, discovered or introduced by Barbara Uttmann in the latter half of the 16th century, and now fostered by Govern- ment schools, has long been an important domestic industry among the villages of the Erz Mountains. Straw-plaiting occupies 6000 hands on the mountain slopes between Gottleuba and Lockwitz. Waxcloth is manufactured at Leipsic, and artificial flowers at Leipsic and Dresden. Stoneware and carthenware are made at Chemnitz, Zwickau, Bautzen, and Meissen, porcelain (“ Dresden china”) at Meissen, chemicals in and near Leipsie. Débeln, Werdau, and Lossnitz are the chief seats of the Saxon leather trade ; cigars are very extensively made in the town and district of Leipsic, and hats and pianofortes at Leipsic, Dresden, and Chemnitz. Paper is made chiefly in the west of the kingdom, but docs not keep pace with the demand. Machinery of all kinds is produced, from the sewing-machines of Dresden to the steam- locomotives and marine-engines of Chemnitz. The last-named place, though the centre of the iron-manufacture of Saxony, has to import every pound of iron by railway. The leading branch is the machinery used in the

industries of the country—mining, paper- making, and weaving. The very large printing trade of Leipsic eneourages the manufacture of printing-presses in that city. In 1883-84 Saxony contained 744 active breweries and 683 distil- leries. The tendency in this branch of industry is to extinguish the smaller establishments, and to form large joint-stock com- panies. The smelting and refining of the metal ores is also an important industry. The chief smelting works, at Freiberg, employed 1377 hands in 1888.

Prade.—Leipsic, with its famous and still frequented fairs, is the focus of the trade of Saxony. The fur trade between eastern and western Europe and the book-trade of Germany centre here. Chemnitz, Dresden, Plauen, Zwickau, Zittau, and Bautzen are the other chief commercial eities. The principal exports are wool, woollen, eotton, and linen goods, and the other produce of the factories and of the mines.

Communication.—The roads of Saxony are numerous and good. In 1888 there were 2304 miles of road in the kingdom. Saxony was the first German state to encourage and develop a railway system, and, although at first private enterprise led the way, the Saxon lines are now almost exclusively in the hands of Govern- ment. The first railway, between Leipsic and Althen, was opened on April 24, 1837. In 1837 there were 9 miles of state railway ; in 1840, 71 miles; in 1850, 250; in 1870, 685; in 1880, 1184; and in 1884, 1355 miles, which, together with 75 miles of private line, mostly worked by the state, employed 24,400 hands. There are no canals in Saxony, and the only navigable river is the Elbe.

Popwlation.—In 1880 the population of Saxony was 2,972,805, or

% per cent. of the total population of the German empire, on 2°7 per cent. of its area. The provisional returns of the census of 1885 gave a population of 3,179,168. With the exeeption of the free towns, Saxony is the most densely peopled member of the empire, and its population is increasing at a more rapid rate than is the case in any of the larger German states, In 1880 Saxony had 513°5 inhabitants per square mile, nearly three times as many as Bavaria ; Prussia had 202°8, and the average for the empire was 216°7. More than half (56 per cent.) of the people live in communities of over 2000 inhabitants. The following table shows the distribu- tion of the

population among the four administrative districts, It will be noticed that the industrial district of Zwickau is the most densely peopled.

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‘ : ee aes ee Population. vere ‘Miles. SanMenes Mile. Bauitaenk,,.....0-351,326 9538 368 °6 Dresden ARB ater 808,512 1675 482°7 ee 707,826 1377 514°0 Zwiekau……..... 1,105,141 1784 619-4

a ee ee ee | The growth of the population since 1815, when the kingdom received its present limits has been as follows :—in 1815, 1,178,802; in 1880, 1,402,066 ; in 1840, 1,706,275; in 1864, 2,344,094; and in 1875, 2,760,586, The number of marriages per 1000 inhabitants is between 8 and

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9; the birth-rate is 48, and the death-rate 30 per thousand, The annual increase of the population, on the average of the five years between 1875 and 1880, is at the rate of 1°48 per cent, The death-rate in Saxony is the highest in Germany, but its birth-rate is also the highest, except in the small state of Reuss (alterer Linie). In 1883, out of 132,209 births, 16,990, or 12°8 per cent., were illegitimate, and 4935, or 3°7 per cent., were still-born, and these rates represent tolerably accurately the average of the last few years. In the relative number of suicides (311 per 1,000,000 inhabitants) Saxony ranks highest among the European states (see Morselli, Jnt. Sez. Ser., vol. xxxvi.). In 1884 1114 persons, of whom 861 were males, committed suicide. In the same year 17,706 persons were punished as vagrants.

The preponderating industrial activity of Saxony fosters the tendeney of the population to concentrate in towns; with the exception of the free towns and Anhalt, no German state has so large a proportion of urban population, ¢.¢., inhabitants residing in communities of 2000 persons and upwards. In the empire as a whole 41°4 per cent. of the population is urban in this sense ; in Saxony the proportion rises to 56°6 per cent. The largest towns are Dresden (245,515 inhabitants), the capital since the middle of the 16th century,

Leipsic (170,076), and Chemnitz (110, 693). Eighteen other towns, chiefly in the manufacturing district of Zwickau, have over 10,000 inhabitants, and thirty-five between 5000 and 10,000. The main results of the industrial census of 1882, which shows an increase of population since 1880 of 42,000, are summarized in the following table, which gives the number of persons (including wives, families, and dependants) supported by the several occupations, and the percentage of the total population :—

Occupations. Persons. | Percentage.

. Agriculture, forestry, and fishing……. . Tiduigteial pumenntge, ...1vemesteann NOG 5 aa waaay Domestic servants and general labourers . Official, military, and professional classes . Not returned under any occupation…

602,378 1,695,895 360,675 58,584 148,361 153,929

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The people of Saxony are chiefly of pure Teutonic stock ; a pro- portion are Germanized Slavs, and in the south of Bautzen there are still about 50,000 Wends, who retain their peculiar customs and language. In some villages near Bautzen hardly a word of German is spoken.

fieligious Statistics.—About 97 per cent. of the inhabitants of Saxony are Protestants ; between 6000 and 7000 are J ews, and the remainder, including the royal family, are mostly Roman Catholics. According to the religious census of 1880, 2,886,806 were livangeli- cals, 74,333 Roman Catholics, 1467 German Catholics, 620 Angli- cans, 453 Greck Catholies, 6518 Jews, and 339 ‘‘others.” The Evangelical-Lutheran or State Church had 1180 pastors and 1393 places of worship in 1884. 1ts head is the minister ‘‘de evangelicis ” so long as the king is Roman Catholic ; and its management is vested in the Evangelical Consistory at Dresden. Its representative assembly, consisting of twenty-nine clergymen and thirty-five lay- men is called a synod (Synode). The Roman Catholic Church has enjoyed the patronage of the reigning family since 1697, though it was the peace of Posen (1806) which placed it on a level with the Lutherans. By the peace of Prague, which transferred Upper Lusatia to Saxony in 1635,

stipulations were made in favour of the Roman Catholics of that region, who are ecclesiastically in the Jurisdiction of the cathedral chapter of St Peter at Bautzen, the dean of which has ex officio a seat in the first chamber of the diet. The other districts are managed by an apostolic vicariate at Dresden, under the direction of the minister of public worship. Two nunneries in Bautzen are the only conventual establishments in Saxony, and no others may be founded. Among the smaller religious sects the MorAvVIAN BRETHREN (q.v.), whose chief scat is at Herrnhut, are perhaps the most interesting. In 1868 civil rights were declared to be independent of religious confession.

Education. —Saxony claims to be one of the most highly educated countries in Europe, and its foundations of schools and universities were among the earlicst in Germany. Of the four universities founded by the Saxon electors at Leipsic, Jena, Wittenberg, and Erfurt, only the first is included in the present kingdom of Saxony. It is second only to Berlin in the number of its students. The endowed schools (Fiirstenschulen) at Meissen and Grimina have long enjoyed a high reputation. Besides these there are 12 other gymnasia, 13 realschulen of the first class, and 19 of the second class, the organization of which resembles that already described in detail under Prussra. ‘There are nearly 4000 elementary and pre- paratory schools ; and education is compulsory. Of 8856 recruits in 1883-84 only 18 (‘15 per cent.) were unable to read and write. Saxony is particularly well-equipped with technical schools, the textile industries being especially fostered by numerous schools of weaving, embroidery, lace-making, &c. ; but the mining academy ot. Freiberg and the school of forestry at Tharandt are probably the

most widely known. The conservatory of music at Leipsic enjoys a world-wide reputation ; not less the art-collections at Dresden. Constitution.—Saxony is a constitutional monarchy and a member of the German empire, with four votes in the federal council and twenty-threc in the reichstag. The constitution rests on a law promulgated on 4th September 1831, and subsequently ameuded. The crown is hereditary in the Albertine Saxon line, with reversion to the Ernestine line, of which the duke of Saxe- Weimar is

now the head. The king enjoys a civil list of 2,940,000 marks or £147,000, while the apanages of the crown, including the payments to the other members of the royal house, amount to £15,670more. The legislature (Standeversammlung) is bicameral,— the constitution of the co-ordinate chambers being finally settled by a law of 1868 amending the enactment of 1831. The first chamber consists of the adult princes of the blood, five hereditary members from among the nobility, representatives of the Lutheran and Roman Catholic Churches, a representative of Leipsic university, twelve representatives of proprietors with landed property of an annual value of at least £150, elected for life, and ten representa- tives of the same class nominated for life by the crown, the chief magistrates of the eight principal towns, and five other life members, chosen without any restrictions by the king. The second chamber consists of thirty-five members from the towns and forty-five from the country, elected for six years. All male citizens twenty-five years old and upwards who pay one thaler (8s.) per annuin in taxes have the suffrage ; and all above thirty years of age who pay 10 thalers in annual taxes are cligible as members of the diet. ‘The chambers must be convened at least once every two years ; and extraordinary meetings take place at every change of ruler and on other special occasions. One-third of the members of

the second chamber retire at the end of every period of two years. |

With the exception of the hereditary and some of the ex-officio members of the first chamber, the members of the diet are entitled to an allowance (12s.) for their daily expenses, as well as their travelling expenses. The executive consists of a responsible min- istry (Gesammtministerium), with the six departments of justice, finance, home affairs, war, public worship and education, and foreign affairs. The minister of the royal household does not belong to the cabinet. The constitution also provides for the formation of a kind of privy council (Staatsrath), consisting of the cabinet ministers and other members appointed by the king.

For administrative purposes Saxony is divided into four Kreishauptmannschaften or governmental departments, subdivided into fifteen Amtshauptmannschaften and one hundred and sixteen Aemter. The cities of Dresden and Leipsic form departments by themselves. The

supreme court of law for both civil and criminal cases is the Oberlandes-Gericht at Dresden, subordinate to which are seven other courts in the other principal towns and one hundred and five inferior tribunals. The German imperial code was adopted by Saxony in 1879. Leipsic is the seat of the imperial supreme court.

Finance.—The Saxon financial period embraces a space of two years. For 1884-5 the “ordinary” budget showed an income of £3,496,000, balanced by the expenditure, which included a reserve fund of £29,400. The chief sources of income were taxes (£1,377,293, including £899,975 of direct taxes), state-railways (£1,357,890), and the public forests and domains (£359,171). Lotterics brought in £232,270, and the royal porcelain manufacture £17,500. The chief expenditure was on the interest (£1,135,681) and sinking fund (£410,000) of the national debt. The “ extraordinary” budget, applying exclusively to public works, showed an income and expenditure tallying at £882,800. The national debt, incurred almost wholly in making and buying railways, amounted on Ist January 1885 to £32,670,300, mostly paying interest at the rate of 4 per cent.

Army.—The Saxon army is modelled on that of Prussia. It forms the 12th army corps in the imperial German army, and con- sists of the 23rd and 24th divisions, with headquarters at Dresden and Leipsic respectively. On its peace-footing the Saxon contingent includes 20,500 infantry, 4180 cavalry, and 3000 artillery ; in war it has 75,800 infantry, 6680 cavalry, and 8050 artillery.

The statistical information in the above article has been derived chiefly from the Xalendar und statistisches Jahrbuch fiir das Kénigreich Sachsen (Dresden, 1875-86) and the Zeitschrift des Kéniglichen Sdchsischen statistischen Bureau (Dresden, 1855-85). The Staatshandbuch ftir das Kénigreich Sachsen is an annual official register. Engelhardt’s Vaterlandskunde fiir Schule und Haus im Koénigreich Sachsen (Dresden, 8d cd. by Flathe, 1877) contains a comprehensive account of the country and its resources; and Daniel’s Handbuch der Geographie

Leipsic, 1881) clearly summarizes the principal points. The standard history of axony is Béttiger’s Geschichte des Kurstaats und K6nigreichs Sachsens (8 vols., Gotha, 3d ed., edited and continucd by Flathe, 1867-73), Brandes’s

Grundriss der Sdichsischen Geschichte (Leipsic, 1860) is a succinct but soniewhat dry sum- mary. Other leading works on the subjects are Gretschel, Geschichte des Séichsischen Staats und Volks (3 vols., Leipsic, 2d ed., continued by Bulau, 1862-63); Meynert, Geschichte des Stichsischen Volks (2 vols., Leipsic, 1833-85) 5 Heinrich, Sdchsische Geschichte (2 vols., Leipsic, 1810-12); and Weissc, Geschichte der Kursdchsischen Staaten (7 vols., Leipsic, 1802-12). The publication of the Codex Diplomaticus Saxonix Regi was begun in 1864 under the carc of Gersdorf, and has been continued undcr Posse and Emerisch. Posse has also published Die Markgrafen von Meissen und das Haus Wettin bis zu Konrad dem Grossen (Leipsic, 1881); and Emerisch is the cditor of the Neue Archiv fiir Sdchsische Geschichte (Leipsie, 6 vols.), whieh contains full information as to works on the

history of the country. Weber's older Archiv ftir die Stichsische Geschichte appeared in 1864 sq.; and a still older periodical publication on the subject is Von Braun's Monatlicher Auszug aus der Geschichte des Kur- und Firstlichen Hauses Sachsens (6 vols., Langensalza, 1778-81). See also Tutschmann's Atlas zur Geschichte der Sdchsischen Lander (Grimma, 1852). (F. MU.)

SAXONY, Prussran (Germ. Provinz Sachsen), one of the central provinces of the kingdom of Prussia, consists mainly of what was formerly the northern part of the kingdom of Saxony (ceded to Prussia in 1815), but also comprises the duchy of Magdeburg, the Altmark, and other districts, the connexion of which with Prussia is of earlier date. The area of the province is 9750 square miles. On the W. it is bounded by Hesse-Nassau, Hanover, and Brunswick, on the N. by Hanover and Brandenburg, on the E. by Brandenburg and Silesia, and on the 8S. by the kingdom of Saxony and the small Thuringian states. It is, however, very irregular in form, entirely surrounding parts of Brunswick and the Thuringian states, and itself possessing several 'exclaves," while the northern portion of the province is almost entirely severed from the southern by the duchy of Anhalt. The major part of the province is flat and belongs to the great North- German

plain, but the western and south-western districts are hilly, including parts of the Harz (with the Brocken, 3417 feet) and the Thuringian Forest. About nine- tenths of Prussian Saxony belongs to the system of the Elbe, the chief feeders of which within the province are the Saale and the Mulde, but a small district on the west drains into the Weser. The saltwater lakes between Halle and Eisleben are the only lakes of the kind in Prussia.

Saxony is on the whole the most fertile province of Prussia, and excels all the others in its produce of wheat and beetroot sugar (as well as in salt, brown coal, and copper), but the nature of its soil is very unequal. The best crop-producing districts lie near the base of the Harz Mountains, such as the ‘ Magdeburger Borde” and the ‘Goldene Aue,” and rich pasture lands occur in the river valleys, but the sandy plains of the Altmark, in the north part of the province, yield but a scanty return for the husbandman’s toil.

Of the total area of the province 61 per cent. is occupied by arable land, 18 per cent. by meadows and pastures, and 20°5 per cent. by forests. Wheat and rye are raised in such abundance as to allow of a considerable export, while the other grain crops meet the local demand. The beetroot for sugar is grown chiefly in the district to the north of the Harz, as far as the Ohre, and on the banks of the Saale; and the amount of sugar produced (upwards of 400,000 tons in 1883-84) is nearly as much as that of all the rest of Prussia together. Flax, hops, and seeds for oil are also cultivated to some extent, and large quantities of excellent fruit are grown at the foot of the Harz and in the valleys of the Unstrut and the Saale. The market-gardening of Erfurt is well-known throughout Germany. Wine, of indifferent quality, is produced in the vicinity of Naumburg. Saxony is comparatively poor in timber, though there are some fine forests in the Harz and other hilly districts. Cattle-rearing is carried on with success in the river valleys, and more goats are met with here than in any other part of Prussia. The live-stock census for 1883 gave the following figures :—horses, 182,485; cattle, 624,973; sheep, 1,390,915; pigs, 719,627 ; goats, 261,225. (Compare the tables under Prussia, vol. xx. p. 14.)

The principal underground wealth of Prussian Saxony consists of its salt and its brown coal, of both of which it possesses larger stores than any other part of the German empire. The rock-salt mines and brine springs (the chief

of which are at Stassfurt, Schonebeck, Halle, &c.) produced in 1883-4 no less than 256,000 tons of salt, while the annual output of brown coal amounts to about 8 million tons, or more than the entire yield of the rest of Germany. Prussian Saxony also possesses three-fourths of the wealth of Germanyin copper, the yield in 1883 amounting to 445,000 tons of ore and 11,000 tons of the pure metal. The copper inincs are found chiefly in the Harz district. Theother mineral resources include silver (one-third of the total German yield), pit-coal, pyrites, alum, plaster of Paris, sulphur, alabaster, and several varieties of good building-stone. Numerous mineral springs occur in the Harz.

In addition to the production of sugar already noted, the most important industries are the manufactures of cloth, leather, iron and steel wares (chiefly at Suhl and Sdémmerda), spirits (Nord-

See Plate V.

hausen), chemicals (Stassfurt), and starch. Beer is also brewed extensively in Prussian Saxony, where the annual consumption per head (107 quarts) is considerably in excess of the average for the kingdom. Trade is much facilitated by the great waterway of the Elbe, as well as by a very complete system of railways, The chief articles are wool, grain, sugar, salt, lignite, and the principal manufactured products named above. ;

The population of the province of Saxony in 1880 was 2,312,007, including 2,154,663 Protestants, 145,518 Roman Catholics, and 6700 Jews ; in 1885, according to provisional census returns, the population was 2,427,968. The great bulk of the inhabitants are of unmixed German stock, but many of those in the east part of the province have Wendish blood in their veins. The province belongs to the more thickly populated parts of Germany, the average being 237 persons to the square mile, and the ratio of the urban population to the rural is about as 44 to 54. The occupation census of 1882 gives the following percentages for the different classes of the population : —agricultural, 36°78; industrial, 35°18 ; trade, 8°15; domestic servants and day labourers, 8°70; official and professional, 5°12.

Prussian Saxony is divided into the three government districts of Magdeburg, Merseburg, and Erfurt. Magdeburg is the most important town and the headquarters of an army corps, but the provincial chambers meet at Merseburg. The province sends twenty members to the reichstag and thirty-eight to the Prussian house of representatives. The religious control of the district is in the hands of a consistory at Magdeburg; the Roman Catholics belong to the diocese of Paderborn. The university of Halle holds a high rank among German seats of learning, and the other educa- tional requirements of the province are adequately provided for. The illiterate recruits of this province in 1888-4 numbered only 13 out of a total of 7868, equivalent to 0°17 per cent. The prin- cipal towns are Magdeburg (about 150,000 inhabitants, including Neustadt and Buekau), Halle (81,869), Erfurt (58,307), Halberstadt (34,048), Nordhausen, Miihlhausen, and Aschersleben,

The history of the present Prussian province of Saxony as such dates only from 1815, and is, of course, merely of local interest. The previous history of its constituent parts, of considerable more interest and importance, must be sought for under the various headings that will suggest themselves, such as SAXONY (supra), Prussia, Macpesure, ErFurt, &c. It is, however, worth noting that the province comprises the Altmark or old North Mark that formed the kernel of the Prussian state (see Prussta, vol. xx. p. 2), and also the old bishoprics on the Elbe and Saale, from which as a centre the Christianization of Germany mainly spread. And the leading position of this part of Germany in promoting the Reformation should also be remembered.

SAY, Jean Baptiste (1767-1832), an eminent French political economist, was born at Lyons 5th January 1767. His father, Jean Etienne Say, was of a Protestant family which had originally belonged to Nimes, but had removed to Geneva for some time in consequence of the revocation of the edict of Nantes. Young Say was intended to follow a commercial career, and was accordingly sent, with his brother Horace, to England, and lived first at Croy- don, in the house of a merchant, to whom he acted as clerk, and afterwards at London, where he was in the service of another employer. When, on the death of the latter, he returned to France, he was employed in the office of a life assurance company directed by Claviére, afterwards known in politics. It was Claviére who called his attention to the Wealth of

Nations, and the study of that work revealed to him his vocation. His first literary attempt was a pamphlet on the liberty of the press, pub- lished in 1789. He worked under the celebrated Mira- beau on the Courrier de Provence. In 1792 he took part as a volunteer in the campaign of Champagne; in 1793 he assumed, in conformity with the Revolutionary fashion, the pre-name of Atticus, and became secretary to Claviére, then finance minister. He married in 1793 Mlle. Deloche, daughter of a former avocat au conseil ; the young pair were greatly straitened in means in consequence of the depreciation of the assignats. From 1794 to 1800 Say edited a periodical entitled La Décade philosophique, lit- téraire, et politique, in which he expounded the doctrines of Adam Smith. He had by this time established his reputation as a publicist, and, when the consular govern- ment was established in the year VIII (1799), he was selected as one of the hundred members of the tribunate,

and resigned, in consequence, the direction of the Decade. He published in 1800 Olhie, ow Essai sur les moyens de réformer les meeurs d’une nation.

In 1803 appeared his principal work, the Traité @ Economie Politique. In 1804, having shown his unwill- ingness to sacrifice his convictions for the purpose of furthering the designs of Napoleon, he was removed from the office of tribune, being at the same time nominated to a lucrative post, which, however, he thought it his duty to resign. He then turned to industrial pursuits, and, having made himself acquainted with the processes of the cotton manufacture, founded at Auchy, in the Pas de Calais, a spinning-mill which employed four or five hundred persons, principally women and children, He devoted his leisure hours to the improvement of his economic treatise, which had for some time been out of print, but which the censorship did not permit him to republish; and in 1814 he availed himself (to use his own words) of the sort of liberty arising from the entrance of the allied powers into France to bring out a second edition of the work, dedicated to the emperor Alexander, who had professed himself his pupil. Inthe same year the French Government sent him to study the economic condition of Great Britain. The results of his observations during his journey through England and Scotland appeared in a tract De

VAngleterre et des Anglais; and his conversations with distinguished men in those countries contributed, he tells us, to give greater correctness to the exposition of prin- ciples in the third edition of the Traité, which appeared in 1817. A chair of industrial economy was founded for him in 1819 at the Conservatoire des Arts et Métiers, in which he lectured with ability and success. In 1831 he was made professor of political economy at the Collége de France. He published in 1828-30 his Oours Complet d'Economie Politique pratique, which is in the main an expansion of the Z'raité, with practical applications. In his later years he became subject to attacks of nervous apoplexy, which increasingly reduced his strength. He lost his wife, to whom he was fondly attached, in January 1830; and from that time his health constantly declined. When the revolution of that year broke out, he was named a member of the council-general of the department of the Seine, but found it necessary to resign that position. He died at Paris 16th November 1832, leaving behind him a well-earned reputation for private worth and polit- ical integrity.

Say was essentially a propagandist, not an originator. His great service to mankind lies in the fact that he disseminated throughout Europe by means of the French language, and popularized by his clear and easy style, the economic doctrines of Adam Smith. It is true that his French panegyrists (and he is not himself free from censure on this score) are unjust in their estimate of Smith as an expositor ; they give falsc or exaggerated ideas of his obscurity, his prolixity, and his want of method ; and they accordingly extol too highly the merits of Say. Those merits are, however, real and considerable ; his writings were without doubt very effective in diffusing throughout Continental Europe a taste for economic inquiry and a knowledge of its principal results. On the side of the philosophy'of science Say is weak ; his observations on that subject are usually commonplace or superficial. Thus he accepts the shallow dictum of Condillac that toute science se réduit & wne langue bien faite. He recognizes political economy and statistics as alike sciences, and represents the distinction between them as having never been made before him, though he quotes what Smith had said of political arithmetic. Whilst always deserving the praise of honesty, sincerity, and independence, he is very inferior to his great predecessor in breadth of view on moral and political questions. In his general conception of human affairs there is a tendency to regard too exclusively the material

side of things, whieh made him pre-eminently the economist of the French liberal bourgeoisie ; thus Storch justly censures the levity with which he doubts the necessity of a public religious cultus, suggesting that enlightened nations might dispense with it “as the Pacific islanders do.” He is inspired with the dislike and jealousy of Governments so often felt and expressed by thinkers formed in the social atmosphere of the last century. Soldiers are for him uot merely

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unproduetive labourers, as Smith ealled them; they are rather “destruetive labourers.” ‘‘A nation might,” he says, “strietly speaking, subsist without a government, each profession exchang- ing the fruits of its labours with the products of the labours of others,’—a remark whieh betrays the notion that eeonomic coin- eides with soeial life. Taxes are uneompensated payments ; they are plagues like hail, war, or depredation; they may fitly be deseribed as of the nature of robbery. When he says, “ Lorsqu’ on vous vend un privilége, comme le droit de ehasse, ou seulement de port d’arines, on vous vole votre droit naturel d’étre armé pour le vous vendre aprés l’avoir volé,” we see that we are still in the region of the jus naturz, which lies at the basis of all the old eeonomics.

Say is considered to have brought out the importanee of eapital as a factor in production more distinetly than the English eeono- mists, who unduly emphasized labour. The special doctrines most eommonly mentioned as due to him arc—(1) that of ‘‘immaterial produets,” and (2) what is ealled his ‘‘théorie des débouchés.” Objecting, as Germain Garnier had done before him, to Smith’s well-known distinetion between produetive and unproduetive labour, he maintains that, produetion consisting in the ereation or addition of a utility, all useful labour is productive. He is thus led to reeognize immaterial produets, whose charaeteristie quality is that they are consumed immnediately and are incapable of aeeumu- lation ; under this head are to be ranged the services rendered either by a person, a capital, or a portion of land, as, ¢.g., the advantages derived from medical attendanee, or from a hired house, or from a beautiful view. But in working out the consequenees of this view Say is not free (as Storeh has shown) from

obseurities and inconsistencies ; and by his eomprehension of these immaterial produets within the domain of economies he is confirmed in the error of regarding that seience as filling the whole sphere whieh really belongs to sociology. His ‘‘théorie des débouchés ” amounts to this, that, produets being, in last analysis, purehased only with produets, the extent of the markets (or outlets) for home produets is proportional to the quantity of foreign produetions; when the sale of any commodity is dull, it is beeause there is not a sufficient number, or rather value, of other eommodities produced with which it eould be purehased. Another proposition on whieh Say insists is that every value is consumed and is ereated only to be consumed. Values ean therefore be accumulated only by being reproduced in the eourse or, as often happens, by the very aet of eonsumption ; henee his distinetion between reproduetive and unproduetive con- sumption. We find in him other correetions or new presentations of views previously aeeepted, and some useful suggestions for the improvement of nomenelature.

_Say’s writings occupy vols. ix.-xii. of Guillaumin’s Collection des Principauz Economistes. Among them are, in addition to those already mentioned, Catéchisme d’ Economie Politique, 1815; Petit Volume contenant quelques apercus des Hommes et de la Société, Lettres & Malthus sur différens sujets d’ Economie Politique, 1820; Epitomé des Principes de Economie Politique, 1831. A volume of Mélanges et Correspondance was published posthumously by Charles Comte, author of the Traité de Législation, who was his son-in-law. To the above must be added an addition of Storch’s Cours d’ Economie Politique, which Say published in 1823 without Storch’s authorization, with notes embodying a ‘feritique amérce et virulente,” a procceding which Storch justly resented.

The last edition of the Tratté d’ Economie Politique which appeared during the life of the author was the 5th (1826); the 6th, with the author’s final corrections, was edited by the eldest son, Horace Emile Say, himself known as an economist, in 1846. The work was translated into English ‘‘from the 4th edition of the French’ by C. R. Prinsep (1821), into German by Ludwig Heinrich yon Jakob (1807) and by C. Ed. Morstadt (1818, and 1830), and, as Say himself informs us, into Spanish by José Queypo. The Cours d’ Economie Politique pratique, from which Morstadt had given extracts, was

translated into German by Max Stirner (1845). The Catéchisme and the Petit Volume have also been translated into several European Janguages. An English version of the Zettres a Malthus appears in vol. xvii. of the Pamphileteer, 1821. (J. K. 1.)

SCALA NOVA, Scata Nuova, or (Turkish) Kusx- ADASSI, also known as New Ephesus, a harbour on the west coast of Asia Minor, in the vilayet of Aidin, opposite the island of Samos. Before the opening of the Smyrna-Aidin railway its excellent roadstead was largely fre- quented by vessels trading with the Anatolian coast, and it has often been proposed to connect it with this system by a branch line, and thus enable it to compete with Smyrna as a trading centre. The population is estimated at 7000 to 10,000, of whom about 3000 are Greeks.

SCALIGER. For some account of the great Della Scala (Lat. Scaliger) family, the reader is referred to the article Verona. ‘The name has also been borne by two scholars of extraordinary eminence in the world of letters.

I. Junius Casar Scaricer (1484-1558), so distin- guished by his learning and talents that, according to De Thou, no one of the ancients could be placed above him and the age in which he lived could not show his equal, was, according to his own account, a scion of the illustrious house of La Scala, for a hundred and fifty years princes of

Verona, and was born in 1484 at the castle of La Rocca on the Lago de Garda. At the age of twelve he was presented to his kinsman the emperor Maximilian, and placed by him among his pages. He remained for seventeen years in the service of the emperor, following him in his expeditions through half Europe, and distin- guishing himself no less by personal bravery as a soldier than by military skill as a captain. But he was unmind- ful neither of letters, in which he had the most eminent scholars of the day as his instructors, nor of art, which lie studied with considerable success under Albert Diirer. In 1512 he fought at the battle of Ravenina, where his father and elder brother were killed. He there displayed prodigies of valour, and received the highest honours of chivalry from his imperial cousin, the emperor conferring upon him with his own hands the spurs, the collar, and the eagle of gold. But this was the only reward he obtained for his long and faithful devotion. He left the service of Maximilian, and after a

brief employment by another kinsman, the duke of Ferrara, he decided to quit the military life, and in 1514 entered as a student at the university of Bologna. He determined to take holy orders, in the expectation that he would become in due time cardinal, and then be elected pope, when he would wrest from the Venetians his principality of Verona, of which the republic had despoiled his ancestors. But, though he soon gave up this design, he remained at the university until 1519. The next six years he passed at the castle of Vico Nuova, in Piedmont, as a guest of the family of La Rovere, at first dividing his time between military expeditions in the summer, in which he achieved great successes, and study, chiefly of medicine and natural history, in the winter, until a severe attack of rheumatic gout brought his military career to a close. Henceforth his life was wholly devoted to study. In 1525 he accompanied M. A. de la Rovére, bishop of Agen, to that city as his physician. Such is the outline of his own account of his early life. It was not until some time after his death that the enemies of his son first alleged that he was not of the family of La Scala, but was the son of Benedetto Bordone, an illuminator or schoolmaster of Verona; that he was educated at Padua, where he took the degree of M.D.; and that his story of his life and adventures before arriving at Agen was a tissue of fables. It certainly is supported by no other evidence than his own statements, some of which are inconsistent with well-ascertained facts.

The remaining thirty-two years of his life were passed almost wholly at Agen, in the full light of contemporary history. They were without adventure, almost without incident, but it was in them that he achieved so much distinction that at his death in 1558 he had the highest scientific and literary reputation of any man in Europe. A few days after his arrival at Agen he fell in love with a charming orphan of thirteen, Andiette de la Roque Lobejac. Her friends objected to her marriage with an unknown adventurer, but in 1528 he had obtained so much success as a physician that the objections of her family were over- come, and at forty-five he married Andiette, who was then sixteen. The marriage proved a complete success; it was followed by twenty-nine years of almost uninterrupted happiness, and by the birth of fifteen children.

A charge of heresy in 1538, of which he was acquitted by his friendly judges, one of whom was his friend Arnoul Le Ferron, was almost the only

event of interest during these twenty-nine years, except the publication of his books, and the quarrels and criticisms to which they gave rise.

In 1531 he printed his first oration against Erasmus, in defence of Cicero and the Ciceronians. It is a piece of

vigorous invective, displaying, like all his subsequent writings, an astonishing knowledge and command of the Latin language, and much brilliant rhetoric, but full of vulgar abuse, and completely missing the point of the Ciceronianus of Erasmus. The writer's indignation at finding it treated with silent contempt by the great scholar, who thought it was the work of a personal enemy—Aleander —caused him to write a second oration, more violent, more abusive, with more self-glorification, but with less real merit than the first. The orations were followed by a prodigious quantity of Latin verse, which appeared in successive volumes in 1533, 1534, 1539, 1546, and 1574; of these, a friendly critic, Mr Pattison, is obliged to approve the judgment of Huet, who says : "par ses poésies brutes et informes Scaliger a deshonoré le Parnasse ;" yet their numerous editions show that they commended them- selves not only to his contemporaries but to succeeding scholars. A brief tract on comic metres (De Comicis Dimensionibus) and a work De Causis Lingux Latine— the earliest Latin grammar on scientific principles, and following a scientific method—were his only other purely literary works published in his lifetime. His Poetics was left unpublished, and only appeared in 1561 after his death. With many paradoxes, with many criticisms which are below contempt, and many indecent displays of violent personal animosity,—especially in his reference to the unfortunate Dolet, over whose death he gloated with brutal malignity, —it yet contains much acute criticism, and shows that for the first time a writer had appeared who had formed an adequate idea of what such a treatise ought to be, and how it ought to be written.

But it is as a philosopher and a man of science that J. C. Scaliger ought to be judged. His tastes were for metaphysics and physics rather than for literature. Classical studies he regarded as an agreeable relaxation from

severer pursuits. Whatever the truth or fable of the first forty years of his life, he had certainly been a most close and accurate observer, and had made himself acquainted with many curious and little-known pheno- mena, which he had stored up in a most tenacious memory, and which he was able to make use of with profit. His scientific writings are all in the form of commentaries, and it was not until his seventieth year that (with the exception of a brief tract on the De Jnsomniis of Hippocrates) he felt that any of them were sufficiently complete to be given tothe world. In 1556 he printed his Dialogue on the De Plantis attributed to Aristotle, and in 1557 his Exercitationes on the work of Cardan, De Subtilitate. His other scientific works, Commentaries on Theophrastus's History of Plants and Aristotle's History of Animals, he left in a more or less unfinished state, and they were not printed until after his death. They are all marked by the same characteristics : arrogant dogmatism, violence of language, irritable vanity, a constant tendency to self- glorification, which we expect to find only in the charlatan and the impostor, are in him combined with extensive real knowledge, with acute reasoning, with an observation of facts and details almost unparalleled. He displays every- where what Naudé calls "an intellect teeming with heroic thought." But he is only the naturalist of his own time. That he anticipated in any manner the inductive philo- sophy cannot be contended; his botanical studies did not lead him, like his contemporary Gesner, to any idea of a natural system of classification, and he rejected with the utmost arrogance and violence of language the discoveries of Copernicus. In metaphysics and in natural history Aristotle was a law to him, and in medicine Galen, but he was not a slave to the text or the details of either. He has thoroughly mastered their principles, and is able to see when his masters are not true to themselves, He

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corrects Aristotle by himself. He is in that stage of learning when the attempt is made to harmonize the written word with the actual facts of nature, and the result is that his works have no real scientific value. Their interest is only historical. His Hxercitationes upon the De Subtilitate of Cardan (1557) is the book by which Scaliger is best known as a philosopher. Its numerous editions bear witness to its popularity, and until the final fall of Aristotle's physics it continued a popular text-book; as late

as the middle of the seventeenth century an elaborate commentary upon it was published by Sperling, a professor at Wittenberg. We are astonished at the encyclopedic wealth of knowledge which the Lxercitationes display, at the vigour of the author's style, at the accuracy of his observations, but are obliged to agree with Naudé that he has committed more faults than he has discovered in Cardan, and with Nisard that his object seems to be to deny all that Cardan affirms and to affirm all that Cardan denies. Yet it is no light praise that writers like Leibnitz and Sir William Hamilton recognize J. C. Scaliger as the best modern exponent of the physics and metaphysics of Aristotle. He died at Agen 21st October 1558.

2. JosEPH JusTUS SCALIGER (1540-1609), the great- est scholar of modern times, was the tenth child and third son of Julius Cesar Scaliger and Andiette de la Roque Lobejac (see above). Born at Agen in 1p40, he was sent when twelve years of age, with two younger brothers, to the college of Guienne at Bordeaux, then under the direction of Jean Gelida. An outbreak of the plague in 1555 caused the boys to return home, and for the next few years Joseph was his father's constant com- panion and amanuensis. The composition of Latin verse was the chief amusement of Julius in his later years, and he daily dictated to his son from eighty to a hundred lines, and sometimes more. Joseph was also required each day to write a Latin theme or declamation, but in other respects he seems to have been left to his own devices. The Latin verse of Julius, faulty as it is in all that constitutes poetry, yet displays a more extensive knowledge of the Latin language, and a greater command of its resources, than is to be found in the verse of any of his contemporaries; and this constant practice in writing and reading or speaking Latin, under the super- vision of one who knew the language thoroughly, was probably the foundation of Joseph's Latin scholarship. But the companionship of his father was worth more to him than any mere instruction. He learned from Julius what real knowledge was, and that it did not consist in discussions on words and phrases; and to his father he owed it that he was not a mere scholar, but something more—an acute observer, never losing sight of the actual world, and aiming not so much at correcting texts as at laying the foundation of a science of historical criticism.

In 1558, on the death of his father, he proceeded to Paris, and spent four years at the university there. Of his life at Paris we know but little. Hitherto

he had not studied Greek. Now he felt that not to know Greek was to know nothing. It was in the literature of Greece that he must look for the true key of antiquity, and he forthwith began to attend the lectures of Turnebus. But after two months he found out his mistake. He had much to learn before he could be in a position to profit by the lectures of the greatest Greek scholar of the time. He shut himself up in his chamber, and determined to teach himself. He read Homer in twenty-one days, and then went through all the other Greek poets, orators, and historians, forming a grammar for himself as he went along. From Greek, at the suggestion of Postel, he proceeded to attack Hebrew, and then Arabic; of both he acquired a respect- able knowledge, though not the critical mastery which he

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possessed in Latin and Greek. The name of Dorat then stood as high as that of Turnebus as a Greek scholar, and far higher as a professor. He has left nothing to justify his reputation as a scholar; but as a teacher he un- doubtedly possessed the highest qualifications. He was able not only to impart knowledge, but to kindle enthu- siasm for his subject in the minds of his hearers and pupils. It was to Dorat that Scaliger owed the home which he found for the next thirty years of his life. In 1563 the professor recommended him to Louis de Chastaigner, the young lord of La Roche Pozay, as a companion in his travels. A close friendship sprung up between the two young men, which remained unbroken till the death of Louis in 1595. The travellers first pro- ceeded to Rome. Here they found Muretus, who, when at Bordeaux and Toulouse, had been a great favourite and occasional visitor of Julius Cesar at Agen. Muretus soon recognized Scaliger’s merits, and devoted himself to making his stay at Rome as agreeable as possible, intro- ducing him to all the men that were worth knowing. After visiting a large part of Italy, the travellers passed to England and Scotland, taking as it would seem La Roche Pozay on their way, for Scaliger’s preface to his first book, the Conjectanea in Varronem, is dated there in December 1564. Scaliger formed an unfavourable opinion of the English. Their inhuman disposition, and inhos- pitable treatment of foreigners, especially impressed him. He was also disappointed in finding

few Greek manu- scripts and few learned men. It was not until a much later period that he became intimate with Richard Thompson and other Englishmen. In the course of his travels he had become a Protestant. His father, though he lived and died in the communion ~~of the Church of Rome, had been suspected of heresy, and it is probable that Joseph's sympathies were early enlisted on the side of Protestantism. On his return to France he spent three years with the Chastaigners, accompanying them to their different chateaux in Poitou, as the calls of the civil war required their presence. In 1570 he accepted the invita~~ tion of Cujas, and proceeded to Valence to study juris- prudence under the greatest living jurist. Here he re- mained three years, profiting not only by the lectures but even more by the library of Cujas, which filled no less than seven or eight rooms and included five hundred manuscripts.

The massacre of St Bartholomew—occurring as he was about to accompany the bishop of Valence on an embassy to Poland—induced him with other Huguenots to retire to Geneva, where he was received with open arms, and was appointed a professor in the academy. He lectured on the Organon of Aristotle and the De Minibus of Cicero with much satisfaction to the students but with little to himself. He hated lecturing, and was bored to death with the importunities of the fanatical preachers ; and in 1574 he returned to France, and made his home for the next twenty years in the chateaux of his friend the lord of La Roche Pozay. Of his life during this period we have for the first time interesting details and notices in the Lettres francaises inédites de Joseph Scaliger, edited by M. Tamizey de Larroque (Agen, 1881), a volume which adds much to our knowledge of Scaliger's life. Constantly moving from chateau to chateau through Poitou and the Limousin, as the exigencies of the civil war required, occasionally taking his turn as a guard when the chateau was attacked, at least on one occasion trailing a pike on an expedition against the Leaguers, with no agcess to libraries, and frequently separated even from his own books, his life during this period seems in one aspect most unsuited to study. He had, however, what so few contemporary scholars possessed—leisure, and freedom from pecuniary

cares. In general he could devote his whole time to study ; and it was during this period of his life that he composed and published the books which

showed how far he was in advance of all his contemporaries as a scholar and a critic, and that with him a new school of historical criticism bad arisen. His editions of the Catalecta (1574), of Festus (1576), of Catullus, Tibullus, and Propertius (1577), are the work of a man who writes not only books of instruction for learners, but who is determined himself to discover and communicate to others the real meaning and force of his author. Discarding the trivial remarks and groundless suggestions which we find in the editions of nearly all his contemporaries and predecessors, he first laid down and applied sound rules of criticism and emendation, and changed textual criticism, from a series of haphazard and frequently baseless guesses, into a "rational procedure subject to fixed laws" (Pattison). But these works, while proving Scaliger's right to the foremost place among his contemporaries as far as Latin scholarship and criticism were concerned, did not go beyond mere scholarship. It was reserved for his edition of Manilius (1579), and his De Hmendatione Temporum (1583), to revolutionize all the received ideas of the chronology of ancient history,—to show for the first time that ancient chronology was of the highest importance as a corrector as well as a supplement to historical narrative, that ancient history is not confined to that of the Greeks and Romans, but also comprises that of the Persians, the Babylonians, and the Egyptians, hitherto neglected as absolutely worthless, and that of the Jews, hitherto treated as a thing apart and too sacred to be mixed up with the others, and that the historical narratives and fragments of each of these, and their several systems of chronology, must be carefully and critically compared together, if any true and general conclusions on ancient history are to be arrived at. It is this which constitutes his true glory, and which places Scaliger on so immeasurably higher an eminence than any of his contemporaries. Yet, while the scholars of his time admitted his pre-eminence, neither they nor those who immediately followed seem to have appreciated his real merit, but to have considered his emendatory criticism, and his skill in Greek, as constitut- ing his claim to special greatness. "Scaliger's great works in historical criticism had overstepped any power of appreciation which the succeeding age possessed ' (Pattison). His commentary on Manilius is really a treatise on the astronomy of the ancients, and it forms. an introduction to the De Emendatione Temporum, in which he examines by the light of modern and Copernican science the

ancient system as applied to epochs, calendars, and computations of time, showing upon what principles they were based.

In the remaining twenty-four years of his life he at once corrected and enlarged the basis which he had laid in the De Emendatione. With incredible patience, some- times with a happy audacity of conjecture which itself is almost genius, he succeeded in reconstructing the lost Chronicle of Eusebius—one of the most precious remains of antiquity, and of the highest value for ancient chronology. This he printed in 1606 in his Thesaurus Temporum, in which he collected, restored, and arranged every chronological relic extant in Greek or Latin. In 1590 Lipsius retired from Leyden, where for twelve years he had been professor of Roman history and antiquities. The university and its protectors, the states-general of Holland and the prince of Orange, resolved to obtain Scaliger as his successor. He declined their offer. He hated the thought of lecturing, and there were those among his friends who erroneously believed that with the success of Henry IV. learning would flourish, and

Protestantism be no bar to distinction and advancement. The invitation was renewed in the most gratifying and flattering manner a year later. Scaliger would not be required to lecture. The university only wished for his presence. He would be in all respects the master of his time. This offer Scaliger provisionally accepted. About the middle of 1593 he started for Holland, where he passed the remaining thirteen years of his life, never returning to France. His reception at Leyden was all that he could wish. A handsome income was assured to him. He was treated with the highest consideration. His rank as a prince of Verona was recognized. Placed midway between The Hague and Amsterdam, he was able to obtain, besides the learned circle of Leyden, the advant- ages of the best society of both these capitals. For Sealiger was no hermit buried among his books; he was fond of social intercourse with persons of merit and intelligence, and was himself a good talker.

For the first seven years of his residence at Leyden his reputation was at its highest point. His literary dictator- ship was unquestioned. It was greater in kind and in extent than that of any man since the revival of letters— greater

even than that of Erasmus had been. From his throne at Leyden he ruled the learned world, and a word from him could make or mar a rising reputation. The electric force of his genius drew to him all the rising talent of the republic. He was surrounded by young men eager to listen to and profit by his conversation, and he enjoyed nothing better than to discuss with them the books they were reading, and the men who wrote them, and to open up by his suggestive remarks the true methods and objects of philological and historical study. He encouraged Grotius when only a youth of sixteen to edit Capella; the early death of the younger Douza he wept as that of a beloved son; Daniel Heinsius, from being his favourite pupil, became his most intimate friend. But Scaliger had made numerous enemies. He hated ignorance, but he hated still more half learning, and most of all dishonesty in argument or in quotation. Himself the soul of honour and truthfulness, with a single aim in all his writings, namely, to arrive at the truth, he had no toleration for the disingenuous arguments, and the mis- statements of facts, of those who wrote to support a theory or to defend an unsound cause. Neither in his conversa- tion nor in his writings did he conceal his contempt for the ignorant and the dishonest. His pungent sarcasms were soon carried to the ears of the persons of whom they were uttered, and his pen was not less bitter than his tongue. He resembles his father in his arrogant tone towards those whom he despises and those whom he hates, and he despises and hates all who differ from him. He is conscious of his power as a literary dictator, and not always sufficiently cautious or sufficiently gentle in its exercise. Nor, it must be admitted, was Scaliger always right. He trusted much to his memory, which was occasionally treacherous. His emendations, if frequently happy, were sometimesabsurd. In laying the foundations of a science of ancient chronology, he relied sometimes upon groundless, sometimes even upon absurd hypotheses, frequently upon an imperfect induction of facts. Some- times he misunderstood the astronomical science of the ancients, sometimes that of Copernicus and Tycho Brahe. And he was no mathematician. But his enemies were not merely those whose errors he had exposed, and whose hostility he had excited by the violence of his language. The results of his system of historical criticism had been adverse to the Catholic controversialists, and to the authenticity of many of the documents upon which they had been accustomed to rely. The Jesuits, who aspired to be the expounders of antiquity, the source of all

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scholarship and criticism, perceived that the writings and authority of Scaliger were the most formidable barrier to their claims. It was the day of conversions. Muretus in the latter part of his life professed the strictest ortho- doxy; Lipsius had been reconciled to the Church of Rome; Casaubon was supposed to be wavering; but Scaliger was known to be hopeless, and as long as his supremacy was unquestioned the Protestants had the victory in learning and scholarship. A determined attempt must be made, if not to answer his criticisms, or to disprove his statements, yet to attack him as a man, and to destroy his reputation. This was no easy task, for his moral character was ab- solutely spotless,

After several scurrilous attacks by the Jesuit party, in which coarseness and violence were more conspicuous than ability, in 1607 a new and more successful attempt was made. Scaliger's weak point was his pride. Brought up by his father, whom he greatly reverenced, in the belief that he was a prince of Verona, he never forgot this him- self, nor suffered it to be forgotten by others. Naturally truthful, honourable, and virtuous in every respect, he conceived himself especially bound to be so on account of his illustrious ancestry. In 1594, in an evil hour for his happiness and his reputation, he published his Epistola de Vetustate et Splendore Gentis Scaligere et J. C. Scaligert Vita. In 1607 Gaspar Scioppius, then in the service of the Jesuits, whom he afterwards so bitterly libelled, published his Sealiger Hypobolimexus ("The Supposititious Scaliger"), a quarto volume of niore than four hundred pages, written with consummate ability, in an admirable and incisive style, with the entire disregard for truth which Scioppius always displayed, and with all the power of that sarcasm in which he was an accomplished master. Every piece of gossip or scandal which could be raked together respecting Scaliger or his family is to be found there. The author professes to point out five hundred lies in the Hpistola de Vetustate of Scaliger, but the main argument of the book is to show the falsity of his pretensions to be of the family of La Scala, and of the narrative of his father's early life, and to hold up both father and son to contempt and ridicule as impudent impostors. 'No stronger proof," says Mr Pattison, "can be given of the impressions produced by this powerful philippic, dedicated to the defamation of an individual, than that it has been the source from which the biography of Scaliger, as it now stands in our

biographical collections, has mainly flowed.” To Scaliger the blow was crushing. Whatever the case as to Julius, Joseph had undoubtedly believed himself a prince of Verona, and in his E£pistola had put forth with the most perfect good faith, and without inquiry, all that he had heard from his father as to his family and the early life of Julius. It was this good faith that laid the way for his humiliation. His Estola is full of blunders and mistakes of fact, and, relying partly on his own memory partly on his father’s good faith, he has not verified one of the statements of Julius, most of which, to speak most favourably, are characterized by rhodomontade, exaggeration, or inaccuracy. He immediately wrote a reply to Scioppius, entitled Confutatio Fabulz Burdonum. It is written, for Scaliger, with unusual moderation and good taste, but perhaps for that very reason had not the success which its author wished and even expected. In the opinion of the highest and most competent authority, Mr Pattison, “as a refutation of Scioppius itis most complete”; but there are certainly grounds for dissenting, though with diffidence, from this judgment. Scaliger undoubtedly shows that Scioppius has committed more. blunders than he has corrected, that his book literally bristles with pure lies and baseless calumnies ; but he does not succeed in

adducing a single proof either of his father’s descent from the La Scala family, or of any single event narrated by Julius as happening to himself or any member of his family prior to his arrival at Agen. Nor does he even attempt a refutation of what seems really to be the crucial point in the whole controversy, and which Scioppius had proved, as far as a negative can be proved,—namely, that William, the last prince of Verona, had no son Nicholas, the alleged grandfather of Julius, nor indeed any son who could have been such grandfather. But whether complete or not, the Confutatco had no success ; the attack of the Jesuits was successful, far more so than they could possibly have hoped. Scioppius was wont to boast that his book had killed Scaliger. It certainly embittered the few remaining months of his life, and it is not improbable that the mortifi- cation which he suffered may have shortened his days. The Confutatio was his last work. Five months after it ap- peared, “on the 21st of January, 1609, at four in the morning, he fell asleep in Heinsius’s arms. The aspiring spirit ascended before the

Infinite. The most richly stored intellect which had ever spent itself in acquiring know- ledge was in the presence of the Omniscient” (Pattison). Of Joseph Scaliger the only biography in any way adequate is that of Jacob Bernays (Berlin, 1855). It was reviewed by the late Mark Pattison in an excellent article in the Quarterly Review, vol. cviii. (1860). Mr Pattison had made many MS. collections for a life of Joseph Scaliger on a much more extcnsive scale, which it is greatly to be regretted he left unfinished, and in too fragmentary a state to be published. The present writer has had access to aud made much use of these MSS., which include a life of Julius Caesar Scaliger written some years since. Jor the life of Joseph, besides the reccntly published letters above referred to, the two old collections of Latin and French letters and the two Sealigerana are the most important sources of information. For the life of Julius Cesar the letters edited by his son, those subsequently published in 1620 by the President de Maussac, the Sealigerana, and his own writings, which are full of autobio- graphical matter, are the chief authorities. M. De Bourousse de Lafiore’s Etude sur Jules César de Leseale (Agen, 1860) and M. Magen’s Documents sur Julius Cesar Sealiger et sa famille (Agen, 1878) add important details for the lives of both father and son. The lives by M. Charles Nisard—that of Julius in Les Gladiateurs de la République des Lettres, and that of Joseph in Le Triwmvirat Littéraire aw setziéme siécle—are equally unworthy of their author and their subjects. Julius is simply held up to ridicule, while the life of Joseph is almost wholly based on the book of Scioppius and the Sealigerana. A complete list of the works of Joseph will be found in his life by Bernays. (R. C. C.) SCAMMONY. Under this name the dried juice of the root of Convolvulus Scammonia, L. (cxapwvia), is used in medicine.1 It appears to have been known to the Greeks as early as the 8d century B.c., and is supposed to have been one of the medicines recommended to Alfred the Great by Helias, patriarch of Jerusalem (Cockayne Leech- doms, vol. ii. pp. xxiv., 289, 175; 273, 281). The scam- mony plant is a native of the countries of the eastern part of the Mediterranean basin, growing in bushy waste places, from Syria in the south to the Crimea in the north, its range extending westward to the Greek islands, but not to northern Africa or Italy. It isa twining perennial, bearing flowers like those of Convolvulus arvensis, and having irregularly arrow-shaped leaves and a thick fleshy root. The drug is collected principally in Asia Minor, and near Aleppo in Syria, although a little is obtained from the neighbourhood of Mount Carmel and

the Lake of Tiberias. The principal places of export are Smyrna and Aleppo (Scanderoon), but the drug often bears in commerce the name of the district where it was collected, ¢.g., Broussa, Angora, &c. Formerly Aleppo scammony was considered the best and commanded the highest price, but at present the purest article comes from Smyrna. The very variable quality of the drug has led to the use of the resin prepared directly from the root, which affords it to the extent of 54

1 Jt was formerly called diagrydion, probably from Sdxpu, a tear, in allusion to the manner the juice exudes from the incised root,

‘per cent., and an establishment for its manufacture was founded at Broussa in 1870. The dried root is also exported to England, and the resin prepared from it there. By purification the resin can be obtained almost white. The crude resin obtained from the root, being free from gum, does not present a milky appearance when rubbed with a wetted finger, and is thus easily distinguished from the natural product.

Scammony is used in medicine as a safe but energetic purgative, and is frequently prescribed in combination with calomel and colocynth. Its medicinal activity is due to the resin scammonin, which is also called jalapin from its occurrence in the root of the male jalap (Jpomexa orizabensis), and of Tampico jalap (J. simulans) (see JALAP). The export of scammony from Smyrna in 1881 was only 97 boxes, valued at £544, the amount having decreased of late years owing to the increased export of the root from Syria. More than half of this quantity was taken by England, about one-fourth by France, and the remainder by Italy, America, and Austria.

The drug is obtained from the root by slicing off obliquely one or two inches from the crown and allowing the milky juice which exudes to drain into a small shell (generally that of a freshwater mussel), which is inserted in the root just below the base of the incision. To prevent the juice from becoming soiled, the earth is scraped away so as to leave exposed four or five inches of the root. The shells are collected in the evening and their contents emptied into a copper or leathern vessel,—the scrapings from the

surface of the root, consisting of Ha) dried tears, being added. On the average, about one drachm is afforded by each incision; a plant four years old may give two drachms; in rare cascs as much as twelve drachms has been obtained from a single large root. The collection usually takes place when the plant is in flower towards the end of summer. The product of different roots naturally varies in quality, and the peasants therefore, on arrival at their homes, render it uniform by mixing it with a knife. It is then spread out in the air todry. Sometimes the gathering of several days is allowed to accumulate, and then moistened, kneaded, and made up into cakes. During the drying it appears to undergo a kind of fermentation, which gives the drug a slightly porous appearance and dark colour. Frequently it is adulterated by adding 40 per cent. of flour and earthy matter. Itthen assumes a paler colour and opaque appear- ance, and loses its brittleness. This adulterated article is known as ‘¢skilip,” and the pure article as “virgin” scammony. The latter is met with in the form of flattened pieces half an inch or more in thickness, with a blackish, resinous fracture, thin fragments being translucent. Externally it is often covered with a greyish powder. The odour, when a piece is freshly broken, is cheesy; when chewed, it leaves an acrid sensation in the throat. Scammony of good quality should yield to ether 80 to 90 per cent. of resin; the remain- der consists of gum and mineral matter.

SCANDERBEG, 7.¢, Iskander (Alexander) Bey, is the Turkish name and title of Gzorce Castriota, the youngest son of John Castriota, lord of an hereditary prin- cipality in Albania. He was born about the year 1404, and as a boy was sent as a hostage to the Ottoman court, where he was brought up as a Mohammedan for the Turkish military service. He early distinguished himself as a soldier and received high promotion under Amurath II. In 1443 he was of the expedition against the Mag- yars, but shortly after taking .the field he heard of his father’s death and resolved to strike a blow for freedom. Availing himself of the opportunity afforded by John Hunyady’s defeat of the Turks at Nish, he forced from the principal secretary of the sultan a firman making him governor of Croya, his native town, and forthwith left the camp with 300 Albanian horsemen. Once master of the place, he abjured Islam and proclaimed his independence. The Albanians soon recognized him as their head, and flocked to his standard, and pasha after pasha was vainly sent to crush him. Amurath IJ. in person

unsuccessfully besieged him in 1450, and Mohammed II. found it neces- sary to grant him favourable terms of peace in 1461. Instigated by the legates of Pius II. and the ambassadors of the Venetian republic, Scanderbeg again proclaimed war in 1464, and at least was successful in repelling the

Territory.

sultan, who had invaded Albania. He died in January 1467 at Alessio, leaving an infant son named John, whom he commended to the care of the Venetians. After a twelve years' war, the Turks finally gained possession of Croya, the representatives of Scanderbeg settling in Calabria.

SCANDEROON (Iscanperty), or ALEXANDRETTA, lies girdled by green hills on the picturesque bay of the same name, the ancient Simus IJssicus, at the extreme north of the Syrian coast, where it forms an angle with that of Asia Minor. Alexandretta succeeded an older town of Alexandria (Little Alexandria), founded by Alexander the Great, but does not perhaps occupy quite the same site. The harbour is the best on the Syrian coast, and steamers call at it regularly, but the town is scourged with fever and has only some 2500 inhabitants, mainly Greek Christians. Jt is the port of Aleppo, and would naturally be the port of an ' Euphrates railway."

SCANDINAVIAN LANGUAGES. By this expres- sion we understand the closely allied languages which are and have been spoken by the Germanic population in Scandinavia, and by the inhabitants of the countries that have been wholly or partially peopled from it. At present the territory of these languages embraces—Sweden, except the most northerly part (Lapland and inland parts of Vesterbotten, where Finnish and Lappish exclusively or chiefly prevail); certain islands and districts on the coast of western and southern Finland, as well as Aland;} a small tract on the coast of Esthonia, where Swedish is spoken, as it is also to some extent in the Esthonian islands of Dagé, Nargé, Nukké, Ormsé, and Ragé;2 Gammal- svenskby ("Galsvenskbi") in southern Russia (govern- ment of Kherson),? a village colonized from Dagé; the Livonian island of Runé,* where Swedish is spoken, as it formerly was on the island of Osel; Norway, except certain regions in the northern part of the country, peopled by Finns and Lapps (diocese of Tromsé); Den- mark, with the Faroes, Iceland, and Greenland,

where, however, Danish is only spoken by a very small part of the population; the northernmost part of Schleswig; and, finally, several Scandinavian colonies in the United States of North America. Scandinavian dialects have besides been spoken for varying periods in the following places:

SCA—SCA

If this view be correct, the Scandinavian languages “have had an existence of more than four thousand years.® But we do not know anything about them during the period before the birth of Christ. It is only from that epoch we can get any infurmation concerning the language of the old Scandinavians, which seems by that time not only to have spread over Denmark and great parts of southern and middle Sweden and of (southern) Norway, but also to have reached Finland (at least Nyland) and Esthonia. In spite of its extension over this considerable geographical area, the language appears to have been fairly homogeneous throughout the whole territory. Con- sequently, it may be regarded as a uniform language, the

mother of the younger Scandinavian tongues, and accord- The ingly has been named the primitive Scandinavian (urnor- primitive

disk) language. The oldest sources of our knowledge of this tongue are the words which were borrowed during the first centuries of the Christian era (some of them perhaps even earlier) by the Lapps from the inhabitants of central Sweden and Norway, and by the Finns from their neighbours in Finland and Esthonia, and which have been preserved in Finnish and Lappish down to our own days.®

amount to several hundreds, with a phonetic form of a very primitive stamp ; as Finn. terva (O. Sw. tiera, Germ. theer), tar; atro (O. Sw. ar), oar; kansa (O. H. G. hansa), people; napakaira (O. H. G. nabagér, O. Sw. navar), auger ; nekla (Got. népla, O. Sw. nal), needle; ansas (Got. ans, O. Sw. as), beam; Lapp sajet (Got. satan, O. Sw. sa), sow ; garves (O. H. G. garawér, O. Sw. gor), finished ; dwvres (O. Sax. diuri, O. Sw. dyr), dear ; saipo (O. Ta. G. sezfa, Sw. sapa), soap. These words, with those mentioned by contemporary Roman and Greek authors, are the oldest existing traces of any Germanic language. Wrested from their context, however, they throw but little light on

the nature of the original northern tongue. But a, series of linguistic monuments have come down to us dating from the end of the so-called early Iron Age (about 450 a.p.),— the knowledge and the use of the oldest runic alphabet (with twenty-four characters) having at that period been

propagated among the Scandinavians by the southern

These borrowed words, denoting chiefly Borrowed utensils belonging to a fairly advanced stage of culture, words.

Norwegian in certain parts of Ireland (800-1300 a.p.) and northern Scotland, in the Isle of Man, the Hebrides (800-1400, or longer), the Shetland Islands (800-1800), and the Orkneys (800-1800);5 Danish in the whole of

Germanic tribes. In fact we still possess, preserved down

to our own times, primitive northern runic inscriptions, Runic

the oldest upon the utensils found at Thorsljerg, dating inscrip- back to about 300 a.p.!°, which, together with the MS. tions.

Age.

Schleswig, in the north-eastern part of England (the ‘‘Danelag”), and in Normandy (900-1000, or a little longer) ;° Swedish in Russia (from the end of the 9th to the beginning of the 11th century).? At what epoch the Germanic population settled in Scandinavia we cannot as yet even approximately decide. It is quite certain, how- ever, that it already existed there before the Christian éra,—nay, most probably as early as the beginning of the so-called Stone Age (three thousand years before Christ),

1 See A. O. Freudenthal, Om Svenska allmogemalet <1 Nyland, 1870 ; Ueber den Narpesdialect, 1878.

2 A. O, Freudenthal, Upplysningar om Radgé- och Wichterpalmdilet, 1875 ; H. Vendell, Laut- und Formlehre der Schwedischen Mundarten in den Kirchspielen Ormsé und Nukké, 1881,

3 H. Vendell, ‘‘Om och fran Gammalsvenskby” (Finsk Tidskrift, 1882). * H. Vendell, Runéimdalets Yud- och Jormlira, 1882-6.

° J. J. A. Worsaae, Minder om de Danske og Nordmendene ¢ fingland, Skotland, og Irland, 1851;

g Worsaae, ic.; J. C. H. R. Steenstrup, Danclag, 1882; Es. Tegnér, ‘‘Norrmiin eller Danskar i N ormandie,” and ‘‘ Ytterligare om de nordiska ortnamnen i Normandie”’ (Nordisk Tidskrift, 1884),

7 V. Thomsen, Ryska rikets grundliggning genom Skandinaverna, 1882 (The Relations between Ancient Russia and Scandinavia,

1877); 8. Bugge, ‘‘Oldsvenske navne i Rusland”’ (Arkiv for Nordisk Filologt, ii. 1885).

fragments of Ulfila’s Gothic translation of the Bible, about two hundred years later in date, constitute the oldest veritable monuments of any Germanic tongue. These runic inscriptions are for the most part found on stone-monuments (sometimes on rocks) and bracteates (gold coins stamped on one side and used for ornaments), as well as on metallic and wooden utensils, weapons, and ornaments. Up to this time there have been discovered more than one hundred, but of these only about one-half give us any information concerning the language, and most of them are only too short. The longest one, the stone-monument of Tune, in south-eastern Norway, con- tains only sixteen words. Their language is somewhat later in character than that of the oldest words borrowed by the Lapps and Finns: accented ¢, for example, is already changed into a (¢f. mariz = Goth. mérs, renowned ; but the Finn. borrowed word nékla = Goth. népla, needle), and the voiced s into a kind of r (cf. dagar= Goth. dags,

8 O. Montelius, ‘“‘Om vara forfaders invandring til] Norden” (Nordisk Tidskrift, 1884).

° W. Thomsen, Ueber den Kinfluss der Germ. Sprachen auf dite Finnisch-Lappischen, 1870.

10 0. Montelius, Die Kultur Schwedens in vorchristlicher Zeit, 1885.

11 See the plates in G. Stephens’s Mandbook of Old Northern Runic Monuments, 1884.

day ;~~but Finn. armas = Goth. arms, poor). On the other hand, in all essential matters it is much earlier in character than the language of contemporary Gothic manuscripts, and no doubt approaches more nearly than any Germanic idiom the primitive form of the Germanic tongue. For the sake of comparison, we give a Gothic translation of one of the oldest of the primitive Scandinavian inscriptions, that on the golden horn of Gallehus, found on the Danish~~ German frontier, and dating from about 400 a.p.:—

Scand.: EK HLEWAGASTIZ. HOLTINGAR. HORNA, TAWIDO ; Goth.: tk hliugasts. hultiggs. haurn. tawida ; Engl.: I, Hlewagastir, son of Holta, made the horn ;

as well as the inscription on the stonemonument of Jdrsbdrg in western Sweden, which is at least a hundred years later :—

Scand. : uBAA 111TE. WARITU ;

Goth. : war hita, hrabns wit jah tk airils rands writu ;

Engl. : In memory of Hitan. We both, Harabanar and I Erilar, wrote the runes.

NARABANAR WIT IAll EK ERILAR RUNOR

transformed its character, This change is especially noticeable in the dropping of unaccented vowels, and in the introduction of a certain vowel harmony of different kinds (“ Umlaut”, vowel changes, caused by a following z (/) or « (w), as kveedi for kwéSi, poem, and “ Brechung”, as healpa instead of helpa, to help), different assimilations of conson- ants (as U/, nn for lp, np; ll, wn, rr, and ss for 7R, mR, rR, and sk), dropping of w before o and w (as 07%, ulfr for word, word, wulfR, wolf), simplified

inflexion of the verbs, a new passive formed by means of affixing the reflexive pronoun sz to the active form (as kalla-sk, to call one's self, to be called), &c.

At this epoch, therefore, the primitive Scandinavian language must be considered as no longer existing. The next two centuries form a period of transition as regards the language as well as the alphabet which it employed.

We possess some inscriptions belonging to this period in Period of which the old runic alphabet of twenty-four characters is transition.

still used, and the language of which closely resembles that of the primitive Scandinavian monuments, as, for

Relation Although very brief, and not yet thoroughly inter- | example, those on the stones of Stentoften and Ljorketorp, to other preted,! these primitive Scandinavian inscriptions are both from southern Sweden, probably dating from the lan-

nevertheless sufficient to enable us to determine with some

10th century, and being the longest inscriptions yet found

ems certainty the relation which the language in which they with the old runic alphabet. On the other hand, inscrip- are written bears to other languages. Thus it is proved | tions have come down to us dating from about the middle that it belongs to the Germanic family of the Indo-Euro- | of the 9th century, in which the later and exclusively pean stock of languages, of which it constitutes an inde- | Scandinavian alphabet of sixteen characters has almost pendent and individual branch. Its nearest relation being | completely superseded the earlier alphabet, from which it the Gothic, these two branches are sometimes taken | was developed, while the language not only differs widely together under the general denomination Hastern Germanic, | from the original Scandinavian, but also exhibits dialec- as opposed to the other Germanic idioms (German, English, | tical peculiarities suggesting the existence of a Danish- Dutch, &c.), which are then called Western Germanic, | Swedish language as opposed to Norwegian, as the

form Dialects. The most essential point of correspondence between the | 7uvw/f on the stone at /lemlise in Denmark, which in a Gothic and Scandinavian branches is the insertion in certain | Norwegian inscription would have been written hruulf cases of gg before w and j (ggj in Gothic was changed | corresponding to ro/f in Old Norwegian literature. into ddj), as in gen. plur. O. H. G. zwetio, O. Engl. twega | These differences, however, are unimportant, and the (two), compared with O. Icel., O. Norw. tveggja, O. Sw., | Scandinavians still considered their language as one and O. Dan. twiggje, Goth. twaddjé; and, still, in Germ. trew, | the same throughout Scandinavia, and named it Donsk Engl. true, compared with Sw., Norw., Dan. trygg, Icel. | twnga, Danish tongue. But when Iceland was colonized tryggr, Goth. triggws. However, even in the primitive | at the end of the 9th and the beginning of the 10th Scandinavian age the difference between Gothic and | century, chiefly from western Norway, a separate (western) Scandinavian is more clearly marked than the resem- | Norwegian dialect gradually sprang up, at first of course blance ; thus, for example—just to hint only at some of.| only differing slightly from the mother-tongue. It was the oldest and most essential differences—Goth. nom. sing, | not until the introduction of Christianity (about 1000 ending in -s corresponds to primitive Scandinavian -aR, rR | 4D.) that the language was so far differentiated as to (as Goth. dags, day, gasts, guest = Scand. dagar, gastir) ; | enable us to distinguish, in runic inscriptions and in the Goth. gen. sing. in -¢s to Scand. -as (as Goth. dagis, day’s = literature which was then arising, four different dialects, Scand. dagas) ; Goth. dat. sing. in -a to Scand. ~~e (as Goth. which have ever since existed as the four literary lan~~ kaurna, corn=Scand. kurne); Goth. Ist pers. sing. pret. guages—lIcelandic, Norwegian, Swedish, and Danish. Of in -da to Scand. -do (as Goth. tawida, did =Scand. tawido), | these the latter two, often comprehended within the name As early as the beginning of the so-called later Iron of Eastern Seandinanan, as well as the former two, Western Age (about 700 a.p.) the primitive Scandinavian language Scandinavian, or, to use the Old Scandinavians’ own name, Trans- had undergone a considerable transformation, as is proved Norrgnt mal, Northern tongue, are very nearly related to ‘Sa for example by the remarkable runic stone at Istaby in | each other. ‘The most important differences between the Ditfer-

two branches, as seen in the oldest preserved documents, ences are the following :—(1) In E. Scand. far fewer cases of Labi “ Umlaut,” as vdri, W. Scand. veri, were ; land, W. Scand. ,n4 lond (from landu), lands; (2) E. Scand. “ Brechung” of Western

2 into 7 (or 0) before ng(w), nk(w), as siunge, W. Scand. Scandi-

the south of Sweden, with the inscription—

AFATR HARIWULAFA HAPUWULAFR HAERUWULAFIA WARAIT RUNAR PAIAR ;

Engl.: In memory of Hariwulfr, Hapuwulfr, son of Heruwulfr, wrote these runes,

Here, ¢.g., we find nom, sing. in -aR changed into -7 (cf. navian,

hapuwulafr with holtingar on the golden horn), and the plural ending -or into -ar (cf. runaR with runor on the Jirsbirg-stone). At the beginning of the so-called Viking Period (about 800 a.p.) the Scandinavian language seems to have undergone an extraordinarily rapid development, which in a comparatively short time almost completely

1 For the interpretations we are principally indebted to Prof, 8S. Bugge’s ingenious investigations, who in 1865 satisfactorily suc- ceeded in deciphering the inscription of the golden horn, and by this Means gained a fixed starting-point for further researches. A short review of their most important results is given by F, Burg, Die dlteren Nordischen Runeninschriften, 1885.

syngva (from singwa), to sing; (3)in E. Scand. mp, nk, nt are In many cases not assimilated into pp, kk, tt, as krumpen, W. Scand. kroppenn, shrunken ; enkie, W. Scand. ekkja, widow ; bant, W. Scand. batt, he bound ; (4) in E. Scand. the dative of the definite plural ends in -omen instead of W. Scand. -onom, as in handomen, hendonom, (to) the hands; (5) in E. Scand. the simplification of the verbal inflexional endings is far further advanced, and the passive ends in -s for ~~sk, as in kalles, W. Scand. kadllask, to be called In several of these points, and indeed generally speaking, the Western~~

~~Scandinavian languages have pre~~ served the more primitive forms, as may be seen in the

Icu- LANDIC.

Old Iee- landic.

Sourees.

Form of

the lan- guage.

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oldest Eastern Scandinavian runic inscriptions, dating from a period before the beginning of the literature, as well as in many modern Eastern Scandinavian dialects, For, having regard to the Scandinavian dialects generally, we must adopt quite a different classification from that indicated by the dialects which are represented in the literature. We now pass on to review the latter and their history.

I, IcrtaAnpic.—In ancient times Icelandic was by far the most important of the Scandinavian languages, in form as well as in literature. To avoid ambiguity, the language before tho Reforma- tion (about 1580-40) is often called Old Icelandic.

1. Old Icelandic was spoken not only in Iceland, but also in Green- land, where Icelandic colonists lived for a lengthened period (983- about 1400). Our knowledge of its character is almost exclusively derived from the remarkably voluminous literature,! dating from the middle of the 12th century, and written in the Latin alphabet, adapted to the special requirements of this language. Nothing is preserved of older runic literature.? Indeed, Old Icelandic pos- sesses only very few runie monuments (about forty), all of them almost worthless from a philological point of view. The oldest, the inscription on the church door of Valpjdfstadr, dates from the beginning of the 13th ecntury,? and is consequently later than the oldest preserved manuscripts* in the Latin alphabet, some of which

are as old as the end of the 12th century. A small frag- ment (Cod. AM. 2387, fol.) of a Book of Homilies (of which a short specimen is given below) is considered the oldest of all. About contemporary with this is the oldest part of an inventory entitled Reykjaholts mdldage. From about 1200 we possess a fragment (Cod. Reg. old sign. 1812) of the only existing Old Icelandic glossary, and from the first years of the 18th century the Stockholm Book of Homilies (Cod. Holm. 15, 4to), which from a philological point of view is of the greatest importance, chiefly on account of its very accurate orthography, which is especially noticeable in the indica- tion of quantity; from the early part of the same century comes the fragment (Cod. AM. 325, 2, 4to) entitled grip (“ abridgment” of the history of Norway), probably a copy of a Norwegian original, also orthographically important. Among later manuscripts we may mention, as philologically interesting, the Annales Regi (Cod. Rog. 2087) from the beginning of the 14th century, orthographically of great value; the rich manuscript of miscellanies, Hauwksbdk (Codd. AM. 3871, 544, 675, 4to), a great part of which is written with THaukr Erlendsson’s (+1334) own hand; and, above all, threc short essays, in which some Icelanders have tried to write a grammatical and orthographical treatise ou their own mother-tongue, all three appearing as an appendix to the manuscripts of the Prose Edda. The oldest and most important of these essays (preserved in tho Cod. Worm. from about 1330) is by an unknown author of about 1150, and is probably intended to be a continuation of a lost work of the first grammarian of Iceland, péroddr Runamcistari (who flourished at the beginning of the 12th century); the second (the oldest known manuscript of which is preserved in the Cod. Ups., c. 1290) is perhaps the work of the famous Snorri Sturloson (+1241) ; the third (the oldest manuscript in Cod. AM. 748, 4to, of the begin- ning of the 14th century) is by Snorri’s nephew Olafr Hvitaskald (+1259), and is no doubt based partly upon Pérodd’s work above mentioned, partly and ehiefly upon Priscian and Donatus.®

The oldest form of the Icelandic language is, however, not pre- served in the above-mentioned earliest manuscripts of the end of the 12th century, which are written in the language of their own age, but in far later ones of the 18th century, which contain poems by the oldest Icelandic poets, such as the renowned Egill Skalla- grimson (about 930) and the unknown authors of the so-called Hdda-songs. In spite of the late date of the manuscripts, the

metrieal form has been the means of preserving a good deal of the ancient language. But, as already remarked, during the 10th and 11th centuries this dialect differs but little from Norwegian, though in the 12th this is no longer the case.

We may here contrast a specimen of the above-mentioned oldest Icelandie manuscript (from the end of the 12th century) with an almost contemporary Norwegian one (Cod. AM. 619; see below):—

1 A complete catalogue of the literature edited hitherto is given by Th. MGbius, Catalogus Librorum Islandicorum et Norvegicorum Aitatis Mediz, 1856, and Ver- zeichniss der . . . altisldindischen und altnorwegischen… von 1855 bis 1879 erschienenen Schriften, 1880. Compare IcELAND.

3 an y ee eeu | ie ac ae den Oldislandske literatur, 1883,

ee Kr. Kualun slands fortidslevninger" (in the Aarddge Oldkyndighed, 1882). a one ee

4 An account of all the oldest Icclandic manuscripts (to about 1230) is glven by J. Hoffory in the Gétt. Gel. Anz., 1884, p. 478 sq.

5 A short review of the most important Old Icelandic manuscripts (and their editions), classed according to subjects, is given by O. Brenner, Altnordisches Handbuch, pp. 13 sg. The principal collections of manuscripts are—1l, the Arnamagnzan (AM.) in Copenhagen, founded by Arni Magniisson (+1730); 2, the collection of the Royal Library (Reg.) in Copenhagen, founded by Th. Torfzus (+1719) and Brynjélfr Sveinsson (+1674); 8, the Delagardian collection (Delag, or Ups.) at Upsala, founded in 1651 by Magnus Gabriel de la Gardie; 4, the

Stockholm collection (Holm,), founded by Jén Rugman (in 1662 Eggertson (in 1682). (: – = . ares

Iccl.—"n pat es vitanda, at allt ma andlega merkiase oc fyllasec i oss, pat es til kirkio bunings epa pionosto parf at haua, ef ver liuom sva hreinlega at vér sem verper at callasc gops mustere.

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Norw.—En pat er vitanda, at allt ma andlega merkiase oc fyllasc i os, pat er til kirkiu bunings eda til pionasto parf at hafa, ef vér lifum sva reinlega, at vér sem verdir at kallasc guds mysteri.

Engl,-—And thatis to be known that all that is needed for the decoration of the church or the service may, spiritually, be found and imitated within us, if we live so cleanly that we are worthy to be called

God’s temple.

Apart fron the fact that the language is, generally speaking, arehaie, we find in the Icelandic text two of the oldest and most essential characteristics of Icelandic as opposed to Norwegian, viz., the more complete vowel assimilation (pionosto, pionasto ; ef. also, c.g., Icel. Kollopom, Norw. kalladwm, we called) and the retention of initial 2 before 7 (hretnlega, reinlega), 1, and ». Other differ- ences, some of which occur at this period, others a little later, are— in Icel. lengthening of a, 0, % before lf, lg, lk, lm, and Zp (as Icel. halfr, Norw. and oldest Icel. halfr, half); later still, also of a, 2, 2, and y before ng and nk; Icel. & and cy for older g and @y (as in Icel. dénu, heyra, Norw. and oldest Icel. déma, to deem, héyra, to hear); Icel. termination of 2nd plur. of verbs in -3 (p) or -t, but Norw. often in -r (as Icel. taki, -t, Norw. takir, yon take). These points may be sufficient to characterize the language of the earlier ‘elassical” period of Icelandic (about 1190-1350). At the middle of the 18th century the written language undergoes material changes, owing in a great measure, no doubt, to the powerful influenec of Snorri Sturloson. Thus in unaccented syllables 7 now appears for older e, and wu (at first only when followed by one or more eon- sonants belonging to the same syllable) for 0; the passive ends iu -2 for ~~sk. The other differences from Norwegian, mentioned above as occurring later, are now completely established. With the begin~~ ning of the 14th century there appear several new linguistic pheno- mena: au is inserted between final 7 and a preceding consonant (as in rékur, mighty); 9 (pronounced as an open 0) passes into 6 (the character 6 was not introduced till the 16th century), or before ng, nk into au (as long, figll, pronounced laung, fidll) ; e before ng, nk passes into e7; a little later é passes into ze, and the passive changes its termination from -z, oldest -sk, into -z¢ (or -zs¢)

(as in kallazt, to be called). The post-classical period of Old Icelandic (1350-1530), which is, from a literary point of view, of but little iunportance, already shows marked differences that are eharacter- istic of Modern Icelandic ; as early as the 15th century we find ddl – for 77 and 71 (as falla, pronounecd faddla, to fall), dd for an and rn (as horn, pron. hoddn, horn); about the year 1500 ve after passes into vo, in other positions to vé (as hvelpr, pron. xvolpur, whelp; kvern, pron. kvdrn, mill), ete.

Although dialectical differences are not altogether wanting, they Dialects.

do not occur to any great extent in the Old Icelandie literary language. Thus, in some manuscripts we find /¢ replaced by /st (oft, ofst, often) ; in manuscripts from the western part of the island there appears in the 18th and 14th centuries a tendency to change If, rf into 1b, rb (tolf, tolb, twelve ; porf, perb, want), &c. To what extent the language of Greenland differed from that of Iceland we cannot judge from the few runic monuments which have come down to us from that colony.

Apart from the comparatively inconsiderable attempts at a Gram- grammatical treatment of Old Icelandic in the Middle Ages which matical we have mentioned above, grammar as a science can only be said treat- to have commenced inthe 17th century. The first grammar, written ment.

by the Icelander Runolphus Jonas (+1654), dates from 1651. His contemporary and compatriot Gudmund Andres (+1654) compiled the first dictionary, which was not, however, edited till 1688 (by the Dane Petrus Resenius, +1688). The first scholars who studied Old Icelandie systematically were H. K. Rask (1787-1832), whose works 6 laid the foundation to our knowledge of the language, and his great contemporary Jac. Grimm, in whose Deutsche Grammatik (1819 sq.) particular attention is paid to Icclandic. Those who since the time of Rask and Grimm have principally deserved well of Icelandic grammar are—the ingenious and learned Norwegian P. A. Munch, 1863,’ to whom we really owe the normalized orthography that has hitherto been most in use in editing Old Icelandic texts; the lcarned Icelander K. Gislason, whose works are chiefly devoted to phonetic researches ;8 the Danish scholars K. J. Lyngby (+1871), the anthor of an essay ® whieh is of funda- mental importanco in Icelandic orthography and phonetics, and L, F. A. Wimmer, who has

rendered great services to the study of the etymology.!® The latest Icelandic grammar is by the Swede Ad. Noreen.” As lexieographers the first rank is held by the

6 .g., Veiledning til det Islandske sprog, 1811; in a new, much improved Swedish edition, Anvisning tit Isldndskan, 1818.

7 Fornswenskans och Fornnorskans sprakbyggnad, 1849, and (along with C. R. Unger) Norrénasprogets grammattk, 1847,

8 Especially Um frumparta Islenzkrar tingu ¢ fornéld, 1846.

® Den Oldnordiske udtale, 1861. 10 Fornnordisk formidra, 1874.

11 Alttsldndische und altnorwegische Grammatik unter Berticksichtigung des Urnordischen, 1884.

‘alects.

q

1 ae

jatial jeat-

Jent,

BCANDINAVIAN LANGUAGES

Icelanders Sy. Egilsson (+1852),1 G. Vigfiisson,? and J. porkels son,* and the Norwegian J. Fritzner.4

2. Modern Icelandic is generally datcd from the introduction of the Reformation into Iceland; the book first printed, the New Testament of 1540, may be considered as the earliest Modern Icelandic document. Although, on account of the exceedingly conservative tendency of Icelandic orthography, the language of Modern Icclandic litcrature still seems to be almost identical with the language of the 17th century, it has in reality undergone a constant and active development, and, phonetically regarded,

has changed considerably. Indeed, energetic efforts to bring about an orthography more in accordance with phonetics were made during the years 1885-47 by the magazine entitled Hélnir, where we find such authors as Jonas Hallgrimsson and Konr. Gislason ; but these attempts proved abortive. Of more remarkable etymological changes in Modern Icelandic we may note the following :—already about the year 1550 the passive termination -z¢ (-zst) passes into the till then very rare termination ~~st (as in kallast, to be called) ; y, §, and ey at the beginning of the 17th century coincided with 2, 4, and ei; the long vowels d, &, and 6 have passed into the diph~~ thongs au (at least about 1650), az (about 1700), ow (as mdi, language, mela, to speak, stdéld, chair); g before 1, j is changed into dj (after a consonant) or 7 (after a vowcl),—e.g., liggia, to lie, ezg?, not; in certain other cases g has passed into gw or w,—e.g., ldgur, low, Yuga, to lie; initial g before n is silent,—e.g., (g)naga, to gnaw; kn has passed into hn,— é.g., kuitr, knot; ps, pt into fs, ft; bb, dd, gg are pronounced as bp, dt, gk, and Ul, rl, nn, rm now in most positions – (not, however, before d, ¢, and s, and in abbreviated names) as dél, din,— as fjall, mountain, bjérn, bear ; f before n is now pronounced as bp, — ashrafn, raven, &c. Both in vocabulary and syntax we find early, €.g., in the lawbook Jénsbék, printed in 1578(—80), Danish exercis- ing an important influence, as might be expected from political circumstances. In the 18th century, however, we meet with purist tendencies. As one of the leading men of this century may be mentioned the poet Eggert Olafsson (+1768), whose poems were not printed till 1832. Worthy of mention in the history of Modern Icelandic language are the learned societies which appeared in the same century, of which the first, under the name of ‘* Hid ésyuilega,” was established in 1760. At this time archaic tendencies, going back to the Old Icelandic of the 18th and 14th centuries, were continually gaining ground. In our century the following havo won especial renown in Icelandic literature :— Bjarne Porarenseu (+1841), Iceland’s greatest lyric poet, and Jénas Hallgrimsson (+1845), perhaps its most prominent prose-author in modern times.®

The dialectical differences in Modern Icelandic are comparatively trifling and chiefly phonetic. The Westland dialect has, for exainple, ,preserved the Old Icelandic long a, while the other dialects have changed it to the diphthong aw; in the Northland dialect initial kn is preserved, in the others changed into hn; in the northérn and western parts of the island Old

Icelandic hw appears as kv, in a part of south-eastern Iccland as x, in the other dialects as xw,—e.g., hvelpr, whelp. Asa matter of curiosity it may be noted that on the western and eastern coasts traces are found of a French-Icelandic language, which arose from the long sojourn of French fishermen there.

Owing to the exclusive interest taken in the ancient language, but little attention is given even now to the granimatical treatment of Modern Icelandic. Some notices of the language of the 17th century may be obtained from the above-mentioned grammar of Runolphus Jonas (1651), and for the language of the 18th from Rask's grammatical works. For the language of our own time there is hardly anything to refer to but N. Fridriks- son's works, J/slenzk mdlmyndalgsing, 1861, and Skgring hinna almennu mdalfredislegu hugmynda, 1864, which, however, are not especially devoted to the modern state of philology ; compare also B. Magnusson Olsen's valuable paper ‘‘ Zur neuislandischen Grammatik" (Germania, xxvii., 1882).

II. NorwkGian or Norst.—The Old Norwegian language (till the Reformation) was not, like the modern language, confined to Norway and the Faroes, but was, as already stated, for some time

1 Lexicon poeticum, 1854-60.

2 An Icelandic-English Dictionary, based on the MS. collections of the late R. Cleasby, 1869-74.

3 Supplement ttl Islandske ordbpger, 1876 and 1879-85,

4 Ordbog over det Gamle Norske sprog, 1862-67 ; new ed., 1883 sq,

5 Sce R. Arpi, "Islands yngre literatur och sprik" (Sprdkvetenskapliga sdll-skapets forhandlingar, 1883-85).

6 Notices of the Modern Icelandic pronunciation are also to be found in II. Sweet's Handbook of Phonetics, 1877, Chr, Vidstcen's Oplysninger om Bygde- maalene t Hardanger, 1885, and R. Arpi's above-quoted paper.

spoken in parts of Ireland and the north of Scotland, the Isle of Man, the Hebrides, Shetland, and Orkney (in the last two groups of islands it continued to survive down to modern times), and also in certain parts of western Sweden as at present defined (Bohuslan, Sarna in Dalarna, Jimtland, and Harjedalen).

Our knowledge of it is due only in a small measure to runic Sources.

inscriptions,' for these are comparatively few in number (a little more than one hundred) and of trifling importance from a philological point of view, especially as they almost wholly belong to the period between 1050 and 1850,8 and consequently are contemporary with or at least not much earlier than the earliest literature. The whole literature preserved is written in the Latin alphabet. The earliest manuscripts are not much later than the oldest Old Icelandic ones, and of the greatest interest. On the whole, however, the earlicst Norwegian literature is in quality as well as in quantity incomparably inferior to the Icclandic. It amounts merely to about a score of different works, and of these but few are of any literary value. A small fragment (Cod. AM. 655, 4to, Fragm. ix., A, B, C), a collection of legends, no doubt written a little before 1200, is regarded as the earliest extant manuscript. From the very beginning of the 18th century we have tho Norwegian Book of Homilies (Cod. AM. 619, 4to) and several fragments of law-books (the older Gulapingslaw and the older Lidsivapingslaw). The chief manuscript (Cod. AM. 248B., fol.) of the principal work in Old Norwegian literature, the Speculwm Regale, or Konungsskuggsjé ('* Mirror for Kings"), is a little later. Of still later manuscripts the so-called legendary Olafssaga (Cod. Delag. 8, fol.), from about 1250, deserves mention. The masses of charters which—occurring throughout the whole Middle Age of Norway ° from the beginning of the 18th century—afford much information, especially concerning the dialectical differences of the language, are likewise of great philological importance.

As in Old Icclandic so in Old Norwegian we do not find the Form of most primitive forms in the oldest MSS. that have come down the lan- to us; for that purpose we must recur to somewhat later ones, guage.

containing old poems from times as remote as the days of Brage Boddason (the beginning of the 8th century) and pjédolfr of Hvin (end of tho same century). It has already been stated that the language at this epoch differed so little from other Scandinavian dialects that it could scarcely yet be called by a distinctive name, and also that, as Icelandic separated itself from the Norwegian mother-tongue (about 900), the difference between the two languages was at first infinitely small—as far, of course, as the literary language is concerned. From the 18th century, however, they exhibit more marked differences ; for, while Icelandic develops to a great extent independently, Norwegian, owing to geographical and political circumstances, is considerably influenced by the Eastern Scandinavian languages. The most important differences between Icelandic and Norwegian at the epoch of the oldest MSS. (about 1200) have already been noted. The tendency in Norwegian to retain the use of the so-called w-Umlaut has already been mentioned. On the other hand, there appears in Norwegian in the 13th century another kind of vowel-assimilation, almost unkuown to Icclandic, the vowel in terminations being in some degree influenced by the vowel of the preceding syllable. Thus, for instance, we find in some manuscripts (as the above-mentioned legendary Olafssaga) that the vowels ¢, o and long a, #, ¢ are followed in terminations by e, 0; 2, uw, y, and short a, &, ¢, on the other hand, by 7, w,—-as in béner, prayers, konor, women ; but ttdir, times, tungur, tongues. The same fact occurs in certain Old Swedish manuscripts. When Norway had been united later with Sweden under one crown (1819) we meet pure Suecisms in the Norwegian literary language. In addition to this, the 14th century exhibits scveral differences from the old language??: al, 7m are sometimes assimilated into 72, n,—as kall (elder karl), man, konn (korn), corn, prestanner (prestarnir), the priests; 7 passes into y before 7, 1,—as hyrdtr (hirdir), shepherd, lykyl (lykiilt), key ; final -r after a consonant is changed into -er or -x7, sometimes only -¢, ~~#,—as hester (hestr), horse; b¢ker (békr), books; the names polleifer (Porleifr), Gudleife (Gudleifr). About the beginning of the 15th century initial &v occurs for old hv (not, however, in pronouns, which take kv only in western Norway), as the local name @vitesetd (hvttr, white). During the 15th century, Norway being united with Denmark, and at intervals also with Sweden, a great many Danisms and a few Suecisms are im~~ ported into the language. As Suecisms we may mention the ter- mination

-in of the 2d pers. plur. instead of -ir, -78 (as vilin, you will), the pronoun jak instcad of ek, J. The most important Danisms

7 For these see especially Nicolaysen, Vorske fornievninger, 1862-66.

8 The oldest are those on the Valdby- (Larvik) and Strand- (Aafjord) stones, both from pagan times. The latest rune-stones are from the end of the 14th century. Owing to influence of tho learned such stones appear again in the 17th century, é.g., in Telemarken.

» On the Old Norwegian manuscripts see the works cited in notes 4, 5, page 368; for the literature hitherto edited sce note 1, page 368.

10 The present writer is indebted to Prof. Joh. Storm for the following remarks on the history of the Norwegian lkinguage and its dialects during the 14th and

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are the following: 0, d, and g are substituted for y, ¢, and i, —as in the local names Nadb¢ (earlier Napa), Tvede sogn (preita sékn) ; -a in terminations passes into ~~e,—as hegre (hayra), to hear, sdghe (spkja), to scek ; single Danish words are introduced,—as jek (ek), I, se (sd), to see ; spgrge (spyrja), to ask, &c. Towards the end of the Middle Ages the Danish influence shows an immense Increase, which marks the gradual decline of Norwegian literature, until at last Norwegian as literary language is completely supplanted by Danish, During the 15th century Norway has hardly any litera~~ ture exeept charters, aud as early as the end of that century by far the greatest number of these are written in almost pure Danish. In the 16th century, again, charters written in Norwegian occur only as rare exceptions, and from the Reformation onward, when the Bible and the old laws were translated into Danish, not into Norwegian, Danish was not only

the undisputed literary language of Norway, but also the colloquial language of dwellers in towns and of those who had learned to read. For the rise in reeent times of a new Norwegian language, employed in literature and spoken by the educated classes, see p. 3738. f

Dialectical differences, as above hinted, occur in great number in the Norwegian charters of the 13th, 14th, and 15th centuries. Especially marked is the difference between the language of western Norway, which, in many respeets, shows a development parallel to that of Ieelandie, and the language of eastern Norway, which exhibits still more striking correspondences with contem- porary Old Swedish. The most remarkable characteristics of the eastern dialects of this epoch are the following :—a is changed into gz in the pronouns penn, this, bet, that, and the particle ber, there (the latter as early as the 13th century), and later on (in the 14th century) also in terminations after a long root syllable, —as senda, to send, Adyrx, to hear (but gera, to do, vita, to know); ta passes (as in Old Swedish and Old Danish) into iwz—as hizwrta (Icel. hyarta), heart; y sometimes passes into iw before 1, 1,—as hiwrder, shep- herd, Zykiul, key, instead of hyrSir, lykyl (older still, hirdir, lykill; see above, p. 369); final -r after a consonant often passes into -ar, sometimes only into -a,—as prestar (prestr), priest, bpkar (békr), books, dat. sing. brg8a (drgdr), (to a) brother; ¢/ passes into tsl, sl, —as lisla (litle), (the) little, the name Afsle, Asie (Atle); ys gives a ‘‘thick” s-sound (written /s),—as Bardols, genitive of the name Bergpérr; nd, id are assimilated into nn, 1/,—as bann (band), band, the local name Westfoll (Vestfold) ; and (as far back as the 13th century) traces occur of the vowel assimilation, ‘‘tiljevning,” that is so highly characteristic of the modern Nor- wegian dialects, —as voko, vuku, for vaku, (Icel. vpko, -u), accusative singular of vaka, wake, mykyll for mykill, much. On the other land, as characteristics of the western dialects may be noted the following : —final -r after a consonant passes into -wr, -or, —as velwur (vetr), winter, rettwr (réttr), right, aftor (aftr), again ; s/ passes into tl,—as sytila (s§sla), charge ; hvis changed into kvalso in pronouns, —as kver (hverr), who, kvassu (hversu), how.

This splitting of the language into dialects seems to have continued to gain ground, probably with greater rapidity as a Norwegian literary language no longer existed. Thus it is very likely that the’present dialectical division was

in all essentials accom- plished about the year 1600; for, judging from the first work on Norwegian dialectology,} the Sgndfjord (Western Norway) dialect at least possessed at that time most of its present features. A little clog-calendar of the year 1644 seems to prove the same regarding the Valders (Southern Norway) dialect. How far the Old Norwegian dialects on the Faroes, in Ireland and Scotland, on the Scottish islands, and on the Isle of Man differed from the mother-tongue it is impossible to decide, on account of the few remnants of these dialects which exist apart from local names, viz., some charters (from the beginning of the 15th century onward) from the Faroes? and Orkneys,' and a few runic inscriptions from the Orkneys (thirty in number)' and the Isle of Man (fourteen in number).° These runic inscriptions, however, on account of their imperfect ortho- graphy, throw but little light on the subject. Of the Orkney dialect we know at least that initial 2, hn, hr still preserved A in the 13th century,—that is, two hundred years longer than in Norway.

Old Norwegian grammar has hitherto always been taken up in connexion with Old Icelandic, and confined to notes and appen- dices inserted in works on Icelandic grammar. A systematic treatise on Old Norwegian grammar is still wanting, with the exception of a short work by the Danish scholar N. M. Petersen (+ 1862), which, although brief and decidedly antiquated, deserves all praise. A most valuable collection of materials exists, how- ever, in the Norwegian charters, carefully and accurately edited by the Norwegian scholars Chr. Lange (+1861) and C. R. Unger,' and in a few texts edited with diplomatic accuracy.®

1 Chr, Jensen's Norsk dictionarium eller glosebog, 1646.

2 See Diplomatarium Norvegicum vol. i. u. 589 and 591.

3 See Dipl. Norv., i. n. 308.

4 See P. A. Muneh, Samlede afhandlinger, iv. 516 sq.

5 See Muneh, Sami. afh., iii, 181 sq.

& Det Danske, Norske, og Svenske sprogs historte, part ii. pp. 1-96 (ed. 1830).

? Diplomatarium Norvegicum, 1857 sq.; 10 vols. have already appeared.

8 Compare the prefaces to Vigftisson’s edition of the Eyrbyggjasaga (1864),

Il], Swepisu.—The Pre-Reformation language is called Old Swenisx,

Swedish.

1. Old Swedish.—The territory of the Old Swedish compre- Old

hended—({1) Sweden, except the most northerly part, where Swedish,

Lappish (and Finnish ?) was spoken, the most southerly (Skane, Halland, and Blekinge—see below, p. 378), and certain parts of western Sweden (see above, p. 369); (2) extensive maritime tracts of Finland, Esthonia, and Livonia, with their surrounding islands; and (8) certain places in Russia, where Swedish was spoken for a short time. of onr knowledge of Old Swedish are those words, almost ex- clusively personal names (nearly one huudred), which were introduced into the Russian language at the foundation of the Russian realm by Swedes (in 862), and which are for the most part somewhat influenced by Russian phonetic laws, pre- served in two Russian documents of the years 912 and 945,9—as Igor (O. Sw. Ingvar), Rurik (Ar¢rikr), Oleg (Hialge, secondary form of Helge), Olga (Hialga, Helga). Of about the same date, but of an infinitely greater variety, are the runic inscriptions, amounting in number to about two thousand, which have been found cut on stones (rarely wood, metal, or other materials) almost all over Sweden, though they occur most frequently (about half of the total number) in the province of Uppland, next to whicli come Sodermanland, Ostergdtland, and Gotland, with about two hundred each. For the most part they are tombstones or monu- ments in memory of deceased relatives, rarely public notices. Their form is often metrical, in part at least. Most of them are anonymous, in so far that we do not know the name of the engraver, though, as a rule, the name of the man who ordered them is recorded, Of the engravers named, about seventy in nuniber, the three most productive are Ubir, Bali, and Asmundr Karasun, all three principally working in Upland ; the first-mentioned name is signed on about

forty, the others on nearly twenty stones each. These inscriptions vary very much in age, belonging to all centuries of Old Swedish, but by far the greatest number of them date from the 11th and 12th centuries. From heathen times—as well as from the last two centuries of the Middle Ages—we havc com- paratively few. ‘T’lie oldest are probably the Ingelstad inscrip- tion in Ostergétland, and the Gursten one found in the north of Smaland.!° The rune stone from Rok in Ostergdtland prob- ably dates from the first half of the 10th century. Its inscrip- tion surpasses, all the others both in length (more than one hundred and fifty words) and in the importance of its contents, which are equally interesting as regards philology and the history of culture; it is a fragment (partly in metrical form) of an Old Swedish heroic tale! From about the year 1000 we possess the inscriptions of Asmundr Karasun, and from about 1050 the so-called Ingvar monuments (about twenty in number), erected most of them in Sédermanland, in honour of the men who fell in a great war in eastern Europe under the eommand of a certain Ingvar ; the stones cut by Bali belong to the same period. Somewhat later are the inscriptions cut by Ubir, and about contemporary with them, viz., from the beginning of the 12th century, is the remarkable inscription on the door-ring of the church of Forsa in Helsingland, containing the oldest Scandinavian statute !* now preserved, as well as other inscriptions from the same province, written in a particular variety of the common runic alphabet, the so-called “ staflésa ” (stafiless, without the perpendicular staff) runes, as the long genealogical inscription on the Malstad-stone. The inscrip- tions 1 of the following centuries are of far less philological interest, because after the 18th century there exists another and more fruit- ful source for Old Swedish, viz., a literature in the proper sense of the word, which was only in a limited degree written in runes. Of the runic literature hardly anything has been preserved to our days,4 while the literature in the Latin letters is both in quality and extent incomparably infcrior to Old Icelandic, though it, at least in quantity, considerably surpasses Old Norwegian. In age, however, it is inferior to both of them, beginning only in the 18th century. The oldest of the extant manuscripts is a codex of the Older Vestgitalaw (Cod. Holm. B 59), written about the year 1290, and philologically of the greatest importance. Not much later is a codex of the Uplandslaw (Cod. Ups. 12) of the year 1300. Of other works of value from a philological point of view we

only mention a codex of the Sédermannalaw (Cod. Holm. B 58) of about 1380, the two manuscripts containing a

Keyser's and Unger's editions of the legendary Olafssaga (1849), and Bariaams Saga ok Josaphats (1851), Unger's ed. of pidrekssaga (1853), and Th. Mébius's essay Ueber die altnordische Sprache, pp. 15-18 (1872).

9 See V. Thomsen, Ryska rikets grundliggning, especially p. 114 sq.; 8S. Bugge, " Oldsvenske navne i Rusland" (Arkiv f. Nord. Filol., ii.).

10 Kindly communicated by Prof. 8. Bugge.

11 See S. Bugge, "Tolkning af runeindskriften pa Rékstenen" (Antiqvarisk Tidskrift f. Sverige, v., 1878).

12 See 8S. Bugge, Runeindskriften paa ringen t Forsa Kirke, 1877.

13 For the runie inseriptions in general, see above all J. G. Liljegren, Runur- kunder, 1833; J. Géransson, Bautil, 1750; R. Dybeek, Svenska runurkunder, 1855-59, and Sverikes runurkunder, 1860-76; and the Journals of the antiquarian soeieties in Sweden.

14 See L. F. Leffler, " Fornsvenska runhandskrifter " (Nordisk Tidskrift, 1879).

The oldest but also the most meagre sources Sources,

collection of legends generally named Cod. Bureanus (written a little after 1350) and Cod. Bildstenianus (between 1420 and 1450), and the great Oxenstiernian manuscript, which consists chiefly of a collection of legends written for the most part in 1385. The very numerous Old Swedish charters, from 1843 downwards, are also of great importance.' Form of Old Swedish, during its earliest pre-literary period (900-1200), the lan- retains quite as original a character as contemporary Old Icelandic guage, and Old Norwegian. The first part of the inscription of the Rok- stone running thus — AFT UAMUp STANTA RUNAR pAR IN VARIN FAI FApPLA AFT

FAIKIAN SUNU,? and probably pronounced— eft Wamdéd standa rinar pér ; en Warenn fade fader eft feighian sunu, would, no doubt, have had the same form in contemporary Icclandic, except the last word, which would probably have had the less original form sun. The formal changes of the Swedish language during this period are, generally speaking, such as appear about the same time in all the members of the group,—as the change of soft R into common r (the Rok-stone runar, later rwnar, runes ; this appeared earliest after dental consonants, later aftcr an accented vowel), and the change of sp into s¢ (in the 10th century raispi, later reisti, raised); or they are, at least, common to it with Norwegian, —as the dropping of & before /, n, and 7 (in the 10th century hraur, younger rr, cairn), and the changing of nasal vowels (the long ones latest) into non-nasalized. A very old specific Swedish charac- teristic, however, isthe splitting up of 7 into 7 before ngw, nkw,— as siunga, to sing, stwnka, to sink, from primitive Scandinavian singwan, sinkwan (Icel.-Norw. syngvd, sékkva). But the case is altogether different during what we may call the classical period of Old Swedish (1200-1350), the time of the later runic inscriptions andthe oldestliterature. During this period the language is already distinctly separate from the (literary) Icelandic-Norwegian (though not yet from Danish). The words of the Older Vestgétalaw— FALDER KLOCK NIDER I HOVOP MANNI, BOTI SOPCN MARCHUM PRIM, EN HAN FAR BAN AF—* would in contemporary Icelandic be— fellr klukka nidr i héfud manni, beti sékn mérkum prim, ef hann fer bana af. : These few words exhibit instances of the following innovations in Swedish :—d is inserted between J (nn) and a following r (as 6 between m and J, 7, and p between m and ¢, n,—as hambrar, Icel. hamrar, hammers, sampt, Icel. samt, together with); an auxiliary vowel is inscrted between final 7 and a preceding consonant; @ in terminations is often changed into #; a w in the final syllable causes no change of a preceding a; the present tense takes the vowel of the infinitive (and the preterite subjunctive that of preterite indicative plural). Other important changes, appearing at the same time, but probably, partly at least, of a somewhat older date, are the following :—all diphthongs are contracted (as dgha, Icel. auga, eye; dréma, Icel. drdyma, to dream; sten, Icel. steinn, stone—traces of which we find as early as the 12th century); ¢ has passed into # (as knw, Icel. kné, knee); ta into t#, as in Eastern Norwegian (as Aiwrta, Icel. hjarta, heart); dt into y after 7, and a consonant +1 (as flygha, Icel. Jyiiga, to fly); the forms of the three persons singular of verbs have

assimilated (except in the so-called strong pretcrite); the 2d pers. plur. ends in -in for -i3, and the passive voice in -s for the earlier -sk; the dat. plur. of substantives with suffixed article ends in -umin (Iecl. ~~onom, as sunumin, sunonom, to the sons). The transition to the 14th century is marked by important changes :— short , ¢.g., passed into 6 in many positions (as dér for dyr, door, &c.), and the forms of the dative and the accusative of pronouns gradually became the same. The number of borrowed words is as yet very limited, and is chiefly confined to ecclesiastical words of Latin and Greek origin, introduced along with Christian~~ ity (as kors, cross, bref, epistle, skolt, school, prester, priest, almosa, alms). At the middle of the 14th century the literary language undergoes a remarkable reform, developing at the same time to a “riksspra k,” a uniform language, common to the whole country. The chief characteristics of this later Old Swedish are the follow- ing:—the long a has passed into 4 (that is, an open 0), and vo (except before rd, rt) into 76 (as své, sea, lake); at the same time there appears a so-called law of vowel balance, according to which the vowels ¢ and w are always found in terminations after a short root syllable, and—at least when no cousonant fol- lows—e and o after a long onc (as Gudi, to God, tl salu, for sale, but ¢ garpe, in the court, for visso, assuredly); g and & (sk) before

palatal vowels are softened into dj and tj (st); & and ¢in unac- cented syllables often pass into gh, dh (as Sverighe for Sverike, Sweden, litedh for litet, a little); the articles pen (or hin), the, and (a little later) en, a, come into use ; the dual pronouns vanish; the relative zr, that, is changed with swm; the present participle takes a secondary form in ~~s (as gangandes, beside gangande, going). A little later the following changes appear :— a short vowel is length~~ encd before a single consonant, first when the consonaut belongs to the same syllable (as hat, hate), afterwards also when it belongs to the following one (as hata, to hate) ; an auxiliary vowel is in- serted between Jor 1 and a preceding consonant (as gavel, gable, oken, desert) ; short 7, ending a syllable, passes into ¢ (as leva, to live) ; th passes into ¢; a new conjugation is formed which has no infini- tive termination, but doubles the sign of the preterite (as bo, bodde, bott, to dwell, dwelt, dwelt). Owing to the political and com- mercial state of the country the language at this period is deluged with borrowed words of Low German origin, mostly social and industrial terms, such as the great number of verbs in -era (¢.9.,

hantera, to handlc), the substantives in -ert (réveri, robbery), -inna (forstinna, princess), ~~het (fromhet, piety), be~~ (betala, to pay), and a great many others (len, weak, smaka, to taste, grover, big, pung, purse, tukt, discipline, bruka, to use, tvist, quarrel, stével, boot, arbeta, to work, frokoster, lunch, &c.). Owing to the political cir- cumstances, we find towards the end of the period a very powerful Danish influence, which extends also to phonetics and etymology, so that, for example, nearly all the terminal vowels are supplanted by the uniform Danish e, the hard consonants 7, t, & by 0, d, g as in Danish, the second person plural of the imperative ends in -er, beside -en (as tagher, for older takin).

Dialectical differences incontestably occur in the runic inscrip- Dialects. tions as well as in the literature ; in the former, however, most of them are hidden from our eyes by the character of the writing, which is, from a phonetic point of view, highly unsatisfactory, indicating the most different sounds by the same sign (for cxam- ple, 0, #, y, and 6 are denoted by one and the same rune) ; in the literature again they are reduced to a minimum by the awakening desire to form a uniform literary language for the whole country, and by the literary productivity and consequent predominant influence of certain provinces (as Ostergotland). This question, moreover, has not hitherto been investigated with sufficient care.* Only one distinct dialect has been handed down to us, that of the island of Gotland, which differs so essentially from the Old Swedish of the mainland that it haswith good reason been characterized, under the name Forngutniska, as in a certain sense a separate language. Forngut- Materials for its study are very abundant’: on one hand we niska. possess more than two hundred runic inscriptions, among them a very remarkable onc of the 12th or 13th century, counting upwards of three hundred runes, cut on a font (now in Aakirkeby on the island of Bornholm), and representing the life of Christ in a series of pictures and words ; on the other hand a literature has becn pre- served consisting of a runic calendar from 1328, the law of the island (from about 1350), a piece of traditional history, and a guild statute. The language is distinguished from the Old Swedish of the mainland especially by the following characteristics :—the old diphthongs are preserved (¢.g., auga, eye, droyma, to dream, stain, stone), and a new triphthong has arisen by the change of 7@ into tau (as fliauga, to fly); the long vowels ¢, @, 6, have passed into t, ¢, y (as kni, knee, mela, to speak, dyma, to deem); short o

rarely occurs except before 7, being in other positions changed into u; wis dropped before 7 (as raipt, wrath); the genitive singular of feminines in -« ends in -wr for ~~u (as kirkiur, of the church). Owing to the entire absence of documentary evidence it is impos~~ sible to determine how far the dialects east of the Baltic, which no doubt had a separate individuality, differed from the mothcr- tongue.

The first to pay attention to the study of Old Swedish ® was the The study Swedish savant J. Bureus (+1652), who by several works (from of Old 1599 onwards) called attention to and excited a lively interest in Swedish. the runic monuments, and, by his edition (1634) of the exccllent Old Swedish work Um Styrilsi Konunga ok Hofpinga, in Old Swedish literature also, His no longer extant Speeimen Primariz Linguxe Seantziane gave but a very short review of Old Swedish inflexions, but is remarkable as the first essay of its kind, and is perhaps the oldest attempt in modern times at a grammatical treat- ment of any old Germanic language. The study of runes was very popular in the 17th century ; M. Celsius (+1679) deeiphered the « stafiless”” runes (see above, p. 370), and J. Hadorph (+1693), who also did good work in editing Old Swedish texts, copied more than a thousand runic inscriptions. During the 18th century, again, Old Swedish was almost completely neglected ; but in the present century the study of runes has been well represented by the col- lection of the Swede Liljegren (+1837) and by the Norwegian §.

Se a ee eS 4 Sec especially K. J. Lyngby, Antiqu. Tidskr., 1858-60, pp. 242 sq. and 260 sq.; J. E. Rydqvist, Sv. Sprakets lagar, iv. 153 sq.; L. F. Leffler, Om v-omljudet, 1877, pp. 87 sqg., 55, 76; 8. Bugge, Runeindskriften fra Forsa, p. 49 sq.; A. Kock, Studéer ¢ Fornsvensk Yudldra, i., 1882, pp. 55 sq., 144 sq., 159 sq., 238. 5 See C. Save, Guiniska urkunder, 1859; J. G. Liljegren, Runurkunder, 1833. 6 See A, Noreen, “Apergu de Phistoire de Ja science linguistique Suédoise” (Le Muséon, ii., 1883).

1 The Old Swedish monuments are for the most part published in the following collections :—Svenska fornskrifisdllskapets samlingar, 84 parts, 1844-84; Cc. J. Schiyter, Samling af Sveriges gamila lagar, vols. i.-vii. and x.—xii., 1827-69 ; Svenskt Diplomatarium, 6 vols., 1829-78, new series, 2 vols., 1875-84.

2 In memory of Wdméd these runes stand; and Warenn, his father, wrote them in memory of his son, (by destiny) condemned to death.

3 If the bell fall down on anybody's head, the parish pays a fine of three marks should he die from it.

Bugge's ingenious interpretation and grammatical treatment of some of the most remarkable inseriptions. Old Swedish literature has also been made the object of grammatical researches. A first outline of a history of the Swedish language is to be found in the work of N. M. Petersen (1880) mentioned above (p. 370), and a scheme of an Old Swedish grammar in P. A. Munch's essay, Fornswenskans och Fornnorskans sprakbyggnad (1849); but Old Swedish grammar was never treated as an independent branch of science until the appearance of J. E. Rydqvist's (t+ 1877) monu- mental work Svenska sprékets lagar (in 6 vols., 1850-83), which was followed in Sweden by a whole literature on the same subject. Thus phouetics, which were comparatively neglected by Rydqvist, have been investigated with great success, especially by L. F Leffler and A. Kock; while the other parts of grammar have been treated of above all by K. F. Soderwall, the chief of contemporary Old Swedish seholars, His principal work, Ordbok dfver Svenska medeltidsspraket (1884 sq.), nowin course of publication, gives the list of words in the later Old Swedish language, and—taken along with the Ordbok till samlingen af Sveriges gamla lagar (1877), by C. J. Schlyter, the well-known cditor of Old Swedish texts, which con- tains the vocabulary of the oldest literature—it worthily meets the demand for an Old Swedish dictionary. An Old Swedish grammar, answering the requirements of modern philology, is still needed.}

girl, tima, to happen, &c,

as fager, fair, hdrja, to ravage, later, manners, snille, genius, tdrna, In addition to this, owing to huinanistic influence, learned expressions were borrowed from Latin during the whole 16th and 17th centuries; and from German, chiefly at the Reformation and during the Thirty Years' War,

numberlcss words were introduced,—as sprdk, language, tapper, brave, prakt, magnifi- cence, hurtig, brisk, &c.; among these may be noted especially a great number of words beginning in an-, er-, for-, and ge-. Owing to the constantly increasing political and literary predominance of France French words were largely borrowed in the 17th century, and to an equally great extent in the 18th ; such are affér, business, respekt, respect, talang, talent, charmant, charming, &c. Inthe 19th century, again, especially about the middle of it, we anew mect with conscious and energetic efforts after purism both in the forma- tion of new words and in the adoption of words from the old language (id, diligence, mala, to speak, fylking, battle-array, &c.), and from the dialects (bliga, to gaze, lis, flake, skrabbig, bad, &c.). Consequently, the present vocabulary differs to a very great extent from that of the literature of the 17th century. As for the sounds aud grammatical forms, on the other hand, comparatively few important changes have taken place during the last two centuries. In the 18th century, however, the aspirates dh and gh passed into d and g (after 7 and r into /),—as lag for lagh, law, bréd for brédh,

Modern 2. Modern Swedish.—The first complete translation of the Bible, | bread ; hv passed into v (in dialects already about the year 1600),—Swedish, edited in 1541 by the brothers Olaus and Laurentius Petri, and | as valp for hvalper, whelp ; Y likewise into 7,—thus Jjuster, leister, g generally called the Bible of Gustavus I., may be regarded as the | occurs written juster. In our time rd, rl, rn, rs, and rt are passing oureeS earliest important mouument of this. Owing to religious and poli- | into simple sounds (“supradental” d, 7, n, s, and t), while the tical circumstanccs, and to the learned influence of humanism, theo- | singular of the verbs is gradually supplanting the plural. A

logical and historico-political works preponderate in the Swedish | vigorous reform, slowly but firmly carried on almost uniformly literature of the following period, which therefore affords but | during all periods of the Swedish langnage, is the throwing back

scanty material for philological research. It is not until the | of the principal accent to the beginning of the word in cases where

middle of the 17th century that Swedish literature adequately | previously it stood nearer the end, a tendency that is characteristic exemplifies the language, for at that period literature first began | of all the Scandinavian languages, but no doubt espeeially of

to be cultivated as a fine art, and its principal representatives, such | Swedish. In the primitive Scandinavian age the accent was

as Stiernhielm, Columbus, and Spegel, were in reality the first to | removed in most simple words'; the originally accented syllable,

study it as a means of cxpression and to develop its resources. | however, preserved a musically high pitch and stress. Thus there Amongst the authors of the 18th century we have to mention in | arose two essentially different accentuations,—the one, with un-

the first place Dalin, who was to some extent the creator of the | accented final syllable, as in Icel. stigr (Gr. oretyeis), thou goest,

prose style of that cpoch ; while of the end of the century Kellgren | the comparative betre (¢f. Gr. rdocwv from raxds), better, the

and Bellman are the most noteworthy examples, representing the | other, with secondary stress and high pitch on the final, as in Icel.

higher and the more familiar style of poetry respectively. The | pret. plur. duSom (Sanskr. bubudhimd), we bade, part. pret. bitenn language of the 19th century, or at any rate of the middle of it, is | (Sanskr. bhinnds), bitten. The same change afterwards took place

best represented in the works of Wallin and Tegnér, which, on | in those compound words that had the principal accent on the

account of their enormous circulation, have had a greater influence | sccond member, so that such contrasts as German urtheil and

than those of any other authors. erthetlen were gradually brought into conformity with the former

Form of _ As to the language itself the earliest Modern Swedish texts, as | accentuation. At the present day it is quite exceptionally (and the lan- Gustavus I.'s Bible, differ considerably from the latest Old Swedish | chiefly in borrowed words of later date) that the principal accent guage. oncs.? We find a decided tendency to exterminate Danisms and | in Swedish is on any other syllable than the first, as in lekdmen,

reintroduce native and partially antiquated forms. At the same

body, vdlsigna, to bless.

time there appear several traces of a later state of the language: all genitives (singular and plural), ¢.g., end in ~~s, which in earlier times was the proper ending of only certain declensions. In spite of the archaistic efforts of many writers, both in forms and in voca~~

The scientific study of Modern Swedish? dates from Sweden's The glorious epoch, the last half of the 17th century. The first regular study of Swedish grammar was written in 1684 (not edited till 1884) in Modern Latin by Er. Aurivillius ; the first in Swedish is by N. Tiallman, Swedish.

bulary, the language nevertheless underwent rapid changes during the 16th and 17th centuries. Thus sf and sj (original as well as derived from sk before a palatal vowel) assimilate into a simple sh- sound ; dj (original as well as derived from g before a palatal vowel), at least at the end of the 17th century, dropped its d-sound (com- pare such spellings as diufwer, gidttar, envogé, for jufver, udder, Jjittar, giants, envoyé, envoy); Ay passcs into 7 (such spellings are found as fort for hjort, hart, and hjdrpe for jarpe, hazel grouse); 6 and p inserted in such words as himblar, heavens, hambrar, hammers, jaémpn, even, sampt, together with (see above, p. 371), are dropped ; the first person plural of the verb takes the form of the third person (as vi fara, foro, for vi farom, forom, we go, went); by the side of the pronoun J, you, there arises a secondary form Ni, in full use in the spoken language about 1650; the adjective gradually loses all the case-inflexions ; in substantives the nomin- ative, dative, and accusative take the same form as early as the middle of the 17th century ; in the declension with suffixed article the old method of expressing number and case both in the substan- tive and the article is changed, so that the substantive alone takes the

number-inflexion and the article alone the case-ending ; neuter substantives ending in a vowel, which previously had no plural ending, take the plural ending -n, some -er,—as bi-n, bees, bagert-er, bakeries. About the year 1700 the Old Swedish inflexion may, in general, be considered as almost completely given up, although a work of sueh importanee in the history of the language as Charles XII.'s Bible (so-called) of 1708 (edited by Bishop J. Svedberg) by a kind of conscious archaism has preserved a good many of the old forms. To these archaistic tendencies of certain authors at the end of the 17th century we owe the great number of Old Swedish and Icelandie borrowed words then introduced into the language, — ee eee een

1 A. Noreen has an Old Swedish grammar in preparation.

2 The printed characters are also considerably ehanged by the introduction

of the new letters & (with the transl. of the New Testament of 1526), and @, é (both already in the first print in Swedish of 1495) for aa, x, ¢$.

ry

1696. Nothing, however, of value was produced before the great work of Rydqvist mentioned above, which, although chiefly dealing with the old language, throws a flood of light on the modern also. Among the works of late years we must call spccial attention to the researches into the history of the language by K. F. Sdderwall,4 F, A. Tamm,' and A. Kock.® But little study, and that only in isolated parts, has been devoted to the grammar of the modern language, if the advanced state of philology is considered. A good though short abstract is given in H. Sweet's essay on "Sounds and Forms of Spoken Swedish " (Zrans, Phil. Soe., 1877- 79). Attempts to construct a dictionary were made in the 16th cen- tury, the carliest being the anonymous Variarwm Rerum Voeabula cum Sueca Interpretatione, in 1538, and the Synonymorum Libellus by Elavus Petri Helsingius, in 1587, both of which, however, followed German originals. The first regular dictionary is by H. Spegel, 1712; and in 1769 Joh. Ihre (+ 1780), probably the greatest philological genius of Sweden, published his Glossariwm Sviogoticum, which still remains the most copious Swedish dictionary in existence. In the present century the diligent lexicographer A. F. Dalin has published several useful works. At present the Swedish Academy has in preparation a

gigantie dic- tionary on about the same plan as Dr Murray's New English Dictionary ; there will also appear as soon as possible a complete list (with grammatical and etymological notes), drawn up by A. Andersson, Ad. Norecn, and F. A. Tamm, of the words in use in the present language. The characteristic differences between the Swedish literary language used in Finland and that of Sweden are exhibited in the Finsk Tidskrift, vol. xix. pts. 5, 6, 1885 ("Studier pi Svensk sprakbotten i Finland," by Karl Lindstrém).

3 See A. Noreen, ''Apercu," é&e.; H. Hernlund, Férslag och dtgdrder tilt Svenska skriftsprakets reglerande, 1883,

4 Hufoudepokerna af Svenska sprakets utbildning, 1870

® Several essays on the borrowed words in Swedish.

6 Sprakhistoriska undersékningar om Svensk akcent, i., 1878, fi,, 1884-5,

DANISH.

Old Danish.

Sources.

Dialects.

Form of the lan-

guage.

Gram- matical treat- meut,

SCANDINAVIAN LANGUAGES

IV. Dantsu, like Swedish, is divided into the two great Pre- and Post-Reformation epochs of Old and Modern Danish.

1. Old Danish.—The territory of Old Danish included not only the present Denmark, but also the southern Swedish pro- vinces of Halland, Skane, and

Blekinge, the whole of Schles- wig, and, as stated above, for a short period also a great part of England, and Normandy. The oldest monumcuts of the lan- guage are runic inscriptions, altogether abont 250 in number.? The oldest of them go as far back as to the beginning of the 9th century, the Snoldelev-stone for instance on Sealand, and the Fleml¢se-stone on Fiiuen. From about the year 900 date the very long inscriptions of Tryggevelde (Sealand) and Glavendrup (Fiinen); from the 10th century we have the stoncs of Jel- linge (Jutland), in memory of two of the oldest historical kings of Denmark (Gorm and Harald) ; while from about 1000 we have

a stone at Dannevirke (Schleswig), raised by the conqueror of

England, Sven Tjuguskegg. Relics of about the same age are the words that were introduced by the Danes into English, the oldest of which date from the end of the 9th century, the time of the first Danish settlement in England ; most of these are to be found in the early English work Ormwulum.* No Danish literature arose before the 13th century. The oldest manuscript that has come down to us dates from the end of that century, written in runes and containing the law of Skane. From about the year 1300 we possess a manuscript written in Latin characters and containing ‘Valdemar’s and Erik’s laws of Sealand, the Flensborg manuscript

of the law of Jutland, and a manuscript of the municipal laws of

Flensborg. These three manuscripts represent three different dialects,—that, namely, of Skane, Halland, and Blckinge, that of Sealand and the other islands, and that of Jutland and Schleswig. There existed no uniform literary language in the Old Danish period, although some of the most important works of the 15th century, such as Michael’s Poems and the Rhymed Chronicle (the first book printed in Danish, in 1495), on account of their excellent diction, contributed materially to the final preponderance of their dialect, that of Sealand, towards the Reformation.

As to the form of the language, it hardly differs at all during the period between 800 and 1200 a.p. from Old Swedish. It is only in the oldest literature that we can trace any marked differ- ences; these are not very important, and are generally attributable to the fact that Danish underwent a little earlier the same changes that afterwards took place in Swedish (¢g., 4

in hv and fy in Danish was mute as early as the end of the 14th century; ¢. p. 872, above). The laws referred to above only agree in differing from the Swedish laws in the following points:—the nominative already takes the form of the accusative (as kad/, calf, but Old Sw. nom. kalver, acc. kalf); the second person plural ends in ~~@ (as képx, but Old Sw. képin, you buy) ; in the subjunctive no differ~~ ences are expressed between persons and numbers. Among them- selves, on the contrary, they show considerable differences ; the law of Skane most nearly corresponds with the Swedish laws, those of Sealand keep the middle place, while the law of Jutland exhibits the most distinctive individuality. The Skane law, ¢.g., retains the vowels a, 7, % in terminations, which otherwise in Danish have become uniformly #; the same law inserts 6 and d between certain consonants (like Old Sw.; see p. 371), has pre- served the dative, and in the present tense takes the vowel of the infinitive; the law of Jutland, again, does not insert d and d, and has dropped the dative, while the present tense (undergoing an “ Umlaut”) has not always accepted the vowel of the infinitive; in all three characteristics the laws of Sealand fluctuate. After 1350 we meet an essentially altered language, in which we must first note the change of &, p, ¢ after a vowel into g, 6, d (as tag, roof, Ugbe, to ron, zde, to cat); th passes into ¢ (as ting, thing), gh into w (as law for dagh, guild) and into 7 (as vet for wegh, way); id, nd are pro- nounced like 2, nn; sis the general genitive ending in singular and plural, &c. The vocabulary, which in earlier times only borrowed a few and those mostly ecclesiastical words, is now

—chiefly owing to the predominant influence of the Hanse towns—

inundated by German words, such as those beginning with bc-, bi-, ge-, for-, and und-, and ending in -hed, and a great number of others, as live, to become, ske, to happen, fri, free, krig, war, buxer, pantaloons, ganske, quite, &c.

An Old Danish grammar is still wanting, and the preparatory studies which exist are, although excellent, but few in number, being chiefly essays by the Danes K. J. Lyngby and L. hy Be Wimmer, with N. M. Petersen’s treatise Det Danske, Norske, og Svenske sprogs historie, vol, i. (1829), one of the first works that paid any attention to Old Danish, which till then had been com- pletely neglected. A dictionary on a large scale covering the whole of

Old Danish literature, except the very oldest, by O. Kalkar, has been in course of publication since 1881 ; older and smaller is Chr. Molbech's Dansk Glossariawm (1857-66).

a 1 See P. G. Thorsen, De Danske runemindesmerker, i., 1864, ii., 1879-81; L. F. A. Wimmer, " Runeskriftens Oprindelse" (Aarbdger for Nordisk Oldkyndighed, 1874). 2 See E. Brate, * Nordische Lehuwiérter im Orrmmulum" (Paul-Braune's Bettrage, x., 1884).

oto

2. Modern Danish. —The first important monument of this is the Modern translation of the Bible, by Chr. Pedersen, Peder Palladius, and Danish. others, the so-called Christian HII.'s Bible (1550), famous for the Sources. unique purity and excellence of its language, the dialect of Sealand, then incontestably promoted to be the language of the kingdom.

The first secular work deserving of the same praise is Vedel's translation of Saxo (1575). The succceding period until 1750 offers but few works in really good Danish ; as perfectly classical, however, we have to mention the so-called Christian V. '*s Law of Denmark (1683). For the rest, humanism has stamped a highly Latin-French character on the literature, striking even in the works of the principal writer of this period, Holberg. But about

the year 1750 there begins a new movement, characterized by a reaction against the language of the preceding period and purist tendencies, or, at least, efforts to enrich the langnage with new- formed words (not seldom after the German pattern), as omkreds, periphery, selustendighed, independence, valgsprog, devise, digter,

poet. The leading representatives of these tendencies were Kilschow

and Sneedorf. From thcir time Danish may be said to have acquired its present essential features, though it cannot be denied

that several later authors, as J. Ewald and Ohlenschlager, have exercised a considerable influence on the poetical style. As the

most important differences between the grammatical forms of the Form of 18th and 19th centuries on one hand and those of the 16th and 17th the lan- centuries on the other may be noted the following :—most neuter guage, substantives take a plural ending ; those ending in a vowel form

their plural by adding -r (as riger, for older rige, plural of rige, kingdom), and many of those ending in a consonant by adding -e

(as huse for hus, of hus, house) ; substantives ending in -ere drop

their final -e (as dommer for dommere, judge); the declension with suffixed article becomes simplified in the same way as in Swedish

(see above, p. 372) ; the plural of verbs takes the singular form (as

drak for drukke, we drank); and the preterite subjunctive is sup- planted by the infinitive (as var for vaare, were). The first Modern Danish grammar is by E. Pontoppidan, 1668, but in Latin ; the Gram- first in Danish is by the famous Peder Syv, 1685. The works of matical the self-taught J. Hgjsgaard (eg.,

by Th. M@bius (1871). The vocabnlary of the 16th and 17th centuries is collected in Kalkar's Ordbog, mcntioned above, that of

the 18th and 19th centuries in the voluminous and as yet unfinished dictionary of Videnskabernas Selskab, and in C. Molbech's Dansk ordbog (2d ed. 1859).?

As already mentioned (p. 370), Danish at the Reformation Dano- became the language of the literary and educated classes of Nor- Norway and remained so for three hundred years, although wegian. it cannot be denied that many Norwegian authors even during this period wrote a language with a distinct Norwegian colour, as for instance the prominent prose-stylist Peder Claussgn Friis (+1614), the popular poct Peder Dass (1708), and, in a certain degree, also the two literary masters of the 18th century, Hol- berg and Wessel. But it is only since 1814, when Norway gained her independence, that we can clearly perceive the so- called Dano-Norwegian gradually developing as a distinct offshoot of the general Danish language.

The first representatives of this new language are the writer of popular life M. Hansen (1842), the poet H. Wergeland (+ 1845), and above all the tale-writer P. C. Asbjgrnsen fe 1885). In our own days it has been further developed, especially by the great poets Ibsen and Bjgrnson and the novelist Lie ; and it has been said, not without reason, to have attained its classical perfection in the works of the first-named author. This language differs from Danish particularly in its vocabulary, having adopted very many Norwegian provincial words (6000 to 7000), less in its inflexions, but to a very great extent in its pronunciation. The most striking differences in this re- spect are the following :—Norwegian p, 4, k answer to Danish 8, d, g in cases where they are of later date (see above),—as ddpe, Danish Jdbe, to run, liten, D. liden, little, bak, D. bag, back) ; to Danish &, g before palatal vowels answer Norwegian f, j ; 7 (point- trill, not back-trill as in Danish) is assimilated in some way with following ¢ (d), 7, n, and s into so-called supradental sounds (see p. 872); both the primitive Scandinavian systems of accentuation are still kept separate from a musical point of view, in opposition to the monotonous Danish. There are several other character-istics, nearly all of which are points of correspondence with Swedish.4 Dano-Norwegian is grammatically treated by J. L¢kke (Modersmaalets formlzre, 1855), K. Knudsen (Dansk-Norsk sprog- lzere, 1856), and K. Brekke (Bidrag til Dansk-Norskens lydlzre, 1881), and others.

At the middle of this century, however, far more advanced pre- Nor-tensions were urged to an independent Norwegian language. By wegian-

Form of the lan- guage.

Nor- 3 Sec L(udvig) Wimmer), ‘Det Danske Sprog,” in Nordisk Conversations- . lexikon, 3d ed,, 1885; T. Strim, Dansk Literaturhistorie, 2d ed., 1878, We SEINE

4 See J. A. Lundell, ‘ Norskt sprik” (Nordisk Tidskrijt, 1882).

DIALECTS.

BYE: the study of the Modern Norwegian dialects and their mother language, Old Norwegian, the eminent philologist J. Aasen was led to undertake the bold project of constructing, by the study of these two

sources, and on the basis of his native dialect (Séndmgre), a Norwegian-Norwegian (“ Norsk-Norsk ”) language, the so-called “Tandsmal.” In 1853 he exhibited a specimen of it, and, thanks to such excellent writers as Aasen himself, the poets O. Vinje and K. Janson, and the novelist A. Garborg, as well as a zealous pro- pagandism of the society “ Det Norske Samlag ” (founded in 1868), there has sinee arisen a valuable though not very large literature in the “Landsmal.” But it isnowhere spoken.’ Its grammatical structure and vocabulary are exhibited in Aasen’s Norsk gram- matik, 1864, and Norsk ordbog, 1878.

SCANDINAVIAN DIALECTS. —As above remarked, the Scandinavian dialects are not grouped, so far as their relationship is concerned, as might be expected judging from the liter- ary languages. Leaving out of account the Icelandie dialects and those of the Faroes, each of whieh constitutes a separate group, the remainder may be thus classified *—

(1) West-Norwegian Dialects, —spoken on the western coast of Norway between Christiansand and Molde.

(2) North-Scandinavian,—the remaining Norwegian and the Swedish dialects of Vestmanland, Dalarna, Norrland, Finland, and Russia,

(3) The dialects on the island of Gotland.

(4) Middle-Swedish,—spoken in the rest of Sweden, except the southernmost parts (No. 5).

(5) South-Scandinavian,—spoken in the greater part of Smaland and Halland, the whole of Skane, Blekinge, and | Denmark, and the Danish-speaking part of Schleswig. This group is distinctly divided into three smaller 2% groups,—the dialects of southern Sweden (with the island of Born- holm), of the Danish islands, and of Jutland (and Schleswig).

The study of the Modern Scandinavian dialects has been very unequally prosecuted. Hardly anything has been done towards the investigation of the Icelandic dialects, while those of the Faroes have been studied ehiefly by Hammershaimb. The Norwegian dialects have been thoroughly examined by Aasen, whose works give a general account of them ; while in our own days Joh. Storm, above all, displays an unwearying activity, especially | in the minute investigation of their phonetic / constitution, to which Aasen had paid but scant attention. The substance of these researches in the Norwegian dialects has re- cently been presented in a magazine, called Norvegia, of which the first volume is in course of publication ; it employs an alpha- bet invented by Storm. For the study of Danish dialeets but little has been done, Molbech's Dialect-Lexicon of 1841 being very deficient. The Schleswig dialect,on thecon- | 7 trary, has been admirably treated of by E. |& Hagerup (1854) and K. J. Lyngby (1858). At present two important works are in pre- paration,—H. F. Feilberg's great dictionary of the dialect of Jutland, and J. C. Espersen's of the dialect of Bornholm. There is no country in which the dialects have been and are studied with greater zeal and more fruit- ful results than in Sweden? during the last hundred and fifty years. Archbishop E. Benzelius the younger (+1743) made collec- – ig M4 og eine tions of dialeet words, and on his work igs ~~ *** 4 based the dialectical dictionary of Ihre of 1766. An excellent work considering its age is 8. Hof's Dialectus Vestrogothica, 1772. The energy and zeal of C. Siive (essays on the dialects of Gotland and Dalarne) inspired these studies with extraordinary animation at the middle of the 19th century ; in 1867 J. E. Rietz published a voluminous dialect dictionary ; the number of special essays, too, increased yearly. From 1872 so-called " landsmalsforeningar " (dia-

a ema Cations, Seeman iat tenatntiticinmeaie nieces a io ane aM ns | 1 See J. Storm, ‘‘Det Norske maalstraey” (Nordisk Tidskrift, 1878). *See J. A. Lundell, “Om de Svenska folkmalens frandskaper ”

(Antropologiska Sektionens Tidskrift, 1880).

3 See J. A. Lundell, “‘Ofversikt af de senaste artiondenas vark-

samhet for kannedom om folkmal” (Svenska Landsmilen, i., 1880).

J. Bartholomew, Edin?

1. Old Town Hall. 2, Custom House.

5. News Room.

6. Theatre Royal. 7. Police Station. 8. Museum.

SCA—SCA

lect societies) were founded among the students at the universities of Upsala, Lund, and Helsingfors (at Upsala alone 13), for a systematic aud thorough investigation of dialects. We find remarkable progress in scientifie method—espccially with regard to phonetics—in the eonstantly increasing literature; special mention maybe made of the detailed descriptions of the dialects of Varmland, Gotland, and Dalarna by Ad. Noreen, and A. F. Freudenthal’s monographson the . Finnish and Esthonian Swedish dialeets. Since 1879 the Swedish dialect societies have published a magazine on a eomprehensive plan, De Svenska Landsmélen, edited by J. A. Lundell, who has invented for this purpose an excellent phonetic alphabet (partially based on C. J. Sundevall’s work Om phonctiska bokstdfver, 1855). (A. NO.)

SCARBOROUGH, a parliamentary borough of England, frequently called “the Queen of Watering Places,” situ-

Scale of % a Mile | <8 Seam’ D>

9. St Mary’s Church. 10. Christ Do. 11. St Thomas’ Do. 12, Independ’t Do.

13. Rom. Cath. Ch.

14, Post Office.

15. York City and

County Bank.

ated on the east coast of Yorkshire, in the North Riding, 40 miles from York, and between 54° 15’ 0” and 54° 17’ 15” N. lat. and 0° 22’ 25” and 0° 26’ 24” W. long. Its two parts, north and south, each with a fine stretch of sand and bay, are divided by a rocky promontory 300 feet above the sea, on which stand the remains of the castle. The cliff is much exposed to denudation by the sea, which has been proceeding during the present century at the rate of 1 yard in 17 years. The plateau forming the castle yard in 1190, according to William of Newburgh, comprised 60

16. Savings Bank.

17. Sea-Bathing In- firmary.

18. Theatre.

SCA—SCA

acres, but it is not now more than 17 acres 10 perches, or Lhe first castle was built in the Anglo-Norman period, and is referred to as being in decay in 1154—a fact which throws back its origin earlier than 1136, the date assigned for its erection by William Le Gros, earl of Albemarle

43 acres, including store yards, dykes, and holms.

The list of its The streets

and Holderness, its first known governor. governors stretches from that date to 1832.

of the older part of the town, immediately south of the castle hill, come down to the sea, but the newer parts of the south as well as the north side

are built upon rising A deep valley (Ramsdale) which divides the south side is bridged from St Nicholas Cliff to the South Cliff. The approach by rail is through the upper part of this valley, by the side of which there is a marsh known as

ground.

the Mere. The town is thus situated ina kind of basin,

which opens out to the north towards extensive and lofty

moorland ranges. The modern period of its history dates

from 1620, when Mrs Farren, a lady resident, first discovered The town contained 30,504 inhabi- tants in 1881, but during the season, which lasts from May to October, its population is augmented by from ten

its mineral springs.

to twenty thousand visitors, for whose convenience there is increasingly ample accommodation. The Grand Hotel, fronting the sea on the south bay, stands on St Nicholas Cliff, at the north side of the Ramsdale valley, and is one of the largest in England. An aquarium (1877) stands beneath the Cliff Bridge, and close by is the museum, a Roman-Doric rotunda, built in 1828. The spa saloon, opened in 1800, contains a hall in the Italian- Renaissance style, a theatre, and refreshment rooms. There is a. promenade in front protected by a sea wall. The south spring is aperient but contains some iron, while the north or chalybeate spring is more tonic in its pro- perties. The waters, however, are seldom taken now, the town being mainly frequented for the sea-bathing. The grounds of the present spa are tastefully laid out. A foreshore road, made in 1878 by the corporation, and shortly to be extended round the castle cliff to the north side, makes an excellent drive or promenade. The north side has fine sands, a hoist, and a promenade pier, but is not so attractive as the south side, nor are the houses there of so good a character and style. The salubrity of Scarborough is attested by its vital statistics. The mean annual mortality from 1873 to 1882 was 18-4 per 1000. The death-rate from consumption in all England is 2-4 per 1000; amongst the indigenous population of Scar- borough from 1873 to 1882 it was 1°7

per 1000. The mean annual temperature is 47°9 Fahr. In December, January, and February it is only 0°6° colder than Brighton, whilst in the summer months Brighton is 3°6 warmer.

The town is a royal borough, its charter of incorpora- tion dating from 1161. It returned two members to parliament from 1283 to 1885, when one of the seats was taken away. The limits of the municipal and_parlia- mentary boroughs coincide,—the area being 2348 acres, the population 24,259 in 1871 and 30,504 in 1881.

Shipbuilding, salt-manufacture, and knife-making were formerly cominon, but the only craft now remaining is jet-manufacture. The fishing trade is, however, very considerable. Disputes about dues for the old pier and the fish-tithe occupy a conspicuous place in the town records ; the pier seems to have suffered greatly in the various sieges to which the town, after it was walled, became exposed. The old town-hall in St Nicholas Street, the new town-hall in Castle Road, the market-hall in St Helen's Square, in the Tuscan style, and the new post office in Huntriss Row are conspicuous amongst the public buildings. There are two theatres. Of the monastic buildings belonging to the Grey Friars, Dominicans, and Carmelites there are no remains, but the parish church of St Mary, conspicuously situated on a mound to the south of Castle Hill, occupies the site of the old Cistercian monastery. The old church was made the site of a battery in the siege of the castle in 1644, and one of its towers fell in 1659. The

restoration of the present building took place in 1850. There are other churches and chapels of a much more recent date, including a Roman Catholic church. The racecourse is on the top of a hill, commanding fine views of the moors and of the sca.

The old name of the town was written Skardeburge. It is not mentioned in Domesday Book, but it was probably waste, as Tosti, count of Northumberland, had ravaged and burnt it some time previously. _Thorklen mentions it as having been ravaged by Adelbrecht, king of Northumberland, and by Harold Hardrada. Douglas, the Scottish chief, also burnt it in 1818. Henry II. com- pelled the count of Aumale to surrender the castle in 1155.

King John visited the castle in 1206 and 1216, and the “house and castle of Scarborough” are mentioned in 1228. When not used as a temporary royal residence the castle was a royal prison. In 1312 the earl of Pembroke besieged it, and in the Pilgrimage of Grace insurrection (1536) it was unsuccessfully besieged by Sir Robert Aske. A detailed survey of it, made in 1538, is still extant, the castle yard and land therein described, with the buildings, corresponding with a survey made in 1839. It was again besieged in 1644-45 and in 1648. In 1655 George Fox the Quaker was imprisoned in the castle. In 1645 the town was captured by assault, and in later years its inhabitants were much impoverished by military exactions and expenses. A view of the town and castle in 1485 is still extant. The precise date when the town-walls were dismantled is not known. In 1780 Daniel Defoe, writing from the place, said: “The town is well-built, pleasant, and populous, and we found a great deal of company here, drink- ing the waters, who have not only come from the north of England but from Scotland.”

See History of Scarborough Spaw, 1679; Gent’s History of Scarborough, 1735; Hinderwell’s History of Scarborough, 1798; Cole’s Scarbrough Worthies, 1820; Constitution and Byelaws of the Corporation of Scarbrough, 1827; Brief History of St Mary’s, Scarbrough, 1845; The Geology of Scarbrough, by C. Fox Strang- ways, 1880; Flora of Scarbrough, by G. Masser, 1881; and Scarborough as a Health Resort, by A. Haviland, 1883.

SCARLATTI, Atessanpro (1659-1725), composer of sacred and dramatic music, was born at Trapani in Sicily in 1659, and became in early youth a pupil of Carissimi. In 1680 Queen Christina of Sweden appointed him her maestro di cappella, and commissioned him to write his first opera, L’Onesta nell’ Amore, for performance at her palace in Rome. In 1693 he produced his first oratorio, IT Dolori di Maria-sempre Vergine. In the following year he was appointed maestro di cappella to the viceroy of Naples, and from that time forward his works multiplied with astonishing rapidity, his time being spent partly in Naples and partly in Rome, where he entered the service of Cardinal Ottoboni, as private maestro di cappella. His prodigious fertility of invention did not, however, tempt him to write carelessly. On the contrary he did his best to neutralize the evil caused by the founders of the monodic school, whose insane hatred of counterpoint

and form reduced their dramatic music to the dreary level of monotonous declamation. He was by far the most learned contrapuntist of his age; and it was to this circumstance that his compositions owed their resistless power. More- over, his sense of form was as just as his feeling for harmony, and to this he was indebted for the originality of many of his finest conceptions. He has been credited with two very important inventions—accompanied recita- tive and the da capo. That he really did invent the first there is very little doubt. Instances of the latter have been found of earlier date than most of his works, but he was certainly the first to bring it into general use. He also struck out ideas in his orchestral accompaniments which must have seemed bold indeed to the musicians of the period, using obbligato passages and other combina- tions previously unknown, and introducing ritornelli and. sinfonie with excellent effect. In 1707 Scarlatti was appointed principal maestro di cappella at Santa Maria Maggiore, and soon afterwards he was invested by the pope with the order of the Golden Spur, with which Gluck and Mozart were afterwards honoured. He resigned his appointment after two years' service, and died at Naples October 24, 1725.

Very few of Scarlatti's works have been published. His com- positions include 115 operas (41 only of which are now known to exist, and these only in MS.), 200 masses 9 oratorios, more than

500 cantatas, and innumerable smaller pieces, both sacred and secular. MSS. of three of his operas, Gerone, Il Flavio Cuniberio, and La Teodora Augusta, are preserved in the library of Christ Church, Oxford; and Zt Prigioniero Fortwnato forms part of the " Dragonctti Collection " in the British Museum.

SCARLATTI, Domenico (1683-1757), son of the pre- ceding, was born at Naples in 1683, and studied music first under his father and then under Gasparini. He began his career by composing a few operas, among them Amleto, produced at Rome in 1715, and remarkable as the earliest known attempt to pose Shakespeare's hero as the primo uomo of adramma per la musica. But his real strength lay in the excellence of his performances on the harpsichord and organ. During Handel's first sojourn in Italy in 1708-9 D. Scarlatti was invited to a trial of skill with him on both instruments at the

palace of Cardinal Ottoboni, and all present decided that the harpsichord performances terminated in a drawn battle, though Handel had a decided advantage on the organ. The justice of the verdict cannot be doubted ; for, whenever Scarlatti was afterwards praised for his organ-playing, he used to cross himself devoutly and say, “ You should hear Handel!”

On the death of Bai in 1715 D. Scarlatti was appointed maestro di cappella of St Peter’s in Rome. In 1719 he conducted the performance of his Narciso at the King’s Theatre in London, and in 1721 he played with great success in Lisbon. He then returned to Naples; but in 1729 he was invited to Madrid, with the appoint- ment of teacher to the princess of Asturias, and remained there twenty-five years, returning in 1754 to Naples, where he died in 1757.

D. Scarlatti’s compositions for the harpsichord are almost in- numerable, and many of them have been published. In the character of their technique they are infinitely in advance of the age in which they were written and played ; and many of them are difficult enough to tax the powers of the best performers of the present day.

SCARLET FEVER and Scartatina are names applied indifferently to an acute infectious disease, characterized by bigh fever, accompanied with sore throat and a diffuse red rash upon the skin. This fever appears to have been first accurately described by Sydenham in 1676, before which period it had evidently been confounded with small- pox and measles.

In connexion with the causation of this disease, the following points have been ascertained. (1) It isa highly contagious malady, the infective material being one of the most subtle, diffuse, and lasting known in fevers. It would seem that the disease is communicable from an early period of its occurrence, all through its progress, and especially during convalescence when the process of desquamation is proceeding, and when the shed-off epidermis which contains the germs of the disease in great abundance is apt to be inhaled, to become attached to articles of clothing, to find entrance into food, or to be transmitted in other ways to healthy persons. (2) It is a disease for the most part of early life, young children being specially susceptible; but adults may also suffer if they have not had this fever in childhood. (3) It occurs both in isolated cases (sporadically) and in

epidemics. (4) One attack in general, although not always, confers immunity from a second. (5) Certain constitutional conditions act as predisposing causes favouring the development of the fever. Thus, where overcrowding prevails, and where the hygienic state of children is ill attended to, the disease is more likely to prevail and spread, and to assume unfavourable forms. Further, in the puerperal state in women there appears to be a special susceptibility to suffer in a dangerous manner should there be exposure to the infection of the fever. As to the nature of the infecting agent, nothing positive is known, although from the analogy of similar diseases it is

probable that specific micro-organisms or germs are concerned in its production.

The period of incubation in scarlet fever (that is, the time elapsing between the reception of the poison and the development of symptoms) appears to vary. Sometimes it would seem to be as short as one or two days, but in most instances it is probably about a week. The invasion of this fever is generally sudden and sharp, consisting in rigors, vomiting, and sore throat, together with a rapid rise of temperature and increase in the pulse. Occasionally, especially in young children, the attack is ushered in by convulsions. These premonitory symptoms usually continue for about twenty-four hours, when the characteristic eruption makes its appearance. It is first seen on the neck, chest, arms, and hands, but quickly spreads all over the body, although it is not-distinctly marked on the face, This rash consists of minute thickly-set red spots, which coalesce to form a general diffuse redness, in appearance not unlike that produced by the application of mustard to the skin. In some instances the redness is accompanied with small vesicles containing fluid. In ordinary cases the rash comes out completely in about two days, when it begins to fade, and by the end of a week from its first appearance it is usually gone. The severity of a case is in some degree measured by the copiousness and brilliancy of the rash, except in the malignant varieties, where there may be little or no eruption. The tongue, which at first was furred, becomes about the fourth or fifth day denuded of its epithelium and acquires the peculiar ‘strawberry ”

appearance characteristic of this fever. The interior of the throat is red and somewhat swollen, especially the uvula, soft palate, and tonsils, and a considerable amount of secretion exudes from the inflamed surface. There is also tenderness and slight swelling of the glands under the jaw. In favourable cases the fever departs with the dis- appearance of the eruption and convalescence sets in with the commencement of the process of ‘‘desquamation” or peeling of the cuticle, which first shows itself about the neck, and proceeds slowly over the whole surface of the body. Where the skin is thin the desquamation is in the form of fine branny scales; but where it is thicker, as about the hands and feet, it comes off in large pieces, which sometimes assume the form of casts of the fingers or toes. The duration of this process is variable, but it is rarely complete before the end of six or eight weeks, and not unfrequently goes on for several weeks beyond that period. It is during this stage that complications are apt to appear, particularly those due to cold, such as inflam- mation of the kidneys; and all throughout its continuance there is the further danger of the disease being communi- cated to others by the cast-off epidermic scales.

Scarlet fever shows itself in certain well-marked varieties, of which the following are the chief :—

1. Searlatina Simplex is the most common form; in this the symptoms, both local and general, arc moderate, and the case usually runs a favourable course. It is always, however, to be borne in mind that the duration and the infectiveness of the disease, in- cluding its convalescence, are uninfluenced by the mildness of the attack. In some rare instances it would seem that the evidences of the disease are so slight, as regards both fever and rash, that they escape observation and only become known by the patient subsc- quently suffering from some of the complications associated with it. In such cases the name latent scarlet fever (searlatina latens) is applicd.

2. Scarlatina Anginosa is a more severe form of the fever, par- ticularly as regards the throat symptoms. The rash may be well marked or not, but it is often slow in developing and in subsiding, There is intense inflammation of the throat, the tonsils, uvula, and soft palate being swollen and ulcerated, or having upon them mein- branous patches not unlike those of diphtheria, while externally the gland tissnes in the neck are enlarged and indurated and

not unfrequently become the seat of abscesses. There is difficulty in opening the mouth ; an acrid discharge exudes from the nostrils and excoriates the lips; and the countenance is pale and waxy-

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looking. This form of the disease is marked by great prostration of strength, and it is much more frequently fatal than the preceding.

8. Scarlatina Maligna is the most serious form of all. The malignancy may be variously displayed. Thus a case of scarlatina anginosa may acquire such a severe character, both as to throat and general symptoms, as rapidly to produce profound exhaustion and death. But the typically malignant forms are those in which the attack sets in with great violence and the patient sinks from the very first. In sucli instances the rash either does not come out at all or is of the slightest amount and of livid rather than scarlet appearance, while the throat symptoms are often not prominent. Death in such cases may take place in from twenty- four to forty-eight hours, and is frequently preceded by great eleva- tion of the tempcrature of the body and by delirium, coma, or other nervous symptoms. A further example of a malignant form is occasionally observed in cases where the rash, which had previously been well-developed, suddenly recedes, and convulsions or other nervous phenomena and rapid death supervene.

The complications and effects of scarlet fever are, as already indicated, among the most important features in this disease, and, although their occurrence is exceptional, they appear with sufficient frequency, and are of such a nature, as ought to make the medical attendant carefully watch every case for any of their early indications. The most common and serious of these is inflammation of the kidneys, which may arise during any period in the course of the fever, but is specially apt to appear in the con- valescence, while desquamation is in progress. Its onset

is sometimes announced by a return of feverish symptoms, —

accompanied with vomiting and pain in the loins; but in a large number of instances it occurs without these and comes on insidiously. One of the most prominent symptoms is slight swelling of the face, particularly of the

eyelids, which is rarely absent in this complication. If the urine is examined it will probably be observed to be diminished in quantity and of dark smoky or red appear- ance, due to the presence of blood; while it will also be found to contain a large quantity of albumen. This, together with the microscopic examination which reveals the presence of tube casts containing blood, epithelium, &c., testifies to a condition of acute inflammation of the kidney (glomerular and tubal nephritis). In favourable cases these symptoms may soon disappear, but they may on the other hand prove extremely serious,—the risks being the suppression of urine, leading to uremic poisoning and causing convulsions which may terminate fatally, or, further, the rapid development of general dropsy, and death from this cause. Although thus a very formidable complication, it is yet one which is amenable to treatment, and by the prompt and judicious application of remedies lives may often be saved, even in desperate circumstances. Occasionally this condition does not wholly pass off, and consequently lays the foundation for Bricut's DisEass (g.v.). Another of the more common complications or results of scarlet fever is suppuration of the ears, due to the extension of the inflammatory process ~~from the throat along the Eustachian tube into the middle ear. This not unfrequently leads to permanent ear~~ discharge, with deafness from the disease affecting the inner ear and temporal bone, a condition implying a degree of risk from its proximity to the brain. Other maladies affecting the heart, lungs, pleura, &., occasionally arise in connection with scarlet fever, but they are of less common occurrence than those previously mentioned. Apart, however, from such definite forms of disease there may remain as the result of scarlet fever simply a general weakening of health, which may render the patient delicate and vulnerable for a long time.

In the treatment of scarlet fever, one of the first require- ments is the isolation of the case, with the view of prevent- ing the spread of the disease. In large houses this may be possible, but in most instances it can only be satisfactorily accomplished by sending away those other members of the

O17 family who have not suffered from the fever. The establishment in many large towns of hospitals for infec- tious diseases, which provide accommodation for patients of all classes, affords the best of all opportunities for thorough isolation. In large families, where few or none of

the members have had the disease, the prompt removal of a case to such an hospital will in many instances prevent the spread of the fever through the household, as well as beyond it, and at the same time obviate many difficulties connected with the cleansing and purification of the house, which, however carefully done, may still leave remaining some risk in the case of a fever the contagious power of which is so intense.

When, however, the patient is treated at home, the sick room should contain only such furniture as may be re- quired, and the attendants should come as little as possible in contact with other members of the household. Should other children be in the house, they should be kept away from school during all the time that the risk of infection continues. The possibility of the fever being communi- cated by letters sent from the sick room should not be forgotten by those in attendance. Disinfectants, such as car- bolic acid, Condy's fluid, &c., may be used freely in the room and passages, and all body or bed clothes when removed should be placed at once in boiling water, or in some disin- fecting fluid. In convalescence, with the view of preventing the transmission of the desquamated cuticle, the inunction of the body with carbolized oil (1 in 40) and the frequent use of a bath containing soda are to be recommended.

All books, toys, &c., used by the patient during the illness should be carefully destroyed or given to fever hospitals, as their preservation has frequently been known to cause an outbreak of the disease at a subsequent time. With respect to the duration of the infective period, it may be stated generally that it is seldom that a patient who has suffered from scarlet fever can safely go about before the expiry of eight weeks, while on the other hand the period may be considerably prolonged beyond this, the measure of the time being the completion of the pro- cess of desquamation in every portion of the surface of the body. As to general management during the progress of the fever,—in favourable cases little is required beyond careful nursing and feeding. The diet all through the fever and convalescence should be of light character, con- sisting mainly of milk food. Soups may be taken, but solid animal food should as far as possible be avoided. During the febrile stage a useful drink may be made by a weak solution of chlorate of potash in water (1 drachm to the pint), and of this the patient may partake freely. In the more severe forms of the disease, where the throat is much

affected, the application with a brush of a strong solution of Condy's fluid or other disinfectant, such as boroglyceride, glycerine of carbolic acid, quinine, &c., may be required, or gargling with these substances when this can bedone. In the malignant variety, where the eruption is not appearing, or is but ill developed, stimulants inter- nally, and the hot bath or pack, may sometimes afford a chance, or the hypodermic use of pilocarpin,—although it must be confessed that in such cases little can be expected from any remedies. The treatment of the kidney com- plication and its accompanying dropsy is similar to that for acute Bright's disease. Depletion by leeching or cup- ping the loins, and the promotion of cutaneous action by a hot air bath or a hot wet pack, or by pilocarpin, are the most useful measures, and will often succeed in saving life. The abscesses of the neck which occasionally occur as complications should be opened antiseptically, while the ear disorders, which are apt to continue long after the termination of convalescence, will demand the special attention of the aurist. (oh 0-4.)
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SCARRON, Paur (1610-1660), poet, dramatist, novel- ist, and husband of Madame de Maintenon, was born or at least baptized on the 4th July 1610. His father, of the same name, was a man of position, and a member of the parlement of Paris. Paul the younger (who is said to have quarrelled with his stepmother) became an abbé, was not ill-allowanced, and travelled to Rome in 1634. He returned and became a well-known figure in literary and fashionable society. A wild story used to be told of his having (when in residence at his canonry of Le Mans) tarred and feathered himself as a carnival freak, of his having been obliged to take refuge from popular wrath in a swamp, and of his consequent deformity from rheumatism. The simple fact seems to be that in 1637 he had an attack of fever with the usual sequele of rheumatic attacks, and that he put himself into the hands of a quack doctor. This at least is how Tallemant tells the story, though he substitutes a less creditable disease for fever. What is certain is that Scarron, after having been in perfect health for nearly thirty years, passed twenty more in a state of miserable deformity and pain. His head and body were twisted, and his legs became useless. Nevertheless he bore up against his sufferings with invincible courage, though they were complicated by his

inheriting nothing from his father, and by the poverty and misconduct of his sisters, whom he supported. For a few years he really held a benefice at Le Mans, but was then in no case to play pranks. It is said, however, that here he conceived the idea of the Roman Comique and wrote the drama of Jodelet, which gave a nickname to the actor who performed it. In 1646 he returned to Paris and worked hard for the booksellers, from the name of one of whom he is said to have called literature pleasantly his " marquisat de Quinet." He had also a pension from Mazarin and one from the queen, but lost both from being accused of "Frondeur" sentiments. The most singular action of his life remains to be told. In his early years he had been, as hinted, something of a libertine, and a young lady of some family, Céleste Palaiseau, had openly lived with him. But in 1652, sixteen years after he had become almost entirely paralysed, he married a girl of much beauty and no fortune, Francoise or Francine d'Aubigné, granddaughter of Agrippa d'Aubigné, after- wards famous as Madame de Maintenon. Scarron's house was, both before and after the marriage, a great centre of society, despite his narrow means. Yet only the most malignant and unscrupulous libellers of the future favourite accuse her of light conduct during the eight years of her marriage to this strange husband, and the well-informed author of the Historiettes distinctly acquits her of any such. But Scarron, who had long been able to endure life only by the aid of constant doses of opium, was at length worn out, and died on the 6th October 1660.

Scarron's work is very abundant, and, written as it was under pressure of want and pain, it is very unequal. The piece most famous in his own day, his Virgile Travesti (1648-53), is now thought, and not unjustly, a somewhat ignoble and unprofitable waste of singular powers for burlesque. But the Roman Comique (1651) is a work the merit of which can be denied by no competent judge who has read it. Unfinished, and a little desultory, this history of a troop of strolling actors is almost the first French novel, in point of date, which shows real power of painting manners and character, and is singularly vivid. It furnished Théophile Gautier with the idea and with some of the details of his Capitaine Fracasse. Scarrou also wrote some shorter novels of merit, which are thought to have inspired Moliére and Sedaine. Of his plays Jodelet (1645) and Don Japhet d' Arménie (1653) are the best. Both these and the others which he wrote are of course somewhat antiquated in style, but with Corneille's Menteur they stand above

everything else in comedy before Moliére. He also produced many miscellaneous pieces.

Scarron is generally spoken of and thought of as a representative writer of burlesque, but in reality he possessed in abundance the faculty of true comedy. The most complete edition of his works is

held to be that of 1737 (10 vols., Amsterdam), but his more celebrated pieces, including all those mentioncd above, have been frequently reprinted.

SCAUP,—the wild-fowler's ordinary abridgment of Scaup-Duck, meaning a Duck so called " because she feeds upon Scaup, i.e, broken shelfish," as may be seen in Willughby's Ornithology (p. 365); but it would be more proper to say that the name comes from the '' Mussel- scaups," or " Mussel-scalps,!" the beds of rock or sand on which Mussels (Mytilus edulis, and other species) are ageregated,—the Anas marila of Linneus and Fuligula maria of modern systematic writers, a very abundant bird around the coasts of most parts of the northern hemisphere, repairing inland in spring for the purpose of reproduction, though so far as is positively known hardly but in northern districts, as Iceland, Lapland, Siberia, and the fur-countries of America. It was many years ago believed (Hdin. WV. Philos. Journal, xx. p. 298) to have been found breeding in Scotland, but assertions to that effect have not been wholly substantiated, though apparently corroborated by some later evidence (Proc. N. H. Soc. Glasgow, ii. p. 121, and Proc. Phys. Soc. Edinburgh, vii. p. 203). The Scaup- Duck has considerable likeness to the PocHarD (vol. xix. p. 252), both in habits and appearance ; but it much more generally affects salt-water, and the head of the male is black, glossed with green, and hence the name of " Black- head," by which it is commonly known in North America, where, however, a second species or race, smaller than the ordinary one, is also found, the Fuligula afinis. The female Scaup-Duck can be readily distinguished from the Dunbird or female Pochard by her broad white face. (A. N.)

SCEPTICISM signifies etymologically a state of doubt or indecision in the face of different mutually conflicting statements (axémropat, I consider, reflect, hesitate, doubt). It is implied, moreover, that this doubt is not

merely a stage in the road to certainty and true knowledge. The provisional suspense of judgment recommended by Descartes and others as the true beginning of philosophy is no more than a passing phase of the individual's mind in his search for truth. But the doubt of the sceptic is professedly the last result of investigation; it is the renunciation of the search for truth on the ground that truth or real knowledge is unattainable by man. An account of the chief historical appearances of scepticism and its different motives will serve to illustrate and amplify this statement, and will lead up to any further considera- tions of a general nature. At the outset, and in general terms, scepticism may be summarily defined as a thorough- going impeachment of man's power to know—as a denial of the possibility of objective knowledge.

Trust, not distrust, is the primitive attitude of the mind. Histori- What is put before us, whether by the senses or by the °#! ap-

g Pearances,

statements of others, is instinctively accepted as a veraciou: report, till experience has proved the possibility of decep- tion. In the history of philosophy, in the same way, affirmation precedes negation; dogmatism goes before scepticism. And this must be so, because the dogmatic systems are, as it were, the food of scepticism; without them it would be without motive, without a basis oper- andi. Accordingly, we find that sceptical thought did not make its appearance till a succession of positive theories as to the nature of the real, by their mutual incon- sistency, had suggested the possibility that they might all alike be false. sophy was, in great part, such a negative reaction against the luxuriance of self-confident assertion in the nature- philosophies of the preceding age. Though scepticism as a definite school of opinion may be said, in accordance

1 **Scalp" primarily signifies a shell; ¢f Old Dutch schelpe and Old Fr. escalope (Skeat, Htymol. Dictionary, p. 528).

The Sophistic epoch of Greek philo- The

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with old precedent, to date only from the time of Pyrrho of Elis, there can be no doubt that the main currents of Sophistic thought were sceptical in the wider sense of that term. The Sophists were the first in Greece to dissolve knowledge into individual and momentary opinion (Prota- goras), or dialectically to deny the possibility of know- ledge (Gorgias). In these two examples we see how the weapons forged by the dogmatic philosophers to assist in the establishment of their own theses are sceptically turned against philosophy in general. As every attempt to rationalize nature implies a certain process of criticism and interpretation to which the data of sense are subjected, and in which they are, as it were, transcended, the anti- thesis of reason and sense is formulated early in the history of speculation. The opposition, being taken as absolute, implies the impeachment of the veracity of the senses in the interest of the rational truth proclaimed by the philosophers in question. Among the pre-Socratic nature-philosophers of Greece, Heraclitus and the Eleatics are the chief representatives of this polemic against the "lying witness" of the senses. The diametrical opposi- tion of the grounds on which the veracity of the senses is impugned by the two philosophies (viz., by Heraclitus because they testify to an apparent permanence and identity in things, by the Eleatics because they testify to an apparent multiplicity and change) was in itself sugges- tive of sceptical reflexion. Moreover, although these philo- sophers are not in any sense themselves sceptical, their arguments are easily susceptible of a wider application. Accordingly we find that the arguments by which Heraclitus supported his theory of the universal flux are employed by Protagoras to undermine the possibility of objective truth, by dissolving all knowledge into the momentary sensation or persuasion of the individual. The idea of an objective flux, or law of change constituting the reality of things, is abandoned, and subjective points of sense alone remain,— which is tantamount to eliminating the real from human knowledge.

Still more unequivocal was the sceptical nihilism ex- pressed by Gorgias in his three celebrated theses :—(1) nothing exists; (2) if anything existed, it would be un- knowable; (3) if anything existed and were knowable, the knowledge of it could not be communicated. The arguments of his book, " Concerning the Non-existent, or Nature," were drawn from the dialectic which the Eleatics had directed against the existence of the phenomenal world. But they are no longer used as indirect proofs of a universe of pure

and unitary Being. The prominence given by most of the Sophists to rhetoric, their cultiva- tion of a subjective readiness as the essential equipment for life, their substitution of persuasion for conviction, all mark the sceptical undertone of their teaching. This attitude of indifference to real knowledge passed in the younger and less reputable generation into a corroding moral scepticism which recognized no good but pleasure and no right but might.

What Socrates chiefly did was to recreate the instinct for truth and the belief in the possibility of its attain- ment. The scientific impulse thus communicated was sufficient to drive scepticism into the background during the great age of Greek philosophy (7.¢., the hundred years preceding Aristotle's death, 323 s.c.). The captious logic of the Megaric school,—in which the Eleatic in- fluence was strong,—their devotion to eristic and the elab- oration of fallacies, was indeed in some cases closely related to sceptical results. The school has been considered with some truth to form a connecting link with the later scep- ticism, just as the contemporary Cynicism and Cyrenaicism may be held to be imperfect preludes to Stoicism and Epicureanism. The extreme nominalism of some of the

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Cynics also, who denied the possibility of any but identical judgments, must be similarly regarded as a solvent of knowledge. But with these insignificant exceptions it holds true that, after the sceptical wave marked by the Sophists, scepticism does not reappear till after the exhaustion of the Socratic impulse in Aristotle.

The first man in antiquity whose scepticism gave name

to his doctrine was Pyrrho of Elis (about 360-270 B.c.). Pyrtho.

Pyrrho proceeded with the army of Alexander the Great as far as India, in the company of Anaxarchus, the Democritean philosopher. He afterwards returned to his native city, where he lived in poor circumstances, but: highly honoured by his fellow-citizens. Pyrrho himself left no writings, and the accounts of his doctrine are mainly derived from his pupil Timon of Phlius (about 325-235 B.c.). Timon is called the Sillographist, from his satirical

poem (3/AAoz), in which all the philosophers of Greece are held up to ridicule, with the exception of Xenophanes, who honestly sought, and Pyrrho, who succeeded in finding, the truth. Other disciples are mentioned besides Timon, but the school was short-lived, its place bemg presently taken by the more moderate and cultured doubt of the New Academy. Zeller sums up Pyrrho's teaching in three propositions: We know nothing about the nature of things; hence the right attitude towards them is to withhold judgment; the necessary result of withholding judgment is imperturbability. The technical language of the school expresses the first position by the word dxaradyyia; things are wholly incompre- hensible or inaccessible; against every statement the opposite may be advanced with equal justice (icooGevera rav \éyov). The sceptical watchword which embodies the second position is érox/, reserve of judgment, or, as it is put by Timon, oddév paAdov, that is, no one assertion is truer than another. This complete suspense of opinion is also expressed by the terms dppeyia, or equilibrium, and daca, or refusal to speak, as well as by other expressions, The Pyrrhonists were consistent enough to extend their doubt even to their own principle of doubt. They thus attempted to make their scepticism universal, and to escape the reproach of basing it upon a fresh dogmatism. Mental imperturbability (drapagia) was the result to be attained by cultivating such a frame of mind. The happiness or satisfaction of the individual was the end which dominated this scepticism as well as the contem- porary systems of Stoicism and Epicureanism, and all three philosophies place it in tranquillity or self-centred indif- ference. Scepticism withdraws the individual completely into himself from a world of which he can know nothing. It is men's opinions or unwarranted judgments about things, say the sceptics, which betray them into desire, and painful éffort, and disappointment. From all this a man is delivered who abstains from judging one state to be preferable to another. But, as complete inactivity would have been synonymous with death, it appears to have been admitted that the sceptic, while retaining his consciousness of the complete uncertainty enveloping every step, might follow custom in the ordinary affairs of life.

strictly, of the Middle Academy, under Arcesilaus and ¢% Carneades, founders respectively of the so-called second 4 and third Academies) differed very little from that of the Pyrrhonists. The differences asserted by later writers are not borne out on investigation. But the attitude main- tained

by the Academics was chiefly that of a negative criticism of the views of others, in particular of the some- what crude and imperious dogmatism of the Stoics. They also, in the absence of certainty, allowed a large scope to probability as a motive to action, and defended their doctrine on this point with greater care and skill. The

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whole position was stated with more urbanity and cul- ture, and was supported, by Carneades in particular, by argumentation at once more copious and more acute. It seems also true that the Academics were less overborne than the Pyrrhonists by the practical issue of their doubts (imperturbability) ; their interest was more purely intel- lectual, and they had something of the old delight in mental exercitation for its own sake. Arcesilas or Arcesilaus (about 315-240 B.c.) made the Stoic theory of irresistible impressions (favraciat katadyrrixat) the special object of his attack. Mere irresistibleness (xarddyyus), he maintained, is no criterion of truth, since false perceptions may equally possess this power to sway the mind. He seems chiefly to have supported his position by adducing the already well-known arguments of former philosophers against the veracity of the senses, and he evidently held that by these arguments the possibility of knowledge in general was sufficiently subverted. We can know nothing, he concluded,—not even this itself, that we know nothing. He denied that the want of knowledge reduces us to inaction. Notions influence the will immediately, apart from the question of their truth, and, in all questions of conduct, probability (rd evAoyov) is our sufficient guide, as it is our highest

attainable standard. It is stated that Arcesilaus made his negative criticism merely a preliminary to the inculcation of a modified Platonism. But this account, though not in itself incredible, is not borne out by any evidence at our disposal. The theory of Carneades (213-129 B.c.) repre- sents the highest development of Academic scepticism. The dogmatic system which Carneades had in view was that of Chrysippus, the Stoic, whose main positions, whether in the theory of knowledge, in morals, or in theology, he subjected to an acute and thorough-going criticism. As to the criterion of truth, Carneades denied that this could be found in any impression, as such; for in order to prove its truth an impression must testify, not only to itself, but also to the objects causing it. We find, however, admittedly, that in many cases we are deceived by our impressions; and, if this is so, there is no kind of impression which can be regarded as guaranteeing its own truth. According to his own examples, it is impossible to distinguish objects so much alike as is one egg to another ; at a certain distance the painted surface seems raised, and a square tower seems round; an oar in water seems broken, and the neck-plumage of a pigeon assumes different colours in the sun; objects on the shore seem moving as we pass by, and so forth. The same applies, he argued, to purely intellectual ideas. Many fallacies cannot be solved, and we cannot, for example, draw any absolute distinction between much and little, or, in short, between any quantitative differences. Our impressions, therefore, furnish us with no test of truth, and we can derive no aid from the operations of the understanding, which are purely formal, combining and separating ideas without giving any insight into their validity. Besides this general criticism of knowledge, Carneades attacked the cardinal doctrines of the Stoic school,—their doctrine of God and their proof of divine providence from the evidences of design in the arrangements of the universe. Many of his arguments are preserved to us in Cicero’s Academics and De Natura Deorum. His criticism of the contradictions involved in the Stoic idea of God really constitutes the first discussion in ancient times of the personality of God, and the difficulty of combining in one conception the characters of infinity and individuality. As a positive offset against his scepticism, Carneades elaborated more fully the Academic theory of probability, for which he employed the terms gudacis and wifavdrns. Being necessarily ignorant of the relation of ideas to the

objects they represent, we are reduced to judging them by their relation to ourselves, z.e., by their greater or less clearness and appearance of truth. Though always falling short of knowledge, this appearance of truth may be strong enough to determine us to action. Carneades recog- nized three degrees of probability. The first or lowest is where our impression of the truthfulness of an idea is derived simply from the idea itself; the second degree is where that impression is confirmed by the agreement of related ideas; if a careful investigation of all the individual ideas bears out the same conclusion, we have the third and highest degree of probability. In the first case, an idea is called probable (wifavy); in the second, probable and undisputed (mifavy kat daepiomacros) ; in the third, probable, undisputed, and tested (aia) Kat dmepiamactos Kal mepuwdevxnevn). The scepticism of Carneades was expounded by his successor Clitomachus, but the Academy was soon afterwards (in the so-called fourth and fifth Academies) invaded by the Eclecticism which about that time began to obliterate the distinctions of philosophical doctrine which had hitherto separated the schools. Cicero also, who in many respects was strongly attracted by the Academic scepticism, finally took refuge in a species of Eclecticism based upon a doctrine of innate ideas, and on the argument from the consensus gentium.

The later scepticism—which is sometimes spoken of as the third sceptical school—claimed to be a continuation of the earlier Pyrrhonism. Ainesidemus, though not abso- lutely the first to renew this doctrine, is the first of whose doctrine anything is known. He appears to have taught in Alexandria about the beginning of the Christian era. Among the successors of Alnesidemus, the chief names are those of Agrippa, whose dates caunot be determined, and the physician Sextus Empiricus (about 200 a.p.), whose Pyrrhonic Hypotyposes, and his work Adversus Mathematicos, constitute a vast armoury of the weapons of ancient scepticism. They are of the utmost value as an historical record. With Saturninus, the pupil of Sextus, and Favorinus, the grammarian, ancient scepticism may be said to disappear from history. What speculative power remained was turned entirely into Neoplatonic channels. To Ainesidemus belongs the first enumeration of the ten so-called tropes (rpdzox), or modes of sceptical argument, though the arguments themselves were, of course, current before his time. The first trope appeals to the different constitution of different animals as involving

different modes of perception; the second applies the same argument to the individual differences which are found among men; the third insists on the way in which the senses contradict one another, and suggests that an endowment with more numerous senses would lead toa different report as to the nature of things; the fourth argues from the variability of our physical state and mental moods; the fifth brings forward the diversities of appearance due to the position and distance of objects ; the sixth calls attention to the fact that we know nothing directly, but only through some medium, such as air or moisture, whose influence on the process cannot be elimi- nated ; the seventh refers to the changes which the sup- posed object undergoes in quantity, temperature, colour, motion, &c.; the eighth really sums up the thought which underlies the whole series, when it argues from the rela- tivity of all our perceptions and notions ; the ninth points out the dependence of our impressions on custom, the new and strange impressing us much more vividly than the customary ; the tenth adduces the diversity of customs, manners, laws, doctrines, and opinions among men. AMnesidemus likewise attacked the notion of cause at con- siderable length, but neither in his arguments nor in the

Later scepti- cism of antiquity.

Sceptical tropes.

Com- parison of ancient and modern scepti- cism.

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numerous objections brought against the notion by Sextus Empiricus do we meet with the thought which furnished the nerve of modern scepticism in Hume. The practical result of his scepticism /Mnesidemus sought, like the Pyrrhonists, in drapagic. He is somewhat strangely said to have combined his scepticism with a revival of the philosophy of Heraclitus ; but the assertion perhaps rests, as Zeller contends, on a confusion. To Agrippa is attri- buted the reduction of the sceptical tropes to five. Of these, the first is based on the discrepancy of human opinions ; the second on the fact that every proof itself requires to be proved, which implies a regressus in injint- tum; the third on the relativity of our knowledge, which varies according to the constitution of the percipient and the circumstances in which he

perceives. The fourth is really a completion of the second, and forbids the assump- tion of unproven propositions as the premises of an argu- ment. It is aimed at the dogmatists, who, in order to avoid the regressus in infinitum, set out from some principle illegitimately assumed. The fifth seeks to show that reasoning is essentially of the nature of a circulus im pro- bando, inasmuch as the principle adduced in proof requires itself to be supported by that which it is called in to prove. The attack made in several of these five tropes upon the possibility of demonstration marks this enumeration as distinctly superior to the first, which consists in the main of arguments derived from the fallibility of the senses. The new point of view is maintained in the two tropes which were the result of a further attempt at generaliza- tion. Nothing is self-evident, says the first of these tropes, for, if all things were certain of themselves, men would not differ as they do. Nor can anything be made certain by proof, says the second, because we must either arrive in the process at something self-evident, which is impossible, as has just been said, or we must involve ourselves in an endless regress.

When we review the history of ancient thought, we find, as Zeller puts it, that “the general result of all sceptical inquiries lies in the proposition that every asser- tion may be opposed by another, and every reason by reasons equally strong—in the icocGévea trav Adywv. Or, as the same thing may be expressed, what all sceptical proofs come back to is the relativity of all our ideas. We can never know the nature of things as they are, but always only the manner in which they appear tous. The criterion of the sceptic is the appearance. Not even his own proof can claim truth and universal validity : he does not assert; he only seeks to relate how a thing strikes him at the present moment. And even when he expresses his doubts in the form of universal statements they are intended to be included in the general uncertainty of knowledge” (Phil. d. Griechen, iii. 2, p. 58). Both Zeller and Hegel, it may be added, remark upon the difference between the calm of ancient scepticism and the perturbed state of mind evinced by many modern sceptics. Universal doubt was the instrument which the sceptics of antiquity recommended for the attainment of complete peace of mind ; rest and satisfaction can be attained, they say, in no other way. By the moderns, on the other hand, doubt is portrayed, for the most part, asa state of unrest and painful yearning. Even Hume, in various noteworthy passages of his Z’eatise, speaks of himself as recovering cheerfulness and mental tone only

by forgetful- ness of his own arguments. His state of universal doubt, so far from being painted as a desirable goal, is described by him as a “malady” or as “ philosophical melancholy and delirium.” The difference might easily be interpreted either as a sign of sentimental weakness on the part of the moderns or as a proof of the limitation of the ancient sceptics which rendered them more easily satisfied in the

absence of truth. It seems to prove, at all events, that the ancient sceptics were more thoroughly convinced than their modern successors of the reasonableness of their own attitude. But whether the ancients were the better or the worse sceptics on that account is a nice question which need not be decided here. It may be doubted, however, whether the thoroughgoing philosophical scepti- cism of antiquity has any exact parallel in modern times, with the single exception possibly of Hume’s Treatise on Human Nature. It is true we find many thinkers who deny the competency of reason when it ventures in any way beyond the sphere of experience, and such men are not unfrequently called sceptics. This is the sense in which Kant often uses the term, and the usage is adopted by others,—for example, in the following definition from Ueberweg’s History of Philosophy:—‘The principle of scepticism is universal doubt, or at least doubt with regard to the validity of all judgments respecting that which lies beyond the range of experience.” ‘The last characteristic, however, is not enough to constitute scepticism, in the sense in which it is exemplified in the ancient sceptics. Scepticism, to be complete, must hold that even within experience we do not rationally conclude but are irration- ally induced to believe. ‘‘In all the incidents of life,” as Hume puts it, “we ought still to preserve our scepticism. If we believe that fire warms, or water refreshes, ’tis only because it costs us too much pains to think otherwise” (Treatise, bk. i. iv. 7). This tone, which fairly represents the attitude of ancient sceptics, is rare among the moderns, at least among those who are professed philosophers. It is more easily matched in the unsystematic utterances of a man of the world like Montaigne.

One form of scepticism, however, may be claimed as Scepti-

an exclusively modern growth, namely, philosophical a im €

scepticism in the interests of theological faith. These ; sceptics are primarily Apologists. “de bonne foy”; it is simply a means to the attainment of a further end. They find that the dogmas of their church have often been attacked in the name of reason, and it may be that some of the objections urged have proved hard to rebut. Accordingly, in an access of pious rage, as it were, they turn upon reason to rend her. They deny her claim to pronounce upon such matters ; they go further, and dispute her prerogative altogether. They endeavour to show that she is in contradiction with her-self, even on matters non-theological, and that everywhere this much vaunted reason of man (la superbe raison) is the creature of custom and circumstance. Thus the ‘im- becility ” of reason becomes their warrant for the reception by another organ—by faith—of that to which reason had raised objections. ‘The Greeks had no temptation to divide man in two in this fashion. When they were sceptics, their scepticism had no ulterior motives ; it was an end in itself, But this line of argument was latent in Christian thought from the time when St Paul spoke of the “foolishness” of preaching. Tertullian fiercely re-echoed the sentiment in his polemic against the philo- sophers of antiquity :—“ Crucifixus est Dei filius ; non pudet, quia pudendum est. Et mortuus est Dei filius ; prorsus credibile est, quia ineptumest. Et sepultus resurrexit; certum est, quia impossibile est.” But, as Christianity became firmly established, Christian writers became more tolerant of speculation; and, instead of

1 This turn of thought is not confined, however, to Christian thinkers; it appears also in the Arabian philosophy of the East. Al- Ghazzali (Algazel) (1059-1111) in his TahGfot al- Fildsifa (‘The Collapse of the Philosophers”) is the advocate of complete philo- sophical scepticism in the interests of orthodox Mohammedanism—an orthodoxy which passed, however, in his own case into a species of mysticism. He did his work of destruction so thoroughly that Arabian philosophy died out after his time in the land of its birth.

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Theory of the twofold nature of truth.

Pascal.

flaunting the irreconcileable opposition of reason and dogma, they laboured to reduce the doctrines of the church toa rational system. This was the long task essayed by Scholasticism ; and, though the great Schoolmen of the 13th century refrained from attempting to rationalize such doctrines as the Trinity and the Incarnation, they were far from considering them as essentially opposed to reason. It was not till towards the close of the Middle Ages that a sense of conflict between reason and revelation became widely prevalent and took shape in the essentially sceptical theory of the twofold nature of truth. Philo- sophical truth, as deduced from the teaching of Aristotle, it was said, directly contradicts the teaching of the church, which determines truth in theology ; but the contradiction leaves the authority of the latter unimpaired in its own sphere. It is difficult to believe that this doctrine was ever put forward sincerely; in the most of those who professed it, it was certainly no more than a veil by which they sought to cover their heterodoxy and evade its consequences. Rightly divining as much, the church condemned the doctrine as early as 1276. Nevertheless it was openly professed during the period of the break up of Scholastic Aristotelianism. Pomponatius, the Alex- andrist of Padua (00. 1525), was one of its best known advocates.

The typical and by far the greatest example of the Christian sceptic is Pascal (1623-1662). The form of the Pensées forbids the attempt to evolve from their detached utterances a completely coherent system. For, though he declares at times “Le pyrrhonisme est le vrai,” ‘‘Se moquer de la philosophie c’est vraiment philosopher,” or, again, “ Humiliez-vous, raison impuissante, taisez-vous, nature imbécile,” other passages might be quoted in which he assumes the validity of reason within its own sphere. But what he everywhere emphatically denies is the possibility of reaching by the unassisted reason a satis- factory theory of things. The contradictions which meet us everywhere are summed up and concentrated in the nature of man. Man is a hopeless enigma to himself, till he sees himself in the light of revelation as a fallen creature. The fall alone explains at once the nobleness and the meanness of humanity; Jesus Christ is the only solution in which the baffled reason can rest. These are the two points on which Pascal’s thought turns. “There is nothing which is more shocking to our reason” than

the doctrine of original sin; yet, in his own words, “le noeud de notre condition prend ses replis et ses tours dans cet abime; de sorte que ’homme est plus inconcevable sans ce mystére que ce mystére n’est incon- cevable & homme.” Far, therefore, from being able to sit in judgment upon the mysteries of the faith, reason is unable to solve its own contradictions without aid from a higher source. In a somewhat similar fashion, in the present century, Lamennais (in the first stage of his speculations, represented by the Lssai sur Indifférence en Matiére Religieuse, 1817-21) endeavoured to destroy all rational certitude in order to establish the principle of authority; and the same profound distrust of the power of the natural reason to arrive at truth is exemplified (though the allegation has been denied by the author) in the writings of Cardinal Newman. In adifferent direction and on a larger scale, Hamilton’s philosophy of the con- ditioned may be quoted as an example of the same religious scepticism. Arguing from certain antinomies, said to be inherent in reason as such, Hamilton sought to found theology (in great part at Jeast) upon our nescience, and to substitute belief for knowledge. He also imitated Pascal at times in dilating upon the “impotence” and “imbecility” of our faculties; but, as with Pascal, this was rather in reference to their incapacity to evolve an

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“absolute” system than to their veracity in the ordinary details of experience. The theological application and development of Hamilton’s arguments in Mansel’s Bampton Lectures On the Limits of Religious Thought marked a still more determined attack, in the interests of theology, upon the competency of reason.

Passing from this particular vein of sceptical or semi- Sceptics sceptical thought, we find, as we should expect, that the in 16th

downfall of Scholasticism, and the conflict of philosophical theories and religious confessions which ensued, gave a decided impetus to sceptical reflexion. One of the earliest instances of this spirit is afforded by the book of Agrippa of Nettesheim (1487-1535), De Incertitudine et Vanitate Scientiarum. Sceptical reflexion rather than systematic scepticism is what meets us in Michel de Montaigne (1533-1592), though the elaborate

presentation of sceptical and relativistic arguments in his ‘“‘ Apologie de Raimond Sebond ” (£ssais, ii. 12), and the emblem he recommends —a balance with the legend, ‘Que scay-je ?”—might allowably be adduced as evidence of a more thoroughgoing Pyrrhonism. In his “tesmoynages de nostre imbécillité,” he follows in the main the lines of the ancients, and he sums up with a lucid statement of the two great arguments in which the sceptical thought of every age resumes itself—the impossibility of verifying our faculties, and the relativity of all impressions! The argument from the mutability of opinions and customs was probably the one which appealed most strongly to himself. In the concluding lines of this essay, Montaigne seems to turn to ‘‘nostre foy chrestienne” as man’s only succour from his native state of helplessness and uncertainty. But undoubtedly his own habitual frame of mind is better represented in his celebrated saying—‘‘ How soft and healthful a pillow are ignorance and incuriousness…. for a well-ordered head.” More inclined than Montaigne to give a religious turn to his reflexions was his friend Pierre Charron (1541-1603), who in his book De la Sagesse systematized in somewhat Scholastic fashion the train of thought which we find in the Zssais. Francois Sanchez (1562-1632), professor of medicine and _philo- sophy in Toulouse, combated the Aristotelianism of the schools with much bitterness, and was the author of a book with the title Quod nihil scitur. Of more or less isolated thinkers, somewhat later in point of time, who wrote in the same sceptical spirit, may be mentioned the names of Frangois de la Mothe le Vayer (1588-1672), whose Cing Dialogues appeared after his death under the pseudonym of Orosius Tubero ; Samuel Sorbiére (1615-1670), who trans- lated the Hypotyposes Pyrrhonex of Sextus Empiricus ; Simon Foucher (1644-1696), canon of Dijon, who wrote a History of the Academics, and combated Descartes and Malebranche from a sceptical standpoint. The work of Hieronymus Hirnhaim of Prague (1637-1679), De Typho Generis Humani sive Scientiarum Humanarum Inani ac Ventoso Tumore, was written in the interests of revelation. This is still more the case with the bitter polemic of Daniel Huet (1630-1721), Censura Philosophie Carte- sane, and his later work, Zraité Philosophique de la Faiblesse de VEsprit Humain. The scepticism of Joseph Glanvill (1636-1680), in his two works The Vanity of Dogmatizing (1661) and Scepsis Scientifica (1665), has more interest for Englishmen. Glanvill was not a sceptic at all

1 “Pour juger des apparences que nous recevons des subjects, il nous fauldra un instrument judicatoire ; pour verifier cet instrument, il nous y fault de la demonstration ; pour verifier la demonstration, un instrument ; nous voyla au rouet… Finalement il n’y a aulecune constante existence, ny de nostre estre ny de celuy des objects ; et nous, et nostre jugement, et toutes choses mortelles, vont coulant et roulant sans cesse ; ainsin, il ne se peult establir rien de certain de Yun 4 laultre, et le jugeant et le jugé estants en continuelle mutation et bransle” (Hssais, Garnier, i. 570).

and 17th centuries,

Hume.

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points, seeing that he was full of enthusiasm for the advance of physical science and for the newly-founded Royal Society. But he attacked unsparingly the Aristotel- ianism of the schools, which was still dominant at Oxford. Against this, and also against the materialistic dogmatism of Hobbes, he invoked the weapons of scepticism ; and he was led by his own arguments to query “whether there be any science in the sense of the dogmatists.” He based this conclusion partly upon the ground that our knowledge of causes, being derived simply from “ concomitancy,” is far from being “‘infallibly conclusive.” “The causality itself,” he says, anticipating Hume, “is insensible” ; accordingly, “the foundation of scientifical procedure is too weak for so magnificent a superstructure.” More celebrated than any of the above was Pierre Bayle (1647- 1706), whose scepticism lay more in his keen negative criticism of all systems and doctrines which came before him as literary historian than in any theoretic views of his own as to the possibility of knowledge. Bayle also paraded the opposition between reason and revelation ; but the argument in his hands is a double-edged weapon, and when he extols the merits of submissive faith his sincerity is at least questionable.

Hume, the most illustrious and indeed the typical sceptic of modern times, is treated at length in a separate article. Here, therefore, it is only necessary to point out shortly in what his scepticism consists. It is sometimes placed, as we have seen it is by Kant, in his distrust of our ability and right to pass

beyond the empirical sphere. But the mere denial of the possibility of "divinity or school meta- physics," as we find it in the Znguiry, combined with an apparent confidence in "experimental reasoning concern- ing matter of fact and existence," does not constitute scepticism, but rather what would now be called agnosticism or positivism. It is essential to the sceptical position that reason be dethroned within experience as well as beyond it, and this is undoubtedly the result at which Hume arrives in his larger and more thorough- going work. More generally, therefore, his scepticism may be considered to lie in his relation to preceding philosophy. The Treatise is a reductio ad absurdum of the principles of Lockianism, inasmuch as these principles, when consistently applied, leave the structure of experience entirely "loosened" (to use Hume's own expression), or cemented together only by the irrational force of custom. Hume's scepticism thus really arises from his thorough- going empiricism. Starting with " particular perceptions " or isolated ideas let in by the senses, he never advances beyond these "distinct existences." Each of them exists on its own account; it is what itis, but it contains no reference to anything beyond itself. The very notion of objectivity and truth therefore disappears ; the Scheon or appearance of the moment is the only reality. Hume's analysis of the conceptions of a permanent world and a permanent self reduces us to the sensationalistic relativism of Protagoras. He expressly puts this forward in various passages as the conclusion to which reason conducts us. The fact that the conclusion is in "direct and total opposition" to the apparent testimony of the senses is a fresh justification of philosophical scepticism. For, indeed, scepticism with regard to the senses is considered in the Inquiry to be sufficiently justified by the fact that they lead us to suppose "an external universe which depends not on our perception," whereas "this universal and primary opinion of all men is soon destroyed by the slightest philosophy." Scepticism with regard to reason, on the other hand, depends on an insight into the irrational character of the relation which we chiefly employ, viz., that of cause and effect. It is nota real relation in objects but rather a mental habit of belief engendered by frequent

repetition or custom. 'This point of view is applied in the Z'reatise universally. All real connexion or relation, therefore, and with it all

possibility of an objective system, disappears ; it is, in fact, excluded by Hume ad initio, for “the mind never perceives any real connexion among distinct existences.” Belief, however, just because it rests, as has been said, on custom and the influence of the imagination,! survives such demonstrations. ‘“ Nature,” as Hume delights to reiterate, ‘‘is always too strong for principle.” ‘Nature, by an absolute and uncontrollable necessity, has determined us to judge as well as to breathe and feel.” The true philosopher, therefore, is not the Pyrrhonist, trying to maintain an impossible equilibrium or suspense of judgment, but the Academic, yielding gracefully to the impressions or maxims which he finds, as matter of fact, to have most sway over himself. ‘I may— nay, I must—yield to the current of nature, in submitting to my senses and understanding ; and in this blind sub- mission I show most perfectly my sceptical principles,” for, after all, “‘if we believe that fire warms or water refreshes, ’tis only because it costs us too much pains to think other- wise,” @

The system of Kant, or rather that part of his system Sceptical expounded in the Critique of Pure Reason, though side of expressly distinguished by its author from scepticism, has ase been included by many writers in their survey of sceptical oa theories. The difference between Kant, with his system of pure reason, and any of the thinkers we have passed in review is obvious; and his limitation of reason to the sphere of experience suggests in itself the title of agnostic or positivist rather than that of sceptic. Yet, if we goa little deeper, there is substantial justification for the view which treats agnosticism of the Kantian type as essentially sceptical in its foundations and in its results. For criticism not only limits our knowledge to a certain sphere, but denies that our knowledge within that sphere is real; we never know things as they actually are, but only as they appear to us. Our knowledge, in Kant’s language, does not show us “the inward essence of the object in itself, but only the relation of the object to the subject.” But this doctrine of relativity really involves a condemnation of our knowledge (and of all knowledge), because it fails to realize an impossible and self-contradictory ideal. The man who impeaches the knowing faculties because of the fact of relation which they involve is pursuing the phantom of an apprehension which, as Lotze expresses it, does not apprehend things, but is itself things; he is desiring not to know but to Ge the things themselves. If this dream or prejudice be exploded, then the scepticism originating in it—

and a large proportion of recent sceptical thought does so originate—loses its raison @étre.? The prejudice, however, which meets us in Kant is, in a some- what different form, the same prejudice which is found in Preju- the tropes of antiquity—what Lotze calls “ the inadmissible a

relation of the world of ideas to a foreign world of objects.” es

1 “Belief is more properly an act of the sensitive than of the cism cogitative part of our nature.” rests.

2 Much the same conclusion is reached in what is perhaps the ablest English exposition of pure philosophic scepticism since Hume —Mr Arthur Balfour’s Defence of Philosophic Doubt (1879). ‘* The reader may wish to know,” says Mr Balfour, ‘‘what constitute the ‘claims on our belief’ which I assert to be possessed alike by science and theology, and which I put forward as the sole practical founda- tion on which our convictions ultimately rest… . Whatever they may be, they are not rational grounds of conviction. .. It would be more proper to describe them as a kind of inward inclination or impulse” (pp. 816-7).

3 It may be as well to add that the sceptical side of Kantianism is mainly confined to the Critique of Pure Reason, but this side of Kantian thought has been most widely influential. The remarks made above would not apply to the coherent system of idealism which may be evolved from Kant’s writings and which many would consider alone to deserve the name of Kantianism or Criticism.

Function of scepti- cism.

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For, as he rightly points out, whether we suppose idealism or realism to be true, in neither case do the things them- selves pass into our knowledge. No standpoint is possible from which we could compare the world of knowledge with such an independent world of things, in order to judge of the conformity of the one to the other. But the abstract doubt ‘whether after all things may not be quite other in themselves than that which by the laws of our thought they necessarily appear” is a scepticism which, though

admittedly irrefutable, is as certainly groundless. No arguments can be brought against it, simply because no arguments can be brought to support it; the scepticism rests on nothing more than the empty possibility of doubting. This holds true, even if we admit the ‘independent ” existence of such a world of things. But the independence of things may with much greater reason be regarded as itself a fiction or prejudice. The real “objective” to which our thoughts must show con- formity is not a world of things in themselves, but the system of things as it exists for a perfect intelligence. Scepticism is deprived of its persistent argument if it is seen that, while our individual experiences are to be judged by their coherence with the context of experience in general, experience as a whole does not admit of being judged by reference to anything beyond itself.

To the attack upon the possibility of demonstration, inasmuch as every proof requires itself a fresh proof, it may quite fairly be retorted that the contradiction really lies in the demand for proof of the self-evident, on which all proof most ultimately depend. It is of course always possible that in any particular case we may be deceived ; we may be assuming as self-evidently true what is in reality not so. But such incidental lapses are found to correct themselves by the consequences in which they involve us, and they have no power to shake our trust in the general validity of reason. It may, however, be granted that the possibility of lapse throws us open to the objections, ingenuous or disingenuous, of the sceptic; and we must remain exposed to them so long as we deal with our first principles as so many isolated axioms or intui- tions. But the process of self-correction referred to points to another proof—the only ultimately satisfactory proof of which first principles admit. Their evidence lies in their mutual interdependence and in the coherence of the system which they jointly constitute.

Of a scepticism which professes to doubt the validity of every reasoning process and every operation of all our faculties it is, of course, as impossible as it would be absurd to offer any refutation. Here, as Butler incisively put it, “we can go no further. For it is ridiculous to attempt to prove the truth of those very perceptions whose truth we can no otherwise prove than by other per- ceptions of exactly the same kind with them, and which there is just the same ground to suspect, or to attempt to prove the truth of our faculties, which can no otherwise be proved than by means of

those very suspected faculties themselves.” This absolute scepticism, indeed, can hardly be regarded as more than empty words; the position which they would indicate is not one which has ever existed. In any case, such scepticism is at all times sufficiently refuted by the imperishable and justifiable trust of reason in itself. The real function of scepticism in the history of philosophy is relative to the dogmatism which it criticizes. And, asa matter of fact, it has been seen that many so-called sceptics were rather critics of the effete systems which they found cumbering the ground than actual doubters of the possibility of knowledge in general. And even when a thinker puts forward his doubt as absolute it does not follow that his successors are bound to regard it in thesame light. The progress

of thought may show it to be, in truth, relative, as when the nerve of Hume’s scepticism is shown. to be his thoroughgoing empiricism, or when the scepticism of the Critique of Pure Reason is traced to the unwarrantable assumption of things-in-themselves. When the assump- tions on which it rests are proved to be baseless, the parti- cular scepticism is also overcome. In like manner, the apparent antinomies on which such a scepticism builds will be found to resolve themselves for a system based ona deeper insight into the nature of things. The serious thinker will always repeat the words of Kant that, in itself, scepticism is “not a permanent resting-place for human reason.” Its justification is relative and its func- tion transitional.

Authorities.—Ancient scepticism is fully treated in the relative parts of Zeller’s Philosophie der Griechen, with which may be com- pared Zimmermann’s Darstellung d. Pyrrhonischen Philosophie (1841), and Ueber Ursprung wu. Bedeutung d. Pyrrh. Phil. (1848) ; Wachsmuth, De Timone Phliasio (1859); Geflers, De

SCEPTRE. Though the sceptre is now used prin- cipally as one of the insignia of royalty, the word origin- ally had a more extended méaning. Among the early Greeks the oxymrpov was simply a long staff used by aged men (Jd, xviii. 416; Herod., i. 196), and thus came to be used as a sign of authority by officials of many kinds —judges, military leaders, priests, heralds, and others. It is frequently represented on Greek painted vases as a long staff, tipped with metal in some ornamental fashion, and is borne by

some of the gods. Among the Etruscans sceptres of great magnificence were used by the kings and also by the upper orders in the priesthood. Many repre- sentations occur on the walls of the painted tombs of Etruria. Some specimens which still exist are among the finest examples known of ancient jewellery. The British Museum, the Vatican, and the Louvre possess Etruscan gold sceptres of the most minute and elaborate workman- ship. Some of these are hollow gold batons, about nine to twelve inches long and half an inch in diameter, com- pletely covered with that very delicate ornament for which the Etruscan goldsmiths were so famed, produced by soldering thousands of microscopically minute globules of gold arranged in rich patterns on to the plain gold cylinder which forms the ground. One magnificent speci- men in the gold-ornament room of the British Museum has its top formed like a flower, with outer petals of beaten gold and an inner core made by a large emerald ; it is of the greatest beauty both in workmanship and design.

The sceptre of the Romans, like most of their insignia of rank, is said to have been derived from the Etruscans. An old and more Latinized form of the word is scepio (see Liv., v. 41). Under the republic an ivory sceptre (sceptrum eburneum) was one of the marks of consular rank. It was also used by victorious generals who re- ceived the title of imperator, and this use still survives in the modern marshal’s baton. In Roman paintings the long staff-like sceptre is frequently represented in the hands of Jupiter and Juno, as chief of the gods.

Under the empire the sceptrum Augusti (Suet., Galba, i.) was specially used by the emperors. It was often of ivory, tipped with a gold eagle (Juv., Saé., x. 43), and is frequently shown on medallions of the later empire, which have on the obverse a half-length figure of the emperor, holding in one hand the short eagle-tipped sceptre and in the other the orb surmounted by a small figure of Victory. The older staff-like form of sceptre still survived under

the name hasta pura; it is shown on the reverses of many Roman coins.in the hand of deities and of the emperor or empress, though originally the hasta pura had a very different use, being simply a mark of distinction given

by Roman generals to soldiers who had shown unusual bravery (Tac., Ann., ili. 21). After the introduction of Christianity as the state religion, the imperial sceptre was frequently tipped with a cross instead of the eagle, though both were used. All through the Middle Ages both these forms survived, and sceptres of gold studded with jewels were used by most sovereigns of Europe. The gold sceptre of Charlemagne, a magnificent specimen of early jeweller's work, still exists among the regalia at Vienna, Some medizeval sceptres were of crystal or ivory mounted in gold. Several fine ancient examples existed among the regalia of England till after the death of Charles I., when the whole set were broken up and melted by order of the Parliament.

At the Restoration, four new sceptres were made for the coronation of Charles II. (see Archaxologia, xxix. p. 262); and these still exist among the regalia in the Tower. They are—(1) the so-called St Edward's staff of gold, 4 feet 7 inches long, set with jewels, and surmounted with a cross and orb—a copy of the older one which contained in the orb a fragment of the true cross (this sceptre is borne in front of the sovereign during the processional part of the ceremony of coronation); (2) a gold sceptre tipped with a cross, which at the coronation is placed in the sovereign's right hand by the archbishop of Canter- bury; (3) a similar sceptre tipped with a gold dove, which is placed in the sovereign's left hand ;! (4) a small gold jewelled sceptre for the queen consort. Nos. (1) and (2) are both studded with diamonds. In addition to these four, there is a gold-mounted ivory sceptre, which was made for the queen of James II.; it is tipped with a gold dove and is studded with jewels. A sixth gold sceptre is that which was made for the queen at the coronation of William and Mary.

Among the Scottish regalia at Edinburgh a fine 15th- century gold sceptre still exists; and others of the same or earlier date are preserved among the royal insignia of several European countries.

SCHADOW, a distinguished name in the annals of Ger- man art.

I. Jonann Gottrriep ScHapow (1764-1850), an eminent sculptor, was born in 1764 in Berlin, where his father was a poor tailor. His first teacher was an inferior sculptor, Tassaert, patronized by Frederick the Great ; the master offered his daughter in marriage, but the pupil preferred to elope with a girl

to Vienna, and the father-in- law not only condoned the offence but furnished money wherewith to visit Italy. The young man made the most of advantages which in those days fell to the lot of few: he gained in competition a prize for a group of Perseus and Andromeda; three years' study in Rome formed his style, and in 1788 he returned to Berlin to succeed his former master, Tassaert, as sculptor to the court and secretary to the Academy. Prussia in rising into a great kingdom had need for much sculpture, and Schadow brought timely talent and exceptional training. Over half a century, crowded with commissions, he persistently produced upwards of two hundred works, varied in style as in subjects. Among his ambitious efforts are Frederick the Great in Stettin, Bliicher in Rostock, and Luther in Wittenberg. His portrait statues include Frederick the Great playing the flute, and the crown-princess Louise and

1 Both these sceptres (or rather the older ones) were shown, one in each hand of the fine bronze effigy of Edward III. in Westminster Abbey, but as a rule royal effigies were represented with only one sceptre.

her sister. His busts, which reach a total of more than one hundred, comprise seventeen colossal heads in the Walhalla, Ratisbon ; from the life were modelled Goethe, Wieland, and Fichte. Of church monuments and memorial works thirty are enumerated ; yet Schadow hardly ranks among Christian sculptors. He is claimed by classicists and idealists: the quadriga on the Brandenburger Thor and the allegorical frieze on the facade of the Royal Mint, both in Berlin, are judged among the happiest growths from the antique. Fauns, nymphs, cupids, and figures of fancy, scattered among plain portrait work, kept alive to an advanced age early associations formed in Italy. Schadow, as director of the Berlin Academy, gave proof of intellectual powers which made him a leader and secured many and devoted followers. Personal influence he extended and fortified by his books. He wrote on the proportions of the human figure, on national physiognomy, &c.; and many volumes by himself and others describe and illustrate his method and his work. He died, full of honours, at Berlin in 1850.

II. Ruporepn Scuapow (1786-1822), sculptor, son of the preceding, was born in Rome in 1786. His father, who returned to Berlin in 1788, was his first master. Rudolph in 1810 obtained the pension for Rome and received

kindly help from Canova and Thorwaldsen. His talents were versatile: his first independent work was a figure of Paris, and it had for its companion a spinning girl. Following the example set by leading German artists then settled in Rome, he exchanged the Protestant for the Catholic faith, and gave pledge of his convictions by statues of John the Baptist and of the Virgin and Child. In Eng- land he became known by bas-reliefs executed for the duke of Devonshire and for the marquis of Lansdowne. His last composition, commissioned by the king of Prussia, was a colossal group, Achilles with the Body of Penthesilea; the model, universally admired for its antique character and the largeness of its style, had not been carried out in marble when in 1822 the artist died in Rome.

Ill. Frieprich Witnerm Scuapow (1789-1862), painter, born in 1789 in Berlin, was the second son of Johann Gottfried Schadow the sculptor, from whom he received his earliest instruction. In 1806-7 he served as a soldier ; in 1810 he went with his elder brother Rudolph to Rome. He became one of the leaders among the German pre-Raphaelite brethren who eschewed classicism and the Ttalian Renaissance and sought to rebuild Christian art on the principles and practice of early and purer times. Following the example of Overbeck and others, he joined the Catholic Church, and held that an artist must believe and live out the truths he essays to paint. The sequel showed that Schadow was qualified to shine less as a painter than as a teacher and director. The Prussian consul, General Bartholdi, befriended his young com- patriots by giving them a commission to decorate with frescos a room 24 feet square in his house on the Pincian Hill. The artists engaged were Schadow, Cornelius, Overbeck, and Veit; the subject selected was the story of Joseph and his brethren, and two scenes, the Bloody Coat and Joseph in Prison, fell to the lot of Schadow. These well-studied and sound wall-paintings brought re- nown to the brethren, who were further fortified by the friendship of Niebuhr and Bunsen; the former writes— “They are all men of talent,” and “Schadow is parti- cularly refined and intellectual.” Schadow was in 1819 appointed professor in the Berlin Academy, and his ability and thorough training gained devoted disciples, To this period belong pictures for churches, In 1826 the pro- fessor was made director of the Dtisseldorf Academy, and so highly were his character and teachings esteemed that some of the best scholars accompanied their master. The

high and sacred art matured in Rome Schadow trans- planted to Diisseldorf ; he reorganized the Academy, which in a few years grew famous as a centre of Christian art to which pupils flocked from all sides. In 1837 the director selected, at request, those of his scholars best qualified to decorate the chapel of St Apollinaris on the Rhine with frescos, which when finished were accepted as the fullest and purest manifestation of the Diisseldorf school on its spiritual side. To 1842 belong the Wise and Foolish Virgins, in the Stadel Institute, Frankfort; this large and important picture is carefully considered and wrought, but lacks power. Schadow's fame indeed rests less on his own creations than on the school he formed ; he imparted to others nobility of conception, beauty of form, refine- ment and delicacy in expression and execution. Yet the master in Ditisseldorf encountered opposition: a reaction set in against the spiritual and sacerdotal style he had established ; a younger generation rose who stigmatized his system as narrow and bigoted ; and in 1859 the party of naturalism and realism after a severe struggle drove the venerable director from his chair. Schadow died at Diissel- dorf in 1862, and a monument in the platz which bears his name was raised at the jubilee held to commemorate his directorate. (5.7 AS) SCHAFARIK (in Bohemian Sarakrx), Paut Josery (1795-1861), was by origin a Slovak, and was born in 1795 at Kobeljarova, a village of northern Hungary, where his father was a Protestant clergyman. It was not till his sixteenth year that any enthusiasm was aroused in him for the language and literature of his race. At this time an essay of Jungmann's fell into his hands, and at once gave a direction to his studies. His first production was a volume of poems in Bohemian entitled The Muse of Tatra with a Slavonic Lyre, published at Levocza in 1814. After this we find him collecting Slovak songs. In 1815 he began a course of study at the university of Jena, and while there translated into Czech the Clouds of Aristophanes and the Maria Stuart of Schiller. In 1817 he came to Prague and joined the literary circle of which Dobrovsky, Jungmann, and Hanka were members. In 1819 he was appointed headmaster of the high school at Neusatz (Novi Sad) in the south of Hungary; he remained occupied with the duties of this office till 1833. But besides his educa- tional functions he busied himself with the

study of Servian literature and antiquities, and acquired many rare books and manuscripts. In 1826 his Geschichte der Slawischen Sprache und Literatur nach allen Mundarten appeared at Pesth. This may truly be called an epoch-making book in the history of Slavonic studies. It was the first attempt to give anything like a systematic account of the Slavonic languages, the knowledge of which was at that time in such a rudimentary state that even Schafarik is not able to classify properly the Bulgarian language, but has grouped it with Servian. In 1833 appeared his Serbesche Lesekirner oder historisch-kritische Beleuchtung der Serbischen Mundart, and in 1837 his great work Slovanské StarozZitnosti ("Slavonic Antiquities"), by which he is at the present time best known. The " Antiquities" have been translated into Polish, Russian, and German, and we are promised an English version shortly from the pen of Mrs Alexander Kerr. This valuable work was enlarged and improved in the second edition, which appeared among the collected works of Schafarik, edited by Jiretek after the author's death. In 1840 he published in conjunction with Palacky Dee altesten Denkmiiler der Béhmischen Sprache, in which he defended the authenticity of those Bohemian docu- ments which have been declared spurious by some scholars. In the year 1837 poverty compelled him to accept the uncongenial office of censor of Czech publications, which he abandoned in 1847 on becoming custodian of the

Prague public library. In 1842 he published his valuable work Slovansky Ndrodopis, which gives a complete account of Slavonic ethnology. In 1848 he was made professor of Slavonic philology in the university of Prague, but resigned it in the following year, probably from causes in some way connected with the political troubles of that period, of which Prague was one of the centres. He was then made keeper of the university library, in which office he con- tinued till his death in 1861. He had long been in broken health,—his pains of body being augmented by brain dis- ease, which had been brought on by his severe literary labours and also by family anxieties. His latter days were devoted to philology, one of the chief subjects treated of by him being the antiquity of the Glagolitic alphabet, about which he held very different opinions at various periods of his life. He was also for some time conductor of the "Journal" of the Bohemian

Museum, and edited the first volume of the Vybor, or selections from old Czech writers, which appeared under the auspices of the literary society in 1845. To this he prefixed a grammar of the Old Bohemian language. His correspondence with Pogodin has been published by Prof. Nil Popoff of Moscow among the letters of that eminent scholar.

Schafarik was a man of the purely literary type, —an indefatigable worker, an enthusiast, and a sincere patriot. The study of Slavonic philology and ethnology has advanced since his time, but the greater part of his work is permanent and monumental. Besides his collected writings (Sebrané Spisy), which were reprinted at Prague after his death during the years 1862-1865, a posthumous work by him also made its appearance, edited by J. Jiretek, Geschichte der Stidslawischen Literatur.

-SCHAFFHAUSEN, in area (111-7 square miles) and actual population (38,348) the 19th and in relative density of population the 7th of the cantons of Switzer- land, forms the most northern angle of the Swiss territory, and lies on the right or German side of the Rhine, which separates it from the cantons of Thurgau and Zurich. It is divided into three distinct portions by spurs of the grand-duchy of Baden, which also possesses the small enclave of Biisingen on the Rhine. Geologically it belongs for the most part to the Swabian Jura, and directly or indirectly it all drains to the Rhine, which forms its famous falls in the neighbourhood of the chief town (see RuINs, vol. xx. p. 519). In the broad straths of the Klettgau vine-growing and agriculture go hand in hand (the wines of Hallau being in high repute); the more elevated districts of Rauden and Reyat (highest point 3040 feet above the sea) raise the grain-production of the canton above the home demand, and also provide large quantities of potatoes, hemp, and fruit. Under a careful regime the forests are recovering from a state of comparative exhaustion. The Schaffhausen cattle are partly Swabian and partly Swiss; Klettgau has a special breed of pigs of its own. Manufacturing industries have their best development at Schaffhausen-Neuhausen. The population, which increased from 35,300 in 1850 to 38,348 in 1880, is almost exclusively of German speech (230 individuals only using other languages). Protestants are to Roman Catholics as 8 to 1 (33,897 and 4154); the latter are attached to the bishopric of Basel. Schaffhausen has been a member of the Swiss confederation since 1501. By the new constitution of 1876 it

became remarkably democratic. The great council consists of representatives of the people elected for four years at the rate of one for every five hundred inhabitants. On the petition of any thousand of the electors, a measure may be introduced to the chamber or submitted to the direct vote of the citizens. The five members of the administration are also popularly elected. Education is well endowed, primary education being compulsory. A reformatory for destitute children is maintained at Friedeck, near Buch.

SCH—SCH

SCHAFFHAUSEN, the capital of the above canton, is situated on the bank of the Rhine, 303 miles by rail west of Constance and 60 east of Basel, and communicates by a bridge with the village of Feuerthalen (1000 inhabitants) +n Zurich. It is a city of contrasts—medizval architec- ture of the true Swabian type and modern manufactures mingling curiously together. The cathedral, formerly the church of the abbey of All Saints (Allerheiligen), is a massive basilica founded in 1104 and completed in 1453 ; its great bell (1486) bears the inscription V2vos voco, mortuos plango, fulgura frango, which suggested Schiller's "Song of the Bell" and_ the opening of Longfellow's Golden Legend. On the Rebhiigel above the town rises the castle of Manoth (1564-1590) with bomb-proof case- mates, and a tower whose top is reached by a spiral ascent up which one can ride or drive. In Herrenacker Platz stands the Imthurneum, a building erected (1864) and pre- sented to the town by a Swiss citizen, resident in London, for the 'promotion of zsthetic and scientific culture"; it contains a theatre, concert-rooms, &c. The public library (28,000 volumes) possesses the printed and MS. collections

of Johann von Miiller, who was born at Schaffhausen in 1752, and his monument adorns the promenade of the Vesenstaub. In the museum is preserved the famous Kesvlerloch "find." Among the industrial establishments of the city and vicinity are ironworks, waggon and carriage factories, woollen and cotton factories, breweries, distilleries, and champagne factories. The population of the commune was 10,303 in 1870 and 11,795 in 1880.

Schaffhausen (Latinized as Scafusia or Greeized into Probatopolis) first appears in the 9th century, and had already attained the rank of an imperial eity in 1264.

SCHALCKEN, Goprrrep (1643-1706), genre and por- trait painter, was born at Dort in 1643, and studied under Van Hoogstraten, and afterwards under Gerhard Douw, whose works his earlier genre-pictures very closely resemble. He visited England and painted several portraits, of which the half-length of William III., now in the Museum, Amsterdam, is a good example. In this work he shows an effect of candle-light, which he also introduced— frequently with fine effect—in many of his subject-pictures. These may be studied in the collections at Buckingham Palace, the Louvre, Vienna, and Dresden. He executed several Scriptural subjects—such as that of the Wise and Foolish Virgins, at Munich—of very indifferent merit. He died at The Hague in 1706.

SCHAMYL (i.e, SAMUEL), prophet and hero of the Caucasian mountaineers, was born in 1797. See Caucasus, vol. v. p. 258. After his defeat and capture he passed ten years in Russia, where he was well treated. In 1870 he went on pilgrimage to Mecca, and died at Medina in March of the following year.

SCHANDAU, a small town of Saxony, is situated on the right bank of the Elbe, at the mouth of the little valley of the Kirnitzsch, 21 miles to the south-east of Dresden, and 4 miles from the Bohemian frontier. Its position in the heart of the romantic ‘Saxon Switzer- land” gives it an importance to which on other grounds it is not entitled, and thousands of tourists make it their headquarters in summer, The stationary population in 1880 was 3301.

SOHARNHORST, Gernarp Jonann Davip VoN (1756-1813), Prussian general, celebrated as the author of the so-called “Kriimpersystem,” or short-service system (see vol. ii. p. 594), by which the Prussian nation was prepared for the war of liberation, was a Hanoverian by birth, and served in the Hanoverian army from 1778 to 1801, when he passed into Prussian service, and soon became the leader in the reconstruction of its forces. In the war with France in 1813 he accompanied Bliicher as

chief of the general staff, but received a severe wound m the first battle (Grossgérschen), which soon after was followed by his death. ‘The first part of an extensive and important biography of Scharnhorst by Lehmann has recently appeared (Leipsic, 1886).

SCHASSBURG (Hung. Segesvdr), chief town of the Transylvanian county of Nagy-Kiikiillo, Hungary, stands on the river Nagy-Kiikiillo, 24 miles east-south-east of Maros-Vasarhely, in 46° 10’ N. lat, 24° 47° E. long. It consists of two parts,—the one which formerly served as a fortress on the top of a hill, and the other in the valley below,—the two being connected by a covered passage. Schissburg is the seat of various public offices and of a district court of justice; its other institutions include a Franciscan convent, a Protestant upper gymna- sium, a teachers’ institute and seminary, two savings banks, a free library, hospital, barracks, &e. As a station on the eastern system of the Hungarian State Railways, Schassburg has a good woollen and linen trade, as well as exports of wine and fruit. Among its principal buildings an old Gothic church and the lofty town-hall are specially worthy of mention. The population in 1884 amounted to 8810, the majority being Germans (Saxons), and the remainder Roumanians and Hungarians.

Schiissburg was founded by Saxon colonists at the end of the 12th eentury ; its Latin name was Castrum Sex. The most important event in its history was the battle on the 31st July 1849, in whieh the Hungarian army under Bem was defeated by the overwhelming numbers of the Russian General Liiders. The great national poet, Petofi, was last seen, and is generally believed to have met his end, in this engagement.

SCHAUMBURG-LIPPE. See Lippe.

SCHEELE, Karn Wirtneim (1742-1786), an eminent chemist, was born at Stralsund, the capital of Pomerania, which then belonged to Sweden, on the 19th December 1742. His father was a merchant, and Karl Wilhelm was the seventh of a family of eleven. In due time the boy was sent to school, but he did not care for the languages, and as he showed a strong taste for pharmacy he was apprenticed at the age of fourteen to an apothecary in Gothenburg, called Bauch, with whom he stayed for eight years. He was thoughtful and silent, and very punctual and precise in discharge of his duties. His spare

time and great part of his nights were devoted to the experimental examination of the different bodies which he dealt with, and the careful study of the standard works on chemistry. By these means he acquired a large store of knowledge and great practical skill and manipulative dexterity. In 1765 he removed to Malm, and resided for five years with Kalstrém, an apothecary, whence he removed to Stockholm, to Scharenberg, also an apothecary. While here he wrote out an account of his experiments with cream of tartar, from which he had isolated tartaric acid, and sent it to Bergman, the leading chemist in Sweden. Bergman some-how neglected it, and this caused for a time a reluctance on Scheele's part to become acquainted with that savant, but the paper, through the instrumentality of Retzius, was ultimately communicated to the Academy of Sciences at Stockholm. In 1771 Scheele finished an elaborate inquiry into the composition of the beautiful mineral fluor-spar, and showed that it consisted of lime and a peculiar acid which he called fluor acid. He misunderstood, however, the true character of the decomposition he had effected, and gave an erroneous explanation of it. His experiments had been conducted in glass vessels, and he was not aware that what he actually got was the fluo-silicic acid. This mistake was subsequently pointed out and corrected by some other chemists. He left Stockholm in 1773 and took up his residence at Upsala. Here he made the acquaintance of Gahn, assessor of mines at Fahlun, through whose mediation he was at length introduced to

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Bergman ; the two soon became excellent friends. In 1774 Scheele published his epoch-making investigation into the black oxide of manganese, which had occupied him for two or three years, and in 1775 his memoirs on benzoic and arsenicacids. Inthe same year he left Upsala, in order to settle at K6piug, a small place at the western extremity of Lake Malar. Having heard that an apothe- cary's shop was vacant, he applied for it, passed a brilliant examination before the medical college, and was appointed. But, instead of a small flourishing business, he found that he had to face confusion and debt. Undismayed he set to work, introduced order and some prosperity, and in two years bought the business from the widow of the former proprietor. During this unfortunate period Scheele must have worked very hard, for in spite of debt and diffi- culties he published in 1777

his treatise upon Air and Fire, one of the most remarkable books in the whole range of chemical literature, whether its originality, its close reasoning, the number of discoveries which it contains, or the enormous amount of experimental work it represents bé considered. About this time Bergman obtained for him from the Academy a grant, Scheele's appreciation of which was shown by his reserving one-sixth for his personal wants and devoting the remainder to his experiments.

Subsequent to this period, and for the remaining nine years of his life, the only events to be recorded are the papers which he composed. Every year he published two or three, and almost every one contained a capital discovery, either the explanation of a phenomenon or reaction previously misunderstood or the description of some new compounds. He was at the zenith of his now European fame asa profound chemist and unfailing experimenter, and in the best years of his life, when his career was suddenly arrested. The common account is that his unremitting work, especially at night, exposing him to cold and draughts, induced a rheumatic attack, to which in the course of a couple of months he succumbed. Possibly his strength had been exhausted by long years of privation and neglect of himself. He had intended, as soon as his circumstances should enable him, to marry the widow of his predecessor. His illness, however, increased very fast, and it was on his death-bed that he carried out his design on the 19th May 1786. Two days later he died, bequeathing to his wife what property he had acquired. He was only forty-four years of age.

The discoveries with which Scheele enriched chemistry are numerous and important. Reference has been already made to the discovery of tartaric acid and of the composition of fluor-spar. The analysis of manganese oxide in 1774 led him to the discovery of chlorine and of baryta (terra ponderosa, as it was called), to indi- vidualizing the salts of manganese itself, ineluding the green and purple compounds with potash, and to the explanation of how manganese colours and decolorizes glass. In 1775 he showed how to prepare benzoic acid by precipitating it from a solution in lime, and he investigated arsenic acid and its reactions with different sub- stances, discovering arseniuretted hydrogen and the green colour "Schecle's green,"—a process for preparing which on the large seale he published in

1778. Other researches of this period were con- eerned with the nature of quartz, clay, and alum, and with an

animal concretion or caleulus from which he got for the first time urie acid.

The treatise on Air and Fireappearedin1777. Itis unnecessary now to enter into Scheele's argument, for, however admirably it be worked out, it started from an erroneous basis, and it is equally impossible in limited space even to enumerate the experiments and the discoveries which fill this book, and which have remained as permanent acquisitions to science through all subsequent changes of theory. Among the most important of these is his demonstra- tion that the air consists mainly of two gases, —one which supports the burning of bodies, the other which preventsit. This he showed both analytically and synthetically. His "empyreal," or ''fire-air," or oxygen, he obtained for his synthesis from acid of nitre, from saltpetre, from black oxide of manganese, and from several other bodies. After the discovery of this substance Scheele applied it to account for a great number of actions, and especially for its function in respiration and the growth of plants. He went through a long

series of actions, seemingly the most diverse in character, trying to bring them under one general law and making at every step the most acute and far-reaching observations and discovering new compounds and new reactions. Thus he incidentally made and described sulphuretted hydrogen gas, and he explained the chemical effect of light upon compounds of silver and other substances.

In 1778 he proposed a new method of making calomel and powder of algaroth. He also examined a mineral, molybdana nitens, which had been supposed to contain lead, but which he showed was quite distinet, and he got from it molybdic acid. He demonstrated in 1779 that plumbago consists almost solely of carbon, and he published a record of estimations of the amount of pure air, é.¢., of oxygen, contained in the atmosphere, which he had carried on daily during the entire year of 1778. In 1780 he showed that the acidity of sour milk was due to a peculiar acid, now ealled lactic acid ; and from milk sugar, by boiling it with nitric acid, he obtained mucic acid.

His next discovery, in 1781, was the com- position of tungsten, since called scheelite, which he found consisted of lime combined with a peculiar acid —tungstic acid. The follow- ing year he examined the mode of producing ether, and in 1783 discovered glycerin, the sweet principle of fats and oils. In 1782— 1783 appeared a research which—of all those Scheele conducted — exhibits his experimental genius at its very best. By a wonderful succession of experiments he showed that the colouring matter of Prussian blue could not be produced without the presence of a substance of the nature of an acid, to which was ultimately given the name of prussic acid. He showed how this body was vom- posed, described its properties and compounds, and mentioned its smell and taste, utterly unaware of its deadly character. Nothing but a study of Scheele's own memoir can give an adequate notion of the manner in which he attacked and solved a problem – so difficult and complicated as this was at the period in the history of chemistry when Scheele lived. In 1784-85-86 he returned to the subject with which he had begun his career, that of the vegetable acids, and described four new ones—citric, malic, oxalic, and galliec acids.

The preceding is a bare list of the more prominent of Scheele's discoveries, for it must be remembered that he was not merely the first to prepare these bodies, but that he made all the compounds of them possible at the time and explained the conditions under which he produced them. Notable as is the list, and of supreme im- portanee as are most of the bodies themselves, no conception ean be gathered from it of Scheele's immense power of experimental re- seareh,—a power that has seldom, if ever, been surpassed. Tis natural endowments were cultivated by unwearicd practice and un- divided attention; for scientific work was at once his occupation and his relaxation. To appreciate this fully his own account of his researches must be studied. It will thus be seen that his dis- coveries were not made at haphazard, but were the outcome of experiments carefully planned to substantiate the accuracy of theoretical views at which he had arrived. He thus saved himself unnecessary labour; his.experiments tell decisively on the question at issue, and he reached his conelusions by the shortest and simplest means. At the same time he left nothing in doubt if experiment would establish it; he grudged no labour to.make the truth indis- putable ; and he evidently never considered his work complete about any body unless he could both unmake and remake it. For him chemistry was both an

analytic and a synthetic science, and he shows this prominently in his researches on Prussian blue.

His accuracy, qualitative and quantitative,—considering his primitive apparatus, his want of assistanec, his place of residence, the undeveloped state of chemical and physical science, —was un- rivalled. The work he executed left hardly anything to be added to it: it was as thoroughly done as it was in the power of an all- conscientious man to do. The one aim of Scheele's life—and he never swerved from it—was the experimental discovery of the truth in nature. Like many other short-lived men of genius he compressed into his few years an amount of work of the greatest originality ; but how he managed to do it isa mystery to the less- gifted. What he might have achieved had he lived a little longer ean only be surmised; but it may be supposed that, under the newer theory of combustion to which he himself had unwittingly contributed so much, he would have made certainly no fewer and no less important discoveries than those which were the outcome of

its erroneous predecessor.

Scheele's papers appeared first in the Zransactions of the Swedish Academy of Sciences, in Crell's Veue Entdeckungen and Annalen, and in other periodicals. A list_of them is given in Fuchs's Repertorium der chemischen Litteratur, J ena, 1806-1808; in Reuss's Repertorium Commentationum, vol. iii, Gbttingen, 1803; and in Poggendorfi's Biographisch-literarisches Iandwérterbuch, Leipsic, 1863, They were collected and published in French, English, Latin, and German : Mémoires de Chymie, 2 vols., Paris, 1785-88; Chemical £ssaus, by Thomas Beddoes, 1 vol., London, 1786; Opuscula, translated by Sehafer, cditcd by Hebenstreit, 2 vols., Leipsic, 1788-89; Sdmmtliche Werke, edited by Hermbstiidt, 2 vols., Berlin, 1793. The Yreatise on Air and Fire appeared in German, Upsala and Leipsic, 1777, and again in 1782; in English, by J. R. Forster, London, 1780; in French, by Dietrich, Paris, 1781. (J. F.)

SCHEFFER, Ary (1795-1858), Dutch painter, who was born at Dort on 10th February 1795, represents the senti-

mental phase of the Romantic movement in France.

After the early death of his father, a poor painter, Ary was taken to Paris and placed in the studio of Guérin by

his mother, a woman of great energy and character. The

moment at which Scheffer left Guérin coincided with the He had little sympathy with the directions given to it by either of its most conspicuous representatives, Sigalon, Dela-

commencement of the Romantic movement.

croix, or Gericault, and made various tentative efforts—

Gaston de Foix (1824), Suliot Women (1827)—before.

he found his own path. Immediately after the exhibition of the last-named work he turned to Byron and Goethe, selecting from Faust a long series of subjects which had an extraordinary vogue. Of these, we may mention Margaret at her Wheel; Faust Doubting ; Margaret at the Sabbat ; Margaret Leaving Church ; the Garden Walk ; and lastly, perhaps the most popular of all, Margaret at the Well. The two Mignons appeared in 1836; and Francesca da Rimini, which is on the whole Scheffer's best work, belongs to the same period. He now turned to religious subjects: Christus Consolator (1836) was followed by Christus Remunerator, the Shepherds Led by the Star (1837), The Magi Laying Down their Crowns, Christ in the Garden of Olives, Christ Bearing his Cross, Christ Interred (1845), St Augustine and Monica (1846), after

which he ceased to exhibit, but, shut up in his studio, con—

tinued to produce much which was first seen by the outer world after his death, which took place at Argenteuil on the 15th June 1858. At the posthumous exhibition of his works there figured the Sorrows of the Earth, and the Angel Announcing the Resurrection, which he had left unfinished. Amongst his numerous portraits those of La Fayette, Béranger, Lamartine, and Marie Amélie were the most noteworthy. His reputation, much shaken

by this posthumous exhibition, was further undermined by the sale of the Paturle Gallery, which contained many of his most celebrated achievements ; the charm and facility of their composition could not save them from the con- demnation provoked by their poor and earthy colour and vapid sentiment. Scheffer, who married the widow of General Baudrand, was only made commander of the Legion of Honour in 1848,—that is, after he had wholly withdrawn from the Salon. His brother Henri, born at The Hague 27th September 1798, was also a fertile painter.

See Vitet's notice prefixed to Bingham's publication of works of A. Scheffer ; Etex, Ary Scheffer; Mrs Grote, Life of A. Scheffer ; Julius Meyer's Geschichte der franzdsischen Kunst.

SCHELDT, or Scuenpe (Fr. Escaut, Lat. Scaldis, O. Dutch Schoude or Schouwe), a river of north-west Europe, belonging for 75 miles of its course to France, 137 to Belgium, and 37 to the Netherlands. Rising at a height of 295 feet above the sea, in a small lake (7 square miles) at the old abbey of St Martin, near Catelet, in the French department of Aisne (Picardy), it becomes navigable by the junction of the St Quentin Canal, below Catelet, and passes by Cambray, Denain (where it receives the Selle), Valenciennes, at the mouth of the Rouelle, Condé, at the mouth of the Haisne or Henne, and Chateau l'Abbaye, at the mouth of the Scarpe. Entering Belgium between Mortagne and Hollain, it continues by Fontenoy, Tournay, and Oudenarde to Ghent, where it is joined by the Lys from the left, and by the canals which unite this town with Sas and Bruges. At Ghent the tide rises 3} feet and lasts for four hours; and it would ascend much farther were it not for sluices. But the river, instead of proceeding straight towards the sea, as it appears to have done perhaps as late as the time of Charlemagne, makes a great bend towards the east to Dendermonde (the mouth of the Dender) and Antwerp, whence it again turns north- west and loses itself in the estuaries among the islands of

Zealand. The whole of the lowlands to the north of Ghent are so intersected with canals, and the natural channels are so intermingled with those partially or entirely artificial, that it is impossible to discover with. certainty what has been the real history of the lower course of the Scheldt.! The Hont

or Western Scheldt, the principal estuary by which nearly all Belgium commerce is conveyed, was probably opened up by a storm in 1173 and about 1058 must have been a mere narrow creek.

“The Eastern Scheldt, which then received most of the

river, has gradually diminished in importance, and since the construction of the railway bridge across it between the mainland and South Beveland in 1867 has become completely obstructed with sands. At Antwerp the depth at high water is 49 feet.

Between 1648 and 1792 the Dutch closed the mouths of the Scheldt against foreign commerce. The emperor Joseph of Austria, at that time ruler of Antwerp, protested agaiust this action in 1788,. but in 1784, by the treaty of Fontainebleau, he recognized, in return for concessions of territory and 94 million florins, the right of the Dutch to adhere to the terms of the peace of Westphalia. In 1792 by conquest of Dumouriez, and in 1795 by treaty between France and Holland, the Scheldt was declared open. During the union of Holland and Belgium the question naturally lay in abeyance. When Belginm became independent (1839) Holland so far resumed her exclusive policy, but in 1863 the dues which she was allowed to levy by the treaty of separation were capitalized by Belgium paying 17,141,640 florins, a sum which was largely repaid to Belgium by twenty other countries who felt they had an interest in the free navigation of the Scheldt. Great Britain’s share was 8,782,320 francs.

See Vifquain, Des Voices Navigables en Belgique, 1842 ; Wauvermans, ‘Sur les Variations de ’Escaut au XVI. siécle,” in Bull. de la Soc. de Géogr. @ Anvers, vol.

i.; Raemdonck, ‘‘L’Hist. du Cours de PEscaut,” and Verstraete, “Cours Primitif de I’Escaut,” both in Bull. de la Soc. Belgede Géogr., 1878.

SCHELLING, Frrmeprich WinHetm JOSEPH VON (1775-1854), a distinguished German philosopher, was born on 27th January 1775 at Leonberg, a small town of Wiirtemberg, otherwise notable as scene of the early years of Kepler’s life. Through both parents he was connected with families of distinction in the Protestant church com- munity. His father, a

solidly trained scholar of Oriental languages, was called in 1777 as chaplain and professor to the cloister school of Bebenhausen, near Tiibingen, a pre- paratory seminary for intending students of theology at Ttibingen. Here Schelling received his earliest education and gave the first evidences of what afterwards so eminently distinguished him, remarkable precocity and quickness of intellect. From the Latin school at Niirtin- gen, whither he had been sent in his tenth year, he was returned in two years as having already acquired all the school could give him, and his father with regret was compelled to allow him at so abnormally young an age to study with the seminarists at Bebenhausen. In 1790, with special permission, for he was yet three years under the prescribed age, Schelling entered the theological seminary at Tiibingen, where he had as fellow students, contemporary as scholars though elder in years, Hegel and Hélderlin. The character and direction of his studies may be gathered sufficiently from the titles of the essays which for various purposes were accomplished during the five years of his student career. In 1792 he graduated in the philosophical faculty with a thesis Antiquissimi de prima malorum humanorum origine philosophematis explicands tentamen criticum et philosophicum; in 1793 he contri- buted to Paulus's Memorabilien a paper Ueber Mythus, historische Sagen, und Philosopheme der diltesten Welt; and in 1795 his thesis for his theological! degree was De Marcione Paullinarum epistolarum emendatore. The in- fluence of these early studies over his later literary career

1 Bylandt, Belpaire, Renard, and Wauvermans impugn, and Des Roches, Vifquain, Van Raemdonck and Verstraete maintain, the existence within historic times of a direct main-river channel from Ghent northward to the sea.

has been often exagverated, but doubtless they contributed to strengthen his natural tendency to dwell rather on the large historico-speculative problems than on the difficulties of abstract thinking. Before the date of his last essay noted above, a new and much more important influence had begun to operate on him. In conjunction with some of his fellow-students he wasin 1793 studying the Kantian system. 'The difficulties or imperfections of that system he claims soon to have perceived, and no doubt the per- ception was

quickened by acquaintance with the first of those writings in which Fichte put forward his amended form of the critical philosophy. The "' Review of Aineside- mus" and the tractate On the Notion of Wassenschaftslehre found in Schelling's mind most fruitful soil. With characteristic zeal and impetuosity Schelling had no sooner grasped the leading ideas of Fichte's new mode of treating philosophy than he threw together the thoughts suggested to him in the form of an essay, which appeared, under the title Veber die Méglichkeit einer Form der Philo- sophie iiberhaupt, towards the end of 1794. There was nothing original in the treatment, but it showed such power of appreciating the new ideas of the Fichtean method that it was hailed with cordial recognition by Fichte himself, and gave the author immediately a place in popular estimation as in the foremost rank of existing philosophical writers. The essay was followed up in 1795 by a more elaborate writing, Vom Ich als Princip der Philosophie, oder tiber das Unbedingte wm menschlichen Wissen, which, still remaining within the limits of the Fichtean idealism, yet exhibits unmistakable traces of a tendency to give the Fichtean method a more objective application, and to amalgamate with it Spinoza's more realistic view of things.

The reputation so quickly gained led soon to its natural result. In midsummer 1798 Schelling was called as extraordinary professor of philosophy to Jena, and thus stepped into the most active literary and philosophical circle of the time. The intervening period had not been unfruitful. While discharging for two years at Leipsic the duties of companion or tutorial guardian to two youths of noble family, Schelling had contributed various articles and reviews to Fichte and Niethammer's Journal, and had thrown himself with all his native impetuosity into the study of physical and medical science. From 1796 date the Briefe tiber Dogmatismus und Kriticismus, an admirably written critique of the ultimate issues of the Kantian system, which will still repay study ; from 1797 the essay entitled Neue Deduction des Naturrechts, which to some extent anticipated Fichte's treatment in the Grundlage des Naturrechts, published in 1796, but not before Schelling's essay had been received by the editors of the Journal. The reviews of current philosophical literature were afterwards collected, and with needful omissions and corrections appeared under the title " Ab- handlungen zur Erlauterung des Idealismus der Wissen- schaftslehre" in Schelling's Philos. Schriften, vol. 1., 1809. The studies of

physical science bore rapid fruit in the Ldeen zu einer Philosophie der Natur, 1797, and the treatise Von der Weltseele, 1798, the drift of which will be noted later.

Schelling's professoriate in Jena lasted till the early part of 1803. His lectures were extraordinarily attrac- tive; his productive powers were at their best; and the circumstances of his surroundings developed forcibly the good and evil qualities of his character. Of his writings during this period a merely chronological notice will mean- while suffice. In 1799 appeared the Lirster Entwurf eines Systems der Naturphilosophie, with an independent and sub- sequent Hinleitung ; in 1800 the System des transcenden- talen Idealismus, in form one of the most finished, in substauce one of the most satisfactory of his works; in

the same year, in the Zeitschrift fiir spekulative Physik, edited by him, "Allgemeine Deduction des dynamischen Processes"; and in 1801 the Darstellung meines Systems der Philosophie; in 1802, in the Meue Zettschr. fiir spek. Physik, the '"Fernere Darstellungen aus dem System der Philo- sophie"; also in 1802 the dialogue Bruno and the excellently written Vorlesungen tiber die Methode des akademischen Studiums. In conjunction with Hegel, who in 1801 at Schelling's invitation had come to Jena, he edited the Kritisches Journal fiir Philosophie, the greater part of which was written by Hegel. Regarding the authorship of certain articles in the volume and a half of this Journal a discussion of no great significance has arisen, concerning which perhaps the best statement is that by Schelling's son in the preface to vol. v. of the Sdmmtliche Werke, Abth. i.

The philosophical renown of Jena reached its culminat- ing point during the years of Schelling's residence there, in no small measure through the imposing force of his character and teaching. Recognized as of the first rank among living thinkers he was received with every mark of distinction, and his intellectual sympathies soon united him closely with some of the most active literary tenden- cies of the time. With Goethe, who viewed with interest and appreciation the poetical fashion of treating fact characteristic of the Naturphilosophie, he continued on excellent terms, while on the other hand he was repelled by Schiller's less expansive disposition, and failed

alto- gether to understand the lofty ethical idealism that animated his work. By the representatives of the Romantic school, then in the height of their fervour and beginning their downward course, he was hailed as a most potent ally, and quickly became par excellence the philo- sopher of the Romantic type. The Schlegels and their friends, who had found at least one fundamental prin- ciple of Romantic strain in Fichte, had begun to be dis- satisfied with the cold and abstract fashion of viewing nature that seemed necessarily to follow from the notion of the Wrssenschaftslehre, and at the same time the deep- seated antagonism of character between Fichte and the impetuous litterateurs of the Romantic school was begin- ning to be felt. In Schelling, essentially a self-conscious genius, eager and rash, yet with undeniable power, they hailed a personality of the true Romantic type, and in his philosophy a mode of conceiving nature adequate to the needs of poetic treatment. During the Jena period the closest union obtained between Schelling and those who either at Jena or at Berlin carried on warfare for the Romantic idea. With August Wilhelm Schlegel and his gifted wife Caroline, herself the embodiment of the Romantic spirit, Schelling's relations were of the most intimate kind. Personal acquaintance made at Dresden before Schelling began his professorial career at Jena rapidly developed into a warm friendship, to which circum- stances soon gave a new and heightened colour. Caroline Schlegel, a woman of remarkable receptive and apprecia- tive power, emotional to excess, and full of the ardent ill- balanced sympathies that constituted the Romantic tone, felt for Schelling unbounded admiration. In him she found the philosophic view which gave completeness and consistency to the tumultuous literary and personal feel- ings that animated her, and she was not less attracted by the dominating force of his personal character. It is pro- bable that in the early stages of their friendship a future marriage between Schelling and Caroline's young daughter, Auguste Bohmer, was, if not definitely understood, yet vaguely contemplated by both, and that in consequence neither was fully aware of the nature of the feelings springing up between them. 'The untimely death of Auguste in the summer of 1800, a death in which Schel- ling's rash confidence in his medical knowledge was unfer-

tunately involved, while a severe blow to both, drew them much more closely together, and in the following year, A. W. Schlegel having removed to Berlin, and Caroline remaining in Jena, affairs so developed themselves that quietly, amicably, and in apparently the most friendly manner, a divorce was arranged and carried to its comple- tion in the early summer of 1803. On the 2d June of the same year Schelling and Caroline, after a visit to the former's father, were married, and with the marriage Schelling's life at Jena came to anend. It was full time, for Schelling's undoubtedly overweening self-confidence and most arrogant mode of criticism had involved him in a series of virulent disputes and quarrels at Jena, the details of which are in themselves of little or no interest, but are valuable as illustrations of the evil qualities in Schelling's nature which deface much of his philosophic work. 'The boiling fervour which the Romanticists prized is deplorably ineffective in the clear cold atmosphere of speculation.

A fresh field was found in the newly-constituted uni- versity of Wiirzburg, to which he was called in September 1803 as professor of "Naturphilosophie," and where he remained till April 1806, when the Napoleonic conquests compelled a change. The published writings of this period (Philosophie und Religion, 1804, and Ueber das Ver- hiiltniss des Realen und Idealen in der Natur, 1806), and still more the unpublished draft of his lectures as con- tinued in volumes v. and vi. of the Sdimmtliche Werke, exhibit an important internal change in his philosophic views, a change which was accentuated by the open breach on the one hand with Fichte and on the other hand with Hegel. Schelling's little pamphlet Darlegung des wahren Verhiiltnisses der Naturphilosophie zur verbesserten FMicht- ischen Lehre was the natural sequel to the difference which had brought the correspondence of the former friends to a close in 1803, and to Fichte's open condemnation in the Grundztige d. gegenwirt. Zeitalters. Hegel's preface to the Phiinomenologie des Geistes was in like manner the sequel to the severe treatment which in his Jena lectures he had bestowed on the emptiness of the Schellingian method, and with the appearance of that work correspond- ence and friendship between the two ceased, and- in Schelling's mind there remained a deeply rooted sense of injury and injustice.

The Wirzburg professoriate had not been without its inner trials. Schelling had many enemies, and his irre- concilable and lofty tone of dealing with them only increased the virulence of their attacks. He embroiled himself with his colleagues and with the Government, so that it was doubtless with a sense of relief that he found external events bring his tenure of the chair to a close. In Munich, to which with his wife he removed in 1806, he found a long and quiet residence. A position as state official, at first as associate of the academy of sciences and secretary of the academy of arts, afterwards as secretary of the philosophical section of the academy of sciences, gave him ease and leisure. Without resigning his official position he lectured for a short time at Stutt- gart, and during seven years at Erlangen (1820-27). In 1809 Caroline died, and three years later Schelling married one of her closest, most attached friends, Pauline Gotter, in whom he found a true and faithful companion.

During the long stay at Munich (1806-1841) Schel- ling's literary activity seemed gradually to come to a standstill. The "Aphorisms on Naturphilosophie" con- tained in the Jahriiicher der Medicin als Wissenschaft (1806-8) are for the most part extracts from the Wiirz- burg lectures; and the Denkmal der Schrift von den gottlichen Dingen des Herrn Jacobi was drawn forth by the special incident of Jacobi's work. The only writing

of significance is the " Philosophische Untersuchungen tiber das Wesen der menschlichen Freiheit," which appeared in the Philosophische Schriften, vol. i. (1809), and which carries out, with increasing tendency to mysticism, the thoughts of the previous work, Philosophie und Religron. In 1815 appeared the tract Ueber die Gottheiten zu Samo- thrake, ostensibly a portion of the great work, Die Weltalter, on which Schelling was understood to be engaged, a work frequently announced as ready for publication, but of which no great part was ever written. Probably it was the overpowering strength and influence of the Hegelian system that constrained Schelling to so long a silence, for it was only in 1834, after the death of Hegel, that, in a preface to a translation by H. Beckers of a work by Cousin, he gave public utterance to the antagonism in which he stood to the Hegelian and to his

own earlier conceptions of philosophy. The antagonism certainly was not then a new fact; the Erlangen lectures on the history of philosophy (Stimmt. Werke, x. 124-5) of 1822 express the same in a pointed fashion, and Schelling had already begun the treatment of mythology and religion which in his view constituted the true positive complement to the negative of logical or speculative philosophy. Public attention, which had been from time to time drawn to Schelling's prolonged silence, was powerfully attracted by these vague hints of a new system which promised something more positive, as regards religion in particular, than the apparent results of Hegel's teaching. For the appearance of the critical writings of Strauss, Feuerbach, and Bauer, and the evident disunion in the Hegelian school itself, had alienated the sympathies of many from the then dominant philosophy. In Berlin particularly, the headquarters of the Hegelians, the desire found expression to obtain officially from Schelling a treatment of the new system which he was understood to have in reserve. The realization of the desire did not come about till 1841, when the appointment of Schelling as Prussian privy councillor and member of the Berlin Academy, gave him the right, a right he was requested to exercise, to deliver lectures in the university. The opening lecture of his course was listened to by a large and most appreciative audience ; and thus, in the evening of his career, Schelling found himself, as often before, the centre of attraction in the world of philosophy. The enmity of his old foe H. E. G. Paulus, sharpened by Schelling's apparent success, led to the surreptitious publication of a verbatim report of the lectures on the philosophy of revelation, and, as Schelling did not succeed in obtaining legal condemnation and suppression of this piracy, he in 1845 ceased the delivery of any public courses. No authentic information as to the nature of the new positive philosophy was obtained till after his death in 1854, when his sons began the issue of

his collected writings with the four volumes of Berlin

lectures :—vol. i., Introduction to the Philosophy of Mytho- logy (1856) ; ii., Philosophy of Mythology (1857); iti. and iv., Philosophy of Revelation (1858).

Whatever judgment one may form of the total worth of Schelling as a philosopher, his place in the history of that important move- ment called

generally German philosophy is unmistakable and assured. It happened to him, as he himself claimed, to turn a page in the history of thought, and one eannot ignore the actual advance upon his predecessor achieved by him or the brilliant fertility of the genius by which that achievement was accomplished. On the other hand it isnot to be denied that Schelling, to whom an unusually long period of activity was accorded, nowhere succeeds in attaining the rounded completeness of scientific system. His philosophical writings, extended over more than half a century, lie before us, not as parts of one whole, but as the successive maili- festations of a restless highly endowed spirit, striving continuously but unsuccessfully after a solution of its own problems. Such unity as they possess is a unity of tendency and endeavour ; they are not parts of a whole, and in some respects the final form they assumed is the least satisfactory of all. Hence it has come about

that Schelling remains for the philosophic student but a moment of historical value in the development of thought, and that his works have for the most part ceased now to have more than historic interest. Throughout his thinking bears the painful impress of hurry, incompleteness, and spasmodic striving after an ideal which could only be attained by patient, laborious, and methodic effort. Brilliant contributions there are without doubt to the evolution of a philosophic idea, but no systematic fusion of all into a whole. It is not unfair to connect the apparent failings of Schelling's philosophizing with the very nature of the thinker and with the historical accidents of his career. In the writ- ings of his early manhood, for example, more particularly those making up Naturphilosophie, one finds in painful abundance the evidences of hastily-acquired knowledge, impatience of the hard labour of minute thought, over-confidence in the force of individual genius, and desire instantaneously to present even in crudest fashion the newest idea that has dawned upon the thinker. Schelling was prematurely thrust into the position of a foremost productive thinker; and when the lengthened period of quiet meditation was at last forced upon him there unfortunately lay before him a system which achieved what had dimly been involved in his ardent and impetuous desires. It is not possible to acquit Schelling of a certain disingenuousness in regard to the Hegelian

philosophy ; and if we claim for him perfect disinterestedness of view we can do so only by imposing on him the severer condem- nation of deficient insight.

It was a natural concomitant of this continuous hurry under which Schelling's successive efforts at constructive work were carried out that he should have been found at all stages supporting himself by calling to his aid the forms of some other system. The successive phases of his development might without injustice be characterized by reference to these external supports. Thus Fichte, Spinoza, Jakob Boehme and the Mystics, and finally, the great Greek thinkers with their Neoplatonic, Gnostic, and Scholastic commen- tators, give respectively colouring to particular works in which Schelling unfolds himself. Atthe same time it would be unjust to represent Schelling as merely borrowing from these external sources, There must be allowed to him genuine philosophic spirit and no small measure of philosophic insight. Of the philosophic affatus he was in no want; and it might be fairly added that, under all the differences of exposition which seem to constitute so many differing Schellingian systems, there is one and the same philo- sophie effort and spirit. But what Schelling did want was power to work out scientifically, methodically, the ideas with which his spirit was filled and mastered. Hence he could ounly find expression for himself in forms of this or that earlier philosophy, and hence too the frequent formlessness of his own thought, the tendency to relapse into mere impatient despair of ever finding an adequate vehicle for transmitting thouglit.

It is thus, moreover, a matter of indifference how one distributes or classifies the several forms and periods of Schelling's philosophic activity. Whether one adopts as basis the external form, 7.e., the foreign mode of speculation laid under contribution, or endeavours to adhere closely to inner differences of view, the result is very niuch the same. There is one line of speculative thought, in the development of which inevitable problems call for new methods of handling, while the results only in part can claim to have a place accorded to them in the history of philosophy. It is fair in dealing with Schelling's development to take into account the indications of his own opinion regarding its more significant momenta. In his own view the turning points seem to have been —(1) the transition from Fichte's

method to the more objective conception of nature,—the advance, in other words, to Natur- philosophie ; (2) the definite formulation of that which implicitly, as Schelling claims, was involved in the idea of Naturphilosophie, viz., the thought of the identical, indifferent, absolute substratum of both nature and spirit, the advance to Identitétsvhilosophic ; (3) the opposition of negative and positive philosophy, an opposi- tion which is the theme of the Berlin lectures, but the germs of which may be traced back to 1804, and of which more than the germs are found in the work on freedom of 1809. Only what falls under the first and second of the divisions so indicated can be said to have discharged a function in developing philosophy ; only so much constitutes Schelling's philosophy proper. A very brief ee of the characteristic features of the three studia must here suffice.

(1) Naturphilosophie.—The Fichtean method had striven to exhibit the whole structure of reality as the necessary implication of self-consciousness. The fundamental features of knowledge, whether as activity or as sum of apprehended fact, and of conduct had been deduced as elements necessary in the attainment of self- consciousness. Fichtean idealism therefore at once stood out negatively, as abolishing the dogmatic conception of the two real worlds, subject and object, by whose interaction cognition and practice arise, and as amending the critical idea which retained with | dangerous caution too many fragments of dogmatism ; positively, as insisting on the unity of philosophical interpretation

and as supplying a key to the form or method by whicli a completed philosophic system might be constructed. Butthe Fichtean teach- ing appeared on the one hand to identify too closely the ultimate ground of the universe of rational conception with the finite, indi- vidual spirit, and on the other hand to endanger the reality of the world of nature by regarding it too much after the fashion of sub- jective idealism, as mere moment, though necessitated, in the existence of the finite thinking mind. It was almost a natural consequence that Fichte never succeeded in amalgamating with his own system the esthetic view of nature to which the Kritik of Judgment had pointed as an essential component in any complete philosophy. :

From Fichte’s position Schelling started. From Fichte he derived the ideal of a completed whole of philosophic conception ; from Fichte he derived the formal method to which for the most part he continued true. The earliest writings tended gradually towards the first important advance. Nature must not be con- ceived as merely abstract limit to the infinite striving of spirit, as a mere series of necessary thoughts for mind. It must be that and more than that. It must have reality for itself, a reality which stands in no conflict with its ideal character, a reality the inner structure of which is ideal, a reality the root and spring of which is spirit. Nature as the sum of that which is objective, intelligence as the complex of all the activities making up self- consciousness, appear thus as equally real, as alike exhibiting ideal structure, as parallel with one another. The philosophy of nature and transcendental philosophy are the two complementary portions of philosophy as a whole.

Animated with this new conception Schelling made his hurried rush to Naturphilosophie, and with the aid of Kant and of frag- mentary knowledge of contemporary scientific movements, threw off in quick succession the Zdeen, the Weltseele, and the Erster Entwurf. Naturphilosophie, which thus became an historical fact, has had scant mercy at the hands of modern science; and un- doubtedly there is much in it, even in that for which Schelling alone is responsible, for which only contempt can be our fecling. Schelling, one must say, had neither the strength of thinking nor the acquired knowledge necessary to hold the balance between the abstract treatment of cosmological notions and the conercte researches of special science. His efforts after a construction of natural reality are bad in themselves and gave rise to a wearisome flood of perfectly useless physical speculation. Yet it would be unjust to ignore the many brilliant and sometimes valuable thoughts that are scattered throughout the writings on Naturphilosophie,— thoughts to which Schelling himself is but too frequently untrue. Regarded merely as a criticism of the notions with which scientific interpretation proceeds, these writings have still importance and inight have achieved more had they been untainted by the tendency to hasty, ill-considered, @ priort anticipations of nature.

Nature, as having reality for itself, forms one conipleted whole. Its manifoldness is not then to be taken as excluding its funda- mental unity;

the divisions which our ordinary perception and thought introduce into it have not absolute validity, but are to be interpreted as the outcome of the single formative energy or: complex of forces which is the inner aspect, the soul of nature. Such inner of nature we are in a position to apprehend and constructively to exhibit to oursclves in the successive forms whicli its development assumes, for it is the same spirit, though uncon- scious, of which we become aware in self-cousciousness. It is the realization of spirit. Nor is the variety of its forms imposed upon it from without; there is neither external teleology in nature, nor mechanism in the narrower sensc. Nature is a whole and forms itself ; within its range we are to look for no other than natural explanations. The function of Naturphilosophie is to exhibit the ideal as springing from the real, not to deduce the real from the ideal. Tle incessant change which experience brings before us, taken in conjunction with the thought of unity in productive force of nature, leads to the all-important conception of the duality, the polar opposition through which nature expresses itself in its varied products. The dynamical series of stages in nature, the forms in which the ideal structure of nature is realized, are matter, as the equilibrium of the fundamental expansive and contractive forces ; light, with its subordinate processes, magnetism, electricity, and chemical action; organism, with its component phases of reproduc- tion, irritability, and sensibility.

Just as nature exhibits to us the series of dynamical stages of processes by which spirit struggles towards consciousness of itself, so the world of intelligence and practice, tlie world of mind, exhibits the series of stages through which self-consciousness with its inevitable oppositions and reconciliations develops in its idcal form. The theoretical side of inner nature in its successive grades from sensation to the highest form of spirit, the abstracting reason which emphasizes the difference of subjective and objective, leaves

1 The briefest and best account in Schelling himself of Naturphilosophie is that contained in the Linleitung zu dem Erster Entwurf (S. W., iii.). The fullest and most lucid statement of Naturphilosophie is that given by K. Fischer in his Gesch. d. n. Phil., vi. 483-692.

recognized by the latter as the reconciler of idealism and realism.

an unsolved problem which receives satisfaction only in the prac- tical, the individualizing activity. The practical, again, taken in

conjunction with the theoretical, forces on the question of the

reconciliation between the free conscious organization of thought and the apparently necessitated and unconscious mechanism of the

objective world. In the notion of a teleological connexion and in that which for spirit is its subjective expression, viz., art and genius, the subjective and objective find their point of union.

(2) Nature and spirit, Naturphilosophie and J'ranscendentalphito- sophie, thus stand as two relatively complete, but complementary parts of the whole. It was impossible for Schelling, the animating principle of whose thought was ever the reconciliation of differences,

not to take and to take speedily the stcp towards the conception of

the uniting basis of which nature and spirit are manifestations, forms, or consequences. For this common basis, however, he did not succeed at first in finding any other than the merely negative expression of indifference. The identity, the absolute, which

underlay all difference, all the relative, is to be characterized –

simply as neutrum, as absolute undifferentiated self-equivalence. It lay in the very nature of this thought that Spinoza should now offer himself to Schelling as the thinker whose form of presentation came nearest to his new problem. The Darstellung meines Systems, and the more expanded and more careful treatment contained in the lectures on System der gesummten Philosophie und der Natur- philosophie insbesondere given in Wiirzburg, 1804 (published only in the Samméliche Werke, vol. vi. p. 181-576), are thoroughly Spinozistic in form, and to a large extent in substance. They are not without value, indeed, as extended commentary on Spinoza. With all his efforts, Schelling does not succeed in bringing his conceptions of nature and

spirit into any vital connexion with the primal identity, the absolute indiffcrence ofreason, No true solution could be achieved by resort to the mere absence of distinguishing, differencing feature. The absolute was left with no other function than that of removing all the differences on which thought turns. The criticisms of Fichte, and more particularly of Hegel (in the “Vorrede” to the Phdnomenologie des Geistes), point to the fatal defect in the conception of the absolute as mere featureless identity.

(3) Along two distinct lines Schelling is to be found in all his later writings striving to amend the conception, to which he re- inained true, of absolute reason as the ultimate ground of reality. It was necessary, in the first place, to give to this absolute a char- acter, to make of it something more than empty sameness ; it was necessary, in the second place, to clear up in some way the relation in which the actuality or apparent actuality of nature and spirit stood to the ultimate real. Schelling had already (in the System der ges. Phil.) begun to endeavour after an amalgamation of the Spinozistic conception of substance with the Platonic view of an ideal realm, and to find therein the means of enriching the bare- ness of absolute reason. In Bruno, and in Philos. w. Religion, the saine thought finds expression. In the realm of ideas the abso- lute finds itself, has its own nature over against itself as objective over against subjective, and thus is in the way of overcoming its abstractness, of becoming concrete. This conception of a differ- ence, of an internal structure in the absolute, finds other and not less obscure expressions in the mystical contributions of the Menschliche Fretheit and in the scholastic speculations of the Berlin lectures on mythology. At the same time it connects itself with the second problem, how to attain in conjunction with the abstractly rational character of the absolute an explanation of actuality. Things,—nature and spirit,—have an actual being. They exist not mercly as logical consequence or development of the absolute, but have a stubbornness of being in them, an antagonistic feature which in all times philosophers have been driven to recog- nize, and which they have described in varied fashion. The actu- ality of things is a defection from the absolute, and their existence compels a reconsideration of our conception of God. There must be recognized in God as a completed actuality, a dim, obscure ground or basis, which can only be described as not yet being, but as con- taining in itself the impulse to externalization, to existence. It is through this ground of Being in God Himsclf that we must

find explanation of that independence which things assert over against God. And it is easy to sce how from this position Schclling was led on to the further statements that not in the rational conception of God is an explanation of cxistence to be found, nay, that all rational conception extends but to the form, and touches not the real, that God is to be conceived as act, as will, as something over and above the rational conception of the divine. Hence the stress laid on will as the realizing factor, in opposition to thought, a view through which Schelling connects hiniself with Schopenhaucr and Von Hartmann, and on the ground of which he has been Finally, then, there emerges the opposition of negative, ¢.¢c., merely rational philosophy, and positive, of which the content is the real evolution of the divine as it has taken place in fact and in history and as it is recorded in the varied mythologies and religions of man- kind. Not much satisfaction can' be felt with the exposition of either as it appears in the voluines of Berlin lectures.

Schelling''s works were collected and published by his sons, in 14 vols., 1856-61. For the life good materials are to be found in the three vols., dws Schelling's Leben in Briefen, 1869-70, in which a biographie sketch of the philosopher's early life is given by his son, and in Waitz, Karoline, 2 vols.,1871 An interesting little work is Klaiber, Hélderlin, Hegel, u. Schelling in ihren Schwdbischen Jugend- jahren, 1877. The biography in Kuno Fiseher's volume is complete and admir- able. Apart from the expositions in the larger histories of modern philosophy, in Michelet, Erdmann, Willm, and Kuno Fischer, and in Haym's Romantische Schule, valuable studies are—Rosenkranz, Schelling, 1843; Noack, Schelling und die Philosophie der Romantik, 2 vols., 1859; Frantz, Schelling's positive Philosophie, 3 vols., 1879-80; Watson, Schelling's Transcendental Idealism, 1882. (R. AD.) .

SCHEMNITZ (Hung. Selmeczbénya), a mining town in the Cis-Danubian county of Hont, Huagary, lies about 65 miles north from Budapest, in 48° 27' N. lat., 18° 52' E. long., on an elevated site, 2300 feet above the level of the sea. Its institutions include a Roman Catholic and a Protestant gymnasium, a high school for girls, a court of

justice, a hospital, and several benevolent and scientific

societies. Schemnitz owes its chief importance to the fact of its being the mining centre of the kingdom. Con- nected with this local industry are important Government institutions, such as various mining superintendencies, a chemical analytical laboratory, and an excellent academy of mining and forestry (with a meteorological observa- tory and a remarkable collection of minerals), attended by pupils from all countries of Europe and also from America, ‘The mines are chiefly the property of the state and the corporation; the average yield annually is— gold, 232 ib; silver, 45,000 ib; lead, 11,600 cwt.; copper, 180 cwt. Iron, arsenic, &c., to the value of about £150,000 are also produced. There are also flourishing potteries where well-known tobacco pipes are manufactured. With Schemnitz is conjoined the town of Bélabanya ; their united population in 1884 was 15,265, chiefly Slovaks, of whom nearly 3000 were engaged in mining.

Schemnitz, which was already noted for its mines in the time of the Romans, has played considerable part in the history of Hungary. The archives of the town contain many interesting documents. ‘After the Tartar invasion in the 12th century it was colonized by Germans, but had become quite Slavonized before the academy of mining was founded by Maria Theresa (1760). The school of forestry was added in 1809. The corporation is wealthy, having received special commercial privileges from the crown in considera- tion of pecuniary aid afforded in times of emergency.

SCHENECTADY, a city of the United States, county seat of Schenectady county, New York, in the valley of the Mohawk river, 17 miles by rail north-west of Albany, with which it is also connected by the Erie Canal. It is best known as the seat of Union College, an institution founded in 1795 by a union of several religious sects, and now possessed of large endowments, extensive buildings, and a valuable library, and along with the Albany medical and law schools, &c., forming the Union University. Besides manufacturing locomotives, iron bridges, and agricultural implements, Schenectady has shawl, hosiery, carriage, and varnish factories. ‘The population was 9579 in 1860, 11,026 in 1870, and 13,655 in 1880.

Occupying the site of one of the council grounds of the Mohawks, Schenectady was chosen as a Dutch trading post in 1620, was chartered in 1684, and became a borough in 1765 and a city in 1798. In 1691 it was burned by the French and Indians, and sixty-three of its inhabitants massacred.

SCHETKY, Joun ALEXANDER (1785-1824), a younger brother of J. C. Schetky (see below), studied medicine in Edinburgh university and drawing in the Trustees' Academy. As a military surgeon he served with distinc- tion under Lord Beresford in Portugal. He contributed excellent works to the exhibitions of the Royal Academy and of the Water-Colour Society, and executed some of the illustrations in Sir W. Scott's Provincial Antiquities. He died at Cape Coast Castle, 5th September 1824, when preparing to follow Mungo Park's route of exploration.

SCHETKY, Joun Curisrtan (1778-1874), marine painter, descended from an old Transylvanian family, was born in Edinburgh on the 11th of August 1778. He studied art under Alexander Nasmyth, and after having

travelled on the Continent he settled in Oxford, and taught for six years as a drawing-master. In 1808 he obtained a post in the military college, Great Marlow, and three years later he received a congenial appointment as professor of drawing in the naval college, Portsmouth, where he had ample opportunities for the study of his favourite marine subjects. From 1836 to 1855 he held a similar professorship in the military college, Addiscombe. To the Royal Academy exhibitions he contributed at intervals from 1805 to 1872, and he was represented at the Westminster Hall competition of 1847 by a large oil- painting of the Battle of La Hogue. He was marine painter to George IV., William IV., and Queen Victoria. Among his published works are the illustrations to Lord John Manners's Cruise tn Scotch Waters, and a volume of photographs from his. pictures and drawings issued in 1867 under the title of Veterans of the Sea. He died in London, on the 28th of January 1874.

One of his best works, the Loss of the Royal George, painted in 1840, is in the National Gallery, London, and the United Scrvice

Club possesses another important marine subjeet from his brush. His memoir by his daughter was published in 1877.

SCHEVENINGEN, a fishing village and watering-place in Holland, on the North Sea, about two miles from The Hague, with which it is connected by a shaded avenue with a tramway. ‘There is a fine sandy beach below the line of dunes that separate the village from the sea. The terrace crowning the dunes serves as a promenade. Popu- lation in 1879, 7713. Scheveningen has a considerable herring fleet. In a naval engagement off the coast in 1673 De Ruyter defeated the combined forces of the French and English.

SCHIAVONETTI, Luier (1765-1810), engraver, was born at Bassano in Venetia, on April 1, 1765. After having studied art for several years he was employed by Testolini, an engraver of very indifferent abilities, to execute imitations of Bartolozzi’s works, which he passed off as his own. In 1790 Testolini was invited by Bartolozzi to join him in England, and, it having been discovered that Scliiavonetti, who accompanied him, had executed the plates in question, he was taken by Bartolozzi into his employment, and, having greatly improved under his instruction, he became an eminent engraver in both the line and the dot manner, “ developing an individual style which united grandeur with grace, boldness, draughtsman- like power, and intelligence with executive delicacy and finish.” Ainong his early works are four plates of subjects from the French Revolution, after Benazech. He also produced a Mater Dolorosa after Vandyck, and Michel- angelo’s cartoon of the Surprise of the Soldiers on the Banks of the Arno. From 1805 to 1808 he was engaged in etching Blake’s designs to Blair’s Grave, which, with a portrait of the artist engraved by Schiavonetti after T. Phillips, R.A., were published in the last-named year. The etching of Stothard’s Canterbury Pilgrims was one of his latest works, and on his death on the 7th of June 1810 the plate was taken up by his brother Niccolo, and finally completed by James Heath.

SCHIEDAM, a town of the Netherlands, in the pro- vince of South Holland, not far from the confluence of the Schie with the Maas, 3 miles by rail from Rotterdam. It is best known as the seat of a great gin manufacture, which,

carried on in more than two hundred distilleries, gives employment besides to malt-factories, cooperages, and cork- cutting establishments, and supplies grain refuse enough to feed about 30,000 pigs. Other industries are ship-building, glass-blowing, and candle-moulding. Schiedam, which has recently been growing rapidly towards the south- west in the Nieuw-Frankenland, is not behind the larger of the Netherlands cities in the magnificence of its private

residences, but none of its public buildings are of much note. It is enough to mention the Groote or Jans-Kerk, with the tomb of Cornelis Haga, ambassador to Turkey, the old Roman Catholic church, the synagogue, the town- house, the exchange, the Musis Sacrum, the post office (Blaauwhuis), and a ruined castle (Huis te Riviere). The population of the commune increased from 9157 in 1811 to 12,360 in 1840, 21,103 in 1875, 23,035 in 1880, and 24,321 in 1884; the population of the town was 18,854 in 1870.

Schiedam, which first appears in a document of 1264, obtained privileges from Floris V. in 1275, and gradually acquired im- portance as a commereial town. In the 16th century it had a eon- siderable share in the herring fishery aud carried on salt-making, brick-making, and weaving, and began to turn its attention to dis- tilling. The town was flooded in 1775.

SCHIEFNER, Franz Anton (1817-1879), linguist, was born at Reval, in Russia, on the 18th July 1817. His father was a merchant who had emigrated from Bohemia at the end of last century. He received his education at the grammar school of his native place, where also his subsequent colleague, the celebrated naturalist Karl Ernst von Baer, had been brought up. He matricu- lated at St Petersburg as a law student in 1836, but while qualifying for this profession he pursued with keen in- terest the study of the classics, and subsequently devoted himself at Berlin, from 1840 to 1842, exclusively to Eastern languages. On his return to St Petersburg in 1843 he was employed in teaching the classics in the First Grammar School, and soon afterwards received a post in the Imperial Academy, where in 1852 the cultivation of the Tibetan language and literature was assigned to him as his special function. Simultaneously he held from 1860 to 1873 the professorship of classical languages in the Roman Catholic theological seminary. From 1854 till his death he was an

extraordinary member of the Imperial Academy. He died after a fortnight's illness on the 16th November 1879.

Schiefner made his mark in literary research in thrce directions. First, he contributed to the Memoirs and Bulletin of the St Petersburg Academy, and brought out independeutly, a number of valuable articles and larger publications on the language and literature of Tibet. He possessed also a remarkable acquaintanec with Mongolian, and when death overtook him had just finished a revision of the New Testament in that language with which the British and Foreign Bible Society had entrusted him. Further, he was one of the greatest authorities ou the philology and ethnology ofthe Finnic tribes. He edited and translated the great Finnic epic Kalevala; he arranged, eompleted, and brought out in twelve volumes the literary remains of Alexander Castrén, bearing on the languages of the Samoyedie tribes, the Koibal, Karagass, 'Tungusian, Buryat, Ostiak, and Kottic tongues, and prepared several valuable papers on Finnie mythology forthe Imperial Academy. In the third place, he made himself the exponent of recent investigations into the languages of the Caucasus, which, thanks to his lueid analyses, have now been placed within reaeh of European philologists. Thus he gave a full analysis of the Tush language, and in quick succes- sion, from Baron P. Uslar's investigations, comprehensive papers on the Awar, Ude, Abkhasian, Tchetehenz, Kasi- Kumiik, Htirkanian and Kiirinian languages. He had also eompletely mastered the Ossetie, and brought out a number of translations from that language, several of them accompanied by the original text. For many of his linguistical investigations he had, with as much tact as patience, availed himself of the presence in St Petersburg of natives (soldiers chiefly) of the distriets on the languages of whieh he happened to be engaged. The importance, however, of the vast mass of linguistical material thus opened up by him, and of the results to which his investigations led, has not yet been fully realized, except so far, perhaps, as his numerous con- tributions to our knowledge of Eastern fables are concerned, for which branch of literature he evinced throughout his works a keen appreciation.

With a rare philological acumen, which with equal facility grasped the morphological and idiomatie parts of a language, Schiefner eombined an indefatigable industry and a love of research which never flagged. He

visited England three times for purposes of research, —in 1863, 1867, and 1878,—when he endeared himself to all who were brought in contact with him by his modesty and _single- heartedness, his animated and spirited conversation, and his un- swerving devotion to his various literary pursuits.

SC H—SCH

The following list of his works has been drawn up from biographical notices which appeared in the Athenzwm for 24th January 1880, and in the Bulletin of the St Petersburg Academy, xxvi. pp. 30-44:—Bemerkungen zum Poley'schen Text des Devimahatmya, 1846; Beitradge zur Krittk des Bhartrihart aus Carngad- hara's Paddhati, 1847; (with A. Weber), Varia Lectiones ad Bohlenii editionem Bhartriharis sententiarum pertinentes, 1850; Ueber die logischen und grammat- ischen Werke des Tandjur, 1847; Ueber Indra's Donnerkeil, 1848 ; Nachirdge zu den von O. Béhilingk und J. Schmidt verfassten Verzeichnissen der auf Indien und Tibet beztigitchen Handschriften und Holzdrucke im astatischen Museum der k, Akademie der Wissenschaften, 1848; Hine tibettsche Lebensbeschreibung Cakya- munt's, 1848; Ueber das Werk "' Roya tcher rol pa," 1848-50; Tibetische Studien, 1851-64; Ueber eine eigenthiimliche Art der tibetischen Compostita, 1856 ; Veber Pluralbezeichnungen im Tibetischen, 1877; Ueber die Verschlechterungs-Perioden der Menschheit nach buddhistischer Anschauungsweise, 1851; Bericht tiber die neueste Biichersendung aus Peking, 1851; Das buddhistische Stitra der 42 Sdize aus dem Tibetischen tibersetzt, 1851; Ergdnzungen und Berichtigungen zu J. Schnvidt's Ausgabe des Dsanglun, 1852; Ueber das Werk ** Histoire de la vte de Hiouen-thsang," 1853; Bericht tiber die wissenschaftliche Thdtighkett des Herrn Professors Wassiljew, 1854; Uber die nepalischen, assamischen, und ceylonischen Miinzen des asiatischen Museums, 1854; Ein kleiner Beitrag zur mongoltschen Paldographie, 1856; Sprachliche Bedenken gegen das Mongolenthum der Skythen, 1856; Bericht tiber Prof. Wassiljew's Werk tiber den Buddhismus, 1856; Ueber die unter dem Namen 'Geschichte des Ardshi Bordshi Chan," bekannte mongolische Méarchensammlung, 1857; Carminis indici Vimalapracnotiara ratnamald versio tibetica, mit deutscher Uebersetzung, 1856; Buddhistische T'riglotte, 1859, Ueber ein indisches Krdhenorakel, 1859; Ueber die hohen Zahlen der Buddhisten, 1862; Jiischke's Bemithungen um eine Handschrift des Gesar, 1868; Térandihe de

doctrine buddhice in India propagatione narratio tibetica, 1868 (German, 1869); Veber einige morgenldindische Fassungen der Rhampstniisage, 1869 ; Zur buddhist- ischen Apokalyptik, 1874; Bharatz# responsa, ttb. et latine, 1874 ; Mahakaijdjana und Kénig Tchanda-pradjota, 1875; Indische Ktinstleranekdoten, 1875; Indische Erzadhlungen, 1876-77 (an English translation of these by W. R. 8. Ralston ap- peared in 1882); Ueber Vasubandhu's Gathdsangraha, 1878 ; Ueber eine tibetische Ulandschrift des India Louse, 1879; Ueber das Bonpo-Sétra, 1880; Zur Sampo- mythe, 1850; Kleine Bettrdge zur finnischen Mythologte, 1852; Zur ehstnischen Mythologte, 1854; Ueber den Mythengehali der Jinnischen Marchen, 1855; Ueber die Heldensagen der minussinischen Tataren, 1858 ; Heldensagen, &c., rhythmisch bear- beitet, 1859; Zum Mythus vom Weltuntergange, 1859; Ueber die ehstnische Sage vom Kalewi-poeg, 1860; Zur russischen Heldensage, 1861; Ueber Kalewa und die Kalewingen, 1862; Kalevala, deutsch in_rhythmischer Form, 1852; Ueber das Thier "tarvas" im finnischen Epos, 1848-49; Die Lieder der Woten, metrisch iibertragen, 1856; Ueber das Wort "'sampo" im jinnischen Epos, 1861; Versuch einer ostjakischen Sprachlehre, 1849-1856; Grammattk und Worterverzeichnisse der samojedischen Sprachen, 1854-1855; Grundztige einer tungustschen Sprachlehre, 1856; Versuch einer burjitischen Sprachlehre, 1857; Versuch einer koibalischen und karagassischen Sprachlehre, 1857; Versuch einer jeniset-ostjakischen und kottischen Sprachlehre, 1858; Das 13-monatliche Jahr und die Monatsnamen der sibirischen Volker, 1856; Ueber die Sprache der Jukagiren, 1859-71; Bettrage zur Kenniniss der tungusischen Mundarten, 1859; Tungusische Miscellen, 1874; Ueber die von G. von Maydell gesammelten tungusischen Sprachproben, 1874; A. Czeka- nowskt's tungusisches Wérterverzeichniss, 1877; Ueber sibtrische Eigenthumszeichen, 1855-1859; Kurze Charakteristik der Thuschsprache, 1854; Versuch uber die Thusch- sprache, 1856; Versuch tiber das Awarische, 1862; Ueber Baron Usiar's neuere linguistische Forschungen, 1863; Versuch tiber die Sprache der Uden, 1863; Aus- fiihrlicher Bericht tiber Baron Uslar's abchasische Studien, 1863 ; Tschetschenzische Studien, 1864; Ausfithrlicher Bericht tiber Baron Uslar's Kasikumiikische Studien, 1866; Iltirkanische Studien, 1871; Awarische Studien, 1872; Kérinische Studien, 1873; Awarische Texte, 1873; Ossetische Sprtichworter, 1862; Ossetische Texte, 1863; Zwei ossetische Thiermdrchen, 1864; Ossetische Sagen und Mdarchen, 1867.

SCHILLER, Jonann CuristopH Friepricn (1759- 1805), German dramatist and poet, was born at Marbach, in Wiirtemberg, on the 10th or 11th (probably 10th) November 1759. His grandfather and great-grandfather had been bakers in Bittenfeld, a village at the point where the Rems flows into the Neckar; and the family was probably descended from Jacob Georg Schiller, who was born in Grossheppach, another Swabian village, in 1587. Schiller's father, Johann Kaspar Schiller, who was about thirty-six years of age when his son was born, was a man of remarkable intelligence and energy. In 1749, after the War of the Austrian Succession, in which he had served as a surgeon in a Bavarian regiment of hussars, he went to visit a married sister at Marbach, a little town on the Neckar; and here, a few months after his arrival, he married Elizabeth Dorothea Kodweiss, a girl of seventeen, the daughter of the landlord of the inn in which he had a lodging. She had great sweetness and dignity of character, and exercised a strong influence over her husband, who, although essentially kind and thoroughly honourable, was apt to give way to a somewhat harsh and imperious temper. They had six children, of whom the eldest, Christophine, was born eight years after their marriage. Next came Schiller, and after him were born four daughters, of whom only two, Louisa and Nanette, survived infancy.

Until Schiller was four years of age his mother lived with her parents in Marbach, while his father served in the Wiirtemberg army, in which he gradually rose to the rank of major. In 1764 the elder Schiller was joined by his family at Lorch, a village on the eastern border of Wiirtem- berg, where he served for about three years as a recruiting officer. Afterwards he was transferred to Ludwigsburg,

adherent of the

and in 1775 he was made overseer of the plantations and nursery gardens at the Solitude, a country residence of the duke of Wiirtemberg, near Stuttgart. The duties of this position were congenial to the tastes of Major Schiller, and he became widely known asa high authority on the subjects connected with his daily work.

At Lorch Schiller had been taught by the chief clergy- man of the village, Pastor Moser, whose name he after- wards gave to one of the characters in Die Aduber. When the family settled in Ludwigsburg he was sent to the Latin school, which he attended for six years. He took a good place in the periodical examinations, and was much liked by his masters and fellow-pupils, for he was active, intelli- gent, and remarkable for the warmth and constancy of his affections. At a very early age he gave evidence of a talent for poetry, and it was carefully fostered by his mother, who was herself of a poetic temperament. His parents intended that he should become a clergyman, but this decision was abandoned at the request—practically by the order—of the duke of Wiirtemberg, who insisted on his being sent to the military academy, an institution which had been established at the Solitude for the training of youths for the military and civil services. Schiller entered this institution early in 1773, when he was between thirteen and fourteen years of age, and he remained in it until he was twenty-one. For some time he devoted himself to the study of jurisprudence, but the subject did not interest him, and in 1775, when a medical faculty was instituted at the academy, he was allowed to begin the study of medicine. In that year the academy was transferred from the Solitude to Stuttgart.

Schiller was often made wretched by the harsh and narrow discipline maintained at the academy, but it had no permanently injurious effect on his character. With several of his fellow-students he formed a lasting friend-ship, and in association with them, notwithstanding the vigilance of the inspectors, he was able to read many forbidden books, including some of the writings of Rousseau, Klopstock's Messiah, the early works of Goethe, translations of a few of Shakespeare's plays, and a German translation of Macpherson's rendering of the poems of Ossian. Under these influences he became an ardent school which was then protesting vehemently against traditional restrictions on indi- vidual freedom; and he contrived to make opportunities for the expression, in more or less crude dramas and poems, of his secret thoughts and aspirations. For about two years work of this kind was interrupted by the pres- sure of professional studies; but in the last year of his residence at the academy he resumed it with increased fervour. In this year he wrote the greater part of Due Réuber, the most striking passages of which he read to groups of admiring comrades.

On the 14th December 1780 Schiller was informed that he had been appointed medical officer to a grenadier regiment in Stuttgart, and he almost immediately began his new duties. He was not a very expert doctor, and he was too passionately devoted to literature to take much trouble to excel in a profession which he disliked. Dve Réuber was soon finished, and in July 1781 it was published at his own expense, some persons of his acquaintance having become security for the necessary amount. This famous play is ill-constructed, and contains much boyish extravagance, but it is also full of energy and revolutionary fervour, and it captivated the imagina- tion of many of Schiller's contemporaries. Harly in 1782 it was represented at the Mannheim theatre, and it was so warmly applauded that Schiller, who had stolen away from Stuttgart to see his play, began to think it might be possible for him to devote his time wholly to the work of

a dramatist. By and by he was persuaded to go again to Mannheim without leave; and for this offence, of which the duke of Wiirtemberg was informed, he was condemned to two weeks' arrest. Shortly afterwards he was per- emptorily forbidden to write books, or to hold communica- tion with persons who did not reside in Wirtemberg. This tyrannical order filled him with so much indignation that he resolved at all costs to secure freedom, and on the 17th September 1782, accompanied by his friend Streicher, a young musician, he fled from Stuttgart.

Schiller had now before him a time of much distress and anxiety. In the course of a few weeks he finished Fiesco, a play which he had begun at Stuttgart; but Dalberg, the director of the Mannheim theatre, declined to put it on the stage, and the unfortunate poet knew not how he was to obtain the means of living. At the same time it was thought probable that a request for his extradition might be addressed to the elector of the Palatinate. In this perplexity Schiller wrote to Frau von Wolzogen, a friend at Stuttgart, asking to be allowed to take refuge in her house at Bauerbach, a village in the Thuringian Forest, within two hours' walk of Meiningen. This request was granted, and at Bauerbach Schiller remained for nearly seven months, working chiefly at the play which he ultimately called Cabale und Ivebe and at Don Carlos.

In July 1783 Schiller returned to Mannheim, and this time he obtained from Dalberg a definite appointment as dramatic poet of the Mannheim theatre. esco, which was soon represented, was received rather coldly, but for this disappointment Schiller was amply compensated by the admiration excited by Cabale und Liebe. These two plays express essentially the same mood as that which prevails in Die Rduber, but they indicate a striking advance in the mastery of dramatic methods. This is especially true of Cabale und Lvebe, which still ranks as one of the most effective acting plays in German literature.

In addition to his dramas Schiller wrote a good many lyrical poems, both before and during his residence at Mannheim. Few of these pieces rise to the level of his early plays. For the most part they are excessively crude in sentiment and style, while in some his ideas are so vague as to be barely intelligible. Perhaps the best of them are the poems entitled Die ILreundschaft and Rousseau, both of which have the merit of expressing thoughts and feelings that were within the range of the writer's personal experience.

Schiller's engagement with Dalberg was cancelled in August 1784, and, as he had now a heavy burden of debt, he thought for some time of resuming the practice of his profession, but in the end he decided to try whether he could not improve his circumstances by issuing a periodi- cal, Thalia, to be written wholly by himself. This plan he accomplished, the first number being published in the spring of 1785. It contained the first act of Don Carlos and a paper on "The Theatre as a Moral Institution," which he had read on the occasion of his being admitted a member of the German Society, a literary body in Mannheim, of which the elector palatine was the patron.

Meanwhile, he had been corresponding with four.

admirers who had written from Leipsic to thank him for the pleasure they had derived from his writings. These friends were C. G. Kérner, L. F. Huber, and Minna and Dora Stock. Weary of incessant struggle, Schiller pro- posed to visit them; and K6rner, the leading member of the party, not only encouraged him in this design, but readily lent him money. Accordingly, in April 1785 Schiller left Mannheim, and for some months he

lived at Gohlis, a village in the Rosenthal, near Leipsic. In the summer of the same year Korner and Minna Stock were

married, and settled in Dresden, taking with them Dora, Minna's sister. Schiller and Huber also went to Dresden, and Schiller remained there nearly two years. Almost every day he spent the afternoon and evening at Korner's house, and he derived permanent benefit from this in- timate intercourse with the kindest and most thoughtful – friends he had ever had. While in Dresden, he published in Thalia several prose writings, among others Philoso- phische Briefe, in which he set forth with enthusiasm some of his opinions about religion, and a part of the Geester- seher, a romance, which, although written in a brilliant style, was so imperfectly planned that' he was never able to finish it. He also issued Don Carlos, which he completed early in 1787. A considerable interval having passed between the writing of the earlier and that of the later parts of this play; Don Carlos represents two different stages of intel- lectual and moral growth. It lacks, therefore, unity of design and sentiment. But it has high imaginative quali- ties, and the Marquis Posa, through whom Schiller gave utterance to his ideas regarding social and political progress, is one of the most original and fascinating of his creations. Posa is not less revolutionary than Karl Moor, the hero of Die Réuber, but, while the latter is a purely destructive force, the former represents all the best reconstructive energies of the 18th century.

In July 1787 Schiller went to Weimar, where he was cordially welcomed by Herder and Wieland. For several years after this time he devoted himself almost exclusively to the study of history, and in 1788 he published his Geschichte des Abfalls der vereinigten Nrederlande von der Spanischen Regierung. This was followed by a number of minor historical essays (published in Zhalia), and by his Geschichte des dreissigjihrigen Krieges, which appeared in 1792. These writings secured for Schiller a high place among the historians of his own time. In every instance he derived his materials from original authorities, and they were presented with a freedom, boldness, and energy which made them attractive to all classes of readers. One result of the publication of his history of the revolt of the Netherlands was his appointment to a professorship at the university of Jena, where he

delivered his introductory lecture in May 1789. He lived in Jena for about ten years, and during that time frequently met Fichte, Schel- ling, the two Schlegels, Wilhelm von Humboldt, and many other writers eminent in science, philosophy, and literature.

On the 22d of February 1790 Schiller married Char- lotte von Lengefeld, whom he had met at Rudolstadt about two years before. She was of a tender and affectionate nature, bright and intelligent, and Schiller found in her love and sympathy a constant source of strength and happiness. They had four children, the eldest of whom was born in 1793.

About a year after his marriage he was attacked by a dangerous illness, and from this time he was always in delicate health, suffering frequently from paroxysms of almost intolerable pain. In the autumn of 1793 he went with his wife to Wiirtemberg in the hope that his native air might do him good; and he did not return to Jena until the spring of the following year. He was enabled to obtain this period of rest through the kindness of the hereditary prince of Augustenburg and the minister Count von Schimmelmann, who had jointly begged to be allowed to place 3000 thalers at his disposal, to be paid in yearly instalments of 1000 thalers. Schiller heartily enjoyed his visit to his native state, where he had much pleasant inter- course with his father, mother, and sisters, and with some of bis earlyfriends. He did not again see hisfather and mother, the former of whom died in 1796, the latter in 1802.

The Geschichte des dreissigjthrigen Krieges was the last

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important historical work written by Schiller. He abandoned history in order to study philosophy, which, under the impulse communicated by Kant, was then exciting keen interest among the educated classes of Germany. Schiller’s philosophical studies related chiefly to esthetics, on which he wrote a series of essays, some of them being printed in Neue Thalia (issued from 1792 to 1794), others in the Horen, a periodical which he began in 1794 and continued until 1798. The most remarkable of these essays are a paper on “ Die Anmuth und Wiirde,” a series of letters addressed to the prince of Augustenburg on “Die asthetische Erziehung des Menschen,” and a treatise on ‘“ Die Naive und Sentimentalische Dichtung.” In philosophical

speculation Schiller derived inspiration mainly from Kant, but he worked his way to many independent judgments, and his theories have exercised considerable influence on those German writers who have dealt with the ultimate principles of art and literature. Goethe was of opinion that in “Die Naive und Senti- mentalische Dichtung” Schiller had laid the foundation of modern criticism. In that powerful essay the vital dis- tinction between classical and romantic methods was for the first time clearly brought out.

Schiller had been introduced to Goethe in 1788, but they did not begin to know one another well until 1794, when Goethe was attracted to Schiller by a conversation they had after a meeting of a scientific society at Jena. Afterwards their acquaintance quickly ripened into inti- mate friendship. To Schiller Goethe owed what he him- self called “‘a second youth,” and this debt was amply repaid, for by constant association with the greatest mind of the age Schiller was encouraged to do full justice to his genius. Moreover, his intellectual life was enriched by new ideas, and he was led by Goethe’s indirect influence to balance his speculative judgments and idealistic concep- tions by a keener and more accurate observation of the facts of ordinary life. :

During the years which followed his departure from Mannheim Schiller had written An die Mreude, Die Gotter Griechenlands, Die Kiinstler, and other lyrical poems, all of which are of very much higher quality than the poems of his earlier period. But he had been so absorbed by labours of a different kind that he had had little time or inclination for his proper work as a poet. Now, stimu- lated by intercourse with Goethe, he began to long once more for the free exercise of his creative faculty ; and from 1794 he allowed no year to pass without adding to the list of his lyrical writings, Among the lyrics pro- duced in this the last and greatest period of his career the foremost place belongs to the Lied von der Gilocke, but there is hardly less imaginative power in Das Ideal und das Leben, Die Ideale, Der Spazergang, Der Genius, Die Erwartung, Das Eleusische Fest, and Cassandra. Few of Schiller’s lyrics have the charm of simple and spontaneous feeling ; but as poems giving expression to the results of philosophic contemplation the best of them are unsur- passed in modern literature. Schiller had a passionate faith in an eternal ideal world to which the human mind has access; and the contrast between ideals and what is called reality he

presents in many different forms. In developing the poetic significance of this contrast his thoughts are always high and noble, and they are offered in a style which is almost uniformly grand and melodious.

In 1796 Schiller and Goethe together wrote for the Musenalmanach (an annual volume of poems, issued for several years by Schiller) a series of epigrams called Xenien, each consisting of a distich, Most of them were directed against contemporary. writers whom the poets disliked, and much animosity was excited by their sharply satirical tone. A higher interest attaches to

Votivtafeln, another series of epigrams, written at the same time as the Xenien. They are among the most suggestive of Schiller's writings, for, as he explains in the introductory epigram, they embody truths which he had found helpful in the experience of life. Soon after finish- ing these fine poems Schiller began, in rivalry with Goethe, to write his ballads, which surprised even his most ardent admirers by the boldness of their conceptions and by the graphic force of their diction, As a writer of ballads Goethe yielded the palm to Schiller, and this

judgment has been confirmed by the majority of later

critics.

Schiller never intended that Don Carlos should be his last drama, and from 1791 he worked occasionally at a play dealing with the fate of Wallenstein. He was unable, however, to satisfy himself as to the plan until 1798, when, after consulting with Goethe, he decided to divide it into three parts, Wallensteins Lager, Die Piccolomini, and Wallensteins Tod. Wallensteins Lager was acted for the first time at the Weimar theatre in October 1798, and Die Piccolomini in January 1799. In April 1799 all three pieces were represented, a night being given to each. The work as a whole produced a profound impression, and it is certainly Schiller's masterpiece in dramatic literature. He brings out with extraordinary vividness the ascendency of Wallenstein over the wild troops whom he has gathered around him, and at the same time we are made to see how the mighty general's schemes must

necessarily end in ruin, not merely because a plot against him is skilfully pre- pared by vigilant enemies, but because he himself is lulled into a sense of security by superstitious belief in his supposed destiny as revealed to him by the stars. Wallen- stein is the most subtle and complex of Schiller's dramatic conceptions, and it taxes the powers of the greatest actors to present an adequate rendering of the motives whieh explain his strange and dark career. The love-story of Max Piccolomini and Thekla is in its own way not less impressive than the story of Wallenstein with which it is interwoven. Max and Thekla are purely ideal figures, and Schiller touches the deepest sources of tragic pity by

his masterly picture of their hopeless passion and of their

spiritual freedom and integrity.

Wallenstein was received with so much favour that Schiller resolved to devote himself in future mainly to the drama; and in order to be near a theatre—partly, too, that he might have more frequent opportunities of inter- course with Goethe—he transferred his residence, in December 1799, from Jena to Weimar, where he spent the rest of his life. He took with him to Weimar three acts of Maria Stuart, and early in the summer of 1800 he finished it at Ettersburg, a country house of the duke of Weimar. 'The technical qualities of Maria Stuart are of the highest order, but the subject does not seem to have interested Schiller very deeply, and it cannot be said either that the characters are finely conceived or that the closing scenes of Queen Mary's life are presented in a truly poetic spirit. In his next play, Die Jungfrau von Orleans, completed about a year afterwards, Schiller had a more congenial theme, and the vigour with which he handled it commanded the warm admiration of Goethe. The scenes in which the maid is misled by her passion for Lionel are slightly perplexing, as they do not appear to accord with the essential qualities of her character ; but in the earlier and later parts of the play Schiller displays splendid dramatic art in revealing the lofty courage and enthusiasm with which she fulfils her mission. In Dire Braut von Messina, which was acted for the first time at the Weimar theatre in March 1803, Schiller attempted to combine romantic and classical elements. The experiment is not perfectly successful, and even in its most striking

passages the play is remarkable rather for brilliant rhetoric than for pure poetry. His last original drama, Wilhelm Tell, the first representation of which took place in March 1804, is in some respects greater than any of those which preceded it, Wallenstein excepted. It has some obvious faults of construction, but these defects do not seriously mar the impression produced by its glowing picture of a romantic and truly popular struggle for freedom. :

Besides his complete original plays, Schiller left some dramatic sketches and fragments, the most important of which, Demetrius, has been finished in Schiller's manner by several later writers. He also produced German versions of Macbeth, of Gozzi's Turandot, of two comedies by Picard, and of Phédre. Wis renderings of Picard's comedies are entitled Der Parasit and Der Neffe als Onkel.

In his last ycars Schiller received many tokens of growing fame. In 1802 he was raised to noble rank, and in 1804 he was informed that if he pleased he might be invited to settle in Berlin on advantageous terms. He went with his family to the Prussian capital, but the only result of the negotiations into which he entered was that the duke of Weimar, alarmed at the prospect of losing him, doubled his salary of 400 thalers. His health was at this time completely undermined, and from the summer of 1804 work was often rendered impossible by serious illness. On the evening of the 29th April 1805 he returned from the Weimar theatre in a state of high fever, and from this attack he was unable to rally. He died on the 9th May 1805, in his forty-sixth year.

Schiller was tall, slight, and pale, with reddish hair, and eyes of an uncertain colour, between light-brown and blue. At the military academy he acquired a manner somewhat formal, like that of a soldier; but in carrying on conversa- tion that interested him he became eager and animated. He had little appreciation of humour, and even in the treatment of subjects which he made his own he was apt to recur too frequently to the same ideas and the same types of character. But when he is at his best he is excelled among the poets and dramatists of Germany only by Goethe in the power with which he expresses sublime thoughts and depicts the working of ideal passions. As

a man he was not less great than as a writer. He started in life with high aims, and no obstacle was ever formidable enough to turn him from paths by which he chose to advance to his goal. Terrible as his physical sufferings often were, he maintained to the last a genial and buoyant temper, and those who knew him intimately had a con- stantly increasing admiration for his patience, tenderness, and charity. With all that was deepest and most humane in the thought of the 18th century he had ardent sympathy, and to him were due some of the most potent of the influences which, at a time of disaster and humilia- tion, helped to kindle in the hearts of the German people a longing for a free and worthy national life.

There have been many editions of Schiller's collected works. The first was issued in twelve volumes at Stuttgart and Tiibingen in 1812-15, the editor being his friend C. G. Korner. There are also a good many volumes of Schiller's correspondence, the most interesting being his correspondence with Goethe. Of the bio- graphics of Schiller, Carlyle's—publishcd in 1825—was one of the carlicst. Scealso Schillers Leben, by Frau von Wolzogen, Schiller's sister-in-law; Schdllers Leben, by Hoffmeister (extended by Viehoff) ; Schillers Leben, by Boas; Sehillers Leben und Werke, by Palleske ; Schillers Leben, by H. Diintzer; and Schiller, by J. Sime (in " Yoreign Classics for English Readers"). (J. SL)

SCHINKEL, Karu Frrepricu (1781-1841), architect and painter, and professor in the academy of fine arts at Berlin from 1820, was born at Neuruppin, in Brandenburg, on March 13, 1781, and died at Berlin, on October 9, 1841. He is esteemed one of the most original of modern German architects. His principal buildings are in Bertin (g.v.) and its neighbourhood. They include the Bauakademie,

which contains a museum of his designs. His Sammlung archatektonischer Entwiirfe (1820-1837 ; 3d ed. 1857-58) and Werke der hiheren Baukunst (1845-6 ; new ed. 1874) exemplify his style.

SCHIRMER, Frieprich Winieim (1802-1866), land- scape artist, was born in 1802 in Berlin. Asa youth he painted flowers in the royal porcelain factory ; afterwards he became a pupil of F. W. Schadow in the Berlin

Academy, but his art owed most to Italy. His first journey across the Alps was taken in 1827; his sojourn extended over three years; he became a disciple of his countryman Joseph Koch, who built historic landscape on the Poussins, and is said to have caught inspiration from Turner. In 1831 Schirmer established himself in Berlin in a studio with scholars ; in 1839 he was appointed professor of landscape in the academy; in 1845 he again visited Italy, but duties soon brought him back to Berlin. Illness compelled him in 1865 to seek a southern clime; he grew worse in Rome, and died on his way home in 1866.

Schirmer's plaee in the history of art is distinctive : his sketches in Italy were more than transcripts of the spots ; he studied nature with the purpose of composing historic and poctic landseapes. On the completion of the Berlin Museum of Antiquities eame his opportunity : upon the walls he painted classic sites and temples, and elueidated the eollections by the landscape scenery with which they were historieally assoeiated. His supreme aim at all times was to make his art the poetic interpretation of nature. His pictnres appeal to the mind by the ideas they embody, by beauty of form, harmony of line, significance of light and colour. In this construe- tional landscape German critics discover "motive," ''inner mcan- ing," ''the subjective," "the ideal." And Schirmer thus formed asechool. Nevertheless at times he painted poor pictures, partly because he deemed technique secondary to conception.

SCHIRMER, Jonann Wituetm (1807-1863), land- scape painter, was born in 1807, at Jiilich in Rhenish Prussia. This artist, only a namesake of the preceding, had similar aim and career. He first was a student, and subse- quently became a professor in the academy of Diisseldorf. In 1854 he was made director of the art school at Carlsruhe, where in 1863 he died. He travelled and sketched in Italy, and aimed at historic landscape after the manner of the Poussins. His Biblical landscapes with figures are held in good esteem.

SCHIZOMYCETES, a term proposed by Nigeli in 1857 to include all those minute organisms known as Bacteria, Microphytes, Microbes, &c., and allied forms. These terms have been used at various times by different authors with widely different meanings in detail, but it is now agreed that

the Schizomycetes are minute vegetable organisms devoid of chlorophyll and multiplying by repeated bipartitions. They consist of single cells, which may be spherical, oblong, or cylindrical in shape, or of filamentous or other aggre- gates of such cells. True spores oceur in several, but no trace whatever of sexual organs exists. From their mode of growth, division, and spore-formation (in part), as well as their habit of forming deliquescent, swollen cell-walls, and other peculiarities, there can be no doubt of the close alliance between the Schizomycetes and certain lower Algzx; whence both groups have been conjoined under the name Schizophyta. No one character except the want of chlorophyll—which of course entails physiological differ- ences—separates the Schizomycetes from other Schizophyta; morphologically and phylogenetically the two groups are united. From this point of view we relegate all the so- called bacteria which contain chlorophyll (e.g., Engelmann's Bactervum chlorinum, Van Tieghem's B. viride and Bacillus virens, Cohn's Micrococcus chlorinus, &c.) to the Alge.

Schizomycetes, then, are saprophytic or parasitic Schizo- phyta devoid of chlorophyll, though they may secrete other colouring matters. In size their cells are commonly about 0-001 mm. (called 1 micro-millimetre = 1) in diameter, or from two to five times that length ; but smaller ones and

a few larger are known. The various shapes assumed by the cells are shown in fig. 1; the filamentous and other aggregates will be described below.

Fig. 1.—Typical forms of Schizomycetes. (After Zopf.) a, Micrococcus; b, Macrococcus or "Monas"; c, Bacterium; d, Bacillus; e, Clostridium; f, Monas okenii; g, Leptothrix; h, t, Vibrio; k, Spiriltum; 1, '' Spirulina" (a form of Beggiatoa alba); m, " Spiromonas" (Warming); n, Spirocheie; 0, Cladothrix. The granules in 6, f, and / are particles of sulphur.

Schizomycetes are ubiquitous as saprophytes in still ponds and ditches, in running streams and rivers, and in the sea, and especially in drains, bogs, refuse heaps, and in the soil, and wherever organic infusions are allowed to stand for a short time. Any liquid (blood, urine, milk, beer, &c.) containing organic matter, or any solid food- stuff (meat, preserves, vegetables, &c.), allowed to stand exposed to the air soon swarms with bacteria, if moisture is present and the temperature not abnormal. Though they occur all the world over in the air and on the surface of exposed bodies, it is not to be supposed that they are by any means equally distributed, and it is questionable whether the bacteria suspended in the air ever exist in such enormous quantities as was once believed. The evidence to hand shows that on heights and in open country, especially in the north, there may be few or even no Schizomycetes detected in the air, and even in towns their distribution varies greatly ; sometimes they appear to exist in minute clouds, as it were, with interspaces devoid of any, but in laboratories and closed spaces where their cultivation has been promoted the air may be considerably laden with them. Of course the distribution of bodies so light and small is easily influenced by movements, rain, wind, changes of temperature, &c. As parasites, certain

Schizomycetes inhabit and prey upon the organs of men

and animals in varying degrees, and the conditions for

their growth and distribution are then very complex.

Plants appear to be less subject to their attacks,—possibly,

as has been suggested, because the acid fluids of the

higher vegetable organisms are less suited for the develop- ment of Schizomycetes ; nevertheless some are known to be parasitic on plants. Schizomycetes exist in every part of the alimentary canal of animals, except, perhaps, where acid secretions prevail ; these are by no means necessarily harmful, though, by destroying the teeth for instance,

certain forms may incidentally be the forerunners of damage which they do not directly cause.’

Little was known about these extremely minute organ- History.

isms before 1860. Leeuwenhoek figured Bacteria as far back as the 17th century, and O. F. Miiller knew several important forms in 1773, while Ehrenberg in 1830 had advanced to the commencement of a scientific separation and grouping of them, and in 1838 had proposed at least sixteen species, distributing them into four genera. Our modern more accurate though still fragmentary knowledge of the forms of Schizomycetes, however, dates from Cohn’s brilliant researches, the chief results of which were pub- lished at various periods between 1853 and 1872; Cohn’s classification of the Bacteria, published in 1872 and ex- tended in 1875, has in fact dominated the study of these organisms almost ever since. He proceeded in the main on the assumption that the forms of Bacteria as met with and described by him are practically constant, at any rate within limits which are not wide: observing that a minute spherical Micrococcus or a rod-like Bacillus regularly pro- duced similar micrococci and bacilli respectively, he based his classification on what may be considered the constancy of forms which he called species and genera. As to the constancy of form, however, Cohn maintained certain reser- vations which have been ignored by some of his followers.

| The fact that Schizomycetes produce spores appears to

have been discovered by Cohn in 1857, though it was expressed dubiously in 1872; these spores had no doubt been observed previously. In 1876, however, Cohn had seen the spores germinate, and Koch, Brefeld, Pratzmowski, Van Tieghem, De Bary, and others confirmed the discovery in various species.

The supposed constancy of forms in Cohn’s species and genera, received a violent shock when Lankester in 1873 pointed out that his Bacterium rubescens (since named Beggiatoa roseo-persicina, Zop{) passes through conditions which would have been described by most observers influ- enced by the current doctrine as so many separate “ species” or even “ genera,”—that in fact forms known as Bacterium, Micrococcus, Bacillus,

Leptothriz, &c., occur as phases in one life-history. Lister put forth similar ideas about the same time; and Billroth came forward in 1874 with the startling view that the various “form-species” and ‘ form- genera” are only different states of one and the same organism. From that time to the present the discussion as to the limits of ‘species ” among the Schizomycetes has been maintained ; much extravagance has resulted, as well as valuable additions to our knowledge of the forms. Klebs (1875) and Nageli (1877) upheld similar views to those suggested by Lankester ; and the researches of Cien- kowski, Zopf, Kurth, and De Bary have rendered it clear that forms employed by Cohn to define genera and species (it should be borne in mind that Cohn recognized their provisional nature) occur as phases in one and the same life-history. Zopf showed (1882) that minute spherical “cocci,” short rodlets (“bacteria”), longer rodlets (‘‘ba- cilli”), and filamentous (“leptothrix”) forms as well as curved and spiral threads (“vibrio,” ‘‘spirillum”), &c., occur as vegetative stages in one and the same Schizomy- cete (cf. fig. 16). In the meantime, while various observers were building up our knowledge of the morphology of the Schizomycetes, others were laying the foundations of what is known of the relations of these organisms to fermenta-

1 See De Bary, Morphologie und Biologie der Pilz, 1884, and Vorlesungen tiber Bacterien, 1885; Zopf, Die Spaltpilze, 3d ed., 1885 ; Cohn, Beitr. zur Biol. der Pfl., Hft. 2, 1872; Magnin, Les Bactéries, 1878 ; Burdon-Sanderson, Quart. Jour. Micros. Sc., 1871 ; Tyndall, Floating Matter of the Air, 1881 ; Miflet, in Cohn’s Beitr. zur Biol., tii. Hft. i., 1879; Pasteur, Jour. de Chim. et de Phys.,

ser. iii., 1862 ; Miquel, Comptes Rendus, 1878, and Annuaire de I’ ob- servatoire de Montsouris, 1877 sq.

tion and disease, —that ancient Will-o’-the-wisp ‘“ spontane- ous generation” being revived by the way. When Pas- teur in 1857 showed that the lactic fermentation depends on the presence of an organism, it was already known from the researches of Schwann (1837) and Helmholtz (1843) that fermentation and putrefaction are intimately con- nected with the presence of organisms derived from the air, and that the preservation of

putrescible substances de- pends on this principle. In 1862 Pasteur placed it beyond reasonable doubt that the ammoniacal fermentation of urea

is due to the action. of a minute Schizomycete ; in 1864

this was confirmed by Van Tieghem, and in 1874 by Cohn, who named the organism JMicrococcus uree. Pasteur and Cohn also pointed out that putrefaction is but a special case of fermentation, and before 1872 the doctrines of Pasteur were established with respect to Schizomycetes. Meanwhile two branches of inquiry had arisen, so to speak, from the above. In the first place, the ancient question of “spontaneous generation” received fresh impetus from the difficulty of keeping such minute organisms as bacteria from reaching and developing in organic infusions; and, secondly, the long-suspected analogies between the pheno- mena of fermentation and those of certain diseases again made themselves felt, as both became better understood. Needham in 1745 had declared that heated infusions of organic matter were not deprived of living beings; Spal- lanzani (1777) had replied that more careful heating and other precautions prevent the appearance of organisms in the fluids. Various experiments by Schwann, Helmholtz, Schultz, Schroeder, Dusch, and others led to the refutation, step by step, of the belief that the more minute organ- isms, and particularly bacteria, arose de novo in the special cases quoted. Nevertheless, instances were adduced where the most careful heating of yolk of egg, milk, hay- infusions, &c., had failed,—the boiled infusions, &c., turn- ing putrid and swarming with Schizomycetes after a few hours.

Ih 1862 Pasteur repeated and extended such experi- ments, and paved the way for a complete explanation of the anomalies; Cohn in 1872 published confirmatory results ; and it became clear that no putrefaction can take place without Schizomycetes. In the hands of Brefeld, Burdon-Sanderson, De Bary, Tyndall, Roberts, Lister, and others, the various links in the chain of evidence grew stronger and stronger, and every case adduced as one of ‘‘spontaneous generation” fell to the ground when examined. No case of so-called “spontaneous genera- tion” has withstood rigid investigation ; but the discussion contributed to more exact ideas as to the ubiquity, minuteness, and high powers of resistance to physical agents of the spores of Schizomycetes, and led to more exact ideas of antiseptic treatments.

Methods were also improved, and the application of some of them to surgery at the hands of Lister, Koch, and others has yielded results of the highest importance.

Long before any clear ideas as to the relations of Schizomycetes to fermentation and disease were possible, various thinkers at different times had suggested that resemblances exist between the phenomena of certain diseases and those of fermentation, and the idea that a virus or contagium might be something of the nature of a minute organism: capable of spreading and reproducing itself had been entertained. Such vague notions began to take more definite shape as the ferment theory of Cagniard-Latour (1828), Schwann (1837), and Pasteur made way, especially in the hands of the last-named savant. From about 1870 onwards the “germ theory of disease” has passed into acceptance. Rayer in 1850 and Davaine had observed the bacilli in the blood of animals dead of anthrax (splenic fever), and Pollender discovered

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them anew in 1855. In 1863, imbued with ideas derived from Pasteur’s researches on fermentation, Davaine re- investigated the matter, and put forth the opinion that the anthrax bacilli caused the splenic fever; this was proved to result from inoculation. Koch in 1876 pub- lished his observations on Davaine’s hacilli, placed beyond doubt their causal relation to splenic fever, discovered the spores and the saprophytic phase in the life-history of the organism, and cleared up important points in the whole question (figs. 10 and 11). In 1870 Pasteur had proved that a disease of silkworms was due to a ferment-organism of the nature of a Schizomycete ; and in 1871 Oertel showed that a Mucrococcus already known to exist in diphtheria is intimately concerned in producing that disease. In 1872, therefore, Cohn was already justified in grouping together a number of “pathogenous” Schizomycetes. Thus arose the foundations of the modern “germ theory of disease”; and, in the midst of the wildest conjectures and the worst of logic, a nucleus of facts was won, which has since grown, and is growing daily. Septiceemia, tuberculosis, glanders, fowl-cholera, relapsing fever, and a few other diseases are now brought definitely within

the range of biology,.and several other contagious and infectious diseases are known to be also due to Schizomycetes.

Other questions of the highest importance have arisen from the foregoing. A few years ago Pasteur showed' that Bacillus anthracis cultivated in chicken broth, with plenty of oxygen, and at a temperature of 42-43° C. lost its virulence after a few "generations," and ceased to kill even the mouse; Toussaint and Chaveau confirmed, and others have extended the observations. More remarkable still, animals inoculated with such "attenuated" bacilli proved to be curiously resistent to the deadly effects of subsequent inoculations of the non-attenuated form. In other words, animals vaccinated with the cultivated bacillus showed immunity from disease when reinoculated with the deadly wild form. The questions as to the causes and nature of the changes in the bacillus and in the host, as to the extent of immunity enjoyed by the latter, &., are now burning,—Metschnikoff's recent observations (1884), show- ing that the white corpuscles eliminate the bacilli from the blood, being one of the most startling contributions to the answers.

Another burning question has already been in part touched upon. Experiments have shown that Schizomy- cetes are pleomorphic; they are also very sensitive, so to speak, to the influences of the environment. The investi- gations of Cohn, Pasteur, Koch, Nageli, Kurth, De Bary, and others leave no doubt that many Schizomycetes are sensibly affected by the media in which they are cultivated: not only are the forms modified, but also the physiological activity varies in degree, and even in kind. These and similar facts seem to be largely responsible for recent ideas as to the possibility of being able to cultivate or "educate" certain Schizomycetes. One case only need be referred to. Bacillus anthracis and B. subtilis are only distinguish- able with great difficulty morphologically (cf. figs. 10-12) ; the former is parasitic in its vegetative stages, the latter is always a saprophyte. Now JB. anthracis, as said, can become harmless by cultivation, and so it has been thought that the two forms were convertible. Buchner even went so far as to declare that he had transformed B. anthracis into B. subtilis, z.¢., that the differences which botanists detect are only due to the influence of the environment at the time. These assertions cannot be regarded as proved ; but the question whether harmless forms can become edu- cated, as it were,

to a parasitic mode of life within periods which we can control is of course of the highest import- ance. Such area few of the questions now under discussion, together with others as to the mode of action of patho-

genic Schizomycetes, as to the nature of immunity, and as to the limitation of “species” among such simple forms. MorpPHoLoey.—Sizes, Forms, Structure, &c.—The Schizo- mycetes consist of single cells, or of filamentous or other groups of cells, according as the divisions are completed at once or not. While some unicellular forms are less than 1p (001 mm.) in diameter, others have cells measuring 4h or 5p or even 7p or 8y in thickness, while the length may vary from that of the diameter to many times that measure- ment. In the filamentous forms the individual cells are often difficult to observe until reagents are applied (e.., fig. 14), and the length of the rows of cylindrical cells may be many hundred times greater than the breadth. Simi- larly, the diameters of flat or spheroidal colonies may vary from a few times to many hundred times that of the indivi- dual cells, the divisions of which have produced the colony.

‘orm and The shape of the individual cell (fig. 1) varies from that of “tructure. a minute sphere to that of a straight, curved, or twisted

filament or cylinder, which is not necessarily of the same diameter throughout, and may have flattened, rounded, or even pointed ends. The rule is that the cells divide in one direction only—z.e., transverse to the long axis—and therefore produce aggregates of long cylindrical shape ; but in rarer cases iso-diametric cells divide in two or three directions, producing flat, or spheroidal, or irregular colonies, the size of which is practically unlimited. As to the structure of the cell, little more can be said than that it consists of a mass of homogeneous or very slightly granular protoplasm, with a pearl-like lustre, and without vacuoles; this is enveloped by a membranous envelope, which is so delicate as to be scarcely perceptible. In the actively vegetating or mobile conditions this cell wall appears very thin and sharp, and is extremely flexible and elastic, but at other times it is swollen and diffluent, fur- nishing the intercellular gelatinous matrix of the zoogloea condition (fig. 3). Itis doubtful whether the thin envelope closely applied to the protoplasm is not always simply the innermost layer of a very

diffluent covering, which is con- tinuously thickening and throwing off its outermost swollen and disorganized lamelle. The facts to hand seem to show that, while in some cases this envelope consists mainly of cellulose, in others (zoogloea of Bacteria, e.g.) it contains relatively large proportions of nitrogenous compounds. In some cases the cell-walls form a lamel- lated sheath. No cuticularization occurs, nor are deposits of lime or silex known in the cell walls. Colouring pigments, however (red, yellow, and even green and blue), are sometimes met with, and a rusty or brown tinge is in some cases produced by the precipitation of iron oxides in the walls. In the typical Schizomycetes the protoplasmic contents (which are said to consist largely of a peculiar substance named mycoprotein) are colourless, or more rarely tinged with colouring matters—bright red, yellow, &c.—which cannot be mistaken for chlorophyll. The few forms described as containing a green pigment, allied to or identical with chlorophyll, will not be considered here, but relegated to the Algw. The occurrence of starch or a granulose-like substance in some Bacteria is undoubted ; it yields a deep blue colour with iodine solutions, is diffused in bands or patches, and arises in cases where

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1 In addition to the foregoing, compare Nigeli, Untersuchungen tber niedere Pilze, 1882; Buchner, ibid., and in Virch. Arch,, xci., 1883 ; Niageli, Theorie der Gdéhrung, 1879; Chaveau in Comptes Rendus, 1879-1884 ; Davaine, ibid., 1863-64 and 1873; E. Ray Lankester, Quart. Jour. of Micros. Sc., 1873 and 1876 (also valuable papers in Q. J. M. S. from 1870 to 1884); Pasteur, numerous papers in Comptes Rendus—especially 1862 and 1877—and in Ann. de Chim. et Phys., 1858, 1862, &c.; Koch in Cohn’s Beitr., ii. Aft, 2, 1876; Kurth, Bot. Zeitung, 1883; Schiitzenberger, Fermentation, 1876; Metschnikoff, Virch. Arch., 1884; Nature, various papers from 1871 to 1878.

the Schizomycete is nourished by a matrix which does not contain starch. ‘Trécul noticed this formation of amyloid substance in Clostridium, Van Tieghem in a Spirillum, and several other cases are known; Ward detected starch in a Bacillus found in decaying coffee seeds, and in other media

devoid of starch. In the filamentous Schizomycetes (Beggiatoa, e.g.) are found extremely minute dark gran- ules; Cramer and Cohn have shown that these consist of sulphur in fine crystals (fig. 14). Oily or fatty substances and minute granules of undetermined nature occur in the protoplasm, but no nucleus has as yet been discovered in any Schizomycete.

Vegetative States—While many forms are fixed to a Vegetative substratum, others are free; and in certain conditions States.

single cells or groups may be motile. In some cases the movements are mere oscillations, in others there are rapid movements of translation, sometimes ascribed to the action of flagella or cilia; these movements are of course not to be confounded with the dancing “Brownian motion” observed in the case of all such minute bodies suspended in fluids. Cilia have now been described in some of the smallest Bacteria by several good observers (Dallinger and Drysdale,” Cohn, Koch, Zopf), though, on account of their extreme fineness, and the difficulty of fixing them, much discussion has taken place as to their nature, functions, origin, numbers, and even existence ; that they occur is proved by the photographs, but whether they are not sometimes mere filaments drawn out from the cell-walls is very doubtful (figs. 2 and 12). While some Schi- zomycetes appear to have no active stage, and many are only motile under certain conditions when

swarming, others Fre. re of motile and ciliated forms of Schizo-

: mycetes. (After Zopf.) 1, Micrococcus with one

are described as cilium; 2, the same dividing ; 3, group of swarming

possessing two or macrococci of Beggiatoa roseo-persicina (Bacterium

: rubescens of Lankester); 4, bacterium-like motile

even three dis- form of the same; 7, 8, 9, and 10, other forms of the

] 1 game (8 is dividing); 5, bacillus-like motile form

tinctactiveforms. Goch): 6, motile chain of hay bacilli (Brefeld)—each

When vigorously terminal rodlet has one cilium; 11, spdillum form growing and di- viding, the Schi- zomycetes aS a

with one cilium at each end; 12, stouter spirillum- like form with two cilia at each end; 138, ‘ ophido- monas” form (Warming), The granules in 8, 4, 7, 8, 9, 12, and 18 are particles of sulphur. rule present certain definite forms, which are at any rate so constant under constant conditions that they can be figured and described with such accuracy and certainty that good observers have regarded them as fixed species, or at least as ‘‘form-species” or “‘form-genera.” We now know, however, that many Schizomycetes pass through several such phases, and we may therefore regard them in these cases as “vegetative forms,” which pass into one another too gradually to admit of their being employed as sharply distinctive of genera.

As the chief of these forms may be mentioned the following (see fig. 1) :—

2 Dallinger and Drysdale, Monthly Micros. Jour., 1875. ‘ XXII. — 51

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Cocci: spherical or spheroidal cells, which, according to their Growth and Division.—Whatever the shape and size Reproduce. — (not very be ey bass ra SNE of as Micro- of the individual cell, cell-filament, or cell-colony, the tion. cocct, Macrococct, and perhaps Monas forms. : F Me

Rods or rodlets : slightly is es considerably elongated cells immediate ‘ visible – wes which are cylindrical, biscuit-shaped, or somewhat fusiform. | sults of active nutrition The cylindrical forms are short, ¢.¢., only three or four | are elongation of the times as long as broatl (Bacterium), “eee coke i, the | cell and its division biscuit-shaped ones are Bactcria in the early stages of divi- | . sion, Clostridia, &e., are spindle-shaped. into two equal halves,

Filaments (Leptothrix forms) really consist of elongated cylindri- | @CrOss the long axis, cal cells which remain united end to end after division, and | by the formation of a they may break up later into elements such as those septum, which either described above. Such filaments are not always of the

: same diameter throughout, and their segmentation varies : : considerably. They may be free, or attached at one (the | mains intact “basal”) end.

Curved and spiral forms. Any of the elongated forms described above may be curved, or sinuous, or twisted into a corkscrew- like spiral instead of straight. If the sinuosity is slight we have the Vibrio form; if pronounced, and the spiral wind- | ing well marked, the forms are known as Spirillwm, Sptrochxtc, &c. These and similar terms have been applied partly to individual cells, but more often to filaments con- sisting of several cells; and much confusion has arisen from the difficulty of defining the terms themselves. Various | Fic, 4.—A, branch of a zooglea of Cladothrix dichotoma (cf. fig. 8, F), x 540.

splits at once or re- for a

observers have, moreover, described particular cases where | Sane on it Meer a short and —= Vioris (a) and « a vee ’ Ce Ca sys : orms ©, some of which are curved like Vibrio and Spirillum, the the cells pe eell filaments exhibit irregularities of form > | same, but the rodlets breaking up into eoeei. (After Zopf.) , such “involution forms,” “torula forms,” &c., appear to be | : sted sche – i+ cases. has BR j ‘ shorter or longer time. This process is then repeated, n addition to the above, however, certain Schizomycetes presen scl “ry Hoe alas aggregates in the form of plates, or solid or hollow and irregular and : the first case the separated cells assume the characters of the

parent-cell whose @ 6

division gave rise // to them; in the 4¢%

second case they form filaments, or,

if the further elon- gation and divisions

of the cells proceed £ in different direc 6 ©

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tions, plates or sphe- fice

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fn f i

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roidal or other- shaped colonies. It not unfrequently happens, however, that groups of cells K

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z . break away from 0 ® "8008 their former con- 4 0 : J _nexion as longeror “> ¢ 2g) i Q shorter straight or o E curved filaments, or ¢ 3g 0 as solid masses. In y b H G

a

ae fila —_ tous… 5.—Types of Spore-formation in Schizomyeetes. forms this frag- (After Zopf.) A, various stages in the develop- 2 ” * ment of the endogenous spores in a Clostridium mentation into (Bacilius)—the small letteis indieate the order. B, | multicellular pleces endogenous spores of the hay bacillus. C, a chain f 1] h of cocct of Leuconostoc mesenterioides, with two

or equal length or «resting spores,” 4.e., arthrospores. (After Van nearly 80 is a nor- Tieghem.) D,a motile rodlet with one cilium and with a spore formed inside. E, spore-formation in

mal phenomenon, Vibrio-like © and Spirillum-like (a, 6, d) Schizo- 0 myeetes. F, long rod-like form containing a spore

each partial fila- (these are the so-called ‘‘Kédpfchenbacterien” of ment repeating the Germanauthors). G, Vibrio form with spore. (After soe

Prazmowski.) H, Clostridium—one cell eontains

growth, division, two spores (Prazmowski). I, Spiritiwm eontaining ; many spores (a), which are liberated at 6 by the

and fragmentation renin up : te parent eells. K, gornilnneete of ‘ as before (cf. figs. 15 the spore of the hay bacillus (B. swbté/és),—the axis Fig. 8.—Types of Zoogloes. (After Zopf.) A, mixed zooglea found as a and 16) Finall of growth of the germinal rodlet is at right angles pellicle on the surface of vegetable infusions, &c.; it consists of various forms, 2 MAaHY, to the long axis of the spore. L, germination of and eontains eocei (a) and rodlets, in series (6 and c), &c. (x 540). B,egg-shaped | such filaments may spore of Clostridium butyricum—the axis of growth mass of zooglea of Beggiatoa roseo-persicina (Bacterium rubescens of —_” : jal coincides with the long axis of the spore. Lankester); the gelatinous swollen walls of the large crowded cocci are fused reax up Into their

(980) gelatinous envelope. C, reticulate zooglea of the same | individual cells, forming “ baciti,” “bacteria,” or “cocci” as

D, E, H, eolonics of Afyconostoc enveloped in diffluent matrix x 540). F,’ branched fruticosc zooglcea of Cladothrizx (slightly magnified). the case may be. By these means hundreds of thousands of

G, zoog] i ; a) “ae ieee fi . in tablets, | DUterium merismopedioides, Zopf, containing cocel arranged | cells may be produced in a few hours, and, according to the branched colonies. This may be due to the successive divisions 1 Brefeld has observed that a bacterium may divide once every half

rich ees in two or three planes instead of only across the long axis | hour, and its progeny repeat the process in the same time, One (—) or to displacements of the cells after division (as in the | bacterium might thus produce in twenty-four hours a number of zooglea conditions, &e., see fig. 3). segments amounting to many millions of millions.

Zooglaex.

species and the conditions (the medium, temperature, é&e.), enormous collections of isolated cells may cloud the fluid in which they are cultivated, or form deposits below or films on its surface ; A valuable charac- ‘ tersaresometimes® °° , obtained frome 3 o % theseappearances. When these dense ales “swarms ” of ve-

getative cells be-

come fixed in 4 yy¢. 6.—Charactcristic groups of Micrococci. (After matrix of their Cohn.) A, Micrococcus prodigiosus. B, M. vaccine.

own swollen con- tiguous cell-walls, they pass over into a sort of resting state as a so-called zoogloea (fig. 3).

One of the most remarkable phenomena in the life- history of the Schizomycetes is the formation of this zoogloea stage, which corresponds to the “ palmella” con- dition of the lower Alge. This occurs as a membrane on the surface of the medium, or as irre-

highly magnified.)

gular clumps or branched masses (sometimes several

inches across) sub- é merged in it, and ° consists of more or less gelatinous ma- trix enclosing in- numerable ‘ cocci,” “ bacteria,” or other

“ af

elements of there. 7.—Ascococcus bilirothit. (After Cohn.) It : . forms irregular colonies of zooglea containing

Schizomycete COD- innumerable micrococei. (x 65.)

cerned, Formerly

regarded as a distinct genus—the natural fate of all the various forms—the zoogloea is now known to be a sort of resting condition of the

Schizomycetes, the various elements being glued together, as it were, by their enormously swollen and diffluent cell-walls becoming con-

Fig. 8.—Bactertum zopfii. (After Kurth.) A, coils of the filamentous (lepto-

thriz) stage still actively growing. B, the same coils observed a few hours later ; the filaments have become cut up into segments by septa, the segments separating as rodlets (bacteria). C, the same coils a few hours later still; the rodlets broken up into yet shorter segments or cocci. (x 740.)
tiguous. The zoogloea is formed by active division of single or of several mother-cells, and the progeny appear to go on secreting the cell-wall substance, which then

C, zooglea stage of a Micrococcus, forming a close membrane on infusion —Pasteur's Mycoderma. (Very

'ent species,—spherical,

absorbs many times its volume of water, and remains as a consistent matrix, in which the cells come to rest. The matrix—7.e., the swollen cell-walls—in some cases consists mainly of cellulose, in

others chiefly of '" my- " at coprotein," the substance ie said to be met with in (2) the protoplasm ; the ma- aA trix in some cases is EA horny and resistent, in we

others more like a thick solution of gum. It is intelligible from the mode of formation that foreign bodies may be- come entangled in the gelatinous matrix, and compound zoogloese may arise by the apposition ig, %Puslva, meter, (sto stl of several distinct forms, growing and dividing (baciili); b, a pair of a common event in ma- Meili setvely growing end, dlvgingy cerating troughs (fig. 3, four segments) after treatment with alco- A). Characteristic forms holic iodine solution; c, d, e, 7, successive may be assumed by the

young zoogleea of differ-

stages in the development of the spores; r, a rodlet segmented in four, each segment containing one ripe spore; g}, g?, 9%, early stages in the germination of the spores (after being dricd several days); 14, A, 4, k,l, and m, successive stages in the germina- tion of the spore. (@ xX 250; all the rest

ovoid, reticular, filament- x 600.)

ous, fruticose, lamellar, &c.,—but these vary considerably as the mass increases or comes in contact with others. Older zoogloez may precipi- tate oxide of iron in the matrix, if that metal exists in small quantities in the medium. Under favourable conditions the elements in the zooglwa again become active, and move out of the matrix, distribute themselves in the surrounding medium, to grow and multiply as before' (fig. 4). If the zoogloea is formed on a solid substratum it may become firm and horny; immersion in water softens it as described above.

Fie. 10.—Bacillus anthracis. (After Koch.) A, Baciili mingled with blood-

corpuscles from the blood of a Guinea pig; some of the baciilt dividing. B,

the rodlets after three hours' culture in a drop of aqueous humour. They

grow out into long leptothrix-like filaments,*which become septate later, and

spores are developed in the segments. (x 650.)

Spores.—Spores or resting-cells are now known in many Spores. Schizomycetes (fig. 5). They may be formed in two ways. In Leuconostoc, Bacterium zopfit, Crenothrix, Beggratoa, and Cladothrix the spore is simply one of the smallest segments ("cocci") into which the filament at length breaks up. De Bary terms such forms "arthrosporous" (cf. figs. 8, 13, 14, and 16). In others the formation of the spore is "endosporous" (De Bary). It begins with the appearance of a minute granule in the protoplasm of a vegetative cell; this granule enlarges, and in a few

hours has taken to itself all the protoplasm, secreted a dense envelope, and is a ripe ovoid spore, smaller than the mother-cell, and lying loosely in it (cf. figs. 9, 11, and 12).

Pleomorphism.—As already stated, some Schizomycetes Pleo- have been shown to present as vegetative forms, or phases morph- in one and the same life-history, “cocci,” “bacteria,” *™

In the case of the simplest and most minute Schizomycetes (Micrococcus, &ec.) no definite spores have been discovered ; any one of the y vegetative micrococci may commence } a new series of cells by growth and | division. We may call these forms { “ asporous,” at any rate provisionally.

The spore may be formed in short or long segments, the cell-wall of which may undergo change of form to accom- modate itself to the contents. As a rule only one spore is formed in a cell, and the process usually takes place in a bacillar segment. In some cases the spore-forming protoplasm gives a blue reaction with iodine solutions. The spores may be developed in cells which are actively swarming, the movements not being interfered with by the process (fig. 5, D). The so-called “Kopfchenbacterien” of older writers are simply bacterioid segments with a spore at one end, the mother cell-wall having adapted itself to the outline of > the spore (fig. 5, F). The ripe spores Fre, 11—A, Bacitius an- of Schizomycetes are spherical, ovoid, yor miore Hanon or long-ovoid in shape, and extremely (, fig. 10), ie minute (e.g., those of Bacillus subtilis tiiped, fos «pedis measure 0°0012 mm. long by 0:0006 was a — mm. broad according to Zopf), highly a little too small— they refractive and colourless (or very dark, fiamster transversely ae probably owing to the high index of ste sage ea. X Fee) refraction and minute size). Themem- (fter “De Bate | 7 i, brane may be relatively thick, and even ‘tagments of filaments exhibit shells or strata.

The germination of the spores has now been observed in several forms with care. The spores are capable of germination at once, or they may be kept for months and

with ripe spores; 2-5, successive stages in the germination of the spores, the remains of the spore attached to the germinal rodlets. (x 600.)

even years, and are very resistent against desiccation, heat

and cold, &c. In a suitable medium and at a proper tem- perature the germination is completed in a few hours. The spore swells and elongates, and the contents grow forth to a cell like that which produced it, in some cases clearly break- ing through the membrane, the remains of which may be

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i} i \ / Ly} | Fic. 12.—Bacillus subtilis. (After Strasburger). A, zooglea pellicle (x 500). B, motile rodlets (x 1000). ©, development of spores (x 800),

seen attaclied to the young germinal rodlet(figs. 5,9,and 1 L in other cases the surrounding membrane of the spore swells and dissolves. The germinal cell then grows forth into the

forms typical for the particular Schizomycete concerned.!

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1 Cohn, Beitrige zur Biologie, passim ; Zopf, Die S; } spalispilze, 3d ed., 1885; De Bary, Morph. und Biol, der Pilze, &., 1884, and

“leptothrix-filaments,” and even spiral and curved forms known as “ spirillum,” ‘“‘ vibrio,” &c. On the other hand, several Schizomycetes which have been long and diligently investigated by the best observers show no such pleo- morphism. As examples of the latter we may select Bacillus megaterium (fig. 9) and numerous Micrococct which produce similar cells generation after generation. A remarkable example of a pleomorphic form is Clado- thriz dichotoma (fig. 16). According to Zopf this species passes successively through the stages known as “coccus,” “bacterioid,” ‘bacillar,” and “ leptothrix,” by mere elongation and division by transverse septa; the observer named declares that these

simple filaments have formerly names (Leptothrix parasitica f

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Fig. 14.

Fic. 13.—Crenothrix kiihniana. a to e, cocci or spores,—c, d, and e, dividing ; J to n, filamentous stage. The filaments vary in shape, diameter, &c., and are fixed below; at 7 to m is seen the common investing sheath; m and j, the segments separating and escaping; in m the segments divide up still further eet ee as minute cocct or spores—all stages of division are seen.

x 600.

Fie. 14.—Beggiatoa alba, (After Zopf.) 1, a group of attached filaments (x 540); 2, a filament breaking up ; 3, 4, 5, portions of filaments treated with methyl- violet so as to show the septa, which are usually obscured by the sulphur granules in the filaments; in 5 some of the segments are undergoing longi- tudinal as well as transverse divisions prior to forming cocci (spores); 6, cocci becoming isolated (x 900).

and L. ochracea, Kiitz.). Certain of the threads then

partially break up, and the portions become slightly dis-

placed from the linear series ; these portions go on growing in a direction at an angle with the previous one, but still in contact, and thus produce the “ false-branching” to which Cladothriz owes its name. Finally the filaments break up into segments corresponding with the septa which have been formed across them. This fragmentation is peculiar in that the filaments separate first into shorter filaments, then into rodlets, and finally into “cocci.”

Portions of the filaments or branches may become separated

and travel with a gliding movement, or even become

more active and swarm by means of cilia. Such portions may break up into shorter filaments or rods which also

i Re Senet MN A

Vorlesungen tiber Bacterien, 1885. The enormous and scattered

literature on the morphology of Schizomycetes is collected to a great extent in the works cited.

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swarm. But, in addition to these straight and more or less rigid forms (which, it will be noticed, simulate Ehren- berg and Cohn's "genera" Micrococcus, Bactervum, Bacillus,

and Leptothric so

that any of them observed alone would undoubtedly have been formerly placed f apart in one of those " gene- fy ra"), it is interesting to find [/ that some of the filaments(become spirally twisted and simulate Spirdlum, Spwro- chete, and Vibrio, the dis- ° tinctions depending on the relative length and thick-

ness of the filament,

closeness or steepness of Moreover these twisted filaments also break up into shorter gliding or ciliated portions, which at length fall into rodlets and

the coils.

"cocci" as before.

A branched zoogloea form also occurs, and this con-

Vibrio according to stances. other species which

other Schizomycetes have now been shown to be more

or less pleomorphic, and the researchesof Lankester, Nageli, Zopf, Miller, Kurth, De Bary, and others

have laid the foun-

dation for a know- ledge of the cir- cumstances which induce the changes in form referred to ; it is at least certain that alterations in the nutritive me- dium, in the quan- tity of oxygen at the disposal of the organism, and in the temperature, &c., play their part in the matter.

It by no means follows, however, that because some species are pleomor- phic all must be so, and still less that no species of Schizo- mycetes—or only one—exist at all; those who deny the existence of species among the Schizo- mycetes on the evi- dence to hand must,

to be logically consistent, deny the existence of species But even if that be allowed, some name of similar intention must be employed to denote any group

altogether.

In Lankester's Bacterium rubescens we have an-

of organisms which within our experience exhibit periodi- cal repetitions of a process of development, 7.¢., all the individuals of successive generations go through the same phases periodically. It matters not that variations—ill-defined deviations from an average or "'type"—occur on the part of individuals or generations; the periodically repeated life-history or development marks what we term a Species.

The difficulties presented by such minute and simple organisms as the Schizomycetes are due partly to the few "characters" which they possess, and partly to the dangers of error in manipulating them ; it is anything but an easy matter either to trace the whole development of a single form or to recognize with certainty any one stage in the development unless the others are known. This being the case, and having regard to the minuteness and

ubiquity of these organisms, we should be very careful in accepting evidence as to the continuity or otherwise of any two forms which falls short of direct and uninterrupted observation. The outcome of all thesc considerations is that, while recognizing that the “genera” and “species” as defined by Cohn must be recast, we are not warranted in uniting any forms the continuity of which has not been directly observed ; or, at any rate, the strictest rules should be followed in accepting the evidence adduced to render the union of any forms probable.!

CLASSIFICATION. —The limits of this article prevent our ex- Classifi- amining in detail the system of classification proposed by Cohn, cation, or the modifications of it followed by other authorities. Zopf, in the third editjon of his work (1885), proposes a scheme based on the modern views as to the pleomorphism: we must refer to the original for the details, simply remarking that, apart from the ex- treme views accepted by the author, his system is impracticable to a degree and recognized by him as provisional only. Indeed any such classification must be provisional, for we are at the threshold only of a knowledge of the Schizomycetes.

The best starting-point for a modern classification of these organisms is that suggested by De Bary—the two modes of forma- tion of the spores,—and as a provisional scheme, and simply to facilitate comparison of the groups, we might perhaps employ De Bary’s two groups, and a third one to include those simple forms which show no trace of spore-formation. Many gaps exist, and many changes will probably have to be made. Meanwhile it

might be advisable to classify the Schizomycetes provisionally as follows : —

closely

and the

di é : ~”” Fia. 15.—Beggiatoa alba, (After Zopf.) tains cocci, bacterium-like cCurvea and spiral forms. G, D, separ

: ated spirally-wound pieces, which are or bacillar rods, or filaments freaking up still further in H. E,

resembling Leptothrix or motile spiri/lum form with a cilium at

: each end. (x 540.) circum-

is variable in a high degree. Many

| a

Group A. Aspores.

There are no spores distinct from the vegetative cells. I. Coccacna (figs. 6 and 7). Genera: 1, Micrococcus (and Streptococcus); 2, Sarcina (and Zopf's Merismopedia) ; 3, Ascococcus.

Group B. Arthrospores (De Bary).

The vegetative cells differ in shape, size, growth, or other eharacters from the spores: the latter are produced by segmenta- tion.

II. ARTHROBACTERIACER,

Genera: 4, Bacterium (fig. 8); 5, Leuconostoc; 6, Spirochete (1). ILI. LeprorricHEs. Genera: 7, Crenothrix (fig. 13); 8, Beggiatoa (figs. 14 and 15); 9, Phragmidothrix (2); 10, Leptothrix. IV. CLADOTRICHER. Genus: 11, Cladothrix (fig. 16).

Grovr ©. Endosporesx (De Bary).

Genera: 12 (figs. 9-12), Bacillus (and Clostridium); 18, Vibrio (2); 14, Spirillwm (at least in part).?

ive)

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Fig. 16.—Cladothriz dichotoma. A, branched plant, the branches in part spiral and of the form known as Vibrio (a) or Spirtilum (6) (slightly magnified). B, a long coiled branch more highly magnified. C, portion of branch resembling Spirillum at one end and Vibrio at the other. D, coiled

branches,— a, not segmented ; 6, ¢, segmented into rodlets and cocci. E, Spirochexte-like portions preaking up into rodlets and cocci.

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1 Ray Lankester, Quart. Jour. Micr. Sc., 1873 and 1876; Nageli and Buchner, Wiedere Pilze, 1882; Billroth, Untersuchungen tiber die Vegetationsformen der Coccobacteria septica, Berlin, 1874; Klebs, numerous papers in Archiv f. exp. Pathol. und Pharmacol. ; Kurth, Bot. Zeitung, 1883; Prazmowski, Biol. Centralblatt, 1884; Zopf, Zur Morph. der Spalipflanzen, Leipsic, 1882; Cienkowski, Zur Morpho- logie d. Bacterien, 1876.

2 Wor the definitions of the genera (and species) the reader is re- ferred to the special works, especially those of Zopf and De Bary ; also Winter-Rabenhorst, Kryptogamen Flora—Pilze, i., 1881; and Grove, Synopsis of the Bacteria and Yeast-Fungi, 1884.

Nutri- Nutrition.—Having no chlorophyll, the Schizomycetes of course | factor ; and other conditions also affect the matter, e.g., slightly tion, depend on other organisms for their carbonaceous food, and are | acid media are more fatal than neutral or feebly alkaline ones, either saprophytes—z.¢., live on the remains of dead organisms— | denser less so than thin ones (ceteris paribus), and so on. or parasites—z.e., obtain their food direct from living organisms. To illustrate the importance of these facts we may note Tyn- Pasteur, Nigeli, and others have shown that these organisms can | dall’s method of ‘discontinuous heating”: by boiling the soln- derive their carbon from very numerous and widely different | tions containing the spores for 5-10 minutes daily all the life was organic substances, ¢.g., sugars of all kinds, mannite, glycerine, | destroyed in two or three days, though an exposure of an hour or tartaric and other vegetable acids, &c., and even from ethyl- | more toa temperature of 100° C. did not kill the spores if not alcohol, benzoic, salicylic, and carbolic acids to some extent. | repeated. The explanation is that the spores which resist the Carbonic, formic, and oxalic acids, cyanogen, urea, and oxamide | first or second short boiling have time to begin germinating in are, however, useless for this purpose. The nitrogen and carbon | the interval, and they then succumb at once when the liquid is together may be obtained from leuciu, asparagin,

methylamine, | again boiled.} &c., or the nitrogen alone from these or urea, and compounds of Light, Electricity, Gravitation, &c.—The relations between these ammonia with vegetable acids or phosphorus. The best nutritive | and the functions of Schizomycetes have been partly investigated, substances are proteids (peptones) and sugars (glucoses); others | but the results must be passed over here. A few of the higher must be passed over here. The nature of the particular Schizo- | genera show polarity—or at any rate difference between base and mycete has to be studied as well as the solution, and external | apex.? agents affect the matter also. Certain minerals are of course Effects of Chemical Agents. —Oxygen. —Pasteur showed that, while Chem- necessary,-—sulphur, phosphorus, potassium (or rubidium or | some Schizomycetes require free oxygen like other plants, there istry. cesium), and calcium (or magnesium, barium, or strontium) being | are some which necd none, or at most very little—the extreme case indispensable. As one of many suitable nutritive solutions we | is perhaps still doubtful ; but ‘‘anaerobiotic” forms like Bacillus may select the following :— butyricus stand in sharp contrast to such exquisitely “ aerobiotic” . . : ones as Lacterium aceti, Bacillus subtilis, &c. A few are known to fee eee aia Me aaa flourish best—or at any rate they are more active—when supplicd THESMUMESUO MALO nena te eeerceeet eee 0°04 Cs, th ; fs th esvith, eae ag W@oteNern CGC Gt sa. iciis

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PHystoLoay.—As in the case of other plants, we are here concerned with the functions of the Schizomycetes and their relations to the environment; for convenience, the subject may be treated under various headings. Limitation of space prevents our doing more than touch lightly upon such matters as the action of the Schizomycetes as ferments, and their relations to disease, though both subjects belong strictly to the physiology of their nutrition and actions on the euvironment.

the best average temperature is about $5° C., but the optimum may differ for each species and for each function. The same is generally true for the minimum and maximum temperatures, which have to be determined separately also. Remarkable phenomena are con- nected with the death-points of certain Bacilli, &c. The spores of some of these forms have been

frozen for days or weeks without injury, and some are said to have resisted temperatures as low as ~ 100° C., or even lower: it appears to be all but impossible to kill such spores by cold, High temperatures are more fatal; but the

SCHL ZO YC’ ts

spores of Bacilli have germinated after the fluid containing them was boiled for an hour, and even a temperature of 110° C. and higher has been withstood. The vegetative states are less re- sistent ; nevertheless the bacilli of anthrax were not killed by heating the fluid to 75-80° for an hour or more. Speaking generally, ripe spores are most resistent and germinating ones least so; dry cells or spores resist extreme temperatures better than normally saturated ones. Of course time is an important

Pasteur, Ann. de Chimie, 1862.

2 See Engelmann, Unters. aus d. Physiol. Lab. eu Utrecht, 1882; Cohn and Mendelssohn in Bettr. zur Biol. d. Pf, iti. Hft. 1, 1879; Pfetfer, Pflanzen-phystologie, ii. p. 156, 1881.

3 See Pasteur, Comptes Rendus, 1861-62; Nigeli, Theorie der Gahring , 1879; Schiitzenberger, Fermentation, 1876; Engelmann, Bot. Zeitung, 1881 and 1882; Pfeffer, Phanzenphysiologie, 1881.

4 See Pasteur, Comptes Rendus, 1883; Kurth, ‘Bacterium zopfii,” in Bot. Zeitung, 1883; Brefeld, Schtmmelpilze, iv.; sce also the literature on distribu- tion and oecurrence of Schizomycetes.

5 See Woodhead and Hare, Pathological Mycology, i., 1885. Further literature is there quoted.

Fermen-

| tation.

Rela- tions to disease.

SCHIZOMYCETES

attraction on the organism the reader is referred to his treatise, “Tocomotorische Richtungsbewegungen durch chemische Reize,” in Unters. aus dem bot. Inst. zu Tubingen, i. Hft. 3, 1884.

Fermentation and Putrefaction.—The growth and development of a Schizomycete in any organic medium results in a breaking down of the complex food-matcrials into simpler bodies, which may then become oxidized and still further decomposed. Such processes are known as fermentation in the wider sense. The particular kind of fermentation depends on the medium and on the species of Schizomycete, and may be affected by other eircum- stances ; as the process goes on volatile substances may escape and others remain behind. Where proteid substances are being decom- posed by Schizomycetes and evil-smelling gases escape, the fer- mentation is spoken of as putrefaction ; in certain cases, where intense oxidation follows and still further consumes the products of decomposition, the process has becn termed eremocausis. In a few instances a process of reduction sets in, as when sulphur salts are decomposed by Beggiatoa. The theory of FERMENTATION (9.v.) cannot be treated in detail here, but it is important to note that side by side, with the actions referred to another kind of action may goon. Many Schizomycetes excrete what are called “soluble ferments,” which are capable of changing proteids into peptones, sugar into glucose, and so on. These processes of inversion, Xc., result simply in an alteration of the proteid, &c., from the non-diffusible and non-assimilable condition to the diffusible and assimilable one, and are in no way destructive as are the fermenta- tions described above. Nevertheless it is the custom to speak of both as cases of fermentation ; the one series of changes renders the medium less and less capable of supporting life at every stage, the other series does not do so, yet the same name is frequently given to both kinds of action. It is a curious fact that the same Schizomycete may produce a different fermentation in each of two different media. The various fermentations are distinguished and valued according to the products which result; these bye-products are usually injurious to the ferment organism as they accumulate, and often complicate the investigation.

Of important fermentations due to Schizomycetes may be men- tioned those concerned in the making of vinegar and cheese, in the preparation of flax,

hemp, &c., in the souring and diseases of beer, wines, &c., the destruction of sugars, preserved food, &. Others are of importance in the soil, and in the destruction of organic matter in ponds, rivers, drains, &c. In fact, much of the raison d'étre of sanitary science may be referred here; and it may turn out to be still more true than we now know that Schizomycetes are important in agriculture.

In pathology the changes due to these organisms are at length being duly recognized. Apart from the comparatively harmless actions of those forms normally existing in the alimentary canal— Leptothriz aids in the decay of teeth, &e.—it is now ccrtain that some invasions are dangerous. The injurious effects of some Schizomycetes when introduced into open wounds, &c., against which the brilliant labours of Lister have been so successfully directed, are acknowledged everywhere; but it is important to recognize that on the whole the diseases due to organisms in the blood depend fundamentally upon changes of the same category as those referred to. Of course the fluids of a living body present complicated conditions, and the action of a patlogenous Schizo- mycete cannot be treated and studied simply as a typical fermenta- tion; but, although the conditions presented are involved and special, it cannot be doubted that common principles lie at the base of all the phenomena, and that the fluids of the diseased organism must be treated, so to speak, as fermentable media.

Numerous other fermentations of scicntific interest are due to Schizomycetes : ¢.g., those in which colours are formed, certain eases of phosphorescence, the ammoniacal fermentation of urine, &e.

ScHIZOMYCETES AND D1skASE.—The presence of Schizomycetes in the blood, tissnes, or organs of animals and man suffering from certain specifie diseases is admitted, and has naturally suggested the question—Are they accompaniments only or have they any causal relations to the diseased conditions? Their constancy in given cases excluded the former view. Next arose the discussion as to how the causal connexion comes about and in what it consists, a discussion which is still going on as to the details. The chief points now cstablished may be expressed generally somewhat as follows.

In a given specific disease, due to the action of a definite Schizomycete, the latter may be conceived to be injurious in

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1 Watson Cheyne, Antiseptic Surgery, 1882; Duclaux, Chimie Biologique, 1883 ; Fitz, '* Ueber Sehizomyecten-Guhrungen," various papers in Ber. ad, deutsch. chem. Gesellschaft, 1876-1884; Lister, Pharm. Jour., 1877; Niageli, Theorie der Géhrung, 1879; Wortmann, Zeitschr. f. phystol. Chemie, Vi. ; Schtitzenberger, Fermentation, 1876; Museulus, " Ueber die Gahrung des Harnstoffs," in Pfliiger's Archiv, xif.; Pasteur, Ann, de Chim. et Phus., 1858, and various papers in Comptes Rendus, also Etudes sur ia Biére, 1876, and Etudes sur le Vin, 1866; Sehldssing and Mtintz, Comptes Rendus, \xxxiv., 1xxxix.; Pasteur: his Life and Labours, London, 1885; Sehrocter in Cohn's Beitr. zur Biol., Hft. 2, 1872; Van Tieghem, " Baetllus Amylobacter," in Comptes Rendus, 1879.

several ways. If it robs the blood or tissues of oxygen or of any other valuable constituent, or if its activity results in the excre- tion of poisonous substances or in their formation as products of degradation of the matrix, or if it simply acts more or less as a mechanical obstruction or irritant, —in any of these cases harm may result to the delicately adjusted organism of the host. It being known that Schizomycetes act thus in nutrient pabula outside the body, their rapid growth and multiplication inside can of course only be explained as due to their success in the pabula there met with, and are indications that they produce changes there which must result in abnormality so far as the host is concerned. This does not end the matter, however. The living tissues of a healthy animal exert actions which are antagonistic to those of the parasitic invader ; and itis now generally admitted that the mere admission of a Schizomycete into an animal does not necessarily cause disease. Were it otherwise it is difficult to see how the higher organisms could escape at all. Schizomycetes abound all over, about and around us; many, of course, are unable to live in the fluids of the body, but manyare able todoso. Something must therefore be placed to the action of the tissues of the host, which when healthy can "resist" the attempts of a Schizomycete to settle, grow, and multiply with fatal effect. Much can

undoubtedly be explained by this struggle for existence between the cells of the parasite and those of the healthy tissues invaded. But the higher organisms, again, present obstacles of other kinds to the lodgment of Schizo- mycectes: ciliary actions, active excretions, isolating processcs of tissue-formation, &c., may be mentioned. Thus not every Schizo- mycete met with in the body can do harm.

But even when a Schizomycete has gained acccss to the blood- vessels, lymph-passages, &c., and has succeeded in establishing itself and multiplying, there are other facts to be taken into

| account before we dismiss the question as to its relations to disease,

The rapidity of its growth may vary according to many circum- stances, —temperature, oxidation, &c.,—as well as the still partially obstructive action of the invaded organisin ; whether the parasite excretes a poison, or simply robs the host, or distributes injurious agents of any kind, it is clear that everything which favours it aids in intensifying its action. And this may be local or general also according to complex circumstances. Of course sores, open wounds, &c., niay render the access of a given Schizomycete very easy, and pave the way for its success in the tissues, &c., different strata of which may be exerting less and less resistance to its attacks. The study of this subject has led to the methods of modern surgery devised by Lister. It may be mentioned that Schizomycetes which produce bad effects on injured or dead tissues of wounds are not uecessarily able to live in the healthy organism, however deadly the poisonous products of their action may be when they succeed in establishing themsclves.

All these and many other facts, then, point to the conclusion that the mere presence of a Schizomycete in an organ or tissue is not sufficient proof of its causal relation to disease, and lead us to the following requirements to be satisfied before any such relation can be admitted (Koch) :—(1) given a specific disease in which a definite Schizomyccte is constantly detected, and with a constant disposition with respect to the tissues, organs, &c.,—this organism should be absent from animals free from the disease ; (2) the Schizomycete should be cultivated in nutrient media outside the body, kept pure for several “generations,” and obtained in some quantity by these means; (3) inoculation of a small amount of this pure cultivation should

reproduce the specific disease in a healthy animal; (4) the same foreign elements as before should be clearly detected in the tissues of the now diseased subject, and in the saine relations as before.

The satisfying of all these requirements is difficult, and the necessity of overcoming the difficulties has led to what may almost be termed a special branch of medical art. At the same time the majority of the principles which are here becoming recognized have long been known to biologists, and especially to botanists, and there are still numerous indications of a waut of botanical training on the part of writers on these subjects. It is impossible here to even mention all the methods devised for staining, prepar- ing, and examining tissues, &c., and the Schizomycetes they contain, or for cultivating these minute organisms under constant conditions on sterilized potatoes, bread-paste, jelly, blood-seram, &c., or in animal infusions or fluids, &c. Some of the more important points in cultivation have already been referred to; the litera- ture must be consulted for further details.* (H. M. W.)

2 Only a few authorities can be mentioned here, for the literature on pathogen- ous Sehizomyectes and methods is simply enormous; further references may be made to the works of Babes, Koch, Davaine, Pasteur, Chauveau, Bollinger, Fehleisen, Klein, Gaffky, Miller, Rosenbach, Oertel, Obermeyer, Burdon- Sanderson, Toussaint, Waldcyer, Watson Cheyne, Dreschfeld, and many others. Fliigge, ‘‘ Ferment und Mikroparasiten,” in Ziemssen’s Handbuch der Hygiene, Leipsie, 1883 ; Magnin, Zes Bactertes, Paris, 1878; Klein, Micro-organisms and Disease, 1884; Woodhead and Hare, Pathological Mycology, 1885. Valuable papers are also to be found in the following periodieals :—Brit. Med. Jour., Trans. of the Pathol. Soc. Virchow’s Archiv, Archiv f. exp. Pathol., Centralbl. f. d. med, Wiss., Bull. de V Acad, de Med., Deutsche med. Wochenschrift, The Lancet, Quart. Jour, of Micr. Sc., and others.

SCHLAGINTWEIT-SAKUNLUNSKI, Hermann von (1826-1882), the eldest of a band of brothers, all more or less noted as scientific explorers or students of foreign countries, sons of an oculist of Munich. Hermann was born on the 13th of May 1826. His first scientific labours were studies in

the Alps, carried on between 1846 and 1848 in association with his brother Adolf (born January 9, 1829). The publication of the Studien wber die physikalische Geographie der Alpen in 1850 founded the scientific reputation of the two brothers, and their reputa- tion was increased by their subsequent investigations in the same field, in which the third brother Robert (born Oct. 27, 1837) also took part. Soon after the publication of the Neue Untersuchungen tiber die phys. Geog. u. Geol. der Alpen (1854, 4to), the three brothers received, on the recommendation of Alex. von Humboldt, a commission from the East India Company to travel for scientific pur- poses in their territory, and more particularly to make observations on terrestrial magnetism. Their explorations extended over the period 1854-57, during which they travelled, sometimes in company, sometimes separately, in the Deccan and in the region of the Himalayas, even prosecuting their investigations beyond the frontiers of the Company's territory into the region of the Karakorum and Kuenlun Mountains. Hermann and Robert were the first Europeans who crossed the latter mountains, and it was in honour of that achievement that the former had the title or surname of Saktinltinski bestowed upon him (in 1864). The two returned to Europe in the summer of 1857, but Adolf, who remained to prosecute his explora- tions in Central Asia, was put to death by the emir of Kashgar on the 26th of August. Between 1860 and 1866 Hermann and Robert published in four volumes the "Results of a Scientific Mission to India and High Asia." The extensive collections of ethnography and natural history made by them were ultimately deposited in the Burg at Nuremberg through the intervention of the king of Bavaria (May 1877). Hermann spent the last years of his life chiefly in literary and scientific activity, partly at Munich partly at the castle of Jagernburg near Forchheim. He died at Munich on the 19th of January 1882.

His brother Robert was appointed professor of geography at Giessen in 1864, but his academical labours were sometimes inter- rupted by travels, especially in the United States, which furnished him with material for more or less important works. He died at Giessen, June 6, 1885. Of two other brothers, one, Edward (born March 23, 1831), killed in battle at Kissingen in 1866, made him- self known by an account of the Spanish expedition to Morocco in 1859-60. Emil (born July 7, 1835) is the author of several learned works relating to India and Tibet.

SCHLANGENBAD. See Scuwaxsacu.

SCHLEGEL, Avcusr Witurtm von (1767-1845), German poet, translator, and critic, was born on the 8th September 1767 at Hanover, where his father, J. Adolf Schlegel, was a pastor. He was educated at the Hanover gymnasium and at the university of Géttingen. Having spent some years as a tutor in the house of a banker at Amsterdam, he went to Jena, where he was made a pro- fessor, and received from the duke of Weimar the title of "Rath." Here he began his translation of Shakespeare, which was ultimately completed, under the superintend- ence of Tieck, by Tieck's daughter Dorothea and Count Baudissin. A revised edition of this rendering, which is considered one of the best poetical translations in the German language, has been issued by the German Shake- speare society. At Jena Schlegel contributed to Schiller's periodicals the Horen and the Musenalmanach; and with his brother Friedrich he conducted the Atheneum, which ranked among the most powerful organs of critical opinion in Germany. He also published a volume of poems, and carried on a rather bitter controversy with Kotzebue. At

this time the two brothers were remarkable for the vigour and freshness of their ideas, and commanded respect as the leaders of the rising Romantic school. In 1802 Schlegel went to Berlin, where he delivered lectures on art and literature; and in the following year he issued Ion, a tragedy in the antique style, which gave rise to a suggestive discussion on the principles of dramatic poetry. About the same time appeared his Spanish Theatre, in which he presented admirable translations of five of Calderon's plays ; and in another volume he gave transla- tions of Spanish, Portuguese, and Italian lyrics. In 1807 he attracted much attention in France by an essay in the French language, in which he compared Racine with Euripides. His lectures on dramatic art and literature, which have been translated into most European languages, were delivered at Vienna in 1808. Meanwhile he had been travelling in France, Germany, Italy, and other countries with Madame de Staél, who owed to him many of the ideas which she embodied in her work, De V Allemagne. In 1813 he acted as the secretary of the crown prince of Sweden, through whose influence the right of his family to noble

rank was revived. Schlegel was made a professor at the university of Bonn in 1818, and during the remainder of his life he occupied himself chiefly with Oriental studies, although he continued to lecture on art and literature, and in 1828 he issued two volumes of critical writings. In 1823-30 he published the Indische Bibliothek ; and as separate works appeared (1823) the Bhagavad-Gita with a Latin translation, and (1829) the Ramdjana. Schlegel was twice married—first to a daughter of Prof. Michaelis of Gottingen, then to a daughter of Prof. Paulus of Heidelberg. Both wives separated from him soon after their marriage. He died at Bonn on the 12th May 1845. As an original poet Schlegel is unimportant, but as a poetical translator he has rarely been excelled, and in criticism he exercised a strong influence by the emphasis with which he marked the distinction between classical and romantic literature. By his study of Sanskrit he helped to prepare the way for the development of the science of language.

In 1846-47 Schlegel's German works werc issued in twelve volumes by Bocking. There is also an edition of his (uwres, écrites en francais, and of his Opuscula Latina.

SCHLEGEL, Jonann Exsas (1718-1749), a German dramatic writer, was born at Meissen on the 28th January 1718. He was educated at Schulpforta and at the uni- versity of Leipsic. In 1743, having finished his studies, he became private secretary to his relative, Von Spener, the Saxon ambassador at the Danish court. Afterwards he was made professor extraordinary at the academy of Sorde, where he died on the 13th August 1749, Schlegel was a contributor to the Bremischen Beitrdge, and for some time, while he was living in Denmark, he edited a weekly periodical, Der Fremde. He was also known as a writer of clever poetical epistles. Incomparably his best works, however, are his dramas, which did much to prepare the way for the dramatic achievements of Lessing, by whom his genius was warmly appreciated. He wrote two lively and well-constructed comedies, the Triumph der guten Frauen and the Stumme Schinheit, the latter in alexandrines, the former in prose. Hermann and Kanut (in alexandrines) are generally considered his best tragedies.

His works were edited after his death by his brother, J. H. Schlegel, who had a considerable reputation as a writer on Danish history. Another

brother, J. Adolf Schlegel, an eminent preacher,

and author of some volumes of verse, was the father of August Wilhelm and Friedrich von Schlegel.

SCHLEGEL, Kart WitHELM Friepricn von (1772- 1829), known chiefly as an historian of literature, was the brother of August Wilhelm von Schlegel. He was born

at Hanover on the 10th March 1772. Having studied at Gottingen and Leipsic, he attracted some attention by a book on the Griechen und Rémer (1797), which was praised by Heyne. This work was soon followed by his Geschichte der Poesie der Griechen und Rémer. At Jena, where he lectured as a privat-docent at the university, he contributed to the Athenzum many striking critical articles, and a number of lyrical poems which were afterwards included in a volume entitled Gedichte. Here also he wrote Lucinde, an unfinished romance, which was held by some of the best of his contemporaries to be of a deeply immoral tendency, and Alarcos, a tragedy, in which he attempted without much success to combine romantic and classical elements. In 1802 he went to Paris, where he edited Europa, lectured on philosophy, and carried ou Oriental studies, some results of which he embodied in a well-known book, Ueber die Sprache und Weiasheit der Indier. In 1803 he and his wife joined the Roman Church, and from this time he became more and more opposed to the principles of political and religious freedom. He went to Vienna in 1808, and in the following year was engaged as imperial court secretary at the head- quarters of the archduke Charles. At a later period he was for some time councillor of legation in the Austrian embassy at the Frankfort diet, but in 1818 he returned to Vienna. Meanwhile he had published two series of lectures, Ueber die neuere Geschichte (1811) and Geschachte der alten und neuen Literatur (1815). After his return to Vienna from Frankfort he edited Concordia, and began the issue of his Stimmtliche Werke. He also delivered lectures, which were republished in his Philosophie des Lebens (1828) and in his Philosophie der Geschachte (1829). He died on the 11th January 1829 at Dresden, where he was delivering the course of lectures which appeared in 1830 under the title Phzlosophische Vorles- ungen, insbesondere tiber die

Philosopae der Sprache und des Wortes. His own collection of his works included ten volumes, and to this number five volumes were added after his death. A permanent place in the history of German literature belongs to Friedrich Schlegel and his brother August Wilhelm as the critical leaders of the Romantic school, which derived from them most of its governing ideas as to the characteristics of the Middle Ages, andas to the methods of literary expression. In their writings, too, there is the fullest and most impres- sive statement of the mystical spiritual doctrines of the Romantic school. Of the two brothers, August Wilhelm did the highest permanent service to his countrymen by his translations from Shakespeare and Calderon. The best of Friedrich's works is his Geschichte der alten und neuen Literatur, in which was presented for the first time a systematic account of the development of European literature as a whole.

Friedrich Schlegel's wife, Dorothea, a daughter of Moses Men- delssohn, was born at Berlin about the year 1770, and died at Frankfort in 1839. She was an eccentric but remarkably clever woman, and wrote or editcd several works, issued by her husband, — the unfinished romance Florentin (1801), the first volume of the Sammlung romantischer Dichtungen des Mittelalters (2 vols., 1804), and Lother und Maller (1805). By her first marriage she had a

son, Philip Veit, who became one of the most eminent painters of his day in Germany.

SCHLEICHER, Aveust (1821-1868), born at Meinin- gen on February 19, 1821, studied at the universities of Leipsic and Tibingen, became extraordinary professor of philology in Prague in 1850, removed to Jena as ordinary professor in 1857, and died there December 6, 1868. His work is characterized in the article Puttoxoey, vol. xviii.

: SCHLEIDEN, Marrmtas (1804-1881), was born at Hamburg in 1804. He studied law at Heidelberg and

practised as advocate in Hamburg till 1831, but not succeeding he studied botany and medicine at Gottingen and Berlin, and graduated in Jena in

1839, where he afterwards became professor of botany (1846-50). In 1863 he was called to Dorpat, but resigned the following year and returned to Germany, where he lived as a private teacher. He died at Frankfurt in 1881. His title to remembrance is twofold. Uniting the labours of two centuries of workers in vegetable histology, from Malpighi and Grew to Mirbel and Robert Brown, he proved that a nucleated cell is the only original constituent of the plant embryo, and that the development of all vegetable tissues must be referred to such cells, thus preparing the way for the epoch-making cell theory of Schwann; and his Prin- ciples of Scientific Botany, which went through several editions (1842-50), did much to shake the tyranny of the purely systematic Linnean school, whose accumulations he was accustomed irreverently to describe as "' hay." Despite a certain inability to criticize and verify his own hypotheses, he gave, both by his speculative activity and by the introduction of improved technical methods, so vivid an impulse to the younger botanists of his time as to have earned from De Bary the title of reformer of scientific botany. His botanical labours practically ceased after 1850, when he entered on various philosophical and historical studies. See ScHWANN.

SCHLEIERMACHER, Frieprich DanieL ERNst (1768-1834), theologian and philosopher, was the son of a Prussian army-chaplain of the Reformed confession, and was born November 21, 1768, at Breslau. In his fifteenth year the boy, who was of a weak constitution, was placed by his parents in a Moravian school at Niesky in Upper Lusatia, and two years later in the seminary of the same sect at Barby near Halle. Here Moravian theology proved inadequate to satisfy the deep religious needs and awak- ening intellect of the youth. It was particularly the doctrines of eternal punishment, of the deity and the substitutionary sufferings of Christ, and of the total corruption of human nature that were stumbling-blocks to him. He was also unable to make his own the peculiar religious experiences of his Moravian and pietistic teachers. The efforts of his strictly orthodox father and of the heads of the seminary to lead him to crush his doubts as sinful, and to shun modern theology and literature, tended only to strengthen his desire to explore the great world of know- ledge. Reluctantly his father gave him permission to leave Barby for the university of Halle, and the correspond- ence between the father and the son on this painful crisis in Friedrich's life supplies a striking illustration of a typical phase of distressing modern mental history. When Schleiermacher entered the

university of Halle (1787) the reign of pietism there had ceased, having given way to the rationalistic philosophy of Wolf with the critical theology of Semler, though the new philosophy of Kant was rapidly displacing Wolf's. As a student he pursued an independent course of reading and neglected to his permanent loss the study of the Old Testament and the Oriental languages. But he frequented the lectures of Semler and of J. A. Eberhard, acquiring from the former the principles of an independent criticism of the New Testa- ment and from the latter his love of Plato and Aristotle. At the same time he studied with great earnestness the writings of Kant and Jacobi. He commenced thus early his characteristic habit of forming his opinions by the process of patiently examining and weighing the positions of all thinkers and parties. But with the receptivity of a great eclectic he combined the reconstructive power of a profoundly original thinker. While yet a student he began to apply ideas gathered from the Greek philosophers in a reconstruction of Kant's system. At the completion

of his three years' course at Halle he obtained through the influence of the court-chaplain Sack an appointment as private tutor in the family of Count Dohna-Schlobitten, which he held upwards of two years, developing in a culti- vated and aristocratic household his deep love of family and social life. After short engagements in tuition and as locum tenens to a clergyman of the small town of Landsberg, he received (1796) the appointment of chaplain to the Charité Hospital in Berlin, a position which he held nearly six years, and which offered no scope for the development of his powers as a preacher. He was the more induced to seek the satisfaction of his mental and

spiritual necessities in the cultivated society of Berlin, and

in profound philosophical studies. This was the period in which he was constructing the framework of his pluloso- phical and religious system. It was the period too when he made himself widely acquainted with art, literature, science, and modern culture generally. He was at that time profoundly affected by German Romanticism, as represented by his friend Friedrich Schlegel, and it required all the energy of his moral nature and the

force of his intellect to preserve himself from its moral and mental extravagances. Of this his Conjidential Letters on Schlegel's Lucinde (1801), as well as his perilous relation to Eleonore Grunow, the wife of a Berlin clergyman, are proof and illustration. Gradually his sound moral nature, his deep religiousness, and his powerful intellect enabled him to emancipate himself entirely from the errors and weaknesses of a transient phase of mental and _ social history, and to appropriate at the same time the elements of truth and goodness which it possessed in rich measure. Romanticism unlocked for him the divine treasures of life and truth which are stored in the feelings and intuitions of the human soul, and thus enabled him to lay the founda- tions of his philosophy of religion and his ethical system. It enriched his imagination and life too with ideals ancient and modern, which gave elevation, depth, and colour to all his thought. Meantime he studied Spinoza and Plato, and was profoundly influenced by both, though he was never a Spinozist; he made Kant more and more his master, though he departed on fundamental points from him, and finally remodelled his philosophy ; with some of Jacobi's positions he was in sympathy, and from Fichte and Schelling he accepted ideas, which in their place in his system, however, received another value and import. The literary fruit of this period of intense fermentation and of rapid development was his "epoch-making" book, Reden tiber die Religion (1799), and his "'new year's gift" to the new century, the Monologen (1800). In the first book he vindicated for religion an eternal place amongst the divine mysteries of human nature, distinguished it from all current caricatures of it and allied phenomena, and de- scribed the perennial forms of its manifestation and life in men and society, giving thereby the programme of his subsequent theological system. In the Monologen he threw out his ethical manifesto, in which he proclaimed his ideas as to the freedom and independence of the spirit, and as to the relation of the mind to the world of sense and imperfect social organizations, and sketched his ideal of the future of the individual and society. In 1802, to his great advantage morally and intellectually, Schleier- macher exchanged the brilliant circle of Berlin Romanticists for the retired life of a pastor in the little Pomeranian town of Stolpe. Here he remained two years, which were full of pastoral and literary work, as well as rich in personal and moral progress. He relieved Friedrich Schlegel entirely of his nominal responsibility for the translation of Plato, which they had together undertaken, and regarded the completion of it as

the work of his life. The first volume was published in 1804, and the last (the

Republic) in 1828, At the same time another work, Grund- linten einer Kritik der bisherigen Sittenlehre (1803), the first of his strictly critical and philosophical productions, occupied him. ‘This work is a severe criticism of all previous moral systems, especially those of Kant and Fichte, Plato’s and Spinoza’s finding most favour; its leading principles are that the tests of the soundness of a moral system are the completeness of its view of the laws and ends of human life as a whole and the harmonious arrangement of its subject-matter under one fundamental principle; and, though it is almost exclusively critical and negative, the book announces clearly the division and scope of moral science which Schleiermacher sub- sequently adopted, attaching prime importance to a “‘Gtiterlehre,” or doctrine of the ends to be obtained by moral action. But the obscurity of the style of the book as well as its almost purely negative results proved fatal to its immediate success. In 1804 Schleiermacher removed as university preacher and professor of theology to Halle, where he remained until 1807, and where he quickly obtained a reputation as professor and preacher, and exercised a powerful influence in spite of the contradictory charges of his being an atheist, Spinozist, and pietist. In this period he wrote his dialogue the Weihnachtsfeier (1806), a charming production, which holds a place midway between his Heden and his great dogmatic work the Christliche Glaube, and presents in the persons of its speakers phases of his growing appreciation of Christianity as well as the conflicting elements of the theology of the period. After the battle of Jena he returned to Berlin (1807), was soon appointed pastor of the Trinity Church there, and the next year married the widow of his friend Willich. At the foundation of the Berlin university (1810), in which he took a prominent part, he was called to a theological chair, and soon became secretary to the Academy of Sciences. He was thus placed in a position suited to his powers and in domestic and social surroundings adapted to meet the wants of his rich nature. At the same time he approved himself in the pulpit and elsewhere as a large-hearted and fearless patriot in that time of national calamity and humiliation, acquiring a name and place in his country’s annals with Arndt,

Fichte, Stein, and Scharn- horst. He took a prominent part too in the reorganiza- tion of the Prussian church, and became the most powerful advocate of the union of the Lutheran and Reformed divisions of German Protestantism. The twenty-four years of his professional career in Berlin were opened with his short but important outline of theological study (Kurze Darstellung des theologischen Studiums, 1810), in which he sought to do for theology what he had done for religion in his Reden. While he preached every Sunday, he also gradually took up in his lectures in the university almost every branch of theology and philosophy—New Testament exegesis, introduction to and interpretation of the New Testament, ethics (both philosophic and Christian), dogmatic and practical theology, church history, history of philosophy, psychology, dialectics (logic and metaphysics), politics, pedagogy, and esthetics. His own materials for these lectures and his students' notes and reports of them are the only form in which the larger proportion of his works exist,—a circumstance which has greatly increased the difficulty of getting a clear and harmonious view of fundamental portions of his philo- sophical and ethical system, while it has effectually deterred all but the most courageous and patient students from reading these posthumous collections. Asa preacher he produced a powerful effect, yet not at all by the force of his oratory but by his intellectual strength, his devotional spirit, and the philosophical breadth and unity of his thought. In politics he was an earnest friend of

Philoso- phical systenl.

SCHLETDERMACHER

liberty and progress, and in the period of reaction which

followed the overthrow of Napoleon he was charged by

the Prussian Government with "'demagogic agitation" in conjunction with the great patriot Arndt. At the same time he prepared for the press his chief theological work Der christliche Glaube nach den Grundsdtzen der evan-

gelischen Kirche (1821-22; 2d edition, greatly altered, 1830-31). The fundamental principle of this classical work is, that religious feeling, the sense of absolute dependence on God as communicated by Jesus Christ

through the church, and not the creeds or the letter of Scripture or the rationalistic understanding, is the source and law of dogmatic theology. The work is therefore

simply a description of the facts of religious feeling, or of

the inner life of the soul in its relations to God, and

these inward facts are looked at in the various stages of

their development and presented in their systematic con- nexion. The aim of the work was to reform Protestant theology by means of the fundamental ideas of the Reden, to put an end to the unreason and superficiality of both supernaturalism and rationalism, and to deliver religion and theology from a relation of dependence on perpetually changing systems of philosophy. Though the work added to the reputation of its author, it naturally aroused the increased opposition of the theological schools it was sntended to overthrow, and at the same time Schleier- macher's defence of the right of the church to frame its own liturgy in opposition to the arbitrary dictation of the monarch or his ministers brought upon him fresh troubles. He felt himself in Berlin more and more isolated, although his church and his lecture-room con- tinued to be largely attended. But he prosecuted his translation of Plato and prepared a new and greatly altered edition of his Christliche Glaube, anticipating the latter in two letters to his friend Liicke (in the Studien und Kritiken, 1829), in which he defended with a masterly hand his theological position generally and his book in particular against opponents on the right and the left. The same year he lost his only son—a blow which, he said, "drove the nails into his own coffin." But he continued to defend his theological position against Hengstenberg's party on the one hand and the rationalists Von Colln and D. Schulz on the other, protesting against both subscrip- tion to the ancient creeds and the imposition of a new rationalistic formulary. In the midst of such labours, and enjoying still full bodily and mental vigour, he was carried off after a few days' illness by inflammation of the lungs. He died thinking '"'the profoundest speculative ideas which were one with his deepest religious feeling," and partaking of the sacrament of the Lord's supper, February 12, 1834.

Schleiermacher’s friend, the naturalist and poet Steffens, has left the following description of his appearance about the beginning of the century : —“ Schleiermacher was of small stature, a little deformed, yet hardly enough to disfigure him ; all his movements were animated, and his features in the highest degree expressive; a certain keen- ness in his glance produced perhaps a repellent effect; indeed, he appeared to see through every one; his face rather long, all his features sharply cut, the lips firmly closed, the chin projecting, the eyes animated and flashing, his look always serious, collected, and thoughtful.”

Sehletermacher’s Philosophical System.—A_ great antithesis lies at the basis of all thought and life—that of the real and the ideal, of organism, or sense, andintellect. But the antithesis is not abso- lute, for in life and being both elements are united—though with- out its presence life and thought would be impossible. In the

actual world the antithesis appears as reason and nature, in each of which, however, there is a combination of its two elements—the

ideal and the real,—the reason having a preponderance of the first and nature a preponderance of the second. At the basis of nature

lies universal reason as its organizing principle, and when reason

becomes a conscious power in man it finds itself in conflict as well as in harmony with external nature. The whole effort and end of human thought and action is the gradual reduction of the realm and the power of this antithesis in the individual, the race, and the world. Though the antithesis is real and deep, the human mind cannot admit its absolute nature ; we are compelled to sup- pose a transcendental reality or entity in which the real and the ideal, being and thought, subject and object, are one. Conscious- ness itself involves the union of the antithetic elements, and prior to moral action nature is found organized and reasou manifested

_or symbolized therein. We are ourselves proofs of the unity of the

real and the ideal, of thought and being, for we are both, our self-consciousness supplying the expression of the fact. As we have in ourselves an instance of the identity of thought and being, we must suppose a universal identity of the ideal and real behind the antithesis which constitutes the world. This supposition is the basis of all knowledge, for thought becomes knowledge only wheu it corresponds to being. The supposition may be called a belief, but it is so only in the sense in which belief appears in the religious department, where it is the ultimate ground of all action. The supposition is the basis of all ethics, for without the conviction of the correspondence of thought and reality action would be fruitless and in the eud impossible. It isabove all the substance of religious feeling, which is the immediate consciousness of the unity of the world, of the absolute oneness behind the infinite multiplicity of contrasts ; indeed, it is the religious conviction of the unity which is the best guarantee of the truth of the suppositions of philosophy. It is "the religious consciousness of the unity of the intellectual and physical world in God" which is to overcome the scepticism of the critical philosophy. But, though this unity must be laid down as the basis of knowledge, it is absolute and transcendental. In contrast with the "world," as the totality of being in its differen- tiation, this absolute unity, or God, in whom the real as manifold, and the spirit as one, find their unifying base, by its very nature is unphenomenal, indefinable, and inconceivable. The idea is outside the boundary of thought, though its necessary postulate, and it is no less inaccessible to religious feeling, though it is its life and soul. Neither member of the antithesis of the real and the ideal must be conceived as producing the other; they are both equally existent and equally constituent elements of the world; but in God they are one, and therefore the world must not be identified with Him. The world and God are distinct, but correlative, and neither can be conceived without the other. The world without God would be "chaos," and God without the world an empty "phan- tasm." But though God is transcendent and uuknowable He is immanent in the world. In self-consciousness God is present as the basis of the unity of our nature in every transition from an act of knowledge to an act of will, and vice versa. As far as man is the unity of the real and the ideal, God isin him. He is also in all things, inasmuch as in everything the totality of the world and its transcendental basis is presupposed by virtue of their being and correlation. The unity of our personal life amidst the

multiplicity of its functions is the symbol of God's immanence in the world, though we may not conceive of the Absolute as a person. The idea of the world as the totality of being is, like the correlative idea of God, only of regulative value ; it is transcendent, as we uever do more than make approaches to a knowledge of the sum of being. The one idea is the transcendental terminus a quo and the other the transcendeutal terminus ad quem of all knowledge. But though the world cannot be exhaustively known it can be known very extensively, and though the positive idea of God must always remain unattainable we are able to reject those ideas which involve a contradiction of the postulate of the Absolute. Thus the pan- theistic and the theistic conceptions of God as the supreme power, as the first cause, as a person, are alike unallowable, since they all bring God within the sphere of antithesis and preclude His absolute unity. On the other hand, the world can be known as the realm of antithesis, and it is the correlative of God. Though He may not be conceived as the absolute cause of the world, the idea of absolute causality as symbolized in it may be taken as the best approximate expression of the coutents of the religious conscious- ness. The unbroken connexion of cause and effect throughout the world becomes thus a manifestation of God. God is to be sought only in ourselves and in the world. He is completely immanent in the universe. It isimpossible that His causality should haveany other sphere than the world, which is the totality of being. "No God without a world, and no world without God." The divine omni- potence is quantitatively represented by the sum of the forces of nature, and qualitatively distinguished from them only as the unity of infinite causality from the multiplicity of its finite phenomena. Throughout the world—not excepting the realm of mind—absolute necessity prevails. As a whole the world is as good and perfect as a world could possibly be, aud everything in it, as occupying its necessary place in the whole, is also good, evil being only the necessary limitation of individual being.

Schleiermacher's psychology takes as its basis the phenomenal dualism of the ego and the non-ego, and regards the life of man as

the interaction of these elements with their interpenetration as its infinite destination. The dualism is therefore not absolute, and, though present in man's own constitution as composed of body and soul, is relative only even there. The ego is_ itself both body and soul,—the conjunction of both constitutes it; our " organization " or sense nature has its intellectual element, and our "intellect" its organic element. There is no such thing as "pure mind" or "pure body." The one general function of the ego, thought, becomes in relation to the non-ego either receptive or spon- taneous action, and in both forms of action its organic, or sense, and its intellectual energies co-operate ; and in relation to man, nature, and the universe tho ego gradually finds its true individuality by becoming a part of them, "every extension of consciousness being higher life." The specific functions of the ego, as determined by the relative predominance of sense or intellect, are either functions of the senses (or organism) or functions of the intellect. The former fall into the two classes of feelings (subjective) and perceptions (objective) ; the latter, according as the receptive or the spontaneous element predominates, into cognition and volition. : being is the object and in volition it is the purpose of thought : in the first case we receive (in our fashion) the object of thought into ourselves; in the latter we plant it out into the world. Both cogni- tion and volition are functions of thought as well as forms of moral action, It is in those two functions that the real life of the ego is manifested, but behind them is sedf-conseiowsness permanently present, which is always both subjective and objective—conscious- ness of ourselves and of the non-ego. This self-consciousness is the third special form or function of thought,—which is also called feeling and immediate knowledge. In it we cognize our own inner life as affected by the non-ego. As the non-ego helps or hinders, enlarges or limits, our inner life, we feel pleasure or pain. Esthetic, moral, and religious feelings are respectively produced by the reception into consciousness of large ideas, —nature, mankind, and the world ; those feelings are the sense of being one with these vast objects. Religious feeling therefore is the highest form of thought and of life ; in it we are conscious of our unity with the world and God; it is thus the sense of absolute dependence. Schleiermacher's doctrine of knowledge accepts the fundamental principle of Kant that knowledge is bounded by experience, but it seeks to remove Kant's scepticism as to knowledge of the Ding an sich, or Sein, as Schleiermacher's term is. The idea of knowledge or scientific thought as distinguished from the passive

form of thought—of esthetics and religion—is thought which is produced by all thinkers in the same form and which corresponds to being. All knowledge takes the form of the concept (Begrif) or the judgment (Urtheil), the former conceiving the variety of being as a definite unity and plurality, and the latter simply connecting the concept with certain individual objects. In the concept there- fore the intellectual and in the judgment the organic or sense element predominates. The universal uniformity of the production of judgments presupposes the uniformity of our relations to the outward world, and the uniformity of concepts rests similarly on the likeness of our inward nature. This uniformity is not based on the sameness of either the intellectual or the organic functions alone. but on the correspondence of the forms of thought and sensation with the forms of being. The essential nature of the concept is that it combines the general and the special, and the same combination recurs in being; in being the system of sub- stantial or permanent forms answers to the system of concepts and the relation of cause and effect to the system of judgments, the higher concept answering to “force” and the lower to the pheno- mena of force, and the judgment to the contingent interaction of things. The sum of being consists of the two systems of snb- stantial forms and interactional relations, and it reappears in the form of concept and judgment, the concept representing being and the judgment being in action. Knowledge has under both forms the same object, the relative difference of the two being that when the conceptual form predominates we have speculative science and when the form of judgment prevails we have empirical or historical science. Throughout the domain of knowledge the two forms are found in constant mutual relations, another proof of the funda- mental unity of thought and being or of the objectivity of know- ledge. It is obvious that Plato, Spinoza, and Kant liad contri- buted characteristic elements of their thought to this system, and directly or indirectly it was largely indcbted to Schelling for fundamental conceptions.

Schletermacher’s Ethics. —Next to religion and theology it was to the moral world, of which, indeed, the phenomena of religion aud theology were in his systems only constituent elements, that he specially devoted himself. In his earlier essays he endeavoured to point out the defects of ancient and modern cthical thinkers, particularly of Kant and Fichte, Plato and Spinoza only finding favour in his eyes. He failed to discover in previous moral systems any necessary basis in thought, any completeness as

regards the phenomena of moral action, any systematic arrangement of its parts, and any clear and distinct treatment of Specific moral acts and relations. His own moral system is an attempt to supply

these deficiencies,

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It connects the moral world by a deductive process with the fundamental idea of knowledge and being ; it offers a view of the entire world of human action which at all events aims at being exhaustive; it presents an arrangement of the

matter of the science which tabulates its constituents after the

model of the physical sciences ; and it supplies a sharply defined

treatment of specific moral phenomena in their relation to the

fundamental idea of human life as a whole. Schleiermacher defines ethics as the theory of the nature of the reason, or as the scientific treatment of the effects produced by human reason in the world of nature and man. Asa theoretical or speculative science it is purely descriptive and not practical, being correlated on the one hand to physical science and on the other to history. Its method is the same as that of physical science, being dis- tinguished from the latter only by its matter. The ontological basis of ethics is the unity of the real and the ideal, and the psychological and actual basis of the ethical process is the tendency of reason and nature to unite in the form of the complete organiza- tion of the latter by the former. The end of the ethical process is that nature (7.¢., all that is not mind, the human body as well as external nature) may become the perfect symbol and organ of mind. Conscience, as the subjective expression of the presupposed identity of reason and nature in their’ bases, guarantees the practicability of our moral vocation. Nature is preordained or constituted to become the symbol and organ of mind, just as mind is eudowed with the impulse to realize this end. But the moral law must not be conceived under the form of an “

imperative” or a “Sollen” ; it differs from a law of nature only as being descriptive of the fact that it ranks the mind as conscious will, or zweekdenkend, above nature. Strictly speaking, the antitheses of good and bad and of free and necessary have no place in an ethical system, but simply in history, which is obliged to compare the actual with the ideal, but as far as the terms “good” and “bad” are used in morals they express the rule or the contrary of reason, or the harmony or the contrary of the particular and the general. The idea of “free ” as opposed to necessary expresses simply the fact that the mind can propose to itself ends, though a man cannot alter his own nature. In contrast to Kant and Fichte and modern moral philosophers Schleiermacher reintroduced and assigned pre-eminent importance to the doctrine of the summum bonum, or highest good. It represents in his system the ideal and aim of the entire life of man, supplying the ethical view of the conduct of individuals in relation to society and the universe, and therewith constituting a philosophy of history at the same time. Starting with the idea of the highest good and of its constituent elements (Giter), or the chief forms of the union of mind and nature, Schleiermacher’s system divides itself into the doctrine of moral ends, the doctrine of virtuc, and the doctrine of duties ; in other words, asa development of the idca of the subjection of nature to reason it becomes a description of the actual forms of the triumphs of reason, of the moral power mani- fested therein, and of the specific methods employed. Every moral good or product has a fourfold character: it is individual and universal ; it is an organ and symbol of the reason, that is, it is the product of the individual with relation to the, community, and represelts or manifests as well as classifies and rules nature. The first two characteristics provide for the functions and rights of the individual as well as those of the community or race. Though a moral action may have these four characteristics at various degrees of strength, it ceases to be moral if one of them is quite absent. Allinoral products may be classified according to the predominance of one or the other of these characteristics. Universal organizing action produces the forms of intercourse, and universal symbolizing action produces the various forms of science ; individual organiz- ing action yiclds the forms of property and individual symboliz- ing action the various representations of feeling, all these constitut- ing the relations, the productive spheres, or the social conditions of moral action. Moral functions cannot be performed by the indi- vidual in isolation but

only in his relation to the family, the state, the school, the church, and society, —all forms of human life which ethical science finds to its hand and leaves to the science of natural history to account for. The moral process-is accomplished by the various sections of humanity in their individual spheres, and the doctrine of virtue deals with the reason as the moral power in each individual by which the totality of moral products is obtained. Schleicrmacher classifies the virtues under the two forms of Gesinnung and Fertigkeit, the first consisting of the pure ideal element in action and the second the form it assumes in relation to circumstances, each of the two classes falling respectively into the two divisions of wisdom and love and of intelligence and appli- cation. In his system the doctrine of duty is the description of the method of the attainment of ethical ends, the conception of duty as an imperative, or obligation, being excluded, as we have seen. No action fulfils the conditions of duty except as it combines the three following antitheses : reference to the moral idea in its whole extent and likewise to a definite moral sphere; connexion with exist- ing conditions and at the same time absolute personal production ; the fulfilment of the entire moral vocation every moincnt though

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Duties are divided with reference to the principle that every mau make his own the entire moral problem and act at the same time in an existing moral society. This condition gives four general classes of duty: duties of general association or duties with reference to the community and duties of vocation (Berufspflicht)—both with a (in which the indi-

it can only be done in a definite sphere.

(Rechtspflicht), universal reference, duties of the conscience vidual is sole judge), and duties of love or of personal association.

It was only the first of the three sections of the science of ethics —the doctrine of moral ends—that Schleiermacher handled with approximate completeness ; the other two sections were treated In his Christian Ethics he dealt with the subject the Christian consciousness instead of from that the cthical phenomena dealt with arc the light on each other, while the Christian system treats more at length and less aphoristically

very summarily. from the basis of of reason generally ; same in both systems, and they throw

the principal cthical realities—church, state, family, art, science, and society. Rothe, amongst other moral philosophers, system substantially, macher's. worked out in its psychological relations.

Schletermacher's Religious System.—From Lcibnitz, Lessing,

Fichte, Jacobi, and the Romantic school he had imbibed a pro- found and mystical view of the inner depths of the human per- sonality. The ego, the person, is an individualization of universal reason; and the primary act of self-consciousness is the first con- junction of universal and individual life, the immediate nuion or Thus every

marriage of the universe with incarnated reason, person becomes a specific and original representation of the uni- verse and a compendium of humanity, a microcosmos in which the world is immediately reflected. While therefore we cannot, as we have seen, attain the idea of the supreme unity of thought and being by either cognition or volition, we can find it in our own personality, in immediate self-consciousness or (which is the same in Schleiermacher's terminology) feeling. Feeling in this higher sense (as distinguished from "organic" sensibility, Empfindung), which is the minimum of distinct antithetic consciousness, the cessation of the antithesis of subject and object, constitutes like-

wise the unity of our being, in which the opposite functions of

cognition and volition have their fundamental and permanent background of personality and their transitional link. Having its seat in this central point of our being, or indeed consisting in the essential fact of self-consciousness, religion lies at the basis of all thought and action. At various periods of his life Schleier- macher uscd different terms to represent the character and relation of religious feeling. In his earlier days he called it a feeling or intuition of the universe, consciousness of the unity of reason and nature, of the infinite and the eternal within the finite and the temporal. In later life he described it as the feeling of absolute

dependence, or, as meaning the same thing, the consciousness of

being in relation to God. In our consciousness of the world the feelings of relative dependence and relative independence are found; we are acted upon, but we also react. In our religious conscious- ness the latter element is excluded, and everything within and without us is referred to its absolute cause, that is, God. But, when we call this absolute cause God, the name stands solely as indicating the unknown source of our receptive and active existence ; on the one hand it means that the world upon which we cau react is not the source' of the feeling, on the other, that the Absolute is not an object of thought or knowledge. This feeling of absolute dependence can arise only in combination with other forms of con- sciousness. We derive the idea of a totality by means of its parts, and the trauscendental basis of being comes to us through the agency of individual phenomena. As in every affection of our being by individual phenomena we are brought into contact with the whole universe, we are brought into contact with God at the same time as its transcendental cause. This religious fecling is not know- ledge in the strict sense, as it is purely subjective or immediate ; but it lies at the basis of all knowledge. As immediate know- ledge, however, it is no more than the consciousness of the unity of the world, a unity which can never be reached by human inquiry. Religious truths, such as the determination of all things by God, are simply the implications of the feeling of absolute dependence. While that feeling is the characteristic of religion generally, this assumes various forms as the religions of the world. 'The so-called natural as distinguished from positive reli- gion, or the religion of reason, is a mere abstraction. All religions are positive, or their characteristics and value are mainly deter- mined by the manner in which the world is

conceived and imagined. But these varying conceptions with their religious meaning become religiously productive only in the souls of religious heroes, who are the authors of new religions, mediators of the religious life, founders of religious communities. For religion is essentially social. It everywhere forms churches, which are the necessary instruments and organs of its highest life. The specific feature of Christianity is its mediatorial element, its profound feeling of the striving of the finite individual to reach the unity of the infinite

bases his with important departures, on Schleier- In Beneke's moral system his fundamental idea was

system the antithetic

whole, and its conception of the way in which Deity deals with this effort by mediatorial agencies, which are both divine and human. It is the religion of mediatorial salvation, and, as Schlciermacher emphatically taught in his riper works, of salvation through the mediation of Christ ; that is, its possessors are con- scious of having been delivered by Jesus of Nazareth from a cou- dition in which their religious consciousness was overridden by the sense-consciousuess of the world and put into one in which it domi- nates, and everything is subordinated to it. The consciousness of being saved in this sense is now transmitted and mediated by the Christian church, but in the case of Jesus, its originator, it was an entirely new and original factor in the process of religious develop- ment, and in so far, like every new and higher stage of being, a supernatural revelation. It was at the same time a natural attain- ment, in as far as man's nature and the universe were so constituted as to involve its production. The appearance of the Saviour in human history is therefore as a divine revelation neither absolutely supernatural nor absolutely beyond reason, and the controversy of the 18th century between the rationalists and supernaturalists rests on false grounds, leads to wrong issues, and each party is right and wrong (see RATIONALISM). As regards Chistian theology, itis not its business to formulate and establish a system of objective truth, but simply to present in a clear and connected form a given body of Christian faith as the contents of the Christian consciousness. Dogmatic theology is a connected and

accurate account of the doc- trine held at a particular time in a given sectionof the Christian church. But such doctrines as constitute no integral part of the Christian consciousness—e.g., the doctrine of the Trinity—must be excluded from the theological system of the evangelical theologian. As regards the relation of theology and philosophy, it is not one of dependence or of opposition on either side, but of complete inde- pendence, equal authority, distinct functions, and perfect harmony. Feeling is not a mental function subordinate to cognition or voli- tion, but of equal rank and authority; yet feeling, cognition, and volition alike conduct to faith in the unknown Absolute, though by different paths and processes.

The marked feature of Schleiermacher's thought in every depart- ment is the effort to combine and reconcile in the unity of a conceptions of other thinkers. He is real- istic and idealistic, individualistic and universalistic, monistic and dualistic, sensationalist and intellectualist, naturalist and super- naturalist, rationalist and mystic, gnostic and agnostic. He is the prince of the Vermittler in philosophy, ethics, religion, and theology. But he does not seek to reconcile the antitheses of

thought and being by weakening and hiding the points of

difference ; on the contrary, he brings them out in their sharpest outlines, His method is to distinctly define the opposing elements and then to seek their harmonious combination by the aid of a deeper conception. Apart from the positive and permanent value of the higher unities which he succeeds in establishing, the light and suggestiveness of his discussions and treatment of the great points at issue in all the principal fields of human thought, un- satisfactory as many of his positions may be considered, make him one of the most helpful and instructive of modern thinkers. And, since the focus of his almost universal thought and inquiry and of his rich culture and varied life was religion and theology, he must be regarded as the classical representative of modern effort to reconcile science and philosophy with religion and theology, and the modern world with the Christian church.

Schleiermacher's collected works have been published in three sections: I. Theological, II. Sermons, 1II. Philosophical and Miscellaneous, Berlin, 1835-64, in 30 vols. Of lives of him the best are his own correspondence.

Aus Schleter- macher's Leben in Briefen, published by W. Dilthey (Berlin, 1858-1863, in 4 vols., Eng. transl. by Rowan); Leben Schleiermacher's by Wilhelm Dilthey (vol. i., the period from 1768-1804, all published as yet); Mriedrich Schletermacher, etn Lebens- u. Charakterbild, by D. Schenkel (Elberfeld, 1868). The accounts and critiques of his philosophy, ethics, and theology are numerous; some of the most valuable are—J. Schaller, Vorlesungen uber Schleiermacher (Halle, 1844); Weis- senborn, Darstellung und Kritik der Schletermacherschen Glaubenslehre (1849) ; Sicgwart, "Schleiermacher's Erkenntnisstheorie und ihre Bedeutung fiir die Glaubenslehre," in the Jahrbo. f. Deut. Theol., vol. ii. pp. 267-827, 829-864 ; Zeller, '¢Sehleicrmacher's Lehre von der Perséniichkeit Gottes," in the Theol. Jahrbb., 1842, pp. 263 sg.; F. Vorlander, Schleiermacher's Sittenlehre (Marburg, 1851) ; W. Bender, Schleiermachers Theologte mit thren philosophischen Grundlagen (1876-78). See also the historics of philosophy and theology by Zcller, Ueberweg, Chalybseus, Dorner, and Gass, and the article by the last-named in Herzog's Encyklopddie. (Ce aS)

SCHLESWIG (Danish Slesviy), the capital of the Prussian province of Schleswig-Holstein, is situated at the west end of the long narrow arm of the sea called the Schlei, 30 miles to the north-west of Kiel. The town consists mainly of a single street, 33 miles long, forming a semicircle round the Schlei, and is divided into the Altstadt (with the Holm), the Lollfuss, and the Friedrichsberg. The principal church, erected aS a cathedral about 1100, but renewed in the Gothic style in the 15th century, contains a very fine carved oak altar- screen, regarded as the most valuable work of "art im

Schleswig-Holstein. Between Friedrichsberg and Lollfuss is the old chateau of Gottorp, now despoiled of its art treasures and used as barracks. The former commercial importance of the town has disappeared, and the Schlei now affords access to small vessels only. Fishing and the manufacture of a few articles of common use are the chief occupations of the inhabitants. The population in 1885 was 15,187, all Protestants except about 250 Roman Catholics and 70 Jews.

Schleswig (ancient forms Sltesthorp, Sliaswic, t.e., the town or bay of the Slia or Schlei) is a town of very remote origin, and seems to have been a

trading place of considerable importance as early as the 9th century. It served asa medium of commercial intercourse between the North Sea and the Baltic, and was known to the old Arabian geographers. The first Christian church in this district was built here by Ansgarius about 850, and it became the seat of a bishop about a century later. The town also became the seat of the dukes of Schleswig, but its commerce gradually dwindled owing to the rivalry of Liibeck, the numerous wars in which the district was involved, and the silting up of the Schlei. At the partition of 1544 the old chateau of Gottorp, originally built in 1160 for the bishop, became the residence of the ducal or Gottorp line of Schleswig-Holstein, which remained here till expelled by Frederick IV. in 1718. From 1731 to 1846 it was the seat of the Danish governors of the duchies. In the wars of 1848 and 1864 Schleswig was an important strategical point on account of its proximity to the Danewerk, and was occupied by the different contending parties in turn. It has been the capital of Schleswig- Holstein since its incorporation by Prussia.

To the south of Schleswig are the scanty remains of the Danewerk or Dannewirke, a line of entrenchments between the Schlei and the Treene, believed to have been originally thrown up in the 9th century or even earlier, and afterwards repeatedly strengthened and enlarged. After the union of Schleswig and Holstein it lost its importance as a frontier defence, and was allowed to fall into disrepair. The Danewerk was stormed by the Prussians in 1848, but was afterwards so greatly extended and strengthened by the Danes tliat it would have been almost impregnable if defended by a sufficient number of troops. In the war of 1864, however, the Danish army was far too small for this task, and General de Meza abandoned the Danewerk without striking a blow, a step which caused deep disappointment to the Danes and led to the dismissal of the general. Since then the works have been entirely levelled.

SCHLESWIG-HOLSTEIN, a maritime province in the north-west of Prussia, formed out of the once Danish duchies of Schleswig-Holstein and Lauenburg, is bounded on the W. by the German Ocean, on the N. by Jutland, on the E. by the Baltic, Liibeck, and Mecklenburg, and on the 8, by Mecklenburg and the lower course of the Elbe (separating it from Hanover). It thus consists of the southern half of the Cimbric peninsula, and forms the

connecting link between Germany and Denmark. In addition to the mainland, which decreases in breadth from south to north, the province includes several islands, the most important being Alsen and Fehmarn in the Baltic, and Rém, Sylt, and Fohr in the North Sea. The total area of the province is 7280 square miles, 450 of which belong to the small duchy of Lauenburg in the south-east corner, while the rest are divided almost equally between Holstein to the south of the Hider and Schleswig to the north of it. From north to south the province is about 140 miles long, while its breadth varies from 90 miles in Holstein to 35 miles at the narrower parts of Schleswig.

Schleswig-Holstein belongs to the great North-German plain, of the characteristic features of which it affords a faithful reproduction in miniature, down to the continua- tion of the Baltic ridge or plateau (see Germany) by a range of low wooded hills skirting its eastern coast and culminating in the Bungsberg (570 feet), a little to the north of Eutin. This hilly district contains the most productive land in the province, the soil consisting of diluvial drift or boulder clay. The central part of the province forms practically a continuation of the great Liineburg Heath, and its thin sandy soil is of little use in cultivation. Along the west coast extends the “ Marsh-

land,” a belt of rich alluvial soil formed by the deposits of the German Ocean, and varying in breadth from five to fifteen miles. It is seldom more than a few feet above the sea-level, while at places it is actually below it, and it has consequently to be defended by an extensive system of dykes or embankments, 25 feet high, resembling those of Holland. The more ancient geological formations are scarcely met with in Schleswig-Holstein. The contrast between the two coast-lines of the province is very marked. The Baltic coast, about 300 miles in length, has generally steep well-defined banks and is very irregular in form, being pierced by numerous long and narrow fjords, which run deep into the interior of the land and often afford excellent harbours. The islands of Alsen and Fehmarn are separated from the coast by very narrow channels. The North Sea coast (200 miles), on the other hand, is very low and flat, and its smooth outline is interrupted only

by the estuary of the Eider and the peninsula of Eiderstedt. Dunes or sand-hills, though rare on the protected main- land, occur on Sylt and other islands, while the small unprotected islands called “ Halligen” are being gradually washed away by the sea. The numerous islands on the west coast probably formed part of the peninsula at no very remote period, and the sea between them and the mainland is very shallow and full of sandbanks. The climate of Schleswig-Holstein is mainly determined by the proximity of the sea, and the mean annual tempera- ture, varying from 45° Fahr. in the north to 49° Fahr. in the south, is rather higher than is usual in the same latitude. Rain and fog are frequent, but the climate is on the whole very healthy. The lower course of the Elbe forms the southern boundary of Holstein for 65 miles, but the only river of importance within the pro- vinee is the Eider, which rises in Holstein, and after a course of 120 miles falls into the North Sea, forming an estuary 3 to 12 miles in breadth. It is navigable from its mouth as far as Rendsburg, and the waterway between the two seas is completed by a canal from Rendsburg to Kiel. The new Baltic Canal, which is to be navigable for large vessels, will also intersect Holstein. There are numerous lakes in north-east Holstein, the largest of which are the Ploner See (12 square miles) and the Selenter See (9 square miles).

Of the total area of the province 58°3 per cent. is occupied by tilled land, 28°5 per cent. by meadows and pastures, and only 6°4 per cent. by forests. ‘The ordinary cereals are all cultivated with success and there is generally a considerable surplus for exportation ; rape is grown in the marsh lands and flax on the east coast, while large quantities of apples and other fruit are raised near Altona for the Hamburg and English markets. In 1883 the province contained 156,534 horses, 727,505 cattle, 320,768 sheep, 268,061 pigs, and 42,580 goats. The marsh lands afford admirable pasture, and a greater proportion of cattle (65 per 100 inhabitants) is reared in Schleswig-Holstein, mainly by small owners, than in any other Prussian province. Great numbers of fat cattle are exported to England. The Holstein horses are also in request, but sheep- farming is comparatively neglected. Bee-keeping is found a productive industry, and in 1883 the province possessed 113,836 hives. The hills skirting the bays of the Baltic coast are generally pleasantly wooded, but the forests are nowhere of great extent except in the duchy of Lauenburg. The fishing in the Baltic is productive ; Eckernforde is the chief fishing station in Prussia. The oysters from the beds on the west coast of

Schleswig are widely known under the misnomer of ‘‘ Holstein natives.” The mineral resources of the province are almost confined to a few layers of rock-salt near Segeberg. The manufacturing industry is also insignificant and does not extend much beyond the large towns, such as Altona, Kiel, and Flensburg. The shipbuilding of Kiel and other seaports is, however, important ; aud lace is made by the peasants of North Schleswig. The commerce and shipping of Schleswig-Holstein, stimulated by its position between two seas, as well as by its excellent harbours and waterways, are much more prominent than its manufactures. Kiel is the chief seaport of Prussia, while an oversea trade is also carried on by Altona and Flensburg. The main exports are grain, cattle, horses, fish, and oysters, in return for which come timber, coal, salt, wine, and

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colonial produce. The trading fleet of Schleswig-Holstein in 1884 consisted of 713 vessels (142 steamers), with a total burthen of 115,600 tons; more than half the ships belonged to the North Sea coast, but 90 per cent. of the steamers and 65 per cent. of the tonnage must be credited to the Baltic.

The population of the province in 1880 was 1,127,149, compris- ing 1,111,383 Protestants, 8903 Roman Catholics, and 3522 Jews. he urban and rural communities are in the proportion of 4 to 6. About 38 per cent. of the population are supported by agriculture, 26 per cent. by manufacturing industry, 10 per cent. by trade, while 12 per cent. are domestic servants and day-labourers, 6 per cent. is absorbed by the official and professional classes, and 54 per cent. by those who returned no occupation. The great bulk of the Holsteiners and more than half the Schleswigers are of genuine German stock, but there are about 150,000 Danes in the north part of Schleswig. Among the Germans the prevalent tongue is Low German, but the North Frisians on the west coast of Schleswig and the North Sea islands (about 30,000 in all) still speak a Frisian dialect, which, however, is gradually dying out. The peninsula of Angeln, between the Gulf of Flensburg and the Schlei, is supposed to have been the original seat of the English, and most

observers profess to see a striking resemblance between this

district and the counties of Kent and Surrey. The peasants of Dithmarschen also retain many of their ancient peculiarities. The boundary between the Danish and German languages is approxi- mately a line between Flensburg and Tondern ; not more than 15 per cent. of the entire population of the province speak Danish as their mother-tongue. The chief educational institution in

Schleswig-Holstein is the university of Kiel; and the excellenee of

the ordinary school system is proved by the fact that in 1883-84 the Schleswig-Holstein recruits showed a smaller proportion of illiter- acy (0°11 per cent.) than those from any other part of the German empire. Schleswig is the official capital of the province, but Altona and Kiel are the largest towns, the former being also the headquarters of an army corps and the latter the chief naval station of Germany. Kiel and Fricdrichsort are fortified, and the old lines of Diippel are also maintained. The province sends ten members to the reichstag and nineteen to the Prussian house of deputies. The provincial estates meet in Rendsburg.

History.—The history of the southern part of the Cimbric peninsula is the record of a struggle between the Danes and the Germans, ending in the meantime in favour of the latter. The earliest inhabitants of whose existence we have any trace seem to have been of German stock, and German authorities maintain that it was the emigration to England of the Jutes and Angles that first gave the Scandinavian or Danish element scope to develop in the district. In the early part of the ninth century we find Charlemagne in conflict with the Danish rulers of South Jutland or Schleswig 1 and establishing a ‘‘ Danish mark ” between the Eider and the Schlei. Some attempt to introduce Christianity was also made at this time by Bishop Ansgarius, but it was not till the middle of the following century that the new creed found anything approaching to general acceptance. In 1027 the Danish king Knud (the English Canute) obtained from Conrad the recognition of Schleswig’s independence of the empire, and henceforth the Eider became the recognized boundary between Germany and Denmark (‘‘Eidora Romani terminus imperii”). Schleswig, though a Danish province, was not merged in the other possessions of Denmark, but enjoyed a certain

measure of independence under the rule of viceroys or dukes cliosen from the younger sons of the royal house. One of the most vigorous of these rulers was Knud Laward (1115-1131), who extended his sway over the Wendish district of Wagria (see below) and held it as a fief of the German empire. He was thus the first ruler of Schleswig to hold that singular double relationship to the king of Denmark and the German empire which afterwards became so important a factor in the history of the country. Valdemar, son of Knnd, became king of Denmark, and Knud's grandson, King Valdemar I1., conferred the duchy of South Jutland or Schleswig on his son Abelin 1232. The terms of this investment afterwards became a fertile subject of dispute between the dukes and the crown, the former maintaining that they held their land as an hereditary and inalienable fief, while the kings argued that the fief was revocable at pleasure. The dukes, however, assisted by their kinsmen, the counts of Holstein, succeeded in establishing their position and finally remained in undisputed possession of theirduchy. In 1326 Duke Valdemar V. of Schleswig was raised to the throne of Denmark through the influence of his uncle, Count Gerhard of Holstein, to whom in return he eeded his duchy. Valdemar had to abdicate in 1330 and received his duchy back again, granting, however, the "'Constitutio Valde- maria," which ensured the rights of eventual succession in Schleswig to the Holstein counts. This compact came to fruition in 1875, when the male ducal line became extinct, and Margaret of Denmark formally recognized the union of the two territories in 1386. Henceforth we have the same prince ruling over Schleswig and

1The name of Schleswig did not come into general use for this part of the Cimbric peninsula until the end of the 14th century.

Holstein, holding the first as a fief of the Danish crown and the other as a fief of the German empire.

The history of Holstein before its union with Schleswig has been partly indicated in the foregoing paragraph. Nordalbingia, or the land to the north of the Elbe, was inhabited by the Saxons, under whom it was divided into four gaws or hundreds :—-DITHMARSCHEN (q.v.) on the west, Holstein proper or Holtsaten ('men of the forest") in the middle, Wagria on the east, and Stormarn on the south. The Nordalbingians were the last of the Saxons

to be sub- dued by Charlemagne (804), who gave Wagria to his Wendish allies the Obotrites, and established a Wendish mark on their frontier at the same time that he established a Danish mark on the Hider. The other three gaus were incorporated with the duehy ef Saxony, Dithmarschen being ineluded in the countship of Stade while Holstein and Stormarn had a count of their own. In 1110 the countship of Holstein was conferred upon Adolphus I. of Schauenburg, who founded the influential line that eventually ruled over Schleswig-Holstein. Wagria was added to Holstein by Adolphus IJ. about 1140. In the beginning of the 18th century the Danish kings extended their sway over all Gcrman territory to the north of the Elbe, and their conquests were confirmed by an imperial grant in 1214. This state of affairs, however, was of no long continuance, and Adolphus III. of Holstein succeeded in re- establishing his independence in 1225. The Holstein family now became split up into several branch-lines, of which that of Rendsburg proved the most lasting and important. A daughter of this line married Duke Abel of Schleswig, and the Holstein counts lent faithful aid to their kinsmen in resisting the encroach- ments and claims of the kings of Denmark. In the distraeted state of Denmark at the beginning of the 14th century Count Gerhard of Holstein became the practical ruler of the kingdom, but

preferred to place the crown on the head of his nephew Valdemar.

Legally speaking, Holstein remained a mediate fief of Saxony; but with the deeline of the Saxon duehy this relationship became obscured, and, when the Holstein lands were ereated a duchy in 1474, the new duke held his lands directly from the emperor.

In 1448 the royal line of Denmark became extinct, and the erown was offered to Adolphus VII. of Schleswig-Holstein, who refused it for himself but exerted his influence to secure it for his nephew Christian of Oldenburg. Adolphus died in 1459, leaving no sons. Christian was the legal heir of Schleswig, but his claims to Holstein were by no means so strong. The estates of Schleswig- Holstein, however, decided in his favour on the plea that the duchies? could not be separated, and cxacted from him a confirma- tion of this indissoluble connexion. It was also formally stipulated that the duchies should never be actually incorporated with the kingdom of

Denmark, while the hereditary nature of the fief was given up and the estates acquired the right to choose as their duke any one of Christian's descendants. This Succession Act was the basis of the union of the two duchies for the next four hundred years, and the practical eontradiction between their own inseparable connexion and their feudal duty to different sovereigns is at once the cause and the explanation of the complicated " Schleswig- Holstein question."

Now follows a series of endless shiftings, divisions, and reunions of the two duchies. After 1580 the various eollateral lines of the Oldenburg family thus formed are represented by two main branches,—the royal or Gliickstadt line and the Gottorp or ducal line. In the division of Schleswig-Holstein between these two no regard was paid to the boundary of the Eider ; each of them ruled over detached parts of both duchies, though the whole of Schleswig was still under the sovereignty of Denmark and the whole of Holstein under that of Germany. Practically Schleswig came to be regarded merely as a part of Denmark, while Holstein's connexion with Germany preserved for it a flicker of independence. In 1660 Denmark became an absolute monarchy and the principle of female succession was acknowledged. As in Schleswig-Holstein the right of inheritance was confined to the male line, the policy of Denmark was vigorously directed towards doing away as far as possible with all separate rights in the duchy and to getting the Gottorp or ducal portions into the possession of the crown. This policy was naturally more suceessful in Schleswig than in Holstein, and in 1721 Frederick IV. was able to gain the guarantce of the powers for the incorporation of the whole of Schleswig with the Danish monarchy. He had, however, to give up his claim to Holstein. In 1762 the Holstein-Gottorp line succeeded to the throne of Russia in the person of Peter II1., and this led in 1773 to an agreement by which the Gottorp line resigned its share of Holstein to the king of Denmark in exchange for Oldenburg and Delmen- horst. The whole of Schleswig-Holstein thus came once more under the sway of a ruler who was at the same time king of Denmark.

The period from 1778 to 1846 was one of peace for the duchies,

with considerable progress in material prosperity. The fall of the ae

2 This use of the term “duchies” anticipates a little, as Ilolstein was not made a duchy till 1474. Dithmarschen, indeed, which was supposed to be a part of ducal Holstein, was not subdued till 1559.

German empire in 1806 released Holstein for a time from any con- nexion with a power outside of Denmark, but in 1815 the Danish monarch had to entcr the German Confederation for Holstein and for the recently acquired duchy of LAvENBURG (q.v.). A strong feeling of German patriotism gradually arose in Holstein, affecting part of Schleswig also, and dissatisfaction with the delay of the Danish crown in recognizing the constitutional rights of the duchies led to the events forming the recent history of Schleswig-Holstein. These will be found described with some detail in the articles DENMARK (vol. vii. pp. 88, 89) and GERMANY (vol. x. pp. 507, 509-512). (J. F. M.) SCHLETTSTADT, a small town in Lower Alsace, stands on the Ill, 26 miles to the south of Strasburg. It possesses two fine churches, relics of a period of former importance, and carries on manufactures of wire gauze, and a considerable trade in country produce. The popu- lation in 1880 was 8979 (7755 Roman Catholics), showing a slight decrease since it has passed into German hands. Schlettstadt is a place of very early origin, and became a free town of the empire in the 13th century. In the 15th century it was the scat of a celebrated academy, founded by Agricola, which contributed not a little to the revival of learning in this part of Germany ; Erasmus of Rotterdam was one of its students. In 1634 the town came into the possession of France, and it was afterwards fortified by Vauban. It offered little resistance, however, to the Germans in 1870, and the fortifications have been razed. SCHLOZER, Avcusr Lupwic von (1735-1809), German historian, was born at Gaggstedt, in the county of Hohenlohe-Kirchberg, on the 5th July 1735. Having studied at the universities of Wittenberg and Géttingen, he went in 1755 as a tutor to Stockholm, and afterwards to Upsala; and while in Sweden he wrote in the Swedish language an Hssay on the History of Trade (1758). In 1759 he returned to Gdéttingen, where he began the study of medicine. Afterwards he went to St Petersburg with Miiller, the Russian historiographer, as Miiller’s literary assistant and as tutor in his family. Here Schlozer learned the Russian language and devoted him- self to the study of Russian history;

and in 1762 he was made an adjunct of the Academy and a teacher at the Rasumovski educational institute. A quarrel with Miiller placed him in a position of some difficulty, from which he was happily delivered by a call to a professor- ship at the university of Géttingen. He began his career at Gottingen in 1767, and soon ranked among the foremost historical writers of his day. His most import- ant works were his Al/gemeine nordische Geschichte (1772) and his translation of the Russian chronicler Nestor to the year 980 (1802-9). He awoke much intelligent interest in universal history by his Weltgeschichte im Auszuge und Zusammenhange (17 92-1801); and in several works he helped to lay the foundations of statistical science, He also produced a strong impression by his political writings, the Briefwechsel (10 vols. 177 6-82) and the Staatsanzeigen (18 vols., 1782-93). In 1804 he was ennobled by the emperor of Russia. He withdrew from active life in 1805, and died on the 9th September 1809. See Zermelo, August Ludwig Schlézer (1875), and Wesendonk, Dic Begriindung der neuern deutschen Geschichtschreibung durch Gatterer und Schlézer (1876). Schlozer's daughter, Dorothea, born on the 10th August, 1770, was one of the most learned women of her time, and received in 1787 the degree of doctor. She was recognized as an authority on several subjects, especially on Russian comage. After her marriage with Rodde, the burgo- master of Liibeck, she devoted herself to domestic duties. She died on the 12th July 1825. Schlézer's son Christian (born 1774, died 1831) was a professor at Bonn, and published Anfangsgriinde der Staatswirthschaft (18046) and his father's Oeffentliches und Privat-Leben aus Originalurkunden (1828).
_SCHMALKALDEN, a town of Prussia, in the pro- vince of Hesse-Nassau, lies about 30 miles to the south- west of Erfurt, and in 1885 contained 6788 inhabitants, chiefly employed in the manufacture of hardware articles. It still possesses the inn in which the important Pro- testant League of Schmalkalden or Smalkald was concluded

in 1531, and also the house in which the articles were drawn up in 1537 by Luther, Melanchthon, and other Reformers. Seo GERMANY, vol. x. p. 498, and Lurunr, vol. Kv. ip. 63.

SCHNEIDEMUHL (Polish Pila), a small town of Prussia, in the province of Posen, lies on the Ciiddow, 45 miles north of Posen and 140 miles east by north of Berlin. It is a railway junction of some importance, carries on a trade in wood, grain, and potatoes, and pos- sesses an iron foundry, several glass works and machine- shops, and other industrial establishments. In 1885 the population was 12,259, of whom 7700 were Protestants and about 1000 Poles.

SCHNORR VON KAROLSFELD, Junius (1794- 1872), of a family of artists, was born in 1794 at Leipsic, where he received his earliest instruction from his father, a draughtsman, engraver, and painter. At seventeen he entered the Academy of Vienna, from which Overbeck and others of the new school who rebelled against the old conventional style had been expelled about a year before. In 1818 he followed the founders of the new school of German pre-Raphaelites in the general pilgrimage to Rome. This school of religious and romantic art abjured modern styles with three centuries of decadence, and reverted to and revived the principles and practice of earlier periods. At the outset an effort was made to recover fresco painting and “monumental art,” and Schnorr soon found oppor- tunity of proving his powers, when commissioned to decorate with frescos, illustrative of Ariosto, the entrance hall of the Villa Massimo, near the Lateran. His fellow- labourers were Cornelius, Overbeck, and Veit. His second period dates from 1825, when he left Rome, settled in Munich, entered the service of King Louis, and trans- planted to Germany the art of wall-painting learnt in Italy. He showed himself qualified as a sort of poet- painter to the Bavarian court; he organized a staff of trained executants, and set about clothing five halls in the new palace with frescos illustrative of the Wibelungenlied. Other apartments his prolific pencil decorated with scenes from the histories of Charlemagne, Frederick Barbarossa, and Rudolph of Hapsburg. These vast and interminable compositions display the master’s merits and defects : they are creative, learned in composition, masterly in drawing, but exaggerated in thought and extravagant in style. Schnorr’s third period is marked by his “Bible Pictures” or Scripture History in 180 designs. The artist was a Lutheran, and took a broad and unsectarian view which won for his Pictorial Bible ready currency throughout Christendom. The merits are unequal: frequently the compositions are crowded and confused, wanting in harmony of line and symmetry in the masses; thus

they suffer under comparison with Raphael's Bible. Chrono- logically speaking, the style is severed from the simplicity and severity of early times, and surrendered to the florid redundance of the later Renaissance. Yet throughout are displayed fertility of invention, academic knowledge with facile execution ; and modern art has produced nothing better than Joseph Interpreting Pharaoh's Dream, the Meeting of Rebecca and Isaac, and the Return of the Prodigal Son. The completion of the arduous work was celebrated in 1862 by the artists of Saxony with a festival, and other German states offered congratulations and presented gifts.

Biblical drawings and cartoons for frescos formed a natural prelude to designs for church windows. The painter's renown in Germany secured commissions in Great Britain. Schnorr made designs, carried out in the royal factory, Munich, for windows in Glasgow cathedral and in St Paul's cathedral, London. This Munich glass provoked controversy: medivalists objected to its want

Chrono- logical limits.

of lustre, and stigmatized the windows as coloured blinds and picture transparencies. But the opposing party claimed for these modern revivals "the union of the severe and excellent drawing of early Florentine oil-paintings with the colouring and arrangement of the glass-paintings of the latter half of the 16th century." Schnorr's busy life closed at Munich in 1872.

SCHOLASTICISM is the name usually employed to denote the most typical products of medizval thought. The final disappearance of ancient philosophy may be dated about the beginning of the 6th century of our era. Boetius, its last representative in the West, died in 525, and four years later the Athenian schools were closed by order of the emperor Justinian. Before this time Christian thought had already been active in the fathers of the church, but their activity had been entirely devoted to the elaborating and systematizing of theological dogmas. Although the dogmas unquestionably involve philosophical assumptions, the fathers deal with them throughout simply as churchnien, and do not profess to supply for them a philosophical

or rational basis. Only incidentally do some of them—like Augustine, for example—digress into strictly philosophical discussion. After the centuries of intellectual darkness during which the settlement of the new races and their conversion to Christianity proceeded and the foundations of the modern European order were being laid, the first symptoms of renewed intellectual activity appear contemporaneously with the consolidation of the empire of the West in the hands of Charlemagne. That enlightened monarch endeavoured to attract to his court the best scholars of Britain and Ireland (where the classical tradition had never died out), and by imperial decree (787) commanded the establishment of schools in connexion with every abbey in his realms. Peter of Pisa and Alcuin of York were his advisers in directing this great work, and under their fostering care the opposition long supposed to exist between godliness and secular learning speedily disappeared. Besides the cele- brated school of the Palace, where Alcuin had among his hearers the members of the imperial family and the dignitaries of the empire as well as talented youths of humbler origin, we hear of the episcopal schools of Lyons, Orleans, and St Denis, the cloister schools of St Martin of Tours, of Fulda, Corbie, Fontenelle, and many others, besides the older monasteries of St Gall and Reichenau. These schools became the centres of medieval learning and speculation, and from them the name Scholasticism is derived. They were designed to communicate instruction in the seven liberal arts which constituted the educational curriculum of the Middle Ages—grammar, dialectic, and rhetoric forming the trivium of arts proper, while geometry, arithmetic, astronomy, and music constituted the quadrivium of the sciences. The name doctor scholas- ticus was applied originally to any teacher in such an ecclesiastical gymnasium, but, as the study of dialectic or logic soon became the object of absorbing interest to the best intellects of the time, it tended to overshadow the more elementary disciplines, and the general acceptation of “doctor” came to be one who occupied himself with the teaching of logic and the discussion of the philo- sophical questions arising therefrom. The philosophy of the later Scholastics is more extended in its scope ; but to the very end of the medieval period philosophy centres in the discussion of the same logical problems which began to agitate the teachers of the 9th and 10th centuries.

Scholasticism in the widest sense thus extends from the 9th to the end of the 14th or the beginning of the 15th century—from Erigena to Occam and his followers. The belated Scholastics who lingered beyond the last-mentioned date served only as marks for the obloquy heaped upon

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the schools by the men of the new time. But, although every systematic account of Scholasticism finds it necessary to begin with Erigena, that philosopher is of the spiritual kindred of the Neoplatonists and Christian mystics rather than of the typical Scholastic doctors. In a few obscure writings of the 9th century we find the beginnings of dis- cussion upon the logical questions which afterwards proved of such absorbing interest ; but these are followed by the intellectual interregnum of the 10th century. The activity of Scholasticism is therefore mainly confined within the limits of the 11th and the 14th centuries. It is clearly divisible (by circumstances to be presently explained) into two well-marked periods,—the first extending to the end of the 12th century and embracing as its chief names Roscellinus, Anselm, William of Champeaux, and Abelard, while the second extended from the beginning of the 13th century to the Renaissance and the general distraction of men's thoughts from the problems and methods of Scho- lasticism. In this second period the names of Albertus Magnus, Thomas Aquinas, and Duns Scotus represent (in the 13th century and the first years of the 14th century) the culmination of Scholastic thought and its consolidation into system.

It is a remark of Prantl's that there is no such thing as Logic philosophy in the Middle Ages; there are only logic and and theology. If pressed literally the remark is hypereritical, aad for it overlooks two facts,—in the first place that the main objects of theology and philosophy are identical, though the method of treatment is different, and in the second place that logical discussion commonly leads up to meta- physical problems, and that this was pre-eminently the case with the logic of the Schoolmen. But the saying draws attention in a forcible way to the two great in- fluences which shaped medizval thought—on the one side the traditions of ancient logic, on the other the system of Christian theology. Scholasticism opens with a discussion of certain points in the Aristotelian logic; it speedily

begins to apply its logical distinctions to the doctrines of

the church; and when it attains its full stature in St Thomas it has, with the exception of certain mysteries, rationalized or Aristotelianized the whole churchly system. Or we might say with equal truth that the philosophy of St Thomas is Aristotle Christianized. It is, moreover, the

attitude of the Schoolmen to these two influences that

yields the general characteristic of the period. Their

attitude throughout is that of interpreters rather than of

those conducting an independent investigation. And though they are at the same time the acutest of critics, and offer the most ingenious developments of the original thesis, they never step outside the charmed circle of the system they have inherited. They appear to contemplate the universe of nature and man not at first hand with their own eyes but in the glass of Aristotelian formule. Their chief works are in the shape of commentaries upon the writings of "the philosopher."[1] Their problems and. solutions alike spring from the master's dicta—from the need of reconciling these with one another and with the conclusions of Christian theology.

The fact that the channels of thought during the Middle Reason Ages were determined in this way by the external influence 224 of a twofold tradition is usually expressed by saying that ee reason in the Middle Age is subject to authority. It ee has not the free play which characterizes its activity in Greece and in the philosophy of modern times. Its con- clusions are predetermined, and the initiative of the individual thinker is almost confined, therefore, to formal details in the treatment of his thesis. From the side of the church this characteristic of the period is expressed in the saying that reason has its proper station as the hand-

1 'The common designation of Aristotle in the Middle Ages.

maid of faith (ancilla fider). But it is only fair to add that this principle of the subordination of the reason wears a different aspect according to the century and writer referred to. In Scotus Erigena, at the beginning of the Scholastic era, there is no such subordination con- templated, because philosophy and theology in his work are in implicit unity. According to his memorable expres- sion, “Conficitur inde veram esse philosophiam veram religionem, conversimque veram religionem esse veram philosophiam ” (De Divisione Naturae, i. 1). Reason in its own strength and with its own instruments evolves a system of the universe which coincides, according to Erigena, with the teaching of Scripture. For Erigena, therefore, the speculative reason is the supreme arbiter (as he himself indeed expressly asserts) ; and in accordance with its results the utterances of Scripture and of the church have not infrequently to be subjected to an alle- gorical or mystical interpretation. But this is only to say again in so many words that Erigena is more of a Neoplatonist than a Scholastic. In regard to the Scholastics proper, Cousin suggested in respect of this point a threefold chronological division,—at the outset the absolute subordination of philosophy to theology, then the period of their alliance, and finally the beginning of their separation. In other words, we note philosophy gradually extending its claims. Dialectic is, to begin with, a merely secular art, and only by degrees are its terms and distinc- tions applied to the subject-matter of theology. The early results of the application, in the hands of Berengarius and Roscellinus, did not seem favourable to Christian orthodoxy. Hence the strength with which a champion of the faith like Anselm insists on the subordination of reason. ‘To Bernard of Clairvaux and many other con- servative churchmen the application of dialectic to the things of faith at all appears as dangerous as it is impious. At a later date, in the systems of the great Schoolmen, the rights of reason are fully established and amply acknow- ledged. ‘The relation of reason and faith remains, it is true, an external one, and certain doctrines—an increasing number as time goes on —are withdrawn from the sphere of reason. But with these exceptions the two march side by side; they establish by different means the same results. For the conflicts which accompanied the first intrusion of philosophy into the theological domain more profound and cautious thinkers with a far ampler appa- ratus of knowledge had substituted a harmony. “The constant effort of Scholasticism to be at once philosophy and theology”! seemed at last satisfactorily realized. But this harmony proved more apparent than

real, for the further progress of Scholastic thought consisted in a with- drawal of doctrine after doctrine from the possibility of rational proof and their relegation to the sphere of faith. Indeed, no sooner was the harmony apparently established by Aquinas than Duns Scotus began this negative criti- cism, which is carried much farther by William of Occam. But this is equivalent to a confession that Scholasticism had failed in its task, which was to rationalize the doc- trines of the church. The two authorities refused to be reconciled. The Aristotelian form refused to fit a matter for which it was never intended ; the matter of Christian theology refused to be forced into an alien form. The Scholastic philosophy speedily ceased therefore to possess a raison @étre, and the spread of the sceptical doctrine of a twofold truth proclaims the destruction of the fabric erected by medieval thought. The end of the period was thus brought about by the internal decay of its method and principles quite as much as by the variety of external causes which contributed to transfer men's interests to other subjects.

‘ Milman's Latin Christianity, ix. 101.

SCHOLAS? Tel ss

But, although the relation of reason to an external authority thus constitutes the badge of medieval thought, it would be in the last degree unjust to look upon Scholas- ticism as philosophically barren, and to speak as if reason, after an interregnum of a thousand years, resumed its rights at the Renaissance. Such language was excusable in the men of the Renaissance, fighting the battle of classic form and beauty and of the many- sidedness of life against the barbarous terminology and the monastic ideals of the schools, or in the protagonists of modern science protesting against the complete absorp- tion of human talent by metaphysics—an absorption never witnessed to the same extent before or since. The new is never just to the old; we do not expect it to be so. It belongs to a later and calmer judgment to recognize how the old contained in itself the germs of the new; and a closer study of history is invariably found to diminish the abruptness of the picturesque new beginnings which furnish forth our current divisions of epochs and periods. In the schools and universities of the Middle Age the intellect of the semi-barbarous European peoples had been trained for the work of the modern world. It had advanced from a childish rudeness to an

appreciation of the subtlest logical and metaphysical distinctions. The debt which modern philosophy owes to the Schoolmen for this formal training has been amply acknowledged even by a writer like J. S. Mill. But we may go further and say that, in spite of their initial acceptance of authority, the Scholastics are not the antagonists of reason; on the contrary they fight its battles. As has often been pointed out, the attempt to establish by argument the authority of faith is in reality the unconscious establishment of the authority of reason. Reason, if admitted at all, must ultimately claim the whole man. Anselm's motto, Credo ut intelligam, marks well the distance that has been traversed since Tertullian's Credo quia absurdum est. The claim of reason has been recognized to manipulate the data of faith, at first blindly and immediately received, and to weld them into a system such as will satisfy its own needs. Scholasticism that has outlived its day may be justly identified with obscurant- ism, but not so the systems of those who, by their mighty intellectual force alone, once held all the minds of Europe in willing subjection. The scholastic systems, it is true, arc not the free products of speculation ; in the main they are summe theologix, or they are modified versions of Aristotle. But each system is a fresh recognition of the rights of reason, and Scholasticism as a whole may be justly regarded as the history of the growth and gradual eman- cipation of reason which was completed in the movements of the Renaissance and the Reformation. Indeed, the widening of human interests which then took place is not without its prelude in the systems of the second period of Scholasticism. The complementary sciences of theology and philosophy remain, of course, the central and dominat- ing interest; but Albertus Magnus was keenly interested in natural science, and a system like that of Aquinas is as wide as Aristotle's in its range, and holds no part of nature to lie outside its inquiries.

In speaking of the origin of Scholasticism—name and thing—it has been already noted that medieval specula- tion takes its rise in certain logical problems. 'To be more precise, it is the nature of " universals" which forms the central theme of Scholastic debate. This is the case almost exclusively during the first period, and only to a less extent during the second, where it reappears in a somewhat different form as the difficulty concerning the principle of individuation. Otherwise expressed, the question on which

centuries of discussion were thus expended concerns the nature of genera and species and their relation to the individual. On this, Nominalists and

Scholags- ticism not unpro gressive,

“ Uni- yersals.”

Por- phyry’s | Isagoge.

Extent of the early School- men’s know- ledge.

SCHOLASTIC IS M

Realists take opposite sides; and, exclusively logical as the point may at first sight seem to be, adherence to one side or the other is an accurate indication of philosophic tendency. The two opposing theories express at bottom, in the phraseology of their own time, the radical diver- gence of pantheism and individualism—the two extremes between which philosophy seems pendulum-wise to oscil- late, and which may be said still to await their perfect reconciliation. First, however, we must examine the form which this question assumed to the first medieval thinkers, and the source from which they derived it. A single sentence in Porphyry’s /sagoge or “introduction” to the Categories of Aristotle furnished the text of the pro- longed discussion. The treatise of Porphyry deals with what are commonly called the predicables, 7.¢., the notions of genus, species, difference, property, and accident ; and he mentions, but declines to discuss, the various theories that have been held as to the ontological import of genera and species. In the Latin translation of Boetius, in which alone the Jsagoge was then known, the sentence runs as follows :—‘ Mox de generibus et speciebus illud quidem sive subsistant, sive in‘solis nudis intellectibus posita sint, sive subsistentia corporalia sint an incorporalia, et utrum separata a sensibilibus an in sensibilibus posita et circa haec consistentia, dicere recusabo ; altissimum enim negotium est hujusmodi et majoris egens inquisitionis.” The second of these three questions may be safely set aside; the other two indicate with sufficient clearness three possible positions with regard to universals. It may be held that they exist merely as conceptions in our minds (in solis nudis intellectibus) ; this is Nominalism or Conceptualism. It may be held, in opposition to the Nominalistic view, that

they have a substantial existence of their own (subdsistentia), independent of their existence in our thoughts. But Realism, as this doctrine is named, may be again of two varieties, according as the substan- tially existent universals are supposed to exist apart from the sensible phenomena (separata a sensibtlibus) or only in and with the objects of sense as their essence (in sensibilibus posita et circa haec consistentia). The first form of Realism corresponds to the Platonic theory of the transcendence of the ideas; while the second reproduces the Aristotelian doctrine of the essence as inseparable from the individual thing. But, though he implies an ample previous treat- ment-of the questions by philosophers, Porphyry gives no references to the different systems of which such dis- tinctions are the outcome, nor does he give any hint of his own opinion on the subject, definite enough though that was. He simply sets the discussion aside as too difficult for a preliminary discourse, and not strictly relevant to a purely logical inquiry. Porphyry, the Neoplatonist, the disciple of Plotinus, was an unknown personage to those early students of the Lsagoge. The passage possessed for them a mysterious charm, largely due to its isolation and to their ignorance of the historic speculations which sug- gested it. And accordingly it gave rise to the three great doctrines which divided the medizval schools :—Realism of the Platonic type, embodied in the formula universalia ante rem; Realism of the Aristotelian type, universalia in re; and Nominalism, including Conceptualism, expressed by the phrase wniversalra post rem, and also claiming to be based upon the Peripatetic doctrine.

To forma proper estimate of the first stage of Scholastic discussion it is requisite above all things to have a clear idea of the appliances then at the disposal of the writers. In other words, what was the extent of their knowledge of ancient philosophy? Thanks to the researches of Jourdain and others, it is possible to answer this question with something like precision. To begin with, we know that till tho 13th century the Middle Age was ignorant

of Greek, and possessed no philosophical works in their Greek original, while in translations their stock was limited to the Categories and the De Interpretatione of Aristotle in the versions of Boetius, and the 7%mezus of Plato in the version of Chalcidius. ‘To these must be added, of course, Boetius’s translation of Porphyry’s Isagoge already referred to. The whole metaphysical, ethical, and physical works of Aristotle were thus unknown, and it was not till the 12th century (after the year 1128) that the Analytics and the J’opics became accessible to the logicians of the time. Some general information as to the Platonic doctrines (chiefly ina Neoplatonic garb) was obtainable from the commentary with which Chalcidius (6th cent.) accompanied his translation, from the work of Apuleius (2d cent.) De Dogmate Platonis, and indirectly from the commentary of Macrobius (c. 400) on the Somnvum Scipionis of Cicero, and from the writings of St Augustine. As aids to the study of logic, the doctors of this period possessed two commentaries by Boetius on the Jsagoge (Ad Porphyrium a Victorino translatum and In Porphyrium a se translatum), two commentaries by the same author on the De Interpretatione and one on the Categories, as well as another, mainly rhetorical, Ad Ciceroms Topica. To these are to be added the following original treatises of Boetius:—ZIntroductio ad Categoricos Syllogismos, De Syllo- gismo Categorico, De Syllogismo Hypothetico, De Divisione, De Definitione, and De Differentus Topicis, the last dealing almost exclusively with rhetoric. There were also in circu- lation two tracts attributed to St Augustine, the first of which, Principia Dialecticae, is probably his, but is mainly grammatical in its import. The other tract, known as Categoriae Decem, and taken at first for a translation of Aristotle’s treatise, is really a rapid summary of it, and certainly does not

belong to Augustine. To this list there must be added three works of an encyclopedic character, which played a great part as text-books in the schools. Of these the oldest and most important was the Satyricon of Marcianus Capella (close of 5th century), a curious medley of prose and allegorical verse, the greater part of which is 3, treatise on the seven liberal arts, the fourth book dealing with logic. Similar in its contents is the work of Cassio- dorus (468-562), De Artibus ac Disciplinis Liberalium Literarum, of which the third work referred to, the Origines of Isidore of Seville (ob. 636), is little more than a re- production. The above constitutes without exception the whole material which the earlier Middle Age had at its disposal.

The grandly conceived system of Erigena (see ERIGENA Erigena.

stands by itself in the 9th century like the product of another age. John the Scot was. still acquainted with Greek, seeing that he translated the work of the pseudo-Dionysius; and his speculative genius achieved the fusion of Christian doctrine and Neopla- tonic thought in a system of quite remarkable meta- physical completeness. It is the only complete and inde- pendent system between the decline of ancient thought and the system of Aquinas in the 13th century, if indeed we ought not to go further, to modern times, to find a parallel. Erigena pronounces no express opinion upon the question which was even then beginning to occupy men’s minds; but his Platonico-Christian theory of the Eternal Word as containing in Himself the exemplars of created things is equivalent to the assertion of uniwersalia ante rem. His whole system, indeed, is based upon the idea of the divine as the exclusively real, of which the world of individual existence is but the theophany ; the special and the individual are immanent, therefore, in the general. And hence ata much later date (in the begin- ning of the 13th century) his name was invoked to cover the pantheistic heresies of Amalrich of Bena. Erigena

and Mysticism)

Influ- ence of Boetius.

does not separate lis Platonic theory of pre-existent exemplars from the Aristotelian doctrine of the universal as im the individuals. As Ueberweg points out, his theory is rather a result of the transference of the Aristotelian conception of substance to the Platonic Idea, and of an identification of the relation of accidents to the substance in which they inhere with that of the individuals to the Idea of which, in the Platonic doctrine, they are copies (Hist. of Philosophy, i. 363, Eng. trans.). Hence it may be said that the universals are in the individuals, constitut- ing their essential reality (and it is an express part of Erigena's system that the created but creative Word, the second division of Nature, should pass into the third stage of created and non-creating things); or rather, perhaps, we ought to say that the individuals exist in the bosom of their universal. At all events, while Erigena's Realism

is pronounced, the Platonic and Aristotelian forms of the »

doctrine are not distinguished in his writings. Prantl has professed to find the headstream of Nominalism also in Scotus Erigena ; but beyond the fact that he discusses at considerable length the categories of thought and their mutual relations, occasionally using the term ' voces" to express his meaning, Prantl appears to adduce no reasons for an assertion which directly contradicts Erigena's most fundamental doctrines. Moreover Erigena again and again declares that dialectic has to do with the stadia of a real or divine classification :—" Intelligitur quod ars illa, quae dividit genera in species et species in genera resolvit, quae duadexrixy dicitur, non ab humanis machinationibus sit facta, sed in natura rerum! ab auctore omnium artium, quae verae artes sunt, condita et a sapientibus inventa " (De Divisione Naturae, iv. 4).

The immediate influence of Erigena's system cannot have been great, and his works seem soon to have dropped out of notice in the centuries that followed. The real germs of Realism and Nominalism, as they took shape in medieval thought, are to be found in the 9th century, in scattered commentaries and glosses (mostly still in manu- script) upon the statements of Porphyry and Boetius. Boetius in commenting upon Porphyry had already started the discussion as to the nature of universals. He is definitely anti-Platonic, and his language sometimes takes even a nominalistic tone, as when he declares that the species is nothing more than a thought or

conception gathered from the substantial similarity of a number of dissimilar individuals. The expression “substantial simi- larity” is still, however, sufficiently vague to cover a multitude of views. He concludes that the genera and species exist as universals only in thought ; but, inasmuch as they are collected from singulars on account of a real resemblance, they have a certain existence independently of the mind, but not an existence disjoined from the singulars of sense. ‘Subsistunt ergo circa sensibilia, intelliguntur autem praeter corpora.” Or, according to the phrase which recurs so often during the Middle Ages, “universale intelligitur, singulare sentitur.” Boetius ends by declining to adjudicate between Plato and Aristotle, remarking in a semi-apologetic style that, if he has ex- pounded Aristotle’s opinion by preference, his course is justified by the fact that he is commenting upon an intro- duction to Aristotle. And, indeed, his discussion cannot claim to be more than semi-popular in character. The point in dispute has not in his hands the all-absorbing importance it afterwards attained, and the keenness of later distinctions is as yet unknown. In this way, how- ever, though the distinctions drawn may still be compara- tively vague, there existed in the schools a Peripatetic tradition to set over against the Neoplatonic influence of John the Scot, and amongst the earliest remains of Scho- lastic thought we find this tradition asserting itself some-

what vigorously. There were Nominalists before Roscel- linus among these early thinkers,

Alcuin, the first head of the school of the Palace, does nothing more in his Dialectic than abridge Boetius and the other commentators. But in the school of Fulda, pre-

sided over by his pupil Hrabanus Maurus (776-856), there Hrabanus are to be found some fresh contributions to the discussion, Maurus.

The collected works of Hrabanus himself contain nothing new, but in some glosses on Aristotle and Porphyry, first exhumed by Cousin, there are several noteworthy expressions of opinion in a Nominalistic sense. The author interprets Boetius’s meaning to be “Quod eadem res individuum et

species et genus est, et non esse univer- salia individuis quasi quoddam diversum.” He also cites, apparently with approval, the view of those who held Porphyry’s treatise to be not de quinque rebus, but de quinque vocibus. A genus, they said, is essen- tially something which is predicated of a subject; but a thing cannot be a predicate (res enim non praedicatur). These glosses, it should be added, however, have been attributed by Prantl and Kaulich, on the ground of diver- gence from doctrines contained in the published works of Hrabanus, to some disciple of his rather than to Hrabanus himself. Fulda had become through the teaching of the latter an intellectual centre. studied there under Haimon, the successor of Hrabanus, and afterwards taught at Auxerre, wrote glosses on the margin of his copy of the pseudo-Augustinian Categoriae, which have been published by Cousin and Hauréau. He there says in words which recall the language of Locke (Essay, iii. 3) that because proper names are innumerable, and no intellect or memory would suffice for the knowing of them, they are all as it were comprehended in the species (“‘Sciendum autem, quia propria nomina primum sunt innumerabilia, ad quae cognoscenda intellectus nullus seu memoria sufficit, haec ergo omnia coartata species com- prehendit, et facit primum gradum”). Taken in their strictness, these words state the position of extreme Nominalism ; but even if we were not forbidden to do so by other passages, in which the doctrine of moderate Realism is adopted (under cover of the current distinction between the singular as felt and the pure universal as understood), it would still be unfair to press any passage in the writings of this period. As Cousin says, ‘“ Realism and Nominalism were undoubtedly there in germ, but their true principles with their necessary consequences remained profoundly unknown ; their connexion with all the great questions of religion and politics was not even suspected. The two systems were nothing more as yet than two different ways of interpreting a phrase of Porphyry, and they remained unnoticed in the obscurity of the schools. ... It was the 11th century which gave Nominalism to the world.” !

Remi or Remigius of Auxerre, pupil of Eric, became Remi.

the most celebrated professor of dialectic in the Parisian schools of the 10th century. As he reverted to Realism, his influence, first at Rheims and then in Paris, was doubtless instrumental in bringing about the general

acceptance of that doctrine till the advent of Roscellinus as a powerful disturbing influence. ‘There is one genus more general than the rest,” says Remi (apud Hauréau, De la Philosophie Scolastique, i. 146), “beyond which the intellect cannot rise, called by the Greeks oicia, by the Latins essentia. The essence, indeed, comprehends all natures, and everything that exists is a portion of this essence, by participation in which everything that is hath its existence.” And similarly with the intermediate genera. “Homo est multorum hominum substantialis unitas.” Remigius is thus a Realist, as Hauréau remarks,

1 Ouvrages inédits d’ Abdélard, Introd., p. Ixxxv. —_

Eric or Heiricus, who Eric.

not so much in the sense of Plato as in the spirit of Parmenides, and Hauréau applies to this form of Realism Bayle’s description of Realism in general as “le Spinosisme non developpé.” The 10th century asa whole is especially marked out asa dark age, being partly filled with civil troubles and partly characterized by a reaction of faith against reason. In the monastery of St Gall there was

considerable logical activity, but nothing of philosophical

interest is recorded. The chief name of the century is that of Gerbert (died as Pope Sylvester IT. in 1003). He studied at Aurillac under Otto of Clugny, the pupil of Remigius, and later among the Moors in Spain, and taught afterwards himself in the schools of Tours, Fleury, Sens, and Rheims. He was a man of universal attainments, put only his treatise De Rationali et Ratione uti need be mentioned here. It is more interesting as a display of the logical acquirements of the age than as possessing any direct philosophical beating. The school of Chartres, founded in 990 by Fulbert, one of Gerbert’s pupils, was distinguished for nearly two centuries not so much for its dialectics and philosophy as for its humanistic culture. The account which John of Salisbury gives of it in the first half of the 12th century, under the presidency of Theodoric and Bernard, gives a very pleasant glimpse into the history of the Middle Ages. Since then, says their

regretful pupil, “less time and less care have been |

bestowed on grammar, and persons who profess all arts, liberal and mechanical, are ignorant of the primary art, without which a man proceeds in vain to the rest. For albeit the other studies assist literature, yet this has the sole privilege of making one lettered.”?

Hitherto, if dialectical studies had been sometimes viewed askance by the stricter churchmen it was not because logic had dared to stretch forth its hands towards the ark of God, but simply on the ground of the old opposition between the church and the world: these secular studies absorbed time and ability which might have been employed for the glory of God and the service of the church. But now bolder spirits arose who did not shrink from applying the distinctions of their human wisdom to the mysteries of theology. It was the excite- ment caused by their attempt, and the heterodox con- clusions which were its first result, that lifted these

Scholastic disputations into the central position which,

they henceforth occupied in the life of the Middle Ages. And whereas, up to this time, discussion had been in the main of a purely logical character, the next centuries show that peculiar combination of logic and theology which is the mark of Scholasticism, especially in the period before the 13th century. For reason, having already asserted itself so far, could not simply be put under a ban. Orthodoxy had itself to put on the armour of reason; and so panoplied its champions soon proved themselves superior to their antagonists on their own battlefield.

One of the first of these attacks was made by Berengarius of Tours (999-1088) upon the doctrine of transubstantiation ; he denied the possibility of a change of substance in the bread and wine without some corre- sponding change in the accidents. Berengarius had studied at Chartres, where his exclusive devotion to dialectic caused Fulbert more than once to remonstrate with his pupil. According to the testimony of his oppo- nent and former fellow-student, Lanfranc, he seems even in his student days to have been by temperament a rebel against authority. “When we were in the schools together,” says Lanfranc, “it was your part always to collect authorities against the Catholic faith.” M. de

See SSS SS ae 1 Metalogicus, i. 27, quoted in Poole’s Illustrations ef Medizval

Thought.

‘eates of that doctrine.

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Rémusat characterizes his view on the Eucharist as a specific application of Nominalism (“un nominalisme special ou restreint & une seule question”). More inti- mately connected with the progress of philosophical thought was the tritheistic view of the Trinity propounded by Roscellinus as one of the results of his Nominalistic theory of knowing and being. The sharpness and one- ! sidedness with which he formulated his position were the immediate occasion of the contemporaneous crystallization of Realism in the theories of Anselm and William of Champeaux. Henceforth discussion is carried on with a full consciousness of the differences involved and the issues at stake; and, thanks to the heretical conclusion disclosed by Roscellinus, Realism became established for several centuries as the orthodox philosophical creed. Roscellinus (ob. c. 1125) was looked upon by later times as the originator of the sententia vocum, that is to say, of Nom- inalism proper. Unfortunately, we are reduced for a knowledge of his position to the scanty and ill-natured notices of his opponents (Anselm and Abelard). From these we gather that he refused to recognize the reality of anything but the individual; he treated “the universal substance,” says Anselm, as no more than “ flatum vocis,” a verbal breathing or sound; and in a similar strain he denied any reality to the parts of which a whole, such as a house, is commonly said to be composed. The parts in the one case, the general name or common attributes in the other, are only, he seems to have argued, so many subjective points of view from which we choose to regard that which in its own essence is one and indivisible, existing in its own right apart from any connexion with other individuals. ‘This pure individualism, consistently interpreted, involves the denial of all real relation what- soever ; for things are related and classified by means of their general characteristics. Accordingly, if these general characteristics do not possess reality, things are reduced to a number of characterless and mutually indifferent points. It is possible, as Hauréau maintains, that Roscel- linus

meant no more than to refute the untenable Realism which asserts the, substantial and, above all, the inde- pendent existence of the universals. Some of the expres- sions used by Anselm in controverting his position favour this idea, since they prove that the Realism of Anselm himself embraced positions discarded by the wiser advo- Anselm upbraids Roscellinus, for example, because he was unable to conceive whiteness apart from its existence in something white. But this is precisely an instance of the hypostatization of abstrac- tions in exposing which the chief strength and value of Nominalism lie. Cousin is correct in pointing out, from the Realistic point of view, that it is one thing to deny the hypostatization of an accident like colour or wisdom, and another thing to deny the foundation in reality of those "true and legitimate universals" which we under- stand by the terms genera and species. "The human race ig not a word, or, if it is, we are driven to assert that there is really nothing common and identical in all men— that the brotherhood and equality of the human family are pure abstractions, and that, since individuality is the sole reality, the sole reality is difference, that is to say, hostility and war, with no right but might, no duty but interest, and no remedy but despotism. These are the gad but necessary consequences which logic and history impose upon Nominalism and Empiricism."? It is not for a moment to be supposed that the full scope of his doctrine was present to the mind of Roscellinus ; but Nominalism would hardly have made the sensation it did had its assertions been as innocent as Hauréau would make them. Like most innovators, Roscellinus stated his posi- 2 Ouvrages inédits d' Abélard, Introd., p. evi.

tion in bold language, which emphasized his opposition to accepted doctrines ; and his words, if not his intentions, involved the extreme Nominalism which, by making universality merely subjective, pulverizes existence into detached particulars. And, though we may acquit Roscel- linus of consciously propounding a theory so subversive of all knowledge, his criticism of the doctrine of the Trinity is proof at least of the determination with which he was prepared to carry out his individualism. If we are not

perfect goodness and truth and justice, by participation in which all earthly things are judged to possess these qualities. In this way he rises like Plato to the absolute Goodness, Justice, and Truth, and then proceeds in Neo-platonic fashion to a deduction of the Trinity as involved in the idea of the divine Word.

Besides its connexion with the speculations of Anselm, the doctrine of Roscellinus was also of decisive influence within the schools in crystallizing the opposite opinion.

William of Champeaux is reputed the founder of a William

prepared to say that the three Persons are one thing—in definitely formulated Realism, much as Roscellinus is of Cham-

which case the Father and the Holy Ghost must have William of P°@™*

Anselm.

been incarnate along with the Son—then, did usage permit, he says, we ought to speak of three Gods.

It was this theological deduction from his doctrine that drew upon Roscellinus the polemic of his most celebrated opponent, Anselm of Canterbury (1033-1109). Roscel- linus appears at first to have imagined that his tritheistic theory had the sanction of Lanfranc and Anselm, and the latter was led in consequence to compose his treatise De Inde Trimtatis. From this may be gathered, in a some- what indirect and incidental fashion, his views on the nature of universals. ‘‘ How shall he who has not arrived at understanding how several men are in species one man comprehend how in that most mysterious nature several persons, each of which is perfect God, are one God?” The manner in which humanity exists in the individual was soon to be the subject of keen discussion, and to bring to light diverging views within the Realistic camp; but St Anselm does not go into detail on this point, and seems to imply that it is not surrounded by special difficulties. In truth, his Realism, as has just been seen, was of a somewhat uncritical type. It was simply accepted by him in a broad way as the orthodox philosophic doctrine, and the doctrine which, as a sagacious

churchman, he perceived to be most in harmony with Christian theology. But Anselm's heart was not in the dialectical subtleties which now began more and more to engross the schools. The only logical treatise which he wrote, De Grammatica, falls so far below the height of his reputation that it leads Prantl into undue depreciation of Anselm's eminence as a thinker. Anselm's natural element was theology, and the high metaphysical questions which are as it were the obverse of theology. Hauréau calls him with truth "the last of the fathers"; the sweep of his thought recalls St Augus- tine rather than the men of his own time. On the other hand, as the first to formulate the ontological argument for the existence of God, he joins hands with some of the profoundest names in modern philosophy. This celebrated argument, which fascinated in turn Descartes, Leibnitz, and Hegel, not to mention other names, appears for the first time in the pages of Anselm's Proslogium. To Anselm specially belongs the motto Credo ut intelligam, or, as it is otherwise expressed in the sub-title of his Pros- logium, Fides quaerens intellectum. 'His method," says Cousin (p. ci.), "is to set out from the sacred dogmas as they are given by the hand of authority, and without at any time departing from these dogmas to impregnate them by profound reflexion, and thus as it were raise the darkness visible of faith to the pure light of philo- sophy." In this spirit he endeavoured to give a philo- sophical demonstration not only of the existence of God but also of the Trinity and the Incarnation, which were placed by the later Scholastics among the "mysteries." The Christological theory of satisfaction expounded in the Cur Deus Homo falls beyond the scope of the present article. But the Platonically conceived proof of the being of God contained in the Monologium shows that Anselm's doctrine of the universals as substances in things (unzver- salia in re) was closely connected in his mind with the thought of the wniversalia ante rem, the exemplars of

regarded as the founder of Nominalism. Champeaux (1070-1121) was instructed by Roscellinus himself in dialectic. His own activity as a teacher belongs to the first years of the 12th century. He lectured in Paris in the cathedral school of Notre Dame till the year 1108, when he retired to the priory of St Victor on the outskirts of Paris. But soon afterwards, unable to resist the importunities of his friends and pupils, he resumed his lectures there, continuing them till his removal to the see of Chalons in 1113, and

thus laying the foundation of the reputation which the monastery soon acquired. Unfortunately none of the philosophical works of William have survived, and we are forced to depend for an account of his doctrine upon the statements of his opponent Abelard, in the Historia Calamitatum Mcarum, and in certain manuscripts discovered by Cousin. From these sources it appears that William professed successively two opinions on the nature of the universals, having been dislodged from his first position by the criti- cism of Abelard, his quondam pupil, There is no obscurity about William's first position. It is a Realism. of the most uncompromising type, which by its reduction of individuals to accidents of one identical substance seems to tremble on the very verge of Spinozism. He taught, says Abelard, that the same thing or substance was present in its entirety and essence in each individual, and that individuals differed no whit in their essence but only in the variety of their accidents, ''Erat autem in ea sententia de communitate universalium, ut eandem essen- tialiter rem totam simul singulis suis inesse adstrueret individuis, quorum quidem nulla esset in essentia diver- sitas, sed sola multitudine accidentium varietas." Thus "'Socratitas" is merely an accident of the substance '"'humanitas," or, as it is put by the author of the treatise De Generibus et Speciebus,! "Man is a species, a thing essentially one (res una essentialiter), which receives certain forms which make it Socrates. This thing, remaining essentially the same, receives in the same way other forms which constitute Plato and the other individuals of the species man ; and, with the exception of those forms which mould that matter into the individual Socrates, there is nothing in Socrates that is not the same at the same time under the forms of Plato. . . . According to these men, even though rationality did not exist in any individual, its existence in nature would still remain intact " (Cousin, Introduction, &e., p. exx.). Robert Pulleyn expresses the same point of view concisely when he makes the Realist say, "Species una est substantia, ejus vero individua multae personae, et hae multae personae sunt illa una substantia." But the difficulties in the way of treating the universal as substance or thing are so insuperable, and at the same time so obvious, that criticism was speedily at work upon William of Champeaux's position. He had said expressly that the universal essence, by the addition

1 This treatise, first published by Cousin in his Ouvrages inédits @ Abélard, was attributed by him to Abelard, and he was followed in this

opinion by Hauréau ; but Prantl adduces reasons which seem satisfactory for believing it to be the work of an unknown writer of somewhat later date (see Prantl, Geschichte d. Logik, ii. 148).

individuum, sed et illud aliter et aliter attentum species et genus et generalissimum est." Adelard of Bath (whose treatise De Eodem et Diverso must have been written between 1105 and 1117) was probably the author or at all events the claborator of this doctrine, and he sought by its means to effect a reconciliation between Plato and Aristotle :—"Since that which we see is at once genus and species and individual, Aristotle rightly insisted that the universals do not exist except in the things of sense. But, since those universals, so far as they are called genera and species, cannot be perceived by any one in their purity without the admixture of imagination, Plato main- tained that they existed and could be beheld beyond the things of sense, to wit, in the divine mind. Thus these men, although in words they seem opposed, yet held in reality the same opinion." Prantl distinguishes from the

of the individual forms, was individualized and present secundum totam suam quantitatem in each individual. But if homo is wholly and essentially present in Socrates, then it is, as it were, absorbed in Socrates ; where Socrates is not, it cannot be, consequently not in Plato and the other individua hominis. This was called the argumeut of the homo Socraticus; and it appears to have been with the view of obviating such time and space difficulties, emphasized in the criticism of Abelard, that William latterly modified his form of expression. But his second position is enveloped in considerable obscurity. Abelard says, 'Sic autem correxit sententiam, ut deinceps rem eamdem non essentialiter sed individualiter diceret." In other words, he merely sought to avoid the awkward con- sequences of his own doctrine by substituting ''individu- aliter" for "essentialiter" in his definition. If we are to

Theory Whether this view is to be traced to William or not, it of indif- is certain that the theory of "indifference" or ''non- Porretanus, or, from his birthplace, Poitiers, also called de !@ ference. difference" (indifferentia)

was a favourite solution in the | Pictaviensis, 1075-1154), who was also a pupil of Bernard's, * °°"

put a sense upon this new expression, William may pro- bably have meant to recall any words of his which seemed, by locating the universal in the entirety of its essence in each individual to confer upon the individual an inde- pendence which did not belong to it—thus leading in the end to the demand for a separate universal for each individual. In opposition to this Nominalistic view, which implied the reversal of his whole position, William may have meant to say that, instead of the universal being multiplied, it is rather the individuals which are reduced to unity in the universal. The species is essentially one, but it takes on individual varieties or accidents. it, however, we are more ill-natured, we may regard the phrase, with Prantl, as simply a meaningless makeshift in extremities; and if so, Abelard's account of the subse- quent decline of William's reputation would be explained. But there is in some of the manuscripts the various read- ing of "indifferenter" for " individualiter," and this is accepted as giving the true sense of the passage by Cousin and Rémusat (Hauréau and Prantl taking, on different grounds, the opposite view). According to this reading, William sought to rectify his position by assert- ing, not the numerical identity of the universal in each individual, but rather its sameness in the sense of indis- tinguishable similarity. Ueberweg cites a passage from his theological works which apparently bears out this view, for William there expressly distinguishes the two senses of the word "same." Peter and Paul, he says, are the same in so far as they are both men, although the humanity of each is, strictly speaking, not identical but similar. In the Persons of the Trinity, on the other hand, the relation is one of absolute identity.

ealistic schools soon after his time. The inherent dif_i- culties of Realism, brought to light by the explicit state- ment of the doctrine and by the criticism of Abelard, led to a variety of attempts to reach a more satisfactory formula. John of Salisbury, in his account of the con- troversies of these days (Metalogicus, ii, 17) reckons up nine different views which were held on the question of the universals, and the list is extended by Prantl (ii. 118) to thirteen. In this list are included of course all shades of opinion, from extreme Nominalism to extreme Realism. The doctrine of

indifference as it appears in later writers certainly tends, as Prantl points out, towards Nominalism, inasmuch as it gives up the substantiality of the universals. ‘The universal consists of the non-different elements or attributes in the separate individuals, which alone exist substantially. If we restrict attention to these non-different elements, the individual becomes for us the species, the genus, &c.; everything depends on the point of view from which we regard it. ‘“ Nihil omnino est praeter

teaching of the school of Chartres, on the study of the ancients. 1167), called by John of

poetic gloss upon the Temacus.

system of indifference the “status ” doctrine attributed by according to which the universal is essentially united to the individual, which may be looked upon, ¢g., as Plato, man, animal, &e., according to the “status” or point of view which we assume. expression for the same position, and the same may doubt- less be said of the theory which employed the outlandish word “ maneries” (Fr. maniére) to signify that genera and species represented the might be regarded. which such views embody make them what Hauréau calls “the Peripatetic section of the Realistic school.”

John of Salisbury to Walter of Mortagne (0d. 1174),

But this seems only a different

different ways in which individuals The concessions to Nominalism representative of

Somewhat apart from current controversies stood the humanistically nourished

He endeavoured, according to John of

to reconcile Plato and Aristotle; but his

of the divine thought. are little more than a William of Conches, a pupil of Bernard’s, was more eclectic in his views, and, devoting himself to

psychological and physiological ques- tions, was of less importance for the specific logico-meta-

they exist in the supersensible world His Megacosmus and Microcosmus

physical problem. But Gilbert de la Porrée (Gilbertus Gilbert

and who was afterwards for about twenty years chancellor of the cathedral of Chartres before he proceeded to lecture in Paris, is called by Hauréau the most eminent logician of the Realistic school in the 12th century and the most profound metaphysician of either school. The views which he expressed in his commentary on the pseudo-Boetian treatise, De Trinitate, are certainly much more important than the mediatizing systems already referred to. The most interesting part of the work is the distinction which Gilbert draws between the manner of existence of genera and species and of substances proper. He distinguishes between the quod est and the quo est. Genera and species certainly exist, but they do not exist in their own right as substances. What exists as a sub- stance and the basis of qualities or forms (quod est) may be said substare; the forms on the other hand by which such an individual substance exists qualitatively (quo est) subsistunt, though it cannot be said that they substant. The intellect collects the universal, which exists but not

Bernard of Chartres (0b. Bernard Salisbury “ perfectissimus inter of

Platonicos seculi nostri,” taught at Chartres in the begin- Ces: ning of the 12th century, when William was still lectur- ing at St Victor. Salisbury, doctrine is almost wholly derived from the former through St Augustine and the commentary of Chalcidius. The universalia in re have little place in his thoughts, which are directed by preference to the eternal exemplars as

Abelard.

as a substance (est sed non substat), from the particular things which not merely are (sunt) but also, as subjects of accidents, have substantial existence (substant), by con- sidering only their substantial similarity or

conformity. The universals are thus forms inherent in things—“ native forms,” according to the expression by which Gilbert’s doctrine is concisely known. The individual consists of an assemblage of such forms ; and it is individual because nowhere else is exactly such an assemblage to be met with. The form exists concretely in the individual things (sensibilis in re sensibil’), for in sensible things form and matter are always united. But they may be conceived abstractly or non-sensuously by the mind (sed mente con- cipitur insensibilis), and they then refer themselves as copies to the Ideas their divine exemplars. In God, who is pure form without matter, the archetypes of material things exist as eternal immaterial forms. In this way Gilbert was at once Aristotelian and Platonist. The dis- tinctions made by him above amount to a formal criticism of categories, and in the same spirit he teaches that no one of the categories can be applied in its literal sense to God. Gilbert was also the author of a purely logical work, De Sex Principis, in which he criticized the Aristotelian list of the ten categories, drawing a distinction between the first four—substance, quality, quantity, and relation (i.e, according to Gilbert, indeterminate or potential rela- tion)—which he called formae inhaerentes, and the remain- ing six, which he maintained belong to an object only through its actual relation to other objects (respectu alte- rius). To these six, therefore, he gave the name of formae assistentes. This distinction was adopted in all the schools till the 16th century, and the treatise De Sex Principiis was bound up with the Jsagoge and the Categories.

But by far the most outstanding figure in the contro- versies of the first half of the 12th century is Abelard (Petrus Abzelardus, also called Palatinus from Pallet, the place of his birth, 1079-1142). Abelard was successively the pupil of Roscellinus and William of Champeaux, and the contrast between their views doubtless emphasized to him at an early period the extravagances of extreme Nominalism and extreme Realism. He speedily acquired a reputation as an unrivalled dialectician, the name Peri- pateticus being bestowed upon him in later years to signify this eminence. Almost before he had emerged from the pupillary state, he came forward in public as the acute and vehement critic of his masters’ doctrines, especially that of William of Champeaux, whom Abelard seems ultimately to have superseded in Paris. About Abelard’s own system there is far from being perfect unanimity of opinion, some, like Ritter and Erdmann, regarding it as

a moderate form of Realism,—a return indeed to the position of Aristotle,—while others, like Cousin, Rémusat, Hauréau, and Ueberweg, consider it to be essentially Nominalistic, only more prudently and perhaps less consistently ex- pressed than was the case with Roscellinus. His position is ordinarily designated by the name Conceptualism, though there is very little talk of concepts in Abelard's own writings ; and Conceptualism, Hauréau tells us, "c'est le nominalisme raisonnable." There can be no doubt, at all events, that Abelard himself intended to strike out a via media between the extreme Nominalism of Roscellinus and the views of the ordinary Realists. As against Realism he maintains consistently Res de re non praedicatur ; genera and species, therefore, which are predicated of the individual subject, cannot be treated as things or sub- stances. This is manifestly true, however real the facts may be which are designated by the generic and specific names ; and the position is fully accepted, as has been seen, by a Realist like Gilbert, who perhaps adopted it first from Abelard. Abelard also perceived that Realism, by separ-

ating the universal substance from the forms which indi- vidualize it, makes the universal indifferent to these forms, and leads directly to the doctrine of the identity of all beings in one universal substance or matter—a pantheism which might take either an Averroistic or a Spinozistic form. Against the system of non-difference Abelard hag a number of logical and traditional arguments to bring, but it is sufficiently condemned by his fundamental doctrine that only the individual exists in its own right. For that system still seems to recognize a generic sub- stance as the core of the individual, whereas, according to Cousin's rendering of Abelard's doctrine, " only individuals exist, and in the individual nothing but the individual." The individual Socrates may be said to be made Socrates by the form Socratitas; now "the subject of this form is not humanity in itself but that particular part of human nature which is the nature of Socrates. The matter in the individual Socrates is therefore quite as much indi- vidual as his form" (p. clxxiv.). Holding fast then on the one hand to the individual as the only true substance, and on the other to the traditional definition of the genus as that which is predicated of a number of individuals (quod praedicatur de pluribus), Abelard declared that this definition of itself condemns the

Realistic theory ; only a name, not a thing, can be so predicated,—not the name, however, as a jlatus vocis or a collection of letters, but the name as used in discourse, the name as a sign, as having a meaning—in a word, not vox but sermo. Sermo est praedicabils. By these distinctions Abelard hoped to escape the consequences of extreme Nominalism, from which, as a matter of history, his doctrine has been dis- tinguished under the name of Conceptualism, seeing that it lays stress not on the word as such but on the thought which the word is intended to convey. Moreover, Abelard evidently did not mean to imply that the distinctions of genera and species are of arbitrary or merely human imposition. His favourite expression for the universal is "quod de pluribus natum est praedicari" (a translation of Aristotle, De Interpretatione, 7), which would seem to point toa real or objective counterpart of the products of our thought ; and the traditional definitions of Boetius, whom he frequently quotes, support the same view of the concept as gathered from a number of individuals in virtue of a real resemblance, What Abelard combats is the substantiation of these resembling qualities, which leads to their being regarded as identical in all the separate individuals, and thus paves the way for the gradual undermining of the individual, the only true and indivisible substance. But he modifies his Nominalism so as to approach, though somewhat vaguely, to the position of Aristotle himself. At the same time he has nothing to say against the Platonic theory of universalia ante rem, the Ideas being interpreted as exemplars, existing in the divine understanding before the creation of things. Abelard's discussion of the problem (which it is right to say is on the whole incidental rather than systematic) is thus marked by an eclecticism which was perhaps the source at once of its strength and its weakness. Rémusat characterizes his teaching as displaying "rather an origin- ality of talent than of ideas," and Prantl says that in the sphere of logic his activity shows no more independence than that of perhaps a hundred others at the same time. But his brilliant ability and restless activity made him the central figure in the dialectical as in the other discussions of his time. To him was indirectly due, in the main, that troubling of the Realistic waters which resulted in so many modifications of the original thesis; and his own somewhat eclectic ruling on the question in debate came to be tacitly accepted in the schools, as the ardour of the disputants began to abate after the middle of the century.

Abelard's application of dialectic to theology betrayed the Nominalistic basis of his doctrine. He zealously combated the Tritheism of Roscellinus, but his own views on the Trinity were condemned by two councils (at Soissons in 1121 and at Sens in 1140). Of the alterna- tives—three Gods or wna ves—which his Nominalistic logic presented to Roscellinus, Roscellinus had chosen the first; Abelard recoiled to the other extreme, reducing the three Persons to three aspects or attributes of the Divine Being (Power, Wisdom, and Love). For this he was called to account by Bernard of Clairvaux (1091-1153), the recognized guardian of orthodoxy in France. Bernard declared that he ''savoured of Arius when he spoke of the Trinity, of Pelagius when he spoke of grace, and of Nestorius when he spoke of the person of Christ." "While he laboured to prove Plato a Christian, he showed himself a heathen." Nor can it be said that the instinct of the saint was altogether at fault. The germs of Rational- ism were unquestionably present in several of Abelard's opinions, and still more so, the traditionalists must have thought, in his general attitude towards theological questions. "A doctrine is believed," he said, "not because God has said it, but because we are convinced by reason that it is so." "Doubt is the road to inquiry, and by inquiry we perceive the truth." (" Dubitando enim ad inquisitionem venimus, inquirendo veritatem percipimus.") The application of dialectic to theology was not new. Anselm had made an elaborate employment of reason in the interest of faith, but the spirit of pious subordination which had marked the demonstrations of Anselm seemed wanting in the argumentations of this bolder and more restless spirit; and the church, or at least an influential section of it, took alarm at the encroachments of Rational- ism. Abelard's remarkable compilation Sic et Mon was not calculated to allay their suspicions. In bringing together the conflicting opinions of the fathers on all the chief points of Christian dogmatics, it may be admitted that Abelard's aim was simply to make these contradic- tions the starting point of an inquiry which should deter- mine in each case the true position and wa media of Christian theology. Only such a determination could enable the doctrines to be summarily presented as a system of thought. The book was undoubtedly the precursor of the famous Books of Sentences of Abelard's own pupil Peter Lombard and others, and of all the Summae Theologiae with which the church was presently to

abound. But the anti- nomies, as they appeared in Abelard's treatise, without their solutions, could not but seem to insinuate a deep-laid scepticism with regard to authority. And even the pro- posal to apply the unaided reason to solve questions which had divided the fathers must have been resented by the more rigid churchmen as the rash intrusion of an over-confident Rationalism. :

Realism was in the beginning of the 12th century the dominant doctrine and the doctrine of the church ; the Nominalists were the innovators and the especial repre- sentatives of the Rationalistic tendency. In order to see the difference in this respect between the schools we have only to compare the peaceful and fortunate life of William of Champeaux (who enjoyed the friendship of St Bernard) with the agitated and persecuted existence of Roscellinus and, in a somewhat less degree, of Abelard. But now the greater boldness of the dialecticians awakened a spirit of general distrust in the exercise of reason on sacred subjects, and we find even a Realist like Gilbert de la Porrée arraigned by Bernard and his friends before a general council on a charge of heresy (at Rheims, 1148). Though Gilbert was acquitted, the fact of his being brought to trial illustrates the growing spirit of suspicion. Those heresy-hunts show us the worst side of St Bernard,

yet they are in a way just the obverse of his deep mystical piety. This is the judgment of Otto of Freising, a con- temporary :—" He was, from the fervour of his Christian religion, as jealous as, from his habitual meekness, he was

in some measure credulous ; so that he held in abhorrence those who trusted in the wisdom of this world and were

too much attached to human reasonings, and if anything alien from the Christian faith were said to him in reference

to them he readily gave ear to it." The same attitude is maintained by the mystical school of St Victor. Hugo Hugo of St Victor (1097-1141) declares that '"the uncor- of St rupted truth of things cannot be discovered by reason- — ing." The perils of dialectic are manifold, especially in ennai: the overbold spirit it engenders. Nevertheless Hugo, by

the composition of his Summa Sententiarum, endeavoured

to give a methodical or rational presentation of the con- tent of faith, and was thus the first of the so-called Sum- mists. Richard of St Victor, prior of the monastery from 1162 to 1173, is still more absorbed in mysticism, and his successor Walter loses his temper altogether in abuse of

the dialecticians and the Summists alike. The Summists have as much to say against the existence of God as for

it, and the dialecticians, having gone to school to the pagans, have forgotten over Aristotle the way of salvation. Abelard, Peter Lombard, Gilbert de la Porrée, and Peter

of Poitiers he calls the ‘four labyrinths of France.”

This anger and contempt may have been partly justified Decline by the discreditable state into which the study of logic °f leet. had fallen. The speculative impulse was exhausted which marks the end of the 11th and the first half of the 12th century,—a period more original and more interesting in many ways than the great age of Scholasticism in the 13th century. By the middle of the century, logical studies had lost to a great extent their real interest and application, and had degenerated into trivial displays of ingenuity. On the other hand, the Summists} occupied themselves merely in the systematizing of authorities. The mystics held aloof from both, and devoted themselves to the practical work of preaching and edification. The intellect of the age thus no longer exhibited itself asa unity ; disintegration had set in. And it is significant of this that the ablest and most cultured representative of the second half of the century was rather an historian of opinion than himself a philosopher or theologian. John of Salisbury (Johannes John of Sarisberiensis) was educated in France in the years Salisbury. 1136—48—in Paris under Abelard (who had then returned to Paris, and was lecturing at St Geneviéve) and Robert of Melun, at Chartres under William of Conches, then again in Paris under Gilbert de la Porrée and Robert Pulleyn.

The autobiographical account of these years contained in his Metalogicus is of the utmost value as a picture of the schools of the time; it is also one of

the historian’s chief sources as a record of the many-coloured logical views of the period. John was a man of affairs, secretary to three successive archbishops of Canterbury, of whom Becket was one. He died in 1180 as bishop of Chartres. When a pupil there, he had imbibed to the full the love of class- ical learning which was traditional in the school. An ardent admirer of Cicero, he was himself the master of an elegant Latin style, and in his works he often appears a

1 Among these may be mentioned Robert Pulleyn (ob. 1150), Peter Lombard (0b. 1164), called the Afagister Sententiarum, whose work became the text-book of the schools, and remained so for cen- turies. Hundreds of commentaries were written upon it. Peter of Poitiers, the pupil of Petcr the Lombard, flourished about 1160-70. Other names are Robert of Melun, Hugo of Amicns, Stephen Langton, and William of Auxerre. More important is Alain de Lille (Alanus de Insulis), who died at an advanced age in 1203. His De Arte seu de Articulis Catholicae Fidei is a Swmma of Christian theology, but with a greater infusion than usual of philosophical reasoning. Alanus was acquainted with the celebrated Laber de Causis.

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more as a cultivated humanist than as a Scholastic divine. His Policraticus, it has been said, “is to some extent an encyclopedia of the cultivated thought of the middle of the 12th century.” The JAfetalogicus is a defence of logic against those who despised all philo- sophical training. But John recoiled from the idle casuistry which occupied his own logical contemporaries ; and, mindful probably of their aimless ingenuity, he adds the caution that dialectic, valuable and necessary as it is, is ‘like the sword of Hercules in a pigmy’s hand ” unless there be added toit the accoutrement of the other sciences. Catholic in spirit rather than dogmatic, John ranks him- self at times among the Academics, “ since, in those things about which a wise man may doubt, I depart not from their footsteps.” The list which he gives of things which may be doubted (quae sunt dubitabilia sapientt) is at once curious and instructive. It is not fitting to subtilize overmuch, and in the end John of Salisbury’s solution is the practical one, his charitable spirit pointing him in particular to that love which is the

fulfilling of the law. The first period of Scholasticism being thus at an end, there is an interval of nearly half a century without any

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of Aphrodisias, of Philoponus, annotated in the same sense by the same hands. This was the rich but dangerous present made by the Mussulman school to the Christian" (i. 382). To these must be added the Neoplatonically inspired Jons Vitae of the Jewish philosopher and poet Ibn Gebirol, whom the Scholastics cited as Avicebron and believed to be an Arabian.

By special command of Raimund, archbishop of Toledo, the chief of these works were translated from the Arabic through the Castilian into Latin by the archdeacon Dominicus Gonzalvi with the aid of Johannes Avendeath (=ben David), a converted Jew, about 1150. About the same time, or not long after, the Lzber de Causis became known—a work destined to have a powerful influence on Scholastic thought, especially in the period immediately succeeding. Accepted at first as Aristotle's, and actually printed in the first Latin editions of his works, the book is in reality an Arabian compilation of Neo- platonic theses. Of a similar character was the pseudo- Aristotelian 7heologia which was in circulation at least as early as 1200.

The first effects of this immense acquisition of new First

material were markedly unsettling on the doctrinal ortho- effects of doxy of the time. The apocryphal Neoplatonic treatises ye and the views of the Arabian commentators obscured for the fee first students the genuine doctrine of Aristotle, and the 13th :

Extension noteworthy philosophical productions. The cause of the of know- new development of Scholasticism in the 13th century ledge of was the translation into Latin for the first time of the " complete works of Aristotle. An inventory has been given

of the scanty stock of works accessible to students in the 9th century. The stock remained unenlarged till towards the middle of the 12th century, when

the remaining trea- tises of the Organon became known. Abelard expressly states that he knew only the Categories and the De Inter- pretatione ; but it seems from passages adduced by Prantl that he must, before the date of his Dialectica, have had some indirect and hearsay knowledge of the contents of the other treatises, though without being able himself to con- sult a copy. The books made their way almost noiselessly into the schools. In 1132 Adam de Petit-Pont, it is stated, made a version of the Prior Analytics. Gilbert de la Porrée, who died in 1154, refers to the Analytics as currently known. His disciple Otto of Freising carried the Analytics, the Topica, and the Soph. Elenchi from France to Germany, probably in the translation of Boetius. John of Salisbury was acquainted with these and also with newer and more literal translations. But, while the fuller knowledge of the ancient logic resulted in an increase of formal acuteness, it appears to have been of but small benefit to serious studies till there was added to it a know- ledge of the other works of Aristotle. This knowledge came to the Scholastics in the first instance through the medium of Arabian philosophy. (See ARABIAN PHIto- sopHy.) The doctrines and the works of Aristotle had been transmitted by the Nestorians to the Arabs, and among those kept alive by a succession of philosophers, first in the East and afterwards in the West. The chief of these, at least so far as regards the influence which they exerted on medizval philosophy, were Avicenna, Avem- pace, and Averroes. The unification by the last-men- tioned of Aristotle's active intellect in all men, and his consequent denial of individual immortality are well known. The universal human intellect is made by him to proceed from the divine by a series of Neoplatonic emanations. In the course of the 12th century the writings of these men were introduced into France by the Jews of Andalusia, of Marseilles, and Montpellier. " These writings contained," says Hauréau, "the text of the Organon, the Physics, the Metaphysics, the Ethics, the De Anima, the Parva Naturalia, and a large number of other treatises of Aristotle, accompanied by continuous commentaries. There arrived besides by the same channel the glosses of Theophrastus, of Simplicius, of Alexander

century opens with quite a crop of mystical heresies. The mystical pantheism taught at Paris by Amalrich of Bena (0b, 1207 ; see AMatRicH and Mysticism), though based by him upon a revival of Scotus Erigena, was doubtless connected in its origin with the Neoplatonic treatises which now

become current. The immanence of God in all things and His incarnation as the Holy Spirit in themselves ap- pear to have been the chief doctrines of the Amalricans. They are reported to have said, “Omnia unum, quia quicquid est est Deus.” About the same time David of Dinant, in a book De Vomis (rendered by Albertus De Dinsionrbus), taught the identity of God with matter (or the indivisible principle of bodies) and nous (or the indivisible principle of intelligences)—-an extreme Realism culminating in a materialistic pantheism. If they were diverse, he argued, there must exist above them some higher or common element or being, in which case this would be God, nous, or the original matter. The spread of the Amalrican doctrine led to fierce persecutions, and the provincial council which met at Paris in 1209, after con- demning the heresies of Amalrich and David, expressly decreed “that neither the books of Aristotle on natural philosophy, nor commentaries on the same, should be read, whether publicly or privately, at Paris.” In 1215 this prohibition is renewed in the statutes of the university of Paris, as sanctioned by the papal legate. ‘“ Et quod legant libros Aristotelis de dialectica tam veteri quam de nova. . . Non legantur libri Aristotelis de metaphysica et naturali philosophia, nec summa de iisdem.” Permission is thus given to lecture on the logical books, both those which had been known all along and those introduced since 1128, but the veto upon the Physics is extended to the AMeta- physics and the summaries of the Arabian commentators. By 1231, however, the fears of the church were beginning to be allayed. A bull of Gregory IX. in that year makes no mention of any Aristotelian works except the Physics. As these had been “prohibited by the provincial council for specific reasons,” they are not to be used in the university ‘till such time as they have been examined and purged of all suspicion of errors.” Finally, in the year 1254, we find the university officially prescribing how many hours are to be devoted to the explanation of the Metaphysics and the principal physical treatises of Aristotle. These dates cnable us to measure accurately the stages by

Mendi- , cant | friars.

John of Rochelle.

doctrine of the Afetaphysics. – Hales (ob. 1245), the

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which the church accommodated itself to, and as it were took possession of, the Aristotelian philosophy. Growing knowledge of Aristotle's works and the multiplication of translations enabled students to distinguish the genuine Aristotle from the questionable accompaniments with which he had made his first appearance in Western Europe. Fresh translations of Aristotle and Averroes had already been made from the Arabic by Michael Scot and Hermannus Alemannus, at the instance of the emperor Frederick II.; so that the whole body of Aristotle's works was at hand in Latin translations from about 1210 to 12265. Soon afterwards efforts began to be made to secure more literal translations direct from the Greek. Robert Grosseteste (0b. 1253) was one of the first to stir in this matter, and he was followed by Albertus Magnus and Thomas Aquinas. Half a century thus sufficed to remove the ban of the church, and soon Aristotle was recognized on all hands as "the philosopher" par eacellence, the master of those that know. It even became customary to draw a parallel between him as the praecursor Christi m naturalibus and John the Baptist, the praecursor Christe m graturtis.

This unquestioned supremacy was not yielded, however, at the very beginning of the period. The earlier doctors who avail themselves of Aristotle's works, while bowing to his authority implicitly in matters of logic, are generally found defending a Christianized Platonism against the So it is with Alexander of first Scholastic who was acquainted with the whole of the Aristotelian works and the Arabian commentaries upon them. He was more of a theologian than a philosopher; and in his chief work, Summa Uni- versae Theologiae, he simply employs his increased philo- sophical knowledge in the demonstration of theological doctrines. So great, however, did his achievement seen that he was honoured with the titles of Doctor Irrefraga- bilis and Theologorum Monarcha, Alexander of Hales be- longed to the Franciscan order, and it is worth remarking that it was the mendicant orders which now came forward as the protagonists of Christian learning and faith and, as it were, reconquered Aristotle for the church. During the first half of the 13th century, when the university of Paris was plunged in angry feuds with the municipality, feuds which even led at one time (1229) to the flight of the students in a body, the friars established teachers in their convents in Paris. After the university had settled its quarrels these continued to teach, and soon became formidable rivals of the

secular lecturers. After a severe struggle for academical recognition they were finally admitted to all the privileges of the university by a bull of Alexander IV. in 1253. The Franciscans took the lead in this intellectual movement with Alexander of Hales and Bonaventura, but the Dominicans were soon able to boast of two greater names in Albert the Great and Thomas Aquinas. Still later Duns Scotus and Occam were both Franciscans. Alexander of Hales was succeeded in his chair of instruction by his pupil John of Rochelle, who died in 1271 but taught only till 1253. His treatise De Anima, on which Hauréau lays particular stress, 1s interesting as showing the greater scope now given to psychological discussions. This was a natural result of acquaintance with Aristotle's De Anima and the numerous Greck and Arabian commentaries upon it, and it is observable in most of the writers that have still to be mentioned. Even the nature of the universals is no longer discussed from a purely logical or metaphysical point of view, but becomes connected with psychological questions. And, on the whole, the widening of intellectual interests is the chief feature by which the second period of Scholasti- cism may be distinguished from the first. Tn some respects

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there is more freshness and interest in the speculations General which burst forth so ardently in the end of the 11th and character the first half of the 12th century. Albert and Aquinas — e no doubt stood on a higher level than Anselm and Abelard, period. not merely by their wider range of knowledge but also by

the intellectual massiveness of their achievements ; but it

may be questioned whether the earlier writers did not possess a greater force of originality and a keener talent. Originality was at no time the strong point of the Middle

Ages, but in the later period it was almost of necessity buried under the mass of material suddenly thrust upon

the age, to be assimilated. On the other hand, the influence of this new material is everywhere evident in

the wider range of questions which are discussed by the doctors of the period. Interest is no longer to the same extent concentrated on the one question of the universals.

Other questions, says Hauréau, are “ placed on the order

of the day,—the question of the elements of substance,

that of the principle of individuation, that of the origin of

the ideas, of the manner of their existence in the human understanding and in the divine thought, as well as various others of equal interest” (i420). Some of these,

it may be said, are simply the old Scholastic problem in a different garb ; but the extended horizon of which Hauréau speaks is amply proved by mere reference to the treatises

of Albert and St Thomas. They there seek to reproduce

for their own time all the departments of the Aristotelian system.

John of Rochelle was succeeded in 1253 by John Bona- Fidanza, better known as Bonaventura (1221-74), who ventura. had also been a pupil of Alexander of Hales. But the fame of “the Seraphic Doctor ” is connected more closely with the history of mysticism (see Mysticism) than with the main stream of Scholastic thought. Like his master, he defended Plato—or what he considered to be the Platonic theory—against the attacks of Aristotle. Thus he de- feuded the universalia ante rem as exemplars existent in the divine intelligence, and censured Aristotle’s doctrine of the eternity of the world. Among the earlier teachers and writers of this century we have also to name William William of of Auvergne (0b. 1249), whose treatises

De Universo and Avvetene. De Anima make extensive use of Aristotle and the Arabians, Platonic leaning. The existence of ‘ntellections in our minds is, he maintains, a sufficient demonstration of the existence of an intelligible world, ideas of sense are sufficient evidence of a sensible world, This archetypal world is the Son of God and true God. Robert Grosseteste, important in the sphere Grosse- of ecclesiastical politics, has been already mentioned as teste. active in procuring translations of Aristotle from the Greek.

He also wrote commentaries on logical and physical works

of Aristotle. Michael Scot, the renowned wizard of popular Michael tradition, earned his reputation by numerous works on S¢ct. astrology and alchemy. His connexion with philosophy

was chiefly in the capacity of a translator. Vincent of Vincent of Beauvais (ob. 1264) was the author of an encyclopedic work Beauvais. called Speculum Majus, in which, without much independent

ability, he collected the opinions of ancient and medieval

writers on the most diverse points, transcribing the fragments of their works which he deemed most interesting.

Albertus Magnus introduces us at once to the great age Albert of Scholasticism. Born in Swabia in 1193, he lived to the and great age of eighty-seven, dying at Cologne in 1280. The

except where their differences make it necessary ; and in giving an account of their common system it will be well to present it at once in its most perfect form. Albert was ‘the first Scholastic who reproduced the whole philosophy of Aristotle in systematic order with constant reference to the Arabic commentators, and who remodelled it to meet the requirements of ecclesiastical dogma” (Ueberweg, i. 436). On this account he was called by his contemporaries “‘the Universal Doctor.” But in Albert it may be said that the matter was still too new and too multifarious to be thoroughly

mastered. The fabric of knowledge is not fitly jointed together in all its parts ; the theologian and the philosopher are not perfectly fused into one individual, but speak sometimes with different voices. In St Thomas this is no longer so; the fusion is almost perfect. The pupil, entering into his master's labours, was able from the first to take a more compre- hensive survey of the whole field; and in addition he was doubtless endowed with an intellect which was finer, though it might not be more powerful, than his master's, Albert had the most touching affection for his distinguished scholar. When he went to Paris in 1245 to lecture and to take his doctor's degree, his pupil accompanied him ; ond, on their return to Cologne, Aquinas taught along with his master in the great Dominican school there. At a later date, when Aquinas proceeded to Paris to lecture inde- pendently, he occupied the Dominican chair at the same time that Bonaventura held the Franciscan professorship. They received the degree of doctor in the same year, 1257. Rivals in a manner though they were, and differing on points of philosophy, the Angelic and Seraphie Doctors were united in friendship and Christian charity.

The monotheistic influence of Aristotle and his Arabian commentators shows itself in Albert and Aquinas, at the from Outset, in the definitive fashion in which the "mysteries " philo- Of the Trinity and the Incarnation are henceforth detached sophy. from the sphere of rational or philosophical theology. So

long as the Neoplatonic influence remained strong, attempts were still made to demonstrate the doctrine of the Trinity, chiefly in a mystical sense as in Erigena, but also by orthodox churchmen like Anselm. Orthodoxy, whether Catholic or Protestant, adopted Thomas's distinction. The existence of God is maintained by Albert and Aquinas to be demonstrable by

'* Mys- teries " excluded

reason ; but here again they reject the ontological argu-

ment of Anselm, and restrict themselves to the a posteriori proof, rising after the manner of Aristotle from that which is prior for us (xpérepov mpds neas) to that which is prior by nature or in itself (wpdrepov dice). God is not fully comprehensible by us, says Albert, because the finite is not able to

grasp the infinite, yet he is not alto- gether beyond our knowledge; our intellects are touched by a ray of his light, and through this contact we are brought into communion with him. God, as the only self-subsistent and necessary being, is the creator of all things. Here the Scholastic philosophy comes into con- flict with Aristotle's doctrine of the eternity of the world. Albert and Aquinas alike maintain the beginning of the world in time; time itself only exists since the moment of this miraculous creation. But Thomas, though he holds the fact of creation to be rationally demonstrable, regards the beginning of the world in time as only an article of faith, the philosophical arguments for and against being inconclusive.

The question of universals, though fully discussed, no longer forms the centre of speculation. The great age of Scholasticism presents, indeed, a substantial unanimity upon this vexed point, maintaining at once, in different senses, the existence of the universals ante rem, in re, and post rem. Albert and Aquinas both profess the moderate

has since generally

Aristotelian Realism which treats genera and species only as substantiae secundae, yet as really inherent in the individuals, and constituting their form or essence. The universals, therefore, have no existence, as universals, in rerum natura; and Thomas endorses, in this sense, the polemic of Aristotle against Plato's hypostatized abstrac- tions. But, in the Augustinian sense of ideas immanent in the divine mind, the universal ante rem may well be admitted as possessing real existence. Finally, by abstraction from the individual things of sense, the mind is able to contemplate the universal apart from its accom- paniments (animal sine homine, asino, et aliis speciebus) ; these subjective existences are the wniversalia post rem of the Nominalists and Conceptualists. But the difficulties which embarrassed a former age in trying to conceive the mode in which the universal exists in the individual reappear in the systems of the present period as the pro- blem of the principium individuationis. The universal, The as the form or essence of the individual, is called its principle quidditas (its "what-ness" or nature);

but, besides pos- ae sessing a general nature and answering to a general defi- “°4U¥™ nition (z.¢., being a “what”), every man, for example, is this particular man, here and now. It is the question of the particularity or “ this- ness ” (haecceitas, as Duns Scotus afterwards named it) that embarrasses the Scholastics, Albert and Aquinas agree in declaring that the principle of individuation is to be found in matter, not, however, in matter as a formless substrate but in determinate matter (materia signata), which is explained to mean matter quan- titatively determined in certain respects. ‘The variety of individuals,” says Albert, “depends entirely upon the division of matter” (individuorum multitudo Jit omnis per divisionem materiae) ; and Aquinas says “the principle of the diversity of individuals of the same species is the quantitative division of matter ” (divisio materiae secundum quantitatem), which his followers render by the abbreviated phrase materia quanta. A tolerably evident shortcoming of such a doctrine is that, while declaring the quantitative determination of matter to be the individual element in the individual, it gives no account of how such quantitative determination arises. Yet the problem of the individual is really contained in this prior question ; for determinate matter already involves particularity or thisness. This difficulty was presently raised by Duns Scotus and the real- istically-inclined opponents of the Thomist doctrine. But, as Ueberweg points out, it might fairly be urged by Aquinas that he does not pretend to explain how the individual is actually created, but merely states what he finds to be an invariable condition of the existence of individuals. Apart from this general question, a difficulty arises on the Thomist theory in regard to the existence of spirits or disembodied personalities. This affects first of all the existence of angels, in regard to whom Aquinas admits that they are immaterial or separate forms (formae separatae). They possess the principle of individuation in themselves, he teaches, but plurality of individuals is in such a case equivalent to plurality of species (im eis tot sunt species quot sunt imdividua). The same difficulty, however, affects the existence of the disembodied human spirit. If individuality depends in matter, must we not conclude with Averroes that individuality is extinguished at death, and that only the universal form survives? This conelu- sion, it is needless to say, is strenuously opposed both by Albert and Thomas. Albert wrote a special treatise De Unitate Intellectus contra Averroistas, and Thomas in his numerous writings is even more explicit. It is still admis- sible, however, to doubt whether the hateful consequence does not follow consistently from

the theory laid down. Aquinas regards the souls of men, like the angels, as immaterial forms; and he includes in the soul-unit, so to

Duns Scotus.

So HO Ls iC TS

speak, not merely the anima rationalis of Aristotle, but also the vegetative, sensitive, appetitive, and motive functions. The latter depend, it is true, on bodily organs during our earthly sojourn, but the dependence is not necessary. ‘The soul is created by God when the body of which it is the entelechy is prepared for it. It is the natural state of the soul to be united to a body (Animae prius con- venit esse unitam corport quam esse a& corpore separa- tam), but being immaterial it is not affected by the dis- solution of the body. The soul must be immaterial since it has the power of cognizing the universal ; and its immor- tality is further based by St Thomas on the natural longing for unending existence which belongs to a being whose thoughts are not confined to the “here ” and “now,” but are able to abstract from every limitation.

Thomism, which was destined to become the official philosophy of the Roman Catholic Church, became in the first instance the accepted doctrine of the Dominican order, who were presently joined in this allegiance by the Augustinians. The Franciscan order, on the other hand, early showed their rivalry in attacks upon the doctrines of Albert and Aquinas. One of the first of these was the Reprehensorium seu Correctorium Fratris Thomae, published in 1285 by William Lamarre, in which the Averroistic consequences of the Thomist doctrine of individuation are already pressed home. More important was Richard of Middletown (died about 1300), who anticipated many of the objections urged soon after him by Duns Scotus. This renowned opponent of the Thomist doctrine was born in the second half of the 13th century, and after achieving an extraordinary success as a lecturer in Oxford and Paris died at an early age in the year 1308. His system is conditioned throughout by its relation to that of Aquinas, of which it is in effect an elaborate criticism. The chief characteristic of this criticism is well expressed in the name bestowed on Duns by his contemporaries—Doctor Subtilis. It will be sufficient therefore to note the chief points in which the two great antagonists differ. In general it may be said that Duns

shows less confidence in the power of reason than Thomas, and to that extent Erdmann and others are right in looking upon his system as the beginning of the decline of Scholasticism. For Scholasticism, as perfected by Aquinas, implies the har- mony of reason and faith, in the sense that they both teach the same truths. To this general position Aquinas, it has been seen, makes several important exceptions ; but the exceptions are few in number and precisely defined. Scotus extends the number of theological doctrines which are not, according to him, susceptible of philosophical proof, including in this class the creation of the world out of nothing, the immortality of the human soul, and even the existence of an almighty divine cause of the universe (though he admits the possibility of proving an ultimate cause superior to all else). His destructive criticism thus tended to reintroduce the dualism between faith and reason which Scholasticism had laboured through cen- turies to overcome, though Scotus himself, of course, had no such sceptical intention. But the way in which he founded the leading Christian doctrines (after confessing his inability to rationalize them) on the arbitrary will of God was undoubtedly calculated to help in the work of disintegration. And it is significant that this primacy of the undetermined will (voluntas superior intellectu) was the central contention of the Scotists against the Thomist doctrine. Voluntary action, St Thomas had said, is action originating in self or in an internal principle. As com- pared with the animals, which are immediately determined to their ends by the instinct of the moment, man deter- mines his own course of action freely after a certain pro- cess of rational comparison (ex collatione quadam rationis).

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It is evident that the freedom here spoken of is a freedom from the immediacy of impulse—a freedom based upon our possession of reason as a power of comparison, memory,

and forethought. Nothing is said of an absolute freedom Freedom of the will; the will is, on the contrary, subordinated to of the the reason in so far as it is supposed to choose what pall reason pronounces good. Accordingly, the Thomist doctrine may be described as a moderate determinism.

To this Scotus opposed an indeterminism of the extremest type, describing the will as the possibility of determining itself motivelessly in either of two opposite senses. Trans- ferred to the divine activity, Thomas's doctrine led him to insist upon the perseitas bont. The divine will is, equally with the human, subject to a rational determination ; God commands what is good because it is good. Scotus, on the other hand, following out his doctrine of the will, declared the good to be so only by arbitrary imposition.

It is good because God willed it, and for no other reason ; had He commanded precisely the opposite course of con- duct, that course would have been right by the mere fact

of His commanding it. Far removed from actuality as such speculations regarding the priority of intellect or will

in the Divine Being may seem to be, the side taken is yet

a sure index of the general tendency of a philosophy. Aquinas is on the side of rationalism, Scotus on the side

of scepticism.

While agreeing with Albert and Thomas in maintaining the threefold existence of the universals, Duns Scotus attacked the Thomist doctrine of individuation. The dis- tinction of the universal essence and the individualizing determinations in the individual does not coincide, he maintained, with the distinction between form and matter. The additional determinations are as truly ''form" as the universal essence. If the latter be spoken of as quidditas, the former may be called Aaecceitas. Just as the genus becomes the species by the addition of formal determina- tions called the difference, so the species becomes the individual by the addition of fresh forins of difference. As animal becomes homo by the addition of humanitas, so homo becomes Socrates by the addition of the qualities signified by Socratitas. It is false, therefore, to speak of matter as the principle of individuation ; and if this is so there is no longer any foundation for the Thomist view that in angelic natures every individual constitutes a species apart. Notwithstanding the above doctrine, how- ever, Scotus holds that all created things possess both matter and form—the soul,

for example, possessing a matter of its own before its union with the body. But the matter of spiritual beings is widely different from the matter of corporeal things. In his treatment of the con- ception of matter, Duns shows that he inclined much more to the Realism which makes for pantheism than was the case with the Aristotelianism of Thomas. A perfectly formless matter (materia prima) was regarded by him as the universal substratum and common element of all finite existences. He expressly intimates in this connexion his acceptance of Avicebron's position. Ego autem ad post- Honem Avicebronis redeo, that is, to the Neoplatonically conceived Fons Vitae of the Jew Gebirol.

In the end of the 13th century and the beginning of the Thomists 14th the Thomists and Scotists divided the philosophical a4 Scot- and theological world between them. Among the Thomists ** may be named John of Paris, igidius of Lessines (wrote in 1278), Bernard of Trilia (1240-92), and Peter of Auvergne. More important was Aigidius of Colonna (1247-1316), general of the Augustinian order, surnamed Doctor Funda- hissimus or Fundamentarius. Herveus Natalis (0b. 1323) and Thomas Bradwardine (0b. 1349) were determined oppo- nents of Scotism. Siger of Brabant and Gottfried of Fon- taines, chancellor of the university of Paris, taught Thomism

William of Occam.

at the Sorbonne; and through Humbert, abbot of Prulli, the doctrine won admission to the Cistercian order. Among the disciples of Duns Scotus are mentioned John of Bas- solis, Franciscus de Mayronis (0b. 1327), Antonius Andrez (ob. c. 1320), John Dumbleton and Walter Burleigh (1275-1357) of Oxford, Nicolaus of Lyra, Peter of Aquila, and others. Henry Goethals or Henry of Ghent (Hen- ricus Gandavensis, 1217-93), surnamed Doctor Solennis, occupied on the whole an independent and pre-Thomist position, leaning to an Augustinian Platonism. Gerard of Bologna (0b. 1317) aud Raoul of Brittany are rather to be ranked with the Thomists. So also is Petrus Hispanus (died 1277 as Pope John XXI.), who is chiefly important, however, as the author of the much-used manual Saum- mule Logicales, in which the logic of the schools was expanded by the incorporation of fresh

matter of a semi- grammatical character. Petrus Hispanus had predecessors, however, in William of Shyreswood (died 1249 as chan- cellor of Lincoln) and Lambert of Auxerre, and it has been hotly disputed whether the whole of the additions are not originally due to the Byzantine Synopsis of Psellus. By far the greatest disciple of Aquinas is Dante Alighieri, in whose Divina Commedia the theology and philosophy of the Middle Ages, as fixed by Saint Thomas, have received the immortality which poetry alone can bestow. Two names stand apart from the others of the century— Raymond Lully (1234-1315) and Roger Bacon (1214- 94). The Ars Jfagna of the former professed by means of a species of logical machine to give a rigid demonstration of all the fundamental Christian doctrines, and was intended by its author as an unfailing instrument for the conversion of the Saracens and heathen. Roger Bacon was rather a pioneer of modern science than a Scholastic, and persecution and imprisonment were the penalty of his opposition to the spirit of his time.

The last stage of Scholasticism preceding its dissolution is marked by the revival of Nominalism in a militant form. This doctrine is already to be found in Petrus Aureolus (ob. 1321), a Franciscan trained in the Scotist doctrine, and in William Durand of St Pourgain (0d. 1332), a Dominican who passed over from Thomism to his later position. But the name with which the Nominal- ism of the 14th century is historically associated is that of the “Invincible Doctor,” William of Occam (0b. 1347 , who, as the author of a doctrine which came to be almost universally accepted, received from his followers the title Venerabilis Inceptor. The hypostatizing of abstractions is the error against which Occam is continually fighting. His constantly recurring maxim—known as Occam’s razor —is Entia non sunt multiplicanda praeter necessitatem. The Realists, he considers, have greatly sinned against this maxim in their theory of a real universal or common element in all the individuals of a class. From one abstraction they are led to another, to solve the difficul- ties which are created by the realization of the first. Thus the great problem for the Realists is how to derive the individual from the universal. But the whole inquiry moves in a world of unrealities. Everything that exists, by the mere fact of its existence, is individual (Quaelibet res, co ipso quod est, est haec res). It is absurd therefore to seek for a cause of the individuality of the thing other than the cause of the thing itself. The individual is the only reality, whether the question be of an

individual thing in the external world or an individual state in the world of mind. It is not the individual which needs explanation but the universal. Occam reproaches the “modern Platonists” for perverting the Aristotelian doctrine by these speculations, and claims the authority of Aristotle for his own Nominalistic doctrine. The uni- versal is not anything really existing ; it is a terminus or

predicable (whence the followers of Occam were at first called Terminists). It is no more than a “mental con- cept signifying univocally several singulars.” It is a natural sign representing these singulars, but it has no reality beyond that of the mental act by which it is pro- duced and that of the singulars of which it is predicated, As regards the existence (if we may so speak) of the uni- versal 7m mente, Occam indicates his preference, on the ground of simplicity, for the view which identifies the concept with the actus intelligendi (“une modalité pas- sagére de l’Ame,” as Hauréau expresses it), rather than for that which treats ideas as distinct entities within the mind. And in a similar spirit he explains the wniversalia ante rem as being, not substantial existences in God, but simply God’s knowledge of things—a knowledge which is not of universals but of singulars, since these alone exist realiter. Such a doctrine, in the stress it lays upon the singular, the object of immediate perception, is evidently inspired by a spirit differing widely even from the moderate Realism of Thomas. It is a spirit which dis- trusts abstractions, which makes for direct observation, for inductive research. Occam, who is still a’ Scholastic, gives us the Scholastic justification of the spirit which had already taken hold upon Roger Bacon, and which was to enter upon its rights in the 15th and 16th centuries. Moreover, there is no denying that the new Nominalism not only represents the love of reality and the spirit of induction, but also contains in itself the germs of that empiricism and sensualism so frequently associated with – the former tendencies. St Thomas had regarded the knowledge of the universal as an intellectual activity which might even be advanced in proof of the immortality of the soul. Occain, on the other hand, maintains in the spirit of Hobbes that the act of abstraction does not pre- Suppose any activity of the understanding or will, but is a spontaneous secondary process by which the first act (perception) or the state it leaves behind (habitus derelictus ex

primo actu= Hobbes's "decaying sense") is naturally followed, as soon as two or more similar representations are present.

In another way also Occam heralds the dissolution of Scholasticism. The union of philosophy and theology is the mark of the Middle Ages, but in Occam their sever- ance is complete. A pupil of Scotus, he carried his master's criticism farther, and denied that any theological doctrines were rationally demonstrable. Even the exist- ence and unity of God were to be accepted as articles of faith. The Centiloguium Theologicum, which is devoted to this negative criticism and to showing the irrational consequences of many of the chief doctrines of the church, has often been cited as an example of thoroughgoing scepticism under a mask of solemn irony. But if that were so, it would still remain doubtful, as Erdmann remarks, whether the irony is directed against the church or against reason. On the whole, there is no reason to doubt Occam's honest adhesion to each of the two guides whose contrariety he laboured to display. None the less is the position in itself an untenable one and the parent of scepticism. The principle of the twofold nature of truth! thus embodied in Occam's system was unquestionably adopted by many merely to cloak their theological unbelief; and, as has been said, it is significant of the internal dis- solution of Scholasticism. Occam denied the title of a science to theology, emphasizing, like Scotus, its practical character. He also followed his master in laying stress on the arbitrary will of God as the foundation of morality.

1 This principle appeared occasionally at an earlier date, for exam- ple in Simon of Tournay about 1200. It was expressly censured by Pope John XXI. in 1276. But only in the period following Occam did it become a current doctrine,

Spread of Nominal- church and the constituted authorities.

ism,

The "last of the Schol- astics."

Nominalism was at first met by the opposition of the In 1339 Occam's treatises were put under a ban by the university of Paris, and in the following year Nominalism was solemnly con- demned. Nevertheless the new doctrine spread on all hands. Dominicans like Armand de Beauvoir (0d. 1334) and Gregory of Rimini accepted it. It was taught in Paris by Albert of Saxony (about 1350-60) and Marsilius of Inghen (about 1364-77, afterwards at Heidelberg), as well as by Johannes Buridanus, who was rector of the uni- versity as early as 1327. We find, however, as late as 1473 the attempt made to bind all teachers in the univer- sity of Paris by oath to teach the doctrines of Realism ; but this expiring effort was naturally ineffectual, and from 1481 onward even the show of obedience was no longer exacted. Pierre d'Ailly (1350-1425) and John Gerson (Jean Charlier de Gerson, 1363-1429), both chancellors of the university of Paris, and the former a cardinal of the church, are the chief figures among the later Nominalists. Both of them, however, besides their philosophical writings, are the authors of works of religious edification and mystical piety. They thus combine temporarily in their own persons what was no longer combined in the spirit of the time, or rather they satisfy by turns the claims of reason and faith. Both are agreed in placing repentance and faith far above philosophical knowledge. They belong indeed (Gerson in particular) to the history of mysticism rather than of Scholasticism, and the same may be said of another cardinal, Nicolaus of Cusa (1401-64), who is sometimes reckoned among the last of the Scholastics, but who has more affinity with Scotus Erigena than with any inter- vening teacher. The title "last of the Scholastics" is commonly given to Gabriel Biel, the summarizer of Occam's doctrine, who taught in Tiibingen, and died in the year 1495. The title is not actually correct, and might be more fitly borne by Francis Suarez, who died in 1617. But after the beginning of the 15th century Scholasticism was divorced from the spirit of the time, and it is useless to follow its history further. As has been indicated in the introductory remarks, the end came both from within and from without. The harmony of reason and faith had given place to the doctrine of the dual nature of truth. While this sceptical thesis was embraced by philosophers who had lost their interest in religion, the spiritually minded sought their satisfaction more and more in a mysticism which frequently cast stself loose from ecclesiastical trammels. The 14th and 15th centuries were the great age of German mysticism, and it was not only in Germany that the tide set this way.

Scholasticism had been the expression of a universal church and a common learned language. The university of Paris, with its scholars of all nations numbered by thousands, was a symbol of the intellectual unity of Christendom; and in the university of Paris, it may almost be said, Scholasticism was reared and flourished and died. But the different nations and tongues of modern Europe were now beginning to assert their individuality, and men's interests ceased to be predominatingly ecclesiastical. Scholasticism, therefore, which was in its essence ecclesiastical, had no longer a proper field for its activity. It was ina manner deprived of its accustomed subject-matter and died of inanition. Philosophy, as Hauréau finely says, was the passion of the 13th century ; but in the 15th humanism, art, and the beginnings of science and of practical discovery were busy creating a new world, which was destined in due time to give birth to a new philosophy.

Authorities. Besides the numerous works dealing with indi-

vidual philosophers, the chief histories of Scholasticism arc those of Hauréau (De la Philosophie Scolastique, 2 vols., 1850; revised

and expanded in 1870 as Histoire de la Phil. Scol.), Kaulich (Geschichte d. schol. Philosophie) and Stéckl (Gesch. der Phil. des Mittelaiters). Supplementary details are given in Hauréau's Singularités Historiques et Littératres, 1861, and in R. L. Poole's Lllustrations of the History of Mediwval Thought (1884). The accounts of medieval thought given by Ritter, Erdmann, and Ucherweg in their general histories of philosophy are exceedingly good. There are also notices of the leading systems in Milman's History of Latin Christianity; and the same writers are considered from the theological side in many works devoted to theology and the history of dogma. Jourdain's Recherches Critiques sur U Age et l Origine des Traductions Latines Aristote (Paris, 1819 ; 2d edition, 1843), Rousselot's Etudes sur la Philosophie dans le Moyen-Age (1840-42), Cousin's Introduction to his Owvrages imédits Abédlard (1836), and Prantl's Geschichte der Logik um Abendlande (4 vols., 1855-70) are invaluable aids in studying the history of medieval thought. (A. SE.)

SCHOMBERG, Frepertck ARMAND, DUKE oF (c. 1619-1690), marshal of France and English general, was descended from an old family of the Palatinate, and was born about 1619. He began his military career under Frederick Henry, prince of Orange, and after his death in 1659 entered the service of France, acquiring ultimately a reputation as a general second only to that of Turenne and the prince of Condé. In Paris he made the acquaint- ance of Charles II., who according to his own account “admitted him to great familiarities with him.” In 1660 he was sent to Portugal, and on his way thither passed through England to concert with Charles measures for supporting that country in the contest with Spain. For his services to Portugal he was in 1668 made a grandee, and received a pension of £5000 a year. In 1673 he was invited by Charles to England, with the view of taking command of the army, but so strong was the general sentiment against the appointment as savouring of French influence that it was not carried into effect. He therefore again entered the service of France, and after his capture of Bellegarde, 29th July 1675, received the rank of marshal. In subsequent campaigns he continued to add to his reputation until the revocation of the edict of Nantes (22d October 1685) compelled him as a Protestant to quit his adopted country. Ultimately he was chosen commander- in-chief of the forces of the elector of Brandenburg, and with the elector’s consent he joined the prince of Orange on his expedition to England in 1688, as second in com- mand to the prince. The following year he was made a knight of the Garter, created successively baron, marquis, and duke, and received from the House of Commons a vote of £100,000. In August he was appointed com- mander-in-chief of the expedition to Ireland against James II. After capturing Carrickfergus he marched unopposed through a country desolated before him to Dundalk, but, as the bulk of his forces were raw and undisciplined as well as inferior in numbers to the enemy, he deemed it imprudent to risk a battle, and entrenching himself at Dundalk declined to be drawn beyond the circle of his defences. Shortly afterwards pestilence broke out, and when he retired to winter quarters in Ulster his forces were in a more shattered condition than if they had sustained a severe defeat. At the same time competent authorities were agreed that the policy of masterly inactivity which he pursued was the only one open to him. In the spring he began the campaign with the capture of Charlemont, but no advance southward was made until the arrival of William. At the Boyne (July 1, 1690) Schomberg gave his opinion against

the determination of William to cross the river in face of the opposing army. In the battle he held command of the centre, and, while riding through the river without his cuirass to rally his men, was surrounded by a band of Irish horsemen and met instantaneous death. He was buried in St Patrick's cathedral, Dublin, where there is a monument to him, with a Latin inscription by Dean Swift. Schomberg was generally regarded in Eng-

land with great respect, and his manners and bearing rendered him universally popular.

SCHONBEIN, Curistian Friepricu (1799-1868), from 1828 professor of chemistry at Basel, is known as the discoverer of OZONE (@.2.).

SCHONEBECK, a town of Prussian Saxony, on the left bank of the Elbe, 9 miles above Magdeburg. It contains manufactories of chemicals, machinery, percussion caps, starch, white lead, and various other articles, but is chiefly noted for its extensive salt springs and works, which pro- duce about 70,000 tons of salt per annum. Large beds of rock-salt also occur in the neighbourhood, in which shafts have been sunk to a depth of more than 1200 feet. There is a harbour on the Elbe here, and a brisk trade is carried on in grain and timber. In 1885 Schénebeck con- tained 13,316 inhabitants (including the adjoining com- munities of Salze, Elmen, and Frohse, about 20,000).

SCHONEBERG, a so-called Prussian " village," in the province of Brandenburg, is now really a suburb of Berlin, which it adjoins on the south-west. It contains the royal botanic garden, a large maison de santé, and manufactories of paper collars, enamels, railway rolling-stock, and chem- icals. The population in 1880 was 11,180. The founda- tion of Alt-Schéneberg is ascribed to Albert the Bear (12th century), while Neu-Schéneberg was founded by Frederick the Great in 1750 to accommodate some Bohemian weavers, exiled for their religion (cf. Rrxporr).

SCHONGAUER, or SHozn, Martin (1450-c. 1488), the most able engraver and painter of the early German school. His father was a goldsmith named Casper, a native of Augsburg, who had settled at Colmar, where the chief

part of Martin’s life was spent.1 Schongauer estab- lished at Colmar a very important school of engraving, out of which grew the “little masters” of the succeeding gene- ration, and a large group of Nuremberg artists. As a painter, Schongauer was a pupil of the Flemish Roger Van der Weyden the Elder, and his rare existing pictures closely resemble, both in splendour of colour and exquisite minute- ness of execution, the best works of contemporary art in Flanders. Among the very few paintings which can with certainty be attributed to him, the chief is a magnificent altarpiece in the church of St Martin, at Colmar, repre- senting the Virgin and Child, crowned by Angels; with a background of roses—a work of the highest beauty, and large in scale, the figures being nearly life size. The Colmar Museum possesses eleven panels by his hand, and a small panel of David with Goliath’s Head in the Munich Gallery is attributed to him. The miniature painting of the Death of the Virgin in the English National Gallery is probably the work of some pupil.2 In 1488 Schongauer died at Colmar, according to the register of St Martin’s church.

The main work of Schongauer’s life was the production of a large number of most highly finished and beautiful engravings, which were largely sold, not only in Germany, but also in lTtaly and even in England. In this way his influence was very widely extended. Vasari speaks of him with much enthusiasm, and says that Michelangelo copied one of his cngravings—the Trial of St Anthony.? Schongauer was known in Italy by the names “Bel

1 The date of Schongauer’s birth is usually given wrongly as c. 1420; he was really born about thirty years later, and is mentioned by A. Diirer as being a young apprentice in 1470. His portrait in the Munich Pinakothek is now known to be a copy by Burgkmair, painted after 1510, from an original of 1483,—not 1453 as has been sup- posed. The date of Schongauer’s death, 1499, written on the back of the panel by Burgkmair is obviously a blunder; see Hensler in Naumann’s Archiv, 1867, p. 129, and Wurzbach, M. Schongauer, Vienna, 1880. These contradict the view of Goutzwiller, in his Martin Schongauer et son Ecole, Paris, 1875. Cf. Schnaase, “Gesch. M. Schongauers,” in the Mitthetl. der K. K. Commission, 1863, No. 7.

? Another painting of the same subject in the Doria Palace in Rome (usually attributed to Ditrer) is given to Schongauer by Crowe and Cavalcaselle,

Flemish Painters, London, 1872, p. 359; but the execution is not equal to Schongauer's wonderful touch.

3 An interesting example of Schongauer's popularity in Italy is

Martino" and "Martino d'Anversa." His subjects are always religious ; more than 130 prints from copper by his hand are still known, and about 100 more are the production of his bottega.4 Most of his pupils' plates as well as his own are signed M+S8. Among the most beautiful of Schongauer's engravings are the serics of the Passion and the Death and Coronation of the Virgin, and the series of the Wise and Foolish Virgins; as much as £420 has been given for a fine state of the Coronation plate. All are remarkable for their miniature-like treatment, their brilliant touch, and their chromatic force. Some, such as the Death of the Virgin and the Adoration of the Magi, are richly-filled compositions of many figures, treated with much largeness of style in spite of their minute scale. Though not free from the mannerism of his age and country, Schongauer possessed a rare feeling for beauty and for dignity of pose; and in technical power over his graver and copper plate he has never been surpassed.

The British Museum possesses a fine collection of Schongauer's prints. Fine facsimiles of his engravings have been produced by Amand-Durand with text by Duplessis, Paris, 1881.

SCHOOLCRAFT, Henry Rows (1793-1864), a North- American traveller, ethnologist, and author, was born 28th March 1793 at Watervliet (now called Guilderland), Albany county, New York, and died at Washington 10th December 1864. After studying chemistry and mineralogy at college he had several years' experience of their practical applica- tion, especially at a glass-factory of which his father was manager, and in 1817 published his Vitreology. In the following year he was appointed to the Geological Survey of Missouri and Arkansas, and in 1819 he published his View of the Lead Mines of Missouri. Soon after he accom- panied General Cass as geologist in his expedition to the Lake Superior copper region, and evinced such capacity for good exploring work on the frontier that in 1823 he was appointed "agent for Indian affairs." He then married the granddaughter of

an Indian chief; and during several years' official work near Lake Superior he acquired a vast fund of accurate information as to the physique, language, social habits, and tribal institutions of the American natives. From 1828 to 1832 Schoolcraft was an active member of the

Michigan legislature, during the same period delivering lec-

tures on the grammatical structure of the Indian language, which procured him the gold medal of the French Institute. In 1832 also, when on an embassy to some Indians, he ascer- tained the real source of the Mississippi to be Lake Itasca.

Previous to 1832 he had published Travels in the Central Por- tions of the Mississippi Valley, and in 1839 appeared his Algic Researches, containing "'Memoirs of a Residence of Thirty Years with the Indian Tribes," and also, notably, ''The Myth of Hia- watha and other Oral Legends,"—probably the first occurrence of the name immortalized (in 1855) in Longfellow's poem. School- craft's literary activity was indeed remarkable, since, besides his ethnological writings, he composed a considerable quantity of poetry and several minor prose works, especially Notes on the Lroquois (1848), Statistics of the Six Nations (1845), Scenes and Adventures in the Ozark Mountains (1853). His principal book, Historical and Statistical Information respecting the Indian Tribes of the United States, illustrated with 336 well-executed plates from original drawings, was issued under the patronage of Congress in six quarto volumes, from 1851 to 1857. It is a vast mine of ethnological researches as to the Red Men of America, systemati- cally arranged and fully, if not exhaustively, detailed, —describing not only their origin, history, and antiquities, but the physical and mental " type," the tribal characteristics, the vocabulary and grammar, the religion aud mythology. Schoolcraft's diplomatic work on the Indian frontier was important,—more than sixteen millions of acres being added to the States' territory by means of treaties which he negotiated.

SCHOOLS. See Epucation, Buinp, DEAF anp Dump, CoNSERVATORY, &c., and the relative sections of the articles on individual countries and states.

given by the lovely Faenza plate in the British Museum, on which is painted a copy of Martin's beautiful engraving of the Death of the Virgin ; see PoTTERY, vol. xix. p. 627.

4 See Bartsch, Peintre Graveur, and Willshire, Ancient Prints, best edition of 1877. According to a German tradition Schongauer was the inventor of printing from metal plates ; he certainly was one of the first who brought the art to perfection. See an intcresting article by Sidney Colvin in the Jahrbuch der k. preussischen Kunstsammlung, vi. p. 69, Berlin, 1885,

Meaning of "school."

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i ue word "school" as applied to painting! is used with various more or less comprehensive meanings. In its widest sense it includes all the painters of one country, of every date,—as, for example, 'the Italian school." In its narrowest sense it denotes a group of painters who all worked under the influence of one man,—as, for example, "the school of Raphael." In a third sense it is applied to the painters of one city or province who for successive generations worked under some common local influence, and with some general similarity in design, colour, or technique,—as, for example, " the Florentine school," ' the Umbrian school." For many reasons the existence of well-defined schools of painting is now almost wholly a thing of the past, and the conditions under which the modern artist gains his education, finds his patrons, and carries out his work have little in common with those

| Medieval which were prevalent throughout the Middle Ages. Painters

in the old times were closely bound together as fellow- members of a painters' guild, with its clearly defined set of rules and traditions; moreover, the universal system of apprenticeship, which compelled the young painter to work for a term of years in the bottega or studio of some estab- lished freedman of the guild, frequently caused the impress of the genius of one man to be very clearly stamped on a large number of pupils, who thus all picked up and fre- quently retained for life certain tricks of manner or peculi- arities of method which often make it difficult to distinguish the authorship of a special painting. The strong similar- ity which often runs through the productions of several artists who had been fellow-pupils under the same master was largely increased by the fact that most popular painters, such as Botticelli or Perugino, turned out from their botteghe many pictures to which the master himself

contributed little beyond the general design,—the actual _

execution being in part or even wholly the work of pupils or paid assistants. It was not beneath the dignity of a great painter to turn out works at different scales of prices to suit rich or poor, varying from the well-paid-for altar- piece given by some wealthy donor, which the master would paint wholly with his own hand, down to the humble bit of decorative work for the sides of a wedding cassone, which would be left entirely to the *prentice hand of a pupil. In other cases the heads only in a picture would be by the master himself or possibly the whole of the principal figures, the background and accessories being left to assistants. The buyer sometimes stipulated in a carefully drawn up contract that the cartoon or design should be wholly the work of the master, and that he should himself transfer it on to the wall or panel. It will thus be seen how impossible it is always to decide whether a picture should be classed as a piece of bottega work or as a genuine production of a noted master ; and this will explain the strange inequality of execution which is so striking in many of the works of the old masters, especially the Italians. Among the early Flemish and Dutch painters this method of painting does not appear to have been so largely practised, probably because they considered minute perfection of workmanship to be of paramount importance.

1. Jtalian.

In Italy, as in other parts of Europe, the Byzantine school of painting was for many centuries universally prevalent,? and it was not till quite the end of the 13th

1 For classical painting, see ARCHHOLOGY, vol. ii. p. 3438 sq. 5 see also Fresco, MuRaAL DxEcoRATION, TEMPERA, and the articles on separate painters.

2 This is especially the case with the numerous pupils of Perugino.

8 See MuRAL DecoratTION, vol. xvii. p. 43 sq.

‘Giunta Pisano, |||

century that one man of extraordinary talent—Giotto— broke through the long-established traditions and inaugu- rated the true Renaissance of this art. According to Vasari, it was Cimabue who first ceased to work in the Byzantine manner; but the truth is that his pictures, though certainly superior to those of his predecessors, are thoroughly charac- teristic specimens of the Byzantine style. Ghiberti, in his Commentary (a century earlier than Vasari’s work), with greater accuracy remarks that both Duccio of Siena and Cimabue worked in the Byzantine manner, and that Giotto was the first who learnt to paint with naturalistic truth.

In the 12th and the early part of the 13th century Pisa Lucca and Lucca were the chief seats of what rude painting then ex- and Pisa isted in Italy. A number of works of this date still exist, chiefly painted Cruci- fixions treated in the most con- ventional By- zantine manner.

who was paint- ing in the first half of the 13th century, was @& little superior to the otherwise dead level of hieratic conven- tionalism. He is said to have been Cimabue’s master. In the 14th century painting in Pisa was either Flor- entine or Sien-

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F1q. 1.—Centre of a triptych, by Duccio di Buonin- ‘ segna,—the Madonna with Angels, and, above, ese in style. David and six Prophets, (National Gallery,

No city, not London.) ere even Florence, was so fertile as Siena in native painters during the 13th and 14th centuries. The earliest, work- ing before 1300, did not emanci- patethemselves from the old Byzantine man- nerism ; Guido da Siena, Duc- cio (see fig. P 1) and Segna | di Buoninsegna é possessed many of the peculi- | arities of the old school,—its rigid attitudes, |= its thin stiff | folds, and its greenish dows in flesh tints. the first half of — Madonna, by Cimabue. thel 4thcentury Gallery.)

a number of very able painters were carrying on at Siena a parallel development to that which Giotto had inaugurated XXII. — 55

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Fig. 2.

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at Florence ; chief among them were Simone di Martino, Lippo Memmi, and especially Ambrogio Lorenzetti, «a

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painter of both panels and large frescos, which show rich and noble imaginative power and much technical skill. It is important to note that Ambrogio and probably other painters of his time were, like the ear- lier Pisan Niccola, beginning to study the then rare ex- amples of classical ff sculpture. Ghiberti, in his Commentary, | speaks with enthu-

: f heb Fig. 4.—Fresco over a door siasm of the beauty the convent of 8. Marco at Florence, by Fra of an antique statue Angelico—Christ meeting St Domenic and

which he knew only St Francis. _ from a drawing by Ambrogio Lorenzetti. In the second half of the 14th century Siena produced a large

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Fic. 5.—Picture on canvas in the ‘Uffizi, Florence, Birth of Venus,

number of more mediocre painters; but these were suc- ceeded by an abler generation, among whom the chief were

aS

“by Botticelli—the

(National Gallery.)

perhaps Sano di Pietro and Matteo di Giovanni, whose grand altarpiece (No. 1155), recently acquired, is one of

SCHOOLS OF PATRTING

the glories of the English National Gallery. cellent masters were ,

working at Siena throughout the 15th century and even later; the last names of any real note are those of Peruzzi and Beccafumi. Sodo- ma, though he settled in Siena in 1501, does not belong to the school of Siena ; his early life was passed at Milan, chiefly under the influence of Da Vinci. His talent was developed at Rome among the fol- y lowers of Raphael.

On the whole the Fic. 7.—Portrait head, by Ghirlandaio, from Florence, Florentine school one of his frescos in the retro-choir of 8S, surpasses ons import- Maria Novella, at Florence.

ance all others throughout Italy.

Many ex-

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Cimabue, though he

o-called School of Pan, by Signorelli, the of his easel pictures. (Berlin Gallery.) did not emancipate himself from the Byzantine manner, was a painter of real ==y”— = genius (see fig. 2). #7)

Giotto is perhaps = (| the most important _ 4}! painter in the his- tory of the develop- ment of art, for during the whole of the 14th century the painters of Flor- ence may be said to have been his pupils and imitators (see fig. 3). Orcag- na alone developed rather a different line, more richly de- ! corative in style and @ brighter in colour,— ‘ a link between the art of Giotto and

that of Siena. In the LS \ ; | 4

15th century Flor- Fic. 9.—Fresco of Isaiah, by Michelangelo, ence reached its pe- from the vault of the Sistine Chapel.

riod of highest artistic splendour and developed an almost

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Fia. 8.—The most beautiful

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16th century the Umbrian school produced many painters of great importance <= grouped around a : nuniber of different centres, such as Gub- bio, where Ottaviano Nelli lived; San Se- verino, with its two Lorenzos; Fabriano, famed for its able masters Allegretto Nuzi and Gentile da Fabriano ;_ Foligno, whence Niccolo took his name; and above |, all Borgo San Sepol- 14 cro, where Piero della | Francesca was born. f Piero was one of the most charming of all painters for his deli- cate modelling, ten- der colour, and beauty } of expression (see fig. 10). His masterpiece, a large altar-painting of the Madonna en- throned, with stand- si ; y Y ing saints at the side

andin fronta kneeling ae a / yy Y} g portrait of Duke Fed- Fic. 12.—Centre of triptych, by Perugino erigo da Montefeltro, painted for the Certosa near Pavia, (Na. in the Brera gallery, tional Gallery.)

naturalistic school, which appears to have been inaugurated by Masolino and Masaccio. Some few painters, such as Fra "Angelico (see fig. 4) and his pupil Benozzo Gozzoli, produced more purely sacred and decorative work, follow- ing the lead of Orcagna. As Baron Rumohr has pointed out, the main bulk of the Florentine 15th-century painters may be divided into three groups with different character- 'stics. The first, including Masolino, Masaccio, Lippo Lippi, Botticelli, Filippino Lippi, and their pupils, aimed especially at strong action, dramatic force, and passionate expression (see figs. 5 and 6). The second, including Baldovinetti, Ros- :

selli, Ghirlandaio, and his pupils, are remarkable for real- istic truth and vigor- ous individuality (see fig. 7). To the third | belong Ghiberti, who & began lifeas apainter, § Pollaiuolo,! Verroc- chio, and his pupils Leonardo da Vinci and Lorenzo di Credi, —a group largely in- fluenced by the prac- tice of the arts of the goldsmith and the sculptor. Signorelli, whose chief works | are at Orvieto and = | Monte Oliveto near = i Siena, was remark- Fic. 10.—Baptism of Christ, by Piero della | able for his know- Francesca. (National Gallery.)

| ledge and masterly treatment of the nude (see fig. 8), and had much influence on the early development of | Michelangelo, whose gigantic

genius in later life produced i the most original and powerful works that the modern | world has seen (see fig. 9). Andrea del Sarto was one i of the last artists of the golden age of painting in I Florence; the soft beauty of his works is, however, often marred by a monotonous mannerism. To him are wrongly attributed many paintings by Puligo and other scholars,

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GD ILM Pr aE ON Le 5 Fic. 11.—The Adoration of the Shepherds, by Fiorenzo di | (Gallery at Perugia.) who imitated his style with various degrees of closeness. The 16th century in Florence was a period of the most rapid decline and was for long chiefly remarkable for 1ts feeble caricatures of Michelangelo's inimitable style. Umbria. Between the end of the 14th and the beginning of the 1 It is interesting to note how Ant. Pollaiuolo's fine figure of St Sebastian in the National Gallery (London) resembles the statue of the same saint in Lucca cathedral by Matteo Civitale.

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Fic. 13._The Madonna between St John Baptist and St Mary Mag- dalene, by Andrea Mantegna, on canvas. (National Gallery.)

is, strange to say, attributed to his pupil Fra Carnovale." Ty OO

2 The attribution of this magnificent picture to Fra Carnovale rests wholly on a statement, evidently erroneous, of Pungileoni ; and hence many other works by Piero, such as the St Michael in the National Gallery, are wrongly given to Carnovale. Tt is doubtful whether any genuine picture by the latter is now known ; if the Brera picture were really by him he would not only be greater than his master Piero, but would be one of the chief painters of the 15th century.

Padua.

Arezzo,

Venice.

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Gentile da Fabriano worked in the purely religious and richly decorative style that characterized Fra Angelico at Perugia. Fiorenzo di Lorenzo (see fig. 11) and Bonfigli prepared the way for Perugino (see fig. 12) and his pupils Pinturicchio, Raphael, Lo Spagna, and others. Timoteo Viti was another Umbrian painter of great ability, whose portrait by Raphael in black and red chalk is one of the most beautiful of the drawings in the Print Room of the British Museum.

The Paduan school is chiefly remarkable for the great name of Andrea Mantegna, the pupil of Squarcione ; his firm and sculpturesque draw- [% ¥ ing is combined with great beauty of colour and vigor- ous expression (see fig. 13). His pupil Montagna also studied under Gian. Bellini at Venice. Andrea Mantegna influenced and was influenced FF by the Venetian school; to him are attributed many of the early paintings of his brother-in-law Gian. Bellini, such as the Vatican Pieta, and other works more remarkable ff for vigour than for grace.

The school of Arezzo was B early in its development. Margaritone, who is absurdly overpraised by his fellow- | townsman Vasari, was an artist of the most feeble abilities. In the 14th cen- tury Arezzo produced such Crivelli, 1476. able painters as Spinello di lery.)

Luca, Niccolo di Gerini, and Lorenzo di Bicci. In the 15th century it possessed no native school worth re- cording.

Venice did not come into prominence till the 15th cen- tury; the Vivarini family of Murano were at work about the middle of it, and were perhaps influ- enced by the Ger- man style of a con- temporary painter from Cologne, known as Johannes Aleman- Bi nus, who had settled 4 in Venice.

Some years later the tech- nical methods of Flanders were intro- duced by Antonello of Messina, who is said to have learnt the secret of an oil

i = ZB Fic. 14.—Centre of retable,

by (National Gal-

Van Eycks.} velli, an able though mannered painter of SSS the second half of Fic.15.—Portrait of Doge Loredano, by Gian, the 15th century, Bellini. (National Gallery.)

adhered to an earlier type than his contemporaries (see fig. 14). Gian. Bellini is one of the chief glories of

2 Antonello certainly possessed technical knowledge beyond that of his contemporaries in Venice, namely, that of glazing in transparent oil colours over a tempera ground, and he must either in Italy or in Flanders have come in contact with some painter of the Flemish school ; many of the chief Flemish painters visited Italy in the 15th century.

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the Venetian school (see fig. 15); as are also in a second- brother Gentile and his pupil Vittore

ary degree his

fa. 16.—So-called Sacred and Profane Love, by Titian. (Borghese Gallery, Rome.)

Carpaccio.? In the following century Venice possessed a school which for glory of colour and technical power has never been rivalled, r= 5 though it soon lost the sweet religious sentiment of the ear- lier Venetians. The chief names of this epoch are Palma Vecchio, Giorgione, Titian (see fig. 16), and Lorenzo Lotto, }i/ —the last a magnifi- cent portrait painter, > a branch of art in which Venice occu- pied the highest rank. In the 16th century 'Tuintoretto and Paul Veronese were supreme (see [477 fig.17). Inthe 17th

and 18th centuries

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Venice — produced | – K\; SSS iis some fairly good Fria. 17.—Various saints, by Paul Veronese. work. (Brera Gallery, Milan.)

The Brescian school has bequeathed two very illustrious names,—Moretto and his pupil Moroni, both portrait painters of extraordinary power during the 16th century (see fig. 18). Mo- te retto also painted some fine large altar-pieces, remark- able for their deli- cate __ silver – grey tones and refined modelling. Ro- manino was an ex- tremely able painter § of frescos as well as § of easel pictures. §

The school of § Verona, which ex- isted from the 13th to the 17th century, contains few names of highest import- ance; except that of Pisanello, the chief (Wle_=_===— Z were painters of the Fic. 18,—Portrait of a Tailor, by Moroni. end of the 15th and (National Gallery.) the early part of the 16th century, as Domenico and Fran- cesco Morone, Bonsignori, Girolamo dai Libri, and Cavaz-

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? It should be noted that there are a large number of forged signa- tures of Gian. Bellini, many of them attached to their own pictures by his pupils, such as Catena and Rondinelli.

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Brescia.

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ScreoOoLSs OF PAINTENG

zola. Paul Veronese, though at first he painted in his native town, soon attached himself to the Venetian school.

Ferrara possessed a small native school in the 15th and 16th centuries, Cosimo Tura, Ercole Grandi, Dosso Dossi, and Garofalo being among the chief artists. The paintings of this school are often vigorous in drawing, but rather mannered, and usually somewhat hard in colour. After

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Francia Gallery.)

1470 there was an intimate connexion between the schools of Ferrara and Bologna.

The Bologna school existed, though not in a very char- acteristic form, in the 14th century. : Francia and Lorenzo Costa of Fer- rara were its chief painters at the end of the 15th century (see fig. 19). It was, however, in the 16th and 17th centuries that Bologna took a leading place as a school of | Italian painting, the beginning of ‘ which dates from about 1480, when several able painters from Ferrara settled in Bologna. The three Car- acci, Guido (see fig. 20), Domeni- 2 chino, and Guercino were the most Fra. 20. —Eece Homo, by admired painters of their time, and ey (National Gal- continued to be esteemed far be- mi yond their real value till about the middle of the 19th century. Since then, however, the strong reaction in favour of earlier art has gone to the other extreme, and

the real merits of the Bolognese school, such as their

powerful drawing and skilful though visibly scholastic composition, are now usually overlooked. Both Modena and Parma possessed me- diocre painters in the § 14th and 15th cen- turies. In the 16th Correggio and his pupil Parmigiano attained to a very high degree of popu- larity. Correggio, who was largely in- fluenced by the Fer- rara-Bologna school, is sometimes weak in drawing and affected % in composition, but will always be es-}

teemed for the rich softness of his model- aa

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ling and the delicate Fic. 21.—The Education of Cupid, by Cor-

pearly tone of his flesh reggio. (National Gallery.)

tints. Fig. 21 is an excellent example of his style, though

much injured by repainting.

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The small school of Cremona occupies only a subordi- Cremona. nate position. Boccaccino was its ablest painter ; his rare works are remarkable for conscientious finish, combined with some provincial mannerism.

In the 15th and early part of the 16th century Milan Milan. had one of the most im- portant schools inItaly. Its first member of any note was Vincenzo Fop- pa, who was painting in 1457 and was the founder of the early school. Ambrogio Bor- { gognone (born c. 1455) was an artist of great merit and strong reli- } gious sentiment. He followed in the foot- steps of Foppa, and his } pictures are remarkable for the calm beauty of the faces, and for their f delicate colour (see fig. 22), which recalls the} manner of Piero della Francesca. Leonardo da Vinci, thoughtrained yg, 22.—The Mystic Marriage of St in Florence, may be said Catherine of Alexandria and St Cather- to have created the ine of Siena to Christ, by Ambrogio

later Milanese school. Borgognone. (National Gallery.)

Fig. 23 shows one of the very few pictures by his hand which still exist. The marvellous and almost universal genius of Leo- nardo caused his influence to be powerfully — ex- tended, not only among his im- mediate pupils, but also among almost all the Lombard paint- ers of his own and the succeed- ing generation. His closest fol- lowers were Sa- laino, Luini, Ce- sare da Sesto, Beltraffio, and§ Marco d'Oggi-§ ono, and in a lesser degree An drea Solario Gaudenzio Fer rari, and So doma, who intro duced a newstylet of

painting into Siena. Solario also studied in Flanders, and in Venice under Gian. Bel- lini, so that a curiously composite style is visible in some of his magnificent portraits (see fig. 24). Most of the pictures and many drawings usually attributed to Da Vinci are really the work of his pupils and imitators. Luini, in his magnificent frescos, was one of the last painters who preserved the religious dignity and simplicity of the older medieval schools. Fresco painting was practised by the Milanese after it had been generally abandoned elsewhere.

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oe Se Fic. 23.—The Madonna with the Rocks, by Leo- nardo da Vinci. (National Gallery.)

Rome.

Naples,

German school,

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Rome has always been remarkable for its absence of native talent in any of the oe res : fine arts, and nearly all the members of the so-called – Roman school came from = other cities. This school at . first consisted of the per- sonal pupils of Raphael,— Fran. Penni, Da Imola, Giv- : lio Romano, and Del Vaga. ; Sassoferrato and Carlo Ma- ratta were feeble but very popular painters in the 17th century. The early history of the @33 Re Neapolitan school is mostly “4—3).5Rm SASS mythical; it had no indi- FiG. 24.— Portrait of a Venetian vidual existence till the 16th aa by Andrea Solario. ; National Gallery) century, and then chiefly in the person of Caravaggio. During the 15th cen- tury many works of the Van Eycks and other Flemish painters were imported into Naples; some of these were afterwards claimed by the vanity of native writers as paintings by early Neapolitan artists, for whom ima- ginary names and his- Sy aoe tories were invented. The Spaniard Ribera, Salvator Rosa, and Giordano were its chief | members in the 17th century.

2. German.

It was especially at | Cologne in Westphalia }/ | and in the Rhine pro- vinces generally that German painting was developed at an early time. William of Col- ogne, who died about fy 1378, painted panels with much delicacy and richness of colour (see fig. 25). A number of large and highly finished Riis ee | altarpieces were painted Fig. 25.—St Veronica, by William of in this part of Germany Cologne. (National Gallery.) during the 15th century, but the names of very few of the painters of that time Tia ie are known. Artists such as Schongauer, Von Meckenen, Cra- f nach, and others were more at home in the engraving of copper and than in painting, and to some extent the same might be said of Albert Diirer, anf artist of the highest f and most varied ta- lents, who especially excelled as a portrait | painter (see fig. 26), The Hans Holbeins, father and son, es- pecially the latter, attained the highest rank as portrait painters ; nothing

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SCHOOLS OF PATTI se

can exceed the vivid truthfulness and exquisite work- manship of the por- traits by the younger Holbein (see fig. 27),

who also painted very

beautiful —_ religious pictures. Since his time Germany has

produced few note- = worthy painters, In the 19th century Overbeck was remark- able for an attempt to revive the long == dead religious spirit ° in painting, and he' attained much popu- larity, which, however, has nowalmost wholly died away.

3. Flemish.

Hubert and Jan The Van van Eyck, who were Fic. 27.—Portrait of an Unknown Lady, by Eycks Holbein. (The Hague Gallery.) me ein ginning of the 15th century, were artists of the very —a highest rank; with pepe a their

unrivalled tech-} nical skill, their ex quisite finish, and the} splendour of thei colour, they produced f works which in some respects even sur

other artists ever lavished time and patient labour quite

to which Jan van Eyck did upon some Yr

of his works, such LPL Ue jE Z, as the Arnolfini and Fic. 28.—Portrait, by Jan van Eyck ; 1433. other portraits in the (National Gallery.)

Fic. 29.—The Entombment of Christ, by Van der Weyden the elder, (National Gallery.)

kneeling Donor in the Louvre. This last is one of the

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loveliest pictures in the world, both as a figure painting and from its exquisite miniature landscape and town in the distance, all glowing with the warm light of the setting sun. The elder Van der Weyden was a most able pupil of the Van Eycks; he occasionally practised a very different technical method from that usually employed in Flanders,— that is to say, he painted in pure tempera colours on un- primed linen, the flesh tints especially being laid on ex- tremely thin, so that the texture of the linen remains unhidden. Other colours, such as a smalto blue used for draperies, are applied in greater body, and the whole is left uncovered by any varnish. A very perfect example of this exists in the National Gallery (see fig. 29). The special method used a

with such success by Z Z the Van Eycks and their school was to paint the whole pic- EE ture carefully in tem- pera and then to glaze it over in trans- E& parent oil colours ; the use of oil! as ak

medium was com- mon in the 13th century and even

earlier (see Murau Decoration). To the school of the Van Eycks belong} a number of other SG LOE MB very talented paint- Fig 30.—St Mary Magdalene, attributed to ers, who inherited the younger Van der Weyden.

(National much of their mar- Gallery.) vellous delicacy of finish and richness of colour ; the chief of these were Memling, Van der Meire, and the younger Van der Weyden, to whom is attributed No. 654 in the National Gallery (see fig. 30). The colour of this lovely picture is magnificent beyond all description. Quintin Matsys (Massys) and Gheerardt David also produced works of great beauty and ex- traordinary finished execution." At the beginning © of the 16th century Flemish art ~~*began to, © lose rapidly in vigour, . a weaker style being © substituted under the influence of Italy. To this period belong Mabuse, Van Orley, and Patinir, who ap*~~ *pear to have been special admirers of Raphael's latest man- ner. In the latter half of the century Antonjj : Mor, usually known Fic. 31.—Portrait by Rubens, known as the as Antonio Moro, was "Chapeau de Poil." (National Gallery.)*

a portrait painter of the very highest rank. A por-

1 Blaborate directions for painting in oil are given by the German monk Theophilus (Sched. div. art., i. 37, 38), who wrote in the 12th century. ' ; ;

2 Though the elder Van der Weyden and other Flemish painters of his time visited Italy, the Italian style of painting appears to have had. very little influence on their vigorous works. The weaker Flemish painters of the 16th century, on the contrary, were close imitators of the Italians and produced pictures of a rather feebly pretty type.

trait of Queen Mary of England at Madrid, and one of a youth of the Farnese family at Parma, are real masterpieces of portraiture. Hep spent some time in | England. The Breu- {ij ghel family in the Hil] 16th and 17th cen- ji turies produced feeble Min} works finished with | microscopic _ detail. Rubens and his pupil Vandyck in the 17th century were among the greatest portrait painters the world has ever seen (see | figs. 31 and 32), and ¢ had many able fol- % lowers on the Con-§ WESAALLD:

tinent and in Eng- Fie.32.—Portrait of Cornelius Van der Geest, land. by Vandyck or Rubens. (National Gallery.)

4, Dutch.

This school was chiefly remarkable for its painters of Dutch genre subjects, often treated with a very ignoble realism, school. especially by the various members of the Teniers family. Rembrandt, the greatest painter of the school, developed a quite original style, remarkable for the force shown in his effective treatment of light and shade. The vigorous life and technical skill shown in some of his por- traits have never been – surpassed (see fig. & 33). Asa rule, how- ZY ever, he cared but | little for colour, and used the etching 7 needle with special | / enjoyment and dex- terity. Terburg, Ger- hard Dou(Douw), and Wouwerman had more sense of beauty, and worked with the most miniature-like deli- Fic. 33.—Portrait of an Old Woman, by cacy. Another school Rembrandt. (National Gallery.) excelled in landscape, especially Ruysdael and Hobbema (see figs. 34 and 35). Vandevelde was remarkable for

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Fia. 34.— Landscape, by Ruysdael.

(National Gallery.)

his sea-pieces, and Paul Potter for quiet pastoral scenes

with exquisitely painted cattle. Throughout the 17th

Spanish school.

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century the painters of the Dutch school far outnumbered

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Fic. 35.—View of Middelharnis in Holland, by Hobbema. (National Gallery.)

those of any other, and many of them reached a very fair average of skill.

5. Spanish. The early Spanish painters of the 15th and 16th centuries were merely feeble imitators of Italian art. Many of them, such as Juan de Juanes, studied in Italy. Ribalta and Zurbaran were per- haps the first able

artists who deve- loped a _ national style. The latter is

remarkable for his paintings of monks ; fig. 36 shows one of the best examples. His large altarpieces are less successful. Velazquez, one of the greatest masters of skilful execution the world has seen, was alike great in portraiture (see fig. 37) and in large figure . subjects. His early religious paintings, executed under the influence of Ribalta, are far inferior to his later works, the best of which are at Madrid. Murillo is usually rather un- dervalued; he was very unequal in his work, and is well represented nowhere 4 except at Seville. No words can de- scribe the exquisite religious beauty and

*pathos of his great * picture of Christ on Fig. 37.—Portrait of Philip IV. of Spain, by*

this Cries "ben: ding Velazquez. (National Gallery.) down to embrace St Francis.

Fig. 36.—Franeiscan Friar, by Zurbaran. (National Gallery.)

Goya, who lived into the

19th century, was an artist of great power, haunted by a hideous imagination. Fortuny, a very clever young painter, who died in Rome in 1874, was remarkable for his daring use of the most brilliant colour, with which his pictures are studded like a mosaic. His success has caused him to have countless imitators, most of whom reproduce the faults rather than the merits of his work. His influence on modern Continental art has been very great.

6. French.

French art, like that of Spain, was almost wholly under French Italian influence during the 15th and 16th centuries, school, Nicolas Poussin, in the 17th century, was the first to develop a native style, though he was much influenced by Titian. His best works are bacchanalian scenes, of which

one of the finest is in the National Gallery (sce fig. 38).

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Fiq@. 38.—Bacchanalian Scene, by Nicolas Poussin, (National Gallery.)

When at his best his flesh painting resembles that of Titian, but it is frequently marred by unpleasant hot colouring. Claude Lorrain is remarkable for his beauti- ful and imaginative landscapes,—often wanting in a real study of nature (see fig. 39). His finest works are in

Fic. 30.— Landscape, by Claude Lorrain. (National Gallery.)

England (see p. 445). Throughout the 18th century the French school was very prolific, but shared the mediocrity of the age, the corruption and artificiality of which im- pressed themselves strongly on the painting of the time. The most popular artists of that century were Watteau, Boucher, Greuze, Claude Vernet, Fragonard, and David, the reviver of the pseudo-classic style. In the first half of the 19th century Prud'hon, Ingres, Horace Vernet, and Delaroche—artists of only moderate merit—were in great repute, and more deservedly the very brilliant landscape painter Rousseau, Millet, though little valued during his lifetime, is now highly appreciated. Regnault, a very able

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painter, who while yet young was killed at the siege of Paris in 1871, belongs to the latest development of French art. At present (1886) Paris possesses by far the most im- portant school of art existing, and French painters on the whole are supreme in power of drawing and in technical skill. Unhappily these great merits are often counter- balanced by false

sentimentalism or excessive realism, and especially by gross sensuality. Art in France—that is, in Paris—is now in a state of the most prolific activity, and is branching out into new and startling phases, such as the impressionist style, in which form is suppressed for the sake of colour, and the naturalist school, which leans rather to what is ugly or even loathsome; to the latter belong some of the technically ablest painters alive.! As in Spain and Italy, the influence of Fortuny is strong in Paris, and Parisian influence now extends very widely, as the Ecole des Beaux-Arts is resorted to by art students from all countries except Germany.

7. British.

The modern Bri- tish? school begins with the painters of miniature portraits in the 16th and 17th # centuries, among whom the earliest 3 were Nicholas Hil- liard and Isaac Oli- ver, artists of some | note in the reign of Elizabeth. Many } very beautiful minia- tures were produced by them and by the younger Peter Oli- ver, who rose into celebrity under '\ oats | the Commonwealth. Fic. "40.—Portrait of Dr Johuson, by Rey- Other able portrait olds. (National Gallery. A replica of painters of the 17th _ this exists in Pembroke College, Oxford.) century were the Scotch Jamesone, a pupil of Rubens, Wiliam Dobson, a SRR ANS pupil of Vandyck,? § AE and Samuel Cooper ; but the chief court painters after the Restoration were the Flemish Sir Peter Lely and Sir God- frey Kneller, whose influence on art in England was disas- trous. The 18th fe century produced | many painters of the | highest merit, as Hogarth, who stands unrivalled as a cari- caturist and moral- ist, Reynolds and his i rival Gainsborough, Fie. 41.—Portrait of Mrs Siddons, by Gains- notable among the borough. (National Gallery.) chief portrait painters of the world (see figs. 40 and

1A few years ago a gold medal was won at the Salon by a picture of this class,—a real masterpiece of technical skill. It represented Job as an emaciated old man covered with ulcers, carefully studied in the Paris hospitals for skin diseases.

2 For medieval painting in England, see MuRAL DECORATION, vol.

xvii. p. 45. 8 Vandyck lived and worked in England from 1632 to 1641.

41), and Richard Wilson, the founder of the English school of landscape, the chief artistic speciality of the country. The three brothers Smith of Chichester, Gainsborough, and later in the a

century John (Old) Crome of Norwich and James Ward, were all landscape _, painters of great (YZ ability. England has since the 18th cen- tury been specially _ famed for its school – of water-colour paint- ers, of which Paul Sandby was one of the founders; he was A followed by Wheat-' ae ley, Webber, Girtin, /\\ and Prout. Sir Henry

yy Raeburn was a Scot-— r ' tish portrait painter \

of the highest rank (see fig. 42), but Fre. 42.—Portrait of Rev. Arch. Alison, by Sir was far less ad- H. Raeburn. (National Portrait Gallery.) mired in England than the very feeble Lawrence. Little favour of many of the most popular

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Fig. 43.—The Temeraire towed to her last Moorings, by Turner. (National Gallery.)

painters of that time, as West, Barry, Fuseli, North- cote, and Shee, who practised what was considered the highest branches of art, such as _ histori- cal painting. William Blake, in spite of his wonderful poet- = ical and ima- ginative power, |: lived and died with very inade- quate recogni- tion. To the first & half of the 19th

Turner, ' greatest of all NYS

landscape paint- \ ers (see fig. 43), \ \

and his very Fic. 44.—Portrait, by Danie Gabriel Rossetti.

able contempo-

raries Constable, J. J. Chalon, Copley Fielding, and Stan- XXI. — 56

field. Scotland produced two of the chief painters of this time—Sir William Allan and Sir David Wilkie. Mulready was a fine draughtsman, skilful in composition, but weak in colour. Etty's scholastic drawing recalls the merits and faults of the Bolognese school, and he is frequently very fine in colour. Eastlake was weak in drawing and feeble in composition. Sir Edwin Landseer excelled in animal painting, especially in his rendering of the texture of hair and fur, but was frequently rather harsh in colour and commonplace in motive. David Roberts is worthy of note for his very clever water- colours of architectural scenes, J. F. Lewis for his ex-

quisitely finished Oriental subjects, and J. 8. Raven for his grand and imaginative landscapes, which, however, are very little known. Dante Gabriel Rossetti (see fig. 44), who died in 1882, was one of the chief painters of the century, both for the richness of his colouring and for his strong poetical imagination ; he was one of the founders of the Pre-Raphaelite "brotherhood " (see Rossertr), whose rise, development, and widespread influence on painting in Britain have been the chief artistic events in this century, and have produced a few painters whose earnestness of purpose and originality of power give them a foremost and absolutely unique position in modern Europe.

List or PAInrers.

The following lists give the chief painters classified according to their schools in

chronological order.1

1. Ltalian Schools. ?

(i.) Lucca and Pisa.

Lotharius and Ranuecius of Lucca, known only from a document, a treaty with Pisa, signed by them in

1228,

Bonaventura Berlinghieri,3 f1.1235-44.

Enrico of Pisa, miniatures, f1.1238.

Marco Berlinghieri, miniatures ina MS. Bible, 1.1250.

Barone Berlinghieri, several crucifixes, f1.1240-84.

Deodati Orlandi of Lucca, f1.12S8-1301.

Giunta Pisano, first half of 13th cen- tury.

Talo Vanni, second half of 14th cen- tury.

The names of many other Pisan painters of the later part of the 13th century are recorded in documents, but no paintings by them are known to exist.

(ii.) Siena.4

Guido da Siena, f1.1220.

Diotisalvi, f1.1270.

Duccio di Buoninsegna, 1.1300.

Segna di Buoninsegna, 1.1305.

Simone di Martino, ¢.12S5-¢.1344.

Lippo Memmi, d.c.1357.

Berna, fl.early 14th century.

Pietro Lorenzetti, f1.1320-c.1348.

Ambrogio Lorenzetti, Pietro's brother, f1.1330, d.c.1348.

Niccolo di Segna, 1.1342.

Jacopo di Mino, f1.1342.

Lippo Vanni, f1.1350-¢.1376.

Niccolo di Buonaccorso, £1.1350-88.

Bartolo di Fredi, f1.1353-1410.

Luca di Tommé, £1.1367.

Paolo di Giovanni, f1.13S0.

Meo da Siena, 1.1380.

Taddeo di Bartolo, 1363-1422,

Andrea di Bartolo, f1.1380, 4.1428,

Gregorio Cecchi, f1.1400.

Martino di Bartolomeo, f1.1403, d.1433.

Domenico di Bartolo, d.1449,

Stefano di Giovanni, f1.142S, 4.1450.

Giovanni di Paolo, ¢.1403-1482.

Sano di Pietro, 1406-81.

Lorenzo di Pietro (Vecchietta), 1410- 80, better known as a sculptor.

Matteo di Giovanni, 1420-95,

Benvenuto di Giovanni, 1436-1518.

Francesco di Giorgio, b.1439.

Neroccio di Landi, 1447-1500.

Pietro di Domenico, 1457-1501.

Bernardino Fungai, 1460-1516,

Andrea di Niccolo, 1460-1529,

Girolamo di Benvenuto, 1470-1524.

Giacomo Pacchiarotto,5 b.1474,

Girolamo del Pacchia,5 1477 to after

1521. 3

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1 When the years ofa painter's birth and death are unknown, fl. for "flourished" is put before the date, which is taken either from existing dated pictures or from documentary records.

2 Of recent years a more careful search for documents relating to Italian art has done much to correct the dates of many painters' lives ; hence in niany cases the years of a painter's birth and death given in the following list differ from those in most previous works on the subject.

3 The three Berlinghieri were of a Milanese family, but worked mostly at Lucea.

4 Most valuable assistance in the preparation of this list of Sienese painters was given by Mr C. Fairfax Murray.

5 The works of these two painters are frequently confounded ; a chromolitho-

Giov. Ant. Bazzi (Sodoma), 1477-1549 ; though not of the Sienese school, he had much influence on the Sienese painters in the early part of the 16th century.

Baldassare Peruzzi, 1481-1537.

Domenico Micharino (Beccafumi),

1486-1550.

The most important Sienese painters during the second half of the 16th and the 17th centuries were Arcangiolo Salimbeni, Alessandro Casolani, Pietro Savi, Ventura Salimbeni, Francesco Vanni, Francesco Rustici, Rutilio Manetti, Astolfo Petrazzi, and Raf- faello Vanni.6

(iii.) Florence.

Andrea Tafi, 1213-21294 (Vasari).

Coppo di Marcovaldo, f1.1261-75.

Gaddo Gaddi, 1239-1312 (according to Vasari).

Giovanni Gualtieri (Cimabue), 1240- ? 1302.

Giotto di Bondone, 1276-1337.

Taddeo Gaddi, ?1300 to after 1366.

Puccio Capanna, first half of 14th century.

Buonamico Christofani (Buffalmacco), first half of 14th century.

Giovanni Jacobi da Milano, 1.1365.

Giottino (real name doubtful), first half of 14th century.

Jacopo Landini, ¢.1310-c.1390,

Agnolo Gaddi (son of Taddeo Gaddi), 14th century.

Andrea Oreagna, ¢.1316-¢.1376, and his brothers Lionardo? (f1.1332-47) and Jacopo.

Francesco Traini, chief of Oreagna's pupils, f1.1341-45.

Antonio Longhi(Veneziano), f1.1370-87.

Gherardo Starnina, 1354, d. after 1406.

Giuliano d'Arrigo (Pesello), 1367 to after 1427,

Tommaso di Fini (Masolino), b.1383.

Lorenzo Monaco, f1.1404-13.

Fra Angelico (Guido di Vicchio), 1387-

1455,

Andrea del Castagno, 1390-1457.

Paolo Uccello, ¢.1396-1475.

Tommaso di 8. Giovanni (Masaccio),

1402-29,

Fra Lippo Lippi, ¢.1412-69.

Francesco di Pesello(Pesellino), 1422-57.

Alesso Baldovinetti, 1422-99.

Domenico Veneziano, f1.1438, 4.1461.

Benozzo Gozzoli, 1424, d. after 1485.

Andrea Verrocchio, 1482-¢.1488.

Antonio Pollaiuolo, 1433-98.

Cosimo Rosselli, 1439-1507.

Luca Signorelli (Da Cortona), 1441- 1523 ; his principal pupil was Girolamo Genga, 1476-1551.

Pietro Pollaiuolo, 1443, d. before 1496.

Sandro Botticelli, 1447-1515.

Domenico Bigordi (Ghirlandaio), 1449- 94. His works were closely imitated by his pupil and brother-in-law Bastiano Mainardi.

Lorenzo di Credi, 1459-1537. His chief scholar was Sogliani, 1492-1544,

Filippino Lippi, 1460-1504.

Piero di Cosimo, 1462-1521.

Raffaellino del Garbo, 1466-1524.

Francesco Granacci, 1469-1543.

Giuliano Bugiardini, 1471-1554.

Mariotto Albertinelli, 1474-1515.

Fra Bartolomeo della Porta, 1475-1517.

graph of a fresco by Pacchia—a scene

froin the life of St Catherine—has been published by the Arundel Society as being from a work of Pacchiarotto,

§ See Lanzi, Painting in Italy, Bohn's

ed., vol. i. p. 290.

7 Wrongly called Bernardo by Vasari.

Michelangelo Buonarroti, 1475-1564.

Francesco di Cristofano (Francia Bigio), 1482-1525,

Nidolfo Ghirlandaio, 1483-1560.

Andrea del Sarto, 1487-1531. His scholar Puligo closely imitated his style.

J mene Carucci da Pontormo, 1494-

1557.

Giulio Clovio of Dalmatia, miniaturist,

1498-1578,

Angelo Bronzino, 1502-72.

Marcello Venusti, d.c.1580.

Daniele da Volterra, 1509-66.

Francesco de' Rossi (called Del Salvi- ati), 1510-63.

Giorgio Vasari, art historian, 1512-74,

Alessandro Allori, 1535-1607.

Orazio Lomi de' Gentileschi, 1562-1646.

Cristoforo Allori, 1577-1621,

Carlo Dolci, 1616-86. The other Florentine painters of the

later part of the 16th and 17th centuries

are of little importance.

(iv.) Umbria.

Oderisio of Gubbio, miniaturist (Dante, Pur., xi. 79), f1.1264-¢.1299.

Guido Palmerucci (Gubbio), 1280-c.

1345,

Allegretto Nuzi, f1.1346-85.

Gentile da Fabriano, b. between 1360 and 1370, d.1450.

Ottaviano Nelli, f1.1410-34.

Lorenzo da San Severino, b.1374, fi.

1400.

Piero Borghese (Della Francesea), c. 1415 to after 1494.

Fra Carnovale, pupil of P. Borghese, second half of 15th century.

Benedetto Bonfigli, £1.1450-96.

Niccolo of Foligno,8 f1.1458-99.

Lorenzo da San Severino the younger, f1.1480-96,

Melozzo da Forli, 1488-94.

Fiorenzo di Lorenzo, f1.1470-99. Giovanni Santi (father of Raphael), pupil of Melozzo da Forli, 4.1494. Pietro Vannucci (Perugino), 1446-1524. Bernardino di Betto (Pinturicchio),

1454-1513.

Marco Palmezzano of Forli, 0.1456, d. after 1537.

Andrea Alovigi (L'Ingegno), f1.1484.

Lodovico Angeli, fl.14S1-1506.

Giovanni di Pietro (Lo Spagna), 1.1503, d. in or before 1530.

Giannicola Manni, f1.1498, d.1544.

Timoteo Viti, 1469-1523.

Raphael Sanzio, 1483-1520 ; belonged to the Perugian school only during the first few years of his career.

Less important Umbrian painters of the 15th century were Giov. Boccati, Girolamo di Giovanni, Matteo da Gualdo, Bartolomeo di Tommaso, and Pietro Antonio, also a number of third- rate painters who belonged to the school of Perugino.

(v.) Padua.

Guariento, f1.1316-65.

Justus of Padua (Giusto Giovanni), c. 1330-1400, apparently a follower of Giotto.

Francesco Squarcione, 1394-1474.

Gregorio Schiavone, second half of 15th century.

Andrea Mantegna, 1431-1506. His chief pupils were his son Francesco (b. c. 1470, died after 1517), Carlo (called) del Mantegna, Gioy. Fran. Carotto, and Francesco Bonsignori of Verona

(1455-1519).

8 Wrongly called Alunno by Vasari.

Bartolomeo Montagna (f1.1487, d.1523), a pupil of Mantegna and Gian. Bel- lini, founded a school at Vicenza, to which belonged Giovanni Speranza and Benedetto Montagna, the latter an able engraver.

(vi.) Arezzo.

Margaritone di Magnano9 (according to Vasari), 1216-93.

Mantano di Arezzo, £1.1305-10.

Jacopo di Casentino, ¢.1310-¢.1390.

Spinello di Luca (Aretino), chief pupil of Casentino,10 ¢.1330-1410,

Niccolo di Pietro Gerini, d. before 1389. His son Lorenzo was also a painter.

Lorenzo di Bicci, f1.1370-1409.

Parri Spinelli, early 15th century.

Bicci di Lorenzo, 1.1420, 4.1459.

Bartolomeo della Gatta, c.1410-91. His pupils Domenico Pecori and Niccolo Soggi were men of but little talent.

(vii.) Venice.

Niccolo Semitecolo, f1.1351-1400.

Lorenzo Veneziano, £1.1357-79.

Stefano Veneziano, f1.1369-81.

Jacobello del Fiore, £1.1400-39.

Johannes Alemannus, probably of Cologne, f1.1440 sq.

Jacopo Bellini, 1395-1470; and his two sons—

Gentile Bellini (1421-1507) and

Giovanni Bellini (1426-1516). Gio- vanni's closest imitator was Niccolo Rondinelli.

Giovanni Vivarini of Murano, f1.1440-47,

Antonio Vivarini, f1.1440-70.

Bartolomeo Vivarini, 1.1459-98,

Alvise Vivarini, f1.1464-1503.

Antonello da Messina, ¢.1444-¢.1493.

Carlo Crivelli, f1.1468 to after 1500.

Mansueti, f1.1494-1500.

Vittore Carpaccio, ¢.1450 to after 1522. His chief pupil was Lazzaro Sebastiani.

Marco Marziale, f1.1492-1507,

Marco Basaiti, f1.1470-1520.

Francesco Torbido (Moro), 1486-1546.

Vicenzo Catena, 1.1495, d. after 1531.

Cima da Conegliano, f1.1489-1517.

Macrino d'Alba, £1.1496-1508.

Bartolomeo Veneziano, fl.¢.1505-30.

Marco Belli, f1.1511.

Francesco Bissolo, f1.1500-28.

Pellegrino da San Daniele, ¢.1465-1547.

Andrea Previtali, f1.1506, d.1528,

Lorenzo Lotto, ¢.1476-1555.

Giorgio Barbarelli (Giorgione), 1477-

1511.

Tiziano Vecellio, 1477-1576.

Jacopo Palma (Vecchio), 1480-1528.

Giov. Ant. Licinio (Pordenone), 1483-

1539.

Sebastiano Luciani (Del Piombo), 1485-

1547.

Girolamo da Treviso, 1497-1544.

Bonifacio. There were three painters of this name,—Bonifacio of Verona, d.1540 ; another Veronese Bonifacio,

9 Margaritone, a very bad painter, much overpraised by Vasari, belongs really to no special school; his works are inferior to contemporary and earlier paintings of the Byzantine school. The National Gallery possesses an ugly but interesting example of his work, signed 'Margarit' de Aritio." Some other painters born at Arezzo belong to the Florentine school, among them Giorgia Vasari, a very feeble imitator of Michel- angelo.

10 These two painters belong rather to the Florentine school.

4.1553, both pupils of Palma Vecchio, and a Venetian, who was painting after 1579, probably a son of one of the elder Bonifacios.

Girolamo da Santacroce, f1.1520-48.

Paris Bordone, 1500-71.

Jacopo da Ponte (Bassano), 1510-92. Four of his sons were painters.

Jacopo Robusti (Tintoretto), 1512-94.

Bernardino da Pordenone, 1520-70.

Andrea Schiavone, 1522-82.

Paolo Cagliari (Veronese), 1528-88.

Battista Zelotti, ¢.1532-92.

Jacopo Pahna (Giovane), 1544-1628.

Alessandro Varotari(Padovanino),1590-

1650.

Sebastiano Ricci, 1660-1734.

Giov. Batt. Tiepolo, 1696-1770.

Antonio Canale (Canaletto), 1697-1768.

Francesco Zuccherelli, 1702-93.

Francesco Guardi, 1712-93.

Bernardo Bellotto, 1720-80, nephew of Canaletto and a close imitator of his style.

(viii.) Brescia.

Vincenzo Foppa, 1.1450-66 (see also Milan).

Vincenzo Civerchio of Crema, f1.1495-

1540.

Fioravante Ferramola, end of 15th cent.

Girolamo Romani (11 Romanino), c¢. 1486 -¢,1566.

Girolamo Savoldo, ¢.1487 to after 1540.

Alessandro Buonvicino (Moretto), 1498-

1555.

a Batt. Moroni of Bergamo, ¢.1525-

8.

(ix.) Verona.

Turone da Verona, fi.1360.

Altichiero da Zevio and Giacomo degli Avanzi, 14th century. The other Veronese painters of the 14th cen- tury were of little artistic power.

Vittore Pisano (Pisanello), 1380 – c.1455. His chief pupils were Stefano da Zevio, Giovanni Oriolo, and Bono of Ferrara (see Ferrara).

Domenico Morone, d. after 1503.

Liberale da Verona, 1451-1536.

Francesco Bonsignori, 1455-1519.

Niccolo Giolfino, ¢.1465 to after 1518.

Francesco Morone, 1473-1529.

Girolamo dai Libri, 1474-1556.

Paolo Morando (Cavazzola), 1486-1522. Paolo Veronese and his imitator

Battista Zelotti, a native of Verona,

pelong rather to the Venetian school.

(x.) Ferrara.

Cosimo Tura, 1430-71496.

Francesco Cossa, latter part of 15th century.

Bono da Ferrara, f1.1461, pupil of Pis- anello.

Francesco Bianchi, ¢.1445-1510.

Ercole Grandi! (or Roberti), ¢.1445, d. before 1513.

Giovanni Oriolo, f1.1449 to after 1461, pupil of Pisanello.

Lorenzo Costa, 1460-1535, belongs rather to the Bolognese school.

Gian. Battista Bartucci, fl.c.1506.

Dosso Dossi, 1480-1560. His brother Gianbattista was also a painter.

Lodovico Mazzolino da Ferrara, 1478- ? 1530.

Francesco Zaganelli da Cotignola, fl. 1505-18, and his brother Bernardino.

Benvenuto Tisio (Garofalo), 1481-1559.

Giovanni Battista Benvenuti (LiOrto- lano), early part of 16th century.

Girolamo Carpi, 1501-56.

(xi.) Bologna.

Guido da Bologna, f1.1177.

Ventura, f1.1197-1217.

Ursone, fi.1226-48.2

Vitale da Bologna, f1.1320-50.

Lippo Dalmasii, f1.1376 to after 1410.

Simone (called) de' Crocifissi, f1.1370.

Giacomo degli Avanzi, fl. later part of 14th century, also classed with Veronese school.

Jacopo di Paolo, early 15th century.

Marco Zoppo, fi.1471-98.

Francesco Raibolini (called Francia after his master), ¢.1450-1517.

Lorenzo Costa of Ferrara, 1460-1535.

Francesco Primaticcio, 1504-70.

Ludovico Caracci, 1555-1619.

Agostino Caracci, 1558-1601.

Annibale Caracci, 1560-1609.

1 As Comm. Morelli has pointed out, Grandi's signature and the date 1531 on a picture of the Entombment, formerly in the Borghese cea in Rome, are a forgery,— Grandi really having died long before; it may, however, "be by the younger painter of the same name.

2See Malvasia, Felsina Pittrice, Bologna, 1678.

Guido Reni, 1575-1642.

Francesco Albani, 1578-1660.

Domenico Zampieri (Domenichino),

1581-1641.

Francesco Barbieri (Guercino), 1591-

1666.

Guido Cagnaccio, 1601-81.

Pier Fran. Mola, 1612-68.

Elisabetta Sirani, 1638-65.

(xii.) Modena and Parma.

Tommaso da Modena, f1.1350-60. Barnabo da Modena, f1.1360-80. Bartolomeo Grossi, 1.1462.

Jacopo Loschi, fl.c.1460.

Cristoforo Caselli, 1.1499.

Lodovico da Parma, pupil of Francia of Bologna, early 16th century.

Mazzuola, thrce brothers, Michele, Pierilario, and Filippo, early 16th century.

Antonio Allegri (Correggio), 1493-1534, closely connected with the Ferrara school.

Francesco Mazzuola (Parmigiano), 1504-40. His pupil Girolamo Mazzuola closely imitated his works.

(xiii.) Cremona.

Francesco Tacconi, f1.1464-90.

Altobello Melone, f1.1515-20.

Boccaccio Boccaccino, f1.1496, d.1525.

Giulio Campi, 1500-72.

(xiv.) Milan.

Vincenzo Foppa, f1.1450-66 (see also Brescia).

Ambrogio Bevilacqua, fl.1486.

Vincenzo Civerchio (see Brescia), closely connected with early Milanese school.

Francesco Bianchi (Il Frare), 1447-1510.

Bernardo Zenale da Treviglio, d. after

1521.

Leonardo da Vinci, 1452-1519. To his school belong Bernardino Luini (. 1470 to after 1530), Sodoma (1477- 1549), Andrea da Solario (¢. 1458 to after 1515), and more directly Gian. Pietrino, Ambrogio Preda, Cesare da Sesto (1480-1521), Marco d'Oggiono (c. 1470-1549), Andrea Salaino, and Giov. Ant. Beltraffio (1467-1516).

Ambrogio da Fossano (Borgognone), ¢. 1455-1528 ; his two brothers were his pupils and assistants.

Bartolomeo Suardi. (Bramantino) (fl. 1495-1529) and

Gaudenzio Ferrari (1485-1549) were also influenced by Leonardo. Ferrari's chief pupils were :-—

Bernardino Lanini (¢.1508-¢.1578) and Giov. Paolo Lomazzo, the Milanese art historian, whose Trattato della Pintura was published in 1584. Ambrogio Figino was an able scholar of Lomazzo, together with Cristoforo Ciocca.

Ercole Procaccini, 1520-90.

Bernardino Campi, 1522-90.

Camillo Procaccini, 1546-1626.

Giov. Batt. Crespi, 1557-1683.

A number of inferior Milanese painters lived in the 16th century.3

(xv.) Rome.

Raphael Sangio, 1483-1520, who in his early youth belonged first to the Perugian and then to the Florentine school, was the founder of the so-called Roman school, which at first consisted almost wholly of his pupils.

Giov. Fran. Penni (il Fattore), 1468-

1528.

Innocenzo da Imola, 1490-1549.

Polidoro da Caravaggio, 1495-1543.

Giulio Pippi de' Giannuzzi (Romano),

1498-1546.

Perino del Vaga, 1500-47.

Federigo Barocci, 1528-1612.

Cesare d'Arpino, 1567-1640.

Bartolomeo Schedone, 1580-1615.

Giov. Lanfranco, 1581-1647.

Bart. Manfredi, 1581-1617.

Pietro da Cortona, 1596-1669.

Andrea Sacchi, 1598-1661.

Gianbattista Salvi (Sassoferrato), 1605-

85.

Carlo Maratta, 1625-1713.

Paolo Pannini, 1691-1764.

(xvi.) Naples.

The names of Simone Napoletano, Colantonio, and other native painters who were supposed to have worked in the 14th and 15th centuries appear to be those of wholly mythical personages. Michelangelo da Caravaggio, 1569-1609. Ghee Ribera (Lo Spagnaletto), 1588-

1656.

Aniello Falcone, 1594-1665.

3 See Lanzi, Hist. of Painting, Bohn's ed., ii, p. 499 sq.

Salvator Rosa, 1615-73. Luca Giordano, 1632-1705.

2. German School.

Wilhehm of Herle or William of Cologne, f1.1358, d.c.1378.

Stephen Lochner, fl.1442, d.1451.

Master of Liesborn, f1.1465.

Michael Wohlgemuth, 1434-1519.

Master of the Lyversberg Passion, fl.

1463-80.

Israel von Meckenen, ¢.1440-1503.

Martin Schongauer, 1450 4-88.

Matthias Grtinewald, ¢.1460 to after

1529.

Master Christophorus, f1.1500-10.

Master of the Death of the Virgin, fl. 1515, d.1556.

Hans Holbein the elder, ¢.1460-1523, and his brother Sigmund Holbein, c. 1465 to after 1540.

Albrecht Diirer, 1471-1528.

Lucas Cranach, 1472-1553.

Hans Burekmair, 1478-1531.

Hans Fuss (Von Kulmbach), pupil of A. Diirer, d.c.1522.

Albrecht Altdorfer, b. before 1480-1538.

Hang Leonhard Schaufelin, 1490-1540.

Hans Holbein the younger, 1497-1548.

Hans Sebald Beham, 1500-50, and his brother Barthel Beham, 1502-¢.1540.

Heinrich Aldegrever, 1502-58.

Virgil Solis, 1514-62.

Lucas Cranach the younger, 1515-86."

Jost. Amman, 1531-91.

Heinrich Golzius, 1558-1617.

Johann Rottenhammer, 1564-1623.

Adam Elshaimer, 1574-1620.

Joachim von Sandrart, 1606-88.

Balthasar Denner, 1685-1747.

Christ. Will. Ernst Dietrich, 1712-74.

Anton Raphael Mengs, 1728-78.

Peter von Cornelius, 1783-1867.

Johann Fried. Overbeck, 1789-1869.

Fried. Wil. von Schadow, 1789-1862.

Julius Schnorr, 1794-1872.

Wilhelm von Kaulbach, 1805-74.

Karl Fried. Lessing, 1808-80.

3. Flemish School.

Melchior Broederlam, f1.1382-¢.1400.

Tiubert van Eyck, b.c.1366, d-after 1426.

Jan van Byck, younger brother of Hubert, d. after 1440.

Margaret van Eyck, a younger sister of the above, died soon after Hubert.

Petrus Christus, a pupil of the Van Eycks, f1.1447-71.

Dierick Bouts, ¢.1391-1475.

Roger van der Weyden the elder, ¢.

1400-64.

Gerard van der Meire, ¢.1410 to after

1474.

Hans Memling, ¢.1430, d. before 1495.

Roger van der Weyden the younger, ¢.

1450-1529.

Hugo van der Goes, fl.1467, d.1482.

Justus of Ghent, f1.1451-70.

Gheerardt David, c.1455-1523.

Quintin Matsys, 1466-1531.

Jan Gossart de Mabuse, 1470-1582.

Bernard van Orley, 1470-1541.

Jan Mostert, 1474-1556.

Henri de Bles, 1480- ¢.1550.

Joachim da Patinir, b. between 1485 and 1490, d. 1524.

Jan van Schoreel, 1495-1562.

Michiel Coxcie, 1499-1592.

Lambert Lombard (Sustermann), 1506 to after 1566.

Marinus van Romerswale, 1.1535 to after 1567.

Pieter Pourbus, 1510-83.

Antonij Mor (Antonio Moro), 1512-77.

Pieter Breughel, c.1520-69.

Paul Bril, 1556-1626.

Pieter Breughel, 1564-1637.

Peter Paul Rubens, 1577-1640.

Frans Snyders, 1579-1657.

Kasper de Crayer, 1582-1669.

David Teniers,5 1582-1649.

Jan (called ‘ Velvet”) Breughel, c.

1589 -¢.1642.

Jacob Jordaens, 1593-1678.

Lucas van Uden, 1595-1672.

Anton Vandyck, 1599-1641.

Adriaan van Utrecht, 1599-1652.

Philippe de Champaigne, 1602-74.

Jan van Essen, 1606-65.

Jan Fyt, 1609-61.

David Teniers the younger, 1610-94.

Jacobus van Artois, 1618 to after 1684.

Gonzales Coques, 1614-84.

Pieter van der Faes (Sir Peter Lely),

1618-80.

aie 4 Not 1420, as is usually supposed. Schongauer is mentioned by A. Durer as being a young apprentice in 1470. 5 The Teniers, though Flemish by birth and education, belong more closely to the Dutch school.

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Abraham Teniers, 1629-71. Gerard de Lairesse, 1641-1711. Jean Francois Millet, 1642-80. Cornelis Huysmans, 1648-1727. Jan van Bloemen, 1662-1740.

A large number of Flemish painters, many of them pupils of Rubens, lived in the 17th century, but they are of little importance.

4, Duteh School.

Albert van Ouwater, early part of 15th century.

Gerard of Haarlem, end of 15th century.

Hieronymus van Aeken, ¢.1460-1518.

Lucas (Jacobsz) van Leyden, 1494-1533.

Jan van Schoreel, 1495-1562.

Marten van Heemskerck (1498-1574), Cornelis van Haarlem (1562-1688), Cor- nelis van Poelenburg (1586-1667) and Gerard van Honthorst (1592-? 1666), though Dutch by birth, were feeble imitators of Italian schools.

Frans Hals, 1584-1666.

Thomas de Keyser, ¢.1595-¢.1660.

Cornelis Janssen, ¢.1596-1665.

Jan van Goyen, 1596-1656.

Jan de Heem, 1603-50.

Albert Cuyp, 1605-91.

Rembrandt van Rijn or Ryn, 1606-69.

Emanuel de Witte, 1607-92.

Jan Wynants, d. after 1674.

Gerhard Terburg, 1608-81.

Salomon Koning, 1609-68.

Jan Both ¢.1610-56, and his younger brother Andries Both.

Adrian van Ostade, 1610-85.

Ferdinand Bol, 1611-81.

Bart. van der Helst, 1613-70.

Gerhard Dou, 1618-75.

Aart van der Neer, c.1619 to after 1691.

Philip de Koninck, 1619-89.

Philip Wouwerman, 1619-68.

Jan Battista Weenix, 1621-60.

Isaac van Ostade, 1621-49.

Gerbrandt van der Eckhout, 1621-74.

Nicholas Berchem, 1624-83.

Paul Potter, 1625-54.

Jacob Ruysdael, 1625-81.

Jan Steen, 1626-79.

Karel Dujardin, 1630-78.

Gabriel Metsu, 1630 to after 1667.

Ludolf Backhuizen, 1631-1709.

Nicholas Maes, 1632-93.

Pieter de Hooch, 1632-81.

Jan van der Meer, 1632-95.

Me Vandevelde the younger, 1633-

fe

J = ae, Capelle, ¢.1635 to after

680.

Frans van Mieris the elder, 1635-81. His sons Jan and Willem were both painters.

Melchior de Hondecoeter, 1636-95.

Jan Hackaert, c.1636-1708.

Jan van der Heyden, 1637-1712.

Meindert Hobbema, 1638-1709.

Adrian Vandevelde, 1639-72.

Gaspard Netscher, 1639-84.

Daniel Mytens the younger, c.1644- c.1688.

Jan Weenix, 1644-1719.

Jan van Huchtenburg, 1646-1733.

Van der Plaas, 1647-1704.

Wil. van Mieris, 1662-1744.

Jan van Huysum, 1682-1749.

a van Mieris the younger, 1689-

1763.

Jan van Os, 1744-1808.

A large number of mostly third-rate painters existed in the 16th and 17th centuries.

5. Spanish School.

Antonio del Rincon, 1446-1500.

Alonso Beruguete, 1480-1561.

Luis de Vargas, 1502-68.

Juau de Juanes (Vicente Joanes), 1506- 79, His chief pupil was Borras.

Luis de Morales, ¢.1510-86.

Alonso Sanchez Coello, ¢.1512-90.

Gasper Becerra, 1520-70.

Francisco de Ribalta, ¢.1550-1628.

Juan de las Roelas, 1558-1625.

Francisco Pacheco, 1571-1654.

Francisco de Herrera the elder, b. 1576, and his son known as Fran- cisco 'El Mozo."

Eugenio Caxes, 1577-1642.

Juan de Ribalta, 1597-1628.

Francisco Zurbaran, 1598-1662.

Diego Velazquez de Silva, 1599-1660.

Francisco Collantes, 1599-1656.

Espinosa, 1600-80.

Alonso Cano, 1601-67.

Juan Carrefio de Miranda, 1614-85.

Bartolome Esteban Murillo, 1618-82.

Juan de Valdes, 1630-91.

Claudio Coello, 1635-93.

Francisco Goya, 1746-1828.

Mariano Fortuny, 1838-74.

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6. French School.

René, king of Anjou, 1408-80, learned painting in Italy, and is said to have practised the art in France.

Jean Fouquet, b. between 1415 and 1420, belongs also to the Italian school. Jean Clouet of Tours, fl.1480; his son

Jean Clouet the younger, ¢.1485-1545,

and grandson Francois Clouet (Janet),

Jean de Gourmont, f1.1557.

Jean Cousin, c.1500-c.1589.

Ambroise Dubois, 1543-1615.

Antoine le Nain, and his brother Louis, f1.1629-77.

Simon Vouet, 1590-1649.

Francois Perrier, 1590-1656.

Nicolas Poussin, 1594-1665.

Jacques Stella, 1596-1657.

Jacques Blanchard, 1600-38.

Valentin de Boullongne, 1600-34.

Claude Gelée (Lorrain), 1600-82.

Charles Antoine Dufresnoy, 1611-65.

Pierre Mignard (Le Romain), 1612-95.

Gaspar Dughet (called Poussin after his brother-in-law Nicolas), 1618-75.

Eustache le Sueur, 1616-55.

Sébastien Bourdon, 1616-71.

Charles le Brun, 1619-90.

Jacques Courtois (Le Bourguignon),

1621-76.

Jean Jouvenet, 1644-1717.

Jean Baptiste Santerre, 1651-1717. Inferior French painters who worked

in the 17th and 18th centuries were the

Boullongne (father and two sons),

Nicolas de Largilliére, Hyacinthe

Rigaud, Nicolas Lancret, Pierre Sub-

leyras, Carl van Loo, Claude Vernet,

ald Madame le Brun.

Antoine Watteau, 1684-1721.

Jean Baptiste Pater, 1699-1736.

Francois Boucher, 1704-70.

Jean Baptiste Greuze, 1725-1805.

Jean Honoré Fragonard, 1732-1806.

Jacques Louis David, 1748-1825. He carried to its highest point the dull pseudo-classic style inaugurated by Joseph-Marie Vien, 1716-1809.

Many other painters of fourth-rate talent worked and obtained much pupularity throughout the 18th century. Pierre Paul Prud'hon, 1758-1823, Francois Marius Granet, 1775-1849. Jean Augustin Ingres, 1780-1867. Horace Vernet, 1789-1863.

Théodore Géricault, 1791-1824,

Léopold Robert, 1794-1835.

Ary Scheffer, 1795-1858.

Paul Delaroche, 1797-1856.

Eugéne Delacroix, 1799-1863.

Alexandre Gabriel Decamps, 1803-60.

Théodore Rousseau, 1812-67,

Jean Francois Millet, 1814-75.

Henri Regnault, 1843-71.

7. British School.

Nicholas Hilliard, 1547-1619 (minia- turist).

Isaac Oliver, 1555-1617 (miniaturist).

George Jamesone, 1586-1644, pupil of Rubens (portraits).

Peter Oliver, 1601-60 (niniaturist).

Robert Walker, d.c.1660 (portraits),

Samuel Cooper, 1609-72 (portraits),

John Hoskins, d.1664 (portraits).

William Dobson, 1610-46, follower of Vandyck.

Isaac Fuller, 4.1672 (portraits).

Henry Stone, 1616-53 (portraits).

Robert Streater, 1624-80 (portraits).

Henry Anderton, 1630 to after 1665 (portraits).

John Riley, 1646-91 (portraits).

Sir Peter Lely, came to England in 1641.

Sir Godfrey Kneller, 1646-1728 (por- traits),

John Greenhill, 1649-76 (portraits).

John Michael Wright, c.1655-1700.

Jonathan Richardson, 1665-1745 (por- traits).

Charles Jervas, 1675-1739 (portraits).

Sir James Thornhill, 1676-1734 (wall decoration).

William Aikman, 1682-1731.

William Hogarth, 1697-1764 (satirist).

8. Scott, d.1772.

Francesco Zuccarelli, 1701-88 (land- scape),

Thomas Hudson, 1701-79, Reynolds's Inaster.

James Wootton, 4.1765 (animals).

Three brothers Smith of Chichester, 1707-66 (landscape),

Francis Hayman, 1708-66.

Allan Ramsay, 1709-84.

Richard Wilson, 1713-82, founder of the English school of landscape.

Sir Joshua Reynolds, 1723-99 (por- traits).

George Stubbs, 1724-1806 (animals).

Francesco Bartolozzi, 1725-1815 (en- graver),

Francis Cotes, 1725-70.

Paul Sandby, 1725-1809 (water-colour).

Thomas Gainsborough, 1727-88 (por- traits and landscape).

Nathaniel Hone, 1730-84 (niniatures).

Nathaniel Dance, second half of 18th century.

Joseph Wright of Derby, 1734-97 (night scenes),

Gcorge Romney, 1734-1802 (portraits).

Johann Zoffany, 1735-1810.

John Singleton Copley, 1737-1815.

Benjamin West, 1738-1820.

Richard Cosway,1740-1821 Gniniatures).

Angelica Kaufmann, 1741-1807 (por- traits).

Hackert, 1741-1800 (water-colour).

James Barry, 1741-1806.

Henry Fuseli, 1741-1825.

Mary Moser, 1744-1819 (flower painter).

David Allan 1744-96.

James Northcote, 1746-1831.

F. Wheatley, 1747-1801 (water-colour).

John Smith, 1750-1812 (water-colour).

Robert Smirke, 1752-1845,

John Webber, 1752-93 (water-colour).

John Cozens, 1752-99 (water-colour).

Thomas Bewick, 1753-1828 (wood-en- graver),

Sir George Beaumont, 1753-1827 (por- traits).

Sir William Beechey, 1753-1839.

Henry Bone, 1755-1834 (miniatures on enamel).

Gilbert Stuart, 1755-1828.

Thomas Stothard, 1755-1834.

Sir Henry Raeburn, 1756-1828 (por- traits).

James Gillray, 1757-1815 (caricaturist).

William Blake, 1757-1828 (poetry).

T. Rowlandson, 1757-1827 (caricaturist).

John Hoppner, 1759-1810.

John Opie, 1761-1807.

Edward Bird, 1762-1819.

Samuel Woodforde, 1763-1817.

George Morland, 1764-1804 (animals),

N. Pococke, 1765-1821. John (Old) Crome, 1769-1821, founder of the Norwich school of landscape Sir Thomas Lawrence, 1769-1830 (portraits). :

H. Howard, 1769-1847.

James Ward, 1769-1859 (landscape).

Thomas Phillips, 1770-1845.

Sir Martin Shee, 1770-1850.

George Clint, 1770-1854.

H. W. Williams, 1773-1829 (classical buildings).

Henry Thomson, 1773-1843.

Thomas Girtin, 1773-1802 (landscape).

Thomas Hargreaves, 1775-1846 (minia- tures).

Joseph Mallord William Turner, 1775-

1851.

John Constable, 1776-1887 (landscape).

John Varley, 1777-1842 (water-colour).

John James Chalon, 1777-1854 (land- scape).

John Christian Schetky, (marine).

John Jackson, 1778-1831 (landscape).

William Payne, f1.1786-90 (water- colour).

John Thomson, 1778-1840.

James Laurent Agasse of Geneva, c.

1779-1846,

Sir Augustus Callcott, 1779-1844.

Andrew Wilson, 1780-1848.

Alfred Chalon, 1780-1860(water-colour).

J. 8. Cotman, 1780-1843 (water-colour),

John Simpson, 1782-1847.

Sir Willian Allan, 1782-1850 (portraits).

1778-1874

PicTURE GALLERIES OF EUROPE. The following list gives some indication of the manner

cover nearly the whole of his short working life.

SCHOOLS Of PRBiravae

C. Wild, 1782-1835 (water-colour).

Thomas Uwins, 1782-1857,

De Wint, 1783-1849 (water-colour).

Samuel Prout, 1783-1825 (water-colour),

Sir David Wilkie, 1785-1841.

W. Milton, 1786-1839.

B. R. Haydon, 1786-1846.

Will. Mulready, 1786-1863.

A. Fraser, 1786-1865.

George Jones, 1786-1869.

William Etty, 1787-1849.

Copley Fielding, 1787-1855 (landscape).

Sir J. Watson Gordon, 1788-1864.

W. Collins, 1788-1847.

John Martin, 1789-1854 (imaginative landscape).

Sir John Gordon, 1790-1865.

H. P. Briggs, 1792-1844.

John Linnel, b.1792.

Francis Danby, 1793-1861.

David Cox (senior), 1793-1858 (water- colour).

Sir Charles Eastlake, 1793-1865.

G. 8. Newton, 1794-1835.

C. R. Leslie, 1794-1859.

J. F. Herring, 1795-1865.

David Roberts, 1796-1864 (architecture and landscape).

Clarkson Stanfield, 1798-1867 (land- scape).

James Holland, 1800-70.

George Cattermole, 1800-68 (water- colour).

William Simson, 1800-47 (water-colour).

R. P. Bonington, 1801-28.

Sir Edwin Landseer, 1802-73 (animals).

George Lance, 1802-64 (still life).

Sir Francis Grant, 1803-78,

Horatio Macculloch, 1805-67 scape).

Sir Daniel Macnee, 1806-82.

William Dyce, 1806-64.

Sir George Harvey, 1866-76.

John Fred. Lewis, 1806-76 (Oriental scenes).

Thomas Dunean, 1807-45.

Joseph Nash, 1807-78 (architecture).

Aaron Penley, 1807-70 (water-colour).

Thomas Creswick, 1811-69 (landscape).

Edw. Will. Cooke, 1811-80 (marine).

Daniel Maclise, 1811-70.

Will. James Muller, 1812-45 (water- colour).

Willian Brodie, 1815-81.

James Drummond, 1816-77.

A. L. Ege, 1816-63.

John Phillip, 1817-67.

Thos. Seddon, 1821-56 (Pre-Raphaelite),

Samuel Bough, 1822-78 (landscape).

Thos. Leeson Rowbothain, 1823-75 (water-colour).

Dante Gabriel Rossetti, 1828-82 (Pre- Raphaelite),

John Samuel Raven, 1829-77 (land- scape).

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In the Venetian

Gallery, number of highly important London, of them signed and dated ;

in which the existing pictures of various schools are distri- buted among the chief galleries of Europe.

The National Gallery, London, contains for its size a very large pictures of the Italian schools, many in fact, as a representative collection, embracing

as it does well-chosen specimens of every school and in- cluding many paintings of very rare masters, it is hardly surpassed by any gallery in the world. Though weak in paintings of Giotto and his school, it possesses many early Sienese pictures of great interest and exceptional importance (see fig. 1), and a collection unrivalled out of Italy of the works of the best Florentine painters of the 15th century, as Paolo Uccello, Lippo Lippi, Pollaiuolo, Signorelli, Botticelli, Lorenzo di Credi, and others (see fig. 6). Of the very few existing easel pictures by Pisanello! the National Gallery contains one (signed), St George and St Anthony. The portrait by Andrea del Sarto is one of his finest works, —full of life and expression and rich in tone. In addition to a large painting on canvas of the school of Michelangelo—Leda and the Swan 2—the National Gallery possesses two unfinished pictures, a Madonna and Angels and an Entombment of Christ, both of which, in spite of many adverse criticisms, appear to be genuine works of Michel- angelo, the former in his early, the latter in his later manner—a very remarkable possession for one gallery, seeing that the only other genuine easel painting by him is the circular panel of the Madonna in the tribune of the Uffizi (Florence). No four pictures could better represent Raphael's highly varied manners than the miniature Knight's Dream, the Ansidei Madonna, the St Catherine, and the Garvagh Madonna, which in the dates of their execution

1 Some small panels attributed to Pisanello in Rome and clsewhere are of very doubtful genuineness,

2 Not exhibited ; it is probably a pupil's copy of the marble group of the same subject designed by Michelangelo. e a nay

school the National Gallery is almost unrivalled: it contains ~~*a large number of fine examples of Crivelli (see fig. 14),—Venice not possessing one ; two rare panels by Marziale, both signed and dated (1500 and 1507); the finest specimens of Giovanni Bellini (see fig. 15) and his school which exist out of Venice ; one of Titian's noblest works,—the Ariadne and Bacchus, finished in 1523 for the duke of Ferrara, together with two other fine pictures of earlier date ; and the masterpiece of Sebastiano del Piombo, his Raising of Lazarus, partly designed by Michelangelo. The smaller schools of Ferrara and Cremona are well represented by examples of nearly all their chief*~~

~~painters. Of the Umbrian school the gallery pos~~ sesses two or rather three important, though much injured, panels by Picro della Francesca (see fig. 10), a fine picture by Fiorenzo di Lorenzo, as well as one of Perugino's best works, the triptych from the Certosa near Pavia (see fig. 12), and other paintings by him. Correggio is represented by three fine pictures, classical and re- ligious, specimens of unusual excellence (sce fig. 21). Of the Bolognese school there are three works by Francia, one signed (see fig. 19), and specimens of the painters of the later school, — Annibale Caracci, Guido (see fig. 20), and others. Paul Veronese's Dream of St Helena and the group of portraits of the Pisani family, arranged as the scene of the family of Darius before Alex- ander, are among his finest works. The three pictures by Lotto are excellent examples of his supreme talents in portraiture ; and no collection outside Brescia and Bergamo is so rich in the noble portrait pictures of Moretto'and his pupil Moroni. Leonardo da Vinci (the rarest of the great masters) is represented by a very beautiful picture® which appears to have been partly finished by

3 In addition to the strong internal evidence in favour of this picture being at least in part a genuine work of Da Vinci, it is expressly mentioned as being by him in the Trattato della Pittura (ii. 17 and iv. 1), written by the Milanese

Lomazzo before 1584. The painting was then in the church of S. Francesco at Milan, where it remained till 1796.

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a pupil; with slight alterations it is the same in design as the Vierge aux Rochers in the Louvre (see fig. 28). Leonardo's use of almost monochromatic colouring differs strongly from the style of his pupils and imitators Luini, Andrea da Solario (see fig. 24), and Beltraffio, all of whom are represented by excellent and characteristic examples. Of the earlier Milanese school the gal- lery contains two magnificent examples by Ambrogio Borgognone, —the Marriage of St Catherine especially being a work of the highest importance and beauty (see fig. 22). The gallery possesses yare examples of the early German masters (see fig. 25, by

William of Cologne), though it is weak in the works of the later Germans, as Albert Diirer, who is represented only by one portrait, which is signed (see fig. 26), and Hans Holbein the younger, who is totally absent except for the noble portrait lent by the duke of Norfolk.? The collection is, however, unusually rich in fine examples of early Flemish art,—of the Van Eycks and their school (see fig. 28). The portrait of Jean Arnolfini and his wife (signed and dated) is one of Jan van Eyck's noblest works on a small scale,—only surpassed, perhaps, by the Madonna and Worshipper in the Louvre. The En- tombment of Christ by Van der Weyden the elder (see fig. 29), the three or more examples of Memling, the Exhumation of St Hubert by Dicrick Bouts, the Reading Magdalene by Van der Weyden the younger (see fig. 30), and the Saints and Donor by Gheerardt David are all unrivalled examples of these great painters. The delicate

little panel of the Madonna by Margaret van Eyck is a work of

much interest. The later Flemish and Dutch schools are equally well represented, especially by a number of noble portraits by Rem- brandt (see fig. 38), Rubens, and Vandyck ; a portrait of an old woman, the "' Chapeau de Poil," and the portrait of Van der Geest (wrongly called Gevartius) are among the finest works of these three masters (see figs. 31 and 32). Hobbema, Ruysdael, De Hooge, Wouwerman, and others of their school are very richly represented (see figs. 84 and 35). Of the Spanish school the National Gallery contains an excellent portrait head of Philip IV. (sce fig. 87) by Velazquez, a full-length of the same king, not wholly by his hand, and also two pictures of sacred subjects and a curious boar-hunting scene of much interest, but of inferior beauty. The examples of Murillo, like most out of Seville, are but third-rate specimens of his power. The Kneeling Friar as an example of Zurbaran's work is unrivalled either in Spain or out of it (see fig. 36). Among the pictures of the French school a number of fine landscapes by Claude Lorrain and a very masterly Bacchanalian Scene by Nicolas Poussin are the most notable (see figs. 38 and 39). The English school is hardly represented in a manner worthy of the chief national collec- tion, but it is supplemented by a large number of fine paintings in the South Kensington Museum. The chief treasures in this branch

*ossessed by the National Gallery are Hogarth's series of ** Marriage & la Mode," some noble portraits by Reynolds and Gainsborough, and an unrivalled collection of Turner's works of all periods (see figs. 40, 41, and 48).*

The royal gallery at Hampton Court (London), among a large number of inferior paintings, contains some of great value, especially the Baptism of Christ, an early work of Francia, a most magnificent portrait of Andrea Odoni by Lor. Lotto, both signed, and a portrait of a youth attributed to Raphael. The chief treasure of the palace is the grand series of decorative paintings (nine in number) executed in tempera on canvas by Andrea Mantegna in 1485-92 for the duke of Mantua, but much injured by repainting. The equally celebrated cartoons designed by Raphael for tapestry to decorate the Sistine Chapel are now moved to the South Kensington Museum. The gallery also possesses several fine examples of Tintoretto, many good Flemish and Dutch pictures, some small but fine examples of Holbein and his school, and a number of historically interesting works by English painters of the 17th century. The portrait of a Jewish Rabbi by Rembrandt is one of his finest works,—a perfect masterpiece of portraiture.

The Dulwich gallery is especially rich in works of the Dutch school, and contains some noble portraits by Gainsborough and Reynolds, as well as an interesting early work by Raphael, —the predella with seven small subjects painted in 1504 as part of the large altarpiece for the monastery of St Anthony in Perngia ; the main part of this large retable, which is the property of the heirs of the duke of Ripalda, has been for many years deposited but not exhibited in the National Gallery. The National Portrait Gallery? at Kensington contains many paintings of different schools which are valuable both as works of art and from their interest as portraits. The Royal Academy has placed in the attics of Burlington House its valuable collection of diploma pictures, and in an adjoining room a few treasures of earlier art, among them a large cartoon of the Madonna and St Anne by Leonardo da Vinci,—similar in subject to, but different in design from, an unfinished picture by him in the Louvre, and a copy of his Cenacolo at Milan by his pupil Marco d'Oggiono, of priceless value now that the original is an utter wreck. In the same room isa very beautiful but un-

1 etn Sal ee ee 1 England generally is, however, very rich in the works of Holbein, —chiefly portraits. 2 Now temporarily moved to Bethnal! Green.

finished piece of sculpture by Michelangelo, a circular relief of the Madonna.

England is especially rich in collections of drawings by the old Other masters. The chief are those in the British Museum, in the Taylor British Buildings at Oxford, and in the possession of the Queen and of Mr collec- Malcolm of Poltalloch. Among the collection in Windsor Castle tions. are eighty-seven portraits in red chalk by Holbein, all of wonderful beauty. The celebrated " Liber Veritatis," a collection of original drawings by Claude Lorrain, is in the possession of the duke of Devonshire at Chatsworth. In Buckingham Palace is a fine collec- tion of paintings of the Flemish and Dutch schools. An almost incredibly large number of fine paintings of all schools are scattered throughout the private galleries of Britain ; an account of the chief of these is given by Dr Waagen, Treasures of Art in Britain, London, 1854. But many of the collections described by Dr Waagen have since been moved or dispersed; the Peel and Wynn Ellis pictures have been purchased by the National Gallery, which has also acquired important pictures from the sales of the Eastlake, Barker, Novar, Hamilton, and Blenheim collections. The largest private galleries which still exist in England are those of the duke of Westminster (Grosvenor House), the duke of Sutherland (Stafford House), the earl of Ellesmere (Bridgewater House), and the marquis of Exeter (Burghley House). The public gallery at Liverpool contains some very important Italian pictures, as does also the growing collection in Dublin. The Edinburgh National Gallery possesses a few speci- mens of early masters, among them part of the great altarpiece by the unknown 'Master of Liesborn," a picture of St Hubert by the 'Master of Lyversberg," some fine Dutch pictures, and Gains- borough's masterpiece, the portrait of the Hon. Mrs Graham, to- gether with many examples of the excellent portraits by David Allan and Sir Henry Raeburn. In the palace of Holyrood is pre- served a very beautiful altarpiece, with portraits of James III. and his queen and other figures. It is supposed to have been painted about 1480 by Van der Goes of the school of the Van

Eycks. Eng- land is especially rich in the finest examples of Nicolas Poussin and Claude Lorrain; the paintings by the latter in Grosvenor House, the National Gallery, and elsewhere in the country are unrivalled by those of any foreign gallery.

The Louvre is rich in works of nearly all schools, and especially Louvre, in fine examples of Signorelli, Mantegna, Raphael, Titian, Paul Veronese, Correggio, and the later Bolognese painters. Its chief glory is the possession of some of the very rare works of Da Vinci,— La Vierge aux Rochers, the Virgin and St Anne, and the wonder- ful portraits of Mona Lisa and La belle Ferronniére. It is chiefly weak in cxamples of the earlier Venetian painters, not possessing a single genuine work by Giovanni Bellini. It contains some very beautiful frescos by Botticelli and by Luini, and the finest work of Murillo which exists out of Seville,—the Virgin in Glory. The later Flemish and Dutch schools are well represented: the small painting of the Virgin with a kneeling Worshipper by Jan van Eyck is one of the loveliest pictures in the world ; but the Louvre is otherwise deficient in paintings of his school. The portraits by Holbein, Rubens, and Vandyck are of great importance. In the French school the Louvre is of course unrivalled: the paintings of Nicolas Poussin and Claude Lorrain are the best among them; but the general average of merit is very low. The Louvre also possesses a magnificent collection of drawings by the old masters.

The Berlin gallery, now rapidly being added to, contains a large German number of very important Italian pictures; among them is Sig- galleries. norelli's finest easel picture (see fig. 8),—a classical scene with Pan and other nude figures playing on pipes, a masterpiece of powerful drawing. The gallery is more especially rich in works of the German, Flemish, and Dutch schools, including six panels from the large altarpiece of the Adoration of the Lamb at Ghent by Hubert and Jan van Eyck. The Dresden gallery is mainly rich in paint- ings of the Flemish and Dutch schools, but also contains some fine Italian pictures. Raphael's Madonna di San Sisto is the chief glory of the collection, together with many fine examples of Giorgione, Palma Vecchio, Titian, Paul Veronese, and Correggio, and a number of works of the later Bolognese school. The gallery is especially remarkable for its genuine examples of that very rare master Giorgione. The Pinakothek at Munich possesses some good Italian pictures, among

them four by Raphael and a number of fine Titians. It contains a large collection of German, Dutch, and Flemish paint- ings, with a number of fine portraits by Albert Diirer and Vandyck. It is especially rich in works of Lucas Cranach the elder, of Mem- ling, of Roger van der Weyden, of Wohlgemuth, and of Rembrandt.' The Cassel gallery is mainly rich in Flemish and Dutch paintings. The small Wallraf-Richartz Museum at Cologne contains a few paintings of great interest to the student of early German art.

The Belvedere Gallery at Vienna is exceptionally rich in works Austria, of the Venetian school, especially of Palma Vecchio, Titian, and Paul Veronese. Holbein, Rubens, Vandyck, and other masters of the Flemish and Dutch schools are richly represented. Vienna also contains some large private galleries, chiefly rich in Flemish

3 A most valuable catalogue of the Munich pictures, well illustrated with photographs, has recently been published.

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and Dutch pictures, and a magnificent collection of drawings by old masters. The Budapest gallery (Eszterhazy collection) contains many fine Venetian and some Florentine pictures, with a large number of Flemish and Dutch works.

The Gallery of the Hermitage at St Petersburg is one of the

largest and most important in Europe; though weak in pictures of

the early Italian schools, it contains fine examples of Luini, Raphael, Titian, Paul Veronese, and the Bolognese school, and is extraordi- narily rich in

paintings by Murillo, Rembrandt, Rubens, Vandyck, and the later Flemish and Dutch schools generally. The many galleries of Belgium and Holland are mostly rich in the works of local schools. Rubens and many fine examples of his pupil Vandyck. The church of St Bavon at Ghent contains the masterpiece of the Van Eycks, the main part of a large altarpiece in many panels with the Adora- tion of the Lamb as the central subject ; this is only rivalled in point cf size and beauty by the Fountain of Salvation painted by Jan van Eyck about 1482, and now in the museum of the Santis- sima Trinidad at Madrid. Among the many fine Flemish and

Dutch pictures in the musenm at The Hague is a half-length of

an unknown lady by Holbein, which is one of the most beautiful portraits in the world (see fig. 27),

The gallery of Madrid is in some respects unrivalled both from

its widely representative character—at least as regards the later schools—and from the number of exceptional masterpieces which it contains ; it possesses, however, very few specimens of Italian art earlier than 1500. In the works of the later Italian masters it is very rich, possessing four important works by Raphael, —the Madonna called La Perla (once at Hampton Court in the collection of Charles I.), the Virgin of the Fish, the Virgin of the Rose, and Christ on His way to Calvary (Lo Spasimo). No other gallery con- tains so many fine specimens of Titian's paintings; it includes a scene of Bacchus at Naxos, with a nude sleeping figure of Ariadne in the foreground, the companion to the magnificent Ariadne in the English National Gallery, but surpassing it in beauty and per- fection of preservation. The third picture of the trio painted for the duke of Ferrara is also at Madrid ; it is known as the Sacrifice to Fecundity, and consists of a large group of nude infants sporting or sleeping, a perfect miracle for its wealth of colour and unrivalled flesh painting. In addition to these wonderful pictures there are some splendid portraits by Titian, and many of his later works, showing a sad decadence in his old age. The gallery also contains many important works of Paul Veronesc and others of the Venetian school, and a very fine collection of Flemish and Dutch pictures, including a number of noble portraits by Antonio Moro, Rubens, aud Vandyck, together with some of Claude Lorrain's best land- scapes. In the Spanish

schools the Madrid gallery is unrivalled ‘ it contains a number of poor but interesting paintings by Juan de Juanes, the best collection of the works of Ribera (Spagnoletto), and the chief masterpieces of Velazquez. It is in Madrid alone that the greatness of Velazquez can be fully realized, just as the marvellous talents of Murillo are apparent only in Seville. Among the many wonderful paintings by Velazqnez in this gallery the chief are the Crucifixion, the Tapestry Weavers (Las Hilanderas), the Surrender of Breda (Las Lanzas), the Drinking Peasants (Los Borrachos), the portrait group known as Las Menifias, and many magnificent por- traits. The gallery also contains a number of Zurbaran’s works, and many by Murillo, none of which are among his finest paintings. The best picture by Murillo at Madrid is the scene of St Elizabeth of Hungary tending the Lepers, preserved in the Academia de San Fernando. Seville alone contains the real masterpieces of Murillo, a very unequal painter, who produced a large number of third-rate works, such as are to be seen in many of the chief galleries of Europe, but who at his best deserves to rank with the greatest painters of the world. It is impossible to describe the wonderful rich tone, the intense pathos, and the touching religious feeling of such pictures as the Crucified Christ embracing St Francis, or the appari- tion of the Infant Saviour to St Anthony of Padua, in the Seville gallery, and the larger composition of the latter scene in the cathedral. Other very noble works by Murillo exist in the monastic church of La Caridad. The Seville gallery also contains several of Zurbaran’s chief pictures, and some by other painters of the Spanish school. The other chief gallery of Spain, that at Valencia, contains a number of weak but historically interesting pictures of early Spanish artists, —feeble imitations of the style of Francia and other Italian painters. It possesses also many pictures by Ribalta and other later and unimportant masters of the Valencian school.

The Vatican Gallery, though not large, contains a very large pro- portion of important pictures, such as a portrait group in fresco by Melozzo da Forli, the unfinished monochromatic painting of St Jerome by Da Vinci, the finest of Raphael’s early works,—the Coronation of the Virgin, the Madonna di Foligno, and the Trans- figuration. The Coronation of the Virgin by Pinturicchio is one of his best panel pictures, and a portrait of a Doge by Titian a master- piece of portraiture. The Last Communion of St Jerome by

Do- menichino is his finest work. The chapel of San Lorenzo, painted by Fra Angelico (see FIESOLE), the Appartamenti Borgia by Pintu-

Antwerp possesses the masterpieces of

SCHOOLS OF PRBAWWe We

ricchio, the stanze by Raphael, and the Sistine angelo are described in the articles on these painters. The Capitol contains but few works of much merit; the chief are a very beauti- ful series of frescos of Apollo and the Muses in separate panels, life- size, by some painter of the school of Perugino, probably Lo Spagna ; they are remarkable for grace of drawing and extreme delicacy of colour. The Rape of Europa, by Paul Veronese, is a fine replica of that in the doge's palace at Venice. The gallery also contains some of the ehief works of Guercino and Guido and a very noble portrait by Velazquez. The Borghese Gallery is perhaps the most important private collection in the world. It is rich in Florentine pictures of the 15th century, and possesses the celebrated Entombment by Raphael. A small panel of St Stephen by Francia (signed) is of unusual beauty and interest,—very highly finished and magnificent in colour ; it seems to show the influence of Jan van Eyck ; it is one of Francia's earliest works, and is very far superior to those of his later style. The great glory of the gallery is the (so-called) Sacred and Profane Love by Titian (see fig. 16), one of the most beautiful pictures in the world both for design and colour, and a marvel for its rich warm rendering of flesh; it appears to be a portrait of the same lady repeated twice,—nude and draped. It belongs to a somewhat earlier period than the bacchanal trio in Madrid and London. This gallery contains also one of Vandyck's finest portraits, that of Catherine de' Medici, and other excellent portraits of the Venetian school. The Danae by Correggio is an interesting example, very weak in drawing, but remarkable for the fine pearly tones of the flesh. The Corsini Gallery, now the property of the municipality of Rome, contains some good panels by Fra Angelico, but is mainly strong only in the later Bolognese paintings. It also possesses a rich collection of early Italian engravings. The Doria Gallery is large, but contains only a small proportion of valu- able pictures. Some paintings by Niccolo Rondinelli are of much interest ; they show him to have been an able pupil and close imitator of Giovanni Bellini, to whom many paintings

in various galleries are attributed which are really the work of pupils. A beautiful Madonna in the Doria Palace by Rondinelli has a cartellino inscribed with Bellini's name. The chief treasures of this collection are the portraits of two Venetians attributed to Raphael, and that of Pope Innocent X. by Velazquez,—the latter a marvel of dashing and alinost too skilful execution. There is also a fine portrait of Andrea Doria by Scbastiano del Piombo, well modelled, but rather wanting in colour. The Sciarra-Colonna Palace contains a few good pictures, among them a very fine portrait of a violin-player by Raphael, and a graceful painting of Modesty and Vanity by Luini, attributed to Da Vinci, as is often the case with Luini's pictures. The Colonna, Barberini, and other private galleries of Rome contain but little that is noteworthy. The church of S. Maria sopra Minerva eontains some splendid frescos by Lippo Lippi; some of Pintu- ricchio's chief frescos are in the churches of S. Maria del Popolo and S, Maria in Ara Coli; and the monastery of 8. Onofrio possesses a very lovely fresco of the Madonna and a kneeling Donor, attributed to Da Vinci,—probably a pupil's work.

The Florentine Accademia delle Belle Arti eontains a most valu- able collection of early Florentine and other 15th-century pictures, including the finest panel picture by Gentile da Fabriano,—the Adoration of the Magi,—a rare example of Verrocchio, partly painted by his pupil Da Vinci, some magnificent examples of Botticelli, good specimens of Fra Angelico, Ghirlandaio, Signorelli, Lippo Lippi, Fra Bartolomeo, and a group of saints by Andrea del Sarto, one of his best works. The magnificent galleries in the Uffizi and Pitti Palaces contain an unrivalled collection of the great Florentine painters of all dates. In the Uffizi are several fine paintings by Raphael,—the Madonna del Cardellino, a portrait of Julius IT., and an exquisitely finished head of an unknown lady. Among the many fine examples by Titian is his portrait of a nude lady reclining (Danae),—a most wonderful work. In the same room (La Tribuna) is the circular panel of the Madonna and St Joseph, an early work by Michelangelo, showing the influence of Signorelli. Many of Botticelli's finest works are in this gallery, and the Uffizi also possesses an almost unrivalled collection of drawings by Italian painters of all dates. The Pitti Palace contains some of the chief works of Raphael,—the early Madonna del Gran Duca, and por- traits of Angelo Doni and his wife, the portraits of Cardinal Bibiena and Leo X. (in his later manner), the Madonna della Seggiola, and the miniature Vision of

Ezekiel. The portrait of a nun, attributed to Da Vinci, but probably the work of a pupil, is a work of extra- ordinary finish and refinement. The Magdalen and the lady's portrait (La Bella) by Titian are among his best works. Both these collections contain some good Flemish and Dutch pictures. In the church of Santa Croce are the chief works of Giotto, in S. Maria Novella the best pictures of Orcagna and Ghirlandaio, and in the monastery of 8. Marco the principal frescos of Fra Angelico. Some of the chief frescos of Spinello Aretino, much repainted, cxist in the sacristy of S. Miniato, and the most important frescos of Andrea del Sarto are in the church of 8. Annunziata.

The small galleries at Perugia and Siena are of great interest for their collections of rare works by painters of the local schools. The

Chapel by Michel.

Florence

Smaller Italian galleries.

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small collection at Pisa also possesses some curious early panels by local painters ; in the church of S. Caterina is a magnificent altar- piece by Fran. Traini, Orcagna's chief pupil. At Prato are the finest frescos of Lippo Lippi. The gallery at Bologna 'contains some of Francia's chief works, the St Cecilia of Raphael, and a number of examples of the Caracci and others of the later Bolognese school. ° Parma is specially rich in the works of Correggio and Parmigiano ; unhappily the great frescos by the former in the cathedral have almost wholly perished. The small collection at Ferrara possesses interesting examples of paintings of the local school. Brescia and Bergamo are very rich in fine works of Moretto and Moroni, and also possess a number of fine Venetian paintings of various dates.

Padua has but a small and unimportant gallery, but. the town is rich in frescos by Giotto, Altichiero, and Jacopo Avanzi, and most noble frescos by Andrea Mantegna. Mantua also contains some grand frescos by Mantegna in the Castello di Corti, and a large quantity of showy and cleverly executed wall and ceiling paintings by Giulio Romano in the Palazzo del Té. The Verona gallery con- tains some few good examples of the local school. The church of S. Zenone possesses a magnificent altarpiece by Mantegna ; and in S Anastasia is the wreck of a fine fresco of St George and the Dragon by Pisancllo, The Vicenza collection contains little of value-except some good examples of Bart. Montagna. The Turin gallery possesses a few good pictures, especially some fine panels by

Botticelli and splendid portraits by Vandyck. Many of Vandyck's. finest works exist in the various palaces of Genoa. The large gallery at Naples contains an unusual proportion of bad pictures ; there are, however, some fine works of Titian and some interesting examples of the early Flemish school which have been in Naples ever since the 15th century. The only painting of much importance in the gallery at Palermo is a very beautiful triptych of the school of Van Eyck.

Venice is extraordinarily rich in the works of its own school, with the exception of those of Crivelli, who is completely absent. The works in Venice of the Bellini family, of Carpaccio and others of Gian. Bellini's pupils, of Titian, Tintoretto, and Paul Veronese, are among the chief glories

of the world. The Grimani breviary, in the doge's library, contains a very beautiful series of miniature pictures of the school of Memling.

The Brera Gallery at Milan contains a large number of master- pieces, especially of the Lombard and Venetian schools, among them the chief work of Gentile Bellini, St Mark at Alexandria, some uurivalled portraits by Lorenzo Lotto, and very important examples of Moretto's religious paintings. One of its greatest treasures is the altarpiece painted for the duke of Montefeltro by Piero della Francesca, and wrongly attribnted to his pupil Fra Carnovale. The celebrated Sposalizio is the most iniportant work of Raphael, executed wholly under the influence of Perugino. The gallery is especially rich in works of the pupils and imitators of Leonardo and other Milanese painters. The Biblioteca Ambrogiana contains some priceless drawings by Leonardo da Vinci and a large number of his autograph MSS., selections from which have been published by Dr Richter, London, 1883. Another important MS. of Da Vinci from the same library, the Codice Ailantico, is now (1886) in course of publication in Rome in its entirety.

This very scanty sketch of the contents of the chief galleries of Europe will give some notion of the places where the works of special schools and masters can best be studied. In some cases there is but little choice: the greatuess of Giotto can only be fully realized in Florence and Padua, of Carpaccio and Tintoretto in Venice, of Signorelli at Orvieto and Monte Oliveto, of Fra Angelico in Florence, of Correggio in Parma, of Velazquez in Madrid, and of Murillo in Seville.

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SCHOPENHAUER, Arruur (1788-1860), was born in Dantzic (117 Heiligen-Geist Strasse) on 22d February 1788. Doomed for the first thirty years of his career to find his works ignored with galling silence, he came, from the year 1845 onwards, to be looked up to by a scanty but devoted following as, what he himself claimed to be, the founder of the first true philosophy. Historical criticism has done much to dispel his pretensions to originality, and logical examination has demonstrated the incongruities lurking in his system. But the fact of his dominant influ- ence on contemporary thought remains undiminished after every such disparaging analysis. He consoled himself for the neglect of his own generation by the assurance that his would be the philosophy of the future. His ideas, recommended by the mastery of language and brilliance of illustration which entitle him to a first class in literature, have become the burden of much of our current speculation, and have leavened to an unusual extent the view of life and of the universe which animates the average educated world and finds expression in literary art.

His father, Heinrich Floris Schopenhauer, the youngest of a family to which the mother had brought the germs of mental malady, was a man of strong will and originality, vehement and resolute in the extreme, and so proud of the independence of his native town that when Dantzic in 1793 surrendered to the Prussians he and his whole establishment withdrew to Hamburg. The mother of the future philosopher was Johanna Henriette Trosiener. Both parents belonged to the mercantile aristocracy, the bankers and traders, of Dantzic. Johanna, who at the age of twenty accepted a husband of forty, was as yet undeveloped in character ; and perhaps he hoped that her want of love, which she did not conceal, might be com- pensated by the community of tastes and interests which, under his guidance, would grow

up between them, But the radical rift in the wedded heart could not be stopped up by a merely intellectual cement. The two children of the marriage, Arthur born in 1788 and Adele in 1796, bore (according to the theory of the former 1) the penalty of their parents' incompatibilities. While they inherited from their mother a high degree of intelligence and literary style, they were burdened by an abnormal urgency of desire and capacity for suffering, which no doubt took different phases in the man and the woman, but linked them together in a common susceptibility to ideal pain.

In the summer of 1787, a year after the marriage, the

a ee 1 Die Welt als Wille, ii. c. 48.

elder Schopenhauer, whom conmercial experiences had made a cosmopolitan in heart, took his young wife ona tour to western Europe. It had been his plan that the expected child should see the light in England, but the intention was frustrated by the state of his wife's health, and they had to beat a hasty retreat homewards in early winter. The name of Arthur, given to the child in St Mary's at Dantzic, was chosen because it remains the same in English, French, and German. The first five years of his life Arthur spent under the care of his mother, chiefly in their country house at Oliva, about 4 miles west of Dantzic. There, at the foot of the prettily wooded sand- hills which look out upon the dim Baltic, the young mother enjoyed a life of leisure, dissipating the long solitary hours with her horses, the gondola on the pond, the foun- tains, and the lambs, or with the French novels her husband put amply at her disposal. It was only on Saturday and Sunday that he would quit his office in town and come down, generally in company with a friend or two, to get a glimpse of his wife and son. The latter was often taken on a visit for weeks to the manor-house, between Dantzic and the sea-coast, where his maternal grandparents lived. After 1793 the father never set foot in his old home 3 but Johanna was allowed every four years to revisit the scenes of her youth.

During the twelve years they had their home at Ham- Ham- burg (1793-1805) the Schopenhauers made frequent ex- burg The year after his sister's birth Arthur was Pe™4

cursions, taken by his father to France, and left for two years (1797-99) as a boarder with M. Gregoire, a merchant of Havre, and friend of the Hamburg house. The boy formed a fast friendship with his host's son, Anthime, and grew so familiar with French that by the end of his sojourn he had almost forgotten his mother-tongue. The youthful friends lost sight of each other for long years; and when the Frenchman sought to renew their corre- spondence in the evening of life they found that they had drifted far asunder ; and unworthy suspicions led Schopen- hauer to dismiss his old comrade in abrupt silence. Arthur returned alone by sea to Hamburg, and for the next four years had but indifferent training. When he reached the age of fifteen the scholarly and literary instincts began to awaken, and he became anxious to be initiated into the fraternity of the liberal arts and sciences. But his father,

'steeped in that old pride of caste which looks down upon

the artist and the writer of books as mere means or instru- ments to decorate and diversify the life of business, was unwilling a son of his should worship knowledge and truth

lengthened tour, of which Johanna has given an account, to Holland, England, France, and Austria.

« boarder with a Rev. Mr Lancaster at Wimbledon.

him most pleasure was the last,—a solitary pedestrian

joined his mother at Dantzic, September 1804, where he was confirmed.

At Hamburg in the beginning of 1805 he was placed in the office of a merchant called Jenisch. He had only been there for three months when his father, who had shown symptoms of mental alienation, fell or threw himself from an elevated opening of his warehouse into the canal. After his death the young widow (still under forty) got affairs wound up, and, leaving Arthur at Hamburg, proceeded. with her daughter Adele in the middle of 1806 to Weimar, where she arrived only a fortnight before the tribulation which followed the victory of Napoleon at Jena, At Weimar her talents, hitherto held in check, found an atmo- sphere to stimulate and foster them;

her esthetic and literary tastes formed themselves under the influence of Goethe and his circle, and her little salon gained a certain celebrity. Arthur, meanwhile, was left at his desk in Hamburg, cursing his prosaic lot, and smuggling literature under the ledger; the hot blood of youth was turning his thoughts to morbid cynicism, and his easy-minded mother, alarmed at his discontent, adopted the advice of her friend Fernow, and offered him a release from the loathed task- work, He hastened to make up lost ground, and at the age of nineteen began to decline mensa with Doering at Gotha. But the wantonness and restiveness which he had grown familiar with in the lax schooling of the world would not let him alone: he allowed his satirical pen to play on one of the teachers of the grammar-school, and pro-fessional etiquette required Doering to dismiss his pupil. After a plain but gentle rebuke for his folly, his mother settled him at Weimar—not in her own house, for, as she told him, she was content to know that he was well and could dispense with his company—but with the Greek scholar Passow, who superintended his classical studies. This time he made so much progress that in the course of two years he became a tolerable scholar, and read Greek and Latin with fluency and interest.

In 1809 his mother handed over to him (aged twenty- one) the third part of the paternal estate, a sum of 19,000 thalers, which, being invested in good securities, yielded him from the first a yearly income of more than 1000 thalers= £150. Possessed of this fair patrimony, Schopen- hauer in October 1809 entered the university of Gottingen, with a clear plan of acquiring all that machinery of know- ledge which schools can give. The direction of his philo- sophical reading was fixed by the advice of Professor G. E. Schulze to study, especially, Plato and Kant. For the former he soon found himself full of reverence, and from the latter he acquired the standpoint of modern philo- sophy. The names of " Plato the divine and the marvel- lous Kant" are conjunctly invoked at the beginning of his earliest work. But neither the formal exercises of the class-room nor the social and hygienic recreations which he did not fail to combine with them filled his hours to the exclusion of the ideas which began to formulate them-

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as ends in themselves. Accordingly he offered his son the choice between the classical school and an excursion to England.

Six months were spent in England, and Arthur, while his parents proceeded as far as Scotland, was left for a few weeks as He found English ways dull and precise and the religious observances exacting; and his mother had—not for the last time—to talk seriously with him on his unsocial and wilful character. Perhaps the part of the tour which gave

stroll along the ridge of the Riesengebirge, just before he

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selves in him. Contempt for the superficiality of human life settled itself more and more deeply in his heart, with the sense of a bitterness tainting the very source of being, and the perception that the egoism of individuals seeks for nothing better than to push on the load of misery from one to another, instead of making an effort to re- duce the burden. These pessimistic reflexions (which his mother found eminently unsocial) were naturally concomi- tant with groundless nervous terrors; sudden panics would dash over his mind, and even in those days he had begun to keep loaded weapons always ready at his bedside. As a philosopher has said, 'the sort of philosophy we choose depends on the sort of people we are ; for a philosophical system is not a dead bit of furniture: it draws its life from the soul of the man who has it." He was a man of few acquaintances, amongst the few being Bunsen, the subsequent scholar-diplomatist, and Bunsen's pupil, W. C. Astor, the son of Washington Irving's millionaire hero. Even then he found his trustiest mate in a poodle, and its bearskin was an institution in his lodging. Yet, precisely because he met the world so seldom in easy dialogue, he was unnecessarily dogmatic in controversy ; and many a pottle of wine went to pay for lost wagers. But he had made up his mind to be not an actor but an onlooker and eritic in the battle of life; and, when Wieland, whom he met on one of his excursions, suggested doubts as to the wisdom of his choice, Schopenhauer replied, 'Life is a ticklish business ; I have resolved to spend it in reflecting upon it."

After two years at Gdttingen, he took two years at Berlin, where the university had been founded only four years before. Here also he dipped

into divers stores of learning, notably classics under Wolf. In philosophy he heard Fichte and Schleiermacher. Between 1811 and 1813 the lectures of Fichte (subsequently published from his notes in his Wachgelassene Werke) dealt with what he called the "facts of consciousness" and the "theory of science," and struggled to present his final conception of philosophy. These lectures Schopenhauer attended,—at first, it is allowed, with interest, but afterwards with a spirit of opposition which is said to have degenerated into con- tempt, and which in after years never permitted him to re- fer to Fichte without contumely. Yet the words Schopen-

hauer then listened to, often with baffled curiosity, certainly helped to give direction to the current of his speculation.

Schopenhauer did not find the city of intellect at all to

his mind, and was lonely and unhappy. One of his inter-

ests was to visit the hospital La Charité and study the evidence it afforded of the interdependence of the moral and the physical in man. In the early days of 1813 sym- pathy with the national enthusiasm against the French carried him so far as to buy a set of arms; but he stopped short of volunteering for active service, reflecting that Napoleon gave after all only concentrated and untram- melled utterance to that self-assertion and lust for more life which weaker mortals feel but must perforce disguise. Leaving the nation and its statesmen to fight out their freedom, he hurried away to Weimar, and thence to the quiet Thuringian town of Rudolstadt, where in the inn Zum Ritter, out of sight of soldier and sound of drum, he wrote, helped by books from the Weimar library, his essay for the degree of doctor in philosophy. On the 2d of October 1813 he received his diploma from Jena; and in the same year from the press at Rudolstadt there was published—without winning notice or readers—his first book, under the title Ueber die vierfache Wurzel des Satzes Satz vom

vom zureichenden Grunde, in 148 pages 8vo. sa enden Schopenhauer's monograph On the Fourfold Root of the Prin- Grunde. ciple of Sufficient Reason urged that, in discussing the principle of necessary connexion, philosophers had failed to distinguish betwecn

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Rupture with his mother.

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reason as ground of belief and reason as cause of a fact. The prin- ciple gives expression to the law that nothing Singular and uncon- nected can be an object for us but only as forming part in a system. This law has four main roots, according to the four classes of objects, in cach of which a special form of connexion prevails. These

objects are—(1) real objects of perception, where the relation of

cause aud effect requires each state to be dependent on its ante- cedent ; (2) propositions, which are tied together as premiscs and conclusions ; (3) the formal conditions of perception, viz., space and time, where cach part is intuitively seen to be in reciprocal depend- ence on every other; (4) voluntary agents, where the law of motiva- tion prescribes the dependence of action upon the idea of an object presented to the character of the agent.1 Modifying the Kantian theory, that things are mental projections, he emphasizes the intel-

lectual operation which elevates sensation to perception. The feelin g

of alteration in an organ is taken by the intellect, whose one category is causality, to refer to a real, ¢.¢., material object which generatcs the change in our body. But the reference is an intuitive interpretation of a felt modification in the organism. Hence the

important place assigned to the human body: it is the first of

objects, the ‘immediate object,” the means by which all other objects come within consciousness. external perceptions, the body further serves as an instrument for separating phantasm from fact. To detect and scare away hallucina- tion we have only to realize the presence of our bodies. with motives Schopenhauer touches upon the relation between volition and cognition. The ego—which is the subject that knows —is a mere correlative

to the known object: object perceived and subject perceiving are not two things, but one, perpetually dividing

itself into two poles; and what are called the several faculties of

*the ego are only an inference or a reflex from the several classes of mental object. The "I" in 'I know" is already the implication and virtual presence of knowledge. But the "I will" is a new fact,—the revelation of another aspect of the world, the first fact of inner and real existence. In this perception there is given us the unity of the volitional self with the knowing subject; and this identity of the '*I" who "will" with the "I" who "know" is in Schopenhauer's words the miracle par excellence (das Wunder kar' efox7v, § 43).*

In November 1813 Schopenhauer returned to Weimar, and for a few months boarded with his mother. But the strain of daily association was too much for their antagon- istic natures. The mother felt herself génée in the pre- sence of a disputatious and gloomy son; she missed the ease of her emancipated life; and her friends found their movements watched by a suspicious eye, which was ready to surmise evil in the open and light- hearted style of housekeeping. In short, his splenetic temper and her volatility culminated in an open rupture in May 1814. From that time till her death in 1838 Schopenhauer never saw his mother again. It was during these few months at Weimar, however, that he made some acquaintances de- stined to influence the subsequent course of his thought. Conversations with the Orientalist F. Mayer directed his studies to the philosophical speculations of ancient India. In 1808 Friedrich Schlegel had in his Language and Wis- dom of the Old Hindus brought Brahmanical philosophy within the range of European literature. Still more in- structive for Schopenhauer was the imperfect and obscure Latin translation of the Upanishads which in 1801-2 Anquetil Duperron had published from a Persian version of the Sanskrit original. Another friendship of the same period had more palpable immediate effect but not so per- manent. This was with Goethe, who succeeded in securing his interest for those investigations on colours on which he was himself engaged. Schopenhauer took up the subject in earnest, and the result of his reflexions (and a few ele- mentary observations) soon after appeared (Easter 1816) as a monograph, Ueber

das Sehen und die Farben. The essay, which must be treated as an episode or digression from the direct path of Schopenhauer's development, due to the potent deflecting force of Goethe, was written at Dresden, to which he had transferred his abode after the

1 This classification Schopenhauer subsequently modified,—substitnt- ing for the first and fourth a graduated scale rising from cause proper (in inorganic nature) to stimulus (in vegetative life) and motive (in

the animal world), the last again being either intuitive motive, as in the lower animals, or rational motive, as in man.

As a perpetual correlative of

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rupture with his mother. It had been sent in MS. to Goethe in the autumn of 1815, who, finding in it a trans. formation rather than an expansion of his own ideas, in- clined to regard the author as an opponent rather than an adherent.

The pamphlet begins by re-stating with reference to sight the Essay on general theory that perception of an objective world rests upon an Sight instinctive causal postulation, which even when it misleads still and remains to haunt us (instead of being, like errors of reason, open Colours, to extirpation by evidence), and proceeds to deal with physiological colour, 7.e., with colours as felt (not perceived) modifications of the action of the retina. First of all, the distinction of white and black, with their mean point in grey, is referred to the activity or inactivity of the total retina in the graduated presence or absence of full light. Further, the eye is endowed with polarity, by which its activity is divided into two parts qualitatively dis- tinct. It is this circumstance which gives rise to the phenomenon of colour. All colours are complementary, or go in pairs; each pair makes up the whole activity of the retina, and so is equivalent to white ; and the two partial activities are so connected that when the first is cxhausted the other spontaneously succeeds. Such pairs of colour may be regarded as infinite in

number; but there are three pairs which stand out prominently, and admit of casy expres- sion for the ratio in which each contributes to the total action. These are red and green (each=}), orange and blue (2:1), and yellow and violet (3:1).2 This theory of complementary colours as due to the polarity in the qualitative action of the retina is followed by some criticism of Newton and the seven colours, by an attempt to explain some facts noted by Goethe, and by some reference to the external stimuli which cause colour.

The grand interest of his life at Dresden was the com- position of a work which should give expression in all its aspects to the idea of man's nature and destiny which had been gradually forming within him. Without cutting himself altogether either from social pleasures or from art, he read and took notes with regularity. More and more he learned from Cabanis and Helvetius to see in the will and the passions the determinants of intellectual life, and in the character and the temper the source of theories and beliefs. The conviction was borne in upon him that scien- tific explanation could never do more than systematize and classify the mass of appearances which to our habit-blinded eyes seem to be the reality. To get at this reality and thus to reach a standpoint higher than that of etiology was the problem of his as of all philosophy. It is only by such a tower of speculation that an escape is possible from the spectre of materialism, theoretical and practical; and so, says Schopenhauer, "the just and good must all have this creed: I believe in a metaphysic." The mere reasonings of theoretical science leave no room for art, and practical prudence usurps the place of morality. The higher life of esthetic and ethical activity—the beautiful and the good —can only be based upon an intuition which penetrates the heart of reality. Towards the spring of 1818 the work was nearing its end, and Brockhaus of Leipsic had agreed to publish it and pay the author one ducat for every sheet of printed matter. But, as the press loitered, Schopen- hauer, suspecting treachery, wrote so rudely and haughtily to the publisher that the latter broke off correspondence with his client. In the end of 1818, however, the book Welt als appeared (with the date 1819), in 725 pages 8vo, with the Wie

title Die Welt als Wille und Vorstellung, in four books, aan

with an appendix containing a criticism of the Kantian

philosophy. : The first book of The World as Will and Idea resumes the argu- Book i.

ment of the earlier work, that all objects are constituted by intel-

lectual relations, describable as forms of the causal principle. As

So apprehending a world of objects, man is said to possess in-

telligence (Verstand), the perception of individual sequences and

coexistences. It is a faculty he sharcs with the animals, and by its

means the world presents itself as an endless number of objects in

space and time bound together by necessary laws of causality. But

man has also the power of reason (Vernunft), by which he generalizes,

the vehicle of this generalization being language. By mcans of

2 Tn this doctrine, so far as the facts go, Schopenhauer is indebted to a paper by R. Waring Darwin in vol. Ixxvi. of the Transactions of the Philosophical Society.

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language and reasoning he rises out of the animal immersion in the present and is able to anticipate the future. He forms general ideas and thus can preserve and communicate abstract knowledge. But reason, though its "laws of thought" have a formal truth of their own, has no independent value either as theoretical or as practical. In the former aspect it gives rise to scientific knowledge —the knowledge of facts and sequences not in their single occur- rences but as instances of a general law. By means of the general truths thus arrived at we can deduce or prove. But a proof is, after all, only a means of showing the disputatious that something which they deny is inseparably bound up with something they admit. It is a mistake, therefore to substitute for the ocular demonstration of which geometry is susceptible a syllogistic reasoning which may compel assent but cannot

inspire insight. Singular experiences are the true workers which support the luxury of general ideas, and reasoning cannot claim to be more than a re-arrangement of pro- ducts from other fields.

Reason is equally important and equally limited as a factor in conduct. It enables us, as it were, to lead a second life, guided by general principles and not by single appetitions. Such a life is what is called a life according to reason, typified in the ideal of the Stoic sage. The wise man carries out the items of conduct accord- ing to a general plan and is superior to the impulses of the moment. But here too the general rests upon the particular ; a systematic happiness takes the place of single and conflicting pleasures, but still can only justify itself by procuring pleasure. Thus, unless there be a new perception of life's meaning, rcasoning cannot make a man virtuous, it can only make him prudent ; it tclls him how to reckon with his natural character, but it cannot show him how to amend it.

Book ii. is an attempt to name that residual reality which is pre- supposed but not explained in every scientific explanation, whether setiological or morphological. The key is found im the conscious- ness of ourselves as exerting will. What to the inner conscious- ness is volition is to the outer perception a bodily movement. And as each act of volition is perceived in a bodily motion, so will as a whole is by us perceived as body. This consciousness that my body is my will objectified—my will translated into terms of scien- tific apprehension—is the " philosophical truth " of truths. And, generalizing this truth, we conclude that, as our eorporeal frame is the visibility of our mode of will, so everything is some grade in the objectification of the will. While the etiology of science accounts for the familiar complex by a simpler and more abstract phase, philosophy uses the clearer and more conspicuous instance to explain the more rudimentary. The law of motivation is taken as a key to open the incomprehensibility of mere causation, and in the stone we presume a feeble analogue of what we know as will. The will as such, apart from its objectification in animals, knows nothing of motives, which, though they explain the special circum- stances, presuppose the underlying and originative force. No doubt a false idea of simplicity has often led theorists to reduce all sciences in the last resort to applied mathematics, in which the mysterious something called force was eliminated and only the forms of space and time and motion left.

But, though it is doubtless possible to reduce the list of original forces, we cannot get rid of an inexplic- able activity. Hence the original force or will is beyond the range of causality ; every cause is only an "occasional cause," and but states the temporal conditions of operation of the eternal energy. While each several act has an aim, the collective will has none.

The numerical differences of objects do not touch the underlying activity. It is felt in one oak as much as in a million, for time and space are only semblance for (animal) intelligence. And there- fore, instead of wondering at the uniformity pervading the in- stances of any objectification of will, we should remember that the will-force operating in all is the same, and reveals its inner identity in the common law. For the same reason the adaptations of the parts of an organic body or of one organie body to another are only the consequences of the unity of will. Just as the series of actions throughout a life are only the utterances of one original character, and so intrinsically interdependent, so the grades of objectification in nature are the expression of one identical will, which forms the conditions of existence as well as the living creatures accommodating themsclves to them. Will, which appears in its lowest grade of objectification as the physical forces of inorganic nature, rises in the vegetative world to a peculiar sympathetic response to the stimulation by external circumstances, and in the animal world produces for itself a special organ, the brain, which possesses the power of presenting under the forms of sense and in- tellect that objective manifestation of will which we call the world of our experience. With the existence of the animal brain, the world emerged into time and space. It was a step necessitated by the growing complexity of type in the will-products, which could neither exist nor preserve their kind without this new instrument which substituted conscious adaptation for unconscious teleology. In this strange mythology by which Schopenhauer replaces the mystery of creation we see the magic world of will, weaving ever higher complexities of material existence, brought at length by

stress of circumstances to forge a material organ which shows the sense-world as the objectification of the will. In this one material organ the will has come to see itself expanded into a complicated order of time and place.

But at first the brain and its function, knowledge, are solely employed in the service of the will.

Book iti. shows how the intellect is emancipated from this bond- Book tii. age to the will. When we contemplate an object simply for its own sake, forgetting everything and ourselves even in the vision, then what we have before us is no longer one thing among many but a type, not one of a class but an ultimate individuality, not a par- ticular but an adequate embodiment of the universal. Instead of the general concept or class-notion we have the Platonic 'idea "— one image into which all the essential life of the object has been concentrated. To realize this individual which has not entered into the bonds of individuation, this universal which is not a mere genus but the eternal truth of the individual, is the province of genius. The man of genius, neglecting the search for relationships between things—unpractical and to practical judgment sometimes seeming to have a touch of maduess—instead of seeking to classify a thing or find out what it is for, looks at it for its own sake and sees the one type or ideal which is seeking for expression in its various and contingent manifestations. Such genius begets art. Yet so much at least of genius is in all men that they can follow where the artist leads and see through his eyes. Everything as thus contemplated disinterestedly for its own sake and in its per- manent significance is beautiful. Yet one thing is more beautiful than another. For there are objects which more than others facili- tate the quiescence of desire and present to us their permanent character without suggesting or stimulating appetite. The sense of sight is more independent than others of associations of desire, the past and distant purer from self-interest than the present. Those objects are specially beautiful where the significant idea is most clearly presented in the individual form. Indeed, when a certain effort is required to keep out of sight the general bearing of the object on the will, then the object, where the perception of genius still sees the perfect type in the single form, is called sublime.

The several arts fall naturally into an order which rises from the passive enjoyment in the contemplation of inorganic forces to the active perception of will in its most complex types. Architecture seeks in works dedicated to human use to give expression to the fundamental features of physical force, e.g., cohesion, weight, &c., and to that end it intensifies the appearance of

strain by refusing the forces an easy and immediate lapse into their natural tendency. In short, it seeks to show resistance visible. Sculpture presents the beauty and grace of the human form, 7.¢., the 'idea " of that form as a whole and in the single movements. Here the "idea" is not derived by comparison and abstraction of obscrved forms ; but we, as ourselves the will seeking manifestation, anticipate by our ideal the meaning of the imperfect phases and lay down an a priort eanon of beauty. While sculpture gives expression to the more generic type in figure and motion, painting aims at repre- senting action. But even historical pictures scek in a given scene to present not the historical importance of the action but its per- manent meaning. Poetry, which uses an arrangement of general concepts to convey an "idea," or moulds reality out of abstractions, gives us the central and abiding truth which history usually dis- sipates in a host of particulars and relations. In lyric poetry the individual subject of will presents himself as the subject of artistic perception: his own experience is displayed as typical and universal. In tragedy the truth shown is the inner conflict at the very root of the will. The hero is exhibited as brought to see the aimlessness of all will; and by suffering he learns resignation. Music, unlike the other arts, is an image of the movement of will not yet ob- jectified ; and in its elements and harmonies we have a parallel to the stages and complexities of the actual world. Hence the ex- planation of music would be a philosophy of the worlds

But art, though it affords an interval of rest from the drudgery Book iv. of will-service, cannot claim to be more than a transient consola- tion. Book iv. indicates a surer way of release. It reminds us that our life is the phenomenon of the will,—a phenomenon which begins at birth and ends at death, and of which every instant is a partial birth and a partial death. But the cessation of the indi- vidual life is not an annihilation of the will ; our essential being is indestructible. The manifestation of the will in human Hie is spread out and disposed in an endless multitude of actions. Ex- perience sums up these in a single formula,—the maxim of our empirical character ; and that result itself is the type or idea which reveals the one unalterable utterance of will, which is the intel- ligible character! It is this immemorial act which fixes our empirical character, which gives the consistency and regularity of our acts. Velle non discitwr. Character is given (by an ante- phenomenal act) ; it is not acquired. If in one sense we can speak of an

“acquired character,” we mean thereby that we now under- stand what manner of men we are, that we have learned the best and worst of ourselves. But, though the character is given once

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1 The terms are borrowed from Kant,

Visit to Ttaly.

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for all in the beginning, knowledge is not useless. We can learn to adopt new means though the end of will remains unaltered. It is this new knowledge which causes repentance, when we see we have adopted undue methods to attain our aim. The survey of the phenomena of life in the light of their principle shows that all life is a ceaseless battle for existence between individuals, that happi- ness is only negative, viz., a relief from pain, that life is a tragedy. But the natural man, immersed in the sense of life, plays the egoist as if he were the centre of existence and the will to life spoke in him alone. In such a spirit he not merely acts as if affirming his own will to life, but as if he denied that of others. He com- mits injustiee. The sense of wrong-doing, he may feel, is the wit- ness of consciousness to the identity between himself and others ; it is the appearance of moral law and gives rise to that sense of right which is the beginning of ethics. But for the most part practical reflexions note only the evils caused by egoisin, and induce the suffercrs to form a law to produce by repression the same results as morality attains by stimulation. Thus penal law, as opposed to moral law, aims only at checking intrusions upon the rights of others, and the whole political organization is only an instrument for checking cgoism by egoism, for making each seek the welfare of all because it includes his own. Its justice is temporal ; it adds an additional pain by legislative machinery, with aview to the welfare of the greater number.

But there is another and an eternal justice. Here there is no separation of time and place between the wrongdoer and the sufferer. This eternal justice reveals itself to him who, having seen through “the veil of Maya,” has found that in the world of truth the divisions between individuals fall away,

and that he who does wrong to another has done the wrong to his own self. The persuasion of this doctrine of eternal justice is so ingrained in human nature that we welcome the punishment that overtakes the victorious evildocr. Similar lessons are hidden in the myths of transmigration of souls. The secret sense that the pains of others are in reality not alien constitutes the torments of remorse which visit the wicked. The good man, on the contrary, who has been brought to sec through the veil of individuality into the unity of all being, will not merely practise justice, —he will be animated by a universal benevolence. Instead of ows or the blind lust of life (seen at its strongest in sexual appetite), he has learned, by means of self-knowledge, that dyar% which is pitying love, or caritas generts humant.

Such benevolence only alleviates the misery of others. It culmi- nates in self-sacrifice, which is carried out by voluntary and com- plete chastity, by utter poverty, by mortification, by fasting, and last of all by death. Such a course of life, however, is seldom taught by instruction alone, and the broken will generally comes only where a mighty shock of grief reveals the inevitable pain of existence and brings a quietive to the lust of life. Yet the victory over the will to life is not attained once for all; the supremacy must he retained by a career of asceticism. Such ascetics, in whom the will to life was deadened and the body remained as a mere empty semblance, were the saints and mystical devotees of all ages. They had crucified the ficsh with its affections and lusts. Their will had been emancipated from the bondage to which in life it was subject, had been released from the objectification in corporeity and restored to its original infinity. In such saints alone has the essen- tial freedom of the will appeared on the temporal scene, but appeared only to destroy the old Adam and bring in the new birth. By the lively knowledge of the truth of things the will has denied itself, has passed into a stage where the objective world is as if it were not,—the stage which was when will as yet had not gone forth to objectify itself in a world and when knowledge had not yet mirrored the reality in an idea, when, in short, nothing was.

Long before the work had come to-the hands of the public, Schopenhauer had rushed off to Italy and ex- changed the labours of giving the gospel of renunciation a metaphysical basis for the gaiety of southern life and the influences of classic art. At Venice, where he first lingered for a while, he

found himself a fellow-denizen with Lord Byron; but, except for a solitary chance when his jealousy was stirred by the outspoken admiration of his fair Venetian companion for the handsome Briton who rode past them on the Lido, the two insurgent apostles of the Weltschmerz never came across each other's path. At Rome, where he passed the depth of winter, he saw the first copies of his book. It found him in assiduous attend- ance on the art galleries, the opera, and theatre,—turning from the uncongenial companionship of his romantic coun- trymen and gladly seizing every chance of conversing in English with Englishmen. In March 1819 he had gone as far as Naples and Pestum. On his way homewards

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he was startled by receiving at Milan a letter from his sister announcing that in consequence of the failure of the Dantzic house a large part of his own and his mother's and nearly the whole of his sister's fortune were endangered. This change of circumstances was a heavy blow to the ladies, and he himself was almost induced by the mischance to qualify himself to teach in the university at Heidelberg in July 1819. But he sternly refused the compromise of seventy per cent. offered by the insolvent firm, and was so angrily suspicious with his sister who accepted it that he ceased to correspond with her for about fourteen years. Fortunately his determined and skilful assertion of his rights was crowned, after a long dispute, with success. He recovered the whole debt, receiving in principal and interest the sum of 9400 thalers.

After some stay at Dresden, hesitating between fixing Appoint. himself as university teacher at Gottingen, Heidelberg, ment at

or Berlin, he finally chose the last-mentioned. In his ex- amination before the faculty (disputatio pro venia legendi) he enjoyed what he reckoned the satisfaction of catching up Hegel (who had just been appointed professor) in a lax use of a technical term ("animal" for "organic" functions). And in his first and only course of lectures he had the further satisfaction of selecting as his hours the same times (12 to 1 on Monday, Wednesday, and Friday) as Hegel had taken for his principal class. This course on the first principles of philosophy or knowledge in general, given in the summer of 1820, was not a success,—indeed did not reach its natural end, and, though

the notice of lecture was repeated during his stay in Berlin up to 1831, the lecture- room knew him no more. Brilliant as he was in powers of luminous illustration and characteristic as is his style, he was wanting in the patient exposition of a subject for its own sake and not as the field for exemplifying a favourite thesis. The result of his experiences in 1820-21, which he attributed to Hegelian intrigues, was to intensify his suspicions of his colleagues, one of whom, F. E. Beneke (another alleged victim to Hegel's jealousies), he accused of garbled quotations in his review of The World as Will and Idea. Except for some attention to physiology, the first two years at Berlin were wasted. In May 1822 he set out by way of Switzerland for Italy. After spending the winter at Florence and Rome, he left in the spring of 1823 for Munich, where he stayed for nearly a year, the prey of illness and isolation. When at the end of this wretched time he left for Gastein, in May 1824, he had almost en- tirely lost the hearing of his right ear. Dresden, which he reached in August, no longer presented the same hospitable aspect as of old, and he was reluctantly drawn onwards to Berlin in May 1825. ~

The place had unpleasant associations of many kinds, but one disagreeable incident of his former stay now re- turned to him in a judicial award of pains and penalties. One day, about a year after his first settlement in Berlin, on 12th August 1821, on returning to his lodging he found three women standing in the passage in front of his room door. The event had annoyed him before, and his land- lady had promised it should not occur again. On this occasion accordingly Schopenhauer ordered them out of what he held to be his own "stair-head," walked into his room, and emerged in a few minutes with hat and stick as he had entered. One of the women was still on the spot, —a semptress, forty-seven years old, a friend of the land- lady, and occupant of a small chamber adjacent to that of Schopenhauer. This person he ejected; and when she returned to pick up a piece of cloth (there stood a chest of drawers belonging to her in the passage) he put her forcibly out again, upon which she fell with a shriek that alarmed the house. Next day she lodged an action against him for personal injuries ; and, after a variety of opposing deci-

sions, the final issue was in 1826 to award the complainant compensation (with five-sixths of costs and a small sum for medical expenses) to the amount of a quarterly aliment of fifteen thalers, which sum she received till her death, fifteen years afterwards.

The six years (1825-31) at Berlin were a dismal period in the life of Schopenhauer. In vain did he watch for any sign of recognition of his philosophic genius. Hegelianism reigned in the schools and in literature and basked in the sunshine of authority. It was a bad time for an independent thinker who ignored the state and the yearlong alliance between philosophy and theology. Thus driven back upon himself, Schopenhauer fell into morbid medita- tions, and the world which he saw, if it was stripped naked of its disguises, lost its proportions in the distorting light. The sexual passion had a strong attraction for him at all times, and, according to his biographers, the notes he set down in English, when he was turned thirty, on marriage and kindred topics are unfit for publication. He had in opening manhood been so fascinated by a Weimar actress that he declared he would take her to his home though he found her breaking stones on the roadside. Later years had nipped the freshness of his enthusiasm, and casual experiences generated an overweening misogyny, which, while allowing woman her place in the natural economy, regarded the /ady as the invention of a false civilization. Yet in the loneliness of life at Berlin the idea of a wife as the comfort of gathering age sometimes rose before his mind,—only to be driven away by cautious hesitations as to the capacity of his means, and by the shrinking from the loss of familiar liberties. He continued his bachelordom, and found consolation in less onerous associations. At home he tuned his flute; he dined, and it might be conversed, with his fellow-guests at the Hotel de Russie ; he read for hours at the royal library, and gave his evenings to the theatres. But he wrote nothing material. In 1828 he made inquiries about a chair at Heidelberg ; and in 1830 he got a shortened Latin version of his physio- logical theory of colours inserted in the third volume of the Scriptores Ophthalmologict Minores (edited by Radius).

Another pathway to reputation was suggested by some remarks he saw in the seventh number of the Lorewgn Review, in an article on Damiron's French Philosophy in the 19th Century. With reference to some statements in the article on the importance of Kant, he sent in very fair English a letter

to the writer, offering to translate Kant's principal works into English. He named his wages and enclosed a specimen of his work. His corre- spondent, Francis Haywood, made a counter-proposal which so disgusted Schopenhauer that he addressed his next letter to the publishers of the review. When they again referred him to Haywood, he applied to Thomas Campbell, then chairman of a company formed for buy- ing up the copyright of meritorious but rejected works. Nothing came of this application.' A translation of selec- tions from the works of Balthazar Gracian, which was published by Frauenst&dt in 1862, seems to have been made about this time.?

In the summer of 1831 cholera raged at Berlin, and Schopenhauer fled to Frankfort. About a year later he adjourned to Mannheim. But after eleven months' ex- perience of the latter he decided, from a carefully weighed list of comparative advantages, in favour of Frankfort. And there, accordingly, for the rest: of his life he remained. He resumed correspondence with his sister, who was liv- ing with her mother in straitened circumstances at Bonn. "SS pei ieee eaaada aaa Ee

1 [Tt was not till 1841 that a translation of Kant's Kritik in English appeared.

2 He also projected a translation of Hume's Essays and wrote a preface for it. '

vulgar charlatans.

which during his subsequent career he his three predecessors Fichte, Schelling, but above all

At first the good people of Frankfort knew him, not as the celebrated philosopher, but as the son of the famous Johanna Schopenhauer,? and as the companion of a familiar poodle. The day had not yet risen when, as he had pro- phesied to his mother (who joked at his book on " four- fold root" as smelling of the apothecary), his works would be read of all, and hers only be used by the grocer to wrap his goods in. The sense of unappreciated

work, aggravated by ill health and by pecuniary worry about his Dantzic property, sank deep into a heart that was yearn- ing for outward recognition. He seemed to see around him none but enemies, a world mainly filled with knaves and fools, where a true man was rarer than an honest woman, and where the very touch of society was so perilous that irony and reserve were imposed on every one who re- tained his self-respect. In solitude he devoured his own soul. At the hotel table a stranger might occasionally be drawn into listening to his vigorous monologue; but it

was seldom he was thus encouraged to discourse. Ground- less fears of hidden dangers made him see himself and

every other independent genius the aim of a conspiracy of He would never entrust his neck to the barber's hand; and he succeeded in secreting his valuables so thoroughly that some of them were after his death recovered only after much search.

Ever since the publication of The World as Wall and

Idea he had silently waited for some response to his message. charged to utter.

He had uttered the word he felt himself As the years passed he noted down every confirmation he found of his own opinions in the

writings of others, and every instance in which his views appeared to be illustrated by new researches. Full of the

conviction of his idea, he saw everything in the light of

it, and gave each apergu a place in his alphabetically arranged note-book. life may be called a commentary, an excursts, or a

Everything he published in later

scholium to his main book; and many of them are decidedly of the nature of commonplace books or collec- tanea of notes. But along with the

accumulation of his illustrative and corroborative materials grew the bitter-ness of heart which found its utterances neglected and other names the oracles of the reading world. The gathered ill-humour of many years, ageravated by the confident assurance of the Hegelians, found vent at length

in the introduction to his next book, where Hegel's works are described as three-quarters utter absurdity and one-

quarter mere paradox,—a specimen of the language in used to advert to

Hegel. This work, with its wild outcry against the philo- sophy of the professoriate, was entitled Ueber den Willen in der Natur, and was published in 1836.

The eight essays which go under the title of The Willin Nature Will in seek to show that his theory has the unique distinction of finding Nature. in physical science testimony to its metaphysical doctrines that will is the primary basis of all nature and intellect a derivative phenomenon. Often a trivial similarity of phrases serves to establish in his judgment an agreement of radical view. In the second essay he argues for the origin of animal organization from will, pointing out how in growing creatures the tendency to use an organ appears before the organ itself is formed, and maintaining that, instead of seeking the protoplasm of the animal kingdom in a mere lump of vitalized matter, to be moulded by external conditions, we should

8 Johanna Schopenhauer (1766-1838) was in her day an authoress ~ of some reputation. Besides editing the memoirs of Fernow, she published Votes on Travels in England, Scotland, and Southern France (1813-17); Johann van Eyck and his Successors (1823); three romances, Gabriele (1819-20), Die Tante (1828), and Sidonia (1828), besides some shorter tales. These novels teach the moral of renunciation (Entsagung). Her daughter Adele (1796-1849) seems to have had a brave, tender, and unsatisfied heart, and lavished on her brother an affection he sorely tried. She also was an authoress, publishing in 1844 a volume of Haus-, Wald-, und Feld-Méhrchen, full of quaint poetical conceits, and in 1845 Anna, a novel, in two vols.

look for it in the immemorial act of will which is the timeless origin of living beings. The third essay represents the intellect— or "the world as idea "— as having its origin in the narrow partition which in men and animals is interposed between the stimulation of a cause and the reaction which supervenes. From this realistic standpoint intellect seems an interloper in nature, an accident associated with the fortunes of man, and made victorious in the genius which can behold the world "'in maiden meditation, fancy- free." The fourth essay traces the grades of disproportion between cause and effect from inorganic to organic nature. Where there is causality there is will; but for us the more obviously the one shows itself the less is the other remarked. Another paper seeks to connect animal magnetism (mesmerism, hypnotism) and magic with the doctrine that in each of us the whole undivided will re- tains its miraculous potency.

In 1837 Schopenhauer sent to the committee entrusted with the execution of the proposed monument to Goethe at Frankfort a long and deliberate expression of his views, in general and particular, on the best mode of carrying out the design. But his fellow-citizens passed by the remarks of the mere writer of books. More weight was naturally attached to the opinion he had advocated in his early criticism of Kant as to the importance, if not the superiority, of the first edition of the Aritek ; in the col- lected issue of Kant's works by Rosenkranz and Schubert in 1838 that edition was put as the substantive text, with

supplementary exhibition of the differences of the second.

delusion. It is rcally a responsibility for our character, which we have gradually learned experimentally to know, and which go known serves as a court of appeal against single actions, or, in other words, becomes a conscience. That character is the supra- temporal action of that will which we and all things are. Thus this question of the freedom of the will, which is "a touchstone for distinguishing the profound from the superficial thinker," is solved by the Kantian distinction of empirical and transcendental world, In the words of Malebranche, "La liberté est un mystére,"

The essay on the foundation of morality is an attempt to present the fundamental fact of the moral consciousness and to. show its metaphysical bearings. It includes a lengthy criticism of Kant's system of ethics as only the old theological morality under a disguise of logical formule. Kant, according to his critic, though he struck a severe blow at eudemonism, made the mistake of founding ethics on ideas of obligation and respect, which are meaningless apart from a positive sanction. His categorical im- perative is attributed to reason,—a power which we only know as human, but which Kant regards as more than human and borrows from the "rational psychology," which itself had received it from theology. The moral spring should be a reality and a fact of nature, whereas Kant seeks it in the subtilties of general ideas, forgetting that reasoning is one thing and virtue another. And, when Kant has to illustrate the application of his rule for discover- ing the categorical imperative, he is forced to have recourse to con- siderations of self-interest.

After this examination, Schopenhauer preludes his exposition by the sceptical survey of so-called virtuous actions as due in the vast majority of instances to other than moral motives, and by a dis- integration of the average conscience into equal parts of fear of

Two In 1841 he published under the title Die becden Grund- | man, superstition, prejudice, vanity, and custom. The mainspring Main probleme der Ethik two essays which he had sent in a pie eenante ole ses a 5 se a apes YS Prob- . ⸮ : A atred or the malice which arises through egoistic conflicts. " Bu

lens of i Se sli EGU doch for de rizes offered. A The first ee though these are the predominant springs of conduct, there are Ethics, 1 answer to the question "Whether man's free will can | cases of unselfish kindness. It is in sympathy, or in our as it were

be proved from self-consciousness," proposed by the Nor- wegian Academy of Sciences at Drontheim. His essay was awarded the prize, and the author elected a member of the society. But proportionate to his exultation in this first recognition of his merit was the depth of his mortification and the height of his indignation at the result of the second competition. He had sent to the Danish Academy at Copenhagen in 1839 an essay "On the

Foundations of Morality" in answer to a vaguely worded subject of discussion to which they had invited candidates. His essay, though it was the only one in competition, was refused the prize on the grounds that he had failed to examine the chief problem (7.c., whether the basis of morality was to be sought in an intuitive idea of right), that his explanation was inadequate, and that he had been wanting in due respect to the swmmi philosophi of the age that was just passing. This last reason, while probably most effective with the judges, only stirred up more furiously the fury in Schopenhauer's breast, and his preface is one long fulmination against the ineptitudes and the charlatanry of his béte noire, Hegel.

In the essay on the freedom of the will Schopenhauer shows

that the deliverance of self-consciousness, "I can do what I will," is a mere statement of our physical freedom, or the sequence of

substituting ourselves for another who is in pain, that we find the impulse which gives an action a truly moral value. The influence of sympathy has two degrees: either it keeps me back from doing wrong to others, and in this sense leads to justice as a moral virtue (whereas civil justice prevents from suffering wrong) ; or sympathy may carry me on to positive kindness, to philanthropy or love of the human kind. It is on sympathy—the feeling of one identical nature under all the appearance of multiplicity—that the two car- dinal virtues of justice and benevolence are based. Schopenhauer notes especially that his principle extends to the relation between man and animals, and that a mistaken conception of human dignity has been allowed to hide the fundamental community of animal nature.

In 1844 appeared the second edition of The World as Will and Idea, in two volumes. The first volume was a slightly altered reprint of the earlier issue; the second consisted of a series of chapters forming a commentary parallel to those into which the original work was now first divided. The longest of these new chapters deal with the primacy of the will, with death, and with the meta- physics of sexual love. But, though only a small edition was struck off (500 copies of vol. i. and 750 of vol. ii.), the report of sales which Brockhaus rendered in 1846 was unfavourable, and the price had afterwards to be reduced.

Yet there were faint indications of coming Dawning

fame, and the eagerness with which each new tribute recog- from critic and admirer was welcomed is both touching a and amusing. From 1843 onwards a jurist named F. genius. Dorguth had trumpeted abroad Schopenhauer's name.

outward act upon inner resolve, in the absence of physical restraint. 'The statement of self-consciousness concerns the will merely a parte post, the question of freedom, on the contrary, a parte ante." Self-consciousness throws no light on the relation of volition to its anteccdents. If, on the other hand, we turn to the objects of the

outer senses, we find that it is part and parcel of their very nature to be not free but necessitated, governed, in short, by the principle of causation. But in the ascending scale of causation cause and effect become more and more heterogeneous, their connexion more unintelligible. This is seen in motivation, especially where the motives are not immediate perceptions but general abstract ideas. It is in the possibility of a conflict of motives that man's freedom of choice consists. But, because we can by a feat of abstraction keep an image of one course of action before us and neglect the other concrete conditions of behaviour, there grows up an illusion that the mere initial solicitation or velleity might, if we pleased, become actual will. Hence the delusion that we are free to will and not to will. Still the necessitating cause or motive is only the rule under which the real force or radical will operates. In this radical will consists our being, and on it action is consequent : operari sequitur esse. By our original character acting in certain circumstances of motive our actions are inevitably determined. But the sense of responsibility for our conduct is not altogether a

In 1844 a letter from a Darmstadt lawyer, Joh. August Becker, asking for explanation of some difficulties, began an intimate correspondence which went on for some time (and which was published by Becker's son in 1883). But the chief evangelist (so Schopenhauer styled his literary followers as distinct from the apostles who published not) was Frauenstidt, who made his personal acquaintance in 1846. It was Frauenstidt who succeeded in finding a publisher for the Parerga und Paralipomena, which appeared at

Berlin in 1851 (2 vols. pp. 465, 531). Yet for this bulky collection of essays, philosophical and others, Schopenhauer received as honorarium only ten free copies of the work. Soon afterwards, Dr E. O. Lindner, assistant editor of the Vossische Zeitung, began a series of Schopenhauerite articles. Amongst them may be reckoned

a translation by Mrs Lindner of an article by John Oxen- ford which appeared in the Westminster Review for April 1853, entitled "Iconoclasm in German Philosophy," being an outline of Schopenhauer's system. In 1854 Frauen- stidt's Letters on the Schopenhauerean Philosophy showed that the new doctrines were become a subject of discus- sion,—a state of things made still more obvious by the university of Leipsic offering a prize for the best exposi- tion and examination of the principles of Schopenhauer's system. Besides this, the response his ideas gave to popular needs and feelings was evinced by the numerous correspondents who sought his advice in their difficulties. And for the same reason new editions of his works were called for,—a second edition of his degree dissertation in 1847, of his Essay on Colours and of Phe Will in Nature in 1854, a third edition of The World as Will and Idea in 1859, and in 1860 a second edition of The Main Problems of Ethics.

of those ardent followers who find in his doctrine that religion of which they stand in need.

It is a religion which owns no connexion with theism His or pantheism. Unlike Spinoza and Hegel and the other religion.

leaders of modern speculation, Schopenhauer disdains the shelter of the old theology. His religion is cosmic and secular; it finds its saints in Buddhist and Christian monasticism, in Indian devotees and 19th-century "beau- tiful souls," and holds the one to be no nearer or more impressive as an example than the other. Of Judaism he has no good to say: its influence on Christianity has been pernicious. The new faith is a ministry of art and of high thinking, which may be rendered by all those who by plain living and

unselfish absorption in the great mean- ing and typal forms of the world have slain the root of bitterness that constantly seeks to spring up within them. It is far from being a worship of the blind force which lies at the back of phenomena: it is a "re-implication " of the

Conven- In these later years Schopenhauer had at length realized | individual into the absolute from which life has separated tional that peace which can be given in the world; he had | him. Each seeker after this reunion is himself (when he oe m become comparatively master of himself. His passions | has learnt wisdom by experience and self-restraint) the very and his had slackened their strain, and he was no longer the | being who has become all things ; and if the "cosmic will" | pessi- = victim of unavailing regrets. Asa youth he had known | may be termed God (an impossible identification) then he . none of those ties which give the individual an esprit de knows God more intimately than he knows anything else. vm, COMPS & Sense of community which he never quite loses. | And here if anywhere it may be said, "He serveth best

Wandering about from place to place throughout Europe, with no permanent home sweetened by the different phases of family affection, with no reminiscences of com- radeship in schoolboy days, with no sentiment of the dues of nationality, Schopenhauer is the fitter interpreter of that modern cosmopolitanism which disdains the more special ties of common life and mutual obligation as being obstacles to free development. In exaggerated self-con- sciousness, he looks down upon the common herd who live the life of convention and compromise, and puts the

who loveth best all things both great and small." Yet love in this creed is second to knowledge; the odz pro-

fanum vulgus of the misanthrope is heard from the soli-

tary's shrine, and instead of the service of humanity we have the contemplation of the eternal forms, and the ele- vation to that world where self ceases to be separated from other selves, and where, in the ultimate ecstasy of know- ledge, all things positive and definite disappear and there is a being which the sensuous soul of man fails to dis- tinguish from non-being.

supreme value on that higher intellectual life which leisure and means permit him to enjoy. A subtler egoism, which emancipates itself from the lusts and the duties of the world, takes the place of the vulgar self-seeking of the multitude and of the self-devotion of the patriot or

It is often said that a philosophic system cannot be Relation rightly understood without reference to the character and of the circumstances of the philosopher. The remark finds ample pees

ames 0 Oyo sopher application in the case of Schopenhauer. The conditions to pis

of his training, which brought him in contact with the system.

philanthropist. Tosuch a mind the friction of professional duties seems irksome: the bonds of matrimony and the duties incumbent on social membership are so many checks on freedom of thought and resolution. The indi- vidualist recognizes none of those minor morals and parochial or provincial duties which appropriate three- fourths of our conduct. In the wide universe he sees himself and others, none more akin to him than another, beings not bound by external ties, and united only in the fundamental sameness of their inner nature. To ordinary mortals, absorbed in "the trivial round, the common tasik," the links that bind individuals are forged by the petty ordinances and observances of society. But to those whom temper and circumstances have denied local and partial associationship, the craving for totality is so keen that it makes them seek their higher country in that far- off world (strangely called " intelligible ") where their per- sonality disappears in the one being of the universe. Thus wide is the antagonism between the eudzemonism of civilization, with aspirations towards perfecting our homes and bodies, so that in all things comfort may be established, and the pessimistic asceticism of Schopen- hauer, which sees the perfection of life not in the abun- dance of those things which we eat and drink and where- with we are clothed but in a deadening of passion, negation of the would-live-and-enjoy, and an existence in a calm ecstasy of beatific vision, of knowledge not abstract but lively intuition. It is this protest of Schopenhauer against the vanity of the aims prescribed by conventional civilization and enlightenment which has gained him some

realities of life before he learned the phrases of scholastic language, give to his words the stamp of self-seen truth and the clearness of original conviction. They explain at the same time the naiveté which set a high price on the products his own energies had turned out, and could not see that what was so original to himself might seem less unique to other judges. Pre-occupied with his own ideas, he chafed under the indifference of thinkers who had grown blasé in speculation and fancied himself persecuted by a conspiracy of professors of philosophy. It is not so easy to demonstrate the connexion between a man's life and doctrine. But it is at least plain that in the case of any philosopher, what makes him such is the faculty he has, more than other men, to get a clear idea of what he himself 's and does. More than others he leads a second life in the spirit or intellect alongside of his life in the flesh,— the life of knowledge beside the life of will. It is inevl-table that he should be especially struck by the points in which the sensible and temporal life comes in conflict with the intellectual and eternal. It was thus that Schopenhauer by his own experience saw in the primacy of the will the fundamental fact of his philosophy, and found in the en- grossing interests of the selfish éows the perennial hin- drances of the higher life. For his absolute individualism, which recognizes in the state, the church, the family only so many superficial and incidental provisions of human craft, the means of relief was absorption in the intellectual and purely ideal aims which prepare the way for the cessa- tion of temporal individuality altogether. But theory is one thing and practice another ; and he will often lay most

Habits of

life.

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stress on the theory who is most conscious of defects in the practice. It need not therefore surprise us that the man who formulated the sum of virtue in justice and bene- volence was unable to be just to his own kinsfolk and reserved his compassion largely for the brutes, and that the delineator of asceticism was more than moderately sensible of the comforts and enjoyments of life.

Having renounced what he would call the superstitions of duty to country, to kindred, and to associates, except in so far as these duties were founded on contract (and that, according to him, all duties imply), it was natural that he should take steps to minimize that friction which he so easily excited, and which had induced his voluntary exile from the arena. His regular habits of life and care- ful regard to his own health remind us of the conduct of the bachelor Kant. He would rise between seven and eight both summer and winter, sponge himself, bathing his eyes carefully, sit down to coffee prepared by his own hands, and soon get to work. He wasa slow reader. The classics were old friends, always revisited with pleasure. He only read original works—the classics of pure literature—avoid- ing all books about books, and especially eschewed the more modern philosophers. Hume in English and Helvétius and Chamfort in French he found to his mind in their sceptical estimates of ordinary virtue. Mystical and ascetic writ- ings, from Buddhism and the Upanishads to Eckhart and the Deutsche Theologie, commended themselves by their in- sistence on the reality of the higher life. Their example of will-force drew his favourable notice to the phenomena of mesmerism, just as his sympathy with the lower brethren of man made him an interested observer of a young orang- outang shown at Frankfort in 1834. He was familiar with several literatures, English certainly not the least. The names of Shakespeare, Scott, Byron, Calderon, Petrarch, Dante, are frequent in his pages. What he read he tried to read in the original,—or anywhere but in a German trans- lation. Even the Old Testament he found more impress- ive in the Septuagint version than in Luther's rendering. The hour of noon brought cessation from his contempla- tions, and for half an hour he solaced himself on the flute. At one o'clock he sat down to dinner in his inn, and after dinner came home for an hour's siesta. After some light reading he went out for a stroll, alone, if possible country- wards, with cane in hand, cigar lit, and poodle following. Occasionally he would stop abruptly, turn round or look back, mutter something to himself, so as to leave on the passer-by the impression that he was either crack-brained orangry. Like Kant, he kept his lips closed on principle. His walk over, he retired to the reading-room and studied the Z'mes,—for he had been always somewhat of an Anglo- maniac, and had learnt this habit of English life from his father. In winter he would sometimes attend the opera.

N haw an

gave an exaggerated importance to trifles, which the sweep of business and customary duty clear away from the ordinary man's memory.

It was not till he was fifty years of age that he set up Person rooms and furniture of hisown. These abodes he changed details,

at Frankfort about four times, living latterly on the street which runs along the Main. On the mat in his chamber lay his poodle,—latterly a brown dog, which had succeeded the original white one, named Atma (the World- Soul), of which he had been especially fond. These dogs had more than once brought him into trouble with his landlord. In a corner of the room was placed a gilt statuette of Buddha, and on a table not far off lay Duperron's Latin translation of the Upanishads, which served as the prayer-book from which Schopenhauer read his devotions. On the desk stood a bust of Kant, and a few portraits hung on the walls. The philosopher's person. was under middle size, strongly built and broad-chested, with small hands. His voice was loud and clear; his eyes blue and somewhat wide apart ; the mouth full and sensuous, latterly becoming broad as his teeth gave way. The high brow and heavy under-jaw were the evidence of his contrasted nature of ample intellect and vigorous im- pulses. In youth he had light curly hair, whereas his beard in manhood was of a slightly reddish tint. He always dressed carefully as a gentleman, in black dress- coat and white necktie, and wore shoes. In his later years his portrait was taken more than once, and by several artists, and his bust was modelled somewhat to his own mind in 1859. Reproductions of these likenesses have made familiar his characteristic but unamiable features.

In 1854 Richard Wagner sent him a copy of the Ring of the Nibelung, with some words of thanks for a theory of music which had fallen in with his own conceptions. Three years later he received a visit from his old college friend Bunsen, who was then staying in Heidelberg. On his seventieth birthday congratulations flowed in from many quarters. In April 1860 he began to be affected by occasional difficulty in breathing and by palpitation of the heart. Another attack came on in autumn (9th September), and again a week later. On the evening of the 18th his friend and subsequent biographer, Dr Gwinner, sat with him and conversed. On the morning of the 21st

September he rose and sat down alone to breakfast ; shortly afterwards his doctor called and found him dead in his chair. By his will, made in 1852, with a codicil dated February 1859, his property, with the ex- ception of some small bequests, was devised to the above- mentioned institution at Berlin. Gwinner was named executor, and Frauenstidt was entrusted with the care of his manuscripts and other literary remains.

The philosophy of Schopenhauer, like almost every system of the Philo-

Between eight and nine he took supper, with a half-bottle of light wine (he avoided his country's beer), at a table by himself,

With his low estimate of the average human being, his

19th century, can hardly be understood without reference to the sophy ideas of Kant. Anterior to Kant the gradual advance of idealism from had been the most conspicuous feature in philosophic speculation. Kant to That the direct objects of knowledge, the realities of experience, Schopen- were after all only our ideas or perceptions was the lesson of every hauer.

sympathies were aristocratic. He left the bulk of his fortune to an institution at Berlin for the benefit of those who had suffered on the side of order during the revolu- tionary struggles of 1848-49. But in so doing it was not his sympathy with kings but his recognition of the merits of public security which gave the motive to his actions. With all his eulogy of voluntary poverty, he did not agree to being deprived of his property by the malice or cupidity of others, and fears of the loss of his means haunted him not less keenly than other imaginary terrors,—the fancied evils distracting him no less perhaps than would have done those domestic and civil obligations from which he endeavoured to hold himself free. The Nemesis of his social ldécheté fell upon him; and, like all solitaries, he

thinker from Descartes to Hume. And this doctrine was gencrally understood to mean that human thought, limited as it was by its own weakness and acquired habits, could hardly ae to cope suc- cessfully with the problem of apprehending the real things. The idealist position Kant scemed at first sight to retain with an even stronger foree than ever. But it is darkest just before the dawn ; and Kant, the Copernicus of philosophy, had

really altered the aspects of the doctrine of ideas. It was his purpose to show that the forms of thought (which he sought to isolate from the peculiarities incident to the organic body) were not merely customary means for licking into convenient shape the data of perception, but entered as underlying elements into the constitution of objects, making expericnee possible and determining the fundamental strue- ture of nature. In other words, the forms of knowledge were the main factor in making objects. By Kant, however, these forms are generally treated psychologically as the action of the several faculties of a mind. Behind thinking there is the thinker. But

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in his successors, from Fichte to Hegel, this axiom of the plain man is set aside as antiquated. Thought or conception without a sub- ject-agent appears as the principle,—thought or thinking in its universality without any individual substrata in which it is em- This is the step of advance which is required alike by Fichte when he asks his

bodied : 7 voety or véqots is to be substituted for vods.

reader to rise from the empirical ego to the ego which is subject- object (#. ¢., neither and both), and by Hegel when he tries to sub- stitute the Begriff or notion for the Vorstellwng or pictorial concep- tion. As spiritism asks us to accept such suspension of ordinary mechanics as permits human bodies to float through the air and

part without injury to their members, so the new philosophy of

Kant's immediate successors requires from the postulant for initia- tion willingness to reverse his customary beliefs in quasi-material subjects of thought.

But, besides removing the psychological slag which clung to Kant's ideas from their matrix and presenting reason as the active principle in the formation of a universe, his successors carried out with far more detail, and far more enthusiasm aud historical scope, his principle that in reason lay the a priort or the anticipation of the world, moral and physical. Not

content with the barren asser- tion that the understanding makes nature, and that we can construct science only on the hypothesis that there is reason in the world, they proceeded to show how the thing was actually done. But to do so they had first to brush away a stone of stumbling which Kant had left in the way. This was the thing as it is by itself and apart from our knowledge of it,—the something which we know, when and as we know it not. This somewhat is what Kant calls a limit-eoncept. It marks only that we fecl our knowledge to be inadequate, and for the reason that there may be another species of sensation than ours, that other beings may not be tied by the special laws of our constitution, and may apprehend, as Plato says, by the soul itself apart from the senses. But this limitation, say the successors of Kant, rests upon a misconception. The sense of inadequacy is only a condition of growing knowledge in a being subject to the laws of space and time; and the very feeling is a proof of its implicit removal. Look at reason not in its single temporal manifestations but in its eternal operation, and then this universal thought, which may be called God, as the sense-condi- tioned reason is called man, becomes the very breath and structure of the world. Thus in the true idea of things there is no irreduc- ible residuum of matter: mind is the Alpha and Omega, at once

| the initial postulate and the final truth of reality.

| In various ways a reaction arose against this absorption of every- thing in reason. In Fichie lumself the source of being is primeval activity, the groundless and incomprehensible deed-action (That- Handlung) of the absolute ego. The innermost character of that ego is an infinitude in act and effort. 'The will is the living principle of reason," he says again. "In the last resort," says Schelling (1809), in his Inquzries into the Nature of Human Freedom, 'there is no other being but will. Wollen ist Ursein (will is primal being); and to this alone apply the predicates fathomless, eternal, independent of time, self-aflirming." It is unnecessary to multiply instances to prove that idealism was never without a protest that there is a heart of existence, life, will, action, which is presupposed by all knowledge and is not itself amenable to ex- planation. We may, if we like, call this element, which is assumed as the basis of all scientific method, irrational,—will instead of reason, feeling rather than knowledge.

It is under the banner of this protest against rationalizing idealism that Schopenhauer advances. But what marks out his armament is its pronounced realism. He fights with the weapons of physical doctrine and on the basis of the material earth. He

| knows no reason but the human, no intelligence save what is ex- hibited by the animals. He knows that.both animals and men have come into existence within assignable limits of time, and that there was an anterior age when no eye or car gathered the life of the universe into perceptions. Knowledge, therefore, with its | yehicle, the intellect, is dependent upon the existence of certain | nerve-organs located in an animal system; and its function is originally only to present an image of the interconnexions of the manifestations external to the individual organism, and so to give to the individual ina partial and reflected form that feeling with other things, or innate sympathy, which it loses as organization becomes more complex and characteristic. Knowledge or intellect, therefore, is only the surrogate of that more intimate unity of feeling or will which is the underlying reality—the principle of all existence, the essence of all manifestations, inorganic and organic. And the perfection of reason is attained when man has transcended those limits of individuation in which his knowledge at first pre- sents him to himself, when by art he has risen from single objects to universal types, and by suffering and sacrifice has penetrated Schopen- to that innermost sanctuary where the euthanasia of consciousness

hauer is reached,—the blessedness of eternal repose. and Her- In substantials the theory of Schopenhauer may be compared bert with a more prosaic statement of Mr Herbert Spencer (modernizing

Spencer. Hume). All psychical states may, according to him, be treated as

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incidents of the correspondence between the organism and its en- vironment. In this adjustment the lowest stage is taken by reflex action and instinct, where the ehange of the organs is purely automatic. As the external complexity increases, this automatie regularity fails ; there is only an incipient excitation of the nerves. This feeble echo of the full response to stimulus is an idea, which is thus only another word for imperfect

*organization or adjustment. But gradually this imperfect correspondence is improved, and the idea passes over again into the state of unconscious or organic memory. Intellect, in short, is only the consequence of insufficient response between stimulus and action. Where action is entirely automatic, feeling does not exist. It is when the excitation is partial only, when it does not inevitably and immediately appear as action, that we have the appcarance of intellect in the gap. The chief and fundamental difference between Schopenhauer and Mr Spencer lies in the refusal of the latter to give this '"'adjustment is or 'automatic action" the name of will. Will according to Mr Spencer is only another aspect of what is reason, memory, or feel- ing,—the difference lying in the fact that as will the nascent ex- citation (ideal motion) is conceived as passing into complete or full motion. But he agrecs with Schopenhauer in basing conscious- ness, in all its forms of reason, feeling, or will, upon ** automatic movement,—psychical change," from which cousciousness emerges and in which it disappears.*

What Schopenhauer professed, therefore, is to have dispelled Main the claims of reason to priority and to demonstrate the relativity tenden- Science, he reminds us, is based on final ciesof his inexplicabilities ; and its attempts by theories of evolution to find system.

and limitation of science.

an historical origin for humanity in rudimentary matter show a misconception of the problem. In the successions of material states there can nowhere be an absolute first. The true origin of man, as of all else, is to be sought in an action which is everlasting and which is ever present: nec te quesiveris extra. There is a source of knowledge within us by which we know, and miore intimately than we can ever know anything extcrnal, that we will and _fecl. That is the first and the highest knowledge, the only knowledge that can strictly be called immediate ; and to ourselves we as the subject of will are truly the "immediate object." It is in this seuse of will—of will without motives, but not without conscious- ness of some sort—that reality is revealed. Analogy and experi- ence make us assume it to be omnipresent. It is a mistake to say will means for Schopeuhauer only force. It means a great deal more; and it is his contention that what the scientist calls force is really will. In so doing he is only following the line predicted

by Kant! and anticipated by Leibnitz. If we wish, said Kant, to give a real existence to the thing in itself or the noumenon we can only do so by investing it with the attributes found in our own

internal sense, viz., with thinking or something analogous thereto.

It is thus that Fechner in his "day-view " of things sees in plants and planets the same fundamental "soul"' as in us—that is, "one simple being which appears to none but itself, in us as elsewhere wherever it occurs self-luninous, dark for every other eye, at the least connecting sensations in itself, upon which, as the grade of soul mounts higher and higher, there is constructed the conscious- ness of higher and still higher relations."? It is thus that Lotze declares? that 'behind the tranquil surface of matter, behind its rigid and regular habits of behaviour, we are forced to seek the glow of a hidden spiritual activity." So Schopenhauer, but ina way all his own, finds the truth of things in a will which is indeed unaffected by conscious motives and yet cannot be separated from some faint analogue of non-intellectual consciousness.

In two ways Schopenhauer has influenced the world. He has shown with unusual lucidity of expression how feeble is the spon- taneity of that intellect which is so highly lauded, and_how over- powering the sway of original will in all our action. He thus re- asserted realism, whose gospel reads, "In the beginning was appetite, passion, will," and has discredited the doctrinaire belief that ideas have original force of their own. This creed of naturalism is dangerous, and it may be true that the pessimism it implies often degenerates into cynicism and a cold-blooded denial that there is any virtue and any truth. But in the crash of established creeds and the spread of political indifferentism and social disin- tegration it is probably wise, if not always agreeable, to lay bare the wounds under which humanity suffers, though pride would prompt their concealment. But Schopenhauer's theory has another side. If it is daringly realistic, it is no less audacious in its ideal- ism. The second aspect of his influence is the doctrine of redemp- tion of the soul from its sensual bonds, first by the medium of art and second by the path of renunciation and ascetic life. It may be difficult in each case to draw the line between social duty and individual perfection. But Schopenhauer reminds us that the welfare of society is a temporal and

subordinate aim, never to be allowed to dwarf the full realization of our ideal being. Man's duty is undoubtedly to join in the common service of sentient

1 Kritik (Trans. Anal.), bk. ii., Appendix. 2 Ueber die Seelenfrage, p. 9, Leipsic, 1861. 3 Mikrokosnvus, vol. i. p. 408 (2d ed.).

beings ; but his final goal is to rise above the toils and comforts of the visible creature into the vast bosom of a peaceful Nirvana. Bibliography.— The works of Schopenhauer were published after his death by J. Frauenstiidt in 6 volumes (Leipsic, 1874). Besides these, several papers and aphorisms appeared in 1834, Aus Schopenhauer's handschrifilichem Nachlass, by the same editor. The best biography of Schopenhauer is that by Gwinner ; second and much enlarged edition in 1878. See also Frauenstidt and Lindner, 'Arthur Schopenhauer ; von thm; tiber thn (1863) ; O. Busch, A. Schopenhawer (1878) ; K. Peters, Schopenhauer als Philosoph (1880), and Willenswelt und Welt- wille (1888) ; and Koeber, Schopenhauer's Erloswngslehre (1881). A list of works on Schopenhauer is given by Balan, Schopenhauer-Literatur (1880). See also

PESSIMISM. ,, (W. W.)

SCHROTER, Jonann Hirronymus (1745-1816), amateur astronomer, principally known by his physical observations of the moon and planets (see OBSERVATORY, under Lilienthal).

SCHUBERT, Franz Perer (1797-1828), composer of vocal and instrumental music, was born at Vienna 31st January 1797. For the foundation of his general educa- tion he was indebted to his father, a schoolmaster in the Leopoldstadt ; but the beauty of his voice attracted so much attention that in 1808 he was received into the choir of the imperial chapel, and during the five years which followed he was taught to sing and to play the violin in the choristers' school called the "Convict." No attempt seems to have been made to teach him com- position, but, through the kind intervention of an

older chorister, he was supplied with music-paper, and thence- forward he wrote incessantly, as his fancy dictated, with- out any help whatever, always carefully signing and dating his MSS., which extend back as far as 1810. When his voice broke in 1813 Schubert left the "Convict," and, to avoid the conscription, taught for three years in his father's school. This, however, in nowise damped his zeal for composition. Even at this early period his invention was inexhaustible and the rapidity of his pen almost in- credible. In 1815 he composed 2 symphonies, 5 operas, and no less than 137 songs (67 of which have been pub- lished), besides a multitude of other important pieces. Yet so little was his genius appreciated that when in 1816 he applied for an appointment at a Government music school, with a salary equal to about twenty guineas a year, he was rejected as "imperfectly qualified."

In 1818 Count Johann Eszterhazy secured the services of Schubert as resident teacher of music to his daughters, for one of whom the young composer has been supposed —on very insufficient authority—to have entertained a romantic, and of course utterly hopeless, affection. The appointment was of great importance to him, for he was poor, almost to starvation; yet it led to no permanent improvement in his prospects: in fact his life was one long bitter disappointment from beginning to end. He wrote on, year after year, producing music of indescribable beauty in such enormous quantities that but for the dated MSS. we should refuse to believe the accounts transmitted to us by his biographers. He wrote because, when his genius inspired him with an idea, he could not refrain. Yet he scarcely ever looked at his compositions after they were finished, and very rarely heard any of them performed. Very little of his dramatic music was given to the world. Two little operettas—Dre Zwillingsbriider and Die Zauberharfe —harely escaped failure in 1820; and the beautiful incidental music to Madame von Chezy's Rosamunde survived but two representations in 1823. Of his greater operas not one was placed upon the stage dur- ing his lifetime. With his songs he was more fortunate. Many of them were published, and their fresh bright melo- dies were irresistible. They were produced by hundreds, and with a rapidity bordering upon the miraculous. Among the MSS. seven or eight may be found dated on the same day; yet even in these he never repeated him- self : every one was the result of a new inspiration, com- mitted to paper at the moment of conception, laid aside immediately afterwards, and so completely forgotten that

he has been known to ask who was the composer of one of his own Lieder not very long after he had composed it. And this wonderful facility of production led to no un- worthy form of treatment. The original MS. of Hari, Hark, the Lark was written at a "'beer-garden," on the back of a bill of fare, the moment after the composer had read the words for the first time; and there are strong reasons for believing that Who zs Sylvia ?—one of the most perfectly finished songs on record—and Come, thou Monarch of the Vine, were produced on the same occasion. But the success of the songs did not make Schubert a prosperous man, All his life long he suffered from grind- ing poverty. Though he received an actual commission to write his greatest dramatic work, /erabras, for the court theatre at Vienna, it was rejected in 1824 for the weakness of its libretto. Once, and once only, a chance seemed open to him. He was accepted in 1826 as a candi- date for the vacant post of conductor to the court theatre, and requested to compose some music as a test of his powers. At the rehearsal the part he had designed for the prima donna was found too trying for her voice, and he was requested to alter it. "I will alter nothing," said Schubert ; and his refusal to listen to reason cost him the coveted appointment. .

Of Schubert's ten symphonies not one made its mark during his lifetime ; yet the stamp of genius is upon these as plainly as upon his songs. It is true that in works of large dimensions genius loses half its power if unsupported by learning ; and Schubert was not learned enough to turn his inspirations to the best account. His ideas came so quickly that the knowledge he possessed was not sufficient to enable him to arrange them in that perfect order which forms the chief charm of the symphonies of Mozart and Beethoven. And the same element of weakness is dis- cernible in his sonatas and other long pieces of chamber music. But these are all true works of genius, precious and imperishable.

It was not to be wondered at that under his heavy trials Schubert's health failed rapidly. After recovering from more than one serious attack of illness, he was seized with a sudden access of delirium while at supper on 13th October 1828; and on 19th November he died, leaving behind him a few clothes and other possessions, which were officially valued at sixty-three

Vienna florins (= £2, 10s.). His grave at the Ortsfriedhof, bought by the scanty savings of his brother Ferdinand, lies within a few feet of that of Beethoven.

Schubert's works, now (1886) in course of publication in a com- plete series by Messrs Breitkopf & Hartel of Leipsic, include 18 dramatic pieces, 8 sacred compositions, 10 symphonies, 24 piano- forte sonatas, a vast collection of songs, of which 457 are already

published, and a multitude of other works which are too numerous to mention.

SCHULTENS. 'Three Dutch Orientalists of this name have an honourable place among the scholars of the 18th century. The first and most important, ALBERT SCHULTENS (1686-1750), was born at Groningen in 1686. He studied for the church at Groningen and Leyden, applying him- self specially to Hebrew and the cognate tongues. His dissertation on The Use of Arabic in the Interpretation of Scripture (1706) indicates the point of view which pre- vailed with the school of Arabists of which he was founder, and which differentiates his aims from those of REIskE (g.v.). After a visit to Reland in Utrecht, he returned to Groningen (1708); then, having taken his degree in theology (1709), he again went to Leyden, and devoted himself to the study of the MS. collections there till in 1711 he became pastor at Wassenaer. Parochial work was little to his taste, and in 1713 he took the Hebrew chair at Franeker, which he held till 1729, when he was transferred to Leyden as rector of the collegium

theologicum, or seminary for poor students. From 1732 till his death (at Leyden on 26th January 1750) he was professor of Oriental languages at Leyden. Schultens was the chief Arabic teacher of his time, and in some sense a restorer of Arabic studies, but he differed from Reiske and De Sacy in mainly regarding Arabic as a handmaid to Hebrew, His chief work was to vindicate the value of comparative study of the Semitic tongues against those who, like Gousset, regarded Hebrew as a sacred tongue with which comparative philology has nothing to do. Schul- tens, on the other hand, certainly went much too far in his appeals to Arabic for the interpretation

of the Old Testa- ment ; the laws of comparative Semitic philology were not yet known, so that the comparison of roots was often guess- work, and the value of the exegetical tradition in Hebrew was not accurately determined. Hence he did not leave so much of permanent value for Hebrew grammar and lexico- graphy as might have been expected from his learning; but the systematic illustration of phrases and modes of thought from Arabic literature, ¢.g., in his Liber Jobs, has a higher value, which has been too much overlooked in the reaction against the extravagances of the school he founded.? Albert's son, JonN Jamus Scuunrens (1716-1778), became professor at Herborn in 1742, and afterwards suc- ceeded to his father's chair. He was in turn succeeded by his son, Henry ALBERT SCHULTENS (1749-1793), a man of great parts, who, however, left comparatively little behind him, having succumbed to excessive work while preparing an edition of Meidani, of which only a part

_ appeared posthumously (1795).

SCHULTZE, Max JoHann S1zeMUND (1825-1874), German microscopic anatomist, was born at Freiburg in Breisgau (Baden) on 25th March 1825. He studied at Greifswald and Berlin, and was appointed extraordinary professor at Halle in 1854 and five years later ordinary professor of anatomy and histology at Bonn. He died at Bonn 16th January 1874. His contributions to biology were numerous and varied. He founded and edited the important Archi fiir mikroskoptsche Anatomie, to which he contributed many papers, and advanced the subject generally, by refining on its technical methods. He also contributed to the knowledge of the Protozoa (see Foraminifera, Prorozoa). He will be longest remem- hered, however, by his reform of the cell theory. Uniting Dujardin's conception of animal sarcode with Von Mohl's of vegetable protoplasma, he pointed out clearly their identity, and included them under the common name of protoplasm. He thus reorganized the theory as established by Schwann, diminished the importance of the cell-wall and nucleus, and laid down the modern definition of the cell as "a nucleated mass of protoplasm with or without a cell-wall" (see PRoropLasm and Scawann). An obituary notice of Schultze is given in Arch. mikr. Anat., 1875.

SCHUMACHER, Hetnrich Curistian (17 80-1850), astronomer, born at Bramstedt in Holstein, 3d September 1780, was director of the Mannheim observatory from 1813 to 1815, and then became professor of astronomy in Copenhagen. From 1817 he directed the triangulation of Holstein, to which a few years later was added a com- plete geodetic survey of Denmark; the latter was left in- complete by Schumacher, but was finished after his death. For the sake of the survey an observatory was established at Altona (see OBsERVATORY) and Schumacher resided there permanently, chiefly occupied with the publication

1 A. Schultens's chief works are Origines Hebrew (2 vols., 1724, WSs) 2d ed., 1761, with the De defectibus lingue Hebreex (Ist ed., 1731) ; Com. on Job, 1737 ; Com. on Proverbs, 1748 ; Hebrew grammar (Insti- tutiones), 17387; Vetus et regia via Hebraizandi, 1738 5; Monwnenta vetustiora Arabum (1740—extracts from Nowairi, Masudi, &c.); ed. of Beha-ed-din's Life of Saladin ; his Opera Minora (1769) and a Sylloge Dissertationum (1772, 1775) appeared posthumously.

of Ephemerides (11 parts, 1822-32) and of the journal Astronomische Nachrichten, of which he lived to edit thirty- one volumes, and which still continues to be the principal astronomical journal. Schumacher died at Altona on 28th December 1850.

SCHUMANN, Rosert (1810-1856), musical critic and

composer, was born at Zwickau, Saxony, on &th June

1810. In deference to his mother's wish, he made a pre-

tence of studying for the law, until he had completed his twentieth year; but in reality he took so little pains to acquaint himself with the mysteries of jurisprudence and so much to master the technical difficulties of the piano-forte that when the day of examination drew near it was evident that he could not hope to pass with credit. His mother therefore wisely gave up her cherished project, and in the summer of 1830 permitted him to settle for a time in Leipsic that he might receive regular instruction from Friedrich

Wieck, the most accomplished and success- ful teacher of the pianoforte then living in North Germany. Under Wieck's superintendence Schumann would doubt- lessly have become a pianist of the highest order had he not endeavoured to strengthen the third finger of his right hand by some mechanical contrivance the secret of which he never clearly explained. But the process failed most signally, and the hand became so hopelessly crippled that the young artist was compelled to give up all thought of success as a performer and to devote himself thenceforward to the study of composition, which he cultivated diligently under the guidance of Heinrich Dorn.

This change of purpose led him to direct his attention

to subjects connected with the higher branches of art which he had previously very much neglected. Moreover, it gave him time and opportunity for the development of a peculiar talent which he soon succeeded in turning to

excellent account,—the talent for musical criticism. His first essays in this direction appeared in the form of con- tributions to the Allgemeine musikalische Zeitung ; but in 1834 he started a journal of his own, entitled Die Neue Zeitschrift fiir Musik, and to this from time to time he contributed critiques of the most profound character, some- times openly written under his own name, sometimes ostensibly emanating from an imaginary brotherhood called the Davidsbund, the members of which were living men and women, Schumann's most intimate friends, though the society itself existed only in his own fertile imagination. His time was now fully occupied. He composed with in- exhaustible ardour, and by the exercise of his extraordi- nary critical faculty struck out for himself new paths, which he fearlessly trod without a thought of the reception his works were likely to meet with from the public. The habit of passing a just Judgment upon the works of others led him to judge his own productions with relentless severity ; and it may be safely said that he was harder upon himself than upon any candidate for public favour whose attempts he was called upon to criticize.

Schumann's first great orchestral work was his Symphony in Bb, produced in 1841,—the year after his marriage with Clara Wieck, now so well known

to the world as Madame Clara Schumann, the accomplished pianiste, to whose fault-

less interpretation of her husband's works we are indebted

for our fullest appreciation of their inherent beauty. Another symphony, in D minor, and an orchestral over- ture, scherzo, and finale, appeared in the same year and from this time forward works on an equally grand scale appeared in rapid succession, culminating with his first and only opera, Genoveva, which, though completed in 1848, was not produced until 1850. In 1843 Schumann was appointed professor of composition in Mendelssohn's newly founded conservatory of music at Leipsic. Two years after Mendelssohn's death he endeavoured to obtain the appoint-

ment of director of the Gewandhaus concerts, but was rejected in favour of J. Rietz. In 1850 he was invited to Diisseldorf as musical director—a post in which Mendels- sohn had greatly distinguished himself many years pre- viously. Schumann retained this until 1853, when his mental powers began to decline rapidly through a disease of the brain from which he had long suffered, and of which he died at Endenich, near Bonn, 29th July 1856.

Sehumann's position in the history of German music is very important and marks the last stage but one of its progress towards its present condition. His style was very advanced and strikingly original. His published works include one opera, four symphonies, five overtures, a series of scenes from Faust, and other choral and orchestral works written on a very extensive scale, and a large quantity of songs, pianoforte pieces, and other smaller works of the highest excellence and beauty.

SCHWABE, Samuxzt Huzinricu (1789-1875), German amateur astronomer, was born on 25th October 1789 at Dessau, where he died on 11th April 1875; he observed the sun-spots regularly from 1826 and pointed out (in 1843) the periodicity in the number of these objects.

SCHWALBACH, or LANGENSCHWALBACH, a favourite German health resort, in the Prussian province of Hesse- Nassau, is pleasantly situated in

the deep valley of the Miinzenbach near its junction with the Aar, 12 miles north- west from Wiesbaden, with which it has regular communi- cation by diligence. Besides a large kursaal, the town has four churches, a synagogue, a real school, and a higher school for girls. The three principal springs, which are largely impregnated in varying proportions with iron and carbonic acid (compare MineraL WATERS), are connected by promenades. The permanent population of the town was 2811 in 1880, and the number of visitors reaches about 5000 annually.

About 44 miles to the south of Schwalbach is SCHLANGEN- BAD (360 inhabitants), the thermal springs of which are efficacious in nervous complaints and attract about 2000 visitors (chiefly ladies) every year The water is used externally only.

SCHWANN, Turopor (1810-1882), author of the cell theory in physiology, was born at Neuss in Rhenish Prussia on 7th December 1810. His father was a man of great mechanical talents; at first a goldsmith, he afterwards founded an important printing establishment. Schwann inherited his father's mechanical tastes, and the leisure of his boyhood was largely spent in constructing little machines of all kinds. He studied at the Jesuits' college in Cologne and afterwards at Bonn, where he met Johannes Miller, in whose physiological experiments he soon came to assist. He next went to Wiirzburg to continue his medical studies, and thence to Berlin to graduate in 1834. Here he again met Miiller, who had been meanwhile trans- lated to Berlin, and who finally persuaded him to enter on a scientific career and appointed him assistant at the anatomical museum. Schwann in 1838 was called to the chair of anatomy at the Roman Catholic university of Louvain, where he remained nine years. He then went as professor to Liége, where, in spite of brilliant offers from many German universities, he led a very quiet un- eventful life, broken only by the international commemora- tion of the fortieth anniversary both of his professoriate and the publication of his magnum opus, till his death on 11th January 1882. He was of a peculiarly gentle and amiable character and remained a devout Catholic through- out his life.

It was during the four years spent under the influence of Miiller at Berlin that all Schwann's really valuable work was done. Miiller was at this time

preparing his great book on physiology, and Sehwann assisted him in the experimental work required. His attention being thus directed to the nervous and muscular tissues, besides making such histological discoveries as that of the envelope of the nerve-fibres which now bears his name, he initiated thosc researches in muscular contractility since so elaborately worked

out by Du Bois Reymond and others. He was thus the first of Miiller's pupils who broke with the traditional vitalism and worked towards a physico-chemical explanation of life. Miller also directed his attention to the process of digestion, which Schwann showed to depend essentially on the presence of a ferment called by him pepsin, thus not only practically bringing the subject up to its modern state but preparing for the subsequent advances in medical treatment made by Roberts. Schwann also examined the question of spontaneous generation, which he aided greatly to disprove, and in the course of his experiments discovered the organic nature of yeast. His theory of fermentation was bitterly attacked and ridiculed by Liebig, but has been, after the lapse of a quarter of a century, triumphantly confirmed. In fact the whole germ theory of Pasteur, as well as the antiseptic application of Lister, is thus traceable to the influence of Schwann. Once when dining with Schleiden, in 1837, the conversation turued on the nuclei of vege- table cells). Schwann remembered having seen similar structures in the cells of the notochord (as had 'becn shown by Miiller) and instantly seized the importance of connecting the two phenomena. The resemblance was confirmed without delay by both observers, aud the results soon appeared in the famous Microscopic Investiga- tions on the Accordance in the Structure and Growth of Plants and Animals (Berlin, 1839 ; trans. Sydenham Society, 1847), and the cell theory (see MorpPHoLocy) was thus definitely constituted. – In the course of his verifications of the cell theory, in which he traversed the whole field of histology, he proved the cellular origin and de- velopment of the most highly differentiated tissues, nails, feathers, enamels, &c. Although mistaken in his view of the origin of new cells, his generalization at once became the foundation of all modern histology, and in the hands of Virchow

(whose cellular pathology is an inevitable deduction from Schwann) has afforded the meauis of placing modern pathology on a truly scientific basis.

An excellent account of Schwann's life and work is that by Léon Frédérieq (Liége, 1884).

SCHWANTHALER, Lupwic Micuazn (1802-1848), German sculptor, was born in Munich on 26th August 1802. His family had been known in Tyrol by its sculptors for three centuries ; young Ludwig received his earliest lessons from his father, and the father had been instructed by the grandfather. The last to bear the name was Xaver, who worked in his cousin Ludwig's studio and survived till 1854, For successive generations the family lived by the carving of busts and sepulchral monuments, and from the condition of mechanics rose to that of artists.

From the Munich gymnasium Schwanthaler passed as a student to the Munich academy; at first he purposed to be a painter, but afterwards reverted to the plastic arts of his ancestors. His talents received timely encourage- ment by a commission for an elaborate silver service for the king's table. Cornelius also befriended him; the great painter was occupied on designs for the decoration in fresco of the newly erected Glyptothek, and at his suggestion Schwanthaler was employed on the sculpture within the halls. Thus arose between painting, sculpture, and architecture that union and mutual support which characterized the revival of the arts in Bavaria. Schwan- thaler in 1826 went to Italy as a pensioner of King Louis, and on a second visit in 1832 Thorwaldsen gave him kindly help. His skill was so developed that on his return he was able to meet the extraordinary demand for sculp- ture consequent on King Louis's passion for building new palaces, churches, galleries, and museums, and he became the fellow-worker of the architects Klenze, Gartner, and Ohlmiiller, and of the painters Cornelius, Schnorr, and Hess. Owing to the magnitude and multitude of the plastic products they turned out, over-pressure and haste in design and workmanship brought down the quality of the art. The works of Schwanthaler in Munich are so many and miscellaneous that they can only be briefly indi- cated. The new palace is peopled with his statues: the throne-room has twelve imposing gilt bronze figures 10 feet high ; the same palace is also enriched with a frieze and with sundry other decorations modelled and painted from his drawings. The sculptor, like his contemporary painters, received help from trained pupils. The same prolific artist also furnished the old Pinakothek with twenty-five marbles, commemorative of as many great painters; likewise he

supplied a composition for the pediment of the exhibition pbuilding facing the Glyptothek, and executed sundry figures for the public library and the hall of the marshals. Sacred art lay outside his ordinary routine, yet in the churches of St Ludwig and St Mariahilf he gave proof of the widest versatility. The Ruhmeshalle afforded further gauge of unexampled power of production ; here alone is work which, if adequately studied, might have occupied a lifetime; ninety-two metopes, and, conspicuously, the giant figure of Bavaria, 60 feet high, rank among the boldest feats of physical force. A short life of forty-six years did not permit serious undertakings beyond the Bavarian capital, yet time was found for the groups within the north pediment of the Walhalla, Ratisbon, and also for numerous portrait statues, including those of Mozart, Jean Paul Richter, Goethe, and Shakespeare. Schwanthaler died at Munich in 1848, and left by will to the Munich academy all his models and studies, which now form the Schwan- thaler Museum. The sculptor's style may be designated ag romantic-classic or modern-antique, and its conventional 'deal stands far removed from the schools of naturalism and of realism.

SCHWARZ, or ScHWARTZ, CHRISTIAN FRIEDRICH (1726-1798), Protestant missionary to India, was born on Sth October 1726 at Sonnenburg, in the electorate of Brandenburg, Prussia. After attending the grammar school of his native town and an academy at Kiistrin, he in 1746 entered the university of Halle. Having learned Tamil to assist in a translation of the Bible into that lan- guage, he was led to form the intention of becoming a missionary to India. He received ordination at Copen- hagen on the 8th August 1749, and, after spending some time in England to acquire the English language, embarked early in 1750 for India, and arrived at Trichinopoly on the 30th July. Tranquebar was for some time his head- quarters, but he paid frequent visits to Tanjore and Tri- chinopoly, and in 1766 removed to the latter place. Here he acted as chaplain to the garrison, who erected a church for his general use. In 1769 he secured the friendship of the rajah of Tanjore, who, although he never embraced Christianity, afforded him every countenance in his mis- sionary labours.

Shortly before his death he committed to Schwarz the education of his adopted son and successor. In 1779 Schwarz undertook, at the request of the Madras Government, a private embassy to Hyder Ali, the chief of Mysore. When Hyder invaded the Carnatic, Schwarz was allowed to pass through the enemy's encampment without molestation. After twelve years in Trichinopoly he removed to Tanjore, where he spent the remainder of his life. He died on 13th February 1798. Schwarz's direct success in making converts exceeded that of any other Protestant missionary in India, in addition to which he succeeded in winning the esteem of Mohammedans and Hindus. The rajah of Tanjore erected a monument, exe- cuted by Flaxman, in the mission church, in which he is represented as grasping the hand of the dying missionary and receiving his benediction. A splendid monument to Schwarz by Bacon was placed by the East India Company in St Mary's church at Madras.

See Remains of Schwarz, with a sketch of his life, 1826; Memoirs of Life and Correspondence, by H. N. Pearson, 1834, 3d ed. 1839 ; Life, by H. N. Pearson, 1855.

SCHWARZBURG-RUDOLSTADT, a small Thuringian principality and an independent member of the German empire, shares with Schwarzburg-Sondershausen the posses- sions of the old house of Schwarzburg, consisting of the upper barony (Oberherrschaft) in Thuringia, on the Gera, Tim, and Saale, and the lower barony (Unterherrschaft), an isolated district on the Wipper and Helbe, about 25 miles to the north, surrounded by the Prussian province

the Prussian army since the convention of 1867. has one vote in the Reichstag and onc in the federal council.

of Saxony. See plate V. As the dignity of prince is held in virtue of the Oberherrschaft alone, a share of both baronies was given to each sub-line of the main house. The total area of Schwarzburg-Rudolstadt is 363 square miles, of which 283 are in the upper and 80 in the lower barony ; the chief towns in the former district are Rudolstadt (8747 inhabitants), the capital, and Blankenburg (1889), and in the latter Frankenhausen (4985). Both

baronies are hilly, but no great height is anywhere attained. The scenery of the Thuringian portion of Schwarzburg-Rudolstadt attracts many visitors annually, the most beautiful spots being the gorge of the Schwarza and the lovely circular valley in which the village of Schwarzburg nestles at the foot of a curiously isolated hill, crowned by the ancient castle of the princely line. Cattle-rearing and fruit-growing flourish in the lower barony, while the upper barony is finely wooded. Of the whole country 44 per cent. is under forest (mainly coniferous trees), and 41 per cent. is devoted to agricul- ture. The chief grain crops are rye, oats, and barley, but in 1883 thrice as much ground was occupied by potatoes as by all these three together. The live-stock returns in 1883 showed 19,831 cattle, 39,024 sheep, 19,544 pigs, 14,420 goats, and 2813 horses. Agriculture and forestry support about 35 per cent. of the population, and mining and cognate industries about 10 per cent. Trade and manufactures are insignificant ; iron, lignite, cobalt, alum, and vitriol are among the mineral productions. In 1880 the population was 80,296 (an increase of 1779 since 1875), or about 221 to the square mile. Of these 79,832 were Protestants.

Schwarzburg-Rudolstadt is a limited hereditary sovercignty, its constitution resting on laws of 1854 and 1870, though a diet has met at intervals since 1816. The present diet consists of sixtcen members elected for six years, four chosen by the highest taxpayers, the others by general election. The diet must be summoned every three ycars. The budget for 1885-87 estimated revenue and ex- penditure each at £101,210 ; £57,670 was the estimated income from the public lands and forests. The public debt was £230,350. The troops of Schwarzburg-Rudolstadt have been incorporated with The principality

Schwarzburg-Rudolstadt is the cadet branch of the family. In 1710 the count was made a prince, in spite of the remonstrances of

the elector of Saxony, although he was prevented from taking his scat in the imperial college until 1754.

The principality entered

the Confederation of the Rhine in 1807 and the German League in

1815.

In 1819 it redeemed the Prussian claims of superiority by surrendering portions of its territory.

SCHWARZBURG-SONDERSHAUSEN, a small Thur-

ingian principality and an independent member of the

German empire, shares the old Schwarzburg lands with Schwarzburg-Rudolstadt, as explained in the preceding article. Its total area is 333 square miles, of which 133 are in the upper and 200 in the lower barony. The chief towns are Arnstadt (10,516 inhabitants), which at one time gave name to a line of counts, in the latter district, and Sondershausen (6110), the capital, in the former. The general description of the nature and resources of Schwarz- burg-Rudolstadt applies also to this principality, except that 58 per cent. of the whole is devoted to agriculture and 30 per cent. to forests, only about two-fifths of which are coniferous trees. The chief crops are oats, barley, wheat, and rye; but here also by far the most land is planted with potatoes. In 1883 the principality contained 21,205 cattle, 54,276 sheep, 22,884 pigs, 11,372 goats, and 4283 horses. About 39 per cent. of the population are sup- ported by agriculture and forestry, and about 5 per cent. by mining. In 1880 the population was 71,107 (an increase of 3627 since 1875), or about 213 to the square mile. Of these 70,450 were Protestants.

Schwarzburg-Sondershausen 1s a limited hereditary sovereignty, its constitution resting on a law of 1857. The diet consists of five representatives elected by the highest taxpayers, five by general election, and not more than five nominated for life by the prince.

The first ten members are elected for four years, which is also the financial period. There is a ministry with five departments—for the prince's houseliold, domestic atfairs, finance, churches and schools, and justice. The budget for each year in the period 1884-87 estimated the income at £112,475 and the expenditure at £1000 less. The public debt in 1885 was

£199,625. The troops of Schwarzburg-Sondershausen have been incorporated with the Prussian army by convention since 1867. The principality has one vote in the Reichstag and one in the federal council.

The house of Schwarzburg is one of the oldest and uoblest in Germany ; and tradition traces its descent from Witikind and the kings of the Franks. Kafernburg, from whom the counts of Schwarzburg sprang about the beginning of the 13th century. The name Giinther became the distinctive name for the members of this house (corresponding to Heinrich in the Reuss family), the various Giinthers being at first distinguished by numbers and afterwards by prefixed names. Various subdivisions and collateral lines were formed, but by 1599 all were extinct but the present two. Count Giinther XL., who died in 1552, was the last common ancestor of both lines. Scliwarz- burg-Sondershausen is the senior line, although its possessions are the smaller.

imperial prince by the emperor Leopold I. The prince had to pay

7000 thalers to the elector of Saxony and 3500 to the duke of

Saxe-Weimar, and numerous disputes arose in connexion with the superiorities thus indicated. In 1807 Schwarzburg-Sondershausen entered the Confederation of the Rhine and became a sovereign state. In 1816 it joined the German League, and redeemed with portions of its territory all rights of superiority claimed by Prussia. Its domestic government has gradually, though not very quickly, improved since that time,—the oppressive game-laws in particular having been abolished. A treaty of mutual succession was made between the two families in 1713.

SCHWARZENBERG, Kart Puiuirp, Prince oF (iii. 1820), Austrian field-marshal, was born on 15th April 1771 at Vienna. He fought in 1789 under Lacy with distine- tion against the Turks and became major in 1792. In the French campaign of 1793 he held command of a por- tion of the advanced guard under the duke of Coburg, and in 1794 his impetuous charge at the head of a cavalry regiment greatly contributed to the victory of Cateau-Cambrésis. After the battle of Wirzburg in September 1796 he was raised to the rank of major-general, and in 1799 to that of field-marshal in command of a division. At the defeat of Hohenlinden in 1800 his promptitude and

courage saved those under his command from being sur- rounded and taken prisoners. In the war of 1805 he held command of a division under General Mack, and when Ulm capitulated to Napoleon in October he cut his way through the hostile lines with some cavalry regiments. At the special request of the emperor Alexander he under- took an embassy to St Petersburg in 1808, but two days before the battle of Wagram he arrived in the camp and assumed command as general of the cavalry. After the peace of Vienna he was sent to Paris to negotiate a marriage between Napoleon and the duchess Maria Louisa. From this time he secured Napoleon's special confidence and esteem, and at his request took command of the Austrian auxiliary corps in the Russian campaign. In August he received the command of the seventh or Saxon army corps; after gaining some slight advantages over the Russians, he was compelled to retreat before superior forces to the duchy of Warsaw, where, according to instructions from Napoleon, he remained for some months inactive at Pultusk. In 1813 he was appointed commander-in-chief of the allied forces, and, after defeating Napoleon at Leipsic in October, carried the campaign to a successful issue by entering Paris in March 1814. On the conclusion of the war he became president of the Aulic Council. He died from paralysis at Leipsic on 15th October 1820.

See Prokesch-Osten, Denkwiirdigkeiten aus dem Leben des Feld- marschalls Fiirsten Schwarzenberg, Vienna, 1823; Berger, Das Firstenhaus Schwarzenberg, Vienna, 1866.

SCHWEGLER, Atserr (1819-1857), historical, philo- sophical, and theological writer, one of the first and most distinguished of the pupils of F.C. Baur and of the dei minores of the Tiibingen school. He was born at Michel-

Its historical ancestors were the counts of

In 1697 the count was raised to the dignity of

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bach in Wtirtemberg on 10th February 1819, the son of a country clergyman, and entered the university of Tiibin- gen in 1836 as a student of

theology, though with a pre- dominant liking for classical philology. Under Baur's influence he devoted himself to the study of ecclesiastical history, and his first work was Der Montanismus wu. die christliche Kirche des 2ten Jahrhunderts (1841), in which he was the first to point out that Montanism was much more than an isolated outbreak of eccentric fanaticism in the early church, though he introduced fresh misconcep- tions by connecting it with Ebionitism as he conceived the latter. This work, with other essays, brought Schwegler into conflict with the authorities of the church, in conse- quence of which he gave up theology as his professional study and chose that of philosophy. In 1843 he com- menced in the Tiibingen university the career of a teacher (privat-docent) of philosophy and classical philology, and in 1848 was made extraordinary professor of the latter subject and soon after ordinary professor of history. His death took place on 5th January 1857.

His principal theological work was Das nachapostolische Zcitalter (2 vols., 1846). It was this book which first put before the world, with Schwegler's characteristic boldness and clearness, the results of the critical labours of the earlier Tiibingen school in relation to the first development of Christianity. Carl Schwarz says of it, "This work—full though it was of youthful exaggerations and pro- vocations, partisan as it was in its line of argument, untrue and abstract as its contrast of Paulinism and Petrinism was, and arbi- trary as was its use of those party names—produced nevertheless by its masterly literary form (which reminds us of Strauss), and by its easy handling and presentation of all the important data, a power- ful impression, and, although in many points of detail it is out of date, it may still be regarded as one of the 'standard works' of the school." Schwegler published also an edition of the Clementine

Homilies (1847), and of Eusebius's Ecclesiastical History (1852), In the department of philosophy we have an edition of the Afeta-

physics of Aristotle, with a translation and commentary (4 vols.,

1847-48), the well-known sketch of the History of Philosophy (1848), and a posthumous Geschichte der Gricch. Philosophie (1859). In history he commenced a Lémische Geschichte (vols. i.~~iii., 1853~~ 58, 2d ed., 1869), which he brought down only to the laws of Licinius.

SCHWEIDNITZ, a manufacturing and trading town of Lower Silesia in Prussia, is picturesquely situated on the left bank of the Weistritz, 28 miles south-west of Breslau. Well built, with wide streets, the town contains several old churches (one of which has a tower 338 feet high) and an ancient town-house with a tower 130 feet high, The surrounding country is fertile and highly cultivated, and the large quantities of flax and hemp there raised encourage an active weaving industry in the town. Beetroot for sugar, grain, and fruit are also grown. The manufacture of furniture, leather gloves, machinery and tools, carriages, nuts and screws, needles, and other hard- ware goods is carried on, The beer of Schweidnitz has long been famous under the name of "Schwarze Schéps," and in the 16th century it was exported as far as Italy. Schweidnitz is the chief grain market of the district. The population in 1885 was 23,775 (an increase of 6 per cent. since 1880); in 1816 it was 10,046.

Schweidnitz, dating from about the 11th century, received town rights in 1250. About 1278 it became the capital of a principality, with an area of 935 square miles, which belonged to Bohemia from 13538 till 1741, when it passed into the possession of Prussia. The "Polerei of Schweidnitz" is the name given to the riotous revolt of the town, in 1520-22, against a royal edict depriving it of the right of coining its own money. The town was four times besieged aud taken in the Seven Years' War; and in 1807 it was captured by the French, who demolished the fortifications. In 1816 new works were raised, but in 1864 they were converted into a public park,

SCHWEINFURT, a manufacturing town of Lower Franconia in Bavaria, is situated on the right bank of the

Main, 22 miles north-east of Wiirzburg. The Renaissance town-house in the spacious market-place dates from 1570 ;

+t contains a library and a collection of antiquities. St John's church isa Gothic edifice with a lofty tower ; St Galvator's was built about 1720. Schweinfurt is well furnished with benevolent and_ educational institutions, including a gymnasium founded by Gustavus Adolphus. The Main is here spanned by two bridges. The chief manufacture is paint ("Schweinfurt

green" is a well-known brand in Germany), introduced in 1809; but beer, sugar, machinery, soapand other drysalteries, straw-paper, vinegar, é&c., are also produced. Cotton-spinning and. bell-founding are carried on; and the Main supplies water-power for numerous saw, flour, and other mills. Schweinfurt carries on an active trade in the. grain, fruit, and wine produced in its neighbourhood, and it is the seat of an important sheep and cattle market. Riickert the poet (d. 1866) was born here in 1788. The population in 1880 was 12,601, of whom one-fourth were Roman Catholics.

Schweinfurt is mentioned in 790, and in the 10th century was the seat of a margrave. It fell later to the counts of Henneberg ; but, receiving town rights in the 13th century, it maintained its independence as a free imperial city with few interruptions until 1803, when it passed to Bavaria. 'Assigned to the grand-duke of Wiirzburg in 1810, it was restored to Bavaria in 1814. In the Thirty Years' War it was occupied by Gustavus Adolphus, who erected fortifications, remains of which are still extant.

SCHWELM, a town of Westphalia, in Prussia, is situated on the river of the same name, 22 miles east of Diisseldorf and 27 north-east of Cologne. Lying close to the Harkort iron and sulphur mines, within the populous and rich mineral district on the lower Rhine, it carries on iron- founding, wire-drawing, and the manufacture of machinery of various kinds, besides an active trade in iron, steel, and brass goods. Scarcely less important are its manufactures of ribbons, damask, cord, and paper. In the neighbour- hood are chalybeate springs, resorted to by invalids. The population in 1880 was 12,127, one-fourth of whom were Roman Catholics. Schwelm is said to have existed as early as 1085, though it did not receive town-rights until

1590.

SCHWENKFELD, Caspar (1490-1561), of Ossing, as he called himself from his property at this place in the principality of Liegnitz in Silesia, one of the first and noblest representatives of Protestant mysticism in the 16th century, was born in 1490. He was of noble descent, and acquired at Cologne and other universities an education greatly superior to that possessed by most noblemen of his time, After leaving the university he served in various minor courts of Silesia, finally entering the service of the duke of Liegnitz, over whom his influence was great. Though he was

educated as a strict Catholic, the writings of Tauler and Luther produced a profound impression upon him, so that in 1522 he visited Wittenberg, where he made the acquaintance of Carlstadt and Thomas Miinzer, spirits destined to be more congenial to him than Luther himself. On his return to Liegnitz he joined in an active propaga- tion of the principles of the Reformation in the principality and in Silesia. But very early Schwenkfeld uttered warn- ings against the abuse of the doctrine of justification by faith. The Protestant controversy as to the Eucharist (1524) revealed his disagreement with Luther on that critical point. He sought to establish a via media between the doctrines of Luther and Zwingli, and vainly hoped to obtain for it Luther's acceptance. He as vainly sought to secure Luther's adoption of a strict rule of church discip- line, after the manner of the Moravian Brethren. Mean- while the Anabaptists obtained a footing in Silesia, and suspicions of Schwenkfeld's sympathy with them were aroused. Letters and writings of his own (1527-28) proved him to hold strongly anti-Lutheran heresies, and both Catholics and Lutherans urged the duke of Liegnitz to dismiss him. He voluntarily left Liegnitz in 1529, and

took up his abode at Strasburg for five years amongst the numerous Reformed clergy there. In 1533, inan important synod, he defended against Bucer the principles of religious freedom as well as his own doctrine and life. But the heads of the church carried the day, and, in consequence of the more stringent measures adopted against dissenters, Schwenkfeld left Strasburg for a time. While residing in various cities of south Germany he kept up a wide corre- spondence with the nobility particularly, and in Wiirtem- berg propagated his views personally at their courts. In 1535 a sort of compromise was brought about between himself and the Reformers, he promising not to disturb the peace of the church and they not to treat him as a dis- turber, The compromise was of only short duration. His theology took a more distinctly heterodox form, and the publication (1539) of a book in proof of his most charac- teristic doctrine—the deification of the humanity of Christ led to the active persecution of him by the Lutherans and his expulsion from the city of Ulm. The next year (1540) he published a refutation of the attacks upon his doctrine with a more elaborate exposition of it, under the title Grosse Confession. His book was very inconvenient to the Protestants, as it served to emphasize the differences be- tween the Lutherans and Zwinglians as regarded the Eucha- rist at a moment when

efforts were being made to reconcile them. An anathema was accordingly issued from Schmal- kald against Schwenkfeld (together with Sebastian Franck) ; his books were placed on the Protestant " index" ; and he himself was made a religious outlaw. From that time he was hunted from place to place, though his wide connexions with the nobility and the esteem in which he was held by numerous followers and friends provided for him secure hiding-places and for his books a large circulation. An attempt in 1543 to approach Luther only increased the Reformer's hostility and rendered Schwenkfeld's situation still more precarious. He and his followers withdrew from the Lutheran Church, declined its sacraments, and formed small societies of kindred views. He and they were frequently condemned by Protestant ecclesiastical and political authorities, especially by the Government of Wiirtemberg. His personal safety was thereby more and more imperilled, and he was unable to stay in any place for more than ashort time. At last, in his seventy-second year, he died at Ulm, on 10th December 1561, surrounded by attached friends and declaring undiminished faith in his views.

Schwenkfeld left behind him a sect (who were called subsequently by others Schwenkfeldians, but who called themselves " Confessors of the Glory of Christ") and numerous writings to perpetuate his ideas. His writings were partially collected in four folio volumes, the first of which was published in the year 1564, containing his principal theological works. Erbkam states that his unprinted writings would make more than another four folios. His adherents were to be found at his death scattered throughout Germany. In Silesia they formed a distinct sect, which has lasted until our own times. In the 17th century they were associated with the followers of Jacob Bohme, and were undisturbed until 1708, when an inquiry was made as to their doctrines. In 1720a commission of Jesuits was despatched to Silesia to convert them by force. Most of them fled from Silesia into Saxony, and thence to Holland, England, and North America. Frederick the Great of Prussia, when he seized Silesia, extended his protection to those who remained in that province. Those who had fled to Philadelphia in Pennsylvania formed a small community under the name of Schwenkfeldians ;

and Zinzendorf and Spangenberg, when they visited the United States, endeavoured, but with little success, to convert them to their views. This community still exists in Pennsylvania, and according to information obtained from their ministers by Robert Barclay they consisted in 1875 of two congregations of 500 members, with three meeting-houses and six ministers. Their views appear to be substantially those of the English Society of Friends. See Robert Barelay's Inner Life of the Religious Societies of the Com- monwealth, London, 1876, pp. 226-247.

Schwenkfeld's mysticism was the cause of his divergence from Protestant orthodoxy and the root of his peculiar religious and

theological position. It led him to oppose the Lutheran view of the value of the outward mcans of grace, such as the ministry of the word, baptism, the Eucharist. He regarded as essential a direct and immediate participation in the grace of the glorified Christ, and looked on an observance of the sacraments and religious ordi- nances as immaterial. He distinguished betwcen an outward word of God and an inward, the former being the Scriptures and perish- able, the latter the divine spirit and eternal. In his Christology he departed from the Lutheran and Zwinglian doctrine of the two natures by insisting on what he called the Vergottung des Fleisches Christi, the deification or the glorification of the flesh of Christ. The doctrine was his protest against a separation of the human and the divine in Christ, and was intimately connected with his mystical view of the work of Christ. He held that, though Christ was God and man from His birth from the Virgin, He only attained His complete deification and glorification by His ascension, and that it is in the estate of His celestial Vergottwng or glorification

that He is the dispenser of His divine life to those who by faith'

become one with Him. This fellowship with the glorified Christ rather than a less spiritual trust in His death and atonement is with him the essential thing. His peculiar Christology was based upon profound theological and anthropological ideas, which contain the germs of some recent theological and Christological speculations.

See Arnoldt, Kirchen- und Ketzer-Historie (Frankfort, ed. 1700); Salig, Historie der Augsburg. Confession ; Erbkam, Gesch. der prot. Sekten (1848); Dorner, Gesch. d. prot. Theol. (1867); also Erbkam's artiele in Herzog's Realencyklopddie, Robert Barclay's work quoted above, and Beard's Hibbert Lectures (1883).

SCHWERIN, the capital and one of the most attractive cities of the grand-duchy of Mecklenburg-Schwerin, is prettily situated at the south-west corner of the Lake of Schwerin (14 miles long and 3$ miles broad), 110' miles north-west of Berlin. The town is closely surrounded and hemnied in by a number of lakelets, with high and in some cases well-wooded banks; and the hilly environs are occupied by meadows, woods, and pretty villas. The old and new towns of Schwerin were only united as one city in 1832; and since that date the suburb of St Paul and another outer suburb, known as the Vorstadt, have grown up. Though Schwerin is the oldest town in Mecklenburg, its aspect is comparatively modern,—a fact due to destructive fires, which have swept away most of the ancient houses. The most conspicuous of the many fine buildings is the ducal palace, a huge irregularly penta- gonal structure with numerous towers (the highest 236 feet), built in 1844-57 in the French Renaissance style. It stands on a small round island between Castle Lake and the Lake of Schwerin, formerly the site of a Wendish fortress and of a later medieval castle, portions of which have been skilfully incorporated with the present building. The older and much simpler palace; the opera-house, rebuilt after a fire in 1882; the Government buildings, erected in 1825-34 and restored in 1865 after a fire; and the museum, in the Greek style, finished in 1882, all stand in the "old garden," an open space at the end of the bridge leading to the new palace. Among the other secular buildings are the palace of the heir-apparent (built in 1779 and restored in 1878), the large arsenal, the ducal stables, the gymnasium, the town-house, the artillery- barracks, the military hospital, &c. The cathedral was originally consecrated in 1248, though the present building —a brick structure in the Baltic Gothic style, with an unfinished tower—dates for the most part from the 15th century. Since 1837 Schwerin has been once more the residence of the grand-duke, and the seat of government and of various high tribunals,—a fact which has had con-siderable influence on the character of the town and the tone of its society. Neither the manufacturing industry nor the trade of Schwerin is important.

Jn 1885 the popu- lation was 32,031—including about 700 Roman Catholics and 400 Jews—an increase of 6°4 per cent. since 1880.

Schwerin is mentioned as a Wendish stronghold in 1018, its name (Zwarin or Swarin) being a Slavonic word equivalent to " game- preserve." The Obotrite prince Niclot, whose statue is placed above the portal of the palace as the ancestor of the present reigning family, had his residence here. The town, founded in 1161 by Heury the Lion in opposition to this pagan fortress, reccived town-

'and powers on the wane, he revisited Vienna.

rights in 1167. From 1170 to 1624 it gave name toa bishopric ; and it was also the capital of the duchy of Schwerin, which forms the western part of the grand-duchy of Mecklenburg-Schwerin. Destructive fires, the hardships of the Thirty Years' War, and the removal of the court to Ludwigslust in 1756 seriously depressed the town. It owes its revival and many of its chief buildings to the grand-duke Paul Frederick (1837-42), to whom a statue by Rauch was crected in 1859.

SCHWIND, Morrrz von (1804-1871), a painter of the romauitic school, was born in Vienna in 1804. He received rudimentary training and led a joyous careless life in that gay capital ; among his companions was the musician Schubert, whose songs he illustrated. In 1828 he removed to Munich, and had the advantage of the friendship of the painter Schnorr and the guidance of Cornelius, then director of the academy. In 1834 he received the com- mission to decorate King Louis's new palace with wall paintings illustrative of the poet Tieck. Healso found in the same palace congenial sport for his fancy in a " Kinder- fries"; his ready hand was likewise busy on almanacs, é&c., and by his illustrations to Goethe and other writers he gained applause and much employment. In the revival of art in Germany Schwind held as his own the sphere of poetic fancy. To him was entrusted in 1839, in the new Carlsruhe academy, the embodiment in fresco of ideas thrown out by Goethe; he decorated a villa at Leipsic with the story of Cupid and Psyche, and further justified his title of poet-painter by designs from the Wiebelungen- lied and Tasso's Gerusalemme for the walls of the castle of

Hohenschwangau in Bavarian Tyrol. From the year 1844 dates his residence in Frankfort; to this period belong some of his best easel pictures, pre-eminently the Singers' Contest in the Wartburg (1846), also designs for the Goethe celebration, likewise numerous book illustrations. The conceptions for the most part are better than the execution. In 1847 Schwind returned to Munich on being appointed professor in the academy. Eight years later his fame was at its height on the completion in the castle of the Wartburg of wall pictures illustrative of the Singers' Contest and of the History of Elizabeth of Hungary. The compositions received universal praise, and at a grand musical festival to their honour Schwind himself played among the violins. In 1857 appeared his exceptionally mature "'cyclus" of the Seven Ravens from Grimm's fairy stories. In the same year he visited England to report officially to King Louis on the Manchester art treasures. And so diversified were his gifts that he turned his hand to church windows and joined his old friend Schnorr in designs for the painted glass in Glasgow cathe- dral. Towards the close of his career, with broken health To this time belong the '"'cyclus" from the legend of Melusine and the designs commemorative of chief musicians which de- corate the foyer of the new opera-house. Cornelius writes, "You have here translated the joyousness of music into pictorial art." Schwind's genius was lyrical; he drew inspiration from chivalry, folk-lore, and the songs of the people ; his art was decorative, but lacked scholastic train- ing and technical skill. Schwind died at Munich in 1871, and his body lies in the old Friedhof of the same town.

SCHWYZ, one of the forest cantons of Switzerland, ranking fifth in the confederation. It extends from the upper end of the Lake of Zurich on the north to the middle reach of the Lake of Lucerne on the south ; on the west it touches at Kiissnacht the northern arm of the latter lake, and at Arth the Lake of Zug, while on the east it stretches to the ridges at the head of the Muottathal, which divide it from Glarus. Its total area is 350-7 square miles, of which 254°9 are classed as "productive land" (193°3 of this being pasture or arable land) and 95:8 as "unpro- ductive land" (glaciers and lakes occupying 21 square

miles). The highest point is the Grieseltstock or Faulen (9200 feet); the summit of the Rigi (Rigi Kulm) is also within its limits. In 1880 the population (nearly equally divided between the two sexes) was 51,235, an increase of 3530 since 1870. The only towns of any size are Einsiedeln (population, 8401) and the capital, Schwyz (6543). German is the mother-tongue of 49,631 of the inhabitants, and there is an Italian colony of 1377. The Roman Catholics number 50,266, the Protestants but 954, 'Till 1814 the canton formed part of the diocese of Constance; since that time it is practically (though not formally) included in that of Chur. Besides a monastery of Capuchin friars and four nunneries, the canton boasts of the great Benedictine abbey of Einsiedeln, which grew up round the cell of the hermit St Meinrad (d. 863) ; it received its first charter in 946 from Otho L, and contains a black statue of the Virgin, which attracts about 150,000 pilgrims annually. In Schwyz primary education is free and compulsory, the state also giving grants in aid of secondary instruction. The population are mainly engaged in pastoral occupations, the chief article of export (largely to north Italy) being a special breed of cattle, which enjoys a very high reputation in the confederation. The only railways in the canton are the portion of the St Gotthard line between Kiissnacht, Immensee, and Sisikon, and the line from Arth to the summit of the Rigi.

The valley of Schwyz first appears in history in 970. Later a community of free men is found settled at the foot of the Mythen, possessing common lands and subject only to the count of the Zurich gau, as the representative of the emperor ; from the Hapsburgs Steinen in 1269 and Arth (completely) in 1354 bought their free- dom and became part of the free community of Schwyz. The early history of Schwyz consists mainly of struggles with the abbey of Einsiedeln about rights of pasture. In 1240 the inhabitants obtained from Frederick II. the " Reichsfreiheit," é.c., direct depend- ence on the emperor, being thus freed from the Hapsburg counts of the Zurich gaz. In 1278 the younger branch of the house of Hapsburg sold all its property and rights in the valley to the elder

branch, which a few months later obtained the empire, and in April |

1291 bought the rights of the Alsatian abbey of Murbach over Lucerne. Schwyz took the lead in making the famous league of 1st August 1291 with

the neighbouring districts of Uri and Unter- walden, for which its position and the free spirit of its inhabitants specially fitted it. An attack by Schwyz on Einsiedeln was the excuse for the Austrian invasion which on 15th November 1315 was gloriously beaten back in Morgarten Pass. In the history of the Teague Schwyz was always to the front, so that its name in a dialectal form (Schweiz) was applied by foreigners from the 14th century onwards to the league as a whole, though it formed part of its formal style only from 1803. Soon after the victory of Sempach (1386) the men of Schwyz began to extend their borders. In 1394 they acquired the town of Kinsiedeln (becoming in 1397, and finally in 1484, the "protectors" of the great abbey) and in 1402 Kissnacht, while in 1412-37 they won the '" March," and in 1440 Wollerau and Pfaffikon,—all on or near the Lake of Zurich. All these districts were governed by Schwyz as subjects, not as equals or allies, supreme power resting with the " Landsgemeinde " (or assenibly of all citizens of full age) of Schwyz, which is first mentioned in 1294. Schwyz joined the other forest cantons in opposing the Reformation, and took part in the battle of Cappel (1531), in which Zwingli fell. In 1586 it became a member of the Golden or Borromean League, formed to continue the work of Charles Borromeo in carrying out the counter-Reformation. In 1798 Schwyz, including Gersau (free since 1390), formed part of the 'Tell gau" or 'République Telliane, : set up by the French, which a week later gave way to the " Helvetic republic," though the free men offered a valiant resistance under Aloys Reding. In 1799 it was the scene of the disastrous retreat from Altdorf to Glarus made over the Kinzigkulm and Pragel Passes by the Russians under Suwaroff in face of the French army. Schwyz steadily resisted all proposals for the revision of the federal constitution of 1815, joined the league of Sarnen in 1882, and, when religious disputes had further complicated matters, the " Sonderbund" (1843 and 1845), which was only put down by the war of November 1847. The constitution of 1848 was revised in 1855, 1876 (when membership of one of the twenty-nine " Gemeinde" or communes became the political qualification), and 1884.

SCIACCA, a town of Italy, in the province of Girgenti, Sicily, 28 miles south-east of Castelvetrano (Selinus) and 37 north-west of Girgenti, lies on the south coast on a steep

historian of Sicily. rible feud between the Perollos (lords of Sciacca) and the counts

rocky decline, and with its walls and castles has from a distance an imposing appearance. The cathedral was founded in 1090 by Julia de Hauteville, daughter of Roger L, who had presented her with the lordship of Sciacca on her marriage with Perollo; and two other churches, 8. Salvadore and S. Maria delle Giummare, date from the same period, In the cliffs are excavated granaries in which under the Spanish viceroys the grain used to be stored under Government control. To the east of the town, at the foot of Monte 8. Calogero, are the hot wells (sulphur- ous and saline) of Sciacca; and the steam that breaks forth from the top of the hill seems to have been used (as

it still is) for vapour baths from a remote (possibly Phoenician) period. The population was 21,451 (22,195

including Marina) in 1881.

Sciacca was the birthplace of Tommaso Fazello (1498-1570), the In the 15th century it was the seene of a ter-

of Luna. SCIATICA. See Neurateata, vol. xvii. p. 364. SCILLY ISLES, a group of islands, about forty in number, in the county of Cornwall (see vol. vi. plate IX.),

England, are situated about 25 miles west by south of

Land's End and 40 west from Lizard Point, in 50° N. lat. and 6° W. long. They are composed wholly of granite,— outliers of the granite highlands of Cornwall. There are some metalliferous veins or lodes, but none that could ever have yielded much iron. On account of the mild climate the vegetation is remarkably luxuriant. The mean average temperature in winter is about 45° and in summer about 58°. Fuchsias, geraniums, and myrtles attain an immense size, and aloes, cactus, and the prickly pear grow in the openair. The inhabitants devote their attention principally to the cultivation of early

potatoes for the London market. Asparagus and other early vegetables, as well as flowers, are also largely cultivated. Lobsters are caught and sent to London, but the fishing industry is of comparatively minor importance.

The total area of the islands is 3560 acres, with a population in 1871 of 2090, and in 1881 of 2320, including 276 persons on board vessels. The inhabited islands are St Mary's (area about 1500 acres), Tresco (700), St Martin's (550), St Agnes (350), and Bryher (300). The principal town, Hugh Town in St Mary's, occupies a sandy peninsula crowned by the height called the Garrison, with Star Castle, erected in the time of Elizabeth. It possesses a harbour and pier with a roadstead affording anchorage for large vessels. The coast-line is wild and picturesque, with precipitous headlands and many extensive caves. On Tresco there are remains of an abbey ; and St Agnes has a lighthouse 72 feet in height. On the islands there are numcrous rude pillars and circles of stones, similar to those in Cornwall.

The Scilly Isles are probably the Cassiterides or '¢Tin Islands" of the Greeks (see vol. xviii. p. 806). The islands were granted in 936 by Athelstan to the monks settled at Tresco, but on the endowment of the abbey of Tavistock the greater portion of them were included amongst its possessions. In the reign of Elizabeth they were divided amongst several proprietors. During the Civil War Hugh Town held out for the king, and in 1645 afforded shelter for a time to Prince Charles until he escaped to Jersey. In 1649 they were taken possession of by Sir J ohn Grenville, a Royalist, who made use of them as a convenient shelter, whence he issued to sweep the neighbouring seas, until in 1651 he was forced to surrender toa fleet under Blake and Sir John Ayscue. In ancient times a frequent haunt of pirates, the islands were afterwards notorious for smuggling. On the suppression of smuggling Mr Augustus J. Smith did much to introduce order and encourage habits of industry amongst the inhabitants.

SCINDE. See Srnp.

SCIO, the Italian name of an island on the west coast of Asia Minor, called by the Greeks Chios (7 Xios, 's 71) Xéo) and by the Turks Saki Adasi; the soft pronunciation of x before « in Modern Greek, approximating to sk, caused Xfo to be Italianized as Scio. Scio, which is about 30 miles long

from north to south, and varies in breadth from 8 to 15 miles, is divided into a larger northern part

and a smaller southern part, called respectively apanomerta XXII. — 59

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and katomeria. The island is rugged and well deserves the epithet "craggy " (wairaddecoa) applied to it in the Homeric hymn. The southern part is less rocky than the northern, and the wealth of the island is concentrated there. The figs of Chios were noted in ancient times, but wine and gum mastic have always been its most important products. The climate is almost perfect, the atmosphere delightful and healthy; oranges, olives, and even palms grow freely. The finest wine was grown on the north- western coast, in the district called by Strabo Ariusia, and was known in Italy as wnwm Arvisiwm. The population of Chios has always been far greater than its resources could feed; the people have therefore been forced to import the necessaries of life in exchange for their wine and mastic and fruit, and alike in ancient and modern times they have been known as merchants and traders. Pottery of Chios and Thasos was exported to Illyria (Strab., p. 317) and doubtless elsewhere ; it formed or contained the cargo of outward-bound trading ships. Thasian ware is familiar in museums, where the stamped handles of Thasian amphoree have been collected in thousands; but no pottery has yet been identified as of Chian manufacture. An incidental proof of the importance of Chian handicrafts lies in the fact that early in the 7th century B.c. Glaucus of Chios discovered the process of soldering iron, and the iron stand of a large crater whose parts were all connected by this process was constructed by him, and preserved as one of the most interesting relics of antiquity at Delphi. The long line of Chian sculptors in marble, Bupalus and Athenis, sons of Archermus, son of Micciades, son of Melas, bears witness to the fame of Chian art in the period 660 to 540 B.c. The Winged Victory of Micciades and Archermus, which was dedicated at Delos, is still preserved,—the most im- portant attested work extant of archaic Greek art. Marble quarries also were worked in the island. In literature the chief glory of Chios was the school of epic poets called Homeride, who carried on and gave an Ionic tone to the traditional art of the older Molic bards. Cinzethus is said to have written

the Homeric Hymn to Apollo of Delos, and is believed by some modern critics to have exer- cised great influence on the text of the Zdzad and Odyssey. The Chian recension of these poems (Xéa "Exdoous) was in later times one of the standard texts. Jon the tragic poet, 'Theopompus the historian, and other writers maintained the position of Chios in literature during the classical period. The chief city of Chios has always borne the same name as the island. It is situated near the middle of the eastern coast, and at the present day contains about 17,000 inhabitants. A theatre and a teniple of Athena Poliuchus existed in the ancient city. About 6 miles north of the city there is a curious monument of antiquity, commonly called "the school of Homer"; it is a very ancient sanctuary of Cybele, with an altar and a figure of the goddess with her two lions, cut out of the native rock on the summit of a hill. On the west coast there is a monastery of great wealth with a church founded by Constantine IX, (1042-54). Starting from the city and encompassing the island, one passes in succession the pro- montory Posidium ; Cape Phane, the southern extremity of Chios, with a harbour and a temple of Apollo; Notium, probably the south-western point of the island ; Laii, opposite the city of Chios, where the island is narrowest; the town Bolissus (now Volisso), the home of the Homerid poets ; Melcena, the north-western point ; the wine-growing district Ariusia ; Cardamyle (now Cardhamili) ; the north-eastern promontory was probably named Phlium, and the mountains that cross the northern part of the island Pelineus or Pelleneus. The situation of the small towns Lenconium, Delphinium, Caucasa, Ceela, and Polichne is uncertain ; probably most of them were in the southern part. The island is subject to earthquakes ; a very destructive shock occurred in March 1881. The history of Chios is very obscure. According to Pherecydes, the original inhabitants were Leleges, while according to other accounts Thessalian Pelasgi possessed the island before it becanie an Ionian state. The name A'thalia, common to Chios and Lemnos in very early time, suggests the original existence of a homogeneous population in these and other neighbouring islands. Cinopium, a mythical hero, son of Dionysus or of Rhadamanthus, was an early king of Chios. His successor in the fourth generation, Hector,

united the island to the Ionian confederacy (Pausan., vii. 4), though Strabo (p. 633) implies an actual conquest by Ionian settlers. 'The name Hector and the fountain Helene (probably at the modern Thelena in the north) might be expected in the island of the Homeride. 'The regal government was at a later time exchanged for an oligarchy or a democracy, but nothing is known as to the manner and date of the change. As in most other states of Greece, tyrants sometimes ruled in Chios; the names of Amphiclus and Polytecnus are mentioned. The early relations of Chios with other states are very obscure, but it seems to have been an ally of Miletus, and to have been at enmity with the Phoceo-Samian alliance, to which the neighbouring Erythre belonged. The same form of the Ionian dialect was spoken in Chios and in Erythre.

When the Persians appeared on the Ionian coast Chios willingly submitted, refused to thcir old enemies the Phoceans, who were fleeing from the Persian yoke, a refuge on their islands Cnusse, and even surrendered the Lydian fugitive Pactyes in defiance of all religious scruples. Strattis, tyrant of Chios, followed Darius in his Scythian expedition. The Chians joined in the Jonian rebellion against the Persians (500-495) and supplied 100 ships. After the Persian victory at Lade the island was most severely treated, the towns and temples burned, and many of the pcople enslaved. At Salamis (480) the Chian ships, led by the tyrant Strattis, served in the Persian fleet. After the battle of Mycale (479) the island became free and a democratic government no doubt took the place of the tyranny. Chios was the most powerful state after Athens in the Delian confederacy, and it was an ally on equal terms of the Athenian empire, paying no tribute, but furnishing ships in casc of war. It remained a faithful ally of the Athenians till the year 412, when, encouraged by the weakness caused in Athens by the Sicilian disasters, it Joined the Lacedemonians. Its fleet then consisted of fifty ships.) The Athenians defeated them in three battles, at Bolissus, Phane, and Leuconium, but could not reconquer the island. Finding the Spartan hegemony more op- pressive than the Athenian, Chios returned to the Athenian con- nexion in 394, but soon afterwards deserted and joined the Thebans. In the wars of Alexander the Great, Memnon, supported by the oligarchical party, held the island for the Persians. It was afterwards involved in the rapid vicissitudes of Ionian history, falling under the power of various dynasties among the diadocht. In the Mithradatic wars it

favoured the Roman alliance, and the king's general Zenobius fined the island 2000 talents and carried off a great number of the population into slavery in Pontus. It had many centuries of peaceful prosperity under Roman and Byzantine rule. The Genoese held it from the 14th century till in 1566 the Turks conquered it and the third great Chian disaster and massacre occurred. Except for a brief Venetian occupation in 1694, Chios has remained in Turkish hands till the present day. A fourth massacre afflicted the island in 1822, when the Turks repressed with fire and sword the attempted Greek insurrection. Till this terrible event the island was ruled very leniently by the Turks; the internal government was left in the hands of five archons, three Greek and two Catholic, while two resident Turkish officials represented the sultan and received through the archons the stipulated tribute. (W. M. RA.)

SCIPIO. 'The Scipios,! a memorable name in Roman history, were a branch of the ancient and noble family of the Cornelii. It was in Rome's wars with Carthage that they made themselves specially famous.

1. Postrus Cornexius Scrpio, the father of the Elder Africanus, was the first Roman general to encounter Hannibal in battle. He was consul in 218 B.c., the first year of the Second Punic War, and, having Spain for his province, he went with an army to Massilia (Marseilles) with the view of arresting the Carthaginian's advance on Italy. Failing, however, to meet his enemy, he hastened back by sea to Cisalpine Gaul, leaving his army under the command of his brother Cneius Scipio, who was to harass the Carthaginians in Spain and hinder them from support- ing Hannibal. In a sharp cavalry engagement in the upper valley of the Po, on the Ticinus, he was defeated and severely wounded, and it is said he owed his life to the bravery of his son, then a mere stripling. Again, in the December of the same year, he witnessed the complete defeat of the Roman army on the Trebia, his colleague Sempronius having insisted on fighting contrary to his advice. But he still retained the confidence of the Roman people, since his term of comniand was extended, and we

find him with his brother in Spain in the following year,

1 The name means a "stick" or "staff."

winning victories over the Carthaginians and strengthen- ing Rome's hold on that country, till 212 or 211. The details of these campaigns are not accurately known to us, but it would seem that the ultimate defeat and death of the Scipios were due to the desertion of the Celtiberi, bribed by Hasdrubal, Hannibal's brother.

2. Pusiius Cornetius Scrrio AFRICANUS THE ELDER.— After having been present at the disastrous battles of the Ticinus, the Trebia, and Cann, and having after that last crushing defeat had the spirit to remonstrate with several Roman nobles who advocated giving up the struggle and quitting Italy in despair, Scipio, at the age of twenty-four, offered to take the command of the Roman army in Spain the year after his father's death. The people already had an intense belief in him, and he was unanimously elected. All Spain west of the Ebro was in the year of his arrival (210) under Carthaginian control, but fortunately for him the three Carthaginian generals, Hasdrubal (Hannibal's brother), Hasdrubal the son of Gisgo, and Mago (also Hannibal's brother), were not disposed to act in concert. Scipio was thus enabled to surprise and capture New Carthage, the headquarters of the Carthaginian power in Spain, from which he obtained a rich booty of war stores and supplies, with a particularly good harbour. The native Spanish tribes now became friendly, and Scipio found use- ful allies among them. In the following year he fought Hasdrubal somewhere in the upper valley of the Guadal- quivir, but the action could hardly have been a decisive one, as soon afterwards the Carthaginian crossed the Pyrenees at the head of a considerable army on his way to Italy. Next year another battle was fought in the same neigh- bourhood, and Scipio's success appears to have been suffi- ciently decided to compel the Carthaginian commanders to fall back on Gades, in the south-western corner of Spain. The country was now for the most part under Roman influ- ence, a result due even more to the statesmanlike tact of Scipio than to his military ability. With the idea of striking a blow at Carthage in Africa, the Roman general paid a short visit to the Numidian princes, Syphax and Masinissa, but at the court of Syphax he was foiled by the presence of Hasdrubal, the son of Gisgo, whose daughter Sophonisba was married to the Numidian chief. On his return to Spain Scipio had to quell a mutiny which had broken out

among his troops. Hannibal's brother Mago had meanwhile sailed for Italy, and Scipio himself in 206, after having established the Roman ascendency in Spain, gave up his command and returned to Rome to stand for the consulship, to which he was unanimously elected the following year, the province of Sicily being assigned to him. By this time Hasdrubal with his army had perished on the Metaurus, and Hannibal's movements were restricted to the south-western extremity of Italy. For Rome the worst part of the struggle was over. The war was now to be transferred by Scipio from Italy to Africa. He was himself eagerly intent on this, and his great name drew to him a number of volunteers from all parts of Italy. There was. but one obstacle: the old-fashioned aristocracy of Rome did not like him, as his taste for splendid living

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drove the Carthaginian army out of the field. There was an attempt at negotiation, but the war party prevailed and Hannibal was recalled from Italy. The decisive battle was fought near the Numidian town of Zama in 202 and ended in Hannibal's complete defeat. Peace was con- cluded with the Carthaginians in the following year on terms which strictly confined their dominion to a compara- tively small territory in Africa, almost annihilated their fleet, and exacted a heavy war contribution. In fact, the independence of Carthage was destroyed, and it became simply a rich commercial city. The old-fashioned and narrow-minded aristocrats who were in sympathy with the " delenda est Carthago" policy subsequently announced by Cato thought these terms too lenient ; but Scipio was too great and too generous a man to lend himself to the base work of utterly extinguishing an ancient and noble centre of civilization. Rome was now perfectly safe from attack. It was a great Mediterranean power: Spain and Sicily were Roman provinces, and the north of Africa was under a Roman protectorate. Such was the end, after seventeen years, of the Second Punic War. Scipio was welcomed back to Rome with the surname of Africanus, and he had the moderation and good sense to refuse the many honours which the people would have thrust upon him. For some years he lived quietly and took no part in politics. In 190 his brother Lucius Scipio was consul and, on the under- standing that he should have the benefit of the military skill and experience of Africanus, he was entrusted with the war in

Asia against Antiochus. The two brothers brought the war to a conclusion by a decisive victory at Magnesia in the same year. Meanwhile Scipio's political enemies had gained ground, and on their return to Rome a prosecution was started against Lucius on the ground of misappropriation of moneys received from Antiochus. As Lucius was in the act of producing his account-books his brother wrested them from his hands, tore them in pieces, and fiung them on the floor of the senate-house. He was then himself accused of having been bribed by Antiochus, but he reminded his accusers that the day was ill chosen, as it happened to be the anniversary of his great victory over Hannibal at Zama. 'There was an outburst of enthusiasm, and Scipio was once again the hero and the darling of the Roman people, who, it is said, crowded round him and followed him to the Capitol. After all, however, he ended his days, as a voluntary exile in all probability, at Liternum on the coast of Campania, dying, it would seem, in 183, the year of Hannibal's death, when a little above fifty years of age. Scipio's wife was Aimilia, daughter of the 'Amilius Paullus who fell at Cannee and who was the father of the conqueror of Macedonia. By her he had a daughter, Cornelia, who became the mother of the two famous Gracchi.

Spain, Northern Africa, the so-called province of Asia, were added to Rome's dominion during his life. Scipio lived to see Rome develop from a mercly Italian power to be in fact the mistress of the world, aud he himself greatly contributed to this result. Among Rome's great generals we must rank him after Cesar. He knew how to plan a campaign as well as how to fight a battle, and he had the faculty of inspiring his soldiers with confidence and enthusiasm. He never had to make head against such tremendous

and Greek culture was particularly offensive to them. A party in the senate would have recalled him, but the popular enthusiasm was too strong for them. A commis- sion of inquiry was sent over to Sicily, and it found that he was at the head of a well-equipped fleet and army. At the commissioners' bidding he sailed in 204 from Lilybeeum (Marsala) and landed on the coast of Africa near Utica. Carthage meanwhile had secured the friendship of the powerful Numidian chief Syphax, whose advance com- pelled Scipio to raise the siege of Utica and to entrench luimself on the shore between that

place and Carthage. Next year he surprised and utterly defeated Syphax and

difficulties as his great antagonist, and his achievements, great as they were, must be distinctly ranked beneath the marvellous suc- cessesof Hannibal. Still the story was told that, in a conversation between the two generals at the court of Antiochus, Hannibal, who had named Alexander as the first and Pyrrhus as the second among military commanders, confessed that had he beaten Scipio he should have put himself before either of them. It seems to be at any rate certain that the two great men respected and admired each other, and it is much to Scipio's credit that he withstood the mean persc- cution with which the Roman senate followed up the Carthaginian. It may be that he had rather too much aristocratic hauteur for a statesman in time of peace, but against this we must set the pleasing fact that he was a man of great intellectual culture and could speak and write Greek just as well as his native Latin. He wrote his

own memoirs in Greek. There must indeed have been a wonderful charm about the man, and there was a belief that he was a special favourite of heaven and held actual communication with the gods. It is quite possible too that he himself honestly shared this belief ; and so it was that to his political opponents he could be harsh and arrogant and towards others singularly gracious and sympathetic. For a time he enjoyed a popularity at Rome which no one but Cesar ever attained. ;

3. Pusiivs Cornevius Scorpio AFRICANUS THE YouncER.—This Scipio, also one of Rome's greatest generals, was the younger son of /®milius Paullus, and he fought when a youth of seventeen by his father's side at Pydna, 168,—the battle which decided the fate of Macedonia and made northern Greece subject to Rome. He was adopted by the eldest son of Scipio Africanus the Elder, and from him took the name Scipio with the surname Africanus. In 151, a time of defeat and disaster for the Romans in Spain, which as yet had been but very imper- fectly subjugated, he served with credit in that country and obtained an influence over the native tribes similar to that which the elder Scipio, his grandfather by adoption, had acquired nearly sixty years before him. In the next year an appeal was made

to him by the Carthaginians to act as arbiter between them and the Numidian prince Masinissa, who, backed up by a party at Rome, was incessantly encroaching on Carthaginian territory. Rome's policy in Africa was to hold the balance between Masinissa and Carthage, and, when it was seen that Carthage, as the result of several years of peace, was again becoming a prosperous and powerful city, there grew up a feeling at Rome that the Numidian king must be supported and their old rival thoroughly humiliated. Marcus Cato and his party would hear of no compromise; Carthage, they said, must be de- stroyed if Rome was to be safe. It was easy to find a pretext for war in the disputes between Carthage and Masinissa. In 149 war was declared, and the Cartha- ginians felt it to be a life-and-death struggle: every man

and every woman laboured to the uttermost for the defence.

of the city with a furious enthusiasm. The Roman army, in which Scipio at first served in a subordinate capacity, was utterly baffled. In the following year he was elected consul, while yet under the legal age, for the express purpose of giving him the supreme command. After two years of desperate fighting and splendid heroism on the part of the defenders, the famished garrison could no longer hold the walls: Carthage was captured, and the ruins of the city were burning for seventeen days ; Rome decreed that the place should be for ever desolate. On his return to Rome Scipio became the subject of violent political attacks, against which he successfully defended himself in speeches (no longer extant) that ranked as brilliant specimens of oratory. In 134 he was again consul, with the province of Spain, where a demoralized Roman army was vainly attempting the conquest of Numantia on the Douro. Scipio, after devoting several months to the discipline of his troops, reduced the city by blockade. The fall of Numantia, which was utterly destroyed in 133, established the Roman dominion in the province of Hither or Nearer Spain, the eastern portion of that country. Rome meanwhile was shaken by the great political agitation of the Gracchi, whose sister Sempronia was Scipio's wife. Scipio himself, though not in sympathy with the extreme men of the old conservative party, was decidedly opposed to the schemes of the Gracchi. "J ustly slain" (jure ceesum) is said to have been his answer to the tribune Carbo, who asked him before the people what he thought of the death of Tiberius Gracchus. This gave dire

offence to the popular party, which was now led by his bitterest foes. Soon afterwards, in 129, he was found dead in bed on the morning of a day on which he had in- tended to make a speech on a point connected with the

SCcI—SCO

agrarian proposals of the Gracchi,—"'a victim of political assassination" Mommsen confidently pronounces him. The mystery was never cleared up, and there were political reasons for letting the matter drop.

The Younger Scipio, great general and great man as he was, is for ever associated with a hideous work of destruction at Carthage, which we feel he might have done more to avert. Yet he wasa man of culture and refinement ; he gathered round him such men as the Greek historian Polybius, the philosopher Panetius, and the poets Lucilius and Terence. And at the same time, according to Polybius and Cicero, he had all the good sterling virtues of an old- fashioned Roman, and steadily set his face against the increasing luxury and extravagance of his day. As a speaker he seems to have been no less distinguished than as a soldier. He spoke remarkably good and pure Latin, and he particularly enjoyed serious and intel- lectual conversation. There seems to have been nothing mean or grasping about him. After the capture of Carthage he gave back to the Greek cities of Sicily the works of art of which Carthage had robbed them. He did not avail himself of the many opportunities he must have had of amassing a fortune. Though politically opposed to the Gracchi, he cannot be said to have been a foe to the interests of the people. He was, in fact, a moderate man, in favour of conciliation, and he was felt by the best men to be a safe political adviser, while, as often happens in such cases, he could not help offending both parties.

4, Scipios are continually appearing in Roman history in more or less prominent positions down to the time of the empire. One of them, Scipio Nasica (Nasica denoting an aquiline nose), contemporary of the Younger Africanus, in- stigated the murder of Tiberius Gracchus, whom the people were bent on re-electing (133) to the tribuneship. Though he was pontifex maximus at the time, the senate, to save him, had to get him away from Rome, and he left never to return, dying soon afterwards in Asia. (w. J. B.)

SCIRE FACIAS, in English law, is a judicial writ founded upon some record directing the sheriff to make it known (scire facias) to the party against whom it is brought, and requiring the latter to show cause why the party bringing the writ should not have the advantage of such record, or why (in the case of letters patent and grants) the record should not be annulled and vacated. Proceedings in scire facias are regarded as an action, and the defendant may plead his defence as in an action. The writ is now of little practical importance; its principal uses are to compel the appearance of corporations aggregate in revenue suits, and to enforce judgments against share- holders in such companies as are regulated by the Com- panies Clauses Act, 1845, or similar private Acts, and against garnishees in proceedings in foreign attachment in the lord mayor's court. Proceedings by scire facias to repeal letters patent for inventions were abolished by the Patents, Designs, and Trademarks Act, 1883, and a petition to the court substituted.

SCOPAS. See Arco oey, vol. ii. p. 360.

SCORESBY, Wittiam (1789-1857), English arctic explorer and physicist, was born near Whitby, Yorkshire, on 5th October 1789. His father, also named William, who achieved distinction as an arctic whaler, was the son of a farmer near Crompton, Lancashire, where he was born on 3d May 1760. He went to sea when he was twenty years of age, and became one of the most prominent and successful, as well as daring, of arctic whale-fishers. In 1823 he retired with an ample competency, and died in 1829. Young Scoresby made his first voyage with his father to Greenland in 1800, when he was only eleven years of age. On his return, up to 1803, he diligently pursued his education, acquiring a very fair knowledge of mathematics and navigation. From 1803 he was his father's constant companion to the whale-fishery. On 25th May 1806, as chief officer of the "Resolution," he succeeded in reaching 81° 30' N. in 19° E. long., the farthest point north attained by any navigator up to that date. On his return, during the following winter, Scoresby attended the natural philosophy and chemistry classes in Edinburgh

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university, as he did again in 1809, when he added several other subjects. In his voyage of 1807 he commenced, as in all subsequent voyages he continued, the study of the meteorology and natural history of the polar regions ; among the earlier results are his original observations on snow crystals. In 1809 Professor Jameson of Edinburgh brought Scoresby's arctic papers before the Wernerian Society of that city, of which he was at once elected a member. Soon after attaining his majority, in 1811, Scoresby was promoted to the command of the '" Resolu- tion," and in the same year married the daughter of a shipbroker. In 1813 he changed the "Resolution" for the "Esk," in both vessels bringing home large and pro- fitable captures. In his voyage of 1813 Scoresby ascer- tained that the temperature of the polar ocean is warmer at considerable depths than it is on the surface. Each subsequent spring found Scoresby in search of whales, and no less eagerly of fresh additions to scientific knowledge. His letters of this period to Sir Joseph Banks no doubt gave the first impulse to the modern search for the north- west passage. In 1819 he was elected a fellow of the Royal Society of Edinburgh, and among other papers of the year was one communicated to the Royal Society of London through Sir Joseph Banks, "On the Anomaly in the Variation of the Magnetic Needle," touching upon a subject of the first scientific importance. In 1820 appeared Scoresby's History and Description of the Arctic Regions, in which he gathers up the results of his own observation, as well as those of previous navigators, and which still remains a standard authority. In his voyage of 1822 to Greenland, among other scientific work, Scoresby surveyed 400 miles of the east coast, between 69° 30' and 72° 30' N., with so much accuracy that the Govern- ment expeditions of the next year were unable to make any substantial correction, although they attempted to ignore his work. This was the last of Scoresby's arctic voyages. On his return he found his wife dead, and this event, acting upon his naturally pious spirit along with other influences, decided him to enter the church. After two years of residence in Cambridge, he in 1825 was ordained and on 17th July was appointed curate of Bass- ingby. Meantime had appeared at Edinburgh, in 1823, his Journal of a Voyage to the Northern Whale-Fishery, including Researches and Discoveries on the Hastern Coast of Greenland. The faithful and successful discharge of his clerical duties at Bassingby, in the mariners' chapel at Liverpool, at Exeter, and at Bradford did not prevent Scoresby from taking as much interest in science as he did during his whaling

voyages. In 1824 the Royal Society elected him a fellow, and the Paris Academy of Sciences an honorary corresponding member. From the first he was an active member and official of the British Association, to which he made several important contributions, one being "An Exposition of some of the Laws and Phenomena of Magnetic Induction." To the progress of terrestrial mag- netism especially Scoresby is recognized as having largely contributed. Of the sixty papers which follow his name in the Royal Society list many are more or less connected with this department of research, But his observations extended into many other departments, including certain branches of optics. In order to obtain additional data for his theories on magnetism he made a voyage to Aus- tralia in 1856, the results of which were published in a posthumous work,—Journal of a Voyage to Australia for Magnetical Research, edited by Archibald Smith (1859). He made two visits to America, in 1844 and 1848; on his return home from the latter visit he made some valuable observations on the height of Atlantic waves, the results of which were given to the British Association. Scoresby interested himself much in social questions, especially the

improvement of the condition of factory operatives. He also published numerous works and papers of a religious character, a list of which, as well as of his many scientific papers, is appended to the Life of William Scoresby by his nephew, Dr R. E. Scoresby-Jackson (1861). In 1850 he published a work on the Franklin expedition, urging the prosecution of the search for the missing ships, and giving the valuable results of his own experience in arctic naviga- tion. Scoresby was twice married after the death of his first wife,—to Miss Elizabeth Fitzgerald in 1828, and in 1849 to Miss Georgina Kerr. After his third marriage Scoresby built a villa at Torquay, where he spent the remainder of his life, and where he died, 21st March 1857. He was a man of simple but deep piety, amiable, cheerful, and guileless.

SCORPION. See ArnacHNipA, vol. il. p. 281 sq.

SCOT, MicwazL, whose fame as a magician has sur- rounded his history with legend, is sometimes claimed by the Italians as a native of Salerno and by the Spaniards as a native of Toledo; but there is no reason to doubt the Scottish origin to which his name testifies. Scottish tradi- tion is unanimous in identifying him with Sir Michael Scot of Balwearie in Fifeshire, but the

ascertainable dates place some difficulties in the way of this. The traditional date of Scot's birth is 1190, but this does not harmonize well with the embassy to Norway attributed to Sir Michael Seot in 1290. Some accordingly have fixed the date of his birth approximately as 1214, but apparently without any further reason than is afforded by the supposed date of his death in 1291. But Jourdain! refers to certain manu- script translations of Scot's which are expressly dated "1917 at Toledo." This would accord fairly well with the date 1190, the translations being executed by Scot soon after the conclusion of his student period. Scot is said to have studied at Oxford, whence he proceeded, as was usual, to Paris, then the centre of medieval learning, devoting himself especially to philosophy and mathematics. Du Boulay, the historian of the university of Paris, adds that he received the degree of doctor of theology and ac- quired a brilliant reputation in that faculty. There is no evidence of this, however, in his writings. At Toledo, where he also studied, Scot acquired a knowledge of Arabic. It is not likely that his knowledge extended to Greek and the other Eastern tongues mentioned by the earlier bibliographers. His knowledge of Arabic was sufficient to open up to him the Arabic versions of Aris- totle and the multitudinous commentaries of the Arabians upon them, with which Western Christendom had only lately become acquainted in Latin translations (see ScHo- Lasticism). It also brought him into contact with the original works of Avicenna and Averroes. His own first work was done as a translator. He was one of the savants whom Frederick II. attracted to his brilliant court, and at the instigation of the emperor he superintended (along with Hermannus Alemannus) a fresh translation of Aris- totle and the Arabian commentaries from Arabic into Latin. There exist translations by Scot himself of the Historia Animalium, the De Anima, and De Celo, along with the commentaries of Averroes upon them. This connexion with Frederick and Averroes—both of evil reputation in the Middle Ages—doubtless contributed to the formation of the legend which soon enveloped Michael Seot's name. His own books, however, dealing as they do almost exclusively with astrology, alchemy, and the occult sciences generally, are mainly responsible for his popular reputation. The chief of these according to the more critical views of recent investigators are Super Auc- torem Sphere, printed at Bologna in 1495 and at Venice in 1631; De Sole et Luna, printed at Strasburg, 1622,

1 Recherches sur les anciennes traductions Latines @ Aristote, p. 133.

in the Theatrum Chimicum, and containing more alchemy than astronomy, the sun and moon being taken as the images of gold and silver; De Chiromantia, an opuscule often published in the 15th century ; and, perhaps best known of all, De Physiognomia et de Hominis Procreatione, which saw no fewer than eighteen editions between 1477 and 1660. 'This treatise is divided into three books, of which the first deals with generation according to the doctrine of Aristotle and Galen, the second with the signs by which the character and faculties of individuals may be determined from observation of different parts of the body. The Physiognomia (which also exists in an Italian translation) and the Super Auctorem Sphere expressly bear that they were undertaken at the request of the emperor Frederick. To the above list should be added certain treatises in manuscript,—De Signis Planetarum ; Contra Averrhoem in Meteora; Notitia Convinctionis Mundi Ter- restris cum Ceoelesti, et de Definitione utriusque Mundi; De Presagus Stellarum et Elementaribus. Michael is said to have foretold (after the double-tongued manner of the ancient oracles) the place of Frederick's death, which took place in 1250. The Italian tradition makes Scot die in Sicily not long afterwards, stating that he foretold the manner of his own death. Jourdain is inclined to agree with this approximate date, observing that Scot is spoken of by Albert the Great as if he were already dead, and that Vincent of Beauvais (d. c. 1268) quotes him with the epithet '"vetus." But the generally received tradition makes him return by way of England (where he was re- ceived with much honour by Edward I.) to his native country. The ordinary account gives 1291 as the date of Scot's death. According to one tradition he was buried at Holme Cultram in Cumberland ; according to another, which Sir Walter Scott has followed in the Lay of the Last Minstrel, in Melrose Abbey. In the notes to that poem, of which the opening of the wizard's tomb forms the most striking episode, Scott gives an interesting ac- count of the various exploits attributed by popular belief to the great magician. "In the south of Scotland any work of great labour and antiquity is ascribed either to the agency of Auld Michael, of Sir William Wallace, or the devil." He used to feast his friends with dishes brought by spirits from the royal kitchens of France and Spain and other lands. His

embassy to France alone on the back of a coal-black demon steed is also celebrated, in which he brought the French monarch to his feet by the effects which followed the repeated stamping of his horse's hoof. Other powers and exploits are narrated in Folengo's Macaronic poem of Merlin Coccaius (1595). But Michael's reputation as a magician was already fixed in the age im- mediately following his own. He appears in the Inferno of Dante (canto xx. 115-117) among the magicians and soothsayers— ' Quell' altro, che ne' fianchi é cosi poco, Michele Scotto fu ; che veramente Delle magiche frode seppe il giuoco."*

He is represented in the same character by Boccaccio, and is severely arraigned by John Pico de Mirandola in his work against astrology, while Naudé finds it necessary to defend his good name in his Apologie pour les grands per- sonnages faussement accusés de magie.

SCOT, Recivaxp (c. 1538-1599), was the son of Richard, third son of Sir John Scot of Scotshall, Smeeth (Kent), studied at Hart Hall in Oxford, and afterwards lived in studious retirement at Smeeth, dying in 1599. He was the author of a very remarkable book, The Discoverie of Witchcraft, the object of which was to put an end to the cruel persecution of witches, by showing that "there will be found among our Witches only two sorts ; the one sort being such by imputation, as so thought of by others (and

these are abused and not abusers), the other by acceptation, as being willing so to be accounted, and these be meer Coseners." This thesis is worked out in sixteen books, with great learning and acuteness, in a spirit of righteous indignation against the witchmongers. Scot was far in advance of his time, and his book, of which the first edition appeared in 1584, was burned by order of King James I. The book is still interesting, not only as having anticipated Bekker by a century, but for the great mass of curious details as to every branch of so-called witchcraft which it contains. It also takes up natural magic and conjuring at considerable length (bk. xiii.), and contains an argument against "alchymistry " (bk. xiv.). , Scot also published in 1574 A perfite Platforme of a Hoppe Garden (3d ed. 1578), which is noteworthy as having originated the cultivation of the hop in England.

‘ Discourse concerning Angels and Spirits.” See B. Nicholson’s Scot’s Discovery of Witchcraft, London, 1886.*

SCOTER, a word of doubtful origin, perhaps a variant of “Scout,” one of the many local names shared in com- mon by the GuituEMor (vol. xi. p. 262) and the Razorsitt, (vol. xx. p. 302), or perhaps primarily connected with Coor (vol. vi. p. 341),! the English name of the Anas nigra of Linneus, which with some allied species has been justifiably placed ina distinct genus, demia (often misspelt Oidemia) —a name coined in reference to the swollen appearance of the base of the bill. The Scoter is also very generally known around the British coasts as the “Black Duck” from the male being, with the exception of a stripe of orange that runs down the ridge of the bill, wholly of that colour. In the representative American form, *. ameri- cana, the protuberance at the base of the bill, black in the European bird, is orange as well. Of all Ducks the Scoter has the most marine habits, keeping the sea in all weathers, and rarely resorting to land except for the purpose of breed- ing. Even in summer small flocks of Scoters may generally be seen in the tideway at the mouth of any of the larger*

_ British rivers or in mid-channel, while in autumn and

winter these flocks are so increased as to number thousands of individuals, and the water often looks black with them. A second species, the Velvet-Duck, . fusca, of much larger size, distinguished by a white spot under each eye and a white bar on each wing, is far less abundant than the for- mer, but examples of it are occasionally to be seen in com- pany with the commoner one, and it too has its American counterpart, *. velvetina; while a third, only known as a straggler to Europe, the Surf-Duck, W. perspicillata, with a white patch on the crown and another on the nape, and a curiously particoloured bill, is a not uncommon bird in North-American waters. All the species of @demia, like most other Sea-Ducks, have their true home in arctic or subarctic countries, but the Scoter itself is said to breed occasionally in Scotland (Zoologist, s.s. p. 1867). The females display little of the deep sable hue that charac- terizes their partners, but are attired in soot-colour, varied, especially beneath, with brownish white. The flesh of all these birds has an*

exceedingly strong taste, and, after much controversy, was allowed by the authorities to rank as fish in the ecclesiastical dietary (cf. Graindorge, Traité de Vorigine des Macreuses, Caen, 1680; and Correspond- ence of John Ray, Ray Soc. ed., p. 148).

1 In the former case the derivation seems to be from the O. Fr. Lscoute, and that from the Latin auscultare (comp. Skeat, Etymol. Dictionary, p. 588), but in the latter from the Dutch Koet, which is said to be of Celtic extraction —cwtiar (op. cit., p. 184). The French Macreuse, possibly from the Latin macer, indicating a bird that may be eaten in Lent or on the fast days of the Roman Church, is of double signification, meaning in the south of France a Coot and in the north a Scoter. By the wild-fowlers of parts of North America Scoters are commonly called Coots.

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SCOTLAND

PART I.—HISTORY.

1. Roman Period.—The first certain lines of the history of Scotland were written by the Romans. Their account of its partial conquest and occupation for more than three hundred years gives the earliest facts to which fixed dates can be assigned. The invasion commenced

-by Julius Cesar reached in Agricola's last campaign

limits never afterwards exceeded. It was in the last year of Vespasian's life that Julius Agricola, the ablest general bred in his camp, came to command the army in Britain. Landing in midsummer 78, he at once commenced a cam- paign against Wales. In his second campaign he passed the Solway and, defeating the tribes of Galloway, introduced rudiments of Roman civilization in the district where Ninian taught the rudiments of Christianity three centuries later. This was the first conquest within modern Scotland. Two main roads, of which traces can still be seen, mark lis advance: the western, from Carlisle through Dumfries and Lanark, extends across the

Clyde to Camelon on the Carron; and the eastern, from Bremenium (High Rie- chester) in Northumberland, passes through Roxburgh and Lothian to the Forth at Cramond. Next year Agri- cola subdued unknown tribes, reached the estuary of the Tay, and occupied camps at various points of central Scotland, in the future shires of Stirling and Perth. Traces of them are still visible at Bochastle near Callander, Dalginross near Comrie, Fendoch on the Almond, Inver- almond at the junction of the Almond with the Tay near Perth, Ardargie on the north of the Ochils, and the great camp at Ardoch south of Crieff. The fourth year of his command was devoted to the construction of a line of forts between the Forth and the Clyde. This barrier, strength-

ened by a wall in the reign of Antoninus Pius, guarded

the conquests already made against the Caledonians—the general Latin name of the northern tribes of the forests and mountains, the Highlanders of later times—and, in connexion with camps already occupied in the lowlands of Perthshire, formed the base for further operations, In the fifth year Agricola crossed the Clyde, and, without inaking any permanent conquest on the western mainland, viewed from Cantyre the coast of Ireland. Statements by one of its chiefs as to the character and factions of that country, whose ports were already known to Roman mer- chants, led to the opinion communicated to Tacitus by Agricola, that with a single legion and a few auxiliaries he could reduce it to subjection. The number of legions in the Roman army of Britain was fixed at five, besides auxiliaries and cavalry,—a total of perhaps 50,000 men. The resistance of northern Britain explains why the easier conquest was not undertaken. A year was required to explore the estuaries of the Forth and the Tay with the fleet. The absence of camps indicates that no attempt was made to conquer the peninsula of Fife, perhaps a separate kingdom; and Agricola prepared to advance against the Caledonians. Two years' fighting, although Tacitus chronicles only an assault on the advanced camp of the IXth legion (at Lintrose (?) near Coupar Angus), passed before the final engagement known in history as the battle of the Grampians (84). It was probably fought in the hilly country of the Stormont near Blairgowrie, the Celts descend- ing from strongholds in the lowest spurs of the Grampians and attacking the Romans, whose camp lay near the junc- tion of the Isla and the Tay. It

decided that the Roman conquest was to stop at the Tay. Galgacus, the Caledonian leader, was, according to the Roman historian, defeated ; but in the following winter Agricola retreated to the

camps between the Forth and the Clyde, while the fleet 78-120. was sent round Britain. Forth and rounding the northern capes, it returned after establishing the fact, already suspected, and of so much consequence in future history, that Britain was an island,— planting during its progress the Roman standard on the Orkneys, which had for several centuries been known by report, and sighting Shetland, the Thule of earlier navi- gators. Agricola, with one legion—probably the TXth, which had suffered most— was now recalled by Domitian.

Starting probably from the

The absence of any notice of Britain for twenty years

implies the cessation of further advances,—a change of policy due to the reverses in the Dacian War and the financial condition of the empire.

The indefatigable Hadrian came to Britain (120) with Ha-

the VIth legion, named Victrix, which replaced the IXth, drian's He began, and his favourite general Aulus Plautorius Nepos completed, between the mouth of the Tyne near Newcastle and the Solway near Carlisle, the great wall of stone (see Haprian, WALL or), about 80 miles in length, 16 feet high, and 8 feet thick, protected on the north by a trench 34 feet wide and 9 deep, with two parallel earthen ramparts and a trench on the south, — proving the line required defence on both sides. Massive

wall.

fragments of the wall, its stations, castles, and protecting camps, with the foundation of a bridge over the North Tyne, may be still seen. It was garrisoned by the Vith legion, and by the XIth and XXth, which remained throughout the whole Roman occupation. The conquests of Agricola in what is modern Scotland were for a time abandoned. Hadrian's wall was the symbol of the strength of Rome, and also of the valour of the northern

Britons. There must have been a stubborn resistance to induce the conquerors of the world to set a limit to their province, though the roads through the wall showed they did not intend this limit to be permanent. 'The first step had been taken. 'The country between the Tyne and Solway and the Forth and Clyde, including the southern Lowlands of Scotland, was now within the scope of Roman history, if not yet of Roman civilization. The country north of the last two rivers remained barbarous and unknown under its Celtic chiefs. Hadrian had thus resumed the task of Agricola, in one of the rapid campaigns by which he consolidated the empire through visits to its most distant parts ; but it +s doubtful whether he passed beyond the wall, which continued to separate the Romans from the barbarians. In the reign of his successor, Antoninus Pius, Lollius Urbicus recovered the country from the wall of Hadrian to the forts of Agricola, and built an earthen rampart about half the length of the southern wall, 20 feet high and 24 thick, protected on the north by a trench 40 feet wide and 20 deep. It was known later as Grim or Graham's dyke. Remains may yet be seen between Carriden near Borrowstounness on the Forth and West Kilpatrick on the Clyde, with forts either then or sub- sequently erected at intermediate stations, connected by a military road on the south of the wall.

About this period Ptolemy composed the first geography of the Ptolemy's world, illustrated by maps—probably constructed somewhat later geography. —of Ireland and Britain, still called Albion.t South of modern Scotland the plan and description of the distances are generally

accurate, but north of the Solway (Itune stuarium) and the Wear (? Vedra) the island is figured as lying west and east instead 2? EE ee

1 His information must have come from Roman officers, who, we know, studied this branch of the military art, as maps have been found painted on the porticos of their villas.

161-3864.

Taeitus's aeeount of inha- bitants.

Hadrian to Severus.

of north and south. Learned ingenuity corrects this error and, by other modifieations and the use of a few points deemed certain, applies the names of Ptolemy to places on the map of modern Seotland. But the certain points are almost confined to the Clyde (Glotta Aistuarium), the Forth (Bodcra Aistuarium), the Tay (Tava A'stuarium), and perhaps the Wear (Vedra) and the Nith (Novius), the Caledonian Wood (Caledonia Silva), and the Orkneys (Orcades). Even if the other identifications were clear, it would not add much to our knowledge of aneient Scotland. The names of Ptolemy are names on his map and in books only. No tribe (exeept the Caledonii), no town, no river (except the Forth and Clyde and Tay), no island (exeept the Orkneys), was, so far as we know, called before or since by the names which there appear. No in- scription or coin confirms them. No mountains in this land of mountains are to be found on the plan of the geographer. Etymo- logical conjeeture, after allowance for mispronunciation and errors of transcribers, fails to reconeile the names of Ptolemy with the oldest names of Celtic origin still retained by the rivers and hills. Yet the attempt represents the highest knowledge embodied in writing to which the Romans attained of this distant and disputed part of the empire, for the Itineraries, except the forged one attri- buted to Richard of Cirencester, stop at Hadrian's wall. His treatise remained until the revival of learning the only written geographical description of the country from which the learned could picture northern Britain. With all its imperfeetions and mistakes, it conveyed in rough outline the figure of a country to the west of the European continent, to the north of the Roman province of Britain, to the east of Ireland, surrounded by the German Ocean, the Northern Ocean, and the Irish Channel, with bold promontories and many rivers (several tidal), peopled by various tribes, its towns chiefly on the rivers or the coast, and in its centre the vast forest to which the Caledonians gave or from which they received their name, itself the northern part of the largest British island, with groups of smaller isles lying off its northern and western shores. This region was unknown to Cesar and imperfectly known to Tacitus,—the only writer of the first century to whom we can resort. Yet the deseription of the Britons by the greatest historical genius of Rome, based on the account of one of its greatest generals, attempts a discrimination between the Celtic tribes first and those afterwards conquered, which may perhaps be applied

to the inhabitants of the north as contrasted with those of the south of Britain.

“Whether the inhabitants of Britain were indigenous or foreigners, being barbarian, they did not take the trouble to inquire. The different character of their bodily appearance in different parts of the island gave rise to arguments. The red hair and big limbs of the natives of Caledonia point toa German origin. The coloured faces of the Silures, their hair generally plaited, and Spain being opposite give credit to the opinion that the ancient Iberi had migrated and occupied these settlements. Those nearest the Gauls were like them, whether on account of the enduring force of descent or the position of the sky determining in lands adjoin- ing the character of the races. On a general view it is credible that the Gauls occupied the neighbouring island. You may detect the same sacred rites and superstitions. There is not much difference in their language. There is the same daring in demand- ing, the same fear in declining danger. The Britons exhibit greater fierceness, as a long peace has not yet softened them. For we have heard that the Gauls also were distinguished in war, until sloth came with ease and valour was lost with freedom. This too has been the case with the Britons formerly conquered. The rest remain what the Gauls were. Their strength is in their foot ; some tribes, however, fight also from chariots. The noble drives ; lis followers are in front. Formerly they obeyed kings. Now they are distracted by parties and factions amongst their chiefs, and the want of eommon counsel is most useful to us. An agree- ment between two or three states to resist a common danger is Tare ; so while they fight singly the whole are defeated.”

In the account of the battle of the Grampian Mount and the speech of Galgacus there is little that is local or individual. What the Celtie chief said in an unknown tongue ean scarcely have been literally interpreted to the Romans. The historian trained in oratory embodies in Latin eloquence the universal sentiments of freedom. It may be thought, however, that the soil and air of Scotland favour independence of aetion and thought, and that the words, whether of Tacitus or of Galgacus, contain an unconscious prophecy of passages in its future annals and traits in the char- acter of its people not yet obliterated. In the first century of the Christian era Seotland was the scene of events which belong to universal history.

The necessity of the walls of Hadrian and Antonine to protect the Roman province soon appeared. It is doubt- ful how long or during what intervals the country between them remained subject. Few coins of emperors later than Antonine have been found to the north of Hadrian's wall.

SCOVLARD

[HISTORY.

In the reign of Aurelius, the philosophic emperor, war was not encouraged ; but Calphurnius Agricola had to be sent (161) as legate and propretor to Britain to prevent incur- sions of the northern tribes. In that of Commodus a more formidable invasion passed the wall, but Ulpius Marcellus drove back the Britons and repaired it, gaining for Commodus the title of Britannicus. While Septimius Severus was removing rivals from his path, his legate, Virius Lupus, purchased peace (201) from the Meate, a tribe of central Scotland now first named, who along with the Caledonii supersede the older designations of Tacitus and Ptolemy for the population in the vicinity and to the north of Antonine's wall, until in the latter half of the 4th century the Picts and Scots appear. Seven years later

(208) Severus, with his sons Caracalla and Geta, came, Severus

hke Edward I. in his last campaign, worn out in body in but not in spirit, to Britain. After repairing the breaches in Hadrian's wall he not only reconquered the country between it and the wall of Antonine, which he restored, but, passing beyond the steps of Agricola, carried the Roman eagles to the most northern points they reached. The traces of Roman roads from Falkirk to Stirling, through Strathearn to Perth, thence through Forfar, Mearns, and Aberdeen to the Moray Firth, and of Roman camps at Wardykes (Keithock), Raedykes (Stonehaven), Norman Dykes (on the Dee), and Raedykes on the Ythan belong to this period and represent an attempt to subdue or overawe the whole island. The historian Dion does not conceal the failure of the enter- prise, which he ascribes to the illness that terminated in the death of Severus at York (211). He adds a little to our knowledge of the Caledonians by describing the painting of their bodies with forms of animals, their scanty clothing and iron ornaments, their arms —a sword, small shield, and spear, without helmets or breastplates—their

chariots, and their mode of warfare by rapid attack and as rapid retreat to the forest and the marsh. Being without towns, they lived on the produce of herds and the chase, not on fish, though they had plenty. Their mode of government he calls democratic, doubtless from the absence of any conspicuous king rather than of chiefs.

From the death of Severus to the accession of Constan- Constan- tius Chlorus, a period of nearly a century, the history of tius to of the depart-

northern Britain is unknown, In the first (305) two years of his reign Constantius defeated the tribes p between the walls called by Eumenius the Panegyrist "the Caledonians and other Picts,"—a name now first heard, and by this association identified with the Caledo- nians. Next year Constantius died at York; and for more than fifty years a veil is again drawn over northern Britain. It was during this period that Constantine was converted to Christianity, which his father Constantius had favoured during the persecutions of Diocletian. So rapid was the progress of the church in the British province that only ten years after the martyrdom of St Alban Celtic bishops of York, London, and Caerleon— probably the place of that name on the Usk—were present at the council of Arles. In 360 the Scots are for the first time named, by Ammianus Marcellinus, who records their descent along with the Picts upon the Roman pro- vince in terms which imply that they had before passed the southern wall. Four years later the Picts, Saxons, Scots, and Attacotts are said by the same writer to have caused the Britons perpetual anxiety ; but Theodosius, father of the emperor of the same name, repulsed them

1 Papinian, the great jurist, then administered justice at York. Whether the Roman Jaw so introdueed survived in any part of modern England is a problem not yet solved; it certainly did not beyond the wall. The Roman substratum of Scottish law was of later origin, derived ehiefly from the eanon law of the elureh.

Britain,

omans,

times using, the deserted wall of Hadrian, they caused it 368-6th to acquire their name,—a name of awe to the provincial cent.

and recovered the country between the walls, which became (368) a fifth province of Britain, called in honour

ects of jman upa-

of the reigning emperor Valentia. It remained so for a very brief space: the revolt of Maximus (391), which reduced the Roman troops to two legions, led to fresh raids of the Picts and Scots. A legion sent by Stilicho drove them back to the northern wall. But it was soon recalled, and the garrisons were permanently removed prior to 409.

The Roman empire in Britain left widely different results in the southern and in the northern portions of the island. The former became an organized, and in the centres of population a civilized province, in which Latin was spoken by the educated, the arts cultivated, Roman law administered, and Christianity introduced. The latter, with the partial exception of the district south of Antonine's wall, remained in the possession of barbarous heathen races, whose customs had altered little since Roman writers described them as similar to, though ruder than, those of the Celts in Gaul before its conquest. The condition of the population be- tween the walls was probably intermediate between that of the southern provincial Britons and that of the northern savages of the same original Celtic stock, more nearly resembling the latter, perhaps not unlike the condition of the people of Wales, which the Romans in like manner overran, but could not hold, or of Afghanistan as compared with British India. No Roman towns existed, and only one or two villas have been found north of York, and quite near to that place. The camp, the altar, the sepulchral monument, possibly a single temple (the mysterious Arthur's Oven or Julius's Hof on the Carron, now destroyed, but described by Boece and Buchanan and figured by Camden), the stations along the wall, the roads with their milestones, a number of coins (chiefly prior to the 2d century), and a few traces of baths are the only vestiges of Roman occupation in this part of Britain. So completely had Britain passed beyond the serious attention of

Britons and their English conquerors. Their language, though Celtic, is still a problem difficult to solve, as so few words have been preserved. Its almost complete absorp- tion in that of the Gaels or Scots suggests that it did not differ widely from theirs, and with this agrees the fact that Columba and his followers had little difficulty in preaching to them, though they sometimes required an interpreter. Some philologists believe it to have been more allied to Cymric, and even to the Cornish variety ; but the proof is inconclusive.

The Scots came originally to Ireland, one of whose Scots or names from the 6th to the 13th century was Scotia ; Gaels.

Scotia Major it was called after part of northern Britain in the 11th century had acquired the same name. Irish traditions represent the Scots as Milesians from Spain. Their Celtic name Gaidhil, Goidel, or Gael appears more akin to that of the natives of Gaul. They had joined the Picts in their attack on the Roman province in the 4th century, and perhaps had already settlements in the west of Scotland; but the transfer of the name was due to the rise and progress of the tribe called Dalriad, which migrated from Dalriada in the north of Antrim to Argyll and the Isles in the beginning of the 6th century. Their language, Gaidhelic, was the ancient form of the Irish of Ireland and the Gaelic of the Scottish Highlanders. No clear conclusion has been reached as to the meaning of Briton, Cruithne, Scot, and Gael.

the emperor of the East that in the beginning of the 6th century Belisarius, Justinian's general, sarcastically offered it to the Goths in exchange for Sicily ; while Procopius, the Byzantine historian, has nothing to tell of it except that a wall was built across it by the ancients, the direction of which he supposes to have been from

The order of the arrival of the three divisions of the Order of Celtic race and the extent of the islands they occupied are @'tival of

uncertain. Bede in the beginning of the 8th century gives ee

north to south, separating the fruitful and populous east from the barren serpent-haunted western district, and the strange fable that its natives were

excused from tribute to the kings of the Franks in return for the service of ferrying the souls of the dead from the mainland to the shores of Britain.

the most probable account.

“This island at the present time contains five nations, the Angles, Britous, Scots, Picts, and Latins, each in its own dialect cultivat- ing one aud the same sublime study of divine truth. . .. The Latin tongue by the study of the Scriptures has become common to all the rest. At first this island had no other inhabitants but the Britons, from whom it derived its name, and who, carried over into

retsor 2, Barly Celtic Period to Union of Picts and Scots by ee Pe eae By meee or ritons. 77 : ceeamntiian’ ritain, as is reported, from Armorica, possessed themselves of the Kenneth Macalp oe It 1s to the Celts, the first known southern parts. When they had made themselves masters of the inhabitants of Britain, that our inquiry next turns. This greatest part of the island, beginning at the south, the Picts from people were not indigenous, but came by sea to Britain. | Scythia, as is reported, putting to sea in a few long ships, were | A conjecture, not yet proved, identifies as inhabitants of ae by the pas been a ee of viene a a ome _ | the northern coast of Ireland, where, finding the nation of the Scots, Britain before the Celts a branch of the race now repre they begged to be allowed to settle among them, but could not sented in Europe only by the Basques. Amongst many | succeed in obtaining their request. The Scots answered that the names of British tribes in Latin writers three occur, two | island could not contain them both, but ‘we can give you good with increasing frequency, as the empire drew near itg | advice what to do: we know there is another island not far from close —- Britons, Picts, and Scots—denoting distinct ours, to the east, which we often see at a distance, when the days ; u ae ng are clear. If you go thither you will obtain a settlement, or, if any branches of the Celts. Britain was the Latin name for | should oppose, you shall have our aid.’ The Picts accordingly, the larger island and Britons for its inhabitants ; Albion, | sailing over into Britain, began to inhabit the northern part of the % niore ancient title, has left traces in English poetry, island. In process of time Britain, after the Britons and Picts, and in the old name Alba or Albany for northern Scot- received a third nation, the Scots, who, migrating from

Ireland : : : y ; : under their leader Renda, either by fair means or force secured land. The Britons in Roman times occupied, if not the | those settlements amongst the Picts which they still possess.” whole island, at least as far north as the Forth and Clyde. | ‘There is,” he says in another passage, “a very large estuary of the Their language, British, called later Cymric, survives in er nek ewe re Pea ie me we ee . : which gulf runs from the west far into the land, where to this day UM as saga and the Breton of Brittany. =! stands the strong city of the Britons called Alclyth. The Scots which became extinct in the 17th century, was a dialect | arriving on the uorth side of the estuary settled themselves there

of the same speech. Its extent northwards is marked by | as in their own country.” the Cumbraes—the Islands of Cymry in the Clyde—and This statement in its main points (apart from the Cumberland, a district originally stretching from the Clyde | country from which the Picts are said to have come) is to the Mersey. confirmed by Latin authors, in whose meagre notices the ictsor The Picts, a Latin name for the northern tribes who Picts appear before the Scots are mentioned, and both Jruithne. preserved longest the custom of painting their bodies, | occur later than the Britons; by the legends of the three

called themselves Cruithne. Their original settlements appear to have been in the Orkneys, the north of Scot- land, and the north-east of Ireland—the modern counties of Antrim and Down. They spread in Scotland, before or shortly after the Romans left, as far south as the Pentland Hills, which, like the Pentland Firth, are thought to pre- serve their name, occupied Fife, and perhaps left a de- tachment in Galloway. Often crossing, probably some-

Celtic races ; by the narratives of Gildas and Nennius, the only British Celtic historians, the Irish Annals, and the Pictish Chronicle. It is in harmony with the facts con- tained in the Life of Columba, written in the 7th century, but based on an earlier Zzfe, by one of his successors, Cumine, abbot of Iona, who may have seen Columba, and must have known persons who had. The northern Britain brought before us in connexion with Columba in the latter XXI. — 60

5th and

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half of the 6th century is peopled by Cruithne or Picts in

6thcents. the north and central Highlands, having their chief royal

Conver- sion to Chris- tianity.

Ninian.

fort on the Ness, and by Scots in Argyll and the Isles, as far north as Iona and on the mainland Drumalban, the mountain ridge which separates Argyll from Perth and Inverness; there isa British king ruling the south-west from the rock on the Clyde then known as Alclyth or Alclyde, now Dumbarton ; and Saxony, under Northum- brian kings, is the name given to the district south of the Forth, including the eastern Lowlands, where by this time Angles had settled. The scarcity of Celtic history? belonging to Scotland indicates that its tribes were less civilized than their Irish and Welsh kin.

Tt is in the records of the Christian church that we first touch historic ground after the Romans left. Although the legends of Christian superstition are almost as fabu- lous as those of heathen ignorance, we can follow with reasonable certainty the conversion of the Scottish Celts. Three Celtic saints venerated throughout Scottish history —Ninian, Kentigern, Columba —Patrick, the patron saint of Ireland, David, the patron saint of Wales, and Cuthbert, the apostle of Lothian and patron saint of Durham, be- longing to the Celtic Church, though probably not a Celt, mark the common advance of the Celtic races from heathenism to Christianity between the end of the 4th and the end of the 6th century. The conversion of Scot- land in the time of Pope Victor I. in the 2d century is unhistoric, and the legend of St Rule (Regulus) having brought the relics of St Andrew in the reign of Constan- tius from Achea to St Andrews, where a Pictish king built a church and endowed lands in his honour, is, if historical at all, antedated by some centuries. There is no proof that amongst the places which the Romans had not reached, but which had accepted Christianity when Tertullian wrote, there was any part of modern Scotland ; but, as Christian bishops from

Britain without fixed local- ity begin to appear in the 4th century, possibly the first converts in Scotland had been made before its close.

Ninian (q.v.), the son of a British chief in Galloway already

Christian, after converting or reforming his countrymen—one of his converts being Tudwalla, king of Alclyde (? Tothael, father of

1 Of the three branches of the Celts which appear as the first known inhabitants of Scotland the native records are scanty and of late date. Respecting the Britons nothing remains except the History of Gildas in the 6th and that of Nennius in the 9th century, of which very small parts relate to Scotland ; the poems of Aneurin and Taliessin, commonly called Welsh bards, but perhaps natives of Strathclyde ; the lives of saints ; and a fragment of criminal law, eommon to them and the Scots, preserved at the time of its suppression by Edward I.

Dealing with the Picts there is a Latin Chronicle of the 10th cen- tury and additions of later date, containing a valuable list of kings in their own language, and the entries in the Book of Deer of the gifts to that monastery by the Pictish mormaers (chicfs) of Buchan ; but the earliest of these is in an old form of Gaelic.

The Scots are noticed in the Life of Columba, the Duan Albanach of the 11th century, a Latin Chronicle of the 12th century, a few poems treating of their origin and migration, later Latin tracts de- scribing their settlement in Scotland, and the lives of saints, not written in their existing form till the 12th century. But a consider- able amount of legendary material, chiefly consisting of additions to or glosses on the earlier sources, has been collected. When all is told, Scotland has nothing to compare with the Irish Annals and the Welsh Triads, whose fulness of detail and fabulous antiquity in the early portions raise suspicions as to the later which are perhaps undeserved. It has no equivalent to the collection of laws contained in the Senchus Mor or Kain Patrick of Ireland and the Dimetian and Venedotian codes of Wales, where, in the midst of a crowd of minute customs implying a long settlement in western lands, there are traces of others that seem to have come with the Celts from their far-off Eastern birth- place. From these sources—especially from the Irish Annals, and in particular the Annals of

Tigernach, who died in 1088, the Synchronisms of Flann Mainistreach, who died in 1056, the Annals of Innisfallen, compiled in 1215, and of Ulster, compiled in 1498, but from older authorities—the dearth of proper Scottish material has been supple- mented ; but this source of information has to be used with caution. The whole materials are collected in the Chronicles of the Picts and Scots, edited by Mr Skene for the lord clerk register of Scotland.

SCOTLAND

[HISTORY.

Rydderick Hael)—and organizing a diocese, went as a missionary to the southern Picts, who lived amongst or near the mountains north of the Forth and Clyde in the modern counties of Stirling, Perth, and Forfar. His fame grew with the church, and as far north as Shetland, as far south as Westmoreland and Northumber- land, churches were dedicated in his name. His wonder-working relics in the shrine of Candida Casa (at Whithorn? in Galloway) became an object of pilgrimage for more than a thousand years. Three other missionaries belong to the period between Ninian and Kentigern, his successor amongst the Britons of the west: Palladius, sent to the Christians in Ireland by Pope Celestine, died at Fordoun in Mearns labouring amongst the Picts, and his disciples Serf and Ternan converted respectively the Picts of Fife and those of the lowlands of Aberdcen.

his bounty to the church. Columba visited Kentigern at the cemetery of Ninian, on the Molendinar Burn, where courtesies were interchanged between these representatives of the two branches of the Celtic Church in western Scotland, shortly before the British bishops declined at the meeting at St Augustine's oak to submit to the Roman missionary who had converted the Saxons of southern England. Jocelyn of Furness states that Kentigern was at Rome seven times and obtained the privilege of being the pope's vicar free from subjection to any metropolitan. The prince of Cumbria is even said to have acknowledged his precedency. These are inventions of a later age ; but the large possessions, extending over the whole western kingdom, conferred by Rydderick, and after a long lapse of time found by the inquest of David I. when prince of Cumbria to have belonged to the see, may be historical. He died about the beginning of the 7th century, and a

long period of darkness hides the British kingdom and church of Strathclyde. St PaTrick (g.v.), succeeding where Palladius failed, Christianized Ireland in the middle of the 5th century. A passage in his Confession, if all of it applies to Scotland, seems to prove the existence of the church in Scotland for two generations before Patrick's birth, and the allowance during these of marriage to the clergy.

Scotland gave Patrick to Ireland, and Ireland returned the gift in Columba,

Columba. A rare good fortune has preserved in Adamnan's Life the tradition of the acts of the greatest Celtic saint of Scotland, and a picture of the monastic Celtic Church in the 6th and 7th centuries, —an almost solitary fragment of history between 'the last of the Roman and the first of the Anglo-Saxon historians. Born in 521 at Gartan in Donegal, CoLuMBA (q.v.) spent his boyhood at Doire Eithne near Gartan, his youth at Moville on Strangford Lough under Abbot Finian, called the foster-father of the Irish saints from the number of his disciples. Here he was ordained deacon, and, after completing his education under Gemmian, a Christian bard, at the monastery of Clonard, he received priest's orders. In 561 he took part in the battle of Culdrevny (in Connaught), when the chiefs of the Hui Néill (Dalriad Scots), his kindred, defeated Diarmid (Diarmait), a king of eastern Ireland. Excommunicated by the synod of Teltown in Meath, the country of Diarmid, for his share in the battle—according to one account fought at his instance —and moved by missionary zcal, he crossed two years afterwards the narrow sca which separates Antrim from Argyll with twelve companions and founded the monastery of Iona (Hy), on the little island to the west of Mull, given him by his kinsman Conall. The Dalriad Scots, who had settled in the western islands of Scotland and in Lorn early in the 6th century, were already Christians ; but Columba soon after visited the Pictish king Brude, the son of Mailochon, at Craig Phadrich, the isolated hill fort on the Ness, whom he converted, and from whom he received a confirmation of Conall's grant. Columba, on the death of Conall, gave the sanction of religion to the succession of his cousin Aidan, and at the council of Drumceat in Derry obtained the exemption of the Dalriads of Iona from tribute, though they were still bound to give military service to the Irish king, the head of the Hui Néill. He frequently revisited Ireland and took part in its wars: the militant spirit is strongly marked in his character ; but most of his time was

devoted to the administration of his monastery of Iona, and to the planting of other churches and religious houses in the neighbouring isles and mainland, till his death in 597. None of the remains now found in almost evcry island—not even those in Jona itself—date from his time, when wood was still used for building. But the original foundations of the churches of Skye and Tiree were his work ; those extending from Bute and Cantyre—on Islay, Oronsay, Colonsay, Mull, Eigg, Lewis, Harris, Benbecula, and even the distant St Kilda—to Loch Arkaig on the northern mainland of Scottish Dalriada are to be ascribed to him or his immediate followers or successors in the abbacy, as well as those in the country of the Picts, from the Orkneys to Deer in Buchan. The churches which received his name farther south were latcr foundations in his honour. The inost celebrated of his disciples were Baithene, his successor as abbot ; Machar, to whom the church of Aberdcen traces its origin ;

2 In a cave at Glasserton rude crosses incised on stone—probably a font—and the letters SANCT.NI.P. (?) have recently been found.

KENTIGERN (q.v.) of Strathclyde was sup- Kentj. ported by Rydderick or Roderick, called Hael (“the Liberal’) from gern,

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Cormac, the navigator, the first missionary to the Orkneys, who perhaps reached the Faroes and Iceland ; and Drostan, the founder of the Scottish monastery of Deer. ‘Celtic The character of the Celtic Church of Columba was, like its Church of mother church in Ireland, modified by migration to a country only Columba. in small part Christian. It was a missionary church, not diocesan but monastic, with an abbot who was a presbyter, not a bishop, for its head, though the office of bishop for ordination existed, and bishops were, in Ireland at least, more numerous than in the later church. It spread, not by the erection of parishes and the care of parochial clergy, but by the reproduction of similar monasteries, the homes of those who adopted a religious life, the only schools in an age of war. It preferred islands for its monasteries for safety, and, in the case of some of its members, who sought, in the language of those times, “a desert in the ocean,” as hermitages ‘

where they might live and die apart from the world. But these were exceptions. The idea of the Celtic monastery was that of a Christian celibate society. Its inmates regarded themselves as being, and often were, members of a family or clan, preserving the customs of their race so far as consistent with celibacy and religious discipline. Of eleven successors of Columba as abbot nine were of his kin. The rule, though its confession is primitive, adapted to an infant and isolated church planted in a heathen world, did not differ greatly from that of later orders. Implicit obedience to the superior, poverty, chastity, hospitality, were the chief precepts. The observance of Easter according to the ancient cycle, the use of the semicircular instead of the coronal tonsure, and a peculiar ritual for mass and baptism were its chief deviations from the practice of the catholic church as fixed by the council of Nice, to which it yielded in the beginning of the 8th century ; frequent prayer, the singing of psalms and hymns, the reading of Scripture, the copying and illuminating of MSS., the teaching of children and novices, and the labour to provide and prepare the necessary food (the ser- vice of women being excluded) were the occupations of the monks. A similar conventual system of which St Bridget, abbess of Kildare, was foundress enlisted the fervour of her sex, and had followers in Darlugdach, abbess of Kildare, who founded Abernethy, in Abba at Coldingham, and in Hilda at Lindisfarne. It was a form of Christianity fitted to excite the wonder and gain the affection of the heathen amongst whom the monks came, practising as well as preaching the self-denying doctrine of the cross. The religion of the Celts is a shadowy outline on the page of history. Notices of idols are rare. They had not the art nccessary for an ideal representa- tion of the human form, though they learnt to decorate the rude stone monuments of an earlier age with elaborate tracery. They had no temples. The mysterious circles of massive stones, with no covering but the heavens, may have served for places of worship, as well as memorials of the more illustrious dead. The names of

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When we pass to civil history our knowledge is restricted 597-685. to a list of names.and battles; but the labours of recent scholars allow a brief account of the Celtic races from the end of the 6th to their union in the middle of the 9th century, in part hypothetical, yet a great advance on the

absolute blank which made historians of the 18th century decline the task in despair.

The Britons, whose chief king had ruled at Alclyde, were separated from their fellow-countrymen, the Cymry in Wales, shortly after Columba's death by the rapid advance of the Anglian kingdom of Northumberland, founded in the middle of the 6th century by Ida of Bamborough. One of his successors, Ethelfred, struck the blow, completed by the wars of the next king, Edwin, which severed modern Wales from British Cumbria and Strathclyde. Even Mona, the holy isle of both heathen and Christian Britons, became Anglesey, the island of the Angles. A later incursion towards the end of the century reached Carlisle and sepa- rated the kingdom of Alclyde, which had for its boundary the Catrail or Picts' trench between Peel Fell and Gala- shiels, from English Cumbria (Cumberland south of the Solway), and reduced for a short time Strathclyde to a subject province. When Bede wrote in 731 an Anglian bishopric had been established at Whithorn, which con- tinued till 803. The decline of the Northumbrian king- dom in the 8th century enabled the kings of Strathclyde to reassert their independence and maintain their rule within a restricted district more nearly answering to the valley of the Clyde, and in Galloway, in which there are some faint indications of a Pictish population, till it was united to the kingdom of Scone by the election of Donald, brother of Constantine IL., king of the Scots, to its throne.

Of the Scots of Dalriada somewhat more is known. Their history is interwoven with that of the Picts and meets at many points that of the Angles of Northumber- land, who during the 7th and the beginning of the 8th century, when their kings were the greatest in Britain, endeavoured to push their boundaries beyond the Forth

gods are conspicuously absent, though antiquaries trace the worship of the Sun in the Beltane fires and other rites ; but in the account of their adversaries we read of demons whom they invoked. Divination by rods or twigs, incantations or spells, strange rites connected with the elements of

water and of fire, "choice of weather, lucky times, the watching of the voice of birds,' are mentioned as amongst the practices of the Druids, a priestly caste revered for superior learning and, if we may accept Cesar as an authority, highly educated. This, rather than fetish or animal worship, appears to have been their cult. It was, so far as scanty indi- cations allow a generalization, by an empirical knowledge of the minor and secondary rather than the greater phenomena of nature that the Druids of Britain and Ireland exercised influence, — the tempest and its clements—wind and rain and snow, thunder and lightning—rather than the sun, moon, and stars. Whatever its precise form, this religion made a feeble resistance to the Chris- tian, taught by the monks, with learning drawn from Scripture and some acquaintance with Latin as well as Christian literature, and enforced by the example of a pure life and the hope of a future world. The charms of music and poetry, in which the Celt de- lighted, were turned to sacred use. Columba was a protector of the bards,—himself a bard.

' Jt ig not with the 'screod' our destiny is, Nor with the bird on the top of the twig, Wor with the trunk of a knotted tree, Wor with a 'seadan' hand in hand.

I adore not the voiec of birds,

Nor the 'screod' nor destiny nor lots in this world, Nor a son nor chance nor woman ;

My Druid is Christ the Son of God,

Christ, Son of Mary, the Great Abbot,

The Father, the Son, and the Holy Ghost."

Adamnan relates miracles of Columba scarcely above the level of the practices of the Druids. But superstition is not vanquished by superstition. Celibacy was a protest against the promiscuous intercourse for which Christian fathers condemn the Celts. Fasts and vigils contrasted with the gross, perhaps cannibal, practices still in use. The intense faith in Christ, of lives such as Patrick's and Columba's; won the victory of the cross.

and the Clyde. The history of this kingdom—see Nort#- North-

UMBERLAND (Kincpom or)—forms part of that of Scot- land during these centuries. It planted in LoTHIAN (q.v.) the seed from which the civilization of Scotland grew. To an early period of the contest between the Angles and the Britons, and to the country between the Forth and the Tweed and Solway, perhaps belong the battles magnified by successive poets who celebrated the hero of British medi- seval romance. Whether these battles were really fought +n southern Scotland and on the borders, and Arthur's Seat was one of his strongholds, still "unknown is the grave of Arthur." Before Edwin's death (633) his kingdom extended to the Forth, and the future capital of Scotland received the name of Edwinsburgh from him in place of the Mynyd Agned and Dunedin of the British and Gaelic Celts. During the reign of Oswald (635-642) the North- umbrians were reconverted by Aidan, a monk whom Oswald summoned from Iona, and who became monastic bishop of Lindisfarne—a southern Tona—from which the Celtic form of the Christian church spread amongst the Angles of the north and east of England, until the council of Whitby and the election of Wilfrid to the see of York restored the Roman ritual and diocesan episcopacy, when Colman, their Celtic bishop at Lindisfarne, retired with his monks to Iona. Oswald's brother Oswy extended the dominion of Northumberland over a portion of the country of the northern Picts beyond the Forth. In his reign lived CurHpert (g.v.), the apostle of Lothian, where the monas- tery of St AZbba at Coldingham, the church on the Bass, the three churches of St Baldred at Auldham, Tynning- hame, and Preston, and the sanctuary of Wedale (Stow) kept alive the memory of the Celtic Church. His name

umbrian

supre- macy.

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685-756. is preserved in St Cuthbert's church at Edinburgh and in

Early Pictish annals.

Kirkeudbright. tions, the earliest records of Anglian speech, one on the cross of Bewcastle in Cumberland, commemorating Alfred, a son of Oswy, the other, taken perhaps from a poem of Czedmon, at Ruthwell in Dumfries. Neither the Tweed nor the Solway was at this period a line of division. was succeeded by his son Egfrid (685), against whom the Picts successfully rebelled; and the Scots and a considerable

part of the Britons also recovered their freedom. Anglian

bishops, however, continued to hold the see of Whithorn

during the whole of the 8th century. The Northumbrian

kings, more successful in the west than in the east, gradually advanced from Carlisle along the coast of Ayr, and even took Alclyde. In what is now England their power declined from the middle of the 8th century before the rise of Mercia. Shortly before the commencement of the 9th century the descents of the Danes began, which led to the conflict for England between them and the Saxons of Wessex. The success of the latter under Alfred and his descendants transferred the supremacy to the princes of the southern kingdom, who, gradually advanc- ing northwards, before the close of that century united all England under their sceptre.

Before its fall Northumberland produced three great men, the founders of English literature and learning, though two of them wrote chiefly in Latin, —Czedmon, the monk of Whitby, the first English poet ; Bede, the monk of Jarrow, the first English historian; and Alcuin, the monk of York, whose school might have become the first English university, had he not lived in the decline of Northumbrian greatness and been attracted to the court of Charlemagne. It is to this early dawn of talent among the Angles of Northumberland that England owes its name of the land of the Angles and its language that of English. The northern dialect spoken by the Angles was the speech of Lothian, north as well as south (in North- umberland) of the Tweed, and was preserved in the broad Scotch of the Lowlands, while modern English was formed from the southern dialect of Alfred, Chaucer, and Wycliffe. This early Teutonic civilization of the lowland district of Scotland, in spite of the Danish wars, the Celtic conquest, and border feuds, never died out, and it became at a later time the centre from which the

Anglo-Saxon character permeated the whole of Scotland, without suppressing, as in England, the Celtic. Their union, more or less complete in different districts, is, after the difference in the extent of the Roman conquest, the second main fact of Scottish history, distinguishing it from that of England. Both, to a great degree, were the result of physical geography. The mountains and arms of the sea repelled invaders and preserved longer the ancient race and its customs.

It is necessary, before tracing the causes which led to the union of races in Scotland, to form some notion of northern Scotland during the century preceding Kenneth Macalpine, during which—the light of Adamnan and Bede being withdrawn—we are left to the guidance of the Pictish Chronicle and the Irish Annals. The Picts whom Columba converted appear to have been consolidated under a single monarch. Brude, the son of Mailochon, ruled from Inverness to Iona on the west and on the north to the Orkneys. A sub-king or chief from these islands appears at his court. The absence of any other Pictish king, the reception of the Columbite mission. in Buchan under Drostan, a disciple of Columba, and perhaps Columba himself, the foundation of the church of Mortlach near Aberdeen by Machar, another of his disciples, favour the conclusion that the dominion of Brude included Aberdeen as wellas Moray and Ross. Its southern limits are unknown,

SCOTLAND

To the same period belong two inscrip-

Oswy

[HISTORY.

The Picts} of Stirling, Perth, and Forfar, corresponding to Strathearn and Menteith,—Athole and Gowrie, Angus and Mearns, had been already converted by Ninian in the 5th century—may have already come under a single king ruling perhaps at Abernethy, with mormaers under him. It seems certain that Abernethy was earlier than Dun- keld a centre of the Celtic Church distinct from Jona, and the seat of the first three bishops of Scotland. Its round tower cannot be safely ascribed to an earlier date than the 9th century, but may have been preceded by a church dedicated to St Bridget either in the 5th by Nechtan Morbet, or in the 6th century by Garnard, son of Donald, a later Pictish king. Although there exists a complete list of the Pictish kings from Brude, son of Mailochon, to Brude, son of Ferat, conquered by Kenneth Macalpine, and of the Scots of Dalriada from Aidan (converted by Columba) to Kenneth Macalpine, with their regnal years, it is only here and there that a figure emerges suffi-ciently distinct to enter history. Parts of these lists are fictitious and others

doubtful, nor do we know over what extent of country the various monarchs ruled. Of the figures more or less prominent amongst the Pictish kings are Brude, the son of Derili, the contemporary of Adam- nan, who was present at the synod of Tara when the law called Kain Adamnan, freeing women from military service, was adopted, and who died in 706, being then styled king of Fortren. Nechtan, another son of Derili, was the contemporary of Bede, who gives (710) the letter of Ceolfrid, abbot of Wearmouth, to him when he adopted the Roman Easter and the tonsure. Six years later Nechtan expelled the Columbite monks from his dominions. They retired to Dalriada, as their brethren in Ncrthumberland had done when a similar change was made by Oswy. Nechtan also asked for masons to build a church in the Roman style, to be dedicated to St Peter, and several churches in honour of that apostle were founded within his territory. Shortly after, Egbert, an Anglian monk, persuaded the community of Hy (Iona) itself to conform, but too late to lead to the union of the churches of the Scots and the Picts, which were separated also by political causes.

Fifteen years later the greatest Pictish monarch, Angus Angus MacFergus, after a contest with more than one rival, Mac- gained the supremacy, which he held for thirty years ***8"*** *(731-761). In revenge for the capture of his son Brude by Dungal, son of Selvach, king of the Dalriad Scots, he attacked Argyll, and laid waste the whole country, destroy- ing Dunnad (?0n Loch Crinan), then the capital, burnt Creich (in Mull), and put in chains Dungal and Feradach, the sons of Selvach. He next conquered (739), and it is said drowned, Talorgan, son of Drostan, king of Athole, one of his rivals, and, resuming the Dalriad war, reduced the whole of the western Highlands. The Britons of Strathclyde were assailed by a brother of Angus, who A a ea a*

? But there had been a time when not one but several Pictish kings ruled the northern and central districts of Scotland, and of this we have perhaps a trace in the Pictish legend according to which Cruithne, the eponymus of the race, had seven sons,—Cait, Cee, Ciric, Fib, Fidach, Fotla, Fortren. Conjecture identifies five of these names with districts known in later history,—Cait with Caithness, Ciric with Mearns (Magh Circen, the plain of Ciric), Fib with Fife, Fotla with Athole (Athfotla), Fortren with southern Perthshire, con- necting it with a division of the same county in a tract of the 12th century. (Comp. plate VI.) Six of the divisions—Angus and Mearns,

Athole and Gowrie, Strathearn and Menteith, Fife and Fortreive, Mar and Buchan, Moray and Ross—fairly correspond to districts after- wards ruled by the Celtic mormaers of Angus, Athole, Strathearn, Fife, Mar, and Moray ; Caithness in the 9th century became Norse, and a new earl (of March) was introduced from the south of the Forth. They correspond also to seven great earldoms of Scotland, which appear with more or less distinctness on several occasions in the reigns of the Alexanders, This, at least, is a highly ingenious theory, but not certain history.

Karly

EARLY CELTIC PERIOD. |

fell in battle at Mugdoch in Stirling; and Angus, with his ally Ecbert, king of Northumberland, retaliated by burning Alclyde (756). About this time (752) Coilin Droighteach (the Bridgemaker), abbot of Iona, removed most of the relics of his abbey to Ireland, and this is the most probable date of the legend of the relics of St An- drew being brought from Patras to St Andrews, where the sons of a Pictish king, Hungus (Angus MacFergus), who was absent in Argyll, or, according to another ver- sion, Hungus himself, dedicated Kilrighmont (St Andrews)

and the district called the Boar's Chase to St Andrew.

The ascription of the foundation to an earlier king of the same name in the 4th century was due to the wish to give the chief bishopric of Scotland an antiquity greater than Iona and Glasgow, greater even than Canterbury and York. After the death of Angus MacFergus no king is connected with any event of importance except. Constantine, son of Fergus (died 820), who is said to have founded the church of Dunkeld, —226 years after Garnard, son of Donald, founded Abernethy. This fact, though the earlier date is not certain, points to the Perthshire lowlands as having been for a long time the centre of the chief Pictish mon- archy. Probably Scone was during this period, as it cer- tainly became afterwards, the political capital; and the kings latterly are sometimes called kings of Fortren. If so, the chief monarchy under the pressure of the Norse attacks had passed south from Inverness, having occupied perhaps at various times, Dunottar, Brechin, Forfar, Fort- eviot, and Abernethy as strongholds ; but it is not possible to

say whether there may not have continued to be inde- pendent Pictish rulers in the north.

The annals of Dalriada are even more perplexing than

ae of those of the Picts after the middle of the 6th century. alriad 'There is the usual list of kings, but they are too numer-

Scots.

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ous, and their reigns are calculated on an artificial system. The forty kings from Fergus MacEarc to Fergus MacFerch- ard, who would carry the date of the Scottish settlement back to three centuries at least before the birth of Christ, have been driven from the pale of history by modern cri- ticism. The date of the true settlement was that of the later Fergus, the son of Earc, in 503. From that date down to Selvach, the king who was conquered by Angus MacFergus about 730, the names of the kings can be given with reasonable certainty from Adamnan, Bede, and the Irish Annals. But the subsequent names in the Scot- tish chronicles are untrustworthy, and it is an ingenious conjecture that some may have been inserted to cover the century following 730, during which Dalriada is supposed to have continued under Pictish rule. This view is not free from its own difficulties. It is hard to explain how Kenneth Macalpine, called by all Scottish records a Scot, though in Irish Annals styled (as are several of his succes- sors) king of the Picts, succeeded in reversing the conquest of Angus MacFergus and establishing a Scottish line on the throne of Scone, in the middle of the 9th century. This difficulty is supposed to be solved by the hypothesis that Kenneth was the son of a Pictish father, Alpine, but of a Scottish mother, and was entitled to the crown by a peculiarity of Pictish law, which recognized descent by the mother as the test of legitimacy. The records which speak of the destruction of the Picts are treated as later inventions, and it is even doubted whether the connexion between Alpine and Kenneth and the older race of Dalriad kings is not fictitious.'

1 The above statement is a brief outline of the reconstruction of this period of Scottish history due to two scholars who have done more than any others

to elucidate it, ‘Father Innes and Mr Skene. Their negative criticism, which destroys the fabric reared by a succession of historians from Fordun or his continuator Bowmaker to Buchanan, is a masterly work, not likely to be superseded. Whether the construc- tive part will stand is not certain, but it explains many of the facts.

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universal.

A77

Whatever may be the solution ultimately reached as to Kenneth Macalpine’s antecedents, his accession represents

a revolution which led by degrees to a complete union of the Picts and Scots and the establishment of one kingdom —at first called Albania and afterwards Scotia—which included all Scotland north of the Forth and Clyde, except Caithness, Sutherland, Orkney and Shetland (the northern isles or Nordreyar), the Hebrides (the southern isles or Sudreyar), and Man; these fell for a time into the hands of the Norsemen. ‘This revolution had two causes or concomitants, one religious and the other poli- tical. Kenneth Macalpine in the seventh year of his reign (851) brought the relics of St Columba from Jona to a church he built at Dunkeld, and on his death he was buried at Iona. A little earlier the Irish Culdees, then in their first vigour, received their earliest grant in Scotland at Loch Leven from Brude, one of the last kings of the Picts, and soon found their way into all the principal Columbite monasteries, of which they represent a reform. The Irish monastic system did not yet give place to the Roman form of diocesan episcopacy. The abbot of Dun- keld succeeded to the position of the abbot of Iona and held it until the beginning of the 10th century, giving ecclesiastical sanction to the sovereign at Scone, as Columba had done in the case of Aidan. As early as the

beginning of the 8th century, however, a Pictish bishop of

Scotland appears at a council of Rome, and he had at least two successors as sole bishops or primates of the Celtic Church before dioceses were

formed. Scotland north of the firths thus remained at a lower stage of church organization than England, where a complete system of dioceses had been established in great part answering to the original Anglo-Saxon kingdoms or their divisions, with Canterbury and York at their head as rivals for the primacy. But the Celtic clergy who now conformed to the Roman ritual preserved some knowledge of the Latin language, and a connexion with Rome as the centre of Latin Christianity, which was certain to result in the adoption of the form of church government now almost The other circumstance which had a powerful influence on the foundation of the monarchy of Scone and the consolidation of the Celtic tribes was the descent on all the coasts of Britain and Ireland of the Norse and Danish vikings.

756-867.

Union of Picts and

Scots.

The Danes chiefly attacked England from Viking

Northumberland and along the whole east and part of the Tids.

southern seaboard; the Norsemen attacked Scotland, especially the islands and the north and west coasts, going as far south as the Isle of Man and the east and south of Ireland. It had now become essential to the existence of a Scottish Celtic kingdom that its centre should be removed farther inland. Argyll and the Isles, including Iona, were in the path of danger. No monk would have now chosen island homes for safety. In 787 the first arrival of the viking ships is noticed in the Anglo-Saxon Chronicle. Some years later the Irish Axnals mention that all "the islands of Britain were wasted and much harassed by the Danes." Amongst these were Lindisfarne, Rathlin off Antrim, Iona (794), and Patrick's island near Dublin (798). ona was thrice plundered between 802 and 826, when Blathmac, an abbot, was killed. A poem composed not long after the event states that the shrine of Columba was one of the objects in search of which the Norsemen came, and that it was concealed by the monks. It was to preserve the relics from this fate that some of them were transferred by Droighteach, the last abbot, to Ireland

and others by Kenneth to Dunkeld. For half a century the vikings were content with plunder, but in the middle of the 9th they began to form settlements. In 849 Olaf the White established himself at Dublin as king of Hii Ivar ; in 867 a Danish kingdom was set up in Northumberland ;

867-914.

Religion of Norse vikings.

Kenneth Mac- alpine.

Donald I.

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and Harold the Fairhaired, who in 872 became sole king of Norway, soon after led an expedition against the vikings, who had already seized Orkney and Shetland, and estab- lished an earldom under Rognwald, earl of Mceri, whose son Hrolf the Ganger conquered Normandy in the begin- ning of the next century. The position of Scotland, therefore, when Kenneth united the Picts and Scots was this: central Scotland from sea to sea—Argyll and the Isles, Perthshire, Angus and Mearns, and Fife—was under the dominion of the king who had Scone for his capital ; the south-west district—the valley of the Clyde, Ayr, Dumfries, and Galloway—was under a British king at Dumbarton; the south-east district or Lothian was part of "Saxon or Sassenach Land,"—the general Celtic name for the country of the Anglo-Saxons, but now owing to the divided state of Northumberland held by different lords ; the north of Scotland was under independent Celtic chiefs, as Moray and Mar, or already occupied by Norse- men, as Caithness, Orkney and Shetland, and the Hebrides. The whole Celtic population was Christian ; but the Norse invaders were still heathen. Their religion was similar to that of their Anglo-Saxon kin, of a type higher than the paganism of the Celts. It resembled the Celtic indeed in. the absence or infrequency of idols, but a complex inythology peopled heaven with gods—Woden and Thor, Freya and Balder, and others of inferior rank—devised legends of the origin of earth and man, Valhalla the hero's paradise, and a shadowy hell for all who were not heroes. Some of its legends are coloured from Christian sources, and underneath the mythology may be detected a ruder

and more ancient superstitious belief in omens and divination,—a nature-worship more like that of the Celts. But it is the later form which represents the Norse character as it was when it came into contact with the nations of Britain,—its daring defiance of man and the gods, its struggle with, yet in the end its calm acceptance of, the decrees of fate. The Norsemen both at home and in their colonies in Scotland embraced Christianity under Olaf Tryggvason in the end of the 10th century ; but along with Christianity they retained the old heathen senti- ments and customs, which, like their language, mingled with and modified the Celtic character on the western but far more on the northern coasts and islands, where the population was largely Norse. A strain neither Celtic nor Teutonic nor Norman occasionally meets us in Scottish history : it is derived from the blood or memory of the Norse vikings.

3. Later Celtic Period: Growth of the Kingdom of Scone Jrom Kenneth Macalpine to Malcolm Canmore.—During this period, though the Celtic annals are still obscure, we can trace the united Celtic kingdom growing on all sides under Kenneth's successors,—southward by the conquest of Lothian on the east and by the union of the Strath- clyde kingdom on the west, and for a time by holding English Cumbria under the English kings, and northward by the gradual incorporation of Angus, Mearns, Moray, and possibly the southern district of Aberdeen. Kenneth Macalpine's reign of sixteen years (844-860) was a time of incessant war. He invaded Saxony (Lothian) six times, burnt Dunbar, and seized Melrose (already a rich abbey, though on a different site from the Cistercian foundation of David I.), while the Britons (of Strathclyde) burnt Dun- blane and the Danes wasted the land of the Picts as far as Cluny and Dunkeld. After they left Kenneth rebuilt the church of Dunkeld and replaced in it Columba's relics. He dicd at Forteviot and was buried at Iona.

He was succeeded by his brother Donald I. (861-863),

who, with his people the Gaels, established the laws of Aed,

son of Eachdach, at Forteviot. Aed was a Dalriad king of the 8th century ; but the contents of his laws are unknown.

SCORLARM®S

Perhaps tanistry, by which the successor to the king was elected during his life from the eldest and worthiest of his kin, usually a collateral in preference to a descendant, was one feature, for it certainly prevailed amongst the Irish and Scottish Gaels. The next king, who succeeded in accordance with that custom, was Constantine I. (863- Consten. 877), son of Kenneth. His reign was occupied with tine 1. conflicts with the Norsemen. Olaf the White, the Norse king of Dublin, laid waste the country of the Picts and Britons year after year, and in 870 reduced Aleclyde, the British capital; but, as he disappears from history, he probably fell in a subsequent raid. He is said to have married a daughter of Kenneth, and some claim in her right may account for his Scottish wars. In the south the Danish leader Halfdan devastated Northumberland and Galloway; while in the north Thorsten the Red—a son of Olaf by Audur, the wealthy daughter of Ketil Flatnose (called Finn, "the Fair," by the Celts), a Norse viking of the Hebrides, who afterwards went to Iceland and figures in the sagas—conquered the coast of Caithness and Suther- land as far as Ekkials Bakki (the Oikel). But he was killed in the following year. Constantine met with the same fate at a battle at Inverdovat in Fife in 877, at the hands of another band of northern marauders. His death led to a disputed succession. His heir, according to the custom of tanistry, was his brother Aodh, who was killed by his own people after a year. Eocha, the son of Run, a king of the Britons, claimed in right of his mother, a daughter of Kenneth, according to the Pictish law, and governed at first along with Cirie or Grig, his tutor; then Grig. Grig ruled alone, until they were both expelled from the kingdom and Donald II., son of Constantine, came to the throne (889). The Pictish Chronicle reports that during the government of Grig the Scottish Church was freed from subjection to the laws of the Picts (meaning probably from liability to secular service). Grig is also said to have subdued all Bernicia and "almost Anglia," a state- ment which if confined to the north of the Northumbrian kingdom is not improbable, for it had then fallen into anarchy through the attacks of the Danes. The church of Ecclesgreig near Montrose possibly commemorates Grig and indicates the northward extension of the monarchy of Scone. In the reign of Donald II. (889-900), son of Donald Constantine I., Scotland was again attacked by the I. Norsemen. Sigurd, the Norse earl of Orkney, seized Caithness,

Sutherland, Ross, and part of Moray, where he built the fort of Burghead, between the Findhorn and the Spey. Farther south the Danes took Dunottar, where Donald was slain. After his time the name of the kingdom of Scone was no longer Pictavia, but Albania or Alba, a more ancient title of northern Scotland, perhaps resumed to mark the growth of the Scottish-Pictish monarchy in the central and eastern Highlands.

Donald IT. was followed by Constantine IT. (900-940), Constan- son of Aodh and grandson of Kenneth, and his long reign is tine U. a proof of his power. He was the greatest Scottish king, as Angus MacFergus had been the greatest of the pure Pictish race. In the first part of it his kingdom was still beset by the Norsemen. In his third year they wasted Dunkeld and all Alba. Next year they were repulsed in Strathearn. In his 8th year Rognwald, the Danish king of Dublin, with earls Ottir and Oswle Crakaban, ravaged Dunblane. Six years later the same leaders were de- feated on the Tyne (? in East Lothian) by Constantine, who had been summoned to assist Eldred, lord of Bam- borough. Ottir was slain, but Rognwald escaped and reappears some years later as king of Northumberland. This is a battle whose site and incidents are told in a con- flicting manner by different chronicles; but it appears certain that Constantine saved his dominions from further

successor of Athelstan, expelled Olaf, son of Sitric, from 914-1014. Northumberland, and in the following year, to prevent the Cumbrians from again aiding the Danes, he 'harried. Cumberland and gave it all up to Malcolm, king of Scots, on condition that he should be his fellow-worker both on sea and land." 'This was the same policy which led his father to call in the aid of Erik Bloody-Axe. The kings of Wessex wisely granted what they could not hold to the best northern warrior, Celt or Scandinavian, under con- ditions which acknowledged more or less strictly their supremacy. The Cumbria so granted was the country south of the Solway to the Dee, but it may also have included Strathclyde, for at this period Strathclyde Waelas and Cumbrians are frequently used as equivalent names. Malcolm lent no aid to Erik Bloody-Axe, when in the reign of Eadred he tried (949) to recover Northumberland, but he joined his brother-

in-law Olaf, Sitric's son, in an expedition with the same object, when they laid waste the country as far south as the Tees. Three years later Erik again returned, and finally drove Olaf back to Ire- land, where he founded the kingdom of Dublin, which lasted till the battle of Clontarf. Malcolm died fighting either against the men of Mearns or of Moray. Three kings followed (954-971),—Indulf, son of Constantine, Duff, son of Malcolm, Colin, son of Indulf ; in the reign of Indulf the Northumbrians evacuated Edinburgh, which thenceforward was Scottish ground. A Saxon burgh, a fort, perhaps a town, was now for the first time within the Celtic kingdom.

Kenneth IT. (971-995), son of Malcolm, soon after his Kenneth accession made a raid on Northumberland as far south as '- Cleveland. The statement of two English chroniclers (John of Wallingford and Henry of Huntingdon), that Lothian was ceded to him by Eadgar on condition of homage, and that the people should still use the language of the Angles, is not mentioned in the Anglo-Saxon or any Scottish chronicle. Nor is it easy to believe the Anglo-Saxon Chronicle as amplified by Florence of Worce- ster, that Kenneth was one of the kings who rowed Eadgar on the Dee in sign of homage. At this time, in the north and west, the Orkney earls were all-powerful, and Kenneth was occupied with contests nearer his own territory, —especially with the mormaer of Angus, whose grandson, through his daughter Fenella, he slew at Dun- sinane, and in revenge for which he was himself treacher- ously killed at Fettercairn in Mearns by Fenella, whose name is still preserved in the traditions of that district. The foundation of the church at Brechin is attributed to this king.

Kenneth was followed, as he had been preceded, by insignificant kings,—Constantine, son of Colin, and Ken- neth, son of Duff. His son, Malcolm IT. (1005-34), gained Malcolm the throne by the slaughter of his predecessor Duff at HU. Monzievaird, and at once turned his arms southwards; but his first attempt to conquer northern Northumberland was repelled by Ethelred, son of Waltheof, its earl, who de- feated him at Durham. About the same time Sigurd, earl of Orkney, having defeated Finlay, mormacr of Moray, became ruler, according to the Norse saga, of "Ross and Moray, Sutherland and the dales » of Caithness. He had conflicts with other Scottish chiefs, but appears to have made terms with the kings of both Norway and Scotland, __with Olaf Tryggvason by becoming Christian and with Malcolm by

marrying his daughter. He fell at Clontarf (1014), the memorable battle near Dublin, by which Brian Boru and his son Murcadh defeated the Danish kings 11 Ireland and restored a Celtic dynasty. Malcolm conferred the earldom of Caithness on his grandson Thorfinn, the infant son of Sigurd ; and Sigurd's Orkney earldom fell to his sons, Somerled, Brusi, and Einar; while Moray again

serious attacks by the vikings. He had now to meet a more formidable foe,—the West Saxons, whose kings, the descendants of Alfred, were steadily moving northwards. In spite of his wars, Constantine found time in the early part of his reign for two important reforms,—one eccle- siastical, the other civil. In his sixth year (906) he, along with Cellach, bishop of St Andrews—the first' of twelve Celtic bishops of Scotland—swore on the Hill of Faith at Scone (906) that "the laws and discipline of the faith, and the rights of the churches and the gospel, should be pre- served on an equal footing with the Scots." This obscure notice of the Pictish Chronicle indicates the establishment or restoration of the Scottish Church, which the Pictish kings had oppressed, to an equality with that of the Pictish. Asa sign of the union the crozier of St Columba, called Cathbuadth ("victory in battle"), was borne before Con- stantine's armies. Two years later, on the death of Donald, king of the Britons of Strathclyde, Constantine procured the election of his own brother Donald to that kingdom. Though he thus strengthened church and state, Alfred's successors were too powerful for him. The Anglo- Saxon Chronicle records of Edward the Elder, that in 924, having built a fort at Bakewell, in the Peak of Derbyshire, "the king and nation of the Scots, Rognwald the North-) umbrian and others, and also the king of the Strath- clyde Welsh and his people, chose him for father and lord." His son Athelstan is related by the same authority to have subjugated all the kings in the island, amongst whom are mentioned by name Howell king of the west Welsh, Constantine king of the Scots, Owen king of Gwent, and Eldred of Bamborough, who "made peace with oaths at Emmet and renounced every kind of idolatry." These entries are not beyond suspicion, The Peak was a distant point for the Scottish king. Rognwald, the Northumbrian, died in 920, according to the Irish Annals. Howell and Constantine were already Christians and could not have then renounced idolatry. If there is any truth in the sub- mission of the Scots to Edward the Elder it did not last, for some years later the Chronicle states that Athelstan

went into Scotland with a land and sea force and ravaged a great part of it. A league of the northern kings against Athelstan was dispersed (937) by his great victory at Brunanburgh (? Wendun, between Aldborough and Knares-borough, according to Skene). The forces allied against him were those of Constantine, his son-in-law Olaf, son of Sitric (called also the Red), and another Olaf, son of Godfrey, from Ireland, besides the Strathclyde and north Welsh kings. For Athelstan there fought, in addition to his own West Saxons, the Mercians and some mercenaries from Norway, amongst them Egil, son of Skalagrim, the hero of a famous Icelandic saga. No greater slaughter had been known since the Anglo-Saxons, " proud war-smiths," as their poet calls them, overcame the Welsh and gained England. A son of Constantine was slain, four kings, and seven earls. Constantine himself escaped to Scot- land, where in old age he resigned the crown for the tonsure and became abbot of the Culdees of St Andrews. Athelstan died two years after Brunanburgh, but before his death granted Northumberland to Erik Bloody-Axe, son of Harold Haarfagr, who was almost immediately expelled by the Irish Danes. Athelstan, even after so great a victory, could not annex Northumberland, much less Scotland, to his dominions. Malcolm Constantine's successor, Malcolm I. (943-954), son of L Donald IL. began his reign by invading Moray and killing Cellach, its chief king. Meantime the Danish kings of Dublin had been endeavouring to maintain their hold on Northumberland with the aid of the Cumbrians, whose country they had already settled, and in this attempt the two Olafs had a temporary success; but Eadmund, the

1014-1058.

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came into the possession of a Celtic mormaer, Finlay, who is called king of Alba by one of the Irish chronicles, and the Hebrides probably into that of a Norse earl, Gilli, from whom they were afterwards recovered by Thorfinn. While the Celts of Ireland were thus expelling the Danish invaders and in Scotland there was divided possession, the result of compromise and of intermarriage, England fell under the dominion of the Danish kings Sweyn and Canute. Canute committed Northumberland to Erik, a Dane, as earl; but Eadulf Cudel, a weak brother of the brave Oswulf and son of Waltheof,

the Anglian earl, still retained the northern district as lord of Bamborough. Profiting by the distracted state of northern England, Malcolm again invaded Northumberland with Owen of Cumbria, called the Bald, and by the victory of Carham

Conquest (1018) near Coldstream won Lothian, which remained

of __ from that time an integral part of Scotland. Canute, | by his son Malcolm (III.) Canmore. Macbeth reigned Lothian. on his return from a pilgrimage to Rome, is said by | seventeen years (1040-57). He was, as far as records the Anglo-Saxon Chronicle to have gone to Scotland, | state, an able monarch, who succeeded in repelling the where Malcolm and two other kings, Maelbeth and Jeh- | attacks of Siward on behalf of his grandson, who showed marc, submitted to him, but he held Scotland for only a | liberality to the church, as the foundation of himself little while. Maelbeth is supposed to be Macbeth, then | and his wife at Loch Leven testify, sent money for the mormaer of Moray, afterwards king, and Jehmarc, a Celtic | poor to Rome, and possibly went with it on a pilgrim- or Scandinavian chief in Argyll. The hold which Canute, | age; but he fell at last in the battle of Lumphanan in who was trying to grasp Norway and Denmark as well as | Mar, where the young Malcolm was aided by Tostig, son England, had upon northern Britain must have been | of Godwine, the great West Saxon earl who had become slender as well as short; but the acknowledgment of the | earl of Northumberland. A few months later, Lulach, remacy of so great a king was natural. At his death | the son of Gillecomhain, a former mormaer of Moray, who supremacy § § : ’ : yy V his overgrown empire fell to pieces, and Scotland was | had continued the war, and 1s nominally counted a king, left to itself, ‘Two years before Malcolm II. died. His | though called fatuous, was slain at Essie in Strathbogie conquest of Lothian perhaps led to the new name of | (N.W. Aberdeen), and Malcolm Canmore became king. Scotia (now generally applied to his kingdom), which | With his reign a new and clearer era of the history of was to become its permanent name. The Scotland he | Scotland commences. governed still had its centre at Scone, but included besides | The Soottishy asls had mone terse maul ol ee — ae Piast said : ment. The united monarchy of Scone lasted for two centuries in archy o the original Pictish district of ad — ce spite of its powerful neighbours, but it was

dependent almost Scone. Mearns, Fife, the southern district of Aberdeen, an entirely on the attachment of the clans to their chiefs and of the Lothian, his own conquest, while Moray and western | whole tace to the hereditary king. It was traditional, not consti- Ross, and perhaps Argyll and the Isles, owned his suze- {ublanal oa fae naspied outa theta at oma not a

; is ti neld together, but with little settled law and no local government. ee Norse oe < ai me It wanted the elements of civil life, for it had no organized towns the Orkneys, Caithness, Sutherland, and the Hebrides. or assemblies of the people. There was little commerce or trade. Whether a Cumbrian king still ruled Strathclyde and | Cattle and sheep were the chief commodities and the medium of Galloway is doubtful. After Owen the Bald, who fought | exchange. There is no trace of an independent coinage. Chris- at Carham, the next king mentioned is Duncan, son of the | tianity had not yet leavened ne whole me ags in

faleolm. 'Maéléolm TI, was monasteries were ccntres of light within Imite circles. @ : grandson and the successor of Malcolm. omre : Celtic character, alien to set and quick forms of business, was Celtic liberal to the church, as we know from his gifts to the | alive to the pleasures of the imagination, oratory, and song. Its and church of Deer ; but the foundation of Mortlach (Banff- | cardinal defect was a aed regard fos soa mes ae: ba Angi

i i devotion to a leader, whether priest, chief, or king. ie Christian Saxon a te oe —" aa gt ing Moe ie oe Anglo-Saxons of the Lothians, the N orsemen, only recently and character

eo ke ee ee ee half converted, in the islands of the north and west, brought qualities spurious, introducing into the Celtic kingdom a fully deve- | and customs into the common stock of the future Scottish people loped feudalism, which was not known in England, still | which were wanting to the Celts. The Anglo-Saxon in his original less in Scotland, till after the Conquest. As he left no heme, as in Yoel athe Lepaae a ee

7 = Naxon, as he was € € = ; male heir, Maleolm's death led iy – doubtful succession and the town a better regulated freedom,—the domestic and

civic and a perplexed period of Scottish history. f virtues. His imagination, even his poetry, had a touch of prose,

The Scottish historians and the Norse sagas can with | put he possessed the prosaic qualities of plain speech, common difficulty be reconciled. Little light can be got from | sense, and truth,—the ee Se The beard u oe either the Anglo-Saxon Chronicle or the Irish Annals. eee Westen eee OR ee The Noriiene iacronceeel Shakespeare seized the weird story of Macbeth, as told new clemeuts, the spirit of chivalry and the too rigid bonds of the by Boece and translated in Holinshed, and history can | feudal law. The changes due to these new elements began in hardly displace the tragedy, so true to the dark side of | Scotland in the reign of Malcolm Canmore, and Ter soeylre in human nature, by the meagre outline at its command, | those of his Geneeniapte. aes net colie eres "while This outline is supported by authentic evidence, and agrees | S™@dually civilized under Saxon and Norm aged

. : en. y, wheeees 8 retaining its native vigour. The result was the establishment of with the situation which existed between the death of Mal- | the independence of Scotlaud within its present bounds during the colm IT. and the accession of Malcolm Canmore. prosperous reigns of the Alexanders (1107-1285).

Duncan. Malcolm II. was succeeded by his grandson Duncan 4. Transition from a Celtic to an Anglo-Norman Feudal Malcolm

(1034-40), son of his daughter Bethoc and Crinan, a lay or secular abbot of Dunkeld; but his right was probably from the first contested by Thorfinn, who had become the most powerful of the Norse earls. If the Orkney saga could be relied upon, he had as many as eleven earls or mormaers subject to him, and a modern but unsafe in-

terpretation of one passage extends his dominion as far as Galloway. Duncan, after an unsuccessful attempt on Durham, turned his arms to the

north to check the further advance of his kinsman, but was defeated on the Pentland Firth, Moddan, whom he had tried to set up as earl of Caithness, was burnt in his own house, and Duncan him- self was killed at Bothgownan near Elgin by Macbeth, his own general, Moray, and his wife Gruoch was daughter of Bocte, son of Kenneth II.; thus he had a possible pretension to the crown if it could descend by females. But his real posi- tion appears to have been that of a successful general asserting the independence of the northern Celts against Duncan, who by his marriage with the daughter of Earl Siward, the Northumbrian earl, had shown the tendency to unite Saxon with Celtic blood which was followed

Morarchy: Malcolm Canmore and his Descendants.— a Malcolm Canmore (1058-93) spent his boyhood in Cum-”™

bria, his youth at the court of Edward the Confessor of England. He was by race only half a Celt, for his mother was an Anglo-Dane, sister of Earl Siward. The court which helped to form his character was already sub-

Macbeth was son of Finlay, mormaer of Macbeth,

CANMORE TO ALEXANDER TIL.)

ject to Norman influence. The Confessor, like Canmore, had been educated in exile, at the Norman court, and favoured the Normans. Though the course of events led Malcolm to ally himself with the Anglo-Saxon royal house, the Anglo-Saxon and Anglo-Norman periods of Scottish history were not, as in England, separated by several centuries, but were nearly contemporaneous. If Malcolm, Edgar, and the first Alexander may be regarded as Scoto- Saxon, David I. and his successors were truly Scoto-Nor- man feudal monarchs. Apart from the customs and language of Lothian, which descended from Anglian North- umberland, Scotland received scarcely any pure Saxon institutions. Those it did receive have a mixed Saxon and Norman imprint. There were no tithings, wapen- takes, or hundreds, no trial by compurgation, no frank- pledge. No witenagemot or folkmotes preceded the great council which became parliament. In short, the system of government we call the Anglo-Saxon constitution never existed in Scotland, although the court of the four southern burghs and the customs of the towns of Lothian copied from those of Newcastle, and a

similar association of burghs, the Hanse of Aberdeen, of which there are faint traces in the north, had a Teutonic origin. And some traces of Anglo-Saxon criminal law are to be found in the early Scottish charters.

Canmore ascended the throne (1058) not long before England was subjugated by William the Conqueror. The only recorded event of his reign prior to the Conquest was his quarrel with Tostig, his "sworn" brother, when he made a raid south of the Tweed and violated the peace of St Cuthbert by ravaging Lindisfarne. The early years of his reign were devoted to establishing his rule in the

northern districts, where his marriage to Ingebiorg, widow.

of Earl Thorfinn, related by the Norse but not the Scottish writers, may have aided him. Ingebiorg, already old, can- not have long survived the union, nor is the fact of the marriage certain. The victory of Hastings brought to the Scottish court as refugees Edgar Atheling, grandson of Edmund Ironside, and his three sisters. Their father, Edward, had found shelter in Hungary in the reign of Canute and married an Hungarian princess. The eldest daughter of the marriage, Margaret, became the wife (1068) of Malcolm Canmore. Her virtues more than his wars make his reign an epoch of Scottish history. This alliance and the advance of the Conqueror on North- umberland in the third year of his reign rendered a collision inevitable. Malcolm twice harried Northumber- land during the reign of the Conqueror with the view of restoring the Atheling. In the interval between these expeditions William retaliated by invading Scotland as far as Abernethy, where he forced Malcolm to do homage. After the second he sent his son Robert, who reached Falkirk ; but he returned without having accomplished anything, except that he built Newcastle as a frontier fortress. In this reign Northumberland itself was never really subdued, and William laid waste the district between the Humber and the Tees as a barrier against the northern Angles and Danes. After the Conqueror's death Malcolm prepared for war, but peace was made before he had left Lothian, and he again took an oath of homage. Next year William Rufus succeeded in reducing Cumbria south of the Solway, then held by Dolphin, lord of Carlisle, a vassal of Malcolm, rebuilt the castle of Carlisle, and made the adjoining co@ntry for the first time English. He then summoned Malcolm

to Gloucester ; but the meeting ended, like others when a summons to do homage at a distance from the border was sent to the kings of Scotland, in settling both in a more hostile attitude. Malcolm on his return raised his whole forces for the last expedition of his life, in which he was slain (1093) in an ambuscade

yCcCoTLAN D

near Alnwick by Morel of Bamborough. He left to his 1058-1097.

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successor a kingdom bounded on the south by the Tweed, the Cheviots, and the Solway, though there was much debatable land along the borders, and the English king claimed Lothian as successor of the Northumbrian Angles, while the Scotch claimed English Cumberland as a de- pendency dating from the grant of Eadgar. Malcolm's defeat of the mother of Maelsnechtan, son of Lulach and mormaer of Moray, is the only event recorded to indicate that his relations with the Celtic population were not peaceful, but the materials are too scanty to make it clear how far the northern chiefs asserted their independence. The foundation of Mortlach by Malcolm is proof that the Aberdeen lowlands at least were within his dominion.

The brightest side of Malcolm's reign was the reform Margaret.

due to Margaret. Her life by Theodoric, a monk of Durham, or her confessor, Turgot, though coloured by par-

tiality for a good woman, the patron of the church, bears

the marks of a true portrait. The miraculous element in the lives of the Celtic saints, diminished but still present in Bede, disappears. The chief changes in the Celtic Church effected by Margaret with the aid of monks sent by Lanfranc from Canterbury were the observance of Lent, the reception of the Eucharist at Easter, which had fallen into neglect, the use of the proper ritual in the mass, the prohibition of labour on the Lord's day, and of marriage between persons related by affinity. She restored Jona, long desecrated, founded the church of Dunfermline in commemoration of

her marriage, and protected the hermits, still common in the Scottish Church. Her severe fasts and her liberality to the sick and aged are especially noted. She washed the feet of the poor and fed children with food she had prepared, procured freedom for captives, and on either side of the ferry called Queensferry after her she erected hostelries for pilgrims. Nor did her piety lead her to neglect domestic duties. The rude manners of the Celtic court were refined by her example. The education of her children, her chief care in her husband's frequent absence, was rewarded by the noble character of the saintly David and the good Queen Maude. She did not long survive her husband: hearing of his death she thanked the Almighty for enabling her to bear such sorrow, to cleanse her from sin, and after receiving the sacrament died praying. The chapel on the castle rock at Edinburgh, erected in her memory, is the oldest building now existing in Scotland, with the exception of the meagre ruins of the Celtic Church in the western Highlands.

After Malcolm's death there was a fierce contest for the crown (1093-97), which showed that the union of Celtic and Saxon blood was not yet complete in the royal house, much less in the nation. Before the corpse of Margaret

could be removed to Dunfermline for burial, Donald Bain, Donald brother of Malcolm Canmore, besieged the castle, and Bain.

its removal was only accomplished under cover of mist. Donald, who had the support of the Celts and the custom of tanistry in favour of his claim, was king nominally at least six months, when he was expelled by Duncan, son of Malcolm and Ingebiorg, assisted by an English force, in which there were Normans as well as Saxons; but his tenure was equally short, and Donald, aided by Edmund, the only degenerate son of Malcolm and Margaret, who slew his half-brother Duncan, again reigned three years. This was the last attempt of the Celts—though partial risings continued frequent—to maintain a king of their race and a kingdom governed according to their customs. Edgar Atheling, who had become reconciled to the Norman king, led an army into Scotland and by a hard-fought battle dispossessed Donald and restored his eldest nephew, Edgar, to his father's throne.

The reign of Edgar (1097-1107) was unimportant.

XXI. — 61

Its Edgar.

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1097-1127. chief event was the cession of the Sudreyar or islands on

Alexan- der J.

the west coast to the Norse king Magnus Barefoot, who also conquered Man and Anglesea. The terms of the treaty which, after two expeditions, he extorted from Edgar were that every island was to be his between which and the mainland a helm-bearing ship could pass, and by carrying one across the mainland he included Cantyre. Magnus was killed in Ulster; but the Hebrides remained in the hands of the Norse kings or lords, and acknowledged their sway till the battle of Largs (1263). Their cession was the necessary price for the consolidation of the Scottish monarchy in the south of thekingdom. Edinburgh was the capital of Edgar, a circumstance which marked the removal of the centre of the kingdom to its southern and Saxon district. His standard had been blessed at Durham when he recovered the crown, and it was to Durham or Dunfermline, where he was buried, that his benefactions were made. Jona had passed into the hands of Magnus, but he, being a Christian, respected its sanctity. Scone was henceforth only the scene of the coronation ceremony.

Edgar, dying childless, was succeeded by his brother Alexander I. (1107-24). Educated by his mother, and after her death in England, Alexander, like his brothers, brought to the government of Scotland Saxon combined with Norman culture. The singular will by which Edgar left Cumbria to his younger brother David was not to Alexander's taste; but the support which the Saxon popu- lation and the Norman barons, now beginning to hold land in that district, gave to David forced his brother to acquiesce in the division of the kingdom. It was now restricted to Lothian, Merse, and the country beyond the firths, as far as Mar and Buchan. His hold of Moray and Ross, Sutherland and Caithness, must have been rather as suzerain than as

sovereign ; the mainland of Argyll was now or soon after in the possession of Somerled, ancestor of the lords of the Isles; the northern isles (Nordreyar) as well as the Sudreyar remained Norse. The chief towns of Alexander were Edinburgh, Stirling, Inverkeithing, Perth, and Aberdeen. At Scone he founded a monastery for canons of St Augustine; but St Andrews was still the sole Scottish bishopric. Alexander married Sibylla, a natural daughter of Henry I. of England, and secured peace with that country. His only recorded war was with the men of Mearns and Moray, who surprised him at Invergowrie. He pursued them to the Moray Firth, where a signal victory (1114) gained for him the epithet of "The Fierce." The change from the Celtic to the Roman form of church government commenced by his mother and his brother Edgar was continued. Anselm congratulated him on his accession, and asked protection for monks sent to Scotland at Edgar's request. On the death of Fothad, the last Celtic bishop of St Andrews, Alexander procured the election of Turgot, his mother's confessor and prior of Durham. His consecration was delayed through a dispute between Canterbury and York, and, having failed to effect the anticipated reforms, he went back to Dur- ham. On his death Eadmer, a monk of Canterbury and chronicler of note, was selected for the office by Ralph, archbishop of Canterbury. The choice was confirmed by the clergy and people ; but a quarrel with Alexander as to his investiture led to his return to Canterbury. Robert, prior of Scone, became bishop in the year of Alexander's death, but his consecration also had to be put off. These disputes as to the consecration and investiture of the bishop of St Andrews turned on the rival claims of Canterbury and York to be the metropolitan of Scotland, and the refusal of Alexander to cede the independence of the Scottish Church, though anxious for an English monk to organize the diocese. National feeling was already strong in Scotland, even in a king with English sympathies.

Without the aid of Turgot or Eadmer, Alexander himself laid the foundation of diocesan episcopacy. The first bishops of Dunkeld and Moray date from his reign, and the first parish on record, Ednam in Roxburghshire. At

Inchcolm, as well as Scone, he introduced the canons regular of Augustine, and on an island of Loch Tay a cell from Scone was built in memory of his wife Sibylla. He restored the '"Boar's Chase" to St Andrews and increased the endowments of Dunfermline. The offices of chancellor, constable, and sheriff also now appear ; and the mormaers of the Celtic districts are designed as earls (comites) in one of his charters. The transition from the Celtic to the feudal monarchy had begun. Alexander was a learned monarch, like his father-in-law Henry Beauclerk, pious and friendly to the church, but severe to his subjects.

David I. (1124-53), the youngest son of Malcolm and Margaret, became king at the ripe age of forty-four. He had been trained at the court of Henry I. and his sister Matilda, so that "his manners were polished from the rust of Scottish barbarity." After Edgar's death he served an apprenticeship for the royal office as earl or prince of Cumbria, where his power was little short of regal. He married a Saxon, the daughter of Waltheof, earl of Northumberland, widow of Simon de St Liz, Norman earl of Northampton, and his friends and followers were chiefly Norman. His marriage brought him the earldom of Huntingdon, and he was guardian of the earldom of Northampton during his stepson's minority, so that he entered into feudal relations with the Norman king of England. In the government of his principality he suc- ceeded in reducing a wild part of Scotland into order, using for this purpose the agency of the church.

The history of the church in Strathclyde since Kentigern's death is obscure. The records of York claim the consecra- tion of a bishop of Glasgow in the middle of the 11th and another at the commencement of the 12th century ; but they are unknown in the records of Glasgow, and were perhaps invented to support the metropolitan claim of York over that see. Glasgow certainly was restored after some considerable lapse in the person of John, the tutor of David, who at his request was consecrated by Pope Paschal II. This was a parallel step to the summons of Turgot and Eadmer to St Andrews, but David, like Alexander, main- tained the independence of his own bishopric, and, though pope after pope sent letters and legates exhorting obedience to York, neither John nor his successors yielded it. A new see erected at Carlisle by Henry I. and the restoration of Whithorn by Henry II., both subject to York, were counter measures on the part of the English

sovereigns. The independence of the Scottish from the English Church (with the exception of Galloway and some places of Lothian still under Durham)- thus asserted by the rulers of Scotland was of great moment in its subsequent history, and was promoted by the liberality of David and his brothers. The inquest by David's order by which the land of the see of Glasgow was made may refer to ancient possession, but it had the effect of a new grant. Its extent—covering lands in the dales of the Clyde, Tweed, Teviot, Annan, Nith, and in Ayrshire—corresponds to the district of Cumbria under David and, with slight deviations, to the future diocese of Glasgow. While David's province did not include all of ancient Cumbria, it did include some parts of ancient Lothian, the future shires of Berwick, Roxburgh, and Selkirk. The Cumbrian nobles were a mixed class,— some Saxon and others Norman. There were few of pure Celtic blood. .

Three years after his accession David was present at the council of London, where, along with the English barons, he swore to accept his niece Matilda as the successor of

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David 1.

Ecclesi- astical affairs.

David and Matilda.

CANMORE TO ALEXANDER iit. |

the "White Ship." Soon after a rising of Scottish Celts under a natural son of Alexander and Angus, a grandson of the mormaer of Moray, was defeated at Stracathro (Forfar) by David's troops in his absence in England, and four years later another under Wimund, who pretended to be Malcolm MacHeth, a chief in Ross, aided by Somerled of Argyll, who had acquired some of the adjacent isles, was put down by Wimund's capture. The death of Henry I. and the claim of Stephen to the English throne led to the invasion of England by David, in support of Matilda, with an army drawn from all parts of his kingdom, —the men of Galloway, Cumbria, Teviotdale, Lothian, Lennox, the Isles, Scotia (the country south of the

Forth or Scots Water), and Moray. Their defeat at the battle of the Standard at Cuton Moor (1138) near Northallerton by the barons of northern England was due to the want of discipline of the men of Galloway, and, though signal, was not decisive. At Carlisle peace was made on condition that David's son Henry should hold Northumberland as an earldom under Stephen, with the exception of the castles of Bamborough and Newcastle. David gave hostages, but retained Carlisle and Cumberland without any condition of homage. Two years later, when Matilda seized London, David joined her; but she was unable to maintain her advantage. David was forced to return to Scotland, and did not again engage in active hostilities against Stephen. His death was preceded by that of his only son; but his power was so firm that he procured the acknowledg-

"ment of his grandson Malcolm, a boy of twelve, as successor

Diocesan and. feudal organiza- tion of kingdom.

to the Scottish crown, while William, his younger grandson, succeeded to Northumberland and the English fiefs his father had held.

The comparative peace of his last twelve years gave David opportunity for the ecclesiastical and civil organiza- tion of the kingdom. He found three and left nine bishoprics, adding to St Andrews, Moray, and Dunkeld the new sees of Glasgow, Brechin, Dunblane, Aberdeen (transferred from Mortlach), Ross, and Caithness. Closely connected with their establishment was the suppression of the Celtic Culdees at Dunkeld, St Andrews, and Loch Leven, and perhaps also at Dunblane and Dornoch, where canons regular of St Augustine became the chapters of the bishop. The abbeys, chiefly Cistercian, which he founded were Holyrood, Newbattle, Melrose, J edburgh, Kelso, Cambuskenneth, Urquhart, and Kinloss. He added to the endowments of his father and mother at Dunfermline, and so lessened the crown lands that James I. called him 'a gore saint for the crown." The division into dioceses stimulated the formation of parishes endowed by the bishops or by the lords of the manor ; but the first steps of the parochial division of Scotland are obscure. The diocesan episcopate now included the whole of Scotland except what was held by the Norsemen, who had bishops of their own for the Orkneys and the western isles, subject to the metropolitan of Drontheim. It preceded the civil division into sheriffdoms,

which also began in this reign, but took a longer period to complete. The Celtic chiefs in the north and in Galloway were as yet too powerful to allow royal officers to hold courts within their territory, and regalities with the full rights of the crown in matters of justice were more lavishly granted in Scotland than in England, where they were confined to the few palatine earls or bishops on the border. The feudal system in Scotland, erroneously antedated to the reign of Malcolm IL. or Malcolm Canmore, really took root in that of David. The king administered justice in person. The great judicial officer of state, the justiciar, who went circuits in the king's name, appears either in this or the preceding reign; so also do the seneschal or steward of the royal household

and the chamberlain who collected the royal revenues. 1127-1165.

The tenure of land by charter, of which there are a few examples by Edgar in favour of Durham and by Alexander I. in favour of Scone, now became common. 'The charters of David to the abbey of Holyrood, to Robert Bruce of Annandale, and others are in the regular style of the Norman chancery. There are also instances of subordinate grants by subjects, which the king confirms. Though no charter to a burgh is extant, David refers to Edinburgh, Perth, and Stirling as his burghs. The inquest in favour of the see of Glasgow is, by the verdict of those best acquainted with the facts, similar to the Norman inquest. The laws of the four burghs of Lothian—Berwick, Roxburgh, Edinburgh, and Stirling—are records of customs existing in this reign, while a variety of other laws called assizes, chiefly relating to tolls and matters of criminal jurispru- dence, were the legislative acts of the king, assisted by the council of his great nobles. The beginning of the feudal system in Scotland was invigorated by the personal character of David. The absence of any large body of settled Celtic or Saxon customs gave full play to its assimilative influence. In the reigns which followed Scotland became a purer example of a feudal state than England, where a large number of Teutonic customs contributed to form the commonlaw. A few of these found their way into Scotland, chiefly through the burghs or the medium of Norman charters, in which they had been incorporated. But the

Scottish common law was in the main derived from the Roman code through the canon law, and not from Anglo- Saxon customs. Though never canonized by the church, this great monarch, for his faithful administration of

justice and the purity of his domestic life, was deemed a

saint by the people.

David's grandson and successor Malcolm TV. (1154-65), Malcolm called "The Maiden," died too young to leave a permanent IV.

impression, A rising by Somerled, lord of the Isles, and the sons of Malcolm MacHeth, mormaer of Moray, was suppressed in the early years of his reign, and peace was made with Somerled in 1158. A treaty by which Malcolm surrendered Northumberland and Cumberland to Henry IL, and his following that king (who knighted him at Tours) in an-expedition to Toulouse, led to the revolt of the earl of Strathearn with five other chiefs. This brought him suddenly home. An attempt to take him by surprise at Perth failed, and next year he succeeded in reducing Moray and Galloway, whose earl, Fergus, had also taken advantage of his absence. Moray was occupied by foreign settlers (1160), amongst whom, besides Norman barons, were Flemings,—a race fitted to civilize a new country by their industry. It is to this settlement that the permanent subjection of Moray to the Scottish kings, and perhaps the peculiar dialect and character of the inhabitants of that part of Scotland, were due. Four years later Somerled again attacked the west coast, but was defeated and slain at Renfrew, when the isles south of Ardnamurchan, which he had won from Godred the Black, son of Olaf, king of Man, were divided amongst his sons Dugall, Reginald, and Angus. Next year (1165) the young king himself died at Jedburgh. While he was reproached for yielding too much to the powerful English monarch, his service abroad enabled him to obtain the necessary experience to contend with the Celtic chiefs. The reduction of Galloway and Moray more than compensated for the loss of the earldoms in northern England, the possession of which by the Scottish king must have been precarious. Before his death Bute had been taken by the steward of Scotland,—the first footing the Scotch got on the larger isles, but it was

afterwards recovered by the Norwegian king Haco and restored to Ruari, a descendant of Reginald.

Malcolm, dying childless—though he had an illegitimate

from Willimm wher a captive, and restored Scotland's ancient mantis.

The second peri ot William's reign was occupied with Intemal internal acfaurs:. Euchard's absence and John's disputes affairs, Wih tie pape uni kis own barons gave a relief from

English war. Tle snisme of the ransom tried the re-

1165-1215 son who predeceased him—was succeeded by his brother William William the Lion (1165-1214). His reign, the longest of | the Lion. any Scottish monarch, though not so uniformly successful

as that of his grandfather, was an important era in Scottish history. It is divided into nearly equal portions by the accession of Richard Coeur de Lion. The first consists of

the war with Henry IL. in which William was captured (1175), and this made him the subject of the English king for fourteen years. dependence, and, resuming the task of his predecessor, consolidated the Scottish kingdom in the north and west. William commenced his reign by taking part in the war with France as vassal of Henry IT. for the fief of Hunting-

don; but, being disappointed of the promised restoration | of the northern earldoms, he entered into negotiations with —

Louis VII. of France. This memorable event is the first authentic connexion between Scotland and France, and was

afterwards antedated by a fiction to the time of Charle- |

magne. Dictated by the situation of the two countries,

In the second he recovered his in- |

equally exposed to danger from the power of England under _

the Angevin or Plantagenet kings, the alliance between

France and Scotland continued with few breaks until the — close of the 16th century, and even in the 17th and 1Sth | was relied upon by the last of the Stuarts. France proved a

broken reed' to the Scottish kings; but the imtereourse

when war with England after the close of the 14th century shut them out from the advancing civilization of that

| William asceeet ar ge 15.000 marks.

sources Of Farimut and was met by an aid from the cerry ané Seem= Easingr by Harold, earl of Caithness, and his son Turgitm (1]?7), and another by Guthred (1211), & dexmmiam of the mormaer of Ross, were qneled. The tr

as Benry Se Pwr on Germany and Richard in England : between the two countries brought the Scottish people. —

many of Gear ctaraarr date from his reign. Legislation

- eentinmed 1 Sie incm a assizes, which required the sanction

country, into contact with the chivalrous manners of the — court and the learning of the schools of France during the ©

Warwith best period of French history. Nothing came of the alliance | England. at this time, and two years later William and his brother

David, in whose favour he resigned the earldom of Hunting- |

don, attended the coronation (during his father's life) of the younger Henry at Windsor. That ill-judged step and the murder of Becket led to a domestic revolution, and William. tempted by the promise of the earldom of Northumberland, joined the young king against his father (1173). in the sieges of Wark and Carlisle, and next year was taken

He failed

prisoner at Alnwick by Ranulph de Glanville and sent by

Henry's order to Falaise in Normandy. To precure his

release he made a treaty with Henry by which he became ©

his vassal for Scotland and all his other territories. The Scottish Church then for the first and last time owned subjection to that of England. This treaty settles the disputed question of the Scottish homage. conquest and the captivity of its king that sueh terms

It was only by

could be obtained. To secure the observance of the treaty

the four burghs of Scotland were to be placed in Henry: hands and hostages giventill their delivery. The ambigzous terms of the clause as to the church enabled the Scottish bishops to refuse obedience to the see of York, amd. Canterbury having advanced a rival claim, Henry. mot displeased to see ecclesiastics quarrel, allowed the Scotus bishops to leave the council of Norham without acknowlede- ing it. The foundation of the abbey of Arbroath in memery of Becket, whom he had known at Henry's court, was almest the only endowment of William. At home he pat dows revolts in Galloway, Ross, and Caithness. A long dispute with successive popes as to the see of St Andrews aforded a signal example of the perseverance of William. He alse procured a distinct acknowledgment of the independence af the Scottish Church and its immediate subjection to Reme alone, which Henry II., now approaching the calamicoms end of his reign, could not

prevent; nor was he able t enforce payment of the Saladin tax from the Seetush bishops. Immediately after Henry's death Richard Cour de Lion, moved by the necessity of money for the erasades, consented for a payment of 10,000 marks to the abregatien of the treaty of Falaise (1189) as having been exterted

a agzat ommci 42m Eneland, the necessity of raising money Irst Qe? cae ar amunicipal rights and to facilities for some Cscissm T oobi effairs in what afterwards grew to be ae partie. This assembly was still the curia reps O Ge was a the King, and the Scottish parlia- ment never fot ametks of tts origin. William died at Sazimg m 1714 m Ge seventy-second year of his age. Tie fen =unpamr winch he took for his seal, became his epitel ani censsemt is chivalrous and determined character. =e == Gnr exemple, which his son and grand- son followed. af cubcvaume friendly relations with the Fagctsh gers, and bis efforts to maintain the inde- pendence of xrimnt wer: rewarded by internal peace. It was aniy Gi Se mmipme districts that risings had now to te feared. "The ammmiver of shires where the king's sheriff, Teqmentiy "Iv = gmlicy wise et the time, but afterwards danzeaems Ge "uet baron of the district, administered jusiee ai ie demi aownr increases, and this, as well as Ge gow af Sui, bron mso prominence the burghs, eacl Will & oT asi where the king in his frequent progresses Sei Ice vom. and if needful summoned the qreas commen af ibe resim. The chief burghs whose charte: date pom Tins reien are Perth, Aberdeen, Inver- ness, Dmices Lemer, Irvime, Ayr, Forfar, Dundee, Acoma. Worem frverorie, Kimtore, Banff, Cullen, and Naa=. Ther smmive ond sives, spread over the whole comirt, Mari & xeet molhcr and the progress of the iaeiem Ge aa o peace. A new diocese—Argyll —was Inmet dy seperation from Dunkeld, to which Joh Be Sere Gua hon. sexi his chaplain as knowing GaeEe . amg, Soumer Ge Hebrides were still Norse, this was 2 Sep Grew She complete organization of the ort geil Gr Se seaension of the kingdom which fol- lowe I le text fen reiens, when the Isles also were aided itd a Seri.

+ —

Sesier

rs eH, We est suede a: Enmeiend for Magna Charta, which Set reacted te comm. Ex sided with the English barons, wie Tate gt greene by which

Carlisle and the county a SNorcemieram? were to te given to Alexander. In Sime =f Gos pe be besiezed Norham, while the Tacs Inseaei at Winens 'Caria a clause by which John

son of William, was crowned Alexan- i= See in ins se~erteenth year, in time to take part in der I

Bc oT

promised to render to Alexander what was his right wit reference to the marriage of his sisters and his kingdom. unless the charters of his father William authorized other wise, and this was to be decided by the judgment of #2 peers in the curia regis. The position of the Scotisr king as one of the English barons in whose favour Marnz Charta was granted is pregnant evidence of the iaci tha: he was not, like John, Henry IIL, and Edward i., = monarch with imperial tendencies, the adversary ! ie rights of the barons and the people. The Scottish mime: in this century and Bruce in the nexi were ponudsay sovereigns, and their memory supported the crowr wher it was worn by less worthy successors. Next veat J an: broke the charter, reduced by the aid of mercenaris: mm northern counties of England, and, advancing mw Ses land, stormed Berwick and burnt Roxburgh, Haadmzvern and Dunbar. On his return he pillaged Coldmgham auc set fire to Berwick. Alexander retaliated by wastmt England as far as Carlisle, which town, but noi the casttc. he took in the autumn; then, marching to Dover. ne Git homage to Louis, the son of Philip Augustus, whom ine English barons had chosen as king. Next year (1227) ae again invaded England, but made peace with Henzy 1 which was confirmed three years later at York. Aiszana= agreed to restore Carlisle, do homage for his Engst mei: and obtain release from the excommunication which ie pope had declared against the barons and ter alize Henry promised to give Alexander one of his sister: = marriage and to procure suitable husbands for the Sectmet princesses. Accordingly, Alexander married Joan. & elder daughter of John, while Margaret, his sister, Be came the wife of Hubert de Burgh, earl of Kem aAL Isabella of Roger Bigod, earl of Norfolk, both movies wa took a prominent part in the Barons War. These alizames: rendered the peace with England more secure. and allows: Alexander to devote himself to the

reducviar i periodical insurrections of the Celtic and Norse cnet a his northern and western borders. He reducen Srovwi (1222), which he created a sheriffdom, and forcer Jem earl of Caithness, to surrender part of his lands ant aT compensation for his share in the burning of Acam sae bishop. The wisdom of his settlement of Argyl! was prover by the inhabitants repelling an attack by Haco, the Nors:

ing. He was equally successful in quelling the Tismos & two chiefs of the same name, Gillescop, one in te wes the other in Moray. Five years later (1230) 2 dispmEec succession in Galloway gave him the opportunity : cma tising that turbulent province and dividing ih amonr ture coheiresses. The fall of Hubert de Burgh anc tnt B- cession of Peter des Roches to the chief piace Be council of Henry IIL changed the atiitude of that Zur towards Scotland, but Otho, the papal legate, presenvet peace by a compromise of the rival claims. 4 ht mor than a year after the death of his wife Joan WiihOT 3s5m Alexander married Mary de Couci, dauchter o 2 Prenm noble house, which counted itseli the equal of EKmo aut Alexander IIL, the child of the marriage, 'war PETTOnRA. when an infant of a year old to Margaret. danome = Henry [Il Two years laver (1244) a setions Tamu: fomented by Walter Bisset, a Scottish exile. anc cause: by a projected alliance of Alexander with France: amc the erection of castles on the border, was avertel OF TH treaty of Newcastle, by which the kings of Emgiamc emt Seotland bound themselves not to make alliance: Wizt Gi enemies of each other. The last year of his ee wee eccupied in putting down a second rismmg im Galiowas and in preparing for an expedition agams: Thace. Want the view of annexing the Hebrides; but ie dwt a re at Kerrera, in the Bay of Oban, while mustermr ne Be These expeditions, all successful, are proof af Te ace

CANMORE TO ALEXANDER III. |

arc

LAND 485 ang, who must have been called " Peace- ial" "weause Ze areserved peace with England, for he was = Zac e westike monarci, enforcing the feudal levy, which, acommimc 0 Wactiew Paris. amounted in his time to 10,000 hore ax (00060 foot, and extending the feudal civil mvesrmesm. [like ins preriecessors, he was a benefactor eo te Sear.

speciaily of the new mendicant orders, wihes: aomeseztes vere founded in all the principal towns. Th: mses muervant of fis statites were the substitution @ cma iy jary “or the ordeals of fire and water, and the rerumiem of wai by atte, with provision for the case cq wees: sani che dergy. Ee was deemed, like David, a Tpstesur ft “he deer.

Seeeanier TT (1249445) was only eight years old when be cater Tec 4 saiccession of contests for the regency nemret & aty ot aonies who favoured English influence auf & uaaiomad party was the consequence. The former cell we ita ce coronation on the pretence that the wer mec we tot a kmght; but Comyn, earl of Menez. ‘weZed «hem Sy the proposal that the bishop « & Seitew= Gowd perform both ceremonies. The pemereai af ‘ns ieseent ‘rom the Celtic line of kings was msi: xcordiing D + “stom becoming old-fashioned, for tm: Gas ame sy # Highland sennachy, to please the Goatie axineets. winie the translation of the corpse of St Merars mio » preeions shrime at Dunfermline was cal- ochaset “ewe samilar effect in the Lowlands. Henry TL Set wcet te gene to declare the coronation illegal witieas (nsomsenr. ot the pope refused. Foiled in this, Hern ekteored w York the nuptials of his daughter and Se seen Enc, wiom he asked to render homage for his fei “The eniy shat te had not come to answer such 2 qussion anf wmas advise vith his counsellors implied faz: ke: “nal counselors little likely to grant it. About dee Game Daeward “He justiciar and Robert the chan- edlier wee: Tizessecd. and the earl of Menteith held the aad pemez ty Ere pears. A secret mission of Simon de Mietsee “Sef wo ie art of Warch, Durward, and other eieeeerme “he yong ing and aneen, and at a meeting ate Geers Sse ce Comyns and their supporters were wemyea Tem sfGee(155) and other regents appointed. Tas ream “baer “he Sisitoy of St Andrews got the pope to axemeore Dnrwarti and the English regents. Next wer & ommrmse vas otlected and a joint regency qe «omating oF the queen dowager and her een, He ort of Wenteith and Durward, and the somerrers: if “ert varties. When Alexander was nearly ee te art ot Wementh died, whereupon the king took te pvemmess mo ms own hands (1261). Henry, sumer mi he tage wth jus barons, could not interfere. Geoearite a mes cesnmer his father’s project for the peimiee 6 es Zehrdes. out Eaco, the Norwegian king, seresiiea! exe Gv uresiing Scotland, when a storm, which dasemeat ma fee. amet “he cosas of the battle of Largs (1263) Sered eee prs -oeche Orkneys. where he died. Magnus toe, “Ga of War the chief Norse

feudatory, a espera "Secret che Black. submitted to Alexander, exitiom somes? che isiands held out they were reduced oe ere of Guetta and War and Alan Durward. At gas Mere He emt Zaen, coneinded a treaty at Perth "ie oe catia Ge aarrendered Wan and the Sudreyar zea marear ot 400 narss and an annual rent of 100; Geom "he Hanon ot Srontheim were reserved. From feu ome te weateen ies vere subject to Scotland. At Se peters of (S% whieh settled the crown on the Met <= Worx. Geir creat nobles, descendants of Synmaetad qtesied we vassals, and the subsequent revolts og weet Heer weer manty' vere instigated by the English Sec wy 'Greet efmi ailies m the chiefs of the Isles. i Se Genes Ver Sexancier sided his father-in-law, on

1215-1266.

Alexan- der III.

Reduction

of the western isles.

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whose side three Scottish barons, John Comyn, Robert Bruce, and John Baliol, fought at Lewes, where the first two were taken prisoners. In the matter of the independence of his kingdom Alexander was as firm as his predecessors, and would not allow Henry himself or the legate Ottobon to collect within it a tithe for the crusade which the pope had guaranteed to the English king. On the accession of

[HISTORY.

A regency administered the kingdom for five years after Alexander's death. A conference at Salisbury between commissioners of Erik of Norway, Edward I., three of the regents, and Bruce, lord of Annandale, agreed that Margaret should be sent home unbetrothed. Her marriage to Ed- Treaty ward's son, for which a dispensation had been got from of Brig- Rome, was sanctioned by an assembly at Brigham near b@™-

1266-1292.

Edward I. (1272) Alexander attended his coronation, but neither then nor six years later, when specially summoned to Westminster, would he do homage for Scotland. The closing years of Alexander were saddened by domestic losses. His wife died in 1273, his younger son David in 1281. His only daughter, Margaret, married two years before to Erik of Norway, and his elder son, Alexander, both died in 1283. The following year the estates at Scone recognized the succession of Margaret, the Maid of Norway ; but Alexander, in hope of a male heir, married Joleta, daughter of Count de Dreux. At the festivities in Jedburgh in honour of the marriage a ghostly figure in the masque was deemed an omen of the king's death, which

Roxburgh (18th July 1290), in a treaty which made anxious provision for the independence of Scotland. This country was to remain free, and, saving the right of the king of England in the marches or elsewhere, separate from Eng- land by its lawful bounds. No parliament was to sit, and no Scottish suit to be tried, out of Scotland. Edward con- firmed this treaty by oath; but the death of Margaret in the Orkneys rendered it abortive. To prevent an armed contest for the crown, Fraser, bishop of St Andrews, invited Edward to intervene, and certain Scottish nobles made a similar request. He accordingly summoned the Scottish estates to meet him on 10th May, and the English parlia- ment on 3d June 1291, at Norham near Berwick.

When Competi-

followed from a fall near Kinghorn (1285). The prosperity of Scotland in his reign was celebrated in one of the earliest verses preserved in the Scottish dialect—

' Quhen Alysander oure kyng was dede,*

the Scots came Edward refused to judge the cause of the tion Scottish succession unless his title as superior of Scotland a was admitted. After some delay the barons and clergy aad :

gave the admission, as also did the claimants—no fewer Baliol.

Feudal Under the wise rule of three kings, extending over | the kingdom should be given to Edward; a week later Scotland. more than a century—a circumstance rare in that age— | the regent surrendered the kingdom of Scotland and the Scotland attained a degree of wellbeing before unknown, | keepers the chief castles into his hands as lord paramount. which did not return till the 18th century. The extent of | He restored possession after adding several Englishmen the revenue is attested by the returns of the sheriffs to the | to the regency. After another adjournment the com- chamberlain and by the accounts of the tax which Boiamund | petitors put in their claims. Three descendants of David, de Vicci, the pope's representative, levied from the clergy for | earl of Huntingdon, brother of William the Lion—all the crusade. Berwick, the chief Scottish port, was likened | English barons, though one, Bruce, had large estates in to Alexandria, and attained an importance it never recovered | Scotland— were alone serious. John Baliol claimed as after its union with England. Its customs were reckoned | grandson of David's eldest daughter Margaret, wife of as equal to a third of those of all England,—a statement | Alan, lord of Galloway ; Robert Bruce as son of David's hardly credible till we remember that the trade of Britain | second daughter, wife of the lord of Annandale; while was chiefly with France and Flanders, and that a harbour | David de Hastings, grandson of the third daughter Ada, for small craft was sufficient. The personal character and | contended that the kingdom was partible. This last ques- bravery of these kings subdued the turbulence of the | tion was postponed until the claims of Baliol and Bruce had outlying districts and kept in check the ambition of the | been considered. After two long adjournments it was at nobles. The bounds of the kingdom were almost as they | last decided (14th October 1292) that the case was to be now are, and the name of Scotland permanently passed to | ruled by the law of the kingdom applicable to titles of the whole country south as well as north of the Forth. | earldoms, baronies, and other indivisible inheritances, and In spite of differences of race, the unity of the nation had | "that by this law in every heritable succession the more been secured, and its independence was acknowledged by | remote by one degree descended from the eldest sister the pope and other sovereigns ; the English alone kept up | was preferable to the nearer in degree from the second." a nominal claim to rights which had for short periods been | Edward accordingly decided (17th November 1292) in Baliol held by Canute and

the Conqueror, and for longer by the | favour of Baliol. Two days afterwards the regents were a second Henry, until they were abandoned by the treaty | ordered to give sasine to Baliol; the day following he "™& of Canterbury. But now all was to be changed. Three | swore fealty to Edward at Norham; ten days after he was centuries of war, though diminishing in intensity as time | crowned at Scone; within a month he did homage to Ed- went on, display heroic character, but imply an amount of | ward at Newcastle. suffering to the people which cannot be told. Perhaps a The judgment was just, according to the principles of contest between the two proud nations which shared Britain | feudal law afterwards fixed, though then imperfectly estab- was inevitable, yet the reigns of the Alexanders suggest a | lished, in favour of primogeniture ; the acknowledgment different possibility. That the contest came when it did | of the suzerainty of Edward was a different matter. In was due to the disputed succession on the death of Mar- | the course of the proceedings Edward obtained from the garet, the Maid of Norway. This gave to the ambition of | cathedrals and religious houses of England .returns of Edward I. an opportunity to reduce the whole island to | homage by Scottish kings. No such returns were asked his sway, which he was quick to seize. from Scotland. Those from England recited the well- Maid of 5. War of Independence ; from Death of Alexander IIT. | known cases of isolated conquest followed by homage to Norway. to Accession of House of Stuart.—The Maid of Norway, | Saxon, Danish, and Norman kings, Edward the Elder and

That Scotland led in luve and le, Away wes sons of ale and brede,

Of wyne and wax, of gamyn and gle, Oure gold was changed into lede.

Cryst, born into virginite, Succour Scotland and remede

That sted in his perplexitie."

whose right was at once acknowledged (for Scotland, like England, knew no Salic law), was not to wear the crown.

than thirteen—but the representatives of the commons withheld any such acknowledgment. The court for the decision of the cause was then appointed. Forty members were named by Baliol and as many by Bruce,

between whom the competition really lay, while Edward chose twenty-four. On the following day the competitors agreed that sasine of

Athelstan, Canute and the two Williams, and the treaty of Falaise by which William the Lion surrendered the

independence of Scotland. They ignored the treaty of Canterbury by which it was restored, the clause of Magna Charta relating to Scotland and the rights of its king, the refusal of the last two Alexanders to render homage for their kingdom, and the treaty of Brigham by which Edward had acknowledged the independence of Scotland. One result of the submission to the English king over- looked by the eager competitors, but not by the lawyers who advised Edward, immediately emerged. An appeal was soon taken from the court of Baliol to the court of his superior at Westminster. Baliol referred in vain to the express clause in the treaty of Brigham that no Scottish suit was to be tried beyond Scotland; Edward replied this was an appeal from his own officers during the interregnum, but asserted his right to hear appeals in all cases. Other appeals followed, and Baliol weakly surrendered his claim to independent jurisdiction. Shortly afterwards (October 1293) he was himself summoned to Westminster as defend- ant in a suit by Macduff, son of the earl of Fife. Declin- ing to appear, he was condemned for contempt, and three of his principal castles were ordered to be seized. He again yielded and promised to attend next parliament. There could be no longer doubt what had been the effect of sub- mitting the dispute as to the crown to Edward. Instances of homage had not been difficult to find; but the records might be ransacked in vain for an example of what would now become frequent,—the adjudication by the court of the English king on the rights of Scotsmen. The exe- cution of this decision by force in Scotland carried with it at no distant date the subjection of the kingdom. Baliol quitted Westminster suddenly in 1294 to escape service in the Gascony war. By yielding in the question of appeal he had lost the confidence of the Scottish barons. In the parliament of Scone a council was appointed to con- trol him, and all fiefs held by Englishmen were forfeited. In the following year he formed an alliance against Eng- land with the French king, and his son was promised the daughter of that king's nephew,

the count of Anjou, in marriage. The Scottish army headed by six earls then invaded England, but was repulsed at Carlisle (28th March 1296), and Edward, leaving his French campaign, at once marched northwards. Before the end of March 1296 he stormed Berwick. While there the abbot of Arbroath brought him a renunciation of Baliol's homage. Dunbar was taken soon afterwards by the earl of Surrey; Rox- burgh, Jedburgh, and Edinburgh fell before the end of June ; Stirling, Perth, and Scone surrendered without a blow. At this time no Scottish town was walled and no resistance could be made against the English feudal levy led by such a general as Edward. In the churchyard of Stracathro in Forfar Baliol renounced his alliance with France, and a few days afterwards (10th July) surrendered Scotland to Anthony Beck, bishop of Durham. Edward marched as far as Elgin, but it was a conquest of Baliol, not of Scotland. This impotent monarch was carried captive with his son to London and vanishes from Scottish history. He died at one of his French fiefs twenty years afterwards, never having attempted to regain the kingdom. On his homeward march Edward took and recorded in the Ragman Rolls the homage of the Scottish nobility, and carried to Westminster the sacred stone of Scone, on which the Celtic monarchs had been crowned, and the black rood of Margaret, the hallowed relic of the Saxon line. Surrey was appointed guardian, Sir Hugh Cressingham treasurer, and William Ormsby justiciar of Scotland; the nobles were treated with lenity and the bishops bribed by the privilege of bequeathing their movables like their English brethren. The most important result of the campaign was the capture and fortification of Berwick. That city, the key to the Lothians, was the commercial capital ;

and Scotland was left without one until the rise, after the 1292-1298.

was beaten by light-armed peasants.

union, of Glasgow and the mercantile centres of the Clyde.

When the fortunes of Scotland were at the lowest, when Wallace's

the country was deserted by the king, and its nobles and

the man of the people, appeared. The second son of Sir Malcolm Wallace of Elderslie near Paisley, his name in- dicates a remote Celtic origin from a Welsh or Cambrian stock. In the spring of 1297, in revenge for the murder of his wife, Wallace slew Hazelrig, sheriff of Ayr, and burned Lanark. Collecting a band of followers animated with like patriotism, and aided by a single noble, Sir William Douglas, he surprised and drove Ormsby, the

justiciar, from Scone and Beck, the bishop of Durham,

from Glasgow. Some of the barons, headed by James the Steward, joined him, and Wallace and Douglas carried everything before them in Lennox and Galloway, —dis- tricts more favourable to the national cause than Lothian. The nobles fell away from Wallace almost as soon as Percy

appeared at the head of an English force, and Douglas, the

Steward, Bruce the future king, and others capitulated at Irvine (9th July 1297). Wallace, while engaged in the siege of the castle of Dundee, heard that Surrey and Cress-

ingham were advancing on Stirling, and he marched to its

relief, There at the bridge over the Forth near Cambus-

kenneth he won his most famous victory (11th September). The English were totally routed and Cressingham was

killed. The disparity of numbers was great, for the

English had 50,000 foot and 1000 horse, against at most

40,000 foot and only 180 horse. The generalship of

Wallace, who tempted his adversary to cross the bridge in

his face and held his troops in hand until the moment of the charge, won the day, the first in which a feudal army Wallace attempted to organize the

kingdom he had won. He assumed the title of guardian of the realm in name of the Lord John (Baliol), and associated with himself Sir Andrew Moray of Bothwell, son of the only baron who stood by him and who fell in the battle. He held the nobles in awe, while he rewarded his adherents. The grant (fortunately pre- served) of the office of constable of Dundee to Alexander Scrymzeour can scarcely have been a solitary one. He introduced better discipline in the army, and tried also to revive trade! Shortly after the battle of Stirling Wallace carried the war as far as Hexham, whose monks he protected. That he penetrated farther south and won the favour of Eleanor, Edward's wife, is one of the romantic additions to his scanty history in the poem of Blind Harry. Edward recognized the crisis and, leaving Flanders, sent a force before him under Pembroke, following in person at the head of 80,000 foot and 10,000 horse. For a brief space success attended Wallace, who defeated the English in Fife and Ayr; but the bishop of Durham retook the castle of Dirleton, and Edward himself, by the victory of Falkirk (22d July 1298), in which the nobles again proved false to the popular cause, reversed that of Stirling. Wallace took refuge in France, and, although the French king at Amiens offered to surrender him, he was soon re- leased and provided with a safe conduct to the pope. Papers found on him when captured show that he received similar letters from Haco of Norway.and Baliol. Whether he went to Rome is not certain, but he may have been one of the Scots who at this time induced Boniface VIII. to claim the superiority of Scotland. The claim was in- dignantly repelled by the English barons at the parliament of Lincoln; Edward, however, thought it prudent to lay before the pope a statement in which he advanced not only

1 A letter from him and Moray to the citizens of Liibeck and

Hamburg who sympathized with the Scottish commons has been found in the archives of Hamburg.

struggle : : de- clergy were making terms with the conqueror, Wallace, eae

1298 -1328.

Settle- ment of Scotland by Ed- ward I,

Robert the Bruce.

the instances of homage collected for use at Norham but the fable of Brute the Trojan, from whose eldest son Locrinus he claimed descent, and therefore superiority over the Scottish kings sprung from Albanactus the second as well as those of Wales descended from Camber the third. Baldred de Bisset, the Scottish commissioner at Rome, in his answer admitted the pope's right, but replied to Edward's fiction by another as bold,—the descent of the Scots from Scota, the daughter of Pharaoh. A more solid argument was founded on the treaty of Brigham. The pope delayed judgment, and in 1302 suddenly changed sides and exhorted the Scots, by several bulls, to submit. Edward had not waited for this sanction; the period be- tween the battle of Falkirk and the taking of Stirling was a continuous and bloody struggle. In person he laid waste Galloway and took Caerlaverock (1300) ; in 1302, his general Sir John Segrave, having fought a battle of doubt- ful issue with Comyn and Fraser at Roslin, Edward re- turned (1303), marched as far as Caithness, and reduced the whole east of Scotland by the capture of Stirling (24th January 1304). Scotland was subdued, yet Wallace lived, and we catch glimpses of him, in the woods of Dunferm- line, in the forest of Ettrick, in the neighbourhood of Lanark, A price was set on his head, and at last he was betrayed by a servant of Sir John de Menteith near Glasgow and taken to London, where, after a mock trial in Westminster Hall, he received the traitor's doom (23d August 1305), though he denied with truth that he had taken any oath to Edward.

This time Edward, in order to make the conquest of Scotland permanent, proceeded to incorporate it in the empire of England. With apparent fairness an assembly was summoned to Perth to elect ten representatives to attend a parliament at Westminster to treat of the affairs of Scotland. Nine commissioners came to London, where they were associated with twenty Englishmen. The result was the "Ordinacio facta per dominum regem pro stabili- tate terres Scotia" (1305). Though never fully carried out, this document, on the model of similar ordinances for Wales and Ireland, discloses Edward's designs. English nobles were appointed to administer the government of the country, and eight justices to administer the law. The law and usages of Scotland (except those of the Brets and Scots, which were abrogated) were to be observed in the meantime ; but the lieutenant (John

of Brittany, the king's nephew) and council were to amend what was contrary to God and reason, or in case of difficulty refer to Edward at Westminster. The whole country was divided into sheriff- doms, the sheriffs being removable at the discretion of the lieutenant. The office of coroner, more important then than now, was also regulated ; certain persons were nomi- nated constables of the chief castles 3; and many nobles were fined and others banished. Bruce (the competitor's grandson) was ordered to put Kildrummy Castle (Aberdeen) in charge of an officer for whom he should be responsible, The ordinance was suitable to its object,— moderate, even humane. The banishment of the nobles was limited as to time. Relief was given in the payment of fines. Many old officers were continued. Edward's aim at this time was to pacify the country he had conquered, to put down resistance, but to encourage submission. I¢ js as wrong to call him a tyrant 'as Wallace a rebel: the one was a statesman king with imperialist aims, the other a patriot leader with keen popular sympathies, The king triumphed; but before his death his well-laid plans were shattered : Scotland again rose in arms, and this time the nobles joined the people, under the leadership of Robert the Bruce.

The position, as well as the character, of Bruce con- trasted with that of Wallace. Instead of being a cadet of the ordinary landed gentry, Bruce represented a family in

which for more than two centuries the purest Norman

blood had flowed. The English branch of Skelton in Cleveland and the Scottish branch of Annandale divided their large possessions ; but those of the latter sufficed to make its head one of the most powerful nobles in Scotland, who still retained, as so many did, English fiefs. More than one of his ancestors had intermarried with the royal house of Scotland (see Roper? THE Bruce, vol. xx. p. 592). On his father's death Bruce succeeded to Annandale. He held besides several manors in England. During the early part of the War of Independence, like many barons with conflicting interests, he had wavered, sometimes supporting Wallace, more frequently

the English king. In 1303-4 he assisted Edward in the preparation for the siege of Stirling. He had been consulted with regard to the ordinance of 1305. But there were already signs of mutual distrust. The provision in the ordinance as to Kildrummy shows that Edward was aware special precautions had to be taken to secure the loyalty of Bruce, and on 11th June 1304 Bruce secretly met near Cambuskenneth Lamberton, bishop of St Andrews, and entered into a bond referring to future dangers from Edward. Of all the Scottish clergy Lamberton had been most friendly to Wallace, and this bond was a link between the two periods of the War of Independence and their leaders. Bruce had attended at Westminster when the ordinance was settled, but left sud- denly, arriving at Dumfries on the seventh day. There he met in the church of the Friars Minor John (the Red) Comyn of Badenoch, Baliol's nephew, and slew him before the high altar (10th February 1306). The die was cast, and indecision vanished from the character of Bruce. Collecting his adherents at Lochmaben and Glasgow, he passed to Scone, where he was crowned by the bishop of St Andrews. It at first seemed likely that a saying of his wife would prove true,—that he was a summer but would not bea winter king. His defeat at Methven (19th June 1306) was followed by another at Strathfillan (11th August), and Bruce took refuge in the island of Rathlin (off Antrim, Ireland). The tales of his hairbreadth escapes, his courage and endurance in all changes of fortune, were gathered by Barbour from the mouths of the people, who followed the life of their champion with the keenest in- terest. Meanwhile Edward came north and gave a fore- taste of his vengeance. But his severity strengthened the party of Bruce, which grew daily. All classes now made, with few exceptions, common cause against the enemy of all. Edward's death at Burgh-on-Sands (7th June 1307) at once changed the whole aspect of the invasion. Edward IT. wasted in the ceremony of a funeral and the diversions of a youthful court the critical moment of the war. Bruce seized his opportunity, and by the close of 1313 Berwick and Stirling alone remained English. The independence of Scotland was finally determined by the ever-memorable victory of Bannockburn (24th June 1314).

Bruce reigned fifteen years after Bannockburn and (if the Irish expedition of his brother Edward be left out of account) with almost uninterrupted success. On his return from Ireland he reduced Berwick (March 1318) and con- verted it from an English to a Scottish frontier town. His recognition

by the pope was followed by the acknow- ledgment of Flanders and France; and the long truce which Edward IT. had been forced to agree to before his death became in the new reign a formal treaty known as that of Northampton (April 1328). By its leading article Treaty of "Scotland according to its ancient bounds in the days of me Alexander ITI. shall remain to Robert, king of Scots, and 7™P™ his heirs, free and divided from England, without any sub-*

jection, servitude, claim, or demand whatsoever." In pur-

suance of another article Johanna, Edward's sister, was married to David, the infant son of Bruce, at Berwick on

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David II.

Struggle against Edward Baliol,

WAR OF INDEPENDENCE. |

equal justice for poor and rich, and framed strict Acts against sedition. shipbuilding, foreseeing its future importance to Scotland. Never off his guard, amongst his most anxious legislative provisions are those relating to the defence of the kingdom, —arming all able-bodied men, prohibiting exports of arms, fortifying the towns and castles on the borders, arranging signals to give notice of invasion. Though attacked by leprosy contracted in his campaigns, he remained active to the last,—a monarch such as occurs only once in many centuries, brave, liberal, wise, and pious, like the English Alfred, the darling of the nation he had delivered. (For fuller details, see RoBERT THE Bruce, vol. xx. p. 594 sq.)

The wise provision that Bruce made for the regency secured the peaceful succession of his son David II, (1329- 70), who was the first Scottish king anointed at his coro- nation,—a privilege conceded to Bruce in a bull which reached Scotland after his death. According to the ideas of the age this placed the Scottish king on an equality with the sovereigns of Europe. quickened the sentiment of Scottish nationality, and left the country poorer

in wealth but richer in spirit. The memories of Wallace and of Bruce educated the people and produced in the next generation their earliest literature. England, unconscious of the benefit, gained by its own de- feat. But for the resistance of the Scots it might have be- come earlier than France a centralized feudal monarchy. The distinct character of the Scots—a blend of the Celt, Saxon, Norseman, and Norman—strengthened by variety the collective force of Britain. The loss which must be balanced against the gain was the bitter hatred between two races of kindred origin within one narrow isle, which for centuries retarded the progress of both, especially of the smaller kingdom.

The almost contemporaneous reigns of David IT. and Edward ITI. reversed the position of the two countries : Scotland had now one of its feeblest and England one of its most powerful kings. Had not the love of liberty become the life-blood of both nobles and commons in Scot- land it must have succumbed in the desperate struggle. After the death of Robert, Randolph, earl of Moray, governed with wisdom and vigour for three years. On his death the estates chose Donald, earl of Mar, another nephew of Bruce, whom he had passed over, foreseeing his inca- pacity. Encouraged by the divisions of the nobles, Edward, son of John Baliol, with the barons who had lost their land by espousing the English side, suddenly landed at Kinghorn. Nine days after his election, Mar was met and worsted by Baliol on Dupplin Muir (11th August 1332), where Mar him- self and many nobles were slain. Baliol was crowned at Scone; but Perth was immediately retaken, and Baliol, hav- ing been defeated at Annan by the young earl of Moray, left Scotland. Next year Edward came with a large army to his support and defeated at Halidon Hill (20th July 1333), chiefly through the skill of the archers, the Scots led by Archibald Douglas, lord of Galloway, who was now regent. Berwick capitulated and Baliol surrendered it to England, pledging in addition the castles of the Lothians, including Edinburgh and Linlithgow, in security for an annual tribute of £2000. Like his grandfather, Edward IIL. made a new ordinance for the government of Scotland, but his officers never obtained possession of their posts. Meantime David and his queen fled to France, where they remained seven years. Fortunately for Scotland a new race of patriotic leaders appeared: Moray of Bothwell handed down the

12th July. As an administrator and legislator he showed an ability not inferior to that which in his earlier years he had manifested as a warrior and a general. He obtained from the estates a settlement of the succession, reformed abuses in the feudal law, regulated the courts, providing

He also encouraged trade, especially

The War of Independence

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traditions of Wallace and Bruce, while Robert the Steward, 1328-1365, Douglas the knight of Liddesdale, and Sir Alexander Ramsay of Dalhousie sustained the fame of Bruce, Ran- dolph, and Douglas. The attraction of a French campaign with the crown of France as prize prevented Edward from ever using his whole force against Scotland, and a French fleet made a diversion by attacking the Channel Islands and threatening the Isle of Wight. Edward retaliated by assuming the title of king of France, and after two years' preparation invaded that country from Flanders. The armies met at Vironfosse (26th September 1339), where David of Scotland was present. Never was the pomp of chivalry seen in greater splendour, but the first act of the Hundred Years' War, which seemed destined to make French and English eternal enemies and French and Scots perpetual allies, passed without a blow.

Two years later the recovery of the Scottish castles and David's the repulse of Salisbury's attempt on Dunbar made it safe captivity for David to return to Scotland, which Baliol had aban- me doned. Though scarcely eighteen, he assumed the govern- ment (30th March 1342). Before his arrival Edinburgh had fallen, and next year Roxburgh was taken by Sir Alexander Ramsay, whom David unfortunately rewarded by the sheriffdom of Teviotdale, which the knight of Liddesdale claimed, and Ramsay, seized by treachery, was Starved to death at the Hermitage by the knight of Liddesdale, who entered into correspondence with the English king, and dishonoured his name of the "Flower of Chivalry." Bullock, an ecclesiastic who had risen to the office of chamberlain under Baliol and transferred his

services to David, met the same fate at the hands of the king on a suspicion of treason. Other signs of weak government were not wanting. On the conclusion of a brief truce, David, tempted by Edward's absence, invaded England in spite of the defection of some of his chief nobles, and was defeated at Neville's Cross (17th October 1346) near Durham by the archbishop of York and the northern barons, the king and several of his nobles being taken prisoners. The rigour of David's captivity (which lasted eleven years) was relaxed so far as to allow him to return frequently to Scotland and try to persuade the people to raise his ransom, which the English king urgently required. Though Baliol was still acknowledged as nominal king by Edward, he resided in Galloway, while Robert the Steward, elected regent in the name of David, really governed, At length by the treaty of Newcastle (13th July 1354) David's ransom was agreed on, sufficient hostages being taken for its payment. Next year the French king resumed the Scottish war by sending Eugene de Garanciére with men, money, and arms. Several border engagements followed, but Edward, advancing to the frontier, took Berwick, and obtained from his puppet Baliol an absolute surrender of the Scottish kingdom for an annuity. He ravaged the Lothians in the raid called the Burnt Candlemas, but failed really to reduce the country. Edward's victory over the French at Poitiers, in which many Scots were slain, forced the Scottish parlia- ment to grant the terms dictated by the English king. Peace was finally concluded by the. treaty of Berwick (3d October 1357), and confirmed at Scone,—the ransom being raised and the condition as to hostages made more severe, David at once returned to Scotland. But his sympathies Relations had become English ; he revisited that country almost with Ed- every year, and it required all the strength of the Scottish ¥2"4 UI. estates to prevent the son of Bruce from making a surrender of his kingdom more ignominious than Baliol's. The enormous ransom pressed hard on so poor a country. An attempt to induce France to resume the war failed, and David, like a debtor dealing with a money-lender, had to renew his bills at usury. Negotiations for this purpose

1365-1390. went on till 1365, when a truce for four years was agreed

Robert iL,

to. Edward and David latterly devised schemes for pay- ment by another process,—the transfer of the crown at David's death to an English prince. At the parliament of Scone David proposed that Lionel, duke of Clarence, should be recognized as his heir; but the estates replied with one voice that no Englishman should rule Scotland, and renewed the settlement of the succession by Bruce on Robert the Steward. Hatred of foreign aggression and the weakness of the king enabled the Scottish barons to playa part similar to that taken by the nobles of England in the reigns of Johnand Henry IIL., and obtain guarantees for the constitution by limiting the monarchy. Such was probably the origin of the committees of parliament (at a later date turned to an opposite use) for legislation and for judicial business which first appear in 1367,—the statutes for the more regular administration of justice, purity of the coinage, and the revocation of the grants of royal revenues and estates. It was expressly declared that no attention was to be paid to the royal mandate when contrary to law. About this period David entered into a secret agreement with Edward, promising in return for a remission of the ransom to settle the crown on him failmg heirs of his own body, but the public negotiations for its payment went on. In the same year his marriage with his second wife, Margaret Logie, a daughter of Drummond, a lesser baron, led to a revolt. He quelled it and threw the steward and at least one of his sons into prison, making lavish grants to Margaret and her relatives. Her influence did not last long, as she was supplanted in the king's favour by Agnes of Dunbar. Margaret was divorced by the Scottish bishops, for what cause is not known, and, though her appeal to the pope succeeded, David did not. survive the decision. He died on 21st February 1370, childless, and the succession opened to Robert, son of Bruce's daughter Marjory, the first of the Stuarts who were to govern Scotland for the next two centuries.

6. House of Stuart from Robert IT. to James IV.—The descent of the house of Stuart is traced from Walter Fitz- Alan, a Norman, steward of David I. His estates were in Renfrew, to which Alexander, the fourth steward, added Bute by marriage. Walter, the sixth steward, was scarcely one of the chief nobles ; but his prowess in the War of In- dependence gained him the hand of the daughter of Bruce. Robert II. was their only son. Such was the prosperous

record of the family before it ascended the throne. Its subsequent history presents a series of tragedies of which that of Mary Stuart is only one, though the most famous. While the fate of kings excites the imagination, history must trace the growth of the nation and the slow changes which transformed the bulk of the Scottish people from loyal subjects to bitter enemies of their native kings and its kgs from patriots to tyrants.

Robert IT. (1370-90), already fifty-four, continued rather than commenced his government on the death of David IL, for he had been twice regent during David's exile and cap- tivity. He did not ascend the throne without opposition, but the memory of Bruce was too fresh to admit of his settlement being put aside. The earl of Douglas, whose great estates on the border made him more formidable as a competitor than his claim by descent from a daughter of David, earl of Huntingdon, was conciliated by the mar- riage of the king's daughter Isabella to his son and by his own appointment as justiciar south of the Forth and warden of the eastern marches. This impediment removed, the coronation proceeded, and it was followed by a public de- claration of the settlement of the crown on Robert's son John, earl of Carrick, at his father's death. A still more explicit settlement was made two years afterwards on the

king's sons by his first marriage with Elizabeth More,— John earl of Carrick, Robert earl of Fife, and Alexander lord of Badenoch ; and failing them on those of his second with Euphemia Ross,—David earl of Strathearn and Walter his brother. A question as to the legitimacy of the children by Elizabeth More rendered this declaration necessary. The first fourteen years of Robert's reign passed with scarcely anything worthy of record. The king, whose portrait is drawn by Froissart as a man "not valiant, with red bleared eyes, who would rather lie still than ride," left the cares of government to his sons, especially the second. England, after the death of Edward IIL (1377), was occupied with the necessary arrangements for a new reign and with the rising of Wat Tyler (1381). The absence of any movement in Scotland similar to this or the French Jacquerie perhaps indicates a better relation between the peasantry and the upper classes ; but

a third estate of the commons was as yet unknown in Scotland. John of Gaunt, who had invaded Scotland the year before, now took refuge there and was hospitably received in Edinburgh till the young Richard IL, by putting down the rising, made it safe for him to return. This visit led to the first entrance into the northern kingdom of the principles of Wickliffe and the Lollards, whom Gaunt favoured. The French, still anxious to incite the Scots to attack England, sent a small party of free lances, who landed at Montrose and were allowed to make a raid on their own account. They were followed by John de Vienne with 1000 men-at-arms and many followers.!_ The licence of the French knights did not promote good feeling ; but the interest of the two countries prevented a rupture. After the French left the Scots made another raid into Northumberland, in retaliation for an expedition in which Richard II. wasted the Lothians. Three years later, under the earl of Douglas, they attacked Newcastle, but were repulsed by Henry Percy, who, true to his name of Hotspur, in order to recover his pennon, pursued them to near Redes- dale, about 20 miles from their own border, and fought the battle of Otterburn (1388). Douglas himself fell, but the victory went to the dead man, for young Percy and his brother were taken captive, and the bishop of Durham would not venture to intercept the retreat of the Scots, In 1388, Robert's inactivity increasing and his son the earl of Carrick being disabled by a kick from a horse, the carl of Fife was chosen regent by the estates under condition of annually accounting to them for his administration. In April 1390 his father died. His prosperous reign rather than any personal quality except an easy disposition gained Robert the praise of Wyntoun, who, writing under his son, prays God to give him grace "To govern and uphold the land

In na war state nor he it fand,

For quhen his fadyr erdyt was

Of Scotland was na part of land

Out of Scottys mennys hand,

Outwith Berwick, Roxburgh, and Jedburgh." This prayer was only partially fulfilled. The English did not acquire more of Scotland, but the border war

was not so successful, and the royal house was the scene of tragic events which threatened to change the order of succession.

Robert III. (1390-1406)—for under that name the earl Robert of Carrick was crowned to avoid the hated name of John I:

1 Froissart gives a vivid account of the poverty of the country and the rudeness of its people. "The people set little upon the distinc- tion of their houses and said shortly how with three or four poles they would make them again, Edinburgh, though the king kept there his chief residence and it is Paris in Scotland, is not like Tournay or Val- enciennes, for in all the town there are not 4000 houses." The men Vienne brought with him had to be lodged in Dunfermline, Kelso, Dal- keith, Dunbar. On his return he was asked by the young king Charles VI. how he fared ; he said he had rather be count of Savoy or Artois than king of Scotland.

—was even less active than his father. He is briefly but truly described by an historian as a good man but not a good king. He scarcely reigned, for the regency of his brother continued after his accession till it was succeeded for a few years by that of Robert's son, on whose death the earl of Fife again became regent. There was a truce with England for nine years, during which the irrepres- sible love of fighting had to satisfy itself within Scotland. The king's younger brother, Alexander, called the Wolf of Badenoch, who had been created earl of Buchan, quarrelled with the bishop of Elgin and burnt his cathedral. The Wolf and his sons were constantly engaged in private wars. The earl died in 1394, but his son Alexander continued to defy the law, which the Government was too weak to enforce in the northern Highlands. Policy was used to suppress the violence of the clans. Such seems the ex- planation of the combat between thirty of the Clan Kay and as many of the Clan Chattan before the king on the North Inch of Perth, which ended in the slaughter of nearly all the combatants on both sides. In the council or parliament of 1398 a change was made in the Govern- ment due to the general distrust of Fife and the rising spirit of the earl of Carrick, the king's eldest son. The form of it was a compromise. The young prince was made lieutenant for three years, but with the advice of a council, of whom his uncle Fife was one; they were created dukes of

Rothesay and Albany respectively, the first of that title in Scotland. Other acts of this council were designed to restrain the monarchy by constitutional laws. Parliament was to meet annually. The king, if accused of misgovernment or breach of law, might, "to excuse his defaults," arraign his officers before the council. No one was to ride through the country with more followers than he could pay for, The grant of £11,000 for the common weal and profit of the kingdom by the three estates— barons, clergy, and burghs—was made under protest that it was not to be a precedent, and the burghs stipulated that in future they were not to pay more than under Robert IJ. In the following year the revolution took place in England which led to the deposition and death of Richard II. and the accession of Henry IV. An im- postor who had assumed the name of Richard took refuge in the- Hebrides and was received at the Scottish court. The expedition of Henry to Scotland (1400), partly due to this, was also prompted by the desire to distinguish a new reign and by the invitation of the earl of March, indignant at the preference given to the daughter of Douglas over his own as wife for Rothesay. Reviving the old claim of feudal superiority, which was now supported by the forged charters of Hardyng as well as the fictions of Geoffrey of Monmouth, Henry cited Robert to do homage at Newcastle, and, on his failing to appear, marched to Edinburgh. Rothesay successfully defended the capital, and Henry was suddenly recalled by the rising of Owen Glendower and the Percies. Next year (1401) occurred the death of Rothesay by starvation at Falkland, where he had been committed by his father at Albany's instance on account of his bad government and dissolute conduct. The declaration of the council at Edinburgh, which acquitted Albany of all concern in the death, was enough for the moment, but in after times, like Bothwell's acquittal, a corroboration of guilt. The last years of Robert were clouded by private and public misfortune. His queen, Annabella Drummond, his son-in-law, the earl of Douglas, and Trail, bishop of St Andrews, one of the wisest of his council, died within a short interval. The son of Douglas, though brave, was unequal to the task of holding the border against the Percies and the earl of March, and so constantly lost battles that he was called Archibald Tyne- man, The Scots were signally defeated at Nisbet Muir

(14th September 1402) in Merse and at Homildon Hill 1390-1413.

near Wooler by Percy, where the slain and prisoners equalled the number at Otterburn. Nor could order be maintained within Scotland itself, of which the forcible marriage of the countess of Mar by Alexander, a bastard of the Wolf of Badenoch, was an example. Afraid of Albany, and warned by the fate of Rothesay, Robert sent his remaining son James to France (1405); but the ship in which he sailed was taken by an English cruiser, and the future king was a prisoner in England for nineteen years. This last blow broke the weak heart of Robert, who died at Dun- donald and was buried at Paisley. Though his reign was inglorious, the tradition of the War of Independence still warmed the heart of the nation and produced the earliest writers in Scottish hterature,—Barbour, Fordun, and Wyn- toun. The Bruce of Barbour became the national epic.

The year after Robert's death the first martyr in Scot- land, James Resby, an English priest, was burnt at Perth by Albany, who is described by Wyntoun as "a constant Catholic." Resby was condemned at the instance of Laur- ence of Lindores, called the Inquisitor of Scotland, for forty theses from the books of Wickliffe. The Lollard doctrines continued to be secretly held by a small sect, chiefly in the west. Knox traces the descent of the first Scottish Re- formers—the Lollards of Kyle—from Wickliffe and Hus. This religious movement was destined to exercise a pro- found influence on the history of Scotland. The time when the church was a civilizing and purifying power was passing away. Its enormous wealth, a contrast to its early poverty, its developed so different from its primitive doc- trine, celibacy, and the confessional in a lax society, that was no longer moved by the fervour of a new faith, pro- duced a corruption which forced itself on minds of a reforming tendency. Catholicism allowed no place for individual reformers, and their protests, often carried to extremes, were deemed attacks upon the church itself, which became (unwillingly on the part of its best friends) the defender of its worst abuses. From first to last in Scotland the movement was popular, though not at first democratic. It did not at all or only to a slight extent change through political causes as in England.

Though he was a captive, the right of James I. (1406-37) James I.

on his father's death was at once acknowledged by a general council held at Perth; but the appointment of Albany as governor boded ill for his return.

ciliate all classes and pave the way to his own accession to the throne, which would have been his by right had the young king died. The recovery of Jedburgh (1408), iong in the hands of the English, gave the regent an easy opportunity of popularity. It was decided by a general council that its walls should be razed and the expense defrayed by a poll tax, but Albany refused to burden the people and paid it out of the royal customs. Next year Albany and Douglas (now released from captivity in Eng- land) entered into a bond of alliance. With the earls of March and Mar and others similar engagements were made; but Douglas, who had acquired the lands of March, which, however, were now restored, had to be conciliated by a grant of Lochmaben and Annandale, the patrimony of the Bruces. The more independent nobles of the north could not be so easily gained, and Donald, lord of the Isles, disappointed in a claim to the earldom of Ross, in- vaded Aberdeenshire with a great host, whose defeat by the earl of Mar at Harlaw (17th May 1412)—the Otter- burn of northern ballads—was followed by the capture of Dingwall, his chief castle on the mainland, and his final defeat at Lochgilphead.

The first Scottish university —St Andrews—was founded by bulls granted a year later at the instance of James and

He held the office Albany's thirteen years, administering it till his death so as to con- regency.

1418-1427,

Educa- tion of James I,

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Bishop Wardlaw, who had been his tutor. The higher education had already been to some extent supplied by cathedral and monastic schools ; but Scots who sought a complete curriculum had to resort to Oxford or Paris. One of their number, Major, expresses his wonder that the Scottish prelates had not

earlier thought of a national university. That now founded was destined to play an important part in promoting the Reformation and along with the later universities in civilizing Scotland.

Little of note occurred during the remaining years of Albany's regency. His futile siege of Roxburgh (1415), soon abandoned, got the name of the Fool's Raid. Greater credit attended the Scottish arms in France, where the earls of Douglas, Buchan, and Wigtown won battles for the French king, and lands and honour for themselves ; but the defeats of Crevant and Verneuil effaced the honours of Beaugé (in Anjou), and, though the remnant of the Scots remained as the king's bodyguard, no considerable num- ber of troops from Scotland afterwards went to France. Albany died at Stirling in his eightieth year (3d September 1419). His son Murdoch assumed the regency as if heredi- tary; but, himself indolent and with lawless sons, he did not retain the influence of his father. In 1423 ambassadors sent by the Scottish parliament to England at last arranged terms for the return of James from his long exile (12th May 1423).

Exile had its uses, and, except at the beginning and again after the accession of Henry V., his captivity had not been rigorous. Sir John Pelham was his governor, and he was instructed in Latin grammar, oratory, and poetry, as well as in bodily exercises,—wrestling and the use of the spear. Though distinguished for physical strength, his bent was to the Muses, and he became pro- ficient in dancing, music, and poetry. Buchanan blames

to the magic which in that age encircled the name of king. The first parliament of James at Perth passed quietly,

but with indications of a policy long meditated and now to be put into operation.

the sheriff what lands 'pertain to the king or has per- tained" in the time of the last three kings and in whose hands they now are. The choice of the privy council was significant. It was headed by Lauder, bishop of Glasgow,

who had negotiated the king's release, but none of the greater nobles were included. In their stead appear an unusual number of minor gentry, some holding high offices, The parliament held at Perth in the following year was the scene of a coup @état (12th March). Albany, his younger son Alexander, Alan of Otterburn his secretar : and Sir John Montgomery were seized on one day, and immediately after Isabella, Albany's wife, whose father, the earl of Lennox, had already been arrested. The only one of Albany's kin still at large, his youngest son J ames, made a short resistance, burnt Dumbarton, and slew the Red Stuart of Dundonald, the king's uncle, but, being hotly pursued, fled to Ireland. Parliament, at an adjourned sitting at Stirling, proceeded to the trial of Albany and his adherents, which was held with feudal solemnity before an assize. Albany, his two sons, and Lennox were con- demned and executed on the Heading Hill. Clemency was shown to those who had not been his intimate sup- porters. Historians are divided as to the policy or neces- sity for such severity. But it secured its immediate object; it was felt that Scotland had again a king to defend his rights. James for twelve years carried out, not without murmurs, but without successful opposition, his projects of reform.

One Act forbade private James war ; another imposed the penalty of forfeiture of life and and the goods for rebellion; and a third directed an inquest by 20bles

Foreign states recognized his power. At the request James's of the Flemish estates Middelburg was restored as the foreign market for Scottish trade; in return the privileges of Policy:

this taste as carried beyond what became a king, but no- thing in his after life showed he was ever led by amuse-

When thirty he was

ments to neglect graver studies. taken by Henry V. to France with the view of detaching the Scottish allies of the dauphin, but refused to be made a tool of, saying he had as yet no kingdom and they owed him no allegiance. He proved his soldiership by the capture of Dreux. On his return to England he married (11th February 1423) Johanna Beaufort, daughter of the earl of Somerset and grand-daughter of John of Gaunt. In the Kingis Quhair he

describes his love at first sight in the language of his master Chaucer, but with original genius. The marriage facilitated his release, which was negotiated for a sum of 60,000 marks. He confirmed the treaty at Melrose and was crowned with his bride at Scone (21st May 1423) by Wardlaw,—Albany, as earl of Fife, placing him on the throne.

He lost no time in addressing himself to the task of restoring the royal authority and the obedience to the law which the long regency had weakened. From this time dates the conflict between the king and the nobles,—the latter not maintaining, as in England, constitutional rights, but contending for exorbitant privileges. The experiment of government without a king had been tried too long not to make those who had exercised unrestrained power desire its continuance. The nature of the country—divided by rivers, mountains, and arms of the sea—the absence of great cities and the number of strong castles, the close con- nexion of the principal nobles by marriage and bonds of alliance, the large jurisdiction within their territories, the clanship not only in the Highlands and on the borders but in some measure throughout the whole country, which made fidelity to the chief a natural duty, strengthened the aristocracy and weakened the crown. The sovereign had to rely on the people and the clergy, on foreign alliances, on the influence due, partly to the virtues of his predecessors, partly

the Scots were guaranteed and Flemish merchants under- took to raise part of James's ransom. Flemish artisans and manufacturers settled in Scotland. More than one embassy passed to and from Rome with regard to the affairs of the Scottish Church, which James, while strictly repressing heresy (a Bohemian doctor, Crawar, being burnt as a disciple of Hus), showed his intention of reforming. The new pope Martin V. had put an end to the schism. The bitter enemy of the English king on account of the regulations which culminated in the Statute of Preemunire, he welcomed James's advances, James, while showing his attachment to the church by founding a Carthusian monastery at Perth and a Franciscan in Edinburgh, asserted his right to remedy abuses of the ecclesiastical courts, and addressed a letter to the Bene- dictine and Augustinian monks reproaching them for laxity. To Erik of Norway he sent an embassy and obtained a commutation of the arrears due for the Hebrides under the treaty of Largs. A marriage between

the dauphin and Margaret, his infant daughter, previously arranged, was celebrated shortly before his death. He thus estab- lished friendly relations with the Continent, and, though his position as regards England could not be the same, the truce was only twice broken towards the end of his reign—by a raid of the English, who were. defeated at Peferden (1425) by the earl of Angus, and his own attempt to recover Roxburgh. During the fourteen years of his actual reign James held thirteen parliaments, prov- ing his desire to obtain the support of the nation in his reforms. In 1426 he introduced the session, a royal court for civil causes sitting in the principal towns, to provide the justice too often denied in the baronial courts. Next year he summoned a parliament to Inverness—an unusual

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STUARTS TO JAMES IV.]

| Subjuga- place of meeting—for the purpose of restoring the peace

tion of High- _ lands.

Dealings with his nobles.

of the Highlands. Its records are lost; but the chief event was the seizure of Alexander, earl of Ross, lord of the Isles, and his mother, along with as many as forty chiefs. 'Two were beheaded and a third hanged, but most of them, including the lord of the Isles, after a short im- prisonment, were released. Ross at once raised the stan- dard of rebellion and burnt Inverness, but was defeated by James at Lochaber, where the clans Chattan and Cameron deserted to the royal side. On the Sunday following the former killed in a church the whole of the latter clan who were present. Another internecine conflict took place in Caithness seven years afterwards. Such private feuds, traditional amongst the Celts, were one cause of the success of James and of the ultimate subjugation of the Highlands. So completely was the power of the lord of the Isles broken that he came as a suppliant and placed his sword in the king's hands at Holyrood. His life was spared, but he was confined to Tantallon castle. In a parliament held later in the same year at Perth an Act was passed for the re- presentation of the shires and the election of a speaker; but this imitation of the English House

of Commons was not acted on. The Scottish parliament continued to sit in one chamber of lords, clergy, and commons, and it was only in the reign of James V. that representation of the shires was admitted. The following parliament (1428) provided that an oath of fealty should be taken to the queen by all persons succeeding to lands or dignities, which shows that James knew the danger of his policy. In 1429 an Act was passed for the protection of the tillers of the ground, who were not to be removed for a year, and provision was made for arming all landowners and burgesses. The birth of twins—Alexander, who died young, and James, afterwards king —strengthened the king's position by interposing two lives besides his own against any attempt at revolution. Two years later Donald Balloch, a kinsman of the lord of the Isles, renewed the rebellion ; but, though he defeated Mar and Caithness, on the approach of James himself he fled to Ireland.

In 1434 the king applied the statute of his first parlia- ment as to the resumption of lands to which no sufficient title could be shown. 'The estates of the earl of March were forfeited on the ground that Albany had exceeded his power in restoring-them. He was created earl of Buchan with the intention no doubt of removing him from The death

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was to spend Christmas at Perth. Before he crossed the 1427-1448.

Forth he was warned by an old Highland woman that if he passed he would never return. She tried unsuccessfully to get access to him again at the Dominican monastery at Perth, where he lodged. At midnight, when he was half undressed, Graham with 300 men surrounded the monas- tery. Their approach was heard; but it was found that the bolts had been removed by treachery. James was hastily concealed in a vault underneath the room. Before the conspirators entered a brave attempt was made by Catherine Douglas, one of the queen's maids, to bar the door with her arm, but the fragile obstacle broke and Graham burst in. The fall of another of the maids into the vault discovered the king, who fought fiercely for his life. The queen was wounded in trying to save him, ful- filling an unconscious prophecy of the Aingis Quhair. At last, after killing two of his assailants, he fell, overcome by numbers (February 1437). Vengeance speedily overtook the

murderers, who had made no provision to follow up their deed. Within a month they were all executed in a manner ‘ exceeding even the barbarous usages of the time. James was buried in the Carthusian monastery, where his doub- let was long kept as a relic and seen by the people with veneration. Such was the sad fate of the best of the Stuarts, —a king in advance of his age and too rapid in his reforms.

James IT. (1437-60), an infant of six, called “ Fiery-face ” James

from a red stain on one cheek, was crowned at Holyrood 11. five weeks after his father’s death, and there commenced one of the long minorities which the early deaths of the Stuart kings made common, and during which history is chiefly occupied with the contest for the person of the king. These have been truly represented as weakening the royal authority. The possession of power rendered the nobles impatient of restraint and accustomed to licence ; but they had also a reverse effect. When the monarch succeeded he was received with favour by the people as a deliverer from the oppression of the barons, too often petty tyrants. A rule of law allowing him to revoke grants in his minority was often used with great effect. On the whole, monarchy, in spite of the weakness and vices of the kings, was popular in Scotland until the Reformation and the fatal chain of events in which Mary was involved in- troduced a democratic tendency, which grew under the bad government of her successors. The nobles, though their word was law with their kinsmen and retainers, were seldom

favourites of the people. Archibald, fourth earl of Douglas, Struggles the greatest of the Scottish nobility and duke of Touraine fF re- in France, was lieutenant-general of the kingdom from ®&™%

the border and conciliating him for his loss. in 1435 of Alexander Stuart, earl of Mar, led to the lapse of that earldom to the crown on account of his bastardy,

and the following year the earldom of Strathearn was re- sumed on the ground that it was a male fee and did not pass to the wife of Patrick Graham, the heir-female. It was bestowed in life-rent on the king’s uncle, the earl of Athole, and Malise, the son of Patrick Graham, was made earlof Menteith. This assertion of right on the part of the king to deal with the

estates of the nobles though fortified by legal documents and recognized possession was certain to make enemies. It is more surprising that James so long succeeded in maintaining his authority than that he at last perished for doing so; but he had the people on his side. In the summer of 1436 he was obliged to relinquish the siege of Roxburgh owing to the barons' refusal of support. In October when the forfeiture of Strathearn was made in a parliament at Edinburgh, Sir Robert Graham, uncle and tutor of the young heir Malise, de- nounced the king in the boldest terms and urged the barons to seize his person; but, failing, he was banished from the court. As in other cases, this leniency was not requited. In his Highland retreat Graham formed a con- spiracy with Athole, the king's uncle, who aimed at the crown, and Sir Robert Stuart, Athole's grandson. James

James's accession till his own death the year after ; but Sir William Crichton, master of the household of James I., who was keeper of the castle of Edinburgh, where the young king was detained, appears to have exercised the chief power. Shortly after the death of Douglas James's mother carried off her son, on the pretext of a pilgrimage, to Stirling, of which Sir Alexander Livingstone of Callander © was governor. Livingstone laid siege to Edinburgh, but made terms with Crichton, who became chancellor. The alternate struggles and reconciliations of these rivals con- tinued till James was fourteen, when he favoured Douglas (the eighth earl) in order to free himself from their control. This was a time of civil or rather of private wars. The only contemporary chronicle marks almost every year with the seizure of a castle or a party fight. Douglas brought the earl of Crawford and his retainers from the Highlands, who ravaged the estates of the bishop of St Andrews, and himself besieged Edinburgh castle. The castle surrendered ; but Crichton, one of the adroit statesmen who rise after every fall, continued chancellor, and soon after, by negotiat- ing the marriage of James with Mary of Guelders (1448), ensured his favour with the court. Shortly after the cele-

1448-1466. bration of this marriage Livingstone, now chamberlain, with many of his kindred and friends, was suddenly arrested and tried before a parliament at Edinburgh ; two were exe- cuted, and the others, including

the chamberlain, attainted and placed in strict ward in Dumbarton. Douglas and Crichton received part of the forfeited estates. James was chiefly advised at this period by Bishop Kennedy, whose counsel was the old one of "divide et impera." He now determined to do to the more powerful Douglas as he had done to the Livingstones. The earl had shown no modera- tion in prosperity. His revenue and retainers equalled those of the king: 1000 horsemen were his ordinary train, and he attended tlie king's marriage with five times that number. His courts on the borders were almost parlia- ments. In the year of jubilee (1450) he went to Rome with a large suite. On his return he visited the new king of England, Edward IV. At the parliament of Edinburgh (1451) he submitted to the king's mercy, and at the request of the queen and' estates received a regrant of his lands and honours. He was already suspected of treason, and had in fact renewed a secret bond with the earls of Crawford and Ross, the most powerful nobles in the north, which threatened the royal authority. James felt a crisis had come and sum-

James's moned Douglas to Stirling at Shrovetide. There the young energetic king, in violation of hospitality and a safe conduct which rule. he had given the earl, when Douglas refused to break the bond with the other earls, struck him with his knife and killed him (21st February 1452)! An appeal to arms neces- sarily followed. Douglas's brother J ames, the ninth earl, came to Stirling and burnt great part of the town. But the clergy and commons and other nobles, some even of Douglas's own kin, not sorry at the fall of one who over- topped them, stood by the king. Parliament sanctioned James's act and declared Douglas had deserved death. At length, after repeated struggles, Crawford was defeated at the Muir of Brechin and Douglas fled to England. His estates were of course forfeited. The lordship of Douglas was granted to Angus. Ettrick Forest and Galloway were annexed to the crown. Some years later Douglas made another desperate effort against James, but after wasting Merse was totally defeated by Angus (1458).2 The energy of James in visiting all parts of his kingdom was con- spicuous during the last period of his reign. The good relations with the French and other Continental courts con- tinued, With England—one brief interruption excepted— peace had been preserved during the reign of Henry VI. Henry even agreed to restore Roxburgh and Berwick to Scotland in return for assistance against the duke of York. When Henry was taken

prisoner at N orthampton, his queen and her young son fled to Scotland, and James was called on to fulfil his engagements. He laid siege to Roxburgh, which for more than a century had defied his predecessors, and after a stout resistance it was taken; but James did not live to enjoy the triumph. When inspecting the dis- charge of a new gun it burst, and he was killed (3d August 1460). He had,not reached his thirtieth year. Char- His reign had been singularly fortunate, for he succeeded acter of (where his father failed) in restoring the royal authority and vaines'S reducing th f the nobles. Thi have b legisla. Teducing the power of the nobles. is may have been ee ee ee ES oe 1 The origin of two great families dates from the fall of Douglas. Sir James Hamilton of Cadzow deserted his kinsman for the king and received large grants of land and the king's daughter as wife. Sir Walter Scott of Kirkurd and Buccleuch, a border chief, was similarly rewarded. These were the ancestors of the dukes of Hamilton and Buccleuch.

? Tn the next reign along with the king's banished brother, Albany, he made a daring raid on Lochmaben, but being taken prisoner he ended his days as a monk at Lindores. A saying attributed to him, "Tf a man cannot better be, he may be a monk," was a sign of the change of times since Celtic kings were proud to assume the cowl.

partly due to the counsels of Kennedy, bishop of St Andrews, and Crichton; but James showed skill in govern- ment and vigour in war, though the murder of Douglas has left a stain on his character. The crown was richer at his death than it had been since the time of Alexander II, by many forfeitures secured from alienation by the Act of Annexation (1455, c. 41). The royal pre- rogative was strengthened by the first statute defining treason (1449, c. 25). Provision was made for the execu. tion of criminal justice by the king, his justiciar, and sheriffs, and of civil justice by the session. Stringent rules were laid down against violent spoliation of lands and goods (1449, c. 30). The coinage was regulated, an attempt made to preserve its standard, and to prohibit export of gold and silver (1451, c. 23). Towards the end of the reign, when war with England was impending, statutes were passed for the defence of the borders, giving the king more direct control, and declaring that the office of warden should not be hereditary. The progress of agri- culture was furthered by the famous Act for the encourage- ment of feu farm, an existing form of tenure becoming

more common, and another giving fixity of tenure to leases until the expiry of their terms notwithstanding alienation of the lands. There were also many minor laws which had for their object the welfare of the people. Though the legislation of James II. was not so large, it was perhaps as important as that of James I.

On the Sunday after his father's death James III. Minority (1460-88) was crowned at Kelso. A regency was formed of James consisting of the queen, Kennedy, and others. A parlia- Ut ment followed at Edinburgh, which was blamed by the nobles for leaving so much power in the hands of a woman : but there was a full appointment to the offices of state, and, though Mary of Guelders aimed at more than the guardianship of her son, it does not appear that she really exercised royal authority. After the defeat of Towton (29th March 1461), Henry VI. and his queen took refuge in Scotland. In return for their reception and in hope of further aid, Henry surrendered Berwick (23d April) to the Scottish king, in whose hands it remained till its final annexation to England at the close of the reign. Edward IV. retaliated by a treaty (13th February 1462) with the anished earl of Douglas, the earl of Ross, lord of the Isles, and Donald Balloch, by which Douglas was to be restored to his estates, and the whole country north of the Forth divided between the two Highland chiefs. George, earl of Angus, who had risen on the ruins of the house of Douglas, made a counter-league with Henry VL, by which he was promised an English dukedom and valuable lands between Trent and Humber, but was to preserve his alle- giance to the Scottish king. These were paper promises, and all that came of them were an ineffectual rising in the north and the relief of Alnwick, which had been besieged by the Yorkists. Next year the Lancastrian cause having received a fatal blow by the defeat of Hexham, a singular offer by Edward IV. to marry the queen dowager of Scot- land—one of the many schemes of the king-maker, earl of Warwick—was frustrated by her death or perhaps by the discovery of an intrigue with Adam Hepburn of Hales, whose wife was alive. Kennedy, who had the chief control of Scottish affairs, negotiated the release of Alexander, the king's brother, who had been taken by an English cruiser, and secured a truce between England and Scotland for fifteen years. He understood the nature of his countrymen better than any man, and was always ready to give counsel in parliament, while his learning, especially in the civil law, made

him respected by foreign powers. When he died the country wept for him as for a parent.

Before his death a plot had been formed which threw the young king into different hands. Amongst the barons

Ascend- ency of Boyd.

STUARTS TO JAMES IV. |

who received office at the commencement of the reign one of the foremost was Robert Boyd of Kilmarnock, the justiciar. Boyd determined to play the part of Livingstone in the last reign, and usurp the supreme power by seizing the person of the king. Bonds with this object were

‘ entered into between him, Fleming of Cumbernauld, Lord

Govern- ment by favour- ites.

Kennedy, a brother of the bishop, and others. While holding a court at Linlithgow James was carried off to Edinburgh by Boyd. Kennedy made a feint to save him by seizing his bridle, but was overpowered ; perhaps the attempt was real, for Kennedy afterwards separated from the Boyds. In parliament Boyd went through the form of asking pardon of the young king in presence of the estates, and was immediately entrusted with the custody of the royal person (October 1466) and that of his brothers Albany and Mar, as well as the fortresses of the kingdom. Next year he was made chamberlain, which gave him control of the revenue. The marriage of his son Thomas, created earl of Arran, with the king’s sister Mary, marked the height of his ambition. The fall of Boyd, as sudden as his rise, whom with his brother Alexander James at first favoured, was due to the same cause as that of Livingstone, —the king’s marriage and his desire when major to assert his independence. Negotiations for an English match having fallen through, an alliance with a Norwegian prin- cess was determined on, and an embassy sent to Norway by parliament. Christian of Denmark and Norway readily assented. He promised his daughter a dowry of 60,000 florins, besides a surrender of the claim of arrears of the annual payment for the Hebrides. But, as it was incon- venient to pay the dowry, both the

Orkneys and the Shetlands were mortgaged to Scotland, and have remained ever since under the Scottish crown. Two years later (July 1469) the princess Margaret arrived in Scotland, when the marriage took place. Arran on his arrival at Leith with the king's bride received a message from his wife warning him that James had conceived a great hatred against him; accordingly he fled to Denmark. In the parliament his father and his uncle, Sir Alexander Boyd, were attainted. The chamberlain saved himself by flight ; Sir Alexander was executed. The specific charge made was the seizure of the king's person ; but a general clause had reference to the immense estates they had annexed. The king's sister, divorced from Arran, was married to Lord Hamilton, who thus laid the foundation of a family whose head more than once aspired to the crown.

The refusal of parliament in 1473 to sanction the pro- posed passage of James to France, to aid Louis XI. against Charles the Bold, on the score of the expense and risk, was the first indication of the difference between the king and the nobility which led to the disasters of the close of his reign. The parliament of 1476 took a bolder step. At its adjournment it committed its whole powers to certain members, of whom the duke of Albany and the earl of Mar, the king's brothers, were the principal,—a measure which indicated a want of confidence in the king. He had shown himself, like Louis XI., disposed to govern by new men who owed their elevation to himself,—a policy which alienated the aristocracy. Of these favourites the chief were Robert Cochrane, originally, it was said, a mason, who proved himself a skilful architect ; Roger, an English musician ; and Andrews, a physician, who dealt in astrology,—all able to gratify tastes of James. There were besides a few young men of birth who gained favour by flattery or other arts. Cochrane became all powerful and disgusted the nobles by sumptuousness and arrogance, and the people by debasing the coin. He succeeded, it was reported, by relating a prophecy that a lion should be devoured by its whelps, in producing in the king's mind an aversion to his brothers, whose characters and knightly

accomplishments made them popular. and sent him to Craigmillar castle. He soon after died (1479) in Edinburgh under circumstances which gave rise to suspicion of foul play. The gift to Cochrane of the vacant earldom or its revenues strengthened the suspicion of his complicity. Albany, committed to Edinburgh castle (1480), escaped to Dunbar and thence to France. He there married Anne de la Tour d'Auvergne, whose son was the regent Albany in the reign of James V. Failing to induce Louis to do more than urge his restoration, two years afterwards he quitted France.and at Fotheringay entered into a treaty (1482) with Edward IV., by which, in return for the empty title of Alexander IV., he owned the subjection of the country to England and made other humiliating promises. Supported by the earl of Gloucester and the exiled earl of Douglas, Albany laid siege to Berwick, while James collected his forces on the Boroughmuir of Edinburgh and advanced to Lauder. There the chief nobles, indignant at the favour shown to Cochrane, mutinied, and, led by Angus, who then acquired his name of "Bell the Cat," seized Cochrane and some of the other favourites of James and hanged them before his eyes. Berwick fell and was never afterwards recovered by the Scots. The nobles, distrusting Angus, who had made secret terms with Albany and the English king, were induced by Schivas, the archbishop of St Andrews, to effect a reconciliation between the king and his brother, who received the vacant earldom of Mar and for a little became chief minister. A parliament in December ap- pointed Albany lieutenant-general, but his continued in- trigues with the English king being discovered he was attainted for treason and fled to England (1483), and thence to France. James had now a brief period of peace, during which the revolutions in England freed him from the danger of war in that quarter. New matrimonial projects were tried. It was proposed that the prince of Scotland should marry a niece of Richard III., Anne de la Pole, daughter of the duke of Suffolk, and after Richard's deposition a marriage with Elizabeth, daughter of Edward IV., was suggested. On the death of Queen Margaret James himself made an offer for the hand of the widow of Edward IV. Such proposals, though abortive, were signs of a better understanding between the two countries, or at least between their sovereigns. When the rebellion broke out in the following year the nobles and James accused each other of treasonable correspondence with England, but no assistance was got by either, for England was still scarcely released from its own civil war. In 1487 the greater part of the Scottish barons rose in arms. James had

abandoned himself to another favourite, Sir John Ramsay, whose life had been spared at Lauder. The chiefs of the party were the earls of Angus and Argyll, Blackadder, bishop of Glasgow, and the Homes and Hep- burns, powerful barons on the border. Having seized the person of the young prince, whom they already desig- nated king, they pretended to act in his name. James retreated to Aberdeenshire, for the northern barons still adhered to him. Father and son, at the head of their respective forces, first met at Blackness (May 1488) on the Forth, where a pacification was agreed to on terms which showed the king's party was the weaker. In the following month the rebellion was renewed and the king was slain at Sauchie (11th June), within sight of Bannockburn. He was buried at Cambuskenneth, being only thirty-five years of age. He did not fall, like his father, through the strength of the nobles, for they were much divided, and he commenced his independent reign master of the situation. The Wars of the Roses gave him an oppor- tunity, which he missed, of strengthening his kingdom in relation to England, whose monarchs adopted a new attitude

James seized Mar 1466-1488.

1488-1512. towards Scotland from that of the Plantagenets,—seeking alliance rather than war. His own weakness, his love of favourites and of money, his passion for music and art— perhaps inherited from his grandfather, but carried to ex- cess and not counterbalanced by the qualities of a states- man and general—proved his ruin. The rebellions, first that of his brother, then that in the name of his son, were fatal precedents in the reign of Mary Stuart.

James James IV. (1488-1513) was already sixteen when crowned IV. at Scone. His reign is an interlude in the record of almost constant battles, murders, and executions with which Scot- tish history abounds. There were not wanting causes of offence between England and Scotland, but the politic

Henry VII. avoided war and effected what previous kings

had failed in the marriage between the royal houses. James,

a popular monarch, succeeded better than any of his pre-

decessors and suécessors in keeping on good terms with

all classes. His court was one of splendour for a small country ; indeed Scotland, almost for the first time, pos- sessed a court which set the fashion of civilization and culture. The death of James III., instead of exciting the horror awakened by the death of James I., was treated with indifference, almost as a relief. The chief offices of state were distributed amongst the supporters of the young king. The first business of the parliament, which met in Edinburgh, was the treason trials. The persons put on their trial were not those who fought against but those who supported the late king. Several were condemned, but prudently treated with 'great leniency. All were charged with correspondence with England as well as with their presence at the field of Stirling (Sauchie). There followed a curious transaction called in the records "the debate and cause of the field of Stirling,"—the first debate in a Scottish parliament of which we have any account. The result was a unanimous resolution "that the slaughter committed in the field of Stirling, when our sovereign lord's father happened to be slain, was due entirely to the fault of him and his privy council divers times before the said field." There was not a single execution. Heritable officers who had fought against the prince were only sus- pended, not deposed, and the heirs of those slain were by special grace admitted to their estates. The only person who felt compunction was the young king. His frequent pilgrimages and an iron belt he wore were due to his re- morse for his father's death. The leniency of James was rewarded by the loyalty of the nobility, except a few northern barons headed by Lennox and Huntly, and these, after being defeated by James in the following year, were also treated with clemency. The only trace of rebellion

during his reign was a secret intrigue between Henry VII.

and Angus, who succeeded to the traditionary policy of

the Douglases.

A determined effort was made by parliament to put down robbery and theft by special commissions to certain lords who were to be responsible for

different districts. It was provided that the king in person should attend the justice air (eyre),—a provision which James acted upon, A new master of the mint was appointed to restore the purity of the coinage. The penalty of treason was to be imposed on those who purchased benefices from Rome. An active spirit of reform, a desire to remedy the evils of the late reign, was displayed by both the king and his advisers, The personal character of James showed itself in a liberal- ity contrasting with his father's avarice, and in a love of chivalrous display encouraging tournaments and martial exercises, as well as in the care of the navy.

From the time of Bruce we hear of ships and shipbuild- ing, natural in a country with so large a seaboard ; Scottish merchantmen now began to make distant voyages, and their ships, half privateers, half traders, were commanded

Legisla- tion.

Forma- tion of a navy.

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and manned by sailors who were a match for those of any country. The most famous commander, Wood of Largo, with the "Flower" and the ' Yellow Carvel," cleared the Forth of English pirates. Stephen Bull, an English captain, promised to take Wood dead or alive, but was captured himself; James sent him back to Henry VIIL. with a chivalrous message that the Scots could now fight by sea as well as land. Wood was made one of the king's council. By his advice James built the "Great St Michael" for a crew of 300 and 1000 men-at-arms. It exhausted all the woods in Fife except Falkland, and cost £30,000. The king's policy was not confined to building ships of war: every town was to have vessels of at least 20 tons. The navy was for the protection of trade, to which the national instinct pointed as a source of wealth.*

The marriage of James early attracted the attention of parliament, and embassies were sent to foreign courts to seek a suitable spouse ; but James

had formed a connexion with Lady Margaret Drummond, and could not be per- suaded to a political alliance. The chief events of his reign prior to his marriage to Margaret Tudor were his ex- peditions to the north-east and the western Highlands. He adopted with the chiefs a similar policy to that which had succeeded with the barons, attaching them to his person by gifts, offices, and favours, and committing to them the suppression of crime. In 1496 the impostor Perkin War- beck came to Scotland and was recognized by James, who gave him his kinswoman, Catherine Gordon, daughter of- the earl of Huntly, called for her beauty the White Rose, in marriage. Raids were twice made across the border on his behalf, but there was only one engagement of any con- sequence, at Dunse (1497), and an unsuccessful siege of Melrose. Henry VII., whose talent lay in diplomacy, ap- James's proached the Scottish king with the tempting offer of the marriage hand of his daughter Margaret. Commissioners met to m consider this at Jedburgh, and, though James refused to 'Tudor give up Perkin Warbeck, a truce was arranged, and Perkin left Scotland. The marriage of James and Margaret was soon afterwards agreed to and a peace concluded. The papal dispensation was procured in 1500, but the final treaty was not ratified till two years later (8th August 1502). Some of Henry's counséllors sought to dissuade him from the marriage, for if his son Henry died James would be next in succession to the English throne; but he replied that if so Scotland would be an accession to Eng- land and not the reverse, recalling the example of Nor- mandy and England. Margaret, a girl in her fourteenth year, made a triumphal progress to Scotland, where she was received with pomp; but the marriage was one of policy, and the young wife was discontented with her new country and her husband. Their court as it is painted in the poems of Dunbar was merry, but not moral. The licence which prevailed and was tolerated by the church was shown by the elevation of one of the king's bastards by Jane Kennedy to the archbishopric of St Andrews when a youth of eighteen. Others received rich benefices, and Jane Kennedy herself married the earl of Angus. Scottish history during the six years after the king's marriage was uneventful.

Henry VII.'s death (1509) changed the relations between Warwith Scotland and England. Henry VIII. had not liked his England. sister's marriage, and his refusal to deliver to her a legacy of jewels left by his father led to a coolness. The mutual attacks of English and Scottish privateers and border

frays increased the bad feeling. Andrew Barton's ship the "Lion," after an obstinate conflict, in which Barton was killed, was seized (1512) in the Downs by the sons of Howard, the English high admiral, and James's request for redress was met with the contemptuous answer that kings should not dispute as to the fate of pirates. But it

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Flodden.

Scottish

| learning

at this epoch.

REFORMATION, | sc OT was Henry's Continental policy which in the end provoked the war. The struggle in Italy between Louis XII. and Pope Julius IT. gave him an opportunity, and he allied him- self with the latter and invaded France. He attempted before leaving England to secure peace with Scotland by promising to redress its grievances. But James had re- newed the old alliance with France, and the only answer given to the first embassy in 1512 was an offer to mediate between France and England. In 1513 the message was, that if Henry passed to France war would not be declared without a herald being sent. The French queen (Anne of Brittany) had given James a ring with a substantial sub- sidy, and he had already made up his mind for war. Like Henry, he longed to win his spurs. Henry went to France in June, and soon after his arrival at the camp at Térouanne, the Scottish Lord Lyon brought the threatened declaration of war (11th August 1513). The grounds stated were the seizure of Scotsmen on the borders, the refusal of Margaret's legacy, and the death of Barton. No time was lost by James in carrying the declaration into effect ; but the war was disliked by the nation. The earl of Arran, sent with the fleet to aid the French, sailed instead, in defiance of orders, to Carrickfergus. James himself called out the whole land force contrary to the advice of his council, mustering at the Boroughmuir 100,000 men according to English accounts—probably exaggerated, but doubtless as large an army as had been seen in Scotland. ° Crossing the border, he took Norham, Wark, and Ford. At the

.last of these castles the wife of Heron, the proprietor,

then a prisoner in Scotland, beguiled James by her beauty, causing him to waste several days and betraying his movements to the enemy. In the conduct of the battle (9th September 1513) which followed he committed almost every fault a general could commit,—neglecting to engage when the enemy were crossing the Till, allowing himself to be outflanked by Surrey, who got between him and the Scottish border, abandoning his strong position on the hill of Flodden, and finally exposing his own person on foot in the centre of the fight. Some Scottish writers claim that the battle was a divided success and that the total number of English killed was greater; but Hall, an exact chronicler, says 12,000 Scots fell and only 1500 English, as appeared from the book of wages when the soldiers were paid. What made Flodden so great a disaster was the quality of the Scottish loss. The king himself, his son, the arch- bishop of St Andrews, two bishops, two abbots, twelve earls, and fourteen lords, besides many knights and gentle- men, were left on the field. There was scarcely a noble family which did not mourn some of its members. Surrey did not follow up his victory by invading Scot- land, since his object was gained: the diversion by the Scots in favour of France was at an end. Scotland was again left with an infant king, scarcely more than a year old.

The character of James IV. was on the surface. An excellent observer, the Spanish ambassador Ayala, notes his good looks and agreeable manners, his knowledge of languages and history, his respect for the service of the church and its priests, his liberality and courage, '" even more than a king should have, not taking the least care of himself," his bad generalship, " beginning to fight before he had given his orders," and his wise statesmanship, deciding nothing without counsel, but acting according to his own judgment, which was generally right.

The reign of James fell within the era of the revival of learning, and Scotland, though late, came within the circle of the intellectual which preceded the religious refor- mation. It was common for Scottish scholars to complete their education and sometimes to remain teaching in the universities of France. One of these, Elphinstone, bishop of Aberdeen, who founded its university, brought another,

Hector Boece, the historian, to be first principal of King's 1512-1516.

College, Aberdeen. James himself engaged Erasmus as tutor to his son, the future archbishop. Two other Scotsmen passed to Paris in the beginning of the next reign, John Major and his pupil Buchanan, who brought back less of the critical but more of the Reforming spirit. These and other learned men neglected a reform as essential as any, — the use of the mother-tongue in their writings, and the neglect has lessened their fame; but it had its exponents in Dunbar, Henryson, Sir David Lyndsay, and Gavin Douglas. The printing press also found its way to Edin- burgh, and Chepman and Myllar published their first broad- sheets with works of Dunbar, Douglas, and the remains of the older poetry (see p. 540 sg. below).

7. The Reformation, its Antecedents and Consequences.— James V.

James V. (1513-42), scarcely eighteen months old when he succeeded, was at once crowned at Scone, where a par- liament met, chiefly attended by the clergy. The queen dowager was appointed regent,—a secret message, however, being sent to John, duke of Albany, to come from France and assume the regency. The son of the exiled brother of James ITI., Albany had by his marriage to his cousin, the heiress of De la Tour d'Auvergne, become a great noble in France, where he held the office of high admiral, and neither he nor the French king, Louis XIL, was willing that he should quit France. The Sieur de la Bastie came as his representative. The precipitate marriage of the queen, four months after the birth of a posthumous child, to the young earl of Angus, and a dispute as to the see of St Andrews, to which Margaret appointed Gavin Douglas the poet, her husband's kinsman, although Hepburn the prior had been chosen by the chapter, led the Scottish.estates to renew their request that Albany should come to Scotland. He arrived at Dumbarton on 18th May 1515 and was at once appointed regent. son, but Albany besieged Stirling and forced her to sur- of

render. Her new husband fled to France, and Margaret 4!>2™Y-

first to Dacre, warden of the marches, and then to her brother's court, where she was joined by Angus. At Harbottle in Northumberland, on her

journey south, she bore a daughter, Margaret Douglas, afterwards Lady Lennox, Darnley's mother. Henry VIII. asked the Scottish parliament to remove Albany from the regency, but was met with a decided refusal ; for, though a party of nobles, especially the border barons Lord Hume, the chamberlain, and his brother, were opposed to him, he was supported by the nation. The young duke of Ross, Margaret's younger son, having died suddenly, Albany procured a declaration from parliament that Ross's elder half-brother was illegitimate and himself next heir to the crown. Hume and his brother were seized and executed at Edinburgh (26th October 1516). These events aroused suspicion that Albany aimed at the crown; but the suspicion appears to have been unfounded. His tastes were French ; hence he quickly tired of trying to govern Scotland, and in autumn obtained with difficulty leave of absence for four months. Before leaving he put Dumbarton, Dunbar, and Inchgarvie (in the Forth) in charge of French garrisons under De la Bastie, who held the post of warden of the marches; but an interim regency was appointed. Margaret now returned to Scotland ; but she was not permitted to take part in the government. Shortly after his arrival in France Albany negotiated the treaty of Rouen (20th August) by which an alliance between France and Scotland was agreed on against England, and a promise given that the Scottish king should marry a daughter of Francis L., or if that failed another French princess. In September De la Bastie was murdered near Dunbar by Hume of Wedderburn with the connivance of Dacre. The perpe- trators were forfeited, but never brought to justice, although XI. — 63

The queen refused to give up her Regency

1516-1534.

See Plate

VI.

Struggle between Angus and Arran,

Supre- macy of Angus.

Arran, who succeeded to the office of warden, was sent for that purpose. The absence of a supreme authority gave free scope to the licence of the nobles.

A serious rising in the Highlands to support the claim of Macdonald of Lochalsh to the lordship of the Isles lasted for several years, till the death of the claimant and the vigour of the earl of Argyll, the head of a house now rising into pre-eminence, led to its suppression. The chief dis- turbances arose from the ambition of Angus: Archibald, his uncle, was chosen provost of Edinburgh ; his brother William seized the priory of Coldingham ; his uncle Gavin, though he failed to secure the primacy, retained the see of Dunkeld. Angus was supported by the earls of Crawford, Erroll, and Glamis, by Forman, archbishop of St Andrews, and most of the other bishops, except James Beaton, arch- bishop of Glasgow and chancellor, The English warden, Dacre, was also on his side and tried by intrigue and bribery to foment dissension and prevent Albany's return. The opposite faction was headed by Arran, Lennox, Eglin- ton, Cassilis, Semple, the bishop of Galloway, and the chancellor. Scotland was thus divided between an English party, strongest in the east, and a French party, chiefly in the west. Their disputes reached a crisis in a street fight in Edinburgh, which got the name of 'Cleanse the Causeway " (30th April 1520), in which Angus drove Arran out of the town and seized the castle. Sir Patrick Hamilton, a brother of Arran, was slain by Angus,—an injury never forgiven. Meantime Margaret quarrelled with her husband, and, though there was a temporary reconciliation, mutual accusations of infidelity were too well grounded to permit of its being permanent.

Next year Albany returned and the queen, who had been in secret correspondence with him, entrusted him with the custody of the young king. Henry VIII. again requested the Scottish parliament to expel Albany ; but they again refused, and Angus made terms with Albany on condition that he should himself withdraw to France. War was now declared between England and Scotland (1522) ; but, although Albany advanced with a large army as far as Carlisle, he was persuaded by Dacre to a month's truce and soon after went back to France, leaving the king in charge of a regency of which Beaton, Arran, Huntly, and Argyll were the leaders. Albany returned in the following year and again with a large force invaded England, but

failed to take Wark, while Surrey, the English commander, ravaged the border. This failure lost Albany his credit with the Scots. In 1524 he went to France on condition that if he did not come back before 3lst August his regency should end. He never returned, and during his absence Margaret carried off her son from Stirling to Edinburgh, where, although only a boy of twelve, he was declared king. Angus made an agreement with Wolsey to support the English interest ; and at a parliament in Edinburgh Albany's regency was declared at an end (12th February 1525), and Angus and Beaton obtained possession of the king's person and governed in his name. The queen, who had now openly broken with her brother, in vain appealed to France and Albany. The French were occupied with the war against the emperor; but she obtained from James Beaton, now archbishop of St Andrews, a divorce from Angus and married Henry Stuart, son of Lord Avondale, creating him Lord Methven.

For three years Angus retained the supreme power and filled all offices with his adherents. Beaton, with whom hé quarrelled, was required to resign that of chancellor, and Angus nominated himself as his successor. The indignant nobles made unsuccessful attempts to seize the person of the king, who at last, on 23d May 1528, effected his escape from Falkland, riding at night to Stirling, where he was welcomed by the governor. Before parliament met a pro-

'the bishop of Dunkeld as privy seal.

clamation forbade any Douglas to remain in the capital. A new ministry was appointed with Gavin Dunbar, now archbishop of Glasgow, who had been the king's tutor, as chancellor ; Cameron, abbot of Holyrood, as treasurer; and The Douglases were attainted and their estates divided amongst the nobles of the opposite faction. A truce was made with England for five years. During the minority and duress of James the Scottish nobility became accustomed to bribes either from England or France. The French, to which the higher clergy belonged, were in the ascendant at the court of the young king, who naturally felt ill-will towards the Douglases and leant

on Albany, and after a time on Cardinal David Beaton, bishop of Mirepoix in France and nephew of the archbishop of St Andrews, whom he afterwards succeeded. Beaton was the Wolsey of Scotland; but James V. was not Henry VITI., and the ambition of the great prelate was baffled, not by the king, but by the nation. Three months before the king's escape Patrick HamixTon (q.v.), abbot of Ferne, was burnt for heresy at St Andrews.

James, only seventeen when he gained his independence (1528), showed, like other Stuarts, activity in government, and the fourteen years of his actual rule, while not marked by outstanding events, were a period of renewed order and prosperity. He first turned to the borders, where constant wars with England had bred a race of lawless freebooters. By the severity of his measures he succeeded in doing what Angus and his predecessors had in vain tried to do. The borders continued till the union to trouble the ministers of the law ; but the clans who lived by plunder and blackmail were first really broken by the expedition of James V. But it was not only borderers who required to be taught that a king was again on the throne: Argyll, who had sought to make himself independent, was deprived of his lieutenancy and imprisoned; Bothwell, the father of Mary's husband, was beheaded for the favour he showed the borderers ; and the estates of the earl of Crawford were forfeited. James made a progress through the Highlands and was sumptuously entertained by the earl of Athole. While criminal justice was strictly enforced, a step was at last taken to organize a central civil court (15th May 1532), which had been a settled plan of the kings since James I. The College of Justice or Court of Session was founded in Edinburgh by the influence of Albany with the pope,— funds being got from the bishops' revenues for the payment of the judges. Of the fifteen judges eight, including the president, were to be clergy, and the barons were conciliated by the anomalous office of extraordinary lords.!

The relations between James and Henry VIII. continued hostile and there were mutual raids till peace was concluded in 1534. Henry was then at the critical point of his divorce from Catherine of Aragon and anxious to secure an ally. France and Spain were also competing for the favour of the Scottish monarch, and Charles V. proposed a marriage with Mary of Portugal. But he had already indicated a preference for a French alliance, selecting Mary, daughter of the duc de Vendédme. The pope addressed James as

defender of the faith, a title Henry VIII. had forfeited. The clergy by Beaton's advice granted him a large allowance out of their revenues. These inducements and the influence of Beaton and Dunbar, the two arch- bishops, kept James firm in his attachment to the old church, in spite of the temptation which Henry held out in its endowments and of the satires in which Sir David

1 There were already signs of the small beginning of the profession of lay lawyers who were to play an important part in Scottish affairs in the 17th and 18th centuries. of justice, independent alike of the baronial and ecclesiastical courts, was a much needed reform; but the latter still retained their consis- torial jurisdiction.

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Assump. tion of govern- ment by James V,

His marriage.

The establishment of a settled system "

| Mary | Stuart.

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Lyndsay, his old tutor, and Buchanan, the tutor of one of his bastards, exposed its abuses. In 1537 he went to France to see his bride, but, falling in love with Madeleine, daughter of Francis I., obtained her hand instead. After an absence of nine months he returned; but the young queen died within a few weeks after landing. The following year he married Mary, dowager duchess of Longueville, daughter of Claude of Lorraine, duke of Guise. Next year (1539) Henry made another attempt to gain James through his envoy Sir Ralph Sadler, but, though the succession to the English crown in the event of Prince Edward's death was held out as a bait, James remained unmoved. In 1540 the king made a voyage round Scotland, —the first circum- navigation of his dominions by a Scottish sovereign. The

Trish are said to have offered him their crown, and the barons of the north of England, whose sympathies were Catholic, were inclined to favour him. The position was perilous for Henry, many of whose subjects still remained Catholics at heart. He made a last attempt to induce James to meet him at York, but the Scottish king would not go so far across the border. Henry now ordered the marches to be put in a state of war, and Sir James Bowes, accompanied by Angus and Sir George Douglas, crossed the border, but was defeated in Teviotdale by Huntly and Home. The duke of Norfolk advanced with a large force, and, efforts to avert war having failed, James assembled the whole Scottish army and marched to Fala on the Lammermuirs, where he was reluctantly obliged to disband his force through the refusal of the nobles to go farther ; they even thought of repeating the tragedy of Lauder, but could not agree as to the victims. James raised a smaller force and gave the command of it to Oliver Sinclair, whose promotion was ill received by the barons. Their discord allowed an easy victory to Dacre, who routed them as they were passing over Solway Moss (25th November 1542), taking Sinclair and several of the leaders prisoners. The news, brought to James at Caerlaverock, together with the disaffection of the nobles, broke his heart. A few weeks later at Falkland he heard of the birth of Mary Stuart, but the news brought him no comfort. His saying, "The crown came with a lass and will go with a lass," has passed into history, although the prophecy was not fulfilled. Outwardly his reign had been, with the exception of the closing scene, successful. He had restored order along the borders, and put down all attempts of the nobles against his person. He had maintained the church, supporting the bishops by severe laws against heresy. He had secured by his marriage the alliance of France and was on good terms with other Continental states. His powerful neighbour had not succeeded in wresting any land from Scotland. He was, like his father, a popular king, mingling with the people in their sports, and respected because of his strict administra- tion of justice. But his foreboding was not without cause. The power of the nobles had only been restrained, not de- stroyed. The aristocracy had too many heads to be cut off by one or several blows. The principles of the Reformation were gradually spreading in spite of the attempts to stifle them, and the infant to whom he left the crown had to encounter rebellion at home and the hostility of England, not the less dangerous that she was heir to the English crown and its rulers veiled their hatred of her by professions of friendship. Knox

describes James as “a blinded and most vicious king.” Buchanan, who knew him better, is more fair, ascribing his faults to his time and bad education and doing justice to the qualities which made him loved by the people.

Mary Stuart was deemed queen of Scotland from 14th December 1542 till 29th July 1567, when her son James VIL. was crowned in her stead. This period of a quarter of a century is more crowded with events than any other part

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of the Scottish annals, except the War of Independence. It was the epoch of the Reformation, and it became a question of European as well as national importance which side Scotland would take. Closely connected with the religious question was the political, affecting the union of Scotland and England. The life of Mary, who united the personal charm of her race and its evil fortune, adds tragic interest to the national history. It falls into three parts,— from her birth to her return from France as the young widow of Francis II. in 1561 ; from her arrival in Scotland till her flight in 1568; and from her arrival in England till her execution in 1587; but only the second of these enters into the direct current of Scottish history. During the first Scotland was under the regency, first of Arran, then of Mary of Guise. It was rumoured that Cardinal Beaton forced James V. on his deathbed to sign a will naming him regent, or had forged such a document ; but the principal nobles proclaimed the earl of Arran heir-presumptive to the crown, governor of the realm, and tutor to the queen, and this was confirmed by parliament in the following spring. Beaton was thrown into prison, but soon released. The death of James suggested to Henry a new scheme for the annexation of Scotland by the marriage of the infant heiress to his son Edward, and he released the nobles taken

at Solway Moss on easy terms under an assurance that they

would aid him. Angus and his brother George Douglas also returned to Scotland from their long exile on the same promise. Sir Ralph Sadler, one of

the ablest English resi- dents at the Scottish court—half envoys, half spies—was sent to conduct the negotiations. Arran was tempted to favour the marriage by the offer of the princess Elizabeth for his son and the government north of the Forth. But the queen dowager, though she pretended not to be averse to it, and Beaton did all they could to counteract Henry's project. One part of it, the immediate delivery of Mary and the principal castles to the English king, was specially objected to. A mutual alliance between the two kingdoms was agreed to on Ist July 1543, and Mary was to be sent to England when ten years old. Soon after a party of the nobles opposed to the match got possession of the young queen and removed her to Stirling. The English treaty was ratified by parliament; but Beaton and his partisans did not attend, and a few days later the regent, as Sadler expresses it, revolted to the cardinal. It was evident that the assured lords, though in English pay, were not to be relied on, and Henry resolved on war. His first act— the seizure of Scottish merchantmen in English ports — roused the patriotic feeling of Scotland. Before the close of the year the Scottish estates declared the treaty with England null and renewed the old league with France. Lord Lisle was sent with a fleet to the Firth of Forth, along with Hertford (afterwards the protector Somerset) as commander of the' army, and Leith was sacked and Edinburgh burnt, though the castle held out. Lisle on his voyage home ravaged the ports of the Forth, while Hertford destroyed the towns and villages of the Lothians, aided by the English wardens, who made a raid across the border. Hertford returned the following year and de- stroyed the abbeys of Kelso, Jedburgh, Melrose, Dryburgh, Roxburgh, and Coldingham, besides many castles, market-towns, and villages. Such barbarous warfare renewed the memory of the War of Independence and the intense hatred of England, which had greatly abated. Lennox and Glen- cairn alone of the nobles sided with the English, and the Reformers saw with regret the nation driven to a French alliance as at least preferable to English conquest.

Beaton at this time really governed, imposing his will on the vacillating regent and sternly repressing heresy. George Wishart, the chief preacher of the Reformers, was seized, found guilty of eighteen articles of heresy, mostly

1534-1545.

Regency of Arran.

War with Henry VIII.

Death

of Wish- art and Beaton.

1545-1558.

Somer- set's raids.

Regency of Mary of Guise.

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taken from Calvin, and burnt at St Andrews. The war of religion, now openly declared, could not be carried on without bloodshed on both sides. Beaton was assassinated less than three months after Wishart's death in his own castle by Norman Leslie and other young men, some with private grievances, all desiring to avenge Wishart. The effect was adverse to the Reformers. Leslie and his asso- ciates, joined by a few others, of whom Knox was one, being shut in the castle, held it for a short time against the regent, but were forced to surrender to Strozzi, the French admiral.

The death of Henry VIIT. (1547) did not put a stop to the war with England. The protector Somerset proved to be an implacable enemy, and, partly to strengthen his position as regent, determined to strike a more signal blow. Invading Scotland simultaneously with a large fleet and army, he defeated the Scottish regent at Pinkie (18th September 1547), took Edinburgh, and placed garrisons in several castles. Scotland had suffered no such reverse since Flodden. The progress of the capital was thrown back at least a century; scarcely a building remains prior to the date of his savage raids. Somerset was not in a position to follow up his advantage, for he had to return home to counteract intrigues. The young queen

was sent from Dumbarton in the following summer (August 1548) to the court of France, where she was

brought up with the children of Henry II. by Catherine de' Medici. Before she went a French force had been sent to Scotland, and in the camp at Haddington the estates had, by a majority led by the regent and queen dowager, agreed to Mary's betrothal to the dauphin. The regent was promised the dukedom of Chastelherault in return

for his part in the treaty. For two years a fierce inter-

mittent war continued between England and Scotland : but the former country was too much engaged in home affairs and the French war to send a large force, and the Scots recovered the places they had lost except Lauder. The issue of the French war was also adverse to the English, who were forced to agree to the treaty of Bou- logne (24th March 1550), in which Scotland was included. In September the queen dowager went to France and ob- tained the transfer of the regency from Arran to herself. On her return, Arran not being prepared to relinquish his office, she proved herself a skilful diplomatist, gaining over the nobles by promises and the people by abstaining from persecution of the Reformers. A single execution —that of Adam Wallace, "a simple but very zealous man for the new doctrines "—took place in 1550 under the sanction of Archbishop Hamilton, natural brother of Arran, who had succeeded Beaton; but that prelate, whose natural dis- position was towards compromise, authorized a Catechism in 1552 which minimized the distinctions in doctrine be- tween the church and the Reformers, and was conspicuous for omitting all reference to the supremacy of the pope. At this time a large section of the clergy and people were still wavering, and the necessity of retaining them by moderation and reform was evident. The death of Edward VI. and the accession of Mary in 1553 had an important influence on the progress of the Scottish Reformation. The Scottish Reformers who had taken refuge in England had to escape persecution by returning home or going abroad, and the powerful preaching of Harlaw, Willock, and Knox, who came to Scotland towards the end of 1555, promoted the new doctrines.

In the spring of 1554 the queen dowager at last suc- ceeded in obtaining from the reluctant Arran a surrender of the regency. Mary had now attained her twelfth year and a nomination by her of her mother as tutor gave the

form of law to what was really the act of the queen dowager, the French king, and the nobility. The people acquiesced,

for all classes were tired of a governor whose chief object was money. His actual investiture in the French dukedom removed any scruples in relinquishing a dangerous dignity. For the next six years the queen dowager was regent and conducted the government with such prudence that her real aims were only seen through by the most penetrating, Knox has been accused of a harsh opinion of her; but the upshot of her policy if successful would have been to subject Scotland to France and to that party in France so soon to be the relentless persecutors of the Reformers. She knew well how to bide her time, to yield when re- sistance was impolitic, to hide her real object, but this she pursued with great tenacity of purpose.

her first step was a mistake so serious as to have well-

nigh provoked revolution. In appointments to offices

she showed such preference for her own countrymen as created intense jealousy on the part of the Scottish nobility,

and would probably have led to open action but for the

fact that many Scotsmen got offices and pensions from the French king. The new regent applied herself at once to

the perennial work of every Scottish Government, the re- pression of disorder in the Highlands, and first Huntly, afterwards Argyll and Athole, were sent to Argyll and the

Isles ; but the presence of royalty was, as had before been found, the best remedy, and she made next year a circuit

in person with more success than any of her lieutenants. Under the advice of her French counsellors she now garri-

soned Dunbar with French soldiers and built a fort at Eyemouth (1556). She even ventured to propose to levy

a tax for the maintenance of a standing army; but the remonstrance of 300 barons, headed by Sir John Sandi- lands, forced her to abandon a project so fatal in that age

to liberty. Next year, at the instigation of the French

king, she endeavoured to force the country into an English

war. No time could have been worse chosen, for com- missioners from England and Scotland had actually met

at Carlisle to adjust differences between the two countries.

The Scottish barons refused to fight, and from that date, Bishop Lesley notes, the queen regent could never agree

with the nobility, and sundry of them sought by all means

to raise sedition against her and the French.

In the parliament at the close of the year commis- Mary's sioners were appointed to go to France for the marriage marriage between Mary and the dauphin. 'heir instructions were neal to obtain a promise from both to observe the liberties and (7P™ privileges of Scotland and its laws, and a ratification of the Act passed in 1548, when it was first proposed to send the young queen to France. The contract of marriage pro- vided that their eldest son was to be king of France and Scotland and the eldest daughter (should there be no son) queen of Scotland, to be given in marriage by the joint consent of the king of France and the Scottish estates,

In the event of her husband's death Mary was to be free to stay in France or return to Scotland. The marriage was solemnized at Notre Dame on 24th July 1558. But prior to the public contract a secret arrangement had been made, by which Mary, in three several deeds, made over the kingdom of Scotland to the king of France and his heirs if she died childless, assigned

to him possession of the kingdom until he was reimbursed in a million pieces of gold for her entertainment in France, and declared that, whatever documents she might afterwards sign by decree of parliament, this arrangement expressed her genuine in- tention. After the return of the commissioners the crown

REFORMATION. |

matrimonial, with the title of king, was granted by parlia- ment to the dauphin.

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praying that the canons should be enforced against clergy 1557-1559,

who led scandalous lives, that there should be preach-

| Progress While statesmen were occupied with the queen's mar-| ing on every Lord's day and on holidays, that no priests of Re- riage the Reformation had been steadily advancing. Knox } should be ordained unless able to read the Catechism a laboured incessantly, preaching in Edinburgh ten days in | distinctly, that prayer should be in the vulgar tongue,

succession and making rapid visits to the central and west- ern shires. He attracted to his side representatives of the nobility and gentry, and had much support in the towns. The earl of Glencairn, Lord Lorne, Lord James Stuart, the future regent, and the laird of Dun, John Erskine, in Angus were amongst his earliest followers, as well as many of the tradesmen and artisans. Knox now openly denounced attendance at mass as idolatrous and began to administer the Lord's Supper after the manner of the Swiss Reformers. He was summoned to Edinburgh on a charge of heresy ; but, though he kept the day, the proceedings were dropped. Shortly after he was again summoned, but meanwhile had accepted a call from Geneva. In his absence he was condemned for heresy and burned in effigy at the market cross of Edinburgh. Though absent, he continued the master-spirit of the

Reformation in Scotland, and as the result of his exhortations Argyll, Glencairn, Morton, Lord Lorne, and Erskine of Dun drew up a bond (3d December 1557) to "defend the whole congregation of Christ and every member thereof . . . against Satan and all wicked power," themselves forsaking and renouncing "the congregation of Satan with all the superstition, abomination, and idolatry thereof." This was the first of many bonds or covenants in which, borrowing the old form of league amongst the Scottish nobility, the Lords of Congregation applied it to the purposes of the Reforma- tion. They afterwards passed resolutions that prayers should be read weekly in all parishes by the curates publicly, with lessons from the Old and New Testaments,

that the mortuary dues and Easter offerings should be optional, and that the consistorial process should be re- formed. Another point was included according to Lesley, —that bishops should be elected with the consent of the laity of the diocese and priests with that of their parish- ioners. The synod replied that they could not dispense with Latin in public prayer as appointed by the church,

and that the canon law must be observed as to elections

of bishops and priests. On other matters they were pre- pared to make concessions, and passed thirty-four canons in the spirit of the council of Trent directed to the due investigation and punishment of immorality of the clergy and the inspection of monasteries, better provision for preaching by bishops and priests, the remission of mortuary dues to the very poor, and the recognition of the sacrament of baptism as administered by the Reformers. A short exposition of the mass was to be published. These con- cessions proved the necessity for reform ; but, as they were silent on the principal points of doctrine, as well as on the more radical reforms in church government, they could not

'be accepted. The time of compromise, if compromise had

ever been practicable between Rome and Geneva, to which the Scottish Reformers adhered, was now past. Two events had occurred before the synod separated which hastened the crisis. On 17th November 1558 the death of Mary Tudor once more placed on the English throne a sovereign

inclined to favour the Reformation. In May, during the sittings of the synod, Knox returned to Scotland and the Scottish Reformers once more had a determined leader.

and that doctrine and the interpretation of the Scriptures should be used privately in quiet houses until God should move the prince to grant public preaching by faithful ministers. Argyll at once acted upon the resolutions and protected John Douglas, formerly a Dominican, his chap-

The regent issued about Easter (1559) a proclamation Struggle forbidding any one to preach or administer the sacraments between without authority of the bishops. Willock and other lead- C°28” 5 6 : 0 gation ing preachers having disregarded it were summoned to gndMary Stirling on 10th May. Their adherents assembled in great of Guise.*

lain, who preached at Castle Campbell in spite of the remonstrance of Archbishop Hamilton. That prelate next took a fatal step. Walter Myln, parish priest of Lunan near Montrose, an old man of eighty-two, was burnt for heresy at St Andrews (8th April 1558). He was the last Protestant martyr in Scotland. The total number of deaths was small, it is believed twenty in all; but many people were banished or forced to leave the country and many fined, while none were allowed freedom of worship. Immediately after the death of Myln there began, says Knox, “a new fervencie amongst the whole people.” Gathering courage from the popular feeling, the Lords of Congregation presented petitions in rapid succession to the regent. The first laid before her prayed “that it might be lawful to meet in public or in private for common prayer in the vulgar tongue, to interpret at such meetings hard places in Scripture, and to use that tongue in administer- ing baptism and the Lord’s Supper”; in reply permission was granted to preach in private and to administer the sacraments in the vulgar tongue. The second presented at the meeting of parliament prayed for a suspension of all Acts against heretics until a general council, that copies of the accusation and depositions should be given to all persons accused of heresy, that the accused should be allowed themselves to interpret any words charged as heretical, and should not be condemned unless found guilty of teaching contrary to Scripture. “The regent,” Knox remarks, “spared not amiable looks and good words,” but suffered the parliament to

be dissolved (2d March 1557) without any answer. In the spring a synod met in Edinburgh and a third petition was laid before it,

numbers, but mostly unarmed, at Perth, a town zealous for the Reformed opinions. Erskine of Dun went from there as a mediator to the regent at Stirling; she pro- mised, but in vague terms, that she would take some better order with the ministers if their supporters did not advance. Notwithstanding they were outlawed for not appearing on the day of trial. Next day, when the news reached Perth, Knox preached his first public sermon (11th May) since his return, inveighing against "idolatry." Hardly had he ended when a priest began mass and opened the tabernacle on the high altar. A young man called out, ' This is intolerable that, when God by His Word hath plainly damned idolatry, we shall stand and see it used." The priest struck the youth, who retaliated by throwing a stone, which broke an image. From this spark the fire kindled. The people destroyed the images in the church and then proceeded to sack the monasteries. The example of Perth was followed at many other places. The regent could not remain passive when the Congregation was sanctioning such action. But her position was one of grave difficulty. Her main support was from France, and, though she had adherents amongst the Scottish nobility, Argyll and Lord James, who were still with her at Stirling, were really committed to the Congregation. What course the new queen of England would take was still uncertain. On 11th May the regent advanced towards Perth, but the arrival of Glencairn with 2500 men from the west to aid the Congregation led to a compromise, of which the terms were these: both parties were to disband their troops; Perth was to be left open to the regent, but no French troops were to come within 3 miles; the inhabitants were*

Negotia- tions of Reform- ers with England.

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and all controversies were to be reserved for parliament. The Congregation, however, remained distrustful ; Knox openly preached that the treaty would only be kept till the regent and her Frenchmen became the stronger, and before leaving Perth the Lords of Congregation entered into a new bond for mutual defence. The regent entered Perth the day they left (29th May), accompanied by the duke of Chastelherault and a bodyguard of French as

well as Scottish troops paid by French money. The deposition of the provost in favour of a Papist and the occupation of the town by these troops were deemed breaches of the agreement, and Argyll and Lord James now joined the Reformers and took the lead in their proceedings. Their numbers increasing, the regent felt unable to retain Perth, and quitting it marched south, followed by the army of the Congregation, to which she abandoned Stirling, Lin- lithgow, and Edinburgh, taking refuge at Dunbar. The only conflict was at the Muir of Cupar, where a small force sent to save St Andrews was quickly dispersed by the superior numbers of its opponents. It was made a condi- tion of a truce that no Frenchman should be left in Fife. The Reformers occupied Edinburgh for a few weeks, but were obliged to abandon it upon new terms of truce in- tended to preserve the status quo. Both parties were engaged in negotiations for active assistance, the one from France and the other from England. The regent had been daily expecting reinforcements, and a considerable number of troops about this time landed at Leith, which they began to fortify.

In the end of June Kirkaldy of Grange began a corre- spondence, afterwards continued by Knox, with Cecil, Percy, and Sir Herbert Croft. Their scheme was far-reaching. The young earl of Arran, though brought up in France, had become Protestant, and if he, the heir-presumptive to the Scottish crown, were married to Elizabeth the union of the two countries would be secured along with the Reforma- tion. This would be a counter-stroke to the union of France and Scotland under a Catholic, which almost at the moment became for a brief time an accomplished fact, by the dauphin succeeding as Francis II. to the French crown on the death of his father. The policy of the Guises, who continued to control the Government under the new king, almost forced Elizabeth in this direction. Mary quartered the arms of England with those of Scot- land, implying denial of Elizabeth's right both as illegiti- mate and as a heretic. But Elizabeth knew the value both of her hand and of the state, which, thanks to the ability of her ministers, was daily becoming more loyal. She had special cause for hesitating to ally herself with the Lords of Congregation. Knox had offended her by his vehement Blasts against the Regiment of Women, which, though primarily aimed against the Catholic queens, ad- mitted no exception in favour of a Protestant. Nor could Knox even when supplicating aid adopt the courtier's language to which Elizabeth was accustomed. She was really

afraid of the revolutionary principles of some of the Reformers, which seemed to threaten the throne as well as the altar. Moreover, Arran, who came secretly to the English court, did not please her, and there was an end of the matrimonial part of the scheme. The rest of it would probably also have miscarried but for the consummate statesmanship of Cecil, who saw where the interest of England lay. In August 1559 Sadler was sent with £3000 to the assistance of the Scottish Protestants. Another supply followed, but was intercepted, and in January 1560 a treaty was agreed to at Berwick between Elizabeth and the Lords of Congregation, to whom the duke of Chastel- herault had now gone over. The Scots engaged not to enter into an alliance with France, and to defend the

country against French aggression. Elizabeth was to support Scotland by an army, but no place of strength was to be left in English hands. If any were taken from the French they were to be razed or retained by the Scots, The Scots were to assist England if attacked by France, and to give hostages for fulfilment of the treaty. Next spring an English army under Lord Grey crossed the Tweed (28th March 1560), met the forces of the Congregation at Prestonpans, and invested Leith, in which the French were also blockaded by sea.

adherents. The last to go was Maitland of Lethington, the most talented but also the most cunning of the Scottish statesmen. His desertion was the sign of a lost cause. Even some of the higher clergy now conformed. Lord Erskine almost alone remained faithful. The regent's own courage never failed, and, though she received a visit from the leaders of the Congregation and consented to see Willock, she died a firm Catholic. Her misfortunes and her conciliatory policy during her long struggles to main- tain the French connexion with Scotland have gained her a lenient judgment even from Protestants, all save Knox, whose personal animosity is palpable, though his view of her policy is correct.

Her death removed the chief obstacle to peace, which Treaty of the English and the French courts had for some time de- Edin- sired, and the treaty of Edinburgh was concluded on 8th PS!

July 1560 upon terms favourable to Scotland. The mili- tary forces of both France and England were to evacuate Scotland, except a certain number of French, who were to remain in Inchkeith and Dunbar. Leith and Eyemouth were to be dismantled ; Mary and Francis were to abstain from using the arms of England. By separate articles certain concessions were granted to the nobility and people of Scotland showing the length to which the limitation of the monarchy was carried. No French or other soldiers were to be brought into the realm unless in the event of an invasion and only with the consent of the estates. Neither peace nor war was to be made without their con- sent. A council of twelve (seven chosen by the king and queen and five by the estates out of twenty-four selected by the estates) were to govern the kingdom during the absence of Mary and Francis. The chief officers of the crown were to be natives. An Act of oblivion was to be passed for all Acts since 6th March 1558. Neither the nobles nor any other persons were to assemble in arms ex- cept in cases provided by the law. The duke of Chastel- herault and his son, Arran, and all other Scots were to be restored to their French estates. With matters of religion the deputies refused to deal; but envoys were to be sent to the king and queen to lay before them the state of affairs, particularly those last mentioned.

Before parliament met an important step towards a new Reform-

organization of the church was taken. Superintendents, some lay, others clerical, were appointed for Lothian, Glas- gow, Fife, Angus, Mearns, Argyll, and the Isles. The principal ministers of the Congregation were planted in the chief towns,—Knox receiving Edinburgh as his charge. The convention parliament which assembled on 10th July and began its business on 1st August 1560 was the Reforma- tion parliament of Scotland. Like Henry VIII's famous parliament, its work was thorough. It not merely reformed abuses but changed the national creed and accomplished more in one than the English parliament did in three sessions. The parliament was the most numerous yet held in Scotland, being attended not only by nearly all the nobility but by some bishops and an unusually large nuni- ber of

lesser barons or landed gentry, representatives of the burghs. Its statutes never received the royal assent,

The regent had taken refuge in Death of Edinburgh castle, and here on 10th June she died of dropsy, Mary of She had been deserted gradually by almost all her Scottish S™s®:

Mary's return to Scotland.

REFORMATION. |

but were confirmed by the first parliament after Mary's deposition. On 18th August the Confession of Faith received the sanction of the estates. On the 24th an Act was passed declaring that the bishop of Rome had no juris- diction or authority within the realm. Another rescinded all Acts passed since James I. contrary to God's word ; and a third prohibited the mass or baptism according to the Roman rite, and ordained strict inquisition against all persons contravening the statute. The form of church government was not explicitly altered. The archbishop of St Andrews, and Dunkeld and Dunblane alone of the bishops, are said to have voted against the Confession, and Athole, Somerville, Caithness, and Bothwell alone of the nobles. 'The whole power of the state was at this time in the hands of the party of the Reformation and resist- ance was useless. The Confession of Faith, the corner- stone of the new policy both in church and state, was drawn up by Knox and five other ministers, but revised by the more moderate Reformers Lethington and Winram. 'The power of the civil magistrate was declared in terms which indicate the revision of Lethington rather than the original draft of Knox. Its language is certainly such as monarchs had been little accustomed to, though the expression is not so blunt as Knox used in preaching and conversation. Kings, princes, and magistrates in free cities are declared

to be those to whom the reformation of religion "chiefly

and most principally appertains." They are themselves to be judged by God, being appointed for the maintenance of the true religion and suppression of idolatry. Resistance to them, but only when vigilant in the execution of their office, is declared sinful.

The same persons who had prepared the Confession were entrusted with the composition of a code of ecclesi- astical polity, and a draft, after being first laid before the convention of 1560, was submitted as revised to that of the following year. This First Book of Discipline was not universally approved ; several of its provisions, especially those relating to church estates and their application to the support of the ministry, the relief of the poor, and the furtherance of education, were little to the taste of the nobility, and it was never sanctioned by the estates or fully acted on. Other parts of it were, however, embodied in the Second Book of Discipline, which became the law of the Reformed Church. It remains a memorial of the far- sighted views of Knox, its author; and the verdict of posterity has been in his favour and against the nobles who prevented its being carried out. See PRESBYTERIANISM, volwxax. p, G7 9%sq.

The death of Francis IT. (6th December 1560) materially altered the political situation. The much feared subordi- nation of Scotland to France was at last averted. Mary Stuart, only nineteen, was young enough to be influenced by a new husband and new responsibilities. Her character was not yet known, but her relations with Catherine de' Medici were not friendly, and there was little doubt that she would take advantage of the provision in her marriage articles and return to Scotland. Sir John Sandilands's mission to France to procure the royal sanction to the treaty of Edinburgh and the Acts of the Reformation parliament must have been unpalatable, and he was not favourably re- ceived. Before she left France Mary was visited by envoys of the opposite parties into which Scotland was divided. Lesley, official of Aberdeen, afterwards bishop of Ross, and lier valiant defender, was sent by the Catholic lords and bishops with a special message from Huntly, urging her to come to Aberdeen, where an army of 20,000 men would be at her disposal. But Huntly had not proved trustworthy during the regency and Mary rejected an offer which would have plunged the kingdom in war from the moment she landed. The very day after she had seen

Lesley her brother Lord James, who had been sent by 1560-1563.

the Lords of Congregation, met her at St Dizier. She received him favourably, but declined to ratify the treaty till she consulted her council. An attempt was made to capture Mary on her way to Scotland ; but, sailing from Calais on 14th August, she landed at Leith on the 19th. She was accompanied by three uncles and a considerable suite, including Castelnau the historian, Brantéme the memoir writer, and the poet Chastelard.t

On her return to Scotland Mary showed herself disposed to conciliate the Reformers provided she was allowed the exercise of her own faith. This had been guaranteed her by Lord James. His near kinship to the queen at a time when the stain of bastardy was less regarded, and his close relation with the Reformers, made him necessary to both and gave him an influence which his eminent prudence used for the good of the nation, but with an eye to his own advantage. Without thrusting himself too promi- nently forward, he led the privy council (ably supported by Lethington), and, without the name, was in fact prime minister. The title of Mar, and, when that was reclaimed by the heir of the Erskines, of Moray or Murray (9.v.), with its large territories, gave him the designation by which he is best known, as well as great wealth, which he dispersed by means not well explained. But the leaven of another influence than that of the statesman was now at work in Scottish politics. most representative Scotsman since Wallace.

mass at Holyrood, and Moray had himself to keep the chapel door to prevent its being broken. 'His best ex- cuse was," says Knox, "that he wald stop all Scotchmen to enter into the mass." Next Sunday Knox preached in Edinburgh against idolatry. "One mass was more fearful to him," he said, '"'than 20,000 armed enemies." Little likely as such sentiments were to please the young queen, a meeting between her and the preacher was arranged by Moray, the only third party present. On the matter of religion he was unbending, yet not more so than Mary. His judgment of the queen's character was, "If there be not in her a proud mind, a crafty spirit, and an indurate heart against God and His truth my judgment faileth me." In 1562 Huntly, the chief Romanist in the north, who offered to have the mass said in three counties, rebelled, being indignant at the grant to Moray of an earldom whose estates he then held. Mary, accompanied by her brother, made a progress in the north, where Huntly was defeated and slain at Corrichie, his elder son being imprisoned, his second beheaded, and the

lands of Huntly, of his kinsman the earl of Sutherland, and other barons of the house of Huntly forfeited. On her return to Edinburgh Mary again met Knox at Holyrood. He rebuked her for dancing and other frivolitiés, advised her to attend the public sermons, and told her that it was not his duty to leave his studies in order to wait at her chamber door. There were other interviews, in one of which (April 1563) only Mary seemed to yield a little. She was anxious to use his influence to quiet a threatened rising in the west, and to heal a quarrel between her half sister the countess of Argyll and her husband. Knox promised his aid, but required in return that the penal laws should be enforced against the Papists. This Mary agreed to, and her promise was also apparently kept. Hamilton, archbishop of St Andrews, and forty- seven other persons were prosecuted for hearing confession – 1 The story of Mary Stuart, which now approaches by rapid steps its climax, has been told by Mr Swinburne (see Mary, vol. xv. p. 594 sq.), and a poet may regard human character in a manner different from the historian, interpreting motives and drawing conclusions which history, whose view is limited by evidence, cannot reach. Here only

the leading facts in her personal story can be stated so far as they affect the course of Scottish history.

This was embodied in John Knox, the Knox The first and Sunday after Mary's arrival the mob tried to interrupt ™"¥:

1563-1567.

Mary's marriage to Darn- ley.

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and celebrating the mass. Yet Knox's comment in his fistory is, 'This conference we have inserted to let the world see how Marie queen of Scotland can dissemble, and how that she could cause men to think that she bore no indignation for any controversy in religion, while that yet in her heart was nothing but venom and destruction, as short after that did appear." She was in fact corre- sponding with her uncle the cardinal of Lorraine, with the pope, with Philip IL. testifying her steadfast attachment to Papacy and her desire to restore the Catholic faith. At a last conference

Knox remonstrated against her marriage, then thought imminent, with a Papist, claiming the right of a subject "to speak out on this topic which so nearly concerned the commonwealth," remaining unmoved by the last argument of a woman, which he savagely describes as "howling and tears in greater abundance than the matter required." Nothing but perusal of the conversations can bring before us this pregnant passage of history—the abase- ment of the Scottish monarchy before the religious de- mocracy—of the woman forced to dissemble and weep be- fore the stern man believing he delivered a message from God to the head of a corrupt court. Something was allowed to Knox's sincere outspokenness. He moved men and women alike by words which, like Luther's, go straight to the realities of life. He is the typical Scottish divine framed on the model of the Hebrew prophets, and often reproduced in weaker copies. The Reformation in Scotland, in both its strength and its weakness, was his work inore than that of any other man. The Presbyterian form of government, of which his friend Calvin was the author, was introduced by Knox from Geneva and con- tinued for long to enforce discipline, first by censure and then, if need be, by excommunication and temporal punish- ment, entirely in his spirit.

Not only to Knox and the Reformers but to all classes the question of the day was the queen's marriage. Apart from her beauty, her political position rendered her hand of importance to the balance of power. It held not only the dowry of France and the possession of Scotland but a claim, which might be at any moment asserted, to the English crown. She avowed her inclination to marry, and indeed she required a man to put her in possession of her kingdom. Don Carlos, the archduke of Austria, son of Philip of Spain, Charles IX. of France, the kings of Denmark and of Sweden, the archduke Charles, second son of the emperor, were all passed in review but rejected. Elizabeth pressed the claim of her favourite Leicester,—a project supported by Cecil and Moray. In the end the fair face and fine figure of her young cousin Henry Stuart, Lord Darnley, carried the day. A party of the Scottish nobles—Athole, himself a Stuart, Morton, Crawford, Eglin- ton, and Cassilis—favoured the alliance. David Rizzio, the queen's foreign secretary, who already had great in- fluence with her, promoted it. But it was her own act, the most dangerous of many false steps in her life. Shortly before the marriage (29th July 1565) Moray attempted to seize Darnley and the queen as they rode from Perth to Callendar near Falkirk. When it was

accomplished he rose in arms with the duke of Chastelherault, the head of the Hamiltons, Argyll, and Rothes; but Mary witha large force pursued them from place to place in the Roundabout Raid, from the neighbourhood of Edinburgh through Fife, where she levied fines, and finally to Dumfries, from which Moray fled to England. He had been secretly but not vigorously supported by Elizabeth, who, when she heard of his flight, recalled her orders to Bedford, then on the marches, to place troops at the disposal of the insurgents. Mary still retained some of the popularity of a young queen, and fostered it by an apparent desire to humour the Re- formers. For the first time she attended a Protestant

sermon. But the consequences of a union between a high- spirited woman, active in mind and body beyond her sex and years, with a vain and dissolute youth were soon seen. His alienation from the queen, the murder of Rizzio, with the intrigues that preceded and followed it, the rapid growth of Bothwell's influence, the pitiable vacillations of Darnley, and his murder at Kirk of Field (10th February Murder 1567) have been sketched in the article Mary (vol. xv, of Dam- — p. 596 sq.). The authors of the last crime were Bothwell, 1° who devised it, and his servants, who executed it. Their confessions leave no doubt of their own guilt. Who were their accomplices has from that day to this been debated without conclusive answer. The great controversy is whether the nobles with Moray at their head had bound themselves to support Bothwell, as he and Mary after- wards declared, or whether Mary, possessed with passion for Bothwell and hate of Darnley, herself instigated her husband's murder. Some have thought both the queen and the nobles were implicated. The casket letters, alleged to have been found in a coffer that was given to Morton by Dalgleish when intrusted with it by Sir James Balfour for its delivery to Bothwell, must be left out in any fair examination of this question. The mode of their recovery and their production, first partially and secretly before Elizabeth's commissioners at York, then with apparent but not real publicity at Westminster (for Mary's counsellors were not allowed to see them), their contents, so different from her known writings, and the disappearance of the originals render their evidence inadmissible. What weighs most against Mary is her subsequent conduct, explicable only in favour of innocence if she was absolutely in Both- well's power from the time of the murder to the defeat of Carberry,— an hypothesis not borne out by facts. Though Lennox and his wife urged that the murderers be brought to justice, there was delay till 13th April, when Bothwell was at last brought before an assize. The trial was a sham, and his acquittal on the pretence that there was no accuser could deceive no one.

The strange wooing which commenced when Darnley was Mary's just buried, if not before, was continued by the seizure of relations Mary by

Bothwell near Cramond and her captivity in her a own castle of Dunbar—a pretence according to her adver- ely, saries, an opportunity for an outrage from which marriage was the only escape according to her defenders—at last culminated in the marriage at six in the morning, at Holy- rood, on the 15th of May 1567. It was the month when wicked women marry, said the people, writing Ovid's line on the Tolbooth walls. Before it took place she created Bothwell duke of Orkney, and pardoned him for any violence. She also wrote in palliation of his conduct to the French king. His divorce from Lady Jane Gordon had been hurried through both the bishops' court and that of the Protestant commissaries,—in the former on the false pretence that there had been no papal dispensation for his marriage to one of near kin, and in the latter on the ground of adultery. Mary had been more than once warned of the consequences of such a marriage by Lord Herries, by the faithful Melville, and by Craig, the minister who, with the utmost reluctance, proclaimed the banns. It was an act which required no warning. She had no alternative, urge her vindicators, to save her honour, and her tears on the morning of marriage are proof that she was forced; but the more scrupulous admit she should have preferred death to union with a man she must at least have known was not clear of Darnley's murder. Her enemies said then, and historians who take their side repeat, that it was the mad- ness of a passion she could not resist. The view most consistent with the facts seems to be that she accepted, not without fits of remorse, the service of the strongest sword at her disposal on the only terms on which she

could obtain it. But, if Mary cannot be acquitted of the degree of complicity implied in accepting the conse- quences of the murder, many of the leading nobles were involved in equal guilt. On 19th April a bond asserting Bothwell's innocence and urging Mary to marry him had been signed at Ainslie's tavern, not only by Bothwell's few friends, but by "'a great part of the lords." Most of those who signed had in the parliament just concluded re- ceived grants of land or remission of forfeiture, and it is urged by Mary's defenders that they were bribed to acqui- esce in Bothwell's designs. When the bond was after- wards put in evidence against them their plea was that they had been forced to sign it by Bothwell. It is con- tended on Mary's

behalf that with so many of the nobles committed to approval of the marriage she had no one on whom to rely. There is something in this argument; but it does not meet the point—Why did she rely on Bothwell? That a scheme was arranged before Darnley's murder to entrap her into this marriage, in order to pave the way for her deposition, and that the casket letters were fabri- cated to clench her guilt, has been suggested; but the

are wanting. The two Scotsmen who almost alone main- tained the character of honest men, Kirkaldy of Grange and Sir James Melville, who were so far from being un- friendly to Mary that they ultimately espoused her cause, believed that she was a willing victim and threw herself into Bothwell's arms. The narrative in her own despatch

testant party increased in Scotland until it became a 1567-1569.

majority almost representative of the whole nation; even her own son when he came to hold the sceptre, little in- clined as he was to accept Presbyterian principles, regarded her as a revolutionary element fortunately removed. Her knowledge of Babington's plot for the invasion of England is proved, though her assent to the death of Elizabeth is still an open question. By her will, confirmed by her last letters, she bequeathed the crown of Scotland and her claim to that of England to Philip II. The letters contain this modification only, that her son was to have an opportunity of embracing the Catholic faith under the guardianship of Philip to save his own throne. There was no such reservation as regards that of England. The Armada, from whose overthrow date the fall of Spain and the rise of Britain as the chief European power, was due to the direct instigation of Mary Stuart.

Meantime, in Scotland, four regencies rapidly succeeded each other during the minority of James. The deaths by violence of two regents, Moray and Lennox, the suspicion of foul play in the death of the third, Mar, and the end scarcely less violent because preceded by a trial of the fourth, Morton, mark

a revolutionary period and the im- possibility of the attempted solution by placing the govern- ment in the hands of the most powerful noble. Heredi- tary royalty, not the rule of the aristocracy, was still dominant in Scottish politics and a regency was an experiment already disparaged in the preceding reigns.

facts necessary to prove so deep a train of conspiracy

to the bishop of Dunblane does not allege that she was forced, but only that "he partlie extorted and partlie | obtained our promise to take him as our husband."

Moray, said Sir J. Melville, "was and is called the good Moray's regent," mingling with this praise only the slight qualifi- charac- cation that in his later years he was apt to be led by %™*

Mary a prisoner.

The leading nobles were not disposed to accept a new master in Bothwell, whose vices, unlike those of Darnley, were coupled with a strong instead of a weak character. They kept jealous possession of the young prince, placed in the custody of Mar in Stirling ; and, when a muster was called to enforce order on the border, secretly collected their forces to act against instead of for the queen and her husband. Within a month of her marriage she was met at Carberry Hill, near Musselburgh (15th June 1567), by a force of the confederate lords, headed by Morton and Glencairn, Ruthven and Lindsay. Mary, after a fruitless attempt at mediation by Du Croc, the French ambassador, and an offer equally vain by Bothwell to decide the issue by single combat, surrendered to Kirkaldy. Both- well rode off to Dunbar with a few followers, and Mary was conducted to Morton's camp. Once in their hands, the lords treated her as a prisoner, and confined her at Lochleven Castle, where she was forced to abdicate, sur- rendering the crown in favour of her son and committing the regency during the minority to Moray. The young king was crowned at Stirling on 29th July. The prudent Moray, who had kept out of the way in France while these events were transacted in Scotland, now returned and was installed as regent (22d August). Mary remained prisoner in Loch Leven for nearly a year. After her escape on 2d May 1568 the duke of Chastelherault and other Catholic nobles rallied

round her standard ; but on 13th May Moray and the Protestant lords met her forces at Jangside near Glasgow, and the issue of that battle forced her to fly to England, where she placed herself (19th May) in the hands of Lord Lowther, governor of Carlisle, recalling Elizabeth's promises of protection. Mary, however, found that she was really a prisoner. Like Baliol, she disappears personally from the field of Scottish history; but her life in exile, unlike his, was spent in busy plots to recover her lost throne. It became clear as time went on that she placed her whole reliance on the Catholic minority and foreign aid ; even in prison she was a menace to Elizabeth and ready to plot against her as an enemy. The Pro-

flatterers, but testifying to his willingness to listen to Melville's own counsels, This epithet bestowed by the Protestants, whose champion he was, still adheres to him ; but only partisans can justify its use. He displayed great promptness in baffling the schemes of Mary and her party, suppressed with vigour the border thieves, and ruled with a firm hand, resisting the temptation to place the crown on his own head. His name is absent from many plots of the time. He observed the forms of personal piety,— possibly shared the zeal of the Reformers, while he moder- ated their bigotry. But the reverse side of his character is proved by his conduct. He reaped the fruits of the conspiracies which led to Rizzio's and Darnley's murders. He amassed too great a fortune from the estates of the church to be deemed a pure reformer of its abuses. He pursued his sister with a calculated animosity which would not have spared her life had this been necessary to his end or been favoured by Elizabeth. The mode of production of the casket letters and the false charges added by Buchanan, "'the pen" of Moray, deprive Moray of any reasonable claim to have been an honest accuser, zealous only to detect guilt and to benefit his country. The reluctance to charge Mary with complicity in the murder of Darnley was feigned, and his object was gained when he was allowed to table the accusation without being forced to prove it. Mary remained a captive under suspicion of the gravest guilt, while Moray returned to Scotland to rule in her stead, supported by nobles who had taken part in the

steps which ended in Bothwell's deed. Moray left London His During the year between his Tegency.

on 12th January 1569. return and his death several events occurred for which he has been censured, but which were necessary for his secur- ity,— the betrayal of the duke of Norfolk and of the secret plot for the liberation of Mary to Elizabeth, the imprison- ment in Loch Leven of the earl of Northumberland, who after the failure of his rising in the north of England had taken refuge in Scotland, and the charge brought against Maitland of Lethington of complicity in Darnley's murder. Lethington was committed to custody, but rescued by XXI. — 64

1569-1575.

Regen- cies of Lennox and Mar.

Knox's work.

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Kirkaldy of Grange, who held the castle of Edinburgh, and while there "the chameleon," as Buchanan named Maitland in his famous invective, contrary to the nature of that animal, gained over those in the castle, including Kirkaldy. Moray was afraid to proceed with the charge on the day of trial, and Kirkaldy and Maitland became partisans of the queen. The castle was the stronghold of the queen's party,—being isolated from the town and able to hold out against the regent who governed in the name of her son. This defection was mourned over by the Reformers. Knox, with the self-confidence which marked his character, sent from his deathbed to Kirkaldy a message of warning that "neither the craggy rock in which he confided, nor the carnal wisdom of the man [Maitland] whom he esteemed a demi-god, nor the assist- ance of strangers, should preserve him from being disgrace- fully dragged to ignominious punishment." It has been suspected that Maitland and Kirkaldy were cognizant of the design of Hamilton of Bothwellhaugh to murder Moray, for he had been with them in the castle. This has been ascribed to private vengeance for the ill-treatment of his wife ; but the feud of the Hamiltons with the regent is the most reasonable explanation. As he rode through Linlithgow Moray was shot (23d January 1570) from a window by Hamilton, who had made careful preparation for the murder and his own escape. Moray was buried in the south aisle of St Giles Cathedral, Edinburgh, amid gen- eral mourning.

Knox preached the sermon and Buchanan furnished the epitaph, both unstinted panegyrics. His real character is as difficult to penetrate as that of Mary. It is easy for the historian to condemn the one and praise the other according to his own religious or political creed. It is nearer truth to recognize in both the graces and talents of the Stuart race, which won devoted followers, but to acknowledge that times in which Christian divines approved of the murder of their enemies were not likely to produce a stainless heroine or faultless hero, indeed necessitated a participation in deeds which would be crimes unless they can be palliated as acts of civil war. Let us absolve, if we can, Moray and Mary of Darnley's blood. It remains indisputable that Mary ap- proved of Moray's assassination and that Moray would have sanctioned Mary's death.

Moray was succeeded in the regency by Lennox, Darnley's father, the male nearest of kin to the future sovereign, but really the nominee of Elizabeth. His brief term of office was marked by the renewal of the English war under Sussex and other generals, which made the queen's cause again the more popular. Lennox, another victim of violence, was slain (3d September 1571) in a hasty attack by one of the Hamiltons on Stirling, from which Morton, the real head of the Protestant party, who at first had been taken and threatened with the same fate, barely escaped. Mar, who had all along held the custody of the young king, was now chosen regent and held the post for a year, when he died (28th October 1572). During his regency the civil war between the queen's and the king's party continued. An English intrigue was carried on with great mystery, and never brought to a point, by Randolph and Killigrew to deliver Mary to the regent that she might be tried within her own dominions. On the death of Mar, Morton, who had been the most powerful noble during the last regency, at length reached the object of his ambition by being elected regent. On the day of Morton's election Knox died. He was "one," said Morton, "who never feared the face of man." If we condemn his violent language and bitter spirit, it is just to remember that he lived during the red heat of the struggle between Rome and the Reformation, and died before the triumph of the latter in Scotland was secure. He had felt the thongs of

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the galleys and narrowly escaped the stake. The massacre of St Bartholomew spread consternation throughout Pro- testant Europe just before his last illness. Mary and Philip of Spain were still plotting for the destruction of all he held vital. His scheme for the reformation of the church and application of its revenues was in advance not of his own time only. He contemplated free education for children of the poor who really required such aid,— a graduated system of parish schools, burgh schools, and universities, which would have forestalled the most recent educational reform. While he introduced Presbyterian government by kirk-sessions, presbyteries, synods, and general assembly and opposed even a modified Episcopacy, he saw the advantage of the superintendence of districts by the more learned and able clergy. While he insisted on the preaching of the Word and the administration of the sacraments in the vulgar tongue, his liturgy shows his favour for forms of public prayer. Knox's first wife was English, and two of his sons took orders in the Church of England. Scottish Presbyterianism had not yet been hardened by persecution into a hatred of prelacy as bitter as that of Popery. It meant separation from Rome, but inclined to union with England, and the question of the form of church government was still open.

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Morton, like his predecessor, favoured the Episcopal Regency

order, and, acting upon a compromise agreed to at Leith, of

a modified Episcopacy was restored. The bishops appointed "o™%»-

were declared subject to the king in temporal and to the church and general assembly in spiritual matters, and were to have the same jurisdiction as the superintendents. The assembly of Perth protested against the use of certain ecclesiastical titles, but passed over that of bishop. Most of the clergy sanctioned, though with reluctance, the ap- pointment of bishops in the hope of retaining their re- venues. 'The people called them "tulchan" bishops, from the straw counterfeit used to rob the calf of its mother's milk. Almost the whole church property remained in the hands of the landed

proprietors, Moray in the first instance and afterwards Morton receiving a lion's share. Avarice was Morton's besetting sin. In other respects he was an energetic and capable ruler. He effected at Perth, with the aid of Elizabeth's envoy, a pacification with Huntly, Chastelherault, and the Catholic nobles who supported Mary. Only the castle of Edinburgh held out, and this, aided by English artillery, he succeeded in taking after a brave resistance by Kirkaldy and Lethington. Kirkaldy and his brother were executed at the cross of Edinburgh. Lethington escaped their fate in what Melville calls "the Roman manner,"—at his own hands, perhaps by poison. The death of the bravest and the ablest Scotsman of that age put an end to the last chance of Mary's restoration by native support. Morton, now without a rival, restored order in the borders, and when an encounter occurred between the English and Scottish borderers called the Raid of the Redswyre his prudence prevented it becoming a national conflict. He appointed a commission for the reform of the law,—a far-sighted scheme, often attempted but always stopping short of success, to codify the law, which several Continental states, notably Denmark, about this period engaged in. The time was not ripe for a change which, now that it is, remains unaccomplished. But, while all seemed to favour Morton, there were undercurrents which combined to procure his fall. The Presby- terian clergy were alienated by his leaning to Episcopacy, and all parties in the divided church by his seizure of its estates. Andrew Melville, who had succeeded to the leadership of Knox, was more decided than Knox against any departure from the Presbyterian model, and refused to be won by a place in his household. His expensive buildings at Dalkeith, which got the name of

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James Stuart) regents.

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the Lion's Den, roused the jealousy of the nobles. The arrogance of his favourites exceeded his own. The com- mons were disgusted by a depreciation of the coinage. The powerful earl of Argyll, incensed by the recovery from his wife, the widow of Moray, of some of the crown jewels, and Athole, a Stuart and Roman Catholic, united with Alexander Erskine, governor of Stirling, who now had the custody of the young king, in a league which received so much support that Morton bent before the storm and offered to resign. The king, whose education had been forced by Buchanan, now barely twelve years of age, nominally assumed the government, but was directed by a council of nobles headed by Athole as chancellor. Morton surrendered the castle of Edinburgh, the palace of Holyrood, and the royal treasures, retiring to Loch Leven, where he busied himself in laying out gardens. But his ambition could not deny itself another stroke for power. Aided by the young earl of Mar, he got possession of Stirling castle and the person of the king, Civil war was avoided only by the influence of Bowes, the English ambassador. A nominal reconciliation was effected, and a parliament at Stirling introduced a new government. Morton, who secured an indemnity, was president of the council, but Athole remained a privy councillor in an en- larged council with representatives of both parties. Shortly afterwards Athole died, of poison it was said, and suspicion pointed to Morton. His return to power was brief, and the only important event was the prosecution of the two Hamiltons, the abbots of Arbroath and Paisley, who still supported Mary and saved their lives by flight to England. The struggle with the Presbyterian clergy continued. The Second Book of Discipline had been presented to the king before he assumed office, and, although the general assembly in 1580 condemned Episcopacy absolutely, parliament did not sanction the condemnation. The final fall of Morton came from an opposite quarter. In September 1579 Esmé Stuart, Lord D'Aubigny, the king's cousin, came to Scot- land from France, gained the favour of James by his courtly manners, and received the lands and earldom of Lennox, the custody of Dumbarton castle, and the office of chamberlain. One of his dependants, Captain James Stuart, son of Lord Ochiltree and brother-in-law of Knox, had the daring to accuse Morton at a meeting of the council in Holyrood of complicity in the murder of Darnley, and he was at once committed to custody. Some months later Morton was condemned by an assize for having taken part in that crime, and the verdict was justified by his con- fession that Bothwell had revealed

to him the design, although he denied participation in its execution. He was executed by the Maiden—a guillotine he had himself brought from England —on 2d June 1581.

From December 1580 to August 1582 the government was in the hands of Lennox and Stuart, now captain of the guard,—a small force which the estates had reluctantly allowed the king to protect his person. Their jealousy threatened but never reached an open rupture. Stuart was rewarded by the gift first of the tutory, then of the earldom of Arran in April 1581. Lennox was created duke, a title seldom granted in Scotland. Their aim, carefully concealed by nominal adherence to the Protestant faith, appears to have been the association of Mary with her son in the government, a breach with England, the renewal of the league with France, and the restoration of the Roman Church. The nobles, bribed by office or the spoils of the church, were men of too feeble character to resist, but the Presbyterian ministers were made of stronger metal. Illegal banishment of the contumacious clergy and arbitrary orders of council were followed by a rising against Epis- copacy. The proclamation of an extraordinary chamberlain air—an itinerant court of justice—to be held by Lennox

at Edinburgh on 27th August precipitated the coup @état of 1575-1585. the Raid of Ruthven, which took the usual form of Scottish revolutions,—the seizure of the king and the transfer of

power to his captors. When on a visit (22d August 1582)

to the earl of Gowrie, son of his mother's foe Lord Ruthven, Raid of at his castle of Hunting Tower near Perth, the earl his host, Ruthven. Mar, the master of Glamis, and others, taking advantage

of the absence of Lennox and Arran, surrounded the castle

with armed men and made James a prisoner, though still ostensibly treating him as king. Arran, returning to Perth

with only two followers, was seized and put in prison. Lennox, after taking refuge in the castle of Dumbarton,

fled to France, where he died in disgrace with the Catholics,

because he had conformed to the Protestant doctrine.

The government was for ten months in the hands of a new council, of which Gowrie as treasurer was the head.

There was no parliament, but a convention at Holyrood ratified the consequences of the Raid of Ruthven. A declaration was extorted from the king condoning his capture; but James, no longer a boy, chafed under the tutelage of the Protestant nobles and the admonitions of

the Protestant ministers. In June of the following year

he escaped from Falkland to St Andrews, which was held

by Colonel Stewart. Arran was recalled, the Raid of Reaction Ruthven declared treason, Gowrie executed, and the chief favour Protestant lords banished. Melville and other ministers . Epis found it necessary to fly to England. . A parliament con- = firmed the supremacy of Arran, who was created chan- cellor, and the forfeiture of the chief persons implicated

in the Ruthven Raid. The king's power was declared to extend over all estates and subjects within the realm; all jurisdictions not approved by parliament and all assemblies

and conventions without the king's licence were discharged.

A commission was granted to Patrick Adamson, archbishop

of St Andrews, and other bishops for trying ecclesiastical causes, and a form of judgment was established for depriv-

ing ministers of their benefices for worthy causes.

to their ordinary bishop or superintendent appointed by

him, under pain of forfeiture. A few subscribed uncondi- tionally, others with the qualification, "according to the Word of God"; but a large number

declined, and suffered

the penalty. Early in 1585 Adamson issued a paper de- claring the king's supremacy in matters ecclesiastical, defending the restoration of bishops, and announcing the king's intention that the bishops should hold synods twice

a year, that general assemblies should be allowed provided

they had his sanction, but that no jurisdiction was to be exercised by presbyteries. This document, which cut at

the root of the Presbyterian system and was a formal declaration in favour of the royal supremacy and Episco-

pacy, was met with vehement protests by Melville and the exiled ministers.

Meantime a series of intrigues went on between the James English and Scottish courts. Elizabeth, while osten- 24 sibly favouring the exiles, disliked their political principles. ag James and Arran, instead of leaning on the papacy as Mary did, had shown signs of accepting a solution of the problem of church government more like that of England than of Geneva. There was here ground for a compromise of the religious controversy which political reasons made so desirable. Accordingly Lord Hunsdon, a favourite courtier of Elizabeth, met Arran near Berwick in the autumn, when it was arranged that the master of Gray, then a follower of Arran and personal favourite of James, should go to London in October. At his instance Elizabeth removed the banished Scottish lords and ministers from Newcastle to London. But Gray was playing his own

game, and his suggestions that these lords might return to Scotland, and that the alliance with England should be carried out by their aid and his own influence independ- ently of Arran, were taken up by the queen, who had no personal liking for Arran, and ultimately effected. Eliza- beth sent

Wotton to Scotland, who won the confidence of James, to whom he promised a pension of £5000 a year, and while openly negotiating with Arran secretly plotted with Gray for his downfall. A mutual league between England and Scotland against the Catholics, called "the Bond anént the True Religion," was agreed to by a con- vention of estates in July 1585.

This was a turning-point in the life of James and in the history of Scotland. The choice was made between France and England, Romanism and Protestantism. It was not likely to be reversed when with Elizabeth's declining years the crown of England was thrown into the balance. The day before the conclusion of the treaty Arran was at the request of Elizabeth's envoy put in strict ward, under the pretext that he had been privy to the death of Lord Russell, son of the earl of Bedford, in a border fray, and he only escaped at the price of his estates and honours. In November the banished lords—Angus, Mar, the master of Glamis—returned, and along with them the two Hamil- tons ; and, aided by Gray, they seized the person of the king, the castle of Stirling, and assumed the government. The alliance with England was finally ratified at Berwick by Randolph. James, at the instigation of Gray, wrote a harsh letter to his mother; and at the instance of Eliza- beth he allowed George Douglas, who had been concerned in Darnley's murder, to return to Scotland. The exiled Pro- testant ministers were restored to their livings; but James was resolute in maintaining Episcopacy and enforcing the laws against all who denied the royal supremacy. Adam- son was indeed forced by a general assembly to disclaim any authority as archbishop not allowed by God's Word, and an Act was passed again dividing Scotland into presby- teries, but the king refused to subject the bishops to their jurisdiction. Mary, deserted by her son, now allowed herself through her immediate confidants, especially her secretaries Nau and Curle, to take an active though secret part in the Jesuit plots which embraced both Scotland and England in their ramifications. That which had for its aim the assassination of Elizabeth was discovered by

the king was still allowed to grant feus of church lands, the nobles and landed gentry really profited most by this measure, which gave a

parliamentary title to their estates derived from the church and the hope of future spoils. The Act was accompanied by a general revocation of all gifts made during the king's minority or by Mary after his accession. Another statute of constitutional import- ance renewed, and for the first time carried into effect, the law of James I. by which the lesser barons in the counties were excused from personal attendance and allowed to send representatives to parliament. This was a check on the nobles who had hitherto almost exclusively attended and ruled parliament. It was the first and only large deviation of the Scottish parliament from the feudal model of the curia regis.

Projects for the king's marriage had been on foot at an earlier period; but at last the choice fell upon Anne of Denmark. Elizabeth opposed the match ; but James, per- haps tempted by the offer to surrender the Danish claim to Orkney and Shetland, perhaps also not unwilling to show he could choose for himself, was married to Anne by proxy. Anne set sail for Scotland, but was driven back by a storm. Accordingly James himself went to claim his bride, when the actual marriage was at once celebrated at Copenhagen, where he spent the winter. It was a political advantage both to the king and Scotland to form a connexion with a kingdom which, though small, stood comparatively high at that time in Europe, and was completely independent both of England and of France. After the king's return the Presbyterian party was in the ascendant. It has been doubted whether the favour shown to it by James at this time was genuine, but without reason. He had been married, and the queen was crowned, by Robert Bruce, a leading minister, for whom he had a personal liking. Shortly before going to Denmark James had published a tract interpreting the Apocalypse in the well-known Protest- ant sense, Notwithstanding the failure of the Armada, the air was still full of Jesuit intrigues and Spanish plots. At no moment of his life was James less inclined towards the English form of the Reformation, which he described in a celebrated speech as retaining the superstition of the mass "without the liftings." A severe blow was given to Episcopacy in Scotland by Archbishop Adamson shortly before his death retracting in a published confession his

Walsingham's spies, and, though forgery was resorted to, it is difficult to doubt that Mary was cognizant of the design. The trial at Fotheringay could

have but one result under a statute according to which any attempt against

writings against Presbyterianism. In 1592 parliament, led Re-estab-
according to James Melville by Maitland, now Lord Thirle- lishment stane
and chancellor, re-established Presbyterian church 0! Pt

: byterian- government. General assemblies were to meet once 4 jem.

the queen's life was treason in the person for whom it was made as well as in the actual perpetrators. The execu- tion (8th February 1587) of Mary naturally roused the anger of the Catholic powers and some indignation in Scotland, which James professed to share; yet he did nothing but expostulate. In truth his own crown was threatened by the same enemies. Mary had disinherited him in favour of Philip of Spain, unless he adopted the Catholic faith. The defeat of the Spanish Armada by the sovereign and people of both countries was felt to be a providential deliverance. Nothing could have served better to efface the memory of Mary and extinguish pity for her

year, and provincial assemblies or synods, presbyteries, and sessions were confirmed. The Act of 1584 conferring jurisdiction on bishops was rescinded, but there was no formal abrogation of the office. The assembly had asked for the repeal of the Act of Annexation of 1587, but this was not conceded. The landed interests were too powerful to allow of the Reformed Church receiving the patrimony of its predecessor. Shortly after the termination of the parliament the discovery of the plot of "the Spanish blanks" showed that the danger of a Catholic rising and foreign invasion was real. The conspiracy proved abor- tive, and two of its chief promoters (Huntly and Erroll)

Majority fate. The fall of Gray, who was tried and condemned for ofJames, treachery during his English embassy and for correspond- ence with Catholic princes, left James, now of full age, without what was almost a necessity to his weak nature, —a favourite, though Sir Jolin Maitland, a younger brother of Lethington, was secretary and exercised the chief influ- ence in the government. Advantage was taken of the royal majority to pass an Act annexing to the crown all church lands under certain limited reservations. But, as all prior grants to lay impropriators were saved, and

left Scotland ; on their return three years later they publicly renounced Catholicism and conformed to the Protestant faith.

From the king's majority to his accession to the English Rela- throne, his relations to the nobles on the one hand and to ee the Presbyterian' party led by the ministers on the other chee require to be kept in view as giving the key to a singularly ana confused and changing course of events. After the death state. of Thirlestane in 1595, the king had to rely on his own counsel, of the value of which he had an overweening

The Octa- vians,

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opinion. He had studied the theory of kingcraft and wrote the Basilicon Doron expounding it. He fancied that he really governed, while he was in fact drawn this way or that by the contending forces which emerged in this revolu- tionary epoch. In spite of occasional displays of resolution, his character was at bottom weak. It was the destiny which conducted him to the English throne that saved him from the dangers of his situation in Scotland. A noble- man, who, although only connected by his mother with Mary's Bothwell, seemed to inherit the reckless daring of his predecessor in the title, thrice attempted and once for a short time succeeded in seizing the royal person and assuming the reins of government. But James, who was not without adroitness in baffling plotters by arts similar to their own, escaped from his custody. Towards the Catholic lords his policy was not to proceed to extremities, but to keep them in hand as a counterpoise to the extreme Protestant party. He prudently allowed the finances to be managed after Thirlestane's death by a committee, called from its number the Octavians, on which both Catholics and Protestants acted,—Seton, afterwards Lord Dunferm- line, the president of the session, and Lindsay of Balcarres being the leading members. With their advice James set himself against any measures which the Protestant minis- ters proposed for the restoration or increase of the revenues of the church. It was this critical point of money, the assertion of the royal supremacy in spiritual matters, and the favour the king showed to the Catholics which led to the quarrel between him and the ministers. Ata conven- tion of the estates at Falkland and then more strongly as one of a deputation sent by the ministers from

Cupar, Andrew Melville, in the spirit and manner of Knox, made his well-known speech to "' God's silly vassal" on the two kingdoms and the two kings. Although James, frightened by this vehement language, made promises that he would do nothing for the Catholic lords till they had made terms with the church, it was impossible that a quarrel, whose roots were so deep, as to the limits of the royal authority and jurisdiction in matters ecclesiastical could be appeased. Neither party to it could see how far each overstepped the bounds of reason. The king was blind to the right of freedom of conscience which Protestantism had established as one of its first principles. Melville and the ministers

diminishing the authority of the general assemblies and 1595-1603,

of conferring on parliament a competency to deal with matters ecclesiastical. Parliament in 1597 passed an Act that all ministers promoted to prelacies (7.e., bishoprics or abbacies) should have seats in parliament, and remitted to the king with the general assembly to determine as to the office of such persons in the spiritual policy and govern- ment of the kirk. Accordingly James summoned succes- sive assemblies at Perth and Dundee, where there were two sessions in 1597, and finally at Montrose in 1600, selecting those towns in order to procure a good attendance from the north, always more favourable to royalty and Hpisco- pacy and less under the influence of the Edinburgh clergy. By this and other manceuvres he obtained some concessions,

but not all that he desired (see PRESBYTERIANISM, Vol. xix. Gowrie

pp. 681-682). It was the Gowrie conspiracy (5th August 1600) whose failure gave him the courage and the ground for finally abandoning the Presbyterians and casting in his lot with the bishops. Repeated investigations at the time and since cannot be said to have completely cleared up the mystery of this outrage. The most probable solution was afforded by the discovery several years afterwards of a corre- spondence between Gowrie and Logan of Restalrig which pointed to the seizure of the

person rather than the murder of James as the object of the plot. More important than this object, which failed, was the sequel. The Ruthvens, who were chiefly implicated, were amongst the most promi- nent of the Protestant nobility, and the Presbyterian minis- ters with few exceptions refused to accept James's own account of what had happened, confirmed though it was by depositions of various noblemen who were with the king at the time. They even insinuated that the plot had not been by but against Gowrie at the king's instance. Although James by arguments and threats at last extorted an acknowledgment of the truth of his account from all the ministers except Bruce, who was deprived of his benefice and banished for his contumacy, the insult and the injuri- ous suspicions were never forgiven.

In October, with the consent of the convention of estates, he appointed three bishops to vacant sees, and they sat in parliament, though as yet without any place in the government of the church, which was still Presbyterian, and with no sanction of course from the assembly or the

ministers. James had to assume the English crown before Union of Episcopacy could really be restored. This crisis of his English career was not long delayed. Already Elizabeth's death es

was being calculated on, and her courtiers from Cecil crowns,

were equally blind to the impossibility of any form of monarchy yielding to the claim that the members of an ecclesiastical assembly should use the name of Christ and the theory of His headship over the church to give them-

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selves absolute power to define its relations to the state. Other occasions quickly arose for renewing the controversy. A violent sermon by Black at St Andrews gave a favour- able opportunity to James of invoking the jurisdiction of the privy council, and the preacher was banished north of the Tay. Soon afterwards a demand made on the king in consequence of a sermon of another minister, Balcan- quhal, and a speech of Bruce, the king's former favourite, that he should dismiss the Octavians, led to a tumult in Edinburgh, which gave James a pretext for leaving the town and removing the courts of justice to Linlithgow. Supported by the nobles, he

returned on New-Year's Day 1597, received the submission of the town, levying a severe fine before he would restore its privileges as a corporation and withholding from it the right of electing its own magis- trates or ministers without the royal consent. Emboldened by this success, James now addressed himself to the diffi- cult problem of church and state. He did not yet feel strong enough to restore Episcopacy, perhaps had not quite determined on that course. The ingenious scheme due to Lindsay of Balcarres was fallen on of introducing repre- sentatives of the church into parliament without naming them bishops. This would have the twofold effect of

downwards were contending for the favour of her heir. She died on 24th March 1603 and James was at once pro- claimed her successor in accordance with her own declara- tion that no minor person should ascend her throne but her cousin the king of Scots. Leaving Edinburgh on 5th April, James reached London on 6th May, being every- where received with acclamation by the people. Thus peacefully at a memorable epoch in the history of Europe was accomplished the union of South and North Britain. Often attempted in vain by conquest, it was now attained in a manner soothing the pride of the smaller country, without at first exciting the jealousy of the larger, whose interest was, as Henry VII. prophesied, sure to predominate. To James it was a welcome change from nobles who had threatened his liberty and life, and from ministers who withstood his will and showed little respect for his person or office, to the courtier statesmen of England trained by the Tudors to reverence the monarch as all but absolute,

and a clergy bound to recognize him as their head. To Advan-

Scotland, a poor country, and its inhabitants, poor also but enterprising and eager for new careers, it opened pro- spects of national prosperity which, though not at once, were ultimately realized. It was an immediate gain that

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end, This more than counterbalanced the loss of the court, a loss which probably favoured the independent develop- ment of the nation. For the

present no change was made in its constitution, its church, or its laws. The Reforma- tion had continued the work of the War of Independence. Scotland no longer consisted only of the prelates, the nobles, and the landed gentry. The commons, imperfectly represented in parliament by the burghs, not yet wealthy enough to be powerful, had found a voice in the assemblies of the church and leaders in its ministers and elders. Superstition did not fall with the fall of the church of Rome nor licence with the decline of the nobility. Rather, both took new forms of extreme virulence and threatened to impede the national progress; but both were exposed to the light of public discussion and the growth of public opinion. The contact with the more cultured south was of immense value. Scotland, now beginning to use in the services of the church, in the proceedings of the courts, and in printed books the vulgar tongue, which differed only as a dialect from that of England, was admitted to the freedom of the noblest language and literature in Europe, then in its prime. The arts which increase the convenience and pleasure of daily life spread northward with the increase of wealth. Science, starting on a new method taught by the great English philosopher, was intro- duced and after a time eagerly prosecuted. Commerce,

for which the Scots had a natural aptness, found new

fields, And all these benefits were procured without any sacrifice of the independent spirit which had been derived from their forefathers. Even the separate intercourse with the Continent—with France, Germany, Holland, and Scandinavia—from which Scotland had already received so much advantage, though not quite so intimate with France as before, continued. But before the blessings of the union could be fully realized a century was to inter- vene, which at times seemed to hide if not to bury them, —a century of civil war and religious controversy. At the moment when James ascended the throne and pro- claimed the virtues of peace it required no far-sighted observer to discern elements of discord which might at any moment burst in storm. To hold Papal Ireland,

 border wars and English and French intrigues were at an

Cecil, Lord Salisbury, the son of Burghley, an hereditary statesman of great ability as an administrator. But on two subjects closely connected with Scotland the king had decided opinions of his own. He desired to see Scotland bound to England, not merely by the union of the crowns, but by a union of the parliaments and laws, and if not an immediate an ultimate union of the churches. He was equally determined that the church in both countries should combine a moderate Protestant doctrine—a via media be- tween Rome and Geneva—with Episcopal government. Both desires were founded on prudent policy and might possibly have been accomplished by a stronger and wiser monarch, But the former was opposed by the jealousy of England and the pride of Scotland. The latter could not be accomplished in Scotland without force, so deep were the roots which Presbyterianism had struck. James at- tempted to carry both measures in a manner calculated to raise rather than to overcome opposition. The union scheme was brought before his first English parliament, and commissioners were appointed to treat with the Scottish commissioners nominated somewhat reluctantly by the par- liament of Perth. The commissioners met, but differences at once emerged on the topics of freedom of trade between the two countries, to which the English were averse, and the acceptance of the laws of England, which the Scots objected to. Two important points were carried by a declaration of the law rather than agreement of the com- missioners,—that subjects born in either country after the accession (post nati) should have the full privileges of sub- jects and not be deemed aliens, and that those born before should be capable of denization and so of inheriting or acquiring land in England, though not of political rights or offices. The English parliament of 1607, however, refused to sustain the decision of the Exchequer Chamber in favour of the post nati, although it consented to abolish the laws which treated Scotland as an enemy's country and made arrangements for the extradition of criminals. The reli- gious or ecclesiastical question was first brought to a point in England at the Hampton Court conference, which met on 14th January 1604, in which trifling concessions were made to the Puritans, chiefly as to the observance of Sunday and the removal of the Apocrypha from the Authorized

James's desire for political union,

Episcopal England, and Presbyterian Scotland united under one sceptre was a task of infinite difficulty, not lessened because in each there was a minority who dissented strongly

*Version. In Scotland Episcopacy was restored by a series Re-estab- of steps which were gradual only for the purpose of over- re coming opposition, not because James hesitated as to the ® ~P**

from the prevailing opinion as to church government and doctrine. The sudden separation from Rome gave birth to every variety of religious opinion, and Scotland became even more than England a land of sects. The constitution of the civil government was a problem not yet solved. In England the Tudor sovereigns had sapped the principles of the parliamentary constitution established in the times of the Plantagenets, and fortunatelyrecorded in writings which could not be forgotten. In Scotland such principles had never yet been practically adopted. Ireland was ruled as a dependency on the principle of subjection.

At this point in the treatment of some historians the history of Scotland ends. Juster views now prevail. Neither the union of crowns nor of parliaments really closes the separate record of a nation which retained sepa- rate laws, a separate church, a separate system of education, and a well-marked diversity of character. But a great part of the subsequent history of Scotland is necessarily included in that of Great Britain, and has been treated under ENGLAND (¢.v.). Considerations of space and pro- portion make it necessary that what remains should be told even more rapidly than the narrative of what preceded the accession of James to the English throne. James during the first half of his reign as sovereign of Great Britain allowed himself to be mainly guided by Robert

end in view. At length the parliament of 1612 repeated the Act of 1592, so that Episcopacy was now once more established in Scotland by law, but contrary to the wish of the majority of the nation and under circumstances which made it the symbol of absolute government. While thus resolute in favour of Episcopacy, James showed no sign of leaning to the Roman Church, although efforts to convert him had been made at an earlier period in Scot- land. The Armada, now followed by the Gunpowder Plot,

convinced him that he had nothing to hope for from the Papists but open war or secret conspiracy.

After the death of Cecil James gave way to that influence of favourites to which he had shown himself prone in his younger years ; but in the affairs of Scotland, which pro- duced much trouble and little profit, Somerset and Buck- ingham took no interest and James was his own master. After an absence of fourteen years he visited his native country. He had promised to return every three years, but the business and pleasures of the English court detained him. His main object was to carry out still further the uniformity of the church, in which the bishops had not succeeded in establishing the same service as in England.

copacy.

This object was apparently attained in 1618 by the adop- piv tion of the Five Articles of Perth (see vol. xix. p. 682), Articles but at the cost of sowing the seed of religious war. From of Perth.

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In spite of the opposition of a convention of the estates, 1603-1637. which nearly ended in bloodshed, the king carried out the resumption of tithes for the benefit of the clergy from their

lay impropriators, The revocation in 1625 of all grants in Ecclesi- prejudice of the crown, whether before or after the Act of tical

Annexation of 1587, was superseded by a new measure, ee

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this time to James's death little occurred worthy of note in the history of Scotland. A parliament in 1621, held under the marquis of Hamilton as commissioner, confirmed the Five Articles, though by a majority that is narrow when the power of the king in a Scottish parliament is kept in view, and only on an assurance from the commissioner

that no further ecclesiastical innovations would be proposed. It also introduced a new mode of electing the Lords of the Articles, which practically gave the whole influence to the bishops, the nominees of the crown. As this body prepared the entire business of a parliament in which there was no power of bringing in Bills by private members, this was a long step in the direction of absolute government. James, in fact, declared in one of his speeches to the English parlia- ment that, according to the Scottish constitution, he was master of its whole proceedings, with the absolute power of initiative as well as of veto. His declaration was an ex- aggeration, for there were well-known precedents of the estates passing laws without the royal assent; but the Scottish constitution was in a fluid state without the guarantee of written charters or clearly defined rules as to the refusal of supplies, and above all without an independ- ent House of Commons to represent the wishes of the people and demand redress for their grievances. The only part of the policy of James on which it is possible to look back with satisfaction was that which concerned coloniza-

iza- tion, then called " plantation." This gave an outlet to the

increasing population, while it advanced the civilization of the countries to which the settlers went. The earliest of these schemes, the "plantation" of the Hebrides by a number of gentlemen of Fife called "undertakers," had comparatively little effect, but, apart from it, some progress was made in introducing order and law in the Highlands and islands, where the people were still in a semi-barbarous condition. More important was the plantation of Ulster, chiefly by Scottish farmers, whose descendants still retain a Scottish dialect and a Presbyterian church. But as an augury of the future the colonization of Nova Scotia, though attempted in an arbitrary manner, was of the greatest consequence. It was a commencement of the great migration to the New World across the Atlantic and to the other colonial possessions of Great Britain, in which, equally to their own profit and that of the empire, the Scottish nation in the two following centuries was to play so great a part. Qn 22d March 1625 James died, leaving to his son Charles a burden of government heavier than when he had himself undertaken it. His apparent success in carrying to a further point the absolute and arbitrary principles of the Tudor sovereigns scarcely concealed the real failure. Ireland, with difficulty kept down, was not really subdued. The

parliament of England had given unmistakable signs that it was only waiting an opportunity to restore the constitution on the old basis. The religious and political instincts of the Scottish nation, suppressed by force, were gathering strength to reassert themselves if necessary by revolutionary methods. An exhausted ex- chequer, which James had attempted to fill by monopolies, and by the sale of offices and honours and so-called bene- volences, added to the other difficulties of carrying on the government, but was fortunately, as in the time of the Plantagenets, to afford the occasion for maintaining the constitutional struggle.

8. Period of Civil Wars, Charles I. to Revolution.— Eight years after his accession Charles I. revisited Scotland (1633). During these he had pursued his father's policy. No Scottish parliament sat, though a nominal one was adjourned annually between 1628 and 1633. No general

ratified by parliament in 1633, declaring the terms on which the tithes might still be acquired and valued by the heritors. Few measures have been of greater importance in their bearing on Scottish history. The revocation alienated the nobles and landed gentry, who dreaded that when so much had been, still more might be, taken from their profits in the Reformation. The new valuation left the parochial clergy in the position of a poor class, with interests antagonistic to the gentry, whose income was diminished whenever the ministers attempted to raise their seanty stipends. The loyalty for which the Scots had been distinguished had received a shock by the removal of the court, and this was a second and more serious blow. Yet when Charles came to Edinburgh and received the crown at Holyrood (18th June 1633) he was well re- ceived. The disaffection still lay beneath the surface. Although the Five Articles of Perth were not rigidly en- forced, all the court could do was done to introduce the most obnoxious,—the practice of kneeling at the com- munion, which Presbyterians deemed a relic of the mass. The question of a liturgy was not allowed to rest. It was brought before the Scottish bishops in 1629 ; their draft was submitted to Laud, who, detecting in it Low Church doctrine as to baptism and traces of Knox's Book of Common Order, refused his approval and advocated the introduction of the English Prayer Book, by which uni- formity would be secured. Though this was not yet at- tempted, Charles took the same view as the zealous and ambitious churchman who was now his guide in ecclesi-

astical matters. When he came to Scotland Laud was in his suite, and the coronation was conducted with a ritual which "had great fear of inbringing of Popery." Edin- burgh was created a bishopric. The parliament over which Charles presided passed thirty-one Acts, "not three of which," says a contemporary, but were most "hurtful to the liberty of the subject." One in particular declared in a large sense the royal prerogative, and by an ill-omened conjunction gave the king power to regulate the apparel of churchmen. It was disputed in parliament whether this Act was carried, but the presence of the king, who took notes of the votes, overawed opposition. About a year after Charles left Scotland the trial of Lord Balmerino, which grew out of the Acts of this parliament, gave the first impulse to the Scottish revolution. That nobleman, who had possessed a copy of a petition protesting against the Acts then carried, was tried under the old Acts against leasing-making or sedition and condemned by a majority of one upon a single charge,—that of not revealing the petition and its author (March 1635). Although Charles respited the capital sentence, the condemnation deeply stirred the people, who saw almost the only mode of con- stitutional redress, that by petition, declared illegal and an act capable of innocent interpretation treated as a heinous crime. Before the trial the appointment of Spot- tiswoode as chancellor, the first ecclesiastic who held the office since the Reformation, and the admission of nine bishops to the privy council, increased the disaffection. In 1636 the Book of Canons, ratified by the king the year before, was published at Aberdeen, containing the most distinct assertion of the royal supremacy and a complete Episcopal organization.

At last on Sunday, 23d July 1637, the much-dreaded Introduc- liturgy, the use of which had been enjoined by the Canons tion of and announced on the preceding Sunday, was introduced /t" "sY-

1 assembly met, but the restoration of Episcopacy and the uniformity of the churches were steadily prosecuted by royal influence and the exercise of the royal prerogative.

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promoting the true religion, were devised, but failed to satisfy even the least zealous Covenanters.

Anassembly at last met in Glasgow, over which Hamilton Asgom. presided, with faint hope that matters might still be accont- bly of modated. Hamilton had orders to dissolve it if it proved Glasgow. to be intractable. The members had been chosen by the

in the service of St Giles Cathedral, Edinburgh. For the most part a transcript of the English Prayer Book, it deviated slightly in the direction of the Roman ritual. Its use provoked an uproar, of which the stool flung at the dean by a woman, Jenny Geddes or Anne Mein, was the symbol, and brought the service to a close,—Lindsay, the

bishop, being with difficulty saved from the violence of the

influence of the Tables, according to a mode invented in

mob. Asimilar riot took place in Greyfriars church, where | 1597. Three ministers represented each presbytery and the bishop of Argyll attempted to use the book, There | an elder the laity of the district. The burghs also sent re- had been no such tumult since the Reformation. The | presentatives. The Covenanters had declared their inten-

privy council arrested a few rioters, but suspended the use of the service book until the king's pleasure was known, and when Laud at the king's request wrote that its use should be continued no one dared to read it in Edinburgh or throughout Scotland except in afew cathedrals. Meantime numerous supplications against it and the Canons, joined with accusations against the bishops, were sent to Charles. His only answer was the removal

of the courts and privy council to Linlithgow and an order to all ministers who signed the supplications to leave Edinburgh. There fol- lowed fresh supplications and protests, in which some of the nobility, especially Rothes, Balmerino, Loudon, Mon- trose, and a prontinent lawyer, Johnston of Warriston, joined with the ministers. Hope, the king's advocate, secretly favoured them. Traquair, a leading member of the privy council, went to London to press on Charles and Laud the gravity of the situation ; but, though ambiguous concessions were made, the king and his advisers were determined to insist on the service book. In a proclama- tion issued at Stirling (20th February 1638) the king as- sumed the responsibility of its introduction ; but the op- position was too powerful to be put down by words. Its organization, begun by commissioners headed by Rothes, continued in committees of the nobles, lesser barons, ministers, and burghs, was now called "the Tables" from those in the Parliament House, where they sat sometimes separately, sometimes collectively, and formed a standing assembly which defied the king's council. The Covenant, prepared by Alexander Henderson, leader of the ministers, and Johnston of Warriston, was revised by Rothes, Loudon, and Balmerino, and accepted by upwards of two hundred ministers who had gathered in Edinburgh. It was signed at Greyfriars church on lst March 1638, first by many of the nobles and gentry, then by three hundred ministers and a great multitude of the people. Copies were at once despatched throughout the country, and with few excep- tions, chiefly in St Andrews and Aberdeen, it was accepted by all ranks and classes. Its form was suggested by the bonds for material aid of which Mary's reign had given so many examples, but the new name pointed to a Biblical origin, and the parties were not the nobles and their retainers but God and His people. While nominally professing respect for the royal office, it was entered into, as it anxiously reiterated, for "the defence of the true religion (as reformed from Popery) and the liberties and laws of the kingdom." The spirit in which it was signed was that of a religious revival. Many subscribed with tears on their cheeks, and it was commonly reported that some signed with their blood. Charles could not relish a movement which opposed his deepest convictions as to church government and under the form of respect repudi- ated his supremacy; but, destitute of power to coerce the Covenanters, he was compelled to temporize. Hamilton as his commissioner offered to withdraw the service book and Book of Canons, to give up the Court of High Com- mission, and to allow the Articles of Perth

to remain in abeyance. A new confession called the "negative," framed on that of 1580, and a new covenant called the "king's," on the model of one drawn in 1590, which bound the signers only to stand by the king in suppressing Papists and

tion of prosecuting the bishops, and a libel laid before the presbytery of Edinburgh was read in the churches. Charles on his side announced that he challenged the mode of election and would not allow the prosecutions. He was already preparing for war. At the first sitting Alexander Henderson was chosen moderator, and Johnston of Warri- ston clerk. In spite of the commissioner's attempt to raise the question of the validity of elections, the assembly de- clared itself duly constituted. A letter from the bishops was read declining its jurisdiction, and the commissioner, while offering redress of grievances and that bishops should be responsible to future assemblies of clergy, declared that the present assembly was illegal in respect of the admission of lay representatives. Discussion was useless between a commissioner and an assembly whose power to act he denied. He accordingly dissolved it in the name of the king and left Glasgow ; but this only stimulated its mem- bers. It annulled the pretended assemblies between 1606 and 1628, condemned the service book, Book of Canons, Book of Ordinances, and the High Commission Court, de- posed the bishops on separate libels which set forth various acts of immorality or crime, many of which were false, declared Episcopacy to have been abjured in 1580, and con- demned the Five Articles of Perth. It concluded its month's labours by restoring Presbyterian church government.

The distance from such an assembly to the field of arms Appeal was short, and on 7th June 1639 the army of the Cove- toarms,

nanters under Alexander Leslie, a general trained in the service of Gustavus Adolphus, met the royal troops led by the king at Dunse Law. Charles, though slightly superior in numbers, had an undisciplined army and no money to maintain it, while Leslie had trained officers and troops animated by religious zeal. Their colours were stamped with the royal arms, and the motto "For Christ's Crown and Covenant" in golden letters. Councils of war as well as religious meetings were held daily, and the militant fervour of the Covenanting troops steadily rose. Charles declined

to engage such an army and general, and by the Pacification of Berwick (18th June) both parties agreed to disband, and Charles to issue a declaration that all ecclesi- astical matters should be regulated by assemblies, and all civil by parliament and other legal courts. On 1st August a free general assembly was to be held at Edinburgh, and on the 20th a free parliament in which an Act of Oblivion was to be passed. The assembly met as appointed and, without explicitly conforming, re-enacted the principal re- solutions of that of Glasgow, and declared that the Covenant should be subscribed by every one in office and authority. Before it separated it condemned the Large Declaration, a pamphlet by Balcanquhal, dean of Durham, published in the king's name, which gave an adverse narrative of recent events in Scotland. The parliament effected little legis- lation, but showed its disposition by abolishing Episcopacy and reforming the election of the Lords of the Articles, of whom eight were henceforth to be chosen by the nobles, lesser barons, and burghs respectively. The predominance of the king and the church was thus removed from the body which initiated all legislation, Charles had beforehand determined not to sanction the abolition of Episcopacy, and the parliament was prematurely adjourned (14th

Charles's conces- sions to theScots.

November) without the royal assent to its Acts. It was evident that the struggle between the king and the Scots

would be renewed, and both parties reluctantly had re-

course to allies whose choice showed their sense of the crisis. Charles summoned an English parliament ; but the three weeks' session of the Short Parliament was spent in a vain attempt to obtain redress for its own grievances. It separated without granting supplies, and the king had to depend on private loans. The Scots negotiated with the French king; but Richelieu prevented the unnatural alliance of the Catholic king and the Covenanters. The Scots took the first step inthe war. The army under Leslie crossed the Tweed and, forcing the passage of the Tyne at Newburn, occupied Newcastle. Charles, who had his headquarters at York, paralysed

by the want of money and new demands to summon an English parliament, was driven to accept a truce at Ripon (2d September 1640), under which the Scottish army was to receive a subsidy to relieve the northern counties from contributions. Parliament was summoned to Westminster for 3d November ; but its first act was the impeachment of Strafford. Until a pledge was given by his death that Charles would recognize the limits of monarchy, the Parliamentary leaders thought it safer that the Scots should hold the north of England. Peace was concluded by the Act immediately following that of Strafford's attainder, by which £300,000 was ordered to be raised as 'friendly assistance and relief promised to our brethren in Scotland."

The king now made up his mind to revisit Scotland, hoping there to find a way out of his English troubles. He had received a letter from Montross (¢.v.), urging him to come and gain the Scots by a moderate policy. He came to Edinburgh early in August 1641 and a parliament met under his presidency, when he not only ratified the Acts substituting a Presbyterian for the Episcopal form of church government but sanctioned important reforms. The Lords of the Articles were in future to be elected by each of the three estates separately, the burghs taking the place of the bishops ; the Court of High Commission was abolished ; arbitrary proclamations were prohibited ; the officers of state and the judges were to be chosen with the advice of parliament ; and, following an English Bill, parlia- ment was to meet every third year. During his stay in Scotland occurred 'the Incident,"—still spoken of as mysterious by historians, some of whom liken it to the English incident of the arrest of the five members. Argyll and Hamilton had led the party which carried all the measures of this parliament. Montrose had been com- mitted to the castle by the estates before the arrival of Charles on a charge of plotting against Argyll by false accusations to the king. From his prison he renewed his charges against both Argyll and Hamilton, whom he accused of treason. Charles about this time unwisely attended parliament with an unusual guard of 500 men, which gave Hamilton and Argyll a pretext for asserting that their lives were in danger and to quit Edinburgh. They soon re- turned and a favourable committee of investigation let the matter drop. Argyll was now more powerful than ever. In November the king returned to London, which

became during the next year the centre of the events which led to the Civil War.

The progress of the Civil War belongs to English history. Here only the part taken by the Scots can be stated. They were now courted by king and Parliament alike. The campaign of 1642-43 under Essex proved indecisive, and the Parliament sent commissioners headed by Sir Henry Vane to Edinburgh in the autumn of 1643, who agreed to the "Solemn League and Covenant," already accepted by the Scottish assembly and parliament, and now ratified by the English parliament and the assembly of divines

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at Westminster. showed its descent from the National Covenant, bound the parties to it "to preserve the Reformed Church in Scot- land and effect the reformation of that in England and Ireland in doctrine, worship, discipline, and government according to the Word of God and the example of the best Reformed Churches." But the alliance with the Scottish Covenanters did not produce the advantage expected from it. The victory of Marston Moor was due to Cromwell and his Ironsides, who were Puritans and Independents. The Scots, who formed the centre of the Parliamentary army, were repulsed. In the autumn, although the Scots took Newcastle, the king gained ground in the west, where Essex, the general who represented the Presbyterians, narrowly escaped capture. Next year Montrose, in the briliant campaign on which his military fame rests, made a formidable diversion in the Highlands. With dazzling rapidity, at first supported only by a handful of followers, but gathering numbers with success, he erected the royal standard in Dumfries; then, passing to the Highlands, after the victory of Tippermuir he took Perth, and defeated Lord Lewis Gordon at the Bridge of Dee. Next, after ravaging the county of Argyll, he marched to Inverness, but returned to defeat Argyll at Inverlochy, won further victories at Auldearn near Nairn and Alford on the Don, and by that of Kilsyth appeared to have recovered Scot- land for Charles. The fruit of all these victories was lost by his defeat at Philiphaugh (13th September 1644) by Leslie. Meantime Charles had lost the battle of Naseby, and next year was forced to take refuge at Newark with Leslie, whom he had created earl of

Leven. As the result of his surrender he ordered Montrose, who was again raising the Royalists in the Highlands, to lay down his arms; and the Scottish army in England, no longer on good terms with the Parliament, returned to Newcastle, that, being nearer home, it might dictate the terms of its services.

Here it remained eight months, during which a strenuous Charles

attempt was made to force Charles to accept the Covenant. Alexander Henderson argued the matter with him in a singularly temperate correspondence. bound to Episcopacy by hereditary sentiment and personal conviction. Another negotiation was going on at the same time between the Scottish army and the English Parlia- ment for arrears of pay. On 30th January 1646 they surrendered the king to the English commissioners, the question of pay having been settled by the receipt of £200,000 a few days before and a like sum a few days after that date. There was no express condition which bound the two circumstances together, but their concur-

'rence cannot have been accidental.

In his captivity Charles renewed his negotiations with the Scottish estates, over which Hamilton had now ac- quired influence, and a compromise was at last agreed to at Newport in the Isle of Wight by which he promised to confirm the League and Covenant by Act of Parliament, to establish Presbyterianism and the Westminster Confes- sion, which as well as the Directory had been adopted by the Scottish parliament for three years. After that period it was to be fixed by the king and parliament what form of church government was most agreeable to the Word of God, and this after consultation with the assembly was to be established. The Scots consented that in the meantime the Covenant should not be enforced on those who had conscientious scruples, and that the king might continue to use the English service. The Covenanters who accepted these terms, and who formed the most moderate section, received the name of Engagers. Relying on the promised support from Scotland, Charles rejected the proposals of the English Parliament. That body had now broken with the army, in which the Independents and Cromwell were

This memorable document, whose name 1639-1647.

But the king was geots,

1647-1654.

Charles II.'s ac- ceptance of Cove- nant.

Crom-

well's in- vasion of Scotland.

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fast acquiring supremacy. Their division afforded an opportunity for renewing the war, and Hamilton invaded England in the following year, but was routed at Preston (17th August 1648) by Cromwell. A party led by Argyll had opposed the compromise with Charles effected by Hamilton. They were chiefly strong in the south-west, and in the autumn of this year a band of them raised by Lord Eglinton marched to Edinburgh and were met by Argyll, who put himself at their head. Their numbers had risen to 6000, a sufficient force to give them supreme influence over the Government. It was from this—the " Whiggamore" raid—that the name of Whigs took its rise. The meeting of estates now resolved to renew the Solemn League and Covenant, and by an Act called the Act of Classes removed from the courts and all places of public trust those who had accepted the "late unlawful engagement." The English Parliament at this point took an exactly opposite course and showed signs of conciliation with the king; but the frustration of its action by the energetic policy of Cromwell was quickly followed by the trial and execution of the king. Hamilton, who had been taken after Preston, soon after shared the same fate.

The death of Charles altered in a moment the relations between England and Scotland. In the former Croniwell became all powerful, while in the latter the moderate Presbyterians attached to the principle of monarchy and the hereditary line at once proclaimed Charles II. Charles II. had been brought up with different views of royalty from those of the Covenanters, and Scotland was not pre- pared to accept a king except on its own terms. A

com- mission from the estates and from the assembly was at once set (March 1649) to The Hague, where the young king was. Charles promised to maintain the government of Scotland in church and state as settled by law, and particu- larly the Covenant, Confession of Faith, and Presbyterian system, but declared that he could not impose the Solemn League and Covenant on England and Ireland without the consent of their parliaments. The commissioners returned dissatisfied with this answer and with the presence at court of Montrose, by whom it had probably been framed. But in October Ormonde's Irish expedition failed, and Crom- well, already master of England, had reduced Ireland by force of arms; both parties felt inclined to renew the treaty. At length it was agreed that Charles should be accepted as king on condition of his subscribing the Covenant, establishing Presbyterian church government and worship, sanctioning the Acts of Parliament passed in his absence, and putting in force the law against Catholics. In return he stipulated for the free exercise of his royal authority, the security of his person, and the aid of a Scottish army. The treaty was closed in these terms on 9th May 1650, and early in June Charles set sail for Scotland. On the voyage he was forced to consent to further conditions which the Scottish parliament ordered the commissioners to impose, in particular to exclude from his court all persons within the first and second classes of the Acts of 1646 and 1649, and to keep the duke of Hamilton, brother of the late duke, and certain other persons out of Scotland. On Sunday, 23d June, at the mouth of the Spey he subscribed the Covenant and landed. Whilst Charles was negotiating with the commissioners, the expedition of Montrose, which he had encouraged but afterwards disowned, had come to an end by the capture of its gallant leader in Caithness. He was executed in Edinburgh a month before Charles reached Scotland.

Alarmed at the prospect of another Scottish invasion, Cromwell with wonderful rapidity transferred his forces from Ireland, and within a month after Charles landed crossed the Tweed and advanced to Edinburgh. Baffled in all attempts against the town by the tactics of David

Leslie, the nephew of Leven, he was forced from want of supplies to retire. His retreat was nearly cut off, but he gained an unexpected victory at Dunbar (3d September 1650) over that able general, who had been induced by the over-confidence of the ministers in his camp to descend from the Doon Hill and attack the English on level ground, So complete was the defeat that the south of Scotland fell into Cromwell's hands. Meantime Charles had attempted to escape from the restraints of the Presbyterian camp by "the Start," as it was called, from Perth to Clova, where he hoped to raise the loyal Highlanders ; but, not getting the support expected, he returned. In the beginning of next year, after renewing his subscription to the Covenant and submitting to the imposition of a day of fasting and humiliation on account of the sins of his family, he was crowned at Scone on Ist January 1651. Argyll, still the leader of the Covenanters, placed the crown on his head, a circumstance which he recalled when he lost his own. The invasion of England was now determined on,! and, Cromwell having been unable to intercept the royal army, it advanced as far as Worcester. Here, after effecting a junction with Fleetwood, Cromwell with a much smaller force routed the king's army on the anniversary of Dun- bar. Charles had a hairbreadth escape from capture, and after many adventures crossed from Brighton to France. The last great battle of the Civil War placed England in the hands of the army and its general.

Scotland offered more resistance; but Monk, whom Monk's

Cromwell had left in command, stormed Dundee and terri- oe] ration.

fied the other towns into submission. Although a nomina union was proclaimed and Scotland was allowed members in the English parliament, it was really governed as a conquered country. In 1653 the general assembly was summarily dissolved by Colonel Cotterel. Next year Monk was sent by the Protector to quell a Royalist rising, which, first under the earl of Glencairn and afterwards under Middleton, a soldier of fortune, began to show head in the Highlands. Monk, as usual, carried out effectually the work he was sent for and, partly by an indemnity which many leading Royalists accepted and partly by the defeat of Middleton at Lochgarry (25th July 1654), reduced the Highlands. He also dispersed the

general assembly, which made another attempt to sit. Strong forts were built at Leith, Ayr, Inverness, and Glasgow, and Monk

with an army of 10,000 men garrisoned the country. A Protect- council of state, containing only two Scottish members, was orate of

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appointed, but matters of importance were referred to Scotland.

Cromwell and his English council. The administration of justice was committed to four English and three Scottish judges in place of the Court of Session, with the view of introducing English law. The use of Latin in legal writs was abolished. A sequestration court to deal with the forfeited estates sat at Leith. A separate commission was issued for the administration of criminal justice, and theft and highway robbery were stringently inquired into

1 With the view of procuring forces for the expedition, a reconcilia- tion was effected between the Royalists and the more moderate Cove- nanters by a resolution to the effect that all persons not excommunicated should be allowed to serve in the army. This new party, now called ' Resolutioners," was practically the same as that formerly known as the " Engagers."" A minority, on the other hand, became known as the "Protestors" or " Remonstrants" (compare vol. xix. p. 683). This division of the Covenanters into a moderate and an extreme section continued throughout the whole of the 17th century. The Engagers and Resolutioners were the ancestors of the Established Presbyterian Church; the Protestors or Remonstrants of the Seceders or Dissenting churches, each of which maintained with unabated confidence, however small its numbers, that it was the true church of Scotland, the only church really faithful to the Covenant and Christ as the head of the church. Both parties for long regarded Episcopalians and Romanists alike as "' malignants," standing without the pale of the chureh, with whom no compromise could be made.*

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and punished. In the church the Presbyterian form of service and the system of presbyteries and synods were allowed to continue, but the stipends of ministers depended on their being approved by a commission appointed by Cromwell. Justices of the peace were introduced for local business. Free trade and an improved postal system be- tween the two countries were established. The universities were visited. In all departments of government there was vigour and the spirit of reform, so that it was admitted even by opponents that the eight years of Cromwell's usurpation were a period of peace and prosperity. There was undoubtedly one exception. The taxation was severe. A land-tax of £10,000 a month, afterwards reduced to £6000, and levied upon the valued rent under a valuation of Charles, far exceeded any subsidy before granted to the crown, Customs and also excise duties, recently intro- duced from England, were diligently levied ; so also were the rents of the crown and bishops' lands. Altogether it was estimated that a revenue of £143,000 was collected in Scotland. But this had to be supplemented by an equal sum from England to meet an expenditure of £286,000. As nearly the whole was spent in Scotland and the burden of taxation fell on the upper classes, the nation generally did not feel it so much as might have been expected. It was a maxim of Cromwell's policy to improve the condition of the commons, and in one of his last speeches he claimed in memorable words to have effected this in Scotland. In this respect the Commonwealth and protectorate continued the political effect of the Reformation. The commonalty for the first time since the War of Independence acquired a consciousness of its existence and hope for the future.

Union of Cromwell, like former powerful rulers, aimed at uniting Seottish Scotland with England, but his proposals in this direction

anc English parlia- ments.

tion.

were premature. To Barebones's Parliament (1653), which met after the dissolution of the Long Parliament, five Scottish members were summoned, there being 134 from England, Wales, and Ireland. By the Instrument of Government and an ordinance following on it, Scotland was granted 30, while England had 400 members; but only 20 Scottish attended the

parliament of 1654, and care was taken by Monk that they should be men attached to Cromwell's interest. When in his second parliament in 1656 he tried the experiment of a House of Lords, three Scotsmen were summoned, the quota of members to the Commons remaining as before. Cromwell's idea of a parliament was an assembly to ratify, noteto discuss, his measures, and this, like his other parliaments, was speedily dissolved. Had it continued the Scottish representatives would have had little weight. Scotland continued to be governed by the council of state. On the death of the Protector his son Richard was proclaimed his successor in Scotland as well as in England, and 30 members were again returned to the new parliament, which, however, was almost immediately afterwards dissolved. The Re- storation soon followed, though in Scotland there was no need of it, for Charles II. was already king. However beneficial the rule of Cromwell may be deemed, it had a fatal defect in the eyes of a people proud of their freedom. It was iniposed and maintained by force. His death and the restoration of the ancient line of kings were looked on as a deliverance from oppression.

The hopes of the Scots from Charles II. were doomed to speedy disappointment. So far from being grateful for the support they had given him in adversity, he looked back with disgust, as his grandfather had done, on the time when he was under the yoke of the Presbyterian ministers. Cromwell had shown the possibility of govern- ing Scotland by military force and of raising a consider- able revenue from it, and Charles took advantage of both lessons. From this date rather than from the earlier or

later union Scottish history assumes a provincial character. 1654-1664.

Scotland was governed without regard to its interest or wishes according to the royal pleasure or the advice of the nobles who for the time had the ear of the king. The power of the clergy had been broken by Cromwell's policy and their own divisions, The party of the Resolutioners or moderate Presbyterians, some of whom now leant to Episco- pacy, and the party of the Remonstrants were still irrecon- cilable, and their mutual hatred

rendered the task of government easier. The burghs were not yet sufficiently organized to be a power in the state, and the nobles again resumed their old position as leaders with no rivals, for the bishops were shorn of their revenues and dependent

on royal favour. For the first two years after the Restora- Govern- tion the government of Scotland was in the hands of ment of

Middleton, who had been created an earl. The measures of retaliation were few but signal. Argyll was tried and beheaded on a charge of treason, which could not have been established but for the treachery of Monk, who gave up private letters written to him when they both were sup- porting the Commonwealth. Guthrie, a leading minister of the Remonstrants, was hanged. Johnston of Warriston, two years later, was brought back from France and exe- cuted. No hesitation was shown as to the mode of governing Scotland. Parliament, under the presidency of Middleton, passed the Rescissory Act, annulling the Acts of all parliaments since 1640, declaring the Covenant no longer binding, and imposing an oath on all persons in office, not only of allegiance but of acknowledgment of the royal prerogative restored in all its fulness over all persons and in all causes.

Middle- ton.

In August Lauderdale, who Restora-

acted as secretary for Scotland in London, wrote to the nee of privy council announcing the royal intention to restore eo Episcopacy, and, regardless of his oath, Charles sanctioned

this by the first Act of the parliament of 1662. James Sharp, minister of Crail, who had been sent on behalf of the Resolutioners to Charles before his return, allowed himself to be easily converted to Episcopacy and was re- warded by his appointment as archbishop of St Andrews ; his example was followed by other ministers of the same party. But the majority and all the Remonstrants stood firm; 350 were deprived of their livings, each of which became a centre of disaffection towards the Government, while their attachment to the Covenant was every day strengthened by persecution. The Covenant and Solemn League and Covenant were declared unlawful oaths,

and all persons speaking or writing against the royal supre- macy in matters ecclesiastical were incapacitated from office. Middleton had the immediate responsibility for these measures, and the condemnation and forfeiture of the new earl of Argyll, whose estates he coveted, under the old law against leasing-making increased the hatred with which he was regarded. His fall was due to an attempt to supplant his rival Lauderdale by the Act of Billeting, under which the Scottish parliament named by ballot twelve persons with Lauderdale at their head as incapable of holding public office. This and other Acts were carried out without the previous consent of Charles ; Lauderdale persuaded Charles that his personal authority was in danger, and Middleton was called to court and sent as governor to Tangier, where he soon after died. The earl of Rothes was now appointed commissioner, but the chief influence was in the hands of Lauderdale, who con- tinued to act as Scottish secretary in London.

The change in its rulers brought no relief to Scotland. Severe The declaration that the Covenants were illegal oaths was treat-

re-enacted and imposed on all persons in office who ha not yet taken it. The old mode of electing the Lords of the Articles, which placed the election in the hands of the bishops, the nominees of the king, was restored. Sharp,

ment of d Cove- nanters.

1664-1681.

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not warned by the fate of Laud, procured the restora- tion of the Court of High Commission to enforce the laws against ecclesiastical offenders. Fines were imposed on all who absented themselves from their parish churches or attended the sermons of the deposed ministers. Sir James Turner was sent by the privy council to the western shires to prevent conventicles and field preaching and to enforce the law as to conformity ; and his exactions, with the burden of maintaining his soldiers quartered upon all persons suspected of favouring the ousted ministers, led to risings in Galloway, Clydesdale, and Ayr. With their ministers and a few of the gentry at their head the Covenanters marched to Edinburgh, but were defeated at Rullion Green in

the Pentlands by Dalziel, a Scottish officer whom Charles had recalled from the service of the ezar. The executions which followed, and especially that of Hugh M'Kail, a young and enthusiastic preacher, sank deeply into the spirit of the people. He was the first martyr of the Covenant as Wishart had been of the Re- formation. The use of torture, before this rare, now be- came frequent, and bonds of law-burrows were wrested from their original use to compel the principal landowners to be sureties for the peace of the whole district. Large fines continued to be extorted from all persons who re- fused to conform to the ecclesiastical laws. Next year a change in the Scottish administration, the cause of which is not well explained, but which was probably due to the fall of Clarendon and the rise of the Cabal ministry, led to

Policy of a milder but undecided policy in Scotland. Lauderdale,

indul- gence,

one of the Cabal, still directed Scottish affairs, but Rothes and Sharp were treated as responsible for the rising in the west and suspended. An indemnity was offered to all who would appear before the council and subscribe bonds to keep the peace. A rash attempt to assassinate Sharp in Edinburgh prevented this policy from being adhered to in 1668 ; but it was renewed in the following year. An in- dulgence was granted which allowed the deposed ministers who had lived peaceably to return to their manses and glebes, and to receive such a stipend as the privy council might allow. The grace of this concession was undone by a severe Act against conventicles. It favoured a con- ciliatory policy that schemes for union were in the air. Leighton, the good bishop of Dunblane, proposed a union of the churches upon the basis that the bishops were no longer to exercise jurisdiction, but to act only as perpetual moderators of presbyteries, subject to censure by the synods, and that ministers should be ordained by the bishops, but with consent of the presbyters. There was a meeting at Holyrood with some of the leading ministers, but they would listen to no compromise. The name of bishop was hateful whatever were his functions. It may be doubted whether Charles and his English advisers would have submitted to a curtailment of the bishop's office and dignity. The subject of the union of the kingdoms was again brought forward in the parliament of

1669, to which Lauderdale was sent as commissioner; and though it was not well received commissioners were appointed in the following year, who went to London in autumn to dis- cuss with English commissioners certain specified points proposed by the king. After several meetings the con- ference broke up in consequence of a demand by the Scottish members that Scotland should have the same number of members in the united as in its own parliament. The arbitrary government favoured by the want of a settled constitution in Scotland was more to the taste of the king and his advisers. Lauderdale openly boasted, as James VI. had done, that nothing could be proposed in the Scot- tish parliament except what the king through the Lords of the Articles approved. The "indulgence" entirely failed of the desired effect. The ministers who took advantage of

it were despised by the people, who continued to attend the conventicles. In 1672 an Act was passed punishing preachers at such conventicles with death and imposing fines, imprisonment, and exile for having children baptized by deprived ministers and for absence for three Sundays from the parish church. In 1675 letters of interecommun- ing were issued against about a hundred of those who attended the conventicles, both ministers and laymen, for- bidding their friends and relations to have any dealings with them under the same penalties as if they had them- selves been present at the conventicles. In 1678 Mitchell, a fanatical preacher, who had ten years before attempted the life of Sharp and mortally wounded the bishop of Orkney, was tried and executed. The feeling of the times, and the cruel manner in which a confession had been wrung from him by torture, led to his being regarded as amartyr. Prior to this year 17,000 persons had suffered fines or imprisonment for attending conventicles. A host of 10,000 men, chiefly Highlanders, was quartered in the western shires in order to force the landowners who favoured the Covenanters to enter into bonds of law-burrows.

It appears to have been the design of Lauderdale, Rising of who still governed Scotland absolutely through the privy 1679.

council (no parliament having been summoned since 1674), to force the Scots to rebel. "When I was once saying to him," relates Burnet, "' Was that a time to drive them into a rebellion?' ' Yes,' said he, ' would to God they would rebel that he might bring over an army of Irish Papists to cut their throats.'" One part of his wish was speedily fulfilled. In 1679 the rebellion so long smoulder- ing broke out. The murder of Sharp (3d May) by Hack- ston of Rathillet and a small band of Covenanters was followed by a still more stringent proclamation against field conventicles, which were declared treasonable, and the possession of arms was prohibited. This severity provokeda rising in the west. A small party led by Hamilton, a youth educated by Bishop Burnet at Glasgow, who had joined the Covenanters, burnt at Rutherglen the statutes and acts of privy council on the anniversary of the Restoration, and being allowed to gather numbers defeated Graham of Claverhouse at Loudon Hill (Ist June). The duke of Monmouth, the favourite natural son of Charles, sent with troops from England to suppress the rising, gained an easy victory at Bothwell Bridge (22d June). His desire was to follow it up by a policy of clemency, and a new indulgence was issued, but its effect was counteracted by Lauderdale. All officers, ministers, and landowners, as well as those who had taken part in the rising and did not surrender within a short space, were excepted from the indulgence. Several preachers were executed and many persons sent to the colonies, while fines and forfeitures multiplied. A new and fiercer phase of the rebellion was originated by Cargill and Cameron, two preachers who escaped at Bothwell Bridge, and, assembling their followers at Sanquhar, pub- lished a declaration renouncing allegiance to Charles as a perjured king. They were soon surprised and Cameron was killed, but Cargill continued to animate his followers, called the "Society Men" or '"'Cameronians," by his preaching, and at a conventicle at Torwood in Ayrshire excommunicated the king, the duke of York, Lauderdale, and Rothes.

The duke of York, who had become a Roman Catholic Continu-

during his residence abroad, was now sent to Scotland, partly to avoid the discussion raised by his conversion as to his exclusion from the succession. During a short stay of three months he astonished the Scots by the mildness of his administration, but on his return in the following year he revealed his

true character. The privy council renewed its proclamations against conventicles and increased the fines, which were levied by the sheriff or other magistrate under the pain of liability if they were remiss in their

Killing Times.

James VII.

LATER STUARTS. |

exaction, Military commissions were issued to Claver- house and other officers in the southern and western shires

empowering them to quarter their troops on recusants and administer martial law. Torture was freely resorted to by the privy council and the duke himself took pleasure in A parliament summoned in 1681, after passing a general Act against Popery to lull suspicion, pro- ceeded to declare the succession to be in the ordinary line of blood and unalterable on account of difference of religion The Test Act was then carried, not Its ambiguous and contradictory clauses make it an admirable instrument of tyranny, a shelter for the lax and a terror to the upright Tt was at once enforced, and Argyll, who de- clared he took it only so far as it was consistent with itself

witnessing it.

by any future law. without many attempts to modify it.

conscience.

and the Protestant religion, was tried and condemned to death for treason, but escaped from prison to Holland. Dalrymple, the president of the Court of Session, and many leading Presbyterian ministers and gentry followed his ex- ample, and found a hospitable refuge in the republic which first acknowledged toleration in religion. They there met a similar band of English exiles. The next two years were spent in plots, of which the centre was in Holland, with branches in London and Edinburgh. The failure of the Rye House Plot in 1683 led to the execution of Russell and Sidney and the arrest of Spence, a retainer of Argyll, Carstares, Baillie of Jerviswood, and

Campbell of Cess- nock. Against Campbell the proof of complicity failed, and Spence and Carstares, though cruelly tortured, revealed nothing of moment. Baillie, however, was condemned and executed upon slender proof. The Cameronians, who kept alive in remote districts the spirit of rebellion, were treated with ruthless cruelty. Although doubt has been cast on the death of Brown the carrier, shot down in cold blood by Claverhouse, and the Wigtown martyrs, two poor women tied to a stake and drowned in the Bay of Luce, the account of Wodrow has, after a keen discussion, been sustained as accurate. The conduct of the Government in Scotland gained for this period the name of the " Killing Times." The short reign of James VII. is the saddest period in the history of Scotland. He succeeded in the brief space of three years in fanning the revolutionary elements in both England and Scotland into a flame which he was powerless to quench. He declined to take the Scottish coronation oath, which contained a declaration in favour of the church then established. A submissive parliament held (28th April 1685) under the duke of Queensberry as commissioner not only overlooked this but expressed its loyalty in terms acknowledging the king's absolute supremacy. The excise was granted to the crown for ever and the land- tax to James for life. The law against conventicles was even extended to those held in houses, if five persons besides the family attended domestic worship ; while, if the meeting was outside the house, at the door or. windows, it was to be deemed a field conventicle, punishable by death. The class of persons subject to the test was enlarged. Undeterred or provoked by these terrors of the law, Argyll made a descent upon the western Highlands and tried to raise his clansmen, but, being badly supported by the officers under him, his troops were dispersed and he himself taken prisoner, when he was brought to Edinburgh, condemned, and executed under his former sentence. Next year Perth the lord chancellor, Melfort his brother, and the earl of Moray became converts to the Popish faith. The duke of Queensberry, who did not follow their example, was enabled only by the most servile submission in other points to the royal wishes to save himself and his party in the privy council from dismissal. James sent a letter to parliament offering free trade with England and an indem- nity for political offences, in return for which it was required

that the Catholics should be released from the test and the 1681-1689.

penal laws. But the estates refused to be bribed. Even the Lords of the Articles declined to propose a repeal of the Test Act. The burghs almost for the first time in a Scottish parliament showed their independence. 'The refractory parliament was at once adjourned and soon after dissolved, and James had recourse in Scotland as in England to the dispensing power. Under a pretended prerogative he issued a proclamation through the privy council, granting a full indulgence to the Romanists, and by another deprived the burghs of the right of electing magistrates. A more limited toleration was granted to Quakers and Presby- terians, by which they were allowed to worship according to their consciences in private houses. This was followed by a second and a third indulgence, which at last gave full liberty of worship to the Presbyterians and was accepted by most of their ministers ; but the laws against field con- venticles continued to be enforced. In February 1688 Renwick was executed under them at Edinburgh, A band of his followers, including women and children, were marched north and imprisoned with great cruelty in Dunnottar,

Meantime the rapid series of events which led to the Revolu- Revolution in England had reached its climax in the trial tion of and acquittal of the seven bishops. William of Orange, who aaa had long watched the progress of his father-in-law's tyranny, j saw that the moment had come when almost all classes in England as well as Scotland would welcome him as a deliverer. But the Revolution was differently received in each part of the United Kingdom. In England there was practically no opposition; in Catholic Ireland it was established by force. Scotland was divided. The Catholics, chiefly in the Highlands, and the Episcopalians led by their bishops adhered to James and formed the Jacobite party, which kept up for half a century a struggle for the principle of legitimacy. The Presbyterians—probably the most numerous, certainly the most powerful party, especi- ally in the Lowlands and burghs—supported the new settle- ment, which for the first time gave Scotland a constitu- tional or limited monarchy. Shortly before his flight James had summoned his Scottish troops to England ; but Douglas, brother of the duke of Queensberry, their com- mander-in-chief,

went over to William. Claverhouse, now Pacifica- Viscount Dundee, the second in command, who had the tion of spirit of his kinsman Montrose, after in vain urging James or to fight for his crown, returned to Scotland, followed by ‘ some thirty horsemen. In Edinburgh the duke of Gordon still held the castle for James, while the convention parlia- ment, presided over by the duke of Hamilton, was debating on what terms the crown should be offered to William. Dundee passed through Edinburgh unmolested, and en- couraged Gordon to hold out, while he himself gathered the Highland chiefs round his standard at Lochaber. Mackay, a favourite general of William, sent to oppose him, was defeated at Killiecrankie (29th July 1689), where the spirited leadership of Dundee and the dash of the Highlanders’ attack gained the day; but success was turned into defeat by a bullet which killed Dundee almost at the moment of victory. No successor appeared to take his place and keep the chiefs of the clans together. The Cameronians, organized into a regiment under Cleland, repulsed Cannon, the commander of the Highland army, at Dunkeld, and the success of Livingston, who defeated the remnant under Cameron and Buchan at the Haughs of Cromdale on the Spey, ended the short and desultory war. The castle of Edinburgh had been surrendered a month before the battle of Killiecrankie. Three forts, at Fort William, Fort Augustus, and Inverness, sufficed to keep the Highlands from rising for the next two reigns.

Meantime the convention parliament in Edinburgh had

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1689-1705.

William III.’s accept- ance of Scottish crown.

His gov- ernment of Scot-

land.

carried the necessary measures for the transfer of the government of Scotland to William and Mary. It declared in bolder terms than the English parliament that James had forfeited the crown and that the throne was vacant. The fifteen articles which contained the reasons for this resolution were included in a Declaration and Claim' of Right,—a parallel to the English Declaration and Bill of Rights. Besides the declarations against the Papists with which it commenced—that no Papist could be king or queen, that proclamations allowing mass to be said, Jesuit schools and colleges to be erected, and Popish books to be printed were contrary to law—it detailed each of the un- constitutional acts of James and pronounced it contrary to law. This formidable list included imposing oaths without the authority of parliament; grants without the consent of parliament ; employing officers of the army as judges throughout the kingdom; imposing exorbitant fines ; imprisoning persons without expressing the reason, and delaying trials; forfeiture upon insufficient grounds, especi- ally that of Argyll; the nomination by the king of the magistrates of burghs ; sending of royal letters to courts of justice with reference to pending cases ; granting pro- tections for debt; forcing the lieges to depone against themselves in capital crimes; the use of torture without evidence in ordinary crimes; quartering of an army in time of peace upon any part of the kingdom ; the use of law-burrows at the king's instance ; putting garrisons in private houses in time of peace without the consent of the owners and of parliament; and fining husbands for their wives. It closed with asserting that Prelacy and the superi- ority of any office in the church above presbyters were insupportable grievances and ought to be abolished, and that it was the right and privilege of subjects to protest to parliament for "remeid" of law and to petition the king, and that for redress of grievances it was necessary parlia- ment should frequently be called, with freedom of speech secured to members. As a conclusion from these premises the estates resolved that William and Mary should be de- clared king and queen of Scotland during their lives, but with the right of exercising regal power in William alone as long as he lived. After their death the crown was to pass to the heirs of the queen's body, and failing her to Anne of Denmark and her heirs, failing whom to the heirs of William. Commissioners were despatched to London to present the declaration and statement of grievances and take the royal oath to the acceptance of the crown on their terms. This was done at Whitehall in the following March (1689); but William, before taking the

oath, required an assurance that persecution for religious opinion was not intended and made a declaration in favour of toleration. By desire of William the convention was superseded by a parliament which met in June; but, with the exception of an Act abolishing Prelacy, it transacted no business of importance. The parliament of 1690 was more fruitful. It abolished the committee of the Articles, which had become an abuse inconsistent with the freedom of parlia- ment, and, while it retained a committee on motions and overtures in its place, declared that the estates might deal with any matter without referring it to this committee. The Act of Supremacy was rescinded. The Presbyterian ministers deposed since 1661 were restored and the West- minster Confession approved, though not imposed as a test except on professors. With more difficulty a solution was found for the question of church government. The Presby- terian Church' was re-established with the Confession as its formula, and patronage was placed in the heritors and elders with a small compensation to the patrons. These prudent measures were due to the influence of Carstares, the chief adviser of William in Scottish ecclesiastical matters. He was not so well advised in the conduct of

the civil government by the master of Stair, who became sole secretary for Scotland. The proclamation for calling out the militia may have been a necessary precaution, but it raised much opposition amongst the landed gentry, and

the militia was not then embodied. The massacre of the Glencoe,

Macdonalds at Glencoe by Campbell of Glenlyon was con- trary to the spirit of the indemnity offered to the High- landers. While the treachery with which it was executed may be attributed to Glenlyon, it was too plainly proved before the committee of inquiry which the Scottish parlia- ment insisted on that it had been designed by Stair and Breadalbane, and, now that the whole documents have been published, it is also proved that it had been sanctioned by William. It was intended to strike terror; but its partial success was dearly bought, for it kept alive the Jacobite

disaffection and gained for it much sympathy. The unfair Darien,

treatment of the Scots in the matters of free trade and navigation, in which the new Government appeared to follow the policy of Charles rather than that of Cromwell, and acted with an exclusive regard to the prejudices and sup- posed interests of England, reached a climax in the abandon- ment of the Scottish settlement at Darien when attacked by the Spaniards. The over-sanguine hopes of Paterson and the Scottish colonists and capitalists who supported his enterprise, so suddenly transformed into a financial disaster overwhelming to a poor country, accompanied by the loss of many lives, embittered the classes on which the Revolution settlement mainly depended for its support. It was the anxious wish of William to have effected the legislative union; but, although he twice attempted it, the last time a month before his death, the temper of the English parliament and of the Scottish people appeared to give small chance of its realization.

9. The Union and its Consequences.—The reign of Anne, Union of so far as it relates to Scotland, centred in the accomplish- parlia- In spite of the disparity of num-™:*

ment of the union. bers, both nations now met to treat on equal terms. Still there were grave difficulties, and it required all the wisdom of the ministers of the early years of Anne, aided by the glory of Marlborough's arms, to overcome national preju- dices and secure an object plainly for the benefit of both, The memories of Glencoe and Darien and the refusal of equal rights of trade led the Scottish parliament, the year after Anne's accession, to pass an Act of Security, by which, if the queen died without issue, the Scottish estates were to name a successor from the Protestant descendants of the royal line; but the successor to the English crown was expressly excluded unless there were "such conditions of government settled and enacted as may secure the honour and sovereignty of the crown and kingdom, the freedom, frequency, and power of parliament, the reli- gious freedom and trade of the nation from English or any foreign influence." Political economy had not yet taught the reciprocal advantage of free trade, and the English jealousy of Scottish traders was intense. An incident about this time warned the English ministers that Scot- land might easily revert to its old attitude of enmity. A Scottish ship of the African or Darien Company

having been seized in the Thames at the suit of the English East India Company, the "Worcester," an English East India- man, was taken in the Forth by way of retaliation, and Green, its captain, with two other officers, was executed at Leith on a charge of piracy insufficiently proved. An attempt had been already made to complete the union by a.commission, which sat frofm 10th November 1702 to 3d February 1705 ; but this miscarried through the refusal to grant free trade between the kingdoms. But again in 1705 the English parliament sanctioned the appointment of other commissioners, and new officers of state were nominated for Scotland with the express purpose of press-

Terms of compromise.

treaty of union.

Its un- popular- ity in Scotland,

UNION. |

ing the scheme forward in the Scottish parliament. Though opposed on contrary grounds by the Jacobites and the party of Fletcher of Salton, the Scottish ministry of Queensberry succeeded, by the aid of a third party nick-named the "'Squadrone Volante," in getting the consent of parliament to the appointment of commissioners by the crown. The Act expressly excepted the church from the matters with which the commission was to deal. The com- missioners, thirty-one from each country, met at Whitehall on 16th April and concluded their sittings on 23d July. The nomination by the crown had secured persons anxious to accomplish the union; experience had disclosed the cause of former failures, and the commissioners were guided by the statesmanship of Somers. It had been recognized from the first that the only settlement of the ecclesiastical question possible was to leave to each country its own church. It was wisely decided to treat the law and the courts in the same manner. These two subjects being re- moved from the scope of the treaty narrowed the debates to four main points,—the succession, trade, taxation, and the composition of the future parliament. The Scottish commissioners yielded on the first, the English on the second, and the remaining two were adjusted by a skilful The chief articles of the treaty were the settlement of both crowns according to the English Act of

Succession on Anne and her descendants, and failing them on the electress Sophia and the Hanoverian line; the establishment of free trade between England and Scotland, and the admission of the Scots to equal privileges as regards trade with other countries ; the national debt and taxation were adjusted by the imposition on Scotland of a moderate share (£48,000) of the land-tax, of which England was still to bear £200,000, and there was to be a uniform rate of custom and excise, Scotland being compensated by an equivalent of about £400,000 for becoming liable to a proportion of the English national debt, which already amounted to £16,000,000 ; forty-five representatives of Scotland were to be admitted to the House of Commons and sixteen elected peers to the House of Lords. Although the terms were on the whole favourable to Scotland, their announcement was received with dissatisfaction, especially in Edinburgh. The loss was immediate, from the aboli- tion of an independent parliament, the reduction of the capital to a provincial town, and the increase of taxation to pay the growing national debt. The gain was in the future and in part doubtful. No one contemplated the rapid and enormous extension of trade. A proud people was unwilling to admit the advantage consequent upon free intercourse with a country in which wealth and civiliza- tion were more widespread. It had a natural attachment to its own institutions, though these were less popular than the English. It feared that, notwithstanding the most solemn guarantee, neither its church nor its laws could resist the influence of a country so much larger and more populous, in which henceforth was to be the sole seat of government, and that much of its wealth and talent would be attracted to the south and become English. The last parliament of Scotland was preceded by a stormy agita- tion against the union, and began its session with numer- ous addresses praying that the treaty should not be ratified, while none were presented in its favour. The popular feeling was embodied in the speeches of Lord Belhaven from a sentimental and patriotic point of view, and of Fletcher of Salton, who represented the democratic or re- publican element latent in a portion of the nation, But common sense aided by ministerial influence prevailed. The vote on the first article was prudently taken with a proviso that it was to be dependent on the rest being carried, but it really decided the fate of the measure. The Government commanded a large majority of the peers,

perhaps more amenable to influence. They were accused by the Jacobites of being bribed, but the sums received in name of payment of arrears of pension and of debts were too small to justify the charge. The lesser barons or county members and the representatives of the burghs were nearly equally divided ; but there was a majority of four of each of these estates in favour of the article. The whole estates voted together and the total majority was thirty-five. This was increased when the last vote was taken to 41, the numbers being 110 for and 69 against, and the Act of Ratification to take effect from lst May 1707 was carried. The Presbyterian Church received an additional guarantee in an Act passed for "securing the Protestant religion and the Presbyterian Establishment."

In the English parliament there was less serious opposi- tion, proceeding chiefly from the High Church party, which was conciliated by an Act for the security of the Church of England. On 6th March 1707 the Scottish and English Acts ratifying the union received the royal assent.

Two Acts of the British parliament naturally followed the Act of Union. The Scottish privy council was abol- ished in 1708. A secretary of state for Scotland continued until 1746 to manage the Scottish department in London ; but the lord advocate, the adviser of the crown on all legal matters both in London and Edinburgh, gradually acquired a large, and after the suppression of the office of the Scottish secretary a paramount influence in purely Scottish affairs, though he was nominally a subordinate of the home secretary.1 In 1709 the law of treason was assimilated to that of England, being made more definite and less liable to extension by construction in the criminal courts. In the later years of Anne, when after the fall of Marlborough power passed from the Whig to the Tory party, two statutes were passed of a different character. Patronage was restored in the Presbyterian Church not- withstanding the protests of the assembly, and proved a fertile source of discord. A limited toleration Act in favour of the Episcopalians, permitting them to worship in private chapels, was opposed by the Presbyterians but carried.

With the union of the parliaments Scotland lost its legislative independence. Its representation in the British parliament for more than a century, based

on the freehold franchise in the counties and in the burghs controlled by town councils, which were close corporations, was a repre- sentation of special classes and interests rather than of the nation. It almost appeared as if the prophecy of Belhaven would be accomplished and there would be an end of an old song. But Scottish history was not destined yet to end. The character of the people, though their language and manners gradually became more like those of Eng- land, remained distinct. They retained a separate church and clergy. Independent courts and a more cosmopolitan system of law opened a liberal profession and afforded a liberal education to youthful ambition. A national system of parish schools, burgh schools, and universities, though inadequately endowed and far from reaching the ideal of Knox and Melville, gave opportunities to the lower as well as the higher classes of receiving at a small cost an educa- tion suited for practical uses and the business of everyday life. The Scot had been from the earliest times more in- clined to travel, to migrate, to colonize than the English- man, not that he had a less fervent love of home, but a soil comparatively poor made it necessary for many to seek their fortune abroad. This tendency which had led Scottish monks, soldiers, and professors to embrace foreign service, now found new openings in trade, commerce, colonial enter- prise in America, the East, and the West Indies, in the southern hemisphere and the exploration of unknown parts

1 In 1885 a secretary for Scotland was again appointed with a separate office at Dover House, London.

1705-1709.

Legisla- tion con- sequent on union,

Other results of union

to Scot- land.

1709-1746. of the globe. Accustomed to poverty, Scottish emigrants acquired habits of frugality, industry, and perseverance, and were rewarded by success in most of their undertak- ings. Nor, if war be regarded as

necessary to the continued existence of a nation, was it altogether absent, but the cause with which the name of Scotland became identified was the losing one. The two rebellions proved the devoted loyalty which still attached many of the Highland clans, the Catholics, and some of the Episcopalians to the descend- ants of the Stuarts. But that in 1715, preceded by an abortive attempt in 1708, was put down by a single battle; Sheriffmuir, if it could scarcely be claimed as a victory by Argyll, led to the speedy dispersal of the clans which had gathered round the standard of Mar. Thirty years later the romantic rising of the Highlanders under the Young Pretender found the Government unprepared. Once more for a brief space Holyrood was a royal court. The defeat of Cope at Prestonpans and the rapid march of the Scottish army, slightly reinforced by Catholics from the northern

Jaeobite rebel- lions.

and midland shires of England, to Derby, by which it cut.

off the duke of Newcastle's forces from the capital, made London tremble. Divided counsels, the absence of any able leader, and the smallness of their number (not more than 5000) prevented the daring policy of attacking London, which Charles himself favoured, and a retreat was deter- mined on. It was skilfully effected, and on 26th December the little army, which had left Edinburgh on 31st October and reached Derby on 4th December, arrived in Glasgow. It was not favourably received, the south-west of Scotland being the district least inclined to the Stuarts, and it marched on Stirling to assist Lord John Drummond and Lord Strathallan, who had commenced its siege, which General Hawley threatened to raise. His defeat at Falkirk was the last success of the Jacobites. The duke of Cum- berland was sent to command the royal forces, and Charles Edward was forced by Lord George Murray and the High- land chiefs to abandon the siege of Stirling and retreat to Inverness. He was at once pursued by the duke, and his defeat at Culloden (16th April 1746) scattered his followers and compelled him to seek safety in flight to the Hebrides, from which, after five months' wanderings, he escaped to France. The last rebellion within Great Britain was put down with severity. Many soldiers taken in arms were shot and no consideration was shown to the wounded. The chief officers and

*even some privates taken prisoners were tried and executed at various places in the north of England. The earls of Cromarty and Kilmarnock and Lord Balmerino were reserved for the judgment of their peers in London, and having pleaded guilty were beheaded at Tower Hill. The crafty Lovat, who had avoided appearing in arms, but was really at the bottom of the rising, though le pretended to serve both sides, was the last to suffer. An Act of indemnity was passed a few weeks after his execution. But effective measures were taken to prevent any renewal of the rebellion. The estates and titles of all who had been privy to it were forfeited. An Act was passed prohibiting the use of arms and the Highland dress ; and the abolition of the military tenure of ward-holding, un- *forigately preserved at the union, rooted out the remnants "of feudal and military power till then left in the hands of the nobles and chiefs. These changes in the law had the willing consent of the Lowland and burghal population in Scotland, to whom the lawless and freebooting habits of the Highlanders had been a cause of frequent loss and constant alarm. Somewhat later the masterly policy of Pitt enlisted the Scottish Celts in the service of the crown by forming the Highland regiments. The recollection of Glencoe and Culloden was forgotten after the common victories of the British arms in India, the Peninsula, and Waterloo. In one direction the Jacobite cause survived*

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its defeat. Poetry seized on its romantic incidents, ideal- ized the young prince who at least tried to win his father's crown, satirized the foreign and German, the Whig and

Covenanting, elements opposed to the Stuart restoration, and substituted loyalty for patriotism. Self-sacrifice and

devotion to a cause believed right, though deserted by

fortune (qualities rare amongst the mass of any nation), dignified the Jacobites like the cavaliers with some of the nobler traits of chivalry, and the Jacobite ballads have their place in literature as one of the last expiring notes of medieval romance. Music and tradition fortu- nately preserved their charm before the cold hand of history traced the sad end of Charles Edward, the pensioner of foreign courts, wasting his declining years in ignoble plea- sures. It might be hard to say whether the first Hanover- ians or the last Stuarts least deserved that men should fight and. die for them ; but the former represented order, pro- gress, civil and religious liberty; the latter were identified with the decaying legend of the divine right of kings and the claim of the Roman Church not merely to exclusive orthodoxy but to temporal power and jurisdiction inconsist- ent with the independence of nations and freedom of con- science. Although a larger minority in Scotland than in England clung to the traditions of the past, an overwhelm- ing majority of the nation, including all its progressive elements, were in favour of the new constitution and the change of dynasty.

During the remaining half of the 18th century and the commence- Progress ment of the 19th a period of prosperity was enjoyed by Scotland, during and the good effects of the union, intercepted by the rebellions, 19thcen- became visible. The Scottish nation, without losing its indivi- tury. duality, was stimulated by contact and friendly rivalry with its English neighbour in the arts of peace. It advanced in intel- lectual as well as material respects more than in any part of its previous history. It became, through commerce, manufactures, and improved agriculture, a comparatively rich instead of a poor country. Skilful engineering made the Clyde a successful com- petitor with the Thames and the Merscy, and Glasgow became one of the most populous cities in Great Britain. The industrial arts made rapid progress, and the fine arts began to flourish. The art of saving capital and using it as a source of credit was reduced to a system. Banks, not unknown in other countries and at an earlier date, are in their modern form a Scottish invention. Besides those which sprang up in Scotland itself, the national banks of England and France owed their origin to two Scotsmen. A safe system of life insurance represented the provident habits and business talents of the nation, Adam Smith shares with the French economists the honour of founding political economy as the science of the wealth of nations. Mental philosophy became a favourite study, and a dis- tinctively

Scottish school produced thinkers who deeply influenced the later systems of the Continent. The history not of Scotland only but of England and some portions of that of Europe were written by Scotsmen in works equal to any cxisting before Gibbon. The dawn of the scientific era of the 19th century was foreshadowed by Scottish men of science, the founders of modern geology, chemistry, anatomy, physiology, and the practice of medicine. in Scotland was made the first of the great line of discoveries in the practical application of science by the use of steam as a motive- power. The same period—so varied were its talents—gave birth to two Scottish poets, of world-wide fame. Burns expressed the feelings and aspirations of the people ; Scott described both in verse and prose their history and the picturesque scenes in which it had been transacted. During the last half-century the material progress continued, but the intellectual was too brilliant to last. The preponderating influence of England even threatened to extin- guish native Scottish genius by centralizing the political and social life of the island in the English capital. Only two changes of importance occurred. The political institutions of Scotland were reformed by a series of Acts which placed the franchise on a broader basis and made the representation of the people real. The Estab- lished Church, already weakened by secessions, was further divided by a disruption largely due to the ignorance of political leaders as to the deep-scated aversion of the nation to any interference with the independence of the church, especially in matters of patronage. Educational reform has also in recent years raised the standard of the universities and schools without injuring their popular eharacter. While it would be incorrect to say that Scotland has had no inde- pendent history since the union, that history must be chiefly read in the annals of its church, its law, and its literature. Its political existence has been absorbed in that of Great Britain. (4. M.)

GEOLOGY. |

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PART II.—PHYSICAL FEATURES.

Scotland forms the northern portion of Great Britain and is divided from England by the rivers Sark, Liddell, and Kershope (an affluent of the Liddell), the Cheviot Hills, the river Tweed, and the liberties of Berwick. The mainland lies between 58° 40’ 30” (at Dunnet Head, Caithness) and 54° 38’ N. lat. (Mull of Galloway) and 1° 45’ 80” (Peterhead) and 6° 14’ W. long. (Ardnamurchan Point, Argyllshire). Including the islands, the extreme N. lat. is 60° 51' 30” (Outsack, Shetland) and the extreme W. long. 8° 35’ 30” (St Kilda). Its greatest length from north to south, from Durncss in Sutherland to Burrow Head in Wigtownshire, is 272 miles, and the greatest breadth from east to west, from Petcrlead in Aber- deenshire to Applecross in Ross-shire, is 155, while the narrowest part, from Grangemouth in Stirlingshire to Bowling in Dumbarton- shire, is only 304 miles wide. The total area in 1881, according to the Ordnance Survey, was 19,777,490 acres or 30,902 square miles, —the area of foreshore being 310,413 acres or 485 square miles, of water 403,846 acres or 631 square miles, and of land-surface 19,063,231 acres or 29,786 square miles. But of the water area the acreage included under lakes and rivers respectively has not been ascertained.

GEOLOGY.

In the article GroLocy (vol. x.) descriptions will be found of most of the geological formations of Scotland. All that need therefore be inserted here is a succinct summary of these formations with references to the pages of that article where fuller details are given.

The oldest rocks of Scotland and of the British Islands, known as Archean, consist chiefly of gneiss (Fundamental, Lewisian, Hebridian), which varies from a coarsely crystalline granitoid mass to fine schist. The coarse varicties are most abundant, intermingled with bands of hornblende-rock, hornblende-schist, pegmatite, eurite, mica-schist, sericite-schist, and other schistose accompaniments. In a few places limestone has been observed. No trace of any organism has ever been detected in any of these rocks. Over wide areas, particularly on the mainland, the bands of gneiss have a general north-west trend and undulate in frequent plications with variable inclination to north-east and south-west. The largest tract of Archeean rock is that which forms almost the whole of the Outer Hebrides, from Barra

Head to the Butt of Lewis. Other areas more or less widely separated from each other run down the western parts of Sutherland and Ross, and are probably continued at least as far as the Island of Rum. How far Archean rocks reappear to the east of this western belt has not yet been ascertained.

Above the Archean gneiss lies a series of redand chocolate-coloured sandstones, conzlomerates, and breccias (Cambrian or Torridon sandstone), which form a number of detached areas from Cape Wrath down the seaboard of Sutherland and Ross, across Skye, and as far as the Island of Rum (GEoLocy, vol. x. p. 330). They rise into prominent pyramidal mountains, which, as the stratification is usually almost horizontal, present in their terraced sides a singular contrast to the neighbouring heights, composed of highly plicated crystalline schists. In the Torridon district these sandstones can be secn towering bed above bed to a height of about 4000 feet, and their thickness is still greater. They have not yet yielded any recognizable fossil; their geological age is accordingly doubtful, though from their relation to the overlying fossiliferous rocks and from their own lithological characters they have with much prob- ability been classed with the Cambrian system of Wales. They are not met with anywhere else in Scotland than in the north-west Highlands.

Rocks belonging to the Silurian system occur in two distinct regions and in two very strongly contrasted conditions. They constitute nearly the whole of the southern uplands (GroLocy, vol. x. pp. 333, 337). In that belt of country they consist for the most part of greywacke, grit, shale, and other sedimentary rocks, but in the south-west of Ayrshire they include some thick lenti- cular bands of limestone. They have been thrown into many plica- tions, the long axes of which run in a general north-easterly direction. It is this structure which has determined the trend of the southern uplands. The plications of the Highlands and the chief disloca- tions of the country lave followed the same general direction, and hence the parallclism and north-easterly trend of the main topo- graphical features. Abundant fossils in certain parts of the Silurian rocks have shown that representatives of both the Lower and Upper divisions are present. By far the larger part of the uplands belongs to the former. The Upper Silurian shales and sandstones appear only along the northern and southern margins.

In the north-west Highlands the Cambrian red sandstones are overlain unconformably by several hundred feet of white quartzite with annelid tubes, followed by fossiliferous limestones and shalcs (GEoLOGY, vol. x. p. 333). The abundant fossils in these strata prove them to be of Lower Silurian age. It was believed by Murchison that, as these Silurian strata dip conformably below various schists which spread eastwards into the rest of the High- lands, they demonstrate the crystalline rocks of the Highlands to

be of later than Silurian age. Recently, however, the structure of Sutherland has been investigated anew with minute care and the result is to show that the schists believed to overlie the Silurian strata conformably have been really pushed over them and consist in part of the Archean gneiss. It has been ascertained that from the mouth of Loch Erriboll on the north coast of Sutherland south- wards to the Isle of Skye, a distance of more than 100 miles, a gigantic system of earth-movements has taken place, whereby the Silurian, Cambrian, and Archean rocks have been crumpled, inverted, dis-located, and have pushed over each other. In some places the hori- zontal displacement of these shifted masses has been not less than 10 miles. So intense has been the shearing of the rocks that their original structure has in many places been entirely destroyed. They have acquired a new schistosity, which is in a general sense parallel with the bedding of the Silurian rocks to the west of the line of disturbance. Hence the apparent conformability of the schists overlying these rocks. The total thickness of recognizable Silurian strata is about 2000 feet. The rocks that overlie them to the east of the line of disturbance in Suthcrland and Ross are fine flaggy schists, quite unlike any part of the Archzan gneiss and often strangely suggestive of altered sandstones. What are their true age and history remains still to be determined. There can be no doubt, however, that they have acquired their present schistosity since the Lower Silurian period, and hence that the present condi- tion of the metamorphic rocks of the central Highlands does not go back to Archean time. That portions of the Archwan series may have been pushed up in different parts of the Highlands is quite conceivable. But that mnch of the Highlands consists of altered sedimentary rocks like those of the Silurian uplands admits of no question. The solution of this difficult but interesting problem has the most important bearing upon the theory of meta- morphism, but it can only be attained by paticnt and

laborions mapping of the ground such: as is being prosecuted by the Geo-logical Survey.

As Scotland is the typical European region for the Old Red Old Red Sandstone a full account of this series of rocks has already becn Sand- These rocks stone.

given in the article GzoLocy (vol. x. pp. 348, 344). are grouped in two divisions, Lower and Upper, both of which appear to have been deposited in lakes. The Lower, with its abun- dant intercalated lavas and tufts, extends continuously as a broad belt along the northern margin of the midland valley, reappears in detached tracts along the sonthern border, is found again on the south side of the uplands in Berwickshire and the Cheviot Hills, occupies a tract of Lorne in Argyllshire, and on the north side of the Highlands underlies most of the low ground on both sides of the Moray Firth, stretches across Caithness and through nearly the

"whole of the Orkney Islands, and is prolonged into Shetland. The

Upper Old Red Sandstone covers a more restricted space in most of the areas just mentioned, its chief development being on the flanks of the north-eastern part of the sonthern uplands, where it spreads out over the Lammermuir Hills and the valleys of Berwick- shire and Roxburghshire.

The areas occupied by Carboniferous rocks are almost entirely Carbon- restricted to the midland valley, but they are also to be found iferous.

skirting the southern uplands from the mouth of the Tweed to that of the Nith. The subdivisions of this important system, its coal-fields and igneous rocks, have been described in the article GEOLOGY (vol. x. pp. 346, 348, 349).

Rocks assignable to the Permian system occupy only a few small Permian.

areas in Scotland. Extending from Cumberland under the Solway Firth, they fill up the valley of the Nith for a few miles north of Dumfries, and, reappearing again in the same valley a little farther north, run up the narrow valley of the Carron Water to the Lowther Hills. Other detached

tracts of similar rocks cover a considerable space in Annandale, one of them ascending the deep defile at the head of that valley. Another isolated patch occurs among the Lead Hills; and lastly, a considerable space in the heart of the Ayrshire coal-field is occupied by Permian rocks. Throughout these separate basins the prevailing rock is a red sandstone, varied in the narrow valleys with intercalated masses of breccia (GEOLOGY, vol. x. p. 351). There can be no doubt that the valleys in which these patches of red rocks lie already existed in Permian time. They seem then to have been occupied by small lakes or inlets, not unlike fjords. Numerous amphibian tracks have been found in the red sandstone of Annandale and also near Dumfries, but no other traces of the life of the time. One of the most interesting features of the Scottish development of the Permian system is the occurrence of intercalated bands of contemporaneously erupted volcanic rocks in the Carron Water, Nithsdale, and Ayrshire. The actual vents which were the sites of the small volcanoes still remain distinct, and the erupted lavas form high ground in the middle of Ayrshire. i

The Triassic system appears to be only feebly represented in Triassic.

Scotland. To this division of the geological record are assigned the yellow sandstones of Elgin, which have yielded remains of rep-

tiles, but which at the same time cannot be satisfactorily separated from similar underlying strata whieh contain Upper Old Red Sandstone fishes. There occur also below the Lias on some parts of the west coast unfossiliferous red sandstones, conglomerates, and breecias which may possibly belong to the same system. These rocks attain their greatest thickness at Gruinard Bay on the west coast of Ross, where they must be several hundred feet thick. On the east side of the country, where so many fragments of the Second- ary rocks occur as boulders in the glacial deposits, a large mass of strata was formerly exposed at Linksfield near Elgin containing fossils which appear to show it to belong to the Rhetic

beds at the top of the Trias. But it was not in place, and was almost certainly a mass transported by ice. Rheetic strata no doubt exist in situ at no great distance under the North Sea.

The Jurassic system is well represented on both sides of the Highlands. Along the east coast of Sutherland good sections are exposed showing the succession of strata. Among these the Lower and Middle Lias can be identified by their fossils. The Lower Oolite is distinguished by the occurrence in it of some coal-seams, one of whieh, 34 feet in thickness, has been worked at Brora. The Middle Oolite consists mostly of sandstones with bands of shale and limestones and includes fossils which indicate the English horizons from the Kellaways Rock up to the Coral Rag. The lower part of the Kimmeridge Clay is probably represented by sand- stones and conglomerates, forming the highest beds of the series in Sutherland. On the west side of the Highlands Jurassic rocks are found in many detached areas from the Shiant Isles to the southern shores of Mull. Over much of this region they owe their preservation in great mcasure to the mass of lavas poured over them in Tertiary time. They have been uncovered, indeed, only They comprise a con-

volcanic period was a prolonged one is shown by the great denuda- tion of the plateaus before the last eruptions took place. In the Isle of Eigg, for example, the basalts had already been deeply eroded by river-action and into the river-course a current of glassy lava (pitch- stone) flowed. Denudation has continued active ever since, and now, owing to greater hardness and consequent power of resistance, the glassy lava stands up as the prominent and picturesque ridge of the Scuir, while the basalts which formerly vose high above it have been worn down into terraced declivities that slope away from it to the sca, A remarkable feature in the volcanic phenomena was the disruption of the basaltic plateaus by large bosses of gabbro and of various granitoid rocks. These intrusive masses now tower into conspicuous groups of hills,—the Coolins in Skye, the moun- tains of Rum and Mull, and the rugged heights of Ardnamurchan.

Under the Post-tertiary division eome the records of the Ice Age, Youngest when Scotland was buried under sheets of ice which ground down, forma- striated, and polished the harder rocks over the whole country and tions.

left behind them the widespread accumulations of clay, gravel, and sand known as glacial deposits. The nature of the evidence and the deductions drawn from it have been already stated (GEOLOGY, vol. x. pp. 365-368). The youngest geological formations are the raised beaches, river-terraces, lake-deposits, peat-mosses, and other

-accumulations, which are related to the present configuration of the

country and contain remains of the plants and animals still living on its surface (GEOLOGY, vol. x. pp. 256, 290, 369).

PHYSICAL FEATURES.

The physical features of Scotland may be best realized by regard- ing the country as composed of three distinct belts of territory, differing from each other in their geological structure and con- sequently presenting striking contrasts in their scenery.

at a comparatively recent geological date. secutive series of deposits from the bottom of the Lias up to the Oxford Clay. The Lower Middle and Upper Lias consist chiefly of shales and shelly limestones, with some sandstones, well seen along

1. The Highlands, for convenience of description, are here re- The garded as embracing all that part of the country which lies west High- and north of a line drawn along the Firth of Clyde, and thence lands.

the shores of Broadford Bay in Skye and in some of the adjacent islands. The Lower Oolites are made up of sandstones and shales with some limestones, and are overlaid by several hundred feet of an estuarine series of deposits consisting chiefly of thick white sandstones, below and above which lie shales and shelly limestones. These rocks form a prominent feature underneath the basalt terraces of the east side of Skye, Raasay, and Kigg. They form the highest menibers of the Jurassic series, representing

probably some part of the Oxford clay. The next Secondary rocks (Cretaceous) succeed them unconformably.

diagonally in a north-easterly direction from the mouth of the river Clyde to the east coast at Stonehaven. Nearly the whole of this region is high ground, deeply trenched with valleys and penetrated by long arms of the sea. The only cousiderable area of lowland lies in the north-eastern counties, embracing the eastern part of Aberdeenshire and the northern parts of Bauff, Elgin, and Nairn. Along both sides of the Moray Firth a strip of lower land intervenes between the foot of the hills and the sea, while farther north the county of Caithness is one wide plain, which is prolonged into the Orkney Islands. Seen from beyond its southern margin, the area

Creta- Rocks belonging to the Cretaceous system undoubtedly at one | of the Highlands presents a well-defined ehain of hills, which rise ceous. time covered considerable areas on both sides of the Highlands, but | abruptly from the plains of the Lowlands. This is best observed : they have been entirely stripped off the eastern side, while on the | in Strathmore, but it is also conspicuous in the estuary of the Clyde, western they have been reduced to a few fragmentary patches, | where the low hills on the south contrast well with the broken line which have no doubt survived because of the overlying sheets of | of rugged mountains to the north. From any of the islands of the basalt that have protected them. Some greenish sandstones con- | chain of the Inner Hebrides the Highlands along their western sea- taining recognizable and characteristic fossils are the equivalents | front rise as a vast rampart, indented by many winding fjords and of the Upper Greensand of the south of England. These rocks | rising up to a singularly uniform general level, which sinks here are found on the south and west coasts of Mull and on the west | and there and allows glimpses to be had of still higher summits in coast of Argyllshire. They are covered by white sandstones and | the interior. The northern margin is hardly less striking when these by white chalk and marly beds, which represent the Upper | looked at from the Moray Firth, or from the plains of Caithness or Chalk of England. Enormous numbers of flints and also less | Orkney. abundant fragments of chalk are found in glacial deposits border- From a commanding summit in the interior the Highlands are High- ing the Moray Firth. These transported relics show that the | seen to differ from a

mountain chain such as the Alps, not merely land Chalk must once have been in place at no great distance, if indeed | in their inferior elevation, but essentially in their configuration and moun- it did not actually occupy part of Aberdeenshire and the neigh- | structure. They are made up of a succession of more or less nearly tains. bouring counties. parallel confluent ridges, which have, on the whole, a trend from Basaltie Above the highest Secondary rocks on the west coast come | north-east to south-west. These ridges are separated by longitudinal plateaus. terraced plateaus of basalt, which spread out over wide areas in | valleys, and each of them is likewise furrowed by transverse valleys.

Skye, Eige, Mull, and Morven, and form most of the smaller islets of the chain of the Inner Hebrides (GroLoey, vol. x. p. 362). These plateaus are composed of nearly horizontal sheets of basalt—colum- nar, amorphous, or amygdaloidal—which in Mull attain a thick- ness of more than 3000 feet. They are prolonged southwards into Antrim (Ireland), where similar basalts overlying Secondary strata cover a large territory. Occasional beds of tuff are intercalated among these lavas, and likewise seams of fine clay or shale which have preserved the remains of numerous land-plauts. The presence of these fossils indicates that the eruptions were subaerial, and a com- parison of them with those elsewhere found among older Tertiary strata shows that they probably belong to what is now called the Oligocene stage of the Tertiary series of formations, and therefore that the basalt cruptions took place in early Tertiary time. The

The portions of ridge thus isolated rise into what are termed mountains. But all the loftier eminences in the Highlands are only higher parts of ridges along which their geological structure is prolonged. It is singular to observe liow the gencral average of level of the summits of the ridges is inaintained. From some points of view a mountain may appear -to tower above all the surrounding country, but, looked at from a sufficient distance to take in its environment, it may be found not to rise much above the general uniformity of elevation. There are no gigantic dominant masses that must obviously be due to some special terrestrial disturbanee. A few apparent exceptions to this statement rise along the western seaboard of Sutherland, in Skye, and elsewhere, but an examination of their structure at once explains the reason of their prominence and confirms the rule.

The gencral surface of the Highlands is rugged. The rocks pro- Surface ject in innumerable bosses and crags, which roughen the sides and of High- The forms and colours of these roughnesses lands.

volcanic episode to which these plateaus owe their origin was onc of the most important in the geological history of Great Britain. It

appears to have resembled in its main features those remarkable out-pourings of basalt which have deluged so many thousand square miles of the western territories of the United States. The eruptions were connected with innumerable fissures up which the basalt rose and from numerous points on which it flowed out at the surface. These fissures with the basalt that solidified in them now form the vast assemblage of dykes which cross Scotland, the north of England, and the north of Ireland (GEoLogy, vol. x. p. 812). That the

erests of the ridges. depend on the nature of the rock underneath. Where the latter is hard and jointed, weathering into large quadrangular blocks, the hills are more especially distinguished for the gnarled bossy character of their declivities, as may be seen in Ben Ledi and the chain of heights to the north-east of it formed of massive grits and mica-schists. Where, on the other hand, the rock decays into smaller débris, the hills are apt to assume smoother contours, as

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the slate hills that run from the Kyles of Bute to Loch Lomond. Wherever any mass of rock occurs differing much from those around it in its power of resisting decomposition it affects the scenery, rising into a prominence where it is durable, or sinking into lower ground where it is not. This relation between relative destructibility and external configuration is traceable in every part of Scotland, and indeed may be regarded as the law that has mainly determined the present topography of the country. Two The Highlands are separated into two completely disconnected regions and in some respects contrasted regions by the remarkable line of High- of the Great Glen, which runs from Loch Linnhe to Inverness. In lands. the northern portion the highest ground rises along the west coast, mounting steeply from the sea to an average height of perhaps between 2000 and

3000 feet. The watershed consequently keeps close to the Atlantic seaboard, indeed in some placcs it is not more than a mile and a half distant from the beach. From these heights, which catch the first downpour of the western rains, the ground falls eastwards, but with numerous heights that prolong the moun- tainous character, to the edge of the North Sea and the line of the Great Glen. The best conception of the difference in the general level on the two sides of the watershed may be obtained by observ- ing the contrast between the lengths of their streams. On the western side the drainage is poured into the Atlantic Ocean after flowing only a few miles, while on the eastcrn side it has to run at least 30 or 40. At the head of Loch Nevis the western stream is only 3 miles long ; that which starts from the eastern side has a course of some 18 to the Great Glen. Throughout the northern or north-western region a general uniformity of feature characterizes the scenery, betokening cven at a distance the general monotony in the structure of the underlying schists. But the sameness is relieved along the western coast of Sutherland and Ross by singular groups of cones and stacks (to be afterwards referred to), and farther south by the terraced plateaus and abrupt conical hills of Skye, Rum, and Mull. The valleys run for the most part in a north-west and south-east direction, and this is also generally true of the sea lochs.

The south-eastern region of the Highlands, being more diversi- fied in geological structure, presents greater contrasts of scenery. In the first place, its valleys chiefly run in a south-west and north- cast direction and so also do most of the lakes and sea lochs. This feature is strikingly exhibited in the western part of Argyllshire. But there are also numerous and important transverse valleys, of which that of the Garry and Tay is the most conspicuous example. Again, the watershed in this region is arranged somewhat differ- ently. It first strikes eastward round the head of Loch Laggan and then swings southward, pursuing a sinuous course till it emerges from the Highlands on the east side of Loch Lomond. But the streams flowing westward are still short, while those that run north-east and east have long courses and drain wide tracts of high ground. The Tay in particular pours a larger body of water into the sea than any other river in Great Britain. Moreover, the occurrence of many bosses of granite and other eruptive rocks gives rise to various interruptions in the monotonous scenery of the crystalline schists which constitute the greater part of the

country. But a marked contrast may be traced between the configuration of the north-eastern district and the other parts of this region. In that arca the Grampians rise into wide flat-topped heights or elevated moors often over 3000 and sometimes exceeding 4000 feet in height and bounded by steep declivities or not infrequently by precipices. Secn from an eminence on their surface, these plateaus look like fragments of an original broad tableland, which has been trenched into segments by the formation of the transverse and longitudinal valleys. Farther to the south'-west in Perthshire, Inverness-shire, and Argyllshire, they give place to the ordinary hummocky crested ridges of Highland scenery, some summits on which, however, exceed 4000 feet in elevation. For the probable meaning of this transition from broad flat-topped heights to narrow crests and isolated peaks, sce below (pp. 525-526).

Besides the principal tracts of low ground in the Highlands already referred to, there occur numerous long but narrow strips of flat land in the more important valleys. Each strath and glen is usually provided with a floor of detritus which, spread out be- tween the bases of the bounding hills, has been levelled into mceadow-land by the rivers, and furnishes as a rule the only arable

round in each district. Southern 2. The southern uplands form the most southcrly of the three uplands. transverse belts in Scottish topography. Extending from St Patrick's Channel to St Abb's Head, they constitute a well-defined belt of hilly ground, but present a striking contrast to the scenery of the Highlands. The rocks which underlie them consist almost wholly of Silurian grits, grcywackes, and shales, which have been greatly plicated, the general axis of the folds running parallel with that of the whole belt, or from south-west to north-east. These uplands, though much less elevated than the Highlands (their highest point is not more than 2764 feet above the sea), rise with scarcely less abruptuess above the lower tracts that bound them. Their north-western margin for the most part springs boldly above

the fields and moorlands of the midland valley, and its boundary for long distances continues remarkably straight. Their southern and south-castern limits are in general less prominently defined, except to the west of the Nith, where they plunge into the sea. Between the Solway Firth and the Cheviot Hills they pass under a line of high and picturesque escarpments which runs from Birrenswark in a north-east direction. In Berwickshire, however, they again tower boldly above the plain of the Merse. These up- lands are distinguished above all by the smoothness of their sur- face. They may be regarded as a rolling tableland or moorland, traversed by innumerable valleys which with gentle verdant declivities conduct the drainage to the sea. This character is impressively seen from the heights of Tweedsmuir. Wide mossy moors, lying 2000 feet or more above the sea and sometimes level as a racecourse, spread out on all sides. Their continuity, how- ever, is interrupted by numerous intervening valleys which separate them into detached flat-topped hills. Unlike the Highlands, these southern heights comparatively seldom present precipices of naked rock. Where the rock projects it more usually appears in low crags and knolls, from which long trails of grey or purple débris descend the slopes till they are lost among the grass. Hence, besides being smooth, the uplands are pre-eminently verdant. They form indeed excellent pasture-land, while the alluvial flats in the valleys and even some of the lower slopes of the hills are fitted for corn and green crops.

This uniformity of external aspect is doubtless traceable to the Their

prevalence of the same kind of rocks aud the same geological struc- geo- ture. The Silurian greywackes and shales that underlie almost logical the whole of these uplands weather generally into small angular structure. débris, and at a tolerably uniform rate of disintegration. But slight differences may readily be detected even where no feature interferes in a marked way with the general monotony. The bands of massive grit and coarse greywacke, for example, break up into larger blocks and from their greater hardness are apt to project above the general surface of the other and softer rocks. Hence their line of trend, which like that of all the other strata is in a north-easterly direction, may be followed from hill to hill even at a distance by their more craggy contours. Only in the higher tracts of these uplands are any rngged features to be seen that remind one of the

more savage character of Highland scenery. In the heights of Hartfell (2651 feet) and Whitecoomb (2695), whence the Clyde, Tweed, Annan, and Moffat Water descend, the high moorlands have been scarped into gloomy corries, with crags and talus-slopes, which form a series of landscapes all the more striking from the abrupt and unexpected contrast they present to everything around them. In Galloway, also, the highest portions of the up- lands have acquired a ruggedness and wildness morc like those of the Highlands than any other district in the south of Scotland. For this, however, there is an obvious geological reason. In that region the Silurian rocks have been invaded by large bosses of granite and have undergone a variable amount of metamorphism which has in some places altered them into hard crystalline schists. These various rocky masses, presenting great differences in their powers of resisting decay, have yielded unequally to disintegration : the harder portions project in rocky knolls, crags, and cliffs, while the softer parts have been worn down into more flowing outlines. The highest summit in the south of Scotland—Merrick (2764 feet) —consists of Silurian strata much altered by proximity to the granite, while the rest of the more prominent heights (all in Kirkcudbrightshire)—Rinns of Kells (2668 feet), Cairnsmore of Carsphairn (2612), and Cairnsmore of Fleet (2331)—are formed of granite.

The watershed of the southern uplands is of much interest in Water-

relation to their geological history. It runs from the mouth of shed of Loch Ryan in a sinuous north-easterly direction, keeping near the southern northern limit of the region till it reaches the basin of the Nith, uplands. where it quits the uplands altogether, descends into the lowlands of Ayrshire, and, after circling round the headwaters of the Nith, strikes south-eastwards across half the breadth of the uplands, then sweeps north aud eastwards between the basins of the Clyde, Tweed, and Annan, and then through the moors that surround the sources of the Ettrick, Teviot, and Jed, into the Cheviot Hills. Here again the longest slope is on the east side, where the Tweed bears the whole drainage of that side into the sea. Although the rocks throughout the southern uplands have a persistent north-east and south-west strike, and though this trend is apparent in the bands of more rugged hills that mark the outcrop of hard grits and grcywackes, nevertheless geological structure has been much less effective

in determining the lines of ridge and valley than in the Highlands. On the southern side of the watershed, in Dumfries- shire and Galloway, the valleys run generally transversely from north-west to south-east. But in the eastern half of the uplands the valleys do not appear to have any relation to the geological structure of the ground underneath.

3. Between the two belts of high ground lie the broad lowlands Central of central Scotland, or the midland valley, bounded on the north lowlands. side by the range of heights that extends from the mouth of the

Clyde to Stonehaven, on the south side by the pastoral uplands that stretch from Girvan to Dunbar. The simplest conception of the general aspect and structure of this important part of the king- dom is obtained by regarding it as a long trough of younger rocks let down by parallel dislocations between the older masses of the high grounds to the south and north. The lowest of these younger rocks are the various sedimentary and volcanic members of the Old Red Sandstone. These are covered by the successive formations of the Carboniferous system. The total thickness of both these groups of roek cannot be less than 80,000 feet, and, as most of them bear evidence of having been deposited in shallow water, it is manifest that they could only have been accumulated during a prolonged period of depression. The question arises whether this depression affected only the area of the midland valley itself, or whether it extended also over the regions to the north and south. Materials do not yet exist for a definite answer to this question ; but so far as the evidence now before us gocs there is ground for the infer- ence that, while the depression had its maximum along the line of the lowlands, it also involved some portion at least of the high grounds on either side. In other words, the Old Red Sandstone and Carboniferous rocks, though chiefly accumulated in the broad lowland valley, crept also over some part at least of the hills on either side, where a few outliers are left to tell of their former ex- tension. The central Lowlands of Scotland are thus of great geo- logical antiquity. During and since the deposition of the rocks that underlie them the tract has been the scene of repeated ter- restrial disturbances. Long dislocations, running like the ridges of the

Highlands and the southern uplands from south-west to north-east, have sharply defined its northern and southern margins. By other fractures and unequal movements of upheaval or depres- sion portions of the older rocks have been brought up within the bounds of the younger, and areas of the younger have been enclosed by the older. On the whole, these terrestrial disturbances have followed the same prevalent north-easterly trend, and hence a general tendency may be observed among the main ridges and valleys to run in that direction. The chains of the Ochil, Sidlaw, Pentland, Renfrew, Campsie, and Fintry Hills, and the valleys of Strathmore, Firth of Tay, and the basin of Midlothian, may be cited as examples. But, undoubtedly, the dominant cause in the determination of the topographical prominences and depressions of the district has been the relative hardness and softness of the rocks. Almost the whole of the eminences in the Lowlands consist of hard igneous rocks, forming not only chains of hills like those just referred to and others in Ayrshire and Lanarkshire, but isolated crags and hills like those of Stirling Castle, Edinburgh Castle, and others conspicuous in the scenery of Fife and the Lothians.

Of the three chief valleys in the central Lowlands two, those of the Tay and the Forth, descend from the Highlands, and one, that of the Clyde, from the southern uplands, Though on the whole transverse, these depressions furnish another notable example of that independence of geological structure alrcady mentioned.

We now proceed to consider the leading physical features of the country with especial reference to their distinctive aspects and their respective modes of origin. Though an eminently hilly country, Scotland is not dominated by any leading mountain chain on which all.the other topographical features are dependent. Its leading features are not the monotonous ridges of the high grounds but the valleys that have been opened through them. [If these valleys were filled up, the high grounds would once more become what they probably were at first, elevated plains or plateaus, with no strongly marked features, —no eminences rising much above nor hollows sinking much below the general surface.

Valleys.—Kven apart from any knowledge of their origin, the valleys of the country are thus seen to be its fundamental topo- graphical element, and to

deserve the first consideration in any attempt to describe and explain its physical features. The longi- tudinal valleys, which run in the same general direction as the ridges—that is, north-east and south-west—have had their trend defined by geological structure, such as a line of dislocation (the Great Glen), or the plications of the rocks (Lochs Ericht, Tay, and Awe, and most of the sea lochs of Argyllshirc). The transverse valleys run north-west or south-east and are for the most part in- dependent of geological structure. The valley of the Garry and Tay crosses the strike of all the Highland rocks, traverses the great fault on the Highland border, and finally breaks through the chain of the Ochil Hills at Perth. The valley of the Clyde crosses the strike of the Silurian plications in the southern uplands, the boundary fault, and the ridges of the Old Red Sandstone, and pursues its north-westerly course across the abundant and often powerful dislocations of the Carboniferous system.

Origin of. That valleys are essentially due to erosion and not to dislocation Seottish or subsidence of the earth's surface is a fact which has now been

valleys,

demonstrated by so overwhelming a mass of evidence from all parts of the globe that it may be accepted as one of the axioms of geology. The plications of the earth's crust which folded the rocks of the Highlands and southern uplands not improbably upraised above the sca a series of longitudinal ridges having a general north-easterly

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direction. off them, first in transverse watercourses down each short slope and

[PHYSICAL The earliest rain that fell upon these ridges would run

then in longitudinal depressions wherever such had been formed during the terrestrial disturbance. Once chosen, the pathways of the streams would be gradually deepened and widened into valleys. Hence the valleys are of higher antiquity than the mountains that rise from them. The mountains in fact have emerged out of the original bulk of the land in proportion as the

valleys have been excavated. The denudation would continue so long as the ground stood above the level of the sea; but there have been prolonged periods of depression, when the ground, instead of being eroded, lay below the sea-level and was buried sometimes under thousands of feet of accumulated sediment, which completely filled up and obliterated the previous drainage-lines. When the land reappeared a new and independent series of valleys would at once begin to be eroded ; and the subsequent degradation of these overlying sedi- ments might reveal portions of the older topography, as in the case of the Great Glen, Lauderdale, and other ancient valleys. But the new drainage-lines have usually little or no reference to the old ones. Determined by the inequalities of surface of the overlying

mantle of sedimentary material, they would be wholly independent

of the geological structure of the rocks lying below that mantle. Slowly sinking deeper and deeper into the land, they might event-

ually reach the older rocks, but they would keep in these the lines

of valley that they had followed in the overlying deposits. In

process of time the whole of these deposits might be denuded from the area. regard of the geological structure of the rocks around them, and

The valleys would then be seen running in utter dis-

there might even remain' no trace of the younger formations on which they began and which guided their excavation. This is probably the explanation of the striking independence of geological structure exhibited by the Tweed and the Nith.

Among the valleys of Scotland certain prevailing characteristics General have been recognized in the popular names bestowed upon them. eharac- "Straths" are broad expanses of low ground between bounding teristics, hills usually traversed by one main stream and its tributaries, — Strath Tay, Strath Spey, Strath Conon. The name, however, has also been applied to wide tracts of lowland which embrace portions

of several valleys, but are defined by lines of heights on either side; the best example is afforded by Strathmore—the "great strath "'—

between the southern margin of the Highlands and the line of the Ochil and Sidlaw Hills. This long and wide depression, though it looks like one great valley, strictly speaking, includes portions of the valleys of the Tay, Isla, North Esk, and South Esk, all of which cross it. Elsewhere in central Scotland such a wide depres- sion is known as a "howe," as in the Howe of Fife between the Ochil and Lomond Hills.

River-gorges are characteristic features in many of the valleys of River- Scotland. In the Old Red Sandstone they are particularly proimi- gorges, nent where that formation has lain in the pathway of the streams sweeping down from the Highlands. In the basin of the Moray Firth some fine examples may be seen on®he Nairn and Findhorn, while on the west side of the Cromarty Firth some of the small streams descending from the high grounds of the east of Ross-shire have cut out defiles in the conglomerate, remarkable for their depth and narrowness. On the south side of the Highlands still more notable instances of true "cafions" in the Old Red Sandstone are to be seen where the Ericht, Isla, and North Esk enter that forma- tion. The well-known gorge in which the Falls of Clyde are situated is the best example in the midland valley.)

Types of Mountain and Hill.—While the topography of the Flat- country is essentially the result of prolonged denudation, we may topped reasonably infer that the oldest surfaces likely to be in any measure moun- preserved or indicated are portions of some of the platforms of tains. erosion which have successively been produced by the wearing away of the land down to the sea-level. Relics of these platforms seem to be recognizable both in the Highlands and among the southern uplands. Allusion has already been made to the remarkable flat- topped_moorlands which in the eastern Grampians reach heights

! For the principal rivers, the Tay, Spey, Forth, Clyde, and Tweed, see the

separate articles, and for the Dee (Aberdeen, Kirkeudbright), &c., see articles on the respective counties.

of 3000 to 4000 feet above the sea. Their most familiar example perhaps is the top of Lochnagar, where when the level of 3500 feet has been gained the traveller finds himself on a broad undulating moor, more than a mile and a half long, sloping gently southwards towards Glen Muick and terminating on the north at the edge of a range of granite precipices. The top of Ben Macdui stands upon nearly a square mile of moor exceeding 4000 feet in elevation. These mountains lie within granite areas; but not less striking examples may be found among the schists. The mountains at the head of Glen Esk and Glen Isla, for instance, sweep upward into a broad moor some 8000 feet above the sea, the more prominent parts of which have reccived special names,—Driesh, Mayar, Tom Buidhe, Tolmount, Cairn na Glasha. It would hardly be an exaggeration to say that there is more level ground on the tops of these moun- tains than in areas of corresponding size in the valleys below. That these high plateaus are planes of erosion is shown by their independence of geological structure, the upturned edges of the vertical and contorted schists having been abruptly shorn off and the granite having been wasted and levelled along its exposed sur- face. They look like fragments of the original tableland of erosion out of which the present valley-systems of the Highlands have been carved. Among the southern uplands traces of a similar tableland of erosion are in many places to be detected. The top of Broad Law in Peeblesshire, for example, is a level moor com- prising between 300 and 400 acres above the contour line of 2500 feet and lying upon the upturned edges of the greatly denuded Silurian grits and shales. An instructive example of the similar destruction of a much younger platform is to be found in the ter- raced plateaus of Skye, Eigg, Canna, Muck, Mull, and Morven, which are portions of what was probably originally a continuous plain of basalt. Though dating back only to older Tertiary time, this plain has been so deeply trenched by the forces of denudation that it has been reduccd to mere scattered fragments. Thousands of feet of basalt have been worn away from many parts of its sur- face; deep and wide vallcys have been carved out of it; and so enormously has it been wasted that it has been almost entirely stripped from wide tracts which it formerly covered and where only scattered outliers remain to prove that it once existed.

It is a curious fact, to which allusion has already been made, that broad flat-topped mountains are chiefly to be found in the eastern parts of the country. Traced westwards these forms gradu- ally give place to narrow ridges and crests. No contrast, for in- stance, can be greater than that between the wide elevated moors of the castern Grampians, and the crested ridges of western Inver- ness-shire and Argyllshire—Loch Hourn, Glen Nevis, Glencoe— or that between the broad uplands of Peeblesshire and the preci- pitous heights of Galloway. No satisfactory reason for these con- trasts can be found in geological structure alone. Perhaps the key to them is to be sought mainly in differences of rainfall. The western mountains, exposed to the fierce dash of the Atlantic rains, sustain the heaviest and most constant precipitation. Their sides are seamed with torrents which tear down the solid rock and sweep its detritus into the glens and sea lochs. The eastern heights, on the other hand, experience a less rainfall and consequently a dimi- nished rate of erosion. There is no reason to doubt that the present preponderance of rainfall in the west has persisted for an enormous duration of time.

Regarding the existing flat-topped heights among the eastern Grampians as representing what may have been the general char- acter of the surface out of which the present Highlands have been carved, we can trace every step in the gradual obliteration of the tableland and in the formation of the most rugged and individual- ized forms of isolated mountain. In fact, in journeying westwards across the tops of the Highland mountains we pass, as it were, over successive stages in the history of the origin of Highland scenery. The oldest types of form lie on the east side and the newest on the west. From the larger fragments of the denuded tableland we advance to ridges with narrow tops, which pass by degrees into sharp rugged crests. The ridges, too, are more and more trenched until they become groups of detached hills or mountains. In the progress of this erosion full scope has been afforded for the modifica- tion of form produced by variations in geological structure. Each ridge and mountain has been cut into its shape by denudation, but its actual outlines have been determined by the nature of the rocks and the manner in which they have yielded to decay. Every distinct variety of rock has impressed its own characters upon the landscapes in which it plays a part. Hence, amid the monotonous succession of ridge beyond ridge and valley after valley, consider- able

diversity of detail has resulted from the varying composition and grouping of the rocks.

The process by which the ancient tablelands of the country have been trenched into the present system of valleys and confluent ridges is most instructively displayed among the higher mountains, where erosion proceeds at an accelerated pace. The long "screes " or talus-slopes at the foot of every crag and cliff bear witness to the continual waste of the mountain sides. The headwaters of a river cut into the slopes of the parent hill. Each valley ig consequently

lengthened at the expense of the mountain from which it descends. Where a number of small torrents converge in a steep mountain recess, they cut ont a crescent-shaped hollow or half-cauldron, which in the Scottish Highlands is known as a '"'corry." Whether Corries the convergent action of the strcams has been the sole agency con- and cerned in the erosion of these striking concavities, or whether snow glens. and glacier-ice may have had a share in the task, is a question that cannot at present be satisfactorily solved. No feature in Highland scenery is more characteristic than the corries, and in none can the influence of geological structure be more instructively seen. Usu- ally the upper part of a corry is formed by a crescent of naked rock, from which long trails of débris descend to the bottom of the hollow. Every distinct variety of rock has its own type of corry, the pecu- liarities being marked both in the details of the upper cliffs and crags and in the amount, form, and colour of the screes. The Scottish corries have been occupied by glaciers. Hence their bottoms are generally well ice-worn or strewn over with moraine stuff, Not infrequently also a small tarn fills up the bottom, ponded back by a moraine. It is in these localities that we can best observe the last relics left by the retreat of the glaciers that once overspread the country. Among these high grounds also the gradual narrowing of ridges into sharp, narrow, knife-edged crests and the lowering of these into cols or passes can be admirably studied. Where two glens begin opposite to each other on the same ridge, their corries are gradually cut back until only a sharp crest separates them. This crest, attacked on each front and along the summit, is lowered with comparative rapidity, until in the end merely a low col or pass may separate the heads of the two glens. The various stages in this kind of demolition are best scen where the underlying rock is of granite

or some similar material which possesses considerable toughness, while at the same time it is apt to be split and splintered by means of its numerous trans- verse joints. 'The granite mountains of Arran furnish excellent illustrations.

Where a rock yields with considerable uniformity in all directions Forma- to the attacks of the weather it is apt to assume conical forms in tion the progress of denudation. Sometimes this uniformity is attained of moun- by a general disintegration of the rock into fine débris, which rolls tain down the slopes in long screes. In other cases it is secured by the cones. intersection of joints, whereby a rock, in itself hard and durable, is divided into small angular blocks, which are separated by the action of the elements and slide down the declivities. In many instances the beginning of the formation of a cone may be detected on ridges which have been deeply trenched by valleys. The smaller isolated portions, attacked on all sides, have broken up under the influence of the weather. Layer after layer has been stripped from their sides, and the flat or rounded top has been narrowed until it has now become the apex ofa cone. The mountain Schiehallien (3547 feet) isa noble instance of a cone not yet freed from its parent ridge. Occasionally a ridge has been carved into a series of cones united at their bases, as in the chain of the Pentland Hills. A further stage in denudation brings us to isolated groups of cones completely separated from the rest of the rocks among which they once lay buried. Such groups may be carved out of a continuous band of rock which extends into the regions beyond. The Paps of Jura, for instance, rise out of a long belt of quartzite which stretches through the islands of Isla, Jura, and Scarba. In many cases, however, the groups point to the existence of some boss of rock of greater durability than those in the immediate neighbourhood, as "hn the Cuchullins and Red Hills of Skye and the group of granite cones of Ben Loyal, Sutherland. The most impressive form of soli- tary cone is that wherein after vast denudation a thick overlying formation has been reduced to a single outlier, such as Morven in Caithness and the two Ben Griams in Sntherland, and still more strikingly the pyramids of red sandstone on the western margin of Sutherland and Ross-shire. The horizontal stratification of some of these masses gives them a curiously architectural aspect, which is further increased by the effect of the numerous vertical joints by which the rock is cleft into buttresses and recesses along the fronts of the precipices and into pinnacles and finials

along the summits. Solitary or grouped pyramids of red sandstone, rising to heights of between 8000 and 4000 feet above the sea, are mere remnants of a once continuous sheet of red sandstone that spread far and wide over the western Highlands.

Stratified rocks when they have not been much disturbed from Esearp- their original approximate horizontality weather into what are ments. called "escarpments,"—lines of cliff or steep bank marking the edge or outcrop of harder bands which lie upon softer or more easily eroded layers. Such cliffs may run for many miles across a country, rising one above another into lofty terraced hills. In Seotland the rocks have for the most part been so dislocated and disturbed as to prevent the formation of continuous escarpments, and this interesting form of rock-scencry is consequently almost entirely absent, except locally and for the most part on a compara- tively small scale. 'The most extensive Scottish escarpments are found among the igneous rocks. Where lava has been piled up in successive nearly horizontal sheets, with occasional layers of tuff

or other softer rock between them, it offers conditions peculiarly favourable for the formation of escarpments. In the wide basalt plateaus of the Inner Hebrides these conditions have been mani- fested on a great scale. The Carboniferous lavas of the Campsie and Fintry Hills and of the south of Dumfriesshire and Roxburgh- shire likewise rise in lines of bold escarpment.

Lakes.—These important features in the landscapes of Scotland present the general eharacters of the water-basins so profusely scattered over the northern parts of Europe and North America. They may be elassified in four groups, each of which has its own peculiar scenery and a distinct mode of origin—(1) glen lakes, (2) rock-tarns, (3) moraine-tarns, (4) lakes of the plains.

Glen (1) Glen lakes are those which occupy portions of glens. They lakes. are depressions in the valleys, not due to mere local heaping up of detritus, but true rock-basins, often of great depth. Much discus- sion has arisen as to their mode of origin. They have been re- garded as eaused by special

subsidence of their areas, open fissures of the ground, general depression of the central part of each mountain district from which they radiate, and by the erosive action of glacier ice. That they are not open fissures and cannot be explained by any general subsidence of a neighbouring region is ‘ now generally admitted. That glaciers have occupied the glens where these lakes exist and have worn down the rocks along the sides and bottom cannot be doubted, but whether the ice would be capable of eroding hollows so deep as many of these lakes is a question which has been answered with equal eonfidence affirma- tively and negatively. On the other hand, to suppose that each of these hollows has been eaused by a special local subsidence would involve a complex series of subterranean disturbances, for which some better evidence than the mere existence of the basins is re quired. Under any circumstances it is quite certain that the lakes must be of recent geological date. Any such basins belonging to the time of the plication of the crystalline schists would have been filled up and effaced long ago. “So rapid is the infilling by the torrents which sweep down detritus from the surrounding heights that the present lakes are being visibly diminished, and they eannot, therefore, be of high geological antiquity. It is worthy of remark that the glen lakes are almost wholly confined to the western half of the Highlands, where they form the largest sheets of fresh water. Hardly any lakes are to be seen cast of a line drawn from Inverness to Perth. West of that line, however, they abound in both the longitudinal and the transverse valleys. The most remarkable line of them is that which fills up so much of the Great Glen. Loch Ness, the largest, is upwards of 20 miles long, about 13 miles broad, and not less than 774 feet deep in the deepest part. This great depression exceeds the general depth reached by the floor of the North Sea between Great Britain and the opposite shores of the Continent. Other important longitudinal lakes are Lochs Tay, Awe, Ericht, and Shiel. The most pictur- esque glen lakes, however, lie in transverse valleys, which being eut across the strike of the rocks present greater variety, and usually also more abruptness of outline. Lochs Lomond, Katrine, and Lubnaig in the southern Highlands, and Lochs Maree and More in the north, are conspicuous examples, Rock- (2) Rock-tarns are small lakes lying in rock-basins on the sides tarns. of mountains or the summits of ridges, and on rocky platcaus or plains. Unlike the glen lakes, they have no necessary dependence upon lines of valley. On the contrary, they are scattered as it were broadcast over the districts in which they occur, and are by far the

most abundant of all the lakes of the country. Dispersed over all parts of the western Highlands, they are most numerous in the north-west, especially in the Outer Hebrides and in the west of Ross-shire and Sutherland. The surface of the Archean gneiss is so thickly sprinkled with them that many tracts eonsist almost as much of water asof land. They almost invariably-lie on strongly ice-worn platforms of rock. Their sides and the rocky islets which diversify their surface have been powerfully glaciated. They cannot be due to either fracture or subsidence, but are obviously hollows pro-duced byerosion. They have accordingly with much probability been assigned to the gouging action of the sheets of land-ice by which the general glaciation of the eountry was effected. In the southern uplands, owing probably to the greater softness and uniformity of texture among the rocks, rock-tarns are comparatively infrequent, except in Galloway, where the protrusion of granite and its associated metamorphism have given rise to conditions of rock-structure more like those of the Highlands. Over the rocky hill-ranges of the central Lowlands rock-tarns occasionally make their appearance. Moraine- (3) Moraine-tarns—smal] shects of water ponded back by some tarns. of the last moraines shed by the retreating glaciers—are confined to the more mountainous tracts. Among the southern uplands many beautiful examples may be seen, probably the best known and eertainly one of the most picturesque being the wild lonely Loch Skene lying in a recess of Whitecoomb at the head of the Moffat Water. Others are sprinkled over the higher parts of the valleys in Galloway. None occur in the central Lowlands. In the Highlands they may be eounted by hundreds, nestling in the bottoms of the corries. In the north-western counties, where the

glaciers continued longest to descend to the sea-level, lakes retained by moraine-barriers may be found very little above the sea.

(4) The lakes of the plains lie in hollows of the glacial detritus Lakes which is strewn so thickly over the lower grounds. As these of the hollows were caused by original irregular deposition rather than plains, by erosion, they have no intimate relation to the present drainage- lines of the eountry. The lakes vary in size from mere pools up to wide sheets of water several square miles in area. Asa rule they are shallow in proportion to their extent of surface. Though still sufficiently numerous in the Lowlands, they were once

greatly more so, for, partly from natural causes and partly by artificial means, they have been made to disappear. The largest sheets of fresh water in the midland valley are of this class, as Loch Leven and the Lake of Menteith.

Coast-Line.—The eastern and western seaboards of Scotland Coast- present a singular eontrast. The former is indented by a series of line, broad arms of the sca, but is otherwise tolerably unbroken. The land slopes gently down to the margin of the sea or to the edge of eliffs that have been eut back by the waves. The shores are for the most part low, with few islands in front of them, and cultivation comes down to the tide-line. The western side of the country, on the contrary, is from end to end intersected with long narrow sea lochs or fjords. The land shelves down rapidly into the sea and is fronted by chains and groups of islands. his contrast has some- times been erroneously referred to greater erosion by the waves on the western than on the eastern eoast, The true explanation, however, must be sought in the geological structure of the land. The west side of Scotland, as we have seen, has been more deeply eroded than the eastern. The glens are more numerous there and on the whole deeper and narrower, Many of them are prolonged under the sea ; in other words, the narrow deep fjords which wind so far into the land are seaward. continuations of the glens which emerge from their upper ends. The presence of the sea in these fjords is an accident. If they eould be raised out of the sea they would become glens, with lakes filling up their deeper portions, That this has really been their history can hardly admit of question. They are submerged land-valleys, and as they run down the whole western coast they show that side of the country to have subsided to a considerable depth beneath its former level. The Scottish sea lochs must be viewed in connexion with those of western Ireland and of Norway. The whole of this north-western coast-line of Europe bears witness to recent submergence. The bed of the North Sea, which at no distant date in gcological history was a land surface across which plants and animals migrated freely into Great Britain, sank beneath the sea-level, while the Atlantic ad- vanced upon the western margin of the continent and filled the sea- ward ends of what had previously been valleys open tothesun. Not: improbably the amount of subsidence was greater towards the west.

Nearly the whole coast-line of Scotland is rocky. On the east side of the country, indeed, the shores of the estuarics are gener- ally low, but the land between the mouths of these inlets is more or less precipitous. On the west side the coast is for the most part either a steep rocky declivity or a sea-wall, though strips of lower ground are found in the bays. The sea-cliffs everywhere vary in their characters according to the nature of the rock out of which they have been carved. At Cape Wrath precipices nearly 800 fect high have been eut out of the Archean gneiss. The varying tex- ture of this rock, its irregular foliation and jointing, and its rami- fying veins of pegmatite conspire to give it very unequal powers of resistance in different parts of its mass. Consequently it projects in irregular bastions and buttresses and retires into deep recesses and tunnels, showing everywhere a ruggedness of aspect which is eminently characteristic. 'In striking contrast to these precipices are those of the Cambrian red sandstone a few miles to the east. Vast vertical walls of rock shoot up from the waves to a height of 600 feet, cut by their perpendicular joints into quadrangular piers and projections, some of which even stand out alone as cathedral- like islets in front of the main cliff. The sombre colouring is relieved by lines of vegetation along the edges of the nearly flat beds which project like vast cornices and serve as nesting-places for crowds of sea-fowl. On the west side of the country the most notable eliffs south from those of Cape Wrath and the Cambrian sandstones of Sutherland are to be found among the basaltic islands, particularly in Skye, where a magnificent range of precipiccs rising to 1000 feet bounds the western coast-line. The highest cliffs in the country are found among the Shetland and Orkney Islands, The sea-wall of Foula, one of the Shetland group, and the western front of Hoy in Orkney rise like walls to heights of 1100 or 1200 feet above the waves that tunnel their base. Caithness is one wide moor, terminating almost everywhere in a range of sea-precipices of Old Red Sandstone. Along the eastern coast-line most of the cliffs are formed of rocks belonging to the same formation. Begin- ning at Stonehaven, an almost unbroken line of precipice varying up to 200 feet in height runs southwards to the mouth of the estuary of the Tay. The southern uplands plunge abruptly into the sea near St Abb's Head in a noble range of precipices 300 to 500 feet in height, and on the western side the same high grounds

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Islands.

Influ- ences of topo- graphy on inhabit- ants.

FEATURES. |

terminate in a long broken line of sea-wall, which begins at the mouth of Loch Ryan, extends to the Mull of Galloway, and re- appears again in the southern headlands of Wigtown and Kirkeud- bright. One of the most picturesque features of the Scottish sea- cliffs is the numerous " stacks" or columns of rock which during the demolition and recession of the precipices have been isolated and left standing amidst the waves. These remnants attain their most colossal size and height on the cliffs of Old Red Sandstone. Thus the Old Man of Hoy in Orkney is a huge column of yellow sandstone between 400 and 500 feet high, forming a conspicuous landmark in the north. The coast of Caithness abounds in out- standing pillars and obelisks of flagstone.

The low shores on the west coast are not infrequently occupicd by sand-dunes. Such accumulations fringe the western margin of North and South Uist, and are found in many bays from the north of Sutherland to the coast of Ayrshire. They are more abundant on the east coast, especially on the shores of Aberdeenshire, between the mouths of the two Esks, on both sides of the mouth of the Firth of Tay, and at various places in the Firth of Forth. Raised sea-beaches likewise play a part in the coast scenery of the country. These alluvial terraces form a strip of low fertile land between the edge of the sea and the rising ground of the interior, and among the western fjords sometimes supply the only arable soil in their neighbourhood, their flat green surfaccs presenting a strong con- trast to the brown and barren moors that rise from them. Most of the scaport towns of the eountry stand upon platforms of raised beach. Considerable deposits of mud, silt, and sand are accumu- lating in most of the estuaries. In the Tay, Forth, and Clyde, where important harbours are situated, considerable expense is in-volved in dredging to remove the sediment continually brought down from the land and carried backward and forward by the tides. Wide alluvial flats are there exposed at low water.

While no islands except mere solitary rocks like May Island, the Bass Rock, and Inchkeith diversify the eastern seaboard, the western side of Scotland presents a vast number, varying in size from such extensive tracts as Skye down to the smallest sea-stack or skerry. Looked at in the broadest way, these numerous islands may be regarded as belonging to two groups or series,—the Outer and the Inner Hebrides. The Outer Hebrides, extending from Barra Head to the Butt of Lewis, consist of a continuous chain of islands composed (with the exception of a small tract in the east of Lewis) entirely of Archean rocks. Most of the ground is low, rocky, and plentifully dotted over with lakes; but it riscs into mountainous heights in Harris, some of the summits attaining elevations of 2600 feet. 'The general trend of this long belt of islands is north-north-east. The Inner Hebrides form a much less definite group. They may be regarded as beginning with the Shiant Isles in the Minch and stretching to the southern headlands of Isla, the most important members being Skye, Mull, Isla, Jura, Rum, Eigg, Coll, Tiree, and Colonsay. The irregularity of this fringe of islands has no doubt been in ehief measure brought about by its remarkable diversity of geological structure. Archean gneiss, Cambrian sandstone, Silurian quartzite, limestone, and schist, Jurassic sandstone and limestone, Cretaceous sandstone, and Tertiary basalts, gabbros, and granitic rocks all enter into the composition of the islands.

Within the limits of this article it is only possible to allude to some of the more important influences of the topography on the history of the inhabitants. How powerfully the configuration of the country affects the climate is shown in the remarkable difference between the rainfall of the mountainous west and of the lowland east. This difference has necessarily affected the eharacter and employments of the people, leading to the development of agricul- ture on the one side and the raising of sheep and cattle on the other. The fertile low grounds on the east have offered facilities for the invasions of Romans, Norsemen, and English, while the moun- tainous fastnesses of the interior and the west have served as secure retreats for the older Celtic population. While, therefore, Teutonic people have spread over the one area, the earlier race has to this day maintained its ground in the other. Not only the external configuration but the internal geological structure of the eountry has profoundly influenced the progress of the inhabitants. In the Highlands no mineral wealth has been discovered

to stiniulate the industry of the natives or to attract the labour and eapital of strangers. These tracts remain still as of old sparsely inhabited and given over to the breeding of stock and the pursuit of game. In the Lowlands, on the other hand, rich stores of coal, iron, lime, and other minerals have been found. The coal-fields have gradually drawn to them an ever-increasing share of the population. Villages and towns have there sprung recently into existence and have rapidly increased in size. Manufactures have been developed and commerce has advanced with accelerated pace. Other influences have of course eontributed largely to the development of the country, but among theni all the chief place must undoubtedly be assigned to that fortu- nate geological structure which, amid the revolutions of the past, has preserved in the centre of Scotland those fields of coal and ironstone which are the foundations of the national industry. (A, GE.)

s CO TE 2 ND

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Climate.—In considering the climate of Scotland the first place Climate.

must be assigned to the temperature of the various districts during the months of the ycar, it being this which gives the chief charac- teristics of climate and not the mean temperature of the whole year. Thus, while the annual temperatures of the west and east coasts are nearly equal, the summer and winter temperatures are very different. At Portree (on east coast of Skye) the mean temperatures of January and July are 39° and 568, whereas at Perth they are 87°°5 and 59°0. The prominent feature of the isothermals of the winter months is their north and south direction, thus pointing not to the sun but to the warm waters of the Atlantic as the more powerful influence in determining the Scottish climate at this season through the agency of the prevailing westerly winds. The Atlantic isin truth a vast repository of heat, in which the higher temperature of summer and that of more southern latitudes are treasured up against the rigours of winter; and.in exceptionally cold seasons the ocean protects all places in its more immediate neighbourhood against the severe frosts which occur in inland situations. While this influ- ence of the ocean is felt at all seasons, it is most strikingly seen in winter; and it is more decided in proportion as the locality is surrounded by the warm waters of the Atlantic. At Edinburgh the

temperature is 27°0 and at Lerwick 32°5 higher than would otherwise be the case ; in other words, but for the ameliorating influence of the Atlantic the temperature of Edinburgh in mid- winter would only be 12°5 and of Lerwick 7°°5, or such winters as eharacterize the climates of Greenland and Iceland. The influence of the North Sea is similarly apparent, but in a lessdegree. Along the whole of the eastern coast, from the Pentland Firth southwards, temperature is higher than what is found a little inland to the west. The lowest temperature yet observed in the British Isles was ~~16°0, which occurred near Kelso in December 1879. In summer, every~~ where, latitude for latitude, temperature is lower in the west than in-the east and inland situations. In winter the inland climates are the coldest, but in summer the warmest. The course of the isothermal lines at this season is very instructive. Thus the line of 59° passes from the Solway directly northwards to the north of Perthshire and thence curves round eastwards to near Stonehaven. From Teviotdale to the Grampians temperature falls only one degree ; but for the same distanee farther northwards it falls three degrecs. The isothermal of 56° marks off the districts where the finer cereals are most successfully raised. This distribution of the temperature shows that the influence of the Atlantic in moderating the heat of summer is very great and is felt a long way into the interior of the country. On the other hand, the high lands of western districts by robbing the westerly winds of their moisture, and thus elearing the skies of eastern districts, exercise an equally striking effect in the opposite direction,—in raising the temperature.

There is nearly twice as much wind from the south-west as from the north-east, but the proportions vary greatly in different months. The south-west prevails most from July to October, and again from December to February ; accordingly in these months the rainfall is heaviest. These are the summer and winter portions of the year, and an important result of the prevalence of these winds, with their accompanying rains, which are coincident with the annual extremes of temperature, is to imprint a more strictly insular character on the Scottish climate, by moderating the heat of summer and the cold of winter. The north-east winds acquire their greatest frequency from March to June and in November, which are accordingly the driest portions of the year.

The mountainous regions of Scotland are mostly massed in the west and lie generally north and south, or approximately perpen- dicular to the rain-bringing winds from the Atlantic. Hence the westerly winds are turned out of their horizontal course, and, being thrust up into the higher regions of the atmosphere, their temperature is lowered, when the vapour is condensed into cloud and deposits in rain the water they can no longer hold in sus-pension. Thus the climates of the west are essentially wet. On the other hand, the climates of the east are dry, because the surface is lower and more level ; and the breezes borne thither from the west, being robbed of most of their superabundant moisture in eross- ing the western hills, are therefore drier and precipitate a greatly diminished rainfall. It thus happens that the driest climates in the east are those which have to south-westwards the broadest extent of mountainous ground, and that the wettest eastern climates are those which are least protected by high lands on the west. The breakdown of the watershed between the Firths of Clyde and Forth exposes southern Perthshire, the counties of Clackmannan and Kinross, and nearly the whole of Fife to the clouds and rains of the west, and their climates are consequently wetter than those of any other of the eastern slopes of the eountry. The driest elimates of the east, on the other hand, are in Tweeddale about Kelso and Jedburgh, the low grounds of East Lothian, and those on the Moray Firth from Elgin round to Dornoch. In these districts the annual rainfall for the twenty-four years ending 1883 was about 26 inehes, whereas over extensive breadths in the west it exceeds 100 inches, in Glencroe being nearly 180 inches and on the top of Ben Nevis 150 inches. (A. B.)

Popula- tion.

PART III.—STATISTICS.

Population ; Vital and Social Statistics. —At the end of the 15th century it is supposed that the population of Scotland did not exceed 500,000,—

Edinburgh having about 20,000 inhabitants, followed by Perth with about 9000, and Aberdeen, Dundee, and St Andrews each with about 4000. By the time of the Union in 1707 it is supposed to have reached 1,000,000, while according to the returns furnished by the clergy to Dr Webster in 1755 it was 1,265,380. At the time of the first Government census in 1801 it had reached 1,608,420. The increase through all the succeeding decades has been continuous, though fluctuating in amount, and in 1881 it had reached 3,735,578 (males 1,799,475, females 1,936,098),—an increase within the eighty years of 132 per cent. During the same period the population of England and Wales had increased 192 per cent., while the population of Ireland, owing to a rapid decrease since 1841, does not now differ greatly from what it was at the beginning of the century. The following table (I.) gives the areas of the various counties and of the whole of Scotland, the population in 1871 and 1881, the num- ber of persons to the square mile of land-surface in the latter year, and the increase or decrease per cent. between 1871 and 1881 :—

q Increase ; a Population. Pop. per ae

Counties, theres Sq. Mile, | Decrease

P 1881. per cent.

1871. 1881. 1871-1881

Aberdeen …... 1,262,098 } 244,608 | 267,990 187 + 9°56 EADY ec 5:< 2,184,274 75,679 76,468 24 + 1:04 EAS scesasetsre eieite 735,262 200,809 217,519 193 — 8°32 Banff pono coOdnE 413,791 62,023 62,736 98 cape 1LCTL Berwick…..... 297,161 36,486 35,392 Ti – 3:00 Jase! Sieceqresene 143,997 16,977 17,657 81 + 4:00 Caithness …... 448,867 39,992 38,865 57 = aoe Clackmannau .. 31,876 23,747 25,680 539 ap evil Dumbarton …. 172,677 58,857 76,3383 312 +27°99 Dumfries …... 705,946 74,808 76,140 72 + 1°78 Edinburgh ….| 234,996 | 398,379 | 389,164 1075 +18°51 Elgin or Moray 312,346 43,128 43,788 92 Se 153 Hiei, serena a 328,427 160,735 171,931 349 + 6°96 ORT ies occa 569,851 237,567 266,360 304 Sroleabe, Haddington …. 179,142 37,771 88,502 142 + 1°94 Inverness …... 2,767,078 88,015 90,454 22 ae 207 Ff Kincardine …. 248,195 34,630 34,464 90 – 0°48 KOMEOSS os ces 49,812 7,198 6,697 92° – 6°96

Kirkcudbright. . 610,343 41,859 42,127 47 + 0°64 Ganatk …..... 568,868 765,339 904,412 1026 =ilgeliy Linlithgow …. 81,113 40,965 43,510 363 ++ 6°21 Nairn…... seee| 127,906 10,225 10,455 58 + 2:95 Orkney and Orkney 85 | + 2°46 Shetland 638, 332 62,882 61,749 | Shetland 54 | – 6:02 Peebles …..... 227,869 12,330 13,822 39 ++12°10 ReMi ees tes 1,664,690 | 127,768 | 129,007 51 + 0:97 Renfrew…..... 162,428 216,947 263,374 1075 +21°40

Ross and Cro-

marty…....| 2,078,896 80,955 78,547 25 — 2:97 Roxburgh…... 428,464 49,407 58,442 80 ++ 8:17 Selkirk seeeretee ae 166,524 18,572 25,564 99 +37°65 Stitling .)..... 298, 579 98,218 | 112,448 251 ++14°48 Sutherland ….| 1,859,846 24,317 23,370 12 — 3°89 Wigtown …... 827,906 38,830 38,611 79 — 0°56 sc ee 19,777,490 | 2,360,018 | 3,735,578 12 | +1118

Table II. (see below) affords a comparison of the numbers of the population in 1861, 1871, and 1881 as grouped in towns, villages, and rural districts. The returns do not afford a means of comparison between earlier years than those given. A striking fact deserving of mention is that in every county in Scotland the population increased between 1801 and 1841, the increase being more than

10 per cent. in cach county, with the exception of Argyll, Perth, and Sutherland. The census returns for these years do not supply materials for an accurate estimate as to the increase of the purely rural or agricultural population, but it must have been considerable. Between 1841 and 1881 the following counties declined in population: — Argyll, Inverness, Kinross, Perth, Ross and Cromarty, Sutherland, and Wigtown,—all chiefly agricultural, and five of them in the Highlands, where much of the land was held by crofters. Only one county, Kinross, has a smaller population in 1881 than in 1801. Between 1851 and 1881 the island population, chiefly crofters, decreased by 4866, and the rural population between 1861 and 1881 by 125,583. In the following Highland counties the diminution in rural population between 1861 and 1881 was as follows :—Argyll from 60,109 to 46,081, Caithness from 28,279 to 24,309, Inverness from 74,439 to 67,355, Perth from 69,480 to 57,016, Ross and Cromarty from 59,147 to 49,882, and Sutherland from 21,560 to 18,696. In the total population of Scotland

the rate of increase was considcrably less between 1841 and 1881 than during the first forty years of the century,—42°5 to 62°9 per cent. The rates per cent. of increase in the several decades from 1801 have been as follows :—12-27, 15°82, 13°04, 10°82, 10°25, 6,9°72,and 11:18. The high rate of increase between 1871 and 1881 was due to an exceptional briskness of trade, and unless it has been maintained (which is not probable) the estimate of the registrar- general, which makes the population in 1885 number 3,907,736, must be regarded as much too sanguine. Table III. (see below) gives the population of the eight largest towns of Scotland at decennial periods since 1801. It is a curious fact that each of these towns has maintained its place in the "eight," although several towns now tread closely on the heels of Perth, whose rate of progress with that of Paisley has lagged greatly behind that of the other six.

While in England and Wales the number of persons to the square Distribu- mile in 1881 was 452 and in Ireland 159, in Scotland the number tion of was only 125, The small density of Scotland is due chiefly to the popula- In the north-western coun- tiou.

large proportion of mountainous land. ties the density was only 23 to the square mile, in the northern 34, in the west midland 68, in the southern 68, while in the north- eastern it was 115, in the cast midland 149, in the south-eastern 299, and in the south-western—Renfrew, Ayr, and Lanark—614. Table IV. (sec p. 529) shows by the excess of births over deaths the increase that should have taken place between 1861 and 1871, and between 1871 and 1881 (but for the balance of emigration over immigration), compared with the actual increase, the grouping being into towns with over 25,000 inhabitants, towns between 10,000 and 25,000, towns under 10,000 and above 2000, and rural districts. It is impossible to make a comparison between 1861 and 1881 inasmuch as the proportion of large and small towns and rural districts has varied. It must also be cxplaincd that in comparing 1861 and 1871 the census of 1861 is taken as the authority for the grouping and in comparing 1871 and 1881 the census of 1871. This table shows in both decades an actual increase in the large and in the principal towns greater than that resulting from excess of births over deaths. It is the result not only of migration from the small towns and rural districts but of the immigration of English, Irish, and foreigners, and the

return of natives of Scotland from abroad. By a comparison with Table II. it will be observed that the increase in the rural districts between the decades in Table IV. occurs only in the villages, and a closer examination of Table IV. further shows that any seeming increase is really delusive, and arises from the fact that there is no provision for the increase in

TABEE

anne eee en ee

. Increase or Decrease. Tucrease or Decrease Percentage Groep. Total Population. 1861 tols7l. 1871 to1ssl. to Total Population. | ee ee es 1861. 1871, | 1881 Actual. Percentage. Actual. Percentage. |} 1861. 1871. 1881. Si BO ec hya coy oa vient 1,616,134 1,951,704 2,306,852 +335,570 +20°76 +355,148 +18°20 52°78 | 58:09 | 61°75 Coen 339,740 386,993 447,884 + 47,253 +13°90 + 60,891 +15°78 11:09 | 11°52 | 11-99 Rural districts …....., 1,106,420 1,021,321 980,837 — 85,099 – 769 – 40,484 — 3:96 36°13 | 30°39 | 26-26 SCOHMH 2… ceo ce es 3,062,294 8,360,018 | 8,785,573 +297, 724 + 9°72 +375,555 +1118 | 100:00 | 100:00 | 100-00 TABLE III. Name, 1801. 1811. | 1921, 1831. 1841, | 1851. 1361. 1871. 1881. eae Edinburgh 136,548 132,977 | 160,302 168,121 196,979 298,38 5 os. :, |e 7 302 97 57 250,616 Leith 'a ee 136,351 25,855 25,984 30,919 33,628 44,280 59,485 68,414 GIGEBOW seca 77,058 108,224 140,432 198,030 261,004 329,097 394,864 477,156 551,415 519,965 Aberdeen …..... 26,992 34,640 43,821 56,681 63,288 71,973 73,805 88,108 105,189 113,212 Dundee… ss. cs 27,396 31,058 82,126 48,026 64, 629 78,931 90,417 118,977 140,239 152,838 ROG ase ivca cede 25,058 29,461 38,102 46,292 48,263 47,952 47,406 48,240 55,638 59,108 Greenock …..... 17,190 18,750 21,719 27,082 36,169 36,689 42,098 57,146 66,704 73,695 Perth …., 16,388 16,564 18,197

ano.do a 19,238 20,407 23,835 25, 250 25,585 28,980 31,322

Nation- ality.

Emigra-

tion.

Vital statistics.

STATISTICS. |

the number of small towns. Thus according to the grouping of 1871 the rural population of 1871 was nearly 28,000 less than the rural population of 1861 according to the grouping of 1861. It

is from the villages and small towns that the large towns are principally recruited, the purely rural population preferring as a rule to emigrate.

Table V. shows the nationalities of the people of Scotland in 1871 and 1881, with the nationalities in 1881 in those burghs which had a population of 10,000 and upwards :—

Burghs 1881.

Scotland 1871. Scotland 1881.

Nationalities, Per- Per- Per- Number. | centage ; Number. | centage | Number. | centage to Pop. to Pop. to Pop. SOO sopoaengedoo 8,061,531 | 91°117 | 8,397,759 | 90°957 1,429,012 | 87-116 lvsisih Bap apeeemees 207,770 6°184 5 5°856 | 141,626 8°634 HIMUISH 5. eee es 69,401 2°065 90,017 2°410 51,402 3°134 British colonials… 9,740} 0°290 12,874 0°345 7,768 0-473

British subjects

from abroad …. 5,068 07151 7,024 07188 4,954 0°254 Foreigners …... 4,698 07140 6,399 0171 4,171 0°302 REISE cece eiers eine 1,081 070382 1,806 0-048 882 0°054 From Channel Isles 729 0°021 949 0°025 545 0°033 NOTA)... se «ie 3,360,018 | 100°000 | 3,735,573 | 100-000 | 1,640,360 | 100-000

This table indicates not merely an actual but a proportional in-

crease in non-natives, there being an actual increase but a pro- portional decrease of natives of Ireland, and both an actual and a proportional increase of natives of England. Over the whole of Scotland the proportion

of non-natives is a little over 9 per cent., while in the burghs it is nearly 13 per cent. The number of persons of Scottish birth in Ireland in 1881 was 22,328, and in England it was 253,528,—a total in the two countries of 275,856. On the other hand, the natives of the two countries in Scotland in 1881 were together 308,762, so that therc is a smaller migra- tion from Scotland to these countries than from these countries to Scotland.

The following table (VI.) shows the emigration of persons of Scottish origin from the United Kingdom at various periods since 1853 :—

1866-70

85,621

1871-75

95,055

1856-60

59,016

1861-65

62,461

1876-80

70,596

1881-85

133,527

1853-85

568,790

1853-55

62,514

Years ….

Emigrants

Comparing 1856-60 with 1881-85 it will be seen that the number of emigrants has more than doubled,—an increase of course propor- tionately much greater than the population. There are no statistics as to the number of immigrants into Scotland ; and the significance of Table VI. is further lessened by the fact that it includes persons who may have been for some time resident in England or Ireland, or who may have been born there of Scottish parentage, and also sup- plies no information regarding emigration to the Continent. Ouly the principal ports, moreover, are included in the return.

The male population in 1881 was 1,799,475, an increase since 1871 of 12°2 percent. ; the female population 1,936,098, an increase of only 10°2 per cent. Since 1811, when there were 118°5 females to every 100 males, the proportion has been continuously diminishing, and in 1881 it was 107°6, but still greater than prevails either in England, which was 105°5, or in Ireland, which was 1043. The proportion differs greatly in different counties, being as high as 134°71 in Shetland, chiefly on account of the number of males at sea. In Scotland the proportion of female births is smaller than that of male births: in 1885 it was 100 to 105; and males preponderate in the population up till the age of twenty-five, clearly showing that the excess of females is due to male emigra- tion or the greater mortality of male occupations. The percentage

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of illegitimate to the total number of births in 1855 was 7:8, and reached its maximum in 1865, when it was 10:2, while in 1885 it was 846. It is much higher in the lowland rural districts than in the Highland rural districts, and lowest in the large towns. The percentages of births, deaths, and marriages to population in the annual reports of the registrar-general are

in a great degree misleading, inasmuch as the estimated population generally differs greatly from the actual. They place it, however, beyoud doubt that the greatest birth, marriage, and mortality rates are in the town districts, that the smallest birth and marriage rates are in the insular districts, after which come the mainland rural districts, and that the mortality is not so high in the insular rural as in the mainland rural districts. Table VII. (see below) gives the percentage of single, married, and widowed to the total of each sex in Scotland, England and Wales, and Ireland respect- ively in 1881.

The number of blind persons in Scotland in 1881 was 3158 Blind, (males 1556, females 1602), the proportion to the total population &c.

being 1 in 1182 (males 1156, females 1208) ; the proportion in 1871 was lin 1112. The deaf and dumb in 1881 numbered 2142 (males 1149, females 993), the proportion to the total population being 1 in every 1744 as against 1 in every 1610 in 1871. The number of lunatics was returned as 8406 (males 3939, females 4467) or 1 in every 444 of the total population, the proportion in 1871 being 1 in every 494, In addition to this there were 5991 imbeciles (males 2896, females 3095), or 1 to every 623 of the population, the pro- portion in 1871 being 1 in every 727.

Table VIII. gives a classification of the population according to Occupa-

occupations in 1871 and 1881 :—

Per cent. of Total Pop.

ion. 1871. 1, Classes of Occupation 871 188 1871 reed 1. Professional …... 72,911 96,108 brill oan H, IDWS "Saoooane 159,403 176,565 4°74 4°73 SaCOMMETCIAIO =). 6 <1 114,694 132,126 3°41 8°54 4, Agricultural …... 270,008 269,537 8°04 21 De LOCUStrIall ss cs «0. – 751,281 932,653 22°36 24°97 6. Unproductive ….| 1,991,721 2,128,589 59°28 56°98

It should be explained that the apparent diminution in the pro- Pauper- portion of the nnproductive class may be accounted for by the fact ism.

that in 1871 paupers were returned in this class, whereas in 1881 they were returned under the occupation at which they used to work. The increase in the proportion of the professional and commercial classes is at least a slight indication of higher average prosperity, but this is more conclusively established by the fact that the number of paupers has for many years been steadily on the decline, the proportion being now (1886) only 2°4 of the population. The average cost of maintenance is, however, on the increase, owing entirely to the increased cost of the maintenance of the lunatic poor.

Crime, like pauperism, is also steadily declining, as is shown Crime.

by Table IX. :—

Average, 1884. Offences. Total. 1836-| 1851-| 1875-| 1880- 40. | 55. | 79. | 84, Males. | Females. Against Persom. conc. .cccee «s 751|1014| 881] 838} 905 75 980 Against property with violencc| 530} 532| 520) 524] 515 80 595 Against property without vio-

CTC OW eerste rec siace ede 1676 | 1916 | 1102] 980; 649 262 911 Against property, malicious..; 47/ 62) 122] 6&9 52 8 60 ROMEO ATCC C ea osony assie asi s/cuere close) 120) 109| 44] 48 36 6 42 OUlCTIOMCHCES net. cars ene ee 266| 247) 112] 122 82 7 89

3390 8880 |2781|2551| 2239 | 4388 | 2677

TABLE IV, Population according to || Population according to 'Increase or Decrease | Increase or Decrease Grouping in 1861. Grouping in 1871. from 1861 to 1871. from 1871 to 1881. Births | Deaths} Births | Deaths Groups. 1861-71. |1861-71.| 1871-81. |1871-81. ora aes 1861. 1871. 1871. 1881. Actual. ier Actual. asiers Deaths. Deaths. Principal towns…. 884,955 1,068,556 1,193,940 1,411,536 876,856 | 274,511 | 429,679 | 296,285 |) +183,601 | +109,345 | +217,596 | +133,394 Large towns sae 254,030 310,165 327,734 388,797 103,519 | 68,769) 150,095 | 94,498 |; + 56,185 | + 34,750] + 61,063 | + 55,597 Smailtowns .. 502,833 540,807 696,958 790,796 190,128 + 115,147 | 293,220 | 171,485 || + 37,974 | + 74,981] + 93,838 | +121,735 Rural districts . 1,420,476 1,440,490 1,141,386 1,144,444 450,288 | 247,769 | 361,357 | 203,200 |! + 20,014 | +202,519; + 3,058 | +-158,157 Scotland …... 3,062,294 8,360,018 3,360,018 8,735,573

|| 1,120,791 | 706,196 | 1,234,351 | 765,468 |’ +-297,724 | +-414,595 | +875,555 | +468,883 TABLE VII.

Scotland.

England and Wales. Treland.

Single. Married. Widowed. Single. Married. Widowed. Single. Married. Widowed. INANE S Wate aie) sieve s, cssalcuscereiaeiesns 66-281 30°441 8-278 61°932 34°628 3°440 68°714 27°501 3°785 SHG WPAN OS ar aics eielseieleleniers nile 62°854 28°957 8-189 59°226 33°282 7499 63°442 26°976 9°582

XXI, — 67

Roads.

Canals.

Rail- ways,

530

Communication.—In the 12th century an Act was passed provid- ing that the highways between market-towns should be at least 20 feet broad. Over the principal rivers at this early period there were bridges near the most populous places, as over the Dee near Aberdeen, the Esk at Brechin, the Tay at Perth, and the Forth near Stirling. Until the 16th century, however, traffic between distant places was carried on chiefly by pack-horses. The first stage-coach in Scotland was that which ran between Edinburgh and Leith in 1610. In 1658 there was a fortnightly stage-coach between Edinburgh and London, but afterwards it would appear to have been discontinued for many years. Separate Acts en- joining the justices of the peace, and afterwards along with them the commissioners of supply, to take measures for the maintenance of roads were passed in 1617, 1669, 1676, and 1686. These provisions had reference chiefly to what afterwards came to be known as “statute labour roads,” intended primarily to supply a means of communication within the several parishes. They were kept in

repair by the tenants and cotters, and, when their labour was not sufficient, by the landlords, who were required to " stent" (assess) themselves, customs also being sometimes levied at bridges, ferries, and causeways. By separate local Acts the 'statute labour'? was in many cases converted into a payment called "conversion money," and the General Roads Act of 1845 made the alteration universal. By the Roads and Bridges (Scotland) Act of 1878 the old organization for the management of these roads was entirely superseded in 18838. The Highlands had good (mili- tary) roads earlier than the rest of the country. The project, begun in 1725, took ten years to complete, and the roads were afterwards kept in repair by an annual parliamentary grant. In the Lowlands the main lines of roads have been constructed under the Turnpike Acts, the earliest of which was obtained in 1750. Originally they were maintained by tolls exacted from those who used them; but this method was—after several counties had obtained separate Acts for its abolition—superseded throughout Scotland in 1883 by the general Act of 1878, providing for the maintenance of all classes of roads by assessment levied by the county road trustees.

Scotland possesses two canals constructed primarily to abridge the sea passage round the coast,—the Caledonian and the Crinan. The Caledonian Canal, extending from south-west to north-east, a distance of 60 miles along the line of lochs from Loch Linnhe on the west coast to the Moray Firth on the east coast, was begun in 1803, opened while yet unfinished in 1822, and com- pleted in 1847, the total cost being about £1,300,000. Constructed originally to afford a quicker passage for ships to the east coast of Scotland and the coasts of Europe, it has, owing to the increased size of vessels, ceased to fulfil this purpose, its chief service having been in opening up a picturesque route for tourists, assisting local trade, and affording a passage for fishing boats between the east and west coasts. The Crinan Canal, stretching across the Mull of Cantyre from Loch Gilp to Jura Sound, a distance of 9 miles, and admitting the passage of vessels of 200 tons burden, was opened in 1801 at a cost of over £100,000. The principal boat canals are the Forth and Clyde or Great Canal, begun in 1798, between Grange- mouth on the Forth and Bowling on the Clyde, a distance of 30} miles, with a branch to Port Dundas, making the total distance 33% miles ; the Union Canal between Edinburgh and the Forth and Clyde Canal at Port Dundas, near Glasgow, completed in 1822 ; and the Monkland

Canal, completed in 1791, connecting Glasgow with the Monkland mineral district and communicating with a lateral branch of the Forth and Clyde Canal at Port Dundas. Several other canals in Scotland have been superseded by railway routes.

The first railway in Scotland for which an Act of Parliament was obtained was that between Kilmarnock and Troon (92 miles), opened in 1812, and of course worked by horses. A similar rail- way, of which the chief source of profit was the passenger traffic, was opened between Edinburgh and Dalkeith in 1831, branches being afterwards extended to Leith and Musselburgh. By 1840 the length of the railway lines in Scotland for which Bills were passed was 1914 miles, the capital being £3,122,133. The chief railway companies in Scotland are the Caledonian, formed in 1845, total capital in 1884-85 £37,999,933; the North British, of the same date, total capital £32,821,526 ; the Glasgow and South-Western, formed by amalgamation in 1850, total capital £13,230,849 ;

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the Highland, formed by amalgamation iu 1865, total capital £4,445,316 ; and the Great North of Scotland, 1846, total capital £4,869,983. The management of the small branch lines belonging to local companies is generally undertaken by the larger companies. By 1849 there were 795 miles of railway in Scotland. The follow- ing table (X.) shows the progress since 1857 (see also RAILWay, vol. xx. pp. 226-230) :—

ad Passengers. g : & Receipts a 8 Sp ” se ES! from Year. = &5| First | Second a ae Total Se B £) Goods Total. |} Class. | Class. Clases: ES oe Trains.

1857 |1248)1,823,542/2,180,284)10,729,677|14,738,503| 916,697|1,584,781|2,501,478 1874 |2700|4,261,473/3,769,485|30,189,934|38,220,89212, 350, 5938/3, 884,424 6,235,017 1884 |2999/4,711,600 2,715,982/46,877,642|54,305,074|2, 931,737 4,426,028 7,357,760 | et ee eee ee Agriculture.—Table XI. shows the divisions of land as regards ownership according to the return (the latest) of 1873 :—

S 3 5 ke be Zl . BE £ fe Gross | & be E Owners holding each 2qa = § Annual | o@ [E< . BE BS Value. | x [Sd Be Da “| oO |\o'as ea 13) DA lO6o a Pes £ es: (hessatl aml acres) site. yaei acces 113,005 28,177) 5,800,046/205 17 ral More than 1 acre and less than 10..}| 9,471 29,327|| 1,433,106] 48 17 re " 10 r 50..| 38,4691 77,619|| 8$43,471| 10 17| “4 s 50 , 100..| 1,213) 86,483) 880,345] 4 5 100 = 500..| 2,367| 556,372/| 1,674,773] 8 0| 2:9 »» 500 a 1,000..) 826} 582,741)| 1,263,524 2 3] 8-1 », 1,000 ie 2,000..| 596] $85,242'| 1,179,756] 1 8} 4:4 2,000 :, 5,000..| 587] 1,848,378|| 1,946,507} 1 1] 9:7 yy 8,000 i 10,000 250} 1,726,869 | 1,043,519] 012) 9-1 >, 10,000 _ 20,000 159] 2,150,111)| 965,166} 0 9) 11°3 », 20,000 5 50,000 108) 3,071,728) 945,914] 0 6] 16-2 y, 80,000 » 100,000 44] 3,025,616] 588,788] 0 4] 16°0 100,000 and upwards …..... 24] 4,931,884} 623,148! 0 3) 2671 IGRI Base paneesGaunes > soontes i 06 10,740} .. 6G INOMentall ssaleerears cis case se vineinree iil 1147 a on 20 TOtal ecccss cece eee 132,136]18, 946, 694|/18,698,804] 1 0! 100-0

Scotland, as compared with either England or Ireland, is em- phatically a country of large proprietors. Taking the population of 1871 as the basis of comparison, a little over 3°9 per cent. of the population of Scotland have a share in the ownership of the soil, the proportion in England and Wales being about 5 per cent., while in Ireland it is only about 1°7. On an average each owner in England possesses 33 acres, in Scotland 148, and in Ireland 293. While in Ireland, however, only a little over one-half of the number

Owner- ship of 7 soil.

of proprietors possess less than 1 acre, and in England about five- .

*sevenths, this class in Scotland amounted to about five-sixths of the whole. They possessed only *1 per cent. of the total area, the re- maining 99°9 being possessed by 19,131 persons, while 171 persons held 58°3, and 68 persons 42°1. Whereas in England 1 and in Ireland only 3 proprietors held upwards of 100,000 acres each, in Scotland there were 24 persons who each held more than this amount, and together they possessed 26-1 per cent. of the total area. The 'excessive size of the propertics of Scotland may be partly accounted for by the fact that a large proportion of the land is so mountainous and unproductive as to be unsuitable for division into small properties; but two other causes have also powerfully co-operated with this, viz., the wide territorial authority exercised by some of the lowland nobles, as the Scotts and Douglases, and such powerful Highland nobles as the Argylls and Breadalbanes, and the stricter law of entail introduced by the Act of 1685 (see EnTarL, vol. viii. p. 452). The largest estates are thus in the hands of the old hereditary families. The almost absolute power anciently wielded by the landlords, who within their own territories were lords of regality, tended to hinder in- dependent agricultural enterprise, and it was not till after the abolition of hereditary jurisdictions in 1746 that agriculture in Scotland made any real progress.*

The following table (XII.) gives a classification of the holdings Holdings.

of Scotland in 1875 and 1880 :—

50 Acres and From 50 to 100 From 100 to 300 From 300 to 500 From. 500 to 1000 under. Acres. Acres. Acres. Acres. Above 1000 Acres. Total. a SS SS

| SS @ Area in Area in Area in Area in Area in |e Area in Area in Number. icra Number "A eves: Number Rees: Number. ores. Number. eves. Number. cee. Number. ROE. 1875 | 56,311 | 666,356 9878 697,620 | 11,828 {1,980,081 | 1967 729,885 691 427,478 126 109,675 | 80,796 | 4,611,095 1880 | 55,280 | 653,295 9726 721,844 | 12,348 | 2,082,914] 2007 750,295 661 418,650 79 114,298 | 80,101 | 4,741,296

It will be observed that nearly one-half of the total area of the hold- ings is occupied by those possessing from 100 to 300 acreseach. The holdings over 300 acres are generally sheep farms, and it is to the enterprise of the medium class of holders that the agricultural progress of Scotland is chiefly due. A society of improvers in the knowledge of agriculture was fouuded in 1723, but ceased to

exist after the Rebellion of 1745; and the introduction of new and improved methods, where not the result of private enterprise, has been chiefly associated with the efforts of the Highland Society, instituted in 1783, and latterly known as the Highland and Agri- cultural Society. A great stimulus was also afforded in the be- ginning of the 19th century by the high prices obtained during the

Land- Continental wars, and, although periods of occasional severe depres- | right to security of tenure ; but when the old feudal system of the lord and sion have occurred since then, not only has the science of agriculture | Highlands was suddenly abolished after the Rebellion of 1745 no tenant. continued rapidly to advance but the position of the large farmer | legal steps were taken for the recognition of this right, and from has until within recent years been one of increasing prosperity. | the beginning of the 19th century wholesale clearances of tenants The system of nineteen years' lease had proved, as regards both | were carried out in many districts even by the heirs of the old agricultural progress and the interests of the farmer, a much superior | Highland chiefs. In the words of the report of the crofters com- arrangement to the system of yearly tenancy so largely prevailing | mission of 1884 :—"The crofter of the present time has through in England; but it was conjoined with customs and modified by | past evictions been confined within narrow limits, sometimes on eonditions which during the period of agricultural distress prevail- | inferior land and exhausted soil. He is

subject to arbitrary ing since 1872 have caused the relations between landlord and | augmentations of money rent, he is without security of tenure, and tenant to become severely strained. The more prominent griev- | has only recently received the concession of compensation for im- ances of the farmer were the difficulty of obtaining sufficient com- | provements." The crofters in Scotland are now estimated to pensation for improvements, the inconveniences resulting from the | number 40,000 families or 200,000 persons, and many of them sup- law of hypothec (see HypoTHEC, vol. xii. p. 598), and the hardships | port themselves partly by fishing. In the struggle for existence suffered from the existence of the game laws. Hypothec was | they have had to eontend against the tendency towards the creation abolished in 1879, except as regards the Act of Sederunt ; aground | of large farms, the demand for sporting estates, the desire of game Act was passed in 1880; and, succeeding the report of the | landlords to escape the burden of poor rates, and the fact that duke of Richmond's commission in 1882, the Agricultural Holdings | they have absolutely no choice as regards the conditions imposed Act was passed in 1883, containing provisions for securing to the | on them by the landlord. In Mareh 1883 a commission was ap- tenant control in the disposition of his lease, and also compensation | pointed to inquire into the condition of the cotters and crofters in for improvements; but already it is evident that these reforms | the Highlands and islands of Scotland ; this commission gave in have failed to meet the difficulties created by the altered conditions | its report in 1884, and an Act based on their recommendations was of things, due to the increasing scarcity of land and the import- | passcd in 1886. ation of foreign produce. Notwithstanding the unsatisfactory condition of agricultural Distribu- Crofters. While the relations between the landlord and the large farmer | affairs in Scotland at present, there is no country in the world tion of

STATISTICS, |

cannot be regarded as satisfactory, the difficulties of the crofters— small holders now chiefly to be found in the western Highlands and the islands to the north and west of Scotland—have reached a more acute stage. The crofter systeni prevailing in Orkney and Shetland—described in the article on those islands—has a totally different origin from that prevailing in the Highlands. On account of the ancient relations between the Highlander and

his chief, the inheritance is claimed by the Highland crofters of an inalienable

Yearly Averages.

se eTisA ND

531

where farming is prosecuted with more skill and enterprise. On account of the great variety of soil and climate the methods in operation differ greatly in different districts, and for special details the reader is referred to the articles on the several counties. The following table (X11I.) shows the cultivated area and the areas under each kind of crop in different years, with the proportion of the acreage under each kind of crop, &c., to every 1000 acres of cultivated land for 1885 in Scotland, England, and Ireland : —

Average per 1000 Acres 1885.

crops.

1880. 1885.

1867-70. 1871-75. Scotland. | England. Ireland. Acres. Acres. Acres. Acres. Acres Acres Total aereage under crops, bare fallow, and grass 4,420,375 4,560,825 4,738,127 4,845,805 1000 1000 EMIMAMEMbMIASLULE! olsls els ols)e/clclsiel ele v1 vie 6 slelein ele 1,036,844 1,084,983 1,159,353 1,220,000 492 673 JNEL DIG GUNG so.msoeeooenoe HOoU DONE OOCoOU OIC EAGaS 8,383,531 3,475,842 3,578,774 3,625,805 508 Bee Corn crops— \WIDCES ee qseduodans conganooun ee DB OUD OHH DS 124,296 122,513 73,976 55,155 95 5 Iautley F WORE gnoecgcncugs 0nonvooD os opDAde 227,988 252,105 264,120 237,472 76 11 RRM re oe erin eeen eins 1,011,480 1,007,339 1,037,254 1,046,285 66 87 IENP® send doco nocd dboagnoncocdsnatnn cocosEDS 8,135 10,480 7,333 7,095 2 1 IEETING . dlouesun sea Sonn pnerinn COUODLNUCe mar: 23,711 26,746 19,977 23,135 16 DRO RSC ME eeieicie derclciisie ste wei s.coidels creccaaiecelesieialy 2,367 95382 227, 1,750 9 Total undercom

€rops) .....—.... 1,397,977 1,421,515 1,403,887 1,370,892 264. 104 Green crops— IPODS ene. coee.qann coopodMOdMOGnnoeUoddne 170,978 167,880 187,061 148,994 14 53 PUES PATIL SAVECLES!.,. «./+e1-1s\ele.s ce cies el seiee nie 490,598 503,709 485,987 484,213 59 20 LUE SN ooongcoocabconnenonuepanean oHDeHA OE 944 1,748 1,822 1,495 14 2; ChIRWGES oa96.0n oo TODD GOUUCODS COMOOOUTEIO OoUOEE 964 1,048 1,393 1,296 1 BS Cabbage, kohl-rabi, and rape … ..... 8,441 4,656 5,478 5,833 6 3 Wailea, Oi; "boronauce Osean rece ame 14,529 14,780 15,705 18,088 16 2 Motalwundenereenverops …. 5.20. c— ee. 681,454 693,821 697,446 659,919 110 80 GMASseS UMGACT TOUALION 4 sens cccceeeccccs cess 1,248,747 1,338,106 1,455,745 1,571,745 110 134 PSAP te tia vorsrere afeiets©cisyniecsisioie sls Giere'acoieie.avaieraiora s 1,417 731 182 41 an ff 180/05 Gu coon OOH CE NOGOC. 60 SCAB COE eC r ae aneTG 1 He ae ae 8 ao TLSUGR an vensoadacusseteeee me Mere eee 54,289 21,669 21,514 23,208 21 1

1857, 1884, and 1885, with the average yield per acre in the Yield of

The earliest year included in this table (1867) is the date at which last two years :— erops.

the agricultural statistics began to be collected and published by the Board of Trade. The work previous to this had been under- taken by the Highland and Agricultural Society of Seotland, but

Average per Acre

1857. 1884. 1885.

their returns were necessarily less complete and accurate. The iss4. | 1885. return for 1857, for example, gives the arable acreage (" acreage aa SS – under a rotation of crops") as 3,776,572; but this is clearly too Bene : ie 38607 ee nie ae ae . — . 2 = Ht) Om

much, as it exceeds that of 1885, and since 1867 there has been | | Oats ~.. 32,750,763 | 36,718,321 | 38,407,127 | 35°10 | 31°93 a gradual increase. Only a little over one-fourth of the area of | | Beans i be 1,087,760 705,398

709,577 | 32:23 | 30°67 Scotland is cultivated, while in England only one-fourth is left } | Pease . ada 38,551 37,464 | 24°74 | 21-41

. be taken into consideration Turnips .. Tons 6,690,109 7,532,77 6,496,189 | 15°53 15°39 uncultivated. It must, however, be ta Potatoes.. ,, 430,468 986,808 803,523 | 6°02 5°39

that in the agrienltural returns " permanent pasture" does not

inelude the mountainous districts whieh form such a large por- tion of the surface of Scotland, where heaths and natural grasses occupy the soil and yield a scanty herbage for sheep and cattle. In the return "' permanent pasture" is represented as occupying an area little more than a third as large as that occupied by arable land, while in England the two areas are pretty nearly equal, but as a matter of fact pasturage plays a much more im- portant part in the economy of the Scottish than of the English farmer. It will be observed that as regards the main divisions of arable land the total areas under both corn crops and green crops have becn slightly decreasing, while there has been a considerable increase in the area under rotation grasses. The fol- lowing table (XIV.) shows the yield of the principal crops in

This table being founded on estimates can, of course, only be regarded as approximately correet. The average yield of both wheat and barley is higher than that of England, while the average yield of both oats and potatoes is lower, which may be accounted for by the fact that the first two crops occupy the best soils of Scotland, while the last two occupy every variety of soil in the country. Wheat is grown chiefly in the sea-coast districts and the fertile river-valleys. The area under wheat has declined more than a half since 1867, the combined causes of this being wet seasons and increased foreign competition. Barley, for which the distilleries keep up a steady demand, and oats, the staple crop of the country, have rather increased in area since 1867. The area under potatoes— a very uncertain crop—has rather declined within recent years, and

that under turnips has considerably declined, partly owing to the increased use of artificial stuffs in cattle-feeding. The following

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in the Lowlands, especially in the hilly south-western districts. The grouse moors of Scotland occupy a much more extensive area, and are

*Live table (XV.) shows the number of live stock in different years, with | also much more widely distributed, while they supply sport to a stock. the average number to every 1000 acres of cultivated land in 1885 | much greater number of persons. Ptarmigan and blackcock are in Scotland and Eneland :— * | abundant in many districts ; and pheasants and partridges, as well a as hares, are carefully preserved on many estates in the cultivated Average districts. Rabbits are common throughout the whole country. Fox-Yearly Average. abet 100 | | hunting is a fashionable sport in most of the Lowland counties; but 1880. apes tee otter-hunting has almost died out. The bear, wolf, and beaver, at 1867-70. | 1871-78 Scot-|Eng-| | one time common in Scotland, have become extinct. The last wolf, i ‘ land./land.| | it is said, was killed by Sir Ewen Cameron of Lochiel in 1680. The Horas eta ee “~~ 1”~”| | wild cat is still to be found in the Highlands, and the polecat, ermine, Used solely for agricultural and pine marten exist in considerable numbers. The golden eagle I Co BE cn Beco 138,564, 186,689}/ 141,332) 141,522] 29] 30 _ vee ee eal: tenant the spe pe ti ergo? Unbroken horses and mares ut other larger birds of prey, as the osprey and the kite, are Kept FOr DEBSHINE —2-7- gl) eera| | ae a becoming seiee, In all a are more ‘aven, 300 species of birds Totalihorses’ ...—..-.< 1172,871) 178,652]| 194,013) 188,292] 39] 48) | in Scotland, including a great variety of water-fowl in the sea oan ee | al) "tuut\me twa} sala! | vandemnilancdiioelns: : af, a er ca leslie onesie Fisheries.—Details regarding the Scottish fisheries will be found Fisheries Cin calf ys sesesrorsscoq| 880,800] 992,252]| 67,195) a1o,z10l sr| 74| | under Fisuinrms (vol. ix. pp. 257-262), ‘The former Board of White Other ee old Hiei Gotaaall Hace! See! eA ae eee Fishery was abolished in 1882 and the Fishery Board of Gh DONT Sa ? , 58,9 p Scotland established, which has devoted more systematic attention MBER EPPO Hy eae] S928) SON ae, ee*

™) | to the collection of statistics and the gencral shicouiapenaiaat of the Total cattle…..... 1,022,886 /1, 127,887//1,099,286)1,176,004| 243] 189/ | industry. In 1856 the herring and deep-sea fisheries engaged only anes ile | Lia peep en neon in Scotland, oa in mii ae ee basis = or indirectly 103,804 persons, while the total estimated produce Under one year old..-+-7-[ese 149 averid|aaa0 972 Soap Tee| sas] ooo | | in 1884 was valued at £8,851/848,—the value of cured fish being se ——__|__ || | £2,279,614 (herrings, £2,121,346; cod, ling, and hake dried, Totalisheepin… <<... 6,937,977|7,161,122/|7,072,088|6, 957,198) 1436 _ 876) | £149,407 ; ditto pickled, £8861) ; of white fish sold fresh, £716,295 a : aon (haddocks, £300,712; herrings, £150,720; cod, ling, and hake, Bivens ea 153,959] 166,148) 120,925] 150,984) 31| 82 £57,445 Yorsk and amie £10,481 ; whitings, £32,808 ; sprats, This table does not indicate any constant decrease or increase in co Ce bee ; eee ans age es any of the classes of live stock. It will be observed that the average ne O7). f bi re . ne 93 ye a – - = a ae 00 ade number of cattle to the acreage of cultivated land in Scotland is = 1)3 of shell-lish, £ ne 3 alld o of liane asia Ith of about a third more than in England, and of sheep more than double ining Industries.—The chief sources of the mineral wealth of Coal, as many ; but the number of pigs in England is more than double Scotland are coal and iron, Which are generally found in convenient as many to the acreage of cultivated land as it is in Scotland, and | J¥Xtaposition. The principal coal-fields are ese ee a the number of horses is greater. The special breeds of horses in oer eae Bogle). pee ae of digging bb bi a oe a Scotland are the Shetland ponies, the Highland ponies, and the Be ET conferred 2 e a om i sia . ao mae f Clydesdale draught horses, the latter originally bred in the Clydes- N bai i Abb a nee aL f oe Me = 7 Lec ; ‘ Tae i dale district from crossing with Flemish stallions imported about oo ee a 1 us “att ms: ds Pons Pi 5 II s y ss t 4 the beginning of the 18th century. The breeds of cattle include So and a y an (a aera oe te 4 a us 4 Me the Ayrshire, which, since they are chiefly noted for their yield of ee 4 e 1st Sen HES he “808 ee oy 7 ‘oh a milk, and are specially adapted for dairy farms (which prevail people received at the church doors a species of stone whic we especially in the south-west of Scotland), have in a great mcasure burned in ples of wood ; ee the value of coal for sone supplanted the Galloway in their native district, except where these and artificer’s work was early recognized, x bid i. lie ae ‘4 are kept for feeding purposes; the polled Angus or Aberdeen, fair employed for eke a

eed eee) oF a va oe Ce a milkers, but chiefly valuable for their beef-making qualities, and century. In pid et ce ei gee i fr ed gt on this account, as well as their hardihood, in especial favour in | S°TV!¢e at the works at ~ ag me bee joe or ue the north-east of Scotland, where the art of cattle-feeding has emancipation did not take place till 1799. An Act was passed Pa reached its greatest perfection; and the west Highland breed, _ forbidding the employment of children of tender years and noted for their long horns, their shagginess, the decided character of women in underground mines, According – the census of 1851, of their various colours—black, red, dun, cream, and brindle— the number of persons engaged in connexion with coal-mining was and their power of thriving on wild and heathy pasture. The 36,973 males and 358 females (the latter employed above ground), special breeds of sheep are the fine-woolled breed, peculiar to Shet- and in 1881 the numbers were 58,340 and 401. According to the land ; the blackfaced, native to the Highland districts; and the mineral statistics of 1885 there were 69,425 persons employed in Cheviots, native to the range of hills of that name, and now the on coal-mines of 5 oe eee oaey oe vig oe and i ace favourite breed in the south of Scotland, although border Leicesters ule eat a ane PUL pay be in twenty years has a and other English breeds, as well as a variety of crosses, are kept | More than dou ed. In 1854 it was 7,488,000 tons, by 1866 it ha for winter feeding on the lowland farms. increased to 12,034,638, and in 1884 it was 21,186,688. ; Forests. | The area under orchards as returned on 4th June 1885 was 1892 hue Wass the iron industry in Scotland dates from the establish~ Irom acres and under nursery grounds 1654. Orchards, chiefly for apples, pee in 1760 of a Carron ironworks near Falkirk. The 1 are most numerous in the Carse of Gowrie and the neighbourhood | 0! Persons employed in iron-mining in 1851 was 1648, eS ea of Perth, and along the banks of the Clyde above Hamilton. manufacture 13,296; and by 1881 the numbers had increased The area under woods in 1812 was 907,695 acres, of which 501,469 respectively to 10,473 and 38,309. The total output of iron ore acres were natural woods and 406,226 planted ; by 1872 it had and ironstone in Scotland in 1884 was 1,885,376 tons, valued at declined to 734,490, but by 1881 (d.¢., by the latest return) it had £854,416, less than the estimated er in 1858, which was increased to 829,476, the principal increase having been in Aberdeen, 2,312,000 We sy valued at £750,000. There has oon bod ie cae um Perth, and Inverness, the counties where the growth of woods is

the manufacture of pig-iron since about 1866. ‘The imports of iron largest. The Board of Trade returns do not distinguish between ore were 356,380 tons in eee valued at £359,918, = — planted and natural woods, but it is well known that large cuttings 406,007 tons, valued at £356,451. The production of Meee have been made in the indigenous forests of the Hi chlands, while increased with great rapidity after the introduction of re at the same time considerable attention has been paid within the In 1796 the quantity produced was 18,640 tons, and in 1830 a Z present century to the growth of plantations in the Lowlands, partly 37,500 ; in 1840 it had naa to 241,000, in 1845 le jel _ 86 : asa covert for game; the science of forestry has made great ad- to 1,164,000 ; but = 1884 it was only 988,000, the a ustry ville vances within recent years owing to the encouragement and guid- confined to Ayrshire, Fifeshire, and Pere apc a Herne = ance of the Scottish Arboricultural Society, established in 1854, and forges in operation are confined to the a ea e ‘Tl ae and of the Highland and Agricultural Society. The modern planta- | 7" ae 22 works, 334 puddling furnaces, and 82 rol ing ae S. o 4 tions are formed chiefly of Scotch fir with a sprinkling of larch. 1884 there were 63 open-hearth steelworks in Pago a. On the botany of Scotland H. C. Watson’s Topographical Botany | 46,were in Glasgow, 10 in Holytown, 4 in Motherwell, and 3 in (1883) may be consulted. Wishaw, the quantity made in 1884 being 208,650 tons. ; Deer According to the report of the crofters commission, the area under Since about the years 1850-55 shale-mining has become a ee forests, deer forests in Scotland is 1,975,209 acres, or about one-tenth of the | Portant industry, especially in Linlithgowshire and Midlothian, ae oe game, whole area of the country. The species of deer peculiar to the | t2e total quantity raised in Scotland in 1884 being 1,469,649 Me indus- &c. Scottish Highlands is the red deer; the fallow deer is not uncommon | Valued at £370,024. Lead ore is worked at Abington in Lanark- tries.

shire and Wanlockhead in Dumfriesshire ; the dressed lead ore

1 These figures are for 1870 only. obtained amounts to 4327 tons, valucd at £34,997, and yielding

STATISTICS. |

3219 tons of lead and 20,011 ounces of silver. The amount of fire-

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Spindles.

clay dug in 1884 was 463,294 tons, valued at £56,237. Stone quarry- Sonne Ree. | | eae Persons “ ially of it dst flacst Jat dli i ee 5 Loomis. employed. ing, especially of granite, sandstone, flagstone, slate, and limestone, Spinning. | Doubling.

1 is extensively carried on, but the returns of the several amounts

| raised annually are incomplete. The number of persons engaged | | jg677“ “7) Le a pee Ebi Z ae : Stee. | | ier… 7,579 19,917 77,195 in quarries in 1881 was 13,742, and the value of the materials raised | | 1878….. 205,268 | 18,495 16,756 36,476*

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Woollen Manufactures. —Although a company of woollen weavers was | lished eotton-factories in 1785 at New Lanark, afterwards so closely cloth. incorporated by the town council of Edinburgh in 1475, the cloth | associated with the socialistic schemes of his son-in-law, Robert worn by the wealthier classes down to the beginning of the 17th | Owen, and thus laid the foundation of the industry in the two century was of English or French manufacture, the lower classes | counties, Lanark and Renfrew, which are now its principal seats wearing “ coarse eloth made at home,” in the fashion still prevailing | in Scotland. Nine-tenths of the cotton-factories of Scotland are | in the remoter districts of the Highlands. In 1601 seven Flemings | now concentrated in Glasgow, Paisley, and the neighbouring towns, | were brought to Edinburgh by commissioners from the burghs to | but the industry extends into other districts of the west of Scotland instruct the people in the manufacture of serges and broadcloth, and | and is also represented in the counties of Aberdeen, Perth, and eight years later a company of Flemings was established in the | Stirling. The following table (XVII.) gives particulars for 1850, | Canongate (Edinburgh) for the manufacture of cloth under the | 1861, 1875, and 1885 :— special

protection of the king; but, notwithstanding also the | ~~} establishment in 1681 of an English company for the manufacture Years. Factories. | Spindles. – sat Benens of woollen fabrics near Haddington, the industry for more than Le aassiealee| | Siteameniend 9 Sncateee cl Le fifty years after this made very tardy progress in the country. In 1850 . 168 1,683,093 23,564 34,325 fact its importance dates from the introduction and improvement 1861 ….....— 163 1,915,398 30,110 41,237 of machinery in the 19th century. The most important branch of ie po Se a an see ee ve trade, that of tweeds, first began to attract attention shortly | |” aes é s after 1830; though still having its principal seat in the district r furth ti : ine i : from which it takes its name, including Galashiels, Hawick, In- one Fe eam PREIS SH NS ORRO OES. nerleithen, and Selkirk, it extends to a large number of towns Silk is manufactured in Paisley and Glasgow, but the industry Silk, &e. throughout Scotland, especially to Aberdeen, Elgin, Inverness, is of minor importance, employing only about 600 persons. Floor- Stirling, Bannockburn, and Paisley. The chief seat of the hosiery | cloth is manufactured at Kirkcaldy, where also the first linoleum trade is Hawick. Carpet manufacture has had its principal seat factory in Scotland was established in 1877. in Kilmarnock since 1817, but is also carried on in Aberdeen, Ayr, Next to textile fabrics, the most important manufacture in Whisky. Bannockburn, Glasgow, Paisley, and other towns. Tartans are | Scotland is that of whisky, in which it has Ireland for its largely manufactured in Tillicoultry, Bannockburn, and Kilmarnock, | only competitor. Distillation was introduced into Seotland from and shawls and plaids are largely manufactured in several towns. | England, but by 1771 large quantities of spirits were sent to In 1850 there were in Scotland 188 woollen and worsted factories, | England from Scotland. The legal manufacture of whisky was with 233,533 spindles and 247 power-looms, employing 10,210 | greatly checked in the 19th century by occasional excessive ad- persons. Twenty-eight years later (1878) the total number of | vances in the rates of duty, but after the reduction to 2s. 43d. per factories was 246, in which there were 559,021 spinning spindles, | gallon in 1823 the number of licensed distillers rapidly increased, 62,018 doubling spindles, and 6284 power-looms, the number of } while illegal distillation became much less common. The following persons employed being 22,667, of whom 10,083 were males and | table (XVIII.) shows the number of gallons made in various years 128 584 females. since 1824 :— Linen The

manufacture of cloth from flax is of very ancient date in and jute. Scotland, and towards the close of the 16th century Scottish linen Year Gallons. Year. Gallons. Year Gallons. cloths were largely exported to foreign countries, besides having an 1894 5.108.373 1955 11.283.636 1878 17,670,460 extensive sale in England. Regulations in regard to the manufacture 1840 9,082,353 1865 13,445,752 1884 20,164,962

in 1884 was estimated at £1,030,650. The principal granite works occur in Aberdeenshire and Kirkeudbrightshire, while freestone quarries are common throughout the greater part of the Lowland district, although whinstone also is frequently used for building purposes. Large quantities of paving stones are exported from Caithness and Forfarshire, and there are very extensive slate-quarries at Ballachulish and other places in Argyllshire.

were passed in 1641 and 1661. In a petition presented to the privy council in 1684, complaining of the severe treatment of Scotsmen selling linen in England, it was stated that 12,000 persons were engaged in the manufacture. Through the intercession of the secretary of state with the king these restrictions were removed. To further encourage the trade it was enacted in 1686 that the bodies of all persons, with the exception of poor tenants and cotters, should be buried in plain linen only, spun and made within the kingdom. The Act was repeated in 1693 and 1695, and in the former year another Act was passed prohibiting the export of lint and permitting its import free of duty. At the time of the Union the annual amount of linen cloth manufactured in Scotland is supposed to have been about 1,500,000 yards. The Union gave

Principally owing to foreign competition, the linen manufacture has within recent years been in a very languid condition.

The first cotton-mill in Scotland was built at Rothesay by an Cotton.

English Company in 1778. It was soon afterwards acquired by David Dale, who was the agent in Scotland for Arkwright, and had the invaluable aid of his counsel and advice. Dale also estab-

Ale was a common beverage in Scotland as early as the 12th century, there being one or more brew-houses attached to every religious house and barony. So important was the use of the bever- age even in the beginning of the 18th century that a threatened imposition of a tax on malt in 1725 led to serious riots in Glasgow and a proposal to repeal the Union. Though ale has been super- seded by whisky as the national beverage, Seotland still possesses several large breweries, and Edinburgh ales vie in repute with those of Burton-on-Trent. The number of barrels charged with duty in Scotland in 1885 was 1,237,323, the number in England being

24,519,173.

The first sugar-refinery in Scotland was erected in 1765 in Miseel-

Greenock, where the industry made rapid progress and has still laneous its principal seat, although it is extensively carried on in Leith indus- and in a lesser degree in Glasgow and Dundec. Glass-making, tries.

a eonsiderable impetus to the manufacture, as did also the establishment of the Board of Manufactures in 1727, which applied

a

an annual sum of £2650 to its encouragement, and in 1729 established a colony of French Protestants in Edinburgh, on the site of the present Picardy Plaee, to teach the spinning and weaving of cambric. From 1st November 1727 to lst November 1728 the amount of linen cloth stamped in Scotland was 2,183,978 yards, valued at £103,312, but by the year ending 1st November 1771 it had increased to 13,672,548 yards, valued at £632,389, during the year ending 1st November 1798 to 21,297,059, valued at £850, 405, and by the year ending 1st November 1822, when the regulations as to the inspection and stamping of linen ceased, to 36, 268,530 yards, valued at £1,396,296. The counties in which the manufacture is now niost largely carricd on are Forfar, Perth, Fife, Kinross, and Clackmannan, but Aberdeen, Renfrew, Lanark, Edinburgh, and Ayr are also in a considerable degree associated with it. Dundee is the principal seat of the eoarser fabrics, Dunfermline of the table and other finer linens, while Paisley is widely known for its sewing threads. The allied

industry of jute is the staple industry of Dundee. The number of persons employed in the flax-factories of Scotland in 1837 was 15,462. The following table (XVI) gives particulars of these factories for the years 1856, 1867, and 1878 :—

introdueed in 1610 by Sir John Hay at Wemyss in Fife, is now of considerable importance, Edinburgh being celebrated for the finer branches of the manufacture. A paper-mill was erected in 1675 at Dalry Mills on the Water of Leith, in which French workmen were employed to give instruction, with the result, as was reported by the owners, that "grey and blue paper was produced much finer than ever was done before in the kingdom." The most important seat of the industry is now Valleyfield near Penicuik, where it was intro- duced in 1709. Edinburgh has since the time of the Ballantynes enjoyed a widely-extended fame for the excellence and beauty of its printing. The other manufactures prevailing in different parts of Scotland, such as those of leather, soap, earthenware and hardware, carriages, and the various implements and utensils in general use, do not call for special characterization.

Commerce and Shipping.—That Scotland had a considerable trade Shipping.

with foreign countries at a very early period may be inferred from the importation of rich dresses by Malcolm III. and the enjoy- ment of Oriental luxuries by Alexander I. David I. receives the special praise of Fordun for enriching 'the ports of his kingdom with foreign merchandise." In the 18th century the Scots had

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acquired a considerable celebrity in shipbuilding ; and a powerful French baron had a ship specially built at Inverness in 1249 to convey him and his vassals to the Holy Land. The principal ship- owners at this period were the clergy, who embarked the wealth of their religious houses in commercial enterprises. Definite state- ments regarding the nuinber and tonnage of shipping are, however, lacking till the 18th century. From two reports printed by the Scottish Burgh Record Society in 1881, it appears that the number of vessels belonging to the principal ports—Leith, Dundee,

Glasgow, Kirkcaldy, and Montrose—in 1656 was 58, the tonnage being 3140, and that by 1692 they had increased to 97 of 5905 tons. These figures only represent a portion of the total shipping of the king- dom. At the time of the Union in 1707 the number of vessels was 215 of 14,485 tons. The following table (XIX.) gives the numbers for various years from 1850 :—

1850. isso. || iso. |] ass, No. | Tons. No. | Tons. No. | Tons. || No.| Tons Sailing vessels} 3432 | 491,395 |] 3172 | 552,212 || 2715 | 727,942 || 2065 827,295 Steam vessels | 169 | 30,827 || 314 | 71,579 || 582 | 209,142 || 1403] se6;7s0

Total ….|3601 | 522,222 || 3486 | 628,791 | 3297 | 937,084 || 3468 1,694,075 Table XX. shows the progress of the coasting and foreign trade since 1855 :—

Coasting. Colonial and Foreign. Total.

Entered. Cleared. | Entered. Cleared. | Entered. | Cleared.

1,968,552 | 2,057,936 | 668,078 840,150 | 3,631,630 | 2,898,086 6,628,853 | 5,691,136 | 2,700,915 | 3,001,897 | 9,329,768 | 8,693,033 7,167,230 | 6,098,938 | 3,073,561 | 3,638,423 |10,240,791 | 9,737,361

Com- merce.

Table XXI. shows the great expansion of the foreign and colonial trade since 1755 :—

Year. Imports. Exports. Year. Imports. Exports.

£5,842,296

5,016,116 17,912,932 18,243,078 20,822,355

1825 1851 1874 1880 1884

1755 1790 1795 1800 1815

£464,411

1,688, 337 1,268,520 2,212,790 3,447,853

£535,576

1,235,405

976,791 2,340,069 6,997,709

£4,994,304

8,921,108 31,012,750 84,997,652 30, 600,258

The value of the imports into Scotland is only about a tenth of that of England, but this does not represent the proper proportion of foreign imports used or consumed in Scotland, as large quantities find their way to Scotland from England by rail,—nearly all the tea, for example, consumed in Great Britain being imported into London, while various other ports have almost a monopoly of certain other imports. Reckoning by the combined value of their imports and exports, the principal ports of Scotland are Glasgow, Leith, Greenock, Dundee, Grangemouth, and Aberdeen, in the order named, but for particulars regarding the trade of these and other ports reference must be made to the articles on the several towns.

Ship- For many of the most important improvements in the coustruc-building. tion of ships, especially steam vessels, Great Britain is indebted to the enterprise and skill of the Clyde shipbuilders. From the time of the construction by Mr Robert Napier of the steamers for the Cunard line, formed in 1840, the shipbuilders on the Clyde have enjoyed an unrivalled reputation for the construction of large ocean steamers, both as regards mechanical appliances and the beauty and convenience of the internal arrangements. Shipbuilding is also carried on to a considerable extent at Dundee, Leith, and Aberdeen, and to a certain degree at most of the ports of the king-

Population at different Ages.

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Persons in Receipt of Education.

(STATISTICS,

dom, but within recent years the industry has been in a very fluctuating condition, the tonnage of the vessels constructed annu- ally varying between 1880 and 1885 from a little over 100,000 to nearly 300,000.

National Wealth.—The immense increase in the wealth of N ational Scotland within the last 200 years is sufficiently proved by the fact wealth, that, while in 1674 the valued rent was only £3,656, 408 Scots or £304,700 sterling, the gross annual value of the land according to the estimate in the return of 1873 was £18,698,804, or more than sixty times as much, and about fifteen times as great as the proportional increase of population. This increase is of course partly due to agricultural improvements and partly to the discovery and development of the mineral wealth in coal and iron, but it may also be accounted for by the smaller representative value of money, and by the fictitious increase in rents in towns, which does not represent an increase in absolute value. The annual value of real property assessed for income-tax under schedule A in 1843 was £9,481,000 ; the average valuc for the three years ending 5th April 1883 was £16,995,718, and for the year ending 5th April 1884 the value was £17,066,705. For the year ending 5th April 1857 the amount of property and income charged with duty was £22,563,238 ; and during the following twenty-five years it was morc than doubled, the average amount for the three years ending 5th April 1883 being £48,069,765, and for the year ending 5th April 1884 £49, 600,348, This is less than a tenth of that for the United Kingdom. The total amount of money lying in deposit in savings banks in 1884 was £7,709,471,—about a seventh part of the whole amount deposited in the savings banks of the United Kingdom. Notice of the rise and progress of banking in Scotland will be found under BANKING (vol. ili. pp, 332-336). The total paid-up capital of the Scottish banks at the dates of balance in 1885 was £9,052,000 and their total liabilities £107,882,595.

Lducation.—Notices of the existence of schools in the principal Element. towns occur as early as the 13th century. They were under the ary supervision of the chancellor of each diocese and were chiefly schools, devoted to studies preparatory for the church. Previous to the Reformation

schools for general education were attached to many religious houses. In the First Book of Discipline, 1560, a com- prehensive scheme of general education was propounded, but neither this proposal nor an Act passed in 1616 by the privy council for the establishment of a school in every parish was carried into effect ; and the system of parochial schools which prevailed till the passing of the Education Act of 1872 really dates from the Act of William and Mary in 1696 providing for the maintenance of a school in every parish at the cost of the heritors, The various religious secessions in Scotland led to the founding of a large number of denominational and subscription schools, and at the Disruption in 1843 the Free Church made provision for the supply of secular education as well as religious instruction to its adherents. The Education Act of 1872 abolished the old management of the parish schools, and provided for the creation of districts under the manage- ment of school boards elected for threc years by the ratepayers, male and female. These boards have the power to levy rates for the maintenance and erection of schools for primary instruction, elect the teachers, and cnforce the clause in regard to compulsory attendance. The maintenauce of schools is also aided by a Govern- ment grant, and the salary of the tcacher is paid partly by school fees and partly by a grant dependent upon the result of the examina- tion of the scholars by the Government inspector, the school board having the power, however, to make their own terms with the teacher. Denominational schools are permitted to receive a Govern- ment grant. The following table (XXII.) shows the proportion of persons in the receipt of education in Scotland in 1861, 1871, and 1881 :—

Percentages to the Population at cach Age.

Particulars in regard to schools under school board management are given in the following table (X XIII.) :—

ee 7 C= : o =) cS

x2 oF. fs 4 So S|n'E Bf ee Be ra 8 | ES | 88 |School| 28 [gee egiseng| 83185128 | £2 | GS |Places.| $3 [Reo se Sena Ss | ae | o's o 59 PIS K Sl eo | as ® Eley | ao ee PRAQ) Sa lda | & 1875/£551,140| 314,164 | 391,588 | 2730 | £1 15 9}! 12,958 | 3811 | 129 | 4262 1884) 938,223) 458,121 | 655,672 | 8131 | 2 1 53: 61,429 | 6220 | 1012 | 3620

All the training colleges for teachers in board schools are connected

with religious denominations—three with the Established Church, Second- three with the Free Church, and one with the Episcopal Church. ary As early as the 14th century some of the burghs had grammar- schools. schools partly under the. control of the magistrates. In 1496 an

0-5 years. |5-15 years.!15 and above.| Total. |0-5 years, |5-15 years.|15 and above.| Total. | 0-5 years. |5-15 years.} 15 and above.| Total. 417,259 | 685,912 1,959,123 3,052,294 8,666 439,388 19,002 467,056 2°08 64°05 0°96 15°25 455,620 | 776,871 MT, oe) 3,360,018 | 10,025 541,995 22,101 574,121 2°19 69°77 1°04 17-09 510,591 | 855,015 2,369,967 | 3,735,573 | 14,152 675,314 30,633 720,099 2°77 78°98 1-29 19°28

Act was passed enjoining the attendance at the schools of the eldest sons of barons and freeholders until " they be founded in perfect Latin, and thereafter to remain at the schools of arts and law" (where ecclesiastics were trained). The grammar or burgh schools enjoyed a monopoly of teaching certain branches, and private schools were frequently prohibited as interfering with their rights. Grammar-schools were chiefly devoted to instruction in Latin, and the course usually extended to five years. According to the report of the education commissioners, the number of burgh schools in 1867 was twenty-six. By the Act of 1872 their management was transferred to the school board, but they were excluded from participation in the school fund, and no provision was made for their inspection. The Act of 1878 authorized certain grants of money, and contained certain provisions for inspection, which, however, have been practically inoperative. The Educational Endowments Act of 1882 provides for a more comprehensive scheme for the

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Presby- terian churches.

Other deno- mina- tions.

Parlia- mentary repre- senta- tion.

Law.

STATISTICS. |

promotion of secondary education, and also for a scheme of systematic inspection. These educational endowments—the result of private bequest—yield an annual income of £175,000, and, on account of the changed conditions of society, the primary objects of the donors were in a great degree frustrated by the manner in which they were being administered. Some of the best secondary schools in Scotland are under the management of trustees. For the four universities of Scotland (St Audrews, Aberdeen, Glasgow, and Edinburgh) see the articles on these cities, also UNIVERSITIES. University College in Dundee and Anderson's College in Glasgow have similar courses of instruction to the ulliversities, but possess no power to grant degrees and receive no Government aid. A notice of the various medical schools and scientific colleges will be found in the articles on the towns in which they are situated. Religion.—For an historical account of the more important religious denominations of Scotland the reader is referred to the articles SCOTLAND, CHURCH OF, FREE CuurcH oF SCOTLAND, UnitepD PRESBYTERIAN CHURCH, and PRESBYTERIANISM. The bulk of the population is Presbyterian, and the following table

(XXIV.) gives particulars reported in 1885 regarding the Church of

Scotland and other churches originated by secessions from it at various times,—the " contributions" indicating the amounts raised by the churches for all purposes, and of course excluding the endowments of the Established Church :—

Church of| Free (Wels Evang. | Original 'Reformed Scotland. | Church. | Church. | Union. |Seceders.| Presby.

| — |] i

1,479 1,067 548 87 27 12

565,261 | 329,541| 177,517] 18,210 1037 £366,431 |£626,028 | £387,355 | £21,760 | £5606 | £2592

Congregations .. Members Contributions ..

The Roman Catholic Church has 327 ‘churches, chapels, and stations,” — the estimated population connected with it being over 340,000. The Episcopal Church in Scotland has about 250 churches with 80,000 members (of all ages) and nearly 30,000 communi- cants. The churches in connexion with the Congregational Union number 101, 73 of which report a membership of 10,869, the money raised for all purposes in 1884-85 being £23,027. The Baptist Union has 88 churches with 9688 members; and the Wesleyan Methodists have 26 “circuits” with 4658. There are a few other religious denominations, such as the Primitive Methodists, the Catholic Apostolic Church, and the Glassites, but the member- ship of each is comparatively small.

Government, Law, and Local Adméinistration.—By the Act of Union in 1707 Scotland ceased to have a separate parliament and its government was assimilated to that of England. In the parliament of Great Britain its representation was fixed at sixteen peers (the same number as at present) elected by the peers of Scotland at each new parliament, in the House of Lords, and at forty-five members in ‘the House of Commons,—the counties returning thirty and the burghs fifteen. The power of the sove- reign to create new Scottish peerages lapsed at the Union, and their number has already diminished by nearly one-half. By the Reform ‘Act of 1832 the number of Scottish representatives in the Commons was raised to fifty-three, the counties under a slightly altered arrangement returning thirty members as before, and the burghs, reinforced by the erection of various towns into parliamentary burghs, twenty-three; the second Reform Act (1868) increased the number to sixty, the universities obtaining representation by two members, while three additional members were assigned to the counties and two to the burghs; by the Redistribution of Seats Act of 1885 an addition of six members was made to the representation of the counties and six to that of the burghs, the total representation being raised to seventy-two. The management of Scottish business in parliament has since 1885 been under the charge of the secretary for Scotland.

‘At the Union Scotland retained its old system of law and legal administration, a system modelled on that of France ; but since the Union the laws of England and Scotland have been on many points assimilated, the criminal law of the two countries being now practically identical, although the methods of procedure are in many respects different. The Court of Session, as the supreme court in civil causes is called, dates from 1532, and was formed on the model of the parlement of Paris ; it is held at Edinburgh, the capital. Since the Union it has undergone certain modifica- tions. It consists of thirteen judges, acting in an Inner and an Outer House. The Inner House has two divisions, with four judges cach, the first being presided over by the lord president of the whole court, and the second by the lord justice clerk. In the Outer House five judges, called lords ordinary, sit in separate courts. Appeals may be made from the lords ordinary to either of the divisions of the Inner House, and, if the occasion demands, the opinion of all the judges of the Court of Session may be called for ; but whether this be done or not the decision is re- garded as a decision of the Court of Session. Appeals may be made from the Court of Session to the House of Lords. The lord justice general (lord president), the lord justice clerk, and five other

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judges form the High Court criminal cases, the three Lothians and of cases referred from the circuit courts. The latter meet for the south at Jedburgh, for the west at Glasgow, Inveraray, and Stirling ; at Perth, Aberdeen, Dundee, and Inverness. undertake cases to be decided before the supreme courts are either solicitors before the supreme courts or writers to the latter of whom possess certain special privileges.

authorized to plead before the supreme courts is termed an ad- vocate. The principal law officer of the crown is the lord advocate, who is assisted by the solicitor-general and by advocates-depute. The lord advocate has since

purposes of registration to each of which an examiner for inspection of registers is appointed tration,

represents missions of the peace, holds the position of high sheriff, and is a

is little more than honorary, affairs is in the hands of commissioners of supply, who were originally appointed to apportion and collect the national revenue, but who now regulate the land-tax,

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of Justiciary, instituted in 1672, for which sits at Edinburgh for the trial of cases from

Dumfries, and Ayr; and for the north The law agents who

signet, the The lawyer

1885 ceased to have the charge of Scottish business in the House of Commons. Sec ADVOCATE, vol. i. 178. The subordinate legal courts and officials are described

under the next heading. The largest administrative area is that of the county, but for Local Scotland is partitioned into eight divisions, adminis-

by the registrar-general ; and for the carrying out of the provisions of the Lunacy Acts it is divided into twenty-two districts. Regis-

tration counties date from the Act of 1854 providing that for pur-

poses of registration the areas of the counties may be altered. For the purposes of the General Police Act of 1862 part of the area of one county may also be brought into the area of another. Certain counties have been united for parliamentary or other purposes, and certain others have been divided for parliamentary purposes, while others again for certain administrative purposes retain their old subdivisions, Lanark for assessment purposes being still divided into wards, The civil counties were originally synonymous either with sheriffdoms or stewartries. Stewartries ceased with the abolition of hereditary jurisdictions in 1748, but Kirkcudbright still retains the designation. The office of sheriff, which formerly implied a much less limited authority than at present, was in existence in the reign of David I., when the greater part of the kingdom was divided into twenty-five sheriffdoms. In the latter part of the 13th century

they numbered thirty-four. The counties now number thirty-three, of which Ross and Cromarty constitutc one, while Edinburgh is a ‘county of a city.” The highest county dignitary is the lord-

lieutenant, the office being instituted in 1782. Heis nominated by

the crown, holds office for life, except in cases of misconduct, the crown in military matters, recommends for com-

member of the police committee. Practically, however, the office and the real administration of county

control the county police, raise the militia, and levy rates to meet the county expenditure. In 1878 an Act

was passed for the creation of road trustces, who have the power to levy rates for the maintenance throughout the county of roads and bridges (see p. 580 above). in the county is under

The practical administration of the law the control of the sheriff. Sec SHERIFF. A large proportion of his duties are, however, delegated to the sheriff-substitute. At onc time the functions of the sheriff-principal were confined to one county, but by an Act passed in 1855 it was arranged that as sheriffdoms fell vacant certain counties should be grouped into districts, each under the control of one sheriff-princi- pal, and in 1870 this arrangement was further modified and ex- tended. The sheriff-clerk, appointed by the crown, has, under the Ballot Act of 1872, the charge of ballot papers in connection with the parliamentary elections, and is cwstos rotulorum. The public prosecutor for counties is the procurator ~~fiscal, who takes the initiative in regard to suspected cases of sudden death, although in this respect the law of Scotland is less strict than that of England. Justices of the peace, who are unpaid and require no special qualifi~~ cation, but who, as they are recommended by the lord-lieutenant, are generally persons of position in the county, exercise a certain subordinate jurisdiction. Their office expires on the demise of the crown. In every commission of the peace certain public officials are included. The justices of the peace hold quarter sessions, take affidavits and declarations (such as declarations of marriage), sign warrants, try petty criminal cascs (such especially as

poaching and assault), and regulate public-house licences. Under Boroveu (vol. iv. pp. 63-64) will be found an account of the history and constitu- tion of the three classes of ancient burghs in Scotland,—royal burghs, burghs of regality, and burghs of barony. Police burghs, which may include any of the other classes of burghs, are formed of those places which have adopted the General Police and Improve- ment Acts (13 and 14 Vict. c. 83 and 25 and 26 Vict. c. 101). They are governed by police commissioners, who have power to regulate all sanitary matters. They may include more than one of the other burghs and may extend into another county. Under the Improvement Act (25 and 26 Vict. c. 101) most of the burghs with over 7000 inhabitants maintain their own police. The parliament- ary burghs do not now include all the royal burghs and include various other towns in addition to them. The number of royal

burghs is seventy, and, as was to be expeeted, while some sinee their formation have enormously inereased in population and wealth, others have so deelined or made so little progress that they now rank only as villages. In 1881 there were ten royal burghs whieh had less than 1000 inhabitants eaeh and four which had less than 500 eaeh, Earlsferry (Fife) having only 286. Under the Publie Health Aet of 1867, amended in 1879, the erection of urban and rural sanitary distriets was provided for. The corporation of the burghs is formed of the provost (or lord provost), bailies, and eouncillors. Bailie eourts are held in the burghs for the trial of minor offenees. The eivil parish or parish guoad omnia, origin- ally the ecelesiastieal parish or area subject to one eure of souls, is a division of the county for registration of births, deaths, and

certain civil parishes may be elassed as burghal, landward, and mixed. Under Graham's Act (7 and 8 Viet. c. 44) a parish guoad sacra may be erected on the application of persons who have built and endowed a ehurch. For administrative purposes the oldest parish organization is that of the heritors or landowners, who are required to provide and maintain a chureh,

ehurehyard, manse, and ehurch glebe, and, before the passing of the Edueation Act in 1872, had to maintain the parochial school, In 1579 the power was granted them of assessmeut for poor relief, but in 1600 the kirk-session was united with them for these purposes. This organiza- tion still exists in those parishes, now very few in number, whieh have not adopted the Poor Law Amendment Act of 1845 ; this Aet provides for the constitution of a

marriages and for poor law administration.

The boundaries are

determined by the boundaries of the estates whieh appear to lie in the parish, but may be altered by eonsent of proprietors holding

the major value of the property in it. the areas of burghs are removed from t

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It is remarked by Dr Hill Burton, and Carlyle repeats the Period of

TERIANISM the history of the Church of Scotland was remark, that " Scots dissent never was a protest against the Mode-

brought down to the middle of the 18th century, and the story of the secessions of 1733 and 1751 was there told. We take up here the church's history at the beginning of the " Moderate" rule. Her annals during the next three- quarters of a century are singularly uneventful. In close alliance with the state, she increases in power and dignity, and becomes the home of letters and philosophy. But there is no great movement of a theological nature, no striking religious development to lend her popular interest.

The strength of the church as well as her tendency to moderation arose in great part out of the political circum- stances of the early part of the 18th century. Presbytery, being loyal to the house of Hanover, while Episcopacy was Jacobite, enjoyed the royal favour and was treated as a firm ally of the Government. The Patronage Act of 1712 threw the filling up of parishes into the hands of those well-affected to the Government, and the example of the mode of patronage practised in England may have tended to promote a disregard of the religious feelings of the people. The effect on the clergy was to encourage them to seek the friendship of the landed gentry and to regard the higher rather than the lower orders of society as their natural allies, so that they were at the same time led to liberal ways of thinking and rendered largely independent of their congregations,

principles of the church, but always tended to preserve the old principles of the church, whence the Establishment—by the progress of enlightenment as some said, by deterioration according to others—was lapsing." The secessions carried off the more fervent elements ; yet enough of the old leaven always remained to exert a powerful influence. Thus, while the church as a whole was more peaceful, more courtly, more inclined to the friendship of the world than at any former time, it contained two well-marked parties, in one of which these characteristics of the religion of the 18th century were more marked than in the other. The Moderate party, which maintained its ascendency till the beginning of the 19th century, and

impressed its character on the church, sought to make the working of the church in its different parts as systematic and regular as possible, to make the assembly supreme and enforce respect for its decisions by presbyteries, and to render the judicial procedure of the church as exact and formal as that of the civil courts. The popular party, regarding the church less from the side of the Government, had less sympathy with the rome: movements of the

age, and desired greater strictness in discipline. The main Question

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ascend-

enley:

subject of dispute arose at first from the exercise of patron- oe age. Presbyteries in various parts of the country were stil] P27

disposed to disregard the presentations of lay patrons, and >

to settle the men desired by the people; but legal decisions

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CHURCH. |

had shown that if they acted in this way their nominee, while legally minister of the parish, could not claim the stipend. To the risk of such sacrifices the church, led by the Moderate party, refused to expose herself. By the new policy inaugurated by Dr Robertson, which led to the second secession, the assembly compelled presbyteries to give effect to presentations, and ina long series of disputed settlements the "call," though still held essential to a settlement, was less and less regarded, until it was declared that it was not

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at this time sought to procure the miscarriage of justice in dealing with such cases. That some offenders were acquitted on technical grounds is true; it was insisted that in dealing with the character and status of their members the church courts should proceed in as formal and punctilious a manner as civil tribunals and should recognize the same laws of evidence, in fact, that the same securities should exist in the church as in the state for individual rights and liberties.

necessary, and that the church courts were bound to induct any qualified presentee. The substitution of the word "'con- currence" for " call" about 1764 indicates the subsidiary and ornamental light in which the assent of the parishioners was now to be regarded. The church could have given more

The religious state of the Highlands, to which at the Re. period of the Union the Reformation had only very par- ligious tially penetrated, occupied the attention of the church dur- an ing the whole of the 18th century. In 1725 the gift called High-

the "royal bounty" was first granted, —a subsidy amounting Jands,

weight to the wishes of the people ; she professed to regard patronage asa grievance, and the annual instructions of the assembly to the commission (the committee representing the assembly till its next meeting) enjoined that body to take advantage of any opportunity which might arise for getting rid of the grievance of patronage, an injunction which was not discontinued till 1784. It is not likely that any change in the law could have been obtained at this period, and dis- regard of the law might have led to an exhausting struggle with the state, as was actually the case at a later period. Still it was in the power of the church to give more weight than she did to the feelings of the people ; and her working of the patronage system drove large numbers from the Establishment. A melancholy catalogue of forced settle- ments marks the annals of the church from 1749 to 1780, and wherever an unpopular presentee was settled the people quietly left the Establishment and erected a meeting-house. In 1763 there wasa great debate in the assembly on the pro- gress of schism, in which the popular party laid the whole blame at the door of the Moderates, while the Moderates rejoined that patronage and Moderatism had made the church the dignified and

powerful institution she had come to be. In 1764 the number of meeting-houses was 120, and in 1773 it had risen to 190. Nor wasa conciliatory attitude taken up towards the seceders. The ministers of the Relief desired to remain connected with the Establish- ment, but were not suffered to do so. Those ministers who resigned their parishes to accept calls to Relief con-gregations, in places where forced settlements had taken place, and who might have been and claimed to be recog- nized as still ministers of the church, were deposed and forbidden to look for any ministerial communion with the clergy of the Establishment. Such was the policy of the Moderate ascendency, or of Principal Robertson's adminis- tration, on this vital subject. It had the merit of success in so far as it completely established itself in the church. The presbyteries ceased to disregard presentations, and lay patronage came to be regarded as part of the order of things. But the growth of dissent steadily continued and excited alarm from time to time; and it may be questioned whether the peace of the church was not purchased at too high a price. The Moderate period is justly regarded as in some respects the most brilliant in the history of the church. Her clergy included many distinguished Scotsmen, of whom an account is given under their respective names. See Rerp (Thomas), CAMPBELL (George), Fercuson (Adam), Home (Jolin), Buair (Hugh), Ropertson (William), and Erskine (John). The labours of these men were not mainly in theology; in religion the age was one not of advance but of rest; they gained for the church a great and widespread respect and influence.

Another salient feature of the Moderate policy was the consolidation of discipline. It is frequently asserted that discipline was lax at this period and that ministers of scandalous lives were allowed to continue in their charges. It cannot, however, be shown that the leaders of the church

at first to £1000 per annum, increased in George IV.'s reign to £2000, and continued to the present day ; its original object was to assist the reclamation of the Highlands from Roman Catholicism by means of catechists and teachers. The Society for Propagating Christian Knowledge, incor- porated in 1709, with a view partly to the wants of the Highlands, worked in concert with the Church of Scotland, setting up schools in remote and destitute localities, while the church promoted various schemes for the dissemination of the Scriptures in Gaelic and the encouragement of Gaelic

students. In consequence of these efforts Roman Catho- licism now lingers only ina few islands and glens on the west coast. In these labours as well as in other directions the church was sadly hampered by poverty. The need of an increase in the number of parishes was urgently felt, and, though chapels began to be built about 1796, they were pro- vided only in wealthy places by local voluntary liberality ; for the supply of the necessities of poor outlying districts no one as yet looked to any agency but the state. In every part of the country many of the ministers were miserably poor ; there were many stipends, even of important parishes, not exceeding £40 a year; and it was not till after many debates in the assembly and appeals to the Government that an Act was obtained in 1810 which made up the poorer livings to £150 a year by a grant from the public exchequer. The churches and manses were frequently of the most miserable description, if not falling to decay.

With the close of the 18th century a great change passed over the spirit of the church. The new activity which sprang up everywhere after the French Revolution pro- duced in Scotland a revival of Evangelicalism which has not yet spent its force. Moderatism had cultivated the ministers too fast for the people, and the church had become to a large extent more of a dignified ruler than a spiritual mother. About this time the brothers Robert

and James Haldane devoted themselves to the work of pro- The Hal- moting Evangelical Christianity, James making missionary danes.

journeys throughout Scotland and founding Sunday schools; and in 1798 the eccentric preacher Rowland Hill visited Scotland at their request. In the journals of these evan- gelists dark pictures are drawn of the religious state of the country, though their censorious tone detracts greatly from their value; but there is no doubt that the efforts of the Haldanes brought about or coincided with a quickening of the religious spirit of Scotland. The assembly of 1799 passed an Act forbidding the admission to the pulpits of laymen or of ministers of other churches, and issued a manifesto on Sunday schools. These Acts helped greatly to discredit the Moderate party, of whose spirit they were the outcome ; and that party further injured their standing in the country by attacking Leslie, afterwards Sir John Leslie, on frivolous grounds,—a phrase he had used about Hume's view of causation—when he

applied for the chair of mathematics in Edinburgh. In this dispute, which made a great sensation in the country, the popular party success- fully defended Leslie, and thus obtained the sympathy of XXI.— 68

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the enlightened portion of the community. In 1810 the Christian Instructor began to appear under the editorship of Dr Andrew Thomson, a churchman of vigorous intellect and noble character. It was an ably written review, in which the theology of the Haldanes asserted itself in a somewhat dogmatic and confident tone against all unsound- ness and Moderatism, clearly proclaiming that the former things had passed away. The question of pluralities began to be agitated in 1813, and gave rise to a long struggle, in which Dr Chalmers took a notable part, and which terminated in the regulation that a university chair or principalship should not be held along with a parish which was not close to the university seat.

The growth of Evangelical sentiment in the church, along with the example of the great missionary societies founded in the end of the 18th and the beginning of the 19th century, led to the institution of the various missionary schemes still carried on, and their history forms the chief part of the history of the church for a number of years. The education scheme, having for its object the plant- ing of schools in destitute Highland districts, came into existence in 1824. The foreign mission committee was formed in 1825, at the instance of Dr Inglis, a leader of the Moderate party ; and Dr Duff went to India in 1829 as the first missionary of the Church of Scotland. The church extension committee was first appointed in 1828, and in 1834 it was made permanent. The colonial scheme was inaugurated in 1836, and the Jewish mission in 1838, M'Cheyne and Andrew Bonar setting out in the following year as a deputation to inquire into the condition of the Jews in Palestine and Turkey and on the Continent of

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carried his appeal throughout the country. By 1835 he had collected £65,626 and reported the building of sixty- two churches in connexion with

the Establishment. The keenness of the conflict as it approached the crisis of 1843 checked the liberality of the people for this object, but by 1841 £305,747 had been collected and 222 churches built.

The zealous orthodoxy of the church found at this period several occasions to assert itself. M'Leod Campbell, min- ister of Row, was deposed by the assembly of 1830 for teaching that assurance is of the essence of faith and that Christ died for all men. He has since been recognized as one of the profoundest Scottish theologians of the 19th century, although his deposition has never been removed. The same assembly condemned the doctrine put forth by Edward Irving, that Christ took upon Him the sinful nature of man and was not impeccable, and Irving was deposed five years later by the presbytery of Annan, when the out- burst of supposed miraculous gifts in his church in London had rendered him still more obnoxious to the strict censures of the period. In 1841 Wright of Borthwick was deposed for a series of heretical opinions, which he denied that he held, but which were said to be contained in a series of devotional works of a somewhat mystical order which he had published.

The influence of dissent also acted along with the rapidly Disrup-

rising religious fervour of the age in quickening in the oe d °

church that sense of a divine mission, and of the right an power to carry out that mission without obstruction from any worldly authority, which belongs to the essential con- sciousness of the Christian church. An agitation against patronage, the ancient root of evil, and the formation of

Church Europe. Of these schemes that of church extension has | an anti- patronage society, helped in the same direction. exten- most historical importance. It was originally formed to | The Ten Years' Conflict, which began in 1833 with the scheme, Collect information regarding the spiritual wants of the | passing by the assembly of the- Veto and the Chapel

country, and to apply to the Government to build the churches found to be necessary. As the population of Scot- land had doubled since the Reformation, and its distribution had been completely altered in many counties, while the number of parish churches remained unchanged, and

meet- ing-houses had only been erected where seceding congrega- tions required them, the need for new churches was very great. The application to Government for aid, however, proved the occasion of a " Voluntary controversy," which raged with great fierceness for many years and has never completely subsided. The union of the Burgher and the Antiburgher bodies in 1820 in the United Secession—both having previously come to hold Voluntary principles— added to the influence of these principles in the country, while the political excitement of the period disposed men's minds to such discussions. The Government built forty- two churches in the Highlands, providing them with a slender endowment ; and these are still known as parlia- mentary churches. Under Dr Chalmers, however, the church extension committee struck out a new line of action. That great philanthropist had come to see that the church could only reach the masses of the people effectively by greatly increasing the number of her places of worship and abolishing or minimizing seat-rents in the poorer districts. In his powerful defence of establishments against the voluntaries in both Scotland and England, in which his ablest assistants were those who afterwards became, along with him, the leaders of the Free Church, he pleaded that an established church to be effective must divide the country territorially into a large number of small parishes,

Acts, is treated in the article FREE CHURCH OF SCOTLAND. It is not therefore necessary to dwell further in this place on the consequences of those Acts." The assembly of 1843, from which the exodus took place, proceeded to undo the Acts of the church during the preceding nine years. The Veto was not repealed but ignored, as having never had the force of law; the Strathbogie ministers were recog- nized as if no sentence of deposition had gone forth against them. The protest which the moderator had read before leaving the assembly had been left on the table; and an Act of Separation and deed of demission were received from the ministers of the newly formed Free Church, who were now declared to have severed their connexion with the Church of Scotland. The assembly addressed a pastoral letter to the people of the country, in which, while declin- ing to "admit that the course taken by the seceders was justified by irresistible necessity," they counselled peace and goodwill towards them, and called for the loyal support of the remaining members of the church.

Two Acts at once passed through the legislature in answer to the claims put forward by the church. The Scottish Benefices Act of Lord Aberdeen, 1843, gave the people power to state objections personal to a presentee, and bearing on his fitness for the particular charge to which he was presented, and also authorized the presbytery

in dealing with the objections to look to the number and

character of the objectors. Sir James Graham's Act, 1844, provided for the erection of new parishes, and thus created the legal basis for a scheme under which chapel ministers might become members of church courts.

The Disruption left the Church of Scotland in a sadly Develop- maimed condition. Of 1203 ministers 451 left her, and i of among these were many of her foremost men. A third of ae her membership is computed to have gone with them. IM gince Edinburgh many of her churches were nearly empty. The 1843.

Gaelic-speaking population of the northern counties com-

so that every corner of the land and every person, of what- ever class, shall actually enjoy the benefits of the parochial machinery. This "territorial principle" the church has steadily kept in view ever since. With the view of realizing this idea he appealed to the church to provide funds to build a large number of new churches, and personally

Aboli- tion of patron- age.

Improve- ments in public

worship.

CHURCH. |

pletely deserted her. All her missionaries left her but one. She had no gale of popular enthusiasm to carry her forward, representing as she did not a newly arisen principle but the opposition to a principle which she maintained to be dangerous and exaggerated. For many years she had

much obloquy to endure. But she at once set herself to the task of filling up vacancies and recruiting the mission- ary staff. A lay association was formed, which raised large sums of money for the missionary schemes, so that their income was not allowed seriously to decline. The good works of the church, indeed, were in a few years not only continued but extended. All hope being lost that parlia- ment would endow the new churches built by the church extension scheme of Dr Chalmers, it was felt that this also must be the work of voluntary liberality. Under Dr James Robertson, professor of church history in Edinburgh, one of the leading champions of the Moderate policy in the Ten Years' Conflict, the extension scheme was transformed into the endowment scheme, and the church accepted it as her duty and her task to provide the machinery of new parishes where they were required. By 1854 30 new parishes had been added at a cost of £130,000, and from this time forward the work of endowment proceeded still more rapidly. In 1860 61 new parishes had been endowed, in 1870 150, in 1876 250, while in 1886 there were 351. In 1843 the number of parishes was 924. Of 42 parlia- mentary churches existing at that time 40 have been erected into parishes guoad sacra; hence the total number of parishes in Scotland at midsummer 1886 was 1315. By the Poor Law Act of 1845 parishes were enabled to remove the care of the poor from the minister and the kirk-session, in whom it was formerly vested, and to appoint a parochial board with power to assess the ratepayers. The Education Act of: 1872 severed the ancient tie con- necting church and school together, and created a school board having charge of the education of each parish. At that date the Church of Scotland had 300 schools, mostly in the Highlands. The church, however, continues to carry on normal schools for the training of teachers in Edinburgh, Glasgow, and Aberdeen.

In 1874 patronage was abolished. The working of Lord Aberdeen's Act had given rise to many unedifying scenes and to lengthy struggles over disputed settlements, and it was early felt that some change at least was necessary in the law. The agitation on the subject went on in the assembly from 1857 to 1869, when the assembly by a large majority condemned patronage as restored by the Act of Queen Anne, and resolved to petition parliament for its removal. The request was granted, and the right of electing parish ministers was conferred on the congrega- tion; thus a grievance of old standing, from which all the ecclesiastical troubles of a century and a half

had sprung, was removed and the church placed on a thoroughly democratic basis. This Act, combined with various efforts made within the church for her improvement, has secured for the Scottish Establishment a large measure of popular favour, and during the last quarter of a century she has grown rapidly both in numbers and in influence. This revival is largely due on the one hand to the improvement of her worship which began with the efforts of Dr Robert Lee (1804-1868), minister of Old Greyfriars, Edinburgh, and professor of Biblical criticism in Edinburgh university. By introducing into his church a printed book of prayers

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1 Those branches of the church extension scheme which dealt with church building, and with the opening of new missions to meet the wauts of increasing populations, were taken up by a new department, ealled the home mission scheme. The home mission as the pioneer in opening up uew fields of labour, and the endowment scheme which renders permanent the religious centres that the mission has founded, are both traceable to Dr Chalmers.

and also an organ Dr Lee stirred up vehement controversies in the church courts, which resulted in the recognition of the liberty of congregations to improve their worship. A church service society, having for its object the study of ancient and modern liturgies, with a view to the prepara- tion of forms of prayer for publie worship, was founded in 1865; it has published five editions of its " Book of Common Order," which, though at first regarded with suspicion, is now recognized as a useful and respected ad- Church music has been cultivated and improved in a marked degree; a fine collection of hymns has been introduced to supplement the psalms and paraphrases. And architecture has restored the larger churches from their disfigurement by partition walls and galleries— though much still remains

to be done in this way—and has erected new churches of a style favourable to devotion.

The fervour of the church has, on the other hand, found Commit- a channel in the operations of a " Committee on Christian tee on Life and Work," appointed in 1869 with the aim of exercis- Sie 2 08 ife and ing some supervision of the work of the church throughout work, the country, stimulating evangelistic efforts, and organizing the labours of lay agents. This committee publishes a magazine of "Life and Work," which has a circulation of about 100,000, and has lately been seeking to organize young men's guilds in connexion with congregations. It was to reinforce this element of the church's activity, as well as to strengthen her generally, that Mr James Baird in 1873 made the munificent gift of £500,000. This fund is administered by a trust which is not under the control of the church, and the revenue is used mainly in aid of church building and endowment throughout the country.

The church has greatly increased of late years in liberal- ity of sentiment, and there has been no deposition for heresy since 1843. A volume of Scotch Sermons pub- lished in 1880 by ministers holding liberal views brought out the fact that the church would not willingly be led into such prosecutions. An agitation on the part of the Dissenters for disestablishment sprang up afresh after the passing of the Patronage Act and has continued ever since ; while a counter-movement was represented by a Bill, intro- duced into parliament in 1886 to declare the spiritual independence of the Church of Scotland, which, if success- ful, would, it was understood, have opened the way for a reunion of the Presbyterian bodies."

Church Membershiy.—The Church of Scotland has now (1886) Statistics 1315 parishes, 160 non-parochial churches, and 121 preaching and of mem- mission stations, in all 1596 charges. The number of presbyteries bership, is 84, and there are 16 provincial synods. The general assembly &c. consists of 252 clerical and 118 lay members elected by presbyteries, with 73 representatives of royal burghs and universities, aud 4 representatives of churches abroad, in all 447 members. In 1873 the number of communicants as returned to parliament in 1874 was 460,526; in 1878 the number as returned to parliament in 1879 was 515,786; in 1883

the nwmber returned to the assembly of 1884 was 543,969 ; in 1885, 564,435. The professors of divinity at the four Scottish universities must be ministers of the church, and students aspiring to the ministry are required to attend one of the divinity halls of the universities for three sessions, after an arts course of three years. A large number of ministers of the church are employed elsewhere than in Scotland. The Church of Scotland in England consists of 16 charges. There are 31 chaplains minis- tering to Presbyterians in the army and navy, 15 of these being stationed in India. The foreign mission employs 15 ordained and 11 unordaincd European missionaries, with a large number of native agents, in India, East Africa, and China. The Jewish mission em- ploys 6 ordained ministers, with other agents, at Constantinople, Smyrna, Salonica, Beyrout, and Alexandria. The colonial com- mittee supplies religions ordinances to emigrants from Scotland in India, Fiji, Cyprus, Mauritius, Ceylon, and the West Indies, besides assisting Presbyterian colleges in Canada and Australia. A minister of the church presides over a Scots church of old standing at Amster- dam. Two lectureships have been founded in recent times in con- nexion with the church—one by Mr James Baird (alrcady mentioned),

2 For the period since 1843 the most useful book is Dr Story's Life of Dr Robert Lee, 1870.

Finance.

Adam- nan.

-Temains (see Cettic Lrreraturg, vol. v. p. 313). In the

most accurate indication of the general progress of the body. The

far north as Aberdeen. Its earliest writer is Thomas of Ercildoune, or Thomas the Rhymer, who reached the height of his fame in 1280. The fairy tale or romance that bears his name may be regarded ag the earliest example of romance poetry in Britain. Nearly contemporary with the Rhymer were two other distinguished Scots, Michael Scor (g.v.) and John of Duns, or Duns Scorus (7.v.), both of whom, however, wrote in Latin. Three

Arthurian Arthur. romances taken from Anglo-Norman sources relating to ian ro- Sir Gawain, one of the most celebrated knights of the auees. Round Table, seem to have been composed about the end of the 13th century. These were—Syr Gawayn and the Grene Knycht, the Knightly Tale of Golagros and Gawayne, and the Awntyrs of Arthur at the Ternewathelyne. Sir Gawain's exploits were so popular in the south of Scotland that he was claimed by the people as one of their own chieftains and called the lord of Galloway. The Awntyrs of Arthur, or the adventures of King Arthur at the Tern- wadling, a small lake near Carlisle, and the Pystil of Swete Susan, a version of the apocryphal story of Susanna, are supposed to have been the productions of Sir Hew of Eglintoun about that period. The Zaill of Rauf Coilzear, in which the adventures of the emperor Charlemagne in

the other by Mr John Croall of Southfield—and these have already produced several notable contributions to Scottish theology.

An association for augumenting the smaller livings was formed in 1866, and the church now has a smaller livings scheme, which aims at bringing up to £200 a year all livings that fall below that sum. Such numbered 311 in 1885; and the sum distributed among them was £8537, which, however, was £5000 short of the sum neces. sary to accomplish fully the desired object. :

In the following details of the income of the church we give first the value of her endowments and then some figures showing the growth of her voluntary liberality. ;

Means from Endowments.—(1) From a parliamentary return ob- tained in 1874 the church is seen to derive from teinds, includ- ing the value of manses and glebes, the annual sum of £289, 413. Augmentations have been obtained since that date amounting to upwards of £10,000, but the fiars prices have declined during the same period by nearly 25 per cent., so that the total ammount so derived has not increased. The unexhausted teinds amounted in 1880 to £134,413. (2) The exchequer pays to 190 poor parishes and to 42 Highland churches, from church property in the hands of the crown, £17,040. (3) From local sources the church derives £23,501. (4) The endowments raised by the church for 342 new parishes amount to £42,500. The total endowments, not counting church buildings, amount to £383,041. : ;

Means from Voluntary Liberality.—The following table (I.) gives a view of the financial progress of certain of the schemes of the church since the secession :—

Bren Foreign fhavdation Colonial Jewish Home : : ea' | Mission. "| Sehene.|_Mission. | Mission, | | the house of a charcoal:burner named Ralph in the neigh-

1842 £6,748 £3630 £3,753 £4998 2 bourhood of Paris are related with much poetic humour,

tne ae pe Be Bd eo and the fairy tale of Orfeo and Heurodis were written in

1855 3,712 4466 3,060 2619 3,866 the early part of the 14th century and were very popular

1860 4,873 4487 3,228 2804 4,85 . ;

1865 5°89 4959 3696 5000 5389 in Scotland in former times.

de wee eee aoe su ae The War of Independence gave a new Impetus to Scot-

1880 16,270 – 11,674 4715 15,604 tish nationality and produced a corresponding effect on the

1885 13,346 | Ee 4,750 5198 9,450 literature of the country. The Brus, or metrical account

of the deeds of Robert Bruce, was written by John Bar- Barbour BOUR (9.v.), archdeacon of Aberdeen, in the latter part of the 14th century. To him we owe a translation of a medizval romance on the Zrojan War, nearly 3000 lines in length, and a large collection of metrical lives of saints, which, after being long preserved in manuscript, have re- cently been printed by Dr Horstmann. About this time was compiled the first formal history of Scotland by John of ForDun (q.v.), which was written in Latin and brought Fordu. down to the death of David I, He, however, left materials for the completion of the work, the last date of which is 1385. In 1441 a continuation of it was made by Walter

No attempt was made until 1873 to collect statistics of the whole liberality of the church; and changes introduced from time to time in the mode of stating the various sums make it impossible to give a complete comparative statement since that date. The following table (II.) shows the amount at quinquennial periods down to 1885, the church-door collections and seat-rents probably affording the

*building operations of which the values are given include only such building as is the result of voluntary effort. Under the head of '*general church objects" are included the collections for missions, for small livings, aged and infirm ministers, zenana missions, &c. These figures do not include income from trust funds or endow- ments; they state what was given in the year referred to. A number of objects of liberality are not included in the table.*

Church | General Bower or Bowmaker. The whole work was then styled Bower. Your. [Goitections.| Heats. (Bralame'sr| Gneren | oO" | tote | | she Scottehwonteon id brings the history of Scotland dow Collections. } Rents. | Building or Objects, | Objects. CE NORE OCCT Name JUSs tie nistory ol Scotland down Repairs. to 1437. A metrical history was written between 1420

and 1424 by Andrew of Wyntoun, a canon regular of St Wyn- Andrews and prior of St Serf's Inch in Loch Leven. This toun. work, known as the Orygynale Cronykil of Scotland, is pre- faced by an account of the human race from the creation, and, although for the most part its verse is homely and dull, its author occasionally describes stirring incidents with considerable power. The beautiful poem of James I. James 1. called The Kingis Quhair, written about this period, was

far in advance of the contemporary metrical chronicles.

It possesses a melody of verse unknown before and gives

the king a conspicuous place in early Scottish literature.

He is supposed to have also written A Ballad of Good Counsel and a song On Absence ; but two poems, Christis Kirk of the Grene and Peblis to the

Play, believed to have been his composition, have been recently shown by the Rev. W. W. Skeat to be by some other early poet. An allegorical poem called the Buke of the Howlat was written about 1450 by Sir Richard Holland, an adherent of the noble family of Douglas. It is a warning against pride, exemplified by the owl, decked out in the splendour of borrowed feathers, compelled on account of his insolence

to resume his original form. The poem displays some inventive and descriptive power, though marred by its alliteration, The exploits of Sir William Wallace found

1872 | £41561 | £35,295 | £31,851 £43,618 | £27,204 | £255,350 1877 | 65,827 53,094 69,800 40,117 54,572 | 373,715 1882 | 76,399 59,859 67,134 51,520 61,253 | 386,061 1885 | 80,887 63,197 59,395 60,110 61,739 | 374,576

The following sums were raised during the thirteen years 1872- 84 :— congregational and charitable purposes, £1,462,091 ; support of ordinances and supplement of stipends, £233,406; education (exclusive of sums raised for training colleges), £161,931 ; home mission work, £358,543 ; church building, £737,775 ; endowment of new parishes, £486,698 ; foreign mission work, £376,523 ; total, £3,816,962. Mr James Baird's gift is not included in this state- ment. (A, M.)*

SCOTLAND, Lrreraturez or. Literature in Scotland, as distinct from England, dates from the time of CoLUMBA (g.v.). Adamnan, abbot of Iona, who in 690 wrote in Latin the life of his predecessor, may be regarded as the first author that Scotland produced. In addition to his biography of St Columba, a long extract from a work of his on the "Holy Places " is incorporated by Bede in his ficclesiastical History, The greater part of Scotland was at that time inhabited by a Celtic population and the period from the 7th to the 13th century has left but few literary

latter part of the 13th century what may be called the ancient literary language of Scotland was used in the dis- trict between the Humber and the Forth and coastwise as

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~ ere

Blind Harry.

Henry- son.

Dunbar.

Gavin Douglas.

LITERATURE, |

about 1460 a worthy chronicler in Henry the Minstrel, or Blind Harry, who, born with such a serious defect, must be regarded as one of the most extraordinary individuals recorded in the annals of literature. His well-known poem, which bears the name of his hero, is in versification, ex- pression, and poetic imagery a remarkable production for that period. The grave and thoughtful poetry of Robert HeEnryson (g.v.), notary public and preceptor in the Bene- dictine convent at Dunfermline, who flourished about 1470, contrasts favourably with that of his English contempo- raries. His Testament of Cresseid was often incorporated in the old editions of the works of Chaucer, to whose poetry it is not inferior. His Robene and Makyne is the earliest specimen of pastoral poetry in the Scottish lan- guage. These, with his ables and other works, entitle him to a high place amongst the early Scottish poets. Nearly coeval with Henryson was Sir Gilbert Hay, chamberlain to Charles VI. of France, who made several translations from the works of French authors. One of these, taken from a popular French romance of Alex- ander the Great, extends to upwards of 20,000 lines. A long anonymous poem called Clariodus belongs to this period, It is a romance founded on a French original, the more material incidents of which are supposed to have happened at the English court. It abounds with illustra- tions of the manners and customs peculiar to the age of chivalry. Being nearly 3000 lines in length, it is, like the last-mentioned, an extensive specimen of the language and versification of the time. The Zhrie Tales of the Thrie Preistis of Peblis (1490), the authorship of which is un- known, are moral tales possessing considerable freshness. As a

fragment of an old version of them occurs in the Asloan MS., written in 1490, they must have existed long before the edition printed by Henry Charteris in 1603, in which form only they are now accessible. The Ledger of Andrew Halyburton, conservator of the privileges of the Scottish nation in the Netherlands, 1492-1503, is a valu- able source of information regarding the early trade of Scotland.

The close of the 15th century exhibited a consider- able growth of literary ability in the writings of William DunBar (g.v.) and his contemporaries. His works were so highly esteemed at the time he wrote that he was raised to the dignity of "the makar" or poet-laureate of Scot- land. Such of Dunbar's writings as have come down to the present time are of a miscellaneous character, in which there is much power of description and command of verse. The Thistle and the Rose and the Golden Targe are excel- lent specimens of his poetic power. His satirical poems, such as the Zwa Mariit Wemen and the Wedo and the lyt- ing with Kennedie, contain much coarse humour. Seven of his poems were the first specimens of Scottish typo- graphy, having been printed by Chepman and Myllar at Edinburgh in 1508, followed in 1509 by the well-known Breviary for the church of Aberdeen. A humorous poem called the Freiris of Berwik has been attributed to Dunbar and is usually printed with his works. Contemporary with Dunbar were a number of minor Scottish poets, of whose works only a few specimens have come down to the present time. These were Walter Kennedie, with whom he had his " flyting" or poetical contest, Sir John Rowll, Quintyne Shaw, Patrick Johnestoun, Merseir, James Afflek, and others.! The most classical of the Scottish poets was Gawyn or Gavin Douctas (g.v.), bishop of Dunkeld, whose great literary work was the translation of the dneid of Virgil into Scottish verse. To each book he prefixed a prologue;

1 Kennedie wrote The Praise of Aige and The Passioun of Christ ; Rowll, Zhe Cursing on the Steilaris af his Fowlis; Shaw, Advice to a Courtier ; Johnestoun, The Three Deid Powis; Merseir, Perrell in Paramours ; and Afflek, The Quair of Jelousy.

the one before the twelfth is an admirable descriptive poem of the beauties of May. His Palice of Honour and Kyng Hart, two allegorical poems, are able productions, the latter of which is full of dramatic vigour. Contemporary with Douglas was Sir David Lynpsay (¢.v.), Lyon king-of-arms Sir

in the feign of James V., who may be regarded as the most David His Monarchie, or Lyndsay.

popular of the early Scottish poets. ane Dialog betuix Experience and ane Courteour of the Miserabyl Estait of the Warld gives a short survey of sacred and classical history which rendered it very popular in its time. His Satire of the Thrie Estaitis is a skilfully written attempt to reform the abuses of the period, especi- ally those of the church. While some of its characters recite long and erudite political speeches, he introduces interludes of a farcical kind suited to the tastes of the times. This work may be considered the first dramatic effort of any British author. In his Zestament of Squire Meldrum he relates the adventures of his hero with mucl1 poetic fire. Lyndsay's other poems consist of appeals to the king for advancement and some jeux desprit of no great length. One of the best scholars and teachers of this period was John Major or Mair, a native of Haddington, who was principal of St Salvator's College, St Andrews. Besides being the author of learned commentaries on Aristotle, he wrote a well-known work, De historia gentis Scotorum libri sex, printed in 1521. Another Scottish author that wrote in Latin with considerable elegance was

Hector Borck (q.v.), principal of King's College, Aberdeen. Boece.

His great work, Historia gentis Scotorum a prima gentis origine, was published in Paris in 1526. It was translated into Scottish by John Bellenden, archdeacon of Moray, under the title of the Hystory and Croniklis of Scotland, printed at Edinburgh in 1536. Bellenden also translated the first five books of Livy into Scottish. The Chronicle of Boece was versified in Scottish in 1531-35 by William Stewart, a descendant of the first earl of Buchan. It was written by command of Margaret, sister of Henry VIII. of England, for the instruction of her son, the youthful James V. A Latin poem of much merit, entitled De animi tran- quillitate, was published in 1543 by Florence Wilson, master of Carpentras School. It is in

the form of a dialogue and displays much variety of knowledge, while its Latinity has long been celebrated. In an anonymous work, written in 1548 or 1549, and called the Complaynt of Scotland, the author deplores the calamities to which Scotland was then subject. These are stated to be the wrongs done to the Scottish labourers at the hands of the landholders and the clergy, the difficulties with England, and the treachery of the Scottish nobility. The work is valuable as affording a glimpse of the literature then popular in Scotland, some pieces of which are no longer to be found,—such as Zhe Tayle of the Reyde Eyttyn [red giant] vith the Thre Heydes, The Tayl of the Volfe of the Varldis End, The Tayl of the Giantis that eit Quyk Men, The Tayl of the thrie futtat Dog of Norroway, and Robyn Hude and Litil Jhone.

In 1552 there was printed at St Andrews a Catechism, that is to say ane Commone and Catholike Instructioun of the Christian People in Materis of our Catholike Faith and Religioun, written by John Hamilton, archbishop of St Andrews, the last primate of the Roman Catholic faith in Scotland.

those of Lyndsay, contain much information about the abuses of the time (1560), such as the oppressive conduct of the landholders, vexatious lawsuits, and the depredations of the Border thieves. Sir Richard deserves the thanks of posterity for the large manuscript collection of poems by Scottish authors which he and his daughter formed, and which is now preserved in the Pepysian Library, at Magdalene College, Cambridge. The name of George

The poems of Sir Richard Maitland, which are Mait- of a somewhat satirical kind, are valuable, as they, like land.

Banna- tyne.

Rolland.

Buchanan.

Lyndsay of Pit- scottie.

Lesley.

Bannatyne is inseparably connected with the history of Scottish poetry, as in 1568 he too formed an extensive collection of Scottish poetry which is certainly the most valuable now extant. It was written by hin at Edin- burgh in the time of the plague, when the dread of in- fection confined him closely at home. The Bannatyne ALS. now preserved in the Advocates' Library extends to 800 pages folio, and includes several of Bannatyne's own poems, of which the two most considerable are of an amatory character. The works of Alexander Scott, con- sisting principally of love poems, embrace also a spirited account of a Jousting betwix Adamson and Sym at the Drum, a place a little to the south of Edinburgh. The author, who was one of the most elegant poets of this period, has sometimes been called the 'Scottish Anacreon." Two poems of some merit—the Praises of Wemen and the Miseries of a Puir Scolar—were written by Alexander Arbuthnot, principal of King's College, Aberdeen, about 1570. A poem of considerable length, called the Sege of the Castell of Edinburgh, published in 1573, was by Robert Semple, who also wrote an attack on Archbishop Adamson, called the Legend of the Bishop of Sanct Androis Lyfe. To this period belong two poems of considerable length— the Court of Venus (1575), an imitation of the Palice of Honour of Gawyn Douglas, and the romance of the Seaven Seages (1578), a Scottish version of one of the most re- markable medizeval collections of stories belonging to the same class as the Arabian Nights, in which one single story is employed as a means of stringing together a multi- tude of subsidiary tales. These poems were written by John Rolland, notary in Dalkeith. One of the best Latin scholars that modern Europe has produced was George BUCHANAN (q.v.), who flourished in the middle of the 16th century. He wrote several Latin tragedies and an unrivalled translation of the Psalms. His De jure regni apud Scotos was composed to instruct James VI., to whom he had been tutor, in the duties belonging to his kingly office. His last and most important labour was his History of Scotland, originally printed in 1582, of which seventeen editions have appeared. An excellent specimen of the ancient vernacular language is the Chronicle of Scotland by Robert Lyndsay of Pitscottie. It includes the period from 1436 to the marriage of Mary to Darnley in 1565. Although its

author was a simple-minded and credulous man, he describes events of which he was an eye-witness with circumstantiality and great prolixity of detail. An- other historical work of greater importance was the De orugine, moribus, et rebus gestis Scotorum (1578) by John Lesley, bishop of Ross. A translation of this work made by Father James Dalrymple, a religious in the Scottish cloister of Ratisbon, 1596, is in course of publication by the Rev. Father E. B. Cody for the Scottish Text Society. Lesley also wrote in Scottish a History of Scotland from the death of James I. in 1436 to the year 1561. This work, intended for the perusal of Mary while in captivity in England, is written in an elegant style. The bishop was the champion of that unfortunate queen, and in 1569 wrote a Defence of the Honour of Marie Quene of Scotland and Dowager of France, with a declaration of her right, title, and interest to the succession of the crown of England.

The Reformation exerted a considerable influence on Scottish literature. Amongst the earliest Protestant writers of the country may be mentioned Alexander Ales or Alesius, a native of Edinburgh, who published several controversial works and commentaries on various parts of the Bible. But the most eminent promoter of the reform was John Knox (¢.v.), who wrote several controversial pamphlets and some religious treatises ; his great work was the fTistory of the Reformation of Religion in Scotland, first printed in 1586. One of the principal opponents of Knox was Ninian

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Winzet, a priest of considerable ability and one familiar Winzet,. with the scholastic learning of the age. He began life as master of Linlithgow school and subsequently became abbot of St James's at Ratisbon. He wrote séveral tracts

in which he strenuously recommended the observance of — certain popish festivals. In 1562 he published his Buke

of Four Scoir Thrie Questions tuching Doctrine, Ordour, and Maneris proponit to the Prechouris of the Protestantis in Scotland and deliverit to Jhone Knox the 20th day of Hebruary 1562. The writings of James VL, who was a James man of scholarly attainments, embrace several works both VL in poetry and prose. His earliest production, published

in 1584, when he was only eighteen, was the Lssayes of

a Prentice in the Divine Art of Poesie. This was followed

by his poetical Exercises at Vacant Houres (1591). He also wrote a great many sonnets and a translation of

the Psalms. His prose works are Demonologie (1597), BactAccov Adpov (1599), Counterblast to Tobacco, Para- phrase on Revelation, Law of Free M onarchies, &c, Among

the Scottish poets who frequented his court were William Fowler, the elegant translator of the Triumphs of Petrarch,

and Stewart of Baldinnies (Perth), a translator of Ariosto. Both these poets wrote other works which exist in MS.,

but are still unpublished. The zeal of Sir David Lyndsay Reli- and others for the reformation of the church initiated a gious religious revival, and in 1597 was published the collection Pts known as Ane Compendious Booke of Godly and Spiritual Sangs for avoiding of Sinne and Harlotrie, This very curious work is attributed to John and Robert Wedder- burn, the latter of whom was vicar of Dundee. A number

of religious poems were written about the end of the 16th century by James Melville, minister of Anstruther, after- wards of Kilrenny, both in Fife. His Morning Vision, printed in 1598, consists of paraphrases of the Lord's Prayer, the Shorter Catechism, and the Ten Command- ments. He also wrote the Black Bastel, a lamentation over

the Church of Scotland, which is dated 1611. Another religious poet was James Cockburn, a native of Lanark- shire, who wrote Gabriel's Salutation to Marie (1605), and some other poems not destitute of merit. An eminent theological writer of this era, Robert Rollock, first principal

of the university of Edinburgh, wrote many commentaries

on the Scriptures which show extensive learning. Most

are in Latin ; but one or two are in the Scottish language.

A very popular poem, the Cherrie and the Slae, first printed Mont- by Waldegrave at Edinburgh in 1597, afterwards went gomerie. through many editions. Its author was Alexander Mont- gomerie, who also wrote some translations of the Psalms and the Mlyting betwixt Montgomerie and Polwarth, in imitation of Dunbar's Flyting with Kennedie. In 1599

was published an interesting volume of poems written by Alexander Hume, entitled Hymnes or Sacred Songs, wherein

the Right Use of Poesie may be espied. One is on the defeat

of the Spanish Armada. To the beginning of the 17th century belongs a comedy in rhyming stanza, the authorship

of which is unknown,—Ane verie Excellent and Delectabill Treatise intitulit Philotus, quhairin we may perceive the Greit Inconventences that fallis out in the Marriage betuix Aige and Youth (1603). Its versification is easy and pleasant, and

its plan a nearer approximation to the modern drama than

the satire of Lyndsay. In the same year appeared the poems of Sir William ALEXANDER (¢.v.), earl of Stirling. sir_ One, called Doomsday, or the Great Day of the Lord's Judg- William ment, consists of 11,000 verses. His Monarchicke Tragedies, nce four in number, were not intended for representation on

the stage. His exhortation or Parenesis to Prince Henry (1604) is his best poem. He also wrote Recreations with

the Muses (1637), which is of a somewhat philosophical character. One of the most distinguished writers of this

era was William Drummonp (¢.v.) of Hawthornden, who

Drum- mond of Haw- thorn- den.

Hannay.

Mathe- mati- cians.

Philo- sophers.

Writers on juris- prud- ence.

Medical writers.

published Poems, amorous, funerall, divine, pastorall (161 6), and Flowers of Zion, or Spiritual Poems (1623). He also wrote a History of Scotland during the Reigns of the Five Jameses (1655), some political tracts, and the Cypress Grove, a moral treatise in prose. As a writer of sonnets he has always been highly esteemed. Nearly contemporary with Drummond was Patrick Hannay, a native of Gallo- way, who seems to have followed James to England. He published his poems in 1622, the principal of which are Philomela the Nightingale and Sheretrine and Mariana. He occupies a favourable position amongst the minor Scottish poets. After the removal of the Scottish court to London and the union of the crowns in 1608, the old language began to be considered as a provincial dialect ; and the writers subsequent to Drummond, who was the first Scottish poet that wrote well in English, take their places amongst British authors.

To the short sketch above given may be added a notice of the carly Scottish writers on mathematics, philosophy, jurisprudence, and medicine. In mathematical science the name of Joannes Sacro Bosco (John Holywood or Holybush) may be mentioned, as he is believed to have been a native of Nithsdale and a canon of the monastery of Holywood, from which he took his name. He flourished about the beginning of the 13th century, and his treatise De Sphera Mundi was very generally taught in colleges and schools. The system of astronomy and the other mathematical treatises of James Bassantie, who taught at Paris about 1560 with much success, were cclebrated in their time. The greatest of the Scottish mathe- maticians, however, was John NAPIER (q.v.) of Merchiston, who wrote on various kindred subjects, and in 1614 astonished the world by his discovery of

logarithms. In philosophy, besides the voluminous works of Duns Scotus and John Major already men- tioned, various learned commentaries on Aristotle, of which Scottish philosophy then almost entirely consisted, were published by Robert Balfour, principal of the college of Guienne ; by John Ruther- ford, professor of philosophy at St Andrews (under whom Admirable Crichton wasa pupil); and by James Cheyne, professor of philosophy at Douai. In jurisprudence a cclebrated treatise on the Feudal Law was written by Sir Thomas Craig about 1603. It was not, however, published till about half a century after his death, as the printing of any treatise on the law of Scotland while he lived seems to have becn considered as out of the question. Commentaries on some of the titles of the Pandects of Justinian, and a treatise De Potestate Pape (1609), in opposition to the usurpation of temporal power by the pope, were written by William Barclay, professor of law in the university of Angers. Another early legal work was a treatise On the Connexion between Government and Religion, by Adam Blackwood, judge of the parlement of Poitiers, who was the antagonist of Buchanan and a strenuous defender of Mary queen of Scots. In medicine the principal early Scottish works were written by Duncan Liddell, a native of Aberdeen, who in 1605 published at Helmstadt his Disputationes medicinates, containing the theses or disputations maintained by himself and his pupils from 1592 to 1606. He also published other works, which contain an able digest of the medical learning of his age. Henry Blackwood, dean of faculty to the college of physicians at Paris, wrote various treatises on medicine, of which a list will be found in Mackenzie's Lives of the Scottish Writers, but which are now only historically interesting. (J. SM.)

SCOTT, Davip (1806-1849), historical painter, was born at Edinburgh in October 1806, and studied under his father, Robert Scott, an engraver of repute in the city. For a time in his youth he occupied himself with the burin ; but he soon turned his attention to original work in colour, and in 1828 he exhibited his first oil picture, the Hopes of Early Genius dispelled by Death, which was followed by Cain, Nimrod, Adam and Eve singing their Morning Hymn, Sarpedon carried by Sleep and Death, and other subjects of a poetic and imaginative character. In 1829 he became a member of the Scottish Academy, and in 1832 visited Italy, where he spent more than a year in study. At Rome he executed a large symbolical painting, entitled the Agony of Discord, or the Household Gods Destroyed. On his return to Scotland he

continued the strenuous and unwearied practice of his art; but his productions were too recondite and abstract in subject ever to become widely popular, while the defects and exaggerations of their draftsmanship repelled connoisseurs. So the

gravity which had always been characteristic of the artist passed into gloom; he shrank from society and led a secluded life, hardly quitting his studio, his mind con- stantly occupied with the great problems of life and of his art. The works of his later years include Vasco da Gama encountering the Spirit of the Storm, a picture— immense in size and most powerful in conception—finished in 1842, and now preserved in the Trinity House, Leith ; the Duke of Gloucester entering the Water Gate of Calais (1841), an impressive subject, more complete and har- monious in execution than was usual with the artist; the Alchemist (1838), Queen Elizabeth at the Globe Theatre (1840), and Peter the Hermit (1 845), remarkable for their varied and elaborate character-painting ; and Ariel and Caliban (1837) and the Triumph of Love (1846), distin- guished by their beauty of colouring and depth of poetic feeling. The most important of his religious subjects are the Descent from the Cross (1835) and the Crucifixion— the Dead Rising (1844). In addition to his works in colour Scott executed several remarkable series of designs. Two of these—the Monograms of Man and the illustra-

tions to Coleridge's Ancient Mariner—were etched by his

own hand, and published in 1831 and 1837 respectively, while his subjects from the Pilgrim's Progress and Nichol's Architecture of the Heavens were issued after his death. Among his literary productions are five elaborate and

thoughtful articles on the characteristics of the Italian masters, published in Blackwood's M agazine, 1839 to 1841,

and a pamphlet on British, French, and German Painting,

1841. He died in Edinburgh on the 5th of March 1849.

‘As a colourist David Scott occupies a high place in the Scottish school, but the most distinctive merit of his works lies in the boldness of their conception and their imagina- tive and poetic power.

See W. B. Scott, Memoir of David Scott, R.S.A. (1850), and

J. M. Gray, David Scott, R.S.A., and his Works (1884).

SCOTT, Siz Grorce Ginpert (1811-1878), one of the

most successful ecclesiastical architects of the 19th century, was born in 1811 at Gawcott near Buckingham, where his father was rector; his grandfather was Thomas Scott

(1747-1821),

the well-known commentator on the Bible.

In 1827 young Scott was apprenticed for four years to an architect in London named Edmeston, his pupildom acted as clerk of the works at the new

and at the end of

Fishmongers’ Hall and other buildings in order to acquire a knowledge of the practical details of his profession, In Edmeston’s office he became acquainted with a fellow- pupil, named Moffat, a man who possessed considerable talents for the purely business part of an architect’s work, and the t

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England, and in the next twenty-eight years completed an almost incredibly large number of new churches and “restorations,” the fever for which was fomented by the Hcclesiological Society and the growth of ecclesiastical feeling in England.

In 1844 Scott won the first premium in the competition for the new Lutheran church at Hamburg, a noble building with a very lofty spire, designed

strictly in the style of the 13th century. In the following year his partnership with Moffat was dissolved, and in 1847 Scott was employed to renovate and refit Ely cathedral, the first of a long series of English cathedral and abbey churches which passed through his hands. In 1851 Scott visited and studied the architecture of the chief towns in northern Italy, and in 1855 won the competition for the town-house at Hamburg, designed after the model of similar buildings in north Germany. In spite of his having won the first prize, another architect was selected to construct the building, after a very inferior design. In 1856 a competition was held for designs of the new Government offices in London : Scott obtained the third place in this, but the work was afterwards given to him on the condition (insisted on by Lord Palmerston) that he should make a new design, not Gothic, but Classic or Renaissance in style: This Scott very unwillingly consented to do, as he had Little sympathy with any styles but those of England or France from the 13th to the 15th century. In 1862-63 he was employed to design and construct the Albert Menorial, a very costly and elaborate work, in the style of a magnified 13th-century reliquary or ciborium, adorned with mInany statues and re- hiefs in bronze and marble. On the partial completion of this he received the honour of knighthood. In 1866 he competed for the new London law-courts, but the prize was adjudged to his old pupil, G. E. Street. In 187 3, owing to illness caused by overwork, Scott Spent some time in Rome and other parts of Italy. The mosaic pavement which he designed for Durham cathedral soon afterwards was the result of his study of the 13th-century mosaics in the old basilicas of Rome. On his return to England he resumed his professional labours, and continued to work almost without intermission till his short illness and death in 1878. He was buried in the nave of Westminster Abbey, and an engraved brass, designed by G. E. Street, was placed over his grave. In 1838 Scott married his cousin, Caroline Oldrid, who died in 1870; they had five sons, two of whom have taken up their father's profession.

Scott's architectural works were more numerous than those of

any other architect of the century; unfortunately for his fame, he undertook far more than it was possible for him really to design or supervise with thought and care. He carried out extensive works of repair, refurnishing, and restoration in the following buildings : —the cathedrals of Ely,

Hereford, Lichfield, Salisbury, Chichester, Durham, St David's, Bangor, St Asaph, Chester, Gloucester, Ripon, Worcester, Exeter, Rochester, the abbeys of Westminster, St Albans, Tewkesbury, and countless minor churches. He also built the new Government offices (India, Foreign, Home, and Colonial), the Mid- land Railway terminus and hotel, and a large number of private houses and other buildings. His style was (with the one exception of the Government offices) a careful copy of architectural periods of the Middle Ages, used with a profound knowledge of detail, but without much real inventive power, and consequently rather dull and uninteresting in effect. Asa "restorer" of ancient buildings he was guilty of an immense amount of the most irreparable destruc- tion, but any other architect of his generation would probably have done as much or even more harm. While a member of the Royal Academy Scott held for many years the post of professor of archi- tecture, and gave a long serics of able lectures on medixval styles, which were published in 1879, He wrote a work on Domestic Architecture, and a volume of Personal and Professional Recollections, which, edited by his eldest son, was published in 1879, and also a large number of articles and reports on many of the ancient build- ings with which he had to deal. Owing to his numerous pupils, among whom have been many leading architects, his influence was for, some time very widely spread; but it is how rapidly passing away, mainly owing to the growing reaction against the somewhat

harrow medizvalism of which he, both in theory and practice, was

the ehief exponent.

SCOTT, Joun. See Expoy, Earn or,

SCOTT, Micwart. See Scot, MIcHAEt.

SCOTT, Sir Watrer (177 1-1832), poet and novelist, was born at Edinburgh on 15th August 1771. His pedi- gree, in which he took a pride that strongly influenced the course of his life, may be given in the words of his own fragment of autobiography. "My birth was neither dis- tinguished nor sordid. According to the prejudices of my country it was esteemed gentle, as

I was connected, though remotely, with ancient families both by my father's and mother's side. My father's grandfather was Walter Scott, well known by the name of Beardie. He was the second son of Walter Scott, first laird of Raeburn, who was third son of Sir William Scott, and the grandson of Walter Scott, commonly called in tradition Awd Watt of Harden. T am therefore lineally descended from that ancient chicf- tain, whose name I have made to ring in many a ditty, and from his fair dame, the Flower of Yarrow,—no bad genealogy for a Border minstrel,"

Scott's desire to be known as a cadet of the house of Harden, and his ruling passion—so disastrous in its ultimate results—to found a minor territorial family of Scotts, have been very variously estimated. He himself, in a notice of John Home, speaks of pride of family as "natural to a man of imagination," remarking that, "in this motley world, the family pride of the north country has its effects of good and of evil." Whether the good or the evil preponderated in Scott's own case would not be easy to determine. It tempted him into courses that ended in commercial ruin; but throughout his life it was @ constant spur to exertion, and in his last years it proved itself as a working principle capable of inspiring and main- taining a most chivalrous conception of duty. If the ancient chieftain Auld Watt was, according to the anecdote told by his illustrious descendant, once reduced in the matter of live stock to a single cow, and recovered his: dignity by stealing the cows of his English neighbours, Professor Veitch is probably right in holding that Scott's Border ancestry were, as a matter of literal fact, sheep- farmers, who varied their occupation by "lifting" sheep and cattle, and whatever else was "neither too heavy nor too hot." The Border lairds were really a race of shepherds in so far as they were not a race of robbers. Professor Veitch suggests that Scott may have derived from this pastoral ancestry an hereditary bias towards the observation of nature and the enjoyment of open-air life. He certainly inherited from them the robust strength of constitution that carried him successfully through so many exhausting labours. And it was his pride in their real or supposed feudal dignity and their rough marauding exploits that first directed him to the study of Border history and poetry, the basis of his fame as a poet and romancer. His father, a writer to the signet (or attorney) in Edinburgh—the original of the elder Fairford in Red- geuntle-—was the first of the family to adopt a town life or a learned profession. His mother was the daughter of

Dr Rutherford, a medical professor in the university of Edinburgh, who also traced descent from the chiefs of famous Border clans. 'The ceilings of Abbotsford display the arms of about a dozen Border families with which Scott claimed kindred through one side or the other. His father was conspicuous for methodical and thorough in- dustry ; his mother was a woman of imagination and cul- ture. The son seems to have inherited the best qualities of the one and acquired the best qualities of the other.

The details of his early education are given with great precision in his autobiography. Stuart Mill was not more minute in recording the various circumstances that shaped

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his habits of mind and work. We learn from himself the secret—as much at least as could be ascribed to definite ex- traneous accident—of the "extempore speed " in romantic composition against which Carlyle protested in his famous review of Lockhart's Life of Scott.! The indignant critic assumed that Scott wrote "without preparation"; Scott himself, as if he had foreseen this cavil, is at pains to show that the preparation began with his boyhood, almost with his infancy. The current legend when Carlyle wrote his essay was that as a boy Scott had been a dunce and an idler. With a characteristically conscientious desire not to get a bad example, the autobiographer solemnly declares that he was neither a dunce nor an idler, and explains how the misunderstanding arose. His health in boyhood was uncertain ;2 he was consequently irregular in his attend- ance at school, never became exact in his knowledge of Latin syntax, and was so belated in beginning Greek that out of bravado he resolved not to learn it at all.

Left very much to himself throughout his boyhood in the matter of reading, so quick, lively, excitable, and un- certain in health that it was considered dangerous to press him and prudent rather to keep him back, Scott began at a very early age to accumulate the romantic lore of which he afterwards made such splendid use. As a child he seems to have been an eager and interested listener and a great favourite with his elders, apparently having even then the same engaging charm that made him so much beloved as a man. Chance threw him in the way of many who were willing to indulge his delight in stories and ballads. Not only his own relatives—the old women at

his grandfather's farm at Sandyknowe, his aunt, under whose charge he was sent to Bath for a year, his mother—took an interest in the precocious boy's ques- tions, told him tales of Jacobites and Border worthies of his own and other clans, but casual friends of the family —such as the military veteran at Prestonpans, old Dr Blacklock the blind poet, Home the author of Douglas, Adam Ferguson the martial historian of the Roman republic—helped forward his education in the direction in which the bent of his genius lay. At the age of six

1 Latest edition in 10 vols. feap. 8vo, Edinburgh, 1847-48.

2 Dr Charles Creighton supplies us with the following medical note on Scott's early illness :—"Scott's lameness was owing to an arrest of growth in the right leg in infancy. " When he was eighteen months old he had a feverish attack lasting three days, at the end of which time it was found that he 'had lost the power of his right leg,'—7.e., the child instinctively declined to move the ailing member. The malady was a swelling at the ankle, and either consisted in or gave rise to arrest of the bone-forming function along the growing line of cartilage which connects the lower epiphysis of each of the two leg-bones with its shaft. In his fourth year, when he had otherwise recovered, the leg remained 'much shrunk aud contracted.' The limb would have been blighted very much more if the arrest of growth had taken place at the upper epiphysis of the tibia or the lower epiphysis of the femur. The narrowness and peculiar depth of Scott's head point to some more general congenital error of bone-making allied to rickets but certainly not the same as that malady. The vault of the skull is the typical 'scaphoid' or boat-shaped formation, due to premature union of the two parietal bones along the sagittal suture. When the bones of the cranium are universally affected with that arrest of growth along their formative edges, the sutures become prematurely fixed and effaced, so that the brain-case cannot expand in any direction to accommodate the growing brain. This universal synostosis of the cranial bones is what occurs in the case of microcephalous idiots. It happened to me to show to an eminent French anthropologist a specimen of a miniature or micro- cephalic skull preserved in the Cambridge museum of anatomy ; the French savant, holding up the skull and pointing to the ' scaphoid' vault of the crown and the effaced sagittal suture, exclaimed ' Voila Walter Scott!' Scott had

fortunately escaped the early closure or arrest of growth at other cranial sutures than the sagittal, so that the growing brain could make room for itself by forcing up the vault of the skull bodily. When his head was opened after death, it was observed that 'the brain was not large, and the cranium thinner than it is usually found to be.' In favour of the theory of congenital liability it has to be said that he was the ninth of a family of whom the first six died in 'very early youth,'"

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he was able to define himself as 'a virtuoso," "one who wishes to and will know everything." At ten his collec- tion of chap-books and ballads had reached several volumes, and he was a connoisseur in various readings. Thus he took to the High School, Edinburgh, when he was strong enough to be put in regular attendance, an unusual store of miscellaneous knowledge and an unusually quickened intelligence, so that his master "pronounced that, though many of his schoolfellows understood the Latin better, Gualterus Scott was behind few in following and enjoying the author's meaning."

Throughout his school days and afterwards when he was apprenticed to his father, attended university classes, read for the bar, took part in academical and professional debating societies, Scott steadily and ardently pursued his own favourite studies. His reading in romance and history was really study, and not merely tle indulgence of an ordinary schoolboy's promiscuous appetite for excit- ing literature. In fact, even as a schoolboy he special- ized. He followed the line of overpowering inclination ; and even then, as he frankly tells us, "fame was the spur." He acquired a reputation among his schoolfellows for out-of-the-way knowledge, and also for story-telling, and he worked hard to maintain this character, which compensated to his ambitious spirit his indifferent distinc- tion in ordinary school-work. The youthful ' virtuoso," though he read ten times the usual allowance of novels from the circulating library, was carried by his enthusiasm into fields much less generally attractive. He was still a schoolboy when he mastered French sufficiently well to read through collections of old French romances, and not more than fifteen when, attracted by translations to Italian romantic literature, he learnt the language in order to read Dante and Ariosto in the

original. This willingness to face dry work in the pursuit of romantic reading affords a measure of the strength of Scott's passion. In one of the literary parties brought together to lionize Burns, when the peasant poet visited Edinburgh, the boy of fifteen was the only member of the company who could tell the source of some lines affixed to a picture that had attracted the poet's attention,—a slight but significant evidence both of the width of his reading and of the tenacity of his memory. The same thoroughness appears in another little circumstance. He took an interest in Scottish family history and genealogy, but, not content with the ordinary sources, he ransacked the MSS. preserved in the Advocates' Library. By the time he was one and twenty he had acquired such a reputation for his skill in deciphering old manuscripts that his assistance was sought by professional antiquaries.

This early, assiduous, unintermittent study was the main secret, over and above his natural gifts, of Scott's extempore speed and fertility when at last he found forms into which to pour his vast accumulation of historical and romantic lore. He was, as he said himself, "like an ignorant gamester who keeps up a good hand till he knows how to play it." That he had vague thoughts from a much earlier period than is commonly supposed of playing the hand some day is extremely probable, if, as he tells us, the idea of writing romances first occurred to him when he read Cervantes in the original. This was long before he was out of his teens; and, if we add that his leading idea in his first novel was to depict a Jacobitic Don Quixote, we can see that there was probably a long interval between the first conception of Waverley and the ultimate completion.

Scott's preparation for painting the life of past times was probably much less unconsciously such than his equally thorough preparation for acting as the painter of Scottish manners and character in all grades of society. With all

the extent of his reading as a schoolboy and a young man he was far from being a cloisteral student, absorbed in his books. In spite of his lameness

and his serious illnesses in youth, his constitution was naturally robust, his dis- position genial, his spirits high: he was always well to the front in the fights and frolics of the High School, and a boon companion in the "high jinks" of the junior bar. The future novelist's experience of life was singularly rich and varied. While he lived the life of imagination and scholarship in sympathy with a few choice friends, he was brought into intimate daily contact with many varieties of real life. At home he had to behave as became a member of a Puritanic, somewhat ascetic, well-ordered Scottish household, subduing his own inclinations towards a more graceful and comfortable scheme of living into outward con- formity with his father's strict rule. Through his mother's family he obtained access to the literary society of Edin- burgh, at that time electrified by the advent of Burns, full of vigour and ambition, rejoicing in the possession of not a few widely known men of letters, philosophers, historians, novelists, and critics, from racy and eccentric Monboddo to refined and scholarly Mackenzie. In that society also he may have found the materials for the manners and characters of St Honan's Well, From any tendency to the pedantry of over-culture he was effectually saved by the rougher and manlier spirit of his professional comrades, who, though they respected belles lettres, would not tolerate anything in the shape of affectation or senti- mentalism. The atmosphere of the Parliament House (the Westminster Hall of Edinburgh) had considerable influence on the tone of Scott's novels. His peculiar humour as a story-teller and painter of character was first developed among the young men of his own standing at the bar. They were the first mature audience on which he experi- mented, and seem often to have been in his mind's eye when he enlarged his public. From their mirthful com- panionship by the stove, where the briefless congregated to discuss knotty points in law and help one another to enjoy the humours of judges and litigants, '"' Duns Scotus " often stole away to pore over old books and manuscripts in the library beneath ; but as long as he was with them he was first among his peers in the art of providing enter- tainment. It was to this market that Scott brought the harvest of the vacation rambles which it was his custom to make every autumn for seven years after his call to the bar and before his marriage. He scoured the country in search of ballads and other relics of antiquity; but he found also and treasured many traits of living manners, many a lively sketch and story with which to amuse the brothers of "the mountain" on his return. His staid father did not much like these escapades,

and told him bitterly that he seemed fit for nothing but to be a " gangrel scrape-gut." But, as the companion of "his Liddesdale raids" happily put it, "he was makin' himsell a' the time, but he didna ken maybe what he was about till years had passed: at first he thought o' little, I daresay, but the queerness and the fun."

We may as well dispose at once of Scott's professional career. His father intended him originally to follow his own business, and he was apprenticed in his sixteenth year; but he preferred the upper walk of the legal profession, and was admitted a member of the faculty of advocates in 1792. He seems to have read hard at law for four years at least, but almost from the first to have limited his ambition to obtaining some comfortable appointment such as would leave him a good deal of leisure for literary pursuits. In this he was not disappointed. In 1799 he obtained the office of sheriff-depute of Selkirk- shire, with a salary of £300 and very light duties. In 1806 he obtained the reversion of the office of clerk of

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session. It is sometimes supposed, from the immense amount of other work that Scott accomplished, that this office was a sinecure. But the duties, which are fully described by Lockhart, were really serious, and kept him hard at fatiguing work, his biographer estimates, for at least three or four hours daily during six months out of the twelve, while the court was in session. He discharged these duties faithfully for twenty-five years, during the height of his activity as an author. He did not enter on the emoluments of the office till 1812, but from that time he received from the clerkship and the sheriffdom combined an income of £1600 a year, being thus enabled to act in his literary undertakings on his often-quoted maxim that "literature should be a staff and not a crutch."

Scott's profession, in addition to supplying him with a competent livelihood, supplied him also with abundance of opportunities for the study of men and manners. Char- acters of all types and shades find their way into courts of law. The wonder is that so much technical drudgery did not crush every particle of romance out of him; but such was the elasticity and strength of his powers that this daily attendance at the transaction of affairs in open court face to face with living men—under a strain of attention that would

have exhausted an ordinary man's allowance of energy—seems rather to have helped him in giving an atmosphere of reality to his representations of the life of the past.

It was not, however, as a prose writer that he was first to make a reputation. The common notion is that Scott, having made a reputation as a poet, was led to attempt romances in prose by a chance impulse, hitting upon the new vein as if by accident. The truth seems rather to be that, as it is his prose romances which give the fullest measure of his genius, so the greater part of his early life was @ conscious or unconscious preparation for writing them ; whereas his metrical romances, in every way slighter and less rich and substantial, were, comparatively speak- ing, a casual and temporary deviation from the main pur- pose of his life. According to his own account, he was led to adopt the medium of verse by a series of accidents. The story is told by himself at length and with his customary frankness and modesty in the Essay on Imita- toons of the Ancient Ballad, prefixed to the 1830 edition of his Border Minstrelsy, and in the 1830 introduction to the Lay of the Last Minstrel. The first link in the chain was a lecture by Henry Mackenzie on German literature, delivered in 1788. This apprized Scott, who was then a legal apprentice and an enthusiastic student of French and Italian romance, that there was a fresh development of romantic literature in German. As soon as he had the burden of preparation for the bar off his mind he learnt German, and was profoundly excited to find a new school founded on the serious study of a kind of literature his own devotion to which was regarded by most of his com- panions with wonder and ridicule. We must remember always that Scott quite as much as Wordsworth created the taste by which he was enjoyed, and that in his early days he was half-ashamed of his romantic studies, and pursued them more or less in secret with a few intimates. While he was in the height of his enthusiasm for the new German romance, Mrs Barbauld visited Edinburgh, and recited an English translation of Biirger's Lenore. Scott heard of it from a friend, who was able to repeat two lines— .

‘ Tramp, tramp, across the land they speed ; Splash, splash, across the sea !” The two lines were enough to give Scott a new ambition. He could write such poetry himself! The impulse was strengthened by his reading Lewis’s Afonk and the ballads in the German manner interspersed through the work. He hastened to procure a copy of Biirger, at once executed*

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translations of several of his ballads, published two of them in a thin quarto in 1796 (his ambition being perhaps quickened by the unfortunate issue of a love affair), and was much encouraged by the applause of his friends. Soon after he met Lewis personally, and his ambition was con- firmed. ‘Finding Lewis,” he says, “in possession of so much reputation, and conceiving that if I fell behind him in poetical powers, I considerably exceeded him in general information, I suddenly took it into my head to attempt the style of poetry by which he had raised himself to fame.” Accordingly, he composed Glenjinlas, The Hve of St John, and the Gray Brother, which were published in Lewis’s collection of Zales of Wonder. But he soon be- came convinced that “the practice of ballad-writing was out of fashion, and that any attempt to revive it or to found a poetical character on it would certainly fail of success.” His study of Goethe’s Gotz von Berlichingen, ot which he published a translation in 1799, gave him wider ideas. Why should he not do for ancient Border manners what Goethe had done for the ancient feudalism of the Rhine? He had been busy since his boyhood collecting Seottish Border ballads and studying the minutest details of Border history. He began to cast about for a form which should have the advantage of novelty, and a subject which should secure unity of composition. He was en- gaged at the time preparing a collection of the Minstrelsy of the Scottish Border, The first instalment was published in 1802; it was followed by another next year, and by an edition and continuation of the old romance of Sir Tristram ; and Scott was still hesitating about subject and form for a large original work. It seems probable from a conversa- tion recorded by Gillies that he might have ended by casting his meditated picture of Border manners in the form of a prose romance. But chance at last threw in his way both a suitable subject anda suitable metrical vehicle. He had engaged all his friends in the hunt for Border ballads and legends. Among others, the

countess of Dal- keith, wife of the heir-apparent tothe dukedom of Buccleuch, interested herself in the work. Happening to hear the legend of a tricksy hobgoblin named Gilpin Horner, she asked Scott to write a ballad about it. He agreed with delight, and, out of compliment to the lady who had given this command to the bard, resolved to connect it with the house of Buccleuch. The subject grew in his fertile imagination, till incidents enough had gathered round the goblin to furnish a framework for his long-designed picture of Border manners. Chance also furnished him with a hint for a novel scheme of verse. Coleridge's fragment of Christabel, though begun in 1797—when he and Words- worth were discussing on the Quantock Hills the prin- ciples of such ballads as Scott at the same time was recit- ing to himself in his gallops on Musselburgh sands—was not published till 1816. But a friend of Scott's, Sir John Stoddart, had met Coleridge in Malta, and had carried home in his memory enough of the unfinished poem to convey to Scott that its metre was the very metre of which he had been in search. Scott introduced still greater variety into the four-beat couplet ; but it was to Christabel that he owed the suggestion, as one line borrowed whole and many imitated rhythms testify.

The Lay of the Last Minstrel appeared in January 1805, and at once became widely popular. It sold more rapidly than poem had ever sold before. Scott was astonished at lis own success, although he expected that " the attempt to return to a more simple and natural style of poetry was likely to be welcomed." Many things contributed to the extraordinary demand for the Lay. First and foremost, no doubt, we must reckon its simplicity. After the abstract themes and abstruse, elaborately allusive style of the 18th century, the public were glad of verse that

could be read with ease and even with exhilaration, verse in which a simple interesting story was told with brilhant energy, and simple feelings were treated not as isolated themes but as incidents in the lives of individual men and women, The thought was not so profound, the lines were not so polished, as in The Pleasures of Memory or

The Pleasures of Hope, but the "light-horseman sort of

stanza" carried the reader briskly over a much more diversified country, through boldly outlined and strongly coloured scenes. you had not to keep

attention on the stretch or pause and construe laboriously before you could grasp the writer's meaning or enter into his artfully condensed

No stanza required a second reading ;

sentiment. To remember the pedigrees of all the Scotts, or the names of all the famous chiefs and hardy retainers "whose gathering word was Bellenden," might have re- quired some effort, but only the conscientious reader need

care to make it. The only puzzle in the Lay was the goblin page, and the general reader was absolved from all trouble about him by the unanimous declaration of the

critics, led by Jeffrey in the Edinburgh Reve, that he

was a grotesque excrescence, in no way essential to the

story. It is commonly taken for granted that Scott acquiesced in this judgment, his politely ironic letter to Miss Seward being quoted as conclusive. This is hardly

fair to the poor goblin, seeing that his story was the germ of the poem and determines its whole structure ; but it is a tribute to the lively simplicity of the Lay that few people should be willing to take the very moderate amount of pains necessary to see the goblin's true position in the action. risky innovation. conservative reformer, careful not to offend established traditions. bellion, as Wordsworth had done, against the great artistic canon of the classical school

The supernatural element was Scott's most For the rest, he was a cautious and

He was far from raising the standard of re-

"True art is nature to advantage dressed."

To "engraft modern refinement on ancient simplicity," to preserve the energy of the old ballad without its rudeness

and bareness of poetic ornament, was Scott's avowed aim. He adhered to the poetic diction against which Words-

worth protested. His rough Borderers are "dressed to

advantage" in the costume of romantic chivalry. The baronial magnificence of Branksome, Deloraine's " shield and jack and acton," the elaborate ceremony of the com- bat between the pseudo-Deloraine and Musgrave, are concessions to the taste of the 18th century. Further, he disarmed criticism by putting his poem into the mouth of an ancient minstrel, thus pictorially emphasizing the fact that it was an imitation of antiquity, and provid- ing a scapegoat on whose back might be laid any remain- ing sins of rudeness or excessive simplicity. And, while imitating the antique romance, he was careful not to smitate its faults of rambling, discursive, disconnected structure. He was scrupulously attentive to the classical unities of time, place, and action. The scene never changes from Branksome and its neighbourhood ; the time occupied by the action (as he pointed out in his preface) is three nights and three days; and, in spite of all that critics have said about the superfluity of the goblin page, ++ ig not difficult to trace unity of intention and regular progressive development in the incidents.

The success of the Lay decided finally, if it was not decided already, that literature was to be the main busi- ness of Scott's life, and he proceeded to arrange his affairs accordingly. It would have been well for his comfort, if not for his fame, had he adhered to his first plan, which was to buy a small mountain-farm near Bowhill, with the proceeds of some property left to him by an uncle, and

divide his year between this and Edinburgh, where he had good hopes, soon afterwards realized, of a salaried appointment in the Court of Session. This would have given him ample leisure and seclusion for literature, while his private means and official emoluments secured him against dependence on his pen. He would have been laird as well as sheriff of the cairn and the scaur, and as aman of letters his own master. Since his marriage in 1/97 with Miss Charpentier, daughter of a French refugee, his chief residence had been at Lasswade, about six miles from Edinburgh. But on a hint from

the lord- lieutenant that the sheriff must live at least four months in the year within his county, and that he was attending more closely to his duties as quartermaster of a mounted company of volunteers than was consistent with the proper discharge of his duties as sheriff, he had moved his household in 1804 to Ashestiel. When his uncle's bequest fell in, he determined to buy a small property on the banks of the Tweed within the limits of his sheriffdom, There, within sight of Newark Castle and Bowhill, he proposed to live like his ancient minstrel, as became the bard of the clan, under the shadow of the great ducal head of the Scotts. But this plan was deranged by an accident. It so happened that an old schoolfellow, James Jallantyne, a printer in Kelso, whom he had already be- friended, transplanted to Edinburgh, and furnished with both work and money, applied to him for a further loan. Scott declined to lend, but offered to join him as sleeping partner. Thus the intended purchase money of Broad-meadows became the capital of a printing concern, of which by degrees the man of letters became the over- wrought slave, milch-cow, and victim.

When the Lay was off his hands, Scott's next literary enterprise was a prose romance—a confirmation of the argument that he did not take to prose after Byron had 'et him," as he put it, in verse, but that romance writing was a long-cherished purpose. He began Waverley, but a friend to whom he showed the first chapters—which do not take Waverley out of England, and describe an educa-

tion in romantic literature very much like Scott's own—

not unnaturally decided that the work was deficient in interest and unworthy of the author of the Lay. Scott accordingly laid Waverley aside. ture that he would not have been go easily diverted had he not been occupied at the time with other heavy publish-

ing enterprises calculated to bring grist to the printing

establishment. His active brain was full of projects for

big editions, which he undertook to carry through on con-

dition that the printing was done by Ballantyne & Co., the "Co." being kept a profound secret, because it might have injured the lawyer and poet professionally and socially to be known as partner in a commercial concern, Between 1806 and 1812, mainly to serve the interests of the firm, though of course the work was not in itself unattractive to him, Scott produced his elaborate editions of Dryden, Swift, the Somers Tracts, and the Sadler State papers. Incidentally these laborious tasks contributed to his pre- paration for the main work of his life by extending his knowledge of English and Scottish history.

Marmion, begun in November 1806 and published in February 1808, was written as a relief to "' graver cares," though in this also he aimed at combining with a romantic story a solid picture of an historical period. It was even more popular than the Lay. Scott's resuscitation of the four-beat measure of the old "gestours" afforded a signal proof of the justness of their instinct in choosing this vehicle for their recitations, The four-beat lines of Mar- mton took possession of the public like a kind of madness : they not only clung to the memory but they would not keep off the tongue: people could not help spouting them

We may fairly conjec-

for a good defence of these introductions.

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in solitary places and muttering them as they walked about the streets, have been offended by the pronounced politics of the poet, were on the whole better pleased than with

The critics, except J effrey, who may

the Lay.

Their chief complaint was with the "introductions" to the various cantos, which were objected to as vexatiously

breaking the current of the story.!

The triumphant success of Marmion, establishing him as facile princeps among living poets, gave Scott such a heeze, to use his own words, "as almost lifted him off his feet." He touched then the highest point of prosperity and happiness. Presently after, he was irritated and tempted by a combination of little cireumstances into the great blunder of his life, the establishment of the publish- ing house of John Ballantyne & Co. A coolness arose between him and Jeffrey, chiefly on political but partly also on personal grounds. They were old friends, and Scott had written many articles for the Renew, but its political attitude at this time was intensely unsatisfactory to Scott. To complete the breach, J effrey reviewed Mar- mon in a hostile spirit. A quarrel occurred also between Scott's printing firm and Constable, the publisher, who had been the principal feeder of its press. Then the tempter appeared in the shape of Murray, the London publisher, anxious to secure the services of the most popular littérateur of the day. The result of negotiations was that Scott set up, in opposition to Constable, "the crafty," "the grand Napoleon of the realms of print," the publishing house of John Ballantyne & Co., to be managed by a dissipated and swaggering little tailor, whom he nicknamed "Rigdumfunnidos" for his talents as a mimic and low comedian. Scott interested himself warmly in starting the Quarterly Review, and in return Murray constituted Ballantyne & Co. his Edinburgh agents. Scott's trust in Rigdumfunnidos and his brother, '" Aldiborontiphos- cophornio," and in his own power to supply all their defi- ciencies, is as strange a piece of infatuation as any that ever formed a theme for romance or tragedy. Their devoted attachment to the architect of their fortunes and proud confidence in his powers helped forward to the catastrophe, for whatever Scott recommended they agreed to, and he was too immersed in multifarious literary work and pro- fessional and social engagements to have time for cool examination of the numerous rash speculative ventures into which he launched the firm.

The Lady of the Lake (May 1810) was the first great publication by the new house. It was received with enthusiasm, even Jeffrey joining in the chorns of applause. It made the Perthshire Highlands fashionable for tourists, and raised the post-horse duty in Scotland. But it did not make up to Ballantyne & Co. for their heavy invest- ments in unsound ventures. The Edinburgh Annual register, meant as a rival to the Edinburgh Review, though Scott engaged Southey to write for it and wrote for it largely himself, proved a

failure. In a very short time the warehouses of the firm were filled with unsaleable stock. By the end of three years Scott began to write to his partners about the propriety of "reefing sails." But apparently he was too much occupied to look into the accounts of the firm, and, so far from understanding the real state of their affairs, he considered himself rich enough to make his first purchase of land at Abbotsford. But he had hardly settled there in the spring of 1812, and begun his schemes for building and planting and converting a bare moor into a richly wooded pleasaunce, than his business troubles began, and he found himself harassed by fears of bankruptcy. Rigdumfunnidos concealed the situation as

1 See Mr Hutton's Scott, in English Men of Letters Series, p. 56,

Scott advertised them originally as a separate publication.

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long as he could, but as bill after bill came due he was obliged to make urgent application to Scott, and the truth was thus forced from him item by item. He had by no means revealed all when Scott, who behaved with admir- able good-nature, was provoked into remonstrating, " For heaven's sake, treat me as a man and not as a milch-cow." The proceeds of Rokeby (January 1813) and of other labours of Scott's pen were swallowed up, and bankruptcy was inevitable, when Constable, still eager at any price to secure Scott's services, came to the rescue. With his help three crises were tided over in 1813.

It was in the midst of these ignoble embarrassments that Scott opened up the rich new vein of the Waverley novels. He chanced upon the manuscript of the opening chapters of Waverley, and resolved to complete the story. Four weeks in the summer of 1814 sufficed for the work, and Waverley appeared without the author's name in July. Many plausible reasons might be given and have been given for Scott's resolution to publish anonymously. The quaintest reason, and possibly the main one, though it is hardly intelligible now, is that given by Lockhart, that he considered the writing of novels beneath the dignity of a grave clerk of the Court of Session. Why he

kept up the mystification, though the secret was an open one to all his Edinburgh acquaintances, is more easily understood. He enjoyed it, and his formally initiated coadjutors enjoyed it; it relieved him from the annoyances of foolish compli- ment; and it was not unprofitable,—curiosity about " the Great Unknown" keeping alive the interest in his works. The secret was so well kept by all to whom it was de- finitely entrusted, and so many devices were used to throw conjecture off the scent, that even Scott's friends, who were certain of the authorship from internal evidence, were occasionally puzzled. He kept on producing in his own name as much work as seemed humanly possible for an official who was to be seen every day at his post and as often in society as the most fashionable of his professional brethren. His treatises on chivalry, romance, and the drama, besides an elaborate work in two volumes on Border antiquities, appeared in the same year with Waverley, and his edition of Swift in nineteen volumes in the same week. The Lord of the Isles was published in January 1815; Guy Mannering, written in "six weeks about Christmas," in February ; Paul's Letters to his Kinsfolk and The Field of Waterloo in the same year. Harold the Dauntless,! not to mention the historical part of the Annual Register, appeared in the same year with The Antiquary, The black Dwarf, and Old Mortality (1816). No wonder that the most positive interpreters of internal evidence were mystified. It was not as if he had buried himself in the country for the summer half of the year. On the contrary, he kept open house at Abbotsford in the fine old feudal fashion and was seldom without visitors. His own friends and many strangers from a distance, with or without introductions, sought him there, and found a hearty hospitable country laird, entirely occupied to all outward appearance with local and domestic business and sport, building and plant- ing, adding wing to wing, acre to acre, plantation to plantation, with just leisure enough for the free-hearted entertainment of his guests and the cultivation of friendly relations with his humble neighbours. How could such a man find time to write two or three novels a year, besides what was published in his own name? Even the few intimates who knew how early he got up to prepare his packet for the printer, and had some idea of the extra- ordinary power that he had acquired of commanding his faculties for the utilization of odd moments, must have

1 This poem, like the Bridal of Triermain, did not bear his name on the title-page, but the authorship was an open secret, although he tried to encourage

the idea that the author was his friend Erskine,

wondered at times whether he had not inherited the arts of his ancestral relation Michael Scot, and kept a goblin in some retired attic or vault.

Scott's fertility is not absolutely unparalleled ; the late Mr Trollope claimed to have surpassed him in rate as well as total amount of production, having also business duties to attend to. But in speed of production combined with variety and depth of interest and weight and accuracy of historical substance Scott is still unrivalled. On his claims as a serious historian, which Carlyle ignored in his curiously narrow and splenetic criticism, he was always, with all his magnanimity, peculiarly sensitive. A certain feeling that his antiquarian studies were undervalued seems to have haunted him from his youth. It was probably this that gave the sting to Jefirey's criticism of Marmion, and that tempted him to the somewhat questionable pro- ceeding of reviewing his own novels in the Quarterly upon the appearance of Old Mortality. He was nettled besides at the accusation of having treated the Covenanters un- fairly, and wanted to justify himself by the production of historical documents. In this criticism of himself Scott replied lightly to some of the familiar objections to his work, such as the feebleness of his heroes, Waverley, Ber- tram, Lovel, and the melodramatic character of some of his scenes and characters. But he argued more seriously against the idea that historical romances are the enemies of history, and he rebutted by anticipation Carlyle's ob- jection that he wrote only to amuse idle persons who like to lie on their backs and read novels. His apologia is worth quoting. Historical romances, he admits, have always been failures, but the failure has been due to the imperfect knowledge of the writers and 'not to the species of composition. If, he says, anachronisms in manners can be avoided, and "the features of an age gone by can be recalled in a spirit of delineation at once faithful and striking, . . . the composition itself is in every point of view dignified and improved; and the author, leaving the light and frivolous associates with whom a careless observer would be disposed to ally him, takes his seat on the bench of the historians of his time and country. In this proud assembly, and in no mean place of it, we are disposed to rank the author of these works. At once a master of the great events and minute incidents of history, and of the manners of the times he celebrates, as distin- guished from those which now prevail, the intimate thus of the

living and of the dead, his judgment enables him to separate those traits which are characteristic from those that are generic; and his imagination, not less accurate and discriminating than vigorous and vivid, presents to the mind of the reader the manners of the times, and in- troduces to his familiar acquaintance the individuals of the drama as they thought and spoke and acted." This defence of himself shows us the ideal at which Scott aimed, and which he realized. He was not in the least unconscious of his own excellence. He did not hesitate in this review to compare himself with Shakespeare in – respect of truth to nature. 'The volume which this author has studied is the great book of nature. He has gone abroad into the world in quest of what the world will certainly and abundantly supply, but what a man of great discrimination alone will find, and a man of the very highest genius will alone depict after he has discovered it. The characters of Shakespeare are not more exclusively human, not more perfectly men and women as they live and move, than those of this mysterious author."

The immense strain of Scott's double or quadruple life as sheriff and clerk, hospitable laird, poet, novelist, and mis- cellaneous man of letters, publisher and printer, though the prosperous excitement sustained him for a time, soon told upon his health. Early in 1817 began a series of

attacks of agonizing cramp of the stomach, which recurred at short intervals during more than two years. But his appetite and capacity for work remained unbroken. He made his first attempt at play-writing} as he was recover- ing from the first attack ; before the year was out he had completed /ob Hoy, and within six months it was followed by The Heart of Midlothian, which by general consent occupies the highest rank among his novels. The Bride of Lammermoor, The Legend of Montrose, and Ivanhoe were dictated to amanuenses, through fits of suffering so acute that he could not suppress cries of agony. Still he would not give up. When Laidlaw begged him to stop dictating he only answered, "Nay, Willie, only see that the doors are fast. I would fain keep all the cry as well as the wool to ourselves ; but as to giving over work, that can only be when I am in woollen."

“Throughout those two years of intermittent ill-health, which was at one time so serious that his life was despaired of and he took formal leave of his family, Scott’s semi- public life at Abbotsford continued as usual,—swarms of visitors coming and going, and the rate of production on the whole suffering no outward and visible check, all the world wondering at the novelist’s prodigious fertility. Mr Ruskin lately put forward the opinion that there is a distinct falling off in the quality of Scott’s work traceable from the time of his first serious illness, arguing as a proof of the healthiness of Scott’s organization that “he never gains anything by sickness; the whole man breathes or faints as one creature ; the ache that stiffens a limb chills his heart, and every pang of the stomach paralyses the brain.” Yet, when the world was not aware of the state of the novelist’s health, and novel after novel was received without any abatement of enthusiasm, but rather with growing wonder and admiration, no critic was acute enough to detect this, and it is somewhat unfortunate for the theory that Mr Ruskin has mistaken the date of Scott’s first illness and included among the masterpieces produced in perfect health Rob Roy and The Heart of Midlothian, both composed through recurrent fits of intense bodily pain. The first of the series concerning which there were murmurs of dissatisfaction was The Monastery, which was the first completed after the re-establishment of the author’s bodily vigour. The failure, such as it was, was due rather to the subject than the treatment, and The Abbot, in which Mary Queen of Scots is introduced, was generally hailed as fully sustaining the reputation of “the Great Unknown.” Kenilworth, The Pirate, The Fortunes of Nigel, Peveril of the Peak, Quentin Durward, St Ronan’s Well, fedgauntlet, followed in quick succession in the course of three years, and it was not till the last two were reached that the ery that the author was writing too fast began to gather volume. S¢ Ronan’s Well was very severely criticized and condemned. And yet Mr Leslie Stephen tells a story of a dozen modern connoisseurs in the Waverley novels who agreed that each should write down separately the name of his favourite novel, when it appeared that each had without concert named St Ronan’s Well. There is this certainly to be said for St Ronan’s, that, in spite of the heaviness of some of the scenes at the “hottle” and the artificial melodramatic character of some of the personages, none of Scott’s stories is of more absorbing or more bril- hantly diversified interest. Contradictions between con- temporary popular opinion and mature

critical judgment, as well as diversities of view among critics themselves, rather shake confidence in individual judgment on the rr ee eee ae

1 The Doom of Devorgoil. This and his subsequent dramatic sketches, Macduff's Cross, Halidon Hill, and The Ayrshire Tragedy, were slight compositions, dashed off in a few days, and afford no measure of what

Scott might have done as a dramatist if he had studied the conditions of stage representation.

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vexed but not particularly wise question which is the best of Scott's novels. There must, of course, always be in- equalities in.a series so prolonged. The author cannot always be equally happy in his choice of subject, situation, and character. Naturally also he dealt first with the subjects of which his mind was fullest. But any theory" of falling off or exhaustion based upon plausible general considerations has to be qualified so much when brought into contact with the facts that very little confidence can be reposed in its accuracy. Zhe Fortunés of Nigel comes comparatively late in the series and has often been blamed for its looseness of construction. Scott himself always spoke slightingly of his plots, and humorously said that he proceeded on Mr Bayes's maxim, "What the deuce is a plot good for but to bring in good things?" Yet so com- petent a critic as Mr Hutton has avowed that on the whole he prefers The Lortunes of Nigel to any other of Scott's novels, An attempt might be made to value the novels according to the sources of their materials, according as they are based on personal observation, documentary history, or previous imaginative literature. On this prin- ciple Ivanhoe and The Tales of the Crusaders might be adjudged inferior as being based necessarily on previous romance. But as a matter of fact Scott's romantic char- acters are vitalized, clothed with a verisimilitude of life, out of the author's deep, wide, and discriminating know- — ledge of realities, and his observation of actual life was coloured by ideals derived from romance. He wrote all his novels out of a mind richly stored with learning of all kinds, and in the heat of composition seems to have drawn from whatever his tenacious memory supplied to feed the fire of imagination, without pausing to reflect upon the source, He did not exhaust

his accumulations from one source first and then turn to another, but from first to last drew from all as the needs of the occasion happened to suggest.

Towards the close of 1825, after eleven years of brilliant and prosperous labour, encouraged by constant tributes of admiration, homage, and affection such as no other literary potentate has ever enjoyed, realizing his dreams of baronial splendour and hospitality on a scale suited to his large literary revenues, Scott suddenly discovered that the foundations of his fortune were unsubstantial. He had imagined himself clear of all embarrassments in 1818, when all the unsaleable stock of John Ballantyne & Co. was bargained off by Rigdum to Constable for Waverley copyrights, and the publishing concern was wound up. Apparently he never informed himself accurately of the new relations of mutual accommodation on which the print- ing firm then entered with the great but rashly speculative publisher, and drew liberally for his own expenditure against the undeniable profits of his novels without asking any questions, trusting blindly in the solvency of his com- mercial henchmen. Unfortunately, "lifted off their feet " by the wonderful triumphs of their chief, they thought themselves exempted like himself from the troublesome duty of inspecting ledgers and balancing accounts, till the crash came. From a diary which Scott began a few days before the first rumours of financial difficulty reached him we know how he bore from day to day the rapidly unfolded prospect of unsuspected liabilities. "Thank God," was his first reflexion, "I have enough to pay more than 20s. in the pound, taking matters at the worst." But a few weeks revealed the unpleasant truth that, owing to the way in which Ballantyne & Co. were mixed up with Con- stable & Co., and Constable with Hurst & Robinson, the failure of the London house threw upon hini personal responsibility for £130,000.

How Scott's pride rebelled against the dishonour of bankruptcy, how he toiled for the rest of his life to clear

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off this enormous debt, declining all offers of assistance and asking no consideration from his creditors except time, and how nearly he succeeded,

is one of the most familiar chapters in literary history, and would be one of the saddest were it not for the heroism of the enterprise. His

- wife died soon after the struggle began, and he suffered

other painful bereavements ; but, though sick at heart, he toiled on indomitably, and, writing for honour, exceeded even his happiest days in industrious speed. If he could have maintained the rate of the first three years, during which he completed Woodstock, three Chronicles of the Canongate, The Fair Maid of Perth, Anne of Geverstem, the Life of Napoleon (involving much research, and equal in amount to thirteen novel volumes), part of his History of Scotland, the Scottish series of Tales of a Grandfather, besides several magazine articles, some of them among the most brilliant of his miscellaneous writings, and prefaces and notes to a collected edition of his novels,—if he could have continued at this rate he might soon have freed him- self from all hig encumbrances. The result of his exertions from January 1826 to January 1828 was nearly £40,000 for his creditors. But the terrific labour proved too much even for his endurance. Ugly symptoms began to alarm his family in 1829, and in February of 1580 he had lis first stroke of paralysis. Still he was undaunted, and not all the persuasions of friends and physicians could induce him to take rest. "During 1830," Mr Lockhart says, "he covered almost as many sheets with his MS. as in 1829," the new introductions to a collected edition of his poetry and the Letters on Demonology and Witchcraft being amongst the labours of the year. He had a slight touch of apoplexy in November and a distinct stroke of paralysis in the following April; but, in spite of these warnings and of other bodily ailments, he had two more novels, Count Robert of Paris and Castle Dangerous, ready for the press by the autumn of 1831. He would not yield to the solicitations of his friends and consent to try rest and a change of scene, till fortunately, as his mental powers failed, he became possessed of the idea that all his debts were at last paid and that he was once more a free man. In this belief he happily remained till his death. When it was known that his physicians recommended a sea voyage for his health, a Government vessel was put at his disposal, and he cruised about in the Mediterranean and visited places of interest for the greater part of a year before his death. But, when he felt tliat the end was near, he insisted on being carried across Europe that he might die on his beloved

Tweedside at Abbotsford, where he expired on 21st September 1832. He was buried at Dryburgh Abbey on 26th September following.

A complete list of Scott's works is given in the Catalogue of Scott Exhibition, 1871, Edinburgh, 1872. The standard biography of Scott is that by Lockhart referred to above; see also Allan, Life of Scott, Edinburgh, 1834.

SCOTT, Wittram. See Srowett, Lorp.

SCOTT, Wryrietp (1786-1866), American general, was born near Petersburg, Virginia, 13th June 1786, the grandson of a Scottish refugee from the field of Culloden. He was a student at William and Mary College in 1805, and was admitted to the bar at Rich- mond, Virginia, in 1807. One of the sudden war excite- ments of the time changed the course of his life, and he obtained a captain's commission in the United States army in 1808. He served on the Niagara frontier throughout the war of 1812-15, and became one of its leading figures, rising rapidly through all the grades of the service to that of major-general, which was then the highest. Among other curious testimonials to his valour and conduct, he received from Princeton College in 1814 the honorary degree of doctor of laws, a distinction on

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which he never ceased to look with peculiar satisfaction. In 1841 he became the senior major-general of the army, and in 1855, after he had passed out of political life, the exceptional grade of lieutenant-general was created for him. His most noteworthy military achievement was his conduct of the main campaign against Mexico in 1847. Landing (9th March) at Vera Cruz with but 5500 men, he fought his way through a hostile country to the capital city of Mexico, which he captured 14th September, thereby practically ending the war. His service, however, was not confined to the army ; from 1815 until 1861 he was the most continuously prominent public man of the country, receiving and justifying every mark of public confidence in his integrity, tact, and reasonableness. At a time (1823) when duelling was almost an imperative duty of an officer, he resisted successfully the persistent efforts of a brother officer (Andrew Jackson) to force him into a

combat ; and the simple rectitude of his intentions was so evident that he lost no ground in public estimation. In 1832, when ordered to Charleston by President Jackson during the "nullification" troubles, he secured every advan- tage. for the Government, while his skilful and judicious conduct gave no occasion to South Carolina for an out- break. In like manner, in the Black Hawk Indian troubles of 1832-33, in the Canadian " Patriot War" of 1837-38, in the boundary dispute of 1838 between Maine and New Brunswick, in the San Juan difficulty in 1859, wherever there was imminent danger of war and a strong desire to keep the peace, all thoughts turned instinctively to Scott as a fit instrument of an amicable settlement, and his success always justified the choice. Such a career seemed a gateway to political preferment, and his position was strengthened by the notorious fact that, as he was a Whig, the Democratic administration had persistently tried to subordinate his claims to those of officers of its own party. In 1852 his party nominated him for the presi- dency; but, though his services had been so great and his capacity and integrity were beyond question, he had other qualities which counted heavily against him. He was easily betrayed into the most egregious blunders of speech and action, which drew additional zest from his portly and massive form and a somewhat pompous cere- moniousness of manner. He destroyed his chances of election in the North. The Southern Whigs, believing him to be under the influence of the Seward or anti-slavery wing of the party, cast no strong vote for him, and he was overwhelmingly defeated in both sections, completing the final overthrow of his party. In 1861 he remained at the head of the United States armies, in spite of the secession of his State, until November, when he retired on account of old age and infirmities. After travelling for a time in Europe, he published in 1864 his autobiography, a work which reveals the strong and weak points of his character, —his integrity and complete honesty of purpose, his inclina- tion to personal vanity, his rigid precision in every point of military precedent and etiquette, and his laborious affecta- tion of an intimate acquaintance with belles lettres. He died at West Point, New York, 29th May 1866.

The Autobiography of Lieutenant-General Winfield Seott, DL.D., in two volumes, gives the facts of his career at length. For his defeat in 1852, see Von Holst's Constitutional History, vol. iv. p. 171 of the original, p. 206 of the English translation.

SCOTUS. See Duns Scorus-and ScHOLASTICISM.

SCRANTON, a city of the United States, capital of Lackawanna county, Pennsylvania, on a plateau at the junction of the Roaring Brook and the Lackawanna river, 162 miles north of Philadelphia. It is the centre of the great coal-mining district in the country and the seat of a large number of iron and steel works, rolling-mills, blast- furnaces, &c., and extensive factories for the production of

rails, locomotives, mining machinery, steam-boilers, stoves, carriages, edge-tools, &e. A public library, a theatre, an academy of music, a hospital, a public hall, a driving park, a Roman Catholic cathedral, a home for the friend- less, and a museum of Indian stone relics are among the more prominent features of the place. The population was 9223 in 1860, 35,092 in 1870, and 45,850 in 1880,

Slocum Farm, as the site was called subsequent to 1798, saw its first blast-furnace erected in 1840 by George and Selden Scranton, who soon added a rolling-mill and the manufacture of rails. The opening of the railway in 1856 gave a great stimulus to the new town (1854), which obtained a city charter in 1866. It is divided into twenty-one wards, of which the 4th, 5th, 6th, 14th, 15th, and 18th are known as Hydc Park, the Ist, 2d, and 8d as Providence,

SCREAMER, a bird inhabiting Guiana and the Amazon valley, so called in 1781 by Pennant (Gen. Birds, p. 37) 'from the violent noise it makes,"—the Palamedea cornuta of Linneus. First made known in 1648 by Marcgrave under the name of " Anhima," it was more fully described and better figured by Buffon under that of Kamichi, still applied to it by French writers, Of about the size of a Turkey, it is remarkable for the curious "horn " or slender caruncle, more than three inches long, it bears on its crown, the two sharp spurs with which each wing is armed, and its elongated toes. Its plumage is plain in colour, being of an almost uniform greyish black above, the space round the eyes and a ring round the neck being variegated with white, and a patch of pale rufous appearing above the carpal joint, while the lower parts of the body are white. Closely related to this bird is

another first described by Linneus as a species of Parra (JACANA, vol. xiii. p. 531), to which group it certainly does not belong, but separated therefrom by Illiger to form the genus Chauna, and now known as C. chavaria, very generally in English as the 'Crested Screamer," ! a name which was first bestowed on the Serrema (¢.v.). This bird inhabits the lagoons and swamps of Paraguay and Southern Brazil, where it is called "Chaj4" or "Chaka," and is smaller than the preceding, wanting its "horn," but having its head furnished with a dependent crest of feathers. Its face and throat are white, to which succeeds a blackish ring, and the rest of the lower parts are white, more or less clouded with cinereous. According to Mr Gibson (Zbis, 1880, pp. 165, 166), its nest is a light construction of dry rushes, having its founda- tion in the water, and contains as many as six eggs, which are white tinged with buff. The young are covered with down of a yellowish brown colour. A most singular habit possessed by this bird is that of rising in the air and soar- ing there in circles at an immense altitude, uttering at intervals the very loud ery of which its local name is an imitation. From a dozen to a score may be seen at once So occupying themselves. The young are often taken from the nest and reared by the people to attend upon and de- fend their poultry, a duty which is faithfully ? and, owing to the spurs with which the Chaka's wings are armed, successfully discharged. Another very curious property of this bird, which was observed by Jacquin, who brought it to the notice of Linneus,? is its emphysematous condi- tion,—there being a layer of air-cells between the skin and the muscles, so that on any part of the body being pressed a crackling sound is heard. In Central America occurs another species, C. derbiana, chiefly distingnished by the darker colour of its plumage. For this a distinct genus, Ischyrornis, was proposed, but apparently without neces- sity, by Reichenbach (Syst. Avium, p. XX1.).

The taxonomic position of the Palamedeidx, for all will

- *Under this name its curious habits have been well described by Mr W. H. Hudson (Genéleman's Magazine, Sept. 1885, pp. 280-287). 2 Hence Latham's name for this species is "Faithful J acana,"—he Supposing it to belong to the genus in which Linneus placed it. '"Tacta manu cutis, sub pennis etiam lanosa, crepat ubique for- titer" (Syst. Naé., ed. 12, i. p. 260).*

families.” as forming a distinct “ Order,” Palamedex, which he, how-

allow to the Screamers the rank of a Family at least, has been much debated, and cannot be regarded as fixed. Their Anserine relations were pointed out by Prof. Parker in the Zoological Proceedings for 1863 (pp. 511-518), and in the same work for 1867 Prof. Huxley placed the F amily among his Chenomorphe ; but this view was contravened in 1876 by Garrod, who said, “The Screamers must have sprung from the primary avian stock as an independent offshoot at much the same time as did most of the other important Accordingly in 1880 Mr Sclater regarded them

ever, placed next to the true Anseres, from the neighbour- hood of which, as has been already stated (ORNITHOLOGY, vol. xviii. p. 47), the present writer thinks the Palamedeidz can hardly be removed. (A. N.) SCREW. The screw is the simplest instrument for converting a uniform motion of rotation into a uniform motion of translation (see MEcHANtcS, vol. xv. p. 754). Metal screws requiring no special accuracy are generally cut by taps and dies. A tap isa cylindrical piece of steel having a screw on its exterior with sharp cutting edges; by forcing this with a revolving motion into a hole of the proper size, a screw is cut on its interior forming what is known as a nut or female screw. The die is a nut with sharp cutting edges used to screw upon the outside of round pieces of metal and thus produce male screws. More accurate screws are cut in a lathe by causing the carriage carrying the tool to move uniformly forward, thus a con- tinuous spiral line is cut on the uniformly revolving cylinder fixed between the lathe centres, The cutting tool may be

an ordinary form of lathe tool or a revolving saw-like disk.

(See Macuryx Toots, vol. xv, p. 153.)

Errors of Screws.—For scientific purposes the screw must be so regular that it moves forward in its nut exactly the same distance for each given angular rotation around its axis. As the mountings of a screw introduce many errors, the final and exact test of its accuracy can only be made when it is finished and set up for use. A large screw can, however, be roughly

examined in the following manner. (1) See whether the surface of the threads has a perfect polish. The more it departs from this, and approaches the rough torn surface as cut by the lathe tool, the worse it is. A perfect screw has a perfect polish. (2) Mount upon it between the centres of a lathe and the slip a short nut which fits perfectly. Ifthe nut moves from end to end with equal friction, the screw is uniform in diameter. If the nut is long, unequal resistance may be due to either an error of run or a bend in the screw. (3) Fix a microscope on the lathe carriage and focus its single cross-hair on the edge of the screw and parallel to its axis. If the screw runs true at every point, its axis is straight. (4) Observe whether the short nut runs from end to end of the screw without a wabbling motion when the screw is turned and the nut kept from revolving. If it wabbles the screw is said to be drunk. One can see this error better by fixing a long pointer to the nut, or by attaching to it a mirror and observing an image in it with a telescope. The following experi- ment will also detect this crror, (5) Put upon the screw two well- fitting and rather short nuts, which are kept from revolvin by arms bearing against a straight edge parallel to the axis of the screw. Let one nut carry an arm which Supports a microscope focused on a line ruled onthe other nut. Screw this combination to different parts of the screw. If during one revolution the microscope remains in focus, the screw is not drunk ; and, if the cross-hairs bisect the line in every position, there is no error of run.

Making Accurate Screws.—To produce a screw of a foot or even a yard long with errors not exceeding y/yyth of an inch is not difficult. Professor William A. Rogers of Harvard observatory has invented a process in which the tool of the lathe while cutting the screw is moved so as to counteract the errors of the lathe screw. The screw is then partly ground to get rid of local errors. But, where the highest accuracy is needed, we must resort in the case of screws, as in all other cases, to grinding. A long solid nut, tightly fitting the screw in one position, cannot be moved freely to another position unless the screw is very accurate. If grinding material is applied and the nut is constantly tightened, it will grind out all errors of run, drunkenness, crookeduess, and irregularity of size. The condition is that the nut must be long, rigid, and capable of being tightened as the grinding proceeds ; also the screw must be ground longer than it will finally be needed so that the imperfect ends may be removed.

The following process will produce a screw suitable for ruling

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gratings for optical purposes. Suppose it is our purpose to produce a screw which is finally to be 9 inches long, not including bearings, and 1} inches in diameter. Sclect a bar of soft Bessemer steel, which has not the hard spots usually found in cast steel, about 13 inches in diameter and 30 long. Put it between lathe centres and turn it down to 1 inch diameter everywhere, except about 12 inches in the centre, where it is left a little over 1} inches in diameter for cutting the screw. Now cut the screw with a triangular thread a little sharper than 60°. Above all, avoid a fine screw, using about 20 threads to the inch.

The grinding nut, about 11 inches long, has now to be made. Fig. 1 represents a section of the nut, which is made of brass, or better

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Fia. 1.—Section of grinding nut.

of Bessemer steel. It consists of four segments,—c, @, which can be drawn about the screw by two collars, 6, 6, and the screw c. Wedges between the segments prevent too great pressure on the screw. The final clamping is effected by the rings and screws, d, d, which enclose the flanges, ¢, of the segments. The screw is now placed in a lathe and surrounded by water whose temperature can be kept constant to 1° C., and the nut placed on it. In order that the weight of the nut may not make the ends too small, it must either be counterbalanced by weights hung from a rope passing over pulleys in the ceiling, or the screw must be vertical during the whole process. Emery and oil seem to be the only available grinding materials, though a softer silica powder might be used towards the end of the operation to clean off the emery and prevent future wear. Now grind the screw in the nut, making the nut pass backwards and forwards over the screw, its whole range being nearly 20 inches at first. Turn the nut end for end every ten minutes and continue for two weeks, finally making the range of the nut only about 10 inches, using finer washed emery and moving the lathe slower to avoid heating. Finish with a fine silica powder or rouge.

During the process, if the thread becomes too blunt, recut the nut by a short tap so as not to change the pitch at any point. This must of course not be done less than five days before the finish. Now cut to the proper length; centre again in the lathe under a microscope ; and turn the bearings. A screw so ground has less errors than from any other system of mounting. The periodic error especially will be too small to be discovered, though the mountings and graduation and centering of the head will introduce it; it must therefore finally be corrected.

Mounting of Screws.—The mounting must be devised most care- fully, and is indeed more difficult to make without error than the screw itself. The principle which should be adopted is that no workmanship is perfect; the design must make up for its imper- fections. Thus the screw can never be made to run true on its bearings, and hence the device of resting one end of the carriage on the nut must be rejected. Also all rigid connexion between the nut and the carriage must be avoided, as the screw can never be adjusted parallel to the ways on which the carriage rests. For many purposes, such as ruling optical gratings, the carriage must move accurately forward in a straight line as far as the horizontal plane is concerned, while a little curvature in the vertical plane produces very little effect. These conditions can be satisfied by making the ways V-shaped and grinding with a grinder somewhat shorter than the ways. By constant reversals and by lengthening or shortening the stroke, they will finally become nearly perfect. The vertical curvature can be sufficiently tested by a short carriage carrying a delicate spirit level. Another and very efficient form of ways is V-shaped with a flat top and nearly vertical sides. The carriage rests on the flat top and is held by springs against one of the nearly vertical sides. To determine with accuracy whether the ways are straight, fix a flat piece of glass on the carriage and rule a line on it by moving it under a diamond ; reverse and rule another line near the first, and measure the distance apart at the centre and at the two ends by a micrometer. If the centre measure- ment is equal to the mean of the two end ones, the line is straight. This is better than the method with a mirror mounted on the carriage aud a telescope. The screw itself must rest in bearings, and the end motion be prevented by a point bearing against its flat end, which is protected by hardened steel or a flat diamond. Collar bearings introduce periodic errors. The secret of success is so to

_ward almost indepen-

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design the nut and its connexions as to eliminate all adjustments of the screw and indced all imperfect workmanship. The connexion must also be such as to give means of correcting any residual periodic errors or errors of run which may be introduced in the mountings or by the wear of the machine.

The nut is shown in fig. 2. It is made in two halves, of wrought iron filled with boxwood or lignum vite plugs, on which the screw is cut. To each half a long piece of sheet steel is fixed which bears against a guiding edge, to be described presently. The two halves are held to the screw by springs, so that each moves for-

dently of the other. To join the nut to the carriage, a ring is attached to the latter, vertical and which can turn round a The bars fixed midway on the two halves | against this ring at points 90° distant Hence each half docs its share independ- other in moving the carriage forward. parallelism between the serew and the tricity in the screw mountings thus the forward motion of the carriage. The which the steel pieces of the nut rest can | form as to correct any small error of run the screw. Also, by causing it to move forwards periodically, the periodic error mountings can be corrected.

In making gratings for optical purposes error must be very perfectly eliminated, since the peri- odic displacement of the lines only one- [. millionth of an inch from their mean position will pro- Fig. 2. duce ghosts ” in the spectrum.! Indeed this is the most sensitive method of detecting the existence of this error, and it is practically impos- sible to mount the most perfect of screws without introducing it. A very practical method of determining this error is to rule a short grating with very long lines on a piece of common thin plate glass; cut it in two with a diamond and superimpose the two halves with the rulings together and displaced sideways over each other one-half the pitch of the screw. On now looking at the plates in a proper light so as to have the spectral colours show through it, dark lines will appear, which are wavy if there is a periodic error and straight if there is none. By measuring the comparative amplitude of the

waves and the distance apart of two lines, the amount of the periodic error can be determined. The phase of the periodic error is best found by a series of trials after setting the corrector at the proper amplitude as determined above.

A machine properly made as above and kept at a constant temperature should be able to make a scale of 6 inches in length, with errors at no point exceeding yo¢yooth of an inch. When, however, a grating of that length is attempted at the rate of 14,000 lines to the inch, four days and nights are required and the result is seldom perfect, possibly on account of the wear of the machine or changes of temperature. Gratings, however, less than 3 inches long are easy to make. (H. A. R.)

SCRIBE, Aucustin Evcine (1791-1861), the most popular playwright of France, was born at Paris on 24th December 1791, and died there on 20th February 1861. His father was a silk merchant and he was well educated, being destined for the bar. But, having a real gift for the theatre (a gift which unfortunately was not allied with sufficient literary power to make his works last), he very soon broke away from professional study and at the age of twenty produced, in collaboration, as is common in France, the first of a series of dramas which continued for fifty years. Les Dervis (1811) is usually cited as the first play in which he took a hand, though, as for some time he did not sign his work, identification is somewhat difficult. He achieved no distinct success till 1816, when Une Nut de Garde Nationale made him in a way famous. Thence- forward his fertility was unceasing and its results pro- digious. There may be in existence a complete list of Scribe's works, but we have never seen any that pretended

to be such. He wrote every kind of drama—vaudevilles,

whose plane is 'vertical axis. of the nut bear from its axis. ! ently of the Any want of ways or eccen- scareely affects guide against be made of such due to wear of backwards and of the head and

the periodic

1 In a machine made by the present writer for ruling gratings the periodic error is entirely due to the graduation and centering of the head. The

uncorrected periodic error from this cause displaces the lines zy¢oyath of an inch, which is sufficient to entirely ruin all gratings made without correcting it.

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comedies, tragedies, opera-libretti. To one theatre alone he is said to have furnished more than a hundred pieces. But his life was entirely uneventful, and his election to the Academy in 1834 is almost the only incident which deserves chronicling. It ought to be said to Scribe's credit that, although he was the least original of writers and was more an editor of dramas than a dramatist, although he was for many years an object of the bitterest envy to impecunious geniuses owing to his pecuniary success, and although he never has pleased and never can please any critic who applies purely literary tests, his character stands very high for literary probity and indeed generosity. He is said in some cases to have sent sums of money for "copyright in ideas" to men who not only had not actually collaborated with him but who were unaware that he had taken suggestions from their work. His industry was untiring and his knowledge both of the mechanism of the stage and of the tastes of the audience was wonderful. Nevertheless he hardly deserves a place in literature, his style being vulgar, his characters common- place, even his plots lacking power and grasp. He wrote

a few novels, but none of any mark. The best known of Scribe's pieces after his first successful one are Une Chaine

(1842), Le Verre d' Eau (1842), Adrienne Lecowvreur (1849),

and the libretti of many of the most famous operas of

the middle of the century, especially those of Auber and Meyerbeer.

SCRIBES. See Israzt, vol. xiii. p. 419.

SCRIVENER'S PALSY. See Cramp, vol. vi. p. 543,

SCROFULA or Srruma (formerly known in England as "king's evil," from the belief that the touch of the sovereign could effect a cure), a constitutional morbid condition generally exhibiting itself in early life, and characterized mainly by defective nutrition of the tissues and by a tendency to inflammatory affections of a low type with degenerative changes in their products. The subject has been considered in most of its features under Patuo- Locy (vol. xviii. p. 405), and only a further brief reference is here necessary. Scrofula may be either inherited or acquired. Heredity is of all causes the most potent, and naturally operates with greater certainty where both parents possess the taint. As in all hereditary diseases, however, the liability may be scarcely perceptible for one or two generations, but may then reappear. Other causes refer- able to parentage may readily produce this constitutional state in children, as weakness or ill health in one or both parents, and, as seems probable, marriages of consanguinity. But, apart altogether from hereditary or congenital influ- ences, the scrofulous habit is frequently developed, especi- ally in the young, by such unfavourable hygienic conditions as result from overcrowded, cold, and dark dwellings, in- sufficient and improper food, exposure, and debauchery. Even among the old in such circumstances the evidences of scrofula may be seen to present themselves where before they had been absent.

There are two well-marked types of the scrofulous con- stitution to be often observed, especially among the young. In the one the chief features are a fair complexion with delicate thin skin, blue eyes, dilated pupils, long eyelashes, soft muscles, and activity of the circulatory and nervous system ; while in the other the skin is dark, the features heavy, the figure stunted, and all the functions, physical and mental, inactive. In many instances, however, it will be found that both types are more or less mixed together in one individual. The manifestations of scrofula generally appear in early life, and are often exhibited in young

1 This superstition can be traced back to the time of Edward the Confessor in England, and to a much earlier period in France. Samuel Johnson was touched by Queen Anne in 1712, and the same pre- Trogative of royalty was exercised by Prince Charles Edward in 1745.

children during the first dentition by inflammatory skin eruptions of obstinate character on the face and other parts ; later on in youth there appear glandular swellings either externally, as on the neck, or affecting the gland structures of the chest or abdomen, while at the same time mucous membranes and bones may become implicated. The distinctive features of the scrofulous inflammatory affections are their tendency to chronicity and to suppura- tive and degenerative changes, the affected parts either healing slowly with resulting disfigurement, as on the neck, or continuing to retain traces of the products of the diseased action, which may set up serious disturbance of the health at some future time, Further, the scrofulous constitution always influences the duration and progress of any disease from which the individual may suffer, as well as its results. Thus in pneumonia, to which the scrofulous would seem to be specially liable, the products of the inflammation are not readily absorbed as in previously healthy persons, but, remaining in the lung-tissues, are apt to undergo caseous degenerative changes, which may issue in phthisis (see PNEUMONIA and Purutsis), The connexion of scrofula with tubercle is pointed out in the article Parnonocy (loc. cit.).

Scrofula may under favourable circumstances tend to improvement as age advances, and it occasionally happens that persons who in early life showed unmistakable evi- dences of this condition appear ultimately to outgrow it, and become in all respects healthy and vigorous. The treatment is essentially similar to that described for rickets or phthisis, and is partly preventive and partly curative. It consists mainly in hygienic measures to pro- mote the health and nutrition of the young, and of suitable diet, tonics, &c., where evidences of the disease have declared themselves. See Rickrts, PHrutsts.

SCRUB-BIRD, the name (for want of a better, since it is not very distinctive) conferred upon the members of an Australian genus, one of the most curious ornithological types of the many furnished by that country. The first examples were procured by the late Mr Gilbert between Perth and Augusta in West Australia, and were described by Gould in the Zoological Society's Proceedings for 1844 (pp. 1, 2) as forming a new genus and species under the name of Atrichia clamosa, the great peculiarity observed by that naturalist being the absence of any bristles around the gape, in which

respect alone it seemed to differ from the already known genus Sphenura. In March 1866 Mr Wilcox obtained on the banks of the Richmond river on the eastern side of Australia some other examples, which proved the existence of a second species, described by Mr Ramsay in the Proceedings for that year (pp. 438-440) as A. rufescens ; but still no suspicion of the great divergence of the genus from the ordinary Passerine type was raised, and it was generally regarded as belonging to the Maluridz or Australian Warblers. However, the peculiar formation of the sternum in Atrichia attracted the present writer's attention almost as soon as that of A. clamosa was exhibited in the museum of the College of Surgeons, and at his re- quest Mr Ramsay a little later sent to the museum of the university of Cambridge examples in spirit of A. rufescens, which shewed a common structure. One of the sternal peculiarities was noticed by Mr Sclater (bis, 1874, p. 191, note); and in the present work (Brrps, iii. p. 741) the Scrub-birds were declared to form a distinct Family, Atrichudz, standing, so far as was known, alone with the Lyre-birds (see vol. xv. p. 115) as "abnormal Passeres." Much the same view was also taken the next year by Garrod, who, in the Proceedings for 1876 (pp. 516, 518, pl. i figs. 4-7), further dwelt on the taxonomic importance of the equally remarkable characters of the syringeal muscles exhibited alike by Mfenwra and Atrichia, which he accord-

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ingly placed together in a division of the Acromyodian Passeres, differing from all the rest and since recognized, as has been said (ORNITHOLOGY, vol. xviil. pp. 40, 41), by Mr Sclater as a Sub-order Psewdoscines. A detailed anatomical description of Atrichia has, however, yet to be given, and a comparison of many other Australian types is needed ! before it can be certainly said to have no nearer ally than Menura. Both the known species of Scrub-bird are about

West-Australian Scrub-bird (Atrichia clamosa). the size of a small Thrush—A. clamosa being the larger of

the two.

upper plumage.

to violent gesticulations.

conspicuous appearance and retiring habits. (A. N.)

SCUDERY is the name of a family which is said to have been of Italian origin and to have transferred itself to Provence, but which is only known by the singular brother

and sister who represented it during the 17th century.

Grorcus DE Scupiry (1601-1667), the elder of the pair, was born at Havre, whither his father had moved from He served in the army for some time, and, though in the vein of gasconading which was almost peculiar to him he no doubt exaggerated his services, there But he con- ceived a fancy for literature before he was thirty, and during the whole of the middle of the century he was one of the most characteristic figures of Paris. Despite his own merit, which was not inconsiderable, and his sister's, which was Indeed from some stories told by men not his friends he seems to have hurt his own chances by independence of spirit. He received, however, the governorship of the fortress of Notre Dame de la Garde near Marseilles in 1643, and in 1650 was elected to the Academy. Long before he had made

Provence, in 1601.

geems little doubt that he was a stout soldier.

more, he was unlucky in his suits for preferment.

1 Forbes shewed that OrTHONYX (vol. xviii. p. 52) did not belong

to the group as at one time supposed.

This species is brown above, each feather barred with a darker shade; the throat and belly are reddish white, and there is a large black patch on the breast ; while the flanks are brown and the lower tail- coverts rufous. A. rufescens has the white and black of the fore-parts replaced by brown, barred much as is the Both species are said to inhabit the thickest "scrub" or brushwood forest ; but little has been ascertained as to their mode of life except that the males are noisy, imitative of the notes of other birds, and given The nest and eggs seem never to have been found, and indeed no example of the female of either species is known to have been procured, whence that sex may be inferred to escape observation by its in-

himself conspicuous by a letter attacking Corneille's Cid, which he addressed to that body. He was himself an industrious dramatist, L'Amour Tyrannique being the chief piece which (and that only partially) has escaped oblivion. His other most famous work was the epic of Alaric (1654). He lent his name to his sister's first romances, but did little beyond correcting the proofs. His death occurred at Paris on 14th May 1667. Scudéry's swashbuckler affectations (he terminates his introduction to the works of Théophile de Viaud by something like a challenge in form to any one who does not admit the supremacy of the deceased poet), the bombast of his style, and his various oddities have been rather exaggerated by literary gossip and tradition. Although probably not quite sane, he had some poetical power, a fervent love of literature, a high sense of honour and of friendship.

His sister MADELEINE (1607-1701), born also at Havre in 1607, was a writer of much more ability and of a much better regulated character. She was very plain and had no fortune, but her abilities were great and she was very well educated. Establishing herself at Paris with her brother, she was at once admitted to the Rambouillet coterie, afterwards established a salon of her own under the title of the Société du Samedi, and for the last half of the 17th century, under the pseudonym of "Sapho" or her own name, was acknowledged as the first blue-stocking of France and of the world. Her celebrated novels, Ariaméne ou le Grand Cyrus, Clélie, Ibrahim ou 0 Illustre Bassa, Almahide, and others are known by quotation to every one,

and were the delight of all Europe, including persons of the wit and sense of Madame de Sévigné. But for at least a century and a half they have lain unread, and their immense length has often been satirized even by persons well read in letters with the term "folio," when in fact they were originally issued in batches of small octavos, sometimes (allowing for two parts to each volume) running to a score or 80. Neither in conception nor in execution will they bear criticism as wholes. With classical or Oriental personages for nominal heroes and heroines, the whole language and action are taken from the fashionable ideas of the time, and the personages can be identified either really or colour- ably with Mademoiselle de Scudéry's contemporaries. The interminable length of the stories is made out by endless conversations and, as far as incidents go, chiefly by suc- cessive abductions of the heroines, conceived and related in the most decorous spirit, for Mademoiselle de Scudéry is nothing if not decorous. Nevertheless, although the books can hardly now be read through, it is still possible to perceive their attraction for the wits, both male and female, of a time which certainly did not lack wit. In that early day of the novel prolixity did not repel. "Sapho" had really studied mankind in her contempo- raries and knew how to analyse and describe their characters with fidelity and point. She was a real mistress of con- versation, a thing quite new to the age at least as far as literature was concerned, and proportionately welcome. She could moralize—a favourite employment of the time— with sense and propriety, and the purely literary merits of the style which clothed the whole were considerable. Madeleine survived her brother more than thirty years (scandal says that she was not sorry to be relieved from his humours), and in her later days published numerous volumes of conversations (to a great extent extracted from her novels) and short moral writings. Dryden says that he had heard of an intention on her part to translate the Canterbury Tales, and it is not impossible. She never lost either her renown or her wits or her good sense, and died at Parison 2d June 1701. It is unfortunate and rather surprising that no one has recently attempted an anthology from her immense work.

Early Chris- tian,

SCULPTURE

HE present article is confined to the sculpture of the T Middle Ages and modern times ; classical sculpture has been already treated of under ARCHAOLOGY (Cass- ICAL), vol. ii. p. 343 sg., and in the articles on the several individual artists.

In the 4th century a.p., under the rule of Constantine's successors, the plastic arts in the Roman world reached the lowest point of degradation to which they ever fell. Coarse in workmanship, intensely feeble in design, and

utterly without expression or life, the pagan sculpture of

that time is merely a dull and ignorant imitation of the work of previous centuries, The old faith was dead, and the art which had Sprung = ga We from it died with it. In the same century a large amount of sculpture was produced by Christian workmen, which, though it reached no very high standard of merit, was at least far superior to the pagan work. Although it shows no increase of technical skill or know- ledge of the human form, yet the mere fact that it was inspired and its sub- jects supplied by a real living faith was quite sufficient to give it a | vigour and a dramatic force which raise it eaxs- thetically far above the expiring efforts of pagan- ism. Fig. 1 shows a very fine Christian relief of \ the 4th century, with a |

noble figure of an arch- } angel holding an orb and asceptre. Itisaleaf from ff an ivory consular dip- tych, inscribed at the top AEXOY TIAPONTA KAT MA@O@N THN AITIAN, 'Receive these presents and having learnt the oc- casion .. .' A number of large marble sarco- phagi are the chief exist- ing specimens of this early Christian sculpture. In general design they are close copies of pagan tombs, and are richly decorated outside with reliefs, The subjects of these are usually scenes from the Old and New Testaments, From the former those subjects were selected which were supposed to have some typical reference to the life of Christ : the Meeting of Abraham and Melchisedec, the Sacrifice of Isaac, Daniel among the Lions, Jonah and the Whale, are those which most frequently occur. Among the New Testament scenes no representations occur of Christ's sufferings ;! the subjects chosen illustrate His power and beneficence: the Sermon on the Mount, the Triumphal Entry into J erusalem, and many of His miracles are

ur | Fig. 1.—Relief in ivory of the 4th century. (British Museum.)

E A partial exception to this rule is the scene of Christ before Pilate, which sometimes occurs,

frequently repeated. The Vatican and Lateran museums are rich in examples of this sort. One of the finest in the former collection was taken from the crypt of the old basilica of St Peter; it contained the body of a certain Junius Bassus, and dates from the year 359.2. Many other similar sarcophagi were made in the provinces of Rome, especially Gaul; and fine specimens exist in the museums of Arles, Marseilles, and Aix ; those found in Britain are of very inferior workmanship.

In the 5th century other plastic works similar in style were still produced in Italy, especially reliefs in ivory (to a certain extent imitations of the later consular diptychs), which were used to decorate episcopal thrones or the bindings of MSS. of the Gospels. The so-called chair of St Peter, still preserved (though hidden from sight) in his great basilica, is the finest example of the former class ; of less purely classical style, dating from about 550, is the ivory throne of Bishop Maximianus in Ravenna cathedral (see fig. 2). Another very remarkable work of

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Fig, 2.—Reliefs in ivory of the Baptist and the Four Evangelists in front of the episcopal throne of Maximianus in Ravenna cathedral.

the 5th century is the series of small panel reliefs on the doors of 8. Sabina on the Aventine Hill at Rome. They are scenes from Bible history carved in wood, and in them much of the old classic style survives.?

In the 6th century, under the By- zantine influence of Justinian, a new class of decorative sculpture was pro- duced, especially at Ravenna. Sub- —— : ject reliefs do not often occur, but } ras SOS large slabs of marble, forming screens, Pui), altars, pulpits, and the hike, were ornamented in a very skilful and ori- ginal way with low reliefs of graceful vine-plants, with peacocks and other birds drinking out of chalices, all treated in a very able and highly Fic 3.— Sixth – century decorative manner (see fig. 3 and peng from 8. Vitale the upper band of fig. 2). Byzan- % Ravenna. tium, however, in the main, became the birthplace and*

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2 See Dionysius, Sac. Vat. Bas. Cryp., and Bunsen, Besch. d. Stadt Rom, 1840.

3 Various dates have been assigned to these interesting reliefs by different archeologists, but the costumes of the figures are strong evidence that they are not later than the Sth century.

_ Influence

BYZANTINE. |

seat of all the medieval arts soon after the transference thither of the headquarters of the empire. The plastic arts of Byzantium were for a while dominated by the survival of the dull classic art of the extreme decadence, but soon fresh life and vigour of conception were gained by a people who were not without the germinating seeds of a new esthetic development. The bronze statue of St Peter in his Roman basilica is an early work which shows some promise of what was to come in the far-off future ; though classical in its main lines and stiff in treatment, it possesses a simple dignity and force which were far beyond the powers of any mere copyist of classic

sculp- ture.! Very early in the 5th or 6th century a school of decorative sculpture arose at Byzantium which produced work, such as carved foliage on capitals and bands of orna- ment, possessed of the very highest decorative power and executed with unrivalled spirit and vigour. The early Byzantine treatment of the acanthus or thistle, as seen in the capitals of S. Sophia at Constantinople, the Golden Gate at Jerusalem, and many other buildings in the East, has never since been surpassed in any purely decorative sculpture ; and it is interesting to note how it grew out of the dull and lifeless ornamentation which covers the degraded Corinthian capital used so largely in Roman buildings of the time of Constantine and his sons. It was, however, especially in the production of METAL-WoRK (q.v.) that the early Byzantines were so famous, and this notably in the manipulation of the precious metals, which were then used in the most lavish way to decorate and furnish the great churches of the empire. This extended use of gold and silver strongly influenced their sculpture, even when the material was marble or bronze, and caused an amount of delicate surface-ornament to be used which was sometimes injurious to the breadth and simplicity of their reliefs. For many centuries the art of Byzantium, at least in its higher forms, made little or no progress, mainly owing to the tyrannical influence of the church and its growing suspicion of anything like sensual beauty. A large party in the Eastern Church decided that all repre- sentations of Christ must be "without form or comeliness," and that it was impious to carve or paint Him with any of the beauty and nobility of the pagan gods. Moreover, the artists of Byzantium were fettered by the strictest rules as to the proper way in which to portray each sacred figure : every saint had to be represented in a certain attitude, with one fixed cast of face and arrangement of drapery, and even in certain definitely prescribed colours. No deviation from these rules was permitted, and thus stereotyped patterns were created and followed in the most rigid and conventional manner. Hence in Byzantine art from the 6th to the 12th century a miniature painting in an illuminated MS. looks like a reduced copy of a colossal glass mosaic; and no design had much special relation to the material it was to be executed in: it was much the same whether it was intended to be a large relief sculptured in stone or a minute piece of silver-work for the back of a textus.

Till about the 12th century, and in some places much

| of Byzan- Jater, the art of Byzantium dominated that of the whole

tine art. Christian world in a very remarkable way. From Russia

to Ireland and from Norway to Spain any given work of art in one of the countries of Europe might almost equally well have been designed in any other. Little or no local peculiarities can be detected, except of course in the methods of execution, and even these were wonderfully similar everywhere. The dogmatic unity of the Catholic Church and its great monastic system, with constant interchange

of monkish craftsmen between one country and another, oo Sa eee

1 There is no ground for the popular impression that this is an antique statue of Jupiter transformed into that of St Peter by the addition of the keys.

SPOCUnr TUE

were the chief causes of this widespread monotony of style. An additional reason was the unrivalled technical skill of the early Byzantines, which made their city widely resorted to by the artist-craftsmen of all Europe,—the great school for learning any branch of the arts.

The extensive use of the precious metals for the chief works of plastic art in this early period is one of the reasons why so few examples still remain,—their great intrinsic value naturally causing their destruction. One of the most important existing examples, dating from the 8th century, is a series of colossal wall reliefs executed in hard stucco in the church of Cividale (Friuli) not far from Trieste. These represent rows of female saints bearing jewelled crosses, crowns, and wreaths, and closely resembling in cos- tume, attitude, and arrangement the gift-bearing mosaic figures of Theodora and her ladies in 8. Vitale at Ravenna. It is a striking instance of the almost petrified state of Byzantine art that so close a similarity should be possible between works executed at an interval of fully two hundred years. Some very interesting small plaques of ivory in the library of St Gall show a still

later survival of early forms. The central relief is a figure of Christ in Majesty, and closely resembles those in the colossal apse mosaic of S. Apollinare in Classe and other churches of Ravenna ; while the figures below the Christ are survivals of a still older time, dating back from the best eras of classic art. A river-god is represented as an old man holding an urn, from which a stream issues, and a reclining female figure with an infant and a cornucopia is the old Roman Tellus or Earth-goddess with her ancient attributes.?

Tt will be convenient to discuss the sculpture of the medizeval and modern periods under the heads of the chief countries of Europe.

England.—During the Saxon period, when stone build- ings were rare and even large cathedrals were built of wood, the plastic arts were mostly confined to the use of gold, silver, and gilt copper. The earliest existing speci- mens of sculpture in stone are a number of tall churchyard crosses, mostly in the northern provinces and apparently the work of Scandinavian sculptors. One very remarkable example is a tall monolithic cross, cut in sandstone, in the churchyard of Gosforth in Cumberland. It is covered with rudely carved reliefs, small in scale, which are of special interest as showing a transitional state from the worship of Odin to that of Christ. Some of the old Norse symbols and myths sculptured on it occur modified and altered into a semi-Christian form. Though rich in decora- tive effect and with a graceful outline, this sculptured cross shows a very primitive state of artistic development, as do the other crosses of this class in Cornwall, Ireland, and Scotland, which are mainly ornamented with those ingeni- ously intricate patterns of interlacing knotwork designed so skilfully by both the early Norse and the Celtic races.? They belong to a class of art which is not Christian in its origin, though it was afterwards largely used for Christian purposes, and so is thoroughly national in style, quite free from the usual widespread Byzantine influence. Of special interest from their early date—probably the 11th century —are two large stone reliefs now in Chichester cathedral, which are traditionally said to have come from the pre- Norman church at Selsey. They are thoroughly Byzantine in style, but evidently the work of some very ignorant sculptor; they represent two scenes in the Raising of

2 On early and medieval sculpture in ivory consult Gori, Thesaurus Veterum Diptychorum, Florence, 1759 ; Westwood, Diptychs of Consuls, London, 1862; Didron, Images ouvrantes du Louvre, Paris, 1871; Maskell, Ivories in the South Kensington Museum, London, 1872 ; Wieseler, Diptychon Quirintanum zu Brescia, Gottingen, 1868 ; Wyatt and Oldfield, Sculpture in Ivory, London, 1856.

3 See O'Neill, Sculptured Crosses of Ireland, London, 1857.

Church- yard crosses.

Norman period,

Effigies.

pose very awkward, and the drapery of exaggerated Byzantine character, with long thin folds. To repre- sent the eyes pieces of glass or coloured enamel were inserted; the treatment of the hair in long ropelike twists suggests a metal rather than a stone design (see fig. 4). ean iy

Fic. 4,—Relief of Christ at the tomb of Lazarus, now in Chichester cathedral ; 11th century, Byzantine style.

During the Norman period sculpture of a very rude sort was much used, especially for the tympanum reliefs over the doors of churches. Christ in Majesty, the Harrowing of Hell, and St George and the Dragon occur very fre- quently. Reliefs of the zodiacal signs were a common decoration of the richly sculptured arches of the 12th century, and are frequently carved with much power. The later Norman sculptured ornaments are very rich and spirited, though the treatment of the human figure is still very weak.2

The best-preserved examples of monumental sculpture of the 12th century are a number of effigies of knights- templars in the round Temple church in London.? They are laboriously cut in hard Purbeck marble, and much re- semble bronze in their treatment; the faces are clumsy, and the whole figures stiff and heavy in modelling ; but they are valuable examples of the

military costume of the time, the armour being purely chain-mail. Another effigy in the same church cut in stone, once decorated with paint- ing, is a much finer piece of sculpture of about a century later. The head, treated in an ideal way with wavy curls, has much simple beauty, showing a great artistic advance. Another of the most remarkable effigies of this period is that of Robert, duke of Normandy (d. 1134), in Gloucester cathedral, carved with much spirit in oak, and decorated aS 8 cA tN NO A hasan Whoa Pi saab at

1 One of these reliefs is imperfect and has been clumsily mended with a fragment of a third relief, now lost.

2 In Norway and Denmark during the 11th and 12th centuries carved ornament of the very highest merit was produced, especially the framework round the doors of the wooden churches ; these are formed of large pine planks, sculptured in slight relief with dragons and interlacing foliage in grand Sweeping curves,—perfect masterpieces of decorative art, full of the keenest inventive spirit and originality.

® See Richardson, Monumental Effigues of the Temple Church, London, 1843.

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Lazarus'; the figures are stiff, attenuated, and ugly, the | with painting (fig. 5),

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Most rapid progress in all the arts, especially that of sculpture, was made in England in the second half of the 13th and the begin- ning of the 14th century, large- ly under the patronage of pi.

5.—Effigy in oak of Robert, duke of Nor- HenrylIIL,who mandy, in Gloucester cathedral ; once painted employed and and gilt.

handsomely rewarded a large number of English artists, and also imported others from Italy and Spain, though these foreigners took only a secondary

position among the painters and sculptors of England. The end of the 13th century was in fact the culminating period of English art, and at this time a very high degree of excellence was reached by purely national means, quite equalling and even surpassing the general average of art on the Continent, except perhaps in France. Even Niccola Pisano could not have surpassed the beauty and technical excellence of the two bronze effigies in Westminster Abbey

modelled and cast by William Torell, a goldsmith and William citizen of London, shortly before the year 1300. These Torell

are on the tombs of Henry ITI. and Queen Eleanor, and, though the tomb itself of the former is an Italian work of the Cosmati school, there is no trace of foreign influence in the figures. At this time portrait effigies had not come into general use, and both figures are treated in an ideal way. The crowned head of Henry IIL. with noble well- modelled features and crisp wavy curls, resembles the con- ventional royal head on English coins of this and the following century, while the head of Eleanor is of re- markable, almost classic, beauty, and of great interest as showing the ideal type of the 13th century (see fig. 6).*

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Fig. 6.—Head of the effigy of Queen Eleanor in Westminster Abbey ; bronze gilt, by William Torell.

In both cases the drapery is well conceived in broad sculp- turesque folds, graceful and yet simple in treatment. The casting of these figures, which was effected by the cire perdue process, is technically very perfect. The gold em- ployed for the gilding was got from Lucca in the shape of the current florins of that time, which were famed for their purity. Torell was highly paid for this, as well as for two other bronze statues of Queen Eleanor, probably of the same design.

Much of the fine 13th-century sculpture was used to Archi- The grandest example — is the west end of Wells cathedral, of about the middle of pa

decorate the facades of churches.

the century. It is covered with more than 600 figures in the round or in relief, arranged in tiers, and of varying sizes. The tympana of the doorways are filled with reliefs, and above them stand rows of colossal statues of kings and queens, bishops and knights, and saints both male and

4 The effigy of King John in Worcester cathedral of about 1216 is an exception to this rule; though rudely executed, the head appears to be a portrait.

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ENGLISH. |

the building they are meant to decorate.

reliefs form an essential part of the design of the building to which they are affixed, and are treated in a subordinate manner to their architectural surroundings—very different from the sculpture on modern buildings, which usually looks as if it had been stuck up as an afterthought, and frequently by its violent and incongruous lines is rather an impertinent excrescence than an ornament.’ Peter- borough, Lichfield, and Salisbury cathedrals have fine examples of the sculpture of the 13th century: in the chapter-house of the last the spandrels of the wall-arcade are filled with sixty reliefs of subjects from Bible history, all treated with much grace and refinement. To the end of the same century belong the celebrated reliefs of angels in the spandrels of the choir arches at Lincoln, carved in a large massive way with great strength of decorative effect. exist in the transepts of Westminster Abbey; being high from the ground, they are broadly treated without any high finish in the details.”

It may here be well to say a few words on the technical methods employed in the execution of medieval sculpture, which in the main were very similar in England, France,and Germany. When bronze was used—in England as a rule only for the effigies of royal persons or the richer nobles—the metal

was cast by the delicate cire perdue process, and the whole surface of the figure was then thickly gilded. At Limoges in France a large number of sepulchral effigies were produced, especially between 1300 and 1400, and ex- ee to distant places. These were not cast, but were made of

ammered (repoussé) plates of copper, nailed on a wooden core and richly decorated with champlevé enamels in various bright colours. Westminster Abbey possesses a fine example, executed about 1300, in the effigy of William of Valence (d. 1296)? The ground on which the figure lies, the shield, the border of the tunic, the pillow, and other parts are decorated with these enamels very minutely treated. The rest of the copper was gilt, and the helmet was sur- rounded with a coronet set with jewels, which are now missing. One royal effigy of later date at Westminster, that of Henry V. (d. 1422), was formed of beaten silver fixed to an oak core, with the exception of the head, which appears to have been cast. The whole of the silver disappeared in the time of Henry VIII., and nothing now remains but the rough wooden core; hence it is doubtful whether the silver was decorated with enamel or not; it was probably of English workmanship.

In most cases stone was used for all sorts of sculpture, being decorated in a very minute and elaborate way with gold, silver, and colours applied over the whole surface. In order to give addi- tional richness to this colouring the surface of the stone, often even in the case of external sculpture, was covered with a thin skin of gesso or fine plaster mixed with size; on this, while still soft, and over the drapery and other accessories, very delicate and minute patterns were stamped with wooden dies (see Murat DE- CORATION, fig. 17), and upon this the gold and colours were applied; thus the gaudiness and monotony of flat smooth surfaces covered with gilding or bright colours were avoided. In addition to this the borders of drapery and other parts of stone statues were fre- quently ornamented with crystals and false jewels, or, in a more laborious way, with holes and sinkings filled with polished metallic foil, on which very minute patterns were painted in transparent varnish colours; the whole was then protected from the air by small pieces of transparent glass, carefully shaped to the right size and fixed over the foil in the cavity cut in the stone. It is difficult*

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1 The sculpture on the new Paris opera-house is a striking instance of this; and so, in a small way, are the statues in the new reredos of Westminster Abbey and Gloucester cathedral.

2 On the whole, Westminster possesses the most completely repre- sentative collection of English medieval sculpture in an unbroken succession from the 18th to the 16th century.

3 Other effigies from Limoges were imported into England, but no other example now exists in the country.

4 In the modern attempts to reproduce the medixval polychromy these delicate surface reliefs have been omitted; hence the paiuful re- sults of such colouring as that in Notre Dame and the Sainte Chapelle in Paris and many other "restored" churches, especially in France and Germany.

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female, all treated very skilfully with nobly arranged drapery, and graceful heads designed in a thoroughly architectonic way, with due regard to the main lines of In this respect the early medieval sculptor inherited one of the great merits of the Greeks of the best period: his figures or

Other fine reliefs of angels, executed about 1260,.

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now to realize the extreme splendour of this gilt, painted, and jewelled sculpture, as no perfect example exists, though in many cases traces remain of all these processes, and show that they were once very widely applied. The architectural surroundings of the figures were treated in the same elaborate way. In the 14th cen- tury in England alabaster came into frequent use for monumental sculpture; it too was decorated with gold and colour, though in some cases the whole surface does not appear to have been so treated. In his wide use of coloured decoration, as in other re- spects, the medieval sculptor came far nearer to the ancient Greek than do any modern artists. Even the use of inlay of coloured glass was common at Athens during the 5th century B.C.,—as, for example, in the plait-band of

some of the marble bases of the Erechtheum,—and five or six centuries earlier at Tiryns and Mycene.

Another material much used by medieval sculptors was wood, though, from its perishable nature, comparatively few early ex- amples survive ;® the best specimen is the figure of George de Cantelupe (d. 1273) in Abergavenny church. This was decorated with gesso reliefs, gilt and coloured in the same way as the stone. The tomb of Prince John of Eltham (d. 1334) at Westminster is a very finc cxample of the carly use of alabaster, both for the re- cumbent effigy and also for a number of small figures of mourners all round the arcading of the tomb. These little figures, well pre- served on the side which is protected by the screen, are of very great beauty and are executed with the most delicate minuteness ; some of the heads are equal to the best contemporary work of the son and pupils of Niccola Pisano. The tomb once had a high stone canopy of open work—arches, canopies, and pinnacles,—a class of architectural sculpture of which many extremely rich examples exist, as, for instance, the tomb of Edward II. at Gloucester, the De Spencer tomb at Tewkesbury, and, of rather later style, the tomb of Lady Eleanor de Percy at Beverley. This last is remark- able for the great richness and beauty of its sculptured foliage, which is of the finest Decorated period and stands unrivalled by any Continental example.

In England purely decorative carving in stone reached Four- its highest point of excellence about the middle of the teenth 14th century,—rather later, that is, than the best period Case

of figure sculpture. Woop-caRrvineG (q.v.), on the other hand, reached its artistic climax a full century later under the influence of the fully developed Perpendicular style.

The most important effigies of the 14th century are those Effigies.

in gilt bronze of Edward III. (d. 1377) and of Richard TI. and his queen (made in 1395), all at Westminster. They are all portraits, but are decidedly inferior to the earlier work of William Torell. The effigies of Richard II. and Anne of Bohemia were the work of Nicolas Broker and Godfred Prest, goldsmith citizens of London. Another fine bronze effigy is at Canterbury on the tomb of the Black Prince (d. 1376); though well cast and with care-

fully modelled armour, it is treated in a somewhat dull and conventional way. The recumbent stone figure of Lady Arundel, with two angels at her head, in Chichester cathe- dral is remarkable for its calm peaceful pose and the beauty of the drapery. A very fine but more realistic work is the tomb figure of William of Wykeham (d. 1404) in the cathedral at Winchester. 'The cathedrals at Rochester, Lichfield, York, Lincoln, Exeter, and many other ecclesi- astical buildings in England are rich in examples of 14th- century sculpture, used occasionally with great profusion and richness of effect, but treated in strict subordination to the architectural background.

The finest piece of bronze sculpture of the 15th century is the effigy of Richard Beauchamp (d. 1439) in his family chapel at Warwick,—a noble portrait figure, richly de- corated with engraved ornaments. The modelling and casting were done by William Austen of London, and the gilding and engraving by a Netherlands goldsmith who

5 On the tomb of Aymer de Valence (d. 1326) at Westminster a good deal of the stamped gesso and coloured decoration is visible on close inspection. One of the cavities of the base retains a fragment of glass covering the painted foil, still brilliant and jewel-like in effect.

6 The South Kensington Museum possesses a magnificent colossal wood figure of an angel, not English, but Italian work of the 14th century. A large stone statue of about the same date, of French work- manship, in the same museum is a most valuable example of the use of stamped gesso and inlay of painted and glazed foil.

Six- teenth century.

Torri- giano,

Seven- teenth century.

had settled in London, named Bartholomew Lambespring, assisted by several other skilful artists.

At the beginning of the 16th century sculpture in Eng- land was entering upon a period of rapid decadence, and to some extent had lost its native individuality. The finest series of statues of this period are those of life-size high up on the walls of Henry VII.'s chapel at West- minster and others over the various minor altars. These ninety-five figures, which represent saints and doctors of the church, vary very much in merit: some show German influence, others that of Italy, while a third class are, as it were, "archaistic " imitations of older English sculpture! (see fig. 7). In some cases the heads and general pose are graceful, and the drapery dignified, but in the main they are coarse both in design and in workmanship compared with the better plastic art of the 13th and 14th centuries. This decadence of English sculpture caused Henry VII. to invite the Florentine Torrigiano (14721-1522) to come to England to model and cast the bronze figures for his own magnificent tomb, which still exist in almost perfect preserva- tion. The recumbent effigies of Henry VII. and his queen are fine specimens of Florentine art, well modelled with life-like portrait heads and of very fine technique in the casting. The altar-tomb on which the effigies lie is of black marble, decorated with large medallion re- liefs in gilt bronze, each with a pair of saints—the patrons of Henry and : i Elizabeth of York—of very graceful — ee design. The altar and its large bal- py¢, 7.—statue (life-size) dacchino and reredos were the work of St Thomas of Canter- of Torrigiano, but were destroyed calle en during the 17th century. The : Gani had a large relief of the ~~ pe ge se Resurrection of Christ executed in painted terra-cotta, as were also a life-sized figure of the dead Christ under the altar-slab and four angels on the top angles of the bal- dacchino; a number of fragments of these figures have recently been found in the "pockets" of the nave vaulting, where they had been thrown after the destruction of the reredos. Torrigiano's bronze effigy of Margaret of Rich- mond in the south aisle of the same chapel is a very skilful but too realistic portrait, apparently taken from a cast of the dead face and hands. Another terra-cotta effigy in the Rolls chapel is also, from internal evidence, attri- buted to the same able Florentine. Another talented Florentine sculptor, Benedetto da Maiano, was invited to England by Cardinal Wolsey to make his tomb ; of this only the marble sarcophagus now exists and has been used to hold the body of Admiral Nelson in St. Paul's Cathedral. Another member of the same family, named Giovanni, was the sculptor of the colossal terra-cotta

heads of the Cesars affixed to the walls of the older part of Hampton Court Palace.

During the troublous times of the Reformation sculpture, like the other arts, continued to decline. Of 17 th-century monumental effigies that of Sir Francis Vere (d. 1607) in the north transept at Westminster is one of the best, though its design—a recumbent effigy overshadowed by a slab covered with armour, upborne by four kneeling

1 There were once no less than 107 statues in the interior of this chapel, besides a large number on the exterior 5 see J. T. Micklethwaite in Archexologia, vol, xlvii. pl. x.-xii,

Jones, appears to have been the chief English sculptor of

figures of men-at-arms—is almost an exact copy of the

tomb of Engelbert IL. of Vianden-Nassau.2 The finest

bronze statues of this century are those of Charles Villiers,

duke of Buckingham (d. 1634), and his wife at the north- ; east of Henry VII.'s chapel. The effigy of the duke, in rich armour of the time of Charles I., lies with folded hands in the usual medizval pose. The face is fine and well modelled and the casting very good. The allegorical figures at the foot are caricatures of the style of Michel- angelo, and are quite devoid of merit, but the kneeling statues of the duke's children are designed with grace and pathos, A large number of very handsome marble and alabaster tombs were erected throughout England during the 17th century. The effigies are poor and coarse, but the rich architectural ornaments are effective and often of beautiful materials, alabaster being mixed with various richly coloured marbles in a very skilful way. Nicholas Stone (d. 1647), who worked under the supervision of Inigo

his time. The De Vere and Villiers monuments are usually attributed to him.' One of the best public monuments of London is the bronze equestrian statue of Charles I. at Charing Cross, which was overthrown and hidden during the protectorate of Cromwell, but replaced at the Restora- tion in 1660. It is very nobly modelled and was pro-

duced under Italian influence by a French sculptor called

Hubert Le Sceur (d. 1670). The standing bronze statue

of James IT. behind the Whitehall banqueting room, very

poorly designed but well executed, was the work of Grinling Gibbons (1648-1721), a native of Holland, who was chiefly

famed for his extraordinary skill in carving realistic fruit

and flowers in pear and other white woods, Many rich

and elaborate works of his exist at Trinity College, Oxford,

at Cambridge, Chatsworth, and several other places in England. In the early part of the 18th century he worked

for Sir Christopher Wren, and carved the elaborate friezes

of the stalls and screens in St Paul's Cathedral and in

other London churches.

During the 18th century English sculpture was mostly in Eight- the hands of Flemish and other foreign artists, of whom eenth Roubiliac (1695-1762), Scheemakers (1691-1773), and Cnty. Rysbrack (1694-1770) were the chief. The ridiculous custom of representing Englishmen of the 18th and 19th centuries in the toga or in the armour of an ancient Roman was fatal alike to artistic merit and eikonic truth 5 and when, as was often the case, the periwig of the Georgian period was added to the costume of a Roman general the effect is supremely ludicrous. Nollekens (1737-1823), a pupil of Scheemakers, though one of the most popular sculptors of the 18th century,

was a man of very little real ability. John Bacon (1740-1799) was in some respects an abler sculptor. John Flaxman® (1755-1826) was in England the chief initiator of the classical revival. For many years he worked for Josiah Wedgwood, the potter, and designed for him an immense number of vases covered with delicate cameo-like reliefs. Many of these, taken from antique gems and sculpture, are of great beauty, though hardly suited to the special necessities of fictile ware. F'laxman's large pieces of sculpture are of less merit, but some of his marble reliefs are designed with much spirit and classic purity. His illustrations in outline to the poems of Homer, ANschylus, and Dante, based on drawings on Greek vases, have been greatly admired, but

2 See Arendt, Chateau de Vianden, Paris, 1884.

3 The Villiers monument is evidently the work of two sculptors working in very opposite styles.

- *An interesting account of many English sculptors of this time is*

given by Smith, Nollekens and his Time, London, 1829.

> See Flaxman, Lectures at the Royal Academy, London, 1829. His

designs on a small scale are the best of his works, —as, for example, the silver shield of Achilles covered with delicate and graceful reliefs,

they are unfortunately much injured by the use of a thicker outline on one side of the figures,—an unsuccessful attempt to give a suggestion of shadow. Flaxman's best pupil was Baily (1788-1867), chiefly celebrated for his nude marble figure of Eve.

*During the first half of the 19th century the preva- lence of a cold lifeless pseudo-classic style was fatal to * individual talent, and robbed the sculpture of England of all real vigour and spirit. Francis Chantrey (1782-1841) produced a great quantity of sculpture, especially sepulchral monuments, which were much admired in spite of their very limited merits.*

Allan Cunningham and Henry Weekes worked in some cases in conjunction with Chantrey, who was not wanting in technical skill, as is shown by his clever marble relief of two dead woodcocks. John Gibson (1790-1866) was perhaps after Flaxman the most success- ful of the English classic school, and produced some works of real merit. He strove eagerly to revive the poly- chromatic decoration of sculpture in imitation of the car- cumlitio of classical times. His Venus Victrix, shown at the exhibition in London of 1862 (a work of about six years earlier), was the first of his coloured statues which attracted much attention. The prejudice, however, in favour of white marble was too strong, and both the popular verdict and that of other sculptors were strongly adverse to the "tinted Venus." The fact was that Gibson's colouring was timidly applied : it was a sort of compromise between the two systems, and thus his sculpture lost the special qualities of a pure marble surface, without gaining the richly decorative effect of the polychromy either of the Greeks or of the medizval period! The other chief sculp- tors of the same very inartistic period were Banks, the elder Westmacott (who modelled the Achilles in Hyde Park), R. Wyatt (who cast the equestrian statue of Wellington, lately removed from London), Macdowell, Campbell, Mar- shall, and Bell.

During the last hundred years a large number of hono- rary statues have been set up in the Houses of Parliament, Westminster Hall and Abbey, and in other public places in London. Most of these, though modelled as a rule with some scholastic accuracy, are quite dull and spiritless, and, whilst free from the violently bad taste of such men as Bernini or Roubiliac, they lack the force and vigorous originality which go far to redeem what is offensive in the sculpture of the 17th and 18th centuries. The modern public statues of London and elsewhere are as a rule tamely respectable and quite uninteresting. One brilliant exception is the Wellington monument in St Paul's Cathe- dral, probably the finest plastic work of modern times. It _ was the work of Alfred Stevens (1817-1875), a sculptor of the highest talent, who lived and died almost unrecognized by the British public. The commission for this monu- ment was given to Stevens after a public competition ; and he agreed to carry it out for £20,000,—a quite inadequate sum, as it afterwards turned out. The greater part of his life Stevens devoted to this grand monument, constantly harassed and finally worn out by the interference of Government, want of money, and other difficulties. Though

he completed the model, Stevens did not live to see the monument set up,—perhaps fortunately for him, as it has been placed in a small side chapel, where the effect of the whole is utterly destroyed, and its magnificent bronze groups hidden from view. The monument consists of a sarcophagus supporting a recumbent bronze effigy of the duke, over which is an arched marble canopy of late Renaissance style on delicately enriched shafts. At each

1 Gibson bequeathed his fortune and the models of his chief works to the Royal Academy, where the latter are now crowded in an upper room adjoining the Diploma Gallery. "See Lady Eastlake, Life of Gibson, London, 1870.

end of the upper part of the canopy is a large bronze group, one representing Truth tearing the tongue out of the mouth of Falsehood, and the other Valour trampling Cowardice under foot (see fig. 8). The two virtues are represented

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Fig. 8.—Bronze group by Alfred Stevens from the Wellington monument.

by very stately female figures modelled with wonderful beauty and vigour; the vices are two nude male figures treated in a very massive way. The whole is composed with great skill and largeness of style. The vigorous strength and sculpturesque nobility of these groups recall the style of Michelangelo, but they are far from being a mere imitation of him or any other master. Stevens's work throughout is original and has a very distinct char- acter of its own. He also designed an equestrian statue of the duke to stand on the summit of the monument, but in its present cramped position there is not sufficient room for this Owing to the many years he spent on this one work Stevens did not produce much other sculpture. In Dorchester House, Park Lane, there is some of his work, especially a very noble mantelpiece supported by nude female caryatids in a crouching attitude,

modelled with great largeness of style. He also designed mosaics to fill the spandrels under the dome of St Paul's. The value of Stevens's work is all the more conspicuous from the feeble- ness of most of the sculpture of his contemporaries.

In the present generation there are some signs of the development of a better state of the plastic arts. A bronze statue of an Athlete struggling with a Python, by Sir Frederick Leighton, is a work of great merit, almost

2 The great merit of this work can now only be seen at the South Kensington Museum, which possesses Stevens's models and (on a small scale) his design for the whole monument.

worthy to rank with the best examples of any period, and remarkable for a profound knowledge of human anatomy (see fig. 9). Unfortunately the real cire perdue process for metal casting is seldom practised in England, and this

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Fic. 9.—Bronze statue of an athlete and python, by Sir Frederick Leighton, P.R.A., in the South Kensington Museum.

statue, as well as all other bronze works produced in Eng- land, suffers much from the disagreeable surface which results from the rude method of forming the moulds in sand. The colossal bronze lions in Trafalgar Square, de- signed by Sir Edwin Landseer, are a melancholy example of this.! :

France.—During the 12th and 13th centuries the sculp- ture of France was, on the whole, the finest in the world, and was there used in the greatest profusion. The facades of large cathedrals were completely covered with

sculptured reliefs and thick-set rows of statues in niches. The whole of the front was frequently one huge composition of statu- ary, with only sufficient purely architectural work to form a background and frame for the sculptured figures. A west end treated like that of Wells cathedral, which is almost unique in England, is not uncommon in France. Even the shafts of the doorways and other architectural accessories were covered with minute sculptured decora- tion,—the motives of which were often, especially during the 12th century, obviously derived from the metal-work of shrines and reliquaries studded with rows of jewels. The west facade of Poitiers cathedral is one of the richest ex- amples ; it has large surfaces covered with foliated carving Se ee ee er

? On English seulpture, see Carter, Specimens of Ancient Sculpture, London, 1780; Aldis, Sculpture of Worcester Cathedral, London, 1874 ; Cockerell, Iconography of Wells Cathedral, Oxford, 1851; Stothard, Monumental Efigies of Britain, London, 1817 ; Westmacott, " Sculp- ture in Westminster Abbey," in Old London (pub. by Archeological Institute), 1866, p. 159 sqg.; G. G. Scott, Gleanings from Westminster, London, 1862; Colling Art Foliage, London, 1865, with good ex- amples of medizval decorative sculpture; W. B. Scott, British School of Sculpture, London, 1872; W. M. Rossetti, " British Sculpture," in Fraser's Mag., April1861; many good illustrations of English medieval

sculpturé are scattered throughout the volumes of Archexologia, the Archeological Journal, and other societies' " Proceedings,"

century (the 12th), but rather later in date, is the very

} tonic effect of the whole facade.

and rows of colossal statues, both seated and standing, reaching high up the front of the church. Of the same

noble sculpture on the three western doors of Chartres cathedral, with fine tympanum sec ppegmes reliefs and colossal statues % attached to the jamb-shafts_ of the openings (see fig. 10). | These latter figures, with their exaggerated height and the| long straight folds of their] drapery, are designed with great skill to assist and not to break the main upward lines of the doorways. The sculptors have willingly sacri- ficed the beauty and propor- tion of each separate statue for the sake of the architec-

The heads, however, are full of nobility, beauty, and even grace, especially those that are softened by the addition of long wavy curls, which give relief to the general stiffness of the form. The sculptured doors of the north and south aisles of Bourges cathedral are fine examples of the end of the 12th century, and so were the west doors of Notre Dame in Paris till they were hopelessly injured by "restoration." The early sculpture

at Bourges is specially interesting from the existence in many parts of its original coloured decoration.

In France, as in England, the 13th century was the Thir- golden age of sculpture ; while still keeping its early dignity teenth and subordination to its architectural setting, the sculpture century. reached a very high degree of graceful finish and even sensuous beauty. Nothing could surpass the loveliness of the angel statues round the Parisian Sainte Chapelle, and even the earlier work on the facade of Laon cathedral is full of grace and delicacy. Amiens cathedral is especi- ally rich in sculpture of this date,—as, for example, the noble and majestic statues of Christ and the Apostles at the west end; the sculpture on the south transept of about 1260-70, of more developed style, is remarkable for dignity combined with soft beauty.2 The noble row of kings on the west end of Notre Dame at Paris has, like the earlier sculpture, been ruined by "restoration," which has robbed the statues of both their spirit and their vigour. To the latter years of the 13th century belong the magnificent series of statues and reliefs round the three great western doorways of the same church, among which are no less than thirty-four life-sized figures. On the whole, the single statues throughout this period are finer than the reliefs with many figures. Some of the statues of the Virgin and Child are of extraordinary beauty, in spite of their being often treated with a certain mannerism,—a curved pose of the body, which

appears to have been copied from ivory statuettes in which the figure followed the curve of the elephant's tusk. The north transept at Rheims is no less rich : the central statue of Christ is a work of much grace and nobility of form ; and some nude figures—for example, that of St Sebastian—show a knowledge of the human form which was very unusual at that- early date. Many of these Rheims statues, like those by Torell at West-

Fie. 10.—Statues on jamb of central west door of Chartres cathedral, 12th century; speci- ally designed to suit vertical lines of columns behind; all once covered with painting and gold.

| minster, are quite equal to the best work of Niccola Pisano.

es er eee ee 2 See Ruskin, The Bible of Amiens, 1878.

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Sixteenth century.

FRENCH.]

The abbey church of St Denis possesses the largest collec- tion of French 13th-century monumental effigies, a large number of which, with supposed portraits of the early kings, were made during the rebuilding of the church in 1264; some of them appear to be "archaistic" copies of older contemporary statues.

In the 14th century French sculpture began to decline, though much beautiful plastic work was still produced.

- Some of the reliefs on the choir screen of Notre Dame at

Paris belong to this period, as does also much fine sculp- ture on the transepts of Rouen cathedral and the west end of Lyons. At the end of this century an able sculptor from the Netherlands, called Claux Sluter, executed much fine work, especially at Dijon, under the patronage of Philip the Bold, for whose newly founded Carthusian monastery in 1399 he

sculptured the great “ Moses foun- tain” in the cloister, with six life-sized statues of prophets in stone, painted and gilt in the usual medieval fashion.

| Fifteenth Not long before his death in 1411 Sluter completed a

‘century.

very magnificent altar tomb for Philip the Bold, now in the museum at Dijon. It is of white marble, surrounded with arcading, which contains about forty small alabaster figures representing mourners of all classes, executed with much dramatic power. The recumbent portrait effigy of Philip in his ducal mantle with folded hands is a work of great power and delicacy of treatment.

The latter part of the 15th century in France was a time of transition from the medizval style, which had gradually been deteriorating, to the more florid and real- istic taste of the Renaissance. To this speriod belong a number of rich reliefs and statues on the choir-screen of Chartres cathedral. Those on the screen at Amiens are later still, and exhibit the rapid ad- vance of the new style. Fig. 11 shows a statuette in the costume of the end of the 15th century, a characteristic example of the later medizeval method of treating saints in a realistic way.

In the 16th century Italian influ- ence, especially that of Benvenuto Cel- lini, was paramount in France. Jean ¥ Goujon (d. 1572) was the ablest French sculptor of the time; he combined great technical skill and refinement of modelling with the florid and affected style of the age. His nude figure of Diana reclining by a Stag, now in the Louvre, is a graceful and vigorous piece of work, superior in sculpturesque breadth to the somewhat similar bronze relief of a nymph by Cellini. Between 1540 and 1552 Goujon executed the fine monument at Rouen to Duke Louis de Brézé, and from 1555 to 1562 was mainly occupied in decorating the Louvre with sculpture. One of the most pleas- ing and graceful works of this period, thoroughly Italian in style, is the marble group of the Three Graces bearing on their heads an urn containing the heart of Henry IL. executed in 1560 by Germain Pilon for Catherine de’ Medici. The monument of Catherine and Henry II. at St Denis, by the same sculptor, is an inferior and coarser work. Maitre Ponée, probably the same as the Italian Ponce Jacquio, chiselled the

noble monument of Albert of Carpi (1535), now in the Louvre. Another very fine portrait effigy of about 1570, a recumbent figure in full armour of the duke of Montmorency, preserved in the Louvre, is the work of

Fia. 11.—Statuette of St Mary Magdalene, late 15th century ; French work, painted and gilt. !

1 See Félibien, Histoire de ? Abbaye de Saint-Denys, Paris, 1706.

Barthélemy Prieur. Francois Duquesnoy of Brussels (1594-1644), usually known as I] Fiamingo, was a clever sculptor, thoroughly French in style, though he mostly worked in Italy. His large statues are very poor, but his reliefs in ivory of boys and cupids are modelled with won- derfully soft realistic power and graceful fancy.

No sculptor of any great merit appears to have arisen in France during the 17th century, though some, such as the two Coustous, had great techni- cal skill. Pierre Puget(1622-1694) produced __ vigor- ous but coarse and tasteless work, such as his Milo de- voured by a Lion. Other sculptors of the time were Simon QGuillain, Frangois and Mi- chel Anguier, and Chas. Ant. Coyze- vox (1640-1720), the last a sculptor of Lyons who pro- duced some fine portrait busts. Fig. 12 shows a group by Clodion, whose real name was Claude Michel (c. 1745-1814). He worked largely in terra-cotta, and modelled | ‘ with Fria 12.—Bacchanal group by Clodion in great spirit and terra-cotta. invention, though . in the sensual unsculpturesque manner prevalent in his time.

In the following century Jean Antoine Houdon (1740- 1828), a sculptor of most exceptional power, produced some works of the highest merit at a time when the plastic arts had reached a very low ebb. His standing colossal statue of 8S. Bruno in 8. Maria degli Angeli at Rome is a most noble and stately piece of portraiture, full of commanding dignity and expression. His seated statue of Voltaire in the foyer of the Théatre Frangais, though sculpturesque in treatment, is a most striking piece of lifelike realism.

Houdon may in fact be regarded as the precursor of the modern school of French sculpture of the better sort. About the middle of the 18th century a revolution was brought about in the style of sculpture by the suddenly revived taste for antique art. A period of dull pseudo-classicism succeeded, which in most cases stifled all original talent and reduced the plastic arts to a lifeless form of archeology. Regarded even as imitations the works of this period are very unsuccessful: the sculptors got hold merely of the dry bones not of the spirit of classic art; and their study of the subject was so shallow and unintelligent that they mostly picked out what was third- rate for special admiration and ignored the glorious beauty of the best works of true Hellenic art. Thus in sculpture, as in painting and architecture, a study which might have been stimulating and useful in the highest degree became a serious hindrance to the development of modern art, and this not only in France but in the other countries of Europe; in France, however, the victories of Napoleon I. and his arrogant pretension to create a Gaulish empire on the model of that of ancient Rome caused the taste for

pseudo-Roman art to be more pronounced than elsewhere. Among the first sculptors of this school were Antoine Chaudet (1763-1810) and Joseph Bosio (1769-1845), The latter was largely employed by Napoleon I.: he executed with some ability the bronze spiral reliefs round the column of the Place Vendéme and the statue of Napoleon on the top, and also modelled the classical quadriga on the triumphal arch in the Place du Carrousel. Jacques Pradier of Geneva (1790-1852) produced the Chained Prometheus of the Louvre and the Niobe group (1822). He possessed great technical ability, but aimed in most of his works at a soft sensuous beauty which is specially unsuited to sculpture. Frangois Rude (1784-1855) worked in a style modelled on Graeco-Roman sculpture treated with some freedom. His bronze Mercury in the Louvre is a clever work, but his statues of Marshal Ney in the Luxembourg Gardens and of General Cavaignac (1847) in the

cemetery of Montmartre are conspicuously bad. The reliefs on the pediment of the Panthéon are by Pierre Jean David of Angers (1789-1856); his early works are of dull classic style, but later in life he became a realist and produced the most unsculpturesque results. A bronze statue of a Dancing Fisher-lad modelled by Frangois Joseph Duvet, now in the Luxembourg collection, is an able work of the genre class. Other French sculptors who were highly esteemed in their time were Ottin, Courtet, Simart, Etex, and Carpeaux.' The last was an artist of great ability, and produced an immense number of clever but often very offensive statues. He obtained the highest renown in France, and was a typical example of the sad degradation of taste which prevailed under the rule of N apoleon ITT.

The existing schools of French sculpture are by far the most important in the world. Technical skill and intimate knowledge of the human form are possessed by several living sculptors of France to a degree which has probably never been surpassed, and some of them produce works of very great power, beauty, and originality. Many of their works have a similar fault to that of one class of French painters: they are much injured by an excess of sensual realism; in many cases nude statues are simply life-studies with all the faults and individual peculiarities of one model. Very unsculpturesque results are produced by treating a statue as a representation of a naked person, — one, that is, who is obviously in the habit of wearing clothes,—a very different thing from the purity of the ancient Greek treatment of the nude. Thus the great ability of many French sculptors is degraded to suit the taste of the voluptuary. An extravagance of attitude and an undignified arrangement of the figures do much to injure some of the large groups which are full of technical merit, and executed with marvellous anatomical knowledge, This is specially the case with much of the sculpture that is intended to decorate the buildings of Paris, The group of nude dancers by Carpeaux outside the. new opera- house is a work of astonishing skill and prurient imagi- nation, utterly unsculpturesque in style and especially unfitted to decorate the comparatively rigid lines of a building. The egotism of modern French sculptors will not allow them to accept the necessarily subordinate reserve which is so necessary for architectonic sculpture, Other French works, on the other hand, err in the direc- tion of a sickly sentimentalism, or a petty realism, which is fatal to

sculpturesque beauty. The real power and merits of the modern French school make these faults all the more conspicuous.? ee ee a

1 See Chesnean, J. B. Carpeaux, sa vie, &c., Paris, 1880.

? On French sculpture see Adams, Recueil de Sculptures Gothiques, Paris, 1858; Cerf, Description de Notre Dame de fieims, Rheims,

1861 ; Bméric-David, L'Art Statuaire, Paris, 1805, and Histotre de la Sculpture Francaise, Paris, 1858 ; Guilhebaud, L' Architecture et la

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Germany.—Till the 12th century sculpture in Germany continued to be under the lifeless influence of Byzantium, tempered to some extent by an attempt to return to classical models. This is seen in the bronze pillar reliefs Bronze and other works produced by Bishop Bernward after his work, visit to Rome (see Mrrat-work, vol. xvi. p. 77). Hildes- 12th heim, Cologne, and the whole of the Rhine provinces a were the most active seats of German sculpture, especially in metal, till the 12th century. Many remarkable pieces of bronze sculpture were produced at the end of that period, of which several specimens exist. The bronze font at Liége, with figure-subjects in relief of various baptismal scenes from the New Testament, by Lambert Patras of Dinant, cast about 1112, is a work of most wonderful beauty and perfection for its time ;. other fonts in Osnabriick and Hildesheim cathedrals are surrounded by spirited reliefs, fine in conception, but inferior in beauty to those on the Liége font. Fine bronze candelabra exist in the abbey church of Comburg and at Aix-la-Chapelle, the latter of about 1165. Merseburg cathedral has a strange realistic sepulchral figure of Rudolf of Swabia, executed about 1100; and at Magdeburg is a fine efligy, also in bronze, of Bishop Frederick (d. 1152), treated in a more graceful way. The last figure has a peculiarity which is not uncommon in the older bronze reliefs of Germany : the body is treated as a relief, while the head sticks out and is quite detached from the ground in a very awkward way. One of the finest plastic works of this century is the choir screen of Hildesheim cathedral, executed in hard stucco, once rich with gold and

colours ; on its lower part is a series of large reliefs of saints modelled with almost classical breadth and nobility, with drapery of especial excellence.

In the 13th century German sculpture had made con- Thir. siderable artistic progress, but it did not reach the high teenth standard of France. One of the best examples is the °™uy "golden gate" of Freiburg cathedral, with sculptured figures on the jambs after the French fashion. The statues of the apostles on the nave pillars, and especially one of the Madonna at the east end (1260-70), possess great beauty and sculpturesque breadth. The statues both inside and outside Bamberg cathedral, of the middle of the 13th century, are nobly designed ; and an equestrian statue of Conrad III. in the market-place at Bamberg, supported by a foliated corbel, exhibits startling vigour and originality, and is designed with wonderful largeness of effect, though small in scale. The statues of Henry the Lion and Queen Matilda at Brunswick, of about the same period, are of the highest beauty and dignity of expression. Strasburg cathedral, though sadly damaged by restoration, still possesses a large quantity of the finest sculpture of the 13th century. One tympanum relief of the Death of the Virgin, surrounded by the sorrowing Apostles, is a work of the very highest beauty, worthy to rank with the best Italian sculpture of even a later period. Of its class nothing can surpass the purely decorative carving at Stras- burg, with varied realistic foliage studied from nature, evidently with the keenest interest and enjoyment.

Nuremberg is rich in good sculpture of the 14th century. Nurem- The church of St Sebald, the Frauenkirche, and the west be fagade of St Lawrence are lavishly decorated with reliefs 2° and statues, very rich in effect, but showing the germs of

Sculpture du Vme au XVime Siecle, Paris, 1851-59; Ménard, Seulp- ture Antique et Moderne, Paris, 1867 ; Didron, Annales Archéo- logiques, various articles; Félibien, Histoire de Art en France, Paris, 1856; Mrs Pattison, Renatssance of Art in France, London, 1879; Montfaucon, Monumens de la Monarchie Francaise, Paris, 1729-33 ; Jouy, Sculptures Modernes du Louvre, Paris, 1855; Reveil, Guvre de Jean Goujon, Paris, 1868 ; Viollet-le-Duc, Dictionnaire de U Architecture, Paris, 1869, art. "

Sculpture," vol. viii. pp. 97-279; Claretie, Peintres et Sculpteurs Contemporains, Paris, in progress.

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that mannerism which grew so strong in Germany during the 15th century. Of special beauty are the statuettes which adorn the "beautiful fountain," executed by Hein- rich der Balier (1385-1396), and richly decorated with gold and colour by the painter Rudolf! A number of colossal figures were executed for Cologne cathedral between 1349 and 1361, but they are of no great merit. Augsburg pro- duced several sculptors of ability about this time; the museum possesses some very noble wooden statues of this school, large in scale and dignified in treatment. On the exterior of the choir of the church of Marienburg castle is a very remarkable colossal figure of the Virgin of about 1340-50. Like the Hildesheim choir screen, it is made of hard stucco and is decorated with glass mosaics. The equestrian bronze group of St George and the Dragon in the market-place at Prague is excellent in workmanship and full of vigour, though much wanting dignity of style. Another fine work in bronze of about the same date is the effigy of Archbishop Conrad (d. 1261) in Cologne cathedral, executed many years after his death. The portrait appears truthful and the whole figure is noble in style. The military effigies of this time in Germany as elsewhere were almost un- avoidably stiff and lifeless from the necessity of repre- senting them in plate ar- mour; the ecclesiastical chasuble, in which priestly effigies nearly always ap- pear, is also a thoroughly unsculpturesque form of drapery, both from its awk- ward shape and its absence of folds. Fig. 13 shows a characteristic example of these sepulchral effigies in slight relief. It is interest- ing to compare this with a somewhat similarly treated Florentine effigy, executed in Fic. 13.—Sepulehral effigy in low marble at tho beginning of Talbot Gunther of Sehvantu the next century, but of

very superior grace and delicacy of treatment (see fig. 16 below).

"Fifteenth The 15th century was one of great activity and origin- 'century. ality in the sculpture of Germany and produced many artists of very high ability. One speciality of the time was the production of an immense number of wooden altars and reredoses, painted and gilt in the most gorgeous way and covered with subject-reliefs and statues, the former often treated in a

very pictorial style.2 Wooden screens, stalls, tabernacles, and other church-fittings of the greatest elaboration and clever workmanship were largely produced in Germany at the same time, and on into the 16th century.® Jérg Syrlin, one of the most able of these sculptors in wood, executed the gorgeous choir-stalls in Ulm cathedral, richly decorated with statuettes and canopied work, be-

1 See Baader, Beitrage zur Kunstgesch. Nirnbergs ; and Rettberg, Niirnbergs Kunstleben, Stuttgart, 1854.

2 This class of large wooden retable was much imitated in Spain and Scandinavia. The metropolitan cathedral of Roskilde in Denmark possesses a very large and magnificent example covered with subject reliefs enriched with gold and colours.

8 See Waagen, Kunst und Kiinsiler in Deutschl., Leipsic, 1843-45,

tween 1469 and 1474; his son and namesake sculptured

the elaborate stalls in Blaubeuren church of 1493 and the great pulpit in Ulm cathedral. Veit Stoss of Nuremberg, though a man of bad character, was a most skilful sculptor in wood ; he carved the high altar, the tabernacle, and the stalls of the Frauenkirche at Cracow, between 1472 and 1495. One of his finest works is a large piece of wooden panelling, nearly 6 feet square, carved in 1495, with central reliefs of the Doom and the Heavenly Host, framed by minute reliefs of scenes from Bible history. It is now in the Nuremberg town-hall. Wohlgemuth (1434-1519), the master of A. Diirer, was not only a painter but also a clever wood-carver, as was also Diirer himself (1471-1528), who executed a tabernacle for the Host with an exquisitely carved relief of Christ in Majesty between the Virgin and St John, which still exists in the chapel of the monastery of Landau. Diirer also produced miniature reliefs cut in boxwood and hone-stone, of which the British Museum (print room) possesses one of the finest examples. Adam Krafft (c. 1455-1507) was another of this class of sculp- tors, but he worked

also in stone; he produced the great Schreyer monument (1492) for St Sebald's at Nuremberg, —a very skilful though mannered piece of sculpture, with very realistic figures in the costume of the time, carved in a way more suited to wood than stone, and too pictorial in effect. He also made the great tabernacle for the Host, 80 feet high, covered with statuettes, in Ulm cathedral, and the very spirited "Stations of the Cross" on the road to the Nuremberg cemetery.

The Vischer family of Nuremberg for three generations Vischer were among the ablest sculptors in bronze during the 15th family.

and 16th centuries. Hermann Vischer the elder worked mostly between 1450 and 1505, following the earlier medieval traditions, but without the originality of his son. Among his existing works the chief are the bronze font at Wittenberg church (1457) and four episcopal effigies in relief, dated from 1475 to 1505, in Bamberg cathedral ; this church also contains a fine series of bronze sepulchral monuments of various dates throughout the 15th and 16th centuries. Hermann's son Peter Vischer was the chief artist of the family; he was admitted a master in the sculptor's guild in 1489, and passed the greater part of his life at Nuremberg, where he died in 1529. In technique few bronze sculptors have ever equalled hin ; but his designs are marred by an excess of mannered realism and a too exuberant fancy. His chief early work was the tomb of Archbishop Ernest in Magdeburg cathedral (1495), surrounded with fine statuettes of the apostles under semi-Gothic canopies ; it is purer in style than his later works, such as the magnificent shrine of St Sebald at Nuremberg, a tall canopied bronze structure, crowded with reliefs and statuettes in the most lavish way. The general form of the shrine is Gothic, but the details are those of the 16th-century Italian Renaissance treated with much freedom and originality. Some of the statuettes of saints attached to the slender columns of the canopy are modelled with much grace and even dignity of form. A small portrait figure of Peter himself, introduced at one end of the base, is a marvel of clever realism: he has represented himself as a stout, bearded man, wearing a large leathern apron and holding some of the tools of his craft. In this work, executed from 1508 to 1519, Peter was assisted by his sons, as is recorded in an inscription on the base— "' Petter Vischer, Purger zu Niirmberg, machet das Werck mit seinen Sunnen, und ward*

folbracht im Jar MDXIxX . . .” This gorgeous shrine is a remarkable example of the un- commercial spirit which animated the artists of that time,

4 This great work is really a canopied pedestal to support and en- close the shrine, not the shrine itself, which is a work of the 14th century, having the gabled form commonly used in the Middle Ages for metal reliquaries.

and of the evident delight which they took in their work. Dragons, grotesques, and little figures of boys, mixed with graceful scroll foliage, crowd every possible part of the canopy and its shafts, designed in the most free and un- conventional way and executed with an utter disregard of the time and labour which were lavished on them. Other existing works by Peter Vischer and his song are the Entombment relief, signed “P. V. 1522,” in the Aegidien- kirche, the monument of Cardinal Albert (1525) in the church at Aschaffenburg, and the fine tomb of Frederick the Wise (1527) in the castle chapel at Wittenberg.

Next to Nuremberg, the chief centres of bronze sculpture were Augsburg and Liibeck.

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16th century, namely twenty-eight colossal figures round the tomb of the emperor Maximilian, which stands in the centre of the nave, representing a suc- cession of heroes and ancestors of the em- peror. The first of the statues which was completed cost 3000 florins, and so Maxi- milian invited the help of Peter Visch- er, whose skill was greater and whose work less expensive than that of the local craftsmen. Most of them, however, were executed by sculptors of whom little is now known. They differ much in style, though all are of great techni- cal merit. The finest (see fig. 14) is an ideal statue of King Arthur of Britain, in plate armour of the 14th ——~ or early 15th century, very remarkable for the nobility of the face and pose. That of Theodoric is also a very fine con- ception. Some of the portrait figures of the Hapsburgs are almost ludicrously realistic, and are disfigured by the ugly German armour of the time. From In the latter part of the 16th

century the influence of sixteenth the later Italian Renaissance becomes very apparent, and _ many elaborate works in bronze were produced, especi- 'ally at Augsburg, where Hubert Gerhard cast the fine " Augustus fountain" in 1593, and Adrian de Vries made the "Hercules fountain" in 1599; both were influenced by the style of Giovanni di Bologna, as shown in his magnificent fountain at Bologna.

In the following century Andreas Schliiter of Hamburg (b. about 1662) produced smaller bronze reliefs and acces. sories of great merit. His colossal statue of Frederick III. on the bridge at Berlin is less successful. On the whole the 17th and 18th centuries in Germany, as in England, were periods of great decadence in the plastic art ; little of merit was produced, except some portrait figures. In the second half of the 18th century there was a strong revival in sculpture, especially in the classic style ; and since then Germany has produced an immense quantity of large and pretentious sculpture, mostly dull in design and second-rate in execution, Johann Gottfried

Fic. 14.—Bronze statue of King Arthur at Innsbruck. :

of Berlin (1764-1850) finished a number of portrait figures, ©

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Innsbruck possesses one of the finest series of bronze statues of the first half of the

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some of which are ably modelled, as did also Friedrich Tieck (1776-1851) and Christian Rauch (1777-1857) ; the works of Rauch are, however, mostly weak and sentimental in style, as, for example, his recumbent statue of Queen ®& Louisa at Charlottenburg (1813) and his statues of Generals Biilow and Scharnhorst at Berlin. Friedrich Drake was the ablest of Rauch's pupils, but he lived at a very unhappy period for the sculptor's art. His chief wvrk is perhaps the colossal bronze equestrian statue of King William of Prussia at Cologne, Albert Wolff was a sculptor of more ability ; he executed the equestrian por- trait of King Ernest Augustus at Hanover,

and a Horse- man attacked by a Lion now in the Berlin Museum. Augustus Kiss (1802-1865) produced the companion group to this, the celebrated Amazon and Panther in bronze, as well as the fine group of St George and the Dragon in a courtyard of the royal palace at Berlin. The St George and his horse are of bronze; the dragon is formed of gilt plates of hammered iron. Kiss worked only in metal. The bad taste of the first half of the present century is strongly shown by many of the works of Theodore Kalidé, whose Bacchanal sprawling on a Panther's Back is a marvel of awkwardness of pose and absence of any feeling for beauty. Rietschel was perhaps the best German sculp- tor of this period, and produced work superior to that of his contemporaries, such as Haagen, Wichmann, Fischer, and Hiedel. Some revival of a better style is shown in some sculpture, especially reliefs, by Hahnel, whose chief works are at Dresden. Schwanthaler (1802-1848), who was largely patronized by King Louis of Bavaria, studied at Rome and was at first a feeble imitator of antique classic art, but later in life he developed a more romantic and pseudo-medizval style. By him are a large number of reliefs and statues in the Glyptothek at Munich and in the Walhalla, also the colossal but feeble bronze statue of Bavaria, in point of size one of the most ambitious works of modern times.! Since the beginning of the second half of the century the sculpture of Germany has made visible progress, and several living artists have produced works of merit and originality, far superior to the feeble imita- tions of classic art which for nearly a century destroyed all' possible vigour and individuality in the plastic pro- ductions of most European countries.?

Spain.—In the early medizval period the sculpture of northern Spain was much influenced by contemporary art in France. From the 12th to the 14th century many Twelfth French architects and sculptors visited and worked in to four- Spain. The cathedral of Santiago de Compostella pos- a sesses one of the grandest existing specimens in the world "™™ of late 12th-century architectonic sculpture ; this, though the work of a native artist, Mastei Mateo,' is thoroughly French in style; as recorded by an inscription on the front, it was completed in 1188. The whole of the western portal with its three doorways is covered with statues and reliefs, all richly decorated with colour, part of which still remains. Round the central arch are figures of the twenty-four elders, and in the tympanum a very noble relief of Christ in Majesty between Saints and Angels. As at Chartres, the jamb-shafts of the

doorways are decorated with standing statues of saints,—St James the elder, the patron of the church, being attached to the

1 In size, but not in merit, this enormous statue has recently been surpassed by the figure of America made in Paris and now (1886) being erected as a beacon at the entrance to the harbour of New York City.

2 On German sculpture see Foerster, Denkmale deutscher Baukunst, Leipsic, 1855 ; Wanderer, Adam Kraft and his School, Nuremberg, 1868; Rabe, Das Grabmal des J. von Brandenburg … von P. Vischer, Berlin, 1843; Reindel, Vischer's Shrine of St Sebaldus, Nuremberg, 1855 ; Liibke, Hist. of Sculpt., Eng. trans., London, 1872.

° A kneeling portrait-statue of Mateo is introduced at the back of

the central pier. 'his figure is now much revered by the Spanish peasants, and the head is partly worn away with kisses,

centuries.

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central pillar. These noble figures, though treated in a somewhat rigid manner, are thoroughly subordinate to the main lines of the building. Their heads, with pointed beards and a fixed mechanical smile, together with the stiff drapery arranged in long narrow folds, recall the Aiginetan pediment sculpture of about 500 B.c. This appears strange at first sight, but the fact is that the works of the early Greek and the medieval Spaniard were both produced at a somewhat similar stage in two far distant periods of artistic development. In both cases plastic art was freeing itself from the bonds of a hieratic archaism, and had reached one of the last steps in a de- velopment which in the one case culminated in the per- fection of the Phidian age, and in the other led to the exquisitely beautiful yet simple and reserved art of the end of the 13th and early part of the 14th century,—the golden age of sculpture in France and England.

In the 14th century the silversmiths of Spain produced many works of sculpture of great size and technical power. One of the finest, by a Valencian called Peter Bernec, is the great silver retable at Gerona cathedral. It is divided into three tiers of statuettes and reliefs, richly framed in canopied niches, all of silver, partly cast and partly hammered.

In the 15th century an infusion of German influence was mixed with that of France, as may be seen in the very rich sculptural decorations which adorn the main door of Salamanca cathedral, the facade of S. Juan at Valladolid, and the church and cloisters of 8. Juan de los Reyes at Toledo, perhaps the most gorgeous examples of architectural sculpture in the world. The carved foliage of this period is of especial beauty and spirited execution ; realistic forms of plant-growth are mingled with other more conventional foliage in the most masterly manner. The very noble bronze monument of Archdeacon Pelayo (d. 1490) in Burgos cathedral was probably the work of Simon of Cologne, who was also architect of the Certosa at Miraflores, 2 miles from Burgos. The church of this monastery contains two of the most magnificently rich monuments in the world, especially the altar-tomb of King John IJ. and his queen by Gil de Siloe,—a perfect marvel of rich alabaster canopy-work and intricate under-cutting. The effigies have little merit.

In the early part of the 16th century a strong Italian

owing to the presence in Spain of the Florentine Torri- giano and other Italian artists. The magnificent tomb of Ferdinand and Isabella in Granada cathedral is a fine specimen of Italian Renaissance sculpture, somewhat similar in general form to the tomb of Sixtus IV. by Ant. Pollai- uolo in St Peter's, but half a century later in the style of its detail. It looks as if it had been executed by Torri- giano, but the design which he made for it is said to have been rejected. Some of the work of this period, though purely Italian in style, was produced by Spanish sculp- tors,—for example, the choir reliefs at Toledo cathedral, and those in the Colegio Mayor at Salamanca by Alonso Berruguete, who obtained his artistic training in Rome and Florence. Esteban Jordan, Gregorio Hernandez, and other Spanish sculptors produced a large nuniber of elabo- rate retables, carved in wood with subjects in relief and richly decorated in gold and colours. These

sumptuous masses of polychromatic sculpture resemble the 15th- century retables of Germany more than any Italian ex- amples, and were a sort of survival of an older medizval style. Alonso Cano (1600-1667), the painter, was re- markable for clever reaM®tic sculpture, very highly coloured and religious in style. Montafies, who died in 1614, was one of the ablest Spanish sculptors of his time. His finest works are the reliefs of the Madonna

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and Saints on an altar in the university church of Seville, and in the cathedral, in the chapel of St Augustine, a very nobly designed Conception, modelled with great skill. In later times Spain has produced little or no sculpture of any merit.

Jtaly.—Till the great revival of plastic art took place in the middle of the 13th century, the sculpture of Italy was decidedly inferior to that of other more northern countries. Much of it was actually the work of northern sculptors,—as, for example, the very rude sculpture on the facade of S. Andrea at Pistoia, executed about 1186 by Gruamons and his brother Adeodatus.!

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Fig, 15.—Relief by Benedetto Antelami for the pulpit of Parma cathedral in 1178 ; Byzantine style.

relief by Antelami of Parma of the year 1178. Unlike the sculpture of the Pisani and later artists, these early figures are thoroughly secondary to the architecture they are de- signed to decorate; they are evidently the work of men who were architects first and sculptors in a secondary degree. After the 13th century the reverse was usually the case, and, as at the west end of Orvieto cathedral, the sculptured decorations are treated as being of primary importance, —not that the Italian sculptor-architect ever allowed

his statues or reliefs to weaken or damage their architectural surroundings, as is unfortunately the case with much modern sculpture. In southern Italy, during the 13th century, there existed a school of sculpture resembling that of France, owing probably to the Norman occupa- tion. The pulpit in the cathedral of Ravello, executed by Nicolaus di Bartolomeo di Foggia in 1272, is an import- ant work of this class; it is enriched with very noble sculpture, especially a large female head crowned with a richly foliated coronet, and combining lifelike vigour with largeness of style in a very remarkable way. The bronze doors at Monreale, Pisa, and elsewhere, which are among the chief works of plastic art in Italy during the 12th century, are described in MonrEALE and METAL-WoRK. The history of Italian sculpture of the best period is given to a great extent in the separate articles on the Pisani (g.v.) and other Italian artists. During the 13th century Rome and the central provinces of Italy produced very few sculptors of ability, almost the only men of note being the Cosmati (see Roms, vol. xx. p. 835).

During the 14th century Florence and the neighbouring cities were the chief centres of Italian sculpture, and there numerous sculptors of successively increasing artistic power lived and worked, till in the 15th century Florence had become the esthetic capital of the world, and reached a pitch of artistic wealth and perfection which Athens

1 The other finest examples of this early class of sculpture exist at Pisa, Parma, Modena, and Verona ; in most of them the old Byzantine influence is very strong.

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alone in its best days could have rivalled. The similarity between the plastic arts of Athens in the 5th or 4th cen- tury B.c. and of Florence in the 15th century is not one of analogy only. Though free from any touch of copyism, there are many points in the works of such men as Dona- tello, Luca della Robbia, and Vittore Pisanello which strongly recall the sculpture of ancient Greece, and suggest that, if a sculptor of the later Phidian school had been

surrounded by the same types of face and costume as those among which the Italians lived, he would have produced plastic works closely resembling those of the great Floren- tine masters. In the 14th century, in northern Italy, various schools of sculpture existed, especially at Verona and Venice, whose art differed widely from the contem- porary art of Tuscany ; but Milan and Pavia, on the other hand, possessed sculptors who followed closely the style of the Pisani. The chief examples of the latter class are the magnificent shrine of St Augustine in the cathedral of Pavia, dated 1362, and the somewhat similar shrine of Peter the Martyr (1339), by Balduccio of Pisa, in the church of St Eustorgio at Milan, both of white marble, decorated in the most lavish way with statuettes and subject reliefs. Many other fine pieces of the Pisan school exist in Milan. The well-known tombs of the Scaliger family at Verona show a more native style of design, and in general form, though not in detail, suggest the influence of transalpine Gothic. In Venice the northern and almost French character of much of the early 15th- century sculpture is more strongly marked, especi- ally in the noble figures in high relief which de- corate the lower story and anglesof thedoge's palace; these are mostly the work | of a Venetian named Bar- tolomeo Bon. A magni- |% ficent marble tympanum |} relief by Bon has recently | been added to the South || Kensington Museum ; it has a noble colossal figure of the Madonna, who shel- ters under her mantle a number of kneeling wor- shippers ; the background | is enriched with foliage |K@} and heads, forming a |} "Jesse tree," designed with greatdecorative skill. The cathedral of Como, |p built at the very end of [Fai |p the 15th century, is de- |g eS corated with good sculp- lk Gi, ,| tureof almost Gothicstyle, but on the whole rather dull and mechanical in de- tail,like much of the sculp- ture in the extreme north of Italy. A large quantity a of rich sculpture was pro- Fic. 16.—Florentine marble effigy in duced in Naples during ul relief

no great merit either in design or in execution, The lofty monument of King Robert (1350), behind the high altar of 8. Chiara, and other tombs in the same church

1 See Ruskin, Stones of Venice ; and Mothes, Gesch. der Bauk. u. Bildh. Venedigs, Leipsic, 1859.

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are the most conspicuous works of this period. Very beautiful sepulchral effigies in low relief were produced in many parts of Italy, especially at Florence. The tomb of Lorenzo Acciaioli (see fig. 16), in the Certosa near Florence, is a fine example of about the year 1400, which has absurdly been attributed to Donatello. Rome was very remarkable during the 14th century for its extraordinary poverty in the production of sculpture. The cluinsy effigies at the north-east of S. Maria in Trastevere are striking ex- amples of the degradation of the plastic art there about the year 1400; and it was not till nearly the middle of the century that the arrival of able Florentine sculptors, such as Filarete, Mino da Fiesole, and the Pollaiuoli, initiated a brilliant era of artistic activity, which, how- ever, for about a century continued to depend on the presence of sculptors from Tuscany and other northern provinces. It was not, in fact, till the period of full decad- ence had begun that Rome itself produced any notable artists.

For the great sculptors of Florence during the 14th and 15th centuries we refer th. # reader to the separate bio- ” ; graphical notices on the sub- Fic. 17.—Statue of St George by ject. The Pisani and Arnolfo Donatello, outside the church of del Cambio were succeeded Or San Michele at Florence.

by Orcagna and others, who carried on and developed the

Fia. 18.—Bronze colossal statue of Colleoni at Venice, modelled by Verrocchio and cast by Leopardi.

great lessons these pioneers of the Renaissance had taught. Ghiberti, the sculptor of the world-famed bap-

Fifteenth century.

[FrALIAN. SCULPTU RE 569 ‘horence. tistery gates ; Donatello, the master of delicate relief and

The 16th century was one of transition to this state of Sixteenth dignified realism (see fig. 17); Luca della Robbia, with

degradation, but nevertheless produced many sculptors of century.

his classic purity of style and sweetness of expression, came next in order. Unsensual beauty elevated by reli- gious spirit was attained in the highest degree by Mino da Fiesole, the two Rossellini, Benedetto da Maiano, and other sculptors of Florence. Two of the noblest equestrian statues the world has probably ever seen are the Gattamelata statue at Padua by Donatello and the statue of Colleoni at Venice by Verrocchio and Leopardi (see fig. 18). A third, which was probably of equal beauty, was modelled in clay by Leonardo da Vinci, but it no longer exists. Finally came Michel- angelo, who raised the sculp- ture of the modern world to its highest pitch of magni- ficence, and at the same time sowed the seeds of its rapidly approaching de- cline; the head of his David(see fig.19) is a work of unrivalled force and dig- nity. His rivals and imitators,

Baccio Bandi- Fis. 19.—Head of the colossal statue of David by salt Cieceacn Michelangelo at Florence.

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della Porta, Montelupo, Ammanati, Vincenzo de' Rossi, and others, copied and exaggerated his faults without possessing a touch of his gigantic genius. In other parts of Italy, such as Pavia, the traditions of the 15th century lasted longer, though gradually fading. The statuary and reliefs which make the Certosa near Pavia one of the most gorgeous buildings in the world are free from the influence of Michelangelo, which at Florence and Rome was overwhelming. Though much of the sculp- ture was begun in the second half of the 15th century, the greater part was not executed till much later. The magnificent tomb of the founder, Giovanni Galeazzo Vis- conti, was not completed till about 1560, and is a gorgeous example of the style of the Renaissance grown weak from excess of richness and from loss of the simple purity of the art of the 15th century. Everywhere in this wonder- ful building the fault is the same; and the growing love of luxury and display, which was the curse of the time, is reflected in the plastic decorations of the whole church. The old religious spirit had died out and

was succeeded by unbelief or by an affected revival of paganism. Monu- ments to ancient Romans, such as those to the two Plinys on the facade of Como cathedral, or '"'heroa" to unsaintly mortals, such as that erected at Rimini by Sigismondo Pandolfo in honour of Isotta,! grew up side by side with shrines and churches dedicated to the saints. We have seen how the youthful vigour of the Christian faith vivified for a time the dry bones of expiring classic art, and now the decay of this saine belief brought with it the destruc- tion of all that was most valuable in medieval sculpture. Sculpture like the other arts became the bond-slave of the

. rich and ceased to be the natural expression of a whole

people. Though for a long time in Italy great technical skill continued to exist, the vivifying spirit was dead, and at last a dull scholasticism or a riotous extravagance of design became the leading characteristics.

1 See Yriarte, Rimini au XVme Stécle, Paris, 1880; also the article RIMINI.

great ability who were not wholly crushed by the declining taste of their time. John of Douay (1524-1608), usually known as Giovanni da Bologna, one of the ablest, lived and worked almost entirely in Italy. His bronze statue of Mercury flying upwards, in the Uffizi, one of his finest works, is full of life and movement. By him also is the Carrying off of a Sabine Woman in the Loggia de' Lanzi. His great fountain at Bologna, with two tiers of boys and mermaids, sur- mounted by a colossal statue of Neptune, a very noble work, is composed of archi- tectural features combined withsculpture, and is remark- able for beauty of proportion. He also cast the fine bronze equestrian statue of Cosimo de' Medici at Florence and the very richly decorated west door of Pisa cathedral, the latter much injured by the over-crowding of its orna- ments and the want of sculp- turesque dignity in the fig- ures ; it is a feeble copy of Ghiberti's noble productior. One of Giovanni's best works, a group of two nude figures ° fighting, is now lost. A fine a

copy in lead existed till Fia. 20.—Group by Giovanni da Bo- recently in the front quad- Ju femetym Brass Co) rangle of Brasenose Col-

lege, Oxford, of which it was the chief ornament (see fig. 20). In 1881 it was sold for old lead by the master and fellows of the college, and was immediately melted down by the plumber who bought it— a quite irreparable loss, as the only other existing copy is very inferior ; the destruction was an utterly inexcusable act of vandalism. The sculpture on the western facade of the church at Loreto and the ela- borate bronze gates of the Santa Casa are works of great technical merit by Girolamo ¢ Lombardo and his sons, about the middle of the 16th cen- tury. Benvenuto Cellini (1500- 1569), though in the main a poor sculptor, produced one work of great beauty and dig- nity,—the colossal bronze Per- seus at Florence (see fig. 21). His large bust of Cosimo de' Medici in the Bargello is mean and petty in style.

by Michelangelo ; the finest are a Piet&' in 8. Maria Pom- posa and a large Descent from the Cross in 8. Francesco,

Fiesole. Many of Bastianini's works are hardly to be dis- tinguished from genuine sculpture of the 15th century, and in some cases enormous prices have been paid for

both at Modena. The colossal bronze seated statue of Julius III. at Perugia, cast in 1555 by Vincenzo Danti, is one of the best portrait-figures of the time.

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Beven- teenth century.

The chief sculptor and architect of the 17th century was the Neapolitan Bernini (1598-1680), who, with the aid of a large school of assistants, produced an almost incredible quantity of sculpture of the most varying degrees of merit and hideousness. His chief early group, the Apollo and

Daphne in the Borghese casino, is a work of wonderful technical skill and delicate high finish, combined with soft beauty and grace, though too pictorial in style. In later life Bernini turned out work of brutal coarseness,! designed in a thoroughly unsculpturesque spirit. The churches of Rome, the colonnade of St Peter's, and the bridge of S. Angelo are crowded with his clumsy colossal figures, half draped in wildly fluttering garments,—perfect models of what is worst in the plastic art. And yet his works re- ceived perhaps more praise than those of any other sculptor of any age, and after his death a scaffolding was erected outside the bridge of S, Angelo in order that people might walk round and admire his rows of feeble half-naked angels. For all that, Bernini was a man of undoubted talent, and in a better period of art would have been a sculptor of the first rank; many of his portrait-busts are works of great vigour and dignity, quite free from the mannered extravagance of his larger sculpture. Stefano Maderna (1571-1636) was the ablest of his contempo- raries ; his clever and much admired statue, the figure of the dead S. Cecilia under the high altar of her basilica, is chiefly remarkable for its deathlike pose and the realistic treatment of the drapery. Another clever sculptor was Alessandro Algardi of Bologna (1598 ?-1654).

Fia, 22,—Colossal marble group of Theseus and a centaur, by Canova, at Vienna.

them under the supposition that they were medieval pro- ductions. These frauds were, however, perpetrated without Bastianini's knowledge.

Scandinavia, déc.—By far the greatest sculptor of the Scandi. classical revival was Bertel Thorwaldsen (1770-1844), an navian Icelander by race, whose boyhood was spent at Copenhagen, a

Eight- eenth century.

In the next century at Naples Queirolo, Corradini, and Sammartino produced a number of statues, now in the tors

chapel of 8. Maria de' Sangri, which are extraordinary

-examples of wasted labour and ignorance of the simplest

canons of plastic art. These are marble statues enmeshed in nets or covered with thin veils, executed with almost deceptive realism, perhaps the lowest stage of tricky de- gradation into which the sculptor's art could possibly fall.? In the 18th century Italy was naturally the headquarters of the classical revival, which spread thence throughout most of Europe. Canova (1757-1822), a Venetian by birth, who spent most of his life in Rome, was perhaps the leading spirit of this movement, and became the most popular sculptor of his time. His work is very unequal in merit, mostly dull and uninteresting in style, and is occa- sionally marred by a meretricious spirit very contrary to the true classic feeling. His group of the Three Graces, the Hebe, and the very popular Dancing-Girls, copies of which in plaster disfigure the stairs of countless modern hotels and other buildings on the Continent, are typical examples of Canova's worst work. Some of his sculpture is designed with far more of the purity of antique art; his finest work is the colossal group of Theseus slaying a Centaur at Vienna (see fig. 22). Canova's attempts at Christian sculpture are singularly unsuccessful, as, for ex- ample, his pretentious monument to Pope Clement XIII.

and who settled in Rome in 1797, when Canova's fame was at its highest point. He produced an immense quantity of groups, single statues, and reliefs, chiefly Greek and Roman deities, many of which show more of the true spirit of antique art than has been attained by any other modern sculptor. His group of the Three Graces is for purity of form and sculpturesque simplicity far superior to that of the same subject by Canova. No sculptor's works have ever been exhibited as a whole in so perfect a manner as Thorwaldsen's; they are collected in a fine building which has been specially erected to contain them at Copenhagen; he is buried in the courtyard. The Swedish sculptors Tobias Sergell and Johann Bystrém be- longed to the classic school ; the latter followed in Thorwald- sen's footsteps. Another Swede named Fogelberg was famed chiefly for his sculptured subjects taken from Norse mythology. W. Bissen and Jerichau of Denmark have produced some able works,—the former a fine equestrian statue of Frederick VII. at Copenhagen, and the latter a very spirited and widely known- group of a Man attacked by a Panther.

Within recent years Russia, Poland, and other countries have produced many sculptors, most of whom belong to

the modern German or French schools. Rome is still a America,

in St Peter's at Rome, that to Titian at Venice, and favourite place of residence for the sculptors of all coun- Russia,

Alfieri's tomb in the Florentine church of §. Croce. Fiesole C.

has in this century produced one sculptor of great talent, named Bastianini. He worked in the style of the great 15th-century Florentine sculptors, and followed especially the methods of his distinguished fellow-townsman Mino da

- *The Ludovisi group of Pluto carrying off Proserpine is a striking example, and shows Bernini's deterioration of style in later life. It has nothing in common with the Cain and Abel or the Apollo and Daphne of his earlier years.*

? In the present century an Italian sculptor named. Monti won much popular repute by similar unworthy tricks; some veiled statues by him in the London Exhibition of 1851 were greatly admired.

tries, but can hardly be said to possess a school of its own. The sculptors of America almost invariably study at one of the great European centres of plastic art, especially in Paris. Hiram Powers of Cincinnati, who produced one work of merit, a nude female figure, called the Greek Slave, exhibited in London in 1851, lived and worked in Florence. A number of living American sculptors now reside both there and in Rome.4

*3 See Eug. Plon, Vie de Thorwaldsen, Paris, 1867. – * On Italian and Spanish sculpture, see Vasari, Trattato della Scul-*

Wire per-

- Pointing , the H marble,

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TECHNICAL METHODS OF THE SCULPTOR.

The production of bronze statues by the ctre perdue process is described in the article METAL-Work, vol. xvi. p. 72; this is now but little practised out of Paris.

For the execution of a marble statue the sculptor first models a preliminary sketch on a small scale in clay or wax. He then, in the case of a life-sized or colossal statue, has a sort of iron skeleton set up, with stout bars for the arms and legs, fixed in the pose of the future figure. This is placed on a stand with a revolving top, so that the sculptor can easily turn the whole model round and thus work with the light on any side of it. Over this iron skeleton well-tempered modelling-clay is laid and is modelled into shape by the help of wood and bone tools; without the ironwork a soft clay figure, if more than a few inches high, would collapse with its own weight and squeeze the lower part out of shape. While the modelling is in progress it is necessary to keep the clay moist and plastic, by squirting water on to it with a sort of garden syringe eapped with a finely perforated rose. When the sculptor is not at work the whole figure is kept wrapped up in damp cloths. A modern improvement is to mix the modelling-elay, not with water, but with stearin and glyeerin; this, while keeping the clay soft and plastic, has the great advantage of not being wet, and so the sculptor avoids the chill and consequent risk of rheumatism which follow from a constant manipulation of wet clay. When the clay model is finished it is cast in plaster. A "piece-mould"? is formed by applying patches of wet plaster of Paris all over the clay statue in such a way that they can be removed piecemeal from the model, and then be fitted together again, forming a complete hollow mould. The inside is then rinsed out with plaster and water mixed to the consistency of eream till a skin of plaster is formed all over the inner surface of the mould, and thus a hollow cast is made of the whole figure. The "piece-monld" is then taken to pieces and the casting set free. If skilfully done by a good formatore or moulder the plaster cast is a perfect facsimile of the original clay, very slightly disfigured by a series of lines showing the joints in the piece-mould, the sections of which cannot be made to fit together with absolute precision. Many sculptors have their clay

model cast in plaster before the modelling is quite finished, as they prefer to put the finishing touches on the plastcr east, —good plaster being a very easy and pleasant substance to work on.

The next stage is to copy the plaster model in marble. The model is set on a large block ealled a "scale stone," while the marble for the future statue is set upon another similar block. The plaster model is then covered with a series of marks, placed on all the most salient parts of the body, and the front of each '< scale stone" is covered with another series of points, exactly the same on both stones. An ingenious instrument called a pointing machine, which has arms ending in metal points or "necdles" that move in ball-soeket joints, is placed between the model and the marble block. Two of its arms are then applied to the model, one touching a point on the scale stone while the other touches a mark on the figure. The arms are fixed by screws in this position, and the machine is then revolved to the marble block, and set with its lower needle touching the corresponding point on the scale stone. The upper needle, which is arranged to slide back on its own axis, cannot reach the corresponding point on the statue because the marble block is in the way; a hole is then drilled into the block at the place and in the direction indicated by the needle, till the latter can slide forward so as to reach a point sunk in the marble block.exactly eorresponding to the point it touched on the plaster mould. This process is repeated both on the model and on the marble block till the latter is drilled with a number of holes, the bottoms of which correspond in position to the number of marks made on the surface of the model. A comparatively un-

aaa eee tura, Florence, 1568, vol. i., and his Vite dei Pittort, éc., ed. Milanesi, Florence, 1880 ; Rumohr, talienische Forschungen, Leipsic, 1827-31 ; Dohme, Kunst und Kiinstler Italiens, Leipsic, 1879; Perkins, Tuscan Sculptors, London (18665), Ttalian Sculptors (1868), and Hand-book of Italian Sculpture (1883) ; Robinson, Italian Sculpture, London, 1862; Gruner, Marmor-Bildwerke der Pisaner, Leipsic, 1858; Ferreri, L' Arco di S. Agostino, Pavia, 1832 ; Symonds, Renaissance in Italy, London, 1877, vol. iii. ; Crowe and Cavalcaselle, Hist. of Painting in Italy, London, 1866, vol. i.; Selvatico, Arch. e Scultura in Venezia, Venice, 1847 ; Ricci, Storia dell' Arch. in Italia, Modena, 1857-60; Street (Arundel Society), Sepulchral Monuments of Italy, 1878; Gozzini, Monumenti Sepolcralt della

Toscana, Florence, 1819 ; De Montault, La Sculpture Religieuse a Rome, Rome, 1870—a French edition (with improved text) of Tosi and Beechio, Monumenti Sacri di Roma, Rome, 1842; Cavallueci and Molinier, Les Della Rodbia, Paris, 1884; Cicognara, Monumenti di Venezia, Venice, 1838-40; Burges and Didron, Tconographie des Chapitaux du Palats Ducal & Venise, Paris, 1857; Richter, " Sculpture of S. Mark's at Venice," Macmillan's Mag., June 1880; Temanza, Vite degli Scultort Veneziant, Venice, 1778; Diedo and Zanotto, Monumenti di Venezia, Milan, 1839; Schulz, Denkméler der Kunst in Unter-Italien, Dresden, 1860; Brinckmann, Die Sculptur von B. Cellini, Leipsic, 1867; Hug. Plon,- Cellint, sa. Vie, &e., Paris, 1882 ; Moses and Cicognara, Works of Canova, London, 1824-28 ; Piroli, Fontana, and others, a series of engraved Plates of Canova's Works, s.l.eta.; Giulliot, Les Artistes en Espagne, Paris, 1870; Carderera y Solano, Iconografia Espafiola, Siglo XI.-XVII., Madrid, 1855-64 ; Monwmentos Arquitectonicos de Espasia, published by the Spanish Government, 1859, and still in progress.

1 Moulds made in one or few pieces, from which the cast can only be extracted by destroying thé mould, are called "spoil-moulds." A large number of casts can be made from a " piece-mould," but only one from a "spoil-mould."

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*skilled scarpellino or *' chisel-man" then sets to work and cuts away*

the marble till he has reached the bottoms of all the holes, beyond

which he must not cut. The statue is thus roughly blocked out,

and a more skilled scarpellino begins to work. Partly by eye and The scar-
partly with the constant help of the pointing machine, which is pellino. used
to give any required measurements, the workman almost com-

pletes the marble statue, leaving only the finishing touches to be

done by the sculptor.

Among the ancient Greeks and Romans and in the medisval Polish on period it was the custom to give the nude parts of a marble statue marble. a considerable degree of polish, which really suggests the somewhat glossy surface of the human skin very much better than the dull loaf-sugar-like surface which is left on the marble by modern sculptors. This high polish still remains in parts of the pedimental figures from the Parthenon, where, at the back, they have been specially protected from the weather. The Hermes of the Vatican Belvidere is a remarkable instance of the preservation of this polish. Michelangelo carried the practice further still, and gave eertain parts of some of his statues, such as the Moses, the highest possible polish in order to produce high lights just where he wanted them ; the artistic legitimacy of this may perhaps be donbted, and in weaker hands it might degenerate into mere trickery. It is, however, much to be desired that modern seulptors should to some extent at least adopt the classical practice, and by a slight but uniform polish remove the disagreeable crystalline grain from all the nude parts of the marble.

A rougher method of obtaining fixed points to measure from was oceasionally employed by Michelangelo and earlier sculptors. They

immersed the model in a tank of water, the water being gradually allowed to run out, and thus by its sinking level it gave a series of

contour lines on any required number of planes. In some cases

Michelangelo appears to have cut his statue out of the marble with-

out previously making a model—a most marvellous feat of skill, In modelling bas-reliefs the modern sculptor usually applies the Relief clay to a slab of slate on which the design is sketched ; the slate seulp-

forms the background of the figures, and thus keeps the relief ture.

absolutely true to one plane. This method is one of the causes of

the dulness and want of spirit so conspicuous in most modern

sculptured reliefs. In the best Greek examples there is no ab- solutely fixed plane surface for the backgrounds. In one place, to gain an effective shadow, the Greek sculptor would cut below the average surface ; in another he would leave the ground at a higher plane, exactly as happened to suit each portion of his design. Other differences from the modern mechanical rules can easily be seen by a careful examination of the Parthenon frieze and other Greek reliefs. Though the word' "bas-relief" is now often applied to reliefs of all degrees of projection from the ground, it should, of course, only be used for those in which the projection is slight ; "basso," "mezzo," and "alto rilievo" express three different degrees of salience. Very low relief is but little used by modern sculptors, mainly because it is much easier to obtain striking effects with the help of more projection.. Donatello and other 15th- century Italian artists showed the most wonderful skill in their treatment of very low relief. One not altogether legitimate method of gaining effect was practised by some medieval sculptors: the relief itself was kept very low, but was "stilted" or projected from the ground, and then undercut all round the outline. A 15th-century tabernacle for the host in the Brera at Milan is a very beautiful example of this method, which as a rule is not pleasing in effect, since it looks rather as if the figures were cut out in cardboard and then stuck on.

The practice of most modern sculptors is to do very little to the Sculp- marble with their own hands; some, in fact, have never really tors' as- learnt how to earve, and thus the finished statue is often very sistants. dull and lifeless in comparison with the clay model. Most of the great sculptors of the Middle Ages left little or nothing to be done by an assistant; Michelangelo especially did the whole of the earving with his own hands, and when beginning on a block of marble attacked it with such vigorous strokes of the hammer that large pieces of marble flew about in every direction. But skill as a earver, though very desirable, is not absolutely neccssary for a sculptor. If he casts in bronze by the cire perdue process he may produce the most perfect plastic works without touching anything harder than the modelling-wax. The sculptor in marble, however, must be able to carve a hard substance if he is to be master of his art. Unhappily some modern sculptors not only leave all mani- pulation of the marble to their workmen, but they also employ men to do their modelling, the supposed sculptor supplying little or nothing but his name to the work. In

some cases seulptors who are neither one nor the other, but who suffer under an excess of popularity, 'are induced to employ aid of this kind on account of their undertaking more work than any one man could possibly accomplish,—a state of things which is necessarily very hostile to the interests of true art. As a rule, however, the sculptor's scar- pellino, though he may and often does attain the highest skill as a carver and can copy almost anything with wonderful fidelity, seldom develops into an original artist. The popular admiration

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for pieces of clever trickery in sculpture, such as the carving of the open meshes of a fisherman's net, or a chain with each link free and movable, would perhaps be diminished if it were known that such work as this is invariably done, not by the sculptor, but by the scarpellino. Unhappily at the present day there is, especially in England, little appreciation of what is valuable in plastic art; there is probably no other civilized country where the state does so little to give practical support to the advancement of monumental and deco- rative sculpture on a large scale—the most important branch of the art—which it is hardly in the power of private persons to further.

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SCURVY, or Scorzurus, a morbid condition of the blood, manifesting itself by marked impairment of the nutritive functions and by the occurrence of hemorrhagic extravasations in the tissues of the body, and depending on the absence of certain essential ingredients in the food.

In former times this disease was extremely common among sailors, and gave rise to a frightful amount of mortality. It is now, however, of rare occurrence at sea, its cause being well understood and its prevention readily secured by simple measures. Scurvy has also frequently broken out among soldiers on campaign, in beleaguered cities, as well as among communities in times of scarcity, and in prisons, workhouses, and other public institutions. In all such instances it has been found to depend closely upon the character and amount of the food. It has been supposed that a too limited diet, either in amount or variety, might induce the disease; but an overwhelming weight of evidence goes to prove that the cause resides in the inadequate supply or the entire want of fresh vegetable matter. The manner in which this produces scurvy is not quite clear. Some high authorities have held that the insufficient supply of potash salts, in which vegetables are rich, is the procuring cause ; but it has been found that the mere administration of these salts will neither prevent nor cure scurvy. Hence,

while it is probable that this may be one of the factors concerned in the production of the disease, the want of other vegetable constituents, especially vegetable acids, is of still greater importance. Besides this essential defect, a diminution in the total amount of food, the large use of salted meat or fish, and all causes of a depressing kind, such as exposure, anxiety, bad hygiene, &c., will powerfully contribute to the development of the disease. See Dixrerics, vol. vii. pp. 207-208.

The symptoms of scurvy come on gradually, and its onset is not marked by any special indications beyond a certain failure of strength, most manifest on making effort, Breathlessness and exhaustion are thus easily induced, and there exists a corresponding mental depression. The countenance acquires a sallow or dusky hue; the eyes are sunken ; while pains in the muscles of the body and limbs are constantly present. The appetite and digestion may be unimpaired in the earlier stages and the tongue comparatively clean, but the gums are tender and the breath offensive almost from the first. These preliminary symp- toms may continue for weeks, and in isolated cases may readily escape notice, but can scarcely fail to attract atten- tion where they affect large numbers of men. In the further stages of the disease all these phenomena are aggravated in a high degree and the physical and mental prostration soon becomes extreme. The face looks haggard; the gums are livid, spongy, ulcerating, and bleeding; the teeth are loosened and drop out; and the breath is excessively fetid. Extravasations of blood now take place in the skin and other textures. These may be small like the petechial spots of purpura (see Purpura), but are often of large amount and cause swellings of the muscles in which they occur, having the appearance of extensive bruises and tending to become hard and brawny. 'These extravasa- tions are most common in the muscles of the lower extremities ; but they may be formed anywhere, and may

easily be produced by very slight pressure upon the skin or by injuries to it. In addition, there are bleedings from mucous membranes, such as those of the nose, eyes, and alimentary or respiratory tracts, while effusions of blood- stained fluid take place into the pleural, pericardial, or peritoneal cavities. Painful, extensive, and destructive ulcers are also apt to break out in the limbs. Peculiar disorders of vision have been uoticed, particularly night- blindness (nyctalopia), but they are not invariably present, nor

specially characteristic of the disease. The further progress of the malady is marked by profound exhaustion, with a tendency to syncope, and with various complications, such as diarrhoea and pulmonary or kidney troubles, any or all of which may bring about a fatal result. On the other hand, even in desperate cases, recovery may be hope- fully anticipated when the appropriate remedy can be obtained. The composition of the blood is materially altered in scurvy, particularly as regards its albumen and its red corpuscles, which are diminished, while the fibrine is increased.

No disease is more amenable to treatment both as re- gards prevention and cure than scurvy, the single remedy of fresh vegetables or some equivalent securing both these ends. Potatoes, cabbages, onions, carrots, turnips, «e., and most fresh fruits, will be found of the greatest service for this purpose. Lime juice and lemon juice are re- cognized as equally efficacious, and even vinegar in the absence of these will be of some assistance. The regulated administration of lime juice in the British navy, which has been practised since 1795, has had the effect of virtually extinguishing scurvy in the service, while similar regula- tions introduced by the British Board of Trade in 1865 have had a like beneficial result as regards the mercantile marine. It is only when these regulations have not been fully carried out, or when the supply of lime juice has become exhausted, that scurvy among sailors has been noticed in recent times. Besides the administration of lime or lemon juice and the use of fresh meat, milk, &e., which are valuable adjuvants, the local and constitutional conditions require the attention of the physician. The ulcers of the gums and limbs can be best treated by stimu- lating astringent applications; the hard swellings, which are apt to continue long, may be alleviated by fomenta- tions and frictions ; while the anemia and debility are best overcome by the continued administration of iron tonics, aided by fresh air and other measures calculated to pro- mote the general health.

SCUTAGE or Escuace was one of the forms of knight- service (see KnicHTHoop, Rea Esrarn). It was prac- tically a composition for personal service. When levied on a knight's fee it was called scutage uncertain, as its amount depended upon the present needs of the crown. Scutage certain was a socage tenure, and consisted in the payment of a sum fixed in amount and payable at regular times. Scutage appears to have been first imposed on the

occasion of the Toulouse War in 1159. Magna Charta (§ 12) forbade the levy of scutage unless per commune con- silium regni. It appears to have fallen into disuse in the reign of Edward IL, and was finally done away with by the Act abolishing feudal tenures (12 Car. IL. c. 24).

SCUTARI (Turkish, Uskidar), anciently Chrysopolis, a seaport town of Turkey in Asia, on the eastern shore of the Bosphorus, opposite Constantinople (see plan, vol. vi. p. 305), of which it is regarded as a suburb. Climbing the slopes of several hills in the form of an amphitheatre, its houses generally painted in red, distinguished by a number of mosques adorned with numerous minarets, pos- sessing some fine bazaars and public baths, and merging farther inland into burying-grounds, gardens, and villas, Scutari presents a very picturesque appearance, especially when viewed from the bridge of the Golden Horn or ap- proached from the Straits of Constantinople right in front of its most prominent point. The inhabitants are largely engaged in the manufacture of saddlery and silk, muslin, and cotton stuffs; the town also contains granaries and is prized as a fruit-market, more particularly for grapes, lemons, and figs. The population is estimated at 60,000 (entirely Mohammedan, with the exception of some Jews). The streets, especially the main street leading from the pier to the barracks, are in general much wider than those of Constantinople. The city includes eight mosques. Behind the landing-place is the Bijiik Jami (great mosque), sur- mounted by a cupola and a minaret and presenting terraces mammillated by small leaden domes. The centre of the square is adorned by a fountain of simple architecture. The mosque of Selim IIL., farther in the interior of the city, is likewise flanked by two minarets and surmounted by a cupola. The most elegant mosque, however, is the Valide Jami or mosque of the dowager sultana, surmounted by two minarets, built in 1547 by the daughter of Solyman. Another prominent mosque, on the right of the main street and south of Biijiik Jami, is Jeni Jami (new mosque). Other noticeable buildings are the barracks built by Selim IIL., forming a handsome and vast quadrangle surmounted by a tower at each angle, and whose corridors, &c., are calcu- lated to have an aggregate length of 4 miles; an old large red building now used as a military hospital, and during the Crimean War as a hospital for the English sick and wounded ; a

seraglio of the sultans; a convent of howling dervishes, a simple wooden structure of two stories front- ing a small cemetery. Other business quarters of the town deserving mention are Jeni Mahalle (new quarter) and the Dohanjilar Mejdani (tobacco merchants' square). The most characteristic feature, however, of Scutari is its immense cemetery, the largest and most beautiful of all the cemeteries in and around Constantinople, extending over more than 3 miles of undulating plain behind the town.! In the centre of the ground rises the magnificent dome, supported by six marble pillars, which Sultan Mohammed erected in memory of his favourite horse. Close to the barracks, on the Bosphorus, the scene of Miss Nightingale's labours, 8000 English dead are over- shadowed bya large granite obelisk. Immediately behind the town is the mountain of Bulgurlu clad in evergreen savins and red beeches, one of the plateaus of which is a favourite holiday resort. Its summit commands a very extensive view. In the plain of Haidar Pasha close by, between the cemetery and Kadikoi (judge's village, anciently Chalcedon), the English army lay encamped during the Crimean War. In front of Scutari, on a low-

1 The cemetery is intersected with numerous paved alleys, and the tombstones are inscribed with verses of the Koran gilded on a dark blue ground and bearing each simply the name of the deceased. The monuments of the men are distinguished each by a turban, those of the women each by a lotus leaf. The nature of the carved turban indicates the rank of the deceased and the fashion of the time to which it refers, so that the tombstones present the sculptured history of the Mohammedan head-dress from the date of the Turkish conquest. Each corpse is allowed a separate grave, never desecrated either by axe or spade. This cemetery lying in Asiatic ground is on that account

the more desired as a burial-place by pious Mahommedans, and holds half the generations of Stamboul (probably some 3,000,000 persons).

lying rock almost level with the water and about a cable's length from the shore, rises a white tower 90 feet high, now used as a lighthouse, called " Leander's Tower," and by the Turks Kiz-kulessi, or the " Maiden's Tower." The first printing press in Turkey was set up at Scutari in 1723.

Its ancient name Chrysopolis most probably has reference to the fact that there the Persian tribute was collected and reposited, as at a later date the Athenians levied there too a tenth on the ships passing from the Euxine. Its more modern name of Uskiidar, signifying a courier who conveys the royal orders from station to station, commemorates the fact that formerly Scutari was the post station for Asiatic couriers, as it is still the great rendezvous and point of departure of caravans arriving from and destined for Syria, Persia, and other parts of Asia, and the spot whence all travellers and pilgrims from Constantinople to the East begin their journeys.

SCUTARI (Turkish, Scodra; Slavic, Skadar), the capital of North Albania, at the south end of the lake of the same name, with a population of 24,500 in 1880 (mostly Mohammedans). There is only one street with any pretensions to regularity. The straggling town is built on the low flat promontory formed by the Bojana, which takes off the waters of the lake to the Adriatic, and the river which flows into the lake after crossing the plain between Scutari and the mountains of Biskassi. In winter the town is often flooded by the Bojana. The mosques and minarets are insignificant; the handsomest of the churches is the Catholic church at the north-east end. In the background is an old Venetian fortress perched on a lofty rock. The town is favourably situated for commerce, being connected by the Bojana with the Adriatic, whence its boats carry the products which descend by the Drina to the mountaineers in exchange for their wool, grain, and dyeing and building woods. There are some manufac- tures of arms and of cotton stuffs. In 1884 330 ships of 123,923 tons entered the port and 325 ships of 123,713 tons cleared.

Livy relates that Scodra was chosen as capital by the Illyrian king Gentius, who was here besieged in 168 B.c., and carried cap- tive to Rome. In the 7th century Scutari fell into the hands of the Servians, from whom it was wrested by the Venetians, and finally, in 1479, the Turks acquired it by treaty. arly in 1885 a beginning was made with the construction of a highway from the roadstead of San Giovanni de' Medici to Scutari.

SCYLAX of Caryanda in Caria was employed by Darius I. to explore the course of the Indus. He started from Afghanistan and is said by Herodotus (iv. 44) to have reached the sea and then sailed to the Gulf of Suez (comp.

Pursta, vol. xviii. p. 569). Scylax wrote an account of his explorations, which is referred to by Aristotle and other ancient writers, but must have been lost pretty early, and probably also a history of the Carian hero Heraclides, who distinguished himself in the revolt against Darius." But Suidas, who mentions the second work, confounds the old Scylax with a much later author, who wrote a refuta- tion of the history of Polybius, and is presumably identical with Scylax of Halicarnassus, a statesman and astrologer, the friend of Paneetius spoken of by Cicero (De Diw., ii. 42). Neither of these, however, can be the author of the Per- plus of the Mediterranean, which has come down to us under the name of Scylax of Caryanda in several MSS., of which the archetype is at Paris. This work is little more than a sailor's handbook of places and distances all round the coast of the Mediterranean and its branches, and then along the outer Libyan coast as far as the Carthaginians traded ; but various notices of towns and the states to which they belong enable us to fix the date with consider- able precision. Niebuhr gave the date 352-348 B.c., others bring it down a year or two later, and C. Miiller as late as 338-335, which is only possible if the writer's informa- tion was sometimes rather stale. See the discussion in Miiller's edition (Geog. Gr. Min., vol. i., Paris, 1855), and against him Unger, in Philologus, 1874, p. 29 sq., who con- Game Cre, OS ee

2 See A. v. Gutschmidt, in Rhein. Dfus., 1854, p. 141 sq.

cludes for the year 347, The latest edition is that of Fabricius (Leipsic, 1878).

SCYLLA anp CHARYBDIS. In Homer (0d, xii. 73 sq.) Scylla is a dreadful sea-monster, daughter of Cratzis, with six heads, twelve feet, and a voice like the yelp of a puppy. She dwelt in a sea-cave looking to the west, far up the face of a huge cliff. Out of her cave she stuck her heads, fishing for marine creatures and snatching the sea- men out of passing ships. was another lower cliff with a great fig-tree growing on it. Under this second rock dwelt Charybdis, who thrice a day sucked in and thrice spouted out the sea water. Between these rocks Ulysses sailed, and Scylla snatched six men out of his ship. In later classical times Scylla and Charybdis were localized

in the Strait of Messina,—Scylla on the Italian, Charybdis on the Sicilian side, In Ovid (Metam., xiv. 1-74) Scylla appears as a beautiful maiden beloved by the sea-god Glaucus and changed by the jealous Circe into a sea-monster; afterwards she was transformed into a rock shunned by seamen. There are various other ver- sions of her story. According to a late legend (Servius on Virgil, dn., ili. 420), Charybdis was a voracious woman who robbed Hercules of his cattle and was there- fore cast into the sea by Jupiter, where she retained her old voracious nature. The well-known line

"'Incidis in Scyllam cupiens vitare Charybdim " occurs in the Alewandrets of Philip Gualtier (a poet of the 13th century), which was printed at Lyons in 1558,

Another Scylla, confounded by Virgil (Ze., vi. 74 sq.) with the sea-monster, was a daughter of Nisus, king of Megara. When Megara was besieged by Minos, Scylla, who was in love with him, cut off her father's purple lock, on which his life depended. But Minos drowned the un- dutiful daughter (Auschylus, Choeph., 613 sq.; Apollodorus, m. 15,0).

Cat of Chios, a Greek geographer of uncertain date, known to us only by a few references in later writers, but perhaps identical with the Scymnus Chius of a Delphic inscription of the beginning of the 2d century B.c.,! was commonly taken to be the author of an imperfect anony- mous Paraphrasis in verse describing the northern coast of the Mediterranean, which in the first edition (Augsburg, 1600) was ascribed to Marcianus of Heraclea. Meineke showed conclusively that this piece cannot be by Scymnus. It is dedicated to a King Nicomedes, probably Nicomedes ITI. of Bithynia, and so would date from the beginning of the lst century B.c. See Miiller, Geog. Gr. Min., vol. i., where the poem is edited with sufficient prolegomena.

SCYROS, a small rocky barren island in the Agean Sea, off the coast of Thessaly, containing a town of the same name. In 469 B.c. it was conquered by the Athe- nians under Cimon, and it was probably about this time that the legends arose which connect it with the Attic hero Theseus, who was said to have been treacherously slain and buried there. A mythic claim was thus formed to justify the Athenian attack, and Cimon brought back the bones of Theseus to Athens in triumph. The inhabitants of Scyros before the Athenian conquest were Dolopes (Thuc., i. 98); but other accounts speak of

Pelasgians or Carians as the earliest inhabitants. There was a sanctuary of Achilles on the island, and numerous traditions connect Scyros with that hero, He was concealed, disguised as a woman, in the palace of Lycomedes, king of the island, when his mother wished to keep him back from the Trojan War ; he was discovered there by Odysseus, and gladly accompanied him to Troy. An entirely different cycle of legends relate the conquest of Scyros by Achilles. The actual worship on the island of a hero or god named

1 See Rhode, in Rhein. Mus., 187 9, p. 153 sq.

Within a bowshot of this cliff

Achilles, and the probable kinship of its inhabitants with a Thessalian people, whose hero Achilles also was, form the historical foundation of the legends. Scyros was left, along with Lemnos and Imbros, to the Athenians by the peace of Antalcidas (387 B.c.). It was taken by Philip, and continued under Macedonian rule till 196, when the Romans restored it to Athens, in whose possession it re- mained throughout the Roman period. It was sacked by an army of Goths, Heruli, and Peucini, in 269 a.v. The ancient city was situated on a lofty rocky peak, on the north-eastern coast, where the modern town of St George now stands. A temple of Athena, the chief goddess of Scyros, was on the shore near the town. The island has a small stream, called in ancient times Cephissus. Strabo mentions as its sole products its excellent goats and a species of variegated marble—the latter in great favour at Rome.

SCYTHE anp SICKLE. Till the invention of the reaping machine, which came into practical use only about the middle of the 19th century, scythes and sickles were the sole reaping implements. The scythe is worked with two hands with a swinging motion, while the sickle or reaping hook is held in one hand and the reaper bends and cuts the crop with a shearing or hitting motion. Of the two the sickle is the more ancient, and indeed there is some reason to conclude that its use is coeval with the cultivation of grain crops. Among the remains of the later Stone period in Great Britain and on the European continent curved flint knives have occasionally been found the form of which has led to the suggestion that they were used as sickles,

Sickles of bronze occur quite commonly among remains of the early inhabitants of Europe. Some of these are deeply curved hooks, flat on the under-side, and with a strengthening ridge or back on the upper surface, while others are small curved knives, in form like the ordinary hedge-bill. Among the ancient Egyptians toothed or serrated sickles of both bronze and iron were used. Ancient Roman drawings show that both the scythe and the sickle were known to that people, and Pliny makes the distinction plain.2 Although both imple- ments have lost much of their importance since the general introduction of mowing and reaping machinery, they are still used very extensively, especially in those countries where small agricultural holdings prevail, The principal modern forms are the toothed hook, the scythe hook, the Hainault scythe, and the common scythe. The toothed hook, which was in general use till towards the middle of the 19th century, consists of a narrow-bladed curved hook, having on its cutting edge a series of fine close-set serratures cut like file-teeth, with their edges inclined towards the heft or handle. Such sickles were formerly made of iron edged with steel; but in recent times they came to be made of cast steel entirely. To- wards the middle of the century the toothed hook was gradually supplanted by the scythe hook or smooth-edged sickle, a somewhat heavier and broader-bladed implement, having an ordinary knife edge. Both these implements were intended for "shearing" handful by handful, the crop being held in the left hand and cut with the tool held in the right. A heavy smooth-edged sickle is used for "bagging" or "clouting,"—an operation in which the hook is struck against the straw, the left hand being used to gather and carry along the cut swath. The Hainault scythe is an implement intermediate between the scythe and nnn ee

- *"Of the sickle there are two varieties, the Italian, which is the shorter and can be handled among brushwood, and the two-handed*

. Gallic sickle, which makes quicker work of it when employed on their

[the Gauls'] extensive domains ; for there they cut their grass only in the middle, and pass over the shorter blades, ~The Italian mowers ent with the right hand only" (H. W., xviii. 67).

the sickle, being worked with one hand, and the motion is entirely a swinging or bagging one. The implement con- sists of a short scythe blade mounted on a vertical handle, and in using it the reaper collects the grain with a crook, which holds the straw together till it receives the cutting stroke of the instrument. The Hainault scythe is exten- sively used in Belgium. The common hay scythe consists of a slightly curved broad blade varying in length from 28 to 46 inches, mounted on a bent, or sometimes straight, wooden sned or snathe, to which two handles are attached at such distances as enable the workman, with an easy stoop, to swing the scythe blade along the ground, the cutting edge being slightly elevated to keep it clear of the inequalities of the surface. The grain-reaping scythe is similar, but provided with a cradle or short gathering rake attached to the heel and following the direction of the blade for about 12 inches. The object of this attachment is to gather the stalks as they are cut and lay them in regular swaths against the line of still-standing corn, The reap- ing scythe, instead of a long sned, has frequently two helves, the right hand branching from the left or main helve and the two handles placed about 2 feet apart. The best scythe blades are made from rolled sheets of steel, riveted to a back frame of iron, which gives strength and rigidity to the blade. On the Continent it is still common to mould and hammer the whole blade out of a single piece of steel, but such scythes are difficult to keep keen of edge. There is a great demand for scythes in Russia, chiefly supplied from the German empire and Austria. The principal manufacturing centre of scythes and sickles in the United Kingdom is Sheffield.

SCYTHIA, SCYTHIANS. When the Greeks began to settle the north coast of the Black Sea, about the middle of the 7th century B.c., they found the south Russian steppe in the hands of a nomadic race, whom they called Scythians. An exacter form of the name was Scoloti. The inhabitants of the steppe must always have been nomads; but the life of all nomads is so much alike that we cannot tell whether the Scythians are the race alluded to in Z2., xii. 5 sq.

The name is first found in Hesiod (Strabo, vii. p. 300) about 800 B.c., and about 689 (Herod., iv. 15) Aristeas of Proconnesus knew a good deal about them in connexion with the ancient trade route leading from their country to Central Asia. From the passage of the Tanais (Don) for fifteen marches north-east through the steppe the country belonged to the nomad

Sarmatians, whose speech and way of life resembled those of the Scythians, Then came the wooded region of the Budini, who spread far inland and were probably a Finnish race of hunters with filthy habits. In this region lay Gelonus, the Greek emporium of the fur trade, round which lived the half-Grecian Geloni, prob- ably on the Volga and hardly farther south than Simbirsk. Seven more marches in the same line ran through desert, and then in the country of the Thyssagete the road turned south-east, and led first through the country of the Lyrcx, whose way of hunting (Herod., iv. 22) indicates that they dwelt between the steppe and the forest, but belonged more to the former; the road perhaps crossed the river Ural near Orenburg, and ascending its tributary the Ilek crossed the Mugojar Mountains. Beyond this in the steppe as far as the Sir-Darya and Amu-Darya the traveller was again among Scythians, who were regarded as a branch of the European Scythians. Next came a long tract of rocky soil, till the bald-headed Argippzei were reached, a race esteemed holy and seemingly Mongolian, who dwelt on the slopes of impassable mountains, probably the Belur-tagh,

1 In Herod., iv. 109, d0ctporpayéover is to be taken literally. Plan de Carpin relates the same thing of the Mongols.

and served as intermediaries in trade with the remoter peoples of Central Asia. The description of the fruit on which they subsisted (Herod., iv. 23) suits the Llzagnus hortensis, indigenous on the upper Zerafshan. Many notices of ancient writers about Scythia (e.g., as to the eight months winter and the rainy summer) suit only the lands on the first part of this trade road; moreover, the Greeks soon began to extend the name of Scythians to all the nations beyond in a northerly or north-easterly direc- tion. But such inaccuracy is not common till the fall of the Scythian race, when their name became a favourite designation of more remote and less known nations. Our best and chief informants, Herodotus and Hippocrates, clearly distinguish the Scolots or true Scythians from all their neighbours, and on them alone this article is based.

The boundaries of Scythia are, broadly speaking, those of the steppe, which had as wide a range in antiquity as at the present day, cultivable land having always been confined to the immediate neighbourhood of the rivers.

But to the west the Scythians went beyond the steppe, and held Great Wallachia between the Aluta and the Danube (Atlas and Ister). Here their northern neigh- bours were the Agathyrsians of Transylvania, who were perhaps Aryans, though in manners they resembled the Thracians. The Dniester was Scythian as far up the stream as the Greeks knew it. On the Bug were found first the mixed Graeco-Scythian Callipide and Alazones as faras Exampeeus (an eastern feeder of the Bug), then agri- cultural Scythians (Aporjpes), who grew corn for export, and therefore were not confined to the steppe. This points to south-east Podolia as their dwelling-place. Beyond them on the upper Bug and above the Dniester were the Neuri, who passed for were-wolves, a superstition still current in Volhynia and about Kieff. On the left bank of the Dnieper the " forest-land" ("YAaéa) reached as far as the modern BPereslaff; then came the Scythians of the Dnieper (the Borysthenians), who tilled the soil (of course only close to the river), and extended inland to the Panticapes (Inguletz?)2 and up the stream to the district of Gerrhi (near Alexandrovsk). Herodotus does not know the falls of the Dnieper; beyond Gerrhi he places a desert which seems to occupy the rest of the steppe. Still farther north were the wandering Androphagi (Cannibals), pre- sumably hunters and of Mordvinian race.? The nomadic Scythians proper succeeded their agricultural brethren to the east as far as the Gerrhus (Konskaya), and their land was watered by the Hypacyris (Molotchnaya). The royal horde was east of the Gerrhus and extended into the Crimea as far as the fosse which cut off Chersonesus Trachea from the rest of the peninsula, and remains of which can still be traced east of Theodosia. The southern neighbours of the royal Scythians were the savage Taurian mountaineers. Along the coast of the Sea of Azoff the. royal horde stretched eastward as far as Cremni (Tagan- rog); farther inland their eastern border was the Don. They extended inland for twenty marches, as far probably as the steppe itself, and here their neighbours were the Melanchleni (Black-cloaks).*

The true Scythians led the usual life of nomads, moving

2 Herodotus (iv. 54) makes it an eastern instead of a western feeder of the Dnieper.

3 The eastern Mordvinians (Ersians) still passed for cannibals in the time of the Arabian travellers.

4 Herodotus (iv. 56) represents the Gerrhus as a branch of the Dnieper flowing into the Hypacyris, which is not impossible (Von Baer, Histor. Fr., p. 66). But Herodotus himself never travelled beyond Olbia, and what he there learned about the rivers was necessarily vague, except for the parts which the Eastern trade route from Olbia touched. He filled up this imperfect information on analogy, suppos- ing that all these rivers came from lakes, as the Bug did, with which he knew a lake was connected called "mother" of that river (iv. 51, D2 aeabd, 57),

through the steppe from exhausted to fresh pasture- grounds, their women in waggons roofed with felt and drawn by oxen, the men on horseback, the droves of sheep, cattle, and horses folowing. They lived on boiled flesh, mare's milk, and cheese ; they never washed, but enjoyed a narcotic intoxication in combination with a vapour bath by shutting themselves up within curtains of felt and strew- ing hemp seed on heated stones. The women, in place of washing, daubed themselves with a paste containing dust of fragrant woods and removed it on the second day. Like many other barbarians, the Scythians, at least in Hippo- crates's time (ed. Littré, ii. 72), were not a specially hardy race ; they had stout, fleshy, flabby bodies, the joints con- cealed by fat, their countenances somewhat ruddy. The observation of Hippocrates that they all looked alike is one that has often been made by travellers among lower races. They were liable to dysentery and rheumatism, which they treated by the actual cautery; impotence and sterility were common, and, though the accounts vary, it is probable that the race was not very numerous (Herod., iv. 81).

Hippocrates's description has led many writers to view the Scythians as Mongolian; but the life of the steppe impresses a certain common stamp on all its nomad in- habitants, and the features described are not sufficiently characteristic to justify the assumption of so distant a Mongol migration. What remains of the Scythian lan- guage, on the other hand, furnished Zeuss with clear proofs that they were Aryans and nearly akin to the settled Iranians. The most decisive evidence is found in Herodotus (iv. 117), viz.,

that Scythians and SARMATIANS (q.v.) were of cognate speech ; for the latter were certainly Aryans, as even the ancients observed, supposing them to be a Median colony (Diod., ii. 43; Pliny, vi. 19). The whole steppe lands from the Oxus and the Jaxartes to the Hungarian pusztas seem to have been held at an early date by a chain of Aryan nomad races.

The Scythian deities have also an Aryan complexion. The highest deity was Tabiti, goddess of the hearth; next came the heaven-god Papzus, with his wife the earth-goddess Apia; a sun-god, CEtosyrus; a goddess of fecundity, Arippasa, who is compared with the Queen of Heaven at Ascalon; and two gods to whom Herodotus (iv. 59) gives the Greek names of Heracles and Ares. These deities were common to all Scythians. The royal horde had also a sea-god, Thamimasadas. In true Iranian fashion the gods were adored without images, altars, or temples, save only that Ares had as his symbol a sabre (Herod., iv. 62), which was set up on a huge altar piled up of faggots of brushwood. He received yearly sacrifices of sheep and oxen, as well as every hundredth captive. Ordinarily victims were strangled. Diviners were common, and one species of them, who came only from certain families, the Enarians or Anarians, were held in high honour. These supposed their race to have offended the goddess of heaven, who in revenge smote them with impotence; they assumed 'the dress and avocations of women and spoke with a woman's voice.!_ Divination was practised with willow withes as among the Old Germans ; the Enarians, however, used lime-tree bark. False pro- phets were tied on a waggon with burning brushwood, and the frightened team was driven forth. Oaths were sealed by drinking of a mixture of wine with the blood of the parties into which they had dipped their weapons. When the king was sick it was thought that some one had sworn falsely by the deities of his hearth,2 and the man ee ee ee

1 Reineggs in 1776 observed the same symptoms, with the same consequence of relegation among the women, in certain Nogai Tatars on the Kuban.

- *The plural (Herod, iv. 69) reminds us of the Fravashi of the king in the Avesta,*

sCYTHis

was beheaded whom the diviners, or a majority of them, pronounced to be the culprit. When the king commanded the death of a man all his male offspring perished with him (for fear of blood-revenge). He who gained a suit before the king had the right to make a drinking-cup of his adversary's skull. Actions at law thus stood on the same footing with war, for this is what one did after slay- ing a foe. The Scythians fought always on horseback with bow and arrow, and the warrior drank the blood of the first man he slew in battle, probably deeming that his adversary's prowess thus passed into him. No one shared in booty who had not brought the king a foeman's head ' the scalp was then tanned and hung on the bridle. Cap- tive slaves were blinded on the absurd pretext that this kept them from stealing the mare's-milk butter they were employed to churn.

The government was strictly despotic, as appears most plainly in the hideous customs at the burial of kings. The corpse of an ordinary Scythian was carried about among all the neighbours for forty days, and a funeral feast was given by every friend so visited. But the royal corpse was embalmed and passed in like manner from tribe to tribe, and the people of each tribe joined the procession with their whole bodies disfigured by bloody wounds, till at length the royal tombs at Gerrhi were reached. Then the king was buried along with one of his concubines, his cupbearer, cook, groom, chamberlain, and messenger, all of whom were slain. Horses, too, and golden utensils were buried under the vast barrow that was raised over the grave. Many such tumuli (called in Tatar dwrgan) have been found between the Dnieper and the sources of the Tokmak, a tributary of the Molotchnaya, Then, on the first anniver- sary, yet fifty horses and fifty free-born Scythian servants of the king were slain, and the latter were pinned upright on the stuffed horses as watchmen over the dead.

The Scythians deemed themselves autochthonous ; their patriarch was Targitaus, a son of the god of heaven by a daughter of the river Dnieper. This legend, with the site of the royal graves, points to the lower Dnieper as the cradle of their kingdom. The further legend (Herod., iv. 5) of the golden plough, yoke, battle-axe, and cup (tokens of sovereignty over husbandmen and warriors) that fell from heaven, and burned when the two eldest sons of Targitaus approached them, but allowed the youngest son to take them and become king, has been well compared by Duncker with the Iranian

conception of hvarend, the halo of majesty, which refused to be grasped by the Turanian Fraiiracé, but attached itself to pious kings like Thraétadna, The eldest brother, Lipoxais, was ancestor of the Auchate ; the second, Arpoxais, of the Catiari and Traspians ; the youngest, Colaxais (whose name seems to be mutilated), was father of the royal tribe of Paralate, and from him, too, the whole nation had the name of Scolots. Pliny (H.W., iv. 88) places the Auchatz on the upper Bug, so this seems to be the proper name of the agricultural Scythians ; if so, the Catiari and Traspians will be the Borysthenian and nomad Scythians who dwelt between the husbandmen and the royal horde. Colaxais divided his kingdom among his three sons, the chief kingdom being that in which the golden relics were kept ; and these three sons correspond to the three kings of the Scythians in the time of Darius's invasion, Viz., Scopasis, whose realm bordered on the Sarmatians ; Idan- thyrsus, sovereign of the chief kingdom ; and Taxacis,—the last two being neighbours of the Budini and the Geloni. According to the Scythians, Targitaus lived just a thousand years before the year 513 B.c.,—a legend which, taken with the tradition of autochthonism, indicates a much earlier date for the immigration of the Scythians than we should deduce from other narratives.

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Aristeas of Proconnesus (Herod., iv. 13) had heard of

a migration of the Scythians into their later settlement. The one-eyed Arimaspians, who, as neighbours of the gold-guarding griffins, may be sought near the gold-fields of the Tibetan plateau, had attacked the Issedones (whom later authors are probably right in placing in the region of Kashgar and Khotan), and the latter in turn fell on the Seythians and drove them from their seats, whereupon these occupied the lands held till then by the Cimmerians. It is a probable conjecture that the branch of the royal Scythians spoken of as dwelling north of the Oxus and Jaxartes was really a part of the nation that remained in their ancient home. Aristeas's story has much internal probability ; but it is impossible to hold that the Scythian migration immediately preceded the first appearance of the expelled Cimmerians in Asia Minor, in Aristeas's own days (695 x.c.). The Scythians must have seized the steppe as far as the Dnieper centuries before, but the

older inhabitants, who were probably of one race with the Thracians, remained their neighbours in the Crimea and the extreme west till the beginning of the 7th century.

Concerning the complete expulsion of the Cimmuerians and the Scythian invasion of Asia that followed, Herodotus (iv. 11 sq. i, 103-106, iv. 1, 3 sg.) gives an account, taken from several sources, which is intelligible only when we put aside the historian's attempts to combine these. A barbarian (i.e, Median) account was that the Scythian nomads of Asia, pressed by the Massagetze, crossed the Araxes (by which Herodotus here and in other places means the Amu-Darya) and fell on Media. Taking these Scythians for Scolots and assuming, therefore, that the reference was to their first migration, Herodotus had to place the expulsion of the Cimmerians between the crossing of the Araxes and the invasion of Media, and he had heard from Greeks (of Pontus) that on the Dniester was the grave of the Cimmerian kings, who had slain each other in single combat rather than share the migration of their people. This local tradition implies that the Cimmerians reached Asia Minor through Thrace, which, indeed, is the only possible route, except by sea; Herodotus, however, is led by his false presuppositions to conduct them east- wards from the Dniester by the Crimea (where many local names preserved their memory), and so along the Black Sea coast, and then westwards from the Caucasus to Asia Minor. The Scythians, he thinks, followed them, but, losing the trail, went east from the Caucasus, and so reached Media. This he gives only as his own inference from two things—(1) that the Cimmierians settled on the peninsula of Sinope, from which their forays into Asia Minor seem to have been conducted, and (2) that the Scythians invaded Media. The Median source spoke further of a great victory of the Scythians, after which they overran all Asia, and held it for twenty-eight years (634-606), levying tribute and plundering at will, till at length the Medes, under Cyaxares, destroyed most of them after making them drunk at a banquet. Here a third, Egyptian, account comes in, viz., that King Psam- metichus (d. 611) bought off certain northern invaders who had advanced as far as Philistzea ; there is no reason to doubt that these are the Scythians of the Median account. Still more important is the evidence of certain prophecies of Jeremiah (comp. iii. 6) in the reign of Josiah (628-609), describing the approach from the north of an all- destroying nation of riders and bowmen (Jer. iv. OIsos,

V: 15 sq., vi. 1 sq., 22 sq.).2 Herodotus's twenty-eight years are simply the period between the accession of Cyaxares

2 This story may be influenced by the myth about the feast of the Sacsea (Strabo, xi. p. 512). Ctesias has it that peace was made.

2 This is Hitzig's discovery aud must be sound. Before the fall of

Nineveh the Chaldwans could not be a source of danger.

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and the taking of Nineveh, which followed close on the overthrow of the Scythians; Justin, on the other hand, gives the Scythians eight years of sovereignty, which fits well with the interval between the first and the second. siege of Nineveh (619-609).?

A fourth account in Herodotus, which connects the O4Xeva vocos of the Enarians with the plundering of the temple of Astarte at Ascalon, is entirely apocryphal, and must come from the Greek identification of this Astarte. with the Scythian Arippasa. Yet it seems to have been chiefly this story that led Herodotus to take the Scythians of his Median source for Scolots. He is refuted by another account of Iranian origin: Ctesias (in Diod., ii. 34) tells of a long war between the Medes and the Sacz, occasioned by the defection of Parthian subjects of Media to the latter nation in the time of Astibaras (Cyaxares); so that the Scythian conquerors actually came from the east, not from the north. Herodotus's Median source closed with Cyaxares recovering his power; the story which follows about the resistance of the slaves of the Scythians to their returning lords, who cowed them by using whips instead of arms, must have come from the Pontic Greeks, and is certainly a local legend, which has nothing to do with the wars in Asia, and indeed is connected by Callistratus (Steph. Byz., s.v. Téfpar) with a war between Scythians and Thracians.

From the expedition of Darius upwards Herodotus names five generations of Scythian kings, Idanthyrsus, Saulius, Gnurus, Lycus, Spargapeithes ; the last may be contemporary with the foundation of Olbia (646 B.c.).° Under Idanthyrsus fell the invasion of Darius (513 B.c.). The motive for this

invasion cannot possibly have been revenge for the Scythian invasion of Media. It is possible that a popular war against the chief nation of the nomads, who are so hated by the Iranian peasants, seemed to Darius a good way of stimulating common feeling among his scattered subjects, and it is certain that he had quite false ideas of the wealth of Scythia, due perhaps to export of grain from the Grecian cities of the Scythian coast. Herodotus's account of the campaign is made up in a puzzling way of several distinct narratives, retouched to smooth away contradictions. Here it must suffice to refer to the article Persia (vol. xviii. p. 570), and to add that the geographical confusion in Herodotus and his exaggerated idea of the distance to which the Persians advanced seem to be due partly toa false combination between a Scythian account of the campaign and certain notices about the burning of Gelonus by enemies and about fortresses on the river Oarus which had come to him from the inland trade route, and had nothing to do with Darius, partly to a confusion between the desert reached by the Persians and that which lay between the Budini and Thyssagete.

While the Persian rule in the newly conquered districts of Europe was shaken by the Ionic revolt, the Scythians made plundering expeditions in Thrace, and in 495 pene- trated into the Chersonesus, whose tyrant Miltiades fled, but was restored after their retreat by the Dolonci (Herod., vi. 40). Darius had Abydus and the other cities of the Propontis burned lest they should furnish a base for a pro- jected Scythian expedition against Asia (Strabo, xiii. p.591); this agrees with the fact known from Herodotus (ca bla,

3 Eusebius's date (634) for the Scythians in Palestine is deduced from Herodotus.

4 It is meant to explain the origin of the fosse (Herod., iv. 3), which the slaves were said to have dug, and of a subject-race in the same district (Pliny, H.W., iv. 80), the Sindians (Amm., Mar., xxii. 8, 41 ; Val. Flac., vi. 86), or rather perhaps the Satarche.

5 That the wise ANACHARSIS (g.v.) was brother of King Saulius (Caduidas of Diog. Laert., i. 101) seems to be a mere guess of Herod- otus's Scythian informant Tunes. The story of Anacharsis's fate is coloured by that of the later king Scyles.

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that Abydus had been retaken by Daurises a little before. In this connexion the Scythian embassy to King Cleomenes at Sparta (Herod., vi. 84) to arrange a combined attack on Asia becomes credible ; for, barbarians though they were, the Scythians had a political organization and many connexions with the Ionians of the Pontic colonies, so that their envoys may well have reached Sparta at the same time with Aristagoras (499) and served as decoys for his fantastic schemes.1

Our accounts of the Scythians begin to fail after the time of King Scyles, who affected Grecian habits and was de-

posed and finally slain for sharing in Bacchic orgies (Herod.,

iv. 78-80) ; his death fell a little before Herodotus's visit to Olbia (c. 456). We read in an unclear context (Diod., ii, 43) of a division of the Scythians into two great tribes, the Pali and the Nape, the former of whom crossed the Don from the east and destroyed the latter and also the Tanaites.? These events seem to point to a change of dynasty in the royal horde.

The Periplus ascribed to Scylax (346 B.c.) knows the Scythians as still occupying almost exactly the same limits as in Herodotus's time ; only in the east there is a small but significant change: the Sarmatians have already crossed the Don (§ 68). King Ateas still ruled Scythia in its old extent (Strabo, vii. 307), but all that we know of the events of his reign took place south of the Danube,— wars with the Triballi in Servia, with Byzantium, with the king of the Greek city of Istrus, and finally with his old ally Philip of Macedon. Philip defeated and slew Ateas near the Danube in 339 B.c. He was then over ninety years old.® .

The Scythians appear once more in the region of the Dobrudja in 313, when they helped the citizens of Callatis against Lysimachus and were defeated by him (Diod., xix. 73). All this points to a considerable advance of their frontier southwards, and in fact Pseudo-Scymnus (Ephorus) gives Dionysopolis (a little to the west of the modern Bal- tchik) as the place

where the Crobyzian and the Scythian territories met in his time (334 B.c.).4 This apparent ad- vance of the realm contrasts singularly with the distress to which Ateas was reduced by the king of the insignificant town of Istrus, an evidence that the Scythian power was really much decayed. Ateas indeed is sometimes painted as a rude barbarian lord of a poor but valiant and hardy race, and Ephorus, who mainly follows Herodotus about Scythia, yet speaks of the Scythians in contrast with the fierce Sarmatians as corresponding to Homer's description of a just and poor people feeding on milk (Strabo, vii. 302). But Aristotle, on the contrary (Hth. Nic., vii. 8), speaks of the effeminacy of the Scythian monarchs as notorious ; and indeed there can be little doubt that the Scythians crossed the Danube and settled in the Dobrudja under pressure of the Sarmatians behind them, and that the idyllic picture drawn by Ephorus presupposes the fall of their political system. Diodorus (ii. 43) tells us that the Sarmatians ex- terminated the inhabitants of most part of Scythia, and this must have taken place in the later years of Ateas, between 346 and 339.

At a later but uncertain date the great inferiority of the Scythians to the Sarmatians is illustrated by the story of Amage, the warlike consort of a debauched Sarmatian king,

who with only 120 chosen horsemen delivered Chersonesus EE ee eee ce

- *King Ariantas, whose primitive census is mentioned in Herodotus {iv. 81), seems to have flourished at this time.*

2 Pliny, H.N., vi. 50; comp. vi. 22, where we must read "Asam- patas, Palos, ab his Tanaitas et Napeos" and, below, " Satarchxos, Palos."

3 For Ateas, sec Frontin., Strateg., ti. 4, 20; Polyen., vii. 44, 1; Aristocritus, in Clem. Al., Strom., v. p. 2389; Justin, ix. 2; Lucian, Afacrob., 10; Aischines, C. Ctesiph., 128, p. 71.

4 Comp. Pliny, Z.N,, iv. 44, who calls the Scythians Aroteres,

in Tauris from the neighbouring Scythian king, slew him with all his followers, and gave the kingdom to his son (Polyzen., viii. 56). Itis, however, not quite certain whether these were a remnant of the old Scythians ; and it is still more doubtful whether the powerful Scythian kingdom of Scilurus, who brought the Greek cities of the Crimea to the verge of ruin, but was destroyed by Mithradates Eupa- tor (105), was really a kingdom of Scolots. The last cer- tain trace of true Scythians occurs about 100 B.c. in the Olbian psephisma in honour of Protogenes.5 Here they appear as a small nation west of Olbia between the Thisa-

mate and Saudarate, who are anxious to take refuge in

Olbia from the (Scordiscian) Galatians. Sourecs. —Herodotus (iv. 1-82, 97-142) and Hippocrates (De Aere,

&c., c. 17-22, in Littré's ed., ii, 66-82) are alone trustworthy, because

they carefully distinguish the Scythians from the other northern nations. Ephorus (in Strabo, vii. p. 302 sg., and Scymn., Perieg., 773-873), Diodorus (ii. 48 sq.), and Trogus (in Justin, it. 1-8, 5, 1-11, and Jordan., @et., v.-vi., x.) do not do so, and must be used with great caution.

Helps. —Ukert, Geog. d. Gr. und Rémer, iii. 2 (complete collection of materials from original sources) ; Niebuhr, Kleine Schriften, vol. i, (1828); Zeuss, Die Deutschen und die Nachbarsténune (1837)—an admirable discussion, which established the Aryan origin of the Scythians ; Boeckh, in C. Inse. Gr., ii. 81 sq. ; K. Neumann, Hel- lenen im Skythenlande (1855)—the best book, in spite of certain fundamental errors, such as the ideas that great part of the steppe was once wooded and that the Scythians were Mongols ; Miillenhoff, "Origin and Speech of the Pontic Scythians and Sarmatians," in Monatsb. d. Berl. Ak. (1866). The best account of the trade route which in the 5th century n.c. passed through a great part of what is now Russian territory is by K. E. v. Baer, Historische Fragen, &e. (1878) ; comp. also Grote, Hist. of Greece, iii. 314 sq. (1850), and Duncker, ii. 430 sg. (5th ed.). There is a class of mere amateurs, especially in east Germany, who absurdly take the Scythians to have been Slavs. (A. v. G.)

SEA. Any part of the ocean marked off from the general mass of water may be called a sea. In geography the name is loosely applied : for instance, the Arabian Sea is an open bay, Hudson's Bay is an enclosed sea. Seas proper lie within the transitional area which divides the permanent continental masses from the permanent ocean basins, and their boundaries are consequently subject to geological change, and to alteration by subsidence and elevation occurring in historic times.

Inland Seas are seas entirely surrounded by land (see Caspian Sea, Dzap Sea, and, for general discussion, LAKE).

Enclosed Seas have communication with the ocean re- stricted to one opening, which may take the form of one, two, or more straits close to each other. The best known are the White Sea of the Arctic Ocean ; the Baltic, Zuyder Zee, Hudson's Bay, Gulf of Mexico, and Mediterranean, with the Adriatic and Black Sea, of the Atlantic; the Red Sea and Persian Gulf of the Indian Ocean; and the Yellow Sea and Sea of Okhotsk of the Pacific.6 They are all cut off from general oceanic circulation and very largely from tides, but the result is not stagnation. The Baltic and Black Sea are but slightly saline on account of the number of large rivers falling into them, and the fresh surface-water flows out as a regular current, liable indeed to be checked, and even reversed for a time, but in the main persistent ; while the salt water flows in uniformly as an undercurrent. A state of equilibrium is arrived at, so that periodical fluctuations of salinity do not affect the average of a num- ber of years. The water of the Mediterranean and Red Sea is much salter than that of the ocean, which therefore flows in as a surface-current, while the dense very salt water escapes below. In the case of the Baltic and Black Sea dilution by rivers, in that of the Mediterranean and Red Sea concentration by evaporation maintains a circu-

° C. I. Gr., ii. No. 2058 ; comp. Zippel, Rim. Herrschaft in Illyrien, Jos 15s),
$ The prevalence of colour names for these seas is noteworthy.

lation. Winds and differences of barometric pressure are, as in inland seas, great factors in producing variable currents. (See Batic Sea, Buack SEA, MEDITERRANEAN Sra, Rep Sz, dc.

Partially Enclosed Seas may be (a) comparatively shallow irregular channels through which strong tides sweep, or (0) ocean basins cut off by barriers barely rising to the surface, or remaining permanently submerged, in which case there may be no break of continuity in the ocean surface to indi- cate the sea. Seas of the first description are related to shallow enclosed seas, but are much affected by tides and ocean currents ; the principal are the Kara Sea of the Arctic Ocean, Baffin Bay and North Sea of the Atlantic, Behring Sea and Japan Sea of the Pacific. They are subject to considerable temperature changes owing to their proximity to land. Seas coming under the second category combine the peculiarities of the open ocean and of deep inland seas. The Caribbean Sea of the Atlantic, the China Sea, Java Sea, and numerous small seas of the eastern archipelago of the Pacific are the best examples. Their chief peculi- arity is that the temperature of the water instead of falling uniformly to the bottom becomes stationary at some inter- mediate position corresponding to the top of the barrier. They are usually very deep. (See Nort Sza, NoRwEGIAN SA, and Pactric OcnAN.)

Other Seas.—Coral Sea, Arabian Sea, Sea of Bengal, are names, now dropping out of use, to designate parts of the ocean. "Sargasso Sea" is an expression devoid of geo- graphical meaning (see ATLANTIC OcEAN, vol. iii. p. 20).

Firths and Estuaries.—A river entering the sea by a short estuary flows over the surface, freshening it to a con- siderable extent, and, if the force of its current is not too great, the rising tide slowly forces a wedge of sea water up between river and river bed, withdrawing it rapidly when ebb sets in. In a firth that is large compared with the river falling into it, judging from results recently obtained in the Firth of Forth,! a state of equilibrium is arrived at, the water increasing in salinity more and more gradu- ally as it proceeds seawards, the disturbing influence of the tide becoming less and less, and the vertical distribution of salinity more and more uniform until the river water meets the sea, diffused through a nearly homogeneous mass with a density little inferior to that of the ocean. Between the extreme cases there are numerous gradations of estuary depending on the ratio of river to sea inlet.

Deposits.—All seas within about 300 miles of continental land, whatever may be their depth, are paved with terrige- nous débris, and all at a greater distance from shore are carpeted with true pelagic deposits (see Pactric OcEAN).

Marine Fauna and Flora.—The mixing of river with sea water produces a marked difference in the fauna and flora of seas. Where low salinity prevails diatoms abound, probably on account of the greater amount of silica dis- solved in river water, and they form food for minute pelagic animals and larvee, which are in turn preyed upon by larger creatures. In some seas, such as the North Sea, there are many celebrated fishing beds on the shallow banks of which innumerable invertebrate animals live and form an inex- haustible food-supply for edible fishes. Naturalists have remarked that in temperate seas enormous shoals of rela- tively few species are met with, while in tropical seas species are very numerous and individuals comparatively few. Organisms, such as the corals, which secrete carbonate of lime appear to flourish more luxuriantly in warmer and salter seas than in those which are colder and fresher.

The geological and dynamic aspects of seas are treated of in GroLocy (vol. x. p. 284 sg.) and GEOGRAPHY (PHYSICAL) ; and in ATLANTIC Ocean, Batic Sra, BLack Sra, INDIAN

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1 Mill, Proc. Roy. Soc. Ed., xiii, 29, 187, and 347.

OcEAN, MEDITERRANEAN SEA, NortH Sea, NoRWEGIAN Sra, Pactric Ocean, Potar Recions, and Rep Sea the general geographical and physical characters of oceans and seas are described. In METEOROLOGY some account is given of the influence of the sea on climate, and chemical problems connected with the ocean are discussed in SEA WATER.

SEA-CAT. See Sea-Wo rr, infra.

SEA-DEVIL. See Fisninc-FrRo«, vol. ix. p. 269.

SEA-HORSE. Sea-horses (Hippocampina) are small marine fishes which, together with pipe-fishes (Syn-

gnathina), form the order of Lophobranchiate fishes, as

already noticed in IcHTHYoLoGy, vol. xii. p. 694. The gills of the members of this order are not arranged in leaf-like series as in other fishes, but form a convex mass composed of small rounded lobes attached to the branchial arches, as shown in the accompanying figure (fig. 1) of the head of a sea-horse, in which the gill-cover has been pushed aside to show the interior of the gill-cavity. Sea-

Fig. 1.—Gills of Hippocampus abdominalis.

horses differ from pipe-fishes by having a prehensile and invariably finless tail; it is long, slender, tapering, quad- rangular in a transverse section, and, like the rest of the body, encased in a dermal skeleton, which consists of horny segments, allowing of ventral, and in a less degree of lateral, but not of dorsal, flexion. The typical sea-horse (Hippo- campus) can coil up a great portion of its tail, and firmly attach itself by it to the stems of sea-weeds or other similar objects. The body is compressed and more or less elevated, and the head terminates in a long tubiform snout, at the end of which the small mouth is situated. The whole configuration of the fore part of the body, as well as the peculiar manner in which the head is joined to the neck-like part of the trunk, bears a striking resem- blance to a horse's head ; hence the name by which these fishes are generally known. Sea-horses are bad swimmers and are unable to resist currents. With the aid of their

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Fia. 2.—Phyllopteryx eques.

single dorsal fin, which is placed about the middle of the fish's body and can be put into a rapid undulatory motion, they shift from time to time to some other object near them, remaining stationary among vegetation or coral

where they find the requisite amount of food and sufficient

cover. Their coloration and the tubercles or spines on the head and body, sometimes with the addition of skinny flaps and filaments, closely resemble their surroundings, and constitute the means by which these defenceless creatures escape detection by their enemies. These protective structures are most developed in the Australian genus Phyllopteryx, one of the most singular types of littoral fishes.

Sea-horses belong to the tropics and do not extend so far north as pipe-fishes. They are abundant at suitable localities, chiefly on the coral-banks of the Indo-Pacific Ocean. Some thirty species are known, of which the majority belong to the genus Hippocampus proper. Their size varies from 2 to 12 inches in length; but in China and Australia a genus (Solenognathus) occurs the species of which attain to a length of nearly 2 feet; they, how-ever, in form resemble pipe-fishes rather than sea-horses. The species which may be sometimes seen in aquaria in Great Britain is Hippocampus antiquorum, from the Mediterranean and the coasts of Portugal and France. The food of the sea-horses consists probably of very small invertebrates and the fry of other fishes. Like the other Lophobranchiates, they take great care of their progeny. The male //ippocampus carries the ova in a sac on the lower side of the tail, in which they are hatched; in the other genera no closed pouch is developed, and the ova are embedded in the soft and thickened integument of either the abdomen or the tail.

SEAL. In the article Mammatta (vol. xv. p. 442) will be found a general account of the distinguishing character- istics of the animals constituting the sub-order Pinnipedia of the order Carnivora, and their divisions into families and genera. It only remains to give some further details respecting those members of the group to which the term "seal" is properly restricted (the sub-family Phocine), especially those which inhabit the British coasts.

Although seals swim and dive with the greatest ease, often remaining as much as a quarter of an hour or more below the surface, and are dependent for their sustenance entirely on living prey captured in the water, all the species frequently resort to sandy beaches, rocks, or ice- floes, either to

sleep or to bask in the sun, and especially for the purpose of bringing forth their young. The latter appears to be the universal habit, and, strange as it may seem, the young seals—of some species at least—take to the water at first very reluctantly, and have actually to be taught to swim by their parents. The number of young produced is usually one annually, though occasionally two. They are at first covered with a coat of very thick, soft, nearly white fur, and until it falls off they do not usually enter the water. This occurs in the Greenland and grey seal when from two to three weeks old, but in the common seal apparently much earlier. One of this species born in the London Zoological Gardens had shed its infantile woolly coat and was swimming and diving about in its pond within three hours after its birth. The movements of the true seals upon the ground or ice are very different from those of the Otariz or eared seals, which walk and run upon all four feet, the body being raised as in the case of ordinary quadrupeds. The hinder limbs (by which mainly they propel themselves though the water) are-on land always perfectly passive, stretched backwards, with the soles of the feet applied to each other, and often raised to avoid contact with the ground. Sometimes the fore limbs are equally passive, being placed close to the sides of the body, and motion is then effected by a shuffling or wriggling action produced by the muscles of the trunk. When, however, there is any necessity for a more rapid mode of progression, the animals use the fore paws, either alternately or simultaneously, pressing the palmar surface on the ground and lifting and dragging the body forwards

in a succession of short jumps. In this way they manage to move so fast that a man has to step out beyond a walk to keep up with them; but such rapid action costs con- siderable effort, and they very soon become heated and exhausted. These various modes of progression appear to be common to all species as far as has been observed. Most kinds of seals are gregarious and congregate, especially at the breeding season, in immense herds. Such is the habit of the Greenland seal (Phoca greenlandica), which resorts in the spring to the ice-floes of the North Sea, around Jan Mayen Island, where about 200,000 are killed annually by the crews of the Scotch, Dutch, and Norwegian sealing vessels, Others, like the common seal vitulina), though having a

of the British islands (Phoca

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Fic. 1.—Common seal (Phoca vitulina).

wide geographical range, are never met with in such large numbers or far away from land. This species is stationary all the year round, but some have a regular season of migration, moving south in winter and north in summer. They are usually harmless, timid, inoffensive animals, though, being polygamous, the old males often fight des- perately with each other, their skins being frequently found covered with wounds and scars. They are greatly attached to their young, and remarkably docile and easily trained when in captivity ; indeed, although there would seem little in the structure or habits of the seal to fit it by nature to be a companion of man, there is perhaps no wild animal which attaches itself so readily to the person who takes care of and feeds it. They appear to have much curiosity, and it is a very old and apparently well-attested observation that they are strongly attracted by musical sounds, Their sense of smell is very acute, and their voice varies from a harsh bark or grunt toa plaintive bleat. Seals feed chiefly on fish, of which they consume enormous quantities ; some, however, subsist largely on crustaceans, especially species of Gammarus, which swarm in the northern seas, also on molluscs, echinoderms, and even occasionally sea-birds, which they seize when swimming or floating on the water.

Although the true seals do not possess the beautiful under-fur (“seal-skin” of the furriers) which makes the skin of the sea-bears or Otariz so precious, their hides are still sufficiently valuable as articles of commerce, together with the oil yielded by their fat, to subject them to a devastating persecution, by which their numbers are being continually diminished (see below, p. 581 sq.).:

Two species of seals only are met with regularly on the British coasts, the common seal and the grey seal. The

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common seal (Phoca vitulina) is a constant resident in all suitable localities round the Scottish, Irish, and English coasts, from which it has not been driven away by the molestations of man. Although, naturally, the most se- cluded and out-of-the-way spots are selected as their habitual dwelling- places, there are few localities where they

Fig. 2.—Skull of eommon seal, showing form of teeth.

may not be occasionally met with. Within the writer's knowledge, one was seen not many years ago lying on the shingly beach at so populous a place as Brighton, and another was lately caught in the river Welland, near Stam- ford, 30 miles from the sea. They frequent bays, inlets, and estuaries, and are often seen on sandbanks or mud- flats left dry at low tide, and, unlike some of their con- geners, are not found on the ice-floes of the open sea, nor, though gregarious, are very large numbers ever seen in one spot. The young are produced at the end of May or beginning of June. They feed chiefly on fish, and the destruction they occasion among salmon is well known to Scottish fishermen. The common seal is widely distri- buted, being found not only on the European and American coasts bordering the Atlantic Ocean but also in the North Pacific. It is from 4 to 5 feet in length, and variable in colour, though usually yellowish grey, with irregular spots of dark brown or black above and yellowish white beneath. The grey seal (Halicherus grypus) is of considerably larger size, the males attaining when fully adult a length of 8 feet from nose to end of hind feet. The form of the skull and the simple characters of the molar teeth distinguish it generically from the common seal. It is of a yellowish grey colour, lighter beneath, and with dark grey spots or blotches, but, like most other seals, is liable to great varia- tions of colour according to age. The grey seal appears to be restricted to the North Atlantic, having been rarely seen on the American coasts, but not farther south than Nova Scotia; it is chiefly met with on the coasts of Ire- land, England, Scotland, Norway and Sweden, including the Baltic and Gulf of Bothnia, and Iceland, though it does not appear to range farther north. It is apparently not migratory, and its favourite breeding places are rocky islands, the young being born in the end of September or beginning of October.

Other species of seals inhabiting the northern seas, of which stragglers have occasionally visited the British coasts, are the small ringed seal or " floe-rat" of the sealers (Phoca hispida), the Greenland or harp seal (Phoca groenlandica), the hooded or bladder-nosed seal (Cysto- phora cristata), and possibly the Bearded seal (Phoca bar- bata), though of the last there is no certain evidence. The general characters and geographical distribution of the remaining species of the group are indicated in the article MAMMALIA, vol. xv. p. 442. (w. H. F.)

SEAL FISHERIES.

From a commercial point of view seals may be divided into two groups, — hair seals and fur seals. The former are valued for the oil they yield and for their skins, which are converted into leather, and the latter for their skins alone. The fur seals are provided

with a dense soft under-fur like velvet and a quantity of long loose exterior hair, which has to be removed in dressing the hides. Hair seals are either entirely without under-fur or possess it in too small a quantity to render the skins of much commercial value as furs. The two groups correspond to the two divisions of eared seals and earless seals described above (see also vol. xv. pp. 442-448).?

Hair Seals.—The principal hair seal fisheries are those of New- foundland and Labrador (area about 200 miles), the Gulf of St Lawrence, Jan Mayen and the adjaceut seas, Nova Zembla, the White Sea and Arctic Ocean, the Caspian, and the North and South Pacific. The first-named is by far the most important. To the immense icefields borne past these shores during the spring months great herds of seals resort for the purpose of bringing forth and suckling their young. These are usually produced in the last week of February and increase rapidly in size. When born they weigh about 5 ib; in four weeks the fat beneath the skin has increased to a depth of 3 to 4 inches, and with the adhering skin weighs from 40 to 50 lb. At this age the animals are in the best condition for being taken, as the oil then yielded is of the best quality. They remain on the ice attended by their dams for about six weeks, when they begin to take to the water, and it becomes mueh more

diffieult to capture them. When a floe containing young seals is reached, the hunters take to the ice armed with a pole or "gaff," having a hook at one end and shod with iron at the other. A blow on the nose from this quickly despatches the animal ; by means of the "scalping-knife" the skin with the fat adhering is then rapidly detaehed. The fat and skins are rolled into bundles and dragged to the ship. When the ship reaches port the skins are separated from the fat and salted for export to Great Britain, where they are converted into leather. Of late years furriers have succeeded in converting a few of the finer skins into ladies' tippets. The fat was formerly thrown into huge vats, where its own weight and the heat of the sun extraeted the oil, but in the improved modern process the fat is ground into minute pieces by machinery and then steamed ; the oil, after being exposed for a time in glass- covered tanks to the action of the sun's rays, is barrelled for exportation. The greater part of it goes to England, where it is largely employed both as an illuminant and asa lubricant. It is also used for tanning purposes and in the manufacture of the finer kinds of soap.

From 8000 to 10,000 men embark annually from Newfoundland on this pursuit. The steamers, which are rapidly superseding sailing vessels, are stoutly timbered, sheathed with iron and wood, and provided with iron-plated stems; they carry from 150 to 300 men each, and make two, and sometimes when very successful even three, trips in the season. From 20 to 25 steamships in all are engaged in this industry, 6 of these being from Dundee, Scotland. The Dundee vessels arrive in Newfoundland in February and there ship their crews ; at the close of the sealing season they proceed to the northern whale fishery and return home in October. A "close time" for seals is now established by law. Sailing vessels cannot clear for this fishery before 1st March, nor can steamers before 10th March. After the young seals have taken to the water, the steamers in their second trips engage in the pursuit of the old breeding seals till the middle or end of May. These are taken either by shooting them or clubbing them when congregated in herds on the ice. This practice, which is most injurious to the fishery, has of late been partially abandoned, by an agreement among the owners of vessels not to continue operations beyond 30th April. The failures and disappointments of the voyage are numerous, many vessels returning to port with few seals or even with none. The prizes, however, are so enormous that there is no hesitation in embarking capital in the enterprise.

It is no uncommon event for a steamer to return two or three weeks after leaving port laden to the gunwale with seals. As many as 42,000 have been brought in by a single steamer, the value at two and a half dollars per seal being $105,000 (£21,875). The men on board the steamers share one-third of the proceeds of the voyage among them; the remainder goes to the owners who equip and provision the vessels. In sailing vessels the men get one-half the proceeds. The number of seals taken annually ranges from 350,000 to 500,000. In the three years 1877, 1878, and 1881 the average take was 436,418, valued at £213,937. Between 1881 and 1886 the returns fell below this average owing to the heavy ice, which comparatively few vessels succeeded in penetrating. The large number of young seals whieh escaped during these years will improve the fishery in the future.

In the seas around Newfoundland and Labrador there are four species of seals,—the bay seal, the harp, the hood, and the square flipper. The first of these frequents the mouths of rivers and harbours and is never found on the ice. The harp, so called from a curved line of dark spots on its back making a figure somewhat resembling an ancient harp, is by far the most numerous, and is par excellence the seal of commerce. The hoods, which owe their

1 Some naturalists have proposed the name Trichophocine for the hair seals and Oulophocitne for the fur seals, in allusion to the different character of the skin in the two groups.

name to a bag or hood on the nose of the males, which they can inflate at pleasure for protection, are much larger than the harps, but their oil is not of such good quality. But few square flippers are taken; they are large seals from 12 to 16 feet in length, and are believed to be identical with the great Greenland seals. The seals frequenting these seas are migratory. In May, attended by their young, they commence their northerly movements to the Greenland seas, where they spend two or three months, and in September begin their southerly migration, moving along the coast of Labrador, feeding in its fiords and bays. One division passes through the Straits of Belle Isle into the Gulf of St Lawrence, the other along the east coast of Newfoundland. By the close of the year they reach the Great Banks, their

southern headquarters, and early in February commence their northerly movement to meet the ice on which their young are to be brought forth.

The Newfoundland fishery was of slight importance till the be- ginning of the 19th century. At first the seals were taken in nets; the next method was shooting them from large boats, which left shore about the middle of April. Afterwards small schooners were employed, and a rapid expansion of the fishery followed. Over 100 of these small vessels used to leave the port of St Jolin's, and as many more the ports of Conception Bay. In 1795 the whole catch of scals was but 5000. In1805 it reached 81,000; in 1815, 126,000; in 1822, 306,983. The largest catches on record were in 1830, when 558,942 seals were taken ; in 1831, 686,836; 1843, 651,370; and in 1844, 685,530. The following table shows the number of seals taken in some recent years : —

Years. No. of Seals, Years. No. of Seals. CRG), er oe aK. 361,317 SCI etree tne ee 447,908 ALIS OURS. crerecvictaroreren cevereriee 375,282 MGS terete cto ere sieves oaree 200,500 MSBOr accecec cssatee asian ecm 359,821 ISS OW ye serecicaiieeine cole 300,350 A SIG! verereroistereseorcletelssetete 500,000 WSS Agassi ve reisieieeieacaiee cere 238,587 TIGSO} 042. artnet 223,798

Of late years an increasing number of steamers from St John's have resorted to the Gulf of St Lawrence as well as small sailing vessels from the southern ports of Newfoundland.

Next in importance is the seal fishery carried on between Green- land, Spitzbergen, and the island of Jan Mayen, —between 68° and 74° N. lat. and 8° E. and 17° W. long. In most years, however, the seals are taken mainly in the vicinity of Jan Mayen. The fishery is carried on by the British, Norwegians, Swedes, Danes, aud Germans. The number taken by the British vessels about equals that taken by all the others together. The species taken are the same as on the Newfoundland coast, the harp or saddleback and the hood or bladder-nose. The breeding season is about threc weeks later than in the ease of the Newfoundland seals, the young being brought forth between the 16th and the 22d of March. 'The method of capture is almost the same as that of the Newfoundland hunters. Steamers are now almost exclusively employed. The only British ports now engaged

in the enterprise are Dundee and Peterhead. During the twelve years 1878 to 1885 the number of British vessels taking part in it was from 14 to 21, the number of men varying from 900 to 1200, and the number of scals taken ranging from 35,000 to 75,000. The total number of seals taken by these vessels during the ten years ending 1884 was 452,013. Formerly, from 1500 to 2700 men were employed, and the number of seals taken ranged from 50,000 to 125,000. The decline has been largely caused by the reckless and barbarous way in which the fishery has been con- ducted, the practice of seal-hunters of all nations having been to reach the seals soon after the young were born, and then to watch for the mothers as they came to suckle them and shoot them with- out mercy, leaving the young to die in thousands of starvation on the ice. The consequence is that the herds are not now a twentieth part of their former size. Newfoundland hunters, on the other hand, do not disturb the seals till they are grown and about to leave their mothers, the old seals not being killed till a later date. By an international treaty between England and Norway—the two nations most interested—a "close season" has been established in the Jan Mayen fishery. The Dundee and Peterhead steamers are chiefly manned by Shetlanders, who are taken on board at Lerwick. The vessels make the ice from the 15th to the 20th March and commence the chase in the destructive way already described. They follow up the capture of the young seals in April, when they are better worth taking. Then they proceed to separate the skins from the fat. The former are salted on board, and the fat is stowed in tanks. In May the pursuit of the old seals on the ice commences and continues till the 16th, when it is time to proceed to the whale fishery. The oil is not manufactured till the vessels reach home late in the antumn. As the blubber undergoes decay in the tanks, the oil is not so good in quality as that made in New- foundland from the fresh fat.

SEAL

The Jan Mayen fishery commenced in 1840, In that year 13 British vessels and 650 men engaged in it, and 17,300 seals were taken. The Norwegians and other nationalities also took part in it. Steamers were introduced in 1858. The following table shows the growth and decline of the fishery :—

No. of N No. of

Year, | British | X90. Of | Seals |) yoo. | pritish | No.of | Seals

Views lise Men. taken. Vecsels. Men. taken. 1840 | 13 650 | 17,300 || 1875 | 20 | 1900 | 71,640 1845 | 39 | 1950 | 94'sso || isso | 74 840 | 41468 1850 | 32 | 1600 | 74.058 || iss1 | 14 840 | 23,984 1856 | 54 | 2700 | 81500 || 1sse | 15 900 | 21/092 1861 | 46 | 2300 | 10350 || 1883 | 17 | 1020 | 49°806 1865 | 26 | 1300 | 112000 || 1884 | 20 | 1200 | 497190 1870 | 22 | 1320 | 198000.

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The Norwegian vessels are all steamers, sheathed with wood and iron, the crews averaging forty-six men. They belong principally to Ténsberg, but Tromso also sends out a number of small vessels to hunt adult seals. The total annual product has reached $300,000. Over twenty Norwegian and Swedish steamers are engaged in this fishery. Since about the year 1873 or 1874 the Norwegians and Swedes have discovered a new fishing-ground for adult seals off the coast of Greenland between Iceland and Cape Farewell. It is carried on in the months of Junc and July. The seals taken are all of the hood kind. At one time the Jan Mayen fishery averaged 200,000 seals annually among all the nationalities engaged. It does not now exceed 120,000 to 130,000.

The Danes, the Eskimo, and the half-breeds carry on a seal- fishery off the western coast of Greenland between Cape Farewell and 79° N. lat. The seals taken are chiefly the floe or spotted seal and the square flipper. Rink, in his Greenland, estimates the annual number taken at 89,000, but at present it does not exceed 50,000, as the seals are becoming scarcer. The oil is made at the Danish settlements on the coast, and the skins are dried, not salted, and both are shipped to Denmark.

The fisheries of Nova Zembla, once productive, have declined in value, and are now carried on by only five vessels, which reach the island about the end of June. The fishermen commence with hunt- ing the seal and the walrus and afterwards fish for the common trout. Five kinds of seals are found here, the chief being the Phoca vitulina and the Phoca grenlandica, The number taken is small.

The Russians carry on a seal-fishery on the eastern and western coasts of the White Sea, in the bays of the Dwina and the Mezen and on the coast of Kanin. The species is the Phoca grenlandica. These seals live in the high regions of the polar seas from May till September, and appear later in the gulfs and bays of the Arctic Ocean, where the young are born on the floating ice early in February. Soon after the hunt commences and lasts till the end of March, On the eastern coast of the White Sea the chase is pursued over a space of 230 miles. Two thousand hunters assemble at Kedy, near Cape Voronoff. High wooden towers are erected along the shore, whence observers watch the movements of the seals. Hunting sheds for the men are also erected. When a herd of seals is observed, the men go out on the ice, drawing small boats after them, and kill the young and old with clubs and guns. To approach the seals without being discovered, the hunters muffle themselves in long white shirts and advance slowly and noiselessly over the snow. 'They are often exposed to the greatest dangers, owing to the sudden movements of the ice. In following up the chase in April they use sailing boats 22 feet long, with an iron- plated bottom, which they draw up on the ice, where a vast en- campment is formed, and shooting-parties search for the seals. On the western shore of the White Sea the seal-hunt is less pro- ductive than on the eastern. The hunters meet at Devyatoe, a few miles north of the river Ponoi. About 500 men engage in the chase. The Russians take each year in the Arctic Ocean and the White Sea from 2,500,000 to 3,000,000 ib of seal blubber. Allow- ing an average of 40 tb per seal, this would imply the capture of 65,000 to 75,000 seals. The skins are made into leather.

The most extensive and valuable seal-fishery of the Russians is in the Caspian Sea, where the seals (Phoca caspica) are plentiful. They pass the summer in deep water, and in the autumn resort to the eastern basin, where the ice forms earliest and breaks up latest. Here the pairing takes place on the ice in December and January. The seals are also hunted at the months of the Volga and the Ural, and in the southern part of the sea, on the islands of the Gulf of Apsheron. There are three methods of hunting the seals,—killing them with clubs (the commonest and most successful way), shooting them on the ice, and taking them in nets. From 130,000 to 140,000 are taken annually.

A few seals are taken off the coast of California and Washington Territory. In the South Pacific, off the eoast of Chili, only a few are now taken where formerly they were captured by the thousand.

The elephant seal or sea elephant (Afacrorhinus Iconina) was formerly taken in great numbers at various places for the sake of

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its oil. This fishery is now almost a thing of the past; since about 1875 it has been earried on solely from New London in Connecticut, the fleet numbering only four or five vessels. The yield in 1880 was 42,000 gallons of oil, worth $21,420.

The average number of hair seals taken annually may be esti- mated as follows :— Bae

Newfoundland, including Labrador and the Gulf of St Lawrence 400,000

Canadian net fishery, Gulf of St Lawrence….....eeeee eens 75,000 Jan Mayen and the adjacent seas …....~~..esseee ceases 130,000 ‘Wie: usin Gikemllaidl4 oan etecon dooce es dopeoNpoocouOOnO poo BAaEoE 50,000 Nova Zembla, White Sea, and Arctic Ocean ….....~~.++6 75,000 Caspian Sa …. ce ceee cece cece eee cece cet ee ene enc es eeec cece 140,000 GEC SOUL HMIA GILL C isfelsfelcyisieieleelels elles niciele’s vcltie civ ee vivian ae 5,000 MotalimiUniber OlNGiE SEALS) <.4.00+ cree s cise sic cine viele vine $75,000

Vailieis aus, “EPSi0) joete SED sbacngnnoodocoeeodon oo $2,187,500

Fur Seals. —The fur seals occupy two distinct areas. None exist on the shores of the North Atlantic. South of the equator they extend from near the tropics to the region of antarctic ice. By far the most important and

valuable fur seal fisheries are those carried on at St Paul's and St George's Islands, belonging to the Pribyloff group,! off the coast of Alaska, at the Commander Islands in the Behring Sea, and that in the same sea 700 miles west of the Alaskan seal islets. The species found here is the northern fur seal (Callorhinus ursinus). The males attain mature size about the eighth year, when their length is from 7 to 8 fect, their girth from 7 to 8 feet, and their weight, when in full flesh, from 500 to 700 tb. The females are full grown at four years old, when they measure 4 feet in length, 23 in girth, and weigh from 80 to 100 Ib. The yearlings weigh from 30 to 40 tb. The seals resort to these islands late in spring chiefly for reproductive purposes, making their appearance from the southward. The number annually visiting St Paul's and St George's is estimated at five millions. About the middle of April the males begin to arrive and take their places along the shore in "the rookeries," as the breeding- grounds are called. The younger males are prevented from landing by the older, and are compelled either to stay in the water or to go to the uplands. By the middle of June all the males have assembled, and then the females begin to appear. Each old male seal collects from ten to fifteen or more females, whom he guards most jealously. The males fight furiously, 'so that night and day the aggregated sound is like that of an approaching railway train." By the middle of July the family circle is complete. Soon after landing the female gives birth to one pup, weighing about 6 Ib, which she nurses at wide intervals without any affection. Pairing takes place soon afterwards. No food is taken by the breeding males while on the rocks, —a period of three to four months. When the males leave after this i fast, they are reduced to half their former weight. In the end of October and middle of November all leave the island, the young males going last and by themselves.

The killing of the seals is carefully regulated. No females are killed, and only a certain number of young "' bachelor " seals whose skins are of superior quality. These younger inale seals are spread out on the slopes above the rookeries to rest. A party of men armed with clubs of hard wood quietly creep between them and the shore, and ata given signal start up with a shout and drive the seals inland. When they reach the killing-grounds near the villages, they select those that are two or three years old and seem likely to yield the most valuable fur. These they despatch with aclub. 'The skins are carefully salted for exportation. Besides the skin each seal yields

about a gallon and a half of oil. But it is not used, as its rank odour renders refining very costly. The value of the skins in the raw state varies from five to twenty-five dollars each; at times, when furs are specially fashionable, a higher price is obtained. The quality of the Alaska furs is superior, but those obtained in the South Shetland and antarctic regions are rated best. A cloak of the richest fur seal, a yard deep or more, will cost from £25 to £40. The roots of the loose exterior hairs penetrate deeper into the skin than those of the fur or short hair, and can readily be cut by paring on the fleshy side, without touching the roots of the fur ; the long hairs then drop off, leaving the valuable fur below in a sheet like pure velvet. The number of seals killed on the Pribyloff Islands is limited to 100,000 annu- ally, and with the precautions taken they increase as fast as if left to themselves, "for when the number of males is in excess, the continual fighting on the rookeries destroys many of both females and young, which get trampled to death."

Alaska was purchased from Russia by the United States in 1867. The Pribyloff Islands were leased to the Alaska Commercial Coin-

1 The sea-lion (Zumetopias stellert) is a characteristie pinniped of the Pribyloff Islands and other parts of Alaska. It has very little commercial value; but by the natives along the Behring Sea eoast of Alaska, Kamchatka, and the Kuriles it is highly prized. From the hide they make coverings for their boats; the intestines are made into garments ; the stomach walls are used as pouehes for oil ; the flesh is dried and eaten; and the whiskers are sold to the Chinese, who use them as pickers to their opium pipes, and in several ecere- monies in their joss houses.

pany of San Francisco for twenty years, from 1st May 1870, under Act of Congress approved 1st July 1870. The annual rental is $55,000 with a tax of $2°62 on each skin taken, —making the total rental $317,000 per annnm. The Alaska Commercial Company have leased the Commander Islands from the Russian Government. About 30,000 fur seals are annually taken there.

The fishery at the mouth of the Straits of Juan de Fuca and its vicinity is carried on by Americans and Canadians. The seals are eaptured in the

waters, the largest number being secured at and about Cape Flattery, to the extent of 15,000 annually. The Lobos Islands, at the mouth of the Rio de la Plata, are under the protection of the Government of Uruguay, the number of seals annually taken being limited to about 12,000. Some of the numerous islands about Cape Horn are the breeding-places of fur seals, as are also the South Shetland Islands farther south. This Cape Horn region is visited by a fleet of seven to ten vessels belonging to New London and Stonington, Connecticut, and also by a few Chilian and other South American vessels. Only occasionally does a yessel visit the South Shetlands, though the quality of skins to be secured there is very superior. The headquarters for the fleet between seasons is at Punta Arenas, or Sandy Point, in the Straits of Magellan. The American fleet in 1880 numbered nine vessels of 1192 tons. The result of the fishery was 9275 skins, worth $90,431. Early in the 19th century the Falkland Islands abounded in fur seals, but they have been exterminated. The number now (1886) annually secured there does not average more than 500; in some years only 50 skins are taken.

There are annually received at London from the Cape of Good Hope about 10,000 sealskins taken at various islands in the Southern Indian Ocean and along the south-west coast of Africa. A few fur seals are taken in the Okhotsk Sea.

Nearly all the fur-seal skins find their way to London, where they are plucked, dressed, and dyed. A few, however, are prepared in New York. At the seal islands they are salted and baled with the fur inside, and in this manner shipped to London. The annual yield of the fur-seal fisheries of the world is about 185,000.

Seals. Pribyloff Islands, Alaska …..... sc eee er eee ec ec eee ee ee ence 100,000 Gomimander EslandS …....:. ccs ccve cscs cece sssscsccaccecees 30,000 Straits of Juan de Fuca and vicinity …....0scesceeeeeeere 15,000 Lobos Islands, mouth of Rio de la Plata….....sesssesees 12,000 Patagonia, including South Shetland Islands and Straits of Magellan 15,000 Falkland Fslands … 20.00 cccccccrcc es ce cesescecececceecess 500 Cape of Good Hope, including south-west coast of Africa and islands in Southern Indian Ocean 10,000 Islands belonging to Japan …....s cece

cece cece c eect ee eee eees 2,500 TRGB eve raratetetetstietetats 185,000 At an average of $7 per Skin the annual value would be $1,295,000 Value of hair seals annually ….....~~0+..20~~ 2,187,500 Total value of hair and fur seals ….....~~+5~~ $3,482,500

See Hatton and Harvey, Newfoundland, 1883; Returns of the Jan Mayen Seal Fisheries, by Captain Adams, 1885; United States Fish Commission Reports for 1873-74 and 1874-75; J. A. Allen, Eared Seals; Charles Bryant, Habits of the Northern Fur Seal; H. W. Elliott, Seal Islands of Alaska. (M. H.

SEA LAWS, a title which came into use amongst writers on maritime law in the 16th century, and was applied by them to certain medizval collections of usages of the sea which had been recognized as having the force of customary law, either by the judgments of a niaritimie court or by the resolutions of a congress of merchants and shipmasters. 'To the former class belong the sea laws of Oléron, which embody the usages of the mariners of the Atlantic; under the latter come the sea laws of Wisby, which reflect the customs of the mariners of the North Sea and of the Baltic.

The earliest collection of such usages which was re- ceived in England is described in the Black Book of the Admiralty as the "Laws of Oléron," whilst the earliest known text is contained in the Leber Memorandorum of the corporation of the City of London, preserved in the archives of their Guildhall. These laws are in an early handwriting of the 14th century, and the title prefixed to them is La Charte d'Oleroun des Juggementz de la Meer. How and in what manner these "Judgments of the Sea" came to be collected is not altogether certain. Cleirac, a learned advocate in the parliament of Bordeaux, in the introduction to his work on Les Us et Coustumes de la Mer, first printed at Bordeaux in 1647, states that Eleanor, duchess of Guienne (the consort of Louis VII. of France, but subsequently divorced from him and married to Henry II. of England), having observed during her visit to the

Holy Land, in company with Louis, that the collection of customs of the sea contained in The Book of the Consulate of the Sea (see vol. vi. p. 317) was

held in high repute in the Levant, directed on her return that a record should be made of the judgments of the maritime court of the island of Oléron (at that time a peculiar court of the duchy of Guienne), in order that they might serve as law amongst the mariners of the Western Sea. He states further that Richard I. of England, on his return from the Holy Land, brought back with him a roll of those judgments, which he published in England and ordained to be observed as law. It is probable that the general outline of Cleirac's account is correct, as it accords with a memorandum on the famous roll of 12 Edw. IIL, "De Superioritate Maris Anglie," which, having been for many years carefully preserved in the archives of the Tower of London, is now deposited in the Public Record Office. According to this memorandum, the king's justiciaries were instructed to declare and uphold the laws and statutes made by the kings of England, in order to maintain peace and justice amongst the people of every nation passing through the sea of England: "Qua quidem leges et statuta per dominum Ricardum, quondam regem Anglia, in reditu suo a Terra Sancta correcta fuerunt, interpretata, declarata, et in Insula Oleron publicata, et nominata in Gallica lingua La Leye Olyroun."

The earliest version of these Oléron sea laws, which, according to the memorandum above mentioned, were re- ceived in England in the latter part of the 12th century, comprised certain customs of the sea which were observed in the wine and the oil trade, as carried on between the ports of Guienne and those of Brittany, Normandy, Eng- land, and Flanders, No English translation seems to have been made before the Rutter of the Sea, printed in London by Thomas Petyt in 1536, in which they are styled "the Lawes of ye Yle of Auleron and ye Judgementes of ye See." French was, in fact, a tongue familiar to the English High Court of Admiralty down to the reign of Henry VI. A Flemish text, however, appears to have been made in the latter part of the 14th century, the Purple Book of Bruges, preserved in the archives of Bruges, in a handwriting somewhat later than that of the Liber Memorandorum. Prefixed to this Flemish version is the title, "' Dit es de Coppie van den Rollen van Oleron van den Vonnesse van der Zee." Certain changes, however, have been made in the Purple Book of Bruges in the names of the ports mentioned in the original Gascon text. For instance, Sluys is in several places substituted for Bordeaux, just as in the Lutter of the Sea London replaces Bordeaux. That these sea laws were administered

in the Flemish maritime courts may be inferred from two facts. First, a Flemish translation of then was made for the use of the maritime tribunal of Damme, which was the chief Flemish entrepét of the wine trade in the 13th century. The text of this translation has been published by Adriaen Verwer under the title of the Judgments of Damme. In the second place, there is preserved in the archives of the senate of Dantzic, where there was a maritime court of old, famous for the equity of its judgments, an early manuscript of the 15th century, which contains a Flemish reproduction of the Judgments of Oléron headed "Dit is Twater Recht in Vlaenderen." So far there can be no doubt that the Judgnients of Oléron were received as sea laws in Flanders as well as in England in the 14th century. Further inquiry enables us to trace them as they followed the course of the wine trade in the North Sea and the Baltic Sea. Boxhorn, in his Chronyk van Zeelande, has published a Dutch version of them, which Van Leeuwen has repro- duced in his Batavia Illustrata, under the title of the Laws of West-Capell in Zealand. Verwer has also pub-

lished a Dutch text of them in his Vederlant's See-Rechten, accompanied by certain customs of Amsterdam, of which other MSS. exist, in which those customs are described as usages of Stavoren, or as usages of Enkhuizen, both ports of active commerce in the 15th century. Of these customs of Amsterdam, or, as they were more generally styled, 'Ordinances of Amsterdam," further mention is made below.

A new and enlarged collection of sea laws, purporting to be an extract of the ancient laws of Oléron, made its appearance in the latter part of the 15th century in Le Grant Routier de la Mer, printed at Poitiers in France by Jan de Marnef, at the sign of the Pelican. The title- page is without a date, but the dedication, which purports to be addressed by its author Pierre Garcie alias Ferrande to his godson, is dated from St Gilles on the last day of May 1483. It contains forty-seven articles, of which the first twenty-two are identical with articles of the "Judg- ments of the Sea," in the Liber Memorandorum, the re- maining articles being evidently of more recent origin. A black-letter edition of this work in French, without a date, is preserved in the Bodleian Library at Oxford, and to the last article this

colophon is appended: "Ces choses pré- cédentes sont extraictes du trés utille et profittable Roolle Doloyron par le dict Pierre Garcie alias Ferrande." An English translation is printed in the appendix to A View of the Admiral Jurisdiction, published in 1661 by Dr John Godolphin, in which the laws are described as "an Extract of the Ancient Laws of Oléron rendered into English out of Garsias alias Ferrand." Although this new text had the recommendation of an advocate who had filled the office of judge of the Admiralty Court during the Commonwealth and been appointed king's advocate- general by Charles II., it seems to have been superseded in a short time by Cleirae's Us et Coustumes de la Mer, to which was appended the following clause of authentication: 'Tesmoin le Seel de l'Isle d'Oléron, estably aux contracts de la dite Isle, le jour du Mardy apres la Feste Sainct André l'an mille deux cens soixant-six." Cleirac does not inform us from what source or under what circumstances he procured his text, nor on what authority he has adopted in certain articles readings at variance with those of Garcie, whilst he retains the same number of articles, to wit, forty- seven. The clause of authentication cannot be accepted as a warranty above suspicion, as the identical clause of authentication with the same date is appended to the early Norman and Breton versions of the rolls, which contain only twenty-six articles, Cleirac's version, however, owing probably to the superior style in which it was edited, and to the importance of the other treatises on maritime matters which Cleirac had brought together for the first time in a single volume, seems to have obtained a preference in Eng- land over Garcie's text, as it was received in the High Court of Admiralty during the judgeship of Sir Leoline Jenkyns, and an English translation of it was introduced into the English translation of the Black Book of the Admiralty made by John Bedford, the deputy registrar of the High Court, and dedicated to Sir Leoline Jenkyns. It seems to have been Bedford's intention to print this translation under the title of "Sea Laws"; but the manu- script passed into the hands of Sir Leoline Jenkyns, who gave it to the College of Advocates in 1685. The Black Book itself, which was missing for a long time from the Admiralty registry, has recently been discovered and has been replaced in the archives of the Admiralty Court. Of these two versions of the sea laws of Oléron the earlier obtained a wide-world reception, for it was translated into Castilian (fuero de Layron) by order of King Alphonso X., and a Gascon text of it is still preserved in the archives of Leghorn, apparently in a handwriting of the 15th cen-

tury, entitled ‘Asso es la copia deus Rolles de Leron de jucgemens de mar.”

The parent stock of the Wisby sea laws would appear to have been a code preserved in the chancery of Liibeck, drawn up in the Old Saxon tongue, and dated 1240. This code contains amongst many others certain articles on maritime law which are identical with articles in the Gothland sea laws, Gothland being the island of which Wisby was the chief port. This collection comprises sixty- six articles, and it is now placed beyond a doubt by recent researches, especially of Professor Schlyter of Lund, that these Gothland sea laws are a compilation derived from three distinct sources,—a Liibeck, an Oléron, and an Am- sterdam source. A Saxon or Low German text of this collection was printed for the first time in 1505 at Copen- hagen by Godfrey de Gemen, a native of Gouda in Holland, who is reputed to have set up the earliest printing-press in Copenhagen. ‘This print has no title-page, and in this respect resembles the earliest known print of Zhe Consulate of the Sea; but upon a blank leaf, which occupies the place of a frontispiece in one of two copies of Godfrey de Gemen’s text, both preserved in the royal library at Copenhagen, there has been inserted with a pen in alternate lines of black and red ink the title “‘Dat hogheste Gotlansche Water-Recht gedrucket to Koppenhaven Anno Domini M.D.V.,” and there has also been inserted on the first page of the text the introductory title “Her beghynt dat hogheste Water-Recht” (here begins the supreme sea law). Professor Schlyter has discovered a MS. (No. 3123) in the royal library at Copenhagen, which is written on parchment in a hand of the 15th century, and from which it seems probable that Godfrey de Gemen mainly derived his text, as it comprises the same number of articles, containing the same matter arranged in the same order, with this minor difference, that, whilst both the MS. and the print have the simple title “ Water-Recht ” prefixed to the first article, the MS. has also a similar title prefixed to the fifteenth. Further, as this article together with those that follow it in the MS., appears to be in a handwriting different from that of the articles that precede, the fifteenth article may justly be considered as the first of a distinct series, more particularly as they are numbered in Roman characters, beginning

with § 1, and such characters are continued with a single interruption down to the end of the MS. Although, however, the numeration of the articles of this second series is continuous and the handwriting of the MS. from the fifteenth to the sixty-sixth article is un- changed, the text of the series is not continuous, as the fortieth article commences with an introductory clause—"This is the ordinance which the skippers and merchants have resolved amongst themselves as ship law." There is no difficulty in recognizing the first division of this second series of sea laws as a Low German version of the Judg- ments of Oléron, transmitted most probably through a Flemish text. This hypothesis would account for the sub- stitution in several articles of Sluys for Bordeaux. On the other hand, the introductory clause which ushers in the fortieth article is identical with the title that is gen- erally prefixed to MSS. of the maritime Ordinances of Amsterdam, and the text of this and of the following articles down to the sixty-fifth inclusive is evidently of Dutch origin and more or less identical with Verwer's text of the usages of Amsterdam. M. Pardessus, in his valuable Collection de Lois Maritimes, published in Paris before Professor Schlyter made known the result of his researches, has justly remarked that the provisions of several articles of this last division of the sea laws are inconsistent with the theory that they originated at Wisby. It may be observed that the sixty-sixth article of the MS. is a Liibeck law identical with the first article of the first

series, which is of Liibeck origin. No colophon is ap- pended to this final article in the MS. Nevertheless, Godfrey de Gemen's edition of 1505, which breaks off in the middle of the sixty-sixth article of the MS., has the following colophon :—" Here end the Gothland sea laws, which the community of merchants and skippers have or- dained and made at Wisby, that all men may regulate themselves by them. Printed at Copenhagen, A.D. M.D.V." The question naturally suggests itself, To what MS. was Godfrey de Gemen indebted for this colophon, or is the alternative more probable that he devised it? There is no known MS. of this collection of an earlier date to which an appeal can be made as an authority for this colophon; on the contrary, the only known MSS. of which the date is earlier than Godfrey de Gemen's print, both of which are in the library of the university of Copen- hagen, are without this colophon, and one of them, which purports to have

been completed at Nykoping on the Eve of the Visitation of the Virgin in 1494, concludes with a colophon which precludes all idea that anything has been omitted by the scribe, viz., 'Here ends this book, and may God send us his grace, Amen." We are disposed to think that Gemen himself devised this colophon. He was engaged in printing for the first time other collections of laws for the Danish Government, and, as Gothland was at that time a possession of Denmark, he may have thus dis- tinguished the sea laws from another collection, namely, of land laws. Professor Schlyter, however, believes Gemen may have borrowed it from a MS. which is lost, or at all events is not known. There is some support to this view in the fact that in the archives of the guildhall of Ltibeck there is preserved a MS. of 1533 which contains a Low German version of the same collection of sea laws, with a rubric prefixed to the first article announcing them to be "the water law or sea law, which is the oldest and highest law of Wisby," and there are good reasons for supposing that the scribe of this MS. copied his text from a MS. other than the Copenhagen MS. The same observation will apply to a second MS. of a similar character preserved in the library of the gymnasium of Liibeck, which pur- ports to have been written in 1537. But as regards the Wisby sea laws little reliance can be placed on such rubrics or colophons as proofs of the facts recited in them, though they may be valuable as evidence of the reputed origin of the sea laws at the time when the scribe com- pleted the MS. In illustration of this view it may be stated that in the same year in which the more recent of these two MSS. purports to have been completed—namely, 1537— there was printed at Liibeck an enlarged edition of the sea laws consisting of seventy-two articles, being a Low German translation of a Dutch text, in which six additional Dutch laws had been inserted which are not found in the Copenhagen MS., nor have a place in Gemen's text, yet to this edition is prefixed the title, "This is the highest and oldest sea law, which the community of mer- chants and shipmasters have ordained and made at Wisby, that all persons who would be secure may regulate them- selves by it." Further, it has an introductory clause to its thirty-seventh article—" This is the ordinance which the community of skippers and merchants have resolved upon amongst themselves as slip law, which the men of Zea- land, Holland, Flanders hold, and with the law of Wisby, which is the oldest ship law." At the end of the seventy- second article there follows this colophon: "Here ends the Gothland sea law, which the community of merchants and mariners have

ordained and made at Wisby, that each may regulate himself by it. All honour be to God, MDxxxvul." Each article of this edition has prefixed to it after its particular number the word " belevinge" (judg- ment). It would thus appear that the Wisby sea laws KXI. — 74

have fared like the Oléron sea laws: they have gathered bulk with increasing years.

The question remains to be answered, How did this col- lection of sea laws acquire the title of the " Wisby sea laws" outside the Baltic? for under such title they were received in Scotland in the 16th century, as may be inferred from extracts from them cited in Sir James Balfour's System of the more Ancient Laws of Scotland, which, although not printed till 1754, was completed before his death in 1583. The text of the Wisby sea laws generally current in Eng- land is an English translation of a French text which Cleirac published in 1641 in his Us e¢ Coustumes de la Mer, and is an abbreviated, and in many respects muti- lated, version of the original sea laws. This inquiry, how- ever, would open a new chapter on the subject of the northern sea laws, and the civilizing influence which the merchants of Wisby exercised in the 13th century through their factories at Novgorod, linking thereby the trade of the Baltic to that of the Black Sea.

See Pardessus, Collection de Lois Maritimes antérieures au X VIII. Siéele (6 vols., Paris, 1828-45) ; Schlyter, Wisby Stadslag och Sjérdtt, being vol. viii. of the Corpus Juris Sueco-Gotorum Antiqui (Lund, 1853); and The Black Book of the Admiralty, ed. by Sir Travers Twiss (4 vols., London, 1871-76). Coats)

SEALING WAX. In medieval times, when the princi- pal use of sealing wax was for attaching the impression of seals to official documents, the composition used consisted of a mixture of Venice turpentine, beeswax, and colouring matter, usually vermilion. The preparation now employed contains no wax. Fine red stationery sealing wax is com- posed of about seven parts by weight of shellac, four of Venice turpentine, and three to four of vermilion. The resins are melted together in an earthenware pot over a moderate fire, and the colouring matter is added slowly with careful

stirring. The mass when taken from tlie fire is poured into oiled tin moulds the form of the sticks required, and when hard the sticks are polished by passing them rapidly over a charcoal fire, or through a spirit flame, which melts the superficial film. For the brightest quali- ties of sealing wax bleached lac is employed, and a pro- portion of perfuming matter—storax or balsam of Peru— is added. In the commoner qualities considerable admix- tures of chalk, carbonate of magnesia, baryta white, or other earthy matters are employed, and for the various colours appropriate mineral pigments. In inferior waxes ordinary resin takes the place of lac, and the dragon gum of Australia (from Xanthorrhea hastilis) and other resins are similarly substituted. Such waxes, used for bottling, parcelling, and other coarser applications, run thin when heated, and are comparatively brittle, whereas fine wax should soften slowly and is tenacious and adhesive.

SEALKOTE. See SranKor.

SEALS! (Gr. o¢payis, Lat. sigillum). During the medizval period the importance of seals was very great, as they were considered the main proofs of the authenticity of all sorts of documents, both public and private.2 That is much less the case now, the written signature being thought a safer guarantee of genuineness. In order to make illicit use or imitation of a seal difficult, the seal itself was usually locked up and guarded with special care, and in the case of royal personages or corporate bodies was often made a very complicated work of art, which it would have been almost impossible to copy exactly. One very curious precaution that was adopted is still in use with the corporate seal of the monasteries of Mount Athos. The circular matrix® is divided into four quarters, each

1 For antique seals, see Gums, JEWELLERY, and Rina.

- *Tn some cases, in the presence of witnesses, a seal which did not belong to the signer of a document was used when the right matrix was not at hand. This has naturally caused many archeological puzzles.*

> The word “seal” is often used to denote both the impression made

of which is kept by one of the four epistatad or ruling monks ; the four pieces are joined by a key-handle, which remains in the custody of the secretary. Thus it is only when all five guardians of the various parts of the matrix meet together that the complete seal can be stamped on any document. The device on the Mount Athos seal is a half-length figure of the Madonna and Child, and the imprint is made by blackening the matrix in the flame of a lamp and then pressing it on the paper or vellum itself, Medizval seals were applied in two different ways: in one the stamp was impressed in wax run on the surface of the document (Fr. plaqué or en placard) ; in the other the wax impression was suspended by cord or strips of parchment (Fr. pendant). The latter method was neces- sarily used with metal seals or bulle (see below).

For the sake of greater security in the case of plaqué seals, it was a common practice from the 12th century onwards, or even earlier, to make a cross cut in the vellum of the document, the corners of which were then turned back, thus forming a square opening, over which the wax seal was stamped; the turned-up corners helped to hold the wax in its place, and the aperture allowed a second matrix to be applied at the back. This was usually a smaller private seal called a secretwm. Thus, for example, an abbot would use on the front of a document the large corporate seal of his community, and on the back would stamp his personal seal as a secretwm.

Till the 12th century pure white beeswax was generally used, after that wax coloured green or red. The use of shellac or other harder materials, such as modern sealing- wax, is of recent date. Thus it was usual to protect the soft wax seals by some sort of "fender," often a wreath of rushes or plaited strips of paper twisted round it ; another method much employed in the 15th century was to cover the seal with leaves of oak, bay, or beech. Pendant seals were often encased in boxes of wood or cuir bowilli, which in some cases are very richly decorated. From the 13th to the 15th century original royal documents are usually on fine vellum and have green seals hung by many-coloured silk and gold thread, while office copies are on coarser vellum and have white seals hung by parchment strips. In England an important official, called the clerk of the chafe-wax, an office which still exists, was entrusted with the duty of softening the wax for state seals over a chafing-brazier. Two different methods of sealing docu- ments, either closed

or open for inspection, are recorded in the legal terms “letters secret ” and “letters patent.”

Owing to the enormous number of medizval seals which still exist, and their frequently great historical and artistic importance, it is necessary to adopt some method of classification, especially for large collections, such as that of the British Museum, which contains about 25,000 specimens, and the very important one of the Society of Antiquaries.t The chief classes are these :—(1) £ecclesi- astical.—(a) Seals belonging to offices, such as those of popes, bishops, abbots, deans, d&c.; (6) common seals of corporate bodies, such as chapters, religious colleges, monas- teries, and the like; (c) official seals without the name of the officer; (d) personal seals, with or without a name. (2) Lay.—(a) Royal seals, including those of queens and royal princes; (6) official seals in the name of the sovereign or a state official ; (c) common seals of corporate bodies, such as towns, universities, guilds, schools, hospi- tals, &c.; (d) personal seals (not being royal) with effigies, heraldry, merchants’ marks, or other devices, with or with- out a name, or with name only, or with legend only.

and the object that makes the impress. More correctly the latter is called the “ matrix,” and only the impression is called the “seal.”

4 This valuable collection has been arranged and catalogued by Dr C.8. Percival, the best modern authority on English seals,

SEALS

French Royal Seals.1—The earliest and most complete series of seals is that of the French kings. The Carlo- vingian and Merovingian monarchs mostly used antique gems or pastes,—portrait heads being selected and a legend added in the metal setting of the matrix. Charle- magne used a head of Jupiter Serapis,? Pippin the Short that of the Indian Dionysus. The British Museum pos- sesses a seal of Odo or Eudes, king of France (888-898), impressed from a fine Greek gem of the 3d century B.c., with a portrait of Seleucus IV. The oldest existing matrix ig that of Lothaire I. (c. 817), now preserved at Aix-la- Chapelle, attached to an altar-cross. It is an oval intaglio in rock crystal, with a laureated portrait and the legend J. XPE, ADIVVA. HLOTHARIVM. REG. ; it is not an antique, but is of

contemporary Byzantino-Rhenish work. Till the time of Louis VI. (1108-1137) these seals were plaqué, but he introduced pendant seals about 1108; and counter- seals at the back were first used by Louis VII. (1137-80). The grand series of round seals with an enthroned figure of the king begins with the Capet Henry I. (1031-60). The king holds a sceptre in one hand and a flower in the other. Those of the queens are frequently of a pointed oval form, with a standing portrait figure holding a flower in each hand. In the 13th and 14th centuries the French royal seals were elaborate works of art, with a finely draped figure of the king seated under a rich canopy on a throne, decorated with lions' or eagles' heads ; the king holds a sceptre in each hand, The queens' seals, of a round or pointed oval form, are also very beautiful, with a graceful figure standing between two shields under a rich canopy. After the 15th century there was a rapid decadence in the royal seals, and in the 17th and 18th centuries they were of the most tasteless style, far worse than those used in England at the same date.

English Royal Seals,—This, which is on the whole the most beautiful of all royal series, begins with the seal of Edward the Con- — fessor (see fig. 1).% The great seal of Will- iam the Norman and his successors was not plaqué, like the earlier ones, but pendant ; it has on one side an enthroned figure of a king copied from contemporary French seals, and on the re- verse the king on af horseback armed with AA spear and shield. ;

These two ways of Fic. 1.—Seal of Edward the Confessor.

representing the sovereign have been used on all the royal seals of England down to the present day. By degrees greater elaboration of ornament was introduced into the throne and its canopy. In Edward ITT.'s time niches with minute statuettes of saints were added at the sides of the obverse. The climax of magnificence was reached in the reign of Henry V. On the obverse of his seal the king

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1 See Wailly, Eléments de Paléographie, vol. ii., pl. A.; by various authors, Trésor de Num. et de Glyptique, vol. i., Paris, 1834 (which contains also plates of English royal seals) ; Douet-d'Areq, Coll. de Sceaux del' Empire,

Paris, 1863-68; Bulletin de la Société de Sphragis- tique, Paris, v.y.; D'Anisy, Recueil de Sceaux Normands, Caen, 1835.

2 The monks of Durham also used a gem with a head of Jupiter Serapis, round which was added the legend—-CAPVT . SANCTI . OSW ALDI.

8 The English kings before the Conquest signed usually with a cross only, but a few, such as Offa, Ethelwulf, and Ethelred, occasionally used seals, especially on documents containing grants to St Denis and other French abbeys, on which they followed the French custom of affixing plaqué seals.

sits holding the orb and sceptre; the gorgeous canopy contains statuettes of the Virgin and two saints, and at each side are three rows of statuettes in minute canopied niches, each row two tiers high; about fifteen minute

figures of saints and angels are introduced into the design. On the reverse is the king on horseback, bearing a sword

and shicld; the horse, going at full speed, is clothed

with richly embroidered heraldic drapery, and on its head. and on the king's is a lion crest. After Henry V. the seals began to decrease in maguificence, and in the reign of Henry VII. the new taste of the Renaissance began to supplant the pure Gothic of the earlier seals. In the time of Philip and Mary both sovereigns appear together, seated

under canopies, or riding side by side. The great seal*

of the Commonwealth is a marvel of ugliness. On the obverse is a perspective view of the interior of the House of Commons, and on the reverse a map of Great Britain and Ireland. Cromwell's seal has an equestrian portrait of himself, and its reverse the arms of the Commonwealth between a lion and a dragon as supporters. Little is noticeable about the seals of succeeding sovereigns; that of Victoria is minutely cut, but is very poor as a work

of art.

Other English Seals.—Gilt bronze was the commonest

material for large seals, but other metals were used, such as gold, silver, and lead, also jet and ivory, especially

before the Norman Conquest. Rock crystal, carnelian, and sard were the favourites among the hard stones cut

for matrices. Large seals were usually either round or of

a pointed oval form (as in figs. 2and 3); the small secreta were sometimes square, triangular, or hexagonal, as well as round or oval.® The most elaborate and beautiful of all were those of religious corporations, such as the chapter seals of monasteries. These are among the most exquisite works of art that the Middle Ages produced, especially during the 14th century, and exceed in delicacy of work- manship and elaboration of design the finest seals of all other classes, not excepting those of the sovereigns. Fig. 2 shows the common seal of Boxgrove priory (Sussex), the matrix of which is now in the British Museum. On one side is a figure of the Virgin enthroned, and on the reverse a representation of the west front of the priory church, with open : tracery and niches contain- ing minute statuettes. This |§& elaborate matrix is made up of four distinct pieces of gilt bronze, and to form the perfect seal must have been a work requiring con- siderable skill and patience. The reverse was formed by two stamps used on two :

separate plaques of softened Fra, 2.—Fourteenth-century seal of wax: one of these formed Boxgrove priory ; reverse.

the background with the various statuettes, and the second was used to stamp the open tracery work of the front of the church; the latter when hard was fitted on to the

4 A variety of design is introduced on the reverse of one of Queen Elizabeth's seals: she is represented standing, holding the orb and sceptre, and wears a dress with enormous hoops. Her other seal has the usual equestrian portrait on the reverse.

5 Asa rule, from the 12th to the 15th century, ecclesiastical seals and those of females were of the pointed oval form, most others being circular ; there are, however, many exceptions to this rule.

6 A special English office for the blessing of seals is printed by Maskell, Mon. Ritualia, 1882, vol. ili.

impression of the background, and thus a sort of miniature model of the church was made, with its statues and the inner planes of the fagade seen through the open tracery work,—the effect being extremely rich and delicate. When the finished obverse and reverse had been fitted together, the legend was added on their edges by means of the fourth piece of the matrix, —a strip of bronze with letters cut into it on both its :

edges; first one side and then the other of this strip was pressed against the rim of the wax seal, which thus received the im- pression of the complete legend all round its edge. The seal of South- wark priory, also of the 14th cen- tury, is even more claborate, as both sides have open tracery separately applied, and thus the matrix consists of five distinct pieces. Many of the bishops' seals, though less com- plicated in design,

See

Fic. 3,—Seal of Richard de Bury, late

are of equal beauty to those of the 14th century. chapters. The common design has a standing figure

under a richly decorated canopy. Fig. 3 shows a very beautiful example, the seal of Richard, bishop of Dur- ham. The standing figure of the bishop in mass vest- ments is modelled with wonderful skill and shows ex- treme taste in the treatment of the drapery; the legend is s[igillum] RICARDI. DEI. GRA. DVNELMENSIS. EPI. A great variety of sacred subjects occur on ecclesiastical seals

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Fig. 4.—Seal of King's College, Cambridge.

in addition to single figures of patron saints; the most frequent were perhaps the Crucifixion, the Annunciation, the Coronation of the Virgin, and the Virgin enthroned in Heaven; small figures of kneeling worshippers were

often added. Fig. 4 shows one of the most magnificent of this class, with, in the centre, a figure of the Virgin in glory, between St Nicholas and Henry VI., each under a very rich canopy; at the sides are shields charged with England and France, and France (modern) alone, held by two monks.! This very beautiful work of art dates about the year 1443. In the 15th century the ecclesiastical seals began to fall off in richness and beauty, and after the Reformation were of little artistic value. Very hand- some seals were used by lay corporations, especially the municipalities of towns. These last frequently have a careful representation of the town itself, with its circuit of walls or that of its chief castle or cathedral, and thus often afford valuable evidence as to fences and principal buildings. Fig. 5 shows a fine example, 3 inches in diameter, —the corporate seal of Rochester, made AR, in the 13th century; Ff [PMS it has a minute re- presentation of the ¥ keep of Rochester ¥ Castle,. surrounded by an outer circuit wallanda moat. On one of the turrets of the gateway is a sentinel blowing a signal horn ; legend, SIGILLVM . CIVIVM . ROFENSIS. The reverse has the same legend repeated round the scene of the Crucifixion of St Andrew. Other corporation seals are covered with small figures under elaborate canopy work, much like those of the ecclesiastical foundations.

Seals of hospitals are often designed in a similar way, with a representation of the hospital building very minutely treated. In the 15th century seals began to be designed in a rather pictorial style, which, though very graceful, is inferior to the earlier and more architect- onic class. Very magnificent — seals were used by state officials : those of the lord high ad-

miral of England are especially fine, from the beautiful form of the ship on the ob- verse. Fig. 6 shows that of the earl of Huntingdon, who was lord high ad- miral in the reign of Henry VIII. In design it resembles those of the admirals of the previous century. On the sails are embroidered the royal arms of England.

Among private seals those of powerful barons are often large and very beautifully cut. Fig. 7 shows a silver matrix, now in the British Museum, whiclr is remarkable for the great beauty of its workmanship. Its legend is SIGILLVM . ROBERTI . FILII. WALTERI. On it an armed knight, of the time of Henry IIL, is riding over a dragon, whose tail ends in a scroll of very beautiful conventional foliage, modelled with the greatest spirit and delicacy.

1 This class of seal is often a sort of miniature reproduction of some magnificent altar retable, as in fig. 4.

Fig. 6.—Seal of Lord High Admiral Huntingdon.

A common and graceful form of private seal in the 13th and 14th centuries has simply a shield with the owner's arms on a diapered —— background, the whole enclosed with- – in many-cusped tra- cery. Fig. 8 shows an example of a fine Greco-Roman gem, —a carnelian en- graved with a female head, full face. The 14th-century owner of this has added a metal setting with the words CAPVT. MARIE . MAGDALENE, to give it a sacred meaning. The le gends of private seals or secreta were often chosen in allu- sion to their use; common phrases are "clausa secreta tego," or "lecta lege, tecta tege." Many ingenious devices were practised to enable & the same matrix to give two or more dif (hey ferent varieties of impression. In some ¥ cases the border with the legend was so Y contrived as to slide up the handle, so ay that the seal could be made either with pio, 8. — Antique or without an inscription. Others had gem used as a the border made to revolve on a swivel, Private seal. so as to supply two different legends ; and the magnificent monastic seals (as that shown in fig. 2) were arranged so as to give a perfect seal without the use of the ela- porate open tracery. In the 15th and 16th centuries mer- chants and handicraftsmen frequently employed devices connected with their trade—either some tool or badge or an arbitrary sign used as a trade-mark ; or a rebus of the owner's name

was used, such asa bolt and a tun (cask) for the name Bolton. The use of seals by the humbler classes was more common in England than abroad ; even bonds- men sometimes had seals, both before and after the Nor- man Conquest. Seals of other countries mostly followed

Fic. 7.—Seal of Robert Fitzwalter, c. 1270.

eet is the art of sailing, manceuvring, and

preserving a ship or a boat in all positions and under all reasonable circumstances, and thus involves a sound practical knowledge of all the forces by which she may be actuated and the means at command to assist or counter- act them; it is a branch of applied mechanics acquired by experience and study. The former can only be obtained thoroughly in many years spent at sea, in personal con- nexion with the work of the ship and her boats ; that such training should commence at an early age is very desir- able, if not even imperative. The practical knowledge so gained should be supplemented and improved by reading, conversation, and discussion, as the casualties which befall ships are so varied that a man may pass forty years in sea- going vessels without experiencing one-half of those which might occur. Many of the old maxims are still applicable to every class of vessel and must always remain So.

The terms "ship" and "vessel" are here intended to embrace all classes, though "ship" is generally applied to the larger without reference to form or description unless such is specified. Though the use of sails has been greatly superseded by the introduction of steam-power both in the navies of all nations and in the mercantile marine, it is still generally admitted that seamanship is best acquired

the same fashions as those of England, though of course varying in design and workmanship with each country. On the whole, the English seals were

superior during their best period (the 14th century) to those of any other country, though matrices of great beauty were produced in both Germany and France. In Italy less care and skill were usually spent on seals, partly owing to the greater use of metal bulle for important charters.

Metal Bullx.—These are necessarily not plaqué but pen- dant, and are held usually by cords passed through a hole in the seal. Lead was the metal most commonly used, but some sovereigns had bulle struck in silver or gold, either as a mark of their own dignity or to confer special honour on the recipient of a charter. An extant letter from Petrarch to Charles IV. thanks that emperor for a diploma of the rank of count, and especially for the honour shown to him by the attachment of gold bulle to the document. Lead bulle were also used by various ecclesiastical dignitaries, from patriarchs to bishops, but were rarely used by ecclesiastics of lower rank. In some cases, however, especially in Sicily and Byzantium, bulle were used by laymen of very moderate rank, A large num- ber of fine papal bull! exist dating from the 7th century onwards.? Since the time of Pope Paschal IT. they have borne heads of St Peter and St Paul; previously they had such simple devices as crosses or stars, with the name of the pontiff. Another early series of bulle begins in the 8th century with the bulle of the patriarchs of Byzantium. Those of the doges of Venice exist in large numbers, bear- ing figures of St Mark and the reigning doge kneeling before him. Existing bulle of Charlemagne have a rude profile portrait crowned with a diadem, and on the reverse the monogram of KAROLVS arranged in the form of a cross.

Consult, in addition to the works named above, Thulemarius, De Bulla Aurea, Frankfort, 1724; Romar-Biichner, Die Siegel der deutsch. Kaiser, Frankfort, 1851; Vossberg, Gesch. der preussischen Siegel, Berlin, 1843; Melly, Siegel-Kunde des Mittclalicrs, Vienna, 1846 ; Heineccius, De Sigillis, Frankfort, 1709 ; Lepsius, Sphragis- tische Aphorismen, Halle, 1842-48; Caulfield, Sigilla Ecclesia Hibernice, London, 1853 ; and more especially various articles in the Gaz. des Beaux-Arts, Archxologia, Archeological Journal, and Proceedings of other antiquarian societies. (J. H. M.)

NSHIP

on board a vessel which is dependent upon her sails. The construction and equipment of sailing ships had reached a high point of perfection at the time steam came into general use. The power derived from the steam-engine does not change any of the former conditions, but simply adds another element, confined to propulsion. directly ahead or astern (except with reversible wheels or twin screws), which when combined with sails renders a ship much more manageable and safe,—that is to say, assuming all the forces at command to be properly applied. Hence it is very desirable that all ocean-going steam vessels should have sufficient sail-power to turn them round (wear) or to enable them to sail with the wind abeam without steam, especially when fitted with single screws or with paddle wheels which do not work separately. Twin screws, of course, give a double chance as far as the engine is concerned ; but even with that advantage the loss of the rudder would leave the ship in a helpless condition if she had not efficient head and after sails to balance her on the desired course.

At present the excessive desire to make quick passages has greatly augmented the danger unavoidably attending a sea voyage, the risk as well as the violence of a collision

ee ee aS ea eee SE eS eS 1 The term "bull" for a papal charter comes from its lead bulla. 2 See Ficoroni, Piombi Anticht, Rome, 1745.

at high speed in thick weather being thereby much in- creased. Through the want of masts and sails there is a probability of total loss by drifting helplessly on a lee shore during a gale, or by foundering "in the trough of the sea." In spite of her monstrous size (22,000 tons), the "Great Eastern," in 1863 or 1864, with her six com- paratively small masts and weak sails was, after the loss of her rudder, very roughly used by the waves striking her full on the side. She was in the position which is expressed by the common sea-phrase "wallowing in the trough of the sea," from which her crew had no power to extricate her. A smaller vessel deeply laden in such a

some time, as the general usefulness of the men has been cramped. Sail drill in harbour is open to grave objec- tions: unless in a tide-way, the ship must be invariably head to wind; for reefing and furling the yards are laid Square, consequently flat aback ; both earings are hauled out at once, and as it is only for exercise they are only half secured. Even when reefing top-sails at sea either for exercise or of necessity in company with other ships, the yards are laid square to enable the men to get readily on the weather-side ; therefore, if on a wind, the sail must re- main aback or the ship must be kept away till the wind is on the beam in order to shake the sail.

position would most probably have foundered, leaving no one to tell the tale. Too much stress is laid upon the re- tardation caused by masts and rigging when steaming head to wind ; it is the pitching and plunging motion of

The foundation of all teaching of seamanship must be a Knots, knowledge of the knots, bends, and splices, and their use hitches, in the various parts of the rigging and equipment of a "4% ship. Some knots, bends, and hitches are intended to afford

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a& Sea- man.

the ship into a succession of waves that principally retards her speed, If the waves are approaching at the rate of 10 miles an hour and the ship is steaming against them at a similar rate, they will strike the bows with a force equal to 20 miles an hour. When a ship is steaming through comparatively smooth water (sheltered by land) against a gale of wind, her speed is but little reduced by the force of the wind alone, when other circumstances admit of her working full power. Storm-sails only require short masts, but these and the canvas they support should be strong, which is not the case in the merchant service generally. Every seaman is expected to be thoroughly acquainted with the rigging of the vessel in which he serves, and when in charge he should frequently examine every part, to see that it is efficiently performing the duty assigned to it, being neither too taut nor too slack, nor suffering from chafing, wet, or other injury. He should be capable of repairing or replacing any part with his own hand if necessary

and of teaching others how to do so. He need not necessarily be a navigator, though a good navigator must be a seaman; nor is it necessary that a seaman should be a shipbuilder, a mast-maker, a rope-maker, or a sail-maker, but he should possess a general knowledge of each art, especially the last ; every able seaman should be able to sew a seam and assist the ship's sail-maker in repairing sails. It is greatly to be regretted that various circumstances have brought about such a change in the system of rigging ships, in both the British navy and the mercantile marine, that those who sail in them seldom see it done. Young officers were in former times frequently entrusted with the charge of day watches, during which they would give the necessary orders for making, shorten- ing, or trimming sails, perhaps even tacking and wearing. That practice gave confidence and quickened the desire to learn more ; it was more frequently done in small than in large ships. The general adoption of the steam-engine in ships has not only diminished the value of sail-power but of seamanship also, and has produced such a change in the rig that instead of masts and yards we find only two or three poles. In the British navy so many new sciences have been introduced that seamanship takes but a low place among them at the examination of a midshipman, who has had but little boat duty and probably found the discussion of seamanship in his mess-place contrary to rule. The rapidity with which all sail and mast drill is executed, combined with the perfection of the "station bill," renders it worse than useless as a means of teaching, as it gives a false confidence which fails in the hour of necessity, when the accustomed routine is thrown out by a sail actually splitting to pieces or a spar snapping. The fact that the same men perpetually do the same thing must tend greatly to render each evolution quick so long as every one is in his accustomed place, but sickness or the absence of a party from duty will disorganize the ship for

security as long as desired, and then to be easily disengaged. Other knots, splices, and seizings are of a more permanent character, generally continuing as long as the rope will last.

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Fig. 2. Fig. 1.—Overhand Knot. Fia, 2.—Figure-of-Eight Knot.

Overhand Knot.—Used at the end of ropes to prevent their unreeving and as the commencement of other knots. Fig. 1 represents an overhand knot hauled by aa ej an illustration of the same not hauled tight see Knot, vol. xiv. p.

» Hg. f

Figure-of-Eight Knot (fig. 2).—Used only to prevent ropes from unreeving ; it forms a large knob,

Reef Knot (see Knot, loc, cit., figs. 8 and 9).—First form an overhand knot; then take the end a over the end } and through the bight.2 This knot is so named from being used in tying the reef points of a sail, since it will not jam. Ifthe end @ were taken under the end 6, a granny's knot would be formed.

Bowline Knot.—Lay the end of a rope a over the standing part b; form with b a bight c over a; take a round behind 6 and down through the bight. This is a very useful knot, forming a loop which will not slip. Running bow- lines are formed by making a bowline round its own standing part above b. It is the most common and convenient temporary running noose. See Knot, i.¢., figs. 11 and 12.

Fig. 4.

ay bh Bowline on a Bight.

Fig. 8. Fia. 7.—Cat's-paw. Fic. 8.—Marling-Spike Hitch.

Bowline on a Bight (figs. 8, 4).—The first part is made similar to the above with the double part of the rope ; then the bight a is pulled through sufficiently to allow it to be bent over past d and come up in the position shown in fig, 4. It makes a more comfortable sling for a man than a single bight. 7

Half-Hitch.—Pass the end a round the standing part b and through the bight.

1 A person wishing to make sailor's knots need not be deterred by the want of material, as nearly all that are here represented were made, for the purpose of sketching them, with the lashing of a packing case.

2 For an explanation of this and other technical terms, see the glossary on p. 603 below.

Fig. 5. Fig. 5.—Two Half-Hitches. Fig. 6.—Double Blackwall Hitch.

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This hitch by itself round a large object would not hold and round a small one would jam excessively. See Knot, v.02 fig. 13.

Two Half-Hitches (fig. 5).—The half-hitch repeated ; this is commonly used, and is capable of resisting to the full strength of the rope. A stop from a to the standing part will prevent it jamming.

Clove Hitch.—Pass the end a round a spar or rope and cross it over b, its standing part ; pass it round again and put the end a through the second bight. This hitch is generally used at right angles to the object and is improved by adding a half hitch with the end a round b. When pulled ina line with the spar it becomes simply two half-hitches. An illustration is given in Knot, Le, fig. 15.

Double Blackwall Hitch (fig. 6).—Pass the end a twice round the hook and under the standing part } at the last cross. The ordinary Blackwall hitch only extends to the first cross at 0, and is quickly formed by passing the hook of ajigger through the bight of a rope so that the end may be jammed between it and the standing part, as frombtoa, Used for setting up top-gallant rigging and similar light work when a slip is of little consequence.

Cat's-paw (fig. 7).—Twist up two parts of a lanyard in opposite directions and hook the tackle in the eyes i, 7. A piece of wood should be placed between the parts at g. A large lanyard should be clove-hitched round a large toggle and a strap passed round it below the toggle.

Marling-Spike Hitch (fig. 8).—Lay the end a over c; fold the loop over on the standing part 6; then pass the marling-spike through, over both parts of the bight and under the part b. Used for tightening each turn of a seizing.

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Fig. 9. Fic. 9.—Fisherman's Bend. Fig. 11.—Timber Hitch.

Fig. 10. Fig. 11. Fra. 10.—Studding-Sail Halyard Bend.

Fisherman's Bend (fig. 9).—Take two turns round a spar, then a half-hitch round the standing part and between the spar and the turns, lastly a half-hitch round the standing part.

Studding-Sail Halyard Bend (fig. 10).—Similar to the above, except that the end is tucked under the first round turn; this is more snug. A magnus hitch has two round turns and one ou the other side of the standing part with the end korg the bight.

Timber Hitch (fig. 11).—Take the end a of a rope round a spar, then round pr aguas part 0, then several times round its own part c, against the lay

e rope.

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~~*Fig. 12.*~~

~~*Fiq. 12.—Snaking. Fig. 13.—Carrick Bend.*~~

~~*Fig. 13. Fig. 14.*~~

~~*Fic. 14.—Inside Clinch. Fia. 15.—Midshipman's Hitch.*~~

~~*Snaking (fig. 12).—This consists of turns and crossings, the latter taken*~~

~~*diagonally with a marling hitch each time. Used to keep wooldings and seiz- ings in place. The same term is applied to lines between the backstays to keep a broken part from falling.*~~

~~*Carrick Bend (fig. 18).—Lay the end of one hawser over its own part to form a bight as ¢, b; pass the end of another hawser up through that bight near }, going out over the first end at c, crossing under the first long part and over its end at d, then under both long parts, forming the loops, and above the first short part at b, terminating at the end e", in the opposite direction vertically and horizontally to the other end. The ends should be securely stopped to their respective standing parts, and also a stop put on the becket or extreme end to prevent it catching a pipe or chock ; in that form this is the best quick means of uniting two large hawsers, since they cannot jam. When large hawsers have to work through small pipes, good security may be obtained either by passing ten or twelve taut racking turns with a suitable strand and securing each end to a standing part of the hawser, or by taking half as many round turns taut, crossing the ends between the hawsers over the seizing and reef-knotting the ends. This should be repeated in three places and the extreme ends well stopped. Connecting hawsers by bowline knots is very objectionable, as the bend is large and the knots jam.*~~

~~*Sheet Bend.—Pass the end of one rope through the bight of another, round both parts of the other, and under its own standing part. Used for bending small sheets to the clews of sails, which present bights ready for the hitch.*~~

~~*An ordinary net is composed of a series of sheet bends. See Knot, Lc., fig. 20. A weaver's knot is made like a sheet bend. .*~~

~~*Single Wall Knot.—Unlay the end of a rope, and with the strand a forma:*~~

~~*bight; take the next strand 6 round the end of a: take the last strand c round the end of } and through the bight made by @; haul the ends taut. A double wall against the lay (not crowned) makes a good stopper.*~~

~~*Single Wall Crowned.—Form a single wall, and lay one of the ends, a, over the knot; lay } over a, and c over 6 and through the bight of a; haul the ends taut. See Knot, l.c., fig. 22.*~~

~~*Double Wall and Double Crown,—Form a single wall crowned; then let the ends follow their own parts round until all the parts appear double; put the ends down through the knot. A very excellent and generally used cable-stopper. See Knot, l.c., fig. 23.*~~

~~*Matthew Walker.—Uniay the end of a rope. Take the first strand round the rope and through its own bight ; the second strand round the rope, through the bight of the first, and through its own bight ; the third through all three bights. Haul all taut. An easily made and useful knot. Illustrations are given in Kwot, l.c., figs. 24 and 25.*~~

~~*Inside Clinch (fig. 14).—The end is bent close round the standing part till it forms a circle and a half, when it is securely seized at a, b, and c, thus making a running eye; when taut round anything it jams the end. Itis used for securing hemp cables to anchors, the standing parts of topsail sheets, and for many other purposes. If the eye were formed outside the bight an outside clinch would be made, depending entirely on the seizings, but more ready for slipping.*~~

~~*Midshipman's Hitch (fig. 15).—Take two round turns inside the bight, the game as a half-hitch repeated ; stop up the end; or let another half-hitch be taken or held by hand. Used for hooking a tackle for a temporary purpose.*~~

~~*Fria, 16.—Turk's Head. Fic. 17.—Spanish Windlass. Fia. 18.—Slings.*~~

~~*Turk's Head (fig. 16).—With fine line (very dry) make a clove hitch round the rope; cross the bights twice, passing an end the reverse way (up or down) each time; then keeping the whole spread flat, let each end follow its own part round and round till it is too tight to receive any more. Used as an ornament variously on side-ropes and foot-ropes of jibbooms, It may also be made with three ends, two formed by the same piece of line secured through the rope and one single piece. Form with them a diamond knot; then each end crossed over its neighbour follows its own part as above.*~~

~~*Spanish Windlass (fig. 17).—An iron bar and two marling-spikes are taken ; two parts of a seizing are twisted like a cat's-paw (fig. 7), passed round the bar, and hove round till sufficiently taut. In heaving shrouds together to form an eye two round turns are taken with a strand and the two ends hove upon. When a lever is placed between the parts of a long lashing or frapping and hove round, we have what is also called a Spanish windlass*~~

~~*Slings (fig. 18).—This is simply the bight of a rope turned up over its own part ; it is frequently made of chain, when a shackle (bow up) takes the place of the bight at s and another at y, connecting the two ends with the part which goes round the mast-head. Used to sling lower yards. For boat's yards it should be a grummet with a thimble seized in at y. As the tendency of all yards is to cant forward with the weight of the sail, the part marked by an beg should be the fore-side,—easily illustrated by a round ruler and a piece of twine.*~~

~~*Fig. 21.*~~

~~*Fig. 21.—Turning in a Dead-Eye end up.*~~

~~*Fig. 19.*~~

~~*Fiq. 19.—Sprit-Sail Sheet Knot. Fig. 20.—Turning in a Dead-Bye Cutter-Stay fashion.*~~

~~*Sprit-Sail Sheet Knot (fig. 19).—This knot consists of a double wall and double crown inade by the two ends, consequently with six strands,—with*~~

the ends furned down. Used formerly in the clews of sails, now as an excellent stopper, a lashing or shackle being placed at s, and a lanyard round the head at J.

Turning in a Dead-Eye Cutter-Stay fashion (fig. 20).—A bend is made in the stay or shroud round its own part and hove together with a bar and strand ; two or three seizings diminishing in size (one round and one or two either round or flat) are hove on taut and snug, the end being at the side of the fellow part. The dead-eye is put in and the eye driven down with a commander.

Turning in a Dead-Eye end up (fig. 21).—The shroud is measured round the dead-eye and marked where a throat-seizing is hove on; the dead-eye is then forced into its place, or it may be put in first. The end beyond a is taken up taut and secured with a round seizing; higher still the end is secured by another seizing. As it is important that the Jay should always be kept in the rope as much as possible, these eyes should be formed conformably, either right-handed or left-handed. It is easily seen which way a rope would natur- ally kink by putting a little extra twist into it. A shroud whose dead-eye is turned in end up will bear a fairer strain, but is more dependent on the seizings ; the under turns of the throat are the first to break and the others the first to slip. With the cutter-stay fashion the standing part of the shroud gives way under the nip of the eye. A rope will afford the greatest resistance to strain when secured round large thimbles with a straight end and a sufficient number of flat or racking seizings. To splice shrouds round dead-eyes is objectionable on account of opening the strands and admitting water, thus hastening decay. In small vessels, especially yachts, it is admissible on the score of neatness ; in

that case a round seizing is placed between the dead-eye and the splice. The dead-eyes should be in dean 1} times the circumference of a hemp shroud and thrice that of wire; the lanyard should be half the nominal size of hemp and the same size as wire; thus, hemp-shroud 12 inches, wire 6 inches, dead- eye 18, lanyard 6 inches.

~~*Short Splice.—The most common description of splice is when a rope is lengthened by another of the sate size, or nearly so, Fig. 22 represents a splice of this kind: the strands have been unlaid, married, and passed through with the assistance of a marling- spike, over one strand and under the next, twice each way. The ca are then cut off close. o render the = : splice neater the strands Hid. 2.=hort Opllan should have been halved before turning them in a second time, the upper half of each strand only being turned in; then all are cut off smooth. LEye- Splice.—Unlay the strauds and place them upon the same rope spread at such a distance as to give the size of the eye; enter the centre strand (unlaid) under a strand of the rope (as above) and the other two in a similar manner on their respective sides of the first; taper each end and pass them through again. If neatness is desired, reduce the ends and pass them through once more; cut off smooth aud serve the part disturbed tightly with suitable hard line. Uses too numerous to mention. Cut Splice.—Made in a similar manner to an eye-splice, but of two pieces of rope, therefore with two splices, Used for mast-head pendants, jib-guys, breast backstays, and even odd shrouds, to keep the eyes of the rigging lower by one part. It is not so strong as two separate eyes, Horse-Shoe Splice.—Made similar to the above, but one part much shorter than the other, or another piece of rope is spliced across an eye, forming a horse- shoe with two long legs. Used for back-ropes on dolphin striker, backstays {one on each side), and cutter's runner pendants. Long Splice.—The strands must be unlaid about three times as much as for a short splice and married,— care being taken to preserve the lay or shape of each, Unlay one of the strands still further and follow up the vacant space with the corresponding strand of the other part, fitting it firmly into the rope till only a few inches remain. Treat the other side in a similar manner. There will then appear two long strands in the centre and a long and a short one on each side, The splice is practically divided into three distinct parts; at each the strands are divided and the corresponding halves knotted (as showu on the top of fig, 24) and turned in twice. The half strand may, if desired, be still further reduced before the halves are turned in for the second time. This and all other splices should be well stretched and hammered into shape before the ends are cut off. The long splice alone is adapted to running ropes.*~~

~~*Shroud Knot (fig, 23),—Pass a stop at such distance from each end of the broken shroud as to afford sufficient leugth of strands, when it is unlaid, to form a single wall knot on each 1 b side after the parts have been e married ; it will then appear as a c represented in the figure, the strands having been well tarred and hove taut separately. The part A en the knot on the d b opposite side and the ends B, b; me) the part c provides the knot and Pia, 30-=Shrona. ned, the ends d, d._ After the knot has been well stretched the ends are tapered, laid smoothly between the strands of the shroud, and firmly served over. This knot is used when shrouds or stays are broken. French Shroud Knot.—Marry the parts with a similar amount of end as before; stop one set of strands taut up on the shroud (to keep the parts together); and turn the ends back on their own part, forming bights. Make a single wall knot with the other three strands round the said bights and shroud; haul the knot taut first and stretch the whole; then heave down the bights close: it will look like the ordinary shroud knot. It is very liable to slip. Ifthe ends by which the wall knot are made after being hove were passed through the bights, it would make the knot stronger. The ends would be tapered and served.*~~

~~*Flemish Hye (fig. 24).—Secure a spar or toggle twice the circumference of the rope intended to be rove through the eye; unlay the rope which is to form the*~~

~~*eye about three times its circumference, at a f ((-5*~~

~~*which part place a strong whipping. Point SQ°r.*~~

~~*the rope vertically under the eye, and bind it taut up by the core if it is four-stranded rope, otherwise bya few yarns. While doing 80, arrange six or twelve pieces of spun-yarn at equal distances on the wood and exactly halve the number of yarns that have been unlaid, If it isa small rope, select two or three yarns from each side near the centre : cross them over the top at a; and half knot them tightly. So continue till all are ex- pended and drawn down tightly on the op- posite side to that from which they came, being thoroughly intermixed. Tic the pieces of aie which were placed under the eye tightly round various parts to keep the ya i eye in shape when taken off the spar, till oie Gea enle ge they are replaced by turns of marline hove on ag taut as possible, the hitches forming a central line outside the eye. Heave*~~

~~*on a good seizing of Spun-yarn close below the spar and another between six and twelve inches below the first; it may then be parcelled and served ; the eye is served over twice, and well tarred each time. As large ropes are composed of so many yarns, a greater number inust be knotted over the toggle each time; a 4-inch rope has 132 yarns, which would require 22 knottings of six each time; a 10-inch rope has 834 yarns, therefore, if ten are taken from each side every time, about twice that number of hitches will be required ; sometimes only half the yarns are hitched, the others being merely passed over. The chief use of these eyes has been to form the collars of stays, the whole stay in each case having to be rove through it,—a very inconvenient device. It is almost superseded for that purpose by a leg spliced in the stay and lashing eyes abaft the mast, for which it is commonly used at present. This eye is not always called by the same name, but the weight of evidence is in favour of calling it a Flemish eye. Ropemaker's Eye, which also has alternative names, is formed by taking out of a rope one strand longer by 6 inches or a foot than the required eye, then placing the ends of the two strands a similar distance below the dis- turbance of the one strand, that is, at the size of the eye; the single strand igs led back through the vacant space it left till it arrives at the neck of the eye, with a similar length of spare end to the other two strands. They are all seized together, scraped, tapered, marled, and served. The principal merit is neatness.*~~

~~*Mouse on a Stay,—Formed by turns of coarse spun-yarn hove taut round the stay, over parcelling at the requisite distance from the eye to form the collar 3 assistance is given by a padding of short yarns distributed equally round the*~~

~~*rope, which, after being firmly secured, especially at what is to be the under*~~

~~*part, are turned back over the first layer and seized down again, thus making a shoulder; sometimes it is formed with parcelling only. In either case it is finished by marling, followed by serving or grafting. The use is to prevent the Flemish eye in the end of the stay from slipping up any farther.*~~

~~*Rolling Hitch (fig. 25).—Two round turng are taken round a spar or large rope in the direction in which it is to be hauled and one half-hitch on the other side of the hauling part. can be put on and off quickly.*~~

~~*Round Seizing (fig. 26).—S80 named when the rope it secures does not cross another and there are three sets of turns. The size of the seizing line is about one-sixth (nominal) that of the ropes to be secured, but varies according to the number of turns to be taken. An eye is spliced in the line and the end rove through it, em- bracing both parts. If either part is to be spread open, commence farthest from that part; place tarred canvas under the seizing ; pass the a round oT pee (with much slack) as it is intended to have sai under-turns ; and pass the end back through Fic. seiainanis Seizing. them all and through the eye. Secure the eye from rendering round by the ends of its splice ; heave the turns on with a marling-spike (see fig. 8), perhaps seven or nine; haul the end through taut; and commence again the riding turns in the hollows of the first. Ifthe end is not taken back through the eye but pushed up between the last two turns (as is sometimes recommended), the riders must be passed the opposite way in order to follow the direction of the under-turns, which are always one more in number than the riders. When the riders are complete, the end is forced between the last lower turns and two cross turns are taken, the end coming up where it went down, when a wall knot is made with the strands and the ends cut close; or the end may be taken once round the shroud. Throat Seizing.—Two ropes or parts of ropes are laid on each other parallel and receive a seizing similar to that shown in fig. 21,—that is, with upper and riding, but no cross turns. As the two parts of rope are intended to turn up at right angles to the direction in which they were secured, the seizing should be of stouter line and short, not exceed- ing seven lower and six riding turns. The end is better secured with a turn round the standing part. Used for turning in dead-eyes and variously, Flat Seizing.—Commenced similarly to the above, but it has neither riding nor cross turns, fs ;*~~

~~*Racking-Seizing (fig. 27).—A running eye having been spliced round one part of the rope, the line is passed entirely round the other part, crossed back round the first part, and so on for ten to tweuty turns accord- é d_b ing to the expected strain, a every turn being hove as*~~

~~*Fic. 25.—Rolling Hitch.*~~

~~*This is very useful, as it*~~

~~*SS.*~~

~~*x yS ANOS*~~

~~*AA 4 tight as possible, after =6=6-8-65 which round turns are<<— 4 22 0922 62 26:*~~

~~*\ yj \'*~~

~~*passed to fill the spaces at the back of each rope, by taking the end a over both parts into the hollow at b, returning at c, and going over tod. When it reaches e aturn may be taken round : , that rope only, the end rove under it, and a half-hitch taken, which will form a clove hitch; knot the end and cut it close. When the shrouds are wire (which is half the size of hemp) and the end turned up round a dead-eye of any kind, wire-seizings are preferable. It appears very undesirable to have wire rigging combined with plates or screws for setting it up, as in case of accident —such as that of the mast going over the side, a shot or collision breaking the ironwork—the seainen are powerless. : Diamond Knot (figs. 28, 29).—The rope must be unlaid as far as the centre if the knot is required there, and the strands handled with great care to keep the lay in them. Three bights are turned vA up as in fig, 28, and the end of a is taken over 0b and up the bight c. The end of b is taken over c and up througha. The end b c is taken over @ and through b. When hauled taut and the strands are laid up again it will appear as in fig. 29, Any number of knots may be made on the same rope. They were used on man-ropes, the foot-ropes on the jibboom, and similar places, where it was necessary to give a good hold for the hands or feet. Turk's heads are now generally used. Double Dia- mond.—Made by the ends of a single dia-mond following their own part till the knot is repeated. Used at the upper end .. 2 side rope as an ornamental stopper- Fics. 28, 29.—Diamond Knot. Stropping-Blocks.—There are various modes of securing blocks to ropes ; the most simple is to splice an eye at the end of the rope a little longer than the block and pass a round seizing to keep it in place; such is the case with jib- pendants. As a general rule, the parts of a strop combined should*~~

~~*possess greater strength than the parts of the fall which act against it. The shell of an ordinary block should be about three times the circumference of the rope which is to reeve through it, as a 9-inch block for a 83-inch rope; but small ropes require larger blocks in proportion, as a 4-inch block for a 1-inch rope. When the work to be done is very important the blocks are much larger; brace-blocks are more than five times the nominal size of the brace.*~~

~~*CNA)*~~

~~*Fic. 27.—Racking Seizing.*~~

~~*Fia. 30.—Grummet-Strop.*~~

~~*Leading-blocks and sheaves in racks are generally smaller than the blocks through which the ropes pass farther*~~

~~*SEAMANSHIP*~~

~~*away, which appears to be a mistake, as more power is lost by friction. A clump-block should be double the nominal size of the rope. A single strop may be made by joining the ends of a rope of sufficient length to go round the block and thimble by a common short splice, which rests on the crown of the plock (the opposite end to the thimble) and is stretched into place by a jigger ; a strand is then passed twice round the space between the block and the thimble and hove taut by a Spanish windlass to cramp the parts together ready for the reception of a small round seizing. The cramping or pinching into shape is sometimes done by machinery invented by a rigger in Portsmouth dockyard. The strop may be made the required length by a long splice, but it would not possess any advantage.*~~

~~*Grummet-Strop (fig. 30).—Made by unlaying a piece of rope of the desired size about a foot more than three times the length required for the strop. Place the centre of the rope round the block and thimble; mark with chalk where the parts cross; take one strand out of the rope; bring the two chalk marks together ; and cross the strand in the lay on both sides, continuing round and round till the two ends meet the third time; they are then halved, and the upper halves half-knotted and passed over and under the next*~~

~~*strands, exactly as one part of a long splice. A piece of worn or well-stretched rope will better retain its shape, upon which success entirely depends. The object is neatness, and if three or multiples of three strops are to be made it is economical.*~~

~~*Double Strop (fig. 81).—Made with one piece of rope, the splice being brought as usual to the crown of the block, t, the bights fitting into scores some inches apart, converging to the upper part, above which the thimble receives the bights a, a; and the four parts of the strap are secured ats, s by a round seizing doubly crossed. If the block be not then on the right slew 5 (the shell horizontal or vertical) a union thimble is used with another strop, which produces the desired effect ; thus the fore and main brace-blocks, being very large and thin, are required (for appearance) to lie horizontally ; a single strop round the yard vertically has a union thimble between it and the double strop round the block, The double strop is used for large blocks; it gives more sup- port to the shell than the single strop and admits of smaller rope being used. Wire rope is much used for block-strops ; the fitting is similar. Metal blocks are also used in fixed positions; durability is their chief recom- mendation. Great care should be taken that they do not chafe the ropes which pass by them as well as those which reeve through.*~~

~~*Selvagee Strop.—Twine, rope-yarn, or rope is warped round two or more pegs placed at the desired distance apart, till it assumes the requisite size and strength ; the two ends are then knotted or spliced. Temporary firm seizings are applied in several places to pind the parts together before the rope or twine is removed from the pegs, after which it is marled with suitable material. A 1.—Doubl large strop should be warped round four or six pegs in Fi. ouhle order to give it the shape in which it is to be used. This BOD: description of strop is much stronger and more supple than rope of similar size. Twine strops (covered with duck) are used for boats' blocks and in similar places requiring neatness. Rope-yarn and spun-yarn strops are used for attaching luff-tackles to shrouds and for many similar purposes. To bring to a shroud or hawser the centre of the strop is passed round the rope and each part crossed three or four times before hooking the 'luff'; a spun-yarn stop above the centre will prevent slipping and is very necessary with wire rope. 'As an instance of a large selvagee block-strop being used,— when the "Melville" was hove down at Chusan (China), the*~~

~~main-purchase-block was double stropped with a selvagee containing 28 parts of 8-inch rope; that would produce 112 parts in the neck, equal toa breaking strain of 280 tons, which is oa than four parts of a 19-inch cable. The estimated strain it bore was 80 tons.~~

~~Stoppers for ordinary running ropes are made by splicing a piece of rope to a bolt or to a hook and thimble, unlaying 3 or 4 feet, tapering it by cutting away some of the yarns, and marling it down securely, with a good whipping also onthe end, It is used by taking a half-hitch round the rope which is to be hauled upon, dogging the end up in the lay, and holding it by hand. The rope can come through it when hauled, but cannot go back.~~

~~Whipping and Pointing.—The end of every working rope should at least be whipped to prevent it fagging out; in ships of war and yachts they are invari- ably pointed. Whipping is done by placing the end of a piece of twine or knittie-stuff on a rope about an inch from the end, taking three or four turns taut over it (working towards the end); the twine is then laid on the rope again lengthways contrary to the first, leaving a slack bight of twine; and taut turns are repeatedly passed round the rope over the first end and over the bight, till there are in all six to ten turns; then haul the bight taut through between the turns and cutit close. To point a rope, place a good whipping a few inches from the end according to size ; open out the end entirely ; select all the outer yarns and twist them into knittles either singly or two or three together ; scrape down; and taper the central part, marling it firmly. Turn every alter- nate knittle and secure the remainder down by a turn of twine or a smooth yarn hitched close up, which acts as the weft in weaving. The knittles are then reversed and another turn of the weft taken, and this is continued till far enough to look well. At the last turn the ends of the knittles which are laid back are led forward over and under the weft and hauled through tightly, making it present a circle of small bights, level with which the core is cut off smoothly. HIawsers and large ropes have a becket formed in their ends during the process of pointing. A piece of 1 to 14-inch rope about 1} to 2 feet long is spliced into the core by each end while it is open: from four to seven yarns (equal to a strand) are taken at a time and twisted up; open the ends of the becket only sufficient to marry them close in ; turn in the twisted yarns between the strands (as splicing) three times ; and stop it above and below. Both ends are treated~~

alike ; when the pointing is completed a loop a few inches in length will protrude from the end of the rope, which is very useful for reeving it. A hauling line or reeving line should only be rove through the becket as a fair lead. Grafting is very similar to pointing and frequently done the whole length of a rope, as a side-rope. Pieces of white line more than double the length of the rope, sufficient in number to encircle it, are made up in hanks called foxes ; the centre of each is made fast by twine and the weaving process continued as iu pointing. Block-strops are sometimes so covered ; put, as it causes decay, a small wove mat which can be taken off occasionally is preferable.

Sheep-Shank (fig. 82).-Formed by making a long bight in a top-gallant-back-

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Fic. 32,—Sheep-Shank.

stay, or any rope which it is desirable to shorten, and taking a half-hitch near each bend, as at a, a. Rope-yarn stops at }, b are desirable to keep it in place

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till the strain is brought onit. Wire rope cannot be so treated, and it is in-jurious to hemp rope that is large and stiff.

Knotting Yarns (fig. 83).—This operation becomes necessary when a com-paratively short piece of junk is to be made into spun-yarn, or large rope into small, which is called twice laid. The end of each yarn is divided, rubbed smooth, and inar- ried (as for splicing). Two of the divided parts, .

~~as ¢, cand d, d, are passed Fia. 33.—Knotting Yarns. in opposite directions round all the other parts and knotted. The ends e and fremain passive. The figure is drawn open, but the forks of A and B should be pressed close together, the knot hauled taut, and the ends cut off.~~

~~Butt Stings (fig. 34).— Made of 4-inch rope, each pair being 26 feet in length, with an eye spliced in one end, through which the other is rove before being placed over one end of the cask; the rope is then passed round the opposite side of the cask and two half-hitches made with the end, forming another run- ning eye, both of which are beaten down taut as the tackle receives the weight. Slings for smaller casks requiring care should be of this description, though of smaller rope, as the cask cannot possibly slip out. Bale Slings are made by splicing the ends of about 3 fathoms of 8-inch rope together, which then looks like a long strop, similar to the double strop repre- sented in fig. 31,—the bights ¢ being placed under the~~

~~AX~~

~~Fia. 34.—Butt Slings. cask or bale and one of the bights a, « rove through the other and attached to the whip or tackle.~~

~~The marks on the lead-line are leather at 2, 8, and 10 fathoms, white at 5 and 15, red at 7 and 17, and blue at 13. The length of the lead is not usually included. The deep-sea line commences with 2 knots at 20, another knot being~~

~~added for every 10 fathoms, and a single knot at each intermediate 5. Log-lines should have ample stray line (distance between the log-ship and the first mark). The distance of 47 feet and a 28-second-glass were adopted to assimilate the sea furlong to the shore furlong, which was absurd. Fifty feet to half a minute would be more correct and more convenient.~~

~~_ Since space will not allow ofa full description of masting and Masting. rigging, only a few of the more important points will be noticed. The masts must be stepped before they are rigged; accordingly we will first describe the mannrr in which they are put on board in cases where the assistance of shears on hulk or jetty is not available ; at an out-port a seaman is still left to his own resources, just as he was in former times. Fixing the masts in a~~

large frigate, such as that shown in fig. 35 below, is a serious consideration, as the mainmast weighs about twenty tons.

Two suitable spars must be procured about three-fourths the length of the main-mast and about two-thirds its diameter,—the greater the housing the higher the shears. They are towed along- side or under the stern with the thicker ends forward, and par- buckled over the side or hoisted in through the stern-ports by means of a derrick, whichever is most convenient. The smaller ends are rested upon a spar across the gunnel or the break of the poop, crossed, and lashed with strong well-stretched rope (about 44 or 5 inches) passed figure-of-eight fashion, commencing at the centre, returning with riding turns as a racking seizing, and crossed again ; the turns at the extreme ends should not be so taut as the others. Care must be taken to place the seizing equidistant from each heel after they have been trimmed to fit flat upon shoes of strong oak planking; they will remain within their full spread by about 2 feet each side till after the head seizing has been secured. Lash a threefold purchase-block to the horns above the lashings, to hang down clear under the cross, so as to correspond with a twofold block to be lashed to the mast. If such blocks cannot be procured two top-blocks may be substituted for the upper block and one on the mast, reserving the fourth top-block as a lead secured to one of the shear legs or near it.1 Two purchases may be used at the same time with advantage, one block hanging on the fore, the other on the after side.

The mizzen-mast should be brought alongside with its head aft, and a sufficiently strong selvagee strop lashed on the fore side if it

1 Top-blocks in large ships are 26 inches, carrying 93-inch rope, the break- ing strain of which is 25 tons; by taking the standing part down to the mast there are three parts lifting, equal to 75 tons,—a sufficient margin over 20 tons. Twenty-two-inch blocks and an 8-inch rope would break at 54 tons. Large ships have one 26-inch and one 24-inch double block for jeers, which would

reeve an 8-inch rope. The size of a block implies the length of the shell, ofa rope its circumference, and ofa chain cable the diameter of the iron.

~~is to be lifted by one purchase, and one on each side if two are used, and as high up as the shears will allow, the limit being from heel to lashing 6 or 8 feet less than from the lower side of the purchase-~~

~~are now usually bolted on in the mast-house. The gird-line from the shear-head must be bent to the head of the mast at a suitable As the mast is hove up by the~~

~~Bow- sprit.~~

~~block to the deck. Old spars 30 having been hung over the side for the mast to rub against and the purchase fall taken round~~

~~height to act as a topping-lift.~~

~~13 capstan a stout rope from out- board must be timber-hitched round the heel so as to ease it in as it clears the gunnel, and to haul~~

~~the capstan, the mast is hove~~

~~up till the head comes above the gunnel; then two single blocks with long-tailed strops are secured round it with the gird-lines of about 4 inches and twice the length of the mast ready rove. The trestle-trees 3S~~

~~it towards the partners (mast-hole); when it has been lowered to within 2 feet of the step, a slew rope is passed three times round the mast and a "cat's-paw" formed on each side, through the eyes of which a capstan bar is passed ready to heave either way as~~

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~~*Fic. 35.—The spars and rigging of a frigate.l1 1, the bowsprit; 2, bobstays, three pairs; 8, sprit-sail-gafls, projecting on each side of the bowsprit,—the ropes at the extremities are jib-guys and flying-jib-guys; 4, jibboom; 5, martingale-stay, and below it the flying-jib-martingale ; 6, back-ropes ; 7, flying-jibboom ; 8, fore-royal-stay, flying-jib-stay, and halyards; 9, fore-top-gallant-stay, jib-stay, and halyards; 10, two fore-top-mast-stays and fore-top-mast stay-sail halyards; 11, the fore-top-bowlines, stopped into the top and two fore-stays ; 12, two fore-tacks; 18, fore-truck; 14, fore-royal-mast, yard, and lift; 15, top-gallant-mast, yard, and lift; 16, fore-top-mast, top-sail-yard, lift, and reef-tackle ; 17, fore-top, fore-lift, and top-sail-sheet ; 18, fore-mast and fore-shrouds, nine pairs; 19, fore-sheets ;.20, fore-gaff'; 21, fore-top-mast back-stays and top-sail-tye ; 22, royal and top-gallant back-stays; 28, fore-royal-braces and main-royal-stay; 24, fore-top-gallant-braces and main-top-gallant-stay ; 25, standing parts or fore-top-sail-braces and main-top-mast-stays ; 26, hauling parts of fore-top-sail-braces and main-to -bowlines ; 27, four parts of fore-braces ; 28, main-stays; 29, main-tacks ; 80, main-truck ; 31, main-royal-braces ; 82, mizzen-royal-stay and mizzen-royal-braces ; 33, main-top-gallant-braces and mizzen-top-gallant-braces ; 34, standing parts of main-top-sail-braces and mizzen-top-mast-stay ; 35, mizzen-top-sail-braces; 86, hauling parts of main-top-sail-braces, mizzen-top-bowlines, and cross- jack-braces ; 87, main-braces and mizzen-stay ; 88, standing part of peak halyards ; 39, vangs, similar on each gaff; 40, ensign staff; 41, spanket-boom ; 42, quarter-boat's davits; 48, one of the davit topping-lifts and wind-sail; 44, main-yard-tackle; 45, a bull-rope.*~~

~~*required ; in the meantime both the heel of the mast and the step should be well coated with white lead or coal-tar. Lower and slew according to directions from below ; when the mast is stepped and brought to the desired position, place four temporary wedges, rig a triangle, trice it up by the gird-lines, un- lash the purchase or strops, overhaul down, unrig the triangle, and haul the gird-lines taut on each side.*~~

~~*The shears can be transported forward in nearly an prt posi- i tion by first pulling the heel-tackles and then ===* —————— *the guys, shifting the p56 guys forward one at a tingal time as necessary. The main-mast and the fore-mast are taken in in the same way as the mizzen-mast, described above,—*~~

~~*all three abaft the shears; but, being much longer, they require greater hoist and greater care generally.*~~

~~*To take in the bowsprit the shears are again moved forward, all the heel-tackles being led forward and extra lashings placed on the heels. A purchase nearly as strong as that to be used in lifting the bowsprit should be secured between the fore-mast-head and the shear-head, or two parts of a stout hawser may be used, the middle being clove-hitched over the horns and the ends taken round*~~

~~*—Schooner yacht. 1, bowsprit, with mar- tingale to the stem ; 2, fore-top-mast-stay, jib, and stay-fore-sail; 3, fore-gaff-top-sail; 4, fore- sail and main-stays; 5, main-gaff-top-sail; 6, main-sail; 7, end of boom.*~~

~~*outside the housing, which is generally about two-fifths of the*~~

~~*whole length. The main purchase should plumb nearly the length*~~

~~*of the housing outside the bows, and the higher the shear-head tr*~~

~~*the greater the freedom of motion. The outer purchase l attached to a strop through the hole in the cap and the guys from the cap to each cat-head alike tend to force in the bow- sprit when it is high enough ; besides this, a heel rope is put AK / f ahead of the ship nearly hori-] zontal, or at the angle (steeve) << b ae which it is intended to assume, / JSS and the ship is moved ahead ——- towards it, till the bowsprit en- == —<—<— ters in the desired position. Fia. 37.—Cutter yacht. 1, bowsprit and The directions for masting a martingale ; 2, jib,—-behind it is the large ship are more than suffi- fore-sail; 8, cross-trees and top-mast-*~~

~~*round it before it leaves the water, and a strop with a tackle*~~

~~*i . shroud; 4, pennant designating the elent for masting a Me mall one, elub to which she belongs; 5, gaff- which is so much easier.*~~

~~*into the hole and mortise. It is hoisted to about an angle of 45° before the heel is entered. A rough sketch made to scale will greatly facilitate such*~~

~~*opera- tions and ensure success. When a bowsprit is put in by shears on a hulk or jetty, it is hoisted up*~~

~~*to the bitts is used to bowse it top-sail; 6, peak of gaff, hoisted by*~~

~~*peak and throat halyards; 7, main- Rigging*~~

~~*beams well aft on either side, ready for veering as the shears are ; 7, mi sail; 8, end of boom and topping-lift. how-*~~

~~*drooped (to an angle of about 45°), then to act as the rincipal support; the fore-guys are also taken aft to assist. The fore-mast must be wedged on both decks and one or more tackles used to keep the head aft. The bowsprit cap is invariably bolted on in*~~

~~*Gammoning the bowsprit is the most important point in ; rigging a ship, as the stays of the fore-mast and main-top-mast Sprit. depend for security on the bowsprit. In large ships there are two distinct lashings (of either new stretched rope or chain) to keep the*~~

~~*the mast-house; the bowsprit is then brought under the bows with the cap end forward and slung for the main purchase a little*~~

~~*1 References are not repeated for each mast where the names and functions are identical.*~~

~~*bowsprit down ; they are passed in a similar manner over a long saddle-shaped piece of wood called a gammoning fish and through the holes in the head knees, the outer one first. One end is clinched or shackled round the bowsprit over the fore-part of the hole; the*~~

~~*Ss eatanNn® Hi P 595*~~

~~*other, being rove through the after-part of the hole, comes up on | necessary to rearrange the gird-lines, as it is obviously inconvenient Lower the aft side of the first turn on the bowsprit and down inside that | to hoist the eye of a shroud over the mast and allow it to fall down rigging.*~~

~~*part and before the turns in the hole, thus forming a double cross with the first turns outside. Every turn is set up as passed by means of a pendant through the hawse-pipe or bow-port, and a block is secured to the hole for the bobstays, which are attached to the gammoning by a selvagee or toggle, and held while the next turn is being passed by a racking seizing if rope and by nails driven through the links into the fish if chain. When the hole is full of turns—eight or ten—the whole is frapped together as tightly as possible, commencing at the lower part.*~~

~~*The clothing of a bowsprit of a large ship consists of nine strops for its own security and the fore-stays. A bobstay collar is hove on at one-third the distance between the night-heads and the outer extremity, and close outside it two bowsprit shroud collars and a fore-stay collar, then the second bobstay collar, two bowsprit shroud collars, another fore-stay collar, and the third bobstay collar ; in addition to these there is a cap bobstay, which sets up to a bolt close inside the bowsprit cap. The bobstay and bowsprit shroud collars are hove on at right angles to the spar and usually cleated in that position. But this cleating is a mistake; as the strain*~~

~~*comes upon each of them very obliquely, it is necessary that they*~~

~~*should yield in that direction before the cleats are nailed, or they will give way and slacken the rope when it is most required to be taut. Bobstays are cut to the required length, wormed and parcelled from the centre towards the ends, and served; they are rove through their respective holes in the cutwater before being spliced, which splice is tapered, parcelled, and served over, and rests on the head of the heart when it is seized in. The bobstays and bowsprit shrouds are set up by lanyards half the nominal size if rope and the same size if wire; the standing parts are secured by running eyes round the necks of the collars confining the hearts, and are set up by two luffs, one acting upon the other.*~~

~~*The cross-trees are swayed up one ata time by the two gird-lines, whose united action and a guy on deck conduct them to their places, where they drop into recesses and are bolted to the trestle-trees. When a whole top is to be got up it is placed abaft the mast (except the mizzen) with the lower side forward and the fore part upper- most ; the gird-lines are passed under it, that is, before it, each being rove up through the second hole from aft for*~~

~~*the futtock- ee and hitched tightly to its own part as it passes the lubber's iole, which part is also stopped to the hole at the fore part of the top. If it bea large top each gird-line may be taken down the fore (under) side (as before), rove up through the after-hole for the futtock-plate, down through the lubber's hole, taut up through the foremost hole, and hitched to the hoisting part, which is stopped firmly to the fore part, where a gird-line leading from the mast abaft is also stopped after the end has been made fast to the centre hole for the top-rail ; that gird-line is to keep the top clear of the trestle-trees as it goes up and to assist in placing it. There are several slightly different ways of slinging a whole top; but in all cases the gird-line blocks (after the stop is cut) hoist the fore part higher than themselves, till it falls over them and hangs as nearly horizontal as could be judged in slinging it. The final ad- justment of it in its place is done by hand, and then it is bolted to the cross-trees. The mizzen-top is put over either in a similar manner with a guy to the taffrail or sent up before the mast with the after part uppermost, a gird-line from the main-mast-head keeping it clear of the trestle-trees, which project much farther on the fore side. Tops are taken off by the reverse process ; but it is more difficult to get the hole back over the mast-head.*~~

~~*Tops are now very seldom made in one part, but in two halves, which is more convenient and equally serviceable. Each half is sent up in a similar manner to the whole top; the gird-lines are bent on precisely the same way, but one half at a time, which falls square at the side of the mast when the stop is cut instead of going over the top of the mast. After the top is bolted, it is advisable to hoist up the lower cap into the top while the whole space of the lubber's hole is still free, but not to put it on till after the lower rigging is fixed. The cap being placed near the mast with the bolts downwards and the hole for the top-mast forward, both gird- lines are brought down through the lubber's hole on the same side , that which crossed before the mast is bent on to the fore part of the cap, and that which belongs to the side on which the cap is lying is made to sling the after part fairly and is then stopped to the fore part, so that this last is hoisted up by both gird-lines end on till in the top, when, the stop at the fore end being cut, the cap hangs in front of the mast and the round hole can be placed exactly over the space between the trestle-trees where the top-mast will come up.*~~

~~*Preparatory to sending up the lower rigging on the masts it is*~~

~~*over both parts of a heavy rope which would require to be hauled up from the deck or rerove every time; therefore they are lashed to the leads in the trestle-trees for the truss falls, and a small gird- line is lashed high up abaft the mast to be worked in the top for both sets of rigging. The starboard tackle-pendant is put over first, then the port pair, next the starboard foremost pair of shrouds followed by the port pair, and so on alternately till all the shrouds are in place, ending with an odd one called a swifter on each side. Large ships have four pairs of shrouds and a swifter on each side. They are all sent up in a similar manner : the large gird-line from the trestle-tree is secured to the pendant at the extremity and to the shrouds more than the length of the mast-head below the seizing by means of a strop with a slip-rope, toggle, and down-haul ; the eye is opened to the shape of the mast-head and the after-port is stopped to the gird-line, which sways it up to the lubber's hole, when the men in the top bend the eye in the direction it is to go over the mast and make fast their small gird-line a fathom or two below the seizing, with a stop on the after part of the eye, which is cut when the pendant or shroud is fair for going over the mast-head. When the shroud is over, each eye is hardened down by a large mallet called a "commander." Ropes should be rove through the thimbles of the pendants and hauled taut when they are being driven down ; then the " up-and-down" tackles should be hooked to the short legs (which are forward), while the long legs are being lashed abaft the mast and the runner-blocks lashed to them for staying the mast by the runners. As each pair of shrouds are put over, they should be temporarily set up by the dead-eyes and lan-yards, or by a luff-tackle on each, to prevent their springing up before another pair presses upon them. It is of very great import- ance to keep each eye taut before others press on it both for pre- servation and appearance ; many an eye has been stripped of its service and parcelling through slipping out from under the weight. A piece of rounding made fast to a bolt in the hounds of the mast with an eye in the other end is very useful for keeping the back of the eye down while it is being made taut, by reeving the short eye end up through the eye of the shroud and hooking a burton from the deck to it, which is Meee upon at the same time that the shroud is set up on the other side of the ship ; when finished, that piece of rope will be jammed. The lower stays, after they have been completely fitted and the*~~

~~*hearts have been turned in, are stopped together one over the other at the fork of the collar, at the sides, and at the eyes. The gird-lines, having been put back to the mast-head, are sent down through the lubber's hole, one crossing the fore side of the mast, and are bent to both stays below the fork of collars and stopped to the eyes ; they are thus swayed up near their pag the respective eyes being lashed together by rose-lashings low down over the eyes of all the shrouds, The hearts are then carried forward, the fore to the hearts in collars round the bowsprit and the main to hearts provided for the purpose near the fore-partners, while the collars of the stays are suspended from the fore-part of the top, the collars being eased down as required to preserve a straight line between the lashing-eyes and the point where the stay is set up.*~~

~~*The following is the method employed to set up the rigging on Setting the masts. It is first drawn forward by the runners and tackles up stays.*~~

~~*(lashed to the long legs of mast-head' pendants, which are lashed together abaft the mast) till brought before the position it is intended to stand in, as the strain of the shrouds will draw it aft. Many seamen recommend, with reason, that a strain should be brought on the after-swifters while it is being stayed, to keep it more firm. The propriety of wedging the mast before the rigging is set up may be considered an open question ; it was considered lubberly forty years ago, but is now the common practice. The lanyards of the stays are in proportion smaller than those of the shrouds, since many more turns can be passed through hearts than through dead-eyes. The standing parts are made fast round the collar or strop of the lower heart by a running eye; the end is rove up through the heart in the stay and down through the lower one twice and the slack hauled through by the sail-tackle, which must be previously secured for that purpose round the lower mast-head and hung over the fore-part of the top; or the two top- burtons may be used, one for each stay. When the slack of the lanyard is through and racked, the double block of a lnff-tackle is attached by turning the bight back over a toggle or glut, as slings are represented in fig. 18. Then a selvagee strop is passed twice round both parts below the bight s (when the figure is turned up). brought up on the side of the arrow, and hooked to the luff, A cat's-paw, as shown in fig. 7, may be used with a glut placed at 9 to keep the parts open, otherwise a large rope would be injured. The single*~~

~~*block of the luff is secured to the stay as high up as it will reach by a long double-tailed selvagee, which is dogged softly at first, but terminates with close-taut turns and a spun- yarn seizing. Care must be taken to prevent kinking the rope, especially if it is wire; if hemp, it should be parcelled to pro- tect the outer yarns. The fall of the luff is connected with the*~~

~~*Lan- A lanyard for rigging with dead-eyes is half the nominal size of | lower cap, upon 'which the after-part will rest, securely lashed to yards. rope shrouds and the same size as wire rigging. The knot is inside | the bolts to prevent it slipping, while the fore-part will lean under the end of the shrond, or is first spliced to a bolt in the | against the top-mast at such a distance as to cnsnre it falling in chains and then rove through that hole; it is rove full before | the right position when the top-mast is lowered and to receive the commencing to set up. The mast having been stayed, luffs are | head of the mast between the trestle-trees as it is swayed up again placed on the shrouds with the double block down and brought to | toa convenient position for recciving the rigging. The rigging is the lanyard as above described ; the up-and-down tackle from the { swayed up by gird-lines on the cross-trees, and put over in a similar inast-head pendant is secured to the fall of the luff by a cat's-paw | manner to the lower rigging, the top-burton pendants first, then and strop and pulled up till taut enough, the foremost shroud on | the shrouds and backstays in succession, and the stays are lashed. the starboard side first, then that on the port side, and so on There is usually a chain necklace round each top-mast-head, sunk alternately till they are all nearly taut alike (the after-swifters not | in the bolsters ; one leg of each is for the top-sail-tye hanging-block quite so taut as the others), which is best ascertained by an | to shackle to, and forward there are two other legs for the jib-hal- experienced man shaking them ; if the dead-eyes are not square | yards and fore-top-mast stay-sail-halyards. After the rigging has (even) when finished, it is far better to turn them in afresh than } been placed over the top-mast-head, the cap is sent up by two gird- to have an uneqnal strain on the shronds. Ifa pair of shrouds | lines lashed as high as possible and bent to the foremost part of were set up at the same time it would be better for the eye and | the cap, with stops to the after-bolts, by which means it goes up the seizing. 'Tar should be used freely on the lanyards as they | before all, with the under-side towards the mast ; when it is high enter the dead-eyes, whether they are of iron or wood*~~

~~; it causes | enough the after-stops are cut and it slides up on the top of the~~ ~~them to slip quite as well as grease and preserves the rope, while | mast,~~ ~~assisted by men at the mast-head, who get it over the square grease causes~~ ~~it to decay. The lanyards are seized to the next | and beat it down. Directly~~ ~~the top-mast is in position to receive part till a clove hitch is taken above~~ ~~the dead-eye and the end | the rigging the top-rope pendants are rove and~~ ~~the tackles secured, seized down; the parts of the lanyard should then be~~ ~~made to | first one to relieve the hawser of the weight and then the other in~~ ~~bear an equal strain, and afterwards seized together lest any part | its~~ ~~place. Copper funnels are sometimes used to receive the top- should be~~ ~~injured. The runners should be kept taut till every- | mast rigging, similar to~~ ~~those for top-gallant-masts. thing is secured, then eased up gently, to avoid~~ ~~straining the Top-gallant and royal rigging is sometimes stripped of the~~ ~~service Top-gal- mast. Lower masts generally have an inclination to belly,—~~ ~~z.¢., | and covered with canvas, which is afterwards painted, for the sake~~ ~~lant and bend aft. Space will not admit of details being given as to the | of~~ ~~neatness; but the durability of the rope is thereby greatly royalrig- various~~ ~~parts of the rigging; the main principles follow the lines | lessened. Another~~ ~~bad practice is that of taking off one of the top- ging. of that which' has~~ ~~been already rather fully described above. | gallant-backstays, thereby~~ ~~directly diminishing the support. But The top-mast stays and rigging are set~~ ~~up by means of top-burtons | worse still is the trick of forming the eyes of~~ ~~rigging and backstays and jiggers, the top-gallant-rigging and that of all~~ ~~small vessels | by two seizings, the ends of each rope going to different sides~~ ~~of by jiggers and light appliances. the ship; this gives two eyes over the~~ ~~mast instead of four, and Lower The lower caps were supposed to have been~~ ~~swayed up by the | makes everything depend on the strength of the seizings.~~ ~~It is now cap and gird-lines and placed in position to receive the top-masts~~ ~~before the | a very common practice to cross the top-gallant rigging and set~~ ~~it top- lower rigging was put over. To fix one of them in its place, let a | up~~ ~~on opposite sides of the top, instead of reeving it through the mast. top-~~ ~~block be hoisted up lashed to the mast-head close below the | necklace on~~ ~~the top-mast and setting it up on the same side.~~

~~*sail-tackle (by one of the means described) and the sail-tackle fall led in the direction of the stay; it is pulled up steadily, the nips of the lanyards having been well tarred to make them slip through the hearts, while they are also shaken up by levers. When taut enough the lanyard is securely seized to the next part, another turn rove, set up, and seized, till the scores in the hearts are full ; then riding turns are taken. Whilst the first riding turn still bears the strain, all the seizings on the lanyards should be cut off, and others put on when each part has taken over an equal strain. After the riding turns are completed, the end of the lanyard is secured by a clove-hitch and a seizing. Where there is not a sail- tackle a long luff may be used in a similar manner, the double block being secured above the single block of the other luff. It is desirable that both stays on the masts should be set up at the same time, but it is not imperative; care should be taken that they are equally taut.*~~

~~*square on which the cap is to rest, on the side suitable to the sheave in the top-mast ; through the block reeve a suitable hawser (9 inches for a large ship) ; send the fore end down through the square hole between the trestle-trees ; lay it along the top-mast (the spare one if allowed two); reeve it through the live sheave in the heel; and hitch it round the head of the top-mast, and hawser, leaving considerable end; also place a good lashing round the mast-head and the hoist- ing-part of the hawser and seize the two parts of the hawser together about half-way up, strong enough to bear the weight of the mast. If the top-mast be much longer than the space between the deck and the trestle-tree, the lashing must be placed low enough from the head of the mast to allow it, while suspended, to project above the top outside, while the heel is guided down the main hatchway or fore-scuttle. The capstan is used to heave the mast up; when it is pointed between the trestle-trees, remove the lashing round the head, and if landed—z.¢., resting its weight on the deck— make the end of the hawser fast round the mast-head, the hitch being on the side opposite to the block, and cast off the racking lashing, leaving the mast ready to be hove up by the two parts of the hawser. If not landed, heave up 3 or 4 feet before securing the end of the hawser, so that, when that has been done and well seized, the capstan may be moved back till both parts bear an equal strain ; the racking can then be taken off without fear of a jerk. After the head of the top-mast has been hove 3 or 4 feet through the hole in the cap, it is securely lashed, commencing*~~

~~*with a clove- hitch round the mast, the ends being passed through the bolts under the cap on one side and repeated on the other, so that it will be sure to hang horizontally. Heave round the capstan till the cap is above the lower mast-head ; then steer it by means of a handspike or capstan bar in the fid-hole, while men in the top direct the head of the top-mast by handspikes, till the hole in the cap is exactly over the square of the mast, when by moving back the capstan and beating the cap down with a commander it will fit firmly in its place.*~~

~~*If the heel of the top-mast rests on the deck before the head*~~

~~*SEA WARHe a IP*~~

~~*is free from the trestle-trees, it is as well to lower it down to that position ; but, if it is too short to rest there, the up-and-down tackles must be used to suspend it by strops through the fid-hole, while the top-block is being unlashed and hooked to the after- bolt fixed for that purpose in the cap and the end of the hawser secured to the foremost bolt on the opposite side. In large ships a shore is placed under the fore-part of the cap to support the weight and resist a possible blow from the top-sail-yard. 'The top- mast may now (unless it is blowing hard) be swayed right up and fidded to prove that it will fit when required (an allowance being made for the wood swelling with wet), and sent on deck in ex- change for the other mast, which when swayed above the lower cap will have a gird-line lashed round the head and then be raised 15 or 20 feet more. One part of the gird-line should be sent down abaft all and bent on to the fore-part of the top-mast cross-trees ; by this, assisted by a guy, they can be swayed up till above the*~~

~~*This is done entirely for the sake of saving seconds in shifting the spars, either the top-gallant-mast or the top-mast. Shrouds so treated give no support to the mast whatever ; probably they act in the reverse way, as may be easily shown by drawing a straight line to represent the masts when standing upright and lines in rough proportion at right angles for the top and cross-trees. Draw the top-gallant rigging on one side from mast to cross-tree and thence to the opposite side of the top. The top-mast, having a little play in the cap and at the heel, is bound to go over some inches at the head, taking the cross-tree with it; it will then be seen that the weather side*~~

~~*of the cross-tree has approached the lee side of the top, slacking the weather and tightening the lee top- gallant rigging.*~~

~~*Getting a lower yard on board requires great care to avoid injury Lower Spars should be slung yards.*~~

~~*to the hammock netting and other things. over the side for it to rub against and slip-ropes through the ports to ease it over the gunnel. If it is to be hoisted in on the port- side, the starboard yard-arm is towed foremost. A hawser may be rove through the port top-block down through the lubber's hole and bent round the centre of the yard. The hatch of the lubber's hole must be open and a strong mat provided. Instead of the hawser the jeers may be partially rove, the standing part being secured to the yard, and also the sail-tackle from the top-mast- head to the lower yard-arm and the starboard up-and-down tackle to the starboard yard-arm, also a burton from the fore-mast to the main-yard, or from the bowsprit if it is a fore-yard. The capstan and jeers will heave up the bulk of the weight, while the other tackles cant it and ease it across the gunnel. A derrick is some- times used to keep it off the ship's side. When a ship is alongside a jetty, a guy froma strong-hold on shore removes all difficulty, and a list towards the side at which the yard is coming in is desir- able. Lower yards are usually rigged while resting across the gunnel ; they are swayed up by the jeers, and slung with strong chains—the part round the yard being connected with that round the lower mast-head by a tongue and slip, The yards must be*~~

~~*ɨ*~~

~~*- 'Single – anchor.*~~

~~*Trim and stowage.*~~

~~*SEAMANSHIP*~~

~~*prevented from canting forward with the weight and drag of the sail ; accordingly the slings, either chain or rope, should be put on with the bight coming up the fore side (see fig. 18, where the arrow indicates the fore side and the direction the sail pulls); they are generally put on the wrong way. Merchant ships are invariably fitted with iron trusses, which are fixtures on*~~

~~the mast, holding the yard at the requisite distance and acting as a universal joint. They are of great advantage where there is not a large crew.~~

~~While the rigging is progressing the disposition of all heavy weights is worthy of serious attention ; for not only ought the vessel to be brought to the draught and trim designed by the builder, or that which has by experience been-found the best, but there must not be too much strain at any one part, especially the extremities. In ships intended for sailing or steaming rapidly this is of vital importance; the bows and sterns of cutter or schooner yachts should be empty. Placing the weights in the wings of the hold will steady the rolling motion and make the intervals longer ; but this may be carried too far for stability,— especially if the vessel has a low free-board. Weights low down close to the keel will increase stability at the expense of a quick uneasy jerking motion. A yacht which carries much ballast low down will be very stiff under canvas and_may sail well in the~~

~~Solent, but would be unfit to go outside the Isle of Wight. When:~~

~~heavy weights are carried in merchant ships as part cargo, they should never be placed as a solid mass; railway bars, for instance, may be stowed gridiron fashion a foot apart, by which ineans they will occupy as much space and act upon the ship in the same way as an equal weight of provision casks.~~

~~Before bending sails all the ropes are rove ready for use. A yacht's sails if new should be scrubbed, to take the stiffness out of them. In all cases they should be set when bent and the yards braced each way (unless it is blowing too hard), or there is a risk of some- thing going wrong when they are required for use. In setting them care should be taken that no part is stretched or girt unduly.~~

~~The inner end of a chain cable is usually secured by a tongue- slip and by a short piece of cable which passes round the mast or is shackled to the keelson; it still retains the name of "clinch." The tongue should not have scope enough to reach the compressor, as it has been known to strip back the ring and slip the cable. It isa good thing to trice up the slip before the cable is stowed, so that it will be accessible at all times, either for slipping, shackling another cable, or bending a hawser. It may be thought that a~~

~~chain cable would run into the locker and stow itself, but that is a mistake ; if care is not taken to spread it evenly, it will form a pyramid with turns round the base, upon which the upper part will fall as soon as the ship leans over ; 1t will then be necessary to haul up several small bights before the cable will run clear.~~

~~A ship should never lie long at single anchor in a tide-way or during variable winds, for fear of fouling her anchor and thereby destroying its holding power. Frequently space is wanted, as ship and cable range over a large circle, with liability to foul other ships or their anchors. A long scope of cable will only keep a ship clear of her anchor during very light winds, unless assisted by close attention and correct judgment on the part of the seaman. The direction of the two streams of tide should be considered in con- nexion with the wind in order to keep the ship to leeward of her anchor each time she passes it. A strong wind blowing across the direction of the tide and acting on the hull of the ship will secure that effect ; but, when the directions of wind and tide are the same or nearly so, precaution is necessary at each turn of the tide; it is then that a buoy watching over the anchor is of great service. When the wind and tide are in the same direction the helm should be kept over to that side which will cause the ship's head to point in the direction on which she has previously passed the anchor, as the bight of the cable will be dragging that way. The force of the tide alone will cause her to shoot over considerably ; but when she is assisted by the fore-top-mast stay-sail (or stay-fore-sail in a small vessel) the sheer will be much greater. The sheet in either case is better to windward and the fore-top-sail braced sharp abox if the wind is light ; but, when the tide commences to change, the sail should be allowed to fill, or it should be taken in and the helm placed in midships. If sufficient effect has not been produced by helm and head-sails before the tide ends, the mizzen-top-sail should be set as soon as the ship falls head to wind, first braced abox to turn her stern in the desired direction and then flat aback so as to drag the cable straight. Cutters and schooners have not that ad- vantage ; they must depend on the helm and head-sails, At the end ofa weather tide the helm and stay-sail will guide the vessel past the anchor. Ifa ship should break her sheer (pass the wrong way), or during calms and variable winds should approach her anchor, the cable should be hove in, and if there is reason to sus- pect the clearness of the anchor it should be sighted, since it will be of~~

~~no use as an anchor if a turn of cable is round the fluke. When anchoring, the state of the tide must be considered in con- nexion with the depth of water ; a vessel was once left high-and- dry by the ebb-tide near Dungeness, and a large iron ship drove her own anchor through her bottom in the Solent, off Lymington.~~

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~~The avoidance of the anchors in shallow water is another reason for mooring.~~

~~When a ship is in an exposed position, where it may become necessary to Ict go two or three anchors through stress of weather, in any part of the northern hemisphere, the bower on the port side should be used first, next the foremost one on the starboard side, and asa third the after one on the starboard side, since the ordinary wind veers with the sun, and at the end of the gale the cables will be clear of each other. In the southern hemisphere the reverse order holds good.~~

~~When a ship is likely to remain many days at an anchorage Mooring. where there is a tide or variable winds it is better to moor at once on arrival, with a scope of cable each way six or eight times greater than the depth of water, and an open hawse towards the worst wind. The two cables combined should always be much in excess of the distauce between the anchors, otherwise they will possess but little strength to resist a rectangular strain, —an error frequently com- mitted. The amount of support which cables will render under such circumstances will be in proportion to the sine of the angle contained between the anchor and the ship's bow and a line from one anchor to the other. Suppose, for example, a ship moored with anchors east and west of each other, 100 fathoms apart and having 55 fathoms on each cable, in 10 fathoms of water. With chain cables the hawse pipes would not be more than 53 fathoms from each anchor, consequently with a south wind the support given to the ship by each cable will only be 33 per cent. of the strain on the cable,—that is, say, 66 tons combined when the cables are strained up to 100 tons each. The support increases rapidly as the cable is veered ; an addition of 5 fathoms each way will (under the above circumstances) give 101 tons, and a scope of 80 fathoms each way will give 153 tons. In practice the cables by dragging over the ground, especially soft~~

~~mud, assume a direction more ahead, particu- larly when each cable has a long scope. The anchors should be placed sufficiently far apart to prevent fouling with the slack chain, but not farther, unless the water is too shallow to allow the ship to pass over her anchor at low tide. Such an anchorage is not suitable for very long ships unless special moorings are provided, for which purpose Parks's mooring-blocks are very suitable and inexpensive ; they are commonly used in Portsmouth harbour. These blocks are recommended as moorings for the use of yachts and small craft, as being trustworthy and less likely to be stolen than anchors of any kind. Should a ship that is moored with a good scope on each cable have the inisfortune to part one of them, her position-will be preferable to what it would be if parted from a single anchor, as the bight of cable dragging over. the ground will retard her progress, giving more time for another anchor to be let go. In all cases of veering cable either it should be done so freely that the ship will fall off broadside to the wind, when it may be secured while drifting, or it should be done very slowly, a few fathoms, or even a few feet ata time, the ship not being allowed to get any stern way. Veering during a squall should be avoided if possible ; it should be done in time, before the violence of the squall is felt; but, if it is intended to pay out freely till broadside on, the head-yards should be braced abox to assist and another anchor should be ready. A cable should never be secured entirely by the bitts or windlass, but the compressor and deck stoppers should participate in the strain. When unmooring, the riding cable should be veered freely to allow the ship to get directly over the lee anchor ; if it is embedded, stopper the cable while vertical and heave on the other, which must break it out.~~

~~The laborious operation of clearing hawse was mitigated or Clearing avoided by the introduction of chain cables and the invention of hawse. the mooring swivel. As the cables unshackle at every 123 or 15 fathoms, the end to be dipped round the other cable need not be long. 'There are two general methods of holding the weight of the lee cable while the turns are taken out. The simplest is to have a light tongue slip to take the flat link, but only about one-tenth the strength of the cable ; in a large ship it should have a roller at the top, so that the end of a hawser may be rove and form a standing part. The slip being fixed on the lee cable close above the turns and the hawser taut, the nearest shackle inboard is taken out, and the short end thus formed is hauled out of the hawse-pipe by the fore-bowline, or else~~

~~*by a rope from the bees of the bowsprit, a hook-rope being also attached for hauling it inboard again. JN boat should be in attendance from which to detach the hook-rope from the end of the cable, pass it round the riding-cable, and make it fast again to the end of the cable (hanging by the bowline) for hauling it back through the hawse-pipe ; thus an elbow is formed taut round the riding-cable in the reverse direction to the elbows and turns below the slip. That operation must be repeated till the same number of turns is formed above as below the slip,—observing that a cross cannot be removed, but the lee cable can be brought under the other. When the cable is taut in and shackled, the slip is knocked off, which allows the turns to drop clear. The cables will then be as they were when moored, with the addition of one or two fathoms on the lee cable. If the short end of the cable is lowered into a boat and lifted by the bowline only for each turn,*~~

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~~*the operation can be performed much quicker. The second method is to lash the two cables together above the turns with a piece of old rope, which acts as the slip and is cut when done with. In rough weather when a boat cannot lie under the bows the lashing must be passed by a man on the cable (if it is not high enough, heave it up), after which both cables are hove into the same hawse-pipe, hse they are easily cleared inboard ; if there are many turns a small lashing will suffice in moderately deep water.*~~

~~*One of the objections made to slack mooring is that turns are formed below water where they are not visible. To meet this objection a piece of paper representing a ship stuck to the glass*~~

~~*SHAMANS HIP*~~

~~*under the tauter part ; this second boat, by continuing in a circle round the anchor and returning to the side of the stationary one, will cause a turn to be formed round the fluke, as represented in the figure. Both crews should again pull hard to tighten the turn round the fluke, after which, both parts being held in one boat and made equally taut, an anchor shackle (buoyed) is placed round them and shaken down by a veer-and-haul pull on both parts by the crew of one boat, while the other tows teal to keep a strain on*~~

~~*the hawser till it is nearly vertical, when the anchor is secured. The ship can then take in the two parts of the hawser and weigh it.*~~

~~*In getting a ship under way there are a few precautions which Getting should necessarily be observed. If the ship is moored, the first under-anchor to be weighed is that which it would be least convenient to way,*~~

~~*cover of a compass, with two differently coloured threads attached to paper anchors or inserted into cuts at the edge of the card,*~~

~~*Mooring- There are various ways of putting on a mooring-swivel, but | regarded by steamers. The hauling part of the cat-fall is always swivel. doiug it inboard appears to be the safest and easiest. First place | through the foremost sheave, to prevent the tackle from fouling it in the riding-cable by shackling the two short legs of the swivel ; | owing to the ship's motion through the water. The cable on the leave the two linked ends for the second cable, the end of which | second anchor should always be hove short before making sail. being hauled out of the hawse by the bowline is hauled into the | Should there be plenty of room and the wind moderate, there is no other pipe by a hook-rope and shackled to the outer long leg; the | caution necessary beyond placing leadsmen in the chains with newly stopper just inside the hawse (which had been holding the weight | marked lines, and putting the helm hard over each way to ensure its outboard of the lee cable) is then slipped and that hawse-pipe is | being clear. The after-yards should be braced up on one tack and left clear for hauling out the inner end of the lee cable, which is | the head-yards on the other, to pay her head off; in cutters and hauled in the other side and shackled to the inner (upper) long leg | schooners the stay-fore-sail is used for that purpose. If another of the swivel; it then becomes a bridle. There are thus three | vessel is at anchor too close astern to ensure gat ering way while parts of cable in that hawse-pipe ; the last, having no weight, should | ahead of her, it should not be attempted; but, by squaring the be stopped here and there to the others so as to be carried out as the | after-yards as soon as the anchor is tripped, the ship's head will swivel is veered towards the water's edge and the bridle hove up | pay off till it becomes safe to fill all the sails and pass under the square. Ships constructed as rams take in both bridles on the | stern of the other vessel. The anchor should have been catted and same side. A*~~

~~*mooring-swivel should always be taken off by first —<- Jished also during the interval ; much way should never heaving it inboard. If moored very slack, turns may form below | be on the ship till the anchor is secured, for fear of it slipping or of the swivel during a calm with still water, but they will disappear | a man falling overboard. Should rocks or shallow water be incon- with a cross strain; and if the ship is about to get under way the | veniently close astern different means must be adopted. If the swivel and turns may be hove in together. If it becomes desirable | wind blows directly on shore, offering no choice of direction, and to put on a mooring-swivel when turns are in the cables, let it be | a current runs parallel to the shore, the ship's head should be cast put on over them ; they will soon shake out. One of the bridles is | against the stream. The yards should be braced abox sharp up, sometimes taken off the swivel for the sake of clearing that side of | with as much sail set over them as the force of the wind will allow, the deck ; the error is obvious on considering that the strength of | every means being taken to heave the anchor up quickly ; and, in the remaining part is not equal to the strain which may come upon | @ well-manned ship, as soon as it is out of the ground, haul on the span, and the nip in the hawse-pipe is always the part most | board the main-tack and aft with the sheet, set jib and spanker. severely tried. The importance of frequently white-leading and | The helm being alee, keep it so as long as is required, and brace greasing all cable shackles and swivels is obvious, but, being | round the head-yards quickly; the ship will soon spring ahead. troublesome, it is much neglected. The bow of a cable shackle | Then, by keeping close to the wind, the rate of movement will be should always be forward ; if the reverse is the case, the shoulder | retarded till the anchor is secured ; then set the fore-sail. may strike the side of the hawse-pipe or get jammed under the The above is applicable in moderate weather when all or nearly Slipping compressor. The shape of a shackle bolt should be such as to pre- | all plain sail could be set. But, should there be a strong wind cable. vent it entering the wrong way ; they often go half way in and jam. | and a rough sea, it might not be possible to weigh the anchor or Anchors. _ It is desirable that every vessel should carry anchors as large as | to prevent it staving the bows if it were hove up; in that case it she can stow and work conveniently, and cables to correspond. A | must be sacrificed for the safety of the ship by passing the strongest wooden-stocked anchor is lighter when under water than an iron- | hawser from the after-port (padded with mats) to the cable,*~~

~~making stocked one of similar holding power, and the wooden stock is less | it fast by a rolling-hitch, and hauling it taut; an axe and block liable to foul when let go; but the durability of iron has nearly | should be in readiness, also guys, to prevent the spring of the rendered the wooden stock obsolete. The old-fashioned anchor | hawser breaking men's legs. The courses should be reefed and all with long shank, fluke, and stock had greater holding power and | ready for setting ; the top-sails (double or treble reefed) should be certainty of grip than the more compact dumpy anchor now in | set or sheeted home ready for setting; and all the yards should common use. Backing large anchors by smaller ones is now | be braced up on the tack it is intended to go off on. The first seldom practised, except when vessels are on shore and the anchor | opportunity should be taken when the ship is commencing a yaw is laid out on a sandy bottom; it is generally better that each | in the desired direction to slip the cable, set the fore-stay-sail and anchor should have its own cable and proportionate strain. Float- | fore-top-mast stay-sail; as soon as the top-sails fill, cut the spring, ing anchors were formerly used to keep ships' bows up ina gale ; | set the reefed courses, and the main- and mizzen-try-sails. To veer they were made of iron crossbars and three or four thicknesses of | the cable previous to aBpping would be more likely to break the strong canvas, or a spar with a heavily weighted sail, spanned | hawser. The expedient of losing an anchor should only be resorted with a stout hawser ; such a contrivance might frequently be im- | to when there is too much wind and sea to admit of weighing it provised and used to prevent a boat or small vessel from foundering. | and not too much to prevent the ship, of whatever description, from Lost Should an anchor be lost in sand or soft mud after having borne | gaining something to windward under a _ of sail. Otherwise anchors. a heavy strain, it may be buried entirely, when it can only be | her condition is made worse by the loss of the anchor ; it would be~~

~~in the directions the anchors actually bear from each other, will represent all the turns which the ship makes with the cables.~~

~~recovered by grappling the chain, if that is of sufficient length. This is best done by a small anchor with a bar of iron to assist the stock and dragged by a long scope of chain. If the anchor is on ordinary ground and only sunk as far as the shank or a little more, as shown in fig. 38, it is easily recovered~~

~~*whether there is any cable on itor not. The full length of a hawser strong enough to weigh the anchor should be used as a sweep, S with a boat at each end oe pulling very slowly or drop-*~~

~~*ping with the tide, in the*~~

~~*reverse direction to the*~~

~~*strain when it parted, so as to catch the fluke as a hook. Towing a hawser against the tide is generally waste of time, and a chain forms too narrow a bight, unless the anchor is buoyed. When the anchor is felt both boats should close together and their crews pull with all their strength for a minute or two. Then, while one boat remains stationary, keeping her part of the hawser steady, the other should cross her bows with a slack hawser, which thus passes*~~

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~~*7 ~*~~

~~*Fig. 38.*~~

~~*sail from. At the time of unmooring the direction of the tide is very important in the case of sailing ships, and should not be dis-*~~

~~*better to decide upon riding the gale out, letting go other anchors, veering all the cable available, striking the top-masts, and bracing the yards nearly fore-and-aft. The cutting away of the lower- masts, when necessary, must always be done with great care to avoid killing people or bilging the ship with the wreckage. The lanyards of the lower rigging on one side should be cut as the ship rolls in that direction, and a few notches made in the mast on both sides 3 or 4 feet above the deck, the men running aft out of the way when it is likely to fall, for which operations they would have from eight to fourteen seconds. As soon as the mast has fallen the lanyards of the stays should be cut and the most strenuous efforts made to cut and clear every rope which would still hold the mast to the ship.*~~

~~*When weighing in rough weather with sufficient room to drift, it is better to have the anchor fully secured before making any sail ; or, if it is intended to run before the wind, the ship can be kept on her course by the jib only till the anchor is stowed. Steaming up to an anchor against strong wind or tide is objectionable, as it requires great attention and judgment to avoid jerks;*~~

~~*the same applies to steaming in a gale to ease the strain on the cable ; acon-*~~

~~*t*~~

~~*| Wearing*~~

~~*ship.*~~

~~*'Running enc : on shore. rocks, and it is apprehended that she may go to pieces or founder*~~

~~*Sei aw ANSE IP*~~

~~*stant watch should be kept to prevent the cable ever becoming slack. Fore-and-aft rigged vessels have much less difficulty in getting under way when close to a lee shore, as their main-sails can be fully set without holding wind, and directly she pays off all the sails draw.*~~

~~*If the anchors drag and the ship strikes the bottom, especially on*~~

~~*in comparatively deep water, it would be right to select the best place on shore (if there be a choice), and endeavour to thrust her into it by slipping or breaking all the cables and making sail, if there is still the means of doing so, with the view of driving her up as high as possible and so saving life; let it also be at the top of high water, if that can be waited for. When there is a heavy strain ona chain cable it is easily broken by scratching a notch with a common saw on a link that rests firmly on the bitts and then striking it with a maul or sledge-hammer.*~~

~~*The usual way of testing whether the anchors are holding or not is by dropping the lead over the side and leaving the line slack ; but the ship is liable to swing over it, causing it to be disturbed. A grapnel over the bow or from the bowsprit is preferable. Also by sitting on a cable before the bitts a trentulous motion is felt if the anchor is dragging.*~~

~~*If instead of a dead lee shore we have the wind oblique with the line of coast, and the ship from some cause too close to admit of a stern-board*~~

~~*towards it, the head-yards should be braced abox to cast her head inshore, while the after-yards are kept square ; this will cause the ship to make a long stern-board from the shore, which will not terminate till the wind is well abaft the beam. The helm up to that time may be kept in midships, as there is no reason to diminish the curve. As the stern-way is lost the helm should be put hard up, the head-yards squared, and the mizzen- top-sail kept shivering till braced up on the desired tack. The main-top-sail should be kept full. If it is necessary to get the ship round as quickly and as shortly as possible, the fore-yard, instead of being squared when about to shake, may be braced entirely round quickly so as to continue paying her bow off till the wind comes aft, then squared to allow her to come to, The jib or the fore-top-mast stay-sail (according to the weather) may be hoisted when the anchor is tripped or not, until the wind is before the beam on the desired tack; if at the former time the sheets should be hauled to windward and kept so till the ship is before the wind, then eased off till the wind comes before the beam. The spanker or mizzen-try-sail should be set as soon as it will draw the right way.*~~

~~*What has been said about trimming the sails as the ship is turned round after casting with her head inshore is equally appli- cable to a case of ordinary wearing when it is desirable to turn the ship with as little loss of ground as possible. As a general guide to the position in which the yards should be placed, it may be remembered that the pressure on the sails always acts at right angles to the yards. This may be exemplified by bracing the yards sharp up when the wind is two or three points abaft the beam. As it will then blow directly into the sails they will certainly receive greater strain, but the speed of the ship will be less than when the yards were square ; and it may be observed that considerable leeway will be caused by the lateral pressure. In wearing ship all the fore-and-aft sails should be taken in except the head-sails, and when the helm is put up the main-sail should be taken in and the mizzen-top-sail shivered,—the latter continued till it is sharp up for the new tack. A fashion has been adopted of leaving the mizzen-top-sail square till after the head-yards have been squared ; hence everything depends for a time upon the action of the rudder, and the ship sails a considerable distance before the wind and loses so much ground. The operation of wearing a cutter requires much more eare than with a square-rigged vessel on account of the heavy boom. A schooner is treated*~~

similarly, but the spars and sails are lighter in proportion to the size of the vessel. Before putting the helm up, the tack of the main-sail is triced up (the top-sail clewed up), and the peak dropped till it is nearly in a line with the boom topping-lifts, which is called scandalizing the main-sail. Both peak and boom are secured firmly in midships by means of the down- haul and sheets. Not only is the diminution of after-sail necessary to allow the vessel to pay off quickly, but the change of wind from one quarter to the other will only cause a gybe which is per- fectly under control. The jib and stay-fore-sail are gybed by haul- ing the sheets flat just before the wind is aft so as to diminish the jerk as much as possible. The peak of the main-sail is easily re-hoisted while the tack is up and the vessel luffed up to the wind. The runners and weather-boom topping-lift should be pulled up while the ship is before the wind and the top-sail-sheet hauled out as soon as the peak is up, —the tack-tackle being shifted to wind- ward and pulled down. In wearing during fine weather, especially in yachts when racing, some risk may be preferable to the loss of time and the main-sail may be kept set. As the main-sheet is usually rove through a treble block on the boom, a double block to move along the horse, and a single block on each quarter, a strong crew can man each part at the same time and haul the boom in

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midships quickly, belaying the part which was at the lee side and is about to become the weather side directly the boom is over the leading block, while the other part is kept in hand till the gybe has been effected to lessen the jerk.

‘ The sails of all vessels are most effective when set as nearly flat Set of as practicable, and also each sail, as well as each part of a sail, sails.

should be spread at the same angle from the keel. If under that condition too much or too little weather-helm is required, the balance should be established by changing the quantity of canvas at either end or by altering the trim, not by permanently easing off a sheet, for that is as detrimental as dragging the rudder at a large angle. By altering the stand of the masts materially the angle and consequent set of all gaff-sails are thrown out.

o tack a fore-and-aft-rigged vessel is very simple; by easing off Tacking.

~~*the jib and fore-sheets at the time the helm is eased down and hauling over the main-sheet, the vessel will soon run up to the wind ; then if the fore-sheet is hauled flat over as for the former tack it will assist to pay her bow off the right way. The jib-sheet would be hauled aft while shaking, but not too soon to cause it to take the wrong way. The fore-sheet is shifted over as the other sails are about to fill, according to the speed with which the vessel is paying off. In a smart vessel, such as a cutter-yacht in smooth water and with a good breeze, there will be no occasion to retain the fore-sheet, but allow it to shake itself over similarly to the jib. Returning to the idea of tacking with difficulty,—the helm should be put hard over as the speed decreases and reversed directly stern- way commences; this remark applies to vessels of all shapes and sizes, as will also the advice not to put the helm over to a large angle while the vessel is going at great speed. At an angle of 10 degrees, more than 98 per cent. of the force on the rudder is applied to turning the vessel and 174 per cent. to retard her ; while at 80 degrees one-half the force would retard and 864 per cent. tend to turn, Hence we see the reasons for recommending close fitting, broad, tapering rudders.*~~

~~*While the vessel is in stays the weather-boom topping-lift should be pulled to take the weight of the boom, the runner-and-tackle on the weather side set up, and the lee one slacked as soon as slie is round; also shift the main taek-tackle over to windward and set it up; get a pull of the gaff-top-sail tack if necessary.*~~

~~*The jib of a cutter, yawl, or schooner with a running bowsprit is a difficult sail to handle when the vessel is under way.. If there is sea-room it is better to keep the yacht away before the wind and let go the outhaul, when the traveller will run in, or pull at the same time on the inhaul, which should be fitted with a span to keep it square. Haul the stay-fore-sail sheet over to make room to haul in the jib to leeward of it. Gather in the slack canvas smartly to keep it from getting overboard ; get hold of the luff of the sail by the stay-rope, while some hands pull on the downhaul. When the sail is perfectly under control let go the halyards and continue hauling on the stay-rope and downhaul. When there is not room to run before the wind, it is best to heave to with forc- sheet to windward while taking in or shifting a jib; by letting go the outhaul the traveller will run in and the sail can be handled as before, a good hold being always kept of the weather side, that is, the luff*~~

~~*of the sail. Ifanother jib is to be bent it should be laid along the weather side of the deck in readiness, with the tack forward and the head aft. The sheets are then untoggled from the former sail, handed across outside (to windward) of the fore-stay, and toggled to the second jib; also take the tack to the traveller, hook it, and run it out. Hook the halyards and hoist the jib up by them; then tauten the luff by the purchase while the sheet is flowing.*~~

~~*A jib-headed gaff-top-sail is ie ane for use on a wind and Gaff-top- ight winds a long yard spreads a sail.*~~

~~*commanding breeze, though for fine sheet of canvas. Such a yard should be slung at one-third from the fore-end (as a boat's dipping lug), the clew-line block secured at the length of the leech from the upper end, and the standing part of the clew-line made fast to the lower end, —this last to keep it clear of the cross-tree when being hauled down, which must always be done on the side it has been set, a tack being made if necessary to bring it to windward. On the approach of a squall the fore-sail should be hauled down by means of the downhaul and the vessel luffed up; it is dangerous to attempt bearing up at such a time until the main-sail has been scandalized ; the effect of the water on the rudder aids greatly in tripping a vessel over.*~~

~~*As bad weather comes on the main-sail must be reefed (a smaller Reefing jib having been already set) by topping up the boom, easing down sails,*~~

~~*the peak and throat, and hauling down the reef cringle to the boom by the reef-tackle ; lash the tack and tie the poiuts without rolling the slack canvas. The second and third reefs are taken in as the wind increases and the fore-sail reefed again or stowed, during which time the jib-sheet should be hauled flat, the main-tack triced up, and the vessel kept close to the wind to avoid plunging the sea over the bow. To reef the bowsprit,—house the top-mast, let the jib run in, slack the bobstays and bowsprit shrouds, take out the fid, and let the bowsprit run in one or two reefs; then refid it, set taut the gear, and set a small jib. It is at all times much more*~~

~~*Nacking.*~~

~~*Missed stays.*~~

~~difficult to steer a short vessel than a long one, but especially in a heavy sea, when the mode of treatment must be entirely different. A small vessel should be luffed up to meet every large wave in order to bow it as much as possible. She will have but little way on at the time of meeting it and will drop into it easily ; the bow will then fall off, the sails fill, and a run be made parallel to the waves till she is luffed up again. A four-oared gig has been taken through a heavy sea under oars by pulling up to meet every danger- ous crest which could not be dodged, and just before it broke over the bow backing away from it. The smallest amount of sail which can be shown by a main-sail is when it is balance-reefed ; this is accomplished by close-reefing it and lowering the jaws of the gaff close down to the boom, while the peak stretches up that part of the leech above the close-reef cringle. The plan is more frequently adopted by fishing smacks than by yachts or other well-found vessels ; they have a try-sail which, being laced on a smaller gaff, is hoisted by the same peak and throat halyards as the larger sail, and has its sheet secured to a bolt near the stern, while the boom is crutched and secured with the main-sail and the large gaff lashed toit. The try-sail admits of being reefed ; it is a safe sail either on or off the wind in rough weather. The greatest care is necessary when running before the wind to keep the vessel on her course and to avoid gybing. A vessel should never get under way without a small boat, and a cutter should never be without her legs for fear of taking the ground unexpectedly. In racing to windward, if the wind is variable, keep nearly dead to leeward of the mark vessel, as every change in the direction of the wind will then be an advantage; unless there is a tidal preference for one direction over the other, that will of course decide it.**

~~If taken aback by a change of wind, and wishing to remain on the same tack, put the helm up and haul over the fore-sheet. In a ship haul over the head-sheets and brace the head-yards abox. The way to tack a ship under favourable circumstances may here be assumed as well known, and only a few hints relative to doubt- ful cases given. A few minutes prior to the attempt set all suit- able sail, keep steadily ‘“‘rap-full” with a small helm,~~

~~so as to get as much way as possible. If the crew is large enough to list the ship, send them over to leeward, ease down fie helm slowly, haul the boom in midships, haul down the head-sails, ease off the fore- sheet, let go the head-bowlines, and check the head-braees. Directly the wind is out of the fore-top-sail, brace the head-yards sharp up again and haul the bowlines. When the wind is entirely out of the main-top-sail, let go the top-gallant bowlines (if those sails are set) and raise tacks and sheets, exeept the fore-tack, which should be raised after the main-yard has been swung. As soon as the vessel loses her way, shift the helm hard over, and send the men to their stations. If she brings the wind across her bow, hoist the head- sails with the sheets on the same side as before ; if the wind takes them well and the ship is still going round, give the order " main- sail haul," haul down the main-tack, aft the sheet, shift over the head-sails, haul the after-bowlines. As the main-top-sail fills, or before, according to the rapidity with whieh she pays off, swing the head-yards to the order of " haul off all."~~

~~If when near head to wind it is found that the bow is falling back and stern-way commencing, it is evident that she has "' missed stays." The helm in that case should not be shifted, as with stern-way it will help her to pay her bow off in the direction it was before. The head-sails should be hoisted, the main-sail and spanker taken in, the fore-sheet hauled aft, the after-yards squared. As the wind comes abaft the beam the mizzen-top-sail should be kept shivering and the main-top-sail just full; shift the helm as she gathers headway. When before the wind square the head- yards, shift over the head-sheets, and keep them flowing. Set the spanker when it will take the right way ; complete wearing as before described. This is similar to "box-hauling"; it is not necessary to braee the head-yards abox if she will fall off without. The manceuvre of putting the helm down and letting the ship shoot up in the wind before wearing is sometimes adopted for the sake of diminishing the run to leeward. HIauling all the yards at onee is very objectionable ; the sails are longer aback and have to be hauled round by main strength against the pressure of the wind.~~

~~" Club-hauling"' may oceasionally save a ship even in these days of steam, as a paddle-steamer will not turn with her head against a strong gale and a heavy sea, nor will a sailing-ship with an auxi- liary serew-propeller. It may be done when the ship is found edging down on a lee shore, too close to~~

~~*wear, and having a depth of water not exceeding 20 fathoms. It will take two or three minutes to open the hawse-pipe, get the cable clear, and procure hammer and punches for unshackling, and mauls for breaking the cable if necessary. Put the helm down and act as in ordinary tacking till she ceases to turn nearer to the wind ; then let go the anchor, whether she has entirely lost her way or not, as passing the anchor a little will give a greater swing back when the strain comes and allow more time for slipping the cable, which should be done directly the wind has crossed the bow ; at the same time swing the after- yards. If the cable has been slipped successfully, the head-yards may be hauled as soon as the after-yards have been braced up, as*~~

~~*SHAMANS ATP*~~

~~*she will soon be broadside on. It has been proposed to run a spring from the after-lee-port to the anchor, but that would take too much time.*~~

~~*"'Backing and filling" is practised in a tidal channel which is Backin too narrow to allow a ship to gather way for tacking. One top-sail, ang*~~

~~*with the jib and spanker occasionally, is generally sufficient to give § slight head or stern way, to avoid either bank or another vessel, while the tide carries her broadside against the wind ; the less sail exposed the less the lee-way. Fore-and-aft vessels having less power to get stern-way should have a boat in attendance with a line and a small anchor.*~~

~~*'*Kedging" was a frequent performance before steam-tugs were Ke*~~

~~*introdueed ; it consisted of a series of movements from one small anchor to another, previously laid out by boats. For a similar purpose harbours that were much frequented were formerly fur- nished with a suecession of warping buoys. The large ropes used for transporting ships are called hawsers, and by a strange anomaly were formerly cable-laid nine-stranded. Such rope is hard and stiff to handle ; it absorbs more wet and retains it longer, therefore is less durable ; when new the strength is far inferior to hawser-laid rope of similar size. Manila and coir hawsers float on the water and are therefore very useful.*~~

~~*lling,*~~

~~*dging,*~~

~~*Dropping through a narrow tidal channel by means of an anchor Dredg. just touching the bottom is called "dredging" or clubbing ; it ean ing,*~~

~~*be praetised in a passage which is too narrow for backing and fill- ing, such as the upper part of the Thames, where it is done every day. The vessel swings to her anchor and points her stern up (or down) the stream ; by heaving in the cable (for which the steam eapstans and windlasses afford great facility) the tide takes the ship on as fast as it is running so long as the course remains elear. When it is desirable to approach either side, a few fathoms of eable paid out will cause it to hold ; the helm and the aetion of the tide will then sheer the ship as desired, and by heaving in cable she will go on again, so that a sailing-ship should go up at half the rate of the tide at least. With a screw-steamer it is far easier, as the screw will straighten her as well as the tide, and when fairly pointed through an open space she can make a stern-board at five knots an hour while perfectly under eontrol.*~~

~~*A few words may be said about making and shortening sail in Making*~~

~~*bad weather.*~~

~~*One point holds good in all cases: the sails should and*~~

~~*never be allowed to flap, as that exposes them to the danger of shorten- splitting. The taek or luff is invariably seeured first, while the ing sail.*~~

~~*sheet bears a steady strain enough to keep the sail from shaking, Before hoisting fore-and-aft sails the sheets are steadied aft ; and, should a sheet carry away, the sail is hauled down or brailed up instantly. Spankers and try-sails should be taken in entirely by the lee-brails, the stack only of the weather-brails being at first taken down. A practice has become general in the British navy of securing the top-sail clew-line blocks to the lower cap instead of rouud the yard, for the sake of saving time when shifting top-sail- yards ; the use of the clew-lines for hauling the yard down and steady- ing it is thus lost ; this is one of many objectionable practices.*~~

~~*There has been a difference of opinion as to the mode of setting Top-sails and taking in top-sails and courses; but the same rule should apply and to all square sails alike: that which is safest for one will be safest courses.*~~

~~*for the others. Experience and the balance of opinion favour the hauling home of the weather top-gallant-sheet, top-sail-sheet, and taek of the fore-sail or main-sail first, with a good strain on the clew-lines, clew-garnets, and bunt-lines, to avoid flapping. The lee sheet may then be hauled and eased down by clew-line and bunt- line. Eaeh bowline should also be steadied taut in succession to prevent the leech from flapping. There appears to be no advan- tage in first hauling the lee-sheet partially down. The taking in of these sails has been equally a matter of dispute, and many ad- voeate taking in a top-sail in a different manner from that which they would adopt in taking in a course. Faleoner's rule was often quoted and followed in former times. It runs thus— ** And he who strives the tempest to disarm, Will never first embrail the lee yard-arm."*~~

~~*It must be remembered that the deeision there supported by the sea-poet was then a novelty, and opposed to the opinion of the practical seaman. A main-sail had been split by " letting fly" the sheet ; but that proves nothing, as all sails will split if the elew flies loose ina gale. The lee clew of an eighty-gun ship's main- top-sail was blown over the yard-arm in consequence of the weather- sheet having carried away ; that clew was hauled up first. It might not have happened had the bunt-lines been well manned and had there been a small strain on the lee bowline. Either plan will answer if the bunt-lines are well manned and the sheets eased steadily ; but that the weather clew should be set first and taken in last is preferable. ;*~~

~~*In taking in top-gallant-sails before the wind both sheets should be kept fast till the yard is down. When a top-sail is to be reefed the yard should be pointed to the wind; and for the first reef the top-gallant-sheets, bunt-line, and bowlines should be hauled taut, for the second reef the top-gallant-sail should be clewed up, to keep the sheets from knoeking the men at the yard-arms, In rough*~~

~~*Se ee! AN Ss i*~~

~~weather a preventer parrel and rolling-tackle should be put on before the men go on the yards. For a fourth reef the top-sail should be clewed up during the operation ; it will then be performed with less difficulty. The long reef-points in top-sails and courses have generally given place to the lighter and more expeditious method of having reef-lines on the sails, with beckets and toggles on the jackstay. The whole strain of the sail is thus thrown on the jackstay and small eyebolts, instead of the points being firmly tied round the yard itself. Also the slab of each reef is usually allowed to hang down and chafe at the fold ; but this can be pre- vented by fastening three or four small slab-lines on each side of each reef. Cunningham's invention for reefing top-sails is very valuable in all weakly manned ships, but it requires to be kept square upon the yard while rolling up. _ If it becomes necessary to~~

~~tween the waves reaching the vessel may be made to disagree with her own period of oscillation, or when running before the wind by braeing the yards up in opposite directions. Steamers at a reduced speed can scarcely be considered as hove to; their masts and sails are too weak to be of any use in a gale and too small in moderate winds ; they make the rudder do all the work. The best sail to scud under is elose-reefed main-top-sail, reefed fore-sail, and fore- top-mast stay-sail.~~

~~Three contingencies should always be anticipated by the captain and officer of the watch, and in some degree by every man in the crew, so that the alarm should lose half its dread and be met by prompt action,—a man falling overboard, fire, and collision, A boat's crew should be appointed in each watch, who on going on deck should see the boat ready and the plug in. If the ship be on~~

~~shift a top-sail during a gale, it should be made up on deck in the shape it would assume if furled on the yard, and stopped with spun-yarn, with the reef-earings and bowline bridles showing near~~

~~a wind and capable of tacking, on the cry "A man overboard !" the Man helm should be put down and the ship steered round on the other over- tack, with either the fore or main yards left square and the courses board.~~

~~*Joasting.*~~

~~*the ends and the clews and bunt-line toggles near the centre, where it would be slung bya slip strop. When the two earings are taken into the centre it will form four parts, and the weather top-mast studding-sail halyards being bent round it will cause it to look like alarge bale. In that state it is hoisted into the top by the sail tackle, at the same time being steadied by the studding-sail hal- yards ; there all the ropes are bent, clew-lines and bunt-lines hauled up, reef-tackles hauled out, and the sail bent to the yard before the stops are slipped or cut; then it is reefed as desired before the weather sheet is hauled home. A fore-sail or main-sail is bent in a similar manner, except that the various ropes employed on a course are bent on deck, by which ropes and the burtons it is swayed up. Studding-sails are very useful in long voyages ; their disuse on the main-mast is to be regretted, especially in long ships. A top-mast or top-gallant studding-sail is shifted "before all," by a man on the yard gathering in the sail as it is lowered to him and holding the outer leech till it cants the right way.*~~

~~*During a coasting voyage the vessel must be within a moderate distance of the shore, therefore the person in charge should con- stantly be ready to rnn for shelter when necessary, and have the moral courage to do itin time. In yachting voyages, however dis- tant, there is a natural desire to see the land and all that is worth seeing, and, being well provided with charts, such vessels can enter any harbour, when perhaps a pilot is not able to get out. A ship starting on a foreign voyage should seek " blue water" as soon as seating and keep a safe distance from all land which is liable to*~~

~~*ecome a lee shore, and not be tempted to edge in because a eertain tack is much nearer to the desired course than the other. For the choice of track and for trade winds, see NAVIGATION.*~~

~~*To heave to for the purpose of stopping is done in a cutter by easing off the jib-sheet, hauling over the weather fore-sheet, and tricing up the tack of the main-sail. A schooner is treated simi- larly : the top-sail (if she has one) is backed and the gaff-fore-sail is taken in. A ship has her courses hauled up, head-sheets eased off, and either the main or fore yard squared. Upon the latter point opinions differ. If two ships are close together, the one to wind-ward had better back the main-top-sail and the ship to leeward the fore-top-*~~

~~*sail ; they should always preserve a little headway. Boats invariably board ships on the lee side ; small vessels, when drifting fast, on the weather side. A ship at anchor in a tide-way will always present a lee side during some period; but a "weather tide" causes a dangerous sea for boats. A boat's oars should never be tossed up or forward when there is danger of their fouling, for fear of staving the boat or injuring some one in the after part.*~~

~~*When in the vicinity of a lee beach and landing by means of a boat is determined on, the oars should be manned to the utmost and the waves watched (as they always vary), and the boat forced in on the top of the third large wave, care being taken to keep her exactly end on to the sea. At the instant of touching the ground every man should jump out and begin to haul up the boat, if she is of reasonable weight ; the next wave will probably put them all out of danger. By holding on to the boat they give and receive mutual support, and avoid being sucked back by the receding water or crushed by the boat.*~~

~~*The term "hove to" as applied to a vessel in a gale of wind is derived from the desire to turn her bow up towards the wind and sea; this under all circumstances of sail should be the point aimed at, since then the seas strike the side obliquely and also the bow, which is the strongest part. The best sails to keep on a ship during a violent gale are the close-reefed main-top-sail, main- and mizzen- try-sails, and fore-stay-sail. The fore-try-sail also may do good, and is far preferable to a main-stay-sail. The pressure of the main- top-sail tends greatly to mitigate the violent motion ; also by heeling the ship she presents a higher side to keep the sea out and a sloping deck to aid the water in running off. The helm should be about one turn "a-lee," never hard down. When north of the equator ships should heave to on the starboard tack, and the reverse in southern latitudes. More sail should be made as soon as the gale moderates, to steady the ship. The violent rolling motion may sometimes be diminished by altering course, so that the period be-*~~

~~*up; she will then drift down towards the man, while the boat, which was at first on the weather side, is being lowered to pick him up. If the ship is running free the case is worse; she must be brought to the wind instantly with the head-yards square. Various plans have been devised for lowering*~~

~~*boats, many of them very good when executed by trustworthy men ; the same may be said of the old system with plain blocks and tackles ; practice and cool- ness will render either successful.*~~

~~*With regard to fire, prevention is better than cure ; lights in the Fire.*~~

~~*hold should never be without a protecting lantern, and passengers' sleeping-cabins should be lighted by lamps fixed in the bulkhead, inaccessible from the inside. Pumps and engines for extinguishing fire should be on the upper deck, for fear of being cut off by the first outbreak. Fire stations and exercise should be frequent even with the smallest crew. On the first alarm all ports and ventilators should be closed, wind-sails hauled up, hatchways closed as much as practicable, awnings and all lower sails taken in, and the ship kept before the wind, unless the fire is in the after-part, in which case the boats should be lowered at once. Many other things will present themselves to a cool head; perhaps the first order should e 'Silence !"*~~

~~*Collisions may be reckoned among those dangers against which Collision.*~~

~~*no man can guard himself, be he ever so wise and experienced ; it avails not that one ship should do what is right, unless they both do so. The laws upon the subject appear to be all that cau be desired (see " Rules of the Road," under NAVIGATION, vol. xvii. p. 277); but the mode of enforcing obedience is very lax and lenient. A purely nautical tribunal is greatly needed, and every unjustifiable deviation should be severely punished, whether followed by an acci- dent or not. It is admitted that in most cases of collision the evi- dence is so conflicting that a judge must be puzzled where to find the truth. The great increase of speed diminishes the time of approach ; the increased length of vessels demands a larger circle to turn in; the want of sail at the extremities diminishes the power of turning, throwing all the work on the rudder, which is proportionately munch smaller than it was. The perpendicular stem gives a deadly blow at the flat side, instead of first cutting down the upper works by the sloping cut-water, and probably coming to a state of rest before reaching the water's edge. Sufficient care is not taken to keep all lights from the upper deck and all places where they may disable the eyes of the officer in charge or the look-out men. Even holes have been made at the back of the bow-light box to*~~

~~*enable the officer of the watch to see them burning ; of course his eyes are thereby rendered unserviceable for seeing distant objects. Officers in the merchant service are invariably in two watches, which does not allow them sufficient time for slcep, especi- ally in windy weather. If immediate action is not taken the instant a sail or a light is reported, the officer in eharge should take bearings by the compass, by which he will soon know if the other vessel is inclined to pass ahead or astern. If it remains stationary by the compass, they must both be converging on the same spot.*~~

~~*If a ship should spring a leak at sea which may be attributable Leaks.*~~

~~*to straining and is sufficiently serious, she should be run before the wind and sea under small sail. If the pumps then clear out the water, she may run for a port or resume her voyage when the gale ceases. If the leak does not abate, though the motion of the ship is easy, it will be evident that a butt (end of a plank) has started if it is a wooden ship, or that a plate has given way if an iron ship. In that case, two stout hauling-lines should be placed under the bowsprit and head-gear, and the end of one secured to the head-earing, the other to the elew of a spare top-sail or course, also two similar ropes to the other side, each of the four ropes being marked at 10 and 15 fathoms from the sail. HIalf a hundredweight of iron (shot or furnace bars) should be attached to each clew, the ship's progress eompletely stopped, the sail thrown overboard and drawn square across the bows ; the hauling-lines on the clews being carried aft and kept square by the marks, while the ropes on the head of the sail are veered, the sail is placed like a large patch over the place desired. Should the position of the leak not be dis- covered, it might be well to place the sail under the main-mast ;*~~

~~*XXI. — 76*~~

~~*Ship on shore,*~~

~~*Rudders.*~~

~~*602*~~

~~*if this has no effect, place another sail under the fore-mast and the fore-foot. This simple device is no doubt very ancient and was prob- ably the*~~

~~*process called in the book of Acts "undergirding the ship." Sails have usually been thrummed ; but that requires much time, and the utility is questionable. If a large hole has been made by collision a spread sail would be burst by the pressure ; but, such a hole being usually at the side and partially visible, a large sail nearly in the form in which it was stowed, having the stops cut, should be thrown over before the hole end downwards, and, when sunk below the supposed depth of the fissure, brought towards it till the bight of the sail enters the vortex, when it will be sucked in violently and either disappear within the ship or block the hole; if the latter, smaller sails can be spread slack over the hole to be sucked in. 'The use of sails for the above purposes has been strangely neglected during late years, though much more frequently needed.*~~

~~*A leak can be stopped from inboard when accessible by placing over it pads of oiled or tarred canvas, tarred coal-sacks, bags of white lead, tallow, paint, clay, or any material which fits close wheu pressed by boards and shored down firmly,—that or something similar could be done when a ship is on shore. If a ship is on shore with a large hole in one part of her bottom, she might be recovered, especially if ebb-tide recedes many feet, by building a double partition with a space of about 2 feet between on eacli side of the injured part, filling the space with clay, and shoring it well, —in other words, by improvising two water-tight bulkheads ; the water having been pope out of the sound parts the rising tide would float her. When a ship is on shore with numerous cracks in her bottom, but not a clear hole, she may be floated by constant pumping, even though at first the expedient should fail to prevent the tide from ebbing and flowing in the hold. By maintaining as much as possible an inward flow the small fissures will gradually choke with weed and sand, till the inflow is so reduced as to be within the power of the pumps; hay, oakum, or dirt of any kind should be thrown over where it can be sucked into the leak. The ordinary pumps of a ship may be supplemented by nailing together four common deal boards and fitting two square valves weighted with lead, hinged and lined with leather, to rest on seats 2 feet from one end, which must be weighted on the outside as the bottom. A large hole near the top should be provided with a leather lip to shoot the water over the combings. When slung in the bights of two ropes four men jerk it up and down; the force with which it descends through the water will send a stream up the tube with less labour than baling entails.*~~

~~*Ships on shore should be secured from driving into a worse posi- tion before being freed from any weight. Hard substances such as guns and shot should not be thrown on the lee side or where the ship in hauling off might strike on them. Keep sufficient fresh water for immediate use. An anchor is usually carried out between two boats, the flukes being hung to a spar across the boats chocked up from the thwarts, while the stock is suspended across the sterns of the boats. The boats should be hauled out to a kedge anchor, while other boats support short bights of hemp cable. Good axes should be used for letting go the anchor,*~~

~~*A wooden rudder when immersed is very little heavier than water and can be shipped and unshipped by seamen with ordinary appliances ; but iron ships have siete rudders sometimes weighing as much as 20 tons. The following remarks apply to wooden rudders only. To unhang arudder remove the woodlock,—a chock recessed and nailed to the stern-post close above the upper pintle,— the use of which is to prevent it being unhung by accident. From a beam or chock above the rudder-head suspend two luff-tackles, single blocks, and two leads up, and the double blocks down to strops through the tiller hole. A few men on each Iluff-fall will easily lift the rudder the length of the pintles; and as they are drawn from the gudgeons it will swing free and may be lowered between two boats provided with spars across their gunnels; the bight of a rope will bring the heel up to a position similar to that of the head,—nearly horizontal. It can then be taken under the main-yard and hoisted in, or be carried for repair to a wharf or suit- able beach at high water. Before a rudder is taken off to be hung, two long guys are rove through holes for the purpose at the fore-part of the heel, one end of each being hitched to the band for the rudder- chains, while the other is in readiness to hand into the ship half- way forward and low down. On the rudder-head being suspended by the luff-tackles a little higher than its position when shipped, the guys will haul it to the exact line with the stern-post ; it is then Iowered into the gudgeons, the guys unrove by means of the short ends, and the woodlock replaced. Smooth water is desirable for that operation ; a little tide ina line with the keel will assist. The tiller Cie be firmly wedged or secured in the rudder-head so as to prevent any jerking motion ; for the same reason, the wheel ropes should be kept moderately taut ; they should also be rove in two parts, lashed together on top of the wheel, for convenience in shift- iug them one part at a time. band, which*~~

~~*embraces the rudder a little above the water, and are attached to a stout rope, usually stopped up round the counter ready*~~

~~*SHAMAD SHIP*~~

~~*The rudder-chains are shackled to a*~~

~~*to receive tackles, by which the ship may be steered imperfectly after the rudder-head is disabled.*~~

~~*_ The construction of a temporary rudder has always been con- sidered an interesting and highly useful piece of seamanship. One easy plan is to pass the end of a large hemp cable out of the rudder- hole or central port, haul it up to the ship's side, lash to it one or more large spars, sling the whole bundle about the centre of the spars with stout hawsers as guys, throw it overboard, and heave in a part of the cable, leaving the part with the spars lashed to the side of it far enough away not to be lifted out of the water with the pitch of the ship. The guys when rove through blocks on the spare top-sail yard-arms, which are lashed across the gunnel for the purpose, are taken to the capstan ; by this means the ship may be steered with the assistance of her sails. If there be not a hemp cable on board, the largest hawser must be used with a spare top- mast or the largest spar available.*~~

~~*Early in the 19th century Captain Edward Pakenham contrived an efficient rudder with the material in his ship. Part of a top-mast heel up formed the rudder-head and main-piece, the fid-hole becom- ing the tiller-hole. The main-piece passed through the round hole of the lower cap, which was made of elm and lined with leather, and which, being secured by a collar near the lower part, acted for pintles and gudgeons, and was drawn into place by two hawsers f, A, till it embraced the stern-post by the square intended for the mast-head (fig. 39). There should be ropes to the bolts 0, b to keep it horizontal. Another top-mast was cut, which with the re- mainder of the first made four parts in all, flat- tened and fitted together, woolded and bolted, and so forming the required width. Three pigs of ballast were let into the lower part and the 4 whole planked over and secured with spike nails. Fine weather was necessary for shipping it and a collar was built above the rudder-hole to confine the motion and to support the weight. The materials carried in modern ships may differ, but a fertile mind will*~~

~~generally find substitutes. The “ Pique” frigate, commanded by the Hon. H. J. Rous, steered across the Atlantic during sixteen days of almost continuous gales, a dis- tance of 1500 miles, by means of a cable over the stern and a Pakenham rudder during part of the time. She had been on shore in the Gulf of St Lawrence ; during the voyage she was making 20 inches of water an hour and she had also two masts aes 3 she reached St Helens in the Isle of Wight on the 13th of October 1835.~~

~~It is a difficult thing to get a lower yard from the deck into its Raising place without letting go either stays or rigging, and this the fol- main- The ‘*Thunderer,” an eighty-four yard,~~

~~owing instance will illustrate. gun ship, broke her main-yard, which was 112 feet long, completely in two, 5 feet to leeward of the slings. The broken parts were sent down, and a main-top-sail-yard crossed instead, while a reefed top- sail did duty as a course and a mizzen-top-sail over it as a main-top- sail. The parts of the main-yard were placed together on deck; the two halves of a spare anchor stock were het in on the fore and aft sides and an oak mast fish on top, with some studding-sail-booms to round it off. All parts were bolted, hooped, and woolded together, making it as strong as ever it was, entirely from the material carried in the ship. The sketch (fig. 40) represents the time of dip- ping the port yard-arm under the main-stay: ¥ represents the jeers, which bear the principal weight (total, 54 tons); f the two fore-tackles lashed to the mast-head pendants; ¢ a top-burton ; s asail-tackle to the top-mast-head ; m, m main-tackles from the mast-head pendants; J the main-lift; y a yard-~~

~~Fig. 40. tackle secured to an upper-deck beam. The main-yard was entirely~~

~~rigged before being crossed; the blocks are not shown. In a long ship the operation would be easier. When a fore-yard has to be got across from the deck, time and trouble can be saved by letting go, half at a time, all the fore-rigging and back-stays which are on that side.~~

~~When feeling the way into harbour during a thick fog, let a boat pretend to tow the ship with the deep-sea lead-line ; by this means a margin of 100 fathoms of safety will be secured. Care should be taken that every running rope in the ship be slacked previous to rain or heavy dew.~~

~~*For further information and variety of opinions see Captain Francis Liardet, R.N,, Points of Seamanship and Discipline; Robert Kipping, Masting, Mast- making, and Rigging*Ships; Vanderdecken, The Yacht Sailor; R, H. Dana, Seaman's Manual (0th ed., 1867); Captain Alston, Seamanship; Charles Bushell, Rigger's Guide ; Captain Sir George S. Nares, Seamanship (6th ed.).*~~

~~*SHiAWANS ATP*~~

~~*GLossary,.1*~~

A.B., ~~***able-bodied," signifies a trained seaman. Avast there," 'Avast heaving"), stop.***~~

~~***Back and fill, a mode of drifting safely with the tide, against the wind. Back a sail, to let the wind press it the reverse way. Backstay, a support at the side and abaft an upper mast. Bale-slings, a long strap of rope for hoisting packages. Ballast, anything carried for the sake of its weight. Banyan-day, formerly a fast-day on which oatmeal was issued in lieu of meat. Bare poles, at sea without any sail set. Barrica, a sinall cask for water in boats. Batten down, to cover the hatchways with canvas secured with battens, in order to ex- clude the sea. Beam, the extreme width. Beam-ends, a ship is on her beam- ends when inclining over atarightangle. Beara hand, make haste. Bear away and bear wp, steer farther from the wind. Bearing, direction 5 down to her bear- ings, a point in the inclination of a good ship at which she resists going further. Becket, a rope eye to receive a kuot or toggle. Bees, strong projections bolted on each side the bowsprit. Belay, to secure a rope by turns round a belaying pin or cleat. Bells, one sound is made for each half-hour from setting the watch (see "watch"). Belly, in a mast, a curve with the convex side aft. Belly-band, a broad strip of canvas across the middle of a sail, to strengthen it. Belly-stay, a rope from the centre of the mast led forward. Bend, sails are said to be bent to the yards; a kink formed in a hemp cable when stowing it; to make fast anything ; to bend on. Bentick shrouds, formerly used to assist the futtock shrouds and set upondeck. Berth, the situation ofa ship or other thing. Between wind and water, at the water's edge. Bight, a loop formed by a rope. Bilge, a gutter nearly the length of the bottom of the ship ; hence bilge-water. Binnacle, a box for the***~~

~~*compass. Bite, the anchor bites when it hooks the ground. Bitts, a rack with sheaves and pins ; cross timbers or iron to secure the cable. Block, a shell of wood or metal containing one or more sheaves. Dlue water, clear of the English Channel ; at a distance from shore. Bluff, broad, as applied to the bows. Boarding-netting, a rope net to exclude an eneiny. Bobstays, strong ropes or chains to keep the bowsprit down. Bold shore, that which has deep water close to it. Bolsters, soft wood and canvas under the eyes of the rigging. Bolt-rope, a superior description, made of fine yarn, used for roping sails. Bonnet, an addition to a try-sail (or other sail), attached by a row of beckets rove through each other. Boom-irons, supports for studding- sail-booms. Booms, spare spars (indefinitely). Both sheets aft, running before the wind. Bower anchors, the two principal anchors for use. Bowdline, a rope to bow the leech of the sail forward ; bowline-bridle, a span for the sane; to sail on a bowline, to sail close to the wind. Bowse, a violent pull. Bow, or braced abou, the head-yards crossed the reverse way of the after-yards ; box her off, to force her bow from the wind. Loa-hauling, letting the ship come to the wind, hauling round all the yards, making a stern-board, and wearing. Brace to or by, to bring the yards back a little, to make them shake or nearly so. Brace wp, to place the yards as far forward as they will go. Brail up, to take in a sail by means of brails. Break bulk, to commence discharging cargo. Break her sheer, to pass the wrong side of her anchor. Breast-fast, a security at right angles to the side. Bridle, two parts of cable from the hawse to a mooring. Bring by the lee, to fall off till the wind, after crossing the stern, packs the sails. Bring to, either to anchor or to stop by backing a sail; to connect the cable with the capstan, or a tackle to a rope. Broaching to, coming to the wind against the helin. Broadside, the whole side; the dis-charge of every gun on one side. Broadside on, the flat side against anything. Broken-backed, a state caused by weakness or strain, when the centre sinks un- duly (see "hogged"). Bucklers, shutters and bars to secure the hawse-holes at sea. Bulk, the cargo is stowed in bulk when without sacks or packages. Bull- rope, arope from the jibboom to keep a buoy or boat from the bows. Bull's- eye, a wooden fair lead or a round thick piece of glass. Bumpkin, a short spar projecting from each bow, to which the fore-tack is hauled down ; it is sup- ported by bumpkin shrouds. Bunt, the centre part of a square sail when furled. Bunt-lines, ropes froin the foot of a sail by which to haul it up. Buoy-rope, the rope*~~

~~*between the crown of the anchor and the buoy. Burton, a long purchase with a double and a single block. Bush ofa sheave, the brass lining upon which the pin rests. Butt, the end of a plank. Butt-slings, strong slings for casks. By, brace the yards by, nearly in the direction of the wind, but not so as to shake. By the bowrd, overboard entirely, as a mast going over the side. By the head or stern, drawing more water forward or aft.*~~

~~*Cable-laid, the designation of nine-stranded a Cahoose, a cook-house on deck. Cant, to turn over. Cap, a large piece of elm fitted on the top of a mast by a square hole, with a round hole for an upper mast to slide through ; with iron masts the cap is of iron. Capshore, a support to the fore-part of a lower cap. Capstan, a drum on a vertical spindle for heaving heavy weights. Careen, to heel over bottom out of water for repairs. Cast off, to let go. Cat-block and cat-fall, used in hoisting the anchor. Catharptn legs, short ropes connecting the lower parts of the futtock shrouds. Cat-head, timber-head projecting from the bow on which to hang the anchor. Cat's-paw, a slight puff of wind ; a means of hooking arope. Caval, a large cleat for securingropes. Chafing-mats, mats to protect the rigging. Chain-plate, an iron plate securing a dead-eye. Chain- pump, the largest hand-pump, which by an endless chain and valves produces acontinuous flow. Channels or chains, projections from the ship's side to spread the rigging. Chock-a-block or block and block, when the blocks of a tackle meet together. Choke-a-lugf, to pass turns of spun-yarn round both parts of the fall to prevent their moving when let go. Cleat, a piece of beech with two horns for belaying ropes; a piece of wood nailed to secure a thing from slipping. Clew-garnet, for hauling up the clew of a course. Clew-line, the rope which hauls up the clew. Clew of a sail, the corner to which the shcet is attached. Clews, an arrangement of sinall lines called knittles for hanging cots and ham- mocks. Clinch, the inner end of a cable; also a mode of fastening a hemp cable to an anchor, and for other purposes. Clubbing, dredging, or driving, each word implies dropping with the tide, while the ship is governed by the helin and an anchor scraping the bottom. Club-haul, to tack by means of letting go and losing an anchor. Coamings, the raised frame of a hatchway. Cockbill, when the anchor hangs loose from the cat-head. Collars, the upper parts of the stays and large straps round the bowsprit. Come wp, to render slack or let go. Coming wp, when the change of wind allows a nearer approach*~~

~~*to the course. Commander, a large mallet for hammering rope. Companion, a high covering over a hatchway. Compressor, a curved bar to squeeze the chain cable against a beamas a stopper. Conntng, directing the helmsman. Cownter, the angle of the stern on either side. Courses, fore-sail and main-sail of a square-rigged vessel. Crank, unstable, easily turned over. Cringle, an iron ring to confine a sail to a stay; an eye formed by a strand on the leech of a sail. Crossing the bows, passing close ahead. Cross-trees, spreaders under the tops and at the top-mast heads to support the top-gallant rigging. Crow's- foot, several spans of small rope brought to a common centre. Crow's-nest, & geat for a lookout man at the top-gallant mast-head. Crupper, a chain to*~~

~~*1 See also the explanation to fig. 35 at p. 594.*~~

~~*keep down the heel of the jibboom. Crutch, an iron rest for a boom; a metal swivel for an oar to work in. Cut and run, to cut the cable and go in haste.*~~

~~*Davit, a derrick of wood or iron to lift a weight. Deaden her way, to retard progress. Dead-eye, a clump of wood with three holes, without sheaves ; an iron frame for setting up rigging. Derrick, a single spar held by guys to lift a weight. Dog, to pass the tails of a stopper or other ropes zigzag. Dog's-ear, the leech of the sail between the reefs when allowed to stick up. Dog-vane, made of feathers for the use of the quartermaster. Dog-watch, 4 to 6 and 6 to 8 p.m.; figuratively, a short time. Dowse, to lower a sail; put out a light. Drag, applied to an anchor not holding. Draught, the depth of water required to float the ship. _ Draw, when a sail takes the wind properly. Dredging, see "clubbing." Drift, floating without guidance. Driving, dragging the anchor unavoidably in a gale; dropping intentionally with the tide and very little cable. Drop astern, to fall behind. Drop of a sail, the distance the foot is from the yard. Dunnage, firewood or valueless things placed under the cargo.*~~

~~*Earings, the upper corners of a square sail; the ropes by which they are secured tothe yard. Ease her, in steamers, go slow. Ease off, to slacken a rope. Ease the helm, move it back towards midships. Edge away, to steer*~~

~~*farther from the wind, or obliquely from a ship. HIdge in with, to steer obliquely towards something. Elbow, an angle formed by two cables orropes. Embrail, to brail up (obsolete). End for end, changing a half-worn rope, substituting a strong part fora weak. End on, in a direct line with the length of the ship. Estivador or stevedore, a man who stows holds but does not go to sea. Even keel, when a ship draws as much water forward as aft.*~~

~~*Fag-end, the end of a rope unlaid; refuse. Fatr-way, the free passage to a harbour. Fair wind, a wind which allows a ship to steer direct for her destination. Fake, one circle of a coil of rope. Fake down, to arrange a rope to and fro clear for running. Fall, ofa tackle, the part which is hauled upon. Falling off, when the change of wind obliges the ship to deviate farther from her course. False keel, an addition to the main keel, not vital to the strength of the ship. Fetch way, to move through being insecure. Jid, a piece of wood or iron to key up a mast or keep out a cutter's bowsprit ; a wooden cone used by riggers. Jill, to place the sails to the wind soas to propel the ship forward. Fish, a piece of wood or iron secured to a weak mast or yard to strengthen it. Fish-davit, a derrick for hoisting the flukes of an anchor; hence jish-block, jish- hook, fish-fall. Flat aft, when the sheet of a sail is as taut as it can be ; flatten in is the order to produce that effect. Flaw ofwind, wind sudden and un- stable in force and direction. Fleet, to rearrange a purchase for another pull. Flemish horse, a foot-rope at the yard-arm for men to stand on. Flotilla, a fleet of small vessels. Flowing sheet, the sheet eased off toa fairwind. Flush, level. Flush-decked, having neither poop nor forecastle. Foot-ropes, ropes on the yards, the jibboom, and the flying-jibboom for men to stand upon. Fore and aft, from one end to the other lengthways of the ship. Fore-and-a/t sails, those not set on yards, therefore capable of being placed in a line with the keel. Forecastle, the front part of the upper deck, but more correctly the deck built over that part; top-gallant forecastle, a short piece of deck open beneath. ore peak, under the front part of the deck; the forward extremity. Fore reach, to sail faster through the water than another when on a wind, though not gaining to windward. Forge ahead, the ship moving ahead slightly when hove to, or inacalm, or over a shoal, Foul, entangled (of a rope); contrary (of a wind); weedy (of the bottom). Foul hawse, when the cables are twisted. Frapping, an irregular*~~

~~*lashing to bind things together. Freeboard, that part which is above water. Freshen the nip, to veer a little cable, or any rope, in order to relieve the parts strained. Full and by, to steer close to the wind, keeping the sails full. Funnel, a copper sheath at the top-mast or top-gallant-mast head. Furl, to roll up square sails; other sails are stowed. Futtock-shrouds, short ropes below each top.*~~

~~*Gammoning, a strong lashing of rope or chain to secure the bowsprit down to the head knee. Gangboard, a plank with battens for people to walk upon. Gangway, the narrow deck between the quarter-deck and forecastle; the en- trance to aship; any passage kept clear. Gaskets, bands of platted rope-yarns to secure the sails when furled. Gird-lines, ropes which are on a mast when it is hoisted in and by which the shrouds are triced up. Girt, when the mooring cables are so stretched as to prevent the ship swinging freely. Glut, a piece of wood which keeps a knot or hitch from closing. Goose-neck, a crooked iron to support a studding-sail-boom. Goose-wings, the parts of a course which are exposed to the wind when confined by clew-garnets and bunt-lines only. Graft, to cover a rope with fine line in an ornamental manner. Griping, coming up to the wind against the helm. Grownd-tackle, anchors, cables, and all con- nected with them. Grow, a term applied to the direction of the cable when it is being hove in. Grwmmet, a rope ring made bya strand. Gudgeon, that part of the hanging of a rudder which is bolted to the stern-post. (wess- warp, a rope stretched taut to haul something to and fro upon. Gunnel or gunwale, the highest part of the bulwark. Guys, ropes to keep a spar or other thing in the desired position. Gybe, to let a fore-and-aft sail shift from one side to the other when nearly before the wind.*~~

~~*Halyards, ropes exclusively for hoisting sails. Hand over hand, to pull with one hand after the other; figuratively, done quickly. Handsomely, an in- junction signifying slow motion; with care. Handy billy, a small axe kept on deck. Hard down and hard-a-lee, position of the helm, the reverse of hard-a- weather and hard up. Haul on board, the usval order for hauling down the main-tack, Haul wp, altering the course more towards the wind. Havwse-holes, the openings in the bows through which the cables pass,—the iron lining is the hawse-pipe ; a large piece of wood which stops the hole at sea is the hawse- plug ; open hawse, when the*~~

~~*cables are clear of each other; a cross, when the ship has swung half round ; an elbow, when once round; a round turn, when twice round; in the hawwse, in the space close ahead. Hauser, a Jarge rope for moving a ship, now frequently of steel wire. Head-sails, the flying-jib, jib, and fore-top-mast stay-sail. Head sea, when the waves run contrary to the course though the wind may not be so. Headway, motion in the direction of the vessel's head. Heart, a block of hard wood, which takes a large rope round it and many turns of a lanyard through it. Heave down, to careen for repairs. Heave in stays, to come up in the wind for tacking. Heave short, to heave in the cable to a short scope. Heave the lead, to cast the lead to ascertain the depth. Heave the log, to throw the log over to test the speed. Heel, the lower part of a mast, spar, rudder, or stern-post. Heel chain, from the bowsprit cap to keep the jib-boom out. Helm's a-lee, a word of command implying that the helm is down. Hog, to scrub or scrape the bottom. Hogged, applied to a vessel when through weakness the bow and stern droop, so that the profile is that of a hog's back (see " broken-backed"). Home, when sheets are close down to the yard they are home; when an anchor is hove upon and draws through the ground it is said to come home. Hoops, broad wooden bands used with gaff-sails and wind-sails. Horse, a bar upou which the fore or main sheet blocks of small vessels run. Hownds, large cheeks on a mast to support the trestle -trees. Housing, of a mast, the part below the upper-deck. Hove to, an abbreviation of hove to the wind, to bow the sea; tostop. Hulk, an old vessel without inasts. Hull, the body of the vessel exclusive of masts and rigging. Hull-down, so far distant that the hull is below the horizon.*~~

~~*Inboard, any place within the ship. Jn irons, when the sails are so badly arranged that the vessel will not obey the helm. Jn the wind, too close, the sails flapping.*~~

~~*Jack-stay, a tight rope to which others are made fast. Jacob's ladder, a rope*~~

~~*ladder with wooden steps. Jaw-rope, to confine the jaws of a gaff to the mast. Jeers, a heavy purchase for swaying up the fore and main yards. Jewel-block, at the extremity of a yard for the studding-sail halyards.*~~

~~*Jew's harp, a shackle at the head of an anchor. Jigger, a small handy tackle with a double and a single block. Junk, old cable or large rope, used for making swabs, mats, spun- yarn, &c. Jury-mast, jury-yord, jury-rudder, temporary substitutes for mast, &c. Keckle, to pass old rope round a hemp cable to protect it from chafing. Kedging, to move by means of warps and kedge anchors. Keelson, a timber. inside on top of the keel. Keep away, steer farther from the wind. Keep her full, the helmsman to keep the sails full of wind. Keep your luff and keep to the wind, synonymous expressions. Kink, a knotty twist in rope; a bend in wire-rope which is difficult to straighten. Knees, angular supports of iron or wood. Knyittle-stugf, small line made by hardening two or three rope-yarns and twisting them together. Knot, a geographical mile (see art. Loa). Lacings, small lines securing sails and other things. Landfall, finding the land as expected. Landlocked, protected by land in every direction. Lanyard,*~~

~~*a rope for tightening larger ropes ; a line to fasten knives, marling-spikes, &c."*~~

~~*Larboard, the old name for the left side, now called port. Lash, to secure two or more things together by ropes. Lay to, to wait; to heave to. Lazy-guy, a rope or tackle on a spanker-boom or main-boom to keep it steady. Lead, the weight for ascertaining the depth of water. Lead, the lead of a rope is its proper direction through the blocks. Leech, either side of a square sail and the lee-side of all others (see " luff"). Leech-lines, on courses only, to haul the leech of the sail close up to the fore-side of the yard. Lee lurch, a deep roll to lee- ward. Lee shore, a shore upon which the wind blows directly and which is unsheltered. Lee side, the side farthest froin the wind, either inside or outside the ship. Under the lee, a ship is so spoken of in relatiou to the land by which it is protected ; similarly a boat may be said to be "under the lee" of a ship. Lee-way, the distance a ship drifts out of her course, indicated by the angle formed by the wake. Legs, spars carried by cutters to keep them upright when on the ground. Life-lines, small ropes to steady the men when standing on the yards, to hold by when being lowered in boats, and for similar purposes. Lift, a rope near the extremity of each yard to top it up, 1.e., lift it. Limbers, boards or plates to keep the bilge clear. List, to lean over continuously. Lizard, a lanyard with a thimble to confine another rope or*~~

~~*to slip at pleasure. Loose sails, letting them fall free to dry or for use. Lubber, a man not skilled in seamanship. Lubber's hole, an open space in the top near the eyes of the rigging, through which a man can crawl instead of going outside. Luff, an order to steer closer to the wind ; of a sail, the fore-part of a stay-sail, try-sail, or jib, and the weather-side for the time being of any square sail. Lwuf-tackle, is formed of 3-inch or 4-inch rope, a double and asingle block, and is used for various temporary purposes.*~~

~~*Make sail, to set sail. Make water, to leak. Manger, a tight enclosure to catch the water from the hawse-pipes. Man-rope, placed over the side at the gangway for people to climb up by, and at other places. Man yards, men to stand in a row on each, as a salute. Marl, to secure things together by a suc- cession of half-hitches. Marling, soft-laid white line for securing sails to the bolt-rope. JMarling-spike, an iron or copper spike used by sailmakers and riggers. Marry, to fit the strands together ready for splicing. Martingale, a tackle to keepdownaspar. Maul, a large double-headed hammer used by riggers. Messenger, an endless rope or chain froin the capstan to bring in the cable. Mid- ships, the centre, 01, when applied to the helm, the neutral point. Miss stays, to try to tack and fail. Mooring-swivel, a swivel with four short legs to ineet two cables from the anchors and two bridles froin the hawse. Mouse, a swelling or obstruction raised on a stay; also a Seizing across the point of a hook.*~~

~~*Neaped, of a ship, to be in a dock or on shore requiring more water to float than neap-tides afford. Near, a caution to the helmsman that the ship is too close to the wind. Necklace, a chain or band round a lower mast for the futtock rigging to be set up to, or round the top-mast for the top-gallant rigging to reeve through, Nip, the part of the rope which bears the chief strain; to freshen the nip is to veer out and change the place. Nipper, a selvagee, rope, or chain for binding the messenger to the cable. Norman, a block of wood placed in one of the holes of a capstan for veering a rope by. Nwn-buoy, a buoy of any material in the form of a double cone.*~~

~~*Offing, a distance from the land. Off the wind, not so close as she might be if sailing ona wind. Open, an anchorage is open when exposed to the*~~

~~*sea; the hawse when the cables are clear of each other; an object when visible, not obscured. Orlop-deck, the lowest in large ships. Out of trim, when the weights are wrongly placed. Overhaul, to slacken every part of a tackle ; to overtake; to examine.*~~

~~*Painter, the rope by which boats are made fast. Parbuckle, to hoist by rolling a thing with two ropes. Parcelling, covering a rope with strips of tarred canvas. Parrels, stout ropes covered with leather, used to confine an upper yard to the inast. Larting, breaking, as parting the cable. Pay a seam, filling it with pitch. Pay away and pay out, applied to slacking hawsers or cables. Pay down, lowering things, as the cable to be coiled or stowed. Pay off, from the wind, as by hoisting head-sail or putting the helm up; to pay and dismiss the crew. Peak, the outer part of a gaff and of a gaff-sail. Pendant, a large rope with a tackle attached. Pennant, a narrow signal flag; a long strip flown by ships of war. Pig, one part of iron ballast; the largest is 3 cwt. Pintle, a large pin bolted to the rudder, by which it is hinged. Pitching and sending signifies plunging the bow into one wave and the stern into another. Plain sail, all except studding-sails and stay-sails between the masts. Point, a plat- ting or line to tie up a reef; to secure the end of a rope with knittles. Pooped, a vessel is said to be pooped when a wave breaks over the stern. Port, the modern word for left. Press of sail, very much sail. Preventer-brace, an additional rope to support the yard during a gale. Prize, to move by a lever oraspar; a lawfulcapture. Purchase, a tackle or lever.*~~

~~*Quarter, the part of the side near the stern, hence quarter-boat; also the part of a yard between the centre and the yard-arm.*~~

~~*Rack, a frame with sheaves and belaying pins, Rake, to fire through a ship from end to end; the inclination of the masts aft. Range of cable, it was for- merly customary to haul up cable equal to the depth of water. Rap-full, the wind acting fully on every sail. Ratlins or ratlings, small lines as steps up the rigging. azee, a ship reduced in height by one or more decks. Reach, the open straight part of a river between two bends. Ready about, ready o' ready, words of warning preparatory to tacking. Reef-tackles and reef-pendants, for hauling up the leeches of top-sails and courses ready for reefing; the latter also on a boom for reefing a sail.*~~

~~*Reeving-line, a small rope rove through blocks to drag a larger one after it. Refit, general repair. Relieving tackles, placed on a tiller to assist the wheel-ropes during a gale. Rendering, slipping, not holding asa knot or fastening should. Ribs and trucks, flat boards and rollers alternating ; used for jaw-ropes and parrels. Riding between wind and tide, when balanced between the two. Riding cable, the cable bearing the strain. Rigging stoppers, for securing the standing rigging when broken. Right a vessel, to recover the upright position. Right the helm, to relinquish the position the helm is in at any moment and place it in midships. Ring-ropes, cable stoppers which pass through the ring-bolts. Robands, small tyers to fasten a top-sail or course to a jack-stay. Rogue's yarn, a thread of worsted spun in the rope to mark it; each British royal dockyard formerly used a differ- ent colour. Rolling tackle, stretched from the lee quarter of a yard to the mast, to relieve the parrel or truss from the jerking strain of the lee roll. Roping,*~~

~~*SHAMANSHAIiP*~~

~~*the bordering of every sail. Rownd down, to overhaul, to slack by hand, Rounding, old 3-inch or 4-inch rope for hack purposes. Rownd in the weather- braces, the wind becoming more favourable, to bring the yards nearer to square, Roundly, to lower or veer quickly. Round to, to come to the wind and heaye to. Round turn, a double twist in a cable ; to veer a rope round a bit-head or cleat. Round up, to shorten up a tackle; to pull upa slack rope through a block. Rouse it in, as hauling a hawser by hand without a purchase. Rowlock.*~~

~~*an opening in the gunwale of a boat foran oar. Rudder chains and pendants are shackled to a band on the rudder ready to steer the ship if the rudder-head gives way. udder coat, canvas or leather round the aperture and rudder-head to exclude the sea. Runner and tackle, a long pendant and tackle for staying lower masts; the chief support aft to a cutter's mast. Running rigging, that which is rove through blocks, or is otherwise hauled upon.*~~

~~*Saddle, a wooden rest for the heel of the jibboom and the end of the spanker boom. Sag to leeward, to make more leeway than headway. Sail close to the wind, to sail with the sails barely full. Sat? large or free, to*~~

~~*sail off the wind, as 'with a flowing sheet." Sail tackle, from the top-mast-head to sway up top-sails and top-sail-yards. Samson-post, a strong piece of elm to fit against a beam above it and in astep on the deck. Scandalize a boom main-sail, to trice up the tack and drop the peak. Scope of cable, the length veered out of the hawse. Scotchman, an iron plate to protect a part of the rigging from chafing. Scudding, running before a gale either with or without sail; the latter is described as "under bare poles." Scull, a small oar. Sculling, propelling a boat by moving the flat of the oar over the stern to and fro while changing the angle. Scupper, a passage for water to run off a deck, Scuttle, a hole in the side to admit light and air; a hole made in the side or deck to let water flowin. Sea, a wave; a long sea or a short sea has reference to the distance between the waves. Sea-boat, a vessel is said to be a good or bad sea-boat according as she behaves ina gale. Sea-room, free from land or shoals, Seizing, a small lashing. Selvagee, a strap made of yarns or small rope wound as askein and marled together. Sending, see "pitching." Sennit, a platting of threc or more rope-yarns. Serving, covering a rope closely with spun-yarn, hove on by a serving mallet. Set wp, applied to standing rigging to make it tight. Setting-fid, a large cone of wood used in fitting rigging. Sewed, to be lifted out of the water, as by running on a ledge, or being left by the tide. Shackle, a curved bar, with two eyes and a bolt, for joining chains. Shank- pointer, a stopper which holds up the fluke of an anchor at the bows. Shape @ course, to steer in the desired direction, the wind favouring. Shear-hulk, a vessel fitted permanently with shears. Shears, two large spars with their heads lashed and heels spread, for masting ships and lifting heavy weights. Sheave, a wheel of brass or lignum vite for ropes to travel on; all the fakes of a coil of rope to complete a layer. Sheer, to swerve from the course, the curve formed by the bow and stern being higher than the centre. Sheer-batton, a bar of iron to keep the dead-eyes square. Sheer off, to edge away. Sheet, the rope which holds the lee lower corner of a sail. Sheet-anchor, one of the largest, and the third for use. Sheet home, to haul the sheets of square sails to their positions. Shift the helm, put it over the otherway. Shipped, taken on board; anything fixed in its place for use. Shipshape, in a proper and seamanlike inauner. Shiver a sail, to make it shake and render it neutral. Shoot, to go ahead after the propulsion has ceased. Shorten sail, to take in some portion. Skid, a spar for something to rest or slide upon, Skin of a sail, the part ex-*~~

~~*posed when it is furled. Skipper, the old name for the master of a small vessel. Slab of a sail, the slack part which hangs down after the leech-lines are hauled up. Sleepers, timbers in the hold and strengthening pieces in the tops. Slew, to turn or cant over. Slips, ropes with toggles, shackles, and tongues, and various contrivances for letting go quickly. Small helm, when the sails are well balanced and the rudder but little used. Small sail, and snug sail, low and reduced, ready for bad weather. Sownd, to ascertain the depth of the sea, or of water in the pump-well. Span, two parts of a rope spread to divide the strain, or for making a point secure in an intermediate place. Spanish windlass, a bar of iron and two marling-spikes to heave seizings taut; tightening ropes by twisting them together by a lever. Spell, a turn or relief. Spider, a small iron outrigger, to keep the niain-brace block clear of the counter. Spilling-lines, ropes passed round a part of a sail which is flapping, to confine it. Spitfire-jib, a small storm-sail used in cutters. Splice, to join two ropes by entwining the strands. Splice the main-brace, to give a glass of grog to every man after some unusual fatigue, or on some occasion of rejoicing. Splicing-tails, a short piece of chain with three tapering tails, for splicing to a hemp cable. Spring, a hawser from the after-part to cant the ship. Spring a leak, to cause a leak by straining. Sprit-sail, formerly set on the sprit-sail-yard ; an efficient four-sided sail for boats and barges, the peak of which is held up by a spar called a sprit. Sprung, cracked, fractured. Spun-yarn, rope-yarns laid up together softly. Square-rigged, having yards and square sails, as ships and brigs have. Square sails, those set upon such yards as have lifts and braces, regardless of their proportions. Square yards, to adjust them by means of their lifts and braces. Stand by a rope, to be in readiness to let it go. Standing off and on, sailing to and fro, as off a port. Standing part, the fixed end ofarunning rope. Standing rigging, such as shrouds and stays. Stand on, to continue the same progress and course. Starboard, the right-hand side. Starboard and port tack express the direction of the wind, on the right hand and on the left respectively. Stay-satls, any sail set ona stay, except the jib, flying-jib, and fore-sails of cutters and schooners. Steady, to the helm; to keep the saine course. Steadying-lines, passed from eye-bolts in the gunnel of a boat to the slings to keep it upright. Steeve, the angle which the bowsprit forms with the horizon. Stem on, striking head foremost at right angles, the reverse of stern on. Stern-board, having considerable stern-way. Stevedore, see*~~

~~*"estivador." Stiffness, stability under canvas. Stirrup, a short rope from a yard to support a foot-rope. Stop, a light temporary seizing. Storm-sails, stay-sails and try-sails of the strongest canvas. Stranded, when one strand is broken; wrecked on a beach. Stream-anchor, about one-third to one-fourth the weight of a bower anchor. Stream the buoy, to throw over the buoy which is to watch over the anchor. Strike, to send down from aloft. Strike colours, a token of submission. Strike soundings, to succeed in reaching the bottom with the lead. Studding-sails, light four-sided sails set only with a fair wind. Surge, to slack back quickly, as a hawser round a capstan, to make it slip up to its place. Swab, a large bundle of rope-yarns for soaking up water; a drunkard. Sway away, to hoist by running with arope. Sweep, a large oar; to search the bottom with a hawser or chain. Swifter, a single shroud, when there is an odd one; to draw rigging together ; a rope or bar to keep things equidistant, or in their proper places. Swinging, the act of turning to the change of wind and tide. Swinging boom, a large spar for spreading the foot of the lower studding-sail ; in harbour for making boats fast.*~~

~~*Tabernacle, a frame for receiving the heel of a boat's mast to make it higher. Tack, the lower weather corner of every sail ; to change course by bringing the wind ahead and round to the other side. Taken aback, applied to a vessel when the wind coming ahead reverses the action of all the sails. Taking in sail, clewing it up and perhaps furling it. Taunt, high masts, comparatively. Taut (also taught), the only word among seamen to signify tight. Tending to the tide, beginning to swing to the change of tide in opposition to the wind. Thimble, an iron ring with a score to receive a rope; union thimble, two thimbles welded within each other. Thole pin, a peg of wood on the gunwale of a boat to confine the oar. Thorough-foot, the fall of a tackle being foul,*~~

~~*requiring to be unrove or the block turned over between the parts. Three sheets in the wind, a ship too close to the wind ; a man half drunk. Throat, the upper corner of a vaff-sail nearest the mast. Throat halyards, for hoisting the end of the gaff nearest the mast. Thwart, across ; the name of all seats which cross a boat. Thwart ships, across the ship. Tide-*~~

~~*way, an anchorage or position affected by tide. Tiller, a lever which moves the rudder. Toggles, pieces of wood varying in shape, generally secured to one piece of rope so as to hold the eye of another, as a button. Top, a large platform resting on the cross-trees of each lower mast; to top a yard is to raise it by the lift. Top-rope, a large rope rove through the heel of the top-mast. Tow, one vessel pulling another in any relative position. Transport a ship, to move her in a harbour by ropes. Traveller, an iron ring covered with leather, for jibs, royals, and boat sails. Travelling backstwy, a support to the top-mast always close above the yard. Traverse, to make several tacks ; the free motion of a sheave or rope. — T'restle- trees, pieces of wood which rest on the hounds of the mast and support the cross-trees. Tricing-line, a small rope used for hoisting up a tackle or larger rope. Trim of the ship, neither too deep nor too light, and having the right draught of water forward and aft. Trim sails, to brace the yards and adjust the sheets. Trip, the anchor is tripped when the shank is raised and the flukes broken out of the ground. Trough of the sea, the hollow between long waves, which are generally nearly parallel. Truck, a disk of wood at the summit of the mast, generally having sheaves for signal halyards; a long wooden fair Jead seized to the shroud. Trusses, fitted variously to confine the centre of the lower yards to the mast. Try-scil, a foul-weather gafi-sail. Try-sail-mast, a smooth spar abaft each mast to support the jaws of the gaff and luff of the gail. Turning in a dead-eye, fitting the shroud or stay round it. Twrning to windward, tacking frequently. "wice laid, rope that has been unlaid and re- twisted to the desired size. Twiddling-lines, for securing the wheel when not in use. Two blocks, signifying that the two ends of a purchase have come together. Tye, a large rope on which the halyards act when hoisting a yard. Under foot, said of an anchor when dropped without veering more cable. Under swil, free from moorings and propelled by sail only. Under steam, pro-pelled by steam only. Under way, having motion; the anchor off the ground.*~~

~~*SEAMEN, Laws RELATING TO. legislation has interfered to protect the seaman from the consequences of that imprudence which is generally sup- posed to be one of his distinguishing characteristics, In the United Kingdom there has been a very large amount of legislation dealing with the interests of seamen with unusual fulness of detail, proving the care*~~

~~*bestowed by a maritime power upon those to whom its commercial suc-cess is so largely due. How far this legislation has had the efficiency which was expected may be doubtful. The loss of life among sailors was one in eighty in 1871, one in seventy-five in 1882. There has been besides a steady diminution in the number of British seamen employed on British ships, nearly one-eighth being foreigners at the present time.*~~

~~*For legislative purposes seamen may be divided into three classes, seamen in the royal navy, merchant seamen,*~~

~~*and fishermen.*~~

~~*Seamen in the Royal Navy.—It is still lawful to impress men for the naval service, subject to certain exemptions (13 Geo, II. c. 17). Among the persons exempt are seamen in the merchant service. In cases of emergency officers and men of the coastguard and revenue cruisers, seamen riggers, and pensioners may be re- quired to serve in the navy (16 and 17 Vict. c. 73). There appears to be no other instance (now that balloting for the militia is sus- pended) where a subject may be forced into the service of the crown against his will, The navy is, however, at the present day wholly recruited by voluntary enlistment. The navy estimates of 1885 provided for 59,000 men (see Navy). Special advantages are afforded by the Merchant Shipping Act, 1854, to merchant seamen enlisting in the navy. They are enabled to leave their ship without punishment or forfeiture in order to join the naval service. The discipline of the navy is, unlike that of the army, for which an annual Army Act is necessary, regulated by a permanent Act of Parliament, that now in force being the Naval Discipline Act, 1866. In addition to numerous hospitals and infirmaries in the United Kingdom and abroad, the great charity of Greenwich Hospital is a mode of provision for old and disabled seamen in the navy (see GREENWICH). At present such seamen are out-pensioners only ; the hospital has been for some years used as the Royal Naval College for officer students. The enactments of the Merchant Shipping Act, 1854, as to savings banks were extended to seamen in the navy by 18 and 19 Vict. c. 91, s. 17. Enlistment without the licence of the crown in the naval service of a foreign state at war with another foreign state that is at peace with the United Kingdom is an offence punishable under the*~~

~~*Foreign Enlistment Act, 1870. Any person buying from a seaman or enticing a sea- man to sell Government property is liable to penalties under the Seamen's Clothing Act, 1869.*~~

~~*Merchant Seamen.—Most of the Acts dealing with this subject, commencing with 8 Eliz. c. 18, were repealed by 17 and 18 Vict. c. 120, after having been consolidated and extended by the Mer- chant Shipping Act, 1854 (17 and 18 Vict. c. 104). The main part of the legislation affecting seamen in the merchant service occurs in the third part of this Act. Since 1854 numerous amending*~~

~~*In most legal systems*~~

~~*605*~~

~~*Vangs, ropes to steady a gaff. Veer, to slack out cable, hawser, or tow-rope ; the old expression for " wear." Veer and haul, slacking and hauling alternately, by a number of men simultaneously, so as to gain by the jerk.*~~

~~*Waist, the centre part of the ship before the gangway port. Wake, the track left in the water. Warp, a small hawser for moving the ship; yarns or rope stretched over pins for making straps. Warping-buoys, buoys moored in suit- able positions for ships to warp by, now rendered nearly obsolete by the use of steam-tugs. Watch, sailors' watches commence or terminate at 4, 8, and 12 o'clock, also at 6 P.M. ; a buoy over an anchor is said to watch while it floats and can be seen. Water-borne, to be entirely afloat. Water-logged, full of water, unmanageable. Way, motion, as under way, headway, sternway. Wear ship, to bring the wind on the other side by first running before it. Weather-bound, detained by contrary winds or bad weather. Weather- gage, being to windward of the enemy. Weatherly, sailing well, without much lee- way. Weather-side, that on which the wind blows. Weather-tide, the stream running contrary to the direction of the wind. Wedging a mast, securing it in the partners or frame on each deck by wedges made to fit. Weigh, to heave up the anchor, Whip, a single rope passing through a block. Whipping, a light seizing of twine at the end of a rope to prevent fraying. Whiskers, pro- jections from the cat-head to spread the jib-guys. Vind a ship or boat, to turn her head where her stern was. To take the wind out of another's sails, to pass close to windward, as*~~

yachts sometimes do. Windlass, a machine for heaving in cable. Wind-rode, being head to wind though in a tide-way. Wind-sail, a canvas ventilator, Wood-lock, a chock to keep the rudder in its place. Woolding, a stout lashing to secure sprung or fished spars. Work a ship, to perform every maneuvre. Worm, to heave small line between the strands of a rope to make it smooth.

Yard, a spar which spreads a sail. Yord-rope, a rope by which a top-gallant or royal yard is sent up from the deck, and afterwards becomes the tye and halyards. Yard-tackles, permanently on the lower yard-arms of large ships for hoisting in things and as preventer braces. Yaw, an involuntary deviation from the course. Yoke, a bent lever across the ship or boat which acts as a tiller.1 (H. A. M.)

Acts have been passed, amounting to no less than eleven in number. They are cited collectively as 'The Merchant Shipping Acts, 1854 to 1883," The enactment of a new consolidation Act is urgently required, and can be only a question of time. The Merchant Shipping Act, 1854, defines a seaman to be "' every person (except masters, pilots, and apprentices duly indentured and registered) employed or engaged in any capacity on board any ship" (s. 2). It should be noticed that most of the enactments relating to merchant seamen do not affect seamen employed on foreign vessels, on fishing boats on the coasts of the United Kingdom, on vessels belonging to the Trinity House, the Commissioners of Northern Lighthouses, and the port of Dublin corporation, and on pleasure yachts. The princi- pal provisions of the Merchant Shipping Acts dealing with seamen are as follows. Where no other reference is given, the Act of 1854 is intended. An elective local marine board under the general super- vision of the Board of Trade is appointed in the principal ports of the United Kingdom. One of the duties of the board is the estab- lishment of mercantile marine offices under superintendents or deputy superintendents.? It is the general business of such officers to afford facilities for engaging seamen by keeping registries of their names and characters, to superintend and facilitate their engage- ment and discharge, to provide means for securing the presence on board at the proper times of men who are so engaged, and to facili- tate the making of apprenticeships to the sea service (s. 124). A seaman must be hired before a superintendent or deputy superin-

~~*tendent, an officer of customs, or a consular officer on a form sanc- tioned by the Board of Trade (usually called the shipping articles) containing the following particulars :—(1) the nature and, as far as practicable, the duration of the intended voyage or engagement, or the maximum period of the voyage or engagement, and the places or parts of the world (if any) to which the voyage or engagement is not to extend; (2) the number and description of the crew, specifying how many are employed as sailors; (8) the time at which each seanian is to be on board or to begin work; (4) the capacity in which each seaman is to serve; (5) the amount of wages which each seaman is to receive; (6) a scale of the provi- sions which are to be furnished to each seaman ; (7) any regulations as to conduct on board and as to fines, short allowance of provi- sions, or other lawful punishments for misconduct, which have been sanctioned by the Board of Trade as regulations proper to be adopted, and which the parties agree to adopt. Every agreement is to be framed so as to admit of stipulations as to allotment of wages, and may contain any other stipulations not contrary to law (s. 149, as amended by the Act of 1873 and the Merchant Seamen Act, 1880). Among illegal stipulations would fall any agreement by a seaman to give up his right to salvage, to forfeit his lien on the ship, or to be deprived of any remedy for the recovery of wages to which he would otherwise have been entitled (s. 182). In the case of foreign- going ships the following rules in addition must be observed :—(1) every agreement made in the United Kingdom (except agreements with substitutes) is to be signed by each seaman in the presence of the superintendent of a mercantile marine office; (2) the superin- tendent is to cause the agreement to be read over and explained to*~~

~~*1 For a fuller explanation of some of these terms, see Vice-Admiral W. H. Smyth, The Sailor's Word Book of Nautical Terms; Falconer's Marine Diction- ary, enlarged by W. Burney; P. L. Breslauer, Illustrated Nautical Polyglot (six languages).*~~

~~*2 These offices and officers were called shipping offices and shipping masters in the Act of 1854. The names were changed to the longer and less convenient ones in the text by the Act of 1862 (25 and 26 Vict. ¢. 63, s. 15).*~~

each seaman, or otherwise to ascertain that each seaman understands the same before he signs it, and is to attest each signature; (3) the agreement is to be in duplicate, one part to be retained by the superintendent, the other by the master; (4) in the case of sub- stitutes, they are where possible to be engaged before a superin- tendent, in other cases the agreement is to be read over and ex- plained to the seaman by the master and signed by the seaman in the presence of a witness (s. 150). The only cases where no agrec- ment in writing is necessary is where the hiring is for a coaster of less than eighty tons register or for a foreign vessel. In the case of union apprentices the indentures must be executed in the pre- sence of and attested by two justices. No stamp duty is charge- able on indentures for the sea service. In the case of foreign- going ships making voyages averaging less than six months in duration, running agreements with the crew may be made (s. 151). No person unlicensed by the Board of Trade, other than a master or mate or agent of the owner, may engage or supply seamen. The discharge of a seaman, like his engagement, must take place before a superintendent or an officer of equivalent authority. The seaman is entitled to receive a certificate of service and dis- charge. His wages must be paid within a limited time from his discharge, varying according to circuinstances, and are not now dependent, as they were at common law, upon the earning of freight. If he is discharged before a month's wages are earned, he is cntitled to a month's wages. As far as possible, payment is to be made in money and not by bill. In the absence of special stipulations, wages are not generally due until the contract of service is complete. By 8 Geo. I. c. 24, s. 7, a master may not advance a seaman more than half his wages while abroad. Sums recoverable as wages are, in addition to wages properly so called, the expenses of subsistence and of the voyage home when a ship is sold or transferred abroad, and the master does not deposit with a consular officer a sufficient sum for the seaman's expenses pursu- ant to s. 205; the expenses of a seaman left behind or discharged from a British ship, or a British subject from a foreign ship, out of the United Kingdom ; allowance for short or bad pro- visions ; the moneys and effects of a deceased seaman who has been employed on a British ship ; expenses caused by illness from want of proper food and accommodation and

~~*medicines ; and double pay for every day, not exceeding ten, during which payment of wages is delayed without proper cause. Wages cannot be attached. They may be forfeited or reduced by desertion, wilful disobedience, smuggling, want of exertion in case of wreck, illness caused by neglect or default of the seaman, and misconduct of other kinds. Advance notes—that is, documents promising the future payment of money on account of a seaman's wages conditionally on his going to sea and made before the wages have been earned—are void, and no money paid in respect of an advance note can be deducted from the wages earned, Merchant Seamen (Payment of Wages and Rating) Act, 1880 (48 and 44 Vict. c. 16, s, 2). Allotment notes may be made in the form sanctioned by the Board of Trade, and may stipulate for the allotment of not more than half the seaman's wages in favour of a wife, parent, grandparent, child, grandchild, brother or sister (s. 169), or of a savings bank (48 and 44 Vict. c. 16, s. 8). Seamen's savings banks have been established and are administered by the Board of Trade, chiefly under the powers given by the Seamen's Savings Banks Act, 1856. If during the absence of a seaman on a voyage his wife and family become chargeable to the parish, two-thirds of his wages at the most are all that can be recovered by the parish. Careful provision is made for the custody of a deceased seaman's effects and wages, and their delivery to his representatives. The possibility of a seaman's being left destitute abroad is provided against by ss. 206, 207. Consular officers abroad are bound to send home any distressed or shipwrecked seaman, the expenses being chargeable upon the mercantile marine fund. Compensation is to be made for insufficiency or bad quality of provisions or water on board. Ifa complaint of the quality or sufficiency be frivolous, the persons complaining are liable to for- feit a week's wages. All foreign-going ships are to carry proper medicines and medical stores. Lime and lemon juice and other antiscorbutics are to be provided on ships bound to foreign ports other than ports in Europe and the north of North America. An ounce a day of lime or lemon juice is to be served to each member of the crew after the ship has been at sea for ten days (Act of 1867, 30 and 81 Vict.c. 124, s. 4). A foreign-going ship having one hundred persons or upwards on board must carry a qualified medical man (s. 130). Each seaman or apprentice is entitled to a space of not less than 72 cubic feet, the place to be. securely constructed, properly lighted and ventilated, and*~~

~~*properly protected from weather and sea, and as far as possible from effluvium caused by cargo or bilge-water. The place is to be inspected and certified by a surveyor of the Board of Trade, and to be kept free from goods and stores. The local marine board (or the Board of Trade where there is no local marine board) may appoint a medical inspector of seamen, who may on application by the master or owner report to the superintendent of the mercantile marine office as to whether any seaman is fit for duty (80 and 81 Vict. c. 124, ss. 9, 10).*~~

~~*SHAMAN*~~

~~*Bye-laws and regulations relating to seamen's lodging-houses may be made by the sanitary authority of any seaport town with the sanction of the president of the Board of Trade. Such bye-laws and regulations are to provide for the licensing of seamen's lodging. houses, the inspection of the same, the sanitary conditions of the same, the publication of the fact of a house being licensed, the due execution of the bye-laws and regulations and the non-obstruction of persons engaged in securing such execution, the preventing of persons not duly licensed holding themselves out as keeping or purporting to keep licensed houses, and the exclusion from licensed houses of persons of improper character (46 and 47 Vict. c. 41, s. 48). Provision is made for the protection of seamen from im-position by crimps and lodging-house keepers. This protection may in certain cases be extended by order in council to foreign ships (s. 287, and 43 and 44 Vict. c. 16, ss. 5, 6). At the time of discharge of the crew in the United Kingdom a list in the form sanctioned by the Board of Trade is to be made out and delivered to a superintend- ent of a mercantile marine office containing, inter alia, the follow- ing particulars :—(1) the number and date of the ship's register and her registered tonnage; (2) the length and general nature of the voyage or employment ; (3) the Christian names, surnames, ages, and places of birth of all the crew, including the master and apprentices, their qualities on board, their last ships or other employments, and the dates and places of their joining the ship ; (4) the names of any members of the crew who have been maimed or hurt, with the times, places, causes, and circumstances thereof; (5) the wages due at the time of their respective deaths to any of the crew who have died; (6) the clothes and other effects belonging to any of the crew who have died,*~~

~~*with a statement of the manner in which they have been dealt with, and the money for which any of them have been sold (s. 273). Every birth or death occurring at sea is to be recorded in the log-book and reported on arrival at any port in the United Kingdom to the registrar-general of shipping and seamen, who forwards a certified copy to the registrar-general of births and deaths (37 and 88 Vict. c. 88, s. 37). An official log-book in a form sanctioned by the Board of Trade is to be kept by the master of every ship except a coaster. It must contain, ¢nter alia, (1) every legal conviction of any member of his crew and the punish- ment inflicted ; (2) every offence committed by any member of his crew for which it is intended to prosecute, or to enforce a forfeiture, or to exact a fine, together with a statement concerning the reading over of such entry and concerning the reply (if any) made to the charge; (3) every offence for which punishment is inflicted on board, and the punishment inflicted ; (4) a statement of the conduct, character, and qualifications of each of his crew, or a statement that he declines to give an opinion on such particulars; (5) every case of illness or injury happening to any member of the crew, with the nature thereof and the medical treatment adopted (if any) ; (6) the name of every seaman or apprentice who ceases to be a member of the crew, otherwise than by death, with the time, place, manner, and cause thereof; (7) the amount of wages due to any seaman who enters Her Majesty's service during the voyage; (8) the wages due to any seaman or apprentice who dies during the voyage, and the gross amount of all deductions to be made therefrom ; (9) the sale of the effects of any seaman or apprentice who dies during the voyage, including a statement of each article sold and of the sum received for it (s. 282). At common law there was no obligation of the owner to provide a seaworthy ship, but by the Act of 1876 every person who sends or attempts to send, or is party to sending or attempting to send, a British ship to sea in such unseaworthy state that the life of any person is likely to be thereby endangered is guilty of a misdemeanour, unless he proves that he used all reason- able means to insure her being sent to sea in a seaworthy state, or that her going to sea in such unseaworthy state was under the circumstances reasonable and justifiable. A master knowingly taking a British ship to sea in such unseaworthy state that the life of any person is likely to be thereby endangered is guilty of a mis- demeanour. In every contract of service between the owner and the master or any seaman and*~~

~~*in every indenture of sea apprenticeship, an obligation is implied that the owner, master, and agent shall use all reasonable means to insure the seaworthiness of the ship (39 and 40 Vict. c. 80, ss. 4,5). A return of certain particulars, such as lists of crews and of distressed seamen sent home from abroad, reports on discharge, births and deaths at sea, must be made to the registrar-general of shipping and seamen, an officer of the Board of Trade. The seaman is privileged in the matter of wills (see WILL), and is exempt from serving in the militia (42 Geo. ITI. c. 90, s. 43). Assaults upon seamen with intent to prevent them working at their occupation are punishable summarily by 24 and 25 Vict. c. 100, s. 40. There are special enactments in favour of Lascars and foreign seamen on British ships (see 4 Geo. IV. c. 80; 17 and 18 Vict. ¢. 104, s. 544; 17 and 18 Vict. c. 120, s. 16; 18 and 19 Vict. c. 91, s. 16). In addition to this legislation directly in his interest, the seaman is indirectly protected by the provisions of the Merchant Shipping Acts requiring the possession of certifieates of competence by ships' officers, the periodical survey of ships by the Board of Trade, and the enactments against deck cargoes and overloading, as well as by*~~

~~*other Acts, such as the Chain Cables and Anchors Acts, enforcing a minimum strength of cables and anchors, and_the Passenger Acts, under which a proper supply of life-boats and life-buoys must be provided. The duties of the seamen appear to be to obey the master in all lawful matters relating to the navigation of the ship and to resist enemies, to encourage him in which he may become entitled to prize money under 22 and 23 Car. II. c. 11 (see Prizm). Any services beyond these would fall under the head of salvage service and be recompensed accordingly. There are certain offences for which the seaman is liable to be summarily punished under the Act of 1854. They comprise desertion, neglect or refusal to join his ship or absence without leave, quitting the ship without leave before she is placed in security, wilful disobedience to a lawful command, either on one occasion or continued, assault upon a master or mate, combining to disobey lawful commands or to neglect duty or to impede the navigation of the ship or the progress of the voyage, wilful damage to the ship, or embezzlement of or wilful damage to her stores or cargo, and*~~

~~*smuggling. The punish- ment varies from forfeiture of all or part of his wages to twelve weeks' imprisonment (s. 243, as amended by the Merchant Scamen Act, 1880). A master, seaman, or apprentice who by wilful breach of duty, or by neglect of duty, or by reason of drunkenness, does any act tending to the immediate loss, destruction, or serious damage of the ship or to immediately endanger the life or limb of any person belonging to or on board of the ship, or who by wilful breach of duty, or by neglect of duty, or by reason of drunkenness refuses or omits to do auy lawful act proper and requisite to be done by him for preserving the ship from immediate loss, destruc- tion, or serious damage, or for preserving any person belonging to or on board of the ship from immediate danger to life or limb, is guilty of a misdemeanour (s, 239). A seaman is also punishable at common law for piracy and by statute for piracy and offences against the Slave Trade Acts. A riotous assembly of seamen to prevent the loading or unloading of any ship or to prevent others from working is an offence under 83 Geo. III. c. 67 (see Rtor), Deserters from Portuguese ships are punishable by 12 and 13 Vict. c. 25, and from any foreign ship by 15 and 16 Vict. c. 26, of course by virtue of conventions with Portugal and other forcign powers. The rating of seamen is now regulated by the Merchant Seamen Act, 1880. By that Acta seaman is not entitled to the rating of "A.B." unless he has served four years before the mast, or three years or more in a registered decked fishing vessel and one year at sea ina trading vessel (43 and 44 Vict. c. 16, s. 7). The Act of 1854 enabled. contributions to seamen's refuges and hospitals to be charged upon the mercantile marine fund. Asa matter of fact, however, there appears to be no grant in support of seamen's hospitals out of any public funds. The principal seamen's hospital is that at Green- wich, established in 1821 and incorporated by 3 and 4 Will. IV. c. 9 under the name of "The Seaman's Hospital Society." Up to 1870 this hospital occupiced the old " Dreadnought" at Greenwich, but in that year it obtained the old infirmary of Greenwich Hospital from the admiralty at a nominal rent, in return for which a certain number of beds are to be at the disposal of the admiralty. The hospital is snpported by voluntary contributions, including those of many foreign Governments, and has between its foundation and the end of 1884 relieved no less than 253,629 seamen of all nations. There is also a dispensary for scamen at the London Docks, and a floating hospital at Cardiff, equally supported by voluntary con- tributions. At one time there*~~

~~was an enforced contribution of six- pence a month from the pay of masters and seamen towards the funds of Greenwich Hospital, levied under the powers of some of the Greenwich Hospital Acts. The payment of these contributions enabled them to receive annuities from the funds of the hospital. These "Greenwich Hospital sixpences," however, became the source of very considerable irritation and have now been discontinued. In their place a purely voluntary seamen's provident fund has been established, its object being to persuade seamen to subscribe six- pence a month towards the seamen's hospital.~~

~~'The remedies of the seaman for wages are an ordinary action in the Queen's Bench Division or plaint in a county court, an action in rem or in personam in the Admiralty Division of the High Court (in Scotland in the Court of Session), a Vice-Admiralty Court, or a county court having admiralty jurisdiction, or summary proceed- ings before justices, naval courts, or superintendents of mercantile marine offices. The master has now the same remedies as the sea- man for his wages, under which are included all disbursements made on account of the ship. At common law he had only a personal action against the owner. He has the additional advan- tage of being able to insure his wages, which a seaman cannot do. A common law action for wages is seldom brought, the statutory remedies being more convenient. By the Admiralty Court Act, 1861, the High Court of Justice (Admiralty Division) has juris- diction over any claim by a seaman of any ship for wages earned by him on board the ship, whether the same be due under a special contract or otherwise (24 Vict. c. 10,s. 10). This section has been liberally construed and held to apply to such persons as a surgeon, purser, pilot, carpenter, and steward. The ceurt can entertain~~

~~claims by foreign seamcen against a forcign ship, on notice being given to the consul of the foreign country. If he protest, the court has a discretion to determine whether the action shall pro- ceed ornot. A claim for wages in the High Court must be brought within six years (4 and 5 Anne, c. 3,s.17). The Vice-Admiralty Court Act, 1863, gives jurisdiction in claims for wages irrespective of amount to vice-admiralty courts. A county court~~

having admir- alty jurisdiction may entertain claims for wages where the amount claimed does not exceed £150 (31 and 32 Vict. c. 71, s. 8). The jurisdiction of the inferior court is protected by the proviso that, if the action be brought in the HIgh Court for a claim not exceed- ing £150, the plaintiff may be condemned in costs, and will not be entitled to costs if he recover less than this sum, unless the judge certifies that it was a proper case to be heard in the HIgh Court (s. 9). In actions in all courts of adiniralty jurisdiction the seaman has a maritime lien on the ship and freight, ranking next after claims for salvage and damage. The amount recoverable summarily before justices is limited to £50. Orders may be en- forced by distress of the ship and her tackle. Proceedings must be taken within six months. A naval court ona foreign station may determine questions as to wages without limit of amount. Asa rule a seaman cannot sue abroad for wages due for a voyage to terminate in the United Kingdom. The superintendent of a mercantile marine office has power to decide any question whatever between a master or owner and any of his crew which both parties in writing agree to submit to him. These summary remedies are all given by the Act of 1854. The Merchant Seamen Act, 1880, further provides that, where a question as to wages is raised before a superintendent, if the amount in question does not exceed £5, the superintendent may adjudicate finally, unless he is of opinion that a court of law ought to decide it. The same Act extends the provisions of the Employers and Workmen Act, 1875, to seamen. The Act of 1875 itself specially excluded them. A county court . or court of snmmary jurisdiction (the latter limited to claims not exceeding £10) may under the Act of 1875 determine all disputes between an employer and workman arising out of their relation as such. The jurisdiction of courts of summary jurisdiction is pro- tected by the enactment of the Act of 1854 that no proceeding for the recovery of wages under £50 is to be instituted in a superior court unless either the owner of the ship is bankrupt, or the ship is under arrest or sold by the authority of such court, or the justices refer the case to such cowrt, or neither owner nor master is or resides within 20 miles of the place where the seaman is put ashore (s. 189). It should be noticed that claims upon allotment notes may be brought in all county courts and before justices without any limit as to amount (s. 169). In Scotland the sheriff court has concurrent jurisdiction with justices in claims for wages and upon allotment notes. !

~~*Fishermen.—The regulations respecting fishermen are contained chiefly in the Sea Fisheries Acts, 1868 and 1883, and in the Mer- chant Shipping (Fishing-Boats) Act, 1883. The Sea Fisheries Act of 1868 constituted a registry of fishing-boats, and that of 1883 gave powers of enforcing the provisions of the Acts to sea-fishery officers. The Merchant Shipping (Fishing-Boats) Act was passed in consequence of the occurrence of some cases of barbarous treat- ment of boys by the skippers of North Sea trawlers. The Act pro- vides, inter alia, that indentures of apprenticeship are to be ina certain form and entered into before a superintendent of a mercantile marine office, that no boy under thirteen is to be employed in sea- fishery, that agreements with seamen on a fishing-boat are to con- tain the same particulars as those with merchant seamen, that running agreements may be made in the case of short voyages, that reports of the names of the crew are to be sent toa superintendent of a mercantile marine office, and that accounts of wages and cer- tificates of discharge are to be given to seamen. No fishing-boat is to go to sea without a duly certified skipper. Provision is also made for special reports of cases of death, injury, ill-treatment, or punishment of any of the crew, and for inquiry into the cause of such death, &c. Disputes between skippers or owners and seamen are to be determined at request of any of the parties concerned by a superintendent. For special privileges of fishermen in the use of the seashore, see RrpaRIAN Laws. They are also exempt from Trinity HIouse dues. There are numerous police provisions con- tained in various Acts of Parliament dealing with the breach of fishery regulations. These provisions act as an indirect protection to honest fishermen in their employment. The rights of British fishermen in foreign waters and foreign fishermen in British waters are in many cases regulated by treaty, generally confirmed in the United Kingdom by Act of Parliament. A royal fund for widows and orphans of fishermen has recently been formed, the nucleus of the fund being part of the profits of the Fisheries Exhibition held in London in 1883.°*~~

~~*United States.—The law of the United States is in general accord- Seine oe ee*~~

~~*1 See the works on merchant shipping, such as those of Abbott, Maclachlan, Maude and Pollock; Roscoe, Admiralty Law and Practice;*~~

~~*Williams and Bruce, Admiralty Practice ; also Roscoe, Modern Legislation for Seamen and for Safety at Sea, 1885,*~~

~~*ance with that of England. The law relating to seamen in the navy will be found in the articles for the government of the navy (Revised Statutes, s. 1624). Legislation in the interests of merchant seamen dates from 1790. A list of the crew must be delivered to a collector of customs. The shipping articles arc the same as those in use in the United Kingdom. For vessels in the coasting trade they are, with ccrtain exceptions, to be in writing or in print. They must in the case of foreign-bound ships be signed before a shipping commissioner appointed by the circuit court or a collector of customs, or (if entered into abroad) a consular officer, where practi- cable, and must be acknowledged by his signature in a prescribed form. One-third of a seaman's wages earned up to that time is due at every port where the ship unlades and delivers her cargo before the voyage is ended. They must be fully paid in gold or its equiva- lent within twenty days of the discharge of the cargo. Advance notes can be made only in favour of the seaman himself or his wife or mother. There is a summary remedy for wages before a district court, a justice of the peace, or a commissioner of a district court. A shipping commissioner may act as arbitrator by written consent of the parties. Seaworthiness is an implied condition of the hiring. There may be an examination of the ship on the complaint of the mate and a majority of the crew. The expenses of an unnecessary investigation are a charge upon the wages of those who complain. A seaman may not leave his ship without the consent of the master. For foreign-bound voyages a medicine-chest and antiscorbutics must be carried, also 60 gallons of water, 100 tb of salted meat, and 100 tb of wholesome bread for every person on board, and for every seaman at least one suit of woollen clothing, and fuel for the fire of the seaman's room. An assessment of forty cents per month per seaman is levied on every vessel arriving from a foreign port and on every registered coasting vessel in aid of the fund for the relief of sick and disabled seamen. In the navy a deduction of twenty cents per month from each man's pay is made for the same purpose. The offences and punishments are similar to those in the United Kingdom. There is also the additional offence of wearing a sheath*~~

~~knife on shipboard.? (J. Wt.) SEARCH, Ricutor. "The right of visiting and search- ing ships on the high seas," says Lord Stowell, "whatever be the ships, whatever be the cargoes, whatever be the destinations, is an incontestible right of the lawfully com- missioned ship of a belligerent nation ; because till they are visited and searched it does not appear what the ships or the cargoes or the destinations are; and it is for the purpose of ascertaining these points that the necessity of this right of visitation and search exists. This right is so clear in principle that no man can deny it who admits the right of maritime capture, because if you are not at liberty to ascertain by sufficient enquiry whether there is property which can be legally captured, it is impossible to capture " ("The Maria," 1 C. Robinson's Reports, 36). This right of~~

~~search or visitation and search has not been at all times .~~

~~recognized. The second armed neutrality of the Baltic powers in 1800 attempted to withdraw their vessels from the right. The bombardment of Copenhagen in 1801 was one of the results of this policy. Since the convention which followed that event the right has been regarded as established within proper limits, and is often regulated by treaty, especially as to the search of vessels suspected of being engaged in the slave trade. Apart from treaty, the main rules which govern the right are these. (1) It isa belligerent right, and can be exercised only in time of war, unless in the case of a vessel reasonably suspected of piracy or breach of revenue regulations. (2) It can be exercised only by a ship of war duly commissioned by the sovereign of the belligerent power and only in the case of a merchant vessel, whether of an enemy or neutral power. (3) It cannot be exercised in neutral waters, and an attempt to exercise it in such waters is a gross violation of neutrality. (4) It can be exercised only for certain purposes, such as to examine the ship's papers and to see Whether she carries any contraband goods. (5) After the ship of war has raised her flag an affirming gun (coup @assurance) loaded with blank cartridge must be fired to bring the merchant vessel to. (6) In case of reasonable suspicion it is the duty of the ship of war to detain the~~

~~1 See Revised Statutes, ss, 4501-4612; Kent, Comm., vol. iii. 177; Parsons, Law of Shipping, vol, ii. 32.~~

~~merchant vessel for the decision of a prize court. Resist- ance by a neutral vessel, whether alone or in convoy, renders her liable to capture according to the English and United States doctrine. But most Continental authorities lay down that the declaration of the officer in charge of the convoy is to be accepted, and that a refusal to accept such declaration may justify the convoy in resisting search, There is also a conflict of opinion as to whether a neutral loses his neutral rights by loading his goods on board an armed ship of the enemy. It has been held in England that such a proceeding is a violation of neutrality, as afford- ing a presumption of resistance to search.~~

~~The right of search is historically interesting, as on two occasions it has brought Great Britain into collision with the United States. One of the causes of the war of 1812 was the right then claimed (but since abandoned) by Great Britain of searching vessels of the United States for British subjects serving in them as seamen, with a view to impressing them for the royal navy. In 1861 the British mail steamer "Trent" was stopped on the high seas by a United States ship of war, and Messrs Slidell and Mason, two commis- sioners of the Confederate States proceeding to Europe, were taken out of her and afterwards imprisoned in the United States. On diplomatic representations being made at Washington by the am- bassadors of Great Britain and other powers the commissioners were released, and a war was avoided.~~

~~See in addition to the ordinary authorities on international law, Visitation and Search, by W. B. Lawrence, Boston, U.S., 1858.~~

~~SEA-SERPENT. The belief in enormous serpents, both terrestrial and marine, dates from very early times. Pliny (27.V., viii. 14), following Livy (Epit., xviii.), tells us of a land-serpent 120 feet long, which Regulus and his army besieged with balistz, as though it had been a city, and this story is repeated by several other writers (Florus, ii. 2; Val. Max., i. 8; Gellius, vi. 3). The most prolific in accounts of the sea-serpent, however, are the early Norse writers, to whom the "S6-Orm " was a subject both for prose and verse. Olaus Magnus (H7st. Gent. Sept., xxi, 24) describes it as 200 feet long and 20 feet round, and states that it not only ate calves, sheep,~~

~~*and swine, but also "disturbs ships, rising up like a mast, and some- times snaps some of the men from the deck," illustrating his account with a vivid representation of the animal in the very act. Pontoppidan, in his Vatural History (Eng. tr., 1755, p. 195 sq.), says that its existence was generally believed in by the sailors and fishermen of his time, and recounts the means they adopted to escape it, as well as many details regarding the habits of the creature. The more circumstantial records of comparatively modern times may be most conveniently grouped according to the causes which presumably gave rise to the phenomena de- scribed. (1) A number of porpoises swimming one behind another may, by their characteristic mode of half emerging from and then re-entering the water during respiration, produce the appearance of a single animal showing a succession of snake-like undulations. The figure given by Pontoppidan was very likely suggested by such an appear- ance, and a sketch of an animal seen off Llandudno by several observers? looks as though it might have had a similar origin, notwithstanding that this hypothesis was rejected by them. (2) A flight of sea-fowl on one occasion recorded by Professor Aldis* produced the appearance of a snake swimming at the surface of the water. (3) A large mass of seaweed has on more than one occasion been cautiously approached and even harpooned under the im- pression that it was such a monster.4 (4) A pair of bask- ing sharks (Selache maxima) furnish an explanation of some of the recorded observations, as was first pointed out by Frank Buckland. These fish have a habit of swimming*~~

~~*2 Mott, Nature, xxvii. pp. 293, 315, 338; also Land and Water, September 1872.*~~

~~*3 Nature, ibid.; also Drew, in vol. xviii. p. 489; Bird, tom. ctt., p. 519 ; Ingleby, tom. cit., p. 541.*~~

~~*4 F. Smith, Zimes, February 1858; Herriman, quoted by Gosse, op. cit. postea, p. 338 ; Pringle, Nature, xviii. p. 519, 1878.*~~

~~*AE ASS*~~

~~*in pairs, one following the other with the dorsal fin and the upper lobe of the tail just appearing above the water, and, as each animal is fully 30 feet*~~

~~long, the effect of a body of 60 or more feet long moving through the water is readily produced. To this category belongs the famous serpent cast up on Stronsay, one of the Orkneys, of which an account was read to the Wernerian Society of Edinburgh !; some of its vertebrae were preserved in the Royal College of Surgeons of London, and identified as those of Selache maxima by both Home and Owen.? There is also evidence to show that specimens of Carcharodon must have existed more than 100 feet long. (5) Ribbon- fish (Regalecus), from their snake-like form and great length (sometimes as much as 20 feet), have been suggested as the origin of so-called "sea-serpents," amongst others by Dr Andrew Wilson*; but Dr Giinther,® from what is known regarding the habits of these fish, does not regard the theory as tenable. (6) A gigantic squid (Architeuthus) was most likely the foundation of the old Norse accounts,® and also of those which in the early part of the 19th century came so frequently from the United States as to gain for the animal the sobriquet of " American sea- serpent."7? These stories were so circumstantial and on the whole so consistent, and vouched for by persons of such eminence, that no doubt was possible (notwithstanding the cavilling of Mitchell)® as to the existence of a strange marine monster of very definite character in those regions. The description commonly given of it has been summed up by Gosse ® somewhat thus:— (i.) general form that of a~~

~~serpent; (ii.) length averaging 60 feet; (iii.) head flattened,~~

~~eye generally not mentioned, some distinctly stating that it was not seen ; (iv.) neck 12 to 16 inches in diameter ; (v.) appendages on the head, neck, or back (accounts here variable) ; (vi.) colour dark, lighter below ; (vii.) swims at the surface, head thrown forward and slightly elevated ; (vill.) progression steady and uniform, body straight but capable of being bent; (ix.) water spouting from it; (x.) in shape like a "nun buoy." The annexed figure (fig. 1) represents one aT~~

~~which was seen _ => from H.M.S. "Deedalus."!° To show the reason- ableness of this hypothesis, it may be added that gigantic Cephalopods are not unfrequent on the shores of Newfoundland,!! and are occasionally met with on the coasts of Scandinavia,!2 Denmark, and the British .~~

~~*Isles,!° that their extreme size seems to be above 60 feet, and, furthermore, that their mode of progression is by means of a jet of water forcibly expelled from the siphon, which would impart that equable motion to which several*~~

~~*1 Mem, Wern. Soc, Edin., vol. i. pp. 418-444, pls. ix.-xi., 1811.*~~

~~*2 Ann, Mag. Nat. Hist., ser. 2, vol. ii. p. 461, 1848 ; fora criticism of these views, see Traill, Proc. Roy. Soc. Edin., vol. iii. p. 208, 1857.*~~

~~*3 Owen, Odontography, p. 30.*~~

~~*4 Leisure Time Studies, p. 115, London, 1879, containing a readable essay on the subject ; Scotsman, 6th September 1878 ; Nature, loc. cit.*~~

~~*> Study of Fishes, p. 521, Edinburgh, 1880.*~~

~~*§ See note 3; also Deinbolt, quoted in Zoologist, p. 1604, 1847.*~~

~~*7 Bigelow, Amer. Journ. Sci., vol. ii. pp. 147-165, 1820; Warburton, ib., vol. xii. p. 375, 1823 ; Zoologist, p. 1714, 1847.*~~

~~*8 Amer. Journ. Sci. vol. xv. p. 351, 1829.*~~

~~*® Romance of Natural History, p. 345, London, 1859.*~~

~~*10 M'Quahae, Times, October 1848 ; Ji. Lond. News, October 1848.*~~

~~*M Verrill, Trans. Connect. Acad., vol. v. part i., 1880, containing an account of all authenticated specimens of gigantic squids.*~~

~~*2 Steenstrup, Forhandl. Skand. Naturf., 7de Méde, pp. 182-185, Christiania, 1857,*~~

~~*13 Saville Kent, Proc. Zool. Soc. Lond., p. 178, 1874; More, Zoologist, p. 4526, 1875; also Ann. Alag. Nat. Hist., ser. 4, vol. vi. p 128.*~~

~~*RPENT 609*~~

observers allude as being evidently not produced by any serpentine bending of the body. A very interesting account of a monster almost certainly originating in one of these squids is that of Hans E sionary to Green- land; the drawing by Bing, given in his work, is repro- duced here (fig. 2), along with a sketch of a squid in the act of rearing itself out from the water 4 (fig. 3), an action & which they have been observed in = aquaria habitually to perform. Nu- merous other ac- ——— counts seem to be explicable by this hypothesis. (7) A sea-lion, or "Anson's seal" (Morunya elephantina), was suggested by Owen!6 as a possible explanation of the serpent seen from Ry H.M.S. "Deedalus"; it » but as this was \ 2 afterwards rejected by Captain M'Qua- hae,!' who stated that it could' not have been any ani- mal of the seal kind, it seems _ bet- ter to refer the ap- pearance to a squid as above stated. (8) A plesiosaurus, or some other of the huge marine reptiles usually be- lieved to be extinct, pro, 3.—Squid, rearing itself out of the water. might certainly

*have produced the phenomena described, granting the possibility of one having survived to the present time. Newman !8 and Gosse' have both supported this theory, the former citing as evidence in its favour the report of a creature with the body of an alligator, a long neck, and four paddles having been seen by Captain Hope of H.M.S. "Fly" in the Gulf of California.2? (9) No satisfactory explanation has yet been given of certain descriptions of the sea-serpent ; among others of this class may be men- tioned the huge snake seen by certain of the crew 2! of the "Pauline" in the South Atlantic Ocean, which was coiled twice round a large sperm whale, and then towered up many feet into the air, and finally dragged the whale to the bottom. Perhaps the most remarkable, however, is Lieutenant Hayne's * account of a creature seen from H.M. yacht "Osborne." Two different aspects were re- corded,—the first being a ridge, 30 feet in length, of tri-*

Egede

M4 Det gamle Grinlands nye Perlustration, Copenhagen, 1741 (Eng. trans., A Description of Greenland, London, 1745, pp. 86-89) ; also Paul Egede, Hfterretninger om Grénland, Copenhagen, n.d., pp.

45, 46,

~~15 [,, de Ferry, quoted by Pontoppidan, op. ett. ; Davidson and Sandford, quoted in Zoologist, p. 2459, 1849 ; Senior, Graphic, 19th April 1879 ; Barnett, Nature, vol. xx. p. 289, 1879.~~

~~16 Ann. Mag. Nat. HIst., ser. 2, vol. ii. p. 461, 1848,~~

~~W Times, 21st November 1848. 18 Zoologist, p. 2395.~~

~~19 Op, cit., p. 358. 20 Zoologist, p. 2356, 1849.~~

~~21 Penny, Jl. Lond. News, vol, lxvii. p. 515, 20th November 1875,~~

~~2 Graphic, 30th June 1877. "5~~

~~AX], — 77~~

~~610~~

~~angular fins, each rising 5 to 6 feet above the water, while the second view showed a large round head 6 feet in diameter, with huge flappers, which moved like those of a turtle! It would thus appear that, while, with very few exceptions, all the so-called "sea-serpents" can be explained by reference to some well-known animal or other natural object, there is still a residuum sufficient to prevent modern zoologists from denying the possibility that some such creature may after all exist.~~

~~Quite distinct in origin from the stories already touched on is the legend of the sea-serpent or ténnin among the Arabs (Mas'tdi, i. 266 sq. ; Kazwinf, i. 132 sq.; Damiri, i. 186 sq.), which is described in such a way as to leave no doubt that the waterspout is the phenomenon on which the fable rests. The tinnin is the HIebrew tannin (E.V. "whale," "dragon"), which in Ps. exlviii. 7 might in the context be appropriately rendered '" waterspout."~~

~~In addition to the sources already cited, the reader may consult Blackwood's Magazine, vol. iii., 1818 ; Lee, Sea Monsters Unmasked (International Fisheries Exhibition HIandbook), London, 1883 ;~~

~~*Cogswell, Zoologist, pp. 1841, 1911 (1847); and Hoyle, Proc. Roy. Phys. Soc. Edin., vol. ix. (W. E. HO.)*~~

~~*SEA-SICKNESS, a peculiar set of symptoms experi- enced by many persons when subjected to the pitching and rolling motion of a vessel at sea, of which depression, giddiness, nausea, and vomiting are the most prominent.*~~

~~*Although the vast majority of persons appear to be liable to this ailment on exposure to its exciting cause (the instances of complete and constant immunity being rare), they do not all suffer alike. Many endure distress of a most acute and even alarming kind, while others are simply conscious of transient feelings of nausea and dis- comfort. In long voyages, while many are affected with sea-sickness for the first few days only, others are tor- mented with it during the entire period, especially on the occurrence of rough weather. In short voyages, such as across the English Channel, not a few even of those sus- ceptible escape, while others suffer in an extreme degree, the sickness persisting long after arrival on shore.*~~

~~*The symptoms generally show themselves soon after the vessel has begun to roll by the onset of giddiness and discomfort in the head, together with a sense of nausea and sinking at the stomach, which soon develops into intense sickness and vomiting. At first the contents of the stomach only are ejected; but thereafter bilious matter, and occasionally even blood, are brought up by the violence of the retching. The vomiting is liable to exacerbations according to the amount of oscillation of the ship; but seasons of rest, sometimes admitting of sleep, occasionally intervene. Along with the sickness there is great physical prostration, as shown in the pallor of the skin, cold sweats, and feeble pulse, accompanied with mental depression and wretchedness. In almost all instances the attack has a favourable termination, and it is extremely rare that serious results arise, except in the case of persons weakened by other diseases, although occasionally the symptoms are for a time sufficiently alarming.*~~

~~*The causes giving rise to sea-sickness have long been discussed, and a vast number of theories have been pro- posed. The conditions concerned in the production of the malady are apparently of complex character, embracing more than one set of causes. In the first place, the rolling or*~~

~~*heaving of the vessel disturbs that feeling of the relation of the body to surrounding objects upon which our sense of security rests. The nervous system being thus sub- jected to a succession of shocks or surprises fails to effect the necessary adjustments for equilibrium. Giddiness and with it nausea and vomiting follow, aided probably by the profound vaso-motor disturbance which produces such*~~

~~*1 Dr Andrew Wilson has claimed this monster as a ribbon-fish, Times, 15th June 1877.*~~

~~*manifest depression of the circulation. Much has been made by some of the effects of the displacement of the abdominal viscera, especially the stomach, by the rolling of the vessel; but, while this may possibly operate to some extent, it can only be as an accessory cause. The same may be said of the influence of the changing impres- sions made upon the vision, which has been regarded by some as so powerful in the matter, since attacks of sea- sickness occur also in the dark, and in the case of blind persons. Other contributory causes may be mentioned, such as the feeling that sickuess is certain to come, which may bring on the attack in some persons even before the vessel has begun to move ; the sense of the body being in a liquid or yielding medium as it descends with the vessel into the trough of the sea, the varied odours to be met with on board ship, and circumstances of a like nature tend also to precipitate or aggravate an attack. Dr Chap- man's view is that the essential cause is an undue afflux of blood to the spinal cord. But, in the few rare instances where sea-sickness has proved fatal, post-mortem appearances have been almost entirely negative, and only such as are met with in death from syncope.*~~

~~*Innumerable preventives and remedies have been proposed ; but most of them fall far short of the success claimed for them. No means has yet been discovered which can altogether prevent the oc- currence of sea-sickness, nor is it likely any will be found, since it is largely due to the pitching movements of the vessel, which cannot be averted. Swinging couches or chambers have not proved of any practical utility. "No doubt there is less risk of sickness in a large and well-ballasted vessel than in a small one; but, even though the rolling may be considerably modified, the*~~

~~*ascending and de- scending movements which so readily produce nausea continue. None of the medicinal agents proposed possess infallible properties: a remedy which suits one person will often wholly fail with another. There appears to be a wide concurrence of opinion that nerve seda- tives are among the inmost potent drugs which can be employed; and full medicinal doses of bromide of potassium, chloral, or opium (the last two only under strict medical direction) taken before sail- ing appear to act usefully in the case of many persons. On the other hand, some high authorities have recommended the employ- ment of nerve stimulants, such as a small cupful of very strong coffee to be taken about two hours before sailing, which will fre- quently prevent or mitigate the sickness. When the vessel is in motion, or even before starting, the recumbent position with the head low and the eyes closed should be assumed by those at all likely to suffer, and, should the weather admit, on deck rather than below,—the body, especially the extremities, being well covered, Many persons, however, find comfort and relief from lying down in their berths with a hot bottle to the feet, by which means sleep may be obtained, and with it a temporary abatement of the distressing giddiness and nausea. Should sickness supervene small quantities of some light food, such as thin arrowroot, gruel, or soup, ought to be swallowed if possible, in order to lessen the sense of exhaustion, which is often extreme. The vomiting may be mitigated by saline effervescing drinks, ice, chloroform, hydro-cyanic acid, or opium. Alcohol, although occasionally useful ill great prostration, is not generally found to be of much service, but tends rather to aggravate the sickness. Dr Chapman, in accordance with his view of the cause of the sickness, introduced a spinal ice-bag, which has been extensively employed and recom- mended; but, like every other plan of treatment, it has only occa- sional success. The more recently proposed remedies, such as nitrite of amyl and cucaine, do not seem to yield any better results than the agents already mentioned.*~~

~~*SEATTLE, county seat of King county, Washington Territory, United States, on Seattle Bay, east side of Puget Sound, with Lake Union, 3 miles long, on the north, and Lake Washington, 25 miles long, on the east, is the largest city of the Territory. A ship canal to connect these lakes with Puget Sound is now (1886) in course of construction. Seattle has shipyards, foundries, machine- shops, sawmills, lumber-yards, breweries,*~~

~~*and manutfac- tories of furniture, carriages, cigars, crackers, patent medicines, boxes, and barrels. It possesses the Territorial university. The Columbia and Puget Sound and the Puget Sound Shore Railroads have their terminus here, whence large shipments of coal take place. The population*~~

~~*in 1880 was 3533, and in 1885 it was estimated at 12,000.*~~

~~*SEA WATER*~~

~~*SEA WATER.! The ocean covers very nearly eight- elevenths of the total area of the globe; its average depth may be estimated as 2000 fathoms, and its total mass at 1°322 × 10%8 (2.¢., 1°3 million million millions) tons. Its general configuration must be assumed to have been sub- stantially the same as it is now for thousands of years ; hence we may safely conclude that the absolute composi- tion of the ocean as a whole is constant in the sense of being only subject to very slow progressive millennial variation, and that, taking one part of the ocean with another, the percentage composition of the fixed part of the solutum can oscillate only within narrow limits. The composition of this solutum is very complex. According to Forchhammer, ocean salt in addition. to the chlorides and sulphates of sodium, magnesium, potassium, and cal- cium —which had long been known to be its principal components—includes silica, boric acid, bromine, iodine, fluorine as acid, and the oxides of nickel, cobalt, manganese, aluminium, zinc, silver, lead, copper, barium, and strontrum as basic components. Arsenic, gold, lithium, rubidium, cesium have been discovered since Forchhammer wrote. But all these subsidiary components, as that investigator found, amount to very little,—so little that in his numerous quantitative analyses of waters which he had procured from all quarters of the globe he confined himself to the determination of the chlorine, sulphuric acid, magnesia, lime, potash, and soda. The soda, however, he determined only by difference, assuming that the muriatic and sul- phuric acids are united with the bases into perfectly neutral salts. Asa general result he found that, in the open ocean, the ratio to one another of the several acids and bases named is subject to only slight variations. But his samples had all been collected at the surface ; the potash had been determined by an insufficiently exact*~~

~~*method; and the assumed neutrality of the total salt had not been proved. With the view primarily of supplementing Forchhammer's work, Dittmar made complete analyses of 77 of the samples brought home by the "Challenger," so selected that 34 out of the 77 represented depths of 1000 fathoms or more. His analyses brought out a small surplus of base, prov- ing the presence of carbonate in all the waters; but the numerical values thus found for the "alkalinity," being charged with the observational errors of the whole series of determinations, could not be relied on. Dittmar there- fore subsequently availed himself of a very easy and yet exact method for the direct determination of this quantity, which meanwhile had been discovered by Tornée, and ap- plied it to over 130 "Challenger" samples. He besides made a special inquiry into the relation between the quantity of lime and the depth at which the water had been collected, and a similar inquiry in regard to the bromine. As a general summary he gives the following three tables. The total salts contained in ocean water amount on an average to about 3°5 per cent., thus leaving 96°5 per cent. for the water proper. –*~~

~~*amen ieee 1 All our knowledge of the subject of chemical oceanography —a*~~

~~*branch of physical geography which has only lately come to be exten- sively cultivated—is derived from a series of investigations chiefly em- bodied in the following publications :—(1) Forchhammer, "On the Composition of Sea Water," &c., in Phil. Trans., i. 155, pp. 203-262 (1865); (2) Oscar Jacobsen, Ann. d. Chem., vol. clxvii. p. 1 sq. (1873); (3) Den Norske Nordhavs Expedition, 1876-78 : Chemi, by Tornve); (4) the Jahresberichte of the Kiel committee for the scien- tific investigation of the German Ocean, 1873-82; (5) Physics and Chemistry of the Voyaye of HW. M.S. "Challenger" —I. 'Report on Researches into the Composition of Ocean Water," &c., by Prof. W. Dittmar, January 1884; II. "Report on the Specific Gravity of samples of Ocean Water," &c., by J. Y. Buchanan, January 1884; III. " Report on Deep-sea Temperature," &c., by the officers of the expedition. A shorter and more popular exposition of the whole is found in—(6) Narrative of the Cruise of H. M.S. " Challenger" (1885). The excellent Handbuch der Oceanographie (Stuttgart), by Prof. G. von Boguslawski, may be referred to as being almost up to date.*~~

Tae I.—Average Composition of Ocean- Water Salis.

Per 100 parts of | Per 100 of HIalogen calculated

Total Salts. as Chlorine. Dittmar. Dittmar. Forchhammer.

UM OrIMe ya cate least. ae bp 292 99°848 | Not determined. BrOmane jin de Mees hevenie= 0°188 J ? 0°340 | Not determined. Sulphuric acid, SO, 6°410 11576 11°88 Carbonic acid*, CO, 0°152 0°274 | Not determined. Mime; CaO cscs. +. os 1°676 3026 2°93 Magnesia, MgO…….. 6209 ial Ale 11:03 Leta IO, I (O) onnosansobe 1°332 2°405 1:93 SoG, INGSO) ponounoocor 41 °234 74°462 | Not determined. (Basic oxygen, cqui-

valent to the halo-

BMA) esas cvsveverenses (-12°493) (-22°559))

181‘1

Total salts …... 100-000 180 ‘584 |

TABLE II.—Results from combining Acids and Bases (Dittmar).

Chloride of sodium…….. 77°758 | Sulphate of potash ……. 2°465
Chloride of magnesium …10°878| Bromide of magnesium — 0217
Sulphate of magnesium… 4°737 | Carbonate of lime ……. 0°345

Sulphate of limre…….. 3°600

Total salts… 100000

Reducing to the absolute mass of the ocean as given above, we arrive at the following numbers :—

TABLE III.—Adsolute Composition of the Salts of the Ocean. Unit=1 million million=10” tons,

~~Chloride of sodium ……. 35990 | Sulphate of potash ……. 1141 Chloride of magnesium … 5034 | Bromide of magnesium 100 Sulphate of magnesium … 2192| Carbonate of lime…….. 160 Sulphate of lime …….. 1666 46283~~

~~Total bromine TpeUl S@aUUTIG! gaacesonasnnnasnoonsednonce Total chloride of rubidium~~

~~Pater etre cists aaemicastae 87:2. (Dittmar). 0°03 (Kottstorfer). Me aa 25°0 (C. Schmidt).~~

~~Of the several quantities recorded in columns 2 or 3 of Table I. "carbonic acid" is proved to be subject to variation ; all the rest, including even the bromine, are practically constant. This shows that Forchhammer's proposition holds for ocean water from all depths, with one important qualification: special research on the lime showed that its quantity increases slightly but appreciably with the depth. Taking s, m, d as representing the lime per 100 of chlorine in shallow, medium-depth, and deep- sea water respectively, Dittmar found as mean results of analyses which agreed very well together—~~

~~s=3°'0175 m=3'0300 Probable error, +0°0012 +0:0014 +0:0011.~~

~~But m—s=0°0124 and d—s=0°0132. One explanation of this result is that the crustaceans, foraminifera, and molluscs which form carbonate of lime shells live chiefly in surface waters, but after their death sink to the bottom, where—especially in great depths—their carbonate of lime is partially redissolved.~~

~~Oceanic Carbonic Acid.—It is well known that not only in the~~

~~neighbourhood of actual volcanoes but in thousands of other places on the dry land carbonic acid gas is constantly streaming forth into the atmosphere, and it is generally admitted now that this supply of telluric carbonic acid amounts to more than all that is furnished by processes of combustion and respiration. That carbonic acid springs should be absent from the bottom of the ocean is too absurd an assumption to be entertained ; hence, supposing even the water of the ocean were perfectly~~

~~*neutral, it could not but contain dis- solved carbonic acid. But such carbonic acid, at the ocean surface at least, would constantly tend to assume, and in general probably actually would come down to, the small limit value prescribed to it by the given proportion by volume of the carbonic acid in the atmosphere and the laws of gas-absorption. This proportion, ac- cording to the best modern researches, is almost constant, every- where amounting to very nearly 0°0003 volume per unit volume of air. The coefficient of absorption by even pure water is 1°8 at 0° and 1:0 at 15° C. Hence, even in the polar regions, the surface water could not hold in permanent solution more than about 0°54 c.¢c., or say one milligramme per litre of water. Jacobsen, in his*~~

~~*d=3‘0308*~~

~~*ee 2 Equal conjointly to 55°376 parts of chlorine, which accordingly is the percentage of "halogen reckoned as chlorine" in the real total solids. 3 Calculating the surplus base as normal carbonate. In Table IT. this carbonate is represented as so much CaOCO,.*~~

~~*numerous analyses of North Sea water, found from 90 to 100 milli-grammes per litre; but he also observed that only a small portion of the carbonic acid is eliminated on boiling: the rest comes out only when the water is distilled to dryness. He presumed that the gas was retained chemically by the chloride of magnesium. Buchanan, who inquired into the subject synthetically, arrived at the conclusion that it was the sulphates! in sea water (qua sul- phates) which retained the carbonic acid. Accordingly in his numerous carbonic acid determinations he liberated the gas by distilling the water down with an excess of chloride of barium. Tornoe was the first to prove that the carbonic acid in sea water is present as carbonate, and that, in the northern part of the North Atlantic at least, the total carbonic acid, while considerably greater than the quantity which would convert the surplus base into normal, falls short of that which would be required to produce fully saturated acid carbonate.*~~

~~*Even without Tornée's discovery it would have been necessary to find the true interpretation of the results of the numerous carbonic acid determinations made during the voyage of the 'Challenger " by Buchanan, Dittmar had no difficulty in prov- ing the non-existence of the alleged affinity of sulphates for car- bonic acid, and naturally concluded that the chloride of barium used in the processes Mberates the loose part of the carbonic acid by converting the normal carbonate part into a precipitate of carbonate of baryta, thus—R"'CO, + «CO, + BaCl,= R"'Cl,+ BaCO,+xCO,. A series of synthetical experiments showed that this is substantially, though not exactly, correct. If Buchanan's modus operandi be rigorously followed, the carbonic acid obtained, as a rule, falls somewhat short of the actual amount of loose carbonic acid present, while on resuming the distillation after addition of fresh water an appreciable part of fixed carbonic acid passes away as gas. Yet,*~~

~~Buchianan's results being of great value, Dittmar discussed them (conjointly with his own alkalinity determinations) on the basis of the assumption that they afforded a fair approximation to the proportions of loose carbonic acid in the respective waters. His gen- eral conclusions are as follows. Taking "alkalinity " as meaning the " weight" of the carbonic acid, CO,, in the normal earbonate part of the carbonate present per 100 parts of total solids, the alka- linity in the water samples analysed (omitting a few obviously abnormal cases) was found to be as follows (Table IV.) :—~~

~~Alkalinity ranges from pA ae Alkalinity ranges from ie aed 0°1400 to 0°1439 ..... 9 0°1640 toO°1719 ..... 6 On40n, Or UanO) see ees | 84 AN OE Boos phen as 1 0°1480,, 0°1519 ..... | 40 5 = Oe oe 1 071520 ,, 0°1559 ..... 19 a =) UOT) Bacconcaen 1~~

~~0'1560,, 01599 .....) 13~~

~~|9'2000 ,, 0-169… . | 4 ||0-1400 to 0°2079 ..... 127~~

~~Values above 0°16 are obviously exceptional; hence the normal range may be said to be from 0°14 to 0°16. The most frequently occurring values were found to be about 0°146 in the case of surface or shallow sea water, and in the case of bottom water about 0°152. In regard to the loose carbonic acid a full discussion of Buchanan's results led to the following conclusions :—(1) carbonic acid rarely occurs in the free state ; asa rule it falls short of the quantity which would produce bicarbonate ; (2) in surface waters it is relatively high where the natural temperature is relatively low, and viee versa ; (3) within equal ranges of temperature it seems to be less in the surface water of the Pacific than it is in that of the Atlantic Ocean. Of the 195 samples of sea water which Buchanan analysed for carbonic acid only 22 contained fully saturated bicarbonate, and only 2 out of these are proved by the analyses to have contained free carbonic acid in addition to bicarbonate. In all the remaining 178 samples the "carbonic acid deficit" (meaning the proportion of carbonie acid which was wanted to completely transform the carbonate into bicarbonate) assumed tangible and often considerable values. We are probably safe in concluding that the ocean as a whole will have to continue taking in carbonic acid for thousands of years before its~~

carbonic acid deficit has been reduced to nothing. But it is as well to observe that at its surface in the warmer lati- tudes the attainment of this condition is a physical impossibility as long as the percentage of carbonic acid in the air retains its present low value.

A solution of a bicarbonate when shaken, say in a bottle, with pure air (free of carbonic acid) at summer heat gives up its com- bined carbonic acid to the air space in the bottle until the partial tension of the acid gas there las come up to a limit value py, which is called the dissociation tension of the bicarbonate at the prevail- ing temperature ¢. General experience concerning such phenomena warrants the presumption that, up to a certain (low) temperature ty, p=0, and thence onwards, p increases with ¢ It does not follow that the bicarbonate in a solution when shaken again and " again with even pure air tends to become normal carbonate ; for aught we know, the elimination of carbonic acid may stop as soon as the residual carbonate has come down to some composition

1 See GEOLOGY, vol. x. p. 222.

SHEA WATER

R'O(1 +x)CO, (where x is Jess than 1), and # may be a function of temperature. Dittmar has attempted to determine the course of the function 1+a=/(¢) in reference to natural sea water on the one hand and to pure air (air freed of its carbonic acid) and ordinary airon the other. One sample of sea water containing its surplus base as practically bicarbonate served for all the experiments. It was shaken again and again at a fixed temperature ¢ with one or the other kind of air, until (after '"N" shakings, always with renewed air) the stage of saturation appeared to have become con- stant. The investigation is not completed yet; the following table (V.) gives the results which have come out so far. The final carbonate was R,O.nCO,.

. . eC 7 : . Pure air. |Ordinary air. Pure air. Ordinary air,

= | t, N, Ng. 2). t, hae Ny. | Ny. 2°C.| 200 1:90 15° 200 1°50 De 200 2°04 0 20° 200 | 1:42 (?) ON 52 2°06 25° 52 3 1°53 10° 200 1°70 O0 32° 52 1°53 13° 50 as 1°841 82° 52 bo 15° 100 1°63 a0 aoe 150

~~*the state of sesquicarbonate, while with ordinary air, even at 32°C it never fell below n=1°8. value characteristic of bicarbonate. Now Buchanan reports a good number of eases where, even at lower temperatures, was con- siderably less than 1°8 at any rate. Hence, if his numbers are correct, unless the atmosphere acts more powerfully than the air in Dittmar's bottle, it would appear that deep-sea water is in general below even the stage of carbonic acid saturation which it could attain at the surface at high temperatures,*~~

~~*In any mixed solution of salts every base is combined with every acid ; hence the "carbonate" of sea water is strictly speaking a complex plural. But as a matter of probability the carbonic acid las very little chance of uniting with any of the potash or soda, and the overwhelmingly large quantity of alkaline chloride would no doubt convert any carbonate of magnesia that was introduced into double chloride of magnesium and alkali metal; hence it is fair to assume that oceanic carbonate is chiefly carbonate of lime. Now immense quantities of this compound are being constantly introduced into the ocean by rivers. Dumas once gave it as his opinion that this imported carbonate remains dissolved in the ocean as long as and wherever the carbonate there is at the bicarbonate stage ; but, as soon as part of the loose carbonic acid goes off into the air, the corresponding weight of normal carbonate separates out as an addition, ultimately, to the solids on the bottom. Dittmar has tried to test this notion synthetically, but without arriving at very definite results. According to his experiments sea water which contains free carbonic acid dissolves added solid carbonate of lime, and more largely carbonate of magnesia; sea water which contains fully, or almost fully, saturated bicarbonate dissolves car- bonate of magnesia very appreciably, but would not appear to act on earbonate of lime at all. But, when carbonate of lime was produced in the water by successive additions of potential calcium carbonate in the form of dissolved sodium carbonate and its equivalent of calcium chloride, the original carbonate of lime could be increased very largely, with formation of solutions whicl remained clear during a long-continued period of observation. Asa set-off against this a few of the many hundred samples of sea water which he received from the " Challenger" deposited in the course of a number of years crystalline crusts of carbonate of lime on the sides of the bottles ; and the mother-*~~

~~*liquor never coutained more than the normal quantity of lime per 100 parts of chlorine. In discussing this question Dittmar gives an estimate, based on data furnished by Boguslawski's work, of the total carbonate of lime introduced into the ocean annually by the thirteen principal rivers ; and by doubling the quantity he estimates the earbonate of lime intro- duced by all rivers as equal to about 1:34 × 109 tons. Now the sum total of carbonate of lime, CaCO,, in the ocean amounts to about 160 ×10! tons; hence it would take 1190 years to increase the present stock of carbonate of lime in the ocean by one per cent. of its value.*~~

~~*Absorbed Oxygen and Nitrogen in Ocean Water.—As a matter of physical necessity these two gases must be prescut in the water of the ocean—and they may be presumed in general to pervade it to its greatest depth—because the whole of the surface of the sea is in constant contact with the atmosphere. Our knowledge regarding their distribution in the ocean may be said to date from 1872, when Jacobsen inquired into the matter in a most masterly manner in connexion with the German North Sea expedition. The work of his predecessors possesses no scientific value, because they em- ployed inadequate methods. Unlike them, Jacobsen did not attempt to analyse a sample of sea water air on board ship: he extracted the air from measured samples (by an excellent method of his own) and then sealed them up in glass tubes, to measure and analyse them after his return home. Buchanan, during the*~~

~~*At 2° m% as well as 1, was =2, the*~~

~~*SHEA WATER*~~

~~*"Challenger" cruise adopted Jacobsen's method. Of the 164 samples which he sealed up successfully 69 came from the surface and 95 from depths varying from 5 to 4575 fathoms.*~~

~~*Percentage of Oxygen in Dissolved Gas.*~~

~~*Tempera- Dissolved Nitrogen and Oxygen in Cubic*~~

~~*Centimétres (volumes).*~~

~~*Nitrogen. 15°60 13°86 12°47 11°34 10°41*~~

~~*9°62*~~

~~*8·94*~~

~~*8°36*~~

~~*34°40 34°24 34°09 33°93 33°78 33°62 33°47 33°31*~~

~~*The method used for obtaining these numbers adapted itself closely to the one which Buchanan had employed for extracting the gas samples. In the ealculations it was assumed that atmo- spheric air contains 21:0 volumes of oxygen for 79°0 volumes of nitrogen, the slight variation in this ratio, which is known to occasionally present itself, being neglected. From the table we can calculate approximately the limits between which the propor- tions of dissolved oxygen and nitrogen in the watcr of the ocean must be presumed to oscillate in nature, The pressure of the atmosphere at the sea-level, though by no means constant, is never far removed from that of 760 mm. of mercury. The temperature of the surface water (with rare exceptions) may be said to vary from —2°C. (in the liquid part of the ocean in the arctic and antarctic regions) to about 30° C. (in the tropics). The ocean receives all its dissolved oxygen and nitrogen from the surface; neither gas comes in from below, except perhaps a relatively insignificant quantity of nitrogen derived from the decay of dead organisms, which may safely be neglected. Hence the ocean can contain nowhere more than 15°6 c.c. of nitrogen or more than 8°18 c.c. of oxygen per litre, and the nitrogen will never fall below 8°55 e.e. We cannot make a similar assertion in regard to the oxygen, because its theoretical minimum of 4°30 ¢c.c. per litre is liable to further diminution by processes of life and putrefaction and by oxidation generally.*~~

~~*At any point in the surface of the ocean the water constantly tends to assume the composition demanded for the prevailing temperature by the laws of gas absorption. But it is rarely possible for it to assume this composition, owing to the water being in a continual state of motion; and, supposing a certain area of the ocean surface were in a state of stagnation, the temperature would vary in diurnal eycles, and even the*~~

~~*calculated volume of nitrogen per litre would be a periodic function of time, exhibiting its maxi- mum at the hour of minimum temperature, and vice versa. The process of absorptiometric exchange, however, even at the constantly oscillating surface of the ocean, is slow; it could not keep pace with the change of temperature, and the actual nitrogen curve would never go as high up or as low down as the theoretical one. In addition to this, the lower strata of the water constantly add to, or take away from, the surface nitrogen by diffusion and occasional intermixture. All this holds for the oxygen likewise, except that it is liable to constant diminution by oxidation. On the whole we may assume that all the disturbing influences will only modify, not efface, the course of events as prescribed by the laws of gas-absorption.*~~

~~*In regard to non-surface water we have to confront a greater complexity of phenomena. The gas-contents of deep-sea water, of course, have nothing to do with the low temperature and the high pressure which in general prevail there. For the purpose of a preliminary survey, let us imagine a deep-sea water formed from one kind of surface water, which took up its air at a constant temperature (¢), and then sank down unmixed with other waters. The volumes of the oxygen and nitrogen per litre have at first the values assigned to them by the laws of gas absorption. But, while the nitrogen (as long as the water remains unmixed with other water) remains constant, the oxygen will become less and less through the processes of oxidation which go on in the deep with- out compensation. Hence if there were absolute stagnation in the ocean anywhere the proportion of oxygen there might be reduced ultimately to nothing. Among the many "Challenger" deep-sea specimens which were analysed for their gas-contents none was*~~

~~*1 Theoretically any number may be substituted for 760; for calculating pur- poses read "1 millimétre."*~~

~~*_ 2 In calculating these limit values the tension of the vapour of water is taken into account ; hence the apparent non-agreement with the entries in the table.*~~

~~*found quite frce from absorbed oxygen; and this confirms the conclusion that absolute stagnation exists nowhere in the ocean, not even at its greatest depth. Occasionally, however, the oxygen was found to have sunk down to very little, as shown by the following two examples :—*~~

~~*No. of C.c. per Litre of C.c. of Oxygen calculated Depth in Sample. Nitrogen. Oxygen. from Nitrogen. Fathoms.*~~

~~*1001 15°08 0°6 8°21 2875*~~

~~*1645 13°38 2°04 6°95 1500*~~

~~*There must have been an approximation to absolute rest at these two places at any rate. On the whole, the results of the gas analy- sis, as interpreted on the basis of Dittmar's absorptiometric deter- minations, agreed fairly well with the inferences which we have just been deducing from physical laws. There was no lack of anomalous results, but it was not found possible to trace them to natural causes. The equilibrium in regard to the absorbed nitrogen and oxygen in the ocean is maintained by the atmosphere ; and, from the fact that the air contained in surface water is always richer in oxygen than is atmospheric air, one naturally concludes that the ocean should constantly add to the percentage of oxygen in the air in the tropics and constantly diminish it in the colder latitudes. But Regnault's numerous air-analyses do not confirm this. Nor need this be wondered at, since, as we have seen, even the corresponding influence on the atmospheric carbonic acid has so far defied the powers of chemical analysis.*~~

~~*Salinity of Ocean Water.—Even in the open ocean the "salinity" — meaning in a given quantity the ratio between the weight of dissolved salt and the weight or volume of the whole—is subject to considerable variation ; and it obviously is one of the foremost duties of observing oceanographers to collect the data by means of which it may be possible one day to represent that quantity mathe- matically as a function of geographic position, depth, and time. For the quantitative determination of the salinity an obvious, easy,*~~

~~*and sufficient method is to determine the specific gravity 8 at a*~~

~~*convenient temperature ¢; this in fact is the method which has*~~

~~*so far been employed by all observers almost to the exclusion of*~~

~~*every other. Buchanan used it during the "Challenger" cruise o o*~~

~~*perhaps more extensively than any of his predecessors had done.*~~

~~*Of the arithmetical relation between salinity on the one hand*~~

~~*and S and ¢ on the other the successive researches of Ekman (as*~~

~~*supplemented by Tornde), Thorpe and Riicket, Dittmar, and others have given us a practically sufficient knowledge. According to Dittmar the function (within the limits of Buchanan's values) coincides practically with the formula ae — Wr=x(a + bt + ct),*~~

~~*where 4S, means the specific gravity at C. referred to that of pure water of +4°C. as equal to 1000; ,W, has a similar meaning in reference to pure water; x stands for the weight of total halogen calculated as chlorine per 1000 parts, by weight, of sea water ; and a=1°45993, b= —0:005592, c= +0°0000649. For oceanographic purposes, however, it is not necessary to go back to x; it suflices from series of values ,8, to deduce the corresponding values ,S;, for a convenient standard temperature, and to reason on these reduced numbers as if they measured the salinity, just as we take the readings of a thermometer as in themselves representing "temperatures." This, in fact, is always done ; only unfortunately different standard temperatures have been chosen by different observers ; Buchanan adopted 15°56 C.=60° Fahr. Before going further, let us observe that the specific gravity of sea water, taking it as it is a situ, has an important oceanographic significance, even as such. But this quantity in the case of deep-sea waters is influenced very largely® by the pressure of the super- incumbent layer of water—which in itself is a complex function of the successive temperatures and salinities—and unfortunately we still lack the constants and formule for making the necessary reductions with adequate exactitude. Meanwhile all our statistics of sea water specific gravities,*~~

~~*valuable as they are, constitute statistics of only salinities and nothing else.*~~

~~*At the surface of the ocean the salinity is liable chiefly to three influences, —(1) concentration by formation of ice or by the action of dry winds ; (2) dilution through the melting of ice or the falling of rain ; (3) concentration or dilution through the virtual addition of salt or water by inflowing currents of salter or fresher water respectively. The effeet of the formation or melting of ice, though great within the arctic circles, does not tell much on the non-polar seas. More important in regard to these is the effect of the south-east and the north-east trade winds, which in the Pacific blow between about 3° and 21°S. lat. and between about 2° and 20° N. lat. re- spectively, leaving between the two a belt of 5° of a region of ealms (see more exactly, METEoRoLoGy, vol. xvi. p. 144), In the Atlantic the limiting lines of both trades oscillate annually, so that the equatorial boundary of the north-east trade shifts from 3° to 11° N. lat., and that of the south-east trade from about 1° to 3° X. lat.*~~

~~*3 According to Grassi's experiments, if sea water under the pressure of one atmosphere has the specific gravity 1026, it assumes at depths=1000, 2000,*~~

~~*3000 fathoms a density of 1026+ 1, 2, 3 times 7°9 units=1033°9, 1041°8, 1049°7 respectively.*~~

~~*614*~~

~~*Both trades blowing from colder into warmer regions absorb water largely and thus raise the salinity within their areas of action. The western anti-trades which blow on the polar sides of the two trades, passing from hotter to colder regions, should dilute the ocean there; but they do not seem to act so powerfully in this direction as might be expected. Inthe belt of equatorial calms*~~

~~*between the two trades abundant rains fall frequently and dilute the water very perceptibly.*~~

~~*What has been said thus far about the distribution of surface salinity applies chiefly to the Atlantic, which in fact is far more i known in this respect than any other ocean:*~~

~~*The ac-*~~

~~*a*~~

~~*companying diagram shows how on the average the surface salinity varies there with the latitude. The bolder curve is drawn after a table given by Buchanan in his part of the Narrative of the Cruise of the "Challenger," the other after a more extensive table given by Boguslawski as embodying the mean results of many observations by different authorities with reference to standard temperatures varying from 15° to 17°5 C.,—coast waters affected by the influx of large rivers having been omitted.' In the North Atlantic there is an area of maximum (surface) salinity (S=1028°5) betw een 25° and 35° N. lat. and 30° and 20° W. long. The zone of minimum salinity lies between 15° N. lat. and the equator. In the South Atlantic (surface) there are two concentration centres,—an eastern about St Helena and between that island and Ascension, and a western north of San Trinidad,—both nearer the equator than that of the North Atlantic. As pointed out by Buchanan, a relatively high salinity (not merely on the surface) is quite a characteristic feature of the Atlantic, and in its northern part prevails up to the high latitudes of the Norw egian Sea, which was so thoroughly in- vestigated by Swensden (1876) and Tornée (1877 and 1878) during the Norwegian expeditions. The salt (and heat) conveying influ- ence of the Gulf Stream makes itself felt up to Spitzbergen (76° N.*~~

~~*lat.). On both sides of the Faroe Islands the specific gravity 15S17.5 Comes up to 1027°0 ; at the Bear Islands it sinks to 1026-7,*~~

~~*and thence farther northwards to 10261. While the Gulf Stream pushes northwards, a current of relatively fresh polar water travels southwards and, creeping along the eastern coast of the United States, forms w hat is known as the 'cold wall." In passing from the surface to the depth of the ocean the general rule (Buchanan) is that the actual specific gravity im sitw increases with the depth ; but this does not hold for the salinity (or*~~

~~specific gravity reduced to standard temperature). In places where there is active dilution at the surface (e.g., in the belt of equatorial calms) the salinity as a rule increases down to some 50 or 100 fathoms ; but thence down- wards it follows the general rule, that is, it decreases down to 800 or 1000 fathoms, and thence increases steadily to the bottom. In the South Atlantic the salinity of the bottom water has an almost constant value (48)5,,=1025°7 to 1025°9); but northwards it in-~~

~~creases to from 102616 to 102632 at 2000 to 4000 fathoms (Buchanan).~~

~~In regard to the Pacific our knowledge is far less complete. A ated at the curve shows that the (surface) salinity at a given latitude is less there than it is in the Atlantic. In the whole of the Pacific there is only one concentration centre, which lies about the Society Islands, with a maximum salinity corresponding to ,S,5.,= 1027°19. (W. D.)~~

~~SEA-WOLF, also Sza-cat and Woxr-FisH (Anarrhichas~~

~~lupus), a marine fish, the largest kind of the family ' For the sake of comparison there is shown on the lower part of~~

~~the diagram the surface salinity curve for the Pacifie drawn after Buchanan' $ summary tabulation of his results.~~

~~SEHEA—S EB~~

~~| Blenniide or Blennies.~~

~~el Fae a~~

~~as cowie variation ie surface salinity of ocean with latitude.~~

~~In spite of its large size, it has. retained the bodily form and general external character- istics of the small blennies, which are so abundant on every rocky part of the coast. Its body is long, subeylin- drical in front, compressed in the caudal portion, smooth and slippery, the rudimentary scales being embedded and almost hidden in the skin. An even dorsal fin extends along the whole length of the back, and a similar fin from the |~~

vent to nd caudal am as in blennies, But its formidable dentition distinguishes the sea-wolf from all the other members of the s\family. Both jaws are armed in front with strong conical teeth, and on the sides with two series of large tubercular molars,' a biserial band of simi- lar molars occupying the === middle of the palate. By these teeth the sea-wolf is able to crush the hard carapaces or shells of the |_| crustaceans and molluscs. ele which it feeds; but ,| Whether it uses the teeth ihre a weapon of defence Pee deserves the character of ferocity generally attri- buted to it would appear to be rather questionable from observations made on specimens in the aquarium at Hamburg, which allowed them- selves to be handled without in any way re- senting the loss , of their liberty. (>

/

It must, how-/

ever, be added

that the small / blennies bite Teeth of the lower and upper jaws of the sea-wolf.

readily when caught. Sea-wolves are inhabitants of the northern seas of both hemispheres, one (A. lupus) being common on the coasts of Scandinavia and North Britain, and two in the seas round Iceland and Greenland. Two others occur in the corresponding latitudes of the North Pacific. They attain to a length exceeding 6 feet, and in the north are esteemed as food, both fresh and preserved. The oil extracted from the liver is said to be in quality equal to the best cod-liver oil. Of late years small num- bers have reached the English markets, where, however, the prejudice which attaches to all scaleless fishes, parti- cularly such as possess a varied pattern of coloration, limits their use as food.

SEBASTE. See Srvas.

SEBASTIAN, Dom. See Portucat, vol. xix. pp. 546-

547,

~~*SEBASTIAN, §8r, the patron saint against plague and pestilence, was by birth a Narbonese. According to the Roman breviary his nobility and bravery had endeared him to the emperor Diocletian, who made him captain of the first cohort. Having secretly become a Christian, he was wont to encourage those of his brethren who in the hour of trial seemed wavering in their profession, This was conspicuously the case when the brothers Marcus and Marcellinus were being led forth to death ; by his exhorta- tions he prevailed on them to resist the entreaties and tears of their wives and children, The emperor having been informed of this conduct sent for him and earnestly remon-*~~

~~*strated with him, but, finding him inflexible, ordered that he should be bound to a stake and shot to death. After the archers had left him for dead a devout woman, Irene, came by night to take his body away for burial, but, find- ing him still alive, carried him to her house, where his wounds were dressed. No sooner had he wholly recovered than he hastened to confront the emperor, reproaching him with his impiety; Diocletian, filled with astonishment, which soon changed into fury, ordered him to be instantly carried off and beaten to death with rods (288). The sentence was forthwith executed, his body being thrown into the cloaca, where, however, it was found by another pious matron, Lucina, whom Sebastian visited in a dream, directing her to bury him in the Catacombs under the site of the church now called by his name. He is celebrated by the Roman Church on 20th January (duplex). His cult is chiefly diffused along the eastern coast of Italy and in other districts liable to visitations of plague. As a young and beautiful soldier, he is a favourite subject of sacred art, being most generally represented as undraped and severely, though not mortally, wounded with arrows.*~~

~~*SEBASTIANO DEL PIOMBO (1485-1547), painter, was born at Venice in 1485, and belongs to the Venetian school, exceptionally modified by the Florentine or Roman. His family name was Luciani. He was at first a musician, chiefly a solo-player on the lute, and was in great request among the Venetian nobility. He soon showed a turn for painting, and became a pupil of Giovanni Bellini and afterwards of Giorgione. His first*~~

~~*painting of note was done for the church of St John Chrysostom in Venice, and is so closely modelled on the style of Giorgione that in its author's time it often passed for the work of that master. It represents Chrysostom reading aloud at a desk, a grand Magdalene in front, and two other female and three male saints. Towards 1512 Sebastiano was invited to Rome by the wealthy Sienese merchant Agostino Chigi, who occupied a villa by the Tiber, since named the Farnesina ; he executed some frescos here, other leading artists being employed at the same time. The Venetian mode of colour was then a startling novelty in Rome. Michelangelo saw and approved the work of Luciani, became his personal friend, and entered into a peculiar arrangement with him. At this period the pictorial ability of Michelangelo (apart from his general power as an artist, regarding which there arose no question) was somewhat decried in Rome, the rival faculty of Raphael being invidiously exalted in comparison ; in especial it was contended that Buonarroti fell short as a colourist. He therefore thought that he might try whether, by furnishing designs for pictures and leaving to Sebastiano the execution of them in colour, he could not maintain at its highest level his own general supremacy in the art, leaving Raphael to sustain the competition as he best might. In this there seems to have been nothing particu- larly unfair, always assuming that the compact was not fraudulently concealed ; and the facts are so openly stated by Michelangelo's friend Vasari (not to speak of other writers) that there appears to have been little or no dis- guise in the matter. Besides, the pictures are there to speak for themselves; and connoisseurs have always ac- knowledged that the quality of Michelangelo's unmatched design is patent on the face of them. Of late years, how- ever, some writers, unnecessarily jealous for Buonarroti's personal rectitude, have denied that his handiwork is to be traced in the pictures bearing the name of Sebastiano. Four leading pictures which Sebastiano painted in pursu- ance of his league with Buonarroti are the Pieta (earliest of the four), in the church of the Conventuali, Viterbo ; the Transfiguration and the Flagellation, in the church of S Pietro in Montorio, Rome; and, most celebrated of*~~

~~*all, the Raising of Lazarus, now in the London National Gallery. This grand work—more remarkable for general strength of pictorial perception than for qualities of de- tailed intellectual or emotional expression—is more than 12 by 9 feet in dimensions, with the principal figures of the natural size; it is inscribed '"Sebastianus Venetus faciebat," and was transferred from wood to canvas in 1771. It was painted in 1517-19 for Giulio de' Medici, then bishop of Narbonne, afterwards Pope Clement VIL. ; and it remained in Narbonne cathedral until purchased by the duke of Orleans early in the 18th century,—coming to England with the Orleans gallery in 1792. It is generally admitted that the design of Michelangelo appears in the figure of Lazarus and of those who are busied about him (the British Museum contains two sketches of the Lazarus regarded as Michelangelo's handiwork) ; but whether he actually touched the panel, as has often been said, appears more than doubtful, as he left Rome about the time when the picture was commenced. Raphael's Transfiguration was painted for the same patron and the same destination. The two works were exhibited together, and some admirers did not scruple to give the preference to Sebastiano's. The third of the four pictures above mentioned, the Flagellation of Christ, though ordinarily termed a fresco, is, according to Vasari, painted in oil upon the wall. This was a method first practised by Domenico Veneziano, and afterwards by some other artists ; but Sebastiano alone succeeded in preventing the blackening of the colours. The contour of the figure of Christ in this picture is supposed by many to have been supplied by Buonarroti's own hand. Sebastiano, always a tardy worker, was occupied about six years upon this work, along with its companion the Transfiguration, and the allied figures of saints.*~~

~~*After the elevation of Giulio de' Medici to the pontificate, the office of the " piombo" or leaden seal—that is, the office of sealer of briefs of the apostolic chamber—became vacant ; two painters competed for it, Sebastiano Luciani, hitherto a comparatively poor man, and Giovanni da Udine. Finally Sebastiano, assuming the habit of a friar, secured the very lucrative appointment,—with the proviso, however, that he should pay out of his emoluments 300 scudi per annum to Giovanni. If he had heretofore been slow in painting, he became now supine and indifferent in a marked degree. He lived on the fat of the land, cultivated sprightly literary and*~~

~~other society, to which he contributed his own full quota of amusement, and would scarcely handle a brush, saying jocularly that he benefited the profession by leav- ing all the more work for other artists to do. Berni, one of his intimates, addressed a capitolo to him, and Sebastiano responded in like versified form. One of the few subject- pictures which he executed after taking office was Christ carrying the Cross for the patriarch of Aquileia, also a Madonna with the body of Christ. The former painting is done on stone, a method invented by Sebastiano himself. He likewise painted at times on slate,—as in the instance . of Christ on the Cross, now in the Berlin gallery, where the slate constitutes the background. In the same method, and also in the same gallery, is the Dead Christ supported by Joseph of Arimathea, with a weeping Magdalene,— colossal half-length figures. Late in life Sebastiano had a serious disagreement with Michelangelo with reference to the Florentine's great picture of the Last Judgment. Sebastiano encouraged the pope to insist that this picture should be executed in oil. Michelangelo, determined from the first upon nothing but fresco, tartly replied to his holiness that oil was only fit for women and for sluggards like Friar Sebastian ; and the coolness between the two painters lasted almost up to the friar's death. This event, consequent upon a violent fever acting rapidly upon a~~

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~~very sanguine temperament, took place at Rome in 1547. Sebastiano directed that his burial, in the church of §S. Maria del Popolo, should be conducted without ceremony of priests, friars, or lights, and that the cost thus saved should go to the poor ; in this he was obeyed.~~

~~Numerous pupils sought training from Sebastiano del Piombo ; but, owing to his dilatory and self-indulgent habits, they learned little from him, with the exception of Tommaso Laureti. Sebas- tiano, conscious of his deficiency in the higher sphere of invention, made himself especially celebrated as a portrait painter: the like- ness of Andrea Doria, in the Doria Palace, Rome, is one of the most renowned. In the London National Gallery are two fine specimens: one canvas represents the friar himself, along with Cardinal Ippolito de' Medici; the other, a portrait of a~~

~~*lady in the character of St Agatha, used to be identified with one of Sebastiano's prime works, the likeness of Julia Gonzaga (painted for her lover, the aforenamed cardinal), but this assumption is now discredited. There were also portraits of Marcantonio Colonna, Vittoria Colonna, Ferdinand marquis of Pescara, Popes Adrian VI., Clement VII. (Studj Gallery, Naples), and Paul III., Sanmicheli, Anton Fran- cesco degli Albizzi, and Pietro Aretino. named sitter is in Arezzo and another in the Berlin gallery.*~~

~~*SEBASTOPOL, or SEvasropot, the chief naval station of Russia on the Black Sea, is situated in the south-west of the Crimea, in 44° 37' N lat. and 33° 31' E. long., 935 miles from Moscow, with which it is connected by rail via Kharkoff. The estuary, which is one of the best roadsteads in Europe and could shelter the combined fleets of Europe, is a deep and thoroughly sheltered indentation among chalky cliffs, running east and west for nearly 3? miles, with a width of three-quarters of a mile, narrowing to 930 yards at the entrance, where it is protected by two small promontories. It has a depth of from 6 to 10 fathoms, with a good bottom, and large ships can anchor at a cable's length from the shore. The main inlet has also four smaller indentations,—Quarantine Bay at its entrance, Yuzhnaya (Southern) Bay, which penetrates more than a mile to the south, with a depth of from 4 to 9 fathoms, Dockyard Bay, and Artillery Bay. A small river, the Tchornaya, enters the head of the inlet. The main part of the town, with an elevation ranging from 30 to 190 feet, stands on the southern shore of the chief inlet, between Yuzhnaya and Artillery Bays. To the east are situated the barracks, hospitals, and storehouses ; a few buildings on the other shore of the chief bay constitute the "northern side." Before the Crimean War of 1853-56 Sebastopol was a well-built city, beautified by gardens, and had 43,000 inhabitants ; but at the end of the siege it had not more than fourteen buildings which had not been badly injured. After the war many privileges were granted by the Govern- ment in order to attract population and trade to the town ; but both increased slowly, and at the end of seven years its population numbered only 5750. The railway line connecting Sebastopol with Moscow gave some animation to trade, and it was thought at the time that Sebastopol, although precluded by the treaty of Paris from reacquiring its military importance, might yet become a commercial city. In November 1870,*~~

~~*during the Franco-German War, the Russian Government publicly threw off the obligation of those clauses of the treaty of Paris which related to the Black Sea fleet and fortresses, and it was decided again to make Sebastopol a naval arsenal. In 1882 Sebastopol had a population of 26,150 inhabitants, largely military. The town has been rebuilt on a new plan, and a fine church occupies a prominent site. There are now two lyceums and a zoological marine station. Although belonging to the government of Taurida, Sebas- topol and its environs are under a separate military governor.*~~

~~*The peninsula between the Bay of Sebastopol and the Black Sea became known in the 7th century as the Heracleotic Chersonese (see vol. vi. p. 587). In the 5th century B.c. a Greek colony was*~~

~~*founded here and remained independent for three centuries, when it became part of the kingdom of the Bosphorus, and subsequently*~~

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~~*One likeness of the last-|*~~

~~*tributary to Rome. Under the Byzantine emperors Chersonesus was an administrative centre to their possessions in Taurida. Ac- cording to the Russian annals, Vladimir, prince of Kicff, conquered Chersonesus (Korsuii) before being baptized there, and restored it to the Greeks on marrying the princess Anna. Subsequently the Slavonians were cut off from relations with Taurida by the Mongols, and only made occasional raids, such as that of the Lithuanian prince Olgerd. In the 16th century a new influx of colonizers, the Tatars, occupied Chersonesus and founded a settlement named Akhtiar. This village, after the Russian conquest in 1788, was sclected for the chict naval station of the empire in the Black Sea and received its present name ("The August City"). In 182¢ strong fortifications were begun, and in 1853 it was a formidable fortress. In September 1854, after having defeated the Russians in the battle of the Alma, the Anglo-French laid siege to the southern portion of the town, and on 17th October began a heavy bombardment. Sebastopol, which was nearly quite open from the land, was strengthened by earthworks thrown up under the fire of the besiegers, and sustained a memorable eleven*~~

~~*months' siege, On 8th September 1855 it was evacuated by the Russians, who retired to the north side. The fortifications were blown up by the allies, and by the Paris treaty the Russians were bound not to restore them.*~~

~~*SEBENICO (Sibenik), a town of Austrian Dalmatia, on the coast of the Adriatic, about half-way between Zara and Spalato, is situated on an irregular basin at the mouth of the Kerka, connected with the sea by a winding channel 3 miles long. The channel is defended by a fort designed by Sanmicheli, and the town itself, picturesquely situated on the abrupt slope of a rocky hill, is guarded by three old castles, now dismantled. There is also a wall on the landward side. Sebenico is the seat of a bishop, and its Italian Gothic cathedral, dating from the 15th and 16th centuries, is considered the finest church in Dalmatia. Its excellent harbour and its situation at the entrance of the Kerka valley combine to make Sebenico the entrepdt of a considerable trade. Fishing is carried on exten- sively. The population of the commune in 1880 was 18,104, of the town proper about 8000.*~~

~~*SECCHI, Ancgxo (1818-1878), Italian astronomer, was born on 29th June 1818 at Reggio in Lombardy, and entered the Society of Jesus at an early age. In 1849 he was appointed director of the observatory of the Collegio Romano, which was rebuilt in 1853; there he devoted himself with great perseverance to researches in physical astronomy and meteorology till his death at Rome on 26th February 1878.*~~

~~*The results of Secchi's observations are contained in a great number of papers and memoirs. From about 1864 he occupied himself almost exclusively with spectrum analysis, both of stars (Catalogo delle Stelle di cwi si é determinato lo Spetiro Luminoso, Paris, 1867, 8vo ; " Sugli Spettri Prismatici delle Stelle Fissc," two parts, 1868, in the Atti della Soc. Ital.) and of the sun (Le Soleil, Paris, 1870, 8vo; 2d ed. 1877). Though his publications always bear witness of his indefatigable zeal and energy, they are often uncritical and wanting in accuracy.*~~

~~*SECKENDORF, Verr Lupwic von (1626-1692), a German statesman and scholar of the 17th century, was the most distinguished member of an ancient and wide- spread German noble family, which took its name from*~~

~~*the village Seckendorf between Nuremberg and Langen- zenn, and is said to have been ennobled by the emperor Otho I. in 950, though it traces its own genealogy no further back than 1262. The family was divided into eleven distinct lines, but at present only three are pre- served, widely distributed throughout Prussia, Wiirtem- berg, and Bavaria! Veit Ludwig von Seckendorf, son of Joachim Ludwig, of the Gudentine line, was born at Herzogenaurach (near Erlangen) in Upper Franconia, 20th December 1626. HIs youth fell in the midst of the Thirty Years' War, in which his father was actively*~~

~~*1 Amongst the Seckendorfs less known to fame than Veit Ludwig are his nephew, Friedrich Heinrich (1673-1763), soldier and diplo- matist ; Leo (1773-1809), poet, literary man, and soldier ; the brothers Christian Adolf (1767-1833) and Gustav Anton ('Patrik Peale") (1775-1823), both literary men of some note.*~~

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~~*engaged. But his talented and noble mother carefully watched over his education. In Coburg, Mihlhausen, and finally in Erfurt, whither his mother removed in 1636, he acquired the Latin, Greek, and French lan- guages. In 1639 he returned to Coburg, and the reign- ing duke, Ernest the Pious, made him his protégé. Enter- ing the university of Strasburg in 1642, he devoted himself to history and jurisprudence. After he finished his university course his patron gave him an appointment in his court at Gotha, with the charge of his valuable library. He there laid the foundation of his great collec- tion of historical materials and mastered the principal modern languages. In 1652 he was appointed to import- ant judicial positions and sent on weighty embassages. In 1656 he was made judge in the ducal court at Jena, a position which he held many years and in which he took the leading part in the numerous beneficent reforms of the duke. In 1664 he resigned office under Duke Ernest, who had just made him chancellor and with whom he continued on excellent terms, and entered the service of Duke Maurice of Zeitz (Altenburg), with the view of lightening his official duties. After the death of Maurice in 1681 he retired to his estate, Meuselwitz in Altenburg, from nearly all public*~~

~~*offices, and devoted himself to his intellectual labours. Although living in retirement, he kept up a correspondence with the principal learned men of the day. He was especially interested in the endeavours of the pietist Spener to effect a practical reform of the German church, although he was hardly himself a pietist. In 1692 he was appointed chancellor of the new university of Halle, but died a few weeks afterwards, on the 18th of Deceniber.*~~

~~*Seckendorf's principal works were the following : — Dewtscher Furstenstaat (1656 and often afterwards), a handbook of German public law; Der Christenstaat (1685), partly an apology for Chris- tianity and partly suggestions for the reformation of the church, founded on Pascal's Pensées and embodying the fundamental ideas of Spener ; Commentarius historicus et apologeticus de Lutheranismo sive de Reformatione (3 vols., Leipsic, 1692) occasioned by the Jesuit Maimbourg's Histoire du Luthéranismé (Paris, 1680), his most important work, and still indispensable to the historian of the Reformation as a rich storehouse of authentic materials.*~~

~~*See D. G. Schreber's Historia vite ac meritorwm Viti Ludovict a Seckendorf (Leipsic, 1733); Schrockh, Lebensbeschreibungen beriihmter Manner (Leipsic, 1790); Nasemann, "Veit Ludwig von Seckendorf," in Preussische Jahrbiucher (vol. xii., 1863, p. 257 sq.); W. Roscher, "Zwei sichsische Staatswirthe im iéten und 17ten Jahrhundert," in Weber's Archiv fiir die stichsische Geschichte (vol, i,, 1862); and Theodor Kolde, "Seckendorf," in Herzog-Plitt's Realen- cyklopddie (1884).*~~

~~*SECRETARY-BIRD, a very singular African animal first accurately made known, from an 'example living in the menagerie of the prince of Orange, in 1769 by Vos- maer,! in a treatise published simultaneously in Dutch and French, and afterwards included in his collected works issued, under the title of Regnum Animale, in 1804. He was told that at the Cape of Good Hope this bird was known as the "Sagittarius" or Archer, from its striding gait being thought to resemble that of a bowman advanc- ing to shoot, but that this name had been corrupted into that of "Secretarius." In August 1770 Edwards saw an example (apparently alive, and the*~~

~~*survivor of a pair which had been brought to England) in the possession of Mr*~~

~~*1 Le Vaillant (Sec. Voy. Afrique, ii. p. 278) truly states that Kolben in 1719 (Caput Bon Spei hodiernum, p. 182, French version, ii. p. 198) had mentioned this bird under its local name of "'Snake-eater"' (Slangen-vreeter, Dutch translation, i. p. 214); but that author, who was a bad naturalist, thought it was a Pelican and also confounded it with the Spoonbill, which is figured to illustrate his account of it. Though he doubtless had seen, and perhaps tried to describe, the Secretary- bird, he certainly failed to convey any correct idea of it. Latham's suggestion (loc. infra cit.) that the figure of the "Grus Capensis cauda cristata" in Petiver's Gazophylaciwm (tab. xii. fig. 12) was meant for this bird is negatived by his description of it (p. 20). The figure was probably copied from one of Sherard's paintings and is more likely to have had its origin in a Crane of some species. Vosmaer's plate is lettered " Amerikaanischen Roof-Vogel," of course by mistake for " Afrikaanischen."*~~

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~~*Raymond near Ilford in Essex ; and, being unacquainted with Vosmaer's work, he figured and described it as "of a new genus" in the Philosophical Transactions for the following year (Ixi. pp. 55, 56, pl. ii). In 1776 Sonnerat (Voy. Nouv, Guinée, p. 87, pl. 50) again described and*~~

~~*Secretary-Bird. figured, but not at all correctly, the species, saying (but no doubt wrongly) that he found it in 1771 in the Philippine Islands. A better representation was given by D'Aubenton in the Planches Enlwminées (721); in 1780 Buffon (Oiseaux, vii. p. 330) published some additional information derived from Querhoent, saying also that it was to be seen in some English menageries; and the following year Latham (Synopsis, i. p. 20, pl. 2) described and figured it from three examples which he had seen alive in England. None of these authors, however, gave the bird a scientific name, and the first conferred upon it seems to have been that of Falco serpentarius, inscribed on a plate bearing date 1779, by John Frederick Miller (Iu. Nat. History, xxviii.), which plate appears also in Shaw's Cimelia Physica (No. 28) and is a misleading caricature. In 1786*~~

~~*Scopoli called it Otis secretarius— thus referring it to the Bustards,? and Cuvier in 1798 designated the genus to which it belonged, and of which 't still remains the sole representative,® Serpentarius. Suc- ceeding systematists have, however, encumbered it with many other names, among which the generic terms G'ypo- geranus and Ophiotheres, and the specific epithets reptil- vorus and cristatus, require mention here.t The Secretary- bird is of remarkable appearance, standing nearly 4 feet in height, the great length of its legs giving it a resemblance to a, Orane or a Heron; but the expert will at once notice that, unlike those birds, its tibie are feathered all the way down. From the back of the head and the nape hangs, loosely and in pairs, a series of black elongated feathers, capable of erection and dilation in periods of excitement."*~~

~~*2 Curiously enough, Boddaert in 1783 omitted to give it a scientific name.*~~

~~*3 Ogilby's attempt to distinguish three species (Proc. Zool. Society, 1835, pp. 104, 105) has met with no encouragement ; but examples from the north of the equator are somewhat smaller than those from the south.*~~

~~*4 The scientific synonymy of the species is given at great length by Drs Finsch and Hartlaub (Vogel Ost-Afrikas, p. 93) and by Mr Sharpe (Cat. B. Brit. Museum, i. p. 45); but each list has some errors in common.*~~

~~*5 It is from the fancied resemblance of these feathers to the pens which a clerk is supposed to stick above his ear that the bird's name of Secretary is really derived.*~~

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~~*The skin round the eyes is bare and of an orange colour. The head, neck, and upper parts of the body and wing- coverts are bluish-grey; but the carpal feathers, including the primaries, are black, as also are the feathers of the vent and tibize,—the last being in some examples tipped with white. The tail-quills are grey for the greater part of their length, then barred with black and tipped with white; but the two middle feathers*~~

~~*are more than twice as long as those next to them, and drooping downwards present a very unique appearance.*~~

~~*The habits of the Secretary-bird have been very frequently described, one of the best accounts of them being by Verreaux in the Zoological Society's Proceedings for 1856 (pp. 348-352). Its chief prey consists of insects and reptiles, and as a foe to snakes it is held in high esteem. Making every allowance for exaggeration, it seems to possess a strange partiality for the destruction of the latter, and successfully attacks the most venomous species, striking them with its knobbed wings and kicking forwards at them with its feet, until they are rendered incapable of offence, when it swallows them. The nest is a huge structure, placed in a bush or tree, and in it two white eggs, spotted with rust-colour, are laid. The young remain in the nest for a long while, and even when four months old are unable to stand upright. They are very frequently brought up tame, and become agreeable not to say useful pets about a house, the chief drawbacks to them being that when hungry they will help themselves to the small poultry, and the fragility of their legs, which follows on any sudden alarm, and ends in their death. The Secretary-bird is found, but not very abundantly and only in some localities, over the greater part of Africa, especially in the south, extending northwards on the west to the Gambia and in the interior to Khartum, where Von Heuglin observed it breeding.*~~

~~*The systematic position of the genus Serpentarius has long been a matter of discussion, and is still one of much interest, though of late classifiers have been pretty well agreed in placing it in the Order SERIEMA, q.v.). (A. N.)*~~

~~*SECULAR GAMES were celebrated at Rome for three days and nights with great ceremony to mark the com- mencement of a new sxculum or generation. Originally they were a propitiatory festival, imported from Etruria under the name of Ludi Terentini, and held at irregular intervals, in view of extraordinary prodigies; but in 249 B.C. it was decreed that they should be celebrated in every hundredth year after that date. This decree was frequently disregarded, partly for political reasons and partly because in Augustus's time and with his approval the quindecem- virl, acting under Greek influence, sanctioned the longer period of 110 years.*~~

~~*The dates of the actual celebrations are as follows :—the first in 509 B.c., the second in 348, the third in 249, the fourth in 146, the fifth by Augustus in 17 (for this occasion Horace wrote his Carmen Seculare), the sixth by Claudius in 47 A.p.=800 A.v.c., the seventh by Domitian in 88, the eighth by Antoninus Pius in 147=900 a.v.c., the ninth by Severus in 204 (220 years after the Augustan celebration), the tenth by Philip in 248, the eleventh and last by Gallienus c. 262. The projected celebration of Maxi- mian in 304 did not take place.*~~

~~*Censorinus, De Die Natali, c. 17; Zosimus, ii. 1 sg.3 Val. Max., if. e. 5. The dates of the first two celebrations appear to rest only on the authority of Valerius Antias ; the others are certain. The quindecemviral books assigned fictitious dates for the pre-Augustan celebrations. Comp. Marquardt, Die romische Staatsverwaltung, iii. p. 369 sq.*~~

~~*SECUNDERABAD, one of the chief British military cantonments in India, is situated in the native state of Haidaribid (Hyderabad) or the Nizam's Dominions, in 17° 26' 30" N. lat. and 78° 33' E. long., 1830 feet above the level of the sea, and 6 miles north-east of Haidardbad city. Secunderabad is the largest military station in India and forms the headquarters of the Haidardbad subsidiary*~~

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~~*force, which constitutes a division of the Madras army. The strength of the military force stationed at Secunderabad in 1883 was 5632, European troops numbering 2276 and native troops 3356. To the south-west of the cantonment there is a large reservoir or tank, known as the Husain Sagar, about 3 miles in circumference. Secunderabad town, which forms the cantonment bazaar, contains a population of over 30,000. Adjoining this cantonment to the north is the Boldram cantonment, one of the stations of the Haidardbad contingent, under the immediate com- mand of the nizam ; and 2 miles to the south of Secunderé- bad cantonment are the lines of the Haidardbad reformed troops, also belonging to the nizam. During the mutiny (1857-58) both the subsidiary force and the Haidarabad contingent rendered good service.*~~

SECUNDUS, Jonannezs, or Jonann Everts (1511- 1536), Latin poet, was born at The Hague on 10th No- vember 1511. He was descended from an ancient and honourable family in the Netherlands ; his father, Nicholas Everts, or Everard, seems to have been high in the favour of the emperor Charles V. On what account the son was called Secundus is not known. His father intended him for the law; but though he took his degree at Bourges it does not appear that he devoted much time to legal pur- suits. Poetry and the sister arts of painting and sculpture engaged his mind at a very early period. In 1533 he went to Spain, and soon afterwards became secretary to the cardinal-archbishop of Toledo, in a department of business which required no other qualification than that which he possessed in a very eminent degree,—a facility in writing with elegance the Latin language. It was during this period that he composed his most famous work, the Basia, a series of amatory poems, of which the fifth, seventh, and ninth Carmina of Catullus seem to have given the hint. In 1534 he accompanied Charles V. to the siege of Tunis, but gained few laurels asa soldier. After quitting the service of the archbishop, Secundus was employed as secre- tary by the bishop of Utrecht ; and so much did he dis- tinguish himself by the classical elegance of his composi- tions that he was called upon to fill the important post of private Latin secretary to the emperor, who was then in Italy. But, having arrived at St Amand, near Tournay, he was cut off by a violent fever on 8th October 1536.

SEDAINE, Micurn Jean (1719-1797), dramatist, was born at Paris on 4th July 1719. Few men of letters have risen from a lower station. Although his father was an architect, he died when Sedaine was quite young, leaving no fortune, and the boy began life as a mason's labourer. He worked himself up in his trade and was at last taken as pupil and partner by the builder who employed him. Meanwhile he had done his best to repair his deficiencies of education, and in 1753 he published a volume of poems of some merit. He then took to the theatre and after composing various vaudevilles and operettas attracted the attention of Diderot, and had two remarkable plays ac- cepted and performed at the Théatre Francais. 'The first and longest, the Philosophe sans le Savoir, was acted in 1765; the second, a lively one-act piece, La Gageure Im- prévue, in 1768, These two at once took their place as stock pieces and are still ranked among the best French plays, each of its class. Sedaine inclined

~~*somewhat to the school of drame or tragédie bourgeoise, but he was free from the excessive sentimentality which in the hands of Diderot and others marred the style, and he had a vein of singularly natural and original comedy. Indeed his originality is one of his chief points, though except the two pieces mentioned little or nothing of his has kept the stage or the shelves. Sedaine, who became a member of the Academy, secretary for architecture of the fine arts division, and a prosperous man generally, was personally*~~

~~*both popular and respected. He lived to a considerable age, dying at Paris on 17th May 1797.*~~

~~*SEDALIA, a city of the United States, county town of Pettis county, Missouri, lies 189 miles west of St Louis, on the highest swell of a rolling prairie, which drains by small streams north-east to the Missouri. It is a railroad centre, and, besides the machine-shops and. carriage- factories of two railway companies (the Missouri, Kansas, and Texas, and the Missouri Pacific, Middle Division), it contains foundries, flour-mills, and establishments for the manufacture of furniture, woollen goods, soap, beer, &c. Among the public buildings are two opera-houses, a public library, a high school, and a gymnasium. Founded in 1860 by General George R. Smith, Sedalia had 4560 inhabitants in 1870, and 9561 in 1880.*~~

~~*SEDAN, a town of France, the chef-lieu of an arrondisse- ment in the department of Ardennes, lies on the right bank of the Meuse, 13 miles east-south-east of Meziéres by the railway to Thionville (Lorraine), and is surrounded by heights of about 1000 feet. Since its fortifications were déclassés, a process of embellishment has been going on. Place Turenne takes its name from the statue of the illustrious marshal, who was born in the town in 1611. The public buildings include a Protestant church, a syna- gogue, a museum, and a college. The manufacture of fine black cloth has long been, and still continues to be, the staple industry, employing in the town and neighbourhood more than 10,000 workmen, and producing to the value of 40,000,000 francs annually. Several spinning-mills have been erected by Alsatian refugees since 1871.*~~

~~*Consider- able activity is also displayed in various departments of metal-working, especially in the surrounding villages. The population was 13,807 in 1872, and 19,240 in 1881 (19,556 in the commune).*~~

~~*Sedan was in the 13th century a dependency of the abbey of Mouzon, the possession of which was disputed by the bishops of Liége and Rheims. United to the crown of France by Charles V., it was ceded by Charles VI. to Guillaume de Braquemont, who sold it to the La Marcks. For two centuries this powerful family managed to continue masters of the place in spite of the bishops of Liége and the dukes of Burgundy and Lorraine ; and in the person of Henri Robert they adopted the title " prince of Sedan." In the 16th century the town was an asylum for many Protestant refugees, who laid the basis of its industrial prosperity, and it became the seat of a Protestant seminary. The last heiress of the La Marck family brought Sedan and the duchy of Bouillon to Henri de la Tour d'Auvergne, viscount of Turenne. When the new duke attempted to maintain his independence, Henry IV. captured Sedan in three days; and the second duke (eldest brother of the great marshal), who had several times revolted against Louis XIII., was at last, after his share in the conspiracy of Cinq- Mars, obliged to surrender his principality. Sedan thus became part of the royal domain in 1641. On Ist September 1870 the fortress was the centre of the most disastrous conflict of the Franco-German War. Shut in by the Germans, who had occupied the surrounding heights, the whole French army, after a terrific contest, was obliged to capitulate,—the emperor, 39 generals, 230 staff-officers, 2600 officers, and 83,000 men becoming prisoners of*~~

~~*war. The village of Bazeilles was the scene of the heroic stand made by the marines under Martin des Pallieres. It now contains the great ossuary, and a monument to the memory of the marines ; and the house which has been rendered famous by Neuville's painting, ""'Les Derniéres Cartouches," is a museum of objects found on the battlefield.*~~

~~*SEDDON, Tuomas (1821-1856), landscape painter, was born in London on 28th August 1821. His father was a cabinetmaker, and the son for some time followed the same occupation; but in 1842 he was sent to Paris to study ornamental art. On his return he executed designs for furniture*~~

~~*for his father, and in 1848 gained a silver medal from the Society of Arts. In the following year he made sketching expeditions in Wales and France, and in 1852 began to exhibit in the Royal Academy, sending a figure- piece, Penelope, and afterwards landscapes, deriving their subjects from Brittany. In the end of 1853 he started for the East and joined Mr Holman Hunt at Cairo. He worked*~~

~~*after a very brief illness, he died on 23d November.*~~

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~~*for a year in Egypt and Palestine, executing views which Mr Ruskin has pronounced to be "the first landscapes uniting perfect artistical skill with topographical accuracy ; being directed, with stern self-restraint, to no other purpose than that of giving to persons who cannot travel trustworthy knowledge of the scenes which ought to be most interest- ing to them." Seddon's Eastern subjects were exhibited in*~~

~~*Berners Street, London, in 1855, and in Conduit Street in 1856. In October 1856 Seddon again visited Cairo, where, In 1857 his works were collected and exhibited in the rooms of the Society of Arts, and his important and elaborately finished picture, Jerusalem and the Valley of Jehoshaphat, was purchased by subscription and presented to the National Gallery. A memoir of Seddon, by his brother, was pub- lished in 1859.*~~

~~*SEDGWICK, Apam (1785-1873), geologist, was born in 1785 at Dent, Yorkshire, where his father was vicar of the parish. He was educated at Sedbergh school and at Trinity College, Cambridge, where he graduated as fifth wrangler in 1808, and was elected a fellow in 1809. For some years he devoted himself chiefly to the studies and duties of academic life, but gradually he acquired an ab- sorbing interest in geology and natural science, which was fostered by long excursions into the country, rendered necessary by the state of his health, In 1818 he suc- ceeded Professor Hailstone in the Woodwardian chair of geology. Among his principal discoveries, which appeared for the most part in the Cambridge Transactions and the Transactions of the Geological Society, were those*~~

~~*of the true position and succession of the Paleozoic strata of Devonshire and Cornwall, of the geological relation of*~~

~~*the beds afterwards named Permian in the north and*~~

~~*north-west of England, and of the general structure of North Wales,—a subject which led him into controversy with Murchison. In 1834 he published a Discourse on the Studies of the University of Cambridge, which reached a*~~

~~*fifth edition. By his generosity and energy he succeeded in rendering the geological collection of the Woodwardian Museum one of the most complete in the kingdom. He was one of the original secretaries of the Cambridge Philo- sophical Society established in 1819, and was president of*~~

~~*the Geological Society of London from 1829 to 1831. Having taken holy orders, he was advanced to the dignity of canon of Norwich cathedral, and for some time also he was vice-master of Trinity College. Sedgwick died at Cambridge on 25th January 1873.*~~

~~*SEDITION in Roman law was considered as majestas or treason. In English law it is a very elastic term, including offences ranging from libel to TREASON (q.v.). It is rarely used except in its adjectival form, ¢.g., sedi- tious libel, seditious meeting, or seditious conspiracy. "Ag to sedition itself," says Mr Justice Stephen, "I do not think that any such offence is known to English law " (Hist. Crim. Law, vol. ii. chap. xxiv.) The same high authority lays down the law in the following terms, which were substantially adopted by the Draft Criminal Code Commissioners.*~~

~~*«Every one commits a misdemeanour who publishes verbally or otherwise any words or any document with a seditious intention. If the matter so published consists of words spoken, the offence is called the speaking of seditious words. If the matter so published is contained in anything capable of being a libel, the offence is called the publication of a seditious libel. Every one commits a misdemeanour who agrees with any other persom or persons to do any act for the furtherance of any seditious intention common to poth orall of them. Such an offence is called a*~~

~~*seditious conspiracy. A seditious intention is an intention to bring into hatred or con- tempt or to excite disaffection against the person of Her Majesty, her heirs and successors, or the Government and constitution of the*~~

~~*1 The word "sedition" occurs, however, in 40 and 41 Vict. c. ZF s. 40.*~~

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~~*United Kingdom, as by law established, or either House of Parlia- ment, or the administration of justice, or to excite Her Majesty's subjects to attempt otherwise than by lawful means the alteration of any matter in church or state by law established, or to raise dis- content or disaffection amongst Her Majesty's subjects, or to pro- mote feelings of ill-will and hostility between different classes of Her Majesty's subjects. An intention to show that Her Majesty has been misled or mistaken in her measures, or to point out errors or defects in the Government or constitution as by law established, with a view to their reformation, or to excite Her Majesty's subjects to attempt by lawful means the alteration of any matter in church or state by law established, or to point out, in order to their removal, matters which are producing or have a tendency to produce feelings of hatred and ill-will between different classes of Her Majesty's subjects, is not a seditious intention. In determining whether the intention with which any words were spoken, any document was published, or any agreement was made, Was or was not seditious, every person must be deemed to intend the consequences which would naturally follow from his conduct at the time and under the circumstances in which he so conducted himself" (Digest of the Criminal Law, §§ 91-94).*~~

~~*The principal enactments now in force dealing with seditious offences were all passed during the last twenty- five years of the reign of George III. They are 37 Geo. ITI. ¢. 123, prohibiting the administering or taking of unlawful oaths (see OATH) or the belonging to an unlaw- ful confederacy ; 60 Geo. III. and 1 Geo. IV. c. 1, pro- hibiting unlawful drilling and military exercises ; and the Acts for the suppression of corresponding societies, 39 Geo. ITI. ¢. 79 and 57 Geo. III. c. 19. No proceedings can be instituted under these last two Acts without the autho- rity of the law officers of the crown (9 and 10 Vict. c. 33). Under the head*~~

~~*of statutes aimed at seditious offences may also be classed 2 Ric. IT. st. 1, ¢. 5 and 12 Ric. IL ec. 11, against scandalum magnatum or slander of great men, such as peers, judges, or great officers of state, whereby discord may arise within the realm, and 13 Car. II. ¢. 5, against tumultuous petitioning (see Petition), There has been no prosecution in recent times for seditious words as distinguished from seditious libel, but such words have been admitted as evidence in proceedings for seditious CoNSPIRACY (¢.v.), aS in the prosecution of O'Connell in 1844 and of Mr Parnell and others in 1880 (see Reg. v. Parnell, Cox's Criminal Cases, vol. xiv. 508). By the Prison Act, 1877, any prisoner under sentence for sedition or seditious libel is to be treated as a misdemeanant of the first division (40 and 41 Vict. c. 21, s. 40).*~~

~~*Scotland.—" All acts by which the minds of the people may be incited to defeat the Government or control legislation by violent or unconstitutional means are seditious" (Macdonald, Criminal Law, 229). Sedition is punishable by fine or imprisonment or both (6 Geo. IV. c. 47). A very large number of Acts of the Scot- tish Parliament dealt with sedition, beginning as early as 1184 with the assize of William the Lion, c. 29. Leasing-making is to be distinguished from sedition, as it attacked only the sovereign individually, not the Government.*~~

~~*United States.—In the Acts of Congress the word "sedition" appears to occur only in the army and navy articles. A soldier joining any sedition or who, being present at any sedition, does not use his utmost endeavour to suppress the same is punishable with death. A sailor uttering seditious words is punishable at the dis- cretion of a court-martial. In 1798 an Act of Congress called the Sedition Act was passed, which expired by effluxion of time in 1801. Its constitutionality was violently assailed at the time. (See Story on the constitution of the United States, §§ 1293-4.) Several prosecutions under the Act will be found in Wharton's State Trials. Sedition is also dealt with by the State laws mostly in a very liberal spirit. Thus the Louisiana Code, § 394, enacts that 'there is no such offence known to our law as defamation of the Govern- ment or either of its branches, either under the name of libel, slander, seditious writing, or other appellation." By§ 111, to con- stitute the offence of sedition 'there*~~

~~*must be not only a design to dismember the State, or to subvert or change its constitution, but an attempt must be made to do it by force."*~~

~~*Continent of Europe.—The Continental codes as a rule are little more definite than English law in their treatment of sedition. In Germany a distinction is drawn between Auflauf, the remaining together of a mob after the authorities have thrice bid it disperse, and dufruhr or Aufstand, an organized resistance to the autho- rities ; but no definition is given of the terms. The Hungarian*~~

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~~*penal code defines Au/stand to be an armed assembly which has the intention of attacking a class of citizens, a nationality, or a religious body. The French penal code recognizes a difference be- tween sédition and réunion séditieuse. If carried out with sufficient numbers and sufficient force sédition becomes rébellion. Section 100 exempts from the penalties of sedition those who have merely been present at a seditious meeting without taking any active part there- 1n, and have dispersed at the first warning of the military or civil authorities.*~~

~~*SEDLEY, Sir Cuarues (1639-1701), a noted " wit" and patron of literature in the Restoration period, the "Lisideius" of Dryden's Essay of Dramatic Poesy. He was born in 1639, the son of Sir John Sedley of Aylesford in Kent. Like many other men of rank and fashion at the court of 'the merry monarch," Sedley had poetical am- bition, and wrote comedies and songs. His most famous song, " Phyllis," is much more widely known now than the author's name. His first comedy, The Mulberry Garden, was published in 1668, but it does not sustain Sedley's contemporary reputation for wit in conversation. He was probably too indolent to master the art of providing con- tinuous opportunities for brilliant sayings, although he continued to try, wrote two more comedies, and left a comedy and two tragedies behind him to be published after his death. An indecent frolic in Bow Street, for which he was heavily fined, made him notorious in his youth, but later on he sobered down, entered parliament for New Romney (Kent), and took an active part in politics. A speech of his on the civil list after the Revolution is cited by Macaulay as a proof (which his plays do not afford) that his reputation as a man of wit*~~

~~*and ability was de- served. His bon mot at the expense of James II. is another well-known fragment of his wit. The king had seduced his daughter and created her countess of Dorchester, where- upon Sedley remarked that he hated ingratitude, and, as the king had made his daughter a countess, he would en- deavour to make the king's daughter a queen. Sedley died on 20th August 1701.*~~

~~*SEDUCTION. Theaction for seduction of an unmarried woman in England stands in a somewhat anomalous posi- tion. The theory of English law is that the woman herself has suffered no wrong; the wrong has been suffered by the parent or person in loco parentis, who must sue for the damage arising from the loss of service caused by the seduction of the woman. Some evidence of service must be given, but very slight evidence will be sufficient. Although the action is nominally for loss of service, still exemplary damages may be given for the dishonour of the plaintiff's family beyond recompence for the mere loss of service. An action for seduction cannot be brought in the county court except by agreement of the parties. As to seduction of a married woman, the old action for criminal conversation was abolished by the Divorce Act, 1857, which substituted for it a claim for damages against the co-respondent in a divorce suit. Seduction in England is not as a rule a criminal offence. But a conspiracy to seduce is indictable at common law. And the Criminal Law Amendment Act, 1885 (which extends to the United Kingdom), makes it felony to seduce a girl under the age of thirteen, and misdemeanour to seduce a girl between thirteen and sixteen (48 and 49 Vict. c. 69, §§ 4, 5). The same Act also deals severely with the cognate offences of procuration, abduction, and unlawful detention with the intent to seduce a woman of any age. In Scotland the seduced woman may sue on her own account.*~~

~~*United States.—In the United States State legislation has gener- ally modified the common law. In some States the father brings the action as the representative of the family whose purity has been invaded ; in others the woman herself may bring the action. In many States there is a criminal as well as a civil remedy. The penal codes of New York, New Jersey, Louisiana, and other States make it a crime to seduce under*~~

~~promise of marriage an unmarried woman of good reputation. Subsequent intermarriage of the parties~~

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~~is in most cases a bar to criminal proceedings. Massachusetts goes still further. By the law of that State if a man commits fornication with a single woman, each of them shall be punished by imprison- ment not exceeding three months, or by fine not exceeding $30. The seduction of a female passenger on a vessel of the United States is an offence punishable by fine or imprisonment. The finc may be ordcred by the court to be paid to the person seduced or her child (Act of Congress of 24th March 1860). The State legislation of the United States is in remarkable opposition to the rule of the canon law, by which the seduction of a woman by her betrothed was not punishable on account of the inchoate right over her person given by the betrothal.~~

~~SEDULIUS, Caxius, a Christian poet of the 5th cen- tury, was the author of an abecedarian [ymnus de Chrosto in iambic dimeters, portions of which maintain their ground in the offices of the Church of Rome, viz., in the Christmas hymn "A solis ortus cardine," and in that for Epiphany (altered from "' Herodes hostis impie"). His other works are Paschale Carmen s. Mirabilium Divinorum Inbri V., originally in four or five books in hexameter verse and afterwards enlarged and turned into prose, and Veterts et Novi Testamenti Collatio, in elegiac verse. De Verln Incarnatione, a Virgilian cento, has also been ascribed to him, but on insufficient grounds. Of his personal history nothing is known, except that he is called a presbyter by Isidore of Seville ; by some other writers of less authority he is designated "antistes" or "episcopus." A Scoto- Irish origin has sometimes been claimed for him; but at all events he must not be confounded with Sedulius the grammarian, an Irish Scot who lived in the 9th century. The best edition of his works is that of Arevalus (4to, Rome, 1794).~~

~~SEDUM. About 120 species are enumerated in this genus of Crassulacee, mostly perennial herbs with succulent leaves of varied form, but never compound. The indivi- dual flowers are usually small and grouped in cymes. In colour they range from white and yellow to pink. They have a~~

~~calyx of five sepals, as many petals, usually ten stamens, and five distinct carpels, which have as many glands at their base and ripen into as many dry seed-pods. Several species are British, including some with tuberous roots and large leaves (Zelephium), and others of smaller size, chiefly found on rocks, walls, and dry banks. Many are cultivated for the beauty of their flowers, and many are remarkable for their prolonged vitality under adverse circumstances. Sedums are very closely allied to Semper-vivums (see HoUSELEEK).~~

~~SEELAND. See ZEALAND.~~

~~SEES, a town of France and a bishop's see, in the de- partment of Orne, is situated on the Orne, 4 miles from its source and 13 miles north of Alengon by the railway from Le Mans to Caen. The very fine cathedral, dating to a large extent from the 13th and 14th centuries, occupies the site of churches founded in 440, 996, and 1058. The west front has two stately spires of open work 230 feet high, which have been restored more than once in the 19th century. The nave, built in the beginning of the 13th century, was remodelled in its upper portion fifty or sixty years after its erection; the choir, built about 1230 and restored in 1260 after a great fire, is remarkable for the lightness of its construction,—the inner galleries of the presbytery being the boldest venture ever made in this kind. In the choir are four bas-reliefs of great beauty and delicacy representing scenes in the life of the Virgin ; and the altar is adorned with another depicting the removal of the relics of St Gervais and St Protais. Most of the stained windows are good. Around the cathedral are the cloisters of the canons ; the episcopal palace (1778), with a pretty chapel ; the great seminary, located in the old abbey of St Martin (supposed to be one of the fourteen or fifteen monasteries founded in the 6th century by St Evroult) ; the hétel de ville; and the statue of Conté, a member of~~

~~the Egyptian expedition of 1798. The population of Sées was 3483 in 1881, and that of the commune 4687.~~

~~The first bishop of Sées (Sagiwn) was St Lain, who lived at the close of the 3d or beginning of the 4th century. In the 9th century it was a fortified~~

~~*town and fell a prey to the Normans; and the stones from its ruined ramparts were used for the erection of a church in the close of the 10th century. In the 12th century Sées belonged to the count of Alencon and consisted of two distinct parts, separated by the Orne,—the bishop's burgh, and to the south the new or count's burgh (Bourg le Comte). Captured in 1154 by Henry II. of England, it was recovered in the following year by Guillaume de Belléme; and in 1186 it was partly burned by the count of Anjou. After being taken by Philip Augustus it enjoyed some years of peace, during which a hospital and a Franciscan mon- astery were built; but it was one of the first towns of Normandy to fall into the hands of the English (1417), who retained posses- sion until their final expulsion from France. Pillaged by the Pro- testants during the Wars of Religion, Sées attached itself to the Leaguc in 1589, but voluntarily surrendcred to Henry IV. in 1590.*~~

~~*SEETZEN, Unricu Jasper (1767-1811), one of the most distinguished of modern travellers in the East, was born the son of a yeoman, in the little lordship of Jever in German Frisia, on 30th January 1767. His father, who was a man of substance, sent him to the university of Gottingen, where he graduated in medicine. His chief interests, how- ever, were in natural history and technology ; he wrote a number of papers on both these subjects which gained him some reputation, and had both in view in a series of journeys which he made from time to time through various parts of Holland and Germany. He also engaged practi- cally in various small manufactures, and in 1802 obtained a Government post in Jever. In 1801, however, the in- terest which he had long felt in geographical exploration had culminated ina resolution to travel by Constantinople to Syria and Arabia, and then, when familiarized with Mohammedan ways, to try to penetrate into Central Africa. He relied mainly on his own resources, but received a small subvention from Gotha, where also he learned from Zach to make astronomical observations. In the summer of 1802 he started down the Danube with a companion Jacobsen, who broke down at Smyrna a year later. His journey was by Constantinople, where he stayed six months, thence through Asia Minor to Smyrna, then again through the heart of Asia Minor to Aleppo, where he remained from November 1803 to April 1805, and made himself sufficiently at home with Arabic speech and ways to travel as a native and without an interpreter.*~~

~~*Now began the part of his travels of which a full journal has been published (April 1805 to March 1809), a series of most instructive journeys in eastern and western Palestine and the wilderness of Sinai, and so on to Cairo and the Fayyfim. His chief ex- ploit was a tour round the Dead Sea, which he made with- out a companion and in the disguise of a beggar. From Egypt he went by sea to Jeddah and reached Mecca as a pilgrim in October 1809. In Arabia he made extensive journeys, ranging from Medina to Lahak and returning to Mocha, from which place his last letters to Europe were written in November 1810. In September of the follow- ing year he left Mocha with the hope of reaching Muscat, and was found dead two days later, having, it is believed, been poisoned by the command of the imam of Sana'a. For the parts of Seetzen's journeys not covered by the published journal (Reisen, ed. Kruse, 4 vols., Berlin, 1854) the only printed records are a series of letters and papers in Zach's Monatliche Correspondenz and Hammer's Fund- gruben. Many papers and collections were lost through his death or never reached Europe. The collections that were saved form the Oriental museum and the chief part of the Oriental MSS. of the ducal library in Gotha.*~~

~~*SE-GAN FOO, the capital of the province of Shen-se in north-western China, is situated in 34° 17' N. lat. and 108° 58' E. long. Like most Chinese cities, Se-gan Foo has repeatedly changed its name during its history, which dates*~~

~~*back to the time of Che Hwang-te (246-210 3.c.), the first universal emperor, whose name will be ever notorious as that of the monarch who built the Great Wall, burnt the books, and established his capital at Kwan-chung, the site of the modern Se-gan Foo. Under the succeeding Han dynasty (206 B.c.-25 a.p.) this city was called Wei-nan and Nuy-she; under the Eastern Han (25-221 a.p.) it was known as Yung Chow; under the T'ang (618-907) as Kwan-nuy ; under the Sung (960-1127) as Yung-hing ; under the Yuen and Ming (1260-1644) as Gan-se; and under the present dynasty as Segan. During the Ts'in, Han, and 'T'ang dynasties it was the capital of the empire, and is at the present time second only to Peking in size, population, and importance. The city, which is.a square, measuring 10 Chinese miles each way, is prettily situated on ground rising from the river Wei, and includes within its limits the two district*~~

~~*cities of Ch'ang-gan and Hien- ning. Its walls are little inferior in height and massive- ness to those of Peking, while its gates are handsomer and better defended than any of which the capital can boast. The population is said to be 1,000,000, of whom 50,000 are Mohammedans. Situated in the basin of the Wei river, along which runs the great road which connects northern China with Central Asia, at a point where the valley opens out on the plains of China, Se-gan Foo occupies a strategical position of great importance, and repeatedly in the annals of the empire has history been made around and within its walls. During the late Mohammedan rebellion it was besieged by the rebels for two years (1868-70), but owing to the strength of the fortifications it defied the efforts of its assailants. From its eastern side three great roads radiate, one reaching to Shan-se, one to Ho-nan, and one to Hoo-pih; while from it runs in a south-westerly direction the great highway into Sze-chuen. It is thus admirably situated as a trade centre and serves as a depdt for the silk from Che-keang and Sze-chuen, the tea from Hoo-pih and Ho-nan, and the sugar from Sze-chuen destined for the markets of Kan- suh, Turkistan, Ili, and Russia. Marco Polo speaking of Kenjanfu, as the city was then also called, says that it was a place "of great trade and industry. They have great abundance of silk, from which they weave cloths of silk, and gold of divers kinds, and they also manufacture all sorts of equipments for an army. They have every necessary of man's life very cheap." Many of the temples and public buildings are very fine, and not a few historical monuments are found within and about the walls. Of these the most notable is a Nestorian tablet,! which was accidentally discovered in 1625 in the Ch'ang-gan suburb.*~~

~~*1 The contents of this Nestorian inscription, which consists of 1780 characters, may be described as follows, (1) An abstract of Christian doctrine of a vague and figurative kind. (2) An account of the arrival of the missionary Olopun (probably a Chinese form of Rabban= Monk), from Tats'in in the year 635, bringing sacred books and images ; of the translation of the said books ; of the imperial approval of the doctrine and permission to teach it publicly. Then follows a decree of the emperor (T'ait-sung, a very famous prince), issued in 638, in favour of the new doctrine, and ordering a church to be built in the square of justice and peace (Ining fang) in the capital. The emperor's portrait was to be placed*~~

~~*in this church. After this comes a description of Tats'in, and then some account of the fortunes of the church in China. Kaoutsung (650-683, the devout patron also of the Buddhist traveller and doctor, HIwen Ts'ang), it is added, continued to favour the new faith. In the end of the century Buddhism got the upper hand, but under Yuen-tsung (718-755) the church recovered its prestige, and Kiho, a new missionary, arrived. Under Tih-tsung (780-783) the monu- ment was erected, and this part of the inscription ends with a eulogy of I-sze, a statesman and benefactor of the church. (8) Then follows a recapitulation of the above in octosyllabic verse. 'The Chinese in- scription, which concludes with the date of erection, viz. 781, is fol- lowed by a series of short inscriptions in Syriac and the Estrangelo character, containing the date of the erection, the name of the reigning Nestorian patriarch, Mar HIanan Ishua, that of Adam, bishop and pope of China, and those of the clerical staff of the capital. Then follow*~~

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~~*The stone slab which bears the inscription is 7} feet high by 3 wide, and at present stands embedded in a brick wall, which forms part of a dilapidated temple.2 From a Chinese point of view, however, the Pei Lin or " forest of tablets" is a place of even greater interest than the above-mentioned temple. For there are collected tablets of the HIan, T'ang, Sung, Yuen, and Ming dynasties, some of which bear historical legends, notably a set of stone tablets having the thirteen classics inscribed upon them, while others are symbolical or pictorial; among these last is a full-sized likeness of Confucius. As might be expected on a site which has played so prominent a part in Chinese history, antiquities are constantly being discovered in the neighbourhood of the city, e.g., rich stores of coins and bronzes, bearing dates ranging from 200 B.c. onwards,*~~

~~*SEGESTA, a very ancient city near the north-western extremity of Sicily, so named by the natives and by the Romans, while the Greeks called it Egesta or Aigesta. Its origin was ascribed by tradition sometimes to Trojan refugees and sometimes to Phocians, followers of Philo- ctetes ; the accounts agree only in making Segesta older than the Greek colonization of Sicily in the 7th century B.c. A tribe named Elymi, distinct*~~

~~*from both the Siculi and the Greeks, occupied the country round the city. The scanty references to the history of Segesta show it in continual warfare with the Greek city Selinus from the year 580 B.c. downwards. As early as 426 B.c. it con- cluded an alliance with Athens; and in 416 a great Athenian fleet sailed to Sicily, ostensibly to aid Segesta against its enemies Selinus and Syracuse, but really to attempt the conquest of the island. After the destruction of the Athenian fleet and army, the Segestans turned to the Carthaginians. But, when Hannibal destroyed Selinus (see SELINUS) in 409 B.c, and Himera, and established the Carthaginian power firmly in the western part of Sicily, Segesta sank to the position of a dependent ally. In 397 it suffered a long siege from Dionysius of Syracuse, but at last was relieved by Himilco. In 307, however, the Greek arms had better success; Agathocles of Syracuse sold the inhabitants into slavery, after massacring 10,000 men, and changed the name of the city to Diceopolis. But it soon recovered its old name and passed again to the Cartha- ginians. In the beginning of the First Punic War the Segestans murdered the Carthaginian garrison and became allies of Rome. Being soon after besieged by the Cartha- ginians, they were relieved by the great naval victory of Duilius, 260 B.c. Segesta was always highly favoured by the Romans, both on account of its early adhesion to their cause and from its supposed Trojan origin. Its site is now deserted, having been exposed to the Saracen depredations in the 10th century ; but the ruins are very fine. Segesta was about 6 miles from the sea, and the modern town of Castellamare probably occupies the site of the ancient harbour. The Crimisus, which is represented on coins of Segesta, is probably the river 8. Bartolommeo, about 6 miles to the south. There were hot springs and baths not far from the city.*~~

~~*SEGOVIA, a province of Spain, formerly part of Old Castile, is bounded on the N. and N.E. by the provinces of Burgos and Soria, on the 8.E. by those of Guadalajara and Madrid, on the 8.W. by Avila, and on the N.W. by Valladolid. It has an area of 2670 square miles, and the population in 1877 was 149,961. The greater portion of the country consists of a dry arable tableland, lifted some*~~

~~*sixty-seven names of persons in Syriac characters, most of whom are characterized as priests, and sixty-one names of persons in Chinese, all*~~

~~*priests but one. ;*~~

~~*2 See Yule, Afarco Polo, London, 1875; Williamson, Journeys in North China, London, 1870; and S. Wells Williams, Zhe Afiddle Kingdom, London, 1888.*~~

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~~*2500 feet above the sea, monotonous enough in appear- ance, and burnt to a dull brown during summer, but yet producing some of the finest corn in the Peninsula. Along the whole south-eastern boundary the Guadarrama range of mountains rises up suddenly, like a huge barrier, sepa- rating Old from New Castile and the basin of the Douro from that of the Tagus,—affording, too, among its ravines and upon its slopes some remarkably fine scenery. There are two well-known passes or "puertos" over the sierra, those of the Nava Cerrada and of Somosiera. The former has been, until quite a recent date, the chief means of communication with the outer world, save when blocked by winter snows. It winds round the lower southern slope of the Pefialara (8500 feet). The Puerto de Somo- siera lies north of the Pefialara. By it in 1808 Napoleon descended upon Madrid. Though to the eye of the stranger almost desert-like in appearance, the province of Segovia is well watered by the streams which rise in the Guadarrama range and flow northwards to the Douro, and by careful methods of irrigation. The Eresma, Cega, Duraton, and Riaza are the principal watercourses. With the exception of Segovia and Sepulveda, there is no town of any import- ance,—the inhabitants being for the most part employed in agricultural and pastoral pursuits and backward in civilization. Since the completion (1883) of the railway from Medina del Campo to the city of Segovia, however, the towns en route have begun to show signs of animation ; and, as the province contains monuments of deepest inter- est to the historian and ecclesiologist, it bids fair to receive its due measure of attention and enlightenment. At the foot of the Nava Cerrada pass lies the royal demesne and summer residence of La Granja, or San Ildefonso, one of the great show places of the Peninsula. The chief trades and manufactures formerly carried on in the province—weaving, tanning, making of earthenware, &c.—have been drawn away to more commercial centres. Paper-making holds its own to some extent, owing to*~~

~~the excellence of the water ; and for the same reason, together with the superior quality of the breed of sheep, the picturesque scenes attendant upon the preparation of the fleeces may still be witnessed. Such prosperity, however, as Segovia retains is dependent upon its agricultural produce—wheat, rye, barley, peas, hemp, flax, &c.—together with the rearing of sheep, cattle, mules, and pigs. The sierras yield excellent granite, marble, and limestone ; but hitherto the difficulty of trans- port has prevented any development of mineral wealth. SEGOVIA, the capital of the. above province, clusters upon a narrow ridge of rock which rises in the valley of the Eresma, where this river is joined by its turbulent little tributary the Clamores, and is one of the best specimens extant of the Gotho-Castilian cities. Founded originally as a Roman pleasure resort, it became in the Middle Ages a great royal and religious centre, and was surrounded by Alphonso VI. with the walls and towers which still give to it, éven in their dilapidation, the air of a military stronghold. The streets are steep, irregular, and narrow, and are lined with quaint old-fashioned houses as irregular and forbid- ding, built for the most part of granite from the neighbour- ing sierra. The place teems with records and monuments of the many vicissitudes of fortune and art through which it has passed, foremost among the latter being the ancient Alcazar, the cathedral, the aqueduct of Trajan, and a notable array of churches and other ecclesiastical edifices. The Alcazar is perched upon the western tip of the long tongue of rock upon which the city is built, and which at this point has a sheer descent upon three sides into the valley. Of the original Middle-Age fortress but little re- mains save the noble facade,—the building having been wantonly fired in 1862 by the students of the artillery school then domiciled within its walls, and all but destroyed. It~~

~~is now in course of slow but praiseworthy restoration. The work is Gotho-Moorish, with an admixture of Renaissance in the decoration. Some of the rooms deserve notice, especially the Sala del Trono and the Sala de Recibimiento. The views obtained over the outlying vega from the towers and windows are superb. The 16th-century cathedral (1521-1577), the work of Juan Gil de Ontasion and his son Rodrigo, occupies the site of a former church of the 11th century, of which the present cloisters, rebuilt~~

~~*in 1524, formed part. It is a well-proportioned and delicate piece of Late Gothic—the latest of its kind in Spain—317 feet long by 177 wide. The central nave rises 99 feet and the tower 330. The exterior is the least satisfactory portion, at once bald and over-decorated ; the interior is light and pure, with an effectiveness greatly enhanced by some very fine stamed glass. The churches of Segovia are legion, though many of them are closed and fast fall- ing into disrepair. The most remarkable are those of La Vera Cruz (Knights Templar, Romanesque of the early 13th century), San Millan and San Juan (both Romanesque of second half of 13th century), El Parral (Gothic of early 16th century), and Corpus Christi, an ancient Jewish sanctuary and an interesting specimen of Moorish work. The towers and external cloistering, or corredores, of several of the later churches—especially those of San Estéban and San Martin—are fine. The great aqueduct, however, called El Puente del Diablo, ranks usually as the glory of Segovia, and is remarkable alike for its colossal propor- tions, its history, its picturesqueness, and the art with which it is put together. Erected first, according to fairly reliable tradition, in the time of the emperor Trajan, and several times barely escaping destruction, it is now, after nearly eighteen hundred years, in perfect working order, bringing the pure waters of the Rio Frio down from the Sierra Fonfria, distant 10 miles to the south. The bridge as striding across the valley into the city is 847 yards ong, and consists of a double tier of superimposed arches, built of rough-hewn granite blocks, laid without lime or cement. The three centre arches are 102 feet in height. Segovia finally lost its ancient prosperity when it was taken and sacked by the French in 1808. Some insignificant manufactories of cloth, leather, paper, and rude earthen- ware still exist in the suburb of San Lorenzo, but the trade of the place languishes year by year. The city is the see of a bishop, suffragan to Valladolid. The population in 1877 was 11,318.*~~

~~*SEIGNORY, or Sxrentory, is the relation of the lord of a fee or a manor to his tenant. There is no land in Eng- land without its lord: "Nulle terre sans seigneur" is the old feudal maxim. Where no other lord can be discovered the crown is lord as lord paramount. The principal inci- dents of a seignory were fealty and rent-service. In return for these privileges the lord was liable to forfeit his rights if he neglected to protect and defend the tenant or did anything injurious to the feudal relation. Every*~~

~~*seignory now existing must have been created before the Statute of Quia Emptores, which forbade the future creation of estates in fee-simple by subinfeudation (see RrAL Estate). The only seignories of any importance at present are the lord- ships of manors. They are regarded as incorporeal heredita- ments, and are either appendant or in gross. A seignory appendant passes with the grant of the manor ; a seignory in gross—that is, a seignory which has been severed from the demesne lands of the manor to which it was originally appendant—must be specially conveyed by deed of grant.*~~

~~*SEINE. This, one of the chief rivers of France (Lat. Sequana), rises on the eastern slope of the plateau of Langres, 18 miles to the north-west of Dijon. It keeps the same general direction (north-westwards) throughout its entire course, but has numerous windings: between its*~~

~~*source and its mouth in the English Channel the air distance is only 250 miles, but that actually traversed (through the departments of Céte-d'Or, Aube, Seine-et-Marne, Seine-et- Oise, Seine, Eure, and Seine-Inférieure) is 482. Though shorter than the Loire and inferior in volume to the streams of the Rhone system when these are at their fullest, the Seine derives an exceptional importance from the regularity of its flow. This feature is due to the geological character of its basin, an area of 19,400,000 acres, entirely belonging to France (with the exception of a few communes in Belgium), and formed in three-fourths of its extent of per- meable strata, which absorb the atmospheric precipitation to restore it gently to the river by perennial springs. It is believed that the Seine never attains a volume so high as 90,000 cubic feet per second. At Paris its average per second is 9000, and after it has received all its tributaries it ranges between 24,000 and 25,000 cubic feet. At Paris it falls as low as 2650 cubic feet and in exceptional droughts the figure of 1200 has been reached. During the flood of 1876, which lasted fifty-five days, the volume between the quays at Paris rose to 58,600 cubic feet per second.*~~

~~*Rising at a height of 1545 feet above sea-level, at the base of the statue of a nymph erected on the spot by the city of Paris, the Seine is at first such an insignificant streamlet that it is often dry in summer as far as to*~~

~~Chatillon (722 feet). At Bar (531 feet) its waters feed the Haute-Seine Canal, so that there is uninterrupted navigation from this point to the sea (395 miles). At Troyes it has descended to 331 feet. It next passes Méry, and at Marcilly receives the Aube (right), from which point it becomes navigable ; here it is deflected in a south-westerly direction by the heights of La Brie, the base of which it skirts past Nogent and Montereau, at the latter point receiving the Yonne, its most important left-hand tributary. It then resumes its general north-westerly direction, receiving the Loing (left) at Moret, then passing Melun (121 feet), being joined at Corbeil by the Essonne (left), and after its junction with the Marne (right), a tributary longer than itself by 31 miles, reaches Paris, From this point to the sea its channel has been so deepened by recent works that vessels of 9 to 10 feet draught can reach the capital. The river then winds through a fen cham- paign country past St Cloud, St Denis, Argenteuil, St Germain, Conflans (where it is joined from the right by the Oise, 56 feet above the sea), Poissy, Mantes, Les Andelys, and Poses, where the tide first begins to be perceptible. It next receives the Eure (left), and passes Pont de l'Arche, Elbeuf, and Rouen, where the sea naviga- tion commences. The river has been dyked to Rouen so as to admit vessels of 20 feet draught, and large areas have thus been reclaimed for cultivation.! At every tide there is a ""'bore" (barre or mas- caret), ranging usually from 8 to 10 feet. Between Rouen and the sea there are numerous windings, as in the neighbourhood of Paris; after Caudebec and Quilleboeuf (where the Rille is received from the left) the estuary begins, set with extensive sandbanks, between which flows a narrow navigable channel. At Tancarville (right) is the commencement of a canal to enable river boats for Havre to avoid the sea passage. The river finally falls into the English Channel between Honfleur on the left and Havre on the right. The Marne brings to the Seine the waters of the Ornain, the Oureq, and the Morin ; the Oise those of the Aisne ; the Yonne those of the Arman- con. The low elevation of the bounding hills has rendered it com- paratively easy to connect the Seine and its affluents with adjoining river basins by means of canals. The Oise and Somme are conuected by the Picardy or Crozat Canal, which in turn is continued to the Scheldt by means of the St Quentin Canal and the Oise, and to the Sambre by that of Oise and Sambre. Between the Aisne and the Meuse is the Ardennes Canal, and the Aisne and the Marne are united by a canal which passes Rheims. The Marne has similar~~

~~*communica- tion with the Meuse and the Rhine, the Yonne with the Sadne (by the Burgundy Canal) and with the Loire (by that of Nivernais). The Seine itself is connected with the Loire by the Loing Canal dividing at Montargis into two branches,—those of Orleans and Briare.*~~

~~*SEINE, the department of France which has Paris as its chief town, was formed in 1790 of part of the pro- vince of Ile-de-France. It lies between 48° 44' and 48° 58' N. lat. and 2° 10' and 2° 34' E. long. and is entirely surrounded by the department of Seine-et-Oise, from which it is separated at certain parts by the Seine, the Marne, and the Biévre. The area of the department is only 118,306*~~

~~*1 Comp. River ENGINEERING, vol. xx. p. 579; see also the valuable paper "The River Seine," in Proc. Inst. Civ. Hng., vol. 1xxxiv., 1886, by L. F. Vernon-Harcourt.*~~

~~*SHEI—SEI*~~

~~*acres, and of this surface a seventh or a sixth is occupied by Paris ; the suburban villages also are close together and very populous. In actual population (2,799,329 in 1881) as well as in density (23°7 persons per acre) it holds the first place. Flowing from south-east to north-west through the department, the Seine forms three links: on the right it receives above Paris the Marne, and below Paris the Rouillon, and on the left hand the Biévre within the pre- cincts of the city. The left bank of the Seine is in general higher than the right and consists of the Villejuif and Chatillon plateaus separated by the Biévre ; the highest point (568 feet) is above Chatillon and the lowest (105) at the exit of the Seine. Below Paris the river flows be- tween the plain of Gennevilliers and Nanterre (commanded by Mont Valérien) on the left and the plain of St Denis on the right. On the right side, to the east of Paris, are the heights of Avron and Vincennes commanding the course of the Marne. Communication is further facilitated by various canals (see PARIS).*~~

~~*Market gardens occupy about 3700 acres within and without the city, and by means of irrigation and manuring are made to yield from ten to eleven crops per annum (see Paris), Some districts are specially celebrated,—Montreuil for its peaches, Fontenay-aux- Roses for its strawberries and*~~

~~*roses, and other places for flowers and nurseries. The department produced in 1883 326,326 bushels of wheat, 4042 of meslin, 75,003 of rye, 3415 of barley, 337,837 of oats, 1,656,009 of potatoes, 14,650 of pulse, and 15,400 tons of beetroot. Altogether, 60,000 persons are engaged in agriculture. The live stock in 1881 comprised 95,796 horses (70,296 in Paris), 4174 cattle, 280 calves, 8159 sheep, 3626 pigs, and 660 goats. Vineyards, producin 366,748 gallons of wine annually, cover 2460 acres. The principa woods (Boulogne and Vincennes) belong to Paris. It is partly owing to the number of quarries in the district that Paris owes its origin: Chatillon and Montrouge in the south yield freestone, and Bagneux and Clamart in the south and Montreuil and Romainville in the cast possess the richest plaster quarries in France. Within the circuit of Paris are certain old quarries now forming the cata- combs, Most of the industrial establishments in the department are situated in Paris or at St Denis. Pantin (17,857 inhabitants in 1881) on the Oureq Canal is the seat of a national factory of tobacco, and also of glass-works, and Aubervilliers (19,437) on the St Denis Canal is the seat of great chemical works. Along the Seine, below Paris, Boulogne (25,615) is partly occupied by laundry establish- ments ; Putcaux (15,586) manufactures woollen goods, and has dye- works, printing works, cloth-dressing works, and engineering works of considerable importance ; Clichy (24,320) manufactures crystal and has a Jarge gaswork, &c. Above Paris, Ivry (18,442) has iron-works and engineering works; Choisy-le-Roi (6978) has factories for the making of porcelain, glass, soda, chemicals, morocco, and waxcloth; Montreuil (18,693), near Vincennes, makes patent leather, porcelain, &c. The department is of course traversed by all the railway lines which converge in Paris, and also contains the inner circuit railway and part of the outer circuit,—making a total of 122 miles of railway, to which are to be added numerous trami- ways, 72 miles of national roads, and 458 of other roads. There are 3 arrondissements (Paris, St Denis, and Sceaux), 28 cantons (20 in Paris), and 72 communes. The department forms the archi- episcopal diocese of Paris, falls within the jurisdiction of the Paris court of appeal, and is divided between the four corps d'armée of Amiens, Rouen, Le Mans, and Orleans. Among the important in- stitutions in the department are the lyceums of Vanves and Sceaux, the lunatic asylum at Charenton, the veterinary college of Maisons- Alfort, and the great Bicétre hospital at Gentilly.*~~

~~*SEINE-ET-MARNE, a department of northern France, was formed in 1790 of almost the entire district of Brie (half of which belonged to Champagne and half to Tle-de- France) and a portion of Gatinais (from Ile-de-France and Orléanais). Lying between 48° 7' and 49° 6' N. lat. and 2° 23' and 3° 13' E. long., it is bounded N. by the departments of Oise and Aisne, E. by Marne and Aube, 8. by Yonne and Loiret, and W. by Seine-et-Oise. The whole department belongs to the basin of the Seine, and is drained partly by that river and partly by its tributaries the Yonne and the Loing from the left, and from the right the Voulzie, the Yéres, and the Marne, with its affluents the Ourcq, the Petit Morin, and the Grand Morin. With the exception of the Loing, flowing from south to north, all these streams cross the department from east to west,*~~

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~~*following the general slope of the surface, which is broken up into several plateaus from 300 to 500 feet in height (highest point, in the north-east, 705 feet, lowest 105), and separated from each other by dcep valleys. Most of the plateaus belong to the Brie, a fertile and well-wooded district of a clayey character. In the south-west lies the dry sandy district of the Fontainebleau sandstones. The climate is rather more "continental" than that of Paris,—the summers warmer, the winters colder; the annual rainfall does not exceed 16 inches. There is a striking difference between the south of the department, where the famous white grape (chasselas) of Fontainebleau ripens, and the country to the north of the Marne,—this river marking pretty exactly the northern limit of the vine.*~~

~~*With a total area of 1,417,534 acres, Seine-et-Marne had in 1879 261,074 under wheat, 274,808 under oats, 58,362 under beetroot, 51,180 under vines. Besides these, meslin, rye, barley, pulse, potatoes are the principal crops grown. In 1884 the yield was 6,567,547 bushels of wheat, 231,959 of meslin, 665,505 of rye, 471,251 of barley, 9,104,254 of oats, 3,035,167 of potatoes, 924,210 tons of beetroot, and 401,427 tons of green fodder (lucerne, clover, sainfoin, &c.). The live stock in 1879 included 40,400 horses, 5190 asses, 522,700 sheep (178,290 superior breed), 101,100 cattle, 16,840 pigs, 3714 goats, and 11,440 beehives (75 tons of honey, 15*~~

~~*of wax). Cereals occupy two-fifths of the department and yield an annual value of £2,400,000, while all other products of the soil do not reach £1,600,000. The wheat and oats of Brie are especially esteemed, as are also the white grapes of Fontainebleau and the roses of Provins (see vol. xix. p. 886). Thousands of the well- known Brie cheeses are manufactured, and large numbers of calves and poultry are reared. The forests (covering a fifth of the surface) are planted with oak, beech, chestnut, hornbeam, birch, wild cherry, linden, willow, poplar, and conifers. Best known and most im- portant is the forest of Fontainebleau, the annual product of which is worth £14,000. Excellent freestone is quarried in the depart- ment, especially in the valley of the Loing, mill-stones at La Ferté- sous-Jouarre; the Fontainebleau sandstone, used extensively for pavements, gives employment to 300 establishments, and the white sand which is found along with it is in great request for the manu- facture of glass, Along the Marne are numerous plaster-quarries ; lime-kilns occur throughout the department; and peat is found in the valleys of the Ourcq and the Voulzic. Beds of common clay and porcelain clay supply the potteries of Fontainebleau, and especially those of Montereau, where upwards of 700 hands are employed. Other industrial establishments are the numerous large flour-mills, the sugar-factories, beetroot distilleries, paper-mills (the Marais paper-mill manufactures bank-notes, &c., both for France and foreign markets), saw-mills, foundries, printing works, tanneries, tawing works, glove factories, chemical works, &c. Most of the motive-power used in these establishments is supplied by the streams. 'The Seine, the Yonne, the Marne, and the Grand Morin are navigable, and, with the canals of the Loing and the Ourcq and those of Chalifert, Cornillon, and Chelles, which cut off the windings of the Marne, form a total waterway of 219 miles. There arc 242 miles of railway. With its 348,991 inhabitants in 1881, Seine-et-Marne is in density of population slightly below the aver- age of France. It has 5 arrondissements, 29 cantons, 530 com- munes, forms the diocese of Meaux, belongs to the jurisdiction of the Paris court of appeal, and to the district of the Orleans corps d'armée. Among the places of note in the department, Montereau (7107 inhabitants in 1881), distinguished as Montereau-faut-Yonne because of its situation at the confluence of the Yonne with the Seine, deserves to be mentioned not only for its porcelain inann- facture but also as a great railway station on the*~~

~~*route from Paris to Lyons at the junction of the Troyes line, as the scene of the assassination of John the Bold, duke of Burgundy, and as one of the battleficlds of Napoleon I. in the campaign of 1814. Its church is an historical monument of the 13th, 14th, 15th, and 16th centuries, A statue of Napoleon stands between the two bridges.*~~

~~*SEINE-ET-OISE, a department of northern France, formed in 1790 of part of the old province of fle-de- France, and traversed from south-east to north-west by the Seine, which is joined by the Oise from the right. Lying between 48° 17' and 49° 14' N, lat. and 1° 27' and 2° 37' KE. long., it is surrounded by the departments of Seine-et-Marne on the east, Loiret on the south, Eure-et- Loir on the west, Eure on the north-west, and Oise on the north. It encloses the department of Seine. The Epte on the north-west is almost the only natural boundary of the department. The streams (all belonging to the basin of*~~

~~*the Scine) are, on the right the Yeres, the Marne, the Oise, and the Epte, and on the left the Essonne (joined by the Juine, which passes by Etampes), the Orge, the Biavre, and the Mauldre. Seine-et-Oise belongs in part to the tableland of Beauce in the south and to that of Brie in the east. In the centre are the high wooded hills which make the charm of Versailles, Marly, and St Germain. But it is in the north-west, in the Vexin, that the culminating point of 690 feet is reached, while the lowest point, where the Seine leaves the department, is hardly 40 feet above the sea. The mean temperature is 51° Fahr. Of the 1,384,695 acres 912,205 are arable soil, 50,330 meadows, 42,852 vineyards, and 199,864 woods. In 1881 the live stock com- prised 48,540 horses, 5626 asses, 162 mules, 70,600 cattle, 341,600 sheep (wool-clip, 1110 tons), 16,200 pigs, 4500 goats, and 13,500 beehives. Seine-et-Oise is a great agricultural and horticultural department. The crops in 1883 were—wheat, 5,817,858 bushels ; meslin, 353,127; rye, 1,034,572; barley, 641,894; oats, 8,705,193 ; buckwheat, 3800 ; potatoes, 6,479,000 ; beetroot for sugar 206,645 tons, and for fodder 237,915; colza seed, 415 tons; hay, 48,242; clover, 18,505 ; lucerne, 140,354; sainfoin, 57,283. Oaks, hornbeams, birch, chestnuts are the prevailing trees in the forests, most of which belong to the state.*~~

~~*Building, paving, and mill stones (1978 workmen), lime, plaster, marl, chalk, sand, clay, and peat (along the Essonne) are all found in the department. At Enghien are cold mineral springs, and Forges has a hydropathic establishment, where the town of Paris maintains a hospital for scrofulous children. The most important industrial establishments are the national por- celain factory at Sevres; the Government powder-mills of Sevran and Bouchet ; the paper-mills and cardboard mills (1570 workmen) of Corbeil (population 6566 in 1881), Ktampes (7465), and Pontoise (6675), but by far the largest is at Essonne (4999); the flax-spinning mills (6368 spindles), cotton-mills (17,830 spindles), silk-mills (5726), wool-mills (8890) ; the foundries and boat and bridge building yards at Argenteuil (10,167) ; the engineering and railway works at Corbeil, &c. ; the agricultural implement factories at Dourdan (2819) ; the sugar-refineries with thousands of workmen ; distilleries on most of the large farms ; starch-works, laundries, large printing establishments close to Paris; factories for chemical products, candles, embroidery, hosicry, perfumery, shoes, and buttons; one of the finest zinc-works in France; saw-mills, &c. Besides the navigation of the Scine, the Marne, the Oise, and the Canal d'Oureq, the department has 420 miles of railroad, 457 of national roads, and 3958 of other roads. The population of the department in 1881 was 577,798 inhabitants (one and a half times the average density of the French departments). There are 6 arrondissements, 37 cantons, and 686 communes; the department forms the diocese of Versailles, is divided between the corps @'armée of Amiens, Rouen, Le Mans, and Orleans, and has its court of appeal at Paris. The commune of Argenteuil (11,849 inhabitants) is not only important for its manufactures but also for its market gardens (asparagus, figs, grapes, &c.); and its church, rebuilt in the 19th century in the Romanesque style, is a fashionable place of pilgrimage.*~~

~~*SEINE INFERIEURE, a department of the north of France, formed in 1790 of four districts (Norman Vexin, Bray, Caux, and Roumois) belonging to the province of Normandy. Lying between 49° 15' and 50° 4' N, lat. and 1° 52' and 0° 4' E. long., it is bounded N.W. and N. by the English Channel for a distance of 80 miles, N.E. by Somme, from which it is separated by the Bresle, E. by Oise, S. by Eure and the estuary of the Seine, which separates the department from Calvados. It is divided almost*~~

~~equally between the basin of the Seine in the south and the basins of certain coast streams in the north. The Seine receives from the right hand before it reaches the department the Epte and the Andelle from the Bray dis- trict, and then the Darnétal, the Cailly, the Austreberte, the Bolbec, and the Lézarde. The main coast streams are the Bresle (which forms the ports of Eu and Tréport), the Yeres, the Arques or Dieppe stream (formed by the junction of the Varennes, the Béthune, and the Eaulne), the Scie, the Saane, the Durdent. As a whole the department may be described as an elevated plateau culminating towards the east ina point 807 feet above the sea and terminating along the Seine in high bluffs and towards the sea in steep chalk cliffs 300 to 400 feet high, which are continually being eaten away and transformed into beds of shingle. There is no striking line of parting between the basins of~~

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~~the Seine and the Channel, but deep valleys have been hollowed out by the streams. The Bray district in the south-east is a broad valley of denudation formed by the sea as it retired, and it is traversed by smaller valleys and covered with excellent pasture. In the comparatively regular outline of the coast there are a few breaks, as at Tréport, Dieppe, St Valery-en-Caux, Fécamp, and Havre, the Cap de la Héve, which commands this last port, and Cape Antifer, 12 or 13 miles farther north. Tréport, Dieppe, Veules, St Valery, Fécamp, Yport, Etretat, and Ste Adresse (to mention only the more important) are fashion- able watering-places with the Parisians. The winters are not quite so cold nor is the summer so hot as in Paris, and the average temperature of the year is higher. The rain- fall is 24 inches per annum, increasing from Rouen to~~

~~Dieppe as the sea is approached.~~

~~With a total area of 1,491,458 acres, Seine Inférieure has 911,938 acres of arable ground, 151,125 of wood, 99,703 grass, 32,977 moorland and pasturage. Out of a total population of 814,068 in 1881 those dependent on agriculture numbered 283,536. The live stock in the same year comprised 81,561 horses of good breeds, 1421 asses, 125 mules, 236,493~~

~~cattle, 259,677 sheep of ordinary kinds and 27,523 of special breeds (wool-clip, 560 tons), 78,186 pigs, 3341 goats, 13,202 beehives (54 tons of honey and 138 of wax). Mulch cows are kept in great numbers, and Gournay butter aud Gournay and Neufchatel cheese are in repute. The farms of the Caux plateau are cach surrounded by an earthen dyke, on which are planted forest trees, generally beech and oak. Within the shelter thus provided apple and pear trees grow, which produce the cider generally drunk by the inhabitants (38,602,036 gallons in 1883). The other crops in 1883 were—wheat, 6,667,650 bushels ; meslin, 59,950; rye, 654,489; barley, 443,751; oats, 7,017,609 ; potatoes, 2,954,457 ; pulse, 98,786 ; beetroot for sugar 28,837 tons, and for fodder 118,099 ; colza seed, 29,076 tons; and 457,047 tons of ordinary fodder. In general the department is fertile and well cultivated. Along the Seine fine meadow-land has been reclaimed by dyking ; and sandy and barren districts have been planted with trees, mostly with oaks and beeches, and they often attain magnifi- cent dimensions, especially in the forest of Arques and along the railway from Rouen to Dieppe ; Pinus sylvestris is the principal com- ponent of the forest of Rouvray opposite Rouen. With the exception of a little peat and a number of quarries, employing 745 workmen, Seine Inférieure has no mineral source of wealth ; but manufactur- ing industry is well devcloped. Rouen is the cliief centre of the cotton-trade, which is in the department represented by 190 spinning and weaving factories, employing 22,947 hands, 1,400,000 spindles, 14,000 power-looms, and 4000 hand-looms, and working up 30,000 tons of cotton annually. Hand-loom weaving, carried on throughout the country districts, employs 18,000 looms ; in the branch of the cotton trade known as rowennerie 190 manufacturers are employed, producing to the value of £2,400,000 per annum; in that of the indiennes 20 establishments with 5000 workpeople turn out ycarly 1,000,000 pieces of 115 yards each. There are 22 establish- ments for dyeing cotton cloth with 700 workmen, and for dyeing cotton yarn 32 cstablishments with 1200 workmen. The woollen manufacture, of which Elbeuf is the centre, employs 24,000 work- men and produces goods valued at about £3,500,000, with raw material valued at £1,720,000, mainly imported from Australia and partly from the La Plata ports. The wool-spinning mills (at Elbeuf and Darnétal) have 92,000 spindles, aud there are 650 power-looms and 3800 hand-looms. At Elbeuf (22,888 inhabitants in 1881) there are 17~~

~~*dyeworks, 50 twist factories, a manufactory of carding machines, and 45 cloth-dressing factories. About 18,000 spindles are employed in flax-spinning, an industry more widely distributed throughout the department. Engineering works, foundries, and iron shipbuilding yards occur at Havre (population 105,540 in 1881) aud Rouen (105,860). Wooden ships are also built at Havre, Rouen, Dieppe (21,585), and Fécamp (11,919). Other establishments of importance are the national tobacco-factories at; Dieppe (1100 hands) and Havre (580 hands), sugar-refineries (£1,440,000 worth of sugar in 1881), glass-works (878 workmen), soap-works, chemical works, candle-factories, flour-mills, oil-factories, ivory-works, lace-works, clock-factories, &c. The total number of industrial establishnients in the department is 975 ; and it is estimated that 305,460 persons depend on industrial pursuits. The fisheries are a great resource for the inhabitants of the seaboard. Fécamp sends yearly £100,000 worth of cod and £80,000 worth of herrings, mackerel, &c., into the market ; Dieppe has the supplying of Paris with fresh fish; St Valery sends its boats as far as Iceland. The principal ports for foreign trade are Havre, Rouen, and Dieppe. There are 364 miles of railway, 370 of national roads, 6543 of other roads, 98 of Seine navigation, and the Bresle is canalized for 2 miles. In population Seine Inférieure stands fourth in the list of French departmcuts ;*~~

~~*SEIIEI—SEI*~~

~~*it has consequently been proposed to divide it into the two depart- ments of Seine Inférieure and Seine Maritime. The density of population is double the average of France. There are 5 arrondisse- ments, 51 cantons (of which 3 are in Havre and 6 in Rouen), and 759 communes. The department forms the archbishopric of Rouen ; the court of appeal and the headquarters of the corps d'armée are also in that city. Places of importance are Elbeuf; Fécamp, a fishing port, with sea-bathing, distilling, &c.; Bolbec_ (10,226 inhabitants), with weaving and spinning factories; and Eu (4827 inhabitants), with a celebrated castle belonging to Louis Philippe and the Orleans faiily.*~~

~~*SEISIN. "Seisin of the freehold may be defined to be the possession of such an estate in land as was anciently thought worthy to be held by a*~~

~~*free man" (Williams, On Seisin, p. 2). Seisin is now confined to possession of the freehold, though at one time it appears to have been used for simple possession without regard to the estate of the possessor. (See Posssssion.) Its importance is consider- ably less than it was at one time owing to the old form of conveyance by feoffment with livery of seisin having been superseded by a deed of grant (see Reau Estar), and the old rule of descent from the person last seised having been abolished in favour of descent from the purchaser. (See INHERITANCE.) At one time the right of the wife to dower and of the husband to an estate by curtesy depended upon the doctrine of seisin. The Dower Act, 3 and 4 Will. IV. c. 105, has, however, rendered the fact of the seisin of the husband of no importance, and the Married Women's Property Act, 1882, appears to have practically abolished the old law of curtesy. In the case of a convey- ance operating under the Statute of Uses, seisin is deemed to be given by the effect of the statute. This constructive seisin may still be of importance where the question arises how long a person has been in actual possession, Thus in Orme's Case (Law Rep., 8 Common Pleas, 281) the right to a county vote depended upon the form of the convey- ance of a rent-charge to the voter. If the conveyance had been under the statute, the claimant would have been seised for a sufficient time; the court, however, held that the conveyance was a common' law grant, and that the grantee must have been in actual receipt of the rent m order to entitle him to be registered.*~~

~~*Primer seisin was a feudal burden at one time incident to the king's tenants in capite, whether by knight service or in socage. It was the right of the crown to receive of the heir, after the death of a tenant im capite, one year's profits of lands in possession and half a year's profits of lands in reversion. The right was abandoned by the Act abolishing feudal tenures (12 Car. IT. c. 24).*~~

~~*In Scotch law the corresponding term is "sasine." Like seisin in England, sasine has become of little legal importance owing to recent legislation. By 8 and 9 Vict. c. 35 actual sasine on the lands was made unnecessary. By 21 and 22 Vict. c. 76 the instru- ment of sasine was superseded by the recording of the conveyance with a warrant of registration thereon. For the register of sasines, see REGISTRATION.*~~

~~*SEISMOMETER. This name was originally given to instruments designed to measure the movement of the ground during earthquakes. Recent observations have shown that, in addition to the comparatively great and sudden displacements which occur in earthquakes, the ground is subject to other movements. Some of these, which may be called " earth-tremors," resemble earthquakes in the rapidity with which they occur, but differ from earthquakes in being imperceptible (owing to the small- ness of the motion) until instrumental means are used to detect them. Others, which may be called " earth-tilt- ings," show themselves by a slow bending and unbending of the surface, so that a post stuck in the ground, ver- tical to begin with, does not remain vertical, but inclines now to one side and now to another, the plane of the ground in which it stands shifting relatively to the horizon. No sharp distinction can be drawn between these classes*~~

~~*of movements. Earthquakes and earth-tremors grade into one another, and in almost every earthquake there is some tilting of the surface. The term "seismometer" may con- veniently be extended (and will here be understood) to cover all instruments which are designed to measure move- ments of the ground.*~~

~~*Measurements of earth-movements are of two distinct types. In one type, which is applicable to ordinary earthquakes and earth-tremors, the thing measured is' the displacement of a point in the earth's crust. In the second type, which is applicable to slow tiltings, the thing measured is any change in the plane of the earth's surface relatively to the vertical, Under Eartaquaks mention is made of instruments designed by Palmieri and others to register the occurrence of earthquakes, and in some cases to give a general idea of their severity. While some of those instruments act well as seismoscopes, none of them serve to determine with precision the character or the magnitude of the motion. In this article notice will be taken only of instruments intended for exact measurement.*~~

~~*Earthquake displacements are in general vertical as well as horizontal. For the purpose of measurement it is con- venient to treat the vertical*~~

~~*component separately, and in some cases to resolve the horizontal motion into two com-*~~

~~*ponents at right angles to each other.*~~

~~*Inertia Method.—In the first type of measurements what may be called the "inertia" method is followed. A mass is suspended with freedom to move in the direction of that component of the earth's motion which is to be measured. When an impulse occurs the supports move, but the mass is prevented by its inertia from accompanying them. It supplies a steady point, to be used as a standard of reference in determining the extent through which the ground has moved in the direction in question, But, in order that the suspended mass shall not acquire motion when its supports move, one essential condition must be satisfied. Its equilibrium must be neutral, or a! nearly so, in order that, ti when the supports are displaced, little or no force may be brought into operation tending to bring the mass into the same position rela- tive to the supports as it occupied before dis- turbance. This can be made plain by consider- ing the case of a common pendulum hung from a support which is rigidly, fixed to the ground. When the ground moves in any horizontal direc- tion the pendulum's inertia causes a certain point in it (the centre of percussion) to remain for the instant at rest. But this contrivance does not yield a steady point, because the sta- bility of the pendulum makes the bob swing down to recover its place directly under the sup- port; and in fact, if a succession of oscillations of the ground occur, the bob acquires a motion often much greater than the motion of the sup- port itself. This tend-\ ency may be corrected, \| and the pendulum made \ fit to act as a seismo- meter, by any contri- vance which (without introducing friction) Fic. will reduce its stability so much as to make the equilibrium of the bob very nearly neutral. In all instruments designed to furnish a steady point the suspended mass must have some small stability,*~~

~~*i i i*~~

~~*a U*~~

~~*a er se) ie f hy fa gh*~~

~~*1.—Duplex pendulum seismograph.*~~

~~*627*~~

~~*else it would be unmanageable; but its period of free oscillation must be much greater than that of the earthquake-motions which it is employed to measure. Even a simple pendulum can have its stability reduced sufficiently to fit it for seismometric work by making it very long. The same result is, however, much more con- veniently achieved by combining a common pendulum with an inverted pendulum placed just beneath it. The common pendulum being stable and the inverted pendulum unstable, if the bobs are jointed so that they must move together, the combination can be made as nearly astatic as may be desired.! Figs. 1 and 2 illustrate*~~

~~*how this combination is applied 'oe in seismometry. The stable bob : E ¢ a, hung from a fixed support Oo =a*~~

~~*above by three parallel wires, is connected with the inverted pen- , dulum 6 by a ball-and-tube joint. (onsen A lever c, carried by a gimbal FASSSSQsey joint in the fixed bracket d, is F geared also by a ball-and-tube " joint to the upper bob. Its long b arm carries a jointed index e, which projects out and touches*~~

~~*a smoked-glass plate f, held on*~~

~~*a fixed shelf. Any horizontal motion of the ground acts on the Fie. 2.—Duplex pendulum lever by the bracket d, and showing details,*~~

~~*causes the index to trace a magnified record on the smoked-glass plate. Fig. 1 is taken from a photograph of an instrument of this kind, constructed to give a much magnified record of small movements. When large earthquakes are to be recorded the mul- tiplying lever is dispensed with, and the index is attached directly to one of the bobs. Observations with instruments of this class exhibit well the very complicated motion which the earth's surface undergoes during an earthquake. In small earthquakes (such as are only slightly or not at all destructive) the greatest amplitude of motion is often less than a millimetre, and rarely more than a centimetre ; the disturbance nevertheless consists of a*~~

~~*multitude of successive movements, quite irregular in amplitude, period, and direction. Fig. 3 isa facsimile of the record given ,*~~

~~*by a duplex pendulum seismograph during one of the earthquakes which occur frequently in the plain of Yedo, Japan. The record, as engraved, is three and a half times the earth's actual motion. Instead of two pendulums, a single inverted pen- ; ' dulum has been used, with a spring stretched ™. ae ll between it and a fixed support above. By ad- % sce aie justing the spring so that a proper proportion of robin the weight is borne by it and the remainder by the rigid stem of the pendulum, an approach to neutral equilibrium can be made." In Forbes's inverted pendulum seismometer a somewhat similar plan was adopted: the foot of the pendulum was attached to an elastic wire which tended to restore it to its normal vertical position when displaced.*~~

~~*Another group of instruments designed to furnish two degrees of freedom for the purpose of recording all motions in a horizontal plane, but much less satisfactory on account of their friction, is that in which a rolling sphere either itself supplies inertia or forms a support for a second inertia-giving mass. Probably the earliest was one used in Japan by Dr G. F. Verbeck in 1876 (see fig. 4). Ona marble table, ground plane and carefully levelled, four balls of rock-crystal were placed, carrying a massive block of hard wood. A pencil, sliding in a hole in the block, re- = gistered the relative motion of the table and the block on a sheet of paper fixed San ss '. Tr be if Fic. 4.—Rolling sphere seismograph. there were no friction) somewhat larger than the true motion of the table, for the system is kinetically equivalent to four upright pieces whose centres of percussion lie in a plane nearly, but not quite, as high as the tops of the balls. This forms what may be called the steady plane ; its position depends on the relative masses of block and balls, and is easily calculated. When the ground moves in any direction the block moves through a short distance in the opposite direction, and the record is magnified in a fixed ratio. Various forms of rolling-sphere seismometers have been*~~

~~*1 J. A. Ewing, "A Duplex Pendulum Seismometer," in Transactions of the Seismological Society of Japan, vol. v., 1882, p. 89.*~~

~~2 Ewing, "A Duplex Pendulum with a Single Bob," in Trans. Sets. Soc, Jap., vol. vi., 1883, p. 19.~~

~~3 Report of Brit. Assoc., 1841, p. 47, or Trans. R. S. H., xv. p. 219.~~

~~proposed by Mr. T. Gray,! Mr. C. A. Stevenson,? and others. Prob- ably the best form would be that of a light spherical segment rolling on a level plane base and carrying a heavy bob fixed to it. To give some stability the bob should be placed so as to bring the centre of gravity a little under the centre of curvature. The centre of percussion, somewhat higher than this, would of course be the steady point, and a multiplying pointer might take the motion either from it or from any other convenient part of the rolling piece. All rolling seismometers—including rolling cylinders, which have been proposed by Mr Gray as single-freedom instruments, to register one component of horizontal motion—fail to act well, partly because of the comparatively great frictional or quasi-fric- tional resistance which is presented to the motion of the free mass, and partly because, owing to imperfections in the construc- tion and want of perfect rigidity in the materials, the ball or cylinder takes up a position in which there is au objectionably great stability as regards very small displacements. These objections make the use of rolling seismometers unadvisable, except perhaps for the rough measurement of violent earthquakes.~~

~~The seismographs which have been described draw a horizontal plan of the path pursued during an earthquake by a point on the earth's surface. They take no note of the relation of the displace- ment to time,—an element which is required if we are to form any estimate of the violence of an earthquake from the record. With this view a different method of registration is also followed. The whole movement is resolved into rectilinear components, and these are separately recorded (by single-freedom seismometers) on a plate or drum which is kept in continuous movement, so that the record of each component takes the form of an undulating line, from which the number, succession, amplitude, velocity, and acceleration of the component movements can be deduced and the resultant motion determined. A single steady mass with two degrees of freedom may still be employed to record, separately, two components of~~

~~*horizontal motion; but it is generally preferable to provide two distinct masses, each with one degree of freedom. The principal instrument of this class is the horizontal pendulum seismograph,* which has been used to record Japanese earthquakes since 1880. It consists of two horizontal pendulums, set at right angles to each other, each supplying a steady point with respect to horizontal motions transverse to its own length. Each pendulum is pivoted about two points, on an axis which is nearly vertical, but in- clined slightly forwards to give a suitable degree of stability. In some forms of the instrument the pivoted frame of the pendulum is light, and the inertia is practically all furnished by a second piece or bob pivoted on the frame about a vertical axis through the centre of percussion of the frame. This construction has the advantage of compactness and of making the position of the steady point at once determinate. But a simpler construction is to at- tach the bob rigidly to the frame. This shifts the steady point a little way outwards from the position it would have if the bob were pivoted. In either construction a prolongation of the pendu- lum beyond the bob forms a convenient multiplying index. Fig.*~~

~~*Fie. 5.—Horizontal pendulum seismograph.*~~

~~*5 shows a complete horizontal pendulum seismograph (with pivoted bobs). Two rectangular components of earthquake motion are re- corded radially on a revolving plate of smoked glass, which receives its motion through a friction roller from a clock furnished with a fluid-friction centrifugal governor. The clock may either be kept going continuously, in expectation of an earthquake at any moment,*~~

~~*1 Gray, Phil. Mag., September 1881.*~~

~~*2 Stevenson, Trans. Roy. Scot. Soc. of Arts, February 1882.*~~

~~*3 Ewing, "On a New Seismograph," in Proc. Roy. Soc., No. 210, 1881, or Trans, Seis. Soc. of Japan, December 1880.*~~

~~*SEISMOMETER*~~

~~*or be started into motion by an electric seismoscope when the earliest indications of an earthquake are felt. The former plan is practicable only when the instrument can receive careful attend- ance and where earthquakes occur often. It has the drawback that the circle which is drawn by each pointer as the plate revolves below it gradually broadens, partly because of warping and tempera- ture changes in the supports and partly because of actual tilting of the ground. As an earthquake generally begins with comparatively insignificant movements, there is not much to object to in having the plate at rest to begin with, provided a sufficiently sensitive starting seismoscope be used. A suitable arrangement for this pur- pose is one due to Palmieri: a short pendulum hangs over a cup of mercury, in the centre of which a depression is formed by an iron pin, whose top is a little lower than the surface of the mercury, The pendulum ends in a platinum point, which stands clear in the centre of this depression, but touches the edge whenever a horizontal movement of the ground takes place, thereby closing the circuit of an electro-magnet, which starts the clock. In the most recent form of the horizontal pendulum seismograph the bobs are fixed to the pivoted frames, and the pointers are arranged to trace their records side by side. Records with instruments of this class, besides giving much additional information, agree with those of the duplex pendulum in show- ing that earthquake motion is a tangle of waves in all azi- muths. This will be seen by reference to fig. 6, which shows a small portion of*~~

~~*an earthquake re- : : . Fic. 6.—Record of earthquake by horizontal gistered by's pair of pendulum seismograph; one-third full size.*~~

~~*horizontal pendu-*~~

~~*lums. Contemporary parts of the two records are shown together, the straight radial lines marking seconds of time. The phases of the two components are con- N*~~

~~*tinually changing, and when the two are compounded the result is a path having the same characteristics as those of the diagram in fig. 3. Fig. 7 — = gives the result of compounding" E the records of fig. 6 during three seconds, while the range of move- ment was a maximum.*~~

~~To register the vertical com- ponent of earthquake motions we require to suspend a mass with vertical freedom. Most ways of doing this give too much stability, as, for instance,~~

~~$~~

~~Fic. 7.—Result of compounding the record of fig. 6.~~

~~when a weight is hung from a sy spring or carried by a hori-~~

~~zontal bar that is fixed to a wall or table by a flexible spring joint. This last is the vertical motion seis- mometer which was used by the British Association Commit- tee at Comrie in 1842. Another form, me- chanically equivalent to this, is a weighted ‘ horizontal bar, pivot- ed on a fixed hori- zontal fulerum, and held up by a spiral spring, stretched from a point near the fulerum to a fixed support above. This mode of suspen- sion is still too stable, though less so than if the spring were~~

~~ANIA AN EPP ARAN AY NAA AAA AA~~

~~Fic. 8.—Principle of~~

~~directly loaded. To Vertical motion — make it nearly a- Seismograph. static Mr T. Gray* proposed the use~~

~~of a tube containing mercury, connected with the bar in such a manner that when the bar goes down the mercury, running to- wards one end of the tube, has the effect of increasing the weight, and when the bar goes up an opposite effect occurs. This plan is open to the objection that the mercury is disturbed by horizontal movements of the ground. A simpler plan is shown in fig. 8.? There the pull of the spring is applied at a short distance v below the plane of the bar. Hence when the weight goes down the spring,~~

~~4 Gray, Trans. Scis. Soc. Jap., vol. iii. p. 187. 5 Ewing, Trans. Seis. Soc. Jap., vol. iii. p. 140. le,~~

~~*which then pulls with more force, pulls with a smaller leverage, and it is easy to adjust the distance v so that the moment of the pull of the spring remains sensibly equal to the moment of the weight,—the condition necessary to make the bar astatic. This is*~~

~~*is stretched transversely across a vertical tube in the upper bob a. This serves to measure horizontal motion in the plane of the drawing. Motion at right angles to this is shown by the lower bob ¢ (drawn in section), which carries a similar transverse hair. A fixed lens b between the bobs gives an image of the lower hair in the plane of the upper hair, so that both appear crossed in the field of the microscope, thereby allowing both components of horizontal motion to be observed together.*~~

~~*Equilibrium Method.—In observing slow earth-tiltings an entirely different process is followed. 'The problem then is, not to measure displacements by aid of the inertia of a body which tends to pre- serve its original position, but to compare the direction of a line or plane fixed to the earth with the direction of the vertical. The earliest observations of earth-tiltings were made by the aid of spirit-levels. If a level be set on a table fixed to the rock, its bubble, watched through a microscope, will be seen to move slowly now to one side and now to another. The movements are so slow that the inertia of the fluid is unimportant. Observations with pairs of levels, set at right angles to each other, have been carried on systematically for some years by M. P. Plantamour.' This is the simplest method of measuring earth-tiltings, but it is liable to errors which are not easily excluded. Another method of investigating changes in the direction of the vertical was initiated in 1868 by M, A. d'Abbadie,3 who had before that observed the movements of level-bubbles. Light from a fixed source is made to fall on a reflect- ing basin of mercury about 10 metres below it. Above the basin is a large lens of long focus, which brings the rays into parallelism dur- ing their passage to the mercury, and causes them to converge after reflexion, so that an image of the source is formed at a convenient distance from it, and in the same horizontal plane. The interval between the source and the image is measured (in amount and azimuth) at least twice a day by a micrometer microscope. The accuracy of the method depends on the fixity of the source of light relatively to the lens and to the surface of the ground, and to secure this M. d'Abbadie*~~

~~*built a massive hollow cone of concrete for the support of his apparatus. HIs observations have shown that the earth's surface undergoes almost incessant slow tilting through angles which, in the course of a year, have been found to range over four seconds. HIe has also noticed the occurrence of earth-tremors by the occasional blurring of the image through agitation of the mercury. An improvement on his apparatus suggested by M. Wolf# is shown in fig, 11. The a instead of being all reflected from the free surface of mercury (a), is partly reflected from that and partly from a plane mirror (6) fixed to the rock. Two images are therefore formed, whose rela- tive position measures the tilting of the surface. The advantage of this is that the position of the source of light need no longer be fixed, and the accuracy of the method depends only on the fixity of the mirror } with respect to the rock. Further, to avoid having the source and image at a great height above the surface, i. {iy M. Wolf allows the light to reach an nS ee a leave the apparatus horizontally, in the Fig. 11. manner indicated in the sketch, by using a plane mirror inclined at 45° to the horizon. Still another mode of a yostiga ne slow changes of the vertical was followed (at the suggestion of Sir William Thomson) by Messrs G. H. and H. Darwin, in observations made by them with the view of measuring the lunar disturbance of gravity. The Reports of the British Association for 1881 and 1882 contain a full account of their apparatus, as well as notices of the work of other observers and a discussion of the cause of earth-tiltings. Their in- strument was a short pendulum hung in a viscous fluid, from a fixed support, by two wires arranged V-wise to leave the pendulum only one degree of freedom. Below the bob was a small mirror hung by two threads, one of which was attached to the pendulum bob and the other to a fixed support. The pendulum was free to swing at right angles to the plane of the threads, and any movement of this kind caused the mirror to rotate through an angle which was measured in the usual way by a telescope and scale. The method is susceptible of very great delicacy, but Messrs Darwin found that when the instrument was adjusted to be specially sensitive its manipulation becaine extremely difficult. Wolfs modification of D'Abbadie's method appears to furnish, on the whole, the most promising apparatus for measurements of this type. The ap- paratus represented in fig. 10 is also applicable. 'I'he method of measurement employed in the case of slow tiltings may be called the equilibrium*~~

~~*method in contradistinction to the inertia method, which is used to measure comparatively sudden displacements. The ne ee*~~

~~*2 Plantamour, Comptes Rendus, 24th June 1878, 1st December 1879, &c.; and numerous papers in Archives des Sciences, Geneva, 1878-84.*~~

~~*3 D'Abbadie, Etudes sur la Verticale (Association Francaise pour l'Avance- ment des Sciences), 1872, p. 159; also Ann. de la Soc. Scient. de Bruxelles, 1881.*~~

~~*4 Comptes Rendus, xevii. p. 228.*~~

~~*2*~~

~~*secured when v=", h being the horizontal distance from the ful-*~~

~~*crum to the point at which the spring acts, and / the length by which the spring is stretched when the bar is undeflected. Stability is given by making v somewhat less than this. A vertical-motion seismograph, constructed on the principle which fig. 8 illustrates diagrammatically, is arranged to trace its record on a revolving glass plate. This, along with a pair of horizontal pendulums recording on the same plate, completes a three-component pana*~~

~~*Au interesting mode of suspension, by which a mass is hung in neutral or nearly neutral equilibrium, with one degree of horizontal freedom, is shown in fig. 9. It is based on the approximate straight /- line linkwork of T'chebicheff. When a bar is hung from fixed supports by crossed ties, at a distance below the supports equal to the distance between the supports, the length of the bar being equal to half that distance, its middle point moves in very nearly a straight line. By fix- ing a weight at the centre of the bar and adding a suitable recording apparatus, we have a very friction- less form of one-component hori- pie 9 Astati ; zontal seismometer When a dis. "** %* "8 sanacll-a: Seema placement of the ground occurs in the line of the bar, the bar is tilted through an angle which is proportional to the linear displace- ment, and the centre of the bar consequently shares, in a small and definite proportion, the motion of*~~

~~*the ground,—a fact which is to be borne in mind in estimating the degree of multiplication given by the recording apparatus,*~~

~~*The instruments which have been described afford complete and satisfactory means of determining the motion which a point of the ground undergoes during any disturbance which would be recog- nized as an earthquake. For minute earth-tremors, however, a larger multiplication is necessary, and the absence of friction is of even more importance than in the measurement of earthquakes proper. Optical methods of magnifying the motion are accordingly resorted to. In the "normal tromometer" of Bertelli, used in Italy to detect earth-tremors, the bob of a pendulum, suspended by a fine wire from a fixed support, is viewed through a reflecting prism and its motion in any azimuth measured by a micrometer microscope. The great stability of the pendulum, which is only 14 metres long, prevents it from behaving as a steady-point seismometer ; and, 1 successive earth-movements were by chance to occur with a period equal or nearly equal to its own free period, its acquired swing would altogether mask the legitimate dications. This kind of action has, in fact, been turned to account as a means of detecting very minute earth-tremors by Rossi, who has devised a micro-seismoscope, consist- ing of a number of pendu- lums of various lengths, one or other of which is likely to be set swinging when the ground shakes to and fro re- peatedly, through even the minutest range. 'To measure tremors, however, the instru- ments of Bertelli and Rossi are inappropriate; for that purpose, just as for the pur- pose of measuring larger motions, the suspended mass must be in nearly neutral am To find a mode of suspension which is at once ¢ astatic and extremely fric- tionless is a matter of some difficulty ; the crossed link suspension, which has been already described, is probably the most satisfactory means ° hitherto suggested. It has been adopted in the micro seismometer sketched in sec- tion in fig. 10. Two bobs are separately suspended, in the manner shown by fig. 9, at right angles to each other, one above the other, in a cast-iron case. A microscope, fixed to the top of the case and furnished with a micrometer eye-piece, is focused on a hair, which*~~

~~*1 Ewing, 'On certain Methods of Astatic Suspension," in Trans, Seis. Soc. Jap., vol. vi. p. 25.*~~

~~Fic. 10.—Microseismometer.~~

~~two methods arc applicable to two widely different classes of move- ments. It is at least possible that between these classes there may be other modes of motion,—displacements which are too slow for the inertia method, and which give rise to too little change of slope for the equilibrium method. How to measure them is, and must appar- ently remain, an unsolved problem in seismometry.~~

~~References.—The Report of the British Association for 1858 contains an account by Mallet of some of the older and now obsolete forms of seismometers (see also Harruquaxke), For accounts of modern instruments of the inertia class, see the Transactions of the Seismological Society of Japan froin 1880, also Prot. Ewing's Memotr on Earthquake Measurement, published by the university of Tokio (1883). References to papers on the equilibrium inethod of measure- inent have been made in the text. (J. A. E.)~~

~~SEISTAN. See Srsran.~~

~~SEJANUS, /Eurus (executed 31 a.p.), the famous ininister of Trpertus (q.0.).~~

~~SELBY, a market town of the West Riding of York- shire, England, is situated on the navigable river Ouse and on the main line of the Great Northern Railway, 15 miles south of York and 20 east of Leeds. Of the ancient abbey for Benedictines, founded by William the Conqueror in 1069 and raised to the dignity of a mitred abbey by Pope Alexander II., there still remains the church of St Mary and St German, although it has been much changed by alterations and additions, the more ancient and notable features being the nave, transept, and west front, The church was made parochial in 1618. In the market-place there isa modern Gothic market cross. Among the public buildings are the drill hall and the mechanics' institute and public rooms. Flax-scutching, seed-crushing,~~

~~*brick and tile making, boat-building, tanning, and brewing are the principal industries. There isa large trade in potatoes, flax, and mustard, and a considerable cattle-market. The town receives its water-supply from artesian wells. A local board of health was established in 1851, consisting of nine members. The population of the urban sanitary district (6193 in 1871), extended in 1881 from 514 to 3760 acres, was in that year 6057,*~~

~~*Henry I. of England was born in the abbey, a fact which prob- ably accounts for the special privileges conferred on it. In the*~~

~~*early part of the Civil War it was held by the Parliament, and after being taken by the Royalists was recaptured by Fairfax.*~~

~~*SELDEN, Joun (1584-1654), jurist, legal antiquary, and Oriental scholar, was born on 16th December 1584 at Salvington, in the parish of West Tarring, near Worthing, Sussex. His father, also named John Selden, held a small farm, and seems to have occasionally added to his liveli- hood by his labour as a wheelwright and his skill as a musician. It is said that his accomplishments as a violin- player gained him his wife, whose social position was somewhat superior to his own, She was Margaret, the only child of Thomas Baker of Rustington, a village in the vicinity of West Tarring, and was more or less re- motely descended from a knightly family of the same name in Kent. John Selden commenced his education at the free grammar-school at Chichester, whence he pro- ceeded in his sixteenth year with an exhibition to Hart Hall at Oxford. In 1603 he was admitted a member of Clifford's Inn, London, and in 1604 migrated to the Inner Teniple, and in due course he was called to the bar. While still a student he appears to have been on terms of friendship with Ben Jonson, Drayton, and Camden ; and among his more intimate companions were Edward Little- ton, afterwards lord keeper ; Henry Rolle, afterwards lord chief-justice ; Edward Herbert, afterwards golicitor- general ; and Thomas Gardener, afterwards recorder of London. His earliest patron was Sir Robert Cotton, the antiquary, by whom he seems to have been employed in copying and abridging certain of the parliamentary records then preserved in the Tower. For some reason which has not been explained, Selden never went into court as an advocate, save on rare and*~~

~~exceptional occasions. But his practice in chambers as a conveyancer and consulting counsel is stated to have been large, and, if we may judge~~

~~from the considerable fortune he accumulated, it must also have been lucrative.~~

~~It was, however, as a scholar and writer that Selden won his reputation both amongst his contemporaries and With posterity. HIs first work, an account of the civil adminis. tration of England before the Norman Conquest, is said to have been completed when he was only two- or three- and. twenty years of age. But if this was the Analecton Anglo-Britannicon, as is generally supposed, he withheld it from the world until 1615. In 1610 appeared his England's Epinomis and Janus Anglorum, Facies Altera, which dealt with the progress of English law down to Henry II., and The Duello, or Single Combat, in which he traced the history of trial by battle in England from the Norman Con- quest. In 1613 he supplied a series of notes, enriched b an immense number of quotations and references, to the first eighteen cantos of Drayton's Polyolbion. In 1614 he published Titles of Honour, which, in spite of some obvious defects and omissions, has remained to the present day the most comprehensive and trustworthy work of its kind that we possess; and in 1616 his notes on Fortescue's De Laudibus Legum Angliz and Hengham's Summez Magna et Parva, In 1617 his De Diis Syriis was issued from the press, and immediately established his fame as an Oriental scholar among the learned in all parts of Europe. After two centuries and a half, indeed, it is still not only the fundamental but also in many respects the best book which has been written on Semitic mythology. In 1618 his Listory of Tithes, although only published after it had been submitted to the censorship and duly licensed, never- theless aroused the apprehension of the bishops and pro- voked the intervention of the king. The author was sum- moned before the privy council and compelled to retract his opinions, or at any rate what were held to be his opin- ions. Moreover, his work was suppressed and himself forbidden to reply to any of the controversialists who had come or might come forward to answer it.~~

~~*This seems to have introduced Selden to the practical side of political affairs. The discontents which a few years later broke out into civil war were already forcing them- selves on public attention, and it is pretty certain that, although he was not in parliament, he was the instigator and perhaps the draftsman of the memorable protestation on the rights and privileges of the House affirmed by the Commons on the 18th of December 1621. He was with several of the members committed to prison, at first in the Tower and subsequently under the charge of Sir Robert Ducie, sheriff of London. During his detention, which only lasted a short time, he occupied himself in preparing an edition of Eadmer's History from a manuscript lent to him by his host or jailor, which he published two years afterwards. In 1623 he was returned to the House of Commons for the borough of Lancaster, and sat with Coke, Noy, and Pym on Sergeant Glanville's election committee. He was also nominated reader of Lyon's Inn, an office which he declined to undertake. For this the benchers of the Inner Temple, by whom he had been appointed, fined him £20 and disqualified him from being chosen one of their nuniber. But he was relieved from this in- capacity after a few years, and became a master of the bench. In the first parliament of Charles I. (1625), it appears from the "returns of members" printed in 1878 that, contrary to the assertion of all his biographers, he had no seat. In Charles's second parliament (1626) he was elected for Great Bedwin in Wiltshire, and took a prominent part in the impeachment of George Villiers, duke of Buckingham. In the following year, in the "benevolence" case, he was counsel for Sir Edmund Hampden in the Court of King's Bench. In 1628 he was returned to the third parliament of Charles for Ludgers-*~~

~~*hall in Wiltshire, and had a large and important share in drawing up and carrying the Petition of Right. In the session of 1629 he was one of the members mainly respon- sible for the tumultuous passage in the House of Commons of the resolution against the illegal levy of tonnage and*~~

~~*poundage, and, along with Eliot, Holles, Long, Valentine, Strode, and the rest, he was sent once more to the Tower. There he remained for eight*~~

~~*months, deprived for a part of the time of the use of books and writing materials.*~~

~~*He was then removed, under less rigorous conditions, to*~~

~~*the Marshalsea, until not long afterwards owing to the good offices of Archbishop Laud he was liberated. Some years before he had been appointed steward to the earl of Kent, to whose seat, Wrest in Bedfordshire, he now retired. In 1628 at the suggestion of Sir Robert Cotton he had compiled, with the assistance of two learned coadjutors, Patrick Young and Richard James, a catalogue of the Arundel marbles. He employed his leisure at Wrest in writing De Successionibus in Bona Defunct secundum Leges Ebreorum and De Successione in Pontificatum Hbreorum, published in 1631. About this period he seems to have inclined towards the court rather than the popular party, and even to have secured the personal favour of the king. To him in 1635 he dedicated his Mare Clausum, and under the royal patronage it was put forth as a kind of state paper. It had been written sixteen or seventeen years before; but James I. had prohibited its publication for political reasons ; hence it appeared a quarter of a century after Grotius's Mare Lnberum, to which it was intended to be a rejoinder, and the pretensions advanced in which on behalf of the Dutch fishermen to poach in the waters off the British coasts it was its purpose to explode. The fact that Selden was not retained in the great case of ship money in 1637 by John Hampden, the cousin of his former client, may be accepted as additional evidence that his zeal in the popular cause was not so warm and unsuspected as it had once been. During the progress of this moment- ous constitutional conflict, indeed, he seems to have been absorbed in his Oriental researches, publishing De Jure Naturali et Gentium juxta. Diseiplinam Hbreorum in 1640. He was not elected to the Short Parliament of 1640; but to the Long Parliament, summoned in the autumn, he was returned without opposition for the uni- versity of Oxford. Immediately after the opening of the session he was nominated a member of the committee of twenty-four appointed to draw up a remonstrance on the state of the nation. He was also a member of the com- mittees entrusted with the preliminary arrangements for the impeachment of Strafford. But he was not one of the managers at the trial, and he voted against the Bill for his attainder. He was, moreover, a*~~

member of the com- mittees nominated to search for precedents and frame the articles of impeachment against Archbishop Laud, although it does not appear that he was implicated in the later stages of the prosecution against him. He opposed the resolution against Episcopacy which led to the exclusion of the bishops from the House of Lords, and printed an answer to the arguments used by Sir Harbottle Grimston on that occasion. He joined in the protestation of the Commons for the maintenance of the Protestant religion according to the doctrines of the Church of England, the authority of the crown, and the liberty of the subject. He was equally opposed to the court on the question of the commissions of lieutenancy of array and to the parlia- ment on the question of the militia ordinance. In 1643, however, he became a member and participated in the dis- cussions of the assembly of divines at Westminster, and was appointed shortly afterwards keeper of the rolls and records in the Tower. In 1645 he was named one of the parliamentary commissioners of the admiralty, and was

elected master of Trinity Hall in Cambridge,—an office he declined to accept. In 1646 he subscribed the Solemn League and Covenant, and in 1647 was voted £5000 by the parliament as compensation for his sufferings in the evil days of the monarchy. He had not, however, relaxed his literary exertions during these years. He published in 1642 Privileges of the Baronage of England when they sit in Parliament and Discourse concerning the Rights and Privileges of the Subject; in 1644 Dissertatio de Anno Civili et Calendario Reipublicw Judaice; in 1646 his treatise on marriage and divorce among the Jews entitled Uxor Ebraica ; and in 1647 the earliest printed edition of the old and curious English law-book /leta. What course he adopted with regard to the trial and execution of the king is unknown; but it is said that he refused to answer the Aikon Basiltke, although Cromwell was anxious he should do so, the task which he declined being after- wards performed by Milton in his Zconoclastes. In 1650 Selden passed the first part of De Synedriis et Prefecturis Juridicis Veterum Ebreorum through the press, the second and third parts being severally published in 1653 and 1655, and in 1652 he wrote a preface and collated some of the manuscripts for Sir Roger Twysden's

~~*Historiz Anglice Scriptores Decem. His last publication was a vindication of himself from certain charges advanced against him and his Mare Clawswm in 1653 by Theodore Graswinckel, a Dutch jurist.*~~

~~*After the death of the earl of Kent in 1639 Selden lived permanently under the same roof with his widow. It is believed that he was married to her, although their marriage does not seem to have ever been publicly acknow- ledged. He died at Friary House in Whitefriars on 30th November 1654, and was buried in the Temple Church, London. Within the last few years a brass tablet has been erected to his memory by the benchers of the Inner Temple in the parish church of West Tarring.*~~

~~*Several of Selden's minor productions were printed for the first time after his death, and a collective edition of his writings was published by Archdeacon Wilkins in 3 vols. folio in 1725, and again*~~

~~*in 1726. His Table Talk, by which he is perhaps best known, did not appear until 1689. It was edited by his amanuensis, Richard*~~

~~*Lee Ie*~~

~~*Milward, who affirms that " the sense and notion is wholly Selden's, and that "most of the words" are his also. Its genuineness has sometimes been questioned, although on insufficient grounds. In Hallam's opinion it "gives perhaps a more exalted notion of Sel- den's natural talents than any of his learned writings," and in Coleridge's it contains " more weighty bullion sense" than he had "ever found in the same number of pages of any uninspired writer." See Bliss, Wood's Athens Oxonienses (London, 1817, vol. iv.); Aikin, Lives of John Selden and Archbishop Usher (London, 1812); Johnson, Memoirs of John Selden, &c. (London, 1835); Singer, Fable Talk of John Selden (London, 1847) ; and Wilkins, Johannis Seldent Opera Omnia, &e. (London, 1725). (F. DR.)*~~

~~*SELECTION anp VARIATION. See VARIATION AND SELECTION.*~~

~~*SELENIUM anp TELLURIUM! are two rather rare chemical elements discovered, the latter by Muller von Reichenstein in 1782, the former by Berzelius in 1817. Both occur only in the mineral kingdom as*~~

~~*components of very rare minerals, most of which are compounds of one or the other or of both and sulphur with silver, lead, bismuth, antimony, gold, and other metals.*~~

~~*Elementary Selenium.—This, like elementary sulphur, exists in a variety of forms, which are conveniently con- sidered as modifications of the two genera now to be described. (1) Won-metallic selenium includes the flocculent scarlet precipitate produced by the reduction of solution of selenium by sulphurous acid in the cold. The scarlet flocks when dried without the aid of heat assume the form of a brown-red powder of sp. gr. 4°26, which dissolves in 1000 times its weight of boiling bisulphide of carbon (at 46°°6 C.). The solution on cooling deposits most of its selenium in the form of minute monoclinic crystals of sp.*~~

~~*1 Comp. CHEMISTRY, vol. v. pp. 498, 499, 501-503, 506, 508.*~~

~~*gr. 4°5 (isomorphous with monoclinic sulphur), which retain their solubility in bisulphide of carbon up to 100°C. At 110° C. or higher temperatures they pass into the metallic modification (see below) with evolution of heat. With the amorphous kind a similar change sets in at or above 80° C. and attains its maximum of rapidity at a point be- tween 125° and 180°C. Fused selenium when cooled down suddenly hardens into a very dark-coloured glass of 4:28 sp. gr., soluble in bisulphide of carbon; on gradual cool- ing it becomes more or less completely "metallic." (2) Metallic selenium is a dark grey or black solid of 4°8 sp. gr. ; it exhibits metallic lustre, stretches perceptibly under the hammer, and its fracture is similar to that of grey cast iron. It is insoluble in bisulphide of carbon. Its fusing point is sharply defined and lies at 217° C. At the ordi- nary temperature it conducts electricity, while the non-metallic modification does not ; at higher temperatures, or after temporary exposure to higher temperatures, the con- ductivity on either side becomes an eminently variable quantity. According to Draper and Moss, glassy selenium begins to conduct electricity at 165° to 175° C., and the conductivity increases regularly as the temperature rises to near the boiling-point. With metallic selenium, which behaves similarly, the increase of conductivity is propor- tional to the increase of temperature to*~~

~~near the fusing point (217° C.); but from this point upwards it decreases rapidly and attains its minimum at 250°C. According to W. Siemens, however, selenium by long exposure to 200° C. becomes what one may call electrically metallic ; the conductivity then decreases when the temperature rises, just as it does with ordinary metals. But this electro-metallicity is not permanent ; on continued exposure to a lower temperature it vanishes gradually, until the propor- tion of quasi-metal has fallen to a limit-value depending on that temperature. Very surprising is the observation of Sale that the electric conductivity of metallic selenium increases on exposure to the light; the red and ultra-red rays, as he found, act most powerfully. The effect of insolation is almost instantaneous, but on re-exposure to darkness the original condition is re-established only very gradually. W. Siemens found that his electro-metallic selenium (as produced at 200° C.) is more sensitive to light than any other kind. The conductivity of such selenium starting from darkness is raised twofold by dif- fuse and tenfold by direct sunlight. The specific heat of selenium, according to Regnault, is 0°0746 both in the glassy and in the metallic modification. Selenium (of any kind) boils at 700° C. (Mitscherlich). The vapour has an intense colour intermediate between that of chlorine and that of sulphur. According to Deville and Troost, at 880° C. it is 7°67 times, and at 1420° is 5-68 times, as heavy as air; theory, for Se,=1 molecule, demands 5°47.~~

~~Lilementary Tellurium.—tThis, the compact form, is a silver-white resplendent metal of markedly crystalline structure ; the crystals are rhombohedra, and the ingot consequently is very brittle. Specific gravity 6-2. The metal fuses at about 500° C., and is distillable at very high temperatures. Its vapour is golden yellow and has a very brilliant absorption-spectrum. The vapour density, accord- ing to Deville and Troost, is 9°08 at 1439° C. (air=1), corresponding to Te,=1 molecule. A bar of tellurium be- comes feebly electrical when rubbed with a woollen cloth. 'The electric conductivity, like that of selenium, is largely influenced by the temperature and previous exposure to heat, and it increases after exposure to light, though not to the same extent as selenium does. Starting from the ordinary temperature the conductivity decreases up to some point between 90° and 145° C.; it then increases up~~

~~*to 200° C. (the highest temperature tried) ; on cooling it de- creases steadily, and finally is only one-fifth or one-sixth of*~~

~~*SEL—SEL*~~

~~*what it was at 200°. The numerical value at 200° (silver = 100) was found equal to 0:0035 to 0:0031 (F. Exner),*~~

~~*Extraction of the Elementary Substanees.—If seleniferous sulphur or pyrites is used for the manufacture of oil of vitriol by the chamber process, most of the selenium accumulates as such in the "chamber mud," from which it may be extracted by the following method of Wohler's. The mud, after having been thoroughly washed and dried, is fused with alkaline nitrate and carbonate, to convert the selenium into selenate (SeO,K, or Na,), which is ex. tracted by means of water. The filtered solution is boiled with hydrochlovic acid to convert the selenic into selenium acid (Se0, + 2HICI=Cl,+H,0+Se0,), and this last is then reduced by addi tion of sulphurous acid and heating, when the selenium comes down asa red precipitate (SeO, + 2S0,=2S0,+Se). A richer material than chamber mud is seleniferous ore-smoke as produced in Mansfeld, which likewise contains frec selenium. Its extraction, according to O. Pettersen and F, Nilson, is best effected by digestion with con- centrated solution of cyanide of potassium at 80°C., which converts the selenium into selenocyanide (SeNCK), easily extractable by water, The filtered solution is acidified with hydrochloric acid and allowed to stand, when the selenium (through the spontaneous decom posi- tion of the SeNC. H into NCH and Se) comes down as a precipitate,*~~

~~*Tellurium is generally prepared from Transylvanian gold ore. The powdered ore is oxidized by means of hot nitric acid and the least sufficiency of hydrochloric acid, the excess of nitric acid being chased away by evaporation, and the residue mixed with sulphuric acid (to convert the lead into insoluble sulphate), and with some tartaric acid to prevent precipitation of tellurious acid (TeO,) in the subsequent treatment with water. From the filtered aqueous solution the gold is removed by addition of ferrous sulphate and by filtration. The filtrate is treated with sulphurous acid to reduce the tellurious acid to tellurium, which separates out as a black precipitate. The precipitated metal is fused down*~~

~~*and then sublimed at a very high temperature, in a porcelain tube, in a current of hydrogen, to remove non-volatile impurities and eliminate the last trace of selenium (SeH,).*~~

~~*Chemical Relations.—Selenium and tellurium are similar in their chemical character to sulphur; the gradation of properties within the triad is in the order of the atomic weights, which are S= 32:06, Se=79°07, Te=128(O=16). In oxygen or air the elementary sub- stances burn readily into (solid) dioxides (SeO,, TcO,), in the case of selenium with production of a characteristic stench of putrid radish, owing probably to the formation of a tracc of hydride, SeH,. Nitric acid, in the heat, converts sulphur directly into sulphuric acid. In the case of the two rare elements the oxidation stops at the stage corresponding to sulphurous acid. The acids ScO,H, and TeO 3H, are not liable to further oxidation by any of the wet-way reagents (HNO;, H,O and Cl,, Br, I,, &¢.) which convert sulphur- ous into sulphuric acid.*~~

~~*By fusion with nitre and alkaline carbonate the three elements, in their elementary or less oxygenated forms, are readily converted into salts, R,2O, (sulphates, &c., Z=S, Se, or Te). Selenic and telluric acids (H,2O,), unlike sulphuric, when boiled with aqueous hydrochloric acid, are gradually reduced to the lower acids (Se or Te)O3H.2, with evolution of chlorine ; and the lower acids are readily reduced to (precipitates of) elementary selenium and tellurium re- spectively by the action of sulphurous acid in the heat. Chlorine combines readily with elementary scleninm and tellurium into dichlorides (Se or Te)Cl,, which, however, on continued chlorina- tion are at last completely converted into the tetrachlorides (Se or Te)Cl, | These last, unlike the corresponding sulphur compound, are distillable without decomposition. Metals capable of uniting directly with sulphur as a rule unite also with selenium and tellurium into corresponding compounds. HHydrogen unites with elementary selenium and tellurium in the heat into gaseous hydrides (Se or Te)H, closely similar to sulphuretted hydrogen. "But, as these hydrides are liable to dissociation, the pure compounds must be preparcd by the decomposition of the zinc compounds Zn= with hydrochloric acid. For the description of individual compounds reference must be made to the handbooks of chemistry. (W. D.)*~~

~~*SELEUCIA, or Sereuceta (ZeAevReva), Of the numer- ous ancient towns of this name the most famous are—(1) the great city on the Tigris founded by Seleucus I. Nicator (see vol. xviii. p. 587), of the greatness and decay of which an account has been given in vol. xviii. p. 601; (2) a city on the northern frontier of Syria towards Cilicia, some miles north of the mouth of the Orontes, also founded by Seleucus I., and forming with Antioch, Apamea, and Laodicea the Syrian Tetrapolis. It served as the port of Antioch (Acts xiii. 4). Considerable ruins are still visible, especially a great cutting through solid rock, about two- thirds of a mile long, which Polybius speaks of as the road from the city to the sea. ; .*~~

~~*SEHEL—SEL*~~

~~*SELEUCIDS. See Macrepontan Empire, vol. xv. p. 142, and Prrsta, vol. xviii. p. 585 sq.*~~

~~*SELIM or Sai, the title borne by three emperors of the Ottoman Turks. For Serr IL, emperor from 1512 to 1520, see Persia, vol. xviil. pp. 635-636, and TurKEy. Setrm IL. grandson of the preceding, was sultan from 1566 to 1574. See Turkey. Servim III, son of Sultan Mus- tapha III., succeeded his father in 1789 and was deposed in 1807. See Turkey.*~~

~~*SELIMNIA. See Sriven,*~~

~~*SELINUS (ZeAcvots), one of the most important of the Greek colonies in Sicily, near the rivers Hypsas and Selinus on the south-west coast, was founded, probably about 628 B.C., by colonists from Megara Hyblea in the east of Sicily and others from the parent city of Megara on the Saronic Gulf of Greece (see Thuc., vi. 4, vii. 57, and Strabo, vi. p. 272). The name of the city and the little river (see H in fig.) on which it stands was derived from the wild parsley (céAwvov) which grew there in abundance (comp. vol. xvii. p- 639). Many autonomous coins of Selinus exist, dating from the 5th and 4th centuries B.c. The tetradrachms have on the obverse a youth, representing the river Selinus, sacrificing at an altar,' and, in the field, a parsley leaf,—legend, SEAINOZ; on the reverse, Apollo and Artemis in a biga,—legend, ZEAINONTION (retrograde). Didrachms have a similar obverse with the river Hypsas,—legend; HYWVAzZ; reverse, Heracles slaying a bull,—legend,*~~

~~ZEAINONTION. As early as 580 B.c. the citizens of Selinus were at war with the adjoining people of Segesta,~~

~~_ a non-Hellenic race who occupied the province north of~~

~~Selinus ; the success of the Segestans on this occasion was mainly owing to aid given them by colonists from Rhodes and Cnidus. Little is known about the early history of Selinus ; but the city evidently grew rapidly in wealth and importance, and soon extended its borders 15 miles west-wards to the river Mazarus and eastwards as far as the Halycus (Diod., xiii. 54; Herod., v. 46). Thucydides (vi.~~

~~_ 20) mentions its power and wealth and especially the rich _ treasures in its temples. From its early oligarchical form of~~

~~government Selinus passed to a short-lived despotism under the tyrant Pithagoras, who was deposed soon after 510 B.c. In 480 B.c., when the Carthaginian Hamilcar invaded Sicily, the city took his side against their fellow Hellenes. In 416~~

~~| B.C. a new dispute between Selinus and Segesta was eventu-~~

~~ally the cause of the fatal Athenian expedition against Sicily, the Athenians acting as allies of Segesta and the Syracusans as allies of Selinus. The conclusion of this expedition (see Syracuse) left Segesta at the mercy of the Selinuntines, whose rapacity and cruelty soon brought about their own destruction, through the aid which the Segestans obtained from Carthage. In 409 B.c. Hannibal, with an overwhelm- ing force, took and destroyed the city, the walls of which were razed to the ground. He killed about 16,000 of the inhabitants, took 5000 prisoners, and only a remnant of 2600 escaped to Agrigentum (Diod., xiii. 54-59). The sur- vivors were afterwards allowed to return and to rebuild~~

~~) Selinus as a city subject to the Carthaginians, under whose~~

~~yoke, in spite of their attempts to regain freedom, the~~

~~*| Selinuntines remained till c. 250, the close of the First | Punic War; after this the Carthaginians transferred the*~~

~~*inhabitants of Selinus:to Lilybeum, and completely de- stroyed the city (Diod. xxiv.). It was never rebuilt, and is mentioned by Strabo (vi. p. 272) as being one of the extinct cities of Sicily.?*~~

~~*1 Sculptured on the altar is a cock, in allusion to the aid given by isculapius against the fever which was caused by the marshy site.*~~

~~*| Drainage works directed by Empedocles are said to have rendered the*~~

~~*site healthy (Diog. Laer., viii. 2, 11). 2 Roman sulphur baths existed under the name Therme Selinuntise, but these were about 20 miles east of the site of the ancient Selinus.*~~

~~*633*~~

~~*The ancient city occupied two elevated plateaus at the edge of the sea and also part of the surrounding plain. The western of these elevations formed the acropolis; on the other was the agora. The walls of the acropolis can still be traced round the whole cir- cuit ; the only entrance was on the north-east. Remains also exist of long walls connecting the city and its port. The chief glory of Selinus was its double group of great temples,— three on the acropolis and three in the agora, one of which was the largest peripteral temple in the world. All are completely ruined, but the materials of each still remain almost perfect, though scattered in confused heaps of stone ; the extraordinary completeness of these fragments is owing to the fact that the site has never been occupied since the final transference of the inhabitants in 250 B.c., and thus the scattered blocks have never been taken as materials for later structures. Of all the six temples? none are later than the 5th century B.c., and those on the acropolis probably date from about 628 B.C., soon after the first settlement. The sculptured metopes from three of the temples are among the most important examples of early Hellenic art (see ARCHIMOLOGY, Vol. ii. p. 349, and Benun- dorf, Die Metopen von Selinunt). 'The buildings themselves are of the highest interest, being the earliest known examples of the Doric style, and differing in many important details from*~~

~~all other examples, even such early ones as the temples at Corinth and Syracuse.~~

~~The three temples on the acropolis (A, C, D in fig.) stand side by side, with their axes north-west to south-east ; all are hexastyle and peripteral, with either thirteen or fourteen columns on the sides. Their stylobates have four high steps along the sides, with an easier approach of more steps at the north- west fronts. To the 4 middle one of the three LS belong the very archaic 24 FAW metopes described in vol.~~

~~ii. p. 349. All have a rather narrow cella with pronaos and opisthodo- mus. Their archaic pecu- liarities are the rapid di- minution of the columns, the absence of entasis, the. narrow mutules over the |= metopes, and especially a |"~~

~~curious cavetto or neck- ing under the usual hypo- trachelia. No other ex- Selinus.~~

~~ample of this feature was A, 0, D, Temples on acropolis, B, Small pro-~~

~~known till 1884, when pa bat he ate E, a % poeiee on : , eastern hill, a,a, Remains of buildings out-~~

~~Dinghld disieees Pe side acropolis walls. H, River Selinus.~~

~~similar Doric capital among the ruins of the citadel of Tiryns. The Tiryns capital dates probably from a little before 600 B.c. and appears to be nearly contemporary with that at Selinus. Between temples A and C are remains of a small prostyle tetrastyle edicula (B) of the Doric order.* The second group of three Doric temples (E, F, G) belongs to a rather later date,—probably 500 to 440 B.c. The first two (H and F) have very narrow celle, so that they are pseudo- dipteral. They also are hexastyle, with fourteen columns on the sides, Though still early in detail, they are without the curious necking of the acropolis temples. The sculptured metopes of temple E are of extraordinary beauty and interest, and appear to date from the finest period of Greek art—the age of Phidias or perhaps that of Myron. The chief subjects are Zeus and Hera on Mount Olympus, Artemis and Acteon, and Heracles defeating an Amazon. They are of the~~

~~*noblest style, simple and highly sculp- turesque in treatment, and full of grace and expression. One remarkable peculiarity in their technique is that the nude parts of the female figures (heads, feet, and hands) are executed in white marble, while the rest of the reliefs are in the native grey tufa, which originally was covered with marble-dust stucco and then painted. The whole of the stonework of all the temples was treated in a similar way, and gives most valuable examples of early Greek coloured decoration. Recent excavations at Selinus have shown that in many cases the cornices and other architectural features. were covered with moulded slabs of terra cotta, all richly coloured*~~

~~*3*~~

~~*Uy,*~~

~~*” \y uw mm CO terdhey,*~~

~~*sft*~~

~~*o*~~

~~*2 3*~~

~~*2 2*~~

~~*3 The stone of which all these temples were built came from a quarry afew miles north-west of Selinus (mod. Campobello). The ancient workings are very visible, and unfinished drums of columns and other blocks still exist in the quarry. It is a brown tufa-like stone.*~~

~~*4 Strange to say, Hittorff and Zanth (Architecture Antique de Sicile, Paris, 1870), in their elaborate work on this subject, restore this edicula with a Doric entablature on Ionic columns ; a good many other similar absurdities occur in this richly illustrated work. More judgment is. shown in Serradifalco’s Antica Selinunto (Palermo, 1881-42), though it is not always accurate in measurements.*~~

~~*XXI. — 80*~~

(see Dorpfeld, Die Verwendung von Terracotten, Berlin, 1881, and TERRACOTTA). The great temple of Zeus! (G in fig.) was the largest peripteral temple of the whole Hellenic world, being almost exactly the same size as the enormous pseudo-peripteral Olym- pieum at the neighbouring Agrigentum. It was octastyle, pseudo- dipteral, with seventeen columms on the sides, and measures 360

by 162 feet; the columns are 10 feet 74 inches at the base and were.

48 feet 7 inches high. This gigantic building was never quite completed, though the whole of the main structure was built. Most of the columns still remain unfluted. In spite of the propor- tional narrowness of its cella, it had an internal range of columns, probably two orders high, like those within the cella at Pestum. The axes of these last three temples have exactly the same inclina- tion as those on the acropolis, The great temple of Zeus possesses some of the curious archaisms of the acropolis temples, and, though never completed, it was probably designed and begun at an earlier date than the two adjacent buildings. These peculiarities are the ungracefully rapid diminution of the shaft and the cavetto under the necking of the capitals. The whole of these six massive build- ings now hie in a complete state of ruin, a work of evidently wilful destruction on the part of the Carthaginians, as the temple at Segesta, not many miles distant, has still every column and its whole entablature quite perfect ; so it is impossible to suppose that an earthquake was the cause of the utter ruin at Selinus. Few or no marks of fire are visible on the stone blocks. (J. H. M.)

SELJUKS is the name of several Turkish dynasties, issued from one family, which reigned over large parts of Asia in the 11th, 12th, and 13th centuries of our era. The history of the Seljuks forms the first part of the his- tory of the Turkish empire. Proceeding from the deserts of Turkestan, the Seljuks reached the Hellespont; but this barrier was crossed and a European power founded by the Ottomans (Osmanli). The Seljuks inherited the traditions and at the same time the power of the previous Arabian empire, of which, when they made their appearance, only the shadow remained in the person of the "Abbasid caliph of Baghdad. It is

~~their merit from a Mohammedan point of view to have re-established the power of orthodox Islam and delivered the Moslem world from the supremacy of the caliph's Shiite competitors, the Fatimites of Egypt, and from the subversive influence of ultra-Shfite tenets, which constituted a serious danger to the duration of Islam itself. Neither had civilization anything to fear from them, since they represented a strong neutral power, which made the intimate union of Persian and Arabian elements possible, almost at the expense of the national Turkish,— literary monuments in that language being during the whole period of the Seljuk rule exceedingly rare.~~

~~The first Seljuk rulers were Toghrul Beg, Chakir Beg, and Ibrahim Niydl, the sons of Mikail, the son of Seljuk, the son of Tukak (also styled Timuryalik, 'iron bow"). They belonged to the Turkish tribe of the Ghuzz (Odo. of Const. Porphyr. and the Byzantine writers), which traced its lineage to Oghuz, the famous eponymic hero not only of this but of all Turkish tribes. There arose, however, at some undefined epoch a strife on the part of this tribe and some others with the rest of the Turks, because, as the latter allege, Ghuzz, the son (or grandson) of Yafeth (Japhet), the son of Nuh (Noah), had stolen the genuine rain-stone, which Turk, also a son of Yafeth, had inherited from his father. By this party, as appears from this tradition, the Ghuzz were not considered to be genuine Turks, but to be Turkmans (that is, according to a popular etymology, resembling Turks). But the native tradition of the Ghuzz was unquestionably right, as they spoke a pure Turkish dialect. The fact, however, remains that there existed a certain animosity between the Ghuzz and their allies and the rest of the Turks, which increased as the former became converted to Islam (in the course of the 4th century of the Flight). The Ghuzz were settled at that time in Transoxiana, especially at Jand, a well-~~

~~i) The dedication of the five smaller temples is unknown ; some were probably consecrated to Poseidon, Apollo, and Artemis. The existing mnetope reliefs are preserved in the museum at Palermo.~~

~~known city on the banks of the Jaxartes, not far from its mouth. Some of them served in the armies of the Ghazna- vids Sebuktegin and Mahmud~~

(997-1030); but the Seljuks, a royal family among them, had various relations with the reigning princes of Transoxiana and Kharizm, which can- not be narrated here.? But, friends or foes, the Ghuzz became a serious danger to the adjoining Mohammedan provinces from their predatory habits and continual raids, and the more so as they were very numerous. It may suffice to mention that, under the leadership of Israil or Pigu Arslan, they crossed the Oxus and spread over the eastern provinces of Persia, everywhere plundering and de- stroying. The imprisonment of this chieftain by Mas'id, the son and successor of Mahmud, was of no avail : it only furnished his nephews with a ready pretext to cross the Oxus likewise in arms against the Ghaznavids. We pass over their first conflicts and the unsuccessful agreements that were attempted, to mention the decisive battle near Merv (1040), in which Mas'id was totally defeated and driven back to Ghazna (Ghazni). Persia now lay open to the victors, who proclaimed themselves independent at Merv (which became from that time the official capital of the principal branch of the Seljuks), and acknowledged Toghrul Beg as chief of the whole family. After this victory the three princes Toghrul Beg, Chakir Beg, and Tbrahim Niyal separated in different directions and con- quered the Mohammedan provinces east of the Tigris; the last-named, after conquering Hamadan and the province of Jebel, penetrated as early as 1048, with fresh Ghuzz troops, into Armenia and reached Melazkerd, Erzerim (Erzeroum), and Trebizond. This excited the jealousy of Toghrul Beg, who summoned him to give up Hamadan and the fortresses of Jebel ; but Ibrahim refused, and the progress of the Seljukian arms was for some time checked by internal discord,—an ever-recurring event in their history. Ibrahim was, however, compelled to submit.

At this time the power of the 'Abbasid caliph of Baghdad (Al-Kéim bi-amr illa4h) was reduced to a mere shadow, as the Shiite dynasty of the Buyids and after- wards his more formidable Fatimite rivals had left him almost wholly destitute of authority. The real ruler at Baghdad was a Turk named Basdsir{, lieutenant of the last Buyid, Al-Malik ar-Rahim. Nothing could, therefore, be more acceptable to the caliph than the protection of the orthodox Toghrul Beg, whose name was read in the official prayer (khotba) as early as 1050. At the end of the same year the Seljuk entered the city and after a tumult seized the person of Malik ar-Rahim. Basdsiri

~~had the good fortune to be out of his reach; after acknowledging the right of the Fatimites, he gathered fresh troops and in- cited Ibrahim Niydl to rebel again, and he succeeded so far that he re-entered Baghdad at the close of 1058. The next year, however, Toghrul Beg got rid of both his antagonists, Ibrahim being taken prisoner and strangled with the bowstring, while Basdsir{ fell in battle. Toghrul Beg now re-entered Baghdad, re-established the caliph, and was betrothed to his daughter, but died before the consummation of the nuptials (September 1063). Alp Arslan, the son of Chakir Beg, succeeded his uncle and extended the rule of his family beyond the former frontiers. He made himself master, e.g., of the important city of Aleppo; and during his reign a Turkish emir, Atsiz, wrested Palestine and Syria from the hands of the Fatim- ites. Nothing, however, added more to his fame than his successful expeditions against the Greeks, especially that of 1071, in which the Greek emperor Romanus Diogenes was taken prisoner and forced to ransom himself for a~~

~~2 Comp. Sachau, "Zur Geschichte und Chronologie von Khwérizm," in Sitzungsberichte of the Vienna Acad., Ixxiv. 304 sq.~~

~~Shia U KS~~

~~large sum. The foundation of the Seljuk empire of Rum (Asia Minor, see below) was the immediate result of this great victory. Alp Arslan afterwards undertook an ex- pedition against Turkestan, and met with his death at the hands of a captured chief, Jusof Barzami, whom he had intended to shoot with his own hand.~~

~~Malik Shah, the son and successor of Alp Arslan, had to encounter his uncle Kawurd, founder of the Seljukian em- pire of Kerman (see below), who claimed to succeed Alp Arslan in accordance with the Turkish laws, and led his troops towards Hamadan. However, he lost the battle that ensued, and the bowstring put an end to his life (1073). Malik Shah regulated also the affairs of Asia Minor and Syria, conceding the latter province as an hereditary fief to his brother Tutush, who established himself at Damascus and killed Atsiz. He, however, like his father Alp Arslén, was indebted for his greatest fame to the wise and salutary measures of their vizier, Nizam al-Mulk. This extraordinary man, associated by tradition with "OMAR Kuayydm (q.v.), the well-known~~

~~*mathematician and free- thinking poet, and with Hasan b. Sabbah, afterwards the founder of the Ismaelites or Assassins, was a renowned author and statesman of the first rank, and immortalized his name by the foundation of several universities (the Nizdimiyah at Baghdad), observatories, mosques, hospitals, and other institutions of public utility. At his instigation the calendar was revised and a new era, dating from the reign of Malik Shah and known as the Jelalian, was in- troduced. Not quite forty days before the death of his master this great man was murdered by the Ismaelites. He had fallen into disfavour shortly before because of his unwillingness to join in the intrigues of the princess Turkan Khatin, who wished to secure the succession to the throne for her infant son Mahmiud at the expense of the elder sons of Malik Shah.*~~

~~*Constitution and Government of the Seljuk Empire.—It has been already observed that the Seljuks considered themselves the de- fenders of the orthotlox faith and of the 'Abbasid caliphate, while they on their side represented the temporal power which received its titles and sanction from the successor of the Prophet. All the members of the Seljuk house had the same obligations in this respect, but they had not the same rights, as one of them occu- pied relatively to the others a place almost analogous to that of the great khan of the Mongols in later times. This position was inherited from father to son, though the old Turkish idea of the rights of the elder brother often caused rebellions and violent family disputes. After the death of Malik Shah the head of the family was not strong enough to enforce obedience, and consequently the central government broke up into several independent dynasties. Within the limits of these minor dynasties the same rules were ob- served, and the same may be said of the hereditary fiefs of Turkish emirs not belonging to the royal family, who bore ordinarily the title of atabek (properly " father bey"), ¢.g., the atabeks of Fars, of Adharbaijan (Azerbijan), of Syria, &c. The title was first given to Nizam al-Mulk and expressed the relation in which he stood to the prince, —as lala, "tutor." The affairs of state were managed by the divan under the presidency of the vizier ; but in the empire of Rim its authority was inferior to that of the pervdneh, whom we may name "lord chancellor." In Rum the feudal system was extended to Christian princes, who were acknowledged by the sultan on con- dition of paying tribute and serving in the armies. The court dignitaries and their*~~

titles were manifold ; not less manifold were the royal prerogatives, in which the sultans followed the example set by their predecessors, the Buyids.

Notwithstanding the intrigues of TurkAn Khatun, Malik Shih was succeeded by his elder son Barkiydérok (1092- 1104), whose short reign was a series of rebellions and strange adventures such as one may imagine in the story of a youth who is by turns a powerful prince and a miser- able fugitive! Like his brother Mohammed (1104-1118), who successfully rebelled against him, his most dangerous enemies were the Ismaelites, who had succeeded in taking the fortress of Alamut (north of Kazvin) and become a

1 A sketch of his reign has been given by Defrémery, Journ. Asia- tique, 1853, i. 425 sq., ii. 217 sq.

formidable political power by the organization of bands of Jiddéwis, who were always ready, even at the sacrifice of their own lives, to murder any one whom they were com- manded to slay (see ASSASSINS).

Mohammed had been successful by the aid of his brother Sinjar, who from the year 1097 held the province of Khorasan with the capital Merv. After the death of Mohammed Sinjar became the real head of the family, though 'Irak acknowledged Mahmud, the son of Mo- hammed, Thus there originated a separate dynasty of 'Trak with its capital at Hamadan; but Sinjar during his long reign often interfered in the affairs of the new dynasty, and every occupant of the throne had to acknow- ledge his supremacy. In 1117 he led an expedition against Ghazna and bestowed the throne upon Behram Shah, who was also obliged to mention Sinjar's name first in the official prayer at the Ghaznavid capital,—a prerogative that neither Alp Arslan nor Malik Shah had attained. In 1134 Behram Shah failed in this obligation and brought on himself a fresh invasion by Sinjar in the midst of winter ; a third one took place in 1152, caused by the doings of the Ghurids (Hosain Jihansuz, or ' world-burner"). Other expeditions were undertaken by him against Kharizm and Turkestan ; the government of the former had been given by Barkiydérok to Mohammed

~~*b, Anushtegin, who was suc- ceeded in 1128 by his son Atsiz, and against him Sinjar marched in 1138. Though victorious in this war, Sinjar could not hinder Atsiz from afterwards joining the gurkhan (great khan) of the then rapidly rising empire of the Kara- chitai, at whose hands the Seljuk suffered a terrible defeat at Samarkand in 1141. By the invasion of these hordes several Turkish tribes, the Ghuzz and others, were driven beyond the Oxus, where they killed the Seljuk governor of Balkh, though they professed to be loyal to Sinjar. Sinjar resolved to punish this crime; but his troops deserted and he himself was taken prisoner by the Ghuzz, who kept him in strict confinement during two years (1153-55), though treating him with all outward marks of respect. In the meantime they plundered and destroyed the flourish- ing cities of Merv and Nishapur; and when Sinjar, after his escape from captivity, revisited the site of his capital he fell sick of sorrow and grief and died soon afterwards (1157). His empire fell to the Karachitai and afterwards to the shah of Kharizm. Of the successors of Mohammed in 'Irak we give only the names with the date of the death of each :—Mahmud (1131); Toghrul, son of Mohammed, proclaimed by Sinjar (1134) ; Mas'ud (1152); Malik Shah and Mohammed (1159), sons of Mahmud ; Sulaiman Shah, their brother (1161); Arslan, son of Toghrul (1175); and Toghrul, son of Arslén, killed in 1194 by Inanej, son of his atabek, Mohammed, who was in confederation with the Khéarizm shah of the epoch, Takash. This chief inherited his possessions ; Toghrul was the last representative of the Seljuks of 'Irak.*~~

~~*The province of Kerman was one of the first conquests of the Seljuks, and became the hereditary fief of Kawurd, the son of Chakir Beg. Mention has been made of his war with Malik Shah and of his ensuing death (1073). Nevertheless his descendants were left in possession of their ancestor's dominions; and till 1170 Kerman, to which belonged also the opposite coast of "Oman, enjoyed a well-ordered government, except for a short interruption caused by the deposition of Iran Shah, who had embraced the tenets of the Ismaelites, and was put to death (1101) in accordance with a fatwa of the ulema. But after the death of Toghrul Shah (1170) his three sons disputed with each other for the possession of the throne, and implored foreign assistance, till the country became*~~

~~utterly devas- tated and fell an easy prey to some bands of Ghuzz, who, under the leadership of Malik Dinar (1185), marched into~~

~~Kerman after harassing Sinjar's dominions. the shahs of Kharizm took this province.!~~

~~The Seljukian dynasty of Syria came to an end after three generations, and its later history is interwoven with that of the crusaders. The first prince was Tutush, men- tioned above, who perished, after a reign of continuous fighting, in battle against Barkiyarok near Rai (1095). Of his two sons, the elder, Ridhwan, established himself at Aleppo (died 1113); the younger, Dukak, took possession of Damascus, and died in 1103. The sons of the former, Alp Arslan and Sultan Shah, reigned a short time nomi- nally, though the real power was exercised by Luli till 1117. We cannot, however, enter here into the very complicated history of these two cities, which changed their masters almost every year till the time of Zengi and Nur ed-din.~~

~~After the great victory of Alp Arslan in which the Greek emperor was taken prisoner (1071), Asia Minor lay open to the inroads of the Turks. Hence it was easy for Sulaiman, the son of Kutulmish,? the son of Arslan Pigu (Israil), to penetrate as far as the Hellespont, the more so as after the captivity of Romanus, two rivals, Nicephorus Bryennius in Asia and another Nicephorus named Botoniates in Europe, disputed the throne with one another. The former ap- pealed to Sulaiman for assistance, and was by his aid brought to Constantinople and seated on the imperial throne. But the possession of Asia Minor was insecure to the Seljuks as long as the important city of Antioch belonged to the Greeks, so that we may date the real foundation of this Seljuk empire from the taking of that city by the treason of its commander. Philaretus in 1084, who afterwards became a vassal of the Seljiks. The con- quest involved Sulaiman in war with the neighbouring Mohammedan princes, and he met his death soon after- wards (1086), near Shaizar, in a battle against Tutush. Owing to these family discords the decision of Malik Shah was necessary to settle the affairs of Asia Minor and Syria; he kept the sons of Sulaiman in captivity, and committed the war against the unbelieving Greeks to his~~

~~generals Bursuk (Hpocovy) and Buzan (Ilovgavos), Barki- yarok, however, on his accession (1092), allowed Kilig Arslan, the son of Sulaiman, to return to the dominions of his father. Acknowledged by the Turkish emirs of Asia Minor, he took up his residence in Niczea, and defeated the first bands of crusaders under Walter the Penniless and others (1096) ; but, on the arrival of Godfrey of Bouillon and his companions, he was prudent enough to leave his capital in order to attack them as they were besieging Nicea. He suffered, however, two defeats in the vicinity, and Nicza surrendered on 23d June 1097. As the cru- saders marched by way of Doryleum and Iconium towards Antioch, the Greeks subdued the Turkish emirs resid- ing at Smyrna, Ephesus, Sardis, Philadelphia, Laodicea, Lampes, and Polybotus;? and Kilig Arsldn, with his Turks, retired to the north-eastern parts of Asia Minor, to act with the Turkish emirs of Sivas (Sebaste), known under the name of the Danishmand.~~

~~The history of the dynasty of the Danishmand is still very ob- secure, notwithstanding the efforts of Mordtmann, Schlumberger, Karabagek, Sallet, and others to fix some chronological details, and it is almost impossible to harmonize the different statements of the Armenian, Syriac, Greek, and Western chronicles with those of the Arabic, Persian, and Turkish. The coins are few in number, very difficult to decipher, and often without date. The founder of the dynasty was a certain Tailu, who is said to have been a schoolinaster (danishmand), probably because he understood Arabic~~

~~and Persian. His descendants, therefore, took the style of "Ibn Danishmand," often without their own name. They took posses-~~

~~7 An outline of the history of this branch of the Seljuks is given in Z.D.M.G., 1885, pp. 362-401.~~

- ~~This prince rebelled against Alp Arslan in 1064, and was found dead after a battle.~~

~~a The Turkmans who dwelt in these western parts of Asia Minor, which were never regained by the Seljiiks, were called Utch (Outsiders).~~

~~*Afterwards*~~

~~*SELJUKS*~~

~~*sion of Sivas, Tokat, Nicsar, Ablastan, Malatich, probably after the death of Sulaiman, though they may have established them. selves in one or more of these cities much earlier, perhaps in 1071, after the defeat of Romanus Diogenes. During the first crusade the reigning prince was Kumushtegin (Ahmed Ghazi), who defeated the Franks and took prisoner the prince of Antioch, Bohemond, afterwards ransomed. He died probably in 1106, and was succeeded by his son Mohammed (d. 1148), after whom reigned Jaghi Basin ; but it is very probable that other members of the same dynasty reigned at the same time in the cities already named, and in some others, e.g., Kastamuni.*~~

~~*Afterwards there arose a natural rivalry between the Seljuks and the Danishmand, which ended with the ex- tinction of the latter about 1175. CKilig Arsl4n took possession of Mosul in 1107, and declared himself independ- ent of the Seljuks of 'Irak; but in the same year he was drowned in the Chaboras through the treachery of his own emirs, and the dynasty seemed again destined to decay, as his sons were in the power of his enemies. The sultan Mohammed, however, set at liberty his eldest son Malik Shah, who reigned for some time, until he was treacher- ously murdered (it is not quite certain by whom), being succeeded by his brother Mas'ud, who established himself at Konieh (Iconium), from that time the residence of the Seljuks of Rum. During his reign—he died in 1155—the Greek emperors undertook various expeditions in Asia Minor and Armenia; but the Seljuk was cunning enough to profess himself their ally and to direct them against his own enemies. Nevertheless the Seljikian dominion was petty and unimportant and did not rise to significance till his son and successor, Kilig Arslan II., had subdued the Danishmands and appropriated their possessions, though he thereby risked the wrath of the powerful atabek of Syria, Nur ed-din, and afterwards that of the still more powerful Saladin. But as the sultan grew old his numerous sons, who held each the command of a city of the empire, embittered his old age by their mutual rivalry, and the eldest, Kotb ed-din, tyrannized over his father in his own capital, exactly at the time that Frederick I.*~~

~~*(Barbarossa) entered his doniinions on his way to the HIoly Sepulchre (1190). Konieh itself was taken and the sultan forced to provide guides and provisions for the crusaders. Kilig Arslan lived two years longer, finally under the protection of his youngest son, Kaikhosrau, who held the capital after him (till 1199) until his elder brother, Rokn ed-din Sulaiman, after having vanquished his other brothers, ascended the throne and obliged Kaikhosrau to seek refuge at the Greek emperor's court. This valiant prince saved the empire from destruction and conquered Erzerum, which had been ruled during a considerable time by a separate dynasty, and was now given in fief to his brother, Mughit ed-din Toghrul Shah. But, marching thence against the Georgians, Sulaiman's troops suffered a terrible defeat; after this Sulaiman set out to subdue his brother Mas'td Shah, at Angora, who was finally taken prisoner and treacherously murdered. This crime is regarded by Oriental authors as the reason of the premature death of the sultan (in 1204); but it is more probable that he was murdered because he displeased the Mohammedan clergy, who accused him of atheism. HIs son, Kilig Arslan HL, was soon deposed by Kaikhosrau (who returned), assisted by the Greek Maurozomes, whose daughter he had married in exile, HIe ascended the throne the same year in which the Latin empire was established in Constantinople, a cir- cumstance highly favourable to the Turks, who were the natural allies of the Greeks (Theodore Lascaris) and the enemies of the crusaders and their allies, the Armenians. Kaikhosrau, therefore, took in 1207 from the Italian Aldobrandini the important harbour of Attalia (Adalia) ; but his conquests in this direction were put an end to by his attack upon Lascaris, for in the battle that ensued he perished in single combat with his royal antagonist (1211).*~~

~~*SBbLoUKS*~~

~~*HIs son and successor, Kaikavus, made peace with Lascaris and extended his frontiers to the Black Sea by the con- quest of Sinope (1214). On this occasion he was fortunate enough to take prisoner the Comnenian prince (Alexis) who ruled the independent empire of Trebizond, and he compelled him to purchase his liberty by acknowledging the supremacy of the Seljuks, by paying tribute, and by serving in the armies of the sultan. lated by this great success and by his victories over the Armenians,*~~

~~*Kaikavus was induced to attempt the capture of the important city of Aleppo, at this time governed by the descendants of Saladin ; but the affair miscarried. Soon afterwards the sultan died (1219) and was succeeded by his brother, Ald ed-din Kaikobad, the most powerful and illustrious prince of this branch of the Seljuks, renowned not only for his successful wars but also for his magnificent structures at Konieh, Alaja, Sivas, and elsewhere, which belong to the best specimens of Saracenic architecture. The town of Alaja was the creation of this sultan, as previously there existed on that site only the fortress of Candelor, at that epoch in the possession of an Armenian chief, who was expelled by Kaikobad, and shared the fate of the Armenian and Frankish knights who possessed the fortresses along the coast of the Mediterranean as far as Selefke (Seleucia). Kaikobad extended his rule as far as this city, and desisted from further conquest only on condition that the Armenian princes would enter into the same kind of relation to the Seljtiks as had been imposed on the Comnenians of Trebi- zond. But his greatest military fame was won by a war which, however glorious, was to prove fatal to the Seljuk empire in the future: in conjunction with his ally, the Eyytbid prince Al-Ashraf, he defeated the Kharizm shah Jelal ed-din near Arzengén (1230). This victory removed the only barrier that checked the progress of the Mongols. During this war Kaikobéd put an end to the collateral dynasty of the Seljuks of Erzerim and annexed its pos- sessions. He also gained the city of Khelét with depend- encies that in former times had belonged to the Shah-i- Armen, but shortly before had been taken by Jelal ed-din ; this aggression was the cause of the war just mentioned. The acquisition of Khelat led, however, to a new war, as Kaikobad's ally, the Eyyubid prince, envied him this conquest. Sixteen Mohammedan princes, mostly Eyyubids, of Syria and Mesopotamia, under the leadership of Al- Malik al-Kamil, prince of Egypt, marched with considerable forces into Asia Minor against him. Happily for Kaiko- bad, the princes mistrusted the power of the Egyptian, and it proved a difficult task to penetrate through the mountainous well-fortified accesses to the interior of Asia Minor, so that the advantage rested with Kaikobad, who took Kharput, and for some time even held Harran, Ar- Roha, and Rakka (1232). The latter conquests were, however, soon lost, and Kaikobdéd himself died in 1234 of poison administered to him by his son and successor, GhiyAts ed-din Kaikhosrau IJ. This unworthy son in- herited*~~

from his father an empire embracing almost the whole of Asia Minor, with the exception of the countries governed by Vatatzes (Vataces) and the Christian princes of Trebizond and Lesser Armenia, who, however, were bound to pay tribute and to serve in the armies,—an empire celebrated by contemporary reports for its wealth. But the Turkish soldiers were of little use in a regular battle, and the sultan relied mainly on his Christian troops, so much so that an insurrection of dervishes which occurred at this period could only be put down by their assistance. It was at this epoch also that there flourished at Konieh the greatest mystical poet of Islam, and the founder of the order of the Mawlawis, Jelal ed-din Rumi

1 See the details in Vincent of Beauvais, Speculum Historiale, bk. xxx. chaps, 148, 144.

(d. 1273; see Rumi), and that the dervish fraternities spread throughout the whole country and became power- ful bodies, often discontented with the liberal principles of the sultans, who granted privileges to the Christian merchants and held frequent intercourse with them. Not- withstanding all this, the strength and reputation of the empire were so great that the Mongols hesitated to invade it, although standing at its frontiers. But, as they crossed the border, Kaikhosrau marched against them, and suffered a formidable defeat at Kuzadag (between Arzengan and Sivds) in 1243, which forced him to purchase peace by the promise of a heavy tribute. The independence of the Seljiks was now for ever lost. The Mongols retired for some years; but, Kaikhosrau dying in 1245, the joint government of his three sons gave occasion to fresh in- roads, till one of them died and Hulagu divided the empire between the other two, 'Izz ed-din ruling the dis- tricts west of the Halys and Rokn ed-din the eastern provinces (1259). But the former, intriguing with the Mameluke sultans of Egypt to expel his brother and gain his independence, was defeated by a Mongol army and obliged to flee to the imperial court. Here he was im- prisoned, but afterwards released by the Tatars of the Crimea, who took him with them to Sarai, where he died. Rokn ed-din was only a nominal ruler, the real power being in the hands of his pervaneh, Muin ed-din Sulaiman, who in 1267 procured an order of the Mongol Khan

~~*Abaka for his execution. The minister raised his infant son, Ghiyats ed-din Kaikhosrau III., to the throne, and governed the country for ten years longer, till he was entangled in a conspiracy of several emirs, who proposed to expel the Mongols with the aid of the Mameluke sultan of Egypt (Beybars or Bibars). The latter marched into Asia Minor and defeated the Mongols in the bloody battle of Ablastan (1277); but, when he advanced farther to Ceesarea, the pervaneh retired, hesitating to join him at the very moment of action. Beybars, therefore, in his turn fell back, leaving the pervaneh to the vengeance of the khan, who soon discovered his treason and ordered a barbarous execution. Ghiydts ed-din continued to reign in name till 1284, though the country was in reality governed by a Mongol viceroy. Mas'ud, the son of 'Izz ed-din, who on the death of his father had fled from the Crimea to the Mongol khan and had received from him the government of Sivds, Arzengén, and Erzertm during the lifetime of Ghiydts ed-din, ascended the Seljuk throne on the death of Ghiydts. But his authority was scarcely respected in his own residence, for several Turkish emirs assumed independence and could only be subdued by Mongol aid, when they retired to the mountains, to re-appear as soon as the Mongols were gone. Mas'td fell, probably about 1295, a victim to the vengeance of one of the emirs, whose father he had ordered to be put to death. After him Kaikobad, son of his brother Faramarz, entered Konieh as sultan in 1298, but his reign is so obscure that nothing can be said of it; some authors assert that he governed only till 1300, others till 1315. With him ended the dynasty of the Seljuks ; but the Turkish empire founded by them continued to exist under the rising dynasty of the Ottomans. (See TURKEY.) .*~~

~~*Bibliography.—The best, though insufficient, account of the Sel- juks is still De Guignes, Histoire Générale des Huns, bks. x.-xii., from whom Gibbon borrowed his dates. Among translations from original sources (of which the most trustworthy are yet unedited), comp. Mirkhond's Geschichte der Seldschuken (ed. Vullers), Giessen, 1838; Tarikh-t-Guzideh, French translation by Defrémery in the Journal Asiatique, 1848, i. 417 sq., ii. 259 sq., 384 sq.; Seid Loemani ex Libro Turcico qui Oghuzname inscribitur Excerpta (ed. J. H. W. Lagus), Helsingfors, 1854 (on the Seljuiks of Asia Minor exclusively, but of little value). Information respecting certain*~~

~~*periods is given incidentally in the well-known works of Von Hammer and D'Ohsson. (M. T. H.)*~~

~~*638 .*~~

~~*SELKIRK, a lowland county of Scotland, of tortuous*~~

~~*outline, is bounded by Midlothian on the N., by Peebles on the N. and W., by Dumfries on the S., and by Roxburgh on the E. Its extreme length from south-west to north- east is 28 miles, its greatest breadth from east to west 17, and its total area 260 square miles or 166,524 acres, of which 1997 are water. This includes two detached portions, one to the north-west, surrounded by Peebles, and another on the east, the estate and barony of Sinton, separated from Roxburgh in the reign of William the Lion on the appoint- ment of Andrew de Synton to the sheriffship of Selkirk. From its lowest altitude (300 feet) at the junction of the Gala and the Tweed the surface rises to 2433 feet at Dun Rig, a wild and desolate summit on the western boundary. Level haughs, beds of ancient lakes, occur in the courses of the rivers ; but the county is otherwise wholly mountain- ous and only a small proportion of it arable. Of its prin- cipal summits, Ettrick Pen (2269), Capel Fell (2223), Deer Law (2064), Herman Law (2014), are in the south, and Windlestrae Law (2161) in the north, about a mile from the borders of Midlothian. Broadly speaking, Selkirk may be said to consist of the two entire valleys of Ettrick and Yarrow and a section of the valley of Tweed, the first two sloping from the south until they merge in the last, which forms the northern portion of the county. Besides St Mary's Loch and its adjunct the Loch of the Lowes, together about 44 miles long, there are several others of considerable size, mostly in the eastern uplands between Ettrick and Teviotdale—the two lochs of Shaws, Clearburn Loch, Kingside Loch, Hellmuir Loch, Alemuir Loch, and Akermuir Loch. These, with the larger rivers and the mountain "burns," attract anglers to Selkirk from all parts of the kingdom.—Geologically, the Selkirk rocks are a portion of that great Silurian mass which occupies the south of Scotland from Wigtown to the north-east coast of Berwick. At no part are they known to be covered by rocks of later forma- tion; but here and there (at Windlestrae Law and Priest-hope, for example) igneous rocks protrude in massive out- crops, almost*~~

~~*granitic, one measuring over 100 feet in thickness. The hillsides yield inexhaustible supplies of blue-grey whinstone, suitable for building; but repeated efforts to establish slate-quarries and lead-mines have ended in failure. According to records of the 16th century, gold was found at Mount Benger, Douglas Craig, and Linglie Burn,—"an ingenious gentleman" named Bevis Bulmer having been "most successful upon Henderland Moor in Ettrick Forest, where he got the greatest gold—the like to it in no other place before of Scotland."*~~

~~*Corresponding with the high average altitude, the pre- vailing climate is cold and wet, and, as the soil is mostly thin, over a close subsoil of clayey "till," agriculture is carried on at a disadvantage. About the middle of the 19th century large areas of virgin soil were brought under tillage ; but the prudence of the "improvement" is now greatly doubted, in regard to a large proportion at least,—its restoration to permanent pasture being now found*~~

~~*almost impracticable.*~~

~~*In 1884 23,263 acres, or nearly a seventh of the whole, were under cultivation and 3228 under wood. The rotation of crops most commonly followed is a six-course shift of (1) turnips, (2) barley or oats, (3), (4), (5) grass or pasture, and (6) oats. Horses in 1884 numbered 580, cattle 2657, sheep 165,061. Till about a century ago the upper farms of the county were stocked exclusively with sheep of the blackfaced breed, and in high heathery tracts these still predominate. But as altitude diminishes sheep improve in quality, from pure Cheviot to half-bred and three-quarters-bred Leicester-Cheviot. Upwards of 60,000 acres, more than a third of the county, belong to the duke of Buccleuch, whose title is derived from an ancient possession of his family in the vale of Rankleburn. Other principal landowners are Mr Maxwell-Stuart of Traquair (9765 acres) and Lord Napier and Ettrick (6988 acres).*~~

~~*Manufactures.—So early as the beginning of the 17th century*~~

~~*SHELRLKIRK*~~

~~*the village of Galashiels did a considerable local trade in woollen cloth, then or shortly afterwards known as " Galashiels grey," and towards the end of the 18th century this industry was greatly stimulated by judicious grants from' 'the equivalent" paid by England at the Union. About the end of the first quarter of the 19th century a few novelties in pattern (mostly accidental) led to the opening up of what has now become a vast industry—the Tweed trade, which still has its acknowledged centre in Selkirk.*~~

~~*Administration and Population.—Selkirkshire with Peeblesshire forms one parliamentary constituency. Of entire civil parishes it contains only two, with parts of nine others; there are also, taken from these, three gwoad sacra parishes and part of a fourth. The population, 4937 in 1755 and 9809 in 1851, was in 1881 returned at 25,564,—an increase partly due to the annexation of a portion of Galashiels formerly reckoned in Roxburgh. Outside the two towns of Galashiels (population 9140 in 1881) and Selkirk population has been almost stationary for more than a century, that of the landward parishes in 1755 and 1881 being respectively as follows :—Ashkirk, 200 and 138; Innerleithen, 60 and 61; Ettrick, 397 and 397; Stow, 260 and 441; Yarrow, 1180 and 611; Roberton, 250 and 250.*~~

~~*Antiquities and HIstory.—The shire is not rich in antiquities, although its hillsides here and there reveal earthen enclosures known as 'British camps," as well as tumuli yielding human remains and the usual fragments of rude pottery. A mysterious ditch, known as "the Catrail," beginning at the north end of the county, traverses its entire extent before entering Roxburgh on its way to the English border. Besides smaller redoubts, there is on its line, at Rink in Galashiels parish, a well-preserved circular fort of formidable strength and dimensions. Near Minchmoor the Catrail is crossed by " Wallace's trench," where, according to an historical document recently published, the Scottish patriot defied for a while the generals of Edward I. Close by is the hill-track by which Montrose escaped from the disastrous field of Philiphaugh in 1645. Newark Castle, built by James II., still stands in fair preservation, notable enough historically, but more familiar as the recital-hall of the "last minstrel's" immortal lay. The county is dotted over with*~~

~~other towers of smaller size, in various stages of decay. Around them cluster those traditions which, sung in ballads full of simple force and tenderness, have made Selkirk the poet's chosen haunt. Yarrow, "garlanded with rhyme," has, without hyperbole, been termed "the Tempe of the West." Selkirk was long known officially as the 'shire of the Forest," an appellation its famous sheriff Sir Walter Scott loved to recall. Except the burgh of Selkirk, its lands, and a large tract in upper Ettrick be- longing to Melrose Abbey, the county remained long under the jurisdiction of a forest court, and its forest-steadings were held by tack from the crown till the time of Queen Mary. It was a favourite hunting-ground of Scottish monarchs and formed the dowry-land of at least two foreign princesses who became queens of Scotland.~~

~~See T. Craig-Brown, Hist. of Selkirkshire.~~

~~SELKIRK, the county town of Selkirkshire, is on the river Ettrick, between its absorption of the Yarrow and its junction with the Tweed, and is connected by a branch railway with the Waverley line from Scotland to Eng- land. Although almost entirely a manufacturing town, having several large mills for woollen cloth and yarn, it is not without importance as the centre of an extensive pastoral area. The county offices and prison excepted, the public buildings of Selkirk are not striking. The popula- tion of the burgh was 1053 in 1735, 1800 in 1831, and~~

~~6090 in 1881.~~

~~From the charter by which David I., while prince of North- umbria, established in Selkirk the Benedictine abbey afterwards removed to Kelso, it appears that even at that remote period (1119- 24) it was an old town and the prince's residence. David's castle continued to be a frequent resort of his successors on the throne, particularly of William the Lion, many of whose charters were signed "in plena curia apud Scelchircham." Enlarged and strength- ened by Edward I., the fortress was captured by the patriotic party soon after Wallacc's return from France. Nothing now remains of it but green mounds and the name " Peel Hill." It is significant of the destruction wrought by repeated conquests and reconquests that Selkirk, notwithstanding its antiquity and early importance, boasts not one building a century and a half old. As its early~~

~~name (Scheleschyrche) implies, it was originally a collection of forest "'shiels" beside which an early church was planted, probably by the Culdees of Old Melrose. Clear light is thrown upon the manners and customs of old border towns by the ancient records of this burgh, still extant (with gaps) from 1503. A minute of 1513 mentions the steps taken to comply with the king's letter ordering the levy before Flodden, where, according to tradition, the burgesses of Selkirk fought with stubborn valour. James V. granted the community right to enclose 1000 acres from the common and gave them leave to elect a provost, the first to fill that office being slain~~

~~SE L—S EM~~

~~in defence of the burgh lands. From an early period shoemakers were a numerous craft in Selkirk, and in 1715 and 1745 they were forced to furnish several thousand pairs of shoes to the Jacobite armies. '" Souters of Selkirk " is still a synonym for the inhabitants. SELKIRK, or Sencraic, ALEXANDER (1676-1723), a sailor who is supposed to have been the prototype of Defoe's "Robinson Crusoe," was the son of a shoemaker and tanner in Largo, Fifeshire, and was born in 1676. In his youth he displayed a quarrelsome and unruly disposition, and, hav- ing been summoned on 27th August 1695 before the kirk- session for his indecent behaviour in church, '" did not com- pear, being gone away to the seas." At an early period he was engaged in buccaneer expeditions to the South Seas, and in 1703 joined the "Cinque Ports" galley as sailing master. The following year he had a dispute with the captain, and at his own request was in October put ashore on the island of Juan Fernandez, where, after a solitary residence of four years and four months, he was taken off by Captain Woods Rogers, commander of a privateer, who made him his mate and afterwards gave him the independent command of one of his prizes. He returned home in 1712; but in 1717 he eloped with a country girl and again went to sea. He died in 1723 while lieutenant on board the royal ship '"' Weymouth." See Howell, Life and Adventures of Alexander Selkirk, 1829.~~

~~SELMA, a city of the United States, in Dallas county, Alabama, at the head of steamboat navigation of the Alabama river, occupies a plateau on~~

~~the bluff of the right bank, 95 miles below Montgomery. It has cotton ware- houses, railroad machine-shops, and various factories. The population was 6484 (3660 coloured) in 1870 and 7529 (4184 coloured) in 1880. Selma, which was strongly fortified during the Civil War and the seat of a Con- federate arsenal (where 1800 men were employed), was captured by the Federal major-general J. H. Wilson on 2d April 1865.~~

~~SEMIPALATINSK, an extensive province (oblast) of the Russian dominions in Central Asia; administratively it forms a part of the general-governorship of the Steppes, although its northern portions really belong to the Irtish plains of West Siberia. It has an area of 188,300 square miles, and is bounded on the N. by Tobolsk and Tomsk, on the §.E. by China, on the 8. by Semiryetchensk, and on the W. by Akmolinsk. As regards configuration, it differs widely in its northern and southern parts. The snowclad ridges (9000 to 10,000 feet) of the great Altai and Narym enter its south-eastern portion, stretching southwards to Lake Zaisan. Another complex of moun- tains, Kandygatai and Katbinsk, rising to 5000 and 6000 feet above the sea, continues them towards the west; a broad valley intervenes, through which the Irtish finds its way from the Zaisan terrace to the lowlands of Siberia. Many extensions of these mountains and subordinate ridges stretch towards the north. The still lower but wild Jinghiz-tau mountains fill the south-western part- of Semipalatinsk, sending out their rocky spurs into the steppe region. In the south, the Tarbagatai (Marmots') range (9000 to 10,000 feet) separates Semipalatinsk from Semiryetchensk and the Chinese province of Jugutchak. Wide steppes fill up the spaces between the mountains : such are the Zaisan steppe (1200 to 1500 feet), between the Tarbagatai and the Altai ranges; the plains of Lake Balkash, some 300 feet lower, to the south of the Jinghiz- tau; and the plains of the Irtish, which hardly rise 600 feet above the sea. All kinds of crystalline rocks—gran- ites, syenites, diorites, and porphyries, as also crystalline slates of all descriptions—are met with in the mountain tracts, which contain also rich gold-bearing sands, silver and lead mines, graphite, coal, and the less valuable pre- cious stones. The geology of the region and even its~~

~~*topography are still but imperfectly known. Numerous boulders widely scattered around the mountains testify to a much wider extension of glaciers in former times. The chief river of the province, the Irtish, which issues from Lake Zaisan, flows north and north-west and waters Semi-palatinsk for more than 760 miles. Between Bukhtarma and Ust-Kamenogorsk it crosses the Altai by a wild gorge, with dangerous rapids, through which, however, boats are floated. Lake Zaisan, 80 miles long and from 10 to 20 wide, has depth sufficient for steamboat navigation; steamers tra- verse also for some 100 miles the lower course of the Black Irtish, which flows from Kuldja to Lake Zaisan. The Kurtchum, the Narym, and the Bukhtarma are the chief right-hand tributaries of the Irtish, while the Bukoii, the Kizil-su, and many smaller ones join it from the left; none are navigable, neither are the Kokbekty and Bugaz, which enter Lake Zaisan on the west. Lake Balkash, which borders Semipalatinsk in the south-west, formerly received several tributaries from the Jinghiz-tau. Many smaller lakes (some of them merely temporary) occur on the Irtish plain, and yield salt. The whole of the country is rapidly drying up. The climate is severe. The average yearly temperature reaches 43° in the south and 34° in the north ; the winter is very cold, and frosts of —44° Fahr. are not uncommon, while heats raising the thermometer to 122° in the shade are experienced in the summer. The yearly amount of rain and snow is trifling, although snow-storms are very common ; strong winds prevail. Forests are plentiful in the hilly districts and on the Irtish plain, the flora being Siberian in the north and more Central Asiatic towards Lakes Balkash and Zaisan.*~~

~~*The chief inhabitants are Kirghiz-kazaks, who acknowledged the supremacy of Russia in 1732 and may number now (1886) nearly half a million (479,750 in 1876, of whom 10,950 were settled in towns). The Russian population, which in the same year amounted to nearly 50,000 Cossacks and peasauts, has slowly increased since. The aggregate population was in 1882 estimated at 538,400, of whom 34,550 lived in towns. The Russians are chiefly agricul- turists, and have wealthy settlements on the right bank of the Irtish, as well as a few patches in the south, at the foot of the mountains. The Kirghizes are almost exclusively cattle-breeders and keep large flocks of sheep, horses, and horned cattle, as also camels. Hunting and fishing (in Lake Zaisan) are favourite and*~~

~~*profitable occupations with the Cossacks and the Kirghizes. In- dustries are of course insignificant, except that of mining,—gold being obtained within the province to the amount of from 300 to 400 tb every year; the extraction of silver and lead is very limited. Trade is of some importance, and is increasing,—Russian manu- factured articles being exchanged for the raw produce (hides, tallow, cattle) of the region. The province is divided into four districts, the chief towns of which are Semipalatinsk (17,820 inhabitants in 1881), Pavlodar (2260), Kokbekty (3680), and Karkaralinsk (2080). All these towns, lost amidst the sandy steppes, are mere administrative centres. Bukhtarma and Ust-Kamenogorsk (3400), among the mountains, are also worthy of mention.*~~

~~*SEMIPALATINSK, capital of the above province, is situated on the right bank of the Irtish, on the highway from Central Asia to northern Europe. At the end of the 18th century it began to be a centre for trade, reach- ing its greatest development in 1850-60. Kazan and Turkestan Tatars formed the bulk of its population. The town still remains, however, a collection of old wooden houses scattered among unfenced spaces of sand. The Tatar town has a somewhat better aspect than the Russian. The inhabitants (17,820 in 1881) consist of officials, mer- chants, and agriculturists.*~~

~~*SEMIRAMIS. According to the legend which the Greeks received from Ctesias, and which is most fully pre- served by Diodorus (book ii.) in a form that, according to the researches of C. Jacoby (Rhein. Museum, 1875, p. 555 sg.), is not taken direct from Ctesias but comes through Clitarchus, and has been modified by traits borrowed from the history of Alexander the Great, the Assyrian empire over all Asia as far as the borders of India was created by*~~

~~*Ninus, the founder of Nineveh, and his greater spouse Semiramis, who was first the wife of his captain, Onnes, but won the king's love by an heroic exploit, the capture of Bactra, which had defied the royal forces. Ninus died, and Semiramis, succeeding to his power, traversed all parts of the empire, erecting great cities (especially Babylon) and stupendous monuments or opening roads through savage mountains. She was unsuccessful only in an attack on India. At length, after a reign of forty-*~~

~~*two years, she delivered up the kingdom to her son Ninyas and dis-appeared, or, according to what seenis to be the original form of the story, was turned into a dove and was thence- forth worshipped as a deity. This legend is certainly not Assyrian or Babylonian ; Ctesias must have had it from Persians or Medes, and the fulness of detail, the multi- tude of proper names, favour the conjecture that Ninus and Semiramis were celebrated in some Median epic tale which went on to tell of the fall of Assyria before the Medes (Duncker, Gesch. d. Alt., 5th ed., ii. 18 sq.). In this legend all the conquests of Assyria were crowded together into one lifetime, and King Ninus and his son Ninyas are mere eponyms of Nineveh, personifications of the Assyrian monarchy. But it is round the figure of Semiramis that all the real interest of the legend gathers; nor can she be the arbitrary creation of a poet, for it is certain that her name was popularly connected with many famous places and monuments. 'The works of Semiramis," says Strabo (xvi. 1, 2), "are pointed out through almost the whole continent, earthworks bearing her name, walls and strong- holds, aqueducts, and stair-like roads over mountains, canals, roads, and bridges." Ultimately every stupendous work of antiquity by the Euphrates or in Iran seems to have been ascribed to her,—even the Behistun inscriptions of Darius (Diod., ii. 13). Of this we already have evi- dence in Herodotus, who, though he does not know the legend afterwards told by Ctesias, ascribes to her the banks that confined the Euphrates (i. 184) and knows her name as borne by a gate of Babylon (iii. 155). Various places in Media bore the name of Semiramis, but slightly changed, even in the Middle Ages (Hoffmann, Syrische Akten, p. 137), and the old name of Van was Shamirama- gerd, Armenian tradition regarding her as its founder (St Martin, J/ém. sur ' Arménie, i. 188). These facts are to be explained by observing that in her birth as well as in her disappearance from earth Semiramis clearly appears not as a mere woman but as a great goddess. In Diodorus's account she is the daughter of the Derceto of Ascalon and miraculously brought up by doves, and again she is finally transformed into a dove, and therefore the Assyrians pay divine honours to this bird. Semiramis, therefore, is a dove-goddess associated with Derceto the fish-goddess. The same association of the fish and dove goddesses appears at Hierapolis (Bambyce, Mabbug), the great temple at which according to one legend was founded by Semi- ramis (De Dea Syria, 14), and where her statue was shown with a golden dove on*~~

~~*her head (2béd., 33, comp. 39). But the Semitic dove-goddess is Ishtar or Astarte, the great goddess of Assyria and Babylon, and the irresistible charms of Semiramis, her sexual excesses (see especially Dinon in Ailian, V.H., vii. 1), and other features of the legend all bear out the view that she is primarily a form of Astarte, and so fittingly conceived as the great queen of Assyria. The word Semiramis in Semitic form, as the Syrians write it, is Shémiram (Hoffmann, wt supra), an epithet rather than a proper name, which may be rendered 'the highly celebrated," or perhaps rather "name [mani- festation| of [the god] Ram."? The historical inference*~~

~~*1 It is noteworthy in this connexion that Mabbug is the Ninus vetus*~~

~~*of Ammianus and Philostratus. 2 Cp. the Phoenician " Astarte bysow" (OPIS! eal, ONO} tgs leis)*~~

~~*become lost in the sands.*~~

~~*SEM—SEM*~~

~~*from all this is that Semitic worship was carried by the Assyrians far into Media and Armenia.*~~

~~*On an Assyrian inscription the name Sammuramat appears as borne by the "lady of the palace" of Rammannivar (812-783 B.C.) 5 see Schrader, K.A.7., 2d ed., p. 366. E. Meyer (Gesch. des Alterth., p- 409) combines this with the statement of Herodotus that Semi- ramis lived five generations before Nitocris, which would make her date 766 B.c. Possibly Herodotus identified the two names, but it is very doubtful whether they are really connected. Shemiramoth (1 Chron. xv. 18) perhaps means " statues of Semiramis," and, if so, was originally a place-name (Ewald, a.i.).*~~

~~*SEMIRYETCHENSK, a province of Russian Turkestan, including the steppes south of Lake Balkash and parts of the Tian-Shan Mountains around Lake Issik-kul. It has an area of 155,300 square miles and is bounded by Semipalatinsk on the N., by China (Jugutchak, Kuldja, Aksu, and Kashgaria) on the E. and S., and by the Russian provinces of Ferganah, Syr-Daria, and Akmolinsk on the W. It owes its name (Jity-su,*~~

~~*Semi-ryetchie, 7.e., "Seven Rivers") to the rivers which flow from the south-east into Lake Balkash. The Jungarian Ala-tau, which separates it from north-western Kuldja, penetrates into its central por- tions, extending south-west towards the river Ili, with an average height of 6000 feet above the sea, several isolated snow-clad peaks reaching about 12,000 feet. In the south Semiryetchensk embraces the intricate systems of the Trans- Th Ala-tau and the Tian-Shan (see TuRKESTAN). Two ranges of the former, connected about their middle by a single mountain-mass, extend east-north-eastwards along the northern shore of Lake Issik-kul, both ranging from 10,000 to about 15,000 feet and both partially snow-clad. To the south of the lake two immense ranges of the Tian- Shan, separated by the valley of the Naryn, stretch in the same direction, raising their icy peaks to above 15,000 and 16,000 feet ; while westwards from the lake the vast walls of the Alexandrovskiy ridge, 9000 to 10,000 feet high, with peaks rising some 2000 feet higher, extend to the province of Syr-Daria. Another mountain complex of much lower elevation runs north-westwards from the Trans-Ilian Ala-tau towards the southern extremity of Lake Balkash. In the north, where the province borders Semipalatinsk, it includes the western parts of the Tarbagatai range, the summits of which (10,000 feet) do not reach the limit of perpetual snow. The remainder of the province consists of a rich steppe in the north-east (Serghiopol), and vast uninhabitable sand-steppes on the south-east of Lake Bal- kash. Southwards from the last-named, however, at the foot of the mountains and at the entrance to the valleys, there are rich areas of fertile land, which are rapidly being colonized by Russian immigrants, who have also spread into the Tian-Shan, to the east of Lake Issik-kul. The climateis relatively temperate (average yearly temperature 44° Fahr. at Vyernyi, 2500 feet above the sea) and the vegetation rich.*~~

~~*The chief river is the Ili, which enters the province from Kuldja, makes its way through the spurs of the Trans-Ilian Ala-tau, flows north-west in a bed varying from 200 to 1000 yards in width, and waters the province for 250 miles before it enters Lake Balkash by several mouths forming a wide delta. Its tributaries from the left are the Naryn, the Tchilik, and the Kurtu; several others The Karatal, the Aksu, and the Lepsa likewise fall into Lake Balkash. The Tchu rises in the Tian-Shan Mountains and flows north-westwards to Lake Saumal-kul; and the Naryn flows south-*~~

westwards along a longitudinal valley of the Tian-Shan, and enters Ferganah to join the Syr-Daria. The province contains several important lakes. Lake Balkash, or Denghiz, in the north (8880 square miles), is crescent-shaped, 400 miles long and 55 wide in its broader part ; but its area is much less than it for- merly was, and it is rapidly drying up,—notably since 1853. Lake Ala-kul, which was connected with Balkash in the Post-Pliocene period, now stands some hundred feet higher, and is connected by a chain of smaller lakes with Sisik-kul. Lake Issik-kul (2260 square miles) is a deep mountain lake, 120 miles long and 37 wide, 5800 feet above the sea. The alpine lakes Son-kul (9400 feet) and Tchatyr-kul (11,100) lie south-west of Issik-kul.

The population, which was estimated at 748,800 by M. Kostenko in 1880 (189,660 being in the Kuldja region), has since increased,

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the latest official figures (1882) giving 685,950 for the province, exclusive of the Kuldja region. Of these Russians numbered, ac- cording to Kostenko, 44,585, 20,640 being Cossacks, who are very poor as compared with the free Russian emigrants. The majority of the population are Kirghiz (595,237); next come Tarantchis (36,265), Kalmucks (about 25,000), Mongols and Manchurians (22,000), and Dungans (19,657), these last two mostly in Kuldja ; while Tatars and Sarts are each represented by some 8000 or 3500 (all the foregoing figures include those for Kuldja). The

SEMITIC L

HE name 'Semitic languages" is used to designate a group of Asiatic and African languages, some living and some dead, namely, Hebrew and Phcenician, Aramaic, Assyrian, Arabic, Ethiopic (Geez and Amharic). The name, which was introduced by Hichhorn,! is derived from the fact that most nations which speak or spoke these lan- guages are descended, according to Genesis, from Shem, son of Noah. But the classification of nations in Genesis x. is founded neither upon linguistic nor upon ethno-graphical principles: it is determined rather by geograph- ical and political considerations. For this reason Elam and Lud are also included

~~among the children of Shem ; but neither the Elamites (in Susiana) nor the Lydians appear to have spoken a language connected with Hebrew. On the other hand, the Phœnicians (Canaanites), whose dialect closely resembled that of Israel, are not counted as children of Shem. Moreover, the compiler of the list in Genesis x. had no clear conceptions about the peoples of south Arabia and Ethiopia. Nevertheless it would be undesirable to give up the universally received terms ""Semites" and "Semitic." There exist large groups of languages and peoples which bear no natural collective appellations, because the peoples grew up unconscious of their mutual relationship; so science must needs give them artificial designations, and it would be well if all such terms were as short and precise as " Semitic."~~

~~The connexion of the Semitic languages with one another is somewhat close, in any case closer than that of the Indo-European languages. The more ancient Semitic tongues differ from one another scarcely more than do the various Teutonic dialects. Hence even in the 17th century such learned Orientalists as Hottinger, Bochart, Castell, and Ludolf had a tolerably clear notion of the relationship between the different Semitic languages with which they were acquainted ; indeed the same may be said of some Jewish scholars who lived many centuries earlier, as, for instance, Jehuda ben Koraish. It is not difficult to point out a series of characteristic marks common to these lan- guages,—the predominance of triconsonantal roots, or of roots formed after the analogy of such, similarity in the formation of nominal and verbal stems, a great resemblance in the forms of the personal pronouns and in their use for the purpose of verbal inflexion, the two principal tenses, the importance attached to the change of vowels in the interior of words, and lastly considerable agreement with regard to order and the construction of sentences. Yet even so ancient a Semitic language as the Assyrian ap- pears to lack some of these features, and in certain modern dialects, such as New Syriac, Mahri, and more particularly Amharic, many of the characteristics of older Semitic speech have disappeared. But the resemblance in voca- bulary generally diminishes in proportion to the modern- ness of the dialects. Still we can trace the connexion between the modern and the ancient dialects, and show, at least approximately, how~~

~~the former were developed out of the latter. Where a development of this kind can be proved to have taken place, there a relationship must~~

~~1 Kinleitung in das A.T., 2d ed., i. 45 (Leipsic, 1787).~~

~~ing too much in this respect.~~

~~64]~~

~~province is subdivided into five districts; Vyernyi (18,423 inhabit- ants in 1879, of whom 38586 were military), the chief town of the province, formerly Almaty, is situated at the foot of the Trans-Tlian Ala-tau, and has a mixed population of Russians, Tatars, Sarts, Kirghiz, Kalmucks, and Jews ; its trade with Kuldja and Kashgar is increasing rapidly, and it has now two lyceums, for boys and girls, and several other schools. The other towns—Kopal (5450 inhabitants), Serghiopol (1045), Tokmak (1770), and Karakol (2780)—are merely administrative centres.~~

~~ANGUAGES~~

~~exist, however much the individual features may have been effaced. The question here is not of logical categories but of organic groups.~~

~~All these languages are descendants of a primitive Primi- ‘ Many of its tive— most important features may be reconstructed with at Semitic~~

~~Semitic stock which has long been extinct.~~

~~least tolerable certainty, but we must beware of attempt- When the various cognate languages of a group diverge in essential points, it is by no means always possible to determine which of them has retained the more primitive form. The history of the development of these tongues during the period anterior to the documents which we possess is often extremely obscure in its details. Even when several Semitic lan- guages agree in important points of grammar we cannot always be sure that in these particulars we have what is primitive, since in many cases analogous changes have taken place independently. To one who should assert the complete reconstruction of the primitive Semitic language to be possible,~~

~~*we might put the question, Would the man who is best acquainted with all the Romance languages be in a position to reconstruct their common mother, Latin, if the knowledge of it were lost? And yet there are but few Semitic languages which we can know as accurately as the Romance languages are known. As far as the vocabulary is concerned, we may indeed maintain with certainty that a considerable number of words which have in various Semitic languages the form proper to each were a part of primitive Semitic speech. Nevertheless even then we are apt to be misled by independent but analogous formations and by words borrowed at a very remote period.? Each Semitic language or group of lan- guages has, however, many words which we cannot point out in the others. Of such words a great number no doubt belonged to primitive Semitic speech, and either disappeared in some of these languages or else remained in use, but not so as to be recognizable by us. Yet many isolated words and roots may in very early times have been borrowed by the Hebrew, the Aramaic, the Ethiopic, &c., perhaps from wholly different languages, of which no trace is left.*~~

~~*The question which of tlhe known Semitic dialects most resembles the primitive Semitic language is less important than one might at first suppose, since the question is one not of absolute but only of relative priority. After scholars had given up the notion (which, however, was not the fruit of scientific research) that all Semitic lan- guages, and indeed all the languages in the world, were de- scendants of Hebrew or of Aramaic, it was long the fashion to maintain that Arabic bore a close resemblance to the primitive Semitic language.? But, just as it is now recog- nized with ever-increasing clearness that Sanskrit is far from having retained in such a degree as was even lately supposed the characteristics of primitive Indo-European*~~

~~*2 The more alike two languages are the more difficult it usually is to detect, as borrowed elements, those words which have passed from one language into the other.*~~

~~*° This theory is carried to its extreme limit in Olshausen's very valuable Zebrew Grammar (Brunswick, 1861).*~~

~~Charac- ter of Semitic mind.~~

~~speech, so in the domain of the Semitic tongues we can assign to Arabic only a relative antiquity. It is true that in Arabic very many features are preserved more faithfully than in the cognate languages,—for instance, nearly all the original abundance of consonants, the short vowels in open syllables, particularly in the interior of words, and many grammatical distinctions which in the other lan- guages are more or less obscured. But, on the other hand, Arabic has coined, simply from analogy, a great number of forms which, owing to their extreme simplicity, seem at the first glance to be primitive, but which nevertheless are only modifications of the primitive forms; whilst per- haps the other Semitic languages exhibit modifications of a different kind. In spite of its great wealth, Arabic is characterized by a certain monotony, which can scarcely have existed from the beginning. Both Hebrew and Aramaic are in many respects more ancient than Arabic. This would no doubt be far more apparent if we knew Hebrew more completely and according to the original pronunciation of its vowels, and if we could discover how Aramaic was pronounced about the 13th century before our era. It must always be borne in mind that we are far more fully and accurately acquainted with Arabic than with the other Semitic languages of antiquity. The opin- ion sometimes maintained by certain over-zealous Assyrio- logists, that Assyrian is the 'Sanskrit of the Semitic world," has not met with the approval even of the Assyrio- logists themselves, and is unworthy of a serious refutation.~~

~~A comparative grammar of the Semitic languages must of course be based upon Arabic, but must in every matter of detail take into consideration all the cognate languages, as far as they are known to us. In the reconstruction of the primitive Semitic tongue Hebrew might perhaps afford more assistance than Ethiopic; but Aramaic, Assyrian, and even the less known and the more modern dialects might furnish valuable materials.~~

~~It is not a formidable undertaking to describe in general terms the character of the Semitic mind, as has been done, for example, by Lassen~~

~~*(Indische Alterthumskunde, i. 414 sg.) and by Renan in the introduction to his Histoire des Langues Sémitiques. But still there is a danger of assuming that the most important characteristics of particu- lar Semitic peoples, especially of the Israelites and of the Arabs, are common to all Semites, and of ascribing to the influence of race certain striking features which are the result of the external conditions of life, and which, under similar circumstances, are also developed among non- Semitic races. And, though it is said, not without reason, that the Semites possess but little talent for political and military organization on a large scale, yet we have in the Pheeniciaus, especially the Carthaginians, in Hamilcar and in Hannibal, a proof that under altered conditions the Semites are not incapable of distinguishing themselves in these domains. It isa poor evasion to deny that the Phe- nicians are genuine Semites, since even our scanty sources of information suffice to show that in the matter of reli- gion, which among Semites is of such supreme importance, they bore a close resemblance to the ancient Hebrews and Aramzans. In general descriptions of this kind it is easy to go too far. But to give in general terms a correct idea of the Semitic languages is a task of very much greater difficulty. Renan's brilliant and most interesting sketch is in many respects open to serious criticism. He cites, for example, as characteristic of the Semitic tongues, that they still retain the practice of expressing psychological pro- cesses by means of distinct imagery. In saying this he is taking scarcely any language but Hebrew into account. But the feature to which he here alludes is owing to the particular stage of intellectual development that had been reached by the Israelites, is in part peculiar to the poetical*~~

~~*style, and is to be found in like manner among wholly different races. That the Semitic languages are far from possessing the fixity which Renan attributes to them we shall see below. But, however this may be, certain gram- matical peculiarities of the Semitic languages—above all, the predominance of triliteral roots—are so marked that it is scarcely possible to doubt whether any language with which we are tolerably well acquainted is or is not Semitic, Only when a Semitic language has been strongly influenced not only in vocabulary but also in grammar by some non- Semitic speech, as is the case with Amharic, can such a doubt be for a moment entertained.*~~

~~*Many attempts have been made, sometimes in a very Reg. superficial fashion and sometimes by the use of scientific tions methods, to establish a relationship between the Semitic languages and the Indo-European. It was very natural fault to suppose that the tongues of the two races which, with ofspeed, the single exceptions of the Egyptians and the Chinese, have formed and moulded human civilization, who have been near neighbours from the earliest times, and who, moreover, seem to bear a great physical resemblance to one another can be nothing else than two descendants of the same parent speech. But all these endeavours have wholly failed. It is indeed probable that the languages, not only of the Semites and of the Indo-Europeans, but also those of other races, are derived from the same stock, but the separation must have taken place at so remote a period that the changes which these languages underwent in prehistoric times have completely effaced what features they possessed in common; if such features have some times been preserved, they are no longer recognizable. It must be rementbered that it is only in exceptionally favour- able circumstances that cognate languages are so preserved during long periods as to render it possible for scientific analysis to prove their relationship with one another.!*~~

~~*On the other hand, the Semitic languages bear so striking a resemblance in some respects to certain lan- guages of northern Africa that we are forced to assume the existence of a tolerably close relationship between the two groups. We allude to the family of languages known in modern times as the " HHamitic," and composed of the Egyptian, Berber, Beja (Bishari, &c.), and a number of tongues spoken in Abyssinia and the neighbouring countries (Agaw, Galla, Dankali, &c.). It is remarkable that some of the most indispensable words in the Semitic vocabulary (as, for instance, " water," " mouth," and certain numerals) are found in HHamitic also, and that these words happen to be such as cannot well be derived from triliteral Semitic roots, and are more or less independent of the ordinary grammatical rules. We notice, too, important resem- blances in grammar,—for example, the formation of the feminine by means of a ¢ prefixed or affixed, that of the causative by means of s, similarity in the suffixes and pre- fixes of the verbal tenses, and, generally, similarity in the personal pronouns, &c. It must be admitted that there is also much disagreement,—for instance, the widest diver- gence in the mass of the*~~

~~vocabulary ; and this applies to the Semitic languages as compared not only with those Hamitic languages that are gradually becoming known to us at the present day but with the Egyptian, of which we possess documents dating from the fourth millennium before the Christian era. The question is here involved in great difficulties. Some isolated resemblances may, improbable as it appears, have been produced by the bor-~~

~~1 The following is an instance of the manner in which we may be deceived by isolated cases. 'Six'? is in Hebrew shesh, almost exactly like the Sanskrit and modern Persian shash, the Latin sex, &c. But the Indo-European root is sweks, or perhaps even Asweks, whereas the Semitic root is shidth, so that the resemblance is a purely accidental one, produced by phonetic change.~~

~~rowing of words. Uncivilized races, as has been proved with certainty, sometimes borrow from others elements of speech in cases where we should deem such a thing im- possible,—for example, numerals and even personal suffixes. But the great resemblances in grammatical formation can- not be reasonably explained as due to borrowing on the part of the Hamites, more especially as these points of agreement are also found in the language of the Berbers, who are scattered over an enormous territory, and whose speech must have acquired its character long before they came into contact with the Semites. We are even now but imperfectly acquainted with the Hamitic languages; it is not yet certain into what groups they fall; and the relation in which Egyptian stands to Berber on the one hand and to the south Hamitic languages on the other re- quires further elucidation. The attempt to write a com-~~

~~parative grammar of the Semitic and Hamitic languages.~~

~~would be, to say the least, very premature.!~~

~~The connexion between the Semitic languages and the Hamitic appears to indicate that the primitive seat of ' the Semites is to be sought in Africa; for it can scarcely be supposed that the Hamites, amongst whom there are~~

~~*gradual transitions from an almost purely European type to that of the Negroes, are the children of any other land than "the dark continent." There seems, moreover, to be a considerable physical resemblance between the Hamites and the Semites, especially in the case of the southern Arabs ; we need mention only the slight development of the calf of the leg, and the sporadic appearance amongst Semites of woolly hair and prominent jaws.? But both Semites and Hamites have been mingled to a large extent with foreign races, which process must have diminished their mutual similarity. All this, however, is offered not as a definite theory but as a modest hypothesis.*~~

~~*It was once the custom to maintain that the Semites came originally from certain districts in Armenia. This supposition was founded on the book of Genesis, accord- ing to which several of the Semitic nations are descended from Arphachsad, 7.¢., the eponym of the district of Arrapachitis, now called Albak, on the borders of Armenia and Kurdistan. It was also thought that this region was inhabited by the primitive race from which both the Semites and the Indo-Europeans derived their origin. But, as we saw above, this ancient relationship is a matter of some doubt; in any case, the separation does not date from a period so recent that the Semites can be supposed to have possessed any historical tradition concerning it. There cannot be a greater mistake than to imagine that nations have been able to preserve during long ages their recollection of the country whence their supposed ancestors are said to have emigrated. The fantastic notion once in vogue as to the permanence of historical memories among uncivilized races must be wholly abandoned. The period in which the Hebrews, the Arabs, and the other Semitic nations together formed a single people is so distant that none of them can possibly have retained any tradition of it. The opinion that the Hebrews and the tribes most closely related to them were descendants of Arphachsad is apparently due to the legend that Noah's ark landed near this district. The notion has therefore a purely mythical origin. Moreover, in Genesis itself we find a totally different account of the matter, derived from another*~~

~~*Scarcely any man of science now believes in the northern origin of the Semites.*~~

~~*Others, as Sprenger and Schrader,' consider the birth- place of the Semitic race to have been in Arabia. There is much that appears to support this theory. History proves that from a very early period tribes from the deserts of Arabia settled on the cultivable lands which border them and adopted a purely agricultural mode of life. Various traces in the language seem to indicate that the Hebrews and the Aramezans were originally nomads, and Arabia with its northern prolongation (the Syrian desert) is the true home of nomadic peoples. The Arabs are also supposed to display the Semitic character in its purest form, and their language is, on the whole, nearer the original Semitic than are the languages of the cognate races. To this last circumstance we should, how- ever, attach little importance. It is by no means always the case that a language is most faithfully preserved in the country where it originated. The Lithuanians speak the most ancient of all living Indo-European languages, and they are certainly not autochthones of Lithuania; the Romance dialect spoken in the south of Sardinia is far more primitive than that spoken at Rome; and of all living Teutonic languages the most ancient is the Icelandic. It is even doubtful whether the ordinary assumption be cor- rect, that the most primitive of modern Arabic dialects are those spoken in Arabia. Besides, we cannot unre- servedly admit that the Arabs display the Semitic char- acter in its purest form; it would be more correct to say that, under the influence of a country indescribably mono- tonous and of a life ever changing yet ever the same, the inhabitants of the Arabian deserts have developed most exclusively certain of the principal traits of the Semitic race. All these considerations are indecisive; but we will- ingly admit that the theory which regards Arabia as the primitive seat of all Semites is by no means untenable.*~~

~~*Finally, one of the most eminent of contemporary Orien- talists, Ignazio Guidi,* has attempted to prove that the home of the Senites is on the lower Euphrates. He contends that the geographical, botanical, and zoological conceptions which are expressed in the various Semitic languages by the same words, preserved from the time of the dispersion, correspond to the natural characteristics of no country but the above-*~~

~~*mentioned. Great as are the ingenuity and the caution which he displays, it is difficult to accept his conclusions. Several terms might be men- tioned which are part of the common heritage of the northern and the southern Semites, but which can scarcely have been formed in the region of the Euphrates. More- over, the vocabulary of most Semitic languages is but very imperfectly known, and each dialect has lost many primitive words in the course of time. It is therefore very unsafe to draw conclusions from the fact that the various Semitic tongues have no one common designation for many important local conceptions, such as "'mountain." The ordinary words for "man," "old man," "boy," " tent," are quite different in the various Semitic languages, and yet all these are ideas for which the primitive Semites must have had names.*~~

~~*We must therefore for the present confess our inability to make any positive statement with regard to the primitive seat of the original Semitic race.*~~

~~*It is not very easy to settle what is the precise con- Con- nexion between the various Semitic languages, considered 2¢xions individually. In this matter one may easily be led to a hasty conclusions by isolated peculiarities in vocabulary or jtic lan-*~~

~~*guages,*~~

~~*source, which represents all nations, and therefore the Semites among them, as having come from Babylon.*~~

~~*1 This of course applies yet more strongly to Benfey's work, Ueber das Verhdltniss der agyptischen Sprache zum semitischen Sprachstamm (Leipsic, 1844) ; but his book has the permanent merit of having for the first time examined this relationship in a scientific manner.*~~

~~*2 Comp. G. Gerland, Atlas der Ethnographic (Leipsic, 1876), p. 40 of the text.*~~

~~*3 The former has maintained this view in several of his works, the latter in Z.D.M.G., xxvii. 417 sq.*~~

~~*4 'Della Sede Primitiva dei Popoli Semitici," in the Proceedings of the Accademia dei Lincei, 1878-79.*~~

~~*North- erm*~~

~~*and southern groups,*~~

~~*644 SE MT Pie*~~

~~*grammar. Each of the older Semitic languages occasion- ally agrees in grammatical points with some other to which in most respects it bears no very close resemblance, while dialects much more nearly related to it are found to exhibit different formations. features peculiar to itself. For instance, the Hebrew- Phoenician group and the Arabic have a prefixed definite article (the etymological identity of which is, however, not quite certain); the dialect nearest to Arabic, the Sabzean, expresses the article by means of a suffixed 2; the Aramaic, which in general more closely resembles Hebrew than does the Arabic group, expresses it by means of a suffixed 4; whereas the Assyrian in the north and the Ethiopic in the south have no article at all. Of this termination » for*~~

~~*the definite article there is no trace in either Arabic or-*~~

~~*Hebrew; the Sabzean, the Ethiopic, and the Aramaic employ it to give emphasis to demonstrative pronouns ; and the very same usage has been detected in a single Phoenician inscription.! In this case, therefore, Hebrew and Arabic have, independently of one another, lost some- thing which the languages most nearly related to them have preserved. In like manner, the strengthening of the pronoun of the third person by means of ¢ (or ¢é) is only found in Ethiopic, Sabsean, and Pheenician. Aramaic alone has no certain trace of the reflexive conjugation formed with prefixed x; Hebrew alone has no certain trace of the causative with sha.? In several of the Semitic languages we can see how the formation of the passive by means of internal vocal change (as kudlima, 'he was ad- dressed," as distinguished from kallama, 'he addressed ") gradually dropped out of use; in Ethiopic this process was already complete when the language first became literary ; but in Aramaic it was not wholly so. In a few cases phonetic resemblances have been the result of later growth.*~~

~~*For example, the termination of the plural masculine of nouns is in Hebrew tm, in Aramaic én, as in Arabic. But we know that Aramaic also originally had m, Whereas the ancient Arabic forms have after the » an a, which appears to have been originally a long 4 (dna, ina) ; in this latter position (that is, between two vowels) the change of m into n is very improbable. These two similar terminations were therefore originally distinct. We must indeed be very cautious in drawing conclusions from points of agreement between the vocabularies of the various Semitic tongues. The Ethiopians and the Hebrews have the same word for many objects which the other Semites call by other names,—for instance, ‘“‘stone,” “tree,” “enemy,” “enter,” “go out”; and the same may be said of Hebrew as compared with Saban, But to build theories upon such facts would be unsafe, since the words cited are either found, though with some change of meaning, in at least one of the cognate languages, or actu- ally occur, perhaps quite exceptionally and in archaic writings, with the same signification. The sedentary habits of the Ethiopians and the Sabzeans may possibly have rendered it easier for them to retain in their vocabu- lary certain words which were used by the civilized Semites of the north, but which became obsolete amongst the Arabian nomads. To the same cause we may attribute the fact that in religion the Sabzeans resemble the northern Semites more closely than do the tribes of central Arabia ; but these considerations prove nothing in favour of a nearer linguistic affinity.*~~

~~*One thing at least is certain, that Arabic (with Sabzean) and Ethiopic stand in a comparatively close relationship to one another, and compose a group by themselves, as contrasted with the other Semitic languages, Hebreeo- Phoenician, Aramaic, and Assyrian, which constitute the*~~

~~*1 Viz., the great inscription of Byblus, C.U.S., fase. i. No. 1. 2 Shalhebeth, “ flame,” is borrowed from Aramaic.*~~

~~*Each Semitic tongue also possesses |*~~

~~*baNev AG is*~~

~~*northern group. Only in these southern dialects do we find, and that under forms substantially identical, the im- portant innovation known as*~~

~~*the "broken plurals." They agree, moreover, in employing a peculiar development of the verbal root, formed by inserting an @ between the first and second radicals (kdtala, takdtala), in using the vowel a before the third radical in all active perfects—for example, (h)aktala, kattala, instead of the haktil, kattil of the northern dialects—and in many other grammatical phenomena. This is not at all contradicted by the fact that certain aspirated dentals of Arabic (th, dh, th) are replaced in Ethiopic, as in HIebrew and Assyrian, by pure sibilants—that is, s (HIebrew and Assyrian sh), 2, e—whereas in Aramaic they are replaced by simple dentals (t, d, t), which seem to come closer to the Arabic sounds, After the separation of the northern and the southern groups, the Semitic languages possessed all these sounds, as the Arabic does, but afterwards simplified them, for the most part, in one direction or the other. HIence there resulted, as it were by chance, occasional similarities. Even in modern Arabic dialects th, dh have become some- times ¢, d, and sometimes s, z Ethiopic, moreover, has kept d, the most peculiar of Arabic sounds, distinct from ¢, whereas Aramaic has confounded it with the guttural 'ain, and HIebrew and Assyrian with ¢. It is therefore evident that all these languages once possessed the con- sonant in question as a distinct one. One sound, sin, appears only in HIebrew, in Phoenician, and in the older Aramaic. It must originally have been pronounced very like sh, since it is represented in writing by the same character ; in later times it was changed into an ordinary s. Assyrian does not distinguish it from sh.3 The division of the Semitic languages into the northern group and the southern is therefore justified by facts. Even if we were to discover really important grammatical phenomena in which one of the southern dialects agreed with the northern, or vce versa, and that in cases where such phenomena could not be regarded either as remnants of primitive Semitic usage or as instances of parallel but independent development, we ought to remember that the division of the two groups was not necessarily a sudden and instan- taneous occurrence, that even after the separation inter- course may have been carried on between the various tribes who spoke kindred dialects and were therefore still able to understand one another, and that intermediate dialects may once have existed, perhaps such as were in use amongst tribes who came into contact sometimes with the agricultural population of the north and sometimes with the nomads of the south (see below). All this is purely hypothetical, whereas the*~~

~~*division between the northern and the southern Semitic languages is a recognized fact.*~~

~~*Although we cannot deny that there may formerly have existed Semitic languages quite distinct from those with which we are acquainted, yet that such was actually the case cannot be proved. Nor is there any reason to think that the domain of the Semitic languages ever extended very far beyond its present mits. Some time ago many scholars believed that they were once spoken in Asia Minor and even in Europe, but, except in the Phcenician colonies, this notion rested upon no solid proof. It cannot be argued with any great degree of plausibility that even the Cilicians, who from a very early period held constant intercourse with the Syrians and the Phoenicians, spoke a Semitic language.*~~

~~*3 It is not quite certain whether all the Semitic languages originally had the hardest of the gutturals gz and kh in exactly the same places that they occupy in Arabic. In the case of k4—where Ethiopic agrees with Arabic—this is at least probable, since there seem to be traces of itin Assyrian. But it would appear that in Hebrew and Aramaic*~~

~~*the distinction between gh and 'ayin, between kh and h, was often different from what it is in Arabic.*~~

~~*Lost Semitic an-*~~

~~*guages.*~~

~~*brew.*~~

~~*SH WITIC*~~

~~*Hebrew.—Hebrew and Pheenician are but dialects of one and the same language. It is only as the language of the people of Israel that Hebrew can be known with any pre- cision. Since in the Old Testament a few of the neigh- bouring peoples are represented as being descended from Eber, the eponym of the Hebrews, that is, are regarded as nearly related to the latter, it was natural to suppose that they likewise spoke Hebrew,—a supposition which, at least in the case of the Moabites, has been fully confirmed by the discovery of the Mesha inscription (date, soon after 900 B.0.). The language of this inscription scarcely differs from that of the Old Testament ; the only important distinction is the occurrence of a reflexive form (with ¢ after the first radical), which appears nowhere else but in Arabic. We may remark in passing that the style of this inscription is quite that of the Old Testament, and enables us to maintain with certainty that a similar historical literature existed amongst the Moabites. But it must be remembered that ancient Semitic inscriptions exhibit, in a sense, nothing but the skeleton of the language, since they do not express the vowels at all, or do so only in certain cases ; still less do they indicate other phonetic modifications, such as the doubling of consonants, &c. It is therefore very possible that to the ear the language of Moab seemed to differ considerably from that of the Judeeans,*~~

~~*The Mesha inscription is the only non-Israclite source from which any knowledge of ancient Hebrew can be obtained. (See Hesrew LANGUAGE AND LITERATURE.) Some fragments in the Old Testament belong to the second millennium before our era,—particularly the song of Deborah (Judges v.), a document which, in spite of its many obscuritics in matters of detail, throws much light on the condition of the Israelites at the time when the Canaanites were still contending with them for the posses- sion of the country. 'The first rise of an historical litera- ture may very probably date.from before the establishment of the monarchy. Various portions of the Old Testament belong to the time of the earlier kings; but it was under the later kings that a great part of extant Hebrew litera- ture came into shape. To this age also belong the Siloam inscription and a few*~~

~~seals and gems bearing the names of Israelites. The Hebrew language is thus known to us from a very ancient period. But we are far from being acquainted with its real phonetic condition in the time of David or Isaiah. For, much as we owe to the labours of the later Jewish schools, which with infinite care fixed the pronunciation of the sacred text by adding vowels and other signs, it is evident that even at the best they could only represent the pronunciation of the language in its latest stage, not that of very early ages. Besides, their object was not to exhibit Hebrew simply as it was, but to show how it should be read in the solemn chant of the synagogue. Accordingly, the pronunciation of the older period may have differed considerably from that repre- sented by the punctuation. Such differences are now and then indicated by the customary spelling of the ancient texts,! and sometimes the orthography is directly at vari- ance with the punctuation.? In a few rare cases we may derive help from the somewhat older tradition contained in the representation of Hebrew words and proper names by Greek letters, especially in the ancient Alexandrine translation of the Bible (the so-called Septuagint). It is of particular importance to remark that this older tradi- tion still retains an original @ in many cases where the~~

~~1 For example, we may conclude with tolerable certainty, from the presence and absence of the vowel-letters y and 2, that in oldér times the accented e and o were not pronounced long, and that, on the other hand, the diphthongs aw and ai were used for the later 6 and é.~~

~~2 The very first word of the Bible contains an Aleph (spdritus lenis), which is required by etymology and was once audible, but which the pronunciation represented by the point-system ignores.~~

~~punctuation has the later ¢ or e. We have examined this point somewhat in detail, in order to contradict the false but ever-recurring notion that the ordinary text of the Bible represents without any essential modification the pronunciation of ancient Hebrew, whereas in reality it ex- presses (in a very instructive and careful manner, it is true) only its latest~~

~~*development, and that for the purpose of solemn public recitation. A clear trace of dialectical differences within Israel is found in Judges xii. 6, which ic that the ancient Ephraimites pronounced s instead of sh,*~~

~~*The destruction of the Judean kingdom dealt a heavy Period of But it is going too far to exile in*~~

~~*blow to the HIebrew language. suppose that it was altogether banished from ordinary life at the time of the exile, and that Aramaic came into use among all the Jews. In the East even small communities, especially if they form a religious body, often cling per- sistently to their mother-tongue, though they may be sur- rounded by a population of alien speech; and such was probably the case with the Jews in Babylonia. See HIeprew Lanevacs, vol, xi. p. 597. Even so late as the time of Ezra HIebrew was in all probability the ordinary language of the new community. In Neh. xiii. 24 we find a complaint that the children of Jews by wives from Ashdod and other places spoke half in the "Jewish" language and half in the language of Ashdod, or whatever else may have been the tongue of their mothers. No one can sup- pose that Nehemiah would have been particularly zealous that the children of Jews should speak an Aramaic dialect with correctness. HIe no doubt refers to HIebrew as it was then spoken,—a stage in its development of which Nehemiah's own work gives a very fair idea. And, more- over, the inhabitants of Ashdod spoke HIebrew. G. HIoff- mann? has deciphered inscriptions (written in Greek letters, but, after the HIebrew fashion, from right to left) on two coins struck about 150 years after Nehemiah, which are in pure HIebrew'; nor does the language seem to diverge at all from that of the Old Testament. It is therefore probable that Nehemiah alludes only to a slightly different local dialect. If the Philistines of Ashdod still continued to speak HIebrew about the year 300 B.c., it cannot be supposed that the Jews had given up this their own lan- guage nearly three centuries earlier. We may also con- clude that the Philistines from the earliest period spoke the same language as their eastern neighbours, with whom they had so often been at war, but had also lived in close pacific intercourse.*~~

~~*After the time of Alexander large bodies of the Jewish HIebrew population were settled in Alexandria and other western SUP*~~

~~*cities, and were very rapidly Hellenized. Meanwhile the*~~

~~*principal language of Syria and the neighbouring countries, Aramaic,*~~

~~*Aramaic, the influence of which may be perceived even in some pre-exilic writings, began to spread more and more among the Jews. Hebrew gradually ceased to be the lan- guage of the people and became that of religion and the schools. The book of Daniel, written in 167 or 166 z.c., begins in Hebrew, then suddenly passes into Aramaic, and ends again in Hebrew. Similarly the redactor of Ezra (or more correctly of the Chronicles, of which Ezra and Nehe- miah form the conclusion) borrows large portions from an Aramaic work, in most cases without translating them into Hebrew. No reason can be assigned for the use of Aramaic in Jewish works intended primarily for Jerusalem, unless it were already the dominant speech, whilst, on the other hand, it was very natural for a pious Jew to write in the*~~

~~*3 See Sallet's Zeitschrift fir Numismatik, 1882 (Berlin).*~~

~~*4 The inscriptions, short as they are, exhibit the exclusively Hebrew word tr ('ir), "town," and the feminine asina (hasinah), 'the strong," with the termination ¢A (not at, asin Phoenician). Had the Ashdodites*~~

~~*been accustomed to use a dead language on their coins they would certainly have employed the native Semitic writing.*~~

~~*Hebrew of the schools.*~~

~~*Medi- eeval Hebrew.*~~

~~*Char- acter of ancient Hebrew.*~~

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~~*ancient "holy" language even after it had ceased to be spoken, Esther, Ecclesiastes, and a few Psalms, which be- long to the 3d and 2d centuries before our era, are indeed written in Hebrew, but are so strongly tinctured by the Aramaic influence as to prove that the writers usually spoke*~~

~~*Aramaic. We are not likely to be far wrong in saying that in the Maccabzean age Hebrew had died out among the Jews, and there is nothing to show that it sur- vived longer amongst any of the neighbouring peoples.*~~

~~*But in the last period of the history of Jerusalem, and still more after the destruction of the city by Titus, the Jewish schools played so important a part that the life of the Hebrew language was in a manner prolonged. The lectures and discussions of the learned were carried on in that tongue. We have very extensive specimens of this more modern Hebrew in the Mishnah and other works, and scattered pieces throughout both Talmuds. But, just as the "classical" Sanskrit, which has been spoken and written by the Brahmans during the last twenty-five cen- turies, differs considerably from the language which was once in use among the people, so this "language of the learned" diverges in many respects from the "holy lan- guage"; and this distinction is one of which the rabbis were perfectly conscious. The 'language of the learned" borrows a great part of its vocabulary from Aramaic,! and this exercises a strong influence upon the gram- matical forms, The grammar is perceptibly modified by the peculiar style of these writings, which for the most part treat of legal and ritual questions in a strangely laconic and pointed manner. But, large as is the propor- tion of foreign words and artificial as this language is, it contains a considerable number of purely Hebrew elements which do not appear in the Old Testament. Although we may generally assume, in the case of a word occurring in the Mishnah but not found in the Old Testament, that it is borrowed from Aramaic, there are several words of this class which, by their radical consonants, prove them- selves to be genuine Hebrew. And even some gram- matical phenomena of this language are to be regarded as a genuine development of Hebrew, though they are unknown to earlier Hebrew speech.*~~

~~*From the beginning of the Middle Ages down to our own times the Jews have produced an enormous mass of writings in Hebrew, sometimes closely following the lan- guage of the Bible, sometimes that of the Mishnah, some- times introducing in a perfectly inorganic manner a great quantity of Aramaic forms, and occasionally imitating the Arabic style. The study of these variations has but little interest for the linguist,*~~

~~since they are nothing but a purely artificial imitation, dependent upon the greater or less skill of the individual. The language of the Mishnah stands in much closer connexion with real life, and has a definite raison Wétre; all later Hebrew is to be classed with medi- eval and modern Latin. Much Hebrew also was written in the Middle Ages by the hostile brethren of the Jews, the Samaritans ; but for the student of language these produc- tions have, at the most, the charm attaching to curiosities.~~

~~The ancient Hebrew language, especially in the matter of syntax, has an essentially primitive character, Para- taxis of sentences prevails over hypotaxis to a greater extent than in any other literary Semitic language with which we are well acquainted. The favourite method is to link sentences together by means of a simple "and." There is a great lack of particles to express with clearness the more subtle connexion of ideas. The use of the verbal tenses is In a great measure determined by the imagination,~~

~~1 It is a characteristic feature that "my father" and " my mother " are here expressed by purely Aramaic forms. Even the learned did not wish to call their "papas" and "mammas" by any other names than those to which they had been accustomed in infancy.~~

~~LANGUZAGHIs~~

~~which regards things unaccomplished as accomplished and the past as still present. There are but few words or inflexions to indicate slight modifications of meaning, though in ancient times the language may perhaps have distinguished certain moods of the verb somewhat more plainly than the present punctuation does. But in any case this language was far less suited for the definite ex- pression of studied thought, and less suited still for the treatment of abstract subjects, than for poetry. We must remember, however, that as long as Hebrew was a living language it never had to be used for the expression of the abstract. Had it lived somewhat longer it might very possibly have learnt to adapt itself better to the formulat- ing of systematic conceptions. The only book in the Old Testament which attempts to grapple with an abstract subject in plain prose—namely, Ecclesiastes—dates from a time when Hebrew was dying out or was already dead, That the gifted author does not always succeed~~

~~*in giving clear expression to his ideas is partly due to the fact that the language had never been employed for any scientific purposes whatsoever. With regard to grammatical forms, Hebrew has lost much that is still preserved in Arabic ; but the greater richness of Arabic is in part the result of later development.*~~

~~*The vocabulary of the Hebrew language is, as we have Vocab said, known but imperfectly. The Old Testament is no lary.*~~

~~*very large work ; it contains, moreover, many repetitions, and a great nuniber of pieces which are of little use to the lexicographer. On the other hand, much may be derived from certain poetical books, such as Job. The numerous dra& Aeydpeva are a suflicient proof that many more words existed than appear in the Old Testament, the writers of which never had occasion to use them. Were we in possession of the whole Hebrew vocabulary in the time of Jeremiah, for example, we should be far better able to determine the relation in which Hebrew stands to the other Semitic languages, the Old Testament would be far more intelligible to us, and it would be very much easier to detect the numerous corrupt passages in our text.*~~

~~*Phenician.—This dialect closely resembles Hebrew, and Pheni-*~~

~~*is known to us from only one authentic source, namely, inscriptions, some of which date from about 600 B,c. or earlier; but the great mass of them begin with the 4th century before our era. These inscriptions? we owe to the Phoenicians of the mother-country and the neighbour- ing regions (Cyprus, Egypt, and Greece), as well as to the Phoenicians of Africa, especially Carthage. Inscriptions are, however, a very insufficient means for obtaining the knowledge of a language. The number of subjects treated in them is not large; many of the most important gram- matical forms and many of the words most used in ordi- nary life donot oceur. Moreover, the "lapidary style" is often very hard to understand. 'The repetition of obscure phrases, in the same connexion, in several inscriptions does not help to make them more intelligible. Of what use is it to us that, for instance, thousands of Carthaginian inscriptions begin with the very same incomprehensible dedication to two divinities? The difficulty of interpreta- tion is greatly increased by the fact that single*~~

~~*words are very seldom separated from one another, and that vowel- letters are used extremely sparingly. We therefore come but too often upon very ambiguous groups of letters, In spite of this, our knowledge of Phoenician has made con- siderable progress of late. Some assistance is also got from Greek and Latin writers, who cite not only many Pheenician proper names but single Phoenician words: Plautus in particular inserts in the Ponulus whole pass- ages in Punic, some of which are accompanied by a Latin*~~

~~*2 The scattered materials are being collected in the Corpus Inserip- tionum Semiticarum of the Paris Academy.*~~

~~*ic, certain is known.*~~

~~*ea er i Tf isc*~~

~~*translation, This source of information must, however, be used with great caution. It was not the object of Plautus to exhibit the Punic language with precision, a task for which the Latin alphabet is but ill adapted, but only to make the populace laugh at the jargon of the hated Carthaginians. Moreover, he had to force the Punic words into Latin senarii; and finally the text, being unintelligible to copyists, is terribly corrupt. Much ingenuity has been wasted on the Punic of Plautus; but the passage yields valuable results to cautious investigation which does not try to explain too much.! In its grammar Pheenician closely resembles Hebrew. In both dialects the consonants are the same, often in contrast to Aramaic and other cognate languages.2 As to vowels, Phcenician seems to diverge rather more from Hebrew. The connecting of clauses is scarcely carried further in the former language than in the latter.*~~

~~*Aramaic.—Aramaic is nearly related to Hebreeo-Phceni- cian ; but there is nevertheless a sharp line of demarcation between the two groups. Of its original home nothing In the Old Testament "Aram" appears at an early period as a designation of certain districts in Syria ("Aram of Damascus," &c.) and in Mesopotamia ("Aram of the Two Rivers"). The language of the sigs a Gildemeister, in Ritschl's Plautus (vol. ii fase, v., Leipsic,*~~

~~2 A an early period the Phenician pronunciation may have distin- guished a greater number of original consonants than are distinguished in writing. It is at least remarkable that the Greeks render the name of the city of Cur (Hebrew Qér), which must originally have been pro- nounced Thurr, with a 7 (TYpos), and the name of Cidén, where the ¢ runs through all the Semitic languages, with ao (Ziduy). Distinctions of this kind, justified by etymology, have perhaps been obscured in Hebrew by the imperfection of the alphabet. In the case of stm and~~

~~shim this can be positively proved. 3 Kén nadar, "had vowed," Idal. 5 (C.I.S., Pheen., No. 98).~~

~~Arameans gradually spread far and wide, and occupied all Syria, both those regions which were before in the possession of the Kheta, probably a non-Semitic people,~~

~~and those which were most likely inhabited by Canaanite~~

~~tribes ; last of all, Palestine became Aramaized. Towards the east this language was spoken on the Euphrates, and throughout the districts of the Tigris south and west of the Armenian and Kurdish mountains; the province in which the capitals of the Arsacides and the Sdsdnians were situated was called "the country of the Aramzans." In Babylonia and Assyria a large, or perhaps the larger, portion of the population were most probably Aramzans, even at a very early date, whilst Assyrian was the language of the Government.~~

~~The oldest extant Aramaic documents consist of inscrip- tions on monuments and on seals and gems. In the Persian period Aramaic was the official language of the provinces west of the Euphrates; and this explains the fact that coins which were struck by governors and vassal princes in Asia Minor, and of which the stamp was in some cases the work of skilled Greek artists, bear Aramaic inscrip- tions, whilst those of other coins are Greek. This, of~~

~~*course, does not prove that Aramaic was ever spoken in*~~

~~*Asia Minor and as far north as Sinope and the Helles- pont. In Egypt Aramaic inscriptions have been found of the Persian period, one bearing the date of the fourth year of Xerxes (482 3.c.)4; we have also official documents on papyrus, unfortunately in a very tattered condition for the most part, which prove that the Persians preferred using this convenient language to mastering the difficulties of the Egyptian systems of writing. It is, further, very possible that at that time there were considerable numbers of Aramzans in Egypt, just as there were of Phcenicians, Greeks, and Jews. . But probably this preference for Aramaic originated under the Assyrian empire, in which a very large proportion of the population spoke Aramaic, and in which this language would naturally occupy a more important position than it did under the Persians. We therefore understand why it was taken for granted that a great Assyrian official could speak Aramaic (2 Kings xviii. 26; Isa. xxxvi, 11), and for the same reason the digni- taries of Judah appear to have learned the language (cbid.), namely, in order to communicate with the Assyrians.® The short dominion of the Chaldzans very probably strengthened this preponderance of Aramaic.*~~

~~*The Aramaic portions of the Old Testament show us Biblical the form of the language which was in use among the Aramaic.*~~

~~*Jews of Palestine. Isolated passages in Ezra perhaps*~~

~~*4 See the Paleographical Society's Oriental Series, plate 1xiii.*~~

~~*5 We possess certain small documents in Semitic writing which date from the Assyrian period, but of which the linguistic character is still very obscure; they contain Aramaic, Phoenician, and probably Assyrian forms. See 7. D.M.G., xxxiii. 321.*~~

~~*6 Some traces of this phenomenon are found later.*~~

~~*Aramaic of Tar- gums,&c.*~~

~~*648 Sk MIT*~~

belong to the Persian period, but have certainly been re- modelled by a later writer.1 Yet in Ezra we find a few antique forms which do not occur in Daniel. The Aramaic pieces contained in the Bible have the great advantage of being furnished with vowels and other orthographical signs, though these were not inserted until long after the composition of the books, and are sometimes at variance with the text itself. But, since Aramaic was still a living language when the punctuation came into existence, and since the lapse of time was not so very great, the tradition ran less risk of corruption than in the case of Hebrew. Its general correctness is further attested by the innumer- able points of resemblance between this language and Syriac, with which we are accurately acquainted. The Aramaic of the Bible exhibits various antique features which afterwards disappeared,—for example, the formation of the passive by means of internal vowel-change, and the causative with ha instead of with a,—phenomena which have been falsely explained as Hebraisms. Biblical Aramaic agrees in all essential points with the language used in the numerous inscriptions of Palmyra (beginning soon before the Christian era and extending to about the end of the 3d century) and on the Nabatzean coins and stone monuments (concluding about the year 100). Aramaic was the language of Palmyra, the aristocracy of which were to a great extent of Arabian extraction. In the northern portion of the Nabatzan kingdom (not far from Damascus) there was probably a large Aramaic population, but farther south Arabic was spoken. At that time, how- ever, Aramaic was highly esteemed as a cultivated lan- guage, for which reason the Arabs in question made use

of it, as their own language was not reduced to writing,—

just as in those ages Greek inscriptions were set up in many districts where no one spoke Greek. That the Nabatzans were Arabs is sufficiently proved by the fact that, with the exception of a few Greek names, almost all the numerous names which occur in the Nabatzean inscrip- tions are Arabic, in many cases with distinctly Arabic terminations. A further proof of this is that in the great inscriptions over the tombs of Hejr (not far from Teim4) the native Arabic continually shows through the foreign disguise,—for instance, in the use of Arabic words when- ever the writer does not happen to remember the corre- sponding Aramaic terms, in the use of the

~~*Arabic particle Ja, of the Arabic ghair, "other than," and in several syntactic features. The great inscriptions cease with the overthrow of the Nabatzean kingdom by Trajan (105) ; but the Arabian nomads in those countries, especially in the Sinaitic peninsula, often scratched their names on the rocks down to a later period, adding some benedictory formula in Aramaic. The fact that several centuries after- wards the name of "'Nabateean" was used by the Arabs as synonymous with " Aramzan" was probably due to the gradual spread of Aramaic over a great part of what had once been the country of the Nabateans. In any case Aramaic then exercised an immense influence. This is also proved by the place which it occupies in the strange Pahlavi writing, various branches of which date from the time of the Parthian empire (see Pantavi). Biblical Aramaic, as also the language of the Palmyrene and Nabatsan inscriptions, may be described as an older form of Western Aramaic. The opinion that the Palestinian Jews brought their Aramaic dialect direct from Babylon — whence the incorrect name " Chaldee " — is altogether untenable.*~~

~~*We may now trace somewhat further the development of Western Aramaic in Palestine; but unhappily few of*~~

~~*1 The decree which is said to have been sent by Hzra is in its present form a comparatively late production.*~~

~~*ANGUAGES*~~

~~*the sources from which we derive our information can be thoroughly trusted. In the synagogues it was necessary that the reading of the Bible should be followed by an oral "targuim" or translation into Aramaic, the language of the people. The Targum was at a later period fixed in writing, but the officially sanctioned form of the Targum to the Pentateuch (the so-called Targum of Onkelos) and of that to the prophets (the so-called Jonathan) was not finally settled till the 4th or 5th century, and not in Palestine but in Babylonia. The redactors of the Targum preserved on the whole the older Palestinian dialect ; yet that of Babylon, which differed considerably from the former, exercised a vitiating influence. The punctuation, which was added later, first in Babylonia, is far less trust-worthy than that of the Aramaic pieces in the Bible. The language of*~~

~~*Onkelos and Jonathan differs but little from Biblical Aramaic. The language spoken some time after- wards by the Palestinian Jews, especially in Galilee, is exhibited in a series of rabbinical works, the so-called Jeru- salem Targums (of which, however, those on the Hagio-grapha are in some cases of later date), a few Midrashic works, and the Jerusalem Talmud. Unfortunately all these books, of which the Midrashim and the Talmud contain much Hebrew as well as Aramaic, have not been handed down with care, and require to be used with great caution for linguistic purposes. Moreover, the influence of the older language and orthography has in part ob- scured the characteristics of these popular dialects; for example, various gutturals are still written, although they are no longer pronounced. The adaptation of the spelling to the real pronunciation is carried furthest in the Jeru- salem Talmud, but not in a consistent manner. Besides, all these books are without vowel-points ; but the frequent use of vowel-letters in the later Jewish works renders this defect less sensible.*~~

~~*Not only the Jews but also the Christians of Palestine retained their native dialect for some time as an ecclesi- astical and literary language. We possess translations of the Gospels and fragments of other works in this dialect by the Palestinian Christians dating from about the 5th century, accompanied by a punctuation which was not added till some tine later. This dialect closely resembles that of the Palestinian Jews, as was to be expected from the fact that those who spoke it were of Jewish origin.*~~

~~*Finally, the Samaritans, among the inhabitants of Samari-*~~

~~*Palestine, translated their only sacred book, the Pentateuch, tan into their own dialect. The critical study of this trans- lation proves that the language which lies at its base was very much the same as that of the neighbouring Jews. Perhaps, indeed, the Samaritans may have carried the softening of the gutturals a little further than the Jews of Galilee. Their absurd attempt to embellish the language of the translation by arbitrarily introducing forms borrowed from the Hebrew original has given rise to the false notion that Samaritan is a mixture of Hebrew and Aramaic. The introduction of Hebrew and even of Arabic words and*~~

~~*forms was practised in Samaria on a still larger scale by copyists who lived after Aramaic had become extinct. The later works written in the Samaritan dialect are, from a linguistic point of view, as worthless as the compositions of Samaritans in HIebrew ; the writers, who spoke Arabic, endeavoured to write in languages with which they were but half acquainted.*~~

~~*All these Western Aramaic dialects, including that of the oldest inscriptions, have this feature among others in common, that they form the third person singular masculine and the third person plural masculine and feminine in the imperfect by prefixing y, as do the other Semitic languages. And in these dialects the termina- tion @ (the so-called "status emphaticus ") still retained*~~

~~*he or san*~~

~~*a .*~~

~~*Poem tric RaANGUAGES*~~

~~*the meaning of a definite article down to a tolerably late period.*~~

~~*As early as the 7th century the conquests of the Moslems greatly circumscribed the domain of Aramaic and a few centuries later it was almost completely supplanted in the west by Arabic. For the Christians of those countries, who, like every one else, spoke Arabic, the Palestinian dialect was no longer of importance, and they adopted as their ecclesiastical language the dialect of the other Aramzan Christians, the Syriac (or Edessene). The only localities where a Western Aramaic dialect still survives are a few villages in Anti-Libanus. Our information upon this subject is but slight and fragmentary ; but it is hoped that Professors Prym and Socin will soon be able to furnish more ample details.*~~

~~*The popular Aramaic dialect of Babylonia from the 4th to the 6th century of our era is exhibited in the Babylonian Talmud, in which, however, as in the Jeru-*~~

~~*_ salem Talmud, there is a constant mingling of Aramaic*~~

~~*and Hebrew passages. To a somewhat later period, and probably not to exactly the same district of Babylonia, belong the writings of the MANDmANS (q.v.), a strange sect, half Christian and half heathen, who from a linguistic point of view possess the peculiar advantage of having remained almost entirely free from the influence of Hebrew, which is so perceptible in the Aramaic writings of Jews as well as of Christians. The orthography of the Man- dzans comes nearer than that of the Talmud to the real pronunciation, and in it the softening of the gutturals is most clearly seen. In other respects there is a close resem- blance between Mandean and the language of the Babylon- ian Talmud. The forms of the imperfect which we have enumerated above take in these dialects » or U1 In Babylonia, as in Syria, the language of the Arabic con- querors rapidly drove out that of the country. The latter has long been totally extinct, unless possibly a few surviv- ing Mandeans still speak among themselves a more modern form of their dialect.*~~

~~*At Edessa, in the west of Mesopotamia, the native dialect had already been used for some time as a literary language, and had been reduced to rule through the influ- ence of the schools (as is proved by the fixity of the grammar and orthography) even before Christianity acquired power in the country in the 2d century. At an early period the Old and New Testaments were here translated, with the help of Jewish tradition. This version (the so-called Peshitta or Peshito) became the Bible of Aramzan Chris- tendom, and Edessa became its capital. Thus the Aramzan Christians of the neighbouring countries, even those who were subjects of the Persian empire, adopted the Edessan dialect as the language of the church, of literature, and of cultivated intercourse. Since the ancient name of the inhabitants, " Arameans," just like that of "EAAnves, had acquired in the minds of Jews and Christians the un- pleasant signification of "heathens," it was generally avoided, and in its place the Greek terms "Syrians" and "Syriac" were used. But "Syriac" was also the name given by the Jews and Christians of Palestine to their own language, and both Greeks and Persians designated the Arameans of Babylonia as "Syrians." It is therefore, properly speaking, incorrect to employ the word "Syriac" as meaning the language of Edessa alone; but, since it was the most important of these dialects, it has the best claim to this generally received appellation. It has, as we have said, a shape very*~~

~~definitely fixed; and in it the above-inentioned forms of the imperfect take ann. As in the Babylonian dialects, the termination @ has become so completely a part of the substantive to which it is added that it has wholly lost the meaning of the definite~~

~~I See Noldeke, Mandédische Grammatik (Halle, 1875).~~

~~article, whereby the clearness of the language is perceptibly impaired. The influence exercised by Greek is very appa- rent in Syriac. From the 3d to the 7th entury an exten- sive literature was produced in this language, consisting chiefly, but not entirely, of ecclesiastical works. In the development of this literature the Syrians of the Persian empire took an eager part. In the Eastern Roman empire Syriac was, after Greek, by far the most important lan- guage ; and under the Persian kings it virtually occupied a more prominent position as an organ of culture than the Persian language itself. The conquests of the Arabs totally changed this state of things. But meanwhile, even in Edessa, a considerable difference had arisen between the written language and the popular speech, in which the pro- cess of modification was still going on. About the year 700 it became a matter of absolute necessity to systematize the grammar of the language and to introduce some means of clearly expressing the vowels. The principal object aimed at was that the text of the Syriac Bible should be recited in a correct manner. But, as it happened, the eastern pronunciation differed in many respects from that of the west. The local dialects had to some extent exer- cised an influence over the pronunciation of the literary tongue ; and, on the other hand, the political separation between Rome and Persia, and yet more the ecclesiastical schism —since the Syrians of the east were mostly Nesto- rians, those of the west Monophysites and Catholics—had produced divergencies between the traditions of the various schools, Starting, therefore, from a common source, two distinct systems of punctuation were formed, of which the western is the more~~

~~convenient, but the eastern the more exact and generally the more in accordance with the ancient pronunciation; it has, for example, in place of the western 6, and 6 in many cases where the western Syrians pronounce @ In later times the two systems have been intermingled in various ways.~~

~~Arabic everywhere put a speedy end to the predomi- nance of Aramaic—a predominance which had lasted for more than a thousand years—and soon began to drive Syriac out of use. At the beginning of the 11th century the learned metropolitan of Nisibis, Elias bar Shinndya, wrote his books intended for Christians either entirely in Arabic or in Arabic and Syriac arranged in parallel columns, that is, in the spoken and in the learned language. Thus, too, it became necessary to have Syriac-Arabic glossaries. Up to the present day Syriac has remained in use for literary and ecclesiastical purposes, and may perhaps be even spoken in some monasteries and schools; but it has long been a dead language. When Syriac became ex- tinct in Edessa and its neighbourhood is not known with certainty.~~

~~This language, called Syriac par excellence, is not the Neo- immediate source whence are derived the Aramaic dialects 5ytiac~~

~~still surviving in the northern districts. In the mountains known as the Tur 'Abdin in Mesopotamia, in certain districts east and north of Mosul, in the neighbouring mountains of Kurdistan, and again beyond them on the western coast of Lake Urmia, Aramaic dialects are spoken by Christians and occasionally by Jews, and some of these dialects we know with tolerable precision. The dialect of Tur 'Abdin seems to differ considerably from all the rest ; the country beyond the Tigris is, however, divided, as regards language, amongst a multitude of local dialects. Among these, that of Urmia has become the most import- ant, since American missionaries have formed a new literary language out of it. Moreover, the Roman Propaganda has printed books in two of the Neo-Syriac dialects. All these dialects exhibit a complete transformation of the ancient type, to a degree incomparably greater than is the case, for example, with Mandzan. In particular, the ancient XXI.—82~~

~~dialects.~~

~~Charac- teristics of Aramaic.~~

~~650 >i Wit re~~

~~verbal tenses have almost entirely disappeared, but have been successfully replaced by new forms derived from parti- ciples. There dre also other praiseworthy innovations. The dialect of Tur 'Abdin has, for instance, again coined a definite article. By means of violent contractions and phonetic changes some of these dialects, particularly that of Urmia, have acquired a euphony scarcely known in any other of the Semitic languages, with their "stridentia anhelantiaque verba" (Jerome). These Aramzans have all adopted a motley crowd of foreign words, from the Arabs, Kurds, and Turks, on whose borders they live and of whose languages they can often speak at least one. Aramaic is frequently described as a poor language. This is an opinion which we are unable to share. It is quite possible, even now, to extract a very large vocabulary from the more ancient Aramaic writings, and yet in this pre- dominantly theological literature a part only of the words that existed in the language have been preserved. It is true that Aramaic, having from the earliest times come into close contact with foreign languages, has borrowed many words from them, in particular from Persian and Greek ; but, if we leave out of consideration the fact that many Syrian authors are in the habit of using, as ornaments or for convenience (especially in translations), a great number of Greek words, some of which were unintelligible to their readers, we shall find that the proportion of really foreign words in older Aramaic books is not larger, perhaps even smaller, than the proportion of Romance words in German or Dutch. The influence of Greek upon the syntax and phraseology of Syriac is not so great as that which it has exercised, through the medium of Latin, upon the literary languages of modern Europe. With regard to sounds, the most characteristic feature of Aramaic (besides its peculiar treatment of the dentals) is that it is poorer in vowels than IIebrew, not to speak of Arabic, since nearly all short vowels in open syllables either wholly disappear or leave but a slight trace behind them (the so-called shéwA). In this respect the punctuation of Biblical Aramaic agrees with Syriac, in which we are able to observe from very early times the number of vowels by examining the metri- cal pieces constructed according to the number of syllables, and with the Mandan,~~

which expresses every vowel by means of a vowel-letter. When several distinct dialects so agree, the phenomenon in question must be of great antiquity. There are nevertheless traces which prove that the language once possessed more vowels, and the Ara- means, for instance, with whom David fought may have pronounced many vowels which afterwards disappeared. Another peculiarity of Aramaic is that it lends itself far more readily to the linking together of sentences than Hebrew and Arabic. It possesses many conjunctions and adverbs to express slight modifications of meaning. It is also very free as regards the order of words. That this quality, which renders it suitable for a clear and limpid prose style, is not the result of Greek influence may be seen by the Mandzan, on which Greek has left no mark. In its attempts to express everything clearly Aramaic often becomes prolix,—for example, by using additional personal and demonstrative pronouns. 'The contrast be- tween Aramaic as the language of prose and Hebrew as the language of poetry is one which naturally strikes us, but we must beware of carrying it too far. Even the Aramexans were not wholly destitute of poetical talent. Although the religious poetry of the Syrians has but little charm for us, yet real poetry occurs in the few extant frag- ments of Gnostic hymns. Moreover, in the modern dialects popular songs have been discovered which, though very simple, are fresh and full of feeling! It is therefore by no

1 See Socin, Die neu-araméischen Dialekte von Urinia bis Mosul, Tiibingen, 1882 ; comp. Z.D.M.G., xxxvi. 679 sq.

means improbable that in ancient times Aramaic was used in poems which, being contrary to the theological tendency of Syrian civilization, were doomed to total oblivion,

Assyrian.—Long before Aramaic another Semitic lan- guage flourished in the regions of the Tigris and on the lower Euphrates which has been preserved to us in the cuneiform inscriptions. It is usually called the Assyrian, after the name of the country where the first and most important excavations were made ; but the term "Babylonian" would be more correct, as Babylon was the birthplace of this lan- guage and of the civilization to which it belonged. Certain Babylonian inscriptions appear

~~*to go back to the fourth millennium before our era; but the great mass of these cuneiform inscriptions date from between 1000 and 500 B.C. Assyrian seems to be more nearly related to Hebrew than to Aramaic; we may cite, for example, the relative particle sha, which is also used as a sign of the genitive, and is identical with the Phcenician ash and the Hebrew asher (she, sha), also the similarity between Assyrian and Hebrew in the treatment of the aspirated dentals. On the other hand, Assyrian differs in many respects from all the cognate languages. The ancient perfect has wholly dis- appeared, or left but few traces, and the gutturals, with the exception of the hard £4, have been smoothed down to a degree which is only paralleled in the modern Aramaic dialects. So at least it would appear from the writing, or rather from the'manner in which Assyriologists transcribe it. The Babylonian form 6é/ (occurring: in Isa. xlvi. 1; Jer, 1. 2 and li, 44,—passages all belonging to the 6th century B.C.), the name of the god who was originally called bal, is a confirmation of this; but, on the other hand, the name of the country where Babylon was situated, viz., Shin'ar, and that of a Babylonian god, 'Anammelekh (2 Kings xvii. 31), as well as those of the tribes Shé'a and K6o'a (Ezek. xxiii. 23) who inhabited the Assyrio- Babylonian territory, seem to militate against this theory, as they are spelt in the Old Testament with 'ain. The Assyrian system of writing is so complicated, and, in spite of its vast apparatus, is so imperfect an instrument for the accurate representation of sounds, that we are hardly yet bound to regard the transcriptions of contemporary Assyrio- logists as being in all points of detail the final dictum of science, It is, for example, very doubtful whether the vowels at the end of words and the appended m were really pronounced in all cases, as this would presuppose a complete confusion in the grammar of the language. However this may be, the present writer does not feel able to speak at greater length upon Assyrian, not being an Assyriologist himself nor yet capable of satisfactorily distinguishing the certain from the uncertain results of Assyriological inquiry.*~~

~~*The native cuneiform writing was used in Babylonia not only under the Persian empire but also in the Greek period, as the discovery of isolated specimens proves. It does not of course necessarily follow from this that Assyrian was still spoken at that time. Indeed, this language may possibly have been banished from ordinary life long before the destruction of*~~

~~*Nineveh, surviving only as the official and sacerdotal tongue. These inscriptions, in any case, were intended for none but a narrow circle of learned persons.*~~

~~*Arabic.—The southern group of Semitic languages con- sists of Arabic and Ethiopic. Arabic, again, is subdivided into the dialects of the larger portion of Arabia and those of the extreme south (the Sabsean, &c.). At a very much earlier time than we were but lately justified in supposing, some of the northern Arabs reduced their language to writing.*~~

~~*Assyrian,*~~

~~*: : _ Tha For travellers have quite recently discovered 1M j,udic*~~

~~*the northern parts of the Hijaz inscriptions in a strange inscrip- character, which seem to have been written long before our tions.*~~

~~*Sami Pic*~~

~~*era. The character resembles the Saban, but perhaps re- presents an earlier stage of graphical development. These inscriptions have been called "Thamudic," because they were found in the country of the Thamud ; but this desig- nation is scarcely a suitable one, because during the period when the power of the Thamud was at its height, and when the buildings mentioned in the Koran were hewn in the rocks, the language of this country was Nabateean (see above). Unfortunately the inscriptions hitherto discovered are all short 1 and for the most part fragmentary, and con- sequently furnish but little material to the student of lan- guages. But there can be no doubt that they are written in an Arabic dialect. The treatment of the dentals, among other things, is a sufficient proof of this. At least in one point they bear a striking resemblance to Hebrew : they have the article ha (not hal, as we might expect). It is possible that the tribes living on Arabian soil which are regarded in the Old Testament as nearly related to Israel, that is, the Ishmaelites, the Midianites, and even the Edomites, may have spoken dialects occupying a middle position between Arabic and Hebrew. 'They are perhaps traces of some such intermediate link that have been pre- served to us in these inscriptions.*~~

~~*The numerous inscriptions scattered over the north-west of Arabia, especially over the wild and rocky district of Safé, near Damascus, probably date from a later period. They are written in peculiar characters, which, it would seem, are likewise related to those used by the Sabzans. They are all of them short and indistinct, scratched hurriedly and irregularly upon unhewn stone. What we at present understand of them—they consist almost entirely of proper names—is owing in nearly every case to the ingenuity of Halévy.? In matters of detail, however, much still remains uncertain, To decipher them with absolute certainty will no doubt always be impossible on account of their careless execution, These inscriptions are probably the work of Arab emigrants from the south.*~~

~~*The Arabs who inhabited the Nabatzan kingdom wrote in Aramaic, but, as has been remarked above, their native language, Arabic, often shows through the foreign disguise. We are thus able to satisfy ourselves that these Arabs, who lived a little before and a little after Christ, spoke a dialect closely resembling the later classical Arabic. The nomi- native of the so-called " triptote" nouns has, as in classical Arabic, the termination wu ; the genitive has ¢ (the accusa- tive therefore probably ended in a), but without the addi- tion of n. Generally speaking, those proper names which in classical Arabic are "diptotes" are here devoid of any inflexional termination. The u of the nominative appears also in Arabic proper names belonging to more northern districts, as, for example, Palmyra and Edessa, All these Arabs were probably of the same race. It is possible that the two oldest known specimens of distinctively Arabic writing—namely, the Arabic portion of the trilingual in- scription of Zabad, south-east of Haleb (Aleppo), written in Syriac, Greek, and Arabic, and dating from 512 or 513 A.D.,? and that of the bilingual inscription of Harran, south of Damascus,' written in Greek and Arabic, of 568—represent nothing but a somewhat more modern form of this dialect. In both these inscriptions proper names take in the genitive the termination uw, which shows that the meaning of such inflexions was no longer felt. These two inscriptions, especially that of Zabad, which is badly*~~

~~*1 The decipherment of these inscriptions was begun by Halévy, who followed the drawings of Doughty. The subject is now being further*~~

~~*investigated by D. H. Miiller of Vienna from Euting's copies. ;*~~

~~*2 "Fssai sur les Inscriptions du Safa," from the Journal Asiatique (Paris, 1882).*~~

~~*3 Sachau, Monatsbericht der Berliner Akademie der Wissenschaften, 10th February 1881, and Z7.D.IG., xxxvi. 345 sq.*~~

~~*4 Le Bas and Waddington, No. 2464, and Z.D.ILG., xxxviii. 530.*~~

~~*Bev GU aG is*~~

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~~*written, have not yet been satisfactorily interpreted in all their details.*~~

~~*During the whole period of the preponderance of Aramaic this language exercised a great influence upon the vocabu- lary of the Arabs. The more carefully we investigate the more clearly does it appear that numerous Arabic words, used for ideas or objects which presuppose a certain degree of civilization, are borrowed from the Aramzans. Hence the civilizing influence of their northern neighbours must have been very strongly felt by the Arabs, and contributed in no small measure to prepare them for playing so import- ant a part in the history of the world.*~~

~~*In the 6th century the inhabitants of the greater part Classical*~~

~~*of Arabia proper spoke everywhere essentially the same 4rbic.*~~

~~*language, which, as being by far the most important of all Arabic dialects, is known simply as the Arabic language. Arabic poetry, at that time cultivated throughout the whole of central and northern Arabia as far as the lower Euphrates and even beyond it, employed one language only. The extant Arabic poems belonging to the heathen period were not indeed written down till much later, and meanwhile underwent considerable alterations®; but the absolute regularity of the metre and rhyme is a sufficient proof that on the whole these poems all obeyed the same laws of language. It is indeed highly probable that the rhapsodists and the*~~

~~*grammarians have effaced many slight dialectical peculiarities ; in a great number of passages, for example, the poets may have used, in accordance with the fashion of their respective tribes, some other case than that prescribed by the grammarians, and a thing of this kind may afterwards have been altered, unless it happened to occur in rhyme ; but such alterations cannot have extended very far, A dialect that diverged in any great measure from the Arabic of the grammarians could not possibly have been made to fit into the metres. Moreover, the Arabic philologists recognize the existence of various small distinctions between the dialects of individual tribes and of their poets, and the traditions of the more ancient schools of Koran readers exhibit very many dialectical nuances. It might indeed be conjectured that for the majority of the Arabs the language of poetry was an artificial one,— the speech of certain tribes having been adopted by all the rest as a dialectus poetica. And this might be possible in the case of wandering minstrels whose art gained them their livelihood, such as Nabigha and A'shé. But, when we find that the Bedouin goat-herds, for instance, in the mountainous district near Mecca composed poems in this very same language upon their insignificant feuds and per- sonal quarrels, that in it the proud chiefs of the Taghh-bites and the Bekrites addressed defiant verses to the king of Hira (on the Euphrates), that a Christian inhabitant of Hira, Adi b. Zaid, used this language in his serious poems, —when we reflect that, as far as the Arabic poetry of the heathen period extends, there is nowhere a trace of any important linguistic difference, it would surely be a para- dox to assume that all these Arabs, who for the most part were quite illiterate and yet extremely jealous of the honour of their tribes, could have taken the trouble to clothe their ideas and feelings in a foreign, or even a perfectly arti- ficial, language. The Arabic philologists also invariably regarded the language of the poets as being that of the Arabs in general. Even at the end of the 2d century after Mohammed the Bedouins of Arabia proper, with the exception of a few outlying districts, were considered as being in possession of this pure Arabic. The most learned grammarians were in the habit of appealing to any unedu- cated man who happened to have just arrived with his camels from the desert, though he did not know by heart twenty verses of the Koran, and had no conception of theo-*~~

~~*5 Comp. the article Mo aLLaKAt.*~~

~~*Dialect of the Koraish,*~~

~~*Changes in classical Arabic,*~~

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~~*retical grammar, in order that he might decide whether in Arabic it were allowable or necessary to express oneself in this or that manner. It is evident that these profound scholars knew of only one classical language, which was still spoken by the Bedouins. The tribes which produced the principal poets of the earlier period belonged for the most part to portions of the Hijaéz, to Nejd and its neighbour- hood, and to the region which stretches thence towards the Euphrates.*~~

~~*The Koran and Islam raised Arabic to the position of one of the principal languages of the world. Under the leadership of the Koraish the Bedouins subjected half the world to both their dominion and their faith. Thus Arabic acquired the additional character of a sacred lan- guage. But soon it became evident that not nearly all the Arabs spoke a language precisely identical with the classical Arabic of the poets. The north-western Arabs played a particularly important part during the period of*~~

~~*SPEMIPIC HRADGUZ Ewe*~~

~~*the Omayyads. The ordinary speech of Mecca and Medina was, as we have seen, no longer quite so primitive as that of the desert. To this may be added that the military expeditions brought those Arabs who spoke the classical language into contact with tribes from out-of-the- way districts, such as 'Oman, Bahrain (Bahrein), and particularly the north of Yemen. The fact that numbers of foreigners, on passing over to Islam, became rapidly Arabized was also little calculated to preserve the unity of the language. Finally, the violent internal and external commotions which were produced by the great events of that time, and stirred the whole nation, probably acceler- ated linguistic change. In any case, we know from good tradition that even in the Ist century of the Flight the distinction between correct and incorrect speech was quite perceptible.*~~

~~*About the end of the 2d century the system of Arabic grammar was constructed, and never underwent any essential modification in later times. The theory as to how one should express oneself was now definitely fixed. The majority of those Arabs who lived beyond the limits of Arabia already diverged far from this standard : and in particular the final vowels which serve to indicate cases and moods were no longer pronounced. This change, by which Arabic lost one of its principal advantages, was no doubt hastened by the fact that even in the classical style such terminations were omitted whenever the word stood at the end of a sentence (in pause); and in the living language of the Arabs this dividing of sentences is very frequent. Hence people were already quite accustomed to forms without grammatical terminations.*~~

~~*Through the industry of Arabic philologists we are able Vocabu- to make ourselves intimately acquainted with the system, lary.*~~

~~*and still more with the vocabulary of the language, although they have not always performed their task in a critical manner. We should be all the more disposed to admire the richness of the ancient Arabic vocabulary when we remember how simple are the conditions of life amongst the Arabs, how painfully monotonous their country, and consequently how limited the range of their ideas must be. Within this range, however, the slightest modification is expressed by a particular word. It must be confessed that the Arabic lexicon has been greatly augmented by the habit of citing as words by themselves such rhetorical phrases as an individual poet has used to describe an ob- ject: for example, if one poet calls the lion the "tearer" and another calls him the '" mangler," each of these terms is explained by the lexicographers as equivalent to "lion." One branch of literature in particular, namely, lampoons and satirical poems, which for the most part have perished, no doubt introduced into the lexicon many expressions coined in an arbitrary and sometimes in a very strange manner. Moreover, Arabic philologists have greatly under- rated the number of words which, though they occur now and then in poems, were never in general use except among particular tribes. But in spite of these qualifications it must be admitted that the vocabulary is surprisingly rich, and the Arabic dictionary will always remain the principal resource for the elucidation of obscure expressions in all the other Semitic*~~

~~tongues, This method, if pursued with the necessary caution, is a perfectly legitimate one. Poems seldom enable us to form a clear idea of the lan- guage of ordinary life, and Arabic poetry happens to have been distinguished from the very beginning by a certain tendency to artificiality and mannerism. Still less does the Koran exhibit the language in its spoken form. This office is performed by the prose of the ancient traditions (Hadith). The genuine accounts of the deeds of the Prophet and of his companions, and not less the stories concerning the battles and adventures of the Bedouins in the heathen period and in the earlier days of Islam, are~~

~~excellent models of a prose style, although in some cases their redaction dates from a later time.~~

~~Grn- Classical Arabic is rich not only in words but in gram- macal matical forms. The wonderful development of the broken fos plurals, and sometimes of the verbal nouns must be re- 'garded as an excess of wealth. The sparing use of the ancient terminations which mark the plural has somewhat obscured the distinction between plurals, collectives, ab- stract nouns, and feminines in general. In its manner of employing the verbal tenses genuine Arabic still exhibits traces of that poetical freedom which we see in Hebrew ; this characteristic disappears in the later literary language. In connecting sentences Arabic can go much further than Hebrew, but the simple parataxis is by far the most usual construction. Arabic has, however, this great advantage, that it scarcely ever leaves us in doubt as to where the apodosis begins. The attempts to define the tenses more clearly by the addition of adverbs and auxiliary verbs lead to no very positive result (as is the case in other Semitic languages also), since they are not carried out in a system- atic manner. 'The arrangement of words in a sentence is governed by very strict rules. As the subject and object, at least in ordinary cases, occupy fixed positions, and as the genitive is invariably placed after the noun that governs it, the use of case-endings loses much of its significance. steicof This language of the Bedouins had now, as we have edeated seen, become that of religion, courts, and polished society. sty. In the streets of the towns the language already~~

~~*diverged considerably from this, but the upper classes took pains to speak "Arabic." The poets and the beaua esprits never ventured to employ any but the classical language, and the "Atticists," with pedantic seriousness, convicted the most celebrated among the later poets (for instance Motan-abbt) of occasional deviations from the standard of correct speech. At the same time, however, classical Arabic was the language of business and of science, and at the present day still holds this position. There are, of course, many gradations between the pedantry of purists and the use of what is simply a vulgar dialect. Sensible writers employ a kind of xovv7, which does not aim at being strictly cor- rect and calls modern things by modern names, but which, nevertheless, avoids coarse vulgarisms, aiming principally at making itself intelligible to all educated men. The reader may pronounce or omit the ancient terminations as he chooses. This language lived on, in a sense, through the whole of the Middle Ages, owing chiefly to the fact that it was intended for educated persons in general and not only for the learned, whereas the poetical schools strove to make use of the long extinct language of the Bedouins. As might be expected, this xow7, like the cow? of the Greeks, has a comparatively limited vocabulary, since its principle is to retain only those expressions from the ancient language which were generally understood, and it does not borrow much new material from the vulgar dialects. ;*~~

~~*It is entirely a mistake to suppose that Arabic is un- suited for the treatment of abstract subjects. On the contrary, scarcely any language is so well adapted to be the organ of scholasticism in all its branches. Even the tongue of the ancient Bedouins had a strong preference for the use of abstract verbal nouns (in striking contrast to the Latin, for example) ; thus they oftener said " Needful is thy sitting" than "It is needful that thou shouldest sit." This tendency was very advantageous to philosophical phraseology. The strict rules as to the order of words, though very unfavourable to the development of a truly eloquent style, render it all the easier to express ideas in a rigidly scientific form.*~~

~~*In the meantime Arabic, like every other widely spread language, necessarily began to undergo modification aud to split up mto*~~

~~dialects. The Arabs are mistaken in attributing this development Minor to the influence of those foreign languages with which Arabic came Arabic into contact. Such influences can have had but little to do with dialects. the matter ; for were it otherwise the language of the interior of Arabia must have remained unchanged, yet even in this region the inhabitants are very far from speaking as they did a thousand years back. A person who in Arabia or elsewhere should trust to his knowledge of classical Arabic only would resemble those travellers from the north who endeavour to make themselves understood by Italian waiters through the medium of a kind of Latin. The written language has, it is true, greatly retarded the development of the dialects. Every good Moslem repeats at least a few short suras several times a day in his prayers, besides being minutely acquainted with the sacred book ; and this must have had a power- ful influence upon the speech of the people at large. But never- theless dialects have formed themselves and have diverged con- siderably from one another. Of these there are indeed but few with which we are tolerably well acquainted ; that of Egypt alone is known with real accuracy.!_ Although the French have occupied Algeria for about fifty years, we still possess but imperfect informa- tion with respect to the language of that country. It is closely connected with that of Morocco on the one hand and with that of Tunis on the other. Arabic has long been banished from Spain ; but we possess a few literary works written in Spanish Arabic, and just before it became too late Pedro de Alcala composed a grammar and a lexicon of that dialect.2. We have also a few ancient speci- mens of the Arabic which was once spoken in Sicily. To the western group of dialects belongs the language of Malta, which, cut off as it is from other Arabic dialects and exposed to the influ- ence of Italian, has developed itself in a very strange manner; in it a considerable number of books have already been printed, but with Latin characters. The dialects of Arabia, Syria, and the other Eastern provinces, in spite of many valuable works, are not yet sufficiently well known to admit of being definitely classified. There can be no doubt that the development of these dialects is in part the result of older dialectical variations which were already in existence in the time of the Prophet. The histories of dialects which differ completely from one another often pursue an ana- logous course. In general, the Arabic dialects still resemble one another more than we might expect when we take into considera- tion the great~~

~~*extent of country over which they are spoken and the very considerable geographical obstacles that stand in the way of communication. But we must not suppose that people, for instance, from Mosul, Morocco, San'd, and the interior of Arabia would be able to understand one another without difficulty. It is a total error to regard the difference between the Arabic dialects and the ancient language as a trifling one, or to represent the development of these dialects as something wholly unlike the development of the Romance languages. No living Arabic dialect diverges from classical Arabic so much as French or Rouman from Latin; but, on the other hand, no Arabic dialect resembles the classical language so closely as the Lugodoric dialect, which is still spoken in Sardinia, resembles its parent speech, aud yet the lapse of time is very much greater in the case of the latter. Sabxan.—Long before Mohammed, a peculiar and highly Saban developed form of civilization had flourished in the table- inscrip- land to the south-west of Arabia. The more we become ° acquainted with the country of the ancient Sabzeans and with its colossal edifices, and the better we are able to decipher its inscriptions, which are being discovered in ever-increasing numbers, the easier it is for us to account for the haze of mythical glory wherewith the Sabeans were once invested. The Sabean inscriptions (which till lately were more often called by the less correct name of " Himyaritic") begin long before our era and continue till about the 4th century. The somewhat stiff character is always very distinct ; and the habit of regularly dividing the words from one another renders decipherment easier, which, however, has not yet been performed in a very satisfactory manner, owing in part to the fact that the vast majority of the documents in question consist of re- ligious votive tablets with peculiar sacerdotal expressions, or of architectural notices abounding in technical terms. These inscriptions fall into two classes, distinguished partly by grammatical peculiarities and partly by peculiarities of phraseology. One dialect, which forms the causative with ha, like Hebrew and others, and employs, like nearly*~~

~~*1 W. Spitta-Bey, Grammatik des arabischen Vulgdrdialects von Aegypten (Leipsic, 1880).*~~

~~*2 'They were published in 1505, reprinted by Lagarde (Petr? Hispant de Lingua Arabica Libri duo, Gottingen, 1883).*~~

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~~all the Semitic languages, the termination / (hi) as the suffix of the third person singular, is the Saban properly speaking. The other, which expresses the causative by sa (corresponding to the Shaphel of the Arameans and others), and for the suffix uses s (like the Assyrian sh), is~~

~~whole. Being zealous local patriots, they discovered in those inscriptions which they imagined themselves to be capable of deciphering many fabulous stories respecting the glory of the ancient Yemenites.~~

~~Farther to the east, in the sea-coast districts of Shihr and Mahra, Dialects~~

~~the Minaic. To this latter branch belong the numerous South Arabic inscriptions recently found in the north of the Hijaz, near Hejr, where the Minzwans must have had a commercial settlement. The difference between the two classes of inscriptions is no doubt ultimately based upon a real divergence of dialect. But the singular manner in which districts containing Saban inscriptions and those containing Minaic alternate with one another seems to point in part to a mere hieratic practice of clinging to ancient modes of expression. Indeed it is very probably due to conscious literary conservatism that the language of the inscriptions remains almost entirely unchanged through many centuries. A few inscriptions from districts rather more to the east exhibit certain linguistic peculiar- ities, which, however, may perhaps be explained by the supposition that the writers did not, as a rule, speak this dialect, and therefore were but imperfectly acquainted with it.~~

~~up to the borders of the barren desert of the interior, and also, we akin to are told, in the island of Socotra, dialects very unlike Arabic are Sabean, still spoken. the 10th century. These dialects depart widely from the ancient Semitic type, but bear some resemblance to the Saban, although they cannot be regarded as actually descended from the latter, One feature which they have in common with Saban is the habit of appending an a to the imperfect. ably also the Saban, they use & (instead of ¢) in the terminations of the first person singular and plural of the perfect tense. there appears, at least in the Unfortunately the information respecting these dialects is meagre and inexact, in part very in. exact.2 Jt is much to~~

~~*be wished that soon tigated as carefully as possible, the more so as there is danger in delay, for Arabic is gradually supplanting them.*~~

~~*too, and in the neighbouring Geez, or countries we find languages which bear a certain resem. Ethiopic*~~

~~*blance to Arabic. The Geez or Ethiopic 3 proper, the lan- P!pe.*~~

~~*Allusions to this fact are found in Arabic writers of*~~

~~*Like the Ethiopic, and prob- the second person singular and In the suffixes of the third person feminine, an s, as in the Minaic. which we have hitherto possessed*~~

~~*they may all be inves-*~~

~~*Lthiopic.—In Abyssinia,*~~

~~*guage of the ancient kingdom of Aksim, was reduced to writing at an early date. To judge by the few passages*~~

~~*Gram- As the Sabsean writing seldom indicates the vowels, our communicated by Salt, the back of 'the inscription of tical r i i i : : ' Ill a0 bao : ae knowledge of the language is necessarily very incomplete ; Aeizanas, king of Akstim about 3 60, extitie writing in*~~

~~*and the unvarying style of the inscriptions excludes a great number of the commonest grammatical forms. Not a single occurrence of the first or second person has yet been detected, with the possible exception of one proper name, in which "our god" apparently occurs. But the know. ledge which we already possess amply suffices to prove that Saban is closely related to Arabic as we are acquainted with it. The former language possesses the same phonetic elements as the latter, except that it has at least one addi- tional sibilant, which appears to have been lost in Arabic. It possesses the broken plural, a dual form resembling that used in Arabic, &c. It is especially important to notice that Sabean expresses the idea of indefiniteness by means of an appended m, just as Arabic expresses it by means of an », which in all probability is a modification of*~~

~~*the former sound. Both in this point and in some others Sabsean appears more primitive than Arabic, as might be expected from the earlier date of its monuments, The article is formed by appending ann. In its vocabulary also Sabzean bears a great resemblance to Arabic, although, on the other hand, it often approaches more nearly to the northern Semitic languages in this respect; and it possesses much that is peculiar to itself.*~~

~~*Soon after the Christian era Sabzean civilization began to decline, and completely perished in the wars with the Abyssinians, who several times occupied the country, and in the 6th century remained in possession of it for a con- siderable period. In that age the language of central Arabia was already penetrating into the Sabzan domain. Jt is further possible that many tribes which dwelt not far to the north of the civilized districts had always spoken dialects resembling central Arabic rather than Sabeean, About the year 600 "Arabic" was the language of all Yemen, with the exception perhaps of a few isolated dis- tricts, and this process of assimilation continued in later times. Several centuries after Mohammed learned Yemen- ites were acquainted with the characters of the inscriptions which abounded in their country ; they were also able to decipher the proper names and a small number of Sabeean words the meaning of which was still known to them, but they could no longer understand the inscriptions as a*~~

~~*1 The literature relating to these inscriptions is widely scattered. Before the Parisian Corpus supplies us with the collected materials, we may hope to see the Sabean grammar of D. H. Miiller, who, with Halévy, has lately rendered the greatest services in this department.*~~

~~*the Sabzean language, which appears to prove that the*~~

~~*"development of the Geez character out of the Sabzean, and*~~

~~*the elevation of Geez to the rank of a literary language, must have taken place after the year 350. "The oldest monuments of this language which are known with cer- tainty are the two great inscriptions of Tazéna, a heathen king of Akstim, dating from about 500. Hitherto our acquaintance with these inscriptions has been derived from very imperfect drawings* ; but they amply suffice to show that we have here the same*~~

~~*language as that in which the Ethiopic Bible is written, with the very same exact indication of the vowels,—a point in which Ethiopic has an advantage over all other Semitic characters. Who in- troduced this vocalization is unknown. When the above- mentioned inscriptions were made the Bible had probably been already translated into Geez from the Greek, perhaps in part by Jews; for Jews and Christians were at that time actively competing with one another, both in Arabia and in Abyssinia; nor were the former unsuccessful in making proselytes. The missionaries who gave the Bible to the Abyssinians must, at least in some cases, have spoken Aramaic as their mother-tongue, for this alone can explain the fact that in the Ethiopic Bible certain religious conceptions are expressed by Aramaic words, During the following centuries various works were produced by the Abyssinians in this language ; they were all, so far as we are able to judge, of a more or less theological character, almost invariably translations from the Greek. We cannot say with certainty when Geez ceased to be the language of the people, but it was probably about a thousand years ago. From the time when the Abyssinian kingdom was reconstituted, towards the end of the 13th century, by the so-called Solomonian dynasty (which was of southern origin), the language of the court and of the Government was Amharic; but Geez remained the ecclesiastical and literary language, and Geez literature even showed a certain*~~

~~*2 See especially Maltzan, in Z.D.M.G., vols. xxv. and xxvii. ;*~~

~~*3 This name is due to the fact that the Abyssinians, under the in- fluence of false erudition, applied the name Al@:orla to their own kingdom.*~~

~~*“ The authorities of the library of Frankfort have kindly enabled the present writer to consult Riippell’s copies, which are more accurate than the lithographs in his book. The English in 1868 did not seize the opportunity to examine thoroughly the antiquities of Aksum, and since then no traveller has taken the trouble to procure accurate copies of these extremely important monuments.*~~

~~*SEI TEC*~~

~~activity in numerous translations from those Arabic and Coptic works which were in use amongst the Christians of Egypt; besides these a few original writings were com- posed, namely, lives of saints, hymns, &c. This literary condition lasted till modern times. The language, which had long become extinct, was by no means invariably written in a pure form; indeed even in manuscripts of more ancient works we find many linguistic corruptions, which have crept in partly through mere carelessness and ignorance, partly through the influence of the later dialects. On points of detail wé are still sometimes left in doubt, as We possess no manuscripts belonging to the older period. This renders it all the more important that the ancient and authentic inscriptions upon the monuments of Aksim should be accurately published.~~

~~Geez is more nearly related to Sabean than to Arabic, though scarcely to such a degree as we might expect. * The historical intercourse between the Sabzeans and the people of Akstm does not, however, prove that those who spoke Geez were simply a colony from Sabzea; the lan- guage may be descended from an extinct cognate dialect of south Arabia, or may have arisen from a mingling of several such dialects. And this colonization in Africa probably began much sooner than is usually supposed. In certain respects Geez represents a more modern stage of development than Arabic ; we may cite as instances the loss of some inflexional terminations and of the ancient passive, the change of the aspirated dentals into sibilants, &c. In the manuscripts, especially those of later date, many letters are confounded, namely, h, h, and kh, s and sh, ¢ and d; this, however, is no doubt due only to the influence of the modern dialects. To this same influence, and indirectly perhaps to that of the Hamitic languages, we may ascribe the very hard sound now given to certain letters, k, t, ¢, and d, in the reading of Geez. The last two are at present pronounced something like ¢s and ts (the German z). A peculiar advantage possessed by Geez and by all Ethiopic languages is the sharp distinction between the imperfect and the subjunctive: in the former a vowel is inserted after the first radical,—a formation of which there seem to be traces in the dialect of Mahra, and which is also believed to have existed in Assyrian. Geez has no definite article, but is very rich in particles. In the ease with which it joins sentences together and in its freedom as to the order of words it resembles Aramaic. The vocabulary is~~

~~*but imperfectly known, as the theologi- cal literature, which is for the most part very arid, supplies us with comparatively few expressions that do not occur in the Bible, whereas the more modern works borrow their phraseology in part from the spoken dialects, particularly Amharic. With regard to the vocabulary, Geez has much in common with the other Semitic tongues, but at the same time possesses many words peculiar to itself; of these a considerable proportion may be of Hamitic origin. Even some grammatical phenomena seem to indicate Hamitic influence ; for instance, the very frequent use of the gerun- dive, a feature which has become still more prominent in the modern dialects, placed as they are in yet closer contact with the Hamitic. We must not suppose that the ancient inhabitants of Aksim were of pure Semitic blood. The immigration of the Semites from Arabia was in all prob- ability a slow process, and under such circumstances there is every reason to assume that they largely intermingled with the aborigines. This opinion seems to be confirmed by anthropological facts.*~~

~~*Not only in what is properly the territory of Aksum (namely, Tigiia, Tigré, north-eastern Abys-inia), but also in the countries bordering i upon it to the north, including the islands of Dahlak, dialects are still spoken which are but more modern forms of the linguistic type clearly exhibited in Geez. The two principal of these are*~~

~~*that spoken in Tigré proper and that of the neighbouring countries.*~~

~~*In reality, the name of Tigré belougs to both, and it would be desirable to distinguish them from one another as Northern and Southern Tigré. But it is the custom to call the northern dialect Tigré simply, whilst that spoken in Tigré itself bears the name of Tigritia, with an Amharic termination. It is generally assumed that Tigré bears a closer resemblance to Geez than docs Tigrifia, although the latter is spoken in the country where Geez was formed; and this may very possibly be the case, for Tigrifta has during several centuries been very strongly influenced by Amharic, which has not been the case with Tigré, which is spoken partly*~~

~~*by nomads. Of Tigré, which appears to be divided into numerous dialects, we have several glossaries ; but of its grammar we as yet know but little. Written specimens of this language are almost entirely wanting. With Tigriia we are somewhat better acquaiuted,! but only as it is spoken in the centre of the country, near the site of the ancient Akstim, where Amharic happens to be particularly*~~

~~*strong, — above all, amongst the more educated classes. In Tigrifia*~~

~~*the older grammatical forms are often subjected to violent altera- tions ; foreign elements creep in; but the kernel remains Semitic.*~~

~~*Very different is the case with Amharic, a language of Amharic, which the domain extends from the left bank of the Takkazé into regions far to the south. Although by no means the only language spoken in these countries, it always tends to displace those foreign tongues which sur- round it and with which it is interspersed. We here refer especially to the Agaw dialects. Although Amharic has been driven back by the invasions of the Galla tribes, it has already compensated itself to some extent for this loss, as the Yedju and Wollo Gallas, who penetrated into eastern Abyssinia, have adopted it as their language. With the exception, of course, of Arabic, no Semitic tongue is spoken by so large a number of human beings as Amharic. The very fact that the Agaw languages are being gradually, and, as it were, before our own eyes, absorbed by Amharic 2 makes it appear probable that this language must be spoken chiefly by people who are not of Semitic race. This supposition is confirmed by a study of the language itself. Amharic has diverged from the ancient Semitic type to a far greater extent than any of the dialects which we have hitherto enumerated. Many of the old forma- tions preserved in Geez are completely modified in Amharic. Of the feminine forms there remain but a few traces ; and that is the case also with the ancient plural of the noun. The strangest innovations occur in the personal pronouns. And certainly not more than half the vocabulary can with- out improbability be made to correspond with that of the other Semitic languages. In this, as also in the grammar, we must leave out of account all that is borrowed from Geez, which, as being the ecclesiastical tongue, exercises a great influence everywhere in Abyssinia. On the other*~~

~~*hand, we must make allowance for the fact that in this language the very considerable phonetic modifications often produce a total change of form, so that many words which at first have a thoroughly foreign appearance prove on further examination to be but the regular development of words with which we are already acquainted. But the most striking deviations occur in the syntax. Things which we are accustomed to regard as usual or even uni- versal in the Semitic languages, such as the placing of the verb before the subject, of the governing noun before the genitive, and of the attributive relative clause after its substantive, are here totally reversed. Words which are marked as genitives by the prefixing of the relative particle, and even whole relative clauses, are treated as one word, and are capable of having the objective suffix added to them. It is scarcely going too far to say that a person*~~

~~*1 Franz Praetorius, Grammatik der Tigrisiasprache, Halle, 1872. The present writer was also permitted to use the manuscript grammar of a Belgian missionary, who spent a long time in the country.*~~

~~*2 Only an advanced guard of the Agaw languages, the Bilin or dialect of the Bogos, is being similarly absorbed by the Tigre.*~~

~~*3 Praetorius, however, in his very valuable grammar, Die amharische Sprache (Halle, 1879), has gone much too far in his attempts to connect*~~

~~*Amharic words and grammatical phenomena with those that occur in Geez.*~~

~~*656*~~

~~*who has learnt no Semitic language would have less diffi- culty in mastering the Amharic construction than one to whom the Semitic syntax is familiar. What here appears contrary to Semitic analogy is sometimes the rule in Agaw. Hence it is probable that in this case tribes originally Hamitic retained their former modes of thought and expres- sion after they had adopted a Semitic speech, and that they modified their new language accordingly. And it is not certain that the partial Semitization of the southern dis- tricts of Abyssinia (which had scarcely any connexion*~~

~~with the civilization of Akstim during its best period) was en- tirely or even principally due to influences from the north.~~

~~In spite of its dominant position, Amharic did not for several centuries show any signs of becoming a literary language. The oldest documents which we possess are a few songs of the 15th and 16th centuries, which were not, however, written down till a later time, and are very diffi- cult to interpret, There are also a few Geez-Amharic gloss- aries, which may be tolerably old. Since the 17th century various attempts have been made, sometimes by European missionaries, to write in Amharic, and in modern times this language has to a considerable extent been employed for literary purposes; nor is this to be ascribed exclu- sively to foreign influence. A literary language, fixed ina sufficient measure, has thus been formed. Books belonging to a somewhat earlier period contain tolerably clear proofs of dialectical differences. Scattered notices by travellers seem~~

~~SEMLER, Joann Satomo (1725-1791), ecclesiastical historian and critic, sometimes called ""the father of German rationalism" (see RATIONALISM), was born at Saalfeld in Thuringia on 18th December 1725. He was the son of a clergyman in poor circumstances, and had to fight his way in the world solely by his own talents. He grew up amidst Pietistic surroundings, which power- fully influenced him his life through, though he was never spiritually or intellectually a Pietist. As a boy he showed the omnivorous appetite for books which was characteristic of his later life. In his seventeenth year he entered the university of Halle, where he became the disciple, after- wards the assistant, and at last the literary executor of the orthodox rationalistic Professor Baumgarten. In 1749 he accepted the position of editor, with the title of professor, of the Coburg official Gazette, with leisure to pursue his- torical and scientific studies. But the next year he was invited to Altdorf as professor of philology and history, and six months later became a professor of theology in Halle. After the death of Baumgarten (1757) Semler be- came the head of the theological faculty of his university, and the fierce opposition which his writings and lectures provoked only helped to increase his fame as a professor. His popularity continued undiminished for more than twenty years, until 1779. In that year he~~

~~*came forward with a reply to the Wolfenbiittel F'ragments (see REIMARUS) and to Bahrdt's confession of faith, a step which was inter- preted by the extreme rationalists as a revocation of his own rationalistic position. Even the Prussian Government, which favoured Bahrdt, made Semler painfully feel its dis- pleasure at this new but really not inconsistent aspect of his position. But, though Semler was really not incon- sistent with himself in attacking the views of Reimarus and Bahrdt, as a comparison of his works prior and subse- quent to 1779 with those in question shows, his popularity began from that year to decline, and towards the end of his life he felt painfully the necessity of emphasizing the apologetic and conservative value of true historical inquiry. With more justification, perhaps, might his defence of the notorious edict of W6llner (1788), the cultus minister, be cited as a sign of the decline of his powers and of an un- faithfulness to his principles. He died at Halle on 14th*~~

~~*SEM—SEM*~~

~~*to indicate that in some districts the language diverges in a very much greater degree from the recognized type. The Abyssinian chronicles have for centuries been written in Geez, largely intermingled with Amharic elements, This "language of the clironicles," in itself a dreary chaos, often enables us to discover what were the older forms of Amharic words. A similar mixture of Geez and Amharic is exemplified in various other books, especially such as refer to the affairs of the Government and of the court.*~~

~~*The languages spoken still farther to the south, that of Gurdgué Gurigy (south of Shoa) and that of Harar, are perhaps more fitly describedand Until Har*~~

~~*as languages akin to Amharic than as Amharic dialects. We possess more precise information respecting them, and in general respecting the linguistic and ethnographical condition of these countries, it would not be safe to hazard even a conjecture as to*~~

~~*the origin of these languages, which, corrupt as they may be, and .*~~

~~*surrounded by tongues of a wholly different class, must still be regarded as Semitic. It is enough to repeat that the immigration of the Semites into these parts of Africa was probably no one single act, that it may have taken place at different times, that the immi- grants perhaps belonged to different tribes and to different districts of Arabia, and that very heterogeneous peoples and languages appear to have been variously mingled together in these regions.*~~

~~*The clever and brilliant work of Renan, Ilistoire générale des langues Sémi- tiques (Ist ed., Paris, 1855), could not fail to produce much effect at the time, in spite of its one-sided character and the actual mistakes that it contains, Even at the present day a scholar may read it with great interest and profit ; but as a whole it has been superseded by the discoveries of the last twenty or thirty years. The remarks of Ewald, in the introduction to his Hebrew grammar, upon the mutual relationship of the Semitic languages are still worthy of perusal, much as they provoke contradiction. A work upon the subject which realizes for the presént state of science what Renan endeavoured to realize for his own time unfortunately does not exist. (TH. N.)*~~

~~*March 1791, worn out by his prodigious labours, embittered by his desertion, and disappointed at the issue of his work.*~~

~~*Semler's importance in the history of theology and the human mind is that of a critic of Biblical and ecclesiastical documents and of the history of dogmas. He was not a ee thinker or theologian, though he insisted, more or less confusedly, and yet*~~

~~*'with an energy and persistency before unknown, on certain distinc-*~~

~~*tions of great importance when properly worked out and applied, e.g., the distinction between religion and theology, that between private personal beliefs and public historical creeds, and that between the local and temporal and the permanent elements of historical reli- gion. His great work was that of the critic. He was the first to reject with sufficient proof the equal value of the Old and the New Testa- ments, the uniform authority of all parts of the Bible, the divine authority of the traditional canon of Scripture, the inspiration and supposed correctness of the text of*~~

~~*the Old and New Testaments, and, generally, the identification of revelation with Scripture. Though to some extent anticipated by the English deist Thome Morgan, Semler was the first to take due note of and use for critical purposcs the opposition between the Judaic and anti-Judaic parties of the early church. He led the way in the task of discovering the origin of the Gospels, the Epistles, the Acts of the Apostles, and the Apocalypse. He revived previous doubts as to the direct Pauline origin of the Epistle to the Hebrews, called in question Peter's authorship of the first epistle, and referred the sccond epistle to the end of the 2d century. Hie wished to remove the Apocalypse altogether from the canon. In textual criticism Semler pursued further the principle of classifying MSS. in families, adopted by R. Simon and Bengel. Though he lacked almost every qualification of the true church historian, Semler did the work of a pioneer in many periods and in several departments of ccclesiastical history. Tholuck pronounces him "the father of the history of doctrines" and Baur "' the first to deal with that history from the true critical standpoint." At the same time, it is admitted by all that he was nowhere more than a pioneer. Baur's description of his work in one department of ecclesiastical history is true of his work generally. " His writings on the history of dogma resemble a fallow-field wait- ing to be cultivated or a building-site on which, underneath refuse and ruins, lie the materials in chaotic confusion for a new edifice. The consequence was that as he was always occupied in preliminary labours, he brought nothing to even partial completion; and, though his general critical standpoint was correct, in its application to details his criticism could only be regarded as extremely bold and arbitrary."*~~

~~*Tholuck gives 171 as the numbcr of Semler's works, of which only two reached a second edition, and none is now read for its own sake. Amongst the chief are—De demoniacis (Halle, 1760, 4th ed. 1779), Selecta capita historiz ceelestastiex (3 vols., Halle, 1767-69), Von freier Untersuchung des Kanon (Halle, 1771-72), Apparatus ad liberalem N. T. interpretationem (1767; ad V. T., 1778), Institutto ad doctrinam Christ. liberaliter discendam (Halle,*~~

~~*art*~~

~~1774), Ueber historisehe, gesellsehaftliche, und moralisehe Religion der Christen (1786), and his autobiography, Semler's Lebensbesehreibung, von thin selbst abgefasst (Halle, 1781-82).~~

~~For estimates of Seinler's labours, see Gass, Gesch. der prot. Dogmatik (Berlin, 1854-67); Dorner, Gesch. der prot. Theol. (Munich, 1867); Tholuck, art. in Herzog's Real-Encyklopddie ; Hilgenfeld, Einlcitung in das Neue Test. (Leipsic, 1875); Baur, Epochen der kirchlichen Geschichtschreibung (1852); and Ritschl, Gesch. des Pietismus (Bonn, 1880-84).~~

~~SEMLIN (Hung. Zimony ; Servian, Semun), a town of Austria-Hungary, the easternmost in the Military Frontier district, stands on the south bank of the Danube, on a tongue of land between that river and the Save. It is the see of a Greek archbishop, has a real school of lower grade, five Roman Catholic and two Greek churches, a synagogue, a theatre, and a custom-house. The population (10,046) consists mostly of Servians, with a few Germans, Greeks, Illyrians, Croats, Gipsies, and Jews. Semlin has recently undergone improvement in its streets and build- ings ; but its suburb Franzenthal near the Danube consists mostly of mud huts thatched with reeds. The town is surrounded by a stockade. On the top of Zigeunerberg are the remains of the castle of John Hunyadi, who died here in 1456. Semlin has a considerable trade, sending woollen cloth, porcelain, and glass to Turkey, and obtain- ing in return yarn, leather, skins, honey, and meerschaum pipes. It is a principal quarantine station for travellers from Turkey. Steam ferry boats cross to Belgrade several times a day, and larger vessels run up the Save as far as to Sissek.~~

~~SEMPER, Gorrrriep (1803-1879), German architect and writer on art, was born at Altona on 29th November 1803. His father intended him for the law, but irresist- ible impulse carried him over to art. His early mastery of classical literature led him to the study of classic monu- ments in classic lands, while his equally conspicuous talent for mathematics gave him the laws of form and proportion in architectural design. While a student of law at the university of Géttingen he fell under the influence of K. O. Miiller, and in after years followed closely in his foot- steps.~~

~~*Semper's architectural education was carried out successively in Hamburg, Berlin, Dresden, in Paris under Gau, and in Munich under Gartner ; afterwards he visited Italy and Greece. In 1834 he was appointed professor of architecture in Dresden, and during fifteen years received many important commissions from the Saxon court. He built the opera-house, which made his fame, the new museum and picture gallery, likewise a synagogue. In 1848 his turbulent spirit led him to side with the revolu- tion against his royal patron; he furnished the rebels with military plans, and was eventually driven into exile. Semper came to London at the time of the Great Exhibition of 1851, and the prince consort found him an able ally in carrying out his plans. He was appointed teacher of the principles of decoration; and his lectures in manuscript, preserved in the art library, South Kensington, deserve to be better known. He was also employed by the prince consort to prepare a design for the Kensington Museum ; he likewise made the drawings for the Wellington funeral car. In 1853 Semper left London for Zurich on his appoint- ment as professor of architecture, and with a commission to build in that town the polytechnic school, the hospital, &c. In 1870 he was called to Vienna to assist in the great architectural projects since carried out round the Ring. A year later, after an exile of over twenty years, he received a summons to Dresden, on the rebuilding of the first opera- house, which had been destroyed by fire in 1869; his second design was a modification of the first. The closing years of his life were passed in comparative tranquillity between Venice and Rome, and in the latter city he died on 15th May 1879.*~~

~~*Semper's style was a growth from the classic orders through the Italian Cinque Cento. He forsook the base and rococo forms he found rooted in Germany, and, reverting to the best historic ex-*~~

~~*amples, fashioned a purer Renaissance. He stands asa leader in the practice of polychrome, since widely diffused, and by his writings and example did much to reinstate the ancient union between arcli- tecture, sculpture, and painting. Amoug his numerous literary works are Ueber Polyehromie u. ihren Ursprung (1851), Die An- wendung der Farben in*~~

~~*der Arehitektur u. Plastik bei den Alten, Der Stil in den teehnisehen u. tektonisehen Kiinsten (1860-63). His Notes of Leetures on Praetieal Art in Metals and Hard Materials ;: its Teehnology, History, and Style, remainsin MS. His teachings are sometimes encumbered by speculations reaching far beyond the domain of his art.*~~

~~*SENAAR (SEnnaar, properly SENNAR), a country of east Central Africa, commonly identified with the "Island of Meroe" of the ancients, and included in the central division of Egyptian (Eastern) Sudan, as reorganized in the year 1882. By European writers the term is often applied to the whole region lying between the Atbara (Takazze) and the White Nile, but by native usage is restricted to the district confined between the latter river and the Bahr- el-Azrak (Blue Nile), and its eastern tributaries, the Rahad and the Dender. It is bordered north and north-east by Upper Nubia, east by Abyssinia, west by the White Nile (Bahr-el-Abiad), separating it from Kordofan, and stretches from the confluence of the two Niles at Khartum south- wards, in the direction of the Berta highlands in the east and the Burtin and Dinka plains in the west. As thus de- fined, Sennar extends across five degrees of latitude (16° to 11° N.), with a total length of about 350 miles, a mean breadth of 120 miles, an area of 40,000 square miles, and an approximate population of 300,000. It comprises two physically distinct tracts, the densely wooded and well- watered Jezirat el-Jesirat ("Isle of Isles") between the Rahad and the Blue Nile, and the "island" of Sennar proper, a nearly level steppe land confined between the two main streams. This western and much larger division, which has a mean elevation of under 2000 feet above sea-level, consists mainly of alluvial and sandy matter, resting on a bed of granite and porphyritic granite, which first crops out sdéme ten days' journey south of Khartum, in the Jebel es- Segati and the Jebel el-Moye, near the town of Sennar on the Bahr-el-Azrak. Between these two groups the plain is dotted over with isolated slate hills containing iron and silver ores. But beyond Sennar the boundless steppe, eithcr under a tall coarse grass, or overgrown with mimosa scrub, or else absolutely waste, again stretches uninterruptedly for another ten or eleven days' journey to the Roséres (Rosaires) district, where the isolated Okelmi and Keduss Hills, con- taining quartz with copper ore, rise 1000 feet above the right*~~

~~*bank of the Blue Nile and 3000 above the sea. Here the plain is furrowed by deep gullies flushed during*~~

~~*the rainy season; and farther south the land, hitherto*~~

~~*gently sloping towards the north-west, begins to rise rapidly, breaking into hills and ridges 4000 feet high in the Fazogl district, and farther on merging in the Berta high- lands with an extreme altitude of 9000 to 10,000 feet. In these metalliferous uplands, recently explored by Marno and Schuver, rises the Tumat, which is washed for gold, and which after a northerly course of nearly 100 miles joins the left bank of the Blue Nile near Fazogl and Famaka. South of and parallel with the Tumat flows the still unexplored Jabus (Yabus), on which stands Fadasi, southernmost of the now abandoned Egyptian stations in the Bahr-el-Azrak basin. This point also marks the present limit of geographical exploration in the direction of the conterminous Galla country, Schuver being the only European traveller who has hitherto succeeded in pene- trating to any distance south of the Jabus.*~~

~~*Sennar lies within the northern limits of the tropical rains, which reach to Khartim, and fall between June and September. In this part of its course the Blue Nile rises from May to August, when the northern and western winds prevail, nearly coinciding with the cool and healthy season. But they are followed by the hot khamtsin from the south or the samum (simoom) from the north-west charged*~~

~~*with fine sand from the Libyan Desert. Still more dreaded are the miasmatic exhalations caused by the glowing sun playing on stag- nant waters after the floods and giving rise to the "Sennar fever," which drives the natives themselves from the plains to the southern uplands. The temperature, which rises at times to over 120° Fahr., is also very changeable, often sinking from 100° Fahr. during the day to under 60° Fahr. at night.*~~

~~*The soil, mainly alluvial, is naturally fertile, and wherever water and hands are available yields bounteous crops of maize, pulse, cotton, tobacco, sesame, and especially durra, of which as many as twenty varieties are said to be cultivated. The forest vegetation, mainly confined to the 'Isle of Isles" and the southern uplands, includes the Adansonia (baobab), which in the Fazog] district attains gigantic proportions, the tamarind, of which bread is made, the deleb palm, several valuable gum trees (whence the term Senndari often applied in Egypt to gum arabic), some dyewoods, ebony, iron- wood, and many varieties of acacia, These forests are haunted by the two-horned rhinoceros, the clephant, lion, panther, numerous apes and antelopes, while the crocodile and hippopotamus frequent all the rivers. The chief domestic animals are the camel, horse, ass, ox, buffalo (used both as a beast of burden and for riding), sheep with a short silky fleece, the goat, cat, dog, and pig, which last here reaches its southernmost limit. The tsetse fly appears to be absent, but is replaced in some districts by a species of wasp, whose sting is said to be fatal to the camel in the rainy season.*~~

~~*The 'African Mesopotamia" is occupied by a partly settled partly still nomad population of an extremely mixed character, including representatives of nearly all the chief ethnical divisions of the continent. But the great plain of Senndr is mainly occupied by Hassanieh Arabs in the north, by Abu-Rof (Rufaya) Hamites of Beja stock (Robert Hartmann) in the east as far as Fazogl, and elsewhere by the Funj (Fung, Fungheh), traditionally from beyond the White Nile, and affiliated by some to the Kordofan Nubas, by others more probably to the Nilotic Negro Shilliks. These Funj, who have been the dominant race since the 15th century, have become almost everywhere assimilated in speech, religion, and habits to the Arabs. Nevertheless on their sacred Mount Guleh the traveller Pruyssenaere found them still performing pagan rites, while according to Marno the Burins, the southernmost branch of the race between the Berta highlanders and the Nilotic Denkas, are addicted to cannibalism. The Berta highlanders themselves (Jebalain, as the Arabs collectively call them) are of more or less pure Negro stock and number about 80,000, grouped in several semi-independent principalities. The "no-man's-land " stretching north of Der era and east of the Tumat valley is also occupie by distinct nationalities, such as the Kadalos in the*~~

~~*extreme north, the Sienetjos and Gumus in the east, here bordering on the Abys- sinian Agaws, the Jabus and Ganti in the south. Most of these appear to be of Negro or Negroid stock ; but the Sienetjos, said to be a surviving remnant of the primitive population of the whole country, are doubtless akin to the Sienetjos of Damot and Gojam in Abyssinia. They are certainly not blacks, and have a yellow or fair complexion, lighter than that of southern Europeans.*~~

~~*The Sennari people cultivate a few industries, such ag cotton- weaving, pottery, gold, silver, and iron work, matting, and leather work (camel saddles, sandals, &c.), noted throughout Sidan. But their chief pursuits are stock-breeding, agriculture, and trade,— exporting to Egypt and Abyssinia gold, hides, durra, sesame, gums, ivory, horses, and slaves. The chief centres of population, all on the Bahr-el-Azrak, are Fazogl (Fazoklo), now replaced by Famaka, at the Tumat confluence; Roséres, formerly capital of an inde- pendent state ; Sennar, also an old capital, which gives its name to the whole region ; Wod-Medineh at the Rahad confluence; and Khartum, just above the junction of the two Niles. A few miles above Khartum are the extensive ruins of Soba, former capital of the Funj empire, which at one time stretched from Wady Halfa to Dar-Berta and from Suakin to beyond Kordofan, but which was overthrown by Ismail Pasha in the year 1822. (AHS)*~~

~~*SENANCOUR, Eimmunne Prvert pe (1770-1846), French man-of-letters, was born at Paris in November 1770. His family was noble and not poor, but its fortunes were ruined by the Revolution. Before that event, how- ever, Sénancour had met with mishap. He was a sickly youth and was destined for the church, but ran away from home and established himself in Switzerland. Here he married and spent some years; his wife died, and he re- turned to Paris about the end of the century. In 1804 he published the singular book entitled Obermann, which has continued to be in a fashion popular to the present day, and the next year a treatise De l'Amour, which had even more vogue at first, but is now little read. Obermann, which is to a great extent inspired by Rousseau, which attracted the admiration of George Sand, and which had*~~

~~*a considerable influence over the last generation in France and England, is a series of letters supposed to be written by a solitary and melancholy person, whose headquarters were in a valley of the Jura, but who writes also from divers other places. The style is meritorious, the descrip- tive power very considerable, the thought sometimes ori ginal, and the expression of a certain form of the maladie du siécle effective and striking. But, viewed from the strictly critical point of view, there is perhaps a certain unreality about the book. Its idiosyncrasy in the large class of Wertherian-Byronic literature has justly enough been said to be that the hero, instead of feeling the vanity of things, recognizes his own inability to be and do what he wishes. Sénancour is tinged to some extent with the older philosophe form of freethinking, and expresses less revolt from the 18th century than Chateaubriand. Having no resources but his pen, Sénancour during the half-century which elapsed between his return to France and his death at St Cloud in February 1846 was driven to literary hack work, and even his more independent productions have none of the attraction of Obermann. When George Sand and Sainte-Beuve revived interest in this latter, Thiers and Villemain successively obtained for the author from Louis Philippe pensions which enabled him to pass his last days in comfort. He committed the usual mistake of writing late in life a continuation to Obermann, entitled Isabelle (1833), but it has been wisely forgotten.*~~

~~*SENEBIER, Jean (1742-1809), a Swiss pastor and voluminous writer on vegetable physiology, was born at Geneva on 6th May 1742. He is remembered on account of his contributions to our knowledge of the influence of light on vegetation. Though Malpighi and Hales had shown that a great part of the substance of plants must be obtained from the atmosphere, no progress was made until more than a century later, when Bonnet observed on leaves plunged in aerated water bubbles of gas, which Priestley recognized as oxygen. Ingenhousz proved the contemporaneous disappearance of carbonic acid; but it was Senebier who clearly showed that this activity was confined to the green parts, and to these only in sunlight, and first gave a connected view of the whole process of vegetable nutrition in strictly chemical terms, so prepar- ing the way for the quantitative researches of N. T. de Saussure. Senebier died at Geneva on 22d July 1809.*~~

~~*See Sachs, Geschichte d. Botunik, and Arbeiten, vol. ii.*~~

~~*SENECA, Lucius Anyaus (c. 3 B.c.65 A.D.), the most brilliant figure of his time, was the second son of the rhe torician Marcus Anneeus Seneca, and, like him, a native of Corduba in Hispania. From his infancy of a delicate con- stitution, he devoted himself with intense ardour to rhetor- ical and philosophical studies and early won a reputation at the bar. Caligula threatened his life, and under Claudius his political career received a sudden check, for the influ- ence of Messalina having effected the ruin of Julia, the youngest daughter of Germanicus, Seneca, who was com- promised by her downfall, was banished to Corsica, 41 A.D. There eight weary years of waiting were relieved by study and authorship, with occasional attempts to procure his return by such gross flattery of Claudius as is found in the work Ad Polybium de Consolatione or the panegyric on Messalina which he afterwards suppressed. At length the tide turned ; the next empress, Agrippina, had him recalled, appointed preetor, and entrusted with the education of her son Nero, then (48) eleven years old. Seneca became in fact Agrippina's confidential adviser ; and his pupil's acces- sion increased his power. He was consul in 57, and during the first bright years of the new reign, the incomparable qguinguennium Neronis, he shared the actual administration of affairs with the worthy Burrus, the pretorian prefect. The government in the hands of these men of remarkable*~~

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~~*insight and energy was wise and humane; their influence over Nero, while it lasted, was salutary, though sometimes maintained by doubtful means. When there came the inevitable rupture between mother and son they sided with the latter; and Seneca, who drew up all Nero's state papers, was called upon to write a defence of matricide. We must, however, regard the general tendency of his*~~

~~*measures ; to judge him as a Stoic philosopher by the*~~

~~*counsels of perfection laid down in his writings would be much the same thing as to apply the standard of New Testament morality to the career of a Wolsey or Mazarin. He is the type of the man of letters who as courtier*~~

~~*and minister rises into favour by talent and suppleness (comitas honesta), and is entitled as such to the rare credit of a beneficent rule. In course of time Nero got to dislike him more and more; the death of Burrus in 62 gavea shock to his position. In vain did he petition for permis- sion to retire, offering to Nero at the same time his enor- mous fortune. Even when he had sought privacy on the plea of ill health he could not avert his doom ; on a charge of being concerned in Piso's conspiracy he was forced to commit suicide. HIs manly end might be held in some measure to redeem the weakness of his life but for the testimony it bears to his constant study of effect and ostentatious self-complacency (" conversus ad amicos, ima- ginem vite suc relinquere testatur"').*~~

~~*Seneca is at once the most eminent among the Latin writers of the Silver Age and in a special sense their representative, not least because he was the originator of a false style. The affected and sentimental manner which gradually grew up in the first century A.D. became ingrained in him, and appears equally in everything which he wrote, whether poetry or prose, as the most finished pro- duct of ingenuity concentrated upon declamatory exercises, sub- stauce being sacrificed to form and thought to point. Every variety of rhetorical conceit in turn contributes to the dazzling effect, now tinsel and ornament, now novelty and versatility of treatment, or affected simplicity and studied absence of plan. But the chief weapon is the epigram (senéentia), summing up in terse incisive antithesis the gist of a whole period. "Seneca is a man of real genius," writes Niebuhr, "which is after all the main thing ; not to be unjust to him, one must know the whole range of that litera- ture to which he belonged and realize how well he understood the art of making something even of what was most absurd." HIs works were upon various subjects. (1) HIs Orations, probably the speeches which Nero delivered, are lost, as also a biography of his father, and (2) his earlier scientific works, such as the monographs describing India and Egypt and one upon earthquakes (Nat. Qu., vi. 4, 2). The seven extant books of Physical Investigations (Natur- ales Questiones) treat in a popular manner of meteorology aud astronomy ; the work has little scientific merit, yet here and there Seneca, or his authority, has a shrewd guess, ¢.g., that there is a connexion between earthquakes and volcanoes, and that comets are bodies like the planets revolving in fixed orbits. (3) The Satire on the Death (and deifiesrtion) of*~~

~~*Claudius is a specimen of the " satira Menippea" or medley of prose and verse. The writer's spite against the dead emperor before whom he had cringed servilely shows in a sorry fashion when he fastens on the wise and liberal measure of conferring the franchise upon Gaul as a theme for abuse. (4) The remaining prose works are of the nature of moral essays, bearing various titles,—twelve so-called Dialogues, three books On Clemency dedicated to Nero, seven On Benefits, twenty books of Letters to Luetlius. They are all alike in discussing practical questions and in addressing a single reader in a tone of familiar conversation, the objections he is supposed to make being occasionally cited and answered. Seneca had the wit to discover that conduct, which is after all "three-fourths of life," could furnish inexhaustible topics of abiding universal interest far superior to the imaginary themes set in the schools and abundantly aualysed in his father's Contro- versie and Swasori#, such as poisoning cases, or tyrannicide, or even historical persons like Hannibal and Sulla. The innovation took the public taste,—plain matters of urgent personal concern sometimes treated casuistically, sometimes in a liberal vein with serious divergence from the orthodox standards, but always with an earnestness which aimed directly at the reader's edification, pro- gress towards virtue, and general moral improvement. The essays are in fact Stoic sermons; for the creed of the later Stoics had be- come less of a philosophical system and more of a religion, especially at Rome, where moral and theological doctrines alone attracted lively interest. The school is remarkable for its auticipation of modern ethical conceptions, for the lofty morality of its exhorta-*~~

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~~*tions to forgive injuries and overcome evil with good ; the obligation to universal benevolence had been deduced from the cosmopolitan principle that all men are brethren. In Seneca, in addition to all this, there is a distinctively religious temperament, which finds ex- pression in phrases curiously suggestive of the spiritual doctrines of Christianity. Yet the verbal coincidence is sometimes a mcre accident, as when he uses sacer spiritus; and in the same writings he sometimes advocates what is wholly repulsive to Christian feel- ing, as the duty and privilege of suicide.*~~

~~*Eight of the tragedies which bear Seneca's name are undoubtedly genuine. In them the defects of his prose style are exaggerated : as specimens of pompous rant they are probably unequalled ; and the rhytlum is unpleasant owing to the monotonous structure of the iambics and the neglect of synapleia in the anapestic sys- tems. The pretexta Octavia, also ascribed to him, contains plain allusions to Nero's end, and must therefore be the product of a later hand. 5*~~

~~*Our materials fora knowledge of Seneca are ample, and are variously pre- sented in such works as Merivale's Romans under the Empire, cc. 52-54; Zeller's Greek Philosophy (Eng. tr. Eclecticism, pp. 202-245); and the histories of Roman literature by Bernhardy, Teuffel (§§ 282-285), and Simcox (ii. pp. 1-27, London, 1883). HIs elder brother Annus Seneca Novatus, afterwards adopted by a Junius Gallio, was the proconsul of Achaia before whom St Paul pleaded (Acts Xvili. 12). The date of Seneca's birth must be approximately inferred from Nat. Qu., i. 1, 3; Ep., 108, 22. HIs mother's name was HIelvia; her sister brought him as a child to Rome and nursed him tenderly. HIs teachers were Attalus, a Stoic, and Sotion, a pupil of the Sextii. In his youth he was a vegetarian and a water-drinker, but his father checked his indulgence in asceti- cisin. Before his exile he had served as questor, was married, and had two children born. Caligula said his style was mere mosaic (commisswras meras) or "sand without line," and would have put him to death, had he not been assured that so consumptive a subject could not last long (Suet., Calig., 63; Dio Cassius, lix. 19,7). Upona Pompeian fresco a butterfly appears as charioteer of a dragon,—Seneca and Nero. HIs second wife was Pompeia Paulina, of noble family ; she attempted to die with him. HIs enormous wealth was estimated at 300 millions of sesterces. HIe had 500 ivory tables inlaid with citron wood (Dio, 1xi. 10, Ixii. 2). The judginent of Tacitus (Ann., xiii. 4, 13, 42 sqg., xiv. 52-56, xv. 60 sq.) is more favourable than that of Dio, who may possibly derive his account from the slanders of some personal enemy like Suilius. Seneca has found many champions—Lipsius (the introduction to his ed.); Diderot, Essai sur les Regnes de Claude et de Néron (iii. 1-407, Paris, 1875); Volquardsen, Ehrenrettung (HIadersleben, 1839); Martha, Les Moralistes sous ! Envpire Romain (2d ed., Paris, 1866). For the dates of his works, see H. Lehmann, in Philologus, Viil. p. 309 ; F. Jonas, De ordine librorum Sen. (Berlin,*~~

~~1870); A. Martens, De Sen. vita (Altona, 1871); also R. Volkmann, in Mager's Pddagog. Revue, xviii. pp. 259-276 (1857). At least eighteen prose works have been lost, among them De superstitione, an attack upon the popular conceptions of the gods, and De matrimonio, which, to judge by the extant fragments, must have been interest – ing reading. Since Gellius (xii. 2, 3) cites a book xxii. of the Letters to Lucilius, some of these have been lost. His style is elaborately criticized by Quintilian (Inst., x. 1, 125-181), also by Fronto (p. 155 sq.; Gellius, xii. 2,1). The doubt as to his authorship of the tragedies is due to a blunder of Sidonius Apollinaris (ix. 229-231); against it must be set Quintilian's testimony ("ut Medea apud Senecam," 1x. 2, 8). Some of the Fathers, probably in admiration of his ethics, reckoned Seneca among the Christians ; this assumption in its turn led to the forgery of a correspondence between St Paul and Seneca, which was known to Jerome (comp. Augustin, Ep., 153: "'Seneca .. . cujus etiam ad Pauluin apostolum leguntur epistole"). This has given rise to an interesting historical problem, most thoroughly discussed in the commentary on the Zp. to the Philippians by Dr Lightfoot, bishop of Durham (London, new ed., 1879, pp. 270-333), who cites (p. 278 note) among earlier authorities A. Fleury, St Paul et Séneque (Paris, 1853); C. Aubertin, Etude (1853), also new ed. Séneque et St Paul (Paris, 1870); F. C. Baur (1858), republished in Drei Abhandlungen (Leip- sic, 1876); F. W. Farrar, Seekers after God (London, s.a.); and G. Boissier, in the Revue des Deux Mondes, xcii., 1871, pp. 40-71. Add the articles by F. X. Kraus in Theolog. Quartalschrift, vol. xlix. pp. 609-624 (Tiibingen, 1867) and by A. Harnack in Theolog. Lit.-Zeitung, 1881, pp. 444-449, the latter being a review a E. Yn eee Untersuchung der Sage, dass Seneca Christ gewesen set (Ber-~~

~~in, 1881).~~

~~The best text of the prose works, that of Haase in Teubner's series (1852), was re-edited in 1872-74; he followed the critical labours of Fickert (Berlin, 8 vols., 1842-45). More recently Gertz has revised the text of Libri de benejicits et de clementia (Berlin, 1876) and H. A. Koch that of the Dialogorum libri XII. (completed by Valilen, Jena, 1879). There is no complete exegetical comment- ary, either English or German. Biicheler's edition of the 'Amoxo\okUvTwots may be found in Symbola philol.~~

~~*Bonnens., i. (1864), pp. 31-89. Little has been done systematically since the notes of Lipsius and Gronovius. There is, how- ever, Ruhkopf's ed. with Latin notes, 5 vols. (Leipsic, 1797-1811), and Lemaire's variorum ed. (Paris, 1827-32, 8 vols., prose and verse). The text of the tragedies was edited by Peiper and Richter for Teubner's series (1867), and more recently by F. Leo (Berlin, 2 vols., 1878-79). Nisard, Etudes de mewrs et de critique sur les poétes de la decadence (4th ed., Paris, 1878), has criticized them in detail. Of some 300 monograplis enumerated in Engelmann may be mentioned, in addition to the above, G. Boissier, Les tragédies de Sénéque ont-ils été représentés ? (Paris, 1861); A. Dorgens, Senec. discipline moralis cum Antoniniana compuratio (Leipsic, 1857); E. F. Gelpke, De Senec. vita et moribus (Bern, 1848); Holzherr, Der Philosoph Seneca (Rastadt, 1858). (ORG DR Jal)*~~

~~*SENECA FALLS, a post village and township of the United States, in Seneca county, New York, 41 miles south-west of Syracuse by the Auburn division of the New York Central Railroad, occupies a beautiful situation on Seneca river, the outlet of Seneca Lake. It turns the water-power of the falls to account in the manufacture of steam fire-engines, fire-extinguishing apparatus, pumps, machinery, knit goods, flour, yeast, &c. The population of the village was 5880 in 1880 and of the township*~~

~~*6853.*~~

~~*SENEFELDER, Atots. pp. 697-698.*~~

~~*See LirHocrapny, vol. xiv.*~~

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~~*SENEGAL, a river of western Africa, which falls into the Atlantic about 16° N. lat., 9 or 10 miles below St Louis. It is formed at Bafulabé! (13° 50' N. lat. and 10° 50' W. long.) by the junction of the Ba-fing or Black River and the Ba-khoy or White River. The Ba-fing, which has a width at the confluence of 1475 feet, descends from the highlands of Futa-Jallon by a northward course of about 350 miles, during which it passes by a series of rapids from the altitude of 2460 feet, at which it takes its rise, to that of 360 feet, and receives from the right the Nunkolo and the*~~

~~*Funkumah (with its tributary the Boki). The Ba-khoy, 800 feet wide at the confluence, has been previously flowing from east to west and gives that general direction to the Senegal, but its source is away in the south-east behind the country of Buré. That of its prin- cipal tributary, the Ba-ule (Red River), is more to the east and lies within a few miles of the course of the Niger in the Mandingo plateau. Below Bafulabé the Senegal, flow- ing north-west, passes a succession of falls—those of Guina (160 feet) and of Felu (50 or 60)—and arrives at Médine, after having accomplished 440 of its total course of 1000 miles. It receives only two important affluents,—from the right the "marigot" of Kulu, which comes from Kuniakhary, draining the slopes of the Kaarta plateau, and from the left the Falemé, which rises in the Futa-Jallon between Labé and Timbo and flows north-west in a permanent stream. Below Médine the Senegal presents a series of great reaches, which become more and more navigable as they approach the sea.*~~

~~*From the Ist of August to the 1st of October it is open as far as Médine to vessels not drawing more than 8 feet. Between Médine and Bakel (85 miles) there are twenty-seven " narrows," of which several, such as that at Kayes, are difficult ; it is on this account that a railway has been projected between Kayes and the Niger. At Bakel below the confluence of the Falemé the river is navigable till the 1st of December, from Bakel to Saldé between the 15th of July and the 15th of December, and lastly from Mafu to the sea for a distance of 215 miles it is navigable all the year round. Outside the limits indicated navigation between Mafu and Médine is often precarious even for barges drawing little over a foot, and above Médine, though some reaches are deep enough, troublesome transhipments are necessary between reach and reach. Between Mafu and Saldé the Senegal changes its direction from north-west to west, and shortly before reaching the sea to south-west. The bar at the mouth can usually be crossed by vessels not drawing more than 10 feet, or at High tides a little more. Below Bakel the river becomes tortuous and encloses the great island of Morfil, 110 miles long, and a series of other islands, of which one is occupied by St Louis. At this point the right branch of the river is only 500 feet from the sea, but the dunes along the coast turn it south for other 9 miles. The scantiness of its sources, the steepness of its upper course, and the rapid evaporation which takes place after the short*~~

~~rainy season would soon dry up the river-system of the Senegal, especially in the upper regions; but natural dams cross the channel at intervals and the water accumulates behind them in deep reaches, which thus act as reservoirs. In the rainy season the barriers are submerged in succession, beginning with the farthest up, the reaches are filled, and the plains of the lower Senegal are changed into immense marshes. Like Lake Meris in antiquity on the Nile and the lake of Cambodia at the present time on the Me-kong, Lake Cayor on the right side of the lower Senegal and Lake Panieful on the left constitute reserve basins, receiving the surplus waters of the river during flood and restoring them in the dry season. For months together the latter forms the only drink- ing pond for the wild beasts of the surrounding country,—lions, elephants, leopards, panthers, ounces, cheetahs, hyznas, lynxes, giraffes, antelopes, gazelles, monkeys, jackals visiting it in crowds. In the upper part of the river the reservoirs are successively emptied to the level of the dams and receive no more water except from the permanent springs; but they are partially protected by curtains of verdure from the effects of the evaporation which makes itself so severely felt on the treeless seaboard. Owing to these natural "locks," similar to those of an artificial canal, the Senegal river never discharges less than 1700 or 1800 cubic feet per second. The lower Senegal forms the boundary between the dry and barren Sahara and the rich and productive region of the western Sudan ; the line of its inundations is an ethnographic march between the nomadic Moor and the settled Negro.~~

~~a eee ee 1 Bafulabé is a native word for " confluence."~~

~~SENEGAE~~

~~SENEGAL,? a French colony of western Africa, com- posed of lines of fortified posts and a loose agglomeration of states and territories in various degrees of subjugation, The forts extend (a) from St Louis at the mouth of the Senegal to Bammako on the Niger,? (6) along the coast of the Atlantic between St Louis and the mouth of the Salum to the south of Cape Verd, and © along the so-called rivers of the south which fall into the ocean between the Gam- bia and Srerra Lzonz (¢.v.). French~~

~~*influence is fully dominant along those lines either in the form of actual territorial possession or of a recognized protectorate.!*~~

~~*The colony is ruled by a governor, sends a deputy to the French legislature, and elects a general council of sixteen members, ten for the electoral district of St Louis, four for that of Gorée-Dakar, and two for that of Rufisque. The three communes just named have each its municipal council. The population of those French pos- sessions was in 1884 197,644,— 46,364 urban, 143,200 rural, 8080 "floating." In the whole number there were only 1474 Europeans, of whom 1461 were French. The population of the protected countries cannot be aseertained. The most important places in the colony are St Louis (18,924 inhabitants in 1883), Dagana (5375), Rufisque (4244), Médine (3000), Joal (2372), Gorée and Dakar (each 2000). The colony has only a single true port, that of Dakar to the east of the peninsula of Cape Verd, since 1885 connected with St Louis by a railroad, 163 miles long, and visited by Atlantic steamers on their way from France to South America. Rufisque and Gorée have open roadsteads, where vessels anchor at some dis- tance from the shore. The port of St Louis in the Senegal is diffi- cult of access owing to the bar, but it is the only place where vessels can repair serious damages. The principal commercial centres are St Louis (imports and exports), Gorée (exports), and Rufisque (exports). The upper Senegal sends ground-nuts (known as Galam nuts), gum, millet, leather, and receives in exchange blue calico (guinée) from India, England, and Belgium, various other cotton stuffs, cotton yarn, guns and ammunition, tobacco, crushed rice, sugar (raw and refined), molasses, biscuits, tinsmiths' wares, &c. The colony also imports Swedish iron, which is manu- factured by the native blacksmiths into agricultural implements, knives, daggers, and spearheads. Cayor sells its ground-nuts for money. The rivers of the south district export ground-nuts, palm kernels, india-rubber, leather, coffce, in return for English and Bel- gian blue calico, Hamburg brandy, English gunpowder, English and Belgian guns, and American tobacco. An English firm has twenty-three factories on the Rio Nuftez, and others on the Rio Pongo and the Mellacorée. The total value of the exports and imports of the colony was £1,325,711 in 1879, £1,774,089 in 1880, and £1,888,657 in 1883, the imports slightly preponderating over the exports. The value of the ground-nuts exported*~~

~~*in 1883 was £700,000, that of the gums only £120,000; and the ground-nut trade is still rapidly developing. The imports comprise French*~~

- ~~*For the physical geography, &c., see SENEGAMBIA.*~~

~~*3 Along this line lie Richard Toll, Dagana (founded in 1821), Podor (1743 and 1854), Saldé (1859), Matam (1857), Bakel (1820), Kayes, Médine (1855), and Bafulabé (1879) on the Senegal, and between this river and the Niger the forts of Badumbé and Tukota on the Ba-khoy, Kita (1881), Kondu (1882), Niagassola (1884-85), and lastly Bam- mako (1883) or Bammaku, on the Niger.*~~

- ~~*ARRONDISSEMENT J.—On the circle of Bakel depend the post of Matam, the protected countries of Damga (1859), Guoy, Kamera, Guidimakha, Bondu, and Bambuk; on the circle of Afédine, Khasso, Logo, and Natiaga; ou the circle of Bafulabé, Barinta, Makadugu, Beteadugu, Farimbula, Bafing ; on the circle of Kita, the province of Kita and Fuladugu; on the circle of Bammako, Birgo and Little Beledugu. This arrondissement is under the command of a superior officer resident at Kayes. ARRONDISSEMENTS IJ., IJI.—These are formed by Lao and Toro (1863), protected countries attached to the circle of Saldé; the circle of Poedor, which comprises the French portion of Toro and a fragment of Dimar; the circle of Dagana, on which depend the other portion of Dimar and a portion of Walo; the sub- urban district of St Louis, including the other portion of Walo, Ross, Merinaghen, the cantons of Gandiole, M'pal, Khattet, Gondu, Diala- khar, N'diago, and Tubé; N'diambor and Merina N'guick, separated from Cayor and placed under French protection, as well as the king- doms of Cayor and Baol; the suburb of Dakar with the island oi Gorée, the cantons of Rufisque and the circles of ALbijem, Thies, Portudal, and Joal. ARRONDISSEMENT IV.—The Rivers of the South district constitutes the fourth arrondissement under a lieutenant- governor, and comprises the circle of Kaolack or Salwm; those cof Carabane and Sedhiu on the Cazamance, with the protected countries of Pakao, Balmadu, Suna, Yacine, Firdu; the circle of Rio Nwhea formed by the Nalus and Landuman tribes; the circle of the tio Pongo with the country of the Susus; the circle of*~~

~~*Afellacorée with the protected countries of Samo, Kaback, Kabita, Kalum, Tabussv, Maneah, Correra, and the island of Tombo.*~~

~~*SEHEN—SEN*~~

~~*goods £360,000, goods passing as French £200,000, foreign goods £440,000, of which £240,000 represent English, £200,000 Belgian, £120,000 German, £80,000 American articles. In 1882 946 vessels entered and 960 cleared. The budget for the colony in 1884 was £100,320, for the communal expenses £14,560, and for the expenses of the capital £250,000.*~~

~~*History.—The navigators of Dieppe are said to have discovered the Senegal about 1360. The Portuguese had some establishments on its banks in the 15th century ; and the first French settlements were probably formed in the latter part of the 16th or beginning of the 17th century. Between 1664, when these French settlements were assigned to Colbert's West India Company, and 1758, when the colony was scized by the English, Senegal had passed under the administration of no fewer than seven different companies, none of which attained any great success, though from 1694 to 1724 affairs were conducted by a really able governor, André Brue. In 1677 the French captured from the Dutch Rufisque, Portudal, Joal, and Gorée, and they were confirmed in possession of these places by the treaty of Nimeguen (1678). In 1717 they acquired Portendic and in 1724 Arguin on the coast of the Sahara, which still belong to the colony. Gorée and the district of Cape Verd were surrendered by the English to the French in 1763, and by the treaty of peace in 1783 the whole of the Senegal was also restored ; but the English again captured the colony in the wars of the first empire (Gorée 1800, St Louis 1809), and, though the treaty of Paris authorized a complete restitution, the French authorities did not enter into pos- session till 1817. Between that date and 1854 little was effected by the thirty-seven governors who succeeded each other at St Louis; but in this year the appointment of General Faidherbe proved the turn- ing-point in the history of Senegal. He at once set about subduing the Moorish (Berber) tribes of the Trarzas, Braknas, and Duaish, whose " kings," especially the king of the Trarzas, had subjected the French settlers and traders to the*~~

~~most grievous and arbitrary exactions ; and he bound them by treaty to confine their authority to the north bank of the Senegal. In 1855 he annexed the country of Walo and erected the fort of Médine in the country of Khasso. This last was a bold stroke for the purpose of stemming the ad- vancing tide of Moslem invasion, which under Omar al-Hadji (Alegui) threatened the safety of the colony. In 1857 Médine was brilliantly defended by the mulatto Paul Holle against Omar, who with his army of 20,000 men had to retire before the advance of General Faidherbe and turn his attention to the conquest of the native states of the Sudan. By treaty of 1860 Omar recognized the French claiin to half of Bambuk, half of Khasso, Bondu, Kamera, Guoy, Guidimakha, Damga, Futa-Toro, Dimar, &c. Since then annexations and protectorates have followed in rapid succession under the governorships of Jauréguiberry, Faidherbe, and Briére de V'Isle. It is sufficient to mention the treaties of 1881 and 1885 by which the confederation of Futa-Jallon and Buré respectively recognized a French protectorate.~~

~~.See Jannequin de Rochefort, Voyage de Libye aw royaume de Sénéga, 1648 ; Adanson, Histoire naturel dw Sénégal, 1757; Mollien, Voyage dans U'intérieur del Afrique fait aux sources du Sénégal et de la Gambie en 1818-1820 ; Tardieu, Sénégambie et Guinée, 1847; Faidherbe on " Populations noires des bassins du Sénégal et du Niger," in Bull. Soc. de Géogr., Paris, 1854; Sénégal et Niger, la France dans U Afrique Occidentale, 1879-88, published by the Ministry of Marine, 1884; Faidherbe, Le Soudan francais, Lille, 1881-85 ; Notices Coloniales pub. a Voccasion de l Exposition d' Anvers, 1885; Annales Sénégalaises de 1854 & 1585, swivies des traités passés avec les indigenes, 1886 ; and Rambaud, 'Sénégal et Soudan Frangais," in Revue des Deum Mondes, 1885.~~

~~SENEGAMBIA, a country in the west of equatorial Africa, comprising, as the name indicates, the regions watered by the Senegal and the Gambia. It lies between 9° and 17° N. lat. and 6° and 17° 30' W. long., being bounded on the N. by the Sahara, W. by the Atlantic, S. by Sierra Leone, and E. by the Joliba or upper Niger. The area is estimated at about 400,000 square miles. Accepting the course of the Senegal and its right hand affluent the Ba-ule as the boundary towards the Sahara, the Joliba~~

~~*as the frontier towards Segu and Upper Guinea, and the watershed between the Mellacorée (Mellicoury) and the Great Scarcies as that between Senegambia and Sierra Leone, we have only for short distances to fall back on a mere conventional delimitation,—in the north between Sidian on the Ba-ule and Sansanding on the Niger via Murdia; in the south-east, from Sansanding to a point above Nyamina; and finally between the Joliba and the sources of the Great Scarcies. The Senegambian coast extends south-south-west almost in a straight line from the N'diadier or Mosquito lagoon (Marigot des Ma- ringouins), formerly the northern mouth of the Senegal, to Cape Verd, the most western point of the African con- tinent ; then it bends south as far as Cape Roxo; and*~~

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~~*afterwards south-east as far as the Mellacorée. With the exception of the two great capes just mentioned, the only headlands of any importance are Cape St Mary, forming the south side of the estuary of the Gambia ; Cape Verga, between Rio Nufiez and Rio Pongo; and Konakry Point, opposite the Los (or Idolos) Islands. The only gulf on the whole coast is that which lies to the south of Cape Verd and contains the island of Goris (¢.v.); the other inlets, such as the bay of Sangareah, are mere estuaries or river mouths. Apart from the island in the Senegal on which St Louis is built and those formed by the deltas of the rivers, the only islands along the coast are Gorée, the Bissagos (or Bijug) Archipelago, the Los Islands, and the*~~

~~*Mosquito Lag/fy 14 Pade, Reng > o Dagana "9 & os Richana Toll 1 g L.f(G@uy er or Paraeful . 16 S$? LOVISY a Senegal] Rav F*~~

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~~***‘alls oJallakotta Sadi***~~

~~*Rarrakonda*~~

~~*Carabane as ROE pence ; Zighinchor*~~

~~*c.Ro®? ® Cacheo 1z Rr.cac Bis say Qa ad OY, 7,*~~

~~*Be*~~

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~~*Bissagos — ?. Archipelago 7B) 1)*~~

~~*Matakong 1. MellacoréeH Yellaborl.y R.Sterry 7*~~

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~~*English Miles ° .° wo*~~

~~*Map of Senegambia.*~~

~~*little island of Matakong. The coast in the northern part has the same appearance as that of the Sahara,—low, arid, desolate, and dune-skirted, its monotony relieved only here and there by cliffs and plateaus. Farther south it be- comes low, marshy, and clothed with luxuriant vegetation.*~~

~~*Behind the low flat seaboard the country rises into a vast Interior.*~~

~~*plateau terminating eastwards in a mountainous region. Though of no great height, these mountains cover a large area and have numerous ramifications. Farther to the east they sink abruptly towards the Niger valley, while southwards they are prolonged towards Sierra Leone and the interior of Upper Guinea, perhaps forming those Kong Mountains which are said to exist between the ocean and the Niger basin. Under the name of Mounts Badet, Yandi, Maté, Kissi (of which the first form the '" Alps" of Futa-Jallon) they descend on the west by a series of terraces to the plains of Senegambia, and on the north they extend to the left bank of the*~~

~~*Senegal and even throw out some spurs into the desert beyond. The moun- tain region is cut by numerous erosion valleys. As to the general altitude nothing is accurately known, but the fol- lowing points have been determined—Mount Daro, 4068 feet ; Kuruworo, 3868 ; Warnani, 3799; Yenkina, 3560 ; Bogoma, 3524; Pampaya, 3290. The principal rivers are the Senegal, the Salum, the Yombas, the Gambia, the Casamance, the Cacheo, the Geba, the Rio Grande, the*~~

~~*Geology;*~~

~~*Climate.*~~

~~*Flora.*~~

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~~*Cassini, the Compony, the Rio Nufiez, the Rio Pongo, the Dubreka or Konakry, the Forecareah, and the Mellacorée. They all rise in the mountains of the interior or at the foot of the highlands and fall into the Atlantic. Their general direction is from east to west with a south-west deflexion, which becomes always more pronounced as we advance southwards. Unlike these rivers, the. Joliba or NicEr (g.v.), flowing north and north-east, soon passes beyond Senegambia. Lagoons and backwaters are com- mon ; but there are no true lakes of any importance.*~~

~~*The geological constitution of the country is as yet very imper- fectly known, especially in the interior. The low region of the seaboard has a very uniform character. It consists of sandstones or clay rocks and loose beds of reddish soil containing marine shells. At certain points, such as Cape Verd and Cape Roxo, the sand- stones crop out; it is the red colour of the sandstone in fact which has given Cape Roxo or Cap Rouge its name. Clay slates also occur, and at intervals these sedimentary strata are interrupted by basaltic amygdaloid and volcanic rocks. For instance, the island of Gorée is basaltic ; the Bissagos (Bissio) Islands are composed of scoriz and other volcanic products ; and a great part of the coast to the north of Rio Nufiez consists of basaltic and amygdaloid rocks. The base of the mountains is formed in certain places of clay slate, but more generally of granite, porphyry, syenite, or trachyte. In those districts unica*~~

~~*schists and iron ores occur. Iron and gold are found in the mountains and thealluvial deposits. The streams also carry down gold dust. Many of the valleys are covered with fertile soils and there is generally a fertile belt along the river sides; but the rest of the couutry is rather arid and sterile.*~~

~~*The climate is far from being so unhealthy as is frequently asserted. Except when yellow fever is raging, Europeans may live there as satisfactorily as at home. There are two seasons, the dry season and the rainy season or winter, the latter contemporaneous with our summer. Along the seaboard the dry season is cool and agreeable; in the interior it is mild only for the three months which correspond to our winter, and then it becomes a time of in- tolerable heat. The annual temperature increases as we advance south and more rapidly as we advance east into the interior, except, of course, where an ascent is made to higher altitudes. To the south of Cape Verd the changes of temperature become less and less marked ; Bissio has a more equable climate than Gorée. East- wards the monthly range of the thermometer becomes more exten- sive, The maximum readings, which are exceptional at St Louis, become almost the rule at Bakel on the upper Senegal and at MacCarthy on the Gambia. In the north, on the banks of the Senegal, the north-east trade- winds blow for eight months of the year, the daily land and sea breezes which cool the atmosphere along the seaboard not being felt far inland. During the other four months there prevails a gentle south-west monsoon accom- panied with frequent calms, storms, tornadoes, and rains. South- wards along the coast the trade-winds gradually decrease in both strength and duration, while the south-west monsoon becomes more powerful and persistent. The rainy season begins at Gorée between 27th June and 13th July, on the Gambia about 20th June, on the Casamance about the end of May, at the Bissagos Archipelago about the middle of May, and on the Rio Nufiez at the end of April. During this season Senegambia, drenched by heavy rains brought from the ocean, has everywhere one uniform appearance. The mean temperature is thioughout very close on 81° Fahr. and the range of the thermometer is extremely limited. The rivers overflow and flood the lowlands. Storms are frequent. Vegetation displays its fullest energy. The fever exhalations are unfortunately also at their worst. At St Louis, Gorée, Dagana, and all along the Senegal there are 35 days of rain, a slight increase being apparent in the upper course of the*~~

~~*river. At St Mary's, Bathurst, there are 48 days, at Sedhiu 84, at Bissfo 111, at Boké 137,—a steady increase as we approach the equator. The number of storms follows almost the same ratio of increase, and showers which last two or three hours at St Louis give place to whole days of rain on the Casamance and the Rio Nufiez.*~~

~~*The king of the Senegambian trees is the baobab (Adansonia digitata), which sometimes at the height of 24 feet has a diameter of 34 feet and a circumference of 104. Acacias are very numerous, one species, 4. Adansonia, being indeed the commonest of all Sene- gambian trees and valuable for its ship-timber. Among the palm- trees the ronier deserves to be mentioned, as the wood resists moisture and the attacks of insects; in some places, as in Cayor, it forms magnificent forests. The wood of the cailcedra (Khaya senegalensis), a tall tree, is used in joiner's work and inlaying, and its bark furnishes a bitter tonic. The mampatas grows sometimes 100 feet high, its branches beginning only at a height of about 25 feet. The tree producing the famous kola-nut! grows on the banks*~~
~~*——_—ee ee ee ee ee*~~

~~*1 A very complete account of this nut will be found in N achtigal, Sahara und Sudan.*~~

~~*SENEGAMBIA*~~

~~*of the southern streams. It is almost needless to mention the m'bilor, the gonat, the mimosa, fig-trees, orange-trees, cocoa-palms, mango-trees, pomegranates, sycamores, and so on. The dimbh, the neteru, the tiamanoi, the dimbguton, the gologne, the n'tabo yield edible fruits. The cultivated plants are millet, rice, tobacco, haricots, ground-nuts, indigo (wild indigo is also abun- dant), cotton (also found wild), maize, sugar-cane, and the butter- tree or karité.*~~

~~*The Senegambian lion is quite different from the Barbary lion ;: Fauna,*~~

~~*its colour is a deeper and brighter yellow, and its mane is neither so thick nor so long, Other beasts of prey are the lcopard, the wild cat, the cheetah, the civet, and the hyena. The wild boar is clumsier than the European variety. Antelopes and gazelles occur in large herds all through*~~

~~upper Senegambia; the giraffe is common in the region of the upper Senegal; the elephant is rare; the hippopotamus is gradually disappearing. Crocodiles swarm both in the upper Senegal and the upper Niger. Monkeys and apes of different species (the chimpanzee, the colobus, the cynocephalus, &c.), the squirrel, rat, and mouse abound. The hedgehog, marmot, © porcupine, hare, rabbit, &c., are also met with. Among the more noteworthy birds are the ostrich, which migrates to the Sahara; the bustard, occurring in desert and uncultivated districts; the marabout, a kind of stork, with its beak black in the middle and red at the point, which frequents the moist meadow-lands and the lagoons ; the brown partridge, the rock partridge, and the quail in the plains and on the mountain sides; and the guinea-fowl in the thickets and brushwood. Along the coast are caught the sperm whale, the manatee, and the cod-fish. The domestic animals are the horse, ass, ox, sheep, goat, dog, and camel.~~

~~The population of Senegambia cannot be ascertained with any Popula approach to accuracy, but it may be roughly stated at from ten to tion,~~

~~twelve millions. It comprises three distinct races,—the Moor, the Negro, and the European. The Moors, or rather Berbers (Trarzas, Braknas, and Duaish), belong strictly to the right bank of the Senegal and appear in Senegambia only exceptionally. The Negroes form the bulk of the population. They are divided into Pouls (Peuls, Fulbe, Fulah, or Fellatah), Toucouleurs, Man- dingoes, Sarakolés, Wolofs, Sereres, Diolas, Bambaras, Balantes, Biafares, Papels, Nalus, Landumans, Bagas, and Susus. The Pouls inhabit Futa, Damga, Bondu, and Futa-Jallon ; they havea reddish complexion and almost straight hair, their body fairly stout, but their limbs slim. They are gentle and hospitable, but addicted to theft. The Toucouleurs, Poul half-breeds, belonging originally to Futa-Jallon, are similar to the Negro proper ; they are treacherous, warlike, fond of plunder, and fanatical in their Moham- medanism, The Mandingoes or Malinkés inhabit the basins of the upper Niger and the upper Senegal and the western slope of the mountains of Futa-Jallon. They comprise the Mandingo proper, occupying Manding, and the Malinkés and Soninkés, scattered about Bambuk, Buré, and Fuladugu. Under the name of Wakore or Wangara they are also found in all the immense tract which~~

~~*extends to the north of the Kong Mountains. They arc tall of stature and of great muscular strength. The Sarakolés are one of the branches of the Bambara race produced by crossing with the Pows. Their character is mild and pacific. Scattered about in Guoy, Kamera, and Guidimakha, they are fond of trade and engage in it with activity. The Wolofs and the Sereres inhabit the sea- board from St Louis to Cape Verd and the left bank of the Senegal from its mouth to Richard Toll and Dagana. They are tall and robust, with black and glossy skin. Most of them are fetishists. The Diolas have flat noses, thick lips, harsh features, and a promi- nent belly; the body is tattooed. The Bambaras, who have invaded Kaarta and Khasso, have a coppery black complexion and frizzly hair; their cheeks are inarked with deep scars. The Balantes inhabit the left bank of the Casamance; they are as cruel and as fond of pillage as the Mandingoes, but are more generous towards the vanquished. The Biafares live on the banks of the Rio Grande and the Papels in the valley of the Cacheo and the Geba, The Nalus and the Landumans are tributary to the French ports of the Rio Nutfiez and the Rio Pongo. Islam is gradually detaching them from fetishism. The Bagas occupy the coast between the Rio Nutiez and the Rio Pongo. The Susus formerly dwelt on the upper Niger, but they were expelled by the invasion of the Moham- medans and are at the present time settled in the valley of the Rio Pongo. The principal languages of Senegambia are Wolof, Poul, Sereres, Mandingo, and Arabic. Wolof is spoken ina large part of Senegambia, in Wolof, Walo, Cayor, Dakar, Baol, Sine, Salum, and in the towns of St Louis and Gorée. The river Senegal marks the line of separation between Wolof and Arabic. Poul is the lan- guage of the Pouls and the Toucouleurs; Mandingo comprises several dialects,—Malinké, Soninké, Bambara. The few Europeans are mainly civil and military officials or traders. White planters are rare. The natives of Senegambia are generally divided into two quite distinct classes,—freemen and slaves. The griots are a kind of bards or trouvéres who live at the expense of those whose praises they sing. Polygamy is generally practised. Circumcision of the adults of both sexes is a rite accompanied with superstitious*~~

~~*observances. Every canton, every village in independent Sene- gambia is governed either by a chief ("king") or by an "almamy" elected by a group of villagers.*~~

~~*Senegambia is divided into French Senegambia (with the terri- tories placed under French protection), English Senegambia, Portu- guese Senegambia, and independent Senegambia, comprising the native states not under the protection of a European power. French Senegambia is called the colony of SENEGAL (¢.v.). English Senegambia comprises the establishments of the GAmBIA (q.v.) and the islands of Los. Portuguese Senegambia consisted till quite recently of Bissagos Archipelago and the " factories" of Zighinchor on the Casamance, Cacheo and Farim on the Rio Cacheo, and Geba on the Geba. By an arrangement effected in 1886 Portugal ceded Zighinchor to France in exchange for Massabé on the Loango coast. Germany, which seemed at one time disposed to place various territories of Dubreka, Koba, and Kabitai under its protection, las formally abandoned the plan. The independent states are not very numerous, but for the most part they are more extensive than the protected countries. They were quite recently —Jolof, lying be- tween the Senegal and the Gambia in one direction and between the Falemé and the ocean in the other; Buré in the Mandingo region, a territory abounding in gold; Guidimakha in Gangara, on the right bank of the Senegal. There still remain among the more important Kaarta, the country of Segu, and Futa-Jallon.*~~

~~*Several lines of English, French, and German packets call at the Senegambian ports, and small steamers ascend the navigable por- tions of the rivers. A railway unites St Louis and Dakar, and another line is being constructed from Kayes to Bafulabé (on the upper Senegal), with a projected extension to Bammako. There is telegraphic communication between Dakar and St Louis, and a second line puts all the ports of the upper Niger and the left bank of the Senegal into connexion with St Louis, which has touch of Europe by means of a submarine cable passing by way of the Canary Islands to Cadiz. The foreign trade of Senegambia consists in the exportation of gums, ground-nuts, sesame, oil, india-rubber, birds' feathers, hides, wax, and ivory, coffee from the Rio Nufiez, and rice from the Casamance, and the importation of iron, alcoholic*~~

~~*liquors, firearms, ammunition, coral, beads, tobacco, preserved foods, and blue calico (guinée). (Dk)*~~

~~*SENICR, Nassau Wirr1am (1790-1864), English political economist, was born at Compton, Berks, on 26th September 1790, the eldest son of the Rev. J. R. Senior, vicar of Durnford, Wilts. IIe was educated at Eton and Magdalen College, Oxford; at the university he was a private pupil of Richard Whately, afterwards archbishop of Dublin, with whom he remained connected by ties of lifelong friendship. IIe took the degree of B.A. in 1811, was called to the bar in 1819, and in 1836, during the chancellorship of Lord Cottenham, was appointed a master in chancery. On the foundation of the professorship of political economy at Oxford in 1825, Senior was elected to fill the chair, which he occupied till 1830, and again from 1847 to 1852. In 1830 he was requested by Lord Melbourne to inquire into the state of combinations and strikes, to report on the state of the law, and to suggest improvements in it. IIe was a member of the Poor Law Inquiry Commission of 1832, and of the IIandloom Weavers Commission of 1837; the report of the latter, published in 1841, was drawn up by him, and he embodied in it the substance of the report he had prepared some years before on combinations and strikes. IIe was also one of the commissioners appointed in 1861 to inquire into popular education in England. In the later years of his life, during his visits to foreign countries, he studied with much care the political and social phenomena they exhibited. Several volumes of his journals have been pub- lished, which contain much interesting matter on these topics, though the author probably rated too highly the value of this sort of social study. Senior was for many years a frequent contributor to the Edinburgh, Quarterly, London, and North British Reviews, dealing in their pages with literary as well as with economic and political sub- jects. IIe died at Kensington on 4th June 1864.*~~

~~*IIis writings on economic theory consisted of an article in the Encyclopedia Metropolitana, afterwards separately published as An Outline of the Science of Political Economy (1836, 3d ed. 1854), and his lectures delivered at Oxford. Of the latter the following were printed—An Introductory Lectwre (1827, 3d ed. 1831); Two Lec-*~~

tures on Population, with a correspondence between the author and Malthus (1831); Three Lectures on the Transmission of the Precious Metals from Country to Country, and the Mercantile Theory of Wealth (1828) ; Three Lectures on the Cost of obtaining Money and on some Effects of Private and Government Paper Money (1880); Three Lectures on Wages and on the Effeets of Absentceism, Machin- ery, and War, with a Preface on the Causes and Remedies of the Present Disturbances (1830, 2d ed. 1831); 4 Lectwre on the Produc- tion of Wealth (1847); and Four Introdwetory Lectures on Political Economy (1852). Several of his lectures were translated into French by M. Arrivabéne under the title of Principes Fondamentaux a' Economie Politique (1835). Senior also wrote on administrative and social questions—A Letter to Lord Howick on a Legal Provision Sor the Irish Poor, Commutation of Tithcs, and a Provision for the Irish Roman Catholic Clergy (1831, 3d ed. 1832, with a preface containing suggestions as to the measures to be adopted in the "present emergency"); Statement of the Provision for the Poor and of the Condition of the Labouring Classes in a considerable portion of America and Europe, being the Preface to the Foreign Communi- cations in the Appendia to the Poor Law Report (1835); On National Property, and on the Prospects of the Present Administration and of their Successors (anon. ; 1835); Letters on the Factory Act, as it affects the Cotton Manufacture (1837) ; Suggestions on Popular Edu- cation (1861); American Slavery (in part a reprint from the Edin- burgh Review; 1862); An Address on Education delivered to the Social Science Association (1863). His contributions to the reviews were collected in volumes entitled Hssays on Fiction (1864) ; Bio- graphical Sketches (1865, chiefly of noted lawyers) ; and Historical and Philosophical Essays (1865). In 1859 appeared his Journal kept in Turkey and Greece in the Autumn of 1857 and the Beginning of 1858; and the following were edited after his death by his daughter—Journals, Conversations, and Essays relating to Ireland (1868) ; Jowrnals kept in France and Italy from 1848 to 1852, with a Sketch of the Revolution of 1848 (1871) ; Conversations with Theers, Guizot, and other Distinguished Persons during the Sccond Limpire (1878) ; Conversations with Distinguished Persons during the Second Empire, from 1860 to 1868 (1880) ; Conversations and Journals in Egypt

~~*and Malta (1882); also in 1872 Correspondence and Conver- sations with Alexis de Tocqueville from 1884 to 1859.*~~

~~*Senior's literary criticisms do not seem to have cver won the favour of the public; they are, indeed, somewhat formal and academic in spirit. The author, while he had both good sense and right feeling, appears to have wanted the deeper insight, the geniality, and the catholic tastes which are necessary to make a critic of a high order, especially in the field he chose, that, namely, of imaginative literature. THis tracts on practical politics, though the theses they supported were sometimes questionable, were ably written and are still worth reading, but cannot be said to be of much permanent interest. But his name will continue to hold an honourable, though secondary, place in the history of political economy. Senior regards a ee economy as a purely deductive science, all the truths of which are inferences from four elementary propositions. It is, in his opinion, wrongly supposed by J. 8. Mill and others to be a hypothetic science,—founded, that is to say, on postulates not corresponding with social realities. The premises from which it sets out are, according to him, not assumptions but facts. It concerns itself, however, with wealth only, and can therefore give no practical counsel as to political action : it can only suggest considerations which the politician should keep in view as elements in the study of the questions with whicli he has to deal. The con- ception of economics as altogether deductive is certainly erroneous, and puts the science from the outset on a false path. But de- duction has a real, though limited, sphere within it. Hence, though the chief difficulties of the subject are not of a logical kind, yet accurate nomenclature, strict definition, and rigorous reasoning are of great importance. To these Senior has given special atten- tion, and, notwithstanding occasional pedantries, with very useful results. He has in several instances improved the forms in which accepted doctrines were habitually stated. He has also done ex- cellent service by pointing out the arbitrary novelties and frequent inconsistencies of terminology which deface Ricardo's principal work,—as, for example, his use of "value" in the sense of " cost of production," and of "high" and "low" wages in the sense of a certain proportion of the product as distinguished from an absolute amonnt, and his peculiar employment of the epithets "fixed" and "circulating" as applied to capital. He shows, too, that in numerous instances the premises*~~

~~assumed by Ricardo are false. Thus he cites the assertions that rent depends on the difference of fertility of the different portions of land in cultivation; that the labourer always receives precisely the necessaries, or. what custom leads him to consider the necessaries, of life; that, as wealth and population advance, agricultural labour becomes less and less pro- portionately productive ; and that therefore the share of the pro- duce taken by the landlord and the labourer must constantly in- crease, whilst that taken by the capitalist must constantly diminish ; and he denies the truth of all these propositions. Besides adopting some terms, such as that of "natural agents," from Say, Senior~~

~~introduced the word " abstinence "—which, though obviously not free from objection, is for some purposes uscful—to express the conduct of the capitalist which is remunerated by interest ; but in defining "cost of production " as the sum of labour and abstinence necessary to production he does not seem to see that an amount of labour and an amount of abstinence are disparate, and do not admit of reduction to a common quantitative standard. He has added some important considerations to what had been said by Smith on the division of labour. He distinguishes usefully between the rate of wages and the price of labour. But in seeking to deter- mine the law of wages he falls into the error of assuming a deter- minate wage-fund, and states as an economic truth what is only an identical proposition in arithmetic. Whilst entertaining such an exaggerated estimate of the services of Malthus that he extra- vagantly pronounces him "as a benefactor of mankind on a level with Adam Smith," he yet shows that he modified his opinions on population considerably in the course of his career, regards his statements of the doctrine with which his name is associated as vague and ambiguous, and asserts that, "in the absence of disturb- ing causes, subsistence may be expected to increase in a greater ratio than population." It is urged by Périn, and must, we think, be admitted, that by his isolation of economics from morals, and his assumption of the desire of wealth as the sole motive-force in the economic domain, Senior has, in cgmmon with most of the other followers of Smith, tended to set up egoism as the legitimate ruler and guide of practical life. It is no sufficient answer to this charge~~

~~*that he makes formal reserve in favour of higher ends. From the scientific side, Cliffe Leslie has abundantly proved the unsubstantial nature of the abstraction implied in the phrase " desire of wealth," and the inadequacy of such a principle for the explanation of economic phenomena. (Ua KS 1b)*~~

~~*SENLIS, a town of France, in the department of Oise, lies on the right side of the Nonette, a left-hand affluent of the Oise, 34 miles north-north-east of Paris by the Northern Railway on the branch line (Chantilly-Crépy) connecting the Paris-Creil and Paris-Soissons lines. In 1881 it had only 6870 inhabitants ; but its antiquity, its historical monuments, and its situation in a beautiful valley, in the midst of the three great forests of Hallatte, Chantilly, and Ermenonville, render it interesting. Its Gallo-Roman walls, 23 feet high and 13 feet thick, are, with those of St Lizier (Ariege) and Bourges, the most perfect in France. They enclose an oval area 1024 feet long from east to west and 794 feet wide from north to south. At each of the angles formed by the broken lines of which the circuit of 2756 feet is composed stands or stood a tower ; number- ing originally twenty-eight, and now only sixteen, they are semicircular in plan, and up to the height of the wall are unpierced. The Roman city had only two gates; the present number is five. The site of the prztorium was afterwards occupied by a castle occasionally inhabited by the kings of France from Clovis to HHenry IV. and still represented by ruins dating from the 11th, 13th, and 16th centuries. In the neighbourhood of Senlis the foundations of a Roman amphitheatre, 138 feet by 105, have also been discovered. The old cathedral of Notre Dame (12th, 13th, and 16th centuries) was begun in 1155 on a vast scale ; but owing to the limited resources of the diocese progress was slow and the transept was finished only under Francis I. The total length is 269 feet, but the nave (98 feet high) is Shorter than the choir. At the west front there are three doors and two bell towers. The right-hand tower (256 feet high) is very striking: it consists, above the belfry stage, of a very slender octagonal drum with open-work turrets and a spire with eight dormer windows. The left- hand tower, altered in the 16th century, is crowned by a balustrade and a sharp roof. In the side portals, especi- ally in the southern, the flamboyant Gothic is displayed in all its delicacy. Externally the choir is extremely simple. In the interior the sacristy pillars with capitals of the 10th century*~~

~~*are noteworthy. The episcopal palace, now an archeological museum, dates from the 13th century; the old collegiate church of St Frambourg was rebuilt in the 12th century in the style which became characteristic of*~~

~~*the "saintes chapelles" of the 13th and 14th centuries; St_*~~

~~*Pierre, though enclosed by cavalry barracks, has preserved*~~

~~*SHEN—SEN*~~

~~*its two towers. The ecclesiastical college of St Vincent, occupying the old abbey of this name, has a very elegant church, the date of which has been greatly disputed by archeologists, who sometimes wrongly refer it to Queen Anne of Russia. The town-house and several private houses are also of architectural interest.*~~

~~*Senlis can be traced back to the Gallo-Roman township of the Silvanectes which afterwards became Augustomagus. Christianity was introduced by St Rieul at the close of the 3d century. During the first two dynasties of France Senlis was a royal residence. After the dismemberment of the Carlovingian empire it belonged to the counts of Vermandois and then to the royal domain, and obtained a communal charter in 1173. Its bishop, Guérin, elected in 1214, signalized himself at the battle of Bouvines. The burgesses took part in the Jacquerie of the 14th century, then sided with the Burgundians and the English, whom, however, they afterwards expelled. The Leaguers were there beaten by the duke of Longue- ville and La Noue. In the time of HIenry IV. the local manufac- tures employed 200 masters and 4000 men, but all industrial activity has now disappeared. The bishopric was suppressed at the Revolu- tion, and this suppression was confirmed by the Concordat.*~~

~~*SENNA (Arab. sand), a popular purgative, consisting of the leaves of two species of Cassia, viz., C'. acutifolia, Del., and C. angustifolia, Vahl. C. acutifolia is a native of many districts of Nubia, e.g., Dongola, Berber, Kordofan, and Senaar, but is grown also in Timbuctoo and Sokoto. The leaflets are collected twice a year by the natives, the principal crop being gathered in September after the rainy season and a smaller quantity in April. The leaves are dried in the simplest manner by cutting down the*~~

~~*shrubs and exposing them on the rocks to the burning sun until quite dry. The leaflets then readily fall off and are packed in large bags made of palm leaves, and holding about a quintal each. These packages are conveyed by camels to Assouan and Darao and thence to Cairo and Alexandria, or by ship by way of Massowah and Suakim. The leaflets form the Alexandrian senna of commerce. Formerly this variety of senna was much adulterated with the leaves of Solenostemma Argel, Hayne, which, however, are readily distinguishable by their minutely wrinkled surface. Of late years Alexandrian senna has been shipped of much better quality. Occasionally a few leaves of C. obovata, Coll., may be found mixed with it. C. angustifolia affords the Bombay, East Indian, Arabian, or Mecca senna of commerce. This plant grows wild in the neighbourhood of Yemen and Hadramaut in the south of Arabia, in Somali Land, and in Sind and the Punjab in India. The leaves are chiefly shipped from Mocha, Aden, Jeddah, and other Red Sea ports to Bombay and thence to Europe, the average imports into Bombay amounting to about 250 tons annually, of which one-half is re-exported. Bombay senna is very inferior in appearance to the Alexandrian, as it frequently contains many brown and decayed leaflets and is mixed with leaf-stalks, &c. C. angustifolia is also cultivated in the extreme south of India, and there affords larger leaves, which are known in commerce as Tinnevelly senna. This variety is carefully collected, and consists almost exclusively of leaves of a fine green colour, without any admixture of stalks. It is exported from Tuticorin.*~~

~~*Senna appears to have been introduced into Europe about the 9th century by Arabian physicians, by whom, however, the pods seem to have been preferred to the leaves. The medicinal activity of senna leaves appears to be due to a very unstable colloid glucoside to which the name of cathartic acid has been given. It is readily decomposed by a temperature much below 100° Fahr. (Pharm. Jour. Trans., [3], Xv. : 704), and hence cold preparations of senna are the most active. In the free state it is soluble in dilute alcohol and in water, forming a brown solution, but is almost insoluble in strong alcohol and entirely so in ether and chloroform. Combined with ammonia it forms an active purgative. Two bitter principles named sennacrol and senna-picrin have been extracted from senna by Ludwig; the former is soluble and the latter insoluble in ether. A*~~

~~*yellow colouring matter has also been obtained from senna, but it appears probable that it is only a decomposition product of cathar- tic acid. Senna must be included among the irritant purgatives, since cathartic acid has no aperient effect when injected into the*~~

~~*SEN—S EO*~~

~~*blood. Ovwving to its colloid character, it is absorbed with difficulty, and its action is thus exerted throughout the greater part of the intestinal canal.*~~

~~*SENNACHERIB. See Basytonta, vol. iii. p. 187, and IsRaEL, vol. xili. p. 413 sq.*~~

~~*SENNAR. See Sznaar.*~~

~~*SENS, a town of France, chef-lieu of an arrondissement in the department of Yonne, lies on the right side of the Yonne near its confluence with the Vanne, and on the railway from Paris to Lyons, 70 miles south-east of the former city at the intersection of the line from Orleans to Troyes. It derives its importance from its autiquity and its archiepiscopal see. The cathedral of St Etienne occu- pies the site of an ancient temple on which St Savinian is said to have built, at the close of the 3d century, a little church consecrated to the Virgin. The present Gothic cathedral, erected between 1122 and 1168, subsequently underwent alteration in the 13th century and again under Louis XII. The west front measures 154 fcet in breadth ; the middle portal has good sculptures, representing the parable of the virgins and the story of St Stephen. The right-hand portal contains twenty-two remarkable statuettes of the prophets, which have suffered considerable injuries. Above this portal rises the stone tower, decorated with armorial bearings and with statues representing the prin- cipal benefactors of the church. The bells in the cam- panile, by which the tower is surmounted, enjoyed immense reputation in the Middle Ages; the two which still remain, La Savinienne and La Potentienne, weigh respectively 15 tons 7 cwts and 13 tons 13 ewts. The left portal is adorued with two bas-reliefs, Liberality and Avarice, as well as with the story of John the Baptist. The portal on the north side of the cathedral is one of the finest examples of French 16th-*~~

~~*century sculpture. Glass windows of the 12th to the 16th century are preserved, some of them representing the legend of St Thomas of Canterbury. Among the interior adornments are an altarpiece finely carved in stone, the tomb of the dauphin (son of Louis XV.) and his consort, Marie Joséphe of Saxony, one of the masterpieces of Coustou, and bas-reliefs from the mausoleum of Cardinal Duprat. The treasury contains a fragment of the true cross presented by Charlemagne, and the vestments of St Thomas of Canterbury. It was in the cathedral of Sens that St Louis, in 1234, married Marguerite of Pro- vence, and five years later deposited the crown of thorns. The official buildings of the cathedral, dating from the 13th century, have been restored by Viollet-le-Duc. The old judgment-hall and the dungeons had remained intact ; in the first story is the synod hall, vaulted with stone and lighted by beautiful grisaille windows. A Renaissance structure connects the buildings with the archiepiscopal palace, which also dates from that period. The oldest of the other churches of Sens is St Savinian, the foundation of which dates from the 3d century, while the crypt is of the early part of the 11th, and the upper portions of the bell-tower of the first years of the 13th. The contents of the museum of sculptured stones have been mainly derived from the old fortifications, which were themselves con- structed during barbarian invasion from the ruins of public monuments. The only town gate still preserved is that kuown as the dauphin's (1777). In the public library are a number of MSS. and a famous missal with ivory covers. The chemist Thenard has his statue in the town. The population in 1881 numbered 13,440.*~~

~~*Sens, when the capital of the Senones, one of the most powerful peoples of Gaul, bore the name of Agenticum. It was not finally subdued by the Romans till after the defeat of Vercingetorix. On the division of Gaul into seventeen provinces under the emperor Valens, Agenticum became the metropolis of the 4th Lugdunensis. Theatres, circuses, amphitheatres, triumphal arches, and aqueducts*~~

~~*were all built in the town by the Romans. It was the meeting point of six great highways. The inhabitants, converted to Chris-*~~

~~*tianity by the martyrs Savinian and Potentian, held out against the Alemanni and the Franks in 356, against the Saracens in 731 or 738, and finally against the Normans in 886,—the last having be- sieged the town for six months. At the commencement of the feudal period Sens was governed by counts, who had become here- ditary towards the middle of the 10th century; and the contests of these counts with the archbishops or with their feudal superiors often led to much bloodshed and disaster. Several councils were held at Sens, notably that at which St Bernard and Abelard met. The burgesses in the middle of the 12th century formed a defensive association which earried on war against the clergy, and Philip Augustus restored the commune. In the ardour of its Catholicism Sens massacred the Protestants in 1562, and it was one of the first towns to join the League. Henry IV. did not effect his entrance till 1594, and he then deprived the town of its privileges. In 1622 Paris, hitherto suffragan to Sens, was made an archbishopric, and the bishoprics of Chartres, Orleans, and Meaux were transferred to the new jurisdiction. In 1791 the archbishopric was reduced to a bishopric of the department of Yonne. Suppressed in 1801, the see was restored in 1807 with the rank of archbishopric. The town was occupied by the invaders in 1814 and 1870-71.*~~

~~*SENSITIVE PLANT. See Mmosa; comp. Prysio- LOGY, vol. xix. p. 62.*~~

~~*SEONTI, or SEonEE, a British district of India, in the Central Provinces, lying between 21° 36' and 22° 58' N. lat. and 79° 14' and 80° 19' E. long., with an area of 3247 square miles, is bounded on the N. by Jabalpur, on the E. by Mandla and Balaghat, on the S. by Nagpur and Bhan- dara, and on the W. by Narsinhpur and Chhindwara. Seoni is a portion of the upland tract formed by the Satpura Hills which extend along the south bank of the Narbada& (Nerbudda) from the plains of Broach on the west to the Maikal range in the east; and it is remarkable for the beauty of its scenery and the fertility of its valleys. The northern and western portions of the district include the plateaus of Lakhnddon and Seoni; the eastern section consists of the watershed and elevated basin of the Wain- ganga; and in the south-west is a narrow strip of rocky land known as Dongartél. The plateaus of Seoni and Lakhnadon vary in height from 1800 to 2000 feet; they are well cultivated, clear of jungle, and their temperature is*~~

always moderate and healthy. Geologically the north part of Seoni consists of trap hills and the south of crystal- line rock. The soil of the plateaus is the rich black cotton soil formed by disintegrated trap, of which about two-thirds of the district are said to consist, but towards the south, where cliffs of gneiss and other primitive formations occur, the soil is silicious and contains a large proportion of clay. Seoni is hilly throughout, the hills for the most part being clothed with small stunted trees; but in the valleys and on the plateaus forest trees are very thinly scattered and are seldom of large size. The chief river of the district is the Wainganga, with its affluents the Hiri, Sagar, Theli, Bijnd, and Thanwar ; other streams are the Timar and the Sher, affluents of the Narbadé. The average annual rain- fall is about 50 inches.

The census of 1881 returned the population of Seoni district at 334,733 (males 167,925, females 166,808) ; of these 179,705 were Hindus, 13,442 Mohammedans, 99 Christians, and 139,444 abori- ginals. SEONI (g.v.) is the only town with a population exceeding 10,000. Of the total district area of 3247 square miles only 1098 are cultivated, and of the portion lying waste 613 are returned as cultivable. Wheat forms the staple crop; rice and other food-grains are also extensively grown; and among miscellaneous products are cotton, fibres, and sugar-cane. In 1888-84 the gross revenue of Seoni amounted to £35,419, of which the land-tax yielded £15,379. Trade is chiefly carried on by means of markets in the towns. Manufactures consist of coarse cloth and some pottery of superior quality made at Kanhiwara. At Khawasa, in the midst of the forest, leather is beautifully tanned. 'The only means of communi- cation is by road, the aggregate length of which is estimated at 90 miles. Seoni came under Lritish rule early in the 19th century, on the downfall of the Nagpur power, and it was formed into a separate district in 1861.

SEONI, principal town and administrative headquarters of the above district, is situated in 22° 5' 30" N. lat. and 79° 35' E. long., midway between Nagpur and Jabalpur.

~~*It was founded in 1774 by Mohammed Amin Khan, and contains large public gardens, a fine market-place, and a handsome tank. In 1881 the population was 10,203. SEPIA is a valuable and much used deep brown pig- ment obtained from the ink-sacs of various species of CUTTLE-FISH (g.v.) ; that from which it is principally ob- tained is Sepia officinalis, a native of the Mediterranean, and especially abundant in the upper parts of the Adriatic, where it is a prized article of food. To obtain sepia the ink-sac is, immediately on the capture of the anizmal, ex- tracted from the body and speedily dried to prevent putre- faction. The contents are subsequently powdered, dissolved in caustic alkali, and precipitated from the solution by neutralizing with acid. The precipitate after washing with water is ready to make up into any form required for use. Sepia-bone or euttle-bone consists of the internal "shell" or skeleton of Sepia oficinalis and other allied species, It isan oblong-convex structure from 4 to 10 inches in length and 1 to 8 inches in greatest width, consisting internally of a highly porous cellular mass of carbonate of lime with some animal matters covered by a hard thin glassy layer. It is used principally as a polishing*~~

~~*material and for tooth powder, and also as a moulding material for fine castings in precious metals.*~~

~~*SEPOY, the usual English spelling of s¢péhi, the Persian and Urdu term for a soldier of any kind. The word sipdh, "army," from which sipdhi, "soldier," is derived, corre- sponds to the Zend ¢gpddha, Old Persian ¢pdéda, and has also found a home in the Turkish, Kurdish, and Pashto (Pushtu) languages (see Justi, Handbuch der Zendsprache, p. 303, 6), while its derivative is used in all Indian verna- culars, including Tamil and Burmese, to denote a native soldier, in contradistinction to gord, 'a fair-complexioned (European) soldier." Towards the middle of the 18th century efforts were made by the East India Company to train natives of good caste, both Hindus and Mohammedans, for military service under the company. Though they were made to use the musket, they remained for some time chiefly armed in the fashion of the country, with sword and target ; they wore the Indian dress—the turban, vest, and long drawers—and were provided with native officers under English superior command. Under their European leaders they were found to do good service and to*~~

~~*face danger with constancy and firmness. In the progress of time a considerable change took place, and natives of every de- scription were enrolled in the service. Though some corps that were almost entirely formed of the lowest classes achieved considerable reputation for valour in the field, it was not considered safe to encourage the system ; and the company reverted to their practice of recruiting from none but the most respectable classes of native society. It is on record that a corps of 100 sepoys from Bombay and 400 from Tellicherry joined the army at Madras in 1747, that the regular sepoys at Madras were employed in the defence of Arcot (1751), and that a company of Bombay sepoys were present at the victory of Plassey.*~~

~~*For instances of the early occurrence of the word see Burnell and Yule's Glossary of Anglo-Indian Terms, s.v. On the history of the sepoys compare Captain Williams's Historical Account of the Rise and Progress of the Bengal Infantry (London, 1817); Captain Broome's History of the Rise and Progress of the Bengal Army (Calcutta, 1850) ; Colonel Wilson's History of the Madras Army*~~

~~*(London, 1882-85, in 3 volumes); No. xxxvi. of the Quarterly Review; and the military histories of India generally.*~~

~~*SEPTEMBER, the seventh month of the old Roman year, had thirty days assigned to it. By the Julian arrangement, while retaining its former name and number of days, it became the ninth month. The Ludi Magni (Ludi Romani) in honour of Jupiter, Juno, and Minerva began on the 4th of September. The principal ecclesias- tical feasts falling within the month are—the Nativity of the Blessed Virgin on the 8th, the Exaltation of the Holy Cross on the 14th, St Matthew the Apostle on the 21st, and St Michael the Archangel on the 29th. September*~~

~~*S E P—S EP*~~

~~*was called "harvest month" in Charlemagne's calendar, and it corresponds partly to the Fructidor and partly to the Vendémiaire of the first French republic.*~~

~~*SEPTICAIMIA. After a wound, whether the result of accident or of operation by the surgeon, blood-poisoning may occur. Sepsis or putrefaction in the wound is the most evident local condition which has been associated by clinical observers with blood-poisoning, and hence the term "septicemia." Within recent years the relation of micro- organisms to the different forms of blood-poisoning has come prominently into notice; putrefaction is now known to be only one of the fermentative changes due to the presence of certain micro-organisms in a wound, and it is admitted that there are many organisms which, when they enter a wound, may give rise there to fermentative changes that are non-putrefactive. (See ScHIZOMYCETES.)*~~

~~*Organisms have recently been divided into two great groups,—those which can only grow in dead or decaying matter and those which can grow in the living tissues and in the blood, which in this relation must be looked upon asa tissue. The first group has been termed 'sapro- phytic." The second group may be termed "pathogenic," to distinguish them from the saprophytic variety. But no distinct line of demarcation can yet be drawn between these two groups, and as a matter of fact some patho-genic organisms may equally with the saprophytic find a pabulum in dead and decaying matter. Yet there can be no doubt that the more common varieties of septic organisms or saprophytes can only grow in dead or decaying matter, and that the living tissues, more especially when their power of vitality is great, are able to resist and destroy the saprophytes. There are also some organisms which, as far as is known at present, may be innocuous and give rise to no symptoms, local or general, when they are implanted in the human body. When an organism finds in the tissues a fit pabulum for its growth and devel- opment, the elements in the tissue are broken up, and the products are termed a "ptomaine" (rrOpa), This ptomaine may irritate the wound and prevent healing; it nay also be absorbed into the blood and poison it, hence the term "ptomaine poisoning." Both the saprophytic and the pathogenic organism may form a ptomaine in the wound. When the wound is due to a saprophyte the absorption of the ptomaine has been termed "sapreemia"; the ptomaine of the saprophyte has been called 'sepsin." No special name has yet been given to the ptomaine formed in the wound by the pathogenic organism; nor has any name been given to the condition due to the absorption of the*~~

~~*ptomaine formed by the pathogenic organism. Our knowledge is not yet sufficient to enable us to separate these two varieties of ptomaine poisoning. There can, however, be little doubt that they do exist as separate conditions, and also there can be little doubt that in some instances both forms of poisoning may be present at one and the same time.*~~

~~*The pathogenic organism, however, has another power which gives rise to an entirely separate condition. Not only may it form its ptomaine in the wound, but the organism itself can enter into and be carried by the blood-stream and lymph-stream to distant parts. It can live in the blood or lymph-stream and can grow there: it may be arrested in the capillaries of the blood-vessels, or in the lymphatic glands of the lymph-vessels, and in these situa- tions may form, so to speak, a colony of organisms which develop and form ptomaines; and the ptomaines, passing into the blood, may still further poison the patient. This power of the pathogenic organism is infective, and the term "infection" has been applied to the process. These colonies or secondary foci of infection often go on to sup- puration; hence the term "secondary" applied to the*~~

~~*abscesses which have long been observed in some forms of blood-poisoning. It was at one time thought that the pus-cells in the original wound passed into the blood, and, being caught in the capillaries, were the cause of the abscess-formation in the parts distant from the wound ; hence the term " pyeemia" or pus in the blood. The pus- cells may enter the blood-stream ; it is not, however, the cellular element that is the essence of the condition, but the organism which the cellular element may carry along with it. The hectic condition observed in a case of long-continued suppuration is in all probability a chronic form of blood-poisoning. In very acute cases, in which the poison is either concentrated, virulent, or in large quantity, death may occur within a very few hours. In other cases the condition may become chronic, and if the strength of the patient can be kept up by stimulants recovery often takes place. The chances of recovery are much greater when the condition is not truly an infective one. When the manufactory of the ptomaine is only in the*~~

~~*wound, the organism may be there destroyed by the use of power- ful antiseptics or antifermentatives. The primary cause being removed, the patient may then be saved. When, however, the pathogenic organism gets into the blood- stream and distant foci of infection are formed, the chances of ultimate recovery are greatly diminished. Various un- successful attempts have been made by the internal admi- nistration of antifermentatives so to alter the blood that the micro-organism cannot find in it or the tissues a fit nidus. The point to attend to is to prevent organismal fermentation in wounds by careful antiseptic or rather antifermentative precautions. Just as the word "septic- emia" has a more general application than can now be strictly allowed if we look to the derivation of the word and the present state of our knowledge, so the word "antiseptic" is applied to all substances which prevent organismal fermentation, although many of these organisms are undoubtedly non- septic in their character.*~~

~~*SEPTUAGINT. The Septuagint (of, LXX.) or Alex- andrian version of the Old Testament seems to be named from the legend of its composition by seventy, or more exactly seventy-two, translators. In the Letter of Aristeas (Aristzeus)} this legend is recounted as follows. Demetrius Phalereus, keeper of the Alexandrian library, proposed to King Ptolemy II. Philadelphus to have a Greek translation of the Jewish law made for the library. The king con- sented and sent an embassy, of which the author of the letter was a member, to the high priest Eleazar at Jeru- salem asking him to send six ancient, worthy, and learned men from each of the twelve tribes to translate the law for him at Alexandria. Eleazar readily consented and sent the seventy-two men with a precious roll of the law. They were most honourably received at the court of Alexandria and conducted to the island (Pharus), that they might work undisturbed and isolated. When they had come to an agree- ment upon a section Demetrius wrote down their version ; the whole translation was finished in seventy-two days. The Jewish community of Alexandria was allowed to have a copy, and accepted the version officially,—indeed a curse was laid upon the introduction of any changes in it.*~~

~~*There is no question that this Letter is spurious.? Aristeas is represented as a heathen, but the real writer must have been a Jew and no heathen.*~~

~~*Aristeas is repre- sented as himself a member of the embassy to Eleazar ; but the author of the Zetter cannot have been a contem- porary of the events he records, else he would have known*~~

~~*1 Edited by 8. Schard (Frankfort, 1610), by Havercamp (in his Josephus), and by M. Schmidt (in Merx's Archiv, 1868). Comp. Lum- broso, in the Transactions of the Turin Academy, 1869.*~~

- ~~*Scaliger, In Eus. Chron. animadv., No. 1784; H. Hody, De Bibli- orum Textibus Originalibus.*~~

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~~*that Demetrius fell out of favour at the very beginning of the reign of Philadelphus, being said to have intrigued against his succession to the throne.3 Nor could a genuine honest witness have fallen into the absurd mistake of making delegates from Jerusalem the authors of the Alex- andrian version. The forgery, however, is a very early one. "There is not a court-title, an institution, a law, a magis- tracy, an office, a technical term, a- formula, a peculiar phrase in this letter which is not found on papyri or in- scriptions and confirmed by them."+ That in itself would not necessarily imply a very early date for the piece; but what is decisive is that the author limits canonicity to the law and knows of no other holy book already translated into Greek. Further, what he tells about Judea and Jeru- salem is throughout applicable to the period when the Ptolemies bore sway there and gives not the slightest sug- gestion of the immense changes that followed the conquest of Palestine by the Seleucids, Thus, too, it is probable that the Jewish philosopher Aristobulus, who lived under Pto- leniy Philometor (180-145), derived his account of the origin of the LXX. from this Letter, with which it corresponds.*~~

~~*If now the Letter is so old, it is incredible that it should contain no elements derived from actual tradition as to the origin of the LXX., and we must try to separate these from the merely fabulous. To this end we must consider what is the main aim and object of the forgery. The chief thing in the Letter is the description of a seven days' symposium of the seventy translators at the Alexandrian court, during which each of them*~~

~~*has a question to answer, and raises the admiration of the king for the wisdom produced among the Jews by their knowledge of the law. Further, very great weight is laid on the point that the LXX. is the official and authoritative Bible of the Hellenistic Jews, having been not only formally accepted by the synagogue at Alexandria but authorized by the high priest at Jerusalem and the seventy elders who are in fact its authors. Other matters receive no special emphasis, and the presumption is that what is said about them is not deliberate fiction and in part at least is true. Thus it has always been taken as a fact that the version originated at Alexandria, that the law was translated first, and that this took place in the time of Ptolemy II. On the other hand, it has been thought difficult to believe that the scholarly tastes of the Alexandrians, personified in Deme- trius Phalereus as the presiding genius of the Alexandrian library, could have furnished the stimulus to reduce the translation to writing. One can hardly call this intrinsic- ally improbable in view of the miscellaneous literary tastes of the court of the Ptolemies. But it has been thought much more likely that the Septuagint was written down to satisfy the religious needs of the Jews by a translated Torah, since in fact the version is fitted for Jews and could have been intelligible only to them, and indeed never came to be circulated and known outside of their circles. Here, however, we must distinguish between written and oral interpretation. If interpretation was needed in the syna- gogue service, it was an oral interpretation that was given. It was not a natural thing for the Jews to write the trans- lation,—indeed they had religious scruples against such a course. Only "Scripture" was to be written, and to put the contents of Scripture in writing in any other than the old holy form was deemed almost a profanation,—a feeling of which there is evidence in the Letter itself.6 It is well*~~

~~*3 Hermippus Callimachius, ap. Diog. Laert., v. 78.*~~

~~*4G. Lumbroso, Recherches sur Econ. Pol. de U Egypte sous les Lagides (Turin, 1870), p. xiii.*~~

~~*° Clem. Alex., Strom., i. p. 842, ed. Sylb.; Euseb., Prep. Ev., ix. 6, p. 410 sg. ; comp. Valckenaer, Diatribe de Aristobulo, Leyden, 1806, reprinted in Gaisford's ed. of the Prep. Ev.*~~

~~§ In what is told of the authors Theopompus and Theodectes, who ventured to insert certain things out of the law in their profane works.~~

~~668 Shera we~~

~~known how in Palestine the Targum was handed down orally for centuries before it was at last reduced to writing; and, if, on the contrary, at Alexandria a written version came into existence so early, it is far from improbable that this was due to some influence from without. That the work is purely Jewish in character is only what was in- evitable in any case. The translators were necessarily Jews and were necessarily and entirely guided by the living tradition which had its focus in the synagogal lessons. And hence it is easily understood that the version was ignored by the Greeks, who must have found it barbarous and unintelligible, but obtained speedy acceptance with the Jews, first in private use and at length also in the synagogue service.~~

~~The next direct evidence which we have as to the origin of the LXX. is the prologue to Ecclesiasticus, from which it appears that about 130 B.c, not only the law but "the prophets and the other books" were extant in Greek. With this it agrees that the most ancient relics of Jewish- Greek literature, preserved in the extracts made by Alex- ander Polyhistor (Eus., Prep. Hv., ix.), all show acquaint- ance with the LXX. These later translations too were not made to meet the needs of the synagogue, but express a literary movement among the Hellenistic Jews, stimulated by the favourable reception given to the Greek Pentateuch, which enabled the translators to count on finding an inter- ested public. Ifa translation was well received by reading circles aniongst the Jews, it gradually acquired public ac- knowledgment and was finally used also in the synagogue, so far as lessons from other books than the Pentateuch were used at all. But originally the translations were mere private enterprises, as appears from the prologue to Ecclesiasticus and the colophon to Esther. It appears also that it was long before the whole Septuagint was finished and treated as a complete work.~~

~~As the work of translation went on so gradually and new books were always added to the collection the compass of the Greek Bible came to be somewhat indefinite. The law always maintained its pre-eminence as the~~

~~basis of the canon; but the prophetic collection changed its as- pect by having various Hagiographa incorporated with it according to an arbitrary arrangement by subjects. The distinction made in Palestine between Hagiographa and Apocrypha was never properly established among the Hel- lenists. In some books the translators took the liberty to make considerable additions to the original, and these additions—e.g., those to Daniel—became a part of the Septuagint. Nevertheless learned Hellenists were quite well aware of the limits of the canon and respected them. Philo can be shown to have known the Apocrypha, but he never cites them, much less allegorizes them or uses them in proof of his tenets. And in some measure the widening of the Old Testament canon in the Septuagint must be laid to the account of Christians. As regards the character of the version, it is a first attempt, and so is memorable and worthy of respect, but at the same time displays all the weaknesses of a first attempt. Though the influence of contemporary ideas is sometimes perceptible, the Septuagint isno paraphrase, but in general closely follows the Hebrew,—so closely indeed that we can hardly understand it with- out a process of retroversion, and that a true Greek could not have found any satisfaction init. The same Greek word is forced to assume the whole range of senses which belongs in Semitic speech to the derivatives of a. single root; a Hebrew expression which has various Greek equivalents according to the context is constantly rendered in one way ; the aorist, like the Hebrew perfect, is employed as an in- choative with a much wider range of application than is tolerated in classical Greek. At the same time, many passages are freely rendered and turned where there is no~~

~~particular need to do so, and that even in books like the Prophetz Priores, in which the rendering is generally quite stiff. The literalness of the version is therefore due not to scrupulousness but to want of skill, and probably in part also to accommodation to a kind of Jewish Greek Jargon which had already developed in the mouths of the people and was really Hebrew or Aramaic in disguise. This Jewish dialect in turn found its standard in the Septuagint.~~

~~*As the version is the work of many hands, it is naturally not of uniform character throughout all its parts,—indeed considerable varieties of character sometimes appear in one and the same book. The older constituents of the canon have an unmistakable family likeness as contrasted with the later books ; this one may see by comparing Kings with Chronicles or Isaiah and Jeremiah with Daniel. The Pentateuch is considered to be particularly well done and Isaiah to be particularly unhappy. Some of the Hagio- grapha (Ecclesiastes, Canticles, Chronicles) are reproduced with verbal closeness; others, on the contrary (Job, Esdras, Esther, Daniel), are marked by a very free treatment of the text, or even by considerable additions. It is not, how- ever, always easy to tell whether a Septuagint addition is entirely due to the translator or belongs to the original text, which lay before him in a recension divergent from the Massoretic. The chief impulse in recent times to thorough investigation of the character of the several parts of the Septuagint was given by Lagarde in his Anmerk- al zur griechischen Uebersetzung der Proverbien, Leipsic,*~~

~~*863.*~~

~~*The Septuagint came into general use with the Grecian Jews even in the synagogue. Philoand Josephus use it, and so do the New Testament writers. But very early small corrections seem to have been introduced, especially by such Palestinians as had occasion to use the LXX., in consequence partly of divergent interpretation, partly of differences of text or of pronunciation (particularly of proper names). The Old Testament passages cited by authors of the first century of the Christian era, especially those in the Apo- calypse, show many such variations from the Septuagint, and, curiously enough, these often correspond with the later versions (particularly with Theodotion), so that the latter seem to rest on a fixed tradition. Corrections in the pro- nunciation of proper names so as to come closer to the Massoretic pronunciation are especially frequent in Jose- phus. Finally a reaction against the use of the Septuagint set in among the Jews after the destruction of the temple,—a movement which was connected with the strict defini- tion of the canon and the fixing of an authoritative text by the rabbins of Palestine. But long usage had made it impossible for the Jews to do without a Greek*~~

~~*Bible, and to meet this want a new version was prepared corre- sponding accurately with the canon and text of the Phari- sees. This was the version of Aquila, which took the place of the Septuagint in the synagogues, and long con- tinued in use there.! A little later other translations were made by Jews or Jewish Christians, which also followed the official Jewish canon and text, but were not such slavish reproductions as Aquila's version; two of these were Greek (Theodotion, Symmachus) and one Syriac (Peshito).*~~

~~*Meantime the Greek and Latin Christians kept to the old version, which now became the official Bible of the catholic church. Yet here also, in process of time, a certain distrust of the Septuagint began to be felt, as its divergence from the Jewish text was observed through comparison of the younger versions based on that text, or came into notice through the frequent discussions be- tween Jews and Christians as to the Messianic prophecies.*~~

~~*1 Corpus Juris Civ., Nov. exlvi.*~~

~~*Soi TUA GEN T*~~

~~*On the whole the Christians were disposed to charge the Jews with falsifying their Scriptures out of hatred to Christianity,—a charge which has left its echoes even in the Koran. But some less prejudiced scholars did not share this current view, and went so far in the other direction as simply to identify the Jewish text with the authentic original. Thus they fell into the mistake of holding that the later Jewish text was that from which the Septuagint translators worked, and by which their work was to be tested and measured. On these critical principles Origen prepared his famous Hexapla, in which he placed alongside of the Septuagint, in six parallel columns, the three younger versions and the Hebrew text in Hebrew and in Greek characters. The Septuagint text he corrected after the younger versions, marking the additions of the LXX. with a prefixed obelus (—, ÷), as a sign that they should be deleted, and supplying omis- sions, generally from Theodotion, with a prefixed asterisk (x). The end of the passage to which the obelus or asterisk applied was marked with a metobelus (<). The same signs were used for various readings, the read- ing of the LXX. being obelized, and the variant, from another version*~~

~~*corresponding to the Hebrew text, follow- ing it with an asterisk. It was only in simpler cases, however, that this plan could be carried through without making the text quite unreadable ; the more complicated variations were either tacitly corrected or left untouched, the reader being left to judge of them by comparing the parallel columns. Origen made most change in the proper names, which he emended in conformity with the Jewish pronunciation of the period, and in the order of the text, which, to preserve the parallelism in the columns, he made to follow the Hebrew.1*~~

~~*Origen's critical labours had a very great influence in shaping the text of the Septuagint, though in quite another direction than he designed. Even before his time the Septuagint was largely contaminated by admixture from the other versions, but such alterations now began to be made systematically. Thus he intensified a mischief which to be sure had begun before him, and even before the labours of Aquila, Theodotion, and Symmachus. The most significant evidence of this contamination of the text lies in the conflate readings, where the same Hebrew words are translated twice, or sometimes even thrice, or where two Hebrew readings of the same passage are represented, sometimes by simple juxtaposition of renderings that differ but slightly, at other times by a complicating inter-lacing of very different forms of the Greek. These con- flate readings, however, in which the true reading survives along with the false, are the least fatal corruptions ; in many cases the genuine text has disappeared altogether before the correction, as can be seen by comparing different MSS. A faithful picture of the corruption of the text of the Septuagint as it has come down to us is given in the apparatus to the great Oxford edition of Holmes and Parsons (5 vols., Oxford, 1798-1827).*~~

~~*Not long after Origen there arose almost contemporane- ously three recensions of the Septuagint, which became established in three regions of the Greek Church. ' Alex- andria et Aigyptus in Septuaginta suis Hesychium laudat auctorem, Constantinopolis usque Antiochiam Luciani martyris exemplaria probat, medise inter has provincie Palestine codices legunt, quos ab Origene elaboratos Eusebius et Pamphilus vulgaverunt ; totusque orbis hac inter se trifaria varietate compugnat," says Jerome in the Pref. in Paralip. ad Chromatium. According to this the text of*~~

~~*Eusebius is that of Origen, 7.¢., a separate edition of the fifth column of the Hexapla, which contained the*~~

~~*1 The best collection of the fragments of the Hexapla is that of Field, Origenis Hexaplorum que supersunt, Oxford, 1875.*~~

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~~*Septuagint with asterisks and obeli. The text of Hesychius has not yet been identified with certainty?; that of Lucian is, according to Field and Lagarde, most probably given in Codd. Holmes., 19, 82, 93, 108, and another series of MSS. for the prophets. It is by no means the case, however, that all our MSS. can be arranged in three families ; many belong to none of the three recensions, and among these are such important codices as the Alexandrian (A) and the Vatican (B).*~~

~~*The divergences of the LXX. from the Hebrew are particularly great in the books of Samuel and Kings, also in the prophets, especially in Ezekiel, and still more in Jeremiah, and finally also in Job and Proverbs. In Jeremiah the differences extend to the order of the chapters in the second half of the book, and therefore have always attracted special attention. In Proverbs too the individual proverbs are differently arranged in the LXX., and similar differences can be traced in the versions of Ecclesiasticus. In the Pentateuch there are considerable variations only in the last part of Exodus. The text of the genuine Septuagint is generally shorter than the Massoretic text.*~~

~~*The chief editions of the Septuagint are—(1) the Complutensis, 1514-17 ; (2) the Aldine, 1516 ; (3) the Sixtine, 1587; (4) the first Oxford edition by Grabe, 1707-20 ; (5) the second Oxford edition by Holmes and Parsons, 1798-1827 ; (6) Lagarde's edition of Lucian, vol. i., Gottingen, 1883.*~~

~~*The LXX. is of great importance in more than one respect : it is probably the oldest translation of consider- able extent that ever was written, and at any rate it is the starting-point for the history of Jewish interpretation and the Jewish view of Scripture. And from this its im- portance as a document of exegetical tradition, especially in lexical matters, may be easily understood. It was in great part composed before the close of the*~~

canon—nay, before some of the Hagiographa were written—and in it alone are preserved a number of important ancient Jewish books that were not admitted into the canon. As the book which created or at least codified the dialect of Bib- lical Greek, it is also the key to the New Testament and all the literature connected with it. But its chief value lies in the fact that it is the only independent witness for the text of the Old Testament which we have to compare with the Massoretic text. Now it may seem that the critical value of the LXX. is greatly impaired, if not entirely cancelled, by the corrupt state of the text. If we have not the version itself in authentic form we cannot reconstruct with certainty the Hebrew text from which it was made, and so cannot get at various readings which can be confidently confronted with the Massoretic text ; and it may be a long time before we possess a satisfactory edition of the genuine Septuagint. But fortunately in this case sound results in detail must precede and not follow the establishment of a text sound throughout. The value of a Septuagint reading must be separately deter- mined in each particular case, and the proof that a read- ing is good is simply that it necessarily carries us back to a Hebrew variant, and cannot be explained by looseness of translation. It is therefore our business to collect as many Greek passages as possible which point to a various SEL ee cai Hg = ae Saini aiaie ir ees aii "ieee

2 See, however, Ceriani's note on the recensions of LXX. in the Rendiconti of the R. Instituto Lombardo for 18th February 1886, where it is shown that the Codex rescriptus Dublinensis, Holmes, viii., edited at Dublin, 1880), and other MSS. written in Egypt, which Ceriani had already cited in his Monumenta (vol. iii. p. xx.) present many features of correspondence with the Coptic versions and with the readings of Cyril of Alexandria. "All these documents at any rate present the character of the Hesychian recension, being all Egyp- tian testimonies contemporary with or little later than Jerome." Most of their characteristic readings appear also in MS. Holmes, 106, to which MSS. 26, 33, 86, 97, 198, 206 are also akin. For an attempt to determine the MSS. containing or akin to the Hesychian recension in Ezekiel, see Cornill, Das Buch Ezechiel, Leipsic, 1886, p. 66 sq.

~~*reading in the Hebrew text of the translators as compared with the Massoretic text. And for this we must not con- fine ourselves to one recension but use all recensions that our MSS. offer. For, though one recension may be better than another, none of them has been exempt from the influences under which the genuine Septuagint was brought into conformity with the received Hebrew text, and those influenced have affected each recension in a different way, and even differently in the different books. In this process, as indeed in all textual criticism, much of course must be dependent on individual judgment. But that it should be so appears to have been the design of pro- vidence, which has permitted the Old Testament text to reach us in a form that is often so corrupt as to sin against both the laws of logic and of grammar—of rhetorical and poetical form. (J. WE.)*~~

~~*SEPULCHRE, Canons Recunar or THE Hoty, an order founded in 1114 by Arnold, patriarch of Jerusalem (or according to another account in 1099 by Godfrey of Bouillon), on the rule of St Augustine. It admitted women as well as men and soon spread rapidly over Europe. In the 17th century it received a new rule from Urban VIII. Shortly after this the canons became extinct 3 but the canonesses are still to be found in France, Baden, and the Netherlands. They live a strictly monastic life and devote themselves mainly to the work of education.*~~

~~*SEPULCHRE, Knicurs or tHE Horny, an English military order which was said to date from the 12th century and which became extinct at the Reformation. A similar order, founded in France, lasted from the end of the 15th century till the time of the Revolution; it was resuscitated by Louis XVIII. in 1814, but again became extinct in 1830.*~~

~~*SEPULCHRE, Tue Hoty, the rock-cut tomb in which, after His crucifixion, the body of our Lord was placed. Few questions of topography have been debated with greater persistence or, in many cases, with greater bitter- ness than that of the site of this tomb. Only a brief sketch of the leading features of the controversy can be given here,*~~

~~*The only information on the subject to be gained from the New Testament is that the tomb was in a garden "in the place where Christ was crucified" (John xix. 41), which again was "near the city" (John xix. 20) and*~~

~~*“without the gate” (Heb. xiii. 12), and that the watch, proceeding from the sepulchre to the chief priest’s, “came into the city” (Matt. xxviii. 11). The first requisite, therefore, of any locality professing to be that of the Sepulchre is that it should, at the date of the crucifixion, have been without the walls of Jerusalem.1*~~

~~*The existing church of the Holy Sepulchre, which is admitted on all hands to have occupied the same site for the last 800 years, is in the heart of the present town, 300 yards from the nearest point of the existing wall and in the immediate vicinity of the bazaars. Saewulf,2 writ- ing in 1102, Hildebrand of Oldenburg? in 1211, and Jacobus de Vitriaco 4 in 1220, assert that up to the time of Hadrian the site was still without the circuit of the walls. Brocardus® in 1230 states that the modern walls included more in breadth than they did at the time of ee. i eee*~~

~~*1 The revised text of John xix. 20 reads 871 éyyvs Fv Tis médews 6 Toros 8rou ésravpwOn 6 Incods ; but the best accredited reading is 67t eyyos qv 6 Téros THs wédews. Mr Buckton, in Notes and Queries (2d series, ii. 97), argues that according to the latter reading Calvary must have been within the city. He would explain Heb. xiii. 12 as spoken “for the allegorical purpose of the writers” of the temple, but offers no explanation of Matt. xxviii. 11.*~~

~~*2 Recueil de Voyages (Société de Géog.), iv. 84, Paris, 1839.*~~

~~*® Leo Allatius, Svupuxra, p. 146, Cologne, 1653.*~~

~~*4 Gesta Dei per Francos, p. 1079, Hanover, 1611.*~~

~~*° Canisius, Thesaurus, iv. 17, 21, Antwerp, 1735.*~~

~~*SEP—SEP*~~

~~*Christ, and that there were even some who refused to be- lieve that the present site was the true one. Ordericus 6 in 1320 and William de Baldensel’ in 1336 corroborated Saewulf ; but Baldensel adds that the sepulchre then shown was no longer the one in which the body of Christ had been laid, for that had been cut out of the solid rock, while the other*~~

~~was formed out of stones cemented to- gether. Gretser® in 1598 and Queresimus® in 1616-25 refer to the objections started in their time by some whom the latter calls "misty Western heretics," and the difficulty was broadly enunciated by Monconys!° in 1647. It wag not, however, until 1741 that the site was openly declared to be false by Korte. The attack of the latter writer was followed up in greater detail by Plessing}2 in 1789, and in England by Dr Edward Clarke!' in 1810 3; but until the appearance of the Biblical Researches of Dr Robinson of New York in 184114 the attention of inguirers in England and America can hardly be said to have been seriously drawn to the subject. This elaborate work called forth energetic replies from Cardinal Newman" and Williams,1° the latter of whom subsequently republished his work in two large volumes in 1849, which, to the up- holders of tradition, may be said to Occupy the same position as those of the American author to its oppo- nents. Since that date the writers on both sides have been numerous ; among them may be specially noted, as im- pugning the accuracy of tradition, Fergusson, Tobler, the author of an elaborate essay in the Museum of Classical Antiquties for 1853, Barclay, Bonar, Schwartz, Sandie, and Conder ; and on the other side Lord Nugent, Schutz, Krafft, Schaffter, De Sauley, Abbé Michon, Thrupp, De Vogué, Lewin, Pierotti, Caspari, and Sir Charles Warren.~~

~~The main question on which the dispute has turned is the circuit of the walls at the time of Christ. The city at that date was surrounded by two walls. The first or oldest began, according to Josephus, "in the north, at the tower called Hippicus, and extended to what was termed the Xystus; it then formed a junction with the council house, and terminated at the western colonnade of the temple."!" By almost all the writers on either side this northern portion of the first wall is traced along the southern side of the depression, which extends from the central valley eastwards to the Jaffa gate.18 From some point in that northern line of wall the second wall took its departure, and of it all we are told by Josephus is that "it had its beginning at the gate called Gennath, belonging to the first wall, and reached to the Antonia, encircling only the western quarter of the city." If this Gennath gate was near Hippicus, the line of the second wall, in order to exclude the present site, must be drawn along a route~~

~~*curiously unsuited, from the slope of the hill, for defensive purposes ; and that it was near Hippicus seems*~~

~~*8 Peregrinatores Medii Evi quatuor, ed. Laurent, p. 149, Leipsic, 1864. 7 Canisius, Thesaurus, iv. 348-349,*~~

~~*8 De Cruce Christi, bk. i. chap. 17, Ingolstadt, 1598,*~~

~~*° Terre Sancte Elucidatio, ii. 515, Antwerp, 1639.*~~

~~*10 Voyages, Paris, 1665-66, 4to, i. 307.*~~

~~*1 Reise nach dem gelobten Lande, Altona, 1741.*~~

~~*2 Ueber Golgotha und Christi Grab, Halle, 1789.*~~

~~*13. Travels, Cambridge, 1810-23,*~~

~~*14 London, 1841, afterwards re-issued with a supplemental journey in 1856.*~~

~~*15 "Essay on the Miracles recorded in Eccles. History," prefixed to translation of Fleury's Eccles. Hist. to end of 4th Century, Oxford, 1842.*~~

~~*16 The Holy City, London, 1845. W Bell. Jud., v. 4, 2.*~~

~~*18 Fergusson and Sandie place Hippicus at the north-western angle of the modern wall, and thus include the existing church of the sepul- chre within the first wall itself, but they have overlooked the assertion of the Jewish historian, that from the ravines which surrounded the latter it was almost impregnable. Bonar, while placing Hippicus some- where near the same spot, does not define the locality, and Schwartz seeks to identify it with "a high rocky hill north of the so-called Grotto of Jeremiah " and far beyond the northern limits of the modern city.*~~

~~*seHEPULCHRE, HOLY*~~

~~*demonstrable from the declaration of Josephus that the city in his time was "fortified by three walls except where it was encompassed by*~~

~~*impassable ravines!; from the absence of any record of an attack on the first wall till the second had been taken ; from a variety of incidental references in the siege by Titus; from the apparent neces- sity of including within its circuit the pool Amygdalon, now known as Hezekiah's Pool or Birket Hamman el- Batrak?; and from the remarkably small area which would otherwise be included by it.*~~

~~*Writers on both sides have pressed into their service the remains of ancient buildings found in the districts traversed by the second wall according to their respect- ive theories. It seemed doubtful, till quite recently, if any sound argument could be based on these, the ruins being too fragmentary and occurring in too many different quarters to warrant any positive identification with a line of fortification as distinguished from other edifices.? But in the summer of 1885 a stretch of ancient wall 40 or 50 yards in length was disinterred, running northwards from the open space within the Jaffa gate 'to the west of Heze- kiah's pool, which certainly, as figured in the January number of the Quarterly Reports of the Palestine Explora- tion Fund, seems to go a long way to settle the question against the genuineness of the existing site.*~~

~~*Considerable stress has been laid by some writers on the existence of ancient Jewish sepulchres, of a date apparently anterior to the Christian era, in the rock on which the present church is built, as proving that that rock could not have been within the circuit of the walls, inasmuch as it is alleged "the Jews never buried within their towns." 4 There is, however, no trace in the historical books of the Bible of any aversion on the part of the Jews to intra- mural interment. Whatever width of interpretation may be given to the recorded burial of eleven of the kings of Judah "in the city of David," the phrase can hardly be held to prove that such burial-place was without the walls ; while 2 Chron. xxviii. 27 and xxxiii, 20 seem to point very strongly in the opposite direction. Joab also, we are told, was buried "in his own house in the wilderness," ° and Samuel "in his house at Ramah." But the most striking case of all is Hebron, where in the midst of the city are found the jealously guarded walls which enclose the cave of Machpelah. If, then, these tombs are older than the time of Christ, there seems little difficulty in crediting that they might have been included within the second wall. We know for a certainty that they were within the*~~

~~*third. The curious point rather is that their existence in the rock may be used as a strong argument against the site, for, speaking of the disinterment of the rock of the sepulchre from the accumulated soil heaped over it by the Romans, Eusebius" impresses on us the fact*~~

~~*1 Bell. Jud., v. 4, 1.*~~

~~*2 It is of course quite possible to draw a line, as Lewin does, which, while it includes this pool, will yet exclude the existing church, but all probability seems opposed to such a route.*~~

~~*3 Pierotti gives a detailed plan of the whole district in which the remains which he seeks to identify with the second wall occur (Jerw- salem Explored, pl. xxx.). But from this it would seem extremely doubtful whether any of those ruins can be identified with a city wall, or should not merely be regarded as portions of detached buildings, the walls of which project, now to the east, now to the west, of the imagined line.*~~

~~*4 Lord Nugent, Lands Classical and Sacred, London, 1845, ii. 47. These tombs have been described by Hepworth Dixon, in Gentleman's Magazine, March 1877, and more fully by Clermont-Ganneau in Quar- terly Report of the Palestine Exploration Fund, 1877, p. 76. In 1885 two additional sepulchral chambers were discovered in the same rock a little to the south-east of the present church, of which a plan and notices are given by Schick in Zeitschrift des deutschen Palaestina- Vereins, 1884, vol. viii. p. 171.*~~

~~*5 1 Kings ii. 34. § { Samuel xxv. 1.*~~

~~*? Theophania, Lee's translation, p. 199.*~~

~~*671*~~

~~*that there was "only one cave within it, lest, had there been many, the miracle of Him who overthrew death should have been obscured."*~~

~~*One argument remained which, at least up to 1847, it seemed difficult for the impugners of the orthodox site to meet, namely,—Was it at all*~~

~~*probable that Constantine should have been deceived, either by erroneous inference or by wilful misrepresentation, when in 325 he erected a monumental church over what was then believed to be the holy tomb? Apart from the consideration that of all localities this seemed to be the least likely to pass from the memory of the Christian church,' its exact position had been in a manner identified by the existence on the rock of Golgotha of a temple or statue of Venus, and on the site of the resurrection of a statue of Jupiter erected by Hadrian in the 2d century ; and the fact remains that on the superincumbent rubbish being cleared away by the orders of Constantine a cave was discovered, which it seems difficult, even were we willing with Taylor® to impute deliberate fraud to the existing bishop of Jerusalem, to believe could have been previously prepared beneath a heathen shrine, and in the midst of a population of pagans and of Jews.1°*~~

~~*In 1847 Fergusson, in his Lssay on the Ancient Topo- graphy of Jerusalem, attempted to show that Constantine had built his memorial church on another site altogether, and that it was still existing under another name. On the eastern hill of the city, in the sacred Mohammedan enclosure of the Hardm-es-Sherif, and on a spot generally considered to have formed part of the temple area, stands the magnificent octagonal building called the Dome of the Rock, usually but erroneously believed to have been erected by the caliph 'Omar, and so popularly known as the mosque of 'Omar. The jealousy of the Moslems had, with rare exceptions, prevented up to quite recent times the intrusion of Christians within its sacred precincts, but it was known to have been erected over a large mass of native rock rising above the surface of the ground and having a cave within it. A section of the building, very roughly executed, was given in the Z'ravels of Ali Bey, published in 1816 (vol. ii. p. 74); but in 1833 Mr. Cother- wood, under the pretext of being a civil engineer in the employment of Mehemet Ali, and of examining into the structural condition of the building with a view to its repair, spent three weeks in examining it and its sur- roundings, of which he made elaborate drawings and sections. A general account of his investigations and their results, published in W. H. Bartlett's Walks about the City and Environs of Jerusalem (p. 148), led to Fergusson's getting access to those drawings, which confirmed him in the belief he had already begun to entertain from*~~

other sources, that the Dome of the Rock was originally a Chris- tian edifice; and in the essay referred to he argued at great length and with much vigour on both architectural and historical grounds that it and the Golden Gateway — a walled-up entrance to the Haram from the east — were built in the time of Constantine ; that the former was the church of the Anastasis, erected by that emperor over the tomb of our Lord, and the latter the entrance to the atrium of the great basilica described by Eusebius?! as

8 Origen (Cont. Cels., i. 51) speaks of Calvary as of a spot well known in his day (185-254).

9 Ancient Christianity, 4th ed., London, 1844, ii. 277.

10 Finlay (Greece under the Romans, p. 561) has argued that exact identification would be easy from the minute registration of property which prevailed in the Roman empire and extended to the provinces, by which the position of Golgotha and the property of Joseph of Arimathea might easily have been traced. But he seems to press his point too far (see Fallmerayer, Golgotha und das heilige Grab, Ato, Munich, 1852, p. 8).

Vita Const., iii. 39.

immediately adjoining ; and that the transference of the site from the eastern to the western hill took place some- where about the commencement of the 11th century, when, in consequence of the invasion of the Turks, the Christians were driven from the former hill for a time. This work was followed up by his article ‘ Jerusalem” in Smith’s Dictionary of the Bible and by several minor pub- lications! ; and the whole question was, with some modifi- cations, re-argued by him at great length in Zhe Temples of the Jews and the other Buildings in the Haram Area at Jerusalem in 1878.

Though at first Fergusson’s essay seemed to fall dead, it inaugurated a discussion which has within the last twenty years been carried on with much keenness. His views have been supported on architectural grounds

~~*by Unger," and on general grounds by Sandie,? Smith,* and Langlois,® while among the multitude of his opponents may be specially noted Williams,® Lewin,' the Abbé Michon,® De Vogué,® Pierotti,!® Sir Charles Warren, and Captain Conder.?*~~

~~*The architectural arguments in favour of Fergusson's theory have forced Lewin, one of his most strenuous opponents, to argue that the Dome of the Rock may have been a temple to Jupiter erected by Hadrian, which he imagines may have been restored or rebuilt by Maximin Daza, the successor of Diocletian.' But they must be studied in Fergusson's own works or in that of Unger above referred to, The topographical objections are mainly founded on the necessity of restricting the Jewish temple to the south-eastern corner of the Haram, the site, how- ever, assigned to it by Lewin himself and Thrupp,!* and on the difficulty of supposing a place of interment so near the sacred building. But Josephus, at the time of the siege, speaks of "the monuments of King Alexander," whatever that may mean, existing just over against or in front of the north colonnade of the temple.*~~

~~*As regards the historical argument, it would certainly appear that up to the close of the 6th century the balance of evidence is in favour of the eastern site. The narrative of the Pilgrim of Bordeaux !6 may perhaps be read as sup- porting either view. But Antoninus Martyr!' and Theo- dosius 18 can hardly be reconciled with the existing location ; in two manuscripts of the latter !® the writer believed that the same hill witnessed in succession the offering of Isaac, the vision of the angel at Araunah's threshing-floor, the building of the temple, and the death and resurrection of*~~

~~*1 Notes on the Site of the Holy Sepulchre at Jerusalem, London, es and The Holy Sepulchre and the Temple at Jerusalem, London,*~~

~~*1865.*~~

~~*2 Die Bauten Constantin's am heiligen Grabe, Gottingen, 1863.*~~

~~*3 Horeb and Jerusalem, Edinburgh, 1864.*~~

~~*4 The Temple and the Sepulchre, London, 1865.*~~

~~*Un Chapitre inédit de la Question des Lieux Saints, Paris, 1861. The Holy City, 2d ed., 2 vols., London, 1849.*~~

~~*The Siege of Jerusalem by Titus, &c., London, 1868.*~~

~~*Voyage religieux en Orient, 2 vols., Paris, 1854.*~~

~~*Le Temple de Jérusalem, fol., Paris, 1864-65.*~~

~~*Jerusalem Explored, 2 vols. fol., London, 1864.*~~

~~*11 The Temple and the Tomb, London, 1880.*~~

~~*12 Various papers in the Quarterly Statement of Palestine Explora- tion Fund.*~~

~~*1 Archexologia, xli. p. 157. Sepp has latterly tried to show that it was built by Justinian—Die Felsenkuppel, eine Justinianische Sophien- kirche, und die iibrigen Tempel Jerusalems, Munich, 1882.*~~

~~*14 Ancient Jerusalem, Cambridge, 1855.*~~

~~*1 Bel. Jud., v.5 § 8. Sandie's attempt (Horeb and Jerusalem, p. 259) to minimize this difficulty by supposing a rocky valley to have run up from the valley of Jehoshaphat westwards at this point, and so to have divided the temple from the tomb, seems inadmissible. Modern investigation shows that such a valley, or rather depression, did exist, but north, not south, of the Dome of the Rock.*~~

~~*16 Ttinera Latina (Soc. de 1'Or. Lat.), Geneva, 1879, i. pp. 16-18.*~~

~~*7 Jb., pp. 100-106. 18 7b., pp. 63-66.*~~

~~*9 The Louvain and British Museum MSS., see Votes and Queries, 27th January 1877.*~~

~~*SE PULCH EE Bole*~~

~~our Lord. Many more passages might be quoted from writers of this period testifying to the belief that the hill that witnessed the offering of Isaac witnessed also the resurrection of Christ, and many others identifying the scene of the offering of Isaac with the hill on which the temple was built. Perhaps the strongest point in this connexion against Fergusson is that so striking a fact as the identity of the hill of the Passion with that. on part of which the temple stood should only be directly spoken to by a single writer. After the 9th century the historical evidence becomes more difficult to interpret. Fergusson would date the transference of the site about 1000 ; but it seems clear from Istakhri (978) 2° and Mokaddasi (987), both of whom were unknown to him, that before their days the Dome of the Rock was a Mohammedan place of worship, and the latter expressly states that it was suggested by a great Christian church.22 The natural date to assign for such a transference would be about 614, when the city was captured by the Persians, and, to quote the carefully guarded narrative of Gibbon, 'the sepulchre of Christ and the stately churches of HIelena and Constantine were con- sunied, or at least damaged, by the flames." The buildings were repaired or rebuilt by Modestus a few years later, and their praises are sung by Sophronius, his successor in the patriarchate, but in terms which give little topographical information. Sophronius lived to see the capture of the city by 'Omar in 636, the earliest records of whose doings as yet available are the brief one of Theophanes (818) and the more lengthened one of Eutychius (937). From both of these it seems clear that the caliph confirmed the Christians in the possession of the sites (whatever these might be) which he found in their hands. In or about 670 the French bishop Arculph visited Jerusalem, and under the hand of Adamnanus we have a detailed account taken down from his lips,?? and a plan of the church of the Resurrec- tion as he saw it, which strikingly corresponds to the Dome of the Rock,—as, however, it necessarily would correspond with any church which had been erected in close imitation of that building.2* There are passages, however, in Arculph descriptive of the city very difficult to understand unless on the assumption that the transference of Sion, which had hitherto (see JERUSALEM) been identified with the eastern hill, had already in his time taken place. The next pil- grim who has left us a record is Willibald,"® who visited the city early in the 8th century, and~~

~~*whose description applies on the whole better to the western than the eastern site;*~~

~~*20 Bibl. Geog. Arab., ed. De Goeje, Leyden, 1870-71, i. p. 56 sq.*~~

~~*Bi 070%, cll, ShOONaN: 22 7b., iti. p. 159*~~

~~*3 Itin. Lat. (Soc. de Or. Lat.), 1879, i. pp. 141-202.*~~

~~*24 The view that at the time when Arculph wrote the Dome of the Rock was in the hands of the Mohammedans seems strengthened by the well-known Cufic inscription which still runs round the colonnade of that building, and a complete translation of which by the late Professor Palmer will be found in the Quarterly Report of the Palestine Exploration Fund (1871, p. 164) and Fergusson's Temples of the Jews (p. 269). In it the construction of the dome of the building is dated 72 A.H. (691), but the name of the builder, which clearly was Abd-el- Melek in the original, has been erased and that of Abdallah el-Mamin (198 a.u.; 818) fraudulently substituted, " the short-sighted forger, as Palmer calls him, having omitted to change the date as well as the name. Jn this inscription there is very special mention made of our Saviour, and in a way which seems inexplicable unless the building on which it was inscribed had been, in the mind of the writer, associated in some important respects with the history of Jesus. And the tradi- tion that it was so continued long after ; for we find Theoderic so late as 1176 writing of it, "Hoc templum, quod nunc videtur, ad honorem Domini nostri Jesu Christi ejusque pie genetricis ab Helena regina et ejus filio, imperatore Constantino, constructum est" (ed. Tobler, St Gall, 1865, p. 46). Fergusson believes this inscription to have been written in the 12th century, but is obliged to admit that the alphabet employed is identical with that found on the coins of Abd-el-Melek (Temples of the Jews, p. 24). A facsimile of the sentence containing the date and the forgery will be found in the Rev. Isaac Taylor's The Alphabet (London, 1883, i. p. 322).*~~

- ~~*Itin. Lat. (Soc. de Or. Lat.), 1879, i. pp. 244-297.*~~

~~*SE Q—S EQ*~~

~~but, on the other hand, that of Bernard,! who travelled | has been recorded 270 feet in length, and a greater height. is said to be occasionally reached, while a diameter of from 12 to 15 feet is sometimes attained at the base.~~

~~a~~

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~~about 870, applies better to the eastern than to the western. If the transference can be supposed to have taken place at the time of the Persian invasion, one of the main difficul- ties in the adoption of Fergusson's theory will be greatly lessened, for the intervening period of more than 450 years would go far to explain how the crusaders, on gaining possession of the city in 1099, failed to make it their first business to revert to the original site. On the whole, the question is one which can hardly be satisfactorily deter- mined until the Arabic authorities on the subject have been duly scrutinized, and as yet we have practically access to none earlier than the two above referred to.?~~

~~Within the last few years a third locality has been sug- gested. In 1878 Captain Conder, in his Zent Work in Palestine (i. pp. 372-376), expressed a strong conviction that the real site was to be found on a rocky knoll outside the northern wall, and close to the cave known as " Jeremiah's Grotto." He argued that not only did this locality meet the requirements of the Gospel narratives, being outside the city and near one of the great roads leading from the country, but that in this direction lay "the great ceme- tery of Jewish times" as testified by "the sepulchre of Simon the Just preserved by Jewish tradition," and the monument of Helena "fitted with a rolling stone such as closed the mouth of the Holy Sepulchre." Here also by early Christian tradition had been the scene of the martyrdom of Stephen, which doubtless occurred at the place of public execution, and to this day, according to Dr Chaplin, the Jews designate the knoll "'by the name Beth has-Sekilah, 'the place of stoning' (domus lapidationis), and state it to be the ancient place of public execution mentioned in the Mishnah." 'The hill itself appears to present a striking~~

~~resemblance to a human skull, and so to associate itself with the word "Golgotha." The adoption of this site by Dr Chaplin, the Rev. 8. Merrill, Schick, and perhaps especially the late General Gordon,? has aided in giving it a considerable popularity. It is, however, a purely conjectural location, and involves the assumption that all the Christian writers from the 4th century down- wards, as well as the mother of Constantine, were in error as to the real site. (a. B. M'G.)~~

~~SEQUESTRATION. See Bankruptcy.~~

~~SEQUOIA, a genus of conifers, allied to Zaxodium and Cryptomeria, forming one of several surviving links between the firs and the cypresses. The two species usually placed in this group are evergreen trees of large size, indigenous to the west coast of North America. Both bear their round or ovoid male catkins at the ends of the slender terminal branchlets ; the ovoid cones, either terminal or on short lateral twigs, have thick woody scales dilated at the extrem- ity, with a broad disk depressed in the centre and usually furnished with a short spine; at the base of the scales are from three to seven ovules, which become reversed or partially so by compression, ripening into small angular seeds with a narrow wing-like expansion.~~

~~The redwood of the Californian woodsmen, S. semper- wrens, which may be regarded as the typical form, abounds on the Coast Range from the southern borders of the State northwards into Oregon, and, according to De Candolle, as far as Nootka Sound. It grows to a gigantic size: a trunk~~

~~1 Itin. Lat. (Soc. de YOr, Lat.), 1879, i. pp. 309-320.~~

- ~~Palmer, in the chapter contributed by him (mainly from Arabic sources) to Jerusalem, the City of Herod and Saladin (by W. Besant aud E. H. Palmer, London, 1871), has failed to give, with rare exceptions, any clue to the date of the writers whose statements he embodied.~~

~~8 Reflections in Palestine, London, 1884, pp. 1-3. See also Quarterly Report of Palestine Exploration Fund for 1883, p. 69; and Sir J. W. Dawson's Egypt and Syria, their Physical Features in Relation to Bible~~

~~*History, London, 1885, pp. 85-95, where two illustrations of the hill are given.*~~

~~*In old*~~

~~*Sequoia sempervirens—a, green cones and catkin; b, section of cone; c, scale of cone.*~~

~~*age the huge columnar trunk rises to a great height bare of boughs, while on the upper part the branches are short and irregular. The bark is red, like that of the Scotch fir, deeply furrowed, with the ridges often much curved and twisted. When young the tree is one of the most graceful of the conifers: the stem rises straight and taper- ing, with somewhat irregular whorls of drooping branches, the lower ones sweeping the ground,—giving an elegant conical outline. The twigs are densely clothed with flat spreading linear leaves of a fine glossy green above and glaucous beneath ; in the old trees they become shorter and more rigid and partly lose their distichous habit. The globular brown catkins appear early in June; the cones, from 1 to 2 inches long, are at first of a bluish green colour, but when mature change to a reddish brown ; the scales are very small at the base, dilating into a broad thick head, with a short curved spine below the deep trans- verse depression. The redwood forms woods of large extent on the seaward slope of the Coast Range and occurs in isolated groups farther inland. From the great size of the trunk and the even grain of the red cedar-like wood it is a valuable tree to the farmer and carpenter: it splits readily and evenly, and planes and polishes well; cut radially, the medullary plates give the wood a fine satiny lustre ; it is strong and durable, but not so elastic as many of the western pines and firs. In England the tree grows well in warm situations, but suffers much in severe winters,—its graceful form rendering it ornamental in the park or garden, where it sometimes grows 30 or 40 feet in height ; its success as a timber tree would be doubtful. In the eastern parts of the United States it does not flourish. Discovered by Menzies in the end of the 18th century, it has long been known in British nurseries under the name of Taxodium sempervirens.*~~

~~*The only other member of the genus is the giant tree of the Sierra Nevada, S. gigantea, the largest of known conifers ; it is confined to the*~~

~~*western portion of the great Californian range, occurring chiefly in detached groups*~~

~~*XXT, — 85*~~

~~*674*~~

~~*locally called " groves," at an altitude of from 4000 to 5000 feet above the sea. The leaves of this species are awl- shaped, short and rigid, with pointed apex; closely ad- pressed, they completely cover the branchlets. The male catkins are small, solitary, and are borne at the ends of the twigs; the cones are from 1} to 3 inches long, ovoid, with scales thicker at the base than those of the redwood, and bearing below the depression a slender prickle. The young tree is more formal and rigid in growth than S. sempervirens, but when old the outline of the head becomes cylindrical, with short branches sparsely clad with foliage sprays. The bark, of nearly the same tint as that of the redwood, is extremely thick and is channelled towards the base with vertical furrows; at the root the ridges often stand out in buttress-like projections. Some of these vast vegetable columns are upwards of 30 feet in diameter and a few have attained a height of 400 feet or more.*~~

~~*The famous group known as the Mammoth Grove of Calaveras in California, containing above ninety large trees, stands in 38° N. lat., about 4370 feet above the sea, between the San Antonio and Stanislaus rivers. According to Viseher, it was diseovered by a hunter in pursuit of a bear in 1852, but had apparently been visited before, as the date 1850 is eut on one of the trees. The bark of one of the finest trunks was foolishly stripped off to the height of 116 feet, and exhibited in New York and London ; it now stands in the Crystal Palace, Sydenham. The tree, known as the "mother of the forest," soon died; at the base it measured 90 feet in girth, and the dead tree was 321 feet high ; a prostrate trunk in the neighbourhood is 18 feet in diameter 300 feet from the base. Some trees in the Mariposa grove rival these in size: one measures 101 feet round the root, and a cut stump is 31 feet in diameter. Gigantie as these trees are and imposing from their vast eolumnar trunks, they have little beauty, owing to the scanty foliage of the short rounded boughs ; some of the trees stand very close together ; they are said to be about 400 in number.*~~

~~*Some are of vast age, perhaps 3000 years or more; they appear to be the remains of extensive woods belonging to a past epoch, and probably have been in distant time much injured by forest fires. The growth of the "mammoth tree" is fast when young, but old trees increase with extreme slowness. The timber is not of great value, but the heartwood is dense and of deeper eolour than that of 8. sempervirens, varying from brownish red to very deep brown ; oiled and varnished, it has been used in eabinet work. S. gigantea was brought to England by Lobb in 1858, and reeeived from Dr Lindley the name of Wellingtonia, by which it is still popularly known, though its affinity to the redwood is too marked to admit of generic distinction. In Ameriea it is sometimes ealled Washing- tonia. In the Atlantic States it does not sueceed; and, though nearly hardy in Great Britain, it is planted only as an ornament of the lawn or paddock. It is never likely to acquire any economic importance in Europe. (ChE Ts)*~~

~~*SERATEVO. See Bosna SERA*~~

~~*SERAING, a town of Belgium, stretching nearly a mile along the right bank of the Meuse, across which a sus- pension bridge connects it with Jemeppe, 3 miles south- west of Liége. It has one of the largest manufactories of machinery on the Continent, founded by John Cockerill, an Englishman, in 1817, on the site of the former palace of the prince-bishops of Liége. Including offices, the works extend over 270 acres, employ 11,000 hands, and the annual value of their products is more than 45,000,000 francs. Down to 1882 they had turned out 52,600 engines or pieces of machinery, including the first locomotive engine built on the Continent (1835). After Cockerill's death in 1840, the works were purchased by 'La John Cockerill Société." A monument was erected to his memory in 1871. The population, which numbered but 2226 im 1827, amounted to 24,315 in 1877, and is now (1886) estimated at about 27,500.*~~

~~*SERAMPUR, a town of British India, in Hugli (Hooghly) district, Bengal, situated on the right bank of the Hugli river, 13 miles by rail north of Calcutta, in 22° 45' 26" N. lat. and 88° 23' 10" E. long. It was formerly a Danish settlenient, and remained so until 1845, when all the Danish possessions in India were ceded by treaty to the East India Company. Serampur is famed as the*~~

~~residence of a body of Protestant Baptist missionaries, who made it the centre of their Christianizing efforts. At the census of 1881 the population of the town was 25,559 (13,137 males and 12,422 females).~~

~~SERAPHIM. In the vision of Isaiah vi. the throne of God is surrounded by seraphim,—figures apparently human (ver. 6), but with six wings, which constantly pro- claim the trisagion. The seraphim are not again mentioned in the Bible ; but in later Jewish theology they are taken to be a class of angels. As the whole vision of Isaiah is symbolical, the seraphim also are in this connexion symbol- ical figures, aiding the delineation of Jehovah's awful holiness. But the imagery is probably borrowed from some popular conception analogous to that of the CHERUBIM (g.v.). The name is sometimes explained to mean "lofty ones," after the Arabic sharufa (Gesenius); but if it has a Hebrew etymology it must signify 'burning ones" ("' consuming," not " fiery"), so that in Isaiah's vision the seraphim will mean the same thing as the "devouring fire" of God's holiness (Isa, xxxiii. 14). But this, again, is a spiritual interpretation of the old Hebrew conception that Jehovah appears in the thunderstorm (Judges v. 4; Ps, xviii., xxix.) escorted by thunderbolts (vesheph, Hab. iii. 5). Among the Phcenicians Resheph is a god (C.L8,, i. 38), probably identical with the Arabian divine archer Kozah, who shoots lightnings. In prophetic monotheism such mythological conceptions could only survive as personi- fications of the natural phenomena attending a theophany.~~

~~In Num. xxi. 6 sq. the word "seraphim" is used of a kind of serpents, not 'fiery serpents " (A. V.) but burning, ¢.e., poisonous ones (comp. hemah, 'glowing heat," "'venom"). In Isa. xiv. 29 and xxx. 6 the singular saraph oecurs with the epithet "flying," and from the seeond passage we see that such flying serpents were supposed to inhabit the desert between Palestine and Egypt; comp. Herod. ii. 75 and the white flying serpents in an Arabian legend (Agh., xx. 185, 30).~~

~~SERAPIS, or SaraPis, in the Leyden papyrus Ocapamts, i.e, Osiris-Apis, apparently meaning the dead Apis wor shipped as Osiris (see Apis), and so as lord of the under- world, was the name under which the Egyptian~~

~~*priests consulted by Ptolemy Soter incorporated with the old religion the Greek worship of Hades. The statue with the attributes of Hades which they professed to identify as Serapis (a name which had till then played no prominent part in Egyptian religion) was brought by the king from Sinope to Alexandria in consequence, it was given out, of a revelation granted to him in a dream (Plut., Js. et Os., 28). The real object of Ptolemy was to provide a mixed Greek and Egyptian religion for his mixed subjects, especi- ally in Alexandria; the true Egyptians disliked the inno- vation, and no Serapeum or Serapis temple was admitted within the walls of Egyptian cities (Macrob., i. 7, 14). Thus the great Serapeum at Memphis lay outside the town (Strabo, xvii. 1, 32), where its ruins were laid bare by Mariette in 1850. From papyri found on the spot it is known that a sort of monastery was connected with this and other Serapea. The so-called Egyptian Serapeum or series of Apis graves excavated in the rock near the Greek Serapeum is distinct and belongs to the old religion, though the old Osiris worship was gradually transferred to Serapis. The cult of Serapis also spread largely in the Graeco-Roman world. Egyptian monasticism seems to have borrowed something from the monks of Serapis, and the Egyptian Christians were accused of worshipping Serapis as well as Christ (Vita Saturnini, 8), perhaps because they identified the god who is represented bearing a corn-measure on his head with the Biblical Joseph; see Firmicus Maternus, c. 13, and Suidas, s.v. Sdpames.*~~

~~*SERENA, a city of Chili, capital of the province of Coquimbo, is situated on an elevated plain on the south side of the river Coquimbo, about 5 miles from the sea,*~~

~~*in 29° 54'S. lat. and 71° 13' W. long. The original town*~~

~~*was founded by Juan Bohon in 1544, on the opposite side of the river, and called by him Serena, after the town of that name in Spanish Estremadura, the birthplace of his chief, Pedro de Valdivia. Being shortly after destroyed by the Indians, it was rebuilt on its present site by Fran- cisco de Aguirre in 1549. Serena is the seat of a bishopric embracing the whole of Chili to the north, and of a court of appeal the jurisdiction of*~~

~~which extends to the province of Atacama. The town is well supplied with water. The principal edifice is the cathedral (1844-60), built of a light porous stone, 216 feet long and 66 broad. The town con- tains eight other churches, an excellent lyceum, a theatre, an episcopal palace, and several convents and charitable institutions. It is connected by rail with its port 9 miles to the south-west, and with the Tamaya copper-mines. A narrow-gauge line up the Elqui valley was opened in 1883. Brewing has recently become an important industry. The population of Serena was 12,293 in 1875, or, including the suburbs of the Pampa (Alta and Baja), 14,403. SERENUS or AnmTissa, an ancient Greek geometer, the author of two treatises—De Sectione Cylindri et Cont, libri duo—which Halley has published in Greek and Latin along with his edition of the Conzcs of Apollonius of Perga. Great difference of opinion has existed as to his date: Halley says in his preface to the Conics, "We know nothing of Serenus except that he was born at Antissa, a town in the island of Lesbos; and that, besides his book On the Section of the Cylinder, and another On the Section of the Cone, he wrote commentaries on Apollonius; and that he lived before Marinus—the pupil of Proclus—as appears from the preface of Marinus to the Data of Euclid." Montucla says vaguely that Serenus lived within the first four centuries of the Christian era. Chasles places him about the same time as Pappus. Bretschneider pointed out that Antissa was completely destroyed by the Romans in 167 3B.c., and inferred thence that Serenus lived c. 220- 180 z.c. To this inference it has been fairly objected by Cantor, after F. Blass, that the name Serenus is Latin and that Antissa had been rebuilt at the time of Strabo. The statement of Halley that 'he lived before Marinus" has been since repeated by many writers; but Heiberg has pointed out (Rev. Crit. d Hist. et de Litt., 1881, p. 381) that the passage referred to in support of this statement is faulty, and that the name of Serenus is certainly not to be found in it. Th. H. Martin, in his edition of the Astronomy of Theon of Smyrna (Paris, 1849), has pub- lished a fragment which in the MS. follows the text of Theon and is headed Irom the Lemmas of the Philosopher Serenus. This is unquestionably the same as Serenus of Antissa, to whoni this appellation "philosopher" is given in the titles of the two treatises edited by Halley. No con- clusion, however, can be drawn from this as to the date of Serenus, for the extract is not given by Theon but by an anonymous scholiast. M. Paul Tannery in an~~

~~*elaborate paper (Bull. des Sc. Math. et Astron., 2d series, vii., 1883) has shown from the character of Serenus's writings that he lived long after the brilliant period of Greek mathematics, and that he must be placed chronologically between Pappus and Hypatia, consequently in the 4th century. This determination of the date of Serenus is accepted by Cantor (Zeitschrift fiir Math. und Phys., August 1885, p. 124). In the treatise On the Section of the Cone, which is the less im- portant of the two books, Serenus, as he tells us in the preface, was the first to take up the particular branch of that subject with which he deals. In it he treats of the area of a triangle formed by cutting a cone, right or scalene, on a circular base by a plane through the vertex. He shows how "to cut a right cone whose axis is not less than the semi-diameter of the base by a plane through the vertex so that the triangle thus formed shall be equal to a given triangle" (Prop. 8), or "a maximum" (Prop. 13). He then considers the case of the scalene cone, solves the problem '*to cut a given scalene coue by a plane through the vertex so as*~~

~~*675*~~

~~*to. form an isosceles triangle" (Prop. 21), and shows that, "of the triangles which are formed by cutting a scalene cone through the axis, the greatest is the isosceles, the least that which is at right angles to the base of the cone ; of the rest, however, that which is nearer the greatest is greater than one more remote" (Prop. 22). The general questions for a scalene cone, corresponding to the problems for the right cone (Props. 8 and 13), and which depend on solid loci for their solution, are not attempted. These have been solved by Halley in his edition of Serenus, p. 68 sq.*~~

~~*In his preface to the treatise On the Section of the Cylinder, Serenus tells us that many geometers of his time supposed that the transverse sections of a cylinder were different from the elliptic sections of a cone, that he thought it right to refute this error and to prove that these sections were of the same kind. Having estab- lished this in a series of theorems ending with Prop. 18, he shows in Prop. 19 that "it is possible to exhibit a cone and a cylinder cutting one another in one and the same ellipse." He then solves problems such as—" given a cone (cylinder) and an ellipse on it, to*~~

~~find the cylinder (cone) which is cut in the same ellipse as the cone (cylinder)" (Props. 20, 21); " given a cone (cylinder), to find a cylinder (cone), and to cut both by one and the same plane so that the sections thus formed shall be similar ellipses" (Props. 22, 23); "given a cylinder cut in an ellipse, to construct a cone having the same base and altitude as the cylinder, so that the section of it by the same plane is an ellipse similar to the ellipse of the cylinder" (Prop. 25). In Props. 26-29 he shows how to cut a sealene cylinder or cone in an infinite number of ways by two planes —which are not parallel—so as to form similar ellipses (subcontrary sections). HIe then gives some theorems: "all the straight lines drawn from the same point to touch a cylindrical surface, on both sides, have their points of contact on the sides of a single parallelogram" (Prop. 31); "all the straight lines drawn from the same point to touch a conical surface, on both sides, have their points of contact on the sides of a single triangle" Ce 34). This last is proved by means of Prop. 33, where we find, indirectly stated, the property of an harmonic pencil.~~

~~SERES, SerrEs, or SrRos, a town of Turkey in Europe, now at the head of a sanjak in the vilayet of Saloniki, is situated in the valley of the Strymon (Karasu), in a district so fertile as to bear among the Turks the name of Altin Ovassi or Golden Plain, and so thickly studded with villages as to have, when seen from the heights of Rhodope, the appearance of a great city with extensive gardens. The principal buildings are the Greek archiepiscopal palace, the Greek cathedral, restored since the great fire of 1879, by which it was robbed of its magnificent mosaics and woodwork, tle Greek gymnasium and hospital (the former built of marble), the richly endowed Eski Jami, and the ruins of the once no less flourishing Ahmed Pasha or Aghia Sophia mosque, whose revenues used to be derived from the Crimea. On a hill above the town are the ruins of a fortress described in a Greek inscription as a " tower built by HIelen in the mountainous region." Cloth-factories and tanneries are the chief industrial establishments and lignite mines are worked in the neighbourhood with some success. The population is 30,000.~~

~~Sercs is the ancient Seris, Sire, or Sirrhe, mentioned by HIerod- otus in connexion with Xerxes's retreat, and by Livy as the place where Aimilius Paulus received a deputation from Perseus. In the 14th century, when~~

~~*Stephen Dushan of Servia assumed the title emperor of Servia, &c., he chose Sirrhe as his capital; and it remained in the hands of the Servians till its capture by Sultan Murad. In 1396 Bayazid summoned his Christian vassals to his camp at Sirrhe.*~~

~~*SERFDOM. See Siavery.*~~

~~*SERGHIEVSKIY POSAD, or Trorrzz-SERGHIEVSK, a town of Russia, in the government of Moscow, which has grown up round the monastery of Troitze-Serghievskaya Lavra, 44 miles by rail to the north-east of Moscow. It is situated in a beautiful country, intersected by pleasant little valleys and varied with woods, the buildings extend- ing partly over the hill occupied by the monastery and partly over the valley below. Including the extensive Kukuevsk suburbs, it had in 1884 31,400 inhabitants. There are several lower-grade schools, an infirmary for old women, and a school for girls. Numerous inns and hotels, some maintained by the monastery and others a rich source of revenue to it, accommodate the numerous pilgrims.*~~

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~~*Serghievsk has long been renowned for its manufactures of holy pictures (painted and carved), spoons, and a variety of other articles carved in wood, especially toys, sold to pilgrims. Within the last twenty years this industry has greatly developed ; separate parts of certain toys are made elsewhere and brought to Serghievsk, where no fewer than 330 workshops, employing 1055 hands, with an annual production valued at more than £30,000, supply the finished article. Several other petty industries are carried on both in the town and in the neighbouring villages.*~~

~~*The Troitsk monastery is the most sacred place in middle Russia, the Great Russians regarding it with more veneration than even the cathedrals and relics of the Kremlin of Moscow. It occupies a picturesque site on the top of a hill, protected on two sides by deep ravines and steep slopes. The walls, 25 to 50 feet in height, are fortified by nine towers, one of which, the Pyatnitsk, has been for some time a prison for both civil and ecclesiastical offenders. Eleven churches, including the Troitskiy (Trinity)*~~

~~*and Uspenskiy cathedrals, a lofty bell-tower, a theological academy, various buildings for monks and pilgrims, and a hospital stand within the precincts, which are nearly two-thirds of a mile in circuit. A small wooden church, erected by the monk Sergius,'and afterwards burned by the Tatars, stood on the site now occupied by the cathedral of the Trinity, which was built in 1422, and contains the relics of Sergius, as well as a holy picture which has frequently been brought into requisition in Russian campaigns. The Uspenskiy cathedral was erected in 1585 ; close beside it are the graves of Boris Godunoff and his family. In the southern part of the monastery is the church of Sergius, beneath which are spacious rooms where 200,000 dinners are distributed gratis every year to the pilgrims. The bell-tower, 290 feet high, has a bell weighing 1374 tons. Several monasteries of less importance occur in the neighbourhood. The site now occupied by the Troitsk monastery was in the 14th century covered with impenetrable forests. In 1337 two brothers, Barthelemy and Stefan, sons of a Rostoff boiar, erected a church on the spot. The elder (born in 1314) took monastic orders under the name of Sergius, erected cells by the church, and became widely famous among the peasants around. The Moscow princes also showed great respect for the chief of the new monastery. Dmitri Joannovich Donskoi received the benediction of Sergius before setting out on the Tatar expedition which terminated in the victory of Kulikovo, and afterwards accepted the advice and help of the monk in his dealings with the prince of Ryazan. Sergius lived a life of diligence and simplicity, and declined to accept the office of metropolitan of Moscow. His monastery acquired great fame and became the wealthiest in middle Russia. Ivan the Terrible in 1561 made it the centre of the ecclesiastical province of Moscow. During the Polish invasion at the beginning of the 17th century it organized the national resistance, and supplied the combatants with money and food. In 1608-9 it withstood a sixteen months' siege by the Poles; at a later date the monks took a lively part in the organization of the army which crushed the outbreak of the peasants. In 1683 and 1689 Peter I. took refuge here from the revolted strelizi. The theological seminary, founded in 1744 and transformed in 1814 into an academy, reckons Platon and Philarete among its pupils.*~~

~~*SERGIUS L, pope from 687 to 701, came of an An- tiochene family which had settled at Palermo, and owed his election as Conon's successor*~~

~~*to skilful intrigues against Paschalis and Theodorus, the other candidates. In the second year of his pontificate he baptized King Ceadwalla of Wessex at Rome. For rejecting certain canons of the Trullan' (Quinisext) council of 692, Justinian II. com- manded his arrest and transportation to Constantinople, but the militia of Ravenna and the Pentapolis forced the imperial protospatharius to abandon the attempt to carry out his orders. Sergius was followed by John VI. as pope.*~~

~~*SERGIUS IL, pope from 844 to 847, a Roman of noble birth, elected by the clergy and people to succeed Gregory IV., was forthwith consecrated without waiting for the sanction of the emperor Lothair, who accordingly sent his son Louis with an army to punish the breach of faith. A pacific arrangement was ultimately made, and Louis was crowned king of Lombardy by Sergius. In this pontificate Rome was ravaged, and the churches of St*~~

~~*Peter and St Paul robbed, by Saracens (August 846).*~~

~~*Sergius was succeeded by Leo IV. SERGIUS IIL succeeded Pope Christopher in 904, and reigned till 911. IIis pontificate, so far as is known, was*~~

~~*SER—SER*~~

~~*remarkable for nothing but the rise of the " pornocracy" of Theodora and her daughters. Sergius restored the Lateran palace, which had been shattered by an earthquake, After him Anastasius ILI. sat on the pontifical throne,*~~

~~*SERGIUS IV., pope from 1009 to 1012, originally bore the name of Peter, and is said to have been the first to change his name on accession to the pontificate. IIe wag a mere tool in the hands of the feudal nobility of the city (see RoME); he was succeeded by Benedict VIII.*~~

~~*SERGIUS, St. The Eastern and Western Churches celebrate the martyrs Sergius and Bacchus, Roman officers who suffered under Maximian, on 7th October. Both were martyred in Syria, Sergius at Rosdfa (Rasifta, Rosdfat IIisham) near Rakka. Sergius was a very famous saint in Syria*~~

~~*and Christian Arabia (comp. what is related of Chosroes II. in vol. xviii. p.614); and Rosdfa, which became a bishop's see (Le Quien, Or. Chr., ii. 951), took the name of Sergiopolis, and preserved his relics in a fortified basilica, The church was adorned and the place further strengthened by Justinian (Procopius, dd., ii. 9).*~~

~~*SERIEMA, or Cartama,! a South-American bird, suffi- ciently well described and figured in Marcgrave's work (Hist. Rer. Nat. Brasilrx, p. 203), posthumously published by De Laet in 1648, to be recognized by succeeding orni- thologists,among whom Brisson in 1760 acknowledged it as forming a distinct genus Cariama, while Linneeus regarded it as a second species of Palamedea (see SCREAMER, vol. xxl. p. 552), under the name of P. cristata, Englished by Latham in 1785 (Synopsis, v. p. 20) the "Crested Screamer,"—an appellation, as already observed, since transferred to a wholly different bird. Nothing more seems to have been known of it in Europe till 1803, when Azara published at Madrid his observations on the birds*~~

~~*of Paraguay (Apuntamientos, No. 340), wherein he gave an account of it under the name of "Saria," which it bore among the Guaranis,—that of "Cariama" being applied to it by the Portuguese settlers, and both expressive of its ordinary cry.2 It was not, however, until 1809 that this very remarkable form came to be autoptically described scientifically. This was done by the elder Geoffroy St-*~~

~~*1 In this word the initial C, as is usual in Portuguese, is pronounced soft, and the accent laid upon the last syllable.*~~

~~*2 Yet Forbes states (Ibis, 1881, p. 358) that Seriema comes from Stri, "a diminutive of Indian extraction," and Hma, the Portuguese*~~

~~*'name for the Rhea (comp. EmEv, vol. viii, p. 171), the whole thus*~~

~~*meaning " Little Rhea."*~~

~~Hilaire (Ann. du Muséum, xiii. pp. 362-370, pl. 26), who had seen a specimen in the Lisbon museum ; and, though knowing it had already been received into scientific nomen- clature, he called it anew Microdactylus marcgravui. In 1811 Illiger, without having seen an example, renamed the genus Dicholophus—a term which, as before stated (OrnrrHoLoey, vol. xviii. p. 46, note 1), has since been frequently applied to it—placing it in the curious con- geries of forms having little affinity which he called Alec- torides. In the course of his travels in Brazil (1815-17), Prince Max of Wied met with this bird, and in 1823 there appeared from his pen (NW. Act. Acad. L.-C. Nat. Curiosorum, xi. pt. 2, pp. 341-350, tab. xlv.) a very good contribution to its history, enibellished by a faithful life-sized figure of its head. The same year Temminck figured it in the Planches Coloriées (No. 237). It is not easy to say when any example of the bird first came under the eyes of British ornithologists; but in the Zoological Proceedings for 1836 (pp. 29-32) Martin described the visceral and osteological anatomy of one which had been received alive the preceding year.~~

~~The Seriema, owing to its long legs and neck, stands some two feet or more in height, and in menageries bears itself with a stately deportment. Its bright red beak, the bare greenish blue skin surrounding its large yellow eyes, and the tufts o elongated feathers springing vertically from its lores, give it a pleasing and animated expression; but its plumage Say is of an inconspicuous ochreous grey above and dull white beneath,—the feathers of the upper parts, which on the neck and throat are lon and loose, being barred by fine zigzag markings of dark brown, w ile those of the lower parts are more or less striped. The wing- uills are brownish black, banded with mottled white, and those of the tail, except the middle pair, which are wholly greyish brown, arc banded with mottled white at the base and the tip, but dark brown for the rest of their length. The legs are red. The Seriema inhabits the campos or elevated open parts of Brazil, from the neighbourhood of Pernambuco to the Rio de la Plata, extending inland as far as Matto Grosso ee: 60°), and occurring also, though sparsely, in Paraguay. It lives in the high grass, running away in a stooping posture to avoid discovery on being approached, and taking~~

~~*flight only at the utmost need. Yet it builds its nest in thick bushes or trees at about a man's height from the ground, therein laying two eggs, which Prof. Burmeister likens to those of the Land-Rail in colour.2. The young are hatched fully covered with grey down, relieved by brown, and remain for some time in the nest. The food of the adult is almost exclusively animal,—insects, especially large ants, snails, lizards, and snakes ; but it also eats certain large red berries.*~~

~~*Until 1860 the Seriema was believed to be without any near relative in the living world of birds*; but in the Zoological Pro- ccedings for that year (pp. 834-336) Dr Hartlaub described an allied species discovered by Prof. Burmeister in the territory of the Argentine Republic.* This bird, which has since been regarded as entitled to generic division under the name of Chunga burmeistert (P.Z.S., 1870, p. 466, pl. xxxvi.), and seems to be known in its native country as the "'Chunnia," differs from the Seriema by fre- quenting forest or at least bushy districts, It is also darker in colour, has less of the frontal crest, shorter legs, a longer tail, and the markings beneath take the form of bars rather than stripes. In other respects the difference between the two birds seems to be immaterial.*~~

~~*There are few birds which have more exercised the tax- onomer than this, and the reason seems to be plain. The Seriema must be regarded as the not greatly modified heir of some very old type, such as one may fairly imagine to have lived before many of the existing groups of birds had*~~

~~*1 The skeleton has been briefly described and figured by Eyton (Osteol. Avium, p. 190, pls. 3, K, and 28 bis, fig. 1).*~~

~~*2 This distinguished author twice cites the figure given by Thiene- mann (Fortpflanzungsgesch. gesammt. Vogel, pl. Ixxii. fig. 14) as though taken from a genuine specimen ; but little that can be called Ralline in character is observable therein. The same is to be said of an egg laid in captivity at Paris ; but a specimen in Mr Walter's pos- session undeniably shows it (cf. Proc. Zool. Society, 1881, p. 2).*~~

~~*3 A supposed fossil Cariama from the caves of Brazil, mentioned by Bonaparte (C.R., xliii. p. 779) and others, has since been shown by*~~

~~Reinhardt (Its, 1882, pp. 321-382) to rest upon the misinterpretation of cortain bones, which the latter considers to have been those of a Fthea.~~

~~4 Near Tucuman and Catamarea (Burmeister, Reise durch die La Plata Staaten, ii. p. 508).~~

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~~become differentiated. Looking at it in this light, we may be prepared to deal gently with the systematists who, having only the present before their eyes, have relegated it positively to this, that, or the other Order, Family, or other group of birds. There can be no doubt that some of its habits point to an alliance with the Bustarp (vol. iv. p. 578) or perhaps certain Plovers (see PioveEr, vol. xix. p. 227), while its digestive organs are essentially, if not absolutely, those of the Heron (vol. xi. p. 760). Its general appearance recalls that of the SzcreTary-Brrp (supra, p. 617); but this, it must be admitted, may be merely an analogy and may indicate no affinity whatever. On the one hand we have authorities, starting from bases so op- posed as Prof. Parker (P.Z.S., 1863, p. 516) and Sundevall, placing it among the Accipitres,> while on the other we have Nitzsch, Prof. Burmeister,® Martin (ut supra), and Dr Gadow (Journ. f. Ornithologie, 1876, pp. 445, 446) declaring in effect that this view of its affinities cannot be taken. Prof. Huxley has expressed himself more cautiously, and, while remarking (P.Z.S., 1867, p. 455) that in its skull "the internasal septum is ossified to a very slight extent, and the maxillo-palatine processes may meet in the middle line, in both of which respects it approaches the birds of prey," adds that "the ossified part of the nasal septum does not unite below with the maxillo-palatines," and that in this respect it is unlike the Accipitres; finally he declares (p. 457) that, as Ot¢s connects the Geranomorphe with the Charadriomorphx, so Cariama connects the former with the Aetomorphe, "but it is a question whether these two genera may be better included in" the Geranomorphe, "or made types of separate groups." (A. N.) SERIES. A series is a set of terms considered as arranged in order. Usually the terms are or represent numerical magnitudes, and we are concerned with the sunt of the series. The number of terms may be limited or without limit; and we have thus~~

~~*the two theories, finite series and infinite series. The notions of convergency and divergency present themselves only in the latter theory.*~~

~~*Finite Series.*~~

~~*1. Taking the terms to be numerical magnitudes, or say numbers, if there be a definite number of terms, then the sum of the series is nothing else than the number ob- tained by the addition of the terms; eg. 4+9+ 10 =25, 1+24+4+8=15. In the first example there is no apparent law for the successive terms ; in the second example there is an apparent law. But it is important to notice that in neither case is there a determinate law: we can in an infinity of ways form series beginning with the apparently irregular succession of terms 4, 9, 10, or with the apparently regular succession of terms I, 2, 4, 8. For instance, in the latter case we may have a series with the general term 2", when for 2 = 0, 1, 2, 3, 4, 5.. the series will be 1, 2, 4, 8, 16, 32,..; or a series with the general*~~

~~*ee eee*~~

~~*5 The author of vol. i. of the British Museum Catalogue of Birds even refers it to the Family Falconid# and sub-Family Polyborineg, though he regards the OsPREY (vol. xviii. p. 56) as the type of a dis- tinct sub-Order, thereby showing a want of penetration which it is difficult to excuse. Here it needs only be said that, whereas in a few points Pandion differs from the normal Falconidx, Cariama diverges in characters too numerous to mention. The suggestion that the Order Accipitres might be justifiably enlarged so as to include the Seriema has before (ORNITHOLOGY, vol. xviii. pp. 45, 46) met with conditional approval ; but that this remarkable and peculiar form should be treated in the way just described indicates an amount of neglect of evidence hardly to be expected at the present day.*~~

~~*6 Nitzsch, as Prof. Burmeister states in his masterly contribution to the natural history of this bird (Abhandl. naturf. Gesellsch. Halle, i. pp. 1-68, pls. 1, 2), in 1834 saw a defective skeleton sent to Munich by the Brazilian travellers Spix and Martius. His description of it was not, however, published until 1858. To it is appended a description by Dr Creplin of some Entozoa found in the Seriema, but this unfortu- nately seems to give no help as to the systematic position of the bird.*~~

~~term s(n + 52+ 6), where for the same values of 2 the series~~

~~will be 1, 2, 4, 8, 15, 26,.. The series may contain nega- tive terms, and in forming the sum each term is of course 'to be taken with the proper sign.~~

~~2, But we may have a given law, such as either of those just mentioned, and the question then arises, to find the sum of an indefinite number of terms, or say of n terms (x standing for any positive integer number at pleasure) of the series. The expression for the sum cannot in this case be obtained by actual addition; the formation by addition of the sum of two terms, of three terms, «&c., will, it may be, suggest (but it cannot do more than suggest) the expression for the sum of x terms of the series, For instance, for the series of odd numbers 1+34+5+7+... : we have 1=1,1+3=4,14345=9, &c. These results at once suggest the law, 1+3+5…4 (2n — 1) =n, which is in fact the true expression for the sum of » terms of the series ; and this general expression, once obtained, can afterwards be verified.~~

~~3. We have here the theory of finite series: the general problem is, wv being a given function of the positive integer m, to determine as a function of » the sum Uy + Uy, + Uy… +%n, Or, in order to have » instead of n+1 terms, say the sum 2%) + Uy + Uy. Uy 1.~~

~~Simple cases are the three which follow.~~

~~(i.) The arithmetic series,~~

~~a+(4+b)+(a+2b)..4(a+n—1)b; writing here the terms in the reverse order, it at once appears that twice the sum is=2a+n— 10 taken n times:~~

~~that is, the sum =na + 5n(n —1)b. In particular we have an expression for the sum of the natural numbers 14+2+4+38.. n= 5n(n-+1),~~

~~and an expression for the sum of the odd numbers 1+34+5..+(2n-1)=n2~~
~~(ii.) The geometric series, atart+ar…tar"-!. here the difference between~~

~~the sum and 7 times the sum is at once seen to be=a— ar", and the sum is thus l—7~~

~~=Q>———_!~~

~~a in particular the sum of the series~~

~~l+rtr?. +a Te (ii.) But the harmonic series, ae) ee G@ a+b a+2b'"* at+(n-1)0 ee ae 1 . : or say t5+3.- -+>, does not admit of summation ; there is no algebraical function of x which is equal to the sum of the series.~~

~~4. If the general term be a given function Un, and we can find v, a function of such that Un+1 — Un =Un, then we have wu =v, — 2%, Uy = Vg — UY, Uy = Ug — Uy. Un = Unt — Up} and hence 2+ Uy + Uy. . + Un =%n+1 — %, — an expression for the required sum. This is in fact an application of the Calculus of Finite Differences. In the notation of this calculus 41-2» is written Av, 3 and the general inverse problem, or problem of integration, is from the equation of differences Avy = tn (where wp is a given func- tion of 2) to find v The general solution contains an arbitrary constant, v= Vn+O; but this disappears in the difference vp14 — Y. Asan example consider the series~~

~~Up tUy…+U,=041438.. 5mn WS here, observing that n(n + 1)(n +2) —(n-1)n(n+1)= nn+1)(n+2 — n — 1),= 3n(n +1), we have Umt1=g_m(n+1)(n+2) ;~~

~~SE m4 hs~~

~~and hence 14+8+6..4 s(n 1) =gn(n 1)(n+ 2),~~

~~as may be at once verified for any particular value of », Similarly, when the general term is a factorial of the order 7, we have 147 a Untl)..(ntr—1)_nnmtl).. (m+7) — rel? .. *¢ °°&4×4×1.8 5. If the general term w,, be-any rational and integral function of m, we have n(n — 1)~~

~~1.2 2 a where the series is continued only up to the term depend- ing on p, the degree of the function wp, for all the subse- quent terms vanish. The series is thus decomposed into a set of series which have each a factorial~~

~~*for the general term, and which can be summed by the last formula; thus we obtain*~~

~~*m(n—1)..(n-p+1)*~~

~~*n U,= Up +7 Arty + Ary ot a i Lup,*~~

~~*1)n Up ty… $U,=(N+ 1) + a — At). +*~~

~~*(n+1)n(n—1)..(n1-p+1) 1:2.3..(p+l) which is a function of the degree p +1.*~~

~~*Thus for the before-mentioned series 14+2+448+..,° if it be assumed that the general term wn isa cubic function of mn, and writing down the given terms and forming the differences, 1, 2, 4, 8; 1, 2,4; 1, 2; 1, we have*~~

~~*tyne ee) n(n—1)(n— 2) { =5(n8-+ 5n-+6),asabove }*~~

~~*p + A %,*~~

~~*il i. WG 253} and the sum u%+4u,.. +2y (n 1)n (n I)n(n — 1) (m+ I)n(2 —1)(2 ~ 2)*~~

~~*en er Mt >, 1.3032 2*~~

~~*=54(m! + 2n3 a 11n? + 342 + 24).*~~

~~*As particular cases we have expressions for the sums of the powers of the natural numbers—*~~

~~*1. +n? =in(n-+1) (n+ 1); 1%+23.. + n= in(n+1) (observe that this=(1+2… +2)?); and so on.*~~

~~*6. We may, from the expression for the sum of the geometric series, obtain by differentiation other results:*~~

~~*7*~~

~~*thus 1+r4e. a car mee gives Mees aygn-2 —@ T= 1 -nr™-14(n-1). 142743877… +(n-1)r ~Grilap? = ee (rp :*~~

~~*and we might in this way find the sum Uy bir… 4 where w,, is any rational and integral function of .*~~

~~*7. The expression for the sum w%+%,... + %y of an in- definite number of terms will in many cases lead to the sum of the infinite series w)+,...; but the theory of infinite series requires to be considered separately. Often in dealing apparently with an infinite series Uj tut… we consider rather an indefinite than an infinite series, and are not in any wise really concerned with the sum of the series or the question of its convergency: thus the equation*~~

~~*m(m—1), nn —*~~

~~*2 1)*~~

~~*(14 me + "=D, Dey .) (14 n+ "Tg et :)*~~

~~*mamta De 4 really means the series of identities (m+n)=m+n m+n)im+n —1)_m(m-1), smn, n(n-1) ee eee 7 ae obtained by multiplying together the two series of the left-hand side. Again, in the method of generating functions we are concerned with an equation ¢$(é) = A,+Ajt… A,t"., where the function 4(¢) is used only to ex- press the law of formation of the successive coefficients. It is an obvious remark that, although according to the original definition of a series the terms are considered as arranged in a determinate order, yet in a finite series*~~

~~*=1+(m+n)e+*~~

~~*&e,*~~

~~*SERIES*~~

~~*(whether the number of terms be definite or indefinite) the sum is independent of the order of arrangement.*~~

~~*Infimte Series.*~~

~~8. We consider an infinite series u+u,+u gt… of terms proceeding according to a given law, that is, the general term wu, is given as a function of x. To fix the ideas the terms may be taken to be positive numerical magnitudes, or say numbers continually diminishing to zero; that is, %,>Un+1, and %, is, moreover, such a function of n that by taking n sufficiently large uv, can be made as small as we please.~~

~~Forming the successive sums S)=%, S,;=u+u,, Sy =U) +U,U,,.. these sums Sp, S}, S,... will be a series of continually increasing terms, and if they increase up to a determinate finite limit S (that is, if there exists a determinate numerical magnitude S such that by taking n sufficiently large we can make S—S;,, as small as we please) S is said to be the sum of the infinite series. To show that we can actually have an. infinite series with a given sum 8, take) any number less than S, then S—u 'is positive, and taking uw, any numerical magnitude less than S'—u, then S—u)—, is positive. And going on continually in this manner we obtain a series w, U,...such that for any value of x however large S—U)—U,... —Un is positive ; and if as " increases this difference diminishes to zero, we have uwj+U g..., —an infinite series having S for its sum, Thus, if S =2,~~

~~1~~

~~and we take w)<2, say m=1; u,<2—1, say m=5; u.<2 — ae aie. say Uy= 43 and soon, we have l+5+7+... =2;~~

~~or, more generally, if 7 be any positive number less than 1, then 1+r+7? +... ee that is, the infinite geo-~~

~~mnetric series with the first term =1, and with a ratio~~

~~This in fact follows from~~

~~; 1~~

~~r~~

~~l—9r the expression 1+7r+7?... +7%-l= Te for the sum of~~

~~*the finite series; taking 7<1, then as increases r" de- creases to zero, and the sum becomes more and more*~~

~~*ih i=,*~~

~~*9. An infinite series of positive numbers can, it is clear, have a sum only if the terms continually diminish to zero ; but it is not conversely true that, if this condition be satis- fied, there will be a sum. For instance, in the case of the*~~

~~*nearly =*~~

~~*harmonic series 1 + 5 + ; + ...it can be shown that by tak-*~~

~~*ing a sufficient number of terms the sum of the finite series may be made as large as we please. For, writing the series*~~

~~*: 1 yal elie*~~

~~*in the form L+5+(5+a)+(g+gtzta)t Go 4 the number of terms in the brackets being doubled at each successive step, it is clear that the sum of the terms in any bracket is always S53 hence by sufficiently increas-*~~

~~*ing the number of brackets the sum may be made as large as we please. In the foregoing series, by grouping the terms*~~

~~*in a diff ata) + (Grete) n ifferent manner 1+(5+5 PNG apt) +3 the sum of the terms in any bracket is always <1; we thus arrive at the result that (n= 3 at least) the sum of 2" terms of the series is > 1] +50 and*~~

~~*10. An infinite series may contain negative terms ; sup- pose in the first instance that the terms are alternately*~~

~~*positive and negative. Here the absolute magnitudes of the terms must decrease down to zero, but this is a suffi-*~~

~~cient condition in order that the series may have a sum. The case in question is that of a series Y)—2,+Y,- .., where , 2, %,.. are all positive and decrease down to zero. Here, forming the successive sums Sp = %, 5S) =U — %; , Sy = Uy — 2 +Uy,.. So, Sy, Sq… are all positive, and we have Sy>j, 8, <8, S,>83,.. and Sri1—Sn tends con- tinually to zero. Hence the sums Sj, Sj, S,,.. tend con- tinually to a positive limit S$ in such wise that S), S,, Sy… are each of them greater and Sj, S3, S;,.. are each of them less than S; and we thus have S as the sum~~

~~of the series. The series 1 — as = i+ .. will serve as~~

~~an example. The case just considered includes the appar- ently more general one where the series consists of alternate groups of positive and negative terms respectively ; the terms of the same group may be united into a single term +v,, and the original series will have a sum only if the resulting series o%—v,+2,... has a sum, that is, if the positive partial sums 7, v,, v.,.. decrease down to zero.~~

~~The terms at the beginning of a series may be irregular as regards their signs ; but, when this is so, all the terms in question (assumed to be finite in number) may be united into a single term, which is of course finite, and instead of the original series only the remaining terms of the series need be considered. Every infinite series whatever is thus substantially included under the two forms,—terms all posi- tive and terms alternately positive and negative.~~

~~11. In brief, the sum (if any) of the infinite series Uy +%+U,+ .. 18 the finite limit (if any) of the succes- SlV€ SUMS Up, Uy +, Uy + %+Usy…3 if there is no such limit, then there is no sum. Observe that the assumed order Up, u,, U,... Of the terms is part of and essential to the definition ; the terms in any other order may have a different sum, or may have no sum. A series having a sum is said to be "convergent"; a series which has no sum is "divergent."~~

~~If a series. of positive terms be convergent, the terms cannot, it is clear, continually increase, nor can they tend to a fixed limit : the series 1+1+1+ ..is divergent. For the convergency of the series it is necessary (but, as has been shown, not sufficient) that the terms shall decrease to zero. So, if a~~

~~series with alternately positive and nega- tive terms be convergent, the absolute magnitudes cannot, it is clear, continually increase. In reference to such a series Abel remarks, " Peut-on imaginer rien de plus horrible que de débiter O= 1" —2"+3"—4"+, &., ob m est un nombre entier positif?" Neither is it allowable that the absolute magnitudes shall tend to a fixed limit. The so- called "neutral" series 1—1+1—1.. is divergent: the successive sums do not tend to a determinate limit, but are alternately +1 and 0; it is necessary (and also suffi- cient) that the absolute magnitudes shall decrease to zero.~~

~~In the so-called semi-convergent series we have an equa- tion of the form S= U,— U, +U,— ..., where the positive values U), U,, U,,... decrease toa minimum value, suppose U,, and afterwards increase; the series is divergent and has no sum, and thus Sis not the sum of the series. S is only a number or function calculable approximately by means of the series regarded as a finite series terminating with the term + U,. The successive sums J), U)—-U,, U,U,+U,,..up to that containing + Up», give alter nately superior and inferior limits of the number or function S.~~

~~12. The condition of convergency may be presented under a different form: let the series w)+%,uU.. be convergent, then, taking m sufficiently large, the sum is the limit not only of w+ +..+Um but also of wy +%...~~

~~/ +Um+r, Where r is any number as large as we please. The~~

~~difference of these two expressions must therefore be in-~~

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~~definitely small; by taking m sufficiently large the sum Un+1+Um+2 . . +Um+r (where 7 is any number how- ever large) can be made as small as we please; or, as this may also be stated, the sum of the infinite series Un+1+Um+2+... can be made as small as we please. If the terms are all positive (but not otherwise), we may take, instead of the entire series ¢m+4i+%m+o+.., any set of terms (not of necessity consecutive terms) subse- quent to wm; that is, for a convergent series of positive terms the sum of any set of terms subsequent to wm can, by taking m sufficiently large, be made as small as we please.~~

~~13. It follows that in a convergent series of positive terms the terms may be grouped together in any manner so as to form a finite number of partial series which will be each of them convergent, and such that the sum of their sums will be the sum of the given series. For instance, if the given series be uw) +, %,..., then the two series Uy + Ug t+Uy+... and u,u,.. will each be convergent and the sum of their sums will be the sum of the original series.~~

~~14. Obviously the conclusion does not hold good in general for series of positive and negative terms: for in- 7 it. . 1s convergent, but the ae § i ¥ two series Lroeet. . and a te ae~~

~~stance, the series 1 5+~~

~~. are each diver-~~

~~gent, and thus without a sum. In order that the conclusion may be applicable to a series of positive and negative terms the series must be "absolutely convergent," that is, it must be convergent when all the terms are made posi- tive. This implies that the positive terms taken by them- selves are a convergent series, and also that the negative terms taken by themselves are a convergent series. It is hardly necessary to remark that a convergent series of positive terms is absolutely convergent. The question of the convergency or divergency of a series of positive and negative terms is of less importance than the question whether it is or is not absolutely convergent. But in this latter question we regard the terms as all positive, and the question in effect relates to series containing positive terms only.~~

~~15. Consider, then, a series of positive terms u)+2 u,..; if they are increasing—that is, if in the limit Un+1/Un be greater than 1—the series is divergent, but if less than 1 the series is convergent. This may be called a first criterion ; but there is the doubtful case where the limit =1. A second criterion was given by Cauchy and Raabe ; but there is here again a doubtful case when the limit considered =1, A succession of criteria was estab- lished by De Morgan, which it seems proper to give in the original form; but the equivalent criteria established by Bertrand are somewhat more convenient. In what follows lx is for shortness written to denote the~~

~~logarithm of w, no matter to what base. De Morgan's form is as follows : —~~

~~Writing w= "; ny put p)= ee 3; lf for ~=o0 the limit a, of p, be greater than 1 the series is convergent, but if less than 1 it is divergent. If the limit a,=1, seek for the limit of p,, = (py) — 1)lw; if this limit a, be greater than 1 the series is convergent, but if less than 1 it is divergent. If the limit a,=1, seek for the limit p,,=(p, — 1l)lzx; if this limit a, be greater than 1 the series is convergent, but if less than 1 it is divergent. And so on indefinitely.~~

~~ak 1 16. Bertrand's form is: —TIf, in the limit for n=, i} ln be negative or less than 1 the series is divergent, but if _ , ro. greater than 1 it is convergent. If it =1, then if r—/, lin nN~~

~~be negative or less than 1 the series is divergent, but if~~

~~SERIES~~

~~1a ' of 5 greater than 1 itisconvergent. Ifit =1, then if/ ae llln~~

~~be negative or less than 1 the series is divergent, but if —~~

~~greater than 1 it is convergent. And so on indefinitely, The last-mentioned criteria follow at once from the~~

~~theorem that the several series having the general terms~~

~~i, 2 1 1 .~~

~~n® nln" nln(lin)® niniin(lln)® ** respectively are each~~

~~of them convergent if a be greater than 1, but divergent~~

~~if a be negative or less than 1 or =1. In the simplest~~

~~x 1 case, series with the general term aie the theorem may be~~

~~*proved nearly in the manner in which it is shown above (cf. § 9) that the harmonic series is divergent. 17. Two or more absolutely convergent series may be*~~

~~*added together, {wy + w+. $+ {% +2 +%-.=} (Uy +%) ..; that is, the resulting series is absolutely con- vergent and has for its sum the sum of the two sums. And similarly two or more absolutely convergent series may be multiplied together {w +%,..} x {oy +0, +%..} = Ugly + (Udy + Uy) + (Ug + UY + Ug) + ..3 that is, the resulting series is absolutely convergent and has for its sum the product of the two sums. But more properly the multiplication gives rise to a doubly infinite series—*~~

~~*Ugo, Uni, UgUges-*~~

~~*UV WP, WyYy*~~

~~*—which is a kind of series which will be presently con- sidered,*~~

~~*18. But it is in the first instance proper to consider a single series extending backwards and forwards to infinity, or say a back-and-forwards infinite series …w_,+w-1 +) +%+U,...; such a series may be absolutely con- vergent, and the sum is then independent of the order of the terms, and in fact equal to the sum of the sums of the two series w)+%+%, .. and wy+w-otu_g3.. respectively. But, if not absolutely convergent, the ex- pression has no definite meaning until it is explained in what manner the terms are intended to be grouped together ; for instance, the expression may be used to denote the foregoing sum of two series, or to denote the series w+ (wu, u-1)(ug+u-2)+.. and the sum may have different values, or there may be no sum, accordingly. F-f+O+i+ 5+ .., im the former meaning the two series 0 7 ; +..and——·——=- if*~~

~~*Thus, if the series be. . —*~~

~~*are each divergent, and there is not any sum. But in the latter meaning the series is 0+0+0+.., which has a sum =0. So, if the series be taken to denote the limit of (by + ty +g. . +m) (u-1%-2… +%-m), where m, m' are each of them ultimately infinite, there may be a sum depending on the*~~

~~ratio m:m', which sum conse- quently acquires a determinate value only when this ratio is given.~~

~~19. In a singly infinite series we have a general term Un, Where " is an integer positive in the case of an ordinary series, and positive or negative in the case of a back-and- forwards series. Similarly for a doubly infinite series we have a general term wm», Where m, m are integers which may be each of them positive, and the form of the series is then~~

~~%,0 1 Yor» Mo2— "1,0 2 Ujz1> U2~~

~~or they may be each of them positive or negative. The latter is the more general supposition, and includes the former, since tm,» may=0 for m or x each or either of them negative. To put a definite meaning on the notion of a sum, we may regard m, 2 as the rectangular coordi- nates of a point in a plane; that is, if m, m are each of~~

~~SHRIES~~

~~them positive we attend only to the positive quadrant of the plane, but otherwise to the whole plane ; and we have thus a doubly infinite system or lattice-work of points. We may imagine a boundary depending on a parameter 7' which for Z'=oo is at every point thereof at an infinite distance from the origin ; for instance, the boundary may be the circle «? +y?= 7, or the four sides of a rectangle, a=+a7',y=+PT. Suppose the form is given and the value of 7', and let the sum 2Um,n be understood to denote the sum of those terms um,» which correspond to points within the boundary, then, if as 7' increases without limit the sum in question continually approaches a determinate limit (dependent, it may be, on the form of the boundary), for such form of boundary the series is said to be conver- gent, and the sum of the doubly infinite series is the afore- said limit of the sum 2vm,,. The condition of convergency may be otherwise stated: it must be possible to take 7' so large that the sum 2w,, for all terms Um, Which correspond to points outside the boundary shall be as small as we please.~~

~~It is easy to see that, if the terms wm,» be all of them positive, and the series be convergent for any particular form of boundary, it will be~~

~~*convergent for any other form of boundary, and the sum will be the same in each case. Thus, let the boundary be in the first instance the circle v+y=T'; by taking 7' sufficiently large the sum Dum, n for points outside the circle may be made as small as we please. Consider any other form of boundary—for in- stance, an ellipse of given excentricity,—and let such an ellipse be drawn including within it the circle 22+ y?= 7. Then the sum 2um,, for terms w%m,» corresponding to points outside the ellipse will be smaller than the sum for points outside the circle, and the difference of the two sums—that is, the sum for points outside the circle and inside the ellipse—will also be less than that for points outside the circle, and can thus be made as small as we please. Hence finally the sum 2wm,,, whether restricted to terms Um,n Corresponding to points inside the circle or to terms corresponding to points inside the ellipse, will have the same value, or the sum of the series is independent of the form of the boundary. Such a series, viz., a doubly infinite convergent series of positive terms, is said to be absolutely convergent; and similarly a doubly infinite series of positive and negative terms which is convergent when the terms are all taken as positive is absolutely convergent.*~~

~~*20. We have in the preceding theory the foundation of the theorem (§ 17) as to the product of two absolutely convergent series. The product is in the first instance expressed as a doubly infinite series ; and, if we sum this for the boundary «+ y= 7, this is in effect a summation of the series wv + (wv, + 2%) +.., Which is the product of the two series. It may be further remarked that, starting with the doubly infinite series and summing for the rectangular boundary x=a7, y= 87', we obtain the sum as the product of the sums of the two single series. For series not absolutely convergent the theorem is not true. A striking instance is given by Cauchy: the series 1- = ne = = i +.. is convergent and has a calcul- able sum, but it can be shown without difficulty that*~~

~~*its square, viz. the series 1 — Ba (=; + 5) Saas , ND ans 8 is divergent.*~~

~~*21. The case where the terms of a series are imaginary comes under that where they are real. Suppose the general term 18 Yn+ nt, then the series will have a sum, or will be convergent, if and only if the series having for its general term py, and the series having for its general term gn be each*~~

~~*convergent; then the sum=sum of first series +7 into sum of second series. The notion of absolute conver-*~~

~~*681*~~

~~*gence will of course apply to each of the series separately ; further, if the series having for its general term the modulus*~~

~~*Vp'n+ Gn be convergent (that is, absolutely convergent, since the terms are all positive), each of the component series will be absolutely convergent ; but the condition is not necessary for the convergence, or the absolute convergence, of the two component series respectively.*~~

~~*22. In the series thus far considered the terms are actual numbers, or are at least regarded as constant ; but we may have a series w+, u,... where the successive terms are functions of a parameter z; in particular we may have a series a) @,2 a2… arranged in powers of z. It is in view of a complete theory necessary to consider z as having the imaginary value x +iy=r(cos$+sin ¢). The two component series will then have the general terms anr" cos np and anr" sin nd respectively ; accordingly each of these series will be absolutely convergent for any value whatever of ¢, provided the series with the general term ayr" be absolutely convergent. Moreover, the series, if thus absolutely convergent for any particular value # of r, will be absolutely convergent for any smaller value of 7, that is, for any value of «+7y having a modulus not exceeding F ; or, representing as usual x+y by the point whose rect angular coordinates are x, y, the series will be absolutely con- vergent for any point whatever inside or on the circumfer- ence of the circle having the origin for centre and its radius =. The origin is of course an arbitrary point. Or, what is the same thing, instead of a series in powers of z, we may consider a series in powers of z —c (where ¢ is a given imaginary value =a+ 7). Starting from the series, we may within the aforesaid limit of absolute convergency con- sider the series as the definition of a function of the vari- able z; in particular the series may be absolutely conver- gent for every finite value of the modulus, and we have then a function defined for every finite value whatever 2+ iy of the variable. Conversely, starting from a given function of the variable, we may inquire under what conditions it admits of expansion in a series of powers of z(or z—c), and seek to determine the*~~

~~expansion of the function in a series of this form. But in all this, however, we are tra- velling out of the theory of series into the general theory of functions.~~

~~23. Considering the modulusr asa given quantityand the several powers of r as included in the coefficients, the com- ponent series are of the forms ay+a,cos $+a,cos 26+.. and a,sin¢+a,sin2¢ +. . respectively. The theory of these trigonometrical or multiple sine and cosine series, and of the development, under proper conditions, of an arbitrary function in series of these forms, constitutes an important and interesting branch of analysis.~~

~~24, In the case of a real variable z, we may have a series dy +a,2+a2?.., where the series a) a@,,.. is a diver- gent series of decreasing positive terms (or as a limiting case where this series is 1+1+1..). For a value of z inferior but indefinitely near to 1, say z=(1-€), where « is indefinitely small and positive, the series will be convergent and havea determinate sum ¢(z), and we may write ¢(+ 1) to denote the limit of ¢(+(1—«)) as ¢ diminishes to zero ; but unless the series be convergent for the value z= +1~~

~~it cannot for this value have a sum, nor consequently a~~

~~2~~

~~sum =¢(1). For instance, let the series be z _ +5 oe~~

~~which for values of z between the limits +1 (both limits excluded) = — log(1—z). For z= +1 the series is divergent and has no sum; but for z=1- —e as ¢ dimi-~~

~~9 il nishes to zero we have — log ¢ and (1—e)+5(1-€«)*..., each positive and increasing without limit; for z= —1~~

~~the series 1 <545 == .. is convergent, and we have at XXI. — 86~~

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~~the limit log 2=1- s+ ; 5 … As @ second example,~~

~~consider the series 1+2+22.., which for values of z be- _ — i 1~~

~~tween the limits +1 (both limits excluded) a For~~

~~z= 1, the series is divergent and has no sum; but for — iI z=] — e as e diminishes to zero we have z and 1(1 — e)~~

~~?.., each positive and increasing without limit ; for z= —1 the series is divergent and las no sum; ‘ 1 , the equation = —~=1(1- e)(1— e)?... is true for any positive value of « however small, but not for the value <«=0. The following memoirs and works may be consulted : — Cauchy,~~

~~Cours d’ Analyse de UEcole Polytechnique — part i., Analyse Algébrique, 8vo, Paris, 1821; Abel, “Untersuchungen tiber die~~

~~ae oe ,»’ in Crelle’s Jowrn. de Math., vol. i.~~

~~Reihe 1 7a — 1 3~~

~~(1826) pp. 211-239, and Gwvres (French trans.), vol.i.; De Morgan, Treatise on the Differential and Integral Caleulus, 8vo, London, 1842; Id., ‘On Divergent Series and various Points of Analysis conuected with them” (1844), in Camb. Phil. Trans., vol. viii. (1849), and other memoirs in Camb. Phil. Trans. ; Bertrand, “Régles sur la Convergence des Séries,” in Liowv. Jowrn. de Math., vol. vil. (1842) pp. 85-54; Cayley, “On the Inverse Elliptic Functions,” Camb. Math. Jowrn., vol. iv. (1845) pp. 257-277, and “Mémoire sur les Fonctions doublement périodiques,” in Liowv. Journ. de Math., vol. x. (1845) pp. 385-420 (as to the boundary for a doubly infinite series); Riemann, “Ueber die Darstellbarkeit einer Function durch eine trigonometrische Reihe,” in Gétt. Abh., vol. xiii. (1854), and Werke, Leipsic, 1876, pp. 213-253 (contains an account of preceding researches by Euler, D’Alembert, Fourier, Lejeune-Dirichlet, &c.); Catalan, Traité Elémentaire des Séries, 8vo, Paris, 1860; Boole, Z’reatise on the Caleulus of Finite Differ- enees, 2d cd. by Moulton, 8vo, London, 1872. (A. C.)~~

~~*SERINGAPATAM, formerly the capital of Mysore, India, is situated on an island of the same name in the Kaveri (Cauvery) river in 12° 25’ 33” N, lat. and 76° 43’ 8’ E. long. It is chiefly noted for its fortress, which figured so prominently in Indian history at the close of the 18th century. This formidable stronghold of Tipu Sultan thrice sustained a siege from the British, but it was finally stormed in 1799; and after its capture the island was ceded to the British. The island of Seringapatam is about 3 miles in length from east to west and 1 in breadth, and yields valuable crops of rice and sugar-cane. The fort occupies the western side of the island, immediately overhanging the river. Seringapatam is said to have been founded in 1454 by a descendant of one of the local officers appointed by Ramdanuja, the Vishnuite apostle, who named it the city of Sri Ranga or Vishnu. At the eastern or lower end of the island is the Lal Bagh or “red garden,” containing the mausoleum built by Tipu Sultan for his father Hyder Ali, in which Tipu himself also lies. In 1881 the population of the town of Seringapatam was 11,734 (males 5579, females 6155).*~~

~~*SERJEANT-AT-LAW is the name given to one who holds an ancient and honourable rank at the English or Trish bar. The word is a corruption of serviens ad legem, as distinguished from apprenticius ad legem, or utter barrister, who probably originally obtained his knowledge of law by serving a kind of apprenticeship to a serjeant. When the order of serjeants was instituted is unknown, but it certainly dates from a very remote period. The authority of serjeant counters or countors (7.e., pleaders, those who frame counts in pleading) is treated in the Mirror of Justices, and they are named in 3 Edw. IL. c. 29. They may possibly have been the representatives of the conteurs mentioned in the great customary of Normandy. The position of the serjeant had become assured when Chaucer wrote. One of the characters in the Canterbury Tales is*~~

~~*“* A serjeant of the law, wary and wise, That often had y-been at the parvis.”?*~~

~~*Serjeants (except king’s serjeants) were created by writ of*~~

~~*summons under the great seal, and wore a special and dis- tinctive dress, the chief feature of which was the coif, a white lawn or silk skull-cap, now represented by a round piece of black silk at the top of the wig. They enjoyed a social precedence after knights bachelors and before companions of the Bath and other orders. In this they differed from queen's counsel, who have simply professional as distinguished from social rank. Socially the serjeant had precedence, professionally the queen's counsel, unless indeed, as was often the case, a patent of precedence was granted to the former. Till past the middle of the 19th century, a limited number of the serjeants were called "king's (queen's) serjeants." They were appointed by patent and summoned to parliament. Until 1814 the two senior king's serjeants had precedence of even the attorney- general and solicitor-general. It was the custom for serjeants on their appointment to give gold rings with mottoes to their colleagues. Down to 1845 the order en- joyed a very valuable monopoly of practice. The serjeants had the right of exclusive audience as leading counsel in the Court of Common Pleas. In 1834 a royal mandate of William IV. attempted to abolish this privilege, but in 1840 the judicial committee of the privy council declared the mandate informal and invalid. The monopoly was finally abolished in 1845 by Act of Parliament (9 and 10 Vict. c. 54). For at least 600 years the judges of the superior courts of comnion law were always serjeants. If a judge was appointed who was not a serjeant at the time of his appointment, he was formally created one immedi- ately before his elevation to the bench. By the Judicature Act, 1873, sect. 8, no person appointed a judge of the High Court of Justice or the Court of Appeal is required to take or have taken the degree of serjeant-at-law. The serjeants had their own inn of court down to a very recent date, Serjeants' Inn was formerly in two divisions, one in Fleet Street and one in Chancery Lane. In 1758 the members of the former joined the latter. In 1877 the latter was dissolved, the inn sold to one of the members, and the proceeds divided among the existing serjeants. The extinc- tion of the order is now only a question of time, no serjeant having been created since 1868. It is, however, still with- in the discretion of the crown to create fresh serjeants if ever it should be deemed advisable to do so. In Ireland the order still exists. The three serjeants at the Irish bar have precedence next after the law officers of the crown.*~~

~~*See Serviens ad Legem, by Mr Serjeant Manning; The Order of the Coif, by Mr. Serjeant Pulling.*~~

~~*SERJEANTY, a form of tenure. See Reat Estate.*~~

~~*SERPENT, a musical instrument. See OPHICLEIDE, vol. xvii. p. 778.*~~

~~*SERPENTINE, a compact crypto-crystalline or fibrous mineral substance, occurring in rock-masses which com- monly present dark green colours, variously mottled and fancifully compared to the markings on certain serpents, whence the name "serpentine." Fora like reason it is some- times called "ophite," while Italian sculptors have termed it "ranocchia," in allusion to its resemblance to the skin of a frog. In consequence of its variegated tints, the stone is frequently cut and polished for ornamental purposes, and is hence popularly called a marble. From true marble, however, it differs in chemical composition, being esseN- tially a hydrated silicate of magnesium, usually associated with certain metallic oxides (such as those of iron, nickel, and chromium) which confer upon the stone its character- istic tints. In some localities serpentine is found in pie Ome*~~

~~*1 The parvis was the porch of old St Paul's, where each serjeant had his particular pillar at which he held interviews with his clients.*~~

~~*masses which are evidently intrusive among other rocks, while elsewhere it occurs interbedded, usually in lenticular masses, associated with gneiss and crystalline schists. It is noteworthy that the serpentine is frequently crushed and brecciated, exhibiting polished slip-faces which are sometimes striated. The surface of an exposed mass of serpentine is generally barren, whence bosses of the rock are known in the Alps as "monts morts." The origin of serpentine has been a subject of much dispute. It was pointed out by Sandberger and Tschermak that the altera- tion of olivine may give rise to this product, and pseudo- morphs of serpentine after chrysolite are well known to inineralogists. Professor Bonney and many other geo- logists regard serpentine as being generally an altered eruptive rock, due to the hydration of peridotites, such as*~~

~~*lherzolite ; probably it may also result from the decom- position of olivine-gabbro and other rocks rich in mag- nesian silicates. Augite and hornblende may become altered to serpentine. On the contrary, Dr Sterry Hunt and certain other chemical geologists believe that serpentine has generally been formed as an aqueous sediment, prob- ably precipitated by the reaction of sulphate or chloride of magnesium upon the silicate of lime or alkaline silicates derived from the disintegration of crystalline rocks and found in solution in many natural waters. Serpentine is a rock of rather limited occurrence. Its principal localities in England are Cornwall, especially in the Lizard district, where it occupies a considerable area. The famous scenery of Kynance Cove owes much of its beauty to the vivid colours and brilliant surface of the serpentine. The rock is worked into vases, columns, mantelpieces, &c., and of late years has been used to a limited extent for the deco- ration of shop-fronts in London. The beauty of the Lizard rock is heightened by the white veins of steatite which traverse it, and in some cases by disseminated crystals of bastite, which glisten with metallic lustre. Much of the Lizard serpentine is of rich red and brown colour. Green serpentine is found near Holyhead in Anglesea, A singu- larly beautiful variety of mottled red and green tints, with veins of steatite, occurs near Portsoy in Banffshire, Scot- land. It is also found with chrome iron ore in the Shetland Islands. The green serpentine of Galway occurs in inti- mate association with crystalline limestone, forming the rock knownas "'ophicalcite" or "serpentinous marble." Such an association is by no means uncommon ; but, though the beauty of the serpentine may thus be enhanced, its dura- bility seems to be impaired. On exposure to the weather the carbonate of calcium decomposes more readily than the silicate of magnesium, and hence the stone soon presents a rough eroded surface. The Galway rock comes into the market under the name of "Irish green" or " Connemara marble." Ophicalcites also occur in Ayrshire, Scotland, and in various parts of the Scottish Highlands; and the green pebbles found in Iona belong to this type of rock. On the Continent serpentines are largely worked at Zoblitz and at Waldheim in Saxony. The famous rock of Zéblitz, mentioned by Agricola, is known to have been wrought for between three and four centuries, and is still extensively explored by open quarries and by subterranean galleries. The rock usually presents various shades of green and brown, red being very rare; but its most in- teresting feature is the*~~

~~*frequent presence of pyrope, or Bohemian garnet, which occurs scattered through the rock in dark red grains, that decompose on weathering to a green chloritic product. Very little of the Zoblitz serpentine comes to England, but it is common throughout Germany, and a good deal is sent to Russia and even to the United States. It has been used in the construction of the mauso- leum of Prince Albert at Frogmore, and for Abraham Lin- coln's monument at Springfield, Illinois. The best known*~~

~~*of the Italian serpentines is the "verde Prato," which has been quarried for centuries at Monteferrato, near Prato in Tuscany. According to Capacci this serpentine is probably of Eocene age. It has been largely used as a decorative stone in ecclesiastical architecture in Prato, Pistoia, and Florence. A good deal of serpentine is found near Genoa and Levanto. The "verde di Pegli" is ob- tained from Pegli, not far from Genoa, while the "verde di Genova" is a brecciated serpentinous limestone from Pietra Lavezzara. Serpentine also occurs at various other points of the Apennines, in Elba, and in Corsica. The term "ophiolite" has been vaguely used to include not only serpentines but many of the rocks associated with the Italian serpentines. In like manner the term " gabbro," derived from a locality near Leghorn, was at one time used as a general name for serpentine and its associates, though now usually restricted to a rock composed essentially of plagioclase and diallage. It is notable that this true gab- bro is often found in company with serpentine.*~~

~~*Serpentine is found in numerous localities in the Alps and in France. An elegant variety is quarried at Epinal in the Vosges, and a beautiful ophicalcite is worked at St Véran and Maurins, in the department of Hautes-Alpes. The serpentine of the Ronda Mountains in Spain has been described by Mr J. Macpherson. In North America serpentine is so extensively distributed that only a few localities can be mentioned. It is found at Syracuse in New York ; on Manhattan and Staten Islands; at Hobo- ken in New Jersey ; at Newport, Rhode Island; at New- buryport, Massachusetts ; at Westchester, Chester county, and at Texas, Lancaster county, in Pennsylvania. It also occurs between Clear Lake and New Idrea in California. A fine ophicalcite has been obtained from near*~~

~~*Milford and New Haven in Connecticut, and a beautiful variety has been worked at Port Henry, Essex county, New York (Dana). The Canadian eozoon occurs in a serpentinous limestone.*~~

~~*See Groocy, vol. x. pp. 228, 282; MARBLE, vol. xv. p. 528 ; and Minera.ocy, vol. xvi. p. 414. The literature of the Italian and Saxon serpentines is rather voluminous. Of recent English writings on serpentine reference may be made to Bonney, in Quart. Journ. Geol. Soc., London, xxxiii. p. 884, xxxiv. p. 769, xxxvil. p. 40, xxxix. p. 21, and in Geol. Mag., [2] vi. p. 362, [3] i. p. 406; and to Collins, Quart. Journ. Geol. Soc., xl. p. 458, and Geol. Mag., [3] ii. p. 298. Sterry Hunt has written an elaborate paper in Proc. Roy. Soc. Canada, 1883, sect. iv. pp. 165-215. See also Teall, British Petrography, 1886, and Becker, in Amer. Journ. of Science, May 1886. (F. W. R*.)*~~

~~*SERPENTS. See Snaxkzs.*~~

~~*SERPUKHOFF, a district town of Russia, in the govern- ment of Moscow, 61 miles south of the city of Moscow, with which it is connected by rail. Built on high cliffs on both banks of the river Nara, 3 miles above its junction with the Oka, Serpukhoff has of late become an important manufacturing and conmercial town. The aggregate pro- duction of its manufactories (cotton and woollen stuffs, paper, leather), which employ about 4000 hands, in 1880 was valued at about £300,000. The surrounding district has several large cotton and woollen factories, with a yearly output worth about £1,000,000. Petty trades are also much developed in the neighbourhood,—textile fabrics, furniture, and earthenware and porcelain being produced by the peasantry. The manufactured goods of Serpukhoff are sent—mostly by rail—to the fairs of Nijni- Novgorod and the Ukraine, while large amounts of grain, hemp, and timber, brought from the east on the Oka, are discharged at Serpukhoff and sent on to Moscow and St Petersburg. The goods traffic by rail and river showed in 1880 an aggregate of 5,400,000 cwts. (exclusive of timber floated down the Oka). Notwithstanding its recent prosperity and the sums bequeathed to the municipality by wealthy merchants, Serpukhoff improves but slowly. The cathedral (1380) was rebuilt in the 18th century; of*~~

~~the old fortress, situated on a promontory formed by a bend of the Nara, a few heaps of stones are the only remains. The population in 1884 was 22,420.~~

~~Serpukhoff is one of the oldest towns of the principality of~~

~~Moscow; it is mentioned in the will of Ivan Daislovich (1328), at which time it was a nearly independent principality under the protectorate of Moscow. Its fortress, protecting Moscow on the south, was often attacked by the Tatars ; Toktamish plundered it in 1382, and the Lithuanian prince Svidrigaito in 1410. In 1556 the town was strongly fortified, so that fifteen years later it was able to resist the Mongol invasion. Its commercial importance dates from the 18th century.~~

~~SERTORIUS, Quintus. The life and career of the Roman Sertorius, a man of remarkable genius both as a general and as a statesman, may be said to be comprised between the years 105 and 72 B.c., a period of civil war and revolution in the Roman world, when every man of any mark had to be an adherent either of Sulla or of Marius. Sertorius, who came from a little Sabine village under the Apennines and was a self-made man, attached himself to the party of the latter, and served under him in 102 B.c. at the great battle of Aque Sextie (Aix), in which the Teutones were decisively defeated. Three years before he had witnessed the rout of a Roman army by the Cimbri on the Rhone. In 97 he was serving in Spain and thus had a good opportunity of making himself acquainted with the country with which his fame is chiefly associated. In 91 he was queestor in Cisalpine Gaul, and on his return to Rome he met with such a hearty welcome that he would have been elected to the tribuneship but for the decided opposition of Sulla. He now declared himself for Marius and the democratic party, though of Marius himself as a man he had the worst opinion. He must have been a con- senting party to those hideous massacres of Marius and Cinna in 87, though he seenis to have done what he could to mitigate their horrors by putting a stop to the outrages perpetrated by the scum of Marius's soldiery. On Sulla's return from the East and the war with Mithradates in 83, Sertorius left Rome for Spain, where he represented the Marian or democratic party, but, it would~~

~~appear, without receiving any definite commission or appointment. Here he passed the remainder of his life, with the exception of some cruises in the Mediterranean in conjunction with Cilician pirates, and of a campaign in Mauretania, in which he defeated one of Sulla's generals and captured Tingis (Tangier). This success recommended him to the Spaniards, more particularly to the Lusitanian tribes in the west, whom Roman generals and governors of Sulla's party had plun- dered and oppressed. Brave and kindly and gifted with a rough telling eloquence, Sertorius was just the man to impress Spaniards favourably, and the native militia, which he organized, spoke of him as the "new Hannibal." Many Roman refugees and deserters joined him, and with these and his Spanish volunteers he completely defeated one of Sulla's generals and drove Metellus, who had been specially sent against him from Rome, out of Lusitania, or Further Spain as the Romans called it. Sertorius owed much of his success to his statesmanlike ability, and it seems that he aspired to be in Spain what the great Agricola after- wards was in Britain. His object was to build upa stable government in the country with the consent and co-opera- tion of the people, whom he wished to civilize after the Latin model. He established a senate of 300 members, drawn from Roman emigrants, with probably a sprinkling of the best Spaniards. For the children of the chief native families he provided a school at Osca (Huesca), where they received a Roman education and even adopted the dress of Roman youths. Strict and severe as he was with his soldiers, he was particularly considerate to the people generally and made their burdens as light as possible. It seems clear that he had a peculiar gift for evoking the~~

~~enthusiasm of rude tribes, and we can well understand how the famous white fawn, which was his constant com- panion, may have promoted his popularity. For six years he may be said to have really ruled Spain. In 77 he was~~

~~joined by Perpenna, one of the officers of Lepidus, from~~

~~*Rome, with a following of Roman nobles, and in the same year the great Pompey, then quite a young man and merely a knight, was sent by the senate to take the command in Spain and with Metellus to crush Sertorius. The war was waged with varying success, but on the whole Sertorius proved himself more than a match for his adversaries, utterly defeating their united forces on one occasion near Saguntum. Pompey wrote to Rome for reinforcements, without which, he said, he and Metellus would be driven out of Spain. Rome's position was very critical, the more so as Sertorius was in league with the pirates in the Mediterranean, was negotiating with the formidable Mithradates, and was in communication with the insurgent slaves in Italy. But owing to jealousies among the Roman officers who served under him and the Spaniards of higher rank he could not maintain his position, and his influence over the native tribes slipped away from him, though he won vic. tories to the last. In 72 he was assassinated ata banquet, Perpenna, it seems, being the chief instigator of the deed. What we know of Sertorius is mainly drawn from Plutarch's Lives, from Appian, and from the fragments of Sallust. There is a good life of him by G. Long in Smith's Class. Dict. SERVANT. See Master anp SERVANT. SERVETUS, Micuast, or MicureiServero (1511-1 553), physician and polemic, was born in 1511! at Tudela in Navarre (according to his Vienne deposition), his father being Hernando Villanueva, a notary of good family in Aragon. His surname is given by himself as Serveto in his earliest works, "per Michaelem Serueto, alias Reues." Later he Latinized it into Servetus, and even when writing in French (1553) he signs " Michel Seruetus."2 It is not certain that he was related to his contemporary Andrés Serveto of Anifion, the Bologna jurist ; but it is probable that he was of the same family as the Spanish ecclesiastic Marco Antonio Serveto de Reves (d. 1598), born at Villanueva de Sigena in the diocese of Huesca (Latassa, Biblio- teca Nueva, 1798, i. 609). Servetus, who at Geneva makes "Villeneufve" his birthplace, fixes it in the adjoining dio- cese of Lerida, in which there are three villages named Vilanova. Having apparently had his early training at the university of Saragossa, he was sent by his father to study law at Toulouse, where he first became acquainted with the Bible (1528). From 1525 he had found a patron in Juan de Quintafia (d. 1534), a Franciscan promoted in 1530 to be confessor to Charles V. In the train of Quintafia he witnessed at Bologna the coronation of Charles in February 1530,*~~

~~*visited Augsburg, and perhaps saw Luther at Coburg. The spectacle of the adoration of the pope at Bologna had strongly impressed his mind in an anti-papal direction. He left Quintajia, and, after visiting Lyons and Geneva, repaired to Cicolampadius at Basel, whence he pushed on to Bucer and Capito at Strasburg. A crude, but very original and earnest, theological essay, De Trinitatis Errort- bus, printed at Hagenau in 1531, attracted considerable attention ; Melanchthon writes "Servetum multum lego." It was followed in 1532 by a revised presentation of its argument. We next find Servetus at Lyons, in 1535, as an editor of scientific works for the printing firm of Trechsel, under the name of Michel de Villeneufve or Michael Villa- novanus, which he used without interruption till the year*~~

~~*1 This date rests upon his own testimony as to his age (both at Vienne and Geneva) and that of Calvin. An isolated passage of his Geneva testimony may be adduced in support of 1509.*~~

~~*® The form "Servet" first appears in a letter of colampadius to the senate of Basel (1531), and is never used by himself. '"Servede" is*~~

~~*an imaginary form.*~~

~~*SHAY ETUS*~~

~~*of his death. Here he found a friend in Dr Symphorien Champier (Campegius) (1472-1539), whose profession he resolved to follow. Accordingly he went (1536) to Paris, where he studied medicine under Johann Giinther, Jacques Dubois, and Jean Fernel. It was in 1536, when Calvin was on a hurried and final visit to France, that he first met Servetus at Paris, and, as he himself says, proposed to set him right in theological matters.1 As assistant to Giinther, Servetus succeeded the famous anatomist Ves- alius ; Giinther, who pays the highest tribute to his general culture, describes him as specially skilled in dissection and "vix ulli secundus" in knowledge of Galen. He gradu- ated in arts and asserts that he also graduated in medicine, published a set of lectures on syrups (the most popular of his works), lectured on geometry and astrology, and de- fended by counsel a suit brought against him (March 1538) by the medical faculty on the ground of his astrological lectures. In June 1538*~~

~~we find him at the university of Louvain (where he was inscribed on the roll of students as Michael Villanova on 14th December 1537), studying theology and Hebrew, explaining to his father (then resi- dent at San Gil) his removal from Paris, early in Septem- ber 1537, as a consequence of the death (8th August) of his master (el sefior mi maestro), and proposing to return to Paris as soon as peace was proclaimed. After this he practised inedicine for a short time at Avignon, and for a longer period at Charlieu (where he contemplated marriage, but was deterred by a physical impediment). In Septem- ber 1540 he entered himself for further study in the medi- eal school at Montpellier. In 1541 he resumed editorial work for the Lyons booksellers, to whose neighbourhood he had returned. Among the attendants upon his Paris lectures had been a distinguished ecclesiastic, Pierre Paulmier, since 1528 archbishop of Vienne. Paulmier invited Servetus to Vienne as his confidential physician. He acted in this capacity for twelve years (1541-53), and made money. Outwardly he conformed to Roman Catholic worship ; in private he pur- sued his theological speculations. It is probable that in 1541 he had been rebaptized. He opened a correspondence with Calvin, and late in 1545, or very early in 1546, he forwarded to Calvin the manuscript of a revised and en- larged edition of his theological tracts, and expressed a wish to visit him at Geneva. Calvin replied on 23d Febru- ary 1546, in a letter which is lost, but in which, he says, he expressed himself "plus durement que ma coustume ne porte." On the same day he wrote to Guillaume Farel, "si venerit, modo valeat mea autoritas, vivum exire nunquam patiar," and to Pierre Viret in the same terms. Servetus had fair warning that if he went to Geneva it was at his peril. In his letter to Abel Pouppin (in or about 1547), after stating that he had failed to recover his manuscript from Calvin, he says, " mihi ob eam rem mori- endum esse certo scio." The volume of theological tracts, again recast, was declined by a Basel publisher in April 1552, but an edition of 1000 copies was secretly printed at Vienne. It was finished on 3d January 1553; the bulk of the impression was privately consigned to Lyons and Frankfort, for the Easter market. But on 26th February a letter, enclosing a sheet of the printed book, and revealing the secret of its authorship, was written from Geneva by Guillaume H. C. de Trye, formerly échevin of Lyons, to his cousin Antoine Arneys in that city. This letter bears no sign of dictation by Calvin; the history of De Trye shows that 1t may have been instigated~~

~~*in part by personal ill-feeling towards the Lyons booksellers. But Calvin furnished (reluctantly, according to De Trye) the samples of Servetus's handwriting enclosed in a subsequent letter, for the express purpose of securing his conviction. 1 Beza incorrectly makes Servetus the challenger and the date 1534.*~~

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~~*The inquisitor-general at Lyons, Matthieu Ory, set to work on 12th March ; Servetus was interrogated on 16th March and arrested on 4th April. Under examination his defence was that, in correspondence with Calvin, he had assumed the character of Servetus for purposes of dis- cussion. At 4 a.m. on 7th April he escaped from his prison, evidently by connivance. He took the road for Spain, but turned back in fear of arrest. How he spent the next four months is not known; Calvin believed he was wandering in Italy; the idea that he lay concealed in Geneva was first started by Spon. On Saturday 12th August he rode into Louyset, a village on the French side of Geneva. Next morning he walked into Geneva, and ordered a boat, to take him towards Zurich on his way for Naples. He was recognized that day at church and immediately arrested. The process against him lasted from 14th August to 26th October, when sentence " estre brusle tout vyfz" was passed, and carried out next day at Champel (27th October 1553). Calvin would have had him beheaded. Meanwhile the civil tribunal at Vienne had ordered (17th June) that he be fined and burned alive ; the sentence of the ecclesiastical tribunal at Vienne was delayed till 23d December. Jacques Charmier, a priest in Servetus's confidence, was condemned to three years' imprisonment at Vienne. The life of Servetus is full of puzzles ; his writings give the impression not only of quick genius but also of transparent sincerity ; they throw, how- ever, little light on the mysterious parts of his story. Don Pedro Gonzalez de Velasco (see his Miguel Servet, 1880) has placed a statue of Servetus in the porch of the Insti- tuto Antropologico at Madrid.*~~

~~*The opinions of Servetus, marked by strong individuality, are not easily described in the terms of any current system. His ana- baptism, with his denial of the tripersonality of the Godhead and of the eternity of the Son, made his views abhorrent to Catholics and Protestants alike; while his*~~

~~*intense Biblicism, his passionate devotion to the person of Christ, and the essentially Christocentric character of his view of the universe give him an almost unique place in the history of religious thought. He is sometimes classed with the Arians ; but he endorses in his own way the homoousian formula, and speaks contemptuously of Arius as "Christi glorie incapacissimus." He has had many critics, some apologists (e.g., Postel and Lincurius), and few followers. The fifteen condemnatory clauses, introducing the sentence of Servetus at Geneva, set forth in detail that he had been found guilty of heresies, expressed in blasphemous language, against the true foundation of the Christian religion. It is curious that one instance of his injurious language is his employment of the term "trinitaires" to denote "ceux qui croyent en la Trinite." No law, current in Geneva, has ever been adduced as enacting the capital sentence. Claude Rigot, the pro- cureur-général, examined Servetus with a view to show that his legal education must have familiarized him with the provisions of the code of Justinian to this effect ; but in 1535 all the old laws on the subject of religion had been set aside at Geneva ; the only civil penalty for religion, retained by the edicts of 1548, was banish- ment. The Swiss churches, while agreeing to condemn Servetus, give no hint of capital punishment in their letters of advice. The extinct law seems to have been arbitrarily revived for the occasion. A valuable controversy followed, on the question of executing here- tics, in which Beza (for), Mino Celsi (against), and several caustic anonymous writers took part.*~~

~~*The works of Servetus are not so rare as is often supposed, but the most common are his earliest, in which he approaches nearer to the position afterwards taken by F. Socinus than he does in his more matured publications. The following is an enumeration of them in the order of their appearance. (1) De T'rinitatis Erroribus Libri Septem, 1531, 16mo. (2) Dialogorwm de Trinitate Libri Duo, 1532, 16mo; four chapters are added on justification and kindred topics. These two books have been twice reprinted and manuscript copies are cominon ; a Dutch version, by Reynier Telle, was pub- lished in 1620. (8) Claudit Ptolomxi Alcxandrini Geographiex Enarrationis Libri Octo: ex Bilibaldi Pirekheymeri translatione, sed ad Grea et prisca exemplaria a Michaele Villanovano jam primum recogniti. Adjecta insuper ab eodem seholia, &c., Lyons, (Melchior & Caspar Trechsel), 1535, fol.; 2d ed., Lyons (Hugo & Porta),*~~

~~*1541, ¢.¢., 1542; printed by Caspar Trechsel at Vienne, fol.; on this work Tollin founds his high estimate of Servetus as a comparative geographer; the passage incriminated on his trial as attacking the authority of Moses is an extract from Lorenz Friese,*~~

~~*Plate I.*~~

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~~*(4) Brevissima Apologia pro Symphoriano Campegio in Leonardum Fuchsium, 1536, 12mo; no extant copy is known; Tollin has reprinted an extract from it. (5) Syruporwm Universa Ratio, &c., Paris, 1537, 16mo; there were four subsequent editions, the last being Venice, 1548 (six lectures on digestion, the composition and use of syrups being treated in the fifth lecture). (6) Jn quendam Mediewm Apologetica Disceptatio pro Astrologia, Paris, 1538, 16mo ; reprinted, Berlin, 1880; the medieus is Jean Tagault, who had in- terrupted the lectures of Servetus on astronomy, under which he included meteorology. (7) Biblia Sacra ex Santis Pagnini Trala- tione.. . recognita, et seholits tilustrata, &c., Lyons (Hugo a Porta), 1542, fol., remarkable for its theory of prophecy, explaincd in the preface and illustrated in the notes. (8) D'Artigny says that Servetus "fit les argumens" to a Spanish version of the Swmma of Aquinas ; but nothing is known of this or of the "divers traités de grammaire" which he translated from Latin into Spanish. (9) Christianismt Restitutio, &c., 1553, 8vo (perfect copies in Vicnna and Paris, an imperfect copy in Edinburgh), partly reprinted, London, 1723; 4to (copies in London and Paris), reprinted 1790 ; 8vo, by Rau at Nuremberg for De Murr, from the Vienna copy ; manuscript copies are rarc; the Paris library has a manuscript copy of an carlier recension of several books, including the often- quoted description of the pulmonary circulation. This work is often called anonymous, but the initials M.S. V. are given at the end and the full name at p. 199 ; the volume is not a single treatise but an assemblage of theological tracts written in a nervous and epigrammatic style and with great.command of very various learn- ing; the Apologia addressed to Mclanchthon, with which it con- cludes, is in the writer's best manner. Two treatises, Desiderius (ante 1542) and De*~~

~~*Tribus Impostoribus (1598), have been erroneously assigned to Servetus. Of his few remaining letters most will be found in Mosheim.*~~

~~*The literature relating to Servetus is very large, but the following are some of the most important pieces. Calvin's Defensio Orthodore Fidei, &¢., 1554, 4to (also in French, Décluration pour maintenir, &c., 16mo, same date), is the source of many prevalent inisconceptions respecting the opinions of Servetus and his attitude on his trial. De la Roche's Historical Account, &c., in Mem. of Lit., 1711-12 (reproduced in French, Biblioth. Angl., Amsterdam, 1717, 18mo), was followed by An Impartial History, &c., 1724, Svo (said to be by Nathaniel Hodges, a Baptist minister, afterwards knighted). Allwoerden's Historia, &e., 1728, 4to (materials furnished by Mosheim), is superseded by Mosheim's Ander- weitiger Versuch, &c., 1748, 4to, with its appendix, Newe Nachrichten, 1750, 4to, issued after the publication of the records of the Vienne trial by D'Artigny, in Nouveaux Mémoires d Hist., &c., vol. ii., 1749, 12mo. Chaufepié's valuable article in Nouv. Dict. Historique, vol. iv., 1756, fol. (translated separately by Rev. James Yair, 1771, 8vo), makes no use of Mosheim's later researches. Trechsel, in Die prot. Antitrinitarier vor F. Socin, &e., bk. 1., 1839, 8vo, uses all available materials up to date. Since then the investigations of H. Tollin (published in a series of some forty separate articles in various journals from 1874 to 1885) have thrown light on every portion of the subject. The records of the Geneva trial, first published by De la Roche, and reproduced in Rillict's Relation, &c., 1844, Svo, and elsewhere, are best given in vol. viii. (1870) of the cdition of Calvin's works by Baum, Cunitz, and Reuss; Roget, in Hist. du Peuple de Genéve, vol. iv., 1877, has a good account of both trials. The passage describing the pulmonary circulation is first noticed by W. Wotton, in Reflections upon Ancient and Mod, Learning, 1694, and has given rise to a literature of its own;—see especially Tollin's Die Entdeckung des Blutkreislaufs, &c., 1876, Hnxley, in Fortnightly Rev., February 1878; and Tollin's Kritische Bemer- kungen iiber Harvey und seine Vorgdnger, 1882. Other physiological speculations of Servetus are noted by Sigmond (The Unnoticed Theories of Servetus, 1826) ; but it has escaped Sigmond that Servetus had an idea of the composition of water and ofair. Asa thinker, Servetus is claimed on superficial grounds by Unitarians (see Wallace, Antitrin. Biog., 1850, i. 420), who have written several accounts*~~

~~of him, of which R. Wright's Apology, &c., 1807, 8vo, is the worst, and J. S. Porter's Servetus and Calvin, &¢c., 1854, Svo, perhaps the best. Saisset, in Rev. des Dewx Mondes, 1848, treats Servetus as a pantheist ; he is followed by Willis, in his Servetus and Calvin, 1877, Svo, a most unsatisfactory book (comp. Theol. Rev., April and July 1878). Tollin's Das Lehrsystem Michael Servet's, 3 vols., 1876-78, 8vo, and Piinjer's compendious De Michaelis Serveti Doctrina, &c., 1876, 8vo, are valuable digests of his opinions, from different points of view. Of Servetus's personal character the best vindication is Tollin's Characterbild Michael Servet's, 1876, Svo (in French with additions by Dardicr, Portrait Caractére, 1879, 8vo). HIs story has been dramatized by Max Ring, Die Genfer (1850), by José Echegaray, La Muerte en los Labios (1880), and_ by Albert Hamann, Servet (1881). The recent discovery at the Record Office, London, (U. 140) and the British Museum (Cotton MSS., Galba B. x.) of inter- ceepted letters from Servetus at Louvain in 1538 adds considerably to our in- formation about his family and early friends, but introduces new problems as to the details of his fitful career. (A. GO.)~~

~~SERVIA, a kingdom belonging to the Balkan peninsula of Europe, lying between Bosnia on the west and Bulgaria and Roumania on the east, and between the Turkish pro- vince of Albania on the south and the Austrian Military Frontier on the north. From Bosnia it is separated by the Drina, from Austrian and Roumanian territory by the Danube and the Save, and from Bulgaria partly by the Timok. Some parts of the southern frontier are indicated by mountains, but elsewhere there are no natural bound- aries. In shape Servia is an irregular trapezium, situated between about 42° 30' and 45° N. lat. and 19° and 22° 30' E. long. The area is about 18,760 square miles, and the population (1,667,159 in 1874) was estimated at the end of 1884 to be 1,902,419, thus giving a density of about~~

~~100 to the square mile. This low density, only about one- third of that of the United Kingdom, is explained by the nature of the surface, the inland~~

~~*position, the defective communications with the exterior, and the absence of manufacturing industries.*~~

~~*The surface is for the most part mountainous or hilly, Oro. though there are no well-defined mountain ranges of any graphy, .*~~

~~*extent. The highest summits lie near the middle of the southern frontier, where Mount Kopaonik attains the height of nearly 7000 feet. Towards the Bosnian frontier the mountains are pretty closely massed together, and some of the summits approach 4000 feet; this height is ex- ceeded on the eastern side of the country, where the moun- tains, forming a continuation of the Carpathians, are in many places more rugged and precipitous than anywhere else in the kingdom. The Rudnik Mountains, which begin immediately to the north of the Servian Morava, have their highest parts in the south and gradually sink towards the north from nearly 3000 to less than 2000 feet. Still lower are the elevations in the provinces in the extreme south acquired in 1878 under the treaty of Berlin, Asa general rule the Servian highlands consist of detached groups of mountains and conical hills with gentle slopes rising from verdant valleys, and they are mostly covered to the top with forests, chiefly of oak and beech, the higher summits in the south also with conifers. But the plains, though numerous, are of no great extent, and occur chiefly along the banks of the rivers. Apart from frontier rivers, the most important stream is the Morava, which, rising on the western slopes of the Kara Dagh, a little beyond the Servian frontier, enters the country with a north-easterly course near the extreme south-east, and then turns north-north-west and flows almost in a straight line through the heart of the kingdom to the Danube. In the upper part of its course it is known as the Bulgarian Morava, and only after receiving the Servian Morava on the left is it known as the Morava simply or as the Great Morava. The only other important tributary is the Nishava, which it receives from the right at Nish. The valleys of all these rivers, especially those of the Bulgarian and the Great Morava, and of the Nishava, contain considerable areas of level or low-lying country well suited for the growth of corn, and the low grounds along the Save and the Danube from the Drina to the Morava are also well adapted for agriculture, though for the most part devoted only to pasture. Altogether no more than one-sixth of the surface is*~~

~~*estimated to be occupied by cultivated fields and vineyards, while one-fifth is estimated to form pasture land and about an equal area woodland. Nearly one-half of the entire area is believed to be unproductive.*~~

~~*Besides the frontier streams on the north and west, the only river of any importance for navigation is the Morava, which is navigable for steamers of light draught as high as Tiupriia about 60 niles from its mouth, but its valley is important as the main highway of the country, and all the more since the introduction of railways.*~~

~~*course of construction under a convention concluded with Austria in 1881. The section common to the two systems, that from Belgrade to Nish, 152 miles in length, was opened for traffic in September 1884, and the line (76 iniles) from Nish to Vranja was completed in March 1886, but the connexion with the Turkish railway from Salonica remains to be completed. At present, in consequence of the unsatisfactory communication with the south, only about 7 or 8 per cent. of the Servian imports enter by the southern frontier, 85 per cent. coming through Austria- Hungary. In the beginning of 1886 work had been begun on only one-half of the line from Nish to Pirot, on the other system.*~~

~~*Railways Rail- both to Constantinople and to Salonica are now (1886) m %**~~

~~*Gemgy.*~~

~~*Migrals.*~~

~~*. the people.*~~

~~*BEE Y 1a*~~

~~*The geological structure of Servia is varied. In the south and west the sedimentary rocks most largely de- veloped are of ancient, pre-Carboniferous date, inter- rupted by considerable patches of granite, serpentine, and other crystalline rocks. Beyond this belt there appear in the north-west Mesozoic limestones, such as occupy so extensive an area in the north-west of the Balkan pen- insula generally, and the valleys*~~

~~*opening in that quarter to the Drina have the same desolate aspect as belongs to these rocks in the rest of that region. In the extreme north-east the crystalline schists of the Carpathians extend to the south side of the Danube, and stretch parallel to the Morava in a band along its right bank. Elsewhere east of the Morava the prevailing rocks belong to the Cretaceous series, which enters Servia from Bulgaria. The heart of the country—the Shumadia, as it is called—is mainly occupied by rocks of Tertiary age, with inter- vening patches of older strata; and the Rudnik Moun- tains are traversed by metalliferous veins of syenite. The mineral wealth of Servia is considerable and varied, though far from being adequately developed. Gold, silver, iron, and lead are said to have been worked in the time of the Romans. Heaps of ancient slag from lead mines still exist in the neighbourhood of Belgrade, and other old lead mines occur in the valley of the Toplitza. Gold dust is washed down by heavy rains in the valley of the Timok, where it is gathered by the peasants. In the syenite veins of the Rudnik Mountains ores of lead, zinc, copper, sulphur, and arsenic are present, but are not worked, and from the mines of Krupani in the north-west argentiferous lead, antimony, and other ores have been obtained. The prin- cipal mining centre east of the Morava is Maidanpek in the north, where there is a large iron-smelting establish- ment in the hands of an English company. Coal or lignite is met with in many places, including a number of points on the Servian railway. The largest deposit lies round Tiupriia, and measures about 19 miles in length by 74 in breadth. All the minerals belong to the state, but permission to work them can be obtained on payment of a moderate royalty.*~~

~~*The climate of Servia is on the whole mild, though subject to the extremes characteristic of inland Eastern countries. In summer the temperature may rise as high as 106° Fahr., while in winter it often sinks to 13° or even sometimes 20° below zero. The high-lying valleys in the south are colder than the rest of the country, not only on account of their greater elevation but also be- cause of their being exposed to the cold winds from the north and north-east. Accordingly, the chief products of the soil are such as thrive under a warm summer and are unaffected by a cold winter. Both maize and wine are grown, but the olive is excluded by the severity of the cold season.*~~

~~*Maize is the principal object of agriculture, the average annual crop being estimated at upwards of 5,000,000 bushels, wheat coming next with an average crop of less than 4,000,000 bushels. Besides cereals, flax, hemp, and tobacco are grown, but the attempts made to cultivate cotton have proved unsuccessful. The chief wine-growing locality is in the north-east round Negotin. Inefficient as are the implements and backward the methods of agriculture, grain makes up a considerable portion of the exports, owing to the scantiness of the population and the deficiency of other industries, and it is expected that this export will be greatly increased on the completion of the railway system to the southern seaports. The grain chiefly exported is wheat,—maize supplying, as among all the Slavs of the Balkan peninsula, the chief food of Hitherto live-stock has formed the largest item in the exports, sometimes amounting to over one-half. Among these pigs, which are fed in immense numbers on the mast of the forests, take the first place. Of late years their number has greatly declined, largely in consequence of American competition; but relatively to population Servia still maintains a much greater number than any other country of Europe; and the same is true of sheep, which are here relatively more than twice as numerous*~~

~~*as in Spain. Cattle also are numerous, but are reared solely as beasts of draught and for export. Bees are very generally kept,—the honey being consumed in the country, the wax exported. The rearing of silkworms is spreading, especially since cocoons and eggs have begun to be exported to Italy. Orchards are very exten- sive, and all kinds of fruit belonging to central Europe are grown in abundance,—above all, the plum, from which is distilled the favourite national spirit, slivovitza. The average annual value of the exports is a little over £1 per head of population. After live animals and grain come hides and prunes. Among the imports the chief items are sugar, salt (wholly absent in Servia), cotton goods, and other textiles. Import duties being high, a consider- able amount must always be allowed for smuggled goods. Though the great bulk of the imports enter the country by the Austrian frontier, an increasingly large proportion comes originally from beyond Austria-Hungary. Thus in 1879, of the total quantity of imports across the Austrian frontier, 76 per cent.*~~

~~*were of Austrian- Hungarian origin, in 1880 73 per cent., in 1881 65 per cent., leaving 24, 27, and 35 per cent. respectively for countries beyond. Among the latter Germany comes next after Austria-Hungary and then England. Colonial wares (sugar, coffee, &c.) are now imported cheaper by way of Hamburg than by way of Trieste.*~~

~~*The natural increase of population in Servia is pretty rapid, the Popu- annual birth-rate being among the highest in Europe, while the lation.*~~

~~*death-rate, though high, is exceeded in several other countries. During the years 1879-84 the average annual number of births was 76,962, of deaths 47,181, the excess of births over deaths 29,781, which figures compared with a total population intermediate between that at the end of 1874 and that at the end of 1884 give a birth-rate of upwards of 43 per thousand, a death-rate of less than 27 per thou- sand,.and an annual excess of births over deaths of nearly 17 per thousand. The average proportion of male to female births is 106:100. The people are mainly Serbs, though the proportions have been modified by the increase of territory under the treaty of Berlin. This territory, at one time occupied by Servians, had been to a large extent deserted by them in consequence of the oppressive Turkish yoke, and their place had been taken by Mohammedan Albanians west of the Morava and by Bulgarians in the valley of the Nishava. Most of the Albanians, however, quitted their homes at the time of annexation, and Servians are now returning to their former seats. Previous to the treaty of Berlin the principal element of the population next after the Servians consisted of Roumaniauns, of whom there were about 130,000. The Servian Church forms a branch of the Oriental Greek Church with a perfectly independent administration. The highest ecclesiastical authority is exercised by the national synod. Elementary education is in a very backward state, but recently a law has been passed to remedy this defect, by making education obligatory on all children between six and thirteen and laying the duty of providing accommodation, books, and teachers upon school districts. At Belgrade there is a high school or university with faculties of philosophy, law, and technics.*~~

~~*The agricultural population are scattered. among a great number of villages, most of which consist of single isolated homesteads, Each homestead is occupied by a group of families connected by blood and acknowledging one head, the stareshina, who is usually the patriarch of the community, but is often chosen by the rest of the members on account of his prudence and ability. IIe regulates the work and distributes the proceeds of the labour of the entire homestead, and his ruling is followed without question. The land cultivated by a family or group of families is always their own property. The buildings belonging to the homesteads are enclosed within an immense palisade, inside which a large expanse of fields is mostly — with plum, damson, and other fruit-trees, surround- ing the houses of the occupiers. In the midst of these is the house of the stareshina, which contains the common kitchen, eating hall, and family hall of the entire homestead. In this last all the members assemble in the evening for conversation and amusement, the women spinning, while the children play. The people take delight in listening to the recitation of the poetical rhapsodies in which the Servian literature is remarkably rich. The houses are mostly very small wooden structures, serving for little clse but sleeping placcs. But that of the stareshina is often of brick, and is invariably of better construction than the rest.*~~

~~*Since 6th March 1882 the government has 'been a constitutional Govern- monarchy. The legislative body is ealled the skwpshtina, and in ment.*~~

~~*1884 consisted of 178 members, three-fourths of whom are elected by the people, the remainder being nominated by the king. A new skupshtina is elected every three years. For the settlement of special questions of great moment an extraordinary skupshtina or great national assembly is elected, in which there are four times as many members, all elected, as in the ordinary sknpshtina. There is also a permanent council of state of 15 members, who have the task of drawing up proposals for legislation, hearing complaints regarding the decisions of ministers, and perforniing other functions. For administrative purposes the kingdom is divided into twenty- two circles, besides the city of Belgrade. In the budget for 1883-84 the revenue and expenditure were each estimated at nearly*~~

~~*Army.*~~

~~*Settle- ment of Serbs in Balkan pen- insula.*~~

~~*688*~~

~~*£1,500,000, and for 1884-85 at about £1,840,000. The national debt at the end of 1884 was about £7,000,000. An additional debt of about £1,000,000 was contracted during the Scrvo-Bulgarian war of 1885-86.*~~

~~*The Servian army is divided into three classes. The first class, embracing men between 25 and 380 years of age, constitutes the standing army, which numbers 18,000 on a peace footing and about 100,000 on a war footing. The first two years are served with the colours and the remainder of the term in the reserve. The second class contains men between 30 and 387 who have served in the*~~

~~*standing army. The third class, which is only called out in extra -:*~~

~~*ordinary emergencies, is composed of men between 37 and 50. The total military strength of Servia for cases of emergency is estimated to be about 210,000 men.*~~

~~*The capital of Servia is Belgrade, at the junction of the Danube and the Save. It is the only town with more than 15,000 inhabit- ants. Next in size is Nish, in the territory added by the treaty of Berlin, where the valley of the Nishava opens into that of the Bulgarian Morava. The other chief towns are Kragushevatz in the centre of the Shumadia, the former capital of the country, Shabatz on the Save, Semendria on the Danube, Krushevatz, Alexinatz (the centre of the flax and hemp growing district), Ushitze, Posharevatz,*~~

~~*Vranja, and Leskovatz.*~~

~~*See Rev. W. Denton, Servia and the Servians, London, 1862 ; Kanitz, Serbien: historische-ethnographische Reisestudien, Leipsic, 1868; Balme, La Principauté de Serbie, Paris, 1880. 4 (es (eB)*~~

~~*History.*~~

~~*The original home of the Croats and Serbs, who are identical in race and language, was the country adjoining the Carpathian range. Their speech shows them to belong to the eastern division of the Slavonic family (see Stavs). The generally accepted derivation of the name Chrobat, Croat, is from the original designation of the Carpathians, Chrbet, "a ridge," an opinion supported by Schafarik and Professor Ljubi¢, author of a Croatian history. This view is rejected by Perwolf! and also by Penka,? but apparently on insuffi- cient grounds. The last-named connects the word with the same root as that from which "Slav" is derived (slu-ti, klu, kru) and makes it signify the "vassals," thosc who follow a chief. The derivation suggested by Schafarik for "Serb" is the root sz, " to produce"; thus the name would come to mean the people, just as deutsch is from diot, "people." He considers it to have been the origiual appellation of all the Slavs. This must be accepted as the best explanation hitherto given, though not altogether satisfactory. We find the name Zép8a in Ptolemy and Sirdi in Pliny.*~~

~~*The Serbs and Croats have no history till the year 638 a.p., at which period they left their original settlements and migrated into the ancient Illyricum and part of Mcesia. Whether any of this people had previously taken up their abode in the Balkan penin- sula is by no means clear, and very different opinions have been held on the subject. The most probable account is that small Slavonic colonies were settled here and there as early as the 2d and 3d centuries, consisting mainly of prisoners taken in war; and we hear of two tribes, the Karpi and the Kostoboki, who are claimed by Schafarik with good reason as Slavs. Jireéek considers that for two hundred years before the Slavs are heard of in history south of the Danube they were scattered as colonists in Mesia, Thrace, Dardania, and Macedonia. Professor Drinoff finds mention of Slav- onic colonies in Thrace in the Ltinerartum Hierosolymitanum and Itinerarium Antonini; and, even if we do not give a complete adhesion to his views, there are many names of towns in Procopius (in the first half of the 6th century) which are undoubtedly Slavonic. The traces of the original inhabitants have disappeared, except in so far as the Albanians represent these peoples. It is generally believed that the word meropch or neropch, signifying a slave, found. in the Zakonik of Duslhian, refers to the Noropians, an old Thracian tribe.*~~

~~*Our authority for the Servian migration in the middle of the 7th century is the emperor Constantine Porphyrogenitus. According to the story, five Croatian princes, the brothers Clucas, Lobelus, Cosentzis, Muchlo, and Chrobatns, and two sisters, Tuga and Buga (i.e, Calamity and Prosperity), came at this period from northern or Belo-Chrobatia, as it was called, the original home of the Croats in the Carpathian Mouutains. The descendants of their people who remained in the territory are lost among the surrounding popula- tion. The services of these Croats were made use of by the emperor Heraclius, and they became a barrier against the Avars, whom they drove out of the country in which they settled. The territory which they occupied was divided by them into eleven Zupas or geuen. The people who inhabited the western portion kept the name of Croat, those in the eastern were called Serbs. We must now leave the Croats, as in this article we have only to do with the Serbs properly so called. The Croatian branch of the family, after being ruled by petty bans (a word said to be of Avar origin), was annexed to the kingdom of Hungary, and after the 16th century followed the fortunes of the house of Hapsburg.*~~

~~*1 Archiv fiir slavische Philologie, vii. 591. 2 Origines Ariace, p. 128, Vienna, 1883.*~~

~~*PkRY TF &*~~

~~*For five centuries after their arrival in their new territories we Early hear nothing of the Serbs save an occasional very brief mention in oomeal The native annalists do not begin earlier With :*~~

~~*Serbs, the Greeks,*~~

~~*the Byzantine chroniclers. than the 12th century. As in Croatia so among the smaller Zupans' gradually became merged into two or three great ones. The head Zupan of Servia, who resided in Desnica, called by Constantine Destinica, was at first the suzerain of all the other Servian Zupans, with the exception of the Pagani, concerning whose Latin name the emperor Constantine makes the very strange remark — Kal yap Hayavol xara riy Tov XKddBwv yAdooay &Barrioror éppn- vevovrat. After the land was harried by the Bulgarians we find the great Zupan of Dioclea (Doclea) supreme; he acquired the title of king, and received his*~~

~~*insignia from the pope. Finally, Nemanya, the descendant of a zupan family of Dioclea, founded a new dynasty in Rasa (mod, Novibazar), and united Servia and Bosnia into one strong empire. The names of the earlier princes, who are insignifi- cant and do not help us to follow the thread of Servian history, need not be mentioned. We find them sometimes tributary to the Greek emperors and sometimes independent. They appear, more- over, to have been engaged in constant wars with the Bulgarians, About 1015 Vladimir was reigning; but he was assassinated by the Bulgarian czar John, who got possession of Servia, but died two years afterwards on an expedition against the Greeks. To. gether with Bulgaria, Servia fell under the power of the emperor, and its affairs were managed by a Greek governor. Stephen Voyislaff made an insurrection in 1040, expelled the governor, Theophilus Eroticus, and defeated the Greeks in 1048. His son and successor, Michael (1050-80), at first lived in peace with the Byzantines, but afterwards entered into diplomatic relations with the West, took the title of king (rex), and received his insignia from the pope (1078). Heconquered Durazzo (Dra¢) in 1079, and reigned thirty years. His son, Constantine Bodin, subjugated the Zupans of Bosnia and Rasa, About 1122 Ourosh, surnamed Bela, zupan of Rasa, ascended the throne. From this time dates the power of Servia. His wife Anna was a German princess. Omitting three insignificant rulers, we come to the famous Stephen Nemanya (1159- 95), whose life has been written by his son Sava. He reigned thirty-six years, and was many times successful against the Greeks, but was not able to take Ragusa. He abandoned the government to his son Stephen in 1195 and became a monk under the name of Simeon, dying in 1200 in the monastery of Chilander on Mount Athos. Stephen was crowned by his youngest brother Sava, first archbishop of the country, with a crown which had been conse- crated by the pope; hence his title Prvovyenchani, "the first- crowned,'—that is to say of the new dynasty, for the Zupans of Dioclea were already kings. He died in 1224 and was followed by his sons Radoslaff and Vladislaff in succession. The latter made an offensive and defensive alliance with Ragusa. He employed Germans to work the Servian mines; and we find them repeatedly mentioned in Servian documents under the name of Saxons, especi- ally in the Zakonik of Stephen Dushan. No traces, however, can be found of them at the present day. Vladislaff's court is said to have been very luxurious. He died childless about 1237 and was*~~

~~*succeeded by his brother Stephen Urosh, whose territories were devastated in 1241 by the Mongols. He was afterwards driven from his throne by his son Dragutin and died in 1272. The latter, however, stung by conscience, abandoned the crown to his brother Milutin and contented himself with Syrmia, where he died in 1317. The reign of Milutin was chiefly occupied with struggles against the Greeks ; he was generally successful in his campaigns. But his domestic life was unhappy: he divoreed three wives and caused his only son Stephen to . blinded from suspicion of his treachery. The operation, however, was imperfectly performed, and the youth recovered his sight. In 1814 Milutin fought on the side of the emperor Andronicus against the Turks, and in the same year forced the Ragusans to pay him tribute. After his brother Dragutin's death he seized his hereditary dominions, and recalling his son Stephen, whom he had banished to Constantinople, gave him Dioclea. In 1319 the Hungarians deprived him of Bosnia; two years later he died. His son Stephen was engaged in perpetual wars. In 1330 he defeated the Bulgarians at the brook Kamencha near Velbuzhd, when the Bulgarian czar Michael was slain. It*~~

~~*was on this occasion that his son called Stephen Dushan first Stephen In spite of the king's successes against the Dushan.*~~

~~*distinguished himself. Greeks, he was destined to close his reign in the most lamentable manner: he was imprisoned and strangled by order of his own son at Zvechan in 1336. It is from this crime that Dushan gained his surname (dushiti, "to suffocate"). Concerning this prince, we are told by the ancient chroniclers that he was gigantic in stature and terrible in appearance. He conducted thirteen campaigns against the Greeks. In 1337 he took Strumitza and subjugated all Mace- donia and Albania to Thessalonica, Kostur, and Janina, threatened Byzantium, and concluded a peace with the emperor Andronicus,*~~

~~*3 The following rules for the pronunciation of the Croatian letters will be found useful :~c=ts; é=a sound between ts and ch, something like tie in the English word "daintier" ; é=ch as in "church"; j=y as in young"; §=sh; %=zh or j in the French "jour."*~~

~~*Cos@o,*~~

~~who was shut up in Thessalonica. He now divided his kingdom into eight districts and arranged everything on the Byzantine model. He conquered the whole of Maccdonia, and caused himself to be crowned emperor of Servia, his son Urosh as king (Kral, rex), and the archbishop of the country as patriarch. In 1349, at a diet, he published his celebrated Zakonik or " Book of Laws'? (see be- low). In 1356 he began a new campaign against the Greeks, his object being to seize Constantinople, to place the Greek crown upon his head, and drive the Turks out of Europe ; but in the midst of his schemes he died at Deabolis in Albania on 18th December 1356. His son Urosh was then but nineteen years of age, and, being sickly in body and weak in mind, he was unable to struggle against the revolted governors of his provinces, some of whom wished to make themselves independent. He was killed in a conflict with one of them in 1867, who ascended the throne under the name of Vukashin. This monarch was at first successful against the Turks, now already masters of considerable portions of the Byzantine empire; but he lost the decisive battle of Tewnarus, and with it his life, in 1371. According to the chroniclers, the Serbs were surprised and many slain while sleeping. Many also were drowned in the waters of the Maritza, "and there their bones lay and were never buried." The fate of Vukashin and of his brother Goiko was uncertain. The empire of Dushan now began to fall to pieces and Servia was again without a ruler. Marco, the son of Vukashin, declared himself the successor of his father ; but the line was unpopular with the Serbs, and ata diet at Peé (Ipek) in 1374 they elected a young noble, Lazar Greblianovich, a connexion of the old princely house. He did not, however, take the title of either emperor or king, but only of knez or prince. Bosnia was separated from Servia and fell under the rule of a noble named Tvertko. Sultan Murad had already conquered the Bulgarian sovereign Shishman and now marched against Servia. On the 15th of Junc 1389 the Serbs were~~

~~Battl of completely defeated at the battle of Kosovo, the "field of black-~~

~~birds." o event has been so much celebrated in the national songs as this. Many are the lays which tell of the treachery of Vuk Brankovich and the glorious self-immolation of Milosh Obilich, who stabbed the conqueror on the battlefield. The silken shroud, embroidered with gold, with which his wife Militza covered the body of her husband is still preserved in the monastery of Vrdnik in Syrmia, and a tree which she planted is shown to travellers at~~

~~upa. According to one account Lazar was killed in the battle ; according to others he was taken prisoner and executed before the eyes ofthe dying Murad. The bones of Lazar now rest at Ravanitza on the Frushka Gorain Syrmia. We hear no more of independent~~

~~ribyry Serb princes ; the country was now tributary to Turkey, and its~~

~~rulers were styled despots. Stephen, the son of Lazar, was confirmed~~

~~. in this title by Bajazid, the successor of Murad. Militza died in~~

~~a convent in 1406. Stephen died in 1427 childless, and was suc- eeeded by George Brankovich, a man sixty years of age, whose reign was a troubled one. In 1437 he was compelled to fly to Hungary to avoid the wrath of Murad II., and did not recover his territory till Hunyadi and Scanderbeg drove back the Turks in 1444. George fell, in the ninety-first year of his age, in battle with a Hungarian magnate named Michael Szilagyi on 24th December 1457. His youngest son Lazar succeeded him after committing many crimes, but only survived his father five weeks, His widow, Helena Pale- ologus, gave the country to the popc in order to secure his assist- ance against the Turks. Upon this the sultan ravaged Servia in the most pitiless manner, burnt the churches and monasteries, and aattied off 200,000 persons into captivity. Servia became in all respects a Turkish province, although we occasionally find the empty title of "despot" borne by some of the descendants of its princes. Great numbers of the Serbs subsequently migrated to Hungary. In 1689 some thousands under the command of the despot George Brankovich entered the imperial~~

~~*(German) army. In 1691 the Servian patriarch, Arsenius Chernoycvich, led about 36,000 families to settle in various parts of Hungary, chiefly in Syrmia and Slavonia. These zadrugas, as they are called, are not families in our sense of the word, consisting of parents and children, but communities of families according to the custom still found among the Croats of the Military Frontier. The number of the emigrants at that time would probably amount to 400,000 or 500,000 persons, Others followed them in 1738 and 1788, These Serbs have kept thcir religion and language in spite of the desperate efforts of the Government to Magyarize them. The last despot of Servia was George Brankovich, who died in captivity in Austria wa Ali,*~~

~~*In consequence of the splendid victories of Prince Eugene, Austria acquired the greater part of Servia by the treaty of Posharevatz in 1718, but the Turks regained it by the peace of Belgrade in 1739. For upwards of four centuries the Serbs groaned under the Turkish yoke, until, in 1804, unable to endure the oppression of the Turkish dahis, they broke out into rebellion under George Petrovich, sur- named 7'srni, or " Black George" (in Turkish Kara). Kara George was born at Topola (Tapolja) in 1767 ; at first he merely aimed at conquering the dahis, but afterwards he attempted to drive the Turks out of Servia. This he succeeded in doing after many failures.*~~

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~~*In 1813, however, they reconquered the country, and George with his adherents was compelled to fly to Austria. He returned in 1817, but was treacherously murdered by order of Milosh Obrenovich, who had now become the Servian leader.*~~

~~*all the Servian aristocracy, leaving only peasants to till the ground, feed swine (one of the great industries of the country), and pay the harach, Milosh was declared prince by the national assembly, and in 1880 secured the consent of the Porte to his enjoyment of the title with the succession reserved to his family. Turkey allowed Servia a quasi-independence, but held and garrisoned several for- tresses. Milosh had so little forgotten his Turkish training that he made himself obnoxious to his subjects by his despotic acts. He was a man of simple, even coarse habits, as many of the*~~

~~anec- dotes told of him testify. He was compelled to abdicate in 1839 in favour of his son Milan, who, however, was of too feeble a con- stitution to direct the government, and, dying soon afterwards, was succeeded by his younger brother Michael. He also abdicated in 1842 and the Serbs then elected Alexander, the son of Tsrni George, or, to give him his Servian patronymic, Karageorgevich. His rule lasted seventeen years; he was compelled to resign in 1859, and Milosh, now very old, was invited to come from Bucharest. He lived, however, only one year, dying in 1860, and left the throne to his son Michael, then aged forty, who was thus a second time elected prince of Servia. Michael was a man of refinement and had learned much during his exile. The condition of the country improved during his reign, and in 1862 he succeeded in getting the Turkish garrisons removed from Belgrade. The Moslem in- habitants have gradually withdrawn from the country, so that they are now represented by a very few families, Of the two mosques still remaining in Belgrade, one is devoted to their use, the other having been turned into a gas-work. While walking in his park, called Koshutniak or Topshidere, near Belgrade, Michael was assassinated by the emissaries of Alexander Karageorgevich on 10th June 1868. He was succeeded by his second cousin, Milan, grand- son of Yephrem, a brother of Milosh. Milan was born in 1854; he became prince of Servia in 1872. In 1875 he married a Russian lady, Natalie de Keczko. In 1878 the Serbs declared war against Turkey, but their arms were unsuccessful, and they were only saved by the intervention of Russia. By the treaty of Berlin, July 1878, the country received a large accession of territory, and the prince caused himself to be proclaimed king. Peace continued till the year 1885, and during this period the Serbs seemed to make con- siderable progress as a nation, in spite of the bitterness of political faction. In 1885, however, Servia made an ill-judged and selfish attack upon Bulgaria, which was ignominiously beaten off.~~

~~LITERATURE,~~

~~For some account of the Servian language, see SLAVS.~~

~~Under Servian literature the Dalmatian and Croatian in the limited sense of the term must be included, The latter, however, is somewhat meagre.~~

~~This literature is divided into three periods— (1) from the earliest times to the fall of Servian independence at the battle of Kosovo, 1389; (2) from the rise of the importance of Ragusa in the 15th century till its decay towards the end of the 17th ; (3) from the time of Dositei Obradovich to the present day.~~

~~First Period.—The earliest composition which has come down to Early us in the Servian or Illyrian language, to use a term in which we chroni- may include the Dalmatian Slavs, who are essentially the samc eles,~~

~~people, is the production of an unknown priest of Dioclea (Doclea), now Duklya, a heap of ruins, but formerly a city of considerable importance on the river Moratza, His title in Latin is " Anonymus Presbyter Diocleus," or in Slavonic " Pop Dukljanin." He must have lived about the middle of the 12th century, as the chronicle compiled by him extends to the year 1161. It is a tedious pro- duction, and_possesses only antiquarian interest ; it is printed by Kukuljevié Sakecinski! in the Arkiv za Povestnicu Jugoslavensku (Agram, 1851). The oldest documents of the Servian language in the narrower sense of the term are a letter of Kulin, the ban of Bosnia in 1189, and the letter of Simeon or Stephen Nemanya to the monastery of Chilander on Mount Athos. These productions are simply Paleoslavonic with a mixture of Serbisms. 'The history of early Servian literature has been thoroughly investigated by Schafarik in his Serbische Lesckirner (Pesth, 1853). We have only space to mention the more important productions. (1) The Life of St Simeon by hisson St Sabbas or Sava, the first archbishop of Servia, was written about 1210. The early manuscripts have been lost and the oldest copy known only datcs from the 17th century. Besides this work, Sava also compiled a ¢ipik or collection of statutes for the monastery of Studenitza, of which he was hegoumen or abbot. He was the founder of the celebrated Chilander monastery. (2) The History of St Simeon and St Sabbas by Dometian was com- piled in 1264, and is preserved in a manuscript of the 14th century.**

~~1 In citing the names of those members of the Servo-Croatian race who use Latin letters the original orthography is preserved.~~

~~od oe~~

~~*We have no space here to Struggles sketch the struggles of Milosh to secure the independence of Servia. for inde- He was himself of peasant origin and in his youth had been a swine- pend- herd. The Turks had contrived to kill or drive out of the country ence.*~~

~~*Servian ballads.*~~

~~*Ragusan era,*~~

~~*690*~~

~~*There is a good edition by Danichich, to whom we are indebted for a valuable lexicon of Old Servian. (8) The Rodoslof or Lives of Servian kings and archbishops, compiled by Archbishop Daniel (died 1338), contains the lives of Kings Radoslaff, Vladislatf, Urosh, Dragutin, Queen Helena, Milutin, &c. After his death the work was continued by an anonymous writer. The style of these pro- ductions is dry and tasteless. They are written in Paleoslavonic mixed with Serbisms. Hilferding has commented with great severity on their bombastic and panegyrical style, —the most com- plimentary epithets being applied to many sovereigns whose careers were stained with crimes. (4) The Life of Stephen, surnamed " De- chanski," from the monastery Dechani which he founded, written by Gregory Tzamblak, hegoumen of the same monastery. (5) In 1359 we have the Codo of Laws (Zakonik) of Stephen Dushan, which has been previously mentioned ; it is the earliest specimen of Servian legislation, and has come down in several manuscripts, being first published by Raich in his History at the close of the 18th century. Since that time other editions have appeared, the two most important being those of Miklosich and Novakovich.*~~

~~*Second Period.—To this epoch, which may be said to commence with the 15th century, belong some of the Servian chronicles, the Lyetopis Koprivnichki and others,—dry and tedious compilations ; the 15th century saw also the outburst of the literature of Ragusa (see below). The Servian ballads have obtained a European celebrity, and must have existed from very early times. Nicephorus Gregoras, who in 1325-26 came to Stephen Urosh IV. as ambassador from the Byzantine emperor Andronicus, noticed that some Serbs attached to his suite sang tragic*~~

~~songs celebrating the great exploits of their national heroes. As M. Pipin remarks in his History of Slavonic Literature, this shows the existence of a national epic among the Serbs before the battle of Kosovo. In the description of an embassy sent from Vienna to Constantinople in 1551 a certain Kuripeshich, by birth a Slovene, speaks of hearing songs sung in honour of Milosh who slew Sultan Murad. The first attempt at collecting them was made by the Franciscan monk Andrew Kati¢-Mio8ié, a Dalmatian, who died in 1785. His work was published at Venice in 1756 under the title of Razgovor Ugodni Naroda Slovinskoga (Recreations of the Slavonic People). Some of the pieces included in this volume were written by Miosi¢ himself, andl Ap made many alterations in the old ones. This, however, was quite in the spirit of the age in which he lived. We find extracts from Servian ballads in some of the Dalmatian poets of the 16th century. In 1794 they were alluded to in the Zravels of the abbé Fortis, and were finally collected by Vuk Stephanovich Karajich and published at Leipsic in 1824 under the title Narodne Srpske Pycsme (Popular Servian Songs). Some of them were afterwards translated into German by Theresa von Jacob and into English by Bowring and Lord Lytton. The versions of the last two possess but little merit. It would be impossible in a short notice like the present to discuss the contents of these remarkable ballads. To the majority of readers the cycle which treats of Knez Lazar and_his fate at the battle of Kosovo will prove the most interesting. Besides historical persons introduced in the ballads, there is the half-mythical hero Marco Kralevich, who, like the Russian Ilya Murometz, has many of the characteristics of a supernatural being. His victories, chiefly over Turks and Magyars, are narrated in the most bombastic phraseology. At last he dies in battle; but the belief prevails that he remains concealed till he shall appear on some future occasion to rescue his people from their oppressors. Almost as mysterious as the hero himself is his horse Sharatz, who was presented to him by a vila or fairy. After the death of Vuk Stephanovich (1864) a supple- mentary volume was published by his widow, which her husband had left prepared for the press Srpske Narodne Pyesme vz Herze- govine (Popular Servian Songs from Herzegovina, Vienna, 1866). A good collection of songs of the Montenegrins (Tsrnogortzi) was edited at Leipsic in 1857 by Milutinovich. There has also appeared a little volume of Servian national songs from~~

~~Bosnia, collected by Bogolub Petranovich in 1867. Since then volumes of Servian popular poetry by Rayachevich and Ristich have appeared.~~

~~During this period Slavonic literature reached a high pitch of culture in the little city of Ragusa, called in Slavonic Dubrovnik. During the 15th, 16th, and 17th centuries this city, now in a state of decay, was a kind of Slavonic Athens. To the influence of Italian literature was added the culture introduced by the crowds of learned Greeks,—Chalcocondylas, Lascaris, and others,—who found refuge within its walls after the fall of Constantinople. Lyrics and the lyric drama seem to have been the general pro- ductions of the more noteworthy authors. The influence of Italian is perceptible throughout. The first writer of eminence was Hannibal Lucid, a very popular poet in his day, author of love- songs, a drama Robinja (The Female Slave), and translations pub- lished first by his son Anthony at Venice in 1556, and reprinted by Dr Gaj at Agram in 1847. A very interesting poem by this author is his Zulogy of the city of Dubrovnik (Ragusa). Another writer of considerable reputation was Nicholas Vetranić-Cavtić (1482-1576), who afterwards became a monk and lived as a hermit on one of the islands on the Dalmatian coast. He has left several~~

~~SHER YtA~~

~~plays and, besides translating the Hecuba of Euripides, wrote several mysteries, in the style of the religious plays once so popular throughout Europe ; of these the Sacrifice of Abraham is the best. His poem entitled Ztaly is remarkable for the warm affection it expresses for the country of his education. Peter Hektorevid (1486- 1572) was a rich proprietor of the island of Zara, and is worth mentioning as having shown a taste for the national poetry of his country. He has introduced some songs in his Ribange i Libarsko Prigovoranje (Fishing and a Dialogue of Fishermen). Very cele- brated in its time was the Jegjupka or Gipsy of Andrew Cubranovyić (1500-1559), who was originally a silversmith. His poem of the Gipsy is said to have been evoked in the following manner,~~

~~ubranović was on one occasion following a young lady and urging his suit when she turned round and said scornfully in Italian to her attendant, in the hearing of the poet, "Che vuole da me questo Zingaro 2?" ("What does this Gipsy want with me ?"). The despised lover took up~~

~~*the word of reproach and wrote a poem in which he introduced a Gipsy prophesying to a company of ladies their various fortunes and concluding with an expostulation to the hard-hearted beauty for her obduracy. Schafarik speaks of this piece with great enthusiasm and calls it "a truly splendid flower in the garden of the Illyrian Muses." The Russian critic Pipin supposes, with great probability, that the poem was written as a sort of masquerade for the carnival. It enjoyed considerable popularity and was frequently imitated. A similar story is said to have suggested the Dervise (Dervish) of Stjepo Guéeti¢, in which the author represents himself as a Turkish dervish. These two pieces are elegant productions in the Italian manner.*~~

~~*Nicholas Naljeskovi¢ (1510-1587) was a native of Ragusa and author of several pastoral plays in the style then so much in vogue throughout Europe. Of the same description are the productions of Marino DrŽié (1520-1580), of whom his contemporaries praised "il puro, vago, e dolce canto." Mention may also be made of Dinko Ranjina and Mauro Orbini (d. 1614). Another celebrated poet was Dominco Zlataridé (1556-1607), who, besides translating the Electva of Sophocles, produced a version of the Aminta of Tasso and has left several minor pieces. The chief of the Ragusan poets, however, was Ivan Gunduli¢ (sometimes called by his Italian name of Gondola). Very few facts are known of his life; but he died in 1658 aged fifty, having discharged several important public offices, His death, says Schafarik, was not too early for his fame but too early for literature and the glory and prosperity of his country. He himself published but little, and many of his writings perished in the earthquake in 1667, after which Ragusa never regained her former prosperity. The so-called Petrarchan school of Illyrian poetry languished after this and wasted its energy on elegant trifles. Dalmatian poets of the 18th and 19th centuries have not made any considerable figure. The Osman of Gunduli¢, on which his fame rests, is an epic in twelve books, aud was written to cele- brate the victory of the Poles under Chodkiewiez over the Turks and Tatars in 1622 at Choeim (Khotin). Schafarik praises Gundulié for the richness of his imagination, the lofty tone of his verse, and its perfectly constructed rhythm. We are willing to allow that Osman possesses considerable spirit and that the versification is melodious, but on the whole it seems a tedious poem. The short quatrains in which it is*~~

~~*written lack the true epic dignity. Leaving the Dalmatians, the only writer worthy of mention among the Serbs is George Brankovich (1645-1711), the last despot, who com- piled a HIstory of Servia till the end of the 17th Century, which has been edited by Chedomil Miyatovich, ambassador from the court of Servia to St James's (1886). From this period till the close of the 18th century there is no Servian literature : the spirit of the people seems to have been erushed out of them by Austrian persceutors on the one hand and by Turkish on the other. Till the reign of Milosh Obrenovich in the 19th eentury hardly a Servian printed book was to be seen. The works of Yuri Krizhanich, who, although a Serb, wrote in Russian, are mentioned under Russta (p. 105).*~~

~~*sThird Period (from 1750).—The spark of nationality was still burning among the Serbs, in spite of their degradation, and men were found to fan it. thorough patriot. HIe was born in Slavonia, a province of Austria inhabited by Serbs, the son of poor parents, but he had all the enthusiasm for learning that animated the Russian Lomonosoff, whom he very much resembled. Thus we find him making his way on foot from his native town to Kieff, whero he was reecived into the eeclesiastical seminary and devoted himself to theology. After spending three years at Kieff, he betook himself to Moscow. Meeting, on his return to his native country, with a cold reeeption from those whom he had expected to foster his studies, he went back to Russia, and while at Kieff resolved to write the history of the Servian nation. Knowing that the Slavonic monasteries In European Turkey contained many unpublished manuseripts (num- bers of which have sinee perished in the wars which have devastated the country or have been destroyed by the Grecks), he visited Con- stantinople and many other parts of that empire in order to eolleet materials. On his return to Austria he took np his abode at Neusatz on the Danube (also long the headquarters of Sehafarik),*~~

~~*Such a man was Raich (1720-1801), a Raich.*~~

~~*SERVIA*~~

~~*and worked at his history, which he finished in 1768, but it was not published till upwards of twenty years later. In 1772 he became a monk, and he died in 1801. The werk of Raich, though interesting as a*~~

~~*monument of learned industry, does not now possess much critical value. The style is harsh and a great deal of the ethnology (a science then in its infancy) unsound. Thus, among other strange statements, he holds the Bulgarians on the Volga to have been Slavs. After Raich we come upon two inde- fatigable Servian workers, Dositei Obradovich (1739-1811) and Vuk Stephanovich (1787-1864). The life of the former has been written by himself. He was a man of varied learning, and his eareer was marked by many curious adventures. After having visited nearly every part of Europe (including England, where he was reccived with great hospitality), Obradovich returned to Servia and became tutor to the children of Tsrni George. He was a man sprung from the people, and an indefatigable and successful labourer for national cducation. The list of his compilations and translations is considerable. Acting on the wise principle that the language as tt is spoken should be cultivated and not a jargon overloaded with archaic and supposed classical forms, he did good by destroying the influence of the Paleoslavonic among his country- men. Before his death his services to his country were recognized by his appointment as member of the senate and superintendent of national education, The mau, however, who was destined to bring the Servian language into the greatest prominence was Vuk (Wolf) Stephanovich Karajich, whose collection of songs was mentioned above. Vuk was an indefatigable scholar and patriot. Till his time the Servian language had been, so far as all foreigners were concerned, simply rudis indigestague moles. He wrote a good grammar, which has formed the basis of all published since, and to this Jacob Grimm furnished a preface. To him also we owe a Servian dictionary and a collection of tales and proverbs. His sup- posed innovations in the Servian language with regard to the rejec- tion of archaisms and the introduction of a new system of ortho- graphy raised up a host of enemies against him, so that not only was he forbidden to enter Servia but his books were excluded from the country. He died at the beginning of 1864, but permission to make use of his innovations was not given till four years afterwards.*~~

~~*A complete enumeration of the Servian and Croatian authors of the 19th century would far exceed the limits of this article. But Matthias Anthony Relkovi¢ (1732-1798) deserves mention, because he wrote in a dialect but little cultivated, viz., the Slavonian in the restricted sense, as applied to the*~~

~~*Austrian province of that name. He published in 1761 a successful satire entitled Satir ditt Divi Csovik (Satire or the Clever Man), at Dresden. A few names, each of which marks a definite feature of the literature, must suffice. Lucian Mushitzki (1777-1851), an archimandrite, afterwards bishop of Carlowitz, was highly esteemed by his countrymen as a poet. His odes are full of patriotic feeling. Yovan Hadchich (1799-1870) wrote under the rom de plwme of Milosh Svetich. For some time he was an authority in Servian literature, but ultimately his influence waned. Simeon Milutinovich, a noted writer, whose life was full of strange adventures, composed an epic poem entitled Serbianka, which describes the chief incidents of the Servian war in 1812. It was published at Leipsic in 1826. We have previously alluded to his collection of Montenegrin songs. He is also the author of a tragedy on Milosh Obilich, who slew Sultan Murad. Milutinovich,*~~

~~*hatred. The account of the cruelties committed by the Turks while collecting the harach and the conclusion, where the body of the slain Agha is brought to the hermit, are dramatically conceived.*~~

~~*The four most celebrated Servo-Croatian poets are Stanko Vraz, Servo-Stanko Vraz (1810- Croatian 1851) was by birth a Slovene; he joined, however, the Illyrian poetry.*~~

~~*Preradovi¢, Yovanovich, and Radichevich.*~~

~~*movement under Ljudevit Gaj and used the Servo-Croatian lan- guage. The attempt of Gaj to form a common literary language under the name of Illyrian by fusing the Servo-Croat and the Sloven- ish languages was not successful. Perhaps the only result, if it had been persevered in, would have been that the Slovenes would have become completely Germanized, as a pedantic literary language would not have been understood by the peasants. Besides many graceful lyrics, Vraz also published collections of national songs. Some of his shorter pieces are very elegant and havea rich Oriental colouring. Peter Preradovié (1818-1872), a native of the Military Frontier and a general in the Austrian army, is the author of many graceful lyrics, widely known throughout all Servian-speaking regiens. A*~~

~~*complete edition of his works appeared in 1873. Peter Yovanovich (born in 1801) is the author of many popular poems. But no one of the later generation of Servian authors has gained such a reputation as Branko Radichevich, who was born in the Austrian Banat in 1824, and ended his short life at Vienna in 1853. His popularity rests upon the patriotism shown in his writings and their spirited tone. Nor have the Servo-Croats lacked important workers in the fields of history and philology. Among these must be mentioned Dyuro Danichich (1825-1882), who was educated partly at Pesth and partly at Vienna, at the latter university be-coming the pupil of Miklosich. He first made himself conspicuous by espousing the cause of Vuk Stephanovich Karajich in the dispute about Servian orthography. Besides contributing valuable papers to the Glasnik, he was the author of an Old Servian dictionary of great service to students. He edited, as previously mentioned, the memorials of Old Servian literature. At the time of his death he was engaged upon a great Servo-Croatian dictionary, a work which, it is to be hoped, will be continued by some of his pupils. Ljudevit Gaj (1809-1872), who has already been mentioned, was a Croat and laboured to bring about a national unity, His services were invalu- able as an editor of the Old Dalmatian classics. Armin Pavié (still living) has written a good history of the Dalmatian drama (Historija Dubrovatke Drame, Agram, 1871). Stoyan Novakovich (born 1842), at one time minister of public instruction, besides contributing valuable articles in the Glasnik, has published an historical chres- tomathy of the Servian language and an edition of the Zakonik of Stephen Dushan. Another worker in the same field was Chedomil Miyatovich, previously mentioned. One of the inost indefatigable and patriotic of modern Croatian scholars is Ivan Kukuljevi¢ Sak- cinski, who has edited, besides many early Croatian and Servian works, an admirable Arkiv za Povestnicu Jugoslavensku (Collection of Documents for South Slavonic History), of which several volumes have appeared, — a veritable storchouse of Slavonic history, archeo- logy, and literature. He has found an excellent coadjutor in Dr Francis Raéki (born 1829), among whose works may be mentioned Pismo Slovjensko (Slavonic Writing, Agram, 1861), Odlomci tz Driavnoga prava Horvatskoga (Fragments of Croatian Law, 1861), and many excellent historical articles in the journals Pozor (The Observer) and Rad (Labour).*~~

~~*After Miklosich, the most indefatigable worker in the field of Slavonic Slavonic literature now living is the Croat Ignaz Vatroslaff Jagi¢ litera- (born 1835), formerly a professor at Berlin, who now occupies the ture chair of Slavonic philosophy at St Petersburg, in the place of gener- Sreznevski. He has published many valuable works on Slavonic ally.*~~

~~*who was a Bosnian, died in poverty in 1847. Yovan Popovich (1806-1856), a native of the Banat, was a writer of much industry and merit, and gained a considerable reputation by his plays, the subjects of which were taken from Servian history and were put*~~

~~*upon the stage with considerable effect. Without being a great dramatic writer, hc had the art of constructing pieces to which people would listen, —something like Sheridan Knowles. To this circle belongs also Yuri Maletich, author of Spomenik Lukianom Mushitzkom (A Memorial to Lucian Mushitzki), and also the Apothe- osis of Kara George. In 1847 the well-known journal Glasnik (The Messenger) was founded, which has continued to the present time and contains many valuable papers on Servian history and literature. Schafarik had previously founded at Neusatz (Novi Sad) the Matitza Srbska, an excellent society for printing Servian books.*~~

~~*The Croats have also been active in modern times. The remark- able poem, Death of the Agha Ismail Cengié, by Ivan Mazurani¢ (born in 1813), is said to be so popular among the Serbs, as stimulat- ing their hatred of the Turk, that it has been called " The Epos of Hate." Ismail was the descendant of an old Bosnian family who had turned Mussulmans to keep their estates when the country was first invaded. These renegades, as might be expected, are more fanatical than the Turks themselves. His exploits were chiefly directed against the Uskoks and the Montenegrins. The poem is composed in the same metre as that of the Servian ballads collected by Vuk. It is spirited, but has a savage air about it, engendered by the scenes described, the fierce border wars of leng hereditary*~~

~~*1 To show the opinion entertained of him in Britain it is only necessary to cite the inscription in a book presented to him by Dr Fordyce, an eminent*~~

~~London physician of the time: "Dositheo Obradovic, Serbiano, viro linguis yarlis erudito, sanctissimis moribus morato," &c.~~

~~philology, such as (in 1867) a History of Servo-Croatian Literature, also a reading-book with specimens of early Glagolitic and Cyrillic works (Priméri Starohervatskoga Jezika). He has also edited two of the oldest Slavonic codices, Marianus and Zographensis. More- over, in 1875 he founded the well-known Archiv fiir slavische Philo- logie, which he still edits with the co-operation of many Slavists. Sime Ljubi¢ is another worker in the field of Slavonic history and literature. To the excellent literary journals already mentioned may be added the Starina, published at Agram. Valuable works have been written by Balthasar BogiSvié on the house-communities of the southern Slavs and south Slavonic law generally. His labours have been made use of by Sir Henry Maine. One of the most cele- brated of living Servian poets is Matthias Ban, the author of several poems and plays, which have been very favourably received.~~

~~A few words may be added here on Montenegrin history and Monte- literature, the details of which are but scanty. On the death of negro.~~

~~Stephen Dushan, a certain prince Balsha became independent ruler of Zeta. Many fugitives betook themselves to the little retreat after the battle of Kosovo. Ivan Chernoyevich settled in Tzetinye (Cettinje) in 1485 and built a church and a monastery. In 1516 his son and successor retired to Venice, and Montenegro was governed by a national assembly and a vladika (prince bishop). The country was ruled by vladikas of various families till 1697. In that year the office became hereditary in the family of Petrovich of Negosh. Originally the ecclesiastical and civil functions were combined in~~

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~~the person of the vladika, but they were separated on the death of Peter II. in 1851. The latter was the author of some poems in the Servian language, the most celebrated being Lowcha Mikrokozma (The Light of the Mierocosm), which appeared at Belgrade in 1845. He was succeeded by his son Daniel, first prince of Montenegro, who, dying in 1860, was followed by his nephew Nicholas, the most memor- able events of whose~~

~~reign have been the war with Turkey and the increase of his territory by the treaty of Berlin. (W. R. M.)~~

~~SERVITES (Servi Beate Marie Virginis). This reli- gious order owes its origin to Bonfiglio Monaldi, a Floren- tine, who in 1233 withdrew along with six of his comrades to the Campo Marzo near the city for prayer and ascetic exercises in honour of the Virgin. Three years afterwards they removed to Monte Senario, where their numbers were considerably increased. The order at a very early period received from Bishop Ardingus of Florence the rule of St Augustine, but did not obtain papal sanction until 1255. It rapidly spread into France, Germany, the Low Countries, Poland, and Hungary, and from Martin V. it received in 1424 the privileges of the mendicant orders. The Servite Tertiaries were founded about the same time by Giuliano Falconierl. Under Bernardino de Ricciolini arose the Hermit Servites (1593). The members of the order (Ob- servants and Conventuals) are now found chiefly in Italy, Hungary, Austria, afid Bavaria.~~

~~SERVIUS, the commentator on Virgil, is all but un- known to us, so far as personal information goes, From notices in the Saturnalia of Macrobius, where he appears as an interlocutor, we may infer that in or about 380, though still quite young, he was already distinguished as a "grammaticus," that is, as an expert in the criticism, explanation, and teaching of the classical literature of Rome. Servius therefore belongs to the latter half of the 4th and the earlier years of the 5th century, to the age of Symmachus and Claudian, of Jerome and Augustine. The allusions of Macrobius and a short letter from Sym- machus to Servius leave no doubt that the grammarian formed one of that band of cultivated men, led by Sym- machus, whose eyes were turned towards the pagan past and away from the Christian future, and who breathed into pagan culture its last transient sparks of life and vigour. The race of " grammatici" to which Servius belonged, and which had now run at Rome a course of some 500 years, had done much evil to literature, had helped to corrupt, falsify, encumber, and even in some instances by abbreviations upon abbreviations to kill out the texts on which they worked ; but on the whole they had done more good. They had helped to save what could be saved of education, culture, and history, and so had in the main contributed to the~~

~~*preservation of the ancient literature that has come down to us. Of all the "gram- matici" none bears on his front more of the virtues and fewer of the vices of the race than Servius. But it must be noted that much which passes under the name of Servius in modern editions, and in modern quotations, most certainly did not proceed from his hand. The comments on Virgil to which his name has been attached come from three different sources. One class of MSS. contains a comparatively short commentary, definitely attributed to Servius. A second class (all going back to the 10th or 11th century) presents a much expanded com- mentary, in which the first is embedded; but these MSS. differ very much in the amount and character of the addi- tions they make to the original, and none of them bear the name of Servius. The added matter is undoubtedly ancient, dating from a time but little removed from that of Servius, and is founded to a large extent on historical and antiquarian literature which is now lost. The third class of MSS., written for the most part in Italy and of late date, repeats the text of the first class, with numerous interpolated scholia of quite recent origin and little or no value.*~~

~~*SE R—SER*~~

~~*The real Servian commentary (for so we must designate the text that we find in the first class of MSS.) practically gives the only complete extant edition of a classic author written before the destruction of the empire. It is con- structed very much on the principle of a modern edition, but with very different ideas both as to the relative and the absolute value of the matters treated. Owing to the delicacy and originality of his veiled style, to the innumerable threads of ancient history, mythology, and antiquities shot through the texture of his poems, owing above all to the firm hold he early gained upon the Latin schools, Virgil had a continuous line of expounders stretching almost from his death to the destruction of the Roman government of the West. Servius built his edition in part on the extensive Virgilian literature of preceding times, much of which is known only from the fragments and facts he has preserved. The notices of Virgil's text, though seldom or never authoritative in face of the existing MSS., which go back to, or even beyond, the times of Servius, yet supply valuable information concerning the ancient recensions and textual criticism of Virgil. In the grammatical interpretation of his author's*~~

~~*language, Servius does not rise above the stiff and overwrought subtleties of that day ; while his etymo- logies, aS is natural, violate every law of sound and sense, As a literary critic the shortcomings of Servius are great, if we judge him by a modern standard, but he shines if compared with his contemporaries. In particular, he deserves credit for setting his face against the prevalent allegorical methods of exposition. But the abiding value of his work lies in his preservation of facts in Roman history, religion, antiquities, and language which but for him might have perished. Not a little of the laborious erudition of Varro and other ancient scholars, to whom time has proved unkind, has survived in Servius's pages. The older MSS. sometimes add to the name Servius that of Magister (given to other distinguished grammarians at different times); the later Italian MSS. in some cases give his name as Maurus Servius Honoratus. Besides the Virgilian commentary, we have other works of Servius,— a collection of notes on the grammar (47's) of Donatus ; a treatise on metrical endings ; the tract De Centum Meteris or Centimeter.*~~

~~*The most noted editions of the Virgilian commentary are by Fabricius (1551); P. Daniel, who first published the enlarged commentary (1600); and by Thilo and Hagen (Leipsic, 1878-84). The Essai sur Servius by E. Thomas (Paris, 1880) is an elaborate and valuable examination of all matters connected with Servius; many points are treated also by Ribbeck in his " Prolegomena"' to Virgil, and by Thilo and Hagen as above. The smaller works of Servius are printed in Keil's Grammatict Latint.*~~

~~*SERVIUS TULLIUS, the sixth king of Rome, described in one account as originally a slave, is said to have married a daughter of Tarquin, and to have gained the throne by the contrivance of Tanaquil, his mother-in-law. Another legend represented him as a soldier of fortune originally named Mastarna, from Etruria, who attached himself to Ceeles Vibenna, the founder of an Etruscan city on the Ceelian Hill. Servius included within one circuit the five separately fortified hills which were then inhabited and added two more, thus completing the "Septimontium"; the space thus inclosed he divided into four " regiones," the Suburana, Esquilina, Collina, and Palatina (see Roms, vol. xx. p. 813). For his contributions to Roman law see Roman Law, vol. xx. p. 669 sg., and for his reforms of the constitution see Roms, vol. xx. pp. 734-735, His legislation was extremely*~~

~~*distasteful to the patrician order, and his reign of forty-four years was brought to a close by a conspiracy headed by his son-in-law Tarquinius Superbus. The street in which Tullia drove her car over her father's body ever after bore the name of the " Vicus Sceleratus."*~~

~~*SES—SET*~~

~~*SESAME, the most important plant of the genus Sesamum (nat. ord. Pedalinee), is that which is used throughout India and other tropical countries for the sake of the oil expressed from its seeds. S. indicum is an herb 2 to 4 feet high, with the lower leaves on long stalks, broad, coarsely toothed or lobed. The upper leaves are opposite, lanceolate, and bear in their axils curved, tubular, two- lipped flowers, each about ?# inch long, and pinkish or yellowish in colour. The four stamens are of unequal length, with a trace of a fifth stamen, and the two-celled ovary ripens into a two-valved pod with numerous seeds, The plant has been cultivated in the tropics from time immemorial, and is supposed on philological grounds to have been disseminated from the islands of the Indian Archipelago, but at present it is not known with certainty in a wild state. The plant varies in the colour of the flower, and especially in that of the seeds, which range from light yellow or whitish to black. Sesame oil, otherwise known as gingelly or til (not to be confounded with that derived from Guizotia oleifera, known under the same vernacular name), is very largely used for the same pur- poses as olive oil, and, although less widely known by name, is commercially a much more important oil; thus, apart from the almost universal use of the oil in India, from 50 to 80 millions of kilogrammes of the seed are stated to have been introduced annually into France in 1870- 1872. The seed is also largely exported from Zanzibar and Formosa. The seeds and leaves also are used by the natives as demulcents and for other medicinal purposes. The soot obtained in burning the oil is said to constitute one of the ingredients in India or Chinese ink, The plant might be cultivated with advantage in almost all the tropical and semi-tropical colonies of Britain, but will not succeed in any part of Europe.*~~

~~*SESOSTRIS (Sécworpis, so Herodotus ; Diodorus writes Sesoosis; other forms are Sesonchosis, Sesosis, Sesothis, &c.) is according to Greek*~~

~~historians the name of a king of Egypt who conquered the whole world, even Scythia, the lands of the Ganges, and /Zthiopia, which were not subject to any of the later great empires. The conqueror in whose exploits these extravagant legends took their rise was Ramses II. (see Ecypr, vol. vii. p. 739); but the Greek accounts unite in his person all the greatest deeds of the ancient Pharaohs, and add much that is purely imagin- ary. In Manetho's lists Sesostris is identified with a much older king, Usertesen IL, perhaps because authentic tradi- tion made him the conqueror of Aithiopia (see vol. vii. p. 734). When Herodotus says that he himself saw monu- ments of Sesostris in Palestine, he has been thought to refer to the figures of Ramses II. hewn in the rocks of Nahr-al- Kalb, near Beirut, but they do not agree well with his description (Hadt., ii, 102-106), which seems to point rather to Astarte pillars (Asherim). The monuments in Ionia of which he speaks still exist in the Karabel Pass. They are not Egyptian but so-called " Hittite," z.e., probably Cappa- docian. See Wright, Empire of the Hittites, last plate.~~

~~SESSA, a town of the kingdom of Italy, province of Terra di Lavoro, situated among hills on the site of the ancient Suessa Aurunca, on a small affluent of the Gari- gliano, is 17 miles east of Gaeta and half a mile from Sant' Agata. The hill on which Sessa is situated is a mass of volcanic tufa, in which have been discovered painted chambers erroneously supposed to have belonged to a city covered by a volcanic eruption, The town contains many ancient remains, particularly the ruins of Ponte Aurunca and of an amphitheatre. It is the see of a bishop, has an interesting basilica with three naves, a gymnasium, a technical school, anda seminary. The cathedral contains inscriptions, a mosaic pavement, and a good ambo decorated with mosaics resting on columns, In the principal street~~

~~are memorial stones with inscriptions in honour of Charles V., surmounted by an old crucifix with a mosaic cross. Exclusive of the environs, the town has a population of 6130. The hills of Sessa are celebrated for thcir vines, the "Ager Falernus " of the Romans.~~

~~SESSION, Court or. See Scornann, p. 535 supra.~~

~~*SETTLE, Evxanan (1648-1723), a minor poet and playwright of the Restoration period, immortalized by the ridicule of Dryden and Pope, was born at Dunstable in 1648. He is the "Doeg" of the second part of Absalom and Achitophel, and is treated by the satirist with some- what more good-humoured contempt than his companion in the pillory— Shadwell.*~~

~~*Doeg, though without knowing how or why,*~~

~~*Made still a blundering kind of melody;*~~

~~*Spurr'd boldly on, and dash'd through thick and thin, Through sense and nonsense, never out nor in.*~~

~~*Dryden treats him as a sort of harmless fool, who ""'rhymed and rattled" along in perfect satisfaction with himself. For some time also he was taken by the public at his own valuation. At college he seems to have been regarded as a prodigy, and his juvenile verse was preferred to Dryden's. Coming to London, he began to produce tragedies. His Lmpress of Morocco (acted in 1673, when the author was twenty-five) was a signal success on the stage, and is said by Dennis to have been "the first play that was ever sold in England for two shillings, and the first that was ever printed with cuts." Puffed up by this success, Settle made haughty allusions in his preface, which excited the ire of his contemporaries; and Dryden co-operated with Crowne and Shadwell in writing sarcastic notes on Zhe Empress. Settle's next collision with Dryden was also provoked by himself. He attempted a counterblast to Dryden's great satire in Absalom Senzor,, and was contemptuously demolished in return. Settle was then comparatively a young man, his age being thirty-five, but he had touched the height of his fame, and the remain- ing forty years of his life were not so successful. Dryden mockingly said of him that his ambition was to be "the master of a puppet-show," alluding to his duties in the office of city poet, in which he was one of the successors of Lodge, Middleton, Jonson, and Quarles; and to this he was literally reduced in his old age, keeping a booth at Bartholomew Fair, where he is said to have played the part of the dragon in green leather. He died in the Charterhouse in 1723.*~~

~~*SETTLEMENT, in law, is a mutual arrangement between living persons for regulating the present or future enjoyment of property. It also denotes the instrument by which such enjoyment is regulated. The prevailing notion of a settlement is the dealing with property in a manner different from that in which the law would have dealt with it apart from the settlement. Definitions of settlement for the purposes of the Acts are contained in the Acts of 1856, 1877, and 1882 (see below). They are, however, scarcely sufficient for a general definition. On the one hand they are too extensive, and include wills ; on the other they are not comprehensive enough, as they apply only to real estate. They also include only cases of successive limitations, but the idea of succession does not in itself seem a necessary part of the conception of settlement, although no doubt most settlements contemplate successive enjoyment. Settle- ments may be either for valuable consideration or not: the latter are usually called voluntary, and are in law to some extent in the same position as revocable gifts ; the former are really contracts, and in general their validity depends upon the law of contract. They may accordingly contain any provisions not contrary to law or public policy.!*~~

~~*1 In this English law allows greater freedom than French, By § 791 of the Code Napoléon, in a contract of marriage the succession to a living person cannot be renounced.*~~

~~*694 Sk PTL eee TFT*~~

~~*The elements of the modern settlement are to be found in Roman law. The vulgaris, pupillaris, or exemplaris substitutio (consisting in the appointment of successive heirs in case of the death, incapacity, or refusal of the heir first nominated) may have suggested the modern mode of giving enjoyment of property in succession. Such a substitutio could, however, only have been made by will, while the settlement of English law is, in the general acceptation of the term, exclusively an instrument inter vivos. The dos or donatio propter nuptias corresponds to a considerable extent with the marriage settlement, the instrument itself being represented by the dotale instru- mentum or pacta dotalia. In the earliest period of Roman law no provision for the wife was required, for she passed under manus of her husband, and became in law his daughter,*~~

~~*entitled as such to a share of his property at his death. In course of time the plebeian form of marriage by usus, according to which the wife did not become sub- ject to manus, gradually superseded the older form, and it became necessary to make a provision for the wife by contract. Such provision from the wife's side was made by the dos, the property contributed by the wife or some one on her behalf towards the expenses of the new house- hold. Dos might be given before or after marriage, or might be increased after marriage. It was a duty enforced by legislation to provide dos where the father possessed a sufficient fortune. Dos was of three kinds :—profectitia, contributed by the father or other ascendant on the male side ; adventitia, by the wife herself or any person other than those who contributed dos profectitia; receptitia, by any person who contributed dos adventitia, subject to the stipulation that the property was to be returned to the person advancing it on dissolution of the marriage. The position of the husband gradually changed for the worse. From being owner, subject to an obligation to return the dos if the wife predeceased him, he became a trustee of the corpus of the property for the wife's family, retaining only the enjoyment of the income as long as the marriage continued. The contribution by the husband was called donatio propter nuptias.1 'The most striking point of dif- ference between the Roman and the English law is that under the former the children took no interest in the con- tributions made by the parents. Other modes of settling property in Roman law were the life interest or wsus, the Jideccommissum, and the prohibition of alienation of a legatum.*~~

~~*The oldest form of settlement in England was perhaps the gift in frankmarriage to the donees in frankmarriage, and the heirs between them two begotten (Littleton, § 17). This was simply a form of gift in special tail, which became up to the reign of Queen Elizabeth the most usual kind of settlement. The time at which the modern form of settlement of real estate came into use seems to be doubtful. There does not appear to be any trace of a limitation of an estate to an unborn child prior to 1556. In an instrument of that year such a limitation was effected by means of a feoffment to uses. The plan of granting the freehold to trustees to preserve contingent remainders? is said to have been invented by Lord Keeper Bridgman in the 17th century, the object being to preserve the estate from forfeiture for treason during the Common- wealth.? The*~~

~~*settlement of chattels is no doubt of consider- ably later origin, and the principles were adopted by courts of equity from the corresponding law as to real estate.*~~

~~*1 See Hunter, Roman Law, p. 150; Maine, Harly History of Insti- tutions, lect. xi. 2 The appointment of such trustees has been rendered unnecessary by 8 and 9 Viet. c. 106 and 40 and 41 Vict. c. 33. 8 This sketch of the history of settlement is abridged from a paper hh Myr Joshua Williams, Papers of the Juridical Society, vol. ' p. °*~~

~~*At the present time the settlement in England is, so fay as regards real estate, used for two inconsistent purposes, — to "make an eldest son," as it is called, and to avoid the results of the right of succession to real property of the eldest son by making provision for the younger children, The first result is generally obtained by a strict settlement, the latter by a marriage settlement, which is for valuable consideration if ante-nuptial, voluntary if post-nuptial. At the same time it should be remembered that these two kinds of settlement are not mutually exclusive: a marriage settlement may often take the form of a strict settlement and be in substance a resettlement of the family estate.*~~

~~*There are three possible varieties of the marriage settlement : — (1) the dotal system (régime dotal), under which the husband generally has the usufruct but not the property in the dos; this is the system generally followed in countries where the Roman law prevails ; (2) the system of community of goods (communauté de biens), by which the wife becomes a kind of partner of the husband ; this system, said to have been originally the custom of ancient Germany, is in vogue in France and Louisiana ; (3) the system of separate property, by which (subject to contract) the wife's pro- perty is free from the control of her husband ; this system prevails in the United Kingdom and the United States. An ordinary English marriage settlement of personalty is a deed to which the parties are the intended husband and wife and trustecs nominated on their behalf. It generally contains the following clauses : — a power to vary the investments of the settled property within limits ; trusts of the income for the benefit of the husband and wife during their lives; trusts for the issue, usually according to the appointmeut of the husband and wife or the survivor,*~~

~~*and in default for sons attaining twenty-one and for daughters attaining that age or marrying, equally, subject to a "hotchpot"' clause, charging the children with the amount of any previous ee ments; a power of advancement of the portions of children in anticipation ; a trust for the maintenance of infant children after the death of the parents, with a direction for the accumulation of surplus income; ultimate trusts fixing the destination of the settled property in default of issue. The receipt and trustee clauses, at one time usual, have been rendered unnecessary hy recent legislation, The Conveyancing Act, 1881, superseding Lord St Leonard's Act of 1859 and Lord Cranworth's Act of 1860, gives power to appoint new trustees, and makes a trustec's receipt a sufficient discharge. 'Trustees were formerly much restricted in their investments, but various Acts of Parliament have now increased their powers of choice of investment (see Trust). The scttlement of real estate is still a matter of greater difficulty than that of personalty, though it has been considerably simplified by recent legislation. A short statutory form of settlement of real estate is provided by the Conveyancing Act, 1881 (Fourth Sehedule, Form iv.). The Act further enacts that a covenant by the settlor for further assurance is to be implied. This takes the place of those covenants usually inserted in settlements before the Act, which were the ordinary covenants for title. (Sec Rrau EsTatez.) The Settled Land Act, 1882, gives statutory authority to certain provisions generally inserted by conveyancers. The clauses must, however, still vary infinitely according to the circumstances of particular cases. Where the settlement is of copyholds, the usual course is to surrender them to the use of trustees as joint tenants in fee upon such trusts as will effect the desired devolution of the property.*~~

~~*A strict settlement of real estate usually takes place on the coming of age or marriage of the eldest son, if it be the intention of the parties that the estate should continue undivided. The consideration for the settlement in the first case is usually an immediate allowance made to the son, in the second the marriage itself, a valuable consideration. It will appear on referring to the articles ENTAIL and Rau Estate that an estate cannot be entailed for a period exceeding a fixed number of existing lives and an additional term of twenty-one years, but that if it be sought to bar the entail within that period the consent of the protector of the settlement must be obtained. The process of resettlement 1s thus described by Lord*~~

~~*St Leonards : " Where there are younger children, the father is always anxious to have the estate resettled on them and their issue, in case of failure of issue of the first son. This he cannot accomplish without the concurrence of the son ; and, as the son, upon his establishment in life in his father's life- time, requires an immediate provision, the father generally secures to him a provision during their joint lives as a consideration for the resettlement of the estate in remainder upon the younger sons. The settlement usually takes the form of a life estate for the father, followed by a life estate for the son, with remainder in tail to the unborn child of the son, the continuance of the estate in the family being further secured by a scries of cross-remainders. There is often a name and arms clause, under which, by means of &*~~

~~*SE Ti.52 0 E NT*~~

~~*shifting use (see Trust), every person succeeding to the settled estate as tenant in tail is forced to assume the name and arms of the settlor under penalty of forfciture of his estate. Certain parts of the personalty of the settlor are often settled upon trusts to devolve with the real estate. In order to attain this end, the chattels are not simply subjected to the same limitations as the real estate. If so subjected, they would vest absolutely in the first tenant in succession, as no estate can be limited in personalty (see PersoNAL Estate). A declaration is added that they shall not vest absolutely in any tenant until he shall attain twenty-one, and in case he should die under that age that they shall devolve as nearly as possible in the same way as the lands. By means of strict settlement the actual possessor of a settled estate at any given time is in general only a tenant for life. It isa rule of law that in a settlement of this nature there should be a full and com- plete communication of all material circumstances by the one party to the other.*~~

~~*It is only within a comparatively recent period that any dis- satisfaction at the system of settlement has been felt. In 1829 the Real Property Commissioners saw no reason to recommend any alteration of the law as it then existed. To use the words of the First Report, p. 6, "Settlements bestow upon the present possessor of an estate the benefits of ownership, and secure the property to his posterity. The existing rule respecting*~~

~~*perpetuities has poe hit the medium between the strict entails which prevail in the northern part of the island, and by which the property entailed is for ever abstracted from commerce, and the total pro- hibition of substitutions? and the excessive restriction of the power of devising' established in some countries on the Continent of Europe. In England families are preserved, and purchasers always find a supply of land in the market." This optimistic view, it is scarcely necessary to say, is not the one generally accepted at present. The inconveniences inseparable in an economical point of view from the settlement of land have been proposed to be met in two ways,—(1) by a total prohibition of the ercation of life estates (see LAND), and (2) by an extension of the powers of the limited owner. The latter is the one which has hitherto com- mended itself to the legislature of the United Kingdom.*~~

~~*Up to thirty years ago a settled estate in England or Ireland could be sold or leased only under the authority of a private Act of Parliament. The dealings of the limited owner with his property were practically confined to certain powers of raising money for draining conferred by 8 and 9 Vict. c. 56 and the Public and Private Drainage Acts (now repealed). The first general Act was the Leases and Sale of Settled Estates Act, 1856, which proceeded on the principles generally followed in the private Acts. The Act allowed the tenant for life to demise the premises (execpt the principal mansion house) for various terms, and to sell with the approval of the court. Several amending Acts were passed, and finally the law was consolidated and amended by the Settled Estates Act, 1877 (40 and 41 Vict. c. 18). Meanwhile the Improve- ment of Land Act, 1864 (which applies to the United Kingdom), and the Limited Owners' Residence Acts, 1870 and 1871, had been passed. The Act of 1864 allowed the owner of a settled estate to charge upon the land, by way of rent-charge, the expenses of certain improvements, such as drainage, irrigation, inclosing, reclamation, clearing, erection of labourers' cottages and farmhouse buildings, planting for shelter, construction of any buildings which will increase the value of the land for agricultural purposes, and con- struction of jetties or landing-places on the sea-coast or navigable rivers and lakes. This list of improvements has been since extended by the Settled Land Act, 1882. The Act of 1870 enabled the owners of settled estates to charge such estates with the expense of building mansions as*~~

~~*residences. The building of such man- sions is by the Act of 1871 an improvement within the meaning of the Act of 1864. The Settled Estates Act, 1877 (40 and 41 Vict. ce. 18), allowed the tenant for life, or for a greater estate, of a scttled estate, to demise settled land on an agricultural lease for a term not exceeding twenty-one years (in Ireland thirty-five years), The lease must not be without impeachment of waste. 'his is the only case in which the powers of the Act may be exercised without the leave of the court. The court may authorize leases of any settled estates or of any rights or privileges over or affecting any settled estates, subject to the conditions that—(1) the lease be inade to take effect in possession at or within one year next after the making, and be for a term for an agricultural lease as above, for a mining lease not exceeding forty years, a repairing lease sixty years, a building lease ninety-nine years, with power for the court to grant*~~

~~*1 The law of Scotland was shortly afterwards altered by the Rutherford Act of 1848 (see ENTAIL).*~~

~~*2 As by the Code Napoléon, § 896. By § 898 substitutions vulgaires are, how- ever, practically allowed, the inconsistency with § 896 being avoided by affirming that these are not substitutions at all. In other countries the right of settlement ov substitution has been much modified by legislation, mostly in the direction of limiting the authority of the scttlor. Thus in Austria no family settlement (Familien-Fideicommiss) can be created without the eonsent of the legislature, Civil Code, § 618.*~~

~~*3 In France the proprictor may only devise half, a third, or a quarter of his estate, aecording to the number of his children.*~~

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~~*for a longer term if in accordance with the eustom of the district and beneficial to the inheritance; (2) the best rent must be reserved; (3) in a mineral lease three-fourths of the rent is to be invested (one-fourth where the limited owner is entitled to work the minerals for his own benefit); (4) the lease is not to authorize felling of trees except for the purpose of clearing for building ; (5) the lease is to be by deed, and is to contain a condition for re- entry on non-payment of rent for twenty-eight days. The*~~

~~*court may also authorize sales of settled estates and of timber, and dedication for streets, roads, squares, gardens, sewers, and other works. The application to the court (which in England is the Chancery Division or the Chancery of Lancashire, in Ireland the Chancery Division) is by petition in a summary way with the consent of the persons having auy beneficial estate under the settlement, and all trustees having any estate on behalf of any unborn child. The court may dispense with consent under certain circumstances. No application is to be granted by the court where a similar application has been refused by parliament. Money received on sale under the Act is to be invested as the Act directs, for the benefit of the settled estate. In1882thepowers of the limited owner were still further increased. In that year was passed the Settled Land Act, 1882 (45 and 46 Vict. c. 88), since amended by 47 and 48 Vict. c. 19. For this very valuable Act the statute book is indebted to the late Karl Cairns, It docs not repeal the Act of 1877, but gives cumulative powers. The Act of 1877 must still be brought into action in certain cases to which the Act of 1882 does not apply. The broad distinction between the two Acts is that the powers given by the Act of 1877 are based entirely, except in agricultural leases, on judicial proceedings, while those given by the Act of 1882 may be excrcised by the tenant for life at his option, generally without the consent of trustees or the court. The powers are those usually inserted in settlements of real estate, and are conferred upon every tenant for life beneficially entitled to possession. 'This includes a tenant in tail by Act of Parliament restrained from defeating an estate tail, but not a tenant in tail where the land in respect of which he is restrained was purchased with money provided by parliament,4 a tenant in fee simple subject to an executory limitation, a person entitled to a base fee, a tenant for years determinable on a life, a tenant pur autre vie, a tenant in tail after possibility of issue extinct, a tenant by the cuttesy, &c. A marred woman may exercise the powers given by the Act in spite of any restraint on anticipation contained in the settlement. The Act docs not apply to corporations, whether solc or aggregate. The chief powers given by the Act are those of sell- ing and leasing, A tenant for lifeimay sell settled land or any part of it, or any easement, right, or privilege over it, or the seignory of a manor, and may make exchange or partition. A sale must be for the best price, aud an exchange or partition for the best con- sideration ; the sale may be in one lot or several, and by auction or private*~~

~~*contract. A reservation as to user or as to mines and minerals may be imposed. Settled land in England may not be exchanged for land out of England. A lease is not to exceed for building ninety-nine years, mining sixty, any other kind twenty- one. The regulations as to leases are in general correspondence with those of the Act of 1877. The time for which non-payinent of rent gives a right of re-entry is thirty instead of twenty-eight days, and there are additional regulations as to building and mining leases. Where the tenant for life is impeachable for waste in respect of mines, three-fourths of the mining rent is to be sct aside as capital money, in other cases one-fourth. The tenant for life may surrender and regrant leases. The principal mansion house and the demesnes thereof, and other lands usually occupied therewith, cannot be sold or leased without the consent of the trustees of the settlement or the order of the court. The Act pro- vides for three kinds of sale :—(1) by the tenant for life mero motu, the ordinary case ; (2) with consent of trustees or the court, as in the case of the principal mansion and of the application of money paid fora lease or reversion ; (3) by order of the court, as in the ease of the variation of a building or mining lease according to the circumstances of the district, of parliamentary opposition for the protection or recovery of settled land, and of the sale or purchase of chattels as heirlooms to devolve with land. Land acquired by purchase, exchange, or partition is to be settled as far as possible on the same trusts as the other settled property. Capital money is to be applied as the Act directs, generally for the benefit of the settled property. The tenant for life may enter into a contract for carrying into effect the purposes of the Act. A' contract not to exercise the powers of the Act is void. As to procednre, an ap- plication to the Chancery Division is to be made by petition or summons. Jnrisdiction is conferred upon county courts (in Ireland civil bill courts) in respect to land or personal chattels settled or to be settled, not exceeding in capital valne £500 or in ~· 4 That is to say, the Act would apply to the estates tail of the marqnis of Abergavenny or the'earl of Shrewsbury, but not to Blenheim or Strathfieldsaye, purchased with public money for the dukes of Marlborough and Wellington (see REAL Estate).*~~

~~*5 Land in this sense has quite reeently been held to inelude an hereditary dignity, sueh as a baronetey,*~~

annual valuc £30. Rules of court have been framed for the pur- pose of carrying into effect the provisions of the Acts of 1877 and 1882. For more minnte information than can be given in this place the Acts and rules themselves must be consulted.

The neeessity for a settlement, as far as the wife's interests are coneerned, has been diminished by the Married Women's Property Act, 1882 (45 and 46 Vict. e. 75). It is still, however, usual to have a settlement on marriage, especially where there is property of any considerable value. The Act contains a saving of existing settle- ments and a power to make future settlements with or without restriction against anticipation (not to be valid against a married woman's ante-nuptial debts). No settlement or agreement for a settlement is to have greater validity against a married woman's creditors than such settlement or agreement would have when made or entered into bya man. A future or reversionary interest in settled personalty is specially excepted from the operation of Malins's Act (20 and 21 Vict. c. 5), under which a married woman may by decd acknowledged dispose of her future or reversionary interest in unsettled personalty. The former law as to equity to a settlement seems to have been rendered obsolete by the Married Women's Property Act. The doetrine of equity formerly was in accordance with the maxim, "He who secks equity must do equity,"— that, where a husband was foreed to obtain the assistance of a eourt of equity to reach property to which he was entitled in right of his wife, equity would only aid him on eondition of his settling a certain portion on his wife. Now that a husband cannot sueceed to any property in right of his wife during her lifetime, the reason for the doctrine of equity to a settlement has dis- appeared.

As a rule a settlement can only be made by a person not under disability, therefore apart from statute not bya lunatic, ora bank- rupt, aud generally not by an infant. Bunt by the Infants' Settle- ment Act (18 and 19 Vict. c. 43) infant males of twenty or over or infant females of seventeen or over may with the approbation of the Chancery Division obtained by petition make a valid settle- ment or contract for a settlement of all or any part of their pro- perty. By the Acts of 1877 and 1882 the powers of the Acts may

~~*in certain cases be exercised by trustees of a settlement, trustees in bankruptcy, committees of lunatics, and guardians of infants.*~~

~~*Where the parties are not in a position to make an immediate settlement, articles for a settlement are sometimes entered into, but more rarely than formerly on account of the facilities offered by the Infants' Settlement Act. The court will enforce the execution of a settlement in accordance with the articles, and will reform one already made if not in accordance with them. The court will also enforce the specific performance of any contract on the faith of which a marriage has taken place, in spite of the pro- visions of § 4 of the Statute of Frauds (see Fravp).? It should be noticed that marriage itself is not such a part performance of a contract as to give the court jurisdiction. An imperfect obligation arising from an informal ante-nuptial agreement can be made binding as between the parties by a post-nuptial settlement ; but this will not protect such a settlement from being treated as a voluntary settlement against creditors.*~~

~~*A settlement or contract for settlement made in consideration of marriage or for other valuable consideration is as a rule irrevocable by the settlor and good against creditors. The only exception or apparent exception is the provision in the Bankruptcy Act, 1883 (46 and 47 Vict. c. 52, § 47 (2)), that any covenant or contract made in consideration of marriage for the future settlement on or for the settlor's wife or children of any money or property wherein he had not at the date of his marriage any estate or interest, and not being money or property of or in right of his wife, shall, on his becoming bankrupt before the property or money shall have been actually transferred or paid, be void against the trustee in bankruptcy. With regard to voluntary settlements, 13 Eliz. c. 5 avoids as against creditors conveyances of lands or chattels con- trived to delay, hinder, or defraud creditors or others, with a proviso oc estates or interests conveyed on good considera- tion and bona fide to persons not having notice of fraud. 46 and 47 Vict. c. 52, § 47 (1), enacts that any settlement of property, not being a settlement made before and in consideration of marriage or made in favour of a purchaser or incumbrancer in good faith and for valuable consideration, or a settlement made on or for the wife or children of the settlor of property which has accrued to the settlor after marriage in right of his wife, shall, if the settlor becomes bankrupt within*~~

~~*two years after the date of the settle- ment, be void against the trustee in the bankruptcy, and shall, if the settlor becomes bankrupt within ten years, be void against the trustee unless the parties claiming under the settlement can prove that the settlor was at the time of making the settlement able to pay all his debts without the aid of the settled property, and that*~~

~~*1 At one time the ecclesiastical courts went farther, and enforced specific per- formance of the ceremony of marriage itself, After a contract of marriage per verba de presenti or per verba de futuro, a celebration in facie ecclesix might have been decreed. This jurisdiction of the ecclesiastical courts was finally abolished by 4 Geo. IV. c. 76.*~~

~~*SETTLEMENT*~~

~~*the interest of the settlor in such property had passed to the trustee of the settlement on the execution thereof. 27 Eliz, c, 4 was passed for the benefit of purchasers, as 13 Eliz. c. 5 was for that of creditors, but refers to real estate and chattels real only. It enacts that every conveyance of lands with intent to defraud purchasers shall be void as against such purchasers only, and that conveyances with power of revocation shall be void against subsequent purchasers. The Act has been construed to mean that a voluntary conveyance of real estate is void as against a sub- sequent purchaser, mortgagee, or lessee for value. With these exceptions a voluntary settlement is good as between the settlor and the objects of the settlement, and as between them and third persons. So far is this the case that the court will not assist 4 settlor to destroy the effect of a voluntary settlement by compelling specific performance against a subsequent purchaser. On the other hand the court will not enforce specific performance of a voluntary settlement, in spite of its being a contract under seal. Such an instrument, however, creates a debt and will be admitted to proof in a creditors' suit.?*~~

~~*Scotland.—A disposition and settlement is a mode of providing for the devolution of property after death, and so corresponds rather to the English will than the English settlement. The English marriage settlement is represented in Scotland by the contract of marriage, which, like the English settlement, may be ante- or post-nuptial. The main*~~

~~*difference between the ante- and the post-nuptial contract is the extent to which the property the subject of the contract may be withdrawn from creditors. In the former case a preference or jus crediti is according to circumstances conferred on the wife or children ; in the latter case the wife or children cannot compete with the creditors. A post-nuptial contract is also liable to revocation by the husband or wife. The Married Women's Property Act, 1881, while it makes the wife complete mistress of her property, at the samo time does not exclude or abridge the power of settlement by ante-nuptial contract of marriage.*~~

~~*A contract of marriage may be made with or without the creation of trustees, the latter being the more usual form. If the contract settle heritable property, it generally contains a narrative or inductive clause, containing the names of the parties with an obligation to celebrate the marriage, a disposition of the estate with its destination, provisions as to the wife and younger children and a declaration that these provisions shall be in full of their legal claims, a conveyance by the wife of her whole means and estate to her husband or the trustees, an appointment of trustees to secure implement of provisions to the wife and children, a registration clause, and a testing clause. If the contract settle movables, it is, mutatis mutandis, in much the same form, with the addition of a clause excluding the jus mariti of a future husband of the wife (see Juridical Styles, vol. i. p. 174, vol. ii. p. 498). The Ruther- ford Act (11 and 12 Vict. c. 36) and the Entail Act, 1882 (45 and 46 Vict. c. 53), specially provide that settlements by marriage contract are not to be disappointed until the birth of a child, who by himself or his guardian consents to disentail, or until the marriage is dissolved, unless with the consent of the trustees of the contract. Improvements by limited owners were allowed by law much earlier than in England. 10 Geo. III. c. 51 enabled heirs of entail to charge the entailed estates with the sums of money laid out by them in building mansions. This principle was expressly adopted for England, as the preamble of the Act shows, by the Limited Owners' Residence Act, 1870. The Ruther- ford Act and other Acts empowered heirs of entail to excamb, to feu, to lease, to charge by bond and disposition in security, to sell, to grant family provisions, and to erect labourers' cottages. The Settled Estates Act and Settled Land Act do not apply to Scotland, Substitution, as in Roman law, can only be made by testamentary or*~~

~~*mortis eausa disposition, The Rutherford Act and the Entail Ainendment Act, 1868 (31 and 32 Vict. e. 84), more striet than the law of England against perpetuities, forbid the creation of a life-rent interest in heritables or movables except in favour of a party in life at the date of the deed ereating such interest.*~~

~~*United States.—Marriage settlements are not in as eommon use as in England, no doubt owing to the fact that the principle of the Married Women's Property Act was the law of most of the States of the Union long before its adoption by England. In Louisiana, in the absence of stipulation to the contrary, community of goods is the rule. Settlements other than marriage settlements are practically unknown in the United States. Property cannot, as a general rule, be tied up to anything like the extent still admis- sible in England. In those States where entail is allowed the entail may be barred by simple means of alienation. (J. Wt.)*~~

~~*SETTLEMENT, Act or. By this Act, 12 & 13 Will. III. c. 2, passed in 1701 (followed by the parliament of Scotland in the Act of Union, 1707, c. 7), the crown was*~~

~~*2 See Williams, The Settlement of Real Estates; Davidson, Precedents of Con-*~~

~~*veyancing, vol. iii; Wolstenholme and Turner, The Settled Land Act; Middleton, The Statutes relating to Settled Estates,*~~

~~*SET—SEV*~~

~~*settled upon the Princess Sophia, electress and duchess dowager of Hanover, granddaughter of James I., and the heirs of her body, being Protestants. The Act contained in addition some important constitutional provisions. Those which are still law are as follows :—(1) that whoso- ever shall hereafter come to the possession of this crown shall join in communion with the Church of England as by law established ; (2) that in case the crown of this realm shall hereafter come to any person not being a native of this kingdom of England, this nation be not obliged to engage in any war for the defence of any dominions or territories which do not belong to the crown of England without the consent of parliament;*~~

~~*(3) that after the limitation shall take effect no person born out of the kingdoms of England, Scotland, or Ireland, or the dominions thereunto belonging, although he be naturalized or made a denizen (except such as are born of English parents), shall be capable to be of the privy council or a member of either House of Parliament, or enjoy any office or place of trust, either civil or military, or to have any grant of lands, tenements, or hereditaments from the crown to himself, or to any other or others in trust for him ;} (4) that after the limitation shall take effect judges' commissions be made quamdiu se bene gesserint,? and their salaries ascertained and established, but upon the address of both Houses of Parliament it may be lawful to remove them ; (5) that no pardon under the great seal of England be pleadable to an impeachment by the Commons in parlia- ment. The importance of the Act of Settlement appears from the fact that in all the Regency Acts it is specially mentioned as one of those Acts which the regent may not assent to repeal (see Recent). To maintain or affirm the right of any person to the crown, contrary to the provisions of the Act of Settlement, is treason by 6th Anne, c. 7. SETTLEMENT OF THE POOR. See Poor Laws. SETUBAL, called by the English St Ubes, a port and commercial town in the province of Estremadura, Portugal, nearly 20 miles south-east of Lisbon, lining for about three-quarters of a mile the north shore of a harbour of the same name, 3 leagues long by half a league broad and inferior only to that of Lisbon, at the end of a fertile valley of 6 miles long from Palmella, where the Sabo river discharges into the Bay of Sétubal, and on the Portuguese railway (Lisbon-Barreiro-Sétubal). It is overtopped on the west by the great red treeless range of Arrabida. In the sandhills of a low-lying promontory in the bay, over against Sétubal, are the ruins of "Troia," uncovered in part by heavy rains in 1814, and again in 1850 by an antiquarian society. These ruins of "Troia," among which have been brought to view a beautiful Roman house and some 1600 Roman coins, refer, beyond almost all dispute, to Cetobriga, which flourished 300-400 a.p. In the neighbourhood, on a mountain 1700 feet high, is the cloister Arrabida, with stalactite cavern, whither pious pilgrimages are made. There are five forts for the defence of the harbour, and that*~~

~~*of St Philip, built by Philip IIL, commands the town.*~~ |

~~*Sétubal isan emporium of the Portuguese salt trade carried on principally with Scandinavian ports, the salt being deemed the finest for curing meat and fish. By reason of this advantage and the excellence of its oranges, the best in Portugal, and of its Muscatel grapes, it has much commercial importance, and is the fourth city in the king- dom. It also manufactures leather and does a considerable fishing trade. There are five churches, several convents, a theatre, a nionument of the poet Bocage, who was born here,*~~

~~*1 This clause is virtually repealed by the Naturalization Act, 1870 (88 & 34 Vict. c. 14, § 7), as to persons obtaining a certificate of naturalization.*~~

~~*2 Their commissions had previously been made durante bene placito.*~~

~~*and an arsenal. Among its other public buildings are the Stapal, the Bomfin, which has a handsome fountain, the Fonte Nova, and the Annunciata. Sétubal suffered severely, along with Lisbon, from the earthquake of 1755. The population was 14,798 in 1878.*~~

~~*SEVENOAKS, a market town of Kent, England, situated on high ground about a mile from the railway station, 25 miles south-east of London by the London, Chatham, and Dover Railway, and 20 by the South-Eastern Railway. It consists principally of two streets which converge at the south end, near which is the church of St Nicholas, of the 13th, 14th, and 15th centuries, restored in 1878, and con- taining monuments of the Amherst family and a tablet to William Lambarde, the " Perambulator" of Kent (d. 1601), removed from the old parish church of Greenwich when that was demolished. At the grammar school founded in 1418 by Sir William Sevenoke, lord mayor of London, George Grote received his education. There is also a school founded by Lady Margaret Boswell, wife of Sir William Boswell, ambassador to Charles I. at The Hague, and alms-houses founded by Sir William Sevenoke in connexion with his school. The Walthamstow Hall for 100 children, daughters of Christian missionaries, erected at a cost of £22,000, was opened in 1882. Close to Sevenoaks is Knole Park, one of the finest old residences in England, which in the time of King John was possessed by the earl of Pembroke,*~~

~~*and after passing to various owners was bought by Archi- bishop Bourchier (d. 1486), who rebuilt the house. He left the property to the see of Canterbury, and about the time of the dissolution it was given up by Cranmer to Henry VIII. By Elizabeth it was conferred first on the earl of Leicester and afterwards on Thomas Sackville, earl of Dorset, by whom it was in great part rebuilt and fitted up in regard to decoration and furniture very much as it at present exists. In the time of Elizabeth county assizes were held in the town. Of late years Sevenoaks has very much increased by the addition of villa residences for persons having their business in London. The popu- lation of the urban sanitary district (area 2028 acres) in 1871 was 4118, and in 1881 it was 6296.*~~

~~*SEVEN SLEEPERS OF EPHESUS, Tue, according to the most common form of an old legend of Syrian origin, first referred to in Western literature by Gregory of Tours (De Glor. Mart., c. 95), were seven Christian youths of Ephesus, who, to escape the rage of Decius, lived for some time in concealment in a cave. The enemy at last, however, discovered their hiding place, and caused great stones to be rolled to its mouth that they might die of hunger. The martyrs fell asleep in a mutual embrace. The occurrence had long been forgotten, when it fell out, in the thirtieth year of Theodosius II., 196 years afterwards, that a certain inhabitant of Ephesus, seeking shelter for his cattle, rediscovered the cave on Mount Ccelian, and, letting in the light, awoke the inmates, who. sent one of their number down to buy food. Cautiously approaching the city, the lad was greatly astonished to find the cross displayed over the gates, and on entering to hear the name of Christ openly pronounced. By tendering coin of the time of Decius at a baker's shop he roused suspicion, and in his confusion being unable to explain how he had come by the money he was taken before the authorities as a dishonest finder of hidden treasure. He was easily able to confirm the strange story he now had to tell by actually leading his accusers to the cavern where his six companions were found, youthful and rosy and beaming with a holy radiance. Theodosius, hearing what had happened, hastened to the spot in time to hear from their lips that God had wrought this wonder to confirm his faith in the resurrection of the dead. This message once, delivered, they again fell asleep.*~~

~~Gregory says he had the legend from tlic interpretation of "a certain Syrian"; in point of fact the story is very common in Syriac sources. It forms the subject of a homily of Jacob of Sarug (ob. 521 A.D.), which is given in the Acta Sanctorum. Another Syriac version is printed in Land's Anecdota, ili. 87 sg. ; see also Barhebreus, Chron. Eccles., i. 142 sq., and compare Assemani, Bib. Or., i. 335 sg. Some forms of the legend give, eight sleepers,— e.g., an aneient MS. of the 6th century now in the British Museum (Cat. Syr. MSS., p. 1090). There are considerable variations as to their names. 'The legend rapidly attained a wide diffusion through- out Christendom ; its currency in the East is testified by its accept- ance by Mohammed (sur. xviii.), who calls them Ashdb al-Kahf, '*the men of tle cave." According to Al-Birint (Chronology, tr. by Sachau, p. 285) certain undecayed corpses of monks were shown in a cave as the sleepers of Ephesus in the 9th century. The seven sleepers are a favourite subject in carly medieval art.~~

~~SEVERN, Tue, next to the Thames in length among the rivers of England, rises at Maes Hafren on the eastern side of Plinlimmon, on the south-south-west borders of Montgomeryshire, and flows in a nearly semicircular course of about 200 miles to the sea; the direct distance from its source to its mouth in the Bristol Channel is about 80 miles. By the Britons it was called Halfren, and its old Latin name was Sabrina. Through Mont- gomeryshire its course is at first in a south-easterly direc- tion, and for the first 15 miles it flows over a rough precipitous bed. At Llanidloes, where the valley widens to a breadth of one or two miles and assumes a more fertile appearance, it bends towards the north-east, passing Newtown and Welshpool. On the borders of Shropshire it receives the Vyrnwy, and then turning in a south-easterly direction enters the broad rich plain of Shrewsbury, after which it bends southward past Ironbridge and Bridg- north to Bewdley in Worcestershire. In Shropshire it receives a number of tributaries (see SHRopsuHIRe). Still continuing its southerly course through Worcestershire it passes Stourport, where it receives the Stour (left), and Worcester, shortly after which it receives the~~

~~*Teme (right). It enters Gloucestershire at Tewkesbury, where it receives the Avon (left), after which, bending in a south-westerly direction, it passes the town of Gloucester, 18 miles below which the estuary widens out into the Bristol Channel, at the point where it receives from the left the Lower Avon or Bristol river, and from the right the Wye.*~~

~~*From Newtown its fall is 465 feet, the average fall per mile being about 2 feet 3 inches, but from Ironbridge to Gloucester, a distance of about 70 miles, the fall is only about 103 feet. Between Stour- port and Gloucester the breadth is 150 feet, but below that town the breadth rapidly increases and the banks become bolder and more picturesque. Owing to the gradual decrease in the width and depth of the Bristol Channel the tide enters with great force, forming a tidal wave or bore about 9 feet in height, which at cer- tain times causes great destruction, among tle more serious inun- dations being those of 1606, 1687, 1703, and 1883. The total area drained by the Severn is about 4500 square miles. Its navigation extends to about 150 miles above its mouth ; barges can ascend as faras Stourport, and large vessels to Gloucester. Owing to the diffi- culties of the navigation the Gloucester and Berkeley Ship Canal, 18 miles in length, was constructed, admitting vessels of 350 tons to Gloucester, the river only admitting vessels of 150 tons. The only other important port is Bristol, but there are a few smaller ports and fishing towns, while by means of canals the Severn has con- nexion with some of the principal towns of England. With the Thames it is connected by the Stroudwater and Thames and Severn Canals; by various canals it has communication with the Trent and the rivers of the north; and the Hereford and Gloucester Canal*~~

~~*connects those two cities. The Severn is a good salmon river, and is specially famous for its lampreys.*~~

~~*SEVERN, Josepn (1793-1879), portrait and subject painter, was born in 1793. During his earlier years he practised portraiture as a miniaturist ; and, having studied in the schools of the Royal Academy, he exhibited his first work in oil, Hermia and Helena, a subject from the Midsummer Night's Dream, in the Royal Academy Exhibi- tion of 1819. In 1820 he gained the gold medal and a three years' travelling studentship for his Una and the Red Cross Knight in the Cave of Despair, a painting now*~~

~~in the possession of the representatives of the late Lord Houghton. He accompanied his friend Keats the poet to Italy, and nursed him till his death in 1821. In 1861 he was appointed British consul at Rome, a post which he held till 1872, and during a great part of the time he also acted as Italian consul. His most remarkable work is the Spectre Ship from the Ancient Mariner. He painted Cordelia Watching by the Bed of Lear, the Roman Beggar, Ariel, the Fountain, and Rienzi, executed a large altarpiece for the church of St Paul at Rome, and pro- duced many portraits, including one of Baron Bunsen and several of Keats. He died at Rome August 3, 1879.~~

~~SEVERUS, Lucius Seprimivs, the twenty-first emperor of Rome, reigned from 193 to 211 a.p. He was born in 146 at Leptis Magna, an African coast town in the district of Syrtes, whose ancient prosperity is still attested by its extensive ruins. In this region of Africa, despite its long possession by the Romans, the Punic tongue was still spoken by the people in general. Severus had to acquire Latin as a foreign language, and is said to have spoken it to the end of his days with a strong African accent. After he had arrived at the throne he dismissed abruptly from Rome a sister who had come to visit him, because he felt shame at her abominable Latin. Yet Severus and his dynasty were almost the only emperors of provincial descent who frankly cherished the province of their origin, while the province showed true loyalty to the only Roman emperor ever born on African soil, and to the successors who derived their title from him.~~

~~Of the origin of the Severi nothing is known: it is a natural but very doubtful conjecture that the L. Septimius Severus, a native of Africa, addressed by the poet Statius, was an ancestor of the emperor who bore the same name. The father of Severus was a Roman citizen of equestrian rank, and it may safely be affirmed that the family held a poor position when he was born, but had risen in importance by the time he reached manhood. Two of his uncles attained to consular rank. Fulvius Pius, the maternal grandfather of Severus, is often identified with the man of that name who was governor of Africa, and, after being condemned for~~

~~*corruption by Pertinax, was highly honoured by Didius Julianus; but dates are strongly against the identification. Of the future emperor's education we learn nothing but its results. Spartianus declares him to have been "very learned in Latin and Greek literature," to have had a genuine zeal for study, and to have been fond of philosophy and rhetoric. But the learning of rulers is often seen through a magnifying medium, and we may better accept the statement of Dio Cassius that in the pursuit of education his eagerness was greater than his success, and that he was rather shrewd than facile. No doubt in his early years he acquired that love for jurisprudence which distinguished him as emperor. Of his youth we know only that it was entirely spent at Leptis. Beyond that there is merely one anecdotal fabri- cation giving an account of youthful wildness,*~~

~~*The removal of Severus from Leptis to Rome is attri buted by his biographer to the desire for higher education, but was also no doubt due in some degree to ambition. From the emperor Marcus Aurelius he early obtained, by intercession of a consular uncle, the distinction of the broad purple stripe. At twenty-six, that is, almost at the earliest age allowed by law, Severus attained the queestor- ship and a seat in the senate, and proceeded as quaestor militaris to the senatorial province of Beetica, in the Peninsula. While Severus was temporarily absent m Africa in consequence of the death of his father, the province of Betica, disordered by invasion and internal commotion, was taken over by the emperor, who gave the senate Sardinia in exchange. On this Severus became*~~

~~*SEVERUS*~~

~~*military questor of Sardinia. HIs next office, probably in 174, was that of legate to the proconsul of Africa, and in the following year he was tribune of the plebs. This magistracy, though far different from what it had been in the days of the republic, was still one of dignity, and brought with it promotion to a higher grade in the senate. During the tribunate he married his first wife Marcia, whose name he passed over in his autobiography, though he erected statues of her after he became emperor. In 178 Severus became preetor, not by favour of the emperor, but by competition for the suffrages of the senators. Then, probably in the same*~~

~~*year, he went to Spain as legate ; after that (179) he commanded a legion in Syria. The death of Marcus Aurelius seems in some way to have interrupted his career; he was unemployed for several years, and devoted great part of his leisure to the study of literature, religion, and antiquities (so says Spartianus) at Athens. The year of Severus's first consulship cannot be determined with precision, but it falls within the space between 185 and 190. In this time also falls the marriage with Julia, afterwards famous as Julia Domna, whose acquaintance he had no doubt made when an officer in Syria. Her two sons Bassianus (known as Caracalla) and Geta were probably born in 188 and 189. Severus was governor in succession of Gallia Lugdunensis, Sicily, and Pannonia Superior. He was in command of three legions at Carnuntum, the capital of the province last named, when news reached him that Commodus had been murdered by his favourite concubine and his most trusted servants.*~~

~~*Up to this moment the career of Severus had been ordinary in its character. He had not raised himself above the usual official level. He had achieved no military dis- tinction,—had indeed seen no warfare beyond the petty border frays of a frontier province. But the storm that now tried all official spirits found his alone powerful enough to brave it. Three imperial dynasties had now been ended by assassination. The Flavian line had enjoyed much shorter duration and much less prestige than the other two, and the circumstances of its fall had been peculiar in that it was probably planned in the interest of the senate and the senate certainly reaped the immediate fruits. But the crisis which arose on the death of Nero and the crisis which arose on the death of Commodus were strikingly alike. In both cases it was left to the army to determine by a struggle which of the divisional commanders should succeed to the command-in-chief, that is, to the imperial throne. In each case the contest began with an impulsion given to the com- manders by the legionaries themselves. The soldiers of the great commands competed keenly for the honour and the material advantages to be won by placing their general in the seat of empire. The officer who refused to lead would have been deemed a traitor to his troops, and would have suffered the punishment of his treason.*~~

~~There is a widespread impression that the Preetorian guards at all times held the Roman empire in their hands, but its erroneousness is demonstrated by the events of the year 193. For the first time in the course of imperial history the Preetorians presumed to nominate as emperor a man who had no legions at his back. This was Pertinax, who has been well styled the Galba of his time—upright and honourable to severity, and zealous for good govern- ment, but blindly optimist about the possibilities of reform in a feeble and corrupt age. After a three months' rule he was destroyed by the power that lifted him up. According to the well-known story, true rather in its out- line than in its details, the Przetorians sold the throne to Didius Julianus. But at the end of two months both the Preetorians and their nominee were swept away by the real disposers of Roman rule, the provincial legions. Four groups of legions at the time were strong enough to aspire~~

~~to determine the destiny of the empire,—those quartered in Britain, in Germany, in Pannonia, in Syria. Three. of the groups actually took the decisive step, and Severus in Pannonia, Pescennius Niger in Syria, Clodius Albinus in Britain, received from their troops the title of Augustus. Severus far outdid his rivals in promptness and decision. By what means we do not know, he secured the aid of the legions in Germany and of those in Illyria. These, with the forces in Pannonia, made a combination suffi- ciently formidable to overawe Albinus for the moment. He probably deemed that his best chance lay in the exhaustion of his competitors by an internecine struggle. At all events he received with submission an offer made by Severus, no doubt well understood by both to be politic, insincere, and temporary. Severus sent a trusted officer, who confirmed Albinus in his power and bestowed upon him the title of Caesar, making him the nominal heir- apparent to the throne.~~

~~Before the action of Severus was known in Rome, the senate and people had shown signs of turning to Pescen- nius Niger, that he might deliver them from the poor puppet Didius Julianus and avenge on the Pretorians the murder of Pertinax. Having secured the co-operation or neutrality of all the forces in the western part of the empire, Severus hastened to Rome.~~

~~*To win the sympathy of the capital he posed as the avenger and successor of Pertinax, whose name he even added to his own, and used to the end of his reign. The feeble defences of Julianus were broken down and the Preetorians disarmed and dis- banded, without a blow being struck. A new body of household troops was enrolled and organized on quite different principles from the old. In face of the senate, as Dio tells us, Severus acted for the moment like "one of the good emperors in the olden days." After a magni- ficent entry into the city he joined the senate in execrat- ing the memory of Commodus, and in punishing the murderers of Pertinax, whom he honoured with the most splendid funeral rites. He also encouraged the senate to pass a decree directing that any emperor or subordinate of an emperor who should put a senator to death should be treated asa publicenemy. But he ominously refrained from asking the senate to sanction his accession to the throne.*~~

~~*The rest of Severus's reign, as it is read in the ancient histories, is in the main occupied with wars, over which we shall rapidly pass. The power wielded by Pescennius Niger, who called himself emperor, and was supposed to control one half of the Roman world, proved to be more imposing than substantial. The magnificent promises of Oriental princes were falsified as usual in the hour of need. Niger himself, as described by Dio, was the very type of mediocrity, conspicuous for no faculties, good or bad. This very character had no doubt commended him to Commodus as suited for the important command in Syria, which might have proved a source of danger in abler hands. The contest between Severus and Niger was practically decided after two or three engagements, fought by Severus's officers. The last battle, which took place at Issus, ended in the defeat and death of Niger (194). After this the emperor spent two years in successful attacks upon the peoples bordering on Syria, particularly in Adiabene and Osrhoene. Byzantium, the first of Niger's possessions to be attacked, was the last to fall, after a glorious defence.*~~

~~*Late in 196 Severus turned westward, to reckon with Albinus, who was well aware that the reckoning was inevitable. He was better born and better educated than Severus, but in capacity far inferior. As Severus was nearing Italy he received the news that Albinus had been declared emperor by his soldiers. The first counter-stroke*~~

of Severus was to affiliate himself and his elder son to the Antonines by a sort of spurious and posthumous adop- tion. The prestige of the old name, even when gained in this illegitimate way, was probably worth a good deal. Bassianus, the elder son of Severus, thereafter known as Aurelius Antoninus, was named Ozsar in place of Albinus, and was thus marked out as successor to his father. With- out interrupting the march of his forces, Severus con- trived to make an excursion to Rome. Here he availed himself with much subtlety of the sympathy many senators were known to have felt for Niger. Though he was so far faithful to the decree passed by his own advice that he put no senator to death, yet he banished and impoverished many whose presence or influence seemed dangerous or inconvenient to his prospects. Of the sufferers probably few had ever seen or communicated with Niger.

The collision between the forces of Severus and Albinus was the most violent that had taken place between Roman troops since the mighty contest at Philippi. The decisive engagement was fought in February of the year 197 on the plain between the Rhone and the Sadne, to the north of Lyons. Dio tells us that 150,000 men fought on each side. The fortunes of Severus were, to all appearance, at one stage of the battle as hopeless as those of Julius Czesar were for some hours during the battle of Munda. The tide was turned by the same means in both cases—by the personal conduct and bravery of the commander.

By this crowning victory Severus was released from all need for disguise, and " poured forth on the civil popula- tion all the wrath which he had been storing up for a long time" (Dio). He particularly frightened the senate by calling himself the son of Marcus and brother of Commodus, whom he had before insulted. And he read a speech in which he declared that the severity and cruelty of Sulla, Marius, and Augustus had proved to be safer policy than the clemency of Pompey and Julius Cesar, which had wrought their ruin. He ended with an apology for Com- modus and bitter reproaches against the senate for their sympathy with his assassins. Over sixty senators were arrested, on acharge of having adhered to Albinus, and half of them were put to death. In most instances the charge was

~~*merely a pretence to enable the emperor to crush out the forward and dangerous spirits in the senate. The murderers of Commodus were punished ; Commodus himself was deified ; and on the monuments from this time onward Severus figures as the brother of that reproduction of all the vice and cruelty of Nero with the refinement left out.*~~

~~*The next years (197-202) were devoted by Severus to one of the dominant ideas of the empire from its earliest days—war against the Parthians. The results to which Trajan and Verus had aspired were now fully attained, and Mesopotamia was definitely established as a Roman pro- vince. Part of the time was spent in the exploration of Egypt, in respect of which Dio takes opportunity to say that Severus was not the man to leave anything human or divine uninvestigated. The emperor returned to enjoy a well-earned triumph, commemorated to this day by the arch in Rome which bears his name. During the six years which followed (202-208) Severus resided at Rome and gave his attention to the organization of the empire. No doubt his vigorous influence was felt to its remotest corners, but our historians desert us at this point and leave us for the most part to the important but dim and defective conclusions to be drawn from the abundant monumental records of the reign. Only two or three events in the civil history of this period are fully narrated by the ancient writers. The first of these is the festival of the Decennalia, or rejoicings in the tenth year of the emperor's reign. Contemporaneous with this festival was the marriage of Aurelius Antoninus*~~

~~*SEVERUS*~~

~~*(Caracalla) with Plautilla, the daughter of Plautianus, com. mander of the reorganized Preetorian guards. This officer holds a conspicuous position in the ancient accounts of the reign, yet it is all but impossible to believe a good deal that we are told concerning him. Nevertheless, without a clear view of the career of Plautianus, it is difficult to grasp definitely some important features in the character of Severus, or to appreciate exactly the nature of his government. According to Dio and Herodian, Plautianus was allowed for years to exercise and abuse the whole power of the emperor, so far as it did not relate to the actual conduct of war. He was cruel, arrogant, and corrupt; and the whole empire groaned under*~~

~~*his exac. tions. Geta, the brother of Severus, tried to open the emperor's eyes, but the licence of Plautianus was merely restricted for a moment, to be bestowed again in full, Finally, in 203 this second Sejanus fell a victim to an intrigue set on foot by his own son-in-law Antoninus (Caracalla), the details of which were not clearly known even to contemporary writers. It is hard to see in what way we are to reconcile this history with the known facts of Severus's character and career, unless we assume that Plautianus was really the instrument of his master for the execution of his new policy towards the senate and the senatorial provinces, That Plautianus abused his authority and brought about his own fall is probable enough,—also that Severus had destined him at one time for the guardian- ship of his sons. Plautianus was succeeded in his offico by two men, one of whom was the celebrated jurist Papinian.*~~

~~*Severus spent the last three years of his life (208-211) in Britain, amidst constant and not very successful war- fare, which he is said to have provoked partly to strengthen the discipline and powers of the legions, partly to wean his sons from their evil courses by hard military service. He died at York in February of the year 211. There are vague traditions that his death was in some way hastened by Caracalla. This prince had been, since about 197, nominally joint emperor with his father, so that no ceremony was needed for his recognition as monarch.*~~

~~*The natural gifts of Severus were of no high or unusual order. He had a clear head, promptitude, resolution, tenacity, and great organizing power, but no touch of genius. That he was cruel cannot be questioned, but his cruelty was of the calculating kind, and always clearly directed to some end. He threw the head of Niger over the ramparts of Byzantium, but merely as the best means of procuring a surrender of the stubbornly defended fortress. The head of Albinus he exhibited at Rome, but only as a warning to the capital to tamper no more with pretenders. The children of Niger were held as hostages and kindly treated so long as they might possibly afford a useful basis for negotiation with their fathcr ; when he was defeated they were killed, lest from among them should arise a claimant for the imperial power. Stern and barbarous punishment was always meted out by Severus to the conquered foe, but terror was deemed the best guarantee for peace. He felt no scruples of conscience or honour*~~

if he thought his interest at stake, but he was not wont to take an excited or exaggerated view of what his interest required. He used or destroyed men and institutions alike with cool judgment and a single eye to the main purpose of his life, the secure establishment of his dynasty. The few traces of aimless savagery which we find in the ancient narra- tives are probably the result of fear working on the imagination of the time.

As a soldier Severus was personally brave, but he can hardly be called a general, in spite of his successful campaigns. He was rather the organizer of victory than the actual author of it. The operations against Niger were carried out entirely by his officers. Dio even declares that the final battle with Albinus was the first at which Severus had ever been actually present. When a war was going on he was constantly travelling over the scene of it, planning it and instilling into the army his own pertinacious spirit, but the actual fighting was usually left to others. His treat- ment of the army is the most characteristic feature of his reign. He frankly broke with the decent conventions of the Augustan constitution, ignored the senate, and candidly based his rule upon — force. The only title he ever laid to the throne was the pronuncia- miento of the legions, whose adherence to his cause he commemorated

si VYHROS

even on the coinage of the realm. The legions voted him the adopted son of Marcus Aurelius; the legions associated with him Caracallain the government of the empire. Severus strove earnestly to wed the army as a whole to the support of his dynasty. He increased enormously the material gains and the honorary distinc- tions of the service, so that he was charged with corrupting the troops. Yet it cannot be denied that, all things considered, he left the army of the empire more efficient than he found it. He increased the strength of it by three legions, and turned the Pretorians, heretofore a flabby body without military experience or instinct, into a chosen corps of veterans. Their ranks were filled by promotion from all the legions on service, whereas pre- viously there had been special enlistment from Italy and one or two of the neighbouring provinces. It was hoped that these picked men would form a force on which an emperor could rely in an emergency. But to meet the possibility

~~*of a legionary revolt in the provinces, one of the fundamental prineiples of the Augustan empire was abrogated : Italy beeame a provinee, and troops of the regular army were quartered in it under the direet command of the emperor. Further to obviate the risk of revolution, the great eommands in the provinces were broken up, so that, excepting on the turbulent eastern froutier, it was not possible for a commander to dispose of troops numerous enough to render him dangerous to the government.*~~

~~*But, while the policy of Severus was primarily a family policy, he was by no means careless of the general security and welfare of the empire. Only in one instanee, the destruetion of Byzantium, did he weaken its defenees for his own private ends—an error for which his sueeessors paid dearly, when the Goths eame to dominate the Euxine. The constantly troublesome Danubian regions re- ceived the special attention of the emperor, but all over the realm the status and privileges of communities and distriets were reeast in the way that seemed likely to econduee to their prosperity. Tho administration aequired more and more of a military character, in Italy as well as in the provinces. Retired military officers now filled many of the posts formerly reserved for eivilians of equestrian rank. The prefeet of the Pretorians reeeived large civil and judi- eial powers, so that the investment of Papinian with the office was less unnatural than it at first sight seems. The alliance between Severus and the juriseonsults had important consequenees. While he gave them new importanee in the body politie, and eo-operated with them in the work of legal reform, they did him material serviee by working an absolutist view of the government into the texture of Roman law. Of the legal changes of the reign, important as they were, we can only niention a few details, The emperor himself was a devoted and upright judge, but he struck a great blow at the purity of the law by transferring the exereise of imperial jurisdie- tion from the forum to the palaee. He sharpened in many respects the law of treason, put an end to the time-honoured quaestiones perpetuae, altered largely that important seetion of the law whieh defined the rights of the fiscus, and developed further the social poliey which Augustus had embodied in the lex Julia de adultertis and the lex Papia Poppaea.*~~

~~*Severus boldly adopted as an official designation the autocratic title of dominus, which the better of his predecessors had renounced, and with which the worse had only toyed, as Domitian, whom Martial did not hesitate to call "his lord and his god." During Severus's reign the senate was absolutely powerless; he took all initiative into his hands. He broke down the distinction between the servants of the senate and the servants of the emperor. All nominations to office or function passed under his scrutiny. The estimation of the old consular and other republican titles was diminished. The growth of capacity in the senate was effectually checked by cutting off the tallest of the poppy-heads early in the reipn. The senate became a mere registration office for the imperial determinations, and its members, as has been well said, a choir for drawling conventional hymns of praise in honour of the monarch. Even the nominal restoration of the senate's power at the time of Alexander Severus, and the accession of so-called '"senatorial emperors' later on, did not efface the work of Septimius Severus, which was resumed and carried to its fulfil- ment by Diocletian.*~~

~~*It only remains to say a few words of the emperor's attitude towards literature, art, and religion. No period in the history of Latin literature is so barren as the reign of Severus. Many later periods—the age of Stilicho, for example—shine brilliantly by con1- parison. The only great Latin writers are the Christians Tertullian and Cyprian. The Greek literature of the period is richer, but not owing to any patronage of the emperor, except perhaps in the caso of Dio Cassius, who, though no admirer of Severus, attributes to encouragement received from him the execution of the great his- torical work which has come down to our time. The numerous restorations of ancient buildings and the many new constructions carried out by Severus show that he was not insensible to the artistic glories of the past ; and he is known to have paid much attention to works of art in foreign countries where his duties took him. But he was in no sense a patron or connoisseur of art. As to religion,*~~

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~~*if we may trust Dio, one of the most superstitious of historians, Severus was one of the most superstitious of monarchs. But apart from that it is difficult to say what was his influence on the religious currents of the time. He probably did a good deal to strengthen and extend the official cult of the imperial family, which had been greatly developed during the prosperous times of the Antonines. But what he thought of Christianity, Judaism, or the Oriental mysticism to which his wife Julia Domna gave such an impulse in the succeeding reign, it is impossible to say. We may best conclude that his religious sympathies were wide, since tradition has not painted him as the partisan of any one form of worship.*~~

~~*The energy and dominance of Severus's character and his capacity for rule may be deemed, without fancifulness, to be traceable in the numerous representations of his features which have survived to our days.*~~

~~*The authorities for this emperor's reign are fairly full and satisfactory, con- sidering the general scantiness of the imperial records. Severus himself wrote an autobiography which was regarded as candid and trustworthy on the whole. The events of the reign were recorded by several contemporaries. The first place among these must be given to Dio Cassius, who stands to the empire in much the same relation as Livy to the republic. He became a senator in the year when Marcus Aurelius died (180) and retained that dignity for more than fifty years. He was well acquainted with Severus, and was near enough the centre of affairs to know the real nature of events, without being great enough to have personal motives for warping the record. Though this portion of Dio's history no longer exists in its original form, we have copious extracts from it, made by Xiphilinus, an ecclesiastic of the 11th century. The faults which have impaired the credit of Dio's great work in its earlier portions, —his lack of the critical faculty, his inexact knowledge of the earlier Roman institutions, his passion for signs from heaven,—could do little injury to the narrative of an eye-witness; and he must here make upon the attentive reader the impression of unusual freedom from the commonest vices of history,—passion, prejudice, and insincerity, His Greek, too, stands in agreeable contrast to the debased Latin of the '*scriptores historiae Augustae." The Greek writer Herodian was also a contemporary*~~

~~*of Severus, but the mere fact that we know nothing of his life is in itself enough to show that his opportunities were not so great as those of Dio. The reputation of Herodian, who was used as the main authority for the times of Severus by Tillemont and Gibbon, has not been proof against the criticism of recent scholars. His faults are those of rhetoric and exaggeration. His narrative is probably in many places not independent of Dio. The writers known as the '"scriptores historiae Augustae" are also of considerable importance,—particularly in the lives of Didius Julianus, Severus, Pescennius Niger, and Caracalla, attributed to Alius Spartianus; those of Clodius Albinus and Opilius Macrinus to Julius Capitolinus; those of Antoninus Diadumenus, Antoninus Heliogabalus, and: Alexander Severus to Lampridius. The personal history of Severus and his family is known to us mainly through these writers. Their principal authority was most probably L. Marius Maximus, a younger contemporary of Septimius Severus, who wrote, in continuation of the work of Suetonius, the lives of eleven emperors from Trajan to Heliogabalus inclusive. 1f we may believe a few words about him dropped by Ammianus Marcellinus, he was a kind of prose Juvenal, whose uniformly dark pigments can hardly have sufficed to paint a true picture even of his own times. The very numerous inscriptions belonging to the age of Septimius Severus enable us to control at many points and largely to supplement the literary records of his reign, particularly as regards the details of his administration. The juridical works of Justinian's epoch embody much that throws light on the government of Severus.*~~

~~*The principal modern works relating to this emperor, after Tillemont and Gibbon, are—J. J. Schulte, De Imperatore L. Septimio Severo, Mtinster, 1867 ; Hofner, Untersuchungen zur Geschichte des Kaisers L. Septimius Severus, Giessen, 1875; Untersuchungen zur rémischen Katsergeschichte, ed, by M. Budinger; H. Schiller, Geschichte der rémischen Katserzeit, Gotha, 1880-83; De Ceuleneer, Essai sur la Vie et le Régne de Septime Sévére, Brussels, 1880; Réville, La Religion a Rome sous les Sévéres, Paris, 1886. Controversy about the many disputed matters pertaining to Severus has been intentionally avoided in what has been said above. (J. S. R.)*~~

~~SEVERUS, Marcus Avretivs ALEXANDER, Roman emperor from 222 to 235, was of Syrian parentage, and was born at Arca near the Syrian Tripolis (now 'Irka; Yakut, iii. 653 ; of. Gen. x. 17), probably in the year 205. HIs father Gessius Marcianus held office more than once as an imperial procurator; his mother Julia Mameza was the daughter of Julia Mesa, the scheming and ambitious lady of Emesa who had succeeded in raising her grand- son Elagabalus to the throne of the Cesars; see the genealogical table in HELIOGABALUS. HIs original name was Alexius Bassianus, but he changed it in 221, when Mesa persuaded Elagabalus to adopt his cousin as suc- cessor and create him Cesar. In the next year Elagabalus was murdered, and Alexander was proclaimed by the Preetorians and accepted by the senate. HE was then a mere lad, amiable, well-meaning, but somewhat weak, and entirely under the dominion of his mother, a woman of many virtues, who surrounded her son with wise counsel- lors, watched over the development of his character, and improved the tone of the administration, but on the other hand was inordinately jealous of her influence, and alien- ated the army by extreme parsimony, while neither she nor her son had a strong enough hand to keep tight the reins of military discipline. Mutinies became frequent in all parts of the empire: to one of them the life of the prectorian prefect Ulpian was sacrificed ; another compelled~~

~~the retirement of Dion Cassius from his command (see Dron). On the whole, however, the reign of Alexander Severus was prosperous till he was summoned to the East to face the new power of the Sdsdnians (see PErsta, vol. xviii. p. 607). Of the war that followed we have very various accounts; Mommsen (vol. v. p. 420 sq.) leans to that which is least favourable to the Romans. At all events, though the Persians were checked for the time, the conduct of the Roman army showed an extraordinary lack of discipline. The emperor returned to Rome and celebrated a triumph (233), but next year he was called to face German invaders in Gaul, and there was slain with his mother in a mutiny which was probably led by Maximinus, and at any rate purchased him the throne. Whatever the personal virtues of Alexander were, and they have~~

~~*not lost by contrast with his successor's brutal tyranny, he was not of the stuff to rule a military empire.*~~

~~*SEVERUS, Sunptrcrus (c. 365-c. 425), early Christian writer. A native of Aquitania, he was thoroughly imbued with the culture of his country and time. The seven southern provinces of Gaul, between the Alps and the Loire, had long been completely Romanized. The very name "Gaul" was repudiated by the inhabitants and confined to the natives of the ruder northern districts. The lifetime of Severus exactly coincided with the period of greatest literary development in Aquitania, then the truest or only true home of Latin letters and learning — their last place of refuge, from which Severus saw them driven before he closed his eyes on the world. Almost all that we know of his life comes from a few allusions in his own writings, and some passages in the letters of his friend Paulinus, bishop of Nola. In his early days he was famous as a pleader in the courts, and his knowledge of Roman law is reflected in parts of his writings. He married a wealthy lady belonging to a consular family, who died young, leaving him no children. At this time Severus came under the powerful influence of St Martin, bishop of Tours, by whom he was led to devote his wealth to the Christian poor, and his own powers to a life of good works and meditation. To use the words of his friend Paulinus, he broke with his father, followed Christ, and set the teachings of the " fishermen" far above all his " Tullian learning." He rose to no higher rank in the church than that of presbyter. His time was passed chiefly in the neighbourhood of Toulouse, and such literary efforts as he permitted to himself were made in the interests of Christianity. In many respects no two men could be more unlike than Severus, the scholar and orator, well versed in the ways of the world, and Martin, the rough Pannonian bishop of Tours, ignorant of learning, sus- picious of culture, the champion of the monastic life, the seer of visions, and the worker of miracles. Yet the spirit of the rugged saint subdued that of the polished scholar, and the works of Severus would have little importance now did they not reflect the ideas, influence, and aspira- tions of Martin, the foremost ecclesiastic of Gaul, and one of the most striking figures in the church of his day.*~~

~~*The chief work of Severus is the Chronica, a summary of sacred history from the beginning of the world to his own times, with the ontission of the*~~

~~*events recorded in the Gospels and the Acts, "lest the form of his brief work should detract from the honour due to those events." The book was in fact a text-book, and was actually used as such in the schools of Europe for about a century and a half after the editio princeps was published by Flacius Illyricus in 1556. Severus nowhere clearly points to the class of readers for whom his book is designed. He disclaims the inten- tion of making his work a substitute for the actual narrative contained in the Bible. "Worldly historians" had been used by him, he says, to make clear the dates and the connexion of events and for supplementing the sacred sources, aud with the intent at one and the same time to instruct the unlearned and to "convinee " the learned. Probably the "unlearned " are the mass of Christians and the learned are the cultivated Christians and*~~

~~*pPEVERUS*~~

~~*pagans alike, to whom the rude language of the sacred te*~~

~~*t whether in their Greek or their Latin form, would be distastedie*~~

~~*The literary structure of the narrative itself slows that Severus had in his mind principally readers on the same level of culture*~~

~~*with himself. He was anxious to show that sacred histo might be presented in a form which lovers of Sallust and Tacitus could appreciate and enjoy. The style is lucid and almost classical. 'Though phrases and even sentences from many classical authors are inwoven here and there, the narvative flows on easily, with no trace of the jolts and jerks which offend us in almost every line of a patchwork imitator of the classies like Sidonius, In order that his work might fairly stand beside that of the old Latin writers, Severus boldly ignored the allegorical methods of interpreting sacred history to which the heretics and the orthodox of the.age were alike wedded. Possibly he was not unshaken in his adherence to the peculiar reading which nearly all men then ee to the maxim that "the letter killeth but the spirit maketh alive.*~~

~~*As an authority for times antecedent to his own, Severus is of little moment. At only a few points does he enable us to correct or supplement*~~

other records. Bernays has shown that he based his uarrative of the destruction of Jerusalem by Titus on the account given by Tacitus in his " Histories," a portion of which has been lost. We are enabled thus to contrast Tacitus with Josephus, who warped his narrative to do honour to Titus. In his allusions to the Gentile rulers with whom the Jews came into contact from the time of the Maccabees onwards, Severus dis- closes some points which are not without importance. But the real interest of his work lies, first, in the incidental glimpses it affords all through of the history of his own time, next and more particularly, in the information he has preserved coneerning the struggle over the Priscillianist heresy, which disorganized and degraded the churches of Spain and Gaul, and particularly affected Aquitaine. The sympathies here betrayed by Severus are wholly those of St Martin. The stout bishop had withstood to his face Maximus, who ruled for some years a large part of the western portion of the empire, though he never conquered Italy. IIe had reproached him with attacking and overthrowing his predecessors on the throne, and for his dealings with the church. Severus loses no opportunity presented by his narrative for laying stress on the crimes and follies of rulers, and on their cruelty, though he once declares that, cruel as rulers could be, priests could be crueller still. This last statement has referenee to the bishops who had left Maximus no peace till he had stained his hands with the blood of Priscillian and his followers. Martin, too, had denouneed the worldliness and greed of the Gaulish bishops and clergy. Aecord- ingly we find that Severus, in narrating the division of Canaan among the tribes, calls the special attention of ecclesiastics to the fact that no portion of the land was assigned to the tribe of Levi, lest they should be hindered in their service of God. " Our elergy seem," he says, "not merely forgetful of the lesson but ignorant of it, such a passion for possessious has in our days fastened like a pesti- lence on their souls. They are greedy of property, and tend their estates and hoard their gold, and buy and sell and give their minds to gain. Those of them who are reputed to be of better prineiples, who neither hold property nor barter, sit and wait for gifts, and pollute all the grace of their lives by taking fees, while they almost make market of their holiness; but I have digressed farther than I intended, through vexation and weariness of the present age." We here catch an interesting glimpse of the circumstances which were winning over good men to monasticism in the West, though the evi- dence of an enthusiastic

~~votary of the solitary life, such as Severus was, is probably not free from exaggeration. Severus also fully sympathized with the action of St Martin touching Priscillianism. This mysterious Western offshoot of Gnosticism had no single feature about it which could soften the hostility of a character such as Martin's was, but he staunchly resisted the introduction of secular punishment for evil doctrine, and withdrew from communion with those bishops in Gaul, a large majority, who invoked the aid of Maximus against their erring brethren. In this connexion it is interesting to note the account given by Severus of the synod held at Rimini in 359, where the question arose whether the bishops attending the assembly might lawfully receive money from the imperial treasury to recoup their travelling and otlier expenses. Severus evidently approves the action of the British and Gaulish bishops, who deemed it unbecoming that they should lie under pecuniary obligation to the emperor. HIs ideal of the church required that it should stand clear of and above the state.~~

~~After the Chronica the chief work of Severus is his Life of Martin, a contribution to popular Christian literature whieh did much to establish the great reputation which that wonder- working saint maintained throughout the Middle Ages. The book is not properly a biography, but a catalogue of miracles, told in all the simplicity of absolute belief. The power to work miraculous signs is assumed to be in direct proportion to holiness, and is by Severus valued merely as an evidence of holiness, which he 1s persuaded can only be attained through a life of isolation from the~~

~~world. In the first of his dialogues Severus puts into the mouth of an interlocutor a most pleasing description of the life of ccenobites and solitaries in the deserts bordering on Egypt. The main evidence of the virtue attained by them lies in the voluntary subjection to them of the savage beasts among which they lived. But Severus was no indiscriminating adherent of monasticism. The same dialogue shows him to be alive to its dangers and defects. The second dialogue is a large appendix to the Life of Martin, and really supplies more information of his life as bishop and of his views than the work which bears the title Vita~~

~~*S. Martini. The two dialogues occasionally make interesting references to personages of the cpoch. In Dial. 1, ec. 6, 7, we have a vivid picture of the controversics which raged at Alexandria over the works of Origen. The judgment of Severus himself is no doubt that which he puts in the mouth of his interlocutor Postumianus: "Iam astonished that one and the same man could have so far differed from himself that in the approved portion of his works he has no equal since the apostles, while in that portion for which he is justly blamed it is proved that no man has committed more unseemly errors." Three epistles complete the list of Severus's genuine works. He is said to have been led away in his old age by Pelagianism, but to have repented and inflicted long-enduring penance on himself.*~~

~~*The text of the Chronica rests on a single MS., one of the Palatine eollection now in the Vatican; of the other works MSS. are abundant. Some spurious letters bear the name of Severus; also ina MS. at Madrid is a work falsely professing to be an epitome of the Chronica of Severus, and going down to 511. The chief editions of the complete works of Severus are those by De Prato (Verona, 1741) and by Halm (forming vol. i. of the Corpus Scriptorum Ecclesiasticorum Latinorum, Vienna, 1866). There is a most admirable mono- graph on the Chronica by Bernays (Berlin, 1861). (J. 8. R.)*~~

~~*SEVIGNE, MarizE DE RABUTIN-CHANTAL, MARQUISE DE (1626-1696), the most charming of all letter-writers in all languages, was born at Paris on February 6, 1626, and died at the chateau of Grignan (Dréme), on April 18, 1696. The family of Rabutin (if not so illustrious as Bussy, Madame de Sévigné's notorious cousin, affected to consider it) was one of great age and distinction in Burgundy. It was traceable in documents to the 12th century, and the castle which gave it name still existed, though in ruins, in Madame de Sévigné's time. The family had been "gens d'épée" for the most part, though Francois de Rabutin, the author of valuable memoirs on the sixth decade of the 16th century, undoubtedly belonged to it. It is said that Bussy's silly vanity led him to exclude this Frangois from the genealogy of his house because he had not occupied any high position. Marie's father, Celse Bénigne de Rabutin, Baron de Chantal, was the son of the celebrated "Sainte" Chantal, friend and disciple of St Francis of Sales; her mother was Marie de Coulanges.*~~

~~*Celse de Rabutin shared to the full the mania for duelling which was the curse of the gentlemen of France during the first half of the 17th century, and was frequently in danger both directly from his adversaries and indirectly from the law. He died, however, in a more legitimate manner, being killed during the English descent on the Isle of Rhé in July 1627. His wife did not survive him many years, and Marie was left an orphan at the age of seven years and a few months. She then passed into the care of her grand- parents on the mother's side; but they were both aged, and the survivor of them, Philippe de Coulanges, died in 1636, Marie being then ten years old. According to French custom a family council was held to select a guardian of the young heiress, for such she was to some extent. Her uncle Christophe de Coulanges, Abbé de Livry, was chosen. He was somewhat young for the guardianship of a girl, being only twenty-nine, but readers of his niece's letters know how well "'Le Bien Bon"—for such is his name in Madame de Sévigné's little language—acquitted himself of the trust. He lived till within ten years of his ward's death, and long after his nominal functions were ended he was in all matters of business the good angel of the family, while for half a century his abbacy of Livry was the favourite residence, both of his niece and her daughter. Coulanges was much more of a man of business than of a man of letters, but either choice or the fashion of the time induced him to make of his niece a learned lady. Chapelain and Ménage are specially mentioned as her*~~

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~~*tutors, and Ménage at least fell in love with her, in which point he resembled the rest of the world, and was constant to his own habits in regard to his pupils. Tallemant des Réaux gives more than one instance of the cool and good- humoured raillery with which she received his passion, and the earliest letters of hers that we possess are addressed to Ménage. Another literary friend of her youth was the poet Saint-Pavin. Among her own sex she was intimate with all the coterie of the Hétel Rambouillet, and her special ally was Mademoiselle de la Vergne, after- wards Madame de la Fayette. In person she was extremely attractive,*~~

~~*though the minute critics of the time (which was the palmy day of portraits in words) objected to her divers deviations from strictly regular beauty, such as eyes of different colours and sizes, a "square-ended" nose, and a somewhat heavy jaw. Her beautiful hair and com- plexion, however, were admitted even by these censors, as well as the extraordinary spirit and liveliness of her expression. Her long minority, under so careful a guardian as Coulanges, had also raised her fortune to the amount of 100,000 crowns—a large sum for the time, and one which with her birth and beauty might have allowed her to expect a very brilliant marriage. That which she finally made was certainly one of affection on her side rather than of interest. There had been some talk of her cousin Bussy, but very fortunately for her this came to nothing. She actually married Henri, Marquis de Sévigné, a Breton gentleman of a good family, and allied to the oldest houses of that province, but of no great estate. The marriage took place on August 4, 1644, and the pair went almost immediately to Sévigné's manor-house of Les Rochers, near Vitré, a place which Madame de Sévigné was in future years to immortalize. It was an unfortified chateau of no very great size, but picturesque enough, with the peaked turrets common in French architecture, and surrounded by a park and grounds of no large extent, but thickly wooded and communicating with other woods. The abundance of trees gave it the repute of being damp and somewhat gloomy. Fond, however, as Madame de Sévigné was of society, it may be suspected that the happiest days of her brief married life were spent there. For there at any rate her husband had less opportunity than in Paris of neglecting her, and of wasting her money and his own. Very little good is said of Henri de Sévigné by any of his contemporaries. He was one of the innumerable lovers of Ninon de l'Enclos, and made himself even more conspicuous with a certain Madame de Gondran, known in the nickname slang of the time as 'La Belle Lolo." He was wildly extravagant. That his wife loved him and that he did not love her was generally admitted, and the frank if somewhat coxcomb-like accounts which Bussy Rabutin gives of his own attempt and failure to persuade her to retaliate on her husband are decisive as to her virtue. At last Sévigné's pleasant vices came home to him. He quarrelled with the Chevalier d'Albret about Madame de Gondran, fought with him and was mortally wounded on the 4th of February 1651; he died two days afterwards. There is no reasonable doubt that his wife regretted him a*~~

~~*great deal more than he deserved. On two different occasions she is said to have fainted in public at the sight once of his adversary and once of his second in the fatal duel; and whatever Madame de Sévigné was (and she had several faults) she was certainly not a hypocrite. Her husband had when living accused her of coldness,—the common excuse of libertine husbands,—but even he seems to have found fault only with her temperament, not with her heart. To close this part of the subject it may be said that though only six and twenty, and more beautiful than ever, she never married again despite frequent offers, and that no aspersion was*~~

~~*ever thrown save in one instance on her fame. For the rest of her life, which was long, she gave herself up to her children. 'These were two in number, and they divided their mother's affections by no means equally. The eldest was a daughter, Francoise Marguerite de Sévigné, who was born on October 10, 1646, whether at Les Rochers or in Paris is not absolutely certain. The second, a son, Charles de Sévigné, was born at Les Rochers in the spring of 1648. To him Madame de Sévigné was an indulgent, a generous (though not altogether just), and in a way an affectionate mother. Her daughter, the future Madame de Grignan, she worshipped with an almost insane affection, which only its charming literary results and the delightful qualities which accompanied it in the worshipper, though not in the worshipped, save from being ludicrous if not revolting. As it is, not one in a hundred of Madame de Sévigné's readers can find in his heart to be angry with her for her devotion to a very undivine divinity.*~~

~~*After her husband's death Madame de Sévigné passed the greater part of the year 1651 in retirement at Les Rochers. She had, however, no intention of renouncing the world, and she returned to Paris in November of that year, her affairs having been put in such order as Sévigné's extravagance permitted by the faithful Coulanges. For nearly ten years little of importance occurred in her life, which was passed at Paris in a house she occupied in the Place Royale (not as yet in the famous Hétel Carnavalet), at Les Rochers, at Livry, or at her own estate of Bourbilly in the Maconnais. She had, however, in 1658 a quarrel with her cousin*~~

~~*Bussy, which had not unimportant results, and at the end of the time mentioned above she narrowly escaped being compromised in reputation, though not poli- tically, at Fouquet's downfall. Notwithstanding Bussy's unamiable character and the early affair of the proposed marriage, and notwithstanding also his libertine conduct towards her, the cousins had always been friends; and the most amusing and characteristic part of Madame de Sévigné's correspondence, before the date of her daughter's marriage, is addressed to him. She had a very strong belief in family ties; she recognized in Bussy a kindred spirit, and she excused his faults as Rabutinades and Rabutinages—the terms she uses in alluding to the rather excitable and humorist temper of the house. But in 1658 a misunderstanding about money brought about a quarrel, which in its turn had a long sequel, and results not unimportant in literature. Bussy and his cousin had jointly come in for a considerable legacy, and he asked her for a loan. If this was not positively refused, there was a difficulty made about it, and Bussy was deeply offended. A year later, at the escapade of Roissy (see Rasputin), according to his own account, he improvised (according to probability he had long before written it) the famous portrait of Madame de Sévigné which appears in his notorious Histoire Amoureuse, and which is a triumph of malice. Circulated at first in manuscript and afterwards in print, this caused Madame de Sévigné the deepest pain and indignation, and the quarrel between the cousins was not fully made up for years, if indeed it was ever fully made up. 'This portrait, however, was more wounding to self-love than in any way really dangerous, for, read between the lines, it is in effect a testimonial of character. The Fouquet matter was more serious. The superin- tendent was a famous lady-killer, but Madame de Sévigné, though he was her friend, and though she had been ardently courted by him as by others (one quarrel in her presence between the Duke de Rohan and the Marquis de Tonquedec had become notorious), had hitherto escaped scandal. At Fouquet's downfall in 1651 it was announced on indubitable authority that communications from her had been found in the coffer where Fouquet kept his love*~~

~~*SEVIGNE*~~

~~*letters. She protested that the notes in question were of friendship merely, and Bussy (one of the not very numerous good actions of his life) obtained from Le Tellier, who ag minister had examined the letters, a corroboration of the protest. But the letters were never published, and there have always been those who held that Madaine de Sévigné regarded Fouquet with at least a very warm kind of friendship. It is certain that her letters to Pomponne describing his trial are among her masterpieces of unaffected, vivid, and sympathetic narration.*~~

~~*During these earlier years, besides the circumstances already mentioned, Madame de Sévigné conceived, like most of the better and more thoughtful among Frenchmen and Frenchwomen, a great affection for the establishment of Port Royal, which was not without its effect on her literary work. That work, however (if writing than which certainly none was ever less carried out in a spirit of mere workmanship can be so called), dates in its bulk and really important part almost entirely from the last thirty years of her life. Her letters before the marriage of her daughter, though by themselves they would suffice to give her a very high rank among letter-writers, would not do more than fill one moderate-sized volume. Those after that marriage fill nearly ten large volumes in the latest and best edition. Wedo not hear very much of Made- moiselle de Sévigné's early youth. For a short time, ata rather uncertain date, she was placed at school with the nuns of St Marie at Nantes. But for the most part her mother brought her up herself, assisted by the Abbé de la Mousse, a faithful friend, and for a time one of her most constant companions. La Mousse was a great Cartesian, and he made Mademoiselle de Sévigné also a devotee of the bold soldier of Touraine to a degree which even in that century of blue stockings excited surprise and some ridi- cule. But Mademoiselle de Sévigné was bent on more mundane triumphs than philosophy had to offer. Her beauty is all the more incontestable that she was by no means generally liked. ussy, a critical and not too bene- volent judge, called her "la plus jolie fille de France," and it seems to be agreed that she resembled her mother, with the advantage of more regular features. She was introduced at court early, and as she danced well she figured frequently in the ballets which were the chief amusement of the court of Louis XIV. in its early days. If, however, she was more regularly beautiful than her mother she had little*~~

~~*or nothing of her attraction, and like many other beauties who have entered society with similar expectations she did not immediately find a husband. Various projected alliances fell through for one reason or another, and it was not till the end of 1668 that her destiny was settled. On January 29 in the next year she married Frangois Adhémar, Comte de Grignan, a Provengal, of one of the noblest families of France, and a man of amiable and honourable character, but neither young nor handsome, nor in reality rich. He had been twice married and his great estates were heavily encum- bered. Neither did the large dowry (300,000 livres) which Madame de Sévigné, somewhat unfairly to her son, bestowed upon her daughter, suffice to clear encumbrances, which were constantly increased in the sequel by the extravagance of Madame de Grignan as well as of her husband.*~~

~~*Charles de Sévigné was by this time twenty years old, but he had no doubt already learnt that he was not the person of chief importance in the family. He never, throughout his life, appears to have resented his mother's preference of his sister ; but, though thoroughly amiable, he was not (at any rate in his youth) a model character. Nothing is known of his education, but just before his sister's marriage he volunteered for a rather hairbrained*~~

~~*all*~~

~~*ShvVIGN EB*~~

~~*expedition to Crete against the Turks, and served with credit. Then his mother bought him the commission of guidon (a kind of sub-cornet) in the Gendarmes Dauphin, in which regiment he served for some years, and after long complaining of the slowness of promotion rather rapidly rose to the rank of captain, when he sold out. But though he always fought well he was not an enthusi- astic soldier, and was constantly and not often fortunately in love. He followed his father into the nets of Ninon de l'Enclos, and was Racine's rival with Mademoiselle Champmeslé. The way in which his mother was made confidante of these discreditable and not very successful loves is characteristic both of the time and of the country. In 1669 M. de Grignan, who had previously been lieu- tenant-governor of Languedoc, was transferred to Provence. The governor-in-*~~

~~*chief was the young duke of Vend6dme. But at this time he was a boy, and he never really took up the government, so that Grignan for more than forty years was in effect viceroy of this important province. HIs wife rejoiced greatly in the part of vice-queen; but their peculiar situation threw on them the expenses without the emoluments of the office, and those expenses were increased by the extravagance of both, so that the Grignan money affairs hold a larger place in Madame de Sévigné's letters than might perhaps be wished.*~~

~~*In 1671 Madame de Sévigné with her son paid a visit to Les Rochers, which is memorable in her history and in literature. The states of Brittany were convoked that year at Vitré. This town being in the immediate neighbourhood of Les Rochers, Madame de Sévigné's usually quiet life at her country house was diversified by the necessity of entertaining the governor, the Duc de Chaulnes, of appearing at his receptions, and so forth. All these matters are duly consigned to record in her letters, together with much good-natured raillery (it must be admitted that it is sometimes almost on the verge of being ill-natured, though never quite over it) on the country ladies of the neighbourhood and their ways. She remained at Les Rochers during the whole summer and autumn of 1671, and did not return to Paris till late in November. The country news is then succeeded by news of the court. At the end of the next year, 1672, one great wish of her heart was gratified by paying a visit to her daughter in her vice-royalty of Provence. Madame de Grignan does not seem to have been very anxious for this visit,—perhaps because, as the letters show in many cases, the exacting affection of her mother was somewhat too strong for her own colder nature, perhaps because she feared such a witness of the ruinous extravagance which characterized the Grignan household. But her mother remained with her for nearly a year, and did not return to Paris till the end of 1673. During this time we have (as is usually the case during these Provengal visits and the visits of Madame de Grignan to Paris) some letters addressed to Madame de Sévigné, but comparatively few from her. A visit of the second class was the chief event of 1674, and the references to this, such as they are, is the chief evidence that mother and daughter were on the whole better apart. 1675 brought with it the death of Turenne (of which Madame de Sévigné has given a very noteworthy account, characteristic of her more ambitious but not*~~

~~*perhaps her more successful manner), and also serious disturbances in Brittany. Notwithstanding these it was necessary for Madame de Sévigné to make her periodical visit to Les Rochers. She reached the house in safety, and the friendship of Chaulnes protected her both from violence and from the exactions which the miserable province underwent as a punishment for its resistance to excessive and unconstitutional taxation. No small part of her letters is occupied by these affairs.*~~

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~~*The year 1676 saw several things important in Madame de Sévigné's life. For the first time she was seriously ill, — it would appear with rheumatic fever, — and she did not thoroughly recover till she had visited Vichy. Her letters from this place are among her very best, and picture life at a 17th-century watering-place with unsurpassed vivid- ness. In this year, too, took place the trial and execution of Madame de Brinvilliers. This event figures in the letters, and the references to it are among those which have given occasion to unfavourable comments on Madame de Sévigné's character — comments which, with others of the kind, will be more conveniently treated together. In the next year, 1677, she moved into the Hétel Carna- valet, a house which still remains and is inseparably connected with her memory, and she had the pleasure of welcoming the whole Grignan family to it. They remained there a long time; indeed nearly two years seem to have been spent by Madame de Grignan partly in Paris and partly at Livry. The return to Provence took place in October 1678, and next year Madame de Sévigné had the grief of losmg La Rochefoucauld, the most eminent and one of the most intimate of her closo personal friends and constant associates. In 1680 she again visited Brittany, but the close of that year saw her back in Paris to receive another and even longer visit from her daughter, who remained in Paris for four years. Before the end of the last year of this stay (in February 1684) Charles de Sévigné, after all his wandering loves, and after more than one talked-of alliance, was married*~~

~~*'to a young Breton lady, Jeanne Marguerite de Mauron,*~~

~~*who had a considerable fortune. In the arrangements for this marriage Madame de Sévigné practically divided all her fortune between her*~~

children (Madame de Grignan of course receiving an unduly large share), and reserved only part of the life interest. The greed of Madame de Grignan nearly broke her brother's marriage, but it was finally concluded and proved a very happy one in a some- what singular fashion. Both Sévigné and his wife became deeply religious, and at first Madame de Sévigné found their household (for she gave up Les Rochers to them) not at all lively. But by degrees she grew fond of her daughter-in-law. During this year she spent a consider- able time in Brittany, first on business, afterwards on a visit to her son, and partly it would appear for motives of economy. But Madame de Grignan still continued with only short absences to inhabit Paris, and the mother and daughter were practically in each other's company until 1688. The proportion of letters therefore that we have for the decade 1677-1687 is much smaller than that which represents the decade preceding it ; indeed the earlier period contains the great bulk of the whole corre- spondence. In 1687 the Abbé de Coulanges, Madame de Sévigné's uncle and good angel, died, and in the following year the whole family were greatly excited by the first campaign of the young Marquis de Grignan, Madame de Grignan's only son, who was sent splendidly equipped to the siege of Philippsbourg. In the same year Madame de Sévigné was present at the St Cyr performance of Zsther, and some of her most amusing descriptions of court cere- monies and experiences date from this time. 1689 and 1690 were almost entirely spent by her at Les Rochers with her son; and on leaving him she went across France to Provence. There was some excitement during her Breton stay, owing to the rumour of an English descent, on which occasion the Breton militia was called out, and Charles de Sévigné appeared for the last time as a soldier ; but it came to nothing. 1691 was passed at Grignan and other places in the south, but at the end of it Madame de Sévigné returned to Paris, bringing the Grignans with her; and her daughter stayed with her till 1694. The XXI. — 89

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year 1693 saw the loss of two of her oldest friends,—Bussy Rabutin, her faithless and troublesome but in his own way affectionate cousin, and Madame de la Fayette, her life- long companion, and on the whole perhaps her best and wisest friend. Another friend almost as intimate,

~~*Madame de Lavardin, followed in 1694. Madame de Sévigné spent but a few months of this latter year alone, and followed her daughter to Provence. She never revisited Brittany after 1691. Two important marriages with their preparations occupied most of her thoughts during 1694-1695. The young Marquis de Grignan married the daughter of Saint-Amant, an immensely rich financier ; but his mother's pride, ill-nature, and bad taste (she is said to have remarked in full court that it was necessary now and then to "manure the best lands," referring to Saint-Amant's wealth, low birth, and the Grignan's nobility) made the marriage not a very happy one. His sister Pauline, who, in the impossibility of dowering her richly, had a narrow escape of the cloister, made a marriage of affection with M. de Simiane, and eventually became the sole representative and continuator of the families of Grignan and Sévigné.*~~

~~*Madame de Sévigné survived these alliances but a very short time. During an illness of her daughter she herself was attacked by smallpox in April 1696, and she died on the 17th of that month at Grignan, and was buried there. Her idolized daughter was not present during any time of her illness; it has been charitably hoped that she was too ill herself. Her known attention to her own good looks, and the terror of the smallpox which then prevailed, supply perhaps a less charitable but sufficient explanation. But in her will Madame de Sévigné still showed her prefer-ence for this not too grateful child, and Charles de Sévigné accepted his mother's wishes in a letter showing the good- nature which he had never lacked, and the good sense which, after his early follies, and even in a way during them, he had also shown. But the two families were, except as has been said for Madame de Simiane and her posterity, to be rapidly broken up. Charles de Sévigné and his wife had no children, and he himself, after occupy- ing some public posts (he was king's lieutenant in Brittany in 1697), went with his wife into religious retirement at Paris in 1703, and after a time sequestered himself still more in the seminary of Sainte-Magloire, where he died on March 26, 1713. His widow survived him twenty years, Madame de Grignan had died on August 16, 1705, at a country house near Marseilles, of the very disease which she had tried to escape by not visiting her dying mother. Her son, who had fought at Blenheim, had died of the same malady at Thionville the year before.*~~

~~*Marie Blanche, her eldest daughter, was in a convent, and, as all the Comte de Grignan's brothers had either entered the church or died unmarried, the family, already bankrupt in fortune, was extinguished in the male line by Grignan's own death in 1714, at a very great age. Madame de Simiane, whose connexion with the history of the letters is important, died in 1737.*~~

~~*The chief subjects of public interest and the principal family events of importance which are noticed in the letters of Madame de Sévigné have been indicated already. But, as will readily be understood, neither the whole nor even the chief interest of her correspondence is confined to such things. In the latest edition the letters extend to sixteen or seventeen hundred, of which, how- ever, a considerable number (perhaps a third) are replies of other*~~

~~*ersons or letters addressed to her, or letters of her family and riends having more or less connexion with the subjects of her cor- respondenee. As a rule her own letters, especially those to her daughter, are of great length. Writing as she did in a time when newspapers were not, or at lcast were scanty and jcjune, gossip of all sorts appears among her subjects, and some of her most famous letters are pure reportage (to use a modern French slang term),*~~

~~*while others deal with strictly private subjects. Thus one of her best known pieces has for subjcct the famous suicide of the great*~~

~~*SEVIGNE*~~

~~*cook Vatel owing to a misunderstanding as to the provision of fish for an entertainment given to the king by Condé at Chantilly Another (one of the most characteristic of all) deals with the projected marriage of Lauzun and Mademoiselle de Montpensier — another with the refusal of one of her own footmen to turn hay- maker when it was important to get the crop in at Les Rochers: another with the fire which burnt out her neighbour's house in Paris. At one moment she tells how a forward lady of honour was disconcerted in offering certain services at Mademoiselle's levée ; at another how ill a courtier's clothes became him. She enters, as has been said, at great length into the pecuniary difficulties of her daughter; she*~~

~~*tells the most extraordinary stories of the fashion in which Charles de Sévigné sowed his wild oats; she takes an almost ferocious interest and side in her daughter's quarrels with rival beauties or great officials in Provence who throw difficulties in the way of government.*~~

~~*Almost all writers of literary letters since Madame de Seviené's days, or rather since the publication of her correspondenee, haye imitated her morc or less directly, more or less consciously, and it is thercfore only by applying that historic estimate upon which all true criticism rests that her full value can be discerned. The charm of her work is, however, so irresistible that, read even with- out any historical knowledge and in the comparatively adulterated editions in which it is generally met with, that charm can hardly be missed. Madame de Sévigné was a member of the strong and original group of writers—Retz, La Rochefoucauld, Corneille, Paseal, St Evremond, Descartes, and the rest—who escaped the finieal and weakening reforms of the later 17th century, while for the most part they had profited by those earlier reforms which sueceeded the classicizing of the Pléiade and the imitation of Spanish and Italian which marred some early work of Louis XIII.'s time. According to the strictest standard of the Academy her phraseology is sometimes incorrect, and it occasionally shows traces of the quaint and affected style of the Précieuses ; but these things only add to its savour and piquancy. In lively narration few writers have excelled her, and in the natural expression of domestic affection and maternal affection none. She had an all-observant eye for trifles and the keenest possible appreciation of the ludicrous, together with a hearty relish for all sorts of amusements, pageants, and diversions, and a deep though not voluble or over-sensitive sense of the beauties of nature. But with all this she had an understanding as solid as her temper was gay. Unlike her daughter she was not a professed blue-stocking or philosophess. But she had a strong affection for theology, in which she inclined (like the great majority of the religious and intelligent laity of her time in France) to the Jansenist side. Her favourite author in this class was Nicole. She has been reproached with her fondness for the romances of Mlle. de Scudéry and the rest of her school. But probably many persons who make that reproach have themselves never read the works they despise, and are ignorant how much merit there is in books whose chief faults are that they are written in a strongly marked and now*~~

~~*obsolete fashion, and that their length (which, however, scarcely if at all exceeds that of Clarissa) is preposterous. In purely literary criticism Madame de Sévigné, few as were the airs she gave herself, was no mean expert. Her preference for Corneille over Racine has much more in it than the fact that the elder poet had been her favourite before the younger began to write ; and her remarks on La Fontaine and some other authors are both judicious and independent. Nor is she wanting in original reflexions of no ordinary merit. All these things, added to her abundance of amusing matter and the charm of her bright and ceaselessly flowing style, fully account for the unchanged and undiminished delight which half a dozen generations have taken in her work. But it cannot be repeated too often that to enjoy that work in its most enjoyable point—the combination of fluent and easy style with quaint archaisms and tricks of phrase—it must be read as she wroteit, and not in the trimmed and corrected version of Perrin and Madame de Simiane.*~~

~~*There can, moreover, be no onc, however wedded he may be to the plan of criticizing litcrature as literature, who will not admit that great part of the interest and valuc of these remarkable works lies in the picture of character which they present. Indeed, great part of their purely literary merit lies in the extraordinary vivid- ness of this very presentation. Madame de Sévigné's characeter, however, has not united quite such a unanimity of suffrage as her ability in writing. In her own time there were not wanting enemies (indeed her unsparing partisanship on her daughters side could not fail to provoke such) who maintained that her letters were written for effect, and that her affection for her daughter was ostentatious and unreal. But few modern erities have followed these detractors, and it may be said confidently that no competent judge of character, after patiently reading the letters, can for a moment admit their view. But this kind of enemy has been followed by another, who, not overshooting his mark so con- spicuously, has been somewhat more successful in persuading spectators that he has hit it. Her excessive affection for Madame de Grignan (the almost importunate character of which seems to*~~

~~*be proved by her own confessions of unhappiness if not of quarrel when they were together) ; her unhesitating blindness to anything but her daughter's interest (manifested especially in the part she took in most unjustifiable attempts of Madame de Grignan to secure her stepdaughters' dowries and to force themselves into a convent) ; her culpable tolerance of her son's youthful follies on the one hand and the uneven balance which she held in money matters between him and his sister on the other ; the apparent levity with which she speaks of the sufferings of Madame de Brinvilliers, of galley slaves, of the peasantry, &c.; and the freedoni of language which she uses herself and tolerates from others, — have all been cast up against her. Here the before-mentioned historic estimate sufficiently disposes of some of the objections, a little common sense of others, and a very little charity of the rest. If too much love felt by a mother towards a daughter be a fault, then certainly Madame de Sévigné was one of the most offending souls that ever lived ; but it will hardly, even with the injustice which like all excessive affection it brought in its train, be held damning. Indeed, the guilty lady was evidently quite aware of her weakness in this respect, and it is one of the most noteworthy things of her literary capacity that, excessive as the weakness is, it does not dis- gust or weary the reader. The singular confidences which Madame de Sévigné received from her son and transmitted to her daughter would even at the present day be less surprising in France than in England. They are only an instance, adjusted to the manners of the time, of the system of sacrificing everything to the mainten- ance of confidence between mother and son, to which the almost invariable,and to foreigners sometimes rather ludicrous, but certainly not unamiable, adoration of Frenchmen for their mothers is duc. Here too, as well as in reference to the immediately kindred charge of crudity of language, and to that of want of sympathy with suffer- ing, especially with the sufferings of the people, it is especially necessary to remember of what generation Madame de Sévigné was and what were her circumstances. That generation was the generation which Madame de Rambouillet endeavoured with some success to polish and humanize, but which had barely recovered the hardening influences of the religious and civil wars when it was plunged into the Fronde. It was the generation to which belong the almost incredible yet trustworthy Historicttes of Tallemant, and in which, when she herself had already reached middle*~~

~~*life, Bussy Rabutin's Histoire Amoureuse exposed him indeed to powerful resentments but did not make him lose all caste as a gentleman and man of honour. It is absurd to expect at such a time and in private letters the delicacy proper to quite different times and circumstances. Moreover, as to the charge of inhumanity not only do these considerations apply but there is more to be pleaded than mere extenuating circumstances, It is not true that Madame de Sévigné shows no sympathy with the oppression of the Bretons; it is very far from true, though her incnrable habit of humorous expression—of Rabutinage, as she says—makes her occasionally use light phrases about the matter. "But it is in fact as unreasonable to expect modern political views from her (and it is from certain modern political standpoints that the charge is usually made) as it is to expect her to observe the canons of a 19th-century propriety. On the whole she may be as fairly and confidently acquitted of any moral fault, save the one peccadillo of loving her daughter too exclusively and blindly, as she may be acquitted of all literary faults whatsoever. Her letters are wholly, what her son-in-law said well of her after her death, compagnons délicieusx ; and, far from faultless as Madame de Grignan was, none of her faults is more felt by the reader than her long visits to her mother, during which the letters ceased.*~~

~~*The bibliographic history of Madame de Sévigné's letters is of considerable interest in itself, and is moreover typical of much other contemporary literary history. The 17th century was par excellence the century of privately circulated literature, and from Madame de Sévigné herself we know that her own letters were copied and handed about, sometimes under specified titles, as early as 1673. None of them, however, were published until her cor- respondence with Bussy Rabutin appeared, in his Memoirs and Correspondence, partly in the year of her death, partly next year. The remainder were not printed in any form for thirty years. Then between 1725 and 1728 appeared no less than seven un-authorized editions, containing more or fewer additions from the copies which had been circulated privately. The bibliography of these is complicated and curious, and must be sought in special works (see especially the Grands Ecrivains edition, vol. xi.). They have, however, abiding interest chiefly because they stirred up Madame de Simiane, the writer's only living representative, to give an authorized version. This*~~

~~*appeared under the care of the Chevalier de Perrin in 6 vols. (Paris, 1734-37). It contained only the letters to Madame de Grignan, and these were subjected to editing rather careful than conscientions, the results of which were never thoroughly removed until qnite recently. In the first place, Madame de Simiane, who possessed her mother's replies, is said to have burnt the whole of these from religious motives ; this phrase is explained by Madame de Grignan's Cartesianism, which is*~~

~~*supposed to have led her to expressions alarming to orthodoxy. In the second, scruples partly having to do with the susceptibilities of living persons, partly concerning Jansenist and other prejudices, made her insist on numerous omissions. Thirdly, and most un- fortunately, the change of taste seems to have required still more numerous alterations of style and language, such as the substitu- tion of "Ma Fille" for Madame de Sévigné's usual and charming "*Ma Bonne," and many others. Perrin followed this edition up in 1751 with a volume of supplementary letters not addressed to Madame de Grignan, and in 1754 published his last edition of the whole, which was long the standard (8 vols., Paris). During the last half of the 18th century numerous editions of the whole or parts appeared with important additions, such as that of 1756, giving for the first time the letters to Pomponne on the Fouquet trial ; that of 1773, giving letters to Moulceau ; that of 1775, giving for the first time the Bussy letters separate from his memoirs, &c. An important collected edition of all these fragments, by the Abbé de Vauxcelles, appeared in 1801 (Paris, An 1X.) in 10 vols.; five years later Gouvelle (Paris, 1806, 8 vols.) introduced the improvement of chronological order ; this was reprinted in 12 vols. (Paris, 1819) with some more unpublished letters which had separately appeared meanwhile. In the same year appeared the first edition of M. de Monmerqué. From that date continual additions of unpublished letters were made, in great part by the same editor, and at last the whole was remodelled on manuscript copies (the originals unfor- tunately are available for but few) in the edition called Des Grands*~~

~~*crivains, which M. de Monmerqué began, but which owing to his death had to be finished by MM. Regnier, Paul Mesnard, and Sommer (Paris,*~~

~~*1862-1868). This, which entirely supersedes all others (even a handsome edition published during its appearance by M. Silvestre de Sacy), consists of twelve volumes of text, notes, &c., two volumes of lexicon, and an album of plates. It contains all the published letters to and from Madame de Sévigné, with the replies where they exist, with all those letters to and from Madame de Simiane (many of which had been added to the main body) that contain any interest. The sole fault to be found with this excellent edition is the omission to add to each volume a table of contents giving each letter as it comes with a brief abstract of its contents. To it, however, must be added two volumes (printed uniformly) of Lettres Inédites, published by M. Ch. Capmas in 1876 and containing numerous variants and additions from a MS. copy discovered in an old curiosity shop at Dijon. Of less elaborate and costly editions that in the collection Didot (6 vols., Paris, v.d.) is by far the best, though, in common with all others except the Grands Ecrivains edition, it contains an adulterated text.*~~

~~*Works on Madame de Sévigné are innumerable. The biography by Paul Mesnard is nearly exhaustive, but the most elaborate biographical book is that of Walckenaer (3d ed., Paris, 1856, 5 vols.), to which should be added the remark- able Histoire de Mme, de Sévignd of Aubcnas (Paris and St Petersburg, 1842). In English an excellent little book by Miss Thackeray (Mrs Ritchie), Edinburgh and aga 1881, may be recommended. Most of the editions have portraits more or fewer,*~~

~~*SEVILLE, a Spanish province—one of the eight into which Andalusia is divided—and formerly one of the four Moorish kingdoms, is bounded on the §. by Malaga and Cadiz, on the W. by Huelva, on the N. by Badajoz, and on the E. by Cordova. The superficial area is 5429 square miles, and in 1877 the population numbered 505,291. Northwards the province is broken up by low spurs of the Sierra Morena, the summits of which in the extreme north rise to a considerable height; but in the southern and larger half the ground is flat and fertile, and the only mountainous part is the frontier line formed by the Sierra de Ronda. The Guadalquivir traverses the province from north-east to south-west and receives in its course the waters of several streams, the chief being the Genil and the Guadaira on the left, and the Guadalimar to the right. The province is*~~

~~one of the most productive and flourishing in Spain, and grows all kinds of grain and vegetables. Oil and wine, oranges and olives, are among its chief exports, while tobacco, leather, paper, spirits, chocolate, textile fabrics of silk and wool, soap, glass, and earthen- ware are amongst its manufactures. Sheep and oxen, horses and asses, are reared on its pastures; and in the mountainous districts there are copper, silver, lead, iron, coal, and salt mines, and quarries of chalk and marble. Commerce has made great strides of late years owing to the opening up of the country by railways, and foreign capital has developed the natural resources of the district. The province is divided for administrative purposes into fourteen partidos judiciales and ninety-eight ayuntamientos,~~

~~and is represented in the cortes by four senators and Almoravids. 'The later years of the Almoravid rule were twelve deputies. The following towns have a population | very oppressive to the Moslems of Spain; in 1133 the of more than 10,000 within the municipal boundaries :— people of Seville were prepared to welcome the victorious Seville (see below), Carmona (17,426), Constantina | arms of Alphonso VIL, and eleven years later Andalusia 10,988), Ecija (24,955), Lebrija (12,864), Marchena broke out in general rebellion. Almohade troops now (13,768), Moron de la Frontera (14,879), Osuna (17,211), | passed over into Spain and took Seville in 1147. Under d Utrera (15,093). the Almohades Seville was the seat of government and SEVILLE (Span. Sela, Latin Ispalis, Arabic Ishbi- enjoyed great prosperity ; the great mosque was com- liya), capital of the above province and the seat of an | menced by Yusuf I. and completed by his son the famous archbishopric, with a population of 133,938 in 1877, is | Almanzor. In the decline of the dynasty between 1228 situated in 37° 22' N. lat. and . — 5° 58' W. long., 62 miles (95 by rail) north-north-east of Cadiz and 355 miles south- south-west of Madrid, on the left bank of the Guadal- quivir, which here flows through a level country as productive as a garden. The river is navigable up to the city, which is highly pictur- esque in its combination of ancient buildings with busy commerce. From the earliest times the port has been a chief outlet for the wealth of Spain. Under the Romans the city was made the capital~~

~~of Betica, and became a favourite resort for wealthy Romans. 'The emperors Hadrian, Trajan, and Theo- dosius were born in the neighbourhood at Ttalica (now Santiponce) where are the remains of a considerable amphitheatre. The chief existing monument of the Romans in Seville itself isthe aqueduct, on four hundred | and ten arches, by which the } water from Alcala de Gua- } dairacontinued until recently to be supplied to the town. At the beginning of the 5th century the Silingi Vandals made Seville the seat of their empire, until it passed in 531 under the Goths, who chose Toledo for their capital. After the defeat of Don Roderick at Guadalete in 712 the Arabs took posses- sion of the city after a siege of some months. Under the Arabs Seville continued to flourish. Edrisi speaks in particular of its great export trade in the oil of Aljarafe. The district was in great Plan of Seville. part occupied by Syrian 'Arabs from Emesa, part of the troops that entered Spain { and 1248 Seville underwent various revolutions, and ulti- with Balj in 741 at the time of the revolt of the Berbers. It mately acknowledged the Hafsite prince, who, however, was a scion of one of these Emesan families, Abu '1-Kasim | was unable to save the city from Ferdinand IJI., who Mohammed, cadi of Seville, who on the fall of the Spanish | restored +t to Christendom in 1248. The aspect of the caliphate headed the revolt of his townsmen against their | town even now is essentially Moorish, with its narrow tortu- Berber masters (1023) and became the founder of the | ous streets and fine inner court-yards to the houses. Many Abbadid dynasty, of which Seville was capital, and which of these date from before the Christian conquest, and the lasted under his son Mo'tadid (1042-1069) and grandson | walls and towers which until recently encircled the city for Mo'tamid (1069-1091) till the city was taken by the | a length of 5 miles have a similar origin. The victory of~~

~~an~~

~~mi VIL iE~~

~~Ferdinand brought temporary ruin on the city, for it is said that 400,000 of the inhabitants went into volun- tary exile, and some time clapsed before Seville recovered fron. the loss. But its position was too favourable for trade for it to fall into permanent decay, and by the 15th century it was~~

~~*again in a position to derive full benefit from the discovery of America. After the reign of Philip IL. its prosperity gradually waned with that of the rest of the Peninsula ; yet even in 1700 its silk factories gave employment to thousands of work- people ; their numbers, however, by the end of the 18th century had fallen to four hundred. In 1800 an out. break of yellow fever carried off 30,000 of the inhab- itants, and in 1810 the city suffered severely from the French under Soult, who plundered to the extent of six millions sterling. Since that time it has gradually recovered prosperity, and is now one of the most busy and active centres of trade in the peninsula. Politically Seville has always had the reputation of peculiar loyalty to the throne from the time when, on the death of Ferdinand III, it was the only city which remained faithful to his son Alphonso the Wise. It was conse- quently much favoured by the monarchs, and frequently a seat of the court. In 1729 the treaty between England, France, and Spain was signed in the city; in 1808 the central junta was formed here and removed in 1810 to Cadiz; in 1823 the cortes brought the king with them from Madrid ; and in 1848 Seville combined with Malaga and Granada against Espartero, who bombarded the city but fled on the return of Queen Maria Christina to Madrid.*~~

~~*Seville contains treasures of art and architecture which make it one of the most interesting cities in Europe. The cathedral, dedi- cated to Santa Maria de la Sede, ranks in size only after St Peter's at Rome, being 415 feet long, 298 feet wide, and 150 fect high to the roof of tho nave. The west front is approached by a high flight of steps, and the platform on which the eathedral stands is surrounded by a aie shafts of columns from the mosque which formerly oecupied the site. The work of building began in 1408 aud was finished in 1519, so that the one style of Spanish Pointed Gothic is fairly preserved throughout the interior, however much the exterior is spoiled by later additions, Unfortunately the west front remained unfinished; until 1827, when the central doorway was completed in a very inferior manner ; but this has now been renewed in a purer style. At the cast end are two fine Gothic doorways with good seulpture in the tympana; and on the north side the Puerta del Perdon, as it is ealled, has some very exquisite detail over the horse-shoe arch, and a pair of fine bronze doors. The exterior of the cathedral may be disappointing, but the interior leaves little to be desired. 'It forms a*~~

parallelogram containing a nave and four aisles with surrounding chapels, a central dome 171 feet high inside, and at the east end a royal sepulchral chapel, which was an addition of the 16th century. The thirty-two immense clustered columns, the ninety-three windows, mostly filled with the finest glass by Flemish artists of the 16th century, and the profusion of art work of various kinds displayed on all sides produce an unsurpassed effect of magnificence and grandeur. The reredos is an enormous Gothic work containing forty-four panels of gilt and coloured wood carvings by Dancart, dating from 1482, and a silver statue of the Virgin by Francisco Alfaro of 1596. The archbishop's throne and the choir-stalls (1475-1548) are fine pieces of carving, and amongst the notable metal-work are the rail- ings (1519) by Sancho Nutioz, and the lectern by Bartolomé Morel of the same period. The bronze candelabrum for tenebre, 25 feet in height, is a splendid work by Morel. In the Sacristia Alta is a silver repoussé reliquary presented by Alphonso the Wise in the 18th century ; and in the Sacristia Mayor, which is a good plateresque addition by Diego de Riafio in 1530, is a magnificent collection of church plate and vestments. At the west end of the nave is the grave of Ferdinand, the son of Columbus, and at the east end, in the royal chapel, lies the body of St Ferdinand, which is exposed three times in the year. This chapel also contains a curious life-size image of the Virgin, which was presented to the royal saint by St Louis of France in the 18th century. It is in carved wood with movable arms, seated on a silver throne and with hair of spun gold. The chief pictures in the cathedral are the Guardian Angel and the St Anthony of Murillo, the Holy Family of Tobar, the Nativity and La Gencra- cion of Luis de Vargas, Valdés Leal's Marriage of the Virgin, and Guadalupe's Descent from the Cross, In the Sacristia Alta are

three fine paintings by Alexo Fernandez, and in the Sala Capitular are a Conception by Murillo and a St Ferdinand by Pacheco. Tho organ is one of tho largest in the world ; It contains over 5800 pipes. A curious and unique ritual is observed by the choir boys on the festivals of Corpus Christi and the Immaculate Conception, ——a solemn dance with castanets being performed by them before the altar; the custom is an old

~~one but its origin is obscure. The Sagrario on the north of the cathedral isa Renaissance addition by Miguel de Zumarraga, which serves as the parish church. At the north-east corner of the cathedral stands the Giralda, a bell tower of Moorish origin, 275 feet in height. The lower part of the tower, or about 185 feet, was built in the latter half of the 12th century by Abu Yusuf Yakub; the upper part and the belfry, which is surmounted by a vano formed of a bronze figure 14 feet high representing The Faith, were added by Fernando Ruiz in 1568, The ascent is made by a series of inclined planes. The exterior is encrusted with delicate Moorish detail, and the tower is altogether the finest specimen of its kind in Europe. At the base lies the Court of Oranges, of which only two sides now remain; the original Moorish fountain, however, is still preserved. But the chief relic of the Arab dominion in Seville is the Alcazar, a palace excelled in interest and beauty only by the Alhambra of Granada. It was begun in 1181 by Jalubi during the best period of the Almohaides, and was surrounded by walls and towers of which the Torre del Oro, a decagonal tower on the river side, is now the principal survival. Pedro the Cruel made considerable alterations and additions in the 14th century, and worse havoc was afterwards wrought by Charles V. Restorations have been effected as far as possible, and the palace is now an extremely beautiful example of Moorish work. The fagade, the hall of ambassadors, and the Patio de las Muiiecas are the most striking portions, after which may be ranked the Patio de las Doncellas and the chapel of Isabella. Among other Moorish remains in Seville may be mentioned tho Casa O'Shea, which is somewhat spoiled by whitewash, and the Casa de las Duchas, with eleven court-yards and nine fountains. The Casa de Pilatos is in a pseudo-Moorish style of the 15th century, and, in addition to its elegant court-yard surrounded by a marble colonnade, contains some fine decorative work. The Casa de los Abades is in tho Sevillian plateresque style, which is strongly tinged with Moorish feeling. The following are the most notable churches in Seville :—Santa Maria la Blanca, an old Jewish syna- gogue ; San Marcos, badly restored, but with a remarkable mudejar portal; Omnium Sanctorum, erected upon the ruins of a Roman temple; San Juan de la Palma; San Ju ian; Santa Catalina; San Miguel; San Clemente el Real; the church of La Sangre Hospital ; the Gothic Parroquia of Santa Ana, in the Triana suburb; and La Caridad. The last-named belongs to a well-conducted almshouse founded by the Sevillian~~

~~*Don J uan, Miguel de Manara. It pos- Sesses six masterpieecs by Murillo, and two by Valdés Leal. 'The other churehes, though generally deficient in architectural interest, are enriched by the produets of the brush or ehiscl of Pachceo, Montaiies, Alonso Cano, Valdés Leal, Roelas, Campafia, Morales, Vargas, and Zurbaran. The muscum was formerly the church and convent of La Mereed. It now contains prieeless examples of the Seville school of painting, whieh flourished during the 16th and 17th eenturies. Among the masters represented are Velazquez and Murillo (both natives of Seville), Zurbaran, Roelas, Herrera the Elder, Paeheeo, Juan de Castillo, Alonso Cano, Cespedes, Boea- negra, Valdés Leal, Goya, and Martin de Vos. The university was founded in 1502, and its present buildings were originally a convent built in 1567 from designs by Herrera, but devoted to its present use in 1767 on the expulsion of the Jesuits. The Casa del Ayuntamiento, in the cinqueeento style, was begun in 1545, and has a fine staircase and hall and handsome carved doors. The Lonja, or exehange, was built by Herrera in 1585 in his severe Doric and Ionic style; the brown and red marble stairease which leads to the Archivo de Indias is the best part of the design. The arehives eontain 30,000 volumes relating to the voyages of Spanish diseoverers, many of which are still unexamined, 'The archbishop's palace dates from 1697 ; the most notable features are the Churri- gueresque doorway and stairease. The royal cigar faetory is an im- mense building 662 feet long by 524 feet wide, and contains twenty- eight eourt-yards. Employment is given in it to 4500 hands, who work up 2,000,000 pounds of tobaeeo yearly. The palace of San Telmo, now oeeupied by the duke of Montpensier, was formerly the seat of a naval college originally founded by the son of Columbus. The immense doorway is the prineipal architeetural feature. The picture gallery is interesting and important. The chief squares in Seville are the Plaza Nueva, the Plaza de la Constitueion, the Plaza del Duque, and the Plaza del Triunfo. The bull-ring aeeommodates 18,000 speetators, and is the next in size to that at Madrid. There are several beautiful promenades, the principal being Las Delicias, along the river bank below the town. The city also contains several theatres. Aeross the river, and conneeted with the city by a bridge, is the Gipsy quarter of the Triana. The navigation of the river has been improved of late years so that vessels of large draught can now ascend the stream. The results aro shown in a larger trade, and in*~~

~~1883 the aggregate burthen of vessels eleared amounted to 358,541 tons (65,324 British). The imports were valued at £1,879, 522, and the exports at £1,190,625. In the latter were included 3110 tuns of olive oil shipped to the United Kingdom, and 1610 tons of quick- silver from the Almaden mines, which had formerly sent their produee via Lisbon. In addition to strietly loeal industries the chief factories of the city are the tobaceo factory, the eannon foundry, and the small-arms factory. 'There are also a petroleum refinery, some soap works, iron foundries, artificial ice and marmalade factories, and several potteries, The ancient sourees of water supply having proved insufficient, a new system of waterworks was designed, and was brought to a successful completion in 18838 by a firm of English engineers. (ELE eis.)~~

~~SEVRES, a town of France, in the department of Seine-et-Oise, on the left bank of the Seine, midway between Paris and Versailles, with a population of 6768 in 1881, owes its celebrity to the Government porcelain manufactory, which dates from 1756. In 1876 a new building was erected at the end of the park of St Cloud to replace the older structures, which were in a dangerous state, but have since been transformed into a normal school for girls. In the museum connected with the works are preserved specimens of the different kinds of ware manu- factured in all ages and countries, and the whole series of models employed at Sévres from the commencement of the manufacture, for an account of which see vol. xix. pp. 637-38. A technical school of mosaic was established at Sévres in 1875.~~

~~SEVRES, Deux, a department of western France, formed in 1790 mainly of the districts of Thouars, GAtinais, and Niortais, which constituted about one-fourth of Poitou, and to a small extent of a portion of Basse-Saintonge and Angoumois, and a very small fragment of Aunis. It derives its name from the Sévre of Niort, which flows across the south of the department from east to west, and the Sévre of Nantes, which drains the north-west. Lying between 45° 58' and 47° 7' N. lat. and between 0° 56' W. and 0° 13' E. long., it is bounded (for the most part conventionally) N. by Maine-et-Loire, E. by Vienne, S.E. by Charente, 8. by Lower Charente,~~

~~*and W. by La Vendée. Part belongs to the basin of the Loire, part to that of the Sévres of Niort, and part to that of the Charente. There are three regions,—the Gatine, the "Plain," and the '"Marsh,'—distinguished by their geo- logical character and their general physical appearance. The GAtine, formed of primitive rocks (granite and schists), is the continuation of the "Bocage" of La Vendée and Maine-et-Loire. It is a poor district with an irregular surface, covered with hedges and clumps of wood or forests. The Plain, resting on Oolitic lime- stone or the "white rock" (pierre blanche), is a fertile grain country. The Marsh, occupying only a small part of the department to the south-west, consists of alluvial clays which also are extremely productive when pro- perly drained. The highest point in the department (892 feet above the sea) is to the east of Parthenay; the lowest lies only 10 feet above sea-level. The climate is mild, the annual temperature at Niort being 54° Fahr., and the rainfall a little more than 24 inches. The winters are colder in the GAtine, the summers warmer in the Plain; and the Marsh is the moistest and mildest of the three districts.*~~

~~*With a total area of 1,482,655 aeres, the department contains 1,043,752 acres of arable ground, 125,534 aeres of meadows, 49,129 of vineyards, 106,222 of forests, 20,429 of heath. The live stoek in 1880 comprised 36,150 horses, 12,800 mules, 2012 asses, 217,935 eattle, 18,405 sheep (wool clip 102 tons) 78,930 pigs, 50,321 goats, 18,845 beehives (55 tons of honey). The horses are a strong breed, and the department raises mules for Spain, the Alps, Auvergne, and Provence. In 1883 there were produeed—wheat, 3,909,260 bushels ; meslin, 466,909 ; rye, 678,920; and in 1880 barley pro- dueed 1,293,600 bushels ; buekwheat, 188,650; maize and millet, 508,062; oats, 2,744,500; potatoes, 4,312,000; pulse, 192,500 bushels ; beetroot, 123,429 tons; hemp, 945 tons; Hax, 245 tons ; colza seed, 75,900 bushels (640 tuns of oil). The wine and cider*~~

~~*amounted in 1882 to 2,859,912 and 210,914 gallons respectively. Vegetables (artichokes, asparagus, eabbage, pease, onions) are largely cultivated. Oaks, chestnuts, and beeches are the most important trees. The apple-trees of the Gatine and the walnut-trees of the Plain are also of*~~

~~*considerable value. Coal (200 miners, and 21,487 tons in 1882) and peat are worked ; iron-ore, argentiferous lead, and antimony exist but are not worked ; and freestone, both hard and soft, is very extensively quarried. here are several sulphurous mineral waters in the department. The most important industry is the manufacture of cloth—serges, druggets, linen, handkerehiefs, flannels, swan-skins, and knitted goods. Wool and ecotton-spin- ning, tanning, and eurrying, glove, brush, and hat making, distil- ling, brewing, flour-milling, and oil-refining are also carried on. In 740 establishments water-power is used to the extent of 38000 horse-power ; and 801 stationary and 165 movable steam-engines represent respectively 1895 and 677 horse-power. The ecommerce of the department, which supplies mules, cattle, and provisions for Paris and the neighbouring great towns, is facilitated by 21 miles of waterway (the Seévre and its left-hand tributary the Mignon), 289 miles of national roads, 3535 of other roads, and 232 miles of railway. In density of population (350,103 in 1881) the depart- ment is below the average of France. It contains 38,000 Pro- testants, especially in the south-east, there being only three French departments—Gard, Ardéche, and Dréme—which surpass it in this respect. The four arrondissements are Niort, Bressuire (3549 inhabitants in the town), Melle (2488), and Parthenay (4842) ; the cantons number 31, and the communes 356. It is part of the dioeese of Poitiers, where also is the court of appeal ; its military headquarters are at Tours. St Maixent (4790) has an infantry school.*~~

~~*SEWAGE. See SEWERAGE.*~~

~~*SEWARD, Witu1am Henry (1801-1872), American statesman, was born May 16, 1801, in the town of Florida, Orange county, N.Y. He was graduated at Union College in 1820, and began the practice of law three years after in the town of Auburn, which became his home for the rest of his life. Several of his cases brought him reputation as a lawyer, but he soon drifted into the more congenial field of politics. After he had served for four years in the State senate, the Whig party of New York nominated him for governor of the State in 1834. Though then defeated, he was nominated again in 1838 and elected,.serving until 1842. He then returned to his law practice, retaining, however, the recognized leadership of the Whig party in the most important State of the Union. During the*~~

~~*next seven years slavery became the burning question of American politics. The purely ethical and the philanthropic sides of the anti-slavery struggle are repre- sented by GARRISON and GREELEY (q.v.). Seward was the first to develop that purely political side, with an economic basis, which probably best met the desires and prejudices of the great mass of those who took part, will- ing or unwilling, in the struggle. The keynote of his theory was struck in 1848 in a speech at Cleveland :— "The party of slavery upholds an aristocracy, founded on the humiliation of labour, as necessary to the existence of a chivalrous republic." The absurdity of the conception of a civilized nation which, in flat opposition to historical development, should tolerate for ever a systematic humilia- tion of labour was only his starting point. His theory culminated naturally in his famous Rochester speech of 1858, in which he enumerated the inevitable direct and indirect consequences of a free-labour and a slave-labour system respectively, showed the two to be absolutely irreconcilable and yet steadily increasing their interferences with one another, and drew this pregnant inference :—there is here "an irrepressible conflict between opposing and enduring forces, and it means that the United States must and will, sooner or later, become either entirely a slave- holding nation or entirely a free-labour nation." But the germ of the "irrepressible conflict " of 1858 lay clearly in the utterances of 1848, and Seward was even then most widely known as its exponent. When, therefore, the New York Whigs, who in 1849 controlled the State legislature, which elects United States senators, sent Seward to the senate with hardly a show of opposition, their defiance of*~~

~~*the southern wing of their party was a premonition of the general break-up of parties three years afterwards. In the senate Seward had at first but two pronounced anti-slavery associates. As anti-slavery feeling increased, and the Republican party was organized in 1855-56, he went into it naturally, for it was to him only an anti-slavery Whig party, and his pre-eminent ability made him at once its recognized leader. In the Republican convention of 1860 he was the leading candidate for the nomination for president ; and it was only by a sudden union of all the elements of opposition to him that the nomination was finally given to Abraham*~~

~~*Lincoln, whose name was then hardly known outside of Illinois. Tt has been an almost invariable rule that American presidents have found their most irritating difficulties in dealing with the New York leaders of their respective parties ; Lincoln when elected removed any such possibility by offering Seward the chief position in his cabinet, that of secretary of state. Here, for at least four years, Seward did the great work of his life. His errors, whether of constitutional law, inter- national law, or policy, are more clearly seen now than they were then. In spite of them all the estimate of the value of his work must be very high, if we consider the chances in favour of foreign intervention at some time during a four years' war, and his unbroken success in in- culcating on other Governments the propriety and wisdom of neutrality. Much of this success was due to circum- stances which he did not create, to his ability to rely solidly on the cordial friendship of the "plain people" (to use Lincoln's common phrase) of Great Britain and France, and particularly to the change of policy induced by the emancipation proclamations of 1862-63; but much is still left to, the credit of the secretary, whose zeal, acuteness, and efficiency brought the ship safely through the intricacies of international relations while the crew were putting out the fire in her hold. In the process of reconstruction which immediately followed the war Seward sided heartily with President J ohnson and shared his defeat. The Whig element had been burned out of the Republican party by the war } & new party had grown up, not limited by ante bellum notions, and it rapidly came to look upon Seward, its once trusted leader, not only as a traitor but as the main intellectual force which supported Johrison's clumsy attempts at treason. At the end of his second term as secretary of state in 1869 he retired to his home at Auburn, broken by loss of health, by loss of political Standing, and by the death of lis wife and daughter. He spent the next two years in foreign travel, and died at Auburn, October 10, 1872.*~~

~~*Of Seward's Life and Works, in 5 vols., edited by George E.*~~

~~*Baker, the last volume deals with his career during his first term as secretary of state.*~~

~~SEWERAGE is the process of systematically collect- ing and removing refuse from dwellings. The matter to be dealt with may conveniently be classified as made up of four parts:—(1) dust, ashes, kitchen waste, and solid matters generally, other than solid excreta; (2) excreta, consisting of urine and feces 3; (3) slop-water, or the discharge from sinks, basins, baths, &c., and the waste water of industrial processes ; (4) surface water due to rainfall. Before the use of underground conduits became general, the third and fourth constituents were commonly allowed to sink into the neighbouring ground, or to find their way by surface channels to a watercourse or to the sea. he first and second constituents were conserved in middens or pits, either together or separately, and were carried away from time to time to be applied as manure to the land. In more modern times the pits in which excre- ment was collected took the form of covered tanks called cesspools, and with this modification the primitive system~~

~~of conservancy, with occasional removal by carts, is still to be found in many towns. Even where the plan of removing excrement by sewers has been adopted, the first kind of refuse named above is still treated by collecting it in pails or bins, whose contents are removed by carts either daily or at longer intervals. It therefore forms no part of the nearly liquid sewage which the other con- stituents unite to form.~~

~~_ The second constituent is from an agricultural point of Character view the most valuable, and from a hygienic point of view of excre- Even healthy mental~~

~~the most dangerous, element of sewage. excreta decompose, if kept for a short time after they are produced, and give rise to noxious gases; but a more serious danger proceeds from the fact that in certain cases of sickness these products are charged with specific germs of disease, Speedy removal or destruction of excremental Sewage is therefore imperative. It may be removed in an unmixed state, either in pails or tanks or (with the aid of pneumatic pressure) by pipes; or it may be defeecated by mixture with dry earth or ashes ; or, finally, it may be conveyed away in sewers by gravitation, after the addition of a relatively large volume of water. This last mode of~~

~~*disposal is termed the water-carriage system of sewerage. Water- towns which have a carriage sufficient water supply, and it is probably the mode which System.*~~

~~*It is the plan now usually adopted in*~~

~~*best meets the needs of any large community. The sewers which carry the diluted excreta serve also to take slop- water, and may or may not be used to remove the surface water due to rainfall. The water-carriage system has the disadvantage that much of the agricultural value of sewage is lost by its dilution, while the volume of foul matter to be disposed of is greatly increased. But it has been found that, even when the excrement of a community is kept out of the Sewers, and subjected to distinct treat- ment, the contents of the sewers are still so foul that their discharge into streams is scarcely less objectionable than when the water-carriage system is adopted; and, further, it appears difficult if not impossible to realize the agricultural value of excrement by any process of separate treatment that is not offensive or dangerous or inappli- cable to towns.*~~

~~*When, in the water-carriage system, the same sewers Combined*~~

~~*to rainfall, the and » separate*~~

~~*carry foul sewage and surface-water due sewerage is said to be "combined "; the "separate system, on the other hand, is that in which a distinct set of sewers is provided to carry off rainfall. its advantages. In the Separate system the foul-water Sewers need be large enough to take only the normal flow : they may thus be made self-cleansing much more readily than if their size were sufficient to carry the immensely greater volume to which (on the combined plan) sewage may be swollen during heavy rain. The amouut of dangerously foul matter is also much reduced. On the other hand, the contents of the rain-water sewers are still too much tainted by the filth of the streets to render their discharge into rivers or lakes desirable ; and the complica- tion of two sets of mains and branches is a serious draw- back. Where old sewers are giving place to new ones it is not unusual to retain the old sewers for the carriage of surface-water ; but in new works a single system of sewers, provided with storm-overflows to relieve them of part of the rainfall during*~~

~~exceptionally heavy showers, would probably be preferred in nearly every case! Since sewers should, in all cases, be water-tight, they do not form suitable collectors of subsoil water.~~

~~1 An exception to this remark may be made in the case of London, where the enormous area to be drained, as well as the difficulty of disposing of the foul sewage on account of its large volume, has led the Comniissioners on Metropolitan Sewage Discharge to advise (in their Report of 1884) that "in new drainage works the sewage should be, as far as possible, separated from the rainfall."~~

~~Each plan has carriage,~~

~~Si Wo i a eG~~

~~Heads The water-carriage system of sewerage will be noticed | air which the soil held in its pores. He estimated that an acre of treat- here under its three aspects a) the ultimate disposal of of suitablo ground, well furnished with subsoil drains to remove ment. . (O) tem of common women. bu winen the water after percolation, could in this way take the sewage of Sewage ; (2) the sys , Aca NA | 2000 persons. This estimate is now considered excessive, and sewage is conveyed to its destination ; (3) the domestic | 1000 persons to the acre is a more recent limit. Mr J. Bailey- arrangements for the collection of sewage. Denton at once took up Dr Frankland's suggestion, and in his Digpowkl L Toe Unrmrare Disposan oF WATER-CARRIED SEw- hands the system of intermittent filtration through land has been ; one successfully applied to the sewage of many towns.? The land Ofer aan AGE.—In the water-carniage system of cee the fertiliz- | vhich constitutes the filter is used to grow vegetables and other puma ing elements are so largely diluted that it becomes a matter | crops. Clay soils are, as far as possible, avoided, and the land is sewage. of the utmost difficulty to turn them to profitable account. | thoroughly underdrained ata depth of about 6 feet. The sewage is It has been estimated that every ton of London sewage distributed over the surface in open chanuels, the proper laying out ae c aiete 1 1 . ne of which is an important item in the cost of the system, but is essen- contalns a lents~~

~~*whose value as manure 18 lather' | +i.) to its success. When the number of persons exceeds 500 per acre more than 2d.,1 a value which, could it be realized, would | it is advisable to precipitate the solid matter that is held in sus- make the sewage of the metropolis worth a million and | pension before the liquid is applied to the land, in order to prevent three quarters sterling per annum. Sewage farming, ee oe fs cet ape Tae clogged meee ee . ey-Denton ointe ne advantage which the system however, does not ¥ pay. After much costly experiment of intermittent filtration offers as a supplement to broad irrigation, the conviction is gaining ground that, neither by applying where that is carried out. A serious objection to the disposal of sewage directly to land, nor by any process of chemical | sewage by irrigation is the fact that the farmer must take the treatment that has yet been proposed, can sewage be made pl aR ree Cag pea nae the He eden ya — dea 5 : : : : en the lan ants 1t. y laying outa portion of the land Cembina- | to yield a return as manure WwW hich will cover the cost of its as a filter bed the sewage may be thrown on that whenever its tion of transport, treatment, | and distribution, except perhaps in @ | presence on the remainder would do harm rather than good. Mr inter- few cases where the circumstances are peculiarly favourable. | Denton has applied this combined system in several instances, and mittent Sewage At the same time, sewage farming does afford one satis- a ey a LS et ne ae See ia | Satis, : : offers a better prospect of prof an any other efficient mode of wi = factory solution of the problem of how to dispose of purifying sewage. The system of intermittent filtration through broad h bl hich Bicone t 3 sewage without creating a nuisance—a problem 1n which | Jand 'has been recommended by the Royal Commission of 1882-84 irrigation. | any question of profit or loss is of secondary importance. | as a mode of treating London sewage. A very early instance of irrigation by sewage is that of nee ti 3 ee ee of oe ashes, a Ai : : coal, coke, peat, &c., though often experimented on, can scarcely be filters. the Craigentinny Meadows, a sandy tract of ks 00 acres, ON | described as an actual system. It is attended by the difficulty that which part of the sewage of Edinburgh has been dis- | the filter becomes speedily choked by the deposit of sludge. Tho*~~

~~charged during certain seasons for nearly a century. There, owing to favourable conditions, and to the fact that complete purification of the sewage is not attempted, the process yields a profit ; but no such result could be looked~~

~~intermittent use of a suitable artificial filter will, however, serve efficiently to oxidize and therefore purify the liquid portion of sewage from which the sludge has been previously precipitated, and filtration through coke is used in some instances as a supple- ment to the process which is next to be described.~~

~~Chemical Treatment, or Preeipitation.—When sewage is allowed Chemieal~~

~~for if the sea were not at hand to receive the imperfectly cleansed sewage and the wholly uncleansed surplus. te aes, or Me thee nen hit pv a ae . a — : : See huaenths subsidence of the solid particles takes place. e subsidence is, ment.~~

~~nee any ae hes nt fi older ee of ms ae however, much too slow to be complete before decomposition sets in.~~

~~in the sewage farm ot the town of bunzlau, which has |} put it may be very greatly accelerated by the addition of certain~~

~~been in existence for more than three hundred years. reagents, with the object of producing a precipitate which, in fall-~~

~~Five methods of treating sewage may be named, of | ing, will carry down with it the minute particles of solid matter ;~~

~~which two or more are often found in combination.' | tibars suspended throughout the mass, Lime ie te estan) Ling Discharge _ Discharge into the Sea or into a largo watercourse is in general | 1544 and in ae Feapention ef about ome ton af Time bo of ania pro into the thc least costly means by which a community can rid itself of its | | nons of sewage. When thoroughly mixed, the liquid is left at ig a: Ut of soutletavis~~

~~*neeasdaty to mle ae and a rapid separation of the sewage follows, into a compara-*~~

~~*this plan effective in avoiding nuisance. Some towns make use of tively clear supernatant liquid and a glutinous precipitate or*~~

~~*tanks or outlet-sewers of large capacity, from which the discharge | « sludge." The sludge has little value as manure, for the best*~~

~~*ee ey eae SO ORO alg agricultural constituents of sewage are contained in solution, and*~~

~~*obmeyage 12 Ven een ee dese not nell ni very little of the soluble matter is carried down in the deposit.*~~

~~*beget eames Ta froin foul deposits. A striking instance | pp, sludge is dried by being strained over beds of slag, pressed into*~~

~~*is furnished by the case of London, which discharges its sewage | books for transport, and got rid of by being burnt or dug into*~~

~~*inte) thes aa a ee eee one ground or thrown into the sea. It has been used in the*~~

~~*aa e vay Pa ane a ura wee ae ee ene oe mantfacture of bricks and of cement (Scott's process), but in general*~~

~~*Twn the : : oe i 1s washed Up anc' | it can be disposed of only at a loss. Theclarified effluent still con-*~~

~~*down tip river with avery YitG cet reaching as far Up a8 | taing dissolved organic matter, and may be admitted into running*~~

~~*Pees 2 Sein a the portion which is not deposited in the streams ouly when a high amedard of purity is not compulsory.*~~

~~*ae oh matt benetonl a eles ia © Bue eae When, however, the volume of the running water which it enters Cee Based Lppigenme — Ey ales eae he ee at seria Cone alas relatively very large a quick purification takes place by*~~

~~means irrigation, a comparatively large tract of cultivated land, in the proportion of | 4¢ i), oxygen which the water carries in solution.~~

~~pee ee lan Midcietbeeace seo uhouseuigne- The lime process is practised, without further purification of~~

~~contributing population. This system is now largely and success- | 4. ominent water, at Leeds and at Burley. At Bradford, after~~

~~fully used, especially where the soil is a porous sandy loam. Fears precipitation by line, the effluent is filtered through beds of coke-~~

~~that the farms would prove dangerous to the health of the neighbour- ee At Birmingham the sewage of 600,000 people, after clari-~~

~~ing district, and that the crops and vegetables grown on them | fcation by lime (which also serves to neutralize the acid contri-~~

~~vo goon ete buted by manufactories), is uscd to irrigate a farm of 1200 acres.~~

~~properly iid out and, oatletl y memaeed the Caen ant a Very many patents have been obtained for the precipitation of~~

~~enquip tebe eames ope ee Boe Mme MP el TE) sewage by other chemicals in place of or in addition to lime. In~~

~~Z oe Bite ame ee a ese Fel Paste Hillé's process lime is the chief ingredient, with tar and chloride~~

~~badge bang ee at scigeQ INS 1 Nag e T y as ree eee lat magnesium or calcium added. At Coventry the precipitants are~~

~~applied, oe 2 ee of chose hae one at sulphate of alumina, protosulphate of iron, and lime, and the Inter- Intermittent Downward Filtration.—This is another mode of SGivenics Hiern 'citened Hiitemett land in de @revortioneemnl mittent purifying sewage by applying it to land, which differs from broad acre to 5000 of the population § 2 Prop filtration irrigation in requiring a much smaller area in proportion to the ban 9 . . –~~

~~*The ABC through sewage dealt with. In 1870 Dr Frankland? drew attention to the ee A Teale tie eae iy Be pee ws is an aie. , land. fact that if sewage were passed through porous soil, not continu- bees ase ae derable value as manure. An emulsion of clay*~~

~~*ously but at intervals long enough to let the soil become aerated, rapid purification took place through the oxidizing action of the*~~

~~*1 Hoffmann and Witt, Report to the Government Referees on Metropolitan Drainage, 1857. 2 Report of the Rivers Pollution Commissioners, 1870.*~~

~~*and carbon with a little blood is first mixed with the sewage ; a precipitating solution of alum is then added, and the mixture*~~

~~*3 J, Bailey-Denton, Intermittent Downward Filtration, with notes on the Practice and Results of Sewage Farming, 1st ed. 1880, 2d ed. 1885.*~~

~~*Relative merits of the systems,*~~

~~*Convey- ance of sewage,*~~

~~*Pipe sewers,*~~

~~*Built sewers,*~~

~~*(“18-inch circular pipe would*~~

~~*SEWERAGE*~~

~~*is allowed to settle. The process gives a remarkably clear effluent g practically the whole of the insoluble constituents of the sewage and a portion of the dissolved impurities are carried down in the precipitate, which, when dried and ground along with some sulphate of magnesia, is sold under the name of native guano. The ABC process has been in successful use for nine years at Aylesbury, where the “guano” finds a sale at 70s. per ton. In 1870 the Rivers Pollution Commissioners reported unfavourably on the pro- cess, a fact which may have prevented its adoption by other towns, but it has since then received the approval of*~~

many specialists, A recent protracted investigation by Dr C. M. Tidy and Prof. Dewar showed that the percentage of oxidizable organic matter removed by the process ranges from 75 to 86—a result, in their judgment, satisfactory. At Leeds, where the process was tried for a time, it was given up because the effluent was purer than the river into which it ran, and the simple lime-process, which costs less but gives a less clear effluent, was adopted in its place.

Much difference of opinion still exists as to the relative merits of broad irrigation, filtration through land, and chemical treat- ment, as means of disposing of sewage. That either of the two first plans or a combination of them both can be made to yield a satisfactory solution of the sewage problem, from a hygienic point of view, seems unquestionable. That chemical treatment, espe- cially if supplemented by filtration through land, will also purify well, is generally admitted. No process of effective purification is now expected to yield a profit ; but the question of cost, on which the choice of a system principally turns, is too extensive to be touched in this article.

II. Taz Conveyancr or Sewacr.—For small sewers, circular pipes of glazed earthenware or fire-clay or of moulded cement are used, from 6 inches to 18 inches and even 20 inches in diameter. The pipes are made in short lengths, and are usually jointed by passing the end or spigot of one into the socket or faucet of the next. Into the space between the spigot and faucet a ring of gasket or tarred hemp should be forced, and the rest of the space filled up with cement, not clay. The gasket prevents the cement from entering the pipe, and so obstructing the flow; at the same time it forms an elastic packing which serves to keep the successive lengths of pipe concentric, even if the cement should fail. The pipes are laid with the spigot ends pointing in the direction of the flow, with a uniform gradient, and, where practi- cable, in straight lines. In special positions, such ag under the bed of a stream, cast-iron pipes are used for the conveyance of sewage. Where the capacity of an be insufficient, built sewers are used in place of earthenware pipes. These are some- times circular or oval, but more commonly of an egg- shaped section, the invert or lower side of the sewer being a curve of shorter radius than the arch or upper side. The advantage of this form lies in the fact that great

~~*variations in the volume of flow must be expected, and the egg-section presents for the small or dry-weather flow & narrower channel than would be sewer of the*~~

~~*presented by a circular same total capacity. Figs. 1 and 2 show*~~

~~*or*~~

~~*ie ‘*~~

~~*So”*~~

~~*Fig. 2.*~~

~~*Fig. 1.*~~

~~*Figs, 1, 2,~Forms of Sewers. two common forms of egg-sections, with dimensions ex- pressed in terms of the diameter of the arch. Fig. 2 is the more modern form, and has the advantage of a sharper invert. The ratio of width to height is 2 to 3. Built sewers are most commonly made of bricks,*~~

~~*‘moulded to suit the curved structure of which they are to*~~

~~*form part. Separate invert blocks of glazed earthenware, terra-cotta, or fire-clay are often used in combination with*~~

~~*An egg-shaped sewer, an invert block, and*~~

~~*ring, or as the sole*~~

~~*713*~~

~~*brickwork, The bricks are laid over a templet made to the section of the sewer, and are grouted with cement. made with two thicknesses of brick,*~~

~~*& concrete setting, is illustrated in fig, 3. Concrete is now very largely used in the construction of sewers, either in combination with brickwork*~~

or alone, For this purpose the concrete con- sists of from 5 to 7 parts of sand and gravel or broken stone to 1 of Port-

land cement. It SES WN RA.

may be used as a jess) VE Ae TN Aras Ra Nuala'

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backing to a brick

Fig. 8.—Brick Sewer,

material of construction by running it into position round a mould which is removed when the concrete is sufficiently

set, the inner surface of the sewer being in this case coated

with a thin layer of cement,

In determining the dimensions of sewers, the amount of sewage Dimen-

proper may be taken as equal to the water supply (generally about sions of 30 gallons per head per diem), and to this must be added an allow-
sewers. ance for the surface water due to rainfall. The latter, which is generally by far the larger constituent, is to be estimated from the maximum rate of rainfall for the district and from the area and character of the surface. In the sewerage of Berlin, for example, (one of the most recent instances of the combined water-carriage system applied on a large scale), the maximum rainfall allowed for is § of an inch per hour, of which one-third is supposed to enter the sewers. In any estimate of the size of sewers based on rainfall account must of course be taken of the relief provided by storm-overflows, and also of the capacity of the sewers to become simply charged with water during the short time to which very heavy showers are invariably limited. Rainfall at the rate of 5 or 6 inches

~~*per hour has been known to occur for a few minutes, but it is altogether unnecessary to provide (even above storm-overflows) sewers capable of discharging any such amount as this ; the time taken by sewers of more moderate size to fill would of itself prevent the discharge from them from reaching a condition of steady flow ; and, apart from this, the risk of damage by such an exceptional fall would not warrant so great an initial expenditure. Engineers differ widely in their estimates of the allowance to be made for the discharge of surface water, and no rule can be laid down which would be of general application.*~~

~~*In order that sewers should be self-cleansing, the mean velocity Velocity of flow should be not less than 24 feet per second. The gradient of dis- necessary to secure this is calculated on principles which have been charge. stated in the article HypRoMECHANICS (g.v.). The velocity of flow,*~~

~~*ee Ve cr/im,*~~

~~*where ¢ is the inclination, or ratio of vertical to horizontal distance ; m is the "hydraulic mean depth," or the ratio of area of section of the stream to the wetted perimeter ; and c is a coefficient depend- ing on the dimensions and the roughness of the channel and the depth of the stream. A table of values of ¢ will be found in § 90 of the article referred to. This velocity multiplied by the area of the stream gives the rate of discharge. Tables to facilitate the determination of velocity and discharge in sewers of various dimensions, forms, and gradients will be found in Mr Latham's and other practical treatises. ;*~~

~~*Where the contour of the ground does not admit of a sufficient Inter- gradient from the gathering ground to the place of destination, the ception sewage must be pumped to a higher level at one or more points in sewers. its course. To minimize this necessity, and also for other reasons, it is frequently desirable not to gather sewage from the whole area into a single main, but to collect the sewage of higher portions of the town by a separate high-level or interception sewer.*~~

~~*Sewer gas is a term applied to the air, fouled by mixture with Sewer gases which are formed by the decomposition of sewage, and by gas. the*~~

~~*organic germs which it carries in suspension, that fills the sewer in the variable space above the liquid stream. It is uni- versally recognized that sewer gas is a medium for the conveyance*~~

~~*XXI.—go*~~

~~*Ventila- tion of sewers.*~~

~~*Man- holes.*~~

~~*Domes- tic sewer- age.*~~

~~*Primary*~~

~~*requi- sites.*~~

~~*Traps.*~~

~~*Common trap.*~~

~~*714*~~

~~*of disease, and in all well-designed systems of sewerage stringent precautions (which will be presently described) are taken to keep it out of houses. It is equally certain that the dangerous character of sewer gas is reduced, if not entirely removed, by free admixture with the oxygen of fresh air. Sewers should be liberally venti- lated, not only for this reason, but to prevent the air within them from ever having its pressure raised (by sudden influx of water) so considerably as to force the "traps" which separate it from the atmosphere of dwellings. The plan of ventilation now most approved is the very simple one of making openings from the sewer to the surface of the street at short distances,—generally shafts built of brick and cement,—and covering these with metallic gratings. Under each grating it is usual to hang a box or 'tray to catch any stones or dirt that may fall through from the street, but the passage of air toand from the sewer is left as free as possible. The openings to the street are frequently made large enough to allow a man to go down to examine or clean the sewers, and are then called '¢manholes." Smaller openings,*~~

~~*large enough to allow a lamp to be lowered for purposes of inspection, are called "lampholes," and are often built up of vertical lengths of drain-pipe.*~~

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~~*the tank accumulates so that it reaches the top of the annular siphon, and begins to flow over the lip, it carries with it enough air to produce a partial vacuum in the tube. The siphon then bursts into action, and a rapid discharge takes place, which con- tinues till the water level sinks to the foot of the Pell aha ped cover.*~~

~~*III. Domestic Sewerace.—In the water-carriage system each house has its own network of drain-pipes, soil-pipes, and waste-pipes, which lead from the basins, sinks, closets, and gullies within and about the house to the common sewer. These must be planned to remove sewage from the house and its precincts quickly and without leakage or deposit by the way; the air within them must be kept out of the dwelling, by placing a water-trap at every opening through which sewage is to enter the pipes, and by making all internal pipes gas-tight ; the pipes must be freely ventilated by a current of fresh air, in order to oxidize any deposited filth and to dilute any noxious gas they may contain ; finally— and this is of prime importance—the air of the common sewer must be rigorously shut out from all drains and pipes within the house. To disconnect the pipes of each indi- vidual house from the atmosphere of the common sewer is the first principle of sound domestic sanitation. When this is done the house is safe from contagion from without, so far as contagion can come through sewer gas; and, how- ever faulty in other respects the internal fittings may be, the house can suffer no other risk than that which arises from its own sewage.*~~

~~*Protection against the passage of gas through open- ings which admit of the entry of water is secured by the familiar device known as the water-trap.*~~

~~*The simplest and in many respects the best form of trap is a bent pipe or inverted siphon (fig. 5) which is sealed by water lying in the bend. The amount of the seal (measured by the vertical distance between the lines a and 6) varies in practice from about 4 an inch to 8 inches. If the pressure of air within the pipe, below*~~

~~*SEWERAGE*~~

~~*be ESM NN NN NN NN NN MMR OTT fifi | oe hh SO*~~

~~*pet Inala ceiceanal a aoa rina*~~

~~*aS Ni 8 ec ces ESTAR AN GS ee T Se vag HOP NY Wat*~~

~~*mana — Field's Siphon Flush Tank.*~~

~~*To facilitate inspection and cleaning, sewers are, as far as possible, laid in straight lines of uniform gradient, with a manhole or lamphole at each change of direction or of slope and at each junction of mains with one another or with branches. The sewers may advantageously be stepped here and there at manholes. Sir R. Rawlinson has pointed out that a difference of level between the entrance and exit pipes tends to prevent continuous flow of sewer gas towards the higher parts of the system, and makes the ventilation of each section more independent and _ thorough. When the gradient is slight, and the dry-weather flow very small, occasional flushing must be resorted to. Flap valves or sliding Flushing penstocks are introduced at manholes; by closing these for a of sewers, short time sewage (or clean water introduced for the purpose) is dammed up behind the valve either in higher parts of the sewer or in a special flushing chamber, and is then allowed to advance with a rush. Many self-acting arrangements for flushing have been devised which act by allowing a continuous stream of comparatively small volume to accumulate in a tank that discharges itself suddenly when full. A very valuable contrivance of this kind is Mr Rogers Field's siphon flush tank, shown in fig. 4. When the liquid in*~~

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~~*SSS Oe. ee bP WANK [[TT TZ oad eet et ihe*~~

~~*RK) Dass SSN URES MURR SE SET NT CAS Wah ND RRRETNOU SH SURAT OR A WAS 0 gQdO UT s DG ORNs ASIA NARA Aero sa Q ow yy DAS AAT AS BB TOD aVEVNT Sy OobORGES Hee oF Rta DAREN*~~
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~~the trap, is greater than that of the air above the trap by an amount exceeding the pressure due to a column of water equal in height to the seal, the trap will be forced and air will bubble through. This Possible | is one way in which a trap may fail, but this may be prevented by causes of | sufficient ventilation of the pipe below the trap. Other failure. possibilities of failure are, however, only too numerous. If the pipe is disused for some time, the water may eva- porate so considerably as to break the seal. The pipe, / if of lead, may bend out of shape, or it may even be so badly set in the first instance as to make the trapin- ,/ 7’ operative. The seal may be broken by the capillary action of a thread or strip of cloth, hang- ing over the lip of the trap and causing the water to drain away. A rush of water down the pipe, suddenly arrested, may pass the trap with such momentum as to leave it wholly or partly empty. Another and a common cause 0~~

~~failure can be explained by re- ference to fig. 5. Let a column of water rush down the soil-pipe Trap.~~

~~c from a closet or sink which~~

~~discharges into it at some higher point. As the water passes the junction with the branch d it will produce a partial vacuum in the branch, and so tend to suck over the contents of the trap. This process, which is sometimes called the siphonage of traps, can be guarded against by ventilating the branch, either by a separate ventilating pipe leading to the open air or by a pipee (shown by dotted lines) connecting the top of the branch d with a point sufficiently far up on the soil-pipe to be above the column of water which is passing the junction. One more imperfection in traps may be named. The experiments of Dr Fergus have shown that the water in traps will allow gases to pass through by absorbing the gas on one surface and giving it off at the other. It is improb- able that this action occurs to such an extent as to be dangerous by permitting the transfer of disease germs from one to the other side. Apart from any risk~~

~~*of this kind, however, it is clear that a trap is open to so many possibilities of failure as to form a very/in- sufficient barrier between the air of a room and the foul air of a sewer. Nevertheless the practiee was until very lately alinost universal, and is still far from uncommon, of connecting closets, sinks, and*~~

~~*Fig. 5.—Common Water-*~~

~~*Diseon- neeting trap on house- drain.*~~

~~*Ventila- tion of soil- pipes.*~~

~~*Buchan trap.*~~

~~*even bedroom basins with common sewers by a continuous system of piping, in which the only safeguard against the entry of sewer gas is a single trap close to each sink or basin. This means that sewer gas, charged with the infection of a whole community, is brought within a few inches of the atmosphere of the dwelling, ready to contamin- ate it whenever the trap fails from any of the causes which have been named, or whenever, by a flow of water through it, the seal is sufficiently disturbed to allow bubbles of gas to cscape into the room.*~~

~~*The remedy for this lies in having, at any convenient point on each house-drain, a disconnecting trap which separates the house system from the sewer, and so establishes what. may be called an outer line of defence. Any accidental leakage of sewer gas through it then does no more than cause a comparatively slight pollution of the air within the house-drains,*~~

~~*An arrangement of double disconnecting trap is illustrated in fig. 8. Any sewer gas forcing the trap next the sewer is still kept back by the upper trap and will escape by a grating or open ventilating shaft which enters at A, while air to ventilate the house-drain enters the upper trap from the manhole. This arrange- ment no doubt gives more absolute protection than a single trap of the kind al- ready described, but it is probable that (except in cases where the sewers are*~~

~~*GRATING*~~

~~*END OPEN FoR VENTILATION*~~

~~*Double diseon- necting trap.*~~

~~*and if these are well ventilated the effects of this are insensible. At each individual basin or other fitting a trap is still required, but its function is now merely to shut out the air of the house-drains from the rooms, and, as the air of the house-drains is no longer polluted by connexion with the sewers, the occasional failure of this function is a matter of com- paratively small moment. Further, the dis- connecting trap on the house-drain furnishes a convenient place of access for fresh air; and the ventilation is completed by carrying the highest point of each soil-pipe or waste-pipe up to the level of the roof and leaving it open*~~

~~*there.*~~

~~*by reference to fig. 6, which shows a soil-pipe, Open at its upper end, discharging into a house-drain in which there is a disconnecting trap provided with an open grating for the entry of air. The soil-pipe is ventilated by a current of air which (usually if not always) flows upwards. This not only dilutes any gases that are produced in the pipe, but quickly oxidizes any foul matter that may adhere to the sides. Care must be taken to avoid having the upper end of the pipe open near windows or under eaves, In the figure the branch leading to a water-closet is ventilated by a pipe carried into an upper part of the soil-pipe; this is scarcely necessary if the branch be short. Another O'SCONNESTING distinct ventilating pipe up from the top of the branch from sewer, and ventilated.*~~

~~*to a point above the roof;*~~

~~*and where several fittings discharge into one soil-pipe, the same ventilating pipe may be made to serve for all. An example of the latterarrangement*~~

~~*is shown in fig. 10. The form of dis- connecting trap shown in fig. 6*~~

~~*is that of Mr _ W. P. Buchan of*~~

~~*Glasgow, who has done excellent ser- vice to the cause*~~

~~*/*~~

~~*form by practising 7*~~

~~*i Y Wy, (the disconuexion | Ean and ventilation of (7/77 yi | Vf*~~

~~*and*~~

~~*very foul and liable to frequent excess of pressure) the ad- vantage is so slight as to be more than counterbalanced by the greater liabil- ity to accidental stoppage and greater complexity which this arrangement entails,*~~

~~*The extent to which it is permissible or advisable in practice to Discharge allow several fittings to discharge into a single waste-pipe or. from soil-pipe will vary in different cases. We can recognize a broad basins, distinction between sewage from closets and urinals, liable to the sinks, most dangerous taint should disease occur within the house, and &, the comparatively innocuous sewage that comes from basins, baths, and sinks. Some sanitarians go so far as to advise that these two classes of sewage should be kept absolutely apart within the house, by the use of a complete double system of house drain-pipes. This, however, is an extreme measure ; no reasonable objection can be urged against the discharge into a water-closet soil-pipe of water from a bath or washhand basin in the same room, except perhaps that if the soil-pipe is of lead its corrosion is hastened by hot water ; and the additional flushing which the soil-pipe so receives is a distinct advantage. But to connect a water-closct soil-pipe with sinks and basins in other apartments is to multiply possibilities for the spread of disease within the house, and it is strongly advis- able to convey the waste from them by a separate pipe, protected from the sewer by a disconnecting trap of its own with a grating open to the air. This applies with special force to the washhand Bedroom basins that are often fixed in bedrooms and dressing-rooms. basins, Nothing could be more dangerous than the usage—of which many good houses*~~

~~still furnish instances—of multiplying these conven- ences without regard to the risk they involve, and making this risk as great as possible by placing each in direct communication through an ordinary trap with the soil-pipe, itself perhaps unven- tilated and provided with no disconnexion from the sewer. Even when the drain or soil-pipe is ventilated and disconnected from the sewer, no bedroom basin should, under any circumstances, be allowed to discharge into it without first passing a separate open trap. On the other hand, a bedroom basin may be made perfectly safe by leading its waste-pipe (trapped under the basin in the usual way) into an open-air channel which communicates with the sewer by a surface-trap or gully outside the house (fig. 9). Similar treatment should be adopted in the case of pantry and_ scullery sinks, Under most Fic. 9.—Open Trap.~~

~~plumbing fixtures it is : : usual to place a safe-tray to rece:ve any water accidentally spilt. Safe-~~

~~. i Sts~~

~~Fig. 8.—Double Disconnecting Trap.~~

~~This arrangement will be understood~~

~~FRESH AIR INLET UM EEO~~

~~Fic. 6.—House-Drain properly disconnected~~

~~YY UM,~~

~~house-drai } Y Y 4 fe Epica, = The saine trap is W | dt The discharge pipes from these trays are sometimes, but very ob- trays. shown to a larger scale in fig. Yz| | FY jectionably, led into the waste-pipe or soil-pipe below the fixture.~~

~~7, where it appears imbedded Y Y~~

~~in concrete and covered by a : | an built manhole, which gives ac- CRY)! cess to the trap in case of its aN~~

~~*becoming choked. The man- tol seweR*~~

~~*The proper method of providing for the discharge of water spilt into the safe-tray is to lead a pipe from it through the wall and allow it to end in the open air (fig. 10, where each of the safe-tray drains is marked " waste-pipe'"') ; a flap valve fixed on the end will serve,*~~

~~*if need be, to keep out draught. ——— Overflow-pipes from cisterns used for dietetic purposes should be Cistern*~~

~~*Ve SEN fo ous QS hs*~~

~~*hole may have a rati CONS C P shot*~~

~~*at ihe eo a tha Soh nay SARS: Ry ; led, in the same way, into the open air and Pe re ets ipes a overflows. i i -pi t be depended on to*~~

~~*closed by a solid plate (if a = ith | Waste-pipes (fig. 10). Traps on them canno l C 1*~~

~~*grating hora be for ate lly ia ie eb ae jaee we' | remain sealed, and any connexion of an overflow-pipe with a soil-*~~

~~*inadmissible), in which case a*~~

~~*ventilating shaft is carried from tne manhole to some other open- ing. Fig. 7 shows such a shaft leading to a grating which is placed vertically in a neighbouring wall. Among other good forms of disconnecting trap, more or less like Buchan's, mention may be made of Weaver's, Potts's, and Hellyer's.*~~

~~*pipe would result in allowing foul air from the pipe to diffuse itself over the surface of water in the cistern—a state of things peculiarly likely to cause pollution of the water. _ When a cistern is used only for water-closet service, its overflow-pipe may properly be led into the basin of the closet. , Rain-pipes, extending as they do to the roof, are sometimes used*~~

~~*to serve as ventilating continuations of soil-pipes and waste-pipes. The practice is open to serious objection, for it discharges the drain air just under the eaves, at a place where air is generally bein drawn into the house. The ventilating end of a soil-pipe shoul be carried to a higher level, as in fig. 6, clear of the lower edge of the roof. It is better to restrict rain-pipes to their legitimate function of taking surface water from the roof, or at most to allow them to receive slop-water from sinks and basins, and to make them terminate in or over open traps from which a connexion is taken to the house-drain or sewer (fig. 9).*~~

~~*In figs. 10 and 11 the sanitary fittings of a small house are shown by diagrains, which should be carefully studied as exemplifying a well-arranged system. 'T'wo closets, and a bath and basin in the closet apart-ment, discharge into asoil-pipe on the right, and the branches (except that of the basin) are venti- lated by pipes leading toa sepa- rate air pipe, which, like the soil-pipe, is carried above the roof, 'The overflow of a cistern which supplies bath, basin, and boiler is carried out to the open air, and so are the waste-pipes of the leaden safe-trays. A sepa- rate cistern supplies each water- closet, and its overflow opens into the closet basin. A rain- pipe (in the middle of the figure) Pipe*~~

~~*Rain- pipes,*~~

~~*Complete system for a small house,*~~

~~*Sim 1ff*~~

~~*CISTERN FOR SUPPLY OF KITCHEN BOER AND BATH & BA*~~

~~*OVERFLOW OPEN TD ouTsIDE GATH ROOM*~~

~~*WC CISTERR*~~

~~*OVERFLOW*~~

~~*if*~~

~~*)*~~

~~*SUPPUED FROM MAIN)*~~

~~*22 OR 3.1NCH AIA PIPE*~~

~~*LS INCH VERTILATING PIP*~~

~~*\J a < WASH HARD BASIN > GQ ies & VP La*~~

~~*ilwe*~~

~~*Ie*~~

~~*Of or fil |*~~

~~*c.*~~

~~*CEA SAFE TRAY*~~

~~*Ri we Cistea AND*~~

~~*a ae*~~

~~*3*~~

~~*er! waste, eS WT ceroen,*~~

~~*RAIN PIPE re i ATH*~~

~~*AND FRESH AIR INLET RAIN PIPE VENTILATED RANGE OF TUBS UPPLIEQ FROM Main } SCULLERY SINK SUPPLIED FROM Masi)*~~

~~*BUCKAN TRAP WITH MANHOLE K GREASE BOx*~~

~~*N*~~

~~*'Ss. OUTSIDE 4.INCHK CAST IAON BOIL Pie*~~

~~*INCH FIRECLAY DRAIN*~~

~~*Si ll!*~~

~~*YY =*~~

~~*6-INCH FIRECLAY DRAIN Fria. 10.—Diagram Section of the Drains and Fittings of a Small House.*~~

~~*receives a bedroom basin waste, and F leads by a 4-inch drain to a venti-lated grease-box, into which: the scullery sink and wash- tubs and an-other rain-pipe also discharge. Finally, the whole system is protected by a Buchan trap in a built manhole, which is covered with a grating.*~~

~~*House-drains, that is to say, those parts of the domestic system of drainage which extend from the soil-pipes and waste-pipes to the sewer, are made of glazed fireclay pipes, generally 6 inches but sometimes only 4 inches in diameter. A larger size than 6 inches is rarely if ever desirable. The pipes are spigot-and-faucet- jointed, and the joints should be made with cement in the manner already described for sewers. When, as is often unavoidable, the house-drain has to pass under a part of the house, or to come from back to front, iron pipes jointed with lead and coated with an anti-corrosive compound are preferred to fireclay pipes, as giving a better security against the production of leaks by the settling of the soil and other causes. Soil-pipes, when carried down inside the house, are of either lead or iron; when outside the house they are usually of iron. An outside soil-pipe is obviously preferable to an inside one; if the arrangement of the building makes an inside soil-pipe necessary, care must be taken that it shall be easily accessible for inspection at all parts of its length, The usual diameter is 4 inches. For the sake of good ventilation it is desirable to continue the soil-pipe to a point above the roof without reduction of diameter rather than apply a smaller ventilating pipe. Amongst reasons for ventilation one remains to be mentioned,— that, owing to the corrosive action of sewer gas, the life of the soil- pipe is greatly shortened if provision for the free circulation of air be wanting or insufficient. A closed soil-pipe becomes in time pitted with holes, especially in the upper parts of its length.*~~

~~*Defective joints in soil-pipes and waste-pipes, particularly where they connect with drains, closet-basins, sinks, &c., are another frequent cause of leakage. Any want of air-tightness in drains or soil-pipes within a dwelling leads to the pollution of the air, not*~~

~~*CULL*~~

~~*Wil MIELE: CELT UCTS, "i Fig, 11.—Plan of the Draius in fig, 10,*~~

~~*House- drains.*~~

~~*Soil- pipes.*~~

~~*Danger of leaks,*~~

~~*SEWERAGE*~~

~~*merely by diffusion, but by an actual in-draught, for generally the air of the house has its pressure reduced by chimney draughts to a value slightly lower than that of the air outside. The house, in fact, ventilates itself by drawing in air from the pipe at any hole, a fact which may easily be demonstrated by holding the flame of a taper near the hole.*~~

~~*Various experimental methods are used of detecting such leaks Smoke as would admit foul air to the dwelling, Of these the best is the test. "smoke test." It consists of filling the house-drain, soil-pipes, and waste-pipes with a dense and pungent smoke, any escape of which into the house is readily observed by eye and nose. A quantity of cotton-waste soaked in oil is lighted, and its fumes are blown into the house-drain by a revolving fan, at the ventilat- ing cover of the disconnecting trap, or at any other convenient opening.. Smoke soon fills the pipes, and begins to escape at the roof, The upper ends of the pipes are then closed, and the house is searched for smoke.! Another test, especially applicable to re those parts of drains that are laid under houses, is the hydraulic Hydraulic | test, which consists in stopping up the lower end of the pipe, test. " filling it with water so as to produce a moderate pressure, and then observing whether the level of the water falls. This test, however, is too severe for any but new and very well constructed drains, ; Every basin, sink, or*~~

~~other fitting should be separately trapped Trapson | by a bend on the waste- individual _ pipe or some other form fittings, of trap. A brass cap, screwed on a ferule which is let into the pipe on the bend, facilitates cleaning (fig. 5). The warm waste- water from pantry and scullery sinks contains much grease, and should be discharged into a grease box (fig. 12) where the water becomes cool and deposits its grease before overflowing into the drain. To collect surface water from laundry floors, areas, court-yards, &c., an open trap or gully is used. Fig. 9 shows a Open simple and good formof open ¢p traps and — trap; but if the water is liable gullies, to carry down sand or earth a gully (fig. 13) is more suit-able. Even in this simple MS fittingaremarkable ingenuity [Oey of error has been displayed. Many of the forms favoured by builders are bad either because of an insecure seal, a narrow outlet, or a tendency to gather filth. One in particular, the well-known "Bell" trap, is an example of nearly everything a trap should not be.~~

~~Water-closets used to be almost invariably of the "pan" type, but wherever sanitary reform has been preached to any purpose the pan closet is giving place to cleaner and wholesomer patterns. The evils of the pan closet will be evi- Pan dent from an inspection of fig. closet. 14. At each use of the closet the hinged pan a is tilted down so that it discharges its contents into the container 6, The sides of the container are inaccessible for cleaning, and their upper portions are out of reach of the flushing action ofthe pan. They gradually become coated with a foul deposit. A gust of tainted air escapes at every use of the closet; and it rarely happens that the container is air-tight, and that the filth it § has gathered does not cause a smell even in intervals of disuse. To make matters worse, many of the older pan closets are provided with the kind of trap shown in yo 34, the sketch, called the D trap, which is also liable to become a gathering place for filth, Even with an ordinary trap, however, the pan closet remains so bad that its use is to be strongly condemned.~~

~~A much better closet is the valve or Bramah closet, an excellent bine — closets.~~

~~1 A novel plan of making the smoke test has lately been introduced, in which smoke is given off by a "smoke rocket" or cake of slowly~~

~~combustible compound which is lighted and placed in the drain.~~

~~Fira. 12.—Grease Trap.~~

~~Water-~~

~~Fra. 13,—Gully-Trap. closets.~~

~~”~~

~~—Pan Water-Closet.~~

~~SEWERAGE ele~~

~~example of which by Frew of Perth is shown in fig. 15. The | and the siphon ceases to act. ad is kept petty full of water by a ground gun-metal valve | desired volume, tightly presse u : : : : a . te ul a fe _ As regards house-drainage generally, the points of chief Summary. at the basin’s foot, importance may be briefly summed up as follows :—(1) the The chamber below is use of one or more disconnecting traps to shut off sewer ioe aha . gas from the whole system of house-drains and pipes ; ee & cannes (2) the thorough ventilation of house-drains, soil-pipes, lee ashy foal mat. and branches, by providing openings through which air ter and may be venti- can enter at the foot and escape at the top; (3) the dis- cm eT charge of all sinks, basins, &c., other than water-closet ee fittings, and especially of fixed bedroom basins, Into open from being overfilled, traps in the open air; (4) the direct discharge of cistern The whole closet is overflows and safe-trays into the open air; (5) the use of eeaped a eine? cleanly and well-designed closets, basins, de. each sealed end on the soil-pipe, by an ordinary bent trap; (6) the use of separate service cisterns for water-closets, _It may seem superfluous to add that the system of Actual pipes must provide a rapid and effective carriage of all state of~~

~~which is not shown in the figure. The volume Fra. 15,—Bramah Water-Closet, Sewage to the sewer, and must be water-tight and air- ho~~

~~The air-pipe ¢ is cut to give the~~

~~t ey) WT) m Tye~~

~~3~~

~~of water in the basin is much greater than in pan closets, where the height is limited bythe : ; , overflow which occurs round the lip of the pan. In some ctosets | tight. During the last five years, however, ve has been of this kind the valve is placed at the side, and, when closed, lies proved, by examination of the best houses in London, nearly vertical. In another type of valvo closet (Jennings's) the | that it is nO uncommon case for & house to be so completely vatve isa conical plug, pressed Vertically down on a seat atthe side without effective connexion with the sewer that all its own Washout Valve closets can be made fairly effective and satisfactory from ones, inks into th iT wader the bh E closet, a sanitary point of view; but a much cheaper and certainly not 8e Sinks Into the soil un ter the asement ; and about less excellent type of closet is the "washout," an example of | 75 per cent. of the houses inspected have failed to pass which (the ' National") is shown in fig. 16. (Another wash. | the smoke test." out closet, by Doulton, appears in fig. 6.) These are now made In this connexion mention should be made of the Co-opera- system of co-operative house-inspection originated by the a ; degree of sanitary perfection that is probably not reached py | late P tof. Fleeming Jenkin. The Edinburgh Sanitary ete the most expensive closets of the kinds already named. They | Protection Association was founded by him in 1878 to~~

~~: . : : " : inspec- have no working parts ; the closet is cleansed after use simply by | carry out the idea that the sanitary fittings of a house tion,~~

~~the flush of water, which Sweeps everything before it. The flush eats : Gale must of course be good: a 14-inch' service pipe from a cistern should be Periodically submitted to exeminehon by an~~

~~not less than 5 fect above the closet will do well. In some recent | ©Xpert, and that householders should combine to secure designs the cistern is a box at the back of the seat with a wide | for this purpose the continuous service of an engineer~~

~~*able to detect flaws, to advise improvements, and to superintend alterations. The Edinburgh association soon justified its existence by discovering, in the houses of its members, a state of things even worse than students of sanitary science had imagined possible. Similar associa- tions are now doing excellent work in London, Glasgow, and many other large towns.*~~

~~*Space admits of only a very brief mention of those systems of sewerage in which excreta are not removed by the aid of water. The dry-earth system, introduced by the Rev. H. Moule, takes advan- Dry- tage of the oxidizing effect which a porous substance such as dry earth earth exerts by bringing any sewage with which it is mixed into system. intimate contact with the air contained in its pores. A discharge of urine and feces is quickly and completely deodorized and absorbed when covered with a small quantity of dry earth; and the same soil, if exposed to the air and allowed to dry, may be used over and over again for the same purpose. Even after soil has been several times used, however, its value as manure is not So great as to pay*~~

~~*with the washout the advantage of having no mechanical parts, is | for its transport to any considerable distance ; and for this reason, Hopper the " hopper," illustrated in fig. 17 (Dodd's Hopper). In all these | as well as from the fact that it leaves other constituents of sewage closet. closets the horn marked V is for attaching a ventilating pipe. to be dealt with by other means, the system is of rather limited Service For the supply of water to a closet a separate cistern is desirable, application. So far as it goes it is excellent, and where there is cisterns especially when water for dietetic purposes is liable to be drawn | no general system of water-carriage Sewerage, or where the watcr- for from the main cistern (instead of being taken direct from the water | supply is small or uncertain, an earth-closet will, in careful hands, Earth- closets, Service pipe, which is better). It would seem needless to add, give perfect satisfaction. N umerous forms of earth-closet are sold in closets. which a suitable quantity of earth is automatically thrown into the pan at each time of use. Arrangements of this kind are, however, not necessary to the success of the system ; a box filled with dry earth and a hand scoop will answer the purpose not less effectively. Ashes are sometimes substituted for or mixed with the dry*~~

~~*earth, CISTERN and powdered charcoal is also used. ; The most primitive method of dealing systematically with Pail excreta is to collect the discharges directly in a vessel which is systenis. either itself carried to the country, and its contents applied to the of closets from being imperfect } land, or is emptied into a more portable vessel for that purpose. through carclessness, many plans ~ In Japan, for example, in spite of the difficulty of transport over bad have been devised for ensuring that 'Fie. 18.—Water-Closet Cistern roads and by human labour, the latter plan is universally followed : once the flow of water is started it with Siphon Flush, the land and the people have in fact performed for centuries what will continue until a given volume has been discharged. Onc of | may be called a complete cycle of operations. The agricultural Auto- the best of these is the arrangement of siphon flush sketched in | return is so good that farmers pay for leave to remove excrement, matic fig. 18 : when the valve @ is opened the downrush of water starts | and householders look to their discharges as a source of income. flush. the siphon 6 into action, and even should a be then closed the | The plan, although carried out in the roughest mauner, appears ow continues until the water-level falls to c, when air is admitted | to involvo fewer sanitary drawbacks than might be expected; but*~~

~~*bedrooms. To prevent flushing*~~

~~*Pneu- matic systems.*~~

~~*the smells from privies and carts, and, above all, from the process of emptying by ladle, are a nuisance which no Western community would tolerate. A simple pail system, in which the sewage is collected and removed in the same vessel, has been used at Roech- dale ; another, with an absorbent lining in the pails, at Halifax. A plan much used in Continental cities is to collect excrement in tight vaults, which are emptied at intervals into a tank cart by a suction pump or injector. A more recent pneumatic system is that of Liernur, applied at Amsterdam, where sewage reservoirs at individual houses are permanently connected with a central reservoir by pipes, through which the contents of the former are sucked by exhausting air from the reservoir at the central station. A similar plan has been tried at Lyons and Paris by M. Berlier.*~~

~~*References.—The blue-book literature of sewage disposal is very voluminous. Special reference should be made to the Reports of the Rivers Pollution Com- misstoners, from 1866; Report of the Referees on Metropolitan Main Drainage, 1857; Reports of the Commission on the Sewage of Towns, 1858-1865; Reports of Select Committees of the House of Commons, 1862 and 1864; Reports of the British Association Committee on the Treatment and Utilization of Sewage, 1869-1876; Report of the Birmingham Sewage Inquiry Committee, 1871; Reports of the Local Government Board; Reports of the Royal Commission on Metropolitan Sewage Discharge, 1884 (the second and final report contains a valuable historical résumé of the subject). See also the following books :—Corfield, Treatment and Utilization of Sewage, 1871; Burke, [andbook of Sewage Utilization, 1873; Robinson and Melliss, Purification of Water-carried Sewage, 1877; Robinson, Sewage Disposal, 1882; J. Bailey-Denton, Intermittent Downward Filtration, 2d ed., 1885. Engineering details of sewerage are given in Baldwin Latham's Sanitary Engineering, 24 ed., 1878; and particulars of the drainage of individual towns will be found in numerous papers in the Minutes of Proceedings of the Institution of Civil Engineers. The domestic aspect of sewerage has been treated by E. Bailey-Denton, Handbook of House Sanitation, 1882;*~~

~~*W. P. Buchan, Plumbing and House Drainage, 4th ed., 1883; W. Eassie, Healthy Houses, 1876; Gerhard, Zouse Drainage, New York, 1882; Waring, Sanitary Drainage of Tlouses and Towns, Boston, 4th ed., 1883; F. Jenkin, Wealthy Houses, 1878 ; and many other writers. (J, A. E.)*~~

~~*SEWIN, or Szwen. See SALMONIDA, vol. xxi. p. 222. SEWING MACHINES. The sewing machine, as is the case with most mechanical inventions, is the result of the efforts of many ingenious persons, although it would appear that the most meritorious of these worked in entire ignorance of the labours and successes of others in the same field. Many of the early attempts to sew by machinery went on the lines of imitating ordinary hand- sewing, and all such inventions proved conspicuous failures. The method of hand-sewing is of necessity slow and intermittent, seeing that only a definite length of thread is used, which passes its full extent through the cloth at every stitch, thus causing the working arm, human or otherwise, to travel a great length for every stitch made, and demanding frequent renewals of thread. The foundation of machine-sewing was laid by the invention of a double-pointed needle, with the eye in the centre, patented by Charles F. Weisenthal in 1755. This device was intended to obviate the necessity for inverting the needle in sewing or embroidering, and it was subsequently utilized in Heilman's well-known embroidery machine. Many of the features of the sewing machine are dis- tinctly specified in a patent secured in England by Thomas Saint in 1790, in which he, ¢nter alia, describes a machine for stitching, quilting, or sewing. Saint's machine, which appears to have been intended principally for leather work, was fitted with an awl which, working vertically, pierced a hole for the thread. A spindle and projection laid the thread over this hole, and a descending forked needle pressed a loop of thread through it. The loop was caught on the under side by a reciprocating hook; a feed moved the work forward the extent of one stitch ; and a second loop was formed by the same motions as the first. It, however, descended within the first, which was thrown off by the hook as it caught the second, and being thus secured and tightened up an ordinary tambour or chain stitch was formed. Had Saint hit on the idea of the eye- pointed needle his machine would have been a complete anticipation of the modern chain-stitch machine. The inventor who first devised a real working machine was a poor tailor, Barthélemy Thimonier,*~~

~~*of St Etienne, who obtained letters patent in France in 1830. In Thi-monier's apparatus the needle was crocheted, and descend- ing through the cloth it brought up with it a loop of thread which it carried through the previously made loop,*~~

~~*fabric.*~~

~~*'model.*~~

~~*SE w—s EW*~~

~~*and thus it formed a chain on the upper surface of the The machine was a rather clumsy affair, made principally of wood, notwithstanding which as many as eighty were being worked in Paris in 1841, making army*~~

~~*'clothing, when an ignorant and furious crowd wrecked*~~

~~*the establishment and nearly murdered the unfortunate inventor. Thimonier, however, was not discouraged, for in 1845 he twicé patented improvements on it, and in 1848 he obtained both in France and the United Kingdom patents for further improvements. The machine was then made entirely of metal, and vastly improved on the first But the troubles of 1848 blasted the prospects of the resolute inventor. His patent rights for Great Britain were sold; a machine shown in the Great Exhi- bition of 1851 attracted no attention, and Thimonier died in 1857 unfriended and unrewarded.*~~

~~*The most important ideas of an eye-pointed needle and a double thread or lock-stitch are strictly of American origin, and that combination was first conceived by Walter Hunt of New York about 1832-34. Hunt reaped nothing of the enormous pecuniary reward which has been shared among the introducers of the sewing machine, and it is therefore all the more necessary that his great merit as an inventor should be insisted on. He constructed a machine having a vibrating arm, at the extremity of which he fixed a curved needle with an eye near its point. By this needle a loop of thread was formed under the cloth to be sewn, and through that loop a thread carried in an oscillating shuttle was passed, thus making the lock-stitch of all ordinary two-thread machines. Hunt's inven- tion was*~~

~~purchased by a blacksmith named Arrowsmith, and a good deal was done towards improving its mechanical details, but no patent was sought, nor was any serious attempt made to draw attention to the invention. After the success of machines based on his two devices was fully established, Hunt in 1853 applied for a patent; but his claim was disallowed on the ground of abandonment. The most important feature in Hunt's invention—the eye- pointed needle—was first patented in the United Kingdom by Newton and Archbold in 1841, in connexion with glove-stitching.~~

~~Apparently quite unconscious of the invention of Walter Hunt, the attention of Elias Howe, a native of Spencer, Mass., was di- rected tomachine- sewing about the year 1843. In 1844 he com- pleted a rough model, and in 1846 he patented his sewing ma- chine (fig. 1). Howe was thus the first to patent a lock-stitch ma- chine, but his in- vention had the two essential feat- ures—the curved ° eye-pointed needle and the under-thread shuttle— which undoubted- ly were invented by Walter Hunt twelve years previously. Howe's invention was sold in England to William Thomas of Cheapside, London, a corset manufacturer, for £250. Thomas secured in December 1846 the English patent in his own name, and engaged~~

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~~Fie. 1.—Howe's original Machine.~~

~~SEWING MACHINES~~

~~Howe on weekly wages to adapt the machine for his manu- facturing purposes. The career of the inventor in London was chequered and unsuccessful ; and, having pawned his American patent rights in England, he returned in April 1849 in deep poverty to America. There in the mean-~~

~~time the sewing machine wag beginning to excite public |~~

~~*curiosity, and various persons were making machines which Howe found to trench on hig patent rights. The _ most prominent of the manufacturers, if not of inventors, ultimately appeared in the person of Isaac Merritt Singer, who in 1851 secured a patent for his machine (fig. 2), and immediately*~~

~~*devoted himself with immense en- ergy to push the fortunes of the infant industry. Howe now became alert to vindicate his rights, and, after regaining possession of his pawned patent, he instituted suits against the in- fringers. Anenor- mous amount of litigation ensued, in which Singer figured as a most obstinate defendant, but ultimately all makers became tributary to Elias Howe. It jg calculated that Howe received in the form of royalties on machines made up to the period of the expiry of his extended patent—September 1867—which was also the month of his death, a sum of not less than two millions of dollars,*~~

~~*The practicability of machine-sewing being demonstrated, inventions of considerable originality and merit followed in quick succession. One of the most ingenious of all the inventors—who worked also without knowledge of previous efforts—was Mr Allan B. Wilson, In 1849 he devised the rotary hook and bobbin combination, which now forms the special feature of the Wheeler & Wilson machine. Mr Wilson obtained a patent for his machine, which included the important and effective four-motion feed, in November 1850. In February 1851 Mr William O. Grover, tailor, of Boston, patented his double chain- stitch action, which formed the basis of the Grover & Baker machine. At a later date, in 1856, Mr James A. E. Gibbs, a Virginia farmer, devised the improved chain- stitch machine now popularly known as the Willcox & Gibbs, These together—all American inventions—form the types of the various machines now in common use, Several thousands of patents have been issued in the United States and Europe, covering improvements in the sewing machine ; but, although the efficiency of the machine has been greatly increased by numerous accessories and attachments, the main principles of the various machines have not been affected thereby.*~~

~~*In machine sewing there are three varieties of stitch made,—(1) the simple chain or tambour stitch, (2) the double chain stitch, and (8) the*~~

~~*lock stitch. In the first variety the machine works with a single thread ; the other forms use two, an upper and an under thread.*~~

~~*The structure of the chain stitch is shown in fig. 8. The needle first descendg through the cloth, then as it begins to ascend the friction of the thread against the fabric is suf- ficient to form a small Dy loop into which the 7 point of 2 hook operat- ing under the cloth plate enters, expanding and holding the loop*~~

~~*while the needle rises to its full height. The feed then moves the fabric forward one stitch length, the hook with its loop is also*~~

~~*OF a yi*~~

~~*Fig, 2,—Singer's original Machine.*~~

~~*Fie. 8.—Chain Stitch.*~~

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~~*projected so that when next the needle descends its loop is formed within the previous loop. The hook then releases loop No. 1, seizes and expands loop No. 2, and in so doing draws up the previous loop*~~

~~*is, by means of a rotating hook, as pas – Eb ly passed through its pre*~~

~~*The double chain stitch is made by machines associated with the name of Grover & Baker. The somewhat complicated course of the threads in this stitch is shown in fig, 4. The under thread in this machine & is supplied from an ordinary = bobbin and is threaded through a circular needle of peculiarform. The machine is wasteful of thread, and the Fia. 4.—Double Chain Stitch, sewing forms a knotted ridge on the under side of the fabric. Except for special manufacturing and ornamental purposes the machine is now in little use,*~~

~~*The lock stitch is that made by all ordinary two-thread sewing machines, and is a stitch peculiar to machine sewing. Its structure 1s, as shown in fig. 5, very simple, and when by proper tension the threadsinterlock with-*~~

~~*in the work the stitch shows the same on both Wy sides and is very secure, 7% When, however, the ten- sion on the upper thread is weak, the under thread runs along the surface as at b, held more or less tightly by the upper loops. It will be seen that to make the chain stitch the under thread has to be passed quite throngh the loop of the upper thread. That is done in two principal ways. By the first plan a small metal shuttle, holding within it a bobbin of thread, is carried backward and forward under 'the cloth plate, and at each forward movenicnt it passes through the upper thread loop formed by each succeeding stroke of the needle. Such is the principle devised by Hunt, introduced by Howe, and improved by Singer and many others. The second principal method of forming the lock stitch consists in seizing the loop of the upper thread by a rotating hook, expanding the loop and passing it around a stationary bobbin within which is wound the under thread. The method is the invention of Mr A. B, Wilson, and is known generally as the Wheeler & Wilson principle. The rotary hook seen at 8, fig. 6, is so bevelled and notched that it opens and expands the upper thread loop, causing it quite to enclose the bobbin of under thread, after which it throws it off and the so-formed lock stitch is pulled up and tightened either by an independent take-up motion as in recent machines, or by the expansion of the next loop as in the older forms. The bobbin A, lenticular in form, and its case B,*~~

~~*Fig. 5.—Lock Stitch,*~~

~~*Fie. 6.—Rotary Hook, Bobbin, and Bobbin Gase (Wheeler & Wilson Machine).*~~

~~*fig. 6, fit casily into a circular depression within the hook, against which they are held by the bobbin holder a, fig. 6. ; Intermediate between the shuttle and the rotary-hook machines is the new oscillating-shuttle machine introduced by the Singer Co. The shuttle is hook-formed, not unlike the Wilson hook, and it carries within it a capacious circular bobbin of thread h, fig. 7. This shuttle is driven by an oscillating driver db within an annular raceway a a, and, instead of revolving completely like the Wilson hook, it only oscillates in an are of 150", so far ag serves to catch and clear the upper thread. The oscillating-*~~

~~*shuttle and rotary-hook machines work with great smoothness and rapidity.*~~

~~*Fie. 7.—Singer's Oscillating-Shuttle Machine.*~~

~~*There are numerous special sewing machines adapted for leather work, glove-sewing, &c., some of which will be alluded to under SHOES. (J. PA.)*~~

~~*SEX. Since the article Repropvuction (¢.v.) includes not only some account of the reproductive processes but an outline of the comparative anatomy of the reproductive organs, and even a somewhat detailed description of the essential sexual elements, it only remains here to make a brief survey of the more important groups with respect to the absence, union, or distinction of the sexes and to the associated "secondary sexual characters" which distinctly male and female organisms so frequently and strikingly present, and to follow up that outline of the morphological facts with a brief discussion of the nature and origin of the sexes and of the theory of reproduction.*~~

~~*Characters of the Sexes.—Starting with the Protozoa, we find indeed that union or conjugation of two or more individuals is of frequent if not universal occurrence ; yet, since, at any rate with rare and slight exceptions, no permanent morphological difference can be made out which would entitle us to speak of males or females, the group is generally defined as characterized by the absence of sexual reproduction. Without at present accepting or rejecting this view, it is convenient to postpone its discussion until the origin of sex comes to be considered.*~~

~~*Passing to the Calentera, we find among the Hydromedusx the sexes usually distinct, and this distinction of the sexes has lately been traced back to the apparently asexual colonies from which the gonophores arise. Exceptions, however, occur,—e.g., Tubularia, which is monecious. The higher Jfeduse# are also usually unisexual, and occasionally even show secondary sexual differences, as in the form and length of the prehensile filaments (Aurelia). Chrysaora, however, is hermaphrodite. The Siphono-phora usually present both sexes within a single colony,—the gono-phores themselves being, however, unisexual. In a few cases (Apolemia*~~

~~*wraria, Diphyes acuminata) the colony itself is entirely male or female. The Ctenophora are invariably hermaphrodite; and among the Hexactinia this is frequently though not generally the case, completely diccious colonies even occurring (Gerardia). Among the Oetactinia the sexes are usually distinct, even so far as the colonies are concerned, yet there are many exceptions, ¢.g., Corallium, which has male, female, and hermaphrodite polyps on the same stock. See Hyprozoa, Cora.s, &c.*~~

~~*The Echinodermata are very rarely hermaphrodite (Synapta, Amphiura squamata), but secondary sexual characters are almost unknown. Thyone, however, has the male orifice on a small pro- tuberance. See EcHINODERMATA. ;*~~

~~*Probably no invertebrate group presents so varied and interest- ing a series of sexual phenomena as the Vermes. Thus the Polyzoa exhibit that remarkable association of hermaphroditism with asexual reproduction which so frequently recurs in organisms of vegetative habit. The Brachiopods also are hermaphrodite, as also are the Oligochetes; the Polychewta only exceptionally so ; some (Nereidx) exhibit secondary sexual characters so well marked as to have been mistaken for specific or even generic ones. The Platyhelminthes with few exceptions are hermaphrodite ; the*~~

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~~*Nemerteans (except Borlasia) are unisexual and occasionally exhibit secondary sexual differences. The Nematodes are very rarely hermaphrodite (Ascaris, Pelodytes), but present very marked sexual differences, the male being usually recognizable by smaller size and caudal curvature. Spicules or claspers for copulation are also present. In Strongylus the female is carried by the male in a ventral furrow. The aberrant nematoid Echinorhynchus is also dicecious. Sagitta is hermaphrodite; Balanoglossus unisexual, but without secondary sexual difference. Some of the most striking cases of sexual dimorphism are presented by the Rotifera, where the male is often a fallen representative of the specific type presented by the female, having not only greatly diminished in size but having undergone thorough degeneration in structure, the alimentary canal especially becoming represented by a mere*~~

imperforate thread of cells. Nor are such cases of male degener- ation by any means confined to this group: a yet more striking instance is presented by the Gephyrean Bonellia, in which the oviduct of the large aud well-grown female contains a number of almost microscopic ciliated Turbellarian-looking parasites, which have been shown to be the degenerate males. The other Gephyrea present no such extraordinary dimorphism, while the Discophora are hermaphrodite. See Poryzoa, BRacHHopopA, ANNELIDA, NE- MERTEANS, PLANARIANS, TAPEWORM, SaciTTa, LEexucu, &c. Among Crustaceans the males are frequently smaller or relatively dwarfish, soinetimes attached parasitically to the female, and the sexes are generally distinguishable at least by differences in 'the structure of some of the appendages, — generally, however, in evident relation to their respective functions. Among the Copepods the gexes are separate, and a marked tendency to dimorphism is manifested, even among the free-living forms. This is sometimes manifested in a way which suggests the sexual magnificence of the highest animals; thus, for instance, the male Sapphirina has the brilliance of a gem. With the appearance of parasitism in the group the reproductive relations become profoundly modified ; thus it is the always less active female which first becomes sessile and parasitic ; the male occasionally permanently retains freedom, as in the common Nicothoe of the lobster's gill ; more usually, how- ever, he settles down beside or even upon the female and becomes more or less completely epi-parasitic, undergoing a more thorough degeneration than the female herself. The analogous series from free to parasitic forms furnished by the Ostracoda and Cirripedia are yet more remarkable in their sexual degeneration, since not only does hermaphroditism become the rule, but "complementary males" (most frequently two to one female) appear. These are utterly degenerate in size and structure, in fact often quite unrecognizable as Cirripedes at all, much less as members of the same species, save for their developmental history aud the existence of afew intermediate degrees of degeneration between the normal and the lost Cirripede organization, e.g., [bla or Scalpellwm, whero the males of some species still retain cirri and buccal pieces. In some cases at least their male reproductive function seems to be discharged early in larval life, before the exchange of free for sessile habits, their subsequent life apparently even sinking below the level of reproductive activity. A reversal

~~*of sex has actually been alleged in some cases, the males having been said to become female. In the Phyllopods the sexes are separate, but partheno-geuesis very frequently occurs, as in Daphnia, Apus, &c., and even in Apus tends to replace sexual reproduction very completely. Von Siebold examined thousands of specimens during twelve years without finding a single male; in other years, however, from 10 to 45 per cent. of males have since been found. Besides the usual copulatory modifications of appendages the males of some Phyllopods have more olfactory filaments on the antenne. In Amphipods similar differences have been noted ; in Isopods these often become much more marked,—sometimes, as in the classical case of Praniza and Anceus, reaching a degree of dimorphism with- out degeneration which is hardly exceeded in the animal kingdom, and which quite naturally led to the separation of the sexes into distinct genera. Iu the parasitic forms (Bopyridx) the females degenerate much more thoroughly than the small and active males. The Schizopods exhibit considerable sexual differences. Thus among the males the antenne bear larger olfactory comb-like structures and larger abdominal members ; copulatory appendages may also be specialized ; while the females, as in many Isopods, &c., have a brood-pouch formed of overlapping ventral lamella. The different position of the sex-openings and the characteristic forms of the limbs render the sexes easily distinguishable among the Decapods ; the crabs have an obviously broader abdomen in the female (see Crustacea). Among the Arachnida, the archaic king-crabs already show slight external scx-differences; among the spiders the males have a maxillary palp specially modified for a copulatory organ, an adaptation which, associated with their often extremely small size, is of great importance in aiding their escape from their larger and ferocious mates. Some species of Theridium have a stridulating apparatus. The male scorpions on the other hand seem to possess a rather stronger development ; in the Acarinz the smaller males are more distinctly segmented,*~~

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~~*possess appendages modified for attachment, and sometimes retain*~~

~~*a free habit of life as distinguished from the parasitic females, See ARACHNIDA.*~~

~~*Among Insects the sexes are distinguished by varying modifica- tions of different parts of the body, and differences in general form and in colour are frequent. The males are generally active and more beautiful, and seem better endowed with sense organs, though usually smaller than the females.*~~

~~*in relation to this that the psychology of sex can first be said to come within the range of observation. said to lower the tone of his song while caressing the female with his antenne. In the parasitic forms dimorphism, as might be expected, becomes very marked ; in Strepstptera the males are free and winged, while the females are blind and wingless, in fact, permanently larval. Similar cases occur in other orders, the glow- worm being probably the most familiar instance, abundantly nourished forms parthenogenesis very frequently appears, the extreme case being presented by Cecidomyta, a fly which exhibits rapid parthenogenetic reproduction in the larval state. The dimorphism of many beetles, in which the male*~~

~~*frequently acquires the most extraordinary specializations of*~~

~~*external form, has received especial attention from Darwin, whose Descent of Man includes the fullest details, Here it is enough to mention that Reichenau has recently pointed out the coexistence of the larger size and relative inactivity of the male with the presence of these functionless outgrowths. The beautiful sexual dimorphism so common among the Lepidoptera need not be more than mentioned at present; while the very remarkable sexual differentiation of Hymenoptera (bees, ants, sawflies, &c.) may also be assumed to be sufficiently familiar. See Insrcts, AnTs, BEEs. Tn several orders (Diptera, Lepidoptera, Coleoptera) cases of dimor- phism occur among the females themselves, or even among the males ; as many as three forms of females have been described in certain butterflies,*~~

~~*The Molluscan series opens with the normally dicecious Lamelli- branchs, of which some genera (most species of Ostrea, Pecten, &c.) are,*~~

~~*however, hermaphrodite. The Pteropods, Pulmonates, and Opisthobranchs are hermaphrodite ; the Prosobranchs, Heteropods, and Cephalopods unisexual. Though slight differences have been described even in Lamellibranch shells (Unio), and though the internal anatomy of the essential and accessory organs is of very high complexity, the extraordinary phenomena, associated with "hectocotylization" among the Cephalopod are the only marked outward manifestations of that sexual dimorphism which reaches its climax in the Argonaut. (See Moutvusca, Curriz-Fisu.) The Tunicates are usually hermaphrodite ; Amphioxus, however, is unisexual (see TUNICATA).*~~

~~*Among Fishes hermaphroditism is extremely rare (Serranus), The males are sometimes characterized by the modification of the pelvic limbs as claspers, &c., and are at the reproductive period often readily distinguishable from the females by their brighter colour or other cutaneous changes, such as ruffling of the skin. Male and female rays are readily also distinguishable by their teeth aud dermal defences. The hooked jaw of the male salmon gives him a characteristic physiognomy during the breeding season. The carp undergoes a sort of epidermic eruption at the same period ; male and female eels, too, are said often to become distinguishable both in colour and shape. Stridulating apparatus may be present, notably in the Siluroids. (See IcHTHYOLOGY.) Among Amphi- bians the bright dorsal crest of the male newt is perhaps the most striking of sex distinctions, but many male frogs and toads have vocal air sacs, epidermal callosities, and some (Cultripes, Pelobates) possess a gland under the fore-limb. (See AMPHIBIA,)*~~

~~*Among the Ophidians the males are smaller, and have longer and more slender tails; the sexes, too, differ sometimes in colour and markings. Male Chelonians, too, have sometimes longer tails and claws and may even give voice. The submaxillary musk-gland of the crocodile is especially active in the breeding season ; the lizards have remarkable throat-pouches and crests, which may be epidermic or even correspond to cranial outgrowths, as in the chameleon,*~~

~~*But it is among Birds and Mammals that the observer of sexual characters finds abundant and remarkable differences extending to the*~~

~~*minutest details, and showing how the higher evolution of parental care which the inevitably prolonged embryonic life in- volves and the wider range of sexual selection have co-operated in modifying the whole organism. As might be expected, the lower mammals show least of this ; but as we ascend the adult males become differentiated from the females by the acquirement of secondary sexual characters which are mainly either offensive and defensive aids for battle with each other, or which assist in gaining the admiration of the females ; and these may coexist or coincide in very various degrees, Thus scent-glands are of common occurrence from the Znsectivora (perhaps even from Ornithorhynchus) upwards. Greater beauty of markings or more vivid colours are acquired, — in many Anthropide (baboons, &c.) the latter being of peculiarly*~~

~~*The males have also a pre- eminence or even monopoly in producing sounds, and itis perhaps*~~

~~*Thus the field-cricket is*~~

~~*In parasitic or*~~

~~*(4*~~

~~*crude magnificence. Abundant loca] growths of hair often appear, most notably in the lion and in many Anthropide. The develop- ment of tusks and horns is also too familiar to need more than passing mention,*~~

~~*But it is unquestionable that in this as in not a few other respects the birds, rather than the mammals, have reached the highest stages of evolution,*~~

~~*Nature and Determination of Sex.—It is not here pro- posed to enter upon the task of historical review and criticism of the various theories of sex—which were esti- mated at so many as five hundred at the beginning of the last century, or even to attempt any sketch of the present very conflicting state of opinion on the subject.)*~~

~~*Although our theories of sex may be still vague enough, the greatest step to the solution has been made in the general abandonment by scientific*~~

~~*men of the doubtless still popular explanation—in terms of a "natural tend- ency " for the production ofan excess of males or the like. It is now held that " quality and quantity of food, elevation of abode, conditions of temperature, relative age of parents, their mode of life, habits, rank, &c,, are all factors which have to be considered." The idea that the problem of the nature of sex is capable of being approached by empirical observation of the numbers of different sexes produced under known sets of conditions, and the obvious practical corollary of this, viz., that the proportion of the sexes must therefore be capable of being experimentally modified and regulated, are conceptions which have steadily been acquir- ing prominence, especially of late. In short, if we can find how sex is determined, we shall have gone far to investigate sex itself,*~~

~~*One of the most crude attempts has been that of Canestrini, who ascribes the determination of sex to the number of sperms entering the ovum, but this view has been already demolished by Fol and Pfliiger. The time of fertilization has also and apparently with greater weight been insisted upon ; thus Thury, followed by Diising, holds that the sex of the offspring depends on the period of fer- tilization : an ovum fertilized soon after liberation produces a female, while the fertilization of an older ovum produces a male, This view has been carried a step farther by Hensen, who suggests that the same should probably hold true of the spermatozoa, and thus the fertilization of a young ovum by a fresh sperm would have a double likelihood of result- ing in a female. There are some observations which support this: thus Thury and other cattle-breeders have claimed to determine the sex of cattle on this principle, and Girou long ago alleged that female flowers, fertilized as soon as they are able to receive pollen, produced a distinct excess of female offspring.*~~

~~*Great weight has also been laid on the relative age of the parents. Thus Hofacker, so long ago as 1828, and Sadler a couple of years later, independently published a body of statistics (each of about 2000 births) in favour of the generalization (since known as Hofacker's and Sadler's law) that when the male parent is the elder the offspring are preponderatingly male : while, if the parents be of the same age, or a fortior if the male parent be younger,*~~

~~1 As for reproduction in general, so for sex, the most convenient starting-point is the work of Hensen (“ Die Zeugung,” in Hermann g Hab. d. Physiologie), while other dissertations are to be found in the leading manuals of zoology and botany, especially, however, in special papers too numerous to mention. See also REPRODUCTION, and for fuller bibliographical details see Geddes, ‘On the Theory of Growth,~~

~~Reproduction, Sex, and Heredity,” Proc. Roy. Soc. Edin., 1886. XXI. — gt~~

~~female offspring appear in increasing majority. This view has been confirmed by Goehlert, Boulanger, Legoyt, and others; some breeders of horses, cattle, and pigeons have also accepted it. Other breeders, however, deny it alto- gether; moreover, the recent statistics of Stieda and of Berner (taken independently from Alsace-Lorraine and Scandinavia) seem to stand in irreconcilable contradiction. At any rate at present we do not seem justified in ascribing greater importance to the relative age of parents than asa secondary factor, which may probably take its place among those causes influencing nourishment discussed below,~~

~~That good nourishment appears to produce a distinct preponderance of females is perhaps the single result which can at present be regarded as clearly proven and generally accepted. Yet it would be too much to say that unanimity is even here complete; thus, among plants, the experiments of Girou (1823), Haberlandt (1869), and others gave no certain result; those of Heyer (1883) have led him to dispute the validity of the generalization altogether, while Haberlandt (1877) brought evidence for regarding the excess of females as largely due to the greater mortality of the males. The investigations of agricultural observers, especially Meehan (1878), which are essentially corroborated by Diising (1883), however, leave little doubt that abundant moisture and nourishment tend to produce females. Some of Meehan’s points are extremely instruc- tive. Thus old branches of Conifers overgrown and shaded by younger ones produce only male inflorescences, a fact which may be taken in connexion with Sadebeck’s obser- vation that some fern prothallia, under unfavourable con- ditions, can still form antheridia but not archegonia. The formation of female flowers on male heads of maize~~

~~*is ascribed by Knop to better nutrition consequent on abund- ant moisture, The only seriously contradictory observa- tions are thus those of Heyer, and it is therefore reassuring when a detailed scrutiny of his paper shows his ill-con- ducted experiments (which land him in the conclusion that the organism is not modifiable by its environment at all) to be largely capable of a reversed interpretation. The agency of temperature is also of considerable importance. Thus Meehan finds that the male plants of hazel grow more actively in heat than the female, and Ascherson states that Stratiotes aloides bears only female flowers north of 52° lat., and from 50° southwards only male ones. Other instances might be given,*~~

~~*Passing to the animal kingdom we find the case of insects peculiarly clear ; thus Mrs Treat showed that if caterpillars were starved before entering the chrysalis state the resultant butterflies or moths were males, while others of the same brood highly nourished came out females. Gentry too has shown for moths that innutri- tious or diseased food produced males; hence perhaps a partial explanation of the excess of male insects in autumn, although temperature is probably more important. The recent experiments of Yung on tadpoles are also very conclusive. Thus he raised the percentage of females in one brood from 56 in those unfed to 78 in those fed with beef, and in another supply from 61 to 81 per cent. by feeding with fish ; while, when the especially nutritious flesh of frogs was supplied, the percentage rose from 54 to 92. Among mammals the difficulties of proof are greater, but evidence is by no means wanting. Thus an important experiment was long ago made by Girou, who divided a flock of 300 ewes into equal parts, of which the one half were extremely well fed and served by two young rams, while the other was served by two mature rams and poorly fed. The proportion of ewe lambs in the two cases was respectively 60 and 40 per cent. JDiising also states is is usually the heavier ewes which bring forth ewe ambs.*~~

~~*'tends to readjust itself."*~~

~~*SEX*~~

~~*Nor does sex in the human species appear to be independent of differences of nutrition. After a cholera epidemic or a war more boys are said to be born, and Diising also points out that in females with small*~~

~~*placenta and little menstruation more boys are found, and even affirms that the number of male children varies with the rise in prices. In towns and in prosperous families there are also more females, while males are more numerous in the country and among the poor. The influence of temperature is also marked: more males are born during the colder months, a fact noted also by Schlechter for horses.*~~

~~*The best known and probably still most influential theory is that systematized by Girou and known as that of 'comparative vigour." This makes sex of offspring depend on that of the more vigorous parent. But to this view there are serious difficulties: thus consumptive mothers produce a great excess of daughters, not sons as might be expected from the superior health of the father. Still less weight can be attached to that form of the hypothesis which would make sex follow "genital superiority" or "relative ardency" alone. Any new theory has thus to reconcile the arguments in favour of each of the preceding views, and meet the difficulties which beset all. As Starkweather puts it, it must at once account for such facts as "' the preponderance of male births in Europe, of females among mulattos and other hybrid races, as also among polygamous animals, and for the equality among other animals. More especially it must suggest some principle of self-adjustment by which not only is the balance of the sexes nearly preserved on the whole, but by which also in cases of special disturbance the balance Starkweather proceeds to attempt this, and his argument may be briefly summarized. While few maintain any essential equality of the sexes, and still fewer any superiority of the female, the weight of authority has been from the earliest times in favour of the doctrine of male superiority. From the earliest ages philosophers have contended that woman is but an undeveloped man ; Darwin's theory of sexual selection presup- poses a superiority in the male line and entailed on that sex; for Spencer the development of woman is early arrested by procreative functions : in short, Darwin's man is as it were an evolved woman, and Spencer's woman an arrested man. On such grounds we have a number of theories of sex. Hough thinks males are born when the system is at its best, more females when occupied in growth, reparation, or disease. So, too, Tiedman and others regard every embryo as originally female and remaining female if errested, while Velpau conversely regards embryos as*~~

~~*all naturally male, but frequently degenerating to the female state. Starkweather points out some of the difficulties to the view of female inferiority, and lays it down as the foundation of his work that 'neither sex is physically the superior, but both are essen- tially equal in a physiological sense." But, while this is true of the average, there are many grades of individual differences and deficiencies in detail, involving a greater or less degree of superiority in one or other of every pair. Starkweather's theory then is "that sex is determined by the superior parent, also that the superior parent produces the opposite sex." 'The arguments adduced in favour of this view, however, are scarcely worthy of it, since, save a chapter of pseudo-physiological discussion of vital forces and polarities, of superiority,—nervous, electrical, &c.,.— they rest mainly on the vague and shifting grounds of physiognomy and temperament. And when superiority is analysed into its factors,—cerebral development and activ- ity, temperament, state of health, of nutrition, &c., —soon we find under the appearance of simplicity a law has been obtained not by discovering any real unity under the many*~~

~~*apparently different factors, but by simply lumping them uuder a common name. Nor is a rationale given of the affirmed reversal of sex, which Schlechter and other authorities moreover wholly deny. Despite these and other faults and failures the work is interesting and often suggestive, and that not only on account of its theoretic position but its sanguine proposals for the practical contro] of sex.*~~

~~*The work of Diising (1883), while less speculative, is of great importance in respect to the causes which regulate the proportions of the sexes ; since, instead of falling back with Darwin on the unexplained operation of natural selection, he seeks to note the circumstances in which a majority of one sex is profitable, and to show that organisms have really the power to produce in such circum- stances a majority of one sex,—in short, that disturbances in the proportion of the sexes bring about their own compensation, and further supports these views by calcula- tion and statistical evidence.*~~

~~*He separates the causes determining sex into those affecting (a) one parent and (bd) both alike. Starting with a minority of one sex, he emphasizes the importance of delayed fertilization, accept- ing it as a fact that females late fertilized bear most males (this corresponding in man to a searcity of males among the lower animals). He notes that the firstborn child is most frequently a male, especially among older persons, and thus explains how after a war, when there is a want of males, most male children are born, He ascribes importance to the amount of sexual intercourse. Thus, suppose a minority of females: their fertilization tends to occur more frequently, and thus (if the general statement be correct) they should produce a majority of their own Sex; Or similarly with males. This is su ported by reference to cattle- breeding, and it is interpreted physiologically to involve that young spermatozoa produce a majority of males. Suppose a great majority of males: the chances of early fertilization of the females are of course great, but eggs fertilized early tend to produce females. Or suppose conversely a great minority of males: the chances of early fertilization are small, but old eggs tend to produce males, and either excess will thus become compensated. Or again, the more decided the minority of one sex the more frequent the scxual activity of its individuals, the younger their sexual elements, and consequently the more individuals of that sex are produced. Diising next takes up as indirect causes equivalent toa minority of individuals—(a) deficient nutrition ; just as fre- quent copulation overstrains the genital organs the same result may arise from the deficient nutrition of the system ; hence an ill- fed cow yields a female to a well-fed bull and vice versa ; (b) relative age ; the nearer either parent is to the period of greatest reproduc- tive capacity the less, he thinks, is a birth of that sex probable.*~~

~~*As factors affecting both parents he first discusses variations in nutrition; although means of subsistence may decrease, there is at*~~

~~*Theory of Reproduction and Sex.—If we now attempt to reach a rational standpoint from which to criticize and compare the innumerable empirical conceptions of SCX,— much more if we seek a firm basis for the construction of a really comprehensive theory,—it is evident 'that such a theory must be addressed not merely to the specialist concerned with problems of reproduction and development, but, while embracing*~~

~~*details and anomalies, must be satis- factory alike to the general morphologist and physio- logist. We must therefore have before us that conception of the main lines of thought on each of these subjects which has been outlined under the headings Puysrotoay and Morpnoroey.*~~

~~*The close coincidence between these two independent developments is especially to be noted. From the vague account of general form and appearance, of habits and temperaments, which made up the descriptive natural history of the past, the two streams of progress, though distinct, are wholly parallel. Thus Buffon furnished a brilliant and synthetic exposition of the oldest view, while one side of their general aspect received new precision at the hands of Linnzeus,—to some extent the other also at the hands of his physiological contemporaries. The anatomical advance of Cuvier is parallel to the detailed study of the functions of the organs, while the great step made by Bichat lay in piercing below the conception of the organ and its function as ultimate, and in seeking to interpret both by reference to the component tissues. The cell- theory of Schwann and his successors analysed these tissues a step farther, while the latest and deepest analysis refers all structure ultimately to the substance called protoplasm, and similarly claims to express all function in terms of the construction and destruction, synthesis and analysis, anabolism and katabolism of this. See PuHysroLoay, Proto- PLASM, Morpnonoey.*~~

~~*Now, since every morphological and physiological fact or theory is in one or other of these few categories, it is evident that we have here the required criterion of theories of reproduction and sex. The question, What is sex? what is meant by male or female? admits of a regular series of answers, The first and earliest is in terms of general aspect, temperament, and habit, and, though crude, em- pirical, and superficial, it lacks neither unity nor usefulness. At this plane are not only most popular conceptions but many theories like that of Starkweather, which may be mentioned as the most recent. The anatomist contents himself with the recognition of specific organs of sex, or at most with a similarly empirical account of their functions ; while the embryologist and histologist will not rest con- tented without seeking to refer these organs to the tissues of which they are composed and the layer from which they*~~

~~spring, and even reaches and describes the ultimate cellular elements essential to sex,—the ovum and spermatozoon. A parallel physiological interpretation of these is next required, and at this point appear such hypotheses as these of Weis- mann and others.~~

~~Thus the bewildering superabundance of widely dif- ferent theories at the present juncture becomes intelligible enough ; and, each once classified according to its stage of progress, a detailed criticism would be easy. But this is not enough: the demand for an explanation at once rational and ultimate, to comprehend and underlie all the preceding ones, is only the more urgent. Where shall we seek for it? On the one hand the morphological aspect of such an explanation must interpret the forms of sex cells in terms of those of cells in general, and in terms of the structural properties of protoplasm itself ; while its more difficult yet more satisfying physiological aspect must express the mysterious difference of male and female in terms of the life processes of that protoplasm,—in terms,~~

~~On reproductive activity, notes the influence of climate, function, &c., and contrasts organisms of high activity, like birds and insects, with parasites. The nutritive relations of the sexes are also~~

~~good harvest, and the rising proportion of boys during a rise of priees. Similarly for animals: the more food the more females, and the more rapidly the species increases; the less food the more males, and the less rapid the increase, Again, plants on good soil produce more female flowers and more seed with profit to the species ; on bad soil male flowers preponderate, mostly perish, and the species tends to disappear. he extreme case of optimum nutrition tends to produce normal parthenogenesis (“thelytokie ”), yielding only females, different in cause and operation from the parthenogenesis resulting from the absence of males (“arrenotokie”).}~~

~~1 See Diising, Jena Zeitschr., 1885 ; Starkweather, Law of Sex, 1883.~~

~~*that is to say, of anabolism and katabolism. Were these steps made a new synthesis would be reached, and from this point it should even next be possible to retrace the progress of the science, and interpret the forms and the functions of tissues and organs, nay, even of the facts of aspect, habit, and temperament, so furnishing the deductive rationale of each hitherto merely empirical order of ob- served fact and connecting theory.*~~

~~*While this conception does not admit of development within the present limits,1.a brief abstract of such an interpretation of reproduction and of sex in terms of anabolism and katabolism may be of interest to the reader. The theory of reproduction, in general principle at least, is simple enough. A continued surplus of anabolism involves growth, and the setting in of reproduction when growth stops implies a relative katabolism, This in short is merely a more precise restatement of the familiar antithesis between nutrition and reproduction. At first this disintegration and reintegration entirely exhaust the organism and conclude its individual existence, but as we ascend the proeess becomes a more and more localized one. The origin of this localization of the reproductive function may best be understood if we figure to ourselves a fragment of the genealogical tree of the evolutionist in greater detail, and bear in mind that this is made up of a con- tinuous alternate series of sex-cell and organism, the organism, too, becoming less and less distinguished from its parent cell until the two practically coincide in the Protozoa, which should be defined not so much as " organisms devoid of sexual reproduction" but rather as undifferentiated reproductive cells (protosperms or protova, as they might in fact be called), which have not built up round them- selves a body. We should note, too, how the continuous immortal stream of Protozoan life (see Prorozoa) is continued by that of ordinary reproductive cells among the higher animals, for the mor- tality of these does not affect this continuity any more than the fall of leaves does the continued life of the tree. The interpreta- tion of sex is thus less difficult than might at first sight appear. For anabolism and katabolism cannot and do not absolutely bal- ance, as all the facts of rest and motion, nutrition and reproduc- tion, variation and disease, in short of life and death, clearly show. During life neither process can completely stop, but their algebraic sum keeps varying within the widest limits. Let us note the result, starting from the undifferentiated ameeboid cell. A*~~

surplus of ana- bolism over katabolism involves not only a growth in size but a reduction in kinetic and a gain in potential energy, @.¢., a diminu- tion of movement. Irregularities thus tend to disappear ; surface tension too may aid ; and the cell acquires a spheroidal form. The large and quiescent ovum is thus intelligible enough. Again starting from the ameeboid cell, if katabolism be in increasing preponderance the increasing liberation of kinetic energy thus implied must find its outward expression in increased activity of movement and in diminished size; the more active cell becomes modified in form by passage through its fluid environment, and the flagellate form of the spermatozoon is thus naturalenough. It is noteworthy, too, that these physiologically normal results of the rhythm of cellular life, the resting, amceboid, and ciliate forms, are precisely those which we empirically reach on morphological grounds alone (sec MorPHo.oey, vol. xvi. p. 841).

Given, then, the conception of the cellular life rhythm as capable of thus passing into a distinctly anabolic or katabolic habit or diathesis, the explanation of the phenomena of reproduction becomes only a special field within a more general view of structure and function, nay even of variation, normal and pathological. Thus the generality, use, and nature of the process of fertilization become readily intelligible. The profound chemical difference surmised by so many authors becomes intelligible as the outcome of anabolism and katabolism respectively, and the union of their products as restoring the normal balance and rhythm of the renewed cellular life. Without discussing the details of this, farther than to note how it resumes the speculations of Rolph and others as to the origin of fertilization from mutual digestion, of the reproductive from the nutritive function, we may note how they illustrate on this view that origin of fertilization from conjugation which is the central problem of the ontogeny and phylogeny of sex. The formation of polar vesicles seems thus an extrusion of katabolic (or male) elements, and conversely its analogues in spermatogenesis (see RrPRoDUC- TION). Passing over such tempting applications as that to the explanation of segmentation and even subsequent developmental changes, it must suffice to note that the constant insistance of embryologists upon the physiological importance of the embryonic layers bears essentially upon their respective predominance of ana- bolism and katabolism. The passage from ordinary

~~growth to that discontinuous growth which we term asexual reproduction, and from this again to sexuality or the frequent reverse progress, is capable of rational interpretation in like manner: the "alternation of gene-~~

~~1 See paper by Geddes already mientioned at p. 721, footnote.~~

~~rations" is but a rhythm between a relatively anabolic and katabolic preponderance; a parthenogenetic ovum is an incompletely differ- entiated ovum which retains a measure of katabolic (male) products, and thus does not need fertilization ; while hermaphroditism is due to the local preponderances of anabolism or katabolism in one set of reproductive cells or in one period of their life. The reversion of unisexual forms to hermaphrodite ones, or of these to asexual ones, which we have seen in such constant association with high nutrition and low expenditure,? is no longer inexplicable. The female sex being thus preponderatingly anabolic, the importance of good nutrition in determining it is explained: menstruation is seen to be the means of getting rid of the anabolic surplus in absence of its foetal consumption, while the higher temperature and greater activities of the male sex express its katabolic diathesis. The phenomena of sex, then, are no isolated ones, but express the highest outcome of the whole activities of the organism—the literal blossoming of the individual life. (P. GE.)~~

~~SEXTANT, an instrument for measuring angles on the celestial sphere. The name (indicating that the instru- ment is furnished with a graduated arc equal to a sixth part of a circle) is now only used to designate an instru- ment employing reflexion to measure an angle; but originally it was introduced by Tycho Brahe, who con- structed several sextants with two sights, one on a fixed, the other on a movable radius, which the observer pointed to the two objects of which the angular distance was to be measured.~~

~~In the article NAVIGATION the instruments are described which were in use before the invention of the reflecting sextant. Their imperfections were so evident that the idea of employing reflexion to remove them~~

~~occurred independently to several minds. Hooke contrived two reflecting instruments. The first is described in his Post- humous Works (p. 503); it had only one mirror, which reflected the light from one object into a telescope which is pointed directly at the other. Hooke's second plan employed two single reflexions, whereby an eye placed at the side of a quadrant could at the same time see the images formed in two telescopes, the axes of which were radii of the quadrant and which were pointed at the two objects to be measured. This plan is described in Hooke's Animadversions to the Machina Celestis of Hevelius, pub- lished in 1674, while the first one seems to have been communicated to the Royal Society in 1666. Newton had also his attention turned to this subject, but nothing was known about his ideas till 1742, when a description in his own handwriting of an instrument devised by him was found among Halley's papers and printed in the Philosophical Transactions (No. 465). It consists of a sector of brass, the are of which, though only equal to one-eighth part ofa circle, is divided into 90°. A tele- scope is fixed along a radius of the sector, the object glass being close to the centre and having outside it a plane mirror inclined 45° to the axis of the telescope, and intercepting half the light which would otherwise fall on the object glass. One object is seen through the tele- scope, while a movable radius, carrying a second mirror close to the first, is turned round the centre until the second object by double reflexion is seen in the telescope to coincide with the first.~~

~~But long before this plan of Newton's saw the light the sextant in its present form had been invented and had come into practical use. On May 13, 1731, John Hadley gave an account of an "octant," employing double re- flexion, and a fortnight later he exhibited the instrument.°~~

~~Ci Ss oe ee~~

~~2 Thus Marshall Ward has lately drawn attention to the association of parasitism with the disappearance of sexual reproduction in Fungi (Quart. Jour. Micr. Sct., xxiv.).~~

~~3 Hadley described two different constructions: in one the teleseope was fixed along a radius as in Newton's form, in the other it was placed in the way afterwards universally adopted; an oetant of the first construction~~

~~*was made as early as the summer of 17380, according to a statement made to the Royal Soeiety by Hadley's brother George on Feb. 7, 1734.*~~

~~*SEX—SEY*~~

~~*On the 20th May Halley stated to the society that*~~

~~*Newton had invented an instrument founded on the same*~~

~~*principle, and had communicated an account of it to the*~~

~~*society in 1699, but on search being made in the minutes*~~

~~*it was only found that Newton had showed a new instru-*~~

~~*ment "for observing the moon and stars for the longitude*~~

~~*at sea, being the old instrument mended of some faults," but nothing whatever was found in the minutes concerning Halley had evidently*~~

~~*the principle of the construction. only a very dim recollection of Newton's plan, and ata meeting of the Royal Society on*~~

~~*different from Newton's.*~~

~~*order of the Admiralty, otherwise it does not seem to have superseded the older instruments for at least twenty years, by Hadley the instrument could only measure angles up to 90°; but in 1757 Captain Campbell of the first to use it assiduously, proposed to enlarge it so*~~

~~*as to measure angles up to 120°, in which form it is now*~~

~~*generally employed.*~~

~~*Quite independently of Hadley and Newton the sextant was invented by Thomas Godfrey, a poor glazier in Phila- delphia, In May 1732 Mr James Logan of that city wrote to Halley that Godfrey had about eighteen months previously showed him a common sea quadrant 'to which he had fitted two pieces of looking-glass in such a Manner as brought two stars*~~

~~*at almost any distance to coincide." The letter gave a full description of the instru- ment; the principle was the same as that of Hadley's first octant which had the telescope along a radius. At the meeting of the Royal Society on January 31, 1734, two affidavits sworn before the mayor of Philadelphia were read, proving that Godfrey's quadrant was made about November 1730, that on the 28th November it was brought by G. Stewart, mate, on board a sloop, the "Truman," John Cox, master, bound for Jamaica, and that in August 1731 it was used by the same persons on a voyage to Newfoundland. There can thus be no doubt that Godfrey invented the instrument independently ; but the statement of several modern writers that a brother of Godfrey, a captain in the West India trade, sold the quadrant at Jamaica to a Captain or Lieutenant Hadley of the British navy, who brought it to London to his brother, an instrument maker in the Strand, has been proved to be devoid of all foundation. Not only is this totally at variance with all the particulars given in the affidavits, but between 1719 and 1743 there was no Officer in the British navy of the name of Hadley, and John Hadley cannot possibly have been in the West Indies at that time, as he was present at many meetings of the Royal Society between November 1730 and May 1731; besides, neither Hadley nor his brothers were professional instrument makers. A detailed discussion of this question by Prof. Rigaud is found in the Nautical Magazine, vol. il. No, 21.1*~~

~~*The annexed figure gives an idea of the construction of the sextant. ABC is a light framework of brass in the shape of a sector of 60°, the limb AB having a graduated are of silver (some- times of gold) inlaid in the brass. It is held in the hand by a small handle at the back, either vertically to measure the altitude of an object, or in the plane passing through two objects the angular distance of which is to be found. CD is a radius movable round ©, where a small plane mirror of silvered plate-glass is fixed ee rewulas to the plane of the sextant and in the line CD. At*~~

~~*is a vernier read through a small lens, also a clamp and a tangent*~~

~~*1 Jobn Hadley was a eountry gentleman of independent means, and the fact that he was the first to bring the construction of reflecting telescopes to any perfeetion has made many authors of astronomieal books believe*~~

~~that he was a professional iustrument maker. HIs brother George, who assisted him in his pursuits, was a barrister.~~

~~December 16, 1731, he declared himself satisfied that HIadley's idea was quite The new instrument was already in August 1732 tried on board the "Chatham " yacht by and was found satisfactory, but~~

~~As constructed~~

~~of the navy, one~~

~~725~~

~~screw which enable the observer to give the arm CD a very slow motion within certain limits. At Eis another mirror " the horizon glass," also perpendicular to the plane of the sextant and paralle] toCB. Fisasmall teleseope 5, fixed across CB, parallel to the plane CAB and pointed ' tothe mirror E, Dark glasses Ss can be placed outside E and Ss between E and C when ob- ' serving the sun. As only \ the lower half of Eissilvered, ' the observer can sce the hori. zon in the telescope through the unsilvered half, while the light from the sun or a star S may be reflected from the "index glass" © to the silvered half of E and thence through F to the observer's eye. If CD has been moved so as to make the image of a star or of the limb of the sun coincide with that of the horizon, it is easy to see that the angle SCH (the altitude of the star or solar limb) is equal to twiee the angle BCD. The limb AB is al- ways graduated so as to avoid the necessity of doubling the mea- sured angle, a space marked as a degree on the limb being in reality only 30'. The vernier should point to 0° 0' 0" when the two mirrors are parallel, or in other words, when the direct and reflected images of a very distant object are seen to coincide, the methods of adjusting the mirrors and finding the index error see NAVIGATION (vol. xvii. p . 268),~~

~~If the sextant is employed on land, an artificial horizon has to be used. This is generally a basin of mercury protected from the wind by a roof of plate-glass with perfectly parallel faees ; some- times a glass plate is used (with the lower surface blaekened), which can be levelled on three screws by a circnlar level. The telescope is directed to the image of the celestial~~

~~*object reflected from the artificial horizon, and this image is made to coincide with that reflected from the index-glass. In this case the angle BCD will be double the altitude of the star. Towards the end of*~~

~~*Sextant.*~~

~~*last and the beginning of this century the sextant was much used*~~

~~*on land for determining latitudes, but, though in the hands of a*~~

~~*skilful observer it can give results far superior to what one might*~~

~~*expect from a small instrument held in the hand (or attached to a small stand), it has on shore been quite superseded by the portable*~~

~~*altazimuth or theodolite, while at sea it continnes to be indis- pensable.*~~

~~*The principle of the sextant has been applied to the construc-*~~

~~*tion of reflecting circles, on which the index arm is a diameter with a vernier at each end to eliminate the error of eccentricity.*~~

~~*The circles constructed by Pistor and Martins of Berlin have a*~~

~~*glass prism instead of the horizon glass and are extremely con-*~~

~~*venient, (J. L. E. D.) SEXTUS EMPIRICUS. See Sceprioram, SEYCHELLES, an archipelago of the Indian Ocean,*~~

~~*consisting of eighty islands—several of them mere islets*~~

~~*situated between 3° 38' and 5° 45' 8, lat. and 52° 55' and 53° 50' E. long., about 1400 miles south-east of Aden and*~~

~~*1000 miles east of Zanzibar. They are the only small*~~

~~*tropical oceanic islands of granitic structure, and rise*~~

~~*steeply out of the sea, culminating in the island of Mahé, at an elevation of 2998 feet above the sea-level. The most northerly island is Bird, $ by } mile; the most southerly, Plate; the most easterly, Frégates ; the most westerly, Silhouette. Mahé, the largest island of the group, 3 by 14 miles, is very nearly central, 60 miles south of Bird, and having to the north and north-east of it La*~~

~~*Digne, Félicité, Praslin, and Curieuse. Only a few—*~~

~~*Mahé, Praslin, La Digne, Denis, and Bird—are inhabited.*~~

~~*The total area is about 50,120 acres, of which Mahé alone*~~

~~*comprises 34,749. The beaches of glistening calcareous*~~

~~*sand are begirt by coral reefs which form a wall round the*~~

~~*islands. The valleys and easier slopes are overlaid with a*~~

~~*very fertile soil, and vegetation is most luxuriant, Though*~~

~~*the climate is tropical, the heat is tempered and rendered uniform by the sea breezes, and probably this accounts for epidemic diseases and endemic fever being of uncommon*~~

~~*occurrence. There are numerous brooks and torrents, making their way to the sea between blocks of granite. The islands are green and fresh at all times, particularly during the wet season from November to May. The total rainfall for 1881 was 113°50 inches. The extreme range of the thermometer in 1881 and 1882 was only 22° (minimum 71°, maximum 93°). The heat is seldom sultry and oppressive. The Seychelles lie too far to the north to receive the hurricanes which occasionally sweep over Bourbon and Mauritius, and even thunderstorms are rare. The population at the census of 1881 was 14,081 (7179 males and 6902 females)—500 white (mostly French creoles), 11,500 black, and 2000 coolies. Since 1881 the population has considerably increased in*~~

~~*consequence of a tide of immigration from Mauritius. Men and women of exceptionally great age are frequently met with, and the death-rate for 1880 amounted to only 13:1 per 1000. The prevailing language is a French patois, but English is taught in the schools.*~~

~~*These islands were discovered at the beginning of the 16th century, but never occupied, by the Portuguese. In 1742 the French took possession of them, calling them at first Iles des Labourdonnais, but afterwards the Seychelles, from Count Heérault de Seychelles, an officer of the East Indian flect. The first settle- ment was made in 1768 at Mahé, now Port Victoria. In 1794 the English wrested them from the French along with Mauritius, and they are now ruled by a board of six civil commissioners, as a dependency under the governor of Mauritius. In 1834 slavery was abolished, and since then the plantations have been in a declining state. In 1884 there were in the islands 20 primary schools aided by Government grants and attended by 1620 children. There are 16 churches belonging to the Roman Catholics (the dominant faith) and 11 to the Church of England. The main product is the cocoa-nut, but tobacco, coffee, rice, maize, sweet potatoes, and manioc are raised for home consumption, while cotton, pepper; cinnamon, and other spices grow wild. Many of the trees*~~

~~*isplay simultaneously blossoms and unripe and ripe fruit. The so-called sea or Maldive double cocoa-nut, "coco de mer," the fruit of the palm-tree Lodotcca Sechellarwm, is peculiar to certain of these islands. It was long known only from sea-borne specimens cast up on the Maldive and other coasts, was thought to grow on a submarine palm, and, being esteemed a sovereign antidote to poisons (Lustad, x. 186), commanded exorbitant prices in the Kast. This palm will grow to a height of 100 feet, and shows fern-like leaves of enormous size. Sensitive plants from America spread like lawns over the soil and quake at every step taken over them. The cocoa-nut palm flourishes in the gardens, overtopping the houses and most other trees, lining the shore, climbing high up the mountains, and in many places forming extensive forests. There are no native mammals, and domestic animals are scarce. The birds comprise gannets, terns in great numbers, and white egrets. Tortoises are common, — among them the gigantic turtle and black turtle, whose flesh is*~~

~~exported. The sea abounds in fish, many of them distinguished by splendid colours, and yields the inhabitants not only a large part of their animal food but also material for building their houses,—a species of massive coral, Porites gaimardi, being hewn into square building blocks which at a distance glisten like white marble.~~

~~The principal harbour is Port Victoria, situated on Mahé island. The total value of imports here in 1884, including Rs.27,097 specie, was Rs.428,605, and of the exports, including Rs.21,582 specie, Rs.392,175. The chicf imports were coffee and cotton manufac- tures; the chief exports, cocoa-nut, cocoa-nut oil, and_ sperm oil. The fiscal receipts for 1884 amounted to Rs.130,047. The cultiva- tion of cocoa is progressing favourably, but the same cannot be said of the vanilla and clove plantations, which suffer from want of regular labour, attributable to the widespread share system, which the negroes prefer to regular work. The leaf disease affect- ing coffee has done great injury, and cocoa-nut plantations have suffered from the ravages of an insect, but no effort seems to have yet been made by weeding the plantations to stamp out the disease. Of the 34,749 acres of land making up Mahé, 12,000 acres are laid out in cocoa-nut, 500 in vanilla, coffee, and cloves, and 1500 are in forest; of the uncultivated land 8000 acres are well suited for vanilla, cocoa, and coffee plantations.~~

~~SEYMOUR, Epwarp. See Somerset, DUKE oF.~~

~~SEYNE, La, a town of France, in the department of Var, 5 miles south-west of Toulon, with a population of 9788 in 1881. It owes its importance mainly to its ship- building, the Société des Forges et Chantiers de la Médi- terranée having here one of the finest building yards in~~

~~Europe, in which more than 2000 workmen are employed ; contracts are executed for private shipowners, for the great Messageries Maritimes Company, and for various Govern- ments. The port, which has communication by steamer and omnibus with that of Toulon, is 6 acres in extent, and admits vessels of the largest tonnage.~~

~~*SFAX, a city of Tunis, second in importance only to the capital, is situated 116 miles south of Mahadia, on the coast of the Gulf of Gabes (Syrtis Minor) opposite the Kerkenah Islands. It consists of three distinct portions: —the new European quarter to the south, with roads, piers, and other improvements carried out by the muni- cipality ; the Arab town in the middle with its tower- flanked walls entered by only two gates; and to the north the French camp. Round the town for 5 or 6 miles to the north and west stretch orchards and gardens and country houses, where most of the Sfax families have their summer quarters. Dates, almonds, grapes, figs, peaches, apricots, olives, and in rainy years melons and cucumbers, grow there in great abundance without irrigation. Two enormous cisterns maintained by public charitable trusts supply the town with water in dry seasons. Sfax was formerly the terminus of a caravan route to Central Africa, but its inland trade now extends only to Gafsa. The export trade (esparto grass, oil, almonds, pistachio nuts, sponges, wool, é&c.) has attained considerable dimensions. Fifty-one English vessels (34,757 tons) visited the port in 1884. The anchorage is 2 miles from the shore, and there isa rise and fall of 5 feet at spring tides (a rare phenomenon in the Mediterranean). In 1881 the popula- tion was said to be about 15,000 (including 1200 Arabs, 1500 Tunisian Jews, 1000 Maltese, &c., 500 Europeans) ; in 1886 it is stated at 32,000 (1200 Maltese, 1000 Euro- peans).*~~

~~*Sfax (the Arabic Asfakis or Safakus, sometimes called the City of Cucumbers) occupies the site of the ancient Taphrura. In the Middle Ages it was famous for its vast export of olive oil. The Sicilians took Sfax under Roger the Norman in the 12th century, and the Spaniards occupied it for a brief period in the 16th century. The bombardment of the town in 1881 was one of the principal events of the French conquest of Tunis; it was pillaged by the soldiers on July 16th and the inhabitants had afterwards to pay a war indemnity of £250,000.*~~

~~*SFORZA, Hovusz or. See Minan, vol. xvi. p. 293, and Iraty, vol. xiii. p. 479.*~~

~~*SHAD is the name given to certain migratory species of Herrings (Clupea), which are distinguished from the herrings proper by the total*~~

absence of teeth in the jaws. Two species occur in Europe, much resembling each other, — one commonly called Allis Shad (Clupea alosa), and the other known as Twaite Shad (Clupea finta). Both are, like the majority of herrings, greenish on the back and bright silvery on the sides, but they are distinguished from the other European species of Clupea by the presence of a large blackish blotch behind the gill-opening, which is succeeded by a series of several other similar spots along the middle of the side of the body. So closely allied are these two fishes that their distinctness can be proved only by an examination of the gill-apparatus, the allis shad having from sixty to eighty very fine and long gill-rakers along the concave edge of the first branchial arch, whilst the twaite shad possesses from twenty-one to twenty-seven stout and stiff gill-rakers only. In their habits and geo- graphical distribution also the two shads are very similar. They inhabit the coasts of temperate Europe, the twaite shad being more numerous in the Mediterranean. While they are in salt water they live singly or in very small companies, but during May (the twaite shad some weeks later) they congregate, and in great numbers ascend large rivers, such as the Severn (and formerly the Thames), the Seine, the Rhine, the Nile, &c., in order to deposit their

spawn, — sometimes traversing hundreds of miles, until their progress is arrested by some natural obstruction. A few weeks after they may be observed dropping down the river, lean and thoroughly exhausted, numbers floating dead on the surface, so that only a small proportion seem to regain the sea. Although millions of ova must be de- posited by them in the upper reaches of a river, the fry does not seem to have been actually observed in fresh water, so that it seems probable that the young fish travel to the sea long before they have attained 'to any size.

On rivers in which these fishes make their periodical appearance they have become the object of a regular fishery, and their value increases in proportion to the distance from the sea at which they are caught. Thus they are much esteemed on the middle Rhine, where they are generally known as " Maifisch"; those caught on their return journey are worthless and uneatable. The allis shad is caught at a size from 15 to 24 inches, and

~~*is con- sidered to be better flavoured than the twaite shad, which generally remains within smaller dimensions.*~~

~~*Other, but closely allied species, occur on the Atlantic coasts of North America, all surpassing the European species in importance as food-fishes and economic value, viz., the American Shad (Clupea sapidissima), the Gaspereau or Ale-wife (C. mattowocea), and the Menhaden (C. menhaden). Sec MENHADEN,*~~

~~*SHADDOCK (Citrus decumana) is a tree allied to the orange and the lemon, presumably native to the Malay and Polynesian islands, but generally cultivated through- out the tropics. The leaves are like those of the orange, but downy on the under surface, as are also the young shoots. The flowers are large and white, and are succeeded by very large globose or pear-shaped fruits like oranges, but paler in colour, and with less flavour. The name Shad- dock is asserted to be that of a captain who introduced the tree tothe West Indies. The fruit is also known under the name of pommeloes and "forbidden frent;" There are two varieties commonly met with, one with pale and the other with red pulp.*~~

~~*SHADWELL, Tuomas (1640-1692), a playwright and miscellaneous versifier of the Restoration period, Dryden's successor in the laureateship, is remembered now, not by his works, though he was a prolific writer of comedies highly successful in their day, but as the subject of Dryden's satirical portraits "MacFlecknoe" and "Og." He was a native of Norfolk —not an Irishman, as he retorted with significant imbecility when Dryden's satire appeared,—went through the forms of study at Cambridge and the Inner Temple, travelled abroad for a little, returned to London, cultivated the literary society of coffee-houses and taverns, and in 1668, at the age of 28, gained the ear of the stage with a comedy The Suillen Lovers. For fourteen years afterwards, till his memorable encounter with Dryden he continued regularly to produce a comedy nearly every year, showing considerable clever- ness in caricaturing the oddities of the time. Ben Jonson was his model, but he drew his materials largely from con- temporary life. He also acquired standing among the wits asatalker. In the quarrel with Dryden he was the aggres- sor, They had been good enough friends, and Dryden in 1679 had furnished him*~~

~~with a prologue for his 7'rue Widow. But when Dryden threw in his lot with the court, and satirized the opposition in Absalom and Achitophel and The Medal, Shadwell was rash enough to constitute himself the champion of the true-blue Protestants and wrote a grossly personal and scurrilous attack on the poet, entitled Lhe Medal of John Bayes. Dryden immediately retorted in MacHecknoe, the most powerful and contemptuously scornful personal satire in our language, adding next month afew more rough touches of supercilious mockery in the second part of Absalom and Achitophel, where Shadwell figures as " Og";~~

~~Og from a treason-tavern rolling liome, Round as a globe, and liquored every chink : Goodly and great he sails behind his link.~~

~~Dryden may not be strictiy fair when he addresses his enemy as "thou last great prophet of tautology," and makes Flecknoe extol him because "he never deviates into sense," but Shadwell had fairly earned his chastise-ment, the sting of which lay in its substantial truth. HIe survived till 1692, and on Dryden's resignation of the laureateship in 1688 was promoted to the office, a sign of the poverty of the Whig side at the time in literary men, and part of the explanation of their anxiety in the next generation to secure literary talent.~~

~~A complete edition of Shadwell's works was published in 1720, in 4 vols. 12mo. HIs dramatic works are—'he Sullen Lovers, 1668 ; The Royal Shepherdess, 1669; The Humorist, 1671; The Miser, 1672; Epsom Wells, 1673 ; Psyche, 1675; The Libertine, 1676 ; The Virtuoso, 1676 3 Timon of Athens, 1678: 4 True Widow, 1679; The Woman Captain, 1680; The Laneashire Witehes, 1682; The Squire of Alsatia, 1688 ; Bury Fair, 1689; The Amorous Bigot, 1690; The Scowerers, 1691; and The Volunteers, 1693.~~

~~SHAM PSH ARITHR. ode Sonne,~~

~~SHAFTESBURY, AntHony AsHiry Coopsr, First EARL oF (1621-1683), was the son of Sir John Cooper of Rockbourne in Hampshire, and of Anne, the only child of Sir Anthony Ashley, Bart., and was born at Wimborne St Giles, Dorset, on J uly 22, 1621. HIs parents died before he was ten years of age, and he inherited extensive estates in Hampshire,~~

~~*Wiltshire, Dorsetshire, and Somersetshire, much reduced, however, by litigation in Chancery. He lived for some time with Sir Daniel Norton, one of his trustees, at Southwick, and upon his death in 1635 with Mr Tooker, an uncle: by marriage, at Salisbury. In 1637 he went as a gentleman-commoner to Exeter College, Oxford, where he remained about a year. No record of his studies is to be found, but he has left an amusing account of his part in the wilder doings of the university life of that day, in which, in spite of his small stature, he was recog- nized by his fellows as their leader. At the age of eighteen, on February 25, 1639, he married Margaret, daugliter of Lord Coventry, with whom he and his wife lived at Durham House in the Strand, and at Canonbury House in Isling- ton. In March 1640, though still a minor, he was elected for Tewkesbury, and sat in the parliament which met on April 13, but appears to have taken no active part in its proceedings. In 1640 Lord Coventry died, and Cooper then lived with his brother-in-law at Dorchester House in Covent Garden. For the Long Parliament, which met on November 3, 1640, he was elected for Downton in Wilt- shire, but the return was disputed, and he did not take his seat,—his election not being declared valid until the last days of the Rump. He was present as a spectator at the setting up of the king's standard at Nottingham on August 25, 1642; and in 1643 he appeared openly on Charles's side in Dorsetshire, where he raised at his own expense a regiment of foot and a troop of horse of both of which he took the command. He was also appointed governor of Weymouth, sheriff of Dorsetshire for the king, and president of the king's council of war in the county. In the beginning of January 1644, however, for reasons which are variously reported by himself and Clarendon, he resigned his governorship and commissions and went over to the Parliament. He appeared on March 6 before the standing committee of the two Houses to explain his conduct, when he stated that he had come over because he saw danger to the Protestant religion in the king's service, and expressed his willingness to take the Covenant. In July 1644 he went to Dorsetshire on military service, and on August 3 received a commission as field-marshal general, He assisted at the taking of Wareham, and shortly after- wards compounded for his estates by a fine of £500 from*~~

~~which, however, he was afterwards relieved by Cromwell. On October 25 he was made commander-in-chief in Dorset- shire, and in November he took by storm Abbotsbury, the house of Sir John Strangways,—an affair in which he appears to have shown considerable personal gallantry. In December he relieved Taunton. His military service terminated at the time of the Self-denying Ordinance in 1645; he had associated himself with the Presbyterian faction, and naturally enough was not included in the New Model. For the next seven or eight years he lived in comparative privacy. He was high sheriff of Wiltshire during 1647, and displayed much vigour in this office. Upon the execution of Charles, Cooper took the Engage- ment, and was a commissioner to administer it in Dorset- shire. On April 25, 1650, he married Lady Frances Cecil, sister of the earl of Essex, his first wife having died in the previous year leaving no family. In 1651 a son was born to him, who died in childhood, and on January 16, 1652, another son, named after himself, who was his heir. On January 17 he was named on the commission for law reform, of which Hale was the chief; and on March 17, 1653, he was pardoned of all delinquency, and thus at last made capable of sitting in parliament. He sat for Wiltshire in the Barebones parliament, of which he was a leading member, and where he zealously and prudently supported Cromwell's views against the extreme section. He was at once appointed on the council of thirty. On the resignation of this parliament he became a member of the council of state named in the "Instrument." In the first parliament elected under this "Instrument" he sat for Wiltshire, having been elected also for Poole and Tewkesbury, and was one of the commissioners for the ejection of unworthy ministers. After December 28, 1654, for reasons which it is impossible to ascertain with clear- ness, he left the privy council, and henceforward is found with the Presbyterians and Republicans, in opposition to Cromwell. His second wife had died during this year ; in 1656 he married a third, who survived him, Margaret, daughter of Lord Spencer, niece of the earl of Southampton, and sister of the earl of Sunderland, who died at Newbury. By his three marriages he was thus connected with many of the leading politicians of Charles II.'s reign.~~

~~Cooper was again elected for Wiltshire for the parlia- ment of 1656, but Cromwell refused to allow him, with many others of his opponents, to sit. He signed a letter of complaint, with sixty-five excluded members, to the~~

~~speaker, as also a "Remonstrance" addressed to the people. In the parliament which met on January 20, 1658, he took his seat, and was active in opposition to the new constitution of the two Houses. He was also a leader of the opposition in Richard Cromwell's parliament, especially on the matter of the limitation of the power of the Protector, and against the House of Lords. He was throughout these debates celebrated for the "nervous and subtle oratory" which made him so formidable in after days: he had "his tongue well hung, and words at will."~~

~~Upon the replacing of the Rump by the army, after the breaking up of Richard's parliament, Cooper endeavoured unsuccessfully to take his seat on the ground of his former disputed election for Downton. He was, however, elected on the council of state, and was the only Presbyterian in it; he was at once accused by Scot, along with White- locke, of corresponding with Hyde. This he solemnly denied. After the rising in Cheshire Cooper was arrested in Dorsetshire on a charge of correspondence with its leader Booth, but on the matter being investigated by the council he was unanimously acquitted. In the disputes between Lambert at the head of the military party and the Rump in union with the council of state, he supported the latter, and upon the temporary supremacy of Lambert's~~

~~party worked indefatigably to restore the Rump. With Monk's commissioners he, with Haselrig, had a fruitless conference, but he assured Monk of his co-operation, and joined with eight others of the overthrown council of state in naming him commander-in-chief of the forces of Eng- land and Scotland. He was instrumental in securing the Tower for the Parliament, and in obtaining the adhesion of Admiral Lawson and the fleet. Upon the restoration of the Parliament on December 26 Cooper was one of the commissioners to command the army, and on January 2 was made one of the new council of state. On January 7 he took his seat on his election for Downton in 1640, and was made colonel of Fleetwood's regiment of horse. He speedily secured the admission of the secluded members, having meanwhile been in continual~~

~~*communication with Monk, was again one of the fresh council of state, con- sisting entirely of friends of the Restoration, and accepted from Monk a commission to be governor of the Isle of Wight and captain of a company of foot. He now steadily pursued the design of the Restoration, but with- out holding any private correspondence with the king, and only on terms similar to those proposed in 1648 to Charles I. at the Isle of Wight. In the- Convention Parliament he sat for Wiltshire. Monk cut short these deliberations and forced on the Restoration without con- dition. Cooper was one of the twelve commissioners who went to Charles at Breda to invite him toreturn. On his journey he was upset from his carriage, and the accident caused an internal abscess which was never cured.*~~

~~*Cooper was at once placed on the privy council, receiv- ing also a formal pardon for former delinquencies. His first duty was to examine the Anabaptist prisoners in the Tower. In the prolonged discussions regarding the Bill of Indemnity he was instrumental in saving the life of Haselrig, and opposed the clause compelling all officers who had served under Cromwell to refund their salaries, he himself never having had any. He showed indeed none of the grasping and avaricious temper so common among the politicians of the time. He was one of the commissioners for conducting the trials of the regicides, but was himself vehemently 'fallen upon" by Prynne for having acted with Cromwell. He was named on the council of planta- tions and on that of trade. In the debate abolishing the court of wards he spoke, like most landed proprietors, in favour of laying the burden on the excise instead of on the land, and on the question of the restoration of the bishops carried in the interests of the court an adjourn- ment of the debate for three months. At the coronation in April 1661 Cooper had been made a peer, as Baron Ashley of Wimborne St Giles, in express recognition of his services at the Restoration ; and on the meeting of the new parlia- ment in May he was appointed chancellor of the exchequer and under-treasurer, alded no doubt by his connexion with Southampton. He vehemently opposed the perse- cuting Acts now passed, —the Corporation Act, the Uni- formity Bill, against which he is said to have spoken three hundred times, and the Militia Act. He is stated also to have influenced the king in issuing his dispensing declara- tion of December 26, 1662, and he zealously supported a bill introduced for the*~~

~~purpose of confirming the declara- tion, rising thereby in favour and influence with Charles. He was himself the author of a treatise on tolerance. He was now recognized as one of the chief opponents of Clarendon and the High Anglican policy. On the break- ing out of the Dutch War in 1664 he was made treasurer of the prizes, being accountable to the king alone for all sums received or spent. He was also one of the grantees of the province of Carolina and took a leading part in its management; it was at his request that Locke in 1669 drew up a constitution for the newcolony. In September~~

~~1665 the king unexpectedly paid him a visit at Wim- He opposed unsuccessfully the appropriation pro-~~

~~borne.~~

~~viso introduced into the supply bill as hindering the due~~

~~administration of finance, and this Opposition seems to~~

~~have brought about a reconciliation with Clarendon. In 1668, however, he sioners to examine the accounts of the Dutch War, though in the previous year he had opposed it. In accordance~~

~~with his former action on all questions of religious tolera- strongly opposed the shameful Five Mile Act of~~

~~tion he 1665. In 1667 he eagerly supported the bill for prohibit- ing the importation of Irish cattle on the ground that it~~

~~would lead to a great fall of rents in Hingland. Ashley~~

~~was himself a large landowner, and moreover was opposed to Ormonde who would have portation. In all other questions of this kind he shows himself far in advance of the economic fallacies of the day.~~

~~His action led to an altercation with Ossory, the son of~~

~~*Ormonde, in which Ossory used language for which he was compelled to apologize. On the death of Southampton, Ashley was placed on the commission of the treasury, Clifford and William Coventry being his principal col- leagues. He appears to have taken no part in the attempt to impeach Clarendon on a general charge of treason,*~~

~~*The new administration was headed by Buckingham, in whose toleration and comprehension principles Ashley shared to the full. A most able paper written by him to the king in support of these principles, on the ground especially of their advantage to trade, has been preserved, He excepts, however, from toleration Roman Catholics and Fifth Monarchy men. His attention to all trade questions was close and constant ; of trade and plantations president from 1672 to 1676. cession also occupied him, and he co-operated thus early in the design of legitimizing Monmouth as a rival to J ames, In the intrigues which led to the infamous treaty of Dover he had no part. That treaty contained a clause by which Charles was bound to declare himself a Catholic, and with the knowledge of this Ashley, as a staunch Protestant, could not be trusted. In order to blind him and the other Protestant members of the Cabal a sham treaty was arranged in which this clause did not appear, considerable while afterwards that he found out that he had been duped. Under this signed the sham Dover*~~

~~*appointed in 1670, and was its*~~

~~*before them as the only one in existence. This is one of the proved dishonourable actions of his life. His approval of the attempt of the Lords to alter a money bill led to the loss of the supply to Charles and to the consequent displeasure of the king. His support of the Lord Roos*~~

~~*Act, ascribed generally to his desire to ingratiate himself*~~

~~*with Charles, was no doubt due in part to the fact that his son had married Lord Roos's sister. It is, too, neces- sary to notice that, so far from advising the "Stop of the Exchequer," he actively opposed this bad measure ; the reasons which he left with the king for his opposition are extant. The responsibility rests with Clifford alone. In the other great measure of the Cabal ministry, Charles's Declaration of Indulgence, he*~~

~~cordially concurred. He was now rewarded by being made Earl of Shaftesbury and Baron Cooper of Pawlett by a patent dated April 23, 1672. It is stated too that he was offered, but refused, the lord treasurership. On November 17, 1672, however, he became lord chancellor, Bridgman having been compelled to resign the seat. As chancellor he issued writs for the~~

~~supported a bill to appoint commis-~~

~~greatly benefited by the im-~~

~~he was a member of the council~~

~~The difficulty of the suc-~~

~~729~~

~~by an angry House of 4, 1673. The writs were cancelled, and the principle was~~

~~ee that the issuing of writs rested with the House itself,~~

~~upholder of Protestantism in the ministry; he rapidly lost favour with Charles, and on Sunday, September 9, 1673, was dismissed from the chancellorship. Among the reasons for this dismissal is probably the undoubted fact that he opposed reckless grants to the king's mistresses. He has been accused of much vanity and ostentation in his office, but his reputation for ability and integrity as a judge was high even with his enemies,~~

~~Charles soon regretted the loss of Shaftesbury, and endeavoured, as did also Louis, to induce him to return, but in vain. He preferred now to become the great popular leader against all the measures of the court, and may be regarded as the intellectual chief of the opposition. At the meeting of parliament on January 8, 1674, he carried a motion for a proclamation banishing Catholics to a distance of ten miles from London. During the whole session he organized and directed the opposition in their attacks on the king's ministers. On May 19 he was dismissed the~~

~~*privy council and ordered to leave London. He hereupon retired to Wimborne, from whence he urged upon his parliamentary followers the necessity of securing a new parliament. He was in the House of Lords, however, in 167 5, when Danby brought forward his famous Non-resisting Test Bill, and headed the opposi- tion which was carried on for seventeen days, distinguish- Ing himself, says Burnet, more in this session than ever he had done before. The bill was finally shelved, a pro- rogation having taken place in consequence of a quarrel between the two Houses, supposed to have been purposely got up by Shaftesbury, in which he vigorously supported the right of the Lords to hear appeal cases, even where the defendant was a member of the Lower House. Parlia- ment was prorogued for fifteen months until F ebruary 15, 1677, and it was determined by the opposition to attack its existence on the ground that a prorogation for more than a year was illegal. In this matter the opposition were clearly in the wrong, and by attacking the parliament discredited themselves. The immediate result was that Shaftesbury, Buckingham, Wharton, and Salisbury were sent to the Tower. In June Shaftesbury applied for a writ of habeas corpus, but could get no release until February 26, 1678, after his letter and three petitions to the king. Being brought before the bar of the House of Lords he at length made a complete submission as to his conduct in declaring parliament dissolved by the proroga- tion, and in violating the Lords' privileges by bringing a habeas corpus in the King's Bench.*~~

~~*The breaking out of the Popish Terror in 1678 marks*~~

~~*XXI.—92*~~

~~*730*~~

~~*the worst part of Shaftesbury's career. That so clear- headed a man could have really credited the extravagant lies of Oates and the other perjurers is beyond belief ; and the manner in which by incessant agitation he excited the most baseless alarms, and encouraged the wildest excesses of fanatic cruelty, for nothing but party advantage, is utterly without excuse. On November 2 he opened the great attack by proposing an address declaring the necessity for the king's dismissing James from his council. Under his advice the opposition now made an alliance with Louis*~~

~~*whereby the French king promised to help them to ruin Danby on condition that they would compel Charles, by stopping the supplies, to make peace with France, doing thus a grave injury to Protestantism abroad for the sake of a temporary party advantage at home, Upon the refusal in November of the Lords to concur in the address of the Commons requesting the removal of the queen from court, he joined in a protest against the refusal, and was foremost in all the violent acts of the session. He urged on the bill by which Catholics were prohibited from sitting in either House of Parliament, and was bitter in his expressions of disappointment when the Commons passed a proviso excepting James, against whom the bill was especially aimed, from its operation, A new parliament met on March 6, 1679. Shaftesbury had meanwhile ineffectually warned the king that unless he followed his advice there would be no peace with the people. On March 25 he made a striking speech upon the state of the nation, especially upon the dangers to Protestantism and the niisgovernment of Scotland and Ireland. He was, too, suspected of doing all in his power to bring about a revolt in Scotland. By the advice of Temple, Charles now tried the experiment of forming a new privy council in which the chief members of the opposition were included, and Shaftesbury was made president, with a salary of £4000, being also a member of the committee for foreign affairs. He did not, however, in any way change either his opinions or his action. He vigorously opposed the compelling of Protestant Nonconformists to take the: oath required of Roman Catholics. That indeed, as Ranke says, which makes him memorable in English history is that he opposed the establishment of an Anglican and Royalist organization with decisive success. The question of the succession was now again prominent, and Shaftesbury, in opposition to Halifax, committed the error, which really brought about his fall, of putting forward Monmouth as his nominee, thus alienating a large number of his sup- porters ; he encouraged, too, the belief that this was agree- able to the king. He pressed on the Exclusion Bill with all his power, and, when that and the inquiry into the payments for secret service and the trial of the five peers, for which too he had been eager, were brought to an end by a sudden prorogation, he is reported to have declared aloud that he would have the heads of those who were the king's advisers to this course. Before the prorogation, however, he saw the invaluable Act of Habeas Corpus, which he had*~~

~~carried through parliament, receive the royal assent. In pursuance of his patronage of Mon- mouth, Shaftesbury now secured for him the command of the army sent to suppress the insurrection in Scotland, which he is supposed to have fomented. In October 1679, the circumstances which led Charles to desire to conciliate the opposition having ceased, Shaftesbury was dismissed from his presidency and from the privy council ; when applied to by Sunderland to return to office he made as conditions the divorce of the queen and the exclusion of James. With nine other peers he presented a petition to the king in November, praying for the meeting of parliament, of which Charles took no notice. In April, upon the king's declaration that he was resolved to send~~

~~for James from Scotland, Shaftesbury strongly advised the popular leaders at once to leave the council, and they followed his advice. In March we find him unscrupulously eager in the prosecution of the alleged Irish Catholic plot. Upon the king's illness in May he held frequent meetings of Monmouth's friends at his house to consider how best to act for the security of the Protestant religion. On June 26, accompanied by fourteen others, he presented to the grand jury of Westminster an indictment of the duke of York as a Popish recusant. In the middle of September he was seriously ill. On November 15 the Exclusion Bull, having passed the Commons, was brought up to the Lords, and an historic debate took place, in which Halifax and Shaftesbury were the leaders on opposite sides. The bill was thrown out, and Shaftesbury signed the protest against its rejection. The next day he urged upon the House the divorce of the queen. On December 7, to his lasting dishonour, he voted for the condemnation of Lord Stafford. On the 23d he again spoke vehemently for exclusion, and his speech was immediately printed. All opposition was, however, checked by the dissolution on January 18.~~

~~Few politicians have been the mark of such unsparing abuse as Shaftesbury. Dryden, while compelled to honour him as an~~

~~*upright judge, overwhelmed his memory with scathing, if venal, satire; and Dryden's satire has been accepted as truth by later historians. Macaulay in especial has exerted all his art, though in flagrant contradiction of probability and fact, to deepen still further the shade which rests upon his reputation. Mr Christie, on the other hand, in possession of later sources of information, and with more honest purpose, has done much to rehabilitate him. Occasionally, however, he appears to hold a brief for the defence, and, though his picture is comparatively a true one, should be read with caution. Worthies," Mr H. D. Traill professes to hold the seales cqually. He makes an interesting addition to our conception of Shaftes- bury's place in English politics, by insisting on his position as the first great party leader in the modern sense, and as the founder of modern parliamentary oratory. In other Tespeets his book is derived almost entirely from Christie. Much of Shaftesbury's career, increasingly so as it came near its close, is incapable' of defence ; but it has escaped his critics that his life up to the Re- storation, apparently full of inconsisteneics, was evidently guided by one leading principle, the determination to uphold the supremacy of parliament, a principle which, however obscured by self-interest, appears also to have underlain his whole political career. He was, too, ever the friend of religious freedom and of an enlightened policy in all trade questions. And, above all, it should not be forgotten, in justice to Shaftesbury's memory, that "during his long political career, in an age of general corruption, he was ever incorrupt, and never grasped either money or land. In the days*~~

~~*of the Commonwealth he never obtained or sought grants of | believed, carried a greater weight than any of the argu-*~~

~~*forfeited estates. In the days of the restored monarchy he never profited by the king's favour for aught beyond the legal emolu- ments of office, and in office or out of office spurned all and many offers of bribes from the French king." (O. A.)*~~

~~*SHAFTESBURY, Anruony AsHLEy Cooprr, Turrp Ear or (1671-1713), wasborn at Exeter House in London, February 26, 1670-71. He was grandson of the first and son of the second earl. His mother was Lady Dorothy Manners, daughter of John, earl of Rutland. According to a*~~

~~*curious story, told by the third earl himself, the marriage between his father and mother was negotiated by John Locke, who was a trusted friend of the first earl, The second Lord Shaftesbury appears to have been a poor creature, both physically and mentally,' born a shapeless lump, like anarchy," according to what is doubtless the exaggerated metaphor of Dryden. At the early age of three his son was made over to the formal guardianship of his grandfather. Locke, who in_ his capacity of medical attendant to the Ashley household had already assisted in bringing the boy into the world, though not his instructor, was entrusted with the superintendence of his education. This was conducted according to the principles enunciated in Locke's Thoughts concerning Education, and the method of teaching Latin and Greek conversationally was pursued with such success by his instructress, Mrs Elizabeth Birch, that at the age of eleven, it is said, young Ashley could read both languages with ease. In November 1683, some months after the death of the first earl, his father entered him at Winchester as a warden's boarder. Being a shy, retiring boy, and being moreover constantly taunted with the opinions and fate of his grandfather, he appears to have been rendered miserable by the rough manners of his schoolfellows, and to have left Winchester in 1686 for a course of foreign travel. By this change he was brought into direct contact with those artistic and classical associations which afterwards exercised so marked an influence on his character and opinions. On his travels he did not, we are told by the fourth earl, "greatly seek the conversation of other English young gentlemen on their travels," but rather that of their tutors, with whom he could converse on congenial topics.*~~

~~*In 1689, the year after the Revolution, Lord Ashley returned to England, and for nearly five years from this time he appears to have led a quiet, uneventful, and studious life. There can be no doubt that the greater part of his attention was directed to the perusal of those classical authors, and to the attempt to realize the true spirit of that classical antiquity, for which he had*~~

~~*| himself aloof from public life.*~~

~~*Finally, in his monograph in the series of « English |*~~

~~*conceived so ardent a passion. He had no intention, however, of becoming a recluse, or of permanently holding Accordingly, he became a candidate for the borough of Poole, and was retumed May 21, 1695. He soon distinguished himself by a speech, which excited great attention at the time, in support of the Bill for Regulating Trials in Cases of Treason, one provision of which was what seems to us the obviously reasonable one that a person indicted for treason or misprision of treason should be allowed the assistance of counsel. In connexion with this speech a story is told of Shaftesbury which is also told, though with less verisimilitude, of Halifax, that, being overcome by shyness, and unable to continue his speech, he simply said, before sitting down: "Tf I, sir, who rise only to speak my opinion on the bill now depending, am go confounded that I am unable to express the least of what I proposed to say, what must the condition of that man be who is pleading for his 'life without any assistance and under apprehensions of being deprived of it?" "The sudden turn of thought," says his son, the fourth earl, 'pleased the House extremely, and, it is generally*~~

~~*ments which were offered in favour of the bill." But, though a Whig, alike by descent, by education, and by conviction, Ashley could by no means be depended on to give a party vote ; he was always ready to support any propositions, from whatever quarter they came, that appeared to him to promote the liberty of the subject and the independence of parliament. Unfortunately, his health was so treacherous that, on the dissolution of July 1698, he was obliged to retire from parliamentary life. He suffered much from asthma, a complaint which was aggravated by the London smoke.*~~

~~*Lord Ashley now retired into Holland, where he became acquainted with Le Clerc, Bayle, Benjamin Furly, the English Quaker merchant, at whose house Locke had resided during his stay at Rotterdam, and probably Limborch and the rest of the literary circle of which Locke had been a cherished and honoured member nine or ten years before. To Lord Ashley this society was probably far more congenial than his surroundings in England. Unrestrained conversation on the topics. which most interested him—philosophy, politics, morals, religion—was at this time to be had in Holland with less danger and in greater abundance than in any other*~~

~~country in the world. To the period of this sojourn in Holland must probably be referred the surreptitious impression or publication of an imperfect edition of the Inquiry concern- ing Virtue, from a rough draught, sketched when he was only twenty years of age. This liberty was taken, during his absence, by Toland.~~

~~After an absence of over a twelvemonth, Ashley returned to England, and soon succeeded his father as earl of Shaftesbury. He took an active part, on the Whig side, in the general election of 1700-1, and again, with more success, in that of the autumn of 1701. It is said that William HT. showed his appreciation of Shaftesbury's services on this latter occasion by offering him a secretary- ship of state, which, however, his declining health compelled him to decline. Had the king's life continued, Shaftesbury's influence at court would probably have been considerable. After the first few weeks of Anne's reign, Shaftesbury, who had been deprived of the vice- admiralty of Dorset, returned to his retired mode of life, but his letters to Furly show that he still retained a keen interest in politics. In August 1703 he again settled in Holland, in the air of which he seems, like Locke, to have had great faith. At Rotterdam he lived, he says in a letter to his steward Wheelock, at the rate of less than £200 a~~

~~year, and yet had much "to dispose of and spend beyond convenient living." He returned to England, much improved in health, in August 1704. But, though he had received immediate benefit from his stay abroad, symptoms of consumption were constantly alarming him, and he gradually became a confirmed invalid. His occu- pations were now almost exclusively literary, and from this time forward he was probably engaged in writing, completing, or revising the treatises which were afterwards included in the Characteristics. He still continued, how- ever, to take a warm interest in politics, both home and foreign, and especially in the war against France, of which he was an enthusiastic supporter.~~

~~Shaftesbury was nearly forty before he married, and even then he appears to have taken this step at the urgent instigation of his friends, mainly to supply a suc- cessor to the title. The object of his choice (or rather of his second choice, for an earlier project of marriage had shortly before fallen~~

~~through) was a Miss Jane Ewer, the daughter of a gentleman in Hertfordshire. The marriage took place in the autumn of 1709, and on February 9, 1710, was born at his house at Reigate, in Surrey, his only child and heir, the fourth earl, to whose manuscript accounts we are in great part indebted for the details of his father's life. 'The match appears to have been a happy one, though Shaftesbury neither had nor pretended to have much sentiment on the subject of married life.~~

~~With the exception of a Preface to the Sermons of Dr Whichcote, one of the Cambridge Platonists or latitudin- arians, published in 1698, Shaftesbury appears to have printed nothing himself till the year 1708. About this time the French prophets, as they were called, attracted much attention by the extravagances and follies of which they were guilty. Various remedies of the repressive kind were proposed, but Shaftesbury maintained that their fanaticism was best encountered by " raillery" and " good- humour." In support of this view he wrote a letter to Lord Somers, dated September 1707 which was published anonymously in the following year, and provoked several replies. In May 1709 he returned to the subject, and printed another letter, entitled Sensus Communis, an Essay on the Freedom of Wit and Humour. In the same year he also published Zhe Moralists, a Philosophical Rhapsody, and in the following year Soliloquy, or Advice toan Author. None of these pieces seem to have been printed either with his name or his initials. In 1711 appeared the Characteristics of Men, Manners, Opinions, Tvmes, in three volumes, also without any name or initials on the title-page, and without even the name of a printer. These three handsome volumes contain in addition to the four treatises already mentioned, Miscellaneous Reflections, now first printed, and the Inquiry concerning Virtue or Merit, described as "formerly printed from an imperfect copy, now corrected and published intire," and as " printed first in the year 1699."~~

~~The declining state of Shaftesbury's health rendered it necessary for him to seek a warmer climate, and in July 1711 he set out for Italy. He settled at Naples in November, and lived there considerably over a year. His principal occupation at this time must have consisted in preparing for the press a second edition of the Character- istics, which appeared in 1713, soon after his death. The copy, most carefully corrected in his own~~

~~*handwriting, is still preserved in the British Museum. He was also engaged, during his stay at Naples, in writing the little treatise (afterwards included in the Characteristics) entitled A Notion of the Historical Draught or Tablature of the Judgment of Hercules, and the letter concerning Design. A little before his death he had also formed a scheme of writing a Discourse on the Arts of Painting,*~~

~~*SHAFT PES EVU Re*~~

~~*Sculpture, Etching, &c., but when he died he had made but little progress with it. " Medals, and pictures, and antiquities," he writes to Furly, "are our chief entertain- ments here." His conversation was with men of art and science, " the virtuosi of this place."*~~

~~*The events preceding the peace of Utrecht, which he regarded as preparing the way for a base desertion of our allies, greatly troubled the last months of Shaftesbury's life. He did not, however, live to see the actual conclu- sion of the treaty (March 31, 1713), as he died the month before, February 4, 1712, O.S. At the time of his death he had not yet completed his forty-second year. His body was brought back by sea to England and buried at St Giles's, the family seat in Dorsetshire. Though he died so long ago, and was one of the earliest of the English moralists, his descendant, the celebrated philanthropist, who died so recently as 1885, was only his great-grandson.*~~

~~*Shaftesbury's amiability of character seems to have been one of his principal characteristics. AJ] accounts concur in representing him as full of sweetness and kindliness towards others, though he may sometimes him- self have been the victim of melancholy and despondency. Like Locke he had a peculiar pleasure in bringing forward young men. Amongst these may be especially mentioned Michael Ainsworth, a native of Wimborne St Giles, the young man who was the recipient of the Letters addressed to a student at the university, and who was maintained by him at University College, Oxford. The keen interest which Shaftesbury took in his studies, and the desire that he should be specially fitted for the profession which he had selected, that of a clergyman of the Church of Eng- land, are marked features of the letters. Other protcgés were Crell, a young Pole, the two young Furlys, and Harry Wilkinson, a boy who was*~~

~~*sent into Furly's office at Rotterdam, and to whom several of the letters still extant in the Record Office are addressed.*~~

~~*In the popular mind, Shaftesbury is generally regarded as a writer hostile to religion. But, however short his orthodoxy might fall if tried by the standards of any particular church, his temperament was pre-eminently a religious one. This fact is shown conspicuously in his letters, where he had no reason for making any secret of his opinions. The belief in a God, all-wise, all-just, and all-merciful, governing the world providentially for the best, pervades all his works, his correspondence, and his life. Nor had he any wish to undermine established beliefs, except where he conceived that they conflicted with a truer religion and a purer morality.*~~

~~*To the public ordinances of the church he scrupulously conformed. But, unfortunately, there were many things both in the teaching and the practice of tlie ecclesiastics of that day which were calculated to repel men of sober judgment and high principle. These evil tendencies in the popular presentation of Christianity undoubtedly begot in Shaftesbury's mind a certain amount of repug- nance and contempt to some of the doctrines of Christianity itself ; and, cultivating, almost of set purpose, his sense of the ridiculous, he was too apt to assume towards such doctrines and their teachers a tone of raillery and banter, which sometimes even approaches grimace.*~~

~~*But, whatever might be Shaftesbury's speculative opinions or his mode of expressing them, all witnesses concur in bearing testimony to the elevation and purity of his life and aims. Molesworth, who had no special reason for flattering him, speaks of him as "possessing right reason in a more eminent degree than the rest of man- kind," and of his character as "the highest that the per- fection of human nature is capable of." Even Warburton, in his dedication of the Divine Legation to the free- thinkers, is compelled to "own that this lord had many*~~

~~*Par rns bp RY*~~

~~*excellent qualities, both asa man and a writer. IIe was temperate, chaste, honest, and a lover of his country."*~~

~~*As an earnest student, an ardent lover of liberty, an en- thusiast in the cause of virtue, and a man of unblemished life and untiring beneficence, Shaftesbury probably had no superior in his generation. HIs character and pursuits are the more remarkable, considering the rank of life in which he was born and the circumstances under which he was brought up. In many respects he reminds us of the impe- rial philosopher Marcus Aurelius, whose works we know him to have studied with avidity, and whose influence is unmistakably stamped upon his own productions,*~~

~~*Most of Shaftesbury's writings have been already mentioned. In addition to these from Shaftesbury to some lctters to Benjamin Furly,*~~

~~*meaning trans- But, on the other hand, he id not equally succeed in attaining elegance, an object at which he seems equally to have aimed. There is a curious affectation about his style,—a falsetto note,—which, notwithstanding all his efforts to please, is often irritating to the characteristic is He poses too much as a fine gentleman, and is vulgar scholastic kind that he falls into the hardly more attractive pedantry of But, notwithstanding these defects, he easily read and easily under- ide popularity which his works enjoyed in the last century ; and hence, undoubtedly, the agreeable fecling with which, notwithstanding all their false taste and their tiresome digressions, they still impress the modern reader, a moralist that Shaftesbury has a claim to a place in the history of literature and philosophy. Like most of the ethical writers of his time his first impulse to speculation, or*~~

~~*progress of doctrines at which society still continued to be seriously alarmed. Hence it became his main concern to assert the reality*~~

~~*been current in ethical treatiscs, and that he preferred to represent "taste," "sentiment," or '* affection," rather than as dictated simply by reason,*~~

~~*Shaftesbury's ethical theory are those of a system, or the relation of parts to a whole, benevolence, moral beauty, and a moral sense,*~~

~~*The individual man himself is a system consisting of various appetites, passions, and affections, all united under the supreme control of reason. Of this system the parts are so nicely adjusted to each other that any disarrangement or disproportion, however slight, may mar and disfigure the whole. "Whoever is in the least versed in this moral kind of architecture will find the inward fabric so adjusted, and the whole so nicely built, that the barely extending of a single passion a little too far, or the continuance of it too long, is able to bring irrecoverable ruin and misery."*~~

~~But morality and human nature cannot be adequatcly studied in the system of the individual man. There are parts in that system, both mental and bodily, which have an evident respect to Something outside it. Neither man nor any other animal, though ever so complete a system of parts as to all within, can be allowed in the same manner complete as to all without ; he must be con- sidered as having a further relation abroad to the system of his kind. So even this system of his kind to the animal system; this to the world (our earth); and this again to the bigger world~~

~~and to the universe. No being can properly be called good or ill except in reference to the systems of which he isa part. 5 In general, all the affections or passions are suited to the public d or end of the species, then is the natural temper entirely If, on the contrary, any requisite~~

~~least the principal moral virtue, The idea of a moral and social system, the parts of which are in a constant proportion to each other,~~

~~f we may suppose, the beauty of a virtuous action would be explained as consisting in its it has its source, or to the other acts of a virtuous life, or to the general condition of a~~

~~or characters, is never long absent from Shaftesbury's mind. Closely connected with it is the idea that morals, no less than art, is a matter of taste or~~

~~This "sense of right and wrong" is "as natural to us as natural affection itself," and "a first principle in our constitution and make," At the same time it includes a certain amount of judgment or reflexion, that is to say, a rational element, Shaftesbury's doctrine on this head may, up as follows. Each man has from the first a natural sense of right and wrong, a " moral sense " or " conscience " (all which expressions he employs as synonymous). This sense is, in its natural condition, wholly or mainly emotional, but, as it admits of constant education and improvement, the rational or reflective element in it gradnally becomes more pro- Its decisions are generally described as if they were immediate, and, beyond the occasional recognition of a rational as well as an emotional element,~~

~~*little or no attempt is made to analyse it. It was reserved for Hume properly to discriminate between these two elements, and to point out that, while the feeling of moral approbation or disapprobation is instantaneous, the moral judgment which precedes it is often the result of an intellectual process of considerable length and perplexity.*~~

~~*It may be sufficient to supplement this brief survey of Shaftes- bury's system by a still briefer suminary of the answers, so far as they can be collected from his works, which he would have given to the principal questions of ethics as they are now usually pro- pounded. His answers to these questions are, as it appears to the present writer, that our moral ideas—the distinctions of virtue and vice, right and wrong—are to be found in the very make and constitution of our nature; that morality is independent of theology, actions being denominated good or just, not by the arbitrary will of God (as had recently been maintained by Locke), but in virtue of some quality existing in themselves ; that the ultimate test of a right action is its tendency to promote the general welfare ; that we have a peculiar organ, the moral sense, analogous to taste in art, by which we discriminate between characters and actions as good or bad; that the higher natures among mankind are impelled to right action, and deterred from wrong action, partly by the moral sense, partly by the love and reverence of a just and good God, while the lower natures are mainly influenced by the opinions of others, or by the hope of reward and the fear of punishment ; that appetite and reason both concur in the determination of action ; lastly, that the question whether the will does or does not possess any freedom of choice, irrespectively of character and motives, is one (at least so we may gather from Shaftesbury's reticence) which it does not concern the moralist to solve.*~~

~~*The close resemblance of Hutcheson's speculations to those of Shaftesbury, amounting sometimes to identity, will be apparent on reference to the account of that philosopher (vol. xii. pp. 409-11). Next to Hobbes, the moralist with whose views Shaftesbury's stand in most direct antagonism is Locke, who not only maintained that moral distinctions depend solely on the arbitrary will of God, but that the sanctions by which they are mainly enforced are the hope of future reward and the fear of*~~

~~future punishment. "By the fanlt is the rod, and with the transgression a fire ready to~~

~~punish it." Shaftesbury's was in reality, though perhaps not in appearance, a more truly religious philosophy. For with him the incentives to well-doing and the deterrents from evil-doing are to be sought not solely, or even mainly, in the opinion of man- kind, or in the rewards and punishments of the magistrate, or in the hopes and terrors of a future world, but in the answer of a good conscience approving virtue and disapproving vice, and in the love of a God, who, by His infinite wisdom and His all- embracing beneficence, is worthy of the love and admiration of His creatures.~~

~~The main object of the Moralists is to propound a system of natural theology, and to vindicate, so far as natural religion is concerned, the ways of God to man. The articles of Shaftesbury's religious creed were few and simple, but these he entertained with a conviction amounting to enthusiasm. They may briefly be summed up as a belief in one God whose most characteristic attribute is universal benevolence, in the moral government of the universe, and in a future state of man making up for the imperfections and repairing the inequalities of the present life. Shaftesbury is emphatically an optimist, but there is a passage in the Moralists (pt. li. sect. 4) which would lead us to suppose that he regarded matter as an indiflerent principle, co-existent and co-eternal with God, limiting His operations, and the cause of the evil and imperfection which, notwithstanding the benevolence of the Creator, is still to be found in His work. If this view of his optimism be correct, Shaftesbury, as Mill says of Leibnitz, must be regarded as maintaining, not that this is the best of all imaginable but only of all possible worlds. This brief notice of Shaftesbury's scheme of natural religion would be conspicuously imperfect unless it were added that it is popularized in Pope's Essay on Man, several lines of which, especially of the first epistle, are simply statements from the Moralists done into verse. Whether, however, these were taken immediately by Pope from Shaftesbury, or whether they eame~~

~~*to him through the papers which Boling- broke had prepared for his use, we have no means of determining,*~~

~~*Shaftesbury's philosophical activity was confined to cthies, esthetics, and religion. For metaphysies, properly so called, and even psychology, except so far as it afforded a basis for ethics, he evidently had no taste. Logic he probably despised as merely an instrument of pedants,—a judgment for which, in his day, and especially at the universities, there was only too much ground.*~~

~~*The influence of Shaftesbury's writings was very considerable both at home and abroad. His ethical system was reproduced, though in a more precise and philosophical form, by Hutcheson, and from him descended, with certain variations, to Hume and Adam Smith. Nor was it without its effect even on the specula- tions of Butler. Of the so-called deists Shaftesbury was probably the most important, as he was certainly the most plausible and the most respectable. No sooner had the Characteristics appeared than they were welcomed, in terms of warm commendation, by Le Clerc and Leibnitz. In 1745 Diderot adapted or reproduced the Inquiry concerning Virtue in what was afterwards known as his Essai sur le Meérite et la Vertu. In 1769 a French translation of the whole of Shaftesbury's works, including the Lefters, was published at Geneva. Translations of separate treatises into German began to be made in 1738, and in 1776-1779 there appeared a complete German translation of the Characteristics. Hermann Hettner says that not only Leibnitz, Voltaire, and Diderot, but Lessing, Mendelssohn, Wieland, and Herder, drew the most stimulating nutriment from Shaftesbury. ' His charms," he adds, "'are ever fresh. A new-born Hellenism, or divine cultus of beauty presented itself before his inspired sonl." Herder is especially culogistic. In the Adrastea he pronounees the Aoralists to be a composition in form well-nigh worthy of Grecian antiquity, and in its contents almost superior to it. The interest felt by Ger- man literary men in Shaftesbury has been recently revived by the publication of two excellent monographs, oue dealing with him mainly from the theological side by Dr Gideon Spicker (Freiburg in Baden, 1872), the other dealing with him mainly from the philo- sophieal side by Dr Georg von Gizycki (Leipsic, 1876).*~~

~~*In the foregoing article the writer has made free use of his monograph on Shaftesbury and Hutcheson in the series of "English philosophers" (1882), published by Sampson Low & Co. In that work he was able largely to sup- plement the printed materials for the Life by extracts from the Shaftesbury papers now deposited in the Record Office. These include, besides many Ictters and memoranda, two lives of him, composed by his son, the fourth earl, one of which is evidently the original, though it is by no means always closely followed, of the Life contributed by Dr Birch to the General Dictionary. For a descrip- tion and criticism of Shaftesbury's philosophy reference may also be made to Mackintosh's Progress of Ethical Philosophy, Whewell's History of Moral Philosophy in England, Jouffroy's Introduction to Ethics (Channing's transla- tion), Leslie Stephen's English Thought in the Eighteenth Century, Martineau's Types of Ethical Theory, and the article Eruics in the present work (vol. viii. pp. 599, 600). For his relation to the religions and theological controversies of his day, scc, in addition to some of the above works, Leland's View of the Principal Deistical Writers, Lechler's Geschichte des Englischen Deismus, Hunt's*~~

~~*heligious Thought tn England, Abbey and Overton's English Church in the Highteenth Century, and A. S. Farrar's Bampton Lectures, (T. F.)*~~

~~*SHAFTESBURY, Antony AsHLEY CoopEr, SEVENTH Ear or (1801-1885), was the son of Cropley, sixth earl,*~~

~~*SHA—SHA*~~

~~*and Anne, daughter of the third duke of Marlborough, and was born 28th April 1801. He was educated at Harrow and Christ Church, Oxford, where he obtained a first class in classics in 1822, and graduated M.A. in 1832. In 1841 he received from his university the degree of D.C.L. He entered parliament as member for the pocket borough of Woodstock in 1826; in 1830 he was returned for Dorchester ; from 1831 till February 1846 he represented the county of Dorset ; and he was member for Bath from 1847 till (having previously borne the courtesy title Lord Ashley) he succeeded his father as earl in 1851. Although giving a general support to the Conservatives, his parliamentary conduct was greatly modified by his intense interest in the improvement of the social condition of the working*~~

~~*classes, his efforts in behalf of whom have made his name a household word. HIe opposed the Reform Bill of 1832, but was a supporter of Catholic emancipa- tion, and his objection to the continuance of resistance to the abolition of the Corn Laws led him to resign his seat for Dorset in 1846. In parliament his name, more than any other, is associated with the factory legislation (see Factory Acts, vol. viii. p. 845). HIe was a lord of the admiralty under. Sir Robert Peel (1834-35), but on being invited to join Peel's administration in 1841 refused, having been unable to obtain Peel's support for the Ten HIours' Bill. Chiefly by his persistent efforts a Ten HIours' Bill was carried in 1847, but its operation was impeded by legal difficulties, which were only removed by successive Acts, instigated chiefly by him, until legislation reached a final stage in the Factory Act of 1874. The part which he took in the legislation bearing on coal niines was equally prominent. It is worthy of notice that his efforts in behalf of the practical welfare of the working classes were guided by his own personal knowledge of their cireum- stances and wants. Thus in 1846 he took advantage of his leisure after the resignation of his seat for Dorset to explore the slums of the metropolis, and by the informa- tion he obtained not only gave a new impulse to the niove- ment for the establishment of ragged schools, but was able to make it more widely beneficial, For over forty years he was president of the Ragged School Union. HIe was also one of the principal founders of reformatory and refuge unions, young men's Christian associations, and working men's institutes. HIe took an active interest in foreign missions, and was president of several of the most important philanthropic and religious societies of London. HIe dicd lst October 1885. By his marriage to Lady Emily, daughter of the fifth Earl Cowper, he left a large family, and was succeeded by his eldest son Anthony, who committed suicide shortly afterwards.*~~

~~*SHAGREEN. See LeEatuer, vol. xiv. p. 390, and SHARK, |,*~~

~~*SHAHABAD, a British district in the Patna division of the lieutenant-governorship of Bengal, India, between 24° 31' and 25° 43' N. lat, and between 83° 23' and 84° 55' E. long., with an area of 4365 square miles. It is bounded on the N. by the district of Ghazipur in the North-Western Provincees and by Saran, on the E. by Patna and Gaya districts, on the 8.*~~

~~*by Lohardaga, and on the W. by Mirzapur, Benares, and Ghazipur districts of the North-Western Provinces. About three-fourtlis of the whole area lying to the north is an alluvial flat, wholly under cultivation, and fairly planted with mangoes, bam- boos, and other trees; while the southern portion of the district is occupied by the Kaimur Hills, a branch of the great Vindhyan range, and is a densely wooded tract. The chief rivers are the Ganges and the Son, which unite in the north-eastern corner of Shahabad.. A series of canals on the Son are reported to have secured for the district immunity from future famine. In the southern portion*~~

~~*of the district large game abounds, bear, leopard, and several varicties of deer ; and among other animals met with are the wild boar, hyzena, jackal, and fox. The nylghau is seen on the Kaimur Hills. The climate is very sultry, and the rains heavy. The East Indian Railway traverses the north of the district for 60 miles, and the aggregate length of roads is about 1000 miles,*~~

~~*including the tiger,*~~

~~*The census of 1881 disclosed a population of 1,964,909 (males 950,250, females 1,014,659); Hindus numbered 1,817,881, Moham- medans 146,732, and Christians 274. Four towns contain a population exceeding 10,000, viz., Arrah 42,998, Dumraon 17,429, Baxar 16,498, and Jagdispur 12,568. The administrative headquarters of the district are at Arrah. The chief staple of Shahabad is rice, which produces three crops during the year ; wheat, barley, maize, cereals, and various other plants are also grown. The principal manufactures of the district are sugar, paper, saltpetre, blankets, coarse cotton cloth, and brass utensils. Its trade is chiefly carried on by means of permanent markets in the town and at fairs. The principal exports are rice, wheat, barley, pulses, grain, oats, linseed, carraway seed, paper, and spices; imports consist of cleaned rice, betel-nut, tobacco, sugar, molasses, salt, pepper, cotton, iron, brass, zinc, copper, lead, tin, and betel- leaf. The revenue of Shahabad district in 1883-84 amounted to £253,542, of which the land yielded £171,263. The southern part of the district was ceded to the British by Shah Alum,*~~

~~emperor of Delhi in 1765, and the northern part by Azuf-ud- Dowlah, vizier of Oudh, ten years later.~~

~~SHAH JAHAN, Mogul emperor from 1627 to 1658. See Inpra, vol. xii. p. 795.~~

~~SHAHJAHANPUR, the easternmost district of the Rohilkhand division in the lieutenant-governorship of the North-Western Provinces of British India, lying between 27° 36' and 28° 29' N. lat. and between 79° 23' and 80° 26' E, long. It has an area of 1746 square miles, and is bounded on the N. and N.W. by Pilibhit, on the E, by Hardoi and Kheri, on the §. by the Ganges, separating it from Farukhabad, and on the W. by Budaun and Bar- eilly. The district consists of a long and narrow tract running up from the Ganges towards the Himalayas, and is for the most part level and without any hills or considerable undulations. The principal rivers are the Gumti, Khanaut, Gardai, and Ramganga. The last-named is the main waterway of the district, and is navigable as far as Kola Ghat near Jalalabad, whence grain is shipped for the Ganges ports. To the north-east beyond Gumti the country resembles the tarai in the preponder- ance of waste and forest over cultivated land, in the sparse- ness of population, and in general unhealthiness, Between the Gumti and the Khanaut the country varies from a rather wild and unhealthy northern region to a densely inhabited tract in the south, with a productive soil well cultivated with sugar-cane and other remunerative crops. The section between the Deoha and Gardi comprises much marshy land; but south of the Gardi, and between it and the Ramganga, the soil is mostly of a sandy nature. From Ramganga to the Ganges in the south is a continuous low country of marshy patches alternating with a hard clayey soil requiring much irrigation in parts. Shdh- jahanpur contains a number of jhils or lakes, which afford irrigation for the spring crops in their neighbourhood. The Oudh and Rohilkhand Railway traverses the district a distance of 39 miles. The climate of the district is very similar to that of most parts of Oudh and Rohil- khand, but moister than that of the Doab. Except in May and June, the country has a fresh and green appearance. Its average annual rainfall is about 38 inches.~~

~~*In 1881 the population of Shahjahanpur numbered 856,946 (males 460,064, females 596,882), of whom 735,244 were Hindus and 120,214 were Mohammedans. The district contains only two towns with a population exceeding 10,000, viz., SHAHJAHANPUR (q.v.) and Tilhar (15,351). Of the total area of 1746 square miles 1090 were under cultivation in 1883-84, and 464 were returned as*~~

~~*cultivable. The chief agricultural products are wheat and gram in spring, and in the autumn sugar-cane, rice, joar, and bajra, and*~~

~~*several kinds of pulses. Exports are chiefly sugar, grain of all kinds, pulses, indigo, cotton, and timber, and the iniports are mainly European goods, metals, and salt. The gross revenue raised in the district in 1883-84 amounted to £186,162, of which the land contributed £118,638. The only manufactures of any importance under European supervision are those of sugar and Tum and of indigo, Shahjahanpur was ceded to the English by treaty in 1801. During the mutiny of 1857 it became the seene of open rebellion. The Enropeans were attacked when in church ; three were shot down, but the remainder, aided by a hundred faithful sepoys, escaped, The force under Lord Clyde put a stop to the anarchy in April 1858, and shortly afterwards peace and authority were restored.*~~

~~*SHAHJAHANPUR, municipal town and administra- tive headquarters of the above district, lies in 27° 53' 41" N. lat. and 79° 57' 30" RB, long., on the left bank of the Deoha. It isa large place, with some stately old mosques and a castle now in ruins. The city was founded in 1647 during the reign of Shah J ahan, whose name it bears, by Nawab Bahadur Khan, a Pathan, It has a considerable export trade in cereals, pulses, and sugar. In 1881 the population was 74,830 (36,840 males, and 37,990 females).*~~

~~*SHAHPUR, the southernmost district of the Rawal Pindi division in the lieutenant-governorship of the Punjab, India, between 31° 39' and 39° 49' N. lat. and between 71° 37' and 73° 24' E. long., with an area of 4691 square miles. The district is bounded on the N. by the Jhelum district, on the E. by Gujrat and the Chenab, on the S. by Jhang, and on the W. and N.W. by Dera Ismail Khan and Bannu. On both sides of the Jhelum*~~

~~stretch wide upland plains, utterly barren or covered only with brushwood ; a considerable portion of this area, how- ever, is composed of good soil, only requiring irrigation to make it productive. The most important physical sub- divisions of the district are the Salt range in the north, the valleys of the Chendb and Jhelum, and the plains between those rivers and between the Jhelum and the Salt range. The characteristics of these two plains are widely different: the desert portion of the southern plain is termed the bar; the corresponding tract north of the Jhelum is known as the thal. That part of Shéhpur to the north of the Jhelum is by far the most interesting, containing as it does such varieties of scenery and climate, such contrasts of soil, vegetation, and natural capabilities. Communications are carried on by well-made roads, by the Jhelum, which is navigable for country craft through- out its course within the district, and by 52 miles of the Salt branch of the Punjab Northern State Railway. The climate of the plains is hot and dry, but in the Salt range it is much cooler; the average annual rainfall is about 15 inches. Tigers, leopards, and wolves are found in the Salt range, while small game and antelope abound among the thick jungle of the bar.~~

~~The census of 1881 diselosed a population of 421,508 (males 221,676, females 199,832); of these 59,026 were HIndus and 357,742 were Mohammedans. The only town in the district with more than 10,000 inhabitants is Bhera, with 15,165 ; but the administrative headquarters of the district are at the small town of Shahpur on the Jhelum river, the population of which in 1881 was 5424, Of the total area only 871 square miles were under cultivation in 1883-84, and 3058 square miles were returned as cultivable. Wheat is the chief staple, and covers nearly a half of the cultivated area; bajra and eotton are the next most extensivel y grown crops ; among other crops are sugar-cane and opium, The commercial importance of the distriet depends almost entirely upon its connexion with the Salt range, salt being found throughout these hills. The revenue derived from this product, however, though collected in the Shahpur district, cannot properly be credited to it, as the mineral, though abundant in the Shahpur portion of the range, is worked chiefly in that part of it which lies in the Jhelum district. The ehief exports are grain, rice, cotton, wool, ght, and saltpetre ; the imports sugar, English pieee-goods, and metals. Its manufactures consist of silk and cotton scarfs, toys,~~

~~*and feltand blankets. The gross revenue in 1883-84 amounted to £55,290, of which the land contributed £39,020.*~~

~~*Shahpur passed into the hands of the English along with the rest of the Punjab on the suppression of the Multan rebellion in*~~

~~*1849. During the mutiny of 1857 the district remained tranquil, and though the villages of the bar gave cause for alarm no outbreak of sepoys occurred. Since annexation the limits and constitution of the district have undergone many changes.*~~

~~*SHAHRASTANI (1086-1153). Abu'l-Fath Mohammed ibn 'Abd al-Karim, called al-Shahrastani, a native of Shahrastan (Shehristén) in Khordsdén, Persia, was noted as a jurisconsult and theologian of the Ash'arite school. He went to Baghdad in 1116 and stayed there three years, but afterwards returned to his native place, where he died. Sam'ani, the famous historian of Baghdad, was one of his hearers, and to him Ibn Khallikén (No. 622, Eng. tr. ii. 675 sq.) mainly owes the little that is known of Shahra- stani's life.*~~

~~*He wrote various works, of which several still exist ; that which gives him a claim to notice here is the interesting Kitdb al-Milal wan-Nihal, or " Account of Religious Sects and Philosophical Schools," published by Cureton in 1846 and translated into German by Haarbriicker (Halle, 1850-51). The book was already used by Pocock for his account of the ancient Arabs and has been much referred to since, but has to be read with caution, as the author is often very uncritical. It treats successively of the Mohammedan sects, of other religious bodies (Jews, Samaritans, Christians, Magians, Manicheans, &c.), of philosophical schools (including the Greeks), and of the ancient Arabs and Indians, and contains a great deal of curious aud valuable matter.*~~

~~*SHAIRP, Joun Campzett (1819-1885), principal of the United College, St Andrews, and professor of poetry at Oxford, was born at Houstoun House, Linlithgowshire, on July 30, 1819. He was the third son of Major Norman Shairp of Houstoun and E. Binning, daughter of J. Campbell of*~~

~~*Kildaloig, Argyllshire. He was educated at Edinburgh Academy and Glasgow University, where he gained the Snell exhibition, and entered at Balliol College, Oxford, in 1840. While a student at Glasgow and an undergraduate at Oxford it was his privilege to make many warm friends and to be very widely loved. At Glasgow began his lifelong friendship with Dr Norman M'Leod, while among those with whom he was most intimate at Oxford were the names of Bradley, Coleridge, Temple, Clough, Walrond, Riddell, Prichard, and Edwin Palmer. In 1842 he gained the Newdigate prize for a poem on Charles XII, and in 1844 took his degree with second class honours. During these years the 'Oxford movement" was at its height. Shairp's earnest nature was greatly stirred by Newman's sermons, while Keble's poetry spoke home to his heart ; but, though full of warm sympathy for many High Church views, he remained faithful to his Presbyterian upbringing. After leaving Oxford he took a mastership at Rugby under Dr Tait ; here he sought loyally to develop Dr Arnold's system by appealing to the better feelings of his pupils and by giving them wide views of culture and education. And in this he was successful, making among his pupils warm and lasting friends. In 1857 he became assistant to the professor of humanity in the university of St Andrews, and in 1861 he was appointed professor of that chair. In 1853 he married Eliza, daughter of Henry Alexander Douglas, Kilhead, Dumfriesshire, and had one surviving son, John Campbell, who became an advocate at the Scottish bar. Shairp was highly respected by the more earnest students, and much loved by some whose spiritual as well as mental nature he helped to quicken. In 1864 he published Ailmahoe, a Mighland Pastoral ; in this his devotion to the scenery and the people of the Scottish Highlands, where he always spent his vacations, found vent. In this poem there was a directness, simplicity, and moral earnestness which showed the true poet. In 1868 he republished some articles under the name of Studies in Poetry and Philosophy; this book showed him to be one of the foremost critics of his day ; the chief subjects it discussed were Wordsworth, Coleridge, and Keble. He insisted strongly on the high spiritual teach- ing and the deep poetical power of the great lake bard.*~~

~~*SHA—SHA*~~

~~*While not blind to his many faults of style, his occasional puerility, and his prosiness, he urged his claims as a unique interpreter of Nature and a spiritual philosopher. Coleridge interested him as a poet, but much more as a religious teacher ; the Aids to Reflection was a favourite present to his young friends, and often gave a text for his deeper conversations. The most popular essay was that on Keble, in which he gave a vivid sketch of Newman's influence in Oxford, while he spoke of the author of Zhe Christian Year with enthusiasm as a Christian teacher, and with discerning criticism as a poet. In 1868 he was presented to the principalship of the United College, vacant by the death of J. D. Forbes ; he discharged the duties of this office with conscientious zeal and interest, and also con- tinued to lecture from time to time on literary and ethical subjects. A course of the lectures, published in 1870, Culture and {eligion, is one of his most popular works. In 1873 he helped to edit the life of Principal Forbes, and in 1874 he edited Dorothy Wordsworth's charming Kecollections of a Tour in Scotland in 1808. In 1877 he was elected professor of poetry at Oxford in succession to Sir F. H. Doyle. Of his lectures from this chair the best were published in 1880 as Aspects of Poetry. In 1877 he had published The Poetic Interpretation of Nature, in which he enters fully into the "old quarrel," as Plato calls it, between science and poetry, and traces with great clear. ness and literary acumen the ideas of nature in all the chief Hebrew, classical, and English poets. In 1879 he published a short life of Robert Burns. Such were Shairp's chief literary works, though many uncollected magazine articles and a few poems show the versatility of his mind ; attention may be specially called to his article KBE in this Encyclopedia as an example of his critical power. In 1882 he was re-elected to the poetry chair and discharged his duties there and at St Andrews till the end of 1884 ; but his health had been frail for some time, and in March 1885 he sought a change of air in the Riviera. He returned in June somewhat benefited, but he caught a chill in the autumn, and, after a short illness, died at Ormsary, Argyll-shire, on September 18, 1885.*~~

~~*SHAKERS is the name commonly applied to and not rejected by a religious denomination of which the official title is "The United Society of Believers in Christ's Second Appearing." The foundress was Ann Lee, who was born in Toad Lane, Manchester, 29th February 1736, but only*~~

~~*privately baptized Ist June 1742. Her father was a blacksmith, and at an early age she found employ- ment, being at one time a cutter of hatter's fur, and at another cook in the infirmary of her native town. She was a quiet child of a somewhat visionary temperament, and in 1758 joined a small religious body, a remnant of the French Prophets. The leader was Jane Wardley, who was regarded by her followers as the "spirit of John the Baptist operating in the female line." These people were called Shakers because, like the early Quakers, they were seized with violent tremblings and shakings when under the influence of strong religious emotion. Ann Lee in 1762 married a blacksmith whose character was not very good. Their four children died in infancy. She became "a seeker after salvation," and her conversion was followed by her taking the lead in the Shaker Society, to which she promulgated a doctrine of celibacy. Their previous training had led them to expect that the second coming of Christ would be in the form of a woman; as Eve was the mother of all living, so in their new leader the Shakers recognized "the first mother or spiritual parent in the line of the female." With their new-born zeal aflame, they preached their doctrine in season and out of season, and suffered something from mob violence and from the intolerance of the constituted authorities. In*~~

~~*1774 Ann the Word and eight of her disciples emigrated to America, and landed at New York on August Ist of that year. Abraham Stanley, not relishing his wife's celibate creed, abandoned her for another woman. The " Believers" settled at N euskenna, now called Watervliet, and were imprisoned for refusing to take the oath, for which reason they were suspected of being unfavourable to the cause of the Revolution. On being released they preached their creed and gradually gained converts, Ann Lee died at Watervliet 8th September 1780. She was succeeded by James Whittaker, who died in 1788, when Joseph Meacham succeeded to the leadership and organized the society on that communistic basis which now distin- guishes it. In the early history of the Shakers various charges were brought against them, including flagellation and naked dancing, but they have outlived these scandals and are now generally respected. There is an interesting sketch of a Shaker community in Howell's Undiscovered*~~

~~*Country. They all work ; they are capital agriculturists : they have a widespread reputation for thoroughness, fru- gality, and temperance. They believe in the reality of constant intercourse with the world of spirits. There are "poems" by Mother Ann which it is claimed have been dictated by her from the spirit world. They claim from*~~

~~*time to time the exercise of the gift of tongues and the gift of healing. The theological ideas of the Shakers are set forth in the Lestimony of Christ's Second Appearing exemplified by the Principle and Practice of the True Church of Christ, of which a fourth edition, printed in 1856, was extensively circulated, A compacter statement is that in F. W. Evans's Shakers? Compendium, which was printed at New Lebanon in 1859. Elder Evans, who is the best- known representative of Shakerism, is of English birth, and has published an autobiography. In 1870 there were eighteen distinct Shaker communities, with eighteen church buildings capable of seating 8850 persons, and possessing property valued at $86,900. These socialist villages are in Connecticut, Kentucky, Maine, Massachusetts, New York, New Hampshire, and Ohio,*~~

~~*The best known of the settlements is that at New Lebanon, where there are three Separate societies in view of each other. Family, the Church Family, and the Second Family are distinct groups, whose members live together and have a common right to land, house, hats, tools, form of government is that supplied by the public opinion of the community, as expressed fession, counsel, and criticism. Mr Hepworth Dixon's New America gives an interesting account of their communistic methods!*~~

~~*There is an extensive literature respeeting the Shakers; a bibliography is appended to W. E. A. Axon's Biographical Notice of Ann Lee, Liverpool, 1876,*~~

~~*SHAKESPEARE*~~

~~*\\ TILLIAM SHAKESPEARE, the national*~~

~~*poet of England, the greatest dramatist that modern Europe has produced, was born in April, in the year 1564, at Stratford-upon-Avon, in the county of Warwick. The known facts of the poet's personal history are compara- tively few, and before giving them in order we purpose considering in some detail the larger educational influences which helped to stimulate his latent powers, to evoke and strengthen his poetical and patriotic sympathies, and thus prepare and qualify him for his future work. Tn dealing with these influences we are on firm and fruitful ground. We know, for example, that Shakespeare was born and lived for twenty years at Stratford-upon-Avon ; and we can say therefore with certainty that all the physical and moral influences of that picturesque and richly-storied Midland district melted as years went by into the full current of his ardent blood, became indeed the vital element, the very breath of life his expanding spirit breathed. We know a good deal about his home, his parents, and his domestic surroundings ; and these powerful factors in the development of any mind gifted with insight and sensibility must have acted with redoubled force on a nature so richly and harmoniously endowed as that of the Stratford poet. It would be difficult indeed to overestimate the combined effect of these vital elements on his capacious and retentive mind, a mind in which the receptive and creative powers were so equally poised and of such unrivalled strength. This review of the larger influences operating with con- centrated force during the critical years of youth and early manhood will help to connect and interpret the few and Scattered particulars of Shakespeare's personal history. These particulars must indeed be to some extent connected and interpreted in order to be clearly understood, and any intelligible account of Shakespeare's life must therefore take the shape of a biographical essay, rather than of a biography proper. We may add that the sketch will be confined to the points connected with Shakespeare's local surroundings and personal history. The large literary questions connected with his works, such as the classifica- tion, the chronology, and analysis of the plays, could not of course be adequately dealt with in sucha sketch. Tt is*~~

~~*the less necessary that this wider task should be attempted as the main points it embraces have recently been well handled by competent Shakespearian scholars. The best and most convenient manuals*~~

~~*embodying the results of recent criticism and research will be. referred to at the close of the article. Meanwhile we have first to look at the locality of Shakespeare's birth, both in its material and moral aspects. Warwickshire was*~~

~~*poraries as the central*~~

~~*Roman roads crossing the island from east to west and west to east met,— forming at their point of junction the centre of an irregular St Andrew's cross, of which the arms extended from Dover to Chester on the one side and from Totnes to Lincoln and the north on the other. The centre in which these roads— Watling Street and the Fosse Way ~— thus met was early known from this circumstance as the HIgh Cross. Being the most important Midland position during the Roman occupation of the country, several Roman stations were formed in the neighbourhood of this venerable Quatre Bras. Of these Camden specifies the ancient and flourishing city of Clychester, represented in part by the modern Clybrook, and Manduessidum, the memory of which is probably retained in the modern Man- cettar. Important Roman remains have also been found within a few miles of Stratford, at Alcester, a central station on the third great Roman road, Ricknild Street, which runs from south to north across the western side of the county. In later times, when means of communication were multiplied, the great roads to the north-west stil]*~~

~~*1 There is considerable similarity between the American disciples of Ann Lee and the English Shakers of the New Forest, who came into public notice in 1874. One of their members had bought 31 acres of land, which they cultivated under the direction of ' 'Mother" Mary Ann Girling, who was at once their foundress and prophetess. As the result of some litigation the Shakers were ejected in 1874, and, after having shelter for a time on a farm belonging to the HIon. Auberon HIerbert, they then became atent community. Ch arges were made against them of naked dancing in the course of their religious ecstasies, They believe in the second advent, regard Mrs Girling as the woman Messiah, have all property in common, and preach the doctrine of celibacy,*~~

~~*known to Shakespeare's contem- War- county or heart of England. It wick- was the middle shire of the Midlands, where the two great Shire.*~~

~~*The Arden division.*~~

~~*passed through the county, and one of them, the mail road from London through Oxford to Birmingham, Stafford, and Chester, was the "streete" or public way that crossed the Avon at the celebrated ford spanned in 1483 by Sir Hugh Clopton's magnificent bridge of fourteen arches. Immediately beyond the bridge rose the homely gables and wide thoroughfares of Shakespeare's native place.*~~

~~*In Shakespeare's time Warwickshire was divided by the irregular line of the Avon into two unequal but well-marked divisions, known respectively, from their main character- istics, as the woodland and the open country, or more technically as the districts of Arden and Feldon. The former included the thickly-wooded region north of the Avon, of which the celebrated forest of Arden was the centre, and the latter the champaign country, the rich and fertile pasture-lands between the Avon and the line of hills separating Warwick from the shires of Oxford and North- ampton. Shakespeare himself was of course familiar with this division of his native shire, and he has well expressed it in Lear's description of the section of the kingdom assigned to his eldest daughter Goneril,—*~~

~~*" Of all these bounds, —even from this line to this, With shadowy forests and with champains rich'd,*~~

~~*With plenteous rivers and wide-skirted meads, — We make thee lady."*~~

~~*No better general description of Warwickshire could indeed be given than is contained in these lines. Taking the Roman roads, Watling and Ricknild Streets, as boundaries, they vividly depict the characteristic features of the county, including its plenteous rivers and wide- skirted meads. The old and central division of Arden and Feldon is clearly embodied, in the second line, "with shadowy forests and with champains rich'd." This distinction, practically effaced in modern times by agricultural and*~~

~~*mining progress, was partially affected by these causes even in Shakespeare's own day. The wide Arden, or belt of forest territory which had once extended not only across the county but from the Trent to the Severn, was then very much restricted to the centre of the shire, the line of low hills and undulating country which stretched away for upwards of twenty miles to the north of Stratford. The whole of the northern district was, it is true, still densely wooded, but the intervening patches of arable and pasture land gradually encroached more and more upon the bracken and brushwood, and every year larger areas were cleared and prepared for tillage by the axe and the plough. In the second half of the 16th century, however, the Arden district still retained enough of its primitive character to fill the poet's imagination with the exhilarating breadth and sweetness of woodland haunts, the beauty, variety, and freedom of sylvan life, and thus to impart to the scenery of As You Zeke It the vivid fresh-ness and reality of a living experience. In this delightful comedy the details of forest-life are touched with so light but at the same time so sure a hand as to prove the writer's familiarity with the whole art of venery, his thorough knowledge of that "highest franchise of noble and princely pleasure" which the royal demesnes of wood and park afforded. In referring to the marches or wide margins on the outskirts of the forest, legally known as purlieus, Shakespeare indeed displays a minute technical accuracy which would seem to indicate that in his early rambles about the forest and casual talks with its keepers and woodmen he had picked up the legal incidents of sylvan economy, as well as enjoyed the freedom and charm of forest-life. Throughout the purlieus, for instance, the forest laws were only partially in force, while the more important rights of individual owners were fully recognized and established. HIence it happened that Corin's master, dwelling, as Rosalind puts it in a quaint but characteristic*~~

~~*simile that betrays her sex, "here in the skirts of the forest, like fringe upon a petticoat," could sell " his cote, his flock, and bounds of feed," and that Celia and Rosalind were able to purchase "the cottage, the pasture, and the flock." It may be noted, too, that, in exchange for the independence the dwellers in the purlieus acquired as private owners,*~~

~~*they had to relinquish their common right or customary privilege of pasturing their cattle in the forest. Sheep, indeed, were not usually included in this right of common, their presence in the forest being regarded as inimical to the deer. When kept in the purlieus, there- fore, they had to be strictly limited to their bounds of feed, shepherded during the day and carefully folded every night, and these points are faithfully reflected by Shake- speare. Again, only those specially privileged could hunt venison within the forest. But if the deer strayed beyond the forest bounds they could be freely followed by the dwellers in the purlieus, and these happy hunting grounds outside the forest precincts were in many cases spacious and extensive. The special office of a forest ranger was indeed to drive back the deer straying in the purlieus. The banished duke evidently has this in mind when, as a casual denizen of the forest, he proposes to make war on its native citizens :— "Come, shall we go and kill us venison ?*~~

~~*And yet it irks me, the poor dappled fools,*~~

~~*Being native burghers of this desert city,*~~

~~*Should, in their own confines, with forkéd heads,*~~

~~*Have their round haunches gor'd." And the melancholy Jaques, refining as usual with cynical sentimentalism on every way of life and every kind of action, thinks it would be a special outrage*~~

~~*"To fright the animals, and to kill them up,*~~

~~*In their assign'd and native dwelling place."*~~

~~*Not only in As You Like It, but in Love's Labour's Lost,. in A Midsummer Night's Dream, in the Merry Wives of Windsor, and indeed throughout his dramatic works, Shakespeare displays the most intimate knowledge of the aspects and incidents of forest life ; and it is certain that in the first instance this knowledge must have been gained from his early familiarity with the Arden district. This, as we have seen, stretched to the north of Stratford in all its amplitude and variety of hilland dale, leafy covert and sunny glade, giant oaks and tangled thickets,— the wood- land stillness*~~

~~*being broken at intervals not only by the noise of brawling brooks below and of feathered outcries and flutterings overhead, but by dappled herds sweeping across the open lawns or twinkling in the shadowy bracken, as well as by scattered groups of timid conies feeding, at matins and vespers, on the tender shoots and sweet herbage of the forest side. The deer-stealing tradition is sufficient evidence of the popular belief in the poet's love of daring exploits in the regions of vert and venison, and of his devotion, although in a somewhat irregular way perhaps, to the attractive woodcraft of the park, the warren, and the chase. The traditional scene of this adventure was Charlecote Park, a few miles north-east of Stratford; but the poet's early wanderings in Arden extended, no doubt, much further afield. Stirred by the natural desire of visiting at leisure the more celebrated places of his native district, he would pass from Stratford to Henley and Hampton, to Wroxall Priory and Kenilworth Castle, to Stoneleigh Abbey and Leamington Priors, to Warwick Keep and Guy's Cliffe. The remarkable beauty of this last storied spot stirs the learned and tranquil pens of the antiquaries Camden and Dugdale to an unwonted effort of description, even in the pre-descriptive era. "Under this hill," says Camden, "hard by the river Avon, standeth Guy-cliffe, others call it Gib-cliffe, the dwelling house at this day of Sir Thomas Beau-foe, descended from*~~

~~*The Feldon division.*~~

~~*History,*~~

~~*SHAKESPEARE*~~

~~*the ancient Normans line, and the very seate itselfe of pleasantnesse. There have yee a shady little wood, cleere and cristall springs, mossy bottomes and caves, medowes alwaies fresh and greene, the river rumbling here and there among the stones with his stream making a milde noise and gentle whispering, and besides all this, solitary and still quietnesse, things most grateful to the Muses." But the whole of the circuit was richly wooded, the towns, as the names indicate, being forest towns,—Henley-in-Arden, Hampton-in-Arden,—while the castles and secularized religious houses were paled off within their own parks and bounds from the sylvan wilderness around them. Some, like the*~~

~~*celebrated castle of the Mountfords, called from its pleasant situation amongst the woods Beaudesert, having been dismantled during the Wars of the Roses were already abandoned, and had in Shake- speare's day relapsed from the stately revelry that once filled their halls into the silence of the surrounding woods. At every point of the journey, indeed, as the poet's eager and meditative eye embraced new vistas, it might be said, 'Towers and battlements it sees Bosomed high in tufted trees." On the southern margin of the Arden division, towards the Avon, small farms were indeed already numerous, and cultivation had become tolerably general. But the region as a whole still retained its distinctive character as the Arden or wooded division of the county. Even now, indeed, it includes probably more woods and parks than are to be found over the same area in any other English shire.*~~

~~*While parts of the Arden district were in this way under cultivation, it must not be supposed that the champaign or open country to the south of the Avon, the Feldon division of the county, was destitute of wood; on the contrary its extensive pastures were not only well watered by local streams overshadowed by willow and alder, but well wooded at intervals by groups of more stately trees. The numerous flocks and herds that grazed throughout the valley of the Red Horse found welcome shelter from the noonday heat and the driving wind under the green roofs and leafy screens that lined and dotted their bounds of feed. And, although even the grazing farms were comparatively small, almost every homestead had its group of protecting elms, its outlying patch of hanging beech and ash, or straggling copse of oak and hazel. This is still reflected in such local names as Wood Park, Shrub Lands, Ockley Wood, Furze Hill, Oakham, Ashborne, Alcott Wood, Berecote Wood, and Radland Gorse. These features gave interest and variety to the Feldon district, and justified the characteristic epithet which for centuries was popularly applied to the county as a whole, that of "woody Warwickshire." And Shakespeare, in passing out of the county on his London journeys, would quickly feel the difference, as beyond its borders he came upon stretches of less clothed and cultivated scenery. As his stout gelding mounted Edgehill, and he turned in the saddle to take a parting look at the familiar landscape he was leaving, he would behold what Speed, in his enthusiasm, calls "another Eden, as Lot the plain of Jordan." While the general aspect*~~

~~*would be that of green pastures and grassy levels, there would be at the same time the picturesque intermingling of wood and water, of mill and grange and manor house, which gives light and shade, colour and movement, interest and animation, to the plainer Sweeps and more monotonous objects of pastoral scenery.*~~

~~*On the historical side Warwickshire has points of interest as striking and distinctive as its physical features. During the Roman occupation of the country it was, as we have seen, the site of several central Roman stations, of which, besides those already noticed, the fortified camps of*~~

~~*perhaps further west have accepted the overlordship of their Teutonic neighbours and united with them in the cultivation and defence of their common territory. The fact that no record of any early Early indicate that, after at union of there was a gradual coalescence of C*ltic rather than any fierce Teutonic or memorable struggle between them. Even the more races.*~~

~~*Angle conquest*~~

~~*739*~~

~~*Tripontium and Presidium on the line of the Avon were the most important. A Roman road crossed the Avon at Stratford, and radiating north and south soon reached some of the larger Roman towns of the west, such as Uriconium and Corinium. Between these towns were country villas or mansions, many of them being, like that at Woodchester, "magnificent palaces covering as much ground as a whole town." The entire district must in this way have been powerfully affected by the higher forms of social life and material splendour which the wealthier provincials had introduced. The immediate effect of this Roman influence on the native populations was, as we know, to divide them into opposed groups whose conflicts helped directly to produce the disastrous results which followed the withdrawal of the Romans from the island. But the more permanent and more important effect is probably to be traced in the far less obstinate resistance offered by the Celtic tribes of Mid Britain to the invading Angles from the north and Saxons from the south, by whom themselves and their district were eventually absorbed. Instead of the*~~

~~*fierce conflicts and wrathful withdrawal or extermination of the conquered Britons which prevailed further east, and for a tiine also, the intervening tribes appear to*~~

~~*remains seems to most a brief resistance, the invading with the native tribes*~~

~~*independent and warlike tribes about the Severn repeatedly*~~

~~*joined the Saxon HIwiccas, whose northern frontier was the*~~

~~*forest of Arden, in resisting the advance of Wessex from the south. And for more than a hundred years after the establishment of the central kingdom of the Angles, the neighbouring Welsh princes are found acting in friendly alliance with the Mercian rulers. It was thus the very district where from an early period the two race elements that have gone to the making of the nation were most nearly balanced and most completely blended. The union of a strong Celtic element with the dominant Angles is still reflected in the local nomenclature, not only in the names of the chief natural features, such as rivers and heights, —Arden and Avon, Lickey, Alne, and Thame,—but in the numerous combes and cotes or cots, as in the reduplica- tive Cotswold, in the duns, dons, and dens, and in such distinctively Celtic elements as man, pol, try, in names of places scattered through the district. The cotes are, it is true, ambiguous, being ina majority of cases perhaps Saxon rather than Celtic, but in a forest country near the old Welsh marches many must still represent the Celtic coet or coed, and in some cases this is clear from the word itself, as in Kingscot, a variation of Kingswood, and even Charlecote exists in the alternative form of Charlewood. This union of the two races, combined with the stirring conditions of life in a wild and picturesque border country, gave a vigorous impulse and distinctive character to the population, the influence of which may be clearly traced in the subsequent literary as well as in the political history of the country. As early as the 9th century, when the ravages of the Danes had desolated the homes and scattered the representatives of learning in Wessex, it was to western Mercia that King Alfred sent for scholars and churchmen to unite with him in helping to restore the fallen fortunes of religion and letters. And after the long blank in the native literature produced by the*~~

~~*Norman Conquest the authentic signs of its indestructible vitality first appeared on the banks of the Severn. Layamon's spirited poem dealing with the legendary history of Britain, and written*~~

~~*at Redstone near Arley, within sight of the river's majestic sweep amidst its bordering woods and hills, is by far the most important literary monument of semi-Saxon. And, while the poem as a whole displays a Saxon tenacity of purpose in working out a comprehensive scheme of memorial verse, its more original parts have touches of passion and picturesqueness, as well as of dramatic vivacity, that recall the patriotic fire of the Celtic bards. A hundred and fifty years later the first great period of English literature was inaugurated by another poem of marked originality and power, written under the shadow of the Malvern Hills. The writer of the striking series of allegories known as Piers Plowman's Visions was a Shrop- shire man, and, notwithstanding his occasional visits to London and official employments there, appears to have spent his best and most productive years on the western border between the Severn and the Malvern Hills. In many points both of substance and form the poem may, it is true, be described as almost typically Saxon. But it has at the same time a power of vivid portraiture, a sense of colour, with an intense and penetrating if not exag- gerated feeling for local grievances which are probably due to the strain of Celtic blood in the writer's veins. Two centuries later, from the same district, from a small town on an affluent of the Severn, a few miles to the west of the river, came the national poet, who not only inherited the patriotic fire and keen sensibility of Layamon and Langland, but who combined in the most perfect form and carried to the highest point of development the best qualities of the two great races represented in the blood and history of the English nation. Mr J. R. Green, in referring to the moral effects arising from the mixture of races in the Midland district, has noted this fact in one of those sagacious side-glances that make his history so instructive. "Jt is not without significance," he says, 'that the highest type of the race, the one Englishman who has combined in their largest measure the mobility and fancy of the Celt with the depth and energy of the Teutonic temper, was born on the old Welsh and English borderland, in the forest of Arden."*~~

~~*And from the purely critical side Mr Matthew Arnold has clearly brought out the same point. He traces some of the finest qualities of Shakespeare's poetry to the Celtic spirit which touched his imagination as with an enchanter's wand, and thus helped to brighten and enrich the profounder elements of his creative genius.*~~

~~*The history of Warwickshire in Anglo-Saxon times is identified*~~

~~*with the kingdom of Mercia, which, under a series of able rulers, was for a time the dominant power of the country. In later times,*~~

~~*hand, South Wales, some of the Midland and most of the western shires, under the leadership of the Beauforts, and the northern counties, under the leadership of Clifford and Northumberland, supported the house of. Lancaster. Political feeling in the Princi- pality itself was a good deal divided. The duke of York still possessed Ludlow Castle, and, the Welsh of the northern border being devoted to the houses of March and Mortimer, Prince Edward, the young earl of March, after the defeat and death of his father at Wakefield, was able to rally on the border a "mighty power of marchmen," and, after uniting his forces with those of Warwick, to secure the decisive victory of Towton which placed him sceurely on the throne. Still, during the earlier stages of the struggle the Beauforts, with the earls of Pembroke, Devon, and Wiltshire, were able to muster in the south and west forces sufficient to keep the Yorkists in check. And when the final struggle came, —when Henry of Richmond landed at Milford Haven,— the Welsh blood in his veins rallied to his standard so powerful a contingent of the southern marchmen that he was able at once to cross the Severn, and, traversing north Warwickshire, to confront the forces of Richard, with the assurance that in the hour of need he would be supported by Stanley and Northumberland. Warwickshire itself was, as already intimated, considerably divided even in the more active stages of the conflict, Coventry being strongly in favour of the Red Rose, while Warwick, under the influence of the earl, was for a while devoted to the cause of the White Rose. Kenilworth was still held by the house of Lancaster, and Henry VI. at the outset of the conquest had more than once taken refuge there. On the other hand Edward IV. and Richard III.*~~

~~*both visited Warwick, the latter being so interested in the castle that he is said to have laid the foundation of a new and "mighty fayre" towcr on the north side, afterwards known as the Bear's Tower. Edward IV., in harmony with his strong instinct for popularity, and command of the arts that secure it, tried to conciliate the people of Coventry by visiting the town and witnessing its selebrefea pageants inore than once—at Christmas in 1465 and at the festival of St George in 1474. Although he was accompanied by his queen the efforts to win the town from its attachment to the rival house do not appear to have been very successful. Under Edward's rule the manifesta- tion of active partisanship was naturally in abeyance, and no doubt the feeling may to some extent have declined. "Indeed, in the later stages of the struggle Warwickshire, like so many other counties, was comparatively weary and quiescent. When Richard III. advanced to the north the sheriff of the shire had, it is true, in obedience to the royal mandate levied a force on behalf of the king, but as this force never actually joined the royal standard it is naturally assumed that it was either intercepted by Henry on his march to Bosworth Field or had voluntarily joined him on the eve of the battle. In view of the strong Lancasterian sympathies in the north and east of the shire the latter is by far the more probable supposition. In this case, or indeed on either alternative, it may be true, as asserted in the patent of arms subsequently granted to Shakespeare's father, that his ancestors had fought on behalf of Henry VII. in the great battle that placed the crown on his head, Many families bearing the name of Shakespeare were scattered through Warwickshire in the 15th century, and it is therefore not at all unlikely that some of their members had wielded a spear with effect in the battle that, to the immense relief of the country, happily closed the most miserable civil conflict in its annals.*~~

~~*But, whether any of his ancestors fought at Bosworth Field Influence*~~

~~*from its central position, the county was liable to be crossed by military forces if rebellion made head in the north or west, as well as to be traversed and occupied by the rival armies during the*~~

~~*or not, Shakespeare would be sure in his youth to hear, almost of local at first hand, a multitude of exciting stories and stirring inci- tradi- dents*~~

~~*connected with so memorable and far-reaching a victory, tions.*~~

~~*periods of civil war. The most important events, indeed, con- nected with the shire before Shakespeare's time occurred during the two greatest civil conflicts in the earlier national annals— the Barons' War in the 13th century, and the Wars of the Roses in the 15th. The decisive battles that closed these long and bitter struggles, and thus became turning points in our constitutional history, were both fought on the borders of Warwickshire, —the battle of Evesham on the south-western and the battle of Bosworth Field on the north-eastern boundary. The great leaders in each conflict—the founder of the Commons House of Parliament and the " setter up and puller down of kings"—were directly connected with Warwickshire. Kenilworth belonged to Simon de Montfort, and its siege and surrender constituted the last act in the Barons' War. During the Wars of the Roses the county was naturally promi- nent in public affairs, as its local earl, the last and greatest of the lawless, prodigal, and ambitious barons of medieval times, was for more than twenty years the leading figure in the strugele. But notwithstanding this powerful influence the county was, like the country itself, very much divided in its political sympathies and activities. The weakness and vacillation of Henry VI. had stimulated the rival house of York to assert its claims, and, as the trading and mercantile classes were always in favour of a strong government, London, with the eastern counties and the chief ports and commercial towns, favoured the house of York. On the other*~~

~~*After the battle Henry VII. had slept at Coventry, and was entertained by the citizens and presented with handsome gifts. He seems there also to have first exercised his royal power by con- ferring knighthood on the mayor of the town. The battle was fought only eighty years before Shakespeare's birth, and public events of importance are vividly transmitted by local tradition for more than double that length of time. At this hour the quiet farmsteads of Mid Somerset abound with stories and traditions of Monmouth and his soldiers, and of the events that preceded and followed the battle of Sedgemoor. And a century earlier local traditions possessed still more vitality and power. In the 16th century, indeed, the great events of the nation's life, as well as more important local incidents, were popularly preserved and transmitted by means of*~~

~~*oral tradition and scenic display. Only a small and cultured class could acquire their knowledge of them through literary chronicles and learned records. The popular mind was of necessity largely fed and stimulated by the spoken narratives of the rustic festival and the winter fireside. And a quiet settled neighbourhood like Stratford, out of the crush, but near the great centres of national activity, would be peculiarly rich in these stored-up materials of unwritten history. The very fact that within eight miles of Shakespeare's birthplace arose from their cedared slopes the halls and towers of the great earl who for more than a quarter of a century wielded a political and*~~

~~*Stratford,*~~

~~*SHAKESPEARE*~~

~~*military power mightier than any*~~

~~*would give the district an exceptional annals, which would be locally reflected in an answering wealth of historic tradition.*~~

~~*we are fortunate in pos- an unrivalled interpreter in our great dramatic poet A regular sequence of historical plays exhibits to us,*~~

~~*the period of the Wars of the Roses we have, comparatively speak. ing, very few contemporary narratives of what took place, and anything like a general history of the times was not written till a much later date. But the doings of that stormy age,—the sad calamities endured by kings—the sudden changes of fortune in great men—the glitter of chivalry and the horrors of civil war,—all left a deep impression upon the mind of the nation, which was kept alive by vivid traditions of the past at the time that our great dramatist wrote. Hence, notwithstanding the scantiness of records and the meagreness of ancient chronicles, we have singularly little difficulty in understanding the spirit and character of the times."*~~

~~*Familiar as he must have been in his youth with the materials*~~

~~*thrilled the nation's*~~

~~*the royal family. to the crown Henry VIII., with Queen Catherine, visited Coventry in state, and Witnessed there a series of magnificent pageants. In 1525 the Princess Mary spent two being entertained with the usual sports and shows, and presented by the citizens on her departure with hand- some presents. The year after Shakespeare's birth Queen Elizabeth made a state visit to Coventry, Kenilworth, and Warwick, the young queen being received at every point of her progress with unusually splendid demonstrations of loyalty and devotion. And nine years before Shakespeare's birth King Edward VI., in the last months of his reign, had specially interested himself in the re- establishment by royal charter of the free grammar school of the guild at Stratford, which had been suppressed at the dissolution of religious houses during his father's reign.*~~

~~*The town of Stratford lies on the north bank of the Avon, at a point about midway in its course from its rise in Northamptonshire hills to its junction with the Severn at Tewkesbury. On entering the town, across Sir Hugh Clopton's noble bridge, the road from the south-east fans out in three main directions, — on the right to Warwick and Coventry, on the left to Alcester, while between runs the central street, the modern representative of the old Roman way to Birmingham, Chester, and the north, Further to the left a fourth and less important road leaves the town beyond the church, and, keeping in the main the line of the river, goes to Bidford, Salford Priors, and Evesham. It is a picturesque country road connecting a string of undulating villages and hamlets with Stratford. The town itself consisted in the 16th century of the low gable- roofed wood-and-plaster houses dotted 'at intervals along these roads and down the cross streets that connected them with each other and with the river. Most of the houses in Shakespeare's time had gardens at the back,*~~

~~*(4)*~~

~~*and many at the sides also; and the space between the houses, combined with the unusual width of the streets, gave the town an open cheerful look which enabled it to retain pleasant touches of its earlier rural state. As its prosperity increased the scattered dwellings naturally tended to close up their Tanks, and present a more united front of exposed wares and convenient hostelries to the yeomen and graziers, who with their wives*~~

~~*and families frequented the place on fair and market days. But in Shakespeare's time the irregular line of gables and porches, of penthouse walls and garden palings, with patches of flowers and overarching foliage between, still varied the view and refreshed the eye in looking down the leading thoroughfares, These thoroughfares took the shape of a central cross, of which Church, Chapel, and High Streets, running in a continuous line north and south, constituted the shaft or stem, while Bridge and Wood Streets, running in another line east and west, were the transverse beam or bar. At the point of intersection stood the High Cross, a solid stone building with Steps below and open arches. above, from which public proclamations were made, and, as in London and other large towns, sermons sometimes delivered. The open Space around the High Cross was the centre of trade and merchandise on market days, and from the force of custom it naturally became the site on which at a later period the market-house was built, Oppo- site the High Cross the main road, carried over Sir Hugh Clopton's arches and along Bridge Street, turns to the left through Henley Street on its way to Henley-in-Arden and the more distant northerly towns. At the western end of Wood Street was a large and open space called Rother Market, whence Rother Street running parallel with High Street led through narrower lanes into the Evesham Road.*~~

~~*This open ground was, as the name indicates, the great cattle The market of Stratford, one of the most important features of its Rother industrial history from very early times. In the later Middle Market. Ages most of the wealthier inhabitants were engaged in farming operations, and the growth and prosperity of the place resulted from its position as a market town in the midst of an agricultural and grazing district. In the 13th century a number of charters were obtained from the early Plantagenet kings, empowering the town to hold a weekly market and no fewer than five annual fairs, four of which were mainly for cattle. In later times a series of great cattle markets, one for each month in the year, was added to the list. The name of the Stratford cattle market embodies this feature of its history, "rother" being a good Saxon word for» horned cattle, a word freely employed in Early English, both alone and in composition. In the 16th century it was still in familiar use, not only in literature but in official documents and especially in statutes of the realm. Thus Cowell, in*~~

~~his law dictionary, nnder the heading ‘ Rother-beasts,” explains that ‘the name compre- hends oxen, cows, steers, heifers, and such like horned beasts,” — and refers to statutes of Elizabeth and James in support of the usage. And Arthur Golding in 1567 translates Ovid’s lines—~~

~~“Mille greges illi totidemque armenia per herbas Errabant—”~~

~~“* A thousand flocks of sheep, A thousand herds of rother-beasts, he in his fields did keep.”~~

~~The word seems to have been longer retained and more freely used in the Midland counties than elsewhere, and Shakespeare himself employs it with colloquial precision in the restored line of Timon of Athens: “It is the pasture lards the rother’s sides.” Many a time, no doubt, as a boy, during the spring and summer fairs, he had risen with the sun, and, making his way from Henley Street to the bridge, watched the first arrivals of the “large-eyed kine” slowly driven in from the rich pastures of the “Red Horse Valley.” There would be some variety and excitement in the spec- tacle as the droves of meditative oxen were invaded from time to time by groups of Herefordshire cows lowing anxiously after their skittish calves, as well as by the presence and disconcerting activity of still smaller deer. And the boy would be sure to follow the crowding cattle to the Rother Market and observe at leisure the humours of the ploughmen and drovers from the Feldon district, whose heavy intermittent talk would be in perfect keeping with the bovine stolidity of the steers and heifers around them. There was a market-cross at the head of the Rother expanse, and this was the chief gathering place for the cattle-dealers, as the High Cross was the rallying point of the dealers in corn and country produce. In~~

~~modern Stratford Rother Market retains its place as the busiest centre at the annual fairs, during one of which it is still customary to roast an ox in~~

~~*the open street, often amidst a good deal of popular excitement and convivial uproar.*~~

~~*The cross ways going from Rother Street to the river side, which cut the central line, dividing it into three sections, are Ely Street and Sheep Street in a continuous line, and Scholar's Lane and Chapel Lane in another line. They run parallel with the head line of Bridge and Wood Streets, and like them traverse from east to west the northern shaft of the cross that constituted the ground plan of the town. Starting down this line from the market house at the top, the first division, the High Street, is now, as it was in Shake- speare's day, the busiest part for shops and shopping, the solid pbuilding at the further corner to the left being the Coru Exchange. At the first corner of the second division, called Chapel Street, stands the town-hall, while at the further corner are the site and railed-in gardens of New Place, the large mansion purchased by Shakespeare in 1597. Opposite New Place, at the corner of the third and last division, known as Church Street, is the grey mass of Gothic buildings belonging to the guild of the Holy Cross, and consisting of the chapel, the hall, the grammar school, and the almshouses of the ancient guild. Turning to the left at the bottom of Church Street, you enter upon what was in Shakespeare's day a well-wooded suburb, with a few good houses scattered among the ancient elms, and surrounded by ornamental gardens and extensive private grounds. In one of these houses, with a sunny expanse of lawn and shrubbery, lived in the early years of the 17th century Shakespeare's eldest daughter Susanna with her husband, Dr Johu Hall, and here in spring mornings and summer afternoons the great poet must have often strolled, either alone or accom- panied by his favourite daughter, realizing to the full the quiet enjoyment of the sylvan scene and its social surroundings. This pleasant suburb, called then as now Old Town, leads directly to the church of the Holy Trinity, near the river side. The church, a fine specimen of Decorated and Perpendicular Gothic with a lofty spire, is approached on the northern side through an avenue of limes, and sheltered on the east and south by an irregular but massive group of elms towering above the churchway path between the transepts, the chancel, and the river. Below the church, on the margin of the river, were the mill, the mill-bridge, and the weir, half hidden by grey willows, green alders, and tall beds of rustling sedge. And, beyond the church, the college, and*~~

~~*the line of streets already described, the suburbs stretched away into gardens, orchards, meadows, and cultivated fields, divided by rustic lanes with mossy banks, flowering hedgerows, and luminous vistas of bewildering beauty. These cross and country roads were dotted at intervals with cottage homesteads, isolated farms, and the small groups of both which constituted the villages and hamlets included within the wide sweep of old Stratford parish. Amongst these were the villages and hamlets of Welcombe, Ingon, Drayton, Shottery, Luddington, Little Wilmcote, and Bishopston. The town was thus girdled in the spring by daisied meadows and blos- soming orchards, and enriched during the later months by the orange and gold of harvest fields and autumn foliage, mingled with the coral and purple clusters of elder, hawthorn, and moun- tain ash, and, around the farms and cottages, with the glow of ripening fruit for the winter's store.*~~

~~*But perhaps the most characteristic feature of the scenery in the neighbourhood of Stratford is to be found in the union of this rich and varied cultivation with picturesque survivals of the primeval forest territory. The low hills that rise at intervals above the well-turned soil still carry on their serrated crests the lingering glories of the ancient woodland. Though the once mighty forest of Arden has disappeared, the after-glow of its sylvan beauty rests on the neighbouring heights formerly enclosed within its ample margin. These traces of the forest wildness and freedom were of course far more striking and abundant in Shakespeare's day thau now. At that time many of the farms had only recently been reclaimed from the forest, and most of them still had their bosky acres "of tooth'd briars, sharp furzes, pricking goss and thorns," their broom groves, hazel copses, and outlying patches of unshrubbed down. And the hills that rose above the chief villages of the neighbourhood were still clothed and crowned with the green and mystic mantle of the leafy Arden. But, though much of the ancient woodland has disappeared since Shakespeare's day, many traces of it still remain. Any of the roads out of Stratford will soon bring the pedestrian to some of these picturesque sur- vivals of the old forest wilderness. On the Warwick*~~

~~*road, at the distance of about a mile from the town, there are on the left the Welcombe Woods, and just beyond the*~~

~~*woods the well-known Dingles, a belt of straggling ash*~~

~~*and hawthorn winding irregularly through blue-bell depths and briery hollows from the pathway below to the crest*~~

~~*of the hill above, while immediately around rise the*~~

~~*Welcombe Hills, from the top of which is obtained the*~~

~~*finest local view of Stratford and the adjacent country. Looking south-west and facing the central line of the town, you see below you, above the mass of roofs, the square tower of the guild chapel, the graceful spire of the more distant church, the sweep of the winding river, and beyond the river the undulating valley of the Red Horse shut in by the blue range of the Cotswold Hills. A couple of miles to the east of the Welcombe Hills is the village of Snitterfield, where Shakespeare's grandfather, Richard Shakespeare, lived and cultivated to the end of his days the acres around his rustic dwelling. Beyond the village on its western side there is an upland reach of wilderness in the shape of a hill, covered with shrub and copsewood, and known as the Snitterfield Bushes. Here Shakespeare as a boy must have often rambled, enjoying the freedom of the unfenced downs, and enlarging his knowledge of nature's exuberant vitality. On the opposite side of the town, about a mile on the Evesham road, or rather between the Evesham and Alcester roads, lies the hamlet of Shottery, half concealed by ancestral elms and nestling amongst its homestead fruits and flowers. From one of these homesteads Shakespeare obtained his bride Anne Hathaway. A mile or two on the central road, passing out of the town through Henley Street, is the village of Bearley, and above the village another sweep of wooded upland known as Bearley Bushes. And at various more distant points between these roads the marl and sandstone heights, fringed with woods or covered with wilding growths, still bear eloquent testimony to the time when Guy of Warwick and his tutor in chivalry, Heraud of Arden, still roamed the forest in search of the wild ox and savage boar that frayed the infrequent travellers and devastated at intervals the slender cultivation of the district. The subtle*~~

~~*power of this order of scenery, arising from the union of all that is rich and careful in cultivation with all that is wild and free in natural beauty, is exactly of the kind best fitted to attract and delight imaginative and emotional minds. It possesses the peculiar charm that in character arises from the union of refined culture with the bright and exhilarating spontaneity of a free and generous nature.*~~

~~*On its moral side such secnery has an expanding illuminating Moral power which links it to the wider and deeper interests of humanity influ-asa whole. Nature seems to put forth her vital energics expressly ences of for the relief of man's estate, appearing as his friend and helper scenery and consoler. Instead of being absorbed in her own inaccessible grandeurs and solitary sublimities, she exerts her benign influcnees expressly as it were for his good, to cheer and brighten his evanescent days, and beautify his temporary home. Bolder and more rugged landscapes, gloomy glens, and thunder-scarred peaks may excite more passionate feelings, may rouse and strengthen by reaction the individualistic elements of mind and character, and thus produce the hardy, daring type of mountaincer, the intense self-centred and defiant local patriot or hero, the chieftain and his clansmen, contra mundum. No doubt it is also true that the vaster and loftier mountain ranges have a unique power of exciting in susceptible minds the emotions of awe, wonder, and sublimity. But the very power and permanence of these mighty solitudes, the grandeur andimmobility of their measureless strength and imperial repose, dwarf by comparison all merely human interests ; and to the meditative mind swept by the spirit of such immensities the moments of our mortal life seem to melt as dew-drops into the silence of their eternal years. The feelings thus excited, being in themselves of the essence of poetry, may indeed find expression in verse and in verse of a noble kind, but the poetry will be lyrical and reflective, not dramatic, or if dramatic in form it will be lyrical in substance. As Mr Ruskin has pointed out, the overmastering effect of mountain scenery tends to absorb and preoccupy the*~~

~~*The old Welsh border.*~~

~~*SHAKESPEARE*~~

~~*mind, and thus to disturb the impartial view, the universal vision }*~~

~~*of nature and human nature asa complex whole, or rather of nature as the theatre and scene of human life, which the dramatist must preserve in order to secnre success in hig higher work. Mountain scenery is, however, not only rare and exacting in the range and intensity of feeling it excites, but locally remote in its separation from the interests and occupations of men. It is thus removed from the vital clement in which the dramatist works, if not in its higher influence antagonistic to that element. Mr Hamerton, who discusses the question on a wider basis of knowledge and experience than perhaps any living authority except Mr Ruskin, supports this view. "As a general rule," he says, "I should say there. is an antagonism between the love of mountains and the knowledge of mankind, that the lover of mountains will often be satisfied with their appearances of power and passion, their splendour and gloom, their seeming cheerfulness or melancholy, when a mind indifferent to this class of scenery might study the analogous phases of human character," Where, indeed, the influence of nature is overpowering, as in the East, wonder, —the wonder excited by mere physical vastness, power, and infinitude,—takes the place of intelligent interest in individual life and character,*~~

~~*But the dramatic poet has to deal primarily with human power and passion; and not for him therefore is the life of lonely raptures and awful delights realized by the moun- tain wanderer or the Alp-inspired bard. HIs work lies nearer the homes and ways of men, and his choicest scenery will be found in the forms of natural beauty most directly associated with their habitual activities, most completely blended with their more vivid emotional experiences, A wooded undulating country, watered by memorable streams, its ruder features relieved by the graces of cultivation, and its whole circuit rich in histori- cal remains and associations, is outside the domain of cities, the natural stage and theatre of the dramatist and story-teller. This was the kind of scenery that fascinated Scott's imagination, amidst which he fixed his chosen home, and where he sleeps his last sleep. It is a border country of grey waving hills, divided by streams renowned in song, and enriched by the monuments of the piety, splendour, and martial power of the leaders*~~

~~*whose fierce raids and patriotic conflicts filled with romantic tale and minstrelsy the whole district from the Lammermoors to the Cheviots, and from the Leader and the Tweed to the Solway Firth. In earlier times Shakespeare's own dis- trict had been virtually a border country also. The medizxval tide of intermittent but savage warfare, between the unsubdued Welsh and the Anglo-Normans under the feudal lords of the marches, ebbed and flowed across the Severn, inundating at times the whole of Powis-land, and Sweeping on to the very verge of Warwickshire, In the 12th and 13th centuries the policy of intermarriage between their own families and the Welsh princes was tried by the English monarchs, and King John, on betroth- ing his daughter Joan to the Welsh prince Llewelyn, gave the manor of Bidford, six miles from Stratford-on-Avon, as part of her dower. The fact of this English princess being thus identified with South Warwickshire may help to explain the prevalence of the name Joan in the county,*~~

~~*power of hardy marchmen to its banner. And that the insurgent Welsh were not idle during the interval between these civil conflicts we have the emphatic testimony of Glendower :—*~~

~~*"Three times hath Henry Bolingbrooke made head*~~

~~*Against my power : thrice from the banks of Wye*~~

~~*And sedgy-bottomed Severn have I sent him*~~

~~*Bootless home, and weather-beaten back." The Hotspur and Mortimer revolt against Henry IV. well illustrates, indeed, the kind of support which English disaffection found for centuries in the Welsh marches, A rich heritage of stirring border life and heroic martial story was thus transmitted from the stormy ages of faith and feudalism to the more settled Tudor times. Apart from the border warfare there were also the multiplied associations connected with the struggles between the nobles and the crown, and the rise of the Commons as a distinctive power in the country. The whole local record of great names and signal deeds was in Shakespeare's day so far withdrawn into the past and mellowed by secular*~~

~~*distance as to be capable of exerting its full enchantment over the feelings and the imagination. The historical associations thus connected with the hills and streams, the abbeys and castles, of Warwickshire added elements of striking moral interest to the natural beauty of the scenery. To the penetrating imagination of poetic natures these elements reflected the continuity of national life as well as the greatness and splendour of the per- sonalities and achievements by which it was developed from age toage. They also helped to kindle within them a genuine enthusiasm for the fortunes and the fame of their native land. And scenery beautiful in itself acquired a tenfold charm from the power it thus possessed of bring- ing vividly before the mind the wide and moving panorama of the heroic past. The facts sufficiently prove that Scenery endowed with this multiplied charm takes, if a calmer, still a deeper and firmer hold of the affections than any isolated and remote natural features, however beautiful and sublime, have power to do. This general truth is illustrated with even exceptional force in the lives of Scott and Shakespeare. Both were passionately attached to their native district, and the memorable scenes amidst which their early years were passed. So intense was Scott's feeling that he told Washington Irving that if he did not see the grey hills and the heather once a year he thought he should die. And one of the few traditions preserved of Shakespeare is that even in the most active period of his London career he always visited Stratford at least once every year. We know indeed from other sources that during his absence Shakespeare continued to take the liveliest interest in the affairs of his native place, and that, although London was for some years his profes- sional residence, he never ceased to regard Stratford as his home.*~~

~~*Amongst other illustrations of this strong feeling of Feeling local attachment that might be given there is one that . ae has recently excited a good deal of attention and is worth 2ttach-*~~

~~*but the early impulse towards the giving of this royal name would no doubt be strengthened by the knowledge that*~~

~~*John of Gaunt's daughter, the mother of the great earl a*~~

~~*of Warwick, had also borne the favourite local name, Shakespeare himself it will be remembered had two sisters of this name, the elder Joan,*~~

~~*born some time before him, the firstborn of the family indeed, who died in infancy, and the younger Joan, who survived him. But the local popularity of a name, familiarly associated with the kitchen and the scullery rather than with the court or the palace, is no doubt due to one of the more striking incidents of the long conflict between the English and the Welsh on the western border. As we have seen, during the Barons' War and the Wars of the Roses the western border was the scene of active conflict, each party seeking Welsh support, and each being able in turn to rally a*~~

~~*noticing in some detail. Mr Hallam, in a well-known passage, has stated that 'no letter of Shakespeare's writ- ing, no record of his conversation, has been preserved," But we certainly have at least one conversation reported at first hand, and it turns directly on the point in question. It relates to a proposal made in 1614 by some of the local proprietors for the enclosure of certain common lands at Welcombe and Old Stratford. The corporation of Strat- ford strongly opposed the project on the ground that it would be a hardship to the poorer members of the com- munity, and their clerk Mr Thomas Greene, who was related to Shakespeare, was in London about the business in November of the same year. Under date November*~~

~~*17th Greene says, in notes which still exist, 'My cosen Shakespear comyng yesterdy to town, I went to see him how he did. He told me that they assured him they ment to inclose no further than to Gospell Bush, and so upp straight (leavyng out part of the Dyngles to the ffield) to the gate in Clopton hedg, and take in Salis- buryes peece ; and that they mean in Aprill to survey the land, and then to gyve satisfaction, and not before; and he and Mr Hall say they think ther will be nothyng done at all." This proves that the agents of the scheme had seen Shakespeare on the subject, that he had gone care- fully into the details of their plan, consulted his son-in- law Dr John Hall about them, and arrived at the conclu- sion that for the present they need take no decided action in the matter. There is evidently on Shakespeare's part a strong feeling against the proposed enclosure, and the agents of the scheme had clearly done their best to*~~

~~*remove his objections, promising amongst other things that if it went forward he should suffer no pecuniary loss, a pro- mise already confirmed by a legal instrument. But nine months later, when the local proprietors seemed bent on pushing the scheme, Shakespeare takes a more decided stand, and pronounces strongly against the whole business. We have a notice, dated September 1, 1615, to the effect that Mr Shakespeare had on that day told the agent of the corporation "that he was not able to bear the enclosing of Welcombe." As his proprietary rights and pecuniary interests were not to be affected by the pro- posed enclosure, this strong expression of feeling must refer to the public advantages of the Welcombe common fields, and especially to what in Scotland would be called their "amenity," the element of value arising from their freedom and beauty, their local history and associations. Welcombe, as we have seen, was the most picturesque suburb of Stratford. The hills divided by the leafy Dingles afforded the finest panoramic view of the whole neighbourhood. On their eastern slope they led to Ful- broke Park, the probable scene of the deer-stealing adven- ture, and towards the north-west to the village of Snitter- field with its wooded sweep of upland "bushes." Every acre of the ground was associated with the happiest days of Shakespeare's youth. In his boyish holidays he had repeatedly crossed and recrossed the unfenced fields at the foot of the Welcombe Hills on his ways to the rustic scenes and occupations of his uncle Henry's farm in the outlying forest village. He knew by heart every boundary tree and stone and bank, every pond and sheep-pool, every barn and cattle-shed, throughout the whole well- frequented circuit. And in his later years, when after the turmoil and excitement of his London life he came to reside at Stratford, and could visit at leisure the scenes of his youth, it was perfectly natural that he should shrink*~~

~~*from the prospect of having these scenes partially destroyed.*~~

~~*and their associations broken up by the rash hand of needless innovation. In his own emphatic language, "he could not bear the enclosing of Welcombe," and the only authoritative fragment of his conversation preserved to us thus brings vividly out one of the best known and most distinctive features of his personal character and history—his deep and life-long attachment to his native place. Another illustration of the same*~~

~~*feeling, common both to Scott and Shakespeare, is supplied by the prudence and foresight they both displayed in husbanding their early gains in order to provide, amidst the scenery they loved, a permanent home for themselves and their families. Shakespeare, the more careful and sharp-sighted of the two, ran no such risks and experienced no such reverses of fortune as those which saddened Scott's later days. Both, however, spent the last years of their lives in the home which their energy and affection had provided, and both*~~

~~*SBHARE SPEARS*~~

~~*sleep their last sleep under the changing skies and amidst the fields and streams that gave light and music to their earliest years. Hence, of all great authors, they are the two most habitually thought of in connexion with their native haunts and homesteads. Even to his contempo- raries Shakespeare was known as the Swan of Avon. The two spots on British ground most completely identified with the noblest energies of genius, consecrated by life- long associations, and hallowed by sacred dust are the banks of the Tweed from Abbotsford to Dryburgh Abbey, and the sweep of the Avon from Charlecote Park to Strat- ford church. To all lovers of literature, to all whose spirits have been touched to finer issues by its regenerating influence, these spots, and above all the abbey grave and the chancel tomb, are holy ground,— national shrines visited by pilgrims from every land, who breathe with pride and gratitude and affection the household names of Shakespeare and of Scott.*~~

~~*The name Shakespeare is found in the Midland counties Shake- two centuries before the birth of the poet, scattered so speare*~~

~~*widely that it is not easy at first sight to fix the locality of its rise or trace the lines of its progress. Several facts, however, would seem to indicate that those who first bore it entered Warwickshire from the north and west, and may therefore have migrated in early times from the neighbour- ing marches. The name itself is of course thoroughly English, and it is given by Camden and Verstegan as an illustration of the way in which surnames were fabricated when first introduced into England in the 13th century. But it is by no means improbable that some hardy borderers who had fought successfully in the English ranks may have received or*~~

~~assumed a significant and sounding designation that would help to perpetuate the memory of their martial prowess. We have indeed a distinct and authoritative assertion that some of Shake- speare's ancestors had served their country in this way. However this may be, families bearing the name are found during the 15th and 16th centuries in the Arden district, especially at Wroxhall and Rowington,—some being connected with the priory of Wroxhall, while during the 15th century the names of more than twenty are enumerated as belonging to the guild of St Ann, at Knoll near Rowington. In the roll of this guild or college are also found the representatives of some of the best families in the county, such as the Ferrerses of Tamworth and the Clintons of Coleshill. Among the members of the guild the poet's ancestors are to be looked for, and it is not improbable, as Mr French suggests, that John and Joan Shakespeare, entered on the Knoll register in 1527, may have been the parents of Richard Shakespeare of Snitterfield, whose sons gave each to his children the favourite family names. Richard Shakespeare, the poet's grandfather, occupied a substantial dwelling and culti- vated a forest farm at Snitterfield, between 3 and 4 miles from Stratford. He was the tenant of Robert Arden of Wilmcote, "a gentleman of worship," who farmed his own estate, situated a few miles to the west of Snitterfield. Richard Shakespeare was settled at the latter hamlet and doing well as early as 1543, Thomas Atwood of Stratford having in that year bequeathed to him four oxen which were then in his keeping; and he continued to reside there certainly till 1560, and probably till his death. He appears to have had two sons, John and Henry, of whom John, the eldest, early broke through the contracted circle of rustic life at Snitterfield, made his way to Stratford, and established himself as a trader in one of the leading thoroughfares of the town. This movement to the town probably took place in 1551, as in 1552 John Shakespeare is described in an official document as residing in Henley Street, where the poet was subsequently born. As to the~~

~~The poet's father.~~

~~Early pro- Sperity,~~

~~SBHAKESPEARE~~

~~*precise nature of his occupation, the kind of wares in which he principally dealt, there are various and conflict- ing statements that have given rise to a good deal of dis- cussion. The carliest official statement on the subject occurs in the register of the bailiff's court for the year 1556. He is there described as a " glover," which, according to the verbal usage of the time, included deal- ing in skins, as well as in the various leather-made articles of farming gear, such as rough gauntlets and leggings for hedging and ditching, white leather gloves for chopping wood, and the like. But in addition to the trade of glover and fell-monger tradition assigns to John Shakespeare the functions of butcher, wool-stapler, corn-dealer, and timber-merchant. These occupations are not incompatible, and together they represent the main lines some of which at least a young farmer going into the town for trading purposes would be likely to pursue. He would naturally deal with the things he knew most about, such as corn, wool, timber, skins, and leather-made articles used in farm work—in a word, he would deal in farm conveniences and farm products. In a town that was the centre and chief market of an agricultural and grazing district, and as the member of a family whose wide connexions were nearly all engaged in farming operations, his prospects were certainly rather favourable than otherwise. And he soon began to turn his country connexion to account. There is distinct evidence that he early dealt in corn and wood as well as gloves and leather, for in 1556 he sues a neighbour for eighteen quarters of barley, and a few years later is paid three shillings by the corporation for a load of timber.*~~

~~*The poet's father was evidently a man of energy, ambition, and public spirit, with the knowledge and ability requisite for pushing his fortune with fair success in his new career. His youthful vigour and intelligence soon told in his favour, and in a short time we find him taking an active part in public affairs. He made way so rapidly indeed amongst his fellow-townsmen, that within five years after entering Stratford he is recognized asa fitting recipient of municipal honours ; and his official appointments steadily rise in dignity and value through the various gradations of leet-juror, ale-taster, constable, affeeror, burgess, chamberlain, and alderman, until in 1568 he gains the most distinguished post of official dignity, that of high-bailiff or mayor of the town. Within twenty years after starting in business in Henley Street he thus rises to the highest place in the*~~

~~direction of municipal affairs, presiding as their head over the deliberations of his fellow aldermen and burgesses, and as chief magistrate over the local court of record. Three years later, in 1571, he was again elected as chief alderman. There is ample evidence, too, that during these years he advanced in material prosperity as well as in municipal dignities and honours. As early as 1556 he had means at his command which enabled him to purchase two houses in the town, one in Henley Street with a considerable garden, and another in Greenhill Street with a garden and croft attached to it. In the following year he married an heiress of gentle birth, Mary Arden of the Asbies, who had recently inherited under her father's will a substantial sum of ready money, an estate at Wilmcote, consisting of nearly 60 acres of land with two or three houses, and a reversionary interest in houses and lands at Snitterfield, including the farm tenanted by Richard Shakespeare, her husband's father. Being now a landed proprietor and a man of rising position and influence, John Shakespeare would be able to extend his business operations, and it is clear that he did so, though whether always with due prudence and foresight may be fairly questioned. To a man of his sanguine and somewhat impetuous temper the sudden increase of wealth was~~

~~probably by no means an unmixed good. But for some years, at all events, he was able to maintain his more Prosperous state, and his new ventures appear for a time to have turned out well. He is designated in official documents as yeoman, freeholder, and gentleman, and has the epithet "master" prefixed to his name; this, being equivalent to esquire, was rarely used except in relation to men of means and station, possessing landed property of their own. In a note to another official document it is stated that about the time of his becoming chief magis- trate of Stratford John Shakespeare had "lands and tene- ments of good worth and substance" estimated in value at £500, and though there may be some exaggeration in this estimate his property from various sources must have been worth nearly that sum. And in 1575 he increased the total amount by purchasing two houses in Henley Street, the two that still remain identified with the name and are consecrated by tradition as the~~

~~*birthplace of the poet. But this was his last purchase, the tide of his hitherto pro- sperous fortunes being but too clearly already on the turn. Having passed the highest point of social and commercial success, he was now facing the downward slope, and the descent once begun was for some years continuous, and at times alarmingly and almost inscrutably rapid.*~~

~~*It seems clear indeed from the facts of the case that, notwith- Reverse of and early fortune.*~~

~~*standing John Shakespeare's intelligence, activity, success, there was some defect of character which introduced an element of instability into his career, and in the end very much neutralized the working of his nobler powers. Faintly discernible perhaps from the first, and overpowered only for a time by the aecess of prosperity that followed his fortunate marriage, this vital flaw ultimately produced its natural fruit in the serious embazrass- ments that clouded his later years. The precise nature of the defeet can only be indicated in general terms, but it seems to have consisted very much in a want of measure and balance, of adequate eare and foresight, in his business dealings and calcula- tions. He seems to have possessed the eager sanguine tempera- ment which, absorbed in the immediate object of pursuit, overlooks difficulties and neglects the wider considerations on which lasting success depends. Even in his early years at Stratford there are signs of this ardent, impatient, somewhat unhecdful temper. He is not only active and pushing, but too restless and excitable to pay proper attention to necessary details, or discharge with punctuality the minor duties of his position. The first recorded fact in his local history illustrates this feature of his character. In April 1552 John Shakespeare is fined twelve pence, equal to between eight and ten shillings of our English money now, for not remoy- ing the heap of household dirt and refuse that had accumulated in front of hisowndoor. Anotherillustration of his want of thorough method and system in the management of his affairs is supplied by the fact that in the years 1556-57 he allowed himself to be sued in the bailiff's court for comparatively smalldebts. This could not have arisen from any want of means, as during the same period, in October 1556, he made the purchase already referred to of two houses with extensive gardens. The actions for debt nmst there- fore have been the result of negligence or temper on John Shakespeare's part, and cither*~~

~~alternative tells almost equally against his habits of business coolness and regularity. Another illustration of his restless, ill-considered, and unbalanced energy may be found in the number and variety of occupations which he seems to have added to his early trade of glover and leather-dealer.~~

~~-As his prospeets improved he appears to have seized on fresh~~

~~branches of business, until he had included within his grasp the whole circle of agricultural products that could in any way be brought to market. It would seem also that he added farming, to a not inconsiderable extent, to his expanding retail business in Stratford. But it is equally clear that he lacked the orderly method, the comprehensive outlook, and the vigilant care for details essential for holding well in hand the threads of so coni- plicated a commercial web. Other disturbing forces may probably be discovered in the pride and ambition, the love of social excite- ment and display, which appear to be among the ground notes of John Shakespeare's character so far as it is revealed to us in the few facts of his history. HIs strong social feeling and love of pleasurable excitement are illustrated by the fact that during the year of his mayoralty he brought companies of players into the town, and inaugurated dramatic performances in the guild hall. It is during the year of his filling the post of high-bailiff that we first hear of stage plays at Stratford, and the players must have visited the town, if not, as is most likely, at the invitation and desire of the poet's father, at least with his sanction and support.~~

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~~Moral effects.~~

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~~In such cases the players could not act at all without the per- mission of the mayor and council, and their first performance was usually a free entertainment, patronized and paid for by the eorpora- tion, and called the mayor's play. In all this John Shakespeare took the initiative, and in so doing probably helped to decide the future career of his son. The notes~~

~~*of personal pride and social ambition are equally apparent. It is on record, for example, that soon after reaching the highest post of municipal distinction the poet's father applied to the heralds' college for a grant of arms. This application was not at the time successful, but it seems to have been so far seriously entertained that official inquiries were made into the family history and social standing of the Shake- spearcs. But the remarkable fact is that such an application should have been made at all by a Stratford burgess whose position and prospects were so unstable and precarious as the events of the next few years showed those of John Shakespeare to be. At the time of the application his increasing family must have enlarged his household expenses, while his official position, combined with his open and generous nature, his love of social sympathy, distinc- tion, and support, would probably have led him into habits of free- handed hospitality and inconsiderate expenditure. All this must have helped to introduce a scale of lavish domestic outlay that would tend directly to hasten the financial collapse in his affairs that speedily followed. And oun finding things going against him John Shakespeare was just the man to discount his available resources,-auld, as the pressure increased, mortgage his future and adopt any possible expedient for maintaining the increased port and social consequence he had imprudently assumed.*~~

~~*This seems to have been the course actually pursued when pecu- niary difficulties arose. During the three years that elapsed after his last purchase of house property his affairs became so seriously embar- rassed that it was found necessary, if not to sacrifice, at least to jeo- pardize the most cherished future of the family in order to meet the exigencies of the moment. In 1578 John and Mary Shakespeare mortgaged for forty pounds their most considerable piece of landed property, the estate of the Asbies. The mortgagee was a family connexion of their own, Edmund Lambert, who had married Mary Shakespcare's sister Joan. The subsequent history of this transac- tion shows how bitter must have been the need that induced the Shakespeares to surrender, even for a time, their full control over the ancestral estate. The next year, however, the pressure, instead of being relieved by the sacrifice, had become still more urgent, and the only outlying property that remained to meet it was the reversionary interest in the Snitterfield estate. Under a family settlement*~~

~~*Mary Shakespeare, on the death of her stepmother, would come into the possession of houses and land at Snitterfield almost equal in value to the Asbies estate. But in 1579 the Shakespeares found it necessary to dispose altogether of this reversionary interest. In that year it was sold to Robert Webb for the sum of forty pounds. The buyer was a nephew of Mary Shakespeare, being the son of Alexander Webb, who had married her sister Margaret. In thus applying to relatives or family con- nexions in their need, and disposing of their property to them, the Shakespeares may have hoped it would be more easily regained should times of prosperity return. The sacrifice of the remaining interests in the Snitterfield property afforded, however, only a temporary relief, quite insufficient to remove the accumulating burden of debt and difficulty which now weighed the Shakespeares down. The notes of the proceedings of the Stratford corporation and of the local court of record sufficiently show that John Shake- speare's adverse fortune continued through a series of years, and they also enable us in part to understand how he bore himself under the changes in his social position that followed. These changes begin in the critical year 1578. In January of that year, when his brother aldermen were called upon to pay a considerable sum each as a contribution to the military equipment to be provided by the town, John Shakespeare is so far relieved that only one half the amount is required from him. Later in the year we find him wholly exempted from the weekly tax paid by his fellow-aldermen for the relief of the poor. In the spring of the follow- ing year, on a further tax for military purposes being laid on the town, he is unable to contribute anything, and is accordingly reported as a defaulter. A few years later, in an action for a debt, a verdict is recorded against him, with the official report that he had no goods on which distraint could be made. About the same time he appears to have been under some restraint, if not actually imprisoned for debt. And as late as 1592 it is officially stated, as a result of an inquiry into the number who fail to attend the church service once a month according to the statutory require- ment, that John Shakespeare with some others, two of whom, curiously enough, are named Fluellen and Bardolph, "come not to church for fear of process for debt." In the year 1586 another alderman had at length been chosen in his place, the reason given being expressly because " John Shakespeare doth not come to the halles when they are warned, nor hath not done for a long time."*~~

~~*From this brief official record it would seem that under his reverse of fortune he was treated with marked sympathy and consideration*~~

~~*SHAKESPEARE*~~

~~*by his fellow townsmen. For at least seven years after his troubles first began his fellow-burgesses persist in keeping his name in its place of honour on their roll, partly no doubt as a mark of respect for his character and past services, and partly it may be in the hope that his fortunes might improve and prosperous days return. And, when at length he is superseded by the appoint- ment of another in his place, this is done, not on the ground of his reduced circumstances, but simply because he voluntarily absents himself from the council, never attends its meetings or takes any part in its affairs. This is a noteworthy fact illustrating still further John Shakespeare's character. The statement clearly indicates the kind of moral eollapse that had followed the con- tinuous pressure of material reverses. The eager sanguine nature that had so genially expanded in prosperity was, it is clear, sorely chilled and depressed by adversity. He abandons the usual places of resort, withdraws himself from the meetings of the corporation, and ceases to associate with his fellow-burgesses, And, what is perhaps still more noticeable, he gives up attending church, and no longer even worships with his fellow-townsmen. All this is the more significant because his circumstances, though seriously embarrassed, and for some years mueh reduced, were never so desperate as to compel him to part with his freehold property in Henley Street. In the darkest hours of his clouded fortune he still retained the now world-famous houses associated with the poet's birth and early years. There was no adequate reason therc- fore why John Shakespeare should have so completely forsaken the usual haunts and regular assemblies of his fellow-townsmen and friends. But it seems clear, as already intimated, that, while gifted with a good deal of native energy and intelligence, and possessing a temper that was proud, sensitive, and even passionate, John Shakespeare laeked the kind of fortitude and moral courage which enables men to meet serious reverses of fortune with dignity and reserve, if not with cheerfulness and hope. With the instinct of a wounded animal he seems to have left the prosperous herd and retired apart to bear his pain and loss in solitude and alone. Nor apparently did he hold up his*~~

~~*head again until the efficient support of his prosperous son enabled him to take active measures for the recovery of his alienated estate and lost position in the town. By the middle of the last decade of the 16th century the poet's success in his profession was thoroughly assured, and he was on the high road to wealth and fame. As actor, dramatist, and probably also as sharer in the Blackfriars theatre, he was in the receipt of a large income, and according to tradition received a considerable sum from the young earl of Southampton, to whom his poems were dedicated. The son was now therefore as able as he had always been willing to help his father to regain the position of comfort and dignity he had formerly occupied. We find accord- ingly that in 1597 John and Mary Shakespeare filed a bill in Chancery against John Lambert for the recovery of the Asbies estate, which had been mortgaged to his father nearly twenty years before. There had indeed been some movement in the matter ten years earlier, on the death of Edward Lambert the mortgagee. His son John being apparently anxious to settle the dispute, it was proposed that he should pay an additional sum of twenty pounds in order to convert the mortgage into a sale, and that he should then receive from the Shakespeares an absolute title to the estate. The arrangement was not, however, carried out, and in 1589 John Shakespeare brought a bill of complaint against Lambert in the Court of Queen's Bench. Nothing further, how- ever, seems to have been done, probably because Lambert may have felt that in the low state of the Shakespeares' fortune the action could not be pressed. In 1597, however, there was a change in the relative position of the litigants, John Shakespeare having now the purse of his son at his command, and a bill in Chancery was accordingly filed against John Lambert. The plea in support of the Shakespeares' claim was that the original con- ditions of the mortgage had been fulfilled, the money in discharge having been offered to Edward Lambert at the proper date, but refused by him on the ground that other sums were owing which must also be repaid at tho same time. To this plea John Lambert replied, and there is a still further "replication" on the part of the Shakespeares. How the matter was eventually decided is not known, no decree of the court in the case having been discovered. But the probabilities arc that it was settled out of court, and, as the estate did not return to the Shakespeares, probably on the basis of the proposal already made,—that of the payment of an additional sum by John Lambert. About the same date, or rather*~~

~~*earlier, in 1596, John Shakespeare also renewed his application to the heralds' college for a grant of arms, and this time with success. The grant was made on the ground that the history and position of the Shakespeare and Arden families fully entitled the applicant to receive coat armour. There can be no doubt that the means required for supporting these applications were supplied by the poet, and he would be well rewarded by the knowledge that in the evening of his days his father had at length realized the desire of his heart, being officially recognized as a "gentleman of worship." And, what would now perhaps please his father still better, he*~~

~~*The poet's mother.*~~

~~*Family of Alwin, an early representative of the family, and himself*~~

~~*Arden,*~~

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~~*would be able to hand on the distinction to his son, whose pro- fession prevented him at the time from gaining it on his own account. John Shakespeare died in 1601, having through the affectionate care of his son spent the last years of his life in the ease and comfort befitting one who had not only been a prosperous burgess, but chief alderman and mayor of Stratford.*~~

~~*Of Mary Arden, the poet's mother, we know little, hardly anything directly indeed ; but the little known is wholly in her favour. From the provisions of her father's will it is clear that of his seven daughters she was his favour- ite; and the links of evidence are now complete connecting her father Robert Arden with the great Warwickshire family of Arden, whose members had more than once filled the posts of high-sheriff and lord-lieutenant of the county. She was thus descended from an old county family, the oldest in Warwickshire, and had inherited the traditions of gentle birth and good breeding. Her ancestors are traced back, not only to Norman, but to Anglo-Saxon times,*~~

~~*nate a landed proprietor who farmed one of his own estates, The fact of his being spoken of in official documents as a husbandman does not therefore in the least affect Robert Arden's social position, or his relation to the great house of Arden, which is now established on the clearest evidence. He was, however, a younger member of the house, and would naturally share in the diminished fortune and obscurer career of such a position. But, even as a cadet of so old and distinguished a family, he would tenaciously preserve the generous traditions of birth and breeding he had inherited, Mary Arden was thus a gentlewoman in the truest sense of the term, and she would bring into her husband's household elements of character and culture that would be of priceless value to the family, and espe- cially to the eldest son, who naturally had the first place in her care and love. A good mother is to an imagina- tive boy his earliest ideal of womanhood, and in her for him are gathered up, in all their vital fulness, the ten- derness, sympathy, and truth, the infinite love, patient watchfulness, and self-abnegation of the whole sex. And the experience of his mother's bearing and example during the vicissitudes of their home life must have been for the future dramatist a vivid revelation of the more sprightly and gracious, as well as of the profounder elements, of female character. In the earlier and prosperous days at Stratford, when all within the home circle was bright and happy, and in her intercourse with her boy Mary Shake- speare could freely unfold the attractive qualities that had so endeared her to her father's heart, the delightful image of the young mother would melt unconsciously into the boy's mind, fill his imagination, and become a storehouse whence in after years he would draw some of the finest lines in his matchless portraiture of women. In the darker days that followed he would learn something of the vast possibilities of suffering, personal and sympathetic, be- longing to a deep and sensitive nature, and as the troubles made head he would gain some insight into the quiet courage and self-possession, the unwearied fortitude, sweet- ness, and dignity which such a nature reveals when stirred to its depths by adversity, and rallying all its resources to meet the inevitable storms of fate. These storms were not simply the ever-deepening pecuniary embarrassments and consequent loss of social position. In the very crisis of the troubles, in the spring of 1579, death entered the straitened household, carrying off Ann, the younger of the*~~

~~*connected with the royal house of Athelstane, having been vice-comes or sheriff of Warwickshire in the time of Edward the Confessor. His son Turchill retained his extensive possessions under the Conqueror ; and, when they were divided on the marriage of his daughter Margaret to a Norman noble created by William Rufus earl of Warwick, Turchill betook himself to his numerous lordships in the Arden district of the county, and assumed the name of De Ardern or Arden. His descendants, who retained the name, multiplied in the shire, and were united in marriage from time to time with the best Norman blood of the kingdom. The family of Arden thus represented the union, under somewhat rare conditions of original distinction and equality, of the two great race elements that have gone to the making of the typical modern Englishman. The immediate ancestors of Mary Shakespeare were the Ardens of Parkhall, near Aston in the north-western part of the shire. During the Wars of the Roses Robert Arden of Parkhall, being at the outset of the quarrel a devoted Yorkist, was seized by the Lancastrians, attached for high treason, and executed at Ludlowin 1452. He left an only son, Walter Arden, who was restored by Edward IV. to his position in the country, and received back his hereditary lordships and lands. At his death in 1502 he was buried with great state in Aston church, where three separate monuments were erected to his memory. He had married Eleanor, second daughter of John Hampden of Bucks, and by her had eight children, six sons and two daughters. | only two remaining daughters of John and Mary Shake- The eldest son, Sir John Arden of Parkhall, having been | speare. A characteristic trait of the father's grief and for some years esquire of the body of Henry VII., was | pride is afforded by the entry in the church books that a knighted and rewarded by that monarch. Sir John was somewhat excessive sum was paid on this occasion for the the great-uncle of Mary Shakespeare,—his brother Thomas, | tolling of the bell. Even with ruin staring him in the the second son of Walter Arden, being her grandfather. | face John Shakespeare would forego no point of customary Thomas Arden is found residing at Aston Cantlowe during respect nor abate one jot of the ceremonial usage proper the first half of the 16th century, and in the year 1501 he | to the family of an eminent burgess, although the observ- united with his son Robert Arden, Mary Shakespeare's | ance might involve a very needless outlay. In passing father, in the purchase of the Snitterfield estate. Mary | through these chequered domestic scenes and vividly*~~

~~*Shakespeare was thus directly connected by birth and realizing the alternations of grief and hope, the eldest son, lineage with those who had taken, and were to take, a | even in his early years, would gain a fund of memorable foremost part in the great conflicts which constitute turning- | experiences. From his native sensibility and strong points in the history of the country. On her father's side | family affection he would passionately sympathize with she was related to Robert Arden, who in the 15th century | his parents in their apparently hopeless struggle against lost his life while engaged in rallying local forces on behalf | the slings and arrows of outrageous fortune. Above all of the White Rose, and on her mother's side to John | he would cherish the memory of his mother's noble bear- Hampden, who took a still more distinguished part in the | ing alike under serene and clouded skies, and learn to momentous civil struggles of the 17th century. estimate at their true worth the refined strength of*~~

~~*A very needless and abortive attempt has been made to | inherited courage, the dignified grace and silent helpful- call in question Robert Arden's social and family position | ness of inherited courtesy and genuine kindness of heart. on the ground that in a contemporary deed he is called a | These recollections were vitalized in the sprightly intelli- husbandman (agricola), — the assumption being that a| gence, quick sympathy, and loving truthfulness belonging husbandman is simply a farm-labourer. But the term | to the female characters of his early comedies, as well as husbandman was often used in Shakespeare's day to desig- | in the profounder notes of womanly grief and suffering,*~~

~~*Mary Arden — character*~~

~~*influence.*~~

~~*748 PHAKRESYP EAE DT*~~

~~*struck with so sure a hand and with such depth and intensity of tone, in the early tragedies. Qualities But in addition to her constant influence and example the inherited noet was probably indebted to his mother for certain ele- en ments of his own mind and character directly inherited from ' her. This position may be maintained without accepting the vague and comparatively empty dictum that Shakespeare derived his genius*~~

~~*from his mother, as many eminent men are loosely said to have done. The sacred gift of genius has ever been, and perhaps always will be, inexplicable. No analysis, however complete, of the forces acting on the individual mind can avail to extract this vital secret. The elements of race, country, parentage, and education, though all powerful factors in its development, fail ade- quately to account for the mystery involved in pre-eminent poetical genius. Like the unseen wind from heaven it bloweth where it listeth, and the inspired voice is gladly heard of men, but none can tell whence it cometh or whither it goeth. While, however, genius is thus without ancestry or lineage, there are elements of character and qualities of mind that, like the features of the countenance and the lines of the bodily frame, appear to be clearly transmissible from parent to child. Shakespeare not unfrequently recognizes this general truth, especially in relation to moral qualities; and it is mainly qualities of this kind that he himself appears to have inherited from his gently born and nurtured mother, Mary Arden of the Asbies. At least it is hardly fanciful to say that in the life and character of the poet we may trace ele- ments of higher feeling and conduct derived from the hereditary culture and courtesy, the social insight and refinement, of the Ardens. Amongst such elements may be reckoned his strong sense of independence and self-respect, his delicate feeling of honour, his habitual con- sideration for others, and, above all perhaps, his deep instinctive regard for all family interests and relationships, for everything indeed connected with family character and position. The two epithets which those who knew Shakespeare personally most habitually applied to him appear to embody some of these characteristics. They unite in describing him as "gentle" and "honest" in character, and of an open and free, a frank and generous disposition. The epithet "gentle" may be taken to repre- sent the innate courtesy, the delicate consideration for the feelings of others, which belongs in a marked degree to the best representatives of gentle birth, although happily it is by no means confined to them. The second epithet, "honest," which in the usage of the time meant honourable, may be taken to express the high spirit of independence and self-respect which carefully respects the just claims and rights of others. One point of the truest gentle breeding, which, if not inherited from his mother, must have been derived from her teaching and example, is the cardinal maxim, which Shakespeare seems to have faith- fully observed, as to nice exactness in*~~

~~*money matters—the maxim not lightly to incur pecuniary obligations, and if incurred to meet them with scrupulous precision and punctuality. This he could not have learnt from his father, who, though an honest man enough, was too eager and careless to be very particular on the point. Indeed, carelessness in money matters seems rather to have belonged to the Snitterfield family, the poet's uncle Henry having been often in the courts for debt, and, as we have seen, this was true of his father also. But, while his father was often prosecuted for debt, no trace of any such action against the poet himself, for any amount however small, has been discovered. He sued others for money due to him and at times for sums comparatively small, but he never appears as a debtor himself. Indeed, his whole life contradicts the supposition that he would ever*~~

~~*have rendered himself liable to such a humiliation. The family troubles must have very early developed and strengthened the high feeling of honour on this vital point he had inherited. He must obviously have taken to heart the lesson his father's imprudence could hardly fail to impress on a mind so capacious and reflective. John Shakespeare was no doubt a warm-hearted lovable man, who would carry the sympathy and affection of his family with him through all his troubles, but his eldest son, who early understood the secret springs as well as the open issues of life, must have realized vividly the rock on which their domestic prosperity had been wrecked, and before he left home he had evidently formed an invincible resolution to avoid it at all hazards. This helps to explain what has often excited surprise in relation to his future career—his business industry, financial skill, and steady progress to what may be called worldly success. Few things are more remarkable in Shakespeare's personal history than the resolute spirit of independence he seems to have displayed from the moment he left his straitened household to seek his fortunes in the world to the time when he returned to live at Stratford as a man of wealth and position in the town. While many of his fellow dramatists were spendthrifts, in constant difficulties, lead- ing disorderly lives, and sinking into unhonoured graves, he must have husbanded his early resources with a rare amount of quiet firmness and self-control. Chettle's testi- mony as to Shakespeare's character and standing during his first years in London is decisive on this head. Having published a posthumous work by Greene, in which Mar- lowe and Shakespeare were somewhat*~~

~~*sharply referred to, Chettle expressed his regret in a preface to a work of his own issued a few months later, in December 1592; he intimates that at the time of publishing Greene's Groats- worth of Wit he knew neither Marlowe nor Shakespeare, and that he does not care to become acquainted with the former. But having made Shakespeare's acquaintance in the interval he expresses his regret that he should, even as editor, have published a word to his disparage- ment, adding this remarkable testimony : " Because myself have seen his demeanour, no less civil than he excellent in the qualities he professes; besides, divers of worship have reported his uprightness of dealing, which argues his honesty, and his facetious grace in writing, which approves his art." So that Shakespeare, during his earliest and most anxious years in London, had not only kept himself out of debt and difficulty, but had estab- lished a reputation of strictly honourable conduct, " divers of worship," 2.¢., men of position and authority entitled to speak on such a point, "having reported his upright- ness of dealing, which argued his honesty." Now, consider- ing the poet's associates, occupations, and surround- ings, this is significant testimony, and conclusively proves that, although fond of social life and its enjoyments, and without a touch of harshness or severity in his temper, he yet held himself thoroughly in hand, that amidst the ocean of new experiences and desires on which he was suddenly launched he never abandoned the helm, never lost command over his course, never sacrificed the larger interests of the future to the clamorous or excessive demands of the hour. And this no doubt indicates the direction in which he was most indebted to his mother. From his father he might have derived ambitious desires, energetic impulses, and an excitable temper capable of rushing to the verge of passionate excess, but, if so, it is clear that he inherited from his mother the firmness of nerve and fibre as well as the ethical strength required for regulating these violent and explosive elements. If he received as a paternal heritage a very tempest and whirl- wind of passion, the maternal gift of temperance and*~~

~~*measure would help to give it smoothness and finish in the working, would supply in some degree at least the power of concentration and self-control indispensable for moulding the extremes of exuberant sensibility*~~

~~*and pas- sionate impulse into forms of intense and varied dramatic portraiture ; and of course all the finer and regulative elenients of character and disposition derived from the spindle side of the house would, throughout the poet's early years, be strengthened and developed by his mother's constant presence, influence, and example.*~~

~~*John and Mary Shakespeare had eight children, four sons and four daughters. Of the latter, two, the first Joan and Margaret, died in infancy, before the birth of the poet, and a third, Anne, in early childhood. In addition to the poet, three sons, Gilbert, Richard, and Edmund, and one daughter, the second Joan, lived to maturity and will be referred to again. William Shakespeare was christened in Stratford church on April 26, 1564, having most probably been born, according to tradition, on the 23d. In July of the same year the town was visited by a severe outbreak of the plague, which in the course of a few months carried off one-sixth of the inhab- itants. Fortunately, however, the family of the Shake- speares wholly escaped the contagion, their exemption being probably due to the fact that they lived in the healthiest part of the town, away from the river side, on a dry and porous soil. At the back of Henley Street, indeed, were the gravel pits of the guild, which were in frequent use for repairing the inundated pathways near the river after its periodical overflows. For two years and a half William, their first-born son, remained the only child of his parents, and all his mother's love and care would naturally be lavished upon him. A special bond would in this way be established between mother and child, and, his father's affairs being at the time in a highly prosperous state, Mary Shakespeare would see to it that the boy had all the pleasures and advantages suitable to his age, and which the family of a foremost Stratford burgess could easily command. Healthy outdoor enjoyment is not the least valuable part of a boy's education, and the chief recreations available for the future dramatist in those early years would be the sports and pastimes, the recur- ring festivals, spectacles, and festivities, of the town and neighbourhood, especially the varying round of rural occupations and the celebration in the forest farms and villages of the chief incidents of the agricultural year. Seed time and harvest, summer and winter, each brought its Own group of picturesque merry-makings, including some more important festivals that evoked a good deal of rustic pride, enthusiasm, and display. There were, during*~~

~~these years, at least three of the forest farms where the poet's parents would be always welcome, and where the~~

~~| to his parents as the proprietors and to himself as the heir of the maternal estate. At Shottery the welcome of the Shakespeares would not be less cordial or friendly, as there is evidence to show that as early as 1566 the families were known to each other, John Shakespeare having in that year rendered Richard Hathaway an im- portant personal service. Here the poet met his future bride, Anne Hathaway, in all the charm of her sunny girl- hood, and they may be said to have grown up together, except that from the difference of their ages she would reach early womanhood while he was yet a stripling. In his later youthful years he would thus be far more fre- quently at the Hathaway farm than at Snitterfield or the Asbies. There were, however, family connexions of the Shakespeares occupying farms further afield,—Hills and Webbs at Bearley and Lamberts at Barton-on-the-Heath. There was thus an exceptionally wide circle of country life open to the poet during his growing years. And in those years he must have repeatedly gone the whole picturesque round with the fresh senses and eager feeling, the observant eye and open mind, that left every detail, fron the scarlet hips by the wayside to the proud tops of the eastern pines, imprinted indelibly upon his heart and brain. Hence the apt and vivid references to the scenes and scenery of his youth, the intense and penetrating glances at the most vital aspects as well as the minutest beauties of nature, with which his dramas abound. These glances are so penetrating, the result of such intimate knowledge and enjoyment, that they often seem to reveal in a moment, and by a single touch as it were, all the loveliness and charm of the objects thus rapidly flashed on the inward eye. In relation to the scenes of his youth what fresh and delightful hours at the farms are reflected in the full summer beauty and motley humours of a sheep-shearing festival in the Winter's Tale ; In the autumn glow of the "sun-burnt sicklemen and sedge-crowned nymphs" of the masque in the Jempest; and in the vivid pictures of rural sights and sounds in spring and winter so musically rendered in the owl and cuckoo songs of Love's Labour's Lost! But, in addition to the festivities and merry-makings of the~~

~~*forest farms, it is clear that, in his early years, the poet had some experience of country sports proper, such as hunting, hawking, coursing, wild- duck shooting, and the like. Many of these sports were pursued by the local gentry and the yeomen together, and the poet, as the son of a well-connected burgess of Strat- ford, who had recently been mayor of the town and possessed estates in the county, would be well entitled to share in them, while his handsome presence and courteous bearing would be likely to ensure him a hearty welcome. If any of the stiffer local magnates looked coldly upon the high-spirited youth, or resented in any way his presence*~~

~~*boy must have spent many a happy day amidst the free- amongst them, their conduct would be likely enough to*~~

~~*Rural dom and delights of outdoor country life. At Snitterfield | provoke the kind of sportive retaliations that might sports his grandfather would be proud enough of the curly- | naturally culminate in the deer-stealing adventure. How- iy headed youngster with the fine hazel eyes, and his uncle | ever this may be, it is clear from internal evidence that rambles, Henry would be charmed at the boy's interest in all he | the poet was practically familiar with the field sports of*~~

~~*saw and heard as he trotted with him through the byres and barns, the poultry yard and steading, or, from a safe nook on the bushy margin of the pool, enjoyed the fun and excitement of sheep-washing, or later on watched the*~~

~~*his day. In the town the chief holiday spectacles and entertain- Holiday ments were those connected with the Christmas, New spectacles*~~

~~*Fj : 71 Year, and Easter festivals, the May-day rites and games, Eaton*~~

~~*mysteries of the shearing and saw the heavy fleece fall from the sides of the palpitating victim before the sure and rapid furrowing of the shears. He would no doubt also be present at the shearing feast and see the queen of the festival receive her rustic guests and distribute amongst them her floral gifts. At Wilmecote, in the solid oak- timbered dwelling of the Asbies, with its well-stocked garden and orchard, the boy would be*~~

~~received with cordial hospitality, as well as with the attention and respect due~~

~~the pageants of delight of Whitsuntide, the beating of the bounds during Rogation week, and the occasional repre- sentation of mysteries, moralities, and stage-plays. In relation to the main bent of the poet's mind, and the future development of his powers, the latter constituted probably the most important educational influence and stimulus which the social activities and public entertain- ments of the place could have supplied. Most of these recurring celebrations involved, it is true, a dramatic~~

~~May- day.~~

~~Whit- suntide,~~

~~Inter- ludes and~~

~~stage- plays.~~

~~750~~

~~element,—some hero or exploit, some emblem or allegory, being represented by means of costumed personations, pantomime, and dumb show, while in many cases songs, dances, and brief dialogues were interposed as part of a performance. There were masques and morris-dancing on May-day, as well as mummers and waits at Christmas. In a number of towns and villages the exploits of Robin Ifood and his associates were also celebrated on May-day, often amidst a picturesque confusion of floral emblems and forestry devices. In Shakespeare's time the May-day rites and games thus included a variety of elements charged with legendary, historical, and emblematical significance. But, notwithstanding this mixture of festive elements, the celebration as a whole retained its leading character and purpose. It was still the spontaneous meeting of town and country to welcome the fresh beauty of thé spring, the welcome being reflected in the open spaces of the sports by tall painted masts decked with garlands, streamers, and flowery crowns, and in the public thoroughfares by the leafy screens and arches, the~~

~~*bright diffused blossoms and fragrant spoils brought from the forest by rejoicing youths and maidens at the dawn. May-day was thus well fitted to be used, as it often is by Shakespeare, as the comprehensive symbol of all that is delightful and exhilarating in the renewed life and vernal freshness of the opening year.*~~

~~*After May-day, Whitsuntide was at Stratford perhaps the most important season of festive pageantry and scenic display. In addition to the procession of the guild and trades and the usual holiday ales and sports, it involved a distinct and somewhat noteworthy element of dramatic representation. And, as in the case of the regular stage- plays, the high-bailiff and council appear to have patron- ized and supported the performances. We find in the chamberlain's accounts entries of sums paid "for exhibit- ing a pastyme at Whitsuntide." Shakespeare himself refers to these dramatic features of the celebration, and in a manner that almost suggests he may in his youth have taken part in them. However this may be, the popular*~~

~~*celebrations of Shakespeare's youth must have supplied a*~~

~~*kind of training in the simpler forms of poetry and dramatic art, and have afforded some scope for the early exercise of his own powers in both directions. This view is indirectly confirmed by a passage in the early scenes of Lhe Return from Parnassus, where the academic speakers sneer at the poets who come up from the country without any university training. The sneer is evidently the more bitter as it implies that some of these poets had been successful,—more successful than the college-bred wits. The academic critics suggest that the nurseries of these poets were the country ale-house and the country green,—the special stimulus to their powers being the May-day celebrations, the morris-dances, the hobby-horse, and the like.*~~

~~*But the moralities, interludes, and stage-plays proper afforded the most direct and varied dramatic instruc- tion available in Shakespeare's youth. The earliest popular form of the drama was the mystery or miracle play, dealing in the main with Biblical subjects; and, Coventry being one of the chief centres for the production and exhibition of the mysteries, Shakespeare had ample opportunities of becoming well acquainted with*~~

~~them. Some of the acting companies formed from the numerous trade guilds of the "shiretown" were moreover in the habit of visiting the neighbouring cities for the purpose of exhibiting their plays and pageants. There is evidence of their having performed at Leicester and Bristol in Shakespeare's youth, and on returning from the latter city they would most probably have stopped at Stratford~~

~~and given some performances there. And in any case,~~

~~SHA KECGQPEHE ABE~~

~~Coventry being so near to Stratford, the fame of the multiplied pageants presented during the holiday weeks of Easter and Whitsuntide, and especially of the brilliant concourse that came to witness the grand series of Corpus Christi plays, would have early attracted the young poet ;~~

~~| and he must have become familiar with the precincts of~~

~~the Grey Friars at Coventry during the celebration of these great ecclesiastical festivals. The indirect evidence of this is supplied by Shakespeare's references to the well- known characters of the mysteries, such as Herod and Pilate, Cain and Judas, Termagaunt with his turbaned Turks and infidels, black-burning souls, grim and gaping hell, and the like. The moralities and interludes that gradually took the place of the Biblical mysteries were also acted by companies of strolling players over a wide area in the towns and cities of the Midland and western counties. Malone gives from an eye-witness a detailed and graphic account of the public acting of one of these companies at Gloucester in 1569, the year during which the poet's father as high-bailiff had brought the stage-players into Stratford and inaugurated a series of per- formances in the guild hall. The play acted at Gloucester was The Cradle of Security, one of the most striking and popular of the early moralities or interludes. Willis, the writer of the account, was just Shakespeare's age, having been born in 1564. As a boy of five years old he had been taken by his father to see the play, and, standing between his father's knees, watched the whole performance with such intense interest that, writing about it seventy years afterwards, he says, "the subject took such an im- pression upon me that when I came afterwards towards man's estate it was as fresh in my~~

~~*memory as if I had seen it newly enacted." In proof of this he gives a clear and detailed outline of the play. Willis was evidently a man of no special gifts, and, if the witnessing a play when a child could produce on an ordinary mind so memorable an impression, we may imagine what the effect would be on the mind of the marvellous boy who, about the same time and under like circumstances, was taken by his father to see the performances at Stratford. The com- pany that first visited Stratford being a distinguished one, their plays were probably of a higher type and better acted than The Cradle of Security at Gloucester ; and their effect on the young poet would be the more vivid and stimulating from the keener sensibilities and latent dramatic power to which in his case they appealed. These early impressions would be renewed and deepened with the boy's advancing years. During the decade of Shakespeare's active youth from 1573 to 1584 the best companies in the kingdom constantly visited Stratford, and he would thus have the advantage of seeing the finest dramas yet produced acted by the best players of the time. This would be for him a rich and fruitful experience of the flexible and impressive form of art which at a moment of exuberant national vitality was attracting to itself the scattered forces of poetic genius, and soon gained a position of unrivalled supremacy. As he watched the performance in turn of the various kinds of interlude, comedy, and pastoral, of chronicle and biographical plays, of historical, domestic, or realistic tragedy, he would gain in instructive insight into the wide scope and vast resources of the rising drama. And he would have opportunities of acquiring some knowledge of stage business, management, and effects, as well as of dramatic form. Amongst the com- panies that visited Stratford were those of the powerful local earls of Leicester, Warwick, and Worcester, whose members were largely recruited from the Midland counties. The earl of Leicester's company, the most eminent of all, included several Warwickshire men, while some of the leading members, like the elder Burbage, appear to have*~~

~~*School eduea- tion.*~~

~~*SHAKESPEARE*~~

~~*been natives of Stratford or the immediate neighbourhood. And the poet's father being, as we have seen, SO great a friend of the players, and during his most prosperous years in constant communication with them, his son would have every facility for studying their art. Curiosity and interest and the like would prompt him to find out all he could about the use of the stage "books," the distribution of the parts, the cues and exits, the management of voice and gesture, the graduated passion and controlled power of the leading actors in the play, the just subordination of the less important parts, and the measure and finish of each on which the success of the whole so largely depended. It is not improbable, too, that in connexion with some of the companies Shakespeare may have tried his hand both as poet and actor even before leaving Stratford. HIs poetical powers could hardly be unknown, and he may have written scenes and passages to fill out an imperfect or complcte a defective play; and from his known interest in their work he may have been pressed by the actors to appear in some secondary part on the stage. In any case he would be acquainted with some of the leading players in the best companies, so that when he decided to adopt their profession he might reasonably hope on going to London to find occupation amongst them without much difficulty or delay.*~~

~~*Shakespeare received the technical part or scholastic elements of his education in the grammar school of his native town. The school was an old foundation from the second half of the 15th century and connected with the guild of the HIoly Cross. But, having shared the fate of the guild at the suppression of religious houses, it was restored by Edward VI. in 1553, a few weeks before his death. The "King's New School," as it was now called, thus represented the fresh impulse given to educa- tion throughout the kingdom during the reign of HIenry VIHI.'s earnest-minded son, and well sustained under the enlightened rule of his sister, the learned virgin queen. What the course of instruction was in these country schools during the second half of the 16th century has recently been ascertained by special research,! and may be stated, at least in outline, with some degree of certainty and precision. As might have been expected, Latin was the chief scholastic drill, the thorough teaching of the Roman tongue being, as the name implies, the very purpose for which the grammar schools were originally founded. The regular teaching of Greek*~~

~~was indeed hardly introduced into the country schools until a somewhat later period. But the knowledge of Latin, as the language of all the learned professions, still largely used in literature, was regarded as quite indispensable. Whatever else might be neglected, the business of " gerund-grinding" was vigorously carried on, and the methods of teaching, the expedients and helps devised for enabling the pupils to read, write, and talk Latin, if rather complex and operose, were at the same time ingenious and effective. Asa rule the pupil entered the grammar school at seven years old, having already acquired either at home or at the petty school the rudiments of reading and writing. During the first year the pupils were occupied with the elements of Latin grammar, the accidence, and lists of common words which were committed to memory and repeated two or three times a week, as well as further impressed upon their minds by varied exercises. In the second year the grammar was fully mastered, and the boys were drilled in short phrase-books, such as the Sententizx Pueriles, to increase their familiarity with the structure and idioms of the language. In the third year the books used were sop's Lables, Cato's Maxims, and some good manual of~~

~~1 "*What Shakespeare learnt at School," Fraser's Magazine, Nov. 1879, Jan. and May, 1880.~~

~~school conversation, such as the Confabulationes Pueriles. The most popular of these manuals in Shakespeare's day was that by the eminent scholar and still more eminent teacher Corderius. HIs celebrated Colloquies were prob- ably used in almost every school in the kingdom; and Hoole, writing in 1652, says that the worth of the book had been proved " by scores if not hundreds of impressions in this and foreign countries," Bayle, indeed, says that from its universal use in the schools the editions of the book might be counted by thousands. This helps to illustrate the colloquial use of Latin, which was so essential a feature of grammar school discipline in the 16th and 17th centuries. The evidence of Brinsley, who was Shakespeare's contemporary, conclusively proves that the constant speaking of Latin by all the boys of the more advanced~~

~~*forms was indispensable even in the smallest and poorest of the country grammar schools. The same holds true of letter-writing in Latin ; and this,'as we know from the result, was diligently and successfully practised in the Stratford grammar school. During his school days, there- fore, Shakespeare would be thoroughly trained in the conversational and epistolary use of Latin, and several well- known passages in his dramas show that he did not forget this early experience, but that like everything else he acquired it turned to fruitful uses in his hands. The books read in the more advanced forms of the school were the Eclogues of Mantuanus, the Tristia and Metamorphoses of Ovid, Cicero's Offices, Orations, and Epistles, the Georgics and dined of Virgil, and in the highest form parts of Juvenal, of the comedies of Terence and Plautus, and of the tragedies of Seneca. Shakespeare, having remained at school for at least six years, must have gone through a greater part of this course, and, being a pupil of unusual quickness and ability, endowed with rare strength of mental grip and firmness of moral purpose, he must during those years have acquired a fair mastery of Latin, both colloquial and classical. After the difficulties of the grammar had been overcome, his early intellectual cravings and poetic sensibilities would be alike quickened and*~~

~~*gratified by the new world of heroic life and adventure*~~

~~*opened to him in reading such authors as Ovid and Virgil. Unless the teaching at Stratford was very exceptionally poor he must have become so far familiar with the favourite school authors, such as Ovid, Tully, and Virgil, as to read them intelligently and with comparative ease.*~~

~~*And there is no reason whatever for supposing that the instruc- tion at the Stratford grammar school was less efficient than in the grammar schools of other provincial towns of about the same size. There is abundant evidence to show that, with the fresh impulse given to education under energetic Protestant auspiees in the second half of the 16th century, the teaching cyen in the country grammar schools was as a rule painstaking, intelligent, and fruitful, Brinsley himself was for many years an eminent and successful teacher in the grammar school of Ashby-de-la-Zouche, a small town on the borders of Warwickshire, only a few miles indeed from Coventry; and in his Ludus Literarius, referring to a book of exercises on*~~

~~*the Latin accidence and grammar he had prepared, he says that he had chiefly followed the order of the questions "of that ancient schoolmaster Master Brunsword of Maxfield (Maccles- field) in Cheshire, so much commended for his order and schollers : who, of all other, commeth therein the neerest unto the marke," Another provincial schoolmaster, Mr Robert Doughty, a contem- porary of Shakespeare, who was for nearly fifty years at the head of the Wakefield grammar school, is celebrated by Hoole, not only as an eminent teacher who had constantly sent out good scholars, but as one who had produced a class of teachers emulating his own educational zeal and intelligence. The masters of the Stratford grammar school in Shakespeare's time seem to have been men of a similar stamp. One of them, John Brunsword, who held the post for three years during the poet's childhood, was almost certainly a relative, probably a son, of the eminent Macclesfield master whose character and work Brinsley praises so highly. At least, Bruns- word being an uncommon name, when we find it borne by two grammar-schoo] masters in neighbouring counties who flourished either together or in close succession to each other, it is natural to conclude that there must have been some relationship between*~~

~~*Home*~~

~~*life on leaving school.*~~

~~*Ta2*~~

~~*them, and if so we may be sure that the Stratford master, who was evidently the younger man, had been well trained and must have proved an efficient teacher. The masters who followed Brunsword were university men of at least average attainments and ability, as they rapidly gained promotion in the church. Thomas Hunt, who was head-master during the most important years of Shakespeare's school course, became incumbent of the neighbouring village of Luddington; and, if there is any truth in the tradition that the poet's marriage was celebrated there, it is not iniprobable that, from having been a favourite pupil, he may have become the personal friend of his former master. In any case, during the years of his school attendance the poet must have gained sufficient knowledge of Latin to read for his own instruc- tion and delight the*~~

~~*authors included in the school curriculum who had struck his fancy and stimulated his awakening powers. While his writings supply clear evidence in support of this general position, they also bring out vividly the fact that Ovid was a special favourite with Shakespeare at the outset of his career. The influence of this romantic and elegiac Roman poet is indeed strongly marked and clearly traceable in the poems as well as in the carly plays.*~~

~~*According to Rowe's account, Shakespeare was with- drawn from school about 1578, a year or two before he had completed the usual course for boys going into business or passing on to the universities. The immediate cause of the withdrawal seems to have been the growing embarrass- ments of John Shakespeare's affairs, the boy being wanted at home to help in the various departments of his father's business. The poet had just entered on his fifteenth year, and his school attainments and turn for affairs, no less than his native energy and ability, fitted him for efficient action in almost any fairly open career. But open careers were not numerous at Stratford, and John Shakespeare's once prosperous way of life was now hampered by actual and threatening difficulties which the zeal and affection of his son were powerless to remove or avert. No doubt the boy did his best, trying to understand his father's position, and discharging with prompt alacrity any duties that came to be done. But he would soon discover how hopeless such efforts were, and with this deepening conviction there would come upon him the reaction of weariness and disappointment, which is the true inferno of ardent youthful minds. His father's difficulties were evidently of the chronic and complicated kind against which the generous and impulsive forces of youth and inexperience are of little avail. And, after his son had done his utmost to relieve the sinking fortunes of the family, the aching sense of failure would be among the bitterest experiences of his early years, would be indeed a sharp awakening to the realities and responsibilities of life. Within the narrow circle of his own domestic relationships and dearest interests he would feel with Hamlet that the times were out of joint, and in his gloomier moods be ready to curse the destiny that seemed to lay upon him, in part at least, the burden of setting the obstinately crooked straight. As a relief from such moods and a distraction from the fruitless toils of home affairs, he would naturally plunge with keener zest into such outlets*~~

~~*for youthful energy and adventure as the town and neighbourhood afforded. What the young poet's actual occupations were during the four years and a half that elapsed between his leaving school and his marriage we have no adequate materials for deciding in any detail. But the local traditions on the subject would seem to indicate that after the adverse turn in his fortunes John Shakespeare had considerably contracted the area of his commercial transactions. Having virtually alienated his wife's patrimony by the mortgage of the Asbies and the disposal of all interest in the Snitterfield property, he seems to have given up the agricultural branches of his business, retaining only his original occupation of dealer in leather, skins, and sometimes carcases as well. His wider speculations had probably turned out ill, and having no longer any land of his own he apparently relinquished*~~

~~*the corn and timber business, restricting himself to the town trades of fellmonger, wool-stapler, and butcher. Aubrey at least had heard that Shakespeare after leaving school assisted his father in these branches,—and at times with a deal of youthful extravagance indicative of irre-pressible energy and spirit. Aubrey also reports, on the authority of Beeston, and as incidentally proving he knew Latin fairly well, that for a time the poet was a teacher in a country school; while Malone believed from the internal evidence of his writings that he had spent two or three years in a lawyer's office. These stories may be taken to indicate, what is no doubt true, that at a time of domestic need the poet was ready to turn his hand to anything that offered. It is no doubt also true that he would prefer the comparative retirement and regularity of teaching or clerk's work to the intermittent drudgery and indolence of a retail shop in a small market-town. There is, however, no direct evidence in favour of either supposi- tion; and the indirect evidence for the lawyer's office theory which has found favour with several recent critics is by no means decisive. Whether engaged in a lawyer's office or not, we may be quite sure that during the years of adolescence he was actively occupied in work of some kind or other. He was far too sensible and energetic to remain without employment; shapeless idleness had no attraction for his*~~

~~*healthy nature, and his strong family feeling is certainly in favour of the tradition that for a time he did his best to help his father in his business.*~~

~~*But, however he may have been employed, this interval of home life was for the poet a time of active growth and development, and no kind of business routine could avail to absorb his expanding powers or repress the exuberant vitality of his nature. During these critical years, to a vigorous and healthy mind such as Shakespeare possessed, action—action of an adventurous and recreative kind, in which the spirit is quickened and refreshed by new experiences—must have become an absolute necessity of existence. The necessity was all the more urgent in Shakespeare's case from the narrower circle within which the once prosperous aud expanding home life was now confined. We have seen that the poet occasionally shared the orthodox field sports organized by the country gentle- men, where landlords and tenants, yeomen and squires, animated by a kindred sentiment, meet to a certain extent on common ground. But this long-drawn pursuit of pleasure as an isolated unit in a local crowd would hardly satisfy the thirst for passionate excitement and personal adventure which is so dominant an impulse in the hey-day of youthful blood. It is doubtful, too, whether in the decline of his father's fortunes Shakespeare would have cared to join the prosperous concourse of local sportsmen. HIe would probably be thrown a good deal amongst a somewhat lower, though no doubt energetic and intelli- gent, class of town companions. And they would devise together exploits which, if somewhat irregular, possessed the inspiring charm of freedom and novelty, and would thus be congenial to an ardent nature with a passionate interest in life and action. Such a nature would eagerly welcome enterprises with a dash of hazard and daring in them, fitted to bring the more resolute virtues into play, and develop in moments of emergency the manly qualities of vigilance and promptitude, courage and endurance, dexterity and skill, It would seem indeed at first sight as though a quiet neighbourhood like Stratford could afford little scope for such adventures. But even at Stratford there were always the forest and the river, the outlying farms with adjacent parks and manor houses, the wide circle of picturesque towns and villages with their guilds and clubs, their local Shallows and Slenders, Dogberries and Verges; and in the most quiet neigh-*~~

~~*Deer- stealing tradition,*~~

~~*SHAKESPEARE*~~

~~*bourhoods it still remains true that adventures are to the adventurous. That this dictum was verified in Shake- speare's experience seems clear alike from the internal evidence of his writings and the concurrent testimony of local tradition. In its modern form the story of the Bidford challenge exploit may indeed be little better than amyth. But in substance it is by no means incredible, and if we knew all about the incident we should probably find there were other points to be tested between the rival companies besides strength of head to resist the effects of the well-known Bidford beer. The prompt re- fusal to return with his companions and renew the contest on the following day,—a decision playfully ex- pressed and emphasized in the well-known doggrel lines,— implies that in Shakespeare's view such forms of good fellowship were to be accepted on social not self-indulgent grounds, that they were not to be resorted to for the sake of the lower accessories only, or allowed to grow into evil habits from being unduly repeated or prolonged. It is clear that this general principle of recreative and adventur- ous enterprise, announced more than once in his writings, guided his own conduct even in the excitable and impulsive season of youth and early manhood. If he let himself go, as he no doubt sometimes did, it was only as a good rider on coming to the turf gives the horse his head in order to enjoy the exhilaration of a gallop, having the bridle well in hand the while, and able to rein in the excited steed at a moment's notice. It may be said of Shakespeare at such seasons, as of his own Prince Hal, that he— "Obscur'd his contemplation Under the veil of wildness ; which, uo doubt,*~~

~~*Grew like the summer grass, fastest by night, Unseen, yet crescive in his faculty."*~~

~~*The deer-stealing tradition illustrates the same point ; and though belonging perhaps toa rather later period it may be conveniently noticed here. This fragment of Shakespeare's personal history rests on a much surer basis than the Bidford incident, being supported not only by early multiplied and constant traditions, but by evidence which the poet himself has supplied. Rowe's somewhat formal version of the narrative is to the effect that Shake- Speare in his youth was guilty of an extravagance which, though unfortunate at the time, had the happy result of helping to develop his dramatic genius. This misfortune was that of being engaged with some of his companions more than once in robbing a park belonging to Sir Thomas Lucy of Charlecote. Sir Thomas, it is said, prosecuted him sharply for the offence, and in retaliation he wrote a satirical ballad upon him, which so incensed the baronet that Shakespeare thought it prudent to leave Stratford and join his old friends and associates the players in London. Other versions of the tradition exist giving fresh details, some of which are on the face of them later additions of a fictitious and fanciful kind. But jt would be useless to discuss the aceretions incident to any narrative, however true, orally transmitted through two or three generations before being reduced to a written shape. All that can be required or expected of such traditions is that they should contain a kernel of biographical fact, and be true in substance although possibly not in form. And tried by this test the tradition in question must certainly be accepted as a genuine contribution to our knowledge of the poet's early years. Indeed it could hardly have been repeated again and again by inhabitants of Stratford within a few years of Shakespeare's death if it did not embody a characteristic feature of his early life which was well known in the town. This feature was no doubt the poet's love of woodland life, and the woodland sports through which it is realized in the most animated and vigorous form.*~~

~~*793*~~

~~*Stratford in Shakespeare's day afforded*~~

~~*i i There was d Arden forest, which, though still nominally i Indeed, the observance of the forest laws had fallen into such neglect in the early years of Elizabeth's reign that even unlicensed deer-*~~

~~*venue to Fulbroke Park, and there they might easily come into Thomas Lucy's keepers. There has been a good*~~

~~*And Mr Bracebridge, in "his interesting pamphlet Shakespeare no Deer-Stealer, has thrown fresh light on the sub-*~~

~~*lors, — Sir Francis Engelfield. Being'a to Spain on the accession of Elizabeth judged a traitor, the Fulbroke administered by the crown. The park being thus without a legal custodian for more than a quarter of a century became disparked, the palings having fallen into places broken down.*~~

~~*any case Sir Thomas's keepers would occasionally perambulate Fulbroke Park as a protection to Charlecote, and in doing go they probably came upon Shakespeare and his companions after they had brought down a buck and were about to break it up for removal. Or the hunted deer may have crossed the river at the shallow ford between the two parks, and, pursued by the eager sportsmen, have been brought down within the Charlecote grounds. In either case the keepers would denounce the trespass, and possibly with menacing and abusive words demand the buck for their master. On being treated in this insulting way, Shake- speare, who had pride and_ personal dignity as well as courage, would deny any intentional or actual trespass, refuse to give up the venison, and plainly tell the keepers that they might report the matter to Sir Thomas Lucy and he would answer for himself and his companions. On finding what had happened, Sir Thonias would be all the more incensed and indignant from the conscious- ness that he had pushed his claims beyond the point at which they could legally be enforced. And, being to some extent in a false position, he would be proportionately wrathful and vindictive against the youthful sportsmen, and especially against their leader who had dared to resist and defy his authority. Sir Thomas was the great man of Stratford, who came periodically to the town on magistrate's business, was appealed to as arbitrator in special cases, and entertained by the corporation during his visits. In character he seems to have combined*~~

~~aristocratic pride and narrowness with the harshness and severity of the Puritan temper. As a landed proprietor and local magnate he was exacting and exclusive, looking with a kind of Puritanical sourness on all youthful frolics, merri- ment, and recreation. He would thus have a natural antipathy to young Shakespeare's free, generous, and enjoying nature, and would resent as an unpardonable outrage his high-spirited conduct in attempting to resist any claims he chose to make. Sir Thomas would no doubt vent his indignation to the authorities at Strat- ford, and try to set the law in motion, and failing in this might have threatened, as Justice Shallow does, to make a Star-Chamber matter of it. This was the kind of extreme course which a man in his position might take where there was no available local redress for any wrong he imagined himself to have suffered. And~~

~~the Stratford authorities, being naturally anxious to propitiate the great man, may have suggested that it would be well if young Shakespeare could be out of the way for a time. This would help him to decide on the adoption of a plan already seriously entertained of going to London to push his fortune among the ee re ee There is, however, another aspect in which this traditional incident may be looked at, which seems at least worthy~~

~~supreme objects of aristocratic and Puritanical zeal. And Sir Thomas, having at length caught him, as he imagined, in a technical trespass, would be sure to pursue the culprit with the unrelenting rigour of his hard and gloomy nature. But, whatever may have been the actual or aggravating circumstances of the original offence, there can be no doubt that an element of truth is contained in the deer-~~

~~Sir of consideration. It is possible that Sir Thomas Lucy may | stealing tradition. The substantial facts in the story are pea have been prejudiced~~

~~against the Shakespeares on religious | that Shakespeare in his youth was fond of woodland sport, lucy.~~

~~grounds, and that this feeling may have prompted him to a display of exceptional severity against their eldest son. As we have seen, he was a narrow and extreme, a persecuting and almost fanatical Protestant, and several events had recently happened calculated to intensify his bitterness against the Romanists. In particular, Mary Shakespeare's family connexions—the Ardens of Parkhall—had been convicted of conspiracy against the queen's life. The son-in-law of Edward Arden, John Somerville, a rash and "hot-spirited young gentleman," instigated by Hall, the family priest, had formed the design of going to London and assassinating Queen Elizabeth with his own hand. He started on his journey in November 1583, but talked so incautiously by the way that he was arrested, conveyed to the Tower, and under a threat of the rack confessed everything, accusing his father-in-law as an accomplice and the priest as the instigator of the crime. All three were tried and convicted, their fate being probably hastened, as Dugdale states, by the animosity of Leicester against the Ardens. Somerville strangled himself in prison, and Edward Arden was hanged at Tyburn. These events produced a deep impression in Warwickshire, and no one in the locality would be more excited by them than Sir Thomas Lucy. His intensely vindictive feeling against the Romanists was exemplified a little later by his bringing forward a motion in parlia- ment in favour of devising some new and _ lingering tortures for the execution of the Romanist conspirator Parry. As Mr Froude puts it, "Sir Thomas Lucy,— Shakespeare's Lucy, the original perhaps of Justice Shallow, with an English fierceness at the bottom of his stupid nature,—having studied the details of the execution of Gerard, proposed in the House of Commons 'that some new law should be devised for Parry's execution, such as might be thought fittest for his extraordinary and horrible treason." The Ardens were devoted Romanists; the terrible calamity that had befallen the family occurred only a short time before the deer-stealing adventure ; and the**

~~Shakespeares themselves, so far from being Puritans, were~~

~~suspected by many of being but indifferent Protestants.~~

and that in one of his hunting adventures he came into collision with Sir Thomas Lucy's keepers, and fell. under the severe ban of that local potentate. The latter point is indirectly confirmed by Shakespeare's inimitable sketch of the formal country justice in the Second Part of Henry LV. and the Merry Wives of Windsor,—Robert Shallow, Esq., being sufficiently identified with Sir Thomas Lucy by the pointed allusion to the coat of arms, as well as by other allusions of a more indirect but hardly less decisive kind. To talk of the sketch as an act of revenge is to treat it too seriously, or rather in too didactic and pedestrian a spirit. Having been brought into close relations with the justice, Shakespeare could hardly be expected to resist the temptation of turning to dramatic account so admirable a subject for humorous portraiture. The other point of the tradition, Shakespeare's fondness for woodland life, is supported by the internal evidence of his writings, and especially by the numerous allusions to the subject in his poems and earlier plays. The many refer- ences to woods and sports in the poems are well known ; and in the early plays the allusions are not less frequent and in some respects even more striking. Having no space, however, to give these in detail, a general reference must suffice. The entire action of Love's Labour's Lost takes place in a royal park, while the scene of the most critical events of the Z'wo Gentlemen of Verona is a forest inhabited by generous outlaws whose offences appear to have been youthful follies, and who on being pardoned by the duke become his loyal followers. In these early plays it seems as though Shakespeare could hardly conceive of a royal palace or capital city without a forest close at hand as the scene of princely sport, criminal intrigue, or fairy enchant- ment. Outside the gates of Athens swept over hill and dale the wonderful forest which is the scene of the Midsummer Night's Dream; and in Titus Andronicus imperial Rome seems to be almost surrounded by the brightness and terror, the inspiring charm and sombre shades of rolling forest lawns and ravines, the "ruthless, vast, and gloomy woods."

There can be no doubt, therefore, that during the years Shake- of home life at Stratford Shakespeare was often in the Speares

*John Shakespeare was an irregular attendant at church, ear forest. But in the latter part of the time he would be ™"™"8**

~~*and soon ceased to appear there at all, so that Sir Thomas*~~

~~*Lucy probably regarded him as little better than a recusant. In any case Sir Thomas would be likely to resent the elder Shakespeare's convivial turn and profuse hospitality as alderman and bailiff, and especially his official patronage of the players and active encouragement of their dramatic representations in the guild hall. The Puritans had a rooted antipathy to the stage, and to the jaundiced eye of the local justice the reverses of the Shakespeares would probably appear as a judgment on their way of life. He would all the more eagerly seize any chance of humiliating their eldest son, who still held up his head and dared to look upon life as a scene of cheerful activity and occasional enjoyment. The young poet, indeed, embodied the very characteristics most opposed to Sir Thomas's dark and narrow conceptions of lifeand duty. His notions of public duty were very much restricted to persecuting the Romanists and preserving the game on Protestant estates. And Shakespeare probably took no pains to conceal his want of sympathy with these*~~

~~*found still more frequently hastening through the fields to Shottery, paying long visits at the Hathaway farm, followed by late and reluctant leave-takings. For the next important fact in Shakespeare's history is his marriage with Anne Hathaway. This event, or rather the formal and ecclesiastical part of it, took place in the end of November 1582, the bond for the licence from the consistory court being dated on the 28th of the month. Mr Halliwell-Phillipps has, however, sufficiently proved by detailed instances that the formal and public part of the ceremony would, according to the usage of the time, have been preceded some months earlier by the betrothal or pre-contract, which was in itself of legal validity. Shake- speare's marriage may therefore be dated from the summer of 1582, he being then in his nineteenth year, while his bride was between seven and eight years older. Many of the poet's biographers have assumed that the marriage was a hasty, unsuitable, and in its results an unhappy one. It is necessary therefore to repeat with all possible*~~

~~*emphasis the well-founded statement of Mr Halliwell- Phillipps that 'there is not a particle of direct evidence " for either of these suppositions.*~~

~~*The marriage could hardly have been a hasty one, for, as we have seen, the two families had been intimate for fifteen years, and Shakespeare had known Anne Hathaway from his early boyhood. As to whether it was suitable or not Shake- speare himself was the best and only adequate judge, and there is not, in the whole literature of the subject, even the shadow of a successful appeal against his decision. And, so far from the marriage having been unhappy, all the evidence within our reach goes to show that it was not only a union of mutual affection but a most fortunate event for the poet himself, as well as for the wife and mother who remained at the head of his family, venerated and loved by her children, and a devoted helpmate to her husband to the very end. Looking at the matter in its wider aspects, and especially in relation to his future career, it may be said that Shakespeare's early marriage gave him at the most emotional and unsettled period of life a fixed centre of affection and a supreme motive to prompt and fruitful exertion. This would have a salutary and steadying effect on a nature go richly en- dowed with plastic fancy and passionate impulse, com- bined with rare powers of reflective foresight and self- control. If Shakespeare's range and depth of emotional and imaginative genius had not been combined with unusual force of character and strength of ethical and artistic purpose, and these elements had not been early stimulated to sustained activity, he could never have had so great and uninterrupted a career. And nothing perhaps is a more direct proof of Shakespeare's manly character than the prompt and serious way in which, from the first, he assumed the full responsibility of his acts, and unflinch- ingly faced the wider range of duties they entailed. He himself has told us that "Love is too young to know what conscience is: Yet who knows not conscience is born of love 2"*~~

~~*and it remains true that conscience, courage, simplicity, and nobleness of conduct are all, in generous natures, evoked and strengthened by the vital touch of that regenerating power. Shakespeare's whole course was changed by the new influence ; and with his growing responsibilities his character seems to have rapidly matured, and his powers to have found fresh and more effective development. His first child Susanna was born in May 1583, and, as she was baptized on the 26th, the day of her birth may have been the 23d, which would be exactly a month after her father completed his nineteenth year. In February 1585 the family was*~~

~~*unexpectedly enlarged by the birth of twins, a boy and a girl, who were named re- spectively Hamnet and Judith, after Hamnet and Judith Sadler, inhabitants of Stratford, who were lifelong friends of Shakespeare. Before he had attained his majority the poet had thus a wife and three children dependent upon him, with little opportunity or means apparently of ad- vancing his fortunes in Stratford. The situation was in itself sufticiently serious, But it was complicated by his father's increasing embarrassments and multiplied family claims. Four children still remained in Henley Street to*~~

~~*tions he decided in favour of trying the metropolitan stage and theatre. He had already tested his faculty of acting by occasional essays on the provincial stage; and, once in London amongst the players, where new pieces were constantly required, he would have full scope' for the exercise of his higher powers as a dramatic poet. At the outset he could indeed only expect to discharge the lower function, but, with the growing popular demand for dramatic representations, the actor's calling, though not without its social drawbacks, was in the closing decades of the 16th century a lucrative one. Greene, in his autobio- graphical sketch Wever Too Late, one of the most interest- ing of his prose tracts, illustrates this point in the account he gives of his early dealings with the players and experiences as a writer for the Stage. Speaking through his hero Francesco, he says that 'when his fortunes were at the lowest ebb he fell in amongst a company of players who persuaded him to try his wit in writing of comedies, tragedies, or pastorals, and if he could perform anything worth the stage, then they would largely reward him for his pains." Succeeding in the work, he was so well paid that he soon became comparatively wealthy, and went about with a well-filled purse. Although writing from the author's rather than the actor's point of view, Greene intimates that the players grew rapidly rich and were entitled both to praise and profit so long as they were "neither covetous nor insolent." In the Return JSrom Parnassus (1601) the large sums, fortunes indeed, realized by good actors are referred to as matter of notoriety. One of the disappointed academic scholars, indeed, moralizing on the fact with some bitterness, exclaims,— "England affords those glorious vagabonds,*~~

~~*That carried erst their fardles on their backs,*~~

~~*Coursers to ride on through the gazing streets,*~~

~~*Sweeping it in their glaring satin suits,*~~

~~*And pages to attend their masterships :*~~

~~*With mouthing words that better wits have framed*~~

~~*They purchase lands, and now esquires are made," And in a humorous sketch entitled Ratseis Ghost, and published in the first decade of the 17th century, an apparent reference to Shakespeare himself brings out the same point. The hero of the tract, Ratsey, a highwayman, having compelled a set of strolling players to act before him, advised their leader to leave the country and get to London, where, having a good presence for the stage and a turn for the work, he would soon fill his pockets, adding, 'When thou feelest thy purse well-lined, buy thee some place of lordship in the country, that, growing weary of playing, thy money may bring thee dignity and reputa- tion." The player, thanking him for his advice, replies, "T have heard indeed of some that have gone to London very meanly, who have in time become exceedingly wealthy." The movement to the London stage was there- fore from a worldly point of view a prudent one, and for the higher purposes of Shakespeare's life it was equally wise and necessary. For besides the economic and practi- cal considerations in favour of the step there must have pressed on the poet's mind the importance of a wider sphere of life and action for the enlargement of his inward horizon, and the effective development of his poetical and dramatic gifts.*~~

~~*The exact date of this event—of Shakespeare's leaving Goes to Stratford for London—cannot be fixed with any certainty. ee All the probabilities of the case, however, indicate that it 224 be-*~~

~~*be provided for,—the youngest, Edmund, born in May 1580, being scarcely five years old. John Shakespeare,*~~

~~*too, was being sued by various creditors, and apparently comes an*~~

~~*in some danger of being arrested for debt. All this was enough to make a much older man than the poet look anxiously about him. But, with the unfailing sense and Sagacity he displayed in practical affairs, he seems to have formed a sober and just estimate of his own powers, and made a careful survey of the various fields available for their remunerative exercise. As the result of his delibera-*~~

~~*must have taken place between the spring of 1585 and the autumn of 1587. In the latter year three of the leading companies visited Stratford, those belonging to the queen, Lord Leicester, and Lord Essex ; and, as Lord Leicester's included three of Shakespeare's fellow townsmen,—Bur-bage, Heminge, and Greene,—it is not improbable that he may then have decided on trying his fortune in London.*~~

~~*actor.*~~

~~*Continues his edu- cation.*~~

~~*756*~~

~~*At the same time it is quite possible, and on some grounds even likely, that the step may have been taken somewhat earlier. But for the five years between 1587 and 1592 we have no direct knowledge of Shakespeare's movements at all, the period being a complete biographical blank, dimly illuminated at the outset by one or two doubtful traditions. We have indeed the assurance that after leay- ing Stratford he continued to visit his native town at least once every year; and if he had left in 1586 we may con- fidently assume that he returned the next year for the purpose, amongst others, of consulting with his father and mother about the Asbies mortgage and of taking part with them in their action against John Lambert. HIs uniting with them in this action deserves special notice, as showing that he continued to take the keenest personal interest in all home affairs, and, although living mainly in London, was still looked upon, not only as the eldest son, but as the adviser and friend of the family. The anec- dotes of Shakespeare's occupations on going to London are, that at first he was employed in a comparatively humble capacity about the theatre, and that for a time he took charge of the horses of those who rode to see the plays, aud was so successful in this work that he*~~

~~*soon had a uumber of juvenile assistants who were known as Shakespeare's boys. Even in their crude form these traditions embody a tribute to Shakespeare's business promptitude and skill. If there is any truth in them they may be taken to indicate that while filling some subordinate post in the theatre Shakespeare perceived a defective point in the local arrangements, or heard the complaints of the mounted gallants as to the difficulty of putting up their horses. His provisions for meeting the difficulty seem to have been completely and even notori- ously successful. There were open sheds or temporary stables in connexion with the theatre in Shoreditch, and Shakespeare's boys, if the tradition is true, probably each took charge of a horse in these stables while its owner was at the play. But in any case this would be simply a brief episode in Shakespeare's multifarious employments when he first reached the scene of his active labours in London. He must soon have had more serious and absorbing professional occupations in the green room, on the stage, and in the laboratory of his own teeming brain, "the quick forge and working house of thought."*~~

~~*But his leisure hours during his first years in London would naturally be devoted to continuing his education and equipping himself as fully as possible for his future work. It was probably during this time, as Mr Halliwell- Phillipps suggests, that he acquired the working knowledge of French and Italian that his writings show he must have possessed. And it is perhaps now possible to point out the sources whence his knowledge of these languages was derived, or at least the master under whom he chiefly studied them. The most celebrated and accomplished teacher of French and Italian in Shakespeare's day was the resolute John Florio, who, after leaving Magdalen College, Oxford, lived for years in London, engaged in tutorial and literary work and intimately associated with eminent men of letters and their noble patrons. After the accession of James L., Florio was made tutor to Prince Henry, received an appointment about the court, became the friend and personal favourite of Queen Anne (to whom he dedicated the second edition of his Italian dictionary, entitled the World of Words), and died full of years and honours in 1625, having survived Shakespeare nine years. Florio had married the sister of Daniel the poet, and Ben Jonson presented a copy of The Fox to him, with the inscription,*~~

~~*“To his loving father and worthy friend Master John Florio, Ben Jonson seals this testi- mony of his friendship and love.” Daniel writes a poem*~~

~~*SHAKESPEATE*~~

~~*of some length in praise of his translation of Montaigne, while other contemporary poets contribute commendatory verses which are prefixed to his other publications.*~~

~~*also one of Florio’s friends, and that during his early years in London he evinced his friendship by yielding for once to the fashion of writing this kind of eulogistic verse. Prefixed to Florio’s Second Fruits, Prof. Minto discovered a sonnet so superior and characteristic that he was impressed with the conviction that Shakespeare must have written it. The internal evidence is in favour of this conclusion, while Mr Minto’s critical analysis and com- parison of its thought and diction with Shakespeare’s early work tends strongly to support the reality and value of the discovery. In his next work, produced four years later, Florio claims the sonnet as the work of a friend “‘who loved better to be a poet than to be called one,” and vindicates it from the indirect attack of a hostile critic, H. S., who had also disparaged the work in which it appeared. There are other points of connexion between Florio and Shakespeare. The only known volume that certainly belonged to Shakespeare and contains his auto- graph is Florio’s version of Montaigne’s Hssays in the British Museum; and critics have from time to time produced evidence to show that Shakespeare must have read it carefully and was well acquainted with its con- tents. Victor Hugo in a powerful critical passage strongly supports this view. The most striking single proof of the point is Gonzalo’s ideal republic in the Tempest, which is simply a passage from Florio’s version turned into blank verse. Florio and Shakespeare were both, moreover, intimate personal friends of the young earl of Southampton, who, in harmony with his generous character and strong literary tastes, was the munificent patron of each. Shakespeare, it will be remembered, dedi- cated his Venus and Adonis and his Lucrece to this young nobleman ; and three years later, in 1598, Florio dedicated the first edition of his Italian dictionary to the earl in terms that almost recall Shakespeare’s words. Shake- speare had said in addressing the earl, ‘ What I have done is*~~

~~yours, what I have to do is yours, being part in all I have devoted yours." And Florio says, "In truth I ac- knowledge an entire debt, not only of my best knowledge, but of all, yea of more than I know or can to your bounte- ous lordship, most noble, most virtuous, and most honour- able earl of Southampton, in whose pay and patronage I have lived some years, to whom I owe and vow the years I have to live." Shakespeare was also familiar with Florio's earlier works, his First Fruits and Second Fruits, which were simply carefully prepared manuals for the study of Italian, containing an outline of the grammar, a selection of dialogues in parallel columns of Italian and English, and longer extracts from classical Italian writers in prose and verse. We have collected various points of indirect evidence showing Shakespeare's familiarity with these manuals, but these being numerous and minute cannot be given here. It must suffice to refer in illustra- tion of this point to a single instance—the lines in praise of Venice which Holofernes gives forth with so much unction in Love's Labour's Lost. The First Fruits was published in 1578, and was for some years the most popular manual for the study of Italian. It is the book that Shakespeare would naturally have used in attempting to acquire a knowledge of the language after his arrival in London ; and on finding that the author was the friend of some of his literary associates he would probably have sought his acquaintance and secured his personal help. As Florio was also a French scholar and habitually taught both languages, Shakespeare probably owed to him his knowledge of French as well as of Italian. If the sonnet~~

~~There Con- are substantial reasons for believing that Shakespeare was nexion~~

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~~is accepted as Shakespeare's work he must have made Florio's acquaintance within a year or two after going to London, as in 1591 he appears in the character of a personal friend and well-wisher. In any case Shakespeare would almost certainly have met Florio a few years later at the house of Lord Southampton, with whom the Italian scholar seems to have occasionally resided. It also appears that he was in the habit of~~

~~*visiting at several titled houses, amongst others those of the earl of Bedford and Sir John Harrington. It seems also probable that he may have assisted Harrington in his translation of Ariosto. Another and perhaps even more direct link connecting Shakespeare with Florio during his early years in London is found in their common relation to the family of Lord Derby. In the year 1585 Florio translated a letter of news from Rome, giving an account of the sudden death of Pope Gregory XITI. and the election of his successor. This translation, published in July 1585, was dedicated "To the Right Excellent and Honourable Lord, Henry Earl of Derby," in terms expressive of Florio's strong personal obligations to the earl and devotion to his service. Three years later, on the death of Leicester in 1588, Lord Derby's eldest son Ferdinando Lord Strange became the patron of Leicester's company of players, which Shakespeare had recently joined. The new patron must have taken special interest in the company, as they soon became (chiefly through his influ- ence) great favourites at court, superseding the Queen's players, and enjoying something like a practical monopoly of royal representations. Shakespeare would thus have the opportunity of making Florio's acquaintance at the outset of his London career, and everything tends to show that he did not miss the chance of numbering amongst his personal friends so accomplished a scholar, so alert, ener- getic, and original a man of letters, as the resolute John Florio. Warburton, it is well-known, had coupled Florio's name with Shakespeare in the last century. He sug- gested, or rather asserted, that Florio was the original of Holofernes in Love's Labour 's Lost. Of all Warburton's arbitrary conjectures and dogmatic assumptions this is perhaps the most infelicitous. That a scholar and man of the world like Florio, with marked literary powers of his own, the intimate friend and associate of some of the most eminent poets of the day, living in princely and uoble circles, honoured by royal personages and welcomed at noble houses,—that such a man should be selected as the original of a rustic pedant and dominie like Holofernes, is surely the climax of reckless guesswork and absurd suggestion. There is, it is true, a distant connexion between Holofernes and Italy—the pedant being a well- known figure in the Italian comedies that obviously affected Shakespeare's early work. This usage calls forth a kind of sigh from the easy-going and tolerant Montaigne as he thinks of his early tutors and youthful interest in knowledge. "TI have in my youth," he tells us, 'often-*~~

~~*times been vexed to see a pedant brought in in most of Italian comedies for a vice or sport-maker, and the nick- name of magister (dominie) to be of no better significa- tion amongst us." We may be sure that, if Shakespeare knew Florio before he produced Love's Labour's Lost, it was not as a sport-maker to be mocked at, but as a friend and literary associate to whom he felt personally indebted.*~~

~~*But, whatever his actual relation to the Italian scholar may have been, Shakespeare, on reaching London and beginning to breathe its literary atmosphere, would nat- urally betake himself to the study of Italian. At various altitudes the English Parnassus was at that time fanned by soft airs, swept by invigorating breezes, or darkened by gloomy and infected vapours from the south. In other words, the influence of Italian literature, so dominant in England during the second half of the 16th century,*~~

~~*may be said to have reached its highest point at the very time when Shakespeare entered on his poetic and dramatic labours. This influence was in part a revival of the strong impulse communicated to English literature from Italy in Chaucer's day. The note of the revival was struck in the title of Thomas's excellent Italian manual, " Principal rules of Italian grammar, with a dictionarie for the better understandyng of Boccace, Petrarcha, and Dante" (1550). The first fruits of the revival were the lyrical poems of Surrey and Wyatt, written somewhat earlier, but published for the first time in Tottle's Miscellany (1557). The sonnets of these poets—the first ever written in English—produced in a few years the whole musical choir of Elizabethan sonneteers. Surrey and Wyatt were sym- pathetic students of Petrarch, and, as Puttenham says, reproduced in their sonnets and love poems much of the musical sweetness, the tender and refined sentiment, of the Petrarchian lyric. This perhaps can hardly in strictness of speech be called a revival, for, strong as was the influ- ence of Boccaccio, and in a less degree of Dante, during the first period of English literature, the lyrical poetry of the south, as represented by Petrarch, affected English poetry almost for the first time in the 16th century. This influence, as subsequently developed by Lyly in his prose comedies and romances, indirectly affected the drama, and clear*~~

~~*traces of it are to be found in Shakespeare's own work. Surrey, however, rendered the Elizabcthans a still greater service by introducing from Italy the unrhymed verse, which, with the truest instinct, was adopted by the great dramatists as the metrical vehicle best fitted to meet the requirements of the most flexible and expressive form of the poetic art. But, although in part the revival of a previous impulse, the Italian literature that most power- fully affected English poetry during the Elizabethan period was in the main new. During the interval the prolific genius of the south had put forth fresh efforts which combined, in new and characteristic products, the forms of classical poetry and the substance of southern thought and feeling with the spirit of medieval romance. The chivalrous and martial epics of Ariosto and Tasso repre- sented a new school of poetry which embraced within its expanding range every department of imaginative activity. There appeared in rapid succession romantic pastorals, romantic elegies, romantic satires, and romantic dramas, as well as romantic epics. The epics were occupied with marvels of knightly daring and chivalrous adventure, expressed in flowing and melodious numbers : while the literature as a whole dealt largely in the favourite elements of ideal sentiment, learned allusion, and elaborate ornament, and was brightened at intervals by grave and sportive, by highly wrought but fanciful; pictures of courtly and Arcadian life. While Sidney and Spenser represented in England the new school of allegorical and romantic pastoral and epic, Shakespeare and his associates betook themselves to the study of the romantic drama and the whole dramatic element in recent and contempor- ary southern literature. The Italian drama proper, so far as it affected the form adopted by English playwrights, had indeed virtually done its work before any of Shake- speare's characteristic pieces were produced. HIs imme- diate predecessors, Greene, Peele, and Lodge, Nash, Kyd, and Marlowe, had all probably studied Italian models more carefully than Shakespeare himself ever did; and the result is seen in the appearance among these later Elizabethans of the romantic drama, which united the better elements of the English academic and popular plays with features of diction and fancy, incident and structure, that were virtually new. Many members of this dramatic group were, like Greene, good Italian scholars, had them- selves travelled in Italy, knew the Italian stage at first*~~

hand, and, as their writings show, were well acquainted with recent Italian literature. But the dramatic element in that literature extended far beyond the circle of regular plays, whether tragedies, comedies, or pastorals. It in- cluded the collections of short prose stories which appeared, or were published for the first time, in such numbers during the 16th century, the novels or novelettes of Ser Giovanni, Cinthio, Bandello, and their associates. These stories, consisting of the humorous and tragic incidents of actual life, told in a vivid and direct way, naturally attracted the attention of the dramatists. We know from the result that Shakespeare must have studied them with some care, as he derived from this source the plots and incidents of at least a dozen of his plays. Many of the stories, it is true, had already been translated, either directly from the Italian, or indirectly from French and Latin versions. Of Cinthio's hundred tales, however, only two or three are known to have been rendered into English ; and Shakespeare derived the story of Othello from the untranslated part of this collection. Many of the Italian stories touched on darker crimes or more aggra- vated forms of violence than those naturally prompted by jealousy and revenge, and are indeed revolting from the atrocities of savage cruelty and lust related so calmly as to betray a kind of cynical insensibility to their true character. Shakespeare, however, with the sound judg- ment and strong ethical sense that guided the working of his dramatic genius, chose the better and healthier materials of this literature, leaving the morbid excesses of criminal passion to Webster and Ford. But the Italian influence on Shakespeare's work is not to be estimated merely by the outlines of plot and incident he borrowed from southern sources and used as a kind of canvas for his matchless portraiture of human character and action. It is apparent also in points of structure and diction, in types of character and shades of local colouring, which realize and express in a concentrated form the bright and lurid, the brilliant and passionate, features of southern life. The great majority of the dramatis persone in his comedies, as well as in some of the tragedies, have Italian names, and many of them, such as Mercutio and Gratiano on the one hand, Iachimo and Iago on the other, are as Italian in nature as in name. The moonlight scene in the Merchant of Venice is Southern in every detail and incident. And, as M. Philaréte Chasles justly poimts

~~*out, Romeo and Juliet is Italian throughout, alike in colouring, incident, and passion. 'The distinctive influence is further traceable in Shakespeare's use of Italian words, phrases, and pro- verbs, some of which, such as "tranect" (from tranare), or possibly, as Rowe suggested, "'traject" (traghetto), are of special local significance. In the person of Hamlet Shakespeare even appears as a critic of Italian style. Referring to the murderer who in the players' tragedy poisons the sleeping duke, Hamlet exclaims, " He poisons him in the garden for his estate. His name 's Gonzago : the story is extant and written in very choice Italian." Jn further illustration of this point Mr Grant White has noted some striking turns of thought and phrase which seem to show that Shakespeare must have read parts of Berni and Ariosto in the original. No doubt in the case of Italian poets, as in the case of Latin authors like Ovid, whose works he was familiar with in the original, Shakespeare would also diligently read the translations, especially the translations into English verse. For in reading such works as Golding's Ovid, Harrington's Ariosto, and Fairfax's Tasso, he would be increasing his command over the elements of expressive phrase and diction which were the verbal instruments, the material vehicle, of his art. But, besides studying the translations of the Italian poets and prose writers made available for English readers,*~~

~~*SHAKESPEARE SE*~~

~~*he would naturally desire to possess, and no doubt acquired for himself, the key that would unlock the whole treasure-house of Italian literature. The evidence of Shakespeare's knowledge of French is more abundant and decisive, so much so as hardly to need express illustration. There can be little doubt therefore that, during his early years in London, he acquired a fair knowledge both of French and Italian.*~~

~~*But, while pursuing these collateral aids to his higher Early work, there is abundant evidence that Shakespeare also @ramatic devoted himself to that work itself. As early as 1592 he efforts.*~~

~~*is publicly recognized, not only as an actor of distinction, but as a dramatist whose work had excited the envy and indignation of his contemporaries, and especially of one so accomplished and so eminent, so good a scholar and master of the playwright's craft, as Robert Greene.*~~

~~*Greene had, it is true, a good deal of the irritability and excitable temper often found in the subordinate ranks of poetical genius, and he often talks of himself, his doings, and associates in a highly-coloured and extravagant way. But his reference to Shakespeare is specially deliberate, being in the form of a solemn and last appeal to his friends amongst the scholarly dramatists to relinquish their connexion with the presumptuous and ungrateful stage. In his Groatsworth of Wit, published by his friend Chettle a few weeks after his death, Greene urges three of his friends, apparently Marlowe, Lodge, and Peele, to give up writing for the players. " Base-minded men, all three of you, if by ny misery ye be not warned; for unto none of you like me sought those burs to cleave ; those puppets, I mean, who speak from our mouths, those anticks garnisht in our colours. Is it not strange that I, to whom they have all been beholding ; is it not like that you, to whom they have all been beholding, shall (were ye in that case that I am now) be both of them at once forsaken? Yes, trust them not; for there is an upstart Crow, beautified in our feathers, that, with his tiger's heart wrapt in a player's hide, supposes he is as well able to bombast out a blank verse as the best of you, and, being an absolute Johannes fac totum, is, in his own conceit, the only Shakescene in a country. Oh that I might intreat your rare wits to be employed in more profitable courses, and let these apes imitate your past excellence, and never more acquaint them with your admired inventions." This curious passage tells us indirectly a good deal about Shakespeare. It bears decisive testimony to his assured position and rapid advance in his profession. The very term of reproach applied to him, "Johannes Factotum," is a tribute to Shakespeare's industry and practical ability. From the beginning of his career he must have been in the widest and best sense a utility man, ready to do any work con- nected with the theatre and stage, and eminently successful in anything he undertook. In the first instance he had evidently made his mark as an actor, as it is in that character he is referred to by Greene, and denounced for going beyond his province and usurping the functions of the dramatist. Greene's words imply that Shakespeare not only held a foremost place as an actor, but that he was already distinguished by his dramatic success in revising and rewriting existing plays. This is confirmed by the parodied line from the Third Part of Henry VI, recently revised if not originally written by Shakespeare. This must have been produced before Greene's death,*~~

~~which took place in September 1592. Indeed, all the three parts of Henry VJ. in the revised form appear to have been acted during the spring and summer of that year. Itis not improbable that two or three of Shake- speare's early comedies may also have been produced before Greene's death. And if so, his resentment, as an academic scholar, against the country actor who had not~~

~~only become a dramatist but had excelled Greene himself in his chosen field of romantic comedy becomes intelligible enough. Even in his wrath, however, Greene bears eloquent witness to Shakespeare's diligence, ability, and marked success, both as actor and playwright. All this is fully confirmed by the more deliberate and detailed language of Chettle's apology, already quoted. Of Shake- speare's amazing industry and conspicuous success the next few years supply ample evidence. Within six or seven years he not only produced the brilliant reflective and descriptive poems of Venus and Adonis and Lucrece, but at least fifteen of his dramas, including tragedies, comedies, and historical plays. Having found his true vocation, Shakespeare works during these years as a master, having full command over the materials and resources of his art. The dramas produced have a fulness of life and a richness of imagery, a sense of joyousness and power, that speak of the writer's exultant absorption and conscious triumph in his chosen work. The sparkling~~

~~with resistless effect against the grandest naval and military armament ever equipped by a Continental power,—an arma- ment that had been sent forth with the assurance of victory by the wealthiest, most absolute, and most determined monarch of the time. There was a vigorous moral element in that national struggle and triumph. It was the spirit of freedom, of the energies liberated by the revolt from Rome, and illuminated by the fair humanities of Greece and Italy, that nerved the arm of that happy breed of men in the day of battle, and enabled them to strike with fatal effect against the abettors of despotic rule in church and state. The material results of the victory were at once apparent. England became mistress of the seas, and Tose to an assured position in Europe as~~

~~*a political and maritime power of the first order. The literary results at home were equally striking. The whole conflict reacted powerfully on the genius of the race, quickening into life its latent seeds of reflective knowledge and wisdom, of poetical and drainatic art.*~~

~~*comedies and great historical plays belonging to this period evince the ease and delight of an exuberant mind realizing its matured creations.*~~

~~*Of these effects the rapid growth and develop- Growth ment of the national drama was the most brilliant of the and characteristic. There was indeed at the time a Dative*~~

~~*Con- Nor after all is this result so very surprising. Shake- unique stimulus in this direction. The greater num- 2" ditions gspeare entered on his London career at the very moment | ber of the eager excited listeners who crowded the favour- : : 5*~~

~~*Peto best fitted for the full development of his dramatic | rude theatres from floor to roof had shared in the*~~

~~*SUCCESS.*~~

~~*genius. From the accession of Elizabeth all the domi- nant impulses and leading events of her reign had pre- pared the way for the splendid triumph of policy and arms that closed its third decade, and for the yet more splendid literary triumph of the full-orbed drama that followed. After the gloom and terror of Mary's reign the coming of Elizabeth to the crown was hailed with exultation by the people, and seemed in itself to open a new and brighter page of the nation's history. Elizabeth's personal charms and mental gifts, her high spirit and dauntless courage, her unfailing political tact and judgment, her frank bearing and popular address, combined with her unaffected love for her people and devotion to their interests, awakened the strongest feelings of personal loyalty, and kindled into passionate ardour the spirit of national pride and patriotism that made the whole kingdom one. The most powerful movements of the time directly tended to reinforce and concentrate these awakened energies. While the Reformation and Renais- sance impulses had liberalized men's minds and enlarged their moral horizon, the effect of*~~

~~both was at first of a political and practical rather than of a purely religious or literary kind. The strong and exhilarating sense of civil and religious freedom realized through the Reformation was inseparably associated with the exultant spirit of nationality it helped to stimulate and diffuse. The pope, and his emissaries the Jesuits, were looked upon far more as foreign enemies menacing the independence of the kingdom than as religious foes and firebrands seeking to destroy the newly established faith, The conspiracies, fomented from abroad, that gathered around the captive queen of Scots, the plots successively formed for the assassination of Elizabeth, were regarded as murderous assaults on the nation's life, and the Englishmen who organized them abroad or aided them at home were denounced and prosecuted with pitiless severity as traitors to their country. Protestantism thus came to be largely identified with patriotism, and all the active forces of the kingdom, its rising wealth, energy, and intelligence, were concentrated to defend the rights of the liberated empire against the assaults of despotic Europe represented by Rome and Spain. These forces gained volume and impetus as the nation was thrilled by the details of Alva's ruthless butcheries, and the awful massacre of St Bar-~~

~~tholomew, until at length they were organized and hurled | means, of popular expression at all.~~

~~adventurous exploits of the age, while all felt the keenest interest in life and action. And the stage represented with admirable breadth and fidelity the struggling forces, the mingled elements, humorous and tragic, the passionate hopes, deep-rooted animosities, and fitful misgivings of those eventful years. The spirit of the time had made personal daring a common heritage: with noble and commoner, gentle and simple, alike, love of queen and country was a romantic passion, and heroic self-devotion at the call of either a beaten way of ordinary life. To act with energy and decision in the face of danger, to strike at once against any odds in the cause of freedom and independence, was the desire and ambition of all. This complete unity of national sentiment and action became the great characteristic of the time. The dangers threatening the newly liberated kingdom were too real and pressing to admit of anything like seriously divided councils, or bitterly hostile parties within the realm. Everything~~

~~*thus conspired to give an extraordinary degree of concentration and brilliancy to the national life. For the twenty years that followed the destruction of the Armada London was the centre and focus of that life. Here gathered the soldiers and officers who had fought against Spain in the Low Countries, against France in Scotland, and against Rome in Ireland. Along the river side, and in noble houses about the Strand, were the hardy mariners and adventurous sea captains, such as Drake, Hawkins, and Frobisher, who had driven their dauntless keels into unknown seas, who had visited strange lands and alien races in order to enlarge the knowledge, increase the dominions, and augment the wealth of their fellow- countrymen. Here assembled the noble councillors, scholars, and cavaliers whose foresight and skill guided the helm of state, whose accomplishment in letters and arms gave refinement and distinction to court pageants and ceremonials, and whose patronage and support of the rising drama helped to make the metropolitan theatre the great centre of genius and art, the great school of historical teaching, the great mirror of human nature in all the breadth and emphasis of its interests, convictions, and activities. The theatre was indeed the living organ through which all the marvellous and mingled experiences of a time incomparably rich in vital elements found expression. There was no other, no organized or adequate Books were a solitary*~~

~~*The theatres,*~~

~~*760.*~~

~~*SHAKESPEARE*~~

~~*entertainment in the hands of few; newspapers did not | of playing Comedies, Tragedies, Interludes, and Stage Plays, exist ; and the modern relief of incessant public meetings | and such other like as, they have been already used and*~~

~~*was, fortunately perhaps, an unknown luxury. And yet, amidst the plenitude of national life centred in London, the need for some common organ of expression was never more urgent or imperious. New and almost inexhaustible springs from the well-heads of intellectual life had for years been gradually fertilizing the productive English mind. The heroic life of*~~

~~*the past, in clear outline and stately movement, had been revealed in the recovered masterpieces of Greece and Rome. The stores of more recent wisdom and knowledge, discovery and invention, science and art, were poured continually into the literary exchequer of the nation, and widely diffused amongst eager and open-minded recipients. Under this combined stimulus the national intellect and imagination had already reacted fruitfully in ways that were full of higher promise. The material results of these newly awakened energies were, as we have seen, not less signal or momentous. The number, variety, and power of the new forces thus acting on society effected in a short period a complete moral revolution. The barriers against the spread of knowledge and the spirit of free inquiry erected and long maintained by medieval ignorance and_pre- judice were now thrown down. The bonds of feudal authority and Romish domination that had hitherto forcibly repressed the expanding national life were effectu- ally broken. Men opened their eyes upon a new world which it was an absorbing interest and endless delight to explore,—a new world physically, where the old geo- graphical limits had melted into the blue haze of distant horizons—a new world morally, where the abolition of alien dogma and priestly rule gave free play to fresh and vigorous social energies; and, above all, more surprising and mysterious than all, they opened their eyes with a strange sense of wonder and exultation on the new world of the emancipated human spirit. At no previous period had the popular curiosity about human life and human affairs been so vivid and intense. In an age of deeds so memorable, man naturally became the centre of interest, and the whole world of human action and_ passion, character and conduct, was invested with irresistible attraction. All ranks and classes had the keenest desire to penetrate the mysterious depths, explore the unknown regions, and realize as fully as might be the actual achievements and ideal possibilities of the nature throbbing with so full a pulse within themselves and reflected so powerfully in the world around them. HIuman nature, released from the oppression and darkness of the ages, and emerging with all its infinite faculties and latent powers into the radiant light of a secular day, was the new world that excited an admiration more profound and hopes far more ardent than any recently discovered lands beyond the sinking sun. At the critical moment Shakespeare appeared as the Columbus of that new world. Pioneers had indeed gone before and in a measure prepared the way, but Shakespeare*~~

~~*still remains the great discoverer, occupying a position of almost lonely grandeur in the isolation and completeness of his work.*~~

~~*Never before, except perhaps in the Athens of Pericles, had all the elements and conditions of a great national drama met in such perfect union. As we have seen, the popular conditions supplied by the stir of great public events and the stimulus of an appreciative audience were present in exceptional force. With regard to the stage conditions,—the means of adequate dramatic representation,—public theatres had for the first time been recently established in London on a permanent basis. In 1574 a royal licence had been granted by the queen to the earl of Leicester's conipany "to use, exercise, and occupy the art and faculty*~~

~~*studied, as well for the recreation of our loving subjects as for our solace and pleasure when we shall think good to see them"; and, although the civil authorities resisted the attempt to establish a public theatre within the city, two or three were speedily erected just outside its boundaries, in the most convenient and accessible suburbs,—the Curtain and the Theatre in Shoreditch, beyond the northern boundary, and the Blackfriars theatre within the precincts of the dissolved monastery, just beyond the civic jurisdic- tion on the western side. A few years later other houses were built on the southern side of the river,—the Rose near the foot of London Bridge, and the Hope and Swan further afield. There was also at Newington Butts a place of recreation and entertainment for the archers and holiday people, with a central building which, like the circus at Paris Garden, was used during the summer months for dramatic purposes. These theatres were occupied by different companies in turn, and Shakespeare during his early years in London appears to have acted at several of them. But from his first coming up it seems clear that he was more identified with the earl of Leicester's players, of whom his energetic fellow townsman, James Burbage, was the head, than with any other group of actors. To Burbage indeed be- longs the distinction of having first established public theatres as a characteristic feature of metropolitan life. His spirit and enterprise first relieved the leading com- panies from the stigma of being strolling players, and transferred their dramatic exhibitions, hitherto restricted to temporary scaffolds in the court-yards of inns and hostelries, to the more reputable stage and convenient*~~

~~*appliances of a permanent theatre. In 1575 Burbage, having secured the lease of a piece of land at Shoreditch, erected there the house which proved so successful, and was known for twenty years as the Theatre, from the fact that it was the first ever erected in the metropolis. He seems also to have been concerned in the erection of a second theatre in the same locality called the Curtain ; and later on, in spite of many difficulties, and a great deal of local opposition, he provided the more celebrated home of the rising drama known as the Blackfriars theatre. When Shakespeare went to London there were thus theatres on both sides of the water—the outlying houses being chiefly used during the summer and autumn months, while the Blackfriars, being roofed in and pro-tected from the weather, was specially used for perform- ances during the winter season. In spite of the persistent opposition of the lord mayor and city aldermen, the denunciations of Puritan preachers and their allies in the press, and difficulties arising from intermittent attacks of the plague and the occasional intervention of the court authorities, the theatres had now taken firm root in the metropolis ; and, strong in royal favour, in noble patron- age, and above all in popular support, the stage had already begun to assume its higher functions as the living organ of the national voice, the many-coloured mirror and reflexion of the national life. A few years later the com- panies of players and the theatres they occupied were consolidated and placed on a still firmer public basis. For some years past, in addition to the actors really or nominally attached to noble houses, there had existed a body of twelve performers, selected by royal authority (in 1583) from different companies and known as the Queen's players. The earl of Leicester's, being the leading company, had naturally furnished a number of recruits to the Queen's players, whose duty it was to act at special seasons before Her Majesty and the court. But within a few years after Shakespeare arrived in London the chief*~~

~~*groups of actors were divided into two great companies, specially licensed and belonging respectively to the Lord Chamberlain and the Lord Admiral. Under the new arrangement the earl of Leicester's actors (who, as already stated, after the earl's death in 1588 found for a time a new patron in Lord Strange!) became the servants of the Lord Chamberlain.*~~

~~*James Burbage had already retired from the company, his place being taken by his more cele- brated son Richard Burbage, the Garrick of the Eliza- bethan stage, who acted with so much distinction and success all the great parts in Shakespeare's leading plays. In order that the Lord Chamberlain's company might have houses of their own both for summer and winter use, Richard Burbage, his brother Cuthbert, and their associates, including Shakespeare, undertook in 1599 to build a new theatre on the bank side, not far from the old Paris Garden circus. We know from a subsequent document, which refers incidentally to the building of this theatre, that the Burbages had originally introduced Shakespeare to the Blackfriars company. He had indeed proved himself so useful, both as actor and poet, that they were evidently glad to secure his future services by giving him a share as part proprietor in the Blackfriars property. The new theatre now built by the company was that known as the Globe, and it was for fifteen years, during the suinmer and autumn months, the popular and highly successful home of the Shakespearian drama. Three years earlier Richard Burbage and_ his associates had rebuilt the Blackfriars theatre on a more extended scale; and this well-known house divided with the Globe the honour of producing Shakespeare's later and more important plays. Shakespeare's position indeed of actor and dramatist is identified with these houses and with the Lord Chamberlain's company to which they belonged. On the accession of James L., this company, being specially favoured by the new monarch, received a fresh royal charter, and the members of it were henceforth known as the King's servants. In the early years of Shakespeare's career the national drama had thus a permanent home in theatres conveniently central on either side of the river, and crowded during the summer and winter mionths by eager and excited audiences, Even before the building of the Globe, the house at New- ington where three of Marlowe's most important plays and some of Shakespeare's early tragedies were produced was often crowded to the doors. In the summer of 1592, when the Hirst Part of Henry VI., as revised by Shake- speare, was acted, the performance was so popular that, we are told by Nash, ten thousand spectators witnessed it in the course of a few weeks. It is true that even in the best theatres the appliances in the way of scenes and stage machinery were of the simplest description, change of scene being often indicated by the primitive device of a board with the name painted*~~

~~upon it. But players and play- wrights, both arts being often combined in the same person, knew their business thoroughly well, and justly relied for success on the more vital attractions of powerful acting, vigorous writing, and practised skill in the construction of their pieces. In the presence of strong passions expressed in kindling words and powerfully realized in living action, gesture, and incident, the absence of canvas sunlight and painted gloom was hardly felt. Or, as the stirring choruses in Henry V. show, the want of more elaborate and realistic scenery was abundantly supplied by the excited fancy, active imagination, and concentrated interest of the spectators.~~

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~~' This is maintained by Mr Fleay in his recent Life and Work of Shakespeare, But the history of the early dramatic companies is so obscure that it is difficult to trace their changing fortunes with absolute certainty.~~

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~~_ The dramatic conditions of a national theatre were New indeed, at the outset of Shakespeare's career, more com- school of plete, or rather in a more advanced state of development, 'Singas~~

~~than the playhouses themselves or their stage accessories. If Shakespeare was fortunate in entering on his London work amidst the full tide of awakened patriotism and public spirit, he was equally fortunate in finding ready to his hand the forms of art in which the rich and complex life of the time could be adequately expressed. During the decade in which Shakespeare left Stratford the play- wright's art had undergone changes so important as to constitute a revolution in the form and spirit of the national drama. For twenty years after the accession of Elizabeth the two roots whence the English drama sprung—the academic or classical, and the popular, devel- oped spontaneously in the line of mysteries, moralities, and interludes—continued to exist apart, and to produce their accustomed fruit independently of each other. The popular drama, it is true, becoming more secular and realistic, enlarged its area by collecting its materials from all sources,—from novels, tales, ballads, and histories,~~

~~*as well as from fairy mythology, local superstitions, and folk- lore. But the incongruous materials were, for the most part, handled in a crude and semi-barbarous way, with just sufficient art to satisfy the cravings and clamours of unlettered audiences. The academic plays, on the other hand, were written by scholars for courtly and cultivated circles, were acted at the universities, the inns of court, and at special public ceremonials, and followed for the most part the recognized and restricted rules of the classic drama. But in the third decade of Elizabeth's reign another dramatic school arose intermediate between the two elder ones, which sought to combine in a newer and' higher form the best elements of both. The main impulse guiding the efforts of the new school may be traced in-directly to a classical source. It was due, not immediately to the masterpieces of Greece and Rome, but to the form which classical art had assumed in the contemporary drama of Italy, France, and Spain, especially of Italy, which was that earliest developed and best known to the new school of poets and dramatists. This southern drama, while academic in its leading features, had nevertheless modern elements blended with the ancient form. As the Italian epics, followinp in the main the older examgles, were still charged with romantic and realistic elements unknown to the classical epic, so the Italian drama, con-structed on the lines of Seneca and Plautus, blended with the severer form essentially romantic features. With the choice of heroic subjects, the orderly development of the plot, the free use of the chorus, the observance of the unities, and constant substitution of narrative for action were united the vivid colouring of poetic fancy and diction, and the use of materials and incidents derived from recent history and contemporary life. The influence of the Italian drama on the new school of English play- wrights was, however, very much restricted to points of style and diction of rhetorical and poetical effect. It helped to produce among them the sense of artistic treat- ment, the conscious effort after higher and more elaborate forms and vehicles of imaginative and passionate expres-sion. For the rest, the rising English drama, in spite of the efforts made by academic critics to narrow its range and limit its interests, retained and thoroughly vindicated its freedom and independence. The central character- istics of the new school are sufficiently explained by the fact that its leading representatives were all of them scholars and poets, living by their wits and gaining a somewhat precarious livelihood amidst the stir*~~

~~*and bustle, the temptations and excitement, of concentrated London life. The distinctive note of their work is the reflex of XXI. — 96*~~

~~*Leading members of the school.*~~

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~~*their position as academic scholars working under poetic and popular impulses for the public theatres. The new and striking combination in their dramas of elements hitherto wholly separated is but the natural result of their attainments and literary activities. From their univer- sity training and knowledge of the ancients they would be familiar with the technical requirements of dramatic art, the deliberate handling of plot, incident, and char- acter, and the due subordination of parts essential for producing the effect of an artistic whole. Their imagina- tive and emotional sensibility, stimulated by their studies in Southern literature, would naturally prompt them to combine features of poetic beauty and rhetorical finish with the evolution of character and action; while from the popular native drama they derived the breadth of sympathy, sense of humour, and vivid contact with actual life which gave reality and power to their representations.*~~

~~*The leading members of this group or school were Kyd, Greene, Lodge, Nash, Peele, and Marlowe, of whom, in relation to the future development of the drama, Greene, Peele, and Marlowe are the most important and influential. They were alinost the first poets and men of genius who devoted themselves to the production of dramatic pieces for the public theatres. But they all helped to redeem the common stages from the reproach their rude and boisterous pieces had brought upon them, and make the plays represented poetical and artistic as well as lively, bustling, and popular. Some did this rather from a necessity of nature and stress of circumstance than from any higher aim or deliberately formed resolve. But Marlowe, the greatest of them, avowed the redemption of the common stage as the settled purpose of his labours at the outset of his dramatic career. And during his brief and stormy life he nobly discharged the self-imposed task. HIs first play, Zamburline the Great, struck the authentic note of artistic and romantic tragedy. With all its extra- vagance, and over-straining after vocal and rhetorical effects, the play throbs with true*~~

~~*passion and true poetry, and has throughout the stamp of emotional intensity and intellectual power. His later tragedies, while marked by the same features, bring into fuller relief the higher characteristics of his passionate and poetical genius. Alike in the choice of subject and method of treatment Marlowe is thoroughly independent, deriving little, except in the way of general stimulus, either from the classical or popular drama of his day. The signal and far-reaching reform he effected in dramatic metre by the introduction of modulated blank verse illustrates the striking originality of his genius. Gifted with a fine ear for the music of English numbers, and impatient of " the gigging veins of rhyming mother wits," he introduced the noble metre which was at once adopted by his contemporaries and became the vehicle of the great Elizabethan drama. The new metre quickly abolished the rhyming couplets and stanzas that had hitherto prevailed on the popular stage. The rapidity and completeness of this metrical revolution is in itself a powerful tribute to Marlowe's rare insight and feeling as a master of musical expression. The originality and importance of Marlowe's innovation are not*~~

~~*materially affected by the fact that one or two classical |*~~

~~*plays, such as Gorboduc and Jocasta, had been already written in unrhymed verse. In any case these were private plays, and the monotony of cadence and structure in the verse excludes them from anything like serious comparison with the richness and variety of vocal effect produced by the skilful pauses and musical interlinking of Marlowe's heroic metre. Greene and Peele did almost as much for romantic comedy as Marlowe had done for romantic tragedy. Greene's ease and lightness of touch,*~~

~~*his freshness of feeling and play of fancy, his vivid sense*~~

~~*SHAK ESPHAE E*~~

~~*of the pathos and beauty of homely scenes and thorough enjoyment of English rural life, give to his dramatic*~~

~~*| sketches the blended charm of romance and reality hardly*~~

~~*to be found elsewhere except in Shakespeare's early comedies. In special points of lyrical beauty and dramatic portraiture, such as his sketches of pure and devoted women and of witty and amusing clowns, Greenc anticipated some of the more delightful and characteristic features of Shakespearian comedy. Peele's lighter pieces and Lyly's prose comedies helped in the same direction. Although not written for the public stage, Lyly's court comedies were very popular, and Shakespeare evidently gained from their light and easy if somewhat artificial tone, their constant play of witty banter and spark- ling repartee, valuable hints for the prose of his own comedies. Marlowe again prepared the way for another characteristic development of Shakespeare's dramatic art. HIs HIdward II. marks the rise of the historical drama, as distinguished from the older chronicle play, in which the annals of a reign or period were thrown into a series of loose and irregular metrical scenes. Peele's Edward J., Marlowe's HIdward II., and the fine anonymous play of Edward III., in which many critics think Shakespeare's hand may be traced, show how thoroughly the new school had felt the rising national pulse, and how promptly it responded to the popular demand for the dramatic treat- ment of history. The greatness of contemporary events had created a new sense of the grandeur and continuity of the nation's life, and excited amongst all classes a vivid interest in the leading personalities and critical struggles that had marked its progress. There was a strong and general feeling in favour of historical subjects, and especially historical subjects having in them elements of tragical depth and intensity. Shakespeare's own early plays—dealing with the distracted reign of King Jolin, the Wars of the Roses, and the tragical lives of Richard II. and Richard IJI.—illustrate this bent of popular feeling. The demand being met by men of poetical and dramatic genius reacted powerfully on the spirit of the age, helping in turn to illuminate and strengthen its loyal and patriotic sympathies.*~~

~~*This is in fact the key-note of the English stage Superi- It was its ovity*~~

~~*in the great period of its development. breadth of national interest and intensity of tragic power that made the English drama so immeasurably superior to every other contemporary drama in Europe. The Italian drama languished because, though carefully elaborated in point of form,*~~

~~*it had no fulness of national life, no common elements of ethical conviction or aspiration, to vitalize and ennoble it. Even tragedy, in the hands of Italian dramatists, had no depth of human passion, no energy of heroic purpose, to give higher meaning and power to its evolution. In Spain the dominant courtly and ecclesi- astical influences limited the development of the national drama, while in France it remained from the outset under the artificial restrictions of classical and pseudo-classical traditions. Shakespeare's predecessors and contemporaries, in elevating the common stages, and filling them with poetry, music, and passion, had attracted to the theatre all classes, including the more cultivated and refined; and the intelligent interest, energetic patriotism, and robust life of so representative an English audience supplied the strongest stimulus to the more perfect development of the great organ of national expression. The forms of dramatic art, in the three main departments of comedy, tragedy, and historical drama, had been, as we have seen, clearly discriminated and evolved in their earlier stages. It was a moment of supreme promise and expectation, and in the accidents of earth, or, as we may more appropriately and gratefully say, in the ordinances of heaven, the supreme*~~

~~*Shake. speare's dramatic career— first period.*~~

~~*PHAKESPEHEARRE*~~

~~*poet and dramatist appeared to more than fulfil the utmost promise of the time. By right of imperial command over all the resources of imaginative insight and expression Shakespeare combined the rich dramatic materials already prepared into more perfect forms, and carried them to the highest point of ideal development. He quickly surpassed Marlowe in passion, music, and intellectual power ; Greene in lyrical beauty, elegiac grace, and narrative interest; Peele in picturesque touch and pastoral sweetness ; dialogue. And having distanced the utmost efforts of his predecessors and contemporaries he took his own higher way, and reigned to the end without a rival in the new world of supreme dramatic art he had created. It is a new world, because Shakespeare's work alone can be said to possess the organic strength and infinite variety, the throbbing fulness, vital complexity, and breathing truth, of nature herself. In points of*~~

~~*artistic resource and technical ability—such as copious and expressive diction, freshness and pregnancy of verbal combination, richly modulated verse, and structural skill in the handling of incident and action—Shakespeare's supremacy is indeed sufficiently assured. But, after all, it is of course in the spirit and substance of his work, his power of piercing to the hidden centres of character, of touch- ing the deepest springs of impulse and passion, out of which are the issues of life, and of evolving those issues dramatically with a flawless strength, subtlety, and truth, which raises him so immensely above and beyond not only the best of the playwrights who went before him, but the whole line of illustrious dramatists that came after him. It is Shakespeare's unique distinction that he has an absolute command over all the complexities of thought and feeling that prompt to action and bring out the dividing lines of character. He sweeps with the hand of a master the whole gamut of human experience, from the lowest note to the very top of its compass, from the sportive childish treble of Mamilius and the pleading boyish tones of Prince Arthur, up to the spectre-haunted terrors of Macbeth, the tropical passion of Othello, the agonized sense and tortured spirit of Hamlet, the sustained elemental grandeur, the Titanic force and utterly tragical pathos, of Lear.*~~

~~*Shakespeare's active dramatic career in London lasted about twenty years, and may be divided into three tolerably symmetrical periods. The first extends from the year 1587 to about 1593-94; the second from this date to the end of the century ; and the third from 1600 to about 1608, soon after which time Shakespeare ceased to write regularly for the stage, was less in London and more and more at Stratford. Some modern critics add to these a fourth period, including the few plays which from internal as well as external evidence must have been among the poet's latest productions. As the exact dates of these plays are unknown, this period may be taken to extend from 1608 to about 1612. The three dramas produced during these years are, however, hardly entitled to be ranked as a separate period. They may rather be regarded as supplementary to the grand series of dramas belonging to the third and greatest epoch of Shakespeare's pro- ductive power. To the first period belong Shakespeare's early tentative efforts in revising and partially rewriting plays produced by others that already had possession of the stage. These*~~

~~efforts are illustrated in the three parts of Henry VI, especially the second and third parts, which bear decisive marks of Shakespeare's hand, and were toa great extent recast and rewritten by him. It is clear from the internal evidence thus supplied that Shakespeare was at first powerfully affected by '"Marlowe's mighty line." This influence is so marked in the revised second~~

~~and Lyly in bright and sparkling |~~

~~and third parts of Henry VI. as to induce some critics to believe Marlowe must have had a hand in the revision. These passages are, however, sufficiently explained by the fact of Marlowe's influence during the first period of Shakespeare's career. To the same period also belong the earliest tragedy, that of Titus Andronicus, and the three comedies—Love's Labour 's Lost, The Comedy of Errors, and the Z'wo Gentlemen of Verona. These dramas are all marked by the dominant literary influences of the time. They present features obviously due to the revived and widespread knowledge of classical literature, as well as to the active interest in the literature of Italy and the South. Titus Andronicus, in many of jts characteristic features, reflects the form of Roman tragedy almost universally accepted and followed in the earlier period of the drama. This form was supplied by the Latin plays of Seneca, their darker colours being deepened by the moral effect of the judicial tragedies and military conflicts of the time. The execution of the Scottish queen and the Catholic con- spirators who had acted in her name, and the destruction of the Spanish Armada, had given an impulse to tragic representations of an extreme type. This was undoubtedly rather fostered than otherwise by the favourite exemplars of Roman tragedy. The Medea and Thyestes of Seneca are crowded with pagan horrors of the most revolting kind. It is true these horrors are usually related, not represented, although in the Medea the maddened heroine kills her children on the stage. But from these tragedies the conception of the physically horrible as an element of tragedy was imported into the early English drama, and intensified by the realistic tendency which the events of the time and the taste of their ruder audiences had impressed upon the common stages. This tendency is~~

~~exemplified in Zitus Andronicus, obviously a very early work, the signs of youthful effort being apparent not only in the acceptance of so coarse a type of tragedy but in the crude handling of character and motive, and the want of har- mony in working out the details of the dramatic concep- tion. Kyd was the most popular contemporary repre- sentative of the bloody school, and in the leading motives of treachery, concealment, and revenge there are points of likeness between Zitus Andronicus and the Spanish Tragedy. But how promptly and completely Shake- speare's nobler nature turned from this lower type is apparent from the fact that he not only never reverted to it but indirectly ridicules the piled-up horrors and extra-vagant language of Kyd's plays.~~

~~The early comedies in the same way are marked by the dominant literary influences of the time, partly classic partly Italian. In the Comedy of Errors, for example, Shakespeare attempted a humorous play of the old classi- cal type, the general plan and many details being derived directly from Plautus. In Love's Labour '*s Lost many characteristic features of Italian comedy are freely intro- duced : the pedant Holofernes, the curate Sir Nathaniel, the fantastic braggadocio soldier Armado, are all well-known characters of the contemporary Italian drama. Of this comedy, indeed, Gervinus says, "the tone of the Italian school prevails here more than in any other play. The redundance of wit is only to be compared with a similar redundance of conceit in Shakespeare's narrative poems, and with the Italian style which he had early adopted." These comedies display another sign of early work in the mechanical exactness of the plan and a studied symmetry in the grouping of the chief personages of the drama. In the Zwo Gentlemen of Verona, as Prof. Dowden points out, "Proteus the fickle is set against Valentine the faithful, Silvia the light and intellectual against Julia the ardent and tender, Lance the humourist against Speed the wit." So in Love's Labour 's Lost, the king and his three fellow-~~

~~Second period.~~

~~students balance the princess and her three ladies, and there is a symmetrical play of incident between the two groups. The arrangement is~~

~~*obviously more artificial than spontaneous, more mechanical than vital and organic. But towards the close of the first period Shakespeare had fully realized his own power and was able to dispense with these artificial supports. Indeed, having rapidly gained knowledge and experience, he had before the close written plays of a far higher character than any which even the ablest of his contemporaries had produced. He had firmly laid the foundation of his future fame in the direction both of comedy and tragedy, for, besides the comedies already referred to, the first sketches of Hamlet and Romeo and Juliet, and the tragedy of Richard III., may probably be referred to this period.*~~

~~*Another mark of early work belonging to these dramas is the lyrical and elegiac tone and treatment associated with the use of rhyme, of rhyming couplets and stanzas. Spenser's musical verse had for the time elevated the character of rhyming metres by identifying them with the highest kinds of poetry, and Shakespeare was evidently at first affected by this powerful impulse. He rhymed with great facility, and delighted in the gratification of his lyrical fancy and feeling which the more musical rhyming metres afforded. Rhyme accordingly has a considerable and not inappropriate place in the earlier romantic comedies. The Comedy of Errors has indeed been de- scribed as a kind of lyrical farce in which the opposite qualities of elegiac beauty and comic effect are happily blended. Rhyme, however, at this period of the poet's work is not restricted to the comedies. It is largely used in the tragedies and histories as well, and plays even an important part in historical drama so late as Richard II. Shakespeare appears, however, to have worked out this favourite vein, and very much taken leave of it, by the publication of his descriptive and narrative poems, the Venus and Adonis and the Lucrece, although the enormous popularity of these poems might almost have tempted him to return again to the abandoned metrical form. The only considerable exception to the disuse of rhyming metres and lyrical treatment is supplied by the Sonnets, which, though not published till 1609, were probably begun early, soon after the poems, and written at intervals during eight or ten of the intervening years. Into the many vexed questions connected with the history and meaning of these poems it is impossible to enter. The attempts recently made by the Rev. W. A. Harrison and Mr T. Tyler to identify the "dark lady" of the later sonnets,*~~

~~*while of some historical interest, cannot be regarded as successful. And the identification, even if rendered more probable by the discovery of fresh evidence, would not clear up the difficulties, biographical, literary, and historical, con- nected with these exquisite poems. It is perhaps enough to say with Prof. Dowden that in Shakespeare's case the most natural interpretation is the best, and that, so far as they throw light on his personal character, the sonnets show that "he was capable of measureless personal devotion; that he was tenderly sensitive, sensitive above all to every diminution or alteration of that love his heart so eagerly craved; and that, when wronged, although he suffered anguish, he transcended his private injury and learned to forgive."*~~

~~*Whatever question may be raised with regard to the superiority of some of the plays belonging to the first period of Shakespeare's dramatic career, there can be no question at allas to any of the pieces belonging to the second period, which extends to the end of the century. During these years Shakespeare works as a master, having complete command over the materials and resources of the most mature and flexible dramatic art. "To this stage,"*~~

~~*SHAKES PEAT II*~~

~~*says Mr Swinburne, " belongs the special faculty of fault- less, joyous, facile command upon each faculty required of the presiding genius for service or for sport. It is in the middle period of his work that the language of Shake- speare is most limpid in its fulness, the style most pure, the thought most transparent through the close and luminous raiment of perfect expression." This period includes the magnificent series of historical plays—Richard If., the two parts of Henry IV., and Henry V.i—and a double series of brilliant comedies. The Midsummer*~~

~~*Jight's Dream, All's Well that ends Well, and the Mer- chant of Venice were produced before 1598, and during the next three years there appeared a still more complete and characteristic group including Much ado about No- thing, As you Like it, and Twelfth Night. These comedies and historical plays are all marked by a rare harmony of reflective and imaginative insight, perfection of creative art, and completeness of dramatic effect. Before the close of this period, in 1598, Francis Meres*~~

~~*paid his cele- brated tribute to Shakespeare's superiority in lyrical, descriptive, and dramatic poetry, emphasizing his un- rivalled distinction in the three main departments of the drama,—comedy, tragedy, and historical play. And from this time onwards the contemporary recognitions of Shakespeare's eminence as a poet and dramatist rapidly multiply, the critics and eulogists being in most cases well entitled to speak with authority on the subject.*~~

~~*In the third period of Shakespeare's dramatic career Third years had evidently brought enlarged vision, wider Period.*~~

~~*thoughts, and deeper experiences. While the old mastery of art remains, the works belonging to this period seem to bear traces of more intense moral struggles, larger and less joyous views of human life, more troubled, complex, and profound conceptions and emotions. Comparatively few marks of the lightness and animation of the earlier works remain, but at the same time the dramas of this period display an unrivalled power of piercing the deepest mysteries and sounding the most tremendous and perplex- ing problems of human life and human destiny. To this period belong the four great tragedies—IHamlet, Macbeth, Othello, Lear; the three Roman plays—Coriolanus, Julius Cesar, Anthony and Cleopatra; the two singular plays whose scene and personages are Greek but whose action and meaning are wider and deeper than either Greek or Roman life—Troddus and Cressida and Timon of Athens ; and one comedy—AJfeasure for Measure, which is almost tragic in the depth and intensity of its characters and incidents. The four great tragedies represent the highest reach of Shakespeare's dramatic power, and they sufficiently illustrate the range and complexity of the deeper problems that now occupied his mind. Timon and Measure for Measure, however, exemplify the same tendency to brood with meditative intensity over the wrongs and miseries that afflict humanity. These works sufficiently prove that during this period Shakespeare gained a disturbing insight into the deeper evils of the world, arising from the darker passions, such as treachery and revenge. But it is also clear that, with the larger vision of a noble, well-poised nature, he at the same time gained a fuller perception of the deeper springs of goodness in human nature, of the great virtues of invincible fidelity and unwearied love, and*~~

~~*he evidently received not only consolation and calm but new stimulus and power from the fuller realization of these virtues. The typical plays of this period thus embody Shakespeare's ripest experience of the great issues of life. In the four grand tragedies the central problem is a profoundly moral one. It is the supreme internal conflict of good and evil amongst the central forces and higher elements of human nature, as appealed to and developed by sudden and powerful temptation, smitten by accumu-*~~

~~*Later personal history.*~~

~~*SHAKESPEARE*~~

~~*lated wrongs, or plunged in overwhelming calamities, As the result, we learn that there is something infinitely more precious in life than social ease or worldly success—noble- ness of soul, fidelity to truth and honour, human love and loyalty, strength and tenderness, and trust to the very end. In the most tragic experiences this fidelity to all that is best in life is only possible through the loss of life itself. But when Desdemona expires with a sigh and Cordelia's loving eyes are closed, when Hamlet no more draws his breath in pain and the tempest-tossed Lear is at last liberated from the rack of this tough world, we feel that, death having set his sacred seal on their great sorrows and greater love, they remain with us aS possessions for ever. In the three dramas belonging to Shakespeare's last period, or rather which may be said to close his dramatic career, the same feeling of severe but consolatory calm is still more apparent. If the deeper discords of life are not finally resolved, the virtues which soothe their perplexities and give us courage and endurance to wait, as well as confidence to trust the final issues,—the virtues of forgive- ness and generosity, of forbearance and self-control,—are largely illustrated. This is a characteristic feature in each of these closing dramas, in the Winter's Tale, Cymbeline, and the Tempest. The Tempest is supposed, on tolerably good grounds, to be Shakespeare's last work, and in it we see the great magician, having gained by the wonderful experience of life, and the no less wonderful practice of his art, serene wisdom, clear and enlarged vision, and beneficent self-control, break his magical wand and retire from the scene of his triumphs to the home he had chosen amidst the*~~

~~woods and meadows of the Avon, and surrounded by the family and friends he loved.~~

~~We must now briefly summarize the few remaining facts of the poet's personal history. The year 1596 was marked by considerable family losses. In August Shake- speare's only son Hamnet died in the twelfth year of his age. With his strong domestic affections and cherished hopes of founding a family, the early death of his only boy must have been for his father a severe blow. It was followed in December by the death of Shakespeare's uncle Henry, the friend of his childhood and youth, the protector and encourager of his boyish sports and enterprises at Bearley, Snitterfield, and Fulbroke. A few months later the Shake- speare household at Snitterfield, so intimately associated for more than half a century with the family in Henley Street, was finally broken up by the death of the poet's aunt Margaret, his uncle Henry's widow. Although the death of his son and heir had diminished the poet's hope of founding a family, he did not in any way relax his efforts to secure a permanent and comfortable home for his wife and daughters at Stratford. As early as 1597, when he had pursued his London career for little more than ten years, he had saved enough to purchase the considerable dwelling- house in New Place, Stratford, to which he afterwards retired. This house, originally built by Sir Hugh Clop- ton and called the "Great House," was one of the largest mansions in the town, and the fact of Shakespeare having acquired such a place as his family residence would at once increase his local importance. From time to time he made additional purchases of land about the house aud in the neighbourhood. In 1602 he largely increased the property by acquiring 107 acres of arable land, and later on he added to this 20 acres of pasture land, with a convenient cottage and garden in Chapel Lane, oppo- site the lower grounds of the house. Within a few years his property thus comprised a substantial dwelling-house with large garden and extensive outbuildings, a cottage fronting the lower road, and about 137 acres of arable and pasture land. During these years Shakespeare made another important purchase that added considerably to his~~

~~*income. From the letter of a Stratford burgess to a friend in London, it appears that as early as 1597 Shakespeare had been making inquiry about the purchase of tithes in the town and neighbourhood. And in 1605 he bought the unexpired lease of tithes, great and small, in Stratford and two adjoining hamlets, the lease having still thirty years torun. This purchase yielded him an annual income of £38 a year, equal to upwards of £350 a year of our present money. The last purchase of property made by Shakespeare of which we have any definite record is at once so interesting and so perplexing as to have stimulated various conjectures on the part of his biographers. This purchase carries us away from Stratford back to London, to the immediate neighbourhood of Shakespeare's dramatic labours and triumphs. It seems that in March 1613 he bought a house with a piece of ground attached to it a little to the south-west of St Paul's cathedral, and not far from the Blackfriars theatre. The purchase of this house in London after he had been for some years settled at Stratford has led some critics to suppose that Shakespeare had not given up all thought of returning to the metropolis, or at least of spending part of the year there with his family in the neighbourhood he best knew and where he was best known. The ground of this supposition is, however, a good deal destroyed by the fact that soon after acquiring this town house Shakespeare let it for a lease of ten years. He may possibly have bought the property as a convenience to some of his old friends who were associated with him in the purchase. In view of future contingencies it would obviously be an advantage to have a substantial dwelling so near the theatre in the hands of a friend. It was indeed by means of a similar purchase that James Burbage had originally started and established the Blackfriars theatre.*~~

~~*The year 1607-8 would be noted in Shakespeare's family calendar as one of vivid and chequered domestic experiences. On the 5th of June his eldest daughter Susanna, who seems to have inherited something of her father's genius, was married to Dr John Hall, a medical man of more than average knowledge and ability, who had a considerable practice in the neighbourhood of Stratford, and who was deservedly held in high repute. The newly married couple settled in one of the picturesque houses of the wooded suburb between the town and the church known as Old Stratford. But before the end of the year the midsummer marriage bells*~~

~~*had changed to sadder music. In December Shakespeare lost his youngest brother, Edmund, at the early age of twenty-seven. He had become an actor, most probably through his brother's help and influence, and was, at the time of his death, living in London. He was buried at Southwark on the last day of the year. Two months later there was family rejoicing in Dr Hall's house at the birth of a daughter, christened Elizabeth, the only offspring of the union, and the only grandchild Shakespeare lived to gee. The rejoicing at this event would be fully shared by the house- hold in New Place, and especially by Shakespeare. himself, whose cherished family hopes would thus be strengthened and renewed. Six months later in this eventful year, fortune again turned her wheel. Early in September Shakespeare's mother, Mary Arden of the Asbies, died, having lived long enough to see and welcome her great- grandchild as a fresh bond of family life. She was buried at Stratford on the 9th of September, having survived her husband, who was buried on the Sth of September 1601, exactly seven years. Mary Shakespeare died full of years and honour and coveted rewards. For more than a decade she had witnessed and shared the growing pro- sperity of her eldest son, and felt the mother's thrill of joy and pride in the success that had crowned his brilliant*~~

~~*career. The loss of his mother would be deeply felt by her favourite son, but there was no bitterness in the bereave- ment, and it even seems to have exerted a tranquillizing, elevating effect on the poet's mind and character. As he laid her in the grave he would recall and realize afresh the early years during which her loving presence and influence were the light and guide of his boyish life. With these vivid and varied family experiences a strong wave of home- yearning seems to have set in, which gradually drew the poet wholly back to Stratford. During the autumn visit connected with his mother's death Shakespeare must have remained several weeks at the New Place, for on the 16th of October he acted as godfather to the infant son of an old personal friend, Henry Walker, who was an alderman of the borough. The child was called William after his godfather, and the poet must have taken a special interest in the boy, as he remembered him in his will.*~~

~~*It seems most probable that soon after the chequered*~~

~~*Stratford. domestic events of this year, as soon as he could con-*~~

~~*veniently terminate his London engagements, Shake- speare decided on retiring to his native place. He had gained all he cared for in the way of wealth and fame, and his strongest interests, personal and relative, were now centred in Stratford. But on retiring to settle in his native town he had nothing of the dreamer, the sentiment- alist, or the recluse about him. His healthy natural feeling was far too strong, his character too manly and well-balanced, to admit of any of the so-called eccentricities of genius. He retired as a successful professional man who had gained a competence by his own exertions and wished to enjoy it at leisure in a simple, social, rational way. He knew that the competence he had gained, the lands and wealth he possessed, could only be preserved, like other valuable possessions, by good management and careful husbandry. And, taught by the sad experience of his earlier years, he evidently guided the business details of his property with a firm and skilful hand, was vigilant and scrupulously just in his dealings, respecting the rights of others, and, if need be, enforcing his own. He sued his careless and negligent debtors in the local court of record, had various commercial transactions with the corporation, and took an active interest in the affairs of the borough. And he went now and then to London, partly on business connected with the town, partly no doubt to look after the administration and ultimate dis-posal of his own theatrical property, and partly it may be assumed for the pleasure of seeing his old friends and fellow dramatists. Even at Stratford, however, Shake- speare was not entirely cut off from his old associates in arts and letters, his hospitable board being brightened at intervals by the presence, and animated by the wit, humour, and kindly gossip, of one or more of his chosen friends. Two amongst the most cherished of lis com-panions and fellow poets, Drayton and Ben Jonson, had paid a visit of this kind to Stratford, and been entertained by Shakespeare only a few days before his death, which occurred almost suddenly on the 23d of April 1616. After three days' illness the great poet was carried off by a sharp attack of fever, at that time one of the commonest scourges, even of country towns, and often arising then as now, only more frequently then than now, from the neglect of proper sanitary precautions. According to*~~

~~*tradition the 23d of April was Shakespeare's birthday, so |*~~

~~*that he died on the completion of the 52d year of his age. Three days later he was laid in the chancel of Stratford church, on the north wall of which his monument, contain- ing his bust and epitaph, was soon afterwards placed, most probably by the poet's son-in-law, Dr John Hall. Shake- speare's widow, the Anne Hathaway of his youth, died in 1623, having survived the poet seven years, exactly the*~~

~~*bearings to John Shakespeare in the year 1596.*~~

~~*SHAKTSPEL Ars.*~~

~~*same length of time that his mother Mary Arden had out- lived her husband. Elizabeth Hall, the poet's grandchild, was married twice, first to Mr Thos. Nash of Stratford, and in 1649, when she had been two years a widow, to Mr afterwards Sir John Barnard of Abington in North- amptonshire. Lady Barnard had no family by either husband, and the three children of the poet's second daughter Judith (who had married Richard Quiney of Stratford, two months before her father's death) all died comparatively young. At Lady Barnard's death in 1670 the family of the poet thus become extinct. By his will made a few weeks before his death Shakespeare left his landed property, the whole of his real estate indeed, to his eldest daughter Mrs Susanna Hall, under strict entail to her heirs. He left also a substantial legacy to his second daughter and only remaining child Mrs Judith Quiney, and a remembrance to several of his friends, including his old associates at the Blackfriars theatre, Burbage, Heminge, and Condell,—the two latter of whom edited the first col- lection of his dramas published in 1623. The will also included a bequest to the poor of Stratford.*~~

~~*From this short sketch it will be seen that all the best Summary known facts of Shakespeare's personal history bring into flifeand |*~~

~~*vivid relief the simplicity and naturalness of his tastes, his love of the country, the strength of his domestic affec- tions, and the singularly firm hold which the conception of family life had upon his imagination, his sympathies, and his schemes of active labour. He had loved the country with ardent enthusiasm in his youth, when all nature was lighted with the dawn of rising passion and kindled imagination ; and after his varied*~~

~~London experi- ence we may well believe that he loved it still more with a deeper and calmer love of one who had looked through and through the brilliant forms of wealthy display, public magnificence, and courtly ceremonial, who had scanned the heights and sounded the depths of existence, and who felt that for the king and beggar alike this little life of feverish joys and sorrows is soothed by natural influences, cheered by sunlight and green shadows, softened by the perennial charm of hill and dale and rippling stream, and when the spring returns no more is rounded with a sleep. In the more intimate circle of human relationships he seems clearly to have realized that the sovereign elixir against the ills of life, the one antidote of its struggles and difficulties, its emptiness and unrest, is vigilant charity, faithful love in all its forms, love of home, love of kindred, love of friends, love of everything simple, just, and true. The larger and more sacred group of those serene and abiding influences flowing from well-centred affections was naturally identified with family ties, and it is clear that the unity and continuity of family life pos- sessed Shakespeare's imagination with the strength of a dominant passion and largely determined the scope and direction of his practical activities. As we have seen, he displayed from the first the utmost prudence and foresight in securing a comfortable home for his family, and provid- ing for the future welfare of his children, The desire of his heart evidently was to take a good position and found a family in his native place. And if this was a weakness he shares it with other eminent names in the republic of letters. In Shakespeare's case the desire may have been inherited, not only from his father, who had pride, energy, and ambition, but especially from his gently descended mother, Mary Arden of the Asbies. But, whatever its source, the evidence in favour of this cherished desire is unusually full, clear, and decisive. While the poet had no doubt previously assisted his father to retrieve his position in the world, the first important step in building~~

~~up the family name was the grant of arms or ese e~~

~~SHAKESPEARE~~

~~father, it may be assumed, had applied to the heralds' college for the grant at the instance and by the help of his son. In this document, the~~

~~*draft of which is still preserved, the grounds on which the arms are given are stated as two :—(1) because John Shakespeare's ancestors had rendered valuable services to HHenry VII.; and (2) that he had married Mary, daughter and one of the heirs of Robert Arden of Wilmcote, in the said county, gentle- man. In the legal conveyances of property to Shake- speare himself after the grant of arms he is uniformly described as 'William Shakespeare of Stratford-upon- Avon, gentleman." HHe is so described in the midst of his London career, and this sufficiently indicates that Stratford was even then regarded as his permanent resid- ence or home. In the following year another important Step was taken towards establishing the position of the family. This was an application by John and Mary Shakespeare to the Court of Chancery for the recovery of the estate of the Asbies, which, under the pressure of family difficulties, had been mortgaged in 1578 to Edward Lambert. The issue of the suit is not known, but, as we have seen, the pleadings on either side occupy a consider- able space and show how resolutely John Shakespeare was bent on recovering his wife's family estate.*~~

~~*Turning to the poet himself, we have the significant fact that during the next ten years he continued, with steady persistency, to build up the family fortunes by investing all his savings in real property,—in houses and land at Stratford. While many of his associates and partners in the Blackfriars company remained on in London, living and dying there, Shakespeare seems to have early realized his theatrical property for the sake of increasing the acreage of his arable and pasture land in the neighbourhood of Strat- ford. In 1598, the year after the purchase of New Place, his family are not only settled there, but he is publicly ranked among the most prosperous and well-to-do citizens of Stratford. In that year, there being some anticipation of a scarcity of corn, an official statement was drawn up as to the amount of wheat in the town. From the list con- tained in this document of the chief houscholders in Chapel Ward, where New Place was situated, we find that out of twenty holders of corn enumerated only two have more in stock than William Shakespeare. Other facts belonging to the same year, such as the successful appeal of a fellow-townsman for important pecuniary help, and the suggestion from an alderman of the borough that, for the sake of securing certain private and public benefits, he should be encouraged to complete a contemplated*~~

~~*purchase of land at Shottery, show that Shakespeare was now recognized as a local proprietor of wealth and influence, and that he had so far realized his early desire of taking a good position in the town and neighbourhood. It will be noted, too, that all the leading provisions of Shakespeare's will embody the same cherished family purpose. Instead of dividing his property between his two daughters, he left, as we have seen, the whole of his estate, the whole of his real property indeed, to his eldest daughter Mrs Susanna Hall, with a strict entail to the heirs of her body. This indicates in the strongest manner the fixed desire of his heart to take a permanent position in the locality, and, if possible, strike the family roots deeply into their native soil. That this purpose was realized in his own case seems clear from the special respect paid to his memory. He was buried, as we have seen, in the chancel of the parish church, where as a rule only persons of family and position could be interred. His monument, one of the most considerable in the church, holds a place of honour on the north wall of the chancel, just above the altar railing. While this tribute of marked official respect may be due in part, as the epitaph intimates, to his*~~

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~~*eminence as a poet, it was no doubt, in a country district like Stratford, due still more to his local importance as a landed proprietor of wealth and position. Indeed, as a holder of the great tithes he was by custom and courtesy entitled to burial in the chancel, ;*~~

~~*If there is truth in the early tradition that Shakespeare originally left Stratford in consequence of the sharp prose- cution of Sir Thomas Lucy, who resented with narrow bitterness and pride the presumption and audacity of the high-spirited youth found trespassing on his grounds, the victim of his petty wrath was in the end amply avenged. After a career of unexampled success in London Shake- Speare returned to his native town crowned with wealth and honours, and, having spent the last years of his life in cordial intercourse with his old friends and fellow towns- men, was followed to the grave with the affectionate respect and regret of the whole Stratford community, This feeling was indeed, we may justly assume, fully shared by all who had ever known the great poet. His con- temporaries*~~

~~*and associates unanimously bear witness to Shakespeare's frank, honourable, loving nature. Perhaps the most striking expression of this common feeling comes from one who in character, disposition, and culture was so different from Shakespeare as his friend and fellow-dramatist Ben Jonson. Even his rough and cynical temper could not resist the charm of Shakespeare's genial character and gracious ways. "T loved the man," he says, "and do honour his memory on this side idolatry as much as any. He was indeed honest, and of an open and free nature, had an excellent phantasy, brave notions, and gentle expressions." As the genius of Shakespeare united the most opposite gifts, so amongst his friends are found the widest diversity of character, endowment, and disposition, This is only another way of indicating the breadth of his sympathies, the variety of his interests, the largeness and exuberant vitality of his whole nature. He touched life at so many points, and responded so in- stinctively to every movement in the complex web of its throbbing activities, that nothing affecting humanity was alien either to his heart or brain. To one so gifted with the power of looking below the surface of custom and con- vention, and perceiving, not only the deeper elements of tapture and anguish to which ordinary eyes are blind, but the picturesque, humorous, or pathetic varieties of the common lot, every form of human experience, every type of character, would have an attraction of its own. 'Tn the view of such a mind nothing would be common or unclean, To Shakespeare all aspects of life, even the humblest, had points of contact with his own. He could talk simply and naturally without a touch of patronage or condescen- sion to a hodman on his ladder, a costermonger at his stall, the tailor on his board, the cobbler in his combe, the hen-wife in her poultry-yard, the ploughman in his furrow, or the base mechanicals at the wayside country inn. He could watch with full and humorous appreciation the various forms of brief authority and petty officialism, the bovine stolidity and empty consequence of the local Dogberries and Shallows, the strange oaths and martial swagger of a Pistol, a Bardolph, or a Parolles, the pedantic talk of a Holofernes, the pragmatical saws of a Polonius, or the solemn absurdities of a self-cunceited Malvolio. On the other hand he could seize from the inner side by links of vital affinity every form of higher character, pas- sionate, reflective, or executive,—lover and prince, duke and captain, legislator and judge, counsellor and king, — and portray*~~

~~with almost equal ease and with vivid truth- fulness men and women of distant ages, of different races, and widely sundered nationalities.~~

~~As in his dramatic world he embraces the widest variety of human experience, so in his personal character he may~~

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~~be said to have combined in harmonious union the widest range of qualities, including some apparently the most opposed. He was a vigilant and acute man of business, of great executive ability, with a power of looking into affairs which included a thorough mastery of tedious legal details. But with all his worldly prudence and foresight he was at the same time the most generous and affectionate of men, honoured and loved by all who knew him, with the irre- sistible charm that belongs to simplicity and directness of | character, combined with thoughtful sympathy and real | kindness of heart. And, while displaying unrivalled skill, sagacity, and firmness in business transactions and practical | affairs, he could promptly throw the whole burden aside, and — in the exercise of his noble art pierce with an eagle's wing the very highest heaven of invention. That indeed was his native air, his true home, his permanent sphere, where he still rules with undisputed sway. He occupies a throne apart in the ideal and immortal kingdom of supreme creative art, poetical genius, and dramatic truth. (2388s)~~

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~~*J. J. Eschenburg, Versuch %t. &., Leipsic, 1787, 8vo; J. Ritson, The Quip Modest, 1788, 8vo; S. Felton, Jm- perfect Hints towards a New Edition of 8., 1787-8, 2 pts. 4to; A. Eccles, Jilustrations and Variorum Comments on Lear, Cymbeline, and Merchant of Venice, 1792-1805, 3 vols. 12mo; E. Malone, Letter to R. Farmer, 1792, 8vo; J. Ritson, Cursory Critieism on Malone's Edition, 1792, 8vo; i. Malone, Prospectus of an Edition in 15 vols. roy. &v0, 1792, 4to; Bishop Percy, cree of the English Stage, 1793, 8vo; E. Malone, Proposals for an Intended Hdition in 20 vols. roy. 8vo, 1795, folio; W. Richardson, issays on some of 8.'s Dramatie Characters, 1797, 1812, 8vo, reprint of separate pieces; Lord Chedworth, Notes on some Obscure Passages, 1805, 8vo, pri- vately printed ; E. H. Seymour, Remarks on the Plays of — 1805, 2 vols. 8vo; F, Douce, Illustrations of 8. and Aneient Manners, 1807, 2 vols. 8vo, new edition 1839, 8vo; H. J. Pye, Comments on the Commentators, 1807, 8vo; J. M. Mason, Comments on the several Editions, 1807, 8vo ; C. (and M) Lamb, Tales from S., 1807, 2 vols. 12mo, plates, frequently translated and reprinted ; A. Becket, 8. himself again, 1815, 2 vols. 8vo; W. Hazlitt, Characters of 8.'s Plays, 1817, 8vo, new edition 1873 ; N. Drake, 8. and his Times, 1817, 2 vols. 4to, and Memorials of S., 1828; Z, Jackson, S.'s Genius Justified, Examples of 700 Errors in his Plays, 1819, 8vo ; [Variorum] Annotations Illustrative of the Plays of S., 1819, 2 vols. 12mo, published with Scholey's edition; W. Hazlitt, Lectures on the Dramatie Literature of the Age of Elizabeth, 1820, 8vo; H. Beyle, Raeine et §., 1823-5, 2 pts. 8vo; T. Bowdler, Letter to Editor of British Critie, 1823, 8vo, defends omissions; T. P. Courtenay, Commen- taries wpon the Historical Plays of 8., 1840, 2 vols. sm. 8vo; K. Sybrandi, Verhandeling over Vondel en §., Haarlem, 1841, 4to; Rev. A. Dyce, Remarks on Collier's and Knight's Editions, 1844, 8vo; J. Hunter, New Illustrations of 8., 1845, 2 vols. 8vo ; G. Fletcher, Studies of S., 1847, 8vo; L. Tieck, Dra- maturgisehe Blatter, 2d ed. 1848-52, 3 vols. 8yo; H. N. Hudson, Leetures on 8. A N.Y., 1848, 2 vols. 8vo; C. Knight, Studies of S., 1849, 8vo; S. T. Coleridge, Notes and Lectures wpon S., &e., 1849, 2 vols. sm. 8vo, and Lectures and Notes on §., by T. Ashe, 1883, sm. 8vo; J, Britton, Essay on the Merit and Char- aeteristres of §.'s Writings, 1849, roy. 8vo ; K. Simrock, Remarks on the Plots of S.'s Plays ees Society), 1850, 8vo ; Rey. T. Grinfleld, Moral Injlu- ence of §.'s Plays, 1850, 8vo; V. E. P. Chasles, Etudes sur W.8., Marie Stuart, et VArétin, 1851, 18mo; F. A. T. Kreyssig, Vorlesungen dw. §.,*~~

~~*1858-60, 3 vols., 2d ed. 1874, 2 vols. 8vo, and §. Fragen, Leipsic, 1871, 8vo; [O'Connell], New Exegesis of S., 1859, 8vo ; 8. Jervis, Proposed Emendations of S., 2d ed. 1861, 8vo; R. Cartwright, The Footsteps of S., 1862, 8vo, New Readings in S., 1866, 8vo, and Papers on S., 1877, 8vo; G. G. Gervinus, 8. Commentaries translated, 1863, 2 vols., new edition revised 1875, 8vo; 8. Bailey, The received Text of S.'s Dramatie Writings, 1862-6, 2 vols. 8vo; C. C. Clarke, §. Characters, chiefly those Subordinate, 1863, 8vo; H. Marggraff, W. S. als Lehrer der Mensehheit, Leipsic, 1864, 16mo ; J. H. Hackett, Notes and Comments, N. Y., 1864, sm. 8vo ; A. Mezitres, S., ses wuvres et ses critiques, 1865, 8v0; H. Wellesley, Stray Notes on the Text of §., 1865, 4to; A. M. L. de Lamartine, S. et son wuvre, 1865, Svo; W. L. Rushton, 8. Illustrated by old Authors, 1867-8, 2 pts. 8vo; T. Keightley, The 8. Expositor, 1867, sm. 8vo; B. Tschischwitz, 8. Forschungen, 1868, 3 vols. 8vo; G. R. French, Shakespearcana Genealogiea, 1869, 8vo; F. Jacox, §, Diversions, 1875-7, 2 vols. 8vo; H. v. Friesen, Das Bueh: 8S, v. Gervinus, Leipsic, 1869, 8vo, 8. Studien, Vienna, 1874-6, 2 vols. 8vo, and K. Elze's W. S., Leipsic, 1876, 8vo; I. T. Hall, Shakespearian Fly Leaves, 1874, 8vo; K. R. Proelss, Hriduterungen, Leipsic, 1874-8, pts. 1-6, sm. 8vo, includ-*~~

~~*necessary. Articles in periodicals not issued separately, and modern critical editions of single plays, are not included ; and only those of the plays usually contained in the collective editions are noticed. The name, in its various spellings (Shakespeare, Shakspeare, Shakespear, Shakspere, &c.), is usually represented by the initial S.*~~

~~*ing Hamlet, Julius Casar, Merchant of Venice, Much Ado, &c., Richard H., Romeo and Juliet; C. W. H. G.v. Riimelin, 8. Studien, 2d ed., Stuttg., 1874, 8vo; R. A.C. Hebler, Aufsétze wb. §., 2d ed., Bern, 1874, 8vo; F. J. Furnivall, The Succession of 8.'s Works and the Uscs of Metrical Tests, 1874, 8vo; O. Ludwig, 8. Studicn, 1874, 8vo; E. Dowden, 8.: a Critical Study of his Mind and Ari, 1875, 8vo; C. M. Ingleby, 8. Hermeneutics, 1875, 4to, S., the Man and the Book, 1877-81, 2 pts. 4to, and Occasional Papers on §&., 1881, sq. lémo; F. K, Elze, Abhandlungen zu &., 1877, 8vo, and Essays on S., trans- lated, 1874, 8vo ; E. Hermann, Drei 8.*~~

~~*Studien, Erlangen, 1877-9, 4 pts. sm. 8vo, Wettcre Beitrdge, ib., 1881, sm. 8vo ; H. H. Vaughan, New Readings and New Renderings of 8.'s Tragedies, 1878-86, 3 vols. 8vo ; F. G. Fleay, 8. Manual, 1878, sm. 8vo; J. O. Halliwell Phillipps, Notes and Memoranda [on 4 Plays], 1868-80, 4 pts., 8vo, and Memoranda [on 12 Plays], 1879-80, 7 pts. 8v0o; A.C. Swinburne, A Study of S., 1880, 8vo; D. J. Snider, System of 8.'s Dramas, new edition, 1880, 8vo; F. A. Kemble, Notes on some of S.'s Plays, 1882,*~~

~~*8vo; H. Giles, Zuman Life in 8., Boston, 1882, 12mo; B. G. Kinnear, Cruces*~~ |

~~*Shakespearianx, 1883, sm. 8vo; C. C, Hense, S. Studien, Halle, 1883, 8vo ; A. 8. G, Canning, Thoughts on S.'s Historical Plays, 1884, 8vo; New Study of S., 1884, 8vo; J. W. Hales, Notes and Essays on §., 1884, sm. 8vo; J. Feis, S. and Montaigne, 1884, sm. 8vo; Sir P. Perring, Hard Knots in S., 1885, 8vo ; E. Rossi, Stwdien 2b. 8. u. d. Moderne Theater, 1885, 8vo; F. A. Leo, &. Notes, 1885, 8vo; R. G. Moulton, 8. as a Dramatic Artist, 1885, 8vo; R. G. White, Studies in §., Boston, 1885, Svo.*~~

~~*B.—Special Works on Scparate Plays, &e., with Dates of Early Quartos.*~~

~~*ALL's WELL THAT ENDS WELL (lst ed. in F.1, 1623): H. v. Ifagen, Ueb. die altfranzis. Vorstufe des Lusispicles, Halle, 1879, 8vo. ANTONY AND CLEOPATRA (1st ed. in F.1). As You Like IT oo ed. in F.1): W. Whiter, Specimen of a Commentary, 1794, 8vo; A. O. Kellogg, Jacques, Utica, 1865, 8vo ; C. Sheldon, Notes, 1877, 8vo; T. Stothard, 8.'s Seven Ages Illustrated, 1799, folio; J. Evans, 8.'s Seven Ages, 3d ed. 1834, 12mo; J. W. Jones, Origin of the Division of Man's Life into Stages, 1861, 4to. CoMEDY oF ERRORS (1st ed. in F.1), CoRIOLANUS (ist ed. in F.1): F. A. Leo, Die Delius'sche Ausgabe kritisch belcwchtet, Berlin, 1861, 8vo. CYMBELINE (1st ed. in V1). HAMLET (Q.1, 1603; Q.2, 1604; Q.3, 1605 ; Q.4, 1608 ; Q.5, 1611 ; Q.6, n.d.; Q.7, 1637): L. Theobald, 8. Restored, 1726, 4to, devoted to Hamlet; Sir T. Hanmer, Some Remarks on Tamilet, 1736, 8vo, reprinted 1863, sm. 8vo; J. Plumptre, Observations on Hamlet, and Appendix, 1796-7, 2 pts. 8vo; F. L, Schmidt, Sammlung der besten Urtheile ciber Ilamlet, Quedl., 1808, 8vo; A. G. Barante, Sur Hamlet, 1824, 8vo; P. Macdonnell, Essay on Hamlet, 1843, 8vo ; Sir E. Strachey, 8.'s Hamlet, 1848, 8vo; H. K. S. Causton, Essay on Mr Singer's*~~

~~*Wormwood, 1851, 8vo; L. N oiré, Hamlet, zwei Vortrage, Mainz, 1856, 16mo; M. W. Rooney, Hamlet, First Edition (1603), 1856, 8vo; S.'s Hamlet, 1603 and 1604, with Bibliographical Prefuce, by S. Timmins, 1860, 8vo; A. Gerth, Der Hamlet v. 8., Leip., 1861, 8vo; J. Conolly, 4 Study of Hamlet, 1863, sm. 8vo; H.v, Friesen, Briefe ib. §.'s Hamlet, Leipsic, 1865, 8vo ; A. Flir, Briefe ub, 8.'s Hamlet, Innsbruck, 1865, 8vo; W. D. Wood, Hamlet from a Psycho- logical Point of View, 1870, 8vo; R. If. Horne (editor), Was Hamlet Mad? a Series of Critiques, 1871, 8vo; G. F. Stedefeld, amlet ein Tendenzdrama, Berlin, 1871, 8vo ; A. Meadows, Hamlet: an Essay, 1871, 8vo; R. G. Latham, The Hamlet of Saxo Grammaticus and S., 1872, 8vo; F. A. Marshall, Study of Hamlet, 1875, 8vo; H. v. Struve, Hamlet eine Charakterstudie, Weimar, 1876, 8vo; H. Baumgart, Die Hamlet Tragédie u. thre;Kritik, Konigsb., 1877, 8vo; A. Zinzow, Die Mamet Sage, Halle, 1877, 8vo; A. Biichner, amlet le Danots, 1878, 8vo; M. Moltke, §.'s Hamlct Quellen, 1881, 8vo; E. P. Vining, The Mystery of Zamlet, Philad., 1881, sm. 8vo [Hamlet a woman]; H. Besser, Zur Hamlet Frage, 1882, 8vo ; E. Stenger, Der Zamlct Charakter, 1883, 8v0; A. Brereton, Some famous Hamlets, 1884, 8vo. HENRY IV. (Pt. i.: Q.1, 1598 ; Q.2, 1599 ; Q.3, 1604; Q.4, 1608; Q.5, 1613; Q.6, 1622; Q.7, 1632; Q.8, 1639. Pt. ii: Q.1 and Q.2, 1600): E, A. Struve, Studien zu 8.'s Henry I V., Kiel, 1851, 4to, Timnry V. (Q.1, 1600; Q.2, 1602; Q.3, 1608): G. A. Schmeding, Essays on 8.'s Henry V., 1874, 8vo. Henry VI. (Pt. i. Ist ed. in Fl. Pt. ii. Ist ed. in F.1. Contention, &c.: Q.1, 1594; Q.2, 1600; Q.3, 1619. Pt. iii, Ist ed. in F.1, Richard of Yorke: Q.1, 1595 ; Q.2, 1600): E. Malone, Dissertation on Henry VI., 1792, 8vo; G. L, Rives, Authorship of Henry VI., 1874, 8vo. HENRY VIII. Sg ed, in F.1). JULIUS Casar (1st ed. in F.1): G. L. Craik, The English of 8. Illustrated, 3d ed, 1866, sm. 8vo; H. Gomont, Le César de &., 1874, 8vo; W. G. Moberly, Hints for 8. Study exemplified in Julius Cesar, 1881, 8vo. Kine JoHN (ist authentic ed, in F.1. Troublesome Raigne, spurious : Q.1, 1591; Q.2, 1611; Q.3, 1622). Kina LEAR (Q.1, Q.2, Q.3, 1608 ; Q.4, 1655): [C. Jennens], King Lear Vindicated, 1772, 8vo ; H. Neumann, Ueber Lear u. Ophelia, Breslau, 1866, 8vo; J. R. Seeley, W. Young, and E. A. Hart, Lhree Essays on Lear, 1851, 8vo, Beaufoy prize essays. LOVE'S LABOUR 'S Lost ol 1598 ; Q.2, 1631). MACBETH (Ist ed. in F.1): [Dr 8. Jolinson], Miscellaneous Observations on Macbeth, 1745, 12mo; J. P. Kemble, Macbeth and Richard ITI, 1817, 8vo; C. W. Opzoomer, Aanteekeningen op Macbeth,*~~

~~*Amst., 1854, 8vo ; G. Sexton, Psychology of Macbeth, 1869, 8vo; J. G. Ritter, Bettrage zur Erkl. des Macbeth, Leer, 1871, 2 pts. 4to; V. Kaiser, Macbeth und Lady Macbeth, Basel, 1875, 8vo; HE. R. Russell, The True Macbeth, 1875, 8vo; T. Hall Caine, Richard ITI. and Macbeth, 1877, 8vo; A. Horst, Konig Macbeth, eine Schottische Sage, Bremen, 1876, 16mo. MEASURE FOR MEASURE (isted. in F,1), MERCHANT OF VENICE (Q.1, Q.2, 1600 ; Q.3, 1637 ; Q.4, 1652): G. Harren, Essay on Shylock, 1833, 8vo; F. V. Hugo, Commentary on the Merchant of Venice, translated, 1863, 8vo; H. Graetz, Shylock in d. Sage, 1880, 8vo; A. Pietscher, Versuch einer Studie tib. 8.'s Kaufmann v. V., 1881, 8vo; C. H. C. Plath, 8s Kaufmann v. V., 1882, 8vo. MERRY WIVES oF WINDSOR (Q.1, 1602; Q.2, 1619; Q.3, 1630): J. O. Halliwell Phillipps, Account of the only known MS, of 8.'s Plays, 1843, 8vo. MIDSUMMER NIGHT'S DREAM (Q.1, Q.2, 1600): N. J. Halpin, Oberon's Vision and Lylie's Endymion (Shake- speare Society), 1843, 8vo; J. O. Halliwell Phillipps, [ntroduction to 8.'s Mid- summer Night's Dream, 1841, 8vo, and Illustrations of the Fairy Mythology of Midsummer Night's Dream (Shakesp. Soc.), 1845, 8vo; the same with J. Ritson, Fairy Tales, Legends, and Romances, ed. Hazlitt, 1875, 8vo; E. Her- mann, Drei S. Studien, Erlangen, 1877-9, 4 pts. sm. 8vo; L. E. A. Proescholdt, On the Sources of 8.'s Midsummer Night's Dream, 1878, 8vo. MucH ADo ABOUT NOTHING (Q.1, 1600): W. W. Lloyd, Much Ado, &c., with essay, 1884, 8vo, to prove reputed prose to be metrical. OTHELLO (Q.1, 1622; Q.2, 1630; Q.3, 1655): W. Parr, he Story of the Moor of Venice, 1795, 8vo; R. G. Macgregor, Othello's Character, 1852, 8vo; J. E. Taylor, The Moor of Venice, Cinthio's Tale and 8.'s Lragedy, 1855, 8vo. PERICLES (Q.1 [Pavier, n. d.J; Q.2, Q.3, 1609 ; Q.4, 1611; Q.5, 1619; Q.6, 1630; Q.7, 1635): R. Boyle, On Wilkins's Share in Pericles, 1882, 8vo. RICHARD II. (Q.1, 1597; Q.2, 1598 ; Q.3, Q.4, 1608; Q.5, 1615; Q.6, 1634): Riechelmann, Zu Richard LI. 8. u. Holinshed, Plauen, 1860, 8vo. R1icHARD III. (Q.1, 1597 ; Q.2, 1598; Q.3, 1602; Q.4, 1605; Q.5, 1612; Q.6, 1622; Q.7, 1624; Q.8, 1629; Q.9, 1684): M. Beale, Lecture on the Times and Play of Richard ITI., 1844, 8vo; I. F. Schoene, Ueber den Charakter Richard III. bei &., 1856, 8vo; L. Méser, Observations on §&.'s Richard I1I., Hertford, 1869, 8vo. RoMEO AND JULIET (Q.1, 1597 3, 9.2, 1599; Q.3, 1609; Q.4, n. d.; Q.5, 1637): J. C. Walker, [Historical Memoir on Italian Tragedy, 1799, 4to ; G. Pace Sanfelice, The Original*~~

~~*Story of Romeo and Juliet, by L. da Porto, 1868, 8vo; T. Straeter, Die Komposition &.'s Romeo u. Julia, Bonn, 1861, 8vo; C. RB. E. Hartmann, Romeo u. Julia, Leipsic,*~~

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~~*1874, 8vo, a critical essay ; M. F. Guenther, Defence of 8.'s Romeo and Juliet, 1876, 8vo; R. Gericke, Romeo u. Julia nach &.'s MS., THE SHREW (1st ed. in F.1). TEMPEST (st ed. in F.1): J. Holt, Remarks on the Tempest, 1750, 8vo; E. Malone,*~~

~~*ee 1808-9, 2 pts. 8vo; G. Chalmers, Another Account, &e., 1815, 8vo; ev.*~~

~~*lo copy known; Q.2, 1600;*~~

~~*THE TWo GENTLEMEN OF VERONA, and THE WINTER'S first printed in F.1),*~~

~~*SONNETS (Q.1, 1609) : J. Boaden, On the Sonnets of &., 1887, 8v0; C. A. Brown, 8.'s Autobiographical Poems, 1838, 8vo; I. Donnelly, The Sonnets of S., 1859, 8vo; Dr Barnstorff, Key to 8.'s Sonnets, translated, 1862, 8vo; B. Corney, The Sonnets of S&., 1862, 8vyo; [E. A. Ifitchcock], Remarks on the Sonnets of 8., N.Y., 1865, 12mo ; R. Simpson, Introduction to the Philosophy of 8.'s Sonnets, 1868, 8vo ; H, Brown, The Sonnets of 8. solved, 1870, 8vo; C. M. Ingleby, The Soule arrayed, Sonnet calvt., 1872, 8vo0 ; G. Massey, The Sceret Drama of 8s Sonnets unfolded, 2d ed. 1872, 8vo,. VENUS AND ADONIS (Q.1, 1593 ; Q.2, 1594; sm. 8vo, 1596, 1599, 1600 (2), 1602, 1617, 1620, 1627, 1630, 1636 ; 8vo, 1675): A. Morgan, Venus and Adonis, Study in Warwickshire Dialect, N.Y., 1885, 8vo. LUCRECE (Q.1, 1594 ; sm. 8vo, 1598, 1600, 1607, 1616 ; 16mo, 1624, 12mo0, 1632; 16mo, 1655). PASSIONATE PILGRIM (16mo, 1599 ; 2d ed. not known; 3d ed. 16mo, 1612): A. Hoelinen, S.'s Passionate Pilgrim, 1867, 8vo, dissertation.*~~

~~*FALSTAFF: C. Morris, True Standard of Wit, with Character of Sir J. Falstaff, 1744, 8v0; W. Richardson, Essays on Character of Sir J. Falstaff, 1788, 8vo ; M. Morgan, Essay on Sir J. Falstaff, 1777, new edition 1825, 8vo, Vindicates his courage; J. H. Hfackett, Falstaff, 1840,*~~

~~8vo; J. O, Lalliwell Phillipps, On the Character of Falstaf in enry IV., 1841, 8vo; E. Schueller, Don Quixote und Faistag, Berlin, 1858, 8vo0; G. W. Rusden, Character of Falstaf, Melbourne, 1870, 8vo. FEMALE CHARACTERS: W. Richardson, On 8.'s Female Characters, &c., 1788, 8vo; A. M. J ameson, Characteristics of Women, 1832, 2 vols. 12mo, illustrated; C. Ifeath, The Heroines of §., 1848, large 4to, illustrated, and The 8. Gallery, containing the Principal Female Characters, 1836, large 8vo, plates reproduced in H. L. Palmer's Stratford Gallery, N.Y., 1859, large 8vo; M. C. Clarke, Girlhood of 8.'s ITeroines, 1850-2, 3 vols. 8vo ; H. Heine, Englische Fragmente und §.'s Médchen und Frauen, Hamburg, 1861, sm. 8vo; F. A. Leo, 8's Frauenideale, Halle, 1868, 8vo; F. M. v. Bodenstedt, 8.'s Frauencharaktere, 2d ed., Berlin, 1876, 8vo ; M. Summer, Les Heroines de Kalidasa et les Héroincs de §., 1879, sm. 8vo; Lady Martin, On some of 8.'s Female Characters, 1885, 8vo; Mrs M pee Elliott, 8.'s Garden of Girls, 1885, 8vo. Humour: J. Weiss, Wit, Zumour, and §., Boston, 1876, 16mo; J. R. Ehrlich, Der Humor 8. 's, Vienna, 1878, 8vo.~~

~~V. LANGUAGE, INCLUDING GRAMMARS AND GLOSSARIES.~~

~~T.. Edwards, Supplement to Mr Warburton's Edition, being the Canons of Criticism and Glossary, 1748, 8vo, 7th ed. 1765; R. Warner, Letter on a Glossary to §., 1768, 8v0; R. Nares, Glossary, 1822, 4to, new cdition 1859, 2 vols. 8vo; J. M. Jost, Erkl. Worterbuch, Berlin, 1830, sm. 8vo; J. O. Halliwell Phillipps, Dictionary of Archaic and Provincial Words, 1846-7, 2 vols. 8vo, and Iand-Book Index to the Works, 1866, 8vo, phrases, mainers, &c.; J. L. Ifilgers, Sind nicht in 8. noch manche Verse wiederherzustellen in Prosa ? Aix-la-Chapelle, 1852, 4to; N. Delius, 8. Lexikon, Bonn, 1852, 8vo; W. S. Walker, S.'s Versisication, 1854, 8vo, and Examination of the Tcat of 8., with Remarks on his Language, 1860, 3 vols. 8vo ; C. Bathurst, 8.'s Versification at different Periods, 1857, sm. 8vo; 8. Jervis, Dictionary of the Language of 8., 1868, 4to; G. Helmes, The English Adjective in 8&., Bremen, 1868, 8vo; A. J. Ellis, On Early English Pronunciation, 1869-75, 4 vols. 8vo; W. L. Rushton, &.'s Euphuism, 1871, 8vo ; D. Rohde, Die Miilfszettwort 'To do" bei S., Gottin- gen, 1872, 8vo; EH. A. Abbott, Shakespearian Grammar, new edition 1873, sm. 8vo; K. Seitz, Die Alliteration im Engl. vor u. bei S.,~~

~~*1875, 4to; F. Pfeffer, Die Anredepronomina bei S., 1877, 8vo.; P. A. Bronisch, Das neutrale Possessivpronom bei §., 1878, 8vo; 0. W. F. Lohmann, Die Auslassung des Relativpronomens, &¢., 1879, 8vo; A. Dyce, Glossary, new edition, 1880, 8v0 ; C. Deutschbein, 8. Grammatik f. Deutsche, 1882, 8vo A. Lummert, Die Orthographie der ersten Folioausgabe, 1883, 8vo; C. M ackay, Obscure Words and Phrases in 8., 1884, 8vo; G. H. Browne, 8.'s Versijication, Boston, 1884, 12mo, includes bibliography; L. Kellner, Zur Syntax des Engl. Verbums, Vienna, 1885, 8vo; J. H. Siddons, Shakespearian Referee, Washington, 1886, 8vo, encyclopedic glossary.*~~

~~*VI. QUOTATIONS.*~~

~~*C. Gildon, Shakespcariana, in his Complete Art of Poetry, 1718, 12mo,' the first of the class; Dr W. Dodd, The Beauties of §., 1752, 2 vols. 12mo, reprinted (in various forms) more frequently than any similar work ; C. Lofft, Aphorisms From &., 1812, 12mo ; T. Dolby, The Shakespearian Dictionary, 1832, 8vo, and A Thousand Shakespearian Mottoes, 1856, 32mo ; Mrs M. C. Clarke, 8. Proverbs, 1847, sm. 8vo, reprinted ; J. B. Marsh, Familiar, Proverbial, and Select Say- ings from S., 1864, 8vo; EH. Routledge, Quotations from S., 1867, 8vo; C. W. Stearns, The 8. Treasury, N.Y., 1869, 12mo; Capt. A. F, P. Harcourt, The 8. Argosy, 1874, sm. 8vo; G. S. Bellamy, New Shakespearian Dictionary, 1877, 8vo; A. A. Morgan, The Mind of S., 1880, 8vo, quotations in alphabetical order; C. Arnold, Index to Shakespearian Thought, 1880, 8vo*~~

~~*VII. CONCORDANCES.*~~

~~*. Becket, Concordance, 1787, 8vo, the earliest ; 8S. Ayscough, Index, 1790, ia 8vo, 2d ed. enlarged, 1827, useful; F. Twiss, Complete Verbal Indez, 1805, 2 vols. 8vo; M. Cowden Clarke, Complete Concordance, 1844, 8vo, deals only with the plays (no complete one exists); Mrs H. H. Furness, Concord- ance to Poems, Philadelphia, 1874, 8vo, completing Mrs C. Clarke's; A. Schmidt, 8. Leaikon, Berlin, 1874-5, 2 vols. large 8vo, in English, both concordance and dictionary; C. and M. C. Clarke, The 8. Key, 1879, 8vo, companion to the Concordance; J. Bartlett, The 8. Phrase Book, 1881, 8vo; W. H. D. Adams, Concordance to Plays, 1886, 8vo.*~~

~~*VIII. PROBABLE SOURCES.*~~

~~*! . Lennox, 8. Illustrated, 1753-4, 3 vols. 12mo, dedication by Johnson, es the observations also said to be by him; T. Hawkins, The Origin of the English Drama, 1773, 3 vols. 8vo; J. Nichols, The Six Old Plays on which &. founded Measure for Measure, &c., 1779, 2 vols. 12mo; T. Echtermeyer, L. Henschel, and K. Simrock, Quelicn des §., Berlin, 1831, 3 vols. 16mo; L. Tieck, 8.'s Vorschule, Leipsic, 1823-9, 2 vols. 8vo; J. P. Collier, S.'s Library [1843], 2 vols. 8vo, 2d ed. [by W. C. Hazlitt] 1875, 6 vols. 8vo; W. C. Hazlitt, 8.'s Jest Books, 1864, 3 vols. 8vo: W. W. Skeat, 8.'s Plutarch, 1875, 8vo; F.*~~

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~~*A. Leo, Four Chapters of North's Plutarch, 1878, folio; R. Simpson, The School of §., 1878, 2 vols. 8vo.*~~

~~*IX. SPECIAL KNOWLEDGE.*~~

~~*ANGLING: H. N. Ellacombe, S. as an Anzgicr, 1883, 8vo. BIBLE: T. R. Eaton, 8S. and the Bibic, 1858, 8vo; J. Brown, Bible Truths with Shakespearian Parallels, 3d ed. 1872, 8vo; J. Rees, 8. and the Bible, Phil., 1876, sm. 8vo; Bp. C. Wordsworth, S.'s Knowledge and Use of the Bibic, 1864, 8vo; C. Bullock, S.'s Debt to the Bible, 1879, 8vo. BOTANY: J. E. Giraud, Flowers of S., 1847, 4to, plates; S. Beisly, S.'s Garden, 1864, 8vo; 1. N. Ellacombe, Plant-lore and Garden-craft of §., 2d ed. 1884, sm. 8vo; L. H. Grindon, S.'s Flora, 1883, 8vo. EMBLEMS: H. Green, 8. and the Emblem Writers, 1870, 4to. FOLK- LORE: W. Bell, S.'s Puck and his Folks-lore, 1852-64, 3 yols.sm. 8vo; W. J. Thoms, '"'The Folk-lore of Shakespeare," in Three Notelets, 1865, 8vo, re- printed from Atheneum, 1847; B. Tschischwitz, Nachklénge Germanischer Mythe in &., Halle, 1868, 8vo ; [W. C. Hazlitt, editor], Fairy Tales, Legends, and Romances illustrating §., &c., 1875, 8vo; T. F. T. Dyer, Folk-lore of S., 1884, 8vo. LEARNING: P. Whalley, Hiquiry into the Learning of S., 1748, 8vo; R. Farmer, Essay on the Learning of S., 1767, 8vo, reprinted in the variorum (1821) and other editions, criticized by W. Maginn, see 8. Papers,*~~

~~*annotated by S. Mackenzie, N.Y., 1856, sm. 8vo; [K. Prescot], Essay on the Learning of §., 1774, 4t0; E. Capell, The School of S., 1780, 4to (vol. iii. of his Votes and: Various Readings to §., 1779-83, 3 vols. 4to); P. Stapfer, 8. et Vantiquité, Paris, 1879, 8vo, translated 1880, 8vo. LEGAL: W. L. Rushton, S. a Lawyer, 1858, 8vo, 8.'s Legal Maxims, 1859, 8vo, 8.'s Testamentary Language, 1869, 8vo, aud 8&. illustrated by the Lex Scripta, 1870, 8vo; Lord Campbell, 8.'s Legal Acquirements, 1859, 8vo; H. T., Was 8. a Lawyer? 1871, 8vo; J. Kohler, §. vor dem Forum der Jurisprudenz, und Nachwort, 1883-4, 2 pts. 8vo; F. F. Heard, S. as a Lawyer, Boston, 1884, 16mo; C. K. Davis, The Law in §., St Paul, U.S., 1884, 8vo. MEDICINE: G. Farren, Essays on Mania exhibited in Hamlet, Ophelia, &c., 1833, 8vo; J. C. Bucknill, The Medical Knowledge of §., 1860, 8vo, and The Mad Folk of 8., 1867, sm. 8vo; C. W. Stearns, &.'s Medical Knowledge, N.Y., 1865, sm. 8vo; G. Cless, Medicinische Blumenlese aus S., Stuttgart, 1865, 8vo; A. O. Kellogg, 8.'s Delineations of Fnsanity, dc., N.Y., 1866, 16mo; H. R. Aubert, 8. als Mediciner, Rostock, 1873, 8vo; J. P. Chesney, 8. as a Physician, St Louis, 1884, 8vo; B. R. Field, Medical Thoughts of §., 2d ed., Easton, U.S., 1885, 8vo. MILITARY: W. J. Thoms, " Was S. ever a Soldier?" in his Three Notelets, 1865, 8vo. NATURAL Hrstory: R. Patterson, Insects mentioned in 8.'s Plays, 1838, 8vo; J. H. Fennell, §. Cyclopxdia, 1862, 8vo, pt. i. Zoology, Man (all published); J. E. Harting, Ornithology of 8,, 1871, 8vo; C. R. Smith, The Rural Life of 8., 1874, 8vo; J. Walter, 8.'s Ifome and Rural Life, 1874, 4to, illustrated; B. Mayou, Natural History of S., 1877, 8vo, quotations ; E. Phipson, Animal Lore of 8.'s Time, 1883, sm. 8vo. PHILO- SOoPHY: W. J. Birch, Philosophy and Religion of S., 1848, sm. 8vo; V. Knauer, W. 8., der Philosoph, Innsbruck, 1879, 8vo. PRINTING: W. Blades, 8S. and Typography, 1872, 8vo. PsycHoLoay: J. C. Bucknill, The Psychology of §., 1859, 8vo; E. Onimus, La Psychologie dans les Drames de S., 1876, 8vo, SEA: J. Schuemann, See u. Seefahrt in S.'s Dramen, 1876, 4to.*~~

~~*X. PERIODICALS.*~~

~~*S. Museum, edited by M. L. Moltke, Leipsic, 23d April 1870 to 23d February 1874, 20 Nos. (all published) ; Shakespeariana, 1883, sm. 8vo, in progress. From the commencement of Notes and Queries in 1856, a*~~

~~*special Shakespeare departmeut (see Indexes) has been carried on. See also W. F. Poole's Index to Periodical Literature, Boston, 1882, and supplements.*~~

~~*XI. SHAKESPEARE SOCIETIES AND THEIR PUBLICATIONS.*~~

~~*Proceedings of the Shefield S. Club (1819-29), 1829, 8vo; Shakespeare Society, various publications, 1841-53, 48 vols. 8vo ; New Shakspere Society, Transactions and other publications, reprints of quartos, &c., 1874, &c., 8vo, in progress; Deutsche S. Gesellschaft, Jahrbuch, Weimar, 1865, &c., in pro- gress. The 8. Societies of New York and Philadelphia publish transactions.*~~

~~*XII. Music.*~~

~~*W. Linley, 8.'s Dramatie Songs, n. d., 2 vols. folio; The 8. Album, or Warwickshire Garland (C. Lonsdale), 1862, folio; G.G. Gervinus, Handel wu. S., Leipsic, 1868, 8vo ; H. Lavoix, Les Traducteurs de 8. en Musique, 1869, 8vo ; A. Roffe, FFandbook of 8. Music, 1878, 4to; List of Songs and Passages set to Music (N. 8. Soc.), 1884, 8vo. See also the musical works of J. Addison, T. A. Arne, C. Hi. Berlioz, Sir H. R. Bishop, C. Dibdin, W. Linley, M. Locke, G. A. Macfarren, F. Mendelssohn-Bartholdy, H. Purcell, G. Verdi, &c.*~~

~~*XIII. PIcToRIAL ILLUSTRATIONS.*~~

~~*C. Taylor, Picturesque Beauties of §., after Smirke, Stothard, &c., 1783-7, 2 vols. 4to; W. H. Bunbury, Series of Prints Fllustrative of §., 1792-6, oblong folio; 8S. Harding, S. Illustrated, 1793, 4to; 8. Ireland, Picturesque Scenes upon the Avon, 1795, 8vo; J. and J. Boydell, Collection of Prints Jrom Pictures Illustrating the Dramatic Works of 8., 1802-3, 2 vols. atlas folio, 100 plates, forms supplement to Boydell's edition; reproduced by photography, 1864, 4to, reduced, and edited by J. P. Norris, Philadelphia, 1874, 4to; S. Portfolio, 1821-9, roy. 8vo; Stothard, Illustrations of 8., 1826, 8vo; F. A. M. Retzsch, Gallerie zu 8.'s dramat. Werken in Umrissen, Leipsic, 1828-46, 8 vols., obl. 4to; J. Thurston, Illustrations of §., 1830, 8vo; F. Howard, The Spirit of the Plays of 8., 1833, 5 vols. 8vo; L. S. Ruhl, Skizzen zu S.'s dram. Werken, Frankfort,*~~

~~*1827-31, Cassel, 1838-40, 6 vols. oblong folio; G. F. Sargent, 8. Fllustrated in a Series of Landscape and Archi- tectural Designs, 1842, 8vo, reproduced as The Book of 8. Gems, 1846, 8vo; W. v. Kaulbach, 8. Gallerie, Berlin, 1857-8, 3 pts. folio; P. Konewka, Hin Sommernachistraum, Heidelb., 1868, 4to, and Falstaff' u. seine Gesellen, Stras- burg, 1872, 8vo; E. Dowden, 8. Scenes and Characters, 1876, 4to, illustrations from A. Y. Pecht's 8. Gallerie, Leipsic, 1876, 4to; J. O. Halliwell Phillipps, Hand List of Drawings and Engravings Illustrative of the Life of §., 1884, 8vo.*~~

~~*XIV. BIOGRAPHIY. A.—General Works.*~~

~~*N. Rowe, The Life of Mr W. 8S., 1748, 8vo, the first separate life; N. Drake, 8. and his Times, 1817, 2 vols. 4to; J. Britton, Remarks on the Life and Writings of 8., revised edition, 1818, sm. 8vo; A. Skottowe, Life of S., 1824, 2 vols. 8vo; J. P. Collier, New Facts, 1835, 8vo, New Particulars, 1836, 8vo, Further Particulars, 1839, 8vo, and Traditionary Anecdotes of S. collected in 1673, 1838, 8vo; T. Campbell, Life and Writings of W. 8., 1838, 8vo; C. Knight, §.,a Biography, 1843, 8vo, repriuted in Studies, 1850, 2 vols. 8vo; J. O. Halliwell Phillipps, The Life of W. 8., 1848, 8vo, 8. Facsimiles, 1863, folio, Illustrations of the Life of S., 1874, folio, and Outlines of the Life of §., 1881, 8vo, 6th ed. 1886, 2 vols. 8vo; F. P. G. Guizot, 8. et son temps, 1852, 8vo, translated into English, 1852, 8vo; G. M. Tweddell, S., his Times and Con- temporaries, 1852, 12mo, 2d ed. 1861-3, unfinished; W. W. Lloyd, Essays on Life and Plays of §., 1858, 8vo; S. Neil, 8., a Critical Biography, 1861, 8vo ; T. De Quincey, S., a Biography, 1864, 8vo; T. Kenny, Life and Genius of s., 1864, 8vo; W. Bekk, W. S., eine biogr. Studie, Munich, 1864, sm. 8vo; 8. W. Fullom, The History of W. 8., 2d ed. 1864, 8vo ; Victor M. Hugo, W. §., 1864,*~~

~~*SHAKERS PHRARE*~~

~~*8vo,—translated into Dutch, German, and English; H.,G. Bohn, Biography and Bibliography of 8. (Philobiblon Soc., 1863), 8vo, illustrations: J. Jordan, Original Collections on 8. and Stratford, 1780, edited by J. O. Halliwell Phillipps, 1864, 4to; J. A. Heraud, 8.'s inner Life as intimated in his Works, 1865, 8vo; R. G. White, Memoirs of the Life of W. S., Poston, 1865, 8vo ; §. A. Allibone, Biography of 8. (in Dictionary,*~~

~~*vol. 2, 1870); H. N. Hudson, S.—his Life, Art, and Characters, Boston, 1872, 4th ed. 1883, 2 vols. 12mo; R. Genée, S., sein Leben u. s. Werke, Hildburghausen, 1872, 8vo; F. K. Elze, W. §S., Halle, 1876, large vo; G. H. Calvert, S.—a Biographic, Atsthetic Study, Boston, 1879, 16mo, W. Tegg, 8. and his Contemporaries, 1879, 8vo; W. Heuty, 8., with some Notes on his early Biography, 1882, sm. 8vo; E. Hermann, Ergdnzungen u. Berichtigungen der hergebrachten 8. Biograph., Erl., 1884, 2 vols. 8vo; F, G. Fleay, Chronicle History of the Life and Work of W. 8., 1886, 8vo.*~~

~~*B.—Special Works.*~~

~~*AUTOGRAPH: Sir F. Madden, Autograph and Orthography of 8., 1837, 4to; S.'s Autograph, copied and enlarged by J. Barris, &c. (Rodd), 1843; J. O. Halliwell Phillipps, §.'s Will, 1851, 4to; H. Staunton, Memorials of 8. Photographed, 1864, folio; J. H. Friswell, Photogr. Reprod. of 8.'s Will, 1864, 4to. BIRTHDAY: B. Corney, Argument on the Assumed Birthday, 1864, 8vo, BONES: C. M. Ingleby, 8.'s Bones, 1883, sm. 4to; W. Hall, S.'s Grave, Notes of Traditions, 1884, 8vo, CRABTREE: C. F. Green, Legend of 8.'s Crab Tree, 1857, 4to, illustrated. DEER STEALING: C. H. Bracebridge, 8S. no Deer Stealer, 1862, 8vo, illustrated. GENEALOGY: J. Jordan, Pedigree of the Family of 8., 1796, in vol. iii. of R. Ryan's Dramatie Table Talk, 1825-30, 3 vols. 8v0; Memoirs of the Families of S.and Hart, 1790, ed. Halliwell, 1865, 4to; G. R. French, Shakspeareana Genealogica, 1869, 8vo; J. O. Halliwell Phillipps, Entries respecting §., his Family and Connexions, 1864, 4to. GHOST-BELIEF: A. Roffe, The Ghost Belief of §., 1851, 8vo; T. A. Spalding, Elizabethan Demonology, 1880, 8vo. NAME: J.' O, Halliwell Phillipps, New Lamps or Old? 1880, 8vo, advocates "Shakespeare." OCCUPATION: see Special Knowledge, above. RELIGION: ¥. Fritzart, War 8. ein Christ 2? Heidelberg, 1832, 8vo,; W. J. Birch, Philosophy and Religion of 8., 1848, sm. 8vo, thinks hima sceptic; E. Vehse, S. als Protestant, Politiker, Psycholog, u. Dichter, Hamburg, 1851, 2 vols. sm. 8vo; J. J. Rietmann, Ueber 8.'s religidse u. ethische Bedeutung, St Gallen, 1858, 12mo; A. F. Rio, S., 1864, 8vo (S. Roman Catholic); W. Koenig, 8. als Dichter, Weltweiser, wu. Christ, Leipsic, 1873, 8v0; A. Gilman, 8.'s Morals, N.Y., 1880, 8vo; J. M. Raich, 8.'s Stellung zur Kathol. Religion, 1884, 8vo, STRATFORD-UPON-AVon: R. B. Wheler, History and Antiquities of Stratford, 1806, 8vo, Accownt of*~~

~~*the Birth- place, new edition 1863, 8vo, and Collectanea, 1865, 4to; ¥. W. Fairholt, The ome of 8., 1847, 8vo, engravings reproduced in 8. Neil's Home of 8., 1871, 8vo; J. O. Halliwell Phillipps, New Boke about 8. and Stratford, 1850, 4to, Brief Hand List of the Borough Records, 1862, 8vo, Descriptive Calendar, 1863, folio, Brief Guide to the Gardens, 1863, 8vo, Historical Account of the New Place, 1864, folio illustrated, and Stratford in the Times of the 8.s, 1864, folio; E, Lees, Stratford as connected with 8., 1854, 8vo; J. R. Wise, 8., his Birthplace and its Neighbourhood, 1861, 8vo; J. C. M. Bellew, 8.'s Home at New Place, 1863, sm. 8vo, illustrated, with pedigrees; R. HE. Huuter, 8. and Stratford, 1864, 8vo; J. M. Jephson, S., his Birthplace, Home, and Grave, 1864, 4to, illustrated; J. Walter, S.s Home and Rural Life, 1874, 4to, illustrative of localities; C. M. Iugleby, 8. and the Welcombe Enclosures, 1883, folio; S. L. Lee, Stratford-on-Avon, 1884, folio, illustrated.*~~

~~*XV. PORTRAITS.*~~

~~*G. Steevens, Proposals for Publishing the Felton Portrait, 1794, 8vo; J. Britton, On the Monumental Bust, 1816, 8vo0; J. Boaden, Authenticity of Various Pictures and Prints offered as Portraits of 8., 1824, 4to; A, Wivell, The Monumental Bust, 1827, 8vo, and Inquiry into the S. Portraits, 1840, 8vo; H. Rodd, The Chandos Portrait [1849], 8vo; R. H. Forster, Remarks on the Chandos Portrait, 1849, 8vo; J. P. Collier, Dissertation upon the Imputed Portraits, 1851, 8v0; J. H. Friswell, Life Portraits of W. 8., 1864, 8vo; G. Scharf, On the Principal Portraits of S., 1864, 12mo; E. T. Craig, S. and his Portraits, Bust, and Monument, 2d ed, 1864, 8vo, and S.'s Portraits phreno- logically considered, Philadelphia, 1875, 8vo; G. Harrison, The Stratford Bust, Brooklyn, 1865, 4to; W. Page, Study of 8.'s Portraits, 1876, sm. 4to; J. P. Norris, Bibliography of Works on the Portraits of S., Philadelphia, 1879, 8vo, 44 titles, The Death Mask of §., 1884, and The Portraits of 8., Phil., 1885, 4to, with bibliography of 111 references,and illustrations. An elaborate account by A. M. Knapp of the portraits in the Barton collection, Boston Public Library, may be found in the 8. Catalogue, 1880, large 8vo.*~~

~~*XVI. LITERARY AND DRAMATIC History.*~~

~~*E. Malone, Historical Account of the English Stage, 1790, enlarged in Boswell's edition, 1821; J. P. Collier, History of English Dramatic Poetry, 1831, new ed. 1879, 3 vols. 8vo, Memoirs of Edw. Alleyne (Shakespeare Society), 1841, 8vo, The Alleyne Papers (Shakespeare Society), 1848, 8vo [see G. F. Warner's catalogue of the Dulwich MSS., 1881, 8vo], and Memoirs of the Principal Actors in the Plays of 8. (Shakespeare Society), 1846, 8vo; N. J. Halpin, The Dramatie Unities of §., 1849, 8vo, ed. by C. M. Ingleby (N.S. Soc., series i., 1875-6); N. Delius, Ueber das Englische Theaterwesen zu 8.'s Zeit, Bremen, 1853, 8vo; A. Mezieres, Prédécesseurs et Contemporains de &., 1863, 3d ed. 1881, 8vo0, and Contemporains et successeurs de §.,3d ed. 1881; Rev. W. R, Arrowsmith, S.'s Editors and Commentators, 1865, 8vo ; W. Kelly, Notices of the Drama and Popular Amusements of the 16th and 17th Centuries, 1865, 8vo ; C. M. Ingleby, Traces of the Authorship of the Works attributed to 8., 1868, 8vo, S's Centurie of Prayse, culled from Writers of the First Century after his Rise, 1874, 4to (enlarged by Miss Toulmin Smith for N. 8. Soc., 1879), and §. Allusion Books (N.S. Soc.), 1874 ; H. 1. Ruggles, The Method of S. as an Artist, N.Y., 1870, 8vo; A. H. Paget, 8.'s Plays, a Chapter of Stage History, 1875, 8vo; H. Ulrici, 8.'s Dramatic Art, translated by L. D. Schmitz, 1876, 2 vols. 8vo; H. P. Stokes, The Chronological Order of 8.'s Plays, 1878, 8vo; C. Knortz, S. in Amerika, Berlin, 1882, 8vo; C, Muerer, Synchronist. Zusammensicllany der wichtigsten Notizen tib. 83 Leben u. Werke, 1882, 4to; J. A. Symonds, S.'s Predecessors in the English Drama, 1884, 8vo; A. R. Frey, S. and the alleged Spanish Prototypes, N.Y., 1886, sm. 4to.*~~

~~*GERMANY : S.'s Schauspiele erléutert von F. Horn, Leipsic, 1823-31, 5 vols. 8vo; E. A. Hagen, S.'s erstes Erscheinen auf den Bilhnen Deutschlands, K6nigs., 1832, 8vo; K. Assman, S. und seine deutschen Uebersetzer, Liegnitz, 1843, 4to ; N. Delius, Die Schlegel-Tiecksche S. Uebersetz., Bonn, 1846, 12mo ; F, K. Elze, Die Englische Sprache in Deutschland, Dresden, 1864, 12mo; FY. A. T. Kreyssig, 8. Cultus, Elbing, 1864, 8vo; L. G. Lemcke, 8. in seinem Verhdlinisse zu Deutschland, Leipsic, 1864, 8vo; W. J. Thoms, "S. in Germany," in Fhree Notelets, 1865, 8vo; A. Cohn, 8. in Germany in the 16th and 17th Centuries, 1865, 4to ; C. Humbert, Moliére, 8., und d. deutsche Kritik, Leipsic, 1869, 8vo; W. Oechelhiiuser, Die Wiirdigung 8.'s in Engl. u. Deutsch- land, 1869,*~~

~~*8vo; R. Genée, Geschichte d. 8.'sehen Dramen in Deutschland, Leipsic, 1870, 8vo; M. Bernays, Zur Entstchwngsgeschichte des Schlegelschen S., Leipsic, 1872, 8vo; R. J. Benedix, Die S.omanic, Stuttgart, 1873, 8vo; W. Wagner, S. und die neueste Kritik, Hamburg, 1874, 8v0; J. Meissner, Die englischen Comédianten in Ocsterreich, Vienna, 1884, 8vo.*~~

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~~*FRANCE: J. B. M. A. Lacroix, Histoire de Vinfluence de §. sur le thédtre Francais, Brussels, 1856, 8v0; W. Reymond, Corneille, S., et Goethe, Berlin, 1864, 8v0; A. Schmidt, Voltaire's Verdienste um die Einfihrung 8., 1864, 4to.*~~

~~*XVII. SHAKESPEARE-J UBILEES.*~~

~~*Essay on the Jubilee at Stratford, 1769, 8vo; S's Garland, 1769, 8vo, second edition 1826, 8v0; Concise Account of Garrick's Jubilee, 1769, and the Festivals of 1827 and 1830, 1830, 8vo ; Descriptine Account of the Second Gala, 1830, 8vo; K. F. Gutzkow, Eine 8. Feier an der Ilm, Leipsic, 1864, 8vo; P. H. A. Mdbius, Die Deutsche 8. Freier, Leipsic, 1864, 8vo; Ter- centenary Celebration by the New England Historic-Genealogical Society at Boston, 1864, 8v0; Oficial Programme at the Tercenterary Festival at Stratford, with Life, Guide, &c., 1864, 8vo.*~~

~~*XVIII. IRELAND CONTROVERSY.*~~

~~*Miscellaneous Papers and Legal Instruments under the ITand and Seal of W. §S., 1795, imp. folio, 2d ed. 1796, 8vo (W. H. Ireland's forgeries) ; Vortigern, an Historical Tragedy, 1796, sm. 8vo, 2d ed. 1832, 8vo (forgery) ; E. Malone, Fnquiry into the Authenticity of Certain Papers and Legal Instruments, 1796, 8vo; W. IL. Treland, Authentic Account of the Shake-spearian MSS., 1796, 8vo; S. Ireland, Investigation of Mr Malone, 1797, 8vo; J. J. Eschenburg, Ueber den vorgeblichen Fund S.schen Iandschriften, Leipsic, 1797, sm. 8vo; G. Chalmers, Apology for the Believers in the § Papers, &c., 1797-1800, 3 pts. 8vo; [G. Hardinge], Chalmeriana, 1800, 8vo; W. H. Ireland, Confessions, 1805, sm. 8vo, new edition, with introduction by R. G. White, 1874, 12mo.*~~

~~*XIX. PAYNE COLLIER CONTROVERSY.*~~

~~*J.P. Collier, New Facts regarding the Life of S., 1835, 8v0, New Particu-lars, 1886, 8vo, Further Particulars, 1839, 8vo, Reasons Sor a New Edition of S.'s Works, 1841, 2d ed. 1842, 8vo, and Notes and Emendations to the Text (Shakespeare Society), 1852, 2d ed. 1853, 8vo, translated into German by Dr Leo, 1853, also in J. Frese's Ergénzungsband zu 8.'s Dramen, 1853, 8vo; 8. W. Singer, The Text of 8S. Vindicated, 1853, 8vo (anti-Collier); J. 0. Halliwell Phillipps, Curiosities of Modern Shakespearian Criticism, 1853, 8vo (anti-Collier), Observations on the MS. Emendations, 1853, 8vo (anti-Collier), and Observations on the Shakespearian Horgeries at Bridgewater Iouse, 1853, 4to (anti-Collier); C. Knight, Old Lamps or New? 1853, 12mo (pro-Collier) ; Rev. A. Dyce, A Few Notes on S., 1853, 8vo ; N. Delius, Collier's alte handschr. Eimendationen, Bonn, 1858, 8vo (anti-Collier); F. A. Leo, Die Delius' sche Kritik, Berlin, 1853, 8vo (pro-Collier); R. G. White, S.'s Scholar, 1854, 8vo (anti-Collier); J.T. Mommsen, Der Perkins S., Berlin, 1854, 8vo (anti-Collier) ; A. E. Brae, Literary Cookery, 1855, 8vo (anti-Collier), and Collier, Coleridge, and 8., 1860, 8vo, disputes authenticity of following lectures; S. T, Coleridge, Seven Lectures on §. and Milton, edited by J. P. Collier, 1856; Rey. A. Dyce, Strictures on Mr Oollier's New Edition [1858], 1859, 8vo (anti-Collier) ; C. M. Ingleby, The 8. Fabrications, 1859, sm. 8vo, and Complete View of the §. Controversy, 1861, with bibliography (anti-Collier) ; N. B. 8. AS Ilamilton, Inquiry into the Genuineness of the MS. Corrections, 1860, 4to (anti-Collier); Collier's Reply to Hamilton, 1860, 8vo; Sir T. D, Hardy, Review of the Present State of the 8. Controversy, 1860, 8vo; J. P. Collier, Trilogy : Conversations, 1874, 3 pts. 4to.*~~

~~*XX. SHAKESPEARE-BACON CONTROVERSY.*~~

~~*J. C. Hart, The Romance of Yachting, N.Y., 1848, 12mo, first work con-taining doubt of Shakespeare's authorship ; Ww. H. Smith, Was Bacon the*~~

~~*SHA Tel*~~

~~*Author of 8.'s Plays? 1856, 8vo,—extended as Bacon and S., 1857, 12mo (anti- Shakespeare) ; D. Bacon, The Philosophy of the Plays of 8. unfolded, 1857, 8vo (anti-Shakespeare) ; N. Holmes, Authorship of §., 1866, new ed. 1886, 2 vols. 12mo (anti-Shakespeare); Bacon's Promus, edited by Mrs H. Pott, 1883, 8vo (anti-Shakespeare) ; W. H. Wyman, Bibliography of the Bacon-S. Contro- versy, Cincinnati, 1884, 8vo, 255 entries (of which 117 pro-Shakespeare, 73 anti-, and 65 unclassified). XXI. BIBLIOGRAPHY. '*~~

~~*F. Meres, Palladis Tamia: Witts Treasury, 1598, 12mo, contains the earliest list of Shakespeare's works; J. Wilson, Shakespeariana,—Cataloque of all the Books, &c., relating to §., 1827, sm. 8vo; W. T. Lowndes, S. and his Commentators, 1831, 8vo, reprinted from the Manual; J. O. Halliwell Phillipps, Shakespeariana : Catalogue of Early Editions, Commentaries, ée., Books, MSS., &c., illust. of S., in his*~~

~~*of S., 1859, 8vo, Hand List of Shakespeariana, 1862, 8vo, List of Works 1867, 8v0, Catalogue of the 8. Library and Musewm at 1868, 8vo, land List of Karly Editions, 1867, 8vo, Cata-*~~

~~*sm. 8vo, bibliography with Shakespeareana: Verzeichniss, Vienna, 1864, 8vo ; from 1564, 2a edition containing the literature continued*~~

~~*1878-80, 2 vols. la. 8vo, the largest collection in UISis" He Ee arranged under Headings, St Louis, 1879, 8v0; Topical Index Shakespearean (sic) in Shakespeariana, 1885-6 pts. xv.—xxii., repr. as Digest Shakespeareanz (sic),*~~

~~*SHALLOT. See Horticurrurs, vol. xii. p. 288.*~~

~~*SHAMANISM is the name commonly given to the type of religion which once prevailed among all the Ural- Altaic peoples,—Tungus, Mongol, and Turkish,—and which still lives in various parts of northern Asia in spite of the progress of Mohammedanism, Buddhism, and Christianity. The shaman himself (in Turkish, Zam) is a wizard-priest, closely akin to the medicine-men of savage tribes in other parts of the world. Outsiders often describe Shamanism as pure devil-worship, but in reality the shaman or Lam deals with good as well as with evil spirits, especially with the good*~~

~~*spirits of ancestors (cf. Rewicion, vol. xx. p. 363). Among the Altaians, for example, the practices of the sorcerers rest on an elaborate cosmogony and a developed doctrine of good and evil powers, the friends and enemies of man. The kam has the power of influen- cing these by magic ritual, and his gift is hereditary,—his own ancestors, now good spirits, being the great assistants of his work. His two chief functions are to perform sacrifice, with which is conjoined the procuring of oracles, and to purify houses after a death, preventing the dead man from continuing his injurious presence among the living ; see the full accounts of Radloff, Aus Siberien, 1884, vol. ii. In his magical apparatus a drum (tiingiir) holds the chief place. The ceremonies have a dramatic character, the wizard acting an ascent to the heavens or a descent to the under-world, and holding colloquy with their denizens in scenes of great excitement ending in ecstasy and physical collapse. The epithet of devil-worship as applied to the Altaian Shamanism is so far justified that the great enemy of man, Erlik, the king of the lower world, from whom death and all evils come, is much courted, addressed as father and guide, and propitiated with offerings. He is***~~

“

~~*not, however, a power co-ordinate with the highest good god Kaira Kan, but is the creature of the latter, who banished him underground for his evil deeds,*~~

~~*SHAMMAI, a Jewish rabbi, sometimes called }223, “the elder,” was the contemporary of Hite. (g.v.) and the head of a rival school. The pair are twelfth in order in the Pirke Aboth, where we are informed that Shammai enjoined his disciples to make a special business of the study of the law, to promise little and perform much, and to receive every one in a friendly spirit. Of his personal history nothing is known. The tendency of Shammai and his school is represented as having been towards a more scrupulously and burdensomely literal construction of the law than was thought necessary by Hillel; but their differences so far as known turned upon very trifling minutiz. One example of his rigour will suffice. It is related of him in the Mishnah that a grandson having been born to him during the feast of tabernacles he caused the ceiling to be removed and*~~

~~*the bed to be canopied with branches, in order that the child also might observe the solemnity according to the law.*~~

~~*SHAMOKIN, a post borough of the United States, in Northumberland county, Pennsylvania, 20 miles south- east of Sunbury, is a great centre of the coal-trade, and had a population in 1881 of 8184.*~~

~~*SHANGHAI, a city of China. The native city of Shanghai is situated in 31° 15' N. lat. and 121° 27' E. long,, and stands on the left or western bank of the Hwang-p'u river, about twelve miles from the point where that river empties itself into the estuary of the Yang-tsze-kiang. The walls which surround it are about 34 miles in circum- ference, and are pierced by seven gates. The streets and thoroughfares may be said to illustrate all the worse*~~

~~*features of Chinese cities—dirt, closeness, and absence of all sanitary arrangements; while the want of any build- ing of architectural or antiquarian interest robs the city of any redeeming traits. On the eastern face of the city, between the walls and the river, stands the principal suburb, off which the native shipping lies anchored. The native town has thus nothing to recommend it except its geographical position. Situated in the extreme eastern portion of the province of Kiang-soo, and possessing a good and commodious anchorage, as well as an easy access to the ocean, it forms the principal port of central China. From the western wall of the city there stretches away arich alluvial plain extending over 45,000 square miles, which is intersected by numerous waterways and_ great chains of lakes. The products of this fertile district, as well as the ; teas and silks of more distant regions, find their natural outlet at Shanghai. The looms of Soochow and the tea plantations of Gan-hwuy, together with the rice of this "garden of China," have for many years before treaty days supplied the Shanghai junks with their richest freight. But though thus favourably situated as an emporium of trade Shanghai did not attract the attention of foreign diplomatists until the outbreak of the war of 1841, when the inhabitants purchased _protec- tion from the bombarding propensities of Admiral Parker by the payment of a ransom of one million taels. In the Nanking treaty, which was signed in the*~~

~~*following year, Shanghai was included among the four new ports which were thrown open to trade by the terms of that document. In 1843 Sir George Balfour, then Captain Balfour, was appointed British consul, and it was on his motion that the site of the present English settlement, which is bounded on the north by the Soochow creek, on the south by the Yang-king canal, and on the east by the river, was chosen. The site, thus defined on its three sides (on the west no boundary was marked out), is three-fifths of a mile in length, and was separated from the native city by a narrow strip of land which was subsequently selected as the site of the French settlement. Later again the Americans established themselves on the other side of the Soochow creek, on a piece of land fronting on the river, which there makes a sharp turn in an easterly direction. At first merchants appeared disinclined to take advantage of the opportunities offered them at Shanghai. "At the end of the first year of its history as an open port Shanghai could count only 23 foreign residents and families, 1 consular flag, 11 merchants' houses, and 2 Protestant missionaries. Only forty-four foreign vessels had arrived during the same period."! By degrees, however, the manifold advantages as a port of trade possessed by Shanghai attracted merchants of all nationalities; and from the banks of the Hwang-p'u arose lines of hongs and handsome dwelling-houses, which have converted a reed-covered swamp into one of the finest cities in the East, ee a eT a*~~

~~*1 The Treaty Ports of China and Japan, by W. F. Mayer.*~~

~~*Zinchorago for Shape of War*~~

~~*Shanghai.*~~

~~*SHANGHAT*~~

~~*The number of foreigners, other than English, who took up their abode in the English settlement at Shanghai made it soon necessary to adopt some more catholic form of government than that supplied by an English consul who had control only over British subjects, and by com- mon agreement a committee of residents, consisting of a chairman and six members, was elected by the renters of land for the purposes of general municipal administra- tion. It was expected when the council was formed*~~

~~*that the three settlements—the British, French, and Americans—would have been incorporated into one municipality, but international jealousy prevented the fulfilment of the scheme, and it was not until 1863 that the Americans threw in their lot with the British, In 1853 the pro- sperity of the settlements received a severe check in con- sequence of the capture of the native city by a band of insurgents, who held possession of the walls from September in that year to February 1855. This incident, though in many ways disastrous, was the exciting cause of the estab- lishment of the foreign customs service, which has proved of such inestimable advantage to the Chinese Government. The confusion into which the customs system was thrown by the occupation of the city by the rebels induced the Chinese authorities to request the consuls: of Great Britain, France, and the United States to nominate three officers to superintend the collection of the revenue. This arrangement was found to work so well that on the re- occupation of the city the native authorities proposed that it should be made permanent, and Mr H. N. Lay, of H.M.'s consular service, was in consequence appointed inspector of the Shanghai customs. The results of Mr Lay's ad- ministration proved so successful that when arranging the terms of the treaty of 1858 the Chinese willingly assented to the application of the same system to all the treaty ports, and Mr Lay was thereupon appointed inspector-general of maritime customs. On the retirement of Mr Lay in 1862 Sir Robert Hart was appointed to the post, which he still (1886) occupies.*~~

~~*During the period from 1856 to 1864 the trade of Shanghai increased by leaps and by bounds, and its prosperity culminated between 1860 and 1864, when, in addition to the ordinary commerce, the influx of Chinese into the foreign settlement in consequence of the advance eastward of the T'ai-p'ing rebels added enormously to the value of land and to the profits of the leaseholders, Both in 1860 and again in 1861 the rebels advanced to the walls of Shanghai, and on both occasions were driven back in confusion by the British troops and volunteers, aided by the naval forces of England and France. It was in connexion with this resistance to the rebels at Shanghai that General Gordon assumed the command of the Chinese force, which under his direction gave a meaning and reality to the hitherto somewhat boastful title of "ever-victorious army" it had assumed under the generalship of the two American adventurers Ward*~~

~~and Burgevine. To Shanghai the successful operations of Gordon against the rebels brought temporarily disastrous conse- quences. With the disappearance of the T'ai-p'ings the refugees who had sought safety in the foreign settlements returned to their homes, leaving whole streets and quarters deserted and empty. The loss thus inflicted on the municipality was very considerable, and was intensified by a commercial crisis in the markets of cotton and tea, in both of which articles there had been a great deal of over- speculation. But, though the abnormal prosperity produced by extraordinary circumstances was thus suddenly brought to an end, the genuine trade of the port has steadily advanced, subject of course to occasional fluctuations, For example, between the years 1878 and 1881 the gross value of the trade increased from 110,956,274 taels to 141,291,357 taels. In 1883, however, this amount fell to 110,433,531 taels, while in 1884 it rose again' to 118,215,520 taels, although at this time, as will be remembered, hostilities were being carried on between France and China. In the same year 53,562 bales of silk were exported, as against 47,807 bales in 1883, and 27,084,675 Tb of green tea, as against 25,336,041 tb in 1883. In black tea there was a falling off, the respective figures being 43,813,058 and 48,251,637 Ib. The total burthen of foreign steamers which entered and cleared at Shanghai during 1884 was 3,145,242 tons. Of this amount 2,238,433 tons were British, 500,222 were American, 188,484 were Japanese, 98,226 were German, 88,983 were French, 24,572 were Russian, and 11,322 were Danish.~~

~~According to the latest estimate the native population of the~~

~~city and suburbs of Shanghai amounts to 156,000. When to this number the boat population, amounting to 11,000, and the mixed inhabitants of the foreign settlements, numbering 145,500, are added, a total is reached of 312,500 souls.~~

~~The vastness of English interests in China and the large British population at Shanghai gave rise in 1865 to the establishment of a British supreme court for China and Japan, —Sir Edmund Hornby, who was then the judge of the British court at Constantinople, being the first judge appointed to the new office. The court thus consti. tuted not only exercises~~

~~*jurisdiction over the British subjects at Shanghai but acts as a court of appeal from all British consular courts in China and Japan. All charges against Chinamen within the settlement are tried before a mixed court, which sits daily, presided over by a Chinese official and an officer of the consular service. During the year 1884 2,304 criminal cases were tried before this tribunal, and 99 civil cases,—in 85 of which cases no less a sum than £60,000 was involved.*~~

~~*A handsome bund runs along the river frontage of the three foreign settlements, and the public buildings, especially in the British settlement, are large and fine. The cathedral, which is built in the Gothic style, is a notable example of Sir Gilbert Scott's skill as an architect, and the municipal offices, club-house, and hospitals are all admirable in their way. Shanghai is now con- nected with Peking by a telegraph, which will doubtless before long be supplemented by a railway. Some years ago a short railway was laid down between Shanghai and Woosung by some foreigners who wished to force the pace at which China was pro- gressing. But the time had not come when such a step would be adopted by the Chinese, and after a few weeks' existence the plant was bought by the native authorities and shipped to Formosa, where it has since been allowed to rust and rot. The climate of Shanghai is essentially unhealthy. It lies low, and, though the early winter is enjoyable, snow and ice being occasionally seen, the summer months are swelteringly hot. Fever, dysentery, and cholera are unfortunately common complaints, and it is only by frequent trips to Japan and Chefoo that the residents are able to preserve health and strength. But, notwithstanding every dis- advantage, the position occupied by Shanghai as a centre of trade, situated as it is at the mouth of the Yang-tsze-kiang, in the immediate neighbourhood of the richest silk and tea districts, and in proximity to Japan and the newly- opened ports of Corea, insures for it an increasing volume of commerce and a widening prosperity in the future. (R. K. D.)*~~

~~*SHANNON. See IrExann, vol. xiii. p. 216.*~~

~~*SHANS. This name is applied to a number of for the most part semi- independent communities occupying a region bounded on the W. by Burmah and Assam, N. and N.E. by the Chinese province of Yun-nan, E.*~~

~~*by Tong- king, and 8. by Siam (see Plate IX.). Ethnologically the race has a much wider extension, including the Siamese (see Stam), and also, according to Garnier and Colquhoun, the hill tribes around the Tong-king delta and various tribes of Kwang-tung and Kwang-se, and extending across the north of Burmah into Assam. It is also widely diffused through south-western Yun-nan. Terrien de Lacouperie considers it allied'to the Mon, the Mung, and the Pa, and places its early home in the mountains north of Sze-chuen, whence, not having amal- gamated with the growing Chinese empire, it was gradually forced southwards. Although the level of civilization and the purity of their Buddhism vary considerably among the different branches of the race, there is everywhere a remarkable resemblance in appearance, manners, customs, and polity. The traditions current of their origin, too, though localized by each in its own habitat, are closely similar. This great homogeneity seems the more remark- able in that the race is found not only living under many different political systems,—.e., either independent, or subject to Burmah, China, or Siam,—but often in com- munities isolated by mountain ranges, inhabited by tribes of different race and character. All this seems to point to a political unity in earlier times.*~~

~~*The Shans probably appeared on the upper Irawadi nearly two thousand years ago, but Burmese and Shan traditions agree that they were established some centuries earlier on the upper waters of the Shweli and on the Salwin and adjacent valleys on the south-west frontiers of Yun-nan. Here, at all events, in the 7th and 8th cen-*~~

| turies, we hear of the growth of that power which,

temporarily broken by Burmah in the 11th century, reached its highest development in the 13th. This Shan empire, known by the classical Indian name of Kausambi, —corrupted after the punning Chinese fashion into Ko- shan-pyi, 7.e., nine Shan states,—was a confederacy of about ten states, known among themselves by the name of the most powerful member, Mau, or Muang Mau. A great leader, Sam Lung Pha, brother of the king of Mau, overran and conquered Upper Assam from the Satiyas in 1229, the dynasty lasting until the British annexation, These Ahoms still inhabit the Assam districts of Sibsagar and south and east Lakhimpur, though pressed on from the south-west by the Bengalis, whom they despise as a black and inferior race, preferring to associate with the Chinese, whom they regard as congeners, and as the greatest race in the world.

This 13th and the following century also saw Tali to the east and Arakan to the west invaded, Burmah being then weakened by the Mongol invasion ; Chieng Mai and other southern Shan states were also annexed, and "Ayuthia " (d.e., Siam), Cambodia, and Tavoy are claimed by the Shan historians as among their conquests, the Shan influence being felt even in Java. From the 14th to the 16th century wars with both Burmah and China were frequent, and Shan dynasties ruled at times in Burmah 3 but in 1556-62 the Burmese conquered Mogaung, the chief province of Mau, when Buddhism is recorded to have been introduced: probably only a reform of religion is meant. In 1604 the districts now known as the Chinese Shan States, z¢, the heart of the Mau empire, lying chiefly in the Ta-peng basin, east of Bamo,—a town whose population also is mainly Shan,—were finally conquered by China, Mogaung remaining independent on sufferance till absorbed by Burmah in 1796.

Zimmé or Chieng Mai (including Kiang Hai, Kiang Sen, Lagong, and Lapong), whose capital is now an important and well-built town, and Vien Chang on the east of the Me-kong, were both great Shan centres, warring, with various fortunes, with Burmah and Cambodia and with

~~each other, till subjected by the growing power of Siam late in the last century.~~

~~The Burmese Shan States, especially those more remote from Mandalay, have latterly become practically inde- pendent; and, the tyranny which led to extensive south- ward migration having thus ceased, the stream is partly returning northwards. Descendants, too, of the popula- tion deported by Siam from Kiang Sen about a hundred years ago are now by the king's permission returning to people that fertile territory. The Burmese plan with the Shans was to govern by fostering internal dissensions, and they are bitterly hated, while the Chinese are in an equal degree liked and respected. The great Shan state of Kiang Hung has now accepted the dictation of China, to whom in fact, like some of its lesser neighbours, it has always paid certain taxes, while acknowledging the supre- inacy of Burmah. Kiang Tung to the south, which has been Burmese for over a century, has lately made over- tures to Siam, though not forgetting the injuries inflicted by that power in 1854. The numerous ruins of great cities over the whole region from Chieng Mai to Kiang Tung testify to former wealth and prosperity, though they may not have all existed contemporaneously. In Luang Pra- bang in the north-east, on the other hand, tribes of a partly Chinese race are pressing southwards. It is remarkable how many of the conquering irruptions of south-east Asia were due mainly to the eviction of such conquerors by some stronger power. Incessant wars and vast deporta- tions have tended to assimilate the various populations of all this region.~~

~~774.~~

~~Each Shan state is governed by a tsobwa (chao p'hya), or supreme chief, aided by a council, and often by a coadjutor. Where the Shans are in immediate contact with one of their great neighbours their habits and customs are necessarily modified ; otherwise, speaking generally, civilization increases southwards. Religion is nominally Buddhist, and the priests, though their lives are usually far from correct, have great influence ; temples, caves, and other localities sacred to Buddha are thronged with worshippers liberal with their offerings ; but the practical exercise of religion consists chiefly in efforts to propitiate or avert the evil~~

~~*influence of the nats or p'hees, demons and spirits everywhere present, to whom all accidents and illnesses are attributed. Along with the Buddha, various images, among which the horse is not uncommon, are adored (though there are temples in which these are not found); and fetiches—natural objects of special form, ¢.g., of some part of the body—are kept in the house to avert disease. Medical treat- ment consists largely in magical practices, and individuals de- nounced by the sick as the cause of their illness frequently have their houses burned and are themselves deported to a distance. Thus, too, ordeals have a prominent place in legal practice. The Shans have no Buddhist prejudices against killing poultry or cattle for food, but like other Indo-Chinese and the Malays do not use milk. Slavery is general; the supply is recruited partly by raids on neighbouring hill tribes ; the Indo-Chinese practice of slavery for debt also prevails. The slaves are not ill-treated, and are chiefly employed in field labour by the chaos, who own great numbers. In appearance the North Shans are sallow, but hardly darker than South Europeans, and are characterized by a short broad flat face, more elongated and nearer the Tartar type in the upper classes ; they have red cheeks, brown eyes hardly oblique, black hair, nose almost aquiline, and are of medium height. The Chinese Shans are much smaller, with squat figures, prominent cheek-bones, and oblique eyes. ;*~~

~~*The practice of tattooing prevails in some districts, down to the upper waters of the Me-nam, and it occurs also among the Laos in the south-east, the tattooed being known as the black-bellied, the non-tattooed as the white-bellied. The Shans are all hardier and more manly than their congeners the Siamese, and they are also more sedate and more self-possessed than the Burmese. Most travellers speak of them as brave, friendly, social, and hospitable, but a good deal of the oppression and cruelty natural to a senii- barbarous condition prevails. They are cleanly and fond of bathing, the towns and villages being supplied with bamboo aqueducts. Drunkeuness, except at festivals, is rare. Gambling is common, whole families being sold into slavery to pay debts thus contracted. Public gaming and the sale of spirits and opium are monopolies. They show much artistic taste in the beautiful colours of their textile fabrics, the needlework and embroidery of the women, and the designing and execution of the silver ornaments which are worn in*~~

~~*profusion, They show great aptitude for trade, and are said by Mr Holt Hallett to welcome the prospect of the railway intended to connect their country with Maulmein, crossing thence to Raheng or some neighbouring point on the Me-nam, and on through the fertile valleys and plateaus on its upper tributaries to the Chinese frontier.*~~

~~*Tea is found, both wild and cultivated, from Zimmé to Kiang Tung. Opium is exported to Mandalay and to China. Indian corn, sugar, and tobacco are grown in the low grounds, and excellent cotton and indigo (which also grows wild in the hills). Teak has long been worked by Anglo-Burmese in the eastern affluents of the Toong-yen and neighbouring valleys, and has become comparatively scarce west of the Me-ping ; but it grows freely in the hills and valleys around Kiang Sen and Lagong, aud in the hill region of eastern Siam, where, however, it is of inferior quality. Silk is produced, and iron, copper, and silver-lead (galena) ores are worked.*~~

~~*The Shan languages are classified by Dr Cushing as follows :— Ahom (Assam), extinct ; Khamti, on the upper Irawadi and other valleys on the extreme north of Burmah ; the Chinese (Mau) Shans, east from Bamo; Shans proper, between the mountains which bound the Burmese plains in the east and the Me-kong, and between 23° and 19° N. lat.; Laos to the south of this, from 19° north to the frontiers of Siam; and lastly, Siamese. The last two, as spoken, differ but little, and the three others may be grouped together. All have separate alphabets (related, however, in form), except the Siamese ; and, the spelling being phonetic, the orthography is tolerably fixed. But it is a tonal language, and the vowel signs are few, so that some have two or three values assigned them. There are a good many Palf words due to Buddhism, many Bur- mese words in the districts under Burmese influence, and a large foreign element in the Chinese Shan state of Ho-tha, where the race is perhaps not fundamentally Shan.*~~

~~*See Ney Elias, Introductory Sketch of the History of the Shans in Upper Burmahand West Yun-nan, Calcutta, 1876 ; Yule, Glossary of Anglo-Indian Words and Phrases (1886), and Narrative of the Mission to Ava (1858) ; Anderson, From*~~

~~*Mandalay to Momien; Colquhoun, Among the Shans ; Cushing, Shan Dictionary*~~

~~*(Introduction); Bock. Temples and Elephants; Sir A. Phayre, History of Burmah, (C. T.)*~~

~~*SHA—SHA*~~

~~*SHARK. The systematic position of the group of Sharks or Selachotdei in the class of Fishes, their classifica- tion, and their general external and anatomical character- istics have been already sufficiently noticed under Icaruy- oLoey (vol. xii. pp. 630 sq.), and we have here to supplement that article only by a fuller reference to the natural history of the more common and more important types of the group.*~~

~~*Sharks are almost exclusively inhabitants of the sea, but some species freely enter the mouths of large rivers, and one species (Carcharias gangeticus) occurs frequently high up in the large rivers of India, and in the Tigris about Baghdad, at a distance of 350 miles from the Persian Gulf in a straight line, and has even been reported from a lake in Viti Levu (Fiji Islands) which is shut off from the sea by a cataract. Sharks are found in all seas; most numerous between the tropics, they become scarcer beyond, a few only reaching the Arctic circle ; it is not known how far they advance southwards in the Antarctic region. Alto- gether some hundred and fifty different species have been described.*~~

~~*With regard to their habits many are littoral species, the majority pelagic, and a few are known to belong to the bathybial fauna, having hitherto been obtained down toa depth of 500 fathoms.*~~

~~*Inttoral Sharks.—The littoral forms are of small size, and generally known under the name of "dog-fishes," "hounds," &. Some pelagic sharks of larger size also live near the shore on certain parts of a coast, but they are attracted to it by the abundance of food, and are as frequently found in the open sea, which is their birth- place ; therefore we shall refer to them when we speak of the pelagic kinds.*~~

~~*The majority of the littoral species live on the bottom, sometimes close inshore, and feed on small marine animals or on any animal substance. The following are deserving of special notice.*~~

~~*The Tope (Galews) is common on the coasts not only of England, Ireland, and of the more southern parts of Europe, but also of South Africa, California, Tasmania, and New Zealand. Its teeth are equal in both u jaws, of rather small size, flat, triangular, with \ the point directed towards the one side, and SS with a notch and denticulations on the shorter side (fig. 1). It is of a uniform slaty-grey colour, and attains to a length of 6 feet. The female brings forth some thirty living young at one birth in May. It cannot be regarded as a U very destructive fish, but becomes troublesome ~· toe at times to fishermen by taking their bait and upper; /tow. driving away other fish they desire to catch, ° (* ®)*~~

~~*The Hounds proper (Mustelus) possess a very different dentition, the teeth being small, obtuse, numerous, arranged in several rows like pavement (fig. 2). Five or six species are known from the shores of the various temperate and _ subtropical seas, one (M. vulgaris) being common on the coasts of Great Britain and the #% United States on the Pacific as wellas Hit the Atlantic side. It is of a uniform /) . grey colour or sparingly spotted with *!% %—Teeth of Mustelus. white, and attains to a length of 3 or 4 feet. The young, about twelve in number, are brought forth alive in November. It is a comparatively harmless fish, which feeds on shells, crustaceans, and decomposing animal substances.*~~

~~*Of the Dog-Fishes proper (Scyllium, Chiloscyllium, vc.) some twenty species are known, which are spread over nearly all the temperate and tropical seas. Their teeth are small, in several series, with a longer pointed cusp in the middle, and generally one or two smaller ones on each side (figs.*~~

~~*SHARK*~~

~~*3and 5). They are all oviparous, their oblong egg-shells being producedat each corner into a long thread by which the egg is fastened to some fixed object. Some of the tropical species are ornamented with a pretty pattern of coloration. ary The two British species, the \AMY Lesser and the*~~

~~*LargerSpotted Dog-Fish (Sc. canicula and Se. catulus), belong to the most common fishes of the *t)*~~

~~*coast, and are often con- sy -P vi founded with each other.*~~

~~*But the formeris finely dotted Fig. 3.—Teeth of Scyllium canicula. with brown above, the latter having the same parts covered with larger rounded brown spots, some of which are nearly*~~

~~*Fic. 4,—Chiloscyllium trispeculare,*~~

~~*as large as the eye. As regards size, the latter exceeds somewhat the other species, attaining to a length of 4 feet, Dogfishes may become extremely troublesome by the large numbers in which they congregate at fishing stations; nor do they compensate for the injury they cause to fishermen, being but rarely used as food, ex- cept at certain seasons by the poorer classes of the Mediterranean countries, in China and Japan, and in the Ork- neys, where they are dried Fie. 5.—Confluent Nasal and Buccal Cavities for home consumption. vials*~~

~~*The Black-mouthed Dog-Fish (Pristiurus melanostomus) is another European species which is rarely caught on the British coasts, and is recognized by a series of small, flat spines with which each side of the upper edge of the caudal fin is armed.*~~

~~*The Tiger-Shark (Stegostoma tigrinum) is one of the commonest and handsomest sharks in the Indian Ocean. The ground colour is a brownish-yellow, and the whole fish is ornamented with black or brown transverse bands or rounded spots. It isa littoral species, but adult specimens, which are from 10 to 15 feet long, are not rarely met far from land. _It is easily recognized by its enormously long bladelike tail, which is half as long as the whole fish. The teeth are small, trilobed, in many series. The fourth and fifth gill-openings are close together.*~~

~~*The genus Crossorhinus, of which three species are known from the coasts of Australia and Japan, is remarkable as the only instance in this group of fishes in which the in- teguments give these inactive ground-sharks, whilst they lie concealed watching for their prey, what may be*~~

~~*called a "celative" rather than a " protective" resemblance to their surroundings. Skinny frond-like appendages are developed near the angle of the mouth, or form a wreath round the side of the head, and the irregular and varied coloration of the whole body closely assimilates that of a rock covered with short vegetable and coralline growth. This peculiar development reminds us of the similar condition in the sea- devil (Lophius), where it serves also to conceal the fish from its prey, rather than to protect it from its enemies, The species of Crossorhinus grow to a length of 10 feet.*~~

~~*775*~~

~~*The so-called Port Jackson Shark (Cestracion) is likewise a littoral form. Besides the common species (C. philippi),*~~

~~*Fig. 6.—Cestracion galeatus,*~~

~~*three other closely allied kinds from the Indo-Pacific are known. This genus, which is the only existing type of a separate family, is one of special interest, as similar forms occur in Primary and Secondary strata. The jaws are armed with small obtuse teeth in front, which in young individuals are pointed, and provided with from three to five cusps. The lateral teeth are larger, pad-like, twice as broad as long and arranged in oblique series (fig. 7),—an*~~

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~~*ree ANE*~~

~~*Fie. 7,—Upper Jaw of Port Jackson Shark (Cestracton philippi). (x 3.)*~~

~~*arrangement admirably adapted for the prehension and mastication of crustaceans and hard-shelled animals. The fossil forms far exceeded in size the living, which scarcely attain to a length of 5 feet. The shells of their eggs are not rare in collections, being found thrown ashore like*~~

those of our dog-fishes. The shell is pyriform, with two broad lamellar ridges each wound edgewise five times round it fig. 8).

tie Spiny or Piked Dog-Fish (Acanthias) inhabits, like the majority of littoral genera of sharks, the temperate seas of both the northern and southern hemispheres. For some part of the year it lives in deeper water than the sharks already noticed, but at uncertain irregular times it appears at the surface and close inshore in almost incredible numbers. Couch says that he has heard of 20,000 having been taken in a sean at one time ; and in March 1858 the newspapers reported a prodigious shoal reaching westward to Uig, whence it extended from 20 to 30 miles seaward, and in an unbroken phalanx eastward to Moray, Banff, and Aberdeen. In the deep fjords of Norway, and indeed at every station of which a shoal of these fishes has taken temporary possession, line-fishing has to be suspended during the time of their visit, as they cut the lines with their scissors-like teeth. As expressed by the name, these

fishes are distinguished from the other British littoral

to this genus. Between thirty and forty species have

sharks by each of the two dorsal fins being armed in front _ been distinguished, all of which are found in tropical seas.

Fig. 8.—Egg-shell of same fish (x 3). I., external view; IJ., section; @ and 0, the two spiral ridges; c, cavity for the ovum. by an acute spine. They do not possess an anal fin. Their teeth are rather small, placed in a single series, with the point so much turned aside that the inner margin of the tooth forms the cutting edge (fig. 9). The spiny dog- fish are of a greyish colour, with some = whitish spots in young specimens, and attain to a length of 2 or 3 feet. They are viviparous, the young being pro- duced throughout the summer months. It is stated that in the northern islands of Great Britain they are dried for food, and that their livers yield a large tg quantity of oil.

~~*Finally, we have to notice among the littoral sharks the 'Angel-Fish" or " Monk-Fish" (hina squatina), which, by its broad flat head and ex- panded pectoral fins approaches in general appearance the rays. It occurs in the temperate seas of the southern as well as the northern hemisphere, and is not uncommon on sandy parts of the coast of England and Ireland. It does not seem to exceed a length of 5 feet, is not used as food, and is too rare to do any perceptible injury to other fish. It is said to produce about twenty young at a birth.*~~

~~*Pelagic Sharks.—All these are of large size, and some are surpassed in bulk and length only by the larger kinds of cetaceans. Those armed with powerful cutting teeth are the most formidable tyrants of the ocean and dangerous to man, whilst others, which are provided with numerous but very small teeth, feed on small fishes only or marine invertebrates, and are otherwise almost harmless and of a timid disposition, which causes them to retire into the solitudes of the open sea. On this account we know very little of their life; indeed, some are known from a few individuals only which have accidentally come ashore. All pelagic sharks have a wide geographical range, and many are found in all seas within the limits of the equatorial zone,—some being almost cosmopolitan. All seem to be viviparous.*~~

~~*Of the more remarkable forms which we propose to notice here the genus most abundantly represented in species and individuals is Carcharias. Perhaps nine-teuths of the sharks of which we read in books of travel belong*~~

~~*sS*~~

~~*thias vulgaris,*~~

~~*They are the sharks which so readily attach themselves to sailing vessels, following them for weeks, and thus exhibit- ing an endurance of muscular power scarcely found in any other class of animals. Others affect more the neighbour- hood of land, congreyating at localities where nature or the vicinity of man provides them with an abundant supply of food. One of the most common species, and one of those which extend far into the temperate zones, is the Blue Shark (Carcharias glaucus), of*~~

~~*which small specimens (4 to 6 feet long) are frequently caught on the south coasts of England and Ireland. Other species of Carcharias attain a length of 25 feet. The mouth of all is armed with a series of large flat triangular teeth, which have a sharp, smooth, or serrated edge (fig. 10).*~~

~~*Fig. 10,—Dentition of the Blue Shark (Ca rias glaucus). 'The single teeth are of the natural size.*~~

~~*Galeocerdo is likewise a large shark very dangerous to man, differing from the preceding chiefly by having the outer side of its teeth deeply notched. It has long been known to occur in the North Atlantic, close to the Arctic Ocean (G. arcticus), but its existence in other parts has been ascertained within a recent period; in fact, it seems to be one of the most common and dangerous sharks of the Indo-Pacific, the British Museum having obtained specimens from Mauritius, Kurrachee, Madras, and the west coast of Australia.*~~

~~*Hammerheaded Sharks (Zygena) are sharks in which the anterior portion of the head is produced into a lobe on each side, the extremity of which is occupied by the eye. The relation of this unique configuration of the head to the economy of the fish is unknown. Otherwise these sharks resemble Carcharias, and are equally formidable, but seem to be more stationary in their habits. They occur in all tropical and subtropical seas, even in the Mediterranean, where Z. malleus is by no means rare. In the Indian Ocean it is common, and Cantor states that specimens of this species may be often seen ascending from the clear blue depths of the ocean like a great cloud.*~~

~~*The Porbeagles (Zamna) differ from the preceding sharks in their dentition (fig. 11), the teeth being large, lanceo- late in shape, not adapted for cutting, but rather for seizing and holding the prey, which consists chiefly in fish. These sharks are therefore not dangerous*~~

~~*Fig. 11.—Teeth of Lamna.*~~

~~*SHARK*~~

~~*to man ; at least, there is no instance known of a persou having been attacked by the species common on the British coast (L. cornubica). It grows to a length of 10 feet, and ranges to New Zealand and Japan. See vol. xix. p. 518.*~~

~~*To the genus Carcharodon particular interest is attached, because the single still existing species is the most form. idable of all sharks, as were those which preceded it in Tertiary times. The existing species (C. rondeletii) occurs in almost all tropical and subtropical seas, but seems to be verging towards extinction. It is known to attain toa length of 40 feet. The tooth figured here of the natural size (fig. 12) is taken from a jaw much shrunk in drying, but still 20 inches wide in its transverse dia- meter, and taken from' a specimen 364 feet long. The extinct spe- cies must have been still more gigantic in bulk, as we may judge from teeth which are found in the crag or which have been dredged up from the bottom of the Pacific Ocean by the naturalists ' of the " Challenger " expedition, and which are 4 inches wide at the base and 5 inches long measured along their | lateral margin. In Fie. 12.—Tooth of Carcharodon rondeletii.*~~

~~*some Tertiary strata these teeth are extremely abundant, so*~~

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~~*Res*~~

~~*much so that—for instance, in Florida—the strata in which |*~~

~~*they occur are quarried to obtain the fossil remains for ex- port to England, where they are con- verted into artificial manure. The Fox-Shark or Thresher (Alopecias vulpes), of which every year specimens*~~

~~*Fic. 13.—Basking Shark.*~~

~~*frequently seen during the summer months, generally in companies, at a distance of from three to a hundred miles off the shore, it is chased by the more courageous of the fishermen for the sake of the oil which is extracted from the liver, one fish yielding from a ton to a ton and a half.*~~

~~*Its capture is not unattended with danger, as one blow from the enormously strong tail is sufficient to stave in the sides of a large boat. The simple method used at present of harpooning the fish entails much patience and loss of time upon the captors, as the fish generally sinks to the bottom and sulks for many hours before it rises again ina more or less exhausted condition ; and the use of more modern appliances could not fail of securing more speedy and better success. The basking shark is gregarious, and many individuals may be seen in calm weather lying*~~

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~~*are captured on the British coast, but which is common*~~

~~*in all the temperate seas of the northern and southern*~~

~~*hemispheres, is readily recognized by its extremely slender tail, the length of which exceeds that of the remainder of the body. Its teeth are small, flat, triangular, and without serrature (fig. 13; the single tooth is of the natural size). It follows the shoals of herrings, pilchards, and sprats in their migrations, destroying incredible numbers and fre- quently injuring the nets by getting entangled in them. When feeding it uses the long tail in splashing the surface of the water, whilst it swims in gradually decreasing circles round a shoal of fishes which are thus kept crowded together, falling an easy prey to their enemy. Sometimes two threshers may be seen working together. Statements that it has been seen to attack whales and other large ceta- ceans rest upon erroneous observations ; its dentition is much too weak to bite through their skin, although, as Couch says, by one splash of its tail on the water it may put a herd of dolphins or porpoises to flight like so many hares. The same effect may be produced by the splash of an oar. The thresher attains toa length of 15 feet, the tail included.*~~

~~*The Basking Shark (Selache maxima), sometimes erro- neously called "Sun-Fish," is the largest fish of the North Atlantic, growing to a length of more than 30 feet, It is one of the few types of sharks which up to a very recent time were considered to be peculiar to the North-Atlantic fauna ; but Prof. F. M'Coy has just recorded its occur- rence on the Australian coast, a specimen 30 feet long having been captured in November 1883 at Portland, on the west coast of Victoria. The mouth is of*~~

~~*an extra- ordinary width, and, like the gill-cavity, capable of great expansion, so as to enable the fish to take at one gulp an enormous quantity of the small fish and other marine creatures on which it subsists. Also the gill-openings are of great width. The teeth are very small, numerous, arranged in several series, conical, and probably without use in feeding. This shark is therefore quite harmless if not attacked. On the west coast of Ireland, where it is*~~

~~*together motionless, with the upper part of the back raised above the surface of the water, a habit which it has in common with the true sun-fish (Orthagoriscus), and from which it has derived its name.*~~

~~*A shark similar in many points to the basking shark (which it exceeds in size), and an inhabitant of the Indo- Pacific Ocean, is Rhinodon typicus. In fact, so far as our present knowledge goes, it is the largest of all sharks, as it is known to exceed a length of 50 feet, but it is stated to attain that of 70. The captures of only a few specimens are on record, viz., one at the Cape of Good Hope, one or*~~

~~*_ two near the Seychelles, where it is known as the "chagrin,"*~~

~~*one on the coast of California, and one (quite recently) on the coast of Peru. The snout is extremely short, broad, and flat, with the mouth and nostrils placed at its extrem- ity; the gill-openings very wide, and the eye very small. The teeth are, as in the basking shark, extremely small and numerous, conical in shape. No opportunity should be lost of obtaining exact information on this shark. The Greenland Shark (Lemargus borealis) belongs to the XXI. — 98*~~

~~*778*~~

~~*same family as the spiked dog-fish, but grows to a much larger size, specimens 15 feet long being frequently met*~~

~~*Fig. 14.—Greenland Shark (Lemargus borealis), ~*~~

~~*with. 'The two dorsal fins are small and destitute of spines. The teeth (fig. 11) in the upper jaw are small, narrow, conical in shape ; those of the*~~

~~*lower flat, arranged in several series, one on the top of the other, so that only the uppermost forms the sharp dental edge of the jaw. The points of*~~

~~*these lower teeth are so much turned aside that the inner margin only enters the dental edge. The Green- land shark is an inhabitant 4M*~~

~~*of the Arctic LP, regions, some- times straying to the lati- tudes of Great Britain and of Cape Cod in the western Atlantic ; it is one of the greatest enemies of the whale, which is often found with large pieces bitten out of the tail by this shark. Its voracity is so great that, as Scoresby tells us, it is absolutely fearless in the presence of man whilst engaged in feeding on the carcase of a whale, and that it will allow itself to be stabbed with a lance or knife without being driven away.*~~

~~*The Spinous Shark (Hchinorhinus spinosus) is readily re- cognized by the short bulky form of its body, its short tail, and the large round bony tubercles which are scattered all over its body, each of which is raised in the middle into a pointed conical spine. More frequent in the Mediterranean, it has been found also not very rarely on the English coasts and near the Cape of Good Hope. It is always living on the ground, and probably descends to some depth. It does not seem to exceed a length of 10 feet.*~~

~~*Bathybial Sharks.—Sharks do not appear to have yet reached the greatest depths of the ocean ; and so far as we know at present we have to fix the limit of their vertical distribution at 500 fathoms. Those which we find to have reached or to pass the 100 fathoms line belong to generic types which, if they include littoral species, are ground- sharks,—as we generally find the bottom-feeders of our littoral fauna much more strongly represented in the deep sea than the surface swimmers. All belong to two families only, the Scylliide and Spinacide, the littoral members of which live for the greater part habitually on the bottom and probably frequently reach to the 100 fathoms line. Distinctly bathybial species are two small dog-fishes,—Spinax granulatus from 120 fathoms, and Scyllium canescens from 400 fathoms, both on the south-west coast of South America ; also Centroscyllium granulatum from 245 fathoms in the Antarctic Ocean, whose congener from the coast of Greenland probably descends to a similar depth. The sharks which reach the greatest*~~

~~*depth recorded hitherto belong to the genus Centrophorus, of which some ten species are known, all from deep water in the North Atlantic, Mediterranean, the Molucca and Japanese seas. The Japanese species were discovered by*~~

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~~*Fic. 15.—Dentition of Greenland Shark.*~~

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~~*the naturalists of the "Challenger" on the Hyalonema ground off Inosima in 345 fathoms. Dr E. P. Wright found C. celolepis at a still greater depth on the coast of Portugal. The fishermen of Sétubal fish for these sharks in 400 or 500 fathoms, with a line of some 600 fathoms in length. 'The sharks caught were from 3 to 4 feet long, and when they were hauled into the boat fell down into it like so many dead pigs"; in fact, on being rapidly withdrawn from the great pressure under which they lived they were killed, like other deep-sea fishes under similar circumstances. It is noteworthy that the organiz- ation of none of these deep-sea sharks has undergone such a modification as would lead us to infer that they are inhabitants of great depths. One of the most interesting types of the divi- sion of sharks is the small family of WNotidanide, which is external- ly distinguished by the presence of a single dorsal fin only, without spine and oppo- site to the anal, and by having six or seven wide branchial open- ings. They repre- sent an ancient type, the presence of which in Ju- rassic formations is shown by teeth extremely similar to those of the living species. Their skeleton is notochordal. Only four species are known, of which one (Noti- danus griseus) has now and _ then strayed _ north- 'wards to the*~~

~~*Fic. 16.—Chlamydoselachus anguineus.*~~

~~*English coast. A member of this family has been re- cently discovered in Japan, and is so scarce that only two specimens are known—one in the museum at Cam- bridge, U.S., and the other in the British Museum. It was named by its first describer, 8. Garman, Chlamy- doselachus anguineus (fig. 16). It resembles somewhat in shape a conger, and differs*~~

~~*from the Wotidani proper by its elongate body, wide lateral and terminal mouth, extremely wide gill-openings, and peculiarly formed teeth. The teeth are similar in both jaws, each composed of three slender curved cusps separated by a pair of rudi- mentary points, and with a broad base directed back- wards. These teeth resemble some fossils of the Middle Devonian, described as Cladodus, and North-American*~~

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~~*naturalists regard, therefore, this fish as " the oldest living type of vertebrate." The Notidani are very pro- bably ground-sharks, perhaps descending into deep water ; and, although nothing positive is known at present of the habits of Chlamydoselachus, the fact that this singu- lar type has escaped so long the observation of the numerous collectors in Japan renders it probable that it inhabits depths the exploration of which has been initiated only recently.*~~

~~*A few words have to be added with reference to the economic uses of this group of fishes. Their utility to man is insignificant in comparison with the havoc they commit among food-fishes and at fisheries, and with the loss of life which is caused by the larger kinds. As mentioned above, some of the smaller dog-fishes are eaten at certain seasons by the captors, and by the poorer classes of the population. An inferior kind of oil, chiefly used for the adulteration of cod-liver oil, is extracted on some of the northern fishing-stations from the liver of the spiked dog-fishes, and occa- sionally of the larger sharks. Cabinet-makers make extensive use of shark's-skin under the name of "shagreen" for smoothing or*~~

~~*polishing wood. This shagreen is obtained from species (such ag |*~~

~~*our dog-tishes) whose skin is covered with small, pointed, closely- set, calcified papille, whilst very rough skins, in which the papille are large or blunt, are useless for this purpose. The dried fins of sharks (and of rays) form in India and China an important article of trade, the Chinese preparing gelatin from them, and using the better sort for culinary purposes. They are assorted in two kinds, viz., " white" and "black." The former consists exclusively of the dorsal fins, which are on both sides of the same light colour, and reputed to yield more gelatin than the other*~~

~~*fins. The pectoral, ventral, and anal fins constitute the "black" sort ; the caudal are not used. One of the principal places where shark fishing is practised as a profession is Kurrachee, and the principal kinds of sharks caught there are spccies of Carcharias, Galeocerdo, and Zygena. Dr Buist, writing in 1850, states that there are thirteen large boats, with crews of twelve men each, constantly employed in this pursuit, that the value of the fins sent to the market varies from 15,000 to 18,000 rupees, that a boat will capture sometimes at a draught as many as a hundred sharks of various sizes, and that the number of 'sharks captured annually amounts probably to not less than 40,000, Large quantities are imported from the African coast and the Arabian Gulf, and various ports on the coast of India. In the year 1845-46 8770 cwt. of sharks' fins were exported from Bombay to China. (A. C. G.)*~~

~~*SHARON, a borough of the United States, in Mercer |*~~

~~*County, Pennsylvania, 14 miles west of Mercer, is the seat of considerable iron manufacture, with blast furnaces, rolling mills, foundries, and nail factories, and had in 1880 & population of 5684,*~~

~~*SHARP, Jamxs (1618-1679), archbishop of St Andrews, was the son of William Sharp, sheriff-clerk of Banffshire, and of Isabel Leslie, daughter of Leslie of Kininvie, of the family of Halyburtons of Pitcur in Angus, and was born in Castle Banff on May 4, 1618. He was a clever boy, and his early disposition for the church led to his being called in jest "the young minister." In 1633 he went to King's College, Aberdeen, and graduated in 1637. He there studied divinity for one or two years, and probably derived his Episcopal tendencies from the "Aberdeen doctors," Aberdeen being at that time the home of Episcopal sentiment. On the outbreak of the Covenanting war he went to England (1639) and visited Oxford and perhaps Cambridge, becoming acquainted with the principal English divines. Upon his return he was chosen in 1643 through the influence of Lord Rothes to be one of the "regents" of philosophy in St Leonard's College, St Andrews. He appears to have continually risen in reputation until in December 1647 he went through his ordinary trials for the ministerial office before the presby- tery of St Andrews, and was appointed minister of Crail in Fifeshire, on the presentation of the earl of*~~

~~*Crawford, on January 27,1648. In the great schism of Resolutioners and Protestors, he, with the large majority of educated men, took active part with the former; he was the friend of Baillie, Douglas, Dickson, Wood, Blair, and others, and*~~

~~*as early as March 1651 was recognized as one of the lead- |*~~

~~*to whom it was of great importance to*~~

~~*| the king at Breda*~~

~~*and Clarendon, not indeed so far as to make up*~~

~~*TO*~~

~~*ing men of the party. His first public employment was*~~

~~*in 1656, when he went to London on their behalf to*~~

~~*endeavour to counteract with the Protector the influence of Warriston, who was acting for the Protestors. Here he became acquainted with Calamy, Ash, and other leading London Presbyterian ministers, and letters passed between him and Lauderdale, then prisoner in the Tower. He displayed all his undoubted talents for petty diplomacy and considerable subtlety in argument while on this service, and his mission was decidedly successful. He returned to Scotland in 1659, but upon Monk's march to London was again, in February 1660, sent by the Resolutioners to watch over their interests in London, where he arrived on February 13. He was most favourably received by Monk, 1 remain on good terms with the dominant party in Scotland. His letters to Douglas and others during this period, if they may be trusted, are useful towards following the intrigues of the time day by day. It must not be forgotten, however, that there is good reason for thinking that Sharp had already made up his mind not to throw away the chances he might have of prominent employment under the Restoration. In the beginning of May he was despatched by Monk to "to deal that he may be sent with a letter to the London Presbyterian ministers, showing his resolution to own the*~~

~~godly sober party." His letters on this occasion to Douglas show that he regarded himself equally as the emissary of the Scottish kirk. It is to be~~

~~| noticed that he was also the bearer of a secret letter from | Lauderdale to the king. He was in fact playing a game~~

~~admirably suited to his peculiar capacity for dark and~~

~~| crooked ways of dealing. There can be little doubt that~~

~~while on this mission he was finally corrupted by Charles his mind to betray the kirk, but at any rate to decide in no way to imperil his own chances by too firm an integrity. The first thing that aroused the jealousy of his brethren, who, as Baillie says, had trusted him as their own souls, was his writing from Holland in commendation of Clarendon. This jealousy was increased on lis return to London (May 26) by his plausible endeavours to stop all coming of Presbyterian commissioners from Scotland and Ireland, though he professed to desire the presence of Douglas and Dickson, by his urgent advice that the Scots should not interfere in the restoration of Episcopacy in England, and by his endeavours to frustrate the proposed union of Resolutioners and Protestors. He informed them that Presbyterianism was a lost cause in England, but as late as August 11 he intimated that, though there had been great danger for the Scottish kirk as well, this danger had been constantly and successfully warded off by his efforts. He returned to Scotland in this month, and busied himself in endeavouring to remove all suspicions of his loyalty to the kirk ; but at the same time he successfully stopped all peti- tions from Scottish ministers to king, parliament, or council. His letters to Drummond, a Presbyterian minister in London, and to Lauderdale, without absolutely committing him, show clearly that he was certain that Episcopacy was about to be set up. How far he was actively a traitor in the matter had always been fairly disputed until the ques- tion was at last set at rest by the discovery of his letter, dated May 21, from London, whither he went in April 1661, to Middleton, the High Commissioner, whose chap- lain he now was, from which it is proved that he was in confidential communication with Clarendon and the English bishops, that he was earnestly and eagerly co-operating 'in the restoration of Episcopacy in Scotland, that he had before leaving Scotland held~~

~~*frequent conferences with Middleton on the subject (a fact which he had explicitly and vehemently denied) and was aware that Middleton had*~~

~~*all along intended it, and that he drew up and was directly responsible for the quibbling proclamation of June 10, the sole purpose of which was 'the disposing of minds to acquiesce in the king's pleasure." The original of this letter (which is printed in the Lauderdale Papers and in the Scottish Review) is preserved in the Museum of the Society of Antiquaries, Edinburgh. It should be noticed that as late as the end of April, on the eve of starting on his mission to court with Rothes and Glencairne, he declared to Baillie that no change in the kirk was intended. The mask was at length dropped in August, when Epis- copacy was restored, and Sharp was appointed archbishop of St Andrews. Heand Leighton, Fairfoul, and Hamilton '""were dubbed, first preaching deacons, then presbyters, and then consecrated bishops in one day, by Dr Sheldon and a few others." On April 8th the new prelates entered Scotland, and on the forenoon of April 20, 1662, Sharp preached his first sermon at St Andrews.*~~

~~*Sharp had carefully kept on good terms with Lauder- dale, and when the Billeting Plot was concocted in Septem- ber 1662 against the latter by Middleton, he managed to avoid acting against him; indeed it is probable that, after being appointed under an oath of secrecy to be one of the scrutineers of the billets, he, in violation of the oath, was the cause of Lauderdale receiving timely informa- tion of the decision against him; and yet he shortly went up to London to explain the whole affair in Middleton's interest. When Lauderdale's supremacy was established he readily co-operated .in passing the National Synod Act in 1663, the first step in the intended subjection of the church to the crown. In 1664 he was again in London, returning in April, having secured the grant of a new church commission. His vanity also had been gratified by his being allowed to take precedence of the chan. cellor at the council. He harassed the ministers who were with his old friend James Wood when he signed his well-known deathbed confession ; he cited and fined others, as well as laymen, for withdrawing from the churches; he urged the thorough prosecution of the arbitrary powers granted to the commission, and*~~

~~*complained of the slackness of his fellow commissioners. So oppressive was his con- duct and that of others of the bishops that it called forth ‘ a written protest from Gilbert Burnet. Sharp at once summoned him before the bishops and endeavoured to obtain a sentence of deprivation and excommunication against him, but was overruled by his brethren. On the death of Glencairne, the chancellor’s greatest efforts were made to secure the vacant office for Sharp, and he was not inactive in his own interest; the place was not, however, filled up until 1667, and then by the appointment of Rothes. He was in strict alliance with Rothes, Hamilton, and Dal- yell, and the other leaders of oppression, and now placed himself in opposition to the influence of Lauderdale, attacking his friends, and especially the earl of Kincardine. In 1665 he was again in London, where, through his own folly and mendacity, he suffered a complete humiliation at the hands of Lauderdale, well described by the historian Burnet. With Rothes he now in great part governed Scotland, and, the result of their system of violence and extortion was the rising of the Covenanters, during which, being in temporary charge during Rothes’s absence, he showed, according to Bellenden, the utmost fear, equalled only by his cruelty to the prisoners after the rout of Pent- land. When the convention of estates met in January 1667 he received his first rebuff, Hamilton being substi- tuted for him as president. He now tried to curry favour with Lauderdale, to whom he wrote letters of the most whining contrition, and who extended him a careless recon- ciliation. The expressions of contempt for him which occur at this time, as previously, in the letters of Robert Moray,*~~

~~*Ha KP*~~

~~*Argyll, and others of Lauderdale’s correspondents, are frequent and very amusing. For a time he made himself actively useful, and was instrumental in restraining his brethren from writing to London to complain of the con- ciliation policy which for a while Lauderdale carried out, a transaction in which he displayed the utmost effrontery of lying ; and, with slight attempts to free himself, he con- tinued faithful in his new service. On July 10, 1668, an attempt was made upon his life by Robert Mitchell, who fired a pistol at him while driving through the streets of Edinburgh. The shot, however, missed Sharp, though his companion the*~~

~~*bishop of Orkney was wounded by it, and Mitchell for the time escaped. In August Sharp went up to London, returning in December, and with his assistance, nominally indeed at his suggestion, Tweeddale's tolerant proposals for filling the vacant parishes with some of the "outed" ministers were carried out. In the debates on the Supremacy Act, by which Lauderdale destroyed the autonomy of the church, he at first showed reluctance to put in motion the desired policy, but gave way upon the first pressure. When, however, Leighton, as archbishop of Glasgow, endeavoured to carry out a comprehension scheme, Sharp actively opposed him, and expressed his joy at the failure of the attempt. From this time he was completely subservient to Lauderdale, who had now finally determined upon a career of oppression, and in 1674 he was again in London to support this policy. In this year also Mitchell, who had shot at him six years before, was arrested, Sharp himself having recognized him, and, upon Sharp's promise to obtain a pardon, privately made a full confession. When brought into the justiciary court, how- ever, he refused to repeat the confession, whereupon the promise of pardon was recalled; the prisoner was sent to the Bass, and was not brought to trial for four years. In 1678, however, the country being again in great disorder, he was tried on his own confession, which, not having been made before judges, could not legally be brought against him. 'This plea being overruled, he claimed the promise of pardon. Sharp, however, basely denied that any such promise had been given. HIs falschood was proved by the entry of the act in the records of the court. Mitchell was finally condemned, but the condemnation was so evidently unfair and contrary to solemn promise that a reprieve would have been granted had not Shar) himself insisted on his death. This, perhaps the basest action of his base life, was speedily avenged. On May 3, 1679, as he was driving with his daughter Isabel to St Andrews, he was set upon by nine men, who were looking for one of the instruments of his cruelty, and, in spite of unmanly beseechings and of the appeals of his daughter, was cruelly murdered. The place of the murder, on Magus Muir, now covered with fir trees, is marked by a monument erected by Dean Stanley, with a Latin inscription record- ing the deed. It is only right, while recording a career of cold-blooded cruelty and almost unexampled political base- ness, to remember that no charge that can be seriously maintained has ever been brought against the morality of Sharp's private life.*~~

~~*Unless otherwise mentioned, the proofs of the statements in this article will be found in vols. i. and ii. of the Lauderdale Papers*~~

~~*(Camden Society) and in two articles in the Scottish Review, July 1884 and January 1885. (0. A.)*~~

~~*SHARP, Wit1ttam (1749-1824), an eminent line- engraver, was born at London on the 29th of Jaauary 1749. He was originally apprenticed to what is called a bright engraver, and practised as a writing engraver, but, gradually becoming inspired by the higher branches of the engraver's art, he exercised his gifts with surprising success on works of the old masters. Among his earlier plates are some illustrations, after Stothard, for the Novelists,*~~

~~*S5HA—SHE 781*~~

~~*Magazine. He engraved the Doctors Disputing on the | worked by needle a minute and elaborate pattern. A*~~

~~*Immaculateness of the Virgin and the Ecce Homo of Guido Reni, the St Cecilia of Domenichino, the Virgin and Child of Dolci, and the portrait of John Hunter of Sir Joshua Reynolds. His style of engraving is thoroughly masterly and original, excellent in its play of line and rendering of half-tints and of "colour." He died at Chiswick on the 25th July 1824. In his youth Sharp was a violent republican, and, owing to his hotly expressed adherence to the politics of Paine and Horne Tooke, he was examined by the privy council on a charge of treason. He was also one of the greatest visionaries in matters pertaining to religion. No imposture was too gross for him to accept, no deception too glaring for his eyes to admire. The dreams of Mesmer and the rhapsodies of Brothers found in Sharp a staunch believer; and for long he maintained Joanna Southcott at his own expense. As an engraver he achieved a European reputation, and at the time of his death he enjoyed the honour of being a member of the Imperial Academy of Vienna and of the Royal Academy of Munich.*~~

~~*SHAWL, a square or oblong article of dress worn in various ways dependent from the shoulders. The term is of Persian origin (shdl), and the article itself is most characteristic and important in the dress of the*~~

~~*natives of north-western India and Central Asia; but in various forms, and under different names, essentially the same piece of clothing is found in most parts of the world. The shawls made in Kashmir occupy a pre-eminent place among textile products ; and it is to them and to their imitations from Western looms that specific importance attaches. The Kashmir shawl is characterized by the great clabora- tion and minute detail of its design, in which the "cone" pattern is a prominent feature, and by the glowing harmony, brilliance, depth, and enduring qualities of its colours. The basis of these excellences is found in the raw material of the shawl manufacture, which consists of the very fine, soft, short, flossy under-wool, called pashm or pashmina, found on the shawl-goat, a variety of Capra hircus inhabiting the elevated regions of Tibet. There are several varieties of pashm, according to the districts in which it is produced, but the finest is a strict monopoly of the maharaja of Kashmir, through whose territory it comes. Inferior pashm and Kirman wool—a fine soft Persian sheep's wool—are used for shawl weaving at Amritsar and other places in the Punjab, where colonies of Kashmiri weavers are established ; but just in proportion to the quality of the pashm used are the beauty and value of the resulting shawl. In Kashmir the shawl wool is sorted with patient care by hand, and spun into a fine thread, a work of so much delicacy, owing to the shortness of the fibre, that a pound of undyed thread may be worth £2, 10s. The various colours, costly and perma- nent, are dyed in the yarn. The subsequent weaving or embroidering isa work of great labour, and a fine shawl will occupy the whole labour of three men not less than a year. Thus a first-rate shawl weighing about 7 Ib may cost at the place of its production £300, made up thus:— material £30, labour £150, duty £70, miscellaneous expenses, £50. In shawl cloth many varieties of dress articles are made; but of shawls themselves, apart from shape and pattern, there are only two principal classes :— (1) loom-woven shawls called tiliwalla, tilikar or kdéni kar,—sometimes woven in one piece, but more often in small segments which are sewn together with such precision and neatness that the sewing is quite impercept- ible (such loom-woven shawls have borders of silk, the weight and stiffness of which serve to stretch the shawl aud make it set properly); and (2) embroidered shawls—amlikar,—in which over a ground of plain pashmina is*~~

~~*large proportion of the inhabitants of Srinagar, the capital of Kashmir, are engaged in the shawl industry ; and there are numerous colonies of Kashmiri weavers settled at Amritsar, Ludianah, Nurpur, and other towns 'in the Punjab. Amritsar is now the principal entrepét of the shawl trade between India and Europe. Imitation Kashmir shawls are made at Lyons, Nimes, Norwich, and Paisley, and some of the products of these localities are little inferior in beauty and elaboration to Oriental shawls ; but owing to the fluctuations of fashion there has been little demand for the finer products of European looms for many years. See also Persta, vol. xviii. p. 626.*~~

~~*SHEA BUTTER. See Ous, vol. xvii. p. 747.*~~

~~*SHEARWATER, the name of a bird first published in Willughby's Ornithologia (p. 252), as made known to him by Sir T. Browne, who sent a picture of it with an account that is given more fully in Ray's translation of that work (p. 334), stating that it is "a Sea-fowl, which fishermen observe to resort to their Vessels in some numbers, swim- ming! swiftly to and fro, backward, forward, and 'about them, and doth as it were radere aquam, shear the water, from whience perhaps it had its name."2 Ray's mistaking young birds of this kind obtained in the Isle of Man for the young of the Coulterneb, now usually called Puri, has already been mentioned under that heading (vol. xx. p. 102); and not only has his name Puffinus anglorum hence become attached to this species, commonly described in English books as the Manx Puffin or Manx Shearwater, but the barbarous and misapplied word Pufinus has come into regular use as the generic term for all birds thereto allied, forming a well-marked group of the F amily Procel- larvide (cf. Perret, vol. xviii. p. 711), distinguished chiefly by their elongated bill, and numbering some twenty species, if not more—the discrimination of which, owing partly to the general similarity of some of them, and partly to the change of plumage which others through age are believed to undergo, has taxed in no common degree the ingenuity of those ornithologists who have ventured on the difficult task of determining their characters. Shear- waters are found in nearly all the seas and oceans of the world,* generally within no great distance from the land, though rarely resorting thereto, except in the breeding- season. But they also penetrate to waters*~~

~~*which may be termed inland, as the Bosphorus, where they have long attracted attention by their daily passage up and down the strait, in numerous flocks, hardly ever alighting on the surface, and from this restless habit they are known to the French-speaking part of the population as ames damnées, it being held by the Turks that they are animated by condemned human souls. Four species of Puffinus are recorded as visiting the coasts of the United Kingdom; but the Manx Shearwater aforesaid is the only one that at all commonly occurs or breeds in the British Islands. It is a very plain-looking bird, black above and white beneath, and about the size of a Pigeon. Some other species are*~~

~~*1 By nsistake, no doubt, for flying or 'hovering, " the latter the word used by Browne in his Account of Birds found in Norfolk (Mus. Brit. MS. Sloane, 18380, fol. 5. 22 and 31), written in or about 1662, Edwards (Gleanings, iii. p. 315) speaks of comparing his own drawing "with Brown's old draught of it, still preserved in the British Museum," and thus identifies the latter's " Shearwater'? with the "*Puffin of the Isle of Man."*~~

~~*2 Lyrie appears to be the most common local name for this bird in Orkney and Shetland; but Scraib and Scrater are also used in Scotland. These are from the Scandinavian Skraape or Skrofa, and considering Prof. Skeat's remarks (HIym. Dictionary, p. 546) as to the alliance between the words shear and scrape it may be that Browne's hesitation as to the derivation of 'Shearwater'? had more ground than at first appears.*~~

~~*3 The chief exception would seem to be the Bay of Bengal and thence throughout the western part of the Malay Archipelago, where, thongh they may occur, they are certainly uncommon,*~~

~~*considerably larger, while some are smaller, and of the former several are almost whole-coloured, being of a sooty or dark cinereous hue both above and below. All over the world Shearwaters seem to have precisely the same habits, laying their single purely white egg in a hole under ground.*~~

ick] ith — ihe joungianarasalaaihneiem long down, and are ex | Magellan, and southward to Louis-Philippe Land in lat. 60° S.

tremely fat. In this condition they are thought to be good

eating, and enormous numbers are caught for this purpose |

in some localities, especially of a species, the P. brevicaudus of Gould, which frequents the islands off the coast of Aus- tralia, where it is commonly known as the " Mutton-bird." For works treating of the Shearwaters, see those cited under PrTREL (vol. xviii. p. 712). (A. N.)

SHEATHBILL, a bird so-called by Pennant in 1781 (Gen. Birds, ed. 2, p. 43) from the horny case! which ensheaths the basal part of its bill. It was first made known from having been met with on New-Year Island, off the coast of Staten Land, where Cook anchored on New Year's eve 1774.2, A few days later he discovered the islands that now bear the name of South Georgia, and there the bird was again found,— in both localities frequenting the rocky shores. On his third voyage, while seeking some land reported to have been found by Ker- guelen, Cook in December 1776 reached the cluster of desolate islands now generally known by the name of the French explorer, and here, among many other kinds of birds, was a Sheathbill, which for a long while no one suspected to be otherwise than specifically identical with that of the western Antarctic Ocean ; but, as will be seen, its distinctness has been subsequently admitted.

The Sheathbill, so soon as it was brought to the notice of naturalists, was recognized as belonging to a genus hitherto unknown, and the elder Forster in 1788 (Zuchtridion, p. 37) con- ferred upon it, from its snowy plumage, the name Chionis, which has most properly received general acceptance, though in the same year the compiler Gmelin termed the genus Vaginalis, as a render- ing of Pennant's English name, and the species alba. It has thus become the Chionis alba of ornithology. It is about the size of and has much the aspect of a Pigeon ;3 its plumage is pure white, its Dill somewhat yellow at the base, passing into pale pink towards the tip. Round the eyes the skin is bare, and beset with cream-coloured papille, while the legs are bluish-grey. The second or eastern species, first discriminated by Dr Hartlaub (Rev. Zoologiquc, 1841, p. 5;

~~*1842, p, 402, pl. 2)* as C. minor, is smaller in size, with plumage just as white, but having the bill and bare skin of the face black and the legs much darker. The form of the bill's "sheath " in the two species is also quite different, for in C. alba it is almost level throughout, while in C. minor it rises in front like the pom- mel of a saddle. Of the habits of the western and larger species not much has been recorded. It gathers its food, consisting chiefly, as Darwin and others have told us, of sea-weeds and shell-fish, on rocks at low water ; but it is also known to eat birds' eggs. There is some curiously conflicting evidence as to the flavour of its flesh, some asserting that it is wholly uneatable, and others that it is palatable,—a difference which may possibly be due to the previous diet of the particular example tasted, to the skill of the cook, or a*~~

~~*1 A strange fallacy arose early, and of course has been repeated late, that this case or sheath was movable. It is absolutely fixed.*~~

~~*? Doubtless some of the earlier voyagers had cncountered it, as Forster suggests (Descr. Animalium, p. 380) and Lesson asserts (Man. @' Ornithologie, ii. p. 348) ; but for all practical purposes we certainly owe its discovery to the naturalists of Cook's second voyage. By some error, probably of transcription, New Zealand, instead of New- Year Island, appears in many works as the place of its discovery, while not a few writers have added thereto New Holland. Hitherto there is no real evidence of the occurrence of a Sheathbill in the waters of Australia or New Zealand.*~~

~~*> In the Falkland Isles it is called the "Kelp-Pigeon," and by some of the earlier French navigators the " Pigeon blanc antarctique." The cognate species of Kerguelen Land is named by the sealers "Sore-eyed Pigeon," from its prominent fleshy orbits, as well as*~~

~~*"Paddy-bird"—the last doubtless from its white plumage calling to | mind that of some of the smaller Egrets, so-called by the English in |*~~

~~*India and elsewhere. * Lesson (Joc. cit.) cites a brief but correct indication of this*~~

~~*species as observed by Lesquin (Lycée Armoricain, x. p. 36) on |*~~

~~*Crozet Island, and, not suspecting it to be distinct, was at a loss to reconcile the discrepancies of the latter's description with that given of the other species by earlier authors.*~~

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~~*the need of the taster. Though most abundant as a shore-bird, it is frequently met with far out at sea, and its most northern recorded limit is by Fleurieu (Voy. de Marchand, i. p. 19), in lat. 44°S., some 260 miles from the eastern coast of Patagonia. It is not uncommon on the Falkland Isles, where it is said to breed (Ibis, 1861, p. 154), though confirmation of the report is as yet wanting, and from thence is found at both extremities of the Strait of*~~

~~*On the other hand, thanks to the naturalists of the British and United States expeditions to Kerguelen Land for the observation of the transit of Venus in 1874, especially Mr Eaton (Philos. Trans- actions, elxviii. pp. 103-105) and Dr Kidder (Bull. U. 8. National Muscum, 1875, No. 2, p. 1-4), much more has been recorded of the eastern and smaller species, which had already been ascertained by Mr Layard (Proc. Zool. Society, 1871, p. 57, pl. iv. fig. 7) to breed on the Crozet Islands, and was found to do so still more numer- ously on Kerguelen, while it probably frequents Prince Edward's Islands for the same purpose. The eggs, of which a considerable number have now been obtained, though of peculiar appearance, bear an unmistakable likeness to those of some Plovers, while occasionally exhibiting a resemblance—of little significance, how- ever—to those of the Tropic-birds.*~~

~~*The systematic position of the Sheathbills has been the subject of much hesitation—almost useless since 1836, when De Blainville (Ann. Sc. Naturelles, ser. 2, vi. p. 97) made known certain anatomical facts proving their affinity to the OYSTER-CATCHERS (vol. xvii. p. 111), though pointing also to a more distant relationship with the Guuts (vol. xi. 274). These he afterwards described more fully (Voy. " Bonite," Zoologie, i. pt. 3, pp. 107-132, pl. 9), so as to leave no doubt that Chionis was a form intermediate be- tween those groups. Yet some writers continued to refer it to the Galline and others to the Columbx. The matter may now be regarded as settled for ever. In 1876 Dr Reichenow in Germany (Jour. f.*~~

~~*Orn., 1876, pp. 84-89) and in America Drs Kidder and Coues (Bull. U. S. Nat. Museum, No. 3, pp. 85-116) published elaborate accounts of the anatomy of C. minor, the first wholly confirming the view of De Blainville, the last two® agreeing with him in the main, but concluding that the Sheathbills formed a distinct group Chionomorphe, in rank equal to the Cecomorphe and Charadriomorphe of Prof. Huxley (which are, to speak roughly, the Gavix and Limicolx of older systematists), and regarding this group as being "still nearer the common ancestral stock of both." These authors also wish to separate the two species generically ; but their proposals are considered needless by Garrod (2. 4. S., 1877, p. 417) and M. Alph. Milne-Edwards (Ann. Sc. Naturelles, ser. 6, xiii. art. 4, p. 24). The opinions of De Blainville and Dr Reichenow are borne out by the observations of Mr Eaton (loc. cit.), and no one knowing the habits of an Oyster-catcher can read his remarks without seeing how nearly related the two forms are. Their differences may perhaps justify the separation of each form into what is vaguely called a "Family," but the differences will be seen by the comparative anatomist to be of slight importance, and the intimate affinity of the Gavix and Limicole, already recognized by Prof. Parker and some of the best taxonomers (cf. ORNITHOLOGY, vol. xvill. p. 45) is placed beyond dispute." (A. N.)*~~

~~*SHEBA. See YEMEN.*~~

~~*SHEBOYGAN, a city of the United States, capital of Sheboygan county, Wisconsin, stands on Lake Michigan,*~~

~~*5 A previous announcement of the discovery of its egg (Ibis, 1867, p. 458) was premature, the specimen, now in the possession of the present writer, proving to be that of a Gull—a fact unknown to the American writer named above.*~~

~~*6 In some details their memoir is unfortunately inaccurate.*~~

~~*? The little group of very curious birds, having no English name, of the genera Thinocorys and Attagis, which are peculiar to certain localities in South America and its islands, are by some systematists placed in the Family Chionidide and by others in a distinct Family Thinocoride (more correctly Thinocorythidx). They are undoubtedly Limicoline, though*~~

~~*having much the aspect of Sand-Grouse, but their precise position and rank remain at present uncertain. Cf. Garrod (ut supra) and Prof. Parker (Trans. Zool. Soc., x. pp. 301 sq.).*~~

~~*Sits 4 EF 783*~~

~~*at the mouth of the river of tle same name, 43 miles east of Fond du Lac and 52 miles north of Milwaukee. Tt pos- sesses a good harbour, and, being surrounded by very productive agricultural land, exports annually a large quantity of grain. The manufactures include farming implements, enamelled hollow-ware, and stone-ware 5 there are a number of tanneries and breweries; and mineral water is exported. Settled in 1836, the city had in 1880 a population of 7314.*~~

~~*SHECHEM, now NAzutvs, a city of Palestine, Eleven hours from Jerusalem on the great north road the traveller finds himself in the broad upland plain of Makhna (1500 feet above the sea), with Mount Gerizim on his left, and, skirting the base of the mountain, reaches the traditional well of Jacob (John iv. 5, 6; of. Gen. xxxiii, 19), a deep cistern with the ruins of an old church beside it. Here the road divides: the caravan route to Damascus continues northward by the village of 'Asker (Sychar of Jolin iv. 51), and so to Beisén (Beth-shan) and Tiberias; but the way to Samaria turns westward into a fertile and well- watered side valley between Gerizim (2849 feet) on the south and Ebal (3077 fect) on the north. This is the Vale of Shechem or Nabulus; it is in fact an easy pass between the Mediterranean and Jordan basins, and at the watershed (1870 feet), where the city stands, 14 miles from Jacob's Well, is not more than 100 yards wide. Thus Shechem commands both branches of the great north road, and several routes from the coast also converge here and connect with the ancient road from Shechem eastward to Kerawa (Archelais) and Al-Salt, the capital of the Belka. The name of Shechem (shoulder, back) accords with the position of the town on the watershed, and the native name in Josephus's time (Mabortha, B. J., iv. 8. 1; Pliny has Mamortha) means simply "the pass." The situation of Shechem at the crossing of so many great roads must have given it importance at a very early date, and it is still a busy town of 20,000 inhabitants, with soap manu- factures and considerable trade. position is equally favourable for*~~

~~*brigandage, to which, under weak governments, the Shechemites were addicted of old (Judges ix. 25; Hosea vi. 9, where "for consent " read "to Shechem"), and the district is still a law- less one,*~~

~~*The ancient inhabitants of Shechem were the Bne Haimor, a Canaanite clan, who were not expelled on the first conquest of Canaan but remained in possession till the events recorded in Judges ix. spoken of in the article Levi, it would seem that they entered into friendly relations with the invaders, and that an attack made on them by Simeon and Levi was repudiated by Israel and led to the dispersion of these two tribes. In Judges ix. the "freemen of Shechem " (psy s5y9) appear as a turbulent but cowardly race, who, in spite of their numbers and wealth, had become vassals of Gideon for the sake of protection against the Midianites, and would have continued to serve his sons but for the enterprise of Abimelech, whose mother was of their race. With the aid of mereenaries hired with the treasure of the sanctuary of Baal-Berith or El-Berith, the god of the town, Abimelech destroyed the sons of Gideon, was crowned king of Shechem, and for three years held Sway also over the surrounding Israelites. A revolt was led by Gaal, an Israelite who scorned to be subject to the creature of the despised Canaanites,! and, the Shechemites having fallen out with Abimelech about their practice of brigandage, Gaal made a dash at the city in the absence of the king, and the fickle inhabitants received him with open arms. Abimelech, however, with his mercenaries proved too strong for his adversaries, and Canaanite Shechem was utterly destroyed. Its place was taken by a Hebrew city, and the Canaanite sanctuary of El-Berith was transformed into*~~

- ~~*In Jndges ix. 28 for 173Y read)T3Y' (Wellhausen after MSS. of LXX.), and translate " Who is Abimelech or who are the Shechemites (his supporters) that we should be his slaves? By all means let the son of Jerubbaal and Zebul his officer enslave the men of Hamor father of Shechem ; but why should we (Hebrews) be his slaves?" These words eannot have been spoken after the Shechemites had renounced Abimelech ; vv. 29, 30 onght to stand immediately after ver. 22. See W. R. Smith, in Theol. Tijdschrift, 1886, p. 195 sq.*~~

~~*On the other hand, the || mendations. He was chosen an associate of the Royal*~~

~~*of that artist.*~~

~~*From the narrative of Gen. xxxiv., which has been |*~~

~~*a Hebrew holy place of El the God of Israel, of which the founda- tion was afterwards referred to Jacob (Gen. xxxiii. 20) or even to Abraham (Gen. xii. 7). The great stone under the famous sacred tree at the sanetuary (the "tree of the revealer " or "tree of the soothsayers," E.V. plain of Moreh" or "of Meonenim" ; Gen. xll. 6, xxxv. 4;2 Deut. xi. 30; Jud. ix. 6, 37) was said to have been set up by Joshua (Josh. xxiv. 26), and Joseph's grave was shown there.* "All this indicates that Sheehem was once the chief sanctuary of Joseph, and so we understand why Rehoboam weut to Shechem to be erowned king of Northern Israel and why Jeroboain at first made it his residence (1 Kings xii. 25), Politieally Shechem Was soon supplanted by Tirzah and Samaria, but it appears to have been still a sanetuary in the time of Hosea, It survived the fall of Ephraim (Jer. xli, 5) and ultimately became the religious centre of the SAMARITANS (q.v.). The Greek name Neapolis, known to Josephus, indicates the building of a new town, which, according to Eusebius and Jerome, was a little way froin the old Shechem, or at least did not include the traditional holy sites. The coins give the form Flavia Neapolis, Neapolis was the birth- place of Justin Martyr, and became the seat of a bishopric. Five Christian churehes destroyed by the Samaritans in the time of Anastasius were rebuilt by Justinian (Procop., De Ad., v. 7). Remains of one of these seem still to exist in the erusaders' church of the Passion and Resurrection (1167), now the great mosque. Neapolis had much to suffer in the crusades ; it was finally lost to the Christians soon after Saladin's great victory at Hittin.*~~

~~*A map of the Shechem valley, with topographical details, &c., will be found in the Memoirs of Pal. Expl. Soc., vol. ii.*~~

~~*SHEE, Sm Martin Arcuer (1770-1 850), portrait- painter, and president of the Royal Academy, was born in Dublin on the 23d of December 1770. He was sprung from an old Irish family, and his father, while he exercised*~~

~~*the trade of a merchant, regarded the profession of a painter as in no sense a fit occupation for a descendant of the Shees. Young Shee became, nevertheless, a student of art in the Dublin Society, and came early to London, where he was, in 1788, introduced by Burke to Reynolds, by whose advice he studied in the schools of the Royal Academy. In 1789 he exhibited his first two pictures, the Head of an Old Man and Portrait of a Gentleman. During the next ten years he steadily increased in practice, and gradually gained ground among the aristocracy, with whom his suavity and good manners were great recoin-*~~

~~*Academy in 1798, shortly after the illustrious Flaxman, and in 1800 he was made a Royal Academician. In the former year he had married, removed to Romney's house in Cavendish Square, and set up as the legitimate successor Shee continued to paint with great readiness of hand and fertility of invention, although his portraits were eclipsed by more than one of his contem- poraries, and especially by Lawrence, Hoppner, Phillips, Jackson, and Raeburn. In addition to his portraits he executed various subjects and historical works, such as Lavinia, Belisarius, his diploma picture Prospero and Miranda, and the Daughter of Jephthah. In 1805 he published a poem consisting of hymes on Art, and it was succeeded by a second part in 1809. Although Byron spoke well of it in his English Bards and Scotch Reviewers, and invoked a place for "Shee and genius" in the temple of fame, yet, as nature had not originally conjoined these two, it is to be feared that even a poet's invocation could not materially affect their relations. Shee published another small volume of verses in 1814, entitled The Commemoration of Sir Joshua Leynolds, and other Poems, but this effort did not greatly increase his fame. He now produced a tragedy called Alasco, of which the scene was laid in Poland. The play was accepted at Covent Garden,*~~

~~*2 Ensebius gives the tree (terebinthus) of Gen. xxxv. 4 a place in his Onomasticon ; and from it probably the bishop Terebinthius in Procop., De 4id., v. 7, had his name.*~~

~~*3 The Canaanite sanctuary was represented as a mere teniporary usurpation by the tradition (in the Elohistic narrative) that Jacob had bought the site of his altar from the Hamorites and bequeathed it to*~~

~~*Joseph (Gen. xxxiii. 19, Josh. xxiv, 32; in the latter passage read with LXX. 3M" for 11").*~~

~~*784*~~

~~*and in the fertile fancy of the poet the play had already gained for him a great dramatic fame, when Colman, the licenser, refused it his sanction, on the plea of its containing certain treasonable allusions, and Shee, in great wrath, re- solved to make his appeal to the public. This violent threat he carried out in 1824, but unfortunately the public found other business to mind, and Alasco is still on the list of unacted dramas. On the death of Lawrence in 1830, Shee was chosen president of the Royal Academy, and shortly afterwards he received the honour of knight- hood. He was excellently qualified by his gentlemanly manners, business habits, and fluent speech for the position; and in the dispute regarding the use of rooms to be pro- vided by Government, and in his examination before the parliamentary committee of 1836, he ably defended the rights of the Academy. He continued to paint till 1845, and died on the 13th of August 1850 in his eightieth year.*~~

~~*The earlier portraits of the artist are carefully finished, easy in action, with good drawing and excellent discrimination of character. They show an undue tendency to redness in the flesh painting, — a defect which is still more apparent in his later works, in which the handling is less "square," crisp, and forcible.*~~

~~*SHEEP. The animals commonly designated by this name constitute the genus Ovws of zoologists, a group belonging to the Artiodactyle or paired-toed section of the Ungulata or hoofed mammals (see MAMMALIA, vol. xv. p. 432), They are ruminants, and belong to the hollow- horned section, 2.e., those having persistent horns composed of conical epidermic sheaths, encasing and supported by processes of the frontal bone. This section includes the various species of Oxen, Goats, and Antelopes, as well as the Sheep, animals all so closely related structurally that it is by no means easy to define the differences between them. —*~~

~~*In nearly all wild sheep the horns are present in both sexes, though smaller in the female. They are trigonal in section, having always three*~~

~~*more or less distinctly marked surfaces, divided by edges running longitudinally to the axis of the horn, sometimes sharply prominent and some- times rounded off. They are also marked by numerous transverse ridges and constrictions, and present a strong more or less spiral curve, which varies in direction in different species. The teeth resemble generally those of the other Bovide. The upper incisors and canines are entirely wanting, their place being taken by a callous pad against which the lower front teeth bite. These are eight in number, all much alike and in close contact; the outer pair represent the canines, the rest the incisors. On each side of the mouth above and below are six teeth close together, three of which are premolars (replacing milk teeth) and three true molars, all markedly selenodont (the grinding surfaces presenting crescent-like patterns) and hypsodont, or with long crowns and small roots. The dental formula is thus—incisors 9, canines 2, premolars 3, molars 3,= °;; total of both sides 32. The vertebral formula is—cervical 7, dorsal 13, lumbar 6 or 7, sacral 4, caudal variable. In the feet the hoofs of the two middle toes (third and fourth) only reach the ground, and are equally developed. The outer toes (second and fifth) are very rudimentary, represented only by small hoofs, without bony phalanges, and by the proximal or upper ends of the slender splint-like metacarpal or metatarsal bones.*~~

~~*Between the two middle toes, in most species, is lodged a*~~ †

~~*deep sac, having the form of a retort and with a small external orifice, which secretes an unctuous and odorous substance. This, tainting the herbage or stones over which the animal walks, affords the means by which, through the powerfully developed sense of smell, the neighbourhood of other individuals of the species is recog- nized, The crumen or suborbital gland, which is so largely developed and probably performs the same office in some*~~

†

~~*SHE—SHE*~~

~~*antelopes and deer, is present, but in a comparatively rudimentary form, though varying in different species. The tail, though long in many varieties of domestic sheep, is' short in all the wild species, in which also*~~

~~*the external covering of the body is in the main hairy,—the fine fleecy coats of wool, or hair so modified as to have the property of "felting" or adhering together under pressure, which give such value to many breeds, having been especially cultivated by selective breeding.*~~

~~*The sheep was a domestic animal in Asia and Europe before the dawn of history, though quite unknown as such in the New World until after the Spanish conquest. It has now been introduced by man into almost all parts of the world where settled agricultural operations are carried on, but flourishes especially in the temperate regions of both hemispheres. Whether our well-known and useful animal is derived from any one of the existing wild species, or from the crossing of several, or from some now extinct species, is quite a matter of conjecture. The variations of external characters seen in the different domestic breeds*~~

~~*From a living animal in the London Zoological Gardens.*~~

~~*Mouffion (Ovis musimon).*~~

~~*are very great. They are chiefly manifested in the form and number of the horns, which may be increased from the normal two to four or even eight, or may be altogether absent in the female alone or in both sexes; in the form and length of the ears, which often hang pendent by the side of the head; in the peculiar elevation or arching of the nasal bones in some Eastern races; in the length of the tail, and the development of great masses of fat at each side of its root or in the tail itself; and in the colour and quality of the fleece. See AGRICULTURE.*~~

~~*The distinction of the various permanent modifications under which wild sheep occur is a matter of considerable diticulty. Trivial characters, such as size, slight variations in colour, and especially the form and curvature of the horns, are relied upon by different zoologists who have given attention to the subject in the discrimination of species, but no complete accord has yet been established. The most generally recognized forms are enumerated below.*~~

~~*The geographical distribution of wild sheep is interesting. The immense mountain ranges of Central Asia, the Pamir and Thian Shan of*~~

~~*Turkestan, may be looked upon as the eentre of their habitat. Here, at an elevation of 16,000 feet above the sea-level, is the home of the magnifieent Ovis poli, named after the eelebrated Venetian traveller Mareo Polo, who met with it in his adventurous travels through this region in the 13th eentury. It is remark- able -for the great size of the horns of the old rams and the wide open sweep of their curve, so that the points stand boldly*~~

~~*SHE—SHE*~~

~~*out on each side, far away from the animal's head, instead of curl- ing round nearly in the same plane, as in most of the allied species. A very similar if not identical species from the same origin, in which the horns retain their more normal development, has received the name of 0. karclin'. Eastward and northward is found the argali (0. ammon), with a wide and not very well determined range. Still further north, in the Stanovoi Mountains and Kamchatka, is 0. nivicola, and away on the other side of Behring's Strait, in the Rocky Mountains and adjacent high lands of western North America, is the "bighorn" or mountain sheep (O. montana), the only one of the genus found in that continent and indeed—except the bison, the musk-ox (Ovibos), mountain goat (Aploceras), and the prongbuck (Antilocapra)—the only hollow- horned ruminant, being like the rest obviously a straggler from the cradle of its race. Turning southward from the point from which we started, and still a little to the east, in N epal and Little Tibet, is O. hodgsoni, a species with large and strongly curved horns, and another with smaller and more spreading horns, the burrhel, O. nahoor, Passing in a south-westerly direction we find a series of smaller forms, 0. vignet of Ladak, 0. cycloceros of northern India, Persia, and Baluchistan, 0. gmclint of Asia Minor, 0. ophion, confined to the elevated pine-clad Troodos Mountains of the island of Cyprus, and said at the time of the British occupation in 1878 to have been reduced to a flock of about twenty-five individuals, and O, mustmon, the moufflon of Corsica and Sardinia (sce figure), believed to have been formerly also a native of Spain. Lastly, we have the somewhat aberrant, goat-like angi, 0. tragclaphus, of the great mountain ranges of North Africa,*~~

~~*We thus find that shcep are essentially inhabitants of high mountainous parts of the world, for dwelling among which their wonderful powers of climbing and leaping give them special advantages. No species frequent by choice either level deserts, ayen plains, dense forests, or swamps. By far the greater number of species are inhabitants of the continent of Asia, one or perhaps two extending into North America, one into Southern Europe, and one into North Africa. No wild sheep occurs in any other part of the world, unless the so called musk-ox (Ovibos moschatus) of the Arctic regions, the nearest existing ally to the true shcep, may be considered as one. Geologically speaking, sheep appear to be very modern animals, or perhaps it would be safer to say that no remains that can be with certainty referred to the genus have been met with in the hitherto explored true Tertiary beds, which have yielded such abundant modifications of antelopes and deer. They are apparently not indigenous in the British ls es, but were probably introduced by man from the East in prehistoric times. (W. H. F.)*~~

~~*SHEEPSHEAD is the name of one of the largest species of the genus Sargus, marine fishes known on the coasts of southern Europe as " sargo" or " saragu." These fishes possess two kinds of teeth :—one, broad and flat, like incisors, occupying in a single series the front of the jaws ;*~~

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~~*PESTS*~~

~~*Sheepshead. the other, semiglobular and molar-like, arranged in several*~~

~~*series on the sides of the jaws. For the systematic posi- tion of the genus, see vol. xii. p. 689. The sheepshead, Sargus ovis, occurs in abundance on*~~

~~*the Atlantic coasts of the United States, from Cape Cod to Florida, and is one of the most valued food-fishes of North America. It is said to attain to a length of 30 inches and a weight of 15*~~

~~*pounds, Its food consists of shellfish, which it detaches with its incisors from the base to which they are fixed, crushing them with its powerful molars, It may be dis- tinguished from some other allied species occurring in the same seas by the presence of seven or eight dark cross- bands traversing the body, by a recumbent spine in front of the dorsal fin, by twelve spines and as many rays of the dorsal and ten rays of the anal fin, and by forty-six scales along the lateral line. The term "'sheepshead " ig also given in some parts of North America to a very different fish, a freshwater Scienoid, Corvina oscula, which is much less esteemed for the table, SHEERNESS-ON-SEA, a seaport, watering-place, naval establishment, and garrison town in the Isle of Sheppey, Kent, is situated on the Thames at the mouth of the Med- way, on the Sittingbourne branch of the London, Chatham, and Dover Railway, 52 miles east of London, and 17 north-east of Maidstone. The older part of Sheerness, containing the dockyard, is called Blue Town, the later additions being known as Miletown, Bankstown, and Marinetown. Marinetown consists chiefly of houses occu- pied by summer visitors, but although there is a good beach for bathing the presence of the dockyard with its surroundings has militated against the success of the town as a watering-place. The dockyard, erected by the admi- ralty about 1830, was seriously damaged by fire in 1881. The naval establishment is only of the second-class, the basins being too small to admit vessels of the largest size. The dockyard is 60 acres in extent, and contains naval barracks with accommodation for 1000 men. A fort was built at Sheerness by Charles H., which on the 10th J uly 1667 was taken by the Dutch fleet under De Ruyter. After this mishap it was strengthened and a dockyard was formed. The fortifications are now of great strength, £100,000 having been spent in adapting them to modern necessities. The town is in the parish of Minster, which possesses the most ancient abbey church in England. The population of the urban sanitary district (area 938 acres) in. 1871 was 13,956, and in 1881 it was 14,286. SHEFFIELD, a municipal and*~~

~~parliamentary borough in the West Riding of Yorkshire, next to Leeds the largest town in the county, and the chief seat of the cutlery trade in England, is situated on somewhat hilly ground in the neighbourhood of the Pennine range, on several rivers and streams, the principal of which are the Don, the Sheaf, the Porter, the Rivelin, and the Loxley, and on the Midland, Great Northern, and various branch railway lines, 39 miles south of Leeds, 37 south-east of Manchester, 172 north of London by the Midland Railway, and 162 by the Great Northern, The borough of Sheffield is coextensive with the parish, and embraces a district 10 miles in length by 3 or 4 miles in breadth. It includes the townships of Sheffield, Brightside Bierlow, Attercliffe-cum-Darnall, Nether Hallam, Heeley, Eccles-~~

~~| all Bierlow, and Upper Hallam, the last two districts~~

~~being in great part rural, but occupied also by the southern and western suburbs of the borough. The older portions of the town are somewhat irregularly built, and in some districts densely populated, but much has been done of late years to widen and otherwise improve the streets in the central districts by the operation of an Act passed in 1875, the expense amounting in all to about £1,000,000. The suburbs contain a large number of beautiful terraces and mansions, picturesquely situated in the neighbourhood of fine natural scenery. A consider- able portion of them is occupied by workmen's cottages, many of which are surrounded by well-kept gardens. Sheffield in 1845 was divided into twenty-five parochial districts, which have been gradually added to in successive years, and in 1855 it was constituted a deanery. The XXI, — 99~~

~~786~~

~~only ecclesiastical building of special interest is the old parish church of St Peter, chiefly in the Perpendicular style, originally cruciform, but by various additions now rectangular, The old Norman building is supposed to have been burned down during the wars of Edward III. with the barons, and the most ancient part of the present structure is the tower, dating from 'the 14th century. The church has lately been restored at the cost of about £20,000. It containsa large number of interesting mural monuments.~~

~~*The free grammar school was founded in 1603 through a bequest of Thomas Smith, a native of Sheffield, practis- ing as an attorney at Crowland, Lincolnshire, and it re- ceived the sanction of King James I. in 1604, with the title "The Free Grammar School of King James of England." The grammar school building of stone in the Tudor style, erected in 1824, is now (1886) used as a technical school, the grammar school trustees having pur- chased the collegiate school at Broomhall Park. 'The other principal educational institutions are the free writ- ing school (1715, rebuilt in 1827), the boys' charity school (founded 1706), the girls' charity school (1786), the Roman Catholic reformatory (1861), the Church of England educational | institute, the Firth College, erected by Mark Firth at a cost of £20,000, for } lectures and classes in connexion with the extension of university education, the Wesley College, associated with London University, Ranmoor College, for training young men for the ministry in the Methodist New Con- nexion, the mechanics' institute, the school of art, and the St George's Museum, founded by Mr Ruskin, and including a picture gallery, a library, and a mineral, a natural history, and a botanical collection, the special pur- pose of the institution being the train- \ ing of art students. The school board was first elected in 1870, and carries on its operations with great energy and success.*~~

~~*The principal public buildings are the town-hall, including the police | offices and rooms for the quarter ses- sions and other courts, erected in 1808, enlarged in 1833, and lately extensively remodelled at a cost of over £10,000; the council hall and municipal buildings, originally used for the mechanics' institute, but purchased by the corporation in 1864; the cutlers' hall, built in 1832 at a cost of £6500, and enlarged in 1857 by the addition of a magnificent banqueting hall, erected at a cost of £9000 ; the general post office, in the Doric style, opened in 1874; the fine new corn exchange, in the Tudor style, erected at a cost of £60,000; the Albert Hall, opened in 1873 by a joint-stock company for concerts and public meetings ; the music hall, erected in 1823 ; the freemasons' hall, opened in 1877; the temperance halls, 1856; the Norfolk market hall, opened ia 1857 at a cost of £40,000 ; the theatre royal, originally erected in 17 93, rebuilt in 1880 at a cost of £8000; the Alexandra theatre, erected 1836-7 at a cost of £8000; the barracks, having accom- modation for a cavalry and an infantry regiment and surrounded by grounds 25 acres in extent; and the*~~

~~*volunteer artillery drill hall, erected at a cost of £9000. The literary and social institutions inelude the Atheneum, established in 1847, with a newsroom and library ; the*~~

~~*SHEP FTEHLD*~~

~~*literary and philosophical society, 1822 ; the Sheffield club, 1862 ; the Sheffield library, commenced in 1777, and con- taining 80,000 volumes ; and the free library, founded in 1856, with various branches opened in subsequent years. Among the medical or benevolent institutions may be mentioned the general infirmary, opened in 1797, and successively enlarged and improved as requirements de- manded ; the public hospital, erected in 1858 (in connexion with the Sheffield medical school established in 1792) and extended in 1869 ; the hospital for women, originally estab- lished in 1864, but transferred in 1878 to a new building erected at the expense of Thomas Jessop, and now called the Jessop hospital for women; the hospital for diseases of the skin, 1880; the ear and throat hospital, 1880; the fever hospital, erected by the Town Council at a cost of about £25,000 ; the school and manufactory for the blind, 1879; the South Yorkshire lunatic asylum, 1872; the Shrewsbury hospital for twenty men and twenty women, originally founded by the seventh earl of Shrewsbury, who died in 1616, but since greatly enlarged by successive*~~

~~*Scale of % a Mile .*~~

~~*Plan of Sheffield.*~~

~~*benefactions ; the HOllis hospital, established in 1700 for widows of cutlers, &c.; the Firth almshouses, erected and endowed in 1869 by Mark Firth of Oakbrook at a cost of £30,000; the licensed victuallers' asylum, 1878; the Deakin institution, 1849; HIanby's charity, 1766; and HIadfield's charity, 1860,*~~

~~*The public monuments are neither numerous nor im- portant, the principal being the Montgomery statue, erected to James Montgomery the poet in 1861, chiefly by the Sunday school teachers of the town, the Ebenezer Elliot monument, erected in the market-place in 1854, and removed to Weston Park in 1875, the column to Godfrey Sykes the artist,*~~

~~*erected in Weston Park in 1871, the cholera monument 1834-5, and the Crimean monument to the natives of Sheffield who died in the Crimean War.*~~

~~*The town is comparatively well supplied with parks and public gardens. In three of the more populous dis- tricts the duke of Norfolk, lord of the manor, presented plots of ground amounting in all to 26 acres, to be used as recreation grounds. In the western suburbs is the*~~

~~*SHE—SHE*~~

~~*Weston Park and Museum, occupying the grounds and mansion house of Weston Hall, which the town council purchased in 1873. The grounds are about 13 acres in extent, and the museum includes—in addition to the Mappin Art Gallery, now (1886) being erected from the bequest of John Newton Mappin—a, picture gallery, a natural history collection, and an extensive collection of British antiquities. The Firth Park, on the north-east of the town, 36 acres in extent, was purchased by Mark Firth, and presented to the town, the opening ceremony by the prince and princess of Wales taking place 16th August 1875. The Norfolk Park, 60 acres in extent, is granted by the duke of Norfolk for the use of the town, but remains his property. The botanical gardens, 18 acres in extent, situated in the western suburbs, are the property of a com- pany, but on certain days they are open to the public ata small charge. The Bramall Lane cricket ground is the scene of most of the Yorkshire county cricket matches,*~~

~~*The prosperity of Sheffield is chiefly dependent on the manu- facture of steel and the application of it to its varions uses. The smelting of iron in the district is supposed to date from Roman times, and there is distinct proof carrying it back as far as the Norman Conquest. The town had become famed for its cutlery by the 14th century, as is shown by allusions in Chaucer. There was an important trade carried on in knives in the reign of Eliza- beth, and the Cutlers' Company was incorporated in 1624, In early times cutlery was made of blister or bar steel ; afterwards shear steel was introduced for the same purpose ; but in 1740 Benjamin Huntsman of Handsworth introduced the manufacture of cast steel, and up to the present time Sheffield retains its supremacy in steel*~~

~~manufacture, notwithstanding foreign com etition, especially that of Germany and the United States, its trade in heavy steel having kept pace with that in the other branches, It was with the aid of Sheffield capital that Henry Bessemer founded his pioncer works to develop the manufacture of his invention, and a large quantity of Bessemer steel is still made in Sheffield. 'The heavy branch of the steel manufacture includes armour plates, rails, tyres, axles, large castings for engines, steel shot, and steel for rifles. The cutlery trade embraces almost every variety of instrument and tool,—spring and table knives, razors, scissors, surgical instru- ments, mathematical instruments, edge tools, saws, scythes, sickles, spades, shovels, engineering tools, hammers, vices, &e. The manufacture of engines and machinery is also largely carried on, as well as that of stoves and grates. The art of silver plating was introduced by Thomas Bolsover in 17 42, and the manufacture is still of importance. Among the minor industries of the town are tanning, confectionery, cabinctmaking, bicycle-making, iron and brass founding, brushes and combs and of optical instruments. On account of various outrages perpetrated by artisans in workshops against per- sons obnoxious to them, a Government commission was in 1867 appointed to make inquiries, the result being the exposure and suppression of confederacies in connexion with various workmen's nnions.~~

~~The town trust for the administration of property belonging to the town dates from the 14th century, and in 1681 the number aud mauner of election of the "town trustees" was definitely settled by a decree of the Court of Chancery. Additional powers were conferred on the trustees by an Act passed in 1874. The annual income of the trust property now amounts to about £5000. Sheffield obtained municipal government in 18438, and is divided into nine wards. The number of aldermen is sixteen. Since 1864 the town council have had control of the police, of the maintenance of the streets, and of the drainage and sanitary arrangements, but the supplies of water and gas are in the hands of private companies. The markets belong to the duke of Norfolk, lord of the manor. The town first returned members to parliament in 1832. In 1885 the representation was increased from two to five members, the parliamentary divisions being Attercliffe, Brightside, Central, Keclesall, and Hallam. The area of the municipal and parliament- ary borough is~~

~~19,651 acres. From 45,755 in 1801 the population had increased by 1841 to 110,891, by 1871 to 239,947, and by 1881 to 284,508 (141,298 males, 143,210 females).~~

~~Sheffield was the capital of Hallamshire from the Norman Con- quest, and it is supposed that the "aula" of the Saxon Lord Waltheof mentioned in Domesday was on the Castle Hill. After the execution of Waltheof for a conspiracy against the Conqueror in 1075 the manor for some time remained in the hands of his countess, but in 1080 was possessed by Roger de Busli. After- wards it passed to the De Lovetots, barons of Huntingdonshire, one of whom had a castle at Sheffield. A number of people, workers in iron, gathered round the castle and formed the nucleus of the~~

~~silver refining, and the manufacture of~~

~~town. Through an heiress of the De Lovetots it passed in the reign of Richard I. to the De F urnivals, one of whom, Thomas de Furnival, strengthened and completed the castle, and obtained from Edward I. a charter under the great seal for a market and annual fair. After the extinction of the male line of the Furnivals in 1406, the manor passed to the Talbots, of whom John, referred to in Shakespeare's Henry VI., was created ear] of Shrewsbury in 1442. Cardinal Wolsey, during his disgrace, was for some time placed in Sheffield Castle under the charge of George, fourth earl of Shrews- bury ; and Queen Mary remained a prisoner in it under the care of George, sixth earl, from the autunm of 1570 to the autumn of 1584. During the Civil Wars the castle was seized in 1642 by the Parliamentary party, who garrisoned it and threw up entrench- ments round the town, but after the capture of Rotherham in April 1648 they, on the approach of the earl of Newcastle, left it in panic and fled to Derbyshire. It was, however, recaptured by the party in the following year, and was subsequently demolished. In 1654 the estate passed by marriage to the Howards, dukes of Norfolk.~~

~~See Hunter's WZallamshire,~~

~~*1819, new ed. by A. Gatty, 1869; Leader,*~~

~~*Shefield Castle and Mary Queen of Scots, 1869; Gatty, Sheffield Past and Present, 1873; W. de Gray Birch, Original Documents relating to Sheffield, 1874 ;*~~

~~*Leader, Reminiscences of Old Sheffield, 1875; Taylor, Pictorial Guide to*~~

~~*Sheffield, 1879,*~~

~~*SHEFFIELD, Joun. See BUCKINGHAMSHIRE, DUKE OF.*~~

~~*SHEIL, Rictarp Laror (1791-1851), Irish political orator, was the eldest son of Edward Sheil, an Irishman who had acquired considerable wealth in Spain, and after the passing of the Act permitting Catholics in Ireland to purchase and transmit property in fee had returned to Ireland, where he purchased the estate of Bellevue, Tipperary. The son was born 17th August 1791, at Drumdowney, Tipperary. He received instruction in*~~

~~*'French and Latin from the Abbé de Grimeau, a French*~~

~~*refugee, and afterwards at Kensington House schocl, London, presided over by a French nobleman, the Prince de Broglie. In October 1804 the was removed to the college at Stoneyhurst, Lancashire, and in November 1807 entered Trinity College, Dublin, where he specially distinguished himself in the debates of the Historical Society. He graduated B.A. in July 1811, and on 13th November of the same year entered Lincoln's Inn, preparatory to being called to the Irish bar. He was admitted a member of the Irish bar at the Hilary term 1814, and meanwhile resolved to support himself by writing plays. His play of Adelaide, or the Emigrants, was played at the Crow Street theatre, Dublin, 19th February 1814, with complete success, and on the 23d May 1816 was performed at Covent Garden. The Apostate, produced at the latter theatre on 3d May 1817, firmly established his reputation, and encouraged him to continue his dramatic efforts till his legal and political duties absorbed the greater part of his leisure. His principal other plays are Bellamira (written in 1818), Zvadne (1819), Huguenot, (1819), and Montini (1820). In 1822 he began, along with W. H. Curran, to contribute to the Vew Monthly M agazine a*~~

series of papers entitled Sketches of the Irish Bar, which attracted considerable attention by their raciness and graphic vigour. Those written by Sheil were published in 1855 in two volumes, with a sketch of his life. Sheil was one of the principal founders of the Catholic Associa- tion in 1823, and drew up the petition for inquiry into the mode of administering the laws in Ireland, which was presented in the same year to both Houses of Parliament. After the defeat of the Catholic Relief Bill in 1825 the suggested the formation of the New Catholic Association, and, along with O'Connell, was the principal leader of the agitation persistently carried on till Catholic emancipation was granted in 1829. In the same year he was returned to parliament for Melbourne Port, and in 1831 for Louth. He took a prominent part in all the debates relating to Ireland, and his brilliant eloquence gradually captivated the admiration of the House. In August 1839 he became vice-president of the board of trade in Lord Melbourne's

ministry. After the accession of Lord John Russell to power in 1846 he was appointed master of the mint. Being desirous, on account of his wife's health, to obtain diplomatic employment abroad, he was in 1850 appointed minister at the court of Tuscany. He died somewhat suddenly of gout at Florence on May 23, 1851.

See Memoirs of Richard Lalor Sheil, by W. Torrens M'Cullagh (2 vols., 1855).

SHEKEL. In the system of Babylonian and Assyrian weights the talent (called in Heb. 123, kikkar) consisted of 60 mana (Heb. 73'?, maneh) or minas, and the latter again

of sixty shekels (Heb. °2Y). For the values of these weights see Numismatics, vol. xvii. p. 631, where it is also explained that the Phoenicians and Hebrews modified the system and reckoned only 50 shekels to the maneh, at all events in applying the names to money, 2.e., to the precious metals,! and that the weight of their silver shekel was also probably modified for convenience of interchange between the gold and silver standard. The silver shekels of the Maccabees (Numismatics, p.

~~650) have a maximum weight of about 224 grains, and correspond to the Phe- nician tetradrachm (four drams). Hence in Matt. xvii. 24 the temple tax of half ashekel is called the didrachm (2 drams). In 2 Sam. xiv. 26 we read of shekels "after the king's weight," 2.¢., according to the Assyrian standard, which is called "royal" on weights found at Nineveh. The Hebrews divided the shekel into twenty parts, each of which was a gerah (7A).~~

~~SHELBURNE, Ear or. of.~~

~~SHELD-DRAKE, or, as commonly spelt in its con- tracted form, SHELDRAKE, a word whose derivation? has been much discussed, one of the most conspicuous birds of the Duck tribe, Anatidz, called, however, in many parts of England the "Burrow-Duck" from its habits presently to be mentioned, and in some districts by the almost obso- lete name of " Bergander" (Dutch, Berg-cende, Germ. Berg- ente), a word used by Turner in 1544.~~

~~The Sheldrake is the Anas tadorna' of Linneus, and the Ladorna cornuta or 7. vulpanser of modern ornithology, a bird somewhat larger and of more upright stature than an ordinary Duck, having its bill, with a basal fleshy protuberance (whence the specific term cornwta), pale red, the head and upper neck very dark glossy green, and beneath that a broad white collar, succeeded by a still broader belt of bright bay extending from the upper back across the upper breast. The outer scapulars, the primaries, a median abdominal stripe, which dilates at the vent, and a bar at the tip of the middle tail-quills are black ; the inner secondaries and the lower tail-coverts are grey ; and the speculum or wing-spot is a rich bronzed-green. The rest of the plumage is pure white, and the legs are flesh-coloured. There is little external difference between the sexes, the female being only somewhat smaller and less brightly coloured. The Sheldrake frequents the sandy coasts of nearly the whole of Europe and North Africa, extending across Asia to India, China, and Japan, generally keeping in pairs and sometimes penetrating to favourable inland localities. The nest is always made under cover, usually in a rabbit-hole among sand- hills, and in the Frisian Islands the people supply this bird with artificial burrows, taking large toll of itin eggs anddown.~~

~~*Barbary, south-eastern Europe, and Central Asia are inhabited by an allied*~~

~~*1 See Exod. xxxviii, 25, where there are 8000 shekels in the talent.*~~

- ~~*Ray in 1674 (Engl. Words, p. 76) gave it from the local "sheld" (=particoloured), which, applied to animals, as a horse or a cat, still survives in Hast Anglia. This opinion is not only suitable but is confirmed by the bird's Old Norsk name Skjéldungr, from Skjéldr, primarily a patch, and now commonly bestowed on a piebald horse, just as Skjalda (Cleasby's Icel. Dict., sub voce), from the same source, is a particoloured cow. But some scholars interpret Skjéldungr by the secondary meaning of Skjéldr, a shield, asserting that it refers to "' the shield-like band across the breast' of the bird. If they be right the proper spelling of the English word would be " Shield-drake," as some indeed haveit. A third suggested meaning, from the Old Norsk Skj6l, shelter, is philologically to be rejected, but, if true, would refer to the bird's habit, described in the text, of breeding under cover.*~~

~~*3 This is the Latinized form of the French Tadorne, first published by Belon (1555), a word on which Littré throws no light except to state that it has a southern variant Tardone.*~~

~~*See LANSDOWNE, Marquis*~~

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~~*species of more inland range and very different coloration, the ZY. casarca or Casarca* rutila of ornithologists, the Ruddy Sheldrake of English authors—for it has several times strayed to the British Islands,—and the "Brahminy Duck" of Anglo- Indians, who find it resorting in winter, whether by pairs or by thousands, to their inland waters. This species is of an almost uniform bay colour all over, except the quill-feathers of the wings and tail, and (in the male) a ring round the neck, which are black, while the wing-coverts are white and the speculum shines with green and purple ; the bill and legs are dark-coloured.®> A species closely resembling the last, but with a grey head, 7. cana, inhabits*~~

~~*South Africa, while in some of the islands of the Malay Archi- pelago, and in the northern parts of Australia, there is a fourth species, 7'. radjah, which almost equals the true Sheldrake im its brightly contrasted plumage, but yet wants some of the lively colours the latter displays—its head, for instance, being white instead of dark green. Further to the southward in Australia occurs another species of more sombre colours, the 7'. tadornotdes; and New Zealand is the home of a sixth species, 7. varicgata, still less distinguished by bright hues. In the last two the plumage of the sexes differs not inconsiderably, but all are believed to have essentially the same habits as the 7. cornuta.®*~~

~~*It is not without a purpose that these different species are here particularized. Sheldrakes will, if attention be paid to their wants, breed freely in captivity, crossing if oppor- tunity be given them with other species, and an incident therewith connected possesses an importance hardly to be overrated by the philosophical naturalist, though it seems not to have met with the attention it deserves. In the Zoological Society's gardens in the spring of 1859 a male of T. cornuta mated with a female of 7'. cana, and, as will have been inferred from what has been before stated, these two species differ greatly in the colouring of their plumage. The young of their union, however, presented an appear- ance wholly unlike that of either parent, and an appearance which can hardly be said, as has been said (P. Z. S., 1859, p. 442), to be 'fa curious combination of the colours of the two." Both sexes of this hybrid have been admirably por- trayed by Mr Wolf (tom. cit., Aves, pl. 158); and, strange to say, when these figures are compared with equally faith- ful portraits by the same master (op. cit., 1864, pls. 18, 19) of the Australian and New Zealand species, 7'. tadornoides and 7'. variegata, it will at once be seen that the hybrids present an appearance almost midway between the two species last named—species which certainly had nothing to do with their production. The only explanation of this astounding fact seems to be that afforded by the principle of "reversion," as set forth by Mr Darwin, and illustrated by him from examples of certain breeds of Doves, domes- tic Fowls, and Ducks (Anim. and Pl. under Domestication, i. pp. 197-200, ii. p. 40), as well as, in the matter of domestic Fowls, by Mr Cambridge Phillips (Zoologist, 1884, p. 331). It is a perfectly fair hypothesis that the existing animals of New Zealand and Australia retain more of their*~~

~~*ancestral character than do those of countries in which we may suppose the struggle for life to have been fiercer and the action of natural selection stronger. Why it is so we cannot say, yet experiment proves that the most widely different breeds of Pigeons and other poultry, when crossed, produce offspring that more re- sembles the ancestral wild species from which the domestic- ated forms have sprung than it resembles either of the immediate parents. This mysterious agency is known as*~~

~~*4 Bonaparte was pleased in 1838 to separate this species from the genus Tadorna, but neither he nor any of his successors has shewn any good reason for doing so.*~~

~~> Jerdon (B. India, iii. p. 798) tells of a Hindu belief that once upon a time two lovers were transformed into birds of this species, and that they or their descendants are condemned to pass the night on the opposite banks of a river, whence they unceasingly call to one another: "Charkwa, shall I come?" "No, Charkwi." " Charkwi, shall Icome?" "No, Charkwa." As to how, under these circum- stances, the race is perpetuated the legend is silent.~~

~~6 The Anas scutellatu of the Indo-Malay countries is by several authorities considered to be a Tadorna, but this vicw is denied by others, among them by Mr Hume (Stray Feathers, viii. p. 158).~~

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~~the principle of "reversion," and the example just cited proves that the same effect is produced in species as well as in "races,"—indicating the essential identity of both, —the only real difference being that "species " are more differentiated than are "races," or that the distinction between them, instead of being (as many writers, some of the first repute, have maintained) qualitative, is merely quantitative, or one of degree.}~~

~~The genus Zadorna, as shewn by its tracheal characters, seems to be most nearly related to Chenalopex, containing the bird so well known as the Egyptian Goose, C. ezgyptiaca, and an allied species, C. jubata, from South America. For the same reason the genus Plectropterus, composed of the Spur-winged Geese of Africa, and perhaps the Australian Anseranas and the Indian and Ethiopian Sarcidiornis, also appear to belong to the same group, which should be reckoned rather to the Anatine than to the Anserine section of the Anatidz. (A. N.)~~

~~SHELLEY, Mary Woutstonecrart (17 97-1851), the second wife of the poet SHELLEY (9.v.), born in London, August 30, 1797 (see vol. x. p. 717), deserves some notice on her own account, as a writer of romance, chiefly imaginative. When she was in Switzerland with Shelley and Byron in 1816 (see below), a proposal was made that various members of the party should write a romance or tale dealing with the supernatural. The result of this project was that Mrs Shelley wrote Frankenstein, Byron the~~

~~*beginning of a narrative about a vampyre, and Dr Polidori, Byron's physician, a tale named "he: Vampyre, the authorship of which used frequently in past years to be attributed to Byron himself, Frankenstein, pub- lished in 1818, when Mrs Shelley was at the utmost twenty-one years old, is a very remarkable performance for so young and inexperienced a writer 3; its main idea is that of the formation and vitalization, by a deep student of the secrets of nature, of an adult man, who, entering the world thus under unnatural conditions, becomes the terror of his species, a half-involuntary criminal, and finally an outcast whose sole resource is self-immolation. This romance was followed by others: Valperga, or the Life and Adventures of Castruccio, Prince of Lucca (1823), an his- torical tale written with a good deal of spirit, and readable enough even now; The Last Man (1826), a fiction of the final agonies of human society owing to the universal spread of a pestilence, — this is written in a very stilted style, but bears some traces of the imagination which fashioned Frankenstein; The Fortunes of Perkin Warbeck (1830) ; Lodore (1835) ; and Falkner (1837). Besides these novels there was the Journal of a Six Weeks' Tour (the tour of 1814 mentioned below), which is published in con- junction with Shelley's prose-writings ; also Rambles in Germany and Italy in 1840-42-43 (which shows an observant spirit, capable of making some true forecasts of ' the future), and various miscellaneous writings. After the death of Shelley, for whom she had a deep and even enthusiastic affection, marred at times by defects of temper, Mrs Shelley in the autumn of 1823 returned to London. At first the earnings of her pen were her only sustenance ; but after a while Sir Timothy Shelley made her an allowance, which would have been withdrawn if she had persisted in a project of writing a full biography of her husband. She was a loving and careful mother, aud shared the prosperous fortunes of her son, when, upon the death of Sir Timothy in 1844, he succeeded to the baronetey. She died in February 1851.*~~

~~*SHELLEY, Percy Byssuz (1792-1822), was born on*~~

~~*1 It is further worthy of remark that the young of 7. variegata when first hatched closely resemble those of 7. casarca, and when the former assume their first plumage they resemble their father more than their mother (P. Z. S., 1866, p. 160).*~~

4th August 1792, at Field Place, near Horsham, Sussex. He was the eldest child of Timothy Shelley, M.P. for Shoreham, by his wife Elizabeth, daughter of Charles Pilfold, of Effingham, Surrey. Mr Timothy Shelley be- came in 1815 Sir Timothy Shelley, Bart., upon the decease of his father Bysshe, who was created a baronet in 1806. This Bysshe Shelley was born in Christ Church, Newark, North America, and married two heiresses, the former, the mother of Timothy, being Mary Catherine, heiress of the Rev. Theobald Michell, of Horsham. He was a handsome man of enterprising and remarkable character, accumulated a vast fortune, built Castle Goring, and lived in sullen and penurious retirement in his closing years. None of his talent seems to have descended to Timothy, who, except for being of a rather oddly self-asser- tive character, was undistinguishable from the ordinary run of commonplace country squires. The mother of the poet is described as beautiful, and a woman: of good abili- ties, bat not with any literary turn ; she was an agreeable letter-writer. The branch of the Shelley family to which the poet Percy Bysshe belonged traces its pedigree to Henry Shelley, of Worminghurst, Sussex, who died in 1623. Beyond that point the genealogical record is not clear ; yet no substantial doubt exists that these Worm- inghurst or Castle Goring Shelleys are of the same stock as the Michelgrove Shelleys, who trace up to Sir William Shelley, judge of the common pleas under Henry VIL, thence to a member of parliament in 1415, and to the reign of Edward L., or even to the epoch of the Norman Conquest. The Worminghurst branch was a family of credit, but not of distinction, until its fortunes culminated under the above-named Sir Bysshe.

In the character of Perey Bysshe Shelley three qualities become early manifest, and may be regarded as innate: impressionableness or extreme susceptibility to external and internal impulses of feeling ; a lively imagination or erratic fancy, blurring a sound estimate of solid facts ; and a resolate repudiation of outer authority or the despotism of custom. These qualities were highly developed in his earliest manhood, were active in his boyhood, and no doubt made some show even on the borderland between childhood and infancy. At the age of six he was sent to a day school at Warnham, kept by the Rev. Mr Edwards : at ten to Sion

~~House School, Brentford, of which the principal was Dr Greenlaw, while the pupils were mostly sons of local tradesmen ; at twelve (or immediately before that age, 29th July 1804) to Eton. The headmaster of Eton, up to nearly the close of Shelley's sojourn in the school, was Dr Goodall, a mild disciplinarian ; it is there- fore a mistake to suppose that Percy (unless during his very brief stay in the lower school) was frequently flagellated by the formidable Dr Keate, who only became headmaster after Goodall. Shelley was a shy, sensitive, mopish sort of boy from one point of view,—from another a very unruly one, having his own notions of justice, independence, and mental freedom ; by nature gentle, kindly, and retiring,—under provocation dangerously violent. He resisted the odious fagging system, exerted himself little in the routine of school-learning, and was known both as 'Mad Shelley" and as "Shelley the Atheist." Some writers try to show that an Eton boy would be termed atheist without exhibiting any propensity to atheism, but solely on the ground of his being mutinous. However, as Shelley was a declared atheist a good while before attaining his majority, a shrewd suspicion arises that, if Etonians dubbed him atheist, they had some relevant reason for doing so.~~

~~Shelley entered University College, Oxford, in April 1810, returned thence to Eton, and finally quitted the school at midsummer, and commenced residence in Oxford~~

~~in October. Here he met a young Durham man, Thomas Jefferson Hogg, who had preceded him in the university by a couple of months ; the two youths at once struck up a warm and intimate friendship. Shelley had at this time a love for chemical experiment, as well as for poetry, philosophy, and classical study, and was in all his tastes and bearing an enthusiast. Hogg was not in the least an enthusiast, rather a cynic, but he also was a steady and well-read classical student. In religious matters both were sceptics, or indeed decided anti-Christians ; whether Hogg, as the senior and more informed disputant, pioneered Shelley into strict atheism, or whether Shelley, as the more impassioned and unflinching speculator, outran the easy-going jeering Hogg, is a moot point; we incline to the latter opinion. Certain it is that each egged on the other by perpetual~~

~~*disquisition on abstruse sub- jects, conducted partly for the sake of truth and partly for that of mental exercitation, without on either side any disposition to bow to authority or stop short of extreme conclusions. The upshot of this habit was that Shelley and Hogg, at the close of some five months of happy and uneventful academic life, got expelled from the university. Shelley—for he alone figures as the writer of the "little syllabus," although there can be no doubt that Hogg was his confidant and coadjutor throughout—published anony- mously a pamphlet or flysheet entitled The Necessity of Atheism, which he sent round, or intended to send round, to all sorts of people as an invitation or challenge to dis- cussion. It amounted to saying that neither reason nor testimony is adequate to establish the existence of a deity, and that nothing short of a personal individual self- revelation of the deity would be sufficient. The college authorities heard of the pamphlet, somehow identified Shelley as its author, and summoned him before then— "our master, and two or three of the fellows." The pamphlet was produced, and Shelley was required to say whether he had written it or not. The youth declined to answer the question, and was expelled by a written sentence, ready drawn up. Hogg was next summoned, with a result practically the same. The precise details of this transaction have been much controverted; the best evidence is that which appears on the college records, showing that both Hogg and Shelley (Hogg is there named first) were expelled for "'contumaciously refusing to answer questions," and for "repeatedly declining to dis- avow" the authorship. Thus they were dismissed as being mutineers against academic authority, in a case pregnant with the suspicion—not the proof—of atheism; but how the authorities could know beforehand that the two undergraduates would be contumacious and stiff against disavowal, so as to give warrant for written sentences ready drawn up, is nowhere explained. Possibly the sentences were worded without ground assigned, and would only have been produced tm terrorem had the young men proved more malleable. The date of this incident was 25th March 1811.*~~

~~*Shelley and Hogg came up to London, where Shelley was soon left alone, as his friend went to York to study conveyancing. Percy and his incensed father did not at once come to terms, and for a while he had no resource beyond pocket-money saved up by his sisters (four in number altogether)*~~

~~*and sent round to him, sometimes by the hand of a singularly pretty school-fellow, Miss Harriet Westbrook, daughter of a retired and moderately opulent hotel-keeper. Shelley, especially in early youth, had a somewhat " priggish" turn for moralizing and argumenta- tion, and a decided mania for proselytizing; his school- girl sisters, and their little Methodist friend Miss West- brook, aged between fifteen and sixteen, must all be enlightened and converted to anti-Christianity. He there-*~~

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~~*fore cultivated the society of Harriet, calling at the house of her father, and being encouraged in his assiduity by her much older sister Eliza. Harriet not unnaturally fell in love with him; and he, though not it would seem at any time ardently in love with her, dallied along the flowery pathway which leads to sentiment and a definite courtship. This was not his first love-affair ; for he had but a very few months before been courting his cousin Miss Harriet Grove, who, alarmed at his heterodoxies, finally broke off with him—to his no small grief and per- turbation at the time. It is averred, and seemingly with truth, that Shelley never indulged in any sensual or dis- sipated amour; and, as he advances in life, it becomes apparent that, though capable of the passion of love, and unusually prone to regard with much effusion of sentiment women who interested his mind and heart, the mere attraction of a pretty face or an alluring figure left him unenthralled. After a while Percy was reconciled to his father, revisited his family in Sussex, and then stayed with a cousin in Wales. Hence he was recalled to London by Miss Harriet Westbrook, who wrote complaining of her father's resolve to send ler back to her school, in which she was now regarded with repulsion as having become too apt a pupil of the atheist Shelley. He replied counselling resistance. 'She wrote to say" (these are the words of Shelley in a letter to Hogg, dating towards the end of July 1811) "that resistance was useless, but that she would fly with me, and threw herself upon my protection." Shelley therefore returned to London, where he found Harriet agitated and wavering; finally they agreed to elope, travelled in haste to Edinburgh, and there, according to the law of Scotland, became husband and wife on*~~

~~*28th August. Shelley, it should be understood, had by this time openly broken, not only with the dogmas and conven- tions of Christian religion, but with many of the institu- tions of Christian polity, and in especial with such as enforce and regulate marriage; he held—with William Godwin and some other theorists—that marriage ought to be simply a voluntary relation between a man and a woman, to be assumed at joint option and terminated at the after-option of either party. If therefore he had acted upon his personal conviction of the right, he would never have wedded Harriet, whether by Scotch, English, or any other law ; but he waived his own theory in favour of the consideration that in such an experiment the woman's stake, and the disadvantages accruing to her, are out of all comparison with the man's. His conduct therefore was so far entirely honourable; and, if it derogated from a principle of his own (a principle which, however con- trary to the morality of other people, was and always remained matter of genuine conviction on his individual part), this was only in deference to a higher and more imperious standard of right.*~~

~~*Harriet Shelley was not only beautiful; she was amiable, accommodating, adequately well educated and well bred. She liked reading, and her reading was not strictly frivolous. But she could not (as Shelley said at a later date) 'feel poetry and understand philosophy." Her attractions were all on the surface; there was (to use a common phrase) 'nothing particular in her." For nearly three years Shelley and she led a shifting sort of life upon an income of £400 a year, one-half of which was allowed (after his first severe indignation at the mésalliance was past) by Mr Timothy Shelley, and the other half by Mr Westbrook. The spouses left Edinburgh for York and the society of Hogg; broke with him upon a charge made by Harriet, and evidently fully believed by Shelley at the time, that, during a temporary absence of his upon business in Sussex, Hogg had tried to seduce her (this quarrel was entirely made up at the end of about a year) ; moved off*~~

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~~*to Keswick in Cumberland, coupled with the company of Southey, and some hospitality from the duke of N orfolk, who, as chicf magnate in the Shoreham region of Sussex, was at pains to reconcile the father and his*~~

~~*too unfilial heir; sailed thence to Dublin, where Shelley was eager, and in some degrce prominent, in the good cause of Catholic emancipation, conjoincd with repeal of the union ; crossed to Wales, and lived at Nant-Gwillt, near Rhayader, then at Lynmouth in Devonshire, then at Tanyrallt in Carnarvonshire. All this was between September 1811 and February 1813. At Lynmouth an Irish servant of Shelley's was sentenced to six months' imprisonment for distributing and posting up printed papers, bearing no printer's name, of an inflammatory or seditious tendency — being a Declaration of Rights composed by the youthful reformer, and some verses of his named The Devil's Walk. At Tanyrallt Shelley was (to trust his own and Harriet's account, confirmed by the evidence of Miss Westbrook, the elder sister, who continued an inmate in most of their homes) attacked on the night of 26th February by an assassin who fired three pistol-shots. The motive of the attack was undefined; the fact of its occurrence was generally disbelieved, both at the time and by subsequent inguirers. To analyse the possibilities and probabilities of the case would lead us too far; we can only say that we rank with the decided sceptics. Shelley was full of wild unpractical notions ; he dosed himself with laudanum as a palliative to spasmodic pains; he was given to strange assertions and romancing narratives (several of which might properly be specified here but for want of space), and was not incapable of conscious fibbing. His mind no doubt oscillated at times along the line which divides sanity from insane delusion. It is difficult to suppose that he simply invented such a monstrous story to serve a purpose. The very enormity of the story tends to dissuade us from thinking so, and the purpose alleged seems disproportion- ately small — that of decamping from Tanyrallt ere creditors should become too pressing. Indeed, we decisively reject this supposed motive. On the other hand, nothing could be traced to corroborate Shelley's assertion. This was at any rate the break-up of the residence at Tanyrallt ; the Shelleys revisited Ireland, and then settled for a while in London. Here, in June 1813, Harriet gave birth to her daughter Ianthe Eliza (she married a Mr Esdaile, and died in 1876). Here also Shelley brought out his first poem of any importance, Queen Mab; it was privately printed, as its exceedingly aggressive tone in matters of religion and morals would not allow of publication.*~~

~~*The speculative sage whom Shelley especially reverenced was William Godwin, the author of Political Justice and of the romance Caleb Williams ; in 1796 he had married Mary Wollstonecraft, authoress of The Ltights of Woman, who died shortly after giving birth, on 30th August 1797, toa daughter Mary. With Godwin Shelley had opened a voluntecred correspondence late in 1811, and he had known him personally since the winter which closed 1812, Godwin was then a bookseller, living with his second wife, who had been a Mrs Clairmont ; there were four other inmates of the household, two of whom call for some mention here — Fanny Wollstonecraft, the daughter of the authoress and Mr Imlay, and Claire, the daughter of Mrs Clairmont, Fanny committed suicide in October 1816, being, according to some accounts which remain unverified, hopelessly in love with Shelley; Claire was closely associated with all his subsequent career. It was towards May 1814 that Shelley first saw Mary Wollstonecraft Godwin as a grown-up girl (she was well on towards Seventeen) ; he instantly fell in love with her, and she with him. Just before this, 24th March, Shelley had remarried Harriet in London, though with no obvionsly cogent*~~

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~~*motive for doing so ; but, on becoming enamoured of Mary, he seems to have rapidly made up his mind that Harriet should not stand in the way. She was at Bath while he was in London, and for a while she heard nothing of him. They had, however, met again in London and come to Some sort of understanding before the final crisis arrived, — Harriet remonstrating and indignant, but incapable of effective resistance, — Shelley sick of her companionship, and bent upon gratifying his own wishes, which as we were not at odds with his avowed . For some months past there had been bickerings and misunderstandings between him and Harriet, aggravated by the now detested presence of Miss more than this cannot be said, for no more is at present known. Tt is certain, however, that while not plainly proving any grave wrongdoing on Harriet's part, exculpates Shelley from the charge of having separated from her without what appeared to himself sufficient cause. The upshot came on 28th July, when Shelley aided Mary to elope from her father's house, Claire Clairmont deciding to accompany them. They crossed to Calais, and*~~

~~*proceeded across France into Switzerland. Godwin and his wife were greatly incensed, Though he and Mary Wollstonecraft had entertained and avowed bold opinions regarding tlie niarriage-bond, similar to Shelley's own, and had in their time acted upon these opinions, it is not clearly made out that Mary Godwin had ever been encouraged by paternal influence to think or do the like, Shelley and she chose to act upon their own likings and responsibility,—he disregarding any claim which Harriet had upon him, and Mary setting at nought her father's authority. Both were prepared to ignore the law of the land and the rules of*~~

~~*society. The three young people returned to London in September. In the following January Sir Bysshe Shelley*~~

~~*died, and Percy became the immediate heir to the entailed property inherited by his father Sir Timothy. This entailed property seems to have been worth £6000 per annum, or little less. There was another very much larger property which Percy might shortly before have secured to himself, contingently upon his father's death, if he would have consented to put it upon the same footing of entail; but this he resolutely refused to do, on the pro- fessed ground of his being opposed upon principle to the system of entail; therefore, on his grandfather's death the larger property passed wholly away from any interest which Percy might have had in it, in use or in expectancy. He now came to an understanding with his father as to the remaining entailed property ; and, giving up certain future advantages, he received henceforth a regular income of £1000 a year. Out of this he assigned £200 a year to Harriet, who had given birth in November to a son, Charles Bysshe (he died in 1826), Shelley, and Mary as well, were on moderately good terms with Harriet, seeing her from time to time. His peculiar views as to the rela- tions of the sexes appear markedly again in his having (so it is alleged) invited Harriet to return to his and Mary's house as a domicile; of course this curious arrangement did not take effect. Shelley and Mary (who was naturally always called Mrs Shelley) now settled at Bishopgate, near Windsor Forest ; here he produced his first excellent poem, Alastor, or the Spirit of Solitude, which was published soon afterwards along with a few others. In May 1816 the pair left England for Switzerland, together with Miss Clairmont, and their own*~~

~~*infant son William. They went straight to Séchcron, near Geneva; Lord Byron, whose separation from his wife had just then taken place, arrived there immediately afterwards. A great deal of controversy has lately arisen as to the motives and incidents of this foreign sojourn.*~~

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~~*The clear fact is that Miss Clairmont, who had a fine voice and some inclination for the stage, had seen Byron, as connected with the management of Drury Lane theatre, early in the year, and an amorous intrigue had begun between them in London. Prima facie it seems quite reasonable to suppose that she had explained the facts to Shelley or to Mary, or to both, and had induced them to convoy her to the society of Byron abroad; were this finally established as the fact, it would show no incon- sistency of conduct, or breach of his own code of sexual morals, on Shelley's part. On the other hand it is asserted that documentary evidence of an irrefragable kind exists showing that Shelley and Mary were totally ignorant of the amour shortly before they went abroad. Whether or not they knew of it while they and Claire were in daily intercourse with Byron, and housed close by him on the shore of the Lake of Geneva, may be left unargued. The three returned to London in September 1816, Byron remaining abroad ; and in January 1817 Miss Clairmont gave birth to his daughter named Allegra. The return of the Shelleys was closely followed by two suicides,—first that of Fanny Wollstonecraft (already referred to), and second that of Harriet Shelley, who on 9th November drowned herself in the Serpentine. The latest stages of the lovely and ill-starred Harriet's career have never been very explicitly recorded. It seems that she formed a con- nexion with some gentleman from whom circumstances or desertion separated her, that her habits became intemper- ate, and that she was treated with contumelious harshness by her sister during an illness of their father. She had always had a propensity (often laughed at in earlier and happier days) to the idea of suicide, and she now carried it out in act—possibly without anything which could be regarded as an extremely cogent predisposing motive, although the total weight of her distresses, accumulating within the past*~~

~~*two years and a half, was beyond question heavy to bear. Shelley, then at Bath, hurried up to London when he heard of Harriet's death, giving manifest signs of the shock which so terrible a catastrophe had produced on him. Some self-reproach must no doubt have mingled with his affliction and dismay; yet he does not appear to have considered himself gravely in the wrong at any stage in the transaction, and it is established that in the train of quite recent events which immediately led up to Harriet's suicide he had borne no part.*~~

~~*This was the time when Shelley began to see a great deal of Leigh Hunt, the poet and essayist, editor of The Examiner ; they were close friends, and Hunt did some- thing (hardly perhaps so much as might have been antici- pated) to uphold the reputation of Shelley as a poet — which, we may here say once for all, scarcely obtained any public acceptance or solidity during his brief lifetime. The death of Harriet having removed the only obstacle to a marriage with Mary Godwin, the wedding ensued on 30th December 1816, and the married couple settled down at Great Marlow in Buckinghamshire. Their tranquillity was shortly disturbed by a Chancery suit set in motion by Mr Westbrook, who asked for the custody of his two grandchildren, on the ground that Shelley had deserted his wife and intended to bring up his offspring in his own atheistic and anti-social opinions. Lord Chancellor Eldon delivered judgment towards 26th March 1817. He held that Shelley, having avowed condemnable principles of conduct, and having fashioned his own conduct to corre- spond, and being likely to inculcate the same principles upon his children, was unfit to have the charge of them. He therefore assigned this charge to Mr and Miss West- brook, and appointed as their immediate curator Dr Hume, an orthodox army-physician, who was Shelley's own nominee. The poet had to pay for the maintenance*~~

~~*of the children a sum which stood eventually at £120 per annum ; if it was at first (as generally stated) £200, that was no more than what he had previously allowed to Harriet. This is the last incident of marked importance in the perturbed career of Shelley ; the rest relates to the history of his mind, the poems which he produced and published, and his*~~

~~changes of locality in travelling. In March 1818, after an illness which he regarded (rightly or wrongly) as a dangerous pulmonary attack, Shelley, with his wife, their two infants William and Clara, and Miss Clair- mont and her baby Allegra, went off to Italy, in which country the whole short remainder of his life was passed. Allegra was soon sent on to Venice, to her father Byron, who, ever since parting from Miss Clairmont in Switzer- land, showed a callous and unfeeling determination to see and know no more about her. In 1818 the Shelleys— mostly, not always, with Miss Clairmont in their company—were in Milan, Leghorn, the Bagni di Lucca, Venice and its neighbourhood, Rome, and Naples; in 1819 in Rome, the vicinity of Leghorn, and Florence (both their infants were now dead, but a third was born late in 1819, the present baronet, Sir Percy Florence Shelley) ; in 1820 in Pisa, the Bagni di Pisa (or di San Giuliano), and Leghorn ; in 1821 in Pisa and with Byron in Ravenna; in 1822 in Pisa and on the Bay of Spezia, between Lerici and San Terenzio. The incidents of this period are but few, and of no great importance apart from their bearing upon the poet's writings. In Leghorn he knew Mr and Mrs Gisborne, the latter a once intimate friend of Godwin ; she taught Shelley Spanish, and he was eager to promote a project for a steamer to be built by her son by a former marriage, the young engineer Henry Reveley; it would have been the first steamer to navigate the Gulf of Lyons. In Pisa he formed a sentimental intimacy with the Contessina Emilia Viviani, a girl who was pining in a convent pending her father's choice of a husband for her; this impassioned but vague and fanciful attachment—which soon came to an end, as Emilia's character developed less favourably in the eyes of her Platonic adorer—produced the transcendental love-poem of Lpipsychidion in 1821. In Ravenna the scheme of the quarterly magazine Zhe Liberal was concerted by Byron and Shelley, the latter being principally interested in it with a view to benefiting Leigh Hunt by such an association with Byron. In Pisa Byron and Shelley were very constantly together, having in their company at one time or another Captain Medwin (cousin and schoolfellow of Shelley, and one of his biographers), Lieutenant and Mrs Williams, to both of whom our poet was very warmly attached, and Captain Trelawny, the adventurous and romantic-natured seaman who has left important and interesting reminiscences of this period. Byron admired very highly the generous, unworldly, and enthusiastic character of Shelley, and set some~~

~~value on his writings; Shelley half-worshipped Byron as a poet, and was anxious, but in some conjunctures by no means able, to respect him asa man. In Pisa he knew also Prince Alexander Mavrocordato, one of the pioneers of Grecian insurrection and freedom ; the glorious cause fired Shelley, and he wrote the drama of Hellas~~

~~1821).~~

~~The last residence of Shelley was the Casa Magni, a bare and exposed dwelling on the Gulf of Spezia. He and his wife, with the Williamses, went there at the end of April 1822, to spend the summer, which proved an arid and scorching one. Shelley and Williams, both of them insatiably fond of boating, had a small schooner named the "Don Juan" built at Genoa after a design which Williams had procured from a naval friend, and which was the reverse of safe. They received her on 12th May, found her rapid and alert, and on Ist July started in her to~~

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~~Leghorn, to meet Leigh Hunt, whose arrival in Italy had just been notified. After doing his best to set things going comfortably between Byron and Hunt, Shelley returned on board with Williams on 8th J uly. It wasa day of dark, louring, stifling heat. Trelawny took leave of his two friends, and about half-past six in the evening found him- self startled from a doze by a frightful turmoil of storm. The "Don Juan" had by this time made Via Reggio; she was not to be seen, though other vessels which had sailed about the same time were still discernible, Shelley, Williams, and their only companion, a sailor-boy, perished in the squall. The exact nature of the catastrophe was from the first regarded as somewhat disputable, but it is only of late years (1875) that it has been keenly debated. The condition of the "Don Juan" when recovered did not favour any assumption that she had capsized in a heavy sea—rather that she had been run down by some other vessel, a felucca or fishing-smack. In the absence of any counter-evidence this would be supposed to have occurred by accident; but a rumour, not strictly verified and certainly not refuted, exists that an aged Italian seaman on his deathbed confessed that he had been one of the crew of the fatal felucca, and that the collision was intentional, as the men had plotted to steal a sum of money supposed~~

~~*to be on the " Don Juan," in charge of Lord Byron. In fact there was a moderate sum there, but Byron had neither embarked nor intended to embark. This may perhaps be the true account of the tragedy ; at any rate Trelawny, the best possible authority on the subject, accepted it as true. He it was who laboriously tracked out the shore-washed corpses of Shelley and Williams, and who undertook the burning of them, after the ancient Greek fashion, on the shore near Via Reggio, on the 15th and 16th of August. The great poet's ashes were then collected, and buried in the new Protestant cemetery in Rome. He was, at the time of his untimely death, within a month of completing the thirtieth year of his age—a surprising example of rich poetic achievement for so young a man.*~~

~~*The character of Shelley can be considered according to two different standards of estimation. We can estimate the original motive forces in his character ; or we can form an opinion of his actions, and thence put a certain construction upon his personal qualities. We will first try the latter method. It cannot be denied by his admirers and eulogists, and is abundantly clear to his censors, that his actions were in some considerable degree abnormal, dangerous to the settled basis of society, and marked by headstrong and undutiful presumption, But it is remarkable that, even:among the censors of his conduct, many persons are none the less impressed by the beauty of his character; and this leads us back to our first point—the original motive forces in that. Here we find enthusiasm, fervour, courage (moral and physical), an unbounded readiness to act upon what he considered right principle, however inconvenient or disastrous the consequences to himself, sweetness and indulgence towards others, extreme gener- osity, and the principle of love for humankind in abundance and superabundance. He respected the truth, such as he conceived it to be, in spiritual or speculative matters, and respected no con- struction of the truth which came to him recommended by human authority. No man had more hatred or contempt of custom and prescription ; no one had a more authentic or vivid sense of uni- versal charity. The same radiant enthusjasm which appeared in his poetry as idealism stamped his speculation with the conception of perfectibility and his character with loving emotion.*~~

~~*In person Shelley was attractive, winning, and alinost beautiful, but not to be called handsome. HIs height was nearly 5 feet 11; he was slim, agile, and strong, with something of a stoop ; his complexion brilliant, his hair abundant and wavy, dark-brown but early beginning to grizzle ; the eyes, deep-blue in tint, have been termed ‘ stag-eyes ”—large, fixed, and beaming. HIs voice was wanting in richness and suavity—high-pitched, and tending to the screechy ; his general aspect, though extremely variable according as his mood of mind and his expression shifted, was on the whole uncominonly juvenile. :*~~

~~*From this necessarily very slight account of the life of Shelley we pass to a consideration—and this too must be equally slender—of his works in poetry. Ifwe except Goethe (and for convenience’ sake leaving out of count any living writers, whose ultimate value*~~

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~~*cannot at present be assessed), we consider Shelley to be the Supreme poet of the new era which, beginning with the French Revolution, remains continuous into our own day. Lord Byron and Victor HIugo come the nearest to Shelley in poetic stature, and each of them might for certain reasons be even preferred to him; Wordsworth also has his numerous champions. The grounds on which we set Shelley highest of all are mainly three. HIe excels all his competitors in ideality, he excels them in music, and he excels them in importance. By importance we here mean the direct import of the work performed, its controlling power over the reader’s thought and feeling, the contagious fire of its white-hot intellectual passion, and the long reverberation of its appeal, Shelley is emphatically the poet of the future. In his own day an alien in the world of mind and invention, and in our day scarcely yet a denizen of it, he appears destined to become, in the long vista of years, an inforining presence in the innermost shrine of human thought. Shelley appeared at the time when the sublime frenzies of the French revolutionary movement had exhausted the elas- ticity of men’s thought—at least in England—and had left them flaccid and stolid ; but that movement prepared another in which revolution was to assume the milder guise of reform, conquering and to conquer. Shelley was its prophet. As an iconoclast and an idealist*~~

~~*he took the only position in which a poet could advantageously work as a reformer. To outrage his contemporaries was the condition of leading his successors to 'triumph and of personally triumphing in their victories. Shelley had the temper of an innovator and a martyr ; and in an intellect wondrously poetical he united speculative keenness and humanitarian zeal in a degree for which we might vainly seek his precursor. We have already named ideality as one of his leading excellences. This Shelleian quality combines, as its constituents, sublimity, beauty, and the abstract passion for good. It should be acknowledged that, while this great quality forms the chief and most admirable factor in Shelley's poetry, the defects which go along with it mar his work too often—producing at times vagueness, unreality, and a pomp of glittering indistinctness, in which excess of sentiment welters amid excess of words, This blemish affects the long poems much more than the pure lyrics ; in 'the latter the rapture, the music, and the emotion are in exquisite balance, and the work has often as much of delicate simplicity as of fragile and flower- like perfection.*~~

~~*In the course of our biographical narrative we have men- tioned a few, but only a few, of Shelley's writings ; we must now give some curt account of others. Of his early work prior to Queen Mab—such romances as Zastrozzi and St Irvyne, such verse as the Fragments of Margaret Nicholson—we can ouly here say that they are rubbish. Alastor was succeeded (1817) by The Revolt of Islam, a poem of no common length in the Spenserian stanza, preaching bloodless revolution ; It is amazingly fine in parts, but as a whole somewhat long-drawn and exhaust- ing. This transcendental epic (for such it may be termed) was at first named Laon and Cythna, or the Revolution of the Golden City, and the lovers of the story were then brother and sister as well as lovers—an experiment upon British endurance which the publishers would not connive at. The year 1818 produced Rosalind and Helen, a comparatively weak poem, and Julian and Maddalo, a very strong one—demonstrating in Shelley a singular power of seeing ordinary things with directness, and at once figuring them as reality and transfiguring them into poetry. The next year, 1819, was his culmination, producing as it did the grand tragedy of The Cenci and the sublime ideal drama Prometheus Unbound, which we have no hesitation in calling his masterpiece. It embodies, in forms of surpassing imagination and beauty, Shelley's deepest and most daring*~~

conceptions. Prometheus, the human mind, has invested with the powers proper to himself Jupiter the god of heaven, who thereupon chains and torments Prometheus and oppresses mankind ; in other words, the anthropo- morphic god of religion is a creation of the human mind, and both the mind of man and man himself are enslaved as long as this god exercises his delegated but now absolute power. Prometheus, who is from of old wedded to Asia, or N ature, protests against, and anathematizes the usurper enthroned by himself. At last the anathema takes effect. Eternity, Demogorgon, dismisses Jupiter to unending nothingness. Prometheus is at once unbound, the human mind is free ; he is reunited to his spouse Nature, and the world of man passes from thraldom and its degradation into limitless progression, or (as the phrase goes) perfectibility, moral and material. This we regard as in brief the argument of Prometheus Unbound. It is closely analogous to the argument of the juvenile poem Queen Mab, but so raised in form and creative touch that, whereas to write Queen Mad was only to be an ambitious and ebullient tyro, to invent Prometheus Unbound was to be the poet of the future. Zhe Witch of Atlas (1820) appears to us the most perfect work among all Shelley's longer poems, though it is neither the deepest nor the most interesting. It may be rated as a pure exercise of roving imagination—guided, however, by an intense sense of beauty, and by its author's ee fineness of nature.

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The poem has often been decried as practically unmeaning ; we do not subscribe to this opinion. The "witch" of this subtle and magical invention seems to represent that faculty which we term "the fancy"; using this assumption as a clue, we find plenty of meaning in the poem, but necessarily it is fanciful or volatile meaning. The elegy on Keats, Adonais, followed in 1821; the Triumph of Life, a mystical and most impressive allegory, con- structed upon lines marked out by Dante and by Petrarch, was occupying the poet up to the time of his death. The stately fragment which remains is probably but a small portion of the projected whole. The translations—chiefly from Homer, Euripides, Calderon, and Goethe—date from 1819 to 1822, and testify to the poetic endowment of

~~*Shelley not less absolutely than his own original compositions. From this list it will be readily seen that Shelley was not only a prolific but also a versatile poet. Works so various in faculty and in formas The Revolt of Islam, Julian and Maddalo, The Cenci, Prometheus Unbound, Epipsychidion, and the grotesque effusions of which Peter Bell the Third is the prime example, added to the consummate array of lyrics, have seldom to be credited to a single writer—one, moreover, who died before he was thirty years of age. In prose Shelley could be as admirable as in poetry ; of late years it has even been pretended—but we regard this proposition as worthy of summary rejection—that his best and most enduring work is in the prose form. His letters to Thomas Love Peacock and others, and his uncompleted Defence of Poetry, are the chief monuments of his mastery in prose ; and certainly no more beautiful prose—having much of the spirit and the aroma of poetry, yet without being distorted out of its proper essence—is to be found in the English language.*~~

~~*The chief original authorities for the life of Shelley (apart from his own writings, which contain a good deal of autobiography, if heedfully sifted and collated) are—(1) the notices by Mrs Shelley interspersed in her edition of the Poems, (2) Hogg's amusing, discerning, and authentic, although in some respects exaggerated, book ; (8) Trelawny's Records; (4) the Life by Medwin; and (5) the articles written by Peacock. Some other writers, especially Leigh Hunt, might be mentioned, but they come less close to the facts. Among biographical works produced since Shelley's death, by authors who did not know him personally, much the largest is The Real Shelley, by J. C. Jeaffreson (1885) ; it is controversial in method and decidedly hostile in tendency, and tries a man of genius by tests far from well adapted (in our opinion) to bring out a right result ; it contains, however, an ample share of solid information and sharp disquisition, The memoir by W. M. Rossetti, prefixed to an edition of Shelley's Poems in two forms of publication, 1870 and 1878, was an endeavour to formulate in brief space, out of the then confused and conflicting records, an accurate account of Shelley—admiring, but not uncandidly one-sided. There is valuable material in Lady Shelley's Shelley Memorials, and in Dr Garnett's Relics of Shelley ; and the memoir written by Mr Symonds, in the series English Men of Letters, is very agreeably and skilfully done.*~~

~~*While we write (November 1885) Prof. Dowden is engaged upon a life of Shelley, which may be expected to distance allits predecessors in authority and completeness, (W. M. R.)*~~

~~*SHELOMOH IBN GEBIROL. See Aviersron.*~~

~~*SHEM. See Noaw. Compare Semitic Lanauacss.*~~

~~*SHEMAHA, a formerly important but now insignifi- cant town in Transcaucasia, in 40° 38’ N. lat. and 66° 19’ E, long., on the Zagolovai, an affluent of the Peerssagat, which falls into the Caspian. It is situated in a moun- tainous, very picturesque country, covered with luxuriant vegetation, at about 2230 feet above the level of the Black Sea. In 1873 it had 25,087 inhabitants, of whom 18,680 were Tartars and Shachsevans, 5177 Armenians, and 1230 Russians. Some 300 Armenian families now pro- fess Lutheranism—the result of a mission first established at Shemaha about twenty years ago. Shemaha was the capital of the khanate of Shirvan, and was known to Ptolemy as Kamachia. Situated as it was on the high road from Europe to India, this old town must at one time have possessed very considerable importance, and evidence of the fact is found in the numerous ruins of large caravansarais, churches, and public buildings. About the middle of the 16th century it was the seat of an English commercial factory, under the well-known traveller Jenkinson (com- pare Russta, vol. xxi. p. 93), afterwards envoy extra- ordinary of the khan of Shirvdn to Ivan the Terrible. In 1742 Shemaha was taken and destroyed by Nadir Shah, who, to punish the inhabitants for their Sunnite creed, built a new town under the same name about 16 miles to the west, at the foot of the main chain of the Caucasus. The new Shemaha was at different times a residence of the khan of Shirvan, but it was finally abandoned, and in its place there stands now only a village called Akhsu, whilst the old town was rebuilt, and under the Russians became capital of the government of Shemaha. In recent times Shemaha has suffered greatly from earthquakes: in 1859*~~

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~~*it was shaken to its foundations, and in consequence the seat of the governor was removed to Baku; in 1872 (16th January) there occurred a still more terrible shock, from which the town has never recovered. Silk manufacture is the principal industry in Shemaha. In 1873 there were one hundred and thirty silk-winding establishments, owned mostly by Armenians. The industry has, however, since 1864 considerably declined.*~~

~~*The district of Shemaha (4426 square miles), corresponding to the ancient khanate of Shirvan, lies along the southern slope of the main chain of the Eastern Caucasus. It contains a popula- tion of 97,801 inhabitants (1873), of whom 8498 are Russians, 14,838 Armenians, 73,124 Tartars, 638 Jats (old Persian tribe), and 708 Jews. As everywhere in Transcaucasia, the number of males is considerably in excess over the females (100 to 81). The district occupies a sparsely-wooded mountainous region, com- pletely shut up on the north, and open to the dry, large, and mostly desolate valley of Kura on the south. The climate is generally healthy, rather dry and moderately warm; in the lower parts the people suffer from malarious fever. The annual rain- fall in Shemaha is 14°52 inches, the mean summer temperature 73° Fahr., winter 87°. The soil, mostly of the Tertiary forma- tion, is very vich and of considerable variety. This district occu- pies in Transcaucasia a foremost place in vine-growing and in the silk industry. The vine region, in the south-west of the district, is a long strip of land of breadth varying from 4 to 20 miles. The highest level of the vine is about 2500 feet above the sea. The plant is left unprotected in winter, and owing to the abundance of water occasioned by the melting snows and the heavy rains in spring, there is no need of irrigation. Accord- ing to a general survey made in 1875 there are in the district 3098 vineyards, occupying a total of 1754 acres. The other products are principally wheat, cotton, and rice. In 1875 the annual vintage at Shemaha was calculated at about 62,160 gallons. The best wine is that of Matrassy. The province of Shirvan, now the district of Shemaha, has been frequently the theatre of terrible struggles and bloodshed. It was conquered by the Persians in 1501 under Shah Ismail I., and it continued with brief interrup- tions to be a part of the Persian dominions until the fall of the Safawi dynasty.*~~

~~*Shemaha, the capital of Shirvan, was sacked in 1712 by the Lesghians; eight years later the town and the whole province were devastated by a certain Daghestani, Ala nd-Daulah, who was later recognized by Persia as the khan of Shirvan. In 1724 the khanate was taken by Turkey, but ten years later Nadir Shah of Persia reconquered it aftcr terrible ravages. On the departure of Nadir Shah soon afterwards Shirvan. enjoyed independence under the rule of Mahmud Seyyid, who rebuilt Shemaha. The Russians entered Shirvan first in 1723, but soon retired. In 1795 they captured Shemaha as well as Baku ; but the conquest was once more abandoned, and Shirvan was not finally annexed to Russia until November 1805 after the voluntary submission of its last khan Mustapha.*~~

~~*SHENANDOAH, a borough of the United States, in Schuylkill county, Pennsylvania, 12 miles north of Potts- ville, is the centre of a great coal district, more than half the total yield of the Schuylkill region being produced within 3 miles of the town. Among its buildings are fifteen churches, a theatre, and two public halls. It was founded in 1863, and its population (partly Welsh and German), which increased from 2951 in 1870 to 10,148 in 1880, is estimated at over 15,000 in 1886.*~~

~~*Shenandoah is also the name of a well-known tributary of the Potomac.*~~

~~*SHENDY, a town on the right bank of the Nile, about 130 miles south of Berber and 100 north of Khartim, which, while its present population does not exceed 2500, was previous to its destruction by the Egyptians in 1822 a place of some 50,000 inhabitants and a station on the great caravan route between Sennér and Egypt and Mecca. The terrible massacre perpetrated by the Egyptians was in revenge for the treacherous assassination by the native chiefs at Shendy of Ismail Pasha and his suite, who were first drugged and then burned to ashes with their huts. Shendy was the capital of a considerable district, and lies only 20 miles south of the ruins of Meroe,*~~

~~*SHENSTONE, Witttam (1714-1763), is one of the best-known minor poets of the 18th century. He owes*~~

~~*such distinction as he has at least as much to his choice of subjects and to the peculiarity of his life as to the felicity of his verse. Coming after a generation whose leading poets wrote for fashionable society, he shut him- self up in the country, tried to follow the life Arcadian, and wrote in the spirit of a recluse. He inherited the small estate of Leasowes, in the parish of Hales-Owen, Worcestershire. He was born at Leasowes in 1714, and after passing through Pembroke College, Oxford, retired there to realize Pope's ideal in the Ode to Solitude, turned his paternal estate into an elaborate landscape garden, and lived there till his death in 1763. From the time that the management of the estate fell into his own hands, "he began," Johnson says, "to point his prospects, to diversify his surface, to entangle his walks, and to wind his waters,—which he did with such judgment and such fancy as to make his little domain the envy of the great and the admiration of the skilful." From this it will be seen that he did not anticipate late sentiment in his love of natural scenery ; he was a true child of the Queen Anne time in his liking for 'Nature to advantage dressed." And it would appear from his letters that he was not a contented recluse, but was weakly desirous of the notice of the world in his Arcadian retreat. Still there is a certain air of sincerity in his references to natural beauty and grandeur. Burns wrote of him in the preface to his first issue of poems as a poet "whose divine elegies do honour to our language." Shenstone practised the elegiac form assidu- ously, and some of his elegies are not without a certain imposing pomp and dignity of language, but we may safely suppose that it was the sentiments rather than the expression that captivated the peasant poet. His Pastoral Baliads in Four Parts, one of his earliest compositions, is also one of his best, and from its use in selections of poetry for the young is much more generally known. The triple rhythm and the simplicity of the language are happily suited to the pastoral fancy, and there is not too much of the artificial diction and imagery of such poetry. Such lines as—Yet time may diminish the pain ; The flower, and the shrub, and the tree Which I rear'd for her pleasure in vain In time may have comfort for me—*~~

~~*come nearer Wordsworth's ideal of poetic diction than was common in the serious poetry of Shenstone's time. But his Schoolmistress, in the Spenserian stanza (published in 1742, and so relieved from any suspicion*~~

~~*of being an imitation of Thomson), is the poem by which he keeps a place in literature.*~~

~~*SHEPTON MALLET, a market-town of Somersetshire, England, is situated at the eastern extremity of the Mendip Hills, on the Somerset and Devon and the East Somerset Railways, 5 miles east of Wells and 20 south of Bristol. The church of Sts Peter and Paul, consisting of chancel, clerestoried nave, and aisles, is specially worthy of notice for its richly carved wooden roof and the ancient monu- ments of the Mallets and Gournays, formerly possessors of the manor. The grammar school was founded in 1677, and there are also a science and art school in connexion with South Kensington, a literary institute, and a mechanics' institute. The principal public buildings are the court-house (1857), the masonic hall (1861), the prison, and the district hospital (1880). The market cross, one of the finest in the county, 51 feet in height, erected by Agnes and Thomas Buckland in 1500, was restored in 1841. About the end of last century Shepton Mallet had important cloth manufactures, and stocking-knitting was also largely carried on. The brewing of ale and porter is now one of its principal industries, and it has also rope- works and brick and tile works. In the vicinity there are*~~

~~*granite quarries and marble, asphalt, and lime works. The population of the urban sanitary district (area, 3572 acres) in 1871 was 5149, and in 1881 it was 5322.*~~

~~*Shepton, previous to the Conquest called Sepeton, was in the possession of the abbots of Glastonbury for four hundred years before it passed to Roger de Coureelle.' Afterwards it came into the possession of the barons Malet or Mallet, one of whom was fined for rebellion in the reign of King John. From the Mallets it went to the Gournays, but in 1536 it reverted to the crown, and. itis now included in the duchy of Cornwall. The town received the grant of a market from Edward II.*~~

~~*SHERBORNE, an ancient market-town of Dorsetshire, England, on the borders of Somersetshire, is situated on the southern slope of a hill overlooking the river Yeo, on the South-Western Railway, 6 miles east*~~

~~*from Yeovil and 118 south-west from London by rail. In 705 Sher- borne was made by Ina, king of the West Saxons, the seat of a bishopric, which in 1078 was removed to Old Sarum (Salisbury). Previous to its removal a great Bene- dictine abbey had been founded by Bishop Roger. The minster or abbey church of St Mary possesses a Norman tower, much altered by later additions, and transepts also originally Norman, but the greater part of the building is Perpendicular. It was restored in 1848-58 at an expense of over £32,000, chiefly contributed by Mr W. Digby and Lord Digby. Ethelbald and Ethelbert, elder brothers of Alfred, were buried behind the high altar of the church, which contains a number of interesting tombs and monu- ments. Near the minster are the ruins of the castle, originally the palace of the bishops. It was besieged during the wars between Stephen and Maud, and also during those of the Commonwealth, when it was held for the king in 1642 by the marquis of Hertford, and resisted a five days' siege by the earl of Bedford, but was in 1645 taken by Fairfax, when it was dismantled and reduced to ruins. The older portion of the modern mansion was built by Sir Walter Raleigh. Sherborne grammar school, occupy- ing the site of the abbey, was founded by Edward VI. in 1550, and holds a high rank among the public schools of England. Near the abbey close is the hospital of St John, dating from the 15th century. A literary institution, now called the Macready Institution, was established in 1850. The manor of Sherborne went with the bishop's see, till in the reign of Elizabeth it was conferred on Sir Walter Raleigh. After his attainder it was bestowed by James I. on his favourite Carr, after which it passed to the Digbys, the present owners. The population of the urban sanitary district (area 411 acres) in 1871 was 5545, and in 1881 it was 5053.*~~

~~*SHERIDAN, the name of an Anglo-Irish family, made illustrious by the dramatist Richard Brinsley, but promi- nently connected with literature in more than one generation before and after his. We take the family in chronological order.*~~

~~*1, THomas SHERIDAN, D.D. (1684-1738), grandfather thomas of the dramatist, was the first to connect the family with Sheridan, He is chiefly known as the favourite com-.D.*~~

~~literature. panion and confidant of Swift during his later residence in Ireland. But enough is left of his writing to enable us to understand the secret of his attraction for a man not easily pleased. HIs correspondence with Swift and his whimsical treatise on the Art of Punning! make perfectly clear from whom his grandson derived his high spirits and delight in practical joking. The Art of Pun- ning might have been written by the author of The Critic. Swift had a high opinion of his scholarship, and that it was not contemptible is attested by an edition of the Satires of Persius, printed at Dublin in 1728. When Swift came to Dublin as dean of St Patrick's, Sheridan was established there as a schoolmaster of very high~~

~~1 Published in Nichols's Supplement to the works of Swift, 1779.~~

~~repute,—a fashionable schoolmaster, with a small landed patrimony in Cavan, and a bishop in the family two generations back. HE so won upon the dean with his mirthfulness, wit, scholarship, good-nature, and honesty that ina short time no party made for the dean's enter- tainment was considered complete without Sheridan. Sheridan was his confidant in the affair of Drapier's Letters ; it was at Quilca,! Sheridan's country cottage in Cavan, that Gullwer's Travels was prepared for the press ; and this favoured friend was from an early period in their acquaintance one of his most confidential correspondents when ata distance. Through Swift's influence he obtained a living near Cork, but damaged his prospects of further preferment by a feat of unlucky absence of mind. HAving to preach at Cork on the anniversary of Queen Anne's death he hurriedly chose a sermon with the text, "Suffi- cient unto the day is the evil thereof," and was at once struck off the list of chaplains to the lord-lieutenant and forbidden the castle. In spite of this mishap, for which the archdeacon of Cork made amends by the present of a lease worth £250 per annum, he "still remained," accord- ing to Lord Orrery, "a punster, a quibbler, a fiddler, and a wit," the only person in whose genial presence Swift relaxed his habitual gloom. HIs latter days were not prosperous, probably owing to his having "a better know- ledge of books than of men~~

~~*or of the value of money," and he died in poverty and ill-health in 1738. The biographers of Brinsley Sheridan are disposed to dwell chiefly on the eccentricities of his ancestors, but both his grandfather and his father gave ample proof of more solid qualities than improvidence and wit. The original source of information about the schoolmaster grandfather is the father's Life of Swift (pp. 369-395), where his scholarship is dwelt upon as much as his improvident conviviality and simple kindliness of nature.*~~

~~*2, THomas SHERIDAN (1721-1788), son of the above, born at Quilea in 1721, had a more conspicuous career than his father. This ambitious father sent him to an English school, Westminster ; but he was forced by stress of circumstances to return to Dublin and complete his education at Trinity College. Then he went on the stage, and at once made a local reputation. There is a tradition that on his first appearance in London he was set up as a rival to Garrick, and Moore countenances the idea that Garrick remained jealous of him to the end. For this tradition there is little foundation. Sheridan's first appearance in London was at Covent Garden in March 1744, when, heralded in advance as the brilliant Irish comedian, he acted for three weeks in a succession of leading parts, Hamlet being the first. He did not appear in London again till ten years afterwards, when he was the leading actor for a season at the same theatre. In the interval he had been manager of a theatre in Dublin, had married a highly accomplished and well-born lady (see next notice), and had been driven from Dublin as a result of taking the unpopular side in politics. After his season in London he tried Dublin again, but after two years more of unremunerative management, he left for England finally in 1758. By this time he had con- ceived his scheme of British education, and it was to push this rather than his connexion with the stage that he crossed St George's Channel. He lectured at Oxford and Cambridge, and received honorary degrees from both universities in 1758 and 1759. But the scheme did not make way, and we find him in 1760 acting under Garrick at Drury Lane. His merits as an actor may be judged from the description of him in the Rosciad (1. 987) at this period. He is placed in the second rank, next to Garrick,*~~

~~*. 1 Spelt Quilea, it may be noted, in the second T. Sheridan's Life of wift.*~~

~~but there is no hint of possible rivalry. Churchill de- scribes him as an actor whose conceptions were superior to his powers of execution, whose action was always forc- ible but too mechanically calculated, and who in spite of all his defects rose to greatness in occasional scenes. Churchill never erred on the side of praising too much, and his description may be accepted as correct, supported as it is by the fact that the actor eked out his income by giving lessons in elocution. Boswell has some amus- ing remarks on his success with a distinguished Scotch pupil, who used his influence to get a pension for him from Lord Bute. Sheridan, however, attracted attention chiefly by his enthusiastic advocacy, im public lectures and books, of his scheme of education, in which oratory was to play a principal part. It is generally said that he traced all the evils and perils of the Commonwealth to the neglect of oratory. But this is a caricature. There was more serious substance in his indictment of the estab- lished system of education. His main count was that it did not fit the higher classes for their duties in life, that it was uniform for all and profitable for none ; and he urged as a matter of vital national concern that special training should be given for the various professions. Oratory came in as part of the special training of men intended for public affairs, but his main contention was one very familiar now,—that more time should be given in schools to the study of the English language. He rode his hobby with great enthusiasm, published an elaborate and eloquent treatise on education, and lectured on the subject in London, Oxford, Cambridge, Edinburgh, and other towns. In 1769, after a residence of some years in France, partly for economy, partly for his wife's health, partly to study the system of education there, he published a matured Plan of Education, with a letter to the king, in which he offered to devote the rest of his life to the execution of his theories on condition of receiving a pension equivalent to the sacrifice of his professional income. His offer was not accepted; but Sheridan, still enthusiastic, retired to Bath, and prepared a pronouncing Dictionary of the English Language, with a prosodial grammar. After his son's brilliant success he assisted in the management of Drury Lane, and occasionally acted. His Life of Swift, a very entertaining book in spite of its | incompleteness as a biography, was published in 1784. He died at Margate in 1788. The year before his death~~

~~*he had a prospect of realizing his scheme of education in Ireland, but the high official who had sought his advice died just as the old man eagerly reached Dubhn, and his hopes were disappointed.*~~

~~*3. FRANcrs SHERIDAN (1724-1766), wife of the above, Mrs and mother of the dramatist, wrote two novels of high ee repute in their day, Sidney Biddulph and Nourjahad, and 8°45*~~

~~*two plays, Zhe Discovery and The Dupe. We have it on the authority of Moore that, when The Rivals and The Duenna were running at Covent Garden, Garrick revived The Discovery at Drury Lane, as a counter-attraction, "to play the mother off against the son, taking on himself to act the principal part in it." But the statement, intrinsi- cally absurd, is inaccurate. Zhe Discovery was not an old play at the time, but one of Garrick's stock pieces, and Anthony Bromville was one of his favourite characters. It was first produced in 1763. So far from being jealous of the elder Sheridan, Garrick seems to have been a most useful friend to the family, accepting his wife's play — which he declared to be "one of the best comedies he ever read " — and giving the husband several engagements. Mrs Sheridan's novels and plays were all written in the last six years of her life. She died at Blois in 1766. Her maiden name was Chamberlaine. Her father was a dignitary in the Irish Church, her grandfather an English*~~

~~*Richard Brinsley Sheridan.*~~

~~*vita k iD A*~~

~~*baronet. Her marriage with the actor was the result of romantic circumstances, fully detailed in the Memoirs of Mrs Frances Sheridan, mentioned below.*~~

~~*4. Ricuarp Brinstey Burier Suerman (1751 — 1816), second son of Thomas and Frances Sheridan, was born in Dublin in September 1751: Moore records for the encouragement of slow boys that the future drama- tist was "by common consent of parent and preceptor pronounced an impenetrable dunce." The plain fact is that the expression occurs in a smart letter about him and his sister, written by his mother to a*~~

~~*schoolmaster. Mrs Sheridan wrote that she had been the only instructor of her children hitherto, and that they would exercise the schoolmaster in the quality of patience, "for two such impenetrable dunces she had never met with," One of the children thus humorously described was Richard Brinsley, and the age of the " impenetrable dunce" at the time was seven. At the age of eleven he was sent to Harrow. There, to please orthodox biographers, he gave no such sign of future eminence as is implied in taking a high place in school. Dr Parr, who was one of his masters, "saw in him vestiges of a superior intellect," but, though he 'did not fail to probe and tease him," by no harassing or tormenting process could he incite' the indolent boy to greater industry than was " just sufficient to save him from disgrace." But these facts about young Sheridan's determined indolence in the study of Latin and Greek should be taken in connexion with his father's peculiar theories on the subject of English education. The father's theories possibly did not encourage the son to learn Latin and Greek. Why, with his views on the unprofitableness of those studies, he sent his younger son to Harrow, is not obvious; but it was probably as much for social as for educational reasons. If so, the purpose was answered, for Sheridan was extremely popular at school, winning somehow, Dr Parr confesses, "the esteem and even admiration of all his schoolfellows," and giving a foretaste of his mysterious powers of getting things done for him by making the younger boys steal apples for his own private store and good-humouredly defying the masters to trace the theft home to him.*~~

~~*Sheridan left Harrow at the age of seventeen, having impressed his schoolfellows at least, who are sometimes better judges than their masters, with a vivid sense of his powers. It was probably his father's design to send him afterwards to Oxford; but the family circumstances were too straitened to permit of it, and the educationist, who had just then returned from France, and was about to launch his appeal to the king on behalf of his new plan of education, took his son home and himself directed and superintended his studies. What his plans were for his brilliant son's future we have no means of knowing, but the probability is that, if the projected academy had becoine an accomplished fact, he would have tried to make Richard Brinsley an upper master in some one of its numerous departments. 'There are traces of method in the*~~

~~*superficially harum-scarum Irishman's courses, and it looks as if he had intended both of his sons to help him in the magnificent project from which his sanguine tempera- ment expected such great things,—the elder, who had been with him in France, in what would now be called the modern side, and the classically educated younger in the ancient side. Meantime, pending His Majesty's resolution on the projector's offer, Brinsley, besides being trained by his father daily in elocution, and put through a course of English reading in accordance with the system, received the accomplishments of a young man of fashion, had fencing and riding lessons at Angelo's, and began to eat terms at the Middle Temple. His destination apparently was the bar, if fortune should deny him the more glorious*~~

~~*OF career of lieutenant in the new academy through which young England was to be regenerated.*~~

~~*As to how young Sheridan, with a cooler head to regulate his hot Irish blood, looked at his father's grand schemes, we have no record. But it is of importance to remember those schemes, and the exact stage they had now reached, in connexion with the accepted view of Sheridan's behaviour at this time, which represents him as a mere idler, hanging on at home like an ordinary ne'er- do-well, too indolent to work for any profession, simply enjoying himself and trusting recklessly to chance for some means of livelihood. The fact would seem to be that over and above whatever he did in the way of qualifying him- self for a regular career—which possibly was little enough—he began from this time with fundamentally steady purpose to follow the bent of his genius. After leaving Harrow he kept up a correspondence with a school friend who had gone to Oxford. With this youth, whose name was Halhed, he had not competed for school honours; but both had dreams of higher things ; and now they concocted together various literary plans, and between them actually executed and published metrical translations of Aristzenctus——an obscure Greek or pseudo-Greek author brought to light or invented at the Renaissance, a writer of imaginary amorous epistles. The two literary partners translated his prose into verse which has the qualities of lightness, neatness, and wit, and is in no respect unworthy of being the apprentice-work of Sheridan.*~~

~~*In conjunction with the same young friend he began a farce entitled Jupiter. It was not completed, but the fragment is of interest as containing the same device of a rehearsal which was afterwards worked out with such brilliant effect in The Critic. Some of the dialogue is very much in Sheridan's mature manner. It would seem indeed that at this time, idle as he appeared, Sheridan was deliberately exercising his powers and preparing himself for future triumphs. Moore's theory is that his seeming indolence was but a mask; and extracts given from papers written in the seven years between his leaving Harrow and the appearance of Zhe Rivals—sketches of unfinished plays, poems, political letters, and pamphlets—show that he was far from idle. He was never much of areader ; he preferred, as he said, to sit and think—a process more favourable to originality than always having a book in his hand ; but we may well believe that he kept his eyes open, and his father's connexion with fashionable society gave him abundant opportunities. The removal of the family to Bath in 1771! extended his field of observation. Anstey's Vew Bath Guide had just been published and had greatly stimulated interest in the comedy of life at this fashionable watering-place.*~~

~~*Presently, too, already a favourite in Bath society from his charming manners and his skill as a writer of graceful and witty verses, the youth played a part in the living comedy which at once made hima marked man. There was in Bath a celebrated musical family—'"a nest of nightingales,"—the daughters of the composer Linley, the head of his profession in the fashionable town. The eldest daughter, a girl of sixteen, the prima donna of her father's concerts, was exceedingly beautiful, and very much run after by suitors, young and old, honourable and dis-honourable. In the latter class was a Captain Mathews, a married man; in the former, young Sheridan. Mathews had artfully won the girl's affections, and persecuted her with his importunities, threatening to destroy himself if she refused him. To protect her from this scoundrel's designs the younger lover, who seems to have acted at first*~~

~~*' Miss Lefanu corrects Moore's date of 1770, considering the difference important as bearing on Sheridan's education (ALemoirs, p. 348).*~~

~~*only as a confidential friend, conceived the romantic of escorting Miss Linley to a nunnery in France.) After performing this chivalrous duty he returned and fought two duels with Mathews, which made a considerable sensation at the time. The youthful pair had gone through the ceremony of marriage in the course of their flight, but Sheridan chivalrously did not claim his wife, kept the marriage secret, and was sternly denied access to Miss Linley by her father, who did not consider the professionless young man an eligible suitor. Ultimately, after a courtship romantic enough to have satisfied Lydia Languish, they were openly married in April 1773.*~~

~~*Sheridan's daring start in life after this happy marriage showed a confidence in his genius which was justified by its success. Although he had no income, and no capital beyond a few thousand pounds brought by his wife, he took a house in Orchard Street, Portman Square, furnished it "in the most costly style," and proceeded to return on something like an equal footing the hospitalities of the fashionable world. His wife—'the celebrated Miss Linley "—was a most popular singer, but he would not allow her to appear in public. She was to be heard only at private concerts in their own house, and her beauty and accomplishments combined with her husband's wit to draw crowds of fashionable people to their entertainments. Sheridan's conduct may have been youthful pride and recklessness, the thoughtless magnificence of a strong and confident nature ; all the same, it answered the purpose of deep-laid and daring policy. When remonstrated with by a friend, and asked how he found the means of supporting such a costly establishment, he is said to have answered— "My dear friend, it is my means." And so it proved, for his social standing and popularity helped to get a favour- able start for his first comedy, The Rivals, produced at Covent Garden on the 17th January 1775.*~~

~~*The S&ivals is said to have been not so favourably received on its first night, owing to its length and to the bad playing of the part of Sir Lucius O'Trigger. But the defects were remedied before the second performance, and the piece at once took that place on the stage which it has never lost. It was the last season but one of Garrick's long career, and the current story preserved by Moore is that the run upon Covent Garden was such as to alarm the veteran of Drury Lane and drive him to extraordinary*~~

~~exertions to counterbalance the attractions of the new play. This seems to be a myth, natural enough in the circumstances, but unfounded in fact, for we have contem- porary testimony ? that Drury Lane was never more crowded than during the last years of Garrick's management, when it was known that he intended to retire from the stage. There were crowded houses at both theatres. Sheridan, though bearing his brilliant success lightly, proceeded at once to take the tide at the flood. St Patrick's Day, or the Scheming Lieutenant, a lively farce, written it is said at the request of Clinch, in gratitude for his coming to the rescue of Sir Lucius, was producced in May. In the course of the year, with the assistance of his musical father-in-law, he wrote the comic opera of Zhe Duenna; and by the end of the year, with an eye to the profits of theatrical manage- ment, he was in negotiation with Garrick for the purchase of his share of Drury Lane. Zhe Duenna was the great theatrical success of the winter of 1775-76; it ran even longer than T'he Beggar's Opera had done—up to that time the longest run on record, The bargain with Garrick was completed in June 1776. The sum paid for the half-share was £35,000; of this Sheridan contributed £10,000.~~

~~1 The letter from Miss Linley to a female friend, giving a minute account of her persecution by Mathews and deliverance by Sheridan, is declared by Mrs Norton to be a " foolish forgery." —Aacmillan's Magazine, iti. 178. ? See Blackwood's Magazine, vol. xx. p, 26.~~

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~~plan | None of his letters show where the money came from, and~~

~~much wonder has been expressed on the subject ; but after all it is not so very mysterious that the most brilliant dramatist of his time, in all the credit of unparalleled success, should have been able to borrow such a sum as this with the best theatrical property to offer as security. There is a tradition that Garrick advanced the money or let it lie at interest; anyhow, the loan could not have appeared at the time a very risky speculation. T'wo years afterwards Sheridan and his friends bought the other half of the property for £45,000.~~

~~*From the first the direction of the theatre would seem to have been mainly in Sheridan's hands. It was opened under the new management in February 1777, with a purified version of Vanbrugh's Relapse, under the title of A Trip to Scarborough. This is printed among Sheridan's works, but he has no more title to the authorship than Colley Cibber to that of Richard III. His chief task was to remove indecencies ; he added very little to the dialogue. Astonishment has been expressed that he should have fallen back on an old play instead of writing a new one. The fact is quoted among the proofs of his indolence. But the new manager, apart from the engagements of a popular man of fashion, probably found work and worry in his novel task of organization sufficient to leave him little leisure for composition. Vanbrugh's play was probably chosen for the simple reason that it suited his company. Possibly also he wished to make trial of their powers before entrusting them with a play of his own. The School for Scandal was produced little more than two months afterwards. Mrs Abington, who had played Miss Hoyden in the Z'rip, played Lady Teazle, who may be regarded as a Miss Hoyden developed by six months' experience of marriage and town life. The actors who played the brothers Surface had been tried in the Z'rip in opposite characters, Charles playing Townley, while Joseph played Tom Fashion. It looks as if shrewd managerial caution was responsible for the delay quite as much as indolence. The former may at least have been in Sheridan's mind the plausible excuse for the latter. There are tales of the haste with which the conclusion of The School for Scandal was written, of a stratagem by which the last act was got out of him by the anxious company, and of the fervent "' Amen" written on the last page of the copy by the prompter, in response to the author's "Finished at last, thank God!" But, although the conception was thus hurriedly completed, we know from Sheridan's sister that the idea of a "scandalous college " had occurred to him five years before in connexion with his own experiences at Bath. His difficulty was to find a story sufficiently dramatic in its incidents to form a subject for the machinations of the character-slayers. He seems to have tried more than one plot, and in the end to have desperately forced two separate conceptions together. The dialogue is so brilliant throughout, and the auction scene and the screen scene so effective, that nobody cares to examine the construction of the comedy except as a matter of critical duty. Buta study of the construction brings to light the difficulties that*~~

~~must have worried the author in writing the play, and explains why he was so thankful to have it finished and done with at last. After all, he worried himself in vain, for Zhe School for Scandal, though it has not the unity of The Rivals, nor the same wealth of broadly humorous incident, is universally regarded as Sheridan's masterpiece. He might have settled the doubts and worries of authorship with Puff's reflexion '" What is the use of a good plot except to bring in good things?" The vitality of a play depends mainly on its good things in the way of character, incident, and happy saying, and to a very limited extent on their relevance to any central plan.~~

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~~The third and last of Sheridan's great comedies, The Critic, was produced in 1779, The School for Scandal meantime continuing to draw larger houses than any other play every time it was put on the Stage. The Critic is perhaps the highest proof of Sheridan's skill as a dramatist, for in it he has worked out, with perfect success for all time, a theme which, often as it has been attempted, no other dramatist has ever succeeded in redeeming from tedious circumstantiality and ephemeral personalities. The laughable infirmities of all classes connected with the stage, — authors, actors, patrons, and audience,— are touched off with the lightest of hands; the fun is directed, not at individuals, but at absurdities that grow out of the circum. stances of the stage as naturally and inevitably as weeds ina garden. It seems that he had accumulated notes, as his habit was, for another comedy to be called A ffectation. But apparently he failed to hit upon any story that would enable him to present his various types of affectation in dramatic interaction. The similar difficulty in his satire against scandal, of finding sufficiently interesting materials for the scandal-mongers, he had surmounted with a violent effort. This other difficulty he might have surmounted too, if he had had leisure to " sit and think " till the happy thought came. But his energies were now called off in a different direction. His only dramatic composition during the remaining thirty-six years of his life was Przarro, pro- duced in 1799—a tragedy in which he made liberal use of some of the arts ridiculed in the person of Mr Puff. He is said also to have written more of The Stranger than he was willing to acknowledge.~~

~~He entered parliament for Staffordin 1780. It was not a sudden ambition to shine on a wider stage after having gained the highest honours of the theatre. Ever since leaving Harrow he had dabbled a little in politics, had sketched letters in the manner of Junius, and begun an answer to Johnson's Taxation no Tyranny. But he had not made any public appearance as a politician until his acquaintance with Fox led to his appearing on a West- minster platform with the great leader of Opposition. Apparently he owed his election for Stafford to more substantial persuasives than the charms of his eloquence. He paid the burgesses five guineas each for the honour of representing them. It was the custom of the time. His first speech in parliament, like the first speech of a great parliamentarian of this century, between whose career and Sheridan's there are many striking points of resemblance and contrast, was a failure. But he persevered, spoke httle for a time and chiefly on financial questions, soon took a place among the best speakers in the House, and under the wing of Fox filled subordinate offices in the short-lived ministries of 1782 and 1783. He was under- secretary for foreign affairs in the Rockingham ministry, and a secretary of the treasury in the Coalition ministry. This was rapid promotion for a man who owed everything to his own talents, and yet not an excessive recognition of the services of such a speaker as he is described as having proved himself at this exciting period. In debate he had the keenest of eyes for the weak places in an opponent's argument, and the happy art of putting them in an irresistibly ludicrous light without losing his good temper or his presence of mind. In those heated days of parlia- mentary strife he was almost the only man of mark that was never called out, and yet he had not his match in the weapon of ridicule.~~

~~The occasion that gave Sheridan a chance of rising above the reputation of an extremely effective and_ brilliant debater into the ranks of great parliamentary orators was the impeachment of Warren Hastings. His speeches in that proceeding were by the unanimous acknowledgment of his contemporaries among the greatest delivered in that~~

~~generation of great orators. The first was in ior, son Burke's proposal that Hastings should be impeached. Sheridan spoke for three hours, and the effect of his oratory was such that it was unanimously agreed to adjourn and postpone the final decision till the House should bé in a~~

~~| calmer mood. Of this, and of his last great speech on~~

~~the subject in 1794, only brief abstracts have been preserved ; but with the second, the four days' speech in Westminster Hall, on the occasion so brilliantly described by Macaulay, posterity has been more fortunate. The reader should, however, be cautioned against accepting the version given in a collection of Sheridan's speeches published by a friend after his death. This long passed current as a genuine specimen of Sheridan's eloquence at its best, in spite of Moore's protest that he had in his Possession a copy of a shorthand writer's report, and that the two did not correspond. But Gurney's verbatim reports of the speeches on both sides at the trial were published at Sir G. Cornewall Lewis's instigation in 1859, and from them we are able to form an idea of Sheridan's power as an orator. There are passages here and there of gaudily figurative rhetoric, loose ornament, and decla- matory hyperbole such as form the bulk of the incorrect version; but the strong common sense, close argumentative force, and masterly presentation of telling facts enable us to understand the impression produced by the speech at the time.!~~

~~Sheridan's long parliamentary career terminated in 1819. He could not help being to the last a conspicuous figure both in society and in parliament, but from the time of the break-up of the Whig party on the secession of Burke he was more or less an "independent member," and his isolation was complete after the death of Fox. The Begum speech remained his highest oratorical achievement, By it he is fixed in the tradition of the House as one of its greatest names. But his opinions on other great questions were given with a force and eloquence worthy of his position. When Burke denounced the French Revolution, Sheridan joined with Fox in vindicating the principle of non-intervention. He maintained that the French people should be allowed to settle their constitution and manage their affairs in their own way. But when the republic was succeeded by the empire, and it became apparent that France under~~

~~*Napoleon would interfere with the affairs of its neighbours, he employed his eloquence in denouncing Napoleon and urging the prosecution of the war. One of his most celebrated speeches was delivered in support of strong measures against the mutineers at the Nore. When the Whigs came into power in 1806 Sheridan was appointed treasurer of the navy, but was denied the honour of admission to the cabinet. After Fox's death he succeeded his chief in the representation of Westminster, and aspired to succeed him as leader of the party, but this claim was not allowed, and thenceforward Sheridan fought for his own hand. When the prince became regent in 1811 Sheridan's private influence with him helped to exclude the Whigs from power. For his interference on this occasion between the regent and his constitutional advisers Sheridan was severely blamed. 'To judge fairly as to how far he was justified in his conduct as a matter of private ethics we must take into account his previous relations with the leaders of his party, a point on which Moore, one of the disappointed placemen, is somewhat reticent. Throughout his parliamentary career Sheridan was one of the boon conipanions of the prince, and his champion in parliament in some dubious matters of payment of debts. But he always resented any imputation*~~

- ~~*For a comparison of the two versions of the speech and an able*~~

~~*exposition of the qualities of Sheridan's oratory see Mr W. Fraser Rae's Wilkes, Sheridan, and Fox, 1874.*~~

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~~*that he was the prince's confidential adviser or mouthpiece. A certain proud and sensitive independence was one of the most marked features in Sheridan's parliamentary career. After a coolness arose between him and his Whig allies he refused a place for his son from the Government, lest there should be any suspicion in the public mind that his support had been bought.*~~

~~*His last years were harassed by debt and disappoint- ment. At the general election of 1812 he stood for Westminster and was defeated, and turned in vain to his old constituency of Stafford. He could not raise money enough to win back their confidence. As a member of parliament he had been*~~

~~*safe against arrest for debt, but now that this protection was lost his creditors closed in upon him, and from this time till his death in 1816 the life of Sheridan, broken in health and fortune, discredited in reputation, slighted by old associates, so enfeebled and low-spirited as to burst into tears at a compliment, yet at times vindicating his reputaticn as the wittiest of boon companions, is one of the most painful passages in the biography of great men. Doubtless, in any attempt to judge of Sheridan as he was apart from his works, we must make considerable deductions from the mass of floating anecdotes that have gathered round his name. It was not without reason that his granddaughter Mrs Norton denounced the unfairness of judging of the real man from unauthenticated stories about his indolent procrastination, his recklessness in money matters, his drunken feats and sallies, his wild gambling, his ingenious but discreditable shifts in evading and duping creditors. The real Sheridan was not a pattern of decorous respect- ability, but we may fairly believe that he was very far from being as disreputable as the Sheridan of vulgar legend. Against the stories about his reckless management of his affairs we must set the broad facts that he had no source of income but Drury Lane theatre, that he bore from it for thirty years all the expenses of a fashionable life, and that the theatre was twice burnt to the ground during his proprietorship. Enough was lost in those fires to account ten times over for all his debts. HIs bio- graphers always speak of his means of living as a mystery. Seeing that he started with borrowed capital, it is possible that the mystery is that he applied much moro of his powers to plain matters of business than he affected or got credit for. The records of his wild bets in the betting book of Brook's Club date in the years after the loss of his first wife, to whom he was devotedly attached. The reminiscences of his son's tutor, Mr Smyth, show anxious and fidgetty family habits, curiously at variance with the accepted tradition of his imperturbable recklessness. Many of the tricks which are made to appear as the unscrupulous devices of a hunted and reckless debtor get a softer light upon them if we ascribe them toa whimsical, boyish, ungovernable love of fun, which is a well-attested feature of his character. But the real Sheridan, as he was in private life, is irrecoverably gone. Even Moore, writing so soon after his death, had to lament that he could " find out nothing about him." Moore seems to have made an imperfect, use of the family papers, and it is on record that Lord Melbourne, who had*~~

~~*undertaken to write Sheridan's life, always regretted having handed over his materials to the professional biographer. HIe died on the 7th of July 1816, and was buried with great pomp in Westminster Abbey.*~~

~~*There is, unfortunately, no complete authoritative biography of Sheridan, Mrs Norton, his granddaughter, questioned the accuracy of Moore's Life in many particulars, and announced her intention of writing a history of the Sheridans from the family papers, of which Moore had made very partial use. But she never*~~

~~*carried out the project. The current statements about the father and grandfather of the dramatist are inaccurate and misleading in*~~

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~~*several important respects. The best account of them—making allowance for a slight bias of family pride—is to be found in the Memoirs of Mrs Frances Sheridan, by her granddaughter, the dramatist's niece, Miss Lefanu. There is an excellent sketch of Sheridan's political career in Mr W. Fraser Rae's Wilkes, Sheridan, and Fox, and Mrs Oliphant's Sheridan, in the "English Men of Letters" series, interprets his character with the luminous breadth and sympathy always to be expected from her. (W. M.)*~~

~~*SHERIF, or Suzreer. See Mxcca, vol. xv. p. 672.*~~

~~*SHERIFF. For the office of sheriff in England, see County. For his jurisdiction in the revision of voters, see REGIsTRATION. The position of the sheriff as an executive officer in the United States is very similar to that of the English sheriff. HIe is usually appointed by popular election. The marshals of the United States and their deputies have in each State the same powers in executing the laws of the United States as the sheriffs and their deputies have in executing the laws of the State.*~~

~~*So far as is known the sheriff, notwithstanding the Saxon etymology of his name (shire grieve or reeve), did not exist in Scotland before the beginning of the Norman period. In the feudal system he became the centre of the local administration of justice, the representative of the*~~

~~*crown in executive as well as judicial business, and was always a royal officer appointed by and directly responsible to the king. The earliest sheriffs on record belong to the reigns of Alexander I. and David I., and the office was common before the death of Alexander III. In many cases it had become hereditary, the most remarkable instance being that of Selkirk, where a De Sinton held it from 1265 to 1805. The ordinance of Edward I. in 1305 recognized most of the existing officers, but rejected the hereditary character of the office by a declaration that the sheriffs were to be appointed and removable at the discretion of the king's lieutenant and the chamberlain. The inveterate tendency of feudalism reasserted itself, however, notwith- standing various attempts to check it, and an Act of James II. shows that the office had again become here- ditary.*~~

~~*One of the consequences was that sheriffs ignorant of law required deputes to discharge their judicial duties. In the course of succeeding reigns, down to that of James VI., the jurisdiction of the sheriffs came to be much limited by grants of baronies and regalities which gave the grantees the right to hold both civil and criminal courts of less or greater jurisdiction to the exclusion of the sheriff.*~~

~~*The civil jurisdiction of the sheriff was originally of very wide extent, and was deemed specially applicable to questions relating to the land within the shire, but after the institution of the court of session in 1532 it became restricted, and all causes relating to property in land, as well as those requiring the action called declarator for establishing ultimate right, and most of those requiring equitable remedies, were withdrawn from it. Nor did it possess any consistorial jurisdiction, as its subjects (marriage, legitimacy, and wills) belonged to the officials of the bishop after the Reformation, when it was trans- ferred to the commissary courts, and at a later period to the court of session. Practically, therefore, the civil jurisdiction of the sheriff fell under the head of actions*~~

~~*concluding for payment of money and actions to regulate*~~

~~*the possession of land. The criminal jurisdiction of the sheriff was in like manner in its origin of almost universal extent. But this was first limited to cases where the offenders were caught in or shortly after the act, after-*~~

~~*wards to cases in which the trial could be held within forty days, and subsequently further restricted as the business of the justiciary court became more organized. The punishment of death, having by long disuse come*~~

~~*.to be held beyond the power of the sheriff, and the sta-*~~

~~*tutory punishments of transportation or penal servitude*~~

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~~*never having been entrusted to him, his jurisdiction as regards crimes was usually said to be limited to those punishable arbitrarily, that is, by imprisonment, fine, or admonition.*~~

~~*As a consequence of the suppression of the Jacobite rising of 1745, after Ist March 1748 all heritable sherifiships were extinguished, and no sheriffship was to be thereafter granted either heritably or for life, or for any certain term exceeding one year, but this provision was not taken advantage of, and the office of sheriff-principal practically ceased, though that name is sometimes given to the sheriff-depute, 20 Geo. II. ¢. 43. The Act declared that there should be but one sheriff-depute or stewart- depute in every shire or stewartry, who was to be an advocate of three years' standing, appointed by the crown, with such continuance as His Majesty should think fit for the next seven years, and after that period ad wtam aut culpam. 'This period was extended by 28 Geo. IL. c. 7 for fifteen years, and thereafter (since 1769) the sheriff- depute has held his office ad witum aut culpam. Power was given to him by 20 Geo. II. c. 43 to appoint one or more persons as substitutes during his pleasure, for whom he should be answerable. At first no legal qualification was necessary and no salary paid, but gradually the shériff-depute delegated more legal business to the sub- stitute, and before 1761 it had become customary for the sheriff-depute to give him some allowance. In 17 87 he was placed on the civil establishment and paid by the crown ; in 1825 a qualification of three years' standing (now five years by 40 and 41 Vict, c. 50) as an advocate or procurator before a sheriff court was required (6 Geo. IV. ¢. 23) ; in 1838 he was made removable by the sheriff- depute, only with the consent of the lord president and lord justice clerk, and it*~~

~~*was made compulsory that he should reside in the sheriffdom, the provision of 20 Geo. II. ¢. 43, which required the sheriff-depute so to reside for four months of each year, being repealed (1 and 2 Vict. c. 119); and in 1877 the right of appointment of the substitutes was transferred from the sheriff-depute to the crown (40 and 41 Vict. c. 50).*~~

~~*While the sheriff-depute has still power to hear cases in the first instance, and is required to hold a certain number of sittings in each place where the sheriff-substitute holds courts, and also once a year a small-debt court in every place where a circuit small-debt court is appointed to be held, the ordinary course of civil procedure is that the sheriff-substitute acts as judge of first instance, with an appeal under certain restrictions from his decision to the sheriff-depute, and from him to the court of session in all causes exceeding £25 in value. An appeal direct from the sheriff-substitute to the court of session is competent, but is not often resorted to,*~~

~~*As regards criminal proceedings, summary trials are usually conducted by the sheriff-substitute ; trials with a jury either by him or, in important cases, by the sheriff- depute. The sheriff-substitute also has charge of the pre- liminary investigation into crime, the evidence in which, called a precognition, is laid before him, and if necessary taken before him on oath at the instance of his procurator- fiscal, the local crown prosecutor.*~~

~~*The duties of the sheriff-depute are now divided into ministerial or administrative and judicial. The ministerial are the supervision of the accounts of the inferior officers of the sheriffdom ; the superintendence of parliamentary elections ; the holding by him- self or his substitutes of the courts for registration of electors ; the preparation of the list of persons liable to serve both on criminal and civil juries; the appointment of sheriff officers and supervision of the éxecution of judicial writs by them ; and the striking of the "fiars." He has also to attend the judges of justi- ciary at the circuit courts for the county or counties over which his*~~

~~*jurisdiction extends. He is generally responsible for the peace of the county, and supervises the police establishment. He is ex officio*~~

~~*a justice of the peace and commussioner of supply. In addition to those general duties of sheriffs-depnte, particular sheriffs are attached to the Board of Supervision for the Relief of the Poor, the _& Board of Northern Lighthouse Commissioners, and the Scottish Fishery Board.*~~

~~*The judicial duties of the sheriff-depute are, as regards crimes, the trial of all causes remitted by the counsel of the crown for the trial by sheriff and jury, as well as summary trials if he chooses to take them. _ This now means most crimes for which a maximum of two years' imprisonment (in practice eighteen months is the*~~

~~*money, whatever may be the cause of action, with the exception of a few where the payment depends on status, all actions with*~~

~~*chancery. Formerly the jurisdiction of the sheriff was absolutely excluded after the institution of the court of session in four important classes of action—(1) relative to property in lands or rights in lands ; (2) requiring the use of pecnliar forms of action, : and suspension; (3) involving the exercise of the nobile oficium, a supreme equitable jurisdiction of the court of session ; and (4) for the determination of rights of status, as well as in many cases in which the proceedings rest on special statutes which gave an exclusive jurisdiction to the court of session. But large exceptions have been made by recent legisla. tion from this exclusion, By another series of statutes, for the most part connected with local administration, as the Road, Burial Grounds, Lunacy, Public-houses, and General Police and Education Acts, the jurisdiction of the court of session is excluded either ag an original court or a court of review, and the sheriff court has exclusive jurisdiction.*~~

~~*The courts which the sheriff holds are (1) the criminal court ; (2) the ordinary civil court ; (3) the small-debt court for cases under £12 in value (6 Geo. IV. c. 48); (4) the debts recovery court for cases above £12 and under £50 in value (30 and 31 Vict. c. 96); and (5) the registration court. His judgment in the criminal court is subject to review by the court of justiciary, and in "he ordinary civil court and the debts recovery court by the court ofsession. In the small debt court it is final; except in certain cases where an appeal lies to the next circuit court of justiciary. he sheriff- substitute may competently exercise all the judicial jurisdiction of*~~

~~*the sheriff, subject to appeal in civil cases other than small-debt cases. As regards his administrative functions he assists the sheriff generally, and may act for him in the registration aud fiars court, and he supcrintends the preliminary stage of criminal inquiries, consulting with the sheriff if necessary ; but the other administrative duties of the office are conducted by the sheriff- depute in person. The salaries of sheriffs-depute vary from £2000 to £500 a year, those of sheriffs-substitute from £1400 to £500.*~~

~~*There is a principal sheriff-clerk appointed by the crown for each county, who has depute clerks under him in the principal towns, and a procurator-fiscal for the conduct of criminal prosecutions for each county and district of a county, who is appointed by the sheriff with the sanction of the home secretary.*~~

~~*Besides the sheriffs of counties, there is a sheriff of chancery appointed by the crown, whose duties are confined to the service of heirs, with a salary of £500. (4. M.)*~~

~~*SHERLOCK, Tuomas (1678-1761), bishop of London, the son of Dr William Sherlock, noticed below, was born at London in 1678. He was educated at Catherine Hall, Cambridge, and in 1704 succeeded his father as master of the Temple. He took a prominent part in the Bangorian controversy against Hoadly, whom he succeeded as bishop of Bangor in 1728; he was afterwards translated to . Salisbury in 1734, and to London in 1738. He pub- lished against Collins's Grounds and Reasons of the Chris- tian Keligion a volume of sermons entitled The Use and Intent of Prophecy in the Several Ages of the World (1725); and in reply to Woolston's Discourses on the Miracles he wrote a volume entitled Zhe T'rial of the Witnesses of the Lesurrection of Jesus (1729), which in a very short time ran through fourteen editions. His Pastoral Letter (1750) on "the late earthquakes" had a circulation of many thousands, and four volumes of Sermons which he pub- lished in his later years (1754-58) were also at one time highly esteemed. He died in 1761. A collected edition of his works in 5 vols. 8vo, by Hughes, appeared in 1830.*~~

~~*XXI. — 101*~~

~~*SHERLOCK, Wiz11am (1641-1707), dean of St Paul's,*~~

~~*was born at Southwark in 1641, and was educated at*~~

~~*Eton and Cambridge (Peterhouse). In 1669 he became rector of St George, Botolph Lane, London, and in 1681 he was appointed a prebendary of St Paul's. In 1684 he published Zhe Case of Resistance of the Supreme Powers stated and resolved according to the Doctrine of the Holy Scriptures, an ably written treatise, in which he drew the distinction between active and passive obedience which was at that time generally accepted by the high church clergy; in the same year he was made master of the Temple. In 1686 he was reproved for preaching against popery and his pension stopped. After the Revolution he was suspended for refusing the oaths to William and Mary, but before his final deprivation he yielded, justify- ing his change of attitude in The Case of the Allegiance due to Sovereagn Powers stated and resolved according to Scripture and Reason and the Principles of the Church of England (1691). During the period of his suspension he wrote a Practical Discourse concerning Death, which became very popular and has passed through many editions. In 1690 and 1693 he published volumes on the doctrine of the Trinity which involved him in a warm controversy with South and others. He became dean of St Paul's in 1691, and died at Hampstead in 1707.*~~

~~*SHERMAN, a city of the United States, in Grayson county, Texas, 73 iniles north of Dallas, is a substantially built and flourishing place, with a court-house and a college. Its population, only 1439 in 1870, was 6093 in 1880 and has since increased to about 8000. The surrounding country is a cotton and grain district.*~~

~~*SHERWIN, Joun Keryse (1751-1790), engraver and history-painter, was born in 1751 at East Dean in Sussex. His father was a wood-cutter employed in shaping bolts for shipbuilders, and the son followed the same occupation till his seventeenth year, when, having shown an aptitude for art by copying some miniatures with exceptional accuracy, he was befriended by Mr William Mitford, upon whose estate the elder Sherwin worked, and was sent to study in London, first under John Astley, and then for three years under Bartolozzi—for whom he is believed to have executed a large portion of the plate of Clytie, after Annibal Caracci,*~~

~~published as the work of his master. He was entered as a student of the Royal Academy, and gained a silver medal, and in 1772 a gold medal for his painting of Coriolanus Taking Leave of his Family. From 1774 till 1780 he was an exhibitor of chalk drawings and of engravings in the Royal Academy. Establishing himself in St James's Street as a painter, designer, and engraver, he speedily attained popularity, and began to mix in fashionable society. His drawing of the Finding of Moses, a work of but slight artistic merit, which introduced portraits of the princess royal of England and other leading ladies of the aristocracy, hit the public taste, and, as reproduced by his burin, sold largely. In 1785 he succeeded Woollett as engraver to the king, and he also held the appointment of engraver to the prince of Wales. His professional income rose to about £12,000 a year ; but he was constantly in pecuniary difficulties, for he was shiftless, indolent, and without method, open-handed and even prodigal in his benefactions,—and prodigal, too, in less reputable directions, for he became a reckless gambler, and habits of intemperance grew upon him. He died in extreme penury on the 24th of September 1790,—accord- ing to Steevens, the editor of Shakespeare, at "The Hog in the Pound," an obscure alehouse in Swallow Street, or, as stated by his pupil J. T. Smith, in the house of Robert Wilkinson, a printseller in Cornhill.~~

~~It is as an engraver that Sherwin is most esteemed ; and it may be noted that he was ambidexterous, working indifferently with~~

~~either hand upon his plates. His drawing is correct, his line ex- cellent, and his textures are varied and intelligent in expression. Such of his plates as the Holy Family after Nicholas Poussin, Christ Bearing the Cross after Murillo, the portrait of the Marquis of Buckingham after Gainsborough, and that of Pitt occupy a high place among the productions of the English school of line-engravers. He also worked after Pine, Dance, and Kauffman.~~

~~SHETLAND ISLANDS. See Orknzy anp SHETLAND.~~

~~SHIELD. See Arms anp Armour, and HERALpRY.~~

~~*SHIELD, Witt1am (1748-1829), composer of English operas, was born at Swalwell, near Newcastle, in 1748. HIs father began to teach him singing before he had com- pleted his sixth year, but died three years later, leaving him in charge of guardians who made no provision what- ever for continuing his musical education, for which he was thenceforward dependent entirely upon his own aptitude for learning, aided by a few lessons in thoroughbass which he received from Charles Avison. Notwithstanding the difficulties inseparable from this imperfect training, he obtained admission into the opera band in 1772, at first as a second violin, and afterwards as principal viola; and this engagement he retained for eighteen years. In the meantime he turned his serious attention to composition, and in 1778 produced his first comic opera, The Flitch of Bacon, at the Little Theatre in the Haymarket, with so great success, that he was immediately engaged as com- poser to Covent Garden theatre, for which he continued to produce English operas and other dramatic pieces, in quick succession, until 1797, when he resigned his office, and devoted himself to compositions of a different class, producing a great number of very beautiful glees, some instrumental chamber music, and other miscellaneous com- positions. He died in London January 25, 1829, and was buried in the south cloister at Westminster Abbey.*~~

~~*Shield's most sueeessful dramatic compositions were Rosina, The Mysteries of the Castle, The Lock and Key, and The Castle of Andalusia. Asa composer of songs he was in no degree inferior to his great contemporary Charles Dibdin. Indeed Zhe Arethusa, The Heaving of the Lead, and The Post Captain are as little likely to be forgotten as Dibdin's Yom Bowling or Saturday Night at Sea. HIs vein of melody was inexhaustible, thoroughly English in eharacter, and always eonceived in the purest and most delicate taste; and hence it 1s that many of his airs are still sung at eon- eerts, though the operas for which they were written have long been banished from the stage. HIs Introduction to Harmony (1794 and 1800) eontains a great deal of valuable information ; and he also published a useful treatise, The Rudiments of Thoroughbase.*~~

~~*SHIELDS, Norra. See Tynemouts, within which borough the port is included.*~~

~~*SHIELDS, Sovuru, a seaport, market-town, and muni- cipal and parliamentary borough of Durham, is situated on the south bank of the Tyne, at its mouth, immediately opposite North Shields and Tynemouth, and on the North- Eastern Railway, 18 miles north-east of Durham and 9 east of Newcastle-on-Tyne. It is connected with North Shields and Tynemouth by steam ferries. The town possesses a spacious market-place, and some of the newer streets are wide and handsome, but the old street running along the shore is narrow and mean. Formerly salt was largely manufactured, but the principal industries now are the manufacture of glass and chemicals, and shipbuilding and ship refitting and repairing, for which there are docks capable of receiving the largest vessels. The North- Eastern Railway Company possesses extensive docks, and the port has a large trade in coal; but, owing to the fact that in the shipping returns of the United Kingdom it is included under the general title "Tyne Ports," it is impos- sible to give an accurate statement regarding the number and tonnage of vessels. The number of fishing vessels connected with the port in 1884 was 15, of 204 tons and employing 98 men. At the mouth of the Tyne there is a pier about a mile in length. A townsman of South*~~

~~*Shields, William Wouldhave, was the inventor of the life-*~~

~~*boat, and the first lifeboat was built there by Henry Greathead, and first used in a storm in 1789. The prin- cipal public buildings are the church of St Hilda, with a picturesque old tower; the town-hall in the market. place ; the exchange ; the custom-house 3 the mercantile marine offices; the public library and museum, which includes a large hall for public meetings and a school of science and art in connexion with South Kensington ; the high school, the grammar school, the marine school, the master-mariners' asylum, the Ingham infirmary, and the union workhouse. 'There is a pleasant marine park near the pier. On elevated ground near the harbour are the remains of a Roman station, where numerous coins, portions of an altar, and several sculptured memorial stones have been dug up. The site of the old station was afterwards occupied by a fort of considerable strength, which was captured by the*~~

~~*Scots under Colonel Stewart 20th March 1644. The town was founded by the convent of Durham about the middle of the 13th century, but on account of the complaints of the bur- gesses of Newcastle an order was made in the 43d year of HIenry III., stipulating that no ships should be laden or unladen at Shields, and that no "shoars" or quays should be built there. This early check seems to have been long injurious to its prosperity, for until the present century it was little more than a fishing station. It received a charter of incorporation in 1850, and is divided into three wards, governed by a mayor, eight aldernien, and twenty-four councillors. Jn 1832 it received the privilege of returning a member to parliament. The corporation act as the urban sanitary authority, and the town has a specially good water supply from reservoirs at Cleadon. The population of the municipal and_parlia- mentary borough (area 1839 acres) was 45,336 in 1871, and in 1881 it was 56,875.*~~

~~*SHIITES. See Sunnrres anp Sur'rres.*~~

~~*SHIIKARPUR, a British district in the province of Sind, Bombay presidency, India, with an area of 10,000 square miles, lying between 27° and 29° N. lat. and between 67° and 70° E. long. It is bounded on the N. by Khelat, Upper Sind Frontier district, and the river Indus ; on the E. by the native states of Bahawalpur and Jaisalmir 3 on the S. by Khairpur state; and on the W. by the Khirthar Mountains. Shikdrpur is a vast alluvial plain, broken only at Sukkur and Rohri by limestone hills. The Khirthar range attains an elevation of 7000 feet, and forms a natural boundary between the district and Baluch- istan, Extensive patches of salt land, known as kalar, are frequently met with, especially in the upper portion of Shikdrpur, and towards the Jacobabad frontier barren tracts of clay land and ridges of sand-hills, covered with caper and thorn jungle, form a poor but distinctive feature in the landscape. The desert portion of Rohri subdivision, known as the Registhdn, is very extensive. The forests (207 square miles) are situated on the banks of the Indus, mostly in the Rohri and Shikdrpur subdivisions. The Indus Valley State Railway runs through the district, and the Kandahar railway also goes through a part of it.*~~

~~In 1881 the population numbered 852, 986 (males 461,038, females 391,953), of whom 93,341 were Hindus, 684,275 Mohammedans, and 736 Christians. The chief towns are Shikarpur, Sukkur (population 27,389), Larkhana (18,188), and Rohri (10,224). The cultivated land in 1882-83 amounted to 764,488 acres, of which 108,636 were twice cropped. Cereals —chiefly rice, joar (millet), and wheat—form the principal crops; but a considerable area is also under pulses and oil-seeds. The chief manufactures are carpets and coarse cotton cloths. The total revenue raised in 1882-83 amounted to £234,792, of which the land contributed £189,869. Passing from the dominion of the caliphs, Shikarpur was overrun by Mahmud of Ghazni in 1025, and a little later was governed by the Suinras, the Sammas, and the Arghuns in succession. The Kalhora dynasty came into prominence in the 18th century, and was followed by the Talpur mirs, who annexed a part of the Durani~~

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~~territory and incorporated it in the district. In 1848 Shikarpur passed to the British, and in 1852 the greater part of the Rohri subdivision was resumed from the mir of Khairpur, who had acquired it by fraud.~~

~~; SHIKARPUR, the chief town of the above district, 1s situated 18 miles west of the Indus, in a tract of low- lying country annually flooded by the canals from that river, It is a great entrepédt for transit trade between the Bolan Pass and Karachi. The population in 1881 num- bered 42,496 (males 22,889, females 19,607).~~

~~SHILOH, a town of Ephraim, where the sanctuary of the ark was, under the priesthood of the house of Eli. According to 1 Sam. iii. 3, 15, this sanctuary was not a tabernacle but a temple, with doors, But the priestly narrator of Josh. xviii. 1 has it that the tabernacle was set up there by Joshua after the conquest. In Judges xxl. 19 sq. the yearly feast at Shiloh appears as of mcrely local character. Shiloh seems to have been destroyed b~~

~~*he Philist; : 7 Y the hilistines after the disastrous battle of Ebenezer ees Jeremiah vi. 12 sq. The position described in Judges, loc. cit. (cf. Onomastica, ed. Lagarde, p. 152), gives cer- tainty to the identification with the modern Seilin lying Some 2 miles east-south-east of Lubbin (Lebonah), on the road from Bethel to Shechem. Here there is a ruined village, with a flat double-topped hill behind it, offering a Strong position, which suggests that the place was a strong- hold as well asa sanctuary. A smiling and fertile land- Scape surrounds the hill. The name Seiltin corresponds to Act in Josephus. LXX. has Syr4, SnAwu. The forms given in the Hebrew Bible (nw, 15) have dropped the final consonant, which reappears in the adjective s3ybwyy. On Shiloh in Gen. xlix. 10 see Jupaun.*~~

~~*SHIMOGA, or Suremoca, a district in the north-west of the native state of Mysore, Southern India. It forms a part of the Nagar division, and is situated between 13° 30' and 14° 38' N. lat. and between 74° 44' and 76° 5' E. long. It has an area of 3797 square miles, and is bounded on the N. and W. by the Bombay districts of Dharwar and N. Kanara, and E. and 8. by the districts of Chitaldroog and Kadur. Its river system is twofold ; in the east the Tungra, Bhadra, and Varada unite to form the Tungabhadra, which ultimately falls into the Kistna and so into the Bay of Bengal, while in the west a few minor streams flow to the Shiravati, which near the north-western frontier bursts through the Western Ghats by the celebrated Falls of Gersoppa, said to be the grandest cataract in India. Flowing over a rocky bed 250 yards wide, the river here throws itself in four distinct falls down a tremendous chasm 960 feet deep.*~~

~~*The western half of the district is very mountainous and covered with magnificent forest, and is known as the Malndad or hill country, some of the peaks being 4000 feet above sea-level. The general elevation of Shimoga is about 2000 feet; and towards the east it opens out into the Maidan or plain country, which forms part of the general plateau of Mysore. The Malndd region is very picturesque, its scenery abounding with every charm of tropical forests and mountain wilds; on the other hand the features of the Maidan country are for the inmost part comparatively tame. The mineral products of the district include iron-ore and laterite. On the summits of the Ghats stones possessing maguetic*~~

~~qualities are occasionally found. The soil is loose and sandy in the valleys of the Malnad, and in the north-east the black cotton soil prevails. Bison are common in the talék of Sagar, where also wild elephants are occasionally seen; while tigers, leopards, bears, wild hogs, sémbhar and chitdl deer, and jungle sheep are numerous in the wooded tracts of the west. Shimoga presents much variety of climate. The south-west monsoon is felt in full force for about 25 miles from the Ghats, bringing an annual rainfall of more than 150 inches, but the rainfall gradually diminishes to 31 inches at Shimoga station and to 25 inches or less at Chennagiri. There is no railroad in the district, but it contains 225 miles of roads,~~

~~The population in 1881 was 499,728 (males 259,296, females 240,432); Hindus numbered 470,678, Mohammedans 27,574, and Christians 1476. The only place with more than 10,000 inhabit- ants is Shimoga town, the. capital and headquarters, which is situated on the Tunga river, with a population of 12,040. Rice~~

~~is the staple food-crop of the district; the next in importance is sugar-cane ; areca-nuts are also extensively grown; and miscel- laneous crops include oil-seeds, vegetables, fruits, pepper, and cardamoms, Of the total area of 3797 square miles only 699 are returned as cultivated and 702 as cultivable. The chief manu- factures are coarse cotton cloths, rough country blankets or kamblis, iron implements, brass and copper wares, pottery, and jaggery. The district is also noted for its beautiful sandal-wood carving.~~

~~During the Mohammedan usurpation of Mysore from 1761 to 1799, unceasing warfare kept the whole country in constant turmoil. After the restoration of the Hindu dynasty Shimoga district repeatedly became the scene of disturbances caused by the mal- administration of the Deshasta Briéhmans, who had seized upon every office and made themselves thoroughly obnoxious. These disturbances culminated in the insurrection of 1830, which led to the direct assumption of the entire state by the British.~~

~~SHINTO. See Japay, vol. xiii. p. 581.~~

~~SHIP. The generic name (A. 8. scip, Ger. Schif', Gr. axdados, from the root skap, cf. "scoop ") for the invention by which man has contrived to convey himself and his goods upon water points in its derivation to the fun- damental conception by which, when realized, a means of flotation was obtained superior to the raft, which we may consider the earliest and most elementary form of vessel. The trunk of a tree hollowed out, whether by fire or by such primitive tools as are fashioned and used with singular patience and dexterity by savage races, represents the first effort to obtain flotation depend- ing on something other than the mere buoyancy of the material. The poets, with characteristic insight, have fastened upon these points. Homer's hero Ulysses is instructed to make a raft with a raised platform upon it, and selects trees "withered of old, exceeding dry, that might float lightly for him" (Od., v. 240). Virgil, glorifying the dawn and early progress of the arts, tells us, "Rivers then first the hollowed alders felt" (Georg., i. 136, il. 451), Alder is a heavy wood and not fit for rafts. But to make for the first time a dug-out canoe of alder, and so to secure its flotation, would be a triumph of primitive art, and thus the poet's expression represents a great step in the history of the invention of the ship.~~

~~Primitive efforts in this direction may be classified in the following order: (1) rafts—floating logs, or bundles of brushwood or reeds or rushes tied together ; (2) dug- outs—hollowed trees; (3) canoes of bark, or of skin stretched on framework or inflated skins (balsas); (4) canoes or boats of pieces of wood stitched or fastened together with sinews or thongs or fibres of vegetable growth ; (5) vessels of planks, stitched or bolted together with inserted ribs and decks or half decks; (6) vessels of which the framework is first set up, and the planking of the hull nailed on to them subsequently. All these in their primitive forms have survived, in various parts of the world, with different modifications marking progress in civilization. Climatic influences and racial peculiarities have imparted to them their specific characteristics, and, combined with the available choice of materials, have determined the particular type in use in each locality. Thus on the north-west coast of Australia is found the single log of buoyant wood, not hollowed out but pointed at the ends. Rafts of reeds are also found on the Australian coast. In New Guinea catamarans of three or more logs lashed together with rattan are the com- monest vessel,~~

~~*and similar forms appear on the Madras coast and throughout the Asiatic islands. On the coast of Peru rafts made of a very buoyant wood are in use, some of them as much as 70 feet long and 20 feet broad ; these are navigated with a sail, and, by an ingenious system of centre boards, let down either fore or aft between the lines of the timbers, can be made to tack. The sea-going raft is often fitted with a platform so as to protect the goods and persons carried from the wash of*~~

~~*the sea. Upright timbers fixed upon the logs forming the raft support a kind of deck, which in turn is itself fenced in and covered over.!_ Thus the idea of a deck, and that of side planking to raise the freight above the level of the water and to save it from getting wet, are among the earliest typical expedients which have found their develop- ment in the progress of the art of shipbuilding.*~~

~~*Whether the observation of shells floating on the water, or of split reeds, or, as some have fancied, the nautilus, first suggested the idea of hollowing out the trunk of a tree, the practice ascends to a very remote antiquity in the history of man. Dug-out canoes of a single tree have been found associated with objects of the Stone Age among the ancient Swiss lake dwellings ; nor are specimens of the same class wanting from the bogs of Ireland and the estuaries of England and Scotland, some obtained from the depth of 25 feet below the surface of the soil. The hollowed trunk itself may have suggested the use of the bark as a means of flotation. But, whatever may have been the origin of the bark canoe, its construction is a step onwards in the art of shipbuilding. For the lightness and pliability of the material necessitated the invention of some internal framework, so as to keep the sides apart, and to give the stiffness required both for purposes of propulsion and the carrying of its freight. Similarly, in countries where suitable timber was not to be found, the use of skins or other water-tight material, such as felt or canvas, covered with pitch, giving flota- tion, demanded also a framework to keep them distended and to bear the weight they had to carry. In the frame- work we have the rudimentary ship, with longitudinal bottom timbers, and ribs, and cross-pieces, imparting the requisite stiffness to the covering material. Bark canoes are*~~

~~*found in Australia, but the American continent is their true home. In northern regions skin or woven material made water-tight supplies the place of bark.*~~

~~*The next step in the construction of vessels was the building up of canoes or boats by fastening pieces of wood together in a suitable form. Some of these canoes, and probably the earliest in type, are tied or stitched together with thongs or cords. The Madras surf boats are perhaps the most familiar example of this type, which, however, is found in the Straits of Magellan and in Central Africa (on the Victoria Nyanza), in the Malay Archipelago and in many islands of the Pacific. Some of these canoes show a great advance in the art of construction, being built up of pieces fitted together with ridges on their inner sides, through which the fastenings are passed.? These canoes have the advantage of elasticity, which gives them ease in a seaway, and a comparative immunity where ordinary boats would not hold together. In these cases the body of the canoe is constructed first and built to the shape intended, the ribs being inserted afterwards, and attached to the sides, and having for their main function the uniting of the deck and cross-pieces with the body of the canoe. Vessels thus stitched together, and with an inserted framework, have from a very early time been constructed in the Eastern seas far exceeding in size anything that would be called a canoe, and in some cases attaining to 200 tons burthen.*~~

~~*From the stitched form the next step onwards is to fasten the materials out of which the hull is built up by pegs or treenails; and of this system early types appear among the Polynesian islands and in the Nile boats described by Herodotus (ii. 96), the prototype of the modern "nuggur." The raft of Ulysses described by*~~

~~*1 The raft of Ulysses described in Homer (Od., v.) must have been of this class.*~~

~~*2 See Capt. Cook's account of the Friendly Islands, La Pérouse on Easter Island, and Williams on the Fiji Islands.*~~

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~~*Homer presents the same detail of construction. It is remarkable that some of the early types of boats belong- ing to the North Sea present an intermediate method, in which the planks are fastened together with pins or trenails, but are attached to the ribs by cords passing through holes in the ribs and corresponding holes bored through ledges cut on the inner side of each plank.*~~

~~*We thus arrive, in tracing primitive efforts in the art of ship construction, at a stage from which the transition to the practice of setting up the framework of ribs fastened to a timber keel laid lengthwise, and subsequently attach- ing the planking of the hull, was comparatively simple. The keel of the modern vessel may be said to have its prototype in the single log which was the parent of the dug-out. The side planking of the vessel, which has an earlier parentage than the ribs, may be traced to the attempt to fence in the platforms upon the sea-going rafts, and to the planks fastened on to the sides of dug-out canoes so as to give them a raised gunwale.! The ribs of the modern vessel are the development of the framework originally inserted after the completion of the hull of the canoe or' built-up boat, but with the difference that they are now prior in the order of fabrication. Ina word, the skeleton of the hull is now first built up, and the skin, &c., adjusted to it; whereas in the earlier types of wooden vessels the outside hull was first constructed, and the ribs, d&c., added afterwards. It is noticeable that the invention of the outrigger and weather platform, the use of which is at the present time distributed from the Andaman Islands eastward throughout the whole of the South Pacific, has never made its way into the Western seas. It is strange that Egyptian enterprise, which seems at a very early period to have penetrated eastward down the Red Sea and round the coasts of Arabia towards India, should not have brought it to the Nile, and that the Pheenicians, who, if the legend of their migration from the shores of the Persian Gulf to the coast of Canaan be accepted, would in all probability, in their maritime expeditions, have had opportunities of seeing it, did not introduce it to the Mediterranean. That they did not do so, if they saw it at all, would tend to prove that even in that remote antiquity both nations possessed the art of constructing vessels of a type superior to the out- rigger canoes, both in speed and in carrying power.*~~

~~*The earliest representations that we have as yet of Egyptian vessels carry us back, according to the best authorities, to a period little short of 3000 years before Christ. Some of these are of considerable size, as is shown by the number of rowers, and by the cargo consist- ing in many cases of cattle. The earliest of all presents us with the peculiar mast of two pieces, stepped apart but joined at the top. In some the masts are shown lowered and laid along a high spar-deck. The larger vessels show on one side as many as twenty-one or twenty-two and in one case twenty-six oars, besides four or five steering. They show considerable camber, the two ends rising in a curved line which in some instances ends in a point, and in others is curved back and over at the stern and terminates in an ornamentation, very frequently of the familiar lotus pattern. At the bow the stem is sometimes geen to rise perpendicularly, forming a kind of forecastle, sometimes to curve backward and then forward again like a neck, which is often finished into a figure-head representing some bird or beast or Egyptian god. On the war galleys there is frequently shown a projecting bow with a metal head attached, but well above the water. This, though no doubt used as a ram, is not identical with the beak a jleur Peau, which we shall meet with in Phoenician and*~~

~~*1 Compare the planks upon the Egyptian war galleys, added so as to protect the rowers from the missiles of the enemy.*~~

~~*Greek galleys. It is more on a level with the proem- bolion of the latter.*~~

~~*The impression as regards the build created by the drawings of the larger galleys is that of a long and some. what wall-sided vessel with the stem and stern highly raised. The tendencies of the vessel to "hog," or rise amidships, owing to the great weight fore and aft unsup- ported by the water, is corrected by a strong truss passing from stem to stern over crutches, The double mast of the earlier period seems in time to have given place to the single mast furnished with bars or rollers at the upper part, for the purpose apparently of raising or lower- ing the yard according to the amount of sail required. The sail in some of the galleys is shown with a bottom as well as a top yard. In the war galleys during action it is shown rolled up like a curtain with loops to the upper yard.*~~

~~*The steering was effected by paddles, sometimes four or five in number, but generally one or two fastened either at the end of the stern or at the side, and above attached to an upright post in such a way as to allow the paddle to be worked by a tiller.*~~

~~*There are many remarkable details to be observed in the Egyptian vessels figured in Duemichen's Fleet of an Egyptian Queen, and in Lepsius's Denkmiiler, The Egyptian ship, as represented from time to time in the period be- tween 3000 and 1000 z.c, presents to us a ship proper as distinct from a large canoe or boat. It is the earliest ship of which we have cognizance. But there is a notice- able fact in connexion with Egypt which we gather from the tomb paintings to which we owe our knowledge of the Egyptian ship. It is evident from these records that there were at that same early period, inhabiting the littoral of the Mediterranean, nations who were possessed of sea-going vessels which visited the coasts of Egypt for plunder as well as for commerce, and that sea-fights were even then not uncommon. Occasionally the com- bination of these peoples for the purpose of attack assumed serious proportions, and we find the Pharaohs recording naval victories over combined Dardanians, Teucrians, and Mysians, and, if we accept the explanations of Egypto- logists, over Pelasgians, Daunians, Oscans, and Sicilians, The Greeks, as they became familiar with the sea, followed in the same track. The legend of Helen in Egypt, as well as the numerous references in the Odyssey, point not only to the attraction that Egypt had for the mari- time peoples, but also to long-established habits of navi. gation and the possession of an art of shipbuilding equal to the construction of sea-going craft capable of carrying a large number of men and a considerable cargo besides.*~~

~~*But the development of the ship and of the art of navigation clearly belongs to the Phcenicians, It is tantalizing to find that the earliest and almost the only evidence that we have of this development is to be gathered from Assyrian representations. The Assyrians were an inland people, and the navigation with which they were familiar was that of the two great rivers, Tigris and Euphrates. After the conquest of Pheenicia they had knowledge of Pheenician naval enterprise, and accordingly we find the war galley of the Phcenicians represented on the walls of the palaces unearthed by Layard and his followers in Assyrian discovery. But*~~

~~the date does not carry us to an earlier period than 900-800 B.C. The vessel represented is a bireme war galley which is "aphract," that is to say, has the upper tier of rowers unprotected and exposed to view. The apertures for the lower oars are of the same character as those which appear in Egyptian ships of a much earlier date, but without oars. The artist has shown the characteristic details, though somewhat conventionally. The fish-like snout of~~

~~the beak, the line of the parodus or outside gangway, the wickerwork cancelli,1 the shields ranged in order along the side of the bulwark, and the heads of a typical crew on deck (the zpwpeds looking out in front in the forecastle, an émiBarns, two chiefs by the mast, and, aft, the xeAevarys and xvPepvyrys). The supporting timbers of the deck are just indicated. The mast and yard and fore and back stays, with the double steering paddle, complete the picture.~~

~~But, although there can be little doubt that the Phcenicians, after the Egyptians, led the way in the development of the shipwright's art, yet the informa- tion that we can gather concerning them is so meagre that we must go to other sources for the description of the ancient ship. The Phcenicians at an early date con- structed merchant vessels capable of carrying large car- goes, and of traversing the length and breadth of the Mediterranean, perhaps even of trading to the far Cassi- terides and of circumnavigating Africa. They in all probability (if not the Egyptians) invented the bireme and trireme, solving the problem by which increased oar- power and consequently speed could be obtained without any great increase in the length of the vessel.~~

~~It is, however, to the Greeks that we must turn for any detailed account of these inventions. The HHomeric vessels were aphract and not even decked throughout their entire length. They carried crews averaging from fifty to a hundred and twenty men, who, we are expressly told by Thucydides, all took part in the labour of rowing, except perhaps the chiefs. The galleys do not appear to have been armed as yet with the beak, though later poets attri- bute this feature to the HHomeric vessel. But they had great poles used in fighting, and the term employed to describe these (vavmaxya)~~

implies a knowledge of naval warfare. The general characteristics are indicated by the epithets in use throughout the Iliad and the Odyssey. The Homeric ship is sharp (607) and swift (dxeta); it is hollow (xoiA7, yAadupy, weyaxyrys), black, vermilion-cheeked (wtAromdpyos), dark-prowed (xvavorpwpos), curved (xopwvis, dudiedicoa), well-timbered (éocehpos), with many thwarts (wodvLvyos, éxard{vyos). The stems and sterns are high, upraised, and resemble the horns of oxen (6pOoxpaipat). They present a type parallel in the history of the shipping of the Mediterranean with that of the vikings' vessels of the North Sea.

On the vases, the earliest of which may date between 700 and 600 3.c., we find the bireme with the bows finished off into a beak shaped as the head of some sea monster, and an elevated forecastle with a bulwark evidently as a means of defence. The craft portrayed in some instances are evidently pirate vessels, and exhibit a striking contrast to the trader, the broad ship of burden (dopris eépeia), which they are overhauling. The trireme, which was developed from the bireme and became the Greek ship of war (the long ship, vais paxpd, navis longa, par excel- lence), dates, so far as Greek use is concerned, from about 700 B.c. according to Thucydides, having been first built at Corinth by Aminocles. The earliest sea-fight that the same author knew of he places at a somewhat later date, —664 B.c., more than ten centuries later than some of those portrayed in the Egyptian tomb paintings.

The trireme was the war ship of Athens during her prime, and, though succeeded and in a measure superseded by the larger rates,—quadrireme, quinquereme, and so on, up to vessels of sixteen banks of oars (inhabilis prope magmtudinis),—yet, as containing in itself the principle of which the larger rates merely exhibited an expansion, a difference in degree and not in kind, has, ever since the revival of letters, concentrated upon itself the attention of

1 See Rawlinson, Ancient Monarchies, vol. ii. 1D LAG.

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the learned who were interested in such matters. The literature connected with the question of ancient ships, if collected, would fill a small library,

~~*and the greater part of it turns upon the construction of the trireme and the disposition of the rowers therein.*~~

~~*During the present century much light has been thrown upon the disputed points by the discovery (1834) at the Pireeus of some records of the Athenian dockyard super- intendents, which have been published and admirably elucidated by Boeckh. Further researches carried out by his pupil Dr Graser, who united a practical knowledge of ships and shipbuilding with all the scholarship and industry and acumen necessary for such a task, have cleared up most of the difficulties which beset the problem, and enable us to describe with tolerable certainty the details of construction and the disposition of the rowers in the ancient ship of war.*~~

~~*One point itis necessary to insist on at the outset, because upon it depends the right understanding of the problem to be solved. The ancients did not employ more than one man to an oar. The method employed in medieval galleys is entirely alien to the ancient system. M. Jal, Admiral Fincati, Admiral Jurien de la Graviére, and a host of other authorities have all been led to erroneous views by neglect of the ancient texts which overwhelmingly establish this as an axiom of the ancient marine—" one oar one mau."*~~

~~*The distinction between "aphract" and "cataphract" vessels must not be overlooked in a deseription of the ancient vessels, The words, meaning "unfenced" and "fenced," refer to the bulwarks which covered the upper tier of rowers from attack. In the aphract vessels these side plankings were absent and the upper tier of rowers was exposed to view from the side. Both classes of vessels had upper and lower decks, but the aphract class carried their decks on a lower level than the cataphract. The system of side planking with a view to the protection of the rowers dates from a very early period, as may be seen in some of the Egyptian repre- sentations, but among the Greeks it does not seem to have been adopted till long after the Homeric period. The Thasians are credited with the introduction of the improvement.*~~

~~*In describing the trireme it will be convenient to deal first with the disposition of the rowers and subsequently with the con- struction of the vessel itself. The object of arranging the oars in banks was to economize*~~

~~*horizontal space and to obtain an increase in the number of oars without having to lengthen the vessel. We know from Vitruvius that the "interscalmium," or space horizontally measured from oar to oar, was 2 cubits. This is exactly borne out by the proportions of an Attic aphract trireme, as shown on a fragment of a bas-relief found in the Acropolis. The rowers in all classes of banked vessels sat in the same vertical plane, the seats ascending in a linc obliquely towards the stern of the vessel. Thus in a trireme the thranite, or oarsman of the highest bank, was nearest the stern of the set of three to which he belonged. Next behind him and somewhat below him sat his zygite, or oarsman of the second bank; and next below and behind the zygite sat the thalamite, or oarsman of the lowest bank. The vertical distance between these seats was 2 feet, the horizontal distance about 1 foot. The horizontal distance, it is well to repeat, between each seat in the same bank was 8 feet (the seat itself about 9 inches broad). Each man had a resting place for his feet, somewhat wide apart, fixed to the bench of the man on the row next below and in front of him. In rowing, the upper hand, as is shown in most of the representations which remain, was held with the palm turned inwards towards the body. This is accounted for by the angle at which the oar was worked. The lowest rank used the shortest oars, and the difference of the length of the oars on board was caused by the curvature of the ship's side. Thus, looked at from within, the rowers amidship seemed to be using the longest oars, but outside the vessel, as we are expressly told, all the oar-blades of the same bank took the water in the same longitudinal line. The lowest or thalamite oar-ports were 8 feet, the zygite 4} feet, the thranite 54 feet above the water. Each oar-port was protected by an ascoma or leather bag, which fitted over the oar, closing the aperture against the wash of the sea with- out impeding the aetion of the oar. The oar was tied by a thong, against which it was probably rowed, which itself was attached to a thowl (ckadués). The port-hole was probably oval in shape (the Egyptian and Assyrian pictures show an oblong). We know that it was large enough for a man's head to be thrust through it.*~~

~~*The benches on which the rowers sat ran from the vessel's side to timbers which, inclined at an angle of about 64° towards the ship's stern, reached from the lower to the upper deck. These timbers were, according to Graser, called the diaphragmata. In the trireme each diaphragma*~~

~~supported three, in the quin- quereme five, in the octireme eight, and in the famous tessera-~~

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~~conteres forty seats of rowers, who all belonged to the same ‘“‘complexus,”’ though each to a different bank. In effect, when once the principle of construction had been established in the trireme, the increase to larger rates was effected, so far as the motive power was concerned, by lengthening the diaphragmata upwards, while the increase in the length of the vessel gave a greater number of rowers to each bank. The upper tiers of oars- men exeeeded in number those below, as the contraction of the sides of the vessel left less available space towards the bows,~~

~~Of the length of the oars in the trireme we have an indication in the fact that the length of supernumerary oars (repivew) rowed from the gangway above the thranites, and therefore probably slightly exceeding the thranitic oars in length, is given in the Attic tables as 14 feet 3 inches. The thranites were probably about 14 feet, The zygite, in proportion to the measurement, must have been 104, the thalamite 74 feet long. Comparing modern oars with these, we find that the longest oars used in the British navy are 18 feet, The university race is rowed with oars 12 feet 9 inches. The pro- portion of the loom inboard was about one third, but the oars of the rowers amidship must have been somewhat longer inboard, The size of the loom inboard preserved the necessary equilibrium. The long oars of the larger rates were weighted inboard with lead, Thus the topmost oars of the tesseraconteres, of which the length was 53 feet, were exactly balanced at the rowlock.~~

~~Let us now consider the construction of the vessel itself. In the cataphract class the lower deck was 1 foot above the water- line. Below this deck was the hold, which contained a certain amount of ballast, and through an aperture in this deck the buckets for baling were worked, entailing a labour which was constant and severe on board an ancient ship at sea. The keel (tpdmis) appears to have had considerable camber. Under it was a strong flee keel (xéauvcpa), very necessary for vessels that were constantly drawn up on the shore. Above the keel was the kelson (Sptoxov), under which the ribs were fastened. These were so arranged as~~

~~*to give the necessary intervals for the oar-ports above. Above the kelson lay the upper false keel, into which the mast was stepped. The stem (eretpa) rose from the keel at an angle of about 70° to the water. Within was an apron (¢dAkis), which was a strong piece of timber curved and fitting to the end of the keel and beginning of the stern-post and firmly bolted into both, thus giving solidity to the bows, which had to bear the beak and sustain the shock of ramming. The stem was carried upwards and curved generally backwards towards the forecastle and rising above it, and then curving forwards again terminated in an ornament which was called the acrostolion. The stern-post was carried up at a similar angle to the bow, and, rising high over the poop, was curved round into an ornament which was called "'aplustre" (&paacrov). But, inasmuch as the steering was effected by means of two rudders (rnddAra), one on either side, there was no need to carry out the stern into a rudder post as with modern ships, and the stern was left therefore much more free, an advantage in respect of the maneuvring of the ancient Greek man-of-war, the weapon being the beak or rostrum, and the power of turning quickly being of the highest importance,*~~

~~*Behind the 'Saplustre," and curving backwards, was the "eheniscus " (xnvicKkds), or goose-head, symbolizing the floating powers of the vessel, After the ribs had been set up and covered in on both sides with planking, the sides of the vessel were further strengthened by waling-pieces carried from stern to stem and meeting in front of the stern-post. These were further strengthened with Aeditierial balks of timber, the lower waling-pieces meeting about the water-level and prolonged into a sharp three-toothed spur, of which the middle tooth was the longest. This was covered with hard metal (generally bronze) and formed the beak. The whole structure of the beak projected about 10 feet beyond the stern- post. Above it, but projecting much less beyond the stern-post, was the 'proembolion " (mpoeuBédrtoy), or second beak, in which the prolongation of the upper set of waling-pieces met. This was generally fashioned into the figure of a ram's head, also covered with metal ; and sometimes again between this and the beak the second line of waling-pieces met in another metal boss called the mpoeuBodis. These bosses, when a vessel was rammed, completed the work of destruction begun by the sharp beak at the water-level, giving a racking blow which caused it to heel over and so eased it*~~

~~*off the beak, and releasing the latter before the weight of the sinking vessel could come upon it. At the point where the pro- longation of the second and third waling-pieces began to converge inwards towards the stem on either side of the vessel stout eatheads (emwrides) projected, which were of use, not only as supports for the anchors, but also as a means of inflicting damage on the upper part of an enemy's vessel, while protecting the side gangways of its own and the banks of oars that worked under them. The catheads were strengthened by strong balks of timber, which were firmly bolted to them under either extremity and both within and without, and ran to the ship's side. Above the curvature of the upper waling-pieces into the mpoeu@daioy were the cheeks of the vessel, generally painted red, and in the upper part of these the*~~

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~~*eyes (6p@aAol), answering to our hawse holes, through which ran the cables for the anchors. the level of the thranitic benches, projected a gangway (mdpodos) supported by brackets (Biaxa) springing from the upper waling- plece, and resting against the ribs of the vessel. was of about 18 to 24 inches, which gave a space, increased to about 3 feet by the inward curve of the prolongation of the ribs to form supports for the deck, for a passage on either side of the vessel, This gangway was planked in along its outer side so as to afford protection to the seamen and marines, who could pass along its whole length without impeding the rowers. Here, in action, the sailors were posted as light-armed troops, and when needed could use the long supernumerary oars (repivew) mentioned above, The ribs, prolonged upwards upon an inward curve, supported on their upper ends the cross beams (orpwrfpes) which tied the two sides of the vessel together and carried the deck. Inthe cataphract class these took the place of the thwarts ((ya) which in the earlier vessels, at a lower level, yoked together the sides of the vessel, and formed also benches for the rowers to sit on, from which the latter had their name (Cvyirat), having been the uppermost tier of oarsmen in the bireme; while those who sat behind and below them in the hold of the vessel were called aAauira: or OaAduakes (from dAapos). In the trireme the additional upper tier was named from the elevated bench (pavos) on which they were placed (Opavira:). On the deck were stationed the marines (€riBarau), fighting men in heavy*~~

~~armour, few in number in the Attic trireme in its palmy days, but many in the Roman quinquereme, when the ramming tactics were antiquated, and wherever, as in the great battles in the harbour at Syracuse, land tactics took the place of the maritime skill which gave victory to the ram in the open sea, The space occupied by the rowers was termed &yxwmov. Beyond this, fore and aft, were the mapeteipéoiat, or parts outside the rowers. These occupied 11 feet of the bows and 14 feet in the stern. In the fore part was the forecastle, with its raised deck, on which was stationed the mpwpebs with his men. In the stern the decks (tpi) rose in two or three gradations, upon which was a kind of deck-house for the captain and a seat for the steerer (kuBepyitns), who steered by means of ropes attached to the tillers fixed in the upper part of the paddles, which, in later times at least, ran over wheels (rpox:Ala.), giving him the power of changing his vessel's course with great rapidity. Behind the deck-house rose the flagstaff, on which was hoisted the pennant, and from which probably signals were given in the case of an admiral's ship. On either side of the deck ran a balustrade (cancellt), which was covered for protection during action with felt (ciliciwm, mapapptmara Tpixivd) or canvas (m. Aevkd). Above was stretched a strong awning of hide (kardBaAnua), as a protection against grappling irons and missiles of all kinds. In Roman vessels towers were carried up fore and aft from which darts could be showered on the enemy's deck ; the heavy corvus or boarding bridge swung sus- pended by a chain near the bows ; and the ponderous 5éAgis hung at the ends of the yards ready to fall ona vessel that came near enough alongside. But these were later inventions and for larger ships. The Attic trireme was built light for speed and for ramming purposes. Her dimensions, so far as we can gather them from the scattered notices of antiquity, were probably approximately as follows :—length of rowing space (€yxwmoy) 98 feet ; bows 11 feet 3 stern 14 feet; total 118 feet; add 10 feet for the beak. The breadth at the watcr-line is calculated at 14 feet, and above at the broadest part 18 feet, exelusive of the gangways ; thespace between the diaphragmata mentioned above was 7 feet. The deck was 11 feet above the water-line and the draught about 8 to 9 feet. All the Attic triremes appear to have been built upon the same model, and their gear was interchangeable. The Athenians had a peculiar system of girding the ships with long cables (sro(éuara), each trireme having two or more, which, passing through eyeholes in front of the stern-post, ran all~~

~~round the vessel lengthwise immedi- ately under the waling-pieces. They were fastened at the stern and tightened up with levers. These cables, by shrinking as soon as they were wet, tightened the whole fabric of the vessel, and in action, in all probability, relieved the hull from part of the shock of ramming, the strain of which would be sustained by the waling-pieces convergent in the beaks. These rope-girdles are not to be confused with the process of undergirding or frapping, such as is narrated of the vessel in which St Paul was being carried to Italy. The trireme appears to have had three masts. The mainmast carried square sails, probably two in number. The foremast and the mizen carried lateen sails. In action the Greeks did not use sails, and everything that could be lowered was stowed below. The mainmasts and larger sails were often left ashore if a conflict was expected. The crew of the Attic trireme consisted of from 200 to 225 men in all. Of these 174 were rowers,—54 on the lower bank (thalamites), 58 on the middle bank (zygites), and 62 on the upper bank (thranites),—the upper oars being more numerous because of the contraction of the space available for the lower tiers near the bow and stern. Besides the rowers were about 10 marines (émiBdra:) and 20 seamen. The officers were the trierarch and next~~

~~to him the helmsman (xuBepyqrns), who was the navigating officer of the trireme. Lach tier of rowers had its captain (oroxapxés). There were also the captain of the forecastle (xpwpevs), the "keleustes" who gave the time to the rowers, and the ship's piper (rpinpavdys). The rowers descended into the seven-foot space between the diaphragmata and took their placcs in regular order, beginning with the thalamites. Thc economy of space was such that, as Cicero remarks, there was not room for one man more.~~

~~The improvement made in the build of their vessels by the Corinthian and Syracusan shipwrights, by which the bows were so much strengthened that they were able to meet the Athenian attack stem on (zpooPody), caused a change of tactics, and gave an impetus to the building of larger vessels—quadriremes and quinqueremes—in which increased oar-power was available for the propulsion of the heavier weights.~~

~~*In principle these vessels were only expansions of the trireme, so far as the disposition of the rowers was concerned, but the speed could not have increased in pro- portion to the weight, and hence arose the variety of contrivances which superseded the ramming tactics of the days of Phormio. In the century that succeeded the close of the Peloponnesian War the fashion of building big vessels became prevalent. We hear of various numbers of banks of oars up to sixteen (éxxaudexypys) — the big vessel of Demetrius Poliorcetes. The famous tesseraconteres or forty-banked vessel of Ptolemy Philo- pator was in reality nothing more than a costly and ingenious toy, and never of any practical use. The fact, however, of its construction shows the extent to which the shipwright's art had been developed among the ancients.*~~

~~*The Romans, who developed their naval power during the First Punic War, were deficient in naval construction till they learnt the art from their enemies the Cartha- ginians. They copied a quinquereme which had drifted on to the coast, and, with crews taught to row on frames set up on dry land, manned a fleet which we are told was built in sixty days from the time the trees were cut down. After the Punic War, in which the use of boarding tactics gave the Romans command of the sea, the larger rates — quinqueremes, hexiremes, octiremes — continued in use until at Actium tlie fate of the big vessels was sealed by the victory of the light Liburnian galleys. The larger classes, though still employed as guardships for some time, fell into disuse, and the art of building them and the knowledge of their interior arrangements were lost.*~~

~~*Table of Measurements, &c., after Graser.*~~

~~*Trireme. |Quinquereme.|Tesseraconteres. Length, exclusive of beak.| (?) 149 ft.1] 168 ft. 420 ft. Beam, greatest ……..|0. 3. 26 ,, moe, Passage between di:adpdy-*~~

~~*[WercG56 Goocobeobcnecooeeoneonus Uw Wit op 49 ,, PE cere er costae x coneeee 84, Ieee 2005. Tons measurement…….. (2) 232 534 11,320 (?) Number of rowers…….. 174 310 4,054 Crew, total complement…| 225 375 7,500*~~

~~*Medieval Ships.—It is not at present possible to trace in its successive stages the transition from the ancient ship of war to the medizval galley. The sailing vessels of the time of the early Roman empire, such as that in which St Paul suffered shipwreck or the great merchantman described by Lucian, were the direct precursors, not only of the mediaval merchant vessels, but also of the large sailing vessels which, after the invention of gunpowder, and the consequent necessity of carrying marine artillery, superseded the long low galleys propelled by oars. The battle of Actium gave the death-blow to the ancient type of vessel with its many banks of oars. The light*~~

~~*1 Taking the interscalmium at 4 feet ; but this does not agree with Vitruvius,*~~

~~*who gives 2 cubits.*~~

~~*Liburnian galleys which, though fully decked, were aphract, and, according to Lucan's testimony (bk. lll.),*~~

~~*Ordine content gemino crevisse Liburne,*~~

~~*had only two banks of oars, were biremes. This appar- ently became the type of Roman war galleys ; and, though the old name trireme survived, its meaning became simply 'man of war," and did not any longer imply three banks of oars. Light vessels were in vogue, and galleys with single banks of oars are common in the representations on coins and in such frescos as survive, but trireme and quinquereme, &c., have vanished,*~~

~~*A cloud of obscurity rests on these, the dark ages of naval history. We know nothing of the character and composition of the fleet in which Ricimer defeated the Vandals in the 5th century of our era. Nor have we any details of the fleets of the Byzantine empire until the end of the 9th century, when a light is thrown upon the subject by the Zactica of the emperor Leo. This emperor, in giving his directions as to the constitution of his fleet, prescribes that dromones (8poudves)—that is, triremes—are to be got ready in the dockyards with a view to a naval engagement. The vessels are not to be too light or too heavy. They are to be armed with siphons for the projection of Greek fire. They are to have two banks of*~~

~~*oars, with twenty-five rowers a-piece, on each side. Some of the vessels are to be large enough to carry two hundred men ; others are to be smaller, like those called galleys or one-banked vessels, swift and light (€Adrrous dpopuxwrdrovs otdver yaralas % povypers Neyomevous Taxwors kal éAadpots). Here we have the name galleys distinctively attached to vessels with one bank of oars. This passage should have saved much of the labour that has been thrown away in attempting to prove that the distribution of rowers in the medizval galleys was upon the same principle as that observed in the ancient biremes or triremes.*~~

~~*The light thrown by the philosophic Byzantine on the naval construction and equipment of his time is but a passing flash. After the 9th century there is darkness again until the 11th and 12th centuries, when the features of the medieval galley first begin to be visible. And here perhaps it is not out of place to say that it is necessary to distinguish between those imaginary representations of the antique in which painters, such as Tintoret, give fanciful arrangement to the oars of their galleys, so as to meet their ideas of bireme or trireme, from those that are historically faithful and figure, perhaps in an ungainly and inartistic manner, the galleys of Venice and Genoa as they appeared in the Middle Ages. It would exceed the space at our disposal here to enter into details which can be gathered from Jal's Archéologie Navale and the Glossaire Nautique of the same author, or the later works of Admiral Jurien de la Gravitre and Admiral Fincati. It must suffice to indicate here a few of the main charac- teristics in which the medieval galley differs from the ancient, and exhibits the last development of man-power as applied to motion in vessels larger than the boats of the present day.*~~

~~*These characteristics may be sketched briefly. Upon the medieval galley, which was essentially a one-banked galley (jovékporov), the use of the longer oar or sweep took the place of the small paddling oars of the ancient vessel. The increased length of the oar requiring for its efficiency greater power than one man could employ led to the use of more than one man toan oar. The necessity therefore arose of placing the weight (or point at which the oar, used as a lever, worked against the thowl, and so pressed against the water, which is the fulcrum) at a greater distance from*~~

~~*the force or man who moved the lever. This was gained by the invention of the apostis.*~~

~~*The art of ship- building.*~~

~~*SHI—~·—SHI*~~

~~*Upon the hull of the medieval galley was laid a frame- work which stood out on either side from it, giving on either side a strong external timber, running parallel to the axis of the vessel, in which the thowls were fixed against which the oars were rowed. Tt will be readily understood how this arrangement gave a greater length inboard for the oar as compared with vessels, where the thowl stood in the aperture of the vessel's side or port-hole. On the inner side, rising inwards towards the centre line of the decks and inclining upwards, were the banks or benches for the rowers, arranged Q la scaloccio, who could each grasp the handle of the oar, moving forward*~~

~~*eH iP Be*~~

~~*ye the memory of the present generation ship-*~~

~~*building, like many other arts, has lost dignity by the extended use of machinery and by the subdivision of labour. Forty years ago it was still'a "mystery" and a "craft." The well-instructed shipbuilder had a store of experience on which he based his successful practice. He gained such advantages in the form and trim and rig of his vessels. by small improvements, suggested by his own observation or by the traditions of his teachers, that men endeavoured to imitate him, neither he nor they knowing the natural laws on which success depended. He had also a good eye for form, and knew how to put his materials together so as to avoid all irregularity of shape on the outer surfaces, and how to form the outlines and bounding curves of the ship so that the eye might be com- pelled to rest lovingly upon them. He was skilled also in the qualities of timber. He knew what was likely to be free from '"'rends" and "shakes" and "cups" which would cause leakage, and which would be liable to split when the bolts and treenails were driven through it. knew what timber would bear the heat of without undue shrinking, and how to improve its qualities by*~~

~~*seasoning. He could foretell where and under what circumstances premature decay might be expected, and he could choose the material and adjust the surroundings so as to prevent it. He knew what wood was best able to endure rubbing and tearing on hard ground, and how it ought to be formed so that the ship might have a chance of getting off securely when she accidentally took the ground or got on shore. Such men were to be found on all the sea-coasts of Europe and on the shores of the Atlantic in America. .*~~

~~*A great change came over the art when steam was intro-*~~

~~*tropical suns*~~

~~*that of the ancient |*~~

~~*as they depressed it for the feather, and | backward for the stroke as they raised their hands for the |*~~

~~*He.*~~

~~*809*~~

~~*Literature.—1. For Ancient Ships :—Duemichen, Fleet J 5 an. Dp F of an Egyptian Queen:*~~

~~*mit Darstellungen antiker Schiffe; Id., Dte — Cartauld, Za Trtére Athénienne ; Breusing, Die Nautik der*~~

~~*ILDING*~~

~~*Mediterranean shores from N ice to Genoa mark the completeness of the change which a few years have made, The Tyne and the Clyde and the Mersey have become the principal centres of the trade, It has been drawn there because the iron and the coal are near,*~~

~~*But, while the art of shipbuilding has lost dignity, the The*~~

~~*science of naval construction has increased in importance, science Tt is of navas*~~

~~*English art is of an eminently practical character. shy of experiment, as being costly in itself and likely to lead to delays and changes of system and of plant. It loves large orders and rapid production. It practises great subdivision of the details in order to cheapen pro- duction, and it stereotypes modes of work. 'There is no lack of boldness and enterprise; but the patient continuous inquiry and the slow but sure building up of theory upon research,—this is the exception. Naval construction in England has had the good fortune during the last quarter of a century to have not only a thriving industry but a home for research. Twenty-five years ago, when the high- pressure condensing engine was in its infancy, when ship- building steel was not, and armour-plated ships had not yet*~~

~~*displaced the wooden line-of-battle ship, this home was founded. The Institution of Naval Architects may be fairly called the home for research in naval construction. It owes its establishment mainly to four well-known men— John Scott Russell, Dr Joseph Woolley, Lord Hampton, for many years its honoured president, and Sir Edward Reed, its first secretary. It has published every year a volume of T'ransactions recording the experience of all the shipbuilders and marine engineers in England. These Transactions contain also valuable contributions from French, Italian, German, and other eminent constructors and engineers.*~~

~~*duced. The old proportions and forms so well suited for the speeds of the ships and for the forces impressed upon them were ill adapted for propulsion by the paddle, and still less so for propulsion by the screw. Experience had to be slowly gained afresh, for the lamp of science burned dimly. It needed to be fed by results, by long records of successes and failures, before it was able to direct advancing feet. The further change from wood to iron and then to steel almost displaced the shipwright. Ships for commercial purposes may be said to be built now, so far as their external hulls are concerned, by draftsmen and boilermakers. The centres of the ship- building industry have changed. The ports where oaks (Italian, English, and Dantzic), pines from America and the north of Europe, teak from Moulmein, and elm from Canada were most accessible,—these marked the suitable places for shipbuilding. The Thames was alive with the industry from Northflect to the Pool. It still lingers, but it is slowly dying out. Travellers along the*~~

~~*Shortly after the foundation of the Institution one of its mem- Ad- bers, Mr William Froude, set up an experimental establishment miralty at Torquay, under the auspices and with the assistance of the experi- Admiralty. The object was to submit to experiment various ments on proportions and forms of ships in model in order to compare the fluid re- relative resistances in the same model at various speeds, and in sistance different forms and proportions at equal speeds. There was some &e reason to doubt the possibility of inferring from a model on a scale of 2 of an inch to a foot what would happen in a ship of corresponding form and proportions. In order to establish satis- factorily the relations betiveen the real and the model ship a series of experiments was desirable upon a real*~~

~~*ship in which the resistances could be measured by a dynamometer at various speeds and compared with those indicated by the model. Up to the date of this trial the 'scale of comparison" which had been employed by Mr Froude was based upon prima Jacie theoretical truth, and it had some experimental justification. It may be stated as follows, as given by Mr Froude in the volume for 1874 of the Transactions of the Institution of Naval Architects :—*~~

~~*Lf a ship be D times the " dimension," as it is termed, of the model, and if at the speeds V;, Vz, Vz… the measured resistances of the model are Ry, Ry, Ry. . . ., then Jor speeds DiV,, DiV,*~~

~~*DtV;, of the ship, the resistances will be PPR, DR,*~~

~~*» 0.4 ee on*~~

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~~*D®R3… To the speeds of model and ship thus related it is conven- ient to apply the term "' corresponding speeds." For example, sup- pose two similar ships, the length, breadth, depth, &e.,of which were double one of the other. Then, if at a given speed (say 10 knots) the resistance of the smaller ship were ascertained, we may infer that at a speed of 4/2×10=14'14 knots in the larger ship there would be a resistance 8 times as great as in the smaller vessel.*~~

~~*This law is in aecordance with the old rule that the resistance varies as the square of the velocity, and also as the area of the surface exposed to resistance. It takes into account both the resistanee due to surface friction (subject to some correction) and the formation of deadwater eddies. The passage of the ship through the water creates waves which are dependent for their character upon the proportions and form of the ship. These con- stitute also an element of resistance. They are due to differences of hydrodynamic pressure inherent in the system of stream-lines which the passage of the ship creates. These wave-configurations should be precisely similar when the originating forms are similar and are travelling at speeds proportional to the square roots of their respective dimensions, because the resulting forces will be in that case as the square*~~

~~*of the speeds. For example, if the surface of the water surrounding a ship 160 feet long, travelling at 10 knots an hour, were modelled together with the ship, on any scale, the model would equally represent, on half that scale, the water surface surrounding a ship of similar form 320 feet long, travelling at 1414 knots an hour; or again, on 16 times that scale, the water surface surrounding a model of the ship 10 feet long, travelling at 24 knots. Experiment has abundantly con- firmed this proportion as to the similarity of waves caused by similar forms travelling at corresponding speeds. The resistance caused to these forms respectively by the development of the waves would therefore also be proportionate to the cubes of the dimensions of the forms and would follow the law of comparison stated above. It is necessary, however, to observe that, in nesltite with surfaces having so great a disparity in length and speed as those of a model and of a ship, a very tangible correction is necessary in regard to surface friction.*~~

~~*The vessel tried by Mr Froude for confirming the law of com- pu was H.M.S. " Greyhound," of 1157 tons. She was towed*~~

~~*y H.M.S. ' Active," of 3078 tons, from the end of a boom 45 feet long, so as to avoid interferences of " wake." It was found to be possible to tow up to a speed of nearly 18 knots. The actual amount of towing strain for the "Greyhound" was approximately as follows:—at 4 knots, 0°6 ton ; at 6, 1°4 tons; at 8, 2°5 tons; at 10, 4:7 tons; and at 12, 9:0 tons.*~~

~~*Comparing the indicated horse-power of the " Greyhound " when on her steam trials and the resistance of the ship as determined by the dynamometer, it appears that, making allowance for the slip of the screw, which is a legitimate expenditure of power, only about 45 per cent. of the power exerted by the steam is usefully employed in propelling the ship, and that the remainder is wasted in friction of engines and screw and in the detrimental reaction of the propeller on the stream lines of the water closing in around the stern of the vessel.*~~

~~*We may describe in Mr Froude's own words the system of ex- periment now regularly carried out for the Admiralty, a system which has been successfully copied in other countries and also by a private shipbuilding firm, Messrs Denny of Dumbarton :—*~~

~~*"That system of experiments involves the construction of models of various forms (they are really fair-sized boats of from 10 to 25 feet in length), and the testing by a dynamometer of the resistances they experienced when running at various assigned appropriate speeds. The system may be described as that of determining the scale of resistance of a model of any given form, and from that the resistance of a ship of any given form, rather than as that of searching for the best form, and this method was preferred as the more general, and because the form which is best adapted to any given circumstances comes out incidentally from a comparison of the various results. We drive each model through the water at the successive assigned appropriate speeds by an extremely sensitive dynamometrical apparatus, which gives us in every case an accurate automatic record of the model's resistance, as well as a record of the speed. We thus obtain for each model a series of speeds and the corresponding resistances ; and, to render these results as intelligible as possible, we represent them graphic- ally in each ease in a form which we call the 'curve of the resistance' for the particular model. On a straight base line Which represents speed to scale we mark off the series of points denoting the several speeds employed in the experiments, and at each of these points we plant an ordinate which represents to scale the corresponding resistance. Through the points defined by these ordinates we draw a fair curved line, and this curve con- stitutes what I have called the curve of resistance. This curve, whatever be its features, expresses for the model of that particular form what is in fact and apart from all theory the law of its resistance in terms of its speed ; and what we have to do is if possible to find a rational interpretation of the law. Now we can*~~

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~~*at once earry the interpretation a considerable way ; for we know that the model has so many square feet of skin in its surface, and we know by independent experiments how much force it takes to draw a square foot of such skin through the water at each indi- vidual speed. The law is very nearly—and for present convenience we may speak as if it were exactly—that skin resistance is as the area simply, and as the square of the speed.*~~

~~*Now, we have so many square feet of immersed skin in the model, and the total skin resistance is a certain known multiple of the product of that number of square feet and of the square of the speed. Now, when we lay off on the curve of resistance a second curve which represents that essential and primary portion of the resistance, then we find this to be the result: the curve of skin resistance when drawn is found to be almost identical with the curve of total resistance at the lower speeds ; but as the speed is increased the curve of total resistance is found to ascend more or less, and in some cases to ascend very much above the curve of skin resistance. The identity of the two curves at the lower speeds is the practical representation of a proposition which the highest mathematicians have long been aware of, and which I have lately endeavoured to draw the public attention to, and to render popularly intelligible, namely, that when a ship of tolerably fine lines is moving at a moderate speed the whole resistance consists of surface friction. The old idea that the resistance of a ship consists essentially of the force employed in driving the water out of her way, and closing it up behind her, or, as it has sometimes been expressed, in excavating a channel through the track of water which she traverses,—this old idea has ceased to be tenable as a real proposi- tion, though prima facie we know that it was an extremely natural one. We now know that, at small speeds, practically the whole resistance consists of surface friction, and some derivative effects of surface friction, namely, the formation of frictional eddies, which is due to the thickness of the stem and of the sternpost ; but this collateral form of frictional action is insignificant in its amount unless the features of the ship in which it originates are so abruptly shaped as to constitute a departure from that necessary fineness of lines which I have described ; and we do not attempt to take an exact separate account of it. Thus we divide the forces represented by the curve of resistance into two elements,—one 'skin resistance,' the other which only comes into existence as the speed is increased, and which we may term 'residuary resist- ance.' And we have next to seek for the cause and governing laws of this latter element. Now when the passage of the model along the surface of the water is carefully studied, we observe that the special additional circumstance which becomes apparent as the speed is increased is the train of waves which she puts in motion ; and indeed it has long been known that this circumstance has important bearings on the growth of*~~

~~*resistance. It is in fact certain that the constant formation of a given series involves the operation of a constant force, and the expenditure of a definite amount of power, ee on the magnitude of those waves and the speed of the model ; and, as we thus naturally conclude that the excess of resistance beyond that due to the surface friction consists of the force employed in wave-making, we in a rough way call that residuary resistance ‘ wave-making resistance.’*~~

~~*‘Perhaps I had better say a few words imore about the nature and character of these waves. The inevitably widening form of the ship at her ‘entrance’ throws off on each side a local oblique wave of greater or less size according to the speed and to the obtuse- ness of the wedge, and these waves form themselves into a series of diverging erests, such as we are all familiar with. These waves have peculiar properties. They retain their identieal size for a very great distance with but little reduction in magnitude. But the main point is that they become at once dissociated from the model, and after becoming fully formed at the bow, they pass clear away into the distant water and produce no further effeet on her resistance. But, besides those diverging waves, there is pro- duced by the motion of the model another notable series of waves which carry their crests transversely to her line of motion. Those waves, when carefully observed, prove to have the form shown in detail in fig. 1. In the figure there is shown the form of a model which has a long parallel middle body accompanied by the series of these transverse waves as they appear at some one particular speed with the profile of the series defined against the side of the model ; only I should mention that for the sake of distinctness the vertical scale of the waves has been made double the horizontal scale, so that they appear relatively to the model about twice as high as they really are. The profile is drawn from exact and careful measurements of the actual wave features as seen against the side of the model. It is seen that the wave is largest. where its crest first appears at the bow, and it reappears again and again as we proceed sternwards along the straight side of the model, but with successively reduced dimensions at each reappearance. That reduction arises thus :—in proportion as each individual wave has been longer in existence, its outer end has spread itself farther into the undisturbed water on either side, and, as the total energies of*~~

~~_the wave remain the same, the local energy is less and less, and~~

~~SHIPBYVIUDIN &G~~

~~the wave-crest, as viewed against the side of the ship, is constantly diminishing. We see the wave-crest is almost at right angles to the ship, but the outer end is slightly deflected sternward from the~~

~~circumstance that when a wave is entering undisturbed water its progress is a little retarded, and it has to deflect itself into an oblique position, so that its oblique progress shall enable it exactly to keep pace with the ship. The whole wave-making resistance is the resistance expended in generating first the diverging bow waves, which, as we have seen, cease to act on the ship when once they have rolled clear of the bow ; secondly, these transverse waves, the crests of which remain in contact with the ship's side ; and thirdly, the terminal wave, which appears independently at the stern of the ship. This latter wave arises from causes similar to those which create the bow wave, namely, the pressure of the streams which, forced into divergence then, here converge under the run of the vessel, and re-establish an excess of pressure at their meeting. The term ' wave-making resistance' represents, then, the excess of~~

~~resistance beyond that due to surface friction, and that excess we,~~

~~know to be chiefly due to this formation of waves by the ship."~~

~~Pursuing these experiments it was found that not only was there a certain length of form necessary in a ship designed to attain a certain speed economically,—a fact which Mr Scott Russell did much to establish,—but that there was also a considerable increase in wave-making resistance dependent upon the position of the after- body or run of the ship with reference to the wave-system left by the bow. Stating this again in Mr Froude's words :——~~

~~'"'The waves generated by the ship in passing through the water originate in the local differences of pressure caused in the surrounding water by the vessel passing through it ; let us suppose, then, that the features of a particular form are such that these differences of pressure tend to~~

~~*produce a variation in the water level shaped just like a natural wave, or like portions of a natural wave of a certain length.*~~

~~*" Now an ocean wave of a certain length has a certain appropriate speed at which only it naturally travels, just as a pendulum of a certain length has a certain appropriate period of swing natural to it. And, just as a small force recurring at intervals corresponding to the natural period of swing of a pendulum will sustain a very large oscillation, so, when a ship is travelling at the speed naturally appropriate to the waves which its features tend to form, the stream line forces will sustain a very large wave. The result of this phenomenon is, that as a ship approaches this speed the waves become of exaggerated size, and run away with a proportionately exaggerated amount of power, causing corresponding resistance. This is the canse of that very disproportionate increase of resistance experienced with a small increase of speed when once a certain speed is reached.*~~

~~*""We thus see that the speed at which the rapid growth of resistance will commence is a speed somewhat less than that appropriate to the length of the wave which the ship tends to form. Now, the greater the length of a wave is the higher is the speed appropriate to it; therefore the gieater the length of the waves which the ship tends to form the higher will be the speed at which the wave-making resistance begins to become formidable. We may therefore accept it as an approximate principle that the longer are the features of a ship which tend to make waves the higher will be the speed she will be able to go before she begins to experience great wave-making resistance, and the less will be her wave-making resistance at any given speed. This principle is the explanation of the extreme importance of having at least a certain length of form in a ship intended to attain a certain speed ; for it is necessary, in order to avoid great wave-making resistance, that the 'wave features,' as we may term them, should be long in comparison with the length of the wave which would naturally travel at the speed intended for the ship.*~~

~~*811*~~

~~*"This view of the matter, then, recognizes the tendency of a ship, when the speed bears a certain relation to the length of her wave-making*~~

~~*features, to make large wavesand to incur correspond- Ing wave-making resistance. But it does not take account of the possibility of the waves made by one feature of the form so placing themselves with reference to other features as, by the differences of pressure essential to their existence, either to cause an additional resistance, or on the other hand to cause a forward force which partly counterbalances the resistance originally due to their creation. The way in which this may occur we have seen strikingly exhibited in the results of the experiments I have been describing. We see that in the very long parallel-sided form the sternmost of the train of waves left by the bow has become so small that its effect on the stern is almost insensible; and here we find, consequently, the united resistance due simply to the generation of a separate wave-system by each end of the ship. As we gradually reduce the length of middle-body, the stern is brought within the reach of waves large enough to produce a sensible effect, and according as it is brought into conjunction with a crest or hollow, the total wave-making resistance becoming least of all (except at the very highest speed) when the middle-body is reduced to nothing."*~~

~~*The variations in residuary resistance due to these transverse wave-formations are variations of quasi-hydrostatic pressure against the after-body, corresponding with the changes in its position with reference to the phases of the train of waves, there being a com- parative excess of pressure (causing a forward force or diminution of resistance) when the after-body is opposite a crest, and the reverse when it is opposite a trough.*~~

~~*It may be proper to introduce here some remarks as to the stream lines which have been referred to in the foregoing considerations. The statement of the case as given by Mr Froude, and derived by him mainly from the investigations of Prof. Rankine, is as*~~

~~*follows :— " By a 'perfect fluid' is meant one the displacements of which Stream are governed solely by the laws expressed in the equation of fluid lines.*~~

~~*motion, the particles of which therefore are without viscosity, and are capable of gliding rectilinearly along a perfectly smooth surface or past each other without frictional interference, By an imperfect fluid is meant*~~

~~*one in which, as in water, as well as those with which we are practically acquainted, such frictional interference is inevitable.*~~

~~*"Dealing first, then, with the case of steady rectilinear motion in a perfect incompressible fluid, infinitely extended in all directions, it is plain that the motion will create differences of pressure, and therefore changes of velocity, in the particles of the surrounding fluid, which thus move in what are called 'stream lines,' At the commencement of the motion of' the body the particles of the fluid undergo acceleration in their respective stream-line paths, and these accelerations imply a resistance experienced by the body ; but after the motion has become established the differences of*~~

~~*ressure satisfy themselves by keeping up the stream-line con- ligarstiains the energy which the particles receive from the body while they are being pushed aside by it along their stream-line paths is finally redelivered by them to it as they collapse around it, and come to rest after its passage, and the integrals of the + and — pressures on the body are exactly equal at every moment. The manner in which this is effected is governed by the general laws of fluid motion, as expressed by the well-known equations ; and, since these equations contain no term which implies a loss of energy, the energy existing in the body, as well as in the stream- line system, remains unaltered ; so that, if the motion is steady, or without acceleration or retardation, the body passes through this theoretically perfect fluid absolutely without resistanee. Nor must it be thought a paradox (for it is unquestionable) that even a plane nioving steadily at right angles to itself through a perfect fluid would in the manner described experience no resistance. But if the fluid, instead of being infinite in all directions, be bounded by a definite free surface parallel to the line of motion, such as a water level, the existence of this surface euts off the reactions of all those particles which would have existed beyond the surface had the fluid been unlimited alike in all directions, and which would have given back in the manner described the energy im parted to them. By the absence of these reactions the stream-line motions which would have existed in the infinite fluid are modified, and the differences of pressure involve corresponding local eleva- tions of the surface of the water in the vicinity of the moving body. And since, in consequence of the*~~

~~*action of gravitation (the force which controls the surface), a water protuberance seeks immediately to disperse itself into the surrounding fluid in accordance with the laws of wave motion, the local elevation partly discharges itself along the surface by waves which carry with them the amount of energy embodied in their production. This energy is, in fact, part of the aggregate energy which was imparted to the particles of fluid while they were being pushed aside, and which, in the infinitely extended fluid, would have been wholly restored to the body during their collapse after its passage, but is now, in fact,*~~

~~*dissipated. The exact equality between the + and — pressures no longer exists, and the body experiences a definite resistance which it would not do if the fluid were infinite in all directions.*~~

~~*"'It is clear, moreover, that the nearer the moving body approaches the surface the greater are the differences of pressure to be satisfied, the greater will be the waves formed, and the greater the dissipation of energy. Thus, for example, a fish will experi- ence an increase of resistance as its path lies nearer to the surface, the train of waves it creates becoming then a visible accompani- ment of its progress. 4 fortiori, when the body moves along the surface as a ship does on water, those differences of pressure which would exist during the motion if the fluid were infinite in all directions satisfy themselves in still larger waves, which, in fact, are the waves which accompany the body in its motion. The waves which thus visibly accompany a vessel in transitu form a marked phenomenon in river steaming. Thus we sce how, although in a perfeet fluid extended infinitely in all directions, a body, when once put in motion, would move absolutely without resistance, yet, when the fluid is bounded by a gravitating surfaee at or near the line of motion, the body will experience resistance by the formation of waves, notwithstanding that the fluid is a perfect one.*~~

~~*"If the fluid is again supposed to be infinite in all directions, but imperfect, the phenomena previously described undergo appropriate*~~

~~*modifications, and the moving body will also suffer a specific resistance, — in the first place by its having to overcome the friction and viscosity of those particles of the fluid with which it is in contact, and next because the friction of the surrounding particles inter se destroys that orderly arrangement of the stream-line con- figuration which allows of the energy imparted to the particles being returned without loss. If the supposed imperfeet fluid is bounded by a free surface, as already described, and the body moves at or near this surface, it will experience resistances depend- ing on fluid friction, almost exactly in the same manner as if the fluid were infinite in all directions. It will also experience very nearly the same resistance in virtue of the wave-making action as in the perfect fluid ; and we here see the two sources of resistance existing independently of each other, and due to totally different causes,*~~

~~*Important as the question is as to the effect of form upon resist- ance, that of its effect upon stability or steadiness at sea is even more so. Before the use of steam for the propulsion of ships the speed which could be attained in seagoing ships by sail power was largely a question of stability or power to earry a large spread of canvas without inclining or "heeling " too greatly. Small differences in the form of the transverse sections of the ship in the region of the load water-line and under water were influential in this respect, and naval constructors occupied themselves greatly with such ques- tions. The form of the problem completely changes when the pro- pelling power is no longer an upsetting force. The important pec pia in steam ships are the proportions of length, breadth, and*~~

~~*epth ; the form of "entrance" and "run"; the construction of propelling machinery within the ship; and the proportions, form, and number of revolutions of the propeller. But, while this is so, the effect of the stability of the steamship upon her behaviour at Sea, as a question of rolling or "labouring," remains very great. There are, moreover, a very large number of seagoing ships still dependent upon sails for their propulsion, and the question of sailing power is very important in vessels employed on our coasts for commerce and for pleasure. The latest and most complete in- vestigation of questions of stability is to be found in Sir Edward J F Reed's recently published work, The Stability of Ships. There isa more*~~

~~*popular exposition of the subject by Mr W. H. White, director of naval construction, in his Manual of Naval Architecture (1877, 2d ed. 1882), of which use has been made in the following pages.*~~

~~*A ship floating freely and at rest in still water displaces a volume of water exactly equal in weight to her own weight. The circum- stances of the water in which she floats are in fact the same whether the cavity made in the water by the ship is filled by the ship as in fig. 2, or by a volume of water having the same weight as the ship (fig. 3), When the ship oc- cupies the cavity = the whole of her weight may be sup- posed to be con- centrated at her centre of gravity, G, fig. 2, and to act vertically downwards. When the cavity is filled with water its weight, called in relation to the ship the "displacement," may be supposed to be concentrated at B, fig. 3, which is the centre of gravity of the "displacement" or of the displaced water. This centre of gravity is usually known in relation to the ship as the "centre of buoyancy." The weight of this water may be supposed to be concentrated at B, and to act vertically downwards. As this water would remain in the cavity at rest, its downward pressure must be balanced by equal upward*~~

~~*pressures, that is by 'the buoyancy of the surrounding water. These upward pressures must act in the same way as if there were a single pressure equal and opposite to the weight of the water, and acting through the 'centre of buoyancy." In fig. 2a ship is represented floating freely and at rest in still water. Her total weight may be supposed to act vertically downwards through the centre of gravity G, and the buoyancy vertically upwards through the centre of buoyancy. The second condition which the ship floating freely and at rest in still water will always satisfy is there- fore said to be that her centre of gravity will lie in the same vertical line with the centre of gravity of the volume of water which she displaces. So long as the ship rests under the action of these opposing and balanced forces the line joining the centres B and G is vertical and represents the common line of action of the weight and buoyancy. There are of course horizontal fluid pres- sures acting upon her, but these are balanced among themselves. The ship may be floating at rest, but under constraint,*~~

~~*and not freely. There may be the pressure of wind on the sails, or the strain of a rope holding her in a position of rest although the centres B and G are no longer in the same vertical line. Fig. 4 represents such a case, The vessel is at rest, but there is some ex- ternal force operating other than that of buoyancy; and the equal and _ opposite forces of the weight and buoyancy act in different vertical lines, and no longer balance each other. They form a mechanical "couple," tending to move the ship from the position of con- strained rest in which she is shown. If W represents the total weight of the ship (in tons), and d the per-*~~

~~*Fig. 4.*~~

~~*pendicular distance between the parallel lines of action of the weight and buoyancy (in feet), then the operative moment of the "couple "*~~

~~*is represented by the product of the two quantities W and d, mea- sured in foot-tons, If the constraint is removed, and the vessel is freed from all external forees save those of the fluid in which she floats, she will move under the operation of the "couple" towards the upright position until the consequent alteration in the form of the cavity of the displacement brings the centre of buoyancy into the same vertical with the centre of gravity of the ship. What has been illustrated by reference to transverse inclination of the ship is Veni true of oblique or longitudinal inclinations. If the position of the weights in the ship remains unaltered under sueh changes of inclination the centre of gravity remains unaltered, In all ealcula- tions it has to be assumed that the eentre of gravity is a fixed point in the ship, and that movable weights will be secured in the ship. With this assumption the position of the centre of gravity of a ship can be correctly assigned by calculation, small disturbances caused by movements of men, &c., not being large enough to be appreciable.*~~

~~*The statical stability of a ship may be defined as the effort which she makes when inclined steadily by external forces to overcome the constraint and return to the position in which she floats freely, at or near the upright. This effort, as already explained, depends upon the position of the centre of buoyancy B, or the distance from the vertical line through G which the altered form of the cavity of the displacement has caused it to assume, It may always be measured by the product of the two quantities*~~

~~W (iu tons) and d (in feet) (see fig. 4). This product in foot-tons is known as the "moment of statical stability" for the particular angle of inclination and corresponding position of B which are assumed. A little reflexion will show that when large angles of inclination are reached the centre B ceases to recede from the vertical through the centre of gravity of the ship, but will, as the inclination increases, approach this vertical line, and eventually pass to the other side of it.~~

~~The moment of statical stability is at its maximum when the distance d is greatest. The angle which the ship has reached when the centre B has reached this point is called the "angle of maximum stability." As the centre B travels backwards from this position with the increasing inclination of the ship the dis- tance d decreases and the righting power of the ship decreases pro- portionately. When B passes the vertical line through G the moment of stability changes its character and becomes an upset- ting force, which will continue to act until the ship reaches a new position of rest, usually bottom upwards. The angle which the ship reaches before this change takes place, z.¢., when B passes to the other side of the vertical line through G, is called the " angle of. vanishing stability" and it indicates the ship's "range of~~

~~stability."" The change may occur at very small angles if the ship is crank and her sides are low in the water. It may not and sometimes does not occur, on the other hand, until the ship is lying on her beam ends.~~

~~Ifa curve is plotted out showing these positions and indicating also how d first increases and then decreases as the ship is inclined more and more from the upright, the curve is known as the curve of stability,~~

~~The following table contains particulars of the metacentric heights of different kinds of vessels of war, and the corresponding time of an oscillation in still water :—~~

~~These devices were introduced into the '"Inflexible" in order to counteract the influenee of a metacentric height of 8 feet which was~~

~~*designedly given to her, They have proved very effective, but there is another feature in this vessel which has tended to*~~

~~*The time of an oscillation from starboard to starboard may be written thus :—*~~

~~*3 Feet*~~

~~*2T=1-14/K2/m, where T is the ship's period in seconds for a single roll, m is the*~~

~~*metacentric height, or height of metacentre above the centre of gravity in feet, and K is the radius of gyration in feet. The*~~

~~*20 Jo #o 5a 6 70 60 90*~~

~~*out towards the sides of the ship. It was seen that these features in the "Inflexible," which were elements in her design, would favour her and tend to counteract the great metacentric height. The event has shown that, while a metaeentric height of 6 feet in the " Normandie" gave 10 seconds to 11 seconds period, 8 feet in the " Inflexible" only gives 11 seconds as a period, eorresponding with a radius of gyration of 28 feet, The feeling expressed that "in order to provide against the impossible contingeney of the loss of stability by complete waterlogging of the ends we had made an intolerable ship" was not justified. The ship is now so stiff that when the un are waterlogged the running in and out of all her guns on one side only inclines her 24 degrees, while in the " Monarch" when intact and light the same operation inclines the ship 5 degrees, The resistance offered by the water to the rolling of the ship Resist- consists of three parts :—(1) that due to the rubbing of the water ance to*~~

~~*keels and deadwood ; (3) the creation of waves by the rolling*~~

~~*; Metacentric | Period ofa ship to replace those which move away from the ship. The*~~

~~*aniaidadliars at Height. | Double Roll. wei of tines: surface waves eres saa and slicabs the*~~

~~*Pec aaate aes thy ship ie sre coe we ‘ ; ;*~~

~~*we is eo se r ite, giving briefly the results of some of the experiments*~~

~~*— * game! ee = Fe of Mr Froude ter. for the Admiralty, says :—*~~

~~*HMS Si ieicace eh agg SSH ee Sain oni 3°7 6-76 ‘Experiments have been made by Mr Froude to show how Crt il stl ‘shell pues jaan : ; rapidly the rate of extinction may be increased by deepening bilge- Bilge- ee (sha Ted sig t);. i) 14°0 2°7 keels. A model of the ‘ Devastation’ was used for this purpose, keels,*~~

~~*Sew welled in aid 7°65 10°7 and fitted with bilge-keels, which, on the full-sized ships, would*~~

~~*inniidlcadlinaad ee ae represent the various depths given in the following table. The*~~

~~*model was one thirty-sixth of the full size of the ship, and was weighted so as to float at the proper water-line, to have its centre of gravity in the same relative position as that of the ship, and to oseillate in a period proportional to the period of the ship. In smooth water it was heeled to an angle of 84 degrees, and was then set free, and allowed to oscillate until it came practically to rest, the number of oscillations and their period being observed. The following results were obtained :—*~~

~~*Generally speaking, decrease in metacen tric height is accompanied by a lengthening of the period of an oscillation, The ship swings more slowly as she loses stiffness,*~~

~~*scilla- There is no sensible difference in the time occupied by a ship in ions. a swing or roll from side to side, whether she rolls through only three or four degrees on either side of the upright or twelve or fifteen degrees. For larger angles there would be small differences,*~~

~~*The tables which have been given show some remarkable changes in the stability conditions in ships of war within recent years. Sailing ships were formerly made with so little deviation from existing types that it was not*~~

~~*found to be necessary to ascertain their exact measure of stability or to lay down rules for regulating it. The position of the centre of gravity was modified by ballast, and as much as nine or ten per cent. of the displacement was allowed for this, Heavy rolling and great uneasiness of ship from excessive stability had often to be endured. In other cases crank-*~~

~~*Number of Double Period of*~~

~~*Rolls before Model Model fitted with was practically*~~

~~*39*~~

~~*Two 86-inch na A single 72-inch #6*~~

~~*height (6 fect) as is to be found in the earlier sailing frigates. The 'Normandie " in the French navy and the "Prince Consort" in the English navy had from 6 to 7 feet, and they were exceed- ingly uneasy and deep-rolling ships. It was soon discovered that a reduction in metacentric height would cure this evil. The later ships in both navies were accordingly designed to have a metacentric height of about 3 feet. The " Magenta" had 34 feet and the "Hercules" 3 feet. This change altered the period during which the ship made a double oscillation, 7.e., from star- board back to starboard, to 14 to 16 seconds instead of 10 to 11 seconds, as it had been in the '*'Normandie" and 'Prince Con-*~~

~~*" Not content with obtaining the aggregatc value of the resistances for ships, Mr Froude has separated them into their component parts, assigning values to frictional and keel resistances as well as to surface disturbance. In doing so, he has been led to the con- clusion that surface disturbance is by far the most important part of the resistance offered to rolling, as the following figures given by him for a few ships will show :-*~~
~~*—*~~

~~*; «att Keel, Bilge-keel Total Surface Ships. Seis and Deadwood. Resistance, | Disturbance.*~~

~~*sort." The effect on the behaviour of the ship in a seaway was ee ee ee*~~

most remarkable. These ships with small metacentric height || Sultan……. | 354 5, 036 20,000 14,610 might be put into the trough of a sea, and as the waves crossed Inconstant…….. 140 4,060 21,500 17,300 them they steadily rose and fell, hardly inclining their masts. The VONG Sb… occcacances 96 2,944 14,100 11,060 effeet on gunnery practice was also valuable, but there is always a || Greyhound…….. 120 700 4,700 3, 880

'peril attending steadiness obtained by such means: vessels having small metacentric height require careful handling under sail or they may be overset and lost. There is another defeet in this system, viz., that wounds in action will cause the ship to incline Sooncr and more considerably, and they become more dangerous than they would be in a stiffer ship. Bilge-keels and water- chambers are now employed in the English navy, together with, and as opposing influences to, much greater metacentric height.

" Frictional and bilge-keel resistances in this table have been obtained by calculation from the drawings of the ship, Mr Froude making use of data as to coefficients for friction and for head resistance. which he had previously obtained by independent experiments, and which may therefore be regarded as leading to thoroughly trustworthy results. It will be noticed that in no ease does the sum of the frictional and keel resistances much exceed

Water cham- bers.

one-fourth of the total resistance, while it is much less than one- fourth in other cases. The consequence is that surface disturbance must be credited with the contribution of three-fourths or there- abouts of the total resistance, a result which could scarcely have been predicted. Waves are constantly being created as the vessel rolls, aud as constantly moving away, and the mechanical work done in this way reacts in a reduction of the amplitude of successive oscillations. Very low waves, so low as to be almost impercept- ible, owing to their great length in proportion to their height, would suflice to account even for this large proportionate effect.

~~*For example, Mr Froude estimates that a wave 320 feet long and only 1} inches in height would fully account for all the work credited to surface disturbance in the fourth case of the preceding table.*~~

~~*" Another important deduction from the figures in the table is the large proportionate effect of 'keel' resistance as compared with frictional resistance, thus establishing the advantages of deep bilge-keels. Ships of the Royal Navy recently constructed have been furnished with much deeper bilge-keels than were formerly in use, but a limit to the depths that can be fitted is often reached, because of the necessity for compliance with certain con- ditions and extreme dimensions, in order that the vessels may be able to enter existing docks."*~~

~~*In the Royal Navy advantage has also been taken of the power of loose water within a ship to quell motion. It was first employed in the " Inflexible" in a part of the ship lying above the bomb- proof deck, and at the level of the water-line. Its use resulted from a discussion, when the " Inflexible" was designed, of the probable effect of water entering this region of the ship through shot holes. The matter has since been thoroughly established by experiment, and affords a new and valuable means of preventing heavy rolling in ships having large initial stability. There is now no hesitation in giving a metacentric height of 6 feet, and obtaining all the security against upsetting which this ensures, because it is felt that the violent rolling formerly inseparable from stiffness can be prevented. The investigation into this matter has been conducted by Mr Philip Watts, Mr R. E. Froude, and Mr W. E. Smith, acting for the Admiralty.*~~

~~*The accompanying memorandum, prepared by the present writer in 1884, gives the general results :—*~~

~~*'In investigating the phenomena attending the use of water as a means of quelling the motion of ships, Mr Froude has not only taken advantage of the experiments made in the ' Edinburgh' by running men across the decks, hut he has also studied similar phenomena in a model water-chamber, mounted, rot on a model of a ship, but on a large pendulum weighted to the required ' period,' the relative level of the model chamber*~~

~~*and the axis of rotation being made to correspond approximately to scale with that in the ship.*~~

~~*The conclusions, stated in the form of a comparison between the quelling effects of bilge-keels and of moving water, are as follows:— (1) There is a certain depth of water in the chamber which gives the maximum effect; this is dependent upon the width of the chamber and the period of the ship. (2) With this depth of water the growth of resistance to rolling commences almost at zero of angle, whereas with either a greater or less depth there is practically no resistance at all due to the water up to a certain angle, which angle increases with increase of departure from the proper depth. (3) At larger angles of roll the disadvantage of departure from the proper depth of water is not marked. (4) The resistance of water in a chamber does not increase at all uniformly with increase of angle of roll, but increases rapidly at first and at the larger angles becomes more nearly constant for all angles. (5) The best quantity of water for the original chamber in the 'Edinburgh' was 43.tons ; the best for the chamber enlarged by removal of cork walls was 79 tons ; and the best for the chamber extending to the sides of the ship would be 100 tons. 'The first-named extension improved the resistance at 10° by 21 per cent., and the further extension by another 22 per cent.*~~

~~*" As compared with bilge-keels the matter is stated as follows :— while 2 feet addition to the breadth of the bilge-keels adds in round numbers two-thirds to the existing extinguishing power of hull and bilge-keels on the 'Edinburgh' at all angles of rolling, the fully extended water-chamber adds at 3° of roll about six times, and at 5° about three times that power ; at 12° the chamber adds no more than 2 feet of bilge-keel, while at 18° it only adds half as much. It is therefore evident that, while both are valuable, the water-chamber is for most kinds of service much the more valuable of the two.*~~

~~*"' Explaining the cause of the phenomena, Mr Froude says :—*~~

~~*" 'The extinguishing or quelling effect of water depends, of course, exteris paribus, upon the value of the moment represented by the transference of water from side to side, #.e., with a given quantity of water, upon the distance moved by its centre of gravity. This distance*~~

~~*increases with increase of angle of roll, and consequently the extinction similarly increases up to a certain point, where we appear to have approximately reached the maximum possible transference of water, and consequently the maximum extinction of which the quantity of water is capable with the dimensions of the chamber. This point occurs generally at a moderate angle, and above*~~

~~*| ship in each swing by the extinction. | generally is of a type very wasteful of energy, the water either rushing*~~

~~*SHIPBUILDING*~~

~~*this angle the extinction becomes practically constant. But the extinguishing effect of the water of course largely depends also upon the timing of its motion from side to side,—the extinction being greatest when that motion takes place most nearly at the time of extreme angle of ship, i.e., in such a manner as that the water may be as much as possible running downhill when it is moving across, and as much as possible upon the rising side of the ship when it is stationary. If, on the other hand, the motion of the water across were to take place when the ship is quite upright, the extinction would be nil. It is therefore conceivable that for the same total degree of motion or transference of water we may have a very different degree of extinction, according to the timing of that motion. In the motion of the water energy is necessarily wasted, and it is clear that, if we are dealing with a permanent condition of things, «.¢., if the ship is being steadily maintained at a constant angle of roll, this waste of energy in each run of water from side to side must be exactly equal to the energy taken out of the The motion of the water may be and*~~

~~*across in a mass, and consuming its energy by breaking with great violence against the opposite side, as it does at the larger angles of rolling, or, at more moderate angles, running across in a breaking wave or bore, which consumes its energy as it goes in its own internal resistance; and under these circumstances the timing of the motion appears invariably to approach pretty nearly to that giving the maximum extinction for the degree of motion. But the motion of the water sometimes takes the form of a mere alternating slope of surface, or tidal swing from side to side, and here there is very little waste of energy, the energy of motion of the flow.*~~

~~*of water in one direction being converted into potential energy in the shapé of rise of water at the side, and then given out again to the water flowing back to the other side, and so on. The waste of energy in this form of motion being almost nil, the timing is almost exactly that appropriate to no extinction, the water being in the middle of its passage across and the surface being level when the ship is upright.'*~~

~~*'The value of the chamber of course increases as its length in the direction of the keel of the ship increases. The actual size of the chamber we adopted appears to give valuable results, although its extent was necessarily limited."*~~

~~*Tabular Statement of Results of the Above Experiments.*~~

~~*Empty Fully Empty Chamber. Chamber. | pxtendeq | Two Feet addi- Existing | Chamber, | tional Width of | Slope Bilge-keels. ; Bilge-keel. ° ° : 9 3°8 39 Steady rolling in co-) | 10 3°8 75 1:22 periodic waves……+ } | 15 10°5 111 2°63 | 20 16°6 14:7 4°59 Irregular rolling repre-) | 5 13 41 "47 sented by angle accu- 10° 4:5 U7 1°29 mulated from rest in ?) 15° 10:7 11°29 2°67 five successive co- 20 16°6 14 8 4°64 periodic waves……*~~

~~*In some lectures recently delivered Mr Smith, assistant con- structor of the navy, illustrated the use of water in quelling motion by models as shown below.*~~

~~*SSSssss*~~

~~*SSSSSSSSSS SSS*~~

~~*Fig. 6.*~~

~~*'The models represented the midship sections of the 'Admiral' class, and were both of the same weight and size. Each model was mounted on trunnions, marked T, and both oscillated freely on these trunnions in exactly the same time. The models were placed one behind the other, so that the parallelism of the masts was evident to the audience. The model in fig. 7 was provided with a glass tube into which varying quantities of*~~

~~*water could be put. An amount of water representing ;4, of the total weight of the model, 7.e., 100 tons in a 10,000-ton ship, was now placed in the tube, the models were started from the same angle as before, and the model with the loose water, instead of keeping up exactly with the other, or rolling more violently, came almost instantaneously to rest.*~~

~~*'The tube was filled with varying quantities of water, and the effect was always to stop the model much sooner than the model with no weights free to move. The two models were always started from the same angle, so that their relative behaviour could be easily seen. When the tube was quite full there was practically no effect. The two models rolled almost together. The same effect resulted from the motion of a marble representing In weight 100 tons in a ship of 10,000 tons. The same reduction must always occur in arolling ship if we have a loose weight of any kind, whether the*~~

~~*Dynami- cal stability.*~~

~~*reat estern.*~~

~~*eat itain,*~~

~~*'at about this date :*~~

~~*weights fixed, but the sea would, in addition, be doing all the work involved i the deck, which is quite impossible under the circumstances of perfect similarity we have supposed, The sea can only do the In the one case that work consists entirely in rolling the vessel, in the other it consists partly of rolling the ship and partly in dashing the weight about. The rolling in the latter must therefore inevitably be less than in the former case."*~~

~~*Dynamical stability is the "work" done or energy expended in heeling the ship from the upright to any inclined position. The unit of " work " employed in measuring dynamical stability is a foot- ton. When the vessel is gradually inclined the forces inclining her must do work depending upon the amount of the statical stability at the successive instantaneous inclinations passed through, and these are given by the curve of stability already described, Dynamical stability is of value as a means of*~~

~~*comparing the resistance of ships to upsetting under the action of suddenly applied forces, such as squalls of wind. Illustrating this Mr White says :—*~~

~~*"'Roughly speaking, it may be said that a force of wind which, steadily and continuously applied, will heel a ship of ordinary form to a certain angle will, if it strikes her suddenly when she is upright, drive her over to about twice that inclination, or in some cases further still. A parallel case is that of a spiral spring ; if a weight be suddenly brought to bear upon it, the extension will be about twice as great as that to which the same weight hanging steadily will stretch the spring. The explanation is simple. When the whole weight is suddenly brought to bear upon the spring, the resistance which the spring can offer at each instant, up to the time when its extension supplies a force equal to the weight, is always less than the weight ; and this unbalanced force Stores up work which carries the weight onwards, and about doubles the extension of the spring corresponding to that weight when at rest."*~~

~~*Structure.*~~

~~*The changes which have come about in materials and modes of construction within the last 50 years have been most remarkable, The first steamer built expressly for regular voyages between Europe and America was not built until 1837. Dr Lardner stated "We have as an extreme limit of a steamer's practicable voyage, without receiving a relay of coals, a run of about 2000 miles." The " Great Western," built by Patterson of Bristol and engined by Maudslay of London under the superintendence of Sir I. K. Brunel, was the first such ship, and she was launched J uly 19, 1837. She was 212 feet long between the perpendiculars, 35 feet 4 inches broad, and had a displacement of 2300 tons. She was propelled by paddles. Iron vessels were built early in the present century for canal service, then for river service, and later for packet service on the coasts. In about the year 1838 iron vessels of small dimensions were built for ocean service. The largest iron vessel built up to 1841 was less than 200 feet long. In 1843 we get for the first time the ocean-going steamship in its present form, built of iron, and propelled by the screw. This was the " Great Britain," 286 feet long, projected and designed by Brunel. Time has abundantly*~~

~~*justified these bold enterprises on the part of Brunel, which he had to carry through in the face of great opposi- tion. He entered with equal boldness on another innovation in 1850, viz., the use of very large dimensions on the ground of economy of power. It was not until 1852 that he had the oppor-*~~

~~*tunity to put these views forward in a way to satisfy him. The different sizes of vessels discussed before the design was finally*~~

~~*settled for the "Great Rastern " were as follows :— No. Length. | Breadth. Midship Section. | Draught. 1 663 79°9 1,646 24 2 634 76°39 1,640 25 3 609 73°5 1,639 26*~~

~~*4 730 87 2,090 28*~~

~~*The dimensions eventually settled were—length, 680 feet; beam, 83 feet; mean draught, about 25 feet ; Screw engine, indicated horse-power, 4,000, and nominal horse-power, 1600 : paddle, indicated horse-power, 2,600, and nominal horse- power, 1,000 ; to work with steam 15 Th to 25 tb; speed of screw, 45 to 55 revolutions ;*~~

~~*The "Great produced by the joint skill of Brunel and Scott Russell, remains in advance of present practice, although she has served as a model for the best of it. Her great size rend- ered it possible to give to her an amount of security against fatal i ; cannot be attained in smaller ships. 18 a mistake to suppose that large ships are less secure than small ship can receive without inconvenience a wound fatal to a small one, and the possibilities of obtaining high speed increase with the size. Had a higher speed been aimed at in the "Great Eastern," it might have altered the whole current of her history, and changed also the history of ship-building itself,*~~

~~*The question of bulkheads, on which Brunel insisted so much in this ship, is one which underlies all questions of construction, If the number of bulkheads in ships were increased as they ought to be, the numbers and sizes of the ribs or frames of the ship would be modified, and the system*~~

of construction generally would be changed, and become more like that of the " Great Eastern." The question is therefore one which justifies some further consideration, so that it may be popularly understood.

Tron ships are commonly made with less than half their bulk out of water. If water enters such a ship, and the amount which enters does not exceed in bulk that portion of the bulk of the ship which is out of the water, and which will, when immersed, exclude the water, then the ship, if she does not turn over, will still float. If, however, the inflow cannot be stopped, but continues, the ship soon sinks.

Let us suppose the case of a ship 50 feet long, 10 feet wide, and 10 feet deep, divided into five equal parts by four watertight par- titions, and floating in water with half its bulk immersed (fig. 8). Suppose now that a =

? — _ ——

under the water, so

hole is made in the i SS 4 middle of this ship oe ——— A fh

i —— ‘

that water can flow 4 freely in, then the i ——— ! part of ; the ship Sr ae which is shaded Fig. &.

ceases to have floating power. The water in this shaded place is no longer displaced, but is admitted, and ifthe ship is to continue afloat, the other parts of the ship must displace water to the amount b which this shaded part has ceased to do so. As it is one-fifth of the whole immersed bulk which is lost, the remaining four compart- ments must sink, so as each to support one-fourth of the whole, instead of one-fifth, as before ; ¢.¢. , the draught of water, or im- mersion of the whole ship, will be increased, and the ship will, if she has stability enough to keep upright, finally float at rest again at this deeper immersion. The water will rise in the centre com- partment to the level of the water outside, and will then cease to flow in. The additional immersion will be only one and a quarter feet, but in an

~~*ordinary ship, divided into compartments of equat length, there would be a greater increase of immersion by the injury of a centre compartment, because the end compartments are narrow, and must sink deeper in order to bear their share of the burden imposed by the loss of the buoyancy of the centre division. ae*~~

~~*Or it may be other than a central compartment which is damaged, and in that case the ship tips, and finds a new floating line, with the end towards which the damaged division lies depressed more than the other end. =*~~

~~*If it should happen that the divisional partitions, or bulkheads as they are called, rise only a few inches above the water level which the ship floats at when undamaged, then, on the occur- rence of a bad leak filling one compartment, the tops of the bulk- heads are brought, by the increased immersion of the ship, beneath the water-level, the water will rise through the hatches, or open- ings in the deck, in the damaged compartment, will flow over the entire deck, and the ship will be lost, either by the filling of other compartments by the water passing down into them, or by the capsizing of the ship. This latter event will generally happen, although only one compartment is full, if the sea has free access to*~~

~~*Great Eastern.*~~

~~*Bulk- heads.*~~

~~*Recom- menda- tions of the Council of the Institu- tion of Naval Archi- tects.*~~

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~~*the deck from end to end of the ship, and it becomes immersed.*~~

~~*In 1866 the president of the Institution of Naval Architects said: "The circumstances of the sad event of the loss of the 'London,' accompanied as it was by the simultaneous loss of another ship of still larger size, and of a higher reputed character " (the " Amalia,"), "was, I think, an event so remarkable that I should be very sorry indeed if this annual meeting of this Institu- tion were to pass by without some notice being taken of the*~~

~~*extra- ordinary circumstances of the loss of that ship, and without some discussion upon what we suppose to be the causes of the loss, and the faults, if any, of the construction of those ships." 'The passengers who pass to and fro are not judges of the question ; they cau take no precaution for their own safety; it is to the skill and scienee of those who build these ships that the passenger trusts, and to the care which the legislature and the Government are bound to take of their fellow-subjects. "*~~

~~*Subsequently the council of the Institution arrived at the follow- ing conclusions and offered them as recommendations to ship- builders and shipowners :—*~~

~~**'1. No general rule can be safely laid down for regulating the proportions of length and depth to the breadth of a ship, and a great variety of propor- tions of length and depth to breadth may be safely adopted, and the ship made sound and seaworthy, by judicious form, construction, and lading.*~~

~~*2, The construction load-water-line of every ship, and her scale of dis- placement from light to load-water-line, should be appended to every design of a ship, showing the extreme draught to which she should be laden; and measures should be taken to ensure that this information be recorded on the ship's papers. It is desirable also that along with a ship's papers, in the possession of the captain, there should always be carried a scale of displacement, a sail draft, and a set of outline plans of the ship, comprising a longitudinal section, and at least four cross sections of the ship. On these plans should be marked the capacity, in tons of 40 cubic feet, of each com- partment of the hold. The surplus buoyancy of each compartment up to the load-water-line, or its power to carry deadweight, should be given in tons deadweight. These papers should always accompany the ship's register, and a copy of them should be lodged in the custom house of the port from which the ship hails.*~~

~~*'3. There is a minimum height of freeboard which eannot be safely reduced in sea-going ships of ordinary fitment; and it is desirable to fix this minimum height, Freeboard should be understood to be the vertical height of the upper surface of the upper deck (not spar-deck) at the side,*~~

~~amidships, above the load-water-line. The proportion of freeboard should increase with the length. One-eighth of the beam is a minimum freeboard for ordinary sea-going ships of not more than five breadths to the length, and », of the beam should further be added to the freeboard for each additional breadth in the length of the ship ; this would give—~~

~~For a ship of 32 feet beam and 160 feet long, 4 feet freeboard ,~~

~~For a length of 192 feet, 5 feet freeboard ;~~

~~For a length of 224 feet, 6 feet freeboard ;~~

~~For a length of 256 feet, 7 feet freeboard ;—the beam remaining the same.~~

~~But, as the addition of a spar-deck on long vessels may be considered an equivalent or substitute for the increased freeboard required for extra length, a complete spar-deck would leave the freeboard of these extra lengths at the original height of 4 feet.~~

~~"4, It is not considered desirable to offer any recommendations with regard to poops and forecastles. It must depend entirely upon the professional judgment of the designer of a ship, whether, looking to her proportions, form, and purpose, the additions of poop and forecastle are expedient and safe. In general, where poops and forecastles are adopted, they should be closed and seaworthy, but their weight may be inexpedient in long fine ships; and there are cases where a light top-gallant forecastle (i.e., an open forecastle raised above the level of the upper deck) may be useful in keeping heavy seas out of the ship. In general, spar-decks in long ships are preferable to poop and forecastle, and no diminution of freeboard should be allowed for a poop or forecastle.~~

~~'5, It would add much to the strength aud security of steamships if transverse and longitudinal bulkheads, coal bunkers, iron lower decks, and screw alley were all so connected with the hull of the ship and with each other as to form independent cellular compartments, watertight, and having all their communications with the decks and each other by water-tight doors worked from the deck. In proportioning the compartments of a~~

~~*ship (and especially of ships devoted to passengers) it is very desirable so to arrange them that if any two adjacent compartments be filled, or placed in free communication with the sea, the remaining compartments will float the ship. It is considered that no iron passenger ship is well constructed unless her compartments be so proportioned that she would fioat safely were any one of them to fill with water, or be placed in free communication with the sea. Double bottoms are to be regarded as a great element, both of safety and strength, in the structure of a large iron ship.*~~

~~*"6, It is very desirable that sufficient ventilation should always be provided in passenger ships to admit of closing all side scuttles and battening down, or otherwise enclosing, all hatches in bad weather.*~~

~~*"7. In regard to hatchways and openings in the deck no limits can be set to their size ; but it is desirable to carry the beams of the ship across them without interruption wherever practicable ; they may also be made removable where required, being replaced on going to sea. All coamings over engine and boiler rooms in passenger ships should be as high as practicable, of iron, and riveted to the beams and carlings. Openings in the deck may be fitted with solid coverings, hinged in place so as to be readily closed.*~~

- ~~*8, It being considered that all openings in the sides or ends of vessels are subject to accidents that endanger the safety of ships, it is desirable that the side and stern windows should, in addition to the glass lights, have hinged dead-lights, with a view to their being always in place, and that all cargo ports should be strongly secured by iron cross bars.*~~

~~*"9, It is believed that all openings from and communications with the sea from engine-room and pipes should be protected by conical, or Kingston, or sluice valves, and similar precautions should be taken for all openings through the bottom of the ship, where damage to pipes or ship would admit water into the holds.*~~

~~*"10. It is considered that all steam vessels, if of iron, should have a brass-barrelled hand-pump to every compartment except the forward and after ones (the former to have a sluice cock), or that, asa substitute for these*~~

~~*pumps, there should be patent pumps having independent connexions to this extent. They should also have a donkey engine and pump capable of pumping from the bilge and from the sea, of feeding the boilers, and of*~~

~~*wholly*~~

~~*SHIT PrEViL Dy £246*~~

~~*throwing water on deck. All vessels should have one or more bilge-pumps, worked by the large engines, with bilge injection pipes if the engines have condensers. In large vessels the donkey engines should have a separate boiler high above the water-line, and also communication with the main boilers. All vessels should have a set of bilge pipes connecting every hold and the engine compartments with these pumps. As a security against fire there should be pumps on the upper deck, fitted as force pumps, and provided with a suflicient length of hose (with the necessary copper delivery jets) to reach either extremity of the vessel, and also provided with suction hose or pipes from the sea. The cocks by which the working of the pumps is regulated should be carefully arranged and marked, and great care should be taken that both cocks and pipes are accessible. A plan of the whole should accompany the ship's papers, and the crew should be periodically exercised in their use.*~~

~~*'11. The stowage of a ship, whether done by contract or not, should be done under inspection of the captain of the ship, and should be conducted under his own orders only ; and he alone should be held responsible for the good stowage of his ship. Ships are often very badly stowed, the weights being sometimes too low, thus causing them to roll with such rapid and violent motions as to carry away the spars, and otherwise endanger the safety of the ship, and at other times too high, thus making the ships crank, and liable to turn over. A ship may, however, generally, whatever her form, be so stowed as to avoid both dangers. As the character of the ship in these respects varies, so does the number of oscillations she would make per minute if she were set rolling in still water, by men running across her deck, or other means, and then allowed to come to rest; that is, if the ship be crank the number of oscillations per minute will be few, and if she be too stiff they will be numerous ; but, under the same conditions of stowage, the number will always be very*~~

~~*nearly the same, whatever the amount of the impulse to set her rolling may be. Although this peculiarity has long been known to scientific men, no such observations have been made in merchant ships as would justify any specific rule on the subject. It is, however, most desirable that information should be collected upon it, and that the attention of the owners and captains of vessels should be called to it.*~~

~~*"12. It is believed that the present rules of the Board of Trade regarding boats, life-boats, and their tackle are good in principle. The responsibility for keeping all boats in constant readiness and efficiency obviously rests on the captain, and must fix on him the blame for all neglect and its consequences. Every open boat built of iron or steel should be fitted with sufficient watertight spaces to float her.*~~

~~*"13. The system of proportioning anchors and cables by Lloyd's, and of proving under licence of the Board of Trade by Act of Parliament is so far satisfactory; but, as the proof-test alone cannot establish the excellence of the cable, the reputation of the makers must be relied upon.*~~

~~*'14. In order to provide for the rapid clearance of the upper deck from water which may break over the ship, flap-boards should be fitted to the lower part of the bulwarks, sufficient in number and in area to admit of the rapid escape of the water,*~~

~~***15. Water-closets on decks below or near the water-line may be the means of gradually and imperceptibly flooding the ship, and. endangering her safety, unless the pipes and valves are strong and are carefully fitted."*~~

~~*It isin the directions indicated in these recommendations that the honesty and skilfulness of the modern builder of steam and sailing ships of war come into play, and some judgment may be formed by the general public of the character of the ship by inquiring into matters upon which the council thought it neces- sary to make such recommendations. The guarantee which the public have of the fitness of passenger ships for service, as a question of proper construction and state of efficiency, is the sur- vey and certificates of the Board of Trade. The law runs thus :—*~~

~~*The owner of every steam vessel constructed or intended to carry passengers Board of*~~

~~*(except vessels which fall within the definition of foreign-going ships con- tained in the Mercantile Marine Act, 1850, and are employed in the convey-*~~

~~*ance of the royal public mails or despatches under contract with and under SUI'VEYS.*~~

~~*the superintendence of the lord high admiral or the commissioners for executing the office of lord high admiral) shall cause such steam vessel to be surveyed twice at least in every year, at the times hereinafter directed, by a shipwright surveyor and by an engineer surveyor appointed for the purposes of this Act by the lords of the said committee, such shipwright surveyor in the case of an iron steam vessel being a person properly qualified to survey iron steam vessels, and shall obtain a declaration of the sufficiency and good condition of the hull of such steamer, and of the boats and other equipments thereof, required by this Act; and also, if the lords of the said committee so require, a statement of the number of passengers (whether deck passengers or other passengers) which such vessel is constructed to carry, under the hand of such shipwright surveyor, and a declaration of the sufficiency and good condition of the machinery of such steamer under the hand of such engineer surveyor; and in such declarations it shall be dis- tinguished whether such vessel is in construction and equipments adapted for sea service as well as for river or lake service, or for river or lake service only; such declaration shall state the local limits within which such vessel is, in the judgment of the surveyor, adapted for plying ; and in the case of seagoing vessels the declaration of one of the surveyors shall contain a statement that he is satisfied that the compasses have been properly examined and adjusted ; and such owner shall transmit such declarations to the lords of the said committee within fourteen days after the dates thereof respect- ively.*~~

~~*As to the fifth recommendation of the council of the Institu- tion of Naval Architects, it must be observed that there is at present no law relating to the subdivision of steamships. There was a clause (No. 300) in the Merchant Shipping Act of 1854, which was virtually a reproduction of*~~

~~*clause 20 of the Steam Navigation Act of 1851, and which read as follows :—*~~

~~*"1, Every steamship built of iron of 100 tons or upwards, the building of which commenced after the 28th day of August 1846, and every steamship built of iron of less burden than 100 tons, the building of which commenced after the 7th August 1851 (except ships used solely as steam tugs), shall be divided by substantial transverse watertight partitions, so that the fore part of the ship shall be separated from the engine-room by one of such partitions, and so that the after part of such ship shall be separated from the engine- room by another of such partitions.*~~

~~*"2. Every steamship built of iron, the building of which commences after the passing of this Act, shall be divided by such partitions as aforesaid into not less than three equal parts, or as nearly so as circumstances permit.*~~

~~*"8. In such last-mentioned ships each such partition as aforesaid shall be of equal strength with the side plates of the ship with which it is in*~~

~~*. contact.*~~

~~*Ineffi- sient subdivi- ion of ron and teel hips,*~~

~~*cares LL DI we*~~

~~*"4, Every screw steamship built of iron, the building of whi h after the passing of this Act, shall, in addition to the BEGTE DereMioiie: penton, se a small watertight compartment inclosing the after extremity of the shaft."*~~

~~*The above law was repealed by the Act dated 29th July 1862, and on the 28th August 1863 the Adiniralty applied to the Board*~~

~~*watertight compartments when employed in conveyance of mails and passengers, observing that the Admiralty were still of Opinion to the Amendment Act of 1869 in respect of contract packets should not have been relaxed. They considered such vessels should have compartments so*~~

~~*arranged that if any one of them became filled with water the loss of buoyancy thereby occasioned should not endanger the safety of the ships, as recommended by them in their communication of the 17th December 1860. 'To this the Board of Trade replied (34 Sep- tember 1868) that their surveyors no longer had any power to require given watertight partitions to be fitted in passenger steam- ships—though they agreed with the Admiralty in thinking that steam vessels carrying passengers and mails should be provided with a sufficient number of watertight partitions,—and had no reason to suppose that the Admiralty would not insist on such partitions being fitted in all steamships employed in conveyance of mails. They further say that the enactments in the Act of 1854 were repealed, not because of any doubts as to the necessity of proper and sufficient watertight partitions, but because those enactinents which required only two of such partitions for all sizes aud classes of ships had become practically useless or mischievous, It was found that in large vessels more partitions than the Act required were necessary to secure the safety of the ship, and it was thought better to leave builders and designers unfettered in pro- viding extra strength and security to meet the various forms, sizes, and descriptions of ships than to tie them down by general statutory regulations which could not be so framed as to meet the varying wants and circumstances of the shipbuilding trade,*~~

~~*In a return by the Board of Trade to the HIouse of Commons, dated 11th August 1875, setting forth the instructions issued to their surveyors under the Merchant Shipping Acts, 1854 to 1873, clause 26 reads—*~~

~~*'Surveyors should not refuse to grant a declaration for a vessel solely on the ground that bulkheads are not fitted, that the ordinary bulkheads are not watertight, or that the bulkheads fitted are otherwise defective, unless they are of opinion that the want of, or the defective state of, the bulkheads renders the ship unseaworthy, in which case they are fully justified in refusing to grant a declaration. They should, in all cases in which they refuse to grant a declaration for a vessel in consequence of defects relative to bulkheads, forward to the Board of Trade a full statement of their reasons for thinking that those defects render the hull of the vessel unseaworthy. Collision watertight bulkheads, at least, must be fitted in all seagoing steamers. The surveyors are also to see that an*~~

~~*after watertight compart- nient is fitted to cover the stern-tube of the screw-shaft, both in old and in new vessels,"*~~

~~*This regulation has been reissued in the latest instructions to Board of Trade surveyors, dated 1884. It thus comes about that the number of bulkheads forming watertight conipartments, the number of doors in them, and how they are fastened, are inade the subject of consideration by the Board of Trade at their inspections ;- but the fact is that the great majority of ocean-going steamers are not divided into watertight compartments in any efficient nianner, and many losses in collision, grounding, and swamping are due to this. Although all steamships have some bulkheads, and some have many bulkheads, they are as a rule distributed in such a way, or are so stopped below the water-level, that for flotation purposes after perforation those lying between the foremost collision bulkhead and the after bulkhead through which the screw shaft passes are practically useless.*~~

~~*With the exception of some four hundred ships, there are no iron steamships afloat which would continue to float were a hole made in the bottom plating anywhere abaft the collision bulkhead and outside the engine-room, or which would not founder were water admitted through breaches made by the sea in weak superstructures and deck openings. Of the four hundred ships referred to as having properly designed bulkheads two hundred are essentially cargo-carriers. They are generally built with five subdivisions, the machinery space being one. ron sailing ships are without exception undivided into compartments. They have by law a collision bulkhead near the bow, and that is all. Between June 1881 and February 1883 there were about one hundred and twenty iron steamships lost, of speeds of nine to twelve knots, not one of which was well constructed according to the opinion of the council of the Institution of Naval Architects.*~~

~~*It may be said that wooden ships were not divided into water- tight compartments, but it must be remembered that in a wooden ship there is far more local resistance to a blow either in collision or by grounding, and that a wooden ship takes a much longer time to settle down in the water and sink. Also, when wood was employed for passenger and trading*~~

~~*ships speeds were much lower and traffic and risks of collision very much less.*~~

~~*The shipbuilding registries prescribe rules for the government*~~

~~*817*~~

~~*of the builder who desires to have their certificate, and these rules ave been so carefully framed and go honestly enforced that English-*~~

~~*ad ships are as a rule well 8t*~~

~~*of 330 feet long and above an additional bulkhead i i hold, extending to the saine height." cane eae*~~

~~*"The foremost or collision bulkhead i I Reem gente Cee In all cases to extend from the floor*~~

~~*the floor Plates to the upper deck in vessels with one, two and to the main deck in spar- The aftermost bulkhead will be required to exteud to the upper deck unless the arrange- ment of bulkheads be submitted to and approved by the committee, .. .*~~

~~*It is not intended by the foregoing remarks, serious as they are, to blot the splendid record of shipbuilding achievement in Great Britain during the last twenty years. The shipowners, ship- builders, marine engineers, Lloyd's Surveyors, and the Board of Trade have all shared in a development of shipping which, in amount and in general efficiency, is not only without parallel in the history of the world, but, as it still appears to us who have witnessed it, almost incredible. It still is to be regretted that expausion has been thought of and sought more ardently than greater security and efticiency. The men who have studied to lmprove their structural arrangements because of their love of prospect of recognition or reward,*~~

~~*There is, perhaps, no structure exposed to a which*~~

~~*combinations embraced in its structure is therefore most import- t. Some of these forces always act, whether the ship be at rest or in motion,*~~

~~*side, or she may be supported in the middle only, with both ends for*~~

~~*pressure of the water upon its body is equal to the total weight of the ship, it does not necessarily follow*~~

~~*pressures are very unequal.*~~

~~*If the vessel be supposed to be divided into a number of laminze of equal thickness, and all perpendicular to the vertical longi- tudinal section, it is evident that the after lamin comprised in the overhanging stern above water, and the fore laminee comprised in the projecting head also above water, cannot be supported by any upward pressure from the fluid, but their weight must be wholly sustained by their connexion with the supported parts of the ship. The lamina towards each extremity immediately con- tiguous to these can evidently derive only a very small portion of their support from the water, whilst towards the middle of the ship's length a greater proportionate bulk is immersed, and the upward pressure of the water is increased.*~~

~~*A ship floating at rest under the view just taken of the relative displacement of different portions of the body, if the weights on board are not distributed so that the different laminz may be supported by the upward pressure beneath them as equally as possible, may be supposed to be in the position of a beam supported at two points in its length at some distance from the centre, and with an excess of weight at each extremity. At sea it would be exposed to the same strain ; and if supported on two waves whose crests were so far apart that they left the centre and ends com- paratively unsupported, the degree of this strain would be much increased. The more these two points of support approach each other, or if they come so near each other that the vessel may be looked upon as supported on one wave, or on one point only in the middle of her length, the greater will be the tensile strain on the upper portion, and the crushing strain on the lower portion of the fabric of the ship. A vessel whose weights and displacements are so disposed as to render her subject*~~

~~*to a strain of this kind beyond what the strength of her upperworks will enable her to bear, will tend to assume a curved form.*~~

~~*The centre may curve upwards by the excess of the pressure beneath it, and the ends drop, producing what is called "hogging," The main remedy for these evils is in the strength of the deck and*~~

~~*XXI° — 103*~~

~~*Curves of*~~

~~*strains.*~~

~~*H.M.S. *€ Mino- taur."*~~

~~*818*~~

~~*upperworks, and their power to resist a tensile strain. There is seldom a want of sufficient strength in the lower parts of the vessel to resist the crushing or compressing force to which it is subjected. The decks of vessels should not, therefore, be too much cut up by broad hatchways ; and care should be taken to preserve entire as many strakes of the deck as possible. The tensile strength of iron can be brought to bear most beneficially in this respect. Though these are the strains to which a ship is most likely to be exposed, it by no means follows that there are no circumstances under which strains of the directly opposite tendency, when pitch- ing, or otherwise, may be brought by recoil to act upon the parts. The weights themselves in the centre of the ship may be so great that they may have a tendency to give a hollow curvature to the*~~

~~*form, and it is therefore equally necessary to guard against this |*~~

~~*evil. When this occurs, the vessel is technically said to be "sagged," in distinction to the contrary or opposite change of form by being hogged. The weight of machinery in a wooden steam-vessel, or the weight or undue setting up of the main-mast, will sometimes produce sagging. The introduction of additional kcelsons tended to lessen this evil, by giving great additional strength to the bottom, enabling it to resist extension, to*~~

~~*which, under such circumstances, it became liable ; and, as the strain upon the deck and upperworks becomes changed at the same time, they are then called upon to resist compression.*~~

~~*When the ship is on a wind, the lee-side is subjected to a series of shocks from the waves, the violence of which may be imagined from the effects they sometimes produce in destroying the bul- warks, tearing away the channels, &c. The lee-side is also sub- jected to an excess of hydrostatic pressure over that upon the weather side, resulting from the accumulation of the waves as they rise against the obstruction offered to their free passage. These forces tend in part to produce lateral curvature. When in this inclined position, the forces which tend to produce hogging when she is upright also contribute to produce this lateral curvature.*~~

~~*The strain from the tension of the rigging on the weather side when the ship is much inclined is so great as frequently to cause working in the topsides, and sometimes even to break the timbers on which the channels are placed. Additional strength ought therefore to be given to the sides of the ship at this place ; and, in order to keep them apart, the beams ought to be increased in strength in comparison with the beams at other parts of the ship.*~~

~~*The foregoing are the principal disturbing forces to which the fabric of a ship is subjected ; and it must be borne in mind that some of these are in almost constant activity to destroy the con- nexion between the several parts. Whenever any motion or working is produced by their operation between two parts, which ought to be united in a fixed or firm manner, the evil will soon increase, because the disruption of the close connexion between these parts admits an increased momentum in their action on each other, and the destruction proceeds with an accelerated pro- gression. This is soon followed by the admission of damp, and the unavoidable accumulation of dirt, and these then generate fermentation and decay. To make a ship strong, therefore, is at the same time to make her durable, both in reference to the wear and tear of service and the decay of materials. It is evident from the foregoing remarks that the disturbing influences which cause "hogging" are in constant operation from the moment of launch- ing the ship. As this curvature can only take*~~

~~*place by the com- pression of the materials composing the lower parts of the ship and the extension of those composing the upper parts, the importance trations of the ——–*~~

~~*aoe az yes Sy A SFR*~~

~~*the ‘ Minotaur ” AA | CN*~~

~~*4*~~

~~*displacement of ad- distribution of the and defects of buoy-*~~

~~*of preparing these separate parts with an especial view to withstand still-water strains*~~

~~*and the “Devas- 8 ip. 9.*~~

~~*jacent transverse*~~

~~*weight of the ships*~~

~~*ancy obtained from*~~

~~*the forces to which they are each to be subjected cannot be over- upon two ar-*~~

~~*tation.”*~~

~~*sections of the*~~

~~*and their lading.*~~

~~*the two curves B and W and set off from a new base line.*~~

~~*rated by the practical builder.*~~

~~*In his Manual of Naval Architecture, Mr W. H. White gives illus- moured ships in the British navy*~~

~~*In these diagrams the curves B represent the distribution of the buoyancy. The ordinates of the curve are proportionate to the ships. The curves W represent the The curves L repre- sent the excesses*~~

~~*Fig, 10.*~~

~~*| there.*~~

~~*SHIPBUILDING*~~

~~*excess of buoyancy above the line is exactly equal to the defect of buoyancy below it. The curves M indicate the bending moments. The ordinates of the curve lying above the base are obtained by summing all the moments, whether upwards or downwards, about the point in the length of the ship where the ordinate is taken. It may happen, as in the case of the " Devastation," that the moments will tend to cause hogging for a portion of the length and will then change their character, and at other por- tions of the length will tend to cause sagging. Where the curve M crosses the base line there is no strain of either hogging or sagging tending to bend the ship In the " Minotaur" there is a hogging tendency throughout. 'Theamount at the midship section is very great, being represented by the moment 4°5 feet x 10-690 tons. After Sir Edward Reed left the Admiralty he strongly expressed his fears that this strain was too considerable for safety in the "Minotaur" and "* Agincourt."*~~

~~*Fig. 11.*~~

~~*Fig. 12,*~~

~~*Designing.*~~

~~*The principal plans of a ship are the "'sheer" plan, giving in outline the longitudinal elevation of the ship; the '" body" plan, giving the shape of the vertical transverse sections; and the "half-breadth"' plan, giving the projections of transverse longi- tudinal sections. In addition to these the builder is furnished by the designer with elevations, plans, and sections of the interior parts of the ship, and of the framing and plating or planking.*~~

~~*The thicknesses or weights of all the component parts are specified in a detailed specification, in order that the ship when completed may have the precise weight and position of centre of gravity con- templated by the*~~

~~*designer. In the case of ships built for the British navy all the building materials are carefully weighed by an agent of the designer before they are put into place by the builder. As each section of the work is completed, the weight is compared with the designer's estimate in the designing office. As soon as the incomplete hull is floated the actual displacement is measured, and compared with the weights recorded as having gone into the ship. It is also the practice in the Royal Navy to calculate the position of the centre of gravity of the incomplete hull, and its draught of water before it is floated, in order to avoid all risk of upsetting from deficiency in stability at that stage of construction. The ship is usually found to float in precise accordance with the estimate. When completed ships float at a deeper draught than was intended, or are found to be more or less stable than was wished, this is nearly always due to additions and alterations made after the com- pletion of the design. Where the designer is at liberty to complete the ship in accordance with the original intention there ought to be precise correspondence between the design and the ship.*~~

~~*In designing a ship of novel type the designer has to pass all the building details through his mind and assign them their just weights and proportions and positions. Every plate and angle bar and plank, every bar and rod and casting and forging, and every article of equipment has to be conceived in detail and its effect estimated.*~~

~~*Building.*~~

~~*The term "laying off" is applied to the operation of transferring to the mould loft floor those designs and general proportions of a ship which have been drawn on paper, and from which all the preliminary calculations have been made and the form decided. The lines of the ship, and exact representations of many of the parts of which it is to be composed, are to be delineated there to their full size, or the actual or real dimensions, in order that nioulds or skeleton outlines may be made from them for the guidance of the workmen.*~~

~~*A ship is generally spoken of as divided into fore and after bodies, and these combined constitute the whole of the ship; they are supposed to be separated by an imaginary athwartship section at the widest part of the ship, called the midship section or dead- flat. The midship body is a term*~~

~~*applied to an indefinite length of the middle part of a ship longitudinally, including a portion of the fore-body and of the after-body. It is not necessarily parallel or of the same form for its whole length.*~~

~~*Those portions of a wooden ship which are termed the square and cant bodies may be considered as subdivisions of the fore-bodies and after-bodies. There is a square fore-body and a square after- body towards the middle of the ship, and a cant fore-body and a cant after-body at the two ends. In the square body the sides of*~~

~~*The | the frames are square to the line of the keel, and are athwartship*~~

~~*H. M.S. ** Devas- tation."*~~

~~*Laying off.*~~

~~*Fore and after bodies.*~~

~~*Timbers.*~~

~~*Keel,*~~

~~*Floors.*~~

~~*Plank- ing,*~~

~~*PHIPHRUILDIN Ee*~~

~~*vertical planes. In the cant bodies the sides of the frames are not square to the line of the keel, but are inclined aft in the fore-body and forward in the after-body. The reason for the frames in these portions of a wooden ship being canted is that, in these parts of the ship, the timber would be too much cut away on account of the fineness of the angle formed between an athwartship plane and the outline or water-line of the ship. The timber is there- fore turned partially round till the outside face coincides nearly with the desired outline, and it is by this movement that the side of a frame in the cant fore-body is made to point aft, and in the cant after-body to point forward.*~~

~~*In wooden ships the term "timbers" is sometimes applied to the frames only, but more generally to all large pieces of timber used in the construction. Timbers, when combined together to form an athwartship outline of the called frames, and sometimes ribs.*~~

~~*The keel, in the United Kingdom at least, is generally made of elm, on account of its toughness, and from its not being liable to split if the ship should take the ground, though pierced in all directions by the numerous fastenings passing through it. It is generally composed of as long pieces as can be obtained, united to each other by horizontal scarphs. angular recess cut into the side to receive the edge of the planks on each side of it. The keel is connected forward to the stem by a*~~

~~*Scarph, sometimes called the boxing scarph, and aft to the stern-*~~

~~*post by mortice and tenon. The apron is fayed or fitted to the after-side of the stem, and is intended to give shift to its searphs, the lower end scarphs to the deadwood. 'The keelson is an internal line of timbers fayed upon the inside of the floors directly over the keel, the floors being thus confined between it and the keel. Its use is to secure the frames and to give shift to the scarphs of the keel, and thus give strength to the ship to resist extension length- ways, and to prevent her hogging or sagging. The foremost end of the keelson scarphs to the stemson, which is intended to give shift to the scarphs connecting the stem and keel. The frames or ribs are composed of the strongest and most durable timber obtainable,*~~

~~*The floors in the Government service were carried across the keel*~~

~~*The rabbet of the keel is an |*~~

~~*819*~~

~~*with a short and long arm on either side alternately, so as to break joint, and between the frames the space was filled in solid. Longitudinal pieces of timber are worked round the interior of a ship for the purpose of receiving the ends of the beams of the several decks ; they are called shelves, and are of the greatest importance, not only for this purpose, but also as longitudinal ties and struts. The beams of a ship prevent the sides*~~

~~*from collapsing, and at the same time carry the decks. The beams are spaced, and their scantling settled upon, according to the strength required to be given to the decks, and to suit the positions of the masts and hatchways, and other arrangements connected with the economy of the ship. All beams have a curve upwards towards the middle of the ship, called the round-up. This is for the purpose of strength,*~~

~~*1 _ and for the convenience of the run of the water to the scuppers. body of a ship, are technically |*~~

~~*Wooden beams are single piece, two, three, or four piece beams according to the number of pieces of timber of which they are composed. The several pieces are searphed together, and dowelled and bolted, the scarphs being always vertical,*~~

~~*The connexion of the ends of the beams to the sides of the ship has been made in various ways. The points to be considered, with re- ference to this connexion, are—that the beam is required to act asa shore or strut, to prevent the sides of the ship from collapsing, and also as a tie to prevent their fallin g apart, that the beam shall not rise from its seat, and that it shall not work in a fore-and-aft direction,*~~

~~*That the beam may*~~

~~*be perfect. In order that it may act as a tie between the two sides, it is generally dowelled to the upper surface of the shelf on which it rests; and the under surface of the waterway plank which lies upon it is sometimes dowelled into it. These dowels, therefore, connect it with the shelf and the waterway, and through this means it is thus connected with the sides of the ship.*~~

~~*From the short outline previously given of the disturbing forces acting on a ship it will be seen that the strain on the ends of the beams to destroy their connexion with the side and loosen the fastenings must be very great when the ship is under sail, either*~~

~~*on a wind or before it—that is, either inclined or rolling. The*~~

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~~Fig. 13.~~

~~principal action of these forces is to alter the vertical angle made by the beam and the ship's side—that is, to raise or depress the beam, and so alter the angle between it and the side of the ship above or below it. On the lee-side the weight of the weather side of the ship and all connected with it, and of the decks and everything upon them, as well as the upward pressure of the water, all tend to diminish the angle made by the beam and the ship's side below it, and consequently increase the angle made between them above it. The contrary effect is produced on the weather side, where the tendency is to close the angle above the beam and open that below it. If the beam, when subjected to these strains, be considered as a lever, it will be evident that the fastenings to prevent its rising ought to be as far from the side as is consistent with the convenience or accommodation of the ship, and that, while the support should also be extended inwards, the fastening to keep down the beam-end should be as~~

~~*close to the end of the beam, and consequently to the ship's side, as it can be placed.*~~

~~*The plank, or skin, or sheathing of a ship, both external and internal, is of various thicknesses. A strake of planking is a range of planks abutting against each other, and generally extend- ing the whole length of the ship. A thick strake, or a combina- tion of several thick strakes, is worked wherever it is supposed that the frame requires particular support—for instance, internally over the heads and heels of the timbers, both externally and internally in men-of-war vessels between the ranges of ports, and internally to support the connexion of the beams with the sides and at the same time form a longitudinal tie. The upper strakes of plank, or assemblages of external planks, are called the sheer- strakes, The strakes between the several ranges of ports, begin-*~~

~~*| ning from under the upper-deck ports of a three-decked ship in the*~~

~~*British navy, were called the channel wale, the middle wale, and the main wale. The strake immediately above the main wale was called the black strake. The strakes below the main wale diminished from the thickness of the main wale to the thickness of the plank of the bottom, and were therefore called the diminishing strakes. The lowest strake of the plank of the bottom, the edge of which fits into the rabbet of the keel, is called the garboard strake. Plank is either worked in parallel strakes, when it is called "straight-edged," or in combination of two strakes, so that alternate seams are parallel. There are two methods of working these com- binations, one of which is called "anchor stock," and the other "top and butt." The difference will be best shown by fig. 18. The difference in the intention is that in the method of working two strakes anchor-stock fashion, the narrowest part of one strake always occurs opposite to the widest part of the other strake, and consequently the least possible sudden interruption of longitudinal fibre, arising from the abutment, is obtained. This description, therefore, of planking is used where strength is especially desirable. In top and butt strakes the intention is, by having a wide end anda narrow end in each plank, to approximate to the growth of the tree, and to diminish the difficulty of procuring the plank. When the planking is looked upon as a longitudinal tie, the advantage of these*~~

~~*edges being, as it were, imbedded into each other is apparent, all elongation by one edge sliding upon the other being thus prevented. The shift of plank is the manner of arranging the butts of the several strakes. In the ships of the British navy the butts were not allowed to occur in the same vertical line, or on the same timber, without the intervention of three whole strakes between them.*~~

~~*be an effective shore, nothing more is neces- Water- sary than that the abutment of the end against the ship's side may ways.*~~

~~*Fasten- ing,*~~

~~*Decks,*~~

~~*Caulk- ing.*~~

~~*820*~~

~~*Of the internal planking the lowest strake, or combination of strakes, in the hold, is called the limber-strake. A limber is a passage for water, of which there is oue throughout the length of the ship, on each side of the keelson, in order that any leakage may find its way to the pumps.*~~

~~*The whole of the plank in the hold is called the ceiling. Those strakes which come over the heads and heels of the timbers are worked thicker than the general thickness of the ceiling, and are distinguished as the thick strakes over the several heads. The strakes under the ends of the beams of the different decks in a man-of-war, and down to the ports of the deck below, if there were any ports, were called the clamps of the particular decks to the beams of which they are the support—asg the gun-deck clamps, the middle-deck clamps, &c. The strakes which work up to the sills of the ports of the several decks were called the spirketting of those decks—as gun-deck spirketting, upper-deck spirketting, &c.*~~

~~*The fastening of the plank is either ""single," by which is meant one fastening only in each strake as it passes each timber or frame ; or it may be "double," that is, with two fastenings into each frame which it crosses; or, again, the fastenings may be "double and single," meaning that the*~~

~~*fastenings are double and single alternately in the frames as they crossthem. The fastenings of planks consist generally either of nails or treenails, excepting at the butts, which are secured by bolts. Several other bolts ought to be driven in each shift of plank as additional security. Bolts which are required to pass through the timbers as securities to the shelf, waterway, knees, &c., should be taken advantage of to supply the place of the regular fastening of the plank, not only for the sake of economy, but also for the sake of avoiding unneces- sarily wounding the timbers.*~~

~~*The decks of a wooden ship must not be considered merely as platforms, but must be regarded as eae er an important part towards the general strength of the whole fabric. They are*~~

~~*enerally laid in a longitudinal direction only, and are then use- Ful as a tie to resist extension, or as a strut to resist compression. The outer strakes of decks at the sides of the ship are generally of hard wood, and of greater thickness than the deck itself ; they are called the waterway planks, and are sometimes dowelled to the upper surface of each beam. Their rigidity and strength is of great importanee, and great attention should be paid to them, and care taken that their searphs are well secured by through-bolts, and that there is a proper shift between their searphs and the scarphs of the shelf.*~~

~~*When the decks are considered as a tie, the importance of keep- ing as many strakes as possible entire for the whole length of the ship must be evident; and a continuous strake of iron or steel plates beneath the decks is of great value in this respeet. The straighter the deck, or the less the sheer or upward eurvature at the ends that may be given to it, the less liable will it be to any alteration of length, and the stronger will it be. The ends of the different planks forming one strake were made to butt on one beam, and, as the fastenings are driven close to the ends, they did not pe much strength to resist being torn out. The shifts of the*~~

~~*utts, therefore, of the different strakes required great attention, because the transference of the longitudinal strength of the deck from one plank to another was thus made by means of the fasten- ings to the beams, the strakes not being united to each other sideways. The introduetion of iron decks or partial decks under the wood has modified this.*~~

~~These fastenings have also to withstand the strain during the process of eaulking, whieh has a tendeney to force the planks sideways from the seam ; and, as the edges of planks of hard wood will be less crushed or compressed than those of soft wood when acted on by the caulking-iron, the strain to open the seam between them to receive the caulking will be greater than with planks of softer wood, and will require more secure fastenings to resist it. It may also be remarked that the quantity of fastenings should increase with the thickness of the plank which is to be secured, for the set of the oakum in eaulking will have the greater meehani- cal effect the thicker the edge.~~

~~When the planks are fastened, the seams or the intervals between the edges of the strakes are filled with oakum, and this is beaten in or caulked with such care and foree that the oakum, while undisturbed, is almost as hard as the plank itself. If the openings of the seam were of equal widths throughout their depth between the planks, it would be impossible to make the caulking sufficiently compact to resist the water. At the bottom edges of the seams the planks should be in contact throughout their length, and from this contact they should gradually open upwards, so that, at the outer edge of a plank 10 inches thiek, the space should be about 4% of an ineh, that is, about vz of an ineh open for every inch of thickness. It will henee be seen that, if the edges of the planks are so prepared that when laid they fit closely for their whole thickness, the force required to eompress the outer edge by driving the caulking-iron into the seams, to open them sufficiently, must be very great, and the fastenings of the planks must be sueh as to be able to resist it. Bad caulking is very injurious in every~~

~~way, as leading to leakage and to the rotting of the planks them-~~

~~selves at their edges.~~

~~Ships are generally built on blocks of about & inch to a foot. them. The inclined plane or sliding plank on which they are launehed has rather more inclination, or about {inch to the foot for large ships, and a slight inerease for smaller vessels, This inclination will, however, in some~~

measure, depend upon the depth of water into which the ship is to be launched.

While a ship is in progress of being built her weight is partly supported by her keel on the blocks and partly by shores. In order to launch her the weight must be taken off these supports and transferred to a movable base ; and a platform must be erected for the movable base to slide on. This platform must not only be laid at the necessary inclination, but must be of sufficient height to enable the ship to be water-borne and to preserve her from striking the ground when she arrives at the end of the ways. For this purpose an inclined plane a, a (fig. 14), purposely left unplaned to diminish the adhesion, is laid on each side the keel, and at about one-sixth the breadth of the vessel distant from it, and firmly secured on blocks fastened in the slipway. This

Fig. 14,

inclined plane is called the sliding-plank. A long timber, called a bilgeway b, b, with a smooth under-surface, is laid upon this plane ; and upon this timber, as a base, a temporary frame-work of shores ¢, c, called " poppets," is erected to reach from the bilge- way to the ship. The upper part of this frame-work abuts against a plank d, temporarily Raton to the bottom of the ship, and firmly cleated by cleats ¢, ¢, also temporarily secured to the bottom. When it is all in place, and the sliding-plank and under side of the bilgeway finally greased with tallow, soft soap, and oil, the whole framing is set close up to the bottom, and down on the sliding piak, by wedges f, f, called slivers or slices, by which means the ship's weight is brought upon the "launch " or cradle.

When the launch is thus fitted, the ship may be said to have three keels, two of which are temporary, and are secured under her bilge. In consequence of this width of support, all the shores may be safely taken away. This being done, the blocks on which the ship was built, excepting a few, according to the size of the ship, under the foremost end of the keel, are gradually taken from under her as the tide rises, and her weight is then transferred to the two temporary keels, or the launch, the bottom of which launch is formed by the bilgeways, resting on the well-greased inclined planes. The only preventive now to the launching of the ship 1s a

~~*short shore, called a dog-shore on each side, with its hee firmly cleated on the immovable platform or sliding-plank, and its head abutting against a eleat secured to the bilgeway, or base of the movable part of the launch. Consequently, when this shore is removed, the ship is free to move, and her weight forees her down the inclined plane to the water. To prevent her running out of her straight course, two ribands are secured on the sliding- plank, and strongly shored. Should the ship not move when the dog-shore is knocked down, the blocks remaining under the fore part of her keel must be consecutively removed, until her weight overcomes the adhesion, or until the action of a serew against her fore-foot forees her off.*~~

~~*A different mode of launching is sometimes practised in British merchant-yards, and has been long in use in the French doekyards,*~~

~~*allowing the keel to take the entire weight of the vessel. The two pieees a, a, which are shown in fig, 15 as being secured to the*~~

~~*which are laid at a deelivity Launch- This is for the facility of launching ing,*~~

~~*eHUPEUIRDING 821*~~

~~*ship's bottom, are the only pieces which need be repared according | iy i : justi ial i to es system ae ey the whole of the regina: bate Tiguan, ot ee Rete ae a ee eee available for every launch. A space of about half an inch is left Where ships have to meet the stress of é between them and the balk timber placed beneath them, as it | sea faith fatness of work is even more 'aeee ae rien 1s not intended that the ship should bear on these balk timbers in necessary to have perfect work, but there must also be multiplied launching, but merely be supported by them in the event of her safeguards and provisions against damage by shot, shell, ram, and heeling over. The ship, therefore, is launched wholly on the torpedo as well as against the enemies which are common to all sliding-plank ¢, fitted under the keel. P : ships. In the article Navy the peculiarities of the ship of war are If a ship is coppered before launching, so that putting her into | described. Regarding them here simply as ships, they may be said a dry-dock for that purpose becomes unnecessary, 1t is then desir- | to be*~~

~~*distinguished neither by size nor speed. They have been far able that she should be launched without any cleats attached to her outstripped in size, the longest English ship of war built within bottom. The two sides of the cradle are prevented from being forced | the last twenty years being only 325 feet in length, while there apart when the weight of the ship is brought upon them by chains | are Atlantic passenger ships 200 feet longer. They have also passing under the keel. Each portion of frame-work composing | been outstripped in speed. The hichest speed ever attained in a the launch has two of these chains attached to it, and brought | vessel of war is that of the "Iris" and '"' Mercury"; and as they under the keel to a bolt which passes slackly through one of the | are only 300 feet long it is easier in vessels of greater length to get poppets, and is secured by @ long forelock, with an iron handle, | higher speeds with less engine power, and easy also to maintain it reaching above the water-line, so that when the ship is afloat it | in a Seaway both as a question of form and power, and also as a may be drawn out of the bolt. The chain then draws the bolt, and | matter of coal endurance. The following table gives the relative in falling trips the cradle from under the bottom. There should dimensions of large 14-knot ships :— be at least two chains on each side secured to the fore-poppets, two on each side secured to the after-poppets, and two on each side Shin' Length divided , |Dispt. in to the stopping-up, and this only for the launch of a small ship ; en aes OWater tice. LHP. |'"Tons. |(Dispt.y in larger ships the number will necessarily be increased according $$: to the weight of the vessel and the tendency that she may have, " Adriatic." ft. in.*~~

~~*according to her form, to separate the bilgeways. This tendency (White Star Line) "Gig = 10°45 | 3,600] 8,250] 408°3 @i6 = 5°42) 8,000 | 10,886} 491:2*~~

~~*on the part of a sharp ship by a rising floor, or by her wedge- shaped form in the fore and after bodies, is great, but there is not || H.M.S. 'Є Dreadnought," much probability of a ship heeling over to one side or the other.*~~

~~*Slop The importance of the work of the designer cannot be too highly H.M.S, "Sultan," ....., 586 9°64| 8,600] 9,286} 441:8 work, estimated.*~~

~~*Unfortunately there is, as has been said "slop work" + ¢e wa 39 324 0 in designing as well as in putting the structure together. There || MS. tee a 750 — 4°32 | 8,000 | 11,500 | 509°5 is often an absence of any attempt at precautions where multiplied || II. M.S. '* Neptune," yy | BOLO 5°01| 8,500! 9,068) 434-7 accidents have shown them to be necessary, as well as inconceivable late 'Independencia,) 60 10 : :*~~

~~*carelessness in the details rendering provisions for security, where : ; :*~~

~~*they exist in principle, useless in practice. _ The differences between the amount and complexity of fitting Cost, In the Report of the Royal Commission on Unseaworthy Ships, | 1 the ship of war and the merchant ship are represented by the*~~

~~*dated September 22, 1 873, we read as follows :—"Competent wit- | greatly increased cost per ton weight of hull. It must, however,*~~

~~*hesses state that many merchant ships are built with bad iron, that | be premised that the war ship has the weight of hull kept down*~~

~~*they are ill put together, and sent to sea in a defective condition, | 0 a very low standard to enable her to carry her offensive and*~~

~~*It is also sai ; th ithout addi- | defensive equipment,—far lower than is usual in the merchant eg eee nee Ee ae crequently lengthened without addi ship. The first-class merchant ship costs £28 per ton weight of*~~

~~*tional strength, and are = ei eg Rig ships. The number hull and about £13 per indicated howss-oser ts the epee*~~

~~*of iron steamers which have been Jost in the last few years, : k : :*~~

~~*many of them having been surveyed and classed under the London | The ship of war built by the same builders under contract with or Liverpool registers, raises a question whether the regulations | the Government costs from £60 to £65 per ton weight of hull of these registers are sufficiently stringent to insure good ship. | for unarmoured ships, and from £70 to £75 or more for armoured building. The directors of the Bureau Veritas*~~

~~have deemed jt | Ships. In the case of an unarmoured vessel, having a protecting necessary to revise the rules of their register, and to increase the pote chen ae and magazines, recently ordered, the prices~~

~~scantling, In the race of competition among shipbuilders it is probable that inferior materials and bad workmanship are ad- | General average…... orga conto £60 10 0 per ton weight of hull. mitted into ships." Average of three London firms. 66 0 0 '5 its The Commissioners on Unseaworthy Ships, referring to the Accepted tender……cccecesceee bf 6 Oo iY a proposal that the Board of Trade should superintend the con- The engines for the same vessel were :— struction, the periodical inspection, the repair, and the loading #4 F : : : GORA AV ORR BI 6.666 8onciixdaedenssSier sce osacee £15 8 0 per I.H.P. of all British merchant ships, said: "We consider it to be a pu ? : ' : : ' Average of three London firmis……. iy & 2 45 question worthy of serious consideration, whether, in the case 8 0 : : CCOPLON HONDO 5.5.65:55. 50204 cppnaeeve cramarinevecees 11 oe of passenger ships, the certificate of the Board of Trade, so far : es as regards specific approval, should not be expressly confined to In the case of a larger armoured ship the rates were :— the number of passengers to be allowed and to the accommodation Average price per ton Weigh! Of Hull. & cchssswusswe caaveeces eo. 2. @ for their health, comfort, and general security,—all questions of | Accepted Lesions a apr er apzrans eis nase ene a 5 o unseaworthiness of hull, machinery, and equipment being left | Average price per I.H.P. of engines! ..... if i : to the owners, subject only to a general power of interference | Accepted tender ……..0… ccssceeeteeeeeeeeseeeeeee LON 7~~

~~Protected Protected Protected First | Gare. | CGS? | arctnos Satpe, | ta- Knce Ships, | te 1s Konus yan eee | Mepruars: Ships Unarmoured, rl aig pebyigee) 19 to 20 eee, | (Garbetie) "Pneteatiod | aagetkon Sheathea, | 'nots.~~

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~~BPMN BAG ooo occ Loose soedvvncs fev easeecoce.,.SEM UNG a weevanils's iavite MEAS ele Seryeisisied tee ine 8,100? 218 152 ot im We i propelling machinery ……. 1310 240 1,060 485 ee 4 i " is~~

~~guns,mounting,andammunition| ... aie 840 285 6 A : or fel, at usual draft… .:..... 1500 600 900 500 ee / ps as Cost of hull per ton of its a £32 £20 £81°2 £56 ry : in po »» propelling machinery, per ton of its weight £60 | £50-55 | £105 egal~~

~~distinguishing characteristics of the ship of war. They will not Charac- be speed or size or coal endurance, or the power of striking with teristics the ram, the torpedo, or the gun. It will be quite easy to arm of war merchant ships with these weapons, and some of these ships ships.~~

~~The use of heavy ordnance in recent times as the Sole weapon for naval warfare brought about a marked distinction between the merchant vessel and the war shi , which had not previously existed. The revival of the ram and the adoption of the torpedo~~

~~tend to abolish this distinction and to bring about an approxima- , Lhe indicated horse-power referred to here fs that obtained by natural draft tion again. 2 Of this the vertical armour (costing before it is worked up, £70 to £90 per It is difficult to say what, in the very near future, will be the | ton) is nearly 2000 tons. — 3 Average of six vessels built by Elder,~~

~~Changes needed in mer- chant ships.~~

~~Armour,~~

~~Com- mittee on designs,~~

~~822~~

~~already outstrip the war vessel in the important advantages of size and ficetness and carrying power. Itis apparently in pro- tective advantages that the essential difference will lie.~~

~~The merchant ship is badly provided against fatal damage by collision, or by a blow delivered in any manner by which water is admitted into the ship. The propelling machinery of these ships and their steering apparatus are also dangerously exposed to artillery fire. Excepting torpedo boats, the ship of war of any size has its propelling machinery~~

~~*either under water or under cover of armour, and in a great number of cases there is either protection for the steering apparatus or there are two propellers. The approximation towards war-ship arrangements which is needed in the merchant ship is the adoption of more than one screw and of greater breadth of ship, so that defences round machinery may be created in time of war. Both these changes in merchant-ship practice are demanded also by mercantile interests. The increase in breadth amidships would greatly reduce the risk of foundering in collisions and give more spacious accommodation amidships. Such increase when accompanied by fine ends is also favourable to speed.*~~

~~*The use of two screws is economical of power, and is a much- needed security against the evil results of an accident to an engine, a shaft, or a propeller. The time will doubtless come when a single propeller in a large passenger ship will be regarded as an unpardonable fault, and when the division into compartments now common will be held to be no better than a delusion and a snare.*~~

~~*The protection given to the regular ships-of-war by side armour, or by a protecting deck, at or near the water-line, will probably become a definite and indispensable feature in them, and may, perhaps, be their only distinguishing characteristic, apart from their outfit and equipment.*~~

~~*If this should prove to be the issue of events, their course wiil have been very indirect. In the ships-of-war of the last century no attempt was made to employ armour on the sides or to prevent the passage of projectiles and water into the holds by means of a protecting deck. There was a deck just below the water-line, but it had no protective qualities. It served, among other things, to furnish passage ways in action for the carpenter and his crew to get at the inner side of the wooden walls of the ship at and near the water-line, so that when shot entered there the holes might be immediately plugged. When screw propulsion was introduced into these ships, and it was found practicable to keep the engines and boilers under water, it would have been possible to place a deck over the machinery and beneath 'the water, which would have greatly added to the security of the engines, boilers, and magazines. The space above this deck niight also have been so subdivided into compartments as to have protected the*~~

~~*buoyancy and stability of the ship against the immediately fatal results of the invasion of water. The protection of the buoyancy and stability by these means would not have been absolute, in the sense of making the ship safe, but it would have been of the utmost value as compared with ships, otherwise similar, but having no such protection.*~~

~~*Thirty years passed between the date when serew-propeller engines were placed beneath the water-level in ships of war and that at which a committee on designs, under the presidency of Lord Dufferin, pro- posed to place such a covering deck over them, or to construct a water-line raft-body. The proposal of the main body of the com- mittee was to associate such a raft-deck for the protection of the buoyancy and stability of the ship against artillery with a central armoured citadel. That of the minority was to suppress the armour in the regiou of the water-line entirely, and to protect buoyancy, stability, machinery, and magazines by a raft-deck alone. In 1873 the plan as indicated by the main body of the committee was put into practice nearly simultaneously in the " Duilio" and " Dandolo" in Italy and in the " Inflexible"" in England. In 1878 the system as conceived in principle by the minority of the committee of 1871, although not in the manner they recommended, was adopted in much smaller vessels in the British navy. A raft-deck was intro- duced into the "Comus" class of corvettes of 2,880 tons displace- ment, a class which was regarded as unarmoured. Since that date the raft-deck has been adopted in a more or less complete form in nearly all classes of unarmoured ships in the English navy. So it has come about that, out of some 850 unarmoured ships of war built and building in Europe, 47 have such protecting raft-decks. Of these 82 are English. There can be no doubt that all unarmoured ships of war will eventually be proteeted in this manner. The num- ber of so-called ironclads built and building in Europe is 270. Of these, 34 are based on the recommendation of the committee on designs ; 18 of them are English. There are six other English ships with central citadels and under-water protecting decks, built more than twenty years ago, but the raft-body principle is absent in them.*~~

~~*If the passage from the steam line-of-battle ship of 1840-1860 to the " Admiral" class of 1884 had been made under the guidance of the principles of the comniittee of 1871, European nations would not find*~~

~~*themselves possessed of large fighting ships covered from end to end, or over large areas of their sides, with thin armour, penetrable to a very large proportion of the guns brought against them, But the sailors of 1854-1860 did not take the view that*~~

~~*SHIPEUVUALPAR SE*~~

~~*buoyancy and stability, and machinery and magazines, were the vital parts, needing defenee by armour or by a raft-deck. They dreaded the effeets of shell exploding between decks, setting fire to the ships, and converting the decks, crowded with men, into slaughter-honses. Their demand was, " Keep out the shells." So it came about that iron armour-plates, thick enough to keep out the most powerful shell of the time, were worked upon the sides of the ships, and the guns were fought through ports cut in this armour. This feeling was so strong that the English Admiralty built the "Hector" and " Valiant" with armoured batterics overlapping by many feet at each end the armour beneath them, which protected the buoyancy, stability, machinery, and magazines. Guns in-creased in power, and the armour was gradually thickened to resist them, until from 44 inches of armour, through which broadside ports were cut, 9 inches and 10 inches were reached. But this thickening of the armour had so reduced the possible number of the guns in a ship of moderate size, and the guns required for breaching such armour had so inereased in weight, that the broadside ship had to give way to the turret or barbette ship, in which about four such guns were all that could be carried, and these had to be worked on turn-tables in or near the central line of the ship.*~~

~~*The point now reached in all navies is that the broadside iron- clad with ports cut through an armoured side, as invented in France by M. Dupuy de Léme, and copied by every power, is obsolete. Guns must be worked singly or in pairs on revolving turn-tables, each turn-table being surrounded by an armoured tower, forming the loading chamber or protecting the mechanism. The side armour protecting the buoyancy, stability, machinery, and magazines, although not introdueed for that purpose originally, is retained in France for very large ships, is given up*~~

~~*in Italy in favour of a raft-body, and is retained partially in England and Germany in conjunction with a raft-body.*~~

~~*The use of armour has arrested the development of the shell, But it is not inconceivable that its abandonment in frout of the long batteries of guns in the French and Italian ships will invite shell attack, and make existence in such batteries, if they are at all crowded, onee more intolerable. It remains to be seen whethier in that case exposure will be accepted, or a new demand made for armour, at lcast against the magazine gun aud the quick-firing gun. If exposure is aecepted, it will be on the ground that the number of men at the guns is now very few, that the gun positions are numerous and the fire rapid, and that, if the guns had once more to be fought through ports in armour, the number of gun positions would be reduced, and the fragments of their own walls,' when struck by heavy projectiles, would be more damaging than the projectiles of the enemy.*~~

~~*Internal armour for the protection of the heavy armour-breach- ing guns must be retained so long as such guns are used, and if they were abandoned an enemy could cover himself with armour invulnerable to light artillery. This the French attempted to do in inaugurating the system. They have been driven from it by the growth of the gun. Abandon the heavy gun, and complete armour-plating might again be adopted.*~~

~~*We must conclude that the buoyancy, stability, machinery, and magazines must be protected as far as possible against fatal damage from a single blow of these armour-breaching guns. The tendency will be to come to the lightest form of such protection. That lightest form appears to be a protecting deck a little above the water-level throughout the greatest part of its surface, but sloping down at the sides and at the ends, so as to meet the side walls of the ship under the water-line. However the armour is arrauged (apart from a complete covering with invulnerable plat- ing), — whether asa belt with its upper edge 3 feet ont of the water, as in the French ships; as a central armoured citadel and a raft- body at the ends, like the English and German ships ; or as a raft- body throughout, like the Italian ships,— shot holes in action will admit water and gradually reduce the necessary stability of the ship. In the French ships the*~~

~~*assistance of the unarmoured upper parts is as necessary to prevent them from upsetting in anything but smooth water as is the assistance of the unarmoured raft ends in the English and German ships. In the intact condition the English ships have far greater stability than those of France. In the English ships a reserve of stability is provided, against the con- tingency of loss by injuriesinaction. Inthe French ships no more is provided than is required for the intact condition. The French have not accepted the position taken up in England that much greater initial stability may be given to heavily-armoured broad ships than is usually given, without causing heavy rolling. Nor have they aeeepted the further incontrovertible truth that the free passage of water in the raft-body from side to side of the ship in rolling is rapidly effective in quelling the motion and bringing the ship to rest in the upright position.*~~

~~*Propulsion.*~~

~~*The propulsion of ships by sails differs from the drifting of Sails.*~~

~~*bodies in the air before the wind in a most important respect. Ships may drift or sail in the direct course of the wind, and they*~~

~~*eHIIPRPUTUDIRN &*~~

~~*will then differ from air-borne bodies only in the comparative slowness imposed by the resistance of the water. Ships having the same length as breadth, or rather opposing the same form and area to side progress as to forward progress could never do other than sail before the wind. No disposition of canvas could make them deviate to the right or left of their course to leeward. But by an alteration of form giving them greater length than breadth, and greater resistance to motion sideways than to motion endwise, they came to possess the power of being able not only to sail to the right or left of the course of the wind, before the wind, but also to sail towards the wind. The wind can be made to impel them towards the point from which it is blowing by means of the lengthened form acted on by the resistance of the water,*~~

~~*Motion directly towards the wind cannot be maintained, but by sailing obliquely towards it first to one side and then to the other progress is*~~

~~*made in advance, and the vessel ‘ beats to windward.” The action is like that which would be required to blow a railway ear to the eastward by the action of an easterly wind. If the line of rails were due east and west, and the wind were always direct from the east, the thing could not be done. But with a wind to the south or north of cast, by setting a sail in the car so that its surface lies between the course of the wind and the direction of the rails, it would then receive the impulse of the wind on its back and would drive the car forwards. There would be a large part of the force of the wind ineffective because of the obliquity of the sail; and of the part which is effective a large portion would be tending to force the car against the rails sideways, but there would be progression to windward. In the case of ‘the ship the resistance to side motion is due to the unsuitability of the proportions and form for progress in that direction as compared with progress ahead, but still there is motion transversely to the line of keel. This notion is called leeway. As the ship moves to leeward and ahead simultaneously there is a point of balance of the forces of the fluid against the immersed body—a centre of fluid pressure. The object of the constructor is to place the masts in the ship in such positions that the centre of pressure of wind upon the sails shall fall a little behind or astern of this centre of resistance of the fluid. In that case there is a tendency in the ship to turn round under the action of these two forces, and to turn with her head towards the wind. This tendency is corrected by the action of the rudder. If the tendeney to turn were the other way, although that could also be corrected by the rudder, yet there would be danger of the wind overcoming the rudder action in squalls, and the ship would then come broadside to the wind. In that case, while she might have been quite capable of bearing the pressure of the wind blowing obliquely upon her sails, she might have her sails blown away, or her masts broken, or be her- self capsized. by the direct impulsion of the wind upon the sail and upon the hull of the ship.*~~

~~*Many cxamples of disposition of sails might be given. Their dis- position is always made to satisfy the conditions that as much sail as possible is required, but if the vessel is small it must be being instantly let go in a squall, or when the wind is gusty. Otherwise, where it cannot be readily Ict go, its area shoyld be capable of reduction in squally weather, still retaining its efficiency, so that no pressure of the wind should be capable*~~

~~*of upsetting the ship. Ifa sudden violent squall should strike the ship she should find relief, not by a large inclination, but by the blowing away of the sails out of the bolt-ropes, or the carrying away of the masts. One or other of these must of course happen if the area of canvas and the strength of the sails and of the spars are so proportioned at the moment the squall strikes the ship as to be less than the resistance offered by the stability of the ship to a large inclination. Ships are sometimes, when struck by a squall, blown over on to their sides, the sails being in the water. If the sails or spars are then cut away or otherwise got rid of the ship may right herself.*~~

~~*In the Transactions of the Institution of Naval Architects for 1881, Mr W. H. White says :—*~~

~~*"Any investigation of the behaviour of sailing ships at sea must take account of the conditions belonging to the discussion of their rolling when no sail is set, and must superpose upon those conditions the other and no less difficnlt conditions relating to the action of the wind upon the sails, the ee ot heaving motions upon the stability, and the steadying effect of sail-spread.*~~

~~*"'It may fairly be assumed that the labours of the late Mr W. Froude have made it possible to predict, with close approximation to truth, the behaviour of a ship whose qualities are known and which has no sails set, when rolling among waves of any assumed dimensions. By a happy combination of experimental investigation and mathematical procedure, Mr Froude succeeded in tracing the motion from instant to instant, and checked the results thus obtained by comparison with the actual observations made in a sea-way on the behaviour of the 'Devastation.' The details of his method, and examples of its application, will be found in the Transactions for 1875, and in the appendix to the report of the 'Inflexible' committee.—*~~

~~*'The conclusion I have reached, after a careful study of the subject, is that we need very considerable extensions of our knowledge of the laws of wind-pressure before more exact investigations will be possible so as to enable us to pronounce upon the safcty or danger of a sailing ship. Nor must it be overlooked that sailing ships are'not to be treated as macliines*~~

~~*worked under certain fixed conditions. Their safety depends at least as much tpon seamanship and skilful management as upon the qualities with which they are endowed by their designers. Moreover, itis idle to pretend*~~

~~*capable of*~~

~~*823*~~

~~*Se comparisc For example, the righting moment at different angles of inclination is usually compared with the corresponding 'sail-monient'; but even here certain assumptions have to be made as to the amount of sail to be reckoned in the calculation, and as to the effective wind-pressure per unit of sail-area. Between ship and ship these assumptions are unobjection-*~~

~~*"The calculations of curves of stability and the determination of the ranges of stability for ships form important extensions of earlier practice.*~~

~~*cannot be fixed, and because some important conditions in the problem are Certain arbitrary standards may be set up, and ships may be pronounced safe or unsafe ; but this is no solution of the problem. There are classes of ships in existence which have been navigated in all weathers, under sail, and in all parts of the world, which might be pronounced unsafe if tested by some of the standards that have been proposed ; but the fact that nota single vessel of that class has been capsized or lost at sea during*~~

~~*For the different kinds of sails, and for sailmaking, see Sart, The 'Comet' was the first steam-vessel built in Europe that Steam. plied with success in any river or open sea. She was built in Scotland in 1811-12 for Mr Henry Bell, of Helensburgh, having been designed as well as built by Mr John Wood, at Port- Glasgow. The little vessel was 49 fect long and 11 feet wide. Her engine was of about four horse-power, with a single vertical cylinder. She made her first voyage in January 1812, and plied regularly between Glasgow and Greenock at about 5 miles an hour. There had been an earlier commercial success than this with a steam vessel in the United States, for a steamer called the "Clermont" was built in 1807, and plied*~~

~~*successfully on the Hud- son River. This boat, built for Fulton, was engined by the English firm of Boulton & Watt. The reason for this choice of engineers by Fulton appears to have been that Fulton had seen a still earlier steamboat for towing in canals, also built in Scotland, in 1801, for Lord Dundas, and having an engine on Watt's double- acting principle, working by means of a connecting rod and erank and single stern wheel. This vessel, the "Charlotte Dundas," was successful so far as propulsion was concerned, bnt was not regularly employed because of the destructive effects of the propeller upon the banks of the canals. The engine of the canal boat was made by Mr William Symington, and he had previously made a marine engine for Mr Patrick Miller, of Dalswinton, Dumfriesshire. This*~~

~~*'last-named engine, made in Edinburgh in 1788, marks, it is said,*~~

~~*the first really satisfactory attempt at steam navigation in the world. It was employed to drive two central paddle-wheels in a twin pleasure-boat (a sort of "Castalia") on Dalswinton Loch. The cylinders were only 4 inches in diameter, but a speed of 5 miles an hour was attained in a boat 25 feet long and 7 feet broad. The first steam vessel built in a royal dockyard was also called the "Comct." She appears to have been built about the year 1822, and was engined by Boulton & Watt. This ship had two engines of forty horse-power each, to be worked in pairs on the plan understood to have been introduced by the same firm in 1814, In 1838 the "Sirius" and "Great Western " commenced the regular Atlantic passage under steam. The latter vessel, proposed by I. K. Brunel, and engined by Maudslay Sons & Field, made the passage at about 8 or 9 knots per hour. One year earlier (1837) Captain Ericsson, a scientific veteran who Serew is still among us (1886), towed the Admiralty barge with their pro- lordships on board from Somerset House to Blackwall and back pellers, at the rate of 10 miles an hour in a small steam vessel driven by a serew.*~~

~~*The screw did not come rapidly into favour with the Admiralty, and it was not until 1842 that they first became possessed of a screw vessel. This vessel, first called the " Mermaid" and afterwards the " Dwarf," was designed and built by the late Mr Ditchburn, and engined by Messrs Rennie. In 1841-3 the " Rattler," the first ship-of-war propelled by a*~~

~~*screw, was built for and by the Admiralty under the general superintendence of Brunel, who was also superintending at the same time the construction of the "Great Britain," built of iron. The engines of the "Rattler," of 200 nominal horse-power, were made by Messrs Maudslay. They were constructed, like the paddle-wheel engines of that day, with vertical cylinders and overhead crank- shaft, with wheel gearing to give the required speed to the screw. The next screw engines made for the Royal Navy were those of the "Amphion," 300 nominal horse-power, made in 1844 by Miller and Ravenhill. In these the cylinders took the horizontal*~~

~~*Econo- mical engines.*~~

~~*Reduce- tion in weight of*~~

~~*engines,*~~

~~*Effi- cieney.*~~

~~*824*~~

~~*position, and they became the type of serew engines in general use. This ship had a serew-well and hoisting gear for the serew. In 1845 the importanee of the screw propeller for ships of war beeame fully reeognized, and designs and tenders were invited from all the principal marine engineers in the kingdom. The Government of that day then took the bold step of ordering at onee ninetcen sets of serew engines. Six of these had wheel gearing; in all the rest the engines were direet-acting. The steam pressure in the boilers was from 5 to 10 tb only above the atmo- sphere, and if the engines indicated twice the nominal power it was considered a good performance. The most suecessful engines were those of the *' Arrogant " and " Encounter" of Messrs Penn. They had a higher speed of piston than the others, and the air- pumps were worked direct from the pistons, and had the same length of stroke. 'These engines developed more power for a given amount of weight than other engines of their day, and were the forerunners of the many excellent engines on the double-trunk plan made by this firm for the navy. The engines with wheel- gearing for the serews were heavier, occupied more space, and*~~

~~were not so successful as the others, and no more of that deseription were ordered for the British navy.~~

~~Up to 1860 neither surface-condensers nor superheaters were used in the navy. The consumption of fuel was about 44 tb per one horse-power per hour. In that year (1860) three ships, the " Arethusa," ' Octavia," and " Constance," were fitted respectively by Messrs Penn, Messrs Maudslay, and Messrs Elder, with engines of large cylinder capacity to admit of great expansion, with sur- face-condensers and superheaters to the boilers. Those of the " Arethusa" were double-trunk, with two cylinders ; those of the "Octavia" were three-cylinder engines ; and those of the "Con- stanee" were compound engines with six cylinders ; the first two were worked with steam of 25 tb pressure per square inch, and the last with steam of 82 Ib pressure. All these engines gave good results as to economy of fuel, but those of the "' Constance " were the best, giving one indicated horse-power with 23 Tb of fuel. But the engines of the " Constance" were excessively complicated and heavy. They weighed, including water in boilers and fittings, about 54 ewts. per maximum indicated horse-power, whereas ordi- nary engines varied between 34 and 43 ewts.~~

~~For the next ten years engines with low-pressure steam, surface-condensers, and large cylinder capaeity were employed almost exclusively in the ships of the Royal Navy.~~

~~Wrought-iron is largely used in the framing in the place of cast- irou, and hollow propeller shafts made of Whitworth steel. By these means the weight is being redueed, and it is to be hoped that a still further reduction may yet be made by the use of high- class materials in the engines and steel in the boilers,~~

~~Mr Thornycroft, of Chiswick, and others, by means of high rate of revolution, forced combustion, and the judicious use of steel, have obtained as much as 455 indicated horse-power with a total weight of machinery of 112 tons, including water in boilers. The ordinary weight of a seagoing marine engine of large size, with economical consumption of fuel, excepting a few of very recent construction, would be six or seven times as great. By closing in the stoke- holes and employing fans to create~~

~~*a pressure of air in them capable of sustaining from one to two inches of water in the gauges the consumption of coal per square foot of fire-grate per hour may be raised to 130 tb and upwards. The indicated horse-power which can be obtained in ordinary cases with the steam-blast in the chimney to quicken consumption does not exceed ten. But by the forced draft above described it can be raised with ordinary boilers to 17 to 18 indicated horse-power per square foot of fire- grate. In torpedo boats with locomotive boilers over 28 horse- power per foot of fire-erate is attainable.*~~

~~*The following observations on efficiency are taken from the work of Mr Sennett on The Marine Steam Engine :—*~~

~~*"In every machine there are always certain causes acting that produce waste of work, so that the whole work done by the machine is not usefully employed, some of it being exerted in overcoming the friction of the mechanism, and some wasted in various other ways. The fraction representing the ratio that the useful work done bears to the total power expended by the machine is called the efficiency of the machine ; or—*~~

~~*Useful work done.*~~

~~*ey = Total power expended.*~~

~~*SHIP EMT wi We*~~

~~*In the marine steam engine, in which the useful work is measured by its propelling effect on the ship, there are four successive stages, in each of which a portion of the initial energy is wasted, and these four causes all tend to decrease the efficiency of the engine as a whole.*~~

~~*"In the first place, only a portion of the heat yielded by the combustion of the coal in the furnaces is communicated to the water in the boiler, the remainder being wasted in various ways. The fraction of the total heat evolved by the combustion of the coal, that is, transmitted to the water in the boiler, is in ordinary cases not. more than from 48; to 7%. This fraction is called the efficiency of the boiler.*~~

~~*"Secondly, the steam, after leaving the boiler, has to perform meehanieal work on the piston of the engine; but this work, in consequenee of the narrow limits of temperature between whieh the engine is worked, is only a small fraction of the total heat contained in the steam—say from ⅛ to ⅓, according to the kind of engine and rate of expansion employed. This fraction, repre- senting the ratio of the mechanical work done by the steam to the total amount of heat contained in it, is called the efficiency of the steam.*~~

~~*" Thirdly, in the engine itself a part of the work actually per- formed by the steam on the pistons is wasted in overcoming the friction of the working parts of the machinery and in working the pumps, &e. The remainder is turned into useful work in driving the propeller. The fraction representing the ratio that this useful work bears to the total power exerted by the pistons is called the efficiency of the mechanism.*~~

~~*"Fourthly, the propeller, in addition to driving the ship ahead, expends some of the power transmitted to it in agitating and churning the water in which it acts, and the work thus performed is wasted,—the only useful work being that employed in overcoming the resistance of the ship and driving her ahead. The ratio of this useful work to the total power expended by the propeller is called the efficiency of the propeller.*~~

~~*" The resultant efficiency of the marine steam engine is made up of the four efficiencies just stated, and is given by the product of the four faetors representing respectively the efficiencies of the boiler, the steam, the mechanism, and the propeller. Any improvement in the efficiency of the marine steam engine, and, consequently, in the economy of its performanee, is therefore due to an inerease in one or more of these elements."*~~

~~*Under Steam ENGINE will be found a discussion of the first three of the efficiencies enumerated above. Propulsion and pro- pellers have to be considered here.*~~

~~*'The prineiple upon which nearly all marine propellers work," Pro- says Mr Sydney Barnaby, "is the projection of a mass of water in pellers.*~~

~~*a direction opposite to that of the required motion of the vessel. When a vessel is in motion at a regular speed the reaction of the mass of water projected backwards by the propeller is exactly equal to the resistance experienced by the vessel. When it is clearly understood that propulsion is obtained by the reaction of a mass of water projected sternwards with a velocity relative to smooth water, the absurdity is at once seen of attempting to get a pro- peller to work without slip. If there is no slip there is no resultant propelling reaction exeept in the limiting case where the mass of water acted upon is infinite. The whole problem therefore resolves itself into this—What is the best proportion between the mass of water thrown astern and the velocity with which it is projected, that is, if the screw propeller is under consideration, the ratio between its diameter and its pitch ?"*~~

~~*"There are four different kinds of propellers apart from sails— the oar, the paddle-wheel, the serew, and the water jet.*~~

~~*"The first and oldest of them—the oar—may be used in two ways. The action may be intermittent, as in rowing, when water is driven astern during half the stroke and the instrument brought back above the water ; or its action may be continuous, as in sculling. When used as in rowing it is exactly analogous to a paddle-wheel, while the aetion of the seull closely resembles that of the serew. It is supposed that in the ancient galleys, which were propelled by a large number of oars in several tiers or banks, the oars hung vertically and worked inwards and outwards with a sculling action. They were not removed from the water, but served as props when the vessel was aground. The oars were always propelling the vessel, in both parts of the stroke. The rowers generally sat with their faeces outwards and forwards. There was great overhang of the sides to allow of several ticrs of rowers one above another. The oar as used for rowing is a very efficient instrument. To obtain the maximum efficiency out of it a eon- stant pressure should be niaintained upon the oar, so that the water is started gradually from rest, and the aeceleration uniformly in- creased throughout the whole of the stroke. A glanee at a univer- sity crew will show that the stroke is kept up with a uniform pressure and without any jerk."'*~~

~~*Speaking of the serew propeller, MrS. Barnaby says :—"The speed with which water ean follow up the blades of a screw depends upon the head of water over it, but when the immersion is suffi-*~~

~~*Causes of ineffi- ciency,*~~

~~*Si TP ie D> Ta &*~~

~~*cient to exclude air a head of water equivalent to 30 feet is sup- plied by the atmosphere, as has been pointed out by Prof. Osborne Experiments on the mode] of the Thornycroft screw*~~

~~*Reynolds. have shown that the efficiency, when properly immersed, falls to the surface of the water.*~~

~~*which is as much ag about 50 As a result of a*~~

~~*70 per cent.*~~

~~*torpedo boat was raised from 18 maining the same.*~~

~~*"There is no doubt that the stern is the best position for the water the friction imparts This layer the stern, so that, after the vessel*~~

~~*screw. As a vessel passes through the motion to the layer of water rubbing against the side. increases in thickness towards has passed through, a considerable quantity of water is left with a motion in the same direction as the vessel. If the screw works in this water it is able to recover some of the energy which has been expended by the ship in giving it motion. The speed of this*~~

~~*water, which Rankine estimates may be as much as one-tenth of*~~

~~*the speed of the vessel, does not depend upon the form but upon the nature and extent of the surface. As it is a heeessity that there should be such a wake, it is a distinct advantage to place the propeller in it and allow it to utilize as much as possible of the energy it finds there. It is important not to confound this water, which has had motion given to it by the side and bottom of the ship, with the wave of replacement, that is, the*~~

~~*water filling in behind the ship. Itshonld be the aim to interfere as little as possible with this motion, as such interference augments the resist- ance of the ship very considerably, even in well-formed ships. The propeller should therefore be kept as far away from the stern as possible,*~~

~~*"In the sinall high-speed stern launches the propeller has been kept outside the rudder, with advantage to the speed. What is required is that before reaching the screw the water shall have*~~

~~*iven out upon the stern of the ship the energy put into it by the BOW. If a screw propeller is placed behind a bluff stern so that its supply of water is imperfect it will draw in water at the centre of the driving face, and throw it off round the tips of the blades, like a centrifugal pump, thus producing a loss of pressure upon the stern of the vessel. For very high speed vessels several propellers would euable the weight of the machinery to be kept down. The weight of an engine of a given type per indicated horse-power varies inversely as the number of revolutions per minute ; that is, the greater the number of revolutions the less the weight per indicated horse-power.*~~

~~*"There is a certain quantity of work which must be lost with any propeller, and it is equal to the actual energy of the discharged water moving astern of the propeller with a velocity relative to still water. As this energy varies as the weight multiplied by the square of the velocity, if we double the quantity of water acted upon we double the loss from this cause, but if we double the velocity with which the water is discharged we increase the loss fourfold. This shows the advantage of acting upon a large column of water, and leaving it with as small a speed as possible relative to still water. For this reason the screw is a more efficient instru- ment than a paddle-wheel, and the jet propeller, with its small area of jet, is so much inferior to the screw. From the above con- siderations it would appear that the larger the diameter of a screw and the smaller the slip the greater the efficiency would be. There is, however, another element of loss which has to be con- sidered, which imposes a limit to the size of a screw in order to obtain the best efficiency. This element is the friction of the screw. blades. How large the cffect of this element may be is shown by the case of H.M.S. 'Iris.' This ship was originally fitted with two four-bladed*~~

~~*propellers, 18 feet in diameter, and with 18 feet pitch or velocity of advance per revolution. She obtained a speed with these propellers of 15% knots with an ex- penditure of 6369 horse-power. Two blades were then taken from each propeller, reducing the total number from eight to four. The indicated horse-power then required for the same speed was 4369, or two thousand less horse-power. This amount had been lost in driving the four additional blades."*~~

~~*'* The causes of loss of work incidental to propellers of different kinds may be summed up as follows :—(1) Suddenness of change from velocity of feed to velocity of discharge. Propellers which*~~

~~*' suffer from this cause are the radial paddle-wheel and the common*~~

~~*uniform pitch screw ; while those which in varying degree avoid it are the gaining pitch screw, the feathering paddle-wheel, Ruthven's form of centrifugal pump, and the oar. (2) Transverse motion impressed on the water. Propellers which lose in efficieney from this cause are ordinary screw-propellers, which impart rotary motion, radial wheels, which give both downward and upward motion on entering and leaving the water, and oars, which impart outward and inward motion at the commencement and end of the stroke respectively. This loss is greatly reduced in the guide- propeller, as the guides take the rotary motion out of the water and utilize it inso doing. (8) Waste of energy of the feed water. This is experienced in the jet propeller as generally applied."*~~

~~*percent. when breaking r change from a diameter of 5 feet 10 inches to 4 feet 6 inches the speed of the first-class to 20 knots, other conditions re-*~~

~~*825*~~

~~*The present condition of the case of screw steaniship propulsion appears, according to Mr Froude's estimate, to be that, calling the effective horse-power (that is, the power due to the net resistance) 100, then at the highest speeds the horse-power required to over- come the indueed negative pressure under the stern consequent on the thrust of the screw is 40 more; the friction of the screw in the water is 10 more ; the friction in the machinery 67 more ; and air- pump resistance perhaps 18 more; add*~~

~~*to this 28 for slip of screw, and we find that, in addition to the power required to overcome the net resistance=100, we need 40+10+67418 +23, making in all 258; 7.¢., at maximum speeds the indicated power of the engines needs to be more than two-and-a-half times that which is directly effective in propulsion. GN EBS)*~~

~~*Boatbuilding.*~~

~~*The foregoing article may be supplemented by a brief account of boatbuilding. The distinction between this and shipbuilding is not of a marked character and cannot be sharply defined. But for all practical purposes the builder of a vessel without a deck, or but partially decked, and propelled partly by sails and partly by oars, or wholly by oars, may be defined as a boatbuilder.*~~

~~*The boats in general use at present may be classified as racing boats, pleasure boats, or boats used for commercial purposes, Racing boats (compare Row1nG) are generally built of mahogany, and are the most perfect specimens of the boatbuilder'sart. The out- rigger sculling boat measures from 30 to 35 feet long, 12 to 14 inches in breadth, and 9 inches in depth, weighing only from 35 to 45 tb, and the eight-oared outrigger, being from 55 to 65 feet long by 2 feet 2 inches to 2 feet 5 inches in breadth, weighs about 300 tb. Pleasure boats vary in form and dimensions, from the 15-feet row- ing boat used on the'sea-coast to the gondola type found principally on the canals of Venice and used occasionally on the Thames, &c., for ceremonial pageants. Boats used for commercial purposes embrace fishing, canal, and ships' boats. Fishing boats (compare FisHERigs) are gradually passing from the sphere of the boat- builder to that of the shipbuilder, —the open boats of former years being in many cases replaced by large, strong, decked craft more able to withstand the gales of the British coasts, Canal boats are gene- rally long, narrow, and shallow, fron: 50 to 70 feet long by 8 to 10 feet in breadth, and from 4 to 5 feet in depth. All sea-going vessels are required by statute to be provided with boats fully equipped for use, not fewer in number nor less in their cubical contents than what is specified for the class to which the ship belongs. The boats vary considerably in form and dimensions as well as in material and construction, according to the service intended.*~~

~~*The number of boats a passenger steamer of 1000 tons and upwards is required to carry is six or seven, according to the dimensions of the boats. In either case two of the largest boats must be fitted as lifeboats. If the smaller number is carried, the set will consist of two lifeboats, one launch, two cutters or pinnaces, and one gig.*~~

~~*Lifeboats are built both ends alike, having a sheer or rise from niidships towards stem and stern of 4 inch to # inch per foot of length. They have air-cases of copper or yellow metal fitted in the ends and along the sides of the boat, of sufficient capacity to give cach person carried in the boat one and a half cubic feet of strong enclosed air-space (compare vol. xiv. p. 570). Cutters arc similar in forn: but of smaller dimensions than lifeboats ; pinnaces are about the same dimensions as cutters, but have square sterns. Gigs are of lighter construction and finer form than pinnaces. A service boat called a dingy is also carried, for the conveyance of light stores between the shore and the vessel. Boats, when carried so close to the funnel of a steamer as to be injuriously affeeted by the heat therefrom, have of late years been built of zinc, iron, or steel. Those built of steel have plates ps inch thick and galvan- ized, the keel, stem, stern, and deadwood knees being of wood, to which the plating is attached. ;*~~

~~*The following is an outline of the method of construction. The designer lays down on paper the lines and body-plan of the craft, which are afterwards traced full size on the floor of the drawing- loft. From these full-sized sections moulds are made. The stem and stern posts, having been cut out to the shape designed, are tenoned into mortices in the keel. Two knees overlap, and bind the stem and stern posts to the keel, and are bolted with through bolts and clenehed outside over a ring or washer. A stout batten of wood is then nailed between the stem and sternpost heads to connect them together, and a line is then stretched from stem to sternpost to represent the water-line. The keel, stem, and stern posts being in position on the stocks, the stem and stern posts arc then plumbed and secured by stays of wood. The rabbets in the keel, stem, and stern posts are then cut out with a chisel, after which the moulds are put into their proper places, plumbed with the water-line, and kept in position by stays. The planking is then proceeded with, strake after strake, and when the boat: is planked up to the top strake the floors and timbers are put in. The*~~

floor extends across the keel and up to the turn of the bilge. They are fastened through the keel with copper or yellow metal bolts and to the planking with copper nails. _

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The timbers generally are about 1 inch by 3 inch, and are sawn out of a clean piece of American elm, then planed and rounded. After being steamed they are fitted into the boat, and as soon as each is in position, and before it cools, it is nailed fast with copper nails. The gunwale is next fitted, a piece of American elm about 2 inches square ; a breast-hook is fitted forward, binding the gunwale, top strake, stern, and apron together ; and aft the gunwale and top strake are secured to the transom by either a wooden or iron knee. A waring or stringer, about 3 inches by $ inch, of American elm, is then fitted on both sides of the boat, about 8 to 9 inches below the gunwale, on the top of which the thwarts or seats rest. The thwarts are secured by knees, which are fastened with clench bolts

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through the gunwale and top strake and also through the thwart and knee. The boat generally receives three coats of paint and is then ready for service.

The following are the dimensions of boats in the British merchant service :—

Length.

Breadth. Depth. TAPCO OAL e sere. cc ccccscenccent 28 ft. Gin. 8 ft. Gin 3 ft. 6in. GUUSBOT. S75 fopes cc esccccceseetoe 26 ft. 7 ft. 3 ft. NACE: ccc ccc ccc 24 ft. 6 ft. Gin 2ft. 8in ig… | 18 ft. 5 ft. 6 in 2 ft. 3 in i vs) 16 ft. 5 ft. 6 in 2ft. 3in,

SHIPLEY, a town of England, in the West Riding of Yorkshire, is situated on the south bank of the Aire, in the neighbourhood of a picturesque

~~*pastoral country, at the junction of the Leeds and Bradford Railway with the Bradford, Skipton, and Colne line, 3 miles north of Brad- ford. The church of St Paul, an elegant structure in the Gothic style erected in 1820, was altered and improved in 1876. The manufacture of worsted is the principal industry, and there are large stone quarries in the neigh- bourhood. A local board was established in 1853. The population of the urban sanitary district (area 1406 acres) in 1871 was 11,757 and in 1881 it was 15,093.*~~

~~*SHIPPING. The island of Britain (to the shipping of which the present historical notice is mainly restricted) is well fitted to serve as a commercial depdt, both by the number of its natural harbours and the variety of its pro- ducts. There is evidence that Phcenician traders visited it for tin, and in after times it served as one of the granaries of the Roman empire. On the other hand raw wool was the staple article of commerce in the Middle Ages, while the supremacy of English manufactures in modern days has contributed to the development of British shipping till it has grown out of all comparison with any- thing in ancient or medizval times.*~~

~~*Britain must have been one of the most distant points that was visited by Phcenician or Carthaginian ships. Adventurous as their sailors were when compared with those of other races, and ready as they were to carry on trading on behalf of neighbouring states, it is not clear that they ever sailed across the Indian Ocean or ven- tured beyond the Persian Gulf, even in the service of the Egyptians (Brugsch). Their coasting habits led to the settlement of a chain of colonies along the Mediterranean shores, and that sea was wide enough to form a convenient barrier between the Greek and the Carthaginian settle- ments. When their empire was at length destroyed the Romans became the heirs of their enterprise, but do not appear to have pushed maritime adventure much further or opened out many new commercial connexions.*~~

~~*Though the Angle and Saxon tribes were doubtless skilled both in shipbuilding and in the management of their vessels at the time when they conquered Britain, these arts had greatly decayed during the four centuries that elapsed before the time of Alfred, who endeavoured to*~~

~~*improve on existing models (Eng. Chron., 897). Hence the necessity of resisting the Danes, with the subsequent fusion of Danish and other elements in our nationality, may be taken as marking the period when English shipping had its rise. Apart from incidental notices of communi- cation with other lands, there is clear evidence, from the early English laws, of efforts to encourage commerce, par- ticularly in the status which was accorded to traders and the protection afforded to merchant ships. The whole of these arrangements seem to imply that the merchant was the owner of the vessel, who "'adventured" with his cargo, and sailed in his ship himself; but these voyages were probably undertaken for the most part to ports on the*~~

~~*other side of the Channel, as it does not appear that English ships penetrated to the Mediterranean till the time of the crusades.*~~

~~*The steady development of English shipping during the Norman and early Plantagenet reigns may be inferred from the more frequent intercommunication with the Continent and the many evidences of the increasing importance of the commercial classes and trading towns. In the time of Edward HL. the shipping interest suffered a temporary check from the removal of the staple to England, a step which was taken with the view of attract- ing foreign merchants to visit England (1353). This policy, however, was soon reversed, and the reign of that monarch was on the whole favourable to the development of shipping. He was himself fond of the sea, and com- manded in person in naval engagements, and by taking possession of Calais and enforcing his sovereignty over the narrow seas he refidered the times more favourable for the development of commerce. More than one of the noble families of England have descended from the mer- chant princes of the 14th century. By this time also the compass, which had been introduced in a rude form as early as the 12th century, had been improved and had come into common use. But many years were to elapse before the enterprise of the 15th and 16th centuries made the most of the new facilities for undertaking long voy- ages ; and the fortunes of English shipping, as depicted by a contemporary (Libell of Englishe Policy, 1436), con- tinued to vary according to the state of political con- nexions with the Continent and the success of English monarchs in "keeping the narrow seas" free from the*~~

~~*ravages of pirates. During this century, too, we hear far more of organizations of merchants to foreign parts, and of struggles between different bodies of traders. The "Merchants of the Staple" dealt in raw wool and the other staple commodities of the realm, which they exported to Calais ; the "' Merchant Adventurers," a powerful asso- ciation which had developed out of a religious guild, dealt chiefly in woollen cloths, but they traded with any port where they could get a footing. This brought them into frequent collision with the "Merchants of the HIouse," who had had a footing in London since before the Con- quest. The chief attempt at accommodation took place in the time of Edward IV. (1474), but the quarrels and re- prisals continued till the discovery of the New World had revolutionized trade, and the HIanse League, expelled by Elizabeth, were unable either to injure or to compete with English shipping.*~~

~~*Considering the interest which all the Tudor monarchs showed in developing shipping,! and the proverbial bold- ness and enterprise of the Cabots, Raleigh, Drake, and other sailors, it is remarkable that England obtained so little footing at first in the new lands which were dis- covered by Columbus (1492) or along the route that was*~~

~~*"The establishment of Trinity HIouse by HIenry MAUI aye looking after pilots, buoys, &e., in 1512, is the most important result of his care for shipping.*~~

~~*PmLTPP ie Ge*~~

~~*opened up by Vasco da Gama (1496). Eventually she inherited much of the commercial empires of Spain, Portugal, HIolland, and France, but there was still com- paratively little permanent acquisition, or establishment of trading factories, at the close of the 16th century. The fact was that such undertakings were beyond the power of private traders, and that Elizabeth was too penurious to inake an attempt on such a scale as to command success, Tt was by the formation of companies that the difficulty was at length overcome, and that associated traders, or traders working on a joint stock, were able to establish factories in foreign parts, and thus to give a new impetus to English shipping. The African Company and others were failures, but there were many which had a long and successful career. The Levant Company was established in 1581, and*~~

~~*had factories at Smyrna. The Eastland Com- pany traded with the Baltic ; it was established in 1579, and had factories in Prussia. The Hudson's Bay Company is much more recent, and only dates from 1670. But by far the greatest of these undertakings was the East India Company, which was founded in 1600, and which, after a long struggle with commercial rivals at home and Dutch competitors abroad, attained at length to the sovereignty of a large empire. The chief cause of complaint against this company in the early stages of its existence lay in the fact that it was a joint-stock company, and that therefore the proprietors had a monopoly of a valuable trade ; the greater part of the other companies were regulated com- panies, and membership was open to any British subject who liked to pay the entrance fees and join with other merchants. The merchants thus associated agreed to abide by certain specified conditions, so as not to spoil the markets for one another, but develop the trade in which all were interested in a manner which should be advantageous toall. The Levant Company and Merchant Adventurers were regulated companies, and they led the attack on the East India Company as the monopoly of a few which injured the trade of other merchants. The controversy raged during the reigns of James I. and Charles I, and many of the leading merchants of the time—Mun, Malynes, Misselden, as well as Wheeler, the secretary of the Merchant Adventurers—took part in it. The advocates of the East India trade argued that, owing to the immense distance of their factories and the special difficulties of maintaining their position abroad, it was impossible to carry on their trade except on the joint- stock principle, and their plea prevailed in the long run.*~~

~~*The Merchant Adventurers and the whole system of regulated companies is less familiar to us in the present day, and it may be worth while to indicate the sort of regulations which were imposed on the members. One series of rules was directed at. regulating the total export trade of certain classes of goods to the chief Continental ports, so that the markets abroad might not be over- stocked, and that they might always be able to get remunerative prices. Other regulations allotted the pro- portion of goods which each member of the company should export, and the terms as to credit and so forth on which he should deal. Each factory was carefully regu- lated so as to secure a respectable and orderly life among the merchants resident abroad ; none of them were to do business during the*~~

~~*times of public preaching or on fast- days; and there was a curious adininistrative system by Which the compliance of the members with these regula- tions was enforced,}*~~

~~*Those English merchants who traded to towns where the Adventurers had a factory, but did not comply with their regulations, were stigmatized as "interlopers," and they were greatly disliked by the regular traders, as they*~~

- ~~*Wheeler in Brit. Mus. Add. MS. 18913.*~~

~~*827*~~

~~*associations. As late that the same thing was the case, and that the fleet which harassed the Armada ships. In the time of the naval wars with Holland, how- ever, this is greatly more effectively organized and regularly maintained. But even when the royal that its continued effectiveness must depend on the maintenance of merchant shipping, interconnected,. and just because special importance was attached to this arm defence there was a purpose of indirectly promoting shipping and providing seamen. This was one of the aspects in which the prosperity of British fisheries Was specially attended to; the consumption of fish was stimulated by insisting on the observance of Lent and of weekly fasts on Wednesdays and Fridays, when "the eating of fish was required politically and not spiritually " 5 Hz. ¢.D,§ 13, 1 Jas I c. 29), and this was principally done as a means of inducing men to take to a seafaring life, and so to fit themselves for the defence of the country and for the manning of our merchant ships. Considerable progress had also been made both in the art of sailing and in the building of ships. The vessels which composed the fleets of the crusaders appear to have been for the most part galleys, provided with a double row of oars ; the huge prows which gave a superiority in hand-to-hand fighting with a grappled vessel were of no advantage when the use of cannon had revolutionized naval warfare. We thus find that the ships of this period were built on a different model, and many inducements were held out to those who built large ships. Both Elizabeth and Charles offered bounties for the building of larger craft (100 and 200 tons); in 1597 800 tons was the largest vessel that an English yard turned out. The legislature also was most assiduous*~~

~~*in endeavouring to encourage this industry. The importation of naval stores of all kinds, the growth of hemp for cordage and of timber, were matters of constant care, both in England itself and in the policy which was dictated to her colonies.*~~

~~*It is easy enough to see that in these cases the encouragement of shipping was undertaken as an indirect means of increasing the power of the country, and the same thing is true of the compli- cated arrangements that were made for giving special inducements to trade in particular articles or with particular countries, Every onc is of course familiar with the fact that during the 17th and 18th centuries efforts were made to regulate trade so that gold and silver might be brought into England. It is unnecessary to enume- rate the expedients that were adopted at different times, or to dis- cuss the vexed question as to how far those who advocated the system were in error. There can be no doubt that the possession of a treasure was vastly important for political purposes, and that trade was the only means by which a state which possessed no mines could procure treasure; and it is of course possible that some of the mercantilists laid too much stress on the desirability for political purposes of amassing wealth in this form. _ But the fundamental principle of this system of commercial policy lay in the connexion which was felt to exist between trade and industry. Trade, it was said, stimulated industry by providing a new market for its products. If two countries trade together, each will stimulate the trade of the other to some extent, but, if England*~~

~~*buys raw products from Portugal and Portugal buys manufactured cloth from England, then the operation of trade between them is such that Portugal stimulates English industry and sets English labour in motion to a far larger extent than English consumption stimulates that of Portugal ; it was believed that this relative stimulus might be detected by examining the balance of trade, and that, if by an ingenious adjustment of duties the balance could be kept in her favour, the trade would be benefiting England more than it stimulated the progress of her possible rivals. In the present day we look at the volume of trade and trust that both are gainers ; in those centuries they looked at the kind of gain that accrued and tried*~~

~~*to ensure that England gained more than her possible enenries. Thus it was generally held that by commercial intercourse between England and France the French gained rela- tively more than the English; to the legislators of the time it seemed desirable to impose such conditions as should alter this state of affairs, or, if no agreement could be come to on the terms of a treaty, the trade should be stopped altogether, lest by continuing to overbalance England in trade the French should be enabled to overbalance her in power. These ideas of commercial policy dominated the whole of British legislation for shipping' from the beginning of the 17th century till after the Napoleonic wars ; the preference which was given to English ships, English built and English manned, was enforeed in a manner that was prejudicial to the development of the colonies by the Navigation Act of 1651, aud was subsequently embodied in the orders in council. But these ideas are expressed most clearly in such discussions as those regarding the Mcthven treaty with Portugal. Without attempting to advocate a systein of which the unwisdom has become patent in our own day, it may yet be worth while to note that it was during this régime that England acquired her position as the great ship- ping nation of the world, and passed the Dutch and French in the struggle for naval supremacy. Napoleon gave unconscious testi- mony to the effectiveness of the commercial policy for building up the strength of the nation when he sought to humble England, not by direct attack, but by destroying the trade and shipping by means of which she had raised herself to power.*~~

~~*This policy of subordinating the interests of shipping as a trade and means by which merchants acquired wealth to the policy and power of the nation as a whole had another side. Revenue for war expenses was furnished almost entirely by the mother country ; neither Ireland nor the colonies contributed at all largely to the burden of maintaining the national struggle with Continental rivals. Hence it was undesirable that these dependencies should develop at the expense of the mother country, as by so doing they would reduce the fund from which parliament drew for the expenses of the realm. Hence, while England was always willing to develop resources or industries—like the linen trade in Ireland—which did not compete with and could not undersell existing English manufactures, her politicians were unwilling to allow her dependencies to*~~

~~*become her competitors in trade so long as they did not co-operate in maintaining power. HIence the galling restrictions to which the Irish and the colonists were subjected, both with regard to the development of some of their resources and the carrying on of profitable trade with other colonies or foreign countries. But it must not be forgotten that English merchants suffered in the same sort of way, as changes of political relations at once brought about changes in the conditions of trade, and that in at least one case the interests of enterprising farmers at home were set aside in favour of protecting an established industry in the colonies. The subordination of the craftsman and trader interest to the public policy of the realm brought about a system of galling regulations which pressed hardly on many persons, though they were most obviously baneful to Ireland and the colonists, who had not so much interest in the political objects for which their wealth was sacrificed.*~~

~~*It is unnecessary to attempt to illustrate in detail the applica- tion of these principles ; it only remains to add that, whether in spite of these regulations or because of them, the shipping of England increased vastly during the 18th century. This was partly due to the greater facilities which were granted for procur- ing capital for trading ventures. In medieval times a merchant could hardly obtain the command of additional capital, unless by means of a temporary partnership, or loans on bottomry ; but the objection to usury was fast giving way, and the public were willing to lend eapital and to share in the profits of trading. The practice of trading on borrowed capital, and of obtaining temporary loans from goldsmiths, was common enough all through the 17th century, but the development of the banking system and the new forms of credit which thus became available gave still greater scope to the enterprising shipper. The full fruits of the new power were only shown, however, in the beginning of the 18th century, when the rivalry of the Old and New East Iudia Companies and the story of*~~

~~*1 It was pursued, but less systematically, all through the Tudor reigns or even earlier. Compare 1H. VII. c. 8, 32 H. VII ec. 14, 1 El. « 18, also the Assize of Arms in 1181.*~~

~~*Sat rr tae*~~

~~*the Darien expedition and the South Sea Bubble show how willing the British public were to pour their capital into trading under- takings. Among the companies which were started about this period there were two which have exercised a most salutary influence on British shipping. The. Royal Exchange Assurance (6 Geo. I. c. 18)and the London Assurance revolutionized the whole system of marine assurance, and did so much to relieve skippers from the losses they suffered through the risks of commerce as to give considerable encouragement to the business. The plantations were developing into important scttlements; the British merchant had outdone his Dutch rivals; and the East India Company was pursuing its course of progress in the Hast. There can be no wonder that, with so many opportunities for trading, and such new facilities for obtaining capital and assuring against risk, the shipping of the country developed during the 18th century. It is wnnccessary to dwell on the shocks it received at the time when the American colonies asserted their independence (27 and 28 Geo. III.) or in the life and death struggle of the Napoleonic wars. The difficulty of recasting the restrictive system under which English merchants plied their trade was very great, and when it broke down in regard to America and Ireland (20 Geo. III. cc. 6, 10) it was becoming apparent that its days were numbered. The doctrines preached by Adam Smith soon began to bear fruit; the practical difficulty of regulating commerce rendered politicians more willing to let it regulate itself; and the controversy between the exclusive companies and the interlopers or independent mer- chants once more came to the front. It was during the reign of George IV. that the old system was practically abandoned and that the greater part of the old companies were dissolved, and trade to all parts of Africa, to the Levant, and to China became open to all British subjects. The East India Company maintained its posi- tion in part despite its many critics for another half century, and the peculiar conditions of the trade of the Hudson's Bay Company have nade it desirable to maintain that privileged cor- poration till the present time.*~~

~~*It became still more obvious that the old policy of regulating the commerce of the country in the supposed interests of its power was being abandoned when Huskisson reformed the tariff in 1825. The measure he succeeded in carrying was not so thoroughgoing as the one he proposed, but its principle was that the customs duties should bo levied for revenue*~~

~~*objects only, and not with the view of maintaining British merchants in one parti- cular employment of their capital. Later the repeal of the corn laws (1846) and navigation laws (1849) removed the last vestiges of the old commercial policy which had ruled over the development of British shipping almost from the earliest times, but which had been steadily and systematically pursued for three hundred years.*~~

~~*It was thus that Adam Smith's criticisms worked so effectively as to realize his dreams at no great interval of time. His deeper reasons for objecting to the commercial system of the 18th century lay in the fact that the colonial trade and shipping altogether seemed to him to have received an unhealthy stimulus, and that the country would be in a sounder economic position if capital were employed at home in developing native resources, and foreign trade built upon a foundation of highly developed native industry. But the removal of the stimulus did not have the effect he antici- pated, or restore the " balance" between industry and shipping. England is far more dependent than ever before on her relations with foreign countries, and therefore on her shipping, for the niaterials of her manufacture and her food, as well as for markets for her products. She is further removed than ever from that condition of " opulence" which has, according to Adam Smith, the greatest promise of stability and progress.*~~

~~*This has undoubtedly been due to the immense developments in manufacturing in which England, with her wealth of coal and iron, led the way. This reacted on shipping in many ways. England came to be the workshop of the world, and her shipping was freighted with soft goods from Lancashire and Yorkshire, and with hardware and machinery, to be conveyed to the most distant parts of the globe. But not only were the opportunities for trading immensely increased; the application of the steam engine to transit by water has accelerated communication, and rendered it so regular and certain as to give an extraordinary stimulus to foreign trade. The first steamboat that was more than a mere toy madé its trial in 1807, and since that time steam shipping has been more and more substituted for the old sailing vesscls. Still more recently there has been a considerable change in the construction of ships, from the success which has attended iron shipbuilding. The first experiment, which was generally deemed exceedingly rash, was made in 1851.*~~

~~*It is impossible to get satisfactory data for a comparison of the relative importance of English and foreign shipping for a long period; but it may be assumed that the shipping of the Italian republics and of the Hanse League excelled that of England during the Middle Ages, that in the 16th century Spain was far ahead of her when she could send such fleets to the West and fit out a Spanish Armada, and that in the 17th and 18th centuries respect-*~~

~~*SHI—S HI*~~

~~*ively England was much in the Same position as the great rivals*~~

~~*—Holland and Francee—with which she had to compcte so keenly. We may compare the prescnt position and the relative growth of tonnage during the last century, so far as figures are available for the purpose :—*~~

~~*1790, 1880, || 1790. ||*~~

~~*I 1880. England…,..... 1,511,411 6,574,513 re… ob 989,128 pain aot 'ses 587,320 | Hovlend®: 20.0.0) see 349,000 a Weeaseeeree es 1,000,000 || United States… 502,146 | 4,000,000 Germany…..... 1,300,000 |*~~

~~*The following aggregates show the growth of the tonnage of British shipping :—in 1588, 12,500 tons (excluding fishing boats) ; in 1770, 682,811 (England and Scotland) ; in 1791, 1,511,401 (in- cluding colonies); in 1830, 2,199,959 (excluding colonies); in 1840, 2,768,262; in 1850, 3,565,133 ; in 1860, 4,658,687; in 1870, 5,690,789 ; in 1880, 6,574,513.*~~

~~*See Macpherson, Annals of Commerce; Lindsay, Tistory of Merchant Shipping.*~~

~~*For earlier periods see Schanz, Englische Handels-Politik, and for later periods Leone Levi, History of British Commerce. (W. CU.)*~~

~~*SHIRAZ, a celebrated city in Persia, capital of Fars, from its site and thoroughly Iranian population may be considered the central point, as it were, of Farsi or Parsi (otherwise Persian) nationality. Owing to the*~~

~~*pasture land in its vicinity some derive the name from the native word shir, "milk;" others again, asserting the number and physical powers of its inhabitants, accept the same word in its sense of "lion," or take the whole dissyllable as an obsolete word meaning the "lion's paunch." To this effect is cited a local saying to the effect that, "like the lion, it devours all they bring into it." Shiraz is situated in 29° 36' 30" N. lat. and 52° 32' 9" E. long., in a high plain or valley more than 20 miles long and less than half as broad, and is approached on the south from the sea—a distance of 170 miles'—through lofty mountain passes reaching some 7000 feet above the level of the waters of the Persian Gulf. On the north the approach is also through chains of mountains separating the plains of Shiraz from the valley of the Marv Dasht, intersecting which is the Band Amfr river, more poetically than accurately described in Lalla Rookh. At Kodiyan, a few miles to the north- west of Shiraz, is the source of another river, which, crossing the high road south of the town under the name of the "Kara Agatch," falls into the sea about 70 miles below Bushahr (Bushire), after a tortuous course of 300 miles. The city has a handsome bazaar and some good private residences ; but its unattractive streets are narrow, and, though not so crowded with beggars as Ispahan, contain many living objects distressing to the eye. The mosques and minarets, albeit of local repute, look more picturesque to the stranger in the distance than under close inspection. One fine view of the town is that on the north, at the pass between the mountains called "Allah Hu Akbar? so named, it is conceived, because this would be the traveller's exclamation of delight when the landscape first opened out upon him. The country in this direction is studded with pleasant gardens. 'Besides these there are the tombs of the poets Hafiz and Sa'di—both within easy reach of the city. The first—a fine marble monument with a beautifully inscribed ode and other writings upon it—is not a mile from the gate, and is situated in an enclosure bearing the name Hafiziya. The most noted product of Shiraz is its wine, on the merits of which, however, there is much difference of opinion from outside judges. Dr Wills gives an original account of an experiment of his own in making the wine of Shirdz. Its cost in the pro- duction was 54d. a bottle, and it sold a year after at more than three times that amount. Shiraz is moreover famous for inlaid work (wood and metal) called khdtam bandi (from khdtam, a seal). The population of the city is estimated under 30,000. The ordinary diseases are inter- mittent fever,*~~

~~diarrhœa, dysentery, typhoid, guinea-worm, cholera, diphtheria, small-pox, and ophthalmia.~~

~~1 As the crow flies, it is only 115 miles N.E. by E. of Bushahr.~~

~~centuries, and are never disputed by Persians who are not Shirazis, yet it is impossible for the sober European traveller to deny that ; We may feel thankful for the wine and the water, the gardens and the monuments, the fruits and the flowers (abundant here as in many other an oasis in the with the national pride t of a Hafiz and a Sa'di; we may believe that the ladies of yore had "eyes brighter than the antelope's, hair cluster- ing like their own dark grapes, and forms fairer and sweeter than \ (that those of the present day would, if unveiled, strike the Spectator with wonder ; but one fact remains, —the modern town of Shirdz is not a paradise for those whose personal experience enables them to compare it with the ordinary cities of Europe.~~

~~According to Eastern authorities, Shiraz was founded (or re- founded, for some accounts ascribe to it a fabulous antiquity) by a brother of the famous Hajjaj about the beginning of the 8th century, or rather by a cousin of Hajjaj called Mohammed b. Kasim b. Abt 'Okail." Six hundred years later it was the capital of the Muzaffar dynasty of princes, when it fell to the arms of Timur. But it attained its greatest reputation in the reign of Karim Khan, who embellished the city greatly and made it the special object of his care. On the downfall of this monarch it was sacked and laid waste by the cruel Agha Mohamined.~~

~~Shir4z has been often described by native geographers and European writers of travel. Among the latter may be mentioned Pietro della Valle, Herbert, Tavernier, Deslandes, and Chardin, in the 17th century, and in the present century Ouseley, Porter, Morier, Scott-Waring, Forster, Binning, and many quite recent travellers, Neither in his serious history nor lighter sketches does Sir John Malcolm give any detailed account of Shiraz asa city, but his notes on its climate may be cited. On one of the hottest days of June 1800 the thermometer registered 94° F. in the house and 100° in a tent. In May 1810 it never rose at noon above 88° nor fell~~

~~*below 74°. In the morning, at eight o'clock, it generally stood about 60°, In autumn the heat continucd, but in winter it was seen to fall considerably below the freezing point. As late as March there is often a hoar frost on the ground. April, he adds, is a delightful month, the thermometer at sunrise being generally from 50° to 55°, at two P.M. 80° to 84°, and at nine p.m. about 64°,*~~

~~*SHIRE. See Counry.*~~

~~*SHIRLEY, a town of Hampshire, consists chiefly of comfortable houses occupied by persons in business in Southampton (2 miles south-east), of which it is practi- cally a suburb. Within its limits are the Barlow home (1840), the Ellyet home (187 9), and the children's hos- pital and dispensary for women (1884). The urban sanitary district of Shirley, formed in 1853, was extended by an Act which came into operation 29th September 1881, the name being also changed to Shirley and Free- mantle. The population of the old district (area 1198 acres) in 1871 was 5339 and in 1881 it was 7856. The population of the new district (area 1392 acres) in 1871 was 9909 and in 1881 it was 12,939.*~~

~~*SHIRLEY, James (1596-1666), dramatist, belonged to the great period of our dramatic literature, but, in Lamb's words, he "claims a place among the worthies of this period, not so much for any transcendent genius in himself, as that he was the last of a great race, all of whom spoke nearly the same language and had a set of moral feelings and notions in common." His career of playwriting extended from 1625 to the suppression of stage plays by parliament in 1642. Born in London in 1596, he had been educated for a profession—at Merchant Taylors' school, St John's College, Oxford, and Catherine Hall, Cambridge. The church was his destination, but he turned Roman Catholic, and made a living for two years as a schoolmaster. His first play, Love Tricks, seems to have been accepted while he was teaching at St Albans, and for eighteen years from that time he was a prolific writer for the stage, producing more than thirty regular plays, tragedies, and comedies, and showing no sign of exhaustion when a stop was put to his occupation by the Puritan edict. He turned again to teaching for a liveli- hood and prospered, publishing*~~

~~*some educational works under the Commonwealth. Besides these he published*~~

~~*830*~~

~~*during the period of dramatic eclipse three small volumes of poems and masques, in 1646, 1653, and 1659. He survived into the reign of Charles IL, but, though some of his comedies were revived, he did not again attempt to write for the stage. It is said that he and his second wife died of the fright caused by the great fire of 1666.*~~

~~*There is little original force but much stage-craft and manipulative dexterity in Shirley's plays. He was born to great dramatic wealth, and he handled it freely. It has been remarked that he did not, like some of his great predecessors, take his plots from narrative fiction or history, but constructed them for himself. This is true; but he constructed them out of the abundance of materials that had been accumulated by more originative men during thirty years of unexampled dramatic activity. He did not strain after novelty of situation or character, but worked with confident ease and buoyant copiousness on the familiar lines, contriving situations and exhibiting characters after types whose effectiveness on the stage had been proved by ample experience. He spoke the same language with the great dramatists, it is true, but this grand style appears in him as the mechanical knack of an able and clever workman. It is often employed for the artificial elevation of commonplace thought. "Clear as day" becomes in this manner "day is not more con- spicuous than this cunning"; while the proverb "Still waters run deep" is ennobled into—*~~

~~*The shallow rivers glide away with noise—*~~

~~*The deep are silent. But it cannot be denied that he uses the poetic diction of his predecessors with ease, spirit, and judgment. His scenes are ingeniously conceived, his characters boldly and clearly drawn ; and he never falls beneath a high lével of stage effect.*~~

~~*His chief plays were—Love Tricks, a comedy, 1625; The Maid's Revenge, a tragedy, 1626; The Brothers, a comedy, 1626 ; The Witty Fair One, a comedy, 1628; The Wedding, a comedy, 1628 ; The Grateful Servant, a*~~

~~*tragi-comedy, 1629; The Changes, or Love in a Maze, 1632; The Gamester, a comedy, 1633; The Example (containing an imitation of Ben Jonson's Humours), 1634; The Opportunity, 1634; The Traitor, a tragedy (perhaps Shirley's best), 1685 ; The Lady of Pleasure (perhaps the best of his comedies), 1635; Zhe Cardinal, a tragedy (an attempt to compete with Webster's Duchess of Maljfi), 1641. An edition of his works in six volumes, with notes by Dyce and Gifford, was published in 1833.*~~

~~*SHODDY. See Woot.*~~

~~*SHOEMAKING. The simplest foot-protector is the sandal, which consists merely of a sole attached to the foot, usually by leather thongs. The use of this the arche- ologist can trace back to a very early period; and the sandal of plaited grass, palm fronds, leather, or other material still continues to be the most common foot-cover- ing among Oriental races. Where climate demanded greater protection for the foot, the primitive races shaped a rude shoe out of a single piece of untanned hide ; this was laced with a thong, and so made a complete covering. Out of these two elements—sole without upper and upper without sole—arose the perfected shoe and boot, which consist of a combination of both. A collection illustrating the numer- ous forms and varieties of foot-covering, formed by M. Jules Jacquemart, is now in the Cluny Museum in Paris. It embraces upwards of 300 specimens of ancient, mediaeval, and modern times, with a special series illustrating the artistic and historical side of the subject in France from the 15th century, and contains examples of the many varie- ties of foot-covering in use, especially in the East, at the present day. (Compare Costume.)*~~

~~*Wooden Shoes.—The simplest foot-covering, largely used through- out Europe, is the wooden shoe, made from a single piece of wood roughly cut into shoe form. The towns of Mende and Villefort*~~

~~*(dep. Lozére) are the headquarters of the wooden shoe trade in France, about 1700 persons there finding employment in the manu-*~~

~~*facture. Analogous to this industry is the clog-making trade of the midland counties of England. Clogs, known also as pattens, are wooden soles to which shoe or boot uppers are attached. Sole and heel are made of one piece from a block of maple or ash two inches thick, and a little longer and broader than the desired size of shoe. The outer side of the sole and heel is fashioned with a long chisel-edged implement, called the clogger's knife or stock ; a second implement, called the groover, makes a groove about one- eighth of an inch deep and wide round the side of the sole ; and by means of a hollower the contour of the inner face of the sole is adapted to the shape of the foot. The uppers of heavy leather, machine sewed or riveted, are fitted closely to the groove around the sole, and a thin piece of leather-binding is nailed on all round the edges, the nails being placed very close, so as to give a firm durable fastening. These clogs are of great advantage to all who work in damp sloppy places, keeping the feet dry and comfortable in a manner impossible with either leather or iudia-rubber. They are consequently largely used on the Continent by agricultural and forest labourers, and in England and the United States by dyers, bleachers, tanners, workers in sugar -factories, chemical works, provision packing warehouses, &c. 'There is also a considerable demand for expensive clogs, with finely trimmed soles and fancy uppers, for use by clog-dancers and others on the stage.*~~

~~*Manufacture of Leather Shoes. —There are two main divisions of work comprised in ordinary shoemaking. The minor division— the making of " turn shoes "—embraces all work in which there is only one thin flexible sole, which is sewed to the upper while out- side in and turned over when completed. Slippers and ladies' thin house boots are examples of this class of work. In the other divi- sion the upper is united to an insole and at least one outsole, with a raised heel. In this are comprised all classes, shapes, and qualities of goods, from shoes up to long-top or riding boots which reach to the knee, with all their variations of lacing, buttoning, elastic-web side gussets, &c. The accompanying cuts (figs. 1 and 2) show the parts and trade names of a riding boot, which is the supreme product of the craft.*~~

~~*Till within recent times shoemaking was a pure handicraft; but now machinery effects almost every operation in the art. On the factory system*~~

~~*all human feet are treated alike; in the handi- craft, the shoemaker deals with the individual foot, and he should peice a boot which for fit, com- ort, flexibility, and strength can- not be approached by the product of machinery.*~~

~~*The shoemaker, after measuring the feet, cuts out upper leathers according to the size and pattern. These parts are fitted and stitched together by the " boot-closers";*~~

~~*LY ME*~~

~~*aniline AON*~~

~~*Fig. 1.*~~

~~*Fia. 1.—Parts of a boot. aa, the extension; a, the front; b, the side seam ; c, the back ; d, the strap; e, the instep; j, the vainp or front; g, the quarter or counter ; h, the rand ; 4, the heel,—the front is the breast, the bottom the face ; j, the lifts of the heel; k, the shank or waist; J, the welt; m, the sole,*~~

~~*Fig. 2.*~~

~~*Fig. 2.—Section of boot. a, the upper; b, the insole; ¢, the outsole; d, the welt ; e, the stitching of the sole to the welt; /, the stitching of the upper to the welt.*~~

~~*but little of this closing is now done by hand. The sole "stuff"*~~

~~*is next cut out and assembled, consisting of a pair of inner soles*~~

~~*of soft leather, a pair of outer soles of firmer texture, a pair of welts or bands about one inch broad, of flexible leather, and lifts and top-pieces for the heels. These the ' maker" mellows by steeping in water. IIe attaches the insoles to the bottom of a pair of wooden lasts, which are blocks the form and size of the boots to be made, fastens the leather down with lasting tacks, and, when dried, draws it out with pincers till it takes the exact form of the last bottom. Then he "rounds the soles," by paring*~~

~~down the edges close to the last, and forms round these edges a small channel or feather cut about one-eighth of an inch iu the leather. Next he pierces the insoles all round with a bent awl, which bites into, but not through, the leather, and comes out at the channel or feather. The boots are then " lasted," by placing the uppers on the lasts, drawing their edges tightly round the edge of the insoles, and fastening them in position with lasting tacks. Lasting is a crucial operation, for, unless the upper is drawn smoothly and equally over the last, leaving neither crease nor wrinkle, the form of the boot will be bad. The welt, having one edge pared or chamfered, is put in position round~~

~~the sides, up to the heel or " seat," and the maker proceeds to "in- seam," by passing his awl throngh the holes already made in the insole, catching with it the edge of the upper and the thin edge of the welt, and sewing all three together in one flat Seam, with a waxed thread. He then pares off inequalities and "levels the bottoms," by filling up the depressed part in the centre with a piece of tarred felt ; and, that done, the boots are ready for the outsoles. After the leather for them has been thoroughly condensed by ham- mering on the "lap-stone," they are fastened through the insole with steel tacks, their sides are pared, and a narrow channel is cut round their edges; and through this channel they are stitched to the welt, about twelve stitches of strong waxed thread being made tothe inch. The soles are now hainmered into shape; the heel lifts are put on and attached with wooden pegs, then sewed through the stitches of the insole ; and the top-pieces, similar to the outsoles, are pnt on and nailed down to the lifts. The finishing operations embrace pinning up the edge of the heel, paring, rasping, scraping, smoothing, blacking, and burnishing the edges of soles and heels, scraping, sand-papering, and burnishing the soles, withdrawing the lasts, and cleaning out any pegs which may have pierced through the inner sole. Of course, there are numerous minor operations connected with forwarding and finishing in various materials, such as punching lace-holes, inserting eyelets, applying heel and toe irons, hob-nailing, &c. To make a pair of common stout lacing boots occupies an expert workman from fourteen to eighteen hours.~~

~~*The principal difficulties to overcome jn applying machinery to shoemaking were encountered in the operation of fastening together the soles and uppers. The first success in this iniportant operation was effected when means other than sewing were devised. In 1809 David Meade Randolph obtained a patent for fastening the soles and heels to the inner soles by means of little nails, &c. The lasts he used were covered at the bottom with plates of metal, and the nails, when driven through the inner soles, were turned and clinched by coming against the metal plates. To fix the soles to the lasts during the operation the metal plates were each perforated with three holes, in which wooden plugs were inserted, and to these the insoles were nailed. This invention may be said to have laid the foundation of machine boot-making. In the following year (1810) the inventor M. I. Brunel patented a range of machinery for fastening soles to uppers by means of metallic pins or nails, and the use of screws and staples was patented by Richard Woodman in the same year.*~~

~~*Apart from sewing by machine or hand, three principal methods of attaching soles to uppers are in use at present. The first is "pegging" with small wooden pins or pegs driven through outsole and insole, catching between them the edges of the upper. The points of the pegs which project through the insole are cut away aud smoothed level with the leather either by hand or by a machine pegging rasp. The second is the system of "riveting or clinching " with iron or brass nails, the points of the nails being turned or clinched by coming in contact with the iron last used. The third method, screwing, has come into extensive use since the standard screwing machine was introduced in America by the Mackay Association of Boston, Massachusetts, and in Europe by the Blake & Good- year Company of London. The standard screw machine, which is an American invention, is provided with a reel of stout screw- threaded brass wire, which by the revolution of the reel is inserted into and screwed throngh outsole, upper edge, and insole. Within the upper a head presses against the insole directly opposite the point of the screw, and the instant screw and head touch the wire is cut level with the outsole. The screw, making its own hole, fits tightly in the leather, and the two soles, being both compressed and screwed firmly together, make a perfectly water-tight and solid shoe. The surface of the insole is quite level and even, and as the work is really screwed the screws are steady in their position, and they*~~

~~add materially to the dnrability of the soles. The principal disadvantage in the use of standard screwed soles is the great diffi- culty met with in removing and levelling down the remains of an old sole when repairs are necessary;~~

~~The various forms of sewing-machine by which uppers are closed, and their important modifications for uniting soles and uppers, are also principally of American origin. But the first suggestion of machine sewing was an English idea. The patent secured by Thomas Saint in the English Patent Office in 1790, while it fore- shadowed the most important features of the modern sewing- machine, indicated more particnlarly the devices now adopted in the sewing of leather. After the introduction of the sewing-machine for cloth work its adaptation to stitching leather both with plain thread and with heated waxed thread was a comparatively simple task. The first important step in the more difficult problem of sewing together soles and uppers by a machine was taken in the United States by Lyman R. Blake in 1858. Blake's machine was ultimately perfected as the Mackay sole-sewing machine,—one of the most successful and lucrative inventions of modern times. Blake secured his first English patent in 1859, his invention being thus described ; "This machine is a chain-stitch sewing-machine. The hooked needle works through a rest or supporting surface of the~~

~~upper part of a long curved arm which projects upwards from the table of the machine. This arm should have such a form as to be capable of entering a shoe so as to carry the rest into the toe part as well as any other part of the interior of it ; It carries at its front end and directly under the rest a looper, which is supported within the end of the arm so as to be capable of rotating or partially rotat- mg round the needle, while the said needle may extend into and~~

~~along in the curved arm, thence through a tension spring applied to the arm, and thence upwards through the notch of the looper. needle carrier extends upwards with a cylindrical block which can i The feed wheel by which the shoe is moved along the curved arm during~~

~~*, and applied thereto so as to be capable of sliding up and down therein. The shoe is placed on the arm with the sole upwards. Blake's original machine was very imperfect and was incapable of sewing*~~

~~*standing which many other sole-sewing machines were patented. important of these is the Goodyear & Mackay machines for welted shoes, — the first mechanism adapted for sewing soles on lasted boots and shoes. These machines originated in a patent obtained in 1862 in the United States by August Destory for a curved-needle machine for sewing outsoles to welts, but the mechan- ism was not successful till taken in hand by Charles Goodyear, son of the well-known inventor in india-rubber fabrics. The Goodyear & Mackay Company make two machines for welted goods, one for sewing the inseam and the second for stitching on the outsole. A large number of the latter form of machine are in use, many manu- facturers preferring to secure the welt or a midsole by the standard screw machine, sewing to that the outsole with the Goodyear-Mackay machine. The same company adapt a circular-needle machine to the sewing of turn shoes, and this, with other similar machines, is in extensive use,*~~

~~*The range of machinery used in a well-equipped shoe-factory is very extensive, embracing machines for cutting leather, pressing rollers for sole leather, and presses with cutting-dies for stamping out sole and heel pieces. There are also, in addition to many kinds of sewing-machine, blocking or crimping appliances for moulding uppers or vamps, vamp-folding machines, eyeleting machines, lasting machines, trimming and paring machines for planing and smoothing the edges of soles and heels, For finishing there are scouring, sand-papering, and burnishing machines for the soles, and stamping machines for marks and monograms, with peg-cutting and nail-rasping machines for smoothing, cleaning out, and dress- ing the snrface of the insole. In short, there is not a single opera- tion necessary in shoemaking, however insignificant, for which machinery has not been devised.*~~

~~*The manufacture of india-rubber goloshes, shoes, and fishing- boots, &c., forms an important branch of the india-rubber industry rather than a department of shoemaking (see INDIA-RUBBER, vol. xii. p. 842). A very*~~

~~*considerable trade exists in boots and shoes with outer soles of gutta-percha (see vol. xi. p. 839) in place of leather, the headquarters of that trade being in Glasgow. (J. PA.)*~~

~~*SHOES, Horsr. The horny casing of the foot of the horse and other Solidungulates, while quite sufficient to protect the extremity of the limb under natural conditions, is found to wear away and break, especially in moist climates, when the animal is subjected to hard work of any kind. This, however, can be obviated by attaching to the hoof a rim of iron—a simple device which has been probably not surpassed in its beneficial effects by the intro- duction of steam-power locomotion. The animal itself has been in a very marked manner modified by shoeing, for without this we could have had neither the fleet racers nor*~~

~~*the heavy and powerful cart-horses' of the present day. Shoeing does not appear to have been practised by either Greeks or Romans ; but there is evidence that the art was known to the Celts, and that the practice became common after the overthrow of the Western empire towards the close of the 5th century. It is only recently that horse-shoeing was introduced in Japan, where the former practice was to attach to the horse's feet slippers of straw, which were renewed when necessary. In modern times much attention has been devoted to horse-shoeing, with the result of show- ing that methods formerly adopted caused cruel injury to horses and serious loss to their owners. The evils as sum- marized by Mr George Fleming, army (British) veterinary inspector, were caused by (1) paring the sole and frog; (2) applying shoes too heavy and of faulty shape ; (3) em- ploying too many and too large nails ; (4) applying shoes too small and removing the wall of the hoof to make the feet fit the shoes ; and (5) rasping the front of the hoof. According to modern principles (1) shoes should be as light as compatible with the wear demanded of them; (2) the ground face of the shoe should be concave, and the face applied to the foot plain ; (3) heavy draught horses alone should have toe and heel calks on their shoes to increase foothold ; (4) the excess growth of the wall or outer por- tion of horny matter should only be removed in ré-shoeing, care being taken to keep both sides of the hoof of equal height ; (5) the*~~

~~*shoe should fit accurately to the circum- ference of the hoof, and project slightly beyond the heel ; (6) the shoes should be fixed with as few nails as possible, six or seven in fore-shoes and eight in hind-shoes ; and (7) the nails should take a short thick hold of the wall, so that old nail-holes may be removed with the natural growth and paring of the horny matter. Horse shoes and nails are now made with great economy by machinery. In rural districts, where the art of the farrier is sometimes combined with blacksmith work, too little attention is, in general, given to considerations which have an important bearing on the comfort, usefulness, and life of the horse. SHOLAPUR, a British district of India, in the Deccan division of the Bombay presidency, with an area of 4521 square miles, lying between 17° 13' and 18° 35' N. lat. and 74° 39' and 76° 11' E. long. It is bounded on the N. by Ahmadnagar district, on the E. by the nizam's territory and Akalkot state, on the S. by Kalddgi district and some of the Patvardhan states, and on the W. by Satéra and Poona districts and the states of Phaltan and Panth Pratinidhi. Except in Karmala and Barsi subdivisions, situated in the north and east, where there is a good deal of hilly ground, the district is generally flat or undulating ; but it is very bare of vegetation, and presents everywhere a bleak treeless appearance. The chief rivers are the Bhima and its tributaries—the Man, the Nira, and the Sina—all flowing towards the south-east. Besides these there are several smaller streams. Lying in a tract of un- certain rainfall, Sholapur is peculiarly liable to seasons of scarcity ; much, however, has been done by the opening of canals and ponds, such as the Ekrik and Ashti tanks, to secure a better water-supply. The Great Indian Penin- sular Railway enters the district at Pomalvadi in the north- west corner and crosses it in a south-easterly direction, a distance of nearly 150 miles. Sholapur has recently been connected with a branch of the Southern Mahratta Railway. The population of Sholapur district in 1881 was 582,487 (294,814 males and 287,678 feinales). HIndus numbered 530,121, Moham- medans 43,967, aud Christians 625. There are three towus with populations exceeding 10,000 cach, viz., SHOLAPUR (q.v.), Pan- dharpur (16,910), Barsi (16,126). In 1883-84 there were 1,763,340 acres under cultivation, of which 22,282 were twice cropped, besides 325,987 acres of fallow or grass land. Joar, which forms the staple food of the people, occupied 923,706 acres, bajri 298,239, wheat*~~

~~55,504, rice 25,027, pulses 185,528, and oil-seeds 147,914 acres. The produce of the district finds an easy outlet by the railway to~~

~~8S II O—S HO~~

~~Poona and Bombay. The chief exports are cotton, which comes from the nizam's dominions, oil, oil-seeds, ghi, turmeric, and cotton cloth ; imports include salt, piece-goods, yarn, gunney bags, and iron ware. The chief industrics are spinning, weaving, and dyeing. The silks and finer sorts of cotton cloth prepared in Sholapur bear a good name; blankets are also woven in large numbers. The gross revenue of the district in 1883-84 amounted to £129,429, of which the land-tax yielded £98, 968.~~

~~Sholapur district passed from the Bahmani to the Bijapur kings and from them to the Marathas. In 1818, on the fall of the Peshwa, it was ceded to the British, when it formed part of the Poona col- lectorate, but in 1838 it was made a separate collectorate. Since then its progress has been rapid.~~

~~SHOLAPUR, chief town and administrative head- quarters of the above district, is situated in 17° 40' 18" N. lat. and 75° 56' 38" E. long., on the plain of the Sina. Its convenient situation between Poona and Haidarabad (Hyderabad), with a station on the Great Indian Penin- sular Railway, has made it the centre for the collection and distribution of goods over a large extent of country. The town contained in 1881 a population of 59,890 (males 30,410, females 29,480). ,~~

~~SHOOTING for sporting purposes requires in the use of firearms two fundamental principles on which rests the~~

~~attainment of dexterity. These are, first, that the weight Weight of the weapon be such that the sportsman can carry and of gun.~~

~~wield it with ease ; and, secondly—of still greater import- ance—that the weapon be so adapted to his chest, arm, and eye that when it is raised and levelled in the act of taking aim it may be as part of his own body. An over- heavy gun may be virtually lightened by being carried by an attendant and only handed to the sportsman when re- quired; but a gun not exactly "fitting the shoulder," can- not possibly serve its user with~~

~~*accuracy. The reason is plain. The slight divergence of his line of aim from the axis of the barrel, due to the shape of the gun not permit- ting the coincidence of the two when the weapon is used rapidly, creates a far from slight divergence of the pellets at any range beyond a few yards, and the object fired at, if struck at all, is only struck by the outer and weaker pellets. The increasing wildness of game-birds, in Great Britain at least, especially of partridges, through the modern system of cutting grain close to the ground and so leaving no sheltering stubble, demands rapid aim and discharge of the gun, and in consequence the efforts of gun- makers have been directed to the production of weapons of great lightness combined with power and precision. How different were the conceptions of our immediate pre- decessors is exemplified in such statements as "'a few addi- tional pounds in the weight of a gun makes a deal of differ- ence," and "the most approved guns" are those "weighing, according to the fancy of the shooter, from six to nine pounds." The most approved guns now vary in weight by a few ounces only, and their configuration not by inches, but by eighths and even sixteenths of an inch. There are also fine lines in their modelling which, while of great consequence, are imperceptible to the eye, and can only be demonstrated by the application of exact and delicate instruments. Yet each of these lines has an important purpose, and their combination produces the perfect weapon. An experienced gunsmith who has studied this branch of his business can catch the salient lines of a sportsman's figure with the eye of an artist, and by the further aid of tests and measurements can construct for him a proper gun, and thus lay the foundation of a correct style of shooting. On the other hand, an unsuitable gun can only be aimed correctly with slowness, and by some straining of the muscles of the neck. Under such condi- tions correct and rapid shooting is at least improbable ; the spread of the shot alone prevents a complete miss. It is the correct configuration of the gun which brings into full effect the elaborate boring of the barrel, and gives*~~

~~*Balance.*~~

~~*Calibre.*~~

~~*Length of barrel.*~~

~~*Bore.*~~

~~*SHO OTT WG*~~

~~*those long shots of which Sportsmen are so proud, and which are due to the central pellets flying Straight to a very considerable distance, much beyond that of the outer pellets.*~~

~~*The next point in a gun is balance 3 that is, the metal in the barrels must be so apportioned and the general con- struction be so arranged that there is no tendency in the muzzle to droop at the moment of discharge, just when the faculties of the sportsman are absorbed in taking aim and his muscular energies are in abeyance. The gun should balance at a point a little in front of the trigger-guard. The centre of gravity should also be low, so that there may be nothing of what may be called " top-hamper,"— in other words, that his gun may not roll in his hand, but may keep on an even keel, as it were, while he is taking aim. If we weigh in the scales two guns of nearly the same weight, the one well the other il] balanced, the former, although feeling quite light in the hand, will generally be found to be really heavier than the latter,—a fact which is frequently the cause of much surprise to sportsmen. When properly balanced, a gun can be carried with much less fatigue.*~~

~~*The calibre—a much disputed point—is, within the bounds commonly used, a question more of the capability of the sportsman to carry weight than one touching his effectiveness in the field. It has been plausibly argued that it matters little how narrow the calibre of a fowling- piece is, and that even gauge "35" ('510 inch) is wide enough. It certainly would throw a few pellets of swan- shot effectively, especially if the barrel was not less than 40 inches long. But for all common purposes the most useful calibre is the twelve-bore, if the weight is not under 64 Ib, or somewhat less for hammerless guns. When a less weight is required, "16" gauge (which in breech- loaders is really "15") is preferable. Calibre 20" belongs to toy-weapons, such guns being also uncertain in their delivery; and, as strong and effective "16" double-barrelled guns can now be made weighing only 6 ib, a smaller calibre can hardly be required, except under peculiar conditions. Against the advantage of less weight has to be set the important matter of recoil, and one cause of recoil is the elongation of the*~~

~~*body of the shot (and especially of the small-sized shot used in such guns) when placed in the barrel or cartridge. The longer that body, and the smaller the shot, the greater the difficulty in starting it ; hence, to bring a "20" as regards recoil to an equality with a "12," the weight of the charge of shot must be unduly reduced, with a more than proportionate reduction of the probability of killing, save in the exceptional cases where the size is not larger than snipe-shot. The shot ina "12" has no part at any appreciable distance from the wadding over the powder, and every pellet may fairly be said to receive a direct impetus from the explosion. An exceed- ingly light gun has also the fault of causing unsteadiness when the sportsman takes aim.*~~

~~*The length of the barrels need not exceed 30 inches, If a sportsman possesses a remarkably correct eye, he may safely go down to 26 inches or even less ; but it must be borne in mind that the shorter the barrel the greater the necessity for a perfectly correct aim. Any divergence on a barrel under 26 inches is vastly increased at 30 or 40 yards. On the other hand, aim is more quickly taken with short barrels. Thirty inches is a sound medium.*~~

~~*Of late years there has been a run on what are termed "choke-bores" (see GUNMAKING, vol. xi. p. 281). But unless the choking is most mathematically true the flight of the shot will not be coincident with the axis of the barrel or the line of aim, but will "train off" in some oblique direction ; and this obliquity will also be more or less affected by any required modifications of the charge. A*~~

~~*just grazing the right front of*~~

~~*choke-bore, therefore, restricts its user to narrow conditions in loading it. The velocity of the shot is also consider- ably reduced, the killing power depending less on that than on the object aimed at being struck with a greater number of pellets. Neither do all the pellets fly with equal velocity, so that, as was proved several years ago by ingenious experimentation (first announced by the present writer), these advance, as it were, in a narrow and pro- longed column, whereas a properly bored "friction and*~~

~~relief" barrel throws its shot in the figure of a broad disk, with all the pellets travelling practically at the same rate, — the inner or central ones having, however, more sustained killing power, their "quality of motion " degree and greatly prolonging the range. bored on the friction and relief method certainly puts the~~

~~game at fair sporting ranges ; but since the introduction of breech-loaders barrels so bored have (undeservedly) fallen so greatly into disuse that the delicate art of friction and relief boring has nearly been lost. A purely cylindrical barrel only shoots well when perfectly clean,—a condition that every discharge impairs.~~

~~between the stood) right in front of his line of vision. barrels and~~

~~How the shutting of one eye (unknown in billiards and similar games) practised in using firearms seems inexpli- cable to those who know how detrimental it is. The keeping of both eyes open was formerly not quite unknown, but was so little practised that, when the present writer took the matter up some thirty years ago and publicly advocated it, he was looked upon as being quite in error; but now his correctness is acknowledged, and what is termed the ' two-eye" system is coming more and more into use. There are still many uncertain "shots" who are not aware that their frequently unaccountable misses are caused by the scientific fact that shutting one eye deprives them of the power of measuring distances, and also of watching the movement of a running or flying object. As a rule, whilst the right eye is actually taking aim, the left is acting subsidiarily and showing the right whether or not it is taking it correctly. It may be noted that almost all exceptionally good shots have the eyes set wide apart, and so take their observation from a broader base.~~

~~The attitude in taking aim should be free and upright, with the left foot somewhat advanced. The right elbow should never be raised to a horizontal level with the shoulder,—a common but bad practice. The gun should be lifted directly upwards, the but-end the chest when reaching its final position, the eyes all the while looking fixedly upon the object. To illustrate this by way of contrast, there is another bad style of throwing the gun forward, the shooter all the while trying to look along the rib (which cranes the neck), and then bringing it back against the shoulder~~

~~*before firing. This, however, is a waste of muscular power and quite throws out the adaptation of the stock to the shoulder, because it is impossible to bring back the gun quite correctly, and it has therefore to be readjusted (which can hardly be accomplished) before firing. Besides, all this consumes time, for which game will not tarry. In military phrase, three " motions " are required ; with the proper style there is only one. ;*~~

~~*The question how far the left hand should be extended in taking Use of aim is much disputed, but is really of secondary consequence. left hand. Pigeon-shooters extend it as far as they well can, because their great object is to prevent the muzzle from drooping at the moment of discharge ; but from this, and also from their custom of planting their feet firmly and squarely upon the ground, so as to stand with their full front to their probable line of aim, no lesson in shooting game need be taken. Good game shots are not unfrequently poor shots at pigeons, and vice versa ; to be expert at the former depends upon the acquisition of a certain knack, and above all of calculation in time, 7.¢., of the power of estimating the average time from the*~~

~~*XXII. — 105*~~

~~*Stock of gun.*~~

~~*Treat- ment of guns.*~~

~~*Rabbits,*~~

~~*Hares,*~~

~~*Roedeer.*~~

~~*Grouse.*~~

~~*834*~~

~~*shooter's cry of the word "pull" to the opening of the trap and flight of the bird. This is so much the case that not unfrequently the gun is fired solely by calculation of time, and before a sluggish bird has flown. In*~~

~~*game-shooting the bird may rise in front or at either side of the shooter, or even behind him. Very rapid lateral movement of the gun may therefore be required, and it appears not only probable in itself but experimentally true that this can best be made by the left arm when it has to describe a circle of the shortest diameter. For this the best and safest position is when the left hand grasps the gun immediately in front of the trigger- guard. In pulling the trigger the finger should be well crooked, so that the pressure may be directly backwards, and no lateral dis- turbance may interfere with the aim at the most critical moment.*~~

~~*If the eye takes in all the rib of the gun when raised to the shoulder in position for firing, so that the full length of its surface is seen, the stock is too straight. If the rib is not seen at all, the stock is too crooked. When a stock is of the proper curve, the eye will catch the rib about one-third of its length from the muzzle, ie., all the rib in front of that point will be visible, and all behind it out of sight. A straight stock is, however, preferable to a crooked one, which makes the gun shoot low,—a bad fault. It is of first-rate importance that the delicate lateral setting of the stock, as distinguished from the perpendicular curve, should bring the centre of the rib exactly into the line of sight. This fine desidera- tum may be arrived at conjointly by the sportsman and the maker of the gun; the latter can be guided by information as to the sports- man's height, length of arm, and breadth of chest. If this point is satisfactory it is immaterial whether a bird flies to the right hand or to the left, and the neglect of it is the reason why some sportsmen are good shots in one only of these directions.*~~

~~*In cleaning breechloaders, including the inside of the barrels, neither oil nor water should be used, but solely spirits of turpentine. The gun should never be laid aside on full-cock, as this weakens the mainsprings. As hammerless guns are necessarily on full-cock when taken down, the triggers should be drawn, but with the eare- ful proviso that the points of the hammers strike upon a block of hard wood held firmly in front of them. The lock should never be snapped unless there is a discharged or a "'dummy" cartridge in the barrel. No hammer can be made, of any metal or form of con- struction, that will not probably crack if it falls without something in front less trying than the hard and impassive breech. On sea*~~

~~*voyages and in damp climates the barrels should be kept from the atmosphere by inserting into them wooden rods covered with woollen cloth, and in such cases the free application of turpentine will be found invaluable. Failing these rods, each end may be closed with wadding or corks. For oiling the locks the finest chronometer oil should be used, and only applied in minute quantities to the points of friction, not over all: oil dries up and if applied copiously frustrates the desired purpose. Raw linseed oil, frequently rubbed into a stock, hardens and preserves it. Explorers and travellers, whose lives may depend on their firearms, may usefully strengthen the weakest part of every gun, the handle of the stock, by wrapping it tightly round with whip-cord.*~~

~~*Shooting Game.—Space forbids entering at length on the modes of shooting the several varieties of game. All that is here possible is briefly to touch upon some of the salient points in the pursuit of the more common varieties.*~~

~~*Rabbits, on which young sportsmen generally first essay their "*prentice hand," dash off for the nearest shelter with great rapidity, and should be instantaucously fired at, the aim being taken slightly in advance. Ifa rabbit has disappeared among brushwood, it may be not unavailing to fire right in front of the line it was seen to take. In "ferreting" the sportsman should stand clear of the burrow (over whieh he should never tread), and never fire at a rabbit until it is well away from the "bolt-hole." Hares are less tenacious of life than rabbits, and, as it is an object not to mangle the body and so cause an effusion of blood, the eyes of the sports- nian should be fixed solely on the tips of the ears in whatever direction the animal is going, when the shot is instantaneously fatal. A hare coming straight towards a sportsman should not be fired at; he should stand quite motionless until it comes within 30 yards, when on his making a slight sound or movement it will turn aside and give an easy shot. No other direction need be given on this head (save possibly that the shot is more easy when a hare is ascending a ridge across which it may be running than when it is descending from the crown to the furrow), seeing that the one principle of firing solely at the ears involves everything. Roedeer are usually killed with buckshot—although a small rifle is pre- ferable—the " guns" being posted at the likely passes. The neck or shoulder should be*~~

~~*fired at. They are easily killed when within fair distance, but are exceedingly clever in keeping out of rauge and in detecting the presence of the lurking sportsman. They also have the trick, in common with the elephant, of doubling back and passing round any knoll, coming out on its other side and then continuing their intended course. Of this instinctive habit the sportsman should avail himself.*~~

~~*Success in grouse-shooting, probably the finest of all sports from*~~

~~*every point of view, depends mainly on vigilance and careful atten- tion to the movements of the dogs, and following them well up as soon as there are indications of gante being in front. Save that a cunning old cock will after rising immediately dip down to nearly the level of the heather and go off with wondrously baffling speed, there is no peculiarity in the flight of grouse calling for special remark. Like partridges, they generally fly straight and nearly horizontally. As the season advances, their wariness and the matured strength of the young birds make their pursuit more difficult, but otherwise they afford fair shots. "‘ Driving" is now quite a recognized branch of grouse-shooting. The "‘ guns" being posted in artificial places of concealment in the line of flight known to be usually taken by the birds on being disturbed by beaters, the shots are taken as the birds are coming overhead. Their speed is so great that it is needless to fire if they have once passed the shooter, seeing that the aim must be taken some feet in front.! It has been found useful for the sportsman to crouch without motion until the birds are coming within distance, when, suddenly showing himself, they are startled and throw their heads up, thus breaking their flight and giving the gun a fair chance. Perhaps the easiest and most fatal shots are at single birds coming straight towards the sportsman, taken at about 30 yards. The aim should be high, and it is aided by the recoil of a gun when fired, which throws the muzzle up in the line of flight. The pellets also strike the head and neck, and with such force that, when meeting the bird, No. 7 shot is most deadly when so discharged. The recoil of a gun when fired "high" is also useful in shooting with a rifle any large bird passing overhead ; the shooter should face the bird. Driving is severe work if thoroughly carried out, as the*~~

~~*sportsmen, as soon as one beat is over, have to find their way rapidly to the next position. It is therefore not an effeminate sport, and it probably indirectly maintains the number of the stock-birds by killing off the old leading cocks (which virtually are vermin). Setters are the proper dogs for grouse-shooting, their hairy feet being well protected from the heather ; hence to maintain vigour they require to drink water frequently and even to squat in shallow pools. Pointers are preferable for dry moors, particularly in hot weather.*~~

~~*Partridge-shooting is akin to grouse-shooting in respect of the Par- mode of pursuit, the difference lying in its being carried on mostly tridges,*~~

~~*upon cultivated or enclosed land. Both in partridge-shooting and in grouse-shooting one bird only ought to be singled out and shot at; no success will follow firing into the "brown" of a covey. Old sportsmen regret that shooting over dogs (pointers being pre- ferable to the swifter and more dashing setters) is going out of practice ; but the close cutting of the grain crops now in vogue leaves so little stubble that the approach of the dogs is seen by the birds, which, generally rising wild, afford few "shots to points." Hence the system of sportsmen walking in line (with no dogs save retrievers) and taking what birds rise before them, and so driving them into turnips or other covert, or of having them " driven" by beaters, is almost enforced. When driven into such coverts the birds are apt to run before the shooters and take their flight from the far end of the field. This may be prevented by the sportsman not advancing directly, but in a series of circuits; then the birds, becoming uncertain as to which way they should run, sit close and only rise on his very near approach. Of course this excellent but almost unknown system can only be well carried out by a single shooter, or by two at the most. In "driving" the "guns" are posted in a line at some distance from each other, under the con- cealment of a hedge some 20 yards in their front. Towards this the beaters (with a fugleman on horseback, if necessary) drive the birds. The shots are generally very difficult, the birds flying with remarkable speed, and the shooter being also often bewildered by the number of smaller birds, such as the various kinds of thrushes, which precede or accompany the partridges ; their sudden appear- ance on coming over the hedge is also trying, whereas the approach of grouse can be seen. These two systems*~~

~~—“ driving” and the circular progression in covert—are of recent introduction. The former has developed greater skill in shooting.~~

~~The art of shooting pheasants depends upon the fact that, unlike Phea- partridges or grouse, the birds generally steadily ascend in their sants.~~

~~flight ; hence the tendency is to shoot under them. This upward flight is greatest in coverts, until it sometimes becomies almost perpendicular, birds rising in this way being called “rocketers.” The inexperienced shooter is also misled by the manner in which the tail is spread out like a fan, concealing the body, and thus diverting the aim from the body upon the tail feathers. To aim high, therefore, is the golden rule. The shooter should face birds which fly rapidly overhead, in the way described above.~~

~~To kill snipe well one must hunt down the wind—an exceptional Snipe~~

~~practice—and on the bird rising fire at once, or, failing that, give it time to change its few preliminary zigzag motions into a steady flight. ee eee~~

~~1 A carrier pigeon can fly a little over 4 miles 5 furlongs in four minutes, — an average of nearly 102 feet a second. Assuming the distance to be 40 yards (a long shot), the aim taken ata bird flying across the shooter at that speed should be more than 5 feet in advance, the flight of the shot to a distance of 40 yards requiring one-nineteenth of a second.~~

~~Black- cock and wood- cock,~~

~~Ammu- nition.~~

~~Rifle- shooting,~~

~~SHO—SHO~~

~~As the least touch of shot brings a snipe down, have passed out of range before the direct line of flight is assumed, This is the only sport followed on land “down wind.” Shot No. 9 or 10 should be used.~~

~~Although greatly different in character, black-game and wood- cock may be well coupled together as being eccentric in their move- ments. ‘The~~

~~*former are most easily shot very early in the season, especially over a steady old pointer, when the broods are yet on the more open ground, under the maternal] charge, like so many domestic chickens ; but, when they have broken up the family ties, congregated, and betaken themselves to the coppices, they become so irregular in their habits and uncertain in their mode of takin flight that no exact rules can be laid down for their pursuit. The Sportsman, using one steady old pointer and a retriever, had best be guided by an experienced attendant, who should take care to beat out any bird lurking in a thick bush from the opposite side and towards the gun. A few shots may also be got at the dawn of day on the edges of stubble-fields ; but black-game shooting is generally disappointing. The femalc birds, " grey hens," are not shot at ; the young males, which greatly resemble them, are dis- tinguished from them by the white feathers in the tail. A solitary blackcock may often be seen to take up a prominent position, usu- ally in the centre of one of the small fields to be found on the side of hilly ground, where he maintains a vigilant watch. With some experience in shooting matters, the present writer knows no pursuit more interesting and invigorating than stalking such a bird: with- out causing undue fatigue, it exercises one's patience, vigilance, and coolness of nerve. Shot for this purpose should not be of a smaller size than No. 4. Woodcock newly arrived may be readily killed, especially near the sea-coast. After recruiting, they frequently betake themselves to heathery moors if there are such near at hand, where they frequent the sides of rivulets and gorges. There they may be readily brought down; but in woods they have a knack of twisting, as it were, round the younger trees, in the branches of which they are mostly found, and' so disconcert the aim. Being of nocturnal habits, their eyes are weak in the full lare of day, and they are fond of the sheltering shade of thickly foliaged trees, such as the holly. The only advice that can be given on this sport is to risk the shot at the merest glimpse of the bird through the branches, and trust to the spread of the pellets to kill, for the woodcock, like its congener the snipe, will fall with a touch, and even (apparently) through mere fright on being fired at, without being touched at all. The best shot to use is No. 8,*~~

~~*Ammunition.—In former times sportsmen carefully adjusted their charges of powder and shot to suit the weather (which affected the strength of the former) and the sport in hand. Now, almost everything is*~~

~~left to the purveyor of cartridges, which are usually charged on average proportions. The sportsman should be careful, therefore, to ascertain the charge best suited to his weapon, and to have his cartridges so loaded. When a gun recoils the charge of shot—not of powder, as is generally supposed—should be reduced ; and it is always safer to use a light charge of shot. Breechloaders require large-grained powder, Messrs Curtis & Harvey's No. 6 being the typical size. Pyroxyline explosives, of which Schultze powder is the normal type, are now largely used, especially in the first barrel, the other being charged with black powder. For almost all regular sport No. 6 shot is the best size ; and it is better to use No. 7 ina smaller quantity than No. 5 for grouse and partridges. For pheasants and black game use No. 5, but of 1} oz. in weight, with a somewhat reduced charge of powder. One oz. or at most 14 0z. of No. 6 is ample ; the former will travel with marvellous and far-reaching velocity. Any excess of shot merely falls to the ground, as may be seen by firing over a sheet of smooth water. For duck-shooting (for which the barrels should be of "10" gauge and 32 inches long) No. 4 shot is a good size; and for this sport it is well to reduce the weight of the shot and increase very considerably that of the powder, velocity being everything,~~

~~Rifle-shooting.—The propriety of shooting with both eyes open is, if possible, more imperative in rifle-shooting than in shooting game, if rapidity is valued, as it must be. Firearms immediately followed the long bow and the cross-bow, and it has never been supposed that the archer discharged these with one eye closed. With both eyes open the "back sight" virtually becomes transparent, and forms no obstacle to the aim, while with one eye closed it cer- tainly does, for, as the head and eyes must be kept fairly up in firing a shot gun, they must be kept well down in firing a rifle. The " express" rifle is the chef-d@'ewvre of modern weapons, and when properly made will throw its bullet up to 200 yards without perceptible curve from one sight. This result is attained mostly by~~

~~it is very unlikely to~~

~~1 This explosive is the invention of Colonel J. F. E. Schultze, of the Prussian artillery service, and was introduced about 1866 into the United Kingdom by Mr J. D. Dougall. It is now being manufactured in Great~~

~~*Britain as well as on the Continent. The advantages claimed for it are that it does not require any special loading, such as hard Tamming, there is a smaller recoil than with black gunpowder, and it has great propulsive power, with little or no fouling of the firearm.*~~

~~*835*~~

~~*an inordinately large charge of powder toa light and partly hollow bullet (see GUNMAKING, vol. xi. p. 282). The 'pull' on the trigger should rather be a pinch than a direct backward pull, ze. the trigger should be pinched between the forefinger and the thumh which grasps the handle of the stock.*~~

~~*presence of mind to inflate his chest with shoot all the better, 1*~~

~~*barrelled ' express" shoots more truly than a double-barrelled one.*~~

~~*and antelopes, for dangerous animals. But for*~~

~~*royal whom he described respectively as the merriest, the wilyest, and the holiest harlot in his realm. A handsome woman of moderate stature, round face, and fair complexion, she was more captivating by her wit and conversation than by her beauty ; yet Sir Thomas More, writing when she was still alive, but old, lean, and withered, declares that even then an attentive observer might have discerned in her shrivelled countenance some traces of its lost charms. She was born in London, and married before she was quite out of girlhood to a citizen named William Shore, who, though young, handsome, and well-to-do, never really won her affections ; and thus she yielded the more readily to the solicitations of King Edward. Her husband on this abandoned her, and after Edward's death she became the mistress of Lord Hastings, whom Richard ITIL, then duke of Gloucester, as protector durin g the minority of Edward V., suddenly ordered to be beheaded on 13th June 1483. According to the report given by More, Richard had accused Hastings at the council table of conspiring against him along with the queen-dowager and Shore's wife, who by sorcery and witchcraft had given him a withered arm. So having got rid of Hastings he caused Jane Shore to be committed to prison and spoiled her house, containing property to the value of 2000 or*~~

~~*3000 marks, equivalent to a sum of £20,000 or £30,000 at the present day. But having sought in the first place to charge her with conspiracy—a charge which apparently he could not sub- stantiate—he thought better afterwards to get the bishop of London to put her to open penance at Paul's Cross for her vicious life. She accordingly went in her kirtle through the streets one Sunday with a taper in her hand, her beauty really enhanced by the blush which her humilia. tion called up in her usually pale cheeks 3 and many who detested her mode of life could not but pity her as the victim of a hypocritical tyranny. The penance certainly did not induce her to reform, for she immediately after- wards became the mistress of the marquis of Dorset 3 and, what is still more extraordinary, next year, having been taken again into custody, and her husband, it may be presumed, being by that time dead, she so captivated the king's solicitor, Thomas Lynom, that he actually entered into a contract of marriage with her. This we know from a letter of King Richard to his chancellor on the occasion, desiring him to dissuade Lynom from the match, as far as he could, by argument, but, if he found him determined, then, provided it was not against the laws of the church, he might convey the king's consent and meanwhile deliver Jane out of prison to her father's custody. Conduct so*~~

~~*$36*~~

~~*unlike his previous severity shows that Richard knew how to be gracious as well as despotic. Whether the marriage actually took place is not known. Jane certainly lived to the year 1513, when More wrote his history of Richard III., but how much later we cannot tell.*~~

~~*SHORTHAND, or Srenocraruy, TACHYGRAPHY, &c., is a term applied to all systems of brief handwriting which are intended to enable a person to write legibly at the rate of speech. (For the ancient Latin and Greek tachygraphy, see the last part of the article on Patmocraruy.) In the 10th century all practical acquaintance with the shorthand systems of Greece and Rome faded completely away, and not till the beginning of the 17th can the art be said to have revived. But even during that interval systems of writing seem to have been practised which for speed ap- proximated to modern shorthand.}*~~

Shorthand in English-speaking Countries.—England was the birthplace of modern shorthand, and at the present time there is no country in Europe, except perhaps Germany and German Switzerland, where the art is so extensively practised as in England. The first impulse to its cultivation may possibly be traced to the Reformation. When the principles of that movement were being pro- mulgated from the pulpit, a desire to preserve the dis- courses of the preacher naturally suggested the idea of accelerated writing. It is certainly striking that in the early systems so many brief arbitrary signs are provided to denote phrases common in the New Testament and Pro- testant theology. Up to the present time (1886) not less than 483 professedly distinct systems of English shorthand have been published, and doubtless many more have been invented for private use. It is impossible here to notice even by name more than a very few of them. Indeed, if we reject all those systems which are imitations or repro- ductions of earlier ones, and systems which are so unpracti- cal as to be little better than elegant toys, and a multitude of utterly worthless catchpenny publications, only a few remain. In Dr Timothy Bright's? Characterie (1588) and Peter Bales's? Arte of Brachygraphie, contained in his

Writing Schoolemaster (1590), almost every word in the language is provided with an arbitrary sign. Only with gigantic memory and by unremitting labour could one acquire a practical knowledge of such methods. The first shorthand system worthy of the name which, so far as is known, appeared in England is that of John Willis, whose Art of Stenographie (London, 13 editions* from 1602 to

1 For instances, see Zeibig's Geschichte u. Lit. der Geschwindschreib-kunst (Dresden, 1878), pp. 67-79. For John of Tilbury's system (c, 1175), see especially Shorthand, No. 5, and Hermes, viii. p. 3038.

2 The Bodleian Library contains the only known copy of Bright's book. For a description of the system, see Phonetic Journal, 1884, p. 86 ; Circulars of Information of the Bureau of Education (Wash- ington), No. 2, 1884, p. 8; and Notes and Queries, 2d ser., vol. ii. p. 394. A is represented by a straight line, the other letters of the alphabet by a straight line with a hook, circle, or tick added at the beginning. Each

~~*alphabetic sign placed in various positions, and having some additional mark at the end, was used to indicate arbi- trarily chosen words beginning with a, b,c, d, &c. There were four slopes given to each letter and twelve ways of varying the base, so that forty-eight words could be written under each letter of the alpha- bet if necessary. Thus the sign for 6 with different terminal marks and written in four different directions signified a number of words commencing with 6; 587 such signs had to be learned by heart. By adding certain external marks these signs were applied to other words : thus by writing a dot in one of two positions with respect toa sign the latter was made to represent either a synonym or a word of opposite ineaning. Under air are given as synonyms breath, exhalation, mist, reek, steam, vapour. The best account of Bright is given in the Dictionary of National Biography, vol. vi. (1886).*~~

~~*3 Bales's method was to group the words in dozens, each dozen headed by a Roman letter, with certain commas, periods, and other marks to be placed abont each letter in their appropriate situations, so as to distin- guish the words from each other. For an account of Bales, see Wood's Athen. Oxon., vol. i. col. 655, and the Dict. of Nat. Biog., vol. iii. (1885).*~~

~~*4 The first edition, published anonymously, is entitled The Art of*~~

~~*1644) is substantially based on the common alphabet ; but the clumsiness of his alphabetic signs, and the confused laborious contrivances by which he denotes prefixes and terminations, involving the continual lifting of the pen, would seem to render his method almost as slow as long- hand. Of the 201 systems which intervene between J. Willis's and Isaac Pitman's phonography (1837) nearly all are based, like Willis's, on the alphabet, and may be called a, b, ec systems.. But seven are, like phonography, strictly phonetic, viz., those by Tiffin (1750), Lyle (1762), Holds- worth and Aldridge (1766), Roe (1802), Phineas Bailey (1819), Towndrow (1831), and De Stains (1839). Of the 281 systems which have appeared since phonography a very large proportion are merely imitations of that system, or proceed on the same lines.*~~

~~*A few. general remarks apply largely to all the a, b, cA, b, ¢ Each letter is designated by a straight line or Systems, |*~~

~~*systems. curve (vertical, horizontal, or sloping), sometimes with the addition of a hook or loop. C and q are rejected, & being substituted for hard ¢ and qg, s for soft. Signs are pro- vided for ch, sh, th. Gand j are classed under one sign, because in some words g is pronounced as J, as in giant, gem. Similarly each of the pairs f, v and s, z has only one sign. A few authors make the signs for Jj, v, z heavier than those for g, f, s. Some class p and 6, ¢ and d, each under one sign. The stenographic alphabet is therefore—a, 6, d, e, f®, g (J), h, 2, k, i, M,N, 0, P, T, 8 (2), t, U, W, X,Y, ch, sh, th. Letters which are not sounded may be omitted. Gh, ph may be counted as f in such words as cough, Philip ; but the th in thing is never distinguished from the th in them. Thus the a, b, ¢ systems are largely phonetic with respect to consonant-sounds; it is rather with regard to the vowels that they disregard the phonetic principle. No attempt is made to provide adequately for the many vowel-sounds of the language. Thus the signs for like and lick, for rate and rat, &c., are the same. In the case of vowel-sounds denoted by two letters, that vowel is to be written which best repre- sents the sound. Thus in meat the e is selected, but in great the a. In some a, b, c systems, including the best of them (Taylor's), a dot placed anywhere does duty for all the vowels. This practice is, of course, a fruitful source of error, for pauper and paper, gas and goose, and hundreds of other pairs of words would according to this plan be written alike. In the early systems of Willis and his imi- tators the vowels are mostly written either by joined char- acters or by lifting the pen and writing the next consonant in a certain position with respect to the preceding one. Both these plans are bad ; for lifting the pen involves ex- penditure of time, and vowels expressed by joined signs and not by marks external to the word cannot be omitted, as is often necessary in swift writing, without changing the general appearance of the word and forcing the eye and the hand to accustom themselves to two sets of outlines, vocalized and unvocalized. In the better a, b, c systems the alphabetic signs, besides combining to denote words, may also stand alone to designate certain short common words, prefixes, and suffixes. Thus in Harding's edition of Taylor's system the sign for d, when written alone, denotes do, did, the prefixes de-, des-, and the terminations -dom, -*~~

~~*end, -ened, -ed. This is a good practice if the words are well chosen and precautions taken to avoid ambiguities. Numbers of symbolical signs and rough word-pictures, and even wholly arbitrary marks, are employed to denote words and entire phrases. Symbolical.or pictorial signs, if suffi- ciently suggestive and not very numerous, may be effective; but the use of "'arbitraries" is objectionable because they are so difficult to remember. In miany shorthand books*~~

~~*Stenographie . . . wherevnto is annexed a very easie Direction for Steganographie, or Secret Writing, printed at London in 1602 for Cuthbert Burbie. The only known copy is in the Bodleian Library.*~~

~~*John Willis.*~~

~~*Rich,*~~

~~*Mason.*~~

~~*SHORTHAND*~~

~~*the student is recommended to form additional ones for*~~

~~*837*~~

~~*'three times since),*~~

~~*himself, and so of course make his writing illegible to others,*~~

~~*The raison-Wétre of such signs is not far to seek. The*~~

~~*proper shorthand signs for many common words were so*~~

~~*clumsy or ambiguous that this method was resorted to in order to provide them with clearer and easier outlines. For the purpose of verbatim reporting the student is recom- mended to omit as a rule all vowels, and decipher his writ- But, when vowels are omitted, hundreds of pairs of words having the same con- sonant skeleton (such as minister and monastery, frontier*~~

~~*ing with the aid of the context.*~~

~~*and furniture, libel and label) are written exactly alike. This is one of the gravest defects of the a, b, ¢ systems. John Willis's system was largely imitated but hardly improved by Edmond Willis (1618), T. Shelton (1620), Witt (1630), Dix (1633), Mawd (1635), and Theophilus Metcalfe (1635). TT. Shelton's system, republished a great many times down to 1687, was the one which Samuel Pepys used in writing his diary.) It was adapted to German, Dutch, and Latin.2 An advertisement of Shelton's work in the Mercurius Politicus of 3d October 1650 is one of the earliest business advertisements known.*~~

~~*according to Shelton's system by Thomas Cross. Metecalfe's Ltadio-Stenography, or Short- Writing, was republished again and again for about a hundred years. The 35th "edition "*~~

~~*is dated 1693, and a 55th is known to exist. The ineffi- ciency of the early systems seems to have brought the art into some contempt. Thus Thomas Heywood, a contem- porary of Shakespeare, says in a prologue ? that his play of*~~

~~*Queen Elizabeth*~~

~~*'* Did throng the seats, the boxes, and the stage So much that some by stenography drew A plot, put it in print, scarce one word true."*~~

~~*Shakespeare critics would in this manner explain the*~~

~~*badness of the text in the earliest editions of Hamlet, Romeo and Juliet, Taming of the Windsor, and Henry V. Perhaps a study of J. Willis's system and of E. Willis's (which, though not published till after Shakespeare's death, was practised long before) may shed light on corrupt readings of the text of these plays.* Rich's system (1646, 20th edition 1792) was reproduced with slight alterations by many other persons, including W. Addy, Stringer, and Dr Philip Doddridge (1799 and The New Testament and Psalms were engraved in Rich's characters (1659, 596 pages, 24× 14 inches, 2 vols.), and Addy brought out the whole Bible engraved in shorthand > (London, 1687, 396 pp.). Locke, in his Treatise on*~~

~~*Education, recommends Rich's system ; but it is encumbered with more than 300 symbolical and arbitrary signs. In 1847 it was still used by Mr Plowman, a most accomplished Oxford reporter.*~~

~~*In 1672 William Mason, the best shorthand author of the 17th century, published his Pen pluck'd from an Eagle's Wing. The alphabet was largely taken from Rich's. But in his Art's Advancement (1682) only six of Rich's letters are retained, and in his Plume Volante (1707) further changes are made. Initial vowels are written by their alphabetic signs, final vowels by dots in certain positions (a, e at the beginning ; 7, y at the middle; 0, u at the end), and medial vowels by lifting the pen and writing the next consonant in those same three positions with respect to the preceding one. Mason employed 423 symbols and*~~

~~*1 See a paper by J. E. Bailey, "On the Cipher of Pepys' Diary," in Papers of the Manchester Literary Club, vol. ii. (1876).*~~

- ~~*See Zeibig's Gesch. u. Lit. d. Geschwindschreibkunst, p. 195.*~~

~~*® Pleasant Dialogues and Drammas (London, 1637), p. 249. ;*~~

~~*4 See M. Levy's Shakspere and Shorthand (London), and Phonetic Journal, 1885, p. 34.*~~

~~*5 This curiosity is described in the Phonetic Journal, 1885, pp. 158, 196. The Bodleian Library has a copy.*~~

~~*The book of Psalms in metre (206 pages, 23 × 1} inches) was engraved*~~

~~*Shrew, Merry Wives of*~~

~~*arbitraries. IIe was the first to discover the value of a small circle for s in addition to its proper alphabetic sign. Mason's system was republished by Thomas Gurney in 1740, a circumstance which has perpetuated its use to the present day, for in 1737 Gurney was appointed shorthand. writer to the Old Bailey, and early in the 19th century W. B. Gurney was appointed shorthand-writer to both IIouses of Parliament, Gurney reduced Mason's arbitraries to about a hundred, inventing a few specially suitable for*~~

~~*parliamentary reporting. The Gurneys were excellent writers of a cumbrous system. Thomas Gurney's Brachy- graphy passed through at least eighteen editions, but the sale of the book has now almost ceased,*~~

~~*In 1767 was Byrom, sometime fellow of Trinity College, Cambridge, entitled The Universal English Shorthand, distinguished for its precision, elegance, and systematic construction. Byrom had died in 1763. Having lost his fellowship by failing to take orders, he made a living by teaching shorthand in London and Manchester, and among his pupils were Horace Walpole, Lord Conway, Charles Wesley, Lord Chesterfield, the duke of Devonshire, and Lord Camden. Shorthand, it is said, procured him admission to the Royal Society. He founded a stenographic club, to the proceed- ings of which his journal,® written in shorthand, is largely devoted. In the strangers' gallery of the House of Com- mons in 1728 Byrom dared to write shorthand from Sir R. Walpole and others. In 17 31, when called upon to give evidence before a parliamentary committee, he took short- hand notes, and, complaints being made, he said that if those attacks on the liberties of shorthand men went on he "must have a petition from all counties where our dis- ciples dwell, and Manchester must lead the way." Thomas Molyneux popularized the system by publishing seven cheap editions between 1793 and 1825. Modifications of Byrom's system were issued by Palmer (1774), Nightingale (1811), Adams (1814), Longmans (1816), Gawtress (1819), Kelly (1820), Jones (1832), and Roffe (1833). Byrom's method received the distinction of a special Act of Parlia- ment for its protection (15 Geo. II. c. 23, for twenty-one years from 24th June 1742). To secure lineality in the writing and facility in consonantal joinings he provided two forms for 8, h, j, w, x, sh, th, and three for J. A, 8 2, 0, #, he represented by a dot in five positions with respect toa consonant. Practically it is impossible to observe more than three (beginning, middle, and end). With all its merits, the system lacks rapidity, the continual recurrence of the loop seriously retarding the pen.*~~

~~*In 1786 was published An Essay intended to establish a Taylor.*~~

~~*Standard for a Universal System of Stenography, by Samuel Taylor (London). This system did more than any of its predecessors to establish the art in England and abroad, Equal to Byrom's in brevity, it is simpler*~~

~~*in construction, No letter has more than one sign, except w, which has two. Considering that five vowel places about a consonant were too many, Taylor went to the other extreme and ex- pressed all the vowels alike by a dot placed in any position. He directs that vowels are not to be expressed except when they sound strong at the beginning and end of a word. Arbitraries he discarded altogether ; but Harding, who re- edited his system in 1823, introduced a few. ach letter when standing alone represents two or three common short words, prefixes and suffixes. But the list was badly chosen: thus m represents my and many, both of them adjectives, and therefore liable to be confounded in many sentences, To denote 7 and on by the same sign is evidently absurd. Taylor's system was republished again and again. The*~~

~~*§ Byrom's private journal and literary remains have been published*~~

~~*by the Chetham Society of Manchester. See, too, a paper by J. E. Bailey in the Phonetic Journal, 1875, pp. 109, 121.*~~

~~*published at Manchester a work by John Byrom.*~~

~~*Mavor.*~~

~~*Pitman's phono- graphy,*~~

~~*838*~~

~~*latest editions are those of J. H. Cooke (London, 1865) and A. Janes (London, 1882). In Harding's edition (1823 and at least twelve times since) the vowels are written on an improved plan, the dot in three positions representing a, e, 1, and a tick in two positions 0, « Several other persons brought out Taylor's system, in particular G. Odell, whose book was re-edited or reprinted not less than sixty- four times, the later republications appearing at New York. The excellence of Taylor's method was recognized on the Continent : the system came into use in France, Italy, Holland, Sweden, Germany, Portugal, Roumania, Hungary, &c. In England at the present day no method excepting Pitman's phonography is more popular than Taylor's, although the systems which have appeared since Taylor's are far more numerous than those which preceded it.*~~

~~*The Universal Stenography of William Mavor (1780 and nine times since) is a very neat system, and differs from Taylor's in the alphabet and in a more definite method of marking the vowels. A, e¢, i, are indicated by commas, 0, u, ¥, by dots, in three places with respect to a letter, namely beginning, middle, and end. Other systems by J. H. Lewis (1812) and Moat (1833) are still used to a small extent.*~~

~~*The vast mass of a, b, c systems are strikingly devoid of originality, and are mostly imitations of the few that have been mentioned. Nearly all may be briefly described as consisting of an alphabet, a list of common words, pre- fixes and suffixes expressed by single letters, a list of ar- bitrary and symbolical signs, a table showing the best way of joining any two letters, a few general rules for writing, and a specimen plate.?*~~

~~*Pitman's phonography, on account of its enormous diffu- sion in Great Britain and the colonies, and in America, its highly organized and original construction, and its many inherent advantages, merits a more extended notice than has been given to the systems already mentioned. In 1837 Isaac Pitman, then teacher of a British school at Wotton- under-Edge and an excellent writer of Taylor's system, composed at the invitation of Samuel Bagster a short stenographic treatise of his own, which Bagster published under the title of Stenographic Sound-Hand, The price was fixed at fourpence, for the author had determined to place shorthand within the reach of everybody. He had won the friendship of the Bible publisher by volun- tarily verifying the half a million references in the Com- prehensive Buble, and Mr Bagster for nine years published Mr Pitman's shorthand books. In 1840 a second edition appeared in the form of a penny plate bearing the title Phonography, the principal feature of the system being that it was constructed on a purely phonetic basis. The name of Bagster helped the enterprise, and the author was indefatigable in spreading the knowledge of his system by lectures and gratuitous teaching through the penny post, then just established. In December 1841 the first number of what is now known as the Phonetic Journal appeared at Manchester in a lithographed form. It was then called the Phonographic Journal, and subsequently in turn the Phonotypic Journal, the Phonetic News, and the Phonetic Journal. The chief instruction books issued by the author at the present time from his press at the Phonetic*~~

~~*Institute, Bath, are the Phonographic Teacher, a little sixpenny book for beginners, of which 1,030,000 copies have been published ; the Manual of Phonography (470th thousand), in which the art is sufficiently developed for the purpose of correspondence, private memoranda, and easy reporting ; and the Phonographic Reporter (133d thousand). The weekly circulation of the Phonetic Journal is about 20,000 copies. A part of it is printed in the*~~

~~*1 For early English systems, see especially some careful papers by Mr A. Paterson in Phonetic Journal (1886).*~~

~~*phonographic character from movable types. The system has been warmly taken up in America, where it has been republished in more or less altered forms, especially by the author's brother Benn Pitman, and by Messrs A. J. Graham, J. E. Munson, E. Longley, and Eliza B. Burns. A large number of periodicals lithographed in phonography are published in England and America. The Shorthand Magazne, monthly, has existed since 1864. Of standard English books printed or lithographed in phonography may be mentioned, besides the Bible, New Testament, and Prayer Book, The Pilgrim's Progress, The Vicar of Wakefield, Pickwick Papers, Tom Brown's School-Days, Macaulay's Hssays and Biographies, Gulliver's Travels, Blackie's Self-culture, Bacon's Essays, and a long list of tales and selections. Numerous societies have been formed in all English-speaking countries for the dissemination of phonography. The largest is the Phonetic Society with 3350 members, who have all certificates of a knowledge of the art and engage to teach through the post gratuitously. Most important towns in the United Kingdom have a phonographic association. London has three. Phono- graphy has been adapted to several foreign languages, but not so successfully as Gabelsberger's German system. Mr T. A. Reed's French Phonography (1882) is intended only for English phonographers who wish to report French speeches. Other adaptations to French are by A. J. Lawson and J. R. Bruce. A society for the adaptation of phonography to Italian was organized at Rome in 1883 by G. Francini, who has published his results (Rome, 1883, 1886). Phonography adapted to Spanish by Parody (Buenos*~~

~~Ayres, 1864) is practised by half the steno- graphers employed in the senate and chamber at Buenos Ayres. It has been adapted to Welsh by R. H. Morgan (Wrexham, 1876), and to German by ©. L. Driesslein (Chicago, 1884). Phonography is steadily driving all other English systems out of the field. MrT. A. Reed stated in the Phonetic Journal, 1883, p. 62, that of the 61 writers employed by the Times, Standard, Telegraph, Morning Post, and the Press Association 31 were using phonography, 18 Taylor's, 5 Gurney's (7.e., Mason's), 4 Lewis's, and 3 other systems; of the 67 members composing the Institute of Shorthand Writers, chiefly practitioners in the law courts, 26 were using phonography, 29 Taylor's, 7 Gurney's Oe Mason's), 3 Mavor's, and 2 Lewis's ; while of the 80 mem- bers of the London Shorthand Writers' Association, chiefly employed in business offices, at least five-sixths were phono- graphers. According to a recent (1882) history of short- hand, of 291 professional stenographers in London 134 used phonography, 89 Taylor's, 35 Gurney's, 8 Lewis's, 8 Mavor's, and 17 other systems (Byrom's, Graham's, Moat's, c&e.).~~

~~The main features of Pitman's system must now be described. Pitman's The alphabet of consonant-sounds is—p, b; t, d; ch (asin chip), system.~~

~~J3 %, g (as in gay); f, v; th (as in thing), dh (as in them); s,23 sh, zh (as in vision); m, n, ng (as in thing); 1, r; w, y,h. The sounds Dp, t, ch, k arc represented respectively by the four straight strokes~~

~~— ; and the corresponding voiced sounds 8, d, j, g by exactly the same signs respectively written heavy. F, th (as in thing), 8,~~

~~sh are indicated by \ee a respectively ; the same signs written heavy and tapering to the ends are used for v, dh, z, zh respect-~~

~~ively. M,n,1,r are denoted by ~W i "\ respectively. JZ is also represented by — written upwards and in a more slanting direction than the sign for ch. The signs for sh and J may be written up or down when in combination, but standing alone sh is written~~

~~downwards and Z upwards. The signs for w, y, h are"~~

~~*all written upwards. A has also / down. Ng, mp (or mb), rch (or rj), lr, are represented by the signs for x, m, 7, Z respectively written heavy. Signs are provided for the Scotch guttural ch (as in loch), the Welsh 7, and the French nasal n. Sis generally written by a small circle. The long-vowel sounds are thus classified—a (as in balm), é (as in bait), ee (as in feet), aw (as in law), 6 (as in coal), 66 (as in boot). The vowels d, @, e¢ are marked by a heavy dot placed respectively at the beginning, middle, and end of a consonant-*~~

~~*vio RTH # WD*~~

~~*sign ; aw, 6, 06 by a heavy dash in the same three positions, and generally struck at right angles to the direction of the consonant. The short vowels are d (as in pat), & (as in pet), t (as in pit), 3 (as in pot), @ (as in but), and 8 (asin put). The signs for these are the same as for the corresponding long vowels just enumerated, except that they are written light. Signs similarly placed are provided for the diphthongs o7 (as in boil), 6& or 6é, Ot (asin Boan- erges, poet, coincide), for the series yd, yé, yee, &e, , and for the series wa, wé, wee, &c. The signs for ez (as in bite) and ow (as in cow) are A,and may be placed in any position with respect toa consonant. A straight linc may receive four hooks, one at each side of the beginning and end, but a curve only two, one at each end in the direction of the curve. Hooks applied to a straight line indicate the addition of 7, J, n, and forv respectively, thus— \ or, . pl,\s pf or pr, and \ pn; ——— kr, _ kl, —5 kf, —> kn; 7 wf or rv, —? rn. Hooks applied to a curve denote the addition of r, n respectively, thus—(_ ee Jn; o˜ mr, —> mn. Vowel signs placed after (or, in the case of horizontal strokes, under) a consonant having the n or f, v hook are read between the consonant and the » or f; thus 7 cough, Sun, but *T™ crow, N pray. A large hook at the commencement of a curve signifies the addi- tion of J, as = jl. The hooks combine easily with the circle sh*~~

~~*ao Sp, eS spr (where the hook r is implied or included in the*~~

~~*circle), X spl, & pus (the hook n being included), \o pfs, &e. The halving principle is one of the happiest devices in the whole history*~~

~~*of shorthand. The halving of a light stroke—that is, writing it*~~

~~*half length—implies the addition ofz ; the halving of a heavy stroke that of d, the vowel placed after (or under) the halved stroke being*~~

~~*read between the consonant and the added ¢ or d, thus—*~~

~~*saw, ~ sought, |, Dee, |, deed, \ pit, ~ cat, © Sat, S note, &c.*~~

~~*t, and that of a light stroke d, thus— \° beautify.*~~

~~*the hook, the circle, and the halving principle, two or three together, exceedingly brief signs are obtained for a number of con- sonantal series consisting of the combination of a consonant with*~~

~~*one or more of the sounds s, r, J, 2, 7, ¢, ie Sp, \ spr, a sprt, \o sprts ; x pl, LR spl, R split, S spint, 8 splnts ; << Wt, \s Sus,*~~

~~*fut, eo fnts ; SS Srn, & frnd, &. As a vowel-mark cannot conveniently be placed to a hook or circle, we are easily led toa*~~

~~*way of distinguishing in outline between such words as i cough*~~

~~*and 7 . coffee, \ pen and\c. penny, race and “) racy,*~~

~~*&e. unvocalized outline.*~~

~~*combines with the circle s, as in circle s made large indicates ss or sz, as in \d pieces, A ¥ losses.*~~

~~*The vowel between s and s (z) may be marked inside the circle, as*~~

~~*in > excreise, AP subsistence The circle s lengthened toa loop*~~

~~*signifies st, as in \ step, % post, while a longer loop indicates str, as*~~

~~*in -> muster, ~3 minster, The loop may be continued through the consonantal stroke and terminate in a circle to denote sts and*~~

~~*strs, as in %& boasts, —~s minsters. The loop written on the left or lower side of a straight stroke implies the n hook and so signifies*~~

~~*nst, as in => against, 0 danced. A curve (or a straight stroke with a final hook) written double length implies the addition of tr,*~~

~~*ar, or thr, as in <- Jather, (" letter, Y kinder, ae Sender,*~~

~~*ee render, This practice is quite safe in the case of curves, but a straight stroke should not be lengthened in this way when there is danger of reading it as a double letter. The lineal eonsonant- signs may stand alone to represent certain short and eommon words as in many of the old a, b, ¢ systems, with this difference, that in the old systems each letter represents several words, but in phonography, in almost every case, only one. By writing the horizontal strokes in two positions with respect to the line (above and on) and the others in three positions (entirely above, resting on, and passing through the line) the number is nearly trebled, and very brief signs are obtained for some seventy or eighty common short words (e.g., be, by, zn, Yf, at, it, my, me, &e.). A few very common monosyllables are represented by their vowel-marks, as*~~

~~*<] — the (remnant of (), : of (remnant of X=: on (remnant of —).*~~

~~*By this means very brief signs are provided for hosts of syllables ending in ¢ and d, and for a number of verbal forms ending in ed, thus— "1 ended. The halving of a heavy stroke may, if necessary, add By combining*~~

~~*This distinction limits the number of possible readings of an A large hook at the end of a stroke indicates the addition of -shon (as in fashion, aetion, &c.). This hook easily*~~

~~*actions, \: positions. The*~~

~~*839*~~

~~*A certain number of longer words which occur frequently are contracted, generally by omitting the latter part, sometimes a*~~

~~*middle part of the word, as in ~\ (Asp) expect, y (djr) danger, (krk sk) characteristic, (nd f t) indefatigable. The con-*~~

~~nective phrase of the is intimated by writing the words between which it occurs near to each other. © The is often expressed by a short slanting stroke or tick Joined to the preceding word and generally struck downwards, thus in the, od Sor the.~~

~~Three principles which remain to be noticed are of such imnport- ance and advantage that any one of them would go far to place phonography at the head of all other systems. These are the principles of positional writing, similar outlines, and phraseography. (1) The first slanting stroke of a word ean generally be written so as either to lie entirely above the line, or rest on the line, or run~~

~~through the line, thus—. Se. Be eS In the case of~~

~~words composed wholly of horizontal strokes the last two positions~~

~~(on and through the line) coincide, as ~·· _. ~=These three positions are ealled first, second, and third respectively. The first is specially connected with first-place vowels (4, &; aw, 8 305 O00) the second with second-place vowels (2, é; 6, %), and the third with third-place vowels (ce, ¢; 00, 06; ou). In a fully vocalized style position is not employed, but in the reporting style it is of the greatest use. Thus the outline (¢m) written above the line~~

~~(5 must be read either time or Tom; when written resting on the line (= tome or tame; when struck through the line Cie) teem,~~

~~team, or tomb. By this method the number of possible readings of an unvocalized outline is greatly reduced. That word in each posi- tional group which occurs the most frequently need not be vocalized, but the others should. In the case of dissyllables it is the accented vowel which deeides the position ; thus methought should be written~~

~~first position (2.), méthod second position(~·-t) . (2) Another way~~

~~of distinguishing between words having the same consonants but different vowels is to vary the outline. The possibility of variety of outline arises from the fact that many consonant-sounds have duplicate or even triplicate signs, as we have seen. For instance, r has two lineal signs and~~

~~*a hook sign, and so each of the words carter, curator, creature, and creator obtains a distinct outline. A few simple rules direct the student to a proper choice of outline, but some difference of practice obtains among phonographers in this respect. Lists of outlines for words having the same con- sonants are given in the instruction books; the Reporter's Assistant contains the outline of every word written with not more than three strokes, and the Phonographic Dictionary gives the vocalized out- line of every word in the language. Aided by a true phonetie representation of sounds, by oecasional vocalization, variety of outline, and the context, the phonographie verbatim reporter should never misread a word.! (3) Lastly, phraseography. It has been found that in numberless cases two or more words may be written without lifting the pen. A judicious use of this praetice promotes legibility, and the saving of time is very considerable. Words written thus should be closely connected in sense and awk-*~~

~~*ward joinings avoided. Such phrases are Iam, \ T have,*~~

~~*a YOU are, n~· YOu may, l it would, I" it would not, eae we are,*~~

~~*we have never been,*~~

~~*A we have, "CL we have not, a" my dear friends,*~~

~~*possible,*~~

~~*in a very short time, as far as*~~

~~*for the most part, and many thousands of others.*~~

~~*For the sake of obtaining a good phraseogram for a common phrase, it is often advisable to omit some part of the consonant outline. Thus the phrase you must recollect that may very well be written*~~

~~*(you mus reeollec that). Lists of reeommended phraseo- grams are given in the Phonographic Phrase Book, the Legal Phrase Book, and the Railway Phrase Book.*~~

~~1 Phonography is so legible that the experiment of handing the shorthand notes to phonographic compositors has often been tried with complete success. A speech of Richard Cobden, on the Corn Laws, delivered at Bath on 17th September 1845, and occupying an hour and a quarter, was reported almost verbatim, and the notes, witha few vowels filled in, handed to the compositors of the Bath Journal, who set them up with the usual accuracy.~~

~~Specimens of Phonography. Corresponding Style.~~

- ~~. Se ee~~

~~co e774 RO Ne W‘1. ox Neve, NT See AON Pl Ree O° Se ON Ge gt VR RMT Pe ee hs Se Ne ee, ee age) kg re i 4 a a of” ie Se MOS ee aS~~

~~Key.—If all the feelings of a patriot glow in our bosoms ona perusal of those eloquent speeches which are delivered in the senate, or in those public assem- blies where the people are frequently convened to exercise the birthright of Britons—we owe it to shorthand. If new fervour be added to our devotion, and an additional stimulus be imparted to our exertions as Christians, by the eloquent appeals and encouraging statements made at the anniversaries of our various religious societies—we owe it toshorthand. Ifwe have an opportunity in interesting judicial cases, of examining the evidence, and learning the pro- ccedings with as much certainty, and nearly as much minuteness, as if we had been present on the occasion—we owe it to shorthand.~~

~~Reporting Style. 7 me \ é lo ome) ~w Q Zz pe i . TSS wv 1 ee Sar ee ot ~ ba | Lap “17s q; _ on Ss (* sf if eS ma aCe Se ar So ee 2 OS ae Qe NX ONE a. 2 Ne Cea s ¢ 28 ok 7 aes es Nona) al a oe Key (the phraseograms being indicated by hyphens).—CHaRAcTERISTICS OF THE AGE.—The peculiar and distinguishing characteristics of the present age are in every respect remarkable. Unquestionably an extraordinary and uni- versal change has commenced in the internal as well as the external world—in the mind of man as well as in the habits of society, the one indeed being the necessary consequence of the other. A rational consideration of~~

~~*the circum- stances in which mankind are at present placed must show us that influences of the most important and wonderful character have been and are operating in such a manner as to bring about if not a reformation, a thorough revolution in the organization of society. Never in the history of the world have benevolent and philanthropic institutions for the relief of domestic and public affliction ; Societies for the promotion of manufacturing, commercial, and agricultural interests; associations for the instruction of the masses, the advancement of literature and science, the development of true political principles, for the extension in short of every description of knowledge and the bringing about*~~

~~*of every kind of reform,—been so numerous, so efficient, and so indefatigable in their operation as at the present day.*~~

~~*Systems Of the numerous systems published since the invention subse- of phonography the principal are A. M. Bell's Steno- eat phonography (Edinburgh, 1852), Professor J. D. Everett's (London, 1877), Pocknell's Legible Shorthand (London, 1881), and J. M. Sloan's adaptation of the French system of Duployé (1882). Of these Professor Everett's must be pronounced much the best. The author claims to have adhered to the phonetic principle more strictly than Mr Pitman. Thus he distinguishes the o in home, comb, from that in so, and treats wr, er asa diphthong. The alphabet is very like Mr Pitman's in construction, light and heavy sounds being represented by light and heavy strokes. The chief feature of the system is that all vowels are marked in. This is done by joined signs, by lengthening the preceding consonant, by separating the preceding from the following consonant, by lifting the pen and writing the one consonant attached to the other, and by intersec- tion. Mr Pocknell, in his somewhat bewildering system,*~~

~~*seeks (like Mr Melville Bell) to provide a method of indi- cating whether a consonant is preceded or followed by a vowel or vowels. To this end he gives to each consonant three linear signs (two curves and a straight line), the requisite number of signs being made up by using three lengths of stroke. The selection of the right sign is deter- mined by the length and class of the words represented. Much energy is devoted to indicate where*~~

~~*a vowel stands, but not to what it is. The vowels, when expressed, are disjoined, as in phonography and most systems. Though Mr Bell's too elaborate classification of vowels is adopted, the phonetic method of representing consonants is fre- quently discarded in favour of the alphabetic. Thus, no sign is provided for zh (as in vision), and the barbarous gh (as in bright) is often retained "for the sake of legi- bility." Mr Pocknell goes back to the antiquated device of pictorial and arbitrary signs. The Sloan-Duployan system has been vigorously propagated ; but it does not provide alphabetic characters for all the vowels and con- sonants in the language, contents itself with representing not actual but "approximate" sounds, does not always indicate the order in which the characters should be read, recommends the frequent omission of consonants and syllables at the "discretion" of the student, avoids angles, and introduces three slopes, instead of one, between the perpendicular and the horizontal, and therefore is not likely to meet with general acceptance.*~~

~~*A considerable number of American systems, as well ag American systems based on Taylor's and Gurney's, were issued dur- systems.*~~

~~*ing the early days of the republic. Since the introduction of phonography into the States in 1845, the dissemination of the art has gone steadily forward, and its use since 1880 has been greatly on the increase, shorthand being now taught in a large number of schools. From elaborate statistics given in Mr Rockwell's Circular of Information it appears that during 1882 10,197 persons received in- struction in schools and classes and 2273 by correspond- ence. But these figures probably bear no proportion to the number of persons studying without a teacher. In almost every case phonography, or a modification of it, was selected for instruction. American shorthand societies are very numerous, most of them having been formed since 1880. Two are devoted to the Stolzean system. Of the fourteen shorthand magazines which Mr Rockwell enumerates eleven are phonographic.*~~

~~*In nine cases out of ten phonography will be found admirably adapted to the purposes of verbatim reporting. But to be legible it must be written with care. This necessity arises from its brevity and its use of light and*~~

~~heavy, halved and double-length strokes. Hence a clumsy scribe may find a longer system, such as Gurney's, answer his purpose better. A theoretical knowledge of most systems may be gained in a few hours. Pitman's method is not so easily acquired, but an intelligent person can master its details in a few weeks. Shorthand writing is, however, mainly a matter of practice. Few can make any considerable use of it with less than six months' assiduous practice. The average rate of public speaking is very slightly over 120 words a minute. Some speakers average 150. The slowest utterance is now and then exchanged for a rapid flow of words, and 180 or 200 words a minute is no uncommon speed in certain styles of speech such as the conversational,—a speed which many persons would never acquire. Most persons of average intelligence may~~

~~1 Phenomenal rates of speed are recorded in the Phonetic Journal for 1885, p. 338. MrT. A. Reed, the veteran phonographer, had been engaged to report a well-known American divine preaching at West- minster Abbey. The sermon was carefully timed, and the words in the printed report counted. The average came out at 213 wordsa minute. A photographed specimen page of Mr Reed's notes on this occasion is given in the Reporters' Magazine, September 1885.~~

~~Parlia- mentary report- ing.~~

~~Foreign systems.~~

~~= 2 OR tf F Aw Dp 841~~

~~by perseverance write with certainty at 150 words a minute. The best method of practice in the early period is to write at dictation from a book 3 in public speaking the frequent pauses help the writer to regain lost time. The student should write on ruled paper, which checks the tendency to a large sprawling hand when following a rapid speaker. Taylor's, Gurney's, and Lewis's systems can be written without lines, but Pitman's only at a dis- advantage. Ink is preferable to pencil.~~

~~Shorthand was first employed officially in the service of Parliament in 1802, when a resolution was passed that "the evidence given before all committees inquiring into the election of members should or might be~~

~~*reported by a person well skilled in the art of writing shorthand," and shortly afterwards W. B. Gurney was appointed shorthand- writer in this capacity to both Houses of Parliament. In 1813 a further resolution was passed by both Houses that the official writer "should attend by himself or sufficient deputy when called upon to take minutes of evidence at the bar of this House or in committees of the same." The lucrative office of shorthand-writer to both Houses of Par- liament is still held by the Gurney family. Of course most of the work is done by deputy. Some of the most efficient members of Messrs Gurney's staff are phono- graphers ; others use Taylor's system. The amount of evidence given in the course of a tolerably long day's sitting may amount to 400 or 500 folios (72 words make a folio), which would occupy from 12 to 15 columns of the Zimes in small type. The whole must often be tran- scribed and delivered to the printers in the course of the night, and copies, damp from the press, are in the hands of the members and "parties" at the beginning of the sitting on the following day. Since parliament abolished election-committees and committed to judges the duty of inquiring into petitions against the return of a member, an official shorthand writer has to be in attendance upon the judge appointed to hear any particular case. He has often a small staff of assistants, Messrs Gurney or their representatives are also required to attend the sittings of the House of Lords as a court of appeal to take the judg- ments of the law lords. Finally, Government shorthand- writers are often employed in taking notes of important state-trials and inquiries conducted by the various depart- ments of Government, as well as of the proceedings of Royal Commissions, whenever the evidence of witnesses is taken.1 The transcription of the notes may be accomplished in several ways, as by dictating from different parts of the notes to several longhand-writers simultaneously.2 Not all the newspaper parliamentary reporters can take a perfect note, and cases occur in which the reporter enters the gallery without being able to write shorthand at all.*~~

~~*hand Writing into Germany in an adaptation of the Taylor-Bertin method. Reischl's (1808) is a modification of Mosengeil's. On Horstig's (1797) are based those of an anonymous writer (Nurem- berg, 1798), Heim (1820), Thon (1825), an anonymous author*~~

~~*the Mosengeil – Horstig system are based Berthold's 1819) and Stark's (1822). On Danzer's (1800), a close imitation A Tahoe is based that of Ellison vy. Nidlef (1820). Other systems are those of Leichtlen (1819) ; J. Brede (1827); Nowack (1834), a system in which the ellipse is employed as well as the circle ; Billharz (1838) ; Caimmerer (1848), a modification of Selwyn's phonography (1847) ; Schmitt (1850); Fischbiick (1857), a reproduc- tion of Taylor's ; and that of an anonymous author (1872), based on Horstig, Mosengeil, and Heim. Nowack, in his later method of 1834, makes a new departure in avoiding right or obtuse angles,*~~

~~*Redezeichenkunst (Munich, 1834) is the most important of the German systems. The author, an official attached to the Bavarian ministry, commenced his system for private purposes, but was induced to perfect it on account of the summoning of a parliament*~~

~~*taught on this system executed their trial specimens with the required speed, and read what they had written, and even what others had written, with ease and certainty. The method is based.*~~

~~*system composed of simple geometrical strokes forming determi- nate angles with each other was unadapted to rapid writing. He does not recognize all the varieties of sound, and makes some dis- tinctions which are merely orthographical. Soft sounds have small, light, and round signs, while the hard sounds have large, heavy, and straight signs. The signs too are derived from the current alphabet, so that one can find the former contained in the latter. Vowels standing between consonants are not literally inserted, but symbolically indicated by either position or shape of the surrounding consonants, without however leaving the straight writing line. The proceedings of the chambers in Austria, Bavaria, Baden, Wiirtember , Saxony, Saxe- Weimar, Coburg-Gotha, Silesia, and the Rhine provinces are reported solely by writers of this method, and half the stenographers in the German reichstag use it. There are in Germany and Austria more than 540 societies containing over 20,000 members devoted to it. It is officially taught in all the middle class schools of Bavaria, Saxony, and Austria. It has been adapted to foreign languages to such an extent that legislative proceedings are reported by it in Prague, Agram, Pesth, Sophia, Athens, Copenhagen, Christiania,*~~

~~*Stock- holm, and Helsingfors. On Gabelsberger's system is based that of W. Stolze (1840). There are nearly 400 Stolzean associations with over 8000 members. The system is officially used in the Prussian, German, and Hungarian parliaments, in the last two along with Gabelsberger's. Faulmann (Vienna, 1875) attempted in his Phonographie to combine the two methods. 'While Gabelsberger's system has remained unchanged in principle, Stolze's has split into two divisions, the old and the new. These contain many smaller factions, e.g., Velten's (1876) and Adler's (1877). Arends's (1860) is copied from the French system of Fayet. Roller's (1874) and Lehmann's (1875) are offshoots of Arends's. Many other methods have appeared and as rapidly been forgotten. "The schools of Gabelsberger and Stolze can boast of a very extensive shorthand literature. Gabelsberger's system has been adapted to English by A. Geiger (Dresden, 1860 and 1873), who adhered too closely to the German original, and more successfully by H. Richter (London, 1886), and Stolze's by G. Michaelis (Berlin, 1868).*~~

~~*French.—The earliest French system worthy of notice is that of Coulon de Thévenot (1777), in which the vowels are disjoined from the consonants. The methods practised at the present day may be divided into two classes, those derived from Taylor's English system, translated in 1791 by T. P. Bertin, and those invented in France. The latter are (z) Coulon de Thévenot's ; (0) systems founded on the principle of the inclination of the usual writing,—the best known being those of Fayet (1832) and Sénocq (1842); and © systems derived from the method of Conen de Prépéan (5 editions from 1813 to 1833). Prévost, who till 1870 directed the stenographic service of the senate, produced the best modification of Taylor. Many authors have copied and spoilt this system of Prévost. The best known are Plantier (1844) and Tondeur (1849). Zeibig thinks well of A. Delaunay's improvements on Prévost's system. On Conen's are based those of Aimé- Paris (1822), Cadrés-Marmet (1828), Potel (1842), the Duployé brothers (1868), Guénin, &c. Among amateur writers the Duployan method is best known, owing largely to vigorous pushing, but the profession class it among the least effi- cient of all. Of the forty writers in the official service of parliament*~~

~~German.—C. A. Ramsay's Tacheographia (Frankfort, 1679, and several times afterwards until 1748) was an adaptation of T. Shelton's English system. Mosengeil (1797) first practically introduced short-~~

~~1 There is no full official report of the debates in the British Parlia- ment (as in most other countries), and technically no person has a right to report them. The House may be cleared at any moment of all strangers, including representatives of the press, by an order of the House as a whole. On seven occasions of note resolutions have been passed prohibiting the reporting of the proceedings of the House of Commons, the last on 25th March 1771. But times have changed, and members now frequently complain that their speeches are not reported. To supply the deficiencies of the newspapers arrangements have been made by the House with Mr Hansard for the special reporting of debates in committee and those occurring at an early hour in the morning, which are given only in the most summary form in the daily papers. Formerly all Hansard's reports were collected from those appearing in the newspapers. See further Mr 8. Whitaker's Parlia- mentary Reporting in England, Foreign Countries, and the Colonies, with notes on Parkiamentary Privilege (Manchester, 1878).~~

~~2 On the best methods of transcribing and dictating, see Mr T. A. Reed's papers in the Phonetic Journal, 1886, pp. 10, 33, 45.~~

~~twenty-two use Prévost's and those founded on it (all based ulti- mately on Taylor's), while ten employ methods based on Conen's,~~

~~Spanish.—The father of Spanish stenography was Don Francisco de Paula Marti, whose system, first published in 1803, still holds its ground against all rivals. The alphabet is a combination of Taylor's and Coulon's. By decree of 21st November 1802 a public professorship of shorthand was founded in Madrid, Marti being the first professor. Founded on Marti's system are those of Serra y Ginesta (1816) and Xamarillo (1811). Of the~~

~~*thirty-two Spanish systems enumerated by Zeibig many are merely imitations or re- productions of Marti's, and adaptations of Gabelsberger's, Stolze's, and Pitman's systems. That of Garriga y Maril (1863) has attained some popularity in Spain.*~~

~~*Portuguese.—Marti's son carried his father's system to Portugal, where shorthand is still cntirely unknown except in the parliament and the courts. Of the twenty reporters in the senate and chamber at Buenos Ayres ten use Pitman's phonography, six Marti's, and the rest Garriga's. A shorthand society was organized in Buenos Ayres in 1880. The systems used in the Brazilian chambers are those of Silva Velho (1852) and Garriga. The reporters in the assembly of Venezuela use Marti's method.*~~

~~*Jtalian.—Italian translations and adaptations of Taylor's system succeeded one another in considerable numbers from Amanti (1809) to Bianchini (1871). Delpino's (1819) is the best. The Gabelsberger- Noe system (1863) is the only other which has gained many followers. Since 1885 the debates of the senate have been partly reported by the Michela stenographic machine with fair results.*~~

~~*Dutch.—J. Reijner's Dutch method (1673) was an adaptation of Shelton's and Bussuijt's (1814) of Conen's system. Sommerhausen and Bossaert (1829) received prizes from the Government for their productions. The twelve stenographers employed in the parliament use the system of Cornelis Steger (1867), president of the bureau, who translated Taylor's work and has written a history of short- hand. Gabelsberger's system was transferred to Dutch by Rietstap (1869) and Stolze's by Reinbold (1881).*~~

~~*Adaptations of Gabelsberger's method have come into use in the remaining countries of Europe, superseding all others.*~~

~~*Numerous mechanical reporting machines have been invented. The best is by Michela mentioned above. For a description of such machines see Phonetic Journal for 1881, p. 274; 1884, pp. 12, 34, 35; 1885, pp. 52, 268, 278, 291, 447; 1886, p. 22. They take as long to learn asa shorthand system, cannot easily be carried about, are liable to get out of order, and make a noise.*~~

~~*Sources of Information.—J. W. Zeibig's Geschichte u. Literatur der Geschwind- schreibkunst (Dresden, 1878) contains an historical sketch of the use of short- hand in ancient and modern times (especially in Germany), a full bibliography of shorthand literature in all languages, a number of lithographed specimens, and a useful index. Circulars of Information of the Bureau of Education, No. 2, 1884 (Washington, 1885), by J. E. Rockwell, contains a very complete and accurate bibliography of English and American shorthand publications, a chronological list of 483 English and American shorthand authors, notices on shorthand in the United States, on the employment of stenographers in the American courts, on American shorthand societies and magazines, and a beau- tifully engraved sheet of 112 shorthand alphabets. The Phonetic Journal, especially the recent volumes, contains a mass of information on shorthand subjects. Isaac Pitman's History of Shorthand (reprinted in the Phonetic Journal of 1884) reviews the principal English systems previous to phono- graphy, and a few foreign ones, The author draws largely on J. H. Lewis's Historical Account of the Rise and Progress of Stenography (London, 1816), Other histories of shorthand are by F. X. Gabelsberger (prefixed to his Anleitung zur deutschen Redezeichenkunst, Munich, 1834), A. Fossé (prefixed to his Cowrs théorique et pratique de Sténographie, Paris, 1849), Scott de Martinville (Paris, 1849), M. Levy (London, 1862), and T. Anderson (London, 1882). Here too should be mentioned J. Heger's Bemerkenswerthes tiber die Stenographie (Vienna, 1841), mainly historical; J. Anders's Entwurf einer allgemeinen Gesch. u. Lit. cd, Stenographie (Coeslin, 1855); R. Fischer's Die Stenographie nach Geschichte, Wesen, wu. Bedeutung (Leipsic, 1860); Krieg's Katechismus der Stenographie (Leipsic, 1876); Dr Westby-Gibson's Early Shorthand Systems (London, 1882) ; T. Anderson's Shorthand Systems, with a number of specimens (London, 1884); T. A. Reed's Reporter's Guide (London, 1885) and Leaves from the Note- book of T. A. Reed (London, 1885). Mr C. Walford's Statistical Review of the Literature of Shorthand (London, 1885) contains valuable information on the circulation of shorthand books and on shorthand libraries. The largest stenographic library in the world is that of the Royal Stenographic Institute at Dresden. (i. G. N. K.-F.)*~~

~~*SHORTSIGHT. See OPHTHALMOLOGY,*~~

~~*SHOSHONG, a town in the British protectorate of Bechuanaland, the chief settlement of the Eastern Bamang- watos, is situated in a glen at the foot of a range of Primary rocks on the Shoshon, a periodically flowing brook which flows eastwards into the Limpopo or Uri river. It lies about 400 miles north of Kimberley, with which it was connected by road and telegraph under Sir Charles Warren's administration. For white men—traders, hunters, and explorers—it is and must always be a place of primary importance, as three great routes, from Griqualand West, the Orange Free State, and the Transvaal, meet at this point and again branch off north to the Zambesi, north-east to the Matabele and Mashona countries, and north-west to the Western Bamangwato*~~

~~*and Damaraland. Shoshong is thus a main gateway between Southern and Central Africa. The site was ori- ginally chosen as easily defensible against the Matabele. Water is scarce, and the present king, Khama, has taken over a well dug by one of the traders, the use of which he permits on the payment of a water-rate of £1 per month per family. Altogether there are 7000 to 8000 native huts in Shoshong, and the population is estimated at from 15,000 to 30,000. The white inhabitants—mostly English traders—number about 20.*~~

~~*See Mackenzie, Ten Years North of the Orange River, 1871;*~~

~~*Holub, Seven Years in South Africa, 1881; Further Government Correspondence respceting the affairs of the Transvaal, 1886.*~~

~~*SHOVEL, Str CioupEstey (c. 1650-1707), English admiral, was according to some accounts a native of York- shire, but the most commonly accepted statement is that he was born of poor parents about 1650 in Clay, a fishing- village of Norfolk, where he was apprenticed to a shoe- maker. Having run away to sea, he became cabin-boy on board a ship commanded by Sir Christopher Mynns. He set himself to study navigation, and, owing to his able sea- manship and brave and open-hearted disposition, became a general favourite and obtained quick promotion. In 1674 he served as lieutenant under Sir John Narborough in the Mediterranean, where he burned four men-of-war under the castles*~~

~~*and walls of Tripoli, belonging to the pirates of that place. HIe was present as captain of the " Edgar" at the first fight at Bantry Bay, and shortly afterwards was knighted. In 1690 he convoyed William HI. across St George's Channel to Ireland; the same year he was made rear-admiral of the blue, and was present at the battle of Beachy HIead on 10th July. In 1692 he was appointed rear-admiral of the red, and joined Admiral Russell, under whom he greatly distinguished himself at La HIogue, having a principal share in burning twenty of the enemy's men-of- war. Not long after, when Admiral Russell was dismissed from the service, Shovel was put in joint command of the fleet with Admiral Killigrew and Sir Ralph Delaval. In 1702 he was sent to bring home the spoils of the French and Spanish fleets from Vigo, after their capture by Sir George Rooke, and in 1704 he served under Sir George Rooke in the Mediterranean. In January 1705 he was named rear-admiral of England, and shortly afterwards com- mander-in-chief of the British fleets. HIe co-operated in the capture of Barcelona along with the earl of Peterborough in 1705, and made an unsuccessful attempt on Toulon in October 1707. When returning with the fleet to England his ship, the "Association," at eight o'clock at night on the 22d October, struck on the rocks near Scilly, and was seen by those on board the "St George" to go down in three or four minutes' time, not a soul being saved of 800 men that were on board. The body of Sir Cloudesley Shovel was cast*~~

~~*ashore next day, and was buried in Westminster Abbey.*~~

~~*See Life and Glorious Actions of Sir Cloudesley Shovel, 1707 ; Burnet's Own Times ; and various discussions in Notes and Queries, 5th series, vols. x. and xi.*~~

~~*SHOVELER, formerly spelt SHIovELAR, and more an- ciently SHOVELARD, a word by which used to be meant the bird now almost invariably called SpoonBiLt (9.v.), but in the latter half of the 16th century transferred to one hitherto generally, and in these days locally, known as the Spoon-billed Duck—the Anas clypeata of Linnzeus and Spatula or Rhynchaspis clypeata of modern writers, All these names refer to the shape of the bird's bill, which, combined with the remarkably long lamelle (not wholly incomparable with the "'' whalebone" of the toothless*~~

~~Cetaceans) that beset both maxilla and mandible, has been thought sufficient to remove the Species from the Linnean genus Anas. Except for the extraordinary for- mation of this feature, which carries with it a clumsy look, the male Shoveler would pass for one of the most beautiful of this generally beautiful group of birds. As it is, for bright and variegated colouring, there are few of his kindred to whom he is inferior, His golden eye, his dark green head, surmounting a throat of pure white and succeeded by a breast and flanks of rich bay, are conspicuous ; while his deep brown back, white scapulars, lesser wing-coverts (often miscalled shoulders) of a glaucous blue, and glossy green speculum bordered with white present a wonderful contrast of the richest tints, heightened again by his bright orange feet. On the other hand, the female, excepting the blue wing-coverts she has in common with her mate, is habited very like the ordinary Wild-Duck, A. boscas (see vol. vii. p. 505). The Shoveler is not an abundant species, and in Great Britain its distribution is local 3 but its numbers have remarkably increased since the passing of the Wild-Fowl Protection Act in 1876,) so that in certain districts it has regained its old position as an indigenous member of the Fauna. It has not ordinarily a very high northern range, but inhabits the greater part of Europe, Asia, and America, passing southwards, like most of the Anatide towards winter, constantly reaching India, Ceylon, Abyssinia, the Antilles, and Central America, while it is known to have occurred at that season in New Granada, and, according to Gould, in Australia. Generally resembling in its habits the other freshwater Ducks, the Shoveler has one peculiarity that has been rarely, if ever, mentioned, and one that is perhaps correlated with the structure of its bill. It seems to be especially given to feeding on the surface of the water in- mediately above the spot where Diving Ducks (Fuliguline) are employing themselves beneath. On such occasions a**

~~pair of Shovelers may be watched, almost for the hour:~~

~~together, swimming in a circle, about a yard in diameter, their heads turned inwards towards its centre, their bills immersed vertically in the water, and engaged in sifting, by means of the long lamellz before~~

~~*mentioned, the floating matters that are disturbed by their submerged allies and rise to the top. These gyrations are executed with the greatest ease, each Shoveler of the pair merely using the outer leg to impel it on its circular course, and to the observer the prettiest part of the performance is the precision with which each preserves its relative distance from its comrade.*~~

~~*Four other species of the genus Spatula, all possessing the characteristic light blue '*shoulders," have been described :—one, S. platalea, from the southern parts of South America, having the head, neck, and upper back of a pale reddish brown, freckled or closely spotted with dark brown, and a dull bay breast with in- terrupted bars; a second, JS. capensis, from South Africa, much lighter in colour than the female of J. clypeata ; a third and a fourth, S. rhynchotis and S. variegata, from Australia and N ew Zealand respectively,—these last much darker in general coloration, and the males possessing a white crescentic mark between the bill and the eye, very like that which is found in the South- American Blue-winged Teal (Querquedula cyanoptera), but so much resem- bling each other that their specific distinctness has been disputed by good authority. In these last two the sexual difference is well marked by the plumage ; but in the South-American and South- African species it would seem that both male and female have much the same appearance, as is the case with so many species of the restricted genus Anas, though this cannot yet be asserted with certainty. (A. N.)*~~

~~*SHIREVEPORT, a city of the United States, capital of Caddo parish, Louisiana, on the west bank of Red River and near to Sodo Lake, is the eastern terminus of the*~~

~~*rt*~~

~~*? Prior to that year there was perhaps only one district in England wherein the Shoveler could be said to breed regularly, and thereto only a few pairs resorted. In 1885 there must have been a dozen counties in which it nested, and in some of them the pairs breeding might be reckoned by the score.*~~

~~*Texas Pacific Railroad, 327 miles by rail north-west of N ew Orleans, with which it hag regular steamboat com- munication. Situated in the heart of a very fruitful cotton-growing region, it is one of the principal cotton-markets in the south-west of the United States, and is the second commercial city in the State. It exports annually about 125,000 bales of cotton, and carries on a trade likewise in hides, wool, and tallow. It has factories for carriages, cotton gins, cotton-seed oil, soap, ice, sashes and blinds, and spokes and hubs, also foundries, machine- shops, a planing mill, saw-mills, and breweries. The town possesses among public buildings a handsome court-house and a cotton exchange. Red River is spanned by an iron bridge 20 feet wide and 1200 long. Shreveport, which was incorporated in 1839, had a population of 4607 in 1870 and of 8009 in 1880; in 1886 the population was estimated at 15,000. SHREW, a general term applied to the species of the family Soricidex, order Insectivora (see vol. xv. p. 403), but in the British Isles more particularly to the common and to the lesser shrew (Sorex vulgaris, L., and S. pygmexus, Pall.). The common shrew is, in England at least, by far the commoner of the two. It is a small animal about the size of the common mouse, which it somewhat resembles in the shape of its body, tail, and feet. But here the resemblance ends, for, unlike the mouse, it possesses a remarkably long and slender muzzle, with prominent nostrils, which project far beyond the lower lip; the eyes are very small and al- most concealed by the fur; the ears are wide and short, scarcely rising above the long hairs surrounding them, and are provided internally with a pair of deep folds, capable, when laid forward, of closing the entrance ; the tail, which is slightly shorter than the body (without the head), is quad- rangular in shape and clothed more or less densely with moderately long hairs, terminating in a short pencil (in old individuals these hairs become worn away, so that in some specimens the tail is almost quite naked) ; the feet are five-toed, the toes terminating in slender, acutely pointed, non-retractile claws. The dentition is very peculiar and*~~

~~*Common Shrew (Sorex vulgaris, L.).*~~

~~*characteristic : there are in all thirty-two teeth, tipped with deep crimson ; of these twelve only (the number is charac- teristic, with one exception only, of the family) belong to the lower jaw ; of the remaining twenty ten*~~

~~occupy each side of the upper jaw, and of these the first three, as they are implanted in the premaxillary bone, are termed incisors. The first incisor is a large tooth with a long anterior canine- like cusp and a small posterior one ; then follow two small unicuspidate teeth ; these are succeeded by three similar progressively smaller teeth, whereof the first has been called a canine and the other two premolars ; the next tooth, also a premolar, is a large multicuspidate tooth ; and this is followed by three molars, of which the third is small with a triangular crown. In the lower jaw we find on each side anteriorly three teeth corresponding to the seven anterior teeth above, of which the first is almost horizontal in direction, its upper surface being marked by three notches, which~~

~~receive the points of the three upper front teeth with which they come in contact when the jaws are closed ; then follow two small teeth and three molars. The body is clothed with closely set uniformly long fur, very soft and dense, varying in colour from light reddish to dark brown above, rarely speckled over or spotted or even banded with white. The under surface of both the body and the tail is greyish; the basal four-fifths of all the hairs above and beneath are dark bluish grey ; the hairs of the tail are less densely set and coarser. On each side of the body, at a point about one- third of the distance between the elbow and the knee, may be found, especially in the rutting season, a cutaneous gland covered by two rows of coarse inbent hairs. This gland secretes a peculiar fluid, on which the unpleasant cheesy odour of the animal depends, and which is evidently also protective, rendering it secure against the attacks of many predaceous animals.~~

~~The lesser shrew (S. pygmeus) is much less abundant in England and Scotland, but comparatively common in Ireland, where the common shrew has not yet been found. It appears at first sight to be a diminutive variant of that species, which it closely resembles in external form. It was said to differ in having the tail longer than the body (without the head), whereas in the common shrew the body (without the head) is longer than the tail, and in the last unicuspidate upper molar tooth being comparatively larger and more external than in the other species. But the~~

~~*present writer has found these characters so exceedingly liable to variation as to be almost worthless ; he has there- fore discovered reliable points of distinction as follows:— in S. pyymeus the third upper incisor (when the teeth are unworn) is shorter, or at least not longer than the next following tooth, whereas in S. vulgaris it is always longer, and the length of the forearm and hand combined is very constantly 13 m.m. in the former species, while in the latter it is 17 m.m.*~~

~~*The habits of both the common and the lesser shrew correspond. They live generally in the neighbourhood of woods, making their nests under the roots of trees or in any slight depression, occasionally even in the midst of open fields, inhabiting the disused burrows of field-mice. Owing to their very small size, dark colour, rapid move- ments, and chiefly nocturnal habits they easily escape observation. They seek their food, which consists of insects, insect larvae, small worms, and slugs, under dead leaves, fallen trees, and in grassy places. Like the mole, they are very pugnacious, and if two or more are confined together in a limited space they invariably fight fiercely, the fallen becoming the food of the victorious. They also, like the mole, are exceedingly voracious, and soon die if deprived of food ; and it is probably to insufficiency of food in the early dry autumnal season that the well-known im- mense mortality amongst these animals at that time of the year is due. The breeding season extends from the end of April to the beginning of August, and five to seven, more rarely ten, young may be found in their nests; they are naked, blind, and toothless at birth, but soon run about snapping at everything within reach, the anterior pair of incisors in both jaws quickly piercing the gum, followed by the last pair of upper premolars, which at birth form prominent elevations in the gum.*~~

~~*The alpine shrew (S. alpinus, Schinz), restricted to the alpine region of Central Europe, is slightly longer than the common shrew and differs from it conspicuously in its much longer tail, which exceeds the length of the head and body, in the colour of the fur, which is dark on both surfaces, and in the large size of the upper antepenultimate premolar.*~~

~~*The water-shrew (Crossopus fodiens, Pall.), the third and last species inhabiting England, differs from the common shrew in being*~~

~~*considerably larger with a shorter and*~~

~~*SHREW*~~

~~*much broader muzzle, comparatively smaller eyes, and larger feet adapted for swimming,—the sides of the feet and toes being provided with comb-like fringes of stiff hairs. The tail is longer than the body (without the head) and possesses a well-developed swimming fringe of moder- ately long regularly ranged hairs, which extend along the middle of its flat under surface from the end of its basal third to its extremity. The fur of the body is long and very dense, varying much in colour in different individuals, and this has given rise to descriptions of many nominal species; the prevailing shades are dark, almost black, brown above, beneath more or less bright ashy tinged with yellowish ; occasionally, sometimes in the same brood, we find some individuals with the under surface more or less dark coloured. In the number as well as in the shape of the teeth the water-shrew differs from the common shrew: there is a premolar less on each side above; the bases of the teeth are much more prolonged posteriorly ; and their cusps are much less stained brown, so that in old individuals with worn teeth they often appear altogether white. This species resembles the otter in its aquatic habits, swimming and diving with great agility. It frequents rivers and lakes, making its burrows in the overhanging banks, from which when disturbed it escapes into the water. Its food consists of the different species of water-insects and their larve, small crustaceans, and probably the fry of small fishes. It is generally distributed throughout England, is less common in Scotland, but as yet it has not been recorded in Ireland. .*~~

~~*The geographical range of the common shrew is exccedingly wide, extending eastwards through Europe and Asia (north of the HIima- layas) to North America. The lesser shrew extends concomitantly through Europe and Asia to Saghalin Island ; and specimens of the water-shrew have been brought from different parts of Europe and from Asia as far east as the Altai range. In Siberia the common shrew is abundant in the snow-clad wastes about the Olenek river within the arctic circle. Indeed the hardiness of this little animal, as well as of other species of red-toothed shrews, is very remarkable. In Dr C. H. Merriam's Mammals of*~~

~~*the Adirondack Region we find the following note on the habits of a common North American species (Blarina brevicauda) of an allied genus :—" The rigors of our northern winters seem to have no effect in diminish- ing its activity, for it scampers about on the snow during the severest weather, and I have known it to be out when the ther- mometer indicated a temperature of — 20° Fahr. It makes long jour- neys over the snow, burrowing down whenever it comes to an eleva- tion that denotes the presence of a log or stump, and I am inclined © to believe that at this season it must feed largely upon the chry- salides and larve of insects that are always to be found in such places." Other species of red-toothed shrews are restricted chiefly to North America, where they are found in much greater variety than in the Old World, though Crossopus is not represented. Its place is taken by two species of the genus Sorex (S. palustris, Richardson, east of the Rocky Mountains, and S. hydrodromus, Dobson, from Unalaska Island), provided, like the water-shrew, with pedal swim- ming fringes, but with the unfringed tail and dentition of the common shrew,—the first-named being about as large as the water-shrew, while the Unalaska species scarcely exceeds the size of the lesser shrew. Of the American forms S. bendiri, Merriam, is by far the largest known species of the genus. In it, as in many others inhabiting North America, the canine shows a tendency to diminish in size, which is more pronounced in S. richardsoniz, Bachm., and in S. vagrans, Cooper ; in S. hoyi, Baird, it is rudimentary, and in S. crawfordi, Baird, altogether absent. The diminutive S. person- atus, Geoff., widely distributed throughont temperate North America, resembles S. pygmaeus in its small size. Other red-toothed shrews belonging to the allied genus Blarina, distinguished from Sorex by their dentition and by the remarkable shortness of the tail, are very common on and characteristic of the North American eo nent. All the red-toothed shrews (except the aquatic forms) closely resemble one another in habits, and Dr Merriam has made the highly interesting discovery that the common short-tailed North American shrew supplements its insectivorous fare by feeding ou beech-nuts, which will account for the generally very worn state of the teeth in this species. In destroying great numbers of slugs, insects, and insect larve they greatly aid the farmer in the pre- servation of his crops and merit protection. Although their pene- trating odour renders them in a great measure safe*~~

~~*from the attacks of rapacious mammals, they are destroyed in large numbers by noc- turnal birds of prey. (G. E. D.)*~~

~~*SHR—SHR*~~

~~*SHREWSBURY, an old market-town, a municipal and parliamentary borough, and the county and assize town of Shropshire, England, is situated on a slightly elevated peninsula formed by a bend of the Severn, and on various railway lines, 30 miles south of Chester, and 163 north-west of London by the London and North-Western Railway, the distance by the Great Western being 171 miles. The Severn is crossed by three stone bridges,—the English bridge (re-erected 1774), on the east, consisting of seven semicircular arches; the Welsh bridge (re-erected 1795), of five arches, on the west; and the Kingsland bridge (opened in 1882), of iron on the bow and girder principle. The streets are hilly and irregular, but strikingly pictur- esque from their number of antique timber houses, among which may be mentioned that in Butcher Row formerly the town residence of the abbot of Lilleshall, and the old council-house overlooking the Severn, erected in 1502 for the presidents of the council of the Welsh marches. Of the town ramparts built in the reign of Henry III. the principal remains are a small portion on the north side called the Roushill walls, and another portion on the south- west, used as a public walk, on which stands a square embattled tower. The castle built by Roger de Montgomery was dismantled in the reign of James IL. but there still remain the archway of the interior gateway, the walls of the inner court, and two large round towers of the time of Edward I. Roger de Montgomery also founded in 1083 the abbey of St Peter and St Paul, which was of great extent and very richly endowed.. At the dissolution it was destroyed, except part of the nave and the western tower of the church, which have been converted into a parish church, under the name of the church of the Holy Cross, The other churches of special interest are St Mary's, founded in the 10th century, a fine cruciform structure with a tower and spire 222 feet in height, displaying examples of various styles of architecture from Early Norman to Perpendicular,—the base of the tower, the nave, and the doorways being Norman, the transept Early English, and the aisles 15th century, while the interior is specially worthy of notice for its elaborate details, its stained glass, and its ancient*~~

monuments ; St Julian's, originally built before the Conquest, but rebuilt in 17 48, except the tower, the older portion of which is Norman and the upper part 15th century; St Alkmond's, also dating from the 10th century, but rebuilt towards the close of the 18th century, with the exception of the tower and spire; and St Giles's, dating from the time of Henry I., much altered at various periods, but still retaining its ancient nave and chancel. The old church of St Chad, supposed to have occupied the site of a palace of the princes of Powis, was destroyed by the fall of the tower in 1788, and of the ancient building the bishop's chancel alone remains. The new church of St Chad was built on another site in 1792. There are still slight remains of the abbey of Greyfriars founded in 1291, and of the Augus-tine friary founded in 1255. The old buildings completed in 1630 for the free grammar-school of Edward VI., founded in 1551, are now occupied by the county museum and free library, the school having been removed in 1882 to new buildings at Kingsland. Among the principal secular buildings of the town are the fine market-house in the Elizabethan style (completed according to an inscription over the northern arch in 1595), the shire hall (rebuilt in 1837, and again, after a fire, in 1883), the music-hall build- ings (1840), the general market and corn exchange (1869), the working-men's hall (1863), the drapers' hall (an old timbered structure dating from the 16th century), the theatre (1834), and the post-office (1877). The principal benevolent institutions are the county infirmary (1747), Millington's hospital (1734), and the eye, ear, and throat

hospital (1881). A monument to Lord Clive was erected In the market-place in 1860, and a Doric memorial pillar to General Lord Hill in 1816 at the top of the Abbey Foregate. The town racecourse occupies a portion of the 'Soldiers' Piece," where Charles I. addressed his army in 1642. To the south-west of the town is a fine park, 23 acres In extent, known as the Quarry, adorned by a beauti- ful avenue of lime trees, Formerly Shrewsbury was one of the principal marts for Welsh flannel, but this trade has now in great part ceased. Glass-staining, the spinning of flax and linen yarn, iron-founding, brewing, malting, the Preparation of brawn, and the manufacture of the well- known Shrewsbury cakes are now the principal industries, The population of the municipal and

~~*parliamentary borough (area, 3674 acres) in 1871 was 23,406, and in 1881 it was 26,478.*~~

~~*Shrewsbury, anciently called Pengwerne, was founded in the 5th century as a defence against the inroads of the Saxons, and became the seat of the princes of Powis. After its conquest by the Saxons its name was changed to Scrobbesbyrig, altered gradually into Sloppesbury, Shrewsbury, and Salop. ‘ It became one of the princi- pal cities of the Saxon kingdom, and a mint was established there by Athelstan about 925. After the Norman Conquest it was in- cluded in the earldom of Shrewsbury bestowed by William I. on Roger de Montgomery, who erected a strong castle on the site of the ancient Saxon fortress. But in 1067 it was besieged by Owen Gwynedd, prince of Wales, til] relieved by William, who marched specially to its assistance from York. On the rebellion of Robert de Belesme, son of the first earl of Shrewsbury, the castle and town were attacked by Henry I. and surrendered in 1102. During the wars of the next two centuries the town was frequently attacked and plundered by the Welsh, being captured by Llewelyn in 1215, surrendered to the English in 1221, plundered by the earl of Pem- broke in 1223, burnt by Llewelyn ap Jorwerth in January 1234, taken by Simon de Montfort in 1264, and restored to the crown in 1265. In 1267 Henry III. assembled his army there, to threaten the Welsh, but peace was restored without bloodshed, after which he strengthened its fortifieations. Edward I. in 1277 made it the*~~

~~*‘seat of his government, and removed to it the Courts of Exchequer*~~

~~*and King’s Bench. In 1283 he held a parliament there for the trial of David, the last of the royal princes of Wales, who was dragged through the streets of the town and afterwards hanged and quartered. At a parliament held in Shrewsbury in J anuary 1398 Richard II. assumed the title of Earl of Chester. Near the town was fought, 23d July 1408, the battle of Shrewsbury, described in Shakespeare’s Henry IV., when the king defeated the earl of Northumberland with great slaughter, Hotspur, the earl’s son, being among the slain. It became the headquarters of Charles I., 20th September 1642, but was taken by the Parliamentarians in February 1645. The town from the reign of William I. to that of James II. received no less than thirty-two charters, its first governing charter*~~

~~*being obtaincd from Richard I. _It returned two members to parliament from the reign of Edward I. until 1885, when it was allowed only one.*~~

~~*See Phillips, History and Antiquities of Shrewsbury, 1779; Owen and Blake- nay, History of Shrewsbury, 1825; Pidgeon, Memorials of Shrewsbury, 1857.*~~

~~*SHREWSBURY, Earts or. See TArpor.*~~

~~*SHRIKE, a bird's name so given by Turner (1544), but solely on the authority of Sir Francis Lovell, for Turner had seen the bird but twice in England, though in Ger- many often, and could not find any one else who so called it. However, the word! was caught up by succeeding writers; and, though hardly used except in books—for Butcher-bird is its vernacular synonym—it not only retains its first position in literary English, but has been largely extended so as to apply in general to all birds of the Family Lanide and others besides. The name Lanius, in this sense, originated with Gesner ? (1555), who thought that the birds to which he gave it had not been mentioned by the ancients. Sundevall, however, considers that the Malacocraneus of Aristotle was one of them, as indeed Turner had before suggested, though repelling the latter's*~~

~~*1 Few birds enjoy such a wealth of local names as the Shrikes. M. Rolland (Faune Pop. de la France, ii. pp. 146-151) enumerates up- wards of ninety applied to them in France and Savoy; but not one of these has any affinity to our word " Shrike."*~~

~~*2 He does not seem, however, to have known that Butcher-bird was an English name ; indeed it may not have been so at the time, but subsequently introduced.*~~

~~*supposition that Aristotle's Zyrannus was another, as well as Belon's reference of Collyrion.*~~

~~*The species designated Shrike by Turner is the Lanius excubitor of Linnzus and nearly all succeeding authors, nowadays! commonly known*~~

~~*as the Greater Butcher-bird, Ash-coloured or Great Grey Shrike,—a bird which visits the British Islands pretty regularly, though not numerously, in autumn or winter, occasionally prolong- ing its stay into the next summer; but it has never been ascertained to breed there, though often asserted to have done so. This is the more remarkable since it breeds more or less commonly on the Conti- nent from the north of France to within the Arctic Circle. Exceeding a Song-Thrush in linear measurements, it isa much less bulky bird, of a pearly grey above with a well-defined black band passing from the forehead to the ear-coverts ; beneath it is nearly white, or—and this is particularly observable in Eastern examples—barred with dusky. The quill-feathers of the wings, and of the elongated tail, are variegated with black and white, but are mostly of the former, though what there is of the latter shows very conspicuously, especially at the base of the remiges, where it forms either a single or a double patch.? _ Much smaller than this is the Red-backed Shrike, Z. collwrio, the best-known species in Great Britain, where it is a summer visitor, and, though its distribution is rather local, it may be seen in many parts of England and occasionally reaches Scotland. The cock is a sightly bird with his grey head and neck, black cheek-band, chestnut back, and pale red breast, while the hen is ordinarily of a dull brown, barred on the lower plumage. A more highly coloured specics is called the Woodchat, LZ. auriculatus or rutilus, with a bright bay crown and nape, and the rest of its plum- age black, grey, and white. This is an accidental visitor to England, but breeds commonly throughout Europe. All these birds, with many others included in the genus Lanius, which there is no room here to specify, have, according to their respective power, the very remarkable habit (whence they have earned their opprobrious name) of catching insects, frogs, lizards, or small birds and mammals, and of spitting them on a thorn or of fixing them in a forked branch, the more conveniently to tear them in pieces and eat them.*~~

~~*The limits of the Family Zaniide have been very variously regarded, and agreement between almost any two systematists on this point seems at present out of the question. The latest synopsis is that by Dr Gadow (Cat. B. Brit. Museum, viii. pp. 88-321), who frankly states that it is "quite impossible to give a concise diagnosis of what we are to understand by" the Family. For his purpose he makes it to include about 250 species and*~~

~~*divides it into five sub-families :—Gymnorhinine, Mala- conotine, Pachycephaline, Laniine, and Vireonine. Of these doubts may be entertained as to the affinity of the first and especially of the last. He, but for the crude plan to which he was compelled to conform, would not have separated Strepera from Gymnorhina ; but the former had*~~

~~*? According to Willughby, Rae, and Charleton, it was in their day called in many parts of England "Wierangle" (Germ. Wiirgengel and Wirger, the Strangler); but it is hard to see how a bird which few people in England could know by sight should have a popular name, though Chaucer had used it in his Assemblye of Foules.*~~

~~*? On this character great store has been laid by some recent writers, who maintain that the birds presenting only a single patch, with some other minor distinctions, as the barred breast above mentioned, come from the far East and deserve specific recognition as the Lanius major of Pallas. But it is admitted that every intermediate form occurs, and Prof. Collett has now shown (Jbis, 1886, pp. 30-40) that the typical L. excubitor and typical LZ. major may be found in one and the same brood, and also that this occasional divergence is due neither to age nor sex. That it does depend to some extent on locality is allowed ; for, though examples with the single patch (¢.¢., Z. major) otcasionally reach Great Britain, it is asserted that nearly all the specimens from Eastern Siberia are so marked. But it is also found that by almost insensible degrees other (and sometimes more important) distinctions are mani- fested, and the extreme terms of the several series have been exalted to the rank of "species"—or at least local races. Thesc are too many to be here enumerated, but it may be mentioned that the Great Grey Shrike of North America, which ordinarily has the lower plumage strongly barred, and is usually known as L. borealis, seems to be only one of these divergent forms, though perhaps the most divergent, as might be expected from the wholly distinct area it occupies. Yet occasionally examples occur in the Old World, which there is no reason to suppose have an American origin, indistinguishable from the typical L. borealis, and an unintcrrupted series from one extreme to the other can be found, The differences when compared with those observable in other animals are, as a whole, too slight to justify the*~~

~~*epithet "poly- morphic" to LZ. excubitor as a species; but enough has been said to show that it indicates a tendency in that direction.*~~

~~*SH R—SHR*~~

~~*been already included, to the exclusion of the latter, among the Corvidz, and even placed among the normal Corvine. The need of exercising reserve on this matter has been before stated (Crow, vol. vi. p.617); but the number of ornitho- logists who think that these two genera should be placed in different Families must be small. The view taken by Prof. Parker seems to be the most reasonable: these genera—with others doubtless and most of them Australian—are morpho- logically inferior to the Corvide, and perhaps deserve some such designation as that of "' Voto-Coracomorphe" suggested by him (Z'rans. Zool. Society, ix. p. 327). At the same time. their relationship to the Landidx appears to be evident, and they may perhaps be best regarded as the less-altered descendants of an old type, whence both the true Crows and the true Shrikes have sprung, each to develop into higher morphological rank, and by the way to throw out numerous other branches. As to the Vireos it would seem almost certain that they have little or no connexion with the Laniide. (A. N.) SHRIMP, the name applied to two species of Crus- taceans commonly used as food in Great Britain. One kind after boiling is brown in colour, the other bright red. The brown kind belongs to the species Crangon vulgaris, the red to the species Pandalus annulicornis. Both these species belong to the sub-order Decapoda, and to that division of it which is distinguished by a well- developed abdomen or tail, and called Macroura. The Crustaceans placed in this division have five pairs of limbs adapted for crawling on the sea-bottom ; usually the an- terior one or more pairs of these five are chelate or pincer- formed. In front of the ambulatory limbs are six pairs of limbs whose function is to assist in the conveyance of food to the mouth, three pairs of maxillipeds, two pairs. of maxille, and a pair of mandibles. In front of these, again, are two pairs of antenne and a pair of eyes. The latter are held by some naturalists to represent a pair of limbs, but evidence exists which is in opposition to this. view. Behind the ambulatory limbs are six segments of the body, each bearing a pair of limbs adapted for swim- ming. The sixth pair of these abdominal limbs are larger than the rest and expanded, extending backwards in the same*~~

~~*plane as the flattened terminal segment of the body or telson, and the three together form a powerful organ of locomotion by which a rapid backward movement of the whole body in the water is produced. The genus Crangon is the type of a family, the Crangonide. The most conspicuous characteristic of the genus is the shape of the first pair of ambulatory limbs. These differ less from the rest than is usually the case, and the terminal pincer apparatus is but slightly developed. The terminal joint is small, and the projection of the second joint against which it acts is still smaller, so that the cutting edges of the pincer are transverse to the rest of the limb. The second pair of limbs have also a terminal pincer apparatus, and both the second and the third are slender. The fourth and fifth pairs are short and thick. The rostrum, the median projection of the anterior part of the carapace, is rudimentary. The line joining the attachments of the two pairs of antenne are transverse to the axis of the body. The abdomen is large. There are seven branchiz on each side. The specific characters of C. vulgaris, Fabr., are the smoothness of the dorsal surface, the carapace presenting only three small spincs, one mnedian in the gastric region and one on each side on the branchi- ostegite. The second pair of ainbulatory limbs are nearly as long as the third. The size of the adult animal is about 24 inches. The species is abundant on sandy shores at nearly all parts of the British and Irish coasts, and is captured by nets which have a semicircular mouth, and are attached to a pole wielded by a fisherman wading in the water at ebb-tide. The common shrimp is an exception to the general rule that the cuticle of Crustaceans is either red in the*~~

~~*living animal or becomes so on boiling. The cuticle of C. vulgaris in the living state is light brown or almost white, and the animal*~~

~~*Plate VIII,*~~

~~*SHR—SHR*~~

~~*The colour closely approximates to that of the sand on which the animal is found. After boiling the cuticle Several other species of Crangon are known on the British shores, but none of them are as*~~

~~*is somewhat translucent. assumes its well-known brown colour.*~~

~~*abundant as C. vulgaris, and they are not captured as food. C.*~~

~~*vulgaris is common on the east coast of North America from North Carolina to Labrador; in the neighbourhood of New York it is used as food. The species also occurs on the west coast of America from San Diego to Alaska, and is commonly eaten at San Francisco,*~~

~~*as also is another species, Crangon Sranciscorum, Stimpson.*~~

~~*The genus Pandalus, first defined by Leach in his Malacologia Britannica, is chiefly distinguished by the great length of the second*~~

~~*pair of antenne, which are longer than the whole body, the presence of a long spiny rostrum curved upwards, the total absence of pincers on the first pair of ambulatory limbs, and the great length of the second of these limbs on the left side. rest. 'The second pair are provided with a very small pincer ap- paratus. The third somite of the abdomen is large and projects upwards, so that the body has a hump-backed appearance. The serrated upper edge of the rostrum extends backwards along the median line of the carapace, half way to its posterior border. The specific characters of the species Annulicornis are that the rostrum js equal in length to the carapace, and that its anterior half is destitute of teeth above, with the exception of one small tooth near the apex. This species is not so abundant as C. vulgaris and is an inhabit- ant of deeper water. It is taken usually for the market on the east and south coasts of Britain, but is widely distributed, occurring in Scotland, Ireland, Shetland, and Iceland. In colour it is when alive of a reddish grey with spots of deeper red ; when boiled it is of a uniform deep red. This species is sometimes con-*~~

~~*founded with the common prawn ; but it never reaches the size of*~~

~~*the prawn, its adult length being 2 to 24 inches. P. annulicornis is the only species of the genus occurring in Great Britain. The common prawn when adult is above 4 inches in length. It belongs to the species Palemon serratus. antenn are long, asin Pandalus, but the first pair are much larger in the former than in the latter. In Palemon both of the first two pairs of ambulatory limbs are didactyle or pincer-formed ; the second pair are stronger than the first, and the left not longer than the right. Some of*~~

~~*the smaller species of Palemon are used as food and sometimes called shrimps. At Poole in Dorsetshire, according to Prof. Bell's British Crustacea, Palemon squilla, Fabr., P. varians, Leach, and P. leachii, Bell, are all taken, and sold as cup-shrimps.*~~

~~*SHROPSHIRE, or Satop, an inland county of England, on the borders of Wales, lies between 52° 20' and 53° 4' N. lat. and 2° 17' and 3° 14' W. long., and is bounded N. by Cheshire and an interpolated portion of Flint, E. by Stafford, S.E. by Worcester, 8. by Hereford, 8.W. by Radnor, W. by Montgomery, and N.W. by Denbigh. The total area in 1880 was 844,565 acres, or about 1319 square miles,*~~

~~*Towards the west Shropshire partakes of the hilly scenery of the neighbouring Wales, from which several ranges are continued into it. South of the Severn on the borders of Montgomery the Breidden Hills of Lower Silurian formation rise abruptly in three peaks, of which Cefn-y-Castell, about 1300 feet high, is in Shropshire; and in the south-west there is a broad range of rough rounded hills known as Clun Forest, extending from Radnor. South and west of the Severn there are four other principal chains of hills extending from south-west to north-east—the Long Mynd (1674 feet), to the west of Church Stretton, of Cam- brian formation ; the Caradoc Hills, a little to the north, which cross the Severn, terminating in the isolated sugar- loaf peak of the Wrekin (1320 feet); the Wenlock Edge, to the east of Church Stretton, a sharp ridge extend- ing for 20 miles, and in some places rising above 1000 feet; and the Clee Hills, near the south-eastern border (Brown Clee Hill, 1805 feet ; Titterstone Clee Hill, 1750 feet). The remainder of the county is for the most part pleasantly undulating, finely cultivated, and watered by numerous rivulets and streams. It may be said to lie in the basin of the Severn, which enters the county near its centre from Montgomery, and flows eastwards to Shrews- bury, after which it turns south-eastwards to Tronbridge, and then continues in a more southerly direction past Bridgnorth, entering Worcester near Bewdley. It is navi-*~~

~~*The ambulatory limbs are all long and slender, and the first pair are not thicker than the*~~

~~*In Palezmon the second pair of*~~

~~gable to Shrewsbury and has connexion with the Doning- ton, the Shropshire Union, the Shrewsbury, the Birming- ham and Liverpool, and the Chester and Ellesmere Canals. Its principal tributaries within the county are—from the right the Meol (which receives the Rea), the Cound, the Mor, and the Borle, and from the left the Vyrnwy (dividing Shropshire from Montgomery), the Perry, the Tern (which Tecelves the Roden), the Bell, and the Worf. The Dee touches the north-western boundary of the county with Denbigh. In the south the Teme, which receives the Clun, the Onny, and the Corve, flows near the borders of Here- ford, which it occasionally touches and intersects. Of the numerous lakes and pools the largest is Ellesmere (116 acres) near the borders of Denbigh. The Severn forms the boundary between the Old and the New Red Sandstone formations, which constitute the principal strata of the county. The Old Red Sandstone rocks lying to the south and west of the river are bounded and deeply interpene- trated by Cambrian and Silurian strata. There are five separate coal-fields within the county,—the Forest of Wyre, Coalbrookdale, Shrewsbury, Clee Hills, and Oswestry. The Forest of Wyre field on the borders of Worcester rests directly on the Devonian rocks, and has a great thickness of measures, but comparatively few workable seams, The Coalbrookdale embraces an area of 28 square miles, and is triangular in form, with its base resting on the Severn and its northern apex at Newport. On its western side it is bounded partly by a great fault, which brings in the New Red Sandstone, and partly by the Silurian strata ; on its eastern side it passes beneath the Permian strata ; and it is supposed that the productive measures are con. tinued towards South Staffordshire. Its general dip is eastwards, and the strata have a vertical thickness of over 1000 feet. The organic remains include fishes, crustaceans, and molluscs. Mingled with the coal strata are several valuable courses of ironstone. The original quantity of coal in the field is estimated to have been about 43 million**

~~'tons, of which there are about 12 millions now remain-~~

~~ing. Neither the Shrewsbury nor the Clee Hills fields are of much value. The Oswestry field is small, but has some workable seams adjoining the~~

~~*extensive field of Denbigh, In 1884 850,000 tons of coal, valued at £286,000, were raised in Shropshire from fifty-five collieries, while 198,700 tons of iron were obtained valued at £109,285. Tron- casting forms one of the most important industries of the county. Lead mining is carried on with some success on the Stiperstones, 3788 tons of lead ore being raised in 1884. The other principal minerals are iron pyrites (500 tons in 1884, valued at £250), barytes (4939 tons, worth £7395), and fire-clay (56,000 tons, worth £8475). There are also a large number of stone and lime quarries.*~~

~~*Manufactures.—With the exception of iron, the manufactures of the county are comparatively unimportant. Bricks and tiles, earthen and china ware, and tobacco pipes are largely made in various districts. At Shrewsbury there are linen, yarn, and thread mills, and in several districts small a es*~~

~~*Agriculture.—There is much fertile land suitable for all kinds of culture, the richest soil being that in the vicinity of the Severn, including the Vale of Shrewsbury. Much of the hilly ground, including Wenlock Edge and the Clee Hills, admits of tillage ; but a portion of the western mountainous region is of comparatively small value even for the pasturage of sheep. Out of a total area of 844,565 acres there were 716,599 in 1885 under culture, of which 150,085 were under corn crops, 61,101 under green crops, 426,859 under permanent pasture, 71,470 under rotation grasses, and 6978 fallow. The area under woods in 1881 was 45,641 acres, and in 1885 the area under orchards was 4015. Of corn crops the areas under wheat and barley were in 1885 nearly equal, 53,161 and 53,300 acres respectively, while that under oats amounted to 34,445 acres, rye to 848, beans 4648, and pease 3683. Nearly five-sixths of the area under green crops were occupied by turnips and swedes, which covered 47,119 acres, the area under potatoes being 6874, and that under mangold wurzel 4355. Horses in 1885 numbered 82,323, of which 19,377 were used solely for purposes of agriculture ; cattle*~~

~~*(chiefly Herefords) 162,932, of which 60,976 were cows and heifers in milk or in calf and 69,865 animals under two years old; sheep (mainly*~~

~~Shropshire) 438,664 ; pigs 61,067 ; and poultry 369,890. In the northern districts Cheshire cheese is largely made. Accord- ing to the latest Landowners' Return for England Shropshire was divided among 12,119 owners, possessing 791,941 acres at an annual value of £1,484,833, or an average value of about £1, 16s. 8d. per acre. 'T'here were 7281 proprictors or about 60 per cent. who pos- sessed less than 1 acre, and 19,675 acres were common land. 'The following possessed over 8000 acres each—Earl of Powis, 26,986; Duke of Cleveland, 25,604; Earl Brownlow, 20,233; Duke of Sutherland, 17,495; Lord Hill, 16,290; Lord Forester, 14,891; Lord Windsor, 10,846; Earl of Bradford, 10,515; Sir V. R. Corbet, 9489; W. O. Foster, 8547; W. L. Childe, 8430; Lord Boyne, 8424; I. D. Corbet, 8118.~~

~~Administration and Population.—Shropshire comprises 14 hun- dreds and the municipal boroughs of Bridgnorth (population, 5885 in 1881), Ludlow (5035), Oswestry (7847), Shrewsbury (26,478), and Wenlock (18,442). For parliamentary purposes the county, which was formerly shared between North and South Shropshire, was in 1885 divided into four separate divisions,—Mid (Wellington), North (Newport), South (Ludlow), and West (Oswestry), each returning one member. At the same time the boroughs of Bridg- north, Wenlock, aud Ludlow were merged in the county divisions to which they severally belong ; but Shrewsbury continues to return one member. Shropshire contains also the following urban sanitary districts :—Broseley (population, 4458 in 1881), Dawley (9200), Ellesmere (1875), Madeley (9212), Much Wenlock (2321), Newport (3044), Wellington (6217), and Whitchurch and Dodington (3756). The county has one court of quarter sessions, and is divided into nineteen special sessional divisions. All the boroughs have separate courts of quarter sessions and commissions of the peace. The county contains 252 civil parishes with parts of six others. Ecclesiastically it is in the dioceses of Hereford, Lichfield, and St Asaph. The population (240,959 in 1861) in 1881 was 248,014 (124,157 males and 123,857 females). The number of persons to an acre was 0°29 and of acres to a person 3°41.~~

~~History and Antiquities.—The British tribes inhabiting Shrop- shire at the time of the Romans were named by them the Ordovices and the~~

~~*Cornavii. It was within its boundaries that Caractacus (Caradoc) struggled against Vespasian in 51 A.D. A connected chain of military works was erected by him over the southern and western districts of the county, the most important fortresses be- ing Caer Caradoc (where he is said to have made his last stand), occupying a commanding position in the forest of Clun, and the earthwork of Hén Dinas at Old Oswestry, consisting of four or five*~~

~~*concentric circles, still well marked. The Roman Watling Street:*~~

~~*entered Shropshire near Weston-under-Lizard in Stafford and passed in an oblique line to Leintwardine in Hereford. Various other Roman roads diverged from it in different directions. Wroxeter, a little to the west of the Wrekin, 'occupies the site of the ancient Roman city Uriconium, of which a portion of the wall, originally 3 miles in circumference, still remains. Explorations made on the site of the city have revealed many interesting features of its con- struction, and have led to the discovery of an immense variety of remains. By some authorities the Roman Mediolanum is placed near Drayton and Rutunium near Wem; but the evidence in both cases is doubtful. Throughout Shropshire there are many remains of Roman camps. Under the Romans it was included in the province of Flavia Cesariensis. After their departure it was annexed to the kingdom of the Saxons by Offa, who about 765 caused Watt's dyke to be erected to guard against the incursions of the Welsh, and later erected parallel with it, 2 miles to the west, the entrenchment known as Offa's dyke, which, extending from the Wye near Hereford to the parish of Mold in Flintshire, forms in some places a well-defined boundary between Shropshire and Montgomery. The greater part of the history of Shropshire is included under that of SHREWSBURY (q.v.). There are several important old ecclesiastical ruins, including Wenlock priory, once very wealthy, said to have been founded by St Milburg, grand-daughter of Penda, king of the Merciaus, as a college for secular priests, and changed into a priory for Cluniac monks by Roger de Montgomery about 1080 ; Lilleshall abbey, for Augustinian canons, founded in the reign of Stephen ; Shrewsbury abbey, founded in 1083 in honour of St Peter and St Paul; Buildwas abbey, one of the finest ruins in the county, founded in 1135 for Cistercians by Roger de Clinton, bishop of Chester; and Haughmond*~~

~~*abbey, for Augustinian canons, founded by William Fitzalan about 1138. Other remains of less consequence are those of the convent of White Ladies or St Leonard's, a Norman struc- ture, said to have been founded in the reign of Richard I. or John ; slight traces of Wombridge priory, for Augustinian canons, founded before the reign of Henry I.; Alberbury priory, for Benedictines, founded by Fulk Fitzwarin between 1220 and 1230; and Chirbury priory, founded towards the close of the 12th century. The castles of Bridgnorth (see BripcenorrH), Ludlow, and Shrewsbury are referred to in the notices of these towns, and in addition to these may be mentioned Clun Castle, which after a long siege was taken*~~

~~*SH R—S HU*~~

~~*and burnt by the Welsh prince Rees about 1196, and Boscobel House, near which Charles II. is said to have been sheltered in an oak,*~~

~~*See Hartshorne, Salopia Antiqua, 1841; Eyton, Antiquities of Shropshire, 12 vols., 1854-60 ; Anderson, History of Shropshire, 1869 ; Blakeway, Sheriffs of | Shropshire; Duke, Antiquities of Shropshire. (T. F. H.)*~~

~~*SHROVE TUESDAY, the day preceding Ash Wednes- day, or the first day of Lent, was so called as the day on which "shrift" or confession was made. CompareCARNnrvat.*~~

~~*SHUMLA (Bulg. Shumen, Turk. Shumna), a fortified town of Bulgaria, 58 miles south-south-west of Silistria and in that pashalic and 50 west of Varna. The town is built within a cluster of hills which curve round it on the west and north in the shape of a horse-shoe. A rugged ravine intersects the ground longitudinally within the horse- shoe ridge. From Shumla roads radiate northwards to the Danubian fortresses of Rustchuk and Silistria and those in the Dobrudja, southwards to the passes of the Balkans, and eastwards to Varna and Baltchik. Shumla is therefore one of the most important military positions to the north of Turkey, while it ranks as the third largest town in Bulgaria. Spread over a large extent of ground, each house mostly isolated in the midst of its own stables and cow-houses, Shumla has the appearance of a vast village. A broad street and rivulet divide the military or upper quarter, Gorni-Mahlé, from the lower quarter, Dolni-Mahlé. The latter, dirty and unhealthy, intersected*~~

~~*by a labyrinth of lanes, is inhabited mostly by Christians and Jews. The Armenians possess a small church, and each of the two Bulgarian quarters has its temple. The houses of the Gorni-Mahlé, occupied chiefly by Turks, stand pleasantly embowered each in its flower and fruit garden. Gorni- Mahlé has preserved the old church of the Resurrection. In the Dolni-Mahlé is the new church of St Cyril, a fine basilica adorned with a peristyle. The Bulgarian com- munity possesses two boys'.and two girls' schools, giving instruction superior to that obtainable at the primary Turkish school. 'In the upper part of the town is the magnificent mausoleum of Jezairli Hassan Pasha, who in the 18th century enlarged the fortifications of Shumla. The principal mosque, with a cupola of very interesting archi- tecture, forms the centre of the Moslem quarter. At the farther end of the town, isolated on a hill, is a large military hospital. The population of Shumla in 1881 was 23,093, exclusive of the garrison. The town is renowned for its manufacture of red and yellow slippers, ready-made clothes, richly embroidered dresses for females, and its copper and tin wares. It also rears silk-worms, spins silk, and carries on an important trade in grain and wine. The branch railway from Shumla to Kaspidjan, 94 miles, to connect the town with the Rustchuk-Varna Railway, though commenced in 1870, was not finished in 1886.*~~

~~*In 811 Shuinla was burned by the emperor Nicephorus, and in 1087 was besieged by Alexius. In 1388 the sultan Murad I. forced the castle to surrender ; and thence till the 17th century Shumla disappears from history. In the 18th century it was enlarged and fortified. Three times—1774, 1810, and 1828—it was unsuccessfully attacked by Russian armies. The Turks consequently gave it the naine of Gazi ("Victorious"). But on 22d June 1878 Shumla capitu- lated to the Russians. The treaty of Berlin stipulated the demoli- tion of the fortifications; but this article has not been executed, and Bulgarian troops garrison the fort.*~~

~~*See F. Kanitz, La Bulgarie Danubienne (1882) ; H. C. Barkley, Bulgaria before the War (1877), and Between the Danube and Black Sea (1876); S. G. B. and C. A. St Clair, Residence in Bulgaria (1869); J. L. Farley, New Bulgaria (1880) ; and J. G. Minchin, Bulgaria since the War (1880).*~~

~~*SHUSHA, a town, formerly a fortress, of Russia, in*~~

~~*the Caucasian government of Elisabethpol, lies in 39° 46'*~~

~~*N. lat. and 46° 25' E. long., 230 miles south-east of Tiflis, on an isolated rocky eminence, 3860 feet high. The town, which is accessible only on one side, occupies but a small part of the plateau, whence there is a splendid view over the surrounding mountain gorges and defiles. In 1873 the population was 24,552 (males 13,666, females 10,886), of whom 13,504 were Armenians and 10,804*~~

~~*SHU—~·S II Ww*~~

~~*Tatars. Instead of flat earthen roofs, as in most other towns of Transcaucasia, the houses have very high steep roofs, covered with shingle. 'The streets are sinuous, and are intersected by ravines. Shusha was formerly the capital of the khanate of Karabagh. 'The town is locally renowned for its carpet manufactures, and the district for its excellent breed of Karabagh horses,*~~

~~*The fortress, formed in 1789 by Pana Khan, has a wall on one side, and is defended naturally on the other three sides. In 1795 Shusha successfully withstood a siege by Agha Mohammed of Persia, but was constrained to surrender two years afterwards. In 1805 Ibrahim Khan of Karabagh invoked 'the protection of Russia, but the annexation was completed only in 1822. The present district of Shusha (2934 square miles) forms only a part of the former khanate of Karabagh. In 1873 it had (exclusive of Shusha) a population of 80,918 (males 45,163, females 35,750), Armenians numbering 48,562 and Tatars 37,351. Agriculture and cattle-breeding are almost the sole occupations of the inhabitants. Gen- eral culture is very low; there is no enterprise, and but inadequate security for life and property.*~~

~~*SHUSTAR, or Sutsrar, SHUSHTAR (Arab. Zostar), once a flourishing provincial capital of Persia, is now a compara- tively unimportant town of 6000 inhabitants, —exclusive, however, of the Bakhtidris, who during the winter months encamp with their flocks and herds in the immediate vicinity. It is situated (32° 3' 30" N. lat. and 48° 59' E. long.) at the foot of an offshoot of the Bakhti4ri Mountains in the north-west of Khuzistan, and just below the point in the Karun (Dojail or Little Tigris) where—the*~~

~~*main stream running westwards—a cutting of 70 feet deep has been made through the natural rock for an easterly branch. Thence the two streams, enclosing a wide alluvial tract, of which Shustar is the crown, follow independent courses until they reunite some 40 miles to the south. According to Lieutenant Selby, I.N., who ascended the Kartn from Muhamrah (Mohammera) in 1842 by the Shutait (or main stream on the west) to within 6 the navigation, of the Ab-i-Gargar (or eastern channel) to within 1 mile, of Shustar, the town is built on a small hill which rises gradually from the south-west and increases in elevation to the citadel, which presents on the north- castern side an abrupt face of about 150 feet in length, having the river immediately beneath. Mr Loftus, who visited Shustar some eight years after Lieutenant Selby, gives an account of the two great dams thrown across the river,—the " Band-i-Mizdn " over the natural course, the " Band-i-Kaisar" over the artificially diverted branch. About a mile below the latter is a similar work of more recent and imore solid and substantial construction, called the "Pul," or bridge of Belaiti, Legend ascribes these ancient works to Shapur I. and his captive the emperor Valerian. In 1875, and again in 1878, Mr Mackenzie visited Shustar; he speaks of the town as being in a wretchedly decayed and filthy condition. The houses are of stone, some few good, with underground roonis (sarddbs or zr zamin) excavated to a depth of two stories below the ground level. In these relief is obtained from the intense summer heat. The traffic of the bazaar, which is & poor one, seemed to depend chiefly on the Iiydts or wandering tribes. The inhabitants—for the most part Arabs and Sdiyids—have a reputation for hospitality.*~~

~~*Some writers have identified Shishar with Susa (Shushan of the Bible), the capital of Susiana and a residenee of the Achemenian kings. The true site of the latter, however, as Loftus's explora- tions showed, is at Shish, a widely spread ruin 30 or 40 miles to the north-west. On the other side of Shustar is the locally classic ground of Ram IIormuz. In fact, of the whole neighbourhood Sir II. Rawlinson writes that it "still requires elaborate exploration, and would well repay any traveller who would devote six months to examining the ruins and carefully copying the inseriptions."*~~

~~*The river Karin, which rises in' the Bakhtiari Mountains and passes down the broad Shattu 'L-'Arab, joins the Tigris and Euphrates. It has been declared by many and trustworthy authorities to be well adapted for steam havigation—save as regards one obstacle at Ahwaz, removable at little cost—from its mouth to the near*~~

~~*miles, and further tested:*~~

~~*849*~~

~~*Thence to Ispahan the land journey Bushahr (Bushire) to that eity by*~~

~~*neighbourhood of Shustar. would be shorter than from 200 miles,*~~

~~*SHUYA, one of the chief centres of the cotton industry in middle Russia, is a district town in the government of Vladimir, 68 miles north-east of the town of Vladimir. A branch railway connects it with the Novki station of the railway from Moscow to Nijni-Novgorod. The town is built on the high left bank of the navigable Teza, a tribu- tary of the Klazma, with two suburbs on the right bank. Annalists mention princes of Shuya in 1403. Its first linen manufactures were established in 1755; but in 1800 its population did not exceed 1500. Its growth began only with the development of the cotton industry in central Russia, and since then has been rapid; in 1882 it had 19,560 inhabitants, as against 10,440 in 1870. Of these about 10,000 live by the manufactures, and only a few keep to agriculture and gardening. In 1881 the output of twelve cotton-mills was valued at £442,160 for various cotton stuffs and £48,000 for cotton yarn. 'Tan- neries, especially for the preparation of sheep-skins—widely renowned throughout Russia—still maintain their im- portance, although this industry has migrated to a great extent to the country districts. The products of its manu- factories are chiefly sent to Moscow and Nijni-Novgorod. The town is mainly built of wood. Tis cathedral (1799) is a large building, with five gilt cupolas. Shuya has also two gymnasia, for boys and girls, besides a progymnasium for girls, and several secondary and primary schools.*~~

~~*The surrounding district is also important for its manufactures. The village of Ivanovo-Voznesensk, north of Shuya, with a popu- lation of*~~

~~more than 19,000 inhabitants, employed 11,329 workmen in its 39 manufactories in 1881, and showed a return of £1,939,950 (£1,700,000 for cottons and the remainder for chemicals and machi- nery). Teikovo and Kokhma are two other centres of manufacture, — the whole production of the manufactories within the district (ex- clusive of Shuya and Ivanovo) being estimated at £630,000. These figures, of course, do not include any statistics of the petty trades carried on side by side with agriculture. Nearly every village has a specialty of its own, — bricks, pottery (Menschikovo), wheels, toys packing-boxes, looms and other weaving implements, house furni- ture, sieves, combs, boots, gloves, felt goods, candles, and so on The manufacture of linen and cotton in villages, as well as the pre- paration and manufacture of sheepskins and rough gloves, occupies about 40,000 peasants. The Shuya merchants carry on an active trade in these products all over Russia, and in corn, spirits, salt, and other food stuffs, which are imported to a great extent. In 1880 the imported goods reached 1,618,000 cwts. (1,208,000 by rail), and the exports 1,318,000 cwts., chiefly by the Teza.~~

~~SHWE-GYENG, a district of British Burmah, in the Tenasserim division, containing an area of 5567 square miles, and lying in the valley of the Tsit-toung (Sitoung) river. It is bounded on the N. by Toung-gnu district, on the E. by the Poung-loung Hills and the Salwin Hill Tracts, on the 8. by Amherst district, and on the W. by the Pegu Yoma Hills. The boundaries have more than once been altered, the last change having taken place in 1877. The aspect of the country is mountainous, especially in the north. The Tsit-toung is navigable throughout its entire length in the district by large boats and steam-launches. Shwe-gyeng has never been accurately surveyed from a geological point of view, but it is supposed to be rich in minerals, Gold is found in most of the affluents of the river Shwe-gyeng ; copper, lead, tin, and coal also exist, but are not worked. Except in the hills, the climate is generally healthy ; the average annual rainfall at Shwe- gyeng station is 144 inches.~~

~~In 1881 the population of the district was 171,144 (89,687 males and 81,457 females), of whom Hindus numbered 958, Mohammedans 855, Buddhists 158,149, and Christians 1250. The only town with more than 5000 inhabitants is Shwe-gyeng, the capital and head-~~

~~quarters of the district, which was founded during the 18th century, before the Burmese conquest, by Alompra. It is situated at the~~

~~junction of the Shwe-gyeng with the Tsit-toung, and had a popula-~~

~~tion of 7519 in 1881. Only 187 square miles of the district were cultivated in 1883-84; the cultivated area is, however, gradually XXL .— 167~~

~~Plate IX.~~

~~Bound- aries,~~

~~850~~

~~extending, and there are some 8474 square miles capable of cultiva- tion. The principal crop is rice, of which twenty-five different kinds are grown; other products are cotton, betel-nuts, tobacco, and sugar-cane. The only industries are potteries, salt-making, and silk-spinning. In 1883-84 the total revenue amounted to £36,476, of which the land-tax contributed £15,967. : yar~~

~~SIALKOT, or SEALKOTE, a district of British India, in the Amritsar division of the lieutenant-governorship of the Punjab, with an area of 1959 square miles. It lies between 31° 44' and 32° 50' N. lat. and 74° 12' and 75° 3' E. long., and is bounded on the N.E. by the Jamu state of Kashmir, on the N.W. by the Chénab, on the E. by Gurdaspur, on the §.E. by the Ravi, and on the W. by Lahore and Gujranwala. Sidlkot is an oblong tract of country occupy- ing the submontane portion of the Rechna (Ravi-Chendb) Doab, and is fringed on either side by a line of fresh alluvial soil, above which rise the high banks that form the limits- of the river-beds. The Degh, which rises in the Jamu Hills, traverses the district parallel to the Ravi, and is likewise fringed by low alluvial soil. The north-eastern boundary of Sidlkot is 20 miles distant from the outer line of the Himdlayas; but about midway between the Ravi and the Chendb is a high dorsal tract, extending from beyond the border and stretching far into the district. Sialkot is above the average of the Punjab in fertility: three-fourths of its area have already been brought under the plough, and a third of the remainder is reported to be capable of~~

~~*improvement. The upper portion of the district is very productive ; but the southern portion, farther re- moved from the influence of the rains, shows a marked decrease of fertility. The district is also watered by numer- ous small torrents ; and several swamps or jhils, scattered over the face of the country, are of considerable value as reservoirs of surplus water for purposes of irrigation. Sialkot is reputed to be healthy; it is free from excessive heat, judged by the common standard of the Punjab; and its average annual rainfall is about 37 inches.*~~

~~*The district possesses a total length of 790 miles of road; and a branch line of the Punjab Northern State Railway, from Wazira- bad in the north-west corner of the district to Sialkot town (28 miles), was opened in January 1884. In 1881 the population was 1,012,148 (males 539,661, females 472,487), of whom Moham- medans numbered 669,712, Hindus 299,311, Sikhs 40,195, and Christians 1535. The only town of any importance is SIALKOT (q.v.). The principal agricultural products of the district arc wheat, barley, rice, maize, millets, pulses, oil-seeds, sugar-cane, cotton, and vegetables. The local commerce centres in the town of Sialkot, which gathers into its bazaars more than half the raw produce of the district. Its surplus stock finds a ready outlet in the markets of Lahore and Amritsar, while the great rivers on either side form natural channels of communication with the lower parts of the Punjab, The native manufactures comprise silk, saddlery, shawl- edging, coarse chintzes, pottery, brass vessels, country cloth, cutlery, and paper. The gross revenue of the district in 1883-84 amounted to £145,531,of which the land-tax contributed £111,713.*~~

~~*The early history of Sialkot is closely interwoven with that of the rest of the Punjab. It was annexed by the British after the Second Sikh War in 1849 ; since then its area has been considerably reduced, assuming its present proportions in 1867. During the mutiny of 1857 the native troops stationed in the cantonments of Sialkot besieged the European residents in the fort, and remained masters of the whole district ; they also plundered the treasury and destroyed all the records.*~~

~~*SIALKOT, the capital and administrative headquarters of the above district, is situated in 32° 31'N. lat. and 74° 36' E. long., on the northern*~~

~~*bank of the Aik torrent. It is an extensive city with handsome and well-built streets, and contains several shrines and buildings of historical interest. In 1881 its population was 39,613.*~~

~~*SIAM. The kingdom of Siam embraces the greater part of the Indo-Chinese and part of the Malay peninsula. On the north-west the river Salwin separates it from Karen-nee, southwards thence the river Toon-gyeen ; then, from the Three Pagodas in 18° 15' N. lat. down to the Pak-chan river in 10° N. lat., the principal watershed*~~

~~*1 Compare MALAY PENINSULA, also SIHaNs, Laos, and CAMBODIA.*~~

~~*SIA—*~~

~~*ot a*~~

~~*separates it from Pegu and Tenasserim. Its seaboard on the Bay of Bengal extends from the Pak-chan river to Wellesley Province in 5° 30' N. lat.; but the islands along the coast are British, On the other (east) side of the peninsula the territory extends to 4° 35' N. lat., or, if the vassal state of Pahang is included, to Johore in about 2° 30' N. lat. On the east side of the Gulf of Siam the frontier line (according to the Siamese authorities; cf. Plate IX.) starts from the Bay of Compong Som in 103° 20' E. long., and runs north inland to Mount Pang-chak, thence, after crossing Tonle-sap Lake, east across the Me- kong to the crests of the range which separates the Me-kong valley from Anam. It then follows this range north, in- cluding the country north-east of Luang Prabang, to the frontiers of Tongking. Thence it runs west-south-west, separating the tributary from the independent or Burmese Shan states, and meets the Salwin in about 20° N. lat.*~~

~~*The great natural and economical centre of Siam is the Rivers,*~~

~~*delta of the Me-nam river, which is annually flooded be- tween June and November, the waters attaining their greatest height in August. The inundation covers several thousand square miles, so that the capacity for production of rice, which furnishes two-thirds of the entire exports, is almost unlimited, but is very partially developed both from scarcity of*~~

~~*population and want of means of trans- port, mills, and better cultivation. Irrigation channels are, however, cut above the point where the creeks naturally cease by some of the small Chinese settlers. The bar formed at the mouth of this and of the other converging rivers—the Tachim, the Me-klong, and the Pechaburi on the west, and the Kharayok on the east—extends right across the upper end of the gulf, and has 12 or 13 feet of water at high water. The yearly encroachment of the land on the sea is considerable, and the entire delta from Chein- nat in 15° 20' N. lat. downwards has probably been formed in comparatively recent times. At Bangkok sea-shells are found 20 feet below the surface. The Tachim, the first great branch of the Me-nam, joins its right bank above Chein- nat ; below this the main stream anastomoses naturally or by canals freely, the banks of the different channels being densely peopled. Above Chein-nat the Me-nam continues deep and navigable up to the junction of the Pak-nam Pho, its east branch being formed by several important affluents from the north-east. The west branch of the Me-nam is formed mainly by two affluents, the Me-wang and the Me- ping, which flow down through the west Laos states, some of whose chief towns are situated on their banks. In this more elevated region the hill ranges, with a general north-south direction, ramify widely, rising in places to from 6000 to 8000 feet, while the valleys between them widen out into great fertile plains, having the appearance of former lake-basins—a view which coincides with ancient local traditions. On the west frontier the rapid and broken stream of the Toon-gyeen, whose tributary valleys on the Siamese side produce valuable teak and cinnamon, flows from a mass of laterite, south of which the central range consists of granite, with syenite and quartzose rocks. Its spurs (6000 feet high) extending in every direction, of sandstones, Carboniferous limestones, and other Secondary formations, are clothed with sappan and other forest trees, and contain probably gold, besides argentiferous lead, tin, coal, and iron, the latter in nodules of clay oxide and brown hematite. On the west of the Gulf of Siam, as far south as 11° N. lat., is a dry barren region, enclosed between two ranges which intercept the rainfall on either side, but farther south are luxuriant damp forests containing Hopea (wood-oil), iron-wood, &c., with occasional clearings for cultivation, and many rivers with wide mouths, but be-coming mere streams higher up.*~~

~~*In about 10° 30’ N. lat. the Malay peninsula is narrowed*~~

~~*Isthmus of Kra.*~~

~~*Eastern Siam.*~~

~~—~~

~~_~·~~

~~*Minerals.*~~

~~*Climate.*~~

~~*Fauna.*~~

~~*SIAM*~~

~~*by @ river at either side to a width of only 27 miles, and there a survey for a canal has been made; the maxi- mum height of the section is 250 feet, the mean 130; the amount of excavation is estimated at 84 million cubic feet, mostly through hard rock, and the cost at*~~

~~*£20,000,000. But the approaches by the river-mouths*~~

~~*on both sides are intricate and bad. This has latterly been*~~

~~*the chief route across the peninsula 3 but there are other*~~

~~*breaks in the range which forms the backbone of the*~~

~~*peninsula, and the Buddhist propaganda is said to have Here, however—*~~

~~*Ceylon Island—is the real termination of the great range which comes*~~

~~*crossed by the isthmus of Ligor. perhaps, properly speaking, in Junk*~~

~~*down unbroken from Yun-nan, separating the Salwin and the Me-nam valleys.*~~

~~*East from the plain of the Me-nam, and separating it from the Me-kong valley, a plateau rises with very gradual ascent, clothed to a width of from 30 to 50 miles with forest. From its east side several large and partly navigable rivers flow towards the Me-kong through a sandy*~~

~~*and for the most part arid plain, with stunted growth of*~~

~~*resinous trees and bamboos, brushwood and grass; but on the lower courses of some of these streams are rich irrigated tracts, producing rice, bananas, sugar, maize, and the usual tropical vegetables. The whole region is very unhealthy, especially in the wet season. Travelling would hardly be possible without elephants, of which some are kept in every village. The rocks are mostly calcareous or sandstone, and at the south edge of the plateau corals and recent shells at a slight depth show the former limits of the land. Farther north the mountains of Pechaboun and Lom are rich in magnetic iron ore, argentiferous copper, antimony, and tin. Only the first- named is worked to any extent; and, though by very primitive methods, a large quantity of tools and weapons are manufactured. From the south of the plateau a range Sweeps round to the south-east into Cambodia, outliers from which are the two peaks north and east from Chanta- boun, the latter noted for its emeralds, topazes, and sapphires. Isolated hills, apparently volcanic, occur, as the sacred Mount Phrabat, to the north-east of Ayuthia, where there are hot springs and a famous footprint of the Buddha, and the conical hills at Pechaburi in the south- west, consisting of lavas, scorix, and trachytic rocks, abounding in caverns elaborately fitted as temples.*~~

~~*Tin is extensively distributed, especially throughout the Malay*~~

~~*eninsula, where it is worked at Bang-ta-phang in the province of Cine sia at Chaija and Chaliang, also on the Me-klong, at Kan- buri, and at Rapri. Gold is found pretty extensively in Tringanu and Pahang; there are mines at Bang-ta-phang ; and it is extracted in the Me-kong valley by washing or with mercury. Most of it is consumed in trinkets and presents given by the king,—gold leaf being imported from China for gilding pagodas, &c. Iron abounds in the east, as at Lom and Mulu Prey, antimony at Rapri, lead at Pak-phrek and Suphan, silver in the Me-pik valley. Both the lead and copper ores are often argentiferous.*~~

~~*Much of the natural rainfall in Siam is intercepted by the high lands of the Malacca peninsula and by the mountains on the north- west and north, while the proximity of the Gulf of Siam tempers the heat. The rainfall at Bangkok on an average of ten years is 67°04 inches, of which 50°59 inches fall from May to October in- clusive.1 The mean annual temperature is 80°1, varying from 74°°8 in December to 83°-4 in April; the lowest recorded absolute minimum was 57° in December 1866, the highest recorded absolute maximum 97°°5 in May 1867. The north-east monsoon begins to blow early in November, preceded by a month of variable weather. It has lost half its force in J anuary, and by March strong south and south-south-west winds have set in, the south-west monsoon blowing then steadily and strongly till September. Thus there are three seasons of four months each, — the hot, rainy, and cold.*~~

~~*As to general features, the fauna of Siam is identical with that of Burmah and of southern China, and is one of the richest in the world. Elephants are very numcrous in the south and east, but*~~

~~*1 But on the neighbouring ranges the fall is, at Moulmain 244 inches, at Tavoy 202, at Mergui 185.*~~

~~*: They are as intelligent as the Indian, but usually less highly trained. © White (albino) mon- keys are Sacred, as are the elephant, an iguana which lives in the house and kills rats and other vermin, and the crow ; white ants' hests are respected as resembling pagodas, so that libraries are often kept in tanks to escape the ants' ravages, i*~~

~~*The flora is very similar in character to that of Burmah and has F'lora. much m common with the Chinese, the transition to which is almost insensible. The coast region is characterized by mangroves, pandanus, rattans, and similar palms with long flexible stems, and the middle region by the great rice-fields, the cocoa-nut and areca palms, and the usual tropical plants of culture. In the temperate uplands of the interior, as about Luang Prabang, Hima- layan and Japanese species occur, — oaks, pines, chestnuts, peach and great apple trees, raspberries, honeysuckle, vines, saxifrages, Cichoracex, anemones, and Violacex; there are many*~~

~~*valuable tim- ber trees, — teak, sappan, eagle-wood, wood-oil (Hopea), and other Dipterocarpaccex, Cedrelacex, Picrocarpacex, X ylia, iron-wood, and other dye-woods and resinous trees, these last forming in many dis- tricts a large proportion of the more open forests, with an under-growth of bamboo.*~~

~~*Numerous caravans of cattle, horses, mules, and porters pass Trade, annually from Yun-nan (south-west China) to the northern (Siamese) Shan states, whence many of them proceed via Chieng-mai to Moul- main (Maulmain). They bring from China silk goods, tea, opium,and brass wares, and take back raw cotton, deer and rhinoceros horns, ivory, and saltpetre. The northern states, which are a great breed- ing-ground for cattle and ponies—elephants too are exported into Burmah—send down teak and other produce. The proposed rail- way from Moulmain via Myawaddi to Raheng, and thence to Kiang- sen, 190 miles from the Chinese frontier, is intended to stimulate not only the traffic with China but the local] resources (see address by Mr Holt Hallett, C.E., in London Chamber of Commerce J ournal, 5th May 1885). The eastern states, comprising nearly half the area and a considerable part of the wealth of the kingdom, send much produce via Korat to Bangkok. They produce chiefly China grass (Behmeria nivea), sugar, indigo, silk, cardamoms, cotton, tobacco, sisiet (a substitute for betel), beeswax, benzoin, lac, iron, lime, sul- phur, salt, coarse pottery, mats, hides, tigers, and bones, horns, and tusks of elephants, rhinoceroses, and boars. European cottons and hardware and Chinese goods penetrate everywhere, the chief entre- pots being Nangkoi in the east and Chieng-mai in the west. The eastern plains produce alternate crops of rice and salt. The rains dissolve the salt in the soil and wash it down, making cultivation possible. In the dry season the salt comes up again and is swept up from the surface. Much alcohol is distilled and consumed. Vast quantities (6900 to 7900 tons) of dried fish are prepared at Lake Tonle-sap, and at fisheries on the coast.? Although silk has been known from remote antiquity, it is produced exclusively by the Lao communities settled throughout the country,—the chief centres being Korat and Battampong. The export in 1884 was 325 cwts., Exports valued at £19,890; but the best quality hardly reaches the Bangkok and im- market, its natural bright yellow colour making it difficult to dye. ports. There is, however, not much of it, the demand for the better kinds*~~

~~being supplied from Cambodia. But for the apathy and indolence of the people the production might be largely increased ; the spinning and reeling apparatus too are very primitive, though some beautiful cloths are woven at Chieng-mai. Much of the trade in teak and cattle is worked by Burmese ; otherwise almost all the trade of the country is in Chinese hands. In some of the remoter districts barter is resorted to, beeswax, salt, lac, and bars of iron being mediums of ex- change ; but generally silver is used, and sometimes Indian rupees. Civilization increases in the eastern districts as the frontier of China is approached. In 1884 419 vessels cleared from Bangkok with cargoes valued at £27,170; of these 240 (tonnage, 151,984) were British. In addition, there were 143 junks (tonnage, 3350). The total value of the exports was £2, 262,240, rice being the prin- cipal item, £1,444,200. The imports were valued at £1,044, 255, the chief items being—grey and white shirtings, £161,997; opium (704 chests), £81,410; chowls, z.¢., shawls, a cotton cloth from Bombay, £105,264. In 1885 the exports were valued at £1,907,006 and the imports at £1,380,233. The exports being in excess of the imports, the difference is paid in Mexican dollars, which are melted down and re-coined,—the silver coinage being the standard of weight.~~

~~The money and weights seem to be the same as the Old Cam- Coinage bodian. A copper coinage has replaced the cowries, and there is and also a silver coinage, viz., the fuang=74 cents, the salung=15 cents, weights. the bat or tikal=60 cents or half a crown, 5 tikals=3 Mexican dollars. From the tikal upwards these coins arc also used as measures of weight. Thus 1 tikal weighs 15 grammes or 231 grains, 4 tikals=1 tamlung, 20 tamlungs=1 chang or catty, or two Chinese catties,=3-2 Ib. There are a few gold coins, but not~~

~~? During the floods vast quantities of fish swarm into the rice- grounds and are caught when the water recedes, furnishing a valuable and abundant food-supply.~~

~~Taxa- tion.~~

~~Adminis- tration.~~

~~Laws.~~

~~in general circulation. in silver.~~

~~The land-tax is fixed at ten per cent., the first person who clears land being entitled to hold it. The tax ou garden produce and on fruit trees is higher, but is fixed at intervals of some fifteen years, or at the beginning of a reigu. There is a corvée of four months in the year, to which all classes except the nobles and the priesthood are theoretically liable, but it may be commuted for a poll-tax of from 6 to 18 tikals, payable either directly in money to Government or to the feudal superior, for all except the nobility are thus depend- ent on a superior; in the provinces it is payable in kind through the governor. A smaller amount, 14 tikals, is payable by masters for their slaves. But there are some considerate exceptions, viz., persous over sixty or under eighteen years of age, or who have three sons paying the tax, and cases of incurable illness. If a special demand for labour be made there is exemption from poll-tax for that year. The Chinese only pay 44 tikals triennially, and Euro- peans are exempted. There is a tax on houses, on amusements (theatricals, dancers, &c.), and on fishing-boats, nets, and other tackle. There isa royalty on tin, and the sale of opium and of alcohol is a Government monopoly, farmed to Chinese. Three per cent. is levied by treaty on British and other forcign imports, export duties on a great number of raw articles, and inland or transit dues on certain tropical products. The revenue from all these sources is estimated at 80,000 catties (£800,000).~~

~~The head of the administration is the king, with five ministers,— viz., of war, foreign affairs, northern provinces, agriculture, justice, —and some thirty councillors. The office known to Europeans as ‘ second king” (Siamese, wang-na, lit., “front palace”) is difficult to define, as the share taken in government by him depends very much on his individual character. IIe has a palace and an official establishment, and a few soldiers at his orders. The country is divided into forty-one provinces, excluding the Laos and Malay states, and the Cambodian provinces. The provinces are of different grades, and their governors have very different degrees of authority. Speaking generally, they have cognizance of all civil cases,—though there is an appeal to the capital (which generally reaches~~

~~its destina- tion, as the governor's council act as spies),—and of minor criminal cases. The graver crimes, as murder and dacoity, involving a question of life or death committed in Siam proper, are referred to a special department in the capital. Villages are governed by a head-man (kamnan, amp'hon, or nakhon), sometimes with a small salary, chosen usually in accordance with the popular wish, and dependent on the provincial capital. The Siamese mandarins in the Lao provinces do not oppress overmuch, nor do the native chiefs, since their power depends on their popularity. Besides the lower grades there are always four principal officials, the chao, lord or king, the wparat, rachavangsa, and rachabutr (the first title of Chinese, the others of Indian origin). These are hereditary in one or two families, any disputed succession being referred to Bangkok. The Siamese law is recognized, but the national "customs" are much regarded, and in ordinary cases followed. Civil and criminal pro- cesses alike end usually ina fine. Besides the capitation tax, there is a duty on rice, and cach state pays tribute to Bangkok. The tie between Bangkok and the Malay states is slighter, being con- fined usually to interference in cases of disputed succession, and to a triennial tribute of a gold or silver tree or flower. The rules of procedure in Siam are very strict, but theoretically there is no hereditary rank.~~

~~The laws of Siam are ancient, though not very full or complete, a great part having been lost at the sack of Ayuthia. in 1753. Generally speaking, they are referable to an Indian origin, especi- ally as regards religious, moral, and ceremonial ordinances ; the civil and criminal codes bear the impress of Chinese influence. There are several digests of the law, some centuries old, under sys- tematic headings, ¢.g., of the civil law, real and personal property, inheritance, ranks, evidence and ordeal, marriage, education, parental authority, slavery, money, weights and measures, contracts, and of the penal code, crimes, punishments, police, prisons. The king is absolute, but claims no absolute rights over the land. Great attention is paid to precedents. Among the peculiarities of the system are the employment of ordeal—by diving or chewing rice, &c.—in the absence of witnesses, and the rejection of the evidence of certain classes, viz., drunkards, gamblers, virgins, executioners, beggars, persons who caunot read, and bad characters. When a crime is committed the family and even neighbours of the accused can be held responsible for his~~

~~*appearance. The property of in- testates gocs to the king, of an intestate priest to his monastery ; but the neglect of the heir to perform funeral rites renders his claim to property invalid,—a curious relic of HIndu feeling. Another trace of this may be found in the hereditary professions, though their doctrinal significance as castes has disappeared. The laws have many curious and not inequitable provisions about slavery (see below), e.g., if a temporary (debtor) slave has undergone punish- ment or suffering for his master, his debt shall be remitted wholly or in part; but, if hc isa slave absolutely, his master is not legally liable. And there are well-defined rules as to non-fulfilment of*~~

~~*Their value is sixteen times their weight*~~

~~*SIAM*~~

~~*contract with a slave, his maintenance during famine, injury by accidents, employment as a substitute in war, &c. Slaves who are allowed to become priests or nuns are free.*~~

~~*All men are liable to serve in war; but only from 4000 to 5000, Ar*~~

~~*taken from classes specially at the disposal of the war de artment, and*~~

~~*are regularly trained under European officers. The capital and sur- rounding forts are garrisoned, and there is a body of palace guards, The fleet consists of some twenty men-of-war and armed steamers and 500 junks.*~~

~~*The population is estimated by the Siamese Government at Popula- 6,000,000 for Siam proper, 3,000,000 Siamese Laos, and 1,000,000 tion.*~~

~~*Malays ; others estimate it variously at from 6,000,000 to 8,000,000. There are besides perhaps from 1,500,000 to 2,000,000 Chinese. In lower Siam the population is clustered along the rivers and canals ; in the diversified hill and plain country to the north it is distributed more generally. In character the Siamese arc mild, paticnt, and submissive to authority. They are hospitable to strangers and to the poor ; quarrels, violent crimes, and suicide are rare. But they are idle and apathetic ;*~~

~~*much time is devoted to amusements, as — festivals and processions, boat races, games, cock and dog fighting, and even combats between fish. The position of women is good, although girls can be sold as wives. The Chinese population are energetic and industrious, but very independent, and sometimes give tronble, so that their increasing numbers and organization through their secret societies are a source of anxiety. The Siamese are of medium height, well formed, with olive complexion, darker than Chinese, but fairer and handsomer than Malays, eyes well shaped, nose slightly flattened, lips a little prominent, the face wide across the cheek bones, top of forehead pointed and chin short, thus giving the face a lozenge shape, beard scanty and with hairs pulled out, hair of head coarse and black. But intermarriage during many ages with Peguans, Laos, and Cambodians (though in many cases they and their descendants keep themselves apart), as well as of slaves from the aboriginal races, has produced much variety of type. Besides the Karens, who are the remnant of a more widely extended people, and who are found on the borders of Siam and Burmah and throughout the mountains of north and west Siam, the Lawas in the same region, and the Khongs, a settled people inland from the north-eastern angle of the Gulf of Siam, many other tribes of the earlier inhabitants are found occupying the whole of the forest region on both sides of the Mc-kong, and known to their different neighbours by various names, all probably mean- ing simply "man," or "savage," as Kha, Moi, Pnom, Lolo. These eastern tribes more or less resemble eachother. They are shy and timid, some having no chiefs or social organization, and these are preyed on or hunted down as slaves by their more civil- ized fellows in'combination with the Laos. One division of these tribes, the Kouis (the name recalls the savage '"'Gueos" of the Portuguese), amalgamates readily with the Laos and in some pro- vinces forms the bulk of the population. They live by cultivating rice, by collecting honey, beeswax, and resin, or by the chase. Their women are absolutely free before marriage, but adultery is punished with death. They worship ancestral and other spirits and can hardly be called Buddhists. Yet with a few exceptions these earlier peoples are by no means inferior in appearance to the Thai or Siamese, but often the contrary; some ethnologists assign them a Caucasian origin, and identify them with the brown Polynesian race,*~~

~~*Slavery is general, but consists mainly of bondage for debt, a Slavery.*~~

~~*debtor being able to sell himself, wife, or children, or nephews or nieces, —their freedom being recoverable on payment of the debt. But the present enlightened ruler has set his face against the practice, and decreed its abolition, except in the Laos provinces and in the eastern states. The market is further recruited, first by the sale of offenders, who have the option between death and slavery, and secondly by slave-hunting raids, made in combination with the Anamites, on the villages of the wilder aborigines. These are dis- posed of on the spot or else to dealers from Cambodia or Siam proper.*~~

~~*BANGKOK (q.v.) was established as the capital in 1782 after the Towns.*~~

~~*sack of Ayuthia by the Burmese. Its population was estimated at about 300,000 in 1886. Ayuthia, now called Krung-krao, the famous capital founded in 1351 and half destroyed by the Burmese in 1767, was a generation ago the second city of the kingdom. It is still im- portant as the entrepot of the trade of south Laos. Many junks and fishermen come up from Bangkok. The modern town is chiefly on the water. In its most prosperous days in the 16th century it was three leagues in circumference, and coutained distinct quarters for foreigners of different nationalities—Chinese, Peguans, Malays, Malabars, Japanese, and Portuguese. Prominent among its great buildings is the pyramidal structure called the Golden Mount, some 400 feet high, surmounted by a dome and spire ; but most of them are now crumbling away into great broken masses of sculp- tured masonry, statues, and spires, half buried under the vegetation of the tropics. Chantaburi, near the Cambodian frontier, the second port of the kingdom, is noted for its shipbuilding and fisheries, and has an active export trade from the south-eastern provinces. There are considerable Chinese and Burmese elements in the popula-*~~

~~*Eduea- tion.*~~

~~*Arts.*~~

~~*SIAM*~~

~~*tion, which in many of these southern towns is much mixed. Paknam, the port of Bangkok, 3 miles from the river's mouth, is fortified, as is Paklat Lang, 5 miles higher up, which is inhabited chiefly by Peouans. Various canals extend hence across the delta towards the- Me-klong. Near its mouth is the town of Me-klong, peopled by Chinese merchants, fishermen, and gardeners, HIgher up the river, at the foot of the hills, is Prapri, peopled by descendants of Cambodian captives. Pechaburi, a little to the south, at the foot of a range some 1500 feet high, where the king has a palace, is built after English designs; its inhabitants are Peguans. Petriu, ou the east side of the Gulf of Siam, on the Kharayok river, has sugar plantations cultivated by Chinese. At Bangplasoi, at the mouth of the river, are extensive fisheries. Raheng, some 300 miles up the Me-nam, possesses docks, and there a good many teak ships are built, In the Lao or Shan country to the north Chieng-mai (Zimmé) is the most important tributary state. Its capital, Chieng-mai, the Jan- gomai of early European travellers, is the principal town of that region, with broad streets of good teak-built houses, surrounded with gardens, numerous pagodas, markets, and a large population, It lies in the wide fertile valley of the Me-ping, and is a great entrepot of trade from Bangkok and south-west China (Yuu-nan and Ssmao), which finds its natural outlet thence to the Bay of Bengal. The rice, timber, &c., of the districts through which this route passes are considerable. Lapong, in the same valley, and Lagong, on a neighbouring tributary, are Lao towns of less importance and subordinate to Chieng-mai, as were formerly Nan and Pre, fertile teak – producing valleys to the east. Kiang- hai and Kiang-sen, farther north, on the Me-kong, were old Lao capitals of note (see SHANS), as was Luang Prabang, with its charm-*~~

~~*'ing capital, which, like Chieng-mai, still retains some administra-*~~

~~*tive independence. The extensive fertile and partly wooded plains to the north and east support great herds of cattle. With Vien- chang, a little lower down the river, Luang Prabang held its own for centuries against both Siam and Burmah. On the destruction of Vicn-chang in 1828, Nangkoi, 25 miles lower down, increased in size and importance, and now has an extensive trade in English and Chinese goods, This district might perhaps without much difficulty be opened up by an easy route starting*~~

~~*from Lakhon, only 180 miles distant from the sea. One of the most important provincial centres is the district of Korat, on the eastern plateau. The country is a series of fertile oases separated by tracts of waterless forest, contain- ing good timber, and full of game. The town is fortified, and has about thirty pagodas and some well-built houses, belonging chiefly to the Chinese merchants. Cart roads converge hither with the traffic both of north Laos and of the Cambodian provinces south and east, the latter passing up the fertile Moun valley on its way to Bangkok. The whole region between the Dang-rek Mountains and the Moun river is full of splendid ruins, attesting the former Cambodian influence as far at least as 16° north, to which limit, therefore, the southward movement of the Laos may be supposed to have reached at the date of these buildings. The principal ruins of the district are found at Korat, Bassac, Phimai, and Ku- khan. The character of this wonderful series of buildings, the greatest of which, those of Angkor, are on Siamese territory, have been touched on under Campopra (q.v.), to which they properly belong ; but it may be mentioned here that the earliest inscription yet found, relating to the erection of a Sivaite linga, is interpreted as belonging to 589 saka = 667 A.D., though another, undated, refers to three generations earlier. The earliest references indisputably Buddhist that have been found are three centuries later than this. With the exception of a few schools in the capital, education is entirely in the hands of the priests, the boys going to the temples between the ages of eight or nine and thirteen. The teaching is elementary, and, by the precepts of Buddhism, must be gratuitous, the pupils repaying it by menial services in house or boat or garden, or by presents of food. At thirteen the boy enters on a novitiate, which lasts till the age of twenty-one ; but, if not inclined for study, he may give it up after three or four months,—this tem- porary consecration symbolizing a separation from the world. At twenty-one, if so disposed, he may enter the priesthood ; but there are no perpetual vows. Girls are taught, if at all, only at home, by parents or brothers. There are no educational endowments ; but a certain number of persons occupy themselves with literary studies, as history, astrology, or alchemy, with which medicine is more or less combined. Medical practice, indeed, comprises a good deal of magic; but there is also considerable knowledge of medicinal herbs, and ancient medical works were written in Pali. Inocula- tion was long ago introduced by the*~~

~~*Chinese, and vaccination lately by European missionaries. Women after childbirth are exposed for some time to the heat of a strong fire, the result being sometimes fatal. . Skill is shown in the casting of large metal statues 50 feet high or more, in repoussé work in gold and silver, in enamelling on metals, and in gold and silver tissue work. Their drawing is spirited, but strictly conventional. The system of music is elabo- rate, but with no written notation. There is no harmony, but all the instruments of the orchestra play in unison, breaking off into*~~

~~*variations and then returnin g to the air. They are proud of their national music, and both men and women play and sing generally.*~~

~~*. Their instruments arc— a harmonicon with wooden or metal bars*~~

~~*struck with a hammer, a two-stringed and a three-stringed violin, flutes, drums, and 'pipes, also the Lao "organ," the tones of which, produced by metal tongues in the pipcs, are very effective. –*~~

~~*The Buddhism of Siam is the same as that of Ceylon, with slight Religion,*~~

~~*doctrinal differences, much insisted on, from the Burmese, It is,*~~

~~*it The religious re- d by King Phra Mongkut, himself for many years a*~~

~~*The former attach more weight to the obser- vance of the canon than to meditation, 'he other sect is again divided into two parties, the one holding more to meditation, the other to the study of the scriptures. The only Brahmanical temple remaining in the country is at Bangkok, and its priests are said to be of Indian descent. Brahmans, however, are constantly employed in divination, in fixing the fortunate days for warlike expeditions, business transactions, marriages, and the like, and in arranging festivals, Buddhism is corrupted by a general worship or propitiation of nats or phees (spirits or demons) ; superstition in the more remote districts constitutes practically the only reli- gion. The belief in*~~

~~these spirits informs and affects every depart- ment of life. There are local earth divinities to whom temples or shrines are erected. Others with human or animal form dwell in the water. Others cause children to sicken and die. Others wander and deceive as ignes fatui. By certain spells men can become tigers or were-wolves. Bodies of the dead are sometimes possessed, and they are carried out not by the door but by an extemporized opening, so that they may not be able to find their way back. The numerous offerings and honours paid to' these spirits lead to drunkenness and to 'lling of animals in sacrifice, Phallic worship prevails to a considerable extent, notwithstanding the efforts of the king to put it down.~~

~~The numerous public festivals are partly connected with religion, Festivals,~~

~~but are accompanied with much rejoicing and amusement. Among them are the lunar and the fixed New-Year's Day, and the festival of agriculture, when the plough is guided by the minister, the ladies of the court following and sowing seeds, which are picked up by the people to add to their usual sowings. At the ceremony at which the king and his ministers pledge themselves, the former to administer impartial justice, the latter to be faithful and loyal in their service, the oath is taken by drinking water, and the meet- ing of the king and nobles, with all the attendant paraphernalia, forms a gorgeous spectacle, the day terminating with fireworks and processions of boats. On the king's state visits to the wats there are festive processions of boats and troops. Other festivals are at the beginning and end of the rainy season. When the floods begin to subside there is a great water procession, and the priests command the waters to retire. Even the cutting of the kin g's hair is madc an occasion for rejoicing. In every family the cutting, at the age of twelve or thirteen, of the tuft left on the top of the head is a ereat ceremony ; itis not practised, except by way of imitation, among the Laos. The head is considered very sacred (this is a characteristic Papuan notion); no one must touch it, nor may it be raised above that of a superior, as in a carriage or boat. The funeral ceremonies of a prince or great man, often delayed for some months after death, are also attended by elaborate feasting, dancing, and other amuse- ments in temporary buildings erected~~

~~*for the purpose. The dead, with the exception of the poor, whose bodies arc given to the vul- tures and wild beasts, and women who die in childbirth, are usually burned within the wats, the ashes being preserved, or mixed with lime to plaster the sacred walls. A rich man will often bequeath a limb to the birds and beasts.*~~

~~*The Siamese month is lunar, and, as a Junar month contains 294*~~
~~*Calendar.*~~

~~*days, they give the odd months 29 and the even 30. This gives*~~

~~*History.*~~

~~*854*~~

~~*a year of 354 days, and to make up the deficiency they intercalate seven or eight months in nineteen years, and add besides an occa- sional day to the seventh month. The years are denoted by a cycle of twelve names (of animals) taken in decades, so that every sixtieth year the year of a given name returns to the same place in the decade. The system resembles the Indian cycle of sixty years, but it is derived from China, where it dates from 2637 B.c. Two eras are in use, the Putta Sakarat or Buddhist, used in reli- gious matters, which commences 5438 B.c., and the civil era or Chula Sakarat (7.¢., little era), said to commemorate the establish- ment of Buddhism in 638 A.p. The ancient Aryan inscriptions usually employ the Saka (Salivahana) era, dating from 79 A.D. History.—The name "Siam" has been usually derived from a Malay word, sajam, "brown"; but this is mere conjecture. They and the Shans both call themselves Thai (Shan Zaz), 7.e., "free," and the Peguans call them Shan or Shian, which seems to be a translation of "Thai" and an allied word, as are perhaps Ahom= Assam, and Sam (Assamese for Shan). The obsolete Siamese word is Siem and the Chinese Sien-lo,—the Sien being, according to them, a tribe which came from the north about 1341 and united with the Lo- hoh, who had previously occupied the shores of the gulf, and were probably Shans, The Siamese call the Shans Thai-nyai, " Great Thai," perhaps as having preceded them, and themselves That-not or "Little Thai." They are probably therefore closely related, though this is disputed by De Rosny and others; but the inferior physique of the Siamese may be*~~

~~*explained as due to intercourse with Malays and other southern races and to their more enervating climate. Meanwhile for many centuries before the southward move above referred to the entire south as well as south-east of the Indo-Chinese peninsula' was Cambodian. The town of Lapong is said to have been founded in 575, and the half-mythical king, Phra Ruang, to have freed the Siamese from the Cambodian yoke and founded Sang- kalok, on the upper waters of the Me-nam, in the following century. Buddhism is said to have been introduced in his time, but Indian influences had penetrated the country both from the north and from the south long before this. Other Lao towns were built about the 7th century, and during the following centuries this branch of the race gradually advanced southwards, driving the Karens, Lawas, and other tribes into the hills, and encroaching on what liad hitherto been Cambodian territory. Their southward progress may indeed almost be traced by their successive capitals, several of which are clustered on the Me-nam within a short distance of each other, viz., Phitsalok, Sukkothai, and Sangkalok on the eastern branch, Nakhon Savan at the junction, and Kamphong-pet, the immediate precursor of Ayuthia, on the western branch. A Sukkothai inscrip- tion of about 1284 states that the dominions of King Rama Kamheng extended across the country from the Me-kong to Pechaburi, and thence down the Gulf of Siam to Ligor; aud the Malay annals say that the Siamese had penetrated to the extremity of the peninsula before the first Malay colony from Menangkabu founded Singapore, i.¢., about 1160. The ancestors of the Siamese were then on the western branch of the Me-nam, and in 1351, under the famous Phaya Uthong (afterwards styled Phra Rama Thibodi, and prob- ably of a Shan family) moved down from Kamphong-pet, where they had been for five generations, to Chaliang ; and, being driven thence, it is said, by a pestilence, they established themselves at Ayuthia. This king's sway extended to Moulmain, Tavoy, Tenasserim, and the whole Malacca peninsula (where among the traders from the West Siam was known as Sornau, 7.¢., Shahr-i-nau or Newtown, probably in allusion to Ayuthia,—Yule's Afarco Polo, ii, 260), and was felt even in Java. This is corroborated by Javan records, which describe a " Cambodian" invasion about 1340; but Cambodia was itself invaded about this time by the Siamese, who took Angkor and held it for a time, carrying off 90,000 captives. The great southward expansion here recorded, whether of one*~~

~~*or of two allied Thai tribes, confirms in a remarkable way the Chinese statement above mentioned, and was probably a conseqnence or a part of the great contemporaneous activity of the more northern Shan kingdom of Mau. The wars with Cambodia continued with varying success for some 400 years, but Cambodia gradually lost ground and was finally shorn of several provinces, her sovereign falling entirely under Siamese influence. This, however, latterly beeame displeasing to the French, now in Coehin China, and Siam has been obliged to reeognize the proteetorate forced on Cambodia by that power. Vigorons attaeks were also made during this period on the Lao states to the north-west and nortli-east, followed by vast deportation of the people, and Siamese supremacy was pretty firmly established in Chieng-mai and its dependencies by the end of the 18th century, and over the great eastern capitals, Luang Prabang and Vien-chang, about 1828. During the 15th and 16th centuries Siam was frequently invaded by the Burmese and Peguans, who, attracted probably by the great wealth of Aynthia, besieged it more than once without success, the defenders being aided by Portuguese mercenaries, till about 1555, when the city was taken and Siam reduced to dependence. From this condition, however, it was raised a few years later by the great conqueror and national hero Phra Naret, who after subduing Laos and Cambodia invaded*~~

~~*SLAM*~~

~~*Pegu, which was utterly overthrown in the next century by his successors. But after the civil wars of the 18th century the Burmese, having previously taken Chieng-mai, which appealed to Siam for help, entered Tenasserim and took Mergui and Tavoy in 1764, and then advaneing simultaneously from the north and the west captured and destroyed Ayuthia after a two years' siege (1767).*~~

~~*The intercourse between France and Siam began about 1580 under Phra Narain, who, by the adviee of his minister, the Cephalonian adventurer Constantine Phaulcon, sent an embassy to Louis XIV. When the return mission arrived, the eagerness of the ambassador for the king's conversion to Christianity, added to the intrigues of Phaulcon with the Jesuits with the supposed intention of establish- ing a French supremacy,*~~

~~led to the death of Phauleon, the persecu- tion of the Christians, and the cessation of all intercourse with France. An interesting episode was the active intercourse, chiefly commercial, between the Siamese and Japanese Governments from 1592 to 1632. Many Japanese settled in Siam, where they were much employed. They were dreaded as soldiers, and as individuals commanded a position resembling that of Europeans in most Eastern countries. The jealousy of their increasing influence at last led to a massacre, and to the expulsion or absorption of the survivors. Japan was soon after this, in 1636, closed to foreigners ; but trade with Siam was carried on at all events down to 1745 through Dutch and Chinese and occasional English traders. In 1752 an embassy came from Ceylon, desiring to renew the ancient friendship and to discuss religious matters. During recent agitations of the Buddhist priests against Christianity in Ceylon they received much active sympathy from Siam. After the fall of Ayuthia a great general, Phaya Takh Sin, collected the remains of the army and restored the fortunes of the kingdom, establishing his capital at Bangkok ; but, becoming insane, he was put to death, and was succeeded by another successful general, Phaya Chakkri, who founded the present dynasty. Under him Tenasserim was invaded and Tavoy held for the last time by the Siamese in 1792, though in 1825, taking advan- tage of the Burmese difficulty with England, they bombarded some of the towns on that coast. The supremacy of China is indicated by occasional missions sent, as on the founding of a new dynasty, to Peking, to bring back a seal and acalendar. But the Siamese now repudiate this supremacy, and have sent neither mission nor tribute for thirty years, and yet their trading vessels are admitted to the Chinese free ports, like those of any other friendly power. The late sovereign, Phra Paramendr Maha Mong- kut, was a very accomplished man, an enlightened reformer, and devoted to science; his death indeed was caused by fatigue and exposure while observing an eclipse. Many of his prede- cessors, too, were men of different fibre from the ordinary Oriental sovereign. Chao Dua, the adversary of Phanlcon, went about seek- ing pugilistic encounters. He is reported to have been a crnel tyrant and debauchee and a keen sportsman ; but the offence given to his subjects in the latter character and the evil reports of the persecuted French missionaries may have unduly blackenced his reputation.~~

~~*Of European nations the Portugnese first established intercourse with Siam. This was in 1511, after the conquest of Malacea by D'Albuquerque, and the intimacy lasted over a century, the tra- dition of their greatness having hardly yet died out. They were supplanted gradually in the 17th century by the Dutch, whose intercourse also lasted for a similar period; but they have left no traces of their presence as the Portuguese always did in these countries to a greater extent than any other people. English traders were in Siam very early in the 17th century ; there was a friendly interchange of letters between James I. and the king of Siam, who had some Englishmen in his service, and, when the ships visited '*Sia"' (which was "as great a city as London") or the queen of Patani, they were hospitably received and accorded privileges, — the important items of export being, as now, tin, varnish, deer- skins, and "' precious drugs." Later on, the East India Company's servants, jealous at the employment of Englishmen not in their service, attacked the Siamese, which led to a massacre of the English at Mergui in 1687; and the factory at Ayuthia was abandoned in 1688. A similar attack is said to have been made in 1719 by the governor of Madras. After this the trade was neglected. Penang, a dependency of Quedah, was occupied in 1786, and in the 19th century the stagnation of trade led to the missions of Crawford (1822), Burney (1826), and Sir J. Brooke (1850); but they were not very cordially received, and effected little. Sir J. Bowring's treaty in 1856, however, put matters on a different footing, and Europeans can now reside in Siam, buy or rent houses, and lease land. The export and import duties are also fixed, and there is a vice-consular court at Chieng-mai, with appeal to the consular court at Bangkok, held from time to time by a judge from Singapore, with which place there are extradition arrangements. Of late years the north-eastern provinces have been harassed by invasions of the Lu and Ho, peoples of Chinese extraction, their incursions extend- ing down the Me-kong as far as Nong-kai.*~~

~~*Besides works referred to at the end of article Spans, the chief authorities are La Loubére, Description du Royaume de Siam, 1714 (the best of the old*~~

~~*Lan- guage,*~~

~~*writers) ; Pallegoix, Royawme Thai ou Siam, Paris, 1854; Crawford, Embassy to Siam; Bowring, The Kingdom and People of Siam, London, 1857 ; Bastian, Die Volker des dstlichen Asiens, vols. i., ili., Leipsic, 1867 ; Garnier, Voyage ad' Explora- tion en Indo-Chine, Paris, 1873; Mouhot, Travels in Indo-China, &e. 3; Journ. of Ind. Archip., vols. i., v.; Gréhan, Le Royawme de Siam, Paris, 1870; Réclus Nouvelle Géographie Universelle, vol. viii. ; Bagge, Report on the Settlement of the Boundary between Siam and British Burmah, 1868 ; Satow, Notes of the Intercourse between Japan and Siam in the 17th Century ; Aynionnier, in Excursions et Recon- natssances, Nos. 20-22 (Saigon); Consular Reports, 1884-85. (C. T.)*~~

~~*Language and Literature.*~~

~~*The Siamese language is spoken over the whole of Siam proper. In the Malay peninsula the boundary-line comes down on the west coast nearly as far as Quedah and Perlis, and includes also Junk Ceylon, while on the east coast the population is mainly Siamese as far as Ligor inclusive, and also in Singora Siamese appears to be the ruling language. Its boundary towards Burmah, the Shan and Laos states, and Anam and Cambodia cannot be defined so precisely. There are also in the north-east a number of wild tribes who speak languages of their own. The name by which the Siamese themselves call their language is phdsd thai, or "language of the freemen"; and it probably dates from the period when the Siamese inade themselves independent of Cambodian rule in the 12th century. The Shan tribes, whose language (with those of the Ahom, Khamti, and Laos) is closely akin to Siamese, also use the term tai (only with the unaspirated ¢) for their race and language.*~~

~~*Both in Shan and Siamese the system of tones, which is one of the main features of all the languages of Indo-China, has attained its greatest development. But, while in Shan the tones are not marked in the written language, in Siamese there are distinct signs to denote at least four of the five simple tones (the even tone not being marked) ; and there is further a classification of the con- sonants into three groups, in each of which certain tones pre- dominate. It is always the initial consonant of a word*~~

~~that indi- cates, either by its phonetic power or by the tonic accent super-added or by a combination of the two, the tone in which the word is to be uttered, so that, c.g., a word beginning with a letter of the second class in which the even tone is inherent, and which has the mark of the ascending tone over it, is to be pronounced with the descending tone.! The difficulties caused to a European student of the spoken language by the tones are increased by the greatly expanded vowel-system. In addition to the short and long, there are shortest vowels, sets of open and closed vowels, &c., and a large number of vowel combinations. Owing to the introduction of the Indian consonantal system and the incorpora- tion in it of many letters to express certain sounds peculiar to Siamese, the number of consonants has been swelled to forty-three ; but, while many of these are only used in words adopted from the Sanskrit and Pali, Siamese utterance knows no more than twenty ; kh, g, gh are all pronounced as kh; similarly ph, b, bh as ph, &c., —the language having a predilection for hard letters, especially aspirates. The only compound letters at the beginning of words are combinations of hard letters with J, r, 2, y, while the finals are confined in pronunciation to k, t, p, » (ng), 2, m. This causes a considerable discrepancy between the spelling of words (especially loan words) and their pronunciation. Thus samparn is pronounced sombun, bhashd—phdsd, nagara—nakhon, saddharma—satham, kuSala—kuson, sesha—set, vdra—van, Magadha—Makhot. The foreign ingredients in Siamese are principally Sanskrit, mostly in a corrupted form. The importation of Pali words dates from about the 12th century, when, the country having shaken off the yoke of Cambodia, a religious intercourse was established between Siam and Ceylon. Besides these, there are some Khmér (Cam- bodian) and Malay words.? Exclusive of those foreign importa- tions, Siamese is a monosyllabic language in which neither the form nor the accent or tone of a word determines the part of speech to which it belongs. Homonymous words abound and are only distinguished from one another by the tones. Compare Jan, "white"; dan, "to relate"; lan, "to flatter"; lén, "to smooth" ; lan, "relation." Words are unchangeable and incapable of inflexion. The Siamese are fond of joining two words the second of which is either purely synonymous to or modifies the sense of the first, or is only a jingling addition. There is no article, and no distinction of gender, number, or case. These, if it is at all necessary to denote them, are expressed by~~

~~*explanatory words after the respective nouns; only the dative and ablative are denoted by subsidiary words, which precede the nouns, the nominative being marked by its position before, the objective by its position after, the verb, and the genitive (and also the adjective) by its place after the noun it qualifies. Occasionally, however, auxiliary nouns serve that purpose. Words like "mother," "son," "water" are often employed in forming compounds to express ideas for which the Siamese have no single words; e.g., lak cdén, "the son of hire," a labourer; mé mii, "the mother of the hand," the thumb. The use of class words with nuinerals obtains in Siamese as it does in Chinese, Burmese, Anamese,*~~

~~*1 See A. Bastian, 'Ueber die siamesischen Laut- und Ton-Accente," in Monats- ber. d. k. Akad. d. Wissensch. zu Berlin, June 1867.*~~

~~*2 See Pallegoix, Gramm., pp, 155-156, and Van der Tunk, Bataksch Leesboek, vol. iv. pp. 127-133, 208-214. :*~~

~~*855*~~

~~*Malay, and many other Eastern languages. As in these, so in Siamese the personal pronouns are mostly represented by nouns expressive of the various shades of superior or lower rank according to Eastern etiquette. The verb is, like the noun, perfectly colour- less, — person, number, tense, and mood being indicated by auxiliary words only when they cannot be inferred from the context. — Such auxiliary words are yd, "to be," "to dwell" (present) ; dai, "to have," 7én, '""end" (past); cd, "also" (future) ; the first and third follow, the second and fourth precede, the verb. fai, "to give" (prefixed), often indicates the subjunctive. As there are compound nouns, so there are compound verbs ; thus, cg., pat, "to go," is*~~

~~*Joined to a transitive verb to convert it into an intransitive or*~~

~~*neuter ; and thik, "*to touch," and tong, "to be obliged," serve to form a sort of passive voice. The number of adverbs, single and compound, is very large. The prepositions mostly consist of nouns. The order of the words in a single sentence is subject, verb, object. All attributes (adjectives, genitive, adverbs) follow the word to which they are*~~

~~*subordinated. The following simple sentence may serve as an example of Siamese construction and diction ; m*~~

~~*(time) dn (read) nansii (book) né (this) Zé (end, done) con (should)*~~

~~*Jak-vai (entrust) ki (to) phiienban (neighbours) had (give, cause) khan*~~

~~*(they) dn (read), ¢.¢., "when you have read this book, please give it to your neighbours that they may read it."*~~

~~*The current Siamese characters are derived from the more monu- mental Cambodian alphabet, which again owes its origin to the alphabet of the inscriptions, an offshoot of the character found on the stone monuments of southern India in the 6th and 8th cen- turies. The sacred books of Siam are still written in the Cambodian character, and some have occasionally an interlinear translation in the current Siamese hand.*~~

~~*The study of the Siamese language was initiated in Europe by La Loubére (1687), from whom Dr J. Leyden ("The Languages and Literature of the Indo- Chinese Nations," in Asiatic Researches, vol. x. pp. 158-289, reprinted in Ais- cellaneous Papers on Indo-China, vol. i., 1886, pp. 84-171) has derived much of his information. Leyden's Comparative Vocabulary of the Barma, Malayu, and That Languages appeared in 1810. The first grammar of the language we owe to James Low, Calcutta, 1828. Very useful Grammatical Notices of the Siamese Language, by the Rev. J. Taylor J ones, appeared at Bangkok in 1842. The Grammatica Lingue, Thai of J. B. Pallegoix, Bangkok, 1850, was followed in 1854 by his great Dictionarium in Siamese, Latin, French, and English. An analytical account of the language was attempted by Ad. Bastian in his Sprach- vergleichende Studien, 1870, pp. 191-226. In 1881 L. Ewald brought out at Leipsic his Grammatik der T'ai- oder Siamesischen Sprache. Lastly, Prof. Fr. Miller gave a summary of Siamese grammar in his Grundriss der Sprachwiss- enschaft, vol. ti. part 2, Vienna, 1882, pp. 367-376. A new grammar, by the Rev. 8. George, is in progress. Compare also W. Schott, Ueber die indo- chinesischen Sprachen, insonderhcit das Siamesische, 1856; and BE. Kuhn, Ueber Herkunft und Sprache der transgangetischen Volker, 1883. An English grammar eee in Siamese, and designed for use in schools, appeared at Bangkok in*~~

~~There are no records in Siamese referring to the time antecedent Litera-~~
~~to the settlement of the nation in their present locality, or, in the ture.~~
~~words of Mr Ney Elias, "of earlier date than the founding of their first~~
~~national capital, Ayuthia, at the commencement of the 14th century."4~~
~~The inscription at Sukkothai, said to be of the year 671 of the Siamese~~
~~era, nine years after the invention of the present Siamese characters,°~~
~~cannot be put in evidence as an historical record till a facsimile and~~
~~revised translation shall have been obtained. The few manuscript annals~~
~~mentioned by Bishop Pallegoix have not yet been critically examined ; but~~
~~metrical compositions, contain- ing legendary tales and romances,~~
~~abound and are eagerly studied. The subjects are mostly taken from the~~
~~Indian epics, as in the case of the Rama-kiwn or Ramayana, more rarely~~
~~from Malay or Javanese legend, such as the drama L-hnao. There is a~~
~~great variety of metres, all of which have been described with much~~
~~minuteness of detail by Colonel Low in his article on Siamese literature,~~
~~in Asiatic Researches, vol. xx. pp. 851-373. In their romantic poetry the~~
~~Siamese have a greater tendency to describe than to relate ; their pictures~~
~~of places and scenery are grand and striking and form the best part of~~
~~their poetical conceptions. The great blemish of their poetry consists in~~
~~tedious embellishments and a hankering after indecent and often gross~~
~~allusions, from which but few works, such as Sang Sin Chai and Samut~~
~~Niyai Si Muang, may be said to be free. The titles of the principal~~
~~romances are Hot Sang, Nang Prathom, Sang Sin Chai, Thepha Lin~~
~~Thong, Suwanna Hong, Thao Sawatthi Racha, Phra Unarut, Dara~~
~~Suriwong, Khun Phan, Nong Sip Sang, and the dramas [-hnao and Phra~~
~~Simuang. The plots of some of these have been given by Colonel Low.~~
~~The most popular of the religious books, all of which are translations or~~
~~amplifications from Pali originals, is called Somanakhodom (Cramana_~~
~~Gautama), which is identical with the /Vessantara Jétaka. In~~
~~miscellaneous literature may be mentioned Suphdsit, consisting of 222~~
~~elegant sayings in the accented metre called Klong, and Wuta~~
~~Chindamant (Vritta Chintémani), a work on prosody like the Pali~~
~~Vuttodaya, but treating also of a number of grammatical questions. The~~
~~fable literature is of course largely represented ; the lists, however, are~~

~~3 See 'The Passive Verb of the Thai Language," by F. L. W. von Bergen, Krung Theph Maha Nakhon, 1874.~~

~~4 Sketch of the History of the Shans, Calcutta, 1876, p. 34. ;~~

~~5 Bastian, in Jour. As. Soc. Bengal, vol. xxxiv. p. 27,and Sprachvergleichende Studien, p. 227. a :~~

~~6 See also Pallegoix, Gramm. Lingux Thui, pp. 120-129.~~

~~frequently swelled by the enumeration of siugle fables which are but parts of larger collections.~~

~~The number of works on law is considerable; and it is remark- able that, while in Burmah many Pali codes have currency, not. a single Pali text-book on law should: have been discovered in Siam ; all that we meet with in the law books are a few Pali quotations here and there. Laksana Phra Thammasat Laksana Phua Mia, an introduction to the code of Siamese laws, founded on the Dharma- gastra and on royal edicts, was completed in 1804. It coutains thirty books, at the head of which stands the Phra Thammasat, attributed to Manosdra or Manu, a treatise on the classification of laws. Next comes the Inthaphat, or book of Indra, a guide or exhortation to councillors and judges, and then the Phra Thamnun, or rules for the general conduct of judicial business. Then follow in order the undermentioned sections—disputes, plaints and allega- tions, official rank, classification of people, debt, marriage, criminal law, abduction, slavery, disputes connected with land, evidence, inheritance, examining officers, appeal, disputes as to classification of people, radius of responsibility for burglaries, &c., the thirty-six laws, the royal edicts, trial by ordeal of water and fire, laws of the palace, laws of the priesthood, offences against the king, offences against the people, rebellion, ancient statutes, recent statutes. Only one of these sections, the one on slavery, has been translated into English, by Dr Bradley ; it appeared in the Bangkok Calendar. The whole work has been printed at Bangkok in two volumes. The Kathu Phra Aiyakan, another compendium of laws, contains edicts principally referring to assaults, adultery, and the~~

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ENCYCLOPADIA BRITANNICA

NINTH EDITION

THE

ENCYCLOPADIA BRITANNICA

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XXII

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MDCCCLXXXVII

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ENCYCLOPADIA BRITANNICA. .

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ee a Sir Roperr (1641-1712), may be considered

as the most eminent representative of science and medicine in Scotland towards the close of the 17th century. He was born near Leslie in Fifeshire in 1641. Educated at Edinburgh, Leyden, and Paris, he settled as a physician in Edinburgh and soon rose to eminence. His career is one of marked initiative: he was the first professor of medicine in the university of Edinburgh, and the first president of the college of physicians, and, along with Sir Andrew Balfour, founded the botanic garden. He was also geographer-royal, and his numerous and miscellan- eous writings deal effectively with historical and anti- quarian as well as botanical and medical subjects. He died in 1712.

Amongst Sibbald's historical and antiquarian works may be men- tioned A History of Fife and Kinross (Edinburgh, 1710, and Cupar, 1803), which is still indispensable to the student of local history and antiquities; dn Account of the Scottish Atlas (folio, Edinburgh, 1683); Vindiciw Scotice Illustrate (folio, Edinburgh, 1710); and Description of the Isles of Orkney and Shetland (folio, Edinburgh, 1711 and 1845). See also his Autobiography (Edinburgh, 1833), to which is prefixed an account of his MSS.

SIBERIA (Russ. Sibi7, a word of unknown origin, probably Permian) in the 16th century indicated the chief settlement of the Tatar khan Kutchum,—Isker on the Irtish. Subsequently the name was extended so as to include the whole of the gradually increasing Russian dominions in Asia, and in the first half of the 19th century it Was applied to the immense region stretching from the Ural Mountains to the Pacific, and from the Arctic Ocean to the Chinese frontier and the Kirghiz steppes. This region, however varied in its separate parts, constituted a geographical whole having its own characteristic physical features. The division into Western and Eastern Siberia which naturally came into general use had also a geogra- phical meaning. In 1856, after the annexation of the Amur and Usuri regions, Eastern Siberia was extended so as to include the Russian dominions on the Pacific,

to the “Orenburg region,” or to the “steppe region” ; but, on the other hand, some districts which really belong to Western Siberia were included under this new denomi- nation. What is now called “Siberia” has thus lost its geographical unity. There still remains, however, for the geographer a vast tract of northern Asia which might be included under this general name, as representing some special features characteristic of the region. It would be limited by the Ural Mountains on the west, by the Arctic and North Pacific Oceans on the north and east respect- ively, and on the south by a line broadly corresponding to the 50th degree of latitude, running from the sources of the river Ural to the Tarbagatai range (thus separating the steppes of the Irtish basin from those of the Aral and Balkash basins), thence along the Chinese frontier as far as the south-east corner of Transbaikalia, whence it might be drawn to the Great Khingan, and along it to the upper Zeya (tributary of the Amur) and Udskoi Ostrog on the Sea of Okhotsk. This wide area would be naturally subdivided into Western Siberia (basins of the Ob and Irtish) and Eastern Siberia (the remainder of the region). Western Siberia would include the governments of Tobolsk and Tomsk, as well as the parts of Perm situated to the east of the Ural Mountains, and those northern parts of Semi- palatinsk which belong to the basins of the Irtish and the Tobol*; while Eastern Siberia would include the govern- ments of Yeniseisk and Irkutsk, the provinces of Yakutsk and Transbaikalia, together with the north-western part of the province of Amur and the northern parts of the Maritime Province. In fact, the north-western parts of Manchuria situated between the Argufi and the Great Khingan, as well as the upper parts of the Selenga and the Yenisei (Shishkit) belonging to Mongolia, are so in- timately connected with Eastern Siberia as regards their physical features that it is difficult for the geographer to separate them.

Since the inclusion of Uralsk, Turgai, Akmolinsk, and Admini- Semipalatinsk within the governor-generalship of the strative steppes, the present administrative subdivisions stand as ‘divisions. follows :—

although these latter in reality belong climatically and physically to a quite separate region,—that of the North Pacific littoral; and, as the Russian dominions extended into the Kirghiz steppes, these last were also reckoned

to Siberia, although mostly belonging in their physical features to another geographical domain,—the Aral-Cas- pian depression. Later on these steppes were transferred

1 This natural subdivision has been adopted by P. Semenoff in his valuable sketch of Western Siberia in Picturesque Russia (Jivopisnaya Rossiya), vol. xi.

XXII. — 1

General descrip- tion.

Oro- graphy.

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It is evident that a territory so immense—covering more than 25 degrees of latitude and 120 degrees of longitude— must include a great variety of orographical and climato- logical characters, and that the popular conception which persists in representing Siberia as a snow-clad desert is erroneous. In fact—not to speak of the rich prairies of the middle Amur and the Usuri region, where the wild vine grows freely—we find in Siberia proper the very fertile black earth prairie steppes, or rather pampas, of the Tobol and Ishim,—not mere patches of fertile land, but plains covering some 25,000,000 acres and ready to receive millions of inhabitants; the highlands of the Altai, with their rich valleys, alpine lakes, glaciers, and snow-clad peaks, ~——a country three times as large as Switzerland and pre- senting almost the same variety of aspects; the high plains of Eastern Siberia, where water-melons are grown in the fields during the short but hot

summer; the rich steppes of Minusinsk, profusely adorned with flowers; the lower plateaus of Transbaikalia, embellished with the beautiful Daurian flora and supplying food to hundreds of thousands of cattle; the high inhospitable marshy plateaus of the Selenga and Vitim; vast hilly tracts densely covered with forests, and visited only by hunters and gold-diggers ; and beyond these the frozen tundras of the north,—all these constitute an immense world, with the most striking con- trasts of scenery and vegetation, of manners and customs. In one direction only is the popular conception true: throughout its extension Siberia is the coldest country of the world in consequence of its protracted and exceedingly severe winter. This variety of characters will be best under- stood from the following brief sketch of the orography.

The leading features of the orography of Siberia are so much at variance in our best maps that a few words are necessary to ex- plain the views taken in what follows. The inhabited districts are well laid down; but the immense areas between and beyond these have only been visited by geographers and are mapped only along a few routes hundreds of miles apart. The intermediate spaces are filled according to information derived from native hunters. With regard to a great many rivers we know only the position of their mouths and their approximate lengths estimated by natives in terms of a day’s march. Even the hydrographical network is very imperfectly known, especially in the uninhabited hilly tracts.? The orographical representation of Siberia is no- thing more than a combination of a few surveys and journeys, in which conscious or unconscious hypothesis is resorted to in order to connect the isolated facts. As soon as the river systems of Siberia ‘began to be approximately known, chains of mountains were drawn in all hilly tracts,—higher ones on the ehief watersheds and lower ones along the secondary ones, This representation

eonveyed quite a false idea as to the surface configuration of Siberia. The immense plateaus which play so predominant a part in the

1? Governor-generalships.

- The wide area between the middle Lena and the Amur, as well as the hilly tracts west of Lake Baikal, the Yeniseisk mining region, and many others, are in this condition. An instance of a map distinguish-

ing between surveys and information derived from natives is given on a cartoon of map 4 of Mem. Russ. Geogr. Soc., General Geography, vol, iii.

structure of Asia (as they also do in the western parts of North America) were quite overlooked. Chains of mountains were drawn as if they rose in the midst of plains, where in reality we have either the slopes of one side of the plateaus or border-chains. Lofty mountains appeared where none exist, as, for instance, in those parts of Yakutsk where tributaries of the Lena and the Amur start from common marshes ; and some of the highest chains were re- presented as minor upheavals because they are pierced by rivers descending from the high plateaus to the lowlands. It was ouly by making use of rich unpublished collections of barometrical observations for the calculation of hundreds of heights that many sections of Siberia could be drawn,' and by going into a minute study of topographical materials scattered through the bulky literature of Siberia and certain MS. field-books —the whole con- trolled by personal journeys—that it became possible to arrive at the following general conclusions as to the structure of the country, which may be of service until] more complete surveys shall have given more reliable data. This study has shown how predomi- nant has been the part played in the formation of Siberia by huge swellings of the earth's crust (plateaus), aud how subordinate that played by isolated chains of mountains, which latter are regulated in their direction in north-eastern Asia by the border ridges of the plateaus; and it has enabled us to make out a close connexion be- tween the structure of Central Asia and Tibet and that of north- eastern Asia, and to establish a link between the two.

A vast plateau, beginning in the south at the foot of the gigantie Great semicircular border range of the Himalayas, aud having the lofty plateau,

plateau of Pamir in the west and the little-known high tracts of the upper Hoang-ho and Yang-tse-kiang in the east, extends towards the north-eastern extremity of Asia. Broadly speaking, it has the shape of a South America pointed towards Behring Strait. It attains a width of no less than 1800 miles and an altitude of from 11,000 to 14,000 feet in the south; but both width and altitude diminish towards the north-east. In north- west Mongolia the

average height is but 4000 to 5000 fect, and this diminishes to 3500 feet in the Vitim plateau; while its width is not more than 700 miles in the latitude of Lake Baikal. On the 50th parallel of latitude there occurs in the platean a broad lateral indentation, occupied by Lake Baikal and the plains of Kansk, and this renders the resemblance of the plateau to South America still more striking. This immense plateau is the remainder of a vast and very old continent, which, so far as we know, has not been submerged since at least the Devonian period.> It extends from the Himalayas to the land of the Tchuktchis, but does not of course present a plane surface of the same altitude in all its parts. It is diversified in the following ways. (1) Like other plateaus, it has on its surface a number of gentle eminences (angehdufte Gebirge of Ritter), which, although reaching great absolute heights, are relatively low. These chains for the most part follow a north- easterly direction in Siberia; but in the southern parts of the plateau, as we approach the Himalayas, they seem to assume a direction at right angles (towards the north-west). (2) On the outskirts of the plateau there are several excavations which can best be likened to gigantic trenches, like railway euttings when with an insensible gradient a higher level has to be reached. These trenches for successive geological periods have been the drainage valleys of immense lakes (probably also of glaciers) which formerly spread over the plateau, or fiords of the seas which sur- rounded it. Now the chief commercial routes have been made to follow these trenches to reach the higher level of the plateau. Their steep excavated sides, which have the appearance of chains of mountains to the traveller who follows the bottom of the trench, have often been described as such ; in reality they are merely uni- lateral slopes, which may best be compared with the steep slope of the Jura turned towards the Lake of Geneva. We have examples of such trenches in the valley of the Uda to the east of Lake Baikal (route to the Amur); in the valley of the Orkhon, leading to Urga and Mongolia (route to Peking), with a branch up the Djida ; in the broad depression of the Ulungur leading from Lake Zaisan to Barkul ; and in a few others which have been utilized as

3 A catalogue of heights in East Siberia is given in the appendix to the present writer’s “ Report on the Olekma and Vitim Expedition” (Mem. Russ. Geogr. Soc., General Geography, vol. iii., 1878); also in Petermann’s

Mitth., 1872. The height of Irkutsk, taken as a basis for the catalogue, has been determined since that date by a levelling through Siberia at 1486 feet.

4 “General Sketch of the Orography of Siberia,” with map and sections, and “Sketch of the Orography of Minusinsk, &c.,” by the same writer (same series, vol. v., 1875). The views taken in these writings have been embodied by A. Petermann in his map of Asia, sheet 58 of Stieler’s Hand-Atlas.

5 The great plateau of North America, also turning its narrower point towards Behring Strait, naturally suggests the idea that there was a period in the history of our planet when the continents turned their narrow extremities towards the northern pole, as now they turn them towards the southern.

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routes from the Lena to the Sea of Okhotsk. (8) There are, moreover, two terraces in the plateau,—a higher and a lower, whieh are very well pronounced in TRANSBAIKALIA (q.v.) and in Mongolia. The Yablonovoi range and its south-western continuation the Kentei are border-ridges of the upper terrace. Both rise very gently above it, but have stcep slopes towards the lower terrace, which is occupied by the Nertehinsk steppes in Transbaikalia and by the Gobi in Mongolia (2000 to 2500 feet above the sea). They rise to from 5000 to 7000 feet above the sea; the peak of Sokhondo in Transbaikalia reaches nearly 8500 feet. Several low chains of mountains have their base on the lower terrace and run from south-west to north-east; they are known as the Nertchinsk Mountains in Transbaikalia, and their continuations reach the uorthern parts of the Gobi.?

The great plateau is fringed on the north-west by a series of high

iges of border-ridges, which have their southern base on the plateau aud

their northern at a much lower level. They may be traced from

. the Thian-Shan to the arctic circle, and have an east-north-easterly

direction in lower latitudes and a north-easterly direction farther north. Both the Alai ridge of the Pamir, continued by the Kokshal- tau rauge and the Khan-Tengri group of the Thian-Shan, and the Sailughem range of the Altai (see Tomsk), which is continued, in the opinion of the present writer, in the yet unnamed border-ridge of West Sayan (between the Bei-khem and the Us),? belong to this cate- gory. There are, however, in these border-ridges several breaches of continuity,—broad depressions or trenches leading from Lake Bal- kash and Lake Zaisan to the upper parts of the plateau. On the other hand,there are on the western outskirts of the plateau a few mountain ehains which take a direction at right angles to the above (that is, from the north-west to the south-east), and parallel to the great line of upheavals in south-west Asia. The Tarbagatai Mountains, on the borders of Siberia, as well as several chains in Turkestan, are instances of these upheavals. But, notwithstanding these com- plications, it remains certain that the Alai Mountains, the Khan- Tengri group, the Sailughem range, and the West Sayan are border- ridges of the high plateau fringing it from 70° to 100° E. long. These border-ridges contain the highest peaks of their respective regious ; they are immense walls which render access to the high plateau extremely difficult, unless the traveller follows the above- mentioned trenches. Beyond 100° E. long. the above structure is complicated by the great lateral indentation of Lake Baikal. But around and beyond this lake we again find the same huge border- ridge fringing the platean and turning its steep north-western slope towards the valleys of the Irkut, the Barguzin, the Muya, and the T’chara, while its southern base lies on the plateaus of the Selenga (uearly 4000 feet high) and the Vitim (see TRANSBAIKALIA). The peaks of the Sailughem range reach from 9000 to 11,000 feet above the sea, those of West Sayan about 10,000, In East Sayan is Munku-Sardyk, a peak 10,000 feet high, together with many others from 8000 to 9000 feet. Farther east, on the southern shore of Lake Baikal, Khamar-daban rises to 6900 feet, and the huge dome-shaped, bald summits of the Barguzin and Southern Muya Mountains attain an elevation of 6000 to 7000 feet above the sea- level. The orography of the Aldan region is but little known ; but travellers who journey from the Aldan (tributary of the Lena) to the Amur or to the Seca of Okhotsk have to cross the same plateau and its border-ridge, the former becoming narrower and barely attaining an average altitude of 3200 feet. Whether it projects farther into the land of the Tchuktchis remains unsettled, although the probability is that it does.

in the Baikal Mountains, which run from Irkutsk to Olkhon Island and the Svyatoi Nos peninsula of Lake Baikal, thus dividing the lake into two parts, the great and the little.» The Barguzin Mountains (on the right bank of the Barguzin river) and the Northern Muya range continue them farther to the north-east, and most probably they are prolouged still farther on the left bank of the Aldan.

A strip of alpine region, 100 to 150 miles in breadth, fringes the Alpine north-western border of the plateau beyond the ridges just men- region.

tioned. This constitutes what is called in Eastern Siberia the taiga : it consists of separate chains of mountains whose peaks rise from 4800 to 6500 feet above the sea, beyond the upper limits of forest vegetation (the goltsy); while the narrow valleys afford diffi- cult means of communication, their floors being thickly covered with boulders, or else swampy; the whole is clothed with thick impenetrable forests. The orography of this alpine region is very imperfectly known ; but the chains have a predominant direction from south-west to north-east. They are described under different names in Siberia:—the Altai Mountains (see Tomsx) in Western Siberia, which also belong to this category, the Kuznetskiy Ala-tau and the Us and Oya Mountains in West Sayan (see YENISEISK), the Nijne-Udinsk tazga or gold-mine district, several chains pierced by the Oka river, the Kitoi Alps in East Sayan, the mountains of the upper Lena and Kirenga, the Olekminsk gold-mine district, and the yet unnamed mountains which protrude north-east between the Lena and the Aldan.

A broad belt of elevated plains, ranging between 1200 and 1700 Elevated These plains.

feet above the sea, extends beyond these alpinc regions. plains, which are entered by the great Siberian highway about Tomsk® and extend farther in a south-westerly direction, fringing the Altai Mountains, are the true abodes of Russian colouizers ; they are fertile for the most part, although sometimes dry, and are rapidly being covered with Russian villages. About Kansk in Eastern Siberia they penetrate in the form of a broad gulf south-eastwards as far as Irkutsk. Those on the upper Lena, having a somewhat greater altitude and being situated in higher latitudes, are almost wholly unfitted for agriculture. The north-western border of these elevated plains

cannot yet be determined with exactitude. In the region between Viluisk (on the Vilui) and Yeniseisk a broad belt of alpine tracts, reaching their greatest ele- vation in the northern Yeniseisk ¢aiga (between the Upper and the Podkamennaya Tunguzka) and continued to the south-west in lower upheavals, separates the elevated plains from the lowlands which extend towards the Arctic Ocean. In Western Siberia these high plains seem to occupy a narrower area towards Barnaut and Seini- palatinsk, and it is difficult to say whether they are separated by an abrupt slope from the Aral-Caspian depression.

Farther to the north-west, beyond these high plains, we find a Northern broad belt of lowlands extending as far as the Ural Mountains lowlands.

and the Arctic Ocean. This vast tract, which is now only a few dozen feet above the sea, and most probably was covered by the sea during the Post-Pliocene period, stretches from the Aral-Caspian depression to the lowlands of the Tobol, Irtish, and Ob, and thence towards the lower parts of the Yenisei and the Lena. Only a few separate mountain ranges, like the Byrranga on the Taimyr penin- sula, the Syverma Mountains, the Verkhoyansk and the Khara- utakh ranges, diversify the monotonous surface of these lowlands, which are covered with a thick sheet of black earth in the south and assume the character of barren tundras in the north (see ToBoLskK and YENISEISK),

A typical feature of the north-eastern border of the high plateau is a succession of broad longitudinal? valleys along its outer base, shut in on the outer side by walls of wild mountains having a very

The south-eastern slope of the great plateau of Asia cannot pro- South-perly be reckoned to Siberia, although parts of the province of eastern Amur and the Maritime Province are situated on it; they have slope of

steep slope towards them. Formerly filled with alpine lakes, these valleys have now a flat alluvial soil occupied by human settlements, and are watered by rivers which flow along them before they make theit way to the north through narrow gorges pierced in the mountain-wall just mentioned. This structure is seen in the valley of the Us in West Sayan, in that of the upper Oka and Irkut in East Sayan, in the valley of the Barguzin, the upper

Tsipa, the Muya, and the Tchara, at the foot of the Vitim plateau, as also, probably, in the Aldan.4 The chains of mountains which fringe these valleys on the north-west belong to the wildest parts of Siberia. They are named the Usinsk and the Tunka Alps in East Sayan; the latter, pierced by the Angara at Irkutsk, in all probability are continued north-eastwards ee ee

1 The lower terrace is obviously continued in the Tarim basin of East Turkestan ; but in the present state of our knowledge we cannot determine whether the further continuations of the border-ridge of the higher terrace (Yablonovoi, Kentei) must be looked for in the Great Altai or in some other Tange situated farther to the south. There may be also'a breach of continuity im some depression towards Barkul.

2 See '' Orographical Sketch of Minusinsk, &c.," ut supra.

3 The word "longitudinal" is here used in an orographical not a geological sense. Meglitzki in 1856 and recently M. Chersky have shown that these valleys are not synclinal foldings of rocks; they seem to be erosion-valleys.

- We do not know at present whether the same structure is exhibited in the Altai at the foot of the Sailughem range. The upper Bukhtarma valley Seems, however, to belong to the same type.

Mountains in West Sayan.

quite a different character, climate, and vegetation, and ought plateau.

properly to be reckoncd to the Manchurian region. As already said, we have to the east of the Yablonovoi border-ridge the lower terrace of the high plateau, reaching about 2000 to 2500 feet in Transbaikalia and extending farther to the south-west through the Gobi to East Turkestan. The south-eastern edge of this lower terrace is fringed by a massive border-ridge—the Khingan—which runs in a north-easterly direction from the Great Wall of China to the sources of the Nonni-ula. The traveller crossing it from the west is hardly aware of its existence ; but it has a very steep slope towards the east, and forms a most important boundary for the Manchurian flora, which does not extend over the plateau. The northern parts of the Khingan are quite unexplored; the most northerly point that has been visited is the

sources of the Gai, where the present writer crossed it ou his way to Mergefi; and we have no direct data for determining where it is crossed by the Amur. But, considering the structure of the country on the left bank of the Amur, it appears probable that this river crosses it below Albazin (between Totbuzina and Kuznetsova, where it makes great windings), and the Zeya where it is-joined by the Gilui,—

5 The deep crevice filled up by Lake Baikal would thus appear to be made up of two longitudinal valleys connected together by the passage between Olkhon and Svyatoi Nos.

6 “Levelling of Siberia,” in Jzvestia of the Russian Geogr. Soce., vol, xxi.

Geology.

and Turkestan, they contain layers of coal.

4

the upper parts of the Zeya flowing on the plateau, while the Ud flows at its base ; so that, as shown elsewhere with greater detail,! we must adniit the Okhotsk coast-range to be a continuation of the Great Khingan. The Stanovoi range was drawn on old maps to connect the Okhotsk range with the Yablonovoi ; but the journeys of the great Siberian expedition have shown that in reality no such range exists,—the upper tributaries of the Gilui (tributary of the Amur) and those of the Konam (basin of the Lena) having their sources in common marshes on the plateau.

A narrow alpine region (40 to 50 miles), consisting of a scries of short secondary ridges parallel to the border-ridge, fringes this latter on its eastern slope. Two such plications may be distinguished, corresponding on a smaller scale to the belt of alpine tracts fring- ing the plateau on the north-west. The resemblance is further maintained by a broad belt of elevated plains, ranging from 1200 to 1700 feet, which follow the eastern border of the plateau. The eastern Gobi, the occasionally fertile and occasionally sandy plains between the Nonni and the Sungari, and the rich plains of the Bureya and Selimja in the Amur province belong to this belt, 400 miles in breadth, the surface of which is diversified by the low hills of the Ilkhuri-

alin, the Khutufi, and the Turan. These high plains are bordered on the south-east by a picturesque chain of mountains (the Amur gorge of which has been often described),— the Bureya Mountains (also Little Khingan). lt extends, with unaltered character, from Moukden and Ghirin (Kirin) to Ulban Bay in the Sea of Okhotsk (close by the Shantar Islands), its peaks covered from top to bottom with a rich forest vegetation rising to a height of 4500 to 6000 feet. A lowland belt about 200 miles broad runs in the same direction from south-west to north-east along the outer border of the above chain. The lower Amur occupies the northern part of this broad valley. These lowlands, covered with numberless niarshes and lakes, seem to have emerged from the sea at a quite recent geological period ; the rivers that lazily flow over their surface are still excavating their valleys. They are shut off from the Pacific by an alpine belt as yet but im- perfectly known, in which at least two separate high chains (the Pribrezhnyi and the Tatar) can be distinguished,—their continua- tions probably appearing in SAGHALIN (q.v.), while Kamchatka contains several chains, the orography of which is almost quite unknown.

The geology of Siberia is still but incompletely known ; some detached regions have been explored, while the vast intermediate spaces remain untouched. Viewed broadly," the great plateau with the alpine tracts fringing it on the north-west and south-east is built up of Paleozoic rocks. On the Vitim and Selenga plateaus immense tracts are composed exclusively of granite, grenatite, and syenite, with subordinate layers of gneisses, which very often are mere modifications, more or less stratified, of the granites and syenites. In some of the ridges that run over the surface of the plateau we find a variety of metamorphic slates, with subordinate layers of crystalline limestones. Extensive beds of lava occur in some parts of the plateau, and in the valleys of the rivers layers of Tertiary sands with petrified wood (Cupressonoxylum aleuticum). The plateaus of the Vitim aud the Selenga are covered with erratic boulders brought from great distances and show unmistakable traces of glaciation; and immense lakes-—small in comparison with their former size—and extensive marshes cover large areas. Besides older metamorphic slates and granites, Silurian and most probably Devonian rocks are widely spread on the lower plateau and in the low chains of mountains which rise above its surface. Silver, lead, gold, and iron are found in these mountains, as also precious stones.

Jurassic deposits, yielding many species of fossil insects and plants, occupy several large depressions. They are all of fresh-water origin and were deposited in great lakes. Like the Jurassic beds of China The alpine tracts in the north-west of the plateau are built up of granites, syenites, gneisses, and chiefly of metamorphic slates, the age of which cannot yet be precisely ascertained (Laurentian, and possibly also Silurian, or even Devonian). ‘Talc schists, and especially clay slates, both intersected with veins of quartz, have also a very great development here. The alluvial and glacial deposits of the valleys contain a rich percentage of gold, derived from the trituration of the clay slates and their quartz veins. Conglomerates, belonging probably to the Tertiary period, fill several valleys. Unmistakable traces of glaciers have been found in West and East Sayan, as also in the Olekma and Vitim regions. In the Altai the mountains are built up of granites, syenites, and diorites covered with metamorphic slates belonging to the Laurentian, Silurian, Devonian, and Car- bonifcrous periods. The Jurassic strata on the outskirts are all fresh-water deposits and contain coal, as in Eastern Siberia and China. The Ala-tau are of more modern origin, containing ex- tensive Jurassic beds, no longer deposited in depressions, but entering into the structure of the hills. The elevated plains of Western and Eastern Siberia have a more varied structure. On the Lena

1 ‘ Orographical Sketch of East Siberia,” ué supra. 2 For further details, see the descriptions of the different provinces of Siberia.

and the Yenisei we find Sihwian, Devonian, Carboniferous, and Triassic marine deposits, covered here and there with fresh-water Jurassic. Immense tracts on the upper Lena are covered with horizontal sheets of red sandstone, the age of which is not yet determined, but seems to be Devonian ; while in the government of Irkutsk large areas are covered with Jurassic coal-bearing sand- stones. The same structure is found on the outskirts of the Altai, tlie Carboniferous and older slates having depressions covered with horizontal strata of Jurassic coal-bearing sandstones. The hilly tracts which rise amidst the Eastern Siberian plains on the Angara and Yenisei consist also of granites, syenites, and diorites covered with Paleozoic rocks up to the Carboniferous, while Jurassic strata are found in

the Vilui Mountains. The broad lowlands of Western Siberia are covered throughout with Post-Pliocene deposits which conceal the older rocks, — shells from this period having been found as far south as Omsk (55° N. lat.). The lowlands and plains of Eastern Siberia exhibit a greater variety of structure,—Carbon- iferous, Triassic, marine Jurassic, and Chalk deposits being mct with both in the deeper ravines and in the few ridges which appear beyond 60° N. lat. Extensive layers of fresh-water Tertiary have been found in depressions of the plateau, in some valleys of the alpine region, and in the plains and lowlands.

There has becn much discussion as to the extent of the glaciers Glacia- in Siberia during the Glacial period,—the want of polished and tion.

scratched surfaces like those of Scandinavia having been urged as proof that they cannot have been considerable. It must neverthe- less be held that the high plateau was at one time covered with a vast ice-sheet, and that in the alpine regions of the Altai, Sayan, Olekma, and Aldan glaciers had a much greater extension than at present, descending in the valleys to at least a level of 2000 feet above the sea, and covering the subordinate swellings between the mountain ranges. Thick layers of Post-Glacial deposits, indicating a climate somewhat more genial than the present, and containing numberless remains of extinct mammals, are extensively spread both in valleys throughout the lowlands and on the islands of the Arctic Ocean ; while in the tundras of the north well-preserved carcases of the mammoth and rhinoceros are occasionally found in the frozen soil. Traces of Paleolithic man have not as yet been met with in Siberia; but relics of the Neolithic period are exceedingly numerous. One may almost say that they have been found wherever they were looked for, especially on the banks of the numberless lakes be which Siberia was dotted during the Lacustrine period (see elow).

Volcanic formations, so far as is known, appear chiefly along the Vol- north-western border-ridge of the great plateau. Hjections of basaltic canoes,

lava have been found on the southern slope of this ridge, extend- ing over wide areas on the plateau itself, on a stretch of more than 600 miles,— namely, in East Sayan about Lake Kossogol and in the valley of Tunka

(river Irkut), in the vicinity of Selenghinsk, and widely spread on the Vitim plateau (rivers Vitim and Tsipa). Extensive layers of trap cover more than 1200 miles along the Tunguzka ; they appcar also in the Noril Mountains on the Yenisei, whence they extend towards the Arctic Ocean. Basaltic lavas are also reported to have been found in the Aldan region. On the Pacific slope extinct volcanoes (:nentioned in Chinese annals) have been found in the Ilkhuri-alin Hills to the east of Mergefi.

The mineral wealth of Siberia is considerable. in almost all the alpine regions fringing the great plateau, where clay slates, talc slates, and dioritic slates, intersected by quartz veins, make up the bulk of the mountains. The chief gold-mining regions in these tracts are the Altai, the upper (or Nijne-Udinsk) and the lower (or Yeniseisk) taigas, and the Olekmaregion. Gold is found on the high plateau in the basin of the upper Vitim, on the lower plateau in the Nertchinsk district, and on the upper tributaries of the Amur (especially the Oldoi) and the Zeya, in the north-east con- tinuation of the Nertchinsk Mountains. It has been discovered also in the Bureya range, and in its north-east continuation in the Amgufi region. Auriferous sands, but not very rich, have been dis- covered in the feeders of Lake Khangka and the Suifun river, as also on the smaller islands of the Gulf of Peter the Great. Silver and lead ores are found in the Altai and the Nertchinsk Mountains, as well as copper, cinnabar, and tin. Iron-ores are known at several places on the outskirts of the alpine tracts (as about Irkutsk), as well as in the Selenghinsk region and in the Altai. The chief iron- works of the Urals are situated on the Siberian slope (see URAL). Coal occurs in many Jurassic fresh-water basins,—namely, on the outskirts of the Altai, in south Yeniseisk, about Irkutsk, in the Nertchinsk district, at many places in the Maritime Province, and on the island of Saghalin. Beds of excellent graphite have been found in the Kitoi Alps (Mount Alibert) and in the Turukhansk district. Rock-salt occurs in thinner deposits at several places on the Lena and in Tiensbaikalia, and salt-springs are numerous,— those of Ust-kut on the Lena and of Usolie near Irkutsk being the chief, A large’ number of lakes, especially in Transbaikalia and in Tomsk, yield salt. Lastly, from the Altai region, as well as from the Nertchinsk Mountains, precious stones, such as jasper, malachite, beryl, dark quartz, and the like, are exported. The Ekaterinburg

Gold-dust is found Minerals |

SIlBE RIA)

stone- polishing works in the Urals and those of Kolyvaii in the Altai are well known.

The orography sketched above explains the great development of the river-systems of Siberia and the uniformity of their course. The three chief rivers —the Ob, the Yenisei, and the Lena—take their rise on the high platcau or in the alpine regions fringing it, and, after descending from the plateau and piercing the alpine regions, flow for a few thousands of miles over the high plains and lowlands before they reach the Aretic Ocean. ‘The three sinaller rivers of north-eastern Siberia—the Yana, Indighirka, and Kolyma—have the same general character, their courses being, however, much shorter, as in these latitudes the plateau approaches the Arctic Ocean. The Amur, the upper tributaries of whieh rise in the eastern border-ridge of the high plateau, is similar. The Shilka and the Argufi, whieh form it, flow first towards the north- east, through the bendings of the lower terrace of the great plateau ; from this the Amur descends, traversing the Great Khingan and flowing down the terraces of the eastern slope towards the Pacific. A noteworthy feature of the principal Siberian rivers is that each is formed by the junction of a pair of great rivers. Examples arc the Ob and the Irtish, the Yenisei and the Angara (itself a double river formed by the Angara and the Lower Tunguzka), the Lena and the Vitim, the Argufi and the Shilka, uniting to form the Amur, which in its turn receives a tributary as large as itself, —the Sungari. Owing to this twofold coniposition and to the circumstance that, the alpine regions once crossed, their course lies over the high plains and lowlands and crosses the few ridges which rise above the plains (as, for example, the Yenisei below Yeniseisk), instead of following the valleys between them, the rivers of Siberia offer immense advan- tages for inland navigation, not only in the line of their main direc- – tion from north to south but also across it, 7.¢., from west to east. It is this circumstance that has facilitated the rapid invasion of Siberia by Russian Cossacks and hunters : they followed the courses of the double rivers in their advance towards the east, and discovered short portages which perniitted them to transfer their boats from the system of the Ob to that of

the Yenisei, and from the latter to that of the Lena, a tributary of which—the Aldan—brought them close to the Sea of Okhotsk. At the present day steamers ply from Tyumefi, at the foot of the Urals, to Semipalatinsk on the border of the Kirghiz steppe and to Tomsk in the very heart of Siberia. And the time is not far distant when the Ob and the Yenisei, both tra- versing the high plains on nearly the same level and separated only by low hills, will be connected by a canal, thus permitting steamers to reach Krasnoyarsk and Irkutsk. As the population becomes denser no difficulty should be found in connecting some of the navigable tributaries of the Yenisei with one of those of the Lena, for they flow within a short distance from onc another on the high plain, and Cossack boats have already been transported from the Yenisei to the Lena. An uninterrupted water communication will then have been established from Tyumefi to Yakutsk, Aldansk, and the gold-mines of the Vitim. Owing to the great plateau separating the Lena from the Amur, no easy water communication can be estab- lished between the latter and other Siberian rivers. The tributaries of the Amur (the Shilka with its affluent the Ingoda) become navi- gable only on the lower terrace of the plateau. But the treneh of the Uda to the cast of Lake Baikal offers an easy access for a railway up to aud across the high plateau ; and at the very foot of its eastern border-ridge lie T'chita, whence boats are floated down (in spring) to the Pacific, and Nertehinsk, whence steamers may ply to the mouth of the Amur, as also up the Sungari to Ghirin and up the Usuri to Lake Khangka. Unfortunately all the rivers are frozen for many months every year. Even in lower latitudes (52° to 55° N.) they are ice-bound from the beginning of November to the beginning of May!; while in 65° N. lat. they are open only for 90 to 120 days, and only for 100 days (the Yenisei) or even 70 days (the Lena) in 70° N. lat. During the cold winter the smaller tributaries freeze tothe bottom, and about 1st January Lake Baikal becomes covered with a solid crust of ice capable of bearing files of loaded sledges.

The chief rivers of Siberia are the following. (1) The Ob (Obi) ' is formed by the confluence of the Biya and the Katufi (400 miles), both of which rise in the Altai Mountains ; it flows north-west and north for 2120 miles, past Barnaut, Tomsk, and Narym, and enters the great Ob Bay of the Arctic Ocean. Its tributary (2) the Irtish, which joins it in 60° N. lat., has an even greater length (2520 miles). It rises in the high plateau, under the name of Black Irtish (500 miles) ; then, descending from the highlands, it enters

Lake Zaisan, whence it flows north and north-west, past Semipalatinsk, Omsk, and Tobolsk, to join the Ob. It receives a great number of tributaries, the chicf being the Tobol, the Ishim, and the Tara. Tyumefi on the last-named will soon be connected by rail with Perm on the Kama, and is already the head of a great line of water communica- tion ; navigation is also open to Lake Zaisan and for a considerable distance up the Black Irtish. The chief tributaries of the Ob are the

1 The Lena at Verkholensk is navigable for 170 days, at Yakutsk for 153 days ; the Yenisei at Krasnoyarsk for 180 days; see Izvestia of the Eastern Siberian Geographical Society, vol. xii. sq.

Anui (160 miles), Tcharysh (230), Tom (450), Tehulym (600), Ket (240), and Sosva (200),—all for the most part navigable. (3) The Yenisei rises on the high plateau in north-western Mongolia, where it is formed by the confluence of two great rivers—the Shishkit and the Bei-khem—and has the name of Ulu-khem. After descending the high plateau on the Chinese frontier, it flows north and enters the Arctic Ocean in a deep bay situated close by that of the Ob. The area of its basin is estimated at 1,380,000 square miles. It receives (4) the Upper Tungnzka or Angara (1100 miles), whieh itself has a basin of 275,000 square miles, (5) the Podkamennaya Tunguzka, and (6) the Lower Tunguzka. The Angara, whose tribu- taries on the left (Irkut, Oka, and Uda) are each large rivers, flows from Lake Baikal (40 miles above Irkutsk) and, describing a huge bend to the north-east, joins the Yeuisei a little above Yeniseisk. (7) The Selenga, which enters Lake Baikal from the east, might be considered as the real source of the Angara. It is a very large river and rises on the high Mongolian plateau, entering Siberia about Kiachta. Its length may be estimated at more than 600 miles; it receives (8) the Uri (outflow of Lake Kossogol), (9) the Orkhon, (10) the Tchikoi (300 miles), (11) the Khilok (800), (12) the Uda (130), and (18) the Djida (200). Lake Baikal has two other con- siderable feeders—the Barguzin and the Upper Angara. (14) The Lena is also an immense river, having an estimated length of not less than 3000 miles. It rises in the Baikal Mountains, some scores of miles from the lake, and flows north and east past Kirensk, Olek- minsk, and Yakutsk. Thence it turns to the north-west and enters the Arctic Ocean, forming a wide delta. It receives several large tributaries—(15) the Vitim, which has a greater length (about 1400 niles)

than the Lena above the point of junction, (16) the Olekma (about 800), (17) the Aldan (about 1800)—which receives in its turn (18) the Utchur (350), (19) the Maya, and (20) the Amga—and (21) the Vilui (about 1800). (22) The Taz (about 750), (23) the Kha- tanga (400), (24) the Anabara (670), and (25) the Olenek (1200), which enter the Arctic Ocean to the west of the Lena, and (26) the Yana (1000), (27) the Indighirka (950), and (28) the Kolyma (1000) to the east of it are also considerable rivers, but small in comparison with the former. (29) The Anadyr enters the gulf of the same name in the Sea of Behring. (80) The Okhota (270) and (31) the Ud (350) are relatively small streams flowing into the Sea of Okhotsk. Of the rivers flowing to the Pacific the chief is (82) the Amur, which is navigable for more than 2400 miles from its entrance into the Tartar Strait (between the mainland and the island of Saghalin) to Sryetensk on the Shilka,—boats being floated from Tehita on the Ingoda. It bears the name Amur after the confluence of (83) the Shilka and (84) the Argufi (see TRANSBAIKALIA) at Ust-Stryelka, and from this point flows east and south-east until its junction with its great tributary the Sungari; thence it flows north-east and north, and finally (for some 50 miles) east, before entering the Pacific. Its length, taking the Ouon for its source, is about 2700 miles, and its basin is at least 785,000 square miles in area, but has diminished recently, —the waters of the Dalai-nor no longer reaching the Argufi. It receives a great many large tributaries,—(35) the Zeya, whose affluent (36) the Selimja is itself a considerable river, (37) the Bureya, (88) the Kur, (89) the Gorin, and (40) the Inn from the left ; while from the right it receives (41) the Sungari and (42) the Usuri, whose affluent, the navigable Sungatcha, brings the Amur into steam communication with Lake Khangka. The rivers flowing into the Sea of Japan are mostly short, only (48) the Suifun being worthy of particular mention.

Numberless lakes oceur in both Eastern and Western Siberia. Lakes.

There are wide areas in the plains of Western Siberia, or on the high plateau of Eastern Siberia, wliere the country may be said to be still passing through the Lacustrine period ; but the total area now under water bears but a trifling proportion to the immeuse extent which the lakes had even at a very recent period, when Neolithic man already inhabited Siberia, All the valleys and depressions bear traces of immense Post-Pliocene lakes. Even

within historical times and during the 19th century the desiccation of lakes has gone on at a very rapid rate. The chief lake is Lake Baikal, more than 400 miles long, from 20 to 53 broad, and 12,480 squarc miles in area. Its surface is 1560 feet above sea-level, and it reaches in its south- west part a maximum depth of 751 fathoms. Another great lake, Lake Kossogol, on the Mongolian frontier, is 120 miles long and 50 broad, 5000 feet above the sea. The large Lake of Oron on the Vitim has not yet becn visited by geographers. Vast numbers of sinall lakes stud the Vitim and upper Selenga plateaus ; the lower valley of the latter river contains the Goose Lake (Gusinoye). In the basin of the Amur are Lake Khangka (1692 square miles), con- nected with the Usuri; Lakes Kada and Kizi, by which the lower Amur once flowed to the Pacific; and very many smaller ones on the left bank of the lower Amur. Numerous lakes and extensive marshes cover the low plains of Western Siberia ; the Baraba steppe is dotted with lakes and ponds,—Lake Tchany (1300 square miles) and the innumerable smaller lakes that surround it being but trifling

2 See Yadrintseff, in Jzvestia of the Russian Geogr. Soc., 1886, No. 1 (with maps).

Coasts and islands.

Climate.

remains of former lacustrine basins; while at the junction of the Irtish and Ob impassable marshes extend for many thousands of square miles. Several alpine lakes, of which the picturesque Telet- skoye may be specially mentioned, fill up the depressions of the valleys of the Altai.

The coast-line of Siberia is very extensive both on the Arctic Ocean and on the Pacific. The former ocean is ice-bound for at least ten months out of twelve ; and, though navigation along its shores has been proved by Nordenskjold to be possible, it is ex- ceedingly doubtful whether it can ever become a commercial route of any importance. The coast-line has few indentations, the chief being the double bay of the Ob and the Taz, separated from the Sea of Kara by an elongated peninsula (Samoyede), and

from the bay of the Yenisei by another. The immense peninsula of Taimyr —a barren tundra intersected by the wild Byrranga Hills—projects in Cape Tcheluskin as far north as 77° 46’ N. lat. The bay of the Yana, east of the delta of the Lena, is a wide indentation sheltered on the north by the islands of New Siberia. The bays of the Kolyma, the Tchaun, and Kolutchin are of little importance. The group of four larger and several smaller islands called New Siberia, situated off the mouth of the Yana, are occasionally visited by a few hunters, as is also the small group of the Bears’ Islands opposite the mouth of the Kolyma. Kellett’s or Wrangel’s Land is still quite unknown. The Strait of Behring at the north-east extremity of Siberia and the Sea of Behring between the land of the Tehuktchis and Alaska, with its great Gulf of Anadyr, are often visited by seal-hunters, and the Commander Islands off Kamchatka are valu- able stations for this pursuit. The Sea of Okhotsk, separated from the Pacific by the Kurile Archipelago and from the Sca of Japan by the islands of Saghalin and Yesso, is notorious as one of the worst seas of the world, owing to its dense fogs and its masses of floating ice. The Shantar Islands in the bay of the Ud are worthy of notice only for their geological interest. The double bay of Ghijiga and Penjinsk, as well as that of Taui, would be useful as harbours were they not frozen seven or cight months every year and covered with dense fogs in summer. The northern part of the Sea of Japan, which borders the shores of the Usuri region, has, besides the smaller Bays of Olga and Vladimir, the beautiful Gulf of Peter the Great, on which stands Vladivostok, the chief Russian naval station on the Pacific (see MARITIME ProvincEr). Okhotsk and Ayan on the Sea of Okhotsk, Petropavlovsk on the east shore of Kamchatka, Nikolaievsk, Konstantinovsk, and Vladivostok on the Sea of Japan, and Dui and Korsakovo on SAGHALIN (q.v.) arc the only ports of Siberia.

Although Siberia is nearly all included between 50° and 72° N. lat.,1 its climate is extremely severe, even in its southern parts. This severity arises chiefly from the orographical structure: the vast plateau of Central Asia prevents the moderating influence of the sea from being felt. The extensive lowlands which cover more than one-half of its area, as well as the elevated plains, lie exposed to the influence of the Arctic Ocean. The warm south-west winds have to cross the elevated plateau of Persia before reaching the Aral-Caspian depression, and there they deposit nearly all their moisture. And, if a current of warmer air flows from the west over Siberia (several

data, such as meteorological observations on Mount Alibert and at the Voznesensk mine in the Olekma region render its existence most probable in Eastern Siberia), it only makes its influence felt in the higher parts of the hilly tracts, by raising the line of perpetual snow in Eastern Siberia to the unusual height of 10,000 feet,? and by elevating by a few degrees the temperature of places situated in the alpine regions above the 3000 or 4000 feet level. The air, after being refrigerated on the plateaus during the winter, drifts, owing to its greater density, down upon the lowlands; hence in the region of the lower Lena we find an exceedingly low tempcrature throughout the winter, and at Ver- khoyansk, in 67° N. lat., the pole of cold of the eastern hemi- sphere.? Nevertheless Siberia enjoys a warm summer; owing to the dryness of the climate, the unclouded sun fully warms the earth during the long summer days in those high latitudes, and gives a short period of warm and even hot days in the immediate neigh- bourhood of the pole of cold. The Siberian winter may be said to last from the end of October until March, and it is exceedingly severe. As early as November mercury freezes in the latitude of Irkutsk (51° to 52° N. lat.), while in December, January, and even February it remains frozen for weeks together in south Siberia. Frosts of – 13° to — 18° Fahr. are not uncommon at Krasnoyarsk, Irkutsk, and Nertchinsk ; even in the warmer southern regions of

1 Only the narrow fringe of the tundras extends beyond 70° N. lat.

2 Although rising to heights ranging from 6000 to 10,000 feet, the mountain peaks of Eastern Siberia do not reach the snow-line, which is found only on the Munku-Sardyk in East Sayan, above 10,000 feet. Patches of perpetual snow occur in Eastern Siberia only on the mountains of the far north. On the Altai Mountains the snow-line is about 7000 feet.

3 The average temperature of winter (December to February) at Yakutsk is —40°°2 Fahr., at Verkhoyansk —53°°1. At the polar meteorological station of Sagastyr, in the delta of the Lena (73° 23’ N. lat.), the following average temperatures were observed in 1882 and 1883—January —34°°3 Fahr. (February — 43°°6), July 40°°8, year 2°°1. The lowest average temperature of a day is —61°°6 Fahr.

Western Siberia and of the Amur the average winter temperature is respectively 2°°4 Fahr. and —10°2; while at Yakutsk and Verkho- yansk the thermometer occasionally falls as low as — 75° and — 85° Fahr. Trees, as observed by Middendorff, become frozen to their very heart, and the axe, which becomes as fragile as glass, can hardly make any impression upon them. Rivers are frozen to the bottom, and water flowing over the ice adds new layers. The soil freezes many feet deep over immense areas even in southern Siberia. The atmosphere becomes laden with frozen vapours. Man, however, successfully resists these rigours, provided he adopts the customary costume of Siberia (two dresses of fur, the upper of which has the hair turned outside), and this all the more as the hardest frosts occur only when an absolute stillness of the air prevails. More dreaded than the frosts are the terrible bwrans or snow-storms, which occur in carly spring and destroy thousands of horses and cattle that have been grazing in the steppes throughout the winter. Although there are very heavy falls of snow in the alpine tracts—especially about Lake Baikal—on the other side, in the steppe regions of the Altai and Transbaikalia and in the neighbourhood of Krasnoyarsk, the amount of snow is so small that travellers use wheeled vehicles, and cattle can find food in the steppe. Spring sets in with re- markable rapidity and charm at the end of April; but in the second half of May come the “icy saints’ days,” so blighting that it is impossible to cultivate the apple or pear. After this short period of frost and snow summer comes in its full beauty; the days are very hot, and, although they are always followed by cold nights, vegetation advances at an astonishing rate. Corn sown about Yakutsk in the end of May is ripe in the end of August. Still, at many places night frosts set in as early as the second half of July. They become quite common in August and September. Nevertheless September is much warmer than May, and October than April, even in the most continental parts of Siberia. By the end of October the rivers begin to freeze, and in the first days of November they are all frozen; even the Amur becomes a high- way for sledges, while the Baikal is usually frozen before the middle of January. The isotherms are exceedingly interesting. That of 32° Fahr. crosses Western Siberia in its middle parts and Eastern Siberia in its southern parts, running through Bogoslovsk, Tobolsk, a little above Omsk and Tomsk, close by Irkutsk, Tchita, Nertchinsk, Blagovyeschensk, and Konstantinovsk. The isotherms of July run as follows. That of 68° Fahr., which in Europe passes through Cracow and Kaluga, here traverses

Omsk, Krasnoyarsk, and Irkutsk, whence it turns north to Yakutsk, and then south again to Vladivostok. Even the mouths of the Ob, Yenisei, Lena, and Kolyma in 70° N. lat. have in July an average temperature of 40° to 50°. Quite contrary is the course of the January isotherms. That of 14° Fahr., which passes in Europe through Uledborg, only touches the southern part of Western Siberia in the Altai Mountains. That of —4° Fahr., which crosses Nova Zembla in Europe, passes through Tobolsk, Tomsk, Krasnoyarsk, and Irkutsk, and touches 45° N. lat. at Urga, turning north in the Amur region and reaching the Pacific at Nikolaievsk. The isotherm of — 22° Fahr., which touches the north point of Nova Zembla, passes in Siberia throngh Turukhansk and descends as low as 55° N. lat. in Transbaikalia, whence it turns north to the Arctie Ocean. one following figures will give a more complete idea of the climate :—

Average Temperature in | Yearly ‘Nebu-

Height “rT above Degrees Fahr. Rainfall losity, ee: Sea in in per- Feet. Year. Jan. July. | Inches. | cent.

Ust Yansk(Yana) 70° 55’ 380 394 | —42°-7 , 56°°0 én Verkhoyansk 67° 84’ 160 2°0 | —56°°0 | 59°8 ore Turukhansk ….| 63° 55’ 70 20°S | -—16°°1 | 59°°5 00 i Berezoff (Ob) 63°56’ | 100 | 23°7 | = 80] 6270 in a Yakutsk.. G2? 2° 520 12°0 | -—46°°7 | 63°°8 on “a Okhotsk. .....) o9 eal 10 CoS c= Oey) acme 96 ie Narym (Ob) ....} 58° 58’ 200 28°°5 | — SO | 67°1 ×0 as Voznesensk mine, 58° 45’ 2800 21°S | -12°5 | 61°°9 es ne Yeniseisk …... 58° 27’ 260 28°°0 -—12°°0 | 66°:0 15°4 55 PLO DOVSIG tec. << <10 58° 12! 160 STO) | = 22 6G eai 12°6 59 MOWMISK isc ss 56° 29° 230 80°9 | — 3°5 |) 66°‘3 fe 59 SUMMA yscercoitare: «cots 56° 6″ 320 81°9 | -— 4°-1] 66°°0 12°6 59 Krasnoyarsk ….| 55° 1’ 560 Ba-0) | — ond.) “6h 0 na ae ISENITNTERS a5 apoo Oo 53° 20° 460 8295 | — 2°°8 | 6rd 9-4 64 Nikolaievsk ….) 53° 8’ 70 O72 | = 9838: | WGle8 | 1s-9 ot RSUES KK. oe css nepcse Spe Me 1486 82°°0 | — 4°°1 | 65°°6 ies 50 Nertchinsk mine] 51° 19’ 2170 25°°8 | —21°°0 | 66°1 154 34 Seimipalatinsk ..| 50° 24’ 590 SOn2) | 8060) Video 9°4 fe Blagovyeschensk, 50° 16’ 370 29°°S | —13°°8 | 69°1 a9 Khabarovka ….| 48° 28! 250 See ||) — 12 se) aes a0 Urga (Mongolia) | 47°56’ | 8770 Qi-°2) | —12°% | 62”6 10°2 30 Vladivostok ….. 43° 7’ 100 40°‘1 4°5 | 67°38 12°6 42

i

The flora of Siberia presents very great local varieties, not only Flora

on account of the diversity of physical characteristics through this wide territory, but also in consequence of the intrusion of new species in various proportions from the neighbouring tracts, as widely different as the arctic littoral, the dry steppes of Central Asia, and the wet monsoon regions of the Pacific littoral. A com- plete description of the flora of Siberia would have to treat of (1)

the high plateau; (2) the alpine tracts—(c) the Altai and (0) East Sayan, with a sub-region to the east of Lake Baikal ; (3) the steppe regions of Western Siberia; (4) the Ishim and Baraba plains of the same ; (5) the high plains of Eastern Siberia, with the sub-region (6) of Minusinsk ; (7) the Daurian flora of the lower terrace of the plateau in Transbaikalia; (8) the Amur; (9) the Usuri and Pacific littoral region ; (10) the arctic tundras, which, as shown by the “ Vega” expedition, may be subdivided into those (a) west of Yenisei and () east of the same to Behring Strait ; and (11) Kamchatka. Each of these has distinct features ; neverthe- less, if the basin of the Amur and Kamchatka be set aside, all have so much in common that the “Siberian flora’”’ may be spoken of as a whole. Siberia is situated for the most part in the great domain which Grisebach describes as the ‘‘ forest region of the Eastern continent.” ! The northern limit of this region must, however, be drawn nearer to the Arctic Ocean. Only a narrow strip, 60 to 200 niles wide (becoming broader in the Taimyr and Samoyede penin- sulas), is totally devoid of tree vegetation. The last trees, it is true, which struggle for existenee on the edge of the tundras are crippled dwarfs and almost without branches ; a few buds each summer are the only evidence that life has not left their frozen stems; and trees a hundred years old are only a few feet long and a few inches thick, concealed amidst lichens. Some 200 speeies of flowering plants are still found in the tundra region,—the frozen ground and the want of humus militating more against them than the want of warmth. From this northern limit to the Aral-Caspian and Mon- golian steppes we have all over Siberia the forest region, where, however, forests are very unequally distributed, covering from 50 to 99 per cent. of

the areas of the separate districts. In the hill tracts and the marshy depression of the Ob they are unbroken, except by the bald summits of the loftier mountains (golésy); they have the aspect of agreeable bosquets in the Baraba ; and they are thinly seattered through the south-eastern corner of Transbaikalia, where the dryness of the Gobi steppe is so much felt; while immense marshy plains covered with the dwarf birch take their place in the north as the tundras arc approached. Over this immense area the trees are for the most part the same as we are familiar with in Europe. The larch becomes predominant and presents itself in two new specics (Laria sibirica and L. dahuriea), The fir appears in the Siberian varieties Picea obovata and P. ayanensis. The silver fir (Abies sibirica, Pinus Pichta) and the stone-pine (P. Cembra) are quite common ; they reach the higher summits, where the last-named becomes a recumbent specics (Cembra pumila), while the larch and the silver fir also acquire a tendeney to spread their side branches instead of rising in height. The willow at high altitudes grows only two inches high, but still bears a few leaves and fully de- veloped flowers, The birch in the loftier alpine traets and plateaus becomes a shrub (Betula nana, B. fruticosa), or in Transbaikalia assumes a new and very elegant aspect with a dark bark (B. dahu- riea). In the decper valleys or on the lowlands of Western Siberia the larches, pines, and silver firs, mixed with birches and aspens, reach a great size, and the streams are fringed with thickets of poplar and willow. The alpine rose (Rhododendron dahwricum) flourishes in large masses on the higher mountains; Juniper, Spirea, Sorbus, the pscudo-acacia (Caragana sibirica and arbor- eseens, C. gubata in some of the higher tracts), various Rosaccw— Potentilla fraticosa and Cotoncaster wniflora—the cherry-plum (Prunus Padus), and many other shrubs fill up the spaees between the trees. Berry-yielding plants are found everywhere, even on the golisy, at the upper limit of tree vegetation; on the lower grounds they are an article of diet to the hunter, and even to the agriculturist, The red whortleberry (Vaceiniwm Vitis idea), the bog whortleberry (V. wliginoswm), the bilberry or cowberry (V. Myrtillus), and the arctic bramble (Rubus arcticus) extend very far northwards; raspberries and red and black currants form a rich undergrowth in the forests, together with the Rives dikusha in Eastern Siberia. The oak, the lime, the maple, disappear to the east of the Urals, to reappear, however, in new varieties on the eastern slope of the border-ridge of the great plateau (timidly pene- trating west for some little distance up the valleys of the Amur and the

Argufi).4| There we have the oak (Q. mongolica), the maple (Acer ginala, Max.), the ash (Fraxvinus manchurica), the elm (Ulmus montana), the hazel (Corylus hetcrophylia), and several other EKuro- pean acquaintances. Farther cast, in the Amur region, a great number of new species of European trees, and even new genera,

1 According to Engler's Versuch einer Entwickelungsgeschichte der Pflanzen- welt (1879), we should have in Siberia—(a) the arctic region ; (b) the sub-arctic or conifer region, —north Siberian province; (c) the Central-Asian domain, —

Altai and Daurian hilly regions; and (d) the east Chinese, intruding into the basin of the Ainur.

2 Middendorff's observations on vegetable and animal life on the borders of and in the tundras—so attractively told in vol. iv. of his Sibirische Reise—will long remain classical.

3M. Kjellmann (Vega Exp. Vet. Iakttagelser) reckons their number at 182; 124 species were found by Middendorff on the Taimyr peninsula, 219 along the borders of the forest region of Olenek, and 344 species within the forest region of the same ; 470 species were collected by M. Maack in the Vilui region.

_3 Nowhere, perhaps, is the change better seen than on crossing the Great Khingan, The change in the flora witnessed by the present writer on his way from Transbaikalia to Mergefi was really astonishing,

such as the cork-tree (Phellodendron amurensis), the walnut (Juglans manchurica), the acacia (Maackia amurcnsis), the graceful climber Maximowiczia amurensis, the Japanese TJ'rochostigna, and many others—all unknown to Siberia proper—make their appearance.

The greatest uniformity prevails on the high plateau, where the larch predominates over all other species of conifers or deciduous trees ; the wide and open valleys—or rather shallow depressions— are covered with Betula nana and B. fruticosa in the north and with thick grasses (poor in species) in its southern and drier parts. The same Siberian larch covers the alpine tracts

fringing the plateau on the north; but the tree assumes different characters in develop- ment and growth according to the physieal features of the region ; and the fir, the stone-pine, the aspen, and the birch also become mixed with it; in the narrow sheltered valleys the forests attain their full development. In the drier parts, on the slopes covered with sand or with a richer soil, the Scotch fir (Pinws sylvestris) makes its appearance. In the alpine tracts of the north the narrowness of the valleys (padz) and the steep stony slopes covered with débris, on which only lichens and mosses can grow, make each green plot of pee (even if it be only of Carex) valuable to the gold-diggers and hunters. For days consecutively the horse of the explorer can get no other food than the dwarf birch. But cven in these dis- tricts the botanist and geographer can easily distinguish between the tcherft of the Altai and the taiga of different parts of Eastern Siberia. The lower plateau exhibits, of course, new characteristics. Its open spaces are lovely prairies, on which the Daurian flora appears in its full beauty. In spring the traveller crosses a sea of grass from which the flowers of the peony, aconite, Orobus, Carallia, Saussurca, and the like rise to a height of 4 or 5 feet. As the Gobi desert is approached the forests disappear, the ground becomes chiefly covered with dry Graminex, and Salsolacce make their appearance on a gravelly clay impregnated with salt. The high plains of the west slope of the plateau are also covered with rich prairies diversified with woods. Nearly all the species of these prairies are common also to Europe (ponies, hemerocallis, asters,

inks, gentians, violets, Cypripedium, Aquilegia, Delphiniwm, acon- ites, irises, and so on); but here the plants attain a much larger size,—so large indeed that a man standing erect is coneealed by the grasses. The flora of Minusinsk—the Italy of Siberia—is well known ; the prairies on the Ishim and of the Baraba (see Tomsk) are adorned with the same rich vegetation, so vividly described by Middendorffand Finsch. Farther north we again reach the domain of forests ; but these once more present new characteristics. They are the wrmans of Western Siberia, into which the hunter does not venture to penetrate far from his village,—immense tracts covered with thickets of trees closely packed and therefore poor in aspect, and often rising from a treacherous carpet of thickly woven grass which conceals deep marshes (zybwny), where even the bear has to tread circumspectly. The prairies of the middle Amur and the rich plains of the

Selimja and Zeya, where Russian Raskolniks are so successful as agriculturists, belong to Manchuria.

The fauna of Siberia is closely akin to that of central Europe ; and the Ural Mountains, although the habitat of a few species which warrant the naturalist in regarding the south Urals as a separate region, are not so important a boundary zoologically as they are botanically. As in European Russia, so in Siberia, three great zones—the aretic, the boreal, and the middle—may be dis- tinguished ; and these, according to M. Syevertsoff,° may be sub- divided into several sub-regions. The arctic (hyperboreal) zone has the same characters as the tundra zones of European Russia, The boreal (cireumboreal) zone, which corresponds to the forest region of Russia, embraces Western Siberia, with the exception of the Urals and the southern steppes, and a notable part of Eastern Siberia,—Transbaikalia and the hilly tracts to the north of it being distinguished as a separate “Eastcrn Siberian” sub-region. The middle zone, extending from south Russia to south Siberia, has two separate sub-regions,—the Ural-Baraba and the Daurian, The zone of the steppes extends from the Caspian Sea through Central Asia, only touching Western Siberia and the neighbourhood of the Gobi in Transbaikalia. Finally, the Amur region shares the character- istics of the north Chinese fauna. On the whole, we may say that the arctic and boreal faunas of Europe extend over Siberia, with a few additional species in the Ural and Baraba region,—a number of new species also appearing in Eastern Siberia, some spreading along the high plateau and others along the lower plateau from the steppes of the Gobi. The arctic fauna is very poor. According to Nordqvist,® it numbers but twenty-nine speeics of mammals, of which seven are marine and only seventeen or eighteen may be safely considered as living beyond the forest limit. Of these, again, four are characteristic of the land of the Tchuktchis. The wild reindeer, the arctic dog (Canis lagopus), the fox, the hare, the wolf. the lemming (Afyodes obcnsis), the collar-lemming (Cunieulus tor- quatus), and two species of voles (Arvicolx) are the most common on land. The avifauna is very rich in migratory water and marsh

5 “ Horizontal Distribution of Animals,” in the Bulletin (lzvestia) of the Society of Friends of Natural Science, vol. viii., 1873. 6 “ Anteckningar och Studier,” &c., in Vega Exp. Vet. Iakt., vol. ii.

fowl (Grallatorcs and Natatores), which come to breed in the coast region; but only five land birds—the ptarmigan (Lagopus alpinus), the snow-bunting, the Icelandic falcon, the snow-owl, and the raven —are permanent inhabitants of the region. The boreal fauna is of course much richer; but here also the great bulk of species, both of mammals and birds, are common to Kurope and Asia. The bear, the badger, the wolverene, the pole-cat, the ermine, the common weasel, the otter, the wolf, the fox, the lynx, the mole, the hedgehog, the common shrew, the water-shrew, and the lesser shrew (Sorcxe vulgaris, fodicns, and pygmaeus), two bats (the long-eared and the boreal), three species of Vespertilio (V. dau- bento, natterert, and mystacinus), the flying and the common squirrel (Zamias striatus), the brown, common, field, and harvest mouse (AZus decumanus, musculus, sylvaticus, agrartus, and minutus), four voles (Arvicola amphibius, rufocanus, rutilus, and schistocolor), the beaver, the variable hare, the wild boar, the roebuck, the stag, the reindeer, the elk, and the Phoca annelata of Lake Baikal,— all these are common alike to Europe and to Siberia; while the bear, the musk-deer (Moschus moschiferus), the ermine and the sable, the ground squirrel (Spermophilus eversmant), Arvicola ob- scurus, and Lagomys hyperboreus, also spread over Siberia, may be considered as belonging to the arctic fauna. In addition to the above we find in Eastern Siberia Afustcla alpina, Canis alpinus, the sable antelope (guccrus sibiricus), several species of mouse (Afus gregatus, ceconomus, and saxatilus), two voles (Arvicola russatus and macrotus), Syphneus aspalax, and the alpine Lagomys, which penetrate from the Central Asian plateaus; while the tiger makes incursions not only in the Amur region but occasionally as far as Lake Baikal. In all, of fifty-seven species of Siberian mammals forty-one are common also to Europe, twenty-seven common to tlie arctic region, and only sixteen special to Asia. On the lower terrace of the great plateau we find an admixture of Mongolian species, such as Canis corsac, Felis manul, Spermophilus dauricus, the jerboa (Dipus jaculus), two hamsters (Cricetus songarus and furunculus), three new voles (Arvicol#), the Tolai hare, the Ogotona hare (Lagomys ogotona), Agocerus argali, Antilope guttwrosa, and Equus hemionus (jighitat) ; while the number of species common to Asia and Europe diminishes notably. The same is true with respect to birds. No less than 285 species have been observed in

Siberia, but of these forty-five only areabsent from Europe. In south-east Siberia we find forty-three new species belonging to the north Man- churian or Amur fauna; and in south-east Transbaikalia, on the borders of the Gobi steppe, only 103 species were found by Radde, among which the most numerous are migratory birds and the birds of prey which pursue them. The rivers and lakes of Siberia abound in fish ; but little is known of their relations with the species of neighbonring regions.!

The insect fauna is very similar to that of Russia; but a few genera, as the Zentyria, do not penetrate into the steppe region of Western Siberia, while the tropical Colasposoma, Popilia, and Lan- guria are found only in south-eastern Transbaikalia, or are confined to the southern Amur. On the other side, several American genera (Ccphalaon, Ophryastes) extend into the north-eastern parts of Siberia.2 As in all uncultivated countries, the forests and prairies of Siberia become almost uninhabitable in summer on account of the mosquitoes. Eastern Siberia suffers less from this plague than the marshy Baraba ; but on the Aiur and the Sungari large gnats become an unsupportable plague, and travellers who have had experience of the mosquitoes of the tropics readily admit that they yield to those of Siberia. Burning the prairie is the only expedient for destroying them, and is freely resorted to, with the result that the forest is frequently set on fire.

In Molluscs Siberia is much richer than had been supposed. The dredgings of the “ Vega” expedition in the Arctic Ocean dis- closed an unexpected wealth of marine fauna, and those of L. Schrenck in the north of the Japanese Sea have led to the dis- covery of no fewer than 256 species (Gasteropods, Brachiopods, and Conchifers). Even in Lake Baikal Dr Dybowski and Dr Godtewski have discovered no fewer than ninety-three species of Gammarides and twenty-five of Gasteropods.? The Sea of Okhotsk is very inter- esting in this respect, owing to its local species and the general composition of its fauna (70 species of Molluscs and 21 of Gastero- pods). The land Molluscs, notwithstanding the unfavourable con- ditions of climate, number about seventy species,—Siberia in this respect thus being not far behind north Europe.

The Siberian fauna is very unequally distributed. The alpine tracts of Eastern Siberia and the wrmans of Tobolsk are from the zoologist’s point of

view exceedingly poor, owing to the want of grass and of a mouldy soil. It is on the plateau, and especially on the lower plateau, as well as on the high plains, where the graz- ing grounds become numerous, that the fauna appears in its full richness. Much remains to be done in the way of investigating

1 Czekanowski (Izvestia Sib. Geog. Soc., 1877) has described fifty species from the basin of the Amur; he considers that these constitute only two-thirds of the species inhabiting that basin.

27. Schrenek, Reisen und Forschungen im Amurlande, 1858-80.

3 Mém. del Acad. des Sc. de St Pétersb., vol. xxii., 1876.

the distribution of animals over Siberia with reference to the physi- cal conditions of its different parts. Although differing little from the European, the fauna of Siberia possesses great interest for the zoologist and geographer. The increase of many animals in size (becoming twice as large as in Europe); the appearance of white varieties among both mammals and birds, and their great prevalence among domesticated animals (Yakut horses); the migrations of birds and mammals over immense regions, from the Central Asian steppes to the arctic coast, performed not only in connexion with the usual rotation of seasons but also as a result of occasional climacteric con- ditions which are not yet fully known (e.g., the occasional migration of thousands and thousands of roebuck from Manchuria across the Amur to the left bank of the river, or the migration of reindeer so well related by Wrangel) ; the various coloration of many animals according to the composition of the forests they inhabit (the sable and the squirrel are well-known instances) ; the mixture of northern and southern faunas in the Amur region and the remarkable con- sequences of that mixture in the struggle for existence ;—all these render the study of the Siberian fauna most attractive. Finally, the laws of distribution of animals over Siberia cannot be made out until the changes undergone by its surface during the Glacial and Lacustrine periods are well established and the Post-Tertiary fauna is better known. The remarkable finds of Quaternary maminals about Omsk and their importance for the history of the Zquidex are but a hint of what may be expected in this field.

The great bulk of the population are Russians, whose number Popuh has increased with great rapidity during the 19th century: although tion, | not exceeding 150,000 in 1709 and 500,000 a century later, they now (1887) number more than 3,000,000, and not far from 4,000,000 if the eastern slopes of the Urals are reckoned to Siberia. At the same time the entire indigenous population does not exceed 700, 000 | if the Kirghizes of Semipalatinsk are reckoned to Turkestan, aud many indigenes are rapidly dying out. The Russians, issuing from Russiat} the middle Urals, have travelled as a broad stream through south immig Siberia, sending lateral branches to the Altai, to the Ili river in tion, Turkestan, and to Minusinsk, as well as down the chief rivers which flow to the Arctic Ocean, the banks of which are studded with vill- ages 15 to 20 miles apart. As Lake Baikal is approached the stream of Russian immigration becomes narrower, occupying only the valley of the Angara, with a series of villages up the Irkut; but it widens again in Transbaikalia, sending lateral branches up the Selenga and its tributaries. It follows the course of the Amur, again in a succession of villages some 20 miles apart, and can be traced up the Usuri to Lake Khangka and Vladivostok, with an extension of villages on the plains between the Zeya and the Selimja. Small Russian settlements also occur on a few bays of the North Pacific and the Sea of Okhotsk, as well as on Saghalin (see SAGHALIN).

The Russians have thus occupied all the best agricultural tracts in Western and Eastern Siberia.

As to the indigenous races, the Ugrian stocks whieh occupy the Indige north-west of Siberia are represented by (1) the Voguls (about 6400), ouszaee on the eastern slopes of the Urals, in Perm and Tobolsk, extending partly over the western slope ; they closely resemble the Ostiaks, in some features approximating the Mongol race, and speak the same language ; (2) the OsTIAks (q.v.); and (3) the SAMOYEDEs (gq…).

Survivals of Turkish stocks, once much more numerous, are spread Turkisii all over south Siberia as far as Lake Baikal. Their territories are stocks, rapidly being occupied by Russians, and their settlements are cut in two by the Russian stream,—the Baraba Tatars and the Yakuts being to the north of it, and the others having been driven back to the hilly tracts. According to

M. Radloff,* they are as follows :— (1) the Karagases in the Yeniscisk and Irkutsk spurs of the Sayan Mountains (about 500); (2) the Abakan Tatars (about 10,000),— driven from the Irtish, they occupied the Abakan steppes after the emigration of the Kalmucks ; (8) those of the Tcholym scattered amidst Russians (500); (4) the Tatars of the north and north-east Altai, in all about 20,000,—(a) the Kumandintsy, (6) the Lebed Tatars, (c) the tcherfi or forest Tatars, (@) the Shorghintses; (5) those of the Altai proper,—(a) Altaians (11,800), (b) Dvoedantsy (2000), who until 1865 paid tribute to both Russia and China, and (c) the Teleutes (5800), mostly Russified; (6) the Soyotes and Uryankhes of East Sayan, of whom a few families are in Siberian territory ; (7) the Baraba Tatars (4650), mostly driven northwards to the forest and marsh region ; (8) the Irtish and Tobolsk Tatars (some 7000 to 10,000 on the Tara and 15,700 in the Tobolsk dis- trict). In all they number about 78,000, to whom should be added a number of Kirghiz from Turkestan. The great Turkish stock of the Yakuts (see YAKUTSK) in the basin of the Lena num- bers about 200,000. Most of these Turkish stocks live by cattle- breeding and some by agriculture, and are a most laborious and honest population. f .

The Mongols (about 350,000) extend into Western Siberia from Mong} the high plateau,—nearly 20,000 Kalmucks living in the eastern Altai. In Eastern Siberia the Buriats occupy the Selenga and Uda, parts of Nertchinsk, and the steppes between Irkutsk and the upper

4 Aus Sibirien, 2 vols., Leipsic, 1884; also in Jivopisnaya Rosstya, vol. xii.

Lena, as also the Baikal Mountains and the island of Orkhon; they support themselves chiefly by stock-breeding, but some of them, especially in Irkutsk, are agriculturists (see TRANSBAIKALIA). On the left of the Amur there are about 10,000 Chinese and Man- churians about tlie mouth of the Zeya, and nearly 3000 Coreans on the Pacific coast. The Tunguses, although few in numbers (50,000), occupy as their hunting-grounds an immense region on the high plateau and its slopes to the Amur, but their limits are yearly becoming more and more circumscribed both by Russian gold-diggers and by Yakut settlers.

Finally, in the north-east we find a group of stocks whose ethno- logical place is not yet accurately determined. They are united into a separate North

Asian linguistic group, and include the Tchuktchis, who may number 12,000, the Koryaks (5000), and the Kamchadales (3000), the Ghilyaks (nearly 5000) of the lower Amur and north Saghalin, and the Ainos (3000) of south Saghalin. The Yukaghirs (1600) scem to be merely Tunguses. Some 5000 Gipsies wander about Siberia.

Much has been written of late about the sad state of the indigen- ous populations of Siberia.! They are pitilessly deprived of their hunting and grazing grounds and compelled to resort to agriculture, —a niodification exceedingly hard for them, not only on account of their poverty but also because they are compelled to settle in the less favourable regions. European civilization has made them familiar with all its worst sides and with nonc of its best. Taxed with a tribute in furs (yasak) from the carliest years of the conquest, they often revolted in the 17th century, but were cruelly reduced to obedience. The tribute was never great (about 14 roubles per head); but the official valuation of furs was always only one-third to one-fourth of their real value and the exactions of the authorities trebled it again. In 1824 the settled indigenes had to pay the very heavy rate of 11 roubles per head, and the arrears, which soon became equal to the sums levied, were rigorously exacted. It must be fully acknowledged that severe measures taken by the Govern- ment in the last two centuries prevented the growth of anything like legalized slavery on Siberian soil; but the people, ruined as they were both by the intrusion of agricultural colonists and by the cxactions of Government officials, fell into what was practically a kind of slavery (kabata) to the merchants. Even the best-inten- tioned Government measures, such as the importation of corn, the prohibition of the sale of spirits, and so on, became new sources of oppression. The action of missionaries, who cared only about nominal Christianizing, had no better effect. It is worthy of notice that the spread of Mohammedanism ainong the Tatars and Kirghizes and of Lamaism among the Buriats took place under the Russians and was favoured by the Government.

The Russians of Siberia differ to some extent from those of the s. mother-country. They might have becn expected to intermix largely with the Finnish, Turkish, and Mongol elements with which they caine in contact ; but, in consequence of causes already mentioned under Russia (vol. xxi. p. 78), the mixture is much less than might be supposed ; and the continuous

arrival of new iminigrants con- tributed to lessen the effects of mixtures which really took place. One is accordingly struck to find in Western Siberia compact masses of Russians who have lost so little of their primitive ethnographical features, and to hear throughout Siberia a language which Miffers from that of northern Russia only by a slight admixture of words borrowed from the natives (mostly relating to hunting or cattle-rearing), and a few expressions of Polish origin. The case is other- wise, however, on the outskirts. Castrén characterized Obdorsk (mouth of the Ob) as a true Samoyedic town, although peopled with '*Russians." The Cossacks of Western Siberia have the features and customs and many of the manners of life of the Kalmucks and Kirghiz. Yakutsk is thoroughly Yakutic; marriages of Russians with Yakut wives are common, and some forty years ago the Yakut language was predominant among the Russian merchants and officials. At Irkutsk and in the valley of the Irkut the admixture

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The natural rate of increase of population is very slow as a rule, and does not excecd 7 or 8 per 1000 annually. The great mortality, especially among children, is one of the causes of this, the birth- rate being also lower than in Russia. In Western Siberia the former is 88 per 1000 in towns and 380 in villages, while the births are 48 in towns and 44 in villages. The climate of Siberia, how- ever, cannot be called unhealthy, except in certain localities where goitre is common (on the Lena, in several valleys of Nertchinsk, aud in the Altai Mountains). The rapid growth of the actual popu- lation is chiefly due to immigration.

Agriculture is the chief occupation both of the settled Russian and Agricul- South Siberia has a very fertile soil and ture.

of the native population. yields rich crops, but immense tracts are utterly unfit for tillage. In the lowlands of Western Siberia it is carried on up to 61° N. lat.2 On the high plains fringing the alpine tracts on the north- west it can be carried on only in the south, farther north only in the valleys, reaching 62° N. lat. in that of the Lena, and in the alpine tracts in only a few valleys, as that of the Irkut. On the high plateau all attempts to grow cereals have failed,—only the wide trenches (Uda, Selenga, Djida), already

described, giving encourage- ment to the agriculturist. On the lower plateau, in Transbaikalia, grain is successfully raised in the Nertchinsk region, — with serious risks, however, from early frosts in the valleys of the mountain- ridges which rise above its surface. South-east Transbaikalia suffers from want of water, and the Buriats irrigate their fields. Although agriculture is carried on on the upper Amur, where land has been cleared from virgin forests, it really prospers only below Kumara and on the rich plains of the Zeya and Selimja. In the depression between the Bureya range and the coast-ranges it suffers greatly from the heavy July and August rains, and from inunda- tions ; while on the lower Amur the agriculturists barely maintain themselves by growing cereals in clearances on the slopes of hills, so that the settlements on the lower Amur and Usuri continually require help from Government to save them from famine. The chief grain-producing regions of Siberia are—the Tobol and Ishim region, the Baraba, the region about Tomsk, and the outskirts of the Altai, which cover an ageregate of 330,000 square miles (155,000

in the Altai); they have a thoroughly Russian population of nearly

2,000,000 inhabitants, aud nearly 8,600,000 acres are under crops. The Tobolsk region, mostly covered with wrmans, but having nearly 1,000,000 acres cultivated, and the northern districts of Semipala- tinsk, which are being rapidly colonized, must be added to the above. On the whole, in the basins of the Ob and Irtish, the annual yield is about 2,850,000 quarters of summer wheat, 1,260,000 of summer rye, 8,240,000 of oats, and 6,000,000 bushels of potatoes. The figures for Eastern Siberia are not so reliable,— about 1,100,000 quarters of various grains in Irkutsk (one-third raised by the Buriats), 400,000 in Transbaikalia, 40,000 in Yakutsk, about 100,000 in the Amur province, and 25,000 in the Maritime Pro- vince; and the Yeniseisk peasants sell every year about 700,000 ewts. of corn. The Minusinsk district, one of the richest in Siberia (45,000 inhabitants, of whom 2800 arc settled and 24,000 nomadic), has more than 45,000 acres under crops ; and in the whole pro- vince of Yeniseisk about 3,000,000 acres are cultivated. Cattle-breeding is extensively carried on in many parts.

horses, 1,500,000 head of horned cattle, 3,000,000 shecp, and 100,000 reindeer; for Eastern Sibcria the figures are approximately 850,000 horses,

1,100,000 horned cattle, 1,120,000 sheep, and about 50,000 reindeer. The industry is, however, carried on in the most primitive manner. In Transbaikalia little hay is made, and the Buriat horses seek their food throughout the winter be- neath the thin sheet of snow which covers the steppes. A single snowstorm in spring sometimes destroys in a few days thousands of horses thus weakened. In Western Siberia the ‘‘Siberian plague” makes great ravages, and the average losses are estimated at about 37,500 head of cattle annually.

In the Cattle- Ob and Irtish region of Western Siberia there are about 2,000,000 breeding.

of Tungus and Buriat blood is obvious, aud still more in the Ner- tchinsk district and among the Transbaikalian Cossacks settled for the last two centuries on the Argufi. They speak the Buriat language as often as Russian, and in a Buriat dress the Argui Cossack can hardly be distinguished from a Buriat. In separate

Bee-keeping is widely diffused, especially in Tomsk and the Bee- Altai. Honey is exported to Russia. The seeds of the stone-pine keeping. are collected for oil in Western Siberia.

Hunting still continues to be a profitable occupation, the male Hunting. population of whole villages in the hilly and woody tracts setting

parts of Siberia, on the borders of the hilly tracts, the mixture with Tatars was quite common. Of course it is now rapidly growing less, and the scttlers who entered Siberia in the 19th century married Russian wives and remained thoroughly Russian. There are accordingly parts of Siberia, especially among the Raskolniks, where the north Russian, the Great Russian, and the Ukrainian types have maintained themselves in their full purity, and only some differences in domestic architecture, in the disposition of their villages, and in the language and character of the population reinind the traveller that he is in Siberia. The Russians in Siberia have emigrated from all parts of European Russia ; but the special features of the language and partly also of the national character are due to the earliest settlers, who came mostly from northern Russia.

) Yadrintseff’s Siberia as a Colony contains a summary of this literature with bibliography.

out in October for a month’s hunting. The sable, however, which forinerly constituted the wealth of Siberia, is now so scarce that four sables per inan is the maximum in the best districts. Squirrels, bears, foxes, snow-foxes, antelopes, and especially deer in spring are at present the principal objects of the chase. But even in Yakutsk the total produce of hunting was in 1879 only 65 sables, 2360 snow-foxes, 28,440 ermines, 140,550 squirrels, 1780 foxes, 145 bears, 1310 reindeer, and 26,780 hares. The forests on the Amur yielded a rich return of furs during the first years of the Russian occupation, and the Amur sable, although much inferior to the Yakutsk and Transbaikalian, was largely exported. In 1862 1800 sables and 40,000 squirrels were killed in the province of Amur,

2 The northern limits of agriculture are 60° N. lat. on the Urals, 62° at Ya- kutsk, 61° at Aldansk, 54° 30’ at Udskoi, and 53° to 54° in the interior of Kam- chatka (Middendorff, Sibirische Reise, vol. iv.).

Fishing.

Manu- factures.

Mining.

Trade.

Com- munica- tion.

and 9300 in the Maritime Province; but in 1877 the total export from the former did not exceed in value £1700 to £2000,

The same falling-off is observable in the fisheries,—one species at least, the Rhytina stelleri, having completely disappeared within the 19th century. Fishing is still a valuable source of income on the lower courses of the great

rivers, especially the Ob, where the yearly earnings amount to about £30,000. The fisheries on Lake Baikal supply cheap food (the om) to the poorer classes of Irkutsk and Transbaikalia. The native populations of the Amur—Golds and Ghilyaks—support themselves chiefly by their fisheries, when the salmon enters in dense masses the Amur and its tributaries.

Though Siberia has within itself all the raw produce neccssary for prosperous industries, it continues to import from Russia with- out exception all the manufactured articles it uses. Owing to the distances over which they are carried and the bad organization of trade, all manufactured articles are exceedingly dear, especially in the east. The manufactories of Siberia employ less than 15,000 workmen, and their aggregate production docs not exceed £1,600,000 in value; of these 11,500 are employed in Western Siberia, the yearly production being about £1,200,000. Nearly one-third of the total represents wine-spirit, 28 per cent. tanneries, 18 per cent. tallow-melting, and a considerable sum cigarette-making. The villages of Siberia do not carry on a variety of petty trades like the villages in Russia, except in the districts of Tobolsk nearest the Urals, where tanning, boot-making, carpet-making, and the like are prosecuted.

Mining is in the same backward state as manufacturing in- dustry. The chief attention is given to gold-mining. But the use of improved machinery is far from common, and the condition of the workmen wretchedly bad,—insufficient food, bad lodgings, and overwork under the most unsanitary conditions. As the geology of the gold-mining districts is quite unknown, immense sums are sunk in futile search. The amount of gold obtained has much increased since mining was begun in the Nertchinsk district and parts of the Altai (a right formerly reserved for the imperial Government), and since the discovery of auriferous deposits in the hasin of the Amur and in the Maritime Province. It reached in 1882 45631b in Western Siberia (nearly all in the Altais), and 58,4201 in Eastern Siberia (about 27,000 in Yakutsk, more than 10,000 in Nertchinsk, and about 8000 in the province of Amur). The Altai mines (12,000 workmen) yielded in 1881 16,670 tb of silver (18,810 in 1882), 18,140 ewts. of lead, 6700 of copper (the last two decreasing itenis), 8200 of iron, 240,000 of coal, and about 820,000 of salt. Silver-mining is almost entirely abandoned in Nertchinsk, and in 1882 only 1900 Ib were extracted.

Trade is in the hands of a few merchants. The chief market is the Nijni-Novgorod fair, where Siberian merchants get twelve or eighteen months' credit at correspondingly high rates.!_ Prices on the Amur are not more favourable, since the trade by sea is pre- vented from developing owing to the facility with which great pro- fits are made by the exchange of wine-spirit and sables for whisky, The villages are in a still worse condition, whole populations being dependent for the necessaries of life upon a few merchants. The foreign trade is insignificant, and the hundred merchant ships (thirty English) which visited the port of Vladivostok in 1888 came chiefly for the needs of the garrison. The imports of manufactured wares from Russia amount to an annual value of £12,000,000; the corresponding exports of raw produce are only about £4,000, 000, —tallow, hides, furs, and grain being the chief items. There are several great fairs in Siberia, that of Ivbit (with an annual turnover of £5,000,000 to £7,000,000) being the most important. Those of Ishim, Tomsk, Irkutsk, and Verkhne-Udinsk deserve mention. In the north and north-east several fairs, where natives gather to pay tribute, to sell furs, and to purchase food and necessaries for hunt- ing, have a local importance.

The main line of communication is the great Moscow road. It starts from Perm on the Kama, and, crossing the Urals, reaches Ekaterinburg—the centre of mining industry—and Tyumefi on the Tara, whence steamers ply via Tobolsk to Tomsk.

1 Salt in the Altai region (where it is obtained) is retailed at 2 roubles 40 co-pecks the pud (4s. 10d. for 32 tb); sugar, which is sold at 7 to 8 roubles the pud in Western Siberia (14s. to 16s. the 82 ib), reaches 12 to 20 roubles in Transbai- kalia, and occasionally 40 roubles at Yakutsk.

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Shilka, whence steamers ply to the mouth of the Amur and up the Usuri and Sungatcha to Lake Khangka. When the rivers are frozen communication is maintained by sledges on the Amur; but in spring and autumu the only continuous route down the Shilka and the Amur, to its mouth, is on horseback along a mountain path (very difficult across the Bureya range). On the lower Amur and on the Usuri the journey is also difficult even on horseback. On the whole the steamer communication is in an unsatisfactory

state, and when the water on the upper Amur is low vessels are sometimes unable to reach the Shilka. The Yenisei is navigated as far as Minusinsk, and communication is maintained along its banks in the summer by boat and horse. The Angara offers great difficulties to navigation on account of its rapids; regular water communication begins only below these and is continued to its mouth. On the Lena, which is an important waterway from Kirensk, merchandise is shipped for the gold-mining companies on the Lena below the Vitim, and sometimes up the lower Vitim. Another route of importance before the conquest of the Amur is that which con- nects Yakutsk with Okhotsk or Ayan. Regular postal communica- tion is maintained by the Russians between Kiachta and Kalgan (close by Peking) across the desert of Gobi. Owing to the relatively good condition of the great highway the journey to Siberia is not so difficult or formidable as is generally supposed. Asa rule the Siberians travel freely, and long journeys are undertaken miore readily than short railway journeys are in Europe.

Siberia has been colonized in two different ways. On the one hand, Colonia, the Government sent parties (1) of Cossacks to settle on the frontiers, tion,

(2) of peasants who were bound to settle at appointed places and maintain the communications along the routes, (8) of stryeltsys to garrison forts, (4) of yamschiks—a special organization of Old Russia intrusted with the maintenance of horses for postal com- munication, and finally (5) of convicts. Even so recently as 1856-57 a good deal of the Ainur region was peopled in this way. Serfs in the imperial mines were liberated and organized in Cossack regiments (the Transbaikalia Cossacks) ; some of them were settled on the Amur, forming the Amur and Usuri Cossacks. Other parts of the river were colonized by peasants who emigrated with Government aid, and were bound to settle in villages, about 20 miles apart, on the Amur, at spots designated by officials. Asa rule, this kind of colonization has not produced the results that were expected. On the other hand, free colonization has been more successful and has been undertaken on a much larger scale. Soon after the first appearance of the Cossacks of Yermak in Siberia thousands of hunters (promyshlonyte), attracted by the furs, im- migrated from north Russia, explored the country, traced the first footpaths, and erected the first houses in the wilderness. Later on serfdom, religious persecutions, and conscription were the chief causes which led the

peasants to make their escape to Siberia and build their villages in the most inaccessible forests, in the prairies, and even on Chinese territory. The scvere measures of the Government against such ‘‘runaways” could not prevent their immigration to Siberia. While governmental colonization studded Siberia with forts, free colonization filled up the intermediate spaces. This free colonization has continued throughout the 19th century, occasionally assuming larger proportions, as in 1848-55. Since the emancipation of the serfs it has been steadily increasing. In spite of the involved formalities which the peasants have to go through before emigrating, and the great expense, whole villages emigrate from Russia to Siberia. During the twenty-five years ending 1879 no fewer than 100,000 persons crossed the Urals; and in 1882 the Ural Railway conveyed 7025 emigrants, while the total number of emigrants to Siberia in the same year was estimated at not less than 40,000.”

Siberia isa great penal colony. Exile to Siberia began in the Exiles. |

first years of its discovery, and as early as 1658 we find the Non-conformist priest Avvakum following in chains the exploring party of Pashkoff on the Amur. Raskoluiks in the second half of the 17th century, rebel stryclisy under Peter I., courtiers of rank dur- ing the reigns of the empresses, Polish confederates under Catherine II., the “ Decembrists” under Nicholas I., nearly 50,000 Poles after the insurrection of 1863, and later on whole generations of socialists were sent to Siberia; while the number of common-law convicts and exiles transported thither has steadily increased since the end of the 18th century. No exact statistics of Siberian exile were kept before 1828. But it is known that in the first years of the 19th century nearly 2000 persons were transported every year to Siberia. This figure had reached an average of 18,250 in 1878-77 and rose above 20,000 in 1882. Between 1828 and 1877 the total was 393,914,4 to which ought to be added the families of many exiles, making more than 600,000 men, women, and children transported since the beginning of the 19th century. Of 151,584 transported during the ten years 1867-76 18,582 were

2 Yadrintseff, Siberia as a Colony; Levitoff, Guide to West Siberia (Russian) ; Russkaya Mysl, July 1882.

3 The autobiography of the protopope Avvakum is one of the most popular books with Russian Nonconformists.

4 The Poles are not reckoned in the above figures.

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eondemned to lard labonr, 28,382 to be settled with loss of civil rights (ssylno-poselentsy), 23,383 to be settled without loss of rights (na vodvorente), 2551 to live nearly free (na jitic),‘while 78,686 were transported simply by orders of the administration or decisions of the village communities. In 1884 21,104 exiles, followed by 1752 women and 8631 children, were transported to Siberia. Their dis- tribution under different heads was nearly the same as the above. The hard-labour convicts (some 1800 or 1900) sent every ycar are distributed among several prisons in Western and Eastern Siberia, the imperial gold-washings at Kara on the Shilka, and the salt-works of Usolie and Ust-Kut; but, as these prisons and works cannot take more than 10,000 in all, the surplus have to be sent to SAGHALIN (q.v.), where they are employed in the coal-mines, or settled. After liberation the hard-labour convicts enter the cate- gory of ssylno-poselentsy, and are settled in villages. It appears from recent inquiries that nearly all are in a wretched condition, and that of the 200,000 on the official registers more than one-third have disappeared without being accounted for. Nearly 20,000 men (40,000 according to other estimates) are living in Siberia the life of brodyaght, trying to make their way through the forests to their native provinces in Russia. The exile population of Siberia is much smaller than is generally supposed, being—in Tobolsk, 59,000, 4°6 per cent. of population ; in Tomsk, 29,800, 2°6; in Yeniseisk, 45,000, 10°6; in Irkutsk, 40,000, 10; in Transbaikalia, 21,335, 4°3; in Yakutsk, 3000, 1:2; total, 198,153 or 4:9 per cent.

Edneation stands at a very low level. The ehicf town of every province is provided with a classical gymnasium, where the sons of the local officials prepare for the university, and a gymnasium or progymnasium for girls ; but the education there received is not of a high grade, and the desire of the local population for ‘‘real schools” is not satisfied. The sum of £10,000 bequeathed by Demidoff in 1817 for the foundation of a university in Siberia, together with an additional £40,000 raised by subscription, remains unemployed, and, although the Government finally permitted the erection of buildings for a university at Tomsk, it again decided (1885), for political reasons, to postpone its opening. In 1883 there were in Western Siberia only 534 schools of all descriptions, with 14,097 male and 4915 female pupils. Transbaikalia had in 1881 108 schools of a very inferior kind, with 3828

pupils; Yakutsk, 23 schools, with 633 pupils in 1882. There are in all five gymnasia and five progymnasia for boys, three gymnasia and two progymnasia for girls, two ‘‘real schools,” and three normal schools; but many vacant teaching posts in gymnasia remain unoccupied. Primary education is in a very unsatisfactory state, and primary schools very scarce.

Siberia is divided into four governments,—Tobolsk, Tomsk, Yeniseisk, and Irkutsk,—and four provinecs,—Yakutsk, Trans- baikalia, Amur, and Maritime or Primorskaya. The first two are under governors, like Russian governments; the next four are under the governor-general of Eastern Siberia, who resides at Ir- kutsk ; the Amur and Maritime provinces are under the governor- general of the Amur, who resides at Khabarovka, at the junction of the Amur and the Usuri. The respective chief towns are—Tobolsk, Tomsk, Krasnoyarsk, Irkutsk, Yakutsk, Tchita, Blagove- schensk, and Khabarovka. The provinces of Akmolinsk (chief town, Akmoly) and Semiryetchensk (chief town, Vyernyi) are now parts of the steppe governor-generalship. Each government and province is subdivided into districts; the administrative head is a civil governor in the governments and a military governor in the provinces. By the regulations of 1834 each governor and governor-general is assisted by a council composed of chiefs of several departments (nominated by the governor-general), and several officials depending directly upon the respective ministries, The council has only a consultative voice, the final decision resting with the administrative head. The governors-general and military governors command the military forces of the provinces, —Cossacks and regulars. The new system of legal procedure introduced in Russia in 1866 has not yet been extended to Eastern Siberia, where the old courts are still in force. It has been introduced in Western Siberia, but without juries. The towns have received the new municipal organization. The zemstvo is not yet organized. The districts are under the control of ispravniks and zasedatels, who have very extensive powers, and are not controlled by self-government of the peasantry. The Cossacks—the Siberian on the Kirghiz frontier (90,000 persons, stretching in villages along a line of 1200 niles), the Transbaikalian, and those of the Amur and the Usuri, whose villages are dotted along the Amur to its junction with the Usuri and along the Usuri to Lake Khangka and Vladivostok—are under their own officers, and special administrative functions are entrusted to the military chief (ataman) of each

separate Cossack voisko. The Altai and Nertchinsk mines, with their territories and populations, are under the imperial cabinet,—all private mines being under the inspection of mining engineers,

Since the earliest years of conquest Siberia has been placed under the rule of voivodes (governors), under a special department at Moscow. In 1708 it was divided into five provinces, depending upon a governor residing at Tobolsk. Catherine II. introduced in

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1764 a vice-royalty, which existed, however, only until 1799, when governors and governors-general were introduced. This system prevailed until 1819. This part of the history of Siberia was an unbroken record of robbery, tyranny, and folly on the part of the governors and tspravniks, such as would seem incredible were the facts not testified to by the annals and documents recently published in Russia. In vain were the severest measures resorted to. Peter I. ordered the governor Prince Gagarin to be hanged, and the governor Jolobotf was executed in 1736, while many minor officials were condemned to hard labour or the knout. ‘The robberies and the cruelties of rulers like Kryloff, Pestel, Treskin, Loskutoff, and their myrmidons compelled the Government to undertake a thorough inquiry, and for this purpose Speranskiy was‘sent in 1819. ‘To him Siberia is indebted for the new system of administration which has since remained in force.

The chief towns of Siberia are—Ekaterinburg (25,150 inhabitants), which belongs, however, to Perm, althongh situated on the eastern slope of the Urals ; Tomsk (31,550), a commercial city, selected as the site of the university; and Irkutsk (36,120 in January 1884), capital of Eastern Siberia, a trading city. Tobolsk (20,130), Kras- noyarsk (16,800), Tchita (12,600), Blagovyeschensk (8000), and Khabarovka (2500) are mere administrative centres. Biysk in Tomsk (18,700) yearly acquires more importance from its trade with the Kirghiz steppe. Kurgan (8915) and Yatutorovsk (4500) in Tobolsk are large villages, dependent chiefly on agriculture and some trade. DBarnaut (17,350), Kotyvafi (12,450), Kuznetsk (7355), Zmeinogorsk (6160), and Zyrianovsk (4450) in the Altai are mining centres ; Barnaut is the seat of the mining administration. Tyumen (14,300) and Tara (8650) in Tobolsk, Mariinsk in Tomsk, Kainsk (8050) and Minusinsk (7400) in

Yeniscisk, Kiachta (4300), Verkhne- udinsk (4150), and Nertchinsk (4070) in Transbaikalia, may be mentioned as local commercial centres—Kiachta having once had great importance in the tea-trade with China. The others ‘are merely administrative centres. Towns like Obdorsk, Berezoff, Narym, Viluisk, Verkhoyansk, Okhotsk, and many others which figure on the maps are merely administrative centres for levying the yasak, each with less than 1000 or even fewer than 500 and 300 inhabitants. Of the fifty-three towns of Western and Eastern Siberia only two lave more than 30,000 and eight from 12,000 to 21,000 inhabitants each ; in ten towns the population ranges from 5000 to 10,000.

The shores of all the lakes which filled the depressions dnring the History.

Lacustrine period are covered with remains dating from the Neo- lithic Stone period ; and numberless Zurgans (tumuli), ovens, and so on bear witness to a much denser population than the present. During the great migrations in Asia from east to west many populations were probably driven to the northern borders of the great plateau and thence compelled to descend into Siberia ; suc- ceeding waves of immigration drove them still farther towards the barren grounds of the north, where they melted away. According to Radloff, the earliest inhabitants of Siberia were the Yeniseians, who spoke a langnage different from the Ural-Altaic; some few traces of them (Yeniseians, Sayan-Ostiaks, and Kottes) have been found among the Sayan Mountains. The Yeniseians were followed by the Ugro-Samoyedes, who also eame originally from the high plateau and were compelled, probably during the great migration of the Huns in the 3d century B.c., to cross the Altai and Sayan ranges and to enter Siberia. To them must be assigned the very numerous reminains dating from the Bronze period which are scattered all over south Siberia. Iron was unknown to them; but they excelled in bronze, silver, and gold work. Their bronze ornaments and im- plements, often polished, evince a great development of artistic taste; and their irrigated fields eovered wide areas in the fertile tracts. On the whole, their civilization stood much higher than that of their more recent successors. Hight centuries later the Turkish stocks of ‘‘Tukiu” (in Chinese spelling), Khagasses, and VUigurs—also compelled to migrate north-westwards from their former seats—subdued the Ugro-Samoyedes. These new invaders have likewise left numerous traces of their sojourn, and

two dif- ferent periods may be easily distinguished in their remains. They were acqnainted with iron, and learned from their subjects the art of bronze-casting, which they used for decorative purposes only, and to which they gave a still higher artistic stamp. Their pottery is also much more perfect and more artistic than that of the Bronze period, and their ornaments now have a place among the finest collections at the St Petersburg Hermitage. This Turkish empire of the Khagasses must have lasted until the 13th century, when the Mongols, under Jenghiz Khan, subdued them and destroyed their civilization. A decided decline is shown by the graves which have been discovered, until the country reached the low level at which it was found by the Russians on their arrival towards the close of the 16th century. In the beginning of the 16th century Tatar fugitives from Turkestan subdued the loosely associated tribes in- habiting the lowlands to the east of the Urals. Agriculturists, tanners, merchants, and mollahs (priests) were called from Turke- stan, and small principalities sprang up on the Irtish and the Ob. These were united by Khan Ediger, and conflicts with the Russians

who were then colonizing the Urals brought him into collision with Moscow ; his envoys came to Moscow in 1555 and consented to a yearly tribute of a thousand sables. This source of wealth attracted Russian adventurers to the trans-Ural regions. As early as the 11th century the Novgorodians had occasionally penetrated into Siberia; but the fall of the republic and the loss of its north- eastern dependencies checked the advance of the Russians across the Urals. On the defeat of Stepan Razin many who were unwill-

ing to submit to the iron rule of Moscow made their way to the.

settlements of Stroganoff in Perm, and tradition has it that, in order to get rid of his guests, Stroganoff suggested to their chief, Yermak, that he should cross the Urals into Siberia, promising to help him in this enterprise with supplies of food and arms. Yermak entered Siberia in 1580 with a band of 1636 men, following the Taghil and Tura rivers. Next year they were on the Tobol, and 500 men suc- cessfully laid siege to Isker, the residence of Khan Kutchum, in the neighbourhood of what is now Tobolsk. Kutchum fled to the steppes, abandoning his domains to Yermak, who, according to

tradition, purchased by the present of Siberia to Ivan IV. his own restoration to favour. Yermak was drowned in the Irtish in 1584, after having been defeated by the Tatars. After his death the Cossacks abandoned Siberia ; but new bands of hunters and adven- turers, attracted by the furs, poured every year into the country, and were supported by regular troops from Moscow. To avoid conflicts with denser populations in the south, they preferred to alvance eastwards along higher latitudes; meanwhile Moscow sent fresh detachments of troops under votvodes, who erected forts and sottled labourers around them to supply the garrisons with food, gunpowder, and arms. Within eighty ycars the Russians had reached the Amur and the Pacific. This rapid conquest is accounted for by the circumstance that they met with no organized resistance : they found only the Tatar Kutchum on the Tobol, and in the Altai the Turkish stocks under the Kalmuck Altyn Khan, the centre of whose power was on the Kemtchik, and who collected tribute from the Teleuts, Uryankhs, Telcsses, Beltirs, Buruts (Kirghiz), and other smaller tribes. Neither Tatars nor Turks could offer any serious resistance. When travelling down the Yenisei in 1607-10 the Cossacks first encountered Tunguses, who strenuously fought for their independence, but were at last subducd about 1623. In 1628 the Russians reached the Lena, founded the

fort of Yakutskiy in 1637, and two years later reached the Sea of

Okhotsk at the mouth of the Ulia river. The Buriats offered some opposition, but between 1631 and 1641 the Cossacks crected several palisaded forts in their territory, and in 1648 the fort on the upper Uda (Verkhne-Udinskiy Ostrog) beyond Lake Baikal. In 1643 Poyarkoff’s boats descended the Amur, returning to Yakutsk by the Sea of Okhotsk and the Aldan, and in 1649-50 Khabaroff oc- eupicd the course of the Amur. The resistance of the Chincse, however, obliged the Cossacks.to quit their forts, and by the treaty of Nertchinsk (1689) Russia abandoned her advance into the basin of the river. In her anxiety to kcep peace with China and not to endanger the Kiachta trade, Russia rigorously prohibited and punished all attempts of the Siberians to advance farther towards that river until 1855. In 1849 the Russian ship ‘‘ Baikal” dis- covered the estuary of the Amur; in 1851 the military post of Nikolaievskiy was established at its mouth, and two years later the post of Mariinsk near Lake Kizi. Next yeara Russian

military expedition under Muravioff cxplored the Amur, and in 1857 a chain of Russian Cossacks and peasants had already scttled along the whole course of the river. The accomplished fact was recognized by China in 1857 and 1860 by a treaty. In the same ycar in which Khabaroff explored the Amur (1648) the Cossack Dejneff, starting from the Kolyma, sailed round the north-eastern extremity of Asia through the strait which was rediscovered and described eighty years later by Behring (1728). Cook in 1778, and after him La Pérouse, settled definitively the broad features of the northern Pacific coast. Although the Arctic Ocean had been reached as early as the first half of the 17th century, the exploration of its coasts by a series of expeditions under Ovtsyn, Minin, Prontchi- scheff, Lasinius, and Lapteff—whose labours constitute a brilliant page in the annals of geographical discovery—was begun only in the 18th century (1735-39).

The scientific exploration of Siberia begun in the period 1733 to 1742 by Messerschmidt, Gmelin, and De Lisle de la Croyere was soon followed up by Miiller, Fischer, and Georgi. Pallas, with several lussian students, laid the first foundation of a thorough exploration of the topography, fauna, flora, and inhabitants of the country. The journeys of Hansteen and Erman (1828-33) were a most important new step in the exploration of the territory. Humboldt, Ehrenberg, and Gustav Rose also paid in the course of these years short visits to Siberia, and gave a new impulse to the accumulation of scicntifie knowledge ; while Ritter elaborated in his Asien the true founda- tions of a sound knowledge of the structure of Siberia. Midden- dorff’s journey (1841-43) to north-eastern Siberia—contemporaneous with Castrén’s journeys for the special study of the Ural-Altaian linguages—directed attention to the far north and awakened in- terest in the Amur, whose basin soon became the scene of the

expeditions of Akhte and Schwarz (1852), and later on (1854-57) of the great Siberian expedition to which we owe so marked an advance in our knowledge of Eastern Siberia. The Siberian branch of the Russian Geographical Society was founded at the same time at Irkutsk, and afterwards became a permanent centre for the cx- ploration of Siberia; while the opening of the Amur and Saghalin attracted Maack, Schmidt,

Glehn, Radde, and Schrenck, whose works on the flora, fauna, and inhabitants of Siberia have become widely known.

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STBSAGAR, or SrEBsAUGOR, a British district of India, in the upper valley of the province of Assam, lying be- tween 26°19’ and 27°16’ N. lat. and 93° 21’ and 95° 25’ K, long., and covering an area of 2855 square miles. It ig bounded on the N. and E. by Lakhimpur district, on the S. by independent Naga territory, and on the W. by the Nowgong and Naga Hills districts. Sibsagar consists of a level plain, much overgrown with grass and jungle, and intersected by numerous tributaries of the Brahma- jutra. It is divided by the little stream Disai into two tracts, which differ in soil and general appearance. The surface of the eastern portion is very flat, the general level being broken only by the long lines of embankments raised by the Aham kings to serve both as roadways and as a protection against floods. The soil consists of a heavy loam of a whitish colour, which is well adapted for rice cultivation. West of the Disai, though the surface soil is of the same character, the general aspect is diver- sified by the protrusion of the subsoil, which consists of a stiff clay abounding in iron nodules, and is furrowed by frequent ravines and water-courses, which divide the cul- tivable fields into innumerable small sunken patches or holas, The chief

river is the Brahmaputra, which is navi- gable throughout the year by steamers and large native craft. The navigable tributaries of the Brahmaputra comprise the Dhaneswari, the Buri Dihing, the Disang, and the Dikhu, all flowing in a northerly direction from the Nagi Hills. Included within the district is the island of Maguli, which is said to have been formed by the silt brought down by the Subansiri river from the Himalayas and deposited in the wide channel of the Brahmaputra. Coal, iron, petroleum, and salt are found in the district. Wild beasts of all kinds abound, including the elephant, rhinoceros, tiger, buffalo, and deer. The climate, like that of the rest of the Assam valley, is comparatively mild and temperate, and the average annual rainfall is about 94 inches.

In 1881 the population of Sibsdgar was 370,274 (males 195,194, females 175,080), of whom Hindus numbered 339,663, Moham- inedans 15,665, hill tribes 13,829, and Christians 804. The only place of more than 5000 inhabitants is SrBsAcar (see below). Of the total area 359,225 acres were under cultivation in 1883-84, besides 78,710 acres of forests. The staple product is rice, which yields two crops in the year; tea is also extensively grown, ‘ibstgar being second only to Cachar among the tca- growing districts of India; other crops include food-grains, pulses, oil- seeds, sugar-cane, and cinchona. The local industries are limited to the weaving of silk and cotton cloth, the making of brass and lell-metal utensils, and coarse pottery. The principal exports are

iva, silk, mustard-seed, cotton, and jungle products ; the imports include salt, oil, opium, piece-goods, and misecllaneous hardware.

On the decline of the Aham dynasty Sibsagar, with the rest of

{he Assam valley, fell into the hands of the Burmese. They were ixpelled by the British in 1823, and in the following year the valley was annexed to British India. The British, however, were indisposed to undertake the responsibilities of admiistration be- yond what scemed absolutely necessary. The country now forming Sibsagar district, together with the southern portion of Lakhimpur, was placed under the rule of Raja Purandhar Sinh, on his agreeing to pay an annual tribute of £5000. Owing to the raja’s misrule, Sibsigar was reduced to a state of great poverty, and, as he was unable to pay the annual tribute, the territories were resumed by

the Governnicnt of India, and in 1838 Sibsdgar was placed under the direct management of a British officer. The tea industry soon brought back prosperity, and the Sibsagar peasants now rank ainong the most eontented and wealthy in Assam.

SIBSAGAR, chief town and civil headquarters of the above district, is situated about 11 miles south from the

Brahmaputra, being picturesquely placed around a magni- ficent tank covering an area of 114 acres. Besides the houses of the civil officials, it possesses a straggling bazaar, in which a brisk business is carried on during the cold season with the neighbouring hill tribes. In 1881 the population of the town was 5868.

SIBYL. Certain women who prophesied under the in- spiration of a deity were called by the Greeks Sibyls. The inspiration manifested itself outwardly in distorted features, foaming mouth, and frantic gestures. The notion that hysterical, convulsive, and epileptic affections are proof of divine inspiration has been common all over the world (see Tylor's Primitive Culture, ii. p. 131 sqg.). Homer does not refer to a Sibyl, nor does Herodotus. The first Greek writer, so far as we know, who does so is Heraclitus (flourished about 500 z.c.). As to the number and native countries of the Sibyls much diversity of opinion prevailed, as is evinced by the contradictory statements of ancient writers. Aristophanes, Plato, and the author of the Oav- pdova dkotopara, attributed to Aristotle, appear to know of only one Sibyl. Heraclides Ponticus, a pupil of Plato, seems to: be the first writer who distinguished several Sibyls,—the Erythrean, the Phrygian, and the Helles- pontine. Later writers speak of two, three, four, eight, ten, and twelve. Pausanias (x. 12) enumerates four. Ac- cording to him, the oldest was the Libyan! Sibyl, a daughter of Zeus and Lamia. The second was Hero- phile, a native of Marpessus or Erythre in the Troad ; she lived mostly in Samos, but visited Clarus, Delos, and Delphi. She lived before the Trojan War, which she is said to have predicted. The third was the Sibyl of Cume in Italy, and the fourth was a Hebrew Sibyl called Sabbe ; others, however, called the last-mentioned Sibyl a Babylonian or Egyptian. According to Plutarch (De Pyth. Orac., 9), the first Sibyl was she of Delphi.

Varro enumerates ten Sibyls,—the Persian, Libyan, Del- phic, Cimmerian, Erythrean, Samian, Cuman, Hellespont- ine, Phrygian, and Tiburtine. The Sibyl of whom we hear most was the Sibyl of Cume, whom Aineas consulted before his descent to Hades, She was supposed to live 1000 years. It was she who sold to Tarquin the Proud the Sibylline books. She first offered him nine ; when he refused them, she burned three and offered him the remaining six at the same price; when he again re- fused them, she burned three more and offered him the re- maining three still at the same price. Tarquin then bought them. They were entrusted to a college of fifteen men (quindecemviri sacris factundis), who preserved them and consulted them on occasions of national danger. It would seem that they were consulted with a view to discover, not exact predictions of definite future events, but the religious observances necessary to avert extraordinary calamities and expiate prodigies. They were written in hexameter verse and in Greek; hence the college of curators was always assisted by two Greek interpreters. The books were kept in the temple of Jupiter on the Capitol and shared the destruction of the temple by fire in 83 Bc. After the restoration of the temple the senate sent ambassadors in 76 to Erythre to collect the oracles afresh and they brought back about 1000 verses; others were collected in Ilium, Samos, Sicily, Italy, and Africa. In the year 12 Augustus sought out and burned a great many spurious oracles and subjected the Sibylline books to a critical revision ; they were then placed by him in the temple of Apollo Patrous, where we hear of them still existing in 363. They seem to have been burned by Stilicho shortly after 400. Accord- ing to the researches of Klausen (neas und die Penates,

1 There is a gap in the text of Pausanias, and his meaning is not quite certain.

Geogra- phical position.

Hamburg, 1839-40), the oldest collection of Sibylline oracles appears to have been made about the time of Solon and Cyrus at Gergis on Mount Ida in the Troad ; it was attributed to the Sibyl of Marpessus and was pre- served in the temple of Apollo at Gergis. Thence it passed -to Erythree,

where it became famous. It was this very collection, it would appear, which found its way to Cume and from Cum to Rome.

SIB—SIC

The collection of so-called Sibylline oracles which has descended to us is obviously spurious, bearing marks of Jewish and Christian origin. Ewald assigns the oldest of them to about 124 B.c. and the latest to about 668-672 a.p. They have been edited by Fried- lieb (Leipsic, 1852) and Alexandre (2d ed., Paris, 1869). For an examination of the different lists of Sibyls, sce E. Maass, De Stbyl- larum Indicibus, Berlin, 1879.

SIBYLLINE BOOKS. TURE, vol. ii. p, 177.

See APocALYPTIC LITERA-

SPECI®

Part I.—HisrTory.

ICILY, slightly surpassed by Sardinia in superficial extent, is, in its geographical and historical position,

the greatest island of the Mediterranean. As such it holds among European lands a position answering to that of Great Britain, the greatest island of the Ocean, and the events of their history have at more than one period brought the two islands into a close connexion with one another. The geo- graphical position of Sicily (see vol. xiii, pl. IV.) led almost as a matter of necessity to its historical position, as the meet- ing-place of the nations, the battle-field of contending races and creeds. Lying nearer to the mainland of Europe and nearer to Africa than any other of the great Mediterranean islands, Sicily is, next to Spain, the connecting link between those two quarters of the world. It stands also as a break- water between the eastern and western divisions of the Medi- terranean Sea. In pre-historic times those two divisions were two vast lakes, and Sicily is a surviving fragment of the land which once parted the two united seas and united the continents which are now distinct. That Sicily and Africa were once joined we know only from modern scien- tific research ; that Sicily and Italy were once joined is handed down in legend,

unless the legend itself is not rather an obvious guess, Sicily then, comparatively near to Africa, but much nearer to Europe, has been a European land, but one specially open to invasion and settlement from Africa, Dividing the eastern and western basins of the Mediter- ranean, it has been a part of western Europe, but a part which has had specially close relations with eastern Europe. It has stood at various times in close connexion with Greece, with Africa, and with Spain ; but its closest connexion has been with the neighbouring land of Italy. Still Italy and Sicily are thoroughly distinct lands, and the history of Sicily should never be looked on as simply part of the history of Italy. Lying thus between Europe and Africa, Sicily has been the battle-field of Europe and Africa. That is to say, it has been at two separate periods the battle-field of Aryan and Semitic man. In the later stage of the strife it has been the battle-field of Christendom and Islam. This history Sicily shares with Spain to the west of it and with Cyprus to the east. And with Spain the island has had several direct points of connexion, There was in all likelihood a near kindred between the earliest inhabitants of the two lands. In later times Sicily was ruled by Spanish kings, both alone and in union with other king- doms. The connexion with Africa has consisted simply in the settlement of conquerors from Africa at two periods, first Phoenician, then Saracen. On the other hand Sicily has been more than once made the road to African con- quest and settlement, both by Sicilian princes and by the Roman masters of Sicily. The connexion with Greece, the most memorable of all, has consisted in the settlement of many colonies from old Greece, which gave the island the most brilliant part of its history, and which made the greater part practically Greek. This Greek element was strengthened at a later time by the long connexion of Sicily with the Eastern, the Greek-speaking, division of

the Roman empire. And the influence of Greece on Sicily has been repaid in more than one shape by Sicilian rulers who have at various times held influence’ and dominion in Greece and elsewhere beyond the Hadriatic (Adriatic), The connexion between Sicily and Italy begins with the primitive kindred between some of the oldest elements in each, Then came the contemporary Greek colonization in both lands. Then came the tendency in the dominant powers in southern Italy to make their way into Sicily also. Thus the Roman occupation of Sicily ended the struggle between Greek and Pheenician. Thus the Norman occupation ended the

struggle between Greek and Saracen. Of this last came the long connexion between Sicily and southern Italy under several dynasties. Lastly comes the late absorption of Sicily in the modern kingdom of Italy. The result of these various forms of Italian influence has been that all the other tongues of the island have died out before the advance of a peculiar dialect of Italian. In religion again both Islam and the Eastern form of Christianity have given way to its Italian form. The connexion with England amounts to this, that both islands came under Norman dynasties, that under Norman rule the intercourse between the two countries was ex- tremely close, and that the last time that Sicily was the seat of a separate power it was under British protection. The Pheenician, whether from old Phoenicia or from Car- thage, came from lands which were mere strips of sea-coast with a boundless continent behind them. The Greek of old Hellas came from a land of islands, peninsulas, and inland seas. So did the Greek of Asia, though he had, like the Pheenician, a vast continent behind him. In Sicily they all found a strip of sea-coast with an inland region behind ; but the strip of sea-coast was not like the broken coast of Greece and Greek Asia, and the inland region was not a boundless continent like Africa or Asia. In Sicily therefore the Greek became more continental, and the Phoe- nician became more insular, than either nation had been in its own land, Neither people ever occupied the whole island: the presence of the other hindered either from occupying even the whole of the coast; nor was either people ever able to spread its dominion over the earlier inhabitants very far inland. Sicily thus remained a world of its own, with interests and disputes of its own, and divided among in- habitants of various nations. The history of the Greeks of Sicily is constantly connected with the history of old Hellas, but it runs a separate course of its own. Their position answers somewhat to that of the English people of the United States with regard to the mother-country of Great Britain. It differs in this, that the independence of the Greek cities in Sicily was not the result of warfare with the mother-country. Otherwise the analogy would have been almost exact, if France or Spain had kept its old power in North America. The Phcenician element ran an opposite course, as the independent Pheenician settlements in Sicily sank into dependencies of Carthage. The entrance of the Romans put an end to all practical independence on the part of either nation. But Roman ascendency did not affect Greeks and Pheenicians in the same way. Pheenician

life gradually died out. But Roman ascendency nowhere crushed out Greek life where it already existed, and in some ways it strengthened it. Though the Greeks never spread their dominion over the island, they made a peace- ful conquest of it. This process was in no way hindered by the Roman dominion; the work of assimilation went on still faster.

The question now comes, Who were the original inhabit- ants of Sicily? The island itself, ZuceAta, Secilia, plainly takes its name from the Sikels (ZuxeAot, Stculi), a people whom we find occupying a great part of the island, chiefly east of the river Gela. They appear also in Italy, in the toe of the boot, and older history or tradition spoke of them as having in earlier days held a large place in Latium and elsewhere in central Italy. They were believed to have crossed the strait into the island about 300 years before the beginning of the Greek settlements, that is to say in the 11th century B.c. They found in the island a people called Sikans (Zcxavoi, Sicant), whose name might pass for a dialectic form of their own, did not the ancient writers straitly affirm them to be a wholly distinct people,

of the highest forms of Aryan and of Semitic man that the history of Sicily draws its highest interest. Of Phoenician occupation there are two, or rather three, marked periods. We must always remember that Carthage —the new city—was one of the latest of Phcenician founda- tions, and that the days of the Carthaginian dominion show us only the latest form of Pheenician life. Phe- nician settlement in Sicily began before Carthage became great, perhaps before Carthage came into being. A crowd of small settlements from the old Pheenicia, settlements for trade rather than for dominion, factories rather than colonies, grew up on promontories and small islands all round the Sicilian coast. These were unable to withstand the Greek settlers, and the Pheenicians of Sicily withdrew step by step to form three considerable towns in the north- west corner of the island,—Motye, Soloeis or Solunto, on a hill overhanging the sea on the north coast, and the great

Panormos, the all-haven (see PALERMO), the city destined to be, in two different periods of the world's history, the head of Semitic power in Sicily.

Our earlier notices of Sicily, of Sikels and Sikans, in the Greek Homeric poems and elsewhere, are vague and legendary, coloniza-

akin to the Iberians, Sikans also appear with the Ligurians Both races appear as given to the buying and selling. of #™

among the early inhabitants of Italy (Virg., @n., vii. 795,

viii. 328, xi. 317, and Servius's note). It is possible then that the likeness of name is accidental, that the Sikels belonged to the same branch of the Aryan family as the Italians, while Sikans, like Ligurians and Iberians and the surviving Basques, belonged to the earlier non-Aryan population of western Europe. But, whatever the origin of either, in the history of the island Sikans and Sikels appear as two distinct nations with a clear geographical boundary. And we may venture to set down the Sikels as undeveloped Latins, who were hindered by the coming of the Greeks from reaching the same independent national life as their kinsfolk in Italy, and, instead of so doing, were gradually Hellenized. On the other hand, some Sikel elements made their way into the Greek life of Sicily. That the Sikels spoke a tongue closely akin to Latin is plain from several Sikel words which crept into Sicilian Greek, and from the Sikeliot system of weights and measures,—utterly unlike anything in old Greece. When the Greek settlements began, the Sikans had hardly got beyond the life of villages on hill-tops (Dion. Hal., v. 6), more truly perhaps villages with places of shelter on the hill-tops. The more advanced Sikels had their hill- forts also, but they had learned the advantages of the sea, and they already had settlements on the coast when the Greeks came. As we go on, we hear of both Sikel and Sikan towns; but we may suspect that any approach to true city life was owing to Greek influences. Neither people grew into any form of national unity. There was neither common king nor common confederation either of Sikels or of Sikans. They were therefore partly subdued, partly assimilated, slowly, but without much effort.

In the north-east corner of the island we find a small territory occupied by a people who seem to have made much greater advances towards-civilized

life. The Elymoi were a people of uncertain origin, but they claimed a mixed descent, partly Trojan, partly Greek. Thucydides however unhesitatingly reckons them among barbarians. They had considerable towns, as Segesta (the Greek Egesta) and Eryx, and the whole history, as well as the remains, of Segesta, shows that Greek influences prevailed among them very early. In short, we find in the island three nations distinct from the Greeks, two of which at least easily adopted Greek culture and came in the end to pass for Greeks by adoption.

But, as we have already seen, the Greeks were not the first colonizing people who were drawn to the great island. As in Cyprus and in the islands of the Aigzan, the Phoenicians were before them. And it is from this presence

slaves (Od., xx. 383, xxiv. 30, 210). The intimate con- nexion between old Hellas and: Sicily begins with the foundation of the Sicilian Naxos by Chalkidians of Euboia under Theokles, which is assigned to the year 735 3.0. The site, a low promontory on the east coast, immediately below the height of Tauromenion, marks an age which had advanced beyond the hill-fortress and which thoroughly valued the sea, The next year Corinth began her system of settlement in the west: Korkyra (Corcyra), the path to Sicily, and Syracuse on the Sicilian coast were planted as parts of one enterprise. From this time, for about 150 years, Greek settlement in the island, with some intervals, goes steadily on. Both Ionian and Dorian colonies were planted, both from the older Greek lands and from the older Sicilian settlements. The east coast, nearest to Greece and richest in good harbours, was occupied first. Here, between Naxos and Syracuse, arose the Ionian cities of Leontinoi and Katana (Catina, Catania) and the Dorian Megara by Hybla. Settlement on the south-western coast began about 688 B.c. with the joint Cretan and Rhodian settle- ment of Gela, and went on in the foundation of Selinous (the most distant Greek city on this side), of Kamarina (Camarina), and in 588 B.c. of the Geloan settlement of Akragas (Agrigentum, Girgenti), planted on a high hill, a little way from the sea, which became the second. city of Hellenic Sicily. On the north coast the Ionian Himera was the only Greek city in Sicily itself, but the Knidians founded Lipara in the AZolian Islands. At the north-east corner, opposite to Italy, and commanding the strait, arose Zankle, a city of uncertain date and

mixed origin, better known under its later name of Messana (Messene, Messina).

Thus nearly all the east coast of Sicily, a great part of the south coast, and a much smaller part of the north, passed into the hands of Greek settlers,—Sikeliots (ZsKe- AvGrat), as distinguished from the native Sikels. This was one of the greatest advances ever made by the Greek people. The Greek element began to be predominant in the island. Among the earlier inhabitants the Sikels were already be- coming adopted Greeks. Many of them gradually sank into a not wholly unwilling subjection as cultivators of the soil under Greek masters,—a relation embodied perhaps in the legend that a native Sikel prince led the Greek settlers to the foundation of Megara. But there were also inde- pendent Sikel towns in the interior, and there was a strong religious intercommunion between the two races. Sikel Henna (Enna, Castrogiovanni) is the special seat of the worship of Demeter and her daughter. The Sikans, on

the other hand, seem more distinct and more steadily hostile. The Phcenicians, now shut up in one corner of the island, with Selinous on one side and Himera on the other founded right in their teeth, are bitter enemies ; but the time of their renewed greatness under the headship of Carthage has not yet come. The 7th century B.c. and the early part of the 6th were a time in which the Greek cities of Sicily had their full share in the general prosperity of the Greek colonies everywhere. For a while they out- stripped the cities of old Greece. Their political constitu- tions were aristocratic ; that is, the franchise was confined to the descendants of the original settlers, round whom an excluded body (d#p0s or plebs) was often growing up. The ancient kingship was perhaps kept on or renewed in some of the Sikeliot and Italiot towns; but it is more certain that civil dissensions led very early to the rise of tyrants. The first and most famous is Phalaris of Akragas, whose exact date is uncertain, whose letters are now cast aside,

‘ and whose brazen bull has been called in question, but

Growth of tyran- nies

Gelon.

who clearly rose to power very soon after the foundation of Akragas. Under his rule the city at once sprang to the first place in Sicily, and he was the first Sikeliot ruler who held dominion over two Greek cities, Akragas and Himera. This time of prosperity was also a time of intel- lectual progress. To say nothing of lawgivers like Char- ondas, the line of Sikeliot poets began early, and the cir- cumstances of the island, the adoption of many of its local traditions and beliefs—perhaps a certain intermingling of native blood—gave the intellectual life of Sicily a char- acter in some things distinct from that of old Hellas. Stesichoros of Himera (c. 632-556 B.c.) holds a great place among the lyric poets of Greece, and some place in the political history of Sicily as the opponent of Phalaris. The architecture and sculpture of this age have also left some of their most remarkable monuments among the Greek cities of Sicily (see Syracuse). The remains of the old temples of Selinous, attributed to the 7th century B.c., show us the Doric style in its earlier state, and the sculp- tures of their metopes (preserved at Palermo) are as dis- tinctly grotesque as any Romanesque sculpture of the 11th or 12th century. In both ages the art of the builder was far in advance of that of the ornamental carver.

This first period of Sicilian history lasts as long as Sicily remains untouched from any non-Hellenic quarter outside, and as long as the Greek cities in Sicily remain as a rule independent of one another. A change begins in the 6th century and is accomplished early in the 5th. The Phoeni- cian settlements in Sicily become dependent on Carthage, whose growing power begins to be dangerous to the Greeks of Sicily. Meanwhile the growth of tyrannies in the Greek cities was beginning to group several towns together under a single master, and thus to increase the greatness of particular cities at the expense of their freedom. Thus Theron of Akragas (488-472), who bears a good character there, acquired also, like Phalaris, the rule of Himera. One such power held dominion both in Italy and Sicily. Anaxilaos of Rhegion, by a long and strange tale of treachery, occupied Zankle and changed its name to Mes- sana. But the greatest of the Sikeliot powers

began at Gela in 505, and was in 485 translated by Gelon to Syra- cuse. That city now became the centre of a greater dominion over both Greeks and Sikels than the island had ever before seen. But Gelon, like several later tyrants of Syracuse, takes his place—and it is the redeeming point in the position of all of them—as the champion of Hellas against the barbarian. The great double invasion of 480 B.c.was planned in concert by the barbarians of the East and the West (Diod., xi. 20; schol. on Pind., Pyth.,i. 146; Grote, v. 294). While the Persians threatened old Greece, Carth- age threatened the Greeks of Sicily. There were Sikeliots

who played the part of the Medizers in Greece: Selinous was on the side of Carthage, and the coming of Hamilkar was immediately brought about by a tyrant of Himera driven out by Theron. But the united power of Gelon and Theron crushed the invaders in the great battle of Himera, won, men said, on. the same day as Salamis, and the victors of both were coupled as the joint deliverers of Hellas (Herod., vii. 165-167; Diod., xx. 20-25; Pind., Pyth., i. 147-156 ; Simonides, fr. 42; Polyainos, i. 27). But, while the victory of Salamis was followed by a long war with Persia, the peace which was now granted to Carthage stayed in force for seventy years. Gelon was

followed by his brother Hieron (478-467), the special Hiern |

subject of the songs of Pindar. Akragas meanwhile! flourished under Theron; but a war between him and Hieron led to slaughter and new settlement at Himera. These transplantings from city to city began under Gelon and went on under Hieron. They made speakers in old Greece (Thuc., vi. 17) contrast the permanence of habi- tation there with the constant changes in Sicily. Hieron won the fame of a founder by peopling Katana with new citizens, and changing its name to Aitna.

None of these tyrannies were long-lived. The power of Theron fell to pieces under his son Thrasydaios. When the power of Hieron passed in 467 B.c. to his brother Thrasyboulos the freedom of Syracuse was won by a combined movement of Greeks and Sikels, and the Greek cities gradually settled

down as they had been before the tyrannies, only with a change to democracy in their con- stitutions. The mercenaries who had received citizenship from the tyrants were settled at Messana. About fifty years of general prosperity followed. We have special pictures of almost incredible wealth and luxury at Akra- gas, chiefly founded on an African trade. Moreover art, science, poetry, had all been encouraged by the tyrants, and they went on flourishing in the free states, To these was now added the special growth of freedom, the art of public speaking. Epicharmos (540-450), carried as a babe to Sicily, is a link between native Sikeliots and the strangers invited by Hieron; as the founder of the local Sicilian comedy, he ranks among Sikeliots. After him Sophron of Syracuse gave the Sicilian mzmes a place among the forms of Greek poetry. But the intellect of free Sicily struck out higher paths. Empedokles of Akragas is best known from the legends of his miracles and of his death in the fires of Autna; but he was not the less philosopher, poet, and physician, besides his political career. It is vaguely implied (Diog. Laert., vill. 2, 9) that he refused an offer of the tyranny or of authority in some shape. Gorgias of Leontinoi (c. 480-375) had a still more direct influence on Greek culture, as father of the technical schools of rhetoric throughout Greece. Architecture too advanced, and the Doric style gradually lost somewhat of its ancient massiveness. The temple at Syracuse which is now the metropolitan church belongs to the earlier days of this time. It is followed by the later temples at Selinous, among them the temple of Zeus, which is said to have been the greatest in Sicily, and by the wonderful series at Akragas, crowned by the Olympian temple, with its many architectural singularities. This, like its fellow at Selinous, was not fully finished at the time of the Carthaginian inroad at the end of the century.

During this time of prosperity there was no dread of Conde a war tion a between Segesta and Lilybaion (Lilybeum). There was as a i

Carthaginian inroads. But in 454 B.c. we read of

yet no town of Lilybaion; but, if the war was waged gikans

against any Phcenician settlement, the fact is to be noticed, as hitherto Segesta has been allied with the Phcenicians against the Greeks. Far more

important are our notices of the earlier inhabitants. For now comes the great Sikel

movement under Douketios, who, between force and per- suasion, came nearer towards uniting his people into one body than had ever been done before. From his native hill-top of Menai, rising above the lake dedicated to the Palikoi, the native deities whom Sikels and Greeks alike honoured, he brought down his people to the new city of Palikai in the plain. His power grew, and Akragas could withstand him only by.the help of Syracuse. Alternately victorious and defeated, spared by Syracuse (451), sent to be safe at Corinth, he came back to Sicily only to form greater plans than before. War between Akragas and Syracuse enabled him to carry out his schemes, and, with the help of another Sikel prince who bore the Greek name of Archomides, he founded Kale Akte on the northern coast. But his work was cut short by his death in 440; the hope of the Sikel people now lay in assimilation to their Hellenic neighbours. Douketios's own foundation of Kale Akte lived on, and we presently hear of Sikel towns under kings and tyrants, all marking an approach to Greek life. Roughly speaking, while the Sikels of the plain country on the east coast became subject to Syracuse, most of those in other parts of the island re- mained independent. Of the Sikans we hear less; but Hykkara in the north-west was an independent Sikan town on bad terms with Segesta. On the whole, setting aside the impassable barrier between Greek and Phoenician, other distinctions of race within the island were breaking down through the spread of the Hellenic element. Segesta was on familiar terms with both Greek and Phoenician neighbours, and had the right of intermarriage (Thuc., vi. 6) with Hellenic Selinous. Among the Greek cities them- selves the distinction between the Dorian and the Ionian or Chalkidian settlements is still keenly felt. The Ionian is decidedly the weaker element; and it was most likely owing to the rivalry between the two great Dorian cities of Syracuse and Akragas that the Chalkidian towns were able to keep any independence at all.

Up to this time the Italiot and Sikeliot Greeks have formed part of the general Greek world, while within that world they have formed a world of

their own, and Sicily has again formed a world of its own within that. Wars and conquests between Greeks and Greeks, especially on the part of Syracuse, though not wanting, have been on the whole less constant than in old Greece. It is even possible to appeal to a vein of local Sicilian patriotism, to preach a kind of Monroe doctrine by which Greeks from other lands should be shut out as strangers (4AAdgvAou, Thuc., vi. 61, 74). Presently this state of Sicilian isolation was broken in upon by the great Peloponnesian War. The Sikeliot cities were drawn into alliance with one side or the other, till the main interest of Greek history gathers for a while round the Athenian attack on Syracuse. At the very beginning of the war the Lacedzmonians looked for help from the Dorian Sikeliots. But the first active – intervention came from the other side. Conquest in Sicily was a favourite dream at Athens (Thuc., vi. 1, cf. i. 48, * and Diod., xii. 54), with a view to wider conquest or influ- ence in the western Mediterranean. An opportunity for Athenian interference was found in 427 in a quarrel be- tween Syracuse and Leontinoi and their allies. Leontinoi craved help from Athens on the ground of Ionian kindred. Her envoy was Gorgias ; his peculiar style of rhetoric was now first heard in old Greece (Diod., xii. 53, 54), and his pleadings were successful. For several years from this time (427-422) Athens plays a part, chiefly unsuccessful, in Sicilian affairs. But the particular events are of little importance, except as leading the way to the greater events that follow. The steadiest ally of Athens was the Italiot Rhegion ; Messana, with its mixed population, was repeatedly won and lost; the Sikel tributaries of Syracuse

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give zealous help to the Athenians. Sikeliot and most of the Italiot cities, under the guidance of Hermokrates of Syracuse, who powerfully set forth the doctrine of Sikeliot, perhaps of Sicilian unity, agreed on a peace, Presently an internal disturbance at Leontinoi led to annexation by Syracuse. This gave the Athenians a pretext for another attempt in 422. Little came of it, though Athens was joined by the Doric cities of Kamarina and Akragas, clearly out of jealousy towards Syracuse. For several years the island was left to itself.

The far more memorable interference of Athens in Sicilian affairs in the year 415 was partly in answer to the cry of the exiles of Leontinoi, partly to a quite distinct appeal from the Elymian Segesta. That city, an ally of Athens, asked for Athenian help against its Greek neighbour Selinous. In a dispute, partly about bound- aries, partly about the right of intermarriage between the Hellenic and the Hellenizing city, Segesta was hard pressed. She vainly asked for help at Akragas—some say at Syra- cuse (Diod., xii. 82)—and even at Carthage. The last appeal was to Athens. But the claims of Segesta and Leontinoi are soon forgotten in the struggle for life and death between Syracuse and Athens.

The details of the great Athenian expedition (415-413) Athenian belong partly to the political history of Athens, partly to expedi- that of Syracuss (q.v.).. But its results make it a marked wer

epoch in Sicilian history, and the Athenian plans, if suc- cessful, would have changed the whole face of the West. If the later stages of the struggle were remarkable for the vast number of Greek cities engaged on both sides, and for the strange inversion of relations among them on which Thucydides (vii. 57, 58) comments, the whole war was yet more remarkable for the large entrance of the barbarian element into the Athenian reckonings. The war was undertaken on behalf of Segesta; the Sikels gave Athens valuable help ; the greater barbarian powers out of Sicily also came into play. Some help actually came from Etruria. But Carthage was more far-sighted. If Syra- cuse was an object of jealousy, Athens, succeeding to her dominion, creating a power too nearly alike to her own, would have provoked far greater jealousy. So Athens found no active support save at Naxos and Katana, though Akragas, if she would not help the invaders, at least gave no help to her own rival. The war is instruct- ive in many ways: it reminds us of the general conditions of Greek seamanship when we find that Korkyra was the meeting-place for the allied fleet, and that Syracuse was reached only by a coasting voyage along the shores of Greek Italy. We are struck also by the low military level of the Sicilian Greeks. The Syracusan heavy-armed are as far below those of Athens as those of Athens are below those of Sparta. The gwasi-continental character of Sicily causes Syracuse, with its havens and its island, to be looked on, in comparison with Athens, as a land power (jrepGrat, Thuc., vii. 21). That is to say, the Sikeliot level

represents the general Greek level as it stood before the wars in which Athens won and defended her doniinion. The Greeks of Sicily had had no such military practice as the Greeks of old Greece; but an able commander could teach both Sikeliot soldiers and Sikeliot seamen to out- manceuvre Athenians. The main result of the expedition, as regards Sicily, was to bring the island more thoroughly into the thick of Greek affairs. Syracuse, threatened with destruction by Athens, was saved by the zeal of her metropolis Corinth in stirring up the Peloponnesian rivals of Athens to help her. Gylippos came; the second Athenian fleet came and perished. Syracuse was saved ; all chance of Athenian dominion in Sicily or elsewhere in the West came to an end. Syracuse repaid the debt by good service to the Peloponnesian cause, and from that XXIT. — 3

But in 424 all the 454-413B.c.

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one another is far stronger than in earlier times.

But before the war in old Greece was over, seventy years after the great victory of Gelon (410), the Greeks of Sicily had to undergo barbarian invasion on a vaster scale than ever. The disputes between Segesta and Selinous called in these enemies also. Carthage stepped in as the ally of Segesta, the enemy of her old ally Selinous. Her leader was Hannibal, grandson and avenger of the Hamilkar who had died at Himera. In 408, at the head of a vast mer- cenary host, he sailed to Sicily, attacked Selinous,

and stormed the town after a murderous assault of nine days, while the other Sikeliot cities; summoned to help, were still lingering. The walls and temples were overthrown ; the mass of the people were massacred; the few who escaped were allowed to return to the dismantled site as tributaries of Carthage; and the city never recovered its old greatness. Thence Hannibal went on to Himera, with the special mission of avenging his grandfather. By this time the other Greek cities were stirred to help, while Sikels and Sikans joined Hannibal; the strife was distinctly a strife of Greeks and barbarians. At last Himera was stormed, and 3000 of its citizens were solemnly slaughtered on the spot where Hamilkar had died. Himera ceased to exist; but the Carthaginians founded the new town of Thermai (Termini) not far off, to which the name is some- times laxly applied. The Phcenician possessions in Sicily now stretched across the island from Himera to Selinous. The next victim was Akragas; its defenders, natives and allies, quarrelled among themselves; the mass of the people forsook the city, and found shelter at Gela and elsewhere. The few who were left were slaughtered ; the town was sacked and the walls destroyed. Akragas was presently restored, and it has lived on to this day ; but it never recovered its old greatness.

Meanwhile the revolutions of Syracuse affected the his- tory of Sicily and of the whole Greek world. Dionysios the tyrant began his reign of thirty-eight years in the first months of 405. Almost at the same moment, the new Carthaginian commander, Himilkon, attacked Gela and Kamarina. Dionysios, coming to the help of Gela, was defeated, and was charged with treachery. He now made the mass of the people of both towns find shelter at Syra- cuse. But now the plague led Himilkon to ask for peace. Carthage was confirmed in her possession of Selinous, Himera, and Akragas, with some Sikan districts which had opposed her. The people of Gela and Kamarina were allowed to occupy their unwalled towns as tributaries of Carthage. Leontinoi, latterly a Syracusan fort, as well as Messana and all the Sikels, were declared independent, while Dionysios was acknowledged as master of Syracuse. No war was ever more grievous to freedom and civiliza- tion. More than half Sicily was now under barbarian dominion ; several of its noblest cities had perished, and a tyrant was established in the greatest. The 5th century B.C., after its central years of freedom and prosperity, ended in far deeper darkness than it had begun. The minuter account of Dionysios

belongs to Syracusan history ; but his position, one unlike anything that had been before seen in Sicily or elsewhere in Hellas, forms an epoch in the history of Europe. His only bright side is his cham- plonship of Hellas against the Phcenician, and this is balanced by his settlements of barbarian mercenaries in several Greek cities. Towards the native races his policy varied according to momentary interests; but on the whole his reign tended to bring the Sikels more and more within the Greek pale. His dominion is Italian as well as Sicilian; his influence, as an ally of Sparta, is important in old Greece; while, as a hirer of mercenaries everywhere, he had wider relations than any earlier Greek

with the nations of western Europe. He further opened new fields for Greek settlement on both sides of the Hadriatic. In short, under him Sicily became for the first time the seat of a great European power, while Syracuse, as its head, became the greatest of European citios. His reign was unusually long for a Greek tyrant, and his career furnished a model for other rulers and invaders of Sicily. With him in truth begins tliat wider range of Greek warfare, policy, and dominion which the Macedonian kingdoms carry on. The master of such a dominion becomes the improver of the military art. With him begins the employment of ships greater than the old triremes, of more effective engines in sieges, and that combined use of troops of various arms and nations which Alexander carried to perfection.

The reign of Dionysios (405-367) is divided into marked His war periods by four wars with Carthage, in 397-396, 392, 383, withCar|

and 368. In the first war his home power was all but overthrown ; but he lived through the storm, and extended his dominion over Naxos, Katana, and Leontinoi. All three perished as Greek cities. Katana was the first Sikeliot city to receive a settlement of Campanian mer-

cenaries, while others settled in non-Hellenic Entella.-

Naxos was settled by Sikels ; Leontinoi was again merged in Syracuse. Now begin the dealings of Dionysios with Italy, where the Rhegines, kinsmen of Naxos and Katana, planned a fruitless attack on him in common with Messana. He then sought a wife at Rhegion, but was refused with scorn, while Lokroi (Locri) gladly gave him Doris. The two cities afterwards fared accordingly. In the first war with Carthage, the Greek cities under Carthaginian dominion or dependence helped him ; so did Sikans and Sikels, which last had among them some stirring leaders; Elymian Segesta clave to Carthage. Dionysios took the Phoenician strong- hold of Motye ; but Himilkon recovered it, destroyed Mes- sana, founded the hill-town of Tauromenion (Taormina) above Naxos for Sikels who had joined him, defeated the fleet. of Dionysios, and besieged Syracuse. Between in- vasion and home discontent, the tyrant was all but lost; but the Spartan Pharakidas stood his friend ; the Cartha- ginians again suffered from pestilence ; and Himilkon went away defeated, taking with him his Carthaginian troops and forsaking his allies. Gela, Kamarina, Himera, Seli- nous, Akragas itself, now passed into the dependent alliance of Dionysios. The Carthaginian dominion was cut down to what it had been before Hannibal's invasion. The lord of Syracuse had grown at the cost of Greek and barbarian alike.

He planted mercenaries at Leontinoi, conquered some Sikel towns, central Henna among them, and made alliances with others. He restored Messana, peopling it with motley settlers, among whom were some of the old Messenians from Peloponnesos. But the Spartan masters of the old Messenian land grudged this possible begin- ning of a new Messenian power. Dionysios therefore moved his Messenians to a point on the north coast, where they founded Tyndaris. He clearly had a special eye to that region. He took the Sikel Kephaloidion (Cefalit), and even the old Phcenician border-fortress of Solous was betrayed to him. He beat back a Rhegine expedi-

| tion; but his advance was checked by a failure to take

the new Sikel settlement of Tauromenion. His enemies of all races now declared themselves. Many of the Sikels forsook him ; Akragas declared herself independent ; Car- thage herself, stirred by the loss of Solous, again took the field.

The Punic war of 392-391 was not very memorable. Both sides failed in their chief enterprises, and the main interest of the story comes from the glimpses which we get of the Sikel states. Most of them joined the Cartha-

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ginian leader Mago; but he was successfully withstood at Agyrion by Agyris, the ally of Dionysios, who is described as a tyrant second in power to Dionysios himself. This way of speaking would imply that Agyrion had so far advanced in Greek ways as to run the usual course of a Greek commonwealth. The two tyrants drove Carthage to a peace by which she abandoned all her Sikel allies to Dionysios. This time he took Tauromenion and settled it with his mercenaries. For new colonists of this kind the established communities of all races were making way. The transportations under the older tyrants had been move- ments of Greeks from one Greek site to another. Now all races are confounded.

Dionysios, now free from Phoenician warfare, gave his mind to enterprises which raised his power to its greatest height. In the years 390-387 he warred against the Italiot cities in alliance with their Lucanian enemies. Rhegion, Kroton (Croton), the whole toe of the boot, were conquered. Their lands were given to Lokroi; their citizens were taken to Syracuse, sometimes as slaves, sometimes as citizens. The master of barbarians fell below the lowest Hellenic level when he put the brave Rhegine general Phyton to a lingering death, and in other cases imitated the Cartha- ginian cruelty of crucifixion. Conqueror of southern Italy, he turned his thoughts yet further, and became the first ruler of Sicily to stretch forth his hands towards the eastern peninsula. In the Hadriatic he helped Hellenic extension. He planted directly and indirectly some settlements in Apulia, while Syracusan exiles founded the more famous Ankon or Ancona. On the east coast he founded Lissos ; he helped the Parians in their settlements of Issa and Pharos; he took into his pay Illyrian warriors with Greek arms, and helped the Molottian Alketas to win back part of his kingdom. He was even charged with plotting with his Epeirot ally to plunder Delphoi. This even

Sparta would not endure; Dionysios had to content himself with sending a fleet along the west coast of Italy, to carry off the wealth of the great temple of Agylla or Czre.

In old Greece men now said that the Greek folk was hemmed in between the barbarian Artaxerxes on the one side and Dionysios, master and planter of barbarians, on the other. These feelings found expression when Dionysios sent his embassy to the Olympic games of 384, and when Lysias bade Greece rise against both its oppressors. Dionysios vented his wrath on those who were nearest to him, banish- ing many, among them his brother Leptines and his earliest friend Philistos, and putting many to death. He was also once more stirred up to play the part of a Hellenic champion: he made ready for yet another Punic war.

In this war (383-382) Dionysios seems for once to have had his head turned by a first success. His demand that Carthage should altogether withdraw from Sicily was met by a crushing defeat. Then came a treaty by which Carthage kept Selinous and part of the land of Akragas. The Halykos became the boundary. Dionysios had also to pay 1000 talents, which caused him to be spoken of as becoming tributary to the barbarians. In the last years of his reign we hear dimly of both Syracusan and Carthaginian operations in southern Italy. He also gave help to Sparta against Thebes, sending Gaulish and Iberian mercenaries to take part in Greek warfare. His last war with Carthage, which was going on at his death, was ended by a peace by which the Halykos remained the boundary.

The tyranny of Dionysios fell, as usual, in the second generation ; but it was kept up for ten years after his death by the energy of Philistos, now minister of his son Dionysios the Younger. It fell with the coming back of the exile Dion in 357. The tyranny had lasted so long that it was less easy than at the overthrow of the elder tyrants to fall back on an earlier state of things. It had

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been a time of frightful changes throughout Sicily, full of 392-3373.0.

breaking up of old landmarks, of confusion of races, and of movements of inhabitants. But it also saw the founda- tion of new cities. Besides Tyndaris and Tauromenion, the foundation of Alaisa marks another step in Sikel pro- gress towards Hellenism, while the Carthaginians founded their strong town and fortress of Lilybaion. Among these changes the most marked is the settlement of Campanian niercenaries in Greek and Sikel towns. Yet they too could be brought under Greek influences; they were distant kinsfolk of the Sikels, and they were the forerunners of Rome. They mark one stage of migration from Italy into Sicily.

The reign of Dionysios was less brilliant in the way of art and literature than that of Hieron. Yet Dionysios himself sought fame as a poet, and his success at Athens shows that his compositions did not deserve the full scorn of his enemies. The dithyrambic poet Philoxenos, by birth of Kythera, won his fame in Sicily, and other authors of lost poems are mentioned in various Sikeliot cities. One of the greatest losses in all Greek history is that of the writings of Philistos (436-356), the Syracusan who had seen the Athenian siege and who died in the warfare between Dion and the younger Dionysios. Through the time of both tyrants, he was, next to the actual rulers, the first man in Sicily ; but of his record of his own times we have only what filters through the recasting of Diodoros, But the most remarkable intellectual movement in Sicily at this time was the influence of the Pythagorean philo- sophy, which still lived on in southern Italy. It led, through Dion, to the several visits of Plato to Sicily under both the elder and the younger Dionysios. To architecture the time was not favourable anywhere but in Syracuse.

The time following the Dionysian tyranny was at Syra- cuse a time full of the most stirring local and personal interest, under her two deliverers Dion and Timoleon. It is less easy to make out the exact effect on the rest of Sicily of the three years' career of Dion. But we may mark that, in driving out the younger Dionysios, he was helped by a general movement of Greeks, Sikels, and Sikans. Between the death of Dion in 354 and the coming of Timoleon in 344 we hear of a time of confusion in which Hellenic life seemed likely to die out. The cities, Greek and Sikel, were occupied by tyrants. Syra- cuse was parted between several, Dionysios coming back to hold Ortygia.

general to freedom and Greek life, and the defence of the Greek cities against Carthage. The victory of the Krimisos in 340 led to a peace with Carthage with the old frontier ; but all Greek cities were to be free, and Carthage was to give no help to any tyrant. Timoleon drove out all the tyrants, and it specially marks the fusion of the two races that the people of the Sikel Agyrion were admitted to the citizenship of free Syracuse. From some towns he drove out the Campanians, and he largely invited Greek settlement, especially from the Italiot towns, which were hard pressed by the Bruttians. The Corinthian deliverer gave, not only Syracuse, but all Greek Sicily, a new lease of life, though a short one.

With Timoleon begins a series of leaders who came from old Greece to deliver or to conquer among the Greeks of Italy and Sicily. The enterprise of Dion most likely sug- gested those that followed, but Dion, as a native Syracusan, does not belong altogether to the same class. Timoleon alone was a pure republican deliverer. The Macedonian kings had established a Greek dominion in the East, and a series of princes from Sparta and Epeiros came to estab- lish in the West a Greek dominion which should balance that of the Macedonians. Archidamos, Alexander of

Timoleon’s work was threefold—the imme- Timo- diate deliverance of Syracuse, the restoration of Sicily in leon.

337-2763.c. Epeiros, Akrotatos, Kleonymos, all unsuccessfully attempted

this work in Italy; it was only Pyrrhos, the last and greatest of the series, who played any great part in Sicily. And before he came, Sicily had become the seat of a greater native power than ever. Never till the Norman came was any Sicilian dominion so famous in the world as that of the Syracusan tyrant or king Agathokles.

We have unluckily no intelligible account of Sicily during the twenty years after the death of Timoleon (337- 317). His deliverance is said to have been followed by great immediate prosperity, but wars and dissensions very soon began again. Agathokles won his first fame in war between Syracuse and Akragas. The Carthaginians played off one city and party against another,

and Agathokles, following the same policy, became in 317, by treachery and massacre, undisputed tyrant of Syracuse, and spread his dominion over many other cities. Akragas, strengthened by Syracusan exiles, now stands out again as the rival of Syracuse. The Carthaginian Hamilkar, by conduct which contrasted with the cruelty of Agathokles, won many Greek cities to the Punic alliance. Defeated in battle, with Syracuse blockaded by a Carthaginian fleet, Agathokles formed the bold idea of carrying the war into Africa. He set the model for Regulus and Scipio, and not a few later rulers of Sicily.

For more than three years (310-307) each side carried on warfare in the land of the other. Carthage was hard pressed by Agathokles, while Syracuse was no less hard pressed by Hamilkar. The force with which Agathokles invaded Africa was far from being wholly Greek; but it was

the kingly title. This was in imitation of the Macedonian leaders who divided the dominion of Alexander. The relations between the eastern and western Greek worlds are drawing closer. Agathokles in his old age took a wife of the house of Ptolemy; he gave his daughter Lanassa to Pyrrhos, and established his power east of Hadria, as the first Sicilian ruler of Korkyra. He carried on wars in the Liparean Islands and in southern Italy, and died in 289 B.c., poisoned, some said, by his own grandson. Alike more daring and more cruel than any ruler before him, he carried the arms of Sicily further afield, and made the island the seat of a greater power than any of them.

This time was not favourable to the intellectual life of Sicily. Hitherto the island had attracted men of letters from old Greece. Now several distinguished Sicilian writers either chose or were driven to find homes else- where. Tinaios of Tauromenion, scorned by Polybios, but whose great Sicilian history is none the less a loss, was banished by Agathokles, and made Athens his headquarters for the last fifty years of his long life (356-c. 260 B.c.). Dikaiarchos (Dicearchus) of Messana, geographer and phil- osopher and author of the Life of Greece, lived mainly in Peloponnesos till about 285 B.c. Euhemeros (Evemerus), despiser of the gods, who is claimed

by more than one birthplace besides Messana, lived in the service and friend- ship of the Macedonian Kassandros. Philemon too, the long-lived writer of comedy (361-262 B.c.), is claimed for Syracuse, and it was only as an adopted citizen that he spent most of his life at Athens.

On the death of Agathokles tyrants sprang up in Period various cities. Akragas, under its king Phintias, won after back for the moment somewhat of its old greatness. By a“

representatively European. Gauls, Samnites, Tyrrhenians, fought for him, while mercenary Greeks and Syracusan exiles fought for Carthage. He won many battles and

hokles, —

towns; he quelled mutinies of his own troops; by inviting and murdering Ophellas lord of Kyrene (Cyrene) he doubled his army and brought Carthage near to despair. Mean- while Syracuse, all but lost, had driven back Hamilkar, and had taken and slain him when he came again with the help of the Syracusan exile Deinokrates. Meanwhile Akragas, deeming Agathokles and the barbarians alike weakened, proclaimed freedom for the Sicilian cities under her own headship. Many towns, both Greek and Sikel, joined the confederacy. It has now become impossible to distinguish the two races; Henna and Erbessos are now the fellows of Kamarina and Leontinoi. But the hopes of Akragas were checked when Agathokles suddenly came back from Africa, landed at Selinous, and marched to Syracuse, taking one town after another. A new scheme of Sicilian union was taken up by Deinokrates, which cut short his dominion. But he now relieved Syracuse from the Carthaginian blockade; his mercenaries gained a victory over Akragas; and he sailed again for Africa, where fortune had turned against his son Archagathos, as it now did against himself. He left his sons and his army to death, bondage, or Carthaginian service, and came back to Sicily almost alone. Yet he could still gather a force which en- abled him to seize Segesta,to slay or enslave the whole popu- lation, and to settle the city with new inhabitants. This change amounts to the extinction of one of the elements in the old population of Sicily. We hear no more of Elymoi ; indeed Segesta has been practically Greek long before this. Deinokrates and Agathokles came to a kind of partnership, and a peace with Carthage, with

the old boundary, secured Agathokles in the possession of Syracuse and eastern Sicily

301).

- some stage of his African campaigns Agathokles had taken the title of king. Earlier tyrants were well pleased to be spoken of as kings; but no earlier rulers of Sicily put either their heads or their names on the coin. Agathokles now put his name, first without, and then with,

a new depopulation of Gela, he founded the youngest of Sikeliot cities, Phintias, by the mouth of the southern Himera. And Hellas was cut short by the seizure of Messana by the disbanded Campanian mercenaries of Agathokles (c. 282). They slew the men, took the women as wives, and proclaimed themselves a new people in a new city by the name of Mamertines, children of Mamers or Mars. Messana became an Italian town; hence- forth its formal name was “ Mamertina civitas.”

The Campanian occupation of Messana is the first of the chain of events which led to the Roman dominion in Sicily. As yet Rome has hardly been mentioned in Sicilian story, either for friendship or for enmity. The Mamertine settlement, the war with Pyrrhos, bring us on quickly.

Pyrrhos came as the champion of the western Greeks Pyrrhos

against all barbarians, whether Romans in Italy or Cartha- ginians in Sicily. His Sicilian war (278-276) was a mere interlude between the two acts of his war with Rome. As son-in-law of Agathokles, he claimed to be specially king of Sicily, and he held the Sicilian conquest of Korkyra as the dowry of Lanassa. With such a deliverer, deliver- ance meant submission. Pyrrhos is said to have dreamed of kingdoms of Sicily and of Italy for his two sons, the grand- sons of Agathokles, and he himself reigned for two years in Sicily as a king who came to be no less hated than the tyrants. Still as Hellenic champion in Sicily he has no peer. As European champion he has none till Roger of Hauteville. Eryx was won from the Pheenician ; Panormos first became a city of Europe; if he failed before Lilybaion, that fortress and Messana were all that was left in bar- barian hands through the whole island.

All this was but for a moment. The Greek king, on his way back to fight for Tarentum against Rome, had to cut his way through Carthaginians and Mamertines in Roman alliance. His saying that he left Sicily as a wrestling-ground for Romans and Carthaginians was the very truth of the matter. Very soon came the first war

between Rome and Carthage, the war which is best marked by its other name of the War for Sicily. It mattered much, now that Sicily was to have a barbarian master, whether that master should be the kindred barbarian of Europe or the barbarian of Asia transplanted to the shore of Africa. That question was decided for Europe, that is for Rome, now beginning her long career as European champion. That strife too gave a large part of Sicily a last day of prosperity under a native ruler who was a king and not a tyrant.

Sicily in truth never had a more hopeful champion than the second Hieron of Syracuse. The established rule of Carthage in western Sicily was now something that could well be endured alongside of the robber commonwealth at Messana. The dominion of the freebooters was spreading. Besides the whole north-eastern corner of the island, it reached inland to Agyrion and Kentoripa. The Mamer- tines leagued with other Campanian freebooters who had forsaken the service of Rome to establish themselves at Rhegion. But a new Syracusan power was growing up to meet them. Hieron, claiming descent from Gelon, pressed the Mamertines hard. He all but drove them to the surrender of Messana ; he even helped Rome to chastise her own rebels at Rhegion. The wrestling-ground was thus opened for the two barbarian commonwealths. Car- thaginian troops held the Messanian citadel against Hieron, while another party in Messana craved the help of the head of Italy. Rome, chastiser of the freebooters of Rhegion, saw Italian brethren in the freebooters of Messana. The War for Sicily began (264).

The exploits of Hieron had already won him the kingly title (270) at Syracuse, and he was the representative of Hellenic life and independence throughout the island. Partly in this character, partly as direct sovereign, he was virtual ruler of a large part of eastern Sicily. But he could not aspire to the dominion of earlier Syracusan rulers. The advance of Rome after the

retreat of Pyrrhos kept the new king from all hope of their Italian position. And presently the new kingdom exchanged independence for safety. When Rome entered Sicily as the ally of the Ma- mertines, Hieron became the ally of Carthage. But in the second year of the war (263) he found it needful to change sides, His alliance with Rome marks a great epoch in the history of the Greek nation. The kingdom of Hieron was the firstfruits out of Italy of the system by which alliance with Rome grew into subjection to Rome. He was the first of Rome's kingly vassals. His only burthen was to give help to the Roman side in war ; within his kingdom he was free, and his dominions flourished as no part of Sicily had flourished since the days of Timoleon.

During the twenty-three years of the First Punic War (264-241) the rest of the island suffered greatly. The War for Sicily was fought in and round Sicily, and the Sicilian cities were taken and retaken by the contending powers. Akragas, held by Carthage, stood a Roman siege (262) ; the Punic garrison escaped ; the inhabitants were sold into slavery. Seven years later the repeopled city was taken and burned and its walls destroyed by a Car- thaginian army. Selinous was utterly destroyed, when, towards the end of the war, Carthage gathered her whole strength again in a few points in the west. Greek Selinous and Elymian Eryx alike gave way to the new fortress of Drepanon, which, along with Lilybaion, held out till the end of the war. Segesta, subject to Carthage, still remem- bered its old traditions, and the sons of Aineas were wel- comed as deliverers by the Trojan city. Kamarina and inland Henna passed to and fro between the two powers. But the great exploit of Rome was the second winning of Panormos for Europe, and its brilliant defence against the Semitic enemy. The highest calling of the Greek had

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Roman people as landlord.

but not of Tauromenion. the people of Henna were massacred. held for Carthage, was for four years (214-210) the centre of an active campaign. The story of Akragas ended in plunder, slaughter, and slavery ; three years later, the story of Agrigentum began.

now, in the Western lands, passed to the Roman. treaty which ended the war Carthage ceded to Rome all her possessions in Sicily. As that part of the island which kept a national Greek government became the first king- dom dependent on Rome, so the share of Carthage became the first Roman province. One point alone did not come under either of those heads. Messana, Mamertina civitas, remained an Italian ally of Rome on Sicilian soil.

We have no picture of Sicily in the first period of Roman rule. One hundred and seventy years later, several towns within the original province enjoyed various degrees of freedom, which they had doubtless kept from the begin- ning. Besides the old ally Messana, Panormos, Segesta, with Kentoripa, Halesa, and Halikye, once Sikel but now Hellenized, kept the position of free cities (libere et im- munes, Cic., Verr., iii. 6). The rest paid tithe to the The province was ruled by a preetor sent yearly from Rome. Within the Roman pro- vince the new state of things called forth much discontent ;

but Hieron remained the faithful ally of Rome through a |

long life. On his death (215) and the accession of his

grandson Hieronymos, his dynasty was swept away by the last revolution of Greek Syracuse. against Rome, the great siege by Marcellus, the taking of the city, the addition of Hieron’s kingdom to the Roman province. side, Tauromenion and Netos, were admitted to the full privileges of Roman alliance (cf. Diod. Fr., Hoeschl., lib.

The result was revolt Two towns only, which had taken the Roman

xxiii, p. 18; Cic., Vern, iii, 6, v. 22). Tauromenion

indeed was more highly favoured than the children of

Mamers. Rome had a right to demand ships of Messana, Some towns were destroyed ; Akragas, again

The reign of Hieron was the last time of independent Greek. culture in Sicily. His great works belong to the special history of Syracuse ; but his

time marks the growth of a new form of local Sicilian genius. The spread of Hellenic culture among the Sikels had in return made a Greek home for many Sikel beliefs, traditions, and customs. Bucolic poetry is the native growth of Sicily ; in the hands of Theokritos it grew out of the germs supplied by Epi- charmos and Sophron into a distinct and finished form of the art. The poet, himself of Syracuse, went to and fro between the courts of Hieron and Ptolemy Philadelphos ; but his poetry is essentially Sicilian. So is that of his suc- cessors, both the Syracusan Moschos and Bion of Smyrna, who came to Sicily as to his natural school. The most renowned Sicilian name of this time, that of Archimedes, is hardly distinctively Sicilian. A great name in the history of science, a great name in the local history of Syracuse, he had not, like the earlier philosophers and the bucolic poets, any direct bearing on the general political or intellectual development of the island.

With the incorporation of the kingdom of Hieron into the Sicily Roman province independent Sicilian history comes to an Roman. end for many ages. Of the state of Sicily under the Roman commonwealth our chief source of knowledge is the plead- ing of Cicero against the worst Roman oppressor of Sicily, Gajus Verres. Next in importance to this come those frag- ments of Diodoros which describe the two insurrections of the slaves. Between those insurrections came the legisla- tion of Rupilius which settled the Roman system of admini- stration in Sicily. Cicero’s description comes later than all these; but the general relations between Rome and Sicily seem to have been much the same from the first occupation till the beginning of the empire. In one part of the island

By the 276-210B.0.

210 B.c.- 477 A.D.

Slave revolts.

the Roman people stepped into the position of Carthage, in another part into that of King Hieron. The allied cities kept their several terms of alliance; the free cities kept their freedom; elsewhere the land paid to the Roman

people, according to the law of Hieron, the tithe which it had paid to Hieron. But, as the tithe was let out to publicans, oppression was easy. The pretor, after the occu- pation of Syracuse, dwelled there in the palace of Hieron, as in the capital of the island. But, as a survival of the earlier state of things, one of his two questors was quartered at Lilybaion. Under the supreme dominion of Rome even the unprivileged cities kept their own laws, magistrates, and assemblies, provision being made for suits between Romans and Sicilians and between Sicilians of different cities (Verr., ii. 16). In Latin the one name Siculi takes in all the inhabitants of the island ; no distinc- tion is drawn between Greek and Sikel, or even between Greek and Pheenician cities. It is assumed that all Siculi are Greeks (Verr., ii. 3, 29, 49, 52, 65; iii. 37, 40, 73). Even in Greek, 2uxeAoé is now sometimes used instead of ZuxeAudrat, All the persons spoken of by Cicero came to have Greek names save—a most speaking exception—Gaius Heius of Mamertina civitas. Inscriptions too from Sikel and Pheenician cities are commonly Greek, even when they commemorate men with Phcenician names, coupled perhaps with Greek surnames (C.J. G., iii. 597, cf. 628). The process of Hellenization which had been so long going on had at last made Sicily thoroughly Greek. Roman con- quest itself, which everywhere carried a Greek element with it, would help this result. The corn of the fertile island was said even then to feed the Roman people. It was this character of Sicily which led to its one frightful piece of local history. The evils of slavery and the slave- trade in their worst form—the slavery of men who are their masters' equals in all but luck—reached their height in the 2d century B.c. The wars of Rome, and the system- atic piracy and kidnapping that followed them, filled the Mediterranean lands with slaves of all nations. Sicily stood out before the rest as the first land to be tilled by slave-gangs, on the estates both of rich natives and of Roman settlers. The free population naturally degener- ated and died out. The slaves were most harshly treated, and even encouraged by their masters to rob. The land was full of disorder, and the preetors shrank from enforc- ing the law against offenders, many of whom, as Roman knights, might be their own judges. Of these causes came the two great slave-revolts of the second half of the 2d century B.c. They did not stand alone in the world, but no others reached the same extent. The first outbreak was stained by some excesses, but after that we are struck with the orderly course of the rebellion. It is regular warfare. Sicily had neither native militia nor Roman army ; the slaves

therefore, strengthened by the poorer freemen, occu- pied the whole land save only the great cities ; they chose kings and founded them a capital. The chosen king of one district submits to the other for the general good. They form armies which could defeat Roman generals, and they are subdued only by efforts on the same scale as the conquest of a kingdom. For most of the slaves were men used to freedom and to arms, not a few of them Sicilian pirates. The fact that in the first war a slave named Achaios—like Davus, Geta, or Syrus—plays a chief part also tells us a good deal. The Syrian element was large, and the movement was mixed up with much of Syrian religion. But the native deities of Sicily and the holy place of the Palikoi were not forgotten. The first slave war lasted from 135 to 132, the time of Tiberius Gracchus and the fall of Numantia. The second lasted from 102 to 99, the time of the Cimbrian invasion. At other times the power of Rome might have quelled the revolt more speedily.

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[HISTORY.

The slave wars were not the only scourge that fell on Lat, Sicily. The pirates troubled the coast, and all other evils Roms were outdone by the three years' government of Verres ei

(73-70 B.c.). Besides the light which the great impeach-"~™ ment throws on the state of the island, his administration seems really to have dealt a lasting blow to its prosperity. The slave wars had not directly touched the great cities; Verres plundered and impoverished everywhere. Another blow was the occupation of Messana by Sextus Pompeius in 42 B.c. He was master of Sicily for six years, and Strabo (vi. 2, 4) attributes to this war the decayed state of several cities. To undo this mischief Augustus planted Roman colonies at Syracuse, Tauromenion, Therme, Tyn- daris, and Katana. The island thus received another Italian infusion ; but, as elsewhere, Latin in no way dis- placed Greek; it was simply set up alongside of it for certain purposes. Roman tastes now came in; Roman buildings, especially amplhitheatres, arose. But Sicily never became Roman like Gaul and Spain. The dictator Cesar designed the Roman, and Marcus Antonius the Latin, franchise for all Sicily; but neither plan was carried out. Sicily remained a province, a province of the senate and people, not of the

prince. Particular cities were promoted to higher privileges, and that was all. The Mamertines were Romans in Pliny's day ; two free cities, Kentoripa and Segesta, had become Latin ; still later, Phoe- nician Lilybaion received a Roman colony. All these were steps in the progress by which, in Sicily as elsewhere, political distinctions were broken down, till the edict of Antoninus bestowed at least the Roman name—no small gift—on all Roman allies and subjects. Sicily was now part of Komania, but it was one of its Greek members.

Till this change was made, Sicily could not be in any sense incorporated with Italy. In the division of Con- stantine, when the word province had lost its meaning, when Italy itself was mapped out into provinces, Sicily became one of these last. Along with Africa, Reetia (Rheetia), and western Illyricum, it became part of the Italian prefecture; along with the islands of Sardinia and Corsica, it became part of the Italian diocese. It was now ruled by a corrector (see the letter of Constantine, which stands first in the Codex Diplomaticus Sicilix of Johannes), afterwards by a consular under the authority of the vicar of the Roman city (Wot. Imp., 14,5). Few emperors visited Sicily; Hadrian was there, as every- where, and Julian also (C.D., 10). In its provincial state Sicily fell back more than some other provinces. Ausonius could still reckon Catina and fourfold Syracuse (' quad- ruplices Syracusas"') among noble cities ; but Sicily is not, like Gaul, rich in relics of later Roman life, and it is now Egypt rather than Sicily that feeds Rome. The island has no internal history beyond a very characteristic fact, a third slave war in the days of Gallienus. External history there could be none in the central island, with no frontier open to Germans or Persians. Sicilian history begins again when the wandering of the nations planted new powers, not on the frontier of the empire, but at its heart.

The powers between which Sicily now passes to and Teuton The earlier stages of Teutonic ™s™*

fro are Teutonic powers. advance could not touch Sicily. Alarie thought of a Sicilian expedition, but a storm hindered him. Sicily was to be reached only by a Teutonic power which made its way through Gaul, Spain, and Africa. The Vandal now dwells at Carthage instead of the Canaanite. Gaiseric (429-477) subdued the great islands for which Roman and Pheenician had

striven. Along with Sardinia, Corsica, and the Balearic Isles, Sicily is again a possession of a naval power at Carthage. Gaiseric, at Rome more than a Hanni- bal, makes a treaty with Odowakar (Odoacer) almost like that which ended the First Punic War. He gave up (Victor

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Vitensis, i. 4) the island on condition of a tribute, which was hardly paid by Theodoric. Sicily was now ruled bya Gothic ‘count, and the Goths claimed to have treated the land with special tenderness (Procopius, Bell. Goth., ili. 16). ‘The island, like the rest of Theodoric’s dominions, was ‘certainly well looked after by the great king and his ‘minister ; yet we hear darkly of disaffection to Gothic rule (Cass., Var., i. 3). Theodoric gave back Lilybaion to the Vandal king Thrasamund as the dowry of his sister Anala- frida (Proc., Bell. Vand., i. 8). Yet Lilybaion was a Gothic possession when Belisarius, conqueror of Africa, demanded it in vain as part of the Vandal possessions (Proc., Bell. Vand., ii. 5; Bell. Groth., i. 3). In the Gothic war Sicily was the first land to be recovered for the empire, arid that with the good will of its people (535). Panormus alone was stoutly defended by its Gothic garrison. In 550 Totila took some fortresses, but the great cities all with- stood him, and the Goths were driven out the next year. Sicily was thus won back to the Roman dominion, but the seat of the Roman dominion was now at Constantinople. Belisarius was Pyrrhos and Marcellus in one. For 430 years some part of Sicily, for 282 years the whole of it, again remained a Roman province. To the Gothic count again succeeded, under Justinian, a Roman pretor, in Greck orparnyds. That was the official title; we often hear of a patrician of Sicily, but patrician was in strictness a personal rank. In the later mapping out of the empire into purely military divisions, the theme (G¢ua) of Sicily took in both the island and the nearest peninsula of the main- land, the oldest Italy. The island itself was divided for financial purposes, almost as in the older times, into the two divisions of Syracuse and Lilybaion. The revolutions of Italy hardly touched a land which looked steadily to | the eastern Rome asits head. The Lombard and Frankish masters of the peninsula never fixed themselves in the island. When the Frank took the imperial crown of the West, Sicily still kept its allegiance to the Augustus who reigned at Constantinople, and was only torn away piece- meal from the empire by the next race of conquerors. This

connexion of Sicily with the eastern division of the empire no doubt largely helped to keep up Greek life in the island. This was of course strengthened by union with a power which had already a Greek side, and where the Greek side soon became dominant. Still the con- nexion with Italy was close, especially the ecclesiastical connexion. Some things tend to make Sicily look less Greek than it really was. The great source of our know- ledge of Sicily in the century which followed the recon- quest by Belisarius is the Letters of Pope Gregory the Great, and they naturally show the most Latin side of things. The merely official use of Latin was, it must be remembered, common to Sicily with Constantinople. Gregory's Letters are largely occupied with the affairs of the great Sicilian estates held by the Roman Church, as by the churches of Milan and Ravenna, But they deal | with many other matters (see the collection in Johannes, C.D., where the letters bearing on Sicily are brought | together, or the usual collection of his letters). Saint | Paul's visit to Syracuse naturally gave rise to many legends ; but the Christian Church undoubtedly took early | root in Sicily. We hear of Manicheans (C.D., 163); _ Jews were plentiful, and Gregory causes compensation | to be made for the unlawful destruction of synagogues. Of paganism we find no trace, save that pagan slaves, doubt- less not natives of the island, were held by Jews (C.D., 127). Herein is a contrast between Sicily and Sardinia, where, ac- cording to a letter from Gregory to the empress Constantina, wife of Maurice (594-595), praying for a lightening of taxa- tion in both islands, paganism still lingered (C.D. 121). Sicily belonged to the Latin patriarchate ; but we already

(C.D., 103) see glimmerings of the coming disputes between 477-829. the Eastern and Western Churches. Things were changed when, in the early days of the iconoclast controversy, Leo the Isaurian confiscated the Sicilian and Calabrian estates of the Roman Church (Theoph., i. 631).

In the 9th, 10th, and 11th centuries the old drama of Sicily was acted again. The island is again disputed between Europe and Asia, transplanted to Africa between Greek and Semitic dwellers on her own soil. Panormus and Syracuse are again the headquarters of races and creeds, of creeds yet more

than of races. The older religious differences—not small certainly when the choice lay between Zeus and Moloch—were small compared with the strife for life and death between Christendom and Islam. Gregory and Mahomet were contemporaries, and, though Saracen occupation did not begin in Sicily till more than two centuries after Gregory's death, Saracen inroads began much sooner. In 655 (Theoph., Early i, 582) part of Sicily was plundered, and its inhabitants Saracen carried to Damascus. Then came the strange episode of #4 the visit of Constans the Second (641-668), the first emperor, it would seem, who had set foot in Sicily since Julian. After a war with the Lombards, after twelve days' plunder of Rome, he came on to Syracuse, where his oppressions led to his murder in 668. Sicily now saw for the first time the setting up of a tyrant in the later sense. Meketios, commander of the Eastern army of Constans, revolted, but Sicily and Roman Italy kept their allegiance to the new emperor Constantine Pogonatos, who came in person to destroy him. Then came another Saracen inroad from Alexandria, in which Syracuse was sacked (Paul. Diac., v. 13). Others followed, but there was as yet no lasting settlement. Towards the end of the 8th century, though Sicily itself was untouched, its patricians and their forces play a part in the affairs of southern Italy as enemies of the Frankish power. Charles himself was believed (Theoph., i. 736) to have designs on Sicily ; but, when it came to Saracen invasion, the sympathies of both pope and Cvsar lay with the invaded Christian land (Mon. Car.,

323, 328).

In 813 a peace for ten years was made between the Saracen Saracens and the patrician Gregory. A few years after it conquest. expired Saracen settlement in the island begins. This was a special time of Saracen inroad on the islands belonging to the Eastern empire. Almost at the same moment Crete was seized by a band of adventurers from Spain. But the first Saracen settlers in Sicily were the African neighbours of Sicily, and they were called to the work by a home treason. The story has been tricked out with many romantic details (Chron. Salern., 60, ap. Pertz, in. 498 ; Theoph. Cont., ii. 272; George Kedrenos, ii. 97); but it seems plain that Euphemios or Euthymios of Syracuse, supported by his own citizens, revolted against Michael the Stammerer (820-829), and, when defeated by an imperial army, asked help of Ziyddet Allah, the Aghlabite prince of Kairawan, and offered

to hold the island of him. ‘The struggle of 138 years now began. Euphemios, a puppet emperor, was led about by his Saracen allies much as earlier puppet emperors had been led about by Alaric and Ataulf, till he was slain in one of the many sieges. The second Semitic conquest of Sicily began in 827 at Mazzara on the old border of Greek and Pheenician. But the land had a brave defender in the patrician Theodotos, and the invaders met with a stout resistance both in the island and from armies both from Constantinople and from Byzantine Italy. The advance of the invaders was slow. In two years all that was done was to occupy Mazzara and Mineum — the old Menai of Douketios—strange points certainly to begin with, and seemingly to destroy Agrigentum, well used to destruction. Attacks on Syracuse failed; so did

 attacks on Henna—Castrum Enne, now changing into

Castrum Johannis (perhaps Kaorpo.dvvy), Castrogiovanni. The actual gain was small; but the invaders took seizin alike of the coast and of the island.

A far greater conquest followed when new invaders came from Spain and when Theodotos was killed in 830. The next year Panormus passed away for ever from Roman, for 230 years from Christian, rule. Syracuse was for fifty years, not only, as of old, the bulwark of Europe, but the bulwark of Christendom. By the conquest of Panormus the Saracens were firmly rooted in the island. We hear dimly of treasonable dealings with them on the part of the strategos Alexios, son-in-law of the emperor Theophilos ; but we see more clearly that Saracen advance was largely hindered by dissensions between the African and the Spanish settlers. In the end the Moslem conquests in Sicily became an Aghlabite principality owning at best a formal superiority in the princes of Kairawan. With the Saracen occupation begins a new division of the island, which becomes convenient in tracing the progress of Saracen conquest. This is into three valleys, known in later forms of language as Val di Mazzara or Mazza in the north-west, Val di Noto in the south-east, and Val Demone (a name of uncertain origin) in the north-east (see Amari, Musulmani in Sicilia, 1.465). The first Saracen settlement of Val di Mazzara answers roughly to the old Carthaginian possessions. From Panormus the emir or lord of Sicily, Mohammed ibn

Abdallah, sent forth his plunderers through- out Sicily and even into southern Italy. There, though they made no lasting settlements, they often occupied par- ticular points. A consul or duke of Naples in 836 even asked for Saracen help against the Lombards, which he is said to have repaid by help against his fellow-subjects in Sicily (Johan. Diac., 57 ; Amari, i. 314).

The chief work of the next ten years was the conquest of the Val di Noto, but the first great advance was made elsewhere. In 843 the Saracens won the Mamertine city, Messana, and thus stood in the path between Italy and Sicily. Then the work of conquest, as described by the Arabic writers, went on, but slowly. At last, in 859, the very centre of the island, the stronghold of Henna, was taken, and the main part of Val di Noto followed. But the divisions among the Moslems helped the Christians ; they won back several towns, and beat off all attacks on Syracuse and Tauromenium. It is strange that the reign of Basil the Macedonian (867), a time of such renewed vigour in the empire, was the time of the greatest of all losses in Sicily. In Italy the imperial frontier largely advanced ; in Sicily imperial fleets threatened Panormus. But in 875 the accession of Ibr4him ibn Ahmed in Africa changed the face of things. The emir in Sicily, Ja‘far ibn Ahmed, received strict orders to act vigorously against the eastern towns. In 877 began the only successful Semitic siege of Syracuse. The next year the city, which for 1600 years had been the seat of Greek, Roman, and Christian life, passed for the first time under the yoke of strangers to the fellowship of Europe.

Thus in fifty-one years the imperial and Christian terri- tory in Sicily was cut down to a few points on or near the eastern coast, to the Val Demone in short without Messana. But between Moslem dissension and Chris- tian valour the struggle had still to be waged for eighty- seven years. Henna had been the chief centre of Christian resistance a generation earlier; its place was now taken by the small fort of Rametta not far from Messina. The Moslems of Sicily were busy in civil wars; Arabs fought against Berbers, both against the African overlord, In 900 Panormus had to be won by a son of Ibrahim from Moslem rebels provoked by his father’s cruelty. But when Ibrahim himself came into Sicily, renewed efforts

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against the Christians led to the first taking of Tauromenium (908), of Rametta, and of other points. The civil war that followed his death, the endless revolutions of Agrigentum, where the weaker side did not scruple to call in Christian help, hindered any real Saracen occupation of eastern Sicily. The emperors never gave up their claims to Sicily or their hopes of recovering it. Besides the struggle with the Christians in the island, there was often direct warfare between the empire and the Saracens; but such warfare was more active in Italy than in Sicily. In 956 a peace or truce was made by the emperor Constantine Porphyro- genitus. A few years later, Otho the Great, the restorer of the Western empire, looked to Sicily as a land to be won back for Christendom. It had not yet wholly passed away, but the day soon came. Strange to say, as Syracuse fell in the reign of Basil the Macedonian, the Saracen occupa- tion was completed in the reign of Nikephoros Phokas (Nicephorus Phocas), the deliverer of Crete. In the very year of his accession (963) Tauromenium was taken for the second time, and became for a hundred years a Mohammedan possession. Rametta alone held out. A fleet and army from Constantinople went in vain to its help; the last stronghold of Christendom was taken (965), and for a season all was over.

Thus in 138 years the Arab did what the Canaanite had never done. The whole island was a Semitic, that is now a Mohammedan, possession. The Greek-speaking Roman of Sicily was a bondinan in his own land, like the Latin- speaking Roman of Spain. Yet the complete Saracen possession of Sicily may seem a thing of a moment. Its first and longest period lasted only 73 years. In that

time Mohammedan Sicily was threatened by a Western Recon

emperor ; which Otho the Second was beaten back in 982 as a Sicilian army. A mightier enemy was threatening in the East. Basil the Second planned the recovery of Sicily in good earnest. In 1027 he sent a great army; but his death stopped their progress before they reached the island. But the great conqueror had left behind him men trained in his school, and eleven years later the eagles of the new Rome again marched to Sicilian victories. The ravages of the Sicilian Saracens in the Greek islands were more fright- ful than ever, and George Maniakes, the first captain of his

time, was sent to win back the lost land. He too was helped by Saracen dissensions. The emir Abul-afar became a Roman vassal, and, like Alaric of old, became magister militum in the Roman army. His brother and rival Abu- hafas brought help from Africa; and finallyall joined against the Christians. Four years of Christian victory (1038- 1042) followed. In the host of Maniakes were men of all races,—Normans, who had already begun to show them- selves in south Italy, and the Warangian guard, the best soldiers of the empire, among whom Harold Hardrada himself is said to have held a place. Town after town was delivered, first Messana, then Syracuse, then a crowd of others. The exact extent of the reconquest is uncertain ; Byzantine writers claim the deliverance of the whole island ; but it is certain that the Saracens never lost Panormus. But court influence spoiled everything: Maniakes was recalled; under his successor Stephen, brother-in-law of the emperor Michael, the Saracens won back what they had lost. Messana alone held out, for how long a time is uncertain. But it could not have been again under the yoke for many years when a conqueror came who had no empresses to thwart him. The second Saracen occupation of all Sicily was short indeed. In 1060 began the thirty years' work of the first Roger.

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The land was won bit by bit. One town was taken by storm ; another submitted on terms harsher or more favourable. ‘The condition of the Christians varied from that of personal slaves to that of communities left free on the payment of tribute. The great mass were in the intermediate state usual among the non-Mohammedan sub- jects of a Mohammedan power. The dhimmi of Sicily were in essentially the same case as the rayahks of the Turk. While the conquest was going on, the towns that remained unconquered gained in point of local freedom. They be- came allies rather than subjects of the distant emperor. So did the tributary districts, as long as the original terms were kept. But, as ever, the condition of the subject race grew worse. After the complete conquest of the island, while the mere slaves had turned Mohammedans, there is nothing more heard of tributary districts. At the coming of the Normans the whole Christian population was in the state of rayahs. Still Christianity and the Greek tongue never died out; churches and monasteries received and held property ; there still are saints and_men of learning. Panormus was specially Saracen ; yet a Christian religious guild could be founded there in 1048 (Zabulariwm Regizx Cap. Panorm., p.1). We have its Greek foundation deed. It would be rash to deny that traces of other dialects may not have lingered on; but Greek and Arabic were the two written tongues of Sicily when the Normans came. The Sicilian Saracens were hindered by their internal feuds from ever becoming a great power; but they stood high among Mohammedan nations. Their advance in civili- zation is shown by their position under the Normans, and above all by their admirable style of architecture (see PanERMo), Saracens are always called in for any special work of building or engineering. They had a literature which Norman kings studied and promoted. The Normans in short came into the inheritance of the two most civilized nations of the time, and they allowed the two to flourish side by side.

The most brilliant time for Sicily as a power in the Never before or after was the island so united or so independent. Some of the old tyrants had ruled out of Sicily; none had ruled over all Sicily. |The Normans held all Sicily as the centre of a dominion which stretched far beyond it. The conquest was the work of one man, Count Roger of the aouse of Hauteville brother of the more famous Robert Wiscard (Guiscard). That it took him

thirty years was doubtless owing to his being often called off to help his brother in Italy and beyond Hadria. The conquests of the Normans in Italy and Sicily form part of one enterprise ; but they altogether differ in character. In Italy they over- threw the Byzantine dominion; their own rule was perhaps not worse, but they were not deliverers. In Sicily they were everywhere welcomed by the Christians as deliverers from infidel bondage.

As in the Saracen conquest of Sicily, as in the Byzan- tine recovery, so in the Norman conquest, the immediate occasion was given by a home traitor. Count Roger had already made a plundering attack, when Becumen of Catania, driven out by his brother, urged him to serious invasion. Messina was taken in 1060, and became for a while the Norman capital. The Christians everywhere welcomed the conqueror. But at Traina they presently changed their minds, and joined with the Saracens to besiege the count in their citadel. At Catania Becumen was set up again as Roger's vassal, and he did good service till he was killed. Roger soon began to fix his eye on the Saracen capital. Against that city he had Pisan help, as the inscription on the Pisan dwomo witnesses (cf. Geoff. Mal, ii. 34). But Palermo was not taken until 1071, and then only by the help of Duke Robert, who kept the prize to himself.

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Still its capture was the turning-point in the struggle. 1060-1090. Taormina (Tauromenium) was won in 1078. Syracuse, under its emir Benarvet, held out stoutly. He won back Catania by the help of a Saracen to whom Roger had trusted the city, and whom he himself punished. Catania was won back by the count's son Jordan. But progress was delayed by Jordan's rebellion and by the absence of Roger in his brother's wars. At last, in 1085, Syracuse was won. Next year followed Girgenti and Castrogiovanni, whose chief became a Christian. Noto, the Saracen Ra- metta, held out till 1090. Then the whole island was won, and Roger completed his conquest by a successful expedition to Malta.

Like the condition of the Greeks under the Saracens, so Saracens the condition of the Saracens under the Normans differed »2der in different places according to the circumstances of each ieee

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conquest. The Mohammedan religion was everywhere tolerated, in many places much more. But it would seem that, just as under the Moslem rule, conversions from Christianity to Islam were forbidden. On the other hand, conversions from Islam to Christianity were not always encouraged; Saracen troops were employed from the begin- ning, and Count Roger seems to have thought them more trustworthy when unconverted. At Palermo the capitula- tion secured to the Saracens the full enjoyment of their own laws ; Girgenti was long mainly Saracen ; in Val di Noto the Saracens kept towns and castles of their own. On the other hand, at Messina there were few or none, and we hear of both Saracen and Greek villains, the latter doubtless abiding as they were in Saracen times. But men of both races were trusted and favoured according to their deserts. The ecclesiastical relations between Greeks and Latins are harder to trace. At the taking of Palermo the Greek bishop was restored; but his successors were Latins, and Latin prelates were placed in the bishoprics which Count Roger founded. Urban the Second visited Sicily to promote the union of the church, and he granted to the count those special ecclesiastical powers held by the counts and kings of Sicily as hereditary legates of the Holy See which grew into the famous Sicihan monarchy (Geoff. Mal, iv. 29). But Greek worship went on; at Messina it lingered till the 14th and 15th centuries (Pirro, Sicilia Sacra, i. 420, 431, 449), as it has been since brought back by the Albanian colonists. But the Greeks of Sicily have long been united Greeks, admitting the authority of the see of Rome.

In its results the Norman conquest of Sicily was a Latin conquest far more thorough than that which had been made by the Roman commonwealth. The Norman princes protected all the races, creeds, and tongues of the island, Greek, Saracen, and Jew. But new races came to settle Lin- alongside of them, all of whom were Latin as far as their guistic official speech was concerned. The Normans brought the pee French tongue with them; it remained the court speech u during the 12th century, and Sicily was

thrown open to all speakers of French, many of whom came from England. There was constant intercourse between the two great islands, both ruled by Norman kings, and many natives of England filled high places in Sicily. But French was only a language of society, not of business or literature. The languages of inscriptions and documents are Greek, Arabic, and Latin, in private writings sometimes Hebrew. The kings understood Greek and Arabic, and their deeds and works were commemorated in both tongues. Hence comes the fact, at first sight so strange, that Greek, Arabic, and French have all given way to a dialect of Italian. But the cause is not far to seek. The Norman conquest opened Sicily to settlers from Italy, above all from the Norman possessions in Italy. Under the name of Lombards, they became an important, in some parts a dominant, element.

Thus at Messina, where we hear nothing of Saracens, we hear much of the disputes between Greeks and Lombards. The Lombards had hardly a distinct language to bring with them, At the time of the conquest, it was already found out that French had become a distinct speech from Latin ; Italian hardly was such. The Lombard element, during the Norman reign, shows itself, not in whole documents or inscriptions, but in occasional words and forms, as in some of the mosaics at Monreale. And, if any element, Latin or akin to Latin, had lingered on through Byzantine and Saracen rule, it would of course be attracted to the new Latin element, and would help to strengthen it. It was this Lombard element that had the future before it. Greek and Arabic were antiquated, or at least isolated, in a land which Norman conquest had made part of Western Europe and Latin Christendom. They could grow only within the island; they could gain no strength from out- side. Even the French element was in some sort isolated, and later events made it more so. But the Lombard element was constantly strengthened by settlement from outside. In the older Latin conquest, the Latin carried Greek with him, and the Greek element absorbed the Latin.

Latin now held in western Europe the place which Greek had held there. Thus, in the face of Italian, both Greek and Arabic died out. Step by step, Christian Sicily became Latin in speech and in worship. But this was not till the Norman reigns were over. Till the end of the 12th century Sicily was the one land where men of divers creeds and tongues could live side by side, each in his own way.

Hence came both the short-lived brilliancy of Sicily and its later decay. In Sicily there were many nations all protected by the Sicilian king ; but there was no Sicilian nation. Greek, Saracen, Norman, Lombard, and Jew could not be fused into one people; it was the boast of Sicily that each kept his laws and tongue undisturbed. Such a state of things could live on only under an en- lightened despotism ; the discordant elements could not join to work out really free and national institutions. Sicily had parliaments, and some constitutional principles were well understood. But they were assemblies of barons, or at most of barons and citizens; they could only have represented the Latin elements, Norman and Lombard, in the island. outside the relations between the Latin king and his Latin subjects. Still, as long as Greek and Saracen were pro- tected and favoured, so long was Sicily the most brilliant of European kingdoms. But its greatness had no ground- work of national life ; for lack of it the most brilliant of kingdoms presently sank below the level of other lands.

Four generations only span the time from the birth of Count Roger, about 1030, to the death of the emperor Frederick the Second in 1250. Roger, great count of Sicily, was, at his death in 1101, succeeded by his young son Simon, and he in 1105 by the second Roger, the first king. He inherited all Sicily, save half Palermo—the other half had been given up—and part of Calabria. The rest of Palermo was soon granted ; the Semitic capital became the abiding head of Sicily. On the death of Duke William of Apulia, Roger gradually founded (1127-40) a great Italian domi- nion. Tothe Apulian duchy he added (1136) the Norman principality of Capua, Naples (1138), the last dependency of the Eastern empire in Italy, and (1140) the Abruzzi, an undoubted land of the Western empire. He thus formed a dominion which has been divided, united, and handed over from one prince to another, oftener than any other state in Europe, but whose frontier has hardly changed at all. In 1130 Roger was crowned at Palermo, by authority

of the antipope Anacletus, taking the strange title of “king of Sicily and Italy.” This, on his recon-

The elder races, Greek and Saracen, stand’

cilation with Pope Innocent the Second, he exchanged for “king of Sicily and of the duchy of Apulia and of the prin- cipality of Capua.” By virtue of the old relations between the popes and the Normans of Apulia, he held his kingdom in fief of the Holy See, a position which on the whole strengthened the royal power. But his power, like that of Dionysios and Agathokles, was felt in more distant regions, His admiral George of Antioch, Greek by birth and creed, warred against the Eastern empire, won Corfu (Korypho ; the name of Korkyra is forgotten) for a season, and carried off the silk-workers from Thebes and Peloponnesos to Sicily. But Manuel Komnenos (Comnenus) ruled in the East, and, if Roger threatened Constantinople, Manuel threatened Sicily. In Africa the work of Agathokles was ; more than renewed ; Mahadia and other points were won and kept as long as Roger lived. These exploits won him the name of the terror of Greeks and Saracens. To the Greeks, and still more to the Saracens, of his own island he was a protector and something more.

Roger’s son William, surnamed the Bad, was crowned Willian in his father’s lifetime in 1151. Roger died in 1154, and !andll } William’s sole reign lasted till 1166, It was a time of domestic rebellions, chiefly against the king’s unpopular ministers, and it is further marked by the loss of Roger’s African conquests. After William the Bad came (1166- 1189) his son William the Good. Unlike as were the two men in themselves, in their foreign policy they are hardly to be distinguished. The Bad William has a short quarrel with the pope; otherwise Bad and Good alike appear as zealous supporters of Alexander the Third, and as enemies of both empires. The Eastern warfare of the Good is stained by the frightful sack of Thessalonica ; it is marked also by the formation of an Eastern state under Sicilian supremacy (1186). Corfu, the possession of Agathokles and Roger, with Durazzo, Cephalonia, and Zante, was granted by William to his

admiral Margarito with the strange title of king of the Epeirots. He founded a dynasty, though not of kings, in Cephalonia and Zante. Corfu and Durazzo were to be more closely connected with the Sicilian crown.

The brightest days of Sicily ended with William the Good. His marriage with Joanna, daughter of Henry of Anjou and England, was childless, and William tried to procure the succession of his aunt Constance and her husband, King Henry the Sixth of Germany, son of the emperor Frederick the First. But the prospect of German rule was unpopular, and on William's death the crown passed to Tancred, an illegitimate grandson of King Roger, Tanovt who figures in English histories in the story of Richard's crusade. In 1191 Henry, now emperor, asserted his claims; but, while Tancred lived, he did little, in Sicily nothing, to enforce them. On the death of Tancred (1194) and the accession of his young son William the Third, the William emperor came and conquered Sicily and the Italian posses- Ii sions, with an amount of cruelty which outdid any earlier war or revolution. First of four Western emperors who wore the Sicilian crown, Henry died in 1197, leaving the kingdom to his young son Frederick, heir of the Norman kings through his mother.

The great days of the Norman conquest and the Norman reigns have been worthily recorded by contemporary his- torians. For few times have we richer materials. The oldest is Aimé or Amato of Monte Cassino, who exists only in an Old-French translation. We have also for the Norman conquest the halting hexameters of William of Apulia, and for the German conquest the lively and par- tial verses of Peter of Eboli. Of prose writers we have Geoffrey Malaterra, Alexander abbot of Telesia, Romuald archbishop of Salerno, Falco of Benevento, above all Hugo Falcandus, one of the very foremost of medieval writers.

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Not one of these Latin writers was a native of the island, and we have no record from any native Greek. Occasional notices we of course have in the Byzantine writers, and Archbishop Eustathios's account of the taking of Thessa- lonica is more than occasional. And the close connexion between Sicily and England leads to many occasional refer- ences to Sicilian matters in English writers.

The relations between the various races of the islands are most instructive. The strong rule of Roger kept all in order. He called himself the defender of Christians ; others, on account of his favour to the Saracens, spoke of him as a pagan. He certainly encouraged Saracen art and literature in every shape. His court was full of eunuchs, of whom we hear still more under William the Bad. Under William the Good the Saracens, without any actual oppres- sion, seem to be losing their position. Hitherto they had been one element in the land, keeping their own civiliza- tion alongside of others. By a general outbreak on the death of William the Good, the Saracens, especially those of Palermo, were driven to take shelter in the mountains, where they sank into a wild people, sometimes holding points of the island against all rulers, sometimes taking military service under them. The Jews too begin to sink into bondmen. Sicily is ceasing to be the land of many nations living side by side on equal terms.

The Germans who helped Henry to win the Sicilian

der- crown did not become a new element in the island, but

only a source of confusion during the minority of his son. Frederick—presently to be the renowned emperor Freder- ick the Second, “Fridericus stupor mundi et immutator mirabilis”—was crowned at Palermo in 1198; but the child, deprived of both parents, was held to be under the protection of his lord Pope Innocent the Third. During his minority the land was torn in pieces by turbulent nobles, revolted Saracens, German captains seeking settlements, the maritime cities of Italy, and professed French deli- verers. In 1210 the emperor Otho the Fourth, who had overrun the continental dominions, threatened the island. In 1212, just when Frederick was reaching an age to be of use in his own kingdom, he was called away to dispute the crown of Germany and Rome with Otho. Hight years more of disorder followed ; in 1220 the emperor-king came back. He brought the Saracens of the mountains back again to a life in plains and cities, and presently planted a colony of them on the mainland at Nocera, when they be- came his most trusty soldiers. His necessary absences from Sicily led to revolts. He came back in 1233 from his crusade to suppress a revolt of the eastern cities, which seem, like those of Italy, to have been aiming at repub- lican independence. A Saracen revolt in 1243 is said to have been followed by a

removal of the whole remnant to Nocera. Some however certainly stayed or came back ; but their day was over.

Under Frederick the Italian or Lombard element finally prevailed in Sicily. Of all his kingdoms Sicily was the best-beloved. He spoke all its tongues; he protected, as far as circumstances would allow, all its races. He legis- lated for all in the spirit of an enlightened and equal des- potism, jealous of all special privileges, whether of nobles, churches, or cities. The heretic alone was persecuted ; he was the domestic rebel of the church; Saracen and Jew were entitled to the rights of foreigners. Yet Frederick, patron of Arabic learning, suspected even of Moslem belief, fails to check the decline of the Saracen element in Sicily. The Greek element has no such forces brought against it. It is still a chief tongue of the island, in which Frederick's laws are put forth as well as in Latin. But it is clearly a declining element. Greek and Saracen were both becom- ing survivals in an island which was but one of the many kingdoms of its king. No wonder that the Italian element

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advanced at the cost of all others. the court speech of Sicily, and he made it more than a court speech, the speech of a new-born literature. Sicily, strangely enough, became the cradle of Italian song.

Two emperors had now held the Sicilian crown. On Frederick's death in 1250 the crown passed to his son Conrad, not emperor indeed, but king of the Romans. He was nominally succeeded by his son Conradin. The real

ruler under both was Frederick's natural son Manfred. Manfred.

In 1258, on a false rumour of the death of Conradin, Manfred was himself crowned king at Palernio. He had to found the kingdom afresh. Pope Innocent the Fourth had crossed into Sicily, to take advantage of the general discontent. The cities, whose growing liberties had been checked by Frederick's legislation, strove for practical, if not formal, independence, sometimes for dominion over their fellows. The 5th century B.c. seemed to have come back. Messina laid waste the lands of Taormina, because

Taormina would not obey the bidding of Messina. Yet, among these and other elements of confusion, Manfred succeeded in setting up again the kingly power, first for his kinsmen and then for himself. His reign continued that of his father, so far as a mere king could continue the reign of such an emperor. The king of Sicily was the first potentate of Italy, and came nearer than any prince since Louis the Second to the union of Italy under Italian rule. He sought dominion too beyond Hadria: Corfu, Durazzo, and a strip of the Albanian coast became Sicilian possessions as the dowry of Manfred's Greek wife. But papal enmity was too much for him. His overlord claimed to dispose of his crown, and hawked it about among the princes of the West. Edmund of England bore the Sicilian title for a moment. More came of the grant of Urban the Fourth (1264) to Charles, count of Anjou, and through his wife sovereign count of Provence.

lord's grant. Manfred was defeated and slain at Bene- vento. The whole Sicilian kingdom became the spoil of a stranger who was no deliverer to any class of its people. The island sank yet lower. Naples, not Palermo, was the head of the new power; Sicily was again a province. But a province Sicily had no mind to be. In the con- tinental lands Charles founded a dynasty; the island he lost after sixteen years. His rule was not merely the rule of a stranger king surrounded by stranger followers ; the degradation of the island was aggravated by gross oppres- sion, grosser than in the continental lands. The conti- nental lands submitted, with a few slight efforts at resist- ance. The final result of the Angevin conquest of Sicily was its separation from the mainland.

Sicilian feeling was first shown in the support given to the luckless expedition of Conradin in 1268. Frightful executions in the island followed his fall. The rights of the Swabian house were now held to pass to Peter (Pedro), king of Aragon, husband of Manfred's daughter Constance. The connexion with Spain, which has so deeply affected the whole later history of Sicily, now begins. Charles held the Greek possessions of Manfred and had designs both on Epeiros and on Constantinople. The emperor Michael Palaiologos and Peter of Aragon became allies against Charles ; the famous John of Procida acted as an agent be- tween them ; the costs of Charles's Eastern warfare caused great discontent, especially in an island where some might still look to the Greek emperor as a natural deliverer. Peter and

Michael were doubtless watching the turn of things in Sicily ; but the tale of a long-hidden conspiracy between them and the whole Sicilian people has been set aside by Amari. The actual outbreak of 1282, the famous Sicilian Vespers, was stirred up by the wrongs of the moment. A gross case of insult offered by a Frenchman

Frederick chose it as 1197-1282.

Charles, crowned Charles by the pope in 1266, marched to take possession of his of Anjou.

1282-1735.

Peter of Aragon,

James,

Freder- ick

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to a Sicilian woman led to the massacre at Palermo, and the like scenes followed elsewhere. The strangers were cut off; Sicily was left to its own people. The towns and districts left without a ruler by no means designed to throw off the authority of the overlord; they sought the good will of Pope Martin. But papal interests were on the side of Charles; and he went forth with the blessing of the church to win back his lost kingdom.

Angevin oppression had brought together all Sicily in a common cause. There was at last a Sicilian nation, a nation fora while capable of great deeds. Sicily now stands out asa main centre of European politics. But the land has lost its character; it is becoming the plaything of powers, instead of the meeting-place of nations. The tale, true or false, that Frenchmen and Provengals were known from the natives by being unable to frame the Italian sound of ¢ shows how thoroughly the Lombard tongue had overcome the other tongues of the island. In Palermo, once city of threefold speech, a Greek, a Saracen, a Norman, who clave to his own tongue must have died with the strangers. ;

Charles was now besieging Messina; Sicily seems to have put on some approach to the form of a federal com- monwealth. Meanwhile Peter of Aragon was watching and preparing. He now declared himself. To all, except the citizens of the great cities, a king would be acceptable ; Peter was chosen with little opposition in a parliament at Palermo, and a struggle of twenty-one years began, of which Charles and Peter saw only the first stage. In fact, after Peter had helped the Sicilians to relieve Messina, he was very little in Sicily; he had to defend his kingdom of Aragon, which Pope Martin had granted to another French Charles. He was represented by Queen Constance, and his great admiral Roger de Loria kept the war away from Sicily, waging it wholly in Italy, and making Charles, the son of King Charles, prisoner. In 1285 both the rival kings died. Charles had before his death been driven to make large legislative concessions to his subjects to stop the tendency shown, especially in Naples, to join the re- yolted Sicilians. By Peter's death Aragon and Sicily were separated ; his eldest son Alphonso took Aragon, and his second son James took Sicily, which was to pass to the third son Frederick, if James died childless. Jamies was crowned, and held his reforming parliament also. With the popes no terms could be made. Charles, released in 1988 under a deceptive negotiation, was crowned king of Sicily by Honorius; but he had much ado to defend his continental dominions against James and Roger. In 1291 James succeeded Alphonso in the kingdom of Aragon, and left Frederick not king, according to the entail, but only his lieutenant in Sicily.

Frederick was the real restorer of Sicilian independence. He had come to the island so young that he felt as a native. He defended the land stoutly, even against his brother. For James presently played Sicily false. In 1295 he was reconciled to the church and released from all French claims on Aragon, and he bound himself to restore Sicily to Charles. But the Sicilians, with Frederick at their head, disowned the agreement, and in 1296 Frederick was crowned king. He had to defend Sicily against his brother and Roger de Loria, who forsook the cause, as did John of Procida. Hitherto the war had been waged on the mainland ; now it was transferred to Sicily. King James besieged Syracuse as admiral of the Roman Church ; Charles sent his son Robert in 1299 as his lieutenant in Sicily, where he gained some successes. But in the same year the one great land battle of the war, that of Falconaria, was won for Sicily. The war, chiefly marked by another

great siege of Messina, went on till 1302, when both sides were thoroughly weakened and eager for peace. By a

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treaty, confirmed by Pope Boniface the next year, Frederick was acknowledged as king of Trinacria for life. He was to marry the daughter of the king of Sicily, to whom the island kingdom was to revert at his death. The terms were never meant to be carried out. Frederick again took up the title of king of Sicily, and at his death in 1337 he was succeeded by his son Peter. There were thus two Peter, Sicilian kingdoms and two kings of Sicily. The king of the mainland is often spoken of for convenience as king of Naples, but that description was never borne as a formal title save in the 16th century by Philip, king of England and Naples, and in the 19th by Joseph Buonaparte and Joachim Murat. The strict distinction was between Sicily on this side the Pharos (of Messina) and Sicily beyond it.

Thus the great island of the Mediterranean again became an independent power. And, as far as legislation could make it, Sicily became one of the freest countries in Europe. By the laws of Frederick parliaments were to be regularly held, and without their consent the king could not make war, peace, or alliance. The treaty of 1302 was not confirmed by parliament, and in 1337 parliament called Peter to the crown. But Sicily never rose to the greatness of its Greek or its Norman days, and its old character had passed away. Of Greeks and Saracens we now hear only as a degraded remnant, to be won over, if it may be, to the Western Church. The kingdom had no foreign pos- sessions ; yet faint survivals of the days of Agathokles and Roger lingered on. The isle of Gerba off the African coast was held for a short time, and traces of the connexion with Greece went on in various shapes. If the kings of Sicily on this side the Pharos kept Corfu down to 1386, those beyond the Pharos became in 1311 overlords of Athens, when that duchy was seized by Catalan adventurers, dis- banded after the wars of Sicily. In 1530 the Sicilian island of Malta became the shelter of the Knights of Saint John driven by the Turk from Rhodes, and Sicily has received several colonies of Christian Albanians, who have replaced Greek and Arabic by yet another tongue.

There is no need to dwell at length on the Sicilian Subse history of the last five hundred years. The descendants quent of Frederick did not forma great dynasty. Under him and after him Sicily played a part in Italian affairs, invading and being invaded on behalf of the Ghibelline cause. But it was torn by dissensions between Spanish and Italian fac- tions, and handed to and fro between one Spanish king and another. At last Ferdinand the Catholic (1479-1515), king by inheritance of Aragon and of Sicily beyond the pharos, conquered the continental Sicily, and called himself king of the Two Sicilies. Both were now ruled by Spanish viceroys. In Charles the First (1516-1555)—Charles of Anjou is not reckoned—Sicily had a third imperial king, and once more became the starting-point for African war- fare. Philip, already king of Naples, became king of the Two Sicilies at the abdication of his father, and the two crowns passed along with Castile and Aragon till the division of the Spanish dominions. Under the foreign rule the old laws were trampled under foot. Three risings took place, that of Messina in 1672, with pretended French help, which led to deeper subjection. At the death of Charles the Second in 1700, Sicily acknowledged the French claimant Philip ; but the peace of Utrecht made it the kingdom of Victor Amadeus of Savoy (1713-1720). He was crowned at Palermo; but he had to withstand Spanish invasion, and to exchange Sicily for the other insular crown of Sardinia. Both Sicilies now passed to the emperor Charles the Sixth, the fourth imperial king, who also is passed by in Sicilian reckoning. Charles the Third is the Spanish prince of the house of Bourbon who won both Sicilies from the Austrian. and who was the last king crowned at Palermo (1735).

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GEOGRAPHY. |

The wars of the French Revolution again parted the Two Sicilies. In 1798 Ferdinand the Fourth (1759-1825) withdrew to the island before the French

armies. In 1805 he withdrew again, while Joseph Buonaparte and Joachim Murat reigned on the mainland as kings of Naples. Under the Bourbon rule, besides the common grievances of both kingdoms, Sicily had specially to complain of being treated as subordinate to Naples. But from 1806 to 1815 Sicily, practically a separate kingdom under British pro- tection, enjoyed a measure of wellbeing such as it had not had for some ages, and in 1812 a constitution was estab- lished. The European settlement of 1815 brought back the Bourbon to his continental kingdom. Ferdinand the First became a constitutional king over the United King- dom of the Two Sicilies. This was equivalent to the suppression of the separate constitution of the island, and before long all constitutional order was trodden under foot. In 1820, and also in 1836 under Francis the First, Sicily rose for freedom and separation. This last time the island was bound yet more firmly to continental rule. In the general stir of 1848 Sicily again proclaimed her independence, and sought for herself a king in the house of Savoy. Again were the liberties of Sicily trodden under foot; and, in the last change of all, the deliverance wrought by Garibaldi in 1860, if not her liberties, her ancient memories were forgotten. Sicily became part of a free kingdom; but her king does not bear her style, and he has not taken the crown of Roger. The very name of Sicily has been wiped out; and the great island now counts only as seven provinces of an Italian kingdom.

The literature bearing on Sicily, old and new, is endless. _ It is something for a land to have had part of its story told by Thucy- dides and another by Hugo Faleandus. Of modern books Holni’s Geschichte Sicilicns im Alterthwm (down to the accession of the second Hieron) is of great value. So are the works of Michele Amari for the Moslem occupation and the War of the Vespers. The old local historian Fazzcllo must not be passed by, nor the colleetions of Carusio, Pirro, and Giovanni. But a history of Sicily and the cycles of its history from the beginning is still lacking. The writers on particular branches of the subject are infinite. Gally Knight’s Normans in Sicily lias probably led many to their first thoughts on the subject ; and, as a guide for the traveller, that of Gsel-fels can hardly be outdone. ~ (E. A. F.)

Part I].—GroGRAPHY AND STATISTICS.

The island of Sicily (Ttal. Sicdlia) belongs to the kingdom of Italy, being separated from the mainland only by the narrow (about 2 miles wide) but deep Straits of Messina. It is nearly bisected by the meridian of 14° E., and by far the greater part lies to the south of 38° N. Its southernmost point, however, in 36° 40’ N. is 40’ to the north of Point Tarifa, the southernmost point of Spain and of the continent of Europe. In shape it is triangular, whence the ancient poetical name of Z’rinacria, referring to its three promontories of Pelorum (now Faro) in the north-east, Pachynum (now Passaro) in the south-east, and Lilybzum (now Boeo) in the west. Its area, exclusive of the adjacent small islands belonging to the compartimento, is, according to the recent planimetrical calculation of the Military Geographical Institute of Italy, 9860 square miles, —considerably less than one-third of that of Ireland ; that of the whole compartimento is 9935 square miles.

The island occupies that part of the Mediterranean in ich the shallowing of the waters divides that sea into ‘ two basins, and in which there are numerous indications of frequent changes in a recent geological period. The channel between Cape Bon in Tunis and the south-west of

Micily (a distance of 80 miles) is, on the whole, shallower

than the Straits of Messina, being for the most part under

190 fathoms in depth, and exceeding 200 fathoms only

for a very short interval, while the Straits of Messina,

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which are at their narrowest part less than 2 miles in width, have almost everywhere a depth exceeding 150 fathoms. The geological structure in the neighbourhood of this strait shows that the island must originally have been formed by a rupture between it and the mainland, but that this rupture must have taken place at a period long antecedent to the advent of man, so that the naine Rhegium cannot be based even on the tradition of any such catastrophe. The mountain range that runs out towards the north-east of Sicily is composed of crystalline rocks precisely similar to those forming the parallel range of Aspromonte in Calabria, but both of these are girt about by sedimentary strata belonging in part to an early Tertiary epoch. That a subsequent land connexion took place, however, by the elevation of the sea-bed there is abundant evidence to show; and the occurrence of the remains of African Quaternary mammals, such as Llephas meridionalis, H. antiquus, Hippopotamus pentlandi, as well as of those of still living African forms, such as Hlephas africanus and Hyxna crocuta, makes it probable that there was a direct post-Tertiary connexion also with the African continent.

The north coast is generally steep and cliffy and abun- Coasts. dantly provided with good harbours, of which that of Palermo is the finest. In the west and south the coast is for the most part flat, more regular in outline, and less favourable to shipping, while in the east, where the sea- bottom sinks rapidly down towards the eastern basin of the Mediterranean, steep rocky coasts prevail except op- posite the plain of Catania. In the northern half of this coast the lava streams of Mount Etna stand out for a distance of about 20 miles in a line of bold cliffs and promontories. At various points

on the east, north, and west coasts there are evidences of a rise of the land having taken place within historical times, at Trapani on the west coast even within the 19th century. As in the rest of the Mediterranean, tides are scarcely observable ; but at several points on the west and south coasts a curious oscillation in the level of the waters, known to the natives as the marrobbio (or marobia), is sometimes noticed, and is said to be always preceded by certain atmospheric signs. This consists in a sudden rise of the sea-level, occasionally to the height of 3 feet, sometimes occurring only once, some- times repeated at intervals of a minute for two hours, or even, at Mazzara, where it is most frequently observed, for twenty-four hours together.

The surface of Sicily lies for the most part more than Surface. 500 feet above the level of the sea. Caltanissetta, which occupies the middle point in elevation as well as in respect of geographical situation, stands 1900 feet above sea-level. Considerable mountains occur only in the north, where the lower slopes of all the heights form one continuous series of olive-yards and orangeries. Of the rest of the island the greater part forms a plateau varying in eleva- tion and mostly covered with wheat-fields. The only plain of any great extent is that of Catania, watered by the Simeto, in the east; to the north of this plain the active volcano of Erna (q.v.) rises with an exceedingly gentle slope to the height of 10,868 feet from a base 400 square miles in extent. This is the highest elevation of the island. The steep and narrow crystalline ridge which trends north-eastwards, and is known to geographers by the name of the Peloritan Mountains, does not reach 4000 feet. The Nebrodian Mountains, a limestone range con- nected with the Peloritan range and having an east and west trend, rise to a somewhat greater height, and farther west, about the middle of the north coast, the Madonie (the only one of the groups mentioned which has a native name) culminate at the height of nearly 6500 feet. From the western end of the Nebrodian Mountains a lower range

Geology.

Climate.

Flora,

(in some places under 1500 feet in height) winds on the whole south-eastwards in the direction of Cape Passaro. With the exception of the Simeto, the principal perennial streams—the Salso, the Platani, and the Belici—enter the

sea on the south coast.

Of the sedimentary rocks of Sicily none are earlicr than the Secondary period, and of the older Sccondary rocks there are only comparatively small patches of Triassic and Jurassic age—most abundant in the west but also occurring on the flanks of the mountains in the north-east. Cretaceous rocks are very sparingly represented (in the south-east), and by far the greater part of the island is occupied by Tertiary (mainly Eocene and Miocene) lime-stones. The Nebrodian Mountains are mainly composed of com- pact limestones of Oligocene date, but are flanked by Eocene rocks including the nummulitic limestone. Quaternary deposits border many of the bays, and the plain of Catania is wholly covered with recent alluvium. Basalts and basaltic tufas border this plain on the south, as the ancient and modern lavas of Etna do on the north.

The climate of Sicily resembles that of the other lands in the extreme south of Europe. As regards temperature, it has the warm aud equable character which belongs to most of the Mediterranean region. At Palermo (where continuous observations have been made since 1791) the range of temperature between the mean of the coldest and that of the hottest month is little greater than at Greenwich. The mcan temperature of January (514° Fahr.) is nearly as high as that of October in the south of England, that of July (77° Fahr.) about 18° warmer than the corresponding month at Greenwich. During the ‘whole period for which observations have been made the thermometer has never been observed to sink at Palermo below the freezing-point; still frost does occur in the island even on the low grounds, though never for more than a few hours. On the coast snow is seldom seen, but it does fall occasion- ally. On the Madonie it lies till June, on Etna till July. The annual rainfall except on the higher mountains does not reach 30 inches, and, as in other parts of the extreme south of Europe, it occurs chiefly in the winter months, while the three summer months (June,

July, and August) are almost quite dry. During these months the whole rainfall does not exceed 2 inches, except on the slopes of the mountains in the north-east. Hence most of the streams dry up insummer. The chief scourge is the sirocco, which is experienced in its most characteristic form on the north coast, as an oppressive, parching, hot, dry wind, blowing strongly and steadily from the south, the atmosphere remaining through the whole period of its duration leaden-coloured and hazy in conse- quence of the presence of immense quantities of reddish dust. It oceurs most frequently in April, and then in May and September, but no month is entirely free from it. Three days are the longest period for which it lasts. The same name is sometimes applied to a moist and not very hot, but yet oppressive, south-east wind which blows from time to time on the east coast. Locally the salubrity of the climate is seriously affected by the occurrence of malaria, regarding which important evidence was furnished to a Government commission of inquiry by officials of the Sicilian rail-ways. From this it appears that the whole of the north-east coast from Catania to Messina is perfectly free from malaria, and so also is the line on the north coast from Palermo to Termini; and, singularly enough, while these parts of the low ground are free, malarial regions are entered upon in certain places as soon as the railway begins to ascend to higher levels. Such is the case with the line which crosses the island from Termini to Girgenti; and on the line which ascends from Catania to Castrogiovanni it is found that the stations become more and more unhealthy as the line ascends to Leonforte, and at that station so unhealthy are the nights that it is necessary to convey the employés by a special train every evening to Castrogiovanni (at the height of more than 3000 feet), and to bring them back by another train in the morning.

The flora of Sicily is remarkable for its wealth of species ; but, comparing Sicily with other islands that have been long separated from the inainland, the number of endemic species is not great. The orders most abundantly represented are the Compositw, Crucifere, Labiate, Caryophyllacce, and Scrophulartacew. The Rosaccw are also abundantly represented, and among them are numerous species of the rose. The general aspect of the vegetation of Sicily, however, has been greatly affected, as in other parts of the Mediterranean, by the introduction of plants within historical times. Being more densely populated than any other large Mediterranean island, and

having its population dependent chiefly on the products of the soil, it is necessarily more extensively cultivated than any other of the larger islands referred to, and many of the objects of cultivation are not originally natives of the island. Not to mention the olive, which must have been introduced at a remote period, all the members of the orange tribe, the agave, and the prickly pear, as well as other plants highly characteristic of Sicilian scenery, have been introduced since the beginning of the Christian era. With respect to vegetation and cultivation three zoncs may be distinguished. The first reaches to about 1600 feet above sca-level, the upper limit of the

members of the orange tribe; the second ascends to about 3300 feet, the limit of the growth of wheat, the vine, and the hardier ever- greens ; and the third, that of forests, reaches from about 3300 feet upwards, But it is not merely height that determines the general character of the vegetation. The cultivated trecs of Sicily mostly demand such an amount of moisture as can be obtained only on the mountain slopes, and it is worthy of notice that the structure of the mountains is peculiarly favourable to the supply of this want. The limestones of which they are mostly composed act like a sponge, absorbing the rain-water through their innumerable pores and fissures, and thus storing it up in the interior, afterwards to allow it to well forth in springs at various elevations lower down. In this way the irrigation which is absolutely indispensable for the members of the orange tribe during the dry season is greatly facilitated, and even those trees for which irrigation is not so indispensable receive a more ample supply of moisture during the rainy season, Hence it is that, while the plain of Catania is almost treeless and tree-cultivation is comparatively limited in the west and south, where the extent of land under 1600 feet is consider- able, the whole of the north and north-east coast from the Bay of Castellamare round to Catania is an endless succession of orchards, in which oranges, citrons, and lemons alternate with olives, almonds, pomegranates, figs, carob trees, pistachios, mulberries, and vines. Oranges are specially important as an export crop, and the value of this product has enormously increased since steamers began to traverse the Mediterranean, Olives are even more extensively

cultivated, but more for home consumption. The limit in heigl.t of the olive is about 2700 feet, aud that of the vine about 3500. A considerable silk production depends on the cultivation of the mulberry in the neighbourhood of Messina and Catania. One of the most striking features in the commerce of the island is the very large proportion of southern fruits sent to the United States, whence petroleum is chiefly imported. Among other trees and shrubs of importance may be mentioned the deep-rooted sumach, which is adapted to the driest regions, the manna ash (Fraxinus ornus), the American Opuntia vulgaris or prickly pear and the agave—the former of which yields a favourite article of diet with the natives, and both of which thrive on the driest soil—the date-palm, the plantain, various bamboos, cycads, and the dwarf-palm, the last of which grows in some parts of Sicily more profusely than anywhere else, and in the desolate region in the south-west yields almost the only vegetable product of importance. The Arwndo Donaa, the tallest of European grasses, is largely grown for vine-stakes. The forests on the higher slopes of the mountains are chiefly of oak, with which are associated large numbers of the fruit-trees of central Europe, and on Etna and the Madonie chestnuts.

Outside of the tree region wheat is by far the most important Cereals

product. ~~At the present day Sicily is still a rich granary, as it was in ancient times when Greek colonies flourished in the south and east, and later under the supremacy of Rome. In all three~~ fourths of the cultivated surface are estimated to be covered with cereals, and it is the cultivation of wheat more particularly which determines in most places the character of the Sicilian landscape throughout the year. The magquis, or thick-leaved stunted ever-greens, which on the other Mediterranean islands withstand this summer drought, have been almost banished from Sicily by the extent of the wheat cultivation. Oats and barley are also grown, but maize scarcely at all, for, being a summer crop, it is almost entirely excluded from cultivation by the extreme drought of that season. Beans form in spring the chief food of the entire popula- tion. Flax is grown for its seed (linseed), and the Crocus sativus for the production of saffron, On the plain of Catania cotton is grown along with wheat, and among other sub-tropical products sugar (probably introduced by the Arabs about the 10th century) and tobacco are

still of some importance; but the cultivation of rice has greatly declined, in consequence of its tendency to produce malaria.

The native fauna of Sicily is similar to that of Southern Italy. Among domestic animals mules aud asses are very important as beasts of burden. At the enumeration of 10th January 1876 mules numbered in Sicily 112,115 out of a total of 298,868 belong- ing to the kingdom of Italy; the number of asses at the same date was 82,702 out of a total of 674,246 in the kingdom. The horses, sheep, and cattle are all of indifferent quality. | Tunny and sardine fisheries arc carried on round the coasts.

Manufacturing industry is little developed in the island, and Tndusty besides agriculture mining is the only important occupation of the and. people. The chief mineral is sulphur, Sicilian sulphur being indeed mining. —

the most valuable mineral product of Italy. There are about 300 mines in operation in the provinces of Girgenti, Caltanissetta, Catania, and Palermo, employing about 27,000 people. The sulphur is found in a particular formation of the Upper Miocene, and is separated from the ore by fusion in a primitive kind of furnace called calcaront, in most of which part of the sulphur is used as fuel. With the exception of a small quantity, which is used in the island for the vineyards, all the sulphur is exported, chiefly to England, France, Belgium, and the United States, and the produe-

tion goes on increasing, notwithstanding the lowering of the price,

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due to the extraction of sulphur from iron pyrites obtained elsewhere, Before 1860 the annual production did not exceed 150,000 tons, while in 1880 it exceeded 300,000 tons, and in 1884 almost reached 400,000 tons. It is estimated that at least 50,000,000 tons are still available in the island. Besides sulphur, rock salt, the annual production of which is about 3000 tons, is the only important mineral product of the island ; but not less than 170,000 tons of bay salt are made in the salt-pans of Trapani and other parts

of the west coast. The rock salt is principally excavated near Racal- muto, Casteltermini, and Trabona, ;

The compartimento of Sicily is divided into seven provinces, the area and population of which are given in the following table :—

P No. of

; Area in Pop. per

Provinces. sq. miles. mad Pop. 1881. sq. mile, Caltanissetta …..... 1270 28 266,379 210 CG CAMIA, verse cc ete renee 1924 63 563,457 292 Girgenti …..c.sseee 1165 41 812,487 268 AIGA chain a ave eae esis 1246 97 460,924 3870 MEEMOPTNO: ayes ersece omy os e's 1985 76 699,151 852 BYTACUBE) 2… cece cece 1489 82 841,526 237 J)c2)6, 0 Spee Igeeeee 929 20 283,977 805

9958 857 2,927,901 294

The areas here given are those of Strelbitsky for 1881, these giving a total which agrees better than the old official figures with the total calculated by the Military Geographical Institute, which has not yet made any calculations for the individual provinces. The voleanic Lipari or Holian Islands to the north of Sicily are included in the province of Messina; the island of Ustica to the north-west

land, overrides the law in taking vengeance on those who have rendered themselves obnoxious to it, is a relic of former misrule, and is diminishing under the present Government. The condition of the peasantry still shows some of the injurious results of Spanish rule, under which the feudal system was introduced in its worst form. The nobles, who then acquired large landed properties, col- lected their serfs or retainers round their own castles, so that a number of considerable towns grew up, and the country districts were to a large extent deserted. The cultivators of the soil had often to walk 10 or 12 miles from their homes to their fields, It is chiefly from this cause that even at the present day the people of the island are mainly congregated

in towns containing not less than 5000 inhabitants each. The three principal towns of Sicily and the chief seats of its foreign commerce are Palermo (population, with suburbs, 244,991 in 1881), Catania (100,417), and Messina (81,049), and the next in size are Marsala (40,251), Acireale (38,547), Trapani (38,231; the headquarters of the coral-fishers of Italy), Caltanissetta (25,027), Syracuse (23,507), Sciacca (22,195), Girgenti (20,008; the centre of the trade in sulphur), Castrogiovanni (18,981), Licata (17,565), Terranova (17,178).

The backward state of education is another consequence of former Educa- In 1881 61°59 per cent of the inhabitants above twelve tion.

misrule, years of age were still unable to read and write (analfabeti), and in 1880-81 the number of pupils in the elementary public schools was only 101,724, or nearly 1 in 29 of the whole population, as against about 1 in 15 for the whole kingdom. Here, however, as in other parts of Italy, improvement is going on in this respect, for the pereentage of the people of Sicily above twelve years old unable to read aud write was 67°59 in 1871 and 78°12 in 1861.

The system of roads and railways is still defective. One line of Com- railway proceeds along the east coast from Messina to Syracuse, munica- and a branch ascends from it to join one of the lines whieh cross tion.

in that of Palermo; the Mgadic group (Lat. Insule gates), con- sisting of a number of limestone islands in the west, in that of

Trapani, from which the nearest is separated by a channel not more than nine fathoms in depth ; and to the same province belongs also Pantelleria, midway between Sicily and Africa,

The prosperity of the island, due chiefly to the stimulation of the cultivation of southern fruits by the extension of commerce in recent years, is shown by the fact that since 1861 the population has increased more rapidly than that of any other part of the king- dom. In 1861 the total population was 2,392,414, and in 1871 2,584,099. Thus the annual rate of increase was 7°74 per thousand as against 6°91 for the whole kingdom ; while between 1871 and 1881 the annual inerease was at the rate of 12°62 per thousand for

Sicily as against 6°02 for the whole kingdom. The number of emigrants issmall. In 1882 the number of emigrants proper (those who declared their intention of remaining out of the country for more than one year) was 2261 out of 65,748 for the whole king- dom, that of the temporary emigrants 954 as compared with 95,814.

The population, which in consequence of the chequered history of the island is necessarily a very mixed one, is said to be on the whole well disposed and industrious. The lawlessness indicated by the continued existence of the secret society called the Majia, which, like the Camorra of the Neapolitan provinces of the main-

SICKINGEN, Franz von (1481-1523), a powerful Ger- man baron, was born at Sickingen, Baden, the castle of his family, on Ist March 1481. He was the greatest of those Rhenish knights who held their lands immediately of the emperor, and was much esteemed by Maximilian I. and by Charles V., to both of whom he rendered good service in war. He held the position of imperial councillor and chamberlain, and won great fame as a protector of the poor and the oppressed. In 1517 he was put under the ban of the empire in consequence of a war with the imperial city of Worms. Afterwards he carried on wars with the duke of Lorraine, the imperial city of Metz, the landgrave Philip of Hesse, and Duke Ulrich of Wiirtemberg. For a short time he was disposed to serve Francis I. of France, from whom he received a persion; but in the imperial election of 1519 Sickingen exercised his influence on behalf of Charles V., and in 1521 he took a prominent part, with the count of Nassau, in the war with France. In 1522 an assembly at Landau elected him head of the confederation of Rhenish and Swabian barons. He was an enthusiastic adherent of the Humanists and Reformers, and when Luther seemed to be in danger offered to pro- vide for him a place of safety. Through the influence of Ulrich von Hutten, Sickingen formed a vast scheme for the overthrow of the spiritual and temporal princes, his intention being that all Germany should be brought

the middle of the island from north to south. Of these there are two,—one from Licata and one from Porto Empedocle, both on the south coast; these lines meet before touching the north coast a little to the east of Termini; thence the railway proceeds along the north coast to Palermo and

Castellamare, whence it recrosses the island again to Mazzara, and afterwards follows the west coast northwards to Trapani. A project is now (1886) entertained for the connexion of the railways of Sicily with those of the mainland by a tunnel under the Straits of Messina.

See W. H. Smyth, Sicily and its Islands, London, 1824; Theo. Fischer, Beitr. 2. phys. Geogr. d. Mittelmeerldinder, besonders Siciliens, Leipsic, 1877; Id., “Das Klima der Mittelmeerlinder,” in Erginzungsband xiii. of Petermann’s Mittheilunyen, Gotha, 1879, A complete account of Etna is given in Arnold von Lasaulx’s edition of Der Aetna, by W. Sartorius von Waltershausen, Leipsic, 2 vols., 1880. The best topographical map of Sicily is that based on Govern- ment surveys on the scale of 1:50,000; and on a small scale (1:800,000) that in Baedeker’s Italy is of peculiar excellence. The geology of the island is shown in a single sheet in the Carta Geologica della Sicilia nella Scala di 1:500,000, and in more detail on the scale of 1: 100,000 in twenty-seven sheets (not yet completed). See also for the geology and currents of the Straits of Messina the ‘‘ Schizzo Geologico dello Stretto di Messina colla Indicazione delle Correnti Marine,” in the Bolletino del R. Comitato Geologico d’Italia, 18th year, Rome, 1882. Regarding the minerals, see the third vol. of I Tesori sotterranet dell’ Italia by W. Jervis, Turin, 1881.

into immediate subjection to the emperor. He was so popular among the landsknechte or mercenary foot soldiers of the time that he had no difficulty in bringing together a powerful army ; and in September 1522 he began the war by attacking the archbishop of Treves. Much alarm was excited by this sudden movement, and the landgrave Philip and the palsgrave Louis hastened to the aid of the besieged prelate, and compelled Sickingen to withdraw from Treves. He had hoped that the barons, the peasantry, and the cities would rise in support of his designs, but in this expectation he was disappointed. Fortress after for- tress was taken from him, and at last, in April 1523, he was besieged in the tower of Landstuhl near Kaiserslautern. During the bombardment he was mortally wounded, and on 7th May 1523 he died, having capitulated almost im- mediately before. With his defeat and death the Barons’ War came to an end, His son was made a count of the empire (Reichsfreiherr) by Maximilian II., and a descend- ant was raised in

1773 by Joseph II. to the rank of Reichsgraf. One line of the family continued to possess immediate estates in the lordship of Landstuhl down to

1803.

SICKLE. See ScyTuHe.

SICYON was a city in the east of Achaia, Greece, about 2 miles inland from the Corinthian Gulf, situated on and below a hill in the angle formed by the confluence

pied by the village of Vasilika.

was almost a suburb of the main city (ZiKvwviwy Ay). The ancient and native form of the name was Zexvov.

The earliest inhabitants were Ionians; but it was con-

quered by the Dorian invaders of Argolis, who extended

their dominion over Corinth, Sicyon, and the whole valley Phalces, son of the first Dorian king of Argos, Temenus, was said to have been the conqueror of

of the Asopus.

Sicyon and founder (oixur7js) of the Dorian city, which, like Corinth, probably continued for a long time subject to the powerful kings of Argos. The population of the Dorian Sicyon was divided into four tribes; the Dorian conquerors constituted three—viz., the usual Dorian tribes

Hylleis, Dymanes, and Pamphyli—and a part of the pre-

Dorian population constituted the fourth tribe, which was called /Sgialeis. (Previous to the Dorian conquest the

city bore, according to Strabo, the name AXgiali, or ac-

cording to Pausanias Aigialeia.) The rest of the ancient population were reduced to the state of serfs, called katwva- kopépor or Kopuvndédpot, whose position was similar to that of the Helots in Sparta. As in most of the cities of Greece, the conflict between the aristocracy and the com- mons, who were superior in number but inferior in organiza- tion, in education, and in power, resulted in the rise of a dynasty of tyrants, the Orthagoride, who destroyed the rule of the Dorian oligarchy and reigned in Sicyon for a century, from about 665 B.c. Under the strong hand of these dynasts Sicyon attained great wealth. Lying near the great commercial centre Corinth, and possessing a harbour, it shared in the immense development of trade with the Italian peninsula which took place in the 8th and 7th centuries. Its marine was considerable, though ap- parently never of the first rank; at a later time it sent fifteen triremes to fight against the Persians at Salamis. The bronze work of Sicyon was renowned, as Strabo mentions ; and we may gain some conception of its style from some of the bronzes found at Olympia, which have probably been fabricated either at Sicyon or in the closely connected workshops of Argos. The Deedalid sculptors Dipcenus and Scyllis from Crete settled in Sicyon about the beginning of the 6th century, and gave the first im- pulse to a school of art, working mainly in bronze or in wood covered with bronze, which lasted for some genera- tions at Sicyon, Corinth, and Argos, and played a very prominent part in the development of Greek art. The early bronze work of the Sicyo-Argive workshops in all probability formed the model after which the Hesiodic description of the Shield of Hercules was composed by a poet of the 7th century. The fame of Sicyonian bronze work gave rise to the epithet TeAyivia, which was some- times applied to the city. Terra-cotta vases which have been fabricated at Sicyon are found in Etruria, whither they were exported in the Italian trade. They closely resemble in style the vases of Corinth, from which they are distinguished by the peculiar form of the letter epsilon in the inscriptions painted on them, and they usually belong to the 6th century. The market-gardens of the fertile Asopus valley supplied the populous Corinth with fruit and vegetables. At least in later times the fine shoes made in Sicyon were widely used in Greece. In the 4th century Sicyon continued to be one of the foremost states in an artistic point of view. The Sicyonian school of painting was founded by Eupompus, and some of the greatest foreign artists, such as Pamphilus and Apelles, studied

in it. Lysippus also, who gave a new impulse and tone to Greek sculpture, was a native of Sicyon.

In the dynasty of the Orthagoride Andreas began to reign about 665, his son Myron before 648; of Aristonymus, son of Myron,

of the rivers Asopus and Helisson ; the site is now occu- It possessed a harbour on the coast round which was a well-fortified town, which

nothing is known ; Myron II., son of Aristonymus, reigned seven years ; Isodamus, brother and murderer of Myron II., reigned a short time, and about 596 was replaced by his younger brother Clisthenes, who ruled till about 565. The dynasty ended with Clisthenes, who had no son; but his institutions continued in force for sixty years longer, until Sicyon came under the influence of the Peloponnesian confederacy, in which the Dorian Sparta wa; the chief power. The policy of the Orthagoride had always been strongly anti-Dorian, and under the Dorian reaction the most unfavourable colour was given to their actions ; hence grew the extremely unpleasant picture of them in the pages of Herodotus, who gives the current Peloponnesian accounts of the 5th century, These accounts are contradicted by the long rule of the dynasty and the permanence of their policy after their extinction. Myron I. won a chariot-race at Olympia in 648, and dedicated a bronze Odédapos (probably a large chest or vatoxos covered with bronze), with an inscription, which Pausanias saw in the Olympian treasury of the Sicyonians. The building of this treasury is ascribed to him by Pausanias, but excavation has shown that the building is not earlier than 500; it consists of a simple cella with a pronaos in antis, and is built of Sicyonian stones, cut and numbered at Sicyon, and thence transported by water to Olympia. Clisthenes was the most powerful and famous of the Sicyonian despots, and he con- tinued the anti-Dorian policy of his predecessors ; but, as we have seen, it is impossible to trust the details of his action as given by Herodotus (v. 67). He is said to have forbidden the rhapsodists to recite the epics in which the fame of Dorian heroes was sung, and to have encouraged the worship of Dionysus, a non-Dorian deity. Another object of his policy was to secure the favour of the Delphian oracle, and he used all his power in the Sacred War on the side of Delphi

against Crissa (590 B.c.), He won a victory in the chariot-race at Delphi in 582. Clisthenes had no son, and he desired to obtain the noblest of the Greeks as a husband for his daughter Agariste. The story of the wooing of Agariste as it was current in Athens, probably in poetic form, has been preserved by Herodotus. Clisthenes, when declared victor at the Olympian games (572 or 568), invited the best of the Greeks to Sicyon. Twelve representatives from all parts of Greece (whose names are chosen by the poet with little regard to chronological possibility) assembled there and spent a year as guests of Clisthenes. First among them all were two Athenians, one of whom, Megacles the Alemxonid, was at last preferred to his rival Hippoclides; and the careless remark of the latter, ‘‘ Hippoclides cares not,”. became proverbial. Megacles and Agariste were parents of Clisthenes, who became famous after 510 as the second founder of the Athenian democracy, and their grand-daughter Agariste was mother of the still more famous Pericles. When Sicyon again came under the Dorian influence shortly before 500, the oligarchical form of goveru- ment was reintroduced and lasted till about 369, when the de- mocracy was again established ; but its form was used by Euphron to exercise his own power, and after him a series of tyrants ruled the city, till in 251 Aratus reintroduced the democratic government and Sicyon joined the Achean league. Under the Roman rule Sicyon profited by the destruction of Corinth in 146 B.c.; it received part of the Corinthian territory together with the presidency of the Isthmian games, But it sank into decay as Corinth revived, and was almost depopulated when Pausanias visited it in the 2d century after Christ. Among the bishoprics of the Byzantine time New Sicyon occurs regularly ; it is probable that this was a town ona new site near the old city. -(W. M, RA.)

SIDDONS, Saran (1755-1831), English actress, was the eldest of twelve children of Roger Kemble, the manager of a company of strolling players, and his wife Sarah Ward, and was born in the “Shoulder of Mutton” public-house, Brecon, Wales, 5th July 1755. Through the special care of her mother in sending her to the schools in the towns where the company played she received a remarkably good educa- tion, although she was accustomed to make her appearance on the stage while stilla mere child. She became attached to William Siddons, an actor of the company ; but this was discountenanced by her parents, who wished her to accept the offer of a

squire. Siddons was dismissed from the company, and she was sent to a situation as lady's mail in Warwickshire ; at last, however, the necessary consent was obtained and the marriage took place at Trinity Church, Coventry, on 26th November 1773. It was while play- ing at Cheltenham in the following year that Mrs Siddons met with the earliest decided recognition of her great powers as an actress, when by her representation of Belvi- dera in Venice Preserved she moved to tears a party of "people of quality" who had come to "scoff." Her merits

) of 1777 went "'on the circuit" in the provinces.

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were made known by them to Garrick, who sent his deputy to Cheltenham to report regarding her abilities, the result being that she was engaged to appear at Drury Lane at a salary of £5 a week. Owing to inexperience as well as other circumstances, her first appearances as Portia and in other parts were unfortunate, and when, after playing with success in Birmingham, she was about to return to town she received a note from the manager of Drury Lane

| stating that her services would not be required. Thus, in

her own words, 'banished from Drury Lane as a worthless candidate for fame and fortune," she again in the beginning After a very successful engagement at Bath from 1778 to 1782,

/ she again accepted an offer from Drury Lane, when her

appearance in Southern's Jsadella was one continued tri- umph, only equalled in the history of the English stage by that of Garrick's first night at

Drury Lane in 1741 and that of Edmund Kean's in 1814. In her earlier years it was in scenes of a tender and melting character that she

| exercised the strongest sway over an audience ; but in the | performance of Lady Macbeth, in which she appeared | February 1785, it was the grandeur of her exhibition of

the more terrible passions as related to one awful purpose that held them spellbound. In Lady Macbeth she found the highest and best scope for her gifts. It fitted her as no other character did, and as perhaps it will never fit another actress. Her extraordinary and peculiar physical endowments—tall and striking figure, brilliant beauty, powerfully expressive eyes, and solemn dignity of demean- our—enabled her to confer a weird majesty on the character which inexpressibly heightened the tragic awe surround- ing her fate. After Lady Macbeth she played Desdemona, Rosalind, and Ophelia, all with great success ; but it was in Queen Catherine—which she first played on her brother's

spectacular revival of Henry VIJJ. in 1788—that she dis-

covered a part almost as well adapted to her peculiar powers as that of Lady Macbeth. In her early life she had attempted comedy, but her gifts in this respect were very limited. It was of course inevitable that comparisons should be made between her and her only compeer Rachel, who undoubtedly excelled her in intensity and the por- trayal of fierce passion, but was a less finished artist and lacked Mrs Siddons's dignity and pathos. Though Mrs Siddons's minute and systematic study perhaps gave a cer- tain amount of stiffness to her representations, it conferred on them a symmetry and proportion to which Rachel never attained. Mrs Siddons formally retired from the stage 29th June 1812, but occasionally appeared on special occasions even when advanced in years. In private life she enjoyed the friendship and respect of a wide circle, including many of the most eminent persons of her time. She died at London on 8th June 1831.

See Thomas Campbell, Life of Mrs Siddons (2 vols., 1834); Fitz- gerald, The Kembles (3 vols., 1871); and Frances Ann Kemble, Records of a Girlhood (8 vols., 1878).

SIDI-BEL-ABBES, chief town of an arrondissement in the department of Oran, Algeria, lies 48 miles by rail to the south of that town, at an elevation of 1552 feet above sea-level, on the right bank of the Mekerra (afterwards the Sig), and surrounded by a plain which is dominated by the escarpments of Mount Tessala. The town, encircled by a crenellated and bastioned wall with a fosse, is traversed from east to west and from north to south by two wide streets shaded by plane trees ; the gates are four in number, named from Oran, Daia, Mascara, and Tlemcen respectively. There are numerous fountains fed from the Mekerra. The civil and military quarters of the town are quite distinct from one another. The population of Sidi-bel-Abbés in 1881 was 13,298, or, including the commune, 16,840; the Spanish considerably preponderates over the French

element. The town, which is of quite recent origin, de- rives its name from a chapel, near which a redoubt was constructed by General Bedeau in 1843. The surrounding country is healthy, fertile, and populous.

SIDMOUTH, Viscount. See Appineron, Henry.

SIDNEY, or Sypney, ALGERNON (1622-1683), was the second son of Robert, second earl of Leicester, and of Dorothy Percy, daughter of Henry, earl of Northumber- land, and was born at Penshurst, Kent, in 1622. Asa boy he showed much talent, which was carefully trained under his father’s eye. In 1632 with his elder brother he accompanied his father on his mission as ambassador ex- traordinary to Christian IV. of Denmark, whom he saw at Rendsburg. In May 1636 Sidney went with his father to Paris, where he became a general favourite, and from there to Rome. In October 1641 he was given a troop in his father’s regiment in Ireland, of which his brother, Lord Lisle, was in command. In August 1643 the brothers returned to England. At Chester their horses were taken by the Royalists, whereupon they again put out to sea and landed at Liverpool. Here they were detained by the Parliamentary commissioners, and by them sent up to London for safe custody. Whether this was intended by Sidney or no, it is certain that from this time he ardently attached himself’ to the Parliamentary cause. On 10th May.1644 he was made captain of horse in Manchester’s army, under the Eastern Association. He was shortly afterwards made lieutenant-colonel, and charged at the head of his regiment at Marston Moor (2d July),

where he was wounded and rescued with difficulty. On 2d April 1645 he was given the command of a cavalry regiment in Cromwell's division of Fairfax's army, was appointed governor of Chichester on 10th May, and in December was returned to parliament for Cardiff. In July 1646 his regiment was ordered to Ireland, and he was made lieutenant-general of horse in that kingdom and governor of Dublin. Leaving London on 1st February 1647, Sidney arrived at Cork on the 22d. He was soon (8th April), however, recalled by a resolution of the House passed through the interest of Lord Inchiquin. On 7th May he received the thanks of the House of Commons. On 13th October 1648 he was made lieutenant of Dover castle, of which he had previously been appointed governor. He was at this time identified with the Independents as op- posed to the Presbyterian party. He was nominated one of the commissioners to try Charles I., but took no part in the trial, retiring to Penshurst until sentence was pro- nounced. That Sidney approved of the trial, though not of the sentence, there can, however, be little doubt, for in Copenhagen he publicly and vigorously expressed his con- currence. On 15th May 1649 he was a member of the committee for settling the succession and for regulating the election of future parliaments. Sidney lost the gover- norship of Dover, however, in March 1651, in consequence, apparently, of a quarrel with his officers. He then went to The Hague, where he quarrelled with Lord Oxford at play, and a duel was only prevented by their friends. He re- turned to England in the autumn, and henceforward took an active share in parliamentary work. On 25th November Sidney was elected on the council of state and was evi- dently greatly considered. In the usurpation of Cromwell, however, he utterly refused all concurrence, nor would he leave his place in parliament except by force when Crom- well dispersed it on 19th April 1653. He immediately retired to Penshurst, where he was concerned chiefly with family affairs. In 1654 he again went to The Hague, and there became closely acquainted with De Witt. On his return he kept entirely aloof from public affairs, and it is to this period that the Lssay on Love is ascribed.

Upon the restoration of the Long Parliament, 7th May

1659, Sidney again took his seat, and was placed on the council of state. He showed himself in this office especi- ally anxious that the military power should be duly sub- ordinated to the civil. On 5th June he was appointed one of three commissioners to mediate for a peace between Denmark supported by Holland and Sweden. He was probably intended to watch the conduct of Montague, who was in command of the Baltic squadron. Of his character we have an interesting notice from Whitelocke, who refused to accompany him on the ground of his “over- ruling temper and height.” Upon the conclusion of the treaty he went to Stockholm as plenipotentiary ; and in both capacities he behaved with resolution and address. When the restoration of Charles IT. took place Sidney left Sweden, 28th June 1660, bringing with him from the king of Sweden a rich present in testimony of the estimation in which he was held. Sidney went first to Copenhagen, and then, being doubtful of his reception by the English court, settled at Hamburg. From there he wrote a celebrated letter vindicating his conduct, which will be found in the Somers Tracts. He shortly afterwards left Hamburg, and passed through Germany by way of Venice to Rome. His stay there, however, was embittered by misunderstandings with his father and consequent straits for money. Five shillings a day, he says, served him and two men very well for meat, drink, and firing. He devoted himself to the study of books, birds, and trees, and speaks of his natural delight in solitude being largely increased. In 1663 he left Italy, passed through Switzerland, where he visited Ludlow, and came to Brussels in September, where his portrait was painted by Van Egmondt ; it is now at Penshurst. He had thoughts of joining the imperial service, and offered to transport from England a body of the old Commonwealth men ; but this was refused by the English court. It is stated that the enmity against him was so great that now, as on other occasions, attempts were made to assassinate him. On the breaking out of the Dutch war Sidney, who was at The Hague, urged an invasion of England, and shortly afterwards went to Paris, where he offered to raise a rebellion in England on receipt of 100,000 crowns. Unable, however, to come to terms with the French Government, he once more went into retirement in 1666,—this time to the south of France. In August 1670 he was again in Paris, and Arlington proposed that he should receive a pension from Louis ; Charles II. agreed, but insisted that Sidney should return to Languedoc. In illustration of his austere principles it is related that, Louis having taken a fancy to a horse belonging to him and insisting on

possessing it, Sidney shot the animal, which, he said, "'was born a free creature, had served a free man, and should not be mastered by a king of slaves." His father was now very ill, and after much difficulty Sidney obtained leave to come to England in the autumn of 1677. Lord Leicester died in November ; and legal business connected with other portions of the succession detained Sidney from returning to France as he had intended. He soon became involved in political in- trigue, joining, in general, the country party, and holding close communication with Barillon, the French ambassador. In the beginning of 1679 he stood for Guildford, and was warmly supported by William Penn, with whom he had long been intimate, and to whom he afforded assistance in drawing up the constitution of Pennsylvania. He was defeated by court influence, and his petition to the House, complaining of an undue return, never came to a decision. His Letters to Henry Savile, written at this period, are of great interest. He was in Paris, apparently only for a short while, in November 1679. Into the prosecution of the Popish Plot Sidney threw himself warmly, and was among those who looked to Monmouth, rather than to

Orange, to take the place of James in the succession, though he afterwards disclaimed all interest in such a question. He now stood for Bramber (Sussex), again with Penn's support, and a double return was made. He is reported on 10th August 1679 as being elected for Amers- ham (Buckingham) with Sir Roger Hill. When parlia- ment met, however, in October 1680, his election was declared void. But now, under the idea that an alliance between Charles and Orange would be more hostile to English liberty than would the progress of the French arms, he acted with Barillon in influencing members of parliament in this sense, and is twice mentioned as receiv- ing the sum of 500 guineas from the ambassador. Of this there is no actual proof, and it is quite possible that Barillon entered sums in his accounts with Louis which he never paid away. In any case it is to be remembered that Sidney is not charged with receiving money for ad- voeating opinions which he did not enthusiastically hold.

Upon the dissolution of the last of Charles's parliaments the king issued a justificatory declaration. This was at once answered by a paper entitled A

Just and Modest Vin- dication, &c., the first sketch of which is imputed to Sidney. It was then, too, that his most celebrated production, the Discourses concerning Government, was concluded, in which he upholds the doctrine of the mutual compact and traverses the High Tory positions from end to end. In especial he vindicates the propriety of resistance to kingly oppression or misrule, upholds the existence of an here- ditary nobility interested in their country's good as the firmest barrier against such oppression, and maintains the authority of parliaments. In each_ point the English constitution, which he ardently admires, is, he says, suffer- ing : the prerogatives of the crown are disproportionately great; the peerage has been degraded by new creations ; and parliaments are slighted.

For a long while Sidney kept himself aloof from the duke of Monmouth, to whom he was introduced by Lord Howard. After the death of Shaftesbury, however, in November 1682, he entered into the conferences held be- tween Monmouth, Russell, Essex, Hampden, and others. That treasonable talk went on seems certain, but it is probable that matters went no further. The watchfulness of the court was, however, aroused, and on the discovery of the Rye House Plot, Sidney, who had always been regarded in a vague way as dangerous, was arrested while at dinner on 26th June 1683. His papers were carried off, and he was sent at once to the Tower on a charge of high treason. For a considerable while no evidence could be found on which to establish a charge. Jeffreys, how- ever, was made lord chief-justice in September ; a jury was packed ; and, after consultations between the judge and the crown lawyers, Sidney was brought to listen to the indictment on 7th November. 'The trial, which began on 21st November, was conducted with a shameless absence of equity: Sidney was refused a copy of the indictment, in direct violation of law, and—more shameful still—he was refused the assistance of counsel. Hearsay evidence and the testimony of the perjured informer Lord Howard, whom Sidney had been instrumental in introducing to his friends, were first produced. This being insufficient, partial extracts from papers found in Sidney's study, and supposed only to be in his handwriting, in which the lawfulness of resistance to oppression was upheld, were next relied on. He was indicted for "conspiring and compassing the deat of the king." Sidney conducted his case throughout with great skill; he pointed especially to the fact that Lord Howard, whose character he easily tore to shreds, was the only witness against him as to

treason, whereas the law required two, that the treason was not accurately defined, that no proof had been given that the papers produced

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were his, and that, even if that were proved, these papers were in no way connected with the charge. Against the determination to secure a conviction, however, his courage, coolness, and skill were of no avail, and the On 25th November Sidney presented a petition to the king, praying for an audience, which, however, under the influence of James and Jeffreys, On the 26th he was brought up for judgment, and again insisted on the illegality of his con- Upon hearing his sentence he gave vent to his Jeffreys having suggested that his mind was disordered, he held out his hand and bade the chief-justice feel how calm and By the advice of his friends he offering, if released, to leave

cloquence, : verdict of ‘guilty ” was given.

Charles refused.

viction. feelings in a few noble and beautiful words.

steady his pulse was. presented a second petition, the kingdom at once and for ever. The supposed necessity, however, of checking the hopes of Monmouth’s partisans, caused the king to be inexorable. The last days of Sidney’s life were spent in drawing up his Apology and in discourse with Independent ministers. He was beheaded on the morning of 7th December 1683. His remains were buried at Penshurst. (0. A.)

SIDNEY, Sir Pururp (1554-1586), although killed at the early age of thirty-two, was one of the most conspicu- ous figures at the court of Elizabeth, was known to the leading statesmen of Europe as a soldier and statesman of the highest promise, took a permanent place in history and legend as a romantic hero, and in literature is dis- tinguished as the author of the first important body of English sonnets and a writer whose works mark a distinct advance in English prose. He was born at Penshurst in Kent on 29th November 1554. His father was Sir Henry Sidney, famous in his time as an administrator of Ireland, his mother a Dudley, sister of Elizabeth’s

favourite, the earl of Leicester, and daughter of the earl of Northumberland executed for high treason in the reign of Mary. Thus Sidney was of notable kindred on both sides—

‘‘ Others, because of both sides I do take My blood from them who did excel in this, Think Nature me a man-at-arms did make.” }

He received his scholastic education at Shrewsbury school and at Christ Church, Oxford. He was entered at Shrewsbury on the same day with his lifelong friend and biographer Fulke Greville, afterwards Lord Brooke. In 1572 he set out with three years’ leave of absence to com- plete his education by Continental travel ; he was in Paris at the house of the English ambassador on the night of the massacre of St Bartholomew, and went thence to Frankfort, Vienna, and the chief cities of Italy. During these travels he associated with scholars and statesmen, making an earnest study of European politics, winning golden opinions for his youthful gravity and sagacity. From that time Hubert Languet, the Reformer, whom he met at Frankfort, main- tained a constant correspondence with him. On his return he was introduced at court, won the favour of Elizabeth, who considered him “‘one of the jewels of her crown,” and, in proof of the versatility which made him one of the wonders of his age, wrote a masque, The Lady of the May, for Leicester’s great reception of the queen at Kenilworth, and distinguished himself in the tournament upon the same occasion. In 1577, at the age of twenty-two, being Sent as ambassador in great state to congratulate and sound Rudolph II., the new emperor of Germany, he met William the Silent, who pronounced him one of the ripest statesmen in Europe. He returned in the following year, and from that time till the expedition to the Netherlands, in which he lost his life, he had no public employnient, but lived partly at court, partly at his country seat at

1 Astrophel and Stella, sonnet 41.

Penshurst in Kent. In 1583 he married the daughter of Sir Francis Walsingham, who after his death became countess of Essex. His most memorable interference in state affairs was a bold letter of remonstrance to Elizabeth against her suspected policy of marrying the duke of Anjou. The

queen’s anger at his boldness drove him for a time into retirement. He was a strong advocate of in- tervention on the Protestant side, and in 1585 accom- panied Leicester in his expedition to the Netherlands, and was appointed governor of Flushing, one of the towns held by the queen’as security. The historical truth of the famous incident at the battle of Zutphen (22d September 1586), when the wounded hero passed a cup of water to a dying soldier, has been questioned; but it is matter of fact that he owed his death to an impulse of romantic generosity. The lord marshal happening to enter the field of Zutphen without greaves, Sidney cast off his also, to put his life in the same peril, and thus exposed himself to the fatal shot. His death took place fifteen days later, on 7th October 1586, at Arnheim.

No poet’s death was ever so lamented by poets as Sidney’s. Pastoral elegy was in fashion, and all the numerous poets and rhymesters of the time from Spenser to Davison hastencd to lay their tribute of verse on the bier of this the darling of all the shepherds—

‘“¢ With whom all joy and jolly merriment Is also deaded and in dolour drent.”

That there was much more than the worship of his rank and his bright eager personality in this is shown by the lasting reputation of what he wrote during the two years of retirement, 1580-81, which he seems to have given mainly to literature. The truth is that Sidney transferred his own strong, radiant, graceful, and lovable character to his writings with a freshness and fidelity such as few finished artists have achieved, so that he really and literally lives in them to charm for ever. None of his writings were published during his lifetime, and the dates of composition are uncertain. But it would seem that Sidney’s first attempt at verse was a metri- cal version of the Psalms, written in conjunction with his sister, the countess of Pembroke, —‘‘ Sidney’s sister, Pembroke’s mother.” The worth of these paraphrases, which have all Sidney’s qualities of sincerity, directness, and sweetness of rhythm, has recently been recognized by Mr Ruskin, who has edited them under the title of Rock Honeycomb in the second volume of his Bibliotheca Pastorum (1877). Sidney’s famous prose romance, The Countess of Pembroke’s Arcadia, the ‘‘ vain amatorious poem” with which Charles I. solaced his imprisonment, was also begun in 1580. It was pub-

lished in- 1590, and kept its popularity as long as that kind of high-flown sentiment and intricate adventure found readers. The buoyancy and freshness of Sidney's style give a certain air of reality even to the artificial scenes of the Arcadia, and many pretty songs are interspersed through the work. Sidney's greatest poetic achieve- ment, however, was the series of sonnets entitled Astrophel and Stella, the first important body of sonnets in the English language. The sonnets, 110 in number, are a chronicle of the poet's love for Penelope Devereux, sister of the earl of Essex, afterwards Lady Rich. He first met the lady when she was a child of twelve at one of the stages in Elizabeth's progress to Kenilworth in 1575. A match was apparently arranged between them by their families, but upon Leicester's disgrace it was broken off and Penclope was given to Lord Rich. Sidney seems then to have discovered that he was in love with her. Whether the passion was real or feigned for artistic purposes is of little consequence, although the reality of it has been hotly maintained ; he writes as if it were real, and the verisimilitude of the story recorded in the sonnets, which express his varying moods towards her throughout the incidents of sub- sequent intercourse and the distractions of his public life, adds greatly to their interest. Very few of the sonnets will bear separa- tion from the context, though there is hardly one that does not contain some sweet ingenuity of fancy or casual felicity of phrase. Some of them were special favourites with Charles Lamb. Sidney's other work during this busy literary passage in his short life, the Apologie for Poctric, has also established itself as a classic.

The best of the sonnets are selected by Mrs Ward in Ward's English Poets; Mr Main also makes a good selection in his Treasury of English Sonnets. The sonnets were probably written in 1581; they were not published till 1591, when they formed the first in a brilliant series of volumes of sonnet literature (see ' Blizabethan Sonneteers," in Minto's Characteristics of English Poets). The Apologie is included in Arber's reprints.

SIDON (Arab. Saida), long the principal city of Pua@ntora (q.v.), and even in the Middle Ages a place of importance, but now little more than a mere village, is situated on the Syrian coast in 33° 36' N. lat. and 35° 20′

at Wiirzburg, and obtained his doctor’s diploma in 1820. In 1822 he entered the service of the king of the Nether- lands as medical officer to the East Indian army. On his arrival at Batavia he was attached to a new mission to Japan, sent by the Dutch with a view to improve their trading relations with that country. Siebold was well equipped with scientific apparatus, and he remained in Japan for six years, with headquarters at the Dutch settle- ment on the little island of Deshima. His medical qualli- fications enabled him to find favour with the Japanese, and he gathered a vast amount of information concerning a country then almost as little known as Corea, especially concerning its natural history and ethnography. He had comparatively free access to the interior, and his reputation spreading far and wide brought him visitors from all parts of the country. His valuable stores of information were added to by trained natives whom he sent to collect for him in the interior. In 1824 he published De Historizx Naturalis in Japonia Statu and in 1832 his splendid Fauna Japonica. His knowledge of the language enabled him also in 1826 to issue from Batavia his Hpitome Linguz Japonice. In Deshima he also laid the foundation of his Catalogus Librorum Japomcorum and Isagoge in Biblio- thecam Japonicam, published after his return to Europe, as also his Bibliotheca Japonica, which, with the co-opera- tion of J. Hoffmann, appeared at Leyden in 1833. During the visit which he was permitted to make to Yedo (Tokio), Siebold made the best of the rare opportunity ; his zeal, indeed, outran his discretion, since, for obtaining a native map of the country, he was thrown into prison and com- pelled to quit Japan on Ist January 1830. On his return to Holland he was raised to the rank of major, and in 1842 to that of colonel. After his arrival in Europe he began to give to the world the fruits of his researches and observations in Japan. His Nippon; Archw zur Beschreibung von Japan und dessen Neben- und Schutz- Léndern was issued in five quarto volumes of text, with six folio volumes of atlas and engravings. He also issued many fragmentary papers on various aspects of Japan. In 1854 he published at Leyden Urkundliche Darstellung der Bestrebungen Niederlands und Russlands zur Hrofinung Japans. In 1859 Siebold undertook a second journey to Japan, and was invited by the emperor to his court. In 1861 he obtained permission from the Dutch Government to enter the Japanese service as negotiator between Japan and the powers of Europe, and in the same year his eldest son was made interpreter to the English embassy at Yedo. Siebold was, however, soon obliged by various intrigues to retire

from his post, and ultimately from Japan. Re- turning by Java to Europe in 1862, he set up his ethno- graphical collections, which were ultimately secured by the Government of Bavaria and removed to Munich. He continued to publish papers on various Japauese subjects, and received honours from many of the learned societies of Europe. He died at Munich on 18th October 1866. Siebold until recent years was our great authority on Japan, and even now his writings on the natural history of that country have not been superseded.

See biography by Moritz Wagner, in Allgemeine Zeitwng, 13th to 16th November 1866.

SIEDLCE (Russ. Syedlets), a government of Russian Poland, between the Vistula and the Bug, having Warsaw on the N.W., ZomZa on the N., Grodno and Volhynia on the E., Lublin and Radom on the S. Its area is 5535 square miles. The surface is mostly flat, only a few hilly tracts appearing in the middle, around Biata, and in the east on the banks of the Bug. Extensive marshes prevail in the north and south-east. Chalk, Jurassic, and Tertiary deposits cover the surface, and are overlain in their turn with widely spread Glacial deposits. The valley of

9” E. long., about midway between Sur (Tyre) and Beirut (Beyrout). The ancient city extended some 800 yards farther inland, over ground now occupied by luxuriant fruit-gardens, on the produce of which the inhabitants of the town live. In front of the flat promontory to which the modern Sidon is confined there stretches northwards and southwards a rocky peninsula; at the northern ex- tremity of this begins a series of small rocks enclosing the harbour, which at present is a very bad one, having been, to some extent at least, purposely filled up. The port was formerly protected on the north by the “Kal’at el-Bahr “Sea Castle”), a building of the 13th century, situated upon an island still connected with the mainland by a bridge. On the south side of the town lay the so-called Egyptian harbour, now quite useless. The wall by which Sidon is at present surrounded is pierced by two gates, those of Beirut and Akko (Acre); at the south-eastern angle, upon a heap of rubbish, stand the remains of the citadel. The streets are very narrow, and the buildings of any interest are few; most prominent are some large caravanserais belonging to the period of Sidon’s modern prosperity, and the

large mosque, formerly a church of the Knights of St John. Sidon looks best from the north. Of its 9000 inhabitants 7000 are Mohammedans; there are a number of institutions conducted by Catholic and Protestant Christians. In the neighbourhood are large Pheenician burial-places, which have been partially explored by Renan ; the natives also engage in the search for anti- quities. The principal finds are sarcophagi, and next to these sculptures and paintings. The most important dis- covery hitherto made has been that of the sarcophagus of Eshmunazar with a long inscription ; it is now (1886) in the Louvre.

In 637-638 Sidon was taken by the Arabs. During the crusades it was alternately in eee of the Franks and the Moham- medans, but finally fell into the hands of the latter in 1291. As the residence of the Druse emir Fakhr ed-Din, it rose to some prosperity about the beginning of the 17th century, but towards the close of the 18th its commerce again passed away, principally to Beirut (Beyrout), and the prosperity of Sidon has cver since been steadily declining.

See Renan, Mission de Phénicie, Paris, 1865.

SIDONIUS APOLLINARIS. See APpoLuinaRis SIDONIUS.

SIEBENBURGEN. See TRANSYLVANIA.

SIEBOLD, Cart TuEopor Ernst von (1804-1885), physiologist and zoologist, the son of a physician and a descendant of what Oken called the “Asclepiad family of Siebolds,” was born at Wiirzburg on 16th February 1804. Educated in medicine and science chiefly at the university of Berlin, he became successively professor of zoology, physiology, and comparative anatomy in Kénigs- berg, Erlangen, Freiburg, Breslau, and Munich. In con- junction with Stannius he published (1845-48) a Manual of Comparative Anatomy, which is still of solid value; and along with Kolliker he founded in 1848 a journal which soon took and still retains a leading place in biological literature, Zeitschrift fiir wissenschaftliche Zoologre. He was also a laborious and successful helminthologist (see PARAsiTIsM) and entomologist, in both capacities contri- buting many valuable papers to his journal, which he continued to edit until his death in 1885. In these ways, without being a man of marked genius, but rather an in- dustrious and

critical observer, he came to fill a peculiarly distinguished position in science, and was long reckoned, what his biographer justly calls him, the Nestor of German zoology. See Ehlers, Zeitschr. f. wiss. Zool., 1885.

SIEBOLD, Pumire Franz von (1796-1866), scientific explorer of Japan and elder brother of the physiologist noticed above, was born at Wiirzburg, Germany, on 17th February 1796. He studied medicine and natural science

the Vistula is mostly wide, with several terraces covered with sand-dunes or peat-bog. Siedlce is watered by the Vistula, which borders it for 50 miles on the west ; the

Bug, which is navigable from Opalin and flows for 170

miles on the east and north-east borders of the province ;

the Wieprz, a tributary of the Vistula, which is also navi- gable, and flows for 25 miles along the southern boundary ; and the Liwiec, a tributary of the Bug, which is navigable for some 30 miles below Wengroff.

Of the total surface of the government only 184,760 acres are unproductive ; 695,420 acres are covered with forests ; 1,708,100 are under crops, and 611,260 under meadows aud pasture land. The population only increases at the rate of 0°75 per cent. a year, and in 1884 numbered 630,240; of these Poles constituted 39°7 per cent., Little Russians 43:1, Jews 15°1, and Germans about 2. According to religious belief they were distributed as follows :— out of 616,649 inhabitants in 1882 there were 367,187 Catholics, 142,945 Orthodox Greeks, 96,764 Jews, 8892 Protestants, 505 Baptists, and 356 Mohammedan Tatars. occupation ; in 1881 the crops yielded 1,531,400 quarters of corn and 10,988,400 bushels of potatoes. Cattle-breeding is in a relatively flourishing state, there being (1881) 57,500 horses, 292,670 horned cattle, 461,700 sheep, and 194,100 pigs. Manufactures are insigni- ficant (2270 workmen) ; their aggregate production, chiefly from distilleries and breweries, was valucd at £394,820 in 1881. Trade also is insignificant, although Siedlce has four railways, one of which, from Warsaw to Brest-Litovsk, crosses it from west to east. There

are two gymuasia for boys (at Siedlce and Biata), one gymna- sium for girls, one seminary for teachers (at Biata), and about 240

rimary schools with 11,260 scholars. The government is divided into nine districts, the chief towns of which, with their populations in 1882, are—SiedIce (see below), Biata (19,435), Constantinoff (3200), Garvolin (14,620), Bukoff (11,030), Radzyn (4440), Sokotoff (6300), Wengroff (8140), and Wtodawa (17,985). Janotf (3030), where a state stud is kept, has also municipal institutions.

SIEDLCE, capital of the above government, is situated 57 miles east-south-east of Warsaw, on the Brest-Litovsk Railway. It received municipal institutions in 1547. The Oginskis, to whom it belonged, have embellished it with a palace and gardens; but it is still nothing more than a large village, where the provincial authorities have their seat. Its population was 12,950 in 1882.

SIEGE. See FoRTIFICATION.

SIEGEN, an ancient mining and manufacturing town of Prussia, in the province of Westphalia, is situated 47 miles to the east of Cologne on the Sieg, a tributary entering the Rhine opposite Bonn. The surrounding dis- trict, to which it gives its name, abounds in iron-mines, so that iron founding and smelting are important branches of industry in and near the town. Large tanneries and leather-works, and factories for cloth paper, and machinery, are among the other industrial establishments. The popu- lation in 1880 was 15,024, of whom 3632 were Roman Catholics and 111 Jews.

Siegen was the capital of an early principality belonging to the house of Nassau ; and from 1606 onwards it gave name to the junior branch of Nassau-Siegen. Napoleon incorporated Siegen in the grand-duchy of Berg in 1806 ; and in 1815 the congress of Vienna assigned it to Prussia, under whose rule it has nearly quintupled its population. Rubens is said to have been born here in 1577.

SIEGFRIED. Sce NiBELUNGENLIED, vol. xvii. p. 475.

SIEMENS, Sir Wiit1am (1823-1883), christened Carl Wilhelm, an eminent inventor, engineer, and natural philo- sopher, was born at Lenthe in Hanover on 4th April 1823. After being educated in the polytechnic school of Magde- burg and the university of Géttingen, he visited England at the age of nineteen, in the hope of introducing a process in electro-plating invented by himself and his brother Werer. The invention was adopted by Messrs Elking- ton, and Siemens returned to Germany to enter as a pupil the engineering works of Count Stolberg at Magdeburg. In 1844 he was again in England with another invention, the “chronometric” or differential governor for steam- engines (see STEAM-ENGINE). Finding that British patent laws afforded the inventor a protection which was then wanting in Germany, he thenceforth made England his

Agriculture is the chief

home ; but it was not till 1859 that he formally became a naturalized British subject. After some years spent in active invention and experiment at mechanical works near Birmingham, he went into practice as an engineer in 1851. He laboured mainly in two distinct fields, the applications of heat and the applications of electricity, and was charac- terized in a very rare degree by a combination of scientific comprehension with practical instinct. In both fields he played a part which would have been great in either alone ; and, in addition to this, he produced from time to time miscellaneous inventions and scientific papers sufficient in themselves to have established a reputation. His _posi- tion was recognized by his election in 1862 to the Royal Society, and later to the presidency of the Institute of Mechanical Engineers, the Society of Telegraph Engineers, the Iron and Steel Institute, and the British Association ; by honorary degrees from the universities of Oxford, Glasgow, Dublin, and Wiirzburg; and by knighthood. He died in London on the 19th of November 1883.

In the application of heat Siemens’s work began just after Joule’s experiments had placed the doctrine of the conservation of energy on a sure basis. While Rankine, Clausius, and Thomson were de- veloping the dynamical theory of heat as a matter of physical and engineering theory, Siemens, in the light of the new ideas, madc a bold attempt to improve the

efficiency of the steam-engine as a converter of heat into mechanical work. Taking up the regenerator —a device invented by Stirling twenty years before, the importance of which had meanwhile been ignored—he applied it to the stcam- engine in the form of a regenerative condenser with some success. This was in 1847, and in 1855 engines constructed on Siemens's plan were worked at the Paris exhibition. Later he made many attempts to apply the regenerator to internal-combustion or gas engines ; but neither in steam-engines nor in gas-engines were his inventions directly and permanently fruitful, though the direction they followed is that in which improvement is still looked for. The regenerative principle, however, as a means of economizing heat soon received at his hands another and far wider application, In 1856 he introduced the regenerative furnace, the idea of his brother Friedrich, with whom William associated himself in directing its applications. In an ordinary furnace a very large part of the heat of combustion is lost by being carried off in the hot gases which pass up the chimney. In the regenerative furnace the hot gases pass through a regenerator, or chamber stacked with loose bricks, which absorb the heat. When the bricks are well heated the hot gases are diverted so to pass through another similar chamber, while the air necessary for combustion, before it enters the furnace, is made to traverse the heated chamber, taking up as it goes the heat which has been stored in the bricks. After a suitable interval the air currents are again reversed. The process is repeated periodically, with the result that the products of combustion escape only after being cooled, the heat which they take from the furnace being in great part carried back in the heated air. But another invention was required before the regenerative furnace could be thoroughly successful. This was the use of gaseous fuel, produced by the crude distillation and incomplete combustion of coal in a distinct furnace, now known as Siemens's gas-producer. From this the gaseous fuel passes by a flue to the regenerative furnace, and it, as well as the entering air, is heated by the regenerative method, four brick-stacked chambers being used instead of two. The com- plete invention was applied at Chance's glass-works in Birmingham in 1861, and furnished the subject of Faraday's farewell lecture to the Royal Institution. It was soon applied to many industrial processes, but it found its greatest development a few years later at the hands of Siemens himself in the manufacture of steel. To produce steel directly from the ore, or by melting together wrought- iron scrap with cast-iron upon the open hearth, had been in his mind from the

first, but it was not till 1867, aftcr two years of experiment in “sample steel works” erected by himself for the purpose, that he achieved success. The modern forms of the Siemens steel process are described in the article IRon (vol. xiii. p. 347 sq.). The product is a mild steel of exceptionally trust-worthy quality, the use of which for boiler-plates has done much to make possible the high steam-pressures that are now common, and has consequently contributed, indirectly, to that improvement in the thermodynamic efficiency of heat engines which Siemens had so much at heart. Just before his death he was again at work upon the same subject, his plan being to use gaseous fuel from a Siemens producer in place of solid fuel beneath the boiler, and to apply the regenerative principle to boiler furnaces. His faith in gaseous fuel led him to anticipate that its use would in time supersede that of solid coal for domestic and industrial purposes, cheap gas being supplied either from special works or direct from the pit; and

Public institu- tions.

Festivals,

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among his last inventions was a house grate to burn gas along with coke, which he regarded as a possible cure for city smoke.

In electricity Siemens’s name is closely associated with the growth of land and submarine telegraphs, the invention and development

-of the dynamo, and the application of electricity to lighting and

to locomotion. In 1860, with his brother Werner, he invented the earliest form of what is now known as the Siemens armature ; and in 1867 he communicated a paper to the Royal Society On the Conversion of Dynamical into Electrical Force without the aid of Permanent Magnetism,” in which he announced the invention by Werner Siemens of the dynamo-electric machine, an invention which was also reached independently and almost simultaneously by Wheatstone and by S. A. Varley. The Siemens-Alteneck or multiple-coil armature followed in 1878, and became the basis

of the modern Siemens dynamo as developed, with great labour, by the firm of Siemens Brothers themselves, and (with later modi- fications) by Edison, Hopkinson, and others. While engaged in eonstructing a trans-Atlantic cable for the Direct United States Telegraph Company, Siemens designed the very original and suc- cessful ship ‘‘ Faraday,” by which that and. other cables were laid. One of the last of his works was the Portrush and Bushmills electric tramway, in the north of Ireland, opened in 1883, where the water- power of the river Bush drives a Siemens dynamo, from which the electric energy is conducted to another dynamo serving aS a motor on the car. In the Siemens electric furnace the intensely hot atmosphere of the electric arc between earbon points is em- ployed to melt refractory metals. Another of the uses to which he turned electricity was to employ light from are lamps as a sub- stitute for sunlight in hastening the growth and fructification of plants. Among his miscellaneous inventions were the differential governor already alluded to, and a highly scientific modification of it, described to the Royal Society in 1866; a water-meter which acts on the principle of counting the number of turns made by a small reaction turbine through whieh the supply of water flows ; an electric thermometer and pyrometer, in which temper- ature is determined by its effect on the electrical conductivity of metals ; an attraction meter for determining very slight variations in the intensity of a gravity ; and the bathometer, by which he applied this idea to the problem of finding the depth of the sea without a sounding line. Ina pe read before the Royal Society in 1882 ‘‘On the Conservation of Solar Energy,” he suggested a bold but unsatisfactory theory of the sun’s heat, in which he sought to trace on a cosmic scale an action similar to that of the regenera- tive furnace. His fame, however, does not rest on his contribu- tions to pure science, valuable as some of these were. His strength lay in his grasp of scientific principles, in his skill to perceive where and how they could be applied to practical affairs, in his zealous and instant pursuit of thought with action, and in the in- domitable persistence with which he clung to any basis of effort that pt to him theoretically sound.

Siemens’s writings consist for the most part of lectures and papers scattered through the scientific journals and the publications of the Royal Society, the Institution of Civil Engineers, the Institute of Mechanical Engineers, the

Iron and Steel Institute, the British Association, &. A biography by Dr William Pole is now (1886) in preparation. (J. A. E.)

SIENA, a city of Italy, and one of the most character- istic of Tuscany, stands (43° 19’ N. lat., 11° 19’ E. long.) on a hill near the mountainous region of Chianti, the Maremma, and Val di Chiana. It is 60 miles by rail south of Florence and 160 north-west of Rome. The area of the city within the walls is about 2} square miles and its population in 1881 was 25,204. The province of Siena, comprising about 1467 square miles, with 37 com- munes, and a total population of 207,000, by the political redistribution of 1882 forms a single electoral college and returns four members to parliament. The diocese of Siena, an archbishopric dating from 1459, includes 18 city and 95 rural parishes divided into 12 vicariates.

The city possesses a university, founded in 1203 and limited to the faculties of law and medicine. Among the other public institutions the following are the more im- portant :—the town library, first opened to students in the 17th century ; the Archivio, a record office, instituted in 1858, containing a valuable and splendidly arranged col- lection of documents ; the Fine Arts Institution, founded in 1816; and the natural history museum of the Royal Academy of the Physiocritics, inaugurated in the same year. There are also many flourishing charities, including an excellent hospital and a school for the deaf and dumb.

The public festivals of Siena known as the “ Palio delle Contrade ” have a European celebrity. They are held in

the public square, the curious and historic Piazza del Campo (now Piazza di Vittorio Emanuele), on 2d July and 16th August of each year; they date from the Middle Ages and were instituted in commemoration of victories and in honour of the Virgin Mary (the old title of Siena, as shown by seals and medals, having been “Sena vetus civitas Virginis”). In the 15th and 16th centuries the celebrations consisted of bull-fights. At the close of the 16th century these were replaced by races with mounted buffaloes, and since 1650 by (ridden) horses. Siena is divided into seventeen contrade (wards), each with a dis- tinct appellation and a chapel and flag of its own; and every

year ten of these contrade, chosen by lot, send each one horse to compete for the prize palio or banner. The aspect of Siena during these meetings is very character- istic, and the whole festivity bears a medizeval stamp in harmony with the architecture and history of the town.

Among the noblest fruits of Sienese art are the public build- Cathe-

ings adorning the city. The cathedral, one of the finest examples of Italian Gothic architecture, was begun in the early years ofthe 13th century, and in 1317 its walls were extended to the baptistery of San Giovanni ; a further enlargement was begun in 13389 but never carried out, and a few ruined walls and arehes alone remain to show the magnificence of the uncompleted design. The splendid west front, of tricuspidal form, enriched with a multitude of columns, statues, and inlaid marbles, was finished in 1880. Space

Siig Ulla 2

Plan of Siena.

fails for the enumeration of the art treasures of the interior, but conspicuous among them is the well-known octagonal pulpit by Niccold Pisano, dating from about 1274. The cathedral pavement is almost unique. It is inlaid with designs in colour and black and white, representing Biblical and legendary subjects, and is supposed to have been begun by Duccio della Buoninsegna. But the finest pee 2 beneath the domes, with scenes from the history of Abra-

am, Moses, and Elijah, are by Domenico Beccafumi and are exe- cuted with marvellous boldness and effect. The choir stalls also deserve mention: the older ones (remains of the original choir) are in tarsia work ; the others, dating from the 16th century, are carved from Riccio’s designs. The Piccolomini Library, adjoining the duomo, was founded by Cardinal Francesco Piccolomini-Todeschini

ches.

SIENA

(afterwards Pius III.) in honour of his uncle, Pius II. Here are Pinturicchio's famous frescos of scenes from the life of the latter

ontiff and the collection of choir books (supported on sculptured desks) with splendid illuminations by Sienese and other artists. The church of San Giovanni, the ancient baptistcry, beneath the cathedral is approached by an outer flight of marble steps built in 1451. It has a beautiful fagade designed by Giovanni di Mino del Pellicciaio in 1382, and a marvellous font with bas-reliefs by Dona- tello, Ghiberti, Giacomo della Quercia, and other 15th-century sculp- tors. The other churches are—the Collegiata di Provenzano, a vast building of some elegance, designed by Schifardini (1594) ; Sant' Agostino, rebuilt by Vanvitelli in 1755, containing a Cruci- fixion and Saints by Pcrugino, a Massacre of the Innocents by Matteo di Giovanni, the Coming of the Magi by Sodoma, and a St Antony by Spagnoletto or his school ; the beautiful church of the Servites (15th century), which contains another Massacre of the Innocents by Matteo di Giovanni and other good examples of the Sienese school ; San Francesco, designed by Agostino and Agnolo about 1326, and now (1887) being restored, which once possessed many fine paintings by Duccio Buoninsegna, Lorenzetti, Sodoma, and Beccafumi, but some of these perished in the great fire of 1655, and the rest were removed to the Institute of Fine Arts after 1862 during the temporary desecration of the church ; San Domenico, a fine 13th-century building with a single nave and transept, con- taining Sodoma's splendid fresco the Swoon of St Catherine, the Madonna of Guido da Siena, and a crucifix by Sano di Pietro. This church crowns the Fontebranda hill above the famous fountain of that name immortalized by Dante, and ina steep lane below stands the house of St Catherine, now converted into a church and oratory, and maintained at the expense of the inhabitants of the Contrada dell' Oca. It contains some good pictures by Pacchia and other works of art, but is chiefly visited for its historic interest and as a striking memorial of the characteristic piety of the Sienese.

The communal palace in the Piazza del Campo was begun in 1288 and finished in 1309. It is built of brick, is a fine specimen of Pointed Gothic, and was designed by Agostino and Agnolo. The light and elegant tower (Torre del Mangia) soaring from one side of the palace was begun in 1325, and the chapel standing at its foot, raised at the expense of the Opera del

Duomo as a public thank-offering after the plague of 1348, dates from 1352. This grand old palace has other attractions besides the beauty of its architecture, for its interior is lined with works of art. The atrium has a fresco by Bartolo di Fredi and the two ground-floor halls contain a Coronation of the Virgin by Sano di Pietro and a splendid Resurrection by Sodoma. In the Sala dei Nove or della Pace above are the noble allegorical frescos of Ambrogio Lorenzetti re- presenting the effects of just and unjust government; the Sala delle Balestre or del Mappamondo is painted by Simone di Martino (Memmi) and others, the Cappella della Signoria by Taddeo di Bartolo, and the Sala del Concistorio by Beccafumi. Another hall is now being prepared in memory of Victor Emmanuel II., and its frescos and decorations are to be entrusted exclusively to Sienese artists. The former hall of the grand council, built in 1827, was converted into the chief theatre of Siena by Riccio in 1560, and, after being twice burnt, was rebuilt in 1753 from Bibbiena's designs. Another Sienese theatre, the Rozzi, in Piazza San Pellegrino, de- signed by A. Doveri and erected in 1816, although modern, has an historic interest as the work of an academy dating from the 16th century, called the Congrega de' Rozzi, that played an import- ant part in the history of the Italian comic stage.

The city is adorned by many other noble edifices both public and private, of which we will mention the following palaces—the Tolomei (1205); Buonsignori, formerly Tegliacci, an elegant 14th- century construction, restored in 1848 ; Grottanelli, formerly Pecci and anciently the residence of the captain of war, recently restored in its original style; Sansedoni; Maral; Piccolomini, now be- longing to the Government and containing the state archives ; Piccolomini delle Papesse, like the other Piccolomini mansion, de- signed by Bernardo Rossellino, and now the national bank ; the enormous block of the Monte de' Paschi, enlarged and partly re- built in the original style between 1877 and 1881, and including the old Dogana and Spannocchi palaces; the Loggia di Mercanzia (15th century), now a club; the Loggia del Papa, erected by Pius II. ; and other fine buildings. We must also mention the two celebrated fountains, Fonte Gaia and Fontebranda; the Fonte Nuova, near Porta Ovile, by Camaino di Crescentino also deserves notice. Thanks to all these architectural treasures, the narrow Sienese streets with their many windings and steep ascents are full of pic- turesque charm,

and, together with the collections of excellent paintings, foster the local pride of the inhabitants and preserve their taste and feeling for art.

_Mistory.—The origin of Siena, like that of other Italian cities, is lost in a mist of legendary tradition, It was prob- ably founded by the Etruscans, and then falling under the Roman rule became a colony in the reign of Augustus, or

a little earlier, and was distinguished by the name of Sena Julia. Few memorials of the Roman era or of the first centuries of Christianity have been preserved, and none at all of the interval preceding the Lombard period. We have documentary evidence that during this epoch, in the reign of Rotaris (or Rotari), there was a bishop of Siena named Mouro. Attempts to trace earlier bishops as far back as the 5th century have yielded only vague and contradictory results. Under the Lombards the civil government was in the hands of a gastaldo, under the Carolingians of a count, whose authority, by slow degrees and a course of events similar to what took place in other Italian communes, gave way to that of the bishop, whose power in turn gradually diminished and was superseded by that of the consuls and the commonwealth.

We have written evidence of the consular government Struggle of Siena from 1125 to 1212; the number of consuls varied between from three to twelve. This government, formed of gentut- a uomim or nobles, did not remain unchanged throughout popolani. the whole period, but was gradually forced to accept the participation of the popolant or lower classes, whose efforts to rise to power were continuous and determined. Thus in 1137 they obtained a third part of the govern- ment by the reconstitution of the general council with 100 nobles and 50 popolant. In 1199 the institution of a foreign podestd gave a severe blow to the consular magistracy, which was soon extinguished; and in 1233 the people again rose against the nobles in the hope of ousting them entirely from office. The attempt was not completely successful ; but the Government was now equally divided between the two estates by the creation of a supreme magistracy of twenty-four citizens,—twelve nobles and twelve popolani. During the rule of the nobles and the mixed rule of nobles and popolani. the commune of Siena

was enlarged by fortunate acquisitions of neighbour- ing lands and by the submission of feudal lords, such as the Scialenghi, Aldobrandeschi, Pannocchieschi, Visconti di Campiglia, &c. Before long the reciprocal need of fresh territory and frontier disputes, especially concerning Poggi- bonsi and Montepulciano, led to an outbreak of hostilities between Florence and Siena. Thereupon, to spite the rival republic, the Sienese took the Ghibelline side, and the German emperors, beginning with Frederick Barbarossa, rewarded their fidelity by the grant of various privileges. During the 12th and 13th centuries there were con- Warwith tinued disturbances, petty wars, and hasty reconciliations Florence. between Florence and Siena, until in 1254-55 a more binding peace and alliance was concluded. But this treaty, in spite of its apparent stability, led in a few years toa fiercer struggle ; for in 1258 the Florentines complained that Siena had infringed its terms by giving refuge to the Ghibellines they had expelled, and on the refusal of the Sienese to yield to these just remonstrances both states made extensive preparations for war. Siena applied to Manfred, obtained from him a strong body of German horse, under the command of Count Giordano, and likewise sought the aid of its Ghibelline allies. Florence equipped a powerful citizen army, of which the original registers are still preserved in the volume entitled Z7 Libro di Mont- apertt in the Florence archives. This army, led by the podest' of Florence and twelve burgher captains, set forth gaily on its march towards the enemy's territories in the middle of April 1260, and during its first campaign, ending 18th May, won an insignificant victory at Santa Petronilla, outside the walls of Siena. But in a second and more important campaign, in which the militia of the other Guelf towns of Tuscany took part, the Florentines were signally defeated at Montaperti on 4th September 1260. This defeat crushed the power of Florence for many years, reduced the city to desolation, and apparently annihilated

Success of popu- lar party.

Council of nine,

Rule of the twelve.

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the Florentine Guelfs. But the battle of Benevento (1266) and the establishment of the dynasty of Charles of Anjou on the Neapolitan throne put an end to the Ghibelline predominance in Tuscany. Ghibelline Siena soon felt the effects of the change in the defeat of its army at Colle di Valdelsa (1269) by the united forces of the Guelf exiles, Florentines, and French, and the death in that battle of her powerful citizen Provenzano Salvani (mentioned by Dante), who had been the leading spirit of the Govern- ment at the time of the victory of Montaperti. For some time Siena remained faithful to the Ghibelline cause ; nevertheless Guelf and democratic sentiments began to make head. The Ghibellines were on several occasions expelled from the city, and, even when a temporary recon- ciliation of the two parties allowed them to return, they failed to regain their former influence.

Meanwhile the popular party acquired increasing power in the state. Exasperated by the tyranny of the Salimbeni and other patrician families allied to the Ghibellines, it decreed in 1277 the exclusion of all nobles from the supreme magistracy (consisting since 1270 of thirty-six instead of twenty-four members), and insisted that this council should be formed solely of Guelf traders and men of the middle class. This constitution was confirmed in 1280 by the reduction of the supreme magistracy to fifteen members, all of the humbler classes, and was definitively sanctioned in 1285 (and 1287) by the institution of the magistracy of nine. This council of nine, composed only of burghers, carried on the government for about seventy years, and its rule was sagacious and peaceful. The terri- tories of the state were enlarged ; a friendly alliance was maintained with Florence; trade flourished ; in 1321 the university was founded, or rather revived, by the introduc- tion of Bolognese scholars; the principal buildings now adorning the town were begun ; and the charitable institu- tions, which are the pride of modern Siena, increased and prospered. But meanwhile the exclusiveness of the single class of citizens from whose ranks the chief magistrates were drawn had converted the government into a close oligarchy and excited the hatred of every other class. Nobles, judges, notaries, and populace rose in frequent revolt, while the nine defended their state (1295-1309) by a strong body of citizen militia divided into terziert (sec- tions) and contrade (wards), and violently repressed these attempts. But in 1355 the arrival of Charles IV. in Siena gave fresh courage to the

malcontents, who, backed by the imperial authority, overthrew the government of the nine and substituted a magistracy of twelve drawn from the lowest class. These new rulers were to some extent under the influence of the nobles who had fomented the rebellion, but the latter were again soon excluded from all share in the government. This was the beginning of a determined struggle for supremacy, carried on for many years, between the different classes of citizens, locally termed ordini or monti,—the lower classes striving to grasp the reins of government, the higher classes already in office striving to keep all power in their own hands, or to divide it in proportion to the relative strength of each monte. As this struggle is of too complex a nature to be described in detail, we must limit ourselves to a summary of its leading episodes.

The twelve who replaced the council of nine (as these had previously replaced the council of the nobles) consisted —hboth as individuals and as a party—of ignorant, incap- able, turbulent men, who could neither rule the state with firmness nor confer prosperity on the republic. They speedily broke with the nobles, for whose manceuvres they had at first been useful tools, and then split into two fac- tions, one siding with the Tolomei, the other, the more restless and violent, with the Salimbeni and the novesche

(partisans of the nine), who, having still some influence in the city, probably fomented these dissensions, and, as we shall see later on, skilfully availed themselves of every chance likely to restore them to power. In 1368 the adversaries of the twelve succeeded in driving them by force from the public palace, and substituting a govern- ment of thirteen,—ten nobles and three noveschi. This government lasted only twenty-two days, from 2d to 24th September, and was easily overturned by the dominant faction of the dodicine (partisans of the twelve), aided by the Salimbeni and the populace, and favoured by the emperor Charles IV. The nobles were worsted, being driven from the city as well as from power ; but the abso- lute rule of the twelve was brought to an end, and right of participation in the government was extended to an- other class of citizens. For, on the expulsion of the thirteen from the palace, a council of 124 plebeians created a new magistracy of twelve difensori (defenders), no longer drawn exclusively

from the order of the twelve, but com- posed of five of the popolo minuto, or lowest populace (now first admitted to the government), four of the twelve, and three of the nine. But it was of short duration, for the dodicint were ill satisfied with their share, and in Decem- ber of the same year (1368) joined with the popolo minuto in an attempt to expel the three noveschi from the palace. But the new popular order, which had already asserted its predominance in the council of the riformatori, now drove out the dodicini, and for five days (11th to 16th December) kept the government in its own hands. Then, however, moved by fear of the emperor, who had passed through Siena two months before on his way to Rome, and who was about to halt there on his return, it tried to conciliate its foes by creating a fresh council of 150 riformatori, who replaced the twelve defenders by a new supreme magistracy of fifteen, consisting of eight popolani, four dodicini, and three noveschi, entitled respectively “people of the greater number,” “people of the middle number,” and “people of the less number.” From this renewal dates the forma- tion of the new order or monte det riformatori, the title henceforth bestowed on all citizens, of both the less and the greater people, who had reformed the government and begun to participate in it in 1368. The turbulent faction of the twelve and the Salimbeni, being dissatisfied with these changes, speedily rose against the new Govern- ment. This time they were actively aided by Charles IV., who, having returned from Rome, sent his militia, commanded by the imperial vicar Malatesta da Rimini, to attack the public palace. But the Sienese people, being called to arms by the council of fifteen, made a most determined resistance, routed the imperial troops, captured the standard, and confined the emperor in the Salimbeni palace. Thereupon Charles came to terms with the Government, granted it an imperial patent, and left the city, consoled for his humiliation by the gift of a large sum of money.

In spite of its wide basis and great energy, the monte dei riformatori, the heart of the new Government, could not satisfactorily cope with the attacks of adverse factions and treacherous allies. So, the better to repress them, it created in 1369 a chief of the police, with the title of esecutore, and a numerous association of popolani—the company or casata grande of the people—as bulwarks against the nobles, who had been recalled from banish- ment, and who, though fettered by strict regulations, were now eligible for offices of the state. But the appetite for power of the “less

people” and the dregs of the populace was whetted rather than satisfied by the installation of the riformatori in the principal posts of authority. Among the wool-carders—men of the lowest class, dwelling in the precipitous lanes about the Porta Ovile—there was an

Riforma- tori and council

of fifteen.

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tion to Milan,

SIENA

association styling itself the “company of the worm.” During the famine of 1371 this company rose in revolt, sacked the houses of the rich, invaded the public palace, drove from the council of fifteen the four members of the twelve and the three of the nine, and replaced them by seven tatterdemalions. Then, having withdrawn to its own quarter, it was suddenly attacked by the infuriated citizens (noveschi and dodicini), who broke into houses and workshops and put numbers of the inhabitants to the sword without regard for age or sex. Thereupon the popular rulers avenged these misdeeds by many summary execu- tions in the piazza. These disorders were only checked by fresh changes in the council of fifteen. It was now formed of twelve of the greater people and three noveschi, to the total exclusion of the dodicini, who, on account of their growing turbulence, were likewise banished from the city.

Meanwhile the Government had also to contend with difficulties outside the walls. The neighbouring lords attacked and ravaged the municipal territories; grave injuries were inflicted by the mercenary bands, especially by the Bretons and Gascons. The rival claims to the Neapolitan kingdom of Carlo di Durazzo and Louis of Anjou caused fresh disturbances in Tuscany. The Sienese Government conceived hopes of gaining possession of the city of Arezzo, which was first occupied by Durazzo’s men, and then by

Enguerrand de Coucy for Louis of Anjou; but while the Sienese were nourishing dreams of conquest the French general unexpectedly sold the city to the Florentines, whose negotiations had been conducted with marvellous ability and despatch (1384). The gather- ing exasperation of the Sienese, and notably of the middle class, against their rulers was brought to a climax by this cruel disappointment. Their discontent had been gradually swelled by various acts of home and foreign policy during the sixteen years' rule of the riformatora, nor had the concessions granted to the partisans of the twelve and the latter's recall and renewed eligibility to office availed to conciliate them. At last the revolt broke out and gained the upper hand, in March 1385. The riformatort were ousted from power and expelled the city, and the trade of Siena suffered no little injury by the exile of so many artisan families. The fifteen were replaced by anew supreme magistracy of ten priors, chosen in the following proportions,—four of the twelve, four of the nine, and two of the people proper, or people of the greater number, but to the exclusion of all who had shared in the government or sat in council under the riformatort. Thus began a new order or monte del popolo, composed of families of the same class as the riformatori, but having had no part in the government during the latter's rule. But, though now admitted to power through the burgher reaction, as a concession to democratic ideas, and to cause a split among the greater people, they enjoyed very limited privileges.}

In 1387 fresh quarrels with Florence on the subject of Montepulciano led to an open war, that was further aggra- vated by the interference in Tuscan affairs of the ambitious duke of Milan, Gian Galeazzo Visconti. With him the Sienese concluded an alliance in 1389 and ten years later accepted his suzerainty and resigned the liberties of their state. But in 1402 the death of Gian Galeazzo lightened their yoke. In that year the first plot against the Vis- contian rule, hatched by the twelve and the Salimbeni and fomented by the Florentines, was violently repressed, and caused the twelve to be again driven from office ; but in

1 The following are the ordini or monti that held power in Siena for any considerable time—gentilwomini, from the origin of the re- public ; nove, from about 1285 ; dodici, from 1355 ; riformatori, from 1868 ; popolo, from 1885.

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the following year a special balia, created in consequence of that riot, annulled the ducal suzerainty and restored the liberties of Siena. During the interval the supreme magis- tracy had assumed a more popular form. By the partial readmission of the riformatort and exclusion of the twelve, the permanent balta was now composed of nine priors (three of the nine, three of the people, and three of the riformatort) and of a captain of the people to be chosen from each of the three monti in turn. On 11th April peace wasemade with the Florentines and Siena en- joyed several years of tranquil prosperity.

But the great Western schism then agitating the Chris- Quarrels In con- with

tian world again brought disturbance to Siena. sequence of the decisions of the council of Pisa, Florence and Siena had declared against Gregory XII. (1409) ; Ladislaus of Naples, therefore, as a supporter of the pope, seized the opportunity to make incursions on Sienese terri- tory, laying it waste and threatening the city. The Sienese maintained a vigorous resistance till the death of this monarch in 1414 freed them from his attacks. In 1431 a fresh war with Florence broke out, caused by the latter's attempt upon Lucca, and continued in consequence of the Florentines' alliance with Venice and Pope Eugenius IV., and that of the Sienese with the duke of Milan and Sigis- mund, king of the Romans. This monarch halted at Siena on his way to Rome to be crowned, and received a most princely welcome. In 1433 the opposing leagues signed a treaty of peace, and, although it was disadvantageous to the Sienese and temptations to break it were frequently urged upon them, they faithfully adhered to its terms. During this period of comparative tranquillity Siena was honoured by the visit of Pope Eugenius IV. (1443) and by that of the emperor Frederick III., who came there to re- ceive his bride, Eleanor of Portugal, from the hands of Bishop Aineas Sylvius Piccolomini, his secretary and his- torian (1452). This meeting is recorded by the memorial column still to be seen outside the Camollia gate. In 1453 hostilities against Florence were again resumed, on account of the invasions and ravages of Sienese territory committed by Florentine troops in their conflicts with Alphonso of Naples, who since 1447 had made Tuscany his battle-ground. Peace was once more patched up with Florence

in 1454. Siena was next at war for several years with Aldobrandino Orsini, count of Pitigliano, and with Jacopo Piccinini, and suffered many disasters from the treachery of its generals. About the same time the republic was exposed to still graver danger by the con- spiracy of some of its leading citizens to seize the reins of power and place the city under the suzerainty of Alphonso, as it had once been under that of the duke of Milan. But the plot came to light; its chief ringleaders were beheaded, and many others sent into exile (1456); and the death of Alphonso at last ended all danger from that source. During those critical times the government of the state was strengthened by a new executive magistracy

called the balia, which from 1455 began to act independ- Institu-

been tion of But he balia,

ently of the priors or consistory. Until then it had merely a provisional committee annexed to the latter. henceforward the balita had supreme jurisdiction in all affairs of the state, although always, down to the fall of the republic, nominally preserving the character of a magis- tracy extraordinary. The election of Aineas Sylvius Pic- colomini to the papal chair in 1458 caused the utmost joy to the Sienese; and in compliment to their illustrious fellow-citizen they granted the request of the nobles and readmitted them to a share in the government. But this concession, grudgingly made, only remained in force for a few years, and on the death of the pope (1464) was re- voked altogether, save in the case of members of the Piccolomini house, who were decreed to be popolani and XXIT. — 6

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were allowed to retain all their privileges. Meanwhile fresh discords were brewing among the plebeians at the head of affairs.

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until he was at last worsted in his struggle with Cesare Borgia, who caused his expulsion from Siena in 1502. But through the friendly mediation of the Florentines and the

Revolu- The conspiracy of the Pazzi in 1478 led to a war in| French king he was recalled from banishment on 29th tion of which Florence and Milan were opposed to the pope and | March 1503. He maintained his power until his death at TEe0 «ie king of Naples, and which was put an end to by the | the age of sixty on 21st May 1512, and was interred with peace of 13th March 1480. Thereupon Alphonso, duke | princely ceremonials at the public expense. The predomi- of Calabria, who was fighting in Tuscany on the side of | nance of his family in Siena did not last long after his his father Ferdinand, came to an agreement with Siena | decease. Pandolfo had not the qualities required to found and, in the same way as his grandfather Alphonso, tried | a dynasty such as that of the Medici. He lacked the lofty to obtain the lordship of the city and the recall of the | intellect of a Cosimo or a Lorenzo, and the atmosphere exiled rebels of 1456. The noveschi (to whose order most | of liberty-loving Siena with its ever-changing factions of the rebels belonged) favoured his pretensions, but the | was in no way suited to his purpose. His eldest son, réformatort were against him. Many of the people sided | Borghese Petrucci, was incapable, haughty, and exceed- with the noveschi, rose in revolt on 22d June 1480, and, | ingly corrupt ; he only remained three years at the head aided by the duke’s soldiery, reorganized the government | of affairs and fled ignominiously in 1515. Through the to their own advantage. Dividing the power between | favour of Leo X. he was succeeded by his cousin Raffaello their two orders of the nine and the people, they excluded | Petrucci, previously governor of St Angelo and afterwards the riformatori and replaced them by a new and hetero- | a cardinal. geneous order styled the aggregati, composed of nobles, This Petrucci was a bitter enemy to Pandolfo’s children. exiles of 1456, and citizens of other orders who had never | He caused Borghese and a younger son named Fabio to be before been in office. But this violent and perilous upset | proclaimed as rebels, while a third son, Cardinal Alphonso, of the internal liberties of the republic did not last long. | was strangled by order of Leo X. in 1518. He was a A decree issued by the Neapolitan king (1482) depriving | tyrannical ruler, and died suddenlyin1522. In the following the Sienese of certain territories in favour of Florence | year Clement VII. insisted on the recall of Fabio Petrucci; entirely alienated their affections from that monarch. | but two years later a fresh popular outbreak drove him Meanwhile the monte of the nine, the chief promoters of | from Siena for ever. The city then placed itself under Under the revolution of 1480, were

exposed to the growing hatred | the protection of the emperor Charles V., created a magis- the pro- and envy of their former allies, the monte del popolo, who, | tracy of “ten conservators of the liberties of the state” re conscious of their superior strength and numbers, now | (December 1524), united the different mondz in one named en | sought to crush the novescht and rise to power in their | the “monte of the reigning nobles,” and, rejoicing to be stead. This change of affairs was accomplished by a | rid of the last of the Petrucci, dated their public books, series of riots between 7th June 1482 and 20th February | ab instaurata libertate year I., I1., and so on. 1483. The monte del popolo seized the lion’s share of the The so-called free government subject to the empire government ; the riformatori were recalled, the aggregati | lasted for twenty-seven years ; and the desired protection abolished, and the novescht condemned to perpetual banish- | of Spain weighed more and more heavily until it became ment from the government and the city. But “in per- | a tyranny. The imperial legates and the captains of the petuo” was an empty form of words in those turbulent | Spanish guard in Siena crushed both Government and Italian republics. The noveschi, being “fat burghers” | people by continual extortions and by undue interference with powerful connexions, abilities, and traditions, gained | with the functions of the balia. Charles V. passed through increased strength and influence in exile; and five years | Siena in 1535, and, as in all the other cities of enslaved later, on 22d July 1487, they returned triumphantly to | Italy, was received with the greatest pomp; but he left Siena, dispersed the few adherents of the popolo who | neither peace nor liberty behind him. From 1527 to 1545 offered resistance, murdered the captain of the people, | the city was torn by faction fights and violent revolts against reorganized the state, and placed it under the protection | the noveschi, and was the scene of frequent bloodshed. of the Virgin Mary. And, their own predominance being | The balia was reconstituted several times by the imperial assured by their numerical strength and influence, they | agents,—in 1530 by Don Lopez di Soria and Alphonso accorded equal shares of power to the other montz. Piccolomini, duke of Amalfi, in 1540 by Granvella (or Pandolfo Among the returned exiles was Pandolfo Petrucci, chief | Granvelle), and in 1548 by Don Diego di Mendoza ; but Petrucci. of the novescht and soon to be at the head of the Govern- | government was carried on as badly as before, and there

ment. During the domination of this man (who, like Lor- enzo de' Medici, was surnamed "the Magnificent") Siena enjoyed many years of splendour and prosperity. We use the term "domination" rather than "signory" inasmuch as, strictly speaking, Petrucci was never lord of the state, and left its established form of government intact ; but he exercised despotic authority in virtue of his strength of character and the continued increase of his personal power. He based his foreign policy on alliance with Florence and France, and directed the internal affairs of the state by means of the council (collegio) of the balta, which, although occasionally reorganized for the purpose of conciliating rival factions, was always subject to his will. He like- wise added to his power by assuming the captainship of the city guard (1495), and later by the purchase from the impoverished commune of several outlying castles (1507). Nor did he shrink from deeds of bloodshed and revenge: the assassination of his father-in-law, Niccold Borghesi (1500), is an indelible blot upon his name. He successfully withstood all opposition within the state,

was increased hatred of the Spanish rule. When in 1549 Don Diego announced the emperor's purpose of erecting a fortress in Siena to keep the citizens in order, the general hatred found vent in indignant remonstrance. The his- torian Orlando Malavolti and other special envoys were sent to the emperor in 1550 with a petition signed by more than a thousand citizens praying him to spare them so terrible a danger; but their mission failed: they re- turned unheard. Meanwhile Don Diego had laid the foundation of the citadel and was carrying on the work with activity. Thereupon certain Sienese citizens in Rome, headed by Adneas Piccolomini (a kinsman of Pius I), entered into negotiations with the agents of the French king and, having with their help collected men and money, marched on Siena and forced their way in by the new gate (now Porta Romana) on 26th July 1552. The towns- people, encouraged and reinforced by this aid from without, at once rose in revolt, and, attacking the Spanish troops, disarmed them and drove them to take refuge in the citadel (28th July). And finally by an agreement with

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Cosimo de’ Medici, duke of Florence, the Spaniards were sentaway on the 5th August 1552 and the Sienese took possession of their fortress.

The Government was now reconstituted under the pro- tection of the French agents; the balta was abolished, its very name having been rendered odious by the tyranny of Spain, and was replaced by a similar magistracy styled capitant del popolo e reggimento, Siena exulted in her recovered freedom; but her sunshine was soon clouded. First, the emperor’s wrath was stirred by the influence of France in the counsels of the republic; then Cosimo, who was no less jealous of the French, conceived the design of annexing Siena to his own dominions. The first hostilities of the imperial forces in Val di Chiana (1552-53) did little damage ; but when Cosimo took the field with an army commanded by the marquis of Marignano the ruin of Siena was at hand. On 26th January Marignano cap- tured the forts of Porta Camollia (which the whole popu- lation of Siena, including the women, had helped to con- struct) and invested the city. On 2d August of the same year, at Marciano in Val di Chiana, he won a complete victory over the Sienese and French troops under Piero Strozzi, the Florentine exile and marshal of France. Meanwhile Siena was vigorously besieged, and its inhabit- ants, sacrificing everything for their beloved city, main- tained a most heroic defence. A glorious record of their sufferings is to be found in the Diary of Sozzini, the Sienese historian, and in the Commentaries of Blaise de Monluc, the French representative in Siena. But in April 1555 the town was reduced to extremity and was forced to capitulate to the emperor and the duke. On 21st April the Spanish troops entered the gates; thereupon many patriots abandoned the city and, taking refuge at Montalcino, maintained there a shadowy form of republic until 1559.

Cosimo I. de’ Medici being granted the investiture of the Sienese state by the patent of Philip II. of Spain, dated 3d July 1557, took formal possession of the city _on the 19th of the same month. A leutenant-general was appointed as representative of his authority; the council of the ba/ia was reconstituted with twenty members chosen by the duke ; the consistory and the general council were left in existence but deprived of their political autonomy. Thus Siena was annexed to the Florentine state under the same ruler and became an integral part of the grand-duchy of Tuscany. Nevertheless it retained a separate administration for more than two

centuries, until the general reforms of the grand-duke Pietro Leo- poldo, the French domination, and finally the restoration swept away all differences between the Sienese and Floren- tine systems of government. In 1859 Siena was the first Tuscan city that voted for annexation to Piedmont and the monarchy of Victor Emmanuel II., this decision (voted 26th June) being the initial step towards the unity of Italy.

Literary History.—The literary history of Siena, while recording ho gifts to the world equal to those bequeathed by Florence, and without the power and originality by which the latter became the centre of Italian culture, can nevertheless boast of some illustrious names. Of these a brief summary, beginning with the department of general literature and passing on to history and science, is sub- Joined. Many of them are also dealt with in scparate articles, to which the reader is referred.

As early as the 13th century the vulgar tongue was already well established at Siena, being used in public documents, commercial records, and private correspondence. The poets flourishing at that period were Féleacchiero, Cecco Angiolieri—a humorist of a very high order—and Bindo Bonichi, who belonged also to the fol- lowing century. The chief glory of the 14th century was St Catherine Benincasa. The year of her death (1380) was that of the birth of St Bernardino Albizzeschi, a popular preacher whose sermons in the vulgar tongue are models of style and diction. To the 15th century belongs Aneas Sylvius Piccolomini (Pius I.), humanist, historian, and political writer. In the 16th century we

find another Piccolomini (Alexander), bishop of Patras, author of a curious dialogue, Della bella Creanza delle Donne; another bishop, Claudio Tolomei, diplomatist, poet, and philologist, who revived the use of ancient Latin metres; and Luca Contile, a writer of nar- ratives, plays, and poems. Prose fiction had two representatives in this century,—Scipione Bargagli, a writer of some merit, and Pietro Fortini, whose productions were trivial and indecent. In the 17th century we find Ludovico Sergardi (Quinto Settano), a Latinist and satirical writer of much talent and culture; but the most original and brilliant figure in Sienese literature is that of Girolamo Gigli (1660-1722), author of the Gazzettino, La Sorellina di Don Pilone, Il Voeabolario

Cateriniano, and the Diario Keelest- astieo. As humorist, scholar, and philologist Gigli would take a high place in the literature of any land. His resolute opposition to all hypocrisy—whether religious or literary—exposed him to merciless persecution from the Jesuits and the Della Cruscan Academy.

In the domain of history we have first the old Sienese chronicles, His- which down to the 14th century are so coufused that it is almost torians.

impossible to disentangle truth from fiction or even to decide the personality of the various authors. Three 14th-century chronicles, attributed to Andrea Dei, Agnolo di Tura, called I] Grasso, and Neri di Donati, are published in Muratori, vol. xv. To the 15th century belongs the chronicle of Allegretto Allegretti, also in Muratori (vol. xxiii.) ; and during the same period flourished Sigis- mondo Tizio (a priest of Siena, though born at Castiglione Aretino), whose voluminous history written in Latin and never printed (now among the MSS. of the Chigi Library in Rome), though de- void of literary merit, contains much valuable material. The best Sienese historians belong to the 16th century. They are Orlando Malavolti (1515-1596), a man of noble birth, the most trustworthy of all; Antonio Bellarmati; Alessandro Sozzini di Girolamo, the sympathetic author of the Diario dell' ultima Guerra Senese ; and Giugurta Tommasi, of whose tedious history ten books, down to 1354, have been published, the rest being still in manuscript. Together with these historians we must mention the learned scholars Celso Cittadini (d. 1627), Ulberto Benvoglienti (d. 1733), one of Muratori's correspondents, and Gio. Antonio Picci (d. 1768), author of histories of Pandolfo Petrucci and the bishopric of Siena. In the same category may be classed the librarian C. F. Carpellini (d. 1872), author of several monographs on the origin of Siena and the constitution of the republic, and Scipione Borghesi (d. 1877), who has left a precious store of historical, biographical, and biblio- graphical studies and documents.

In theology and philosophy the most distinguished names are— Bernardino Ochino and Lelio and Fausto Soccini (16th century); in jurisprudence, three Soccini — Mariano senior, Bartolommeo, and Mariano junior (15th and 16th centuries); and in political economy, Sallustio Bandini (1677-1760), author of the Discorso sulla Maremma. In physical science the names most

worthy of mention are those of the botanist Pier Antonio Mattioli (1501-1572), of Pirro Maria Gabrielli (1643-1705), founder of the academy of the Physiocritics, and of the anatomist Paolo Mascagni (d. 1825).

Art.—The history of Sienese art is a fair and luminous record. Lanzi happily designates Sienese painting as ‘‘Lieta scuola fra lieto popolo” (‘the blithe school of a blithe people”). The special characteristics of its masters are freshness of colour, vivacity of ex- pression, and distinct originality. The Sienese school of painting owes its origin to the influence of Byzantine art; but it improved that art, impressed it with a special stamp, and was for long inde- pendent of all other influences. Consequently Sienese art seemed almost stationary amid the general progress and development of the other Italian schools, and preserved its medisval character down to the end of the 15th century. When the Florentine Giot- tesques aud their few followers were on the wane, this mystic Sienese school still showed continued fertility and improvement. At the close of the 15th century the influence of the Umbrian and—to a slighter degree—of the Florentine scliools began to pene- trate into Siena, followed a little later by that of the Lombard, and these grafts gave fresh vigour to the old stock without destroying its special characteristics. Of this new phase of Sienese art it has been well said that Sodoma was its Leonardo, Baldassare Peruzzi its Raphael, and Beccafumi its Michelangelo. In every age Siena has produced many painters of different degrees of merit. It is impossible to mention all, so we will only cite the names of the more celebrated. In the 13th century we find Guido (da Siena), painter of the well-known Madonna in the church of 8. Domenico in Siena. The 14th century gives us Ugolino, who painted the Madonna del Tabernacolo in Or San Michele, Florence ; Duccio di Buoninsegna, whose chief work is the great panel of the high altar of the cathedral at Siena; Pietro aud Ambrogio Lorenzetti, Simone di Martino (or Memmi), Lippo Memmi, Andrea di Vanni (painter and statesman), and Taddeo di Bartolo. In the 15th century we have Sano di Pietro, Giovanni di Paolo, Stefano di Giovanni (Il Sassetta), and Matteo di Giovanni Bartoli, whose several paintings of the Massacre of the Innocents show a fine sentiment and mucli observation of reality. The 16th century boasts the names of Guidoccio Cossarelli, Giacomo Pacchiarotto, Girolamo del Pacchia,

Scientific writers.

Painters.

Sculptors andarchi- sculptors and architects, such as Lorenzo Maitani, architect of the

tects.

Ad

3aldassare Peruzzi (1481-1537), who was excellent in many branches of art and especially celebrated for his frescos and studies in per- spective and chiaroscuro; Giovanni Antonio Bazzi, otherwise known as I] Sodoma (1477-1549), who, born at Vercelli in Piedmont and trained at Milan in the school of Leonardo da Vinci, came to Siena in 1504 and there produced his finest works ; Domenico Beccafumi, otherwise known as Micharino (1486-1550), noted for the Michel- angelesque daring of his designs ; and Francesco Vanni.

Side by side with these painters marches a notable band of

Orvieto cathedral (end of 13th century) ; Camaino di Crescentino ; Tino di Camaino, sculptor of the monument to Henry VII. in the Campo Santo of Pisa; Agostino and Agnolo, who in 1330 carved the fine tomb of Bishop Guido Tarlati in the cathedral of Arezzo ; Lando di Pietro (14th century), architect, entrusted by the Sienese commune with the proposed enlargement of the cathedral (1839) ; Giacomo della Quercia, whose lovely fountain, the Fonte Gaia, in the Piazza del Campo has been recently restored by the sculptor Sarrocchi; Lorenzo di Pietro (Il Vecchietta), a pupil of Della

Quercia and an excellent artist in marble and bronze ; Francesco }

di Giorgio Martino (1439-1502), painter, sculptor, military engineer, and writer on art; Giacomo Cozzarelli (15th century) ; and Lorenzo Mariano, surnamed I] Marrina (16th century). (C. PA.)

SIERADZ, a town of Russian Poland, in the govern- ment of Kalisz (Kalish), situated on the Warta, 127 miles south-west of Warsaw. It is one of the oldest towns of Poland, founded prior to the introduction of Christianity, and was formerly known as Syra or Syraz. The annals mention it in 1139. Several seems were held there during the 13th to 15th centuries, and it was a wealthy town until nearly destroyed by a fire in 1447. It is full of historical interest for the Poles. The old castle, which suffered much in the Swedish war, was destroyed by the Germans in 1800. There are two churches dating from the 12th and 14th centuries. Sieradz, after having been the chief town of a voiwddztvo, has now no importance. Its population was 15,040 in 1884.

SIERRA LEONE, a British colony on the West Coast of Africa, the capital of which, Freetown, lies in 8° 39’ N. lat. and 13° 14’ W. long. It consists of Sierra Leone proper, part of the Quiah country to the east, Tasso Island, &e., in the Sierra Leone estuary, part of the Bullom country to the north, the Los Islands to the north of the Mellicoury (Mellacorée) river, the Banana Islands to the south of the main settlement, Sherbro (Sherboro) Island

and part of the Sherbro country, the Turner peninsula,

W. E. Tucker’s territory, and generally all the seaboard south to the mouth of the Manoh (Manna) river, which is now recognized as the northern boundary of Liberia. The British territory and protectorate are estimated to have an area of about 3000 square miles; and, though it has not all been formally annexed, the whole coast region from the mouth of the Scarcies in 8° 55’ N. lat. to that of the Manoh in 6° 55’ may be considered as British, at least to the exclusion of any other European sovereignty..

Sierra Leone proper is a peninsula about 18 miles long from north-west to south-east by about 12 broad. It lies between the Sierra Leone estuary on the north and Yawry Bay on the south. Lengthwise it is traversed by a range of high hills attaining a height of 3000 feet in the Sugar Loaf and nearly as much in Mount Horton farther south. From the mainland the peninsula is physically separated by the Bance or Bunce river (properly estuary), which receives the Waterloo Creek and other small streams. Towards the east and south-east the peninsula sinks to the level of the great alluvial zone which extends along the larger portion of this district of the African coast. The

hills seem to consist of some kind of igneous rock (popularly misnamed granite) and of beds of red sandstone, the disintegration of which has given a dark-coloured ferruginous soil of moderate fertility. The “lofty green trees” which clothed the “mountain” at the time of its discovery (Cadamosto) have for the most part been de- stroyed, though Sugar Loaf is still timbered to the top

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and the peninsula is verdant with abundant vegetation. The Negroes give so little attention to agriculture that the local produce would not feed the population for three

Map of Sierra Leone.

months. Among the productions of the peninsula are cola nuts, ginger (in large quantities), malagetta pepper, castor-oil, maize, cassava, ground nuts, and (in small quantities) cotton. Native coffee was discovered in Quiah in 1796, and the growing of Liberian coffee and cocoa has since 1880 been attempted with some success.

The rainfall of Sierra Leone, according to the Colonial Hospital observations at Frectown, is from 150 to 169 inches per annum. The three months of January, February, and March are practically rainless; the rains, commencing in April or May, reach their maximum in July, Angust, and September, and rapidly diminish in October, November, and December. It sometimes rains for thirty hours on end, but generally twelve hours of rain are followed by twenty-four, thirty, or more hours of clear and leasant weather. At the barracks (150 feet higher than the hospital) there are about 40 inches more rain, and at Kissy, 3 miles distant, some 18 or 20 inches less. The annual temperature indoors is from 78° to 86°. The highest reading for 1880 was 95° and the lowest 69°°33. During the dry season, when the climate is very much like that of the West Indies, there occur terrible tornadoes and long periods of the harmattan,—a north-east wind, dry and desiccating, and carrying with it those clouds of fine dust which the sailors designate “smokes.” The dangers of the climate have long been exaggerated. The low swampy regions are like those of other tropical countries, and Frectown, being badly placed and carelessly kept, is too

often a hotbed of malaria and fever; but the higher districts are not the “white man’s grave.”

According to the census of 1880, the population of the colony was as follows :—peninsula of Sierra Leone with British Quiah, 53,862 ; Isles de Los, 1871 ; occupiers of factories on the Sierra Leone river paying rent to Government, 52 ; island of Tasso, 828; British Sherbro (including Bonthe, Mocolo, Mokate, Runteh, York Island, Yelbana, Victoria, Tasso, Bendu, and J amaica), 4333, — total 60,446. But the census officials deem the actual population to be much greater, that of British Sherbro, for example, being pretty certainly 8000 or 9000. Ethnographically Sierra Leone is almost “an epitome of Africa.” The following are the more im- portant raccs that can be distinctly classified :—Mandingos, 1190; Timmanehs, 7448; Joloffs, 189; Baggas, 340; Mendis, 3088; Sherbros, 2882; Gallinas, 697; Limbas, 493; Susus (Soosoos), 1470; Fulahs, 225 ; Lokkos, 1454 ; Serrakulis, 129 ; Bulloms, 129 ; Krumen, 610. The direct descendants of the liberated slaves now number 35,430. The Akus or people of Yoruba and the Eboes from the eastern banks of the Niger are most easily distinguished. The white residents number only 163, almost entirely a floating population.

Most of the inhabitants depend upon trade, and are collected at the north end of the peninsula, in FREETOWN (qg.v.) and the neigh- pouring villages. Freetown has a good supply of pure water, and great improvements in sanitation have recently been effected. Among the villages in the peninsula may be mentioned Kissy (founded in 1817), the seat of two hospitals for male and female incurables, Gloster (1816), Bathurst (1818), Leopold (1817), Charlotte (1818), Regent (1812), Leicester (1809).

According to the census returns of 1880, there were in Sierra Leone 18,660 Episcopalians, 17,098 Wesleyans and Methodists, 2717 of Lady Huntingdon’s connexion, and 369 Ronan Catholics. Since 1861-62 there has been an independent Episcopal Native Church ; but the Church Missionary Society, which in 1804 sent out the first missionaries to Sierra Leone and has spent about £500,000 on the colony, still maintains certain educative agencies. Fourah Bay college, built by the society on the site of General Turner’s estate (14 miles east of Freetown) and opened in 1828

with six pupils, one of whom was Bishop Crowther, was affiliated in 1876 to Durham university, and has a high-class curriculum. Other institutions are the grammar-school (1846), the Wesleyan high school, and the Annie Walsh Memorial Female Institution.

The following figures show the average value of the principal exports in recent years :—

Benni| Cola | Gin- |Ground| yiges Palm | Palm | Rub- | Gum Seed. | Nuts. | ger. | Nuts. €S-\ernels.| Oil. | ber. £ £ £ £ £ £ £ £ 1877-81] 6,847 | 23,731 11,989 | 80,808 12,607 | 116,822 35,869 | 41,941 1882 |10,001 | 25,547 | 7,916| 15,217 | 18,545 | 101,164 | 47,217 | 96,074 1883 | 9721 | 31,661 | 13,409 | 11,282 | 12,326] 81,578 | 21,954 | 89,782 14,780 1884 } 3,776 | 40,002 16,304] 4,846 17,674| 68,377 17,774 | 50,894 12,539

eee With the exception of the ginger, most of these products are brought down the rivers from the interior, and the development of trade has been grievously hampered by inter-tribal wars in non-British territory. A considerable falling off is observable in those articles which require cultivation or labour, or are bulky in transit. Cola nuts have steadily increased in quantity,—that part of the Limba country where they are principally grown being in comparative yeace. The supply of india-rubber has decreased, partly through Hesimiction of the trees, partly through war in the Yonnie country. Gum copal is brought from the northern rivers. The Mendi eountry sends a good deal of rice, which is also grown largely in Sherbro. The total value of all the exports was on an average for 1877-81 £382,620, and for 1882-88 £413,148. The corresponding figures for the imports were £424,447 and £429,273.

The most northerly territory belonging to the colony is the little group of the Los Islands (Islas de los Idolos), about 80 miles north- north-west of Freetown to the south of Sangareah Bay. Tamara or Futabar to the west and Factory Island to the east “enclose, like an atoll, an inner basin, in the centre of which lies the much smaller Crawford Island.” The highest point is a knoll some 450 feet above sea-level in Tamara. All these islands are richly clothed with palm trees and flowering underwood. Factory Island is occupied by a French trading settlement. At one time the islands were a great seat of the slave-trade and about 1812-18 were garrisoned by British

troops for the suppression of the traffic. The climate was then found to be exceedingly fatal.

The small island of Matakoug, 25 miles south-east, is also British. On the mainland the watershed between the Great Scarcies and the Mellicoury (Mellacorée) has been adopted as the boundary between the French and English protectorates or annexation-areas. The Great Scarcies river (Rio dos Carceres) appears to take its rise in the highlands of the Futa-Jallon not far from the sources of the Senegal, but its upper course has not been completely explored. It is navigable for boats a long way inland, though the ascent from the sea is interrupted by rapids a short distance above Kambia, an important Mohammedan town. The Little Scarcies has its headwaters to the north-east of Falaba, a town of the Sulima country, built in 1768 and visited by Laing (1822), Winwood Reade (1869), and Zweifel and Moustier (1879). The Rokelle or Mabile river, which falls into the Sierra Leone estuary, is formed by the drainage of the Koranko country. On a creek which reaches the estuary near the Rokelle mouth stands (at the head of navigation) the important township of Port Lokko, a mission station of the Church Missionary Society. The maritime country between the Scarcies and Sierra Leone is called North Bullom (7.¢., low land) ; the tribe of the same name has been expelled from much of its territory by the Susus (whose country is the unexplored tract to the south of 11° N. lat.) and the Timmanehs (Timnis). At the angle of Yawry Bay lies the mouth of the Ribbi or Kates river, and about 10 miles farther south is the common outflow of the Kamaranka and the Bompé. At the south side of the bay the small eluster of Plantain Islands corresponds to the Banana Islands on the north off Cape Shilling, which were ceded to the British in 1819 and are noted for their healthiness. Southward opens the broad estuary of the Sherbro (popularly river), which lies between

the island of Sherbro, annexed in 1862, and the territory of the game name. The estuary receives the Bagru from the Manoh-Bagru country and the Jong river, whose headstream, the Bampanna, rises far inland in the same country as the Rokelle and has a breadth of 200 feet at Mayosso. From the sea the Jong is navigable for steamers to Matonghbah (or Matubah). It is connected

by the Little Bam Creek with the Great Bin river, which passes through the Mendi country and descends into the alluvial seaboard by rapids at Motappan. The Bam loses itself in a curious network of lagoons and creeks separated from the ocean by the long low tract of Turner's peninsula, The upper Kittam joins it from the east, and by another creek communicates with the Palma or Cassi Lake (20 miles long), which in its turn has a connexion with the Gallinas river (7° 8. lat.). On the narrow strip of land between the ocean and the lake lies Lavanna, an important trading port, where a short line of railway has been laid down. Parallel with the Gallinas flows the Moah or Sulimah river (falls at Whidaro), at the mouth of which is the town of Sulimah; and about 10 miles farther east is the Manoh river. The countries inland be- tween the Manoh and the Sulimah are Gbemna or Massaquoi, Soro, M'perri, Barrie, Cowrah, &c.

History.—Sierra Leone (in the original Portuguese form Sierra Leona) was known to its native inhabitants as Romarong or the Mountain, and received the current designation from the Portuguese discoverer Piedro de Cintra (1462) on account of the lion-like roaring of the thunder on its hill-tops. An English fort was built on the Sierra Leone estuary towards the close of the 17th century, but was soon afterwards abandoned. In 1786 Dr Smeathman proposed his scheme for founding on the peninsula a colony of liberated African slaves ; and in 1787 Captain Thompson, having purchased the territory from Naimbana or King Tom of the Timmanehs, commenced the settlement with 400 Negroes and 60 Europeans. Owing mainly to the utter shiftlessness of the settlers and partly toa hostile attack by a body of natives, this first attempt proved a com- plete failure. In 1791 Falconbridge collected the surviving fugitives and laid out a new settlement (Granville's Town); and the pro-

moters of the enterprise—Granville Sharp, William Wilberforce,

William Ludlam, Sir Richard Carr Glynn, &c., hitherto known as the St George's Bay Company—obtained a charter incorporat-

ing them as the Sierra Leone Company (31 Geo. III. c. 55). In

1792 Clarkson introduced into the colony 1200 Negroes from the Bahamas and NovaScotia. Afzelius the botanist and Nordenskjold the mineralogist

were sent out to explore the capabilities of the country ; but the latter soon after died at Port Lokko (Port Logo). In 1794 the settlement, which had been again transferred to Freetown, was plundered by the French. An attempt to found a similar colony on Bulama (mouth of the Rio Grande) was a com- plete failure (Dalrymple and Beaver). In 1800 the company was allowed to make laws not repugnant to those of England, but in 1807 it was glad to transfer all its rights to the crown. Sydney Smith's jest that Sierra Leone had always two governors, one just arrived in the colony and the other just arrived in England, is but a slight exaggeration. There were eight changes between 1808 and 1824, and as many between 1865 and 1881. The names of Zachary Macaulay, Sir Charles Macarthy, Sir Stephen J. Hill, Sir Arthur Kennedy, Sir Samuel Rowe, and A. E. Havelock deserve to be mentioned. In 1825 General Turner concluded a treaty placing Turner's peninsula, &c., under British protection ; but effect was not given to it till 1881, In 1875 the mouths of the Kates, Kamaranka, Bompé, and Cockboro were annexed, and in 1888 the seaboard towards the Liberian frontier. British influence has been peacefully advancing inland under Sir Samuel Rowe. In 1866 Sierra Leone was made the seat of government of the new general government of the British settlements on the West Coast of Africa (comprising Sierra Leone, Gambia, the Gold Coast, and Lagos, each of which was to have a legislative council); but in 1874 the Gold Coast and Lagos were raised to a separate government, and the

Gambia alone remains attached to Sierra Leone.

Besides the older works of Falconbridge (1794), Winterbottom (1803), Walker (1847), Shrewe (1847), Poole (1850), see the various works of Robert Clarke (Sketches of the Colony of Sierra Leone, 1868, &c.) and Dr Africanus B. Horton (West African Countries and Peoples, 1868, &c.); A. Menzies, ''Bxploratory Expedition to the Mende Country, " in Church Miss. Intell., 1864; A. B.C. Sidthorpe, Hist. of Sierra Leone ;), R. Griffith, 'Sierra Leone, Past, Present, and Future," in Proc. Roy. Col. Inst., 1881-82, vol. xiii. ; " Britische Annexionen an der Sierra-Leone-Kiiste," in Petermann's Mitt., 1883. (H. A. W.)

SIEYES, EmmManvst Josrpu (1748-1836), one of the chief political thinkers and writers of the period of the French Revolution and the first

empire, was born at Fréjus (Var) on 3d May 1748. He was destined for the church, was educated by the Jesuits, became a licentiate of the canon law, and, having early distinguished himself by the astuteness and originality of his ideas, was appointed vicar-general by the bishop of Chartres. He shared the political fervour of the party of advance, and was fearlessly logical in working out the new and as yet indistinct princi-

ples of reform. An excellent opportunity was provided for the inculcation of his views by the invitation which Necker addressed to all French writers to publish their opinions upon the mode of convening the states-general. Sieyés startled his countrymen by the issue of various pamphlets upon the political situation, and particularly by his dar- ing and original treatise upon the Third Estate, with its three famous divisions in question and answer : —“ lst, What is the Third Estate !—Everything. What has it hitherto been in the political order !—Nothing. What does it demand?—To become something.” He attacked unsparingly the privileged classes, and indeed in this his most famous work he constructed, single-handed and at once, a programme for the Revolution. The influence of the book and of its author soon became enormous, and in 1789 the Abbé Sieyés was elected by the city of Paris as a representative to the states-general, where he was the first to propose that the three estates should meet together in one assembly. On the rejection of his motion he boldly suggested the formation of an ‘assembly of repre- sentatives of France already verified.” He was not, how- ever, successful as a speaker, his style being obscure and his matter too compressed for oral expression,—faults which disappeared when he committed his thoughts to writing. Yet he was one of the leaders of the assembly, and was appointed a member of the committee on the constitution. His published speech in opposition to the power of absolute veto by the king brought him still further into notice. But he recognized his inaptitude for public speaking, and, although even Mirabeau declared that the silence of Sieyés was a public calamity, he stood aside while his own ideas were being developed amidst violence and riot both within and without the constituent and afterwards the legislative assembly. As excess fol- lowed upon excess in the wild course of the Revolution Sieyés had neither the courage nor the power to quell the riot. In danger of becoming a

suspect, and fearful of his life, he emerged from obscurity in November 1793, on the occasion of the installation of Reason in Notre Dame. Before the national convention he denied his faith, abjur- ing the title of priest, professing that his only worship was that of liberty and equality and his only religion the love of humanity and country, and concluding by formally renouncing to the state the commuted pension which he enjoyed in lieu of his former benefice. The overthrow of the Jacobins at last overcame his fears and in March 1795 he is found publicly lauding the memory of those guillotined Girondists in whose defence he, two years before, had never once lifted his voice.

In the same year (1795) the ex-abbé was commissioned by the Convention to The Hague, where he successfully con- cluded an offensive and defensive alliance between the United Provinces and France. Without Sieyés no framing of a constitution could be attempted, and he was accord- ingly appointed member of a commission to draw up organic laws, the constitution of 1793 having been found unworkable. When the commission brought forward its report Sieyeés did not dissent ; but he proposed to the Con- vention a separate scheme of his own, the specialty of which was the provision for the appointment of a constitutional jury which should be charged with the duty of revising all legislative decrees against which the challenge was brought that they were themselves at variance with the constitu- tion. His scheme was, however, rejected in favour of the new constitution, and from that moment he became its secret enemy. He was elected one of the first directory of five, but he declined the honour. In 1798 he was appointed the plenipotentiary of France to Prussia, where he was received with great honour and where he speedily began to plot against the Government he represented.

He communicated his views to Napoleon, then in Egypt. Meanwhile (1799) he was again elected to the directory, and, his plans being ripe, he accepted office. Then came the coup détat of 18th Brumaire (9th November 1799), in which Sieyés took so important a part, but in which he was unquestionably overborne by the genius and audacity of Bonaparte. The provisional consulate com- posed of Napoleon, Sieyés, and Ducos lasted but a few

weeks, After a little Sieyés is a count of the empire and the proprietor of Crosne (Seine-et-Oise), while Napoleon is able to boast of how he has bribed the ex-abbé out of his constitutional views. Amid the political changes of France, Sieyés on the second return of the Bourbons fled to Brussels; but after the revolution of 1830 he felt it safe to return to Paris, where he died on 20th June 1836. SIGALON, Xavier (1788-1837), French painter, born at Uzes (Gard) towards the close of 1788, was one of the few leaders of the romantic movement who cared for treat- ment of form rather than of colour. The son of a poor rural schoolmaster, he had a terrible struggle before he was able even to reach Paris and obtain admission to Guérin's studio. But the learning offered there did not respond to his special needs, and he tried to train himself by solitary study of the Italian masters in the gallery of the Louvre. The Young Courtesan (Louvre), which he exhibited in 1822, at once attracted attention and was bought for the Luxembourg. The painter, however, re- garded it as but an essay in practice and sought to measure himself with a mightier motive ; this he did in his Locusta (Nimes), 1824, and again in Athaliah's Massacre (Nantes), 1827. Both these works showed incontestable power; but the Vision of St Jerome (Louvre), which appeared at the salon of 1831, together with the Crucifixion (Issengeaux), was by far the most individual of all his achievements, and that year he received the cross of the Legion of Honour. The terrors and force of his pencil were not, however, rendered attractive by any charm of colour ; his paintings remained unpurchased, and Sigalon found him- self forced to get a humble living at times by painting portraits, when Thiers, then minister of the interior, re- called him to Paris and entrusted him with the task of copying the Sistine fresco of the Last Judgment for a hall in the Palace of the Fine Arts. On the-exhibition, in the Baths of Diocletian at Rome, of Sigalon's gigantic task, in which he had been aided by his pupil Numa Boucoiran, the artist was visited in state by Gregory XVI. But Sigalon was not destined long to enjoy his tardy honours and the comparative ease procured by a small Governnient pension ; returning to Rome to copy some pendants in the Sistine, he died there of cholera on 9th August 1837. See Julius Meyer, Gesch. d. franzisischen Kunst; Villot, Cat. Tableaux, Louvre ; C. Blanc, Histoire des Peintres, Ecole Francaise. SIGHTS. A sight for shooting may be defined as an apparatus for determining the point of impact of a pro- jectile, in popular language, for "aiming" or "laying." In its simplest form it is scarcely recognizable as a

sight. When an expert cricketer throws the ball straight to the wicket the eye and the hand assume that relative position which experience has taught to be correct, and the eye may be said to lay the hand on the wicket by means of the in- tervening muscles, which therefore constitute the sight. The next step towards accuracy is seen in the ordinary shot-gun, where the eye is placed over and behind the centre of the breech, and sees that a bead placed above the centre of the muzzle is in a direct line with the desired point of impact. If we add a notch at the centre of the breech to fix the eye more accurately, we shall have the hind-sight, the fore-sight, and the object brought into line, when the gun is correctly laid. This would constitute a perfect direct mechanical sight

if we could assume (1) that the projectile was not subject to gravity; (2) that it had no tendency to deviate if passing through a calm atmosphere ; (3) that the object aimed at was stationary ; (4) that the weapon discharged was stationary ; (5) that the atmosphere was still.

(1) The first condition is never realized : the projectile begins to drop towards the earth the moment it leaves the gun, and therefore to make it strike at a given level its first direction must be above this level. Hence the hind-sight must be raised to make the necessary correction,

and the angle between the axis of the piece and the straight.

line connecting the elevated hind-sight with the fore-sight and object is called the “angle of elevation.” Supposing the projectile to move % vacuo and to drop simply under the action of gravity, the calculation of the amount of eleva- tion to be given for any range at any velocity would be easily made, but the resistance of the air renders the problem an exceedingly complicated and difficult one (see GuNNERY), and only approximate solutions have as yet been discovered. Next, supposing the hind-sight to be correctly elevated, it is evidently necessary to keep it up- right ; deviation to the right will cause the projectile to strike to the right of the object and deviation to the left to strike to the left of it. The amount of error is given by the equation d=r tan @ tan e,

where d=error in direction, y=range, 0=angle made by plane of elevation with the perpendicular, and «= angle of elevation. The rifleman should study to keep the hind-sight as upright as possible, and indeed little error is likely to occur with a good shot from this cause. But the case is very different with a gun mounted on an uneven or mov- ing platform, and many devices have been resorted to for automatically overcoming the difficulty. They all, however, belong to either the spirit-level or the pendulum type.

(2) Secondly, the projectile deviates of its own accord from the vertical plane. If it is unrifled, its imperfections of manufacture cause errors which may be in any direc- tion, and which, therefore, cannot be compensated by any method of sighting. If it is rifled, the spin given to it renders these imperfections of little consequence, but, on the other hand, confers a constant tendency to deviation. If we lay a gun on the face of a clock, and the rifling causes a point on the surface of the shot to turn in the same direction as the hands, the shot will deviate to the right, contrariwise to the left. The cause and extent of this motion have never been thoroughly worked out. It appears to arise from the circumstance that the axis round which the shot rotates points always above the trajectory, since the principle of least resistance causes the direction of the axis to follow tardily the ever-changing curve ; hence the pressure of the air, which of course acts in the direction of the trajectory, is greater on the lower than on the upper surface, and the unequal friction thereby set up causes the shot, as it were, to roll sideways; here also the principle of least resistance turns the axis slightly out of the vertical plane of fire towards the actual direc- tion of the projectile. The path is doubly curved,—first, downwards by gravity, secondly, sideways by the rotation ; the latter curve, seen in plan, is nearly a parabola. In order to correct this tendency of rifled projectiles to shoot round the corner, as it may be said, the hind-sight is in- clined at an angle with the vertical, so that the more it is raised to give elevation the greater becomes the correc- tion, which assumes the form of a curve not very dis-similar to that due to rotation. The amount of error is practically determined on the firing ground, and the proper angle for the sight is given by the formula

tan 6=—__. r sin €

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(3) Every one who shoots birds on the wing is acquainted with the difficulties appertaining to the non-fulfilment of the third condition. The expert game-shot aims ahead of the object more or less, according to his judgment of the relative velocities of the projectile and the target and of the distance of the latter. Practice makes this compara- tively easy at the short ranges of ordinary sport; but in the case of a heavy fort gun firing at a vessel under full steam 3000 yards off, it becomes evident that considerable allowance must be made. Put the mean horizontal velo- city of the shot over a 3000 yards range at 1000 foot- seconds, the time of flight will be 9 seconds ; if the ship is running past at the rate of 20 foot-seconds it will have traversed 180 feet during the shot's flight, and it will be necessary to direct the gun so much ahead of the desired point of impact. The angle of divergence in the case just given is tan~!:02; and, supposing the horizontal velocity of the projectile to be constant throughout its flight, this angle would be correct for a ship running at a speed of 20 foot-seconds whatever the range.

(4) The fourth condition is rarely met with except on board ship, and it is evident that it obeys the same laws and is subject to the same kind of correction as the third. The correcting angle, however, is here given by the ship's speed across the line of fire and the starting velocity of the projectile.

(5) The fifth source of error differs from the others in being variable and uncontrollable. A gust of wind may spoil the best shot; and, though it is possible in practice to allow for deviation due to a steady breeze, yet the force and even the direction of the moving air differ so fre- quently at different parts of the trajectory that it has hitherto been found impossible to devise any satisfactory correction beyond that obtainable from knowledge of the point of impact of a previous shot. The effect of wind on direction may be calculated from the formula

ne thi Ag Wt ame si},

ee: w D=Wi sin Jee ie log 500 w

where D=deflexion in feet, W=velocity of wind in feet per second, ¢= time of flight in seconds, 6 =angle between direction of wind and line of fire, A =area of longitudinal section of shot in square feet, w= weight of shot in pounds, g=force of gravity. This formula assumes that the wind steadily carries the shot sideways without changing the parallelism of its axis, an assumption not greatly in error with heavy projectiles having the centre of gravity nearly coincident with the centre of figure. The effect of wind on range may be arrived at by adding or subtracting the velocity of the air, resolved in the direction of the object, to or from the horizontal velocity of the projectile and calculating by the tables (see GUNNERY) the loss or gain due to the increased or diminished resistance.

The accompanying diagrams (figs. 1, 2) represent what are called ‘‘speed-sights”’ in the royal navy, as applied to a 4-inch breech- loading gun. The gun is shown elevated at 8° for a range of 4600 yards. The hind or ‘‘tangent” sight is sloped sideways at an angle of 1° 30’ to correct the constant tendency of the projectile to deviate tothe right. The sight is raised in the socket till the lowest visible graduation on the bar reads the required range on the face towards the breech and the elevation in degrees on the face towards the muzzle. A crosshead carries a leaf, which is traversed to the right or left by a double-threaded screw; this leaf is provided with a fine wire strung horizontally between two uprights ; hence this form of sight is sometimes known as the H sight. The crosshead is gra- duated with two scales, one on the muzzle-face reading minutes of deflexion for giving any desired correction for wind or uneven plat- form, the other on the breech-face for allowing for the speed of the enemy in knots across the line of fire. The fore-sight is fixed in the gun, and cannot be raised or lowered. It has a crosshead provided with a traversing leaf, which carries a round bead on a thin support. The crosshead is graduated to allow for the speed of the firing vessel across the line of fire. In practice the gunner makes all these adjustments as nearly as he can judge, then takes up his

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position about 4 feet behind the breech of the gun, holding the firing lanyard taut ; when the object and the bead of the fore-sight appear to be on the centre of the wire across the H of the hind- sight he fires. :

The forms of sights preferred by experts for accurate laying are extremely varied, and nothing but practice can determine the most suitable to individual eyesight. Where the eye can be brought close to the hind-sight, one of the best systems is that adopted for British field-guns, where a fine peep-hole constitutes the hind-sight, and the fore- sight consists of diagonal cross-wires ; the first rapid or rough adjustment hf of the gun is made #2 with the aid of a V-— 4 shaped notch on the Wy hind-sight and an acorn point on the fore-sight. Some prefer pointers for the fore-sight, either ©-

shaped, so that the object appears | between the cusps of the ¢)—this is ike the French method j

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—or placed diagon-

ally like cross-wires

with the intersec- . tion removed. Sil- vered vertical lines are preferred by many good shots. If thegun is mount- ge ed in a fixed posi- £¢ tion, say on a siege (x platform, and, if the \ relative positions ‘ of the target and some other object are known, it may be found convenient to lay the gun on the target by directing the sights at the other object. This is principally done in the case of howitzers dropping shells at high elevation intoa work. They fire over a pro- tecting bank and are laid by reversed sights from the muzzle backwards at a steeple, a pole, or other convenient object.

To secure greater accuracy than can be attained by the eye, telescopes are resorted to. It is obviously easy to apply to a match rifle a telescope with sufficient strength to resist the jar of firing, and to provide it with the neces- sayy fittings for elevation, deflexion, &c. ; but with ordnance the shock is much greater, and the telescope has to be removed before firing. This renders it difficult to secure a truly accurate attachment ; but probably the immediate future will witness a sufficiently satisfactory solution of the problem as regards guns on firm platforms. Efforts have been made from time to time to overcome the necessity for extreme accuracy due to the short bearing of the telescope by bringing the fore-sight into play ; this can be done either by great powers of adjustment of focus, so as to view first the fore-sight and then the target, or by adding a half-object lens, and so getting simultaneous images of fore-sight and target.

The application of electricity to the laying and firing of heavy guns has caused a remarkable development of the systems of sighting introduced recently into the forts which protect the shores of the United Kingdom. Suppose a battery of guns to command a channel, and that +t is desired to concentrate their fire on a hostile vessel endeavouring to run past. Each detachment lays its gun poth for elevation and direction in accordance with the

FORE-SIGHT.

Fig. 2. Speed-sights used in the British navy.

figures which appear on a dial in the emplacement. Each dial is worked by electricity from an observing station away from the smoke and noise of the fort; as the hostile vessel approaches the observing officer follows its course ona chart. The observing station is placed at a consider. able height above the water-line, so that a vertical base of calculation is obtained. Hence the angle of depression given by the telescope when pointing at the object indicates the range, and the direction of the telescope indicates the line of fire; these indications are automatically corrected for the positions of the guns. In practice the officer follows the ship's course, signals to the battery the line and distance of a point a little ahead of the vessel, and receives a signal from the battery that the guns are laid and ready. He then fires electrically as the ship is coming into the ex- pected position. (E. M.)

SIGISMUND (1362-1437), German emperor, was born on 14th February 1362. After the death of his father, the emperor Charles IV., he received the margraviate of Brandenburg ; and his betrothal with Mary, the daughter and heiress of Louis of Poland and Hungary, gave hima right to look forward to the succession in these two coun- tries. But in 1383, when Louis died, the Poles chose Hedwig, Mary's sister, as their queen; and Sigismund was unable to marry Mary and to secure the crown of Hungary until 1387, as her rights had been seized by Charles of Durazzo, and after his death she had _ been made prisoner by the ban of Croatia. Sigismund was soon involved in a war with the Turks, and in order to obtain the means of carrying on the struggle he gave Brandenburg in pledge to his cousin Jobst of Moravia,

Defeated at Nicopolis in 1396, Sigismund fled to Greece ; and in his absence his wife died. When he returned to Hungary the people rose against him, made him prisoner, and gave the crown to Ladislaus of Naples. Sigismund escaped, and having sold the Altmark, which he had in- herited from his brother John, he was able to collect an army and to crush the Hungarian rebellion. Meanwhile his brother Wenceslaus, king of the Romans, had been deposed, and Rupert of the Palatinate was chosen as his successor. In 1410 Rupert died, and Sigismund and Jobst of Moravia were both elected to the crown. Jobst died in the following year, and then Sigismund was universally recognized as king. One of the chief events of his reign was the assembling of the council of Constance, which met for the purpose of bringing the great schism in the church to an end. Sigismund marred his services in connexion with the council by assenting to the burning of John Hus, to whom he had granted a safe conduct. For this treachery he had to pay a heavy penalty, for it led indirectly to the Husite War, which raged for about sixteen years. In 1435 peace was restored, and Sigismund obtained possession of Bohemia. In 1415 he gave Brandenburg, which had been restored to him after Jobst's death, in fief to Frederick, burgrave of Nuremberg ; and in 1423, in reward for ser- vices rendered in the Husite War, Frederick, margrave of Meissen, received the duchy of Saxony with the electoral dignity. Sigismund was crowned emperor in 1433, having obtained the Italian crown two years before. He died at Znaim in Moravia on 9th December 1437. He possessed considerable intellectual ability, but he never did full justice to his powers,—being recklessly extravagant and of a wayward and impulsive temper.

See Aschbach, Geschichte Kaiser Sigismuna's (1838-45) ; Schroller, Die Wahl Sigismund's zum rimischen Konig (1875) ; Bezold, Kéng Sigmund und die Reichskriege gegen die Husiten (1872-77); Kerler, Deutsche Reichstagsakten unter Kaiser Sigmund (1878).

STGISMUND, the name of three kings of Poland. See PoLAND, vol. xix. pp. 290-291 and 294.

STGMARINGEN, the seat of government of the Prussiaa administrative division of the same name, is a small town

on the Danube with (1880) 4154 inhabitants. The divi- sion of Sigmaringen is composed of the two formerly sovereign principalities of Hohenzollern-Sigmaringen and Hohenzollern-Hechingen (see HoHENZOLLERN, vol. xii. p. 52) and has an area of 440 square miles, with a popula- tion in 1880 of 67,624. The Sigmaringen part of the Hohenzollern lands was the larger of the two (297 square miles) and lay mainly to the south of Hechingen, though the district of Haigerloch on the Neckar also belonged to it. The name of Hohenzollern is used much more fre- quently than the official Sigmaringen to designate the combined principalities.

SIGNALS, Navat. A system of naval signals com- prises different methods of conveying orders or information to or from a ship in sight and within hearing, but at a distance too great to permit of hailing,—in other words, beyond the reach of the voice, even when aided by the speaking-trumpet. Signals are divided into classes accord- ing to the instruments with which and the circumstances under which they are made. There are sight and sound signals ; flag, semaphore, fixed lantern, flashing, firework, horn or steam-whistle, and gun signals; day, night, fog, and distant signals. Besides these, there are other divi- sions, such as general, vocabulary, evolutionary, &c., which depend upon technical considerations and are matters of arrangement,

The necessity of some plan of rapidly conveying orders or intelligence to a distance was early recognized. Polybius de- scribes two methods, one proposed by Aineas Tacitus more than three centuries before Christ, and one perfected by himself, which, as any word could be spelled by it, antici- pated the underlying principle of recent systems. The signal codes of the ancients are believed to have been elabo- rate. Generally some kind of flag was used. Shields were also displayed in a preconcerted manner, and some have imagined that the reflected rays of the sun were flashed from them as with the modern heliograph (see HELIo- GRAPHY). In the Middle Ages flags, banners, and lanterns were used to distinguish particular squadrons, and as marks of rank, as they are at present, also to call officers to the admiral, and to report sighting the enemy and getting into danger. The invention of cannon made an important addition to the means of signalling. In the instructions issued by Don Martin de Padilla in 1597 the use of guns, lights, and fires is mentioned. The introduction of the square rig permitted a

further addition, that of letting fall a sail a certain number of times. Before the middle of the 17th century only a few stated orders and reports could be made known by signalling. Flags were used by day, and lights, occasionally with guns, at night. The significa- tion then, and for a long time after, depended upon the position in which the light or flag was displayed. Orders, indeed, were as often as possible communicated by hailing or even by means of boats. As the size of ships increased the inconvenience of both plans became intolerable. Some attribute the first attempt at a regular code to Admiral Penn, but the credit of it is usually given to James IL. when duke of York. Notwithstanding the attention paid to the subject by Paul Hoste and others, signals continued Strangely imperfect till late in the 18th century. Towards 1780 Admiral Kempenfelt devised a plan of flag-signalling which was the parent of that now in use. Instead of in- dicating differences of meaning by varying the position of a solitary flag, he combined distinct flags in pairs. About the beginning of the 19th century Sir Home Popham im- proved a method of conveying messages by flags proposed by Mr Hall Gower, and greatly increased a ship's power of communicating with others. The number of night and fog signals that could be shown was still very restricted. In 1867 an innovation of prodigious importance was made

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by the adoption in the British navy of Captain Philip Colomb's flashing system, on which he had been at work since 1858. This is in general use in all fleets, though, oddly enough, on its first trial at sea it was condemned. It is not too much to say that the Colomb system has made it possible to handle, with confidence and safety, in darkness and fog, squadrons composed of the gigantic armour-clads of the day. Its adoption has not only con- tributed very materially to the increased efficiency of the British fleets but also immensely reduced the risk of acci- dents ; and the saving to the tax-payer since its introduc- tion may probably be estimated in hundreds of thousands of pounds.

In the British navy, which is copied by most others, sight- signals are made with flags, the semaphore, ''flashes," fixed lanterns, and occasionally with fireworks, and for " dis- tant" signals with flags, balls, and pendants

displayed on account of shape but not of colour. Sound-signals are made with horns, steam-whistles, and guns, There are two sets of flags,—one of ten numbered from 1 to 10, and another of twenty-one called after letters of the alphabet. There are also pendants and a few special flags. The numbered flags are used with the general signal book, a kind of dictionary in which figures stand opposite sentences conveying orders or announcements. Opposite 123 might stand “hoist in all boats,” which would mean that, when the flag called 1 was hoisted with 2 beneath it and 3 beneath 2, the ship or ships addressed—indicated by a special flag or by pendants—were ordered to hoist all boats in. The lettered flags are used with the vocabulary signal book, in which opposite collections of letters are put single words or small groups of words. Thus, if ABC were opposite the word “admiral” and STO opposite ‘will sail at noon,” when the first three flags were hoisted the signalman on board each ship addressed would note them down with their signification. When all addressed had acknowledged the first “hoist” the flags would be hauled down and STO would be hoisted, to be acknow- ledged and noted in like manner. The admiral would thus have made known his intention of sailing at a given hour. From this it will appear that the general code is used for words of command and the vocabulary for long communications, The night signal book contains a limited number of definite orders and announcements made known by exhibiting lanterns, never more than four, arranged vertically, horizontally, or in a square. For a few signals some kind of firework is displayed. Fog- signals are made by firing different numbers of guns at fixed intervals. Owing to the slowness of flag-signalling, it is now, especially for the vocabulary and at moderate distances, largely superseded by the semaphore, an upright post with two arms moving in a vertical plane. The changed positions of the arms indicate letters and each word is spelled. Before the adoption of Captain Colomb’s system, at night and in fogs only a few announcements could be made by signal, and sending messages was un- known. By a series of symbols formed of dots and short lines, like those of the Morse alphabet, he represents figures, letters, and special words. Thus … means 3, and .__%. The system can be employed in daylight, at night, and in fogs. In daylight long and short waves of a flag on a staff reproduce the flashes; in fogs long and short blasts on a fog-horn or steam-whistle; and at night the alternate exposure and concealment of the light of a lamp. Every order in the general signal book and every word in the vocabulary—by spelling, indeed, every

word in the language—may be communicated by this system. Distant signals, now rarely used, are made by hoisting flags of different shapes at distances at which colours become invisible. The Army and Navy Signal Book contains the

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code for communications between a ship and its boats or military stations on shore ; the Jnternational, with special flags, is for communicating with merchant vessels. In the British navy there is a corps of signalmen rising in grade from boys to chief petty officers. They are selected from the most intelligent and best educated boys in the training- ships, and go through a course of special instruction in their duties. (Gas BY) SIGNORELLI, Luca (c.1442-c.1524), one of the great- est of the Italian painters who ushered in the full culmina- tion of the art under Leonardo da Vinci, Michelangelo, and Raphael, was born in Cortona—his full name being Luca

W@Egidio di Ventura; he has also been called Luca da

Cortona. The precise date of his birth is uncertain ; but, as he is said to have died at the age of eighty-two, and as he was certainly alive during some part of 1524, the birth-date of 1442 must be nearly correct. He belongs to the Tuscan school, associated with that of Umbria. His first impressions of art seem to be due to Perugia,— the style of Bonfigli, Fiorenzo, and Pinturicchio, Lazzaro Vasari, the great-grandfather of Giorgio Vasari, the his- torian of art, was brother to Luca’s mother; he got Luca apprenticed to Piero della Francesca, In 1472 the young man was painting at Arezzo, and in 1474 at Citta di Castello. He presented to Lorenzo de’ Medici a picture which is probably the one named the School of Pan, discovered some years ago in Florence, and now belonging to Marquis Corsi; it is almost the same subject which he painted also on the wall of the Petrucci palace in Siena,— the principal figures being Pan himself, Olympus, Echo, a nan reclining on the ground, and two listening shep- herds (see ScHoors of ParNTING, vol. xxi. p. 434, fig. 8). He executed, moreover, various sacred pictures, showing a study of Botticelli and Lippo Lippi. Pope Sixtus IV. commissioned Signorelli to paint some frescos, now mostly very dim, in the shrine of

Loreto,— Angels, Doctors of the Church, Evangelists, Apostles, the Incredulity of Thomas, and the Conversion of St Paul. He also executed a single fresco in the Sistine Chapel in Rome, the Acts of Moses; another, Moses and Zipporah, which has been usually ascribed to Signorelli, is now recognized as the work of Perugino. Luca may have stayed in Rome from 1478 to 1484. Inthe latter year he returned to his native Cortona, which remained from this time his ordinary home. From 1497 he began some professional excursions. In Siena, in the convent of Chiusuri, he painted eight frescos, forming part of a vast series of the Life of St Benedict ; they are at present much injured. In the palace of Pan-

dolfo Petrucci he worked upon various classic or mytho- |

logical subjects, including the School of Pan already men- tioned. From Siena he went to Orvieto, and here he produced the works which, beyond all others, stamp his greatness in art. ‘These are the frescos in the chapel of S. Brizio, in the cathedral, which already contained some pictures on the vaulting by Fra Angelico. The works of Signorelli represent the Last Days of the Mundane Dis- pensation, with the Pomp and the Fall of Antichrist, and the Eternal Destiny of Man, and occupy three vast lunettes, each of them a single picture. In one of them, Antichrist, after his portents and impious glories, falls headlong from the sky, crashing down into an innumerable crowd of men and women. Paradise, the Elect and the Condemned, Hell, the Resurrection of the Dead, and the Destruction of the Reprobate follow in other compartments. To Angelico’s ceiling Signorelli added a section showing figures blowing trumpets, &c. ; and in another ceiling he depicted the Madonna, Doctors of the Church, Patriarchs, and Martyrs. There is also a great deal of subsidiary work connected with Dante, and with the poets and legends of antiquity. The daring and terrible invention of the great

compositions, with their powerful treatment of the nude and of the most arduous foreshortenings, and the general mastery over complex grouping and distribution, marked a development of art which had never previously been attained. It has been said that Michelangelo felt so strongly the might of Signorelli’s delineations that he borrowed, in his own Last Judgment,

some of the figures or combinations which he found at Orvieto; this state- ment, however, has not been verified by precise instances. The contract for Luca's work is still on record. He under-

-took on 5th April 1499 to complete the ceiling for 200

ducats, and to paint the walls for 600, along with lodging, and in every month two measures of wine and two quarters of corn. Signorelli's first stay in Orvieto lasted not more than two years. In 1502 he returned to Cortona, and painted a dead Christ, with the Marys and other figures. Two years later he was once more back in Orvieto, and completed the whole of his work in or about that time, 4.e., some two years before 1506,—a date famous in the history of the advance of art, when Michelangelo displayed his cartoon of Pisa.

After finishing off at Orvieto, Signorelli was much in Siena. In 1507 he executed a great altarpiece for 8. Medardo at Arcevia in Umbria—the Madonna and Child, with the Massacre of the Innocents and other episodes. In 1508 Pope Julius IL. determined to re-adorn the camere of the Vatican, and he summoned to Rome Signorelli, in company with Perugino, Pinturicchio, and Bazzi (Sodoma). They began operations, but were shortly all superseded to make way for Raphael, and their work was taken down. Luca now returned to Siena, living afterwards for the most part in Cortona. He continued constantly at work, but the performances of his closing years were not of special mark, In 1520 he went with one of his pictures to Arezzo. Here he saw Giorgio Vasari, aged eight, and encouraged his father to second the boy's bent for art. Vasari tells a pretty story how the wellnigh octogenarian master said to him "Impara, parentino" ("You must study, my little kins- man"), and clasped a jasper round his neck asa preservative against nose-bleeding, to which the child was subject. He was partially paralytic when he began a fresco of the Bap- tism of Christ in the chapel of Cardinal Passerini's palace near Cortona, which is the last picture of his that we find specified. Signorelli stood in great repute not only as a painter but also asa citizen. He entered the magistracy of Cortona as early as 1488, and in 1524 held a leading position among the magistrates of his native place. In or about the year 1524 he died there.

Signorelli from an early age paid great attention to anatomy, carrying on his studies in burial grounds. He surpassed all his contemporaries in showing the structure and mechanism of the nude in immediate action; and he even went beyond nature in experi- ments of this kind, trying hypothetical attitudes and combinations. His drawings in the Louvre demonstrate this and bear a close analogy to the method of Michelangelo. He aimed at powerful truth rather than. nobility of form; colour was comparatively neglected, and his chiaroscuro exhibits sharp oppositions of lights and shadows. He had a vast influence over the painters of his own and of succeeding times, but liad no pupils or assistants of high mark; one of them was a nephew named Franceseo. He was a inarried man with a family; one of his sons died, seemingly through some sudden casualty, and Luca depicted the corpse with sorrow- ful but steady self-possession. He is described as full of kindliness and amiability, sineere, courteous, easy with his art assistants, of fine manners, living and dressing well ; indeed, according to Vasari, he always lived more like a nobleman than a painter. The Torri- giani Gallery in Florence contains a grand life-sized portrait by Signorelli of a man inared cap and vest; this is said to be the likeness of the painter himself, and corresponds with Vasari's ob- servation. The pictorial reputation of Signorelli has revived and ripened very much throughout Europe in recent years. The fore- going account of him is principally founded upon that given by Messrs Crowe and Cavalcaselle. In Great Britain there is no better specimen of his work than the Circumcision of Jesus, a panel lately in Hamilton Palace, near Glasgow. (W. M. R.)

SIK—SIL

SIKHS. See Inpza, vol. xii. p. 808, and Punsas, vol. xx. p. 110; also Hinpustvant, vol. xi. p. 844,

SIKKIM, a native state of India, in the eastern Hima- laya Mountains, between 27° 9' and 27° 58' N. lat., and between 88° 4' and 89° E. long., and bounded on the north and north-east by Tibet, on the south-east by Bhutan, on the south by the British district of Darjiling, and on the west by Nepal. It covers an area of 2600 square miles, with an estimated population of 7000. The Tibetan name for Sikkim is Dingjing or Demo-jong, and for the people Deunjong Maro; the Gurkhas call them Lepchas, but Mr

Clements Markham, in his work on Tibet (1879), says that their proper name is Rong. The whole of the state is situated at a considerable elevation within the Himalayan mountain zone. From the level of the sea to an elevation of 12,000 feet, Sikkim is covered with dense forests of tall umbrageous trees. The mountains in the south are gene- rally lower than those of Darjiling district, but north of Tumlung the passes are of great height. Jelap-la, the most southerly of these, rises to 13,000 feet; the two next are the Guiatu-la and Yak-la, leading into the Chumbi valley of Tibet, the latter being 14,000 feet high; further north are the Cho-la (15,000 fect), on the direct road from Tumlung to Chumbi, and the Tankra-la (16,083 feet), the most snowy passin Sikkim. The state is drained by the Tista and its affluents, and by the Am-machu which rises near Parijong, at the foot of the Chamalhari peak (23,929 feet), and flows through the Chumbi valley into the district of Jalpaiguri under the name of the Torsha. Through Sikkim lie the most promising routes for trade with Tibet. At present, however, the Tibetan passes are closed to ordinary British subjects, though an active trade is main- tained in certain articles by Bhuteas and Tibetans.

The ¢apital of Sikkim is Tumlung, where the raja resides during the winter and spring, usually going to his estates at Chumbi in Tibet in summer, in order to avoid the heavy rains. The raja receives a subsidiary allowance of £1200 a year from the British Government, in consideration of his position as former ruler of the hill territory of Darjiling and a submontane tract on the plain ealled the Morung. Communication with the state is kept up through the deputy commissioner of Darjiling. Sikkim produces

rice, Indian corn, millet, oranges, and two or three sorts of Lepcha cloth. Its mineral products are lime and copper.

SILENUS, a personage of Greek mythology, a drunken attendant of Bacchus and closely allied to the satyrs, of whom he appears as the leader. Elderly satyrs were called Sileni. The Sileni belong especially to the legends of Asia Minor, and particularly of Lydia and Phrygia. The stories as to the birth of Silenus were various. Some called him a son of Hermes, others of Pan and a nymph; others said that he sprang from the drops of the blood of Sky. Sometimes he figures as the guardian of Dionysus. In spite of his dissipated habits he possessed a large stock of general information,

which however, like Proteus, he only imparted on compulsion. Midas, king of Phrygia, caught him by mixing wine in the spring out of which Silenus, in a moment of weakness, had condescended to drink. The conversation which followed is fully reported by Theopompus and Aristotle (Ailian, Var. Hist., iii. 18 ; Plutarch, Consol. ad Apoll., 27). Prefacing his remarks with a slight sketch of terrestrial geography and a brief reference to the fauna characteristic of the different con- tinents, Silenus proceeded to ‘draw an edifying picture of the pleasures of true piety as contrasted with the dreadful fate in store for the wicked, winding up with a gloomy reflexion on the vanity of human life and the expression of a wish that he had never been born. Another of his homilies has been preserved by Virgil (Ecl., 6): two shepherds surprise the sage drunk in a cave; they bind him with flowery chains, and he tells them how the world was made, with stories “of remotest eld.” Apart from

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this gift of sermonizing, the Sileni seem to have resembled the satyrs in their love of music, wine, and women. Indeed, the Greeks appear not to have sharply distinguished between them; for Marsyas, the mythical flute-player, is called sometimes a satyr, sometimes a Silenus. In art Silenus appears as a fat, dumpy old man, with a snub nose and a bald head, riding on an ass and supported by satyrs who keep the jolly toper from tumbling off. Or he is depicted standing or lying with his inseparable companion, a wine-skin, which again he sometimes bestrides. Some- times he is sitting with his Pan’s-pipe or flute in his hand.

SILESIA (Germ. Schlesien), a district in the eastern part of Germany, between 49° 28’ and 52° 7’ N. lat. and 13° 50’ and 19° 20’ E. long., was formerly united with the kingdom of Bohemia in the form of a duchy (or rather group of duchies), and is now unequally shared between Prussia and Austria. Geographically it is divided into Lower and Upper Silesia, the whole of the former and part of the latter belonging to Prussia. The total area is 17,540 square miles.

It is generally asserted that the original inhabitants of Silesia were the Germanic tribes of the Lygii and Quadi, who retired before the Slavonic immigrations of the 6th century, but this statement is beyond the range of

posi- tive proof. The earliest form of the name, Sleenzane or Zlesane, shows a Slavonic origin, and further than this we have no means of penetrating. Various explanations have been given of the name, and one old writer gravely connects it with the prophet Elisha; but there is little doubt that it was first applied to the district round Mount Zlenz (the modern Zobten) and the river Zlenza (Lohe), and thence spread gradually over the whole region now known as Silesia. These early Slavonic inhabitants be- longed to the family of Lechs (Poles), and the modern Polish name for the inhabitants is Zlesaki. The history of Silesia consists substantially of the process which has con- verted it from a Slavonic territory into a predominantly German land. |

The earliest notices of Silesia are extremely vague, nor can we exactly define the scope of the name in the first thousand years of our era. It seems to have formed part of the great but short-lived kingdom of Moravia (q.v.) in the 9th century, and afterwards oscillated between the neighbouring kingdoms of Bohemia and Poland, becoming definitely incorporated with the latter at the end of the 10th century. Christianity was introduced about the year 960, and from 1000 on we have an unbroken list of bishops of Breslau. The first contact of Germany with Silesia was disastrous to the former, as it was on the fastnesses of Silesia that Henry V. squandered his strength in his unsuccessful expedition against Poland in 1109. More fortunate was the intervention of Frederick Barbarossa in 1163 in behalf of the three sons of the dispossessed Ladislaus, a member of the Polish royal family of the Piasts. He succeeded in securing as their share of the Polish dominions the whole of Silesia, though it was not till forty or fifty years later that it could be said to have gained actual independence of Poland. These three princes were the ancestors and founders of the various ducal lines that henceforth ruled in Silesia, and their intimate connexion with the German king accounts in great measure for the process of Germanization which Silesia now began to undergo, chiefly through the in- troduction of German colonists in scantily peopled or desolated districts. The eldest of the three sons of Ladislaus received the town of Breslau and by far the largest portion of territory, so that the history of Silesia tor the next two or three generations is practically that of his line Under his grandson Henry the Bearded (1202-1238) the Germanization of Silesia made rapid pro-

gress, and the duchy at that time may be looked upon as a bulwark or mark against the Slavs in the south-east of Germany, just as the duchy of Prussia was in the north- east. Henry extended his sway much beyond the limits of Silesia, and in fact united under his sceptre nearly three quarters of the old Polish dominions. His son Henry II. (1238-1241) had a short reign with a glorious end, falling in 1241 at the battle of Liegnitz, where his determined resistance turned back from Germany the alarming Mongolian invasion. On his death his terri- tories were shared among his sons, and the series of divisions and subdivisions began which resulted in almost every Silesian town of any importance becoming the capital of an independent prince. At the beginning of the 14th century there were no fewer than 17 prin- cipalities of this kind, nearly all held by dukes of the Piast family. It was inevitable that these petty rulers should feel the want of a support against the encroach- ments of Poland, and it was inevitable; too, that the rela- tion opened in consequence with Bohemia should gradually change from mere protection to feudal supremacy. By 1355 the supremacy of Bohemia was formally recognized as extending over the whole of Silesia, though the Silesians retained a considerable measure of independence, including the right to hold general dicts for the settlement of their internal relations. The kings of Bohemia at this time (John, Charles IV.) were members of the German house of Luxemburg, and Silesia under their sway may be looked upon as an entirely German land.

During the Hussite wars of the 15th century Silesia, which adhered zealously to the old faith, suffered greatly from Hussite forays. The Luxemburg dominion broke up in 1458, when Hungary and Bohemia elected rulers of their own nationality. Silesia, however, neglected the opportunity to elect a German king for itself, and sup- ported the Bohemian king George Podiebrad. Breslau, still the most powerful of the principalities, threw in its lot with Matthew Corvinus of Hungary, who fought many of his battles on Silesian soil. By the treaty of Olmiitz in 1479 Matthew acquired all the tributary lands of the Bohemian crown, including Silesia, which remained attached to Hungary down to 1490. In that year Bohemia and Hungary became once more united under the same king. In 1526 Silesia passed with the rest of the Bohemian inheritance to the house

of Hapsburg (see BouemrA). The Reformation at first made rapid progress in Silesia, and the native dukes placed little opposition in its way. The Hapsburg princes, however, acted very differently, and the Silesian Protestants suffered much persecution before, during, and after the Thirty Years' War. It was not indeed till the 18th century that they acquired formal recognition and the restoration of some of their confiscated churches.

The First Silesian War between Austria and Prussia, which broke out in 1740, had its ultimate cause (nomin- ally at least) in a compact of mutual succession entered into in 1537 by the elector of Brandenburg on the one side and the duke of Liegnitzon the other. The emperor, as feudal superior of the duke, had indeed refused to recognize this agreement, but the Great Elector did not fail to put in his claim on the death of the last duke in 1675, and Frederick now thought the opportunity too good to be lost. The progress of the three Silesian wars is recounted in the article AusTRIA (vol. iii, p. 127-129). At the peace of Hubertusburg (1763) Prussia was left in possession of nearly the whole of Silesia, with the frontier as it still exists. Frederick exerted himself to atone for the evils brought upon the district through the ravages of war by introducing colonists and capital, reforming the administration, granting complete religious liberty, and

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the like. That this seed did not fall on ungrateful soil seems proved by the modern prosperity of Silesia and the loyalty with which its inhabitants have clung to the Prussian cause. Silesia formed part of the reduced king- dom of Prussia left by the peace of Tilsit in 1806, and it was the centre of the national rising of 1813, when the king issued his celebrated address "To my People" from Breslau. Stein's emancipating edict of 1807 was wel- comed with profound satisfaction in Silesia, where the conditions of serfdom had been particularly oppressive, and no doubt contributed materially to the enthusiasm with which the Silesians flocked to the standard a few years later.!

PRUSSIAN SILESIA, the largest province of Prussia (see vol. xx. plate I.), with an area of 15,560 square miles, forms the south- eastern limb of the kingdom, and is bounded by Brandenburg, Posen, Russian Poland, Galicia, Austrian Silesia, Moravia, Bohemia, and the kingdom and province of

Saxony. Besides the bulk of the old duchy of Silesia, it comprises the countship of Glatz, a frag- ment of the Neumark, and part of Upper Lusatia, taken from Saxony in 1815. The provinee is divided into three governmental districts, —Liegnitz and Breslau corresponding to lower Silesia, while Oppeln takes in the greater part of upper, southern, or mountainous Silesia.

Physiographically Silesia is roughly divided into a flat and a hilly portion by the so-called Silesian Langenthal, which begins on the south-east near the Malapane, and extends across the pro- vince in a west-by-north direction to the Black Elster, following in part the valley of the Oder. The south-east part of the province, to the east of the Oder and south of the Malapane, consists of a hilly outpost of the Carpathians (the Tarnowitz plateau), with a mean elevation of about 1000 feet. To the west of the Oder the land rises gradually from the Langenthal towards the southern boundary of the province, which is formed by the central part of the Sudetic system, including the Glatz Mountains and the Rie- sengebirge (Schneekoppe, 5266 feet). Among the loftier elevations in advance of this southern barrier the most conspicuous is the Zobten (2215 feet), the historical connexion of which with the name of the province has been mentioned above. To the north and north-east of the Oder the province belongs almost entirely to the great North-German plain, though a hilly ridge, rarely attain- ing a height of 1000 feet, may be traced from east to west, assert- ing itself most definitely in the Katzengebirge. Nearly the whole of Silesia lies within the basin of the Oder, which flows through it from south-east to north-west, dividing the provinee into two approximately equal parts. The Vistula touches the province on the south-east, and receives a few small tributaries from it, while on the west the Spree and Black Elster belong to the system of the Elbe. The Iser rises among the mountains on the south. Among the chief feeders of the Oder are the Malapane (right), the Glatzer Neisse (left), the Katzbach (left), and the Bartsch (right); the Bober and Queiss flow through Silesia but join the Oder beyond the frontier. The only lake of any extent is the Schlawa See, 7 miles long, on the north frontier. There is a considerable difference in the climate of Lower and Upper Silesia, and some of the villages in the Riesengebirge have the lowest mean temperature of any inhabited place in Prussia (below 40° Fahr.).

Of the total area of the province 56 per cent. is occupied by arable land, 10°8 per cent. by pasture and meadow, and nearly 29 per cent. by forests. The soil along the foot of the mountains is generally good, and the district between Ratibor and Liegnitz, where 70 to 80 per cent. of the surface is under the plough, is reckoned one of the most fertile in Germany. The parts of lower Silesia adjoining Brandenburg, and also the district to the east of the Oder, are sandy and comparatively unproductive. The different cereals are all grown with success, wheat and rye sometimes in quantity enough for exportation. Flax is still a frequent crop in the hilly districts, and more sugar-beets are raised in Silesia than in any other Prussian province except Saxony. Tobacco, oil-seeds, chicory, and hops may also be specified, while a little wine, of an inferior quality, is produced near Griinberg. Mulberry trees for the silk-culture have been introduced and thrive fairly. Large estates are the rule in Silesia, where 35 per cent. of the land is in the hands of owners possessing at least 250 acres, while properties of 50,000 to 100,000 acres are common. The districts of Oppeln and Liegnitz are among the most richly wooded parts of Prussia. According to the live-stock census for 1883, Silesia contains 275,122 horses, 1,397,130 cows, 1,309,495 sheep, 518,612 pigs, 175,283 goats, and 128,828 bce-hives. The merino sheep was introduccd by Frederick the Great, and since then the Silesian

1 Compare Griinhagen, Geschichte Schlesiens (Gotha, 1884 sq.). An aeeount of the poetical schools of Silesia is given under the heading GERMANY (vol. x. pp. 5380-1).

breed of sheep has been greatly improved. The woods and moun- tains harbour large quantities of game, such as red deer, roedcer, wild boars, and hares, while an occasional wolf finds its way into the province from the Carpathians. The fishery includes salmon in the Oder, trout in the mountain-streams, and carp in the small lakes or ponds with which the province is sprinkled. Compare the tables in Prussta (vol. xx. p. 14).

The great wealth of Silesia, however, lies underground, in the shape of large stores of coal and other minerals, and its mining records go back to the 12th century. The coal-measures of Upper Silesia, in the south-east part of the province, are among the most extensive in continental Europe, and there is

another large field near Waldenburg. The annual output, ranging between twelve and fifteen millions of tons, valued at nearly £3,000,000 sterling, is equal to more than a quarter of the entire yield of Germany. The district of Oppeln also contains a great quantity of iron (annual produce 750,000 to 800,000 tons, value about £1,000,000). The deposits of zinc in the vicinity of Beuthen are perhaps the richest in the world, and produce four-fifths of the zine of Germany (550,000 tons). The remaining mineral products include lead (from which a considerable quantity of silver is extracted), copper, cobalt, arsenic, the rare metal cadmium, alum, brown coal, marble, and a few of the commoner precious stones (jaspers, agates, ame- thysts, &c.). The provinco contains practically no salt or brine springs, but there are well-known mineral springs at Warmbrunn, Salzbrunn, and several other places.

A busy manufacturing activity has long been united with the underground industries of Silesia, and the province in this respect yields tho palm to no other part of Prussia except districts in the Rhineland and Westphalia. On the plateau of Tarnowitz the working and smelting of metals is naturally the predominant industry, and in tho neighbourhood of Beuthen, Kénigshiitte, and Gleiwitz there seems an almost endless succession of iron-works, zinc-foundries, machine-shops, and the like. In 1881 the total value of tho metals produced in the various foundries of the pro- vince was £2,376,250. At the foot of the Riesengebirge, and along the southern mountain line gencrally, the textile industries pre- vail. Weaving has been practised in Silesia, on a large scale, since the 14th century ; and Silesian linen still maintains its reputation, though the conditions of production have greatly changed. Cotton and woollen goods of all kinds are also made in large quantities, and among the other industrial products are beetroot sugar (157,000 tons in 1883-84), spirits, chemicals, tobacco, starch, paper, pottery, and “ Bohemian glass.” Lace, somewhat resembling that of Brussels, is made by the women of the mountainous districts. The trade of Silesia is scarcely so extensive as might be expected from its important industrial activity. On the east it is hampered by the stringent regulations of the Russian frontier, and the great waterway of the Oder is sometimes too low in summer for navigation. The extension of the railway system has, however, had its usual effect in fostering commerce, and the mineral and manufac- tured products of the province are freely exported.

At tho census of 1880 the population of Silesia was 4,007,925, of whom 2,082,084 were Roman Catholics, 1,867,489 Protestants, and 52,682 Jews. About 35 per cent. of the population is urban and 65 per cent. rural. The density is 257 per square mile, less than that of Westphalia (262) and the Rhineland (390); but the average is of course very greatly exceeded in the industrial districts, such as Beuthen. The occupation census of 1883 shows that 44 per cent. of the population are supported by agriculture, 36 Ret cent. by industrics, 8°4 per cent. by trade, and 2°2 per cent. by daily labour and domestic service, while 4 per cent. belong to the official and 5 per cent. to the uncmployed classes. Nearly three-fourths of the inhabitants and territory are German, but to the east of the Oder the Poles (nearly 1,000,000) form the bulk of the population, while there are about 50,000 Czechs in the south part of the province and 30,000 Wends near Liegnitz. The Roman Catholics, most of whom are under the ecclesiastical sway of the prince-bishop of Breslan, are predominant in Upper Silesia and Glatz; the Protestants prevail in Lower Silesia, to the west of the Oder, and in Lusatia. The noblesse is very numerous in Silesia, chiefly in consequence of the Polish districts it includes. The educational institutions of the province are headed by the univer- sity of Breslau. In 1883-84 the percentage of illiterate recruits, in spite of the large Polish-speaking contingent, was only 1°70. The capital and seat of the provincial diet is Breslau, which Is also by far the largest and most important town (298,893 inhabitants in 1885). The towns next in point of size are Gorlitz (55,120 inhabitants), Liegnitz (48,851), Kéonigshiitte (31,831), Beuthen (26,478), Schweidnitz (23,775), Neisse (21,444), and Glogau (20,008). The province sends thirty-five members to the Teichstag and sixty-five to the Prussian chamber of deputies. The government divisions of Breslau and Oppeln together form the district of the 6th army corps (seat, Breslau), while Liegnitz belongs to that of the 5th army corps, the headquarters of which are at Posen. Glogau, Glatz, Neisse, and Cosel are fortresses.

AUSTRIAN SILESIA, the part of the duchy that remained to

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Austria after the Seven Years’ War, is a mere fraction of the whole, its area being only 1980 square miles, or about one-eighth of that of Prussian

Silesia. It falls into two small portions of territory, scparated by a projecting limb of Moravia and_sur- rounded by Prussian Silesia, Moravia, Hungary, and Galicia. Until 1849 it was for administrative purposes reckoned a part of Moravia, but since that year it has been a crownland of the Austrian empire (the smallest of all), with the style of duchy. The Troppau or western division of the crownland is flanked by the Sudetic Mountains (Altvater, 4678 feet), and the Teschen or eastern half by the Carpathians (Lissahorn, 4330 feet), and a great proportion of the surface is occupied by offshoots of these ranges, The Vistula rises on the Carpathians, within Austrian Silesia, while the western part of the crownland is close to the headwaters of the Oder, which rises near at hand in Moravia. Owing to its mountainous character and its slope towards the north and north- east the crownland has a somewhat severe climate for its latitude, the mean temperature being only 50° Fahr., while the annual rainfall varies from 20 to 30 inches. Upwards of 45 per cent. of the surface is occupied by arable land, 74 per cent. by meadows and gardens, 104 per cent. by pastures, and 32 per cent. by forests, while 44 per cent. is unproductive ground. The soil cannot as a rule be termed rich, though some of the valleys are fertile. The chief crops are oats, rye, barley, potatoes, clover, and flax. Dairy- farming is carried on in the mountains after the Alpine fashion, and sheep are fairly numerous. Geese and pigeons are reared in great quantities, and the hunting and fishing are both very prolific. The principal mineral resources are coal (Silesia producing 13 per cent. of the produce of Austria-Hungary), iron, marble, and slate. Like its Prussian neighbour, the crownland boasts a very busy industrial activity, the chief products of which are its iron and steel goods, textile fabrics (linen, woollen, cotton, velvet, silk), chemicals, liqueurs, and beetroot sugar. The trade is chiefly a transit one, though the manufactures and agricultural produce of the province are exported in considerable quantity. Troppau, the capital of the duchy, contains large cloth manufactories, while Teschen, Bielitz, and Jagerndorf are also busy places. The population in 1885 was 577,593, of whom 81,000 were Protestants and 9000 Jews. About 48 per cent. of the population is supported by agriculture and 27°5 per cent. by industry. Divided according to nationalities, there are 275,000 Germans, 130,000 Czechs, and 158,000 Poles. The German element is predominant in the towns, the Polish in the eastern or Teschen division. The duchy sends ten members to the Austrian house of representatives and has a provincial diet of thirty-one members, (J. F. M.)

SILICA, the only known oxide of silicon (see Cuemistry, vol. v. pp. 521-524), occurs native in a great variety of forms, which, however, correspond to only the four distinct species of QuARTZ (q.v.; see also MINER-ALOGY, vol. xvi. p. 389), tridymite, OPAL (q.v., and compare vol. xvi. p. 390), and siliceous earth. Ordinary quartz rock and sand are more impure forms of quartz. Tridymite differs from quartz only by a lower specific gravity, and in crystallometric details ; the crystals are as a rule arranged in triplets—hence the name (see vol. xvi. p. 389). Silt ceous earth when dry forms a very voluminous, soft, fine powder ; it consists of the shells of Infusoria. As a chemical species it differs little from opal. Siliceous earth, having a very low rate of thermal conductivity, serves well as a stuffing for the hollow walls of ice-chests, fire-proof safes, &c. It is used besides for the making of Dynamite (9.v.). Silica of any kind is absolutely non- volatile, and is fusible only at the temperature of the oxy- hydrogen flame; a slight admixture of base (potash, lime, &c.), however, suffices to cause it to “frit” at a red heat. It is absolutely proof against the action of water and ordinary mineral acids; hydrofluoric acid acts on it ener- getically, as explained in CuEmistry, vol. v. p. 522.

Alkaline Silicates.—Silica readily dissolves at a red heat in fused alkaline carbonates, with evolution of carbonic acid and formation of alkaline silicates. In this process one molecule SiO, of silica is capable of decomposing at most 2R,OCO, (where R=K or Na). The compound Si0,.2R,0, “ orthosilicate” of alkali, frcezes into a compact non-transparent mass, readily soluble in water, with formation of an intensely alkaline solution. It does not unite with any additional alkali, but readily fuses up with more silica. Without going beyond a red heat it is easy to produce thus homogeneous masses of any composition, Na,O.wSiO, from #=4 up to e= (at least) 4.

Compounds approximating to #=4 are known as water glass. Potash water glass, K,0.4Si0,, was discovered in 1825 by Fuchs in

Munich, who noticed all its practically important properties and saw their significance. Water glass when in compact pieces looks like ordinary glass, and is not at all obviously attacked by cold water. But when the powdered

substance is boiled with water it dissolves, and the solution can be boiled down to the consistence of a syrup without anything separating out even in the cold. Such water-glass syrup, when applied as a coating to wood, pasteboard, &c., dries up into a coherent varnish which renders the object non-inflammable, because in the heat of a fire the coat- ing melts into a continuous viscid covering which prohibits access of oxygen to the interior. ‘The early application of water glass to the scenery of the Munich court theatre explains its long immunity from destructive fires. When mixed with powdered chalk, magnesitc, phosphate of lime, aud many other similar mate- rials, it gradually unites with these into hard stone-like masses. Caustic lime and magnesia (MgO) thus unite with it with ex- ceptional promptitude, with elimination of alkali, Water glass, in short, is to the class of mineral substances referred to whiat ordinary glue is to wood and paper, &c., and it is used largely for analogous purposes. Fuchs himself based upon this property of his preparation a new process of wall painting which was sub- sequently developed and brought to great perfection by Kaulbach and others. In this process of ‘‘stereochromy,” as it is called, the more immediate basis for the painting consists of a thin layer of a kind of cement made up of powdered marble, dolomite, quartz, and air-worn quicklime with water glass. On it the colours are laid with plain water, which causes them to stick on, but quite loosely, so that the artist can work at leisure and correct niistakes. The finished painting is fixed by applying to it a spray of water glass solution, which, in the course of a few days makes it per- fectly fast. All that then remains to be done is to wash the painting with alcohol to remove the eliminated alkali and any dust that may have collected. A stereochromic painting (unlike one made by the old fresco process) is practically proof against atmospheric influences, even under a northern climate. In a water-glass solution the alkaliis, so to say, only half combined with the silica ; part of it in fact must be presumed to be present in the free state. At any rate the solution emulsionizes fats, and therefore is a cleansing agent in the same sense as soap-solution is. Water glass and other alkaline silicates are accordingly used as additions to some of the cheaper kinds of soap.

SILISTRIA, or SrttstRa, a fortified town on the south side of the Danube, 75 miles below Rustchuk, and 150 miles from the mouth of the river, is now

at the head of a district in the principality of Bulgaria. In 1881 the population was 10,657.

Silistria is the Durostorum of the Romans, the Durostolos of the Byzantines, the Drstr of the Bulgarians. It was one of the most important towns of the Roman province of Mesia Inferior, successively the headquarters of the legio I. Italica and the legio XI. Claudia. It was defended by the Bulgarian czar Simeon against the Hungarians (893). Captured by Svyatoslaff, the Varingian called to the assistance of the emperor Nicephorus (967), it was subse- quently recovered by the Bulgarians after a three months' heroic defence. Under the Turks, whose rule began in the latter part of the 14th century, Silistria continued to flourish : Hajji Khalfa describes it as the most important of all the Danubian towns. It was the seat of a Greek metropolitan with five bishops under him ; and a settlement of Ragusan merchants kept alive its com- mercial interests. The Russians, who captured Silistria in 1810, destroyed its fortifications before they withdrew; but they were rebuilt by foreign engineers, and in 1828-9 werc strong enough to offer a serious resistance to the Russians, who lost 3000 men. At that date the population, including the garrison, was 24,000, but in 1837 it was only about 4000. In 1854 the town was successfully defended by General Krach against the Russians till the arrival of the Austrians in the peninsula. Russians in 1877, and on the conclusion of peace was evacuated by the Turks.

SILIUS ITALICUS, a Latin epic poet, was born in 25 and died in 101 a.p. His birthplace is unknown. From his cognomen Italicus the conclusion has been drawn that he came from the town of Italica in Spain; but Latin usage would in that case have demanded the form Jtali- censis, and it is highly improbable that Martial would have failed to name him among the literary celebrities of Spain in the latter half of the lst century. The conjecture that Silius was from [talica, the capital of the Italian confedera- tion during the Social War, is open to still stronger objection. Most likely some ancestor of the poet acquired the title "Italicus" from having been a member of one of the corporations of ''Italici" who are often mentioned

It was again invested by the:

in inscriptions from Sicily and elsewhere. In early life Silius was a renowned forensic orator, later a safe and cautious politician, without ability or ambition enough to be legitimately obnoxious to the cruel rulers under whom he lived. But mediocrity was hardly an efficient protection against the murderous whims of Nero, and Silius was generally believed to have secured at ouce his own safety and his promotion to the consulship by putting his oratorical powers to discreditable use in the judicial farces which often ushered in the doom of the emperor's victims. He was consul in the year of Nero's death (69), and is mentioned by Tacitus as having been one of two witnesses who were present at the conferences between Vitellius and Flavius Sabinus, the elder brother of Vespasian, when the legions from the East wore marching rapidly on the capital. The life of Silius after his consulship is well depicted by the younger Pliny:—" He conducted himself wisely and courteously as the friend of the luxurious and cruel Vitellius; he won repute by his proconsulship of Asia, and obliterated by the praiseworthy use he made of his leisure the stain he had incurred through his active exertions in former days. In dignity and content- ment, avoiding power and therefore hostility, he outlived the Flavian dynasty, keeping to a private station after his governorship of Asia." His poem contains only two passages relating to the Flavians; in both Domitian is eulogized as a warrior ; in one he figures as a singer whose lyre is sweeter than that of Orpheus himelf. Silius had evidently little taste for bowing down in the house of Rimmon, and refrained from using the many opportunities which his epic afforded for humouring the vanity of the imperial house. He was a great student and patron of literature and art, and a passionate collector. Two great Romans of the past, Cicero and Virgil, were by him idealized and veritably worshipped; and he was the happy possessor of their estates at Tusculum and Naples. 'The later life of Silius was passed on the Campanian shore, hard by the tomb of Virgil, at which he offered the homage of a devotee. He closely emulated the lives of his two great heroes: the one he followed in composing epic verse, the other in debating philosophic questions with his friends of like tastes. Among these was Epictetus, who judged him to be the most philosophic spirit among the Romans of his time, and Cornutus, the Stoic, rhetorician, and grammarian, who appropriately dedicated to Silius a commentary upon Virgil. Thongh the verse of Silius is not wrapped in Stoic gloom like that of Lucan, yet Stoicism lends in many places a not ungraceful gravity to his poem. Silius

was one of the numerous Romans of the early empire who had the courage of their opinions, and carried into perfect practice the theory of suicide adopted by their school. Stricken by an incurable disease, he starved himself to death, keeping a

cheerful countenance to the end.

Whether Silius committed to writing his philosophic dialogues or not, we cannot say. Chance has preserved to us his epic poem entitled Punica, in seventeen books, and coinprising some fourteen thousand lines, The epics of Silius, Lucan, Statius, and Valerius Flaccus are but a few waifs carried down to us by the wander- ing stream of time from the vast mass of post-Virgilian cpics. Long before Silius bethought himself of his epic all possible historical and mythological themes had been worn to tatters by these poets. In choosing the Second Punic War for his subject, Silius had, we know, many predecessors, as he doubtless had many followers. From the time of Nevius onwards every great military struggle in which the Romans had been engaged had found its poet over and over again. In justice to Silius and Lucan, it should be observed that the mythologic poet had a far easier task than the historic. Ina well-known passage Petronius pointedly describes the difficulties of the historic theme. A poet, he said, who should take upon him the vast subject of the civil wars would break down bencath the burden unless he were “ full of learning,” since he would have not merely to record facts, which the historians did much better, but must possess an unshackled

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genius, to which full course must be given by the use of digressions, by bringing divine beings on to the stage, and by giving generally a mythologic tinge to the subject. The Latin laws of the historic epic were fixed by Ennius, and were still binding when Claudian wrote. They were never seriously infringed, except by Lncan, who substituted for the det ex machina of his predecessors the vast, dim, and imposing Stoic conception of destiny. By protracted applica- tion, and being (to use the significant phrase of Petronius) “ full of learning,” Silius had acquired excellent recipes for every ingredient that went to the making of the conventional historic epic. Though he is not named by Quintilian, he is probably hinted at in the mention of a class of poets who, as the writer says, “write to show

their learning. ”» To scize the moments in the history, however unimportant, which were capable of pic- turesque treatment; to pass over all events, however important, which could not readily be rendered into heroics ; to stuff out the somewhat modern heroes to something like Homeric proportions ; to subject all their movements to the passions and caprices of the Olympians; toransack the poetry of the past for incidents and similes on which a slightly new face might be put ; to foist in by well-worn artifices episodes, however strange to the subject, taken from the mythologic or historic glories of Rome and Greece,—all this Silius knew how to do, as he knew his own fingers and nails. He did it all with the languid grace of the inveterate connoisscur, and with a simplicity forcign to his time, which sprang in part from cultivated taste and horror of the venturesome word, and in part from the subducd tone of a life which had come unscathed through the reigns of Caligula, Nero, and Domitian. The more thread- bare the theme, and the more worn the machinery, the greater the need of gcnius. Two of the most rigid requirements of the ancient epic were abundant similes aud abundant single combats. But all the obvious resemblances between the actions of heroic man and external nature had long been worked out, while for the renovation of the single combat little could be done till the hero of the Homeric type was replaced by the medieval knight. Silius, however, had perfeet poetic appreciation, with scarce a trace of poetic crcativeness. No writcr has ever been more correctly and more uniformly judged by contemporaries and by posterity alike. Only the shameless flatterer, Martial, ventured to call his friend a poet as great as Virgil. But the younger Pliny gently says that he wrote poems with greater diligence than talent, and that, when, according to the fashion of the time, he recited them to his friends, “ he sometimes found out what men really thought of them.” It is indeed strange that the poem lived on. Silius is never mentioned by ancient writers aftcr Pliny except Sidonius, who, under different conditions and at a much lower level, was such another as he. Since the discovery of Silius by Poggio, no modern enthusiast has arisen to sing luis praises, and in the last sixty years he has found no editor, even for his text. LKighteenth-century editors, at a time when modern Silii were numerous in the field of litcrature and more fashionable than they have been since, found in the Punica passages not unworthy of comparisou with the Henriade, and thought that Silius did not disgrace Virgil ; but even such

gentle commendation is not likely to be repeated again. Yet, by the ey of his taste and his Latin in an age when taste was fast

eeoming vicious and Latin corrupt, by his presentation to us of a type of a thousand vanished Latin epics, and by the historic aspects of his subject, Silius merits better treatment from scholars than he has received. The general reader he can hardly interest again. He is indeed of imitation all compact, and usually dilutes what he borrows ; he may add a new beauty, but new strength he never gives. Hardly a dozen lines anywhere are without an echo of Virgil, and there are frequent admixtures of Lucretius, Horace, Ovid, Lucan, Homer, Hesiod, and many other poets still cxtant. If we could reconstitute the library of Silius we should probably find that scarcely an idca or a phrase in his entire work was wholly his own.

The raw material of the Punica was supplicd in the main by the third decade of Livy, though Silius may have consulted other historians of the Hannibalic war. Such facts as are used are generally presented with their actual circumstances unchanged, and in their historic sequence. The spirit of the Punic times is but rarely miusconceived,—as when to sccret voting is attributed the election of men like Flaminius and Varro, and distinguished

omans are depicted as contending in a gladiatorial exhibition. Silius clearly intended the poem to consist of twenty-four books, like the Tliad and the Odyssey, but after the twelfth he hurries in visible weariness to the end and concludes with seventeen. The general plan of the epic follows that of the Iliad and the Aneid. Its theme is conceived as a duel between two mighty nations, with parallel dissensions among the gods. Scipio and Hannibal are the two great heroes who take the place of Achilles and Hector on the one hand and of Aneas and Turnus on the other, while the ininor figures are all painted with Virgilian or Homeric Pigments. In the delineation of character our poet is neither very powerful nor very consistent. His imagination was too weak to realize the actors with distinetness and individuality, His

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Hannibal is evidently at the outset meant for an incarnation of cruelty and treachery, the embodiment of all that the vulgar Roman attached to the name ‘‘ Punic.” But in the course of the poem the greatness of Hannibal is borne in upon the poet, and his feeling of it betrays itself in many touches. Thus he names Scipio ‘‘the great Hannibal of Ausonia’”’; he makes Juno assure the Carthaginian leader that if fortune had only permittcd him to be born a Roman he would have been admitted to a place among the gods; and, when the ungenerous monster of the first book accords in the fifteenth a splendid burial to Marcellus, the poet cries, “You would fancy it was a Sidonian chief who had fallen.” Silius deserves little pity for the failure of his attempt to make Scipio an equipoise to Hannibal and the coun- terpart in personal prowess and prestige of Achilles. He becomes in the process almost as mythical a figure as the medixval Alexander. The best drawn of the minor characters are Fabius Cunctator, an evident copy of Lucan’s Cato, and Paullus, the consul killed at Cann, who fights, hates, and dies like a genuine man.

Clearly it was a mattcr of religion with Silius to repeat and adapt all the striking episodes of Homer and Virgil. Hannibal must have a shield of marvellous workmanship like Achilles and Aineas ; because Aineas descended into Hades and had a vision of the future history of Rome, so must Scipio have his revelation from heaven; Trebia, choked with bodies, must rise in ire like Xanthus, and be put to flight by Vulcan ; for Virgil’s Camilla there must be an Asbyte, heroine of Saguntum; the beautiful speech of Euryalus when Nisus seeks to leave him is too good to be thrown away, —furbished up a little, it will serve as a parting address from Imilce to her husband Hannibal. The descriptions of the numerous battles are made up in the main, according to epic rule, of single combats—wcarisome sometimes in Homer, wearisome oftener in Virgil, painfully wearisome in Silius. The different component parts of the poem are on the whole fairly well knit together, and the transitions are not often needlessly abrupt; yct oecasionally incidents and episodes are introduced with all the irrelevancy of the modern novel. A son of Regulus escapes from Thrasyinene to a hut, merely to find there an old servant of his father, and to afford him the opportunity of telling over again the tale of the first war against the Carthaginians. To give scope for a eulogy of Cicero, an aucestor of his fights at Canne, and strong devices sometimes usher in such stories as the

judginent of Paris and the choice of Hercules. The interposition of the gods is, however, usually managed with dignity and appro- priateness.

As to diction and detail, we miss, in general, power rather than taste. The metre runs on with correct smooth monotony, with something always of the Virgilian sweetness, though attenuated, but nothing of the Virgilian variety and strength. The dead level of literary execution is seldom broken by a rise into the region of genuine pathos and beauty, or by a descent into the ludicrous or the repellent. There are few absurdities, but the restraining forco is trained perception and not a native sense of humour, which, ever present in Homer, not entirely absent in Virgil, and some- times finding grim expression in Lucan, fails Silius entirely. The address of Anna, Dido's sister, to Juno compels a smile. Though deified on her sister's death, and for a good many centuries already an inhabitant of heaven, Anna meets Juno for the first time on the outbreak of the Second Punic War, and deprecates the anger of the queen of heaven for having deserted the Carthaginians and attached herself to the Roman cause. Hannibal's parting address to his child is also comical : he recognizes in the " heavy wailing" of the year-old babe " the seeds of rages like his own." But Silins might have been forgiven for a thousand more weaknesses than he has if in but a few things he had shown strength. The grandest scenes in the history before him fail to lift him up; his treatment, for example, of Hannibal's Alpine passage falls immensely below Lucan's vigorous delineation of Cato's far less stirring march across the African deserts.

But in the very weaknesses of Silius we may discern merit. He at least does not try to conceal defects of substance by contorted rhetorical conceits and feebly forcible exaggerations. In his ideal of what Latin expression should be he comes near to his con- temporary Quintilian, and resolutely holds aloof from the tenor of his age. Perhaps his want of success with the men of his time was not wholly due to his faults. His self-control rarely fails him; it stands the test of the horrors of war, and of Venus working her will on Hannibal at Capua. The reader of Statius and even Propertius will be thankful for the rarity of recondite epithcts, such as " Rhoetean destiny," ''Garamantian standards," "Lagean river," '"'Smyrnean strings." Only a few passages here and there betray the true silver Latin extravagance, as when Hannibal is compared for speed to a tigress reft of her cubs, which

darts forth and in a few hours traverses the Caucasus, and with a ‘‘ winged ” leap flies across the Ganges ; or when the Cartha- ginians after Capna launch their spears but are too enervated to make them whiz; or when the plague-stricken and famine-

wasted men of Syracuse hide their diminished faces far within their helmcts, and carefully shade their pallor lest hope should arise for the enemy. In the avoidance of rhetorical artifice and epigrammatic antithesis Silius stands in marked contrast to Lucan. Yet he can be pointed ; so of Fabius, ‘‘laudum cladumque quieta Mente capax”; and of Scevola, ‘‘Aspera semper amans et par cuicumque periclo”; and of Africa, ‘‘ Altrix bellorum bellatorumque virorum Tellus, nec fidens nudo sine fraudibus ensi.” Looking at Silius merely as a poet he may not deserve high praise ; but, as he is a unique specimen and probably the best of a once numerous

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ILK is a fibrous substance produced by many insects, principally in the form of a cocoon or covering within which the creatures are enclosed and protected during the period of their principal transformations. The webs and nests, dc., formed by spiders are also of silk. But the fibres used for manufacturing purposes are exclusively pro- duced by the mulberry silk-moth of China, Bombyx mori, and a few other moths closely allied to that insect (see vol. iv. p. 596). Among the Chinese the name of the silk- worm is “si,” Corean “soi”; to the ancient Greeks it became known as onp, the nation whence it came was to them Sijpes, and the fibre itself onpixdv, whence the Latin sericum, the French sote, the German Seide, and the Eng- lish sik.

The silk industry originated in China; and according to native records it has existed there from a very remote period. The empress Se-ling-she, wife of a famous emperor, Hwang-te (2640 B.c.), encouraged the cultivation of the mulberry tree, the rearing of the worms, and the reeling of silk. This empress is said to have devoted herself personally to the care of silkworms, and she is by the Chinese credited with the invention of the loom. A voluminous ancient literature testifies not only to the antiquity but also to

the importance of Chinese sericulture, and to the care and attention bestowed on it by royal and noble families. The Chinese guarded the secrets of their valuable art with vigilant jealousy ; and there is no doubt that many centuries passed before the culture spread be- yond the country of its origin. Through Corea a know- ledge of the silkworm and its produce reached Japan, but not before the early part of the 3d century. One of the most ancient books of Japanese history, the Vihongi, states that towards 300 a.p. some Coreans were sent from Japan to China to engage competent people to teach the arts of weaving and preparing silk goods. They brought with them four Chinese girls, who instructed the court and the people in the art of plain and figured weaving; and to the honour of these pioneer silk weavers a temple was erected in the province of Setsu. Great efforts were made to encourage the industry, which from that period grew into one of national importance. At a period probably little later a knowledge of the working of silk travelled west- ward, and the cultivation of the silkworm was established in India. According to a tradition the eggs of the insect and the seed of the mulberry tree were carried to India by a Chinese princess concealed in the lining of her headdress. The fact that sericulture was in India first established in the valley of the Brahmaputra and in the tract lying between that river and the Ganges renders it probable that it was introduced overland from the Chinese empire. From the Ganges valley the silkworm was slowly carried westward and spread in Khotan, Persia, and the states of Central Asia.

Most critics recognize in the obscure word dmeshek, Amos iii. 12, a name of silk corresponding to the Arabic dimaks, late Greek péraga, English damask, and also follow the ancients in understanding meshi, Ezek. xvi. 10, 13, of “silken gauze.” But the first notice of the silkworm in

class, the preservation of his poem among the remains of*Latin literature is a fortunate accident.

The poet’s full name, Ti. Catius Silius Italicus, is preserved in an inscription (C. Z. £., vi. 1984). The poem was discovered in a MS., possibly at Constance, by Poggio, in 1416 or 1417 ; from this now lost MS. all existing MSS., which belong entirely to the 15th century, are derived. A valuable MS. of the 8th or 9th century, found at Cologne by L. Carrion in the latter

part of the 16th century disappeared soon after its discovery. Two editiones principes appeared at Rome in 1471 ; the principal editions since have been those of Heinsius (1600), Draken- borch (1717), and Ernesti (Leipsic, 1791). A useful variorum edition is that of Lemaire (Paris, 1823). The recent lucubrattones on Silius are mostly small pamphlets, enumerated by Engelmann (Bid. Script. Class., 1878). (J. 8S. RB.)

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Western literature occurs in Aristotle, Hvst. Anim., v. 19 (17), 11 (6), where he speaks of “a great worm which has horns and so differs from others. At its first meta- morphosis it produces a caterpillar, then a bombylius, and lastly a chrysalis,—all these changes taking place within six months. From this animal women separate and reel off the cocoons and afterwards spin them. It is said that this was first spun in the island of Cos by Pamphile, daughter of Plates.” Aristotle’s vague know- ledge of the worm may have been derived from informa- tion acquired by the Greeks with Alexander the Great; but long before this time raw silk must have begun to be imported at Cos, where it was woven into a gauzy tissue, the famous Coa vestis, which revealed rather than clothed the form.

Towards the beginning of the Christian era raw silk began to form an important and costly item among the prized products of the East which came to Rome. Allu- sions to silk and its source became common in classical literature ; but, although these references show familiarity with the material, they are singularly vague and inaccurate

as to its source; even Pliny knew nothing more about the

silkworm than could be learned from Aristotle’s description. The silken textures which at first found their way to Rome were necessarily of enormous cost, and their use by men was deemed a piece of effeminate luxury. From an anec- dote of Aurelian, who neither used silk himself nor would allow his wife to possess a single silken garment, we learn that silk was worth its weight in gold.

Notwithstanding its price and the restraints otherwise put on the use of silk the trade grew. Under Justinian a monopoly of the trade and manufacture

was reserved to the emperor, and looms, worked by women, were set up within the imperial palace at Constantinopie. Justinian also endeavoured, through the Christian prince of Abys- sinia, to divert the trade from the Persian route along which silk was then brought into the east of Europe. In this he failed, but two Persian monks who had long resided in China, and there learned the whole art and mystery of silkworm rearing, arrived at Constantinople and imparted their knowledge to the emperor. By him they were induced to return to China and attempt to bring to Europe the material necessary for the cultivation of silk, which they effected by concealing the eggs of the silkworm in a hollow cane. From the precious contents of that bamboo tube, brought to Constantinople about the year 550, were produced all the races and varieties of silkworm which stocked the Western world, and which gave trade, prosperity, and untold wealth to great communities for more than twelve hundred years. The necessity for again going to the East for a supply of silkworm eggs has only arisen in our own day.

Under the care of the Greeks the silkworm took kindly to its Western home and flourished, and the silken textures of Byzantium became famous. At a later period the conquering Saracens obtained a mastery over the trade, and by them it was spread both east and west,— the textures becoming meantime impressed with the

patterns and colours peculiar to that people. They established the trade in the thriving towns of Asia Minor, and they planted it as far west as Sicily, as Sicilian silks of the 12th century with Saracenic patterns still testify. Ordericus Vitalis, who died in the first half of the 12th century, mentions that the bishop of St Evroul, in Normandy, brought with him from Apulia in southern Italy several large pieces of silk, out of the finest of which four copes were made for his cathedral chanters. The cultivation and manufacture spread northwards to Florence, Milan, Genoa, and Venice—all towns which became famous for silken textures in medieval times. In 1480 silk weaving was begun under Louis XI. at Tours, and in 1520 Francis I. brought from Milan silkworm eggs, which were reared in the Rhone valley. About the beginning of the 17th century Olivier de Serres and Laffémas, somewhat against the will of Sully, obtained royal edicts favouring the

growth of mulberry plantations and the cultivation of silk; but it cannot be said that these industries were firmly established till Colbert encouraged the planting of the mulberry by premiums, and otherwise stimulated local efforts.

Into England silk manufacture was introduced during the reign of Henry VI.; but the first serious impulse to manufactures of that class was due to the immigration in 1585 of a large body of skilled Flemish weavers who fled from the Low Codntries in consequence of the struggle with Spain then devastating their land. Precisely one hundred years later religious troubles again gave the second and most effective impetus to the silk-trade of England, when the revocation of the edict of Nantes sent simultaneously to Switzerland, Germany, and England a vast body of the most skilled artisans of France, who planted in these countries silk-weaving colonies which are to this day the principal rivals of the French manufac- turers. The bulk of the French Protestant weavers settled at Spitalfields, London,—an incorporation of silk throwsters having been there formed in 1629. James I. used many efforts to encourage the planting of the mulberry and the rearing of silkworms both at home and in the colonies. In 1825 a public company was formed and incorporated under the name of the British, Irish, and Colonial Silk Company, with a capital of £1,000,000, principally with the view of introducing sericulture into Ireland, but it was a complete failure, and the rearing of the silkworm cannot be said ever to have become a branch of British industry.

In 1522 Cortes appointed officials to introduce sericul- ture into New Spain (Mexico), and mulberry trees were then planted and eggs were brought from Spain. The Mexican adventure is mentioned by Acosta, but all trace of the culture had died out before the end of the century. In 1609 James I. attempted to reinstate the silkworm on the American continent, but his first effort failed through shipwreck. An effort made in 1619 obtained greater success, and, the materials being present, the Virginian settlers were strongly urged to devote attention to the profitable industry of silk cultivation. Sericulture was enjoined under penalties by statute ; it was encouraged by bounties and rewards ; and its prosecution was stimulated by learned essays and rhapsodical rhymes, of which this is a sample :—

Where Wormes and Food doe naturally abound

A gallant Silken Trade must there be found.

Virginia excels the World in both—

Envie nor malice can gaine say this troth ! In the prospectus of Law's great Compagnie des Indes Occidentales the cultivation of silk occupies a place among the glowing attractions which allured so many to disaster. Onward till the period of the War of Independence

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bounties and other rewards for the rearing of worms and silk filature continued to be offered; and just when the war broke out Benjamin Franklin and others were engaged in nursing a filature into healthy life at Philadelphia. With the resumption of peaceful enterprise, the stimulus of bounties was again applied—first by Connecticut in 1783 ; and such efforts have been continued sporadically down almost to the present day. Bounties were last offered by the State of California in 1865-66, but the State law was soon repealed, and an attempt to obtain State encourage- ment again in 1872 was defeated. About 1838 a specu- lative mania for the cultivation of silk developed itself with remarkable severity in the United States. It was caused principally through the representations of Samuel Whitmarsh as to the capabilities of the South Sea Islands mulberry (Morus multicaulis) for feeding silkworms; and so intense was the excitement that plants and crops of all kinds were displaced to make room for plantations of multicaulis. In Pennsylvania as much as $300,000 changed hands for plants in one week, and frequently the young trees were sold two and three times over within a few days at ever-advancing prices. Plants of a single year's growth reached the ridiculous price of $1 each at the height of the fever, which, however, did not last long, for in 1839 the speculation collapsed; the famous Morus multicaulis was found to be uo golden tree, and the costly plantations were uprooted.

The most singular feature in connexion with the history of silk is the persistent efforts which have been made by monarchs and other potentates to stimulate sericulture within their dominions, efforts which continue to

this day in British colonies, India, and America. These endeavours to stimulate by artificial means have in scarcely any instance resulted in permanent success. In truth raw silk can only be profitably brought to the market where there is abundant and very cheap labour,—the fact that China, Japan, Bengal, Piedmont, and the Levant are the principal producing localities making that plain.

The Silkworm.

The mulberry-feeding moth, Bombyx mori, which is the principal source of silk, belongs to the Bombycidzx, a family of Lepidoptera in which are embraced some of the ‘ largest and most hand- some moths (see vol. iv. p 596). B. mori is itself an inconspicuous moth (figs. 1 and 2) of an ashy white colour, with a body in the case of the male not half an inch in length, the female being a little longer and stouter. Its wings are short and weak ; the fore pair are falcate, and the hind pair do not reach to the end of the body. The larva (fig. 3) is hair-{- a less, of an ashy grey or by Gee cream colour, attains ‘\ to a length of from 3 XK to 34 inches, and is slender in comparison §{-~; with many of its allies. The second thoracic ring is humped, and there is a spine-like horn or protuberance at the tail The common silkworm produces as a rule only one generation

during the year; but there are races in cultivation which XXII. — 8

Hin Fig. 1.—Bombyx mori (male).

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Fie. 2.—Bombyx mori (female).

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are bivoltine, or two-generationed, and some are multi- voltine. Its natural food is the leaves of mulberry trees. The silk glands or vessels consist of two long thick-walled

sacs running along the sides of the body, AY which open by a common orifice—the iM spinneret or seripositor—on the under lip f (Lay

of the larva. Fig. 4 represents the head (a) al SY

and feet (2,) of the common silkworm, | 3 while ¢ is a dia- grammatic view of the silk glands. As the larva ap- proaches maturity __ these vessels be- come gorged with

a clear viscous fluid, which, upon being exposed to the air immediately hardens to a solid mass. Advantage is taken

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Fig. 3.—Larva of Bombyx mori.

of this peculiarity to prepare from fully-developed larvee silkworm gut used for casting lines in rod-fishing, and for numerous other purposes where lightness, tenacity, flexibility, and strength are essential. The larve are killed and hardened by steeping some hours in strong acetic acid; the silk glands are then separated from the bodies, and the viscous fluid drawn out to the condition of a fine uniform line, which is stretched between pins at the extremity of a board. The board is then exposed to the sunlight till the lines dry and harden into the condition of gut. The preparation of gut is, however, merely an unimportant collateral manufacture. When the larva is fully mature, and ready to change into the pupa condition, it proceeds to spin its cocoon, in which operation it ejects from both glands simultaneously a line or thread about 4000 yards in length, moving its head round in regular order continuously for three days or thereby. The thread so ejected a forms the silk of com- merce, which as wound in the cocoon consists of two filaments —one from each gland—laid side by side and agglutinated into one fibre (Fr. bave) by their own adhesive constituents. Under the microscope, _ therefore, cocoon silk presents the appearance (fig. 5) of a somewhat flattened com- bination of two filaments placed side by side, being on an average from ‘033 to ‘036 mm. broad by ~~020 to 025 mm. in thickness. The cocoons are white or yellow in colour, oviform in shape, with often a constriction in the middle (fig. 6). According to race, &c., they vary con~~

Fie. 5.—Microscopic appearance of Silk of Bombyx mori.

siderably in size and weight, but onan average they measure _

from an inch to an inch and a half in length, and from half an inch to an inch in diameter. They form hard, firm, and compact shells with some straggling flossy filaments on the exterior, and the interior layers are so closely and densely agglutinated as to constitute a | parchment-like mass which resists all attempts at unwinding. The whole cocoon | with its enclosed pupa weighs from 15 [grains for the smaller races to about 50 | grains for the breeds which spin large cocoons. From two to three weeks after the completion of the cocoon the enclosed insect is ready to escape; it moistens one end of its self-made prison, thereby enabling itself to push aside the fibres and make an opening by which the perfect moth comes forth. The sexes almost

Fie. 6.—Cocoon of Bombyx mori,

-immediately couple; the female in from four to six days lays

her eggs, numbering 500 and upwards ; and, with that the life cycle of the moth being complete, both sexes soon die.

Sericulture.

The art of sericulture concerns itself with the rearing of silkworme under artificial or domesticated conditions, their feeding, the formation of cocoons, the securing of these before they are injured and pierced by the moths, and the maturing of a sufficient number of moths to supply eggs for the cultivation of the following year. The first essential is a stock of mulberry trees adequate to feed the worms in their larval stage. The leaves preferred in Europe are those of the white-fruited mulberry, Morus alba, but there are numerous other species which appear to be equally suitable. The soil in which the mulberry grows, and the age and condition of the trees, are important factors in the success of silkworm cultivation ; and it has been too often proved that the mulberry will grow in situations where, from the

nature of the leaf the trees put forth and from other circumstances, silkworms cannot be profitably reared. An elevated position with dry friable well-drained soil produces the best quality of leaves. Throughout the East the species of mulberry cultivated are numerous, but, as these trees have been grown for special purposes at least for three thousand years, they show the complex variations peculiar to most cultivated plants.

The eggs of the silkworm, called gramme, are hatched out by artificial heat at the period when the mulberry leaves are ready for the feeding of the larva. These eggs are very minute—about one hundred weighing a grain; and a vast number of hatched worms may at first be kept in a small space ; but the rapid growth and voracious appetite of the caterpillars demand quickly increasing and ample space. Pieces of paper punctured with small holes are placed over the trays in which the hatching goes on ; and the worms, immediately they burst their shell, creep through these openings to the light, and thereby scrape off any fragments of shell which, adhering to their skin, would kill them by constriction. The rearing-house in which the worms are fed (Fr. magnaneric) must be a spacious, well- lighted, and well-ventilated apartment, in which scrupulous cleanliness and sweetness of air are essential, and in which the temperature may to a certain extent be under control. The worms are more hardy than is commonly supposed, and endure variations of temperature from 62° to 78 F. without any injury; but higher temperature is very detrimental. The lower the temperature at which the worms are maintained the slower is their growth and development ; but their health and vigour are increased, and the cocoon they spin is proportionately bigger. The

worms increase in size with astonishing rapidity, and no less remarkable is their growing voracity. Certain races moult or cast their skin three times during their larval existence, but for the most part the silkworm moults four times—about the sixth, tenth, fifteenth, and twenty-third days after hatching. As these moulting periods approach, the worms lose their appetite and cease eating, and at each period of change they are left undisturbed and free from noise. The worms from 1 oz. of graine—numbering, say, 40,000 —consume in their first stage about 6 tb of picked leaf, in the second 18 fb,

in the third 60 ib, fourth 180 bh, and in their final stage 1098 tb,— in all 1362 tb of mul- berry leaf ; but from that is to be deducted about 590 tb of unconsumed fragments removed in the litter, giving of leaf really consumed 772 tb. An ounce of graine so treated may yield from 80 to 120 ib of cocoons, 85 per cent. of which consists of the weight of chrysalides and 15 per cent. of pure cocoon. The growth of the worms during their larval stage is thus stated by Count Dandolo :—

Weight per 100, Size in Lines. Worms newly hatched…..... 1 gr. 1 RPCITIAG TOUT o.oo. ses cee penseo ns Tos, 4 Eg fncvveesyess speeds 94; 6 SORE gsc has eahess 3s nb0% 400 ,, 12 a 1628 ,, 20 Greatest weight and size…..... 9500 ,, 40

When the caterpillars are mature and ready to undergo their transformation into the pupa condition, they cease eating for some time and then begin to ascend the brush- wood branches or echelletes provided for them, in which they set about the spinning of their cocoons. Crowding of positions must now be guarded against, to prevent the spinning of double cocoons (dowbions) by two worms spin- ning together and so interlacing their threads that they cannot be reeled. The insects complete their cocoons in from three to four days, and in two or three days there- after the cocoons are collected, and the pupa killed to prevent its further progress and the bursting of the shell by the fully developed moth. Such cocoons as are selected for the production of graine, on the other hand, are col- lected, freed from the external floss, and preserved at a temperature of from 66° to 72° Fahr., and after a lapse of from eleven to fifteen days the moths begin to make their appearance. The coupling which immediately takes place demands careful attention ; the males are afterwards thrown away, and the impregnated females placed in a darkened apartment till they deposit their eggs.

Diseases.—That the silkworm is subject to many and serious diseases is only to be expected of a creature which for upwards of 4000 years has been propagated under purely artificial condi- tions, and these most frequently of a very insanitary nature, and where, not the healthy life of the insect, but the amount of silk it could be made to yield was the object of the cultivator. Among the most fatal and disastrous of these diseases with which the culti- vator had long to grapple was “ muscardine,” a malady due to the

development ofa fungus, Botrytis bassiana, in the body of the cater- pillar. The disease is peculiarly contagious and infectious, owing to the development of the fungus through the skin, whence spores are freed, which, coming in contact with healthy caterpillars, fasten on them and germinate inwards, giving off corpuscles within the body of the insect. Muscardinc, however, has not been epidemic for inany years. But about the year 1853 anxious attention began to be given in France to the ravages of a disease among silkwornis, which from its alarming progress threatened to issue in national disaster. This disease, which at a later period became known as ‘ pebrine,” —a name given to it by M. de Quatrefages, one of its many-in- vestigators,—had first been noticed in France at Cavaillon in the valley of the Durance near Avignon. Pebrine manifests itself by dark spots in the skin of the larvex ; the eggs do not hatch out, or hatch imperfectly; the worms are weak, stunted, and unequal in growth, languid in movement, fastidious in feeding ; many perish before coming to maturity ; if they spin a cocoon it is soft and loose, and moths when developed are fecble and inactive. When sufficient vitality remains to produce a second generation it shows

) with its devastating action.

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in increased intensity the feebleness of the preceding. The disease is thus hereditary, but in addition it is virulently infectious and contagious. From 1850 onwards French cultivators were com- pelled, in order to keep up their silk supply, to import graine from uninfected districts. The area of infection increased rapidly, and with that the demand for healthy graine correspondingly expanded, while the supply had to be drawn from increasingly remote and contracted regions. Partly supported by imported eggs, the production of silk in France was maintained, and in 1853 reached its maximum of 26,000,000 kilos of cocoons, valued at 117,000,000 frances. From that period, notwithstanding the importation at great cost of foreign graine, reaching in some years to 60,000 kilos, the production of silk fell off with startling rapidity : in 1856 it was not more than 7,500,000 kilos of cocoons ; in 1861 and 1862 it fell as low as 5,800,000 kilos ; and in 1865 it touched its lowest weight of about 4,000,000 kilos. In 1867 De

Quatrefages estimated the loss suffered by France in the 13 years following 1853, from decreased production of silk and price paid to foreign cultivators for graine, to be not less than one milliard of francs. In the case of Italy, where the disease showed itself later but even more disastrously, affecting a much more extended industry, the loss. in 10 years De Quatrefages stated at two milliards. A loss of £120, 000,000 sterling within 13 years, falling on a limited area, and on one class within these two countries, constituted indeed a calamity on a national scale, calling for national effort to contend The malady, moreover, spread east- ward with alarming rapidity, and, although it was found to be less disastrous and fatal in Oriental countries than in Europe, the sources of healthy graine became fewer and fewer, till only Japan was left as an uninfected source of European graine supply.

A scourge which so seriously menaced the very existence of the silkworm in the world necessarily attracted a great amount of attention. The disease was studied by the most eminent men of science ; reports and suggestions innumerable were made, and a whole pharmacopceia of remedies proposed. So early as 1849 M. Guérin Méneville observed in the blood of diseased silkworms cer- tain vibratory corpuscles, but neither did he nor the Italian Signor Filippi, who studied them later, connect them distinctly with the disease. The corpuscles were first accurately described by Signor Cornalia, whence they are spoken of as the corpuscles of Cornalia. The French Academy charged MM. de Quatrefages, Decaisne, and Peligot with the study of the disease, and these learned men issued two elaborate reports—LHtudes sur les Maladics Actuelles des Vers a Soie, 1859, and Nouvelles Recherches sur les Maladies Actuelles des Vers & Soie, 1860; but the suggestions they were able to offer had not the effect of stopping the march of the disease. In 1865 M. Pasteur undertook a Government commission for the investigation of the malady. Attention had been previously directed to the corpuscles of Cornalia, and it had been found, not only that they occurred in the blood, but that they gorged the whole tissues of the insect, and their presence in the eggs themselves could be microscopically demonstrated. Pasteur set himself to elucidate the life-history of these corpuscles, and he soon established (1) that the corpuscles are the special characteristic of the disease, and that these invariably manifest themselves, if not in earlier stages, then in the mature moths; (2) that the corpuscles are

parasites, and not only the sign but the cause of the disease; and (3) that the disease manifests itself by heredity, by contagion with diseased worms, and by the eating of leaves on which corpuscles are spread. In this connexion he established the very important practical con- clusion that worms which contract the disease during their own life-cycle retain sufficient vitality to feed, develop, and spin their cocoon, although the next generation is invariably infected and shows the disease in its most virulent and fatal form. But this fact enabled the cultivator to know with assurance whether the worms on which he bestowed his labour would yicld him a harvest of silk. He had only to examine the bodies of the moths yielding his graine: if they were free from disease then a crop was sure; if they were infected the education would assuredly fail. Pasteur brought out the fact that the malady had existed from remote periods and in many unsuspected localities. He found corpuscles in Japanese cocoons and in many specimens which had been pre- served for lengthened periods in public collections. Thus he came to the conclusion that the malady had been inherent in many suc- cessive generations of the silkworm, and that the epidemic condition was only an exaggeration of a normal state brought about by the method of cultivation and production of graine pursued. The cure proposed by Pasteur was simply to take care that the stock whence graine was obtained should be healthy, and the offspring would then be healthy also. Small educations reared apart from the ordinary magnanerie, for the production of graine alone, were re- commended. At intervals of five days after spinning their cocoons specimens were to be opened and the chrysalides examined micro- scopically for corpuscles. Should none have appeared till towards the period of transformation and escape of the moths, the eggs subsequently hatched out might be depended on to yicld a fair crop of silk; should the moths prove perfectly free from corpuscles

after depositing their eggs the next generation would certainly live well through the larval stage. For special treatment towards the regeneration of an infected race, the most robust worms were to be selected, and the moths issuing from the cocoons were to be coupled in numbered cells, where the female was to be confined till she deposited her eggs. The bodies of both male and female were to be examined for corpuscles, and the eggs of those

found absolutely frec from taint were preserved for similar ‘‘ cellular” treatment in the following year. By this laborious and painstaking method it has been found possible to re-establish a healthy stock of valuable races from previously highly-infected breeds. The rearing of worms in small educations under special supervision has been found to be a most effective means of combating pebrine. In the same way the rearing of worms for graine in the open air, and under as far as possible natural conditions, has proved equally valuable towards the development of a hardy, vigorous, and untainted stock. The open-air education was originally proposed by Dr Chavannes of Lausanne, and largely carried out in the canton of Vaud by M. Roland, who reared his worms on mulberry trees enclosed within ‘‘manchons” or cages of wire gauze and canvas. ‘The insects appeared quickly to revert to natural conditions; the moths brought out in open air were strongly marked, lively, and active, and eggs left on the trees stood the severity of the winter well, and hatched out successfully in the following season. M. Roland’s experience demonstrated that not cold but heat is the agent which saps the constitution of the silkworm and makes it a ready prey to disease. Wild Silks,—The ravages of pebrine and other diseases had the effect of attracting prominent attention to the numerous other insects, allies of the mulberry silkworm, which spin serviceable cocoons. It had been previously pointed out by Captain Hutton, who devoted great attention to the silk question as it affects the East Indies, that at least six species of Bombyx, differing from B. mort, but also mulberry-feeding, are more or less domesticated in India, These: include B. tex- tor, the boro- ~* pooloo of Ben- * gal, a_ large species having one gencration yearly and pro- ducing a soft flossy cocoon ; the Chinese monthly worm, B. sinensis, having several generations, and making a small cocoon; and the Madrasi worm of Bengal (B. cresi), the Dassee or Desi worm of Bengal (B. fortunatus), and B. arracanensis, the Burmese worm,—all of which yield several generations in the year and form reelable cocoons. Besides these there are many other mulberry-feeding Bombycidx in the East, principally belonging to the genera Theophila and Ocinara, the cocoons of which have not attracted cultivators. The moths yielding wild silks which have obtained most attention belong to the extensive and handsome family Saturnidew. The ji most important of the V species at the: present time is the Chinese tussur or tasar worm, Antherwa pernyt (figs. 7, 8), an oak- feeding species, native of

Mongolia, from which is derived the greater part of the so-called tussur silk now imported into

Fie. 7.—Chinese Tussur Moth, Antherea pernyt (male).

Europe. Closely allied to this is the Indian

tussur moth (fig. 9) An- therxa mylitta, found throughout the whole of India feeding on the bher tree, Zizyphus jujuba, and on many other plants. It yields a large compact cocoon (fig. 10) of a silvery grey colour, which Mr Thomas Wardle of Leek, who has devoted a great amount of attention to the wild-silk ques- tion, has succeeded in reeling. Next in promising qualities is the muga or moonga worm of Assam, Antherwa assama, a species to some extent domesticated in its native country. The yama-mai worm of Japan, Antherwa (Samia) yama-mai, an oak-feeder, is a race of considerable importance in Japan, where it was said to be jealously guarded against foreigners. Its eggs were first sent to Europe by M. Duchéne du Bellecourt, French eonsul-general in Japan in 1861; but early in March following they hatched out, when no leaves on which the larvee would feed were to be found. In April a single worm got oak-buds, on which it throve, and ulti-

Fig. 8.—Cocoon of Antherea pernyt.

_very notably towards each extremity.

mately spun a cocoon whence a female moth issued, from which M. Guérin Méneville named and described the species. A further supply of eggs was secretly obtained by a Dutch physician M. Pompe van Meedervoort in 1863, and, as it was now known that the worm was an oak-feeder, and would thrive on the leaves of European oaks, great results were anticipated from the cultivation of the yama-mai. These ex- pectations, however,

for various reasons, have been disap- pointed. The moths hatch out at a period when oak leaves are not ready for their feeding, and the silk is by no means of a quality to compare with that of the common mulberry worm. The mezan- koorie moth of the Assamese, Antherea mezankooria, yields a

valuable cocoon, as does also the Atlas moth, Attacus atlas, which has an omnivorous larva found throughout India, Ceylon, Burmah, China, and Java. The Cynthia moth, Attacus cynthia, is domesticated as a source of silk in certain provinces of China, where .. — it feeds on the Ailanthus glandulosa. The © erila or arrindi moth of Bengal and Assam, At- tacus ricint, which feeds on the castor-oil plant, yields seven generations yearly, forming loose flossy orange-red and sometinies white cocoons. The ailanthus silkworm of Europe is a hybrid between A. cynthia and A. ricini, first obtained by Guérin Méneville, and now spread through many silk-growing regions. These arc only a few of the moths from which silks of various useful- ness can be produced ; but none of these presents / qualities, saving perhaps cheapness alone, which /# can put them in competition with common silk. ff

Fig. 9.—Antherea mylitia (female).

Physical and Chemical Relations of Silk.

Common cocoons enclosing chrysalides weigh each from 16 to 50 grains, or say from 300 to 600 of small breeds and from 270 to 300 of large breeds to the ib. One- seventh of this weight is pure cocoon, and of that not more than one-half is obtainable as reeled silk, the remainder consisting of surface floss and of hard gummy- husk or "'knub." The total length of double thread or "bave" which the silk-worm winds into its cocoon may amount to 4000 yards; the quantity reelable therefrom rarely exceeds 900 yards, and may range from 330 to 650 yards. It is found that the reelable fibre is as a rule thickest and strongest at the middle portion, tapering down In 1885 Mr T. Wardle of Leek showed by an elaborate series of measure- ments that the transverse section of common silk double thread or bave measures on the average gig to yigq Mm. at the thinnest and from +}, to gf, in. at the thickest part, and in some instances the middle was one-third thicker, stronger, and more elastic than the ends. As a great deal of silk remains on the husk after reeling, it is obvious that the thread last emitted by the silkworms on the inner wall of the cocoons must be of extreme tenuity. The silk of the various species of Antherea and Attacus is also thicker and stronger at the centre of the reeled portion than towards its extremities; but the diameter is much greater

Fie. 10.—Cocoon of Antherea mylitia.

than that of common silk, and the filaments under the microscope (fig. 11) present the appearance of flat bands, the exudation from the two spinnerets being joined at their flat edges. On this account the fibres of tussur silk tend to split up into fine fibrillee under the various preparatory =~ processes in manufactur- ing, and its riband struc- ture is the cause of the glassy lustre peculiar to the woven and finished fibres.

Silk fibre consists = essentially of a centre or Fis. 11.—Mieroscopie appearanee of Silk of

‘ é Chinese Tussur.

core of fibroin, with a covering of sericin or silk albumen, and a little waxy and colouring matter. Fibroin, which is analogous to horn, hair, and like dermal products, constitutes about 66 per cent. of the entire mass, and has a composition represented by the formula C,,H.,N.O,. It has the characteristic appearance of pure silk,—a brilliant soft white body with a pearly lustre,—insoluble in water, alcohol, and ether, but it dis- solves freely in concentrated alkaline solutions, mineral acids, strong acetic acid, and in ammoniacal solution of oxide of copper. Sericin, which constitutes the gummy covering (Fr. gres) of the fibre, is a gelatinous body which dissolves readily in warm soapy solutions, and in hot water, in which on cooling it forms a jelly with even as little as 1 per cent. of the substance. It is precipitated from hot solutions by alcohol, falling as a white powder. Its formula is C,,H,,N,O, According to the researches of P. Bolley, the glands of the silkworm contain semi- liquid fibroin alone, and it is on exposure to the air that the surface is acted on by oxygen, transforming the ex- ternal pellicle into the more soluble form of sericin. Silk is highly hygroscopic, taking up as much as 30 per cent. of water without feeling perceptibly damp. It is a most perfect non-conductor of electricity, and in its dry state the fibres frequently get so electrically excited as to seriously interfere with their working, so that it becomes necessary to moisten them with glycerin or soapy solutions. Silk is readily distinguished from wool and other animal fibres by the action of an alkaline solution of oxide of lead, which darkens

wool, &c., owing to the sulphur they contain, but does not affect silk, which is free from that body. Again, silk dissolves freely in common nitric acid, which is not the case with wool. From vegetable fibres silk is readily distinguished by the bright yellow colour it takes from a solution of picric acid, which does not adhere to vegetable substances. The rod-like appearance of silk and its absence of markings under the microscope are also easily recognizable features of the fibre.

Silk Manufacture.

Here we must distinguish between the reeled silk and the spun or waste silk manufactures. The former embraces a range of operations peculiar to silk, dealing as they do with continuous fibres of great length, whereas in the spun silk industry the raw materials are treated by methods analogous to those followed in the treat- ment of other fibres. It is only floss, injured and un- reelable cocoons, the husks of reeled cocoons, and other waste from reeling, with certain wild silks, which are treated by the spun silk process, and the silk thereby produced loses much of the beauty, strength, and brilliance

are characteristic of the manufactures from reeled SUK,

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Filature or Reeling.—When the cocoons have been gathered the chrysalides they contain are killed either by dry heat or by exposure to steam. All cocoons stained by the premature death of the chrysalides (chiques), pierced cocoons, double cocoons, and any from other causes rendered unreelable, are put aside for the spun- silk manufacture. Then the uninjured cocoons are by themselves sorted into classes having similar shades of colour, size, and quality of fibre. This assortment is of great consequence for the success of the recling opcrations, as uniformity of quality and evenness and regularity of fibre are the most valuable features in raw silk. ‘The object of reeling is to bring together the filaments (bave) from two or more (generally four or five, but sometimes up to twenty) cocoons, and to form them into one con- tinuous, uniform, and regular strand, which constitutes the ‘‘raw silk” of commerce. To do this, the natural gum of the cocoons which holds the filaments together must be softened, the ends of the filaments of the

required number of cocoons must be caught, and means must be taken to unwind and lay these filaments together, so as to form a single uniform rounded strand of raw silk. As the reeling proceeds the reeler has to give the most careful attention to the thickness of the strand being produced, and to introduce new cocoons in place of any from which the rcelable silk has become exhausted. In this way a continuous uniform fibre or strand of raw silk of indefinite length is produced. The apparatus used for these purposes in some localities is of a very primitive kind, and the reeling being uneven and lumpy the silk is of inferior quality and low value. With comparatively simple appliances, on the other hand, a skilled reeler, with trained eye and delicate touch, can produce raw silk of remarkably smooth and even quality. According to the method commonly adopted in North Italy and France the cocoons are for a few minutes immersed in water a little under the boiling point, to which a small quantity of alkali has been added. A girl witha small hand brush of twigs keeps stirring them in the water till the silk softens, and the outer loose fibres (floss) get entangled with the twigs and come off till the end of the main filament (mattre brin) is found. These ends being secured, the cocoons are transferred to a basin or tray containing water heated to from 75° to 85° Fahr., in which they float while the silk is being reeled off. If the water is too cold the gum does not soften enough and the cocoons rise out of the basin in reeling ; if it is too hot the cocoons collapse and fall to the bottom. The ends of the requisite number of filaments being brought together, they are passed through an eyelet or guide, and similarly another equal set are passed through a corresponding guide. The two sets of filaments are then crossed or twisted around each other several turns as if to make one thread, after which they are separated and passed through separate guides to the reel round which they are separately wound. When a large number of cocoons are to be combined into one strand they may be recled from the tray in four sets, which are first crossed in pairs, then combined into two, and those two then crossed and after- wards combined into a single strand. The object of erossing (eroissage) is to round, smooth, and condense the separate filaments of each set into one strand, and as the surface of the filaments are gummy and adhesive it is found on drying that they have agglutin- ated into a compact single fibre of raw silk. In the most approved modern filatures there is a separate cocoon boiler (cwisewse), an oblong tank containing water boiled by steain heat. In these the cocoons are immersed in rectangular perforated boxes for about three minutes, when

they are transferred to the beating machine (battewse), an earthenware trough having a perforated false bottom through which steam keeps the water at a temperature of from 140° to 160°. In this water the cocoons are kept stirring by small brushes rotated by mechanical means, and as the silk softens the brushes gradually rise out of the water, bringing entangled with them the loose floss, and thereby revealing the main filament of each cocoon. The cocoons are next, in sufficient number, trans- ferred to the reeler's tray (bacinella), where the water is heated to about 120°. From the tray the filaments arc carried through a series of porcelain and glass eyelets, so arranged that the strand returns on itself, two portions of the same strand being crossed or intertwisted for rounding and consolidation, instead of the croissage of two separate strands as in the old method. The reel to which the raw silk is led consists of a Hight six-armed frame, enclosed within a wooden casing having a glass frame in front, the enclosure being heated with stcam-pipes. 'To keep the strands from directly overlaying each other and so adhering, the last guide through which the silk passes has a reciprocating motion whereby the fibre is distributed within certain limits over the reel. A sectional view of the reeling apparatus and arrangements—now in common use in Italy—is shown in fig. 12.

Throwing.—Raw silk, being still too fine and delicate for ordin- ary use, next undergoes a series of operations called throwing, the object of which is to twist and double it into more substantial yarn. The first operation of the silk throwster is winding. He receives the raw silk in hanks as it is taken from the reel of the filature, and putting it on a light recl of a similar construction,

"= called the swifts, he winds it on bobbins with a rapid reciprocating

motion, so as to lay the fibre in diagonal lines. These bobbins are then in general taken to the first spinning frame, and there the single strands receive their first twist, which rounds them, and prevents the compound fibre from splitting up and separating when, by the subsequent scouring operations, the gum is removed

Fig. 12.

which presently binds them into one. Next follows the operation of cleaning, in which the silk is simply reeled from one bobbin to another, but on its way it passes through a slit which is sufficiently wide to pass the filament but stops the motion when a thick lump or nib is presented. In the doubling, which is the next process, two or more filaments are wound together side by side on the same reel, preparatory to their being twisted or thrown into one yarn. Bobbins to the number of strands which are to be twisted into one are mounted in a creel on the doubling frame, and the strands are passed over smooth rods of glass or metal through a reciprocating guide to the bobbin on which they are wound. Each separate strand passes through the eye of a faller, which, should the fibre break, falls down and instantly stops the machine, thus effectually calling attention to the fact that a thread has failed. The spin- ning or throwing which follows is done on a frame with upright spindles and flyers, the yarn as it is twisted being drawn forward through guides and wound on revolving bobbins with a reciprocat- ing motion. From these bobbins the silk is reeled into hanks of definite length for the market. Numerous attempts have been made to simplify the silk-throwing by combining two or more operations on one machine, but not as yet with much success.

According to the qualities of raw silk used and the throwing operations undergone the principal classes of thrown silk are—(1) “singles,” which consist of a single strand of twisted raw silk made up of the filaments of eight to ten cocoons; (2) tram or weft thread, consisting of two or three strands of raw silk not twisted before doubling and only lightly spun (this is soft, flossy, and comparatively weak); (3) organzine, the thread used for warps, made from two and rarely three twisted strands spun in the direction contrary to that in which they are separately twisted. Silks for sewing and embroidery belong to a different class from those intended for weaving, and thread-makers throw their raw silks in a manner peculiar to themselves.

Numbering of Silk. —The numbering (titrage) of raw and thrown silks, by which the size or fineness of the yarn is stated, is deter- mined by constant length with variable weight, whereas other yarns are indicated by constant weight with variable length. The original standard length was 9600 Paris ells=11,400 metres, the number being the weight in deniers of 24 grains=1°275 grammes. This still remains the most common standard, and

in practice the number is ascertained by the weight in grains, 4; of a denier of a hank containing 476 metres (properly 4753 metres =400 Paris ells). According to this standard a single cocoon filament weighs 2 to 3°5 deniers, a 8 to 4 cocoon strand ranges from 7 to 10 deniers, and a 16 or 17 cocoon strand is numbered from 48 to 52. Spun silk is numbered on a different principle. In the United Kingdom it is determined by the cotton standard, the number of skeins of 840 yards per tb. In Continental manufacturing centres generally the standard is the number of écheveaux of 500 metres contained in a half kilogramme, or, more simply, the number of kilometres per kilogramme. According to the resolution of the international congress for promoting uniformity in the numbering of yarns, held at Vienna in 1873 and at Brussels in 1874, the grade of silk ought now to be expressed by ten times the number of grammes given by a hank of 1000 metres.

| puts 4 certain amount of strain on the elastic fibre. | from the one reel to the other the silk is carried over an agate

These methods of indicating grades of silk give, however, only the most imperfect idea as to the quality of the thread; and specially they convey no information as to uniformity of diameter and strength. To test the raw material in respect of uniformity a most ingenious American invention, the serigraph, has been introduced, and is now largely used. The serigraph has two reels mounted on one spindle, or at least so arranged that they make precisely the same number of revolutions. The reels are covered with india-rubber, and No. 2 is 8 per cent. greater in cireum- ference than No. 1. The silk to be tested is placed on No. 1 reel and from that wound on No. 2, which, being of greater diameter, ln passing

hook attached to the bob of a pendulum, so that the strain on the yarn is communicated to the pendulum. The strain caused by the 3 per cent. tension of course varies with the strength of the yam to which it is applied, being greater with increased strength and thickness, and falling away just as the strength of the yam decreases, Thus the yarn in passing over the agate hook keeps by its tension the pendulum at one particular position while it is uniform, but when it increases in strength it raises the pendulum higher, and when it becomes weaker the pendulum falls. To the extremity of the

pendulum is attached a pencil or inarker, which traces on a web of ae travelling at a rate in fixed proportion to the winding, the changes in the pendulum, and thus is obtained a graphic record in a most distinct manner of every variation in the strength of the silk. The precise spot where any imperfection occurs is shown on the tracing, which thus not only absolutely certifies the quality of the yarn, but also automatically measures the quantity reeled.

Conditioning. —Silk in the raw and thrown state, as has already been pointed out, absorbs a large amount of moisture, and may contain from 20 to 30 per cent. of water without being manifestly damp. As it is largely sold by weight it becomes necessary to ascertain its condition in respect of absorbed water, and for that purpose official conditioning houses are established in all the con- siderable centres of silk trade. In these the silk is tested or con- ditioned, and a certificate of weight issued in accordance with the results. The silk is for four hours exposed to a dry heat of 280° Fahr., and immediately thereafter weighed. To the weight 11 per cent. is added as the normal proportion of water held by the fibre.

Scouring.—Up to this point the silk fibre continues to be com- paratively lustreless, stiff, and harsh, from the coating of albumin- ous matter (gum or gres) on its surface. Asa preliminary to most subsequent processes the removal of the whole or some portion of this gum is necessary by boiling-off, scouring, or decreusage. To boil off say 300 tb of thrown silk, about 60 Tb of fine white soap is shred, and dissolved in about 200 gallons of pure water. This solution is maintained at a heat of 195°, and in it the hanks of raw silk are immersed, hung on a wooden rod, the hanks being con- tinually turned round so as to expose all portions equally to the solvent influence of the hot solution. After being dried, the hanks are packed in linen bags and boiled for three hours in a weaker soapy solution, then washed out in pure warm water and dried ina centrifugal hydro-extractor. According to the amount of gum to be boiled off the soap solutions are made strong or weak; but care has to be exercised not to overdo the scouring, whereby loss of strength, substance, and lustre would result. For some purposes—making of gauzes, erapes, flour-bolting cloth, and for what is termed ‘‘souples”—the silk is not scoured, and for silks to be dyed certain dark colours half-scouring is practised. The perfect scouring of French silks removes from 25

to 27 per cent. of their weight, and Chinese silks lose from 30 to 31 per cent. Scouring renders all common silks, whether white or yellow in the raw, a brilliant pearly white, with a delicate soft flossy texture, from the fact that the fibres which were agglutinated in reeling, being now degummed, are separated from each other and show their individual tenuity in the yarn. Silks to be finished white are at this point bleached by exposure in a closed chamber to the fumes of sulphurous acid, and at the close of the process the hanks are washed in pure cold water to remove all traces of the acid.

Spun Silk Manufacture.—The materials of the spun silk trade are—(1) the floss or loose outer fibres which surround ordinary cocoons ; (2) the remains of cocoons after the reelable silk has been removed ; (3) waste from throwing processes and from all the stages through which reeled silk passes in manufacturing ; (4) unreclable cocoons, #.¢., those which are pierced, torn, or cut, stained by dead chrysalides, &c., and double cocoons; (5) cocoons of various wild silks, which are either unreelable or most profitably worked by carding. The waste spinners' first duty is to bring these diverse materials into uniform fibrous condition for spinning. In dol with cocoons and cocoon husks, the fibres, which are gumme together into a dense compact mass, must be so washed, softened, and freed from each other that they can be readily teased and torn into a tow-like mass. For this purpose they are washed with a strong hot soap solution in a revolving washing machine, im which they are continuously subjected for three or four hours to

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the action of falling stampers. From this treatment they are taken to the cold-water washing machine, where they are treated with a continuous spray of pure water whilst revolving in the tub under the action of falling stampers, as in the hot-water machine. Next the cocoons are rinsed in a spray of pure water, then the moisture is expelled in a hydro-extractor, and so, thoroughly degummed and softened, they are allowed to dry. For further treatment they are damped with a sprinkling of weak solution of Marseilles soap, then beaten either with the hand or by means of a machine. This machine has a series of leather straps attached to an endless band, which by its rapid revolution causes the straps to hit with a quick whipping stroke

against the surface of a revolving tray on which are placed the washed cocoons. The beating serves to free the fibres fully from cach other, and expels in the form of a tine dust the remains of chrysalides from the interior of the cocoons. It now remains only by the operation of the cocoon opener to tease out and separate the fibres into a kind of lap. The cocoon-opener is a modified carding machine, the drum or cylinder of which is covered with strong eard teeth. On this drum the fibres collect as they are opened and teased out, and when the teeth are full the lap so formed is stripped off by the attendant. The silken fibres are now ready for the operations preparatory to spinning.

To bring raw waste other than cocoons to this point a different series of operations are necessary. The removal of the gum is first usually effected by a process of fermentation or maceration instead of washing with soap, whereby a great saving of soap is secured. Into a large tank a quantity of waste is paeked, and soaked with a weak soapy solution which is maintained by steam at about 170°. The tank is closed over, and in the course of a few days fermenta- tion begins, and according to circumstances is allowed to go on from two to three weeks. From time to time proof samples are withdrawn to observe the progress of the rotting, as over-fermenta- tion would result in the same injury which arises from over-scouring, —weakness of fibre, loss of lustre, and waste of substance. By maceration the silk loses from 20 to 30 per cent. of its weight. From the maceration vat the silk is conveyed to the hot-water washing machine, where with a weak soapy solution it is washed under the influence of stampers for about five minutes. Great care is necessary to prevent the silk from cooling before this washing, as thereby the macerated slime would form an almost insoluble deposit on the silk fibre. From the hot soap solution the silk is taken to the cold-water machine, where, with the aid of stampers, it undergoes a thorough and prolonged washing. After being hung over hurdles to dry it is sprinkled with a weak solution of Marseilles soap, and then dried by means of the hydro-extractor and subsequent exposure in a heated well-ventilated chamber. At this point both cocoon waste, as already described, and floss waste are in the same condition.

The spinner has now to deal with a mass of entangled fibres of all lengths, which he must render even, parallel, and comparatively uniform in length

before it can be spun. The fibres are slightly damped with a weak soapy solution and taken to a filling drum, which consists of a large cylinder having set into it, parallel with its axis, from twelve to twenty rows of strong steel spikes. A feeding apron of cloth covered with card-teeth is provided to the machine, and, as the fibre is carried forward towards the drum, a similar card-teeth-covered band travels close over the surface of the apron, so that the fibre is presented to the drum from between two sets of card-teeth. The rows of spikes catch the fibre as presented to them, draw it through the card-teeth, and carrying it with them lap it around the drum in regular combed-out order. When the spikes are sufficiently filled, the lap is cut at each set of spikes, and so stripped from the drum it forms a definite number of "stricks," of the breadth of the drum itself and the length of the space between the sets of spikes. These stricks are caught in wooden elamps or "books," which are fastened in the bed of the flat dressing frame. Over them an endless band travels, having on it at short intervals belts of heckle-teeth, called combs, which comb out doubled and short fibres, and, acting first on one end of the strick and next on the other, leave the silk in the condition of beautifully parallel and comparatively uniform flakes. The pro-duet of the first combing, called the first draft, is the longest and purest fibre. The material combed out as it fills the comb teeth is caught in books, and when itself combed out forms second drafts, shorter and less valuable than the first ; and again the combings of second drafts, when combed, form third drafts still shorter. In this way five or six separate drafts or combings from the original lap are obtained, all increasiifely short and impure. The final combed waste is treated by a different process for making noil or bourette yarn.

A new form of dressing-frame is now coming into favour, in which the stricks of silk have their ends rolled round wooden rods, and so secured between wooden clamps on the surface of a huge eylinder which revolves so slowly that the attendant can change and fill the clamps as the drum goes round. In its revolution tho exposed portion of the silk is first combed on one side by a rapidly revolving card-toothed cylinder, from which it passes

onwards to meet a second similar cylinder revolving in a contrary direction, which combs the opposite side. In the second revolu- tion of the cylinder the portion of the strick which was previously wound on the rod is similarly combed on both sides, and thus the entire strick is rendered smooth and parallel.

The above is an outline of the ordinary process of preparing silk waste as practised in Switzerland and in the United Kingdom, &c., the range of machines being that of Messrs Greenwood and Batley of Leeds. In the great Manningham silk mills at Brad- ford, Mr 8. C. Lister, the well-known inventor of wool-combing machinery, while nsing machinery of the class described, treats by patented methods peculiar to himself a great proportion of his material. According to his original process, scoured, teased, and opened waste is first drawn into a lap on a screw gill box. These laps, containing all the fibres both Nae and short, are taken to the circular nip combing machine, where the “top” of long fibre is drawn out as a continuous sliver and separated from the “ noil” or short fibre, which according to its length is delivered at separate points. In his most recent mode of working, Mr Lister forms his waste into a broad lap on the large drum of a kind of carding engine, the druin being stripped when its teeth are filled with the prepared fibre. These laps are laid on the feeding table of a machine which has an oscillating or rocking filling head. At cach oscillation the end of the lap in front of the table is “filled” on to a row of heckle-teeth parallel with it, and just as the feeding-table recedes a knife comes down between the heckles and the table with a sudden stroke and separates from the lap such fibres as have been placed or filled on to the heckle-teeth. These heckle-teeth in the meantime, being fixed on an endless band, are continuously moving forward in a horizontal direction parallel with the front of the feeding machine, and a set of three sucli machines place a portion of their laps on to the heckle-teeth in their progress, thus filling the teeth with a fair ‘‘bite” of silk. Immediately the heckles have passed the machines, the silk is caught and cleaned off the endless comb by pairs of endless revolving nips rising from under and descending from above, and between these nips the stricks are carried forward in the same horizontal line in which they travelled on the heckle-teeth, which here begin their return journey to be again filled. The stricks in their progress are now submitted to the combing action of revolving card-covered cylinders and

card-covered cloth. Half way on in its horizontal path a second set of endless nips seize the combed portion of the silk, the uncombed portion held between the first set is released, and it in its turn is submitted to the combing action of cylinders and endless card-bands. In the end the fully dressed stricks of silk fall on a narrow feeding cloth, which has a combined reciprocating and forward motion, so that the material is spread with the utmost regularity and evenness. It passes through a set of screw gills, and is delivered into cans in the form of a most uniform and equal continuous sliver. The great advantage of these machines is the small amount of tending they require and the large quantity of dressed silk they deliver with unerring regularity.

The spinning proper of dressed waste is done precisely as in the spinning of flax yarn. The flakes are formed into a broad sliver on the spreading frame, and further attenuated and equalized on the set frame and the drawing frame, from which last the silk passes to the roving frame, where it receives its first preliminary twist and is sufficiently condensed to wind on a bobbin. The rovings are finally elongated and spun on the ordinary spinning frame, and for twisting into thread the yarns in two, three, or more strands are wound together on the doubling frame, and finally twisted asin dealing with raw silk spinning,

Spun silk, as it comes from the spinning frame, shows a good many nibs and irregularities and some roughness of surface. To remove these it is wound from one bobbin to another over an improving or cleaning and gassing machine, which consists of a frame having attached to it a number of small cone rollers, around which the yarn passes in a way which makes the entering portion of the thread rub against the portion running off. In this way, with considerable rubbing, the yarn cleans itself; and in its course over the rollers it rapidly passes through a gas flame, which singes off the fine projecting fibres, leaving the yarn clean, round, and compact. It is submitted to a further examination by eye and hand after being wound into hanks; and some yarns are finally dressed with albumen and gum solutions.

In the combing of waste silk as much as from 25 to 30 per cent. of waste in a second degree arises, much of which is very short, full of nibs anddust. From this a lower quality of yarn is spun, called noil yarn, and on the

Continent “ bourette” silk, to distinguish it from the ‘‘ floret” silk made from first waste. On account of the shortness of staple it is worked up by machinery different from that used in the floret manufacture, being prepared by carding, and combed out with a modification of Heilmann’s or Lister’s combing machines. ‘The finished noil yarn is very lumpy, and requires severe improving and singeing.

Spun silk lacks the smoothness, brilliance, and streneth of raw silk yarn, but still it isan extremely valuablo and useful material,

and its comparative cheapness gives it an important place among the products of textile industry. It is used very largely in mixed fabrics, as well as for the cheaper ribbons, velvets, hat plush, and for many other silk woven fabrics, as also in the hosiery and glove trades and for sewing, knitting, and embroidering yarns.

Silk Weighting.—Into the dyeing of silk it is not here necessary to enter, except in so far as eoncerns a nefarious practice, .carried on in dye-houses, which has exercised a most detrimental influence on the silk trade. Silk, we have seen, loses about one-fourth of its weight in scouring, To obviate that loss it has long been the prac- tice to dye some dark silks “in the gum,” the dye eombining in these cases with the gum or gelatinous coating, and such silks are known as “souples.” Both in the gum and in the boiled-off state silk has the peculiar property of imbibing certain metallic salts largely and eombining very firmly with them, the fibre remaining to external appearance undiminished in strength and lustre, but much added to in size and weight. Silk in the gum, it is found, absorbs these salts more freely than boiled-off; so to use it for weighting there are these great indueements-—a saving of the costly and tedious boiling-off, a saving of the 25 per cent. weight which would have disappeared in boiling, and a surface on which much greater sophistication can be practised than on scoured silk, In dyeing a silk black a certain amount of weight must be added ; and the common practice in former times was to make up on the silk what was lost in the scouring. Up to 1857 the utmost the dyer could add was “weight for weight,” but an accidental discovery that year put dyers into the way of using tin salts in weighting with the result that they can now add 40 oz. per

tb to scoured silks, 120 oz. to sonples, and as much as 150 oz. to spun silks, and yct call these compounds ‘‘silk.” Not only so, but the use of tin salts, especially stannic chloride, SnCl,, enables dyers to weight all colonrs the same as blaek. In his ‘ Report on English Silk Industry” to the Royal Commission on Technical Instruction (1885) Mr Thomas Wardle of Leek says :—

‘Colours and white of all possible shades can very easily be impartcd to this compound of silk and tin, and this method is becoming extensively used in Lyons. Thus weighting, which was until recently thought to apply only to black silks, and from which coloured silks were comparatively free, is now cheapening and deteriorating the latter in pretty much the same ratio as the former. ‘Thus the proto- and per-salts of iron, as well as the proto- and per-salts of tin, including also a large variety of tannin, sumac, divi-divi, chestnut, valonia, the acacias (Areca Catechu and Acacia Catechu from India), from which are obtained cutch and gambier, &c., are no longer uscd solely as mordants or tinctorial matters, but mainly to serve the object of converting the silk into a greatly-expandcd fibre, consisting of a conglomeration of more or less of these substances.”

Sugar also is employed to weight silk. Wardle remarks :—

“With a solution of sugar, silk can have its weight augmented from 1 oz, to 3 oz. per ib. Iam not quite sure that this method of weighting was not first uscd by the throwsters, as sugar is known to have been used for adulterating and loading gum silk for a very long time, and then the idea was afterwards applied to silk after the dyeing operations. 1t is much resorted to for weighting coloured silks by dyers on the Continent, and, though a very clumsy method, no substitute has becn found so cheap and casy of application. Bichloride of tin, having chemical affinity for silk fibre, bids fair to extinguish the use of sugar, which, from its hygrometric qualities, has a tendency to ruin the silk to which it is applied, if great care be not taken to regulate the quantity, There is not the slightest use or excuse for the application of sugar, except to cheapen the silk by about 15 to 20 per cent.” ;

Wild Silk Dyeing.—Among the disadvantages under which the silks of the wild moths long laboured one of the most serious was the natural colour of

the silks, and the extreme difficulty with which they took on dyes, specially the light and brilliant colours. For success in coping with this difficulty, as well as in dealing with the whole question of the cnltivation and employment of wild silks, the unwearying patience and great skill of Mr Thomas Wardle of Leek deserve special mention here. The natural colour of tussur silk is a greyish fawn, aud that shade it was found impossible to discharge by any of the ordinary bleaching agents, so as to obtain a basis for light and delicate dyes. Moreover, the chemical character of the tussur silk differs from that of the mulberry silk, and the fibre has much less affinity for tinctorial

On this adulterant Mr

Sal oak

more freely and evenly than either tussur or eria silk.

substances, whieh it takes up unevenly, requirmg a large amount of dye-stuffs. After protracted experimenting Mr Wardle was able in 1878 to show a series of tussurs well-dyed in all the darker shades of colour, but the lighter and bright blues, pinks, scarlets, &c., he could not produce. Subsequently the late M. Tessie du Motay found that the fawn colour of natural tussur could be dis. charged by solution of permanganate of potash, but the oxidizing action was so rapid and violent that it destroyed the fibre itself, Gentler means of oxidation have since been found for bleaching tussur to a fairly pale ground, but the dyeing of light colours cannot yet be said to be a commercial suecess. The silk of the eria or castor-oil worm (Attacus ricind) presents the same diffieulties in dyeing as the common tussur. A portion of the eria cocoons are white, while the others are of a lively brown colour, and for the dyeing of light colours the latter require to undergo a bleach- ing process. The silk takes up eolour with difficulty from a strong vat, and is consequently costly to dye. Moonga silk from Antheraa assama has generally a rather dark brown colour, but that appears to be much influenced by the leaves on whieh the worm feeds, the cocoons obtained on the champaca tree (Jlichclia champaca) giving a fine white fibre much valued in Assam. The dark colours are very difficult to bleach, but the silk itself takes dye-colours much

Trade and Commerce.

About the commencement of this century the chief silk- producing regions of the world were the Levant (including Broussa, Syria, and Persia), India, Italy, and France, the two first named sending the low-priced silk, the other two the fine qualities. Between 1840 and 1850, after the open- ing of trade with China, large quantities of silk were sent from the northern port of Shanghai, and afterwards also from the southern port of Canton. The export became important just at the time when disease in Europe had lessened the production on the Continent. This increased production of medium silk, and the growing demand for fine sorts, induced many of the cocoon-growers in the Le- vant to sell their cocoons to Europeans, who reeled them in Italian fashion under the name of " Patent Brutia," thus producing a very fine valuable silk. In 1857 commenced the importation of Japan silk, which became so fierce a competitor with Bengal silk as gradually to displace it in favour; and recently the native silk reeled in Bengal has almost ceased to be made, only the best European filatures, produced under the supervision of skilled Europeans, now coming forward.

China and Japan, both of which contribute so largely to the supplies that appear in European and American statistics, only export their excess growth, silk weaving being carried on and native silk worn to an enormous extent in both countries. 'The other Asiatic exporting countries also maintain native silk manufactures which absorb no inconsiderable proportion of their raw material. The silk production of the world, including only the amount exported from these Oriental countries, amounts on an average to from 20,000,000 tb to 25,000,000 tb yearly; but the crop is subject to great variations.

The supply available for European consumption during recent years was thus stated, in bales of 100 Ib, by the Moniteur des Soies of Lyons, 25th July 1885 :—

1354-65! 1875-76. 1876-77. 1877-78.| 1878-79.| 1879-80.) 1880-81,| 1881-82. 1882-83, 1883-$4.| 1884-85. 1885-86 (estimates).

it | Maximum. | Minimum.

MG Wiha ssasd caaeeuscosducestenmee cae emeroees 92,400 | 57,000 | 25,000} 40,500} 62,500 | 32,000 | 68,500} 70,000| 52,000) 73,000) 65,000 | 45,000 40,000 France 44,000| 16,000! 2,000) 19,000} 13,500} 8,500] 9,500] 9,506] 17,500] 14,500; 10,000) 10,000 8,000 Spain croseet 8,300} 2,500} 1,500 750} 1,100 800| 1,500) 1,500] 2,800} 1,750) 1,500 500 500 Grecce and Asia Minor 6,600 | 16,000} 10,000} 6,000] 6,000} 5,000) 5,000) 5,000] 6,000) 12,000] 12,000; 10,000 8,000 MOM DAlCSyecemessecererasearer tee 146,300 | 91,500} 38,500] 66,250] 83,100] 46,300| 84,500 | 86,000) 77,800 | 101,250 | 88,500) 65,500 56,500 Mit eee oe ents ees 55,000 | 68,000 | 65,000} 46,000} 53,000| 55,000} 67,000} 44,000} 47,000} 50,000] 50,000) 45,000 42,000 (Guat Git) ccarendereco deo cccpecnrecrrreccereas: 19,800 , 14,000} 10,000] 12,500] 9,000] 12,500) 5,000) 14,500] 11,500] 16,000] 7,000| 12,000 12,000 TE.OIVi()l sare ORE NCE ete ee eee tare 11,000} 8,492] 6,000] 5,000) 6,000! 5,000) 4,000] 3,000) 3,000| 3,000, 3,000 2,000 2,000 JETER coc eee RE EEE eer CA am 14,000 | 13,000 | 22,000 | 22,000] 14,000] 15,000] 15,500] 25,000 | 25,000) 20,000} 15,000 12,000 PUG UMUUD BLESS, ons +soxe ster cesies totes 85,800 | 104,492 | 94,000} 85,500] 90,000] 86,500] 91,000] 77,000! 86,500} 94,000 | 80,000} 74,000 68,000 Grand total of bales… 232,100 | 195,992 | 132,500 | 151,750 | 173,100 | 132,800 | 175,500 | 163,000 | 164,300 | 195,250 | 168,500 | 139,500 124,500 Price of Tsatlee No. 4…….0005-.-| 168. 15s, 28s, | 17s. 6d. 15s. | 15s. 8d.) 13s. 9d.; 17s l4s. Gd. 16s. 13s. 12s, 6d. 12s. 6d.

» 1 Gk

While these tables indicate remarkable fluctuation of supply they show generally that Asiatic countries, besides supplying their own considerable demands, send to Europe fully one half of the whole silk consumed in Western manufactures. China stands first as a silk-producing country, yielding about 35 per cent. of the entire supply ; the whole produce of Italy amounts to nearly the same proportion ; the exports of Japan account for about 12 per cent. of the annual supply; while in recent years France and the Levant are credited with about equal proportions.

In the United Kingdom the trade in raw silks has been in a condition of decline for a considerable number of years, much of the Chincse and

Eastern produce which formerly came to London now being unshipped at Marseilles, and sold in the Lyons market, which has become the leading silk mart. But there is a very steady and continuous ex- pansion in the demand for waste silks and cocoons for the spun silk trade. The following figures show the official annual returns of silk imports since 1860, the date of the French commercial treaty, which exposed many branches of the trade to severe and fatal competition :—

Knubs or Silk Years. Raw Silk. Husks of Silk} Thrown Silk. Manufaetures. and Waste. Ib Cwts. tb £

1860-65 43,187,997 182,020 543,679 30,127,878 1865-70 31,645,505 141,628 859,251 49,885,971 1870-75 34,220, 037 171,166 747,505 55,116, 815 1875-80 23,003,683 158, 887 545,247 62,539,166 1880 8,678,949 55,002 9038, 567 13,324,935

1881 2,904,580 54,119 | 181,886 | 11,727,397

1882 8,377,119 44,277 294,207 11,174,573

1883 3,178,593 62,064 | 292,488 | 10,528,920 1884 » 4,522,702 67,289 323,947 10,984,078

The sources whence the English imports of raw silk, the commercial names undcr which they pass, and their relative importance and values, are cxemplified in the following table, extracted from the annual circulars issued by Messrs H. W. Eaton & Sons of London :—

Con-

E . Extreme __|sumption, Priees Deseription. Ce ayes, Priees during | including] 1st January . 1885, Export, 1886,

1885.

an ‘ tb Ib S Ch oh Cs Ib S$ ds. eh, Bitlee *,....06 x Haineen, &e. t 2,803,572 | 1,001,436; 9 Otol4 6) 1,225,988; 9 6tol4d 6 Taysaam 2,,..... 416,466 | 271,116) 7 6,,15 0} 293,964) 8 0,, 14 6 AMEOTM 52.0000 339,976]

159,828) 8 6,,12 6] 469,456) 9 9,,13 0 Szcchucn…...0. 23,154 6,936; 7 0,,11 3 17,544) 7 0, 11 3 SUMBTIE escere assess 388,304] 70,560,10 6,,15 6] 3872,176\12 0,,15 6 126,450| 114,000; 8 0,, 14 6} 154,800] 9 6,,15 0 8,750 Tsiolo O,, 28 6 7,700/19 0,,21 0 225 noo 9 oct 200 Bonci0 | axij700|7/ 0102″ 81 aosjaao|57 oto a) 0 ” ” 273,760 | 310,300 ;20 0,,25 0| 307,400 20 0,, 25 0 HPOGH”....5… 4,586,267 | 2,153,251 3,057,198

In the manufacture of silken fabrics France occupies the most important position among the nations. Not only is the whole of the raw silk produced in France worked up within the country, but a very considerable proportion of that imported from the Levant and from Asia passes into the hands of the French manufacturers. In all, between 8,000,000 and 9,000,000 Ib of raw silk are On an average manufactured into various textures in France. Lyons is the headquarters of the trade, and, if the surrounding regions be included, employment is given to about 120,000 looms,—20,000 of which are driven by power,—principally in the production of dress silks, plain and figured, and in other heavy silken fabrics, and at St Etienne and St Chamond in the ribbon trade. There are also important manufactures of silk at Calais, St Pierre

: The figures relating to Tsatlee comprise Re-reel, Hangchow, and Yuun-fa. The figures relating to Taysaaim comprise Tussah.

les Calais (tulles and passementerie), Paris, Nimes, Tours, Avignon, and Roubaix. Next to France in the extent and value of manufactures comes Germany, wherc the principal seat of the silk trade is at Crefcld, nearly one half of the whole production of the empire being manu- factured there. The looms of Crefeld and the district it controls numbcred in 1881 about 33,000, and the trade was flourishing and expansive. The manufacture of union velvets is the special feature of the industry, about one half of the looms being devoted to that textile; but ~Crefeld controls also a large trade in union satins, and pure silk broad goods and ribbons of all kinds. The whole value of its trade amounted in 1881 to almost £4,000,000, one-fourth of which found a market in England, and about a quarter of a million went to France. The other principal centres of the silk trade, all in Rhenish Prussia, are Viersen, Barmen, Elberfeld, and Miihlheim. Third on the list of

Continental producers is Switzerland, where Zurich takes the lead with broad goods (failles, armures, satins, serges, &c.), and Basel rivals St Etienne in the ribbon trade. The number of looms throughout the country is estimated at 40,000, of which 4000 are power- looms. Italy—the early home of the silk trade, the land of the gorgeous velvets of Genoa and the damasks and brocades of medizeval Sicily, Venice, and Florence—has fallen from its high estate, and now employs not more than 30,000 looms, the centre of greatest activity being at Como; but Genoa still makes velvets, and the brocades of Venice are not a thing of the past. In Austria the silk trade has found its principal development in Vienna and its immediate neighbourhood, the number of looms throughout the entire empire being estimatcd at from 15,000 to 20,000, of which 2000 are power-looms. In Russia thcre is, with a growing cultivation of raw silk, a considerable and in- creasing manufacture, the special feature of which is the weaving at Moscow of gold and silver tissues and brocades for sacerdotal use, and for traffic with Central Asia.

In the United Kingdom all the silk industries—these depending on spun silk alone excepted—have been in a depressed and declining condition ever since 1860. The principal silk manu- facturing towns of England have been Coventry, Macclesfield, Congleton, Leek, Derby, London (Spitalfields), Manchester, Middleton, and Nottingham, and it is estimated that at the best period not fewer than 150,000 looms found employment in the trade. In 1872 that number was reduced to 65,000, of whieh 12,500 were power-looms. Spitalfields in her best days (about 1825) kept 24,000 hand-looms occnpied ; now there are not more than 1200. Manchester once had about 20,000 looms weaving silk ; now there are not 6000 so employed. When the French treaty of 1860 came into operation Coventry had about 9000 looms, principally cmployed in ribbon weaving ; now not more than one-fourth of that number are in operation. The cause of several of these severe changes is to be found in the introduction of the factory system of working and the extension of power-loom weaving, which crushed out domestic weaving, the original form of the silk industry ; but undoubtedly also the English manufacturers were

beaten in the battle of free competition brought on by the Freneh treaty. On the other hand, the remarkable devclopment of thc

Silk and Silk Goods exported from the United Kingdom during the years 1860 to 1884 inclusive.

Thrown Silk. Suk Manufactures.

Knubs or Husks of

Raw Silk.

am Foreign and ye Foreign and British. Col SAS; beso Colonial. tb tb £ £

3,153,998 826,107 426,866 1,587,308 224,366 8,137,292 767,058 806,701
1,404,381 166,936 2,644,402 1,154,364 39,771 1,450,397 166,297
2,551,417 880,923 87,924 1,734,519 328,426 8,064,725 1,080,678 50,202
1,794,565 303,054 1,652,935 570,999 17,910 1,705,153 229,130 1,841,505
565,266 40,470 1,922,953 222,133 1,375,608 694,735 24,461 1,697,209
248,495 947,165 683,591 7,553 2,030,659 259,023 903,997 1,008,272
5,561 2,564,730 263,826 915,773 825,572 6,281 2,692,275 341,107
524,182 705,825 5,596 2,426,299 340,805 377,349 612,951 50,559
2,175,410 644,722

kel =o

66

comparatively new trade in spun silk goes far to compensate for the loss of the older trade, and has enabled the exports of silk manufactures from the country to be at least maintained and to show some signs of expansion. The spun-silk industry has chiefly developed in the Yorkshire and Lancashire textile centres,— Bradford, Halifax, Rochdale, &c. But it is highly significant that, while the exports of British silk manufactures have not decreased, the imports in the meantime have shown a marked expansion ; and unquestionably, although the use of silken goods has increased very greatly within twenty-five years, the expansion of native silk manufactures has not kept pace with that growth. Favoured by the operation of protective duties ranging from 50 to 60 per cent. ad valorem, the native manufacture of silk in the United States has been nursed into considerable activity and expansion, till now well-nigh one-half of the silken fabrics used in

SILLIMAN, Bensamtn (1779-1864), American chemist and geologist, was born in 1779 at Trumbull (then called North Stratford), Connecticut. His father, Gold Selleck Silliman, was brigadier-general in the war of the revo- lution, and had also held important civil positions. The history of the family points to an Italian origin, but Daniel Silliman, the first to settle in the United States, came from Holland. Silliman received his early education at Fair- field, Connecticut, at that time the residence of his father's family, and in 1792 he entered Yale College, where he graduated in 1796. He then studied law, and was admitted to the bar in 1802, while a tutor in Yale College, to which position he had been appointed in 1799. In 1802 a professorship of chemistry and natural history was established in the college, and he was at once elected to fill it. He spent portions of 1801 and 1802 in Philadelphia in preparation for his work, and the year 1804 he spent in Europe, chiefly in England and Scotland, where he attended the lectures of Hope and Gregory, and also formed the acquaintance of Davy, Wollaston, Brewster, Leslie, and other eminent men of science. Asa result of this visit he published A Journal of Travels in England, Holland, and Scotland, and of Two Passages over the Atlantic in the years 1808 and 1806 (2 vols., 1810), which had a marked success. In 1813 he began service with the medical department of Yale College as professor of chemistry and pharmacy, and continued to give instruction there for many years. In 1818 he founded the American Journal of Science and Arts, a periodical devoted to the physical sciences, which has been, and is, the most important American scientific serial. In 1851 he made a second journey to Europe, of which he likewise published an account in two volumes, edited by his son, who had accompanied him. In 1853 he became professor emeritus, but he continued to lecture for a year or two longer. His closing years were quietly spent in unabated mental activity at New Haven until his death in 1864. Though devoted to scientific pursuits, he inter- ested himself in the public movements of the time.

One of Silliman's earliest scientific publications was an account of the famous meteorite which fell in Weston, Conn., December 14, 1807. This account, which excited great public interest in the country, was reproduced abroad, and was read before the Royal Society of London, and also before the French Academy. Among his other scientific labours may be mentioned his experiments upon the fusibility of various substances in the flame of the

com- pound blowpipe of Hare, then a novelty in science, and upon the vaporization and transference of the carbon in the voltaic arc from the positive to the negative pole, which he was the first to observe. He also repeated the experiment by which Gay-Lussac had separated potassium froin its hydrate, and obtained the element in its metallic form, doubtless for the first time in the United States. Other professional labours were an exploration of the coal formations of Pennsylvania in 1830, and an examination of the gold mines of Virginia in 1836. In 1832 and 1838, by appointment of the United States Government, he inade a scientific investigation of the culture and manufacture of sugar, embodying his results in a voluminous report published by the Government. Though Silliman published a large number of scientific papers upon chemical and geological subjects, his reputa-

the country are of home manufacture. In 1860 the proportion of native manufacture was 18 per cent., in 1880 it reached 38 per cent., and in 1882 it was 40 per cent. of the cntire consumption, Reeled silks are principally manufactured at Paterson and Hoboken, N. J., aud Brooklyn and New York City, N. Y., and the spun-silk industry flourishes at South Manchester and Hartford, Conn.

The following cstimate of the rclative importance of the silk manufacture of various countries was made in 1883 by Mr Peixotto, the United States consul at Lyons :—

PTATIGE) acecn eves cnc $85,000,000 | Russia…..... 16,000,000 Germany….....- 45,000,000 | Austria…..... 12,000,000 United States….. So O OOK OOM Mibaliyaernei ieee 12,000,000 Great Britain….. PH (OKOLO) (OLN) | IS]SENUE Ggomnbecnosbenc 5,000,000 Switzerland …..... 18,000,000 | Other countries… 17,000,000 giving a total of $270,000, 000. (AEA

tion was more especially due to the courses of public lectures which he delivered in the college and in various cities and towns of the United States. The happy combination of a graceful and interesting style with unwonted splendour of experimental illus- tration gave these lectures an

unprecedented popularity, and they exerted a powerful influence in awakening and developing a taste for scientific matters throughout the country.

Besides the works already mentioned, Silliman published in 1808 an American edition of Henry's Chemistry, with notes, in 1827 an edition of Bakewell's Geology, and in 1830 Elements of Chemistry, in two volumes. An account of his life, by Prof. George P. Fisher, of Yale College, was published in two volumes in

1866,

SILLIMAN, Bensamin (1816-1885), American chemist and physicist, son of the preceding, was born in 1816 at New Haven, Connecticut, and educated at Yale College, where he graduated in 1837. He then became assistant to his father in chemistry, mineralogy, and geology, work- ing in his laboratory at the college, and pursuing original investigations. He began teaching in the laboratory soon afterwards. The school thus informally established was shortly afterwards recognized by a formal act of the cor- poration of the college, and ultimately developed into the Sheffield Scientific School of Yale College. In 1838 he became associate editor with his father of the American Journal of Science and Arts, and he continued in the editorship of the journal until the close of his life, Prof. J. D. Dana (his brother-in-law) having joined him in 1846. In the winter of 1845-46 he gave a course of lectures on agricultural chemistry in New Orleans, which is believed to have been the first course of lectures upon that subject ever given in the United States. In 1849 he was appointed professor of medical chemistry and toxico- logy in the medical department of Louisville university, Louisville, Kentucky, which position he held for five years. In 1854 he succeeded his father as professor of chemistry, and continued to give instruction in this science, first in the academical and afterwards in the medical department of Yale College, until his death in 1885. In 1853 he was connected with the exhibition at the Crystal Palace in New York, having charge of the departments of chemistry, geology, and mineralogy. As a result of this work he edited a large quarto volume, Zhe World of Scvence, Art, and Industry (1853), followed in 1854 by The Progress of Science and Mechanism. He also published in 1846 First Principles of Chemistry, a text-

book which had a wide sale and passed through three editions. In 1858 he published a manual of physics entitled /irst Principles of Physics or Natural Philosophy (2d ed. 1861). In 1864 and again in 1867 and 1872 Silliman visited Cali- fornia, being engaged in professional work connected with various mines and in mineralogical and geological ex- plorations. Still later he made several visits to the mining regions of the western States and Territories, and the results of his observations formed the subjects of numerous scientific papers. In 1874, the centennial annl- versary of Priestley's discovery of oxygen, he delivered at Northumberland, Pa., where Priestley had resided durimg the later years of his life, an historical address on "¢ Amer-

ican Contributions to Chemistry," which he afterwards expanded into a considerable volume.

STLO. A modern silo is a pit or erection in which green crops are preserved in an undried condition for fodder. 'The term is derived from the Greek oipéds (Lat. sirus), a pit for holding grain. It is only of recent years that ensilage, 7.¢., the preservation of green food for cattle by partial fermentation in silos, has become an important feature in agricultural economy. In various parts of Germany a method of preserving green fodder precisely similar to that used in the case of sauerkraut-(see vol. iv. p. 618) has prevailed for upwards of a century. Special attention was first directed to the practice of ensilage by a French agriculturist, M. Auguste Goffart of Sologne near Orleans, who in 1877 published a work (Manuel de la Culture et de VEnsilage des Mais et autres Fourrages Verts) detailing the experiences of many years in preserv- ing green crops in silos. An English translation of M. Goffart's book by Mr J. B. Brown was published in New York in 1879, and, as various experiments had been previously made in the United States in the way of preserving green crops in pits, M. Goffart's experi- ence attracted considerable attention. The conditions of American dairy farming proved eminently suitable for the ensiling of green maize fodder ; and the success of the method was soon indisputably demonstrated among the New England farmers. The favourable results obtained in America led to much discussion and to the extensive introduction of the

system in the United Kingdom, where, with different conditions, success has been more qualified, but still highly encouraging.

It has been abundantly proved that ensilage forms a wholesome and nutritious food for cattle. It can be substituted for root crops with advantage, because it is succulent and digestible; milk resulting from it is good in quality and taste; it can be secured largely irrespective of weather ; it carries over grass from the period of great abundance and waste to times when none would other- wise be available; and a larger number of cattle can be supported on a given area by the use of ensilage than is possible by the use of green crops.

A silo should havea depth of at least 15 feet, and may either be a it ora building above ground, provided it is water-tight and, as ar as possible, air-tight. The crops suitable for ensilage are the ordinary grasses, clovers, lucerne, vetches, oats, rye, and maize; but various weeds may also be stored in silos with good results, notably spurrey (Spergula arvensis), a most troublesome plant in poor light soils. Asarule the crop should be mown when in full flower, and deposited in the silo on the day of its cutting. Fair dry weather is not essential ; but it is found that when moisture, natural and extraneous, exceeds 75 per cent. of the whole, good results are not obtained. The material is spread in uniform layers over the floor of the silo, and closely packed and trodden down. If possible, not

more than a foot or thereby should be added daily, so as to allow the |

mass to settle down closely, and to heat uniformly throughout. When the silo is quite filled a layer of straw or some other dry pases substance is spread over the surface, then it is covered with oards, and a pressure of not less than 100 tb per square foot is applied hy weighting or other mechanical means.

A silo thus contains, to begin with, a mass of living vegetable cells surrounded with a minimum of oxygen. The activity of the cells continuing, oxygen is absorbed and carbonic acid evolved, and part of the starch of the plants is converted into sugar. In the atmosphere of carbonic acid thus created the acid ferments manifest their vitality, and acetic, lactic, and butyric acids are developed at the expense of the starch and sugar. These

chemical changes are accompanied with an evolution of heat, and the temperature of the mass rises, till, when it attains 122° Fahr., the action of the ferments 1s arrested. Should the heat rise to 150° the vitality of the vegetable cells themselves is destroyed ; and also when the available oxygen is exhausted chemical change ceases and swect silage is produced. When from excess of moisture or other cause the temperature of the silo does not reach 122° Fahr., the acid ferments are not killed, and they go on evolving chiefly acetic and lactic acids, the results being sour silage. These ferments, requiring nitrogen for their existence, act on the nitrogenous constituents of the plants,

rendcring the albuminoids partly soluble, evolving peptones, and by further splitting up producing amides, urea, and ammonia. The production of sour silage is accompanied by much greater traus- formation and loss than is incident to sweet silage; and in extreme action the material acquires a most disagreeable odour. There is, however, no sharp line of distinction between the two, and both varieties are eaten freely by stock. Frequently a considerable loss occurs around the edges, and at other points where air gets access to the mass, by mildewing. See Report of Select Committee.

SILURID, a large family of freshwater Fishes, flourishing in the present epoch, and represented by a great variety of forms in all the tropical and temperate regions, many of them reaching back into the Tertiary age. The principal characters of this family (termed a “suborder” by some), its position in the system, its geographical distribution, and some of the most remark- able points in the structure and life-history of its members have been already sufficiently noticed under IcnTHyoLoecy, but we have here to notice more fully the sections into which it has been divided, and certain remarkable forms which were referred to nominally only in that article.

The modifications of the vertical fins, or rather the specialization of certain portions at the expense of others, and the greater or less extent of the branchial aperture form excellent characters for subdividing the Siluroids.

I. In the Stluride Homaloptere the vertical fins are exceedingly long, occupying nearly the whole extent of the embryonal fin, and in one genus

(/eterobranchus) a great part of the dorsal portion retains its embryonic character, being arayless adipose fin. All the Siluroids of this section belong to the fauna of the Old Worldand Australia. The rivers and lakes of tropical Africa harbour many species of the genera Clarias and Heterobranchus,—those of the Nile being known under the name of ‘“‘Carmoot.” One of the Nilotic species, Clarias macracanthus, occurs abundantly in the Lake of Galilee, and, being a long, scaleless, eel-like fish of black colour, with eight long barbels round its broad mouth, was certainly included among those which the Jews were forbidden to eat by the Mosaic law. These fish grow toa length of from 4 to 6 feet, and are eaten by the natives of tropical Africa.

II. In the Siluride Heteroptere the dorsal fin has almost or entirely disappeared ; only its foremost portion and a small adipose remnant may be preserved ; on the other hand the anal portion is retained in its whole extent. The gill- membranes remain separate and overlap the isthmus. This section likewise belongs to the fauna of the Old World, and includes, among many others, the species which has given the name to the whole family, St/wrus glants, the “ Wels”

Fie, 1.—The ‘’ Wels” (Stlurus glanis).

of the Germans. It is the only representative of the family in Europe, and with the exception of the sturgeon, is the largest freshwater fish of the Continent. It was known to Aristotle, who described it under the name of Glanis. It inhabits more the central and eastern portions of Europe than the western, being absent in Italy, Greece, southern Switzerland, France, and those parts of Germany which are drained by the Rhine and its affluents. In general appear- ance it somewhat resembles the burbot. Its head is large

and broad, its mouth wide, furnished with six barbels, of which those of the upper jaw are very long. Both jaws and the palate are armed with broad bands of small closely- set teeth, which give the bones a rasp-like appearance. The eyes are exceedingly small. The short body terminates in a long, compressed, muscular tail, and the whole fish is covered with a smooth, scaleless, slippery skin. Specimens of 4 and 5 feet in length, and of 50 to 80 tb in weight, are of common occurrence. Its food consists chiefly of other bottom-feeding fishes, and in inland countries it is considered one of the better class of food fishes. Stories about children having been found in the stomach of very large individuals are probably inventions.

IIT. The Sewride Anomaloptere are a small section from tropical America, in which the dorsal and adipose fins are very short and belong to the caudal vertebral column, while the anal is very long, and the gill-membranes are entirely separate, overlapping the isthmus.

IV. The Siluride Proteroptere are a section extremely numerous in species, and represented throughout the tropics. The dorsal fin consists of a short-rayed and an adipose portion, the former belonging to the abdominal vertebral column; the anal is always much shorter than the tail. The gill-membranes are not confluent with the skin of the isthmus; they have a free posterior maegin. When a nasal barbel is present, it belongs to the posterior nostril. This section includes among many others the genus Bagrus, of which the “Bayad” (B,. bayad) and “Docmac” (B. docmac) frequently come under the notice of travellers on the Nile; they grow to a length of 5 feet, and are eaten. Of the “Cat-Fishes” of North America (Amiurus), locally called ‘bull-heads” or “ horned-pouts,” with eight barbels, some twenty species are known. Some of them are valued as food, especially one which is abundant in the ponds of New England, and capable of easy introduction into other localities (A. nebulosus). Others which inhabit the great lakes (A. nigricans) and the Mississippi (A. ponderosus) often exceed the weight of 100 ib. Platystoma and Pimelodus people the rivers and lakes of tropical America, and many of them are conspicuous in this fauna by the ornamentation of their body, by long spatulate snouts, and by their great size. The genus Arius is composed of the greatest number of species (about seventy), and has the widest distribution of all Siluroids, being represented in almost all tropical countries which are drained by large rivers. Some of the species enter salt water. They possess six barbels, and their head is extensively osseous on its upper surface ; their dorsal and pectoral spines are generally developed into powerful weapons. Bagurius, one of the largest Siluroids of the rivers of India and Java, ex- ceeding a length of 6 feet, differs from Arius in having eight barbels, and the head covered with skin.

V. In the Siluridx Stenobranchiz the dorsal fin consists of an adipose portion and a short-rayed fin which belongs to the abdominal vertebral column, and, like the adipose fin, may be sometimes absent. The gill-membranes are confluent with the skin of the isthmus. The Siluroids belonging to this section are either South-American or African. Among the former we notice specially the genus Doras, which is distinguished by having a series of bony scutes along the middle of the side. The narrowness of their gill-openings appears to have developed in them a habit which has excited the attention of all naturalists who have visited the countries bordering upon the Atlantic rivers of tropical America, viz., the habit of travelling during seasons of

drought from a piece of water about to dry up to ponds of greater capacity. These journeys are occasionally of such a length that the fish have to travel all night; they are so numerous that the Indians fill

SILURID A

many baskets of them. Hancock supposes that the fish carry a small supply of water with them in their gill-cavity, which they can easily retain by closing their branchial] apertures. The same naturalist adds that they make regular nests, in which they cover up their eggs with care and defend them, —male and female uniting in this parental duty until the eggs are hatched. Synodontis ig

Fia. 2.—Synodontis xiphias,

an African genus and common in the Nile, where the various species are known by the name of “Shal.” They frequently occur among the representations of animals left by the ancient Egyptians. The upper part of their head is protected by strong osseous scutes, and both the dorsal and pectoral fins are armed with powerful spines. Their mouth is small, surrounded by six barbels, which are more or less fringed with a membrane or with branched tentacles. Finally, the Electric Cat- or Sheath-Fishes (Malapterurus) also belong to this section. Externally

Fic. 3.—Malapterurus electricus,

they are at once recognized by the absence of a rayed dorsal fin, of which only a rudiment remains as a small interneural spine concealed below the skin. The entire fish is covered with soft skin, an osseous defensive armour having become unnecessary in consequence of the develop- ment of a powerful electric apparatus, the strength of which, however, is exceeded by that of the electric eel and the large species of Z’orpedo. It has been noticed in vol. xii. p. 650. Three species have been described from rivers of tropical Africa, of which one (J. electricus) occurs in the Nile; it rarely reaches a length of 4 feet.

VI. The section of Siluridx Proteropodes contains small forms, some of which are of interest by the degree of specialization to which they have

attained in one or the other direction. Many of them are completely mailed; but all have in common a short-rayed dorsal fin, with the ventrals below or rarely in front of it. Their gill-openings are reduced to a short slit; their pectorals and ventrals have assumed a horizontal position; and their vent 1s before, or not much behind, the middle of the length of the body. The first group of this section comprises alpine forms of the Andes, without any armature, and with a very broad and pendent lower lip. They have been referred to several genera (Stygogenes, Arges, Brontes, Astroplebus), but are collectively called “ prefiadillas” by the natives, who state that they live in subterranean craters within the bowels of the volcanoes of the Andes, and are ejected with streams of mud and water during eruptions. These fishes may, however, be found in sur- face waters at all times, and their appearance in great quantities in the low country during volcanic eruptions can be accounted for by numbers being killed by the sulphuretted gases which escape during an eruption and

by their being swept down with the torrents of water

issuing from the volcano. The lowland forms have their body encased in large scutes, either rough, scale-like, and arranged in four or five scries (Chetostomus), or polished, forming broad rings round the slender and depressed tail (Loricaria, fig. 4), or polished and large, so as to form two series only along the body and short tail

Fig. 4.—Loricaria lanceolata, from the upper Amazons.

tion is but sparsely represented, chiefly in mountain- streams, by small loach-like Siluroids, in which various kinds of peculiar apparatus are developed to enable them to hold on to stones, this preventing their being swept away by the current ; in Pseudecheneis the adhesive apparatus consists of transverse plaits of the skin on the thorax between the pectoral fins; in Lx- ostoma the~—- mouth is modified in- to a sucto- rial organ, probably with the Fie. 5.—Callichthys armatus, from the upper Amazons. same func- Natural size. tion. Finally, the South-American genus A spredo, which is remarkable for the peculiar mode of protecting its eggs, as mentioned in vol. xii. p. 660, belongs also to this section. VII. The small

section of Siluridx Opisthoptere com- prises South-American forms, the majority of which inhabit waters at high altitudes up to 14,000 feet above the level of the sea. All have a short-rayed dorsal fin, placed above or behind the middle of the length of the body, above or behind the ventrals, which may be absent. Also the anal is short. The nostrils are remote from each other, and the gill-membranes are not confluent with the skin of the isthmus. These little fishes, of which Trichomycterus and Nematogenys are the principal genera, replace in the Andes the loaches of the northern hemi-sphere; they resemble them in appearance and_ habits, and even in coloration, offering a striking illustration of the fact that similar forms of animals are produced under similar external physical conditions.

Natural size.

69

VIII. Finally, the Silwride Branchicole comprise the smallest and least developed members of the family; they are referred to two genera only from South America, Stegophilus and Vandellia, the smallest of which does not exceed the length of 2 inches. Their body is soft, narrow, cylindrical, and elongate; the dorsal and anal fins short; the vent far behind the middle of the length of the body ; gill-membranes confluent with the skin of the isthmus. Each maxillary is provided with a small barbel; and the gill-covers are armed with short stiff spines. Their small size not- withstanding, these Siluroids are well known to the Brazilians, who accuse them of entering and ascending the urethra of persons while bathing, causing inflammation and sometimes death. They certainly live parasitically in the gill-cavity of large Siluroids, probably enter- ing those cavities for places of safety, but without drawing any nourishment from their hosts. (A, ©. G.)

SILVANUS, an ancient Italian god of the woods (silvx), closely allied to Faunus. Virgil speaks of him as a god of fields and cattle, and says that the Pelasgians dedicated a grove to him near Cere. Horace calls him the god of boundaries. Pigs were sacrificed to him, and at harvest festivals he received offerings of milk. He appears sometimes, especially in inscriptions, as a domestic god, and is occasionally associated with the Lares and Penates. Virgil describes him as crowned with fennel and lilies or carrying an uprooted cypress in his hand. On a relief he appears with a crown of pine

branches in his hair, a pine branch in his left hand, a skin filled with fruits hanging about his neck, a pruning-knife in his right hand, and a dog by his side. On votive tablets he is oftener represented as the god of planting and gardening than as the rough woodland deity.

SILVER! is widely diffused throughout the earth's crust, including the ocean, which contains a trace of the noble metal—minute, it is true, in a relative sense, but in absolute amount approaching 10,000 million tons. Of the varieties of silver ores, the following chicfly are metallurgically important :—(1) Reguline Silver, generally alloyed with mercury or gold, and if with the latter including sometimes a trace of platinum ; (2) Horn Silver, native chloride, AgCl; (3) Silver Glance, native sulphide, Ag. ; (4) Silver-Copper Glance, (Ag,Cu),8; (5) Pyrargyr- ite (" Rothgiiltigerz"), Ag.SbS, ; (6) Stephanite, Ag.SbS, ; (7) Polybasite, 9(Ag,,Cu,)S + (Sb,,As,)8,. Silver is also frequently met with in base-metallic ores, ¢g., in lead ores and many kinds of pyrites. Unmixed silver minerals nowhere present themselves in large continuous masses. What we call "silver ores" are all more or less complex mixtures in which the non-argentiferous components are usually decidedly in the majority. Their metallurgic treat- ment depends chiefly on the nature of these admixtures, the state of combination of the silver being as a rule irre- levant in the choice of a process, because some at least of the noble metal is always present as sulphide, and our modes of treatment for it include all other native forms.

Amalgamation.—If a given ore is relatively free of base " metals" (nietallurgically speaking), some process of "amalgamation" may be, and often is, resorted to.

In the Freiberg process the first step is to roast the (ground) ore with common salt, which converts the sulphide of silver into

' Compare CHEMistTRY, vol. v. p. 528-5380; also Mirna, Minv, and MONEY.

chloride (Ag,S + 2NaCl+40 from the air=2AgCl+Na,SO,). The mass, along with certain proportions of water, scrap-iron, and mercury, is placed in

barrels, which are then made to rotate about their axes so that the several ingredients are forced into con- stantly varying contact with ore another. The salt solution takes up a small proportion of chloride, which in this (dissolved) form is quickly reduced by the iron to the metallic state (2AgC1+ Fe=FeCl,+2Ag), so that there is, so to say, room made in the brine for another instalment of chloride of silver, which is reduced in its turn, and so on to the end,—the metal formed uniting with the mercury into a semi-fluid amalgam. Of this the bulk at least readily unites into larger continuous masses, which, on account of their high specific gravity, dre easily separated from the dross mechanically. The amalgam is pressed in linen bags to eliminate a quantity of relatively silver-free liquid mercury (this of course is utilized as such in subsequent operations), and the remaining solid amalgam is subjected to distillation from iron re- torts, whereby its inercury is recovered asa distillate while a more or less impure silver remains in the retort. This process, after having been long wrought in Freiberg with great success, is now super- seded there by the Augustin method (see below), but it survives in some other places, as, for example, the Washoe or Comstock district in the Sierra Nevada (United States). Itis not used in Chili, Peru, and Mexico because of the scarcity of fuel.

The Afexican process, though far less perfect than that of Freiberg, evades this difficulty. It was tried for the first time, if not actually invented, by Bartolomeo de Mcdina in 1557. It was adopted in Mexico in 1566 and in Peru in 1574, and is in use in both countries and in Chili to this day. The stamped ore is ground into a fine paste with water; this paste, after having been allowed to dry up a little in air, is placed on a stone fivor along with a quantity of salt, and the two are trodden together by mules. On the following day there are added certain proportions of ‘‘magistral” (a kind of crude sulphate of copper made by roasting copper pyrites) and of mercury, and the mules are kept going until the silver is as far as possible converted into amalgam, which takes from fifteen to forty-five days. The rationale of the process is not quite understood. According to Boussingault, the cupric chloride (formed by the salt from the sulphate) chlorinates part of the sulphide of silver, thus—

2CuCl, + Ag S=2AgC1+S8+Cu,Cl,,

and the cuprous chloride formed acts upon another portion of sulphide of silver, thus— Cu,Cl, + Ag,S =2AgCl1+Cu,S,

and in this way all the sulphide of silver is gradually converted into chloride. The chloride is reduced to the metallic state by the mercury (AgCl+ Hg=HgCl+Ag) with formation of calomel, the metallic silver uniting with the surplus mercury into amalgam. The calomel is allowed to go to waste.

The Augustin process of silver extraction is only a peculiar mode of metallifying and collecting the silver of an ore after it has been by some preliminary opcration converted into chloride or sulphate. Either salt is brought into solution—the chloride by means of hot brine, the sulphate by means of hot water, acidified with oil of vitriol ; the solution is separated from the insolubles, and made to filter through a bed of precipitated copper. The copper reduces the silver to metal, which remains on the bed as a spongy mass, while an equivalent quantity of copper chloride (or sulphate) passes through as a solution. The silver sponge is col- lected, freed from adhering copper by muriatic acid in contact with air, and then sent to the furnace. From the copper liquor that metal is precipitated in its original form by means of iron,

The silver furnished by any of these methods is never pure, even in the commercial sense. A general method for its purification is to fuse it up with lead and subject the alloy to cupellation (see Luad, vol. xiv. p. 376). Cupel-silver is apt to contain small quantities of lead (chiefly), bismuth, antimony, copper, and more or less of gold, of which metals, however, only the first three are reckoned ‘‘coutaminations” by the metallurgist. They can be removed by a supplementary cupellation, without added lead, at a high temperature. Addition of lead would remove the copper likewise, but it is usually allowed to remain and the alloy sent out as cuprifcrous silver, to be alloyed with more copper and thus con- verted into some kind of commercial “silver” (see below). If gold is present to the extent of 0°1 per cent. or more, it is recovered by treatment of the metal with nitric acid or boiling vitriol. The gold in either case remains as such ; the silver becomes nitrate or sulphate, and from the solution of either salt is recovered by precipitation with metallic copper. Although nitric acid is the more

expensive of the two parting agents, it is often now preferred because photography has created a large demand for nitrate of silver. Compare GoLp, vol. x. p. 749,

For the “incidental ” extraction of silver from essentially base-métallic ores the method in the case of all lead ores is simply to proceed as if only lead were present,

and from the argentiferous Jead produced 1o extract the noble metal by one of the processes described under Leap (vol. xiv. p. 376-7), while for the treatment of sulphureous copper ores one method is so to smelt the ore (with, if neces. sary, an addition of galena or some form of oxide of lead) as to produce a regulus of lead anda “mat” of sulphide of copper, (Cu,S), which latter should contain as little lead as possible. The silver follows chiefly the lead, and is extracted from it by cupellation; but some silver remains in general even with a lead-free mat. Compare account of the Lautenbach process under Leap.

A modern mode of extracting the silver from a copper mat is to roast it at a very low teniperature, so as to produce a relatively large proportion of metallic sulphate, and then to destroy the bulk of the sulphate of copper by a judiciously-regulated higher tem. perature. The silver all remains as sulphate, whicli is extracted by hot dilute sulphuric acid and wrought by the Augustin method,

Very interesting is the process which was patented by Claudet for the remunerative extraction of the few hundredtlis of a per cent. of silver contained in that kind of cupviferous iron pyrites which is now used, almost exclusively, for the making of vitriol. The ‘‘cinders,” as returned by the vitriol maker, are habitually worked up for copper by roasting them with salt and lixiviating the roasted mass with water, when the copper dissolves as chloride, Cu,Cl, and CuCl,, The silver goes with it, but for its precipita. tion no method was known until Field found that silver dissolved as AgCl in a chloride solution can be precipitated exhaustively by addition of the calculated proportion of a soluble iodide, as Agl. Claudet’s process is only an adaptation of Ficld’s discovery. After having diluted the copper liquor

with a ccrtain proportion of water he adds the weight of iodine, calculated from the assay, as solution of iodide of zinc, which produces a very impure precipitate of iodide of silver. Fron it he re-extracts the iodine, by treatment with zine and dilute sulphuric acid, as iodide of zinc, which is used over again, The “silver precipitate,” which now contains its silver as metal mixed with a large quantity of (chiefly) sulphate of lead, goes to the metal-refiner, who treats it as a lead ore.

Chemically Pure Silver.—Even the best “ fine ” silver of commerce contains a few thousandth-parts of copper or other base metal. To produce perfectly pure metal the most popular method is to first prepare pure chloride (by apply- ing the method given below under “Chloride” to a nitric solution of any kind of ordinary “silver”), and then to reduce the chloride to metal, which can be done in a great variety of ways. One way is to mix the dry chloride intimately with one-fifth of its weight of pure quicklime or one-third of its weight of dry carbonate of soda, and to fuse down the mixture in a fire-clay crucible at a bright red heat. In either case we obtain a regulus of silver lying under a fused slag of chloride—2AgCl (CaO or Na,CO,) = 2Ag(CaCl,+O or 2NaCl+CO,+0). The fused metal is best granulated by pouring it from a sufli- cient height, and asa thin stream, into a mass of cold water. A convenient wet-way method for small quantities is to boil the recently precipitated chloride (which must have been produced and washed in the cold) with caustic soda-ley and just enough of sugar to take away the oxygen of the Ag,O transitorily produced. The silver in this case is obtained as a yellowish-grey heavy powder, which is easily washed by decantation ; but it tends to retain unreduced chloride, which can be removed only by fusion with carbonate of soda.

Stas recommends the following process as yielding a metal which comes nearer ideal purity. Slightly cupriferous silver is made into dry nitrate and the latter fused to reduce any platinum nitrate that may be present to metal. The fused mass is taken up in dilute aiminonia and diluted to about fifty times the weight of the silver it contains. The filtered (blue) solution is now mixed with an ex- cess of solution of sulphite of ammonia, SO,(NH,),, and allowed to stand. After twenty-four hours about one-half of the silver has separated out in crystals ; from the mother-liquor the rest comes down promptly on application of a water-bath heat. The rationale of the process is

that the sulphite hardly acts upon the dissolved oxide of silver, but it reduces some of the oxide of copper, 2Cu0, to Cu,O, with formation of sulphate SO,(NH,).._ This Cu,O deox!- dizes its equivalent of Ag,O, forming Ag+Cu,O,, which latter 1s reduced by the stock of sulphite and reconverted into Cu,O which now acts upon a fresh equivalent of Ag,O ; and so on to the end.

SILVER

Pure silver (ingot) has a beautiful white colour and _ lustre ; it is almost as plastic as pure gold, and, like it,) very soft. Jt does not tarnish in natural air ; but in air | contaminated with ever so little sulphuretted hydrogen it | gradually draws a black film of sulphide. The specific | gravity of the frozen metal is 10-42 to 10°51, rising to 10°57 after coinpression under adie. It is the best con- ductor of heat and electricity. The expansion of unit length from 0° to 100° C. is 0:001936 (Fizeau). The specific heat is 0°0570 (Regnault), 0°0559 (Bunsen). It fuses at 954° C. (Violle)—v.e., far below the fusing point of copper or gold—without oxidation, unless it be in con- tact with a surface of silicate (porcelain glaze, &c.), when a trace of silicate of Ag,O is produced. It volatilizes appreciably at a full red heat; in the oxyhydrogen flame it boils, with formation of a blue vapour. The fused metal readily absorbs oxygen gas (under fused nitre as much as twenty times its volume—Gay-Lussac). When the oxygenated metal freezes the absorbed gas goes off suddenly at the temperature of solidification, and, by forcing its way through the solid crust produces volcanic eruptions of metal which are sometimes very beautiful. The presence of even very little base metal in the silver prevents this ‘‘spitting,” the base metal combining with the oxygen faster than it can be reabsorbed. Pure silver retains a trace of the absorbed oxygen permanently, and Dumas in an experiment on one kilogramme of metal extracted from it 82 milligrammes of oxygen in an ab- solute vacuum at 400°-500°C. Water, and ordinary non-oxidizing aqueous acids generally, do not attack silver in the least, hydrochloric acid excepted, —which, in the presence of air, dissolves the metal very slowly as chloride. solution of common salt acts similarly, the liberated

sodium becoming NaOH. Aqueous hydriodic acid, even in the absence of air, dissolves silver perceptibly, with | evolution of hydrogen (Deville).

Aqueous nitric acid dis- solves the metal readily as nitrate ; hot vitriol converts it into a magma of crystalline sulphate, with evolution of sulphurous acid. Silver is absolutely proof against the action of caustic alkali leys, and almost so against that of _ fused caustic alkalies even in the presence of air. It ranks in this respect next to gold, and is much used to make vessels for chemical operations involving the use of fused caustic potash or soda. The ordinary “ fine” metal is good enough for this purpose.

Stiver ALLoys.—Pure silver is too soft to make durable coins or vessels combining lightness with stability of form. This defect can be cured by alloying it with a little copper. All ordinary “silver” articles consist of such alloys. The proportion of silver in these (their fineness”) is habitually stated in parts of real | silver per 1000 parts of alloy. In Great Britain all silver coins | are made of “standard silver,” the fineness of which, by legal definition, 1s 925. The toleration is 4 units (of pure silver in 1000 of alloy), i.¢., a specimen passes as long as its fineness lies between 925 and 921 (compare Mint, vol. xvi. p. 488). As regards silver- plate the “Hall” in London refuses to stamp any poorer alloy. In Germany and in the United States all silver coins, in France and Austria the major silver coins, are of the fineness 900, with a toleration of 8 units. The minor coins of Austria are of the fine- ness 375 to 520; in France all silver coins under one franc contain _ 835 of silver, 93 of copper, and 72 of zinc in 1000 parts. The | neness prescribed by law or custom for “silver” articles is 950 or 800 (£5) in France, 750 in North Germany, 812°5 in South Ger- | many, and 820 in Austria. All these alloys at least are liable to liquation,’ which means that, although they are perfectly homo- Scneous in the crucible, they frecze into layers of not absolutely the same composition. According to Leval, passing from the skin to the core of an ingot of 900 per mille silver the difference may Amount to 3 units. Of all the alloys tried by that chemist only that Composed according to the formula Ag;Cuy, corresponding to 719 per mille of silver, remained perfectly homogeneous on freez- te He therefore tecommends this alloy for coinage; unfor- : ie however, any silver-copper alloy which contains less than Wa, out. 750 per mille of noble metal tarnishes very perceptibly in \the air, British standard silver is quite free of this defect, but it 4s Inconveniently soft, far softer than the “900” alloy.

call

The extent to which the properties of silver are modified by addition of copper depends on the fineness of the alloy produced. The addition of even three parts of copper to one of silver does not quite obliterate the whiteness of the noble metal. According to Kamarsch the relative abrasion suffered by silver coins of the degrees of finencss named is as follows :—

A VOMGSS seis ces cctsta ses 312 750 900 998 AURABIGD, ...0sc0sa0ss. il 2°3 3°9 9°5 The same observer established the following relation between fine- ness p and specific gravity in coins containing from 375 to 875 of silver per 1000 :—sp. gr. =0°001647 p+ 8°833.

The fusing points of all copper-silver alloys lies below that of pure copper; that of British standard silver is lower than even that of pure silver. For the alloys of silver with other metals than copper, see Gotp, PuaTinum, and Nicxex. The present writer has introduced an alloy of 91 of silver, 7 of gold, and 2 of nickel as a material far superior, on account of its higher rigidity, to fine silver for the making of alkali-proof vessels.

“Oxidized” silver is ordinary cupriferous silver superficially modified by immersion into sulphide of sodium solution (which produces a dark film of sulphide), or otherwise.

Silvering.—For the production of a silver coating on a basc- metallic object we have chiefly two methods. One of these is to dissolve silver in mercury and to apply this amalgam to the (care- fully cleaned) surface of the object by means of a brush. The mercury then is driven away by heat, when a coherent film of silver remains, which adheres very firmly, is quite continuons, and needs not be thick to staud polishing and other surface treatment, This very old method is to this day the best for producing a strong coating, but it is dangerous to the health of the workmen, expen- sive, and troublesome, and has becn almost superseded by the modern process of electroplating (sec ELecTro-METALLURGY, vol. viii. p. 116). Objects made of iron or steel must first be coated over with copper, and then treated as if they consisted of that metal.

For Glass-Stlvering, see Mirror, vol. xvi. p. 500.

Inscriptions on linen, consisting of black metallic silver and consequently proof against all ordinary processes of washing, can be produced by using suitably-contrived silver solutions as inks. A mere solution of nitrate of silver (1 to 8 of water)! will do, if the surface to which it is applied has been prepared by impregna- tion with a solution of 6 parts of soda crystals and 17 of gum arabic in 80 of water, and subsequent ironing. The ink must be applied with a quill or gold pen (compare vol. xiii. p. 81).

SILVER ComMpounDs.—(1) Witrate of Silver (AgNO) is made by dissolving fine silver in a moderate excess of nitric acid of 1°2 sp. gr., applying heat at the end. The solution on cooling deposits crystals—very readily if somewhat strongly acid. Even a slightly cupriferous solution deposits pure or almost pure crystals, Any admixture of copper in these can be removed by fusing the dry crystals, when the copper salt only is reduced to black oxide of copper insoluble in water and thus removable, or by boiling the solution with a little pure oxide of silver (Ag,O), which precipitates the CuO and takes its place. Nitrate of silver forms colourless transparent sonorous plates, which, if free of organic matter, remain unchanged in the light,—which agent readily produces black me- tallic silver if organic matter be in contact with the salt or its solution, One hundred parts of water dissolve, of nitrate of silver-—

at 0° ial 19°°5 IMO? (Ch

121°9 127 °7 227 1111 parts.

The solution is neutral to litmus. The salt dissolves in 4 parts of cold alcohol. Nitrate of silver fuses at 198° C. into a thin colour- less quid, which stands even higher temperatures without decom- position, Ata red heat it is reduced to metal. The fused salt, cast into the form of quill-sized sticks, is used in surgery as a cauterizing agent (‘‘ lapis infernalis,” or lunar caustic), The sticks gain in firmness if alloyed with a little nitrate of potash.

(2) Sulphate of Stlver (Ag.SO,) forms white crystals soluble in 200 parts of cold or 68 of boiling water, but more soluble in dilute sulphuric acid. It stands a red heat without decomposition.

(3) Oxide of Stlver (Ag,O) appears as a dark-brown precipitate when a solution of the nitrate is mixed with excess of caustic potash or—preferably for preparative purposes—baryta water. It is slightly soluble in water, forming a very decidedly alkaline (to litmus) solution, behaving as if it contained the (unknown) AgOH. It seems to suffer reduction in the light. In hydrogen it loses its oxygen at 100° C. (Wohler), in air from about 250° C. upwards. Solutions of numcrous organic substances and other agents reduce oxide of silver, more or less readily, to metal. Ritter produced what he took to be a perowide of silver by decom- posing a solution of the nitrate galvanically, in the form of black metallically-lustrous crystals, which gathered at the positive pole. At 110° C. these decompose almost explosively, with evolution of the 12°77 per cent. of oxygen demanded by Ag,O,; yet according to Berthclot the crystals are 4Ag,03. AgNO, + 2H,0. Buta hydrate of Ag,O, is got by the action of peroxide of hydrogen on Ag,0O.

1 Preferably blackened for visibility by incorporation of some Chinese ink (carbon),

(4) Chloride of Silver (AgCl) comes down as a precipitate when solutions of silver salts are mixed with solutions of chlorides (for preparative purposes AgNO, with HCl, which is preferable to NaCl). The mixture at first has the appearance of a milk, but on being violently shaken it divides into a curdy, heavy, easily settling precipitate and a clear solution,—more readily if the co-reagents are exactly balanced or the silver is in excess than when the precipitant predominates. Chloride of silver is as good as insoluble in water, but hydrochlorie acid, and ehloride solu- tions generally, dissolve it pereeptibly. In dilute sulphuric and nitrie acids it is as insoluble as in plain water. Even boiling oil of vitriol attacks it only very slowly. It is readily soluble in ammonia solution and reprecipitated therefrom on acidification. It dissolves in aqueous thiosulphate of soda, Na,S,O, forming the very stable salt NaAg.S,O., and in cyanide of potassium solution, forming KAg.(NC),. From either solution the silver is conven- iently recoverable only by sulphuretted hydrogen or sulphide of ammonium as an Ag,S precipitate. Chloride of silver fuses at 260° C. into a yellowish liquid,

freezing into a transparent, almost eolourless, glass of horn-like consistence (hence the name ‘‘horn- silver”). The specific gravity of frozen AgCl] is 5°45 (Karsten). It remains undecomposed, but volatilizes appreciably at a red heat. Hydrogen at a dull red heat reduces it to metal. A similar reduction is effected in even the compact ehloride by contact with zine, water, and a little dilute sulphuric acid; the reduction, however, proceeds rather slowly and is rarely quite complete. Unfused chloride of silver, when exposed to sunlight, becomes at first violct, then darker and darker, and at last black, through progressive de- ehlorination, Yet even the black final product, according to Bibra, yields up no silver to hot nitric acid.

(5) Bromide of Silver (AgBr) closely resembles the chloride. The reduction on insolation is prevented by the presence of a trace of free bromine and promoted by that of nitrate of silver. Chlorine converts the hot fused salt into chloride.

(6) Iodide of Silver (Agl), while similar on the whole to the other two haloids, presents marked peculiarities. As formed by precipitation it is distinctly yellow ; it is insoluble in, but decol- orized by, ammonia; it is less soluble in water and dilute nitric acid or other nitrate solutions than even the bromide, this latter execeding in this sense the chloride. But boiling oil of vitriol decomposes it slowly, with elimination of iodine vapours and formation of sulphate. Hydrogen at a red heat does not act upon it ; nor is it at all easily decomposed by zine and dilute acid. Pre- eipitated iodide of silver is eharacteristically soluble in solutions of alkaline iodides and in those of nitrate of silver, with forma- tion of double salts, which, however, are all decomposed, more or less completely, by addition of much water. Pure iodide of silver, even if recently precipitated, is not changed by sun- light, but if contaminated with nitrate of silver it readily blackens, For action of light on silver haloids, see PhoroGrapnHy.

Anatysis.—In a solution of salts derived from purely oxygenated acids the least trace of silver can be detected by hydrochloric acid, which precipitates the silver as chloride (see above), The precipitate, when produced in a possibly complex solution, may inelude the chlorides of lead (PbCl) and mereurosum (Hg,Cl,). Repeated treatment of the (washed) precipitate with boiling water extracts the lead chloride; then by pouring ammonia on the

precipitate we convert the Hg,Cl, into an insoluble black body, while the chloride of silver dissolves and, from the filtrate, can be precipitated by acidification. For the quantitative determination of silver, the ordinary laboratory method is to bring the metal into solution as nitrate and then to throw it down as pure chloride. The chloride is washed, collected, dehydrated by fusion, and weighed. According to Stas, if O=16, Ag=107‘93 and Cl=35°454; hence the chloride contains 0°75273 of its weight of metal.

The assaying of silver ores is done preferably in the ‘‘dry way”; in fact relatively poor ores cannot be assayed satisfactorily in any other. The general method with sulphureous ores is to mix them, as powders, with (silver-free) oxide of lead and tartar, and fuse in a clay or graphite crucible. The regulus includes all the silver. The fuse is poured into a eonical mould of cast- iron, when the metal goes to the bottom of the mould ; the ingot, after cooling, is easily separated from the adhering slag. The slag-free regulus is then placed in a little cupel made out of com- pressed bone-ash, and is heated in a mutile to redness and kept at this temperature in the eurrent of air which pervades the mufile in virtue of its disposition in the furnace until all the lead and base metals generally have been sucked up by the porous cupel. The remaining ‘‘button” of metal is weighed, which gives the eonjoint weight of the silver and gold, which latter metal is rarely absent. For its determination the button is rolled out into a piece of thin sheet, which is “‘parted” with nitrie acid (see GoD). The gold remains and goes to the balance; the weight of the silver is found by difference. Similarly, to determine the fineness of silver alloys, a known weight of the alloy—customarily 0°5 gramme—is ‘‘eupelled,” with addition of a proportion of pure lead depending on the weight of base metal to be removed, as shown by

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the following table, which, however, holds strictly only for copper. silver alloys :—

Fineness 1000-900…..... 80 units of lead per unit of copper.

” 900-850…..... 64

i 800-750…..640- 53 i a3) below vats Onmereeese 50-40 .

In a well-appointed laboratory two operators who work into each other’s hands ean easily make several dozen of sucli assays in a day. Cupelling, indeed, is the promptest of all methods of ang. lysis, only the results are not quite as exact as is desivable in the case of precious metal, part of the silver being lost b volatilization, and part by being sucked into the cupel. The error attains its maximum in the ease of alloys of about 700 per mille, aud with these eomes to about 735th of the weight of the silver to be determined. It of eourse can be, and always is being, corrected to some extent by ‘‘blank” assays made with known weights of pure silver and pure copper; but such corrections are not quite safe. Hence cupellation nowadays, in the mints at least, is used only for a first approximation, and the exact fineness determined by the “wet-way” process, invented by Gay-Lussac. See ASSAy1ng, Wolk, tk Yee V2

A most excellent method for the quick determination of a not approximately known weight of dissolved silver has been invented by Volhard. This method rests on the fact that solutions of sulphocyanates (including that intensely red salt Fe(NCS); which is produced when, for instance, NCS.H is mixed with ferrie sul. phate) precipitate silver completely from even strongly acid solu tions, as NCS.Ag. A convenient reagent for the method is pro- duced by dissolving 3 NCS.NH, grammes of (chlorine-free) sulphocyanate of ammoninm in water to 1000 c.c. to produce a solution of which 1 ¢.c. precipitates about 345 Ag=10°8 milligrammes” of silver. To determine the exact ‘‘titre,” we dissolve, say, 540 milli- gramines of pure silver in 1°2 nitric acid, and next boil away every trace of N,O3. We then dilute to say 50 c.c.,add 5 c.c, of saturated solution of iron alum (not less), and, lastly, run in sulphocyanate — from the burette, until the red colour of ferric sulphocyanate which — appears locally from the first, by addition of the last drop of NCS solution, has become permanent on stirring. Supposing 49°3 cc of solution to have been required to reach this point, every lee of reagent precipitates £4. milligrammes of silver, and it, of course, always does so, even, let us add, in the presence of (say) 70 per cent. of eopper beside 80 of silver in the alloy under operation. Volhard’s — method is more exact, and, with a small number of samples, takes even less time, than eupellation. (W. D.)

Mode of Occurrence.—Silver is rarely found in the native state, and then only in comparatively small quanti- ties. Most of the ores of silver are difficult to reduce, and it is therefore deemed safe to regard this as the last of the three great coining metals which came into use. Silver is originally as widespread as gold, occurring in nearly all the volcanic rocks and some of the Primary — ones. In the Silver Reef district of Utah it is found in sedimentary sandstone, though this appears to have undergone some change from volcanic action. But gold remains unaltered by the action of the elements, and is — often carried away long distances from its original place of occurrence by the breaking down of the rocks which contain it and their formation anew elsewhere, either as other rocks or as “placers” of gravel or sand, containing gold easily washed out by hand or with rude appliances. Silver, on the contrary, is only to be found in the rocks where it originally occurs. When these are broken down or worn away, the silver is either driven into new mineral combinations, or, more commonly, dissipated and lost. Hence silver is only to be obtained by subterranean mining, and demands the aid of capital and associated labour. The greater rapidity with which gold can be obtained has often influenced the legal relation of value between these two metals, and its bearing upon prices, commerce, and civilization.

Cost of Production.—In nearly all silver ores there 1s some gold, and in nearly all gold ores some silver. In the £70,000,000 worth of metal produced from the Comstock lode of Nevada nearly one-half in value consisted of gold. For this and other reasons, it is impossible to determme the general average cost of producing gold and silver from all the mines during any reasonably long period of time If recent statistics are to be trusted, both metals are pro

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duced on the average at a loss. Such is alleged to have – been the case in California, Australia, and Nevada,} countries whose combined product has equalled in value nearly £600,000,000.

Value.—In some ancient states the value of silver ap- pears to have been superior to that of gold.?, Agatharchides informs us that such was the case in ancient Arabia; and Tacitus says the same of ancient Germany. Strabo alleges that the ratio of value in a country bordering that of the Sabzeans was at one time one gold to two silver; and so late as the 17th century silver and gold were valued equally in Japan. Going back to a remote antiquity, silver appears to have been everywhere equal in value to gold until the silver mines showed signs of exhaustion, when, as the principal coins were of copper and silver, and prices were commonly expressed in these coins, the threatened decrease of money was probably averted and a profit secured for the state by raising the legal value of gold coins. In Greece, in the time of Herodotus (cf. iii. 95), gold was 13 times the value of silver, at which ratio it appears to have stood for a long period.

When the Romans acquired the placer mines of Pan- nonia, Dacia, Spain, Gaul, &c, they made their principal coins of gold; and at a later period, when the supplies of this metal fell off, they raised the legal value of silver coins to one-tenth that of gold ones of like weight and fineness, This ratio was afterwards changed to 11, and still later to 12 silver for 1 gold. In the Arabian states of the 7th century the ratio was about 64 for 1; yet in France at the same time it was 10 for 1; in England during the 12th century it was 9 for 1; in France during the 14th

century certain silver and gold coins of like weight bore the same value, hence the ratio was 1 for 1; in Castile and Leon in 1454—74 it was 74 for 1. Speaking broadly, between the rise of Mohammedanism and the opening of | the silver mines of America the value of silver compared with gold gradually rose. It is evident that there were two lines of ratios, the one having an Indo-Arabic, the | other a Romano-Germanic origin, and that the conflict _ of ratios—which only ceased when America was discovered _ and a great coinage of the precious metals occurred in _ Spain—gave rise to many of those otherwise inexplicable _ lowerings of coins, of one or the other metal, which charac- _ terize this period.

In Spain, by the edict of Medina (1497), the ratio was 103. When America was plundered the first fruits were gold, not silver; whereupon Spain, in 1546, and before _ the wealth of the silver mines of Potosi was known, raised | the legal value of gold to 134, and, as Spain then mono- polized the supplies of the precious metals, the rest of the world was obliged to acquiesce in her valuation. During the following century Portugal obtained such immense quantities of gold from the East Indies, Japan, and Brazil that the value of her imports of this metal exceeded £3,000,000 a year, whilst those of Spain had dwindled to £500,000 in gold, and had only increased to

£2,500,000 in silver. Portugal now governed the ratio, _ and in 1688 raised the value of gold to 16 times that of silver. Except during a brief period of forty years, _ this ratio has ever since been maintained in Spanish and

British America and the United States. A century later

the spoils of the Orient were exhausted, the Brazilian

placers began to decline, and Portugal lost her importance.

Spain thus again got control of the ratio, and, as her colonial produce was chiefly silver, she raised its value

_ in 1775 from one-sixteenth to one-fifteenth and a half _ | “2

q F DelMar, Hist. Prec. Metals, chap. xxxi. Boeckh, Political Economy of the Athenians, book i. chap. 6.

| = Sir Edward J, Reed, Japan, chap. xviii.; DelMar, Money and | Civilization, chap. xx.

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that of gold for the Peninsula, permitting it to remain at one-sixteenth in the colonies. France, whose previous ratio (that of 1726) was 144, adopted the Spanish ratio of 154 in 1785, and has adhered to it ever since. These three historical ratios, and the bearing of each upon the others, have influenced

all legislation on the subject, and, where there was no legislation, have governed the bullion markets for more than two centuries.

Meanwhile an economical school arose which, while conceding it to be necessary that the state should fabri- cate coins, denied it the right to limit the number of coins, or to exact payment (seigniorage) for coinage. This school found expression in the Act 18 Charles II. (1666), which permitted private persons to have coined for them an unlimited quantity of gold or silver, at the public mint, free of charge. Similar Acts were passed in Holland, France, and other countries. But the crown retained the right to regulate the nominal value of gold and silver coins, the exercise of which has had the greatest influence on the relative market value of those metals.

To check abuses of this prerogative the economical school next directed its efforts towards the adoption of one in place of two metals for full legal tender coins. The principal advocates of this change during the last century were Dutot (1739) and Desrotours (1790), and during the present one Lord Liverpool (1808), De Quincey (1849), and Chevalier (1856). The policy thus advocated was practically adopted in Holland and England during the 18th century, and by the latter definitively in 1816. It was accepted by the Monetary Conference assembled at Paris June 20, 1867, and by the Commercial Convention at Berlin October 20, 1868. In 1871 it was practically, though not definitively, adopted by Germany, and since that date by several smaller states, including distant Japan. In France (1874) and the United States (1873-78) the policy pursued has been a waiting one. Full legal tender silver coins continue to be employed for money, but the state has ceased to coin silver on private account. Either Germany, France, or the United States may, by simple enactment, and without recoinage or change of coins, return to the “bimetallic” basis of money.

The closure of the mints of all important commercial countries to silver, while they have remained open to the free coinage of gold at a fixed valuation, has enhanced the purchasing power of gold, compared with either silver or other commodities, about one-fourth. The price of uncoined silver being usually quoted in gold, this pheno- menon appears as a “‘fall of silver,” by which term it is commonly known. This alleged fall, its causes, conse- quences, and remedies, constitute the “ Silver Question.”

Production.—In the principal producing countries—the United States, Mexico, Chili, and Peru—mining is free, and there are no official returns of the production, which is therefore mere matter of conjecture. In the United States it is the custom to value silver bullion at one- sixteenth that of gold. This unduly swells the value of the conjectural product of that country more than one- fourth (see Report of the United States Monetary Com- mission of 1876, Appendix, pp. 1-66). From a careful consideration of the bullion movement, the total annual product of silver throughout the world at the present time is estimated at between 50 and 60 million ounces, at which figure it has remained steady upwards of ten years.

Consumption in the Arts.—Direct inquiries as to the quantity of silver used in the arts have met with little success, and the statistics so obtained are defective. But the total production of silver in the Western World, from the discovery of America to the present time, has been, in value, about 1400 million pounds sterling, of

which about 300 million pounds remain in coins. Conse- XXIT. — 10

quently 1100 millions, or nearly four-fifths, have been consumed in the arts, lost, &., or exported to Asia. There are estimated to be about 50 or 60 million pounds sterling worth of silver coins in India,! and some trifling amounts each in China, Japan, Persia, &c. On the whole it appears quite safe to estimate the average annual con- sumption of silver in the arts and through wear, tear, and loss as fully equal to three-fourths of the production. Lowe in 1822 estimated it at two-thirds. Silver is princi- pally used for plate and jewellery; it is also consumed in photography, and in numerous chemical preparations, such as lunar caustic, indelible ink, hair dyes, fulminating powder, &e. (A. DE.)

SILVERIUS, the successor of Pope Agapetus I., was a legitimate son of Pope Hormisdas, born before his father entered the priesthood. He was consecrated on June 8, 536, having purchased his elevation to the see of St Peter from the Gothic king Theodotus. Six months afterwards (Dec. 9) he was one of those who admitted Belisarius into the city. He opposed the restoration of the patriarch Anthimus, whom Agapetus had deposed, and

thus brought upon himself the hatred of Theodora, who desired to see Vigilius made pope. He was deposed accordingly by Belisarius in March 537 on a charge (not improbably well founded) of treasonable correspondence with the Goths, and degraded to the rank of a simple monk. He found his way to Constantinople, and Justinian, who entertained his complaint, sent him back to Rome, but Vigilius was ultimately able to banish his rival to Pandataria, where the rest of his life was spent in obscurity. The date of his death is unknown.

SILVESTER I, bishop of Rome from January 314 to December 335, succeeded Melchiades and was followed by Marcus. The accounts of his papacy preserved in the Inber Pontificalis (7th or 8th century) and in Anastasius are little else than a record of the gifts said to have been conferred on the Roman Church by Constantine the Great. He was represented at the council of Nice, and is said to have held a council at Rome to condemn the heresies of Arius and others. The story of his having baptized Con- stantine is pure fiction, as almost contemporary evidence shows the emperor to have received this rite near Nico- media at the hands of Eusebius, bishop of that city. According to Déllinger, the entire legend, with all its details of the leprosy and the proposed bath of blood, cannot have been composed later than the close of the 5th century, while it is certainly alluded to by Gregory of Tours (od. 594) and Bede. ‘The so-called Donation of Constantine was long ago shown to be spurious, but the document is of very considerable antiquity and, in Déllinger’s opinion, was forged in Rome between 752 and 777. It was certainly known to Pope Hadrian in 778, and was inserted in the false decretals towards the middle of the next century.

SILVESTER II., pope from 999 till 1003, and previ- ously famous, under his Christian name of Gerbert, first as a teacher and afterwards as archbishop successively of Rheims and Ravenna, was an Aquitanian by birth, and was educated from his boyhood at the abbey of St Gerold in Aurillac. Here he seems to have had Gerald for his abbot and Raymond for his instructor, both of whom were among the most trusted correspondents of his later life. From Aurillac, while yet a young man (adolescens), he was carried off to the Spanish march by “Borrell, duke of Hither Spain” for the sake of prosecuting his studies in a district where learning, at that time,

flourished more luxuriantly than in Aquitania. Borrell entrusted his young protegé to the care of a certain Bishop Hatto, under whose instruc- tion Gerbert made great progress in mathematics. In

1 R, B. Chapman, Financial Department of Government of India.

this duke we may certainly recognize Borel, who, accord. ing to the Spanish chroniclers, was count of Barcelony from 967 to 993, while the bishop may probably be identified with Hatto, bishop of Vich or Ausona from c. 960 to 971 or 972. In company with his two patrons Gerbert visited Rome, where the pope, hearing of the young student's proficiency in music and astronomy, induced him to remain in Italy, and before long intro. duced him to the emperor Otto I.

When brought before the emperor, Gerbert admitted his skill in all branches of the quadrivium, but lamented his comparative ignorance of logic. Eager to supply this deficiency he seized the opportunity of following Lothaire's ambassador Garamnus, archdeacon of Rheims, to this city, for the sake of studying under so famous a dialec- tician in the episcopal schools which were then (c. 972% rising into reputation under the care of Archbishop Adalbero (969-989). So promising a_ scholar soon attracted the attention of Adalbero himself, and Gerbert was speedily invited to exchange his position of learner for that of teacher. At Rheims he seems to have studied and lectured for many years, having amongst his pupils, now or ata later time, Hugh Capet's son Robert, after- wards king of France, and Richer, to whose history we owe almost every detail of his master's early life. Accord- ing to this writer Gerbert's fame began to spread over western Europe, throughout Gaul, Germany, and Italy, till it roused the envy of a rival teacher, Otric of Saxony, in whom we may doubtless recognize Octricus of Magde- burg, the favourite scholar of Otto I., and, in earlier days, the instructor of St Adalbert, the apostle of the Bohemians. Otric, suspecting that Gerbert erred in his classification of the sciences, sent one of his own pupils to Rheims to take notes of his lectures, and, finding his suspicions correct, accused him of his error before Otto IL. The emperor, to whom Gerbert was well known, appointed a time for the two philosophers to argue before him; and Richer has left a long account of this dialectical tourna-

ment at Ravenna, which lasted out a whole day and was only terminated towards evening at the imperial bidding. The date of this controversy seems to have been about Christmas 980, and it was probably followed almost imme- diately by Otric's death, October 1, 981.

It must have been about this time (c. 982) that Gerbert received the great abbey of Bobbio from the emperor. That it was Otto IT., and not, as formerly supposed, Otto I., who gave him this benefice, seems evident from 4 diploma quoted by Mabillon (Annales, iv. 121). Richer, however, makes no mention of this event; and it is only from allusions in Gerbert's letters that we learn how the new abbot's attempts to enforce his dues waked a spirit of discontent which at last drove him in November 983 to take refuge with his old patron Adalbero. It was to no purpose that he appealed to the emperor and empress for restitution or redress; and it was perhaps the hope of extorting his reappointment to Bobbio, as a reward for his services to the imperial cause, that changed the studious scholar of Rheims into the wily secretary of Adalbero. It was a time of great moment in the history of Western Europe. Otto II. died in December 989, leaving the empire to his infant heir Otto III. Lothaire claimed the guardianship, and attempted to make use of his position to serve his own purposes in Lorraine, which would in all probability have been lost to the empire had it not been for the indefatigable efforts of Adalbero and Gerbert. Into the obscure details of the succeeding years,

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| Mouzon, near Sedan (June 2, 995). _ prohibition Gerbert appeared in his own behalf, The events

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as they have to be pieced together from the letters of Gerbert and the hints of Richer or the later annalists, there is no need to enter here. Gerbert's policy is to be identified with that of his metropolitan, and was strongly influenced by gratitude for the benefits that he had received from both the elder Ottos.

According to M. Olleris's arrangement of the letters, Gerbert was at Mantua and Rome in 985. Then followed

| the death of Lothaire (2d March 986) and of Louis V.,

the last Carolingian king, in May 987. Later on in the same year Adalbero crowned Hugh Capet (1st June) and his son Robert (25th December). Such was the power of Adalbero and Gerbert in those days that it was said their influence alone sufficed to make and unmake kings. The archbishop died 23d January 989, having, according to his secretary's account, designated Gerbert his successor before his decease. Notwithstanding this, the influence of the empress Theophania secured the appointment for Arnulf, a bastard son of Lothaire. The new prelate took the oath of fealty to Hugh Capet and persuaded Gerbert to remain with him. When Charles of Lorraine, Arnulf's uncle, and the illegitimate son of Louis D'Outremer, surprised Rheims in the autumn of the same year, Gerbert fell into his hands and for a time continued to serve Arnulf, who had now gone over to his uncle's side. He had, however, returned to his allegiance to the house of Capet before the fall of Laon placed both Arnulf and Charles at the mercy of the French king (c. 30th March 991). Then followed the council of St Basle, near Rheims, at which Arnulf confessed his treason and was degraded from his office (17th June 991). In return for his services

| Gerbert was elected to succeed the deposed bishop.

The episcopate of the new metropolitan was marked by a vigour and activity that were felt not merely in his own diocese but as far as Tours, Orleans, and Paris. Mean- while the friends of Arnulf appealed to Rome, and a papal legate was sent to investigate the question. As yet Hugh Capet maintained the cause of his nominee and forbade the prelates of his kingdom to be present at the council of Notwithstanding this

of the next few years are somewhat obscure. Council seems to have followed council, but with uncertain results. At last Hugh Capet died in 996, and, shortly after, his son Robert married Bertha, the widow of Odo, count of Blois. The pope condemned this marriage as adulterous ; and Abbo of Fleury, who visited Rome shortly after Gregory V's accession, is said to have procured the restoration of Arnulf at the new pontiff's demand. We

may surmise that Gerbert left France towards the end of 995, as he was present at Otto III.'s coronation, May 21, 996. Somewhat later he became Otto's instructor in arithmetic, and had been appointed archbishop of Ravenna before May 998. Karly in the next year he was elected pope (April 999), and took the title of Silvester IL. In this capacity Gerbert showed the same energy that had characterized his former life. He is generally credited with having fostered the Splendid vision of a restored empire that now began to fill the imagination of the young emperor, who is said to have confirmed the papal claims to eight counties in the Ancona

"march. Writing in the name of the desolate church at

Jerusalem he called upon the warriors of Christendom to arm themselves in defence of the Holy City, once "the light of the world," but now fallen so low. Thus he Sounds the first trumpet-call of the crusades, though almost 4 century was to pass away before his note was repeated 'by Peter the Hermit and Urban IL!

1 This letter,

even if spurious as now suspected, is found in the

| lith-century Leyden MS., and is therefore anterior to the first

. crusade,

Nor did Silvester II. confine himself to plans on a large scale. He is also found confirming his old rival Arnulf in the see of Rheims ; summoning Adalbero or Azelmus of Laon to Rome to answer for his crimes; judging between the archbishop of Mainz and the bishop of Hildesheim ; besieging the revolted town of Cesena; flinging the count of Angouléme into prison for an offence against a bishop ; confirming the privileges of Fulda abbey ; granting charters to bishoprics far away on the Spanish mark ; and, on the eastern borders of the empire, erecting Prague as the seat of an archbishopric for the Slavs. More remarkable than all his other acts is his letter to St Stephen, king of Hun- gary, to whom he sent a golden crown,

and whose kingdom he accepted as a fief of the Holy See. It must, however, be remarked that the genuineness of this letter, in which Gerbert to some extent foreshadows the temporal claims of Hildebrand and Innocent III., has been hotly contested, and that the original document has long been lost. All Gerbert's dreams for the advancement of church and em- pire were cut short by the death of Otto IIL, 4th February 1002; and this event was followed a year later by the death of the pope himself, which took place 12th May 1003. His body was buried in the church of St John Lateran, where his tomb and inscription are yet to be seen.

A few words must be devoted to Silvester II. as regards his attitude to the Church of Rome and the learning of his age. He has left us two detailed accounts of the proceedings of the council of St Basle; and, despite his reticence, it is impossible to doubt that he was the moving spirit in Arnulf's deposition. On the whole it may be said that his position in this question as to the rights of the papal see over foreign metropolitans resembled that of his great predeeessor Hincmar, to whose authority he constantly appeals. But it is useless to seek in his writings for any defini- tion of the relationship of these powers laid down with logical pre- eision. He is rather the practised debater who will admit his opponent's principles for the moment when he sees his way to moulding them to his own purposes, than the philosophical states- man who has formulated a theory from whose terms he will not move. Roughly sketched, his argument is as follows. Rome is indeed to be honoured as the mother of the ehurches ; nor would Gerbert oppose her judgments except in two cases—(1) where she enjoins something that is contrary to the decrees of a universal couneil, such as that of Nice, or (2) where, after having been once appealed to in a matter of ecclesiastical discipline and having re- fused to give a plain and speedy decision, she should, at a later date, attempt to call in question the provisions of the metropolitan synod called to remedy the effects of her negligence. The decisions of a Gregory or a Leo the Great, of a Gelasius or an Innocent, prelates of holy life and unequalled wisdom, are accepted by the universal church ; for, coming from sueh men, they cannot but be good. But who could recognize in the cruel and lustful popes of later days,—in John XII. or Boniface VII., ‘‘monsters, as they were, of more than human iniquity,”—anything else than “Anti- christ sitting in the temple of God and showing himself as God ?” Gerbert proceeds to argue that the church

councils admitted the right of metropolitan synods to depose unworthy bishops, but coutends that, even if an appeal to Rome were necessary, that appeal had been made a year before without effect. This last clause prepares us to find him shifting his position still further at the council of Causey, where he advances the proposition that John XVI. was represented at St Basle by his legate Seguin, archbishop of Sens, and that, owing to this, the decrees of the latter council had received the papal sanction. Far firmer is the tone of his later letter to the same archbishop, where he contends from his- torical evidence that the papal judgment is not infallible, and encourages his brother prelate not to fear excommunication in a righteous cause, for it is not in the power even of the successor of Peter ‘‘to separate an innocent priest from the love of Christ.”

Besides being the most distinguished statesman Gerbert was also the most accomplished scholar of his age. But in this aspect he is rather to be regarded as the diligent expositor of other men’s views than as an original thinker. Except as regards philo- sophical and religious speculation, his writings show a range of interest and knowledge quite unparalleled in that generation. His pupil Richer has left us a detailed account of his system of teaching at Rheims. So far as the trivium is concerned, his text-books were Victorinus’s translation of Porphyry’s Isagoge, Aristotle’s Categories, and Cicero’s Zopics with Manlius’s Commentaries. From dialectics he urged his pupils to the study of rhetoric; but, recognizing the necessity of a large vocabulary, lie accustomed them to read the Latin poets with care. Virgil, Statius, Terence, Juvenal, Horace,

Persius, and Lucan are specially named as entering into a course of training which was rendered more stimulating by a free use of open discussion. More remarkable still were his methods of teach- ing the quadrivium. To assist his lectures on astronomy he con- structed elaborate globes of the terrestrial and celestial spheres, on which the course of the planets was marked ; for facilitating arith- metical and perhaps geometrical processes he constructed an abacus with twenty-seven divisions and a thousand counters of horn. MSS. of those classical authors that his own library did not contain. More extraordinary still was his knowledge of music—an accomplish- ment

which seems to have been his earliest recommendation to Otto I. Probably he was beyond his age in this science, for we read of Garamnus, his first tutor at Rhcims, whom he attempted to ground in this subject: ‘Artis difficultate victus, a musica rejectus est.” Gerbert’s letters contain more than one allusion to organs which he seems to have constructed, and William of Malmesbury has preserved an account of a wonderful musical instrument still to be seen in his days at Rheims, which, so far as the English chronicler’s words can be made out, seems to refcr to an organ worked by steam. The same historian tells us that Gerbert borrowed from the Arabs (Saraceni) the abacus with ciphers (but see NuMERALS, vol. xvii. p. 627). Perhaps Gerbert’s chief claim to the remembrance of posterity is to be found in the care and expense with which he gathered together MSS. of the classical writers. His love for literature was a passion. In the turmoil of his later life he looked back with regret to his student days; and ‘for all his troubles philosophy was his only cure.” Everywhcre —at Rome, at Treves, at Moutier-en-Der, at Gerona in Spain, at Barcelona—he had friends or agents to procure him copies of the great Latin writers for Bobbio or Rheims. To the abbot of Tours he writes that he is ‘‘labouring assiduously to form a library,” and “throughout Italy, Germany, and Lorraine (Belgica) is spend- ing vast sums of money in the acquisition of MSS.” It is note- worthy, however, that Gerbert never writes for a copy of one of the Christian fathers, his aim being, seemingly, to preserve the fragments of a fast-perishing secular Latin literature. It is equally remarkable that, despite his residence on the Spanish mark, he shows no token of a knowledge of Arabic, a fact which is perhaps sufficient to overthrow the statement of his younger contemporary Adhemar as to his having studied at Cordova. There is hardly a trace to be found in his writings of any acquaintance with Greek.

So remarkable a character as that of Gerbert left its mark on the age, and fables soon began to cluster round his name. Towards the end of the 11th century Cardinal Benno, the opponent of Hildebrand, is said to have made him the first of a long line of magician popes. Orderic Vitalis improves this legend by details of an intervicw with the devil, who prophesied Gerbert’s threefold elevation in the famous line that Gerbert’s contemporaries attri- buted to the pope himself:

Transit in R. Gerbertus in R. post papa vigens R.

A few years later William of Malmesbury adds a love adventure at Cordova, a compact with the devil, the story of a speaking statue that foretold Gerbert's death at Jerusalem-—a prophecy fulfilled, somewhat as in the case of Henry IV. of England, by his dying in the Jerusalem church of Rome, —and that imaginative story of the statue with the legend ''Strike here," which, aftcr having found its way into the Gesta Romanorwm, has of late been revived in the Earthly Paradise.

Gerbert's extant works may be divided into five classes. (a) A collection of letters, some 230 in number. These are to be found for the most part in an 11th- century MS. at Leyden. Other important MSS. are those of the Barberini Library at Rome (late 16th century), of Middlehill (17th century), and of St Peter's abbey, Salzburg. With the letters may be grouped the papal decrees of Gerbert when Silvester IT. (6) The Acta Concilit Remensis ad Sanctum Basolum, a detailed account of the proceedings and discourses at the great council of St Basle ; a shorter account of his apologetic speeches at the councils of Mouzon and Causey; and drafts of the decrees of two or three other councils or impcrial constitutions promulgated when he was archbishop of Ravenna or pope, The important works on the three above-mentioned councils are to be found in the llth-century Leyden MS. just alluded to. (c) Gerbert's theological works com- prise a Sermo de Informatione Episcoporum and a treatise entitled De Corpore et Sanguine Domini, both of very doubtful authenticity. (d) Of his philosophical works we only have one, Libellus de Rationalt et Ratione uti, written at the request of Otto III, and preserved in an llth-century MS. at Paris. (e) His mathematical works consist of a Regula de Abaco Computt, of which a 12th-century MS. is to be found at the Vatican; and a Libellus de Numerorum Divisione (11th and 12th century MSS. at Rome, Montpellier, and Paris), dedicated to his friend and correspondent Constantine of Fleury, A long treatise on geometry, attributed to Gerbert, is of somewhat doubtful authenticity. To these may be added a very short disquisition on the same subject addresscd to Adalbold, and a similar one, on one of his own spheres, addressed to Constantiue, abbot of Micy. All the writings of Gerbert are collected in the edition of M. Ollcris. (FAG A

SILVESTER III. When Boniface IX. was driven from Rome early in January 1044, John, bishop of Sabina, was elected in his stead and took the title of Silvester ITI. Within three months Boniface returned and expelled his rival. Nearly three years later (December 1046) the

council of Sutri deprived him of his bishopric and priest. hood. He was then sent to a monastery, where he seems to have died.

SIMANCAS, a walled town of Spain, 84 miles south. west from Valladolid, on the road to Zamora, is situated on the Pisuerga, here crossed by a fine bridge of seventeen arches. The population within the municipal boundaries was 1258 in 1885. In the north-western angle of the town stands the Archivo General del Reino, originally 4 fortified castle, to which the national archives of Spain were removed in 1563 (the suggestion was due to Ximenez), The extensive architectural alterations and repairs which were necessary were made under the direction of Herrera, Berruguete, and Mora, and the arrangement of the papers was entrusted to Diego de Ayala. They now occupy forty- six rooms, and are arranged in upwards of 80,000 bundles (30,000,000 documents), including important private as well as state papers, ambassadors' correspondence, and the like. The archives of the Indies, originally lodged here, were transferred in the 18th century to the Lonja of Seville. Permission to consult the documents at Simancas can now be readily obtained.

SIMBIRSK, a government of eastern Russia, on the right bank of the middle Volga, with Kazaji on the N,, Samara on the E., Saratoff on the §., and Penza and Nijni-Novgorod on the W., has an area of 19,110 square miles, and a population (1882) of 1,471,164. It is occupied by the eastern parts of the great central plateau of middle Russia, which slowly rises towards the south, and gently slopes in the north towards the great Oka depression of the middle Volga. Its higher parts range from 750 to 1000 feet above the sea, and form the Zheguleff range of hills, which compel the Volga to make its great bend at Samara; while the numerous valleys and ravines which intersect it, and are excavated to a depth of 700 to 800 feet, give quite a hilly aspect to several parts of it, especially in the east, where it descends with abrupt crags towards the broad valley of the Volga. In the

west a broad depression, traversed by numerous rivers and streams, extends along the left bank of the Sura. All geological formations, from the Carboniferous upwards, are met with in Simbirsk. The Volga flows for 300 miles along the eastern boundary, separating Simbirsk from Samara. The shallow Sviyaga rises in the Samarskaya Luka Hills and flows parallel to the Volga, at a distance of 2 to 20 miles, but in an opposite direction. The Sura, also flowing northwards, waters the western part of Simbirsk ; it is navigable for more than 270 miles, and, as it is free from ice earlier than the Volga and flows towards central Russia, goods are sometimes transported by land to the Sura to be shipped on it when speedy transport is desired. Its tributaries—the Barysh, Alatyr (100 miles), Piyana, and others—are not navigable. The Usa (80 miles) and the Syzraii (100 miles) flow east and join the Volga below the Samara bend. A few lakes and marshes are met with in the west of the government. The forests, although rapidly disappearing, still cover 3,894,800 acres, while of the remainder 5,930,600 acres are arable, 1,150,800 acres prairie and pasture land, and 605,600 acres uncultivable. In the north excellent forests of timber cover large areas, but in the south they are rare. The climate is severe, and the extremes are great. Simbirsk the average temperature is 38°-7, but the ther mometcr sometimes reaches 114° F., and frosts of — 47 fF, are not uncommon ; the average rain and snow fall is only 17-6 inches. South of the Samara Hills the climate 18 much less severe, and gardening, which is prosecuted with great difficulty in the north, flourishes there.

The population, which was but 1,192,510 in 1867, had reached 1,471,164 in 1882, of whom only 100,740 lived in towns. The

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greater number (about two-thirds)are Great Russians, the remainder being Mordvinians (13 per cent.), Tchuvashes (9‘3 per cent.), and Tartars (8°38 per eent.), with about 1000 Jews. The Mordvinians are chiefly settled in the

north-west, in Ardatoff and Alatyr (40 and 26 per cent. of population), and on the Volga in Senghilei ; the Tehuvashes make about one-third of the population of the districts of Buinsk and Kurmysh, contiguous to Kazafi; the Tartars con- stitute about 35 per cent. in Buinsk and 18 per cent. in Scnghilei. Only the Tartars (about 100,000) are Mohammedans, the remainder peing Greek-Orthodox or Dissenters. As in other Volga govern- ments, the villages in Simbirsk are mostly large, many of them having from 3000 to 5000 inhabitants. Agriculture, favoured by a fertile soil, is the chief occupation, grain being exported or manufactured into spirit. Linseed and hempseed are cultivated for exportation, as also kitchen-garden produce and some fruit. Bee-keeping is a favourite and remunerative occupation with Mordvinians, and fishing (sturgeon) is carried on in the Volga and the Sura. The timber-trade in the north and the shipbuilding on the Sura are considerable sources of wealth ; wooden sledges and wheels are made and exported, as well as bags of lime-tree bast, — the last-named industry giving occupation to whole villages. Other petty trades, also carried on in conjunction with agriculture, are the manufacture of felts and felt hats, linen stuffs (especially among the Mordvinians), cottons, boots, and small metal wares. A character- istic feature of Simbirsk is the trade in wooden vessels, which are exported to Vyatka, Perm, Orenburg, Samara, and the Don, and there exchanged for cat, squirrel, and hare skins. Flour-mills are numerous. Watered by the Volgaand Sura, and moreover traversed in its southern portion by the railway conneeting Orenburg and Samara with Penzaand Ryazafi, by Batraki and Syzrafi, the govern- ment has an active trade. Its exports, however, are much below those of Samara and Saratoff. Batraki and Syzrafi are important eentres of traffic, the aggregate amount of merehandise entered and cleared by rail and boat being respectively 2,485,000 and 2,000,000 ewts. (timber not ineluded). The chief ports of lading on the Sura are Alatyr, Promzino-Gorodisehe, and Berezniki, each with exports valued at about 750,000 roubles. Corn, linseed, woollen stuffs, timber, potash, and wooden wares are the principal articles of trade.

Simbirsk is very backward as regards education. There were in 1882 only 462 schools (17,795 boys and 2663 girls) and 8 secondary schools (497 male and 516 female pupils).

The government is divided into eight districts, the chief towns of which, with their populations in 1880, are—Simbirsk (36,600), Alatyr (15,000), Ardatoff (4740), Buinsk (4180), Karsun (3740), Kurmysh (1930), Senghilei (3500), and Syzrafi (24,500). Kotyakoff (580) and Tagai (2400) have municipal institutions. The above- mentioned ports of lading are more important than most of the towns. ;

The first Russian settlers made thcir appearance in the Simbirsk

| region in the 14th century, but did not extend east of the Sura.

Not till two eenturies later did they cross the Sura and the district begin to be peopled by refugces from Moscow. The Zheguleff Mountains in the south still continuing to be a place of refuge for the criminal and the persecuted, Simibirsk was founded in 1648,

and a palisaded earthen wall was built, running south-west of the

new town, with small forts extending to the Sura. The region thus protected was soon settled, and, as the Russian villages advanced further south, Syzrafi was founded, and a second line of small forts, extending also towards the Sura, was erected. The colonizers settled rapidly, and the aboriginal Mordvinians soon adopted many of their customs, so as to lose their ethnographical individnality, especially within the last fifty years. Simbirsk received the name of au old Tartar settlement, Sinbir, situated 9 miles south of the present town, on the opposite bank of the Volga.

SIMBIRSK, capital of the above government, is situ- ated 576 miles east-south-east of Moscow, between the Volga and the Sviyaga, here separated by an isthmus only 2 miles broad. The central part of Simbirsk—the Crown (Vyenets), containing the cathedral and the best houses— is built on a hill 560 feet above the Volga, whence there 18 a beautiful view over the low left bank of the river. Adjoining is the trading part of Simbirsk, while farther down on the slope, towards the Volga, are scattered the store-houses, the shops for the sale of stoneware and other

_ merchandise brought by the steamers and boats, and the _ poorest suburbs of the city; these last also occupy the

western slope towards the Sviyaga. There are three

_ Suburbs on the left bank of the Volga, communication

with them being maintained in summer by steamers. A Sreat fire having destroyed nearly all the town in 1864, it has been again built on a new plan, still mostly of wood. The cathedral of St Nicholas dates from 1712. The new

ee one, that of the Trinity, was erected by the nobility in com- memoration of 1812. The old church of St Nicholas on the Karamzin Square is architecturally pleasing. A public garden has been laid out on the top of the Vyenets Hill and another in the outskirts of the city, while no fewer than three hundred private gardens, where fruits are grown for exportation, are scattered throughout the town. The historian Karamzin (born in 1766 in the vicinity of Sim- birsk) has a monument here, and a public library bearing his name contains about 15,000 volumes. Gardening and fishing occupy many of the inhabitants. The trade is brisk, corn being the principal item, while next come potash, wool, fruits, wooden wares, and manufactured pro- duce. The Simbirsk fair, having a turnover of some 6 million roubles, still maintains its importance. The popu- lation (24,600 in 1867) was 36,600 in 1880.

SIMEON (PY), second son of Jacob by Leah (Gen. xxix. 33). The tribe of Simeon, like that of Levi, was broken up at a very early period, under circumstances of which we have some indication in Gen. xxxiv. and xlix. (see IsRaEL, vol. xiii. p. 400 sg., and Levirss). In Judges i. the Simeonites appear as sharing the conquests of Judah in the extreme south of Canaan, but there is no mention of them in this region in 1 Sam. xxx., and the tribe is not named at all in the blessing of Moses. It reappears, however, in 1 Chron. iv. 24—43 (cf. xii. 25), and is reckoned to the kingdom of Ephraim (2 Chron. xv. 9; xxxiv. 6). The Arabian wars of Simeon spoken of in 1 Chron. iv. have been connected by Hitzig and others with a supposed Israelite kingdom of Massa, which they find in Prov. xxxi. 1, translating “Lemuel, king of Massa,” and comparing Gen, xxv. 14 and Isa. xxi. 11 sg., where, however, ‘it is quite gratuitous to suppose an embassy to the prophet from Israelites in Arabia. The whole speculation and the further development of Dozy (The Israelites in Mecca) is fanciful; cf. Wellhausen,

Prolegomena, Eng. tr., pp. 212 sg. The heroine of the book of Judith is made to be of the tribe of Simeon, but this book is quite unhistorical.

SIMEON or DurHam. See SyMEoN.

SIMEON STYLITES. See Monacuism, vol. xvi. p. (anil

SIMFEROPOL, the capital of the Russian government of Taurida, is situated in the south-western part of the Crimea, on the Salghir (which frequently becomes dry), 900 miles from Moscow. Occupying an admirable site on the northern slopes of the Tchatyr-dagh, it has on the eastern side many beautiful gardens, and is divided into two parts,—the European, well built in stone, and the Tartar, which consists of narrow and filthy streets peopled by Tartars and Jews. Although it has grown somewhat since the railway brought it into connexion with the rest of the empire, it still remains a mere administrative centre, without either manufacturing or commercial importance. The population was 16,550 in 1866 and 29,030 in 1881.

In the neighbourhood stood the small fortress Napoli, erected by Skilur, the ruler of Taurida, some hundred years before the Christian era, whieh existed until the end of the 3d century. Afterwards the Tartars had here their settlement Ak-metchet, which was in the 17th century the residence of the chief military commander of the khan, and had the name of Sultan-serai. In 1736 it was taken and burut by the Russians, and in 1784, after

the conquest of Crimea by the Russians, it received its present name and became the capital of Taurida.

SIMLA, a small district in the lieutenant-governorship of the Punjab, India, situated among the hills of the lower Himalayan system in 31° 6’ N. lat. and 77° 11’ E. long. It consists of several detached plots of territory, together com- prising an area of only 18 square miles. The mountains of Simla and the surrounding native states compose the southern outliers of the great central chain of the eastern Himalayas. They descend in a gradual series from the

main chain to the general level of the Punjab plain, form- ing a transverse south-westerly spur between the great basins of the Ganges and the Indus, A few miles north- east of Simla the spur divides into two main ridges, one following the line of the Sutlej in a north-westerly direc-

tion, and the other, crowned by the sanatorium of Simla,

trending south-eastwards, till it meets at right angles the mountains of the outer Himalayan system. South and east of Simla the hills between the Sutlej] and the Tons centre in the great peak of Chor, 11,982 feet above the sea. Throughout all the hills forests of deodar abound, while rhododendrons clothe the slopes up to the limit of perpetual snow. ‘The principal rivers here are the Sutlej, Pabar, Giri Ganga, Chambar, and Sarsa. The scenery of the immediate neighbourhood of Simla is very grand and picturesque, presenting a series of magnificent views. The climate is considered highly salubrious and admirably adapted to European constitutions ; the district has there- fore been selected as the site of numerous sanatoria and cantonments. The average annual rainfall amounts to about 72 inches.

The population of the district in 1881 was 42,945 (males 27,5938, females 15,352) ; Hindus numbered 32,428, Mohammedans 6935, and Christians 3353. Cultivation is widely carried on in all the lower valleys of the hills, and the fields are sown with maize, pulses, or millet for the autumn and with wheat for the spring harvest. Poppy, hemp, turmeric, ginger, and potatoes form the principal staples raised for exportation to the plains. The trade of the district centres mainly in the bazaars of Simla, which forms a considerable entrepéot for the produce of the hills. Another important trade-centre is the town of Rampur on the Sutlej, from which the great part of the shawl-wool (pashm) finds its way for exportation to British India.

The acquisition of the patches of territory forming the district dates from various times subsequent to the close of the Gurkha War in 1815-16, which left the British in possession of the whole tract of hill-country from the Gogra to the Sutlej. Kumaun and Dehra Dun were annexed to the British dominions, but the rest, with the exception of a few localities retained as military posts and a portion sold to the raja of Patiala, was restored to the hill rajas, from whom it had been wrested by the Girkhas. Garhwal state became attached to the North-Western Provinces, but the remaining

principalities rank among the dependencies of the Punjab, and are known collectively as the Simla Hill States, under the superintendence of the deputy- commissioner of Simla, subordinate to the commissioner at Ambala.

SIMLA, the administrative headquarters of the above district, and the summer capital of India, stands at an elevation of 7084 feet above sea level. Since the ad- ministration of Sir John Lawrence (1864) it has been the resort, during the hot weather, of the successive governors- general of India, with their secretaries and headquarters establishments. In 1881 it had a population of 13,258.

SIMMS, Wirtitam GinmoreE (1806-1870), an American poet, novelist, and historian, was born at Charleston, S.C., April 17, 1806, of Scoto-Irish descent. His mother died during his infancy, and his father having failed in business, and joined Coffee's brigade of mounted Indian fighters, which kept him in the Seminole country, young Simms was brought up by his grandmother, who gave him as good an education as her limited means would allow. He was clerk in a drug store for some years, and afterwards studied law, the bar of Charleston admitting him to practice in 1827, but he soon abandoned his profession for literature. At the age of eight he wrote verses, and in his 19th year he produced a Monody on Gen. Charles Cotesworth Pinckney. 'Two years later, in 1827, Lyrical and Other Poems and Karly Lays appeared ; and in 1828 he began journalism, editing with conspicuous ability and partly owning the City Gazette—a paper opposed to the doctrine of nullification. The enterprise failed, and the editor devoted his attention entirely to letters, and in rapid succession published Zhe Vision of Cortes, Cain, and other Poems (1829), The Tricolor, or Three Days of Blood

of the sea (1832). Atalantis established his fame as an author, and Martin Faber, the story of a criminal, hig first tale, written in the following year, was warmly received. From this time forward his writings became very abundant ; a classified list is given below. Though sensational and full of excessive colouring, they are held in good repute in the Southern States. During the American Civil War Simms espoused the side of the

Secessicnists in a weekly newspaper, and suffered damage at the hands of the Federal troops when they entered Charleston. He held a seat in the State legislature for some years, and the university of Alabama conferred on him the degree of LL.D, He died at Charleston on 11th June 1870.

In addition to the works mentioned above, Simms published the following poetry :—Southern Passages and Pictures, lyrical, senti- mental, and descriptive poems, 1839; Donna Florida, 1843; Grouped Thoughts and Seattered Fanctes, sonnets, 1845 ; Areytos, or Songs of the South, 1846 ; Lays of the Palmetto, 1848 ; The Eye and the Wing, 1848; The Cassique of Accabec, a Tale of Ashley River, with other pieces, 1849 ; The City of the Silent, 1850. To dramatic literature he contributed Norman Maurice, or the Man of the People ; Michael Bonham, or the Fall of the Alamo ; and a stage adaptation of Timon of Athens, all of which have been acted with success. His revolutionary romances are—The Partisan, 1835 ; Mellichampe, 1836; Katherine Walton, or the Rebel of Dorchester, 1851; The Scout (originally The Kinsman), or the Black Riders of the Congaree, 1841; Wooderaft (originally named The Sword and the Distaff), and Hutaw, 1856. These tales describe social life at Charleston, and the action covers the whole revolu- tionary period, with faithful portraits of the political and military leaders of the time. Of border tales the list includes Guy Rivers, a Tale of Georgia, 1834; Richard Hurdis, 1838; Border Beagles, 1840; Beauwehampe, 1842; Helen Halsey, 1845; The Golden Christmas, 1852; and Charlemont, 1856. The historical romances are The Yemassee, 1835, by far the greatest of his works, and dealing largely with Indian character and nature; Pelayo, 1888; Count Julien, 1845; The Damsel of Darien, 1845; The Lily and the Totem; Vasconselos, 1857, which he wrote under the assumed name of ‘Frank Cooper”; and The Cassique of Kiawah, 1860, Other novels, belonging to the series of which Martin Faber was the first, and treating principally of domestic life and motive, are Carl Werner, 1838; Confession of the Blind Heart, 1842; The Wigwam and the Cabin, a collection of short tales, 1845-46; Castle Dismal, 1845; and Marie de Berniere, 1853. Simms’s other writings comprise a History of South Carolina ; South Carolina in the Revolution, 1854; A Geography of South Carolina ; lives of Francis Marion, Capt. John Smith, The Chevalier Bayard, and General Greene; The Ghost of my Husband, 1866; and War Poetry of the South,—an edited volume,—1867. Simms was alsoa frequent contributor to the magazines

and literary papcrs, six of which he founded and inca: He wrote on a great variety of subjects, and discussed with spirit and boldness the leading political, social, and literary topics of the day. In the discussion on slavery he upheld the views of the pro-slavery party. He edited the seven dramas ascribed to Shakespeare, with notes and an introduction to each play. In the capacity of lecturer and orator, he was in frequent request on public occasions. His principal orations are The Social Principle the True Secret of National Permanence, 1842; The True Sowrees of American Independence, 1844; Self-Development, 1847; Poetry of the Practical; The Battle of Fort Moultrie; and The Moral Character of Hamlet.

SIMON MAGUS. In the extant documents of the first three centuries we meet with Simon Magus in a threefold aspect :—(1) as Samaritan Messiah attempting by the aid of Christianity to establish a new religion ; (2) as founder of a school of Gnostics and as father of heresy ; (3) as a caricature of the apostle Paul. The Tiibingen critics (Baur, Volkmar, Zeller, Lipsius, and until the year 1878 Hilgenfeld also) have tried to show that the oldest accounts are those in which Simon is represented in the last-named aspect; they have accordingly denied his existence, maintaining that all the features attributed to him in the oldest sources are accounted for by the life and personality of Paul. In particular they would explain Simon's visit to Rome by the apostle's journey thither, and further would have it that the church tradition of Peter's having gone to Rome arose solely out of the supposition that the great apostle who had withstood the

im Paris (1830), and his strongest poem, Atalantis, a story | Paul-Simon everywhere else must have followed up his

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victory in the capital of the world also. According to this

view, Simon Magus is an invention of the Jewish Christians, ,a distorted Paul, whom the church at large partly accepted as historical and partly catholicized, adding fresh touches to the picture of Simon, making him the father of all the heresies, the head of all the magi, a pseudo-Messiah, and so forth, but at last destroying the whole point of the story by adding that Peter and Paul had jointly overcome | the magian in Rome.

Were this view of the Tiibingen critics established, their whole conception of apostolic and _post-apostolic times would also be proved; it would have been made out (1) that legends of an anti-Pauline tendency form the basis of the tradition of the church ; (2) that the Acts of the Apostles is a compromise, and rests upon Jewish- Christian myths in part no longer understood ; (3) that the ecclesiastical tradition about Peter's journeyings had its origin merely in those of Paul; and (4) there would be established an indisputable example of the production of biassed and fabricated history within primitive Chris- tianity so remarkable that upon the ground of it alone we should be justified in simply regarding the greater part of the historical statements of the first two Christian centuries as deliberate inventions.

But on no other point are the proofs of the Tiibingen school weaker than in this. Only by inverting the historical order of the original documents, by dint of violent assertion, and by declaring with reference to the most important arguments that they existed in writings which now are lost, has it been possible for them to give even the appearance of stability to their hypothetical structure. The three assertions of the Tiibingen critics —(1) that the written sources of the pseudo-Clementine Homilies and Recognitions go back to the Ist century, (2) that already in these Paul has become distorted into Simon Magus and Peter is represented as having com- bated the Simon-Paul in Rome, and (3) that the Acts of the Apostles, Justin, and other chureh fathers in their | statements about Simon and about Peter's stay in Rome depend upon these Jewish-Christian writings—can none of them be proved. On the other hand,—apart from the Acts of the Apostles,—the existence of a Samaritan , magus, Simon, in apostolic times, as well as of a sect of Simonians in the 2d century (in Samaria, and elsewhere in the Roman empire), is quite conclusively attested through Justin Martyr, and also through Celsus, Clement, Hippolytus, and Origen.! Even the Tiibingen critics themselves could not deny the existence of a sect of

Simonians ; they have therefore been obliged to advance Se LS [SS eee eee ees ' The testimony of Justin derives its great importance from the fact that he was himself a Samaritan; he says expressly (Apol., ii. 15; see aso Dial., 120), rod év T@ €u@ COver doeBods Kal wAdVOU Siywwviavod didd-

yuaros Karedpdyyoa. In Apol., i. 26 he makes direct reference to Simon (see also i. 56), and remarks, kat oxédov mdyres piv Sapa pets, OAlryor BE Kal ev kAdos ZOverw, ds Tov mparov bedy Stuwva duodoyodrres, Sluwva Kad tpockuvovo:. Celsus (quoted in Orig., C. Cels., v. 62) alludes to a sect of Simonians, and says they were also called Helenians; Irenzus (Adv. Her., i. 23) is acquainted with the (‘Titual and writings of this sect; Hippolytus (Philosoph., vi. 7-20) -Sives extracts from a Simonian book’Amdédacis weydAn. Particularly | Interesting is the testimony of Origen (C. Cels., i. 573 of. vi. 11): Also Simon Magus, the Samaritan, wished to gain disciples by his Inagical arts. His impositions were virtually without result at the time, while at present, in ny belief, the number of his adherents throughout the world does not amount to thirty. And perhaps this . estimate is too high. At most there are only a few in Palestine, | while in the other parts of the world where he desired to make his _hame illustrious it is quite unknown. Where it is known, the fact Js entirely due to the Acts of the Apostles. Christians alone still Speak of him.” Some would fain find a testimony in Josephus also; | but the Jewish conjurer Simon, of Cyprus, mentioned in Ant., xx. 7 has nothing whatever to do with the Samaritan. Renan would | recognize Simon Magus in the second beast of Rev. xtii.; but this

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hypothesis ig utterly baseless,

the desperate theory that the sect arose solely on the basis of the Jewish-Christian romance of Simon.

The oldest account of Simon Magus occurs in the Acts of the Apostles. When Philip the evangelist came to Samaria about 37 a.p. he found a great religious movement going on. One named Simon had given himself out for some great person, and by dint of his extraordinary works had stirred up and gained over the whole popula- tion, who took him for the exalted manifestation of the Divine Power itself. Philip converted the majority of Simon’s adherents; and Simon himself, amazed at the deeds wrought by Philip, received baptism, and joined the evangelist’s society. Peter and John then came to Samaris to impart to the baptized the Holy Ghost by the laying

on of hands; and Simon offered the apostles money to invest him with a like power of conferring the gift. But Peter sternly rebuked him, exhorting him to repent and beseech God that the evil thought of his heart might be forgiven him. Simon thereupon begged the apostles to pray on his behalf. We have no means of checking this account, since we possess no other independent source. The author of the Acts seems to have known nothing of Simon Magus from other quarters, else he would hardly have closed the narrative as we have it. Simon is not yet viewed as hostile to Christianity. There is no justi- fication for doubt as regards the main points of this account. That in the fourth decade of the lst century a pseudo-Messiah, named Simon, appeared in Samaria; that he gained a considerable following; that he tried to effect a union with the Christian missionaries, who, however, soon perceived his real character and shook him off,—these facts must be treated as historical.2 They are vouched for by Justin, whose statement is not borrowed from the Acts.? Justin, it is true, makes no direct state- ment about any relations whatever between Simon and Christianity, but represents him as one who gave himself out for God and as the founder of an entirely new religion ; but, since on the other hand he groups him with Menander and Marcion, and thinks of him as the devil-sent father of heretics, it is plain that he knew quite well of some relation between Simon and the Christians.

The conception of Simon as the father of heresy within the church is in no way suggested in the Acts; nor has Justin in the writings which we possess given any hint of a reason why Simon should be viewed in such alight. But the testimony of the Acts (viii. 13) that Simon received baptism, and for a while joined himself to the Christians, enables us at least in some degree to understand how he afterwards got the reputation alluded to. We shall see presently, moreover, that Simon must have introduced certain Christian elements into his teaching.*

Justin has a good deal more about Simon that is not to be found in Acts :—(1) he gives his birthplace as Gittha in Samaria ; (2) he states that Simon came to Rome in the reign of Claudius, and there by his magical arts gained some followers, and was taken for a god, and that a statue was erected to him on the Tiber Island with the inscription SIMONI DEO SANCTO; and (3) he states that the adherents of Simon passed off a woman named Helena,

2 The same historical certainty cannot be claimed for the meeting of Peter and Simon, because in the Acts (ch. i.~~xv.) Peter is through~~ out pushed to the front, and because the motive assigned for his journey to Samaria is open to some suspicion. Still, the fact that even in the Jewish-Christian Acts of the Apostles Peter and Simon have personal dealings affords presumptive evidence that they did meet.

3 Unfortunately, Justin's Syntagma against the heretics, in which he dealt at greater length with Simon, is no longer extant; we are therefore limited to the meagre references in his Apology and Dialogue, and the statements of later writers who had read the Syntagma.

4 Justin repeatedly and emphatically says that Simon pretended to

be a god, and was regarded by his adherents as the Supreme God; see Dial., 120.

whom he brought to Rome with him, and who had previ- ously been a prostitute in Tyre,! as the "first idea" (xparn évvota) of Sinion.

As regards the first of these statements we may point to a Samaritan village "Git" (Karjet-Git), not quite 3 miles south-south-west from the town of Samaria.® Justin's account in this particular seems trustworthy. On the other hand, the allegation that a statue was erected to Simon in Rome is not authentic,' and consequently most critics have regarded the narrative of Simon's journey to Rome as legendary. Some suppose that Justin was led only through the words of the inscription which he has wrongly referred to Simon to believe that Simon himself was in Rome; others (the Tiibingen critics) think, on the contrary, that Justin had been already acquainted with the Jewish-Christian Acts of the Apostles, and had thence learned that Simon (Paul) had gone to Rome and that the inscription therefore only confirmed him in the belief of Simon's presence there. But in either case the distinct assertion of Justin that Simon went to Rome in the time of Claudius remains unexplained ; for the hypothesis that Justin added the arrival of Simon under Claudius because he already knew and credited the legend of Peter's having lived twenty-five years in Rome deserves no refutation.

Consequently we may assume—seeing there is absolutely no trace of any influence of the Jewish-Christian legend upon Justin—that in the Roman community, in the time of that author, a tradition was current that Simon Magus visited Rome in the reign of Claudius. We are no longer in a position to test the trustworthiness of this tradition ; but, seeing there is no indication of any tendency out of which it could have arisen, we have no ground for declar- ing it incredible. The fact attested by Justin, Celsus, and Origen, that there were Simonians also beyond the limits of Samaria (év dAAos veo), favours the view that Simon had travelled. With reference, lastly, to the statement about Helena, we have to observe that here Justin has reported a doctrine not of Simon but of the Simonians. Simon, we are to understand, came to Rome with a woman named Helena, and his adherents afterwards took her for the eon mentioned. Justin gave fuller accounts of Helena and the doctrines of the Simonians in his Syntagma ; and we know their substance from Hegesippus, Irenzus, Tertullian, pseudo-Tertullian, Epiphanius, and Philastrius. Simon, it would appear, declared himself to be "the highest power "—the Supreme God Himself; he taught that among the Jews he mani- fested himself as the Son, in Samaria as the Father, and among other nations as the Holy Spirit. Helena, whom he had purchased in a brothel at Tyre, he gave out to be his xpéry evvova, the mother of all, by whom he had called the angels and archangels into being. She had proceeded from him, had been initiated into his purposes, had voluntarily come down from heaven and become the mother of the angels and powers who created this world ; but after the completion of her work she had been laid under bonds by her own children, the world-creating angels, who desired to be independent, and who knew not the first father Simon; they imprisoned her in a human

1 This does not come directly from the extant manuscript of Justin's Apology, but from Eusebius's quotations (Euseb., H. £., ii, 18).

2 See Lipsius, Quellen der rom. Petrussage, p. 34.

3 A happy accident of the rarest kind has put us in a position to correct Justin's statement. In 1574 a stone which had once served as the base of a statue was dug out upon the Tiber Island, It bore the following inscription : SEMONI SANCO DEO. FIDIO SACRVM (see Orelli, Znscr., vol. i, p. 337

n., 1860). ‘‘Semo Sancus” is a Sabine god (Ovid, Fast., vi. 213 sg.; Lactantius, Inst. Div., i. c. 15). The inscription having been found in the very place where, according to Justin, Simon’s statue must have stood, most scholars suppose, and rightly, that Justin by mistake confounded ‘‘Semo Sancus” with ‘Simon Sanctus.”

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body, and subjected her to every affront; she had to migrate out of one body into another; she became, eg,, that Helen on whose account the Trojan War was waged; finally she found herself in a brothel, out of which Simon at length rescued her, thereby fulfilling the parable of the lost sheep. The supreme god—Simon—had come down in order to redeem his zpwérn a&vora, and to bring salva. tion to all men through the knowledge of himself. He decided upon this descent on seeing that the angels, from their desire for supremacy, were in conflict with each other and were misgoverning the worlds. He assumed every form necessary for the restoration of lost harmony: to men he appeared as man, without being really a man, and in appearance he suffered in Judea. Henceforth it was a duty to believe in Simon and Helena, but to disbelieve the prophets, who were inspired by the world- creating angels, and not by Simon. Believers in Simon are at liberty todo what they will, for by the grace of Simon should men be blessed—but not on account of good works. Should a Simonian do anything wicked he is nevertheless undeserving of punishment, for he is not wicked by nature but only of lis free-will; the law proceeded from the world-creating angels, who thought thereby to enslave their subjects; Simon, however, will bring the world to nought along with the dominion of those angels, and save all who believe on him. To this it is added that the Simonians live dissolutely, vie with each other in the practice of magic, make use of exorcisms, charms, mystic formulas, &c., and further that they wor- ship images of Simon (as Zeus) and of Helena (as Athene), under the names of “The Lord” and “The Lady.”

We may regard this account, which, according to Trenzeus, is partly based upon direct statements of the Simonians themselves, as essentially derived from the Syntagma of Justin. That we have here before us, not the genuine teaching of Simon, but the gnosis of the Simonians is very evident; this

gnosis, however, is just as much bound up with the person of Simon as is the Christian gnosis with the person of Jesus Christ. Simon is the manifested Deity Himself ; but—and herein lies the- Christian, or more properly the anti-Christian element— Simon is at the same time represented as Christ, «¢., 1s identified with Christ. The fusing together of Simon and Christ, a syncretistic-gnostic conception of the world and its creation, and an ethical antinomianism are the distinctive features of this new universal religion. That we have here an attempt to found a new religion, and that a world-religion, upon the principle of embodying all important articles of the older ones, appears also from the fact that Simon is identified not only with Christ but also with Zeus, and that Greek legends and mythologies are utilized for the system. We have therefore in Simon- ianism a rival system to Christianity, in which the same advantages are offered, and in which accordingly Christian elements are embodied, even Christ Himself being iden- tified with the Supreme God (Simon). The attempt to establish such a system in that time of religious syncretism has nothing incredible about it; and in view of the religious conditions then prevailing in the locality it cam easily be understood that it proceeded from a Samaritan.

4 This work must also have had something to say about the rela- tions of Simon to other Samaritan pseudo-Messiahs, viz., to Dositheus, Cleobulus, and Menander (see Hegesippus, quoted by Eusebius, H. E., iv. 22); but the nature of its statements can no longer be with cer tainty ascertained. We are in the dark especially as to the relation between Simon and Dositheus, But the mere fact that in Samaria, in the time of the apostles, so many Messiahs purporting to be founders of religions should have appeared on the scene is extremely interesting. It is a very noteworthy circumstance also that Justin,

Hegesippus, and Irenzus knew nothing about Peter having met Simon in Rome, and having withstood him there.

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The basis of it was laid by Simon himself, who claimed to be a god and yet derived something from the Christian missionaries , but the development was due to his followers in the 2d century, who may have borne to thevoriginal Simonians exactly the same relation as did the Valentinians to the first Christians. From the circles of these later Simonians, who

worshipped Simon especially under the mysterious name of ‘The Standing,”! a book was issued bearing the title “H droddous 7 peyddy, from which Hip- polytus has given us extracts in the Philosophumena. From these it appears—as indeed might have been expected from the statements of Irenzeus (Justin)—that the later Simonianism combined the worship of Simon with a com- plicated Gnostic system, for which it utilized the Greek mythology, as well as isolated sayings of the Old Testa- ment, of the Gospels, and of the apostolic epistles. In point of form, design, medium, and relationship to Christianity, Simonianism bears a striking resemblance to Manicheism, which sprang up two centuries later ; but Mani did not so bluntly as Simon lay claim to be a god, and the Manicheans never had the hardihood to proceed to absolute identification of Mani with Christ; as regards their tenets, however, and viewed as attempts to found a universal religion, Simonian- ism and Manichzism are widely different.

We can understand, then, how it was that the Christ- ians in the Ist and 2d centuries regarded Simon as the emissary of devils and the father of all heresy ; and we ean also understand why—apart from Samaria—this effort to establish a new religion bore little fruit. It rests upon falsifications and a wild jumbling of religions, while it is lacking in religious elements of its own.

Until about the year 220 ecclesiastical tradition knows Simon only as a devil-inspired founder of a religion, and as father of heresy ; it sees in him a caricature of Chnist, not of the apostle Paul, and it knows nothing about Peter having again confuted him after what is narrated in Acts viii. It knows indeed that Simon eame to Rome in the time of Claudius, but previous to the 3d century no ecclesiastical writer mentions his having met {with Peter there, although all state that Peter went to the capital. The first ecclesiastical author to combine the two traditions was \Hippolytus (Philos., vi. 20). Having referred to the events narrated in Aets viii., he proceeds: ‘Simon even went to Rome, and there ‘met with the apostles. As he led many astray through his sorceries, jPeter frequently withstood him. He came at last. . .2 and taught sitting under a plane-tree. When after lengthened reason- ing Simon was on the point of being worsted, he declared that if he were to be buried alive he would on the third day rise again. He aetually caused a grave to be dug for him by his disciples, and gave jorders that he should be

buried. The disciples did as they were bid, he remains in the grave, however, unto this day, for he was not Christ.” This legend is found only in Hippolytus; it evidently corresponds with the idea that Simon was a false Christ, but has no relation whatever with the notion that he was Paul. Hippolytus, ‘moreover, does not say that in Rome Simon met with Peter only, but with the apostles, i.e, with Paul and Peter. The origin of the legend is very intelligible from what we know of the historical | premises, Given that Simon alleged himself to be Christ, that in Samaria he met with Peter, that he as well as Peter afterwards travelled to Rome, then we can very easily explain the origin of a legend which brings Peter once more into personal contact with Simon in Rome, and alleges that Simon became the victim of his nefarious mimiery of Christ.

! At the same time the expression TIpbs Sluwva moAA& Iérpos ev Poun avaxaréorn makes it seem a probable thing to many that Hippolytus already knew of that legend about Simon in whieh the ‘Titbingen eritics think they have found the key to all traditions about him. In the pseudo-Clementine Recognitions and Homilies, or rather in their documentary sources, Simon plays a very im- portant part. He appears as the representative of all possible heresies, and as the great antagonist of Peter, who followed him ‘up throughout Samaria and the east coast of the Mediterranean, “engaging him in great disputations, and always coming off the “ietor, Some of the features attributed in these legends to Simon Ma indisputably borrowed from the apostle Paul, others from

Marcion, others from Valentinus and Basilides, ‘These legends !) ee SS

- Clem., Strom., ii. II, 52; Hippol., Philosoph., vi. 7 sq.: 6 éords,

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therefore arose in strict Jewish-Christian anti-Pauline circies ; we find them, however, in the Recognitions and Homilies already sub- jected to catholic revision. This revision cannot have taken place before the first half of the 8d century, and probably is of much later date. The age of the documentary sources cannot be exactly determined; they may be very old; but what is of most importance is (1) that their influence upon church tradition cannot be traced before the 8d century, and (2) that in those Jewish-Christian sources, as well as in the Homilies and Recognitions themselves, only disputations between Peter and Simon in Samaria and adjacent countries are narrated, nothing whatever being said of any con- troversies between Simon and Peterin Rome. Even if, therefore, the Simon of the Jewish-Christians bears unmistakable traces of Paul, it is also true on the other hand that these Jewish-Christians knew nothing of a journey of Simon to Rome. Henee all the com- binations of the Tiibingen critics as to the origin of the ‘‘ Peter tradition,” and as to the origin of the statement that Simon came to Rome, completely fall to the ground. Hippolytus was the first to combine “Peter in Rome” and “Simon in Rome,” without knowing anything whatever of a Simon-Paul legend. Not until after his day, after the Jewish-Christian legends had become naturalized in the catholic church through the medium of the Recognitions and Homilies, did these legends become current within the church, and only there. It now began to be told that Paul and Peter? had gone to Rome to withstand Simon. Simon was now represented partly in accordance with those Jewish- Christian legends, the tendency of which was not understood. Much, however, that was new was added, such as that Simon appeared before the emperor, that he miserably perished in attempting to fly, and so on. From the 8d (or rather 4th) century the Simon of church tradition becomes invested with some features of Paul in a distorted form. The Recognitions, as trans- lated by Rufinus, were extensively read in the East, and, along with the Acts of the Apostles, kept fresh the memory of the great magian and his Helena in the Middle Ages, Simon also came to figure in popular literature. “Doctor Faustus” has preserved several traits of the ancient magian. Neither are Pauline characteristics wanting in the legendary Faustus ; they are traceable even in

the Faust of Goethe, the “homunculus” of the Simon-Faust being originally a travesty of the “new man” who according to Paul is created through the Gospel. It was not only as the great magian, however, that Simon remained known to the Middle Ages, but also as the first who attempted to purchase spiritual gifts with money, an association made permanent in the word “simony.”

Sources.—Acts viii, 5-24; Justin, Apol., i. 26-56, ii. 14, and Dial. c. Tryph., 120; Hegesippus, ap. Euseb., H. H., iv. 23; Celsus, ap. Orig., C. Cels., v. 623 Trenzus, Adv, Har, i. 23, et al.; Tertullian, De fdolol., 9, Apolog., 18, De Pra- sertpt., 10-33, De Anima, 34-57, De Fuga, 12; Clement Alex., Strom., ti. 11, 52, vii. 17,107; Hippolytus, Syntagma (Pseudo-Tertull., Philastr., 29, Epiph., Her., 21), Philos., vi. 7-20; Origen, C. Cels., i. 57, vi. 11, and vy. 1l.; Eusebius, Z. £., ii. 1, 14 sq.; Arnobius, Adv. Gentes, ii. 12; Pseudo-Cyprian, De Rebapt., 16, 17; Pseudo- Ignatius, Ad. Trall., 11; Homil. Pseudo-Clementis, vv. ll.; Recognit. Pseuto-Clem., vy. ll.; Cyril, Catech., vi, 15 ; Jerome, De Vir. Jil., 1, Com. in Matth., c.24; Consttt. Apost., vi. 809; Ambrose, Heraem., iv. 8; Sulpicius Severus, His¢., ii. 41; Theo- doret, HZ. F.,i.1; Acta Petri et Pauli, 49; Acta Pseudo-Marcelli, Pseudo-Lint, Pseudo-Abdix, &e.

Sources for Samaritan Pseudo-Messiahs contemporary with Simon.—(1) For Dositheus: Hegesippus, ap. Euseb., H. Z., iv. 22; Hippolytus, Syntagma (Pscudo- Tertull., Philast., 4, and Epiph., Her.,18); Recognit. Pseudo-Clementis, i. 54, ii, 8-11; Origen, C. Cels., i. 57, vi. 11, De Princip., iv. 17, Comm. in Matth., ser. 32, Hom. 25 in Luc., in Joh., xiii, 27; Constit, Apost., vi. 8; Eusebius, in Luc., see Mai, Vet. Script. Nova Collect., i. 1, p. 155; Opus imperfect. in Matth., hom. 48; Mucarius Magnus, Apocrtt., iii, 48, iv. 15,21. (2) For Menander: Justin, Apol. i. 26, 56; Hegesippus, ap. Euseb., H. Z., iv. 22; lreneus, Adv. Her, i, 28, iii. 4; Tertullian, De Anima, 30, 50, De Resurr., 5; Hippolytus, Syntagma, &c. (8) For Clcobulus (Cleobius): Hegesippus, ap. Euseb., 2 £., iv. 22; Constit. Apost., vi. 8, 16; Pseudo-Chrysostom, Hom. 48 in Matth., opp. vi. p. cxcix; Pseudo-Ignat., Ep, ad Trail., ii.; Epiphanius, Her. 51, 6; Theodoret, H. F.,1. i. preef., 1. ii. preef.; Ep. Apocr, Pauli ad Cor., &c.

Literature.—Baur, “ Die Christusparthei in Korinth,” in the Tibinger Zeitschrift, 1831, part 4, p. 116 sq.; Baur, Paulus, 1st ed. (1845), p. 85 sg., 218 sq., 2d cd., p. 85 sg.,; Baur, Das Christenthum der drei ersten Jahrhunderte, 2d ed., p. 85 sq.; Simson, ‘‘Leben und Lehre des Simons des Magiers,” in the Zeitschrift f. Hist. Theol., 1841, part 3; Schlurick, De Stmonis M. fatis romanis, Meissen, 1844; Hilgenfeld, Die Clementinischen Recognitionen und Homilien, 1848, p. 317 sq.; Zeller, Apostel- geschichte, 1854, p. 158 sq.; Uhlhorn, Die Homilien und Recognitionen des Clemens Romanus, 1854, p. 80 sq., 281 s9¢.; Grimm, Die Samaritaner, 1854, p. 151 sq.; Volk- mar, “‘Ucberden Simon Magus der Apostelgeschichte,” in the Tubing. Theol. Jahrb., 1856, p. 279 sg.; Noack, “‘ Simon der Magier,” in Psyche, 1860, p. 257 sq.; F, K., ‘“‘ Ueber das Denkma] des Magiers Simon zu Rom,” in the Historisch-Polit. Bldtier, vol. xlvii., 1861, p. 530 sq.; Ginzel, in the Oestr. Vierteljahrschr. f. Kathol. Theol., vol. vi. 1867, p. 455 sq.; see also his Kirchenhist. Schriften, Vicnna, 1872, vol. i. p. 76 sg.; Renan, Les Apétres and L’Antechrist; Hilgenfeld, ‘“ Der Magier Simon,” in the Zettschr. f. wiss. Theol., 1868, p, 357 sg., 1874, p. 294 sq., 1878, p. 32 sq., 1881, p. 16; Huelsen, Simonts Magt vita doctrinaque, Berlin, 1868 ; Lipsius, Die Quellen der rémisehen Petrus-Sage, 1872; Harnack, Zur Quellenkritik der Geschichte des Gnosticismus, 1873; Joh. Delitzsch, “Zur Quellenkritik der altesten Berichte tiber Simon Petrus und Simon Magus,” in Theol. Studien und Kritiken, 1874, part 2, p. 213 sq.; Lipsius, ‘Simon Magus,” in Schenkel’s Bibel- lexicon, vol. v., 1875, p. 301 sq.; Ibid., ‘“‘ Petrus in Rom,” in the Jahrbb. f. Protest. Theol., 1876, p. 561 sq.; Hilgenfcld, Die Ketzergeschichte des Urchristenthuns, 1884, p. 163sg., 453 sq.; Moclicr, ‘‘ Simon Magus,” in Herzog’s R. Encykl., 2d ed., vol. xiv. p. 246 sq.; Hase, Kirchengeschichte auf der Grundlage akadem. Vor’les., part 1, 1885, p. 156 sq.; also the commentaries to the Acts of the Apostles by Meyer, Overbeck, Wendt, and others; the accounts of Gnosticism by Neander, Baur, Moller, Lipsius, Mansel, and others; and the numerous investigations with reference to the sojourn of Peter in Rome. (A. HA.)

3 See Aeta Pauli et Petri. XXII. — 11

SIMON, Asrawam (1622-1692), medallist and mod- eller, was born in Yorkshire in 1622. He was originally intended for the church, but turned his attention to art, and, after studying in Holland, proceeded to Sweden, where he was employed by Queen Christina, in whose train he travelled to Paris, He returned to England before the outbreak of the Civil War, and attained celebrity by his medals and portraits modelled in wax. During the Commonwealth he executed many medals of leading Parliamentarians, and at the Restoration he was patronized by Charles IL, from whom he received a hundred guineas for his portrait designed as a medal for the proposed order of the Royal Oak. Having incurred the displeasure of the duke of York, he lost the favour of the court, and died in obscurity in 1692. Among the more interesting of his medals are those of the second earl of Dunfermline, the second earl of Lauderdale, and the first earl of Loudon; that of the duke of Albemarle, and many other fine medals, were modelled by Abraham Simon and chased by his younger brother Thomas, noticed below.

SIMON, Ricwarp (1638-1712), the “father of Biblical criticism,” was born at Dieppe on the 13th May 1638. His early studies were carried on at the college of the Fathers of the Oratory in that city. He was soon, by the kindness of a friend who discerned the germs of those talents which were afterwards to render him so celebrated, removed to Paris and enabled to enter upon the study of theology, where he early displayed a taste for Hebrew and other Oriental languages. He was allowed great indulgence in the prosecution of his studies by the authorities of the Congregation of the Oratory, being exempted from those exercises of piety which for an entire year were binding on the other students. This dispensation aroused the ill-will and jealousy of the other Oratorian novitiates. Simon was charged with reading “heretical” books, this designation being applied to Walton’s Polyglott, the Critici Sacri, and other works of a similar kind. But this jealous opposition proved abortive. Simon, after investigation, was allowed and encouraged to continue his favourite pursuits. At the end of his theological course he was sent, according to custom, to teach philosophy at Juilly, where there was one of the colleges of the Oratory. But he was soon recalled to Paris, and employed in the congenial labour of preparing a catalogue of the Oriental books in the library of the Oratory. This gave him full access to those works, the fruits of the study of which appear so fully in

his after writings. His first essay in authorship was the publication of a work entitled Fides Heclesie Orientalis, seu Gabrielis Metropohite Philadelphiensis Opuscula, cum interpretatione Latina, cum notis (Paris, 1671), the object of which was to demonstrate that the belief of the Greek Church regarding the Eucharist was the same as that of the Church of Rome. Simon entered the priesthood in 1670, and the same year wrote a pamphlet in defence of the Jews of Metz, who had been accused, as they have so often been before and since, of having murdered a Christian child. It was shortly before this time that there were sown the seeds of that enmity with the Port Royalists which filled Simon's after life with many bitter troubles. The famous Arnauld had written a work on the Perpetuity of the Faith, the first volume of which treated of the Eucharist. M. Diroys, a doctor of theology, and a friend of Arnauld's, asked Simon his opinion of the book. Simon replied that it was one of the best works which had been published by the Port Royalists, but that it nevertheless required correction in several important passages, and agreed reluctantly, and after some delay, at Diroys's request, to write a letter referring to these passages, on the understanding that the

original was to be returned to him. The criticisms of Simon excited great indignation among the friends and admirers of Arnauld, and he felt the effects of their vin. dictiveness to the latest hour of his life. Another matter was the cause of inciting against him the ill-will of the monks of the Benedictine order. A friend of Simon's, one of the Oratorians, was engaged in a lawsuit, in' his capacity as grand vicar of Prince Neubourg, abbé of Fécamp, with the Benedictine monks of that establishment. Simon lent to his friend the aid of his powerful pen, and composed qa memorandum in which he employed pretty strong language against the opponents of his friend. They were greatly exasperated, and made loud complaints to the new general of the Oratory that they were virulently assailed by a member of the brotherhood, with which they had always been on friendly terms. The charge of Jesuitism was also brought against Simon, apparently on no other ground than that his friend's brother was an eminent member of that order. 'The commotion in ecclesiastical circles was great, and it was seriously contemplated to remove Simon not only from Paris but from France. A

mission to Rome was proposed to him, but he saw through the design, and, after a short delay dictated by prudential motives, declined the proposal. He was engaged at the time in superin- tending the printing of his Histoire Critique du Vieux Testament. He had hoped, through the influence of Pére la Chaise, the king's confessor, and the Duc de Montausier, to be allowed to dedicate the work to Louis XIV., but as His Majesty was absent in Flanders at the time the volume could not be published until the king had accepted the dedication, though it had passed the censorship of the Sorbonne, and the chancellor of the Oratory had given his imprimatur, The printer of the book, in order to promote the sale, had caused the titles of the various chapters to be printed separately, and to be put in circulation. These, or possibly a copy of the work itself, had happened to come into the hands of his ever-watchful enemies—the Port Royalists. It seems that, with a view to injure the sale of the work, which it was well known in theological circles had been long in preparation by Simon, the Messieurs de Port Royal had undertaken a translation into French of the Prolegomena to Walton's Polyglott. To counteract this proceeding Simon announced his intention of publishing an annotated edition of the Prolegomena, and actually added to the Critical History a translation of the last four chapters of that work, which had formed no part of his original plan. Simon's announcement prevented the appearance of the projected translation, but his enemies were all the more irritated against him on that account. They had now obtained the opportunity, which they had long been seeking, of gratifying their hatred of the bold Oratorian. The freedom with which Simon expressed himself on vari ous topics, and especially those chapters in which he de clared that Moses could not be the author of much in the writings attributed to him, especially aroused their oppost tion. The powerful influence of Bossuet, at that time tutor to the dauphin, was invoked; the chancellor Le Tellier lent his assistance ; a decree of the council of state was obtained, and after a series of paltry intrigues the whole impression, consisting of 1300 copies, was seized by the police and destroyed, and the animosity of his colleagues in the Oratory rose to so great a height against Simon for having so seriously compromised their order by his work that he was declared to be no longer a member of their body. Full of bitterness and disgust Simon retired to the curacy of Bolleville, to which he had been lately appointed by the vicar-general of the abbey of Fécamp.

The work thus confiscated in France it was proposed to republish in Holland. Simon, however, at first opposed this, in hopes of overcoming the opposition of Bossuet by

making certain changes in the parts objected to. The nego- tiations with Bossuet lasted a considerable time, but finally failed, and the Critical History appeared, with Simon's name on the title page, in the year 1685, from the press of Reenier Leersin Rotterdam. An imperfect edition had previously been published at Amsterdam by Daniel Elzevir, based upon a MS. transcription of one of the copies of the original work which had escaped destruction and had been sent to England, and from which a Latin and an English translation were afterwards made. The edition of Leers was a reproduction of the work as first printed, with a new preface, notes, and those other writings which had | appeared for and against the work up to that date.

The work which had excited so much controversy and opposition consists of three books, the first of which deals with questions of Biblical criticism, properly so called, such as the text of the Hebrew Bible and the changes which it has undergone down to the present day, the authorship of the Mosaic writings and of other books of Scripture, with an exposition of his peculiar theory of the existence) during the whole extent of Jewish history of recorders or annalists | of the events of each period, whose writings were preserved in the | public archives, and the institution of which he assigns to Moses.

The second book gives an account of the principal translations,

j ancient and modern, of the Old Testament, and the third contains } an examination of the principal commentators. He had, with the exception of the theory above mentioned, contributed nothing really new on the subject of Old Testament criticism, for previous critics, as Cappellus, Morinus, and others, had established many points of importance, and the value of Simon's work consisted chiefly in bringing together and presenting at one view the results of Old Testament criticism. The work is written in a clear style, and its tone is confident and frequently sarcastic. He displays great con- | tempt for tradition and the opinions of the fathers. This latter peculiarity it was which specially aroused the enmity of Bossuet and other leading Romanists.

But it was not only from the Church of | Rome that the work encountered strong opposition. The Protestants felt their stronghold—an infallible Bible—assailed by the doubts which Simon raised against the integrity of the Hebrew text. Le Clere ("Clericus"), the distinguished Dutch divine and critic, in his work Sentimens de quelques Theologiens de H ollande, controverted the views of Simon, and was answered by the latter ina tone of con- 'siderable asperity in his Réponse aux Sentimens de quelques Theo- logiens de Hollande, which he signed under the name of Pierre Ambrun, it being a marked peculiarity of Simon rarely to give his jown name, but to assume noms de guerre at various times. The remaining works of Simon may be briefly noticed. In 1689 appeared his Histoire Critique du Texte du Nouveau Testament, consisting of thirty-three chapters, in which he discusses the Jorigin and character of the various books, with a consideration of the objections brought against them by the Jews and others, the |quotations from the Old Testament in the New, the inspiration of the New Testament (with a refutation of the opinions of Spinoza), the Greek dialect in which they are written (against Salmasius), jthe Greek MSS. known at the time, especially Codex D (Canta- brigiensis), &c. This was followed in 1690 by his Histoire WE des Versions du Nouveau Testament, where he gives an account of the various translations, both ancient and modern, and discusses the manner in which many difficult passages of the New Testament have been rendered in the various versions. In 1693 Was published what in some respects is the most valuable of all his writings, viz., Histoire Critique des principaux Commentateurs du Nouvean Testament depuis le commencement du Ohristianisme jusques {@ notre temps. This work exhibits immense reading, and the information it contains is still valuable to the student. The last ie of Simon that we shall mention is his Nouvelles Observations sur le Texte et les Versions dw Nouveau Testament (Paris, 1695), which contains supplementary observations upon the subjects of the text and translations of the New Testament.

| Simon is described as a man of middle stature, with "somewhat unprepossessing features. His temper was sharp and keen, and as a controversialist he displayed a bitterness of tone and an acerbity of expression which 'tended only to aggravate the unpleasantness of controversy. He was entirely a man of intellect, free from all tendency to sentimentality, and with a strong vein of sarcasm and)satire in his

disposition. His reading was immense, and ‘his meinory powerful and retentive. He is said to have usually prosecuted his studies lying on the floor of his Apartment, on a pile of carpets or cushions. Few men have written more that is worth reading on Biblical subjects

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than he, considering the hardships and vicissitudes of his chequered life. He died at hig native city of Dieppe on the 11th April 1712, at the age of seventy-four.

The principal authorities for the life of Simon are the life or ‘‘éloge” by his grand-nephew De la Martiniére in vol. i. of the Lettres Choisies, 4 vols., Amsterdam, 1730; Graf’s article in the first vol. of the Beitr. zu. d. Theol. Wissensch., &c., Jena, 1851 ; Reuss’s article in Herzog’s Encyklopiidie, vol. xiv., new ed.; Richard Simon et son Vieux Testament, by A. Bernus, Lausanne, 1869. For the bibliography, see, in addition to the various editions of Simon’s works, the very complete and accurate account of Bernus, Notice Bibliographique sur Richard Simon, Basel, 1882. (F. C.)

SIMON, Tuomas (1623 1665), medallist, was born, according to Vertue, in Yorkshire about 1623. He studied engraving under Nicholas Briot, and about 1635 . received a post in connexion with the Mint. In 1645 he was appointed by the Parliament joint chief engraver along with Edward Wade, and, having executed the great seal of the Commonwealth and dies for the coinage, he was promoted to be chief engraver to the mint and seals, He produced several fine portrait medals of Cromwell, one of which is copied from a miniature by Cooper. After the Restoration he was appointed engraver of the king’s seals. On the occasion of his contest with the brothers Roettiers, who were employed by the mint in 1662, Simon produced his celebrated crown of Charles IL, on the margin of which he engraved a petition to the king, setting forth the excellence of his own productions and praying for redress. This is usually considered his masterpiece. An

impression of the coin fetched £225 at an auction in 1832. This admirable medallist is believed to have died of the plague in London in 1665.

A volume of The Medals, Coins, Great Seals, and other Works of Thomas Simon, engraved and deseribed by George Vertue, was published in 1753.

SIMONIDES (or Semonipes, as some write the name) or AmorGos stands midway both in time and reputation between the other two iambic poets of Greece—Archilochus and Hipponax. A native of Samos, he led a colony to the island of Amorgos in the Archipelago, and lived there about 660 B.c. in Minoa, a town of his own founding. Besides two books of iambics, we are told that he wrote elegies, and a poem on the early history of the Samians ; but only one insignificant elegy has been with any degree of plausibility attributed to him. We possess about thirty fragments of his iambic poems, written in clear and vigorous Ionic, with much force and no little harmony of versification, With Simonides, as with Archilochus, the iambic is still the vehicle of bitter satire, interchanging with melancholy, but in Simonides the satire is rather general than individual, and in other respects, especially in his gnomic and reflective tendency, he paves the way for the tragic trimeter. One of his two longer fragments dwells pathetically upon the misery of our lot, in which, as he says elsewhere, “we have many years of death, but of life only a few sad years”; the other, far his most famous poem, is a “ Pedigree of Women,” tracing their descent from different animals according to their different characters. The idea may have been suggested by the beast fable, as we find it in Hesiod and Archilochus; it is clear at least that Simonides knew the works of the former. The same conception recurs a century later in Phocylides. Simonides derives the dirty woman from a hog, the cunning from a fox, the fussy from a dog, the apathetic from earth, the capricious from sea-water, the stubborn from an ass, the incontinent from a weasel, the proud from a high-bred mare, the worst and ugliest from an ape, and the good woman froma bee. The remainder of the poem (vv. 96-118) is undoubtedly spurious. There is much beauty and feeling in Simonides’s description of the good woman; and the skilful portraits of character and

judicious selection of prominent features prove him to have been a keen observer and a real artist. The date of his death is unknown.

See Bergk, Poetw Lyrici Greet, vol. ii., Leipsic, 1882, pp. 441- 459. here is a translation in English verse of part of the poem ou women in Mure's Hist. of Gr. Lit., iii. p. 181.

SIMONIDES oF Cros (556-469 3.c.), one of the greatest poets and most accomplished men of antiquity, was born at Iulis in the island of Ceos, 556 B.c. Few poetic natures have ever been planted in more congenial soil. His native island was devoted to the worship of Apollo, the god of song; poetry had been cultivated in his family for generations ; his youth coincided with the period succeed- ing the first great burst of Holian and Doric lyric poetry ; his manhood saw the heroic struggle with Persia, when Greece first awoke to the consciousness of her national unity ; and he died before the inevitable disintegration had begun. Among his friends were all the foremost men of the day,—kings and princes like Hipparchus and Hiero and the Aleuadz and Scopade, statesmen like Pausanias and Themistocles, and poets like A'schylus, Epicharmus, and his own nephew Bacchylides. Pindar alone among his con- temporaries seems to have depreciated Simonides, perhaps not without a touch of jealousy; by all the rest he was revered as the poet laureate of emancipated Greece. He lived for the most part with his friends, whose praises he had sung for money ; we hear of him at the court of Hip- parchus in Athens, with the Scopade in Thessaly, and finally at the court of Hiero of Syracuse, where he died in 469 B.c.

His reputation as a man of learning and ingenuity is shown by the tradition that he added two new letters to the alphabet—y and »—the truth being probably that he was one of the first authors to use these symbols, before the archonship of Euclides. So unbounded were his popu- larity and influence that he was felt to be a power even in the political world; we are told that he reconciled Thero and Hiero on the eve of a battle between their opposing armies. For his poems he could command almost any price: later writers, from Aristophanes onwards, accuse him of avarice, probably not without some reason. From the numerous anecdotes preserved about him we see that he was what we should infer from his poems, a genial and courtly man, "dwelling with flowers,—like the bee, seeking yellow honey" (Fr. 47), yet not without a vein of gentle irony. To Hiero's queen, who asked him whether it was better to be born rich or a genius, he replied '" Rich, for genius is ever found at the gates of the rich."

Of his poetry we possess two or three short elegies (Fr. 85 seenis from its style aud versification to belong to Simonides of Amorgos, or at least not to be the work of our poet), several epigrams, and about ninety fragments of lyric poctry. The epigrams, written in the usual dialect of elegy, Ionic with an epic colouring, were intended partly for public and partly for private monuments. There is strength and sublimity in the former, with a simplicity that is almost statuesque, and a complete mastery over the rhythm and forms of elegiac cxpression. Those on the heroes of Marathon and Thermopyl are the most celebrated. In the private epigrams there is more warmth of colour and feeling, but here it is hard to decide which are genuine and which spurious ; few of them rest on any better authority than that of the Palatine anthology. One interesting and undoubtedly genuine epigram of this class is upon Archedice, the daughter of Hippias the Pisistratid, who, " albeit her father and husband and brother and children were all princes, was not lifted up in soul to pride." The lyric fragments vary much in character and length: one is from a poem on Artemisium, and celebrates those who fell at Thermopyle ; another is an ode in honour of Scopas ; the rest represent odes on victors in the games, hyporchemes, dirges, hymns to the gods, and other varieties. The poem on Thermopyle is reverent and sublime, breathing an exalted patriotism and a lofty national pride ; the others are full of tender pathos and deep feeling, such as evoked from Catullus the linc " Meestius lacrimis Simonideis,"' with a genial worldliness befitting one who had "seen the towns and learnt the mind of many men." For Simonides requires no standard of lofty unswerving rectitude. 'It is hard," he says (Fr. 5), "to become a truly good man, perfect as a square in hauds and feet and mind, fashioned without blame.

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Whosoever is bad, and not too wicked, knowing justice, the benefactor of cities, is a sound man. I for one will tind no fault with him, for the race of fools is infinite. ... . all men who do no sin willingly; but with necessity even the gods do not contend." recalls Hesiod, is set on a high and difficult hill (Fr. 58); let us seek after pleasure, for ''all things come to one dread Charybdis, both great virtues and wealth" (Fr. 38), and '' what life of mortal man, or what dominion, is to be desired apart from pleasure, without which even the gods' existence is not to be envied" (Fr. 71). Yet Simonides is far

from being a hedonist ; his morality, no less than his art, is pervaded by that virtue for which Ceos was renowned—oaw¢poodvy or self-restraint. His most cele- brated fragment, and one of the most exquisite and touching remains of ancient poetry, is a dirge, in which Danae, adrift with the infant Perseus on the sea in a dark and stormy night, takes comfort from the peaceful slumber of her babe. Simonides here illustrates his own saying that ‘‘poetry is vocal painting, as painting is silent poetry ” (one of the opening remarks in Lessing’s Laocoon): from the picture of the sleeping child, standing out as if in relief against the background of surging waves, and Danae in tears, we can well understand how Longinus should have commended this power of vivid presentation as a distinguishing feature in another of Simonides’s poems. This poem has been often translated. One of the best translations is that by Symonds, in the first series

of his Studies on the Greek Poets.

See Bergk, Poet# Lyrict Grect, vol. iii., Leipsic, 1882, pp. 382-535, Welcker was the first who clearly separated the fragments of the Cean Simonides from those of his namesake. Sterling (Essays and Tales, vol. i. pp. 188 sq.) has 4 poetical translation of most of them.

SIMONY is an offence against the law of the church. The name is taken from Simon Macus (q.v.). In the canon law the word bears a more extended meaning than in English law. ‘Simony according to the canonists,” says Aylifie in his Parergon, “is defined to be a deliberate act or a premeditated will and desire of selling such things as are spiritual, or of anything annexed unto spirituals, by giving something of a temporal nature for the purchase thereof ; or in other terms it is defined to be a commutation of a thing spiritual or annexed unto spirituals by giving something that is temporal.” An example of the offence occurs as early as the 3d century in the purchase of the bishopric of Carthage by a wealthy matron for her servant, if the note to Gibbon (vol. ii. p. 457) is to be believed. The offence was prohibited by many councils, both in the East and in the West, from the 4th century onwards. In the Corpus Juris Canon the Decretum (pt. ii. cause i. quest. 3) and the Decretals (bk. v. tit. 3) deal with the subject. The offender, whether simoniacus (one who had bought his orders) or simoniace promotus (one who had bought his promotion), was liable to deprivation of his benefice

and deposition from orders if a secular priest,—to confinement in a stricter monastery if a regular. No distinction seems to have been drawn between the sale of an immediate and of a reversionary interest. The innocent sémoniace promotus was, apart from dispensation, liable to the same penalties as though he were guilty. Certain matters were simoniacal by the canon law which would not be so regarded in English law, ¢.g., the sale of tithes, the taking of a fee for confes- sion, absolution, marriage, or burial, the concealment of one in mortal sin or the reconcilement of an impenitent for the sake of gain, and the doing homage for spiritualities So grave was the crime of simony considered that even infamous persons could accuse of it. English provincial and legatine constitutions continually assailed simony. Thus one of the heads in Lyndewode (bk. v.) is, ‘‘ Ne quis ecclesiam nomine dotalitatis transferat vel pro presenta tione aliquid accipiat.” In spite of all the provisions of the canon law it is well established that simony was deeply rooted in the medieval church. Dante places persons guilty of simony in the third bolgia of the eighth circle of the Inferno :—

“OQ Simon mago, O miseri seguaci, Che le cose di Dio che di bontate Deono esser spose, voi rapaci Per oro e per argento adulterate.”—Jnf., xix. 1.

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Virtue, he tells us elsewhere in language that

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The popes themselves were notorious offenders. In the ‘ canto just cited Pope Nicholas III. is made by the poet the mouthpiece of the simoniacs. He is supposed to mistake the poet for Boniface VIII., whose simoniacal practices, as well as those of Clement V., are again alluded to in Par. xxx. 147. Ata later period there was an open and con- tinuous sale of spiritual offices by the Roman curia which contemporary writers attacked in the spirit of Dante. A pasquinade against Alexander VI. begins with the lines—

- Vendit Alexander claves, altaria, Christum. Emerat ille prius ; vendere jure potest.”

Machiavelli calls luxury, simony, and cruelty the three dear friends and handmaids of the same pope. The colloquy of Erasmus De Sacerdoteis Captandis bears wit- ness to the same state of things. And, best proof of all, numerous decisions as to what is or is not simony are to be found in the reported decisions of the Roman rota.? That part of the papal revenue which consisted of first- fruits (primitix or annates) and tenths (decimz) must have been theoretically simoniacal in its origin. In England this revenue was annexed to the crown by Henry VIII. and restored to the church by Queen Anne (see QUEEN Annz's Bounty).

For the purposes of English law simony is defined by Blackstone as the corrupt presentation of any person to an ecclesiastical benefice for money, gift, or reward. The offence is one of purely ecclesiastical cognizance, and not punishable by the criminal law. The penalty is forfeiture by the offender of any advantage from the simoniaca] transaction, of his patronage by the patron, of his benefice by the presentee. An innocent clerk is under no dis- ability, as he might be by the canon law. Simony may be com- mitted in three ways,—in promotion to orders, in presentation to a benefice, and in resignation of a benefice. Thc common law (with which the canon law is incorporated, as far as it is not contrary to the common or statute law or the prerogative of the crown) has been considerably modified by statute. Where no statute applics to the case, the doctrines of the canon law may still be of author- ity. Both Edward VI. and Elizabeth promulgated advertisements against simony. The Act of 31 Eliz. c. 6 was intended to reach the corrupt patron as well as the corrupt clerk, the ecclesiastical censures apart from the statute not extending to the case of a patron. The first part of the Act deals with the penalties for election or resignation of officers of churches, colleges, schools, hospitals, halls, and societies for reward. The second part of the Act provides that if any person or persons, bodies politic and | corporate, for any sum of money, reward, gift, profit, or benefit, directly or indirectly, or for or by reason of any promise, agree- ment, grant, bond, covenant, or other assurances, of or for any sum of money, &c., directly or indirectly present or collate any person to any benefice with cure of souls, dignity, prebend, or | living ecclesiastical, or give or bestow the same for or in respect of any such corrupt cause or consideration, every such presentation, collation, gift, and bestowing, and every admission,

institution, Investiture, and induction shall be void, frustrate, and of none jeffect in law; and it shall be lawful for the queen to present,

collate unto, or give and bestow every such benefice, dignity, prebend, and living ecclesiastical for that one time or turn only ; and all and every person or persons, bodies politic and corporate, that shall give or take any such sum of money, &c., directly or indirectly, or that shall take or make any such promise, &c., shall forfeit and lose the double value of one year's profit of every such benefice, &c., and the person so corruptly taking, procuring, seeking, or accepting any such benefice, &c., shall be adjudged a – disabled person in law to have or enjoy the same benefice, &c. i Admission, institution, installation, or induction of any person to (a benefice, &c., for any suin of money, &c., renders the offender _ liable to the penalty already mentioned. But in this case the presentation reverts to the patron and not to the crown. The

penalty for corrupt resigning or exchanging of a benefice with _ cure of souls is that the giver as well as the taker shall lose double _ the value of the sum go given or taken, half the sum to go to the _ own and half to a common informer. The penalty for taking Money, &c., to procure ordination or to give orders or licence to preach is a fine of £40; the party so corruptly ordained forfeits _ £10 ; acceptance of any benefice within seven years after such corrupt entering into the ministry makes such benefice merely | void, and the patron may present as on a vacancy; the penalties

| * See Roscoe, Life of Leo X., vol. i. p. 463. i |

‘ 3 Compare the fine distinctions drawn by the casuists and attacked _ by Pascal in the twelfth of the Provincial Letters,

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are divided as in the last case. The Act is cumulative only, and does not take away or restrain any punishment prescribed by ecclesiastical law. The Act of 1 Will. and M. sess. 1, c. 16, guards the rights of au innocent successor in certain cases. It enacts that after the death of a person simoniacally

presented the offence or contract of simony shall not be alleged or pleaded to the prejudice of any other patron innocent of simony, or of his clerk by him presented, unless the person simoniac or simoniacally pre- sented was convicted of such offence at common law or in some ecclesiastical court in the lifetime of the person simoniac or simoniacally presented. The Act also declares the validity of leases made by a simoniac or simoniacally-presented person, if bona fide and for valuable consideration to a lessee ignorant of the simony. By 13 Anne c. 11, if any person shall for money, reward, gift, profit, or advantage, or for any promise, agreement, grant, bond, covenant, or other assurance for any money, &c., take, procure, or accept the next avoidance of or presentation to any bencfice, dignity, prebend, or living ecclesiastical, and shall be presented or collated thereupon, such presentation or collation and every admission, institution, investiture, and induction upon the same shall be utterly void; and such agreement shall be deemed a simoniacal contract, and the queen may present for that one turn only ; and the person so corruptly taking, &c., shall be adjudged disabled to have and enjoy the same benefice, &c., aud shall be subject to any punishment limited by ecclesiastical law. 3 and 4 Vict. c. 113, § 42, provides that no spiritual person may sell or assign any patronage or presentation belonging to him by virtue of any dignity or spiritual office held by him; such sale or assign- ment is null and void. This section has been construed to take away the old archbishop's ''option," 7.¢., the right to present to a benefice in a newly appointed bishop's patronage at the option of the archbishop. By canon 40 of the canons of 1603 an oath against simony was to be administered to every person admitted to any spiritual or ecclesiastical function, dignity, or benefice. By 28 and 29 Vict. c, 122 a declaration was substituted for the oath, and a new canon incorporating the alteration was ratified by the crown in 1866. By the canon law all resignation bonds were simoniacal, and in 1826 the House of Lords held that all resigna- tion bonds, general or special, were illegal. Special bonds have since, however, been to a limited extent sanctioned by law. 9 Geo. IV. c. 94 makes a written promise to resign valid if made in favour of some particular nominee or one of two nominees, subject to the conditions that, where there are two nominees, each of them must be either by blood or marriage an uncle, son, grand- son, brother, nephew, or grand-nephew of the patron, that the writing be deposited with the registrar of the diocese open to public inspection, and that the resignation be followed by pre-

sentation within six months of the person for whose benefit the bond is made, Cases of simony have come before the courts in which clergy of the highest rank have been implicated. In 1695, in the case of Lucy v. The Bishop of St David's, the bishop was deprived for simony. The Queen's Bench refused a prohibition (1 Lord Raymond's Rep. 447). As lately as 1841 the dean of York was deprived by the archbishop for simony, but in this case the Queen's Bench granted a prohibition on the ground of informality in the proceedings (In the Matter of the Dean of York, 2 Queen's Bench Rep., 1). The general result of the law gathered from the statutes and decisions may be exhibited as follows :—(1) it is not simony for a layman or spiritual person not purchasing for himself to purchase while the church is full an advowson or next presenta- tion, however immediate the prospect of a vacancy ; (2) it is not simony for a spiritual person to purchase for himself a life or any greater estate in an advowson, and to present himself thereto ; (3) it is not simony to exchange benefices under an agreement that no payment is to be made for dilapidations on either side ; (4) it is not simony to make certain assignments of patronage under the Church Building and New Parishes Acts (9 and 10 Vict. c. 88,132 and 33 Vict. c. 94), (5) itis simony for any person to purchase the next pre- sentation while the church is vacant ; (6) it is simony for a spiritual person to purchase for himself the next presentation, though the church be full ; (7) it is simony for any person to purchase the next presentation, or in the case of purchase of an advowson the next presentation by the purchaser will be simoniacal if there is any arrangement for causing a vacancy to be made ; (8) it is simony for the purchaser of an advowson while the church is vacant to present on the next presentation ; (9) it is simony to exchange otherwise than stmpliciter ; no compensation in money may be made to the person receiving the less valuable benefice. The law on the subject of simony has been for some time regarded as unsatisfactory by the authorities of the church. The archbishop of Canterbury has under- taken to introduce into the House of Lords a bill for the amendment of the law, the heads of which have recently (February 1886) been under the consideration of convocation. The bill proposes inter alia to prohibit the sale of next presentations and of advowsons unless under certain limitations, to abolish resignation bonds, and to sub- stitute for the present declaration against simony declarations that the presentee has not committed certain specific acts.

In Scotland simony is an offence both by civil and ecclesiastical law. The rules are generally those of the canon law. ‘There are few decisions of Scottish courts on the subject. By the Act of 1584, ce. 5, ministers, readers, and others guilty of simony provided to benefices were to be deprived. An Act of Assembly of 1753 declares pactions simoniacal whereby a minister or probationer before presentation and as a means of obtaining it bargains not to raise a process of augmentation of stipend or demand reparation or enlargement of his manse or glebe after induction. (J. Wt.)

SIMPLICIUS, the successor of Pope MHilarius or Hilarus, was a native of Tibur, and was consecrated bishop of Rome on February 25, 468. He died March 2, 483, and was succeeded by Felix ILI. His extant letters, which date from the banishment of Romulus Augustulus and the early years of Odoacer’s reign, relate almost entirely to the ecclesiastical and court intrigues of Alexandria and Constantinople in connexion with the Monophysite controversy.

SIMPLICIUS, a native of Cilicia, a disciple of Ammonius and of Damascius, was one of the last of the Neoplatonists. From 400 to 529 a.p. the Neoplatonic school at Athens was the centre of pagan opposition to victorious Christianity, and, as such, fell a victim to imperial persecution, The subvention which it had re- ceived from the state was withdrawn ; its private property was confiscated ; and at last in 529 the teaching at Athens of philosophy and jurisprudence was forbidden (Malalas, p. 451, ed. Bonn). Disestablished, disendowed, and silenced, the scholarch Damascius, Simplicius, Priscianus, and four others resolved in 531 or 532 to seek the protec- tion of Khosrau Andsharvan (or Chosroes), who had ascended the throne of Persia in the former of these years. To his court they went; but, though from this patron of Greek learning they received a hearty welcome, they found themselves unable to support a continued residence amongst barbarians. Before two years had elapsed they returned to Greece, Khosrau, in his treaty of peace concluded with Justinian in 533, expressly stipulating that the seven philosophers should be allowed " to return to their own homes, and to live henceforward in the enjoyment of liberty of conscience" (Agathias, ii. 30,31). After his return from Persia Simplicius wrote commen- taries upon Aristotle's De Calo, Physica, De Anima, and Categoriz, which, with a commentary upon the Hnchiridion of Epictetus, have survived. In his writings Simplicius, who had small pretensions to originality of doctrine, devotes himself to the exposition and reconciliation of his authorities. His respect at once for Plato and for Aristotle is so great that he refuses to acknowledge any real difference between them, even in regard to their theories of universals and of matter. His remarks are, however, thoughtful and intelligent, and his learning is prodigious. To the student of Greek philosophy his commentaries are invaluable, as they contain many fragments of the older philosophers as well as of his immediate predecessors.

The editions of the Greek text of the commentaries are as follows :—on the De Cxlo, Utrecht, by S. Karsten, 1865 (the Greek text published at Venice in 1526 is no more than a retranslation from Guil. de Moerbeka's Latin version); on the Physica, Venice, 1526, Berlin (by H. Diels), vol. i. 1882; on the De Anima (a dis- appointing work), Venice, 1527, Berlin (by M. Hayduck), 1882; on the Categorix, Venice, 1499, Basel, 1551; on the

Enchiridion, Venice, 1528, Paris (Didot), 1842, &c. On the life and writings of Simplicius, see J. A. Fabricius, Bibliotheca Graca, ix. 529 sq.; Ch. A. Brandis's excellent article in Smith's Dict. of Greek and Roman Biography ; E. Zeller, D. Phil. d. Gr., ITI. ii. 851 sq.; also Ch. A. Brandis, " Ueber d. Griech. Ausleger d. Aristot. Organons," in Abh. Berl. Akad., 1833, and C. G. Zumpt, " Ueber d. Bestand d. phil. Schulen in Athen," zd7d., 1842.

SIMPSON, Sir James Younc, Barr. (1811-1870), physician, was born in the town of Bathgate, Linlithgow, Scotland, on the 7th of June 1811. His father was a baker in that town, who largely owed a moderate success

in business to a shrewd and managing wife. James wag the youngest of a family of eight, and for the furtherance of his worldly prospects the others struggled and sacrificed, At the age of fourteen he entered the university of Edip. burgh as a student in the arts classes. Two years later he began his medical studies. At the age of nineteen he obtained the licence of the College of Surgeons, and two years afterwards took the degree of doctor of medicine, Dr Thomson, who then occupied the chair of pathology in the university, impressed with the graduation thesis, " On Death from Inflanimation," presented by Simpson, offered him his assistantship. The offer was accepted, and during the session 1837-38 he acted as interim lecturer op pathology during the illness of the professor. The following winter he delivered his first course of lectures on obstetric medicine in the extra-academical school. On February 4, 1840, he was elected to the professorship of medicine and midwifery in the university. Towards the end of 1846 he was present at an operation performed by Liston on a patient rendered unconscious by the inhalation of sulphuric ether. The success of the pro- ceeding was so marked that Simpson immediately began to use it in midwifery practice. He continued, however, to search for other substances having similar effects, and in March 1847 he read a paper on chloroform to the Medico-Chirurgical Society of Edinburgh, in which he fully detailed the history of the use of anzesthetics from the earliest times, but especially dwelt upon the advantages of chloroform over ether. He advocated its use, not only for the prevention of pain in surgical operations, but also for the relief of pain in obstetrical practice. His strong and uncompronising

advocacy of its use in the latter class of cases gave rise to one of the angriest and most widespread controversies of the time, and, although his views may not have been generally indorsed by later professional practice, anesthetics in surgical operations have from that time held an indisputed place, and Simpson's aneesthetic still con- tinues the favourite in the practice of the Edinburgh school. In 1847 he was appointed a physician to the queen in Scotland. In 1859 he advocated the use of acupressure in place of ligatures for arresting bleeding ; his views on this subject have, however, given place to improvements in the ligature and to a better knowledge of the condi- tions influencing its efficiency. His contributions to the literature of his profession and to archeology, in which latter he took an active interest, were very numerous, and embrace Obstetric Memoirs and Contributions (2 vols.), Homeopathy, Acupressure, Selected Obstetrical Works, Anesthesia and Hospitalism, Clinical Lectures on the Diseases of Women, and three volumes of essays on archeological subjects. Simpson, who had been created a baronet in 1866, died on May 6th 1870, and was accorded a public funeral; his statue in bronze now stands in West Princes Street Gardens, Edinburgh. Simpson was a man of strong individuality and somewhat hasty temper, an uncompromising and aggressive opponent when he believed himself in the right, yet so tender and sympathetic that he endeared himself to an immense circle of friends and patients. Endowed with great mental power, activity, and receptivity, he performed a very large amount of literary work, much of which was of great valuc at the time and still continues to be of interest. He will, however, be chiefly remembered in the annals of medicine

as a great personality, who brilliantly fought and won the battle for anesthetics, and introduced chloroform.

SIMPSON, Tomas (1710-1761), mathematician, was born at Market Bosworth in Leicestershire on the 20th of August 1710. His father was a stuff weaver, and, intend- ing to bring his son up to his own business, took little care of the boy's education. Young Simpson, however, was eager for knowledge, and so ardent was he in pursulb 0 it that he neglected his weaving, and in consequence of a quarrel was forced to leave his father's house. He settled

for a short time at Nuneaton, where he met a pedlar who practised fortune-telling. By the encouragement and assistance of this man Simpson was induced to make a profession of casting nativities himself, and he soon became the oracle of the neighbourhood. But he was not hong in discovering the imposture of astrology, and his conscience, as well as an accident which happened to him in the practice of his art, compelled him to abandon this profession. After a residence of two or three years at Derby, where he worked as a weaver during the day and taught pupils in the evenings, he went up to London and pursued the same course, but with more success. The number of his pupils increased ; his abilities became more widely known ; and he was enabled to publish by subscrip- tion his Treatise of Fluxions in 1737. His treatise, as was afterwards acknowledyed, abounded with errors of the press, and contained several obscurities and defects incidental to the author's want of experience and the disadvantages under which he laboured. His next publications were A Treatise on the Nature and Laws of Chance, 1740; Essays on Several Curious and Useful Subjects in Speculatwe and Mixed Mathematicks, 1740 ; The Doctrine of Annuities and Reversions deduced from General and Evident Principles, 1742; and Mathematical Dissertatwons on a Variety of Physical and Analytical Subjects, 1743. Soon after the publication of his Hssays he was chosen a member of the Royal Academy at Stock- holm ; in 1743 he was appointed professor of mathematics in the Royal Military Academy at Woolwich; and in 1745 he was admitted a fellow of the Royal Society of London. In 1745 he published A Treatise of Algebra, jwith an appendix containing the construction of geo- metrical problems, and i1 1747 the Elements of Plane Geometry. The latter book, unlike many others with the same title, is not an edition of Euclid's Zlements, but an independent treatise. Though it can hardly be said that $ an introduction to geometry it is preferable to Euclid, yet the solutions of problems contained in it (and in the appendix to the Algebra as well) are in general exceedingly ingenious. In his 7rigonometry, Plane and Spherical, with the Construction and Application of Logarithms, which 'appeared in 1748, there is a tolerably uniform use of contractions for the words sine, tangent, é&c., prefixed to phe symbol of the angle. Zhe Doctrine and Application of Fluwions, which he issued in 1750, was more full and omprehensive than his earlier work on the same subject, and altogether was so different that he wished it to be 'considered as a new book and not as a second edition of pag former. In

1752 appeared Select Lxercises for Young Proficents in the Mathematicks, and in 1757 his Miscel- laneous Tracts on Some Curious and Very Interesting Subjects nm Mechanics, Physical Astronomy, and Speculative Mathe- matics, the last and perhaps the greatest of all his works. From the year 1735 he had sometimes under his own name, Sometimes under fictitious names, been a frequent ‘ontributor to the Ladies’ Diary, an annual publication partly devoted to the solution of mathematical problems, and from 1754 till 1760 inclusive he was the editor of it. Krom first to last Simpson seems to have had his own share of the cares and anxieties of this world, and it is istonishing how under such circumstances he contrived to iccomplish what he did. His unremitting application and the want of proper regimen gradually undermined jhis health, and he died on the 14th of May 1761 at his native village. His name will probably be considered the ise illustrious in the long roll of the non-academical

athematicians of Britain.

| SIMROCK, Kart (1802-187 6), German poet and student of medieval literature, was born on the 28th ‘August 1802 at Bonn, where his father was a musicseller.

He studied law at the universities of Bonn and Berlin, and in 1823 entered the Prussian civil service, from which he was expelled in 1830 for having written a poem in praise of the July revolution. Afterwards he was per- mitted to lecture at the university of Bonn, and in 1850 he was made a professor of Old German literature. He died on the 18th July 1876.

Simrock established his reputation by his excellent modern rendering of the Nibelungenlied (1827), and of the works of Walther von der Vogelweide (1833). Among other works trans- lated by him into the German of to-day were the Arme Heinrich of Hartmann von Aue (1830), the Parzival and Titwrel of Wolfram von Eschenbach (1842), the Tristan of Gottfried of Strasburg (1852), the Edda, Beowulf, and Heliand. In the Heldenbuch (1843-49) he offered a complete representation of the heroic legends of

Germany, partly by means of translations, partly by means of independent poems. Before the publication of this work he had given evidence of an original poetical faculty in Wieland der Schnried (1835); and in 1844 he issued a volume of Gedichte in which there are many good lyrics, romances, and ballads. In 1850 appeared Lauda Sion, and in 1857 the Dewtsehe Stonsharfe, col- lections of Old German sacred poetry. Of his republications the most popular and the most valuable were the Deutsehen Volks- biicher, of which fifty-five were printed between 1839 and 1867. His best contribution to antiquarian science was his Handbuch der deutschen Mythologie (1853-55). At an early stage of his carcer Simrock took a high place among students of Shakespeare by his Quellen des Shakespeare in Novellen, Marchen, und Sagen (1881); and afterwards he translated Shakespeare's poems and a consider- able number of his dramas. Another important book was Novel- lenschatz der Italiener (1832). Among the rest of his works may be mentioned Die Rheinsagen, Das malerische und romantische

Rheinland, and his Deutsehen Kricgslicder. See Hocker, Karl Simrock (1877).

SIMSON, Roperr (1687-1768), mathematician, was the eldest son of a Glasgow merchant, John Simson of Kirktonhill in Ayrshire, and was born on the 14th of October 1687. He was intended for the church, and passed with distinction through the usual course of study for that profession at the university of Glasgow. The bent of his mind, however, was towards mathematics, not theology ; and, when a prospect was opened up to him of succeeding to the mathematical chair, he proceeded to London in order to become acquainted with some of the eminent mathematicians there and to increase his stock of mathematical knowledge. After a year's residence in London he returned to Glasgow, and in 1711 was appointed by the university to the professorship of mathe- matics. The duties of this office he discharged for half a century. During that time he published several works on pure geometry, and carried on an extensive mathematical correspondence. In 1746 the university of St Andrews, wishing to confer on him an honorary degree, chose, accord- ing to his biographer Dr William Trail, that of doctor of medicine, because in his youth he had made a careful study of botany. He never married, and his long life was spent within the

walls of his college. His habits were exceedingly regular, his hours of work and of amusement being rigorously fixed. A studious man of science, he had no relish for the promiscuous intercourse of society, and his manner of living was simple and inexpensive. In person he was tall, with a handsome countenance and an affable manner, and he used always to dress in light-coloured clothes. Though, like some other distinguished mathematicians, he was rather absent-minded, in matters of business he was very circumspect. He was a man of the strictest integrity, ready to do justice to the merits of others, and not too sensible of his own. He enjoyed a long course of uninterrupted health, and was seriously indisposed only for a few weeks before his death, which took place on the 1st of October 1768.

The first of Simson's published writings is a paperin the Philo- sophieal Transaetions of the Royal Society of London (vol. xl. p. 330, 1723) on the subject of Euclid's Porisms, the nature of which

he was the first to elucidate (see Porrsms). Then followed Sectionum Coniearum Libri V. (Edinburgh, 1735), a second edition

of which, with additions, appeared in 1750. The first three books of this treatise were translated into English, and several times printed, with the title Lhe Elements of the Conie Sections. In 1749 was published Apollonii Perger Locorum Planorum Libri IT., a restora- tion of one of Apollonius's lost treatises, founded on the lemmas given in the seventh book of Pappus's Mathematical Collection. In 1756 appeared, both in Latin and in English, the first edition of his Eueclid's Elements. This work, which contained only the first six and the eleventh and twelfth books, and to which in its English version he added the Data in 1762, has become the standard text of Euclid in England. The additions and alterations which Simson made by way of restoring the text to its '¢ original accuracy " are certainly not all of them improvements, and the notes he appended show with what an uncritical reverence he regarded the creat gcometers of antiquity. Two other works, restorations of Apollonius's treatise De Sectione Determinata and Euclid's treatise De Porismatibus, which Simson was too distrustful of himself to publish during his lifetime, were printed for private circulation in 1776 at the expense of Earl Stanhope, in a volume with the title Roberti Simson,

M.D. ; Opera Quedam Reliqua. The volume contains also two additional books De Sectione Determinata,

two small dissertations on Logarithms and on the Limits of

Quantities and Ratios, and a few problems illustrative of the ancient geomctrical analysis. How far these restorations represent the lost originals will probably always be a matter of conjecture. The De Porismatibus certainly cannot be coextensive with Euclid's three books; but, if it is only a restored fragment, the credit due to Simson's perseverance and penetration in recovering from oblivion the nature and some of the contents of one of the most interesting treatises of antiquity will always be such as to keep his name in the remembrance of geometers.

SIMSON, Witi1am (1800-1847), portrait, landscape, and subject painter, was born at Dundee in 1800, He studied under Andrew Wilson at the Trustees' Academy, Edinburgh, and his early pictures—landscape and marine subjects—were executed with great spirit and found a ready sale. He next turned his attention to figure painting, producing in 1829 the Twelfth of August, which was followed in 1830 by Sportsmen Regaling and a Highland Deerstalker. In the latter year he was elected a member of the Scottish Academy ; and, having acquired some means by portrait-painting, he spent three years in Italy, and on his return in 1838 settled in London, where he exhibited his Camaldolese Monk Showing Relics, his Cimabue and Giotto, his Dutch Family, and his Columbus and his Child at the Convent of Santa Maria la Rabida. He died in London on the 29th of August 1847.

Simson is greatest as a landscapist; his Solway Moss—Sunset, exhibited in the Royal Scottish Academy of 1851 and now in the National Gallery, Edinburgh, ranks as one of the finest examples of the early Scottish school of landscape.

His elder brother George (1791-1862), portrait-paintcr, was also a meniber of the Royal Scottish Academy, and his younger brother David (d. 1874) practised as a landscape-painter.

SINAI. In judging of the points of controversy connected with Sinai we are brought face to face with the question of the historicity of the Hebrew records involved. Though new attempts to fix the stations of the wilderness wandering appear every year, critics have long agreed that the number of forty for the years of wandering and for the stations are round numbers, and that the details are not based on historical tradition of the Mosaic age. This does not exclude the possibility that the names of some or all of the stations belong to real places and are based on more or less careful research on the part of the writers who record them. As regards the Mountain of the Law in particular, if the record of Exod. xix. sg. is strictly historical, we must seek a locality where 600,000 fighting men, or some two million souls in all, could encamp and remain for some time, finding pasture and drink for their cattle, and where there was a mountain (with a wilderness at its foot) rising so sharply that its base could be fenced in, while yet it was easily ascended, and its summit could be seen by a great multitude below. In the valley there must have been a flowing stream. The peninsula of Sinai does not furnish any locality where so great a host could meet under the conditions specified, and accordingly many

investigators give up the statistics of the number of Hebrews and seek a place that fulfils the other conditions. But when we consider that the various records embodied in the PENTATEUCH (q.v.) were composed long after the time of Moses, and that the authors in all probability never saw Sinai, and had no exact topographical tradition to fall back on, but could picture to themselves the scene of the events they recorded only by the aid of imagination, the topographical method of identifying the Mountain of the Law becomes very questionable. The Pentateuchal writers are not at one even about the name of the mountain. It used to be thought that Horeb was the name of the mountain mass as a whole, or of its southern part, while Sinai was the Mountain of the Law proper, but it has been shown by Dillmann that the Elohist and Deuteronomy always use the name Horeb for the same mountain which the Jahvist and the Priestly Code call Sinai. The Elohist belonged to Northern Israel, but Judges v. 5 shows that even in Northern Israel the other name Sinai was not unknown, And it might be shown, though that cannot be done here, that the several accounts vary not

only as regards the name but in topographical details. Thus all that can be taken as historically fixed is that after leaving Goshen the Hebrews abode for some time near a mountain called Sinai or Horeb (cf. Israut, vol. xiii. p. 396), and that this mountain or range was held to 4 holy as a seat of the Deity (Exod. ii, 1, 1 Kings xine.)

Where, then, was this mountain? The Midianites, of whom according to one source Jethro was priest, probably always lived east of the Gulf of “Akaba; yet we can hardly follow Beke in seeking Sinai beyond that gulf, but must rather think of some point in the so-called peninsula of Sinai, which lies between the Gulfs of ‘Akaba and Suez, bounded on the N. by the Wilderness el-Tih, which slopes gently towards the Mediterranean. To the south of this wilderness rises the Jebel el-‘Tih, a mass composed mainly of Nubian sandstone and cretaceous limestone, which attains in fantastic forms an altitude of some 3000 feet; its ridges converge towards the south and are cut off by great valleys from the mass now known as Mount Sinai. The latter is composed of primitive rocks,— granite, porphyry, diorite, gneiss, de. The sandstones of Jebel el- fh are rich in minerals ; inscriptions of Amenophis IIL and Thothmes III. found on the spot show that the ancient Egyptians got emerald, malachite, and kupfergriin at Sarbut al-Khadem; and still older are the turquoise and copper mines of Maghara, where inscriptions occur bearing the names of kings from Senefru and Cheops down to Rameses II, These mines were worked by criminals and prisoners of war, and the waste products of copper foundries indicate that the peninsula was once better wooded than now, of which indeed we have express testimony of post-Christian date. At present the dominant feature is bare walls of rock, especially in the primitive formations ; the steep and jagged summits have a striking effect, which is increased by the various colours of the rock and the clearness of the atmosphere. The deep-cut valleys are filled by rushing torrents after rain, but soon dry up again. In the south the centre of the main mountain mass is Mount Catherine (8540 feet), Omm Shdmar to the south-east being little lower ; this peak and north of it Mount Serbél (6750 feet), which rises more immediately from the plain, dominate the Kah, a waste expanse of sand strown with pebbles, which occupies the south-west margin of the peninsula. In the KaA‘ah is the village of Tur, and at the southern promontory (Ras Mohammed) is the little

hamlet of Sherm. The Sinai group as a whole is called by the Arabs Jebel al-Tur ; the name Sind in Arabic comes only from books. ‘The area

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of the peninsula is about 11,200 square miles, the popula- tion is four to five thousand souls, chiefly Bedouins of various tribes, whose common name, derived from Tur, is Towara. They have sheep and goats, with which they retire in summer to the higher lands, where there is good pasture ground, and where springs are comparatively common. On the chalk and sandstone water is scarcer than among the primitive rocks, and often brackish. Though the rocks are bare, there is always vegetation in the dales, especially acacias and tamarisks; from the latter (7’. mannifera) manna is still derived in quantities that vary with the rainfall, On the hills grow aromatic plants, especially Thymavee. The fauna includes the ibex, hyrax, and hyena; the panther too is sometimes found. Flights of quail have been observed. In some valleys there are well-kept gardens and good date-palms ; the most noted oasis is that of Feiran, in the north-west of the peninsula, which is watered by a perennial stream. Whether Feiran is the Rephidim of Exod. xvii. is a question which, like the identification of the other stations of the Israelites, depends on the localization of the Mountain of the Law.

There is no genuine pre-Christian tradition on this subject. The chief authority for the ancient sanctity of Mount Sinai is Antoninus Martyr (end of the 6th century), who tells that the heathen Arabs in his time still celebrated a moon feast there. As sém means “moon,” this feast has been connected with the name of Sinai, but the proposed etymology is not certain. Of heathen origin, too, are the many Nabatzan inscriptions (see Napatm#ans) of Sinai, found especially in the Wady Mokatteb (in the north-west), and sometimes accompanied by rude drawings. The language and character are Aramaic, but the proper names are mainly those of Arabs, who passing by graved their names on the rocks. That they were pilgrims to Sinai cannot be made out with certainty. The inscriptions date from the

early years of the Christian era, when the Nabateean kingdom was at its height.

In early Christian times many anchorites inhabited Sinai, living for the most part in the caves, which are numerous even in the primitive rocks. Then monasteries were built, the most famous being the great one of St Catherine in Wady el-Dér (the valley of the monastery). On Serbal, too, there were many granite dwellings, and in the neighbouring Pharan (Pheenicion), which was a bishop's see, there were, as the ruins show, churches and convents.

The question then is whether when the hermits first settled in the peninsula there existed a tradition as to the place of the Mountain of the Law, and whether they chose for their residence a spot which was already traditionally consecrated by memories significant to the Christian as well as to the Jew. No assertion of the existence of such a tradition is to be found in Josephus, who only says that Sinai was the highest mountain of the district —a _descrip- tion which might apply to Serbél as seen from the plain below. Eusebius uses expressions which may also seem to point to Serbdl as the place of the law-giving, and it must be admitted that the tradition which seeks the holy site in the group of Jebel Musa (c.c., the mass of which Mount Catherine is the highcst peak) is not older than the time of Justinian, so that the identification with Mount Serbal seems to have greater antiquity in its favour. In later times Jebel Mus& and Serbél had each its own tradition, and the holy places were pointed out at each; thus from the monastery of St Catherine a path of granite Steps was constructed up to "the Mountain of the Law," but similar steps are found at Serbal. That these traditions are not decisive, however, is admitted, more or less, even

by those moderns who, like Lepsius, Ebers, Bartlett, give their voice for Serbal. Most authorities still prefer Jebel Mus4 or some point in that group, but they again differ in details. First of all there is much difficulty in determin- ing the route by which the Hebrews approached the mountain. 'Then comes the question of finding a suitable plain for their encampment under the mountain, which is best met if, with Robinson, Stanley, Palmer, and others, the plain is taken to be that of al-Rahe and the overhang- ing mountain to be Jebel Sufsafeh. The latter is over 6300 feet high, and

consists of pasture ground; it does not fit all the details in Exodus, but this objection is quite as strong against the traditional site on Jebel] Mus& (Mount Moses), which lies farther to the south. Jebel Musa has been accepted by Tischendorf, Laborde, Ritter, Strauss, Farrar, and many others; on this view the Israelites must have encamped in the narrow Wady al-Seba‘iyeh, north of the mount. But the absence of exact topographical detail on the part of the Biblical narrators, who always speak of Sinai as if it were a single summit and give no hint about several summits of which it is one, shows that in their time there was no real tradition on the matter, and that all attempts at identification are necessarily vain.

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SINCLAIR, Str Jouy, Bart. (1754-1835), a volu- minous Scottish author, was descended from the Sinclairs of Ulbster, a branch of the noble house of Caithness. He was the eldest son of George Sinclair and Janet, daughter of William, Lord Strathnaver, and was born at Thurso Castle, 10th May 1754. Fora short time he had Logan the poet as a private tutor, and, after studying Greek and Latin at the high school of Edinburgh, entered the university in his thirteenth year. He was admitted a member of the faculty of advocates in 1775, and was subsequently called to the English bar (Lincoln’s Inn), but, prefering politics to law, was in 1780 elected member of parliament for his native county. As Caithness was then only alternately represented with Bute, he was in 1784 chosen for Lostwithiel, Cornwall, and in 1796 for Petersfield, Hampshire, his parliamentary career extending almost uninterruptedly over thirty years till July 1811. In 1782 he began the issue of those pamphlets on various subjects connected with the welfare of the nation which made him perhaps the most voluminous author of his time, his separate publications, as given in his Memoirs, amounting in all to three

hundred and sixty-seven. His reputation as a financier and political economist was firmly established by his publication in 1784 of the History of the Public Revenue of the British Empire, to subsequent editions of which was added a Review of the Financial Administration of the Right Hon. Wilham Pitt. The adoption of his plan for the issue of exchequer bills during the great commercial stagnation of 1793 pre vented the ruin of a large number of merchants and manufacturers ; and in 1797 Pitt consulted him when the treasury threatened to become exhausted, with the result that the scheme known as the “loyalty loan” was estab- lished. On 4th February 1786 Sinclair was created a baronet of Great Britain. After succeeding his father in 1770 he had set himself to improve the family estates, thus changing in a great degree the aspect of Caithness and affording employment toa largely increased number of the population. In 1791 he established at Edinburgh a society « XXII, — 12

for the improvement of breeds of sheep; and in 1793 he circulated a plan for a board of agriculture and internal improvement. When the board was shortly afterwards established by a charter from the crown he was nominated its first president. From the agricultural reports published by this society he compiled his Code of Agriculture, published in 1819. About 1790 he conceived a plan for a Statestecal Account of Scotland, and the work was published in twenty-one volumes, 1791-1799.

Sir John Sinclair was also the author of a number of tracts on naval and military subjects; and in 1794 he raised for the defence of the kingdom a regiment of a thousand men, at first called the ‘‘Caithness Fencibles,” afterwards the “Rothesay and Caithness Fencibles”; a second battalion of a thousand men was raised by him in 1795, which took part in suppressing the rebellion in Ireland in 1798. Though originally a supporter in parliament of the war policy of Pitt, he afterwards joined the “armed neutrality” party, which advocated retrenchment and reform. In 1805 he was appointed by Pitt a commis- sioner for superintending the construction of roads and bridges in the north of Scotland. He was a member of most of the agricultural societies of the Continent, and held as many as twenty-five foreign diplomas. He was a fellow of the Royal Societies of London and

Edinburgh, a fellow of the Antiquarian Society of London, and president of the Highland Society of London. No man of his time took a more comprehensive and enlightened interest in the general welfare of the country or conferred on it more substantial benefits. He enjoyed the esteem and intimate friendship of many eminent contemporaries both at home and abroad, with several of whom he kept up an extensive correspondence. He died 21st December 1835.

By his first wife, a daughter of Alexander Maitland of Stoke Newington near London, he had two daughters, of whom the elder, Hannah, was the authoress of a work on the Principles of the Christian Faith. By his second wife, the Hon. Diana Macdonald, only daughter of Alexander, first Lord Macdonald, he had thirteen children, of whom the eldest son, George (1790-1860), who sue- eeeded to the baronetey, was a schoolfellow of Byron and Peel at Harrow, and is styled by Byron the ‘prodigy of our school days”; the third son, John (1797-1875), became arehdeacon of Middlesex, and, besides the Memoirs of his father, wrote several theological works; and the fourth daughter, Catherine (1800-1864), who for many years acted as his seeretary, after his death achieved some distinetion as an authoress, her prineipal works being Modern Accomplishments, 1836; Scotland and the Scotch, 1840; Modern Flirtation, 1841; and Popular Legends and Bible Truths, 1852.

See Correspondence of the Right Hon. Sir John Sinclair, Bart., with Reminis- cences of Distinguished Characters, 2 vols., London, 1831; and Memoirs of the Life and Works of the Right Hon. Sir John Sinclair, 2 vols., Edinburgh, 1837.

SIND, the westernmost territorial subdivision of India,

and a frontier province of considerable importance in a,

geographical and political aspect, lies between the 23d and 28th parallels of N. latitude and between the 66th and 71st meridians of E. longitude. Its length from north to south is estimated at 360 miles, and the average of its breadth from east to west at 170. On the north it is bounded by the Khelat state (see Baxucuisran), the Punjab, and Bahawalpur; on the E. by Jaisalmir and Mulani, or generally the more desert tracts of Western Rajputana; on

the 8. by the Runn of Cutch (Rann of Kachh) and the Indian Ocean; and on the W. by Khelat, which overlaps it on the north. Including the alienated district of Khairpur and the extensive tract to the south called the political superintendency of the Thar and Par- kar, its area is set down as between 56,000 and 57,000 square miles.

The one great geographical feature in Sind is the lower Indus, passing, as it does, through the entire length of the province, first in a south-westerly direction, then turning somewhat to the east, then returning to a line more directly south, and finally inclining to the west, to seek an

outlet at the sea. Though there is much similarity in til appearance of the landscape on the two sides of the broad — river, the distant line of mountains between Sakhar and Sehwan, the steep pass overhanging the water at Lakki, and the hill country below Sehwan give a distinctive character to the right bank, and lend it special attraction when contrasted ~~with the flat lowlands, merging into desert, on the left. Sind has been aptly likened to Egypt, If the one depends for life and fertility on the Nile, so does the other on the Indus. The cities and towns are not so readily to be compared. Hyderabad, notwith~~ standing its remarkable fortress and handsome tombs, can_

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Map of Sind.

scarcely vie in interest as a native capital with Cairo; nor can Kurrachee, as a Europeanized capital, be said to have attained the celebrity of Alexandria. Yet there are some respects in which this particular province would not be wholly eclipsed, even in its outside pictures. It contains many monuments of archeological and architectural interest, and to the traveller descending the river from the Punjab, or ascending it from Kotri, the coup Veil on the

approach to Rohri is at times singularly striking. The beautiful little island of Khwaja Kidhr is a gem m itself ; and there is at certain seasons undoubted poetry im the very dreariness of Sakhar and Bakhar.

Owing to the deficiency of rain, the continuance of hot weather in Sind is exceptional. Lying between two monsoons, it just escapes the influence of both. ‘The south-west monsoon stops short at Lakhpat Bandar, the north-west monsoon at Kurrachee, and eved here the annual rainfall is not reckoned at more than six or eight inches, At times there is no rainfall for two or three years, while at others there is a whole season’s rainfall in one or two days. The average temperature of the summer months rises to 95° F., and the winter average is 60°, the summer maximum being 120° and the winter minimum 32°. The temperature on the sea-eoast 1s muc more equable than elsewhere. In Northern Sind we find frost i winter, while both there and in Lower Sind the summer heat 1s extreme and prolonged. This great heat, combined with the pols onous exhalations from the pools left after the annual inundation and the decaying vegetable deposits, produces the fever and ague with which the name of the country is associated, and to which even the natives themselves fall a prey.

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SIND

The soil is largely dependent on the river overflow. This grand provision of nature is, however, uncertainly exercised; and not only ig the actual volume of water supplied from the upper Indus liable to fluctuation, but the particular lands inundated or untouched by inundation vary according to the caprices of the river. Questions of alluvion and diluvion are therefore of frequent occurrence; and it is often as hard to say whether newly-thrown-up lands belong to the state or an individual proprietor as it is to decide who is the loser in the ease of lands newly submerged. In the lands which, as a rule, are reached annually and in fair proportion by the inundation, the soil is so rich as to produce two crops or even more in the year without the assistance of manure. Saltis present in great quantity. The two principal yearly crops are the vernal, known as rabi, sown in autumn and reaped in spring, and the autumnal, knownas khar‘t/,

- gown in summer while the river is high and reaped from October to

December. In some districts there is a distinct third crop called peshras, sown in March and reaped in July and August. The imple- ments of husbandry are the plough (har), drawn by two bullocks; the harrow (sahar), a heavy log of wood drawn by four bullocks, a man standing on each end; the sced-sower (ndr7), a tube fixed to the

lough with a wooden funnel on the top, used while the ground is tag ploughed for the last time ; a curved hook (ddtro) with teeth like a saw, for reaping; and a hoe (kuriah), for weeding.

The principal products are bdjri (a well-known Indian grain), and judri (the Indian millet), rice, cotton, sugar-cane, tobacco, oil-secds, wheat, barley, and indigo. Of these, wheat may be con- sidered the staple produce of Upper, and bdj7i and judri of Middle and Lower Sind. Dates, plantains, mangoes, limes, oranges, pomegranates, citrons, figs, grapes, apples, tamarinds, mulberries, and melons are said to be fruits common to the country ; and it is added that, of late years nectarines, peaches, apricots, and other fruit trees have been successfully introduced, but the statement must be received with some reservation in respect of quantity and quality. here is no doubt that the fruits imported by the Afghan traders find more favour than any home products.

Among the chief manufactures may be mentioned the gold, silver, and silk embroideries, carpets, cloths, lacquered ware, horse-trappings and other leather-work, paper, pottery, tiles, swords, and matchlocks, and the boxes and other articles of inlaid work introduced more than a century ago from Shiraz. The lac work, a widely extended industry in India, is also in vogue in Sind. Variously coloured lac is laid in succession on the boxes, &c., while turning on the lathe, and the design is then cut through the different colours. Hyderabad has long been famous for its silks and cottons, silver and gold work, and lacquered ornaments, and the district could once boast of skilled workmen in arms and armour ; but, unless the demand for the products of its industries increase, it is to be feared that its old reputation will not long be maintained. In the cloths called sudi, silk is woven with the striped cotton—a practice possibly due to the large Mohammedan population of the country, as no Moslem can wear a garment of pure silk

without infraction of the law. As regards the carpets, Sir George Birdwood states that those froth Sind are the cheapest, coarsest, and lcast durable of all made in India. Formerly they were fine in design and colouring, but of late years they have greatly deteriorated. The cheap rugs, which sell for about 9s. each, are made with the pile (if not altogether) of cow hair, woven upon a common cotton foundation, with a rough hempen shoot. ‘The patterns are bold and suited to the material, and the dyes good and harmonious.

In 1837 the zoology of Sind was reported by Burnes to com- prise of genera and species 20 mammals, 191 birds, 36 fishes, Il reptiles, besides 200 in other departments of natural history. Of wild animals we find the tiger (in the jungles of Upper Sind), the hywna, the giirkhar or wild ass (in the south part of the Thar and Parkar district), the wolf, jackal, fox, wild hog, autelope, pharho or hog deer, hares, and porcupines. Of birds of prey, the vulture and several varieties of falcon may be mentioned. The flamingo, pelican, stork, erane, and Egyptian ibis frequent the shores of the delta. Besides these there are the ubdéra (bustard) or tilér, the rock-grouse, quail, partridge, and various kinds of parrots. Waterfowl are plentiful; in the cold season the lakes or dhandhs are covered with wild geese, kulang, ducks, teal, curlew, and snipe. Among other animals to be noted are scorpions, lizards, centipedes, and many snakes.

i he domestic animals inelude camels (one-humped), buffaloes, eep and goats, horses and asses (small but hardy), mules, and

ullocks. Of fish there are, on the sea-coast, sharks, saw-fish, a and skate; cod, sir, cavalho, red-snappcr, gassir, begti,

angdra, and buru abound. A kind of sardine also frequents the Coast. In the Indus, the finest flavoured and most plentiful fish “ee palo, generally identified with the Ailsa fish of the Ganges. ambhro (Labeo rohita) and mullet, mordko (Cirrhina mrigaia), gandan (Notopterus kapirat), khago or catfish (Rita buchanani), ld saranda), shakuir, jerkho, and singhdri (Macrones aor) aL, found. Otter, turtle, and porpoise are frequently met + 80 too are long-snouted alligators and water-snakes.

The extent of forest land is relatively small. eighty-seven in number) are situated for the most part on the banks of the Indus, and extend southward from Ghotki in the Rohri deputy collectorate to the middle delta. They are described as narrow strips of land, from two to three miles in length, and ranging from two furlongs to two miles in breadth. The largest are between 9000 and 10,000 acres in arca, but are subject to diminu- tion owing to the encroachments of the stream. The wood is principally bddul (Acacia arabica), bahan (Populus cuphratica), and kandi (Prosopis spicigcra). The tali (Dalbergia Sissi) grows to some extent in Upper Sind ; the iron-wood tree (Z'ocoma undulata) is found near the hills in the Mehar districts. There are, besides, the nim (Melia Azadirachta), the pipal (Ficus religiosa), the bér (Zizyphus Jujuba). The delta has no forests, but its shores abound with mangrove trees. Of trees introduced by the forest depart- ment we have the tamarind (Tamarindus indica), several Australian wattle trees, the water-chestnut (7rapa natans), the aula (Hmblica officinalis), the bahera (Terminalia Bellerica), the carob tree (Cera- tonia Siliqua), the China tallow (Stillingia sebifera), the bél (digle Marmelos), and the manah (Bassia latifolia). There is a specially organized forest department.

For administrative purposes the province has five well-under- Terri- stood divisions :—(1) Frontier, Upper Sind, of which the principal torial town is Jacobabad, named after the late General John Jacob, divisions.

C.B., its founder ; the hamlet which occupied its site in 1843 was a mere speck in the desert, and its name, Khangarh, can hardly be associated with the fine canal and abundant vegctation now marking the locality ; (2) Shikarpur, with its capital of the same name and Sakhar, both notable places on the right bank of the Indus ; in this division also are the towns of Larkhana and Rohri, the last on the left bank of the river ; (3) Hyderabad (Hatdarabad), of which the chief town, having the same name, was the capital of the province prior to the British occupation ; (4) Kurrachee (Karachi), with its modern Europeanizcd capital and harbour and Tattha, a town of interesting local associations; (5) Thar and Parkar, an outlying district on the south-east, more or less part of the desert tract extending far and wide in that particular quarter. Besides these there is the territory of Mir' Ali Murad, Talpur, greatly curtailed of its original dimensions, but still forming a large land alienation in Upper Sind.

Where cultivation depends so much on the character of the year's Revenue,

inundation, it is natural that the revenue should be uncertain. In 1883-84, for instance, the river was abnormally low. Consequently the area of cultivation was contracted, and, while considerable re- missions had to be granted, collections were with difficulty carried out. The rainfall, moreover, except in the Thar and Parkar dis- trict, was not ouly scanty but unseasonable. In Thar and Parkar the rainfall was especially favourable, and owing to an early in- undation and wise preparations lands never before cultivated were brought under the plough.

The gross canal revenue in Sind amounted in 1883-84 to Rs. 3,686,754, and the land revenue to Rs.1,171,925. In round numbers and English figures—without reference to the deteriora- tion of the rupee—the total is about £487,000, of which three- fourths is due to canal irrigation.

The population may be roughly reckoned at two millions and a Popula- half, an estimate which is borne out by the census of 1881. Kurrachee tion.

is now the most populous of the capitals, and its numbers far ex- ceed those of Shikarpur and Hyderabad. But the character of its inhabitants differs from that of other large towns in Sind. They are for the most part foreign and migratory, and do not represent the true Sindis.

Of the two great divisions of the people in Sind the Moham- Raees and medans comprise about two-thirds of the whole, the Hindus the eastes.

remaining third. The Mohammedans may be divided into two great bodies—the Sindis proper and the naturalized Sindis. The Sindi proper isa descendant of the original Hindu. In religion he is a Suni, though some of the Sindis belong to the Shia sect. There are probably more than three hundred families or elans among the Sindis. There is, as a rule, no distinction of caste, ex- cept that followers of certain vocations—such as weavers, leather- workers, sweepers, huntsmen—are considered low and vile. The six different classes of naturalized Sindis are—the four families of the Saiyids (the Bokhari, Mathari, Shirazi, and Lakhirayi) ; the Afghans, from Khorasan; the Baluchis; the slaves or Sidis— originally Africans ; the Memans ; and the Khwajas. The Hindu population of Sind may be divided

into the following principal castes :—the Brahmans, Kshatrias, Waishias, and Sudras, with their subdivisions. Besides these there are the Sikhs, and the reli- gious mendicants—the Sandsi, Jogi, Gosdin, and Ogar,—all of Brahman origin.

The educational progress made in Sind during the quarter of a Educa- In 1858 there tion.

century succeeding the mutiny has been very great. was but one Government English school, with 82 boys, at Kurrachee, and one with 25 boys at Hyderabad; and of the 82 only 8 of the pupils were Sindi. In 1884-85 Sind could boast of a Government high school at Kurrachee with 400 pupils, of another high school at

The forests (about Forests.

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Language and litera- ture.

History.

Hyderabad with 338 pupils, and of a third at Shikarpur with 228 boys. The three passed 39 out of 48 candidates for matriculation at the Bombay university. Of vernacular or Sindi-Persian schools under native masters there were 34 which came under Government supervision in 1858, whereas there were in 1884-85 no less than 23 middle schools—teaching the vernacular and English—with 1165 pupils ; and in the primary schools the number of pupils was nearly

20,000.

Captain (now Sir Richard) Burton has given a clear and instruc- tive aceount of the language and literature of Sind. The large proportion of Sanskrit and Arabic words admitted, the anomalous structure of the grammar, and the special sounds of certain letters of its alphabet render the

first remarkable; and the original romantic poems and translations of Arabic religious works com- mand the attention of scholars to the second. Among the more celebrated of the native writers are Makhdum Hashim, Makhdum Abdullah, and Saiyid Abdw'l-Latif.

The leading features of the two years' campaign of Alexander the Great in the Punjab and Sind have been touched on else- where (see INDIA, vol. xii. p. 787). About 711 A.D. the Hindus of Sind were conquered by Muhammad Kasim, the young general of the caliph Walid, but his successors were unable to hold their ground. Inreality it was the overwhelming irruption of Mahmud of Ghazni three centuries later which finally subjugated the province. Nearly six centuries later still, Sind was annexed by the great Akbar to Delhi. In the meanwhile it had been governed by princes and petty chiefs, all of whom are celebrated in local history. After Akbar, and up to the time of Nadir Shah's invasion of India, there is little historically important to distinguish the province, separated from the other divisions of the Mughal empire, though its governors possessed a certain delegated power which might well have tempted the more ambitious to revolt. When Nadir took possession of the lands west of the Indus, one Nur Muhammad Kalhora was the quast ruler in Sind. The tribe to which he belonged claimed lineal descent from Abbas, uncle of the prophet, and had a widely-spread repute for sanctity. Their political influence had been, moreover, inereasing for many years, and in the person of one or two of their stronger chiefs they had on sundry occasions risen in arms against the imperial troops. In 1701, or thirty-eight years before the Persian invasion, Yar Muhammad Kahora had obtained possession of Shikarpur, and managed to get from the Mughal emperor a firman conferring upon him the "subahdari" of the Déra districts, with the title of "Khuda Yar Khan." On his death in 1719 he had extended his territory by the acquisition of the Kandiara and Larkhana districts, and of Sibi, a vast tract of country then in- cluding within its limits Sakhar as well as Shikarpur. He was sneceeded by hisson Nur Muhammad, who, as above shown, was in the unenviable position of having to account for his actions to no less notable an antagonist than Nadir himself. The latter was eventually appeased by an annual tribute of 20 lakhs of rupees, and on his return to Persia conferred upon the Kalhora prince the title of "Shah Kuli Khan." On Nadir's death the Sind lands of Nur Muhammad became tributary to Ahmad Shah of Kandahar, the transfer being sealed by the

bestowal of a new title, ‘‘Shah Nawaz Khan.” This occurred in 1748, from which date till 1783—when Abdul Nabi, the last of the Kathora princes, was defeated by Mir Fath Ali Khan, and the ruling dynasty forcibly superseded by the Talpur Baluch chiefs—the local history is a mere record of conflicts and reconciliations, treaties and evasions of treaty, as regards out- side powers, and of revolution and bloodshed within. The seat of government had become established at Hyderabad, founded by Ghulam Shah Kalhora in 1768. We now come to the Talpurs. These Baluchis had immigrated to Sind from their native hills under a Mir Shahdad in the early part of the 18th century, and had taken service under Nir Muhammad Kalhora. Shahdad, raised to rank and influence, died, leaving four sons, the third of whom, Mir Bahram, succeeded as head of the tribe. His murder by a grandson of Nur Muhammad was one of the main causes of the ill- feeling which had culminated in bitter hostility when later acts of treachery and barbarism sealed the fate of the tyrant rulers. The Talpurs entered Hyderabad as conquerors; but unfortunately for the consolidation of their sovereignty the suspicious nature of Mir Fath Ali, the head of the house, alarmed his near relatives. His nephew Sohrab fled to Upper Sind, and founded the principality of Khairpur, while Tara, moving eastward, became the independent chief of Mirpur. Later on, Mir Fath Ali, undeterred by divisions which he had no power to prevent, admitted to a share of his own government of Hyderabad his three younger brothers, Ghulam Ali, Karm Ali, and Murad Ali. On the death of Fath Ali in 1801 the three continued to rule together; and when Ghulam Ali was killed in 1811 the duumvirate remained supreme ; but, on the death of Karm Ali in 1828 and Murad Alia few years later, the old system was revived, and a government of four again instituted. Sueh was the state of things when British relations with the province had become necessarily an urgent consideration, owing to the Afghan expedition of 1838 (sce vol. xii. p. 807).

During this crisis of Anglo-Indian history the political officers in

Sind and Baluchistan had a difficult task to perform, and it jg infinitely to their credit that more mischief did not ensue in these countries from the many and heavy British disasters in the north,

if not for open hostility; and Sir Charles Napier had to call them to account soon after his arrival at Sakhar in the autumn of 1849, The long and complex narrative need not be here repeated. Suffice it to state, that the outcome was the conquest of Sind,—the: immediate result of the battle of Miani, fought in the vicinity of —

administration inaugurated by Sir Charles Napier himself, and

province an important section of the western presidency of India, The story of the eight years' rule of Sir Bartle Frere in Sind has yet to be written, but his name is associated with numerous matters of paramount importance,— in relation especially to the position

the old privileged landholders, the organization of municipal insti- tutions, the promotion of systematic education, the due administra. — tion of justice, and the erection of public works of utility, ==

Records, No, xvii.; Bombay Educational Report, 1885; Annual Report on Ad- ministration of Sind; Report of Director of Public Instruction, Bombay, 1857-58; Birdwood's Handbook to Indian Court, Paris, 1873, J.G,

But the amirs of Sind were to be dealt with for infractions of trea

Hyderabad in February 1848. A course of wise, firm, and kindly

continued by Messrs Pringle, Frere, Inverarity, Gen. John Jacob, Sir W. Merewether, and later commissioners, has since made the

and fortunes of the deposed amirs, the rights and immunities of

See Hughes's Gazetteer of Sind; Burton's History of Sind, Bombay Government

SINGAN, a form of the name Sz-Gan Foo (¢.2.). SINGAPORE, a British dependency, commercially

and administratively the most important of the Srrarrs

SETTLEMENTS (q.v.), which form a separate colonial govern- ment. It consists principally of an island 27 miles long

by 14 broad, lying off the south end of the Malay Penin- sula, but also includes upwards of 70 insignificant islets

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Singapore and its Environs.

to the south and west within a radius of 10 miles. From the mainland of Johor, as this part of the peninsula 1S called, Singapore island is separated by a strait, Salat Tabras or Tambrosh, less than half a mile wide at the narrowest point, which was formerly the main channel of navigation to the Chinese seas. The name of Singapore Strait is given to the much wider channel which separates the island on the south from the various islands 0 Butang, Batang, Bintang, &c., belonging to the Dutch East Indies. The surface of Singapore is undulating, and diversified by hills ranging from 70 to rather less than 400 feet, the highest point being Bukit Timah, to the north-west of the town (about 519 feet). Geologically

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the core of the island consists of crystalline rocks ; but in the west there are shales, conglomerates, and sandstones ; and all round the island the valleys are filled with alluvial deposits on a much more extensive scale than might be looked for where none of the streams have a course of more than six miles, or attain to any considerable size except after heavy rains (see details in J. R. Logan's ' Local and Relative Geology of Singapore," in Jour. Beng. Asi. Soc., vol. xvi. and "The Geology of the Straits of Singa- pore," in Lond. Geol. Jour., 1851, vol. vii.). The south- western shores are fringed with coral reefs, and living coral fields are found in many parts of the strait. Being chiefly composed of red clays and laterite, the soil is not generally rich, and requires careful and liberal husbandry to make it really productive. When it was first occupied by the English the whole island was covered with forest and jungle ; and, although this was largely cleared off sub- sequent to 1837, when a mania for nutmeg plantations set in, the moisture and warmth of the climate have kept it clothed with luxuriant and perpetual verdure, in which palms, ferns, and orchids are conspicuous forms. " Near the shore, by the mouths of creeks, are grouped quaint dwellings of fishermen, built of wood or palm leaf standing on piles over the water. In the smooth sandy bays cocoa- nut palms shelter picturesque Malay houses. More inland we find groves of fruit trees, small patches of sugar-cane, Chinese gardens, tapioca and indigo fields. Neat bunga- lows—the residences of officials, merchants, and rich Chinese and Arabs—diversify the scene, particularly in the vicinity of the town. In the remote parts of the island more especially there are waste spaces which were formerly gambier plantations and are now covered with coarse lalang grass" (Governor Wild). The nutmeg trees which had for twenty years been a main source of wealth were blighted in 1860; the plantations were completely given up; and, though many of the abandoned trees recovered and nutmegs can still be gathered in Singapore, they have never again been cultivated. Cotton- planting was next tried, but without success, and though cinnamon grows well the labour necessary for its cultivation and manu- facture is too expensive. Gutta percha, originally intro- duced to England from Singapore, was so much run upon that all the trees of that kind in the island were exter- minated. Gambier and pepper, both at one time largely grown, have for many years been of little account. Liberian coffee, pine-apples, cocoa-nuts,

and aloes are now the most important objects of cultivation. Quite recently districts have been enclosed for reforestation and the eucalyptus and other trees have been planted. Almost all kinds of fruits do well in the island,—the custard-apple, pine-apple, sour-sop, lime, orange, and plantain being in season nearly all the year, and the durian, blimbing, duku, langsat, mangosteen, rambutan, tarrup, tampang, d&c., in July and August and also for all or some of the months between November and February. The botanical and zoological gardens at Singapore, connected with the Agri-Horticultural Society, have been devoted to the introduction of economic plants, such as China and Assam tea, salt-bush or Rhagodia, which forms excellent fodder, &c.

In climate Singapore is wonderfully fortunate for a country within one degree of the equator. There is hardly any seasonal change, and the annual range of temperature is generally only from

0° to 90°. “The nights especially are very cool and refreshing, and enable people to sleep without difficulty.” The atmosphere is ae uniformly serene, and the face of the ocean is only disturbed Bn a Aen of distant tempests in the China Sea or the Bay of i f = e el monsoon is the master wind from Novem- ae icc Peony neither persistent nor powerful, and

rest monsoon is even less regular in its action. The southerly winds in May and June known as Java winds have very

ps the character of land and sea breezes, but are considered very ervating in spite of the pleasant feeling of freshness which they

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at first produce. Rapid squalls (sumatras) also occur during the south-west monsoon and beneficially clear the air. Instead of periodical rains there are (on a sixteen years’ average) 167 wet days distributed throughout the year. The annual rainfall is 92°27 inches; 1885, a very dry year, showed only 69 inches, according to Dr Rowell’s report. The mean maximum temperature in the shade is 86°°7, the mean minimum in the shade 73°. The highest temperature observed during the sixteen years was 94° in April 1878, and the lowest 65° in February 1874. Most of the domestic animals of Europe

have been introduced, but not in great numbers. Deer, wild hogs, sloths, monkeys, and squirrels are the morc note- worthy mammals; and tigers, which formerly committed serious depredations among the natives, still occasionally find their way across the strait from the mainland. When the first census was taken in 1824 the settlement of Singapore was found to contain 10,603 inhabitants, and by 1850 this number had increased to nearly 60,000. The following figures show the more important components of the population in 1860, 1871, and 1881,—the totals for those years being 80,792, 97,111, and 189,208 respectively :—

1860. 1881.

Europeans and Eurasians. 2,445 2,769 THAMES saicsscns-cernevinssce: 10,888 22,155 TGFs SUC. vce .vecrveonncarr: Bc 12,058 QUYIGSC sc: isn ceaccovoweunaee 50,043 86,766 VAMAMCSC: os nsciencticacerstouss 8,408 5,881

The total is estimated to be now well over 150,000. The pre- ponderance and rapid increase of the Chinese is a most striking feature, mainly due, however, to a steady streain of immigration. The death-rate in Singapore is very much higher than the birth- rate—4473 being the average number of deaths in 1881-85 against 1919 births. This is largely to be ascribed to the paucity of women —33,785 females to 105,423 males in 1881. In the small number of Europeans proper—1283—there are nincteen nationalities re-presented.

The only town in the settlement is the city of Singapore, the general capital of the Straits Settlements. It lies on the south side of the island in 1° 16’ N. lat. and 103° 53’ E. long., a bright, picturesque, prosperous, and progressive place, with a sea-frontage extending for about 6 miles from New Harbour north-east to the Rochore and Kallang suburbs. Under the control of its munici- pality, which has a yearly revenue of more than 300,000 dollars, a great variety of improvements have been effected—the river dredged and deepened, foreshores reclaimed, bridges built, trees planted, and public buildings erected—within the last six or seven years. The principal churches, the court-house, and the European quarters generally are situated on the north side of the river, while on the south side extend the warehouses and shops of the European and Chinese traders, On Peel Hill, 170 feet high,

stands a citadel; and on Government Hill is the Government house—a palatial residence in park-like grounds. The cosmopolitan character of the popula- tion gives great brightness of colour to the crowded streets and is reflected in the architectural peculiarities of the native quarters —where Mohammedan mosques, Chinese joss-houses, and Hindu temples are equally at home. Among the more important Kuropean edifices are St Andrew's cathedral (first consecrated in 1888, present building erected in 1861, became cathedral in 1870), the Roman Catholic cathedral, the supreme court-house, the new post office (1883-84), the new police courts (1884), the European hospital, the jail, the Tanglin barracks, and the Raffles school (dating from 1828), The Raffles public library and museum had 320 subscribers in 1885 and 34,250 visitors, the books issued numbering 16,348. Several English papers, as well as one Chinese and one Malay, are published at Singapore. Asa trading-port Singapore has great ad- vantages over and above its position on the Straits. The harbour is safe and has good anchorage, and it can be approached without the assistance of pilots from three directions. New Harbour is the name of the channel which lies between the southern projection of the main island and the small island of Blakan Mati, and is divided by the still smaller island of Ayer Brazi. It is there that the Peninsular and Oriental Steam Navigation Company and the Mes- sageries Maritimes have their docks and depots. At Tanjong Pagar there are two graving docks,—Victoria Dock having a length of 450 feet, a breadth of 65 feet, and a sill-depth at spring-tides of 20 feet, and the corresponding figures for Albert Dock being 470 feet, 60 fect, and 21 feet. The two New Harbour Docks are respectively 415 and 459 feet long, and 42 and 62 feet broad, and have sill- depths of 14-154 and 19-20 feet. At Pulo Brani, Bon Accord Dock has a length of 330 feet, a breadth of 50, and a sill-depth of 17. A large admiralty dock for the use of ships of the British navy is being constructed. Opposite Singapore proper the sea shallows to a few fathoms. The tides (tables of which were first published in 1884) are as yet imperfectly registered, but in general they consist of a principal high-water and low-water succeeded by a secondary high water and low water of the most limited range.

The commercial movement of the port has rapidly attained vast dimensions. While in 1851-52 the total exports and imports amounted to £5,739,556, they reached £10,871,300 in 1859-60, £18, 292,180 in 1870, £23,050,943 in 1880, and £25,931,930 in 1883. There is no railway in the island; but in 1886 a steam tramway was opened from Tanjong Pagar to Elgin Bridge. Till quite recently the town was practically without defences ; but since 1885 the eolony has constructed a series of batteries at Sera- pong, Blakan Mati, Mount Palmer, &c., at a cost of £75,000, and the home Government has expended £90,000 on the ordnance.

The name Singapore or Sinhapura, ¢.¢., Lion City, was originally given.to a town founded by Hinduized Malay or Javanese settlers from Sumatra at an early date in the Christian era. The eom- niercial importanee of the place in the 14th century is attested by Barros, but the Sanskrit origin of the name had by his time been forgotten, and he was taught to derive it from Malay words. Not long afterwards the town must have fallen into decay, and at the beginning of the present century the only trace of its existence was certain rock-inscriptions in a very old character, and the whole island had not more than 150 inhabitants. Alexander Scott recognized the excellent position of the island in the 18th century, and Sir Stamford Raffles, whose attention was called to it by Captains Ross and Crawford of the Bombay marine, fixed on it as the site of the great commercial emporium which he determined to found for the encouragement of British trade in the East. In 1819 permission was obtained to build a British factory on the south coast ; and in 1824 the island was purchased from the sultan of Johor for 60,000 Spanish dollars (£18,500) and a life annuity of 24,000 dollars (£5400). The eity became the capital of the Straits Settlements instead of Prinee of Wales Island in 1832.

See Belcher, Voyage of the Samarang ; Collingwood’s Naturatlist’s Rambles in the Chinese Seas; The Directory of the Straits Settlements for 1886; the Journal of the Straits Branth of the Royal Asiatic Society, published at Singapore ; and other works quoted under the heading STRAITS SETTLEMENTS.

SINGBHUM, a British district in the lieutenant- governorship of Bengal, lying between 21° 59° afd 22° 53’ N. lat. and between 85° 2’ and 86° 56’ E.

long. It has an area of 3753 square miles, and is bounded on the N. by the districts of Lohardaga and Manbhim, on the E. by Midnapur, on the §. by the tributary states of Orissa, and on the W. by Lohardagaé and the tributary states of Chutid Nagpur. Its central portion consists of a long undulating tract of country, running east and west, and enclosed by great hill ranges. The depressions lying between the successive ridges comprise the most fertile part, which varies in elevation above sea-level from 400 feet near the Subarnarekha on the east to 750 feet around the station of Chaibas4. South of this an elevated plateau of 700 square miles rises to upwards of 1000 feet. In the west of the district is an extensive mountainous tract, sparsely inhabited by the wildest of the Kols; while in the extreme south-west corner is a still grander mass of mountains, known as “Saranda of the seven hundred hills,” rising to a height of 3500 feet. From the Layada range on the north-west of Singbhim many rocky spurs strike out into the district, the more prominent of them attaining an elevation of 2900 feet. Among other ranges and peaks are the Chaitanpur range, reaching an elevation of 2529 feet, and the Kapargadi range, a conspicuous ridge rising abruptly from the plain and running in a south- easterly direction until it culminates in Tuilig4r Hill (2492 feet). The principal rivers are the Subarnarekha, which with its affluents flows through the eastern portion of the district ; the Koel, which rises west of Ranchi, and drains the Saranda region; and the Baitarani, which touches the southern border for 8 miles. About two- thirds of Singbhim district is covered with primeval forest, containing some valuable timber trees; in the forests tigers, leopards, bears, buffaloes, and several kinds of deer abound, and small herds of elephants occasionally wander from the Meghdsani Hills in Morbhanj. The climate is dry, and the hot season is extremely trying, the thermometer frequently registering 106° F. in the shade; the average annual rainfall is about 57 inches.

The census of 1881 disclosed a population of 453,775 (226,681

males and 227,094 females); Hindus numbered 447,810, Moham- medans 2329, and Christians 2988. The only town containing a

population of more than 5000 is Chaibasa, the eivil station and administrative headquarters of the district, with 6006 inhabitants, The staple

crop of Singbhum is rice, and the other chief erops are wheat, Indian corn, pease, gram, mustard, sugar-cane, cotton and tobacco. The principal manufactures are coarse eotton eloths, brass and earthenware cooking utensils, and soapstone platters, Cereals, pulses, oil-seeds, stiek-lac, and iron comprise the chief exports; and the imports include salt, cotton thread, English cloth goods, tobaceo, and brass utensils.

Colonel Dalton, in his Ethnology of Bengal, says that the Singbhtim Rajput chiefs have been known to the British Govern. ment since 1803, when the marquis of Wellesley was governor. general of India; but there does not appear to have been an intercourse between British officials and the people of the Kolhan, previous to 1819. The Hos or Larka Kols, the characteristic aboriginal race of Singbhtim district, would allow no stranger to settle in, or even pass through, the Kolhan ; they were, however, subjugated in 1836, when the head-men entered into engagements to bear true allegiance to the British Government. The country remained tranquil and prosperous until 1857, when a rebellion took place among the Kols under Parahat Raja. After a tedious campaign they surrendered in 1859, and the capture of the raja put a stop to their disturbances.

SINGING. See Vomce.

SINHALESE. See CEYLON.

SINIGAGLIA, or SENIGALLIA (the official form), a city of Italy, in the province of Ancona, in 43° 43’ 16″ N. lat, on the coast of the Adriatic, 17 miles by rail north of Ancona. It is well built, with broad and well-paved streets, and has the general appearance of a thriving commercial town. A modern cathedral, erected subsequent to 1787, a large Jewish synagogue, a theatre, the com- munal buildings, and the old palace of the dukes of Urbino are the more notable buildings. ‘The communal library was founded by Cardinal Nicola Antonelli in 1767; and the principal hospital and one of the orphanages date from 1534. The port is formed by the lower reaches of the Misa, a small stream which flows through the town between solid embankments constructed of Istrian marble. Between July 20 and August 8 Sinigaglia annually holds one of the largest fairs in Italy, which dates originally from 1200, when Sergius, count of Sinigaglia, received from the count of Marseilles, to whose daughter he was affianced, certain relics of

Mary Magdalene. The fair has diminished in importance since the opening of the railway, but formerly it used to be visited by merchants from France, Switzerland, Austria, Germany, and especially the Levant. ‘The population, exclusive of the suburbs, was 10,501 in 1861 and 6634 (commune 22,499) in 1881.

Sinigaglia is the ancient Sena (S4vn) or (to distinguish it from Sena Julia, z. ¢., Siena) Sena Galliea, a town of the Galli Senones (Shvwves), Whose name appears as Senogallia as early as Pliny. Sena was made a Roman colony immediately after the eonquest of the Senones in 289 B.c. It was the rendezvous of the consuls Livius and Nero before the battle of the Metaurus, also known as the battle of Sena, in which Hasdrubal was defeated (207 B.Oge The sack of the town by Pompey, Sulla’s lieutenant, in 82 B.6., is the only other notable fact in its ancient annals. Ravaged by Alarie, fortified by the exarch Longinus, and again laid waste by the Lombards in the 8th century and by the Saracens in the 9th, Sinigaglia was at length brought so low by the Guelf and Ghibelline wars, and especially by the severities of Guido de Montefeltro, that it was chosen by Dante as the typical instance of a ruined eity. In the 15th eentury it was captured and reeaptured again and again by the Malatesta and their opponents. Sigismond Malatesta of Rimini erected strong fortifications round the town m 1450-1455. The lordship of Sinigaglia was bestowed by Pius 11. on his nephew Antonio Piccolomini, but the people of the town m 1464 placed themselves anew under Paul II., and Giacomo Piccolo- mini in 1472 failed in his attempt to seize the place. Sixtus Vi assigned the lordship to the Della Rovere family, from whom it was transferred to Lorenzo di Medici in 1516. After 1624 it formed part of the legation of Urbino. }

SINKING FUND. See Nazvionan Dest, vol. xvi p. 245.

SINOPE, or in Turkish S1ntz, a town and seaport on the north coast of Asia Minor, on the isthmus and peninsula of Boztepeh, which forms part of the most northerly projection of the Anatolian seaboard. Though

it possesses the finest natural harbour save one in the Black Sea, defective communication with the interior, and the consequent rivalry of Ineboli

(since about 1848), have prevented Sinope taking its natural position as a great commercial centre. But between 1882 and 1885 roads have been constructed which give direct access southward to Ceesarea and even to Tarsus, near the south coast. The town still bears the stamp of its former importance. On the isthmus stands a huge but for the most part ruined castle, originally Byzantine and afterwards strengthened by the Seljuk sultans ; and the old town is surrounded by Byzantine walls. Of early Roman or Greek antiquities there is little trace ; but the ancient local coinage furnishes a very beautiful and interesting series of types (see M. J. P. Six's paper in The Numismatic Chronicle, 1885). The population has not greatly changed since 1868, when it was found to be 9668 inhabitants, of whom 7299 were Mohammedans and 2369 Greeks and others.

Sinope (Sivdéan), whose origin was mythically assigned by its own ancient inhabitants to Autolycus, a companion of Hercules, was colonized by the Milesians, and ultimately became the most flourishing Greek settlement on the coast of the Euxine. In the 5th century B.c. it received a colony of Athenians; and by the 4th it had extended its authority over a considerable tract of country and become itself the mother of several colonies—Cerasus (Kerastin), Trapezus (Trebizond), Cotyora, &c. Its fleet was

ractically dominant in the Kuxine, except towards the west, where it shared the field with Byzantium. When in 220 B.c. Sinope was for the first time attacked by the king of Pontus, the assistance of the Rhodians enabled it to maintain its independence. But where Mithradates IV. failed Pharnaces succeeded; and the city, taken by surprise in 183 B.c., became the capital of the Pontian monarchy. Under Mithradates the Great, who was born in Sinope, it had just been raised to the highest degree of prosperity, with fine buildings, naval arsenals, and well-built harbours, when the Romans under Lucullus and Pompey effected the subjugation of Pontus. In 64 B.c. the body of the murdered Mithradates was brought home to the royal mausoleum. Under Julius Cesar the city received a Roman colony. In the Middle Ages it became subject to Trebizond, and in 1470 it passed into the hands of the Turks, In November 1853 the Russian vice-admiral Nakhimoff

destroyed here a division of the Turkish fleet and reduced a good part of the town to ashes.

SIOUX CITY, a city of the United States, the capital of Woodbury county, Iowa, lies 156 miles north-west of Des Moines, on the sloping banks of the Missouri river. It is a great railway centre (Chicago, Milwaukee, and St Paul Railway, Sioux City and Pacific Railway, é&c.), has an extensive trade, and contains an opera house, foundry and machine shops, pork-packing factories, and mills. The population of the city (which was laid out in 1854 and incorporated in 1857) was 3401 in 1870 and 7366 in 1880 (township 7845). |

SIPHANTO, SipHEno, or SrPHNo (ancient Greek Sipvos), an island of the Greek Archipelago, in the nomarchy of the Cyclades, 30 miles south-west of Syra. It has an area of 28 square miles, and the population in 1879 was 5762. A ridge of limestone hills—whose principal sum- mits, Mount Elias and St Simeon, are crowned by old Byzantine churches—runs through the island ; for about 2 miles along the western slope stretches a series of villages, each white-washed house with its own garden andorchard. Apollonia, one of the five (so called because built on the site of a temple to Apollo), is the modern capital ; formerly this rank belonged to Kastro (also called Seraglio), an “old-world Italian town” with medieval castle and fortifications, and an old town-hall bearing date 1365. Inscriptions found on the spot show that Kastro Bae the site of the ancient city of Siphnos; and Mr oie identifies the other ancient town of Minoa (see wih anos) with the place on the coast where a Hellenic ; tte marble tower is distinguished as the Pharos or — and another as the tower of St John.

urches and convents of Byzantine architecture are

scattered about the island. One building of this class is especially interesting —the school of the Holy Tomb or school of Siphnos, founded by Greek refugees from Byzantium at the time of the iconoclastic persecutions, and afterwards a great centre of intellectual culture for the Hellenic world. The endowments of the school are now made over to the gymnasium of Syra. In ancient times Siphnos was famous for its gold and silver mines, the site of which is still easily recognized by the excavations and refuse-heaps. A French company has started mining operations at Kamara. As in antiquity so now the potters of the island are known throughout the Archipelago.

The wealth of the ancient Siphniotes was shown by their treasury at Delphi, where they deposited the tenth of their gold and silver ; but, says the legend, they once sent Apollo a gilded and not a golden bull, and he in his anger flooded their mines. That the mines were invaded by the sea is still evident; and by Strabo's time the inhabitants of the island were noted for their poverty. During the Venetian period it was ruled first by the Da Corogna family and after 1456 by the Gazzadini, who were expelled by the Turks in 1617.

SIPHON, or SypHon, an instrument usually in the form of a bent tube for conveying liquid over the edge of a vessel and delivering it at a lower level, or in a position of less hydrostatic pressure. The principle on which it acts (see HyDROoMECHANICS) may be understood from the accompanying diagram. ABC is a tube filled with liquid, the shorter limb dipping under the ®__..__B_ j surface of the liquid in jar a, the longer in jar 6. The pressure in the tube at A is atmospheric pressure minus that of the vertical column AB', while that at C is atmospheric 4 pressure minus that of the column CB". When CB" is longer than AB' the pressure at C is of course less than that at A, and a current flows in the direction ABC through the siphon. When AB' = B'C, that is, when the liquid stands at the same level, pressure is equal in the two limbs, and the current ceases. The siphon has practically a certain minimum diameter for each liquid, as capillarity prevents a fluid from flowing out of tubes of very small bore unless under the influence of electricity, heat, or great pressure. The instrument is largely employed for chemical work, both in the laboratory and in manufacturing processes ; it is formed of glass, india-rubber, lead, or other substance, according to the purpose for which it is intended. The simple siphon (see fig.) is used by filling it with the liquid to be decanted, closing the longer limb with the finger and plunging the shorter into the liquid, and it must be filled for each time of using. Innumerable forms have been devised adapted for all purposes, and provided with arrangements for filling the tube, or for keeping it full and starting it into action automatically when required. The former purpose is usually effected by blowing into the vessel through a second opening in the stopper through which the siphon passes, or by means of a sucking or blowing tube attached to the longer limb, or by pouring in liquid through a flexible tube attached at the bend. The second plan is frequently realized by having a stop- cock on the longer limb and a

valve opening upwards on the shorter, or by having both limbs of equal length and each standing in a cup, in which case when the level changes in either cup the siphon tends to equalize it by conveying liquid from the higher to the lower. Many other forms are in constant use in the arts, and the siphon is also employed in some of its modifications in surgery, in engineering, and in other sciences.

SIRACHIDES. See Jesus, THE Son oF SiRacH.

SIRAJGANJ, a town in the district of Pabna, Bengal,

and the most important river-mart in that province, is situated near the Jamun& or main stream of the Brahmaputra in 24° 26’ 58” N. lat. and 89° 47’ 5” E. long., with a population of 21,037 (11,213 males and 9824 females) in 1881. The business of Sirdjganj is that of a changing station; the agricultural produce of the surrounding country is brought in in small boats and transferred to wholesale merchants for shipment to Calcutta in steamers or large cargo boats, and in return piece goods, salt, hardware, and all sorts of miscellaneous articles are received from Calcutta for distribution. Siraj-ganj is also the centre of the jute trade of Eastern Bengal.

SIR-DARIA. See Syr-Darya.

SIREDON. At the end of last century specimens of a kind of branchiate tailed Amphibian were brought to Europe from the lakes of Mexico; they were examined by the zoologists of Paris and described by Cuvier in Humboldt’s Recuetd @’Observations de Zoologie, vol. i., and by Daudin in Hist. des Reptiles (Paris, 1802-1804), under their native name of “Axolotls.” The animals were named Siren pisciformis by Shaw (Zool., vol. iil.). Wagler, in his Vattirliches System der Amphabien (Stuttgart, 1828-1833), separated the axolotl from the Linnean genus Siren and called it Siredon axolotl, and later writers have often referred to the animal under the name Szredon pisciforme, Shaw.

The axolotl of Mexico is about 6 or 7 inches in length; it has four pairs of gill-slits and three pairs of long feather-like external branchie. The branchial apertures are between the hyoid arch and the first branchial arch, and between the first-second, second-third, and third- fourth branchial arches. The branchiz are attached to the first, second, and third branchial arches. The body is cylindrical, and a median membranous fin extends along the trunk dorsally, is continued along the tail, passes round the end of the latter and terminates ventrally at the anus. It has four limbs, which are short and somewhat stout; the anterior terminate in four and the posterior in five digits. The colour of the axolotl is a uniform black.

The animal is therefore, except in size, very similar to the aquatic larva of Z'riton, or other Salamandroid, and Cuvier expressed the opinion that it was a larval form which for some unknown reason was unable to attain the adult condition. That it could not be considered simply as the larva of an unknown species of Salamandroid was evident from the fact that it possessed fully developed sexual organs in both sexes. There was every reason to believe that it bred freely in the branchiate condition in which it was discovered. The animal is so common in the lakes near the city of Mexico that it is brought regularly to market and used largely by the Mexicans as food (9).}

If nothing more than the above were known about the axolotl it would be classed aniong the Perennibranchiata, in the family Proteida, having its nearest ally in the genus Menobranchus. Up till the year 1865 no actual observations had been miade by zoologists on the breeding of the axolotl: all that was known was that the genital organs in many of the specimens examined were in perfectly mature condition. In that year, on January 18, 6 axolotls, 5 males and 1 female,—which had been living for a year in the menagerie of reptiles of the Musée d'Histoire Naturelle at Paris,—began to breed, and the deposition and hatching of the eggs was carefully studied by Prof. A. Duméril (1). The eggs were 2 mm. in diameter, and the period of development within the egg was 28 to 80 days ; the larve were hatched in February, and were 14 nm. to 16 mm. in length. In the beginning of September, when the larvee had almost reached the size of the parents, it was noticed that one of them was undergoing a metamorphosis similar to that of the larval Triton to the adult. In a short time yellow

spots appeared on the skin, the branchie disappeared, the gill- slits closed up, the median fin disappeared, the animal began

1 These numerals refer to the ‘‘ Literature ” infra.

to breathe air and permanently quitted the water. The same process of metamorphosis was repeated by several of the larva, until finally out of several hundred about thirty reached the galamandroid condition. The parents in the meantime were stil] alive, and had undergone no change. When the structure of the transformed specimens was examined, they were found to resemble in all generic characters the genus Ambdlystoma, of which several species were known, inhabiting various parts of North America,? The consideration of Duméril’s discovery gives rise to several per- plexing questions, which have been discussed by many zoologists experienced in the study of the Amphibia, and cven now can scarcely be said to be completely scttled. The first question is— To what species of Amblystoma did the transformed axolotls of Duméril belong? Duméril himself, in the full account (2) which he published concerning the animals and their metamorphosis, was unable to give a decided opinion concerning the identification of the species of his Amblystoma, but on a subsequent occasion he confirmed the suggestion of Prof. E. D. Cope (10) that the specific characters were those of 4. mavortiwm, Cope (described in Prov, ° Ac. Philad., 1867).

The publication of Duméril’s discovery excited a great deal of interest among European naturalists, and for a time experiments and observations on axolotls in captivity were carried on with great earnestness, The metamorphosis in the case of Duméril’s specimens had taken place quite unexpectedly, but the case scemed to offer an opportunity for ascertaining the action of definite conditions in producing definite processes of growth. Marie von Chauvin (6), at Freiburg, at the instigation of Prof. Weissmann, attempted, and with perfect success, to transform young axolotls into the Amblystoma form by gradually bringing the animals from water into air.

The transformed axolotls observed by Duméril were kept alive in the Paris Museum, and for ten years showed no symptoms of breeding or sexual

activity. It was currently believed that the Amblystoma derived from the metamorphosis of Siredon was sterile. This belief ultimately proved erroneous. In the autumn of 1874 the animals in the menagerie of reptiles were transferred to new premises, where they were all placed in more healthy conditions. Immediately after this the .Amblystoma deposited fertilized eggs, and the fact was reported by M. Blanchard to the Académie des Sciences (4), with the comment that the Amblystoma was thus shown to be similar to other cold-blooded animals which were capable of reproducing in both the young and the adult condition. :

Although at first Duméril believed and stated that his specimens of axolotl belonged to the species which bears that name in Mexico, he afterwards, in his more detailed work on the subject (2), explained that the grounds for his first opinion had been insufficient. American zoologists, especially Baird and Cope, had distinguished several species of Siredon, and Baird had separated the Mexican species, which alone was originally called axolotl, as Siredon mexicanus. Duméril came to the conclusion that the axolotls in the Paris Museum were identical with Strcdon liche- notdes, Baird (described in Stansburg, Huxped. Gr. Salt Lake, Utah). All the axolotls which were kept and studicd and sub- jected to experiment by naturalists on the Continent after Duméril's discovery were desccndants of the Paris specimens, 80 that the results obtained really did not necessarily prove anything with regard to the true Mexican axolotl, Siredon meaicanus, if that were really a distinct species. There is no evidence 10 literature to show whence the first axolotls in the Paris Museum were obtained. It was evident that Siredon lichenoides was capable of breeding in both the larval and the salamandroid condition, and that its metamorphosis in captivity in Europe was rare and to a certain extent controlled by definite external con- ditions. Prof, O. CG. Marsh has recorded his experience of the metamorphosis of S. lichenoides. He obtained several specimens from alpine lakes 7000 feet above the sea in Wyoming Territory, and some of these metamorphosed into Amblystoma mavortium, Cope. Marsh does not say if the larve he obtained were sexually mature, nor did he ascertain if breeding of the species in the larval condition took place at all in the lakes he visited ; he thinks it probable that the metamorphosis in that region was rare in the natural conditions. J

The metamorphosis of the true axolotl, undoubtedly obtained from the Lake of Mexico, seems to have been observed only once— namely, by Tegetmeier in London. That naturalist had 5specimens, and one of them underwent the metamorphosis. In 1871 Cope (10) stated that no one had seen the metamorphosis of the true siredon, Sircdon mexicanus, Baird, and that no Amblystomz had been obtained from Mexico south of the Tropic of Cancer, while BER Cn ee eee

2 The generic characters of Amblystoma, Tschudi, are, according to Boulenger—tongue subcircular or oval, with radiating plice, lateral borders free, anterior border slightly free; two transverse semes of palatine teeth in same straight line, not separated by a wide interspace in the middle; toes five; tail more or less compressed.

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the true axolotl is found south of that line. He was unaware of Tegetmeier's observation. He further deelared that Prof. Baird was aware of the metamorphosis of all the North American species of Siredon so-called, exeluding S. mexicanus, years before the observation of it by Duméril, though he had at first named one of them Sircdon lichenoides, in the belief that it was adult. Cope eonsidered the observation of Duméril important, as showing that siredons reproduced as such.

Finally, according to Boulenger (7), the S. lichenotdes and mexicanus of Baird are synonymous, the Paris axolotl is identical with the same species, and the perfect form into which it changed is identical with .A. tigrinwm, mexicanum, and mavortium of Cope, obscurum of Baird, while the form named Siredon gracilis by Baird is probably the larva of Amblystoma tencbroswm. Boulenger adopts the name A. tigrinwm of the synonyms given above, and gives as the distribution United States and Mexico ; the specific diagnosis is—series of palatine teeth extending to

external fissure of choanz ; plice of tongue radiating from behind ;

costal grooves twelve; head large; brown or blackish, with yellow markings.

It is therefore very probable that the Paris specimens were really Mexican axolotls, and there is no doubt that these animals do in captivity undergo metamorphosis. So far as is known, they never do so in their natural conditions. But the animals are specifieally identical with .4. tigrinuwm, which is found in many parts of the United States, from New Jersey to California, and normally breeds in the salaniandroid condition. It is not known at present whether the larva of A. tigrinwm ever attains sexual maturity in other regions where the species occurs besides Mexico. It is not improbable that it does so. De Filippi (8) found in a marsh on the shores of the Lago Maggiore 48 larva of Triton alpestris in the branchiate condition, which contained fully developed ova and spermatozoa, so that the occurrence of sexual maturity in the larves of Amblystoma is not unique. Prof. August Weissmann (5) has discussed at considerable length and with much thoughtfulness the true significance of the phenomena exhibited by the axolotl, and has concluded that its ancestors passed through the normal life-history of Amblystoma, the climate of the Mexican tableland having been at one time moist enough to permit of the existence of a terrestrial Salamandroid ; that the climate has now became so dry and unfavourable to vegetation that no amphibian can live in it except in water ; and that Ambystoma has become adapted to these conditions by ceasing to pass through its metamorphosis, and breeding entirely in the branchiate condition. Thus the metamorphosis which takes place occasionally in captivity is a case of what has been called since Darwin’s epoch atavism ; its peculiarity consists in the fact that the evolution of the animal has resulted in the arrest of development at a larval stage, and the oecasional reversion is the continuation of the development to the higher condition of the ancestor. Atavism is the occasional resemblance of one individual to some remote ancestors instead of to its immediate parents. Another possible way of explaining the axolotl is to suppose that it has remained in the perenni>ranchiate condition while other members of the same species elsewhere have developed into the salamandroid condition. This explanation cannot be the true one. It would necessitate the belicf that a metamorphosis lasting a few days or weeks, and induced often by the gradual removal of the animal from water into air, eould produee the same specific characters as a gradual development whieh has occupied a great number of generations. The axolotl is an example of one of the most curious and interesting modes by whieh animals may be adapted to their

conditions, and two species formed out of one. At present the disappearance of the meta- morphosis from the life-history of the axolotl has taken place so recently that not even specific differences exist, according to some observers, between the metamorphosed axolotl] and the natural Amblystoma tigrinum. At some future time slight differenccs are almost sure to occur, and then there will be two species or the tendency to metamorphosis in the axolotl will be lost. In the latter case some slight Wifferences will probably be developed between the axolotl and the branchiate larva of 4. tigrinwm in other parts of Ameriea ; and then the axolotl and A. tigrinwm will be two species, Finally, it may be pointed out that it is possible that the axolotl could have reached its present locality and conditions without any change in the climate of Mexico. The lakes in the arid distriet night somehow occasionally be visited by breeding 4. tigrinwm, and of the larve so produced in them some might become sexually mature before metamorphosing, and so give rise to the present axolotls.

There is some reason to believe, according to the American zoologist Prof. Cope, that the perennibranehiate JMenobranchus lateralis, Tschudi, of the Mississippi, which when full grown is over a foot in length, and has four branehial apertures, stands in the Sane relation to the genus Batrachoscps, Bonap., as Siredon to Amblystoma,

Literature,—(1) A. Duméril, Comptes Rendus, vol. 1x., 1865, p. 765; (2) A

Duméril, Your. Arch, Mus., if., 1866; (3) A. Dumeéril, Copmtes Rendus, vol. Ixi_ | into the sea.

775; (4) M. Blanchard, 7b/d., vol. Ixxxii., 1876, p. 716; (5) A. Weissmann, Zeitschr. f. wiss. Zool., xxv. p. 297; (6) M. von Chauvin, dbid., xxvii. p. 522; (7) G. A. Boulengery, Brit. Mus. Cat,—Batrachia gradientia, &c., 1882; (8) De Filippi, Archivio per la Zoologia, 1861; (9) De Saussure, Verhandl. d. Schweiz. naturforsch. Gesellsch. Einsiedeln, 1868; (10) E. D. Cope, ‘‘ Metamorphosis of Axolotl,” Amer. Journal, 1871; (11) 0. C. Marsh, Amer. Jour., [2], xlvi. p. 364; (12) Tegetmeier, Proc. Zool. Soc., 1870. OmiaC)

SIREN. Stren lacertina, Lin. (Syst. Nat., i., Addenda), is an animal belonging to the class AMpurpia (q.v.). It forms the type of the family Strenidx, called by Prof. Huxley Z'rachystomata, among the group Lerennibran- chiata. The body is elongate and eel-like, only the anterior limbs being present; the posterior are entirely wanting. The anterior limbs are short and feeble, and each is furnished with four digits pointed at the ends. The head is small; the snout is short and broad, and the nostrils are placed at its extreme end. The tongue is free anteriorly. The jaws are destitute of teeth and covered with a horny sheath like a beak. There are numerous teeth on the vomer, arranged in two large patches con- verging anteriorly. The eyes are very small. On each side of the neck are three branched external gills attached to the first, second, and third branchial arclies ; and below the gills are three reduced branchial apertures. The tail is shorter than the body, much compressed, and provided with a median membranous fin ; the tail terminates in a point. The skin is smooth, and black in colour, some- times sprinkled with white dots. Siren grows to a large size, some specimens measuring 3 feet in length; the largest example in the British Museum is 670 mm. or about 2 feet 3 inches. The animal inhabits the stagnant waters of marshes in South Carolina and Texas.

The only other member of the family Sirenide is Pseudobranchus striatus (Gray, Brit. Mus. Cat.—Batrachia, Ist ed.). This animal resembles Siren in most respects, but has only a single branchial aperture on each side, and only three digits to the anterior limb. Its colour is dark- brown with a broad yellow band on each side and a narrower one inferiorly. It occurs in Georgia, but seems to be very rare; there are two specimens in the Paris Musée, none in the British Museuni.

Figures of Siren lacertina are to be found in the following works :—Cuvier in Humboldt's Obs. Zool., i. pl. 11; Daudin, Reptiles, viii. pl. 49; Holbr., WN. Amer. Herp., pl. 34. Pseudo- branchus striatus is figured in Duméril and Bibron, Lrpétologie Générale, pl. 96; Holbr., loc. cit., pl. 36; Leconte, Ann. Lye. N. Y., 1824, pl. 4 (under name Siren striata).

SIREN, or Syren. See Acovusrics, vol. i. p. 109.

SIRENS, fabulous creatures of Greek mythology, that, like the Loreley of German legend, lured mariners to destruction by their sweet song. In the

Odyssey Ulysses sails past their island; but, warned by Circe, he had stopped the ears of his crew with wax and caused himself to be bound to the mast. In Homer they are two in number, but in later writers they are generally three, and are located on the coast of Italy, near Sorrento and Capri, or on the Straits of Messina. The tomb of one of them, Parthenope by name, was shown at Naples in Strabo's time. A sanctuary of the Sirens stood on a headland near Sorrento. According to Eratosthenes the Sirens were a three-headed rock separating the Bay of Naples from the Gulf of Salerno; but Strabo says they were three rocky islands on the southern side of the cape. The cape itself (now Cape Campanella) was sometimes called the Cape of the Sirens. When the Argonauts drew near the isle of the Sirens, Orpheus struck up and drowned their song. According to Hyginus the Sirens were daughters of the river Achelous and the muse Melpomene, and because they had not rescued Proserpine from Pluto they were turned by Ceres into winged creatures, who were to live only so long as no one passed by them as they sang. So, when Ulysses had eluded them, they flung themselves According to another story, they were

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instigated by Hera to vie with the Muses in singing ; the Muses were victorious, and plucked the feathers from the Sirens and made crowns for themselves out of them. In art they are usually represented with the bodies of women and the legs of birds, with or without wings. More rarely they appear as birds with only the heads of women. They seem to have had a funereal significance, and were often represented on tombs. or representations of them see J. E. Harrison, Ifyths of the Odyssey.

SIRICIUS, pope from December 384 till November 398, was the successor of Damasus and was himself suc- ceeded by Anastasius 1. See PopEpom, vol, xix. p. 491.

SIRMUR, one of the sub-Himalayan or Simla hill states under the government of the Punjab, lying between 30° 24' and 31° N. lat. and between 77° 5' and 77° 50' E. long. Its area is 1096 square miles, and it is bounded on the N. by the hill states of Balsan and Jubal, on the E. by the

British district of Dehra Dun, from which it is separated by the rivers Tons and Jumna, on the S.W. by Ambala district, and on the N.W. by the states of Patiala and Keunthal. Except a very small tract about Nahan, the chief town and residence of the raja, on the south-western extremity, where a few streams rise and flow south-westward to the Saraswati and Ghaggar rivers, the whole of Sirmur lies in the basin of the Jumna, which receives from this tract the Giri and its feeders the Jaldl and the Paltir. ‘he Tons, the great western arm of the stream called lower down the Jumna, flows along the eastern boundary of Sirmur, and on the right side receives from it the two small streams Minus and Nairai. The surface generally declines in elevation from north to south ; the chief elevations on the northern frontier (Chor peak and station) are about 12,000 feet above the sea. The valley of the Khidrda Dun, which forms the southern part of the state, is bounded on the S. by the Siwalik range, the hills of which are of recent formation and abound in fossil remains of large vertebrate animals. Though the rocks of Sirmur consist of formations usually metalliferous, the yield of mineral wealth is at present but small. The forests are very dense, so much so that the sportsman finds difficulty in making his way through them in search of wild elephants, tigers, leopards, bears, and hyenas, with which they abound. The climate of Sirmur varies with the elevation; the northern extremity has very little rain; but large and excellent crops are everywhere to be obtained by irrigation.

The population in 1881 was 112,871 (males 63,305, females 49,066), the great majority being Hindus. The only town of any importance is Nahan, with a population of 5253. The principal products of the state are opium, tobacco, and cereals, and its gross revenue is estimated at £21,000. Sirmur, which means “a crowned head,” was the place of residence of the rajas who ruled over the state before the present dynasty entered the country. The reigning raja

(Shamsher Prakash, K.C.S.I.) holds his possessions by a grant made on the expulsion of the Gurkhas by the British in 1815.

SIROHI, or SEEROEE, a native state in the Rajputana agency under the Government of India, with an area of 3020 square miles, lying between 24° 20’ and 25° 20’ N. lat. and between 72° 10’ and 73° 10’ E. long., and

bounded on the W. and N. by Marwar or Jodhpur, on the E. by Mewar or Udaipur, on the S. by Palanpur and the Mahi Kantha states of Edar and Danta. ‘The country is much broken up by hills and rocky ranges; the Aravalli range divides it into two portions, running from north-east to south-west. The south and south-east part of the terri- tory is very mountainous and rugged, containing the lofty Mount Abu, an isolated mass of granite rock, culminating in a cluster of hills, enclosing several valleys surrounded by rocky ridges, like great hollows. The highest peak rises to 5653 feet above sea-level, and is one of the great trigonometrical stations. On both sides of the Aravallis

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the country is intersected with numerous water channels, which run with considerable force and volume during the height of the rainy season, but are dry for the greater part of the year. Western Banas.

The only river of any importance is the A large portion of the state is covered with dense jungle, in which wild animals, including the tiger, bear, and leopard, abound. Many splendid ruins

bear witness to the former prosperity and civilization of the state. and east there is usually a fair amount of rain.

The climate is on the whole dry ; in the south On Abu the average annual rainfall is about 64 inches, whereas in Erinpura, less than 50 miles to the north, the average fall

is only between 12 and 13 inches. The Western Rajputana Railway runs through the length of the state, passing just east of Mount Abu.

In 1881 the population numbered 142, 903 (males 76,182, females

66,771), of whom 123,633 were Hindus, 29385 were Mohammedans,

and 16,137 were Jains. The town of Sirohi, the capital of the

state, is situated at the western base of the range of hills north of

Mount Abu, and its population (1881) numbered 5699. Wheat

and barley are the staple crops ; pulses and cotton are also grown. The present ruling family of Sirohi are Deora Rajputs, a branch of

the great Chauhan clan, and are said to be immediately deseended

from Deo Raj, a descendant of Pirthvi Raj, the Chauhan king of Delhi. During the early years of the present century Sirohi suf-

fered much from wars with Jodhpur and the wild Mina hill tribes.

The protection of the British was sought in 1817 ; the pretensions

of Jodhpur to suzerainty over Sirohi were disallowed, and in 1823 a treaty was concluded with the British Government. For services

rendered during the mutiny of 1857 the reigning “rao” received a

remission of half his tribute.

SIRSA, a British district in the lieutenant-governorship —

of the Punjab, lying between 29° 13’ and 30° 40’N. lat. and between 73°57’ and 75° 23’ E. long. It has an area of 3008 square miles, and is bounded on the N. by Firoz pur district and the native state of Patiala, on the W. by the river Sutlej, on the S.W. by the native states of Bahawalpur and Bikaner, and on the E. by Hissar district. Lying as it does between the barren deserts of Bikaner and the comparatively fertile though sandy plains of the Cis-Sutlej states, Sirsa district in soil as well as position forms an intermediate link between the two. It forms for the most part a bare and treeless plateau stretching from the valley of the little river Ghaggar on the east to the main stream of the Sutlej on its western border. Inthe immediate neighbourhood of the Sutle, however, is a fertile alluvial tract (khddar), intersected by numerous branches of the river, and flooded by their outflow during the rainy season. Eastward of the khadar lies the sandy central tableland, which is chiefly employed for purposes of pasturage. East of this plateau is the valley of the Ghaggar, a formidable torrent in the rainy months, but so

entirely dependent on the rainfall of the lower Himalayas that it is usually dry from October to July. The Ghaggar expands into three jhils or marshy lakes, the largest of which is 5 miles in length by 2 in breadth. South of the Ghaggar spreads a sandy tract beyond the reach of its fertilizing influence, and of small agricultural value. Formerly the district was covered by an excellent grazing grass, known as dkdman, but with the increase of cultivation it is fast disappearing. The climate of Sirsa is extremely dry, the average annual rain- fall reaching only 15 inches. The Rewari-Ferozepore Railway passes through the district from south to north.

The population of the district, according to the census of 1881, was 253,275 (males 138,691, females 114,584), of whom 130,582 were Hindus, 93,289 Mohammedans, and 28,303 Sikhs. The only town with a population exceeding 10,000 is Sirsa, the administrative headquarters of the district, with 12,292 inhabitants, The modern town of Sirsa was founded in 1837, and the ruins of old Sirsa lie near its south-west corner. It is a considerable entrepot for the trade of the wheat-growing countries to the north and east with Bikaner and Marwar. At the opening of the present century nearly the whole of Sirsa district was a barren almost uncultivated waste. Gradually, however, with more peaceful times

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cultivation has again extended. Of the total area 1353 square miles are now cultivated and 1548 square miles are cultivable. The staple product is bajra, which in 1882-83 occupied 546,905 acres; the other principal crops are Joar, barley, and wheat. The district has little trade except in agricultural produce, which goes chiefly to Bikaner ; and the only manufacture of any importance is that of sajjz, an impure carbonate of soda, used in washing and dyeing eloth. Sirsa was officially included in the territory conquered from the Mahrattas in 1803, when it was almost entirely uninhabited. It reqnired re- conquering from the Bhattis in 1818; but it did not come under British administration until 1837. During the mutiny of 1857 Sirsa was for a time wholly lost to British rule. On the restoration of order the district was

administered by Punjab officials, and in the following year, with the remainder of the Delhi territory, it was formally annexed to that province,

SISKIN (Dan. Sidsken; Germ. Zeisig and Zeising), long known in England as a cage-bird, since, in 1544, Turner mentioned it in that character under this name,} and said that he had only once met with it at large—the Fringilla spinus of Linnzus, and Carduelis or Chrysomi- tris spinus of modern writers. In some of its structural characters it is most nearly allied to the Gotprinon (vol. x, p. 758), and both are often placed in the same genus by systematists ; but in its style of coloration, and still more in its habits, it resembles the Redpolls (cf. LINNEt, vol. xiv. p. 675), though without their slender figure, being indeed rather short and stout of build. Yet it hardly yields to them in activity or in the grace of its actions, as it seeks its food from the catkins of the alder or birch, regardless of the attitude it assumes while so doing. Of an olive-green above, deeply tinted in some parts with black and in others lightened by yellow, and beneath of a yellowish-white again marked with black, the male of this species has at least a becoming if nota brilliant garb, and possesses a song that is not unmelodious, though the resemblance of some of its notes to the run- ning-down of a piece of clockwork is more remarkable than pleasing. The hen is still more soberly attired ; but it is perhaps the Siskin's disposition to familiarity that makes it so favourite a captive, and, though as a cage-bird it is not ordinarily long-lived, it readily adapts itself to the loss of liberty. Moreover, if anything like the need- ful accommodation be afforded, it will build a nest and therein lay its eggs, but it rarely succeeds in bringing up its young in confinement. As a wild bird it breeds con- stantly, though locally, throughout the greater part of Scotland, and has frequently done so in England, but more rarely in Ireland. The greater portion, however, of the numerous bands which visit the British Islands in autumn and winter doubtless come from the Continent— perhaps even from far to the eastward, since its range stretches across Asia to Japan, in which country it is as favourite a cage-bird as with us. The nest of the Siskin is very like that of the Goldfinch, but seldom so neatly built; the eggs, except in their smaller size, much resemble those of the GREENFINCH (vol. xi. p. 165).

_ A larger and more brightly coloured species, C. spinoides, inhabits the Himalayas, but the Siskin has many other relatives belonging to the New

World, and in them serious modifications of structure, especially in the form of the bill, occur. Some of these relatives lead almost insensibly to the GREENFINCH (ut supra) and its allies, others to the GoLDFINCH (wt swpra), the Redpolls, and so on. Thus the Siskin perhaps may be regarded as one of the less modified descendants of a stock whence such forms as those just mentioned have sprung. Its striated plumage also favours this Le as an evidence of permanent immaturity or generalization of orm, since striped feathers are so often the earliest clothing of many of these birds, which only get rid of them at their first moult. a this theory the Yellowbird or North-American “ Goldfinch,” Fe ae would seem, with its immediate allies, to rank among

€ highest forms of the group, and the Pine-Goldfinch, C. pinus, q the Same country, to be one of the lowest,—the cock of the re ae generally of a bright jonquil hue, with black crown,

Vitis also called by bird-fanciers “ Abadavine” or “ Aberdevine ” — names of which the etymology is wholly unknown.

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neither hens nor young exhibit any striations. On the other hand, neither sex of the latter at any age puts off its striped garb—the mark, it may be pretty safely asserted, of an inferior stage of development. The remaining species of the group, mostly South- American, do not seem here to necd particular notice, (A. N.)

SISMONDI, Jean Cuartes Lronarp pe (1773- 1842), whose real name was SIMONDE, was born at Geneva on May 9, 1773. His father and all his ancestors seem to have borne the name Simonde, at least from the time when they migrated from Dauphiné to Switzerland at the revocation of the edict of Nantes. It was not till after Sismondi had become an author that, observing the identity of his family arms with those of the once flourishing Italian house of the Sismondi, and finding that some members of that house had migrated to France, he assumed the connexion without further proof and called himself De Sismondi. The Simondes, however, were themselves citizens of Geneva of the upper class, and possessed both rank and property, though the father was also a village pastor, The future

historian was well educated, but his family wished him to devote himself to commerce rather than literature, and he became a banker's clerk at Lyons. Then the Revolution broke out, and as it affected Geneva the Simonde family took refuge in England, where they stayed for eighteen months. Disliking, it is said, the climate, they returned to Geneva, but found the state of affairs still unfavourable ; there is even a legend that the head of the family was reduced to sell milk himself in the town. The greater part of the family property was sold, and with the proceeds they emigrated to Italy, bought a small farm at Pescia near Lucca, and set to work to cul- tivate it themselves. Sismondi worked hard here, both with his hands and his mind, and his experiences gave him the material of his first book, Zableau de ? Agriculture Toscane, which, after returning to Geneva, he published there in 1801. Two years later he published his 7'raité de la Richesse Commerciale, his first work on the subject of political economy, which, with some differences of view, continued to interest him to the end of his life (for his position and work in this respect the reader is referred to the article Porrrican Economy, vol. xix. p. 383). Mean- while he began his great History of the Italian Republics, and was introduced to Madame de Stael. With her he became very intimate, and after being regularly enrolled in the society of Coppet he was invited or commanded (for Madame de Stael's invitations had something of command) to form one of the suite with which the future Corinne made the journey into Italy, resulting in Corinne itself during the years 1804-5. Sismondi was not altogether at his ease here, and he particularly disliked Schlegel, who was also of the company. But during this journey he made the acquaintance of the countess of Albany, Louisa of Stolberg, widow of Charles Edward, and all her life long gifted with a singular faculty of attracting the affection (Platonic and other) of men of letters. She was now an old woman, and Sismondi's relations with her were of the strictly friendly character, but they were close and lasted long, and they produced much valuable and interesting correspondence. In 1807 appeared the first volumes of the above mentioned book on the Italian republics, which (though his essay in political economy had brought him some reputation and the offer of a Russian professorship) first made Sismondi prominent among European men of letters. The com- pletion of this book, which extended to sixteen volumes, occupied him, though by no means entirely, for the next eleven years. He lived at first at Geneva, and delivered there some interesting lectures on the literature of the south of

Europe, which were continued from time to time and finally published ; and he held an official post,—that of secretary of the chamber of commerce for the then

department of the Leman. In 1813 he visited Paris for the first time and abode there for some years, mixing much in literary society. Although a Liberal and in his earlier days almost an Anglomaniac, he did not welcome the fall of the empire. During the Hundred Days he defended Napoleon's constitutional schemes or promises, and had an interview with the emperor himself which is one of the chief events of a not very eventful life. After the Restoration he left Paris. On completing his great book on the Italian republics he undertook a still greater, the Histoire des Francais, which he planned on a vast scale, and of which during the remaining twenty-three years of his life he published twenty-nine volumes. His untiring industry enabled him to compile many other books, but it is on these two that his fame chiefly rests. The earlier displays his qualities in the most favourable light, and has been least injuriously affected by subsequent writings and investigations, The Histoire des Francais, as a careful and accurate sketch on the great scale, has been entirely superseded by that of M. Henri Martin, while it is not to be mentioned, as a work of historical or literary genius, in the same category with that of Michelet. Sainte-Beuve

has with benevolent sarcasm surnamed the author "the

Rollin of French History," and the praise and the blame implied in the comparison are both perfectly well deserved. In April 1819 Sismondi married an English lady, Miss Allen, whose sister was the wife of Sir James Mackintosh, and the marriage appears to have been a very happy one. His later years were chiefly spent at Geneva, in the politics of which city he took a great, though as time and changes went on a more and more chagrined, interest. Indeed, in his later days he became a kind of reactionary. He died at Geneva on June 25, 1842. Besides the works above mentioned he had executed many others, his custom for a long period of years being never to work less than eight hours a day. The chief of these are Vouveaua Principes d'Economie Politique (1819), an historical novel entitled Julia Severa ou VAn 492 (1822), Histoire de la Renaissance de la

Liberté en Italie (1832), Histoire de la Chute de Vv Empire Romain (1835), Précis de Histoire des Frangais, an abridgment of his own book (1839), with several others, chiefly political pamphlets.

Sismondi's literary character has been hinted at in the above remarks on his French history. He was exceedingly laborious, for the most part (though not entirely) free from prejudice, and never violent even when he was prejudiced. He had (with much "'sensi- bility") plenty of common sense, though not perhaps any extra- ordinary amount of acuteness in estimating things uncommon, and he was a little deficient in historical grasp and in the power of taking large views of complicated series of events. His style corre- sponded to his thought, and (putting aside certain solecisms which French critics usually affect to discover in Swiss writers) lacks point, picturesqueness, and vigour. Of his moral character no one has ever spoken except in terms of praisc, and it appears (which is not invariably the case) to have been as attractive as it was estimable. His chief weakness seems to have been a tendency, frequently observ- able in writers of very great industry, to rank his own productions somewhat too much ona level with those of writers who, if less indus- trious, were infinitely more gifted. Thus he has somewhere naively observed that " he should not object to signing" a certain proportion of a certain book of Chateaubriand's. But this overvaluation of self appears to have been merely naif, and not in the least arrogant.

Sismondi's journals and his correspondence with Channing, with the countess of Albany, and others have been published chiefly by Mile. Mongolfier (Paris, 1863) and M. de Saint-René Taillandier. Thelatter work serves as the chief text of two admirable Lundis of Sainte-Beuve (September 1863), republished in the Nouveaux Lundis, vol. vi.

SISTAN, or Seistan (SesisTAN), the ancient Sacastane (Cakasthina, "land of the Sace") and the Mimruz or '"'meridies " of the Vendidad, is situated generally between 30° 0' and 31°35' N, lat. and 61° 0' and (including Rudbar) 62° 40' E. long. Its extreme length is about 100 and its breadth varies from 70 to over 100 miles,—but the exact limits are vague, and the modern signification of the name practically comprehends the peninsula formed by the lower

| gular, called “ Outer Sistan.”

SIS—SIS

Helmand and its embouchure on the one side and the “ HAmun” or “lake” on the other. When British arbitra. tion was brought to bear upon the disputed claims of Persig over this country in 1872, it was found necessary to sup. pose two territories—one compact and concentrated, which was called “Sistén Proper,” the other detached and irre Of each of these a brief description will be given.

1. Sistan Proper is bounded on the north by the “N&izdr,” or reed-bed which fringes the “ Hamun” or expanse ; west by the Hamun itself, of which the hill called ‘“ Kuh-i-Khwajah ”” marks the central point ; south by a line shutting in Sikuha and all villages and lands watered by the main Sistén Canal; and east by the old bed of the Helmand, from a mile above the dam at Kohak to the mouth. Kal‘ah-inau and Rindan are among the more northerly inhabited villages. The Kuh-i-Khwajah is a sufficient indication of the western side. Burj-i-Alam Khan should be included within the southern boundary as well as Sikuha. Khwdjah Ahmad and Jahanabad, villages on the left bank, or west of the true bed of the Helmand, denote the eastern line. The whole area is estimated at 947 square miles. The fixed population may be roughly stated at 35,000,—some 20,000 Sistanis and 15,000 settlers,—the greater part of whom are Parsiwans, or rather, perhaps, a Persian-speaking people. To the above

: numbers may be added 10,000 Baluch nomads. Taking the ageregate at 45,000, and look- %i.,9| ing at the extent of country {cuxpinsur] comprehended, we find nearly 48 persons to the square mile, These figures are eight times in excess of the proportional result found for the whole of Persia, Tt should be explained that the designation Sistén Proper is not arbitrarily given. The territory com- ‘| prehended in it is spoken of as Sistan by the dwellers on the right bank of the Helmand, in contradistinction to their own lands. At the same time it could only be but a fractional part—as indeed the whole country under consideration could only be—of the Sistan of Persian history. ‘

Sistan Proper is an extensive tract of sana and clay alluvium, generally flat, but irregular in detail. It has heaps, but no hills; bushes, ‘but no trees, unless indeed three or four tamarisks of aspiring height deserve the name; many old ruins and vestiges of comparative civi- lization, but few monuments or relics of antiquity. Ite well watered by rivers and canals, and its soil is of proved fertility. Wheat or barley is perhaps the staple cultiva- tion; but pease, beans, oil-seeds, and cotton are also grown. Among fruits, grapes and mulberries are rare, but melons and water-melons, especially the latter, are abundant. Grazing and fodder are not wanting, and besides the reeds peculiar to Sistan there are two grasses which merit notice,—that called bannu, with which the bed of the Hémtn abounds on the south, and the taller and less salt Airta on the higher ground.

2. Outer Sistdn, the country on the right bank of the Helmand, and east of its embouchure in the Hamun, extends more than 100 miles in length, or from a point between the Charboli and Khuspas rivers north to Rud- bar south. In breadth the district of Chakhanstr, measur ing from the old bed of the Helmand, inclusive of Nad Ali, to Kadah, may be estimated at some 30 miles. It

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LNaifaar

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Map of Sistan.

SIS—SIS5

produces wheat and barley, melons, and perhaps a few vegetables and oil seeds. Beyond the Chakhansur limits, southward or up to the Helmand, there is probably no cultivation save that obtained on the river bank, and ordinarily illustrated by patches of wheat and barley with melon beds. On the opposite side of the river, in addition to the cultivated portions of the bank, there is a large tract extending from above (7.e., south of) Kohak, or the Sistin dam (band), to the gravelly soil below the mountain ranges which separate Sistan from Baluchistan and Narmashir. The distance from north to

south of this plain may be computed at 40 miles, and from east to west at 80 or 90 miles. Lands north of the Naizar not belong- ing to the Afghan district of Lash Juwain may also be included in Outer Sistan; but it is unnecessary to make any distinction of the kind for the tract marked “ Hamun ” on the west, where it merges into the Persian frontier. Bellew states there are 1200 houses in Chakhanstr. This can hardly apply to the fort in which the sardar lives, and the comparatively few houses outside, bearing that name, and noticed by Major Lovett on his visit in 1872. Nor did there then appear to be any other centres of population in the district, excepting perhaps Kadah on the eastern limit. The inhabitants are Sistanis or Parsi- wans, Baluch nomads, and Afghans. Between the Kohak band and Rudbar they are mainly Baluch. Most of the less nomad tribesmen are Sanjurani and Toki, the sardars jealously claiming the former appellation.

The most remarkable geographical feature of Sistan generally, in the modern acceptation of the term, is the Hamun, or expanse, which stretches far and wide on the north, west, and south, but is for a great part of the year dry or a mere swamp. In the early spring, at which period the present writer was in the locality, the existence of a lake could only be certified by pools or hollows of water formed at the mouths of the principal feeders, such as the Khash Rid on the north-east, the Farah Rud on the north-west, aud the Helmand, where its old bed terminates at no great distance from the Khash Rud. Bellew describes the aspect of that portion of Sistén limited to the actual basin of the Helmand as indicating the former existence of a lake which covered with its waters a considerable area. On the north this tract has been raised to a higher level than the remainder by the deposit at the mouths of rivers of the solid matter brought down. It is still, however, from 200 to 500 feet below the level of the desert cliffs that bound it, and which at some former period formed the shores of the lake; and it is from 50 or 60 to 200 feet above the level of the beds of the rivers now flowing into the existing Hamun, The tract thus raised by depositions in the bed of the former lake, writes the same authority, is now the inhabited district of Sistan, and contains the Hamiun, a great sedge-grown swamp, the last relic of the lake itself. To the south of the Hamun and inhabited tract of Sistan is the Zarah hollow. It extends for about 100 niles to the Sarhad Mountains. Called by the natives God-i- Zarah, or the hollow of Zarah, it is described as a wide and circular depression sloping gently up to the bounding hills

and desert cliffs, deepest hollow, which, except in seasons of drought, is more or less marshy. It is connected along the western border of the area with the existing Hamin by the Sar-shila, a great drainage gully through which runs the superfluous flood of the Hamin.

The water-supply of Sistan is about as uncertain as that of Sind, though the general inclination to one bank, the left, is more marked in the Helmand than in the Indus. Therefore the boundary lines given must be received with slight reservation. It is easy to see that a good year of inundation extends the borders of the so-called lake to within the Naizdr ; and there are well-defined beds of dry canals intersecting the country, which pa the existence formerly of an extensive water-system no

onger prevailing. The main canal of Sistan, confounded by some Writers with the parent river, bears the waters of the Helmand Mad Into the heart of the country. They are diverted by ete a large band or dam, known indifferently as the “ Amir’s,” tathe 3 istan,” or the “ Kohak ” band. It is constructed of horizon-

y aid tamarisk branches, earth, and perpendicular stakes, and eg te from damage by a fort on the left and a tower on the = ee of the river. Although this diversion of the stream as ae a artificial development of a natural channel, and we te y dates from a period long prior to recent Persian

pation, it appears that the later arrangements have been more

maturely and better organized than those carried on by the pre- |

It receives the drainage of these in its central and °

decessors of the amir of Kaian. The towns of Deshtak, Chelling, Burj-i-Alam Khan, Bahramabad, Kimmak, and others of less note are actually on the banks of this main canal. Moreover, it is the indirect means of supplying water to almost every town and village in Sistan Proper, feeding as it does a network of minor canals, by which a system of profuse irrigation is put in force, which, with an industrious and a contented population, should be

productive of most extensive grain cultivation. To consider the main canal as the river itself is a theory which a brief inspec- tion of the locality seems quite to disprove. On the one hand we have a comparatively narrow passage abruptly turning to the westward, on the other a broad and well-defined river-bed pro- longed in the old direction, into which the waters would at all times flow unrestrained but for an artificial embankment. What- ever arguments, however, may be used on this head, the larger bed is assumed to be the original Helmand for purposes of territorial limitation.

Provisions in Sistan are, as a rule, sufficient, though sheep and oxen are somewhat poor. Bread is cheap and good, being pro- curable to natives at less than a halfpenny the pound. Vegctables are scarce, and rice is chiefly obtained from Herat. The inundated lands abound with water-fowl. Partridges and sand-grouse are occasionally seen. River fish are plentiful enough, but confined to one species, the barbel.

The inhabitants of Sistan are mainly composed of Kaiyanis, descendants of the ancient rulers of the land; Sarbandis and Shahrakis, tribes supposed to have consisted originally of immigrants from western Persia ; and Baluchis of the Nharui and Sanjurani (Toki) clans. Bellew separates the “Sistanis”; but it is a question whether this term is not in a large measure applied to fixed inhabitants of the country, whatever their descent and nationality. For instance, an old Shahraki guide to the Sistan Mission of 1872 persisted in being a “ Sistani”; and, if his defini- tion be accepted, the outside element must be confined to Baluchis and modern settlers only.

History.—The ancient Drangiana (Zaraya, Darafika, ‘‘ lake land ”’) received the name of ‘‘ land of the Saca” after this country was permanently occupied by the ‘‘ Scythians” or Sace, who over- ran Iran in 128 8.c. (see Prrsra, vol. xviii. pp. 594 sq.). It was included in the Sasdnian empire, and then in the empire of the caliphs. About 860 4.p., when it had undergone many changes of government under lientenants of the Baghdad caliphs, or bold adventurers acting on their own account, Yakub b. Laith made it the seat of his power. In 901 it fell under the power of the Sémanids, and a century later into that of the Ghaznavids. An invasion of Jaghatais and the irruption into its richer lands by Timur are salient points in the history of Sistan prior to the Safawid conquest (1508). Under this dynasty for more

than two centuries, or up to 1722, Sistan remained more or less a Persian dependency. At the time of the Afghan invasion of Mir Mahmud (1722), Malik Muhammad Kaiyani was the resident ruler in Sistan, and by league with the invader or other intrigue he secured for himself that particular principality and a great part of Khurasan also. He was slain by Nadir Kuli Khan, the general of Shah Tahmasp, who afterwards, as Nadir Shah, became possessor of Sistan as part of his Persian dominions. Shortly after the death of Nadir (1751) Sistan passed, together with other provinces, into the hands of Ahmad Shah Abdali, the first sovereign in a united Afghanistan. On the death of Ahmad Shah in 1773 the country became a recognized bone of contention, not so much between Persians and Afghans as between Herat and Kandahar; but eventually the internal dissensions of Afghanistan gave Persia the desired opportunity ; and by a steady course of intrigue and encroachment she managed to get within her grasp the better lands on the left bank of the lower Helmand and something on the right bank besides. When the British arbitrator appeared on the scene in the beginning of 1872, though compelled to admit the shah's possession of what has been called "'Sistén Proper," he could in fairness insist on the evacuation of Nad Ali, Kala Fath, and all places occupied on the right bank by Persian troops; and furthermore he left to the Afghans both sides of the river Helmand from the dam of Kohak to its elbow west of Rudbar. For the

precise boundary see PERsIA, vol. xviii. p. 619. See Eastern Persta, vol. i.; Bellew's Record of Sistan Mission; Journal of R. Geog. Society, vol, xlili. (1873). (F. J. G

SISTOVA, a town of Bulgaria, at the head of a district of its own name (40,893 inhabitants in 1881), is situated on the right bank of the Danube, about 40 miles above Rustchuk, and has rather a picturesque appearance on the slopes of the Kadbair and the Chuka. On the latter hill there stood till the fire of 1810 a medizval fortress, and previous to the 15th century it contained a Latin church of traditional celebrity. The lower town along the river consists of modern houses, mostly erected since 1870, and is the scene of busy commercial life, especially during the

grain-export season. The principal church, completed in 1867, is a large and costly building with an imposing dome. Sistova was one of the first of the Bulgarian towns to introduce the national language into its schools (1833), some of which are now well-endowed and flourishi- ing. More than half the inhabitants, who numbered 11,560 in 1881, are Bulgarians, the rest being Turks, Walachians, and Gipsies.

Sistova is identified with the old Roman colony Nove mentioned by Ptolemy and others. The exact site appears to have been Staklen, a cluster of viucyards with remains of ancient buildings to the west of the present town, which has gradually moved eastward since the 16th century, when it was reduced by the Turkish wars to a miserable village. It was at Sistova that the peace of 1790 was signed, by which the Austrian-Turkish boundary was deter- mined. The town was burned in 1810 by the Russian general Saint Priest ; but subsequent to 1820 it began to revive, and the introduction of steam traffic on the lower Danube (1835) restored its prosperity in spite of the effects of the Russian war of 1828-29, when the Walachian town of Alexandria was founded by fugitives from Sistova. In 1877 the Russians entered Bulgaria by passing the river just below Sistova.

SISTRUM, a kind of rattle used by the ancient Egyp- tians in religious ceremonies, especially in the worship of Isis. It consisted of a frame through which passed four rods ; attached to the frame was a handle. When shaken the rods rattled and produced the sound. After the in- troduction of Egyptian worships into Italy the Romans became familiar with the sistrum. It is described by Apuleius (Metam., xi. 4). An ancient sistrum formerly existed in the library of Ste Geneviéve at Paris. In paint- ings found at Portici a priest of Isis and a woman are represented rattling the sistrum. The instrument is said to be still in use in Nubia and Abyssinia.

SISYPHUS, a famous character of Greek mythology, was a son of Adolus and Enarete and brother of Cretheus, Athamas, and Salmoneus. He built Ephyra (Corinth), and married Merope, daughter of Atlas, by whom he had a son Glaucus. According to Pausanias (ii. 3, 11) Sisyphus succeeded Medea in the sovereignty of Corinth. Having found the body of the drowned Melicertes lying on the shore of the isthmus, Sisyphus buried him and instituted in his honour the Isthmian games. From Homer onwards

Sisyphus was famed as the craftiest of men. His name (formed by reduplication from the same root as codés) means the Wise, Wise One. When Death came to fetch him, Sisyphus put him into fetters, so that no one died till Ares came and freed Death, and delivered Sisyphus into his custody. But Sisyphus was not yet at the end of his resources. For before he died he told his wife that when he was gone she was not to offer the usual sacrifice to the dead. So in the under world he complained that his wife was neglecting her duty, and he persuaded Hades to allow him to go back to the upper world and expostulate with her. But when he got back to Corinth he positively refused to return to Deadland ; so he lived to a good old age, and even then Hermes had a tough job to carry him off. In the under world Sisyphus was compelled to roll a big stone up a steep hill; but before it reached the top of the hill the stone always rolled down, and Sisyphus had to begin all over again. The subject was a commonplace of ancient writers, and was depicted by the painter Polygnotus on the Lesche at Delphi.

The way in which Sisyphus cheated Death is a common incident in folk-tales. Thus in a Venetian story the ingenious Beppo ties up Death in a bag and keeps him there for eighteen months ; therc is gencral rejoicing ; nobody dies, and the doctors are in high feather. In a Sicilian story an innkeeper corks up Death in a bottle; so nobody dies for years, and the long white beards are a sight to see. In another Sicilian story a monk keeps Death in his pouch for forty years. (See Crane, Popular Italian

Tales, Nos. 68, 64, 65, 66, with the translator’s notes.) The German parallel is Gambling Hansel, who kept Death up a tree for

seven years, during whieh no one died (Grimm, Household Tales, No. 82; in his notes Grimm cites a number of German parallels), The Norse parallel is the talc of the Master Smith (Asbjérnsen og Moe, Norske Folke-Eventyr, 21; Dasent, Popular Tales from the Norse, p. 106). For a Lithuanian parallel, see Schleicher, Litawische Mdhrehen, Spriechworte, Ritsel, wnd Lieder, p. 108 sq); for Slavonic parallels, Krauss, Sagen wid Mahrehen der Stidslaven, ii., Nos. 125, 126.

SITAPUR, a British district in Sit4pur division or commissionership of Oudh, under the jurisdiction of the lieutenant-governorship of the North-Western Provinces of India. It lies between 27° 7’ and 27° 53’ N. lat. and between 80° 21’ and 81° 26’ E. long., and it is bounded on the N. by Kheri district, on the E. by that of Bahraich, from which it is separated by the Gogra river, and on the S.and W. by Bara Banki, Lucknow, and Hardoi districts, the Gumti river forming the boundary. Sitdpur district is elliptical in shape; its greatest length from south-east to north-west is 70 miles, and its extreme breadth from north-east to south-west 55 miles; its area is 2251 square miles. Being without hills or valleys, and devoid of forests, Sitapur presents the appearance of a vast plain sloping imperceptibly from an elevation of 505 feet above sea-level in the north-west to 400 feet in the south-east. The country is, however, well wooded with numerous groves, and well cultivated, except in those parts where the soil is barren and cut up by ravines. It is inter sected by numerous streams, and contains many shallow ponds and natural reservoirs, which overflow during the rains, but become dry in the hot season. Except in the eastern portion, which lies in the doabs or alluvial plains between the Kewdni and Chauka and the Gogra and Chauka rivers, the soil is as a rule dry, but even this moist tract is interspersed with patches of land covered with saline efflorescence called ‘‘reh.” The principal rivers are the Gogra, which is navigable by boats of large tonnage through- out the year, and the Chauka. Nylghau, many varieties of deer, wild hog, wolf, jackal, and fox are common, but none of the larger wild animals are found within the district. The climate is

considered healthy, and the cantonments of Sitapur are famous for the low mortality of the British troops stationed there. The average annual rainfall is about 33 inches. The district contains no railway, but it is well provided with good unmetalled roads. .

In 1881 the population was returned at 958,251 (505,986 males and 452,265 females) ; Hindus numbered 818,738, Mohammedans 188,783, and Christians 448. Sitapur contains but two towns with more than 10,000 inhabitants,—namely, Khairabad, 14,217, and Laharpur, 10,487. The administrative headquarters of the distriet are at Sitapur town, which is prettily situated on the banks of the Sard4yan river, with good groves in all directions, and with a population in 1881 of 6780. Of the total district area 1450 square miles are cultivated and 510 are cultivable. The principal staples are wheat, barley, joar, gram, bajra, and rice; besides these

a considerable quantity of sugar-eane is raised, as also oil seeds, cotton, and tobaeco. The only manufactures of any note are tobacco and tazias at Biswan, with a little cotton printing and weaving m most of the towns. The history of Sitdpur is elosely associated with that of the rest of Oudh. “The distriet figured prominently in the mutiny of 1857, whén the native troops quartered in the cantonments rose in mutiny and fired on their officers, many of whom were killed, as were also several military and civil officers, with their families, in attempting to escape. Order being restored in 1858, the Government offices were re-opened, aud nothing has since occurred to disturb the peace of the district.

SITTINGBOURNE, an ancient town of Kent, is situated on a navigable creek of the Swale, and on the London, Chatham, and Dover Railway, at the junction for Sheerness, 7 miles south from the latter town and 45 east-south-east of London. It consists principally of one long street and the northern suburb of Milton, formerly celebrated for its oysters, the fishery of which used employ a large number of the inhabitants. Brickmaking is a very important industry, and there are large paper

mills, St Michael’s church, in the Early English and later styles, underwent extensive restoration in 1873 at a cost of nearly £3000. The principal other

public buildings are the old town-hall, the corn exchange (erected 1859), and the museum. Public gardens 10 acres in extent have recently been laid out. The local government board was instituted in 1878. The population of the urban sanitary district (area 1004 acres) in 1871 was 6148 and in 1881 it was 7856. Sittingbourne, or Sedyngburne, reecived a grant of a market and two annual fairs by a eharter of Queen Elizabeth. The style " guardian and free tenants," applied to the eorporation in this charter, was subsequently ehanged to that of "mayor and jurats."

See W. A. Scott Robertson, Sittingbourne and the Names of Lands and Houses in or near tt, Sittingbourne, 1879.

STUT, or Asytr (Asioor), more correctly OsyUT, a town of Upper Egypt, and southern terminus of the railway on the left bank of the Nile, by which it is 229 miles from Bulk Dakrir. The population is about 25,000. See Eeypt, vol. vii. p. 775.

SIVA, See BRAHMANISM.

SiVAS, or SiwAs, a pashalic and capital of a pashalic of great importance in Asia Minor. The town is situated on the right bank of the Kizil Irmak (Halys), in a plain of some 16 to 20 miles in length and 4 to 6 in breadth. From the south the approach is by a good road among the mountains, and the aspect from the heights is pleasing. Dotted here and there with trees, some in large extended clusters, the houses and citadel cover a considerable space and appear much scattered. On the north a military road has been constructed to facilitate communication with the coast. Sivas is 4670-feet above the level of the Black Sea, and should bea healthy residence for Euro- peans. The population, estimated on the spot in 1864 at 10,000 houses, more than a fifth being Armenians, is stated in Murray's Handbook of 1878 to consist of 5000 Turkish and 1200 Armenian families. There are some respectable residences but not many buildings or monuments of note; and the streets are narrow and ill- maintained. The bazaars are fairly stocked with goods, British as well as of other European nations.

Sivas is the aneient Scbasteva (not to be confounded with Sebaste or Gabira on the Lyeus, the modern Niksar), the eapital of Armenia 1I., and the seat of an archbishop. In 1021 it was eeded by the emperor Basil to the Armenian

king, Senekharim. It again beeame Greek in 1080, but soon after fell to the Seljuks. In the 13th century Mareo Polo speaks of Scvaste as the place "where the glorious Messer Saint Blaise suffered martyrdom." It was, when he wrote, in the possession of the Turkmans of Kara- mania, living under the government of the Seljuk prinees. In the 14th eentury we have the testimony of Ibn Batuta, who says (ii. 289) :—"It is one of the possessions of the king of Irak, and the largest town owned by him in the country. His ehiefs and his collectors reside there. It is well-built, and has wide streets and erowded markets." Colonel Goldsmid visited Sivas in July 1864, and was shown some fine monuments deseribed as the mausolea of the Seljuks, the inscriptions on which he found to date no earlier than 670 of the Hijra, though the actual tombs might be traceable to a former period.

SIXTUS I. (Xysrus) figures in the lists accepted by

the Roman Church as having been bishop of Rome from about 119 to about 126. He is conjectured to have been & presbyter and a martyr. _ SIXTUS II. followed Stephanus I. as bishop of Rome m 257, and suffered martyrdom under Valerian in the following year. He restored the relations with the African and Eastern Churches which had been broken off by his pre-decessor on the question of heretical baptism. Dionysius succeeded him.

SIXTUS IIL, bishop of Rome from July 31, 432, to August 18, 440, had Coclestinus I. as his predecessor, and Was succeeded by Leo I.

SIXTUS IV. (Francesco della Rovere), pope from 1471 to 1484, was born 21st July 1414, near Savona. The Statements respecting his parents' situation in life are

very conflicting. In consequence of a vow made by his mother he entered the Franciscan order at an early age, and speedily acquired a great reputation for eloquence and learning, After filling several minor offices he became general of his order, and in 1467 was to his own surprise made cardinal by Paul II., at the recommendation, it is asserted, of Cardinal Bessarion. When, upon Paul's death in 1471, the rigour of Bessarion's principles prevented his profiting by the favourable sentiments of influential

cardinals, who, nevertheless, expected to be recompensed for their suffrages, Rovere seems to have been found more accommodating. The liberality of his donations after his election, at all events, raised suspicion ; but the friendship of Bessarion has also been enumerated among the causes of the sudden elevation of the most recent member of the Sacred College. He was elected on 9th August 1471, and immediately proceeded to lavish Paul's treasures— partly in laudable preparations against the Turks ; partly in embassies, receptions of foreign princes, public improve- ments, and other expenses possibly imprudent, but at least not indecorous; partly, without any excuse, upon his unworthy nephews, Count and Cardinal Riario. The prodigalities of the latter surpassed all measure, and he compromised his uncle much more seriously by his com- plicity in the conspiracy of the Pazzi, aiming at the assassination of the Medici family. Sixtus was cognizant of the plot, but had positively forbidden the shedding of blood, whicl he must nevertheless have known to be in- evitable. He deserves still more censure for entering into a fruitless and inglorious war with Florence, which ter- minated in 1480, after having kept Italy for two years in confusion. Scarcely was it over when he allowed himself to be involved in yet more troublesome and discreditable contests,—first inciting the Venetians to attack Ferrara, and then, after having been delivered by their general Roberto Malatesta from a Neapolitan invasion, turning round upon them and eventually assailing them on their refusal to desist from the hostilities which he had himself instigated. He relied on the co-operation of Lodovico Sforza, who speedily forsook him; and the scandal was witnessed of the secular princes and cities of Italy agreeing to a peace which the Father of Christendom did his best to thwart, and vexation at which was believed to have hastened his death. He died, at all events, a few days afterwards, 13th August 1484, leaving an unfortunate reputation as the first pope who brought nepotism into politics, and, not content with enriching his relatives by gifts and lucrative offices, made their aggrandizement the principal object of his policy as a secular prince. His private character was nevertheless estimable : he was pious, of blameless morals, hospitable and munificent to a fault, and so exempt from avarice, says his secretary Conti, that he could not endure the sight of money. His faults were those of a monk who had no natural outlet for strong affections except unwortly relatives, and who had been called from a cloister to fill the most con- spicuous position in the world. His secular policy was capricious and

spasmodic; he neither maintained the peace of Italy like his predecessor and successor nor carried out a consistent and well-considered scheme of conquest like Alexander VI. He was, notwithstanding, always firm in his resistance to the Turks, and showed magnanimity by aiding his enemy the king of Naples against the common foe of Christendom. The brilliant side of his administration was his munificence as a founder or restorer of useful institutions and a patron of letters and art. He established and richly endowed the first foundling hospital, built and repaired numerous churches, constructed the Sixtine Chapel and the Sixtine Bridge, commissioned paintings on the largest scale, pensioned and

rewarded men of learning, and, above all, immortalized himself as the second founder of the Vatican library. It has been said that the stones alone inscribed with his name would serve to erect a considerable edifice. These great works, however, were not accomplished without grievous taxation and questionable methods of raising money ; and Sixtus's successor expressed the general con- demnation of his government when he declared that he for his part would imitate the example of Paul II. Sixtus was succeeded by Innocent VIII. (R. G.) SIXTUS V. (Felice Peretti), pope from 1585 to 1590, was born 13th December 1521 at Grottamarina, in the district of Fermo, of a family said to be of Dalmatian extraction. His parents were undoubtedly in humble circumstances, but the story of his having been a swine- herd in his youth seems to be a mere legend. He entered the Franciscan order at an early age, and obtained great celebrity as a preacher. After having been successively professor at Rimini and at Siena, he became inquisitor- general in Venice (where his firmness in controversy with the Venetian Government exposed him to personal danger), theologian at the council of Trent, and ultimately vicar- general of his order. In 1565 he accompanied the papal legate to Spain, and in 1570 was created cardinal by Pius V., and entrusted with the publication of a correct edition of the works of St Ambrose, which appeared in 1579-1585. Finding himself out of favour with Pius's successor, Gregory XIII., he withdrew to a villa which he had purchased, and lived in strict retirement, affecting, it is said, to be in a precarious state of health. According to the usual story, which is probably at least exaggerated, this dissimulation greatly contributed to his unexpected elevation to the papacy

on the next vacancy, 24th April 1585. If the electors had indeed anticipated a weak or ephemeral pontificate, they were grievously disappointed. Sixtus speedily proved himself one of the most vigorous popes, both in body and mind, that had ever occupied the chair of St Peter. Within two years he issued seventy- two bulls for the reform of religious orders alone. Ardent, despotic, indefatigable, he did everything by himself, rarely invited advice and still more rarely followed it, and manifested in all his actions a capacious and highly original genius, in most respects eminently practical, but swayed in some things towards the visionary and fantastic by the inevitable effects of a monastic training. His first great aim was to purge the papal dominions of the robbers who had overrun them under the weak administration of his predecessor. This salutary undertaking was effectually accomplished, not without many instances of tyranny and cruelty which have left a stain upon his name ; but security of life and property returned. Sixtus's financial management seemed on a superficial view equally brilliant ; he had found the exchequer enipty, and speedily accumulated an immense treasure. But this end was obtained partly by excessive taxation, partly by the sale of offices which had never before been venal; and the withdrawal of such an amount of specie from circulation inpoverished the community. His intention was to amass a fund for use in special emergencies, such as a crusade or a hostile invasion, which never arose. Much, nevertheless, was expended by Sixtus in the encourage- ment of agriculture and commerce, and in public works, either of signal utility, like his supply of Rome with water, or such at least as impressed the popular imagination with his munificence, as the completion of the cupola of St Peter's, the construction of six new streets, and the eleva- tion of four Egyptian obelisks in various parts of Rome. Though a scholar, Sixtus was no humanist, and did much mischief to the monuments of antiquity, ruthlessly destroying some, and disfiguring those which he repaired

by the addition of Christian attributes. In his ecclesias. tical and foreign policy good sense contended with eccen- tricity but usually obtained the upper hand. He thought of attacking Turkey with the alliance of Poland and Russia, of subjugating Egypt by his own forces, of making a descent into Syria and carrying off the Holy Sepulchre, But he never attempted to realize

these projects, and his conduct of the affairs which imperatively required his attention evinced more moderation than could have been expected. After having strongly sided with Spain and the League, he allowed himself to be convinced by the Venetian ambassador of the evil consequences of Spanish preponderance in Italy, and showed a manifest disposition to acknowledge Henry IV. as king of France, on condition of his abjuration. This led to violent altercations with the Spanish ambassador, and the death of the pope on 27th August 1590 was attributed by many to poison, though without sufficient ground. He was succeeded by Urban VIL Sixtus V. left the reputation of a zealous and austere pope,—with the pernicious qualities insepar- able from such a character in his age,—of a stern and terrible but just and magnanimous temporal magistrate, of a great sovereign in an age of great sovereigns, of a man always aiming at the highest things and whose great faults were but the exaggeration of great virtues.

The best view of his charaeter and government is that given by Ranke. Leti's well-known biography is full of fables ; Tempesti is too panegyrieal ; aud Lorentz is little more than a eompiler from the two. The most valuable part of Baron von Huebner's Site Quint (Paris, 1870) is the rich appendix of doeuments. Sixtus's note-books and drafts of letters in the Chigian library, frequently referred to by Tempesti and Ranke, were published by Cugnoni in 1882. : (RB. G.)

SKATE. See Ray.

SKATING, as at present practised, may be defined asa mode of progression (usually rapid) upon smooth ice, by the aid of steel blades attached to the soles of the feet. It probably originated in the far north of Europe, in Scandi- navia and Germany, where it is still in common use. In Russia it has never been a national pastime, as no smooth ice is formed in the rapidly running rivers. Even in St Petersburg it is mainly engaged in by English and Germans. The earliest skates appear to have been certain bones of large animals, but wood was also used from an early period.

In modern skating there are two totally distinct styles, which require different skates differently attached to the feet, and different extents and qualities of ice. The first, the "running " or "fen" style, simply consists in going straight ahead at the highest possible speed. _ Its home is on the

fiords of Scandinavia, the fens of Lincolnshire, and the large rivers and lakes of North America. In Holland, Denmark, and North America it is the medium for carrying a large winter market traffic. It first be- came common in England in 1662 after the return of the Stuarts. The wooden part or stock of a running skate is from 8 to 12 inches long, according to the length of the foot. The blade is made of the best steel, with an average width of .% inch. The heel is at right angles to the surface of the ice. The prow begins to rise 0 the ice at the fore end of the stock, at a gradually in- creasing angle, and projects 4 inches. The entire skate is attached to the foot by an iron screw in the heel of the stock which enters the skater's boot heel and two long straps which pass through slots in the stock and fasten round the ankle and toes of the skater. The length of the heel strap varies from 22 to 32 inches, and that of the toe strap from 15 to 23inches. Formerly the bottoms of the blades were fluted. A concavity is now effected by grinding; and, when in motion, the blade is rarely flat on the ice, The curve should be slight, and the depth

no greater than will ensure a curve being made without touching the ice. The feet are placed at right angles to cach other with the toes turned out and the body bent slightly forward. Each foot is then raised alternately and set down slightly on the inside edge. It immediately acquires a forward motion, which is increased by pushing with the other foot, that being at right angles and having no sliding motion. The feet must be kept perfectly level when raised and set down, and the skate carried in the same manner an inch above the ice when going forward. The forward stroke is made on the outer edge, and the pressure applied to the inner edge of the other foot. The arms are swung across the chest from side to side, and opposite to the direction of the striking leg in order to balance the weight. The quickest method of stopping is to place the feet parallel, dig the heels into the ice, and arch the back. A longer but more graceful method is to turn the toes in- wards, thus spreading the outside edges athwart the line of going. The feet should never be looked at, as the balance of the body is thereby disturbed. The eye should always be on a line with the horizon.

The fastest skating times recorded, from a standing start, and with no rear wind, have all been made in the United States, at New York, as follows :—

100 yards, 10§ s.; 200, 213 s.; 300, 313 s.; Lmile, 444s.; 4, 1m. 41$8.; 3, 2m. 342-6.; 1, 8m. 2625.3; 2; 6m. 564s.; 8, 10m. 333s.; 4, 14m. 10$s.; 5, 17 m. 45 s.; 6, 21m. 38s.; 7, 25m. 174s.; 8, 29m. 945s.; 9, 82 m. 54$ s.; 10, 36 m. 371s.; 20,1 h. 14m. 7} s.; 30, 2h. 31m. 12s.; 40, 3 h. 91 m. 22s.; 50, 4h. 13m. 36s, The best running high jump on skates recorded is 3 ft. 12 in., and running long jump 15 ft. 2 in.

The second style, termed “figure skating,” is quite modern and purely English in its origin. This may be practised on any small pond, provided the ice is clear of snow and perfectly smooth. The more numerous opportunities thus afforded make it the more popular style in Great Britain, where the large streams seldom freeze. Figure skating consists in cutting arcs, circles, figures, letters, serpentines, and spirals,—either forwards or backwards, slowly or rapidly, on one or both feet, singly or in combination. The style can ultimately be analysed into four kinds of strokes, all made on the edges of the blade— the inside forward, the outside forward, the inside back- ward, and the outside backward. The variety of evolu- tions which can be developed from these four movements is endless. The figure skate is made entirely of metal, is

strapless and fixed to the boots by clamps or like devices. Unlike the running skate, it can be instantly put on or taken off. Many kinds have been invented, but the “‘ Acme,” first produced in Canada, is generally acknowledged the best. The blade projects the merest trifle beyond the length of the foot and is rounded off in an upward direction from the ice at both toe and heel. The bottom is } inch wide, and the best curve for grinding it is to that of a seven- foot radius, equal throughout and not increased at either end. In stopping, the end of one skate is placed at right angles to the other.

Summer skating has been occasionally provided in “ slaciariums” by means of artificially produced ice.

The London Skating Club, founded in 1830, is the leading skating society of Great Britain. Comprising but 170 members, including 20 ladies, and practising on exclusively private water in Regent’s Park, it countenances

figure skating only and gives no encourage- ment whatever to the spread or teaching of a national pastime. The National Skating Association was formed in the year 1879, and, on December 8, held the first race for the running champion- ship at Thorney, Cambridgeshire. The objects of the association are as follows :—

To promote, ascertain, and reward speed in skating,—by the establishment aud managemeut of amateur and open skating championships of England; by stimulating and supplementing local action in holding of skating matches; by establishing an order of merit for speed skaters, and awarding badges for the same; by assisting in providing facilities for skating by the shallow flooding of jand in cach locality where local branches exist; and by collecting through cor- responding members information of the existence of ice on which skating is practicable, and the supplying of such information to its members; and to pro- mote and encourage figure skating, by the establishment of standards at which figure skaters may aim, by bestowing badges of merit on those who attain thesc standards, and by promoting and assisting in the formation of skating clubs. To provide rules and regulations for the game of hockey on the ice. Also to pro- mote the establishment of international skating contests in various countries under the direction of an international council.

In the United States and Canada large and shallow artificial ponds under cover, termed ‘‘rinks,” are in winter frozen by filling them with water. Each night the surface is covered with a layer of water, which gives a fresh sheet of ice by morning. The covers protect the rinks from snow, another great advantage.

As regards a substitute for ice and ice skating on wooden or asphalt floors, the only invention that has ever been found even partially successful is that of James L. Plimpton of New York in 1869. “The implements may be described as skates with two parallel wheels at the toe and heel, so hung that the whecl axles are moved out of parallel by the transverse rocking of the skater’s foot, the wheels setting squarely on the surface whether the skater be upright or canted. The fatigue caused by these ‘‘ roller skates” is quadruple that of ordinary ice skating.

See The Field, December 28, 1882, January 6 and February 3, 1883 ; N. and G, A. Goodman, Handbook of Fen Skating, 1882; G. Anderson, Art of Skating, 4th ed., 1880; H. C. Vendervell and T. M. Witham, Figure Skating, 8d ed., 1880; and M. F. M. and §. F. M. Williams's Combined Figure Skating, 1883.

SKELETON

HE word "skeleton," meaning in Greek a mummy, is popularly taken to denote that assemblage of bones and cartilages which forms the internal support of the body of man and of the animals more or less nearly resembling him. A slight acquaintance with the structure of these animals, however, seems to make it evident that a wider sig- nification must be given to the term, since parts which in man and many of his animal allies are bony or cartilaginous may be only membranous in other such animals ; and, con- versely, parts sometimes quite external, which are merely membranous in man and many animals, may in others assume the structure of horn or bone or may contain bones or cartilages. The word skeleton may indeed be taken to denote both a more or less firm and com- plete external protection to a living body, and also a eS or less firm and complete znternal support to such y.

Tn this very wide sense even many vegetal structures may be said to possess a skeleton. For all plants which can sus- tain themselves in an upgrowth from the ground obviously both require and possess solid structures—various groups and varieties of woody fibres—to support such an upgrowth. Organs also, such as leaves, which need to be maintained

in the form of a thin flat expanse, require and possess bundles of fibres (vulgarly called veins) which are even popularly said to constitute the skeleton of the leaf. Many plants form such skeletal structures largely of silex, as do the grasses and the horsetails (Mquisetum), and others invest themselves to a greater or less degree with carbonate of lime, as do some Algex, such as Corallina and Melobesia, while the Desmidix clothe themselves with a horny coat. Ordinarily, however, the word skeleton is only used to denote certain animal structures, and mainly such structures as form the skeleton of man and of creatures so nearly allied to him as to

constitute, together with him, that primary division of animals known as backboned animals or Vertebrata.

It is to a concise description of the skeleton as it exists in Vertebrates generally that this article is devoted. For the details of the human skeleton the reader is referred to the article ANAtomy. In order, however, that its condi- tion in Vertebrate animals may be better understood, it will be well briefly to point out some of the more important varieties of condition presented by the protecting or sup- porting parts of the body of the lower, or Invertebrate, animals.

THE SKELETON OF INVERTEBRATA.

A great and fundamental distinction exists, however, between those lowly organisms known as Protozoa or Hypozoa—which are generally reckoned as animals—on the one hand and all the higher forms, both Vertebrate and Invertebrate, on the other. lt is a dis- tinetion which renders it difficult to regard any skeletal structures of the Hypozoa as answering to, in the sense of being the homologues of, any of the skeletal structnresof higher animals. This great funda- mental distinction consists in the fact that the bodies of all the higher animals are made up of distinct ‘‘ tissues,” which are derived from three different layers of cells, of which the embryos of all? of them are for a time composed, whereas the bodies of the Hypozoa either consist of but a single cell or else of a smaller or larger number of cells more or less loosely aggregated and not forming any distinct tissue. It follows of course that their reproduction does not take place by means of embryos formed of cellular layers.

Nevertheless the Hypozoa or Protozoa may exhibit very distinct protective structures. Thus the outermost layer of the substance of an Ameba, called its ectosarc, is of a firmer consistency than its interior, and it may in allied forms take on a chitinous character or become quite hard through the deposition within it of calcareous salts (as in the sometimes singularly complex shells of the Fora- minifera) or form syminetrical cases of silica.

In the Radiolaria, the skeleton of the Protozoa attains its maxi- inum of beauty and complexity. It consists of spicules which are generally siliceous, but may consist of a peculiar firm organic substance termed “acanthin.” The spicules arrange themselves in an extraordinarily symmetrical manner, generally radiating from the central portion of the organism and being connected with one or more series of encircling spicules which may constitute a scries of concentric spheres.

Among the Infusori we external cuticle, as in Zintinws lagenula and in some other

orms.

When we pass to that vast group of aniinals—the Metazoa— which includes all but the Protozva (and all those therefore the bodies of which are formed of tissues derived from the three primitive layers), a distinction again requires to be drawn between the Sponges (Porifera), which constitute its lowest group, and all higher forms. The three primitive or germinal layers of the Metazoa are termed respectively—(1) the epiblast, (2) the mesoblast, and (3) the hypoblast. Of these three layers the epiblast and the hypoblast are to be regarded as primary.* The epiblast is essentially the primitive integument, and its cells give rise to the epidermis and cuticle and to the organs of sense. The hypoblast is essentially the digestive layer, and gives rise to the epithelium lining the aliment- ary canal. The mesoblast seems to originate from one or both of the two preceding layers, and gives rise to the general substance of the body—including that part of the skin which is beneath the epi- dermis, the muscles, and the blood-vessels. It may divide into two layers, whereof the more external is distinguished as “somatic,” while the more internal is called ‘‘splanchnic.” Such is the general condition of the three germinal layers in the Metazoa. In the Sponges, however, it seems probable * that the germinal layers have a different nature—the epiblast and miesoblast being respectively the digestive and sensory layers.

The skeletal structures of the Sponges have the form of spicules, which may vary greatly in different genera as to their form, while they may be siliceous, calcareous, or horny. Sometimes they con- stitute structures of singular beauty. They appear to be formed in or on the cells of the

mesoblast, and it does not seem that any skeletal structures arise in the epiblast or hypoblast of the Porifera. Should such, however, be hereafter found, then it must be borne in mind that their homologies with analogous skeletal structures of other organisms must depend on the final decision of the question of the exact relations which may exist between such germinal layers in Sponges and the epiblast and hypoblast of higher ALetazoa.

In the great group of the Celentera, the skeleton may be either cpiblastic or mesoblastic in nature. Thus in the Hydrozoa—where it mostly has the form of a horny investment, but may be (as in the Millepores) calcareous—it is epiblastic. In the Actinozoa— which includes the true coral animals—it is generally mesoblastic, although it is formed from the epiblast in the Gorgonia, Isidine, and Pennatulida.

1 “Homologous parts,” or homologues,” are parts of an organism which cor- respond in relative position, that is, in their relation to surrounding structures, whether or not they serve the same ends. They thus differ from ‘‘ analogous parts,” whieh are parts performing similar functions whether or not they agree 4s to their relations of position to surrounding structures. ‘Thus, ¢.g., the nail of a man’s middle toe and the hind hoof of a horse are “ homologous parts,” but the hoot, as the support of the body and agent in locomotion, is analogous to the whole foot of a man.

2 Certain Coelenterate animals consist but of two layers,

3 See F, Balfour’s Comparative Embryology, vol. i. p. 103.

4 Op. cit., vol. i. p. 122, and vol. ii, p. 285.

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awe also find examples of a hardening of |

In JZsis the skeleton curiously consists of a series of segments which are alternately horny and calcareous.

In the Echinodermata we generally have, notably in the Sea- Urchin (Hehinus), a wonderfully complex skeleton, which is so near the outer

surface that at the first glance it seems necessarily a most external form of skeleton. Nevertheless the plates which compose it are mesoblastic in nature and are independent of the epidermis.

The two valves forming the shell of the Lamp-shells (Branchiono- poda), and the very different two valves which coustitute the shells of creatures of the Oyster class (Lamellibranchiata), as well as the single shells of the Snail and Whelk class (Gasteropoda), are all epiblastic in nature, and are calcifications of the outer part of the epidermis. The same is the origin of the apparently internal shell of the Slug, which is at first external in the embryo and subsequently becomes enclosed.

Similar is the nature of both the internal and external shells of the Squids, Cuttle-fishes, and Nautili, ¢.¢., of the class Cephalo- poda, In the last-named class, as in some Gasteropods, there is a cartilaginous structure inside the head, which structure supports and partly protects the brain. It is unlike any skeletal part yet mentioned save in its mode of origin, which, like the skeleton of some of the Actinozoa, is mesoblastic.

Lastly may be mentioned the hard_protecting external coat of insects and animals of the Crab and Lobster class—in short, the external skeleton of that primary division of animals which is called Arthropoda, This is again epiblastic, and a hardening of a cuticle on the outer surface of the epidermis —a hardening elfected gene- rally by chitinization (the deposition in it of a substance termed ‘“chitin”’), or, as in many Crustacea and some Myriapoda, by calcification.

GENERAL SKELETAL CONDITIONS.

Having thus briefly glanced at the leading skeletal structures of a number of groups of lower organisms, we may make the following generalization, which will be of use to us in helping us to understand how the skeletal parts of backboned animals stand related to the skeletal parts of animals lower in the scale :—

(1) Skeletal structures may conceivably arise in parts

which are epiblastic, or mesoblastic, or hypoblastie.

(2) Skeletal structures belonging to any one of those three categories may be further divisible into two subordinate categories according as they belong to a superficial or a deep part of the layer to which they appertain.

(3) Skeletal structures may be siliceous, chitinous, cal- careous, cartilaginous, or horny.

(4) In certain animals the mesoblast subdivides into two layers, one somatic and the other splanchnie. Obviously, then, there may be skeletal parts corresponding to either of these last-named layers, and conceivably to a deeper or more superficial portion of either of them.

THE SKELETON OF VERTEBRATA.

The skeleton of the Vertebrata—that is, of the five classes of animals named Pisces, Amphibia, Reptilia, Aves, and Mammalia—may in the first place be most conveniently considered as consisting of two parts—a dermal skcleton, or exoskeleton, and an internal framework, or endoskeleton. The latter, which is generally much the more considerable, is mesoblastic, and the muscles are external to it.

EXTERNAL SKELETON OF VERTEBRATA.

This division of the skeleton is itself again made up of two parts. The more external of these is the epidermis and is of epiblastic origin, and dense epidermal structures may arise towards its inner or its outer surface. The more internal constituent of the exoskeleton is the dermis and dense structures formed in it, and these are from the outer portion of the mesoblast.

Epidermal hard structures formed towards either sur face of the epidermis may become intimately united with subjacent dermal hard structures, and then again, as we shall see, with parts of the true endoskeleton.

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Any hard structures formed in the walls of the alimentary canal—the lining of which is continuous at either end with the external skin—are to be reckoned as fundamentally exoskeletal. In the process of development the epiblast becomes inflected more or less into either extremity of the alimentary tube, but the intermediate portion, together of course with any hard structures de- veloped in it, is of hypoblastic origin.

In the great majority of Vertebrate animals the two layers of the skin, the epidermis and the dermis, are, as in man, soft, though locally provided with certain denser appendages, such as epidermal and dermal scales, hairs, nails, scutes, and teeth.

The soft, general exoskeleton or skin invests the body of Man pretty closely, though slightly projecting folds of it extend between the roots of the fingers and toes. In some abnormal cases these folds extend so far and bind the digits together so much that the thus malformed person is said to be “ web-fingered ” or ‘“‘ web-toed.” Such a condition is found normally in many animals, as notably in Ducks and Geese, and such parts form a large portion of the “wing” of the Bat.

Other extensions of the skin of the body are note- worthy. Thus in the “Flying” Squirrels and Opossums, and the curious Rodent named Anomalurus, the skin of the sides, between the arms and the legs, is much expanded, serving for a parachute. There may be a skin parachute supported by long free movable ribs, such as we shall see exist in the little Lizards called “‘ Flying Dragons.” There may be a very remarkable extensive skin round the neck, as in the Frilled Lizard, and folds of skin may hang freely, as in the “dewlap” of Cattle, or may be formed here and there as in the Rhinoceros, the skin of which animal is so thick as to necessitate the existence of such folds to allow free movements to the body and limbs. Long filamentary processes may be formed along the back, as in the Iguana and various other Lizards.

In the Seals a fold of skin connects together the hind legs and the tail, and also in our common Bats, which have in addition their very elongated webbed fingers connected with the sides of the body and legs by another

great fold of skin which, with those between the fingers, forms the entire bat's "' wing."

The integument may be very distensible, as in those Fishes (¢.9., Diodon) which distend themselves with air and then float belly upwards.

_ The epidermis of many Vertebrates, and of Man, is shed in minute fragments, constantly removed by friction and ablution, and constantly replaced; only under abnormal conditions and after certain diseases does it come away in large and continuous patches. In some other Vertebrates, as notably in Snakes, the entire epidermal investment of the body, even that of the eyes, is cast off entire as one whole.

The epidermis never has its superficial layer connected with bone, but it often becomes thickened and horny, as We see in the sole of the foot, or the labourer's hand, and in those abnormal thickenings called "corns." Certain local thickenings which are not abnowmal may exist in animals ; such are the callosities on the inner side of the legs of the Horse, on the breast of the Camel, and on the nates of the lower Old-World Apes.

Of the appendages of the epidermis the most simple are scales, such as we find on the legs of Birds and the bodies of Serpents and Reptiles gencrally.

_scle—a true scale, such as those of Snakes and Lizards— eo of papilla of the dermis invested by the epidermis, the 1 being covered by a cornification of the external part of the M. ermis. Scales may be very diverse in shape, prominence, and relative size, and may form very large plates. The so-called i. of Fishes are of deeper origin and are a form of scutes.

a hair differs from a scale in that, instead of being an cpidermic vestment of a dermal projection outwards, it originates by an

epidermal projection inwards into the subjacent dermis. A small papilla of the dermis, however, soon projects upwards, in turn, into the descending epidermal process, and then cornification sets in (at first in the immediate vicinity of the dermal papilla) in the cells around the axis of the epidermal

descending projection, and this hardened portion soon projects beyond the surface of the body, while the part of the epidermis about its decpest part becomes modified into its so-called ‘‘ root.”

A nail or claw arises as a cornification of the epidermis (but not of its deepest layer) lying upon numerous very vascular ridges (or transversely elongated papille) of the dermis, forming the primitive bed of the nail, and enclosed in a deep fold of the integu- ment. One end of the structure becomes free and projecting superficially, while the opposite region grows by epidermal additions from beneath and at its attached extremity.

A feather is more nearly related to a scale than it is to a hair. It consists at first of an upwardly-projecting dermal papilla invested with epidermis, and it is only at a later stage that its hase sinks into a sack or ‘‘feather follicle.” The outermost layer of epi- dermis becomes converted into a horny sheath, which is thrown off when the feather is completed. The quzll is formed by cornification of the deepest aud more superficial layer of epidcrmis investing the base of the dermal aud vascular papilla, and is open at both ends. The vascular papilla it encloses shrinks up when the feather is fully formed. The vane of the feather is formed from the more apical portion of the papilla, and its central part, or shaft, is con- tinuous with the quill, while ridge-like thickenings of epidermis diverging from either side of this central part constitute the barbs of the vane, from each of which yet smaller processes or barbules proceed.

A scute is a hardening of the outermost portion of the dermis, with an investment from the deepest layer of the epidermis. Sucli are the so-called scales of ordinary Fishes, which may be represeuted by the bony plates and processes called placoid scales—so common in the groups of Sharks and Rays. Iu these latter structures dermal papille appear and calcify, forming a dense structure with- out corpuscles, called dentine, beneath which may be a corpusculated structure of true bone. The calcifying papille receive an invest- ment of still denser calcareous tissue, called enamel, from the deepest layer of the epidermis. These placoid structures often come to project outwards on the surface of the body as long spines or as shorter tooth-like processes, or they may protect the surface of the body as flat plates. Often the dentine more or less entirely atrophies, so that the structure

comes to be formed almost entirely of true bone or of that peculiar calcified tissue of which the scales of ordinary Fishes (such, ¢.g., as the Perch and Carp) are composed.

A tooth is a structure closely related to ascute. It differs from the latter just as a hair differs from a scale—namely, by owing its origin to an ingrowth of the epidermis instead of merely to a primitive outgrowth of the dermis.

The so-called teeth of the Lamprey are not true teeth, but are merely horny epidermal structures essentially similar to scales.

In the origin of a true tooth a process of the epiblastic layer of the mouth—the buccal cpithelium—grows into the subjacent dermis, and, assuming a cup-like form (with the concavity of the cup turned away from the epithelial surface of the mouth), a dermal papilla rises into the cup. The apex of this papilla then superficially calcifies into dentine, and becomes invested with a layer of enamel formed from the immediately adjacent surface of the epidermic cup or ‘‘ enamel organ.” An investment of connective tissue called the dental capsule becomes formed round the whole. The dentine then increases, a remnant of the papilla remaining as the “‘ pulp.” The young tooth gradually approaches the buccal surface, and the base of the papilla becomes formed into the root or fang of the tooth. The enamel organ does not descend so far, but only invests the crown of the tooth. The inner layer of the capsule, however, investing the fang gives rise to a third dental tissue known as the cement. A bud may or may not be given off from the developing tooth to serve as its future successor.

Thus teeth are normally both epiblastic and mesoblastie struc- tures, but in certain Fishes they line parts of the throat (the branchial arches), the superficial membrane of which is derived from the hypoblast, and such may of course be considered as hypoblastic skeletal elements, and, thus considered, must be reckoned as constituting a separate category of teeth.

Such being the various kinds of dense structures which enter into the composition of the Vertebrate exoskeleton, each kind may be developed to a greater or less extent in different groups of Vertebrate animals.

Huemplifications of Epidermal Skeletal Parts.

Scales entirely clothe the bodies of most Lizards and Snakes and the legs of Birds. In Tortoises and Turtles they take the form of large plates, which in one species are known as tortoise-shell. The

shape and size of scales are made great use of as distinctive characters for classification. Sce Repriues. The scales of a Serpent are held together by their epidermic investment in such a way that it and they are cast off as one whole each time the animal effects that process known as changing its skin. In the Rattle- snakes curiously modified thickenings of epidermis surrounding the end of the tail are not cast off but continue partially adherent ; as growth proceeds and successive castings of the skin take place, these ring-like thickenings become numerous, and so knock one against the other, when the end of the tail is vibrated, as to pro- duce a singular sound—the so-called rattling of the system of rings or “taitle:”

Hairs form the characteristic clothing of the class Jfammalia, though certain Mammals, such as Whales and Porpoises in their adult condition, are naked. Man is quite exceptional in having the ventral surface of the body more hairy than its dorsum. Long hair on the head, and whiskers and beard, are variable human characters, also possessed by some Apes; and many animals —as the Lion, the Horse, the Aardvark, &c.—have long hair in one or other region of the body. Some hairs may be especially thickened and serve as feelers, as in the ‘‘vibrisse” or ‘swhiskers”’ of the Cat tribe. But the maximum of development is shown in such creatures as the Hedgehog and the Porcupine, where hairs beconie dense and solid spines.

Nails do not exist in the class of Fishes and rarely in that of Batrachians. They first make their appearance in the most simple form—that is, in the form of slight thickenings of the epidermis— at the ends of the digits in certain Toads and of one kind of Eft. ‘A nail is at its maximum of development when it quite surrounds and encloses the last or end bone of the digit which bears it. Such nails exist in Horses, Oxen, &c., and are called hoofs. A nail when produced into a sharp point is called a claw,—as in the familiar case of the Cat, and also in Birds. Nails may, how- ever, be much reduced in size and not nearly extend to the end of the digits which support them, as in the Sea Bears. They may be altogether wanting, even in

Mammals, as in the Porpoise, or attain a prodigious relative size, so that the body can be suspended by them in progression, as in the Sloth.

Nail-like structures may be developed from the side of the hand, as in certain Birds (¢.g., Palamedea), which are said to be “ spur- winged,” and in a Maminal (Ornithorhynchus) a hollow horny spur grows upon each ankle.

In the Rhinoceros we meet with a horn, or two horns, which grow up from the dorsum of the muzzle like a great blunt nail, long dermal papille extending into it and answering to the dermal ridges beneath a true nail, In Owen’s Chameleon no less than three long horns are developed—one from the nose and a sym- metrical pair from the front of the head.

Other horns which do possess bony cores are developed from the head in pairs on the so-called hollow-horned Ruminants, ¢.¢., the Oxen, Autelopes, Goats, and Sheep; and only in one anomalous form, the Prongbok (Anéilocapra), are these horny structures shed at intervals ; in the rest they persist throughout life. Normally there is never more than one pair amidst existing Ruminants, with the exception of the Four-horned Antelope, which has two pairs. Such horns may be straight or curved or spirally twisted, but they are never branched, with the single exception of the Prongbok.

Sharp-edged, overlapping, horny plates (each of which is com- parable with a nail) may be developed beneath the proximal part of the tail, as in the curious Rodent Anomalurus. Such plates may clothe the entire body, head, limbs, and tail, as in the scaly Manis or Pangolin.

The epidermis and epithelium which respectively line the out- side and inside of the jaws may both be converted into horn, forming a small beak which may be composed of a number of close-set processes and may be temporary, as in the Tadpole, or permanent, as in the Siren. Larger and denser structures of a similar kind form the beak of Birds and of the Turtle and of that most exceptional Mammal, the Ornithorhynchus.

The epithelium within the mouth may be locally cornified, forming horny teeth which have, as before mentioned, rather the nature of scales—as in the suctorial mouth of the Lamprey.

In certain Beasts, as the Cow and the Sheep, the front edentulous part of the upper jaw is invested by a horny epithelial pad against which the teeth of the front of the lower jaw bite. A much more developed structure is met with in the Dugong. The front of both jaws is furnished with a dense horny plate formed like the horn of the Rhinoceros, though of course widely different in shape. But the maximum development of this kind of structure is found in the Whalebone Whales. The upper jaw in these is furnished with very numerous horny plates, termed baleen, which hang down from the palate along each side of the mouth. They thus form two longitudinal serics, each plate of which is placed transversely to the long axis of the body, and all are very close together. ‘The outer edge of each plate is entire, but its inner edge gives forth numerous hair-like processes. These are some of the constituent fibres of the horny plates which thus, as it were, fray

out and line the sides of the buccal cavity with a network of countless fibres formed by the inner edges of the two series of plates. This network acts as a sort of sieve, allowing water to escape between the plates but retaining in the mouth the smal] creatures on which the whale feeds.

Cornifications of the tongue may exist. Thus in some Birds as in Woodpeckers, the structure of its apical portion becomes 80 dense that it serves as a dart or spear. Its surface may be more or less cornified in Beasts. Thus it may be furnished all round with backwardly-pointing spines, as in the Lesser Anteater (Tamandua), There may be a large horny papilla on each side of it, as in the Manatee or Ornithorhynchus, or there may be horny plates on the tongue, as in the Java Porcupine.

Horny structures also exist which cannot be considered as either epiblastic or mesoblastic, but must be hypoblastic in origin. Such are the horny linings of the stomachs or gizzards of Birds, and the similar lining of the stomach of the Great Anteater, Myrme- cophaga jubata.

Feathers are the universal and peculiar cutaneous appendages of Birds, and gencrally differ much in size in different parts of the body, long and strong feathers constituting the most conspicuous part of the wings and so-called ‘‘tails” of Birds. Feathers are implanted on the body neither in an irregular

nor in a uniform manner, but are aggregated together in different modes in different groups of Birds—each definite patch of implanted feathers bein called a feather tract. The arrangement of these tracts in a bin is called its ‘‘ pterylosis,” and serves amongst other characters to distinguish different groups of Birds one from another.

Exemplifications of Dermal Skeletal Parts.

Scutes. —True dermal ossifications are met with in some kinds of Mammals. Thus the Armadillos possess a very complete external dermal skeleton formed of small many-sided bony scutes, the margins of which are adjusted together, and which are differently aggregated—into transverse bands or into larger inflexible masses —in different species. In the extinct Glyptodon, the body was invested, from the neck to the root of the tail, with one such solid case.

In the Armadillos a horny epidermal skeleton is so adjusted to the bony case that the former is divisible into small scales corre- sponding with the several scutes. Amongst Reptiles, we find in the Tortoises and Turtles (¢.g., Emys, Testudo) a solid exoskeleton, the dorsal part of which is called the ‘‘ carapace, ” while the ventral portion is named the ‘‘plastron.” The former consists of a median series of scutes, to each side of which is annexed a series of lateral scutes which are more elongated transversely to the long axis of the animal’s body, and these three series are intimately united with subjacent portions of the internal skeleton. The carapace is completed by a series of smaller scutes, which surround it and are therefore called “marginal” scutes. The plastron consists of eight pairs of scutes and one azygous scute. In the Box-Tortoises the ends of this plastron are movable, and (the head and limbs of the animal being drawn in within the shell) can be applied to the ends of the carapace, so that all the soft parts can be completely enclosed within the dense exoskeleton. As in the Armadillos, the bony scutes are covered by epidermal scales, some of which have been already referred to as constituting “ tortoise shell.” Unlike the Armadillos, however, the segments of the epidermal and dermal skeletons do not correspond. The dorsal scales are much larger and less numerous than are the scutes, but, while the scutes of the plastron are but nine in number, it has twelve horny plates or large scales.

Amongst the Amphibia certain Frogs (¢.g., Ephippifer and Ceratophrys) develop dorsal osseous scutes, and these, as in the Tortoises, are more or less united with parts of the subjacent internal skeleton. r

A solid skeleton of juxtaposed osseous scutes may exist in Fishes, as in the Bony Pike Lepidosteus, where the scutes are enamelled and united by a peg-and-socket articulation. Polyplerus also has an investment of bony scutes, and in the extinct fish Pterichthys they were developed into large plates on both the dorsal and ventral surfaces of the body. The Sharks and Rays may have their scutes thickly distributed over the surface of the body, but quite small. A skin so furnished is called “shagreen.” ‘They may also be larger and fewer, and placed far apart, with elegant patterns on their exposed surfaces; or they may take the form of strong defensive spines. In the Sturgeon the scutes are arrange in rows along the body, separated from each other by softer portions of integument.

In the ordinary bony Fishes, or Teleostet, the scutes (commonly but erroneously called “ scales”) are differently calcified from the scutes of Sharks, and may have their free projecting magi» smooth, when they are described as eyeloid, or in toothed-like processes, when they are termed ctenoid; or they may be inter- mediate between these two types of form. ‘The Teleostean scutes are generally separate, but they may coalesce to form a connected

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solid investment, as in Ostracion and the Seahorses (Lophobranchit), or develop strong projecting spines, as in Diodon.

Fishes have two other very important exoskeletal structures, whieh may be bony or cartilaginous. One set of these structurcs consists of filamentary processes, which may be either horny or calcareous, and which support the skin of the fins, whether those of the back, belly, and tail, or those of the limbs ; such structures are termed “ fin-rays.” The other set consists of bony or cartilagin- ous hard parts, which serve to support tlie fin-rays, which therefore lie more deeply, or at least are less projecting, and are commonly

termed “interspinous bones or cartilages,” but which may be con- veniently distinguished as radials; they are very important elements of the fins of Elasmobranchs.

Certain Siluroid fishes exhibit in the adjustment of portions of their dermal exoskeleton an altogether peculiar mode of articula- tion, called a shackle joint. This is in the form of a dermal scute articulated with a superposed spine. The scute has an osseous ring on its dorsal surface, and through this passes another osseous ring which forms part of the base of the superimposed spine.

In conuexion with dermal scutes and spines may be mentioned those familiar yet exceptional structures, the bony horns of Ungu- lates. In the Oxen, Goats, and their allies horns exist on the head as bony cores, persisting throughout life, and supporting those “hollow horns” before noticed amongst the epidermal or epiblastic parts of the exoskeleton. As is the case with the scutes of Chelo- uians, these bony parts are intimately united with subjacent parts of the true endoskeleton. In the Giraffe there are three such bony prominences, which arise as distinct ossificatious, and only later anchylose with the skull. These are the Giraffe’s pair of short horns, together with the median prominence in front of them. In the Deer we find bony antlers, which are shed annually and are destitute of any horny covering. Antlers may exist in both sexes, as in the Reindeer, but generally they are present in the males only. They arise as soft highly vascular prominences, and when fully grown become hardened by calcareous deposit. In some months the investing skin dries up and is got rid of; and the horn itself falls off after the breeding season, leaving a stump whence a new antlcr shoots forth again in the following year. Antlers, as a rule, are branched—more so as the individual becomes older, till maturity is attained. Some Deer have enormous antlers, weighing as much as 70 Ib, and formed at the rate of 1 tb a day.

Tecth.—The differences in structure, number, form, and develop- ment of the dental organs are so great that they cannot here be treated of. See vol. vii. pp. 232 sq.; also vol. xv. pp. 349 sq.

INTERNAL SKELETON OF VERTEBRATA.

The most essential part of the Vertebrate internal

skeleton is the spinal column, the foundation of which is laid by a temporary or permanent structure called the notochord or chorda dorsalis. At the anterior end of the spinal column there is almost always a solid structure known as the cranium or skull, to which mandibular, hyoidean, and branchial arches may or may not be attached. The spinal column may be divisible into cervical, thoracic, lumbar, sacral, and caudal portions, and may have pro- cesses projecting from it upwards, downwards, or laterally, with arches of varying extent, as neural arches, chevron bones, and ribs, together with a median ventral portion— the sternum. The whole of these parts taken together constitute the axial skeleton. This may exist alone if the body is limbless, but otherwise additional hard struc- tures are found which together constitute the appendicular skeleton. _ Vertebrate animals never have more than two pairs of limbs, and each pair is attached to the body by the help of certain skeleton elements termed a limb-girdle, diverg- Ing from which are the hard parts which constitute the skeleton of either “appendage” or “limb.” In addition to these we find in Fishes certain azygous structures —the unpaired fins,—the osseous or cartilaginous supports of which must be reckoned as a part of the appendicular skeleton. With the occasional (or possibly constant) exception of the notochord, the whole Vertebrate internal skeleton is a mesoblastic structure. In the great majority of the Vertebrata the skeleton is more or less bony, but it always in part consists of cartilaginous and fibrous structures,

The number and nature of the solid parts vary with

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age in the same species. When, in the earlier stages of existence, the process of ossification has once begun, it goes on more or less rapidly till maturity is attained, and is continued, to a certain extent, throughout the whole of life.

The points at which bone formation begins and whence it radiates are termed “ centres of ossification,” and there may be one, two, or several of these in what is ultimately to become a single bone. Sometimes these “ centres” have an important morphological significance, and in other

instances they would seem to be determined by the size of the future structure! Bones are classed as “cartilage bones ” or ‘“‘membrane bones” according as they are formed either through the previous formation of a cartilage which subsequently ossifies or directly from membrane without the intervention of cartilage. These two classes can generally be easily distinguished, but there are instances in which it would seem that what is really the same corresponding bone differs as to its mode of origin in different animals. Moreover, a compound bone, formed of a membrane bone and a cartilage bone intimately united, may come to lose either its cartilaginous or its membranous elements, and thus further difficulties of interpretation may arise. There are also cases (as in the carapace of Chelonians) in which exoskeletal dermal bones coalesce with subjacent bones of the endoskeleton. Such bones may become deeper in position as development advances, and there is reason to think that not a few bones ordinarily reckoned as parts of the endoskeleton are of dermal origin, and first appeared in ancestral forms as placoid scutes or dermal spines.

As the development of the skeleton proceeds, ossification tends to fuse together more and more bones which at their first appearance were separate and distinct. This is notably the case in warm-blooded animals, and is most noteworthy in the warmest-blooded class—that of Birds.

Besides the coalescence of distinct bones, another fusion of bony structures occurs. This is due to the fact that the ends, or projecting portions, of what are essentially and ultimately one bone may for a time persist as distinct bony parts, termed “ epiphyses.” Thus, in the case of Man, the ends of the long bones of the limbsare at first separate from the main part (or shaft) of each long bone, and do not become continuous with the latter till the human frame has nearly attained maturity.

The hard parts of the internal skeleton, being those which as a framework support the body, form points of attachment for the muscles which move the body,—such hard parts being used as either levers or fulcra, as the case may be. ‘The great majority of the bones are thus in- tended to move one upon another. The contiguous surfaces of bones form “joints,” which may be immovable, mixed, or movable. The bones of the skull are united by immovable joints, called “sutures.” Joints are said to be mixed when the

motion allowed is exceedingly slight, as when two bones are allowed to be slightly separated from each other by the intervention of a softer substance which is attached to both. We have examples of movable joints in the human neck, the two uppermost bones of which are articulated on the principle of a pivot ; in the elbow, which forms a hinge ; and in the shoulder, where the upper arm joins the shoulder-blade in a ball and socket joint.

If one convex articulating surface be globular, it is termed a head; if it be elongated, it is called a condyle. If either of these is borne upon a narrow portion of bone, this latter is called a neck; if a pulley-like surface is formed by such a juxtaposition of two condyles as to leave a depression between them, such an articular surface is named a trochlea.

The curious and exceptional arrangement termed a

1 Balfour's Comparative Embryology, vol. ii. p. 448.

shackle joint has been already noticed under the head of "Scutes." AXIAL SKELETON.

The whole axial skeleton—including both the cranium and the spinal skeleton—apart from the notochord, is formed from the mesoblastic tissue bordering the medullary groove of the embryo. As the essential part of the axial skeleton is the spinal column, so the essential foundation of this column itself is what is known as the "notochord." This is an elongated cylindrical rod of soft tissue running along the antero-posterior axis of the body immediately subjacent to the central portion of the nervous system. Its mode of origin from the germ-layers of the embryo has yet to be finally determined. It is said by Balfour? to be developed, in most if not all cases, as an axial differentia- tion of the hypoblast. The cells of the notochord form a tissue resembling cartilage, and it becomes surrounded by a more or less dense fibrous sheath. Such an organ is found to exist, temporarily or permanently, in certain lower creatures—Ascidians—which in most other respects widely differ from Vertebrate animals. Some few of these animals are furnished with a tail throughout the whole of life, while others are

furnished with such an organ only in their larval or immature condition. It is alone in such permanent or temporary tail, and not in the body of As- cidians, that a structure of this kind is met with.

In every Vertebrate animal the notochord is the first part of the skeleton to appear, and it extends throughout the whole length of the body, as well as of the tail. In every such animal, except the Lancelet (Amphiowus), it becomes arrested anteriorly in the midst of that second- arily formed skeletal region which becomes the skull. In Amphioxus, however, in which no skull is ever formed, the notochord extends to quite the anterior end of the body. It is enclosed in a strong sheath, within which its substance is segmented so as to resemble a longitudinal series of coins* or counters. The only other representatives of the internal skeleton in this animal are—(1) longitudinal ligaments (strengthening the sheath of the notochord above and below); (2) fibrous septa which pass out laterally from it between the muscles of the body, to the fibres of which they give attachment; (3) a longitudinal membranous sheath of the central part of the nervous system, forming an elongated antero-posteriorly directed cylinder above the notochord ; (4) two vertical septa,— one dorsal, ascending medianly from such neural sheath, and one ventral, descending medianly from the sheath of the notochord in the region of the tail; (5) two jointed cartilaginous filaments which lie one on each side of the longitudinal slit which serves the lancelet for a mouth; and (6) certain cartilaginous filaments which strengthen the sides of the branchial cavity between the intervening vertical fissures of the walls of that cavity.

In all other Vertebrate animals the axial skeleton is divis- ible into that of the head, or the cranial skeleton, and that of the axial skeleton behind the head, or the spinal skeleton.

Spinal Skeleton.

In all Vertebrate animals except the Lancelet, the axial skeleton is complicated by a longitudinal series of addi- tional hard parts—cartilaginous or osseous—which serve to protect the spinal cord, or marrow, above it, or the great blood-vessels beneath it, and which hard parts support, encroach upon, or replace the notochord itself. Neverthe- less, the notochord persists throughout the whole of life in certain Fishes both of the

lowest and highest types of piscine organization, but it does not persist in its entirety in any adult Vertebrate which is not a Fish.

1 Comparative Embryology, vol. ii. p. 449. 2 Owen's Anatomy of Vertebrates, vol. i. p. 81.

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In the Lamprey the notochord persists, but a longitudinal series of small, similarly shaped cartilages strengthen the sides of the more anterior part of the membranous dorsal canal which encloses the spinal marrow. In the Chimera these are more developed, while numerous circular cal cifications appear in the notochordal sheath. In the most anterior part of the trunk the cartilaginous elements unite to form a continuous investment of the notochord, Amongst the Ganoid Fishes, the notochord persists un-constricted and cylindrical in the Sturgeon and _ the Lepidosiren, but cartilaginous or bony parts appear about it and form a longitudinal series of arches above and below it for the protection respectively of the spinal marrow and sub-vertebral blood-vessels. In different kinds of Sharks further complications arise, and the notochord becomes encroached upon, in different modes, by chondri- fication and calcification, till it becomes segmented by the intervention of a series of thus formed hard parts called "bodies" or 'centra," between which relics of the notochord still remain. By this process of segmentation there come to be formed what are called vertebra, tlie presence of which in the overwhelming majority of Fishes, as well as in all the higher classes of animals, has led to the whole group being called Vertebrata.

In the vertebres of most Vertebrates we have a solid body or centrum, from the dorsum of which there arises on each of its two sides a neural plate, which then bends inwards to meet its fellow of the opposite side, thus form-ing an arch (the neural arch) for the protection of the spinal cord, or marrow, which passes through it. From the dorsal side of such neural arch a process called the neural spine very commonly ascends. From the sides of the centrum or neural arch, or of both, a single process, or two superimposed processes, may jut outwards, which are known as the transverse process or processes, to which the ribs are generally articulated when ribs are present. Inferiorly directed processes, single or double, may

descend from beneath the centrum, or may be developed in the intervals between adjacent centra, and are generally related to the protection of large blood: vessels, though they may only serve for muscular attach- ment.

Adjacent vertebrae are commonly connected together by special modifications of the neural arches or the centra, or of both. Mostly the opposed margins of the neural arches develop special processes for attachment called articular processes or zygapopliyses, and there may be additional interarticulations. ‘There may be as few as ten or as many as four hundred vertebree.

Vertebree may be divisible, as in the highest animals, into five categories : —(1) cervical, or those of the neck; (2) dorsal, or those of the back ; (3) lumbar, or those of the loins; (4) sacral, or those with which the pelvic limbs are connected; and (5) caudal, or those which are posterior to the sacral vertebrae, or which support the tail when such an organ is present. There may be only two categories (dorsal and caudal), as in Fishes.

In most Fishes and some exceptional Reptiles the body or centrum of each vertebra is so imperfectly ossified as to remain biconcave or amphiccelous, —that is to say, lb presents a deeply concave cup-like form both in front and behind. The space thus enclosed by the adjoining cups of each pair of successive vertebrae is filled up by 4 soft, spheroidal remnant of the notochord, which thus serves as an intermediate connecting substance. ‘The cups may become filled up by ossification, as in Man and Beasts, the flattened surfaces being connected by what are called inter- vertebral disks. Each such disk is made of fibrous lamelle which surround a soft elastic central portion which 1s 4 last remnant of the notochord. Often the vertebrae may

have the centrum very convex at one end and very concave at the other, and so give rise to a ball-and-socket joint at each junction between the successive centra. Such yertebrie may be proccelous (¢.e., have the cup in front and the ball behind), as in existing Crocodiles, or opisthoccelous (ue, with the cup behind and the ball in front), as in the Bony Pike Fish (Lepidosteus), the Land Salamander, and the cervical vertebrae of

Ruminants ; sometimes a vertebra may be biconvex (ue, have a ball at each end of its centrum), as in the first caudal vertebra of the Crocodile ; or, very rarely, there may be two prominences, or the cups may exist side by side on one surface of a centrum, as in some cervical vertebrae of Chelonians. Instead of intervertebral disks, with spheroidal remnants of the notochord, adjacent vertebrae are often (as in Snakes) united by what are called synovial sacs, or membranous closed bags containing an albuminous fluid called “synovia” and commonly known as “joint-oil.”

The various parts of a vertebra may be all united to form one single bone, as is generally the case in the higher animals, but such is by no means universally the case. In the Ichthyosaurus we find the neural arch permanently distinct from the centrum; and in the Carp the transverse processes are separate. The neural arch itself may be inade up of two separate pieces on each side, as in some Elasmobranch Fishes, ¢.g., Raia and Spinaz.

Sometimes the neural arch, instead of reposing upon 1ts own centrum only, appears, as it were, shifted so as to be connected with two adjacent centra, as is the case, e.g., with the dorsal vertebree of Tortoises.

Generally the nerves which pass outwards from the spinal marrow which lies in the neural canal pass out in the intervals between adjacent neural arches. Instead of this, however, they sometimes perforate the neural arch.

Neural spines, though generally single, may be double or altogether absent, and sometimes, as in Tortoises, they may intimately coalesce with superimposed dermal plates.

Cervical Vertebre.—As has been already indicated, no vertebrae can be distinguished as cervical in the class of Fishes. Never- theless the first three or four vertebra next the head may, in some of these animals, present a marked difference from the succeeding vertebre, being much elongated and united to each other by suture, as in Fistularia and Bagrus, and they may, as in the latter Fish, develop a continuous inferior vascular canal. The second and third vertebree may form a hollow bladder-like case of bone, as in Cobitis, or send outwards or downwards special processes, as in the Carp.

In Amphibians only a single vertebra can be called cervical, but in Sauropsidans the number may be very large. Thus in the Swan itamounts to twenty-five, while in some of the Plesiosaurians it exceeded forty. Birds, being animals which have to perform with the beak functions which in most animals are performed by limbs, require to have a very movable neck; and consequently a considerable number of joints (and therefore of vertebre) are required in the neck, which is the only part of the spinal column that is very flexible. In Serpents, which have the whole spinal column very flexible, no really satisfactory line can be drawn between cervical and dorsal vertebre. In Lizards there are usually from seven to nine, but in the whole class of Mammals (whether the neck be very long, as in the Giraffe, or, like that of the Porpoise, extremely short) there are constantly but seven cervical Vertebree, except in the Slotls, which may have from nine to six, the Manatee, which has but six, and the Manis, which may have eight. All the cervical vertebres may become anchylosed together into a single mass, as usually iri the true Whales. Ordinarily in Mammals the transverse process is said to be perforated, 7.c., there are two such on each side, which are short and connected at their distal ends by a bony bridge which represents what, in the thorax, ad as a rib, as is shown by their condition in other classes of

ertebrates. Indeed in the lowest Mammals (Zehidna and Or- mithorhynchus) these osseous bridges have the form of distinct, more or less Y-shaped bones, as also in the Crocodile, where they are much prolonged. In many Lizards and Birds the posterior cervical vertebre bear long ribs, and are only counted as cervical ae such tibs do not reach the breast bone, while more pos-

erlorly placed ribs do attain it. The two superimposed transverse Processes, with the rib joining them attached to succecding vertebra, cmon each side of the neck a sort of bony canal in which runs

the vertebral artery. Sometimes, however, as in the Camels and Llamas, this canal is replaced by one excavated in the neural arches. In some Cetaceans the external bar (or rudimentary rib) is wanting, so that there come to be two elongated transverse pro- cesses on each side.

Successive cervical vertebre may differ strikingly one from another. Thus in the common Kuropean Terrapin we find the fourth cervical vertebra with its centrum convex in front and concave behind. The centrum of the fifth is biconvex. That of the sixth is concave in front with a double convexity behind. The seventh is doubly convex both in front and behind. The eighth is doubly concave at each end. The ninth is donbly convex in front and singly so behind.

The first cervical vertebra is known as the atlas, and joins the skull, which in Mau it supports. It may be fused in one solid mass with the skull, as in the Sturgeon, or with a certain number of vertebre, as in the Rays. It may be united by suture, as in Bagrus. The vertebral part of the atlas may be unossified, as in the Wombat, or remain a distinct bone, as in the Thylacine. The neural spine may be detached from the neural arch, as in the Crocodile and Tunny. Its ventral part may send out a pointed process towards the head, asin Amphiwma. It may develop two concave surfaces to articulate with the skull, as in Amphibians and Mammals, or only a single cup, as in Sauropsidans generally.

The second cervical vertebra is known as the axis, and is dis- tinguishable in all Vertebrates above the Ichthyopsida. Its centrum develops anteriorly a special peg-like or tooth-like pro- ininence known as the odontoid process, round which the head and atlas vertebra turn as on a pivot. This process may (as in many Reptiles and in the Ornithorhynchus amongst Mammals) remain a distinct bone, and is regarded as the true centrum of the atlas, which thus generally coalesces into the axis vertebra instead of with the other portions of its own vertebra. The odontoid process may be absent in certain Mammals, as amongst Cetaceans,

Dorso-Lumbar Vertebre. —The vertebrae which come between the cervical vertebrae and those (sacral) which support the pelvic limbs, or, when these latter are absent, the vertebra between the cervical and the caudal vertebrae, form the vertebra of the trunk. These are subdivisible into dorsal and lumbar when some of them (always the more auterior) bear ribs and others do not but have transverse processes only, |

The number of trunk (or dorso-lumbar) vertebrex varies greatly, being very few in Frogs and Tortoises and very numerous in Serpents. In Mammals it

ranges from about seventeen, in some Primates, to twenty-seven, in Hyrax. A definite number of trunk vertebre is characteristic of certain groups of Mammals, though this number may be made up by different numbers of dorsal and lumbar vertebree.

Dorsal Vertebrx.—Rib-bearing vertebre are structures constantly found in all Vertebrate animals save certain Fishes and Amphibians. Dorsal vertebrae must be considered as including the whole number of trunk vertebre in Serpents, since in those animals the whole series of the latter support ribs.

An ordinary Mammaliau dorsal vertebra consists of a body and neural arch with articular processes or zygapophyses and with a more or less elongated neural spine, and a transverse process which juts out and bears an articular surface at its end. This process answers to the more dorsal of each pair of transverse pro- cesses on each side of a cervical vertebra. Another articular surface placed at about the junction of the neural arch and centrum answers to the more ventral of each pair of transverse processes on each side of a cervical vertebra.

The rib which on each side of the vertebra articulates with these two surfaces has generally itself such a surface at its prox- imal end (or head) and another on a inore or less marked promi- nence called the tubercle of the rib. These are respectively designated the capitulum and tuberculum, and therefore the pro- cesses or articular surfaces of the vertebra to which the capitulum and tuberculum are respectively attached arc called the capitular and tubercular processes or surfaces, as the case may be.

Sometimes each vertebra carries but one such articular surface (that for the capitulum of the ribs), as in the Dolphin. The two articular surfaces may co-exist at different levels on one single process, as in the dorsal vertebra: of the Crocodile, or they may be in close apposition, and, as it were, fused together, as in Serpents. They may, however, be supported by two quite distinct processes —one dorsal, the other ventral,—as in Jchthyosaurus and Meno- branchus.

Man has twelve dorsal vertebre. This is a little below the average of his class, where there may be twenty-four, as in the Two- toed Sloth. There are more than twelve in inmost Reptiles, while in Birds there are mostly but

seven to nine, or, very rarely, eleven, while there may, as in Ciconia alba, be but three reckoned as dorsal on account of the great extent of ossification in the sacrum or part connected with the legs.

The most remarkable modification of dorsal vertebre is that in Tortoises and Turtles, where the neural spines expand at their

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summits into wide plates which articulate by suture with each other and with similarly expanded ribs, to form the carapace.

In Serpents and Iguanas we have a special mode of vertebral interarticulation, over and above that formed by the zygapophyses. The neural arch develops a median auterior prominence with two articular surfaces called the zygosphene, and this fits into a corre- sponding median posterior recess called the zygantrum.

The maximum of complication as regards the interarticulation of dorsal vertebra is found in the last dorsal of the Great ‘Anteater. There each posterior zygapophysis develops two additional articular surfaces, oue on each side of a notch which receives a process from the anterior side of the neural arch of the succeeding vertebra, which process is furnished with two corresponding surfaces. More or less distinct traces of certain additional processes, called met- apophyses and anapophyses, are sometimes present, but these it will be better to notice when describing the lumbar vertebra, wherein they are more developed.

We find in some Serpents peculiar processes which project down- wards and forwards from the base of the inner side of the transverse processes. We may also find present a long median inferior pro- cess extending vertically from the ventral surface of the centrum and as long as, or longer than, the neural spine of the same vertebra. Such processes are present in many Serpents—especially the poisonous ones—and in such Birds as the Penguin and Cormorant.

Lumbar Vertebrs.—These are vertebree interposed between the dorsal vertebre and the sacrum; they are generally the largest vertebrae of each

vertebral column, but sometimes (as in Bats and Pterodactyles) the cervical vertebre are yet larger. Lumbar vertebre are generally to be distinguished in Mammals, in Croco- diles, and in certain Lizards, but not in any Ichthyopsidan.

In Birds lumbar vertebre are present, but are disguised and hidden by the extent to which the sacral ossification extends for- wards,

There are five lumbar vertebra in Man, but the number in him is below the average of his class, though some Apes have but four. The Slow Lemur may have nine, the Two-toed Sloth has but three, and the Monotremes but two. ‘These vertebrae are very numerous in the Cetacea, but the hinder limit of the lumbar region is more or less difficult to determine in these animals. The transverse processes are generally much longer than those of the dorsal vertebre, and do not bear either capitular or tubercular arti- cular surfaces.

The processes already spoken of as metapophyses and anapophyses are generally much more developed in the lumbar than in the dorsal vertebre. The former project forwards from the vicinity of the anterior zygapophyses, and the latter project backwards at a lower level. Both processes are to be detectcd in the last dorsal and first lumbar vertebre of Man, but are at their maximum in the Armadillos, In addition, also, to the complexity of articula- tion before described as existing on the last dorsal vertebra of the Great Anteater, we find in that animal’s lumbar region an addi- tional articular surface on each side of each transverse process.

The lumbar vertebree may be anchylosed together and to other parts of the skeleton, as is the case in Birds.

Sacral Vertebree.—These are distinguished from others, not only by their connexion with the skeleton of the pelvic limbs, but also by their coalescence and a certain degradation in their structure as compared with the trunk and cervical vertebre. In Man five vertebrex thus coalesce to form the more or less triangular single bone known as the sacrum, but which always shows plain traces of its composite nature. Such coalescence and degradation generally exist in Vertebrates above the Ichthyopsida, which possess fully developed limbs. The coalescence of vertebre is gencrally less extensive than in Man, though sometimes—as in Birds, some Edentates,

and some Reptiles—it is much greater. The sacrum may be coinposed of as many as ten vertebre (as in some Arma- dillos) or of twenty (as in the Ostrich), and the lumbar or caudal vertebre or both contribute to its formation.

In most if not all Mammals the sacral vertebre—or the more anterior of them—have what are at first distinctly ossified elements in their transverse processes, which elements (like parts before noticed in the cervical vertebrae) are costal in their nature, 2.¢., represent rudimentary ribs, and in Crocodiles and Tailed Amphibians the sacral vertebre have a distinct rudimentary rib attached to each transverse process. In Birds, however, the vertebre of the sacrum, which have expanded transverse processes, do not develop these from distinct ossifications.

As regards the extent of connexion between the sacrum and the hip bones, union is more extensive in Man than in most Beasts, or in animals below Birds. Often in Mammals and almost always in Tailed Batrachians it may be confined to a single vertebra ; but ten vertebre may be involved in this union in Mammals and twenty in Birds.

That the development of the sacrum is not always in proportion to that of the pelvic limbs is proved by the little Lizard Seps, in which, in spite of the rudimentary condition of the limbs, there are true sacral vertebra.

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No Fishes have a true sacrum, though, very rarely, as in the Tur. bot, we meet with a kind of false sacrum, formed by the anchylosis of the bodies and ventral spines of the first two caudal vertebra,

Caudal Vertebre.—The vertebre of the tail may be as many as 270, as in some Sharks. Amongst Mammals 48 (Microgale longi- caudata) is the highest uuimber. Man has usually rudimentary caudal vertebre, completely or partially united so as to form a small conical bone called the coccyx. Its proximal end articulates with the sacrum by its centrum and two small zygapophyses. lt has besides two rudimentary transverse processes and two processes representing piers of the absent neural arch. The other vertebra are destitute of processes and consist but of smaller and smaller vertebral

centra. Thus the last vertebra is the very opposite of the first (or atlas), being all centrum, while the atlas has no centrum at all. The coccyx usually becomes anchylosed to the sacrum about or after the middle of life. The caudal region is still more reduced in some Bats, where there may be but two such vertebre.

In animals provided with numerous coccygeal vertebre, such

vertebrae may be provided with processes and articulations as

complex as those of other spinal regious. Transverse processes may be largely developed at the tail root, but almost always thence backwards diminish in extent; sometimes, however, as in the Armadillo (Chlamydophorus), they may increase in size backwards from the tail root. Rarely (as, ¢g., in Menobranchus) caudal

vertebrae may be furnished with two ribs supported by both

tubercular and capitular processes. Inferior arches may exist in the form of detached "‘ chevron bows ” placed beneath the intervals of successive caudal vertebre, especially toveards the tail root. They may be represented by processes or by continuously ossified inferior arches, which may, as in the Flat Fishes, be very prolonged, extend- ing downwards from cach centrum as much as the neural arch and spine extend upwards from it.

Birds have generally six or eight, but may have ten, caudal vertebra, at the end of which is a so-called ‘‘ ploughshare-bone," consisting of two or more vertebrae anchylosed together.

The caudal region of the Frog is formed in a very peculiar way. It never consists of distinct vertebre at any time of life, but is formed by the ossification of the membrane which surrounds the notochord, to which two small neural arches become attached. This structure is called the urostyle.

In Fishes (as in the Perch and Stickleback) there may bea urostyle continuous with the centrum of the last vertebra. Such a urostyle, unlike that of the Frog, is very sharply bent upwards. It is very small and inconspicuous. In other Fishes the hinder part of the notochord may (as in

the Salmon) remain unossified and only pro- tected by lateral bony plates, but it is still sharply bent upwards. In a few Fishes (as, ¢g., Polyptcrus) the hinder end of the spinal column is not bent upwards. In other Fishes again (as in the Sturgeon and many Sharks) the hinder end of the vertebral column gradually tapers and gradually (not suddenly as in the Perch and Salinon) inclines upwards. In the forms in which the hinder end of the vertebral column bends upwards—whether gradually or suddenly—the arches and processes beneath its hinder end exceed in size those on the dorsal side of it, as also do the fin-rays attached to them. Thus it happens that the part of the caudal fin which is on the ventral side of the gradually or suddenly bent-up part of the spinal column more or less greatly exceeds in size the part on the dorsal side. In those Sea Fishes (c.g., the Sturgeon and many Sharks) in which the upward flexion is gradual and manifest, the ventral part of the caudal fin is evidently the larger, and such a tail is called Acterocercal. In Fishes in which the hinder end of the spinal column is suddenly bent up and of minute size, so that its real condition is disguised, the caudal fin appears symmetrical and as if the parts dorsal and ventral to the end of the spinal column were equal. Such a condition has been named homocercal. Those Fishes in which the spinal column ends without turning upwards, and in which the parts of the caudal fin dorsal and ventral to it are really and not only apparently symmetrical, are said to be diphycercal.

Sternum.—The breastbone or sternum extends more or less along the middle line of the ventral region of the anterior part of the trunk in all Vertebrates above Fishes, except Serpents and a few other Reptiles.

Almost always it is connected with the more anterior ribs. Its anterior end is distinguished as the manubrium or presternum, and its hinder is called the xiphoid process or xiphisternum—the middle part being the “ body” or mesosternum. A sternum may exist without ribs, or without forming any cartilaginous or osseous connexion with ribs, asinthe Amphibia. The plastron of Chelonians might well be supposed to be a great sternum, more especially as the plate-like ribs are connected with it. It appears, however, that this great complex plate does not really include a sternum.

The before-mentioned threefold division of the sternum ‘s normal in Mammals, and also exists, though more obscurely, in Birds and Reptiles. Even in Mammals it is not universal; the manubrium only may be present, as in the Greenland Whale, or the manubrium and xiphisternuin syithout any mesosternum, as in the Dugong.

In Tailed Amphibians and the Slow-Worm (Angus) we have a single sternum, which may be mesosternum only, while in many Frogs and Toads we have only the latter and the xiphisternum. The manubrium may develop a median keel, as in Bats, the Mole, and Armadillos; or the mesosternum, as in the Tamandua; or the mesosternum and xiphisternum, as in most Birds.

The xiphisternum may assume various forms, but attains its maximum development in Birds, where it forms the part of the sternum posterior to the attachment of the ribs, and may consist of a median and four lateral processes, as in the Fowl. It bears the greater part of the keel.

In the Monotremes there is a median ossicle in front of the manubrium, which is often called the episternum. It is really a part of the appendicular skeleton.

Ribs.—Mammals possess a greater or less number of ribs, which are mostly long, slender, curved bones, extending downwards from the transverse processes or bodies of the vertebra, the more anterior of them forming a junction with the sternum. The part of the skeleton formed by the rib-bearing vertebree, the ribs, and the sternum is called the thorax. In Man (see Anatomy) there are twelve ribs (on each side of the body), whereof the first seven join the sternum by the intervention of cartilages, and are called “true ribs.” The other five, which do not join the sternum, are called “false ribs.” Each rib (except the last two on each side) has a double attachment to the spinal column. At its proximal end it has a rounded “head” or “capitulum,” which articulates with the capitular surface of a dorsal vertebra. At a little distance from the capitulum is another rounded articular prominence called the “tubercle” or “‘tuberculum,” which joins a vertebral tubercular surface. The part of the rib between the head and the tubercle is called the “neck.” At its distal end each rib has attached to it an elongated cartilage called costal.” Those costal cartilages which do not join the sternum either end freely or blend with the costal cartilage next in advance.

Frogs and Toads have no ribs, nor can they be said to exist in some Fishes (¢.g., the Chimzra, the Seahorse, the Lamprey and its allies); but in the immense majority of Vertebrates there are cartilaginous or osseous ribs, attached by their proximal ends to the vertebral column, and tending to surround the trunk.

_All rib-bearing animals have both “true” and “ false” tibs, save Serpents, Fishes, and Chelonians, which cam have no true ribs since they have no sternum, and Tailed Amphi- bians, in which, though there is a sternum, no ribs join it. There may, however, be but a single pair of true ribs—as in the Whalebone Whales. The ribs are exceptionally broad in the Two-toed Anteater, where they overlap one another, The number of ribs has already been indicated under the head of “dorsal vertebree,” though in Birds we may have short ribs attached to the cervical vertebrae, and others coming from vertebrae which are generally counted as “sacral.” There may be as few as five or six pairs, as in Amphiuma ; or the numbers may reach 320, as in some Pythons. In many Reptiles, as in the Crocodiles, there may be cervical ribs; and there may even be caudal ribs, as in Menobranchus.

The function of aiding respiration is one which the ribs possess in the higher Vertebrata, but quite other purposes may be subserved by them in addition to, or instead of, respiratory action——namely, locomotion, change of form, or

bodily protection as armour. Thus the ribs may form a solid case for the safe keeping of the parts within, co-oper- ating in this office with other skeletal structures so as to form the “carapace” of Tortoises already noticed. Ribs may be the main agents in locomotion, as in Snakes, which glide along by the successive application to the ground of the edges of their ventral scales, which is brought about by the motions of the ribs, the ends of which are connected with the inner surface of such scales. In the little flying Lizard Draco certain much elongated ribs serve to support a parachute-like flying membrane, and in the Cobra it is certain ribs which sustain its “ hood” when distended.

The presence of a distinct “head” and “ tubercle” is a general but not constant character, and the head of the ribs may be connected with two vertebree or only with one vertebra. The ribs may bifurcate proximally into

two equal diverging branches, one representing the “head” and the other the “tubercle.” A small backwardly- projecting structure termed an “ uncinate process ” may be given off from the ribs and may ossify as a distinct bone, as in most Birds and in the Crocodile.

Sometimes (as in Monotremes and many Lizards) a third segment may be intercalated between a rib and its sternal cartilage, aud sternal cartilages may be represented by bones, as in Birds and Armadillos. In some Lizards the sternal cartilages of opposite ribs are continuous in the mid ventral line. There may be no representative of a sternal rib, as in Fishes and Batrachians.

Rarely, as in the Crocodile, there may be ventral rib-like structures in the wall of the abdomen, which meet and are attached ventrally, but are “free” at their dorsal ends. These cannot, however, be counted as true ribs. Fishes have often two series of ribs on each side of the body, and in Polypterus some vertebrae may have four ribs on either side. In Fishes the ribs may also be in part attachdd to the neural spines above or to the hemal spines below the vertebrae. :

Cranial Skeleton.

By the cranial skeleton we mean the skull, or that part of the axial skeleton which serves to shelter the brain (or anterior expanded end of the central part of the nervous system), together with solid structures continuous or more or less directly connected therewith. Such a structure exists in every Vertebrate animal, except the Amphioxus, which has no brain. Nothing of the kind is known to exist in any Ascidian or in any Invertebrate animal,—unless that cartilage of Cuttlefishes which serves as an investment of the nerve centres and a support for the optic and auditory organs may be deemed a true cranial skeleton, since its portions just enumerated make it, as we shall shortly see, very analogous to a true skull.

The cranial skeleton is, of course, at first composed entirely of soft mesoblastic tissue, parts of which always become cartilaginous and generally also osseous, while more or less of its structure may remain in the condition of mere membrane. The bones which generally, as just said, enter into its framework may arise directly in the membrane or may be preceded

by cartilage which ossifies, a circumstance which divides the cranial bones into two categories—‘‘ membrane bones” and “ cartilage bones.”

The cranial skeleton of Vertebrates is made up of three sets of parts :—(1) parts devoted to enclosing and protect- ing the brain; this is the cranium proper; (2) parts sheltering the organs of sense situated in the head—namely the optic, auditory, and olfactory capsules ; these skeletal parts consist of the bones, cartilages, and mem- branes of the orbit, the internal ear, and the nose respec- tively, or the perioptic, periotic, and perirhinal bones and cartilages ; (3) parts continuous or more or less directly

connected with the cranium, and applied to aid nutrition in the form of deglutition or respiration; such skeletal parts are the jaws and arches (or parts of such) behind the jaws known as the hyoidean and branchial arches.

1. The Cartiluginous Cranial Skeleton.—This is formed “by a differentiation within the membranous cranium,” and consists of two plates (parachordals) placed one on each side of the anterior part of the notochord, and forming with the latter the floor of the hinder part of the cranium, which part is known as the basilar plate. The carti- laginous auditory capsules are closely united to the outer sides of the basilar plate. From the anterior margin of that plate two bars, called the “ trabeculae,” diverge for- wards from the anterior end of the notochord, and then approximate, so as to enclose what is known as the pituitary space, and also the floor of the anterior part of the cranium. Thence they advance (generally united) into the nasal or ethmoidal region of the skull, forming a median nasal septum, having a cartilaginous olfactory capsule on each side of it, and developing lateral pro- cesses in front of and behind those capsules. Only in the Cyclostomata is there a single olfactory capsule instead of a pair. The nature of the parachordals and trabeculz is disputed, but opinion inclines to regard them as corre- sponding to the neural arches of the spinal skeleton,—except the part around the notochord, which corresponds with centra in an unsegmented condition.

Upgrowths arise on the outer side of each parachordal, and these meet above and thus form a complete dorsal arch in the hinder or occipital region of the skull. The posterior aperture of this arch is called the occipital foramen, and through it the spinal cord enters the cranium, there to expand and become the brain. Lateral plates arise on each side farther forwards, in the anterior or sphenoidal region of the cranium. But these do not gene- rally ascend enough to unite together dorsally, at least they almost always form but an imperfect roof to the cranial cavity. This cranial aperture may be related to a median, dorsally placed, eye, which probably once existed in all Vertebrates, and still exists in a rudimentary condi- tion in many Lizards.2 The lateral plates grow together medianly in front, and more or less completely separate the cranial cavity from the ethmoidal region in front of it. Openings are left here and there in the cartilages of the cranial walls for the passage outwards of nerves from the central part of the nervous system ; but these openings or foramina will be noticed in describing the osseous cranial skeleton. On each side of the sphenoidal region are the optic cartilaginous capsules, which, however, never become united (as do the others) with the cranium, and therefore are not generally reckoned as parts of the skull. A special median cartilaginous vertical upgrowth from the trabecule between these capsules may (as in Teleostean Fishes, Lizards, and Birds) form an interorbital plate beneath the most anterior part of the cranial cavity.

The third category of cranial skeletal parts is generally represented by a series of descending cartilaginous bars (or visceral arcs) on each side of the alimentary canal, running forwards beneath the cranium to terminate at the mouth.

As this lateral region of the head corresponds with the body wall behind it, and shows transitory indications of division (like the body wall behind it) into an inner part or splanchnopleure and an outer part or somatopleure, it is obvious that skeletal structures formed in its inner or outer part may be taken as belonging to different cate- gories. In the Cyclostomata, as in the Lamprey, we find cartilaginous bars placed in the somatic division exclu-

1 Balfour, ii. p. 466. 2 See Nature of May 18, 1886, p. 33.

sively,—bars which support and externally protect the series of gill-pouches on each side; and parts probably homologous with these somatic bars of the Lamprey are found also in some Sharks.

The Cyclostomes also possess complex labial cartilages which support the lips of their suctorial mouths. Re. presentatives of these cartilages are also to be found about the mouths of many Fishes, as well as in the temporary suctorial mouth of the Tadpole; and they still persist in connexion with the olfactory capsules, though in a reduced form, in higher animals.? The most important members of the third category of cranial skeletal parts are—(1) the series of cartilaginous arches lying in the splanchnic or inner region of the lateral wall of the head, which arches sup- port the gill-pouches on their inner sides and are known as the branchial arches, and (2) the arches seemingly in series with them, which are more anteriorly placed, and which are known as the hyoidean arches and the jaws.

One or other, or both, of these two sets of arches are well developed in all craniate Vertebrates, except the Cyclostomes, in which there are no true branchial arches, but only a hyoidean and a rudimentary jaw arch. There may be as many as seven branchial arches (¢g., in Not danus), but five are usually present in water-breathing Vertebrates. The hyoidean arch becomes segmented into two noteworthy portions, the upper of which is known as the hyomandibular portion.

The most anterior, or mandibular arch, also becomes segmented into an upper or metapterygoid portion, an inferior or Meckelian portion, and a median or pterygo- quadrate portion, which grows forwards in front of the metapterygoid portion, and forms the foundation of the upper jaw against which the lower jaw (formed from the Meckelian portion) bites.

The thus formed upper and lower jaws may come to be suspended from the cranium in one of three ways. (1) They may depend from the cranium directly, that is, with- out the intervention of the hyoidean arch; this arrange- ment is known as autostylic,* and exists in all Vertebrates above Fishes, as well as in certain of the latter (Chumara and the Dipnoi). (2) They may be suspended by the co-operation of the hyomandibular portion of the hyoidean arch with their own metapterygoid portion ; this arrange ment is known as amphistylic, and is found in Wotzdanus, Hexanchus, and

Ostracion.® (3) They may be suspended exclusively by the hyomandibular portion of the hyoidean arch (to the exclusion of their more proximal portion), as in most Fishes and the Skates—an arrangement known as hyostylic.

2. The Osseous Cranium—The bony skull is formed partly by ossifications of the cartilage of the cartilaginous skull and partly by ossifications of the membranes investing or completing it. The cartilaginous cranium may, asm Elasmobranchs, be covered by a thin calcified layer with- out becoming ossified. It may, as in the Selachian Ganoids, remain itself quite unossified, and yet become enveloped by membrane bones. In most cases, however, the investment of the cartilaginous cranium by membrane bones is accompanied by a more or less complete ossifica- tion of the cartilage itself. In the Amphibia the carti- laginous cranium is to a not inconsiderable extent ossified, but the membrane bones which invest it are nevertheless easily separable from it. The most constant ossifications of the cartilaginous cranium are in the occipital region. In the Lepidosiren these are the only ones, a bone being thus formed on each side of the occipital foramen, which bones are known as the exoccipitals.

3 Balfour, loc. cit., p. 490.

4 These terms were proposed by Professor Huxley. 5 Balfour, loc. cit., p. 475.

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Many disputes have taken place as to what cranial bones (both cartilage and membrane bones) of one group of animals correspond with those of other groups. Such disputes still exist in certain cases, and it would be unwise to positively assert miore than the existence of a general ccr- respondence between the cranial bones of widely different Vertebrates—such, for example, as between Teleostean Fishes and Reptiles or Mammals.

Beneath the occipital foramen the basioccipital bone arises, and it may, as in Birds and Reptiles, develop a posterior prominence which joins with contiguous promi- nences of the exoccipitals to form a single ‘ condyle” for articulation with the spine. On the other hand, there may be, as in Mammals

and Amphibians, two lateral exoccipital condyles unaccompanied by any median basi- occipital prominence. In most Fishes we find only a concave articular surface behind the basioccipital, which thus resembles in form the vertebral centra, the anterior posterior surfaces of which are concave. A fourth bone, the supraoccipital, generally bounds the occipital foramen above.

In front of this occipital segment the auditory capsule, on each side, generally ossifies from three centres of ossifi- cation, which form the prootic, opisthotic, and epiotic bones respectively. Of these the first is the most constant, and is the only one which ossifies in the Frog. When all three are present, the prootic is anterior in position, the opisthotie inferior and posterior, and the epiotic posterior and superior. Sometimes, as in Fishes, two other supero- external boues may be formed in the auditory capsule, the more anterior of which is the sphenotic and the more posterior the pterotic.

The base of the cranium, in front of the basioccipital, generally ossifies as the basisphenoid, and a depression on its upper surface is known as the sella turcica or pituitary fossa. In front of the basisphenoid there may be, as in Mammals, another azygous bone, the presphenoid. The skull’s lateral walls (in front of the auditory capsule) ossify as the alisphenoid and orbitosphenoid on each side, the latter forming the antero-lateral wall of the cranium. The optic capsule or sclerotic may be merely membranous, as in Mammals, or may ossify, as in Birds, but it never forms any solid connexion with the cranial walls.

The olfactory region very often ossifies as a median vertical bone (the mesethmoid) and two lateral ones (the lateral ethmoids or prefrontals). These ethmoidal ossifica- tions may close the cranial cavity anteriorly, or may be altogether anterior to it. The olfactory and presphenoidal region may ossify very exceptionally as one bone. Such a condition we find in the Frog and its allies. These bones vary greatly in different classes of Vertebrates as to the degrees in which they anchylose together or remain dis- tinct, and also as to the order in which those unite which ultimately coalesce. Similar differences occur with respect to the remaining skull bones. Speaking generally, we find the greatest amount of distinctness in

the Osseous Vishes, and the greatest amount of coalescence in the class of Birds.

The membrane bones of the cranium are most con- spicuous and constant on its roof. In Fishes we find every grade of transition between simple dermal scutes and true subdermal bones of the internal skeleton. Well-developed dermal cranial scutes are to be found in the Sturgeon and some Siluroids. Where the membrane bones still retain the character of dermal plates, those on the dorsal surface of the cranium are usually arranged ina series of longitudinal rows, continuing in the region of the head the rows of dermal scutes of the trunk. The dorsal cranial dermal bones differ in different Fishes as regards arrangement and number as well as size. Owing, how-

ever, to their linear arrangements, they usually receive corresponding names, though it is very doubtful whether they can be considered as truly homologous.!' In most Bony Fishes, as in higher animals, we may generally dis- tinguish in the cranial roof one or two parietals, with an interparietal or upper (or upper part of a) supraoccipital behind the parietals, and a frontal or pair of frontals in front of them. A bone called the squamosal may also form part of the cranial roof, as in Mammals, and may send forwards and outwards a process which unites with another form, a preorbital bone, to form a zygomatic arch. In front, above, behind, and beneath the orbit (in which lies the sclerotic) bones may arise termed malars and lachrymals, supraorbitals, and post-frontals respectively, and the zygomatic process of the squamosal may unite with a corresponding process from the malar or the post- frontal. The malar bone, or (as it is often called) the jugal, rather belongs, however, to the third category of cranial skeletal parts. The olfactory or ethmoidal region becomes roofed over in part by the frontals, in part by the lateral bones (belonging to the third category of cranial parts to be presently noticed) called the maxilla, but it is mainly roofed over by two bones (sometimes one bone) called nasals, which bound the posterior surface of the external nasal opening on each side of the skull. In Bony Fishes, Amphibians, and Serpents almost the whole cranium is invested below by a large membrane bone called the parasphenoid.

The nervous centres within the cranial cavity send forth nerves through certain definite small apertures or foramina, which show much constancy of position. As a rule, and in the highest class of Vertebrates, the olfactory nerves pass out medianly in front to the ethmoids, between the orbitosphenoids or the membranous parts which may re- present them. The optic nerves perforate the orbito- sphenoids, but may pass out behind them. In Lizards (e.g., Hatteria, Anguis, and many others) an aperture is left in the roof of the skull which is called the " parietal foramen." It serves for the reception of a third and rudi- mentary eye, the existence of which in Lizards was before referred to in noticing the cartilaginous cranium, It is a structure of great morphological interest. The nerves of the muscles of the eye, as well as the first of the three divisions of the fifth nerve, pass out in the interval between the orbito- and ali-sphenoids. The two other divisions of the fifth, as a rule, perforate the alisphenoid, the third the more constantly, the aperture for it being known as the foramen ovale, the less constant aperture for the sccond branch being called the foramen rotundum. 'The auditory nerve enters the auditory capsule (whether ossified or not) on its inner side, and does not pass out from it, but the facial nerve both perforates and traverses it. The glos- sopharyngeal, pneumogastric, and spinal accessory nerves pass out between the auditory capsule and the exoccipital, which latter bone is perforated and traversed by the hypo- glossal nerve.

Thus the osseous cranium (apart from the sense-cap- sules) consists of three arched segments: of these the hindmost is formed by the basi-, ex-, and supra-occipitals, the median by the basisphenoid, alisphenoids, and parietals, and the anterior by the presphenoid, the orbitosphcnoid, and the frontals. These have been called "cranial vertebre," and certainly if the essence of vertebrae consists in their being a series of solid rings, fitted together and enclosing a tract of the nervous centres, then it must be admitted that the cranium—of the highest class of animals at least—is made up of three such vertebra. Their development, however, is altogether different from that of true vertebrae, and no such resemblance to vertebree
————~—~*«SE«@Bafour, doc. cié., p. 4860 220"

is to be detected in the constituent parts of the cartilagin- ous cranium. Nevertheless it is undeniable that there is a singular secondary and induced resemblance to vertebrae in these ossified skeletal parts. |

The osseous condition of the third category of cranial skeletal parts varies extremely in different classes of Verte- brates. The limits of this article are altogether insuffi- cient for more than a brief indication of the main varieties of the cranial structures of any of the three categories, and the reader must refer for details to the descriptions given in the various articles of this work which are devoted to different groups of animals.

The most anterior lateral descending bar or visceral arc is known as the mandibular arch. That part of it which extends forwards and forms the upper jaw presents us with the following ossifications arranged in two rows — one external, the other internal. The external row, pro- ceeding from before backwards, consists of premaxilla, maxilla, jugal (or malar), and very often of a quadrato- jugal, which latter, when present, is generally in the form of a bar of bone (with an interval between it and the skull), forming, or helping to form, an inferior lateral external arch analogous to the superior lateral arch already noticed as the “zygoma.” There may be a pair of pre- maxille, or they may be represented by an azygous bone. The premaxilla, maxilla, and jugal often unite with the anterior outer margins of the nasal, frontal, and lachrymal to form a continuous bony external wall to the anterior part of the skull. The internal row of bones, proceeding again from before backwards, consists of the vomer, pala- tine, and pterygoid, which, with their fellows of the opposite side (and sometimes with the aid of the parasphenoid), forn the bony roof to the mouth, which roof may (as in Mammals and Crocodiles) be a continuous bony partition, or may be but a sort of open bony framework. Besides the pterygoid proper, other ossifications, adjoining it, have been distinguished as the entopterygoid and ectopterygoid.

The lower part of the most anterior lateral visceral are forms all or part of the lower jaw. In the Mammalia it forms the whole of that jaw, and is invested by but a single bone—the dentary. In other Vertebrates it forms but the distal, though greater, part of that jaw, and may be invested, not only by a dentary, but also by bones called angular, subangular, coronoid, and

splenial. The jaw is further continued, proximally, by two bones—the articular and the quadrate—which are ossifications of the cartilaginous are itself. This may, as in Birds and Rep- tiles, be directly articulated to the cranial wall, or it may be (as in Fishes) suspended therefrom by bones, the highest of which is termed the hyomandibular, which articulates with the ossified auditory capsule. The hyo- mandibular joins below two other bones, the anterior of which is called the metapterygoid and the posterior the symplectic, to both of which the quadrate 1s attached. Thus these four bones act as a “suspensorium” for the lower jaw, the joint between which jaw and the suspenso- rium is placed at the junction of the quadrate and the articular. In Mammals, parts answering to the suspen- sorium, the quadrate, and the articular form no_ part of the jaw but are of relatively minute size and are known as certain parts (the auditory ossicles, Wc.) of the internal ear,! and are protected externally by an ossifica- tion called the tympanic bone.

The second lateral descending bar or visceral arc, known as the hyoidean arch, may have its upper part ossified, in union with the preceding arch, as in the bony suspensorium of Fishes just described. On the other hand its upper part may, as in Mammals, be represented only by minute parts

1 The exact and precise homologies of these parts seem still to be sub judice.

of the internal ear,—except the very summit of the arch, which forms the tympanohyal, and is anchylosed to the ossified auditory capsule of the internal ear. In Bony Fishes the hyoidean arch begins to free itself from the suspensorium, as a bone called the stylohyal, which is attached to the preceding or mandibular arch, between the hyomandibular and the symplectic. The are then continues downwards as the epihyal and ceratohyal, ending below in the basihyal, from which a glossohyal may project forwards and a urohyal backwards. In Fishes certain styliform ossicles termed brancliiostegal rays may project backwards from the hyoidean arch; and above them certain membrane bones called opercular bones—the oper- culum, preoperculum, suboperculum, and interoperculum

—are attached above to the hyomandibular, and lie outside the mandibular and hyoidean arches.

In the air-breathing Vertebrates the hyoidean arch may be well developed or very imperfectly so, and concurs with parts belonging to the more posteriorly situated lateral arches to form a complex bone—the 0s hyoides —as will be further described.

These more posterior lateral arches—the branchial

arches—attain their most complex osseous condition in

Bony Fishes, which have commonly five of them, not solidly united to the skull above, but connected one with another inferiorly and with the inferior part of the hyoid arch. From below upwards these arches consist generally of a basibranchial, a hypobranchial, a ceratobranchial, an epibranchial, and a pharyngobranchial, but the hindmost arch is less fully and complexly formed.

In air-breathing Vertebrates the already-mentioned os hyoides cousists of a central part or “body,” to which are attached two pairs of single or jointed processes termed cornua. The anterior pair of cornua (known in human anatomy as the lesser cornua) represent the hyoidean arch, and may contain all its bones, including the “tym- panohyal.” The posterior pair of cornua (the greater cornua of human anatomy and the thyrohyals of Mammals generally) answer to or represent part of the branchial arches, and may be longer or shorter than the anterior pair of cornua. That they really have this homology is proved by the process of metamorphosis of the Tadpole, which in its early stage has distinct cartilaginous bran- chial arches that become the posterior cornua of the 0s hyoides of the adult Frog.

The osseous skull may, its bones remaining distinet, form a very solid whole, and the brain-case may be com- plete, as in Mammals, or it may be very loosely constructed and largely membranous, as, ¢.g., in most Lizards. Teeth may be connected with various bones,—most constantly with the dentary, maxille, and premaxille,—but the palatines, pterygoids, parasphenoid (in Plethodon), pharynge- branchials, and even the basioccipital (Carp and Tench), may be dentigerous.

The structure of the skull is so exceedingly complex and varied that it is impossible within the limits of the present article to do more than give the above general indications. For further particulars the reader is referred to the anatomical details which will be found in the several articles of this work which are devoted to the description of different single groups of Vertebrate animals, and especially to the description of the skull of Man m the article ANATOMY.

APPENDICULAR SKELETON.

This part of the internal skeleton of Vertebrate animals normally supports two pairs of limbs only, but in one class—that of Fishes—there are azygous stractures—the unpaired fins—which, as before said, must be reckoned as belonging to this category. These latter will be more

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‘conveniently treated of later. The whole appendicular ‘skeleton may, however, be wanting, as in the Lamprey ‘and in most Serpents.

The Skeleton of the Paired Limbs.—The paired-limb skeleton normally consists of that of an anterior, pectoral, or thoracic pair of limbs and that of a posterior or pelvic pair. In certain species there may be but a single pair of limbs, which may either be the pectoral pair, as,

—e.g-, in. the Amphibian genus Siren, or the pelvic pair, as in the Reptilian genera Bipes, Lialis, and Ophiodes.

Normally each pair consists of diverging appendages— the limb skeleton proper—attached to a solid structure embracing parts of the trunk, ze, a limb-root or limb-

girdle. A thoracic limb-girdle may exist in a well-de- veloped condition without any limbs attached to it—as in the Slow-Worm (Anguis), but there is never a well- developed pelvic girdle without a rudiment of a pelvic limb.

In all Vertebrates above Fishes the limbs are divisible into a main part of the limb—arm or leg,—with a distal

part or extremity—“ manus” (hand) or “es” (foot).

| We sometimes find (as in Lialis, Python, and Balena) a

-udimentary development of the skeleton of the leg

- without any rudiment of a pes; but we never find any rudimentary development of an arm without any rudi- ments of a manus. In the paired limb, as we have seen, a limb-girdle may be present without any part of a limb, but no part of the limb skeleton is ever developed with- out any limb-girdle. Normally the two limb-girdles are attached in a solid manner to the axial skeleton, in dif- ferent modes.

Normally the pectoral girdle is only thus connected with the axial skeleton by its ventral part, or with the ventral part of that skeleton, i.¢., with the sternum, while itends freely above, being dorsally connected with the axial skeleton only by soft structures. In Fishes, however, it may abut by its dorsal extremities on each side against the neural region of the spinal

column, as in Aaa clavata, or be connected with the head by skeletal structures, as in Bony Fishes, ¢.g., Perch, Cod, &c.,—having all the time no connexion with the spine by its ventral part.

The pelvic girdle, on the contrary, is normally connected by its dorsal part solidly with the axial skeleton, though, as in Fishes, it may not be at all so connected. It never, however, abuts ventrally against the axial skeleton as does the thoracic girdle.

Appendicular Skeleton of Vertebrates above Lishes.

The paired limbs of all animals above Fishes are formed on one type, and differ greatly from those of the last-mentioned class. It will be convenient to describe first the general condition of the limbs in Mammals, Birds, Reptiles, and Amphibians.

Both the thoracic and pelvic limbs of these animals are divided, as before said, into main parts (arm and leg) and extremity (manus and pes). Each main part is further subdivided into a proximal segment (upper arm and thigh) and a distal segment (fore-arm and lower part of the leg). Each extremity is subdivided into a root portion (‘‘ carpus” and ‘‘ tarsus”), a middle portion (‘‘ metacarpus” and *‘metatarsus”’), and a terminal portion known as the digits. Thus the skeleton, ¢.g., of the hand of Man is composed of—(1) the root part of the hand or the “ carpus ” (made up of eight small bones) ; (2) the middle part of the hand or ‘‘ metacarpus ” (made up of five long bones enclosed in the flesh of the palin); and (8) that of the digits, ¢.e., of the thumb (or ‘‘ pollex”) and of the four fingers, while the great toe (or ‘hallux”) and the four other toes are the ‘‘ digits” of the pes.

The joints between the proximal and distal segments of the main part of each limb are the elbow and the knee, and these are turned mostly (as in ourselves) in opposite directions. Primitively, how- Fi in all animals and permanently in some (e.g., Tortoises), both i ese Joints are so conditioned as to open inwards—the elbow and

a being both directed outwards—while the palm of the manus and the sole of the pes are also both inwards in the embryo, and ie the adult are applied to the ground, the digits of each extremity

eng directed outwards. This is the position in which the corre-

spondence in structure between the thoracic and pelvic limbs is most obvious, and in it the whole surface of the limbs, which (on aceount of the museles there placed) is known as the ‘‘ extensor” surface, is turned outwards, whereas that known as the ‘‘ flexor” surface is turned inwards, while the pollex of the manus and the hallux of the pes are both in front of their respective extremities, This primitive condition is altered during the process of devclopment of Man and most air-breathing Vertebrates, the knee becoming bent forwards and the elbow backwards, while the fore-arm is twisted by a movement called ‘‘ pronation,” so as to enable the flexor or palmar surface of the manus to be applied in a direction parallel to that of the flexor or plantar surface of the pes.

In Bats the thigh is turned backwards, so that the knee bends baekwards like an elbow. Were it necessary in these animals to apply the sole of the pes to the ground with the digits forwards (as in most animals), theua pronation of the lower leg would be needed in them, similar to the pronation of the fore-arm, which, as above said, takes place in the majority of animals here referred to—air-breathing Vertebrates.

The Thoracic or Pectoral Limb-Girdle.—The shoulder-girdle normally consists of the following bones or cartilages :—(1) a superior portion, generally a move or less broad plate of bone, called the scapula, the upper part of which may remain cartilaginous and more or less distinguishable as a suprascapula ; (2) a posterior inferior portion, named the coracoid, which may or may hot be continuous with the scapula, and may have additional parts or subdivisions distinguished as the coracoid proper, pre- coracoid, and epicoracoid; at the junction of the scapula and coracoid there is a concave articular surface—the glenoid cavity, into which the pectoral limb is articulated; (3) an anterior inferior portion, called the clavicle, which may abut against an azygous median structure known as an interclavicle, the two being distinguished from the other elements of the girdle by being more or less entirely membrane boues.

These structures are found well developed in many Lizards and quite exceptionally in Monotremes amongst Mammals. In them and in Birds, the coracoids are largely developed, while they remain mere processes of the scapula in non-Monotrematous Mammals, and sometimes are quite rudimentary. In such Mammals the pectoral arch is only completed inferiorly by the clavicles which abut against the sternum, but sometimes (as, ¢g., in Ungulates) are altogether absent. The “merrythought” of Birds is a clavicular structure. In Amphibians the two halves of the shoulder-girdle are each formed of a continuous plate. Some anatomists reckon part of this as representing a clavicle, but this determination is very doubtful,

The Pelvic Girdle.—This girdle, like the former one, normally consists of three parts—one dorsal, the ilium, and two ventral, whereof the more anterior is the pubis and the posterior the ischium, and all these are cartilage bones. The pubis generally meets ventrally its fellow of the opposite side, but not always so. The ischia meet ventrally more rarely. In Birds and certain extinct Reptiles a third element, the post-pubis, intervenes between the ischium (more or less parallel to the latter) and a pubis which may be fully or only rudimentarily developed. At the junction of the ilium and the ventral pelvic elements there is a concave articular surface for the pelvic limb, the acetabulum. An interval between the pubis and ischium of each side is known as the obturator foramen. We findamongst Amphibians there is a peculiar cartilage in the ventral median line in front of the pubis, which has been ealled the prepubic cartilage! In Marsupials and Monotremes a bone extends forwards in front of each pubis, and these bones are known as the marsupial bones.

The Limbs.—The general condition of these organs and the bones supporting thein in Vertebrates above Fishes having already been indicated, it remains but to fill in a few details as to their normal structure and its principal varieties.

A. Pectoral.—The bone of the upper arm is called the humerus, and is more or less cylindrical in shape, with an expansion at each end. It may, however, be almost as broad as long, as in the Mole and some Cetacea. The lower arm is generally furnished with two bones, the radius and the ulna, placed side by side. The ulna may be more or less abortive, as in Ruminants and

Bats, but it may be the larger of the two fore-arm bones, as is the case amongst Birds.

The carpus may have its parts more or less permanently cartilaginous, as in some Urodeles and Cetaceans.

Taking the carpus of Man as a type of the ossified carpus (for further details, see ANATOMY), it consists of the eight following short bones arranged in two transverse rows. The proximal row (that next the arm) includes the scaphoides, lunare, cuneiforme, and pisiforme, while the distal row (that next the fingers) comprises the trapezium, trapezoides, magnum, and unciforme—starting, in each enumeration, from the thumb side of the manus. The pisi- forme stands out from the rest, and is reckoned as a sesamoid bone

1 Balfour, doc, cit., p. 499.

or ossification of a tendon, rather than a true carpal ossicle. There may be an analogous sesamoid ossicle on the other side of the wrist (on the side of the scaphoid) even in Apes, and this obtains its maximum in the Mole, where it strengthens and broadens the manus for digging. The true carpal bones may be more numerous or less numerous than in Man. Thus there may be an ossicle— called intermedium or centrale—placed in the mid line between the two rows of carpals, and this may be double, as in Crypto-branchus and some Siberian Urodeles. The unciforme may also be represented by two bones, as amongst Chelonians ; the pisiforme is often absent, and also the trapezium. The bones of the distal row are the less constant in number and development, and they may coalesce with the metacarpals, as in the Chameleon. Their development is related to that of the digits with which they articulate. All the true proximal carpal ossicles may unite into one bone, as in Pteropus, and the whole carpus may be reduced to two distinct bones, as amongst Birds.

The metacarpus, when fully developed, consists of five rather long metacarpal bones, as in Man. There may, however, be but two, and these wited into what is called a “canon bone ” (as in Sheep, Deer, &c.); or there

may be but a single one, as in the Horse, — answering to Man’s third metacarpal. They vary in relative size and proportion in different animals, but are most remarkable for their length and slenderness in the Bats, while they are much elongated in the Horse and most Ruminants.

As to the digits, there may be but a single oue, as in the Horse, or two, as in Ruminants and the Marsupial known as Chwropus. There may be three, as in the Rhinoccros, the Proteus, and in Seps ; or there may be four. The digits are never certainly more than five (except by monstrosity), although in the Ichthyosaurus extra mar- ginal bones along the manus give at least the appearance of more.

When a digit is wanting it is generally the iolles (thumb), as in Spider Monkeys, but it may be the fifth, as in Pterodactyles, or both fourth and fifth may be wanting, as in Birds, The pollex may be more or less opposable to the others, as in Lemurs, most Monkeys, and in Man, or two digits may be opposed to the other three, as in the Chameleon.

The second digit may be greatly reduced, as in the Potto, or the third may be disproportionally slender, as in the Aye-Aye, or thick, asin the Great Armadillo. The digits may be enormously elongated, as in the Bats, or short, as in the Mole and the Land Tortoises. They may be very imperfectly developed, asin Birds. They may be so united by dense tissue as to be quite incapable of separate motion, as in the Cetaceans. The bones of the fingers are called phalanges, and there are always three of them to each digit except the pollex, which has but two in all Mammials with the exception of certain Cetaceans, which have more. There may be as many as fourteen phalanges in one digit in @lobiocephalus. The proximal row of these bones may become anchylosed to the metacarpals, as in the Three-toed Sloth. In Reptiles the numbers of the phalanges often increase from two in the pollex to five in the fourth digit, as in the Monitor. The abortive manus of Birds has at its best but three digits, with two phalanges to the pollex, three to the index, and one or two to the third digit. The phalanges are very numerous in the Ichthyosaurus and Plesiosaurus.

B. Pelvic.—The bone of the thigh is called the femur, and is a long bone which varies less in its form and proportion in different animals than does

the humerus. It is, however, relatively very short in the Seals, and still shorter in the Ichthyosaurus.

In front of the knee-joint there is generally present a large sesamoid bone known as the knee-pan or patella, This, however, may cven in Mammals be very small, as in Bats and Scals, or wanting altogether, as in the Wombat.

The leg below the knee is supported by two long bones, the tibia and the fibula, placed side by side, whereof the former is the more internally situated, the larger generally, and the more constant. The two bones may anchylose together at each end, as in the Armadillos, or they may do so only below or only above ; the two bones may be completely fused together, asin the Frog. The tibia may be the only long bone, through the small development of the fibula, as in Ruminants and the Horse. The fibula may be quite styliform, as in Birds, or it may be developed inferiorly but be atrophied at its upper end, as in Bats. Itmay be represented only by a small ossification outside the lower end of the tibia, as in the Ox, and with this there may exist a styliform rudiment of its upper part, as in the Elk.

The joint by which the foot moves on the leg is situated between the lower end of the leg bones and the tarsus in Mammals and Am- phibians. In Birds and Reptiles, however, this joint is placed in the tarsus, the proximal part of which is firmly connected with the leg, while its distal part is firmly connected with the metatarsus.

The tarsus of Man consists of seven irregularly shaped, more or less short bones. Of these the astragalus joins the tibia and has the os calcis beneath it and the naviculare in front of it, while the metatarsals are supported (from the great toe outwards) by the internal, middle, and external cuneiform bones and by the cuboides, which is connected with the fourth and fifth metatarsals.

SKELETON

The tarsus may have its parts morc or less permanently cartila. ginous, as insome Urodeles. The number ofits bones, or cartilages, may be as many as nine, as in the Salamander, or be reduced to three, as in Proteus, or perhaps to two, as in Ophiodes. Tyo tarsal bones (the os calcis and naviculare) may

take the form of long bones, as in Galago and especially in Zarsius. These two bones and the astragalus may be represented by a single bone, as in many Lizards, or may early unite with the tibia, as in almost all Birds, The astragalus may be represented by two bones, as in Urodeles, It may have an extra ossicle annexed to it, as in the imale Ornithorhynchus aud Echidna. Two extra ossicles may be attached to the tibial side of the foot, as in the true Porcupine (Cercolabes), The naviculare may anchylose with one of the distal tarsal bones, as in the Ox and Deer, where it unites with the cuboid. The distal] bones are less constant than the others, and they may anchylose with the metatarsals, as in Birds, the Chameleon, and the Three toed Sloth. The cuboid may be represented by two bones, as in certain Urodeles. The internal cuneiforme may be wanting, as in the Ox, or coalesce with the middle one, as in the Horse,

The metatarsus when fully developed eonsists of five rather long metatarsal bones, as in Man, and never of more. There may be . but a single developed metatarsal, as in the Horse (the third) and Cheropus (the fourth), or two fused together, as in the Sheep, Deer, &c., or three fused together, as in the Jerboa, or four so fused, as in many Birds. There may be but two metatarsals well developed, as in the Hog, or three, as in the Rhinoceros, or four, as in the Dog. They are never enormously elongated like the metacarpals of Bats, but they may all be extremely short, as in Land Tortoises and the Ichthyosaurus.

The digits vary in number, as has just been indicated with respect to the metatarsal bones sustaining then.

When one digit is wanting it may be the fifth, as in Birds, or the hallux (first or great toe), as in the Hare. The third and fourth digits ay be only functional ones, as in the Ostrich; but the third may abort, leaving only the fourth, as in Chwropus, or the fourth, leaving only the third, as in the Horse. The fourth and fifth may be the only functional ones, as in the Kangaroo, The hallux may be opposable to the other digits, as in Monkeys, Lemurs, Opossums, and Phalangers; or the first and fourth digits may be opposed to the second and third, as in Parrots ; or the first and second to the third, fourth, and fifth, as in the Chameleon.

The phalanges of the digits are in Man’s whole class always three to each digit except the hallux, which (like the pollex) has but two —save in the Orang, where it may have but one phalanx. They may be much more numerous than in Mammals, as in the pes of the Ichthyosaurus and Plesiosaurus. The numbers of the phalanges as we proceed from the first to the fifth digit may be 2, 3, 4, 5, 4, as in Lizards generally, or 1, 2, 8, 8, 2, as in the Salamander, or 2, 2, 8, 4, 3, as in the Frog. In Birds (where the fifth digit is more developed) the numbers of the phalanges, proceeding trom the hallux, are mostly 2, 3, 4,5; but they may be 2, 3, 3, 3, asm the Swifts, or 2, 3, 4, 8, as in the Goatsuckers.

Appendicular Skeleton of ishes.

The Paired Limbs. —Most Fishes possess two pairs of limbs, known as the pectoral and ventral fins, which respectively cor respond to the pectoral and pelvic limbs of higher Vertebrates. These limbs are attached to corresponding limb-girdles, whereof the pelvic girdle is always inferior in development and never attams the large relative proportions and fixed position of the pelvic girdle of non-Piscine Vertebrates.

Very often, however, the ventral fins are entirely wanting, and the pectoral fins are sometimes wanting also. In the latter case there is usually present more or less of a pectoral limb-girdle, though it may be, as in Mwrenophis, little more than a filament. In all non-Piscine Vertebrates the right and left limbs are symmetrically and equally developed, but in the Flat Fishes (Pleuroncetidz) one pectoral fin may be larger than the other, or one may disappear, as in Monochirus. ;

The situation of the paired limbs is, in Elasmobranchs, Ganoids, and a good many Teleosteans, similar to that they hold in higher Vertebrates, but in some other Tcleosteans (such as the Fishes on that account called ‘‘thoracic”) the ventral fins arc placed far for- wards so as to come immediately behind the pectoral fins, while in yet other Teleosteaus (known on that account as “jugular ” Fishes) they are placed even in front of the pectoral fins.

The pectoral girdle may consist of a simple cartilaginous arch, a8 in Elasmobranchs, or it may be composed, as amongst Teleosteans, of two

bones meeting ventrally, cach being commonly regarded as a clavicle which is continued up dorsally to the skull by the inter- vention of a supraclavicle and a post-temporal. Besides these there is a cartilaginous element on each side which usually ossifics in two pieces, the upper one of which is reckoned as representing a seapula and the lower onea coracoid. These parts are annexed to the immer side of the clavicle, where also there is sometimes found a styliform bone, more dorsally placed, called the post-clavicle.

The pelvic girdle is represented in Elasmobranchs by a transverse

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cartilaginous structure formed of two separated or two medianly-

united pieces, each of which sometimes, as in Chimera and Callo-

rhynehus, shows much resemblance to the innominate bone of higher

_ process. ‘ united with the spinal column. ‘ very rudimentary, and each lateral portion (which has a slightly-

a

rays annexed to them.

Vertebrates in that it sends up a process simulating (and probably representing) the iliac element and possesses a sort of obturator foramen. In Osseous Fishes the pelvic girdle is normally repre- sented by two innominate bones medianly joincd, each of which may, by rare exception, as in Lophius, send up a tall ilium-like In no Fish, however, does the pelvis become solidly In the cartilaginous Ganoids it is

developed pubic and iliac process) is separated from its fellow on the opposite side, while in Lepidosiren there is only a single simple median cartilage with no iliac process.

The skeleton of the pectoral limb, or fin, of most Elasmobranchs consists of three considerable basal cartilages, placed side by side,

- articulating with the pectoral arch, and named the propterygium,

the mesopterygium, and the metapterygium. Of these the proptery- gium is proximal or anterior in position. To the distal ends of these are articulated a number of slendcr elongated more or less segmented radial cartilages, and to the distal portions of these are aunexed the horny fin-rays which form the solid supports of the distal portion of the fin.

Sometimes there may be but two and rarely only one basal cartilage, which one must then be considered as representing the whole three condifferentiated. In Ceratodus there is a single basal cartilage followed by a series of small cartilages—secondary radial cartilages diverging from both sides of that series and having fin- In Lepidosiren the limb skeleton is still more simplified, consisting only of a single series of short slender cartilages with simall fin-rays attached to one side alone, without the intervention of any radial cartilages.

Insome Bony Fishes (¢.g., Polypterus) the basal cartilages are

_ more or less ossified, as are also most of the radials next them, while

to these small cartilaginous radials are annexed, which support ossified fin-rays. In some other Ganoids certain of the radial cartilages articulate directly with the pectoral arch. In the Teleostei a few, not above five, more or less ossified cartilages lie side by side and articulate with the pectoral arch, and one or more rows of small cartilages succeed tothem. These two elements represent the basal and radial cartilages of Elasmobranchs, and to them are articulated the relatively large fin-rays which make up the far greater part of the Teleostean pectoral limbs.

The skeleton of the ventral fin or pelvie limb is almost always more simple than that of the pectoral one. Only very rarely, as in Ceratodus, Lepidosiren, and Callorhynchus antareticus (see Trans. Zool. Soc., vol. x. p. 455, and plate lxxix. figs. 3 and 4), have they a close, or pretty close, resemblance. Generally the Elasmobranch ventral limb is supported by an elongated

cartilage, the basiptery- gium, which articulates with the pelvic cartilages and bears on its ventral border a series of cartilaginous radialia with which the fin-rays are connected. In Polyodon foliwm there are only radials which support fin-rays but are not themselves supported by any basipterygium, nor is there any pelvic cartilage. In the Teleosted the fin-rays are direetly attached to the osseous pelvic clements.

_ The Unpaired Appendicular Elements.—Besides the two pairs of

limbs there are, as has been mentioned, certain azygous structures commonly known as the unpaired or azygous fins or limbs. They are only fonnd in Fishes, and consist of the dorsal, caudal, and anal fius. ‘These may all run one into the other and form a continuous fin fringe to the body from the head round the tail and forward again to the vent, as in Hels and many Gadoid and Blennioid Fishes, In most cases, however, there are one or two distinct dorsal fins, and au anal fin also distinct from the caudal one.

The structure of the dorsal fin in Elasmobranchs is singularly like that of their paired fins, inasmuch asitis supported by an elongated or segmented basal cartilage or cartilages, from the dorsal margin of which radial cartilages (generally elongated, slender, and seg- mented) proceed, having the fin-rays connected with them distally. The basal cartilages may or may not be directly connected or become confluent with the subjacent spinal skeleton. There may be (as in the second dorsal of Callorhynchus antareticus) but a single longi-

tudinal series of more or less elongated cartilages side by side, like radial cartilages devoid of any subjacent basal cartilages. In the Teleostet the fin-rays may be osseous and in the form of more or less strong spines, or soft and of a horn-like consistency, and segmented both vertically and horizontally; and fin-rays generally consist of two (right and left) halves, which, although closely applied together for the greater part of their length, diverge proximally to embrace the skeletal element to which they are annexed. These latter elements in the Teleostei are small ossicles or chondrifications, termed “ inter- spinous bones or cartilages.” They extend upwards between the neural spines of the axial skeleton and the dorsal

surface of the body. Anal fins are essentially similar in composition to dorsal fins, The caudal fin is modified according to the condition of the posterior termination of the axial skeleton, the different condition of which in Fishes has already been noticed (p. 112). Much-modified axial elements generally form the support of the fin-rays, but the numerous coniplex and varied conditions which these parts may pre sent in different forms is a matter of ichthyology, which can hardly find a place in a general description of the Vertebrate skeleton.

Nature and Origin of Appendicular Skeletal Parts.— From the researches of the late Prof. Balfour it appears that the paired limbs arise as differentiations of continuous lateral folds or projections from the surface of the body, and the azygous fins arise as differentiated projections from its dorsal and ventral surfaces. Thus all these appendicular parts may be viewed as different species of one funda- mental set of parts (pterygia), for the sum total of which the term " sympterygium" has been proposed (see Z'rans. Zool. Soc., vol. x. pp. 481, 482). The paired limbs and azygous fins are of similar origin and nature. Separate narrow solid supports, in longitudinal series, and with their long axes directed more or less at right angles with the long axis of the body, were developed in varying extent in all these four folds or projections. These sup- ports have, it would appear, very often united to form basal cartilages, the original single and united condition persisting in such forms as the ventral fin of Polyodon and the second dorsal of Callorhynchus, both already noticed,

The paired limbs are thus, in all probability, essentially peripheral structures which have become more or less closely connected with the axial skeleton. Their proximal parts uniting and growing inwards have often become directly connected with parts of the axial skeleton. Thus the limb-girdles seem to have arisen,—namely, as ingrowths from the basal cartilages of the limbs; and therefore the whole appendicular skeleton belongs to a different skeletal category from that of the head and spinal column or axial

endoskeleton.

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SKELTON, Jon, an eccentric English scholar and | poet of the 15th century. Mr Dyce, the editor of his works, fixes his birth about 1460. “His first essay in verse Was a poem after the manner of Lydgate on the death of Edward IV. (1483). He lived to pay compliments to Catherine, wife of Henry VIII, to jeer at the Scotch over es battle of Flodden, and to make fierce attacks on Wolsey, and is supposed to have died in 1529. In general intellectual force, fierceness of invective, wildness

of buffoonery, and coarseness of language Skelton bears some likeness to Swift. But he stands by himself as one of the most eccentric and paradoxical characters in English literature. He began life apparently as the protegé of a pious, learned, and literary lady, the mother of Henry VII., who founded St John’s College and Christ’s College, Cambridge, and translated devotional works from the French. He was himself one of the most notable scholars of his time, was appointed tutor to Henry VIII, was

hailed by Erasmus (whether ex officio or propter merita is left to conjecture) as “unum literarum Britanniarum lumen et decus,” was proclaimed poeta laureatus by both universities, and frequently applied this title as well as that of orator regius to himself without challenge. At about the age of forty he took orders, and was appointed rector of Diss in Norfolk, where he seems to have spent the last twenty-five years of his life. Yet this eminent scholar and churchman is the author of the oldest and the best drinking song in the English language—the drinking song in Gammer Gurton’s Needle, and of one of the coarsest poems in any language—Zhe T’wnning of Elinor Rumming. Heis the author of a satire against the clergy of his time—Colin Clout,—unsurpassed in pre-Reforma- tion literature for direct and merciless ridicule, and of a satire against the great cardinal when at the height of his greatness—Why come ye not to Court ?—boiling over with ferocious invective and insolent contempt. At the same time he had such a repute for rough wit and irregularity of life that he became the hero of a book of “merry tales.” These mythical tales were probably in the mind of the historian who has described Skelton as a “ribald buffoon,” “a profligate and illliving wretch.” Whether the real Skelton deserved such epithets is doubtful ; his verse undoubtedly contains much that may fairly be described as ribaldry and buffoonery. It has not a trace of the chivalrous spirit of Chaucer, and his most character- istic form, known as Skeltonical verse, is wayward and unconventional—adopted as if in mad defiance of regular metre. Still, as Skelton himself claimed for it, “it has in it some pith.” ‘Though my ryme be ragged,

Tattered, and jagged,

Rudely rain-beaten,

Rusty and moth-eaten,

If ye take well therewith

1t hath in it some pith.”

Colin Clout, Why come ye not to Court? and The Book of Philip Sparrow —which Coleridge pronounced “an exquisite and original poem”—are written in this metre. The Bowge (ship) of Court, a satirical vision of personified abstractions, is more conventional in form, and was prob- ably one of his earlier works. Both it and his interlude Magnificence show great power in the vivid description of character.

SKIMMER, the English name bestowed by Pennant? in 1781 on a North-American bird which had already been figured and described by Catesby (B. Carolina, 1. pl. 90) as the “Cut-water,”—as it appears still to be called on some parts of the coast,2—remarkable for the unique formation of its bill, in which the maxilla, or so-called upper mandible, is capable of much vertical movement, while the lower mandible, which is considerably the longer of the two, is laterally compressed so as to be as thin as a knife-blade. This bird is the Rhynchops nigra of Linnzeus, who, however, united with it what proves to be an allied species from India that, having been indicated many years before by Petiver (Gazoph. Naturx, tab. 76, fig. 2), on the authority of Buckley, was only technically named and described in 1838 by Swainson (Anim. AMena- geries, p. 360) as R. albicollis. A third species, &. flav- rostris, inhabits Africa ; and examples from South America, though by many writers regarded as identical with nigra, are considered by Mr Saunders (Proc. Zool. Society, 1882, p. 522) to form a fourth, the 2. melanura of Swain- son (ut supra, p. 340). All these resemble one another

1 “T call it Skimmer, from the manner of its collecting its food with the lower mandible, as it flies along the surface of the water” (Gen. of Birds, p. 52).

2 Other English names applied to it in America are ‘‘ Razorbill,” ‘¢Seissorbill,” and ‘* Shearwater.”

have the structure and appearance of TERNS (q.v.).

very closely, and, apart from their singularly-formed bill, Som authors make a family of the genus /’hynchops, but it seems needless to remove it from

the Larzde (GULL, vol, xi. p. 274). In breeding-habits the Skimmers thoroughly agree with the Terns, the largest species of which group they nearly equal in size, and indeed only seem to differ from them in the mode of taking their food, which of course is correlated with the extraordinary formation of their bill. X (A. N.)

SKIN DISEASES. These form a large and important class. In number they are very extensive, owing to the varied forms of morbid change which the skin texture may undergo, no less than to the different portions of the structure and its appendages which may be specially affected. Further, the modifications of the typical forms of these diseases which are to be observed have led to arrangements and classifications of very complex character and multiplied greatly their nomenclature. Skin diseases are regarded by the physician as of great importance, not only from the fact that morbid action in this texture must have a powerful influence on the general health and may bring in its train other maladies, but also because they are not unfrequently themselves the expression of constitu- tional conditions, inherited or acquired, the recognition of which is essential to their effectual treatment. In order to clearness of description it is necessary to make use of some method of classification. Various arrangements have been adopted by writers on the subject, but the following appears sufficient for the present purpose : °—

I. Disorders of the secreting apparatus (of the seba- ceous and sweat glands) ; If. Disorders specially relating to nutrition (hypertro- phies ; atrophies ; new formations ; pigmentary changes) ; III. Inflammatory affections (erythematous ; papular; vesicular ; pustular ; squamous or scaly) ; IV. Neuroses (nervous disorders) ; V. Parasitic affections (animal; vegetable).

I, DisorpErs of THE SecRETING ApraRaTus.—(1) O/ the Sweat Glands.— The chief morbid conditions are exees- sive sweating (hyperidrosis) and foetid sweating (bromt- drosis). Excessive sweating is a symptom observed in various diseases, such as phthisis and rheumatic fever, but it may exist apart from such conditions, and either be general, affecting the whole body, or confined to a part, such as the axillz, head, hands, feet, or, as in some rare instances, the one half of the body. Some persons habitually perspire, often to a great extent, on making any effort, yet never appear to suffer in health,

although the discomfort is considerable. Excessive perspiration may often be pre vented by the habitual use of the cold bath, and by tonics, such as iron, quinine, strychnia, dc. Locally, the use of astringent lotions of vinegar or a weak solution of lead will also be of service. Bromidrosis or fcetid sweating 1s often associated with the former condition, and it too may be general or local. It most frequently affects the feet, especially in those who have much fatigue, and is a souree of much personal discomfort as well as of annoyance to others. It is apparently due to rapid decomposition in the perspiration which has saturated the stockings, and for its treatment it is essential that these should be frequently changed and the feet washed several times a day, drie carefully, and dusted with some antiseptic powder, such as boracic or salicylic acid mixed with starch or French chalk. Hebra recommends the application to the feet of a composition of equal parts of olive oil and litharge laster spread upon linen and used twice a day. (2) Of the Sebaceous Glands.—Seborrhea is a term

3 For the structure of the skin see ANATOMY, vol. i. p. 897.

applied to describe an accumulation on the skin of the normal sebaceous secretion mixed up with dirt and form- ing scales or a distinct incrustation. On the head, where itis commonly seen, it may interfere with the nutrition of the hair and cause partial baldness. A form of this disease occurs in young infants. The main treatment is local, consisting in thorough cleansing of the parts. The crusts may be softened with oil and the affected skin regularly washed with soft soap and rectified spirit. The sebum frequently accumulates in the sebaceous ducts, giving rise to the minute black points so often noticed on the face, back, and chest in young adults, to which the term comedones is applied. A form of this disorder, but of larger size and white appearance, is termed milewm. These affections may toa large extent be prevented by strict attention to ablution and brisk friction of the skin, which will also often remove them when they begin to appear. ‘The retained secretion may be squeezed out or evacuated by incision and the skin treated with some simple sulphur application.

Acne is an eruption produced by inflammation of the sebaceous glands and hair follicles. It may occur in con- nexion with the preceding or

independently, and shows itself in the form of red pimples or papules which may become pustular and be attended with considerable surrounding irritation of the skin. This affection is like- wise most common in early adult life, and occurs on the chest and back as well as on the face, where it may, when of much extent, produce considerable disfigurement. It is apt to persist for months or even years, but usually in time disappears entirely, although slight traces may remain in the form of scars or stains upon the skin. Eruptions of this kind are sometimes produced by the continued internal use of certain drugs, such as the iodide or bromide of potassium. ‘The treatment is similar to that for the previous affection, viz., brisk friction of the skin, short of producing irritation, and the application of a sulphur lotion or ointment. Attention to the general health by suitable diet, tonics, exercise, &c., is a necessary adjuvant. A variety of this malady, to which the name acne rosacea is given, is a more severe and troublesome disorder than that already mentioned. It is characterized by great redness of the nose and cheeks, accompanied with nodular enlargements on the surface of the skin, which produce marked disfigurement. Although often seen in persons who live too freely, it is by no means confined to such, but may arise in connexion with disturb- ances of the general health, especially of the function of digestion, and in females with menstrual disorders. It is apt to be exceedingly intractable to treatment, which is here too, as in the preceding form, partly local and partly constitutional. Of internal remedies preparations of lodine and of arsenic are sometimes found of service.

Molluscum contagiosum belongs to this class of skin diseases. It consists of an enlargement of the sebaceous glands and occlusion of the ducts, and is seen most commonly on the face, body, or hands in children, or on the breasts in women. It is said to be contagious, but it 1s @ rare form of skin disease.

I. Disorpers arrromine Nurnirioy.—(1) ypertro- phies—A corn (clavus) is a local thickening of the skin, generally occurring on the toes. There is hypertrophy of the epidermis, and in the centre of the corn there is usually a still denser mass, which, pressing down upon the subjacent semsitive true skin, causes pain and may give rise to inflammation and suppuration in the part. When situated between the toes the corn is softer than when on the free surface of the foot. The treatment consists in maceration of the

hardened skin and the use of the knife or strong caustics. Salicylic acid combined with ether and collodion,

painted over the part, is said to be useful in the case of soft corns.

A wart (verruca) is an excrescence from the surface of the skin due to hypertrophy of the papillary layer of the cutis and of the epidermis. This form of growth may also occur on mucous membranes. Warts occasionally disappear spontaneously, or they may be excised, or care- fully touched with some strong caustic acid or alkali.

Ichthyosis or xeroderma consists of a general thicken- ing of the whole skin and marked accumulation of the epidermic elements, with atrophy of the sebaceous glands, giving rise to a hard, dry, scaly condition. It generally first appears in infancy, and is probably congenital. It differs in intensity and in distribution in different cases, and is generally little amenable to any but palliative remedies, such as the regular application of oily sub- stances, although it is not a fatal malady.

For elephantiasis Arabum, see vol. vii. p. 126.

(2) Atrophies.—The chief of these relate to the hair. Camties or whitening of the hair consists in the non- formation of the pigmentary matter which is normally present in the substance of the hair, and occurs generally as a slow senile change. It may, however, take place prematurely, in which case it is often hereditary; or it may be associated with degenerative changes taking place in the system. It is occasionally seen to occur temporarily in very young persons in connexion with some defective condition of the general health. Its development suddenly has not unfrequently been observed as the result of some strong mental emotion.

Alopecia, or baldness, is the loss of hair, which is most commonly a senile change and irremediable, or on the other hand may be premature, occurring either heredi- tarily or in connexion with some previous constitutional morbid state (e.g., after fevers or other blood poisons), in which latter case it may be only, although not always, temporary. It appears to depend upon

atrophic changes affecting the hair follicle, including obliteration of the capillary vessels,—the result of which is that strong hairs cease to be produced, and only feeble, short, and thin hair (lanugo) is formed, which soon falls off and is not repro- duced. Usually the whole skin of the hairy scalp under- goes thinning and other atrophic changes as well as the hair follicle. Sometimes the loss of hair occurs in distinct circular patches (alopecia areata), which tend to spread until the whole scalp is denuded. The treatment of temporary or premature baldness bears reference especially to any known conditions affecting the general health ; and tonics, baths, and other means to promote a vigorous skin function are useful. Stimulating liniments containing spirits and cantharides, the regular cléansing and moderate brushing of the parts, the application to the scalp of the constant current of electricity, and various other remedies appear to be of service in promoting the growth of hair.

(3) New Formations.—(a) Lupus is a disease character- ized by the formation in the skin of tubercles or nodules consisting of new cell growth which has no tendency to further development, but to retrograde change, leading to ulceration and destruction of the skin and other tissues in which it exists, and the subsequent formation of per- manent white scars. Lupus vulgaris is most commonly seen in early life, and occurs chiefly on the face, about the nose, cheeks, ears, &e., but it may also affect the skin of the body or limbs. It first shows itself in the form of small, slightly prominent nodules covered with thin crusts or scabs. These may be absorbed and removed at one point, but they tend to spread at another. Their dis- appearance is followed by a white permanent cicatrix. The disease may be superficial in which case both the

ulceration and resulting scar are slight (/upus non- exedens); or, on the other hand, the ulcerative process may be deep and extensive, destroying a large portion of the tissues of the nose or cheeks, and leaving deep marks with much disfigurement (lupus exedens). Another form of this disease, termed lupus erythematosus, is of compara- tively mild character, and occurs on the nose and adjacent portions of the cheeks in the form of red patches covered

with thin scales, underneath which are seen the widened openings of the sebaceous ducts,—this variety of the disease affecting specially that portion of the skin texture. It is very slow in disappearing, but does not leave any marked scar. Lupus is generally more frequently seen in women than in men, and it is held to be connected with a scrofulous constitution. Its treatment bears reference especially to this condition (see Scroruta). In the superficial variety the application of soothing ointments when there is much redness, and Squire's method of slight linear incisions to destroy the increased blood supply, are often serviceable. In the ordinary form the great principle of local treatment is to remove the new tissue growth. This is most readily done either by solid points of caustic, of which the nitrate of silver is perhaps the best, thrust into the tubercles to break them up, or by means of a scoop (Volkmann's spoon) to scrape away the diseased masses. Only by such means can the ulceration be arrested and healing brought about.

(b) Leprosy (elephantiasis Grecorum) may be regarded as belonging to this class of skin diseases, inasmuch as it consists in a new growth of cell material, like lupus, but with less tendency to disintegration and with a wider dis- tribution affecting the skin, mucous membranes, nerves, &e., all over the body. For its history and pathology see vol. xiv. p. 468 sg. Leprosy is not amenable to treat- ment, beyond attempts at palliation of the symptoms and by general hygiene.

(4) Pigmentary Changes.—Chloasma is an abnormal pigmentation, in the form of brown patches, either gene- rally diffused or confined to one part, such as the fore- head and face, and occasionally seen in women suffering from uterine ailments. Addison's disease is connected with a morbid condition of the suprarenal capsules (see Parnonocy), and is accompanied with general bronz- ing of the skin, together with anemia and great and increasing prostration. Leucoderma is a change in the pigmentation of the skin, whereby it becomes white in patches, with a tendency to spread and affect almost the whole surface, until a few dark areas alone remain to represent the original appearance of the skin. It is some- times called white leprosy, but has no relation to that disease, nor is it of any special significance as regards the health. Adbinism is an entire absence of pigment from the hair, skin, eyes, &c. The hair is usually white, and the skin exceedingly pale ; and the eye has a pinkish appearance. This condition is

congenital. It occasionally exists to a partial extent in any of the textures named.

III. InruammatTory Sxin Arrgections.—These embrace the following chief varieties:—(1) diffuse (erythema) ; (2) papular (lichen) ; (3) catarrhal (eczema) ; (4) vesicular (herpes, pemphigus); (5) pustular (impetigo); and (6) scaly (psoriasis, pityriasis).

(1) Diffuse—This variety includes erythema (see ERYSIPELAS) and its forms, particularly erythema nodosum, which consists of spots and patches of dark red colour and slightly elevated, appearing on the front of the legs and back of the arms in young persons, mostly females. The patches continue for a number of days and then become fainter. It is supposed to be connected with rheumatism, joint pains not unfrequently accompanying it. Urticaria or netile-rash is a diffuse redness of the skin, accompanied

with wheals of raised and paler appearance, not unlike the effect produced by the sting of nettles or of insects, and attended with great irritation and itching. Certain kinds of food, such as fruit and fish, produce this eruption in some persons, as also some drugs, such as opium. It is best treated by some soothing application, such as solution of sal volatile, to which a little chloral has been added, and by attention to the state of the alimentary canal. Roseola, which consists in the appearance of roge- coloured spots upon the body, is frequently seen in children, and is apt to be mistaken for measles, but has none of the accompanying febrile or catarrhal symptoms of that disorder, and is of brief duration. (2) Papular.—Lichen, an eruption consisting of small, thickly-set, and slightly-elevated red points, more or less widely distributed over the body, and in the young some- what resembling scarlet fever, but with only slight febrile symptoms and no sore throat, usually results from digestive derangements, but apparently may also arise from exposure to the sun, and it lasts but a short time. Some forms, however (e.g., lichen ruber), are of chronic character and difficult of treatment. The ordinary form requires little beyond attention to the digestive organs and the appli. cation of a soothing lotion or powder. The chronic forms are best treated by the administration of arsenic. Strophulus, or tooth-rash, or, as it is popularly termed, “red gum,” an affection very common in young infants, belongs to this class of skin disorders. (3) Catarrhal.—

Eczema, one of the most common and important of all skin diseases, consists of an inflammation of the true skin, of catarrhal character, together with the formation of papules, vesicles, or pustules, attended with more or less discharge, and with itching and_ other symptoms of irritation. It may be either acute or chronic, and presents itself in a variety of forms. As regards causation, it appears impossible to assign any one condition as giving rise to this disease. It occurs frequently im persons to all appearance in perfect health, and it may m such cases be a permanent or recurring affection during a whole lifetime. Again it is undoubtedly found in persons who possess a morbid constitution, such as the gouty or scrofulous; but apart from any such evident associations it seems in some instances itself distinctly hereditary. Sometimes it is set up as the result of local or general irritation of the skin in certain occupations, and it may exist in connexion with the presence of some other skin disease. It is much more common in men than in women. Numerous varieties of eczema are described, according to its site and duration; only the more inrportant of these can be alluded to. Acute eczema shows itself by redness and swelling of the skin, with the formation of minute vesicles, and attended with severe heat and irritation. Should the vesicles rupture, a raw moist surface is formed, from which a colourless discharge oozes, which when it accumulates forms thin crusts. The attack may be general over the greater portion of the body, or it may be entirely localized to a limb or other part. It usually lasts for a few weeks and then passes off, leaving, however, 4 liability to recurrence. Such attacks may occur as a result of digestive derangements, or in persons of rheumatic oF gouty habit, and they tend to appear at certain seasons, such as springtime. They are usually best treated by attention to the general health, and by a simple and carefully-regulated diet, while locally some soothing application, such as a weak lead lotion or a dusting powder of zinc, starch, or boracic acid, will be found of benefit. Chronic eczema shows itself in various forms, > which we note the most common. In eczema rubrum the disease affects a part, very often a limb, as a severe form of inflammation, with great redness, and weeping or oozing

of serous matter from the raw surface. It gives rise to

great irritation and pain, and may cause considerable

disturbance of the general health. It may last for years, with intervals of partial recovery, but easily recurring.

The skin of the limb becomes in time thickened and the

limb itself much swollen. In dry eczema the skin, though

irritable, remains dry and scaly. In pustular eczema, or ecema impetiginodes, in addition to the cutaneous inflam- mation there occur pustules which break and the purulent matter forms yellow crusts upon the skin. This form is very common on the heads of young children during the period of dentition. The treat- ment of chronic eczema depends in great measure upon the forni it assumes. Where there exists much irritation, soothing lotions or applications similar to those required for acute eczema are necessary ; but where irritation has subsided, stimulating ointments, such as those of zinc or white precipitate, are often of service. Constitutional remedies, such as iron, arsenic, &c., are an important and often essential part of successful treatment. . (4) Vesicular.—Herpes is an inflammation of the true skin, attended with the formation of isolated or grouped vesicles of various sizes upon a reddened base. They contain a clear fluid, and either rupture or dry up. Two well-marked varieties of herpes are frequently met with. (a) In herpes labialis et nasalis the eruption occurs about the lips and nose. It is seen in cases of certain acute febrile ailments, such as fevers, inflammation of the lungs, or even in a severe cold. It soon passes off. (%) In herpes zoster, zona, or shingles, the eruption occurs in the course of one or more cutaneous nerves, often on one side of the trunk, but it may be on the face, limbs, or other parts. It may occur at any age, but is probably more frequently met with in elderly people. The appearance of the eruption is usually preceded by severe stinging neuralgic pains for several days, and, not only during the continuance of the herpetic spots, but long after they have dried up and disappeared, these pains sometimes continue and give rise to great suffering. The disease seldom recurs. The most that can be done for its relief is to protect the parts with cotton wool or some dusting powder, while the pain may be allayed by opiates or bromide of potassium. Quinine internally is often of service.

Pemphigus consists in large blebs upon a red base. They contain clear or yellowish fluid. This disease appears to show itself most frequently on the

bodies and limbs of unhealthy or neglected children. The blebs give rise to much irritation, and when they burst leave raw ulcerated surfaces which are slow of healing. One variety of this malady (pemphigus foliaceus) affects the entire skin of the body, from which there exudes a constant discharge. This form is apt sooner or later to prove fatal

from its exhausting effects. The treatment is mainly con-

stitutional,—by good nourishment, iron, &ec.

(5) Pustular.—Impetigo, consisting of small pustules situated upon a reddened base, mostly occurs in children. There appears to be a contagious form of this malady. Ecthyma consists of large pustules of similar character on the body and limbs. The treatment of these ailments requires special attention to nutrition, since they usually occur In low states of health.

(6) Squamous or Scaly.—Psoriasis, an inflammatory affection of the true skin, attended with the formation of red spots or patches, which are covered with white silvery scales, may affect any portion of the surface of the body, but is most common about the elbows and knees, and on the head. There is as a rule comparatively little irrita- pe except at the outset, but there is an extensive shed-

Ing of the scales from the affected spots. Varieties of

this disease are described in relation to the size and dis- tribution of the patches. The causes of psoriasis have given rise to much discussion, and, while some authorities regard its appearance as in many instances connected with some constitutional morbid state, such as gout, rheumatism, &c., the majority deny any such relationship, and mention hereditary influence as the only recognizable cause, although it must be admitted that even this evidence is wanting in a large number of cases. The disease appears to be consistent with continued good health. It is usually obstinate to treat, and may, with intervals of comparative immunity, last a lifetime.

The remedies most serviceable are arsenic internally and the application externally of preparations of tar. Recently the employment of chrysophanic acid as an ointment or in solution has been resorted to with considerable success.

Pityriasis, a superficial inflammation of the skin, with the formation of minute branny scales, occurs most com- monly on the head, and is of chronic duration. The remedies most useful are alkaline lotions and tar prepara- tions. A variety of this disease (pityriasis rubra) affects the whole body, and is most intractable to treatment.

IV. Nevroszs (Nervous A fections).—Various disorders of nutrition of the skin occur in persons suffering from organic nervous diseases, such as bedsores, atrophic changes, eruptions, &c., but these belong to the symptoins of the several diseases with which they are associated. The most common of the neuroses of the skin is probably pruritus, which is an ailment characterized by intense itching of the surface of the body. It may occur in con- nexion with other morbid conditions, such as jaundice, diabetes, digestive disorders, &c., or as the result of the irritation produced by lice or other skin parasites. The most serious form is pruritus senilis, which affects old persons, and is often a cause of great suffering, depriving the patient of sleep (the malady being specially trouble- some during the night). In such cases it is probably due to atrophic changes in the skin. No eruption is visible, except such marks as are produced by scratching. The treatment consists in the removal of any apparent cause, and measures to strengthen the system, such as the use of quinine, iron, &c. Soothing lotions composed of solutions of alkalis conjoined with chloral, opium, hydrocyanic acid, &c., may be applied to the affected skin at bedtime.

V. Parasitic Diszases.—(1) Animal.—The following are the chief animal parasitic diseases. Phthiriasis is produced by the presence of lice (pediculi), of which there are three varieties, infesting respectively the head, body, and pubis. The cause is in most instances uncleanliness, but occasion- ally in the aged, and in persons suffering from chronic diseases, there appears to be a liability to the development of pediculi, notwithstanding every care to prevent it. The irritation produced by the parasite and the scratching thus occasioned may give rise to abrasions of the skin and eczematous

conditions. The treatment consists in thorough cleansing of the parts and the use of parasiticides, such as red or white precipitate, carbolic lotions (one in twenty), or a decoction or ointment of stavesacre. Where clothing is infested it should be destroyed or subjected to a strong heat to get rid both of the parasites and their ova. Scabies or itch is a skin affection due to the Acarus scabier (see Mire). The female insects burrow into the upper layers of the skin and deposit their eggs in the tract thus made. Great irritation of the skin is set up, and scratching pro- duces eruptions which aggravate the condition, especially at night. The most frequent sites are the parts between the fingers, or the wrists, but by scratching the disease may be conveyed to any part of the body, and in extreme cases the greater portion of the surface of the trunk and limbs may be involved. In infants the feet and buttocks

are the parts which suffer. The eruption in mild cases has at first the appearance of small raised vesicles with clear fluid, but it may become pustular or eczematous, and extensive excoriations may result. The treatment consists in thorough cleansing of the skin and the inunction of some form of parasiticide,—sulphur ointment being on the whole the best. The application should be discontinued after a few days, otherwise irritation may be produced by its use.

(2) Vegetable parasites consist of fungous growths in the texture of the skin and hair, which are characterized microscopically by minute round bodies or spores often coalesced into clusters or bead-like arrangements, and jointed filaments or mycelium of elongate and branching form. They are readily detected by removing a hair, or scraping a portion of the affected skin, treating it with a strong alkaline solution, and submitting it to microscopic examination, by which the slight differences in form and arrangement of the varieties of the parasite can be easily made out. The common name “tinea ” is applied to these parasitic affections. Tinea tonsurans, or ringworm (para- site Tricophyton tonsurans), is a very common form of parasitic disease. It occurs as a result of contagion in

the heads of children, and begins as circular patches with |

a scaly appearance and red border, which tend to spread. The hair at the part becomes thin and brittle and is easily removed. It is often extremely obstinate to treatment, and numerous agents have been proposed as specifics, not one of which, however, appears to possess infallible virtues. Among the best are oleate of mercury (5 to 10 per cent.) and other mercurial preparations, all which, how- ever, must be used with care, and carbolic or sulphurous acid with glycerin, iodine, cantharides, &c.; but isolation of the patient as far as possible, together with strict medical supervision, are essential for the effectual treat- ment of this disorder. Tinea sycosis, or ringworm atffect- ing the beard, and tinea circinata, or ringworm affecting the body, require to be dealt with in a similar manner. Tinea favosa, or favus (parasite Achorion Schénleinit), is less frequently seen than the preceding. It occurs mostly on the scalp in unhealthy and neglected children, but it may affect the skin in any part of the body. It is characterized by round, yellow, sulphur-coloured, cup-shaped spots or crusts, which, when occurring extensively upon the scalp, have a peculiar mousy odour. It is very destructive of hair growth, and is most difficult to cure. The best treat- ment is removal of the hairs by epilation, and the employ- ment of some of the parasiticides already mentioned, together with attention to the healthy nutrition of the patient. Tinea versicolor, or pityriasis versicolor (parasite Microsporon furfur), is a brown-coloured rash of scaly char- acter occurring mostly in the form of spots or patches on the skin of the trunk, particularly on the front of the chest or between the shoulders, but sometimes also upon the arms and legs. It affects adults in whom the skin- function is not sufficiently attended to, or those who are in ill-health. The parasite affects the epidermic cells, and is readily made out by the microscope, thus enabling the disease to be distinguished from other skin disorders to which it often bears resemblance. It is best treated by the regular washing and brisk friction of the parts, and by the use of some of the applications above referred to. (i GAs) SKINNER, Joun (1721-1807), author of 7’ullochgorum and The Ewie wi the Crookit Horn, was an Episcopalian minister in the parish of Longside, Aberdeenshire. He held this charge for more than sixty-four years. The son of an Aberdeenshire schoolmaster, born at Balfour in 1721, he had been intended for the Presbyterian ministry, but, after passing through Marischal College, Aberdeen, and teaching

for a few years, he took orders in the Episcopal Church, and was appointed to the charge of Longside in 1749, There was a considerable remnant of Episcopacy in Aber- deenshire, but very soon after Skinner joined it it became, in consequence of the Jacobite rebellion in 1745, a much persecuted remnant. The young pastor's church was burnt; his house was plundered ; for some years he had to minister to his congregation by stealth; and in 1753 information was lodged that he had broken the law by officiating to more than four persons besides his own family, and he suffered imprisonment for six months, After 1760 the penal laws were less strictly enforced, but throughout the century the lot of the Episcopalian ministers in Scotland was far from comfortable, and only the humblest provisions for church services were tolerated, Skinner's robust nature, however, made light of all priva- tions; and his kindliness, humour, conviviality, ready wit, and generous force of character made him personally a favourite far and near outside the bounds of his own denomination. In 1789 he was presented with the freedom of the town in whose jail he had been a prisoner for conscience sake. It is by his songs, limited in quantity, but some of them of the very highest quality, that Skinner is generally known. An interesting corte- spondence took place between him and Burns, who con- sidered T'ullochgorum "the best Scotch song Scotland ever saw," and addressed the reverend poet with touching respect. His best songs had stolen into print ; a col- lection was not published till 1809, under the title of Amusements of Leisure Hours. Such literally they seem to have been. Throughout his life he was a vigorous student, and in spite of his scanty resources established a more than local reputation for scholarship, while, according to his latest biographer, he had a paramount influence on the doctrinal views of his clerical brethren in the north. He published in 1788 an Ecclesiastical History of Scot- land, in the form of letters; and other works in the same form, which best suited his easy unaffected strength, were collected and published by his son after his death (June 1807), having previously had a wide circulation in manu- script. His prose style has the happiness, ease, and lucid force of a natural master of language. The reasoning of his answer to Beattie's Hssay on Truth is an evidence of his robust clearness of intellect.

A minutely aeeurate biography of Skinner, in eonnexion with the history of Episeopacy in the north of Scotland, was published by the Rev. W. Walker in 1883. An edition of his songs and poems by Mr H. G. Reid, 1859, eontains an interesting memolr.

SKIPTON, an ancient market-town in the West Riding of Yorkshire, is situated on the river Aire, on the Leeds and Liverpool Canal, and on the Midland Railway, 9 miles north-west of Keighley and 15 south-east of Settle. It 1 substantially built of stone. The strong castle built by Robert de Romille in the time of the Conqueror was partly demolished in 1649, but was restored by the countess of Pembroke. Of the ancient building of De Romille all that now remains is the western doorway of the immer castle. In the castle grounds are the ruins of the ancient parish church of St John. The church of the Holy Trinity, in the Decorated Gothic, was also partly demolished during the Civil War, but was restored by the countess of Pembroke, and again underwent renovation in 1854. The free grammar school was founded in 1548 by William Ermysted, a canon of St Paul's, London. The town has a considerable general trade. The population of the urban sanitary district (area 4245 acres) in 1871 was 6078 and in 1881 it was 9091.

Skipton was the capital of the aneient distriet of Craven. At the Norman aeeession it beeame part of the possessions of Ear: Edwin, and was granted to Robert de Romille, who built thc castle about the end of the reign of William. Subsequently it went to

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-Rdward IJ. bestowed it on Piers de Gaveston.

the Albemarle family, but was again vested in the crown, and In 1811 it came

into the possession of the Cliffords. The castle was taken by the

Parliamentary forces in 1645 and demolished in 1649.

SKITTLES. This English game, which somewhat resembles American bowls (see vol. iv. p. 180), was formerly known as Kails (Fr. quilles), and first came into vogue in England in the 14th century. Nine large oval-headed pins with flat bottoms, and made of a hard wood,

are set up on a wooden frame, three pins square on each

side. An angle and not an even side of the said square is presented towards the player, who stands at the distance of 91 feet. ‘There may be one or two players a-side; and the object of each side is to knock down, or “floor,” the

greatest number of pins in the least possible number of

throws, which are generally two or three, though they may extend to five, according to agreement. The roundish ball used for throwing weighs from 8 to 141b, and in fair playing only one step forward is allowed in delivery. A firm grasp should be taken of the ball in a slightly slanting position, so as to strike the fore pin on the shoulder and then reach the back ones. A player who clears the board in two throws may be considered a good all-round one. In different localities there are minor variations in playing

— the game.

SKUA,! the name for a long while given to certain of the Laridx (see GULL, vol. xi. p. 274), which sufficiently differ in structure, appearance, and habits to justify their separation as a distinct genus, Stercorarius (Lestris of some writers), or even Subfamily, Stercorarune. Swift of flight, powerfully armed, but above all endowed with extraordinary courage, they pursue their weaker cousins, making the latter disgorge their already-swallowed prey, which is nimbly caught before it reaches the water; and this habit, often observed by sailors and fishermen, has

_ made these predatory and parasitic birds locally known as

“Teasers,” ‘‘Boatswains,”? and, from a misconception of their intent, ‘“‘Dunghunters.” On land, however, whither they resort to breed, they seek

food of their own taking, whether small mammals, little birds, insects, or berries ; but even here their uncommon courage is exhibited, and they will defend their homes and offspring with the utmost spirit against any intruder, repeatedly shooting down on man or dog that invades their haunts, while every bird

almost, from an Eagle downwards, is repelled by buffets or something worse.

The largest species known is the Stercorarius catarrhactes of ornith- ologists —the ‘‘Skooi” or “ Bonxie” of the Shetlanders, a bird in size equalling a Herring-Gull, Larus argentatus. The sexes do not differ appreciably in colour, which is of a dark brown, somewhat lighter beneath ; but the primarics have at the base a patch of white, visible even when the wings are closed, and forming, when they are spread, a conspicuous band. The bill and feet are black. This is a species of comparatively limited range, breeding only in some two or three localitics in the Shetlands, about halfa dozen in the Firoes,3 and hardly more in Iceland. Out of the breeding-season it shows itself in most parts of the North Atlantic, but never seems

: Thus written by Hoier (circa 1604) as that of a Feroese bird (hodie Skiir) an example of which he sent to Clusius (Mzotie. Auctarium, p. 367). The word being thence copied by Willughby has been generally adopted by English authors, and applied by them to all the congeners of the species to which it was originally peculiar.

This hame in seamen’s ornithology applies to several other kinds of birds, and, though perhaps first given to those of this group, is nowadays most commonly used for the species of TROPIC-BIRD (q.v.), the projecting middle feathers of the tail in each kind being generally Jikened to the marlinespike that is identified with the eel position ; but perhaps the authoritative character assumed

y oth bird and officer originally suggested the name. 1a “ long been subjected to persecution in these islands, a reward wae paid for its head. On the other hand, in the Shetlands a fine eS ae for its death, as it was believed to protect the sheep deal = Yet for all this it would long ago have been extirpated the and have ceased to be a British bird in all but name, but for

to stray further south than Gibraltar or Morocco, and it is therefore a matter of much interest to find the Southern Ocean inhabited by a bird—the ‘Port Egmont Hen” of Cook’s Voyages—which so closely resembles the Skua as to have becn for a long while regarded as specifically identical with it, but is now usually recognized as distinct under the name of S. antarcticus. This bird, character- ized by its stont deep bill and want of rufous tint on its lower plumage, has an extensive range, and would seem to exhibit a tendency to further differentiation, since Mr Saunders, in a mono- graph of the group (Proc. Zool. Society, 1876, pp. 317-382), says that it presents three local forms—one occurring from New Zealand to Norfolk Island and past Kerguelen Land to the Cape of Good Hope, another restricted to the Falklands, and the third hitherto only met with near the south-polar ice. On the western coast of South America, making its way into the Straits of Magellan, and passing along the coast so far as Rio Janeiro, is found S. chilensis, distinguished among other characters by the cinnamon tint of its lower plumage. Three other smaller species of the genus are known, and each is more widely distributed than those just men- tioned, but the home of all is in the more northern parts of the earth, though in winter two of them go very far south, and, crossing the equator, shew themselves on the seas that wash the Cape of Good Hope, Australia, New Zealand, and Peru. The first of them is S. pomatorhinus (often incorrectly spelt pomarinus), about the size of a common Gull, Larus canus, and presenting, irrespective of sex, two very distinct phases of plumage, one almost wholly sooty-brown, the other particoloured—dark above and white on the breast, the sides of the neck being of a glossy straw-colour, and the lower part of the neck and the sides of the body barred with brown ; but a singular feature in the adults of this species is that the two median tail-feathers, which are elongated, have their shaft – twisted towards the tip, so that in flight the lower surfaces of their webs are pressed together vertically, giving the bird the appearance of having a disk attached to its tail. Thesccond and third species so closely resemble each other, except in size, that their distinctness was for many years unperceived, and in consequence their noien- clature is an almost bewildering puzzle. Mr Saunders (loc. cit.) thinks that the larger of them,

which is about the size of a Black- headed Gull, should stand as S. crepidatus, and the smaller as S. parasiticus, though the latter name has been generally used for the larger when that is not termed, as it often is, S. richardsoni—a name that correctly applies only to whole-coloured examples, for this species too is dimorphic. Even its proper English name‘ is disputable, but it has been frequently called the Arctic Gull or Arctic Skua, and itis by far the commonest of the genus in Britain, and perhaps throughout the northern hemisphere. It breeds abundantly on many of the Scottish islands, and in most countries lying to the northward. The nest is generally in long heather, and contains two eggs of a dark olive-colour, suffused with still darker brown patches. Birds of either phase of plumage pair indiscriminately, and the young shew by their earliest feathers whether they will prove whole or particoloured ; but in their immature plumage the upper surface is barred with pale reddish- brown. The smallest species, commonly known in English as the Long-tailed or Buffon’s Skua, is not known to exhibit the remark- able dimorphism to which the two preceding are subject. It breeds abundantly in some seasons on the fells of Lapland, its appearance depending chiefly on the presence of lemmings (Lemmus norvegicus), on which it mainly preys. All these tliree species occasionally visit the southern coasts of Europe in large flocks, but their visitations are highly irregular. (A. N.)

SKUNK. The existence of the animal to which this name® is applied was first notified to European naturalists as long ago as 1636, in Gabriel Sagard-Theodat’s Ilistory of Canada, where, in commencing his quaint account of it (p. 748), he describes it as “enfans du diable, que les Hurons appelle Scangaresse, ... une beste fort puante,” &c. This fully shows in what reputa- tion the skunk was then held, a reputation which has lasted to the present time, and has become so notorious that the mere name of skunk is an opprobrious epithet and can hardly be used in polite society.

The skunks, for there are several species of these animals, are members of the Meline or badger-like sec- tion of the family Jfustelide, which contains also the

(Edmonston and Scott of Melby), whose exertions to that effect deserve the praise and recognition of all ornithologists.

4 It is the ‘“‘Fasgadair” of the Hebrides, the ‘‘Shooi” of the Shetlands, and the ‘‘Scouti-allen”’ of the fishermen on the east coast of Scotland.

5 Probably derived from “ Seecawk,” the Cree name for the skunk. Another form given is ‘‘ seganku.”

martens, stoats, otters, &c., and forms the largest family of the Arctoidea or bear-like division of the Land Carni- vora (see the article Mammatia, vol. xv. p. 439-40, where the zoological characters of these groups are given in detail).

The common skunk (Mephitis mephitica) is a native of North America, extending from Hudson’s Bay southwards to Guatemala in Central America. It is a beautiful little animal, about the size of a cat, though of a stouter and heavier build, with rich lustrous black fur, strikingly

varied on the back by a very variably shaped patch or streak of white. Its muzzle is long and pointed, its eyes sharp and bead-like, and its grey or white tail is long and unusually bushy.

The following account of the habits and disposition of the skunk is extracted from Dr C. Hart Merriam’s Mam- mals of the Adirondack Region, New York, 1884 :—

‘‘The skunk preys upon mice, salamanders, frogs, and the eggs of birds that nest on or within reach from the ground. At times he eats carrion, and if he chances to stumble upon a hen’s nest the eggs are liable to suffer ; and once in a while he acquires the evil habit of robbing the hen-roost, but as a rule skunks are not addicted to this vice.

“Of all our native mammals perhaps no one is so universally abused and has so many unpleasant things said about it as the innocent subject of the present biography; and yet no other species is half so valuable to the farmer. Pre-eminently an insect- eater, he destroys more beetles, grasshoppers, and the like than all our other mammals together, and in addition to these he devours vast numbers of mice.

“He does not evince that dread of man that is so manifest in the vast majority of our mammals, and when met during any of his circumam bulations rarely thinks of running away. He is slow in movement and deliberate in action and does not often hurry him- self in whatever he does. His ordinary gait is a measured walk, but when pressed for time he breaks into a low shuffling gallop. It is hard to intimidate a skunk, but when once really frightened he manages to get over the ground at a very fair pace.

“Skunks remain active throughout the greater part of the year in this region, and hibernate only during the severest portion of the winter. They differ from most of our hibernating mammals in that the inactive period is apparently dependent solely on the temperature, while the mere amount of snow has no influence whatever upon their movements.

“Skunks, particularly when young, make very pretty pets, being attractive in appearance, gentle in disposition, intcresting in manners, and cleanly in habits—rare qualities indeed! They are playful, sometimes mischievous, and manifest considerable affection for those who have the care of them. Their flesh is white, tender, and sweet, and is delicious eating.

“Skunks have large families, from six to ten young being com- monly raised each season ; and as arule they all live in the same hole until the following spring.”

SK V—S K V

We now come to the consideration of the remarkable and overpowering odour which has brought the skunk into such evil notoriety, and which is not the mere smel] of the animal itself, as in the case of most other eyjl. smelling mammals, but arises from the much-modified secretion of the anal glands. These glands, although present in all Justelide, are especially developed in the skunks, and are peculiar for being so entirely under the control of the animal that at ordinary times, as Dr Merriam has stated, the animal is enabled to be both cleanly and free from smell. The glands which secrete the odoriferous fluid are modifications of the ordinary anal glands possessed by nearly all Carnivora, but in the skunks they are enormously enlarged, entirely surround the rectum, and are provided with thick muscular gizzard-like coats. The two ducts leading from these glands open

at the tips of two small conical papillae placed just inside the anus, in such a position that by everting the anus the animal can protrude them externally, and with them can guide the direction of the jet of nauseous fluid, which is often propelled by the powerful muscles surrounding the glands to a distance of from 8 to 12 feet.

It is almost needless to state that the old stories about the skunk's smell arising from its urine, and of its splash- ing the fluid about with its tail are both entirely without foundation. The secretion itself is a clear yellowish liquid, with a marvellously penetrating ammoniacal and nauseous smell. So powerful and penetrating is this smell that Dr Merriam says, '"'I have known the scent to become strikingly apparent in every part of a well-closed house, in winter, within five minutes time after a skunk had been killed at a distance of more than a hundred yards," and under favourable conditions it may be distinctly perceived at a distance of more than a mile; instances are also on record of persons having become entirely unconscious after inhaling the smell. On the other hand it is said to act as a potent remedy in cases of asthma and similar diseases, but to most people such a remedy would be almost worse than the disease itself.

The other species of skunk are the following :—

The Long-tailed Skunk (Mephitis macrura), a native of central and southern Mexico, differs from the common species by generally having two white stripes along its sides, and by its muc longer and bushier tail.

The little Striped Skunk (Mephitis putorius), found in the southern United States, and ranging southwards to Yucatan and Guatemala, is much smaller than M. mephitica, and its colouring is of a very peculiar and striking nature, cousisting of four interrupted longi- tudinal white stripes on a black ground, the general aspect of the animal being one of the most beautiful and striking in all this brightly marked family. Its skull also differs to such an extent from that of the common skunk that this species has been separated as a distinct genus under the name of Spilogale, but there is hardly sufficient reason for this.

Finally, the Conepatl (Conepatus maparito), the skunk of tropical America, ranging from Texas to Chili and Patagonia, differs still more from the true

skunks, although in colour it is almost pre- cisely similar to the common species, varying in the same way an to the same remarkable extent in the relative development of the black and white. Its build is heavier than in Mephitis ; its snout and head are more pig-like ; aud its nostrils open downwards an forwards instead of laterally on the sides of the inuzzle. Its skull has many special characters, and its tecth are different in shape and, as a rule, in number also, the first minute premolar of Mephitis being almost invariably absent, so that its dental formula is only i%, ct, pm}, m$=82.

For deseriptions of the anal glands see Wyman, Pr. Bost. Soc., i. p. 110, 1844; Warren, Pr. Bost. Soc., iii, p. 175, 1851; Parker, Ann. Nat., Vv. D. 946, 1871; Chatin, Ann. Sci. Nat., [5], xix. p. 100, 1874; and for general descriptive accounts see Allen, Bull. Harvard Coll., i. p. 178, 1869; Coues, Fur-bearing Animals, PP. 187-260, 1877; Merriam, wé supra. (0.7)

SKVIRA, a district town of European Russia, in the government of Kieff, 77 miles south-west of Kiefi, and 27 miles from the Fastova railway-junction. It is merely a big village, with 14,200 inhabitants, mostly engaged in agrr culture, and has municipal institutions only as the scat of

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the administration of the district. ‘There is a considerable export of grain and cattle from the district, which is fertile and has many villages of from 3000 to 5000 inhabitants. In the 14th century Skvira was a far more important town than now, but the wars destroyed it, so that two centuries later it was left uninhabited ; it was settled anew by Prince Rozinski, and the population slowly reached the ‘number of 1000 by the end of the last century. The town ‘has grown rapidly during the last ninety years.

SKYE, the largest island of the Inner Hebrides, Scot- land, is situated between the mainland of Inverness-shire, within which county it is included, and the group of the Outer Hebrides. It lies between 57° 1’ 12” and 57° 42’ 30” N. lat. and 5° 38’ 50” and 6° 47’ 8” W. long. It is ‘separated from the mainland at its eastern corner by Loch Alsh and Kyle Rhea, the channel at the narrowest point having a breadth of only about 3 furlongs. Southwards Kyle Rhea widens out into the Sound of Sleat, and to the west of Loch Alsh there is a sudden widening of the gap to the extent of

about 9 miles. Along the eastern shore are the islands of Pabba, Scalpa, Raasay, Fladda, and Rona. The Minch separating Lewis and the mainland bounds Skye on the north, and the Little Minch to the north- west separates it from North Uist and Harris. The total area is 411,703 acres or 643 square miles. The coast- line is extremely irregular, abounding in inlets of a great variety of form and size, and in the north and west it is wildly precipitous. The island is naturally divided into three parts, each marked off by its distinctive geology and scenery. By much the largest division lies to the north of a line drawn from Loch Brittle to the head of Loch Sligachan. In this area the rocks are almost wholly varieties of basalt, disposed in nearly horizontal sheets, which give a singular tabular shape to the hills and ter- raced forms to the slopes. To the east of Loch Snizort are the basaltic groups which include the Storr Rock (2360 feet), with its curious columns, and the Quiraing (1774 feet), with its verdant platform in the centre of a range of rugged cliffs. In the north-west are Macleod's Tables (1601 feet) and some smaller summits. The central division may be defined along its southern border by a line drawn from Loch Slapin to Broadford. Its rocks are almost wholly of volcanic origin, and belong mainly to two groups, each characterized by its peculiar mountain 'outlines. The dark gabbros and dolerites form the jagged ridges of the Cuillins, and reach in Scuir-na-Gillean a height of 3167 feet, and in Blaaven 3042 feet. To the north-east of the Cuillins tower in striking contrast the pyramidal Red Mountains, consisting of granite, syenite, quartz-porphyry, and various allied rocks, and reaching in Glamaig a height of 2670 feet. 'The third division in- cludes all the rest of the island, and consists of two toler- ably distinct tracts. 'The more northerly of these lies along the base of the Red Hills, and forms the narrow _ part of Skye between Strathaird and Broadford Bay. It

 composed mainly of Secondary rocks (Lias and Oolite),

through which the eruptive masses of the Red Hills have | been thrust. The more southerly part comprises the dis-

trict of Sleat, and consists of red sandstone (Torridon sand-

stone or Cambrian), rising in Scuir-na-Coinnich to 2401 feet, and of various crystalline schists and quartzites which stretch from Loch Alsh along the Sound of Sleat to the southern point of the island. A considerable tract of

lime- stone lies in the centre of Strath Parish, some of which has been altered by the eruptive rocks into a pure white

marble. There are several inland lochs of considerable size, | the largest being Loch Coruisk, remarkable for the gloomy _ grandeur of its situation in the heart of the Cuillins.

14 On account of the damp climate the land is better adapted for ‘aring sheep and cattle than for tillage. A large number of cattle

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of the West Highland breed are grazed on the moors. The sheep are principally blackfaced, but some Cheviots are also kept. The

greater portion of the inhabitants are croftcrs, who inhabit chiefly miscrable huts with a fireplace in the middle of the floor, the smoke escaping by a hole in the roof. The number of crofts in Skye, according to the report of the Crofters Commission 1884, was 2051. The number of families ejected by decrees from their holdings between 1840 and 1860 was 5012, representing a popula- tion of 25,060, and between 1860 and 1883 1948, representing a population of 9740. Many of the croftcrs support themselves partly by fishing. In the Loch Carron and Skye district the number of boats in 1884 was 950, cmploying 2904 men and boys. From 20,627 in 1821 the population of Skye had increased to 23,082 in 1841, but by 1871 it had decreased to 17,330 and in 1881 to 16,889, of whom 16,099 were Gaelic-speaking. The number of females was 8903 and of males 7986. Portrec, the principal town, has a population of 893.

See, besides the works referred to under Hesripes, Alexander Smith’s Summer

in Skye, 1865; Robert Buchanan’s The Hebrid Isles, 1883; and Report of the Crofters Commission, 1838/4.

SLANDER. See Lrpet.

SLATE is an argillaceous rock of various colours—blue, green, purple, grey, and black—and a peculiar structure by which it readily splits into thin plates or lamine. It is of sedimentary origin, being primarily deposited on ocean floors as fine mud formed by the waste and denuda- tion of pre-existing rocks, and afterwards compressed, hardened, and altered into compact rock. Slate beds occur mainly in the Cambrian, Silurian, and Devonian formations—frequently alternating with bands of grit and limestone, or interstratified with felspathic lava or ashes— and, being tilted up from their original horizontal or nearly horizontal position, stretch across wide districts in a series of undulations, which rise to the surface in crests, or dip into troughs underground and form angles of every inclina- tion with the horizon.!

Slate rock splits along cleavage planes which are dis- tinct from and independent of original stratification. These planes are, as a rule, vertical or highly inclined, and intersect the lines of bedding at various angles, but some- times coincide with them. The strike of cleavage is generally parallel with that of the slate beds, and a uni- form direction is often maintained over wide areas, as in North Wales, where it is nearly north-north-east and south- south-west, while in Shropshire it is north-east and south- west, and in Pembrokeshire north-by-west and south-by-east. This peculiar cleavage structure is believed to be the result of a combination of intense forces, chiefly lateral pressure acting at right angles to the planes of cleavage.

Contraction, compression, shearing, and other powerful forces have caused great disturbances in slate beds, since they were first thrown down as fine sediment, and the results are seen in the foldings, contortions, fissures, rents, and dislocations that now exist. The fissures often follow well-defined courses and form divisional planes termed joints,—some running parallel with the strike and called strike joints, otlers running in the direction of the dip and called dip joints. Dykes of greenstone and other

1 The following table shows the older scdimentary formations in which slate beds mainly occur, in the order of superposition :— Primary or Paleozoic Rocks. Permian. Magnesian limestone, marls, sandstones, &c. Carboniferous. Coal measures, limestone, slate, &c. Devonian. Old red sandstone, slates, &c. Ludlow group. Wenlock. Upper Llandovery. (Lower

Llandovery. Caradoc and Bala. Llandeilo, Arenig, Tremadoc. Lingula flags. Menevian beds. Cambrian. Cambrian grits, conglomerates, and slates. Primitive crystalline rocks, Gneiss, schists, &c.

Upper.

| Silurian, 1

(

Lower,

volcanic matter, and also veins of quartz, intersect the beds, and the surfaces of rents are frequently baked by heat ejected from the interior. Faults also occur, and cause displacements of the beds by upheaval or down- throw of one or other side of a rent.

Several varieties of clay slate are met with, and are char- acterized by the mineral that chiefly prevails. The colour —yvarying shades of blue, green, and purple being the most common—depends mainly on the presence of iron and the form in which it exists. The common roofing slate of com- merce is generally fine-grained, and combines great strength and durability with moderate weight. It is also very dense, 1 cubic foot weighing over 170 hb, while according to Mr Wilkinson it takes on an average 20,000 ib to crush 1 cubic inch.

Certain varieties of slate, however, are soft and perish- able, particularly the black carbonaceous kinds. Cubes of iron pyrites frequently occur in slate rock, and are generally deleterious owing to their tendency to decompose and fall out, but this is not always the case, as some of the most durable slates are sprinkled with pyrites without detriment.

The following percentage analysis of an average sample of Welsh roofing slate is given by Prof. Hull :!—

ISHb\2 onpepmoongoaopoDnence 60°50 | Magnesia…….....1s+0+ 2°20 Abe otey gyaqopecacandooaas NOHO || OES Gonnsacodsoucoconsode 3°18 Iron (protoxide)..... GPCR) || SiOSks, .coseonsnsonansscnpnoer 2°20 EVING Mi racesesaee oaeartunace WALD, || VAIS cchonassenoncosnco0 3°30

Slate has been used for roofing during many centuries, and it is said that some of the old castles of North Wales—such as Carnarvon and Conway—were covered with this material And no doubt the better class of houses, situated in the neighbourhood of slate beds, would be roofed with slates obtained by rough surface digging, or from blocks exposed by mountain streams and split by the action of the weather, long before regular quarrying operations commenced. The Delabole quarries of Cornwall had acquired considerable importance as far back as the 16th century, and some of the Welsh slate quarries are very old, as are those of Angers in France. But the slate industry belongs mainly to the present century and latter part of the 18th; and since the open- ing up of the country by sea and land communications the progress and development of slate quarries have been great and rapid. The largest and most valuable quarries of North Wales are worked in the Cambrian and Lower Silurian beds, those of Llanberis and Penrhyn being worked in the former, and the Festiniog quarries in the latter. Important quarries are worked in Cumberland (Lower Silurian), Westmoreland, and Lancashire (Upper Silurian), and also in Devon and Cornwall (Devonian and Carboni- ferous), the lake districts being specially noted for their rich green slates. Some of the western and midland districts of Scotland—mainly Argyleshire, Dumbartonshire, and Perthshire—produce very strong and durable slates (Lower Silurian and Cambrian), the largest and most important quarries being at Ballachulish in Argyllshire, where 15,000 tons are annually made. The Scotch slates are chiefly blue in colour, but thin beds of green are found in some of the central districts.

Slate is now almost universally used for roofing houses and buildings of every description, and for such purposes it is unequalled, the better sorts possessing all the qualities necessary for protection against wind, rain, and storm. The finer varieties are made into writing slates, and in districts where cross cleavage exists slate pencils are made. Slabs are also manufactured,

and, being readily cut, planed, dressed, and enamelled, are used for chimney pieces, billiard tables, wall linings, cisterns, paving, tomb-

1 Building and Ornamental Stones of Great Britain and Foreign Countries, 1872.

stones, ridge rolls, and various other architectural and industrial purposes.

Slate rocks are quarried both above ground and below ground according as they lie near to or distant from the surface. When ther are near the surface, and their dip corresponds with the slope of the ground, they are in the most favourable position, and are worked in terraces or galleries formed along the strike of the beds and having a height of about 50 feet. The galleries are generally carried on in sections of 10 yards, worked across the beds, and may rise to any height or be sunk below the surrounding level by excavations. When the rock is much removed from the surface, or inconveniently situated for open workings, it is quarried in under ground chambers reached by levels driven through the intervening mass and across or along the beds. Or it may be necessary to sink shafts as in coal-pits before the rock is arrived at, but the cost of doing so forms a serious drawback. Inclines, waggons, tramways, and other machinery are employed in slate quarries as in other quarries, to suit the special circumstances and position of the opera. tions, and necd not be detailed.

The sections of a gallery are generally worked by crews of six men, who undertake to perform all operations of quarrying, split. ting, and dressing at fixed rates. The rock is bored by jumper drills directed and turned by the hand and driven by hammers, When the bore is short and of small diameter one man can do the work, holding the jumper with one hand and using the hammer with the other. But when a large mass of rock has to be thrown down a bore 4 to 6 feet deep and a diameter of 2 to 8 inchesis required and three men are employed,—one to guide and turn the jumper and two to drive it with heavy hammers. Bores of inter- mediate size are made by two men, one holding and the other driving the drill. When the boring has to be done on a steep face a staging is fixed to the rock or suspended from the top by means of ropes. The explosive generally used is rock-blasting powder,

being the most suitable for the heaving force required to throw out or detach masses of rock without much splintering, which would destroy the blocks for slate making. Advantage 1s taken of the natural euts or joints in blasting, as the rock is readily thrown or worked off these. From the mass thrown out by the blast, or loosened so as readily to come away by the usc of crowbars, the men carefully sclect and sort all good blocks and send them in waggons to the slate huts to be split and dresscd into slates. Two men are employed at-this operation—one splitting and the other dressing, performing their work in a sitting posture. The splitter placesa block on end between his knees, and with chisel and mallet splits it into as many plates as possible of the usual thickness for roofing purposes—namely, quarter of an inch more or less acconae to the size and strength required. These plates are then place horizontally by the dresser on a vertical iron " stand," and cut with a sharp knife into slates of various sizes suitable for the market (from 30 in. x 16 in, to 10 in. x 6 in.). Certain sizes are designated by names from the peerage, such as princesses (24 in. x 14 ins.), duchesses (24×12), marchionesses (22×11), countesses (20 × 10), viscountesses (18×9), ladies (16×10), &c. In every slate rock there is a large amount of waste or bad rock, which is thrown away as rubbish—the proportion of good to bad varying from one in twelve touex thirty. Attempts are being made at present to have-+t*is waste material manufactured into some article of indus- trial value ; and, as it consists ®iicfly of silica and alumina, these attempts should prove successful.

The slate industry of the British Isles is now of very considerable importance, that of North Wales in particular being immense. According to the census of 1881 the number of slate quarriers m the United Kingdom «mounted to 15,765, while over half a million tons of slates and slabs are produced annually, the value of which may be estimated at or over £1,250,000. The number of slates exported in 1884 exceeded 49 millions, the declared value being £251,824, of which over 35 millions went to Germany, valued at £163,321, over 53 millions to Australasia, valued at £37,474, and over 3 millions to Denmark, valued at £34,304.

Good slate beds are also worked in the south of Ireland, pat ticularly in the counties of Wicklow, Tipperary, Cork, and Kerry (Lower Silurian, Devonian, and Carboniferous). On the continent of Europe slate rock is

worked in Devonian and other formations —in France (Lower Silurian and Devonian), Belgium, Sweden, Norway, Germany, Austria, and Italy (Oolitic). In North America immense slate beds extend from Newfoundland westwards to the Great Lakes and southwestwards to Arkansas (U.8.); and slate quarries are successfully worked in Newfoundland, Canada, and 10 the States of Maine, Vermont, Massachusetts, New York, Penu- sylvania, &e. Writing and roofing slates and slabs of every variety of size and eolour are manufactured in these; but none of the quarries have hitherto reached the immense developments of the principal ones in North Wales, and yet, with characteristic a prisc, roofing slates have been within recent years imported to Grea Britain from Newfoundland and the United States. (D. C:)

SLAUGHTER HOUSE. See ABaTTorr.

PbAVY ERY

T appears to be true that, in the words of Dunoyer, the iI economic régime of every society which has recently become sedentary is founded on the slavery of the industrial professions. In the hunter period the savage

‘warrior does not enslave his vanquished enemy, but slays

him; the women of a conquered tribe he may, however, carry off and appropriate as wives or as servants, for in this period domestic labour falls almost altogether on their sex. In the pastoral stage slaves will be captured only to

be sold, with the exception of a few who may be required for the care of flocks or the small amount of cultivation

which is then undertaken. It is in proportion as a sedentary life prevails, and agricultural exploitation is practised on a larger scale, whilst warlike habits continue to exist, that the labour of slaves is increasingly introduced to

provide food for the master, and at the same time save him from irksome toil. Of this stage in the social move-

)ment slavery seems to have been, as we have said, a

universal and inevitable accompaniment.

But wherever theocratic organizations established them- selves slavery in the ordinary sense did not become a vital element in the social system. The members of the lowest class were not in a state of individual subjection : the entire caste to which they belonged was collectively subject. It is in the communities in which the military order obtained an ascendency over the sacerdotal, and which were directly organized for war, that slavery (as the word is commonly understood) had its really natural and appropriate place. And, as war performed an indis- pensable function in human history, our just horror for some aspects of slavery must not prevent us from recogniz- ing that institution as a necessary step in social progress. It is not merely that in its first establishment slavery was an immense advance by substituting for the immolation of captives, often accompanied by cannibalism, their permanent occupation in labour for the benefit of the victor. This advantage, recalled by an old though erroneous! etymology, is generally acknowledged. But it is not so well understood that slavery discharged important offices in the later social evolution—first, by enabling

military action to prevail with the degree of intensity and

continuity requisite for the system of incorporation by conquest which was its final destination; and, secondly, by forcing the captives, who with their descendants came to form the majority of the population in the conquering community, to an industrial life, in spite of the antipathy to regular and sustained labour which is deeply rooted

in human nature, especially in the earlier stages of the

social movement, when insouciance is so common a trait, and irresponsibility is hailed as a welcome relief. With respect to the latter consideration, it is enough to say that nowhere has productive industry developed itself in the form of voluntary effort; in every country of which

we have any knowledge it was imposed by the strong upon the weak, and was wrought into the habits of the

4 Servs is not cognate with servare, as has often been sup- posed; it is really related to the Homeric efpepos and the verb €pw, With which the Latin sero is to be connected. It may be here mentioned that slave was originally a national name; it meant a mau of Slavonic race captured and made a bondman to the Germans. ; From the Euxine to the Adriatic, in the state of captives or sub- Jects, .. they [the Slavonians] overspread the land, and the national Re of the Slaves has been degraded by chance or malice from fae of glory to that of servitude" (Gibbon, Decline and

al, ch. l¥.). The historian alludes to the derivation of the national

see slava, glory. See Skeat's Htym. Dict., s.v.; sce also

people only by the stern discipline of constraint. From the former point of view the freeman, then essentially a warrior, and the slave were mutual auxiliaries, simulta- neously exercising different and complementary functions —each necessary to the maintenance and furthering the activity of the other, and thus co-operating, without competition or conflict, towards a common public end. In modern slavery, on the other hand, where the occu- pations of both parties were industrial, the existence of a servile class, instead of rendering the citizens dis- posable for social service in a different field, only guaranteed for some of them the possibility of self- indulgent ease, whilst it imposed on others the necessity of indigent idleness.

It was in the Roman state that military action—in Greece often purposeless and, except in the resistance to Persia, on the whole fruitless—worked out the social mission which formed its true justification. Hence at Rome slavery also most properly found its place, so long as that mission was in progress of accomplishment. As soon as the march of conquest had reached its natural limit, slavery began to be modified ; and when the empire was divided into the several states which had grown up under it, and the system of defence characteristic of the Middle Ages was substituted for the aggressive system of antiquity, slavery gradually disappeared, and was replaced by serfdom, which again, with the rise of modern industrial life, gave way to personal freedom.

We have so far dealt with the political results of ancient slavery, and have found it to have been in certain respects not only useful but indispensable. When we consider its moral effects, whilst endeavouring to the utmost to avoid exaggeration, we must yet pronounce its influence to have been profoundly detrimental. In its action on the slave it marred in a great measure the happy effects of habitual industry by preventing the development of the sense of human dignity which lies at the foundation of morals, whilst the culture of his ideas and sentiments was in most cases entirely neglected, and the spontaneous education arising from the normal family relations was too often altogether denied him. On the morality of the masters— whether personal, domestic, or social—the effects of the institution were disastrous. The habit of absolute rule, always dangerous to our nature, was peculiarly corrupting wh it penetrated every department of daily life, and wh4n no external interference checked individual caprice in its action on the feelings and fortunes of inferiors. It tended to destroy the power of self-command, and exposed the master to the baneful influences of flattery. As regards domestic morality, the system offered constant facilities for libertinism, and tended to subvert domestic peace by coni- promising the just dignity and ruining the happiness of the wife. The sons of the family were familiarized with vice, and the general tone of feeling of the younger generation was lowered by their intimate association with a despised and degraded class. On social morality, properly so called, the habits of cruelty, or at least of harshness, engendered by the relation, had a powerful reaction. Hume observes on “the little humanity com- monly observed in persons accustomed from their infancy to exercise so great authority over their fellow-creatures and to trample upon human nature. Nor,” he adds, “can a more probable reason be assigned for the severe, I might say, barbarous manners of ancient times than the practice of domestic slavery, by which every man of rank was rendered a petty tyrant, and educated amidst the

XXII. — 17

GREECE.

Heroic times.

Historic period.

flattery, submission, and low debasement of his slaves.” These deplorable results were, of course, not universally produced ; there were admirable exceptions both amongst masters and amongst slaves—instances of benevolent pro- tection on the one side and of unselfish devotion on the other, which did honour to human nature; but the evil effects without doubt greatly preponderated.

We proceed to a closer study of the institution of slavery as it existed in the Greek and Roman societies respectively.

We find it already fully established in the Homeric period. The prisoners taken in war are retained as slaves, or sold (JU., xxiv. 752) or held at- ransom (Ji., vi. 427) by the captor. Sometimes the men of a conquered town or district are slain and the women carricd off (Od., ix. 40). Not unfrequently free persons were kidnapped by pirates and sold in other regions, like Eumzus in the Odyssey. The slave might thus be by birth of equal rank with his master, who knew that the same fate might befall himself or some of the mem- bers of his family. ‘he institution does not present itself in a very harsh form in Homer, especially if we consider (as Grote suggests) that “all classes were much on a level in taste, sentiment, and instruction.” The male slaves were employed in the tillage of the land and the tending of cattle, and the females in domestic work and household manufactures. The principal slaves often enjoyed the confidence of their masters and had important duties entrusted to them ; and, after lengthened and meritorious service, were put in possession of a house and property of their own (Od., xiv. 64). Grote’s idea that the women slaves were in a more pitiable con- dition than the males does not seem justified, except perhaps in the case of the aletrides, who turned the household mills which ground the flour consumed in the family, and who were sometimes overworked by unfeeling masters (Od., xx. 110-119). Part of the agricultural work was sometimes done by poor hired freemen (thetes), who are spoken of as a wretched class (Od., xi. 490), and were perhaps employcd almost exclusively by the smaller land- holders. Having no powerful protector to whom they could look up, and depending on casual jobs, they were

probably in a less desirable position than the average slave. Hoiner conceives the lot of the latter as a bitter one (Od., viii. 528; 27., xix. 302); but it must be remembered that the clement of change from a former elevated position usually enters into his descriptions. He marks in a celebrated couplet his sense of the moral deterioration com- monly wrought by the condition of slavery (Od., xvii. 322).

It is, however, in historic Greece, where we have ample docu- mentary information, that it is most important to study the system of slavery,—and especially at Athens, where the principal work of Greek civilization found its accomplishment. The case of Sparta, in some respects peculiar, must be separately considered.

The sources of slavery in Grecce were :—1l. Birth, the condition being hereditary. This was not an abundant source, women slaves being less numerous than men, and wise masters making the union of the sexes rather a reward of good service than a matter of specu- lation (Xen., @con., ix. 5). It was in general cheaper to buy a slave than to rear one to the age of labour. 2. Sale of children by their free parents, which was tolerated, except in Attica, or their exposure, which was permitted, except at Thebes. The conse- quence of the latter was sometimes to subject them to a servitude worse than death, as is seen in the plays of Plautus and Terence, which, as is well known, depict Greek, not Roman, manners. Freemen, through indigence, sometimes sold themselves, and at Athens, up to the time of Solon, an insolvent debtor became the slave of his creditor. 38. Capture in war. Not only Asiatics and Thracians thus became slaves, but in the many wars between Grecian states, continental or colonial, Greeks were reduced to slavery by men of their own race. Thus Spartans were slaves at Tegea, and Gelon sold out of their country the commonalty of Hyblean Megara. At Platea, at Scione, in Melos, the men were massacred or deported, the women enslaved. Athenians were sold at Samos, and in Sicily after the failure of the expedition. In the struggle of parties at Corcyra, each faction, when triumphant, con- demned the other to massacre or slavery. Callicratidas pronounced against the enslavement of Greeks by Greeks, but violated his own principle, to which, however, Epaminondas and Pelopidas appear to have been faithful. Philip sold his Olynthian captives, and, after Thebes was taken by Alexander, 30,000 women and children are said to

have been sold. 4. Piracy and kidnapping. The descents of pirates on the coasts were a perpetual source of danger, the pirate was a gainer either by the sale or by the redemption of his captives. If ransomed, the victim became by Athenian law the slave of his redeemer till he paid in money or labour the price which had been given for him. Kidnappers (andrapodistx#) carried off children even in cities, and reared them as slaves. Whether from hostile forays or from piracy, any Greek was exposed to the risk of enslavement ; it was a sword of Damocles suspended over all heads. 5. Commerce. Besides the sale of slaves which took place as a result of the capture of cities or other military opcrations,

there was a systematic slave trade. Syria, Pontus, Lydia, Galat and above all Thrace were sources of supply. Egypt and Eth also furnished a certain number, and Italy afew. Of foreigng the Asiatics bore the greatest value, as most amenable to ¢o mand, and most versed in the arts of luxurious refinement. 8 Greeks were highest of all in estecm, and they were much so for foreign sale. Greece proper and Jonia supplicd the pet Eastern princes with courtesans and female musicians and dance; Athens was an important slave-market, and the state profited a tax on the sales; but the principal marts were those of Cyprug Samos, Ephesus, and especially Chios. –

The slaves were employed either in domestic service—as hou hold managers, attendants, or personal escorts—or in work of oth kinds, agricultural or urban. In early Attica, and even down ; the time of Pericles, the landowners lived in the country. 4 Peloponnesian War introduced a change ; and after that time the proprietors ‘resided at Athens, and the cultivation was in the hand: of slaves. In manufactures and commerce, also, servile gradually displaced free labour. Spcculators either directly employed slaves as artisans or commercial and banking agents, or hircd them ont, sometimes for work in mines or factorics, sometimes for service i private houses, as cooks, flute-players, &c., or for viler uses, Then were also public slaves; of these some belonged to temples, to which they were presented as offerings, amongst them being the courtesans who actcd as hterodules at Corinth and at Eryx in Sicily; others were appropriated to the service of the magistrates or to public works ; there were at Athens 1200 Scythian archers

for the police of the city; slaves served, too, in the flects, and were employed in the armics, commonly as workmen, and exceptionally as soldiers.

The number of slaves in Greece, or even at Athens, can scarcely Ni be determined with any tolerable approach to certainty. Itis stated by Atheneus (vi. 20), on the authority of Ctesicles, that the census of Demetrius Phalereus gave for Athens 21,000 citizens, 10,000 metics (resident foreigners), and 400,000 slaves. It is also stated by the same author that Corinth had possessed 460,000 slaves and Aigina 470,000. Hume, in his Hssay “On the Pop. lousness of Ancient Nations,” maintained that the assertion of Atheneus respecting Athens is quite incredible, —that the number of Athenian slaves “is at least augmented by a whole cipher, and ought not to be regarded as more than 40,000.” Boeckh and Letronne have since made the question the subject of fresh studies. The former has fixed the number of Attic slaves at about 365,000, the latter at 100,000 or 120,000. M. Wallon has revised the labours of these scholars, and adduced further considerations of his own.! He estimates the number of slaves employed in all Attica in domestic service at 40,000; in agriculture at 35,000; m the mines at 10,000; in manufactures and commerce at 90,000. To these must be added, for old people and children under twelve ycars of age, 6000 and 20,000 respectively, and also the public slaves, of whom, as we have said, 1200 were Scythian archers. He thus arrives at the conclusion that the servile population of Attica was comprised between the limits of 188,000 and 203,000 souls, the free population being about 67,000, and the metics amount: ing to 40,000. The slaves thus bore to the free native population the ratio of 8 to 1. The numbers given by Athenzeus for Corinth and Aigina, though accepted by Boeckh, appear to be excessive, and are rejected by Chpaion and by M. Wallon; the true numbers were no doubt large, bit we have no means of determining them even approximately. Next after these citics in the magnitude of their slave population came, on the mainland, Megara, and, amongst the insular states, Chios and Rhodes. Miletus, Phocea, Tarentum, Sybaris, and Cyrene also had numerous bodies of slaves. ; The condition of slaves at Athens was not in general a wretehed Co) one. Demosthenes (Jn Mid., p. 580) says that, if the barbarians tio from whom the slaves were bought were informed of the mild treat- ment they received, they would entertain a great estcem for the Athenians. Plautus in

more than one place thinks it necessary 0 explain to the spectators of his plays that slaves at Athens enjoyed such privileges, and even licence, as must be surprising to a Roman audience. ‘The slave was introduced with certain customary rites into bis position in the family; he was in practice, though not by law, permitted to accumulate a private fund of his own; his marriage was also recognized by custom; though in gener excluded from sacred ceremonies and public sacrifices, slaves were admissible to religious associations of a private kind; there were some popular festivals in which they were allowed to participate | they had even special ones for themselves both at Athens and in other Greek centres. Their remains were deposited in the family tomb of their master, who sometimes erected monuments In testi- mony of his affection and regret. They often lived on terms 0 intimacy either with the head of the house or its younger members; but it is to be feared that too often this intimacy was founded, not eee ee ee ee

1 Dr W. Richter (Die Sklaverei im Griechischen Altertume, 1886) maintains the eorrectness of the statement in Athenzeus.

on mutual respeet, as in the heroic example of Ulysses and Eumens, put on insolent self-assertion on the one side and a spirit of unworthy compliance ou the other, the latter having its raison détre in degrading services rendered by the slave. Aristophanes and Plautus show us how often resort was had to the discipline of the lash even in the case of domestic slaves. Those employed in workshops, Whose overseers were themselves most commonly of gervile status, had probably a harder lot than domestics ; and the agricultural labourers were not unfrequently chained, and treated | much in the same way as beasts of burden. The displeasure of the master sometimes dismisscd his domestics to the more oppressive Jabonrs of the mill or the mine. A refuge from cruel treatment ‘was afforded by the temples and altars of the gods and by the sacred groves. Nor did Athenian law leave the slave without rotection. He had, as Demosthenes boasts, an action for outrage ike a freeman, and his death at the hand of a stranger was avenged like that of a citizen (Kurip., Hee., 288), whilst, if caused ‘by his master’s violence, it had to be atoned for by exile and a religious expiation. Even when the slave had killed his master, the relatives of the house could not themsclves inflict punishment ; they were obliged to hand him over to the magistrate to be dealt with by legal process. The slave who had just grounds of com- plaint against his master could demand to be sold; when he alleged his right to liberty, the law granted him a defender and the sanetuaries offered him an asylum till judgment should be given. Securities were taken against the revolt of slaves by not associating those of the same nationality and language; they were somctimes fettered to prevent flight, and, after a first attempt at escape,) branded to facilitate their recovery. There were treaties betwoen ‘states for the extradition of fugitives, and contracts of mutual ‘assurance between individuals against their loss by flight. Their inclination to take advantage of opportunities for this purpose is shown by the number that escaped from Athens to join the Spartans when occupying Decelea. There were formidable revolts at the mines of Laurium, and more than once in Chios. The evidence of slaves—women as well as men—was often, with the consent of their masters, taken by torture; and that method is generally commended by the orators as a sure means of arriving at the truth, though sometimes, when it suits their immediate object, they take a different tone. The scveral forms of the “question” are enumerated in the Frogs of Aristophanes. If the slave was mutilated or seriously injured in the process,

compensation was made, not to him, but to his master by the person who had demanded the use of torture. | The slave could purchase his liberty with his peculium by | agreement with his master. He could be liberated by will, or, during his master's life, by proclamation in the theatre, the law courts, or other public places, or by having his name inscribed in the public registers, or, in the later age of Greece, by sale or donation to certain temples—an act which did not make the slave a hierodule but a freeman. Conditions were sometimes attached to emancipation, as of remaining for life or a definite time with the former master, or another person named by him, or of performing some special service ; payments or rights of succession to | property might also be reserved. By manumission the Athenian slave became in relation to the state a metic, in relation to his master a client. He was thus in an intermediate condition between slavery and complete freedom. If the freedman violated his duties to his patron he was subject to an action at law, and if the decision were against him he was again reduced to slavery. He beeame a full member of the state only, as in the case of foreigners, by a vote in an assembly of six thousand citizens ; aud even this vote might be set aside by a graphe paranomon. Slaves who had rendered cminent services to the public, as those who fought at Arginuse and at Cheronea, were at once admitted to the status of citizens in the class of (so-called) Plateans. But it would appear that even in their case some civic rights were reserved aud aeeorded only to their children by a female citizen. The number of freedmen at Athens seems never to have been great.

It is well known that Aristotle held slavery to be necessary and natural, and, under just conditions, beneficial to both parties in n the relation—views which were correct enough from the political 4 side, regard being had to the contemporary social state. His practical motto, if he is the author of the Evonomies attributed to him, is—"no outrage, and no familiarity." There ought, he says, to be held out to the slave the hope of liberty as the reward 0) his service. Plato condemned the practice, which the theory of Aristotle also by implication sets aside as inadmissible, of Greeks having Greeks for slaves. In the Laws he accepts the institution as a necessary though embarrassing one, and recommends for the safety of the masters that natives of different countries should be mixed and that they should all be well treated. But, whilst condemning harshness towards them, he

encourages the feeling of eet for them as a class. Xenophon also, in urging a mild

eatment of them, seems to have in view, not their own well- “ung; but the security of the masters. The later moral schools of

teece scarcely at all concern themselves with the institution.

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The Epicurean had no scruple about the servitude of those whose labours contributed to his own indulgence and tranquillity ; he would at most cultivate an casy temper in his dealings with them. The Stoic regarded the condition of freedom or slavery as an external accident, indifferent in the eye of wisdom ; to him it was irrational to see in liberty a ground of pride or in slavery a subject of complaint ; from intolerable indignity suicide was an cver-open means of escape. The poets—especially the authors of the New Comedy—strongly inculcate humanity, and insist on the funda- mental equality of the slave. The celebrated ‘‘homo sum”’ is a translation from Alexis, and the spirit of it breathes in many passages of the Greek drama. A fragment of Philemon declarcs, as if in reply to Aristotle, that uot nature, but fortune, makes the slave. Euripides, as might be expected from his humanitarian cast of sentiment, and the “premature modernism” which has been remarked in him, rises above the ordinary feclings of his time in regard to the slaves. As Mr Paley says, he loves ‘‘to record their fidelity to their mastcrs, their sympathy in the trials of life, their gratitude for kindness and considerate treatment, and their pride in bearing the character of honourable men… . He allows them to reason, to advise, to suggest ; and he even makes them philosophize on the follies and the indiscretions of their superiors” (compare Med., 54; Orest., 869; Hel., 728; Jon, 854; Frag. Melan., 506; Phrix., 823). But we are not to suppose that even he, latitudinarian and innovator as he was, could have coneeived the possibility of abolishing an institution so deeply rooted in the social conditions, as well as in the ideas, of his time.

The case of the Helots of Laconia was different from that of the The slaves in most Grecian communities. disputed, and we cannot here enter into the controversy. They were regarded as the property of the state, which gave their services to individuals but kept in its own hands the power of emancipat- ing them. The domestic servants of the Spartans were all Helots, and they waited on their masters at the syssitia or public meal. But they were in the main serfs, living in small country villages or in detached farms, cultivating the lands of the Spartan pro- prietors, and paying to those proprietors a proportion of the pro- duce which could not be increased. They enjoyed their homes, wives, and families, could acquire property, were not to be sold out of the country, and perhaps could not be sold at all. They were, doubtless, employed in public works ; in war they commonly acted as light-armed troops attending on the Spartan or Pcricecic hoplites, but in particular emergencies themselves served as hoplites (Thucyd., iv. 80). They were sometimes rewarded for good service by emancipation, which, however, did not make them Periceci, but introduced them into a special class known as neodamodeis, The condition of the Helot does not seem to have been economically onerous; but his consciousness of Grecian lineage, which Grote regards as an alleviation of his lot, must surely have becn one of its bittercst elements, whilst it constantly kept alive the fear and consequent hatred of his Spartan masters, and made the relation between the two classes less natural than that of the ordinary Greek masters with slaves of foreign and less civilized races. By the ruling powers of Sparta the Helots were never trusted, and in one memorable case some two thousand of them, selected for special military merit, werc massacred in secret (Thucyd., iv. 80). According to Plutarch, whose statement, how- ever, has not always bcen credited, the ephors declared war against the Helots every year, and there was a practice, known as the krypteia, of detailing a number of young Spartan citizens for the purpose of assassinating such of them as were considered formidable. Wallon cstimates the number of the Helots at 220,000, that of the Spartans being 32,000. The Peneste in Thessaly and the Clarotz in Crete seem to have occupied a position somewhat similar to that of the Helots in Laconia.

We have already observed that the Roman system of Rom. life was that in which slavery had its most natural and relatively legitimate place; and accordingly it was at Rome that, as Blair has remarked, the institution was

more than anywhere else “extended in its operation and methodized in its details.” Not only on this ground is it especially deserving of our study, but because out of the slave-class, as it was organized by the Romans in the countries subject to the empire, the modern proletariate has been historically evolved.

We must distinguish from the later slavery at Rome what Sources.

Mommsen calls ‘‘the old, in some measure innocent” slavery, under which the farmer tilled the land along with his slave, or, if he possessed more land than he could manage, placed the slave— either as a steward, or as a sort of lessee obliged to render up a portion of the producc—over a detached farm. Though slaves were obtained by the early victories of Rome over her Italian neighbours, no large number was employed on the small holdings of those periods. But the extension of properties in the hands of the

The origin of this class is Helots.

Employ- ments.

Num- bers.

patricians, and the continual absences of citizens required by the expanding system of conquest, necessarily brought with them a demand for slave labour, whieh was increasingly supplied by captives taken in war. Of the number furnished from this souree a few particulars from the time of the mature republic and the first century of the empire will give some idea. In Epirus, after the victories of Amilius Paullus, 150,000 captives were sold. The prisoners at Aque Sextie and Vercelle were 90,000 Teutons and 60,000 Cimbri. Czsar sold on a single occasion in Gaul 63,000 captives; Augustus made 44,000 prisoners in the country of the Salassi; after immense numbers had perished by famine and hard- ship and in the combats of the arena, 97,000 slaves were acquired by the Jewish war. But slavery, as Hume has shown, is unfavourable to population, and even the wars of Rome were insufficient to maintain the supply. Hence a regular commerce in slaves was established, which was based on the ‘‘systematically- prosecuted hunting of

man,” and indicated an entire perversion of the primitive institution, which was essentially connected with conquest. The pirates sold great numbers of slaves at Delos, where was the chief market for this kind of wares ; and these sales went on as really, though more obscurely, after the successful expedi- tion of Pompey. There was a regular importation at Rome of slaves, brought to some extent from Africa, Spain, and Gaul, but ehiefly from Asiatic countries—Bithynia, Galatia, Cappadocia, and Syria. A portoriuin —apparently one-eighth for eunuchs, one- fortieth for others—was paid on their import or export, and a duty of 2 or 4 per cent. on their sale.

There were other sources from which slavery was alimented, though of course in a much less degree. Certain offences reduced the guilty persons to slavery (servi panz), and they were employed in public work in the quarries or the mines. Originally, a father could sell his children. A creditor could hold his insolvent debtor as a slave, or sell him out of the city (trans Tiberim). The enslavement of creditors, overwhelmed with usury in consequence of losses by hostile raids or their own absence on military service, led to the revolt of the Mons Sacer (493 B.c.). The Pcetelian law (326 B.c.) restricted the creditor’s lien (by virtue of a nexwm) to the goods of his debtor, and enactcd that for the future no debtor should be put in chains; but we hear of debtors addicti to their creditors by the tribunals long after—even in the time of the Punic Wars.

There were scrvi publici as well as privati. The service of the magistrates was at first in the hands of freemen ; but the lower offiees, as of couriers, servants of the law courts, of prisons, and of temples, were afterwards filled by slaves. The execution of public works also came to be largely committed to them,—as the construc- tion of roads, the cleansing of the sewers, and the maintenance of the aqueducts. Both kinds of functions were discharged by slaves, not only at Rome, but in the rural and provincial municipalities. The slaves of a private Roman were divided between the familia rustica and the familia urbana. At the head of the familia rustica was the villicus, himself a slave, with the wife who was given him at once to aid him and to bind him to his duties, Under him were the several groups employed in the different branches of the exploitation and the care of the cattle aud flocks, as well as those who kept or prepared the food, clothing, and tools of the whole staff and those whe attended on the master in the various species of

rural sports. A slave prison (ergastulwm) was part of such an establishment, and there were slaves whose office it was to punish the offences of their fellows. To the familia urbana belonged those who discharged the duties of domestic attendance, the service of the toilct, of the bath, of the table, of the kitchen, besides the entcrtainment of the master and his guests by dane- ing, singing, and other arts. There were, besides, the slaves who aecompanicd the master and mistress out of doors, and who were chosen for their beauty and grace as guards of honour, for their strength as chairmen or porters, or for their readiness and address in remembering names, dclivcring messages of courtesy, and the like. There were also attached to a great household physicians, artists, sccretaries, librarians, copyists, preparers of parchment, as well as pedagogues and preceptors of different kinds,—readers, grammarians, men of letters and even philosophers, —all of servile condition, besides accountants, managers, and agents for the transaction of business. Actors, comic and tragic, pantomimi, and the performers of the circus were commonly slaves, as were also the gladiators. These last were chosen from the most warlike races—as the Samnites, Gauls, and Thracians. Familiw of gladiators were kept by private speculators, who hired them out ; they were sometimes owned by men of high rank.

As to the numbers of slaves belonging to individual masters, though we have no distinct general statement in the Roman

writers, several special examples and other indirect indications

serve to show that the wealthier mien possessed very large familiz. This may be inferred from the columbaria of the house of Livia and of other great houses. Vettius armed four hundred of his own slaves when he entered on the revolt which was a prelude to the Second Servile War. The slaves of Pedanius Secundus, who, in

spite of a threatened outbreak of the indignant populace, were ajj put to death because they had been under their master’s roof when he was murdered, were four hundred in number. Pliny tells that Cecilius, a freedinan of the time of Augustus, left by his as Iaany as 4116. The qucstion as to the total number of slaves at Rome or in Italy is a very difficult one,

and it is not, perhapg possible to arrive with any degree of certainty at an approximate estimate. Gibbon supposes that there were in the Roman world in the reign of Claudius at least as many slaves as free inhabitants, But Blair seems right in believing that this number, though prob- ably eorreet for an earlier period, is much under the truth for the age to whieh it is assigned. He fixes the proportion of slaves to free men as that of three to one for the time between the conquest of Grecce (146 B.c.) and the reign of Alexander Severus (229-935 A.D.). The entire number of slaves in Italy would thus have been, in the reign of Claudius, 20,832,000, that of the free population being 6,944,000. {

By the original Roman law the mastcr was clothed with absolute dominion over the slave, extending to the power of life — and death, whieh is not surprising when we eonsider the nature of the patria potestas. The slave could not possess property of any kind ; whatever he acquired was legally his master's. He was, however, in practice permitted to enjoy and aceumulate chanee earnings or savings, or a share of what he produced, under the name of peculiwm. A master could not enter into a contract with his slave, nor could he accuse him of theft before the law; for, if the slave took anything, this was not a subtraction, but only a displacement, of property. The union of a male and female slave had not the legal character of a marriage ; it was a cohabita- tion (contuberniwm) merely which was tolerated, and might be terminated at will, by the master; a slave was, therefore, not capable of the crime of adultery. Yet general sentiment seems to have given a stronger sanction to this sort of connexion ; the names of husband and wife are freely uscd in relation to slaves on the stage, and even in the laws, and in the language of the tombs. For entering the military service or taking on him any state ofhee a slave was punished with death. He could not in general he examined as a witness, except by torture. A master, when accused, could offer his slaves for the " question," or demand for the same purpose the slaves of another ; and, if in the latter case they were injured or killed in the process, their owner was indemnified. A slave could not accuse his master, except of adultery or ineest (under the latter name being included the violation of sacred things or places) ; the case of high treason was afterwards added te these. An accused slave could not invoke the aid of the tribunes. The penalties of the law for crime were more severe on guilty slaves than on freemen ; "majores nostri," say the legists,

“in omni supplicio severius servos quam liberos punierunt.” The capital punishment of the freeman was by the sword or the precipice, —of the slave by the axe or the cross. The lex Cornelia punished the murder of a slave or a freeman alike ; but the master | who killed his own slave was not affeeted by this law. |

Columella, like Xenophon, favours a certain friendliness and Tra: familiarity in one’s intercourse with his farm slaves, Cato ate and ment: drank the same coarse victuals as his slaves, and even had the slaves children suckled by his wife, that they might imbibe a fondness for the family. But that rigid old economist had a strict eye to profit in all his dealings with them. He allowed the contubernium of male and female slaves at the price of a money payment from their peculium. Columella regarded the gains from the births as a sufficient motive for encouraging these unions, and thought that mothers should be rewarded for their fecundity ; Varro, too, seems to have taken this view. The immense extension of the rural estates (latifundia) made it impossible for masters to know their slaves, even if they were disposed to take trouble for the purpose. Effective superintendence even by overseers became less easy; the use of chains was introduced, and these were worn not only in the field during working hours but at night in the ergastulum where the labourers slept—a practice which Pliny lamented as a disgrace to agriculture. Urban slaves had probably often a life as little enviable, especially those who worked at trades for speculators. Even in private houses at Rome, so late as the time of Ovid, the porter was chained. In the familia urbana the favourites of the mastcr had good treatment, and might exereist some influence over him which would lead to their receiving flattery and gifts from those who sought his vote or solicited his support. Doubtless there was often genuine mutual affection; slaves sometimes, as in noted instances during the civil was, showed the noblest spirit of devotion to their masters. Those who were not inmates of the household, but were employed outside of it as keepers of a shop or boat, chiefs of workshops, or clerks m4 mercantile business, had the advantage of greater freedom of action. The slaves of the Zeno and the lanista were probably most cases not only degraded but unhappy. The lighter punish- ments inflicted by masters were commonly personal chastisement oF banishment from the town house to

rural labour ; the severer were employment in the mill (pistrinwm) or relegation to the mies

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quarries. To the mines speculators also sent slaves; they worked

“half-naked, men and women, in ehains, under the lash and guarded

py soldiers. Vedius Pollio, in the time of Augustus, was said to have thrown his slaves, condemned sometimes for trivial mistakes

or even accidents, to the lampreys in his fishpond. Cato advised the agriculturist to sell his old oxen and his old slaves, as well

as his sick ones; and sick slaves were exposed in the island of Asculapius in the Tiber; by a decree of Claudius slaves so

- exposed, if they recovered, could not be reclaimed by their

masters. ; Though the Roman slaves were not, like the Spartan Helots,

kept obedient by systematic terrorism, their large numbers were a constant source of solicitude in the later period of the republic and under the early empire. The law under which the slaves of Pedanius were put to death, probably first made under Augustus and more fully enacted under Nero, is sufficient proof of this anxiety, which indeed is strongly stated by Tacitus in his narrative of the facts. There had been many conspiracies amongst the slaves in the course of Roman history, and some formidable insurrections. We hear of a conspiracy about 500 B.c. and another in 419 n.c.; again just before the sea-fight of Duilius and between the battles of Trasimenus and

Cann. In 198 B.c. a servile war had almost broken out; in 196 B.c. there was a rising in Etruria and in 185 3.c. in Apulia. The growth of the latifundia made the slaves more and more numerous and formidable. Free labour was discountenaneed. Cato, Varro, and Columella all agree that slave labour was to be preferred to free exeept in unhealthy regions and for large occasional operations, which probably transcended the capacity of the permanent familia rustica. Cicero and Livy bear testimony to the disappearance of a free plebs from the country districts and its replacement by gangs of slaves working on great estates. ‘The policy of the Graeehi and their successors of the popular party was opposed to this reduction of the free working population, which they sought to counteract by agrarian laws and by colonization on a large scale—projects which could not be effectively carried out until civil supremacy was united with military power in the hands of a popular ehief, and which, even when this condition was satisfied by the establishment of the empire, were inadequate to meet the evil. The worst form of predial slavery existed in Sicily, whither Mominsen supposes that its peculiarly harsh features had been brought by the Carthagin- ians. In Sicily, aeceordingly, the first really serious servile insurrections took place, at once provoked by the misery of the slaves and facilitated by the habits of brigandage which, it is said, the proprietors had tolerated and even encouraged as lighten- ing the cost of subsistenee of their slaves. The rising under Kunus in 133 3B.c. was with some difficulty suppressed by Rupilius. Partial revolts in Italy succeeded ; and then eame the second Sicilian insurrection under Trypho and Athenio, which, after a severe struggle, was put down by Aquilius. These were followed by the Servile War in Italy under Spartacus, whieh, occurring at an otherwise eritical period, severely tested the military resources of Rome. In the subsequent civil confliets the aid of slaves was sought by both parties, even by Marius himself, and afterwards by Catilinc, though he finally rejected their services. Clodius and Milo employed bands of gladiators in their city riots, and this action on the part of the latter was approved by Cicero. In the First Civil War they were to be found in both camps, and the murderers of Cesar were escorted to the Capitol by gladiators. Antony, Octavius, and Sextus Pompeius employed them in the Second Civil War; and it is recorded by Augustus on the Monumentum Ancyranum that he gave back to their masters for punishment about 30,000 slaves who had abseonded and borne arms against the state. Under Tiberius, at the death of Caligula, and in

the reign of Nero there were threatening movements of the slaves. In the wars from Otho to Vespasian they were employed, as Tacitus tells us, even by the most scrupulous generals.

Of the moral influences of slavery we have already spoken. In the particular case of Rome it cannot be doubted that it largely contributed to the impuritics which disgraced private life, as seen in the pages of Juvenal, Martial, and Petronius. It is shocking to observe the tone in which Horace, so charaetcrized by geniality and bonhomie, speaks of the subjection of slaves to the brutal passions of their masters (Sat., i. 2, 116). The hardening effeet of the system appears perhaps inost strikingly in the barbarous Spectacles of the amphitheatre, in which even women took pleasure and joined in condemning the gladiator who did not by his desperate vourage satisfy the demands of a sanguinary mob. It led, further, to a contempt for industry, even agriculture being no longer held m esteem ("'quum sit publice aecepta et confirmata jam vulgaris existimatio, rem rusticam sordidum opus," Col., i., pref. 20). The Pag of slavery, degrading free labour while competing with Teeinen for urban enlployment, multiplied the idle and worthless poration of Rome, who sought only '* panem et eircenses," These fous Supported by publie distributions, which the emperors ant like 4 could not discontinue, and by the bounty of patrons,

» ake the ''mean whites" of modern America, formed a danger-

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ous class, purehasable by selfish ambitions and ready to aid in eivil disturbances.

Blair, in eomparing the Greck and Roman systems of slavery, Emanei-points with justice to the greater facility and frequeney of pation.

emancipation as the great superiority of the latter. No Roman slave, he says, ''needed to despair of becoming both a freeman and a eitizen." Manumission was of two kinds—justa or regular, and minus justa. Of manumissio gusta there were four modes :— (1) by adoption, rarely resorted to; (2) by testament, already recognized in the Twelve Tables; (8) by census, which was of exceptional use, and did not exist later than the

time of Vespasian ; and (4) by vindicta, which was the usual form. In the last method the master turned the slave round, with the words “ liber esto,” in the presence of the preetor, that officer or his lietor at the same time striking the slave with his rod. The manwmissio minus Justa was effeeted by a sufficient manifestation of the will of the master, as by letter, by words, by putting the pileus (or cap of liberty) on the slave, or by any other formality which had by usage beeome significant of the intention to liberate, or by sueh an aet as making the slave the guardian of his children. This extra- legal sort of manumission was incomplete and precarious; even after the lex Julia Norbana (19 a.p.), whieh assimilated the position of those so liberated to that of the Latin colonists, under the name of Latini juniores, the person remained in the eye of the law a slave till his death and eould not dispose of his peculium.

A freedman, unless he became sueh by operation of law, re- mained elient of his master, and both were bound by the mutual obligations arising out of that relation. These obligations existed also in the case of freedmen of the state, of cities, temples, and corporations. The freedman took his former master’s name; he owed him deference (obsequiwm) and aid (officiwm); and neglect of these obligations was punished, in extreme cases even with loss of liberty. Conditions might be annexed by the master to the gift of freedom, as of continued residenee with him, or of general service or some particular duty to be performed, or of a money payment to be made. But the pretor Rutilius, about the beginning of the 1st eentury 3B.c., limited the excessive imposition of such conditions, and his restrictions were earried further by the later jurists and the imperial constitutions. Failing natural heirs of an intestate freedman, the master, now patron, succeeded to his pon at his death ; and he could dispose by will of only half lis possessions, the patron receiving the other half. Freedmen and their sous were subjeet to eivil disabilities ; the third genera- tion became tingenua (full citizens), Thus, by a process of constant infiltration, the slave element tended to merge itself in the gencral popular body ; and Seipio Amilianus could reply to the murmurs of a plebeian crowd, ‘‘Taceant quibus Italia noverca est; non efficietis ut solutos verear quos alkenes adduxi” (Val. Max., vi.

2, 3).

It was often a pecuniary advantage to the master to liberate his slave ; he silane a payment which enabled him to buy a substitute, and at the same time gained a client. This of course presupposes the reeognition of the right of the slave to his peculium ; and the same is implied in Cicero's statement that a diligent slave could in six years purchase his freedom. Augustus set himself against the undue multiplication of manumissions, probably considering the rapid succession of new citizens a source of social instability, and recommended a similar policy to his successor. The lex Allia Sentia (about 3 A.p.) forbade manumission, except in strietly limited cases, by masters under 20 years of age or of slaves under 30 ; and the lex Furia Caninia (about 7 a.p.) fixed the proportion of a man's slaves which he could liberate by testament, and forbade more than a hundred being so enfranehised whatever might be the number of the familia. Under the empire the freedmen rose steadily in influenee; they beeame admissible to the rank of equites and to the senate; they obtained provincial governments, and were appointed to offices in the imperial household which virtually placed them at the head of adminis- trative departments. Pallas and Narcissus are familiar types of the unworthy members of this class, and there were doubtless many outside of official life who exhibited the ostentation and insolence of the parvenu; but there were others who were highly deserving of estecm. Freedinen of humbler rank filled the minor offiees in the administrative service, in the city cohorts, and in the army; and we shall find that they entered largely into the trades and professions when free labour began to revive. They appeared also in literature ; we hear of several historical and biographical memoirs by freedmen under the republic and the early empire; many of them were professors of grammar and the kindred arts, as Tiro, the amanuensis of Cicero, and Hyginus, the librarian of Augustus; and names of a higher order are those of Livius Andronicus, Cecilius, Statius, Terence, Publius Syrus, Phedrus, and Epictetus.

In the 2d eentury of the Christian era we find a marked change Reforms.

with respeet to the institution of slavery, both in the region of thought and in that of law. Already the principles of reason and humanity had been applied to the subject by Seneca who, what-

Infiu- ence of Chris- tianity.

alteration should be suddenly wrought cither in the social system which was in harmony with it, or even in the general ideas which had grown up under its influence. The latter would, indeed, be gradually affected ; and accordingly we have observed a change in the policy of the law, indicating achange in sentiment with respect to the slave class, which does not appear to have been at all due to Christian teaching, but to have arisen from the spon- taneous influence of circumstances co-operating with the softened manners which were inspired by a pacific régime. But the institu. tion itself could not be at once scriously disturbed ; it was too deeply rooted and too closely bound up with the whole existing order of things. If it could have been immediately abolished, the results must have been disastrous, most of all to the slave popula. tion itself. Before that end could be accomplished, an essentially new social situation must come into existence ; socicty must be organized for defence as it had previously becn for conquest; and this transformation could not be wrought in aday. But in the meantime much might be done towards further mitigating the evils of slavery, especially by impressing on master and slave their relative duties and controlling their behaviour towards one another by the exercisc of an independent moral authority. This was the work open to the Christian priesthood, and it cannot be denied that it was well discharged. Whilst the fathers agree with the | Stoics of the 2d century in representing slavery as an indifferent circumstance in the eye of religion and morality, the contempt for the class which the Stoics too often exhibited is in them replaced by a genuine sympathy. They protested against the multiplica- tion of slaves from motives of vanity in the houses of the great, against the gladiatorial combats (ultimately abolished by the noble gelf-devotion of a monk), and against the consignment of slaves to the theatrical profession, which was often a school of corruption, The church also encouraged the emancipation of individual slaves and the redemption of captives. And its influence is to be secn in the legislation of the Christian emperors, which softened some of the harshest features that still marked the institution. There is not, indeed, a uniform advance in this legislation ; there is even retrogression in some particulars under Constantine, as in his renewed permission to fathers to sell their

children and to the finder of an exposed child to make it his slave—enactments which it is sometimes sought to excuse by the prevailing poverty of his period. But a stronger influence of Christianity appears in Theodosius, and this influence is at the highest in the egislation of Justinian. Its systematic cffort is, in lis own words, “pro libertate, quam et fovere et tucri Romanis legibus et pracipue nostro numini peculiare est.” Law still refused in general to recognize the marriages of slaves ; but Justinian gave them a legal value after cmancipation in establishing rights of succession. Unions between slaves and free women, or between a freeman and the female slave of another, continued to be forbidden, and were long punished in certain circumstances with atrocious severity. ‘As witness, the slave was still subject to the question ; as criminal, he was punished with greater rigour than the freeman. If he accused his master of a crime, unless the charge was of treason, he was burnt. But he could maintain a legal claim to his own liberty, not now merely through an adsertor, but in person. female slave was still held incapable of the offence of adultery ; but Justinian visited with death alike the rape of a slave or freed- woman and that of a free maiden. Already the master who killed his slave had been punished as for homicide, except in the case of his unintended death under correction ; Constantine treated as homicide a number of specially-enumerated acts of cruclty. Even under Theodosius the combats of the amphitheatre were permitted, if not encouraged, by the state authoritics ; these sports were stil expected from the candidates for public honours. Combats of men with beasts were longest continued; they had not ecased cven i the early years of the reign of J ustinian. A new process of manu- mission was now established, to be performed in the churches through the intervention of the ministers of religion; and it was provided that clerics could at any time by mere expression of will Iiberate their slaves. Slaves who were admitted to holy orders, of who entered a monastery, became freemen, under certain restric: tions framed to prevent fraud or injustice. Justinian abolished the personal conditions which the legislation of Augustus ha required to be satisfied by the master who emancipated and the slave who was manuiitted, and removed the limitation of number. The liberated slave, whatcver the process by which he had obtained his frecdom, became at once a full citizen, his former master, how- ever, retaining the right of patronage, the abolition of which would probably have discouraged emancipation.

The slavery of the working classes, justly described by ot Hume as the most important difference between the al social life of antiquity and that of modern times, was nob | directly changed into the system of personal freedom. There was an intermediate stage which has not always been sufficiently discriminated from slavery, though the

ever we may think of him as a man, deserves our gratitude for the just and liberal sentiments he expressed respecting the slaves, who, he says, should be treated as ‘‘ humble friends,” and especially for his energetic reprobation of gladiatorial combats and of the brutality of the public who enjoyed those sanguinary shows. But it was in the 2d century, as we have said, that “the victory of moral ideas” in this, as in other departments of life became “decisive, .. . Dio Chrysostom, the adviscr of Trajan, is the first Greek writer who has pronounced the principle of slavery to be contrary to the law of nature” (Mark Pattison). And a parallel change is found in the practical policy of the state. The military vocation of Rome was now felt to have reached its normal limits; and the emperors, understanding that, in the future, industrial activity must prevail, prepared the abolition of slavery as far as was then possible, by honouring the freedmen, by protecting the slave against his master, and by facilitating manumissions. The jurists who, in the absence of a recognized spiritual power, provisionally discharged in their own way the office of systematizing practical morals, modified, by means of the useful fiction of the jus natwrale, the presumptions of law and the interpretation of doubtful instruments. (Quod ad jus naturale attinet, omnes homines equales sunt ”—Ulpian. ‘*Servitus est constitutio juris gentium, qua quis dominio alieno contra naturam subjicitur”—Florentinus.) The general tendency both of the imperial constitutions and of the maxims of the legists is in favour of liberty. (‘*Ncc ignotum est quod multa contra juris rigorem pro libertate sint constituta”—Ulpian.) The practices of exposure and sale of children, and of giving them in pledge for debt, are for- bidden. An edict of Diocletian forbade a free man to sell himself. Manstealers or kidnappers (plagiarit) were punished with death. The insolvent debtor was withdrawn from the yoke of his creditor. While the slave trade was permittcd, the atrocious mutilation of boys and young men, too often practiscd, was punished with exile and even with death. In redhibitory actions (for the annulment of sales), if a slave were returned to the seller, so must also be his parents, brothers, and personz contubernio conjunc. In the

interpretation of testaments it was to be assumed that members of the same family were not to be separated by the division of the succession. The law also favoured in special cases the security of the peculium, though in general principle it still remained the property of the master. The state granted to public slaves the right of bequcathing half their possessions ; and private persons sometimes permitted similar dispositions even to a greater extent, though only within the familia. Hadrian took from masters the power of life and death and abolished the subterranean prisons. Autoninus Pius punished him who killed his own slave as if he had killed another's. Already in the time of Nero the magistrates had been ordered to receive the slave's complaint of ill-treatment ; and the lex Petronia, belonging to the same or an earlier period, forbade masters to hand over their slaves to combats with wild beasts, Antoninus directed that slaves treated with excessive cruelty, who had taken refuge at an altar or imperial image, should be sold; and this provision was extended to cases in which the master had employed a slave in a way degrading to him or beneath lis character. M. Aurelius gave to masters an action against thcir slaves for any cause of complaint, thus bringing their relation more directly under the surveillance of law and public opinion. A slave's oath could still not be taken in a court of law ; he was interrogated by the ''question"; but the emperors and jurists limited in various ways the application of torture, adding, how- ever, as we have mentioned, to the cases in which it could previously be appealed to that of the crime of majestas. For certain alleged offences of the master the slave could bring an action, being repre- sented for the purpose by an adsertor. Emancipation was facilitated; some of the old formalities were dispensed with ; obstacles to it were removed, and legal difficulties solved in such a way as to further it. The power of imposing conditions on testamentary manumissions was restricted, and these conditions interpreted in the sense most favourable to freedom. 'The emperor could confer liberty by pre- senting a gold ring to a slave with the consent of the master, and the legal process called restitutio nataliwm made him a full citizen. It was decided that liberty could not be forfeited even by a pre- scription of sixty years' duration.

The rise of Christianity in the Roman world still further improved the condition of the slave. The sentiments it created were not only favourable to the humane treatment of the class in the present, but were the germs out of

which its entire liberation was destined, at a later period, in part to arise. It is sometimes unreasonably objected to the Christian church that it did not denounce slavery as a social crime and insist on_ its immediate abolition, that on the contrary it recognized the institution, ecclesiastical persons and societics themselves being owners of slaves. We have scen that slavery was a fundamental element of the old Roman constitution, not only incorporated with the laws, but necessarily arising out of, and essential to, the military mission of the state. When the work of conquest had been sufficiently achieved, it could not be expected that a radical

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confusion of the two leads to endless misconceptions. We mean the régime of serfdom. In studying the origin of this transitional state of things, four principal considerations have to be keptin view. (1) As Gibbon observes, the sub- stantial completion of the Roman system of conquest and incorporation reduced the supply of slaves by restricting the dealings in them to such trade as took place within the now fixed limits of the empire. It is true that, when ‘the barbarian invasions began in the 3d century, many captives were made, who, when not enrolled in the army, were employed in agriculture or domestic service ; but the regular importation was greatly and increasingly dimin- ished, and the Romans were obliged to have recourse to “the milder but more tedious method of propagation.” ‘The effect of this was to improve the condition of the ‘slave by rendering his existence an object of greater value to his master. It tended, indeed, directly to the ‘transformation of slavery into serfdom by making it the interest of each family to preserve indefinitely its own hereditary slaves, who could not be replaced except with difficulty and at great expense. The abolition of the lextomnal slave trade tended, in fact, to put an end to internal sales, and the slaves became attached to the households or lands of their masters. (2) The diminished ‘supply of slaves further acted in the direction of the ree eation of free labour. A general movement of this kind is noticeable from the 2d century onwards. Freemen had always been to some extent employed in the public service—(a) as subordinate assistants to the magistrates and priests ; the places of scribes, viatores, criers could be filled only by citizens; the

apparitors attached to the ‘new imperial administration were also free plebeians, with slaves in the lower ranks; but these apparitorships were usually held by freedmen. So also (6) public works were in the 2d century divided amongst corporations of free plebeians, with public slaves under them. In_ private “service the superior posts were often filled by freedmen ; the higher arts—as medicine, grammar, painting—were partly in the hands of freedmen and even of ingenui; the more successful actors and gladiators were often freedmen. In the factories or workshops kept by wealthy persons slave labour was mainly employed; but free artisans sometimes offered their services to these establishments or ‘formed associations to compete with them. We have seen that free persons had all along been to some extent employed in the cultivation of land as hired labourers, and, as we shall presently find, also as tenants on the ‘great estates. How all this operated we shall understand when we examine the remarkable organization of the state ‘introduced by Diocletian and his successors. (3) This organization established in the Roman world a personal and hereditary fixity of professions and situations which was not very far removed from the caste system of the | Kast, The purpose of this was doubtless to resist by a | Strong internal consolidation the shock of the invasions, to Secure public order, to enforce industrious habits, and to guarantee the financial resources of the state. Personal independence was largely sacrificed, but those still more Important ends were in a great measure attained. The all- | pervading nature of this discipline will be understood from the following particulars. Members of the admin- istrative service were absolutely bound to their employ- _Ments; they could not choose their wives or marry their daughters out of the collegia to which they respectively | belonged, and they transmitted their obligations to their (children. If they abandoned their posts, they were sought for everywhere and forced to return. In muni- | Clpalities, even the curvales, or members of the local | ire Were bound to their places and their functions; _umste were other members of the municipal service who

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might supply a substitute on condition of resigning to him their lands, but this power was rarely used ; they commonly remained in their posts; their families, too, were bound to remain ; they were attached to the collegia or other bodies to which they belonged. The soldier, procured for the army by conscription, served as long as his age fitted him for his duties, and his sons were bound to similar service. The same sort of compulsion appears to have been exercised upon those belonging to, at least, such free industrial corporations as were recognized and regulated by the state. Every one was treated, in fact, as a servant of the state, and was bound to furnish labour or money, or both ; and the nature of his labour was permanently fixed for him; he was, in the language of the law, “conditionis laqueis irretitus.” This general system, by diminishing the free- man’s inastery over himself and his power to determine his oceupation, reduced the interval between him and the slave ; and the latter on the one hand, the free domestic servant and workshop labourer on the other, both passed insensibly into the common condition of serfdom. (4) The corresponding change, in the case of the rural slaves, took place through their being merged in the order of coloni. The Roman colonus was originally a free person who took land on lease, contracting to pay to the proprietor either a fixed sum annually or (when a colonus partiarius) a certain proportion of the produce of the farm. Under the emperorsof the4thcentury thename designated a cultivator, who, thougli personally free, was attached to the soil, and transmitted his condition to his descendants; and this became the regular status of the great mass of Roman cultivators. In sanctioning this personal and hereditary fixity, the law probably only recognized a state of things which had previously existed, having been spontaneously brought about by the circumstances of society, and especially by the needs of agriculture. The class of coloni appears to have been composed partly of tenants by con- tract who had incurred large arrears of rent and were detained on the estates as debtors (obwrati), partly of foreign captives or immigrants who were settled in this condition on the land, and partly of small proprietors and other poor men who voluntarily adopted the status as an improvement in their position. They paid a fixed proportion of the produce (pars agraria) to the owner of the estate, and gave a determinate amount of labour (operx) on the portion of the domain which he kept in his own hands (mansus dominicus). The law for a long time took no notice of these customary tenures, and did not systematically constitute them until the 4th century. It was indeed the requirements of the fiscus and

the conscription which impelled the imperial Government to regulate the system. The coloni were inscribed (adscriptt) on the registers of the census as paying taxes to the state, for which the proprietor was responsible, reimbursing himself for the amount. In a constitution of Constantine (332 A.D.) we find the colonus recognized as permanently attached to the land. If he abandoned his holding he was brought back and punished ; and any one who received him had not only to restore him but to pay a penalty. He could not marry out of the domain; if he took for wife a colona of another proprietor, she was restored to her original locality, and the offspring of the union were divided between the estates. The children of a colonus were fixed in the same status, and could not quit the property to which they belonged. They and their de- scendants were retained, in the words of a law of Theodosius, " quodam eternitatis jure," and by no process could be relieved from their obligations. By a law of Anastasius, at the end of the 5th century, a colonus who had voluntarily come into an estate was by a tenure of thirty years for ever attached to it. The master (dominus)

could inflict on his coloni "moderate chastisement," and could chain them if they attempted to escape, but they had a legal remedy against him for unjust demands or injury to them or theirs, In no case could the rent or the labour dues be increased. The colonus could possess property of his own, but could not alienate it without the consent of the master. Thus, whilst the members of the class were personally free, their condition lad some incidents of a semi-servile character. They are actually designated by Theodosius, though the lax language of the codes must not be taken too literally, "servi terre cui nati sunt." And Salvian treats the proposition "coloni divitum fiunt" as equivalent to 'vertuntur in servos." This is indeed an exaggeration ; a deduction must always be made from the phrases of the medizeval Jeremiah ; the colonatus was not an oppressive system ; it afforded, on the contrary, real security against unreasonable demands and wanton disturbance, and it was a great advance on the system of cultivation by the familia rustica. But the point which it is important for our present purpose to observe is, that there was a certain approxiniation between the condition of the colonus and the slave which tended towards the fusion of

both in a single class. To make this plain, we must go a little further into detail.

Besides the coloni there were on a great estate—and those of the 4th century were on a specially large scale— a number of preedial slaves, who worked collectively under overseers on the part of the property which the owner limself cultivated. But it was a common practice to settle certain of the slaves (and possibly also of the freed- men) on other portions of the estate, giving them small farms on conditions similar to those to which the coloni were subject. These slaves are, in fact, described by Ulpian as quasi colon. They had their own households and were hence distinguished as casati. In law these slaves were at first absolutely at the disposal of their masters ; they had no property in the strict sense of thie word, and could be sold to another proprietor and separated from their families. But the landlord's interest and the general tone of feeling alike modified practice even before the intervention of legislation ; they were habitually continued in their holdings, and came to possess in fact a perpetual and hereditary enjoyment of them. By a law of Valentinian I. (377) the sale of these slaves was interdicted unless the land they occupied were at the same time sold. The legal distinction between the coloni and the slave tenants continued to exist after the invasions; but the practical difference was greatly attenuated. The colonus often occupied a servile mansus, and the slave a mansus originally appropriated to a colonus. Intermarriages of the two classes became frequent. Already at the end of the 7th century it does not appear that the distinction between them had any substantial existence. The servile tenures were, no less than the others, stable and hereditary ; and the charges to be borne by the former were not necessarily the heavier.

Whilst giving their due weight to the social and economic circumstances which tended thus to merge the free labourer and colonus on the one hand and the slave on the other in a common class of serfs, we must never leave out of account the directly moral agencies which worked towards the same result by modifying slavery. Nor ought we to have in view only the influence of Christian doctrine and precept considered in themselves ; we must regard them as constantly applied in daily life by an independent spiritual order, which was revered alike by the two classes whose relations it assisted in regulating,

and whose general attitude towards slavery is sufficiently

shown by the celebrated declaration of Gregory the Great.

SLAVERY

tions. But, on the whole, it appears that, as in the case of the rise of the feudal system generally, so in the particular respect of the accompanied it, the influence of the Northern nations was really of little account, and that both changes would have

| Dei” and “pro remedio anime.”

A review of what has been said will make it plain that the Northern invasions had little to do with the transition from slavery to serfdom. Only two modes have bee . suggested in which they may possibly have accelerated the change. It is:~~not likely that the newly established proprietors would understand, or respect in practice, nice distinctions between classes of cultivators; they would probably regard the coloni and slaves, now that their conditions were so much assimilated, as standing on the same basis. And, secondly, the Germans, if we may believe Tacitus, had in their original seats no menial slaves, whilst, on the other hand, they were familiar with the system of slaves settled on separate portions of a domain and paying a fixed share of the produce to its owner. There may be a certain value in these considera~~

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qualified personal freedom which

equally, though perhaps not so speedily, taken place if the

invasions had never occurred.

Whilst ancient slavery was, as we have seen, a system Disp fitted to endure under given social conditions, and had pea a definite political function to fulfil, succeeded when that function was exhausted, was 4 merely transitory condition, with no other destination than that of leading the working

population up to a state of entire personal freedom. How thie serf in cities and towns became a free labourer for hire can be easily con- ceived ; he doubtless in many cases purchased. his liberty out of his earnings, and in others it was not the master's interest to retain his services at the cost of his maim tenance. favoured by the movement (not, however, to be confounded with it)

The emancipation of this entire class was

which established free industrial communities and gave them municipal jurisdiction. But it is very difficult to trace the steps by which the rural serf was transmuted into a free tenant. "The time and manner,' says Adam Smith, 'in which so important a revolution was brought about is one of the most obscure points In modern history." Smith himself attributes the change to two causes—(1) the greater advantage to the proprietor derived from the exertions of the cultivator when he worked entirely for himself, and (2) the encouragement which sovereigns, jealous of the great lords, gave to the villeins (under which term Smith seems to comprehend the whole mixed class of non-free tenants) to encroach on their authority. To these economic and political reasons, though doubtless real and important, Smith appears to attribute too exclusive an efficacy, neglecting the moral and religious causes which conspired to the same result, especially the personal influence of the clergy, who were natural mediators between the serfs and the proprietors. The serfs were best treated on the ecclesiastical estates, and many on private properties were liberated '' pro amore

Let us examine more particularly the circumstances of the transition in France and in England.

M. Guérard has shown that from the conquest by Ceesar to the Frat abolition of feudalism there was a steady improvement in the eon- dition of the class originally enslaved. He distinguishes three periods—one of slavery proper, lasting till the conquest of Gaul by the barbarians; the second, ending about the close of the reign Charles the Bald (d. 877), in which slavery is replaced by #2 intermediate state which he calls by the indeterminate name 0 "servitude," the rights of the servus being recognized, respected, and protected, if not yet in a sufficient degree by the civil laws, at least by those of the church and by social manners ; and a third m which,

under the developed regime of feudalism, serfdom proper 8 fully established and the serf-tenant has become simply a tributary under various appellations (homme de corps or de poté, mam

serfdom, whieh

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‘mortable, tatllable, serf, vilain). The three personal conditions here described coexisted to some extent in all these periods, one of ‘them, however, greatly preponderating in each. Towards the end “of the 9th century the serf-tenants were already proprietors of their holdings ; under the third dynasty they were rather subjects than tenants, and the dues they paid were rather taxes than rents; they were, in short, vassals occupying the lowest round of the feudal ladder. Guérard enumerates as Immediate causes which led to the liberation of serfs (besides the master’s voluntary gift or bequest) ‘their flight,—with the prescription which arose after a certain ‘interval oft absence,—ordination, redemption by themselves or others, marriages with women of higher status, and the action of law in the case of certain wrongs inflicted by the master. The -chureh co-operated to the same result, as might be shown by many instances. Thus St Benedict of Aniane (d. 821), the reformer of the monasteries.in the Carolingian territories, reccived a number of donations of lands from the faithful; but, whilst accepting them E his religious establishments, he enfranchised the serfs who inhabited them. All the serfs, not merely in a village, bourg, or _ city, but in whole districts, were liberated by charters of sovereigns or lords. Such documents are most common in the 13th century. The general edicts of Louis X. (1315) and Philip V. (1318) are little more than recognitions of a fait accompli, and were dictated, at least in part, by financial motives. Some relics of serfdom con- tinued to exist in local customs down to the Revolution, and were not abolished till the night of the 4th August 1789. But these survivals do not affect the truth of the proposition that the work of emancipation was essentially accomplished early in the 14th

} century. 4. Guérard has observed on the difficulty created by the ambiguity of the word servws in the mediwval authorities. In the study of

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English serfdom, even eminent writers like Robertson, Hallam, and Kemble have obscured the subject by the use of the term slave, sometimes in its proper sense, sometimes in relation to the serf. Dr Stubbs has avoided this equivocal nomenclature, and by

attending more to social fact than to the letter of the law has

_ placed the history of the class in a clear light.

The slaves of Anglo-Saxon times were " regarded as the stock of their owner;.. . their offences against a third person he must answer for, as for the

_ mischief done by his cattle; ... they had no credibility, no legal ' rights ; wrongs done to them were regarded as wrongs done to their

master." Practice, indeed, was kinder to them than legal theory ;

_ as in the case of the Roman peculium, they were "in some un-

explained way" allowed to keep their savings, and so to purchase

_ their freedom; and "the spiritual law could enforce a penance on

the master for ill-treating them." There were laws of Ethelbert

_ and Canute forbidding the sale of men to heathen masters, and the slave trade, the principal seat of which was Bristol, was put down

_ by the preachin

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. appeared altogether.

g of St Wulfstan. The villein of Domesday Book is not a slave; 'he represents the Anglo-Saxon ecorl; he is an irre- movable cultivator, now regarded as customary tenant of a lord. The Norman knights probably confounded with the villanus the bordarii and other tenants who stood on a less favorable footing, Whilst the free ceorl became a villein, the servus

(theow) dis- } The position which the class constituted by this fusion came to occupy was one “compatible with much personal comfort and some social ambition.” The villeins ‘‘ were safe in the possession of their homes; they had a remedy against the violence of their masters; they could, if they chose to renounce their holdings and take refuge in a town, become members of the guild, and there, when unclaimed for a year and a day, obtain the full rights of freemen; they could obtain manumission by the intervention of the church, which always proclaimed the liberation of the villein to be a work of merit on the part of the master… .

‘Under a fairly good lord, under a monastery or a college, the

villein enjoyed inimunities and security that might be envied by his superiors ; he had a ready tribunal for his wrongs, a voice in the management of his village; he might with a little contrivance redeem his children and start them in a higher state of life.” Walter Map declares that in his time (12th century) the villeins

_ Were educating their ignoble offspring in the liberal arts. In the

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carly part of the 14th century “it was by a mere legal form that the villeins were described as less than free.” In the reign of Richard IT. it seems that “the legal theory of their status has become hardened and sharpened so as to warrant almost wanton Oppression ;” but social causes, on the other hand, have ameliorated ee actual lot. It was not their normal condition that led to € msurrection of 1381, but the enforcement of jthe Statute of Labourers and the attempt of the lords to reassert legal claims which were practically obsolete. Serfdom died out in England without any special legislation againstit. It survived in exceptional instances, as in France; Hallam mentions as the latest deed of enfranchise- aaa one of Elizabeth in 1574 in favour of the bondmen on some ; a manors ; and it appears that in Scotland the workers in coal i” pi mines were in a state of serfdom until they were liberated i cts of the 15th and 39th years of the reign of George III. sscntially similar movements took place in the other countries

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of the West. In Italy “the 11th and 12th centuries,” says Hallam, “saw the number of slaves ” (by which word he means serfs) ‘‘ begin to decrease ; early in the 15th a writer quoted by Muratori speaks of them as no longer existing. ... The greater part,” he adds, “of

the peasants in some countries of Germany had acquired their Germany.

liberty before the end of the 13th century; in other parts… they remained in a sort of villenage till the present age.” The most rigorous forms of serfdom (Leibeigensehaft) existed in those German districts which were once Wendish,—as Lusatia, Pomerania, and Mecklenburg, —and in Holstein. The last remains of the system in Germany were abolished in 1832 and 1848. were slowly converted into solariegos, who cultivated the land of the lord under obligations similar to those of the colonus. Alphonso X. (El Sabio) declared that the solariego could quit lis holding when he wished, though he could not alienate it or demand anything for his improvements, Alphonso XI. (El Justiciero) decreed that no lord should take the solar (holding) from the tenant, nor from his sons or grandsons, so long as they paid the fixed dues. They thus became irremovable, and their tenures were hereditary.

By these gradual processes every form of servitude dis- appeared from the social order of western Europe, whilst at the same time was bequeathed to the modern world the inexorable problem, still but partially solved, of the definitive position of the classes whose origin is traceable to that condition.

But not very long after the disappearance of serfdom Modern in the most advanced communities comes into sight the slave new system of colonial slavery, which, instead of being the ‘”@4*

spontaneous outgrowth of social necessities and subserving a temporary need of human development, was politically as well as morally a monstrous aberration, and never pro- duced anything but evil. –

In 1442, when the Portuguese under Prince Henry the Spanish Navigator were exploring the Atlantic coast of Africa, one Colonies.

of his officers, Antam Gonsalves, who had captured some Moors, was directed by the prince to carry them back to Africa. He received from the Moors in exchange for them ten blacks and a quantity of gold dust. This excited the cupidity of his fellow-countrymen ; and they fitted out a large numbér of ships for the trade, and built several forts on the African coast. Many negroes were brought into Spain from these Portuguese settlements, and the colonial slave trade first appears in the form of the introduction into the newly-discovered western world of children or descendants of these negroes. When Ovando was sent out in 1502 as governor of Hispaniola, whilst regulations, destined to prove illusory, were made for the protection of the natives of the island, permission was given to carry to the colony negro slaves, born in Seville and other parts of Spain, who had been instructed in the Christian faith. It appears from a letter of Ovando in 1503 that there were at that time numbers of negroes in Hispaniola; he requested that no more might be per- mitted to be brought out. In 1510 and the following years King Ferdinand ordered a number of Africans to be sent to that colony for the working of the mines. Before this time Columbus had proposed an exchange of his Carib prisoners as slaves against live stock to be furnished to Hispaniola by Spanish merchants. Infidels,

“he represented, would thus be converted, the royal treasury

enriched by a duty on the slaves, and the colonists sup- plied with live stock free of expense. He actually sent home in the ships of Antonio Torres, in 1494, above 500 Indian prisoners taken in wars with the caciques, who, he suggested, might be sold as slaves at Seville. But, after a royal order had been issued for their sale, Queen Isabella, interested by what she had heard of the gentle and hos- pitable character of the natives and of their docility, pro- cured a letter to be written to Bishop Fonseca, the super- intendent of Indian affairs, suspending the order until inquiry should be made into the causes for which they had been made prisoners, and into the lawfulness of their sale. Theologians differed on the latter question, and XX{iI, — 18

In Castile the serfs Spain.

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Isabella directed that these Indians should be sent back to their native country, and that a policy of conciliation should be followed there instead of one of severity.

Bartolomé de las Casas, the celebrated bishop of Chiapa, accompanied Ovando to Hispaniola, and was a witness of the cruelties from which the Indians suffered under his administration. He came to Spain in 1517 to obtain measures in their favour, and he then made the suggestion to Charles that each Spanish resident in Hispaniola should have licence to import a dozen negro slaves. Las Casas, in his Historia de las Indias (lib. iii. cap. 101), frankly confesses the grave error into which he thus fell. ce is advice that licence should be given to bring negro slaves to these lands the clerigo Casas first gave, not consider- ing the injustice with which the Portuguese take them and make them slaves; which advice, after he had appre- hended the nature of the thing, he would not have given for all he had in the world." Other good men appear to have given similar advice about the same time, and, as has been shown, the practice was not absolutely new ; indeed the young king had in 1516, whilst still in Flanders, granted licences to his courtiers for the importation of negroes into the colonies, though Ximenes, as regent of Castile, by a decree of the same year forbade the practice. The suggestion of Las Casas was no doubt made on the ground that the negroes could, better than the Indians, bear the labour in the mines, which was rapidly exhaust- ing the numbers of the latter! He has sometimes on this plea been exonerated from all censure; but, as we have seen, he did not exculpate himself; and, though entitled to honour for the zeal and perseverance which he showed on behalf of the natives of the New World, he must in justice bear the blame due from posterity for his violation or neglect of moral principle. His advice was unfortunately adopted. ‘‘Charles," says Robertson, "granted a patent to one of his Flemish favourites, con- taining an exclusive right" of supplying 4000 negroes annually to Hispaniola, Cuba, Jamaica, and Porto Rico. "The favourite sold his patent to some Genoese mer- chants for 25,000 ducats"; these merchants obtained the slaves from the Portuguese; and thus was first brought into a systematic form that odious "commerce between Africa and America which has since been carried on to such an amazing extent," the action of the Spaniards being "imitated by all the nations of Europe who have acquired territories in the warmer climates of the New World."

The first Englishman who engaged in the hateful traffic was Captain John Hawkins (g.v.). The English slave traders were at first altogether occupied in supplying the Spanish settlements. Indeed the reign of Elizabeth passed without any English colony having been permanently established in America. But in 1620 a Dutch ship from the coast of Guinea visited Jamestown in Virginia, and sold a part of her cargo of negroes to the tobacco- planters. This was the first beginning of slavery in British America ; the number of negroes was afterwards continually increased— though apparently at first slowly—by importation, and the field- labour was more and more performed by servile hands, so that in 1790 the State of Virginia, which is only a small part of the original colony so named, contained 200,000 negroes.

The African trade of England was long in the hands of exclusive eompanies ; but by an Act of the first year of William and Mary it became free and open to all subjects of the crown. The African Company, however, continucd to exist, and obtained from time to time large parliamentary grants. By the treaty of Utrecht the asiento,? or contract for supplying the Spanish eolonies with 4800

1 The Spaniards, in the space of fifteen years subsequent to the discovery of the West Indies, had, as Robertson mentions, reduced the natives of Hispaniola from a million to 60,000.

2 The Spaniards were prevented from forming establishments on

the African coast by the Bull of Demarcation (‘‘Inter cetera”) of

Pope Alexander VI. (1493), which forbade their acquiring territory to the east of the meridian line of 100 miles west of the Azores. They could therefore supply their American possessions with slaves ouly by contracts with other powers.

negroes annually, which had previously passed from the Dutch to the French, was transferred to Great Britain ; an English company was to enjoy the monopoly for a period of thirty years from 1st May 1718. But the

contract came to an end in 1789, when the complaints of the English merchants on one side and of the Spanish officials on the other rose to such a height that Philip V. declared his determination to revoke the asiento, and Sir Robert Walpole was forced by popular feeling into war with Spain. Between 1680 and 1700 about 140,000 negroes were exported by the African Company, and 160,000 more by private adventurers, making a total of 300,000. Between 1700 and the end of 1786 as many as 610,000 were transported to Jamiaica alone, which had been an English possession since 1655. Bryan Edwards estimated the total import into all the British colonies of America and the West Indies from 1680 to 1786 at 2,130,000, being an annual average of 20,095. But this, he admits, is much less than was in his time commonly supposed. The British slave trade reached its utmost extension shortly before the War of American Independence, It was then carried on principally from Liverpool, but also from London, Bristol, and Lancaster ; the entire number of slave ships sailing from those ports was 192, and in them space was provided for the transport of 47,146 negroes. During the war the number decreased, but on its termination the trade immediately revived. When Edwards wrote (1791), the number of European factorics on the eoasts of Africa was 40; of these 14 were English, 3 French, 15 Dutch, 4 Portuguese, and 4 Danish. As correct a notion as can be obtained of the numbers annually cxported from the continent about the year 1790 by traders of the several European countries engaged in the traffic is supplied by the following statement :— "' By the British, 38,000; by the French, 20,000 ; by the Dutch, 4000; by the Dancs, 2000; by the Portuguese, 10,000; total 74,000." Thus more than half the trade was in British hands. '* At present," said Robertson, writing in 1791, ''the number of negro slaves in the settlements of Great Britain and France in the West Indies excecds a million; and, as the establishment of servitude has been found, both in ancient aud modern times, extremely unfavourable to population, it requires an annual im- portation of at least 58,000 to keep up the stock." The slaves in the Spanish dominions and in North America, he thought, probably amounted to an additional million. The hunting and stealing of human beings to make them slaves, Effects | which were already practised in Africa for the supply of the central the si states of that continent, as well as of the markets of northern trade, | Africa, Turkey, and other Mohammedan countries, were greatly aggravated by the demand of the European colonies, The native chiefs engaged in forays, sometimes

even on their own subjects, for the purpose of procuring slaves to be exchanged for Western com-) modities. They often set fire to a village by night and captured the inhabitants when trying to escape. “Thus all that was shock- | ing in the barbarism of Africa was multiplied and intensified by this foreign stimulation. To the miserics thus produccd, andto =| those suffered by the captives in their removal to the coast were added the horrors of the middle passage. Exclusive of the slaves who died before they sailed from Africa, 124 per cent. were lost during their passage to the West Indics; at J amaica 4% per cent. died whilst in the harbours or before the sale, and one-third more in the “seasoning.” Thus, out of every lot of 100 shipped from Africa 17 died in about 9 weeks, and not more than 50 lived to | be effective labourers in the islands. The circumstances of their subsequent life on the plantations were not favourable to the in- erease of their numbers. In Jamaica there were in 1690 40,000; from that year till 1820 there were imported 800,000; yet at the latter date there were only 840,000 in the island. One cause which prevented the natural increase of population was the in- equality in the numbers of the sexes ; in Jamaica alone there was in 1789 an excess of 30,000 males. It may be truly said that from the latter part of the Mov

17th century, when the nature of the slave trade began to seat be understood by the public, all that was best in England a i was adverse to it. Among those who denounced it— tmi besides some whose names are now little known, but are fn recorded with the honour they deserve in the pages of | Clarkson—were Baxter, Sir Richard Steele (in Jnhle and Yarico), the poets Southern (in Oroonoko), Pope, Thomson, Shenstone, Dyer, Savage, and above all Cowper (see his Charity, aud Task, bk. 2), Thomas Day (author of Sand- ford and Merton), Sterne, Warburton, Hutcheson, Beattie, John Wesley, Whitfield, Adam Smith, Millar, Robertson, Dr Johnson, Paley, Gregory, Gilbert Wakefield, Bishop Porteus, Dean Tucker. The question of the legal exist- ence of slavery in Great Britain and Ireland was raised in consequence of an opinion given in 1729 by York and Talbot, attorney-general and solicitor-general at the time,

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to the effect that a slave by coming into those countries from the West Indies did not become free, and might be com- pelled by his master to return to the plantations. Chief- Justice Holt had expressed a contrary opinion; and the matter was brought to a final issue by Mr Granville Sharp in the case of the negro Somerset. It was decided by Lord Mansfield, in the name of the whole bench, on June 22d 1772, that as soon as a slave set his foot on the soil of the British islands he became free. In 1776 it was moved in the House of Commons by David Hartley, son of the author of Observations on Man, that "the slave trade was contrary to the laws of God and the rights of men"; but this motion—the first which was made on the subject—failed ; public opinion on the question was far from being yet fully ripe.

The first persons in England who took united practical action against the slave trade were the Quakers, following the expression of sentiment which had emanated so early as 1671 from their founder George Fox. In 1727 they declared it to be "not a commendable or allowed" practice; in 1761 they excluded from their Society all who should be found concerned in it, and issued appeals to their members and the public against the system. In 1783 there was formed amongst them an association " for the relief and liberation of the negro slaves in the West Indies, and for the discouragement of the slave trade on the coast of Africa." This was the first society established in England for the purpose. The Quakers in America had taken action on the subject still earlier than those in England. The Pennsylvanian Quakers advised their members against the trade in 1696; in 1754 they issued to their brethren a strong dissuasive against encouraging itin any manner; in 1774 all persons concerned in the traffic, and in 1776 all slave holders who would not emancipate their slaves, were excluded from membership. The Quakers in the other American provinces followed the lead of their brethren in Pennsylvania. The individuals amongst the American Quakers who laboured most earnestly and indefatigably on behalf of the Africans were Jolin Woolman (1720-1773) and Anthony Benezet (1713-1784), the latter a son of a French Huguenot driven from France by the revocation of the edict of Nantes. The former confined his efforts chiefly to America and indeed to his coreligionists there; the latter sought, and not without a large measure of success, to found a universal propaganda in favour of abolition. A Pennsyl- vanian society was formed in 1774 by James Pemberton and Dr Benjamin

Rush, and in 1787 (after the war) was reconstructed on an enlarged basis under the presidency of Franklin. Other similar associations were founded about the same time in different parts of the United States. The next important movement took place in England. Dr Peckard, vice-chancellor of the university of Cam- bridge, who entertained strong convictions against the slave trade, proposed in 1785 as subject for a Latin prize dissertation the question, “An liceat invitos in servitutem dare.” Thomas Clarkson resolved to compete for the prize. Reading Anthony Benezet’s Historical Account of Guinea and other works in the course of his study of the Subject, he became so powerfully impressed with a sense of the vile and atrocious nature of the traffic that he ere long determined to devote his life to the work of its abolition, a resolution which he nobly kept. Tis essay, Which obtained the first prize, was translated into English man expanded form by its author, and published in 1786 with the title Hssay on the Slavery and Commerce of the Human Species. In the process of its publication he was brought into contact with several persons already deeply Interested in the question ; amongst others with Granville Sharp, William Dillwyn (an American by birth, who had

known Benezet), and the Rev. James Ramsay, who had lived nineteen years in St Christopher, and had published an Essay on the Treatment and Conversion of the African Slaves in the British Sugar Colonies. The distribution of Clarkson’s book led to his forming connexions with many persons of influence, and especially with William Wilber- force, who, having already occupied himself with the subject, went fully into the evidence bearing on it which Clarkson laid before him, aud, as the result of his inquiries, undertook the parliamentary conduct of the movement which was now decisively inaugurated. A committee was formed on 22d May 1787 for the abolition of the slave trade, under the presidency of Granville Sharp, which after twenty years of labour succeeded, with the help of eminent public men, in effecting the object ofits foundation, and thus removing a grave blot on the character of thie British nation, and mitigating one of the greatest evils that ever afflicted humanity. It is unquestionable that the principal motive power which originated and sustained their efforts was Christian principle and feeling. The most earnest and unremitting

exertions were made by the persons so associated in investigating facts and collecting evidence, in forming branch committees and procuring petitions, in the instruction of the public and in the infor- mation and support of those who pleaded the cause in parliament. To the original members were afterwards added several remarkable persons, amongst whom were Josiah Wedgwood, Bennet Langton (Dr Jolnson's friend), and, later, Zachary Macaulay, Henry Brougham, and James Stephen.

In consequence of the numerous petitions presented to parliament, a committee of privy council was appointed by the crown in 1788 to inquire concerning the slave trade ; and Mr Pitt moved that the House of Commons should early in the next session take the subject into con- sideration. Wilberforce's first motion for a committee of the whole House upon the question was made on 19th March 1789, and this committee proceeded to business on 12th May of the same year. After an admirable speech, Wilberforce laid on the table twelve resolutions which were intended as the basis of a future motion for the abolition of the trade. The discussion of these was postponed to the next session, and in 1790-91 evi- dence was taken upon them. At length, on 18th April of the latter year, a motion was made for the introduction of a bill to prevent the further importation of slaves into the British colonies in the West Indies. Opinion had been prejudiced by the insurrections in St Domingo and Martinique, and in the British island of Dominica; and the motion was defeated by 163 votes against 88. Legislative sanction was, however, given to the estab- lishment of the Sierra Leone Company, for the coloniza- tion of a district on the west coast of Africa and the discouragement of the slave trade there. It was hoped at the time that that place would become the centre from which the civilization of Africa would proceed; but this expectation was not fulfilled. On 2d April 1792 Wilber- force again moved that the trade ought to be abolished ; an amendment in favour of gradual abolition was carried, and it was finally resolved that the trade should cease on lst January 1796. When a similar motion was brought forward in the Lords the consideration of it was postponed to the following year, in order to give time for thie examination of witnesses by a committee of the House. A bill in the Commons in the following year to abolish that part of the trade by which British merchants supplied foreign settlements with slaves was lost on the third read- ing ; it was renewed in the Commons in 1794 and carried there, but defeated in the

Lords. Then followed several years during which efforts were made by the abolitionists

France.

in parliament with little success. But in 1806, Lord Grenville and Fox having come into power, a bill was passed in both Houses to put an end to the British slave trade for foreign supply, and to forbid the importation of slaves into the colonies won by the British arms in the course of the war. On 10th June of the same year Fox brought forward a resolution “that effectual measures should be taken for the abolition of the African slave trade in such a manner and at such a period as should be deemed advisable,” which was carried by a large majority. A similar resolution was successful in the House of Lords. A bill was then passed through both Houses forbidding the employment of any new vessel in the trade. Finally, in 1807, a bill was presented by Lord Grenville in the House of Lords providing for the abolition of the trade, was passed by a large majority, was then sent to the Commons (where it was moved by Lord Howick), was there amended and passed, and received the royal assent on 25th March. The bill enacted that no vessel should clear out for slaves from any port within the British dominions after lst May 1807, and that no slave should be landed in the colonies after 1st March 1808.

In 1807 the African Institution was formed, with the primary objects of keeping a vigilant watch on the slave traders and procuring, if possible, the abolition of the slave trade by the other European nations. It was also to be made an instrument for promoting the instruction of the negro races and diffusing information respecting the agricultural and commercial capabilities of the African continent.

The Act of 1807 was habitually violated, as the traders knew that, if one voyage in three was successful, they were abundantly remunerated for their losses. This state of things, it was plain, must continue as long as the trade was only a contraband commerce, involving merely pecu- niary penalties. Accordingly, in 1811, Brougham carried through parliament a bill declaring the traffic to be a felony punishable with transportation. Some years later

another Act was passed, making it a capital offence ; but this was afterwards repealed. The law of 1811 proved effectual, and brought the slave trade to an end so far as the British dominions were concerned. Mauritius, indeed, continued it for a time. That island, which had been ceded by France in 1810, three years after the aboli- tion, had special facilities for escaping observation in con- sequence of the proximity of the African coast; but it was soon obliged to conform.

The abolition of the French slave trade was preceded by stormy struggles and by many deplorable excesses. The western part of St Domingo, nominally belonging to Spain, had been occupied by buccaneers, who were recognized and supported by the French Government, and had been ceded to France at the peace of Ryswick in 1697. So vast was the annual importation of enslaved negroes into this colony before 1791 that the ratio of the blacks to the whites was as 16 to 1. In that year there were in Freneh St Domingo 480,000 blacks, 24,000 mulattoes, and only 30,000 whites. The French law for the regulation of slavery in the plantations, known as the Code Noir (framed under Louis XIV. in 1685), was humane in its spirit; but we are informed that its provisions were habitually disregarded by the planters, whilst the free mulattocs laboured under serious grievances and were exposed to irritating indignities. A “Société des Amis des Noirs” was formed in Paris.in 1788 for the abolition, not only of the slave trade, but of slavery itself. The president was Condorcet, and amongst the members were the Duc de la Rochefoucault, the Abbé Gregoire, Brissot, Clavitre, Pétion, and La Fayette; Mirabeau was an active sympathizer. The great motor of the parallel effort in England was the Christian spirit; in France it was the enthusiasm of humanity which was associated with the revolu- tionary movement. There were in 1789 a number of mulattoes in Paris, who had come from St Domingo to assert the rights of the poe of eolour in that colony before the national assembly. The

eclaration of the Rights of Man in August 1789 seemed to meet their claims, but in March 1790 the assembly, alarmed by rumours of the discontent and disaffection of the planters in St Domingo,

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passed a resolution that it had not been intended to comprehend the internal government of the colonies in the constitution framed for the mother country, and added that the assembly would not cause any innovation to be made, direetly or indirectly, in any system of commerce in which the colonies were already concerned, —a declaration which could only be interpreted as sanctioning the continuance of the slave trade. Vincent Ogé, one of the mulatto delegates in Paris, disgusted at the overthrow of the hopes of his race, returned to St Domingo, and on landing in October 1790 addressed a letter to the governor announcing his intention | of taking up arms on behalf of the mulattoes if their wrongs were not redressed. He rose accordingly with a few followers, but was soon defeated and foreed to take refuge in the Spanish part of the island. He was afterwards surrendered, tried, and sentenced to be broken on the wheel. When the news of this reached Paris, it created a strong feeling against the planters; and on the motion of the Abbé Gregoire it was resolved by the assembly on 15th May 1791 **that the people of colour resident in the French colonies, born of free parents, were entitled to, as of right, and should be allowed, the enjoyment of all the privileges of French citizens, and among others those of being eligible to seats both in the parochial and colonial assemblies." On the 23d August a rebellion of the negroes broke out in the northern province of St Domingo, and soon extended to the western province, where the mulattoes and blacks combined. Many enormities were com- mitted by the insurgents, and were avenged with scarcely inferior barbarity. The French assembly, alarmed by these scenes, and fearing the loss of the colony, repealed on 24th September the decree of the preceding May. This lamentable vacillation put an end to all hope of a reconciliation of parties in the island. Civil commissioners sent out from France quarrelled with the governor and called the revolted negroes to their assistance. The white inhabitants of Cape Frangois were massaered and the city in great part destroyed by fire. The planters now offered their allegiance to Great Britain; and an English force landed in the colony. But it was insufficient to encounter the hostility of the republican troops and the revolted negroes and miulattoes ; it suffered dread- fully from disease, and was obliged to evacuate the island in 1798. On the departure of the British the government remained in the hands of Toussaint l'Ouverture, the noblest type ever produced by the African race. Slavery had disappeared ; the blacks were employed as hired servants, receiving for their remuneration the third part

of the crops they raised ; and the population was rapidly rising in civilization and comfort. The whole island was now French, the Spanish portion having been ceded by the treaty of Basel. The wish of Toussaint was that St Domingo should enjoy a practical independence whilst recognizing the sovereignty and exclusive commercial rights of France. Of the violent and treacherous conduct of Bonaparte towards the island and its eminent chief we cannot here give an account ; the final issue was that the blacks drove from their soil the forces sent to subdue them, and founded a constitution of their own, which was more than once modified. There can be no doubt that the Government of the Restoration, in seeking to obtain possession of the island, had the intention of re-establishing slavery, and even of reopening the slave trade for the purpose of recruiting the diminished popu- lation. But Bonaparte abolished that trade during the Hundred Days, though he also failed to win back the people of St Domingo, or, as it was now called by its original name, Hayti, to obedience. The Bourbons, when again restored, could not reintroduce the slave trade; the notion of conquering the island had to be given up ; and its independence was formally recognized in 1825. Thus France lost her most important colonial possession, which had yielded produce to an amount almost as great as that of all the rest of the West Indies; and the negro race obtained its first and hitherto its only independent settlement outside the African con- tinent.

England had not been the first European power to Prog § abolish the slave trade ; that honour belongs to Denmark ; * a royal order was issued 16th May 1792 that the traffic on should cease in the Danish possessions from the end of 1802. The United States had in 1794 forbidden any participation by American subjects in the slave trade to foreign countries ; they now prohibited the importation of slaves from Africa into their own dominion. This Act was passed 2d March 1807; it did not, however, come into force till lst January 1808. At the congress of Vienna (opened November 1, 1814) the principle was acknowledged that the slave trade should be abolished as soon as possible; but the determination of the limit of time was reserved for separate negotiation between the powers. It had been provided in a treaty between France

and Great Britain, May 30, 1814, that no foreigner should

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in future introduce slaves into the French colonies, and that the trade should be absolutely interdicted to the French themselves after June 1, 1819. This postponement of abolition was dictated by the wish to introduce a fresh stock of slaves into Hayti, if that island should be recovered. Bonaparte, as we have seen, abolished the French slave trade during his brief restoration, and this abolition was confirmed at the second peace of Paris, November 20, 1815, but it was not effectually carried out by French legislation until March 1818. In January 1815 Portuguese subjects were prohibited from prosecut- ing the trade north of the equator, and the term after which the traffic should be everywhere unlawful was fixed to end on 21st January 18238, but was afterwards extended to February 1830; England paid £300,000 as a compensation to the Portuguese. A royal decree was issued on 10th December 1836 forbidding the export of slaves from any Portuguese possession. But this decree was often violated. It was agreed that the Spanish slave trade should come to an end in 1820, England paying to Spain an indemnification of £400,000. The Dutch trade was closed in 1814; the Swedish had been abolished in 1813. By the peace of Ghent, December 1814, the United States and England mutually bound themselves to do all in their power to extinguish the traffic. It was at once prohibited in several of the South American states when they acquired independence, as in La Plata, Vene- mela, and Chili. In 1831 and 1833 Great Britain entered into an arrangement with France for a mutual right of search within certain seas, to which most of the other powers acceded; and by the Ashburton treaty (1842) with the United States provision was made for the joint maintenance of squadrons on the west coast of Africa. By all these measures the slave trade, so far as it was carried on under the flags of European nations or for the supply of their colonies, ceased to exist.

Meantime another and more radical reform had been in preparation and was already in progress, namely, the abolition of slavery itself in the foreign possessions of the several states of Europe. When the English slave trade had been closed, it was found that the evils of the traffic, as still continued by several other nations, were greatly ageravated. In consequence of the

activity of the British cruisers the traders made great efforts to carry as many slaves as possible in every voyage, and practised atrocities to get rid of the slaves when capture was imminent. It was, besides, the interest of the cruisers, who shared the price of the captured slave-ship, rather to allow the slaves to be taken on board than to prevent their being shipped at all. Thrice as great a number of negroes as before, it was said, was exported from Africa, and two-thirds of these were murdered on the high seas. It was found also that the abolition of the British slave trade did not lead to an improved treatment of the negroes in the West Indies. The slaves were overworked now that fresh supplies were stopped, and their numbers rapidly decreased. In 1807 there were in the West Indies 800,000; in 1830 they were reduced to 700,000. It became more and more evident that the root of the evil could be reached only by abolishing slavery altogether. At the same time, by the discussions which had for years gone on throughout English society on the subject of the slave trade, men's consciences had been awakened to question the lawfulness of the whole system of things out of which that trade had taken its rise.

An appeal was made by Wilberforce in 1821 to Thomas Fowell Buxton to undertake the conduct of this new question in parliament. An anti-slavery society was established in 1823, the principal members of which, besides Wilberforce and Buxton, were Zachary Macaulay, Dr Lushington, and Lord Suffield. Buxton moved on

5th May of the same year that the House should take into con- sideration the state of slavery in the British colonies. The object

he and his associates had then in view was gradual abolition by establishing something like a system of serfdom for existing slaves, and passing at the same time a measure emancipating all their children born after acertain day. Canning carried against Buxton and his friends a motion to the effect that the desired ameliorations in the condition and treatment of the slaves should be recommended by the home Government to the colonial legislatures, and enforced only in case of their resistance, direct action being taken in the single instance of Trinidad, which, being a crown colony, had no legislature of its own. A well-conccived series of measures of re- form was

accordingly proposed to the colonial authorities. There- upon a general outcry was raised by the planters at the acquiescence of the Government in the principles of the anti-slavery party.

The example of Great Britain was gradually followed by the other European states, and some American ones had already taken action of the same kind. The immediate emancipation of the slaves in the French colonies was decreed by the Provisional Government of 1848. In 1858 it was enacted that every slave belonging to a Portuguese subject should be free in twenty ycars from that date, a system of tutelage being established in the meantime. This law came into operation on 29th April 1878, and the status of slavery was thenceforth illegal throughout the Portuguese possessions. The Dutch emancipated their slaves in 1863. Several of the Spanish Amcrican states, on declaring their independence, had adopted measures for the discontinuance of slavery within their limits. It was abolished by a decree of the Mexican republic on 15th September 1829. The Governinent of Buenos Ayres enacted that all children born to slaves after 31st January 1813 should be free; and in Colombia it was provided that those born after 16th July 1821 should be liberated on attain- ing their eighteenth year.

Three of the most important slave systems still re- mained in which no steps towards emancipation had been taken—those of the Southern United States, of Cuba, and of Brazil.

Slavery was far from being approved in principle by United the most eminent of the fathers of the American Union. States.

Washington in his will provided for the emancipation of his own slaves; he said to Jefferson that it was ‘‘among

his first wishes to see some plan adopted by which slavery in his country might be abolished by law,” and again he wrote that to this subject his own suffrage should never be wanting. John Adams declared his abhorrence of the practice of slaveholding, and said that “every measure of prudence ought to be assumed for the eventual total extirpation of slavery from the United States.” Frank- lin’s opinions we have already indicated; and

Madison, Hamilton, and Patrick Henry all reprobated the principle of the system. Jefferson declared that in the presence of the institution “he trembled for his country when he remembered that God was just.” The last-named states- man, at the first continental congress after the evacuation by the British forces, proposed a draft ordinance (lst March 1784) for the government of the territory—includ- ing the present Tennessee, Alabama, and Mississippi— ceded already or to be ceded by individual States to the United States ; and it was an article of this ordinance that “after the year 1800 there should be neither slavery nor involuntary servitude in any of the said States, otherwise than in punishment of crime.” This proviso, however, was lost. At the convention of Philadelphia in 1787, where the constitution was settled, the sentiments of the framers were against slavery ; but South Carolina and Georgia insisted on its recognition as a condition of their joining the Union, and even an engagement for the mutual rendition of fugitive slaves was embodied in the federal pact. The words “slave” and “slavery” were, however, excluded from the constitution, ‘‘ because,” as Madison says, “they did not choose to admit the right of property in man” in direct terms; and it was at the same time provided that Congress might interdict the foreign slave trade after the expiration of twenty years. It must not be forgotten that either before or soon after the formation of the Union the Northern States—beginning with Vermont in 1777, and ending with New Jersey in 1804—either abolished slavery or adopted measures to effect its gradual abolition within their boundaries. But the principal opera- tion of (at least) the latter change was simply to transfer Northern slaves to Southern markets.

We cannot follow in detail the several steps by which the slave power for a long time persistently increased its influence in the Union. The acquisition of Louisiana— including the State so named, Arkansas, Missouri, and Kansas—(1803), though not made in its interest, the Missouri compromise (1820), the annexation of Texas (1845), the Fugitive Slave Law (1850), the Kansas- Nebraska bill (1854), the Dred Scott decision (1856), the attempts to acquire Cuba (1854) and to reopen the foreign slave trade (1859-60), were the principal steps—only some of them successful—in its career of aggression. They roused a determined spirit of opposition, founded on deep-seated convictions. The pioneer of the more recent abolitionist movement was Benjamin Lundy (1789-1839). He was followed by William

Lloyd Garrison (1805-1879), Elijah P. Lovejoy (1802-1837)—a martyr, if ever there was one—Wendell Phillips, Charles Sumner, John Brown (b. 1800, hanged 1859), all of whom were in their several ways leading apostles or promoters of the cause. The best intellect of America outside the region of practical politics has been on the anti-slavery side. William E. Channing, R. W. Emerson, the poets Bryant, Longfellow, pre-eminently Whittier, and more recently Whitman, have spoken on this theme with no uncertain sound. The South, and its partisans in the North, made desperate efforts to prevent the free expression of opinion respecting the institution, and even the Christian churches in the slave States used their influence in favour of the main- tenance of slavery. Butin spite of every such effort opinion steadily grew. Publicsentiment in the North was

deeply stirred. by the Uncle Tom's Cabin of Mrs Harriet Beecher Stowe (1852), which, as Senior said, under the disguise of a novel was really a pamphlet against the Fugitive Slave Law. It gradually became apparent that the question could not be settled without an armed con- flict. The designation of Abraham Lincoln as president in November 1860 was the signal for the rising of the South, The North at first took arms simply to maintain the i Union ; but the far-sighted politicians from the first, and | | soon the whole nation, saw that the 'real !issue was the im continued existence or the total abolition of slavery. See 7 Unitep STATES.

The war was closed by the surrender at Appomattox (9th April 1865), but already in 1862 slavery in the ' Territories had been abolished by Congress; on 22d of September of the same year Lincoln had issued his pro- clamation of freedom to the slaves; and in 1864 a con- stitutional amendment had been passed abolishing and for ever prohibiting slavery throughout the United States.

The Spanish slave code, promulgated in 1789, is adinitted on Cuba, all hands to have been very humane in its charaeter ; and, in eon- sequence of this, after Trinidad had become an English possession, the anti-slavery party resisted—and_ suceessfully—the attempt of the planters (1811) to have the Spanish law in that island replaeed by the British. But, notwithstanding this mildness of the code, so habitually and glaringly were its provisions

violated in the colonies of Spain, that Dr R. R. Madden, who had personal | knowledge of the affairs of Cuba, declared in 1840 that ‘slavery in Cuba was more destructive to human life, more pernicious to society, degrading to the slave and debasing to the master, more | fatal to health and happiness, than in any other slaveholding country on the face of the habitable globe.” ‘‘It is in Cuba at

this day,” wrote Cairnes in 1862, ‘‘. . . that we see in the servile class the coarsest fare, the most exhausting and unremitting toil, and even the absolute destruction of a portion of its numbers every year by the slow torture of overwork and insufficient sleep ale | rest.” The slave population of the island was estimated in 1792 at 84,000; in 1817 at 179,000; in 1827 at 286,000; and in 1843 at 436,000. An Act was passed by the Spanish legislature in 1870, providing that every slave who had then passed, or should thercafter pass, the age of sixty should be at once free, and that all yet unborn children of slaves should also be free. The latter, however, were to be maintained at the expense of the proprietors up to their eighteenth year, and during that time to be kept, as apprentices, to such work as was suitable for their age. This is known as the Moret Law, having been carried through the house of representatives by Sefior Moret y Prendergast, then minister for the colonies. By the census of 1867 there was in Cuba a total popula- tion of 1,370,211 persons, of whom 764,750 were whites and 605, 461 black or coloured ; and of the latter number 225,938 were free and 379,523 were slaves. In 1873 the Cubans roughly estimated the population at 1,500,000,—of whom 500,000, or one-third, were slaves. Mr Crowe, consul-general in the island, has lately (1886) stated that “the institution is rapidly dying, —that in a year, or at most two, slavery, even in its present mild form, will be extinet,” There was a convention between Great Britain and Brazil m Broz 1826 for the abolition of the slave trade, but it was habitually violated in spite of the English cruisers. In 1830 the traffic was declared piracy by the emperor of Brazil. England asserted by the Aberdeen Act (1845) the right of seizing suspected craft in Bra- zilian waters. Yet by the connivance of the local administrative authorities 54,000 Africans continued to be annually imported. In 1850 the trade is said to have been decisively put down. The planters and mine proprietors cried out against this as a national calamity. The closing ofthe traffic made the labour of the slaves more severe, and led to the employment on the plantations of many

who before had been engaged in domestic work ; but the slavery of Brazil has always been lighter than that of the United States. On 28th September 1871 the Brazilian chambers deereed that slavery should be abolished throughout the empire. Though existing slaves were to remain slaves still, with the exception of those possessed by the Government, who were liberated by the Act, facilities for emancipation were given ; and it was provided that all children born of female slaves after the day on which the law passed should be free. They were, however, bound to serve the owners of their mothers for a term of 21 years. A clause was inserted to the effect that a certain sum should be anuually set aside from fines to aid each province in emancipating slaves by purchase. Seven years before the passing of this Act the emperor, whose influence has always been exerted in favour of freedom, had liberated his private slaves, and many Brazilians after 1871 followed his example. According to the census of 1835 there were then 12

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Brazil 2,100,000 slaves. It was estimated that at the beginning of 1875 there were not more than 1,476,567. But in 1884 they are spoken of as 3,000,000 in number. A gradual separation has been for some time taking place between the parts of the country in which slave labour is used and the frec-labour regions. Slavery is being concentrated in the districts between Maranhdo and Sao Paulo, In 1880 the deputy Joachim Nabuco, leader of the anti- slavery movement, obtained leave to introduce a bill for a more rapid liberation of slaves than was attainable under the law of 1871, and for the final extinction of slavery in Brazil by 1st January 1890, The Government, however, refused to sanction the further progress of the bill ; but the question has since become again of pre- sent political interest, being the prineipal subject of discussion in the parliament which opened Ist

March 1885. A bill has been passed, known as the Saraiva Law, on whieh we eannot yet form a definitive judgnient, but which is understood to have disappointed the expectations of the abolitionists. It is said to provide exorbitant compensation for the slave-owners ; and, although slaves over 60 years of age are to obtain their freedom, it appears that all slaves, on being set free, as well as the indentured children of slaves, are to remain three years longer with their masters at very low wages, the planters thus practically receiving an additional indemnity.

In the eolonies of more than one Huropean country, after the prohibition of the slave trade, attempts were made to replace it by a system of importing labourers of the inferior raees under contracts for a somewhat lengthened term; and this was in several instances found to degenerate into a sort of legalized slave traffic. About 1867 we began to hear of a system of this kind which was in operation between the South Sea Islands and New Caledonia and the white settlements in Fiji. It seems to have begun in really voluntary agrcements ; but for these the unscrupu- lous greed of the traders soon substituted methods of fraud and violence. The natives were decoyed into the labour ships under false pretences, and then detained by force ; or they were seized on shore or in their canoes and carried on board. ‘The nature of the engagements to go and work on the plantations was not fully explained to them, and they were hired for periods exceeding the legal term. The area of this trade was ere long further extended. In 1884 attention was drawn in a special degree to tlhe Queensland traffic in Pacific Islanders by the “ Hopeful” trials, and a Govern- ment commission was appointed to inquire into the methods followed by labour ships in recruiting the natives of New Guinea, the Louisiade Archipelago, and the D’Entrecasteaux group of islands. ‘The result of the investigations, during which nearly five hundred witnesses were examined, was the disclosure of a system which in treachery and atrocity was little inferior to the old African slave trade. These shameful deeds have made the islanders regard it as a duty to avenge their wrongs on any white men they can entice upon their shores, The noble-hearted bishop of Melanesia, John Coleridge Patteson, fell a victim to this retaliation on the island of Nukapu 20th September 1871. The tendency of the whole system is to ereate a war of races. It may be questioned whether this trade in labour can be safely continued at all; if so, it must be under a constant and vigorous system of surveillance and regulation.

We have seen that the last vestiges of the monstrous anomaly of modern colonial slavery are disappearing from all civilized states and their foreign possessions. It nowremainsto consider the slavery of primitive origin which has existed within recent times, or eon- tinues to exist, outside of the Western world.

In Russia, a country which had not the same historical ante- eedents with the Western nations, properly so called, and which is in fact more correctly classed as Eastern, whilst slavery had dis- appeared, serfdom was in force down to our own days. The rural population of that country, at the earliest period accessible to our Inquiries, consisted of (1) slaves, (2) free agricultural labourers, and (3) peasants proper, who were small farmers or ecottiers and members of a commune. The sources of slavery were there, as elsewhere, capture in war, voluntary sale by poor freemen of them- selves, sale of insolvent debtors, and the action of the law in certain erminal cases. In the 18th eentury we find the distinction between the three elasses named above effaced, and all of them merged in the class of serfs, who were the property either of the landed proprietors or of the state. They were not even adscripti glebe, though forbidden to migrate; an imperial ukase of 1721 says, “the proprietors sell their peasants and domestic servants, hot even in families, but one by one, like cattle.” This practice, at first tacitly sanctioned by the Government, which received dues on the sales, was at length formally recognized by several imperial ukases, Peter the Great imposed a poll-tax on all the members of a Tural population, making the proprietors responsible for the AX charged on their serfs ; and the ‘free wandering people ” who Me hot willing to enter the army were required to settle on the aud either as members of a commune or as serfs of some pro- He The system of serfdom attained its fullest development in

Ne reign of Catherine II. The serfs were bought, sold, and given

in presents, sometimes with the land, sometimes without it, some- times in families and sometimes individually, sale by public auction being alone forbidden, as ‘‘ unbecoming in a European state.” The proprietors could transport without trial their unruly serfs to Siberia or send them to the mines for life, and those who presented complaints against their masters were

punished with the knout and condemned to the mines. The first symptoms of a reaction appear in the reign of Paul (1796-1801). He issued an ukase that the serfs should not be foreed to work for their masters more than three days in each week. There were several feeble attempts at further reform, and even abortive projects of emancipation, from the commencement of the present century. But no decisive measures were taken before the accession of Alexander II. (1855). That emperor, after the Crimean War, created a secret committee eom- posed of the great officers of state, called the chief committee for peasant affairs, to study the subject of serf-emancipation. Of this body the grand-duke Constantine was an energetic member. To aecelerate the proceedings of the committee advantage was taken of the following ineident. In the Lithuanian provinces the relations of the masters and serfs were regulated in the time of Nicholas by what were ealled inventories. The nobles, dissatisfied with these, now sought to have them revised. The Government interpreted the application as implying a wish for the abolition of serfdom, and issued a reseript authorizing the formation of eommittees to pre- pare definite proposals for a gradual emancipation. A cireular was soon after sent to the governors and marshals of the nobility all over Russia proper, informing them of this desire of the Lithuanian nobles, and setting out the fundamental principles which should be observed ‘‘if the nobles of the provinces should express a similar desire.” Public opinion strongly favoured the projected reform; and even the masters who were opposed to it saw that, if the operation beeame necessary, it would be more safely for their interests intrusted to the nobles than to the bureaucracy. Accord- ingly during the year 1858 a committee was created in nearly every province in which serfdom existed. From the schemes prepared by these committees, a general plan had to be elaborated, and the Government appointed a special imperial commission for this purpose. The plan was formed, and, in spite of some opposition from the nobles, which was suppressed, it became law, and serf- dom was abolished (19th February = 8d March 1861). Its nature and results have been indicated in Russia, vol. xxi. p. 82. The total number of serfs belonging to proprietors at the time of the emancipation was 21,625,609, of whom 20,158,231 were peasant serfs and 1,467,378 domestic serfs. This number does not include the state serfs, who formed about one-half of the rural population. Their position had been better, asa rule, than that of the serfs on private estates ; it might indeed, Mr Wallace says, be regarded as ‘fan intermediate position between serfage and

freedom.” Amongst them were the serfs on the lands formerly belonging to the church, which had been secularized and transformed into state demesnes by Catherine IT. There were also serfs on the apanages affected to the use of the imperial family ; these amounted to nearly three and a half millions, Thus by the law of 1861 more than forty millions of serfs were emancipated.

The slavery of the Mohammedan East is usually not the slavery Moham- of the field but of the household. The slave is a member of the medan The Koran slavery.

family, and is treated with tenderness and affection. breathes a considerate and kindly spirit towards the class, and encourages manumission. The child of a slave girl by her master is born free, and the mother is usually raised to be a frec wife But behind this slavery, however mild in itself, stands the slave trade, with its systematic man-hunting, which has been, and still is, the curse of Africa. The traffic in slaves has becn repeatedly declared by the Ottoman Porte to be illegal throughout its dominions, and there have been several conventions between Great Britain and the khedive for its suppression in Egypt; but it is still largely car- ried on both in the latter country and in Turkey, owing to the laxity and too often the eomplieity of the Government officials,

In the days of the eolonial slave trade its African eentre was the Africa.

region about the mouths of the rivers Calabar and Bonny, whither the eaptive negroes were brought from great distances in the interior. As many slaves, Clarkson tells us, came annually from this part of the eoast as from all the rest of Africa besides, At present, it is commonly said,—though Cameron in 1875 was other- wise informed,—no slaves are exported from the westcrn side of the continent. The principal centres from which the supply is now furnished to Egypt, Turkey, Arabia, and Persia are three in number. (1) The Soudan, south of the Great Sahara, appears to be one vast hunting-ground. Captives are brought thence to the slave market of Kuka in Bornu, where, after being bought by dealers, they are, to the number of about 10,000 annually, marched over arid desert tracks under a burning sun to Murzuk in Fezzan, from which place they are distributed to the northern and eastern Mediterranean coasts. Their sufferings on the route are

dreadful; many succumb and are abandoned. Rohlfs informs us that ‘‘any one who did not know the way” by which the caravans pass “would only have to follow the bones which lie right and left of

the track.” Negroes are also brought to Morocco from the Western Soudan and from Timbuktu. The centre of the traffic in Morocco is Sidi Hamed ibn Musa, seven days’ journey south of Mogador, where a great yearly fair is held. The slaves are for- warded thence in gangs to different towus, especially to Morocco city, Fez, and Mequinez. About 4000 are thus annually im- ported, and an ad valorem duty is levied by the sultan, whieh produces about £4800 of annual revenue. The total number of negro slaves in Morocco appears to be about 50,000. (2) The basin of the Nile, extending to the great lakes, is another region infested by the slave trade; the slaves are either smuggled into Egypt or sent by the Red Sea to Turkey. The khedive Ismail in 1869 appointed Sir Samuel Baker to the command of a large force with which he was “to strike a direct blow at the slave trade in its distant nest.” The instructions in the firman issued to him were as follows :—‘‘T’o subdue to our authority the countries situated to the south of Gondokoro, to suppress the slave trade, to introduce a system of regular commerce, to open to navigation the great lakes of the equator, and to establish a chain of military stations and commercial depéts throughout Central Africa.” The work energetically commenced by him was continued by Colonel C. G. Gordon (1874 to 1879), but since the revolt of the Soudan, it is to be feared, no trace of his or of Baker’s work remains in the scene of their labours. The most effectual direct methods of deal- ing with the slave trade in the present territories of Egypt seem to be those suggested by the Anti-Slavery Society to Mr Gladstone’s Government in 1881—extended consular supervision, and a com- pulsory registration of all existing slaves. (3) There has long been a slave trade from the Portuguese possessions on the East African coast, The stream of supply came mainly from the southern Nyassa districts by three or four routes to Ibo, Mozambique, Angoche, and Kilimane. Madagascar and the Comoro Islands obtained most of their slaves from the Mozambique coast. It was believed in 1862 that about

19,000 passed every year from the Nyassa regions to Zanzibar, whence large supplies were drawn for the markets of Arabia and Persia up to 1873. The mission of Sir Bartle Frere to the sultan of Zanzibar in 1873 brought about a treaty

for the suppression of the slave trade, but it is to be feared that.

the cessation of the traffic from that port has not extinguished the traffic but has in part only given it a different direction, through Somali markets. In Madagascar, which had been supplied from the Mozambique coast, the import and sale of slaves were prohibited within the Hova dominions by Queen Ranavalona IJ. in June 1877. The rulers of the Comoro Islands, Mohilea and Anjuan (or Johanna), have signed treaties for the abolition of the status of slavery in their dominions after 1890, the fulfilment of which, however, it will probably be difficult to enforce. The stations established by the English universities in the valley of the Rovuma and by the Established and Free Churches of Scotland on Lake Nyassa doubtless contributed much to the diminution of the traffic in those parts. It is said that, whereas no less than 10,000 slaves formerly passed the southern end of the Nyassa every year, in 1876 not more than 38 were known to have been conveyed by that route. Lieutenant O'Neill, British consul at Mozambique, writing in 1880, fixed at about 3000 the number then annually exported from the coast between the rivers Rovuma and Zambesi. But since that date the traffic seems to have received a fresh impetus from an increased demand for ivory, the slave and ivory trades being "hand and glove." The Portuguese appear to be the most determined upholders of the evil system, and in consequence are everywhere detested by the natives.

There are other minor branches of the trade elsewhere in Africa. Thus from Harar in Somfli-land caravans are seut to Berbera on the coast, where there is a great annual fair. The slaves are collected from the inland Galla eountries, from Guragwe, and from Abyssinia.

Clarkson first, and Buxton afterwards, whilst they urged all other means for the suppression or discouragement of the slave trade and slavery, saw clearly that the only thoroughly effectual method would be the development of legitimate commerce in Africa itself. When Buxton published in 1840 his book cntitled The Slave Trade and its Remedy, this was the remedy he con-

templated. The unfortunate Niger expedition of 1841 was directed to similar ends ; and it has been more and more felt by all who were interested in the subject that here lies the radical solution of the great problem. It was for some time thought that from Sierra Leone as a centre industry and civilization might be diffused amongst the nations of the continent ; and in 1822 the colony (which in 1847 became the independent republic) of Liberia had been founded by Americans with a similar object ; but in neither case have these expeetations been fulfilled. A new, and it would seem really hopeful, effort for the same great end has recently been undertaken.

Leopold II., king of the Belgians, invited in September 1876 representative geographers to a conference in his palace, to discuss the question of the exploration and civilization of Africa through the development of commerce and the abolition of the slave trade.

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Six European nations were represented, and an International African Association was formed. Thecentral committee organized seven successive expeditions from the east coast to Lake Tanganyika. The exploration of the Congo by Stanley turned attention to the west coast, and he went out to the Congo in 1879 as commander. in-chief of the association, to open up that river. The association obtained, by treaties with the native chiefs, the cession of eertain territories. The recognition of its flag and its territorial rights by the European Powers has transformed the association into the Congo Free State. A conference was held at Berlin on 15th November 1884, attended by plenipotentiarics from all the European states, to regulate the position of the new state, and one of its declara- tions was that “these regions shall not be used as markets or routes of transit for the trade in slaves, no matter of what race ; each of these powers binds itself to use all the means at its disposal to put an end to this trade and to punish those engaged in it.” The terri- tory of the new state was fixed so as to comprise 1,065,200 square miles, with an estimated population of 42,608,000 souls. Stations have been built at points extending for nearly 1500 miles into the centre of Africa.

There are, it cannot be denied, real dangers connected with this great enterprise for the civilization of Africa. Disputes may arise between the powers having interests in the territories of the new state, and, still worse, the natives may be led to take sides in such disputes. That the African population should be sometimes op- pressed, or have justice denied them, by European traders or officials is by no means unlikely in the present state of opinion witli respect to our dutics towards the retarded races. Difficulties, too, may be created by the rivalries and mutual jealousies of the missionaries of the several Western communions. But, whilst foreseeing these possibilities and urging the necessity of guarding, as far as possible,

against the evils referred to, we ought not to view in a grudging or suspicious spirit an enterprise which is begun with pure intentions, and will probably do much to right the wrongs and improve the position of a deeply-injured portion of our race. The establishment

of the state will be no reason for the cessation of any effort which Western Governments can make, by the exercise of influence and by remonstrance, toinduce Turkey and Egypt to fulfil their engage- ments respecting the slave trade. The rulers of those states are well disposed to appropriate the results of more advanced eiviliza- tion ; and we need not bear of the disappearance in Mohammedan communities of slave-holding and its ally polygamy, since those practices are not enjoined, but only tolerated, by a religious code

which social progress will inevitably lead its adherents to modify by interpretation.

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relating to slavery and serfdom; but they are somewhat loose and uncritical; the author, too, repeats himself much, and dwells on many topics scarcely if at all con- nected with his main themes, The largest and most philosophical views on slavery generally will be found in Hume's Zssay " On the Populousness of Antient Nations," and in Comte's Philosophie Positive, vol. v., and Politique Positive, vol. tii. For its economic effects, when it is regarded as an organization of labour, reference may be had to Smith's Wealth of Nations, book iii, chap. 2, J. 5. Mill's Polétical Economy, book ii. chap. 5, and J. E. Cairnes's Slave Power, chap. 2. (J. K. 1.)

SLAVONIA. See CroaTIA AND SLAVONIA.

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CCORDING to the tables published by Boudilovich

in connexion with the adnuirable ethnological map

of Mirkovich (St Petersburg, 1875), the Slavs may be grouped geographically as follows :—

I. SourH-EasTErRN Division.—1. Russians.—(a) The Great Rus- sians (Velikorousskie), who occupy the governments round Moscow and extend as far north as Novgorod and Vologda, south to Kieff and Voronezh, east to Penza, Simbirsk, and Vyatka, and west to the Baltic provinces and Poland ; they number about 40,000,000. (2) The Little Russians (Malorossiane), who include the Rousines or Rousniaks in Galicia and the Boiki and Gouzouli in Bukovina ; they number 16,370,000. Drawing a straight line from Sandec near Cracow to the Asiatic frontier of Russia, we shall find their language the dominant tongue of Galicia and all the southern parts of Russia till we

come to the Caucasus. It is also spoken in a strip of territory in the north of Hungary. (c) The White Russians, inhabiting the western governments ; they number 4,000,000. _

9, Bulgarians, including those in Russia, Austria, Roumania, Bulgaria, eastern Roumelia, and those under Turkish government in Macedonia ; their total number is 5,123,592.

3. Servo-Croats, including those of Servia, Montenegro, the southern part of Hungary, and a few in the south of Russia ; they are returned as numbering 5,940,539. Here also may be placed the Slovenes, including those in Styria, Carinthia, and Carniola, amounting to 1,287,000.

II. WrstERN Division.—1. Poles, divided between Russia, Austria, and Prussia; they number 9,492,162; under this head may be included the Kashoubes near Dantzic, numbering 111,416.

2. Chekhs' and Moravians, 4,815,154 in number ; here also may be included the Slovaks, nunibering 2,223,820.

3. Lusatian Wends or Sorbs, Upper and Lower, partly in Saxony and partly in Prussia. The Upper Wends number. 96,000, the Lower 40,000.

Total number of Slavs in both divisions 89,499,683.

Originally the Slavs were spread over a great part of northern Germany, extending as far as Utrecht, which was

-anciently called Wiltaburg and was a city of the Wilzen.

Thus Slavonic was certainly spoken in Pomerania, Mecklen-

burg, Brandenburg, Saxony, west Bohemia, Lower Austria, |.

the greater part of Upper Austria, north Styria and north Carinthia, a large part of what is now Hungary, and in the localities now occupied by Kiel, Lttbeck, Magdeburg, Halle, Leipsic (= Lipsk, the city of lime-trees), Baireuth, Linz, Salzburg, Gratz (= Gradetz, Gorodetz), and Vienna. The names of the old Slavonic tribes originally settled in these parts of Germany

are given in Schafarik's Slawische Alterthiimer, to which work the reader desiring further information must be referred. They are mentioned frequently in such writers as Helmold, Dietmar, Arnold, Wittekind, and others. We hear of a commercial city of importance, which some writers have rather fantasti- cally termed the Slavonic Amsterdam, called Wolin, on an island of the same name, which was known as Winetha to the Germans and as Julin to the Danes. Schafarik even wished to see the Slavonic tribe of the Wilzen in English Wiltshire. This, however, cannot be accepted; the original name is Wilsetas and that of the town Wil- tun, the town on the river Wily. It has long been a generally received opinion that the modern Greeks have a large Slavonic admixture. This opinion was boldly asserted some years ago by Fallmerayer and has not been upset even by the labours of M. Sathas. He dwells much upon the form 2AuGyvor as distinct from ZKAaByvou ; but this corruption seems to be owing to some such false analogy as éc@dds. Miklosich, in his Mtymologisches Worterbuch der slavischen Sprachen (1886), considers the two forms to be identical. In like fashion Procopius connects Serbi with Zzdépo. and Constantine Porphyro- genitus turns Svatopluk into 2evddrAoxos. Mediaeval Greece, especially the Peloponnesus, abounded with Slavonic eee

1 This spelling has been adopted as best calculated to show the

prouunciation of the name Czech, in the same way as the French write the word Tchéque.

names, which are now being replaced by others drawn from classical sources. Kollar and Wolanski wished to find a Slavonic population in Italy; but their opinions are con- sidered the wild dreams of unscientific patriots, though these views found their way into such works as the Var- ronianus of Dr Donaldson, Equally unfounded appears to be the belief that a Slavonic element may be traced in Spain and Asia Minor. If the Slavs have lost in the west of Europe, they have gained in the east considerably, as Russia has encroached upon the Ugro-Finnish tribes of the northern and eastern portions of its empire, and many of these races are now in various stages of Russification.

As to the original home of the Slavonic race there are three leading opinions :—(1) the Slavs settled in Europe at a period contemporaneous with or

shortly after the arrival of the Teutonic and other Indo-European families ; (2) they first made their appearance in Europe with the Huns, Avars, and other Asiatic barbarians in the 3d cen- tury after Christ ; (3) they originated in Europe, as did the so-called Indo-European race altogether. This last view has been maintained by Penka? and Schrader? (see below).

The first of these views has been supported by Scha- farik. He considers that the Slavs left Asia in very early times for the following reasons :—(a) the fact that the Slavonic languages are more closely connected with Euro- pean tongues than with those of Asia, even granting the many aflinities of Slavonic with Zend or (as has been recently shown by Hiibschmann) with Armenian; (0) the similarity of the manners and customs of the Slavs to those of the Celts, Germans, and other European popu- lations ; (c) the occurrence of many mountains, rivers, and towns having Slavonic names which are mentioned long before the Slavs themselves are found in history; (d) the fact that the Slavs are always spoken of by the earlier writers in terms which show that these writers considered them to be an ancient European nation, and were struck with the large area over which their populations extended. Moreover, the arrival at a comparatively late period of such large hordes would have made a great impression upon the surrounding nations at the time, and this would certainly have found an echo in their historians and chroniclers,

Schafarik believes that the Slavs or Wends (as they were called by their Teutonic neighbours) were settled at a very early period on the southern coast of the Baltic. The word ‘‘ Wend” he connects with a Slavonic (voda) and Lithuanian (wandé) root meaning “water”; thus it would signify the people dwelling about the water. He appears to include under the Slavs all people bearing the name Wends, notably the Veneti on the Adriatic. Other writers, however, consider that the word was applied generally to any maritime people; and this view appears probable. The name also occurs in Switzerland. The Wends then, according to Schafarik, were the earliest inhabitants of the Baltic coast; but they were expelled by the Goths in the 4th century B.c. Nestor makes other tribes of Slavs to have been established at an early period on the Danube and to have been driven thence by the Vlachs, a people whom scholars are inclined to identify with the Latin colonists from whom in a great measure the modern Roumans are

descended. We find other tribes settled in the neighbour- hood of the Carpathians. The first historian who relates anything about the Slavs is probably Herodotus, whose account of the north of Europe is very vague. Among the Scythian tribes mentioned by him two have been

2 Origines Ariaew, Vienna, 1883. 3 Sprachvergleichung und Urgeschiehte, 1885.

Original home of

Slavs,

Scha- farik's view.

Classical accounts.

identified with the Slavs by Schafarik with consider- able probability,—the Budini and the Neuri. Of the former we are told that they were a large nation and had blue eyes and red hair. The description of the country they inhabited corresponds pretty closely to Volhynia and portions of White Russia. The Neuri are placed by Gchafarik on the river Bug, which flows through Podolia. There at the present day we find a river named Nureff, and the surrounding country is called Nurska. This opinion is supported by Schrader, who places the original home of the Slavs in Scythia. Pésche! goes so far as to consider the eastern part of Europe—especially that portion of Russia which constitutes the basin of the Pripet, the Beresina, and the Dnieper—as the primary abode of the Indo-European race. Dr Kurd von Schlézer interprets Herod. iv. § 6— the-story of Targitaus and his three children—as an allusion to the Slavs. The falling of a plough with its yoke from heaven would hardly be a characteristic tale of a nomad people. We seem to have an echo of the stories of the peasants Mikoula, Selianinovich, Piast, and P¥Yemysl, all dear to Slavonic legend. The view that the ancestors of the Slavs are to be found among the Scythian tribes has been supported in recent times by the Russian author Zabielin= He also thinks

that their original settlement was in Volhynia and White Russia. The specimens of the Scythian language which have come down in Herodotus and elsewhere can certainly best be explained by Indo- European roots. The name Slav does not occur in any writer before the time of Jordanes, unless it be in the Sravavol of Ptolemy. Jordanes says of them—'" quorum nomina licet nunc per varias fainilias et loca mutentur, principaliter tamen Sclavini et Antes." It is probably connected with the root slovo, "the word," which is related to the Greek xAvw (Slav. slit, "to be called"); and in a Polabish vocabulary we get the form slo. The Slav thus comes to mean "the intelligibly speaking man" in contrast to "the dumb man," Wiemetz, which in the modern Slavonic languages has come to mean simply "German." Miklosich (Etym. Worterb.) thinks that the termination -ene in Slovene shows the word to be derived from the name of a place and rejects the explanation from s/ovo. Some Slavonic scholars have sought an explanation of the name in the word slava, 66 glory."

Penka,® however, attempts to upset the ordinary ety- mology. According to him the Slavs are non-Aryan and belong rather to the Ugro-Finnish race. Their name, he tells us, shows that they were subjected by the Aryans and became their dependants. He considers it to be derived from the present participle of the root Adu ("to hear," Slav. sit), and thus identifies it with "client." The name Wend is used by Tacitus, who speaks of the Peucini, the Venedi, and the Fenni. Ptolemy also alludes to the Wendic mountains. He tells us that Sarmatia, 7c. all the terri- tory east of the Vistula and north of Dacia, was inhabited by widely scattered races and that the Wenede were established along the whole of the Wendish gulf. J ordanes calls them Winide. The other name, Antes, applied by this historian to the Slavs, which, like the word Wend, they never used themselves, Schafarik connects with a Gothic root. Duchinski, Henri Martin, and others have denied to the Russians the right of being called Aryan. Penka,' as stated before, carries this opinion much further and refuses the appellation to the whole Slavonic family. Finding that many of the Slavs have chestnut-coloured curly hair and dark eyes, that the White Russians are blond, that the southern Slavs are darker and have a shorter head

1 Die Arier, ein Beitrag zur historischen Anthropologie, Jena, 1878. 2 See, however, the arguments on the other side in the article ScYTHIA. 3 Op. cit.,

Pp. L2G. Oe, Gilkey 1, 15.

SLAVS

a very mixed race, and quotes Procopius® in support of his opinion.

The second of the opinions alluded to above has been Wocg, adopted by Wocel,® according to whom the Slavs in the view.

north of Germany on the Elbe, Moldau, Sale, Spree, as also those living south of the Danube, were not living in

juxtaposition in the Bronze Age, but wandered into those

regions some centuries after the birth of Christ. In proof of this assertion he cites many names of objects which are

common to the Slavonic languages and yet could not have —

been known to any people in the Bronze Period,—as, for example, iron (O.S. Zeleso),' objects made of iron, as scythe (O.8. kosa), chisel (O.S. dlato), tongs (O.S. klésta), knife (ni2), saw (pila), hoe (motyka), sword (meé), stirrup (st¥emen), spur (ostruha), needle (jehla), anchor (kotva). Common to all the Slavonic languages are the names for gold (zlato), silver (st¥ibro), copper (med), tin (olovo). All these words must have been formed while the Slavonic people dwelt together in a comparatively narrow space, — according to Wocel between the Baltic, the Vistula, and the Dnieper; otherwise, according to this author, if we suppose that the Lutitzes, Obotrites, Sorbs, and Chekhs were autochthonous, it is difficult to see how they could

have had the same names for many objects which did not

exist in the Bronze Age, ¢.g., iron, as the Slavs on the

Dnieper, the Balkans, and the Adriatic had. Wocel con-

siders the Slavs to have been a pastoral people who entered Europe through the passes of the Caucasus. He compares

the agricultural words which all branches of the family have in common, as ploug, “plough” (and also ralo);

lemesh, “ploughshare”; zhito, “corn”; pshenitze, “wheat”;

yechmen, “barley”; oves, “oats”; proso, “millet”; snop,

“sheaf.” On the other hand, as Wocel maintains, objects connected with civilization the knowledge of which only dates from the introduction of Christianity have not a common name in the Slavonic languages, such as “ paper,” “pavement,” “steel,” “velvet,” d&e. So also there is no common term for “property” or “inheritance,” for the simple reason that the Slavs knew nothing of private property,—the land being held in common under the care of the vladika or stareshina, as in the Servian zadrugas at the present day.

The condition of the original Slavs has also been investi- gated from the linguistic point of view by Gregor Kreck.* According to this writer, besides the cereals previously mentioned the Slavs cultivated the rape (repa), the pea (sochivo, grakh), the lentil (lenshta), the bean (406), the poppy (mak), hemp (konop), the leek (louk), d&e.; corm ground by a hand-mill or water-mill (zhrinows, malin) into meal (manka) and baked into bread (4hleb), honey (med)— the collection of which was an important occupation among the Slavs, as we find by the Polish laws—meat (menso), milk (mleko), and fruit (ovoshtiye) formed their food. The drinks were o/ and vino ®, beer and wine. Kreck considers that the minute details of house-building point to a habit of living in fixed residences,—thus the house (dom), the stable (lev), the threshing-floor (yowmno), the court (dvor), the village (ves). In opposition, however, to this view of Kreck we have the opinion of Hehn, who contends that all the words used among the Slavs for stone buildings

are borrowed, and seeks to prove that till comparatively eh en

5 Bell. Goth., iii, 14—“ ra be copara kal ras Kopas, ottre Neuxol és dyav % EavOol eiow, otre Ty és 7d wdhay abrois travTedOs TETPAMTAL; ANN brépvOpol elow, &mavres.”

6 Pravtk Zems Ceské (The Early Days of Bohemia), Prague, 1868. It is cited by Schrader, p. 90.

7 The words not specified as Old Slavonic are Bohemian.

8 Hinleitung in die slavische Litteratwr-Geschichte, Gratz, 1874 ; see Schrader, p. 92.

9 A word which some recent scholars Armenian origin.

are inclined to think of

recent times they had only huts made of osiers and led a half nomadic life. Certainly municipal institutions are no feature of Slavonic life, and the paucity of large towns in Russia is striking even at the present day. According to Kreck, words are to be found very early which show the development of the nation from the family. Thus the commune (obstchina, rod) becomes the family (plemya) and the family the people (narod, yenk). There are common terms for law (pravo pravda, “right”; zakon, “law”). Besides agricultural pursuits we have mention of the arts of braiding (plesti), weaving (¢katz), tailoring in a series of common expressions for portions of apparel, carpentering (tesati), working in iron, &c. Of the primitive Slavonic flora we have the oak (dowb), the lime tree (/ipa), the acorn (yavor), the beech (bouky), the willow (v7’ba), the birch (bréza), the pine (bor), as also special kinds of fruit, the apple (yabl’ko), the pear (grousha), the cherry (vshnya), the nut (orekh), and the plum (slva).

between the Transylvanian Alps and the Danube.2 From this place they migrated to the localities which they have since occupied, where they became mixed with the original settlers, to whom they gave their name, just as the German Franks imposed theirs on the Gauls, and a branch of the Slavonians took the Finnish name of their conquerors. (3) Serbs.—See Servia (vol. xxi. p. 688). The name “Croat” has been already explained under Servia (/.c.). (4) The Slovenes have preserved an old form of the

family name, and therefore no explanation is necessary. (5) Poles.—The first authentic date of their history is the year 963. Perhaps they are the Bulanes of Ptolemy. See PoLAND, vol. xix. p. 285. (6) Bohemians or Chekhs.— The word ‘“ Bohemia ”—“ home of the Boii,” a Celtic tribe — has nothing to do with the Slavs who came into the country about 495, after the Marcomanni, who had dis- possessed the Boii. The derivation of the name ‘“Chekh” or Czech has never been satisfactorily traced. Dobrovsky

tir Pictet placed the original home of the German and | sought to connect it with a word ¢ceti, signifying ‘to begin,”

ie. Litu-Slavic races on the northern bank of the Oxus. | and thus makes the name imply the original inhabitants. Thence he thought they came over the extensive plains | Schafarik, however, does not endorse this etymology.

_ of Scythia to the Pontus Euxinus. Perwolf*# connects it with a root ¢ak, “to beat,” and thus

The doctrine of the European origin of the Aryans | makes the name mean “the warriors.” Whatever the appears to be steadily gaining ground, It is supported | word “Chekh” may signify, it occurs, as Schafarik has by Professors Rhys and Sayce of Oxford. The last-named | shown, in other Slavonic countries. (7) Lusatian Wends ig inclined to see the home of the Indo-European race | or Sorbs.—The word “ Lusatia” (German Lausitz) is de- in “the district in the neighbourhood of the Baltic.” Dr | rived from the Slavonic Jug or luza, signifying a low, Ludwig Wilser! makes Sweden and the north German | marshy country. shores the centre of the primitive Aryans, from which the Germanic tribes, Celts, Latins, Greeks, Slavs, Lithuanians, SLavonic Lancuaces aND LITERATURES. Iranians, and the invaders of India gradually detached The first to attempt a classification of the Slavonic Classi- themselves, migrating mostly southwards and eastwards.? | languages was Dobrovsky,® who was followed by Schafarik fication

Leaving now the attempts to determine the primitive | and Schleicher. These agree in the main, except that® |

home of the Slavs and the date of their immigration into | Schafarik was so little acquainted with Bulgarian—at that teristics Europe, and also the names which they have in common, | time almost a lost langfage—that he grouped it with of lan- whether used by themselves or given by foreigners, we | Servian.6 The following are the characteristics of the two guages.

_ will trace as far as possible the derivation of the chief | divisions, which we take from Schafarik's account with

Naes appellations of the Slavonic peoples. (1) Russians.—For | some trifling omissions :—

ohe an analysis of this name see Russia (vol. xxi. p. 87 sq.). SourH-EssTErn, WESTERN.

“ie (2) Bulgarians.—By the 3d century we find Slavs settled (1) raz, razowm. rox, Town.

between the Danube and the Balkans. Immigrations were going on till the middle of the 7th century, as these hordes

(2) tz, tedati. wy, wydati. (8) korabl, zemlia,

korab, zemia. (4) pravilo, molitisa.

prawidlo, modirti se.

| were driven southwards by new invaders. About 681 the (5) mot, not. moc, noc. , Slavonic settlers fell under the yoke of the Bulgarians, a (6) zvieeda, tzvet. hwiexda, gwiazda, kwict.

Ugro-Finnish race, if we accept the views of Schafarik, (7) ago. ego, cho.

(8) omou, toj. emu, ten

Drinoff, and others. The origin of the Bulgarians them-

1 : This division, however, has been repeatedly challenged. Schleicher selves 18 obscure. Some have made them Tatars. Pro- | insisted upon the two following as important principles: (1) primi- fessor [lovaiski believes them to have been Slavs. The | tive Slavonic dj, tj become in all west Slavonic dialects dz, ts (=) ;

theory which connects the name “ Bulgarian,” “ Bolgare,” with the Volga is now no longer held. Early modifica- tions of the name, such as Burgari, Wurgari, &c., show its analogy with forms like Onoguri, Uturguri, Kutriguri. The elements of the word are bul and gart. Professor Vambéry attempts to derive the name from the Turkish verb bulga-mak, “to revolt”; but this seems little better than a guess, We are told that Koubrat, a Bulgarian prince, made himself independent of the Avars, and that on his

death his territories were divided among his five sons. The eldest remained in the ancient settlement on the Volga, where the ruins of their former capital, Bolgari, are still to be seen. The third son, Asparoukh, crossed the Dnieper and the Dniester, and settled in a place called Onklus, probably the Old Slavonic ongl, “ angulus,”

1 Die Herkunft der Deutschen: Neue Forschungen iiber Urgeschichte, Abstammung, und Verwandtschaftsverhdltnisse unseres Volkes, Carls- ruhe, 1885. PF See an interesting article in the American Nation (8d December

85), where it is shown that the first person to advocate this theory, which seems to be gaining ground among scholars, was Dr Latham, in

his edition of the Germania of Tacitus. This view was supported by Theodor Benfey in 1868.

among the Chekhs and Sorbs dz becomes at a later period z; (2) d, ¢ before 7, m are preserved in the western dialects, but disappear in the south-eastern. Upon this last canon Johannes Schmidt’ remarks as follows: “The dentals are preserved in Slovenish, certainly in the western part of its area; thus modlim in the Freisingian documents, in the perfect participles, as predel, bodel, pletel, cretel, fem. dla, tla, and in the suffix dlo, as kresadlo, motovidlo, Sidlo. D is also preserved in Slovenish before n, as omladnem, osladnem, zbodnem, padnem, kradnem. T, on the other hand, appears every-where to vanish before n, as obernem, ‘I go round.’” He also criticizes two of the principles of difference given by Schafarik. The nom. sing. masc. of pronouns appears in western Slavonic to be increased by , thus Chekh, Polish, Lower Sorb, éen ; Upper Sorbish, ton; Polabish, to; this, however, occurs in the Freisingian monu- ments, the earliest form of Slovenish, as fon. This n belongs to the stem, and is not a particle which has become fused with it ; ten, ton, original form ¢’n, correspond to the Old Prussian éans. The use of the preposition vi instead of iz is not a criterion ; vz is as much used in Russian as in west Slavonic, thus vtborni, “the

3 See Drinoff’s ‘‘Settlement of the Balkan Peninsula by the Slavs” (Zaselenie Balkanskago Poluostrova Slavyanami), Moscow, 1873.

4 Arch. f. slaw. Phil., vii. 622.

5 Institutiones Lingue Slavice Veteris Dialecti, Vienna, 1822.

8 Geschichte der slawischen Sprache und Literatur nach allen Mundarten, Pesth, 1826, p. 32.

7 Zur Geschichte des Indo-Germanischen Vocalismus, part ii. p. 178, Vienna, 1871-75.

Litu- Slavic Jan- guages,

village deputy”; there are traces of it in Slovenish ; it is only in Bulgarian and Servian that it is entirely wanting. The principle laid down that mot, noé represent a south-eastern variation and moc, noe a western is far from being universally true ; in Servian we have tsrn, “black,” as against Bohemian ¢éerny, Russian chérni. Compare too Servian ¢sesta, “a road,” also Slovenish, with Chekh éesta.

Schmidt gives a completely new table of differences, illustrating them by the accom- A panying diagram. Casting aside some of the distinguishing marks __ previously adopted, he makes great use of the phonetic law found in the Slavonic lan- guages which will be explained shortly. Thereader willeasily identify the divi- sions of the circle to which the rules refer. (1) dj, tj be- come among the western Slavs dz, ts (=e). (2) d, ¢ dis- appear before 7 and a n among the Russians, Little Russians, Bulgarians, Serbs, and Croats, but are preserved by the Slovenes, with the exce tion of tu, and by the western Slavs. (3) vt is not used by the Bulgarians, Serbs, and Croats, but is kept by the Slovenes, Russians, and western Slavs. (4) (a) ere by svarabhakti’ became ré at an early period among the southern Slavs and Chekhs, but is preserved in its original form among the rest. It became reat a later period among the Poles, Polabes, and Sorbs. (0) ele became le not only among the southern Slavs and Chekhs but also among the Polabes. Among the Poles and Sorbs ele and the cognate olo became simplified into le and lo. (e) &ré&? in inlaut became ra among the southern Slavs and Chekhs. As in early times the Chekhs and southern Slavs were in close connexion with the Poles and Sorbs, the mutation developed among them ; thus Polish straz with stroz, Upper Sorbish straza with stroza, Polish and

Upper Sorbish, trapie. (d) dla in inlaut became la not only among the southern Slavs and Chekhs but also among the Polabes. This contraction spread over a wider region than that of ard into ra. That the Polish also adopted it is shown by the form piazie’ sig compared with ptozté sig.

Various opinions have been held as to what languages are to be considered the closest congeners of the Slavonic branch. That they stand in intimate relations to Lithuanian and Lettish has long been agreed ; and as a convenient classification it is customary to speak of them together as the Litu-Slavic family. In Russia there are 1,900,000 Lithuanians (including the Samogitians or Zhmudes). There are also 1,100,000 Letts. The rest of the Lithuanians, numbering 146,312, are in Eastern Prussia, commencing not far from Konigsberg and extending along the shores of the Kurisches Haff, The Lithuanian language in many respects exhibits an earlier type than the Slavonic. It has preserved the s of the nominative singular, as in Sanskrit ; but, on the other hand, the verb exhibits a much poorer form. As Leskien truly remarks,? ‘‘it has degener- ated most remarkably in its conjugation, and in this respect is far inferior to the oldest known Slavonic.” He adds that Lithuanian is of primary importance in the comparative treatment of the Slavonic languages. Very closely connected with Lithuanian was Old Prussian, which died out in the 16th century ; the remains which have come down to us belong to the 15th and 16th centuries. Old Prussian extended from the lower Vistula (from Thorn down- wards) to the Niemen. The exact course of the boundary-line which separated it from Lithuanian can only be approximately deter- mined by historical arguments. Leskien has proposed ‘‘ Baltic” as a generic name for Lithuanian, Lettish, and Prussian. The general opinion of philologists is that Litu-Slavic is most closely connected with the Germanic branch of the Indo-European family. Jacob Grimm was the first to assert this. Hiibschmann has shown that Slavonic has affinities with Armenian, and he seeks to make the latter language a link between the European and Asiatic branches of this family. Kuhn‘ writes, “The Slavonic languages remained a longer time in close connexion with the Indian or more probably with the Zend and Persian than with the remaining Indo-

i inn nh a eT

1 This is the name given by the Indian grammarians to the vowel developed between the liquids J and r and the consonant with which they come into con- tact, as vias, volos. It has been called in Russian polnoglasie, and in Greek dvdmrvis. It means in Sanskrit “ voice-breaking.” It isa marked feature in the Slavonic languages.

2 This is the way adopted by Schmidt to express the unaccented Slavonic 0, which is pronounced a; the form is taken from Swedish.

3 Proc. Phil. Soc., 1877, p. 49.

4 Zur diltesten Gesch. d. indog. Volker, Berlin, 1845, p. 324.

SLAVS

European languages.” Bopp regards the separation of the Litu. Slavic languages as having taken place before the division of the Asiatic branch of the family into Indian and Iranian.

If we examine the Old or Paleo-Slavonic,° the oldest known form Old of the Slavonic languages, we may note the following characteristics$ Slayonj, It has the vowels a, é, t, 0, u, 7, a guttural 7, a short ¢ sometimes – pronounced as ya, and the semi-mutes % and @ It has also two nasals equivalent to the French zn and on, now only found in Polish and Kashoubish, and in some of the Bulgarian dialects ; traces of them, however, occur in Slovenish aud in the words which Magyar has borrowed from Slovenish.

The Aryan diphthongs have been contracted to single vowels and General the hiatus is frequently avoided by the interposition of j (= Eng, char.: | y) or v, both of which constantly occur at the beginning of wont acteris. | which formerly commenced with a vowel. The addition of a y ties of sound before vowels is one of the great characteristics of the Slavonic Slavonic languages, called “ preiotization”’; and the inability to mark this tongues distinctly is one of the deficiencies of the Cyrillic alphabet. It is also worthy of note that in the provincial dialects v is frequently put before vowels, as by the lower classes in Bohemia and Russia. The Aryan aspirates gh, dh, bh have been changed into the simple

explosives g, d, b; on the other hand, a number of fricatives have been, developed, as sh, z, and the French j—all unknown to the common Aryan—and & is frequently changed to the palatal ch, Servo-Croatian, Slovenish, Slovakish, and Bohemian possess the vocal 7, while the vocal 7 is found in both Bohemian and Slovakish. The latter has also 7 and r, both short and long.

As regards grammar, the following peculiarities of the Slavonic family may be noted. A trace of the article exists in the adjectival termination, as in velék-i; but this has been forgotten, and attempts have been made to supply it in the use of the demonstrative pro- noun in Sorbish, which appears to have been used in the more corrupt stages of Slovenish also, but has been expelled since the regeneration of the language. Primus Truber, who translated the New Testament into Slovenish in the 16th century, was not free from this vice.

The languages being in @ high state of synthesis, the nouns and adjectives are fully declined, having three genders and seven cases, —the nominative, genitive, dative, accusative, vocative, instru- mental, and prepositional. Sorbish and Slovenish have the dual number in both nouns and verbs. More of the numerals are de- | clined than in most Aryan languages. The verbs have the so-called)

Fons e.g., the iterative, perfect, imperfect, &c., whereby very delicate shades of meaning are expressed, and this partly atones for the poverty of tenses in some of them: Russian, for example, has only one past tense, which is inflected according to gender, having been originally a past participle. Traces of these verbal aspects have been ceeded in Celtic and in Greek.

We now proceed to classify the Slavonic languages according to their dialects. The following table has been adapted (in the main) from the valuable Russian History of Slavonie Literatures by Pipin and Spasovich.

SourH-EASTERN BraNncu.—Russian.—(1) Great Russian : Mos- cow, Novgorod and northern, Siberian, and central Russian. (2) Little Russian : eastern, western (sometimes called Red Russian), and Carpathian. (3) White Russian. Bulgarian.—(1) Old Bul- garian (the ecclesiastical language ; see

below). (2) Modern Bul- garian : Upper Mesian, Lower Meesian, and Macedonian. Servo- Croatian and Slovenish.—(1) Servo-Croatian : southern or Herzego- vinian, Syrmian, Resanian, and language of the coast or Dalinatian. (2) Slovenish: dialects of Upper, Middle, and Lower Carniola, Styrian, Ugro-Slovenish, Resanian, and Croato-Slovenish.

‘WESTERN BraNcu.—(1) Polish: Masovian or Mazurian, Great Polish, Silesian, and Kashoubish. (2) Bohemian : Chekish, Mor- avian, and Slovakish. (3) Lusatian Wendish or Sorbish : Upper Lusatian and Lower Lusatian. (4) Polabish (extinct).

South-Eastern Braneh.

Russian Dialects. —These as yet have rarcly been scientifically Russ! treated ; but that can hardly be a ground of complaint against the Russian people, as our own are only just beginning to be properly studied. The work entitled Optt Oblastnago Velikorousskago Slovara (Attempt at a Provincial Dictionary of the Great Russian Lan- guage), published at St Petersburg in 1852, can, as its name imphies, only be regarded as tentative : it is no more a scientific production than is Halliwell’s Provineial Dictionary of English. Traces of Ugro- Finnish words and idioms occur in the northern and eastern dialects, but their importance has been much exaggerated. Whitney’s theory that the Russian verb has been modified by Ugro-Finnish, influence claims attention. Some have supposed that the origin of the svarabhakti is to be traced to it; it occurs, however, m Little Russian and the western languages, as previously sliown. | It is much more frequent in Russian than in any other Slavonic lan- guage, and is even more developed in its dialects.? An account

Sa

5 Sometimes called ‘the church language.”

6 See Hovelacque, Science of Language, p. 280, London, 1877. __

7 The quaint little English-Russian vocabulary compiled by Richard James in Russia at the beginning of the 16th century, and still preserved in manu:

of Russian literature is given under Russi, vol. xxi. p. 102 sq. Siberian Russian is spoken by the descendauts of prisoners and convicts who have settled in that vast tract of northern Asia since Yermak conquered it for Ivan the Terrible. Specimens of it are occasionally quoted in the letters of Kiichelbecker, the Decabrist, and other exiles. Little Russian is spoken in all the southern governments of Russia. As current in Galicia and Bukovina it is called Red Russian ; an interesting variety is the Gouzoulian dialect in which Fedkovich composed his poems (see RussIA, vol. xxi. p. 110). Mention has already been made of the same language as spoken in Hungary.' There is a good grammar by Osadtza, a pupil of Miklosich. The latter justly regards it as a language and notadialect. Till quite recently there were very poor aids by way of lexicons: of the Dewtsch-Ruthenisches Handwérterbuch by Professor Partitzki of Lemberg the Ruthenish-German portion never ap- peared ; the vocabularies of Piskunoff and Verkhratzki are but frag- mentary. A gooddictionary, however, is now in course of publica- tion by Professor Zelechowski of Stanislau, which promises to be all that could be desired. The orthography of Malo or Little Russian is not yet settled. A peculiar type is used for some of the books issued at Lemberg, especially the excellent Chitanka (Reading Book) of Alexander Barvinski. An altogether whimsical orthography was adopted by Hatzouk in his Ouzhinok Ridnogo Pola (Gleanings from a Native Field), which appeared at Moscow in 1857.

The following are some of the chief characteristics which mark off the Little from the Great Russian language. The G.R. ze passes into 7, as povist=~poviest, L.R. richka=G.R. ricchka ; 0 undergoes the same mutation, especially in monosyllables, L.R. pid=G.R. pod, L.R. kin=G.R. kon, L.R. vivsa=G.R. ovsa, where we may note the tendency to put v before the initial vowel already alluded to. The Russian ow is changed into L.R. v, and vice versa, thus vmirayou=G.R. owmirayou ; ouchora, on the other hand, is G.R. vchera, The Russian g is pronounced 4; the strong ¢ (Polish 2) is changed (especially at the end of a word or before other consonants) into v or ou, thus G.R. pisal, L.R. pisaow. The Russian ¢ is want- ing, and L.R. changes the Old Slavonic & and g into ch and French j oftener than Russian does. In the conjugations and declensions Little very much resembles Great

Russian. It has, however, like Polish, lost the present participle passive, which is retained in Russian, and it possesses infinitive forms with diminutive mean- ings. Moreover, the accent differs considerably from Russian. The peculiarities of the Little Russian spoken in the north of Hungary are fully treated by De Vollant in his Owgro-Rousskia Narodnia Piesnt (Ugro-Russian Popular Songs), St Petersburg, 1885.

White Russian abounds with Polonisms, and in its orthography expresses the unaccented Russian o as a, which is in accordance with the pronunciation ; thus we have starana for storona, kago for kogo. Asin Malo-Russian, g is pronounced h, as aharod, “a garden” ; gutturals are softened before 7e, as na routzie, “onthe hand.” The

Slavonic to be Old Servian, afterwards an early language out of which both Servian and Bulgarian were formed. Vostokoff was nearer the truth when he discovered elements of Old Slovenish.

The views held by scholars with regard to the country from which the Palzo-Slavonic, as preserved to us, has come may be briefly stated as follows. (1) It is Old Bulgarian. This opinion has been held by Schleicher, Schafarik, J. Schinidt, and Leskien. In the latter part of his life Schafarik? appears to have somewhat modified his views and to have looked upon it as a mixture of Bulgarian and Slovenish. (2) It is Old Slovenish, ¢.¢., the older form of the langnage now spoken in Styria, Carinthia, and a part of southern Hungary. This opinion was first held by Kopitar and afterwards by his pupil Miklosich. Among its supporters may also be mentioned Danichich and Jagi¢. (8) Geitler,? now a professor at Agram, leans to the theory that the Russian language is a much earlier form of Slavonic than Old Slovenish. The case for Old Slovenish is clearly put by Miklosich4 as follows :—

“So far as the linguistic grounds of the Bulgarian hypothesis are concerned, it is undoubtedly true that Old Slovenish [Palezo-Slavonic] agrees with a dialect of Bulgarian with regard to the combinations st, 3d, whereas the Carinthian (Carantanian) Slovenish employs generally % and j ; but how do we know that the Pannonian Slovenes pronounced é and not §d, j and not #d? The Hun- garian mostoha (pr. moshtoha), pest (pr. pesht), and palast

(palasht) for the Old Slovenish maateha, pest, and plast, and rozsda (pr. rozhda) for the Old Slovenish rida, postulate the existence of § and 2d in the dialect of the Pannonian Slovenes. The nasalized sylables (to express the Old Slavonic nasals) in (modern) Sloven- ish and in the oldest loan words in Magyar from Slavonic separate the language from which these words are borrowed from Bulgarian.5 Let us also consider the following fact: Modern Bulgarian is more unlike Paleo-Slavonic than any other language of the eastern branch. Perhaps it may be observed with refer- euce to this that these corruptions have only crept in during the last centuries. But the language of the Tale of the Trojan War (of date 1350) is already Bul- garian, and, whatever may be said to the contrary, Modern Bulgarian. In the same stage of vocalic corruption is the Gospel of Trnov (Tirnova), which belongs to the year 1273. And does not the same remark hold good of the Psalter of Bologna, of the date 1186-1196? A Bulgarian language identical with Paleo- Slavonic fades from our eyes like a fata morgana however far we follow it." The same author considers that even before the 9th century the Slavonic languages were separated as they are to-day. The most able exponent of the Old Bulgarian theory, Schleicher, writes as follows :—

'The proofs which Kopitar and Miklosich have brought forward in support of their opinion appear capable of being overthrown, while facts speak irresistibly for the opposite opinion that churcu Slavonic was the language of the Old Bulgarians, especially the.softening of original Aryan ¢ and d into sht and zhd. And besides linguistic there are also historical grounds. Cyril arid his Slavonic fellow-workers were Bulgarians.6 Why, then, should they not have written in

their own language, especially since they found no written language among the other Slavs?"

Schleicher asks, "How came the Bulgarisms in the Codex Sup- rasliensis [see below], which, according to the opinion of Miklosich, was written 'in ipsa lingue paleoslovenice patria'?" Hesums up: "We therefore hold the language which we regard in this work? as alone the oldest to be Old Bulgarian." Schleicher appears to the present writer to have the best of the argument.

Modern Bulgaria embraces ancient Meesia, Thrace, and Mace- Modern donia ; the Danube separates it from Roumania ; on the west it has Bul- Servian, on the south-west Albanian, and on the south Greek, which garian.

collection of poems published at Vilna in 1844, entitled Piosnki Wie sniacze (Rustic Songs), in what is called the Krevichian dialect,

isinreality White Russian. There isa good White Russian diction- ary by Nosovich.

Bulgarian.—Connected with the Bulgarian division is the diffi- cult question as to which of the Slavonic languages, ancient or modern, exhibits the earliest form. The original tongue is, of course, lost, and only an elder sister remains, but to which language shall that title be assigned? In the early days of Slavonic philology many curious ideas prevailed on this point. According to the old- fashioned views the church language was the old and stately mother- tongue from which all the living dialects had sprung, Russians considered it to be Old Russian, Serbs Old Servian, and those who used the Glagolitic ritual held it to be Old Croatian. These opinions Were very natural. The fragments of the Old Slovenish language had not yet been found at Freising, and the only accessible manu- scripts in the infantine state of the study of Slavistic were recent ones, in which Russian, Servian, and Croatian forms were mixed. The Russians had forgotten many of their historical traditions dur- ing their long servitude under the Mongols, and the same was the case with the Serbs and Bulgarians under the yoke of the Turks.

he names of Cyril and Methodius were hardly remembered. The two precursors of Dobrovsky, but of inferior intellectual calibre, Were the Bohemian Fort. Durich (1738-1802), who was the first to have sound views on the relations of Old Slavonic to the later lan- stages, and the Russian Kalaidovich (1792-1832), who threw con- siderable light on the question by his edition of the works of John, the exarch of Bulgaria. He, however, considered the Paleo-Slavonic to be Old Moravian. But the foundation of Slavonic scholarship was laid by Dobrovsky (1753-1829) and Vostokoff (1781-1864) ; the former treated the subject scientifically in his Institutiones Lingux Slavices Dialecti Veteris (Vienna, 1822), and the latter

edited the Ostromir Coden, a Paleo-Slavonic manuscript of the Gospels, written in Russia in the 11th century. Dobrovsky at first considered Palo-

script in the Bodleian,

y gives some interesting examples; thus for modern Ussian sram, ‘ shame,”

he gives sorom, &c.

Mis An excellent map of this district is given in the Slavianskt Sbornik (Slavonic:

ceHany), vol. ii.

begins to prevail from a line drawn from Salonica to Constantinople. Its area is dotted by Turkish colonies—the Turks, however, are now fast emigrating—and there is a considerable admixture of Greeks. Modern Bulgarian is a very corrupt form of Slavonic. The vocabu- lary, to begin with, is full of Turkish words. The wonder is that the language did not altogether disappear. It uses the Slavonic demonstrative pronoun as an article, which is placed at the end of words, as in Rouman, Albanian, and the Scandinavian languages. The cases are very defective, and are mostly expressed by preposi- tions. There is no regular form of the infinitive, for which a peri- phrasis is used. The language has only been resuscitated of late years. An American missionary named Riggs published a sketch of the grammar and a short vocabulary. In 1852 the brothers Tzankott compiled a grammar in which Latin letters were employed. There are other grammars in Bulgarian by Momchiloff and Grouyeff. A dictionary (Bulgarian-French) has since been published by Bogo- roff, and there are indications that the language will be scientifi- cally treated, to judge by some excellent papers in the Archiv fiir slawische Philologic. From these we learn that in the Bulgarian dialects the nouns are much more fully inflected, and traces of nasals are found. The Upper Meesian dialect is also called the Shopsko narcchie or dialect of the Shopi. Jireéek says that these Shopi differ very much in language, dress, and habits from the other Bulgarians, who regard them as simple folk. Their name he connects with the old Thracian tribe of the Sapei. Those Bul- garians who have embraced Islam are called Pomaks, —a word of which no satisfactory derivation has been given.

2 Ueber den Ursprung und die Heimath des Glagolitismus, Prague, 1858.

3 See his Starobulharska Fonologie se stdlym z¥etelem k Jazyku Litevskemu (Old Bulgarian ih gs in Relation to Lithuanian), Prague, 1873.

4 Altslovenische Formenlehre in Paradigmen, Vienna, 1874.

5 But, as previously stated, nasals have been found in Bulgarian dialects.

6 This is rather strongly stated. They are said to have been of Greek origin, but had probably become thoroughly Bulgarized ; yet the argument used by Schleicher remains quite as strong, for they would use the form of Slavonic with which they were familiar. :

7 Die Formenlere der Kirchen-Slawischen Sprache, Bonn, 1852.

Bul- garian litera- ture.

Servian.

Sloven- ish.

As for the sake of convenience we group Palzeo-Slavonic under Old Bulgarian, we shall divide Bulgarian itself into Old and New. (1) Old Bulgarian.—We have space here only to mention some of the more remarkable codices. (a) Codea Assemani in the Vatican, edited by Ratki, perhaps belonging to the 11th century, contains extracts from the Gospels for each day of the year. (b) Codex Clozianus, so called because it once belonged to Count Cloz of Trent, contains homilies by Chrysostom, Athanasius, and Epiphanius, supposed to be of the 11th century. (c) Codex Marianus, found by Grigorovich in a monastery on Mount Athos, edited by Jagi¢, of the 11th century. (d) Codex Zographensis, also edited by Jagi¢, assigned to the 12th century. These are the chief Glagolitic! manu- scripts. One of the oldest Cyrillic? manuscripts is (a) the Ostromir Codex (see Russt, vol. xxi. p. 108). Itis of the 11th century and was written by the diak or deacon Gregory for Ostromir, the posadnik or governor of Novgorod.

Other Cyrillic documents are (0) certain legends and homilies which originally belonged to the monks of the abbey of Suprasl near Bialystok in Poland. They have been edited by Miklosich. The half Cyrillic and half Glagolitic manu- script called the Texte dw Sacre must not be forgotten, because on it the French kings were accustomed to take the oath at their coronation at Rheims ; part of it is of the 14th century. There are also many translations from the Byzantine writers in Old Bulgarian, as from John Malalas, George Hamartolus, and others. (2) Modern Bulgarian.—The Bulgarians have some fine collections of popular songs. We can only allude here to the most celebrated. (a) The edition of the brothers Miladinoff published at Agram in 1861,— a very interesting collection, with notes on Bulgarian proverbs and customs; these unfortunate men were murdered in a Turkish prison. (b) The popular songs of the Macedonian Bulgarians collected by Verkovich ; of this only one volume appeared, now vely scarce. Verkovich has since published a work entitled Veda Slovena,in which he professes to have discovered Old Bulgarian ballads relating to Orpheus ; but the production is regarded by most critics as an 1m- posture. (c) The collection panied in 1875 by Auguste Dozon, con- taining many interesting ballads. (d) The Bulgarian Popular Miscel- lany (Bulgarski Narodni Slovnik) of Basil Cholakoff, published in 1873. The rise of Modern Bulgarian literature is altogether recent. The father of it was the monk Paisi, who lived towards the end of the 18th century. He wrote a book on the history of Bulgaria in Bulgarian, which may be compared to the similar one of Raich in Servian. One of his pupils was Sophronius, bishop of Vracha (Vratza), who wrote his own life and adventures (1804). A trans- lation of the New Testament was published by Sapernoff in 1821. George Venelin (1802-1834), a Little Russian from the neighbour- hood of the Carpathians, travelled in Bulgaria in search of manu- scripts and had some remarkable adventures there, which are related in the account of him by Bezsonoff ; he may be said to have revealed the existence of Bulgaria to the west. Among other writers may be mentioned Rakovski, the author of some eccentric works, but a true patriot, and Slaveikoff, Vazoff is a living poet of some reputation. The Bulgarian Literary Society has now been removed from Braila to Sofia, where it issues its journal (Periodichesko Spisanic).

Servo-Croatian and Slovenish.—Of these languages the southern or Herzegovinian dialect has become the literary language of Servia. It is

sometimes called the “shtokavstchina” from its use of the word shto for the interrogative ‘‘ what.” The language of the coast or Dalmatian littoral is called ‘‘ chakavstchina ” from the use of cha in the same way, and Slovenish “kajkavstchina” from the use of kaj. There is practically no difference between the Servian and Croatian dialects, but a quasi-difference has been created between them, much more apparent than real, by the employment of the Latin alphabet by the Croats and of the Cyrillic by the Serbs. The reasons for this divergence being theological, it is probable that it will not soon be put anend to. The Servian language is the softest of all the Slavonic tongues and elides many of the consonants. _ It is rich in tense forms, having preserved the Old Slavonic aorist. The accent is capricious.? The vocabulary has incorporated many Turkish words ; but these will probably be gradually eliminated as the nation wakes to greater self-consciousness. For an account of Servian literature, see ServIA, vol. xxi, p. 689.

The Slovenes are sometimes called “ Wends” and their language “ Windish ” or “ Wendish,” an inconvenient term, as it causes some confusion with the tongue of the Lusatian Wends, of which more will be said shortly. Slovenish begins in Styria just south of Klagenfurt (Celovec). Besides Carinthia and Carniola, it is also the vernacular of a small part of Hungary, being spoken in the corner adjoining the

1 The origin of the Glagolitic alphabet still remains a puzzle. It is now considered older than the Cyrillic. According to some, it is a modification of Greek cursive writing. thers connect it with Armenian and Albanian alphabets. But none of these views have found general acceptance. The alphabet is now only used by the Dalmatian Slavs in their liturgical books.

2 An account of the Cyrillic alphabet is given in vol. i. p. 613 sq.

3 The accent in Russian and Servo-Croatian is especially difficult. Professor Grote of St Petersburg has already written with great learning on the subject, and Professor Leskien of Leipsic is now publishing a work, Untersuchungen

iiber Quantitat und Betonung in den slawischen Sprachen, of which the first part on quantity in Servian has already appeared.

this part of the country using Magyar orthography. These Slovenish provinces formed a margravate and have long been attached to the domains of the house of Hapsburg. In 1883 they celebrated the six hundredth anniversary of this union and a handsome volume was published in commemoration of the event. For a time they were seized by Ottocar of Bohemia, but regained by Rudolph 1., who divided them among his sons. The theory that Old Slovenish ex- hibits the oldest known form of Slavonic has already been discussed, The language has preserved a dual both in the noun and the verb and its vocabulary teems with interesting Slavonic forms. The attempt of Ljudevit Gaj to fuse Slovenish and Servo-Croatian and make one great South Slavonic literary language is alluded to in SERVIA (vol. xxi. p. 691). Slovenish exhibits an older form of Slavonic than Servian, just as Slovak is earlier than Bohemian. A good grammar was published by Kopitar at Laibach in 1808. To this is prefixed | a valuable essay on the Slavonic languages, which was the first . treatment of Slavonic philology in a scientific way ; nothing so . valuable appeared till the cpoch-making Institutiones of Dobrovsky | (1822). Grammars were afterwards published by, Metelko and | Murko, but these have been far surpassed by that of Suman, a pupil of Miklosich.¢ The orthography of the language has been much | improved and it is to be hoped that some of the Germanisms which now disfigure it will be expelled. The Slovenes must banish from their vocabulary such words as farba (farbe), farar (pfarrer), and ; britof' (friedhof).

The earliest specimens of the literature are the manuscripts from Sloven Freising in Bavaria now preserved in the library of Munich. They ish have been assigned to the 9th or 10th century and are written in liters. Latin letters. From that time we find no more trace of thetur, | language till the Reformation, when Truber (in 1557) translated | the New Testament into Slovenish. He was obliged, however, to quit his country. In 1584 the whole Bible appeared at Tubingen under the superintendence of Juri Dalmatin; in 1584 the first Slavonic grammar was published by Bohorié, a schoolmaster of Laibach and pupil of Melanchthon; and in 1592 appeared the first Slovenish dictionary by Megiser.® After the Protestant movement had been stopped by Ferdinand II., the country fell into a torpor, as did Bohemia. In

this condition it remained during almost the whole of the 18th century,—the only productions of that barren period being a few plays and religious works without merit, and: the grammars of Pochlin and Gutsmann. Valentine Vodnik | (1758-1819) was a poet of some eminence. He flourished durmg the existence of the short-lived Illyrian kingdom which had been evoked by Napoleon and was destined to fall to pieces rapidly. About this time he composed his Iliria Ozivijena (The Revival of Illyria); but, sympathizing too much with the French, he incurred the wrath of the Austrians when they came back into possession, and was deprived of his posts, dying soen afterwards in poverty. Other writers are Jarnik and Ravnikar. The most celebrated poet was Francis Pregern (1800-1849), whose lyrics enjoy great popu- larity among his countrymen. The Matica Slovenska (Slovenish Literary Society) issues a journal and publishes useful works. In a recent number there is an interesting article by M. Enjavee, entitled ‘‘ Fragments from a Traveller’s Wallet,” where we have lists of words gathered by the author from rural districts inhabited by Slovenes. The Resanian dialect of Slovenish may be said to have been discovered by Professor Baudouin de Courtenay; certainly no one before lis time had made any study of it. The Rezami, amounting to about 27,000, live on the north-eastern corner of the Italian frontier, in two valleys of the Julian Alps, and are Italian subjects. There is also a work on this dialect by Carlo Podrecca, called Slavia Italiana. The Ugro-Slovenish dialect, although it has not been used much as a literary language, is interesting, because it shows some connexion with Slovakish, and is thus a link between the south-castern and western branches of the Slavonic languages.

Western Braneh. |

Polish.—The dialect of Great Poland has become the literary Poli language. It isa vigorous tongue, but has incorporated too many German and Latin words. The “macaronic” style of Polish writing which did so much to disfigure the language is discussed in POLAND (vol. xix. p. 801). Polish has preserved the nasals g andg, Its accent is almost invariably on the penultimate. There are excel- lent grammars by Matecki and Malinowski, and the monuments of Old Polish have been well edited by Nehring and Baudouin de Courtenay. The splendid lexicon of Linde in six large volumes Is a monumental work. The Silesian dialect is threatened with rapid

extermination by the encroachment of the Germans. has been treated of by Malinowski.® Here also may be mentioned a book by Krynski on the dialect of Zakopan at the foot of the Tatra mountains to the south of Cracow. Under POLAND (vol. xix. p. 299 sq.) will be found an account of Polish literature.

4 Slovenska Slovnica, by Spisal J. Suman, Laibach, 1882 : :

5 Others have since appeared by Murko and J anezit, The Slovenish Literary Society is now publishing a dictionary, of which the German-Slovenish part has appeared in two stout volumes,—a very valuable work. ;

6 Beitréige zur slavischen Dialectologie; tdber die Oppelnsche Mundart im Oberschlesien, Leipsic, 1873. j

SsLayVs

The Kashoubish dialect is spoken by about 200,000 persons according to Hilferding (others, however, make the number less) in the neighbourhood of Dantzic. This dialect presents some very interesting variations: among others the accent is free and not confined to the penultimate as in Polish, and it has more nasals. Its philology has been treated by Dr Cenova, who has also collected their songs and published a small volume of dialogues and literary miscellanies. The word ‘‘Kashoub” appears to be a nickname, their proper appellation being ‘‘Slovintzi.” Schafarik makes the word signify “‘goats.”” The position of Kashoubish in the Slavonic family has formed the subject of controversy. In his Beitrige zur Slavisehen Dialektologie, Herr Leon Biskupski has written an interesting pamphlet in which he essays to prove that it is only a dialect of Polish. This is in opposition to the opinions of Schleicher and Hilferding, who have connected it with the extinct Polabish, The pamphlet contains curious details on the varieties of Kashoubish: the author tells us that every district has its own local dialect. For Kashoubish and its dialects Prince Lucien Bonaparte proposes the term ‘‘ Baltic”?; this appellation, however, would be more appropriate to group together Lithuanian, Lettish, and Old Prussian, and in this way it has been used by Leskien.

(2) Bohemian (Chekh). —This language has several] dialects, some too small to be specified here ; they will be found enumerated along with other Slavonic dialects in Erben's work.? Connected with the Moravian is the Hanacky. Both the grammar and the lexico- graphy of Chekh have been copiously treated, the latter in the excellent work of Jungmann. Schafarik wrote a grammar of the old Janguage. The vocalization of both r and 7 has been previously mentioned ; / has crept in in many places instead of g, but this is not found earlier than the 13th century. The accent is always on the ante-penultimate.

Bohemian literature may be divided into the three following periods, in which we follow Tieftrunk in his History*:—(1) the early period, the productions of which are chiefly of poetry from the beginning of Chekh literature till the Hussite wars (1410) ; (2) the second period, which shows a great development of prose, but also a great decline in literature generally, extends from the time of Hus to the latter part of the 18th century ; (8) from the renaissance of Chekh literature till the present time.

(1) The earliest period of Bohemian civilization was subjected to hoth Latin-German and Greek-Slavonic influences. The Latin alphabet may have been introduced even in heathen times. Rosti- slaff of Moravia invited to his kingdom Methodius, who was appointed archbishop of the country by the pope. We hear even ; iu the 11th century of a Slavonic school in the VySehrad (Wy- scherad, Prague) where St Procopius studied, to whom tradition assigned a hand in the transcription of the Texte du Saere, pre- viously alluded to. Professor Jagi¢ has printed an extract from an old service book the language of which shows Chekh influences. He has assigned the book to the 10th century. Some other very early specimens of the language are contained in the so-called Glagolitic fragments, Zlomky Hlaholské. Two ancient hymns belonging to this orthodox period of the Bohemian Church have come down to us, Hospodine, pomiluj, ny (Lord, have mercy upon us) and Svaty Va'elave, Vevodo Ceské Zeme (Holy Wenceslaus, Lord of the Bohemian land). In 1817 a fragment called Libusin Soud (The Judgment of Libu¥a) was anonymously forwarded to the newly founded Bohemian museum. The sender was afterwards found to have been one Kovar, the steward of Count Colloredo. Some critics assigned it to the 9th century ; according to others it Is a forgery. With the limited space at

our disposal it would be impossible to discuss the question here. The same year also wit- nessed the discovery by Hanka of the so-called Kéniginhof manu- seript (Kralodvorsky Rukopis), consisting of epic and lyric pieces, the authenticity of which some critics have attempted to bring tnto doubt. The chief hand in these forgeries is alleged to have been Wenceslaus Hanka (1791-1861), who was for some time head of the museum library and the author of some mediocre verse. the next poem of any importance is the Alexandreis, a free Chekh version of the Latin work of Philip Walter ab Insulis, surnamed

‘De Castellione.” The Bohemian version was composed by an un- known author probably between 1240 and 1253, To this time belong many versificd lives of saints and legends, such as those of St

focopius and St Catherine. The manuscript of the latter poem has been brought back from Sweden, whither it had been removed during the Thirty Years’ War, and is now preserved at Briinn in

Moravia. The so-called Chronicle of Dalimil, a work of some importance, belongs to the 14th century. It is a tedious produc- hon, written in octosyHabics, and extends from the creation of the world till 1814. The author is supposed to have been a Bohemian knight, but there is no ground for believing that his name was Delimnl. The work is inspired by great hatred of the Germans.

e have a good deal of tedious moral poetry belonging to the 13th century. More interesting matter can be found in the ‘‘Satires eee ter scan be found in the satires

1 Dig Kassubisch-Slovinische Sprache. 2 Trans. Phil. Soc., 1883.

3 Sto Prostond’rodnich, Pohad s ek, &c. (A Hundred Popular Tales), Prague, 1865, “Second ed., Prague, 1880.” ‘ ‘ a

on Craftsmen” (Satyry o Remeslnicich), and a poem on the Ten Commandments. Most of these pieces are anonymous, but the name of one

author is known, Smil of Pardubitz, surnamed ‘¢Wlaska,” a leading Bohemian of his day. But little is known of the events of his life, except that he was killed in a skirmish in 1403. His chief work is the New Couwneil, one of the beast epics so much in vogue in the Middle Ages. Others, however, are assigned to him, of which the most original and amusiyg is the ‘‘ Dialogue between the Groom and Scholar” (Podkoni a Zak). A valuable legal document belonging to this period is the Book of the Old Lord of Rosenberg, which is one of the earliest specimens of Bohemian prose. Rosenberg was royal chamberlain from 1318 to 1346 and died the following year. Another legal work of im- portance is the ‘‘ Exposition of the Law of the Land of Bohemia” (Vyklad na Pravo Zeme Ceske), by Andrew of Duba, chief justice of the country. Considcrable portions of the Bible were translated into Bohemian during the 13th and 14th centnries. The version was completed at the beginning of the 15th century. Wickliffe says of Anne of Luxemburg, the first wife of Richard II., ‘‘ Nobilis regina Anglie, soror Cesaris, habet evangelium in lingua triplici exaratum, scilicet in lingua Bohemica, Teutonica, et Latina.” There are two early versions of the Psalter,—the Clementine at the end of the 13th or beginning of the 14th century, and the Wittenberg also at the beginning of the 14th. The doubts which have been thrown on the fragments of the early version of the Gospel of St John appear to be completely dissipated by the well-timed work of Dr Jan Gebauer. Dr Adolf Patera has discovered recently another religious poem of this period.® Another early prose chronicle deserving of mention is that of Pulkava, a priest, who died in 1380. It extends from the earliest times to the year 1380, and was originally written in Latin, but he afterwards translated it into Chekh. ‘‘The Weaver” (Tkadletek), called after the name of its author, who lived in the first half of the 14th century, is a curious prose poem, in which the author celebrated the fair Adhtka, one of the beauties of the Bohemian court. The piece is full of the usual conceits of the age; it has not yet been ascertained whether it is original or only an adaptation. It very much resembles Der Ackermann aus Bohmen, of which four manuscripts have been preserved. Perhaps, as Gebauer has surmised, they are both adaptations of a piece which is now lost. Passing over a quantity of medieval legends and tales, such as Flore et Blaneh- Jlore, we need only mention, as dealing with native subjects, the two chronicles of Stifrid and Brunevik, supposed to have been originally written in verse, The most remarkable Bohemian writer of the 14th century is Thomas of Stitny,

who writes on ethical and religious subjects. He was born of a noble family about 1880, and probably lived till the close of the century. He appears to have studied at the university of Prague, then newly founded. His chief works are a treatise on General Christian Matters, in six books (edited in 1852), and the Books of Christian Instruetion, printed with an introduction by Vrtatko in 18738. His style is easy and flowing. lLoserth has rightly said that the object of Stitny was to put in a popular form the sum total of the scholastic knowledge of his age. ‘here is also a Chekh version of the History of the Trojan War, composed by Guido di Colonna from Dictys Cretensis and Dares Phrygius ; it was one of the first printed in Bohemian, and was issued from the press at Pilsen in

1468.

(2) The second period begins with the great name of Hus, whose Second Hus de- period ;

Bohemian writings were edited by Erben in 1865-68. veloped his native language as Luther did German. He corrected the translation of the Bible, and improved Bohemian orthography. We have nine letters written by him while in prison at Constance. During the period of the Hussite wars there was abundance of political and religious pamphlets. Most of these productions, how- ever, were of ephemeral interest. The travels of Marco Polo and Sir John Mandeville were translated into Bohemian. Peter Chel- cicky, one of the leaders of the United Brethren, was a popular writer. He was a cobbler by trade, hence he was nicknamed “*Kopyta,” or the Shoe-Last. His works, written between 1430 and 1456, have a strongly marked democratic tone ; among them may be especially mentioned his Postils and the Net of Faith (Sit Viry). In 1488 the complete Bible was printed in Bohemia, the first regular printing press at Prague having been set up the year before. In 1506 a Calixtine Bible appeared at Venice. The national literature made distinct progress under George Podébrad, a native king. Vavrinec z Brezové (1370-1455) wrote in Latin Historia de Bello Hussitico, of which there is an early Chekh trans- lation. There is a satire in Latin by Jan Hasisteinsky z Lobkovic, entitled Lament of St Weneeslaus over the Morals of the Chekhs. He was also a considerable traveller in the East. The Chekhs were fond of making pilgrimages to the Holy Land; Martin

Kabatnik was a traveller of this kind. His Peregrinations were first printed in 1518. Works on law were written by Ctibor and Viktorin, and many translations from the classics appeared. Gregory Hruby z Jclene (called Gelenius) and his son Sigismund

5 See Arch. f. slaw. Phil., vol. vii.

were very industrious in this way; the latter published at Basel in 1536 a curious dictionary, Lexicon Symphonwm, an early attempt at comparative philology, in which he compares Greek, Latin, German, and Slavonic. We must find space for a mention of the writings of Dubravius (¢. 1489-1553), bishop of Olmiitz, although he used the Latin and not the Bohemian language. His work on fish-ponds and fish (Libedlus de Piseinis et Piscium qut in ets aluntur Natura, 1547) is not altogether unknown to Englishmen owing to the citations in Izaak Walton, with whom the bishop was a great authority. His most important work, however, was his History of Bohemia in thirty-three books, from the earliest times to the coronation of Ferdinand I. at Prague in 1527, the termination of Bohemian independence. In 1533 appeared the first Chekh gram- mar, by BeneS Optat. Verse-writers abounded at this time, but no poet of eminence. Veleslavin (1545-1 599) was an indefatigable worker, being, like Caxton, both printer and author. The Latin herbal of Audrew Matthiolus, physician to the archduke Ferdinand, was translated by Thaddeus Hajek. Some good works on law appeared, and there are quantities of sermons. Simon Lomnicky (b. 1560) wrote a great deal of poetry ; he was the laureate of Rudolph II., and also wrote a triumphal song for the elector Frederick when chosen king of Bohemia by the Protestants. He was severely wounded at the battle of the White Mountain and spent the rest of his days in poverty ; but there appears to be no truth in the story that he became a public beggar. The claiins of Lomnicky to be considered a poet are but meagre; he writes little better than rhymed prose. his comic picces and satires. At this period flourished the chronicler Hajek, who appears to have been a priest, and who died in 1553. His work is interesting, but altogether uncritical, and he does not seem to have cared much about truth. He gives us all the old Chekh sagas, and fortunately uses the Chekh language. His book attained great popularity,

and was translated into German. Indeed, it was almost the chief authority for Bohemian history till towards the close of the 18th century. The travels of Christopher Harant in the Holy Land are full of learning and of curious matter. A new edition was published in 1854, The author perished on the scaffold on the memorable 19th June 1621, when Bohemia lay completcly at the feet of the Hapsburg conqueror. Harant started for his journey in 1598, he and his companions being dressed as Franciscan triars.. There is also the account by Wenceslaus Vratislav of Mitrovitz (1576-1635) of his three years' captivity at Constanti- uople,—a work full of picturesque incidents. The letters of Karl ze Zerotin (d. 1636), one of the Moravian Brethren, who was for some time in the service of Henry IV. of France, have been edited by Brandl. With the battle of the White Monntain in 1620 terminates what has been called the golden age of Chekh literature. In 1615 the diet had made a resolute effort to protect the national language. But now the country became Germanizcd, and books in Chekh were eagerly sought out and destroyed. In addition to its sufferings during the Thirty Years' War, Bohemia had the misfor- tune to lose many of its most valuable manuscripts, which were carried off by the conquerors. For nearly 200 years Bohemia ceased] to be counted among the nationalities of Europe. Here and there a patriot laboured in the interest of his country, such as the Jesuit Balbin or Balbinus (1621-1688), who was professor of rhetoric at Prague and author of Epitome Rerwm Bohemicarum (1677) and also Miscellanea Rerum Bohemicarum (1680-81). His services to Bohemian literature were considerable, but his writings are in Latin. Many authors of repute were, however, at this time in exile, and of these no one has earned a greater renown than Jan Amos Komensky (frequently styled by the Latin form of his name, Comenius). This eminent man was born at Nivnitz ncar Hungarian Brod in Moravia and was the last bishop of the Moravian Brethren. After the battle of the White Mountain he fled to Poland, which at that time had not altogether lost its spirit of toleration. Here he was joined by some Polish dissidents and formed the nucleus of a religious society. In 1631 he published his Janua Linguarwm Reserata, in which he developed a new theory of learning languages. This work became very popular and has been repeatedly translated. He afterwards visited England and Sweden, and in 1659 gave to the world his Orbis Pictus, which also enjoyed great reputation as an educational work. He died at Amsterdam in 1670. It would be impossible in a brief sketch like the present to give a detailed list of the

writings of Komensky. Of his Bohemian works we may mention the prose poem Labyrint Sv8ta a Raj Srdce (The Labyrinth of the World and Paradise of the Heart) and his Informatoriwm Skoly Mate¥ske. He also translated the Psalms into Chekh. In 1656, on the destruction of the town of Leszno by fire, Komensky lost some of his most valuable works still in manuscript; we may especially regret his Poklud Jazyka Ceského (Treasury of the Bohemian Language), upon which he had been engaged from 1612. During the latter part of the 17th century and the greater part of the 18th the language and literature of Bohemia steadily declined. A few scribblers appeared, such as Rosa, Pohl, and Simek, but their names are hardly deserving of mention. But Gelasius Dobner and Martin Pelzcl were valuable workers in the field of Bohemian history.

SLAV®s

There is some merit, however, in’

(3) The true study of the Slavonic languages may be said to have Mode begun with Joseph Dobrovsky. In 1809 he published Ausfihrliches periog

Lehrgebiude der bohm. Sprache. In 1822 appeared at Vienna his

great work Institutiones Lingus Slaview Dialects Veterts. Dobrovsky

died in 1829. The strange thing about him is that, in spite of all his labours, he had no faith in his native language and despaired of its revival. But, like Columbus, he was destined to accomplish greater results than he expected. Joseph Jungmann (1773-1847) another regenerator of the Chekh language, was author of the great dictionary and an esteemed translation of Paradisc Lost. Besides these works he wrote a history of Bohemian literature. Kollar (1793-1852) and Celakovsky (1799-1852) both earned a considerable reputation as poets,—the first by a series of sonnets called Slavy Deera (The Daughter of Glory), under which title he celebrates the praises of all Slavonic lands and at the same time his love for the daughter of a German pastor ; the second by his ‘‘ Echo of Russian Songs” (Ohlas Pisni Ruskych) and the ‘Rose with a Hundred Leaves” (Rize Stolista). A good poetical style was now formed for the Bohemians, and a host of minor poets appeared for whose names we cannot find space. Karel Erben (1811-1870) has left some

excellent ballads in his Kytice (Garland). His genius was kindled by the folk tales with which Bohemia abounds. He conferred a benefit upon Slavonic students by his interesting collection of national tales previously alluded to; moreover, he was a sound scholar and an indefatigable antiquary. Re gesta diplomatica necnon epistolaria Bohemiz et Moraviz, extending to 1253, and editions of Harant's Journey to the Holy Land and Nestor's Chronicle are monuments of his industry.

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he has written a good historical novel entitled Andrew Chernisheff, which deals with the reign of Catherinc II. of Russia. In 1880 appeared two other tales by the same writer, Romance concerning the Faithful Friendship of Amisa and Anvil, and a strange book of Oriental tales styled Baje Rosany (Stories of Susannah). As with us, the social romance or novel of domestic life has latterly been much cultivated among the Chekhs. The legends and tales current among the peasantry have also been carefully collected, first by Boztna Nemcova (1820-1862), whose Slovenske Povesti had a very great success. She was followed by Madame Muzak, authoress of some of the most popular of the modern Bohemian novels. Her "Country Romance" (Vesnicky Roman) has been translated into French, Excellent pictures of rural life have also been given by Vaclaff Smilovsky (a nom de plume of Smilauer), who has writtcn a great many novels, as the ''Old Organist" (Stary Varharnih), Martin Oliva, &c., much in the style of Auerbach and Zschokke. Other writers of historical novels are M. Bohumil Cidlinsky and Vaclaff Vivek. Madame Zofie Podlipska, sister of Madame Mudak, is known as a popular writcr of social romances. For an account of the historical labours of Francis Palacky, see PaLacky. Among the pupils of the great historian the first place must be given to Vaclatf Viadivoj Tomek (b. 1818), now professor of Austrian history in the university of Prague, whose chief production is a history of that city, which he has carried to a fifth volume. In 1849 he published the first volume of a history of the university of Prague, which seems never to haye been completed, and in 1880 a biography of the Bohemian hero Zizka. He appears throughout as a most accurate and painstaking writer. Vocel (1808-1871) is the author of a

valuable work, ‘‘The Early Days of Bohemia” (Pravtk Zemé eské), which we have quoted already when treating of Slavonic ethnology. Alois Sembera (1807-1882), whose literary activity ex- tended over a long period, wrote voluminously on Bohemian history and literature. He was professor of the Bohemian language at the university of Vienna. Ina work on the western Slavs (O Zépadnich Slovanech) he maintained that the Chekhs, Moravians, Slovaks, and Polabes were settled much earlicr in the countries which they at present occupy than many historians have been willing to admit. As a critic, Professor Sembera is an iconoclast and has attacked many of the (supposed) early monuments of the Chekh language. Dr Antonine Gindely, born at Prague in 1829, has proved himself to be a most conscientious and enthusiastic worker in the field of historical research. In order to collect materials for his publica- tions he travelled in various parts of Bohemia, Poland, Germany, France, Belgium, Holland, and Spain. The results of this diligence have appeared in a collection of valuable historical works, such as the History of the Bohemian Brethren, Rudolph IT. and his Times, and later a History of the Bohemian Revolt of 1618. The brothers Joseph and Hermenegild Jireéek have won a reputation in Bohemian literature by many useful works. They have conjointly published a book in defence of tha Kralodvorsky Rukopis which is well worthy the attention of those Who wish to make themselves acquainted with the literature of this vexed question. Joseph is now occupied in editing ina cheap form some of the most interesting monuments of early Bohemian literature. In 1880 Hermenegild published a valuable Collection of Slavonic Laws, containing an almost complete series of the early codes of the Slavs in the original languages, Joseph Jirevek is also author of a useful chrestomathy of Bohemian literature with biographical and critical notices. J oseph Constan- tine Jireéek (son of Joseph, born in 1854), formerly a privatdocent of the university of Prague, has devoted himself to Bulgarian his- tory and bibléllra phy. In 1872 he published a Bibliography of Modern Bulgarian Literature, and has written a Hf istory of Bulgaria, of which a German translation has appeared. Joseph Emler and Karl Tieftrunk have been co-operators with Dr Gindely in his “Old Monuments of Bohemian History ” (Stare Pamiti Dejin Ceskych). he former has also edited the second volume of the Regesta Bohemica and since 1870 has becn editor of the “Journal ” (Casopis) of the Bohemian museum. Karl Tieftrunk has written several useful works, among them the History of Bohemian Literature from the

earliest period to the present time, and the interesting mono- graph on the opposition of the Bohemian states to Ferdinand I. mn 1547, The History of Bohemian Literature is very carefully written and gives in a short compass much valuable information. An elaborate work is now appearing in parts by F. Backovsky, entitled Zevrubne Dejiny Ceského Pisemnictyt Doby Nové (A Com- plete History of Modern Bohemian Literature) from the year 1774 to the present time. There is also a work by Jerdbek, Zarly Days a Lomantie Poetry. Many valuable contributions to Bohemian ol have proceeded from the pen of Dr Joseph Kalousek (b. 88). Vincent Brand] and Beda Dudik have devoted particular attention to Moravian history and antiquities. The former, among other works, has edited the ‘letters of Karl ze Zerotin, previously neuponed. Beda Dudik, a Benedictine monk and historiographer q Moravia, has published some valuable works on the history of pe portion of the Bohemian kingdom and has also written a weld of Moravia. Like the great work of Palacky, it was first *n In German, but has since appeared in the Bohemian laun-

guage. Extracts from the interesting diary of Zerotin have been edited by him in the Méhrisehe Gesehichtsquellen. Through his efforts twenty-one Bohemian manuscripts which had been carried away to Sweden at the time of the Thirty Years’ War have been restored, and are now preserved in the state archives of Briinn. Among these is the Legend of St Catherine, many words in which are said to explain difficult passages in the Kralodvorsky Rukopis and to furnish testimony to its authenticity. Jakub Maly (d. 1885) was the author of many important articles in the Slounik Nawiny, the Chekh Conversations-Leaicon, and of a popular his- tory of the Bohemian people. He also wrote a grammar of Chekh for Englishmen, besides assisting in the translation of Shakespeare, which has been produced by the joint labours of many Bohemian scholars. In 1868 was published under the editorship of Erben the second volume of the Vybor z Literatury Ceské, a very important work, containing specimens of the old Bohemian authors. The first volume had been edited by Schafarik, for an account of whose literary activity see ScHAFARIK. Valuable works on philology have been written by Martin Hattala, by birth a Slovak, who is now professor of Slavonic philology at the university of Prague. One of his most important productions is in Latin,

De Contiqguarum Consonantium Imitatione in Linguis Slavicts. We is a defender of the genuineness of the two celebrated manuscripts, the Zelenohorsky (t.e., “that which contains the judgment of Libu¥a’’) and the Kralod- vorsky. Among sound philologists are reckoned Drs Gebauer and Geitler. The former has contributed some valuable papers to the Archiv fiir slawische Philologie, edited by Professor Jagi¢é of St Petersburg. The latter, born in 1847, is at present professor of Slavonic philology at the university of Agram. He commenced his studies at Prague under Alfred Ludwig, the translator of the Vedas, and Hattala, and at Vienna under Miklosich. Having begun with a dissertation in the Casopis on the present condition of comparative philology, he published in the same year a work on the Old Bulgarian language. In 1873 he made a tour in Russian and Prussian Lithuania, that, like Schleicher, he might study that interesting language from the mouths of the people. He afterwards published the results of his travels in his Lithauisehe Studien. He has since written a treatise on the Albanian alphabet (Dic Albanesischen und Slavischen Schriften, Vienna, 1883). In this an attempt is made to connect the Glagolitic and Albanian alphabets. A valuable work was written by Antonin Matzenauer (b. 1823), entitled “Foreign Words in Slavonic Languages” (Cizi Slova ve Slovanskych ReXech). Yxcellent works on classical philology have been published by A. Kvivala and Vanitek. Natural science was successfully cultivated by Jan Svatopluk Pres] (1791-1849), professor in the university of Prague, and Jan Ey. Purkyné (1787-1869), pro- fessor of physiology in the same university. As regards moral philosophy, the first part of Dr J. Durdik’s History of Recent Philosophy has just appeared, which extends from Kant to Herbart. Throughout the whole period of the resuscitation of Bohemian literature the society called the Matice Ceska has worked energe- tically, printing its excellent journal or Casopis four times a year, and also issuing some of the old Bohemian classic and meritorious works by modern authors. It was a great trinmph for the Chekhs when a part of the instruction of the university was allowed to be carried on in the Bohemian language. A new magazine (Slovansky Sbornik) made its appearance at the beginning of 1884. The Listy Philologické (Philological Leaves) is still published. Recently a new literary journal (7’he Atheneum) has been started, which seems to be more or less modelled upon its English namesake.

Slovak.—This language or dialect is spoken in the north-western Slovak.

corner of the kingdom of Hungary. It is generally considered to exhibit an earlier form of Chekh, and this is proved by many of its grammatical peculiarities being found in the older Chekh litera- ture. One characteristic of the language is the use of diphthongs in cases where the other Slavonic tongues use simple vowels. For a long time the Slovaks employed Chekh in all their published writings. About the close of the 18th century a separatist move- ment began. The first Slovak grammar was published by Bernolak at Presburg in 1790. It was followed by those of Diani$ka and Viktorin. There is a Slovak dictionary by Loos. The attempt to form a new literary language was to be deplored on many grounds, for both the Magyar and the German have to be resisted. Fora short time a literary society existed among the Slovaks, which published useful books and a journal. The Magyars, however, sup- pressed it, because it was “contra integritatem patrie,” as we were told by one of their ecclesiastics. The Bohemian naturally resents the attempts at separation by the Slovak, and in 1846 the Chekh Litcrary Society issued a work entitled “Opinions in Favour of One Written Language for the Chekhs, Moravians, and Slovaks ” (Hlasove 0 pot¥ebé Jednoty Spisovntho Juzyka pro Cechy, Moravany, a Slovaky). The Slovaks have produced a few poets of repute, such as Holly, Sladkovié, and Chalupka, but their literature is meagre.

Lusatian Wendish.—This language is divided into two dialects, Lusatian Upper and Lower, although even these are capable of subdivision. Wendish.

The word “ Wend,” as previously explained, is a purely German name and is never used by the Slavs themselves. The Lusatians are also

sometimes called Serbs and Sorbs. They are the remnants of the powerful tribes which once oceupied nearly the whole of north Germany. The Lusatians in the earlier period of their history were under the dominion of the Poles and afterwards of the Chekhs. In the early part of the 17th century the bulk of them had been annexed to the electorate of Saxony, with the

exception of the small part about Kottbus, which had belonged to Brandenburg since 1445. In 1815, however, when the states of Europe were rearranged, in most instances with very small regard to the nationalities under their sway, many more of the Lusatians were handed over to Prussia ; and, according to the statistics of Boudilovich, at the present time (1886) all the Lower Lusatians, amounting to 40,000, belong to Prussia, as well as 44,000 of the Upper Lusatians. Besides the two dialects specified there are other minor ones, to judge from an article in the Bohemian Literary Journal ; but they are too minute to be specified here. The Upper Lusatian dialect shows most affinity with Chekh, especially in substituting h for g; the Lower more resembles Polish, and has the strong or barred 2, as in Zos, ‘hair.”’ The Upper dialect has been the most cultivated ; some good grammars have been published by Seiler, Jordan, and Pfulil, and there is a copious dictionary edited by Pfuhl in conjunction with others. The language is full of Germanisms and German words and cannot hold out long against the vigorous attempts at denationalization nade by its Teutonic neighbours. There is a small Lower Lusatian dictionary by Zwahr, a posthumous work of very little merit. The Macica Serbska, the literary society of the Sorbs, founded on the model of the Bohemian Society in 1847, publishes its journal twice a year, which contains interesting articles on folk-tales and folk-lore generally, with popular songs taken down from the mouths of the people. The first printed book in the Upper Sorbish language was the little catechism of Luther, published in 1597 by the pastor Worjech. ‘his was not, however, the first time that any Lusatian or Sorbish words had been printed, for we find the names of plants in that language giveu in Franke’s Hortus Lusatix, published in 1594. In 1706 Michael Brancel or Frencel published a translation of the New Testament into Sorbish ; a little before, in 1689, a grammar had appeared by Zacharias Bierling, entitled Didascalia seu Ortho- graphia Vandalica. In 1693-96 Abraham Frencel, son of Michael, published a dictionary. In 1806 Mohn translated some extracts from Klopstock’s Messiah. From 1837 a new impulse was given to Sorbish literature: newspapers were printed in the language and useful books translated into it. One poet has ap eared among them, Andrew Seiler, a clergyman, who fied in 1872. Lower Sorbish has always been much less developed than Upper. The first book printed in it was a collection of hymns and a catechism, by Albin Moller, in 1574. Chojnan, a pastor in Lubin, wrote the first

grammar between 1642 and 1664; in the latter half of the same century Korner compiled a dictionary. At the commencement of the 18th century Bohumil (Gottlieb) Fabricius published his trans- lation of the New Testament (first edition in 1709) ; at the end of the same century a version of the Old Testameut by Frico appeared. A good collection of Sorbish songs has been edited by Haupt and Gchmaler. According to an interesting article by Hornik in the second volume of the Slavianski Sbornik, a number of these Wends emigrated to America and settled in Bastrop county, Texas, where they have divine service performed in their own language, and publish some newspapers.

Polabish.—Of the Slavonic languages spoken in the north of Polabis! Germany the Lusatian Wendish and Kashoubish are alone living. Of those which are extinct Polabish is the only one of which any memorials have come down to us, aud these are but scanty. The language affords a parallel to Cornish, not only iu the few fragments which remain, but also in the date of its decline and extinction. It is considered by Schleicher,! who has written an excellent grammar by piecing the scanty materials together, just as geologists restore an ichthyosaurus, to have more affinity to Polish than to Chekh, owing to the possession of nasals. This interesting language? ex- pired in the first quarter of the 18th century in the eastern corner of the former kingdom of Hanover, principally in the circuit of Liichow, which even at the present time is called Wendland. | Between 1691 and 1786 certain vocabularies and dialogues in this language (including also a song) were taken down, and from them Schleicher has taken the materials for his grammar and the valu- able little dictionary appended to it. Dr Pfuhl printed these memorials in their entirety in 1863-64. The spelling is altogether phonetic, and, owing to the ignorance of the Slavonic peasaut and his German interrogators, the former of German and the latter of Slavonic, there are some ludicrous blunders. The two most im- portant of these documents are a German- Wendish dictionary, compiled at the end of the 17th century by Christopher Henning, by birth a Lusatian, and pastor of Wustrow near Liichow. Divine service is said to have been held in that town in Wendish as late as 1751. Secondly, we have the Slavonic words and dialogues col- lected by a farmer named Johann Parum-Schultz. His

manuscript is still in the possession of his descendants. There is a valuable monograph on the dialect of the Liineburg Slavs by Biskupski. In the 15th century Slavonic had ceased to be spoken in the island of Riigen, and in the same century it could only be heard from peasants in the market-place of Leipsic, a town (as already stated) with a Slavonic name. What the Slavs, however, have lost in the West they have partly gained in the East, and few languages have a more magnificent prospect than Russian,—the dignity and strength of which fit it to be the tongue of an imperial people. (W. R. M.)

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SEAVYANSK, a town of Russia, in the government of Kharkoff, situated 158 miles by rail to the south-east of the town of Kharkoff, on the Torets river and close by several salt lakes. From these salt is extracted to the annual value of more than £10,000; there are also several tallow-works in the place. The Stavyansk merchants carry on a brisk trade in salt, cattle, and tallow. The population (11,650 in 1870) reached 15,400 in 1883.

The ancient name of Stavyansk was Tor. The town, which is supposed to occupy the site of a former settlement of the Torks (Turks) who inhabited the steppes of the Don, was founded in 1676 by the Russians to protect the salt marshes. Having an open steppe behind it, this fort was often destroyed by the Tatars. Its salt trade became insignificant in the 18th century and has only revived during the last twenty years since coal was brought from Ekaterinoslaff.

SLEEP is a normal condition of the body, occurring periodically, in which there is a greater or less degree of unconsciousness due to inactivity of the nervous system and more especially of the brain and spinal cord, It may be regarded as the condition of rest of the nervous system during which there is a renewal of the energy that has been expended in the hours of wakefulness. For in the nervous system the general law holds good that periods of physio- logical rest must alternate with periods of physiological activity, and, as the nervous system is the dominating mechanism in the body, when it reposes, all the other systems enjoy the same condition to a greater or less extent. Rest alternates with work in all vital phenomena. After a muscle has contracted frequently at short intervals, a period of

relaxation is necessary for the removal of waste products and the restitution of energy ; the pulsating heart,

apparently working without intermission, is in reality not doing so, as there are short intervals of relaxation between ‘ndividual beats in which there is no expenditure of energy ; the cells in a secreting gland do not always elaborate, but have periods when the protoplasm is comparatively at rest. Nervous action also involves physico-chemical changes of matter and the expenditure of energy. This is true even of the activity of the brain associated with sensation, per- ception, emotion, volition, and other psychical phenomena, and therefore the higher nervous centres require rest, during which they are protected from the stream of impressions flowing in from the sense-organs, and in which waste matters are removed and the cerebral material is recuperated for another time of wakeful activity.

The coincidence of the time of sleep with the occurrence Ti] of the great terrestrial phenomena that cause night is more§! apparent than real. The oscillations of vital activity are not correlated to the terrestrial revolutions as effect and cause, but the occurrence of sleep, in the majority of cases, on the advent of night is largely the result of habit. Whilst the darkness and stillness of night are favourable to sleep, the state of physiological repose is determined more by the condition of the body itself. Fatigue will normally cause sleep at any time of the twenty-four hours. Thus many of the lower animals habitually sleep during ee

1 Laut- und Formen-Lere der Polabischen Sprache, St Petersburg, |

1871.

2 To avoid confusion it must be remembered that the word “ Pola- bish” is used somewhat carelessly by ethnologists to denote (1) the SJavonie tribes in north Germany generally, (2) the partieular Slav- onie tribe on the Elbe (Slav. Laba).

Sinp- tes.

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the day and prowl in search of food in the night; some hibernate during the winter season, passing into long periods of sleep during both day and night ; and men whose avocations require them to work during the night find that they can maintain health and activity by sleeping the requisite time during the day.

The approach of sleep is usually marked by a desire for sleep, or sleepiness, embracing an obscure and complicated group of sensations, resembling such bodily states of feeling as hunger, thirst, the necessity of breathing, &c. All of these bodily states, although on the whole ill defined, are referred with some precision to special organs. Thus

hunger, although due to a general bodily want, is referred

to the stomach, thirst to the fauces, and breathing to the chest ; and in like manner the desire for sleep is referred chiefly to the region of the head and neck. There is a sensation of weight in the upper eyelids, intermittent spasm of the sub-hyoid muscles causing yawning, and drooping of the head. Along with these signs there is obscuration of the intelligence, depression both of géneral sensibility and of the special senses, and relaxation of the muscular system. The half-closed eyelids tend more and more to close; the inspirations become slower and deeper; the muscles supporting the lower jaw become relaxed, so that the mouth opens; the muscles of the back of the neck that tend to support the head also relax and the chin droops on the breast ; and the limbs relax and tend to fall into a line with the body. At the same time the hesitating utterances of the sleepy man indicate vagueness of thought, and external objects gradually cease to make an impression on the senses. These are the chief phenomena of the advent of sleep. After it has supervened there are many grada- tions in its depth and character. In some cases the sleep may be so light that the individual is partially conscious of external impressions and of the disordered trains of thought and feeling that pass through his mind, constituting dreams, and these may be more or less vivid according to the degree of consciousness remaining. On the other hand, the sleep may be so profound as to abolish all psychical phenomena : there are no dreams, and when the sleeper awakes the time passed in this und@nscious state is a blank. The first period of sleep is the most profound.

After a variable period, usually from five to six hours of deep sleep, the faculties awaken, not simultaneously but often fitfully, so that there are transient periods of consciousness. This is the time of dreaming. As the period of waking approaches the sensibility becomes more acute, so that external impres- sionsare faintly perceived, These impressions may influence and mould the flow of images in the mind of the sleeper, frequently altering the nature of his dreams or making them more vivid. The moment of waking is usually not instantaneous, but is preceded by an intermediate state of partial consciousness, in which there are feelings of a pleasant lassitude, a sense of repose, a luxurious abandon- ment of the body to any position in which it may happen to be, and a strange play of the mental faculties that has more of the character of an “intellectual mirage ” than of consecutive thought. The intensity of sleep has been measured by Kohlschiitter by the intensity of the sound necessary to awaken the sleeper. This intensity increases rapidly during the first hour, then decreases, sometimes rapidly, sometimes slowly, during the next two or three hours, and then very slowly until the me of waking. This statement agrees generally with oo As a rule the deeper the sleep the longer it asts, _ Various physiological changes have been observed dur- ing sleep, but much remains to be done in this direction.

he pulse becomes less frequent ; the respiratory move- ments are fewer in number and are almost wholly thoracic,

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not abdominal ; all the secretions are reduced in quantity ; the gastric and intestinal peristaltic movements are less rapid ; the pupils of the eye are contracted and during profound sleep are not affected by light ; and the eyeballs are rotated upwards. The pupils dilate slightly when strong sensory or auditory stimuli are applied, and they dilate the more the lighter the sleep; at the moment of waking they become widely dilated. Whilst muscular relaxation is general, there seems to be increased contrac- tion of certain sphincter muscles, as the circular fibres of the iris and the fibres concerned in closing the eyelids. The state of the circulation of the brain has been fre- quently investigated. The older view was that there was a degree of plethora or congestion of the vessels of the brain, as is the state of

matters in coma, to which the state of sleep has a superficial resemblance. Coma, how- ever, 1s not sleep, but a condition of inactivity of the cerebral matter owing to the accumulation of dark venous blood in its vessels, This has been actually observed in cases where it was possible to see the brain. During sleep the surface of the exposed brain has been observed to become pale and to shrink somewhat from the sides of the opening (Blumenbach).

from the parietal region of a dog, and, to obviate the effects of atmospheric pressure, inserted a watch glass into the aperture so that the surface of the brain could be seen. His results are summarized thus :—

- Pressure of distended veins on the brain is not the cause of sleep, for during sleep the veins are not distended ; and, when they are, symptoms and appearances arise which differ from those which characterize sleep. (2) During sleep the brain is in a comparatively bloodless condition, and the blood in the encephalic vessels is not only diminished in quantity, but moves with diminished rapidity. (3) The condition of the cerebral circulation during sleep is, from physical causes, that which is most favourable to the nutrition of the brain tissue; and, on the othcr hand, the condition which

revails during waking is associated with mental activity, because

it is that which is most favourable to oxidation of the brain sub- stance, and to various changes in its chemical constitution. (4) The blood which is derived from the brain during sleep is distri- buted to the alimentary and excretory organs. (5) Whatever in- creases the activity of the cerebral circulation tends to preserve wakefulness ; and whatever decreases the activity of the cerebral circulation, and, at the same time, is not inconsistent with the general health of the body, tends to induce and favour sleep. Such circumstances may act primarily through the nervous or through the vascular system. Among those which act through the nervous system may be instanced the presence or absence of impressions upon the senses, and the presence or absence of excit- ing ideas. Among those which act through the vascular system may be mentioned unnaturally or naturally increased or decreased force or frequency of the heart’s action.”

Dr William A. Hammond and Dr Weir Mitchell have repeated and extended Durham's observations, with the same general results (1866), and more recently Ehrmann, Salathé (1877), Frangois Franck (1877), and Mosso (1881), by more refined methods of observation, have arrived at the same general conclusions.

the circulation during sleep. He made observations on three persons who had lost a portion of the cranial vault and in whom there was a soft pulsating cicatrix. They were a woman of thirty-seven years of age, a man of thirty-seven years, and a child of about twelve years. By special arrangements, Mosso took simultaneous tracings of the pulse at the wrist, of the beat of the heart, of the movements of the wall of the chest in respiration, and of the movements of the denuded brain. Further, by means of the plethysmograph,—an instrument of Mosso's own in- vention,—he obtained tracings showing changes in the volume of the hand and forearm; and he succeeded in showing that during sleep there is a diminished amount

A careful experimental re- Durham's search was conducted by Arthur E. Durham in 1860, in observa- which he trephined a portion of bone as large as a shilling ™*

Mosso in particular has Mosso's applied with great success the graphic method of registra- experi- tion to the study of the movements of the brain and of ments.

of blood in the brain, and at the same time an increased amount in the extremities. He showed further that there are frequent adjustments in the distribution of the blood, even during sleep. Thus a strong stimulus to the skin or to a sense organ—but not strong enough to awaken the sleeper—caused a contraction of the vessels of the fore- arm, an increase of blood pressure, and a determination of blood towards the brain; and, on the other hand, on suddenly awakening the sleeper, there was a contraction of the vessels of the brain, a general rise of pressure, and an accelerated flow of blood through the hemispheres of the brain. §o sensitive is the whole organism in this respect, even during sleep, that a loudly spoken word, a sound, a touch, the action of light, or any moderate sensory impression

modified the rhythm of respiration, determined a contraction of the vessels of the forearm, increased the general pressure of the blood, caused an in- creased flow to the brain, and quickened the frequency of the beats of the heart. These observations show how a physiological explanation can be suggested of the influ- ence of external impressions in modifying the dreams of a sleeper. Further, Mosso found that during very pro- found sleep these oscillations disappear : the pulsatory movements are uniform and are not affected by sensory impressions, and probably this condition exists when there *s the absolute unconsciousness of a “dead” sleep. By such methods as have been employed by Mosso, three movements of the brain have been observed,—(1) pulsa- tions, corresponding to the beats of the heart ; (2) oscilla- tions, or longer waves, sometimes coinciding with the heart beats, or more generally consisting of longer festoons, carrying each a number of smaller waves, and believed to correspond generally to the respiratory movements ; and (3) undulations, still longer and less marked elevations and depressions, first clearly observed by Mosso, and believed by him to indicate rhythmic contractions of the vessels of the pia mater and of the brain. This view is in keeping with the observations of Donders, Kussmaul, Tenner, and others on changes of calibre observed in the cerebral vessels, and with the experiments of many physio- logists, showing that the vessels of the pia mater, like other vessels, are controlled by the vaso-motor system of nerves (see Puysrotoay, ‘‘ Nervous System”). It may therefore be considered certain that during sleep there is an anemia, or partially bloodless condition, of the brain, and that the blood is drawn off to other organs, whilst at the same time this anzmic condition may be modified by changes in the circulation or in the respiratory mechanism caused by posi- tion, by sensory impressions, or by sudden changes in the state of repose of the muscles. The examination of the retina (which may be regarded as a cerebral outwork) by the ophthalmoscope during sleep also shows a compara- tively bloodless condition. Such are the facts; the de- ficiency in the way of a theoretical explanation is that physiologists cannot satisfactorily account for the anemic condition causing unconsciousness. Sudden heemorrhage from the brain and nerve-centres, or a sudden cessation of the supply of blood to the brain, as occurs in syncope (failure of the heart’s action,—a faint), no doubt causes unconsciousness, but in these circumstances there 1s a tendency to convulsive spasm. Such spasm is usually absent in sleep, but sudden jerks of the limbs may some- times be

observed during the time when there is the con- fusion of ideas preceding the passage into sleep.

During sleep the amount of carbonic acid eliminated is very much reduced, indicating that molecular changes in the tissues do not occur to the same extent as in the wak- ing state. This is also shown by the fact that less heat is produced. Helmholtz states that the amount of heat pro- duced by a man weighing 67 kilogrammes (14774 Ib) is

about 40 calories per hour during sleep, as against 112 calories per hour while awake. This diminished production of heat may be largely accounted for by the quiet condition of the muscles of locomotion, but it also indicates dimi- nished tissue changes throughout the body. In profound sleep the bodily temperature may fall from °6° to 2° Fahr, In consequence of diminished oxidation changes during sleep, it is not improbable that excess of nutrient matter may then be stored up in the form of fat, and that thus the proverb ‘‘ He who sleeps dines” is based on a correct appreciation of the fact that sleep tends to produce plethora or obesity.

Whilst it is easy to state that sleep is caused by fatigue Theorie of the nervous system, it is a more difficult matter to ex- 4s to plain what the precise changes are that produce the state |)” of of unconsciousness. Various hypotheses have been ade vanced, but it cannot be said that any one is wholly satis. ” factory. Aware that the fatigue of muscle is associated | with the accumulation of sarcolactic acid, Preyer surmised that the activity of nervous matter might be interfered with by the accumulation in the nerve-centres of some such acid, or of its soda salt (lactate of soda), but this view has not been supported by the results of experiment, as the injection into the blood of a dose of lactate of soda has not produced sleep. Pfliiger has observed that frogs de- prived for a considerable time of oxygen passed gradually into a state resembling profound sleep, and he has advanced the theory that there is no organ of the body so quickly affected by deprivation of oxygen as the brain. According to Pfliiger, the phenomena of life depend on a dissociation of living matter, and in particular the activity of the cere- bral substance connected with psychical states depends on dissociation changes in the grey matter. To excite the dissociation, however, oxygen is

necessary. The oxygen unites with certain of the compounds set free by the dis- sociation, forming, amongst other substances, carbonic acid. If such matters as these that unite with oxygen are in sufficient amount to use up all the oxygen, the grey matter of the brain suffers from a deficiency of oxygen (or from its absence), and also from the accumulation of carbonic acid, According to such a theory, cerebral activity depends on cerebral respiration, and sleep is @ kind of cerebral asphyxia. Some such condition is not improbable, but it must be stated that the evidence at present in support of it is meagre. Possibly, in attempt ing to account for the phenomenon of sleep, too much im- portance has been attributed to the changes occurring in the brain, forgetting that not merely brain matter but every tissue of the body becomes exhausted by work, and that sleep may be partly due to phenomena oceurring through- out the body and not in the brain alone. Some more comprehensive hypothesis than any yet advanced may be possible when the condition of all the functions during sleep has been more thoroughly investigated.

All the phenomena of sleep point toa diminished ex- citability of the cerebral nerve-centres and of the spinal cord. Contrary to what is often stated, there can be no doubt that reflex action is in partial abeyance and that the spinal cord is in a state of partial inactivity as well as the brain, The only nerve-centres that do not sleep are those absolutely essential to life, such as those connected with the heart, with respiratory movements, and with the dis- tribution of blood by the vaso-motor arrangements ; and Mosso’s experiments indicate that even these have a certain amount of repose in profound sleep.

There is little doubt that all living beings require periods Sle of repose alternating with periods of activity. Many anil plants close their flowers and bend their petioles at certain times of the day. These phenomena, called “ the sleep of plants,” depend apparently on changes in solar radiation,

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and there is no reason to believe that during the time of quiescence any reparative processes go on, as during the sleeping period of animals. ‘

Naturalists have observed many of the lower animals apparently in a state of sleep. Insects, crustaceans, fishes, reptiles, may all be observed occasionally to be almost motionless for considerable periods of time. The sleeping of birds is familiar to all, and in these there are anatomical arrangements by which the bird may, like the crane, sleep perched on one leg, or grasping a branch with both feet, like perching birds generally, without any muscular effort and consequently without fatigue.

The amount of sleep required by man varies according

vant : | tep to age, sex, and habit. The popular notion that a child eqgred sleeps half its time, an adult one-third, whilst an old person

ye” may do little except eat and sleep is not far wrong. In

early life the cerebral faculties appear to be easily exhausted and during the frequent and prolonged sleeps of infancy the brain rests and the vegetative changes connected with nutrition and growth go on actively. As life advances, less sleep is required, until in adult life a period of seven or eight hours is sufficient. As arule, women require more sleep than men ; but much depends on habit. Thus most women bear the loss of sleep in the first instance better than men, because they have been accustomed more to loss or irregularity of sleep. The effect of habit is well seen in nurses, both male and female, who will often be able to work for weeks continuously with snatches of sleep, not amounting to more than two or three hours daily. Sooner or later, however, even in these cases nature asserts her demands, and prolonged sleep is necessary to maintain health and vigour.

Injonia, Wakefulness during the time when one ought to be asleep is frequently a distressing condition, undermining the strength and incapacitating for active and efficient work. Insomnia or sleepless- ness often afflicts those of active mental habits and lays the founda- tion of premature decay. From what has been stated as to the cause of sleep it is evident that whatever tends to augment unduly the circulation through the brain may cause wakefulness, Thus long-continued or excessive intellectual action, or any powerful emotion, may be injurious. Moderate intellectual work is favourable tosleep. The remedy,in such cases is to avoid as far as possible the exciting causes or todcounteract them by bodily exercise and attention to

the general health. When sleeplessness overtakes a brain-worker it is a sure indication that less intellectual work must he done, and that he ought to betake himsclf, if possible, to out- of-door exercise in the pure air of the country. It is dangerous to persist, and still more to induce sleep artificially by drugs, as the overworked organ may become the seat of permanent disease or pernicious habits may be formed. The posture of the body in bed may influence sleep. Thus such positions as impede the flow of blood from the brain without affecting the supply of blood to it by the arteries may cause sleeplessness. Sometimes in cases of insomnia from excessive mental work there is the distressing con- dition that sleep disappears when the person lies down in bed, although before fing down he felt drowsy. In such a case resting with the head high may produce the desired result. Insomnia may also be caused by various functional discases, whereby the amount of blood in the brain is increased. Thus in young females derangement of the menstrual functions may cause a hyperesthesia or Increased sensibility to such an extent that the sufferer cannot sleep, or, if sleep be obtained, it is so light as to be dispelled by Weak sensory impressions that would fail to arouse a healthy person. i, an irregular or defieient action of the heart may cause wake- fulness, especially if associated with coldness of the extremities. In such cases the application of heat to the feet and attention to the digestive organs may produce refreshing sleep. Lastly, the excessive use of various drugs, such as alcohol, opium, belladonna,) Indian hemp, tea, and coffee, may cause sleeplessness. In these cases a moderate dose usually acts as a hypnotic, whilst frequently | repeated doses have the reverse effect. Thus sleeplessness is one

of the most distressing symptoms of delirium tremens, and it occurs | also in those in the habit of indulging in opium, morphia, chloral,) orIndian hemp. The general correetives of sleeplessness are active

Work, a moderate amount of bodily exercise, freedom from worry | a anxiety, the use of the warm bath in some cases to allay irri-) ability before going to bed, and such a posture in bed as the indi- |

ee has found in his own case to be favourable. Sometimes a ight but nutritious meal about an hour before retiring may con-

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duce to sleep, but as a rule late suppers are unfavourable. The use of drugs should be indulged in only with medical adviee. It is not too much to say that the injudicious use of bromide of potassium, chloral, opium, morphia, and stimulants by literary persons to procure sleep has often been productive of sad results, such as shattered health, an incurable habit of self-indulgence, and even accidental death (see Hammond, On Wakefulness).

It is a matter of common observation not only that certain per- Hyp- sons require more sleep than others but that they have less power nosia. of resisting its onset and of awaking. This condition may become morbid, constituting a veritable nervous disease, to whieh the name ‘‘maladie du sommeil” or hypnosia may be given. It may be described as invincible sleep, and it may continue for weeks and for months, terminating in convulsive seizures, and even death. A persistent drooping of the upper eyelid has been observed even during waking hours. Dr W. Ogle has observed in such cases an engorgement of the cervical ganglia of the sympathetic; but this may have nothing to do with the condition. Cases of very pro- longed sleep are not uncommon, especially amongst hysterical females, lasting four, seven, or ten days. On awaking the patient is exhausted and pale, with cold extremities, and not unfrequently, after a brief interval of waking, passes off into another lethargic sleep. Something similar to this may be seen in very aged persons towards the close of life.

Dreams (cf. DREAM, vol. vii. p. 452 sq.) only occur when sleep is Dream- light, and they indicate that consciousness is still continued. The ing. characteristic feature of dreaming is that the mind has no control over the groups of images that crowd upon it. These images are either revivals of old sensory impressions that have been stored up in the brain or they are the result of an untrammelled imagination. The will has lost the power of direction and control ; ideas, often grotesque, always confused, rise apparently spontaneously, are vivid for an instant, and then disappear. Dreaming may be described as a kind of physiological delirium. A consideration of the state in- dieates that the cerebral hemispheres are partially active and that itis the inhibitory power that is deficient (see

PaysioLoey, “Nervous System”). A further explanation cannot be given in the present state of our knowledge of cerebral physiology, but some of the more evident conditions or laws of the dreaming state may be indicated. (1) The character of dreams is often determined by a predominant thought or train of ideas that has occupied the mind before going to sleep. Thus the events of the preceding day may produce a particular kind of dream, and not unfrequently when a person attempts on waking to unravel his dream he may find the conuect- ing thread in an oecurrence or in a conversation or in the thoughts suggested by a book on the previous day. It would thus seem that the memory of recent things (and physiologieally there must be an organic basis for memory) may revivify old and apparently forgotten impressions, (2) In dreaming, the train of thought may be influenced by impressions made on the senses of the sleeper, sufficiently intense to produce this result, but not intense enough to awake him. Thus a sudden sensory impression, such as a loud sound, a current of cold air, a restrained position of one of the limbs, a word or sentence uttered by a familiar voice, may arouse a dream or turn the disordered throng of fancies in a new direction. In some instances, the dreamer is peculiarly susceptible to such external impressions, so that the same stimulus will always give rise to the same kind of dream. (3) It has frequently been observed that in dreaming there may be memories of old impressions, scenes, faces, words, that have long since faded from the recollection during waking hours, showing that many impressions that are supposed to be lost are only forgotten and require but the appropriate stimulus to cause them to start vividly into mental life. (4) In rare in- stances there may be conseeutive thought in dreams, so that the dreamer may write verse, frame speeches, or even work out mathe- inatical problems. Most persons have had experience of this strange kind of power and have regretted, in the partially conscious state before awaking, that they could not preserve some of the results, feeling assured that the sober reality of waking life would dispel the vision. (5) Dreams make only a feeble impression on the memory, so that on awaking what is at first vivid and distinct fades insensibly and rapidly away. This may be accounted for by the evanescent character of the mental ‘‘stuif” of dreams. In the waking state an act of attention is required to fix anything in the memory, and, as this is absent in dreaming, the impressions do not leave a permanent effect. For this reason also in dreams we have no memory of former dreams. (6) All have observed that there is no feeling of time or of space in dreams. We

live in an ideal world. This probably arises from the absence of fixity of thought, so that there is no apparent connexion between the successive pictures of the imagination. (7) In some dreams the activity of the cerebrum is such that the train of thoughts prompts to movement, and the sleeper may be heard muttering in his sleep or tossing the arms or inaking gestures. There are gradations between this condition of a ‘‘ troubled” dream and that of true somnambulism.

Somnambulism.—Some persons rise during sleep, walk about, Somnam- apparently unconscious of all external impressions, after a time bulism.

return to bed, and when they are awake they have no recollection of any of these occurrences. Sometimes the actions performed are of a complicated character and bear some relation to the daily life of the sleeper. Thus a cook has been known to rise out of bed, carry a pitcher to a well in the garden, fill it, go back to the house, fill various vessels carefully and without, spilling a drop of water, then return to bed, and have no recollection of what had transpired. Again, somnambulists have been observed to write letters or reports, execute drawings, and play upon musical instruments. Frequently they have gone along dangerous paths, executing delicate move- ments with precision. Four types of somnambulist may be noticed,—(1) those who speak without acting, a common variety often observed in children and not usually considered somnam- bulistic ; (2) those who act without speaking, also well known and the most common type; (8) those who both act and speak, more exceptional ; and (4) those who both act and speak and who have not merely the sense of touch active but also the senses of sight and hearing. ‘The fourth class is the most extreme type and merges into the physiological condition of mesmerism or hypnotism. This peculiar condition has already been fully described under animal magnetism (see MAGNETISM, AwntMaz), and it is necessary here only to notice it in connexion with the subject of sleep. Many observa- tions indicate that, at all events in some cases, the somnambulist, engaged, for example, in writing, has a mental picture of the page before him and of the words he has written. He does not see what he really writes. This has been proved by causing persons to write on a sheet of paper lying on the top of other sheets. After

he has been allowed to write a few sentences, the sheet was carefully with-drawn and he continued his writing on the next sheet, beginning on the new sheet at the corresponding point where he left off on the first one. Moreover, the somnambulist, by force of habit, stroked t's and dotted i's at the exact places where the t's and i's would have becn had he written continuously on one sheet, showing that what he was conscious of was not what was before him but the mental picture of what he had done.

The following table, modified from two such tables given by Ball and Chambard in their exhaustive article ''Somnambulisme " in the Dictionnaire Encylopédique des Sciences Médicales, shows the relation of the various intermediate conditions of sleeping and awaking and of the dreaming and somnambulistic states. The horizontal stroke indicates the presence of the condition the name of which heads the column :—

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Normal waking state Sleep, Ist degree…....- » z2ddegree…....- », 93d degree Deep sleep

Waking, 1st degree

» 2d degree (speci- ally dreaming state) .. 2… 38d degree \Complete waking \Dreaming state Ordinary somnambulism —(2) above 'Profound somnambulism (perfect unconscious- MIESS), oe eiceens oe wise vee Somnambulistic dream (movements in a dream)

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The somnambulist acts his dream. His condition is that of a vivid dream in which the cerebrum is so active as to influence centres usually concerned in voluntary movements. Under the dominant idea he executes the movements that this idea would naturally excite in the waking state. Many of his movements are in a sense purposive ; his eyes may be shut so that the movements are executed in the dark, or the eyes may be open so that there is a picture on the retina that may awaken no consciousness, and yet may, by reflex mechanisms, be the starting-point of definite and deliberate movements. In many cases he does not hear, the audi- tory centres not responding; but in others suggestive words may alter the current of his dream and lead him to perform other actions than what he intended to do. On awaking there is either no memory of what has taken place or the dim recollection of a fading dream.

It is important to notice that there is scarcely any action of which a somnambulist may not be capable, and immoral acts from which the individual would shrink in waking hours may be per- formed with indifference. Considering the abrogation of self-con- trol peculiar to the physiological condition, it is evident that no moral responsibility can be attached to such actions. In cases where somnambulistic propensities place a person in danger, an endeavour should be made to induce him to return to bed with- out awaking him; as a rude awakening may produce a serious

shock to the nervous system. Inquiry should then be made into the exciting cause of the somnambulistic dream, such as a particular train of thought, over-excitement, the reading of special books, the recollection of an accident or of a crisis in the person’s history, with the view of removing the cause if possible. It should never be forgotten that somnambulism, like chorea, hysteria, and epilepsy, is the expression of a general morbid predisposition, an indication of a nervous diathesis, requiring careful treatment so as to avoid more dangerous maladies.

Seearticle ‘“Sommeil” inthe Dictionnaire Encyclopédique des Sciences Médicales where a full bibliography is given and where also there is an account of the medico-legal questions connected with sleep and somnambulism; Macnish Physiology of Sleep ; Durham, “‘On the Physiology of Sleep,” in Gay’s Hospital Reports, 1860; Kohlschiitter, ‘“Die Mekanik des Schlafes,” in Z. fi ration, Med., vol. xxxiii., 1869 ; Pfliiger, ‘ Theorie des Schlafes,” in Pfliiger’s Archiv, vol. x., 1875; Mosso, Ueber den Kretslauf des Blutes im menschlichen Gehirn, Leipsic, 1881. As to somnambulism, see the article on the subject in the Dictionnaire

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both for full details and a copious bibliography. . GM. SLEIDANUS, Joun (c. 1506-1556), the annalist of the Reformation, was born at Schleiden (now a small village in the Oleffthal, about 42 miles south-west of Cologne) in 1506 or 1508. Passing from the village school, he studied at Liége, Cologne (?), Louvain (where he became tutor to the son of Count Manderscheid of Schleiden), Paris, and Orleans (where he studied law). In 1536 he became secretary to Cardinal du Bellay, minister of Francis L., and spent five years with him and with his brother Cardinal Guillaume du Bellay. The cardinals Du Bellay belonged to that party among the French nobility who desired on political grounds an alliance betwen the German Protestants and Francis against the emperor Charles V., and who employed the leaders of the Strasburg citizens as inter- mediaries. Sleidanus, whilst among the humanists of Liége, had adopted Protestant opinions, had learned to dis-trust the Romanist policy of Charles V., and was himself a strong supporter on religious and political grounds of the plans of the brothers Du Bellay. Their confidence in him was such that he was sent (1540) to watch the conduct of the French ambassador at Hagenau, and this brought him into personal relation with the German Protestant leaders. Next year Du Bellay sent him to confer with the heads of the Schmalkaldic League, when he found his patron’s ideas unacceptable. Philip of Hesse and the elector of Saxony would make no alliance with a foreign power against the emperor, and distrusted Francis personally because of his persecution of French Protestants. It is possible that this news made Du Bellay feel that he had no further need for his secretary, for we find Sleidanus leading a wandering life for two years, and finally making Strasburg his home, although he still kept

up a political correspondence with France. Sleidanus had been accustomed to copy all docu- ments bearing upon the Reformation to which he had access, and Bucer, who had seen his collection, proposed to | Philip of Hesse to appoint him historian of the Reformation, giving him a salary and access to all necessary documents. After some delay the heads of the Schmalkaldic League agreed to Bucer's proposal, and Sleidanus began his great work and finished the first volume in 1545. In that year he was again recalled to diplomacy and went to England — in a French embassy to Henry VIII. While there he dili- gently collected materials for his history. On his return to Strasburg he was sent by that city as one of its repre- sentatives to the diets of Frankfort and Worms ; and thence he proceeded to Marburg to explore the archives of Philip of Hesse. The Schmalkald War interfered with this work and also prevented the payment of Sleidanus, who in his difficulties applied to England for aid, and at Cranmer's intercession received a yearly pension (not long continued) from Edward VI. In 1551 Sleidanus went to the council of Trent as representative from Strasburg, charged also with full powers to act for the imperial cities Esslingen, Ravensburg, Reutlingen, Biberach, and Lindau. On his return his friends got him appointed professor of law 10 Strasburg, and he was once more able to give his whole | attention to his great work, which he finished for the press

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in 1554. But want of money, the death of his wife— whom he had married in 1546 on his return from the diet of Frankfort—and other misfortunes compelled him to delay printing. The book at length appeared,—Commen- tariorum de statu religionis et reipublicxe, Carolo V. Cesare, Libri XXVI. (translated into English by John Daws in 1560 and by G. Bohum in 1689). But the troubles of Sleidanus were not ended. The work was too impartial to please any one, and even the gentle Melanchthon was unable to praise it. It remains notwithstanding the most valuable contemporary history of the times of the Refor- mation, and contains the largest collection of important documents. The author died at Strasburg in October 1556 in poverty, and inconsolable since the death of his wife.

See H. Baumgarten, Ueber Sleidanus Leben und Briefwechsel (1878), and Sleidans Briefwechsel (1881).

SLIGO, a maritime county in the north-west of Ireland, in the province of Connaught, is situated between 53° 54’ and 54° 28’ N. lat. and between 8° 10’ and 9° 10’ W. long., and is bounded N. by the Atlantic, E. by Leitrim, 8.E. by Roscommon, and §. and W. by Mayo. The total area is 451,129 acres, or nearly 705 square miles. Its greatest length from north to south, between Mullaghmore Head and Lough Gara, is 38 miles and its greatest breadth from east to west is 41.

The coast-line is very irregular and in some places rises into grand escarpments and terraces. The principal inlets are Killala Bay and Sligo Bay, the latter subdivided into Brown Bay, Drumcliffe Bay, and Ballysadare Bay. Near the coast are the islets of Inishmurray, Coney, and Oyster. Though Sligo cannot be compared for scenery with the western parts of Mayo, it is in many places charmingly picturesque, being well wooded and possessing several fine lakes and rivers, as well as some ranges of hills which from their situation and grouping have a very striking effect. In the north are the limestone elevations of Ben- bulbin (1722 feet) and Knocknarea (1078), contrasting finely with the adjacent rugged gneiss mountains, among which are King’s Mountain (1965 feet) and Gullogherboy (1430). In the west are the ranges of the Sheve Gamph and Ox Mountains, 1300 and 1600 feet respectively. The Curlew Mountains (nearly 900 feet high) separate Sligo from Roscommon. The principal rivers are the Moy, form- ing for a part of its course the boundary with Mayo, and flowing south-westwards and then northwards into Killala Bay ; the Easky, flowing northwards from Lough Easky ; the Ballysadare, with its branches the Owenmore, Owenbeg, and Arrow or Unshin; and the Garvogue, flowing from Lough Gill. Except the finely situated Lough Gill (3130 acres) extending into Leitrim, Lough Arrow (3010), and Lough Gara (3683), none of the lakes have so large an area as 400 acres.

The Carboniferous Mountain Limestone forms the basis of a great part of the county, and includes the Lower Limestone calp or black shale series and the Upper Limestone, which rises occasionally into a lofty tableland. There is a small tract of Yellow Limestone in the extreme north, as also on the

north and north-east of Lough Gara, whence it extends into Mayo. The Old Red Sandstone appears m two masses near Lough Arrow. A small tract of granite enters the county on the south-west, coming from between Lough Conn and Foxford in Mayo, giving place to a broad belt of trap porphyry bounded by a narrow fringe of Old Red Sandstone, which stretches ma north-easterly direction along the line of the Ox Mountains to Ballysadare Bay. Iron is abundant, especially in the neighbour- hood of the Ox Mountains, but from want of fuel is not worked. Pure copper is found in the beds of some of the rivers, and sulphate ol copper and iron pyrites occur in some places.

Agricultwre.—There is considerable variety both in the character of the soil and in the agricultural advancement in different parts a the county. In some parts it is a light sandy loam resting on a

teestone bottom, and in the lower districts a rich and deep mould prevails resting on a substratum of liniestone. Owing to the

moistness of the climate cattle feeding is found to be the most Temunerative method of farming. Out of a total of 451,129 acres

231,758 or 51:3 per cent. in 1884 were under grass, 86,365 under crops, 38,431 bog and marsh, 70,599 barren mountain land, 7577 woods and plantations, and 417 fallow, the remaining 15,987 acres being under water, roads, fences, &c. The total number of hold- ings was 15,352, there being 752 under 1 acre, 1448 between 1 and 5 acres each in extent, 5834 between 5 and 15, 4592 between 15 and 30, 1520 between 30 and 50, and 1211 of 100 acres and upwards. The total area under corn crops in 1884 was 24,324 acres, while in 1875 it was 30,810; under green crops 25,897, in 1875 30,491 ; under meadow and clover 36,120, in 1875 32,396 ; and under flax 24, in 1875 175,—the total area under tillage having decreased between 1875 and 1884 from 93,872 to 86,365 acres. Of the corn crops in 1884 oats occupied 23,055 acres, and green crops and potatoes 19,835. The number of horses between 1875 and 1884 increased from 7244 to 8292, of asses from 7588 to 8471; cattle decreased from 97,658 to 89,458, sheep from 65,857 to 64,824; pigs, again, increased from 19,726 to 26,996, goats from 8081 to

4745, and poultry from 277,118 to 305,509. According to the Jandowners return Sligo was divided among 856 proprietors, possessing 448,397 acres at an annual value of £210,382, or about 9s. 44d. per acre. The principal proprietors were Colonel E. H. Cooper, 34,120 acres; Sir Robert Gore Booth, 31,774; Charles W. O'Hara, 21,070; W. R. O. Gore, 21,019 ; Owen Wynne, 12,982; Colonel King-Harman, 12,629 ; Hon. Evelyn Ashley, 12,426 ; and William Phibbs, 10,507.

Manufactures and other Industries. —Coarse woollens and linens are manufactured for home consumption, and there are tanneries, distilleries, and breweries in the principal towns. A considerable general trade is carried on at the ports of Ballina (on the Moy) and Sligo. The fisheries on the coast are valuable, and there are im- portant salmon fisheries at the mouths of the rivers.

Administration and Population.—The county is divided into 6 baronies, and contains 37 parishes and 4 parts of parishes, and 1292 townlands. The county has three poor-law unions—Dromore West, Sligo, and Tobereurry—with parts of the unions of Ballina and Boyle (Roscommon). Itis in the Connaught circuit, and assizes are held at Sligo and quarter sessions at Ballymote, Easky, and Sligo. Itis in the Dublin military district, and there are barracks at Sligo. For parliamentary representation the county has since 1885 formed two divisions (North and South), each returning a member. Between 1841 and 1851 the population decreascd from 180,886 to 128,515 or 29 per cent., and by 1881 it had decreased to 111,578 (55,144 males, 56,484 females), or 38°3 per cent. since 1841. In 1881 the number of persons who could read and write was 52,602, who could read only 15,574, who could neither read nor write 43,402. There were 2326 who could speak Irish only, while 24,263 could speak Irish and English, There were 10 superior schools with 266 pupils, of whom 142 were Catholics and 124 Pro- testants, and 211 primary schools with 13,714 pupils, of whom 12,070 were Catholics and 1644 Protestants. The principal towns are Sligo (population 10,808 in 1881), Ballina (1442 in Sligo and 4318 in Mayo), Ballymote (1145), and Tobercurry (1081).

History and Antiquities.—In the time of Ptolemy the district was inhabited by the Nagnatx, the capital Nagnata being some- where near the site of the

present town of Sligo. Afterwards it was possessed bya branch of the O'Connors, called O'Connor Sligo. On the landing of Henry II. it gradually fell into the power of the De Burgos. The district formed part of Connaught, which, in the reign of Elizabeth, was divided into seven counties. On the lands of Carrowmore, between Sligo and Ballysadare, there is a remarkable collection of Druidical remains, consisting of cairns, a circle, cromlechs, and pillar stones. At Drumceliffe is the only round tower now remaining in the county, and a beautiful Celtic cross 18 feet in height. The principal monastic ruins are the abbey of St Fechan at Ballysadare, with an ancient church displaying some curious architecture of the 11th or 12th century ;. the remarkable group of buildings on Inishmurray ; and the abbey of Sligo, noticed under the town below. There are a considerable number of old castles, but none of special interest.

SLIGO, the chief town of the above county and an important seaport, is finely situated at the mouth of the Garvogue, near Lough Gill, 137 miles north-west of Dublin by rail. The town is rather irregularly built and has a decayed appearance, which somewhat belies its actual pros- perity. Formerly it was fortified by a castle and walls, but of these there are now no remains. The abbey, founded in 1252 by Maurice Fitzgerald, lord-justice, is one of the finest monastic ruins in Ireland. It was partly destroyed by fire in 1414 and again in 1642. Within recent years measures have been taken to preserve it. Three sides of the cloister of the quadrangle still remain, and the lofty quadrangular tower at the junction of the nave and chancel is entire. The eastern window, still very perfect, is of the date of the original structure. The

principal modern buildings are the new Catholic cathedral, in the Norman style with a finely sculptured doorway, the town-hall (1865-66), the county court-house, the cus- tom-house, the lunatic asylum, and the barracks. The quays are commodious, and steamers ply to and fro be- tween Sligo and Glasgow, Liverpool, and Londonderry,— the principal exports being cattle, fowls, eggs, and butter, and the imports coal, iron, timber, and provisions, The port is under the control of harbour commissioners. There is an

important butter-market, and maize, flour, and corn mills. The population in 1861 was 10,693, and in 1881 it was 10,808.

A castle was built at Sligo by Maurice Fitzgerald in 1242, which in 1270 was taken and destroyed by O'Donnell; in 1310 it was rebuilt by Richard, ear] of Ulster, and was again partly destroyed in 1369 and 1394. Early in the reign of James I. the town received a market and two annual fairs; in 1613 it was incorporated and received the privileges of a borough ; and in 1621 it received a charter of the staple. In 1641 it was besieged by the Parliament- ary forces under Sir Charles Coote, but was afterwards evacuated, and occupied by the Royalists till the termination of the war. In 1688 it declared in favour of James II., and, after being captured by the Enniskilleners, was retaken by General Sarsfield, but ulti- mately surrendered to the earl of Granard. The borough was dis- franchised in 1870. .

SLIVEN, Suivno, SeLrmnta, Istemnive, or IsLIMYE, an important town of East Roumelia, situated at the southern base of the Balkans, 750 feet above the sea, where several mountain streams flow south to the Tunja, a tributary of the Maritza. The luxuriant foliage of its trees and the general picturesqueness of its appearance gain in effect by the contrast which they present with the bare gneiss and porphyry summits that rise immediately to the north. On the south it is surrounded by orchards, gardens, and extensive mulberry plantations. Besides a large number of mosques, the public buildings comprise a synagogue and four Christian churches; but there is nothing of much architectural interest in the town, A Government factory for the manufacture of military cloth- ing was established in 1834 ; there isa good silk industry ; and Sliven red wine is famous. The population (Turks, Bulgarians, Armenians, Greeks, Jews, and Gipsies) was 22,000 in 1872.

Sliven, the Stlifanos of the Byzantine writers, owes a good deal of its importance to its strategical position on one of the trans-Balkan highways to Adrianople and the south. In early times, when it was a subject of dispute between Byzantium and Bulgaria, it generally followed the fate of Aidos and Mesembria (Misivri). After its capture by the Turks (1388) it was one of the "' voinik" towns which remained exempt from taxes and were allowed to elect their own voivode ; but those privileges were lost in the

16th cen- tury. On 12th August 1829 Sliven was occupied by the Russian army under Riidiger and Gortchakoff.

SLOANE, Sir Hans (1660-1753), a celebrated collector and successful physician, was born on 16th April 1660 at Killileagh in county Down, Ireland, where his father had settled at the head of a Scotch colony sent over by James I. He had as a youth a strong turn for collecting objects of natural history and other curiosities. This led him to the study of medicine, which he went to London to pursue, directing his attention assiduously to botany, materia medica, and pharmacy. His collecting propensities made him useful to the more philosophically minded Ray and Boyle, and procured him their patronage. After four years in London he travelled through France, spending some time at Paris and Montpellier, and taking his M.D. degree at the university of Orange. He returned to London with a considerable collection of plants and other curiosities, of which the former were sent to Ray and uti- lized by him for his History of Plants. Sloane was quickly elected into the Royal Society, and at the same time he had the good fortune to attract the notice of Sydenham, who took a fancy to him and gave him valuable introduc- tions to practice. In 1687 he became fellow of the College

of Physicians, and took the opportunity of proceeding to Jamaica the same year as physician in the suite of the duke of Albemarle. The duke died soon after landing, and Sloane’s visit lasted only fifteen months; but during that time he got together about 800 new species of plants, the island being at the time virgin ground to the botanist. Of these he published an elaborate catalogue in Latin; and at a later date (1707-25) he made the experiences of his visit the subject of two sumptuous folio volumes. His merits as a collector were sufficient to give him a high place in the scientific circles of the time. He became secre- tary to the Royal Society in 1693, and edited its T’rans- actions for twenty years. His practice as a physician among the upper classes was large and lucrative ; he is said to have inspired the members of the court and aristo- cracy with the “greatest confidence in his prescriptions,” In the pamphlets written concerning Dr Cockburn’s sale of a secret remedy for dysentery and other fluxes, it was stated for the defence

that Sloane himself did not disdain the same kind of professional conduct ; and there is some colour given to that charge by the fact that his only medical piece, an Account of a Medicine for Soreness, Weakness, and other Distempers of the Eyes (London, 1745) was not given to the world until its author was in his eighty-fifth year, and had retired from practice.

On the accession of George I. Sloane was made physician- general to the army, and in 1716 was created a baronet, being the first medical practitioner to receive an hereditary title. In 1719 he became president of the College of Phy- sicians, and held the office sixteen years. In 1727 he suc- ceeded Sir Isaac Newton in the presidential chair of the Royal Society ; he retired from it at the age of eighty, “much against the inclination of that respectable body, who chose Martin Folkes to succeed him, and in a public assembly thanked him for the great and eminent services which he had rendered them.” Sloane’s memory survives more by his judicious investments than by anything that he contributed to the subject-matter of natural science or even of his own profession ; his name is absolutely unknown in the history of medicine, and his services to botany were such as, in the nature of things, would be soon forgotten. But his purchase of the manor of Chelsea has perpetuated his memory in the name of a “place,” a street, and a square, His great stroke as a collector was to acquire (by bequest, conditional on paying off certain debts) in 1701 the cabinet of William Courten, who had made collecting the business of his life. When Sloane retired from active work in 1741 his library and cabinet of curiosities, which he took with him from Bloomsbury to his house in Chelsea, had grown to be very extensive and of unique value. On his. death on 11th January 1753 he bequeathed his books, manu- scripts, prints, drawings, pictures, medals, coins, seals, cameos, and other curiosities to the nation, on condition that parliament should pay to his executors £20,000, which was a good deal less than the value of the collection. The

same year, and the collection, together with George IL’ royal library, &c., was opened to the public at Bloomsbury as the British Museum in 1759. benevolence or munificence may be mentioned his gift to the Apothecaries’ Company of the freehold of the botanical or physic garden, which they had rented from the Chelsea estate since 1673, also his help in starting the foundling hospital. Sloane is described as having been a man of con-

siderable presence and of courtly address. See Weld, History of the Royal Society, i. 450 (London, 1848) ; and Munk, Roll of the College of Physicians, 2d ed., i. 466 (Lon- don, 1878).

SLODTZ, Runit Micwen or Micuen Anos (1715-17 64), French sculptor, was born at Paris on 29th September

bequest was accepted on those terms by an Act passed the |

Among his other acts of |

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1715. He passed seventeen years of his life at Rome, where he was chosen to execute a statue of St Bruno, one of the best modern works of the ¢lass in St Peter's. He was also the sculptor of the tomb of Marquis Capponi in St John of the Florentines. Other works of his are to be seen at the church of St Louis of France and at Santa Maria della Scala. After his return to France, Slodtz, in conjunction with his brothers Sebastian and Paul, produced many decorative works in the churches of Paris, and, though much has been destroyed, his most considerable achievement—the tomb of Languet de Gergy in St Sul- pice—exists at the present day. He died at Paris on 26th October 1764.

Slodtz had been, like his brothers, a member of the Academy of Painting and Sculpture, and many particulars of his life are pre- served in a memoir written by Cochin, and also ina letter from the same to the Gazette Littéraire, which was reproduced by Castilhon in the Néerologe of 1766. Slodtz's father (1655-1726) was also a sculptor, born at Antwerp; he became a pupil of Girardon and worked mostly under him at Versailles and the Tuileries.

See C. N. Cochin, Mém. inéd., Paris, 1881; Barbet de Jouy, Sculpture moderne du Louvre, Paris, 1856 ; Dussieux, Artistes Francais a VEtranger, Paris, 1852.

SLONIM, a district town of Russia, in the government of Grodno, 105 miles south-east of Grodno and 20 from the railway from Moscow to Warsaw, on the high craggy banks of the Schara. It derives its importance from this river, which is navigable and enters the system of the Oginski Canal connecting the Niemen with the Dnieper. Corn, tar, and especially timber are exported annually toa large amount, which in 1882 reached the value of £20,700. The population was 21,110 in 1883.

Stonim is a very old town, being mentioned in 1040, when Yaroslaff defeated the Lithuanians in its neighbourhood and com- pelled them to acknowledge his rule. In 1241 the Mongols, under Batyi, pillaged it and burned its wooden fort. Owing to its position between Galician Russia and Lithuania, it often changed hands until it was conquered by the Lithuanians in the 14th century. From 1631 to 1685 it was the seat of the Lithuanian seim and became a flourishing city. In the 18th century, under the hetman Oginski, a canal was dug to connect the Schara with the Dnieper. Oginski embellished the city and founded there a printing-office. Russia annexed the town in 1795.

SLOTH. The general characters by which the family Bradypodide are distinguished from the rest of the order Edentata have been given in the article Mammatia (vol. xv. p. 384). The sloths, as the animals of this family are called on account of the habitual sluggishness of their

Two-toed sloth (Cholepus hajfmanni).

Movements, are the most strictly arboreal of all mammals, living entirely among the branches of trees, usually hang- Ing under them, with thcir backs downwards, and clinging

to them with the simple hook-like organs to which the terminations of all their limbs are reduced. When they are obliged from any cause to descend to the ground, which they rarely, if ever, do voluntarily, their limbs, owing to their unequal length and the peculiar conformation of the feet—which allows the animals to rest only on the outer edge—are most inefficient for terrestrial progression, and the sloths crawl along a level surface with

considerable difficulty. Though generally slow and inactive, even when in their natural haunts, they can on occasions travel with considerable rapidity along the branches, and, as they do not leap, ike most other arboreal creatures, they avail themselves of the swaying of the boughs by the wind to pass fromi tree to tree. They feed entirely on leaves and young shoots and fruits, which they gather in their mouth, the fore-limbs aiding in dragging boughs within reach, but not being used as hands, as they are by monkeys, squirrels, &c. When sleeping they roll themselves up in a ball, and, owing to the dry shaggy character of their hair, are very inconspicuous among the mosses and lichens with which the trees of their native forests abound; and the concealment thus afforded is heightened in some species by the peculiar greenish tint of the outer covering,—very uncommon in maminals. This is not due to the colour of the hair itself, but to the presence upon its surface of an alga, the lodgement of which is facilitated by the fluted or rough surface of the exterior of the hair, and the growth of which is promoted by the dampness of the atmosphere in the gloomy tropical forests, as it soon disappears from the hair of animals kept in captivity in England. Sloths are nocturnal, silent, inoffensive, and solitary animals, and produce usually but one young at birth. They appear to show an almost reptilian tenacity of life, surviving the most severe injuries and large doses of poisons, and ex-hibiting longer persistence of irritability of muscular tissue after death than other mammals.

The sloths were all included in the Linnean genus Bradypus, but Illiger very properly separated the species with but two claws on the fore-feet, under the name of Cholwpus, leaving Bradypus for those with three.

Genus Bradypus.—Three-toed sloths. Teeth usually $ on each side ; no tooth projecting greatly beyond the others; the first in the upper jaw much smaller than any of the others; the first in the lower jaw broad and compressed ; the grinding surfaces of all much cupped. Vertebre: C 9, D and L 20 (of which 15 to 17 bear ribs), 8 6, C 11. All the known species present the remark- able peculiarity of possessing nine cervical vertebrae, 7.¢., nine vertebre in front of the one which bears the first thoracic rib (or first rib connected with the sternum, and corresponding in its general relations with the first rib of other mammals); but the ninth, and sometimes the eighth, bears a pair of short movable ribs. The arms or fore-limbs are

considerably longer than the hind legs. The bones of the fore-arm are complete, free, and capable of pronation and supination. The hand is long, very narrow, habit- ually curved, and terminates in three pointed curved claws, in close apposition with each other; they are, in fact, incapable of being divaricated, so that the hand is rednced to the condition of a triple hook, fit only for the function of suspension from the boughs of trees. The foot closely resembles the hand in its general struc- ture and mode of use. The sole is habitually turned inwards and cannot be applied to the ground in walking. The tongue is short and soft, and the stomach large and complex, bearing some resem- blance to that of the ruminating animals. The windpipe or trachea has the remarkable peculiarity among mammals—not unfrequent among birds and reptiles—of being folded on itself before it reaches the lungs. The mamme are two and pectoral in position.

‘‘Ai” is the common name given in books to the three-toed sloths. They were all comprised by Linnzeus under the species Bradypus tridactylus. More recently Dr Gray has described as many as eleven, ranged in two genera, Bradypus and Arctopithecus ; but the distinctions which he assigns both to species and to genera do not bear close examination. Some are covered uniformly with a grey or greyish brown coat ; others have a dark collar of elongated hairs around the shoulders (B. torquatus); some have the hair of the face very much shorter than that of the rest of the head and neck ; and others have a remarkable-looking patch of soft short hair on the back between the shoulders, consisting when best marked of a median stripe of glossy black, bordered on each side by bright

eX = “ar

orange, yellow, or white. There are also structural differences in the skulls, as in the amount of inflation of the pterygoid bones, which indicate real differences of species ; but the materials in our museums are not yet sufficient to correlate these with external characters and geographical distribution. The habits of all are apparently alike. ‘They are natives of Guiana, Brazil, and Peru, and one if not two species (B. infuscatus and B. castaneiceps) extend north of the Isthmus of Panama as far as Nicaragua,

the former of these Dr Seeman says that, though generally silent, a specimen in captivity uttered a shrill sound like a monkey when forcibly pulled away from the tree to which it was holding.?

Genus Cholepus.—Teeth §; the most anterior in both jaws separated by an interval from the others, very large, caniniform, wearing to a sharp, bevelled edge against the opposing tooth, the upper shutting in front of the lower when the mouth is closed, unlike the true canines of heterodont mammals. Vertebre: C 6 or 7, D 23-24, L. 8, 8 7-8, C 4-6. One species (C. didactylus) has the ordinary number of vertebre in the neck ; but an otherwise closely allied form (C. hoffmannt) has but six. The tail is very rudimentary. The hand generally resembles that of Bradypus; but there are only two functional digits, with claws,—those answering to the second and third of the typical pentadactyle manus. The structure of the hind limb generally resembles that of Bradypus, the appellation “two-toed” referring only to the anterior limb, for in the foot the three middle toes are functionally developed and of nearly equal size. C. didactylus, which has been longest known, is commonly called by the native name of Unaw. It inhabits the forests of Brazil. ©. hoffmannt has a more northern geographical range, extending from Ecuador through Panama to Costa Rica. Its voice, which is seldom heard, is like the bleat of a sheep, and if the animal is seized it snorts violently. Both species are very variable in external coloration. (W. H. F.)

SLOUGH, an urban sanitary district of Buckingham- shire, England, is situated on the Great Western Railway, 184 miles west of London and 2 north of Windsor. Within recent years it has largely increased, and it contains a number of good shops and villas. It is supplied with water from artesian wells. The parish church of St Mary, erected 1837, has been recently enlarged, Among other public buildings are the British orphan asylum, the Eton union workhouse, and the reading-room and literary ‘nstitute. Sir William Herschel, the astronomer, resided at Slough, and there constructed his telescope. ike population of the urban sanitary district, which embraces parts of the parishes of Stoke Poges and Upton-cum-Chalvey, in 1871 was 4509, and in 1881 (area, 401 acres) it was 5095.

SLOVAKS. See Siavs.

SLOVENES. See SLAVS.

SLUG. See SNAIL.

SERUTSK, a district town of Russia, in the government of Minsk, situated on the Stutcha river (tributary of the Pripet), 123 miles south of Minsk. This old town is men- tioned in the 12th century as a dependency of Kieff, and, like other towns of the region, was devastated by the Tatars, and later suffered in the wars between Russia and Poland. It is now merely a large village, whose inhabitants are chiefly engaged in agriculture, with a little trade in corn, timber, and wooden wares. The immense marshy and woody tracts of the Polyesie (see Minsk) surround it on all sides, the Stutcha being its chief means of communica- tion. Its population remains almost stationary and was 19,000 in 1883.

SMALLPOX, or VARIoLA (varus, “a pimple”), an acute infectious disease characterized by fever and by the appear- ance on the surface of the body of an eruption, which, after passing through various stages, dries up, leaving more or less distinct cicatrices. Few diseases have been so destruc- tive to human life as smallpox, and it has ever been re- garded with horror alike from its fatality, its loathsome accompaniments and disfiguring effects, and from the fact that no age and condition of life are exempt from liability to its occurrence. Although in most civilized countries its ravages have been greatly limited by the protection

1 Godman and Salvin’s Biologia Centrali-Americana, p. 184.

‘from uncommon, affecting especially those who are un-

protected, or whose protection has become weakened by lapse of time.

Much obscurity surrounds the early history of smallpox, It appears to have been imported into Europe from Asia, where it had been known and recognized from remote antiquity. The earliest accounts of its existence reach back to the middle and end of the 6th century, when it was described by Procopius and Gregory of Tours as occur- ring in epidemic form in

Arabia, Egypt, and the south of Europe. In one of the narratives of the expedition of the Abyssinians against Mecca (c. 550) the usual miraculous details are combined with a notice of smallpox breaking out among the invaders? Not a few authorities, however, regard these accounts as referring not to smallpox but to plague. The most reliable statements as to the early exist- ence of the disease are found in Rhazes (see vol. xv. p, 805), by whom its symptoms were clearly described, its pathology explained by a humoral or fermentation theory, and directions given for its treatment. During the period of the crusades smallpox appears to have spread exten- sively through Europe, and hospitals for its treatment were erected in many countries. But at this period and for centuries afterwards the references to the subject include in all likelihood other diseases, since no precise distinction appears to have been made between the different forms of eruptive fever until a comparatively recent date. Small- pox was known in England as early as the 13th century,

and had probably existed there before. It appears to have been introduced into America shortly after the discovery

of that continent, and there, as in Europe and throughout the known world, destructive epidemics were of frequent

occurrence during succeeding centuries. The only known factor in the origin of smallpox is con- Con | tagion,—this malady being probably the most contagious of tsi”

all diseases. Its outbreak in epidemic form in a locality may frequently be traced to the introduction of a single case from a distance. The most direct means of com- municating smallpox is inoculation (see below). By far the most common cause of conveyance of the disease, however, is contact with the persons or the immediate surroundings of those already affected. The atmosphere around a smallpox patient is charged with the products of the disease, which likewise cling tenaciously to clothing, furniture, &c. The disease is probably communicable from its earliest nianifestations onwards to its close, but it is generally held that the most infectious period extends from the appearance of the eruption till the drying up of the pustules. Smallpox may also readily be communicated by the bodies of those who have died from its effects. No age is exempt from susceptibility to

smallpox. In- fants are occasionally born with the eruption or its marks upon their bodies, proving that they had undergone the disease in utero. Dark-skinned races are said to sufler more readily and severely than whites. One attack of smallpox as a rule confers immunity from any recurrence, but there are numerous exceptions to this rule. Over. crowding and all insanitary surroundings favour the spread of smallpox where it has broken out; but the most in- fluential condition of all is the amount of protection afforded to a community by previous attacks and, especi- ally in the present day, by vaccination. Such protection, although for a time most effectual, tends to become eX- — hausted, unless renewed. Hence in a large population there is always likely to be an increasing number of indi- viduals who have become susceptible to smallpox. This probably explains its occasional and even apparently dukes aan:
ommmmmmammnmnmeiiaiainiemaa sy eee

2 See Nuldeke, Geschichte der Perser.. . aus Tabari (Leyden, 1879), p. 218. Ndéldeke thinks that this notice may be taken from genuine historical tradition, and seems to find an allusion to it in an old poem.

periodic epidemic outbreaks in large centres, and the well-known fact that the most severe cases occur at the commencement,—those least protected being necessarily more liable to be first and most seriously attacked.

While the symptoms of smallpox are essentially the game in character in all cases, they are variously modified according to the form which the disease may assume, there being certain well-marked varieties of this as of most other infectious maladies. The following descrip- tion applies to an average case. After the reception into the system of the smallpox contagion the onset of the symptoms is preceded by a period of incubation, during which the patient may or may not complain. This period is believed to be from about ten to fourteen days. In cases of direct inoculation of the virus it is considerably shorter. The invasion of the symptoms is sudden and severe, in the form of a rigor followed by fever (the primary fever), in which the temperature rises to 103° or 104° Fahr. or higher, notwithstanding that perspiration may be going on. A quick pulse is present, together with thirst and con- stipation, while intense headache accompanied with vomit- ing and pain in the back is among the most characteristic of the initial symptoms. Occasionally the disease is ushered in by convulsions. Some authorities hold that the more violent the invasion the more severe the attack is likely to prove. These symptoms continue with greater or less intensity throughout two entire days, and during their course there may occasionally be noticed on various parts of the body, especially on the lower part of the abdomen and inner sides of the thighs, a diffuse redness accompanied by slight spots of extravasation (petechiz), the appearance somewhat resembling that of scarlet fever. These “prodromal rashes,” as they are termed, appear to be more frequent in some epidemics than in others, and they do not seem to have any special significance. They are probably more frequently seen in cases of thé mildest form of smallpox (varioloid), referred to below. On the third day the characteristic eruption begins to make its appearance. It is almost always first seen on the face, particularly about the forehead and roots of the hair, in the form of a general redness; but upon this surface there may be felt by the finger numerous elevated points more or less thickly set together. The eruption, which is

accompanied by heat and itching, spreads over the face, trunk, and extremities in the course of a few hours,—con- tinuing, however, to come out more abundantly for one or two days. It is always most marked on the exposed parts ; but in such a case as that now described the individual “pocks” are separated from each. other (discrete). On the second or third day after its appearance the eruption undergoes a change,—the pocks becoming vesicles filled with a clear fluid. These vesicles attain to about the size of a pea, and in their centre there is a slight depression, giving the characteristic umbilicated appearance to the pock, The clear contents of these vesicles gradually become turbid, and by the eighth or ninth day they are changed into pustules containing yellow matter, while at the same time they increase still further in size and lose the central depression. Accompanying this change there are great surrounding inflammation and swelling of the skin, which, where the eruption is thickly set, produce much disfigure- ment and render the features unrecognizable, while the affected parts emit an offensive odour, particularly if, as often happens, the pustules break. The eruption is present not only on the skin but on mucous membranes, that of the mouth and throat being affected at an early period ; and the swelling produced here is not only a source of Steat discomfort but even of danger from the obstruction thus occasioned in the upper portion of the air-passages.

€ Voice is hoarse and a copious flow of saliva comes from

and with symptoms of great prostration.

the mouth. The mucous membrane of the nostrils is simi- larly affected, while that of the eyes may also be involved, to the danger of permanent impairment of sight. The febrile symptoms which ushered in the disease undergo marked abatement on the appearance of the eruption on the third day, but on the eighth or ninth, when the vesicles become converted into pustules, there is a return of the fever (secondary or suppurative fever), often to a severe extent, and not unfrequently accompanied by pro- minent nervous phenomena, such as great restlessness, delirium, or coma. On the eleventh or twelfth day the pustules show signs of drying up (desiccation),

and along with this the febrile symptoms decline. Great itching of the skin attends this stage. The scabs produced by

.the dried pustules gradually fall off and a reddish brown

spot remains, which, according to the depth of skin in- volved in the disease, leaves a permanent white depressed scar,—this “pitting” so characteristic of smallpox being specially marked on the face. Convalescence in this form of the disease is as a rule uninterrupted.

There are certain varieties of smallpox depending upon Varieties.

the form it assumes or the intensity of the symptoms. Confluent smallpox (variola confluens), while essentially the same in its general characters as the form already described, differs from it in the much greater severity of all the symptoms even from the onset, and particularly in regard to the eruption, which, instead of showing itself in isolated pocks, appears in large patches run together, giving a blistered aspect to the affected skin. This confluent condi- tion is almost entirely confined to the face, and produces shocking disfigurement, while subsequently deep scars re- main and the hair may be lost. The mucous membranes suffer in a similar degree of severity, and dangerous com- plications may arise from the presence of the disease in the mouth, throat, and eyes. Both the primary and secondary fevers are extremely severe. The mortality is very high, and it is generally estimated that at least 50 per cent. of such cases prove fatal, either from the vio- lence of the disease or from one or other of the numerous complications which are specially apt to attend upon it. Convalescence is apt to be slow and interrupted. Another variety is that in which the eruption assumes the hemor- rhagic form owing to bleeding taking place into the pocks after their formation. This is apt to be accompanied with hemorrhages from various mucous surfaces (particularly in the case of females), occasionally to a dangerous degree Many of such cases prove fatal. A still more serious form is that termed malignant smallpox, in which, as in the malignant forms of other infectious diseases (see MEAsLEs and SCARLET FeEvER), the patient is from the onset overwhelmed with the poison and quickly succumbs,—the rash scarcely, if at all, appearing or showing the hemorrhagic or purpuric character. Such cases are, however, comparatively rare. The term varioloid or modified smallpox is applied to

cases occurring in persons constitutionally but little sus- ceptible to the disease, or in whom the protective influence of vaccination or a previous attack of smallpox still to some extent exists. Cases of this mild kind are of very common occurrence where vaccination has been systematic- ally carried out. As compared with an average case of the unmodified disease as above described, this form is very marked, the differences extending to all the phenomena of the disease. (1) As regards its onset, the initial fever is much milder and the premonitory symptoms altogether less in severity. (2) As regards the eruption, the number of pocks is smaller, often only a few and mostly upon the body. They not unfrequently abort before reaching the stage of suppuration; but should they proceed to this stage the secondary fever is extremely slight or even

Attendant

circum- stances.

Vaccina- tion.

Treat- ment.

absent. There is little or no pitting. (3) As regards com- plications and injurious results, these are rarely seen and the risk to life is insignificant.

Various circumstances affect the mortality in ordinary smallpox and increase the dangers attendant upon it. The character of the epidemic has an important influence. In some outbreaks the type of the disease is much more severe than in others, and the mortality consequently greater. Smallpox is most fatal at the extremes of life, except in the case of vaccinated infants, in whom there is immunity from the disease. Again, any ordinary case with discrete eruption is serious, and a case of confluent or even semi-confluent character is much more grave, while the hemorrhagic variety is frequently and the malignant always fatal. Numerous and often dangerous complica- tions, although liable to arise in all cases, are more apt to occur in the severer forms, and in general at or after the supervention of the secondary fever. The most important are inflammatory affections of the respiratory

organs, such as bronchitis, pleurisy, or pneumonia, diphtheritic condi- tions of the throat, and swelling of the mucous membrane of the larynx and trachea. Destructive ulceration affect- ing the eyes or ears are well-known and formidable dan- gers, while various affections of the skin, in the form of erysipelas, abscess, or carbuncles, are of not infrequent occurrence. Persons of enfeebled health, and those whose constitutions are impaired by intemperance, readily suc- cumb to attacks of smallpox, even of comparatively mild character, as do also pregnant women, to whom this dis- ease is peculiarly dangerous.

The most important of all the conditions tending to affect the mortality from smallpox, alike in the individual and the community, is the protection afforded by VaccINna- TION (q.v.). During the first decade of life, if vaccination has been fully and successfully accomplished in infancy, the risk of death from smallpox is nz; but, should the disease be caught—which is improbable—it will in all likelihood show itself in the mild form of varioloid. As regards revaccination, it has been found in all smallpox hospitals that the attendants and nurses escape the disease when revaccinated. In the experience of the late he Waller Lewis in the case of an average of 10,504 persons permanently employed in the General Post Office, London, all of whom had to be revaccinated on admission, it was proved that in the ten years 1870-79 not a single fatal case of smallpox occurred, and only ten mild cases were seen during a period embracing two epidemics.

Treatment.—The treatment of smallpox is conducted upon the same general principles as that for the other infectious diseases (see CHOLERA, DipHTHERIA, MEASLES, Scartet Frver). The establishment of smallpox hospitals separated as far as possible from populous localities, and the prompt removal of cases of the disease where practi- cable, as well as the diligent prosecution of vaccination and revaccination, are among the first requirements. The plan ‘ntroduced into several large towns of compulsory notifica- tion of infectious diseases has much to recommend it. The special treatment applicable to a person suffering from smallpox includes in the first place the providing competent nurses, who, together with all others in the neighbourhood of the patient, should be duly protected by recent vaccina- tion. The patient should lie on a soft bed in a well-venti- lated but

somewhat darkened room and be fed with the lighter forms of nutriment, such as milk, soups, &. The skin should be sponged occasionally with tepid water, and the mouth and throat washed with a solution of chlorate of potash, Condy's fluid, or other safe disinfectant. Ina severe case, with evidence of much prostration, stimulants may be advantageously employed. The patient should be always carefully watched, and special vigilance is called

for where delirium exists.

This symptom may sometimes be lessened by sedatives, such as opium, the bromides or chloral. With the view of preventing pitting many applications have been proposed, but probably the best are cold or tepid compresses of light weight kept constantly – applied over the face and eyes. The water out of which these are wrung may be a weak solution of carbolic or boracic acid. When the pustules have dried up the itching this produces may be much relieved by the application of oil or vaseline. Complications are to be dealt with as they arise and the severer forms of the disease treated in reference to the special symptoms presented. In cases where the eruption is tardy of appearing and the attack threatens to assume the malignant form, the writer has seen marked benefit attend the use of the wet pack. Disinfectants should be abundantly employed in the room and its vicinity, and all clothing, &c., in contact with the patient should be burnt.

Inoculation.—Previous to the introduction of vaccination Tno-u! the method of preventive treatment by what was known tion. as inoculation had been employed. This consisted in in- troducing into the system—in a similar way to the method now commonly employed in vaccination—the smallpox virus from a mild case with the view of reproducing the disease also in a mild form in the person inoculated, and thus affording him protection from further attack. This plan had apparently been resorted to by Eastern nations from an early period in the history of the disease. It was known to be extensively practised in Turkey in the begin- ning of the 18th century, when, chiefly through the letters

of Lady Mary Wortley Montagu, it became known and was speedily adopted in England. There is no doubt, both from the statistics of the Smallpox and Inoculation Hospital, London, and from the testimony of physicians throughout the country, that this practice made a marked impression upon the fatality of the disease, and was itself attended with extremely little risk to life. The objections to it, however, were great, for, although usually conveying the smallpox in a mild form, it not unfrequently took effect severely, and, while death might be averted, the disfiguring results of the disease remained. Further, each inoculated person upon whom the operation took effect became for the time being a possible source of infection to others, and in point of fact the practice tended to spread the. disease and so to increase the general mortality. Although inocu- lation continued to be practised for a number of years subsequently to Jenner's great discovery, it gradually be- came displaced by that vastly superior and safer preventive. In 1840 an Act of Parliament was passed rendering small- pox inoculation unlawful in England. (J. 0. As)

SMART, CuristopHer (1722-1771), English poet, was born at Shipbourne in Kent on 11th April 17 22. The dis- covery that Smart was anything more than an unfortunate Bohemian of letters who wrote much uninteresting verse of second-rate 18th-century quality is quite recent. After one or another of his superseded translations or ineffective exercises in heroics had in turn been assigned the place of honour as his representative literary work, his real master- piece was discerned in a poem which, except for a reprint — issued in 1819, had been singularly overlooked, and even omitted from the collected editions of his poetry. The history of this poem, A Song to David, is somewhat Te markable. It was written in the saner moments of con Gnement for a fit of insanity, and was, it is said, on not unimpeachable authority perhaps, indented with an iron nail or a key on the wall of the cell in default of other means of writing. The real facts of the case would seem to be that the unfortunate poet inscribed one or two stanzas +n the manner asserted, and that he either dictated or was , given the materials wherewith to write the rest of the poem.

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There is no internal evidence of any morbid origin, how- ever, for the poem is full of a healthy and virile energy. As a boy he was delicate and precocious, with a facile gift of verse, which already won him a certain notoriety, of not the best effect haply, at Durham school, whither he had been sent on leaving a preparatory school at Maidstone. During a holiday visit to Raby castle his boyish gifts attracted the interest of the duchess of Cleveland, who made him an allowance of £40 a year, which was continued until her death, and which possibly served further to weaken his self-reliance. At Cambridge, where he was entered at Pembroke Hall in 1739, he led a rather dissi- pated life, getting heavily into debt, and, while he easily excelled in certain congenial branches of study, he paid little attention to the usual college routine. In spite of his irregularities, he was made a fellow of his college in 1745, and at a later date won the newly instituted Seaton prize for an English poem,—the subject each year being one of “the attributes of the Supreme Being.” Smart gained this prize five times in all. Resorting then to London and marrying there a daughter-in-law of Newbery, the publisher, the poet attempted to make a living by literary hack-work and journalism, but sank gradually into difficulties through his improvident and dissipated habits, so that his wife and children were at last obliged to leave him. His misfortunes seem to have culminated in the fit of insanity associated with A Song to David, which was published in 1763, and in 1771 Smart died from the effects of poverty and disease.

Amid all his miserics Smart must have been fairly industrious if his journalistic work was at all proportionate to his more sub- stantial literary productions. Of all that he wrote, however, 4 Song to David will alone bear the test of time. Unlike in its simple forceful treatment and impressive directness of expression, as has been said, to anything else in 18th-century poetry, the poem on analysis is found to depend for its unique effect also upon a certain ingenuity of construction, and the novel way in which David’s ideal qualities are enlarged upon. This will be more readily understood on reference to the following verse, the first twelve words of which become in turn the key-notes, so to speak, of the twelve succeeding verses : —

“ Great, valiant, pious, good, and clean, Sublime, contemplative, serene,

Strong, constant, pleasant, wise ! Bright effluence of exceeding grace ; Best man !—the swiftness, and the race,

The peril, and the prize.”

The last line is characteristic of another peculiarity in 4 Song to Dawid, the effective use of alliteration to complete the initial energy of the stanza in many instances. But in the poem throughout is revealed a poetic quality which cludes critical analysis and gives its a an exceptional interest hardly maintained by his other works,

A Song to David is found in somewhat shortened form in Ward’s English Poets, vol. iif., and Smart’s other poems are given in Anderson’s British Poets (1794), vol. xi., which contains also a full account of his life.

SMEATON, Joun (1724-1792), English civil engineer, the son of an attorney, was born at Austhorpe Lodge, near Leeds, on 8th June 1724. He received a good education at the grammar-school of Leeds, displaying special proficiency m geometry and arithmetic. At a very early age he evinced a great liking for the use of mechanical tools, and in his fourteenth or fifteenth year contrived to make a turning-lathe. On leaving school in his sixteenth year he was employed in his father’s office, but, after attending for some months in 1742 the courts at Westminster Hall, he carnestly requested to be allowed to follow some mechani- eal profession, He became apprentice to a philosophical instrument maker, and in 1750 set up in business on his Own account. Besides improving various mathematical Instruments used in navigation and astronomy, he carried On several experiments in regard to other mechanical appliances, amongst the most important being a series on Which he founded a paper—for which he received the Copley medal of the Royal Society in 1759—entitled An

“perimental Inquiry concerning the Native Powers of

Water and Wind to turn Mills and other Machines depend- ing on a Circular Motion. In 1754 he made a tour of the Low Countries to study the great canal works of foreign engineers. Already by his papers read before the

Royal Society and his intercourse with scientific men his abilities as an engineer had become well known, and in 1756 application was made to him to reconstruct the Eddystone lighthouse, which had been burnt down in December of the previous year (see LIGHTHOUSE, vol. xiv. p. 616). Smeaton now began to be much consulted in regard to all kinds of important engineering projects, including river navigation, the drainage of fens, the designing of harbours, and the repair and construction of bridges, owing to the thorough engineering skill he displayed in every operation he under- took. In judging of his achievements it ought to be remembered that he was the precursor of the great modern engineers. James Watt said of him, “His example and precepts have made us all engineers.” He combined in a remarkable degree theoretical with practical skill, much of his success being due to the fact that, as Stevenson states, ‘he was an incessant experimenter.” A considerable portion of his time was also devoted to astronomical studies and observations, on which he read various papers before the Royal Society. In order to prepare an account of the various works on which he had been engaged as an engineer, Smeaton resolved to retire from his profession, but he only lived to complete in 1791 his Narrative of the Building of Eddystone Lighthouse. He died at Austhorpe, 28th October 1792, and was buried in the old parish church of Whitkirk.

See 4 Short Narrative of the Genius, Life, and Works of the late Mr John Sincaton, 1793 ; and Smiles, Lives of the Engineers.

SMELL is a sensation excited by the contact with the olfactory region of certain substances, usually in a gaseous condition and necessarily in a state of fine subdivision. The sense is widely distributed throughout the animal kingdom. The lower animals, especially those breathing in water, become cognizant of the presence of odoriferous matter near them without touch, vision, or hearing, and we suppose that they do so by some sense of taste or smell, or a combination of both. In such cases smell has been appropriately termed “taste at a distance,” by which is meant that particles of matter may be diffused through the water so as to come into contact with the terminal organ and give rise to a sensation such as would have been excited had the matter from which the particles emanated come directly into contact with the nerve-end- ings. It is therefore of no great importance whether such sensations in humble aquatic organisms are termed taste or smell. In the

higher air-breathing animals, however, the senses are differentiated: that of taste is found at the entrance of the alimentary canal, whilst that of smell guards the opening of the respiratory tract. This view assists in the interpretation of various structures met with in the lower forms which have been fairly regarded by naturalists as olfactory organs.

Comparative View of Olfactory Organs.—In various Medusx pit-like depressions, lined with ciliated epithelium, on the dorsal side of the exeavation in which the ‘‘ marginal” bodies are found, have becu called olfactory regions. In many Arthropoda the sense of smell is located in delicate tubular structures, or conical projec- tions, found on the antenne and connected with nerves. Similar organs are met with in Crustacea. In Cyclops (Copepoda), Isopoda, and Thoracostraca olfactory hairs are present as delicate appen- dages of the anterior antcnne, chiefly in the male sex. In Schizopoda the anterior antenne have a comb-like prominence bearing a great number of olfactory hairs. Jnsecta have olfactory organs largely developed, usually in the form of hairs, cones, or knobs on the antenne, and connected with gangliated nerve-end- ings. Olfactory organs are also met with in Aollusca : in Lamelli- branchiata they appear as hairs on the margin of the mantle ; in aquatic Gasteropoda as tufts of hairs scattered over the sur- face of the body and specially aggregated in those parts where

tactile sensibility is highly developed ; in terrestrial Gasteropoda the antennsz have on their end plates a number of club-shaped cells with rods, which are held to be olfactory, and recently in the game class Sprengel has shown that an organ ‘which was supposed to be a rudimentary gill, and is innervated from the supra-intestinal ganglion,” has an olfactory function. In Ascidians the olfactory region is believed to be a depression on the wall of the pharynx, situated in frout of the ganglion, and lined with ciliated epithelium.

In Fishes the olfactory organs consist of a membrane (the pitui- tary membrane) lining one or two pits, to which the olfactory or first pair of cranial nerves are distributed. This highly vascular membrane is usually thrown into numerous folds, so as to admit of an extensive surface being packed into small space, and it is covered by ciliated epithelinm. In the

lowest vertebrate, Amphi- oxus, the olfactory organ is a simple unsymmetrical pit at the anterior end of the nervous system. In the hag fishes (Myxinide) the olfactory pit has a posterior opening which pierees the palate and ean be closed by a valvular apparatus. In the lampreys (Petromyzon) the flask-shaped nasal sac opens on the top of the head, and from this a tube descends which expands into a blind sac towards the base of the skull. In all other fishes the olfactory organs are double and have no communication with the mouth. In osseous fishes the olfactory capsules or saes are covered with skin which is usually pierced by two openings for each sac. Some, sueh as the wrasses, have a single nasal opening ; and where there are two the anterior ean be closed by a valve. The olfactory region may be extensive owing to the pituitary membrane being thrown into plaits or folds, and it may be divided into two portions, one quite smooth and the other plicated. The smooth portion, prob- ably acting as a reservoir, may be large, extending down to the palate, as in the wnackerel, or to the back part of the palate, as in the wolf-fish (Owen). The nasal cavities exist below the snout in sharks, near the angles of the mouth in the rays, and beneath the fore part of the head, behind the base of the rostrum, in the saw-fish. In such fishes the olfactory organ is guarded by valves, con- taining cartilaginous plates moved by muscles, and we may there- fore conclude with Owen ‘‘that these fishes scent as well as sinell, i.e. actively search for odoriferous impressions by rapidly changing the current of water through the olfactory sac.”

The olfactory organs of Amphibia are always ee cavities, opening internally either anteriorly within the lips or further back, as in the batrachians and salamandrines. In the Perenni- branchiates (Siren, Proteus, Axolotl) there are no outward signs of olfactory organs, and the thick upper lip must be yaised to bring the plicated sac with its two remote orifices into view (Owen). In the Tritonida# (newts) and Salamandrine (salamanders) the olfae- tory membrane is smooth and lines an oval bag having an external nostril, guarded by a valvular fold of skin, anda ee opening. Frogs and toads (Batrachia) have also an externa nostril with a flap of skin, and the palatal opening is wide and near the fore part of the mouth. ‘The skulls of extinct saurians of marine habits (Ichthyosaurus and Plesiosawrus) show that the external nostrils opened near the orbits at a distance from the muzzle. In snakes (Ophidia) the external nostrils are double, and the internal nostril is

single and in the median linc. In water snakes the external orifices ean be closed by valves.

In Chelonia (turtles, tortoises) and in Crocodilia the external nasal opening is single and near the end of the snout; but in Chelonia the nostrils are really distinct, although their external apertures coincide. In the turtle the nasal cavity is large and contains a twisted shell-like cartilage, so as to give extent of surface to the darkly pigmented and highly vascular pituitary membrane. In the crocodiles and alligators the nostrils ean be closed by a valvular lobe, and in the gavials (Rhamphostoma gangeticum and Rkyncho- suchus schlegclti) the integument can be raised round the nostril +n the form of a tube so as to bring the orifice to the surface of the water without exposing the other parts of the head (Owen). In all Crocodilia the nasal cavity is of great length, commencing at the fore part of the muzzle and ending beneath the oeciput by a single aperture, and the surface of this long olfactory meatus is inereased by the meatus communicating with large cells or sinuses. In snakes and lizards a second olfactory organ is found embedded between the turbinals and the vomer and is known as “J acobson’s organ.” It has the form of a cup or depression round a cartilaginous papilla and _ is supplied by a nerve which arises from the end of the olfactory lobe.

he olfactory organs of Birds are somewhat similar to those of the cold-blooded reptiles and amphibians in that ‘‘the external nostrils are simple perforations, having no movable cartilages or muscles provided for dilating or contracting their apertures, as in mammalia” (Owen). The extent of the olfactory surface is in- -ereased by projections and folds of turbinated bones and not by large accessory cavities. With the exception of the apteryx and dinornis, the ‘olfactory nerve passes out of the skull by a single foramen. The external nostrils are in the majority of birds placed at the sides of the upper mandible ; but in some cases, as in the toucans, they are found at the base of the bill, and in the apteryx they open at the extremity of the long upper mandible. In herons

be regarded as the beginning of the respiratory tract. dicated by the arrangement of the nerves, the olfactory nerve being

and middle turbinated bones, whilst the lower portion and turbinals are supplied by the fifth nerve,—a nerve of general sensi- bility. The upper

turbinals reach their greatest development in the apteryx, where they are attached, aceording to Owen, to the whole

largest olfactory nerves In proportion to its size,

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the apertures are so gmall as scarcely to admit the point of a pin ; and in the pelicans they are wanting, and odours get access ie the olfactory organ from the palate. The Rasores (scratching birds) have the nostrils defended by a seale, and the erows (Corvidz) have a bunch of stiff feathers for the sane purpose. The septum or partition between the nostrils is usually complete and is formed of bone and cartilage. The outer wall of each nasal passage is furnished with three turbinal or twisted shell-like bones, of which the middle is the largest, thus affording a considerable extent of olfactory surface. In most birds there are two posterior nasal apertures communicating with the palate; but in some, as in the cormorant and gannet, the passages unite and there is only one opening. In birds the upper part of the nasal passage is more especially devoted to the sense of smell, whilst the lower part may This is in-

distributed to the membrane covering the septum and the a ower

outer part of the prefrontals.

This bird has amongst birds the and it would appear to be guided by the sense of smell to the worms that form its food. A contrast as regards the anatomical arrangements for the olfactory sense is well seen on comparing the turkey with the vulture, Tn the turkey the olfactory nerve is small, about one- fifth the size of that in the vulture, and is distributed over a small

middle turbinal, there being no extension over a superior turbinal.

The vulture, on the other hand, has a large nerve and the olfactory

region is extensive, owing to the largely developed superior turbinal

bone. There can be no doubt that the carrion-eating vulture is guided from great distances to its food by the sense of smell, althongh it will be assisted by its powerful sense of vision.

The sense of smell reaches its highest development in Mammalia. The anatomical surface is enormously extended in many eases, not only by the complication of the ethmoidal labyrinth, but also by the nasal passages communicating with spaces in the neighbourmg cranial and facial bones. The olfactory nerves also are very numer- ous and arise from a special encephalic centre. They pass out of

the skull by numerous holes in the cribriform or sieve-like plate of

the prefrontal bone, which, on account of this peculiarity, is ealled the ethmoid bone. These nerves ramify on the olfactory membraue, eovering the upper or ethmo-turbinal bones. The cavity contain- ing the organ of smell is bounded by the prefrontal, vomerine, nasal, sphenoid, pterygoid, palatine, maxillary, and premaxillary bones, and it is usually in connexion with air-cavities or sinuses in many or all of the bones of the skull. The median partition by which the two nostrils are formed consists of bone and cartilage and is built up by processes of the prefrontals, the vomer, and by the ridges of the nasals, palatines, maxillaries, and premaxillaries with which the vomer articulates. Each passage thus formed is the beginning of the respiratory traet, ~ is continued forwards into a more or less mobile part called a nose, snout, or proboscis, whilst posteriorly it communicates with the upper part of the pharynx, into which opens the windpipe. On the outer wall there are three turbinal bones—superior, middle, and inferior—dividing partially the nasal cavity into three meatuscs or passages. The superior meatus is between the superior and middle turbinated bones, the middle meatus between the middle and_ inferior turbinated bones, and the inferior meatus between the inferior turbinated bones and the floor of the nose (see ANATOMY, Vol. i p. 823, fig. 7; also vol. i, pl. XIX. fig. 2). Many of the lower mammals have in addition a process from the frontal and nasal bones, sometimes called the superior spongy bone, which is not the same as the superior turbinated, as described in the anatomy of the human being. The extent of olfactory surface is enormously increased by numerous phiee or processes of bone which to a great extent mask the comparatively

simple arrangement above described. In Ornithorhynchus there is a single olfactory nerve escaping through an aperture in the prefrontal bone; in Echidna, the other member of the Monotremata, there are numerous olfactory nerves and a large development of ethmo-turbinals. In many Marsupials the sense of smell is largely developed, and in some (Osphranter) the turbinated bones are so large as to eause a lateral bulging of the nasal eavity, forming a marked feature of the skull. In Rodents the ethmo-tur- binals may be subdivided into lamella so as to increase the olfactory surface ; such is the case in the common hare. In the poreupime the sinuses developed from the olfactory cavity are of large size, forming a spongy mass surrounding the cavity of the skull in which the anterior portion of the brain hes. In Insectivora the olfactory surface is very large. Thus in the mole the ethmo-tur binal has not fewer than eight lamelle or plates and the external nose is developed into a snout capable of considerable movement. Such a snout is very large and mobile in the elephant shrews Armaditlos and ant-eaters (Hdentata) have a strong sense of smel

Thus in Dasypus the nasal portion of the skull is about equal i

yolume to all the rest, and in Chlamydophorus (dwarf armadillo) the frontals are raised ‘into a pair of domes” by sinuses in them com- municating with the large olfactory cavity. In most armadillos the external nose is strengthened by small bones. The air sinuses in the sloth extend upwards into the frontals and downwards into the sphenoid bone. No Cetaceans have olfactory organs, except the baleen or whalebone whales, and thus are devoid of the sense of smell. In the manatee (Sirenia) the nasal openings are placed far forwards and have movable eartilages, and the bony walls of the nasal passages are not extensive in proportion to the size of the rest of the skull. The elephants (Proboscidea) have the part of the nasal cavity concerned in smell contracted and narrow, but the cavity is prolonged into the trunk, at the end of which are the nostrils; the nasal cavity communicates with sinuses permeating every bone of the cranium. The tapirs have a shorter but very mobile proboscis, and the development of the

nasal passages is ex- tensive. The horse has the power of dilating and contracting each nostril, and the cribriform plates transmit very numerous olfactory nerves from the olfactory bulbs, which are large in proportion to the size of the rest of the brain. The Swide (swine) have a large and complex olfactory region; the accessory sinuses or spaces attain a great development ; the nose is prolonged and truncate, the cartilages forming a complete tube, whieh is a continuation of the bony nostrils, and these tubes open on a naked disk. In the ox and sheep the olfactory region is large, but not so large as in the horse. ‘The external, glandular, and moist part of the nose is a linear tract running from the mid-furrow of the upper lip to the oblique nostril in the sheep, and this portion passes through many gradations in size, as seen in the roebuek, fallow-deer, red-deer, and the ox. The Carnivora have the ethmo-turbinal and maxillo- turbinal regions even more largely developed than in Herbivora,. and the latter portion reaches its maximum in the seals, where “these turbinals scem to block up the entry of the nasal respi- ratory passages, and must warm the air in aretic latitudes as well as arrest cvery indication from the effluvia of alimentary substances or prey” (Owen). In Quadrwmana the nasal chamber becomes shorter and gains in depth, but not proportionally. In the platyrhine monkeys the cartilage forming the septum

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2 ie Longitudinal section through the olfactory membrane of guinea-pig. x about 400.

1, Olfactory epithelium on free surface; 2, plexus of olfactory nerve-fibres ; p Sid of serous glands containing epithelial cells. From Klein’s Atlas of Ye

cpithelial cells, often branched at their lower ends and ane a yellow or brownish red pigment ; and it con- “Ms peculiar tubular glands named “ Bowman’s glands.”

The respiratory portion contains ordinary serous glands. In the olfactory region also are the terminal organs of smell. These are long narrow cells passing to the surface between the columnar epithelium covering the surface. (See Ana- TOMY, vol. i. p. 885, fig. 76.) The body of the cell is spindle-shaped and it sends up to the surface a delicate rod-like filament, whilst the deeper part is continuous with varicose nerve-filaments, the ends of the olfactory nerve. In the frog the free end terminates in fine hairs.

Physical Causes of Smell—Electrical or thermal stimuli do not usually give rise to olfactory sensations. Althaus states that electrical stimulation caused a sensation of the smell of phosphorus. To excite smell it is usually sup- posed that substances must be present in the atmosphere in a state of fine subdivision, or existing as vapours or gases. ‘The fineness of the particles is remarkable, because if the air conveying an odour be filtered through a tube packed with cotton wool and inserted into the nose a smell is still discernible. This proceeding completely removes from the air organisms less than the tvooooth of an inch in diameter which are the causes of putrefaction and fermentation. A grain or two of musk will scent an apart- ment for years and at the end of the time no appreciable loss of weight can be detected. Substances exciting smell are no doubt usually gases or vapours. Only a few ten- tative efforts have been made to connect the sense with the chemical constitution of the substance. One of the most important of these is in an Essay on Smell, by Dr. William Ramsay of University College, Bristol. The following gases have no smell :—hydrogen, oxygen, nitrogen, water gas, marsh gas, olefiant gas, carbon monoxide, hydro- chloric acid, formic acid vapour, nitrous oxide, and ammonia. (It is necessary, of course, to distinguish between the sensa- tion of smell and the irritant action of such a gas as ammonia.) The gases exciting smell are chlorine, bromine, iodine, the compounds of the first two with oxygen and water, nitric peroxide, vapours of phosphorus and sulphur, arsenic, antimony, sulphurous acid, carbonic acid, almost all the volatile compounds

of carbon except those already mentioned, some compounds of selenium and tellurium, the compounds of chlorine, bromine, and iodine with the above-named elements, and some metals, Chlorine, bromine, iodine, sulphur, selenium, and tellurium, which are volatile and give off vapour at ordinary temperatures, have each a characteristic smell. Ramsay points out that as a general rule substances having a low molecular weight have either no smell or simply cause irritation of the nostrils. He also shows that in the carbon compounds increase of specific gravity as a gas is associated to a certain point with a sensation of smell. Take the marsh gas or methane series commonly called the paraffins. The first two have no smell; ethane (fifteen times as heavy as hydrogen) has a faint smell ; and it is not till butane (thirty times heavier than hydrogen) that a distinct sensation of smell is noticed. Again, a similar relation exists among the alcohols. Methyl alcohol has no smell. Ethyl, or ordinary alcohol free from ethers and water, has a faint smell; “and the odour rapidly becomes more marked as we rise in the series, till the limit of volatility is reached, and we arrive at solids with such a low vapour tension that they give off no appreciable amount of vapour at the ordinary temperature.” Acids gain in odour with increase in density in the form of gas. Thus formic acid is devoid of smell ; acetic acid has a characteristic smell ; and the higher acids of the series—propionic, butyric, valerianic—increase in odour. It would appear also that “the character of a smell is a property of the element or group which enters into the body producing the smell, and tends to make it generic.” Many compounds of chlorine, hydrogen, compounds of sulphur, selenium, and tellurium, the paraffins, the alcohols, the acids, the nitrites,

the amines, the pyridine series, the benzene group, have each a characteristic odour. Ramsay has advanced the theory that the sense of smell “is excited by vibrations of a lower period than those which give rise to the sense of light or heat,” and he points out a series of important facts in support of this view. He states that to produce the sen- sation of smell a substance must have a molecular weight at least fifteen times that of hydrogen. For instance, the specific gravity of marsh gas is eight (no smell), of ethane fif- teen (faint smell), of propane twenty-two (distinct smell). Again, prussic acid has a specific gravity of fifteen, and many persons fail

to detect its odour. Further, Ramsay sup- poses that smell may be excited by vibrations, and suggests that the period of vibration of the lighter molecules is too rapid to affect the sense ; at last a number of vibrations is reached capable of exciting the sense organ ; and beyond an upper limit the sense is again lost. Graham pointed out that odorous substances are in general readily oxidized.! Tyndall showed that many odorous vapours have a con- siderable power of absorbing heat. Taking the absorptive capacity of the air as unity, the following absorptions were observed in the respective cases : —

Absorption | Absorption

Name of Perfume. per 100. Name of Perfume. per 100. Bat@houlil ts eer u- 30 Lavender …....eeees 60 Sandal-wood …....- 82 | Wann) gnegeogorgenod 65 Geranium …....--- 83 | Portugal…....—++++ 67 Oil of cloves …....--- 33°S Thyme …-.e0+—0s 68 Otto of roses …...— 36°5 WROSEMATY – 2. comes. + 74 Bergamot …...----+- 44 Oil of laurel …....— 80 WOE ag ooano acted an0O 47 (Chis 36) guqoodanooucucsn | 109

In comparison with the air introduced in the experi- ments the weight of the odours must be almost infinitely small. ‘Still we find that the least energetic in the list produces thirty times the effect of the air, whilst the most energetic produces 109 times the same effect.” *

Venturi, B. Prévost, and Liégeois have studied the well- known movements of odoriferous particles, such as cam- phor, succinic acid, &c., when placed on the surface of water, and they have suggested that all odoriferous sub- stances ina state of fine subdivision may move in a similar way on the moist surface of the olfactory menibrane, and thus mechanically irritate the nerve- endings. This ex- planation is too coarse ; but it is well known that the odours of flowers are most distinctly perceived in the morning, or after a shower, when the atmosphere contains a considerable amount of aqueous vapour. It would appear also that the odours of animal effluvia are of a higher specific gravity than the air, and do not readily diffuse,—a fact which may account for the pointer and bloodhound keeping their noses to the ground. Such smells are very persistent and are apparently difficult to remove from any surface to which they have become attached. The smell of

a corpse may haunt a living person for days, notwithstanding copious ablutions and change of clothes.’

Special Physiology of Smell.—It is necessary that the air containing the odour be driven forcibly against the membrane. Thus the nostrils may be filled with eau de Cologne, or with air impregnated with sulphuretted hydro- gen, and still no odour is experienced if the person does not breathe. When a sniff is made the air within the nasal passages is rarefied, and, as the air rushes in to equili- brate the pressure, it is forcibly propelled against the olfactory surface. The olfactory surface must be moist ; if it is dry, or is covered with too thick a layer of mu- cus (as in catarrh), the sense is much weakened or lost.

1 Bain, Senses and Intellect, 3d ed., p. ey),

2 Tyndall, Contributions to Molecular Physics in Domain of Radiant Heat, p. 99.

3 Liégeois, Archiv de Physiol., 1868.

‘wickshire, is situated on the Birmingham, Dudley, and

The first moment of contact is the most acute and the sense quickly becomes blunted. The first scent of a flower is the strongest and sweetest ; and after a few minutes’ ex- posure the intensity of even a foetid odour may not be perceived. This fact may be accounted for on the sup- position that the olfactory membrane becomes quickly coated with a thin layer of matter, and that the most intense effect is produced when the odoriferous substances are applied to a clean surface. The intensity of smell depends on (1) the area of olfactory surface affected, and (2) the degree of concentration of the odoriferous matter. Tt is said that musk to the amount of the two-millionth of a milligramme, and one part of sulphuretted hydrogen in 1,000,000 parts of air, may be perceived. If the two nostrils are filled with different odorous substances, there is no mixture of the odours, but we smell sometimes the one and sometimes the other (Valentin). Morphia, mixed with sugar and taken as snuff, paralyses the olfactory ap-

paratus, while strychnine makes it more sensitive (Lichten- fels and Frohlich). The delicacy of the sense is much greater in many of the lower animals than in man, and it is highly probable that the dog or cat obtain information by means of this sense which a human being cannot get. Odours may excite in the minds of many animals vivid impressions, and they have probably a memory of smells which the human being does not possess. Even in man the sense may be greatly im- proved by exercising it. A boy, James Mitchell, was born blind, deaf, and dumb, and chiefly depended on smell for keeping up a connexion with the outer world. He readily observed the presence of a stranger in the room and he formed his opinions of persons apparently from their char- acteristic smells. Im some rare cases, the sense of smell is congenitally absent in human beings, and it may be much injured by the practice of snuffing or by diseases of the nose affecting the olfactory membrane. Subjective im- pressions of smells, like spectral illusions or sounds in the ears, are occasionally, but rarely observed in the insane. Finally, it may be observed that the sense of odour gives ‘nformation as to the characters of food and drink and as to the purity of the air. In the lower animals, also, the sense is associated with the sexual functions. See art. ‘Olfaction” by Frangois Franck, in Dictionnatre Ency- clopédique des Sciences Médicales, 2d series, where a full historical bibliography is given; Hermann’s Handbuch der Physiologie: d. Sinnesorgane: Zweiter Theil, Geruchsinne, by Prof. V. Vintschgat, p. 226 ; Owen’s Comp. Anatomy and Physiol. of Vertebrates ; Bain, op. cit., p. 147; Grant Allen’s Physiological isthetics, p. 73 Ramsay, Nature, vol. xxvi. p. 187; and for James Mitchell’s case, see Dugald Stewart’s Works, vol. iv. p. 300. (J. G. M.) SMELT. See SatMonrps, vol. xxi. p. 1. S\METHWICK, an urban sanitary district of Stafford- shire, England, on the borders of Worcestershire and War-

Wolverhampton Canal, and on branches of the London and North-Western and the Great Western Railway lines, 2 miles west from Birmingham, of which the town of Smethwick isa suburb. It possesses `public hall aud` free library and reading-room. Within the limits of the district is the Soho foundry originated by James Watt; and since its origin numerous other industries have been concentrated in the suburb, the more important being the manufacture of glass, chemicals, hydraulic jacks, patent — nuts and bolts, and patent tubes. Many of the works are of great extent. The

population of the urban sanitary district in 1871 was 17,158, and in 1881 (area, 1882 acres) it had increased to 25,084.

SMIRKE, RosERt (1752-1845), subject painter, was born at Wigton near Carlisle in 1752. In his thirteenth year he was apprenticed in London with an heraldic paintet, and at the age of twenty he began to study in the schools

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of the Royal Academy, to whose exhibition he contributed | four parts—(1) natural theology ; (2) ethics ; (3) a treat-

in 1786 a Narcissus and a Sabrina, which were followed by many works, usually small in size, illustrative of the English poets, especially Thomson. In 1791 Smirke was elected an associate of the Royal Academy, and two years later a full member. In 1814 he was nominated keeper to the Academy, but the king refused to sanction the appoint- ment on account of the artist's pronounced revolutionary opinions. He was engaged upon the Shakespeare gallery, for which he painted Katharina and Petruchio, Prince Henry and Falstaff, and other subjects. He also executed many clever and popular book-illustrations. His works, which are frequently of a humorous character, are pleasing and graceful, accomplished in draftsmanship and handled with considerable spirit. He died in London on the 5th of January 1845. SMITH, Apam (1723-1790), the greatest of political economists, was the only child of Adam Smith, comptroller of the customs at Kirkcaldy in Fifeshire, Scotland, and of Margaret Douglas, daughter of Mr Douglas of Strathendry, near Leslie. He was born at Kirkcaldy on 5th June 1723, some months after the death of his father. Of a weak constitution, he required and received during his early years the most tender care of an affectionate mother, which he repaid in after life by every attention which filial gratitude could dictate. When he was three years old he was taken on a visit to his uncle at Strathendry, and when playing alone at the door of the house was carried off by a party of "'tinkers." Fortunately he was at once missed, and the vagrants pursued and overtaken in Leslie wood. He received his early

education in the school of Kirkcaldy under David Miller, amongst whose pupils were many who were afterwards distinguished men. Smith showed as a boy great fondness for books and remarkable powers of memory ; and his friendly and generous disposi- tion made him popular amongst his schoolfellows. He was sent in 1737 to the university of Glasgow, where he attended the lectures of Dr Hutcheson; and in 1740 he went to Baliol College, Oxford, as exhibitioner on Snell's foundation, with a view to his taking orders in the English Church. He remained at that university for seven years. At Glasgow his favourite studies had been mathematics and natural philosophy ; but at Oxford he appears to have devoted himself almost entirely to moral and political science and to the cultivation of the ancient and modern languages. He also laboured to improve his English style by the practice of translation, particularly from the French. He was not impressed with a favourable opinion of the system of education then pursued at Oxford. After his return to Kirkcaldy he resided there two years with his mother, continuing his studies; he had relinquished the idea of entering the ecclesiastical profession, but had not yet adopted any other plan for his future life. In 1748 he removed to Edinburgh, and there, under the patronage of Lord Kames, gave lectures on rhetoric and belles-lettres. About this time commenced his acquaintance with David Hume, which afterwards ripened into an intimate friend- ship, founded on mutual esteem ; his relations with that great thinker must have powerfully influenced the forma- tion of his opinions, In 1751 he was elected professor of logic at Glasgow, and in the following year was transferred to the chair of moral philosophy in the same university, which had become vacant by the death of Thomas Craigie, the suecessor of Hutcheson, This position he occupied for nearly twelve years, which he long afterwards declared to ia been "by far the most useful, and therefore by far a lapplest and most honourable period of his life." He ou highly esteemed by his colleagues, of whom, on his ide, he speaks as "very excellent men." His course of cctures, as Professor Millar informs us, was divided into

ment of that branch of morality which relates to justice, a subject which he handled historically after the manner of Montesquieu, "endeavouring to trace the gradual progress of jurisprudence, both public and private, from the rudest to the most refined ages, and to point out the effects of those arts which contribute to subsistence and to the accumulation of property in

producing corresponding improvements or alterations in law and government"; (4) a study of those political regulations which are founded, not upon the principle of justice, but that of expediency, and which are calculated to increase the riches, the power, and the prosperity of a state. Under this view he con- sidered the political institutions relating to commerce, to finances, to ecclesiastical and military establishments. He first appeared as an author by contributing two articles to the Edinburgh Review (an earlier journal than the present, which was commenced in 1755, but of which only two numbers! were published),—one on Johnson's Dictionary and the other a letter to the editors on the state of litera- ture in the different countries of Europe. In 1759 ap- peared his Theory of Moral Sentiments, embodying the second portion of his university course, to which was added in the 2d edition an appendix with the title, '' Con- siderations concerning the first Formation of Languages." After the publication of this work his ethical doctrines occupied less space in his lectures, and a larger develop- ment was given to the subjects of jurisprudence and political economy. Stewart gives us to understand that he had already, as early as 1752, adopted the liberal views of commercial policy which he afterwards preached with so much effect ; and this we should have been inclined to believe independently from the fact that such views were propounded in that year in the Political Discourses of his friend Hume. His residence at Glasgow brought him into personal relations with many intelligent men from whose practical experience he could derive information on mer- cantile questions ; and, on the other hand, we are told, his reasonings convinced several eminent merchants of that city of the soundness of the principles of free trade, which were at variance with their previous opinions.

In 1762 the senatus 'academicus of Glasgow conferred on him the honorary degree of doctor of laws. In 1763 he was invited to take charge of the young duke of Buc- cleuch on his travels. He accepted the proposal, and resigned his professorship. He went abroad with his pupil in March 1764; they remained only a few days at Paris and then settled at Toulouse, then the seat of a parliament, where they spent eighteen months in the best society of the place, afterwards making a tour in the south of France and passing two months at Geneva. Returning to Paris about Christmas of 1765, they remained there till the October of the following year. The period was one of

intellectual and social ferment, and Smith was brought into relation with the most eminent persons of the time. He lived in the society of Quesnay, Turgot, D'Alembert, Morellet, Helvétius, Marmontel, and the duke de la Roche- foucault. It was the regard he entertained for the young nobleman? last named that dictated the omission in the later editions of his J/oral Sentiments of the name of the celebrated ancestor of the duke, whom he had associated with Mandeville as author of one of the "licentious sys-

1 These two numbers were reprinted in 1818. Smith's letter to the editors is specially interesting for its account of the Ancyciopédie and its criticism of Rousseau's pictures of savage life.

2 The duke undertook a translation of the Theory of Moral Sents- ments, but the Abbé Blavet's version appeared (1774) before his was completed and he then relinquished the design. An earlier French translation had been published (1764) under the title AZétaphysique de V Ame; and there is a later one—the best—by the marquis de Con- dorcet (1798, 2d ed. 1830).

tems" reviewed in the seventh part of that work. Smith was without doubt much influenced by his contact with the members of the physiocratic school, especially with its chief, though Dupont de Nemours probably goes too far in speaking of Smith and himself as having been "'con- disciples chez M. Quesnay." Smith afterwards described Quesnay as a man "of the greatest modesty and sim- plicity," and be, 'with all its imperfections, the nearest approximation to truth that had yet been published on the principles of that science." In October 1766 tutor and pupil returned home, and they ever afterwards retained strong feelings of mutual esteem. For the next ten years Smith lived with his mother at Kirkcaldy, only paying occasional visits to Edinburgh and London ; he was engaged in close study during most of this time, but unbent his mind in familiar intercourse with a few friends. He describes himself to Hume during this period as being extremely happy, com- fortable, and contented. He was now occupied on his Inquiry into the Nature and Causes of the Wealth of Nations, which there is some reason for believing he had begun at Toulouse. That great

work appeared in 1776. After its publication, and only a few months before his own death, Hume wrote to congratulate his friend— “ Buge! belle/ dear Mr Smith, I am much pleased with your performance, and the perusal of it has taken me from a state of great anxiety. It was a work of so much ex- pectation by yourself, by your friends, and by the public, that I trembled for its appearance; but am now much relieved. Not but that the reading of it requires so much attention, and the public is disposed to give so little, that I shall still doubt for some time of its being at first very popular. But it has depth, and solidity, and acuteness, and is so much illustrated by curious facts that it must at last take the public attention.” Smith attended Huine affectionately during a part of his last illness, and soon after the death of the philosopher there was published, along with his autobiography, a letter from Smith to Strahan, in which he gave an account of the closing scenes of his friend’s life and expressed warm admiration for his character. This letter excited some rancour among the theologians, and Dr George Horne, afterwards bishop of Norwich, published in 1777, by way of comment on it, A Letter to Adam Smith on the Life, Death, and Philosophy of his Friend David Hume, by one of the people called Christians. But Smith took no notice of this effusion.” He was also attacked by Archbishop Magee for the omission in subsequent editions of a passage of the Moral Sentiments which that prelate had cited with high com- mendation as among the ablest illustrations of the doctrine of the atonement. Smith had omitted the paragraph in question on the ground that it was unnecessary and mis- inna

1 Mr J. E. T. Rogers published in the Academy, 28th February 1885, a letter of Smith to William Pulteney, written in 1772, from which he thinks it probable that the work lay ‘¢ynrevised and un- altered”? in the author’s desk for four years. A similar conclusion seems to follow from a letter of Hume in Burton’s Life, ii. p. 461.

2 A story was told by Sir Walter Scott, aud is also related in the Edinburgh Review, of an “ unfortunate rencontre,” arising out of the publication of the same letter, between Smith and Dr Johnson, during the visit of the latter to Glasgow. The same story is given in a note in Wilberforce’s Correspondence, the scene being somewhat vaguely laid in “Scotland.” But it is impossible that it should be true; for Johnson made his tour in 1773, whilst Hume’s death did not take place till 1776. Smith seems not to have

met Johnson in Scotland at all. It appears, however, from Boswell's Life, under date of 29th April 1778, that Johnson had on one occasion quarrelled with Smith and treated him rudely at Strahan's house, apparently in London ; but, as Robertson met Johnson "for the first time" immediately after that incident, and as we know that Robertson met him in Scotland, it follows that the "unlucky altercation"? at Strahan's must have occurred before the Scotch tour, and could have had nothing to do with the letter on Hume's death.

placed; but Magee suspected him of having been influ-

declared his system of political economy to.

enced by deeper reasons.

The greater part of the two years which followed the publication of the Wealth of Nations Smith spent in Lon- don, enjoying the society of the most eminent persons of the day, amongst whom were Gibbon, Burke, Reynolds, and Beauclerk. In 1778 he was appointed, through the in- fluence of the duke of Buccleuch, one of the commissioners of customs in Scotland, and in consequence of this fixed | his residence at Edinburgh. His mother, now in extreme old age, lived with him, as did also his cousin, Miss Jane i

Douglas, who assisted him in the care of his aged parent, and superintended his household. Much of his now ample sncome is believed to have been spent in secret charities, and he kept a simple, though hospitable, table, at which, "without the formality of an invitation, he was always happy to receive his friends." "His Sunday suppers," says M'Culloch, ''were long celebrated at Edinburgh," One of his favourite places of resort in these years wasa club of which Dr Hutton, Dr Black, Dr Adam Ferguson, John Clerk the naval tactician, Robert Adam the archi- tect, as well as Smith himself, were original members, and to which Dugald Stewart, Professor Playfair, and other eminent men were afterwards admitted. Another source of enjoyment was the small but excellent library he possessed; it is still

preserved in his family ; Professor Nicholson has had access to it, and was struck by the varied nature of the collection, and especially by the large number of books of travel and poetry which it contained. In 17 87 he was elected lord rector of the university of Glasgow, an honour which he received with “heartfelt joy.” If we can believe a note in Wilberforce’s Correspondence, he visited London in the spring of the same year, and was introduced by Dundas? to Pitt, Wilberforce, and others. From the death of his mother in 1784, and that of Miss Douglas in 1788, his health and strength gradually declined, and after a tedious and painful illness he died on 17th July 1790,

Before his decease Smith directed that all his manuscripts except a few selected cssays should be destroyed, and they were accordingly committed to the flames. Of the pieces preserved by his desire the most valuable is his tract on the history of astronomy, which he himself described as a ‘‘fragment of a great work”; it was doubt- less a portion of the ‘‘counected history of the liberal sciences and clegant arts” which, we are told, he had projected in early life. Among the papers destroyed were probably, as Stewart suggests, the lectures on natural religion and jurisprudence which formed part of his course at Glasgow, and also the lectures on rhetori¢ which he delivered at Edinburgh in 1748. To the latter Blair seems to refer when, in his work on Lhetoric and Belles-Lettres (1783), he acknowledges his obligations to a manuscript treatise on rhetoric by Smith, part of which its author had shown to him many years before, and which he hoped Smith would give to the public. It was probably the lectures on jurisprudence which Smith had in view when, some time before his death expressing regret that he ‘‘had done so little,” he added, ‘‘I meant to have done more, and there are materials in my papers of which I could have made a great deal.” He had promised at the end of his Theory of Moral Sentiments a treatise on the gencral principles of jurispru- dence from the historical point of view, which would doubtless have been a devclopment of his university lectures on that subject.

In person Smith was of about the middle size, well made and stout, though not corpulent. His features are said to be well represented in the medallion by Tassie engraved in M‘Culloch’s edition of the IVealth of Nations. Wis discourses as professor Wel? almost entirely extemporary, and, as he was

always interested in his subject, he never failed to interest his hearers. He was some- times, Millar tells us, embarrassed and spoke with hesitation at the outset; but ‘as he advanced the matter scemed to crowd upon him, his manner became warm and animated, and his expression easy all fluent.” In society, except amongst intimate friends, he spoke but. seldom, and was rather disposed to enjoy in silence the gaiety of those around him. He often seemed altogether oceupied with his own thoughts, or might even have been supposed, from his looks and gestures, to be ‘‘in the fervour of composition.” ‘‘ He was the most absent man in company,” says Alexander Carlyle, ‘‘ that I

pa i ee OE 3 An interesting letter of Smith to Dundas (1st November 1779) on free trade for Ireland is printed in the Eng. Hist. Review, No. 2

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ever saw, moving his lips and talking to himself and smiling in the midst of large companies.” When called on to give his opinion of the matter under discussion he was apt to do so too much in the manner of a lecture. Easy and flowing as is the style of his books, yet to the end he wrote slowly and with difficulty ; he did not usually himself take pen in hand, but dictated to an amanuensis, whilst he walked up and down his apartment. In character he was sincere and earnest, in manner apparently cold, but capable of strong feelings, whether of personal affection or of moral indigna- tion. His frequent acts of beneficence were marked by delicacy no less than by liberality. He was a model of filial love and duty, and took to the last the warmest interest in all that concerned the welfare of his friends.

As amoral philosopher Smith cannot be said to have won much acceptance for his fundamental doctrine. This doctrine is that all ourinoral sentiments arise from sympathy, that is, from the principle of our nature “which leads us to enter into the situations of other men and to partake with them in the passions which those situations have a tendency to excite.” Our direct sympathy with the agent in the circumstances in which he is placed gives rise, according to this view, to our notion of the propriety of his action, whilst our indirect sympathy with those whom his actions have benefited or

injured gives rise to our notions of merit and demerit in the agent himself, It seems justly alleged against this system by Dr Thomas Brown that ‘‘ the moral sentiments, the origin of which it ascribes to our secondary feelings of mere sympathy, are assumed as previously existing in the original emotions with which the secondary feelings are said to be in unison.”’ A second objection urged, perhaps with less justice, against the theory is that it fails to account for the authoritative character which is felt to be inherent in our sense of right and wrong—for what Butler calls the ‘‘supremacy of conscience.” But those who most strongly dissent from Smith’s gencral doctrine are warm in their adiniration of the eloquence of his style—sometimes, however, faulty on the side of redundancy— and the felicity of his illustrations. In all its minor details, says Brown, ‘‘the work may be considered as presenting a model of philosophic beauty,” and it is universally admitted that the author has thrown much light on many delicate and subtle phenomena of our moral nature. ‘The minute observation and the rare ingenuity which he shows in dealing with the finer traits of character and the less obvious indications of feeling remind us of the similar qualities exhibited in a different field in the Wealth of Nations.

It is on the latter work that Smith’s fame mainly rests. Under Poniticat Economy (vol. xix. pp. 865-370) will be found a detailed analysis of the economic scheme contained in it, and an examina- tion of its spirit and tendency as a contribution to the philosophy of society. We have there sufficiently exposed the exaggeration whieh represents Smith as the creator of political economy. But the Wealth of Nations is, without doubt, the greatest existing book on that department of knowledge, the only attempt to replace and so antiquate it—that of John Stuart Mill—having, notwithstanding its partial usefulness, on the whole decidedly failed. Buckle, however, goes too far when he pronounces it ‘‘the most important book ever written,” just as he similarly exceeds due measure when he makes its author superior asa philosopher to Hume. Mackintosh more justly said of it that it stands on a level with the treatise De Jure Belli ct Pacis, the Essay on the Human Understanding, and the Spirit of Laws, in the respect that these four works are severally the most conspicuous landmarks in the progress of the sciences with which they deal. And, when he added that the Wealth of Nations was “ perhaps the only book which produced an immediate, general, and irrevocable change in some of the most important parts of the

legislation of all civilized states," he scarcely spoke too strongly if we understand him as referring to its influence as an agent of demolition. It certainly operated powerfully through the harmony of its critical side with the tendencies of the half-century which followed its publication to the assertion of personal freedom and "natural rights." It discredited the economic policy of the past, and promoted the overthrow of institutions which had come down from earlier times, but were unsuited to modern society. As a theoretic treatment of social economy, and therefore asa guide to social reconstruction and practice in the future, it is provisional, not definitive. But here too it has rendered eminent service: it has established many truths and dissipated many obstinate pre- Judices ; it has raised the views of all thinking men on national Wealth to a higher level ; and, when the study of its subject comes to be systematized on the basis of a general social philosophy more complete and durable than Smith's, no contributions to that final construction will be found so valuable as his.

Buckle has the idea that the two principal works of Smith, the Theory of Moral Sentiments and the Wealth of Nations, are mutually complementary parts of one great scheme, in which human nature 1S intended to be dealt with as a whole,—the former exhibiting the operation of the benevolent feelings, the latter of what, by a singular Nomenclature, inadmissible since Butler wrote, he calls "the passion of selfishness," In each division the motor contemplated is regarded aS acting singly, without any interference of the opposite principle.

This appears to be an artificial and misleading notion. Neither in the plan of Smith's university course nor in the well-known passage at the end of his Jforal Sentiments is there any indication of his having conceived such a bipartite scheme. The object of the Wealth of Nations is surely in no sense psychological, as is that of the Moral Sentiments. The purpose of the work is to exhibit social phenomena, not to demonstrate their source in the mental consti- tution of the individual. And Buckle seems to have fallen into the error of confounding ''sympathy " with benevolence, or at least of regarding their spheres as coextensive. It is only in his ethical treatise that

Smith carries back the pursuit of wealth to its ulti- mate motive; and, when he does so, instead of tracing it to a selfish principle, which is to be placed in contrast with sympathy, he ex- pressly declares it to have its origin in ‘‘a regard to the sentiments of mankind”; in other words, he makes it a consequence of the desire of sympathy.

In relation to Smith’s personality, which is at present our princi- pal object, it may be observed that his moral features are exhibited in an interesting way in his great work. The most marked charac- teristics thus reflected are his strong sympathy with the working classes, his contempt for vulgar politics, and his hatred of the spirit of monopoly,—the last manifesting itself especially in his suspicion of the public conduct of merchants and manufacturers. The first of these seutiments breaks out in several places, as in the discussion of the laws of settlement and in the remarks on combinations, and notably in the often-quoted passage whiere he says: ‘‘It is but equity that those who feed, clothe, and lodge the whole body of the people should have such a share of the produce of their own labour as to be themselves tolerably well fed, clothed, and lodged.” He has no respect for that “insidious and crafty animal, vulgarly called a statesman or politician,” and complains that the ‘sneaking arts of underling tradesmen” are erected into political maxims for the conduct of a great empire. ‘‘ All for ourselves and nothing for other people scems in every age of the world to have been the vile maxim of the masters of mankind.” The project of shutting out every other nation from a share in the benefits of our colonial trade he brands as an ‘invidious and malignant” one. He never tires of condemning the ‘‘mean rapacity,” the ‘‘monopolizing spirit,” the ‘‘impertinent jealousy,” the ‘‘ interested sophistry” of the capitalist class. ‘‘Our merchants and manufacturers,” he says—and the remark is not yet out of date—“ complain mucli of the effect of high wages in raising the price, and thereby lessening the sale, of their goods both at home and abroad; they say nothing concerning the bad cffects of high profits; they are silent with respect to the pernicious effects of their own gains; they complain only of those of other people.” ‘Their interest is never exactly the same with that of the public ; they have generally an interest to deceive and even to oppress the public; and they accordingly have upon many occasions both deceived and oppressed it.” This class he regarded, in fact, as corrupting by its selfishness the policy of the European nations and in particular of England, sii as con-

stituting the strength of the opposition, which he feared would be insuperable, to a system of commercial freedom. The general im- pression of its author which the book leaves behind it is that of a large, healthy, and generous nature, earnest in insisting on fair play for all and prompt to denounce with contemptuous vehemence anything which wore the appearance of injustice.

Our principal authority for the biography of Smith is Dugald Stewart's Account of his Life and Writings, originally read (1793) before the Royal Society of Edinburgh, and afterwards prefixed to Sinith's Essays on Philosophical Subjects, as edited by Black and Hutton. Additional particulars are given in Brougham 's Men of Letters and-Science, Burton's Life of Hume, and Alexander Carlyle's Autobiography; and some characteristic anecdotes of him will be found in Memoirs of the Life and Works of Sir John Sinclair (1837). For comments on his Theory of Moral Sentiments, see, besides Stewart, as cited above, Dr T. Brown's Philosophy of the Human Mind, lects. 80 and 81; Sir J. Mackintosh's Dissertation on the Progress of Ethical Philosophy; J. A. Farrer's Adam Smith (1881), in the series entitled English Philosophers; and the art. Erutcs in the present work. On the Wealth of Nations, the student may consult the prefaces to M'Culloch's, Rogers's, and Nicholson's editions of that work; Rogers's Histori- cal Gleanings (1869); the art. "Smith" in Coquelin and Guillaumin's Diction- naire de UV Economie Politique; Bagehot's Economic Studies (1880); and Cossa's Guide to the Study of Political Economy (Eng. trans., 1880), chap. v., where the

author has enumerated the most important memoirs by foreign writers on Smith as an economist. (J. K. 1

SMITH, Apert (1816-1860), an instance of the jour- nalistic rather than the truly literary type of writer, was one of the most popular men of his time; a favourite humourist in the vein of humour then in vogue, but now already rather out of date ; a leading contributor to Punch ; the author of successful books of light social satire ; and, not least, the exponent of " Mont Blanc" in a pre-scientific popular entertainment descriptive of that famous moun- tain. He was born at Chertsey, Surrey, on 24th May 1816, and was educated to follow his father's profession ofasurgeon. Having, in the course of his

medical studies, been to the Hotel Dieu, Paris, his first literary effort was an account of his life there, which appeared in the J/zrror.

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From this time he gradually relinquished his medical work for the more congenial occupation of light literature. He was associated with Punch from its beginning, and was also a regular contributor to Bendley's Miscellany, in

whose pages his first and best book, The Adventures of

Mr Ledbury, first appeared. His other books were A History of Evening Parties, Christopher Tadpole, issued in monthly parts, Pottleton's Legacy, and, as a series of so- called natural histories, Zhe Gent, The Ballet Girl, The Idler upon Town, and The Flirt. Albert Smith also wrote extravaganzas and adapted some of Charles Dickens's stories for the stage. He conducted too for a time a magazine called The Man in the Moon, which was discontinued in 1849. In 1851 he visited the Alps and ascended Mont Blanc, and the year after produced the descriptive enter- tainment before referred to. "China," a similar enter- tainment, was afterwards produced, but less successfully. Smith married in 1859 a daughter of Keeley, the comedian. He died at Fulham, Middlesex, on 23d May 1860, from an attack of apoplexy.

SMITH, AtexanpER (1830-1867), was the most pro- minent representative of the so-called "spasmodic" school of poetry, whose peculiarities first gained for it a hasty repu- tation, and then, having suffered under closer critical exa- mination, it almost as speedily dropped out of mind again. Smith has never yet perhaps had his true position assigned to him. His first book, A Life Drama and other Poems (1853), which made his name, was a work of real promise. Although deficient in dramatic grasp of subject, in restraint of expression, in metrical quality, and although showing too obviously the influence of Keats and Tennyson in certain exaggerations of epithet and phrase, the book yet contains evidence of a poetic faculty which might, under more fortunate conditions, have developed into genuine power. Alexander Smith was one of those writers who require the critical safeguards of the schools to chasten their somewhat importunate energies; and for want of these academic restrictions he wasted his powers in

discursive experiments of not much abiding value. Born at Kilmarnock on the last day of 1830, he received the usual schooling common at that time; and, his parents being too poor to send him to college, he was placed in a linen factory to follow his father's trade of a pattern designer. His literary pro- clivities, however, soon showed themselves, and from time to time his early poems appeared in the Glasgow Citizen, in whose editor, James Hedderwick, he found a sympathiz- ing and appreciative friend. His poems, having attracted the attention also of the Rev. George Gilfillan, found through him an opening in the London Citizen. A Life Drama and other Poems, published in 1858, speedily ran through several editions, and gained Smith the appoint- ment of secretary to Edinburgh university in 1854. In the same year Sydney Dobell, whose name is now familiarly associated with Smith's, came to Edinburgh, and an ac- quaintanceship at once sprang up between the two, which resulted in their collaboration in a book of War Sonnets, inspired by the Crimean War, which was published in 1855. The volumes of verse issued independently by Alexander Smith in the ensuing years did not receive much attention ; their author then turned himself to prose, after publishing City Poems in 1857 and Edwin of Deira, a Northumbrian epic poem, in1861. His first prose work was Dreamthorpe, 1863; it was followed in 1865 by A Summer in Skye, which contains his best prose writing, and is full of a quiet charm and true sympathy with nature. His last work was an experiment in fiction, Alfred Hagart's Household (1866), which ran first through Good Words. In this the same faults of construction, conjoined with the same in- cidental grace of description, that show themselves in his larger poems are repeated. The strain produced by his

literary and other work began to tell towards the end of 1866, and his death followed on 5th January 1867.

A memoir of Smith by P. P. Alexander is prefixed to a volume of remains, entitled Last Leaves, in which will be found a fairly complete account of his life and writings.

SMITH, Corvin (1795-1875), portrait painter, was born at Brechin, Scotland, in 1795. He studied in London in the schools of the Royal Academy and worked in Nolle- kens's studio. He then proceeded to Italy, where he exe- cuted some fine copies from Titian; and at Antwerp he made studies from the works of Rubens. Returning to Scotland in 1827, he settled in Edinburgh, occupying the house and studio which had formerly belonged to Raeburn, Soon he attained a wide practice as a portrait-painter, and among his sitters were Lord Jeffrey, Henry Mackenzie, author of The Man of Feeling, and many of the most cele brated Scotsmen of the time. His portrait of Sir Walter Scott was so popular that he executed some twenty replicas of it, for seven of which he received fresh sittings. His works are distinguished by excellent draftsmanship, by directness and simplicity of treatment, and by well-marked individuality. He died in Edinburgh on 21st July 1875..

SMITH, Hunry Joun SrepuEn (1826-1883), mathema- tician, was born in Dublin on 2d November 1826 and was the fourth child of his parents. When Henry Smith was

just two years old his father died, whereupon his mother

left Ireland for England. Mrs Smith taught her children herself, and until Henry was over eleven he was under her exclusive care and teaching; after that he was educated by private tutors till he went to Rugby in 1841. Whilst under the first of these tutors, in nine months he read all Thucydides, Sophocles, and Sallust, twelve books of Tacitus, the greater part of Horace, Juvenal, Persius, and several plays of Auschylus and Euripides. He also got up six books of Euclid and some algebra, besides reading a considerable quantity of Hebrew and learning the Odes of Horace by heart. On the death of his elder brother in September 1843 Henry Smith left Rugby, and in the end of 1844 gained a scholarship at Balliol College, Oxford. He won the Ireland scholarship in 1848 and obtained a first class in both the classical and the mathematical schools in 1849. He gained the senior mathematical scholarship in 1851. He was elected fellow of Balliol in 1850 and Savilian professor of geometry in 1861, and im 1874 was appointed keeper of the university museum. He was elected F.R.S. in 1861, and was an LL.D. of Cambridge and Dublin. He served on various royal com- missions, and

from 1877 was the chairman of the managing body of the meteorological office. He died at Oxford on 9th February 1883.

After taking his degree he wavered between classics and mathe- matics, but finally chose the latter. After publishing a few short papers relating to theory of numbers and to geometry, he devoted himself to a thorough examination of the writings of Gauss, Le- jeune-Dirichlet, Kummer, &c., on the theory of numbers. The main results of these researches, which occupied him from 1854 to 1864, are contained in his Report on the Theory of Numbers, which appeared in the British Association volumes from 1859 to 1865. This report contains not only a complete account of all that had been done on this vast and intricate subject but also original con- tributions of his own. Some of the most important results of his discoveries were communicated to the Royal Society in two memous upon Systems of Linear Indeterminate Equations and Congruences and upon the Orders and Genera of Ternary Quadratic Forms (Phil. Trans., 1861 and 1867). He did not, however, confine himself to the consideration of forms involving only thrce indeterminates, but succeeded in establishing the principles on which the extension to the general case of 7 indeterminates depends, and obtained the general formule, thus effecting what is probably the greatest ad- vance made in the subject since the publication of Gauss's Disquist- tiones Arithmetice. A brief abstract of Smith's mcthods and re sults appeared in the Proc. Roy. Soc. for 1864 and 1868, In the second of these notices he gives the general formule without de- monstrations. As corollaries to the general formule he adds the formule relating to the representation of a number as a sum of five

squares and also of seven squares. This class of representation ceases when the number of squares exceeds eight. The cases of two, four, and six squares had been given by Jacobi and that of three squares by Eisenstein, who had also given without demon- stration some of the results for five squares. Fourteen years later the French Academy, in ignorance of Smith's work, set the demon- stration and completion of Hisenstein's theorems for five squares as the subject of their ‘‘Grand Prix des Sciences Mathématiques.”

Smith, at the request of a member of the comniission by which the prize was proposed, undertook in 1882 to write out the demonstra- tion of his general theorems so far as was required to prove the re- sults for the special case of five squares. A month after his death,

in March 1883, the prize of 3000 francs was awarded to him. The fact that a question of which Smith had given the solution in 1867, asa corollary from general formule governing the whole class of investigations to which it belonged, should have been set by the French Academy as the subject of their great prize shows how far in advance of his contemporaries his early researches had carried him. Many of the propositions contained in his dissertation are general; but the demonstrations are not supplied for the case of seven squares. He was also the author of important papers in which he extended to complex quadratic forms many of Gauss's in- vestigations relating to real quadratic forms. After 1864 he devoted himself chiefly to elliptic functions, and numerous papers on this subject were published by him in the Proc. Lond. Math, Soc. and elsewhere. At the time of his death he was engaged upon a memoir on the Theta and Omega Funetions, which he left nearly complete.

In 1868 he was awarded the Steiner prize of the Berlin Academy for a geometrical memoir, Sur quelques problémes cubiques et biquadra-

tiques. He also wrote the introduction-to the collected edition of Clifford's Mathematical Papers (1882), The three subjects to which

Smith's writings relate are theory of numbers, elliptic functions,

and modern geometry; but in all that he wrote an ''arithmetical"

mode of thought is apparent, his methods and processes being arith-

metical as distinguished from algebraic. He had the most intense

admiration of Gauss. He was president of the mathematical and

physical section of the British Association at Bradford in 1873 and

of the London Mathematical Society in 1874-76. A memorial edition

of his collected mathematical works is being (1887) printed by the

Oxford university press.

An article in the Spectator of 17th February 1883, written by Lord Justice Bowen, gives perhaps the best idea of Smith's extraordinary personal qualitics and influence, his sound judgment, perfect temper, – gentle and Lelian wisdom, sweetness of character, delicate gaiety of spirit, and brilliant conversational power, which made him one of the most accomplished and attractive ornaments of any edu- cated company in which he moved. :

For further details relating to Henry Smith, reference should be made to

the Fortnightly Review for May 1883 and to the ''Mouthly Notices" of the Roy, Ast. Soc., vol. xliv.

SMITH, Jamus (1775-1839) and Horace (1779-1849), sons of an eminent and prosperous London solicitor, were

born, the former on 10th February 1775 and the latter on

3lst December 1779, both in London. They were joint authors of the Rejected Addresses, described by Horace as "one of the luckiest hits in literature." The occasion of this happy jew d'esprit was the rebuilding of Drury Lane theatre in 1812, after a fire in which it had been burnt down. The managers had offered a prize of £50 for an address to be recited at the reopening in October. Six weeks before that date the happy thought occurred to the brothers Smith of feigning that the most popular poets of the time had been among the competitors and issuing a volume of unsuccessful addresses in parody of their various styles. They divided the task between them, James taking Wordsworth, Southey, Coleridge, and Crabbe, while Byron, Moore, Scott, and Bowles were assigned to Horace.! The parodists were ready with their small volume by October, but they had some difficulty in getting a publisher, although the success of their clever imitations once published was such that seven editions were called for within three months, The Rejected Addresses are the most widely popular

parodies ever published in England, and have taken quite a classical rank in that kind of literature. The brothers fairly divided the honours: the elder brother's Wordsworth is evenly balanced by the younger's Scott, ae

' The particulars of the authorship are given in the 18th edition (1820), and in the memoir of his brother by Horace prefixed to a col- lection of fugitive pieces (1840). James contributed the first stanza to the imitation of Byron, but otherwise they worked independently.

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and both had a hand in Byron. A striking feature in the parodies is the absence of malice ; none of the caricatured bards took offence, while the imitation is so clever that both Byron and Scott are recorded to have said in effect that they could hardly believe they had not written the addresses ascribed to them.

After this brilliant success James, the elder brother, determined, as he said, ''to leave off a winner" and follow Warburton's advice to Anstey: "Young man, you have written a highly successful work ; never put pen to paper again." He was tempted occasionally to transgress this self-denying ordinance, and made another hit in writing Country Cousins, A Trip to Paris, A Trip to America, and other lively skits for Charles Mathews, earning from the comedian the praise of being "the only man who can write clever nonsense." His social reputation as a wit stood high. He was reputed one of the best of conversers in an age when the art was studied, and it was remarked that he held his own without falling into the great error of wits,—sarcasm. But for all his good-nature he did not wholly escape the Charybdis of great talkers,—the charge of being something of a bore. In his old age the irreverent Fraser's put him in its gallery of living portraits as a gouty and elderly but painstaking joker. He died in London on 26th December 1839,

Horace Smith was less timorously careful of his poetical reputation than his elder brother, whom he survived, and, after making a fortune as a stockbroker, followed in the wake of Scott and wrote about a score of historical novels, —Brambletye House, Tor Hill, Reuben Apsley, Zillah,

The New Forest, Walter Colyton, &e. His sketches of eccentric character are brilliant and amusing; but he was more of an essayist than a story-teller. He began in 1826, when Scott, still retaining his hold on the public, had made suc- cess impossible for imitators with less wealth of historical substance and inferior command of stirring incident. As he went on he encountered such competitors as Bulwer Lytton, Disraeli, Marryat, and Dickens. Still Horace Smith established a fair reputation, and some of his novels may still be found in the smoking-rooms of country houses. He was also a frequent contributor to the WVew Monthly Magazine under the editorship of Campbell. Three volumes of Gareties and Cravities, published in 1826, contain many witty essays both in prose and in verse, but the only single piece that has taken a permanent place is the ‘“ Address to the Mummy in Belzoni’s Exhibition.” There is more of earnest in this than is generally found in his jesting. In private life Horace Smith was not less popular than his brother, though less ambitious of renown as a talker. It was of him that Shelley said: “Is it not odd that the only truly generous person I ever knew who had money enough to be generous with should be a stockbroker 4 He writes poetry and pastoral dramas and yet knows how to make money, and does make it, and is still generous.” Horace Smith died at Tunbridge Wells on 12th July 1849.

SMITH, Jonn (1580-1631), usually distinguished as Captain John Smith, some time president of the English colony in Virginia, was the elder son of George Smith, a well-to-do tenant-farmer on the estate of Lord Willoughby d’Eresby at Willoughby near Alford in Lincolnshire. The life of this Virginian hero falls conveniently into five periods.

The first of these, 1580-1596, that of his early youth, is thus described by himself in his 7’ravels: ‘“‘ He was born [1580] in Willoughby in Lincolnshire and was a scholar in the two free schools of Alford and Louth. His parents, dying [April 1596] when he was thirteen [or rather fifteen | years of age, left him a competent means, which he, not being capable to manage, little regarded. His mind being even then set upon brave adventures, he sold his satchel,

books, and all he had, intending secretly to get to sea, but that his father's death stayed him. But now the guardians of his estate more regarding it than him, he had liberty enough, though no means, to get beyond the sea. About the age of fifteen years,-he was bound an apprentice to Master Thomas Sendall of [King's] Lynn, the greatest merchant of all those parts; but, because he would not presently send him to sea, he never saw his master in eight years after."

The second period, 1596-1604, is that of his adventures in Europe, Asia, and Africa. He first went to Orleans in attendance on the second son of Lord Willoughby. Thence he returned to Paris, and so by Rouen to Havre, where, his money being spent, he began to learn the life of a soldier under Henry IV. of France. On the conclusion of the peace with the League he went with Captain Joseph Duxbury to Holland and served there some time, probably with the English troops in Dutch pay. By this time he had gained a wide experience in the art of war, not merely as an infantry officer, but also in those more technical studies which are now followed by the Royal Engineers. At length he sailed from Enkhuisen to Scotland, and on the voyage had a narrow escape from shipwreck upon Holy Island near Berwick. After some stay in Scotland he returned home to Willoughby, 'where, within a short time being glutted with too much company, wherein he took small delight, he retired himself into a little woody pasture, a good way from any town, environed with many hundred acres of other woods. Here by a fair brook he built a pavilion of boughs, where only in his clothes he lay. His study was Machiavelli's Art of War and Marcus Aurelius; his exercise a good horse with his lance and ring ; his food was thought to be more of venison than anything else; what [else] he wanted his man brought him. The country wondering at such a hermit, his friends per- suaded one Signior Theadora Polaloga, rider to Henry, earl of Lincoln, an excellent horseman and a noble Italian gentleman, to insinuate [himself] into his woodish acquaint- ances, whose languages and good discourse and exercise of riding drew Smith to stay with him at Tattersall… . Thus, when France and the Netherlands had taught him to ride a horse and use his arms, with such rudiments of war as his tender years, in those martial schools, could attain unto, he was desirous to see more of the world, and try his fortune against the Turks, both lamenting and repenting to have seen so many Christians slaughter one another."

Next came his wanderings through France from Picardy to Marseilles. full of pilgrims going to Rome. These, cursing him for a heretic, and swearing they would have no fair weather so long as he was on board, threw him, like another Jonah, ‘nto the sea. He was able to get toa little uninhabited island, from which he was taken off the next morning by a Breton ship of 200 tons going to Alexandria, the captain of which, named La Roche, treated him as a friend. In this ship he visited Egypt and the Levant. On its way back the Breton ship fought a Venetian argosy of 400 tons and captured it. Reaching Antibes (Var) later on, Captain La Roche put Smith ashore with 500 sequins, who then proceeded to see Italy as he had already seen France. Passing through Tuscany he came to Rome, where he saw Pope Clement VIII. at mass, and called on Father R. Parsons. Wandering on to Naples and back to Rome, thence through Tuscany and Venice, he came to Gratz in Styria. There he received information about the Turks who were then swarming through Hungary, and, passing on to Vienna, entered the emperor’s service.

In this Turkish war the years 160] and 1602 soon passed away; many desperate adventures did he go

through, and one in particular covered him with great honour. two armies, as the champion of the Christians, he fought on horseback and killed three Turkish champions in suc- cession. On 18th November 1602, at the battle of Rothen- thurm, a pass in Transylvania, where the Christians fought desperately against an overpowering force of Crim Tatars Smith was left wounded on the field of battle. dress saved him, for it showed that he would be wortha ransom. for a slave and then marched to Constantinople, where he was presented to Charatza Tragabigzanda, who fell in love with him. Fearing dest her mother should sell him, she sent him to her brother Timor, pasha of Nalbrits, on the Don, in Tartary. wrote so much for his good usage that he half suspected as much as she intended ; for she told him, he should there but sojourn to learn the language, and what it was to bea Turk, till time made her master of herself. But the Timor, her brother, diverted all this to the worst of cruelty. For, within an hour after his arrival, he caused his ‘drubman’ to strip him naked, and shave his head and beard so bare as his

hand. bowed like a sickle, was riveted about his neck, and a coat [put on him] with a piece of an undressed skin. more Christian slaves, and nearly a hundred forsados of

There he took ship for Italy in a vessel

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At Regal (Stuhlweissenburg), in the presence of

His rich

As soon as his wounds were cured he was sold

“To her unkind brother this kind lady

A great ring of iron, with a long stalk

made of ulgry’s hair, guarded about There were many

Turks and Moors, and he being the last was the slave of slaves to them all.” While at Nalbrits the English captain

kept his eyes open, and his account of the Crim Tatars is careful and accurate. able estate, as he became a thresher at a grange in a great field, more than a league from the Timor’s house. The pasha, as he oft used to visit his granges, visited him, and

‘So long he lived in this miser-

took occasion so to beat, spurn, and revile him, that for- getting all reason Smith beat out the Timor’s brains with his threshing bat, for they have no flails, and, seeing his estate could be no worse than it was, clothed himself in the Timor’s clothes, hid his body under the straw, filled his knapsack with corn, shut the doors, mounted his horse, and ran into the desert at all adventure.” For eighteen or nineteen days he rode for very life until he reached a Muscovite outpost on the river Don; here his irons were taken off him, and the Lady Callamata largely supplied all his wants. Thence he passed, attracting all the sym- pathy of an escaped Christian slave, through

Muscovy, Hungary, and Austria until he reached Leipsic in Decem- per 1603, There he met his old master, Prince Sigismund, who, in memory of his gallant fight at Regal, gave him a grant of arms and 500 ducats of gold. Thence he wandered on, sightseeing, through Germany, France, and Spain, until he came to Saffi, from which seaport he made an excursion to the city of Morocco and back.

While at Saffi he was blown out to sea on board Captain Merham's ship, and had to go as far as the Canaries. There Merham fought two Spanish ships at once and beat them off. Smith came home to England with him, having a thousand ducats in his purse.

The third period, 1605-1609, is that of Captain Smith's experiences in Virginia. Throwing himself into the colon- izing projects which were then coming to the front, he first intended to have gone out to the colony on the Oyapok in South America; but, Captain Ley dying, and the reinforcement miscarrying, "the rest escaped as they could." Hence Smith did not leave account, But he went heartily into the Virginian project with Captain Bartholomew Gosnold and others. He states that what he got in his travels he spent in colon- izing. 'When I went first to these desperate designs, 1 cost me many a forgotten pound to hire men to go, and

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procrastination caused more to run away than went. I have spared neither pains or money according to my ability, first to procure His Majesty's letters patents, and a com- pany here, to be the means to raise a company to go with me to Virginia, which beginning here and there cost me nearly five

years' [1604-1609] work, and more than five hundred pounds of my own estate, besides all the dangers, miseries, and incumbrances I endured gratis." Two colon- izing associations were formed,—the London Company for South Virginia and the Western Company for North Virginia. Smith was one of the founders of the London Company. The colonies which Sir W. Raleigh had estab- lished at Roanoke and other islands off the American coast had all perished, mainly for want of a good harbour, so that really nothing at all was known of the Virginian coastline when the first expedition left London on 19th December 1606; and therefore the attempt was bound to fail unless a convenient harbour should be found. The expedition consisted of three ships (the " Susan Constant," 100 tons, Captain C. Newport; the "God Speed," 40 tons, Captain B. Gosnold; and a pinnace of 20 tons, Captain J. Ratcliffe), with about 140 colonists and 40 sailors. They made first for the West Indies, reaching Dominica on 24th March 1607. At Nevis, their next stopping place, a gallows was erected to hang Captain Smith on the false charge of conspiracy ; but he escaped, and, though afterwards the lives of all the men who plotted against him were at his mercy, he spared them. Sailing northwards from the West Indies, not knowing where they were, the expedition was most fortunately, in a gale, blown into the mouth of Chesapeake Bay, discover- ing land on 26th April 1607. Anchoring, they found the James river, and, having explored it, fixed upon a site for their capital in the district of the chief or weroance of Paspaheh, its chief recommendation being that there were 6 fathoms of water so near to the shore that the ships could be tied to the trees. Orders had been sent out for the government of the colony in a box, which was opened n 26th April 1607. Captains B. Gosnold, E. M. Wing- field, C. Newport, J. Smith, J. Ratcliffe, J. Martin, and G. Kendall were named to be the council to elect an annual president, who, with the council, should govern. Wingfield was, on 13th May, elected the first president ; and the next day they landed at James Town and com- menced the settlement.

All this while Smith was under restraint, for thirteen weeks in all. His enemies would have sent him home, out of a sham commiseration for him; but he challenged their charges, and so established his innocency that Wingfield was adjudged to give him £200 as damages. After this, on 20th June 1607, Smith was admitted to the council.

As in going to America in those days the great diffi- culty was want of water, so in those colonizing efforts the paramount danger was from want of food. “There were never Englishmen left in a foreign country in such misery as we were in this new discovered Virginia. We watched every three nights [every third night], lying on the bare cold ground, what weather soever came, and warded all the next day, which brought our men to be most feeble wretches. Our food was but a small can of barley sodden in water to five men a day. Our drink, cold water taken out of the river, which was, at a flood, very salt, at a low tide, full of slime and filth, which was the destruction of many of our men.” So great was the mortality that out of 105 colonists living on the 22d June 1607 67 died by the following 8th January. The country they had settled in was sparsely populated by many small tribes of Indians, who owned as their para- mount chief, Powhatan, who then lived at Werowocomoco,

knowledge, and succeeded.

a village on the Pamunkey river, about 12 miles by land from James Town. Various boat expeditions left James Town, to buy food in exchange for copper. They generally had to fight the Indians first, to coerce them to trade, but afterwards paid a fair price for what they bought.

On 10th December 1607 Captain Smith, of whom it is said ‘“‘the Spaniard never more greedily desired gold than he victail,” with nine men in the barge, left James Town to get more corn, and also to explore the upper waters of the Chickahominy. They got the barge up as far as Apocant. Seven men were left in it, with orders to keep in midstream. They disobeyed, went into the village, and one of them, George Cassen, was caught ; the other six, barely escaping to the barge, brought it back to James Town. It so happened that Opecanchan- ough (the brother of Powhatan, whom he succeeded in 1618, and who carried out the great massacre of the English on Good Friday 1622) was in that neighbourhood with two or three hundred Indians on a hunting expedi- tion. He ascertained from Cassen where Smith was, who, ignorant of all this, had, with Jehu Robinson and

Thomas Emery, gone in a canoe 20 miles farther up the river. The Indians killed Robinson and Emery while they were sleeping by the camp fire, and went after Smith, who was away getting food. They surprised him, and, though he bravely defended himself, he had at last to surrender. He then set his wits to confound them with his superior Opecanchanough led him about the country for a wonder, and finally, about 5th January 1608, brought him to Powhatan at Werowoco- moco. “Having feasted him after their best barbarous manner they could, a long consultation was held; but the conclusion was two great stones were brought before Powhatan; then as many as could laid hands on Smith, dragged him to them, and thereon laid his head. And, being ready with their clubs to beat out his brains, Poca-hontas, the king’s dearest daughter, when no entreaty could prevail, got his head in her arms and laid her own upon his to save him from death. Whereat the emperor was contented Smith should live, to make him hatchets, and her bells, beads, and copper; for they thought him as well of all occupations [handicrafts] as themselves.”

The truth of this story was never doubted till 1866, when

the eminent antiquary, Dr Charles Deane of Cambridge,

Mass., in reprinting Smith’s first book, the 7rue Relation of 1609, pointed out that it contains no reference to this hairbreadth escape. Since then many American historians and scholars have concluded that it never happened at all ; and, in order to be consistent, they have tried to prove that Smith was a blustering braggadocio, which is the very last thing that could in truth be said of him. The rescue of a captive doomed to death by a woman is not such an unheard-of thing in Indian stories. If the truth of this deliverance be denied, how then did Smith come back to James Town loaded with presents, when the other three men were killed, George Cassen in particular, in a most horrible manner? And how is it, supposing Sinith’s account to be false, that Pocahontas afterwards frequently, came to James Town, and was next to Smith himself the salvation of the colony? ‘The fact is, nobody doubted the story in Smith’s lifetime, and he had enemies enough.’

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1 Pocahontas never visited James Town after Smith went to England in October 1609, until she was brought there a state prisoner in April 1613 by Captain 8. Argall, who had obtained possession of her by treachery on the Potomac river. The colony, while treating her well, used her as a means to secure peace with the Indians. In the mean- time, believing Smith to be dead, she fell in love with an English gentleman, John Rolfe, apparently at that time a widower. They Were married about Ist April 1614. Subsequently she embraced Christianity. Sir T. Dale, with Rolfe and his wife, landed at Ply- mouth on 12th June 1616. Before she reached London, Smith

Space fails to describe how splendidly Smith worked after his deliverance for the good of the colony, how he explored Chesapeake Bay and its influents, how (when all others had failed) the presidency was forced on him on 10th September 1608 ; how he tried to seize Powhatan at Werowocomoco on 12th January 1609, but he fled to Orapakes, 40 miles farther off; how with only eighteen men he cowed Opecanchanough in his own house at Pamunkey, in spite of the hundreds of Indians that were there, and made him sell corn; how well he administered the colony all through the spring and summer of 1609.

Meanwhile the establishment of this forlorn hope in Virginia had stirred up a general interest in England, so that the London Company were able in June 1609 to send out 9 ships with 500 colonists. Smith had now got the Indians into splendid order ; but from the arrival on 11th August of the newcomers his authority came to an end. They refused to acknowledge him, and robbed and injured the Indians, who attacked them in turn. Smith did his best to smooth matters, while the rioters were plotting to shoot him in his bed. In the meantime he was away up the river. On his return, “sleeping in his boat, acci- dentally one fired his powder bag, which tore his flesh from his body and thighs, 9 or 10 inches square, in a most pitiful manner; but to quench the tormenting fire frying him in his clothes he leaped overboard into the deep river, where, ere they could recover him, he was nearly drowned.” Thus disabled, he was sent home on 4th October 1609 and never set foot in Virginia again. Nemesis overtook the rioters the winter after he left, which is known in Virginian story as “the starving time.” Out

of 490 persons in the colony in October 1609 all but 60 died by the following March. |

The rest of Smith's life can only be briefly touched upon. The third period, 1610-1617, was chiefly spent in discover- ing Nusconcus, Canada, and Pemaquid in North Virginia, to which, at his solicitation, Prince Charles gave the name of New England. His first object was to fish for cod and barter for furs, his next, to discover the coast-line with the view to settlement. Two attempts, in 1615 and 1617, to settle at Capawuck failed, but through no fault of his. It was in connexion with these projects that the Western Company for North Virginia gave him the title of admiral of New England. We cannot better conclude this sketch of his active operations than in his own words printed in 1631. 'Having been a slave to the Turks; prisoner among the most barbarous savages; after my deliverance commonly discovering and ranging those large rivers and unknown nations with such a handful of ignorant companions that the wiser sort often gave me up for lost ; always in mutinies, wants, and miseries; blown up with gunpowder; a long time a prisoner among the French pirates, from whom escaping in a little boat by myself, and adrift all such a stormy winter night, when their ships were split, more than £100,000 lost which they had taken at sea, and most of them drowned upon the Isle of Rhé—not far from whence I was driven on shore, in my little boat, &c. And many a score of the worst winter months have [I] lived in the fields; yet to have lived near thirty-seven years [1593-1630] in the midst of wars, pesti- lence, and famine, by which many a hundred thousand have died about me, and scarce five living of them that went first with me to Virginia, and yet to see the fruits of my labours thus well begin to prosper (though I have but my

petitioned Queen Anne on her behalf; and itis in this petition of June 1616 that the account of his deliverance by the Indian girl first appears, After a pleasant sojourn of about seven months, being well received both by the court and the people, Pocahontas with her husband embarked for Virginia in the George, Captain S. Argall (her old captor), but she died off Gravesend about February 1617.

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[JOHN

labour for my pains), have I not much reason, both private] and publicly to acknowledge it, and give God thanks?”

The last period, 1618-1631, of Smith’s life was chiefly devoted to authorship. In 1618 he applied (in vain) to Lord Bacon to be numbered among his servants. In 1619 he offered to lead out the pilgrim fathers to North Virginia ; but they would not have him, he being a Protestant and they Puritans. The London Virginia Company became bankrupt for £200,000 in 1624. A list of his publications will be found at the end of this article. Thus having done much, endured much, and written much, while stil] contemplating a History of the Sea, Captain John Smith died on 21st June 1631, and was buried in St Sepulchre’s Church, London.

Two of the sixty survivors of “the starving time,” Richard Pots and William Phettiplace, thus nobly ext pressed in print, so early as 1612, their estimate of Smith: “What shall I say? but thus we lost him [4th October 1609] that in all his proceedings made justice his first guide and experience his second; ever hating baseness, sloth, pride, and indignity more than any dangers; that never allowed more for himself than his souldiers with him; that upon no danger would send them where he would not lead them himself; that would never see us want what he either had, or could by any means get us; that would rather want than borrow or starve than not pay; that loved actions more than words, and hated falsehood and cozenage than death ; whose adventures were our lives, and whose loss our deaths.”

A fairly complete bibliography will be found in Professor Edward Arber’s reprint of Smith’s Works, Birmingham, 1884, 8vo, The order of their first appearance is, A True Kelation, &c., 1608 (first attributed to a gentleman of the colony, next to Th. Watson, and finally to Captain Smith); 4 Map of Virginia, ed. by William] S[immonds], Oxford, 1612; 4 Description of New England, 1616; New England’s Trials, 1620; New England’s Trials, 2d ed., 1622; The General History of Virginia, New England, and the Summer Isles, 1624; An Accidence for all Young Seamen, 1626 ; the same work recast and enlarged as 4 Sea Grammar, 1627, both works continuing on sale for years, side by side; The True Travels, &e., 1630; Advertisements for the Unexpertenced Planters, &c., 1631. Of some of the smaller texts limited 4to

editions have been published in the United States by Dr C. Deane, J. Carter Brown, and others. (E. A.)

SMITH, Joun Rapwaet (1752-1812), English painter and mezzotint engraver, a son of Thomas Smith of Derby, the landscape painter, was born in 1752. He was apprenticed to a linen draper in Derby, and afterwards pursued the same business in London, adding, however, to his income by the production of miniatures. He then turned to engraving, and executed his plate of the Public Ledger, which had great popularity, and was followed by his mezzotints of Edwin the Minstrel (a portrait of Thomas Haden), after Wright of Derby, and Mercury Inventing the Lyre, after Barry. He reproduced some forty of the works of Reynolds, some of these plates ranking among the masterpieces of the art of mezzotint, and he was ap-pointed engraver to the Prince of Wales. Adding to his artistic pursuits an extensive connexion as a_print-dealer and publisher, he would soon have acquired wealth had it not been for his dissipated habits. He was passionately attached to field-sports, pugilism, and the stage, and was a boon companion of George Morland, whose figure-pieces he excellently mezzotinted. He executed many original portraits in chalks, and painted subject-pictures such as the Unsuspecting Maid, Inattention, and the Moralist, exhibiting in the Royal Academy from 1779 to 1790. Upon the decline of his business as a printseller he made a tour as an itinerant portrait painter through the northern and midland counties of England, producing much hasty and indifferent work, and settled in Doncaster, where he died on 2d March 1812.

As a mezzotint engraver Smith occupies the very first rank. His

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prints are delicate, excellent in drawing, and finely expressive of colour, His small full-lengths in crayons and his portraits of Fox, Horne Tooke, Sir

Francis Burdett, and the group of the duke of Devonshire and family support his claims as a successful drafts- man and painter. He was possessed of a very thorough knowledge

of the principles and history of art, and was a brilliant conversa- |

tionalist.

SMITH, JoszepH. See Mormons.

SMITH, Sypney (1771-1845), one of the founders of the Edinburgh Review, and one of the wittiest talkers and political writers of his generation, was the son of an English country gentleman, and was born at Woodford in Essex on 3d June 1771. His father, a man of restless ingenuity and activity, ‘very clever, odd by nature, but still more odd by design,” who bought, altered, spoiled, and sold about nine- teen different estates in England, had talent and eccentricity enough to be the father of such a wit as Sydney Smith on the strictest principles of heredity ; but Sydney was wont him- self to attribute not a little of his constitutional gaiety to an infusion of French blood, his maternal grandfather being a French Protestant refugee of the name of Ollier, who could not speak a word of English. Sydney was the second of a family of four brothers and one sister, all remarkable for their talents. While two of the brothers, ‘‘ Bobus” and Cecil, were sent to Eton, Sydney was sent with the youngest to Winchester, where he rose to be captain of the school, and with his brother so distinguished himself that their schoolfellows signed a round-robin “refusing to try for the college prizes if the Smiths were allowed to contend for them any more, as they always gained them.” From Winchester Sydney went to New College, Oxford, and in due course became a fellow of his college. It was his wish then to read for the bar, but his father would add nothing to his fellowship, and he was reluctantly compelled to enter the church, and became a curate in a small village in the midst of Salisbury Plain. From this dreary in- cumbency he was relieved after two years, and conducted to the scene of the foundation of the Ldinburgh Review by a combination of accidents. The squire of the parish in- vited the new curate to dine, was astonished and charmed to find such a man in such a place, and engaged him after a time as tutor to his eldest son. ‘“‘It was arranged,” he afterwards said, ‘that I and his son should proceed to the university of Weimar. We set out, but before

reaching our destination Germany was disturbed by war, and in stress of politics we put into Edinburgh.” This was in 1797. In Edinburgh, as everywhere else, Smith made numer- ous friends, whose cordiality was in no way abated by his constant quizzing of the national foibles and peculiarities ; and among those friends were the future Edinburgh Re- viewers. It was towards the end of his five years’ residence in Edinburgh, in the elevated residence of the then Mr Jeffrey, ‘‘in the eighth or ninth story or flat in a house in Buccleuch Place,” that Sydney Smith proposed the setting up of a review as an organ for the opinions and a vehicle for the ambition of the young malcontents with things as they were. ‘I was appointed editor,” he says in the preface to the collection of his contributions, ‘‘and remained long enough in Edinburgh to edit the first number [October 1802] of the Hdinburgh Review. The motto I proposed for the Review was ‘Tenui musam meditamur avena’—‘ We cultivate literature on a little oatmeal.’ But this was too near the truth to be admitted, and so we took our present grave motto from Publius Syrus, of whom none of us had, Tam sure, ever read a single line.” He continued to write for the Review for the next quarter of a century, and his brilliant articles were a main element in its success. They represent the very perfection of journalism. They were not merely the most readable, the most entertaining: the solidity of substance and the seriousness of purpose were quite as indisputable as the brilliancy of the execution.

The writer seemed to tackle the gravest of political and social questions in the highest of spirits, yet he never lost sight of his aim in purposeless buffoonery ; and, however heartily the reader might be made to laugh, the laughter was always directed at what seemed to the writer absurd and unreasonable opinion. It was remarked of his wit in conversation that the butts of it were often seen to laugh as heartily as the audience; there was nothing base and personal in Sydney Smith’s raillery. The same with his writing when it was anonymous. His wonderful powers of humorous exaggeration were such as to detach a ridicu- lous opinion as far as possible from its human incarnation and present it in the bare essence of its

absurdity. This was his habit as a controversialist ; and, when his purpose was simply to convey information, to give the gist of a book of travels, or a system of education, or a body of statistics, he was unequalled in the art of amusing the reader with ludicrous images in the most unexpected places without departing from the main lines of a most clear, orderly, and instructive exposition. The fact is that the serious didactic purpose in all Sydney Smith's writing and the closeness of his adherence to the matter in hand are the main obstacles to the living permanence of his fame as the writer of the best colloquial prose of his generation ; for though his range of topics was wide—political, ecclesi- astical, educational, geographical, and otherwise miscellane- ous—they were all of immediate, practical, and passing interest, and his remarks were pushed home to the life of the time so closely as to have comparatively little inde- pendent interest for posterity.

Most of Sydney Smith's contributions to the Ldinburgh Review were sent from the country parish of Foston-le-Clay in Yorkshire, where he spent the best part of his life. He left Edinburgh for good in 1803, when the education of his pupils was completed ; and, yielding to his wife's con- fidence in his powers—he had married Miss Pybus, an English lady of good family, while still unsettled in life— adventured on London, where he rapidly became known as a preacher, a lecturer, and a social lion. His success as a preacher, although so marked that there was often not standing room in the church in Berkeley Square, where he conducted the morning service, was not gained by any sacrifice of dignity: there was no eccentricity, nothing sensational in his preaching; it was a pure triumph of good sense, right feeling, earnestness, and freshness of pulpit oratory. He lectured on moral philosophy at the Royal Institution for three seasons, from 1804 to 1808 ; and here also, handling the ordinary topics of a philosophy chair in a Scotch university, he treated them with such vigour, freshness, and liveliness of illustration that the London world crowded to Albemarle Street to hear him. He made no pretence to originality, and in the main followed Dugald Stewart, whose lectures he had attended in Edinburgh ; but there is more originality as well as good sense in his lectures, especially on such topics as imagination and wit and humour, than in many more pre- tentious systems of philosophy. With the brilliant re- putation that Sydney Smith had acquired in the course of a few seasons in London, he would probably have

obtained some good preferment had he been on the powerful side in politics. His Whig friends came into office for a short time in 1806, and presented him with the living of Foston- le-Clay in Yorkshire. He shrank from this banishment for a time, and discharged his parish duties through a curate; but Mr Percival's Residence Act was passed in 1808, and, after trying in vain to negotiate an exchange, he quitted London in 1809 and moved his household to Yorkshire. His most famous single production, Peter Plymley's Letters on the subject of Catholic emancipation, ridiculing the opposition of the country clergy, appeared

before this migration. From being the idol of London society to being the pastor of a country parish with no educated neighbour within 7 miles was a violent change ; but Sydney Smith accommodated himself cheerfully to his new circumstances, and won the hearts of his parishioners as quickly as he had conquered a wider world. Not the least entertaining chapter in his daughter's biography of him is the account of his Yorkshire life. An interest- ing contrast might be drawn between it and Carlyle's life in somewhat similar circumstances at Craigenputtock. Sydney Smith's life at Foston, with its cheerful energy and ingenuity, its vigorous jesting at difficulties and eccen- tric ways of conquering them, is of much better example, and moralists might do worse than put the story into form for general edification.!

Sydney Smith, after twenty years' service in Yorkshire, obtained preferment at last from a Tory minister, Lord Lyndhurst, who presented him with a canonry in Bristol cathedral in 1828, and afterwards enabled him to exchange Foston for the living of Combe Florey near Taunton. From this time he discontinued writing for the Ldinburgh Review on the ground that it was more becoming in a dignitary of the church to put his name to what he wrote. It was expected that when the Whigs came into power Sydney Smith would be made a bishop. There was nothing in his writings, as in the case of Swift, to stand in the way, for with all his humour and high spirits he had always, as he said himself, fashioned his manners and conversation so as not to bring discredit on his reverend profession. He had been most

sedulous as a parochial clergyman. Still, though he was not without warm friends at head- quarters, the opposition was too strong for them. One of the first things that Lord Grey said on entering Downing Street was, “Now I shall be able to do something for Sydney Smith”; but he was not able to do more than appoint him to a prebendal stall at St Paul’s in exchange for the one of inferior value he held at Bristol. Lord Melbourne is reported to have said that there was nothing he more regretted than the not having made Sydney Smith a bishop. Some surprise must be felt now that Sydney Smith’s reputation as a humourist and wit should have caused any hesitation about elevating him to the episcopal dignity, and perhaps he was right in thinking that the real obstacle lay in his being known as “a high-spirited, honest, uncompromising man, whom all the bench of bishops could not turn upon vital questions.” With characteristic philosophy, when he saw that the promotion was doubt- ful, he made his position certain by resolving not to be a bishop and definitely forbidding his friends to intercede for him, This loss and the much more painful loss of his eldest son did not destroy the cheerfulness of his later life. He retained his high spirits, his wit, practical energy, and powers of argumentative ridicule to the last. His Letters to Archdeacon Singleton on the Ecclesiastical Commission (1837), and his Petition and Letters on the repudiation of debts by the State of Pennsylvania (1843), are as bright and trenchant as his best contributions to the Edinburgh Review. Smith died in London on 22d February 1845.

Lady Holland’s Memoir of her father, containing such specimens of his table talk as give one some idea of his charm and worth as a mirthful companion and philosopher, is one of the most interest- ing of biographies. A cheap edition of his Works was published in 1869. (W. M.)

SMITH, Str Tuomas (1512-1577), the contemporary and friend of Sir John Cheke, was born at Saffron-Walden in Essex in 1512. He became a fellow of Queens’ College, Cambridge, in 1531, and was afterwards appointed to read the public Greek lecture, in the discharge of which function

1 See Lady Holland’s Memoir, chaps. v., vi. Lady Holland, Sydney

Smith’s eldest daughter, was the wife of Sir Henry Holland, the famous physician, —not of Lord Holland, as is sometimes absurdly stated.

he first introduced the new Greek pronunciation,which soon became universal in England. After studying in France and Italy and taking a degree in law at Padua, he wag appointed first regius professor of civil law in Cambridge in 1542. During Somerset's protectorate he entered public life and was sent as ambassador first to Brussels and after- wards to France. In 1548 he was made a secretary of state and knighted. On the accession of Mary he was deprived of all his offices, but in the succeeding reign was frequently employed in public affairs. He died in 1577.

His best-known work, entitled De Republica Anglorwm: the Maner of Government or Polieie of the Realme of England, was pub- lished posthumously in 1583, and passed through many editions, His epistle to Gardiner, De recta et emendata linguex Grace pro- nunciatione, was printed at Paris in 1568; the same volume includes his dialogue De recta et emendata lingue Anglicanex seriptione,

SMITH, Witt1am (1769-1839), called "the father of English geology," and among his acquaintances "Stratum Smith," will be generally remembered as the framer and author of the first complete geological map of England and Wales, and as the discoverer of the principle of the identifi- cation of strata by their included organic remains. He was born at Churchill in Oxfordshire on 23d March 1769. De- prived of his father, an ingenious mechanic, before he was eight years old, he depended upon his father's eldest brother, who was but little pleased with his nephew's love of collecting " pundribs" (Z'erebratulz) and " pound-stones" or "quoit-stones" (large Echinites, frequently employed as a pound weight by dairywomen), and had no sympathy with his propensity for carving sundials on the soft brown "oven-stone" of his neighbourhood. William became a mineral surveyor and civil engineer. In the former capa- city he traversed the Oolitic lands of Oxfordshire and Gloucestershire, the Lias clays and red marls of Warwick-shire, and other districts, studying their varieties of strata and soils. In 1791 he surveyed an estate in Somersetshire and observed the strata of the district. In 1793 he executed the surveys and completed the levellings for the line of a proposed canal, in the course of which he confirmed a previous

supposition, that the strata lying above the coal were not horizontal, but inclined in one direction—to the eastwards—so as to terminate successively at the surface, and to resemble on a large scale the ordinary disposition of the slices of bread and butter on a breakfast plate—an illustration which he was wont to use on all occasions.

On being appointed engineer to the Somerset Coal Canal – in 1794, he was deputed to make a tour of observation with relation to inland navigation. During this tour, which occupied nearly two months, and extended over 900 miles, he carefully examined the geological structure of the country, and corroborated his preconceived generaliza- tion of a settled order of succession in the several strata, a continuity of range at the surface, and a general declina- tion eastwards. Five years subsequently he prepared @ tabular view of the Order of the Strata, and their embedded Organic Remains, in the neighbourhood of Bath, examined and proved prior to 1799. From this period to 1812 he was completing and arranging the data for his large Geological Map of England and Wales, with part of Scot- land, which appeared in 1815, in fifteen sheets, engraved on a scale of 5 miles to 1 inch, The map was reduced to smaller form in 1819; and from this date to 1822 separate county geological maps were published in succes- sive years, the whole constituting a Geological Atlas of England and Wales. In January 1831 the Geological Society of London conferred on Smith the first Wollaston medal; and the Government, at the request of several English geologists, conferred upon him a life-pension of £100 per annum. The degree of LL.D. he received from Dublin, at the meeting of the British Association in that city in 1835. At such meetings he was nearly always

present. In 1838 he was appointed one of the commis- sioners to select building stone for the new Houscs of Parliament. The last years of his life were spent at Hackness (of which he made a good geological map), near Scarborough, and in the latter town. His usually robust health failed in 1839, and on 28th August of that year he died at Northampton. He once said he was born on the Oolite, and should wish to be buried on it; and so he was, at Northampton.

His Memoirs by Professor John Phillips appeared in 1844.

SMITH, Witt1am Henry (1808-1872), best known as the author of Thorndale, is one of those thinkers and students whose work, whilst scarcely recognized in their own day and soon all but overlooked in the larger per- spective of history, is yet of real value for an appreciation of the intellectual character of the time. The literary pro- duction of which Thorndale is the most representative example affords a moral countenance to contemporary workers in philosophy which is invaluable, but which for obvious reasons can never be exactly appraised. With a fine and reflective, rather than robust and active, intel- ligence, Smith deals suggestively in the form of conversa- tion—which he adopts in Thorndale and in his later book Gravenhurst—with the problem of good and evil, with materialism and idealism, with most of the subtle modern perplexities in the interaction of religion, philosophy, and science. But his more exact contributions to thought, such as the Discourse on the Ethics of the School of Paley and the Hssays on Knowing and Feeling, do not work out anything like a complete system, and are somewhat lacking in intellectual grip. Smith also wrote several books of yerse and two plays, one of which, Athelwold, was produced by Macready in 1842. Much graceful reflexion and a true feeling for nature are found in his verse, but it lacks energy. Smith spent a serene uneventful life, chiefly in the studious seclusion which he loved, but which must have tended to foster the inactive tendencies that led him to call himself playfully in his latter days “the snail.” He was born at Hammersmith in 1808 in comfortable sur- roundings, his father being a retired merchant ; his mother was of German extraction, with a vein of mysticism, which is worth noticing in view of the son’s metaphysical tend- encies, He was sent in 1821 to Glasgow, where Byron’s poetry and Scottish metaphysics seem to have had most mfluence upon hin. Then he entered a lawyer’s office, in which he remained for five years. His first writings ap- peared in the Literary Gazette and in the Athenxum, to which he contributed under the name of ‘ Wool-gatherer,” attracting some attention by the delicacy and finish of his style. His ambition was at the outset chiefly poetical, however, and, when his first book appeared and was almost completely ignored, he dug a grave and buried the unsold copies in a fit of Byronic despondency. JLrnesto, a philo- sophical romance, also belongs to this early period. In 1836 he wrote for the Quarterly Review, and in 1839 he formed a connexion with Blackwood’s Magazine, which lasted for thirty years, during the latter part of which he acted as its philosophical critic. In

1846 a visit to Italy led to the writing of a tale entitled Mildred, which Was too purely reflective to be successful. In 1851 he declined the chair of moral philosophy at Edinburgh, having determined a year or two previously to retire to the

English Lake district, there to study in seclusion. There

he completed Thorndale, which was published in 1857. 7ravenhurst appeared in 1862; a second edition contained & memoir of the author by his wife. He died at Brighton on 28th March 1872.

SMITH, Str Winuram Sipney (1764-1840), English admiral, was the second son of Captain John Smith of the Guards, and was born at Westminster on 21st July

1764. He entered the navy, according to his own account, “at the beginning of the American War,” being only about eleven years of age. For his bravery under Rodney: in the action near Cape St Vincent in January 1780, he was on 25th September appointed lieutenant of the “ Alcide.” After serving in the actions against the French fought by Graves off Chesapeake in 1781 and by Rodney at the Leeward Islands in 1782, he was on 6th May of the latter year promoted to be commander of the ‘‘ Fury ” sloop, and on 18th October advanced to the rank of captain. His ship having been paid off in the beginning of 1784, he spent two years in France and afterwards visited Spain. From 1790 to 1792 he was employed in advising the king of Sweden in the war with Russia, receiving for his services the honour of knighthood. After his return to England he was sent on a mission to Constantinople, and, having joined Lord Hood at Toulon from Smyrna in December 1793, he burnt the enemy’s ships and arsenal. In the following years he cleared the Channel of French privateers; but, having with the boats of his squadron boarded in Havre-de-Grace harbour a lugger which was driven by the tide above the French forts, he was on 19th April 1796 compelled to surrender and sent a prisoner to Paris. By means of forged orders for his removal to another prison he made his escape from the Temple, and, crossing the Channel in a small skiff picked up at Havre, arrived in London on 8th May 1798. In Octo- ber he was sent as

plenipotentiary to Constantinople. Learning of Buonaparte's approach to St Jean d'Acre, he hastened to its relief, and on 16th March 1799 captured the enemy's flotilla, after which he successfully defended the town against several furious attacks of the French, compel- ling Napoleon on 20th May to raise the siege and retreat in disorder, leaving all his artillery behind. For this bril- liant exploit he received the special thanks of the Houses of Parliament and was awarded an annuity of £1000. Subsequently he co-operated with Abercromby, under whom he served as brigadier-general at the battle of Aboukir, where he was wounded. On his return to England he was in 1802 elected M.P. for the city of Rochester. In March 1803 he was commissioned to watch the preparations of the French for an invasion of England. Having on 9th Novem- ber 1805 been promoted to be rear-admiral of the blue, he was in the following January despatched on secret ser- vice for the protection of Sicily and Naples. He relieved Gaeta and captured Capri, but on 25th January 1807 received orders to proceed to Malta, whence he joined Sir John Duckworth, who was sent to act against the Turks. On 7th February, with the rear division of the squadron, he destroyed the Turkish fleet and spiked the batteries off Abydos. In November following he was sent to blockade the Tagus and was mainly instrumental in embarking the Portuguese prince regent and royal family and sending them under safe protection to Rio de Janeiro, after which he was sent as commander-in-chief to the coast of South America. On 31st July 1810 he was made vice-admiral of the blue and on 18th July 1812 was despatched as second in command under Sir Edward Pellew to the Mediterranean, but the expedition was uneventful. His term of active service practically closed in 1814, He was made K.C.B. in 1815 and in 1821 admiral. The later years of his life were spent at Paris, where he died on

26th May 1840. See Barrow's Life of Admiral Sir W.S. Snvith, 2 vols., 1848.

SMOKE ABATEMENT. The nuisance created by coal History.

smoke seems to have been recognized in London as early as the reign of Queen Elizabeth ; but it is only in more modern times that the question has come to be regarded as one of real practical importance, and even yet it is far from receiving that general attention which it demands.

Com- A knowledge of the nature of coal and of the chemical | ment is thus seen to resolve itself into the problem of the ae changes that it undergoes when burnt is essential for an | production of perfect combustion.

In 1785 the first smoke-abating invention was patented by James Watt, who, as the inventor of the steam-engine, is responsible for so many boiler fires and so much consump- tion of coal. In 1815 Cutler patented the first would-be smokeless grate for domestic purposes ; and his principle of feeding underneath was afterwards adopted by Dr Neil Arnott in a grate which has now been in use in one form or another for more than half a century. There is now a vast number of such inventions, good and bad. In 1819 the attention of parliament was directed to the question, and a select committee was appointed “to inquire how far persons using steam-engines and furnaces could erect them in a manner less prejudicial to public health and comfort.” This committee gave an encouraging report. In 1843 another select committee recommended the introduction of a bill prohibiting the production of smoke from furnaces and steam-engines. In 1845 yet another select committee reported that such an Act could not in the existing state of affairs be made to apply to dwelling-houses. The Acts of 1845 and 1847 followed as the results of these inquiries ; and since then there has been much legislation brought to bear on factories and railways. The results have been most beneficial; but very much still remains to be done. One is apt to think that, because steam-engines and fac- tories consume individually much more coal than dwelling- houses, they alone are responsible for the smoke nuisance, forgetting how greatly the dwelling-houses outnumber the factories. In reality there is little doubt that domestic fires are mainly responsible for the smoky condition of the atmosphere of our towns; and they for the most part continue to evolve smoke undeterred by legislation or scientific invention. In 1881, however, a movement was commenced by the National Health Society and the Kyrle Society, which resulted in a great smoke-abatement exhi- bition being held at South Kensington. At the close of the exhibition a national smoke-abatement institution, with offices in London, was incorporated by authority of the Board of Trade.

water-vapour, (2) carbonic acid, (3) nitrogen, and (4) sulphurous acid, the first of which contains all the hydro- gen originally present in the coal, the second all the carbon, the fourth all the sulphur, while the nitrogen is liberated as such together with the very much larger volumes of nitrogen derived from the air which has sup- plied the necessary oxygen. All these products of com. bustion are discharged through the chimney.

Two things are necessary for the ensuring of such com- plete combustion, viz., an adequate, but not too large, supply of air, properly adniinistered, and the maintenance of the requisite temperature. In practice, however, these conditions are never perfectly fulfilled, and consequently the combustion of coal is always more or less imperfect and gives rise to a complex mixture of vapours. This

mixture contains not only the combustion products already –

mentioned but also the following unburnt or partly burnt distillation products :—(5) hydrogen, (6) hydrocarbons, (7) carbonic oxide, which contains a lower proportion of oxygen than carbonic acid, (8) unburnt carbon in a very finely divided state,—and also considerable volumes of unused air.

Usually the name “smoke” is applied to this vaporous Smoke.

mixture discharged from a chimney only when it contains a sufficient amount of finely divided carbon to render it dark-coloured and distinctly visible. The quantity, how- ever, of this particular ingredient is apt to be overrated. It always bears an extremely small proportion to the vast volumes of water-vapour, carbonic acid, and nitrogen with which it is mixed; it probably never amounts, even in the worst cases, to 3 per cent. of the weight of the coal from which it is formed ; and its importance, reckoned in terms of so much fuel wasted, is certainly not greater than that of the unburnt hydrogen and hydrocarbons. It is per- haps best to use the name “smoke” for all the products of imperfect combustion (5 to 8) which are avoidable, as con- trasted with the necessary and unavoidable ingredients (1 to 4) of the mixture. The problem of smoke abate-

The first advantage to be gained by the solution of this Adva problem is an important saving in fuel. It has been cal. tages | culated that at least twice as much coal is used in boiler .

a ; ; , smok(| fires and six times as much in domestic fires as is theore- abate

understanding of the smoke problem. More detailed in- formation on these points is given under Coat, where the several varieties are described. For the purposes of this article coals may be classified as smoke-producing and

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smokeless, the former including all those varieties most commonly used as fuel. The elementary constituents of such coals are carbon (generally about 80 per cent. of the whole), hydrogen, nitrogen, oxygen, and sulphur ; and they also contain a varying quantity of earthy impurity or ash. The process which occurs in a coal fire consists of two dis- tinct operations. The first, which requires a comparatively low temperature and is independent of the presence of air, is one of destructive distillation, and is similar to that which occurs in the retorts of gasworks. It results in the decom- position of the coal, and in the rearrangement of its con- stituent elements and the formation of the following sub- stances :—(1) hydrogen, marsh gas, carbonic oxide, olefiant gas, benzine, other hydrocarbons of the type of marsh gas or of benzine, water,—all of which are either gaseous at the temperature at which they are formed or capable of being converted into gas at somewhat higher temperatures, and all of which are combustible except the water ; (2) ammonia and other compounds of nitrogen, and certain compounds of sulphur, which are also volatile and combustible ; (3) coke, which consists of carbon (and ash) and is non- volatile but combustible. It is these products of distilla- tion, not the coal itself, that burn, in the strict sense of the word ; and this second process requires the presence of air and also a much higher temperature than the first. Tf the combustion is perfect, the only products are (1)

tically required for the production of the effects obtained. ment.

A considerable portion of this loss is due to causes other than those that can be treated of here, aud some is cer- tainly unavoidable ; but there is no doubt that much of this enormous waste could be prevented by improved methods of combustion, such as would solve the smoke problem. The second advantage to be looked for is @ great gain in cleanliness and public

convenience. Not only would there be an end to sooty chimneys but the atmo- sphere of towns would no longer be polluted as it is now by the discharge of unburnt carbon, whose total quantity is enormous, though the amount contained in any given puff of smoke is very small. The ‘London fog” would be a thing of the past,—not because fogs would become any less frequent than now in London and other large cities, but because they would lose their distinctive char- acter of grimy opacity. It is often stated that these fogs are caused by the smoke that blackens them; but this is an error. The combustion of coal is certainly responsible for their existence, but it is the sulphur of the coal (oxidized ultimately to sulphuric acid), and not the carbon, that is the active agent. And so long as coal is burnt at all this manufacture of sulphuric acid and of fogs must continue; it is not to be got rid of by improved methods of combustion, though the character of the fogs may be materially altered for the better. The evil effects of town

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air on plant life and human lungs, also often attributed to preventible smoke, are in like manner due to this non-

‘preventible sulphuric acid. The great gain in cleanliness,

however, that would follow the abolition of smoke cannot be overrated.

The methods that have been suggested for the abolition of smoke may be divided into two great classes, viz., those that seek to attain this end by improving the appliances for the burning of bituminous coal, and those that propose to abolish its use and substitute for it some other kind of fuel. The proposals of the first class may be divided into those applicable to domestic purposes and those applicable to boiler fires and other large-scale operations. Those of the second class may be divided according to the nature of the fuel which they suggest. The innumerable inventions of the first class depend for their success (so far as they are successful) on the attention bestowed on the scientific requisites for complete combustion,

viz., a sufficient but not too great supply of air, the thorough admixture of this air with the products of the destructive distillation of the coal, and the maintenance of a high temperature within the fire. In our old and crude methods the facts which most militate against the attainment of these desiderata are—(1)that large masses of fresh fuel are continually being thrown on at the top, which cool down the fire just at that point where highest temperature is required ; (2) that the products of the distillation of this fresh fuel, heated from below, do not get properly mixed with air till they have been drawn up the chimney; (3) that unduly large volumes of cold air are continually being sucked up through the fire, cooling it and carrying its heat away from where it is wanted, and yet without remedying the second evil. In the improved methods regularity of supply of both fuel and air is sought so as to maintain a steady evolution of distillation products, a steady temperature, and a steady and complete combustion. In many cases it is sought to warm fresh air before it enters the room by a regenerative system, the heat being taken from the escaping gases which would otherwise carry it up the chimney ; and in some cases the air which feeds the fire is heated in the same way.

We cannot here discuss the merits of individual inven- tions ; but we may summarize the chief results of the tests applied at the South Kensington Exhibition. These tests, for domestic grates and stoves, included a chemical ex- amination of the chimney gases, observations of the “smoke-shade” as indicating the proportion of unburnt carbon, and a record of the amount of coal burnt, of the rise of temperature produced, of the radiation, and of the amount of heat lost by being carried away through the chimney. Domestic grates and stoves were divided into six classes as follows :—(1) open grates having ordinary bottom grids and upward draught ; (2) open grates having solid floors (adapted for “slow combustion”) and upward draught ; (3) open grates fed from below,—supplied with fresh fuel beneath the incandescent fuel ; (4) open grates fed from the back or from the sides or from hoppers ; (5) Open grates having downward or backward or lateral draught ; (6) close stoves. Each of these classes was sub- divided according as the apparatus was “‘air-heating ” or * non-air-heating,” 7.e., according as an attempt was or was not made to save heat on the regenerative principle. This attempt does not appear to have been distinctly successful many class except the fifth ; indeed the evidence of the tests as a whole is rather against the air-

heating principle. The following table gives the average results of tests for each class and sub-class as regards general rise of tempera- ture and radiation per pound of coal and smoke-shade. The figures under the last head refer to a standard of shades ranging from 0 (smoke imperceptible) to 10 (black and dense). It was found in practice that the results of

this smoke-shade test were in general accord with those of the chemical examination of the chimney gases. The letters “a” and “n” in the first column signify air-heating and non-air-heating respectively, the average results for the whole class being given before those for each sub-class. All the experiments were made with Wallsend coal, a fair representative of the bituminous coals. —

Average rise of | Average radia- (Gin, No. of appli-| temp. per tb of | tion per tb of Average ances tested.| coal per hour, | coal per hour, | smoke-shade. in degrees Fahr.| in degrees Fahr.

a 19 2°88 3°58 3°01 wae 9 3°37 2°88 3°22 ~ i 10 2°45 4°21 2°78 2 12 2°99 4:07 8°23 4 ® 2 2°81 3°93 4°11 Ae al 10 8‘02 4:09 3°09 3n 5 3°81 3°61 2°82 me none “30 aa 560 4 6 3°05 3°14 2°66 ya 2 2°41 2°42 2°28 4 0 4 3°37 3°50 2°88 5 18 3°38 3°70 2°73 ya 11 3°45 4:00 2-29 oil 7 3°28 3°22 3°21 10 4:14 1°66 211

” 2 3°79 1:78 1°58 a 8 423 1°64 2:25

1-5 (total

average). 60 3°22 3°62 2°89

From this table the following facts, among others, may be deduced :—(a) the air-heating principle has not been applied with success except in class 5; (6) close stoves (class 6) are superior to open grates (total average of classes 1-5) in respect of freedom from smoke and of general heating effect, but they are greatly inferior in radiating power,—a deficiency which partly explains their unpopularity in the United Kingdom ; (c) the “slow-com- bustion” principle gives a high radiation factor, but is otherwise not

successful; (d) the class of air-heating grates with downward, backward, or lateral draughts is, on the whole, most efficient.

Much attention has been devoted for many years to the Boiler question of how to work boiler fires, both for locomotives fires.

and for fixed appliances, with the least possible production of smoke and the greatest possible evaporative power. Here the desiderata are essentially the same as in the case of domestic fires, viz., adequate admixture of the com- bustible vapours given off by the coal with the necessary air and the maintenance of a high temperature ; and the principles involved are consequently also the same, though the appliances are necessarily different. These improve- ments may be all classed under one or other of two heads, according as the mode of supplying the fuel or the mode of supplying the air is the subject of the improvement. These two kinds of improvement may of course be com- bined. The article FurNAcE may be consulted ; see also STEAM-ENGINE, sect. ‘ Boilers.”

In the old forms of furnace fresh fuel, as it is wanted, Mechani-

is supplied by hand labour, the furnace doors being opened 1 and large quantities of coal thrown in. is the inrush of great volumes of cold air, which, aided by the equally cold fuel, lowers the general temperature of the furnace. Mechanical stokers meet this difficulty by supplying the coal regularly in small quantities at a time. They may be divided into those which deliver the coal at the front and gradually push it backward, those which scatter it generally over the surface of the grate, and those which raise it from below so that the products of its dis- tillation pass through the already incandescent fuel. The mechanism by which these results are attained is often of a complex nature.

It is generally recognized that air cannot be efficiently Air-supply.

One result of this *°*e™

Substi- tutes for bitumin- ous coal. Anthra- cite.

Coke.

Liquid fuel.

Gaseous fuel.

supplied to the furnace if admitted only in front, and accordingly there have been many plans devised for supply- ing it also at the back. In some cases currents of air are induced by steam-jets; but this plan has not proved very successful. The best inventions are on the regenerative principle. In them the air, before entering the furnace, is made to circulate through chambers heated externally by the products of combustion, and, having thus acquired a high temperature and absorbed heat that would other- wise have been lost, is admitted through openings at the bridge. Many of these appliances are almost absolutely smokeless, and they are much in use.

The advocates of the total or partial disuse of smoke- producing coals are variously in favour of the following substitutes—anthracite, coke, liquid fuel, and gas.

For some purposes anthracite and other coals containing a high percentage of carbon may be, and have long been, advantageously used as fuel. They yield a much smaller percentage of distillation products than ordinary coals, and produce no smoke, or almost none. But they are difficult to ignite, and in small fires difficult to keep burning ; they give very little flame, and are comparatively expen- sive, so that they are under considerable disadvantage as compared with the usual kinds of coal. Many of the grates and stoves exhibited at South Kensington were specially devised for burning anthracite, and some of them are decidedly successful ; but it is not likely that anthracite will ever take the place of bituminous coal to any great extent in the British Isles. There the great coal-fields undoubtedly are the natural sources of fuel, and no pro- posal involving a complete neglect of this fact can ever be successfully carried out.

This remark, however, does not apply to the use of coke and of gas, which are themselves made from coal. Coke is produced in large quantities both for its own sake and as a bye-product in the manufacture of gas for lighting purposes, and is largely used in various kinds of furnace. It gives no smoke

; but it resembles anthracite also in being but ill adapted to use in open grates on account of the difficulty of ignition and the absence of flame (see FUEL).

In America, where natural petroleum is obtained in such enormous quantities, the experiment has been made of using it as the source of heat for boilers. A jet of superheated steam (at about 600° Fahr.) is blown into the hot combustion chamber and the oil and air enter mixed with it, The results are said to be excellent,—the fire smokeless and the efficiency high. The residue from coal- tar, after the naphtha and light oils have been recovered from it, can also be advantageously used in this way. The chief disadvantage attending the use of liquid fuels such as petroleum seems to lie in the fact that they are some- what dangerous, fatal accidents having occurred in America; and the range of their application is necessarily limited. To use them for the heating of houses is of course quite out of the question.

Of all the schemes and inventions for the abatement of smoke that one which proposes to distil coal in one opera- tion, and to burn the products of the distillation in another and quite separate operation, is without doubt the most thoroughly scientific; and to it, rather than to patent grates and furnaces, we must look for the ultimate solution of the question. Many arguments may be adduced in favour of gas-heating as opposed to coal-heating, the most important of which are here briefly given. (1) Coal gives, on distillation, not only gas and coke, which are both good heating agents, but intermediate products, many of which are of commercial value ; these include ammonia, benzine, carbolic acid, anthracine, &c. As science advances the value of coal-tar will probably be enhanced by further dis- coveries ; already it gives the raw material for the pre-

paration of numberless beautiful dyes, of antiseptics, and of some drugs, and quite lately a substance described as an admirable substitute for sugar has been prepared from it. All these intermediate products are now, according to our barbarous methods of burning coal, used simply as fuel. (2) Gas can be laid on in pipes to any spot, can be lit or turned out at any moment, and can be so managed that less heat is frittered away and more

applied to the specific object than in the case of coal-burning. (3) It produces no smoke and leaves no ash or cinder, so that cleanliness is attained and much labour and expense are saved. (4) The coke produced during the preparation of the gas has uses of its own as solid fuel and for other purposes. (5) As has been already said, sulphur is an ingredient of all coals, and sulphuric acid is one of the necessary results of burning them, not to be got rid of by “smoke abatement.” Coal gas, however, can to a great extent be freed from sulphur compounds, and it is possible that the purification methods in vogue may hereafter be improved, so that we have here a means, if any exist, of curing the chief evils of our present system,—injury to our respiratory organs, production of fogs, and destruction of vegetation in towns. The principal disadvantage of the proposal is to be found in the high cost of coal gas, which now varies generally from 3s. to 4s. per 1000 cubic feet, whereas it has been calculated that it would have to cost not more than ls. or at most 1s. 6d. to compete success- fully with coal. There is no doubt, however, that the cost might, and it probably will, be brought down to this, as the high rate is due to causes not inherent in the nature of things, Sir William Siemens proposed that two sets of mains should be laid in English towns, one for heating and one for lighting gas, and showed that the first and last portions of every preparation of gas are possessed of very low illuminating power, but if collected apart would do excellently for heating purposes, while the rest would be improved for lighting. It is probable, however, that electricity will ultimately drive gas out of the field as an illuminating agent and that it will then be relegated to its true place as a heating agent. When that is done coal will no longer be burnt as a whole, but only those of its products (gas and coke) which are good for heating and for nothing else.

Meanwhile, ordinary coal gas has already, expensive as it now is, been largely applied to certain purposes, notably to cooking stoves and other domestic requirements, to gas engines (in which the generation of steam is unnecessary), and to bakers’ ovens; and these inventions are calculated materially to diminish the smoke nuisance. In order to obtain an economical gas capable of being generated on the spot and used for operations on a large scale, Sir W. Siemens devised a gas-producer in which coal is partially burnt in a limited atmosphere and is wholly converted into gaseous products (chiefly carbonic oxide), only the ash being left. This “ producer-gas” is a

weak fuel, being largely diluted with atmospheric nitrogen, and is therefore in- applicable to domestic purposes ; but for many others It suits admirably, one of the best examples of its application being Siemens's own regenerative gas furnace for melting steel (see SreMENS). Other gas-producers have been patented, and the cost of the gas so made is as low as 4d. per 1000 cubic feet, or even less. It is probably, however, but a temporary substitute for true coal gas. In the use of this latter we shall, without doubt, find the true scientific solution of the smoke-abatement problem. As an example of what gaseous fuel can do, it may be mentioned that in Pittsburgh in Pennsylvania the furnaces are now being fed by natural oil gas and that that city, once one of the dirtiest of manufacturing towns, 1s be- coming one of the cleanest.

Literature.—The specifications of patents may be consulted. See also C. W. Williams, The Combustion of Coal and the Preven- tion of Smoke (London, 1858); W. W. Barr, Praetieal Treatise on the Combustion of Coal (Indianapolis, 1879) ; Oficial Report of the Smoke-Abatement Committee (London, 1882); Smoke-Abatement Exhibition Review (London, 1882); and papers and discussions in the Jowrnal of the Society of Chemical Industry, 1881 and follow- ing years. (O. M.)

SMOLENSK, a government of middle Russia, belonging partly to Great Russia and partly to White Russia, is bounded by Moscow and Kaluga on the E., Orel and Tcher- nigoff on the S., Moghileff and Vitebsk on the W., and Pskoff and Tver on the N. It covers an area of 21,638 square miles in the west of the great central plateau, its northern districts extending towards the hilly region of the Valdais, where the flat-topped gentle declivities reach about 1000 feet above the sea. nt surface is also hilly in the western districts (Smolensk, Dorogobuzh), whence it slopes away gently towards im- mense plains on the east and south. Carboniferous lime- stones, containing a few layers of coal (in Yuchnoff) and quarried for building purposes, occupy the east of Smolensk ; white Chalk appears in the southern extremity; while Tertiary sands, marls, and ferruginous clays cover all the west. The whole is overlain with a thick sheet of boulder clay, with irregular extensions to the north ; Post-Tertiary sands are spread over wide surfaces; and peat-bog fills

the marshy depressions. The soil, mostly clay, is generally unfertile, and stony and sandy in several districts. Many large rivers belonging to the basins of the Volga, the Oka, the Dnieper, and the Dwina have their origin in Smolensk. The Vazuza and the Gzhat, both flowing into the Volga, and the Moskva and the Ugra, tributaries of the Oka, are channels for floating timber. The two tributaries of the Dwina—the Kasplya and the Mezha—are of much more importance, as they and their affluents carry considerable numbers of boats to Riga. The Dnieper takes its origin in Smolensk and waters it for more than 300 miles; but neither this river nor its tributaries (Vop, Vyazma, Sozh, and Desna), whose upper courses belong to Smolensk, are navigable; timber only is floated down some of them. Many small lakes and extensive marshes occur in the north- west. One-third of the area is under forests. The popula- tion of Smolensk reached 1,191,172 in 1882, of whom only 106,133 lived in towns, and consists of White Russians in the west (46°7 per cent.), Great Russians in the east (42:6), and of a mixed population of both (10-4). Nearly 1000 Jews and 1000 Poles are scattered through the towns.

The climate is like that of middle Russia generally, although the moderating influence of the wet climate of western Europe is felt to some extent. The average yearly temperature at Smolensk is 45°“5 Fahr. (January, 13°°5 ; July, 67°-2). Notwithstanding the unproductive soil and the frequent failures of crops (especially in the north-west), the chief occupation is agriculture. In 1884 3,040,000 acres were under crops, and 2,379,600 quarters of grain of various kinds were raised (2,930,400 in 1883), —the potato crop yielding 5,498,400 bushels, Nearly all the land is cultivated by the peasant communes,—only 766,500 acres (out of 6,868,900) in the hands of single individuals being under cultivation. Oats are an important crop. Hemp and flax are largely raised and exported. Cattle-breeding stands at a low level ; the cattle of the peasantry suffer froma want of meadow and pasture land, which is mostly in private ownership. In 1882 there were 329,850 horses, 349,000 homed cattle, 401,000 sheep, and 162,000 pigs. The peasantry are mostly very poor, in consequence not only of the desolation Inflicted on Smolensk in 1812, the effects of which are still felt, Dut also of insufficient allotments and want of meadows. Garden- Ing and bee-keeping, which formerly flourished, have almost disappeared. The timber trade and boat-building are important sources of income, but do not furnish employment

for all who are 7 heed of it; more than one-half of the male population of west

miolensk leave their homes every year in search of work, principally : havvies throughout Russia. “The manufactures are developing

ut slowly, and in 1882 employed only about 5100 workmen, —their Tea Production being valued at £328,800; of this amount the ‘istileries yielded nearly one-third. A few cotton-mills in the fast have a production valued at £62,160 per annum. A lively

The rivers being deeply cut in the plateau, the

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traffic is carried on on the rivers, principally the Kasplya, the Obzha, and the Ugra, where corn, hemp, hempseed, linseed, and especially timber are shipped to the amount of nearly £400,000 annually. A considerable quantity of corn is imported into the western districts. Smolensk is crossed by two important railways, from Moscow to Warsaw and from Riga to Saratoff; a branch-line connects Vyazma with Kaluga. The educational institutions embrace eleven gym- nasia and progymnasia (8380 ‘boys and 1402 girls), and 394 primary schools (15,031 boys and 2142 girls). Smolensk is divided into twelve districts, the chief towns of which, with their populations in 1882, are—Smolensk (see below), Byctyi (7150), Dorogobuzh (8400), Duhovshina (3660), Elnya (4850), Gzhatsk (7050), Krasnyi (3550), Poryetchie (4650), Rostavl (9050), Sytchevka (5720), Vyazma (13,000), and Yuchnoff (3230).

SMOLENSK, capital of the above government, is situ- ated on both banks of the Dnieper, at the junction of the railways from Moscow to Warsaw and from Riga to Orel, 262 miles by rail west-south-west of Moscow. The town, with the ruins of its old kremlin, is built on the high crags of the left bank of the Dnieper, its suburbs extending around and on the opposite bank of the river. Its walls are now rapidly falling into decay, as well as all other remainders of its past. The cathedral was erected in 1676-1772, on the site of a more primitive building (erected in 1100); which was blown up in 1611 by the defenders of the city. The picture of the Virgin brought to Russia in

1046, and attributed to St Luke, which is kept in this cathedral, is much venerated throughout central Russia. Two other churches, built in the 12th century, have been spoiled by recent additions. Smolensk is neither a commercial nor a manufacturing centre; its population was 35,830 in 1882.

Smolensk, one of the oldest towns of Russia, is mentioned in Nestor as the chief town of the Crivitchis, situated on the great com- inercial route “from the Varyaghs to the Greeks.” It maintained a lively traffic with Constantinople down to the 11th century, when the principality of Smolensk included Vitcbsk, Moscow, Kaluga, and parts of the present government of Pskoff. The princes of Kieff were often recognized as military chiefs by the vyetche (council) of Smolensk, who mostly preferred Mstislaff and his descendants, and Rostislaff Mstislavovitch became the head of a series of nearly independent princes of Smolensk. From the 14th century these last fell more and more under the influence of the Lithuanian princes, and in 1404 Smolensk was annexed to Lithuania. In 1449 the Moscow princes renounced their claims upon Smolensk; never- theless this important city, which was both a stronghold and a commercial centre with nearly 100,000 inhabitants, was a constant source of contention between Moscow and Lithuania. In 1514 it fell under Russian dominion; but during the disturbances of 1611 it was taken by Sigismund III. of Poland, and it remained under Polish rule until 1654, when the Russians retook it; in 1686 it was definitively annexed to Russia. In the 18th century it played an important part as a basis for the military operations of Peter I. during his wars with Sweden. In 1812 it was well fortitied; but the French took it, when it suffered much from conflagrations, and generally, during the war.

SMOLLETT, Tostas Grorcs (1721-1771), novelist, was born at Dalquhurn, in the valley of Leven, Dumbartonshire, in 1721. His buoyant humour and energy were the gifts of nature, and early experience furnished him with abundant provocation for the harsh and cynical views of human nature to be traced in his novels. At a very early age he was placed in a position calculated to harden the heart of a proud and sensitive child. His father, the youngest son of the laird of Bonhill, a Scottish legal dignitary, married against the ambition of his family, aid died young, leaving three children, of whom the future novelist was the second son, entirely unprovided for. The boy, being thus left dependent on the charity of relatives, grudgingly and

insolently bestowed, as it seemed to him, learned to look with suspicion on kindly professions. He seems to have received the ordinary book education of the place and period. He was sent to the neighbouring granimar-school of Dumbarton—tauglit at the time by one of the most eminent schoolmasters in Scotland—-and thereafter to the university of Glasgow. He wished then to enter the army, as his elder brother had done, but much against his will was apprenticed to a surgeon. His

grandfather died when he was in his eighteenth year, without leaving any provision for the children of his youngest son, and in his nineteenth year Smollett left Glasgow and launched himself on London in quest of for- tune with the tragedy of the Regicide in his pocket. He failed to get the tragedy accepted, and, reduced almost to starvation, was fain to take the situation of surgeon's mate on board a ship of the line. He was present in 1741 at the siege of Cartagena. He soon quitted the navy in disgust, but during his service of a few years he acquired, as Scott says, "such intimate knowledge of our nautical world as enabled him to describe sailors with such truth and spirit of delineation that, from that time, whoever has undertaken the same task has seemed to copy more from Smollett than from nature."

Returning to England in 1746, Smollett made a de- sperate attempt to live by his pen, publishing the satires Advice and Reproof—satire being then in fashion—and pushing the Regicide and other dramatic works on thea- trical managers and patrons. He revenged himself in his satires for the rebuffs given to his plays. Whether he was ever reduced to such straits as Mr Melopoyn, whom Roderick Random met with in the Fleet, is not known for certain, but it is certain that he was sharply pinched; and he did not mend his circumstances by marrying a portion- less lady whom he had met in the West Indies. His buoyant spirit was not in the least broken by adverse fortune, but it was considerably inflamed and embittered. His fierce and distempered mood when he wrote Roderick Random is reflected in the characters of the novel, which are drawn with a much more defiant and contemptuous hand than he used in any of his subsequent works. The author was not a cold-blooded cynic, but a proud warm- hearted man enraged by what he considered unjust usage. He was not in a mood to dwell upon

lovable traits in human nature, or to find pleasure in pretty sentiments. The public, however, when Roderick Random was published —in 1748, a few months before Z'om Jones—did not con- cern themselves with the character of the author. The wealth of humorous incident, the rapidly moving crowd of amusing figures, concealed all those harsher features in the picture of life which quiet reflexion can now trace to the circumstances of the author, smarting as he was under petty insults and real or fancied indignities. This novel at once raised Smollett into reputation. It was followed after an interval of three years by Peregrine Pickle (L751), the immediate popularity of which was helped by the in- sertion into the body of the novel of two stories from real life, the memoirs of a lady of quality (Lady Vane) and the memoirs of the philanthropist M'Kercher. This second masterpiece was written with a much lighter heart than the first, although it must be confessed that the hero is not much of an improvement on Roderick Random. Scott describes him as "the savage and ferocious Pickle, who, besides his gross and base brutality towards Emilia, besides his ingratitude to his uncle, and the savage propensity which he shows in the pleasure he takes to torment others by practical jokes, resembling those of a fiend in glee, exhibits a low and ungentlemanlike tone of thinking, only one degree higher than that of Roderick Random." There is, however, this difference, that the author seems much more conscious of the bad qualities of Pickle than of Random. He expends no sympathy or fine sentiment on either, but Random's defects are represented as the results of the harsh treatment he had himself received, while Pickle's appear rather as the outcome of a naturally harsh and insolent character. Both are far from being model gentlemen, but Pickle is several degrees lower rather than one degree higher than Random. In the second novel there is a still richer crowd of characters,

quaint, amusing, disgusting, and contemptible ; but there is more of a tendency to secure variety by extravagant caricature. For some of the indecencies in the first edition Smollett apologized, and withdrew them in a second edition but he still left enough to satisfy the greediest taste in that particular. sion to Fielding, and in his next novel, The Adventures of Ferdinand, Count Fathom, paid that great rival the com- pliment of imitation. Though Smollett was far from being a, servile imitator, there can

be no doubt that he profited greatly by Fielding's example in all the higher essentials of his craft. same exuberant humour and fresh variety of character, is vastly better in point of constructive skill and sustained power of description. get himself to show that he too as well as the author of

character is so repulsive that the novel is much less often read than others of Smollett's; but it is his greatest feat of invention, being not a mere string of lively adventures, but a connected series in the progressive movement of the villain's career. cynical comments on human motives, as well as passages that illustrate strikingly his real goodness of heart. He was not at home, however, in the direct expression of tender sentiment ; when any of his persons gush, they do so with such wordiness and extravagance as to give them an air of insincerity.

invention seemed to be exhausted for the time.

literary work, translating Don Quixote (published 1756), compiling a Compendium of Voyages and T'ravels (1751),

He also withdrew a very offensive allu-

This, his third effort, although it has not the

It looks as if he had deliberately

Tom Jones could make a plot. The vileness of Fathom's

It contains some of Smollett's most

With the composition of Cownt Fathom in 1753 Smollett's For the

next ten years he occupied himself with miscellaneous

and producing a History of England from the Landing of Cxsar to the Treaty of Aia-la-Chapelle (1757), followed by a continuation down to the date of publication (1761-69). Smollett, in short, from the time of his first success made his living as a professional man of letters. He obtained a medical degree from a German university about 1752, and set up asa physician, but seems never to have acquired much practice. He turned this

experience to account, how- ever, by caricaturing in Count Fathom the arts of rising in the profession. He had very little more success in his attempts to write for the stage. The Regicede was never acted, and, when it was published in 1749 to expose the folly of managers in not accepting it, the verdict of the public was — rather with the managers than with the author. Smollett's single success on the stage was a farce with a political object, The Reprisals, or the Tars. of Old England, produced in — 1757 to excite feeling against the French. Asa journalist also Smollett was not particularly successful, partly perhaps | because he attached himself to the losing side,— the Tory and High Church party. He edited their organ The Or- | tical Review for some years, and in 1759 suffered imprison- ment for an attack on Admiral Knowles. At the beginning of the reign of George III. he supported Lord Bute's ministry in The Briton, but The Briton was driven out of the field by Wilkes's Worth Briton. Altogether Smollett's revenue from play-writing and journalism seems to have been small, unless his party services were requited inde-— pendently of the sale of his papers. But his name stood high with booksellers. He introduces himself in Lumphrey | Clinker as a dispenser of literary patronage, surrounded by a number of humble dependants. These were probably the hacks to whom he gave employment in his journals and in such booksellers' jobs as his translation of Voltaire | and the compilation entitled The Present State of all Nations, containing a Geographical, Ne atural, Commercia, and Political History of all the Countries of the Known World (1763).

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In the course of this hard miscellaneous task-work, under which Smollett's health gave way completely, he wrote by instalments for the British Magazine (in 1760 and 1761) the curious satirical romance of Sir Lancelot Greaves. It is only in externals that this work bears any resemblance to Don Quixote. The author seems to have hesitated between making Sir Lancelot a mere madman and making him a pattern of perfectly sane generosity. The fun and the seriousness do not harmonize. The young knight's craze for riding about the country to redress wrongs armed cap-a-pie is too harshly out of tune with the right- ness of his sympathies and the grave character of the real abuses against which his indignation is directed. In execu- tion the work is very unequal and irregular, but the open- ing chapters are very

powerful, and have been imitated by hundreds of novelists since Smollett's time.

Upon the failure of his health in 1763 Smollett went abroad and lived in France and Italy for three years. He

ublished two volumes of 7'ravels soon after his return in 1766. Three years more he spent in England, trying in vain to get some consular post abroad, where the climate might suit his shattered constitution. His extremely clever and extremely coarse political satire, Zhe Adventures of an Atom, published in 1769, was probably inspired partly by resentment at the neglect of his own claims by successive ministries. He left England soon after its publication, and spent the last two years of his life in a house at Monte Novo in the neighbourhood of Leghorn. Here, labouring under a painful and wasting disease, he composed his last work, The Haupedition of Humphrey Clinker, published in 1771. 'This is generally regarded as his best novel. It certainly is the most pleasant reading, much softer and more humane in tone, while equally alive with vivid sketches and studies of character and a never-failing supply of ludicrous adventures. The loose and easy plan does not require for its execution the sustained power shown in Count Fathom ; but, on the other hand, it leaves the novelist free to introduce greater variety of character and incident. None of his novels gives a better impression of Smollett's versatility than Humphrey Clinker, and there is none of them to which his successors have been more indebted. But whoever would understand how much the English novel owes to Smollett must read all his five fictions and not merely the most celebrated three. His influence upon novel-writing was wider even than Fielding's. He died at Monte Novo on 21st October 1771. (w. M.)

SMUGGLING denotes a breach of the revenue laws either by the importation or the exportation of prohibited goods or by the evasion of customs duties on goods liable to duty. Smuggling is, as might be expected, most pre- valent where duties are high. The best preventive is the imposition of duties so low in amount and on so few articles that it becomes scarcely worth while to smuggle. Legisla- tion on the subject in England has been very active from the 14th century downwards. In the reign of Edward II. the illicit introduction of base coin from abroad led to the

provision of the Statute of Treasons (25 Edw. ITI. st. 5) making it treason to import counterfeit money as the money called “Lushburgh.” Such importation is still an offence, though no longer treason. After the Statute of ‘Treasons a vast number of Acts dealing with smuggling were passed, most of which will be found recited in the repealing Act of 6 Geo. IV. c. 105. In the 18th and the early years of the 19th century smuggling (chiefly of wine, spirits, tobacco, and bullion) was so generally prac- tised in Great Britain as to become a kind of national fail- ing, and the smuggler was often regarded as a popular hero, like the contrabandista of modern Spain. The prevalence of the offence a century and a half ago may be judged from the report of Sir J. Cope’s committee in 1732 upon the

frauds on the revenue. The smuggler of the 18th century finds an apologist in Adam Smith, who writes of him as “fa person who, though no doubt highly blamable for vio- lating the laws of his country, is frequently incapable of violating those of natural justice, and would have been in every respect an excellent citizen had not the laws of his country made that a crime which nature never meant to be so.” The gradual reduction of duties has brought the offence in the United Kingdom into comparative insig- nificance, and it is now almost confined to tobacco. Most of the existing legislation on the subject of smuggling is contained in the Customs Consolidation Act, 1876 (39 and 40 Vict. c. 36, ss. 169-217).

The main provisions are as follows. Vessels engaged in smug- gling are liable to forfeiture and their owners and masters to a penalty not exceeding £500. Smuggled and prohibited goods are liable to forfeiture. Officers of customs have a right of search of vessels and persons. Fraudulent evasion or attempted evasion of customs duties renders the offender subject to forfeit either treble the value of the goods or £100 at the election of the commissioners of customs. Heavy penalties are incurred by resistance to officers of customs, rescue of person or goods, assembling to run goods, signalling smuggling vessels, shooting at vessels, boats, or officers of the naval or revenue service, cutting adrift customs vessels, offering goods for sale under pretence of being smuggled, &c. Penalties may be recovered either by action or information in the superior courts or by summary

proceedings. In criminal proceed- ings the defendant is competent and compellable to give evidence. The Act applies to the United Kingdom, the Isle of Man, and the Channel Islands. Besides, the Customs Act, 50 Geo. III. c. 41, s. 16 (the corresponding Act for Scotland is 55 Geo. III. c. 71, s. 9), enacts that a hawker's licence is to be forfeited on his conviction for knowingly selling smuggled goods, The Merchant Shipping Act, 1854 (17 and 18 Vict. c. 104, s. 248), makes any seaman or apprentice, after conviction for sung lng whereby loss or damage: is caused to the master or owner of a ship, liable to pay to such master or owner such a sum as is sufficient to reimburse the master or owner for such loss or damage, and the whole or a proportional part of his wages may be retained in satisfaction of this liability. Additional provisions as to cuuee ane are also contained in 42 and 43 Vict. c. 21 and 44 and 45 Vict. c.12. A smuggling contract is generally illegal. But it may be valid, and the vendor may re- cover the price of goods, even though he knew the buyer intended them to be smuggled, unless he actually aids in the smuggling so as to become particeps criminis, Contracts to defraud the revenue of a foreign state are, according to English decisions, not illegal. There is a German decision, more consonant with international morality, to the opposite effect.

The penalties for smuggling in the United States will be found mainly in tit. xxxiv. ch. 10 of the Revised Statutes. The seaman guilty of smuggling is liable to the same penalty as in England, and in addition to imprisonment for twelve months, s. 4596.

A considerable amount of historical information on this subject will be found in Dowell's History of Taxation and Pike's History of Crime in England.

SMYRNA, in ancient times one of the most important and now by far the greatest of the cities of Asia Minor (see vol. xv. Plate II.), has preserved an unbroken con- tinuity of record and identity of name from the first dawn of history to the present time. It is said to have been a Lelegian city before the Greek colonists settled in Asia Minor. The name, which is said to be derived from an Amazon called Smyrna, is indubitably Anatolian, having been applied also to a quarter of Ephesus, and (under the cognate form Myrina) to a city of Aolis, and to a tumulus in the Troad. The AMolic

settlers of Lesbos and Cyme, pushing eastwards by Larissa and Neonteichus and over the Hermus, seized the valley of Smyrna. It was the frontier city between Aolis on the north and Ionia on the south, and was more accessible on the south and east than on the north and west. At the same time it was by virtue of its favourable situation necessarily a commercial city, like the Ionian colonies. It is there- fore not surprising that the Molic element grew weaker ; strangers or refugees from the Ionian Colophon settled in the city, and finally Smyrna passed into the hands of the Colophonians and became the thirteenth of the Ionian states. The change had taken place before 688, when the Ionian Onomastus of Smyrna won the boxing prize at

Olympia, but it was probably then a recent event. The Colophonian conquest is mentioned by Mimnermus (before 600 .c.), who counts himself equally a Colophonian and a Smyrnean. The Molic form of the name, Zpupva, was retained even in the Attic dialect, and the epithet ‘‘ Holian Smyma” remained long after the conquest. The favour- able situation of Smyrna on the path of commerce between Lydia and the west raised it during the 7th century to the height of power and splendour. It lay at the eastern end of an arm of the sea, which reached far inland and admitted the Greek trading ships into the heart of Lydia. One of the great trade routes which cross Anatolia from east to west descends the Hermus valley past Sardis, and then diverging from the valley passes south of Mount Sipylus and crosses a low pass into the little valley, about 7 miles long and 2 broad, where Smyrna lies between the mountains and the sea. Miletus, and at a later time

ground between the hill and the sea. The beauty of the city when seen from the sea, clustering on the low ground and rising tier over tier on the hillside, is frequently praised by the ancients and is celebrated on its coins; the same impression still strikes the spectator, and must in ancient times have been

much stronger, when magnificent build- ings, an imposing acropolis, and the wide circle of massive walls combined with the natural scenery in one splendid picture. Smyrna is shut in on the west by a hill now called Deirmen Tepe, with the ruins of a temple on the summit. The walls of Lysimachus crossed the summit of

this hill, and the acropolis occupied the top of Pagus, Between the two the road from Ephesus entered the city by the "'Ephesian gate," near which was a gymnasium. Closer to the acropolis the outline of the stadium is still visible, and the theatre was situated on the northern slopes of Pagus.

The line of the walls on the eastern side is

Ephesus, situated at the sea end of the other great trade route across Anatolia, } competed for a time successfully with | Smyrna for the conveyance of traffic | from the interior; but both Ephesus and Miletus have long ago lost their | harbours, and Smyrna now remains without a rival. It was of necessity | in close relation with the Lydians, and | when the Mermnad kings raised the } Lydian power and aggressiveness it | was one of the first points of attack. | Gyges (687-653) was, however,defeated | in a great battle on the banks of the } Hermus; the situation of the battle- | field shows that the power of Smyrna | extended far to the east, and probably | included the valley of Nympheum (Nif). A strong fortress, the ruins of whose ancient and massive walls are still imposing, on a hill in the pass between Smyrna and Nymphezum, was probably built by the Smyrnean Ionians to command the valley of Nympheum. According to the poet | Theognis (about 500 B.c.), "pride de- stroyed Smyrna." Mimnermus laments = the degeneracy of the citizens of his || Derm QSei st 0G, » 2

day, who could no longer stem the Ly- ee Ze gece A iii ww e:

dian advance. Finally, Alyattes (610- }p—:\SQ IN Se i, i ANS f° Scale of Half aMfile. 563) conquered the city, and Smyrna [[uj.:: Vo = SSS AAT WS Ff? *

for 300 years lost its place in the list 7 of Greek cities. It did not entirely

cease to exist, but the Greek life and political unity were destroyed, and the Smyrnzan state was organized on the village system (gxelro kwpyddv). It is mentioned in a fragment of Pindar, about 500 B.c., and in an in- scription of 388 B.c. A small fortification of early style, rudely but massively built, on the lowest slope of a hill behind Burnabat, is perhaps a fortified village of this period. Alexander the Great conceived the idea of restoring the Greek city; the two Nemeses who were worshipped at Smyrna are said to have suggested the idea to him in a dream. The scheme was, according to Strabo, carried out by Antigonus (316-301), and Lysi- machus enlarged and fortified the city (301-281). The acropolis of the ancient city had been on a steep peak about 1250 feet high, which overhangs the north-eastern extremity of the gulf; its ruins still exist, probably in much the same condition as they were left by Alyattes. The later city was founded on the site which it still occupies, partly on the slopes of a rounded hill called Pagus near the south-east end of the gulf, partly on the low

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Plan of Smyrna.

unknown ; but they certainly embraced a greater area than is included by the Byzantine wall, which ascends the castle hill (Pagus) from the Basmakhané railway station. Smyrna possessed two harbours,—the outer, which was simply the gulf, and the inner, which was a small basin, with a narrow entrance closed by a rope in case of need, about the place now occupied by bazaars. The inner harbour was partially filled up by Timur in 1402, but it had not entirely disappeared till the beginning of the 19th | century. The modern quay has encroached considerably

on the sea, and the coast-line of the Greek time was about |

90 yards farther to the south. The streets were broad, | well paved, and regularly laid out at right angles; many |

were named after temples: the main street, called the Golden, ran across the city from west to east, beginning probably from the temple on Deirmen Tepe, and continuing towards Tepejik outside the city on the east, where prob- | ably the temple of Cybele, the Metroon, stood. Cybele, | worshipped under the name of Meter Sipylene, from Mount Sipylus, which bounds the Smyrna valley on the north,

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was the tutelar goddess of the city. The plain towards the sea was too low to be properly drained, and hence in rainy weather the streets were deep with mud and water.

The river Meles, which flowed by Smyrna, is famous in literature and was worshipped in the valley. The most common and consistent tradition connects Homer with the valley of Smyrna and the banks of the Meles; his figure was one of the stock types on Smyrnzan coins, one class of which was called Homerian ; the epithet ‘ Mele- sigenes” was applied to him ; the cave where he was wont to compose his poems was shown near the source of the river; his temple, the Homereum, stood on its banks. The steady equable flow of the Meles, alike in summer and winter, neither swollen after rain nor dry during drought, its pleasant water, its short course, beginning and ending near the city, are celebrated by Aristides and Himerius. The description applies admirably to the stream which rises from abundant fountains, now known as Diana’s Bath, some way to the east of the city, and flows into the south-eastern extremity of the gulf. The common belief that the torrent, dry except after rains, which flows by Caravan Bridge is the ancient Meles flatly contradicts the ancient descriptions.

In the Roman period Smyrna was the seat of a conventus which included southern olis and great part of the Hermus valley. It vied with Ephesus and Pergamum for the title ‘‘First (city) of Asia.” A Christian church ex- isted here from a very early time, having its origin in the considerable Jewish

colony. Porycarp (q.v.) was bishop of Smyma. The bishops of Smyrna were originally subject to the metropolitan of Ephesus ; afterwards they became independent (aitoxéfador), and finally were honoured with metropolitan rank, having underthem thebishopsof Phocea, Magnesia ad Sipylum, Clazomenz, Sosandrus (Nymph- um ?), Archangelus (Temnos‘), and Petra (Menemen 4).

When Constantinople became the seat of government the trade between Anatolia and the west lost in import- ance, and Smyrna declined apace. A Turkish freebooter named Tacha seized Smyrna in 1084 and maintained himself there for some time, but it was recovered by the generals of Alexius Comnenus. The city was several times alterwards ravaged by the Turks, and had become quite ruinous when the emperor John Ducas Vatatzes about 1222 rebuilt it. The famous chieftain Aidin conquered it about 1330 and made his son Amur governor. Soon after- wards the knights of Saint John established themselves in the town, but failed to conquer the citadel. In 1402 Timur stormed the town and massacred almost all the in- habitants. The Mongol conquest was only temporary, but Smyrna has remained till the present day in Moham- medan hands, It is now the greatest commercial city in the Levant ; its population is about 200,000, of whom neatly half are Greeks. It is the terminus of the railway system which is gradually spreading over Anatolia. Two lines start from Smyrna: one ascends the Hermus valley by Magnesia and Sardis to Alashehr (Philadelphia), about 110 miles; the other goes south by Ephesus to the Meander Valley beside Magnesia on the Meander and then ascends the valley to the neighbourhood of Laodicea on the Lycus, 143 miles. Since the revival of the Levant trade by the Genoese and Venetians Smyrna has been the emporium for the whole produce of Anatolia ; the chief raw pro- duets ‘exported are valonea, figs, raisins, opium, madder, liquorice, cotton, sponges, emery, d&c.; almost the only articles of native manufacture which are exported from Smyrna are the carpets woven at Geurdiz, Coula, Ushak, and other places in the interior. Smyrna has frequently been partially destroyed by earthquakes ; that of 178 a.p. is the most famous, and in 1688, 1768, and 1880 the town suffered severely. (W. M. RA.)

SNAIL. In England the word “snail” in popular lan-

guage is associated with Gasteropods which inhabit land or fresh water and which possess large conspicuous spiral shells ; terrestrial Gasteropods in which the shell is rudi- mentary and concealed are distinguished as “slugs.” In Scotland the word “slug” is absent from the vernacular vocabulary, both shell-bearing and shell-less inland molluscs being known as snails. Marine Gasteropods are occasionally termed “sea-snails,” and the compounds “pond-snails,” ‘river-snails,” ‘water-snails” are in common use. The commonest land-snails are those species which constitute the family Helicidx, order Pulmonata, sub-order Stylommato- phora. The other two families of the same sub-order, Limacide and Onchidiidz, include all the slugs. In the first of these are comprised all the slugs known in Great Britain, and indeed in Europe. The Onchidiide are entitled to the name “sea-slugs,” as they are shell-less Pulmonates living on the seashore, though not actually in the sea. The term “ water-snails” includes the whole of the remaining sub-order of the Pulmonata, namely, the Basommatophora, in which the eyes are sessile. This division comprises two families, Limnxidx and Auriculide ; some of the members of the first are amphibious, some entirely aquatic; the – snails of the second family are found near but not in the water. Thus the whole of the Pulmonata which breathe air, are destitute of gill-plumes and operculum, and have a complicated hermaphrodite reproductive system. are either snails or slugs. But there are a considerable num- ber of snails, both terrestrial and aquatic, which are not Pulmonates. The land-snails which have no gill-plume in the mantle-chamber and breathe air, but have the sexes separated, and possess an operculum belong to the order Azygobranchia, of which they form a distinct sub-order, the Pnewmonochlamyda, containing three families, Cyclosto- mide, Helicinide, and Aciculide. The fresh-water snails which are not Pulmonates are the Paludinidx, Valvatide, and Ampullaride, together with Weritina, a genus of the Neritidx. These all possess a fully developed gill-plume and are typical Azygobranchiates of the sub-order Holo- chlamyda, most of the members of which are marine. _ The family Helicide has a world-wide distribution. In Helix the spire forms a more or less obtuse-angled cone ; there are above 1200 species, of which 24 are British. Helix nemoralis, L., of which H. hortensis is a variety, is one of the commonest forms. Helix pomatia, L., is the largest species, and is known as the “edible snail” ; it is commonly eaten

in France and Italy, together with other species. It was formerly believed to have been introduced into Britain by the Romans, but there is no doubt that it is a native. In Succinca the cone of the spire is acute-angled ; three species are British. In Vitrina the spire is very flat and the surface glassy. In Bulimus the spire is elongated with a pointed apex. Pupa is named from its resemblance to a chrysalis, the apex being rounded. The shell of Clausilia is sinistral and its aperture is provided with a hinged plate. The commoner European slugs of small size all belong to the genus Limax, in which the opening of the mantle-chamber is posterior. L. flavus is the cellar slug. L. agrestis, L. arborum, L. maximus, occur in gardens and fields. The larger black slugs are species of Arion, of which two are British, A. ater and A. hortensis. Lestacella haliotidea is common in Great Britain and throughout Europe.

The Tapers occur in all parts of the world. Zimnzxus contains the largest species. . pereger, Miiller, is ubiquitous in Great Britain and common all over Europe. All the species are usually infested with Cercariw and Rediz, the larval forms of Trematode parasites of vertebrates. JZ. truncatulus harbours the Cercaria of Fasciola hepatica, the liver-fluke, which causes rot in sheep. Ancylus, which occurs in rivers, has a minute limpet-like shell. Planorbis has the spire of the shell in one plane. Physa is smaller than Limnezus and has the upper part of the spire much shorter. In the Auriculide# the aperture is denticulated. Auricula is confined to the East Indies and Peru. Carychiwm minimum is British.

Of the Cyclostomidz only one species, Cyclostoma elegans, Miiller, is British ; it hides nnder stones and roots. The Helicinide are exotic, ranging from the West Indies to the Philippines. Of the Aciculidz, which are all minute, Acicula lineata is British.

The Ampullaride are confined to the tropics. Ampullaria has very long tentacles and a long siphon formed by the mantle.

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Valvata is common in fresh waters throughout Britain ; the gill when the animal is expanded is protruded beyond the mantle- chamber. The

Paludinide are common in the northern hemisphere. Paludina and Bithynia are both British genera. In Paludina the

whorls of the spiral are very prominent ; the genus is viviparous. Bithynia is smaller and the shell smoother.

Neritina has a very small spire, the terminal portion of the shell containing nearly the whole animal.

For the morphology and classification of snails, see MoLLusca, vol. xvi. p. 648 sq. A history of the British forms is given in Gwyn Jeffreys's British Conchology, 1862, and by Forbes and Hanley in British Mollusca. For specie- graphical details, see Woodward's Manual of the Mollusca, 1875, and Bronn's Thierreich (Weichthiere). For Fasciola hepatica, fee Thomas, Quart. Journ. Mic. Sci., 1882.

SNAKE-BIRD, to use the name commonly given to it by the English in North America, because of its "long slender head and neck," which, its body being submerged as it swims, "appear like a snake rising erect out of the water" (Bartram's MS., quoted by Ord in Wilson's Am. Ornithology, ix. p. 81), the " Darter" of many authors, and the Plotus anhinga} of ornithology, is the type of a small but very well-marked Family of Birds, Plotde, belonging to the group Steganopodes (the Dysporomorphe of Prof. Huxley), and consisting of but a single genus and three or four species. They bear a general resemblance both outwardly and in habits to Cormorants (see vol. vi. p. 407), but are much more slender in form and have both neck and tail much elongated. The bill also, instead of being tipped with a maxillary hook, has its edges beset with serratures directed backwards, and is sharply pointed,—in this respect, as well as in the attenuated neck, likening the Snake-birds to the Herons (see vol. xi. p. 760); but the latter do not generally transfix their prey as do the former.

The male of the American specics, which ranges from Illinois to the south of Brazil, is in full breeding-plumage a very beautiful bird, with crimson irides, the bare skin round the eyes apple-green

Indian snake-bird (from Col. Tickell's drawing in the library of the Zoological Society).

and that of the chin orange, the head, neck, and most part of the body clothed in black glossed with green; but down each side of the neck runs a row of long hair-like white feathers, tinged with pale lilac. The much elongated scapulars and the small upper wing-coverts bear each a median white mark, which on the former is a stripe pointed at cither end, and on the latter a broad ovate patch." The larger wing-coverts are dull white, but the quill- feathers of the wings and tail are black, the last broadly tipped with brownish-red, passing into greyish-white, and forming a con- spicuous band when the tail is spread in form of a fan, as it often

~j " Anhinga," according to Marcgrave, who first described this bird Nees Rer, Nat. Brasiliw, p. 218), was the name it bore among the natives,

- These feathers are very characteristic of each species of the genus, and in India, says Jerdon, are among the Khasias a badge of royalty.

is under water. The hen differs much in appearance from the cock, having the head, neck, and breast of a more or less deep buff bounded beneath by a narrow chestnut band; but otherwise hee plumage is like that of her mate, only not so bright in colour. The habits of this species have been repeatedly described by American writers, and those of its congeners, to be immediately mentioned seem to be essentially the same. The Snake-bird frequents the larger rivers or back-waters connected with them, where it may be seen resting motionless on some neighbouring tree, generally choos- ing a dead branch, or on a "snag" projecting from the bottom, whence it plunges beneath the surface, in pursuit of its fishy prey,

its slender head and neck. Its speed and skill under water are almost beyond exaggeration, and it exhibits these qualities even in captivity, taking—apparently without effort—tish after fish that

and twist, and only returning to its perch when its voracious appe- tite is for the moment appeased or its supply of food temporarily exhausted. Then, after adjusting its plumage with a few rapid passes of its bill, and often expanding its wings, as though, Cor- morant-fashion, to dry them, it abandons itself to the pleasurable and passive process of digestion,

reawaking to activity at the call of hunger. Yet at liberty it will indulge in long flights, and those of the male at the breeding-season are ostentatiously performed in the presence of his mate, around whom he plays in irregular zigzag courses. The nest is variously placed, but almost always in trees or bushes overhanging the water's edge, and is a large structure of sticks, roots, and moss, in which are laid four eggs with the white chalky shell that is so characteristic of most Steganopodous birds. Not unfrequently several or even many nests are built close together, and the locality that suits the Snake- bird suits also many of the Herons, so that these, its distant relatives, are often also its near neighbours.¢ The African Snake-bird, P. congensis (or levaillanti of some authors), inhabits the part of that continent from Natal northwards ; but, though met with on the White Nile, itis not known to have occurred in Egypt, a fact the more remarkable seeing that Canon Tristram found it breeding in considerable numbers on the Lake of Antioch, to which it is a summer visitor, and it can hardly reach its home without passing over the intervening country. The male bird is easily distinguishable from the American species by its rufous coronal patch, its buff throat and its chestnut greater wing-coverts, A thind species, P. melanogaster, ranges from Madagascar to India, Ceylon,

orneo, Java, and China, This so closely resembles the last-men- tioned that the differences between them cannot be briefly expressed. The Australian region also has its Snake-bird, which is by some

unite it to that last-mentioned, which is perhaps somewhat variable, and it would seem (P. Z. S., 1877, p. 349) that examples from New Guinea differ somewhat from those inhabiting Australia itself

The anatomy of the genus Plotus has been dealt with more fully than that of most forms. Beside the excellent description of the American bird's alimentary canal fur- nished to Audubon by Macgillivray, other important points in its structure have been well set forth by Garrod and Forbes in the Zoological Proceedings (1876, pp. 335- 345, pls. xxvi-xxviii.; 1878, pp. 679-681; and 1882, pp. 208-212), showing among other things that there is an appreciable anatomical difference between the species of the New World and of the Old; while the osteology of P. melanogaster has been admirably described and illus- trated by Prof. Milne-Edwards in M. Grandidier's great

Oiseaux de Madagascar (pp. 691-695, pls. 284, 285). In all the species the neck affords a feature which seems to be unique. The first seven of the cervical vertebra form a continuous curve with its concavity forward, but the eighth articulates with the seventh nearly ata right angle, and, when the bird is at rest, lies horizontally. The ninth is directed downwards almost as abruptly, and those which succeed present a gentle forward convexity. The muscles moving this curious framework are as curiously specialized, and the result of the whole piece of mechanism is to enable the bird to spear with facility its fishy prey. (A. ¥.)

8 This peculiarity, first pointed out to the writer by Mr. Bartlett, who observed it in birds in the Zoological Society's possession, doubt: less suggested the name of " Water-Turkey" by which in some places Plotus anhinga is said to be known. '

4 The curious but apparently well-attested fact of the occurrence 12 England, near Poole, in June 1851, of a male bird of this species

(Zoologist, pp. 8601, 3654) has been overlooked by several writers who profess to mention all cases of a similar character.

to emerge, in the manner before related, showin little more than ~

may be introduced into its tank, however rapidly they may swim

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regarded as forming a fourth species, P. nove-hollandiz ; but others ©

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SNAKE-ROOT. In most countries where snakes abound some root or herb is used by the natives as an antidote for the bites of venomous species, and many herbs have consequently received the name of snake-root. Botanically speaking, the name properly belongs to Ophiorrhiza Mungos, L., a plant of the Cinchona family, used in the East Indies for the purpose above

indicated. In medicine, however, the roots of Aristolochia Serpentaria, L., Polygala Senega, L., or Comecifuga racemosa, Elliott, are alike understood by this name, being distinguished respectively as the Virginian, Seneka, and Black Snake-roots. The first is now employed as an aromatic antiseptic tonic in typhoid fever, the second as a stimulant expectorant in bronchitis, and the third as a sedative in rheumatic or inflammatory affections, especially in muscular rheumatism and lumbago. The root of Aristolochia reticulata, Nutt., which is known in the United States as Red River or Texan Snake-root, is the kind most frequently met with in the United Kingdom as Serpentary or Virginian Snake-root. (See Guaco.)

The roots or rhizome of Liatris spicata, Willd., Eryngium aquaticum, L., and Hupatorium altissimum, L., have all been used in North America for snake-bites, the first two being known as Button Snake-root and the last as White Snake-root. The rhizome of Asarwm canadense, L., passes under the name of Canadian Snake-root. All of these con- tain acrid or aromatic principles which, when a warm de- coction of the drug is taken, exercise a powerfully diapho- retic or, in some cases, diuretic action, to which any benefit that may be derived from their use must be attributed.

SNAKES constitute an order (Ophidia) in the olass of Reptiles which is characterized by an exceedingly elongate body, cylindrical or sub-cylindrical, and terminating in a tapering tail. The integuments are folded into flat imbri- cate scales, which are rarely tubercular or granular. The spinal column consists of a very great number of vertebra, with which the numerous ribs are movably articulated. Limbs are entirely absent, or only rudiments of the pos- terior occur more or less hidden below the skin; there is no sternum. The bones of the palate and jaws are mov- able; the mandibles are united in front by an elastic liga- ment and are very distensible. Generally both jaws and the palate are toothed, the teeth being thin and needle- like. There are no eyelids, no ear-opening. The vent is a transverse slit. |

Great as is the difference in appearance between a typical snake and a typical lizard, the two orders of Ophidians and Lacertilians are nearly allied ; the former is probably merely a specialized descendant of the latter or of the pythonomorphous reptiles, or perhaps of both. Moreover, the living

Lacertilians include forms which approach the Ophidians by having a greatly increased number of verte- bree, a much advanced degradation of the scapular and pel- vic arches and limbs, a simple dentition, and the absence of eyelids and external ear-opening. And on the other hand we find Ophidians with a greatly diminished flexibility of the vertebral column, with closely adherent, smooth and polished scales, with a narrow mouth—totally unlike the enormous gape of the typical snakes—and even without that longitudinal fold in the median line of the chin which 18 So characteristic of the order (Typhlopide). Thus of the Ophidian characters as given above only that taken from the loose connexion of the bones of the skull remains as a sharp line of separation between snakes and lizards. The mandibulary symphysis is not by suture but by an elastic band ; the intermaxillary, palatine, and pterygoid bones are so loosely attached to the cranium that they can be easily pressed outwards and forwards, and the maxillary and mandibulary of one side can be moved in those directions independently of their fellows opposite. The intermaxillary is small, generally toothless, and coalesces

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with the nasals and vomer into a single movable bone : finally, the suspensory is much elongate and movable at both ends. This arrangement ensures an extraordinary degree of mobility and elasticity of all parts of the gape, which, however, varies in the different families of the order. For the other characteristic points of their structure and for their distribution, see REPrizEs.

The number of known species of snakes has been given Distribu- The tion and limits of their distribution seem to be the 70th parallel }#bits.

as 1500 by some authorities and as 1800 by others.

N. lat. in Europe, the 54th in British Columbia, and the 40th parallel S. lat. in the southern hemisphere. The num- ber of species and of individuals in a species is small in the temperate zones, but increases as the tropics are approached. In the tropical zone they are abundant, especially where a well-watered soil nourishes a rich vegetation, with glades open to the sun, and where a variety of small animals serve as an abundant and easily obtained

prey. It is in the tropics also that the largest (boas, pythons) and the most specialized kinds occur (tree snakes, sea snakes, the large poisonous snakes). On the other hand, every variety of soil is tenanted by some kind of snakes: they form a contingent in every desert fauna. In accordance with this general distribution snakes show a great amount of differentiation with regard to their mode of life and general organization ; and from the appearance alone of a snake a safe conclusion can be drawn as to its habits. The following categories may be distinguished.

(1) Burrowing snakes, which live under ground and but rarely appear on the surface. They have a cylindrical rigid body, covered with generally smooth and polished scales; a short strong tail; a short rounded or pointed head with narrow mouth ; teeth few in number; small or rudimentary eye; no abdominal scutes or only narrow ones. They feed chiefly on invertebrate animals, and none are poisonous. (2) Ground snakes, living chiefly on the ground, and rarely ascending bushes or entering water. Their body is cylindrical, flexible in every part, covered with smooth or keeled scales, and provided with broad ventral and subcaudal scutes. All the various parts of their body and head are well proportioned; the non- poisonous kinds of ground snakes are in fact the typical and least specialized snakes, and more numerous than any of the other kinds. They feed chiefly on terrestrial vertebrates. The majority are non-poisonous; but the majority of poisonous snakes must be referred to this category. (3) Tree snakes, which are able to climb bushes or trees with facility or pass even the greater part of their existence on trees. Their body is rarely cylindrical, generally compressed and slender; their broad ventral scutes are often carinate on the sides. Those kinds which have a less elongate and cylindrical body possess a dis- tinctly prehensile tail. The eye is generally large. Their coloration consists often of bright hues, and sometimes resembles that of their surroundings. They feed on animals which likewise lead an arboreal life, rarely on eggs. Poisonous as well as innocuous snakes are repre- sented in this category. (4) Freshwater snakes, living in or frequenting fresh waters; they are excellent swimmers and divers. The nostrils are placed on the top of the snout and can be closed whilst the animal is under water. Their body is cylindrical, moderately long, provided with narrow ventral scutes ; the tail tapering; head flat, rather short; and the eyes of small size. They feed on fish, frogs, and other aquatic animals, and are innocuous and vivipar- ous. (5) Sea

snakes are distinguished by the compressed, rudder-shaped tail, supported by erect neural and hemal spines, They never leave the sea (with the exception of one genus) and are unable to move on land. They feed on fishes, are viviparous and poisonous.

Locomo- tion.

Integu- ments.

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The majority of snakes are active during the day, their energy increasing with the increasing temperature of the air; whilst some delight in the moist sweltering heat of dense tropical vegetation, others expose themselves to the fiercest rays of the midday sun. Not a few, however, lead a nocturnal life, and many of them have, accordingly, their pupil contracted into a vertical or more rarely a horizontal slit. Those which inhabit temperate latitudes hibernate. Snakes are the most stationary of all verte- brates; as long as a locality affords them a sufficiency of food and some shelter to which they can readily retreat, they have no inducement to change it. Their dispersal, therefore, must have been extremely slow and gradual. Although able to move with extreme rapidity, they can- not maintain it for any length of time. Their organs of locomotion are the ribs, the number of which is very great, nearly corresponding to that of the vertebrae of the trunk. They can adapt their motions to every variation of the ground over which they move, yet all varieties of snake locomotion are founded on the following simple process. When a part of the body has found some projection of

Fic. 1.—Diagram of natural locomotion of a snake.

the ground which affords it a point of support, the ribs are drawn more closely together, on alternate sides, there- by producing alternate bends of the body. The hinder portion of the body being drawn after, some part of it © finds another support on the rough ground or a projection ; and, the anterior bends being stretched in a straight line, the front part of the body is propelled (from a to d) in con- sequence. During this peculiar locomotion the numerous broad shields of the belly are of great advantage, as by means of their free edges the snake is enabled to catch and use as points of support

the slightest projections of the ground. A pair of ribs corresponds to each of these ventral shields. Snakes are not able to move over a per- fectly smooth surface. Thus it is evident that they move by dragging their body over the ground, or over some

Fria. 2.—Diagram of conventional idea of a snake's locomotion.

other firm base, such as the branch of a tree; hence the conventional representation of the progress of a snake, in which its undulating body is figured as resting by a series of lower bends on the ground whilst the alternate bends are raised above it, is an impossible attitude. Also the notion that snakes when attacking are able to jump off the ground is quite erroneous; when they strike an object, they dart the fore part of their body, which was retracted in several bends, forwards in a straight line. And sometimes very active snakes, like the cobra, advance simultaneously with the remainder of the body, which, how- ever, glides in the ordinary fashion over the ground ; but no snake is able to impart such an impetus to the whole of its body as to lose its contact with the ground. Some snakes can raise the anterior part of their body and even move in this attitude, but it is only about the anterior fourth or third of the total length which can be thus erected. —

With very few exceptions, the integuments form imbri- cate scale-like folds arranged with the greatest regular- ity ; they are small and pluriserial on the upper parts of the body and tail, large and uniserial on the abdomen, and generally biserial on the lower side of the tail. The folds can be stretched out, so that the skin is capable of a great degree of distension. The scales are sometimes rounded behind, but generally rhombic in shape and more

or less elongate; they may be quite smooth or provided with a longitudinal ridge or keel in the middle line. The integuments of the head are divided into non-imbricate bones or having any relation to them. The form and and scutes, and the

shape and arrange-

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shields or plates, symmetrically arranged, but not cor- responding in size or shape with the underlying cranial

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ment of the head- . shields, are of great in distin-

and species, and it will therefore be

the accompanying woodcut (fig. 3) the terms by which these parts are de- signated, The skin does not form eye- lids; but the epi- dermis passes over the eye, forming a transparent disk, concave like the

glass of a watch,Fro. Eire eye sen of eee (Piya jorvod . : r, Rostral; f, posterior frontal ; ’, anterior frontal; behind which the 4° yertical’’’s, supraciliary or supraccular; 0, oc. eye moves. It is pgp i n/, nasals TP apse 3s on a é or orbital, or preorbital or anteocular; p, post-

the first part which is cast off when

oculars; wu, u, upper labials; ¢, t, temporals; m,

mental; *, *, lower labials; ¢, c, chin-shields. the snake sheds its skin; this is done several times in the year, and the epidermis comes off in a single piece.

The tongue in snakes is narrow, almost worm-like, Tongu generally of a black colour and forked; that is, it terminates in front in two extremely fine filaments. It is often exserted with a rapid motion, sometimes with the object of feeling some object, sometimes under the influence of anger or fear.

Snakes possess teeth in the maxillaries, mandibles, pala- Denti | tine, and pterygoid bones, sometimes also in the inter- tiou: | maxillary ; they may be absent in one or the other of the bones mentioned. In the innocuous snakes the teeth are simple and uniform in structure, thin, sharp like needles, and bent backwards; their function consists merely in seizing and holding the prey. In some all the teeth are nearly of the same size; others possess in front of the jaws (Lycodonts) or behind in the maxillaries (Diacras- terians) a tooth more or less conspicuously larger than the rest ; whilst others again are distinguished by this larger posterior tooth being grooved along its outer face. The snakes with this grooved kind of tooth have been named Opisthoglypht, and also Suspecti, because some herpeto- logists were of opinion that the function of the groove of the tooth was to facilitate the introduction of poisonous saliva into a wound. ‘The venomous nature of these snakes, however, has never been proved, and persons are frequently bitten by them without any evil consequences. Nevertheless as the depth of the groove, the length of the tooth, and the development of the salivary glands in its vicinity vary greatly, it is quite possible that the func- tion and the physiological effect of this apparatus are not the same in all Opisthoglyphs. In the true poisonous snakes the maxillary dentition has undergone a special modification. The so-called Colubrine Venomous snakes, which retain in a great measure an external resemblance to the innocuous snakes, have the maxillary bone not at all, or but little, shortened, armed in front with a fixed, erect fang, and provided with a deep groove or clo

canal for the conveyance of the poison, the fluid being secreted by a special poison-gland. One or more small ordinary teeth may be placed at some distance behind this poison-fang. In the other venomous snakes (Viperines and Crotalines) the maxillary bone is very short, and is armed with a single very long curved fang with a canal and aperture at each end. Although firmly anchylosed to the bone, the tooth, which when at rest is laid backwards, is erectile,—the bone itself being mobile and rotated round its transverse axis by muscles. One or more reserve teeth, in various stages of development, lie between the folds of the gum and are ready to take the place of the one in func- tion whenever it is lost by accident, or shed, which seems to happen at regular intervals. The gland which secretes the poison is described under Ruprrius (vol. xx. p. 457). All snakes are carnivorous, and

as a rule take living prey only ; a few feed habitually or occasionally on eggs. Many swallow their victim alive ; others first kill it by smothering it between the coils of their body (constriction). The effects of a bite by a poisonous snake upon a small mammal or bird are almost instantaneous, preventing its escape; and the snake swallows its victim at its leisure, sometimes hours after it has been killed. The prey is _ always swallowed entire, and, as its girth generally much exceeds that of the snake, the progress of deglutition is very laborious and slow. Opening their jaws to their fullest extent, they seize the animal generally by the head, _ and pushing alternately the right and left sides of the jaws forward, they press the body through their elastic gullet into the stomach, its outlines being visible for some time through the distended walls of the abdomen. Digestion is quick and much accelerated by the quantity of saliva _ which is secreted during the progress of deglutition, and in venomous snakes probably also by the chemical action of the poison. The primary function of the poison- apparatus in the. economy of snakes is without doubt to serve as the means of procuring their food. But, like the weapons of other carnivorous animals, it has assumed the secondary function of an organ of defence. Only very few poisonous snakes (like Ophiophagus elaps) are known _toresent the approach of man so much as to follow him | on his retreat and to attack him. Others, as if conscious

of their fearful power of inflicting injury, are much less

| inclined to avoid collision with man than innocuous kinds, | and are excited by the slightest provocation to use that power in self-defence. They have thus become one of the _ Steatest scourges to mankind, and Sir J. Fayrer! has de- Monstrated that in India alone annually some 20,000 human beings perish from snake-bites. Therefore it will not be out of place to add here a few words on snake- poison and on the best means (ineffectual though they be mMnumerous cases) of counteracting its deleterious effects, Chemistry has not yet suceeeded in separating the aetive princi- ple of snake-poison or in distinguishing between the seeretions of (itferent kinds of poisonous snakes ; In fact it seems to be identieal mall, and probably not different from the poison of seorpions and hany Hymenoptera. The physiological effeets of all these poisons on warm-blooded Vertebrates are identieal, and vary only in degree, the sinallest quantities of the poison

produeing a loeal irritation, whilst in serious eases the whole mass of the blood is poisoned | In the course of some seconds or minutes, producing paralysis of the herve-eentres. That there is some difference, however, in oe action of the poisons upon the blood has been shown by ayter, who found that the poison of Viperine snakes invariably

| Sestroys its eoagulability, whilst nothing of the kind is observed in / animals which perished from the bite of a Colubrine Venomous | a The same observer has also experimentally demonstrated) gua the blood of a poisoned warm-blooded animal assumes poison- | a Properties, and, when injected, kills like the poison itself, F ough the bodies of the animals may be eaten by man with mpunity. On the other hand, he has proved that the opinion Seherally adopted since Redi's time, viz., that snake-poison is

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- The Thanatophidia of India, fol., London, 1872.

effieacious only through direet injection into the blood, is fallacious, aud that it is readily absorbed through mucous and serous mem- aie Slabs the same effects, though in a milder degree.

e in the first plaee on the quantity of poison injeeted : vigorous snake whieh has not bitten for some time is more to be snake- feared than one of small size or one which is weakly or has ex- bites, hausted its stock of poison by previous bites. The bite of some of the smaller Australian Diemenias and Hoplocephali is followed by no worse eonsequenees than those arising from the sting of a wasp or a hornet, while immediately fatal eases are on reeord of persons bitten by the eobra or the large South-Ameriean Crotalines.

In the second place it depends on the strength of the individual bitten: a man of strong physieal constitution and energetic mental disposition is better able to survive the immediate effeets

of the bite than a ehild ora person wanting in eourage. Thirdly,

it depends on the position and depth of the bite: the bite may

be merely a superficial serateh, or niay penetrate into tissue hay-

ing few blood-vessels, and thus be almost harmless ; or it may be deep in vascular tissue or even penetrate a vein, produeing im- mediate and fatal effeets. It must be mentioned also that Fayrer

is distinetly of opinion that the poison of some kinds is more powerful than that of others. The mere shock produeed by the

bite of a snake upon a nervous person may be sufficiently severe

to be followed by symptoms of eollapse, although no aetual poison-

ing of the blood has taken place, or although the bite was that

of an innoeuous snake. It is said that persons have actually died under sueh eircumstances from x ; mere fright. The local appearanees in the neighbourhood of a poisoned e wound, whieh soon after the bite is * mueh swollen and diseoloured and very painful, readily prove its ehar- aeter ; but this can be often aseer- tained also immediately after the bite by the inspeetion of the wound, —the teeth, which are so differently arranged in poisonous and non- poisonous snakes, leaving a different pattern on the skin. As a non- poisonous snake has four rows of teeth in the upper jaw, the pattern of its bite will more or less resemble fig. 4, whilst a petsoneus snake Fic. 4.—Diagram of toothmarks of leaves two rows of more distinetly an innocuous snake. marked punctured wounds in the Fic. 5.—Diagram of toothmarks of a plaee of the two outer series in the Poisonous snake (cobra), non-poisonous (see fig. 5). Of eourse, there may be modifieations of these patterns, as, for instance, when one fang only hits or penetrates the part aimed at, or when the direction of the stroke is slanting, producing merely a serateh.

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Fig. 4 Fig. 5.

Unfortunately no antidote is known capable of eounteraeting Remedies Some years ago injee- and treat-

or neutralizing the aetion of snake-poison. tions of ammonia or liquor potasse were recommended, but there ment. is the obvious objeetion that hardly in one out of a thousand eases of snake-bite would either the applianees or the operator be at hand. Fayrer’s experiments, however, have distinctly disproved the effieaey of this remedial measure. Equally useless is permanganate of potassium ; it is indeed true that a solution of this eompound destroys the properties of snake-poison when mixed with it; and therefore sueh of the poison as remains in the wound will be neutralized by the external application or injeetion of the perman- ganate, but the remedy is entirely without effeet after the poison has passed into the eirculation.’ Treatment is therefore limited to endeavours to prevent by meehanieal means the poison from entering the eireulation, or by ehemieal ageneies to destroy or remove as mueh of it as possible that remains in the wound, and to save the patient from the subsequent mental and physical depression by the free use of stimulants. Whatever is or can be done must be done immediately, as a few seconds suffice to earry the poison into the whole vaseular system, and the slightest delay diminishes the ehances of the patient’s reeovery. Courageous persons badly bitten in a finger or toe are

known to have saved their lives by the immediate amputation of the wounded member. To the mode of treatment summarized by Giinther? but little ean be added. (1) If the wound is on some part of the extremities, one or more ligatures should be made as tightly as possible at a short distanee above the wound, to stop eireulation ; this is most effeetually done by inserting a stick under the ligature and twisting it to the uttermost. The ligatures are left until means are taken to destroy the virus in the wound and other remedial measures are resorted to, or until the swelling neeessitates their removal. (2) The punetured wounds should be enlarged by deep ineisions, to eause a free efflux of the poisoned blood, or should be eut out

entirely. (8) The wound should be sucked either by the patient

Reptiles of British India, London, 1864, 4to.

- eos S,. : egree of danger arising from a snake-bite to man depends Causes in- a large fluencing

Propaga- tion.

Classi- fication.

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or some other person whose mouth is free from any solution of continuity. Cupping-glasses, where they can be applied, answer the same purpose, but not with the same effect. (4) By cauteriza- tion with a red-hot iron, a live coal, nitrate of silver or carbolic or mineral acid, or by injections of permanganate of potassium, the poison which remains in the wound can be destroyed or neutralized. Ammonia applied to the wound as a wash and rubbed into the neighbouring parts is likewise undeniably of great benefit, especially in less serious cases, since it alleviates the pain and reduces the swelling. (5) Internally, stimulants are to be taken freely ; they do not act as specifics against the virus, but are given to excite the action of the heart, the contractions of which become feeble and irregular, to counteract the physical and mental depression, and to prevent a complete collapse. Brandy, whisky, and ammonia in any of its officinal forms should be taken 1n large doses and at short intervals. The so-called ‘‘snake-stones” can have no other

effect than, at the best, to act as local absorbents, and can be of use only in the very slightest cases.

Snakes are oviparous; they deposit from ten to eighty eggs of an ellipsoid shape, covered with a soft leathery shell, in places where they are exposed to and hatched by moist heat. The parents pay no further attention to them, except the pythons, which incubate their eggs by coiling their body over them, and fiercely defend them. In some families, as many freshwater snakes, the sea snakes, Viperidx, and Crotalide, the eggs are retained in the oviduct until the embryo is fully developed. These snakes bring forth living young, and are called “ ovo-viviparous.”

The order of snakes may be divided into the following

sub-orders and families or groups.

First Sub-order.—Hopoterodontes.

Small burrowing snakes, with a cylindrical body, which is nearly of the same thickness from its anterior to its posterior extremity, and is covered with smooth polished scales of the same size in its whole circumference. No mental groove. Head small, not distinct from the trunk, with imbricate scale-like scutes. Eye rudimentary. Mouth very natrow, at the lower side of the head, armed with small teeth in one jaw only.

Family 1. Typanoripz.—Teeth in the upper jaw only.

Genera: Zyphilina, Onychocephalus, Typhlops (see figs. 6, ioe

Family 2. STENOSTOMATID#.—Teeth in the lower jaw only.

Genera: Stenostoma, Siagnodon.

Second Sub-order.—Ophidii Colubriformes.

Innocuous snakes. Teeth in both jaws, noue of the anterior being grooved or perforated. Scales more or less differentiated. A mental groove is generally present. Eye developed.

Family 1. Tortricip#.—Body cylindrical, with a rounded head not distinct from the neck ; tail very short. Rudiments of hind limbs hidden in a small groove on each side of the vent. Scales rounded, polished, those of the ventral series but little enlarged ; only one pair of frontals ; six upper labials. Eye small. Mouth ot moderate width ; teeth few in number, sub-equal in size.

Genera: Ilysia (tropical America) ; Cylindrophis (India).

Family 2. XENOPELTIDS. —Body cylindrical, with a rounded head not distinct from the neck; tail short. No rudimentary hind limbs. Scales rounded, polished ; ventral shields well differentiated ; two pairs of frontals ; occiput covered with five shields. Eye small. Mouth of moderate width ; teeth numerous, sub-equal.

One genus, from the Indian region : Xenopeltis.

Family 38. UROPELTIDS (Rough Tails).—Body cylindrical, with a short head not distinct from the neck ; tail very short, trun- cated or scarcely tapering, frequently terminating in a rough naked disk or covered with keeled scales. Scales rounded and polished, those of the ventral series being always somewhat larger than the rest; only one pair of frontals ; four upper labials. Eye very small. Mouth of moderate width ; teeth few in number, small, sub-equal, none on the palate. Mental groove generally absent. Small burrowing Indian snakes.

Genera: Rhinophis, Uropeltis, Silybura, Plectrurus, Melan- ophidiwm.
Family 4. CaLamarmpa.—Small snakes, with a rather rigid

body; the short head not distinct from the neck; tail more or less short. Scales in from thirteen to seventeen series ; ventral shields well developed, generally less than 200 in number; the

normal number of head-shields always reduced by two or more of

them being confluent. Cleft of the mouth of moderate width ; nostril lateral ; palatine teeth present.

African genera: Homalosoma, Calamelaps, Prosymna, Opistho- tropis, Xenocalamus, Amblyodipsas, Elapops, Urobelus, Uriechis. Europeo-Asiatic genera: Khynchocalamus, Psilosoma. Indian genera: Calamaria, Macrocalamus, Typhlogcophis, Xylophis, Oxycalamus, Brachyorrhos, Elapoides, Rhinosimus, Aspidura,

SNAKES

smooth rounded scales ; nearly always with symmetrical arrow-shaped markings above, Ventral scutes broad ; rostral shield large, more or backwards. Maxillary teeth few in number, the hindmost enlarged not grooved.

the non-venomous snakes and the least specialized forms. body of moderate length compared to its circumference, flexible in every part; the head, trunk, portioned ; nostril lateral ;

the palate, maxillary. divided ‘in accordance with the general habitus or mode of life into several groups, which, however, are connected by numerous intermediate forms.

which swim well when driven into the water, search of food ; they are of moderate or rather large size.

Haplocercus, Achalinus (Japan). North-American genera; Carphophis, Conocephalus, Streptophorus, Contia. Tropical American genera: Homalocranium, Arrhyton, Rhegnops, Colo- bognathus, Geophidium, Catostoma, Stenognathus, Leptocala- mus, Chersodromus, Elapomorphus, Cercocalamus, Microdromus Stcnorhina, Rhinostoma, Rhynchonyx. Genus with wide dis- tribution : Geophis.

Family 5. OLIGODONTID#&.—Body rather rigid, covered with

head short, not distinct from neck, and

less produced

Indian.

Genera: Oligodon, Simotes.

Family 6. CoLusripz.—This family comprises the majority of Their

and tail—in fact all parts—well pro- teeth numerous in the jaws and on but without fangs in front or in the middle of the Double row of sub-caudals. This family may he

The group of (i.) Ground Colubrides, Coronellina, consists of

small forms, generally of brilliant coloration, and comprises the following genera :—

Genera with wide distribution : Ablabes, Cyclophis, Tachymenis, Coronella, Liophis. African: Psammophylax, Ditypophis. Indian: Megablabes, Mymphophidiwm, Odontomus. Tropical American: Erythrolamprus, Pliocercus, Hypsirhynchus.

The group of (ii.) True Colubrides, Colubrina, are land snakes,

or climb when in

Genera with wide distribution: Coluber, Elaphis, Ptyas, Zamenis. African genera: Xenurophis, Herpetzxthiops, Scaphiophis. In- dian genera: Compsosoma, Xenelaphis, Cynophis, Lielaphis, Lytorhynchus. Europeo-Asiatic: Rhinechis. North-American: Pituophis. South-American: Spilotes. Australian: Zamenophis.

The group of (iii.) Bush Colubrides, Dryadina, leads up to the true Tree snakes, its members having a more or less elongate and compressed body, frequently of green colour; they are more numer- ousin the New than in the Old World, and belong to the following

Genera: Dromicus, Herpetodryas, Herpetoreas, Philodryas, Diplo- tropis, Zaocys, Dryocalamus.

Finally, the group of (iv.) Freshwater Colubrides, Natricina, are generally neither elongate nor compressed, and possess frequently keeled scales. They freely enter water in pursuit of their prey,— chiefly frogs and fishes.

Genera with wide distribution: Zropidonotus, Heterodon, African: Grayia, Neusterophis, Limnophis, Hydrethiops, Macrophis. Indian: Xenochrophis, Prymnomiodon,

Family 7. Homa.orsips (Freshwater Snakes).—Body of mode- rate length, cylindrical or slightly compressed ; head rather thick, broad, not very distinct from neck; tail strong, of moderate length. Ventral scutes rather narrow; double row of sub-caudals. Eye small. Nostrils on the upper surface of the head, small, pro- vided with a valve; nasal shields enlarged at the expense of the anterior frontals, which are frequently confluent into a single shield. The other head shields may deviate ftom the usual arrangement,

Indian genera: Fordonia, Cantoria, Cerberus, Hypsirhina, Fer- ania, Homalopsis, Hipistcs, Herpcton (see fig. 8), Gerrarda, Tachyplotus. American genera: Calopisma, LHclicops, Hy- drops, Tachynectes, Hydromorphus.

Family 8. PsAMMOPHIDH (Desert Snakes).—Loreal concave. Scales smooth ; double row of sub-caudals. Cleft of the mouth wide; nostril lateral. Eye of moderate size. Shields of the head normal; posterior frontals rounded or angular behind ; vertical narrow ; supraciliaries prominent. Loreal present. One of the four or five anterior maxillary teeth longer than the others, and the last grooved. Old World.

Genera: Psammophis, Celopeltis, Psammodynastes, Mimophis.

Family 9. RHACHIODONTIDE

region very

Taphromctopon, Rhagerrhis,

(Egg-Eaters).—Body of moderate dimensions ; head short, deep. Eyes small, pupil round. Scales strongly keeled, in twenty-three or twenty-five serics. Maxillary teeth very small and few in number ; the lower spinous processes — of the posterior cervical vertcbre penetrate the cesophagus and act as supplementary teeth. African. One genus: Dasypeltis (see fig. 9). ;
Family 10. DEnpRropHips (Tree Snakes).—Body and. tail much |

compressed or very slender and elongate ; head generally elongate — and distinct from the very slender neck ; snout rather long, obtuse or rounded in front. Cleft of the mouth wide. Eye of moderate size or large, with round pupil. Shields of the head normal ; scales

gencrally narrow and much imbricate ; ventral scutes kceled later- ally; double row of sub-caudals. No large fang cither in front or in the middle of the upper jaw. ‘ ;

African genera: Bucephalus, Hapsidophrys, Rhamnophis, Philo- thamuus, Ithycyphus. Indian and Australian genera: Gonyo- soma, Phyllophis, Dendrophis, Chrysopelea. Tropical American : Ahezxtulla. , ;

Family 11. Dryvopnip™ (Whip Snakes).—Body and tail ex- cessively slender and elongate ; head very narrow and long with tapering snout, which sometimes is produced into a longer or shorter appendage. Mouth very wide. Eye of moderate size, generally with a auiial pupil. Scales very narrow, much imbricate ; double row of sub-caudals, Posterior maxillary teeth grooved.

Genera: Tropidococcyx, Cladophis, Dryophis, Tragops, Passerita

(see fig. 10), Langaha.

Family 12. Dipsapip#2.—Body much compressed, elongate or of moderate length ; head short, broad behind, with short rounded snout distinct from neck. Eye large, generally with vertical pupil. Cleft of the mouth wide. Seales of the vertebral series frequently enlarged. Dentition strong, frequently with enlarged anterior and posterior maxillary teeth.

Genera: Chamzxtortus, Leptodira, Tropidodipsas, Hemidipsas, Thamnodynastes, Dipsas, Dipsadoboa, Rhinobothryum, Pythono- dipsas.

Baily 13. SoyvraLipa#.—Head, trunk, and tail of moderate dimensions. Eye of moderate size, with elliptical pupil. Scales smooth, in seventeen or nineteen rows; anal entire; siugle or double row of sub-caudals. Posterior maxillary teeth grooved, anterior ones equal in length.

Genera: Scytale, Oxyrhopus, Rhinosimus.

Family 14, Lycopontipm. Body of moderate length or rather elongate ; snout generally depressed, flat, and elongate. Eye rather small, often with vertical pupil. Upper head-shields regular, with the posterior frontals enlarged. Maxillary with a fang in front, but without posterior grooved tooth.

African genera: Boodon, Holwropholis, Alopecion, Lycophidium, Bothrophthalmus, Bothrolycus, Lycodryas, Hormonotus, Simo- cephalus, Lamprophis, Indian genera: Lycodon, Dinodon, Tetragonosoma, Leptorhytaon, Ophites, Cercaspis, Ulupe.

Family 15. AmMBLYCEPHALIDZ (Blunt Heads)—Body com-

ressed, slender, and of moderate length ; head short, thick, very Mstinct from neck; nostril in a single shield. Eye with vertical pupil. Cleft of the mouth narrow and not very extensible. Scales smooth or faintly keeled, those of the vertebral series generally enlarged. Maxillary dentition feeble, no grooved tooth.

Indian genera: Digsadomorus, Amblycephalus, Parcas, Astheno- dipsas, Elachistodon. South-American genera: Leptognathus, Opisthophis.

Family 16. Erycipa (Sand Snakes).—Body of moderate eet cylindrical, covered with small short scales; tail very short, with a single series of sub-caudals, Eye small, with vertical pupil. None of the labials are pitted. Anterior teeth longest. Adult individuals of some of the species with rudiments of hind limbs.

Genera: Eryx, Cursoria, Gongylophis, Bolyeria, Ercbophis, Lich-

anura, Calabaria, Wenona, Charina,

Family 17. Borpa#.—Body and tail of moderate length or elon- gate; tail prehensile ; snout rounded in front. Eye with vertical

Hologerrhum, Pseudoxyrhopus,

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Fia. 6.—Typhlops bothriorhynchus. from India,

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loreal absent. Venom-fang grooved ; maxillary long, with short teeth behind the fang.

Genus with wide distribution: Naja (see fig. 13). Indian genera: Callophis, Megerophis, Hemibungarus, Xenurelaps, Bungarus, Ophiophagus. African genera: Pacilophis, Elapsoidea, Cyrt- ophis. South-American genus: Laps (see fig. 14). Australian genera: Vermicella, Brachysoma, Neelaps, Brachyurophis, Lthinelaps, Diemenia, Cacophis, Hoplocephalus, Tropidechis, Pseudechis, Pseudonaja, Pseudohaje, Ogmodon.

Family 2. ATRAcTasP1DID&.—Body cylindrical, of moderate pro- portions ; tail short. Head short, not distinct from neck. Mouth natrow. Maxillary short, with perforated poison-fang, without other teeth behind, Africa.

Genus:

Family 3, Causipa.—Body of moderate proportions, tail moderate or rather short. Head distinct from neck. Mouth wide. Maxil- lary short, with perforated poison-fang, without other teeth behind.

African genera: Sepedon, Cawsus. South-American : Dinodipsas.

Family 4. DinopHipa (Venomous Tree Snakes).— Body and tail much elongate ; head distinct from neck. Mouth wide. A perforated poison-fang, without other teeth behind. Africa.

Genus: Dinophis (Dendraspis).

Family 5. Hyproruipm (Sea Snakes).— Body generally com- pressed, and without broad ventral scutes; tail compressed, rudder- shaped. Nostrils directed upwards. Poison-fangs small, grooved. Viviparous.

Genera: Platurus, Aipysurus, Distetra, Acalyptus, Hydrophis,

Enhydrina, Pelagophis, Pelamis (see fig. 15).

Fourth Sub-order.—Ophidii Viperiformes.

Viperine snakes. Maxillary very short, capable of rotation in its transverse axis, and armed with a single long tooth, which is perforated. Viviparous.

Family 1. VipERip# (Vipers).— Loreal region flat, without pit.

Old World genera: Vipera, Cerastes, Daboia, Echis (see fig. 17), Atheris, Australian: Acanthophis.

Family 2. CroTaLips# (Pit Vipers, Rattlesnakes).—Loreal region

with a pit.

Old World genera: Halys, Hypnale, Trimeresurus (see fig. 18), Calloselasma, Peltopelor. New World genera: Cenchris, Both- rops, Bothriopsis, Bothriechis (Rhinocerophis), Atropos, Tri- gonocephalus, Lachesis, Crotalophorus, Crotalus (see fig. 16).

This list, from which many genera or sub-genera that are not well defined have been excluded, will give an idea of the great variety of forms by which the Ophidian type is represented at the present period. Additions, more or less numerous, are made to it every year; but the

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discoveries of late years have not revealed any new im- portant modifications of structure, but rather have under- mined the distinctions hitherto made be- tween genera, groups, and families, so that it would appear as if we were acquainted with all the principal forms of snakes now

ae Scales in numerous series; single or double row of sub- living. candals, In some of the genera the upper and lower labials are Sut pitted. Teeth strong, unequal in size, none grooved; no inter- We have ee bas add poms eae on snakes 5 os maxillary teeth. Rudinients of hind limbs are generally present. | tO which special interest is attached, or which a ” Genera: Boa (see fig. 11), Pelophilus, Xiphosoma, Corallus, Epi- | are most frequently brought to the notice of ; ae; lea Chilabothrius, Enygrus, Leptoboa, Ungalia, Trachyboa. | the observer or reader. The snakes most > \ amily 18, PyrHontp# (Rock Snakes).-~Distinguished from + as / p the preceding family by the presence of intermaxillary teeth. remote from the true Ophidian Ape ah the x Genera: Python (see fig. 12), Morelia, Chondropython, Liasis, members of the first family, Z’yphlopide. Aspidiotes, Nardoa, Loxocemus. They are a small degraded form, adapted for Family 19. AcCROCHORDIDE (Wart Snakes).—Body of moderate burrowing and leading a subterranean life gb, covered with small, non-imbricate, tubercular or spiny | jixe worms. Their body is cylindrical, rigid Scales ; tail rather short, prehensile. Head covered with seales ‘uh # oh, hivkl ii bi like the body ; nostrils close together, at the top of the snout. Eye covered wit smooth, short, highly po ished, small, Teeth short, strong, sub-equal in size. Aquatic. Vivi- | and closely fitting scales, without broad ven- parous. India. tral scutes; tail very short; head joined to the Genera: Acrochordus, Chersydrus. trunk without neck-like constriction behind Family 20, XENODERMIDA.—Distinguished from the preceding : ; family by possessing broad ventral and sub-caudal scutes. and short, rounded, or with an acute rostral Fic. 7. — Three

One genus: Xenodermus (Java). ? Nothopsis (Central Amcrica).

Third Sub-order.—Ophidii Colubriformes Venenosi.

Venomous Colubrine snakes. An erect grooved or perforated tooth in front of the maxillary which is not capable of rotation in its transverse axis. Scales differentiated. A mental groove.

Family 1, ELarrp£,—Tail conical, tapering. Head with shield :

i ee nel 4 views of head shield,—the principal instrument for bur- Ce Typhtops bra-

rowing in loose soil or mould, Their eye is ‘minus (India),

quite rudimentary and can only give them a ™*2™***

general perception of light. Their mouth is narrow, small,

armed with but a few teeth in one of the jaws, and not

distensible, allowing them only to feed on very small XXII. — 25

Smooth snake.

Indian rat snakes.

Aascula- pius’s snake.

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animals, such as worms, larve, and burrowing insects. They are found in all tropical countries and the parts ad- joining, and some of the small species have a wide range, having been probably transported by accident on floating objects to distant countries. Some species attain to a length of 24 inches, whilst others scarcely grow to one- fourth that size.

An almost unbroken series leads from these degraded worm-like snakes to the typical Colubride, of which the Smooth Snake of Europe (Coronella), the Corn Snake of North America (Coluber), the Rat Snake of India and South America (Ptyas, Spilotes), Aisculapius’s Snake of the south of Europe, the common Ring Snake of England (Tropidonotus), are well-known representatives.

The Smooth Snake (Coronella levis) is common in the warmer parts of Europe, extending northwards into the New Forest district of England. In coloration, general habits, and size it somewhat resembles the viper; but,

although it is rather fierce and ready to bite when caught, it is quite harmless and soon becomes tame in captivity. The shields on its head readily distinguish it from the viper. Its chief food consists of lizards, and it attains a length of 2 feet.

The Indian Rat Snakes (Ptyas mucosus and P. korros) are two of the most common species of India, the former in- habiting India proper and Ceylon, the latter the East Indian Archi- pelago, Siam, and southern China. J.

range. Naturalists believed formerly that the occurrence of this snake at widely distant and isolated localities wag due to its introduction by the Romans, who had settle ments in those localities.

The common British Snake or Ring Snake (7Tropi- Britis

donotus natrix) is extremely common all over Europe (except in the northern parts), and belongs to a genus extremely rich in species, which are spread over Europe, Asia, India, Australia, and North America, Some of the species, like the Indian 7’, guincunciatus and 7’. stolatus and the North-American 7’. ordinatus, are perhaps more abun- dant as regards the number of individuals than any other snake. 7’. natrix is easily recognized even at a distance by two yellow or white spots which it has behind its head, It grows rarely to a length of 4 feet; it never bites, and feeds chiefly on frogs and toads. Its eggs, which are of the size and shape of a dove’s egg, and from fifteen to thirty in number, are deposited in mould or under damp leaves, and are glued together into one mass.

A very peculiar genus of snakes, Dasypeltis, represented by three species only, is the type of a separate family and is restricted in its distribution to Central and South Africa, In Cape Colony these snakes are well known under the name of “eyervreter,” ic. “egg-eaters.” Their principal diet seems to consist of eggs, their mouth and cesophagus

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mucosus is a powerful snake, attaining to a length of 7 feet, the tail being one-third . or rather more; it is — easily recognized by having three loreal * shields, one above the *% other two; its scales \ are arranged in seven- | teen rows. Its food – consists of mammals, \ birds, and frogs; and "< by clearing them of | AN. Lys rats and mice. It is we "

of fierce habits, always ready to bite; when irritated it utters a peculiar diminuendo sound, not unlike that produced by a tuning-fork when struck gently.

Asculapius's Snake (Coluber xsculapw) was probably the species held in veneration by the ancient Romans. It grows toa length of about 5 feet, is of mild disposi- tion, and can be readily domesticated. Its original home is Italy, where it is common, but it has extended its range northwards across the Alps into the south of France, and thence into northern Spain. Following the course of the Inn and the Danube, it has reached the Black Sea; and it is also now & 3s common in several local- ~~ ities along the middle parts of the Rhine. From direct observations made during the last twenty years there can be no doubt that it is still extending its

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Fig. 8.—Head of Herpeton tentaculatus.

Fic. 9.—Dasypeltis wnicolor, in the act of swallowing a fowl's egg.

Sor" _ = being so distensible that an individual scarcely 20 inches in length, and with a body not surpassing a man's little finger in circumference, is able to swallow a hen's egg. The teeth in the jaws are very small and few in number; but the inferior processes of the posterior cervical vertebra are prolonged and provided with a cap of enamel, and penetrate the oesophagus, forming a kind of saw. As the egg passes through the cesophagus its shell is broken by this apparatus, and, whilst its contents are thus retained and swallowed without loss, the hard fragments of the shell are rejected. This peculiar apparatus occurs also in another snake, Elachistodon, which belongs to the Indian fauna and has been referred (provisionally) to the family Amblycephalidx. Also two prominences at the base of the skull of the Indian Coronelline Vymphophidium probably have

the same function. Besides the snakes mentioned, we have observed species of Dipsas feeding on eggs of parrots, the eggs reaching the stomach entire, as these

ring | snake,

Ege.

eaters,

SNAKES

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snakes lack a special apparatus for breaking the shell. | bars, the bands of each pair being separated by a narrow

The Indian cobra also is said to rob birds of their eggs. The Tree Snakes (Dendrophide) are among the greatest ornaments of tropical fauna. The graceful form of their body, the elegance and rapidity of their movements, and the exquisite beauty of their colours have been the admiration of all who have had the good fortune to watch them in their native haunts. The majority lead an exclu- sively arboreal life ; only a few descend to the ground in search of their food. They prey upon every kind of

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arboreal animal,—birds, tree-frogs, tree-lizards, &c. All seem to be diurnal, and the larger kinds attain to a length of about 4 feet. The most beautiful of all snakes are perhaps certain varieties of Chrysopelea ornata, a species extremely common in the Indian Archipelago and many parts of the continent of tropical Asia. One of these varie- hes is black, with a yellow spot in the centre of each scale; these spots are larger on the back, forming a series of tetrapetalous flowers; the head is similarly ornamented. Another variety has a red back, with pairs of black cross-

yellow space ; sides brown, dotted with black ; belly dark green, the outer portion of each ventral shield being yellow, with a blackish spot.

The features by which the tree snakes are distinguished Whip are still more developed in the family of Whip Snakes snakes.

(Dryophidx), whose excessively slender body has been compared to the cord of a whip. Although arboreal, like the former, they are nocturnal in their habits, having a horizontal instead of a round pupil of the eye. They are said to be of a fierce disposition, feeding chiefly on birds ; and indeed a long tooth placed about the middle of the maxillary seems to assist them much in penetrating the thick covering of feathers and in obtaining a firm hold on their victims. In some of the species the elongate form of the head is still more exaggerated by a pointed flexible appendage of the snout (Passerita), which may be nearly half an inch in length, and leaf-like, as in the Madagascar Langaha.

The well-defined family of Lycodontide is chiefly com- Lyco- posed of ground snakes, but a few of its members have a dontide.

sufficiently elongate body to indicate arboreal habits. The Indian genera are principally reptilivorous, while the African prey upon mice, rats, and other small nocturnal mammals. Scarcely any other snake is so common in collections as the Indian Lycodon aulicus, which inhabits the continent of India and Ceylon, some of the islands of the East Indian Archipelago (Timor), and the Philippines. It occurs in many varieties, but generally is of a uniform brown, or with some whitish crossbands on the anterior part of the body. Although only 2 feet long, it is a fierce snake, which when surprised bites readily, but its bite is innocuous.

The Borde are so similar in their habits to the Pythons Boas.

(see PyrHon, vol. xx. p. 144) that it is sufficient to refer in a few words to the species most frequently mentioned in the literature dealing with the fauna of the virgin forests of tropical America. The real Boa constrictor iscom- 4 mon from the north- G4 ern parts of Central America to southern Brazil, and is fre- quently brought alive to Europe. Generally it is only about 7 feet long; but the present writer has seen skins of specimens which

must have been nearly twice that length. The giganticsnakes of from 20 to 30 feet in length mentioned in books of South-American travels belong to a different species, the Anaconda or Jb. murina, which has the same habits as the £B. constrictor, haunting the banks of rivers and lakes and lying in wait for peccaries, deer, and other mammals of similar size, which come to the water to drink. It has already been stated (see Ruprizxs) that this family is not restricted to South Anierica, but is well represented in the tropical Pacific region. The Boid most common in that region is Hnygrus, which ranges all over New Guinea, the Fiji Islands, the Solomon group, Samoa, and many other Pacific islands; it is of small size, scarcely 30 inches long.

We pass now to the Venomous Colubrine snakes, that is, snakes which combine with the possession of a perfect poison apparatus the scutellation and general appearance of the typical non-poisonous snakes. It is a remarkable

Fic. 12.—Head of Python reticulatus.

Cobras,

fact, however, that the snakes of this sub-order agree in the absence of the small shield on the side of the snout, the so-called “loreal”; and this is all the more remarkable as the same shield has by no means a similar taxonomic significance in the non-venomous snakes, many of whicli are without it, although it is present in the majority. No snake of this sub-order is more widely known and more dreaded than the species of the genus Vaja or cobras. Probably more than two species should be distinguished ; but the two which cause the greatest loss of life are the Indian Cobra or Cobra di Capello or Naga (WV. tripudians) and the African Cobra (WV. haje). In a report to the Bengal Government the commissioner of Burdwan states that he has ascertained from statistics collected during a series of nine years that above 1000 persons are killed annually by snakes in a population of nearly 6,000,000, the majority being bitten by the cobra, which is by far the most common. And other districts in India seem to suffer still more severely, although it is difficult to obtain information of all the accidents caused by snakes. The cobra is found throughout India, extending westwards to the

Sutle}] and eastwards to the Chinese island of Chusan; in the Hima- layan alps it reaches an altitude of 8000 feet ; it occurs also in abundance in many of the islands of the East Indian Archipelago, and is here joined by another apparently dis- tinct species (V. sputatriz), whilst in the central portions of Asia, which geographically separate it from the African cobra, it is replaced by a fourth, WV. owi- ana. The Indian cobra appears in # many varieties of } colour, which are & distinguished by — separate names in the nomenclature of the Hindu snake-charmers. The ground colour varies from a yellowish olive to brown and to black with or without whitish or white crossbands on the back, and with from one to four or without any black bars across the anterior part of the belly. Some of these varieties are characterized by a pair of very con- spicuous white, black-edged spectacle-like marks on the expansible portion of the neck, called the “hood”; but these marks may lose their typical form and become merely a pair of ocellated spots, or be confluent into a single ocellus, or may be absent altogether. All these varieties, however, are the same species, which generally attains to a length of 5 feet, but sometimes exceeds 6. It is more of nocturnal than of diurnal habits, feeding on every kind of small Ver- tebrates and also eating eggs. The cobra and the other species of this genus have the anterior ribs elongated, and can move them so as to form a right angle with the spine. The effect of this movement is the dilatation of that part behind the head which is generally ornamented with the spectacles or ocelli, When the cobra is irritated or excited it spreads its “hood,” raising the anterior third of the body from the ground, gliding along with the pos- terior two-thirds, and holding itself ready to strike forwards or sidewards. All accounts agree that the cobra is not aggressive unless interfered with or impelled by a sense of danger. It is said to share the habitations of man where superstition prevents people from molesting it, and to live peaceably with the inmates; and there is no doubt that professional snake-charmers exercise a certain control over them, for, although generally the cobras exhibited are rendered harmless by the removal of the poison-fangs, they very rarely attempt to injure their masters even after the fangs have been reproduced. Of the natural enemies of the cobra, the mongoos (see vol. xii. p. 629) does probably the greatest amount of execution ; many are destroyed by

S Fic. 13.—Head of cobra.

_be frequently without serious effect, owing to their narrow

fowls shortly after being hatched. The cobra is oviparous, depositing from eighteen to twenty-five eggs in the year, The African cobra is extremely similar to its Indian cop- gener in size, form, and habits, and varies in coloration to the same extent. It inhabits the whole of Africa, from Egypt to the Cape of Good Hope, but has been nearly exterminated in the cultivated districts of the Cape Colony, One of its greatest enemies (as indeed of all snakes) is the secretary bird of South Africa (Serpentarius), which, there- fore, is protected by law. Accidents from this snake do not appear to be of common occurrence; they happen more frequently to domestic animals than to man. In the Egyptian hieroglyphics the cobra occurs constantly with the body erect and hood expanded; its name was ouro, which signifies “king,” and the animal appears in Greek literature as owraios and basiliscus. With the Egyptian gnake-charmers of the present day the cobra is as great a favourite as with their Hindu colleagues. They pretend to change the snake into a rod, and Geoffroy St-Hilaire main- tains that the supple snake is made stiff and rigid by a strong pressure upon its neck, and that the animal does not seem to suffer from this operation, but soon recovers from the cataleptic fit into which it has been temporarily thrown. More dangerous than either of the species of cobra, Ophio | which it exceeds in size, is Hamadryas or Ophiophagus phagis | elaps, the largest poisonous snake of the Old World, — attaining to a length of 14 feet. It has almost the same geographical range as the cobra, but is much scarcer ; it greatly resembles it also in general habit, but differs from it in scutellation, possessing three large shields behind the occipitals, . It has the reputation of occasionally attacking and pursuing man; its favourite food consists of other snakes. Snake-charmers prize it highly for exhibition on account of its size and its docility in captivity, but are always careful to extract the fangs. It lives in captivity for many years. | The species of Bungarus, four in number, are extremely Bun. common in India, Burmah, and Ceylon, and are distinguished garum| by having only one row of undivided sub-caudal shields. Three of the species have the body ornamented with black rings, but the fourth and most common (B. coeruleus), the “krait” of Bengal, possesses a dull and more uniform coloration. The fangs of the bungarums are shorter than those of

the cobras, and cannot penetrate so deeply into the wound. Their bite is therefore less dangerous and the effect on the general system slower, so that there is more prospect of recovery by treatment. N evertheless, according to Fayrer, the krait is probably, next to the | cobra, the most destructive snake to human life in India. | Several genera of this sub-order of Venomous Colubrines Nar } are similar to the innocuous Calamariide in general habit pmoutty that is, their body is of a uniform cylindrical shape, me terminating in a short tail, and covered with short polished scales; their head is short, the mouth rather narrow, and the eye small. They are the tropical American Elaps, the Indian Callophis, the African Pecilophis, and the Australian Vermicella. The majority are distinguished by the beautiful arrangement of their bright and highly ornamental colours; many species of Elaps have the pattern of the so-called coral snakes, their body being encircled by black, red, and yellow rings,—a pattern which is peculiar to snakes, venomous as well as non-venomous, of the fauna of tropical America. Although the poison of these narrow: mouthed snakes is probably as virulent as that of the pre- ceding, man has much less to fear from them, as they bite only under great provocation. Moreover, their bite must

mouth and the small size of their poison-fangs. They are also comparatively of small size, only a few species rarely exceeding a length of 3 feet.

SNAKES

No part of the world possesses so many snakes of this

+ gub-order as Australia, where, in fact, they replace the non-

venomous Colubrine snakes. Of the genus Diemenia six species, of Pseudechis three, and of Hoplocephalus some twenty species have been described, and many of them are extremely common and spread over a considerable area.

ar ERE zu Fig. 14.—A poisonous snake (Klaps fulvius) swallowing a non-poisonous (Homalocranium semicinctum).

Fortunately the majority are of small size, and their bites are not followed by more severe effects than those from the sting of a hornet, especially if

the simple measures of sucking or cauterizing the wound are resorted to. Only the following are dangerous to man and larger animals : —the Brown Snake (Diemenia superciliosa), found all over Australia and attaining to a length of over 5 feet; the Black Snake (Pseudechis porphyriacus), likewise common throughout the Australian continent, especially in low marshy places, and upwards of 6 feet in length; it is black, with each scale of the outer series red at the base ; when irritated it raises the fore part of its body and flattens out its neck like a cobra ; the Brown-banded Snake (Loplo-cephalus curtus), with a similar distribution, and also com- mon in Tasmania, from 5 to 6 feet long, and considered the most dangerous of the tribe. The small family Causidx contains two African genera ‘well known to and much feared by the inhabitants of South Africa. One, Sepedon hemachates, is named by the Boers “roode koper kapel” or “Ring-Neck Snake,” the latter name being, however, often applied also to the cobra. It resembles in colour some varieties of the latter snake, and, like this, it has the power, though in a less degree, of expanding its hood. But its scales are keeled and its form is more robust. It is equally active and courageous, hot rarely attacking persons who approach too near to its resting-place. In confinement it evinces great ferocity, opening its mouth and erecting its fangs, from which the poison is seen to flow in drops. During such periods of excitement it is even able, by the pressure of the muscles on the poison-duct, to eject the fluid to some distance ; hence it shares with the cobra a third Dutch name, that of “spuw slang” (Spitting Snake). It grows to a length of 2 or 3 feet. The second African snake of this family is the “schapsticker” (Sheep Stinger), Causus rhombeatus. It is extremely common in South Africa and extends far north- wards along the eastern as well as western coast. It is of smaller size than the preceding and causes more injury to animals, such as sheep, dogs, &c., than to man. It vanes in colour, but a black mark on the head like an hiverted V remains nearly always visible.

Good descriptions and figures of all these snakes are given in Krefit’s Snakes of Australia, Sydney, 1869, 4to.

The Dinophide are the arboreal type of this sub-order ; Dino- they resemble non-venomous tree snakes in their gracile P12.

form, narrow scales, generally green coloration, and in their habits ; nevertheless the perfect development of their poison-apparatus, their wide mouth, their large size (they grow to a length of 7 feet), leave no doubt that they are most dangerous snakes. They do not appear to be com- mon, but are spread over all districts of tropical Africa in which vegetation flourishes.

Of Sea Snakes (Hydrophide) some fifty species are known. Sea All are inhabitants of the tropical Indo-Pacific ocean, and snakes.

most numerous in and about the Persian Gulf, in the East Indian Archipelago, and in the seas between southern China and northern Australia. One species which is ex- tremely common (Pelamis bicolor), and which is easily re- cognized by the black colour of its upper and the yellowish tints of its lower parts (both colours being sharply defined), has extended its range westwards to the sea round Madagascar, and eastwards to the Gulf of Panama. Sea snakes are viviparous and pass their whole life in the water; they soon die when brought on shore. The most striking feature in their organization is their ele- vated and compressed tail. The hind part of the body is compressed, and the belly forms a more or less sharp ridge. The ventral shields would be of no use to snakes moving through a fluid, and there- fore they are either only rudimentary or entirely absent. The genus Platurus, how- ever, is a most remarkable exception in having broad ventral shields; probably these serpents frequently go on shore, sporting or hunting over marshy ground. In many sea snakes the hind part of the body is curved and prehensile, so that they are able to secure a hold by twisting this part of the body round corals, sea- weed, or any other projecting object. Their tail answers all the purposes of the same organ in fish, and their motions in the water are almost as rapid as they are un- certain and awkward when the animals are removed out of their proper element. Their nostrils are placed quite at the top yyo, 15.— of the snout, as in crocodiles and in fresh- water snakes, so that they are enabled to breathe whilst the entire body and the greater part of the head are immersed in the water. These openings are small and subcrescentic, and are provided with a

valve interiorly, which is opened during respiration, and closed when the animal dives. They have very capacious lungs, extending backwards to the anus, and consequently all their ribs are employed in performing the respiratory function ; by retaining air in these extensive lungs they are able to float on the surface of the water without the slightest effort, and to remain under water for a considerable length of time. The scales of sea snakes are frequently very different from those of other snakes: they overlap one another in only a few species; in others they are but little imbricate and are rounded behind; and in others they are of a subquadrangular or hexagonal form, placed side by side, like little shields. The less imbricate they are the more they have lost the polished surface which we find in other snakes, and are soft, tubercular, sometimes porous. Sea snakes shed their skin very frequently ; but it peels off in pieces as in lizards, and not as in the fresh- water snakes, in which the integuments come off entire. Several species are remarkable for the extremely slender

Sea snake, Pelamis bicolor,

and prolonged anterior part of the body, which is termed the “neck,” and terminates in a very small head. The eye is small, with round pupil, which is so much con- tracted by the light when the snake is taken out of the water that the animal becomes blinded and is unable to hit any object it attempts to strike. The tongue is short, and the sheath in which it lies concealed opens near to the front margin of the lower jaw; scarcely more than the two terminating points are exserted from the mouth when the animal is in the water. The mouth shuts in a somewhat different way from that of other snakes: the middle of the rostral shield is produced down- wards into a small lobule, which prevents the water from entering the mouth ; there is generally a small notch on each side of the lobule for the passage of the two points of the tongue. Cantor says that when the snake is out of the water and

Fic. 16.—Rattlesnake (Crotalus durissus). blinded by the light it freely makes use of its tongue as a feeler, The food of sea snakes consists entirely of small fish; the present writer has found all kinds of fish in their stomach, among them species with very strong spines (Apogon, Siluroids). As all these animals are killed by the poison of the snake before they are swallowed, and as their muscles are perfectly relaxed, their armature is harmless to the snake, which commences to swallow its prey from the head, and depresses the spines as deglutition proceeds. There cannot be the slightest doubt that sea snakes be- long to the most poisonous species of the whole order. Russell and Cantor have ascertained it by direct observa- tion : tortoises, other snakes, and fish died from their bite in less than an hour, and a man succumbed after four hours. Accidents are rarely caused by them, because they are extremely shy and swim away on the least alarm ; but, when surprised in the submarine cavities forming their natural retreats, they will, like any other poisonous terres- trial snake, dart at the disturbing object ; and, when out of the water, they attempt to bite every object near them,

even turning round to wound their own bodies (Cantor), They cannot endure captivity, dying in the course of two or three days, even when kept in capacious tanks. The greatest size to which some species attain, according to positive observation, is about 12 feet, and therefore far short of the statements as to the length of the so-called sea serpents (see SEA-SERPENT). The largest examples the present writer has seen measured only 8 feet.

Passing over Rattlesnakes (fig. 16) and Vipers, which are treated of in separate articles, we notice the following types of the fourth sub-order, the Ophidii viperiformes.

The sole representative of the sub-order in Australia is Death the Death Adder (Acanthophis antarctica), a short stout adder of |

snake having a similar habitus and habits to vipers and a Tana,

scarcely attaining 3 feet in length.

=

It differs from the

Fia. 17.—Echis carinata (India).

other Viperines in having the poison-fang permanently erect. Although much feared, and justly, there is reason to believe that its bite is not so dangerous as has been represented, and that the majority of the fatal accidents ascribed to it are in fact caused by other snakes, probably Hoplocephalus curtus. It occurs throughout the whole of Australia, except Tasmania and perhaps South Australia. Generally it is of a uniform grey colour, relieved by some forty dark rings of irregular outline.

The “tic-polonga” of the Singalese (Daboia russellit) is beautifully marked: on a light chocolate ground colour three series of large black white-edged rings run along the back and sides of the body, a yellow line borders the surface of the head on each side, the two lines being con- vergent on the snout. It attains to a length of 50 inches, and occurs locally in abundance in southern India, where

it is called “cobra monil”; in Bengal, where it is called

“jessur”; in the plains of central India, as well as in the Himalayas to an altitude of 6000 feet; and in Burmah. It is highly poisonous, probably causing many deaths.

Daboii russel

SNA—SNE

Fortunately its loud hissing when disturbed warns those who come within dangerous proximity to it.

The small Viperine snake, Echis carinata (fig. 17), which scarcely exceeds a length of 20 inches, shares with the pre- ceding part of its range, being found in the arid districts of southern India, and extending through the intervening parts of Asia to North Africa. It isa desert type, having the

lateral scales curiously arranged, strongly keeled, with the tips directed downwards. It produces with their aid a rustling sound. Whilst some observers deny that fatal consequences have resulted from its bite, Dr Imlach reports that it (the “kuppur”) is “ the most deadly poisonous snake

Fig. 18.—Trimeresurus erythrurus (India).

in Sind.” This desert type is replaced farther south in Africa where vegetation flourishes by a closely allied genus, Atheris, which, however, possesses a prehensile tail and vivid coloration and has assumed truly arboreal habits.

Of the pit vipers without rattles the largest and most formidable inhabit tropical America. Z’rigonocephalus araraca, T’. atrox, and J’. lanceolatus attain to a length of 6 feet, the first. two being common in Brazil and northwards to Central America. The last is limited to some islands in the West Indies, especially Martinique and St Lucia, and is generally known by the name of “fer de lance,” which has been given to it from the markings on itshead. It infests the sugar-plantations, and has greatly thultiplied in consequence of the protection which the cover of the cane-fields afforded it, and the abundance of food supplied by the rats which swarm on the plantations. Thus, whilst it did a certain amount of good by the destruction of vermin, it caused a great number of deaths among the black labourers who were engaged in the fields, These three species of Z’rigonocephalus are sur-

passed in size by Lachesis mutus, probably the largest of terrestrial poisonous snakes, ~~which is said to exceed a length of 10 feet, and is bulky in proportion. It is con~~ fined to the hottest parts of tropical America. Similar snakes, but smaller in size, inhabit the warmer and tem- perate parts of North America, viz., the Copper-head (Cenchris contortrix) and the Crater-mocassin (C. pisci- vorus), the former of terrestrial habits, the latter being always found near water and feeding chiefly on aquatic animals. Both are much feared and cause accidents more frequently than rattlesnakes, being more aggressive and striking the intruder without previously warning him of their presence. In the Indian region this type of pit vipers without rattles

is likewise well represented, one genus (Z'rimeresurus) being adapted for an arboreal life, like Atheris among the Viperidx. Their body (fig. 18) is not more elongate than that of other ground Crotalines, but their tail is prehensile, and their colour generally resembles that of the bright foliage among which they live. Some- times bright yellow or red markings render these snakes still more pleasing to the eye. Accidents caused by them are of not uncommon occurrence, but fortunately only a few individuals exceed a length of 2 feet, and the consequences of their bite are less to be dreaded than of that of other allied genera. Indeed, numerous cases are on record which show that the constitutional symptoms caused by their poison were of short duration, lasting only from two to forty-eight hours, and being confined to nausea, vomit- ing, and fever. The bite of larger specimens, of from 2 to 3 feet long, is more dangerous and has occasionally proved fatal. They feed on frogs, mammals, and birds. (A. c. G.)

SNAKE-STONE, a name sometimes applied to Water- of-Ayr stone (see Hons, vol. xii. p. 134). Certain stones reputed, on insufficient grounds, to possess efficacy as antidotes to snake-bites are known as snake-stones (see above, p. 192). The term is also popularly applied to ammonites and certain other fossils which, owing to their spiral shape, were formerly regarded as petrified snakes.

SNEEK, a town of the Netherlands, in the province of Friesland, 18 miles south-south-west of Leeuwarden, with which it is connected by canal and (since 1885) by rail. It is one of the great butter and cheese markets of the country and has communal buildings (1863), a town-house, a court-house, an orphanage, a synagogue, and several churches, in one of which (the Groote or Maartenskerk) is the tomb of the naval hero Lange Pier (Long Peter). The population of the town was in 1870 8456; that of the commune, which numbered only 3253 in 1714, was 9248 in 1870 and 10,496 in 1880.

Sneek appears in the list of Frisian towns in 1268. It was almost reduced to ashes in 1295, and again in 1417 and 1457, In 1515 it was attacked and in 1517 formally besieged by the Burgundians. A diet met in the town in the close of this latter year; and long after, in 1672, Sneek was again the seat of an assembly of the states. In 1570 and in 1825 there were severe inundations.

SNELL, Witteprorp (1591-1626), commonly known as SNELLIUS, astronomer and mathematician, was born at Leyden in 1591. In 1613 he succeeded his father as professor of mathematics in the university of Leyden. In 1615 he planned and carried into practice a new method of finding the dimensions of the earth, by deter- mining the distance of one point on its surface from the parallel of another, by means of a triangulation. His work Hratosthenes Batavus, published in 1617, describes the method and gives as the result of his operations be- tween Alkmaar and Bergen-op-Zoom a degree of the meridian equal to 55,100 toises= 117,449 yards. (A later recalculation has given 57,033 toises = 121,569 yards, after applying some corrections to the measures indicated by himself.) Snell also distinguished himself as a mathe- matician, and discovered the law of refraction, which,

however, is generally attributed to Descartes, who made it more widely known. Snell died at Leyden on 30th

October 1626.

In addition to the Eratosthencs Batavus he published Cyelometria sive de cireult dimensione (Leyden, 1621, 4to), and edited Cali et siderum in eo crrantium observationes Hassiace (ibid., 1618, 4to), containing the astronomical observations of Landgrave William IV. of Hesse. About his Tiphys Batavus s. Histiodromice, de navium cursibus ct re navali (1624), see NAVIGATION, vol, xvii. p. 255, note. A trigonometry (Doctrina triangulorwm) by him was published a year after his death.

SNIPE (Anglo-Saxon Snite, Icelandic Snipa, Dutch Snip, German Schnepfe), one of the commonest Limicoline birds, in high repute no less for the table than for the exciting sport it affords. It is the Scolopax gallinago of Linnzus, but by many later writers separated from that genus, the type of which is the Woopcock (q.v.), and hence has been variously named Gallinago ce#lestis, G. media, or G. scolopacina. Though considerable numbers are still bred in the British Islands, notwithstanding the diminished area suitable for them, most of those that fall to the gun are undoubtedly of foreign origin, arriving from Scandinavia towards the close

of summer or later, and many will outstay the winter if the weather be not too severe, while the home-bred birds emigrate in autumn to return the following spring. Of late years British markets have been chiefly supplied from abroad, mostly from Holland.

The Snipe is fortunately too well known to need description, for a description of its variegated plumage, if attempted, would be long. It may be noticed, however, as subject to no inconsiderable variation, especially in the extent of dark markings on the belly, flanks, and axillaries, while examples are occasionally seen in which no trace of white, and hardly any of buff or grey, is visible, —the place of these tints being taken by several shades of chocolate- brown. Such examples were long considered to form a distinct species, the S. sabiniz, but its invalidity is now generally admitted. Other examples in which buff or rust-colour predominates have also been deemed distinct, and to these has been applied the epithet russata. the tail, whose rectrices normally number 14, and present a rounded termination, has led to the belief in a species, S. brehnvi, now wholly diseredited. But, setting aside two European species, to be pre- sently noticed more particularly, there are at least a score, more or less nearly allied, belonging to various parts of the world, for no considerable territory is without its representative. Thus North America produces G. wilsoni, so like the English Snipe as not to be easily distinguished except by the possession of 16 rectrices, and Australia has G. australis, a larger and somewhat differently coloured bird with 18 rectrices. India, while affording a winter resort to multitudes of the common species, which besides Europe extends its breeding range over the whole of northern Asia, has the so-called Pin-tailed Snipe, @. stenwra, in which the number of rectrices is still greater, varying from 20 to 28, it is said, though 22 seems to be the usual number. This curious variability, de- serving more attention than it has yet received, only occurs in the outer feathers of the series, which are narrow in form and extremely stiff, there being always 10 in the middle of ordinary breadth.

Those who only know the Snipe as it shows itself in the ,shoot- ing-season, when without warning it rises from the boggy ground uttering a sharp note that sounds like scape, seape, and, after a few rapid twists, darts away, if it be not brought down by the gun, to disappear in the distance after a desultory flight, have no con- ception of the bird’s behaviour at breeding-

time. Then, though flushed quite as suddenly, it will fly round the intruder, at times almost hovering over his head. But, if he have patience, he will see it mount aloft and there execute a scries of aerial evolutions of an astounding kind. After wildly circling about, and reaching a height at which it appears a mere speck, where it winnows a random zigzag course, it abruptly shoots downwards and aslant, and then as abruptly stops to regain its former elevation, and this process it repeats many times. A few seconds, more or less according to distance, after each of these headlong descents a mysterious sound strikes his ear—compared by some to drumming and by others to the bleating of a sheep or goat,! which sound evidently comes from the bird as it shoots downwards, and then only ; but how the sound is made is a question on which many persons are still unde- cided. There arc those who maintain that it proceeds from the throat, while some declare it is produced by the wings, which sharp-sighted observers say they can see in tremulous motion. ee SE eee

1 Hence in many languages the Snipe is known by names signifying "Flying Goat," "Heaven's Ram," as in Seotland by "'Heather-bleater."

SNI—SNI

Again, a slight deviation froin the ordinary formation of

Others, again, assert that it is caused by the vibration of the webs of the outer rectrices, and these last have in support of their opinion the fact that a similar sound may be made by affixing those feathcrs to the end of a rod and drawing them rapidly downwards in the same position as they oceupy in the bird's tail while it is performing the feat.? But, however it be produced, the air wil] also ring with loud notes that have been syllabled tinker, tinker tinker, while other notes in a different key, something like djepp, djcpp, djcpp rapidly uttered, may be heard as if in response. The nest is always on the ground and isa rather deep hollow wrought in a tuft of herbage, and lined with dry grass-leaves. The eggs ave four in number, of a dark olive colour, blotched and spotted with rich brown. The young when freshly hatched are beautifully clothed in down of a dark maroon, variegated with black, white and buff.

The Double or Solitary Snipe of English sportsmen, S. major, a larger species, also inhabits northern Europe and may be readily re- cognized by the white bars in its wings and by its 16 or occasionally 18 rectrices. It has also avery different behaviour. When flushed it rises without alarm-cry, and flies heavily. In the breeding season much of its love-performance is exhibited on the ground, an the sounds to which it gives rise are of another character ; but the exact way in which its “drumming” is effected has not been ascer- tained. Its gesticulations at this time have been well described by Prof, Collett ina communication to Mr Dresser’s Birds of Ewrope (vol. vii. pp. 635-637). It visits Great Britain every year at the close of suminer, but in very small numbers, and is almost always seen singly—not uncommonly in places where no one could expect to find a Snipe.

The third species of which any details can here be given is the Jack-3 or Half-Snipe, S. gallinula, the smallest and most beautifully coloured of the group. Without being as numerous as the common or full Snipe, it is of frequent occurrence in Great Britain from Sep- tember to April (and occasionally both earlier and later); but it breeds only, so far as is known, in northern Scandinavia and Russia ; and the first trustworthy information on that subject was obtained by Wolley in June 1853, when he found several of its nests near Muonioniska in Lapland.4 Instead of rising wildly as do most of its allies, it generally lies so close as to let itself be almost trodden upon, and then takes wing silently, to alight at a short distance (if it escape the gun), and to return to the same place ou the morrow, In the breeding-season, however, it is as noisy and conspicuous as its larger brethren while executing its aerial evolutions.

As a group the Snipes are in several respects highly specialized, but here there is only space to mention the sensitiveness of the bill, which, though to some extent noticeable in many Sandpipers (see vol. xxi. p. 260), is in Snipes carried to an extreme by a number of filaments, belonging to the fifth pair of nerves, which run almost to the tip, and open immediately under the soft cuticle ina series of cells that give this portion of the surface of the premaxillaries, when exposed, a honeycomb- like appear- ance, Thus the bill becomes a most delicate organ of sensation, and by its means the bird, while probing for food, is at once able to distinguish the nature of the objects it encounters, though these are wholly out of sight. So far as is

known, the sternum of all the Snipes, except the Jack-Snipe, departs from the normal Limicoline forma- tion, a fact which tends to justify the removal of that species to a separate genus, Limnocryptes.° (A. XN.)

2 Of. Meves, Efvers. K. Vet.-Akad. Forh., 1856, pp. 275-277 (transl. Naumannia, 1858, pp. 116, 117), and Proc. Zool. Society, 1858, p- 202, with Wolley's remarks thereon, Zool. Garten, 1876, pp. 204-208. 3 Though this word is elearly not intended as a nickname, such as is the prefix, which custom has applied to the Daw, Pie, Redbreast, Titmouse, or Wren, one ean only guess at its origin or meaning. It may be, as in Jackass, an indication of sex, for it is a popular belief that the Jack-Snipe is the male of the common species ; OF, again, it may refer to the eomparatively small size of the bird, as the "jack" in the game of bowls is the smallest of the balls used, and as fishermen eall the smaller Pikes Jaeks.

4 His aceount was published by Hewitson in May 1855 (Hogs Br. Birds, 3d ed., ii. pp. 356-358).

5 The so-called Painted Snipes, forming the genus Rhynchea, demand a few words, Four species have been described, natives respectively of South America, Africa, India with China, and Australia. In all of these it appears that the female is larger and more brilliantly eoloured than the male, and in the Australian species she is further distinguished by what in most birds is emphatically a masculine pro- perty, though its use is here unknown,—namely, a eomplex trachea, while the male has that organ simple. He is also believed to under- take the duty of incubation.

SNO—S NO

SNORRO STURLUSON (Snorri, son of Sturla) (1179- 1241), the celebrated Icelandic historian, born in 1179, the youngest son of a chief in the Vestfirdir (western fiords), was brought up by a powerful chief, Jon Loptsson, in Odda, who seems first to have awakened in him an interest for history and poetry. His career begins with his marriage, which made him a wealthy man; in 1206 lie settled at Reykjaholt, where he constructed magnificent buildings and a bath of hewn stones, preserved to the present day, to which water was conducted from a neighbouring hot spring. He early made himself known as a poet, especially by glorifying the exploits of

the contemporary Norse kings and earls ; at the same time he was a learned lawyer, and from 1215 became the ‘logsdgumadr,” or president of the legislative assembly and supreme court of Iceland. The prominent features of his character seem to have been cunning, am- bition, and avarice, combined with want of courage and aversion to effort. By royal invitation he went in 1218 to Norway, where he remained a long time with the young king Hakon and his tutor Earl Skul. When, owing to disputes between Icelandic and Norwegian merchants, Skuli thought of a military expedition to Iceland, Snorro persuaded him to give up this plan, promising to make the inhabitants submit to Hakon of their own free will. Snorro himself became the ‘‘lendrmadr,” vassal or baron, of the king of Norway, and held his lands as a fief under him. On his return home Snorro sent his son to the king as a hostage, and made peace between Norway and Iceland, but his power and influence were used more for his own enrichment and aggrandizement— he was “logsdgumadr ” again from 1222 to 1232—than for the advantage of the king. Hakon, therefore, stirred up strife between Snorro’s kinsman Sturla and Snorro, who had to fly from Reykjaholt in 1236; and in 1237 he left the country and went back to Norway. Here he joined the party of Skuli, who was meditating a revolt. Learning that his cousin Sturla in Iceland had fallen in battle against Gissur, Snorro’s son-in-law, Snorro, although expressly forbidden by his liege lord, returned to Iceland in 1239 and once more took possession of his property. Meanwhile Hakon, who had vanquished Skuli in 1240, sent orders to Gissur to punish Snorro for his disobedience either by capturing him and sending him back to Norway or by putting him to death. Gissur took the latter course, attacked Snorro at his residence, Reykja- holt, and slew him on 22d September 1241.

Snorro is the author of the Edda and of the Sagas of the Nor- wegian Kings. ‘The Edda, now called the Prose Edda, to distinguish it from the Poetic or Semund’s Edda, was finished in 1222, and con- sists of three parts. (1) The Gylfaginning, or the Delusion of Gylfi, with a short preface, gives a suminary of the ancient Norse myth- ology, founded on the Véluspdé and othcr mythical poems; the author gives a euhemeristic account of the ancient gods, regarding them as chiefs versed in witchcraft who had immigrated to the north and there introduced their special religion. (2) The Skdlds- kaparmdl, or Art of Poetry, gives, under the form of a dialogue between the god Bragi and the giant (jotun) Agir, an explanation of all

figurative mythological expressions of the ancient poetry, and the rules for using them. (3) The Hdttatal, or Enumeration of Metres, is a running commentary on three poems composed by Snorro in 1222 in honour of Hakon and Skuli, the stanzas of which, numbering about a hundred, are each in a different metre. In the MSS. the Hdda has received many additions, which are wrongly aseribed toSnorro. For different editions see Eppa. The Sagas of the Norwegian Kings gives a connected series of biographies of the kings of Norway down to Sverri in 1177; here the author stops, because the history of Sverri and his successors had already boen written. The work opens with the Ynglinga Saga, a brief history of the pre- tended immigration into Sweden of the Asir, of their successors in that eountry, the kings of Upsala, and of the oldest Norwegian kings, their deseendants. Next come the biographies of the succeeding

orwegian kings, the most detailed being those of the two mission- ary kings Olaf Tryggvason and St Olaf. Snorro's sources were partly Sueeinct histories of the realm, as the chronological sketch of Ari ; partly more voluminous early collections of traditions, as the Noregs Konungatal (Fagrskinna) and the Jarlasaga; partly legendary

lographies of the two Olafs; and, in addition to these, studies and

collections which he himself made during his journeys in Nor- way. All these he worked up with great independence and critical sagacity into an harmonious whole. His critical principles are ex- plained in the preface, where he dwells on the necessity of starting as much as possible from trustworthy contemporary sources, or at least from those nearest to antiquity,—the touchstone by which verbal traditions can be tested being contemporary poems. He inclines to rationalisin, rejecting the marvellous and recasting legends containing it in a more historical spirit ; but he makes an exception in the accounts of the introduction of Christianity into Norway and of the national saint St Olaf. Snorro's style is peculiar to himself. He strives everywhere to impart life and vigour to his narrative, to express the sentiments and feelings of the actors, and he gives the dialogues in the individual character of each person. Especially in this last he shows a tendency to epigram and often uses humorous and pathetic expressions.

Besides his principal work, he elaborated in a separate form its better and larger part, the History of St Olaf (the great Olaf's Saga). In the preface to this he gives a brief extract of the earlier history, and, as an appen- dix, a short account of St Olaf's miracles after his death ; here too he employs critical art, as appears from a comparison with his source, the Latin legend.

The Sagas of the Norwegian Kings has been preserved in several MSS. of the 13th century ; the oldest of these, no longer extant, had lost at an early period its first leaf containing the preface, and thus came to begin with the words, Kringla heimstns(=orbis terrarum), which caused first this MS. and later (about 1700) the whole work to be called the Heimskringla. Editions: —by Pering- skidld, 3 vols. fol., Stockholm,1697; by Gerhard Schoning and Skule Thorlacius, 3 vols. fol., Copenhagen, 1777-1783; by C. R. Unger, 1 vol. 8vo, Christiania, 1868. Modern translations :—into Danish, by N. F. 8. Grundtvig, 1818-22 ; Norwegian, by Jacob Aall, 1833-39, and by P. A. Munch, 1859; Swedish, by Richert, 1816- 29, and by H. Hildebrand, 1869-71 ; German, by Wachter, 1835-36; English, by Laing, 1844. (G. 8.

SNOW. See Mergorotocy, vol. xvi. p. 154; also GxoLoey, vol. x. pp. 280-281.

SNOWDROP, Galanthus nivalis, is the best-known representative of a small genus of Amaryllids, all the species of which have bulbs, linear leaves, erect flower- stalks, destitute of leaves but bearing at the top a solitary pendulous bell-shaped flower. The white perianth is six- parted, the outer three segments being larger and more convex than the inner series. The six anthers open by pores or short slits. The ovary is three-celled, ripening into a three-celled capsule. The snowdrop is a doubtful native of Great Britain, but is largely cultivated for market in Lincolnshire. There are numerous varieties, differing in the size of the flower and the period of flowering. The double form is probably the least attractive. Other dis- tinct species of snowdrop, not to be confounded with the varieties before mentioned, are the Crimean snowdrop, G. »licatus, with broad leaves folded like a fan, and G@. LElwesii, a native of the Levant, with large flowers, the three inner segments of which have a much larger and more conspicuous green blotch than the commoner kinds. All the species are very graceful, and as universal favourites ainply repay cultivation.

SNOW-SHOES are a kind of foot gear used by Indians and trappers in Canada for travelling over the frozen surface of snow. In the long North-American winters they are the sole means of locomotion whenrailways and roads are snowed up, as the frozen surface of snow is not sufficiently consistent to support the weight of the human body without artificial aid. The snow-shoer protects his feet by wearing moccasins of moose-skin, The framework of a snow-shoe consists of a long narrow piece of pliable hickory wood, placed edge- ways and then bent round with an oval-shaped front, and is adorned on the sides with tufts of crimson wool. The ends taper gradually to the rear, where they are fastened firmly to each other. The total length is about 39 inches and the width from 13 to 16 inches. Across the oval, and fitted into the inside of the framework by mortices, are two battens of wood, 5 or 6 inches clear of both ends. Over the front one at an open space a deerskin thong is fastened, forming an aperture for the reception of the great toe.. The thong is then crossed over the top of the foot, passed round and tied to the sides. This leaves the heel free to move up and down on the shoe and rests the weight of it on the toes. Over the remainder of the oval

is stretched a network of tightly drawn strips of leather. At a convention held in Montreal on 30th December 1871 a rule was passed that a “pair of racing shoes, including strings, shall not weigh less than 14 tb nor measure less than 10 inches of gut in width.” The motion of a snow- shoer in the distance is curious and resembles that of some ungainly web-footed animal. On using the implements the knees must be turned inwards and the fore part of the feet outwards to avoid wounding the ankles with the frameworks. At first the fatigue and consequent stiffness are great ; but with practice this wears off and the motions become easy. ‘The speed attained as compared to that in skating is not quick. The following are the best recorded times in Montreal, Canada, with shoes of regulation size and weight :—100 yards, 12 sec. ; 220 yards, 26 sec. ; + mile, 1 min. 72 sec. ; 4 mile, 2 min. 33 sec. ; # mile, 4 min. 21 sec.; 1 mile, 5 min, 424 sec.; 2 miles, 11 min, 523 sec.; 3 miles, 20 min. 18 sec.; 4 miles, 27 min, 10) see. ; 41 miles, 30 min. 36 sec. ;

5 miles, 33 min. 494 sec. The best history of the pastime and its records is Montreal Snow-shoe Club, sm. 8vo, Montreal, 1882.

SNUFF. See Tosacco,

SNYDERS, Franz (1579-1657), painter of animals and still life, was born at Antwerp in 1579. In 1593 he was studying under Peter Breughel, and afterwards he received instruction from Henry van Balen, the first master of Vandyke. He devoted himself to painting flowers, fruit, and subjects of still life, but afterwards turned to animal-painting, and executed with the greatest skill and spirit hunting pieces and combats of wild animals, His composition is rich and varied, his drawing correct and vigorous, his touch bold and thoroughly ex- pressive of the different textures of the furs and skins of the animals represented. His excellence in this depart- ment excited the admiration of Rubens, who frequently employed him to paint animals, fruit, and still life in his own pictures, and he assisted Jordaens in a similar manner. In the lion and boar hunts which bear the name of Snyders the hand of Rubens sometimes appears. He was appointed principal painter to the archduke Albert, governor of the Low Countries, for whom he executed some of his finest works. One of these, a Stag-Hunt, was presented to Philip IIL, who commissioned the artist to paint several subjects of the chase, which are still pre- served in Spain. Snyders died at Antwerp in 1657.

SOAP may in general terms be defined as a chemical compound resulting from the union of fatty oils and fats with alkaline bodies. In a scientific definition the com- pounds of fatty acids with basic metallic oxides, lime, magnesia, lead oxide, &c., should also be included under soap ; but, as these compounds are insoluble in water, while the very essence of a soap in its industrial relations is solubility, it is better to speak of the insoluble compounds as “ plasters,” limiting the name “soap” to the compounds of fatty acids with soda and potash. Soap both as a medi- cinal and as a cleansing agent was known to Pliny (H.W, xxviii. 51), who speaks of two kinds—hard and soft—as used by the Germans. He mentions it as originally a Gallic invention for giving a bright hue to the hair (“ruti- landis capillis”). There is reason to believe that soap came to the Romans from Germany, and that the detergents in use in earlier times and mentioned as soap in the

Old Testament (Jer. ii. 22; Mal. iii. 2, &c.) refer to the ashes of B97), and other such purifying agents (comp. vol. x. p. 697).

Till Chevreul's classical researches on fatty bodies (1811- 23) it was believed that soap consisted simply of a binary compound of fat and alkali. Claude J. Geoffroy in 1741 pointed out that the fat or oil recovered from a soap solution by neutralization with a mineral acid differs from

the original fatty substance by dissolving readily in alcohol which is not the case with ordinary fats and oils. The significance of this observation was overlooked ; and equally unheeded was a not less important discovery by Scheele in 1783. In preparing lead plaster by boiling olive oil with oxide of lead and a little water—a process palpably analogous to that of the soap-boiler—he obtained a sweet substance which, called by himself ' Oelsiiss" (" principium dulce oleorum"), is now known as "glycerin." These discoveries of Geoffroy and Scheele formed the basis of Chevreul's researches by which he laid bare the con- stitution of oils and the true nature of soap. (See Oits, yol. xvii. p. 740, and Giycerrn, vol. x. p. 697.) In those articles it is pointed out that all fatty oils and fats are mixtures of glycerides, that is, of bodies related to the alcohol glycerin C;H,(OH),, and some fatty acid such as palmitic acid (C,,H,;0,)H. Under suitable conditions C,H,(OH)s + 8(CygHs,0.)H give C3H53 + 3H,0 Glycerin. Palinitic Acid. Palmitin, Water.

The corresponding decomposition of palmitin into palmitic acid and glycerin takes place when the glyceride is distilled in superheated steam, and similarly it can be realized by

boiling in water mixed with a suitable proportion of caustic

potash or soda, But in this case the fatty acid unites

with the alkali into its potash or soda salt, forming a soap— C3H, (CigH3102)s + 8Na0H = 8NaC,gH:0. + C,H;(OH), Palmitin. Soda Hydrate. Soap. Glycerin.

Of the natural fats or glycerides contained in oils the most

important in addition to palmitin are stearin and olein, and these it may be sufficient to regard as the principal fatty bodies concerned in soap-making.

The general characters of a soap are a certain greasiness

to the touch, ready solubility in water, with formation of

viscid solutions which on agitation yield a tenacious froth or “lather,” an indisposition to crystallize, readiness to

amalgamate with small proportions of hot water into homogeneous slimes, which on cooling set into jellies or

more or less consistent pastes. Soaps give an alkaline reaction and have a decided acrid taste; in a pure condi- tion—a state never reached in practice —they have neither smell nor colour. Almost without exception potash soaps even if made from the solid fatty acids are “soft,” and soda soaps, although made with fluid olein, are “hard”; but there are considerable variations according to the pre- vailing fatty acid in the compound. Almost all soda soaps are precipitated from their watery solutions by the addition of a sufficiency of common salt. Potash soap with the same reagent undergoes double decomposition—a proportion being changed into a soda soap with the forma- tion of chloride of potassium. Soap when dissolved in a large amount of water suffers hydrolysis, with formation of a precipitate of alkaliferous fatty acid and a solution con- taining free alkali. Its cleansing power is ordinarily ex- plained by this reaction ; but it is difficult to see why a solution which has just thrown off most of its fatty acids should be disposed to take up even a glyceride. It 1s more likely that the cleansing power of soap is due to the inherent property of its solution to emulsionize fats.

Resin soaps are compounds of soda or potash with the complex acids (chiefly abietic) of which coniferous resins consist. ‘Their formation is not due to a true process of saponification ; but they occupy an important place ™ compound soaps.

MANUFACTURE.—The varicties of soaps made are numerous ; the purposes to which they are applied are varied ; the materials em- ployed embrace a considerable range of oils, fats, and other bodies ; and the processes adopted undergo many modifications, As regards processes of manufacture soaps ay be made by the direct combina- tion of fatty acids, separated from oils, with alkaline solutions. In the manufacture of stearin for candles, &c., the fatty matter is de- composed, and the liquid olein, separated from the solid fatty acids, is employed as an ingredient in soap-making. A soap SO made 1s

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SO

not the result of saponification but of a simple combination, as is the case also with resin soaps. All other soaps result from the com- bination of fatty oils and fats with potash or soda solutions under conditions which favour saponification. The soap solution which results from the combination forms soap-size and is a mixture of soap with water, the excess alkali, and the glycerin liberated from the oil. In such condition ordinary soft soaps and certain kinds of hard soap are brought to the market. In curd soaps, however, which form the basis of most household soap, the uncombined alkali and the glycerin are separated by ‘‘salting out,” and the soap in this condition contains about 30 per cent. of water. Soap may be framed and finished in this state, but almost invariably it receives a further treatment called “refining ” or “ fitting,” in which by remelting with water, with or without the subsequent addition of other agents to harden the finished product, the soap may be made to contain from 60 to 70 per cent. of water and yet present a firm hard texture.

Among the raw materials used by the soap-boiler the principal fatty bodies are tallow, lard, palm oil, palm-kernel oil, olive oil, cotton-seed oil, sesame oil, and cocoa-nut oil for hard soaps, and fish oils, linseed oil, marrow fat, and the lower qualities of other oils obtained by extraction, &c., for potash or soft soaps. Almond oil, sperinaceti, cocoa-butter, ground-nut oil, and some others form the basis of certain toilet and medicinal soaps. Resin and colophony form essential ingredients in yellow soaps. The alkalis are used almost exclusively in the condition of caustic lyes,—solutions of their

respective hydrates in water. Caustic soda is now obtained direct from the soda manufacturer, and one operation, causticizing the soda, is thus spared the soap-boiler. Potash lyes are, however, principally sharpened or causticized by the soap-boiler himself from potash carbonate, the process for which is described under PorAssiuM METALS (vol. xix. p. 589).

The process of soap-boiling is carried out in large iron boilers called “soap pans” or “coppers,” some of which have capacity for a charge of 30 tons or more. The pan proper is surmounted by a great cone or hopper called a curb, to provide for the foaming up of the boiling mass and to prevent loss trom overflowing. Formerly the pans were heated by open firing from below; but now the almost universal practice is to boil by steam injected from per- forated pipes foiled within the pan, such injection favouring the uniform heating of the mass and causing an agitation favourable to the ultimate mixture and saponification of the materials. Direct firing is used for the second boiling of the soap mixture ; but for this superheated steam may with advantage be substituted, either aniied by a steam-jacket round the pan or by a closed coil of pipe within it. In large pans a mechanical stirring apparatus is pro- vided, which in some cases, as in Morfit’s steam ‘‘ twirl,” is formed of the steam-heating tubes geared to rotate. Closed cylinders in which the materials are boiled under pressure are also employed for certain soaps.

Curd Soap.—The oil mixture used differs in the several manu- facturing countries, and the commercial name of the product is correspondingly varied. In Germany tallow is the principal fat ; in France olive oil occupies the chief place and the product is known as Marseilles or Castile soap ; and in England tallow and palm oil are largely used. But in all countries a mixture of several oils enters into the composition of curd soaps and the proportions used have no fixity. For each ton of soap to be made from 12 to 16 cwts. of oil is required. The soap pan is charged with the tallow or other fat, and open steam is turned on. So soon as the tallow is melted a quantity of weak lye is added, and the agitation of the injected steam causes the fat and lye to become intimately mixed and pro- duces a milky emulsion. ‘As the lye becomes absorbed, a condition Indicated by the taste of the goods, additional quantities of lye of mereasing strength are added. After some tiine, the contents of the pan begin to clear and become in the end very

transparent. Lye still continues to be poured in till a sample tastes distinctly alkaline,—a test which indicates that the whole of the fatty acids have been taken up by and combined with the alkali. Then with- out further addition of alkali the boiling is continued for a few minutes, when the soap is ready for salting out or ‘ graining.” Hither common salt or strong brine in measured quantity is added to the charge, and, the soap being insoluble in such salt solution, 4 separation of constituents takes place: the soap collects on the surface in an open granular condition, and the spent lye sinks to the bottom after it has been left for a short time to settle. Suppos- Ing now that a pure soap withont resin is to be made—a product little scen in the market —the spent lye is run off, steam is again turned on, ure water or very weak lye run in, and the contents boiled up till the whole is thin, close, and clear. The soap is from this again grained off or salted out, and the underlye so thrown down carries with it coloured impurities which may have been in the materials or which arise from contact with the boiler. Such Washing process may have to be repeated several times when im- Pure materials have been used. The spent lye of the washing being drained off, the soap now receives its strengthening boil. Steam 18 turned on, and, the mass being brought to a clear condition with

weak lye or water, strong lye is added and the boiling continued with close steam till the lye attains such a state of concentration that the soap is no longer soluble in it, and it will separate from. the caustic lye as from a common salt solution. The contents of the pan are once more allowed to cool aud settle, aud the soap as now formed constitutes a pure curd soap, carrying with it some pro- portion of uncombined alkali, but containing the minimum amount of water. It may be skimmed off the underlye and placed direct in the frames for solidification ; but that is a practice scarcely at all followed, the addition of resin soap in the pan and the sub- sequent ‘‘crutching in” of silicate of soda and adulterant mixings being features common to the manufacture. The lye from the strengthening boil contains much alkali and is used in connexion with other boilings,

Afottled Soap.—A pure curd soap always carries with it into the cooling frame a considerable amount of coloured impurity, such as iron sulphate,

&c. When it is permitted to cool rapidly the colouring matter remains uniformly disseminated throughout the mass ; but when means are taken to cause the soap to cool and solidify slowly a segregation takes place: the stearate and palmitate form a semi-crystalline solid, while the oleate, solidifying more slowly, comes by itself into translucent veins, in which the greater part of the coloured matter is drawn. In this way mottled or marbled soap is formed, and such mottled appearance was formerly highly valued as an indication of freedom from excess of water or other adulteration, because in fitted soaps the impurities are either washed out or fall to the bottom of the mass in cooling. Now, however, the most perfect mottle can be produced by working colouring matter into the soap in the frame, and mottling is very far from being a certificate of excellence of quality.

Yellow Soap consists of a mixture of any hard fatty soap with a variable proportion—up to 40 per cent. or more—of resin soap. That substance by itself has a tenacious gluey consistence, and its intermixture in excess renders the resulting compound soft and greasy. The ordinary method of adding resin consists in stirring it in small fragments into the fatty soap in the stage of clear- boiling ; but a better result is obtained by separately preparing a fatty soap and the resin soap, and combining the two in the pan after the underlye has been salted out and removed from the fatty soap. The compound then receives its strengthening boil, after which it is fitted by boiling with added water or weak lye, continu- ing the boil till by examination of a sample the proper consistency has been reached. On settling a dark-coloured “nigger” or under- lye separates out, which, because it contains some soap and alkali, is saved for future use,

Marine Soap.—Cocoa-nut oil behaves as regards saponification quite differently from all other oils and fats in relation to the caustic alkalis. It does not form an emulsion with weak alkalis ; these even under prolonged boiling have no influence on the fat. With strong alkaline solutions, on the other hand, it saponifies with the utmost readiness even without heat, and forms without the separation of any underlye a soap of stiff firm consistence notwith- standing the presence of a very large percentage of water. Such soap is not insoluble in a strong solution of salt ; hence it forms a lather and can be used for washing with sea-water, from which peculiarity it derives its name ‘‘marine soap.” Being thus soluble in salt water it cannot of course be

salted out like common soaps ; but if a very concentrated salt solution is used precipitation is effected, aud a curd soap is separated so hard and refractory as to be practically useless. Cocoa-nut soap is usually prepared by the so-called cold method, in which the fat heated to 80° C. is treated with a calculated quantity of caustic soda solution of sp. gr. 1°350, the two constituents being stirred together till the setting and hardening of the combination prevents further agitation. The property that cocoa-nut soap possesses of absorbing large propor- tions of water, and yet presenting the appearance of a hard solid body, makes the material a favourite basis for highly sophisticated compounds, in which water, sulphate of soda, and other alkaline solutions, soluble silicates, fuller's earth, starch, &c., play an im- portant and bulky part. Cocoa-nut soap is little prepared by itself; but it forms a principal ingredient in compound soaps meant to imitate curd and yellow soaps. Two principal methods of prepar- ing such compound soaps are employed. In the first way the ordinary oil and the cocoa-nut oil are mixed and saponified together with such a measured quantity of alkaline solution as serves to produce a hard soap without any salting out or separation of under- lye. According to the second plan, the ordinary oil is treated as for the preparation of a curd soap, and to this the cocoa-nut soap separately saponified is added in the pan and both are boiled to- gether till they form a homogeneous soap.

Silicate Soaps.—A further means of enabling a soap to contain large proportions of water and yet present a firm consistence is found in the use of silicate of soda. The silicate in the form of a concentrated solution is crutched or stirred into the soap in a mechanical mixing machine after the completion of the saponifica- tion, aud it appears to enter into a distinct chemical combination with the soap. While silicate soaps bear heavy watering, the

soluble silicate itself is a powerful detergent, and it possesses certain advantages when used with hard waters, so that, taking its cheap- ness into account, the question whether its introduction into soap is a fraud may be fairly discussed and much said in its defence.

Framing.—The frames into which hard soaps are ladled for cooling and solidification consist of rectangular boxes made of iron plates and bound and clamped together in a way that allows the sides to be removed when required. The solidification is a very gradual pro- cess, depending, of course, for its completion on the size of the block ; but before cutting into bars it is essential that the whole should be set and hardened through and through, else the cut bars would not hold together. Many ingenious devices for forming bars have been produced ; but generally a strong frame is used, aeross which steel wires are stretched at distances equal to the size of the bars to be made, the blocks being first cut into slabs and then into bars.

Soft Soup.—As already said, soft soaps are made with potash lyes, although in practice a small quantity of soda is also used to give the soap some consistence. There is no separation of underlyes in potash soap, consequently the product contains the whole eonsti- tuents of the oils used, as the operation of salting out is quite im- practicable owing to the double decomposition which results from the action of salt, producing thereby a hard principally soda soap with formation of chloride of potassium. Owing to this circum- stance it is impossible to ‘‘fit” or in any way purify soft soap, and all impurities whieh go into the pan of necessity enter into the finished product. The making of soft soap, although thus a much less complex process than hard soap making, is one that demands much skill and experience for its suceess. From the conditions of the manufacture care must be taken to regulate the amount and strength of the alkali in proportion to the oil used, and the degree of concentration to which the boiling ought to be continued has to be determined with close observation. ;

Toilet Soaps, &c.—Soaps used in personal ablution in no way

differ from the soaps previously alluded to, and may consist of any of the varieties. It is of consequence that they should, as far as nossible, be free from excess of alkali and all other salts and foreign ingredients which may have an injurious effect on the skin. The manufacturer of toilet soap generally takes care to present his wares in convenient form and of agreeable appearance and smell; the more weighty duty of having them free from uncombined alkali is in many cases entirely overlooked. Transparent soaps are prepared by dissolving ordinary soap in strong alcohol and

distilling otf the greater portion of the alcohol till the residue comes to the condi- tion of a thick transparent jelly. This, when cast into forms and allowed to harden and dry slowly, comes out as transparent soap. A class of transparent soap may also be made by the cold process, with the use of cocoa-nut oil, castor oil, and sugar. It generally contains a large amount of uncombined alkali, and that, with its unpleasant odour of cocoa-nut oil, makes it a most undesirable soap for personal use. Toilet soaps of common quality are perfumed by simple melting and stirring into the mass some eheap odorous body that is not affected by alkalis under the influence of heat. The finer soaps are perfumed by the cold method ; the soap is shaved down to thin slices, and the essential oil kneaded into and mixed with it by special machinery, after which it is formed into cakes by pressure in suitable moulds.

Glycerin soap ordinarily consists of about equal parts of pure hard soap and glycerin (the latter valuable for its emollient properties). The soap is melted by heat, the glycerin is stirred in, and the mixture strained and poured into forms, in which it hardens but slowly into a transparent mass. With excess of glycerin a fluid soap is formed, soap being soluble in that body, and such fluid soap has only feeble lathering properties. Soap containing small proportions of glycerin, on the other hand, forms a very tenacious lather, and when soap bubbles of an enduring character are desired glycerin is added to the solution. Soaps are also pre- pared in which large proportions of fine sharp sand, or of powdered pumice, are incorporated, and these substances, by their abrading action, powerfully assist the detergent influence of the soap on hands much begrimed by manufacturing operations.!

Medicated soaps contain certain substances which exercise a specific influence on the skin.

The following table indicates the average conzposition of several commercial soaps :—

sn ie ee a a eS 1 “Soap powders” and “ soap extracts” are simply preparations of alkalis.

Soda.

3 2 a ‘ Fatty y 28 3 oa Water.) scid.|Com-| ree! & |S) 2) 55 1°™ bined. | 7°” | & | ale On Tallow soap ….| 28°8 580 6°8 16 23 | 25 Marseilles soap, mothled . is… 10°15 | 76°0 8°65 | 0°25 = 4°95 Palm-oil soap ..| 35°4 | 49°9 | 7:0 | 10 « 11 | 56 Yellow soap ….| 22°23 | 62°95] 8°03) .. He 6°79 Cocoa-nutoilsoap| 58°74 | 32°82 | 4:26) 1°50 er. 2°26 | 0-42 Silicate soap ….| 50°4 eo MOF fs a, OBS ES Be ¥ Bottsoap ssc ws 43°3 | 41°9 a lor? oo Be A

Soap Analysis. —Here it will be sufficient to mention a few tests

which can be executed without special chemical knowledge. To de- termine the water in a soap—a most important question—a few thin slices are weighed and dried in a stove at 105°C. so long as loss of weight continues. water in the sample. phates, &c. and insoluble earthy adnuixtures are detected by boiling a sample with alcohol, in which only the soap proper dissolves, The residue is colleeted in a filter, washed with hot alcohol, and weighed. An excessive proportion of surplus alkali can be detected by dissolving the soap in hot water and adding

The loss of weight is the measure of uncombined Added salts, such as alkaline silicates, sul-

a sufficiency of saturated solution of common salt to salt it out. The alkali remains

in solution and can be determined by the amount of a standard acid

solution it neutralizes. ;

Commerce. —Marseilles has long been recognized as the most im- portant centre of the soap trade, a position that city originall achieved through its ready command of the supplies of olive oil, The city is still very favourably situated for obtaining supplies of oils both local and foreign, including sesame, ground nut, castor oil, &e. In England the soap trade did not exist till the 16th century. In the reign of Charles I. a mnonoply of soap-making was farmed to a corporation of soap-boilers in London,—a proceed- ing which led to serious complications. From 1712 to 1853 an excise duty

ranging from 1d. to 3d. was levied on soap made in the United Kingdom, and that heavy impost (equal when 8d. to more than 100 per cent.) greatly impeded the development of the industry. In 1798, when the excise duty was 24d. on hard and 12d. on soft soap, the revenue yielded was a little over £400,000 ; in 1815 it was almost £750,000; in 1835, when the duty was levied at 14d. and 1d. respectively (and when a drawback was allowed for soap used in manufactures), the revenue was almost £1,000, 000; and in 1852, the last year in which the duty was levied, it amounted to £1,126,046, with a drawback on exportation amount- ing to £271,000. What the manufacture has risen to since that time there is no accurate way of estimating. (W. D.—d. PA.)

SOAP BARK. A vegetable principle known as “sap- onin,” and chemically analogous to the arabin of soluble gums and to mucilage, forms with water a lather, and is on that account available as a substitute for soap. Saponin is obtainable from soap nuts, the fruit of a tree, Saponaria officinalis and allied species; but its most important source is the Quillai bark of Chili yielded by a large tree, Quillaja saponaria. The inner bark of the tree, reduced to powder, is employed in Chili as a substitute for soap.

SOBIESKI, Joun, king of Poland. See JonN TII., vol.

xiii. p. 714, and Poanp, vol. xix. p. 295. SOCAGE is a form of tenure. Bracton, Britton, and other old writers derived the word from the French soe, ‘a ploughshare.” Modern etymologists, however, prefer to derive it from the Old English soc, “a franchise ” or “ privi- lege,” or the land over which such franchise or privilege was exercised. Socage differs from knight service in being agricultural rather than military in its nature, and from frankalmoign in being based on temporal rather than spiritual services. It is either free or villein. Free socage in capite was abolished by 12 Car. II. c. 24. That form of free socage called common socage is the ordinary modern freehold tenure. Varieties of it are burgage, gavelkind, and petit serjeanty. Scutage, while it existed, was another variety. The only representative of villein socage is the comparatively rare tenure of ancient demesne confined to manors, described in Domesday Book as terre regis. Socage tenure is said to have formerly existed in Scotland. The descent of socage lands in

Scotland seems to have been to all the sons equally, as was originally the case 10 England. (See BurGacE, GavELKIND, Ruat Estate, ScuracE.)

2 Including resin aeids.

SOCIALISM’

HE word “socialism” is of comparatively recent origin, having been coined in England in 1835. In that year a society which received the grandiloquent. name of the ‘“*‘ Association of all Classes of all Nations” was founded under the auspices of Robert Owen; and the words “socialist” and “‘socialism” were first used during the discussions which arose in connexion with it. As Owen and his school had no esteem for the political reform of the time, and laid all emphasis on the necessity of social improvement and reconstruction, it is obvious how the name came to be recognized as suitable and distinctive. The term was borrowed from England by a distinguished French writer, Reybaud, in his well-known work the Reformateurs modernes (1839), in which he discussed the theories of Saint-Simon, Fourier, and Owen. Through Reybaud it soon gained wide currency on the Continent, and is now the accepted world-historic name for one of the most remarkable movements of the 19th century.

The name was thus first applied in England to Owen’s theory of social reconstruction, and in France to those also of Saint-Simon and Fourier. The best usage has always connected it with the views of these men and the cognate opinions which have since appeared. The word, however, is used with a great variety of meaning not only in popular speech and by politicians but even by economists and learned critics of socialism. The general tendency is to regard as socialistic any interference with property undertaken by society on behalf of the poor, the limitation of the principle of /atssez-faire in favour of the suffering classes, radical social reform which disturbs the present system of private property as regulated by free competition. It is probable enough that the word will be permanently used to express the tendency indicated in these phrases, as a general name for the strong reaction that has now set in against the overstrained individualism and one-sided freedom which date from the latter half of the 18th century.

The application is neither precise nor accurate; but it is use and wont that determine the meaning of words, and this seems to be the tendency of use and wont.

Even economic writers differ greatly in the meaning they attach to the word. The great German economist ’ Roscher defines it as including “those tendencies which demand a greater regard for the common weal than consists with human nature.” Adolf Held says that “we may define as socialistic every tendency which demands the subordina- tion of the individual will to the community.” Janet more precisely defines it as follows :—‘‘ We call socialism every doctrine which teaches that the state has a right to correct the inequality of wealth which exists among men and to legally establish the balance by taking from those who have too much in order to give to those who have not enough, and that in a permanent manner, and not in such and such a particular case,—a famine, for instance, a public calamity, dc.” Laveleye explains it thus: “In the first place every socialistic doctrine aims at introducing greater equality in social conditions, and in the second place at realizing those reforms by the law or the state.” Von Scheel simply defines it as the “economic philosophy of the suffering classes.” Of all these definitions it can only be said that they more or less faithfully reflect current opinion as to the nature of socialism. They are either too vague

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4 The aim of the present article is essentially to give a history and ex- position of socialism in its leading phases and principles. The point of view is objective,—to explain what socialism has been and is. A controversial or critical article on the many vexed questions sug-

gested by the subject would have been inconsistent with the plan of this work,

or they are misleading, and they quite fail to bring out the clear and strongly marked characteristics that distinguish the phenomena to which the name of socialism is properly applied. To say that socialism exacts a greater regard for the common weal than is compatible with human nature is to pass sentence on the movement, not to define it. In all ages of the world, and

under all forms and tendencies of government and of social evolution, the will of the individual has been subordinated to the will of society, often unduly so. It is also most misleading to speak as if socialism must proceed from the state as we know it. The early socialism proceeded from private effort and experiment. A great deal of the most notorious socialism of the present day aims not only at subverting the existing state in every form but all the existing political and social institutions. The most powerful and most philosophic, that of Karl Marx, aimed at superseding the existing governments by a vast international combination of the workers of all nations, without distinction of creed, colour, or nationality.

Still more objectionable, however, is the tendency not Socialism unfrequently shown to identify socialism with a violent noe pcg

ially vio- d, lent and t lawless,

and lawless revolutionary spirit. As sometimes use ‘“‘socialism” means nothing more nor less than the mos modern form of the revolutionary spirit with a suggestion of anarchy and dynamite. This is to confound the essence of the movement with an accidental feature more or less common to all great innovations. Every new thing of any moment, whether good or evil, has its revolutionary stage in which it disturbs and upsets the accepted. beliefs and institutions. The Protestant Reformation was for more than a century and a half the occasion of national and international trouble and bloodshed. The suppression of American slavery could not be effected without a tremen- dous civil war. There was a time when the opinions com- prehended under the name of “liberalism” had to fight to the death for toleration; and representative government was at one time.a revolutionary innovation. The fact that a movement is revolutionary generally implies only that it is new, that it is disposed to exert itself by strong methods, and is calculated to make great changes. It is an unhappy feature of most great changes that they have been attended with the exercise of force, but that is be- cause the powers in possession have generally attempted to suppress them by the exercise of force.

In point of fact socialism is one of the most elastic and protean phenomena of history, varying according to the time and circumstances in which it appears and with the character and opinions and institutions of the people

who adopt it. Such a movement cannot be condemned or approved en bloc. Most of the current formule to which it has been referred for praise or censure are totally errone-

ous and misleading. Yet in the midst of the various Its cen- theories that go by the name of ‘‘socialism” there is a kernel] tral prin- ciple eco- nomic.

of principle that is common to them all. That principle is of an economic nature, and is most clear and precise. The central aim of socialism is to terminate the divorce of the workers from the natural sources of subsistence and} of culture. The socialist theory is based on the historical assertion that the course of social evolution for centuries has gradually been to exclude the producing classes from the possession of land and capital and to establish a new stibjection, the subjection of workers, who have nothing to depend on but precarious wage-labour. The socialists maintain that the present system (in which land and capital are the property of private individuals freely struggling for increase of wealth) leads inevitably to social and

Points of differ- ence amongst socialists.

Great changes implied in social- ism.

economic anarchy, to the degradation of the working man and his family, to the growth of vice and idleness among the wealthy classes and their dependants, to bad and in- artistic workmanship, and to adulteration in all its forms ; and that it is tending more and more to separate society into two classes, wealthy millionaires confronted with an enormous mass of proletarians,—the issue out of which must either be socialism or social ruin. To avoid all these evils and to secure a more equitable distribution of the means and appliances of happiness, the socialists propose that land and capital, which are the requisites of labour and the sources of all wealth and culture, should become the property of society, and be managed by it for the general good. In thus maintaining that society should assume the management of industry and secure an equit- able distribution of its fruits

socialists are agreed, but in the most important points of detail they differ very greatly.

They differ as to the form society will take in carrying out the socialist programme, as to the relation of local bodies to the central government, and whether there is to be any central government, or any government at all in the ordinary sense of the word, as to the influence of the national idea in the society of the future, &c. They differ also as to what should be regarded as an “equitable” system of distribution, The school of Saint-Simon advocated a social hierarchy in which every man should be placed according to his capacity and rewarded according to his works. In the communities of Fourier the minimum of subsistence was to be guaranteed to each out of the common gain, the remainder to be divided between labour, capital, and talent,—five-twelfths going to the first, four- twelfths to the second, and three-twelfths to the third. At the revolution of 1848 Louis Blanc proposed that remu- neration should be equal for all members of his social workshops. In the programme drawn up by the united social democrats of Germany (Gotha, 1875) it is provided that all shall enjoy the results of labour “‘according to their reasonable wants,” all of course being bound to work. It is needless to say also that the theories of socialism have been held in connexion with the most varying opinions in philosophy and religion. A great deal of the historic socialism has been regarded as a necessary implicate of idealism. Most of the prevailing socialism of the day is based on the frankest and most outspoken revolutionary materialism. On the other hand, many socialists hold that their system is a necessary outcome of Christianity, that socialism and Christianity are essen- tial the one to the other; and it should be said that the ethics of socialism are closely akin to the ethics of Chris- tianity, if not identical with them.

Still it should be insisted that the basis of socialism is economic, involving a fundamental change in the relation of labour to land and capital,—a change which will largely affect production, but will entirely revolu- tionize the existing system of distribution. But, while its basis is economic, socialism implies and carries with it a change in the political, ethical, technical, and artistic arrangements and institutions of society which would con- stitute a revolution greater probably than has ever taken place in human history, greater than the transition from the ancient to the medizval

world, or from the latter to the existing order of society. In the first place, such a change generally assumes as its political complement the most thoroughly democratic organization of society. The early socialism of Owen and Saint-Simon was marked by not a little of the autocratic spirit; but the tendency of the present socialism is more and more to ally itself with the most advanced democracy. So- cialism, in fact, claims to be the economic complement of democracy, maintaining that without a fundamental

economic change political privilege has neither meaning nor value. In the second place, socialism naturally goes with an unselfish or altruistic system of ethics. The most characteristic feature of the old societies was the exploita- tion of the weak by the strong under the systems of slavery, serfdom, and wage-labour. Under the socialistic régime it is the privilege and duty of the strong and talented to use their superior force and richer endowments in the service of their fellow-men without distinction of class or nation or creed. In the third place, socialists maintain that under their system and no other can the highest excellence and beauty be realized in industrial production and in art, whereas under the present system beauty and thoroughness are alike sacrificed to cheapness, which is a necessity of successful competition. Lastly, the socialists refuse to admit that individual happiness or freedom or character would be sacrificed under the social arrangements they propose. They believe that under the present system a free and harmonious development of indi- vidual capacity and happiness is possible only for the privi- leged minority, and that socialism alone can open up a fair opportunity for all. They believe, in short, that there is no opposition whatever between socialism and indi- viduality rightly understood, that these two are comple- ments the one of the other, that in socialism alone may every individual have hope of free development and a full realization of himself.

Having seen, then, how wide a social revolution 1s Bssence

implied in the socialistic scheme of reconstruction, let us of sovia ism,

repeat (1) that the essence of the theory consists in this —associated production with a collective capital with the view to an equitable

distribution. In the words of Schiftle, ‘the Alpha and Omega of socialism is the trans- formation of private competing capitals into a united collective capital” (Quwintessenz des Socialismus). A. Wag- ner’s more elaborate definition of it (in his Grundlegung) is entirely in agreement with that of Schiiffle. This is the principle on which all the schools of socialism, how- ever opposed otherwise, are at one. Such a system, while insisting on collective capital (including land), is quite consistent with private property in other forms, and with perfect freedom in the use of one’s own share in the equitable distribution of the produce of the associated labour. A thoroughgoing socialism demands that this principle should be applied to the capital and production of the whole world; only then can it attain to supreme and perfect realization. But a sober-minded socialism will admit that the various intermediate stages in which the principle finds a partial application are so far a true and real development of the socialistic idea. (2) Socialism is both a theory of social evolution and a working force im the history of the 19th century. Some of the most eminent socialists, such as Rodbertus, regard their theory as a pro phecy concerning the social development of the future rather than as a subject of agitation. In their view socialism 1s the next stage in the evolution of society, destined after many generations to supersede capitalism, as capitalism displaced feudalism and feudalism succeeded to slavery. Even the majority of the most active socialists consider the question as still in the stage of agitation and propaganda, their present task being that of enlightening the masses until the consummation of the present social development, and the declared bankruptcy of the present social order, shall have delivered the world into their hands. Socialism, therefore, is for the most part a theory affecting the future, more or less remote, and has only to a limited degree gained a real and practical footing in the life of our time. Yet it should not be forgotten that its theories have most powerfully affected all the ablest recent

economic writers of Germany, and have even considerably

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modified German legislation. Its influence is rapidly growing among the lower and also among the most ad- vanced classes in almost every country dominated by European culture, following as a destroying negation the development of capitalism. (3) In its doctrinal aspects socialism is most interésting as a criticism of the present economic order, of what socialists call the capitalistic system, with which the existing land system is connected. Under the present economic order land and capital (the material and instruments without which industry is impossible) are the property of a class, employing a class of wage- labourers handicapped by their exclusion from land and capital. Competition is the general rule by which the share of the members of those classes in the fruits of pro- duction is determined. Against this system critical social- ism is @ reasoned protest ; and it is at issue also with the prevailing political economy, in so far as it assumes or maintains the permanence or righteousness of this eco- nomic order. Of the economic optimism implied in the historic doctrine of Jazssez-faire socialism is an uncom- promising rejection. (4) Socialism is usually regarded as a phase of the struggle for the emancipation of labour, for the complete participation of the working classes in the material, intellectual, and spiritual inheritance of the human race. This is certainly the most substantial and most prominent part of the socialist programme, the working classes being the most numerous and the worst sufferers from the present régime. This view, however, is rather one-sided, for socialism claims not less to be in the interest of the small capitalist gradually crushed by the competition of the larger, and in the interest also of the large capitalist, whose position is endangered by the huge unmanageableness of his success, and by the world-wide economic anarchy from which even the greatest are not secure. Still it is the deliverance of the working class that stands in the front of every socialistic theory ; and, though the initiative in socialist speculation and action has usually come from the middle and upper classes, yet it is to the working men that they generally appeal.

While recognizing the great confusion in the use of the word “socialism,” we have treated it as properly a pheno- menon of the 19th century, beginning in France with Saint-Simon and Fourier, in England with Robert Owen, and most powerfully represented at the present day by the school of Karl Marx. As we have seen, however, there are definitions of the word which would give it a wider range of meaning and a more ancient

beginning, com- pared with which capitalism is but of yesterday,—which would, in fact, make it as old as human society itself. In the early stages of human development, when the tribe or the village community was the social unit, the subordina- tion of the individual to the society in which he dwelt was the rule, and common property was the prevalent form. In the development of the idea of property, especially as re- gards land, three successive historical stages are broadly re- cognized,—common property and common enjoyment of it, common property and private enjoyment, private property and private enjoyment. The last form did not attain to full expression till the end of the 18th century, when theprinciple of individual freedom, which was really a reaction against privileged restriction, was proclaimed as a positive axiom of government and of economics. 'The free individual struggle for wealth and for the social advantages dependent on wealth is a comparatively recent thing. In all periods jof history the state reserved to itself the right to interpose In the arrangements of property,—sometimes in favour of the poor, as in the case of the English poor law, which may thus be regarded as a socialistic measure. Moreover, all through history revolts in favour of a rearrangement of Property have been very frequent. And in the societies

of the Catholic Church we have a permanent example of common property and a common enjoyment of it.

How are we to distinguish the socialism of the 19th century from these old-world phenomena, and especially from the communism? which has played so great a part in history? To this query socialists, especially of the school of Marx, have a clear and precise answer. Socialism is a stage in the evolution of society which could not arrive till the conditions necessary to it had been established. The first and most essential of these was the development of the great industrialism which after a long period of pre- paration and gradual growth began to reach its culminating point with the inventions and technical improvements, with the application of steam and the rise of the factory system, in England towards the end of the 18th century. Under this system industry was organized into a vast social operation, and was thus already socialized ; but it was a system that was

exploited by the individual owner of the capital at his own pleasure and for his own behoof. Under the pressure of the competition of the large industry, the.small capitalist is gradually crushed out, and the working pro- ducers become wage-labourers organized and drilled in immense factories and workshops. The development of this system still continues and is enveloping the whole world. Such is the industrial revolution. Parallel with this a revolution in the world of ideas equally great and equally necessary to the rise of socialism has taken place. This change of thought which made its world-historic announcement in the French Revolution made reason the supreme judge and had freedom for its great practical watchword. It was represented in the economic sphere by the school of Adam Smith. Socialism was an outcome

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ism.

of it too, and first of all in Saint-Simon and his school Saint- professed to give the positive and constructive corrective to Simon,

a negative movement which did not see that it was merely negative and therefore temporary. In other words, Saint- Simon may be said to aim at nothing less than the com- pletion of the work of Voltaire, Rousseau, and Adam Smith. Thus socialism professes to be the legitimate child of two great revolutions,—of the industrial revolution which began to establish itself in England towards the end of the 18th century, and of the parallel revolution in thought which about the same time found most prominent expression in France. Robert Owen worked chiefly under the influence of the former; Saint-Simon and Fourier grew up under the latter. The conspiracy of Babeuf is properly to be regarded as a crude revolutionary communism not essen- tially different from the rude efforts in communism made in earlier periods of history. With Saint-Simon and Owen historic socialism really begins, and is no longer an isolated fact, but has had a continuous and widening development, the succession of socialistic teaching and propaganda being taken up by one country after another throughout the civilized world.

We have.seen, then, that the rise of socialism as a new and reasoned theory of society was relative to the industrial revolution and to the ideas proclaimed in the French Revolution, prominent among which, besides the much emphasized idea of freedom and the less easily realized ideals of equality and fraternity, was the conception of the worth and dignity of labour. Though Owen was most largely influenced by the former and Saint-Simon and Fourier by the latter, it is certain that all three were

1 As used in current speech, and also in economics, no very definite line of distinction between communism and socialism can be drawn. Generally speaking communism is a term for a system of common property, and this should be accepted as the reasonably correct usage of the word ; but even by socialists it is frequently used as practically synonymous with socialism. Collectivism is a word which has recently come into vogue to express the economic basis of socialism as above explained.

greatly affected by both the new movements. The motive power in Owen's career was the philanthropy and humani- tarjanism of the 18th century. He had grown up in the midst of the industrial revolution ; he was one of the most successful pioneers in the improvement of the cotton manu- facture. No one could be more deeply conscious of the enormous abuses of the factory system ; and no one better knew the wonderful services it could render if technical improvement were only made subordinate to human well- being. In the career of Owen we see the new spirit of the 18th century seeking to bring the mechanism of the new industrial system under the direction of a nobler prin- ciple, in which the good of all should be the great and sole aim. The position of Saint-Simon was considerably different, yet akin. As Owen had before his eyes the evils of a young but gigantic industrialism, Saint-Simon con- templated the hoary abuses of an idle and privileged feudalism, fearfully shaken no doubt by the Revolution, but still strong in Europe, and in France as elsewhere powerfully revived during the period after Waterloo. Saint- Simon saw that a new world, an industrial

world resting on labour, had arisen, while the old feudal and theological world—fainéant courtiers and a clergy steeped in ignorance still ruled. All this array of parasites, who had no longer any useful function to perform for society, Saint-Simon sought to replace by the industrial chiefs and scientific leaders as the real working heads of the French people. Only he expected that these exceptionally gifted men, instead of exploiting the labour of others, should control an industrial France for the general good. Neither Owen nor Saint-Simon was revolutionary in the ordinary sense. Owen was most anxious that the English and other Govern- ments should adopt his projects of socialistic reform. Leading statesmen and royal personages befriended him. He had no faith in the political reforms of 1832; he reckoned the political side of chartism as of no account, and he preferred socialistic experiment under autocratic guidance until the workmen should be trained to rule themselves. The same autocratic tendency was very pro- nounced in Saint-Simon and his school. His first appeal was to Louis XVIII. He wished to supersede the feudal aristocracy by a working aristocracy of merit. His school claim to have been the first to warn the Governments of Europe of the rise of revolutionary socialism. (For further information as to Saint-Simon and his school, see SAINT- Srmon.) The good and bad aspects of the Saint-Simon socialism are too obvious to require elucidation in this article. The antagonism between the old economic order and the new had only begun to declare itself. The extent and violence of the disease were not yet apparent ; both diagnosis and remedy were superficial and premature. Such deep-seated organic disorder was not to be conjured away by the waving of a magic wand. The movement was all too utopian and extravagant in much of its activity. The most prominent portion of the school attacked social order in its essential point—the family morality—adopting the worst features of a fantastic, arrogant, and prurient sacerdotalism, and parading them in the face of Kurope. Thus it happened that a school which attracted so many of the most brilliant and promising young men of France, which was so striking and original in its criticism of the existing condition of things, which was so strong in the spirit of initiative, and was in many ways so noble, un- selfish, and aspiring, sank amidst the laughter and indigna- tion of a scandalized society. The beginning of socialism may be dated from 1817, the ear when Owen laid his scheme for a socialistic com- munity before the committee of

the House of Commons on the poor law, the year also that the speculations of Saint-Simon definitely took a socialistic direction. The

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outlines of the history of socialism are very simple, Till 1850 there was a double movement in France and England. In the former country after Saint-Simon and Fourier the movement was represented chiefly by Proudhon and Louis Blanc. In England after Owen the movement was taken up by the body of Christian socialists associated with Maurice and Kingsley. The more recent socialism is due chiefly to German and also Russian thinkers, but is

generally international both in sympathy and activity. Considered as a purely literary and speculative product} Fourier }

the socialism of Fourier was prior to those of both Owen and Saint-Simon. His great work, Théorie des Quatre Mouve- ments, was published as early as 1808. The socialism of Fourier, however, scarcely attracted any attention and exercised no influence till those of Owen and Saint-Simou were on the decline. His system is one in which the wildest fantasy is mixed with ingenious theory and the most searching criticism of the present competitive system ; even yet it is almost unrivalled in pungency and effective- ness. The pantheistic conception of the world which underlay the Saint-Simonian theory of the “ rehabilitation of the flesh” formed the basis also of the social ethics and arrangements of Fourier. According to Fourier, evil is the artificial product and attendant of civilization, the result of

perverted human institutions, which have run counter to the

ordinances of the Creator in pronouncing passions and affec- tions to be bad which are simply natural. Between the creature and the Creator there have been 5000 years of misunderstanding. There is but one way of removing this

misunderstanding,—to give a free and healthy and com-

plete development to our passions. This Fourier sought to accomplish in his phalanges, which, united in a system of free federation, would, as he believed, soon cover the world (see FouRIER).

The year 1830 was an important turning-point in the Revol-| that tiou of

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history of socialism. During the fermentation of time the activity of the Saint-Simon school came toa crisis, and the ideas of Fourier had an opportunity of taking practical effect. Some of the Saint-Simonians joined him. The movement in France was short-lived; and the numerous experiments tried in America were not more successful. One of the most notable societies suggested by Fourier's influence, but entirely free from his immoral tendencies, was Brook Farm, established by George Ripley and other cultured Americans in 1840. A most praiseworthy and successful institution also suggested by the teaching of Fourier is the Familistére at Guise (Aisne) conducted by M. Godin. But by far the greatest result of the revolution of 1830 was the definitive establishment of the contrast be- tween the bourgeoisie and the proletariat. Hitherto these two classes had fought side by side against feudalism and the reaction. The bourgeoisie were now rulers, and the proletariat became the revolutionary party, the first outbreak under the new conditions taking place at Lyons in 183], when the starving workmen rose to arms with the device, "Live working or die fighting." During the latter half of the reign of the bourgeois king Louis Philippe Paris be- came more than ever the centre of socialistic fermentation. In 1839 Louis Blanc published his Organisation du Travail, and Cabet his Voyage en Icarie. In 1840 Proudhon pub- lished his book on property. At this period Paris counted among her visitors Lassalle, the

founder of the social de- mocracy of Germany; Karl Marx, .the chief of scientific international socialism; and Bakunin, the apostle of anarchism.

The socialism of Saint-Simon and Fourier was largely speculative, imaginative, and utopian, and had only a very remote connexion with the practical life of ther time J With Louis Blane (1811-1882) socialism came into real Loui) contact with the public history of France. The most cod

spicuous feature of Louis Blanc's teaching was that he demanded the democratic organization of the state as pre- paratory to social reorganization. His system, therefore, had a positive and practical basis, in so far as it allied itself to a dominant tendency in the existing state. Louis Blane was an eminent journalist, born at Madrid, where his father had a high post on the finances of King Joseph. His celebrated work on socialism, Organisation du Travail, exerted a very large influence on the thought of France. The formula of progress, says Louis Blanc, is double in its unity,—moral and material amelioration of the lot of all by the free co-operation of all and their fraternal associa- tion. He saw, however, that the great end of social re- form could not be attained without political reform. It was not enough to discover the true methods for inaugurat- ing the principle of association and the organization of labour according to the rules of reason, justice, and human- ity. It was necessary to have political power on the side of social reform, political power resting on the chambers, on the tribunals, and on the army ; not to take it as an in- strument was to meet it as an obstacle. For these reasons he wished to see the state constituted on a thoroughly democratic basis as the first condition of success. He demanded that the state thus reformed should establish associations, which he called social workshops, for co-opera- tive production. The money should be provided by the state, which also should draw up the rules. The state should appoint the functionaries for the first year. After that the workmen should elect their own managers. "Though the false and anti-social education given to the present generation makes it difficult to find any other motive of emulation and encouragement than a higher salary, the wages will be equal, as the ideas and character of men will be changed by an absolutely new education." Louis Blanc hoped that private firms would not be able to exist

under the competition of such associa- tions, and that the latter would in time absorb all the production of the country. Notwithstanding the influence exerted by Louis Blanc and the working men's party in the provisional Government of 1848, it cannot be said that his plans obtained a fair hearing or a fair trial. His schemes were certainly not carried out in the national workshops of that year. These were really a travesty of Louis Blane's proposals, instituted expressly to discredit them. They were simply means of finding work for a motley proletariat thrown out of employment during the period of revolutionary disturbance ; and these men were put to unproductive work, whereas of course Louis Blanc contemplated nothing but productive work, and the men he proposed to invite to join his associations were to give guarantees of character. The months following the re- volution of February were, moreover, a period of industrial stagnation and insecurity, when any new project of trade, either on the old or new lines, had very little prospect of Success. 'This remark applies largely also to the private associations for co-operative production subsidized by the republican Government. These were more closely akin to the plans of Louis Blanc ; but to them also the times were unfavourable, and the help given them was both scanty and injudicious. As one of the leaders during this diffi- cult crisis Louis Blanc had neither personal force nor enduring political influence sufficient to secure any con- siderable success for his cause. He was an amiable and Senial enthusiast, but without weight enough to be a,con- troller of men on a wide scale. 'The labour conferences at

the Luxembourg, over which he presided, ended also as.

8 opponents desired, without any tangible result. The proletariat at Paris, incensed at the closing of the national Workshops, rose in armed insurrection, which was over-

thrown by Cavaignac in the sanguinary days of June (see |

_ wretched in the extreme.

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Cavaienac). Louis Blane was in no way implicated in the revolt, but he found it necessary to go into exile in England. With the bloodshed of the

days of June French socialism ceased for a time to be a considerable force, Socialism in the true acceptation of the word was indeed only partially responsible for the insurrection. It was a rising of a proletariat not particularly versed in theories of social reconstruction, but deeply incensed at the re- actionary measures of their rulers. Inasmuch, however, as it destroyed the most enterprising leaders of the work- men and quelled the spirit of the remainder, it thoroughly repressed the tendency to innovation amongst them for a long time to come, while the false prosperity of the second empire removed their most crying grievances. Under Napoleon III. there was consequently comparative quiet- ness in France. Even the International had very little influence on French soil, though French working men had an important share in starting it.

Compared with the parallel movement in France the England, early socialism of England had an uneventful history (see Owen.

Owen). In order to appreciate the significance of Owen's work it is necessary to recall some of the more important features of the social condition of the country in his time. The English worker had no fixed interest in the soil. He had no voice either in local or national government. He had little education or none at all. His dwelling was The right even of combination was denied him till 1824. The wages of the agricultural labourer were miserably low. The workman's share in the benefits of the industrial revolution was doubtful. Great numbers of his class were reduced to utter poverty and ruin by the great changes consequent on the introduction of improved machinery; the tendency to readjustment was slow and continually disturbed by fresh change. The hours of work were mercilessly long. He had to compete against the labour of women, and of children brought fre- quently at the age of five or six from the workhouses. These children had to work the same long hours as the adults, and they were sometimes strapped by the over- seers till the blood came. Destitute as they so often were of parental protection and oversight, with both sexes huddled together under immoral and insanitary conditions, it was only natural that they should fall into the worst habits, and that their offspring should to such a lament- able degree be vicious, improvident, and physically de- generate. In a country where the labourers had neither education nor political or social rights, and where the peasantry were practically landless serfs, the

old English poor-law was only a doubtful part of an evil system. All these permanent causes of mischief were aggravated by special causes connected with the cessation of the Napole- onic wars, which are well known. It was in such circum- Stances, when English pauperism had become a grave national question, that Owen first brought forward his scheme of socialism (1817). In his communities, which were intended to be self-dependent units, Owen sought to provide the best education and the constant exercise of unselfish intelligence, to unite the advantages of town and country, and to correct the monotonous activity of the factory with the greatest variety of occupation, while utilizing all the latest improvements in industrial technique. The causes of Owen's failure in establishing his communi- ties are obvious enough. Apart from the difficulties in- herent in socialism, he injured the social cause by going out of his way to attack the historic religions and the accepted views on marriage, by his quixotry and tediousness, by refusing to see that for the mass of men measures of transition from an old to a new system must be adopted. If he had been truer to his earlier methods and retained the autocratic guidance of his experiments, the chances of XXII, — 27

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Chartism.

Christian socialism in Eng- land.

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success would have been greater. Above all, Owen had too great faith in human nature, and he did not understand the laws of social evolution. His great doctrine of the influence of circumstances in the formation of character was only a very crude way of expressing the law of social continuity so much emphasized by recent socialism. He thought that he could break the chain of continuity, and as by magic create a new set of circumstances, which would forthwith produce a new generation of rational and unselfish men. The time was too strong for him, and the current of English history swept past him. Evena very brief account of Owen, however, would be incomplete without indicating his relation to Malthus. Against Mal- thus he showed that the wealth of the country had, in con-

sequence of mechanical improvement, increased out of all proportion to the population. The problem, therefore, was not to restrict population, but to institute rational social arrangements and to secure a fair distribution of wealth. Whenever the number of inhabitants in any of lis communities increased beyond the maximum, new ones should be created, until they extended over the whole world, uniting all in one great republic with one interest. There would be no fear of over-population for a long time to come. Its evils were then felt in Treland and other coun- tries ; but that condition of things was owing to the total want of the most ordinary common sense on the part of the blinded authorities of the world. ably never arrive when the earth would be full; but if it should the human race will be good, intelligent, and rational, and would know much better than the present irrational generation how to provide for the occurrence. Such was Owen's socialist treatment of the population problem.

In England the reform of 1832 had the same effect as the revolution of July (1830) in France : it brought the middle class into power, and by the exclusion of the work- men emphasized their existence as a separate class. The discontent of the workmen now found expression in Chart- ism. As is obvious from the contents of the charter, Chartism was most prominently a demand for political reform; but both in its origin and in its ultimate aim the movement was more essentially economic. As regards the study of socialism, the interest of this movement hes greatly in the fact that in its organs the doctrine of ' sur- plus value" afterwards elaborated by Marx as the basis of his system is broadly and emphatically enunciated. While the worker produces all the wealth, he is obliged to con- tent himself with the meagre share necessary to support lis existence and the surplus goes to the capitalist, who, with the king, the priests, lords, esquires, and gentlemen, lives upon the labour of the working man (Poor Man's Guardian, 1835).

After the downfall of Owenism began the Christian socialist movement in England (1848-52), of which the leaders were Maurice, Kingsley, 'and Mr Ludlow. The abortive Chartist demonstration of April 1848 excited in Maurice and his friends the deepest sympathy with the sufferings of the English working class,—a feeling which was intensified by the revelations regarding '' London Labour and the London Poor" published in the Morning Chromele (1849). Mr Ludlow, who had in France become

acquainted wvith the theories of Fourier, was the economist of the movement, and it was with him that the idea originated of starting co-operative associations. In Politics for the People, in the Christian Socialist, in the pulpit and on the platform, and in Yeast and Alton Locke, well-known novels of Kingsley, the representatives of the movement exposed the evils of the competitive system, carried on an unsparing warfare against the Manchester school, and maintained that socialism rightly understood was only Christianity applied to social reform, Their labours in

The period would prob- ,

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insisting on ethical and spiritual principles as the true bonds of society, in promoting associations, and in diffusing a knowledge of co-operation were largely beneficial. In the north of England they joined hands with the co-operative movement inaugurated by the Rochdale pioneers (1844) under the influence of Owenism. Productive co-operation made very little progress, but co-operative distribution has proved a great success.

In 1852 the twofold socialist movement in France and England had come toa close, leaving no visible result of any importance. From that date the most prominent leaders of socialism have been German and Russian. To reach the beginnings of German socialism we must go back a little, as it took its rise in the years preceding the revolu- tion of 1848. Its most conspicuous Friedrich Engels, two, see LassALLE and Ropsertus). The greatest and most influential of the four was unquestionably Marx, who and his like-minded companion Engels are the acknow- ledged heads of the “scientific and revolutionary” school of socialism, which has its representatives in almost every country of the civilized world, and is generally recognized as the most serious and formidable form of socialism. Karl Marx (1818-1883) was of Jewish extraction, He was born at Treves, and studied at Berlin and Bonn, but neglected the speciality of law, which he nominally adopted, for the more congenial subjects of philosophy and history. He was a zealous student and apparently an adherent of Hegelianism, but soon gave Up his intention of following an academic career as a teacher of philosophy and jomed the staff of the Rhenish Gazette, published at Cologne as an organ of the extreme democracy. In

1843, after marry ing the sister of the Prussian minister Von Westfalen, he removed to Paris, where he applied himself to the study of economic and social questions and began to publish those youthful writings which must be reckoned among the most i powerful expositions of the early form of German socialism. With Arnold Ruge he edited the Deutsch-Franzisische Jahrbiicher. In 1845 he was expelled from Paris and settled in Brussels, where he published his Discours sur le Libre Echange, and his criticism of Proudhon's Philosophie de la Misere, entitled Misére de la Philosophie. Yn Paris he had already met Friedrich Engels, who was destined to be his lifelong and loyal friend and companion-in-arms, and who in 1845 published his important work Die Lage der arbeitenden Klasse in England. The two friends found that they had arrived at a complete identity of opinion ; and an opportunity soon occurred for an emphatic expres: sion of their common views. A society of socialists, a kind of forerunner of the International, had established itself in London, and had been attracted by the new theories of Marx and the spirit of strong and uncompromising convic- tion with which he advocated them. They entered into re- lation with Marx and Engels; the society was reorganized under the name of the Communist League ; and a congress was held, which resulted (1847) in the framing of the Mant- festo of the Communist Party, which was published in most of the languages of western Europe, and is the first proclamation of that revolutionary socialism armed with all the learning of the 19th century, but expressed with the fire and energy of the agitator, which in the Interna tional and other movements has so startled the world. During the revolutionary troubles of 1848 Marx returned to Germany, and along with his comrades Engels, Wolff, &e., he supported the most advanced democracy in the New Rhenish Gazette. In 1849 he settled in London, where till his death in 1883 he applied himself to the elaboration of his economic views and to the realization of his revolutionary programme. During this period he published Zur Kritik der politischen Ockonomie (1859);

chiefs are Karl Marx, Karl Lassalle, and Rodbertus (for the last Mar.

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and the first volume of his great work on capital, Das Kapital (1867).

The causes which have variously contributed to the rise of German socialism are sufficiently clear. With the acces- ‘sion of the romanticist Frederick William IV. to the throne of Prussia in 1840 German liberalism received a fresh expansion. At the same time the Hegelian school began to break up, and the interest in pure philosophy began to wane. It was a time of disillusionment, of dis- satisfaction with idealism, of transition to realistic and even to materialistic ways of thinking. This found strongest expression in the Hegelian left, to which, after the ideals of the old religions and philosophies had proved unsub- stantial, there remained as solid residuum the real fact of man with his positive interests in this life. The devotion and enthusiasm which had previously been fixed on ideal and spiritual conceptions were concentrated on humanity. To adherents of the Hegelian left, who had been delivered from intellectual routine by the most intrepid spirit of criticism, and who, therefore, had little respect for the conventionalisins of a feudal society, it naturally appeared that the interests of humanity had been cruelly sacrificed in favour of class privilege and prejudice. The greatest thinkers of Germany had recognized the noble elements in the French Revolution. To recognize also the noble and promising features of French socialism was a natural thing, especially for Germans who had been in Paris,—the great hearth of the new ideas. Here they found themselves definitely and consciously in presence of the last and greatest interest of humanity, the suffering and struggling proletariat of western Europe, which had so recently made its definite entry in the history of the world. Thus social- ism became a social, political, and economic creed to Karl Marx and his associates. But they felt that the theories which preceded them were wanting in scientific basis ; and it was henceforward the twofold aim of the school to give scientific form to socialism and to propagate it in Europe by the best and most effective revolutionary methods.

The fundamental principle of the Marx school and of the whole cognate socialism is the theory of “surplus value,”— the doctrine, namely, that, after the labourer has been paid the wage necessary for the subsistence of himself and family, the surplus produce of his labour is appropriated by the capitalist who exploits it. This theory is an applica- tion of the principle that labour is the source of value, which was enunciated by many of the old writers on economics, such as Locke and Petty, which was set forth with

some vagueness and inconsistency by Adam Smith, and was more systematically expounded by Ricardo. The socialistic application of the principle in the doctrine of surplus value had been made both by Owenites and chart- ists. It was to prevent this appropriation of surplus value by capitalists and middlemen that the Owen school tried the system of exchange by labour notes in 1832,— the value of goods being estimated in labour-time, repre- sented by labour notes. The principle that labour is the source of value has been accepted in all its logical conse- quences by Marx, and by him elaborated with extraordinary dialectical skill and historical learning into the most com- plete system of socialism that has ever been formulated. A like application of the principle but in a less rigorous fashion has been made by Rodbertus ; and it is the same theory that underlies the extravagancies and paradoxes of Proudion, The question whether the priority in the Scientific development of the principle is due to Marx or Rodbertus cannot be fully discussed here. But it may be said that, while the Social Letters of Rodbertus to Von Kirehmann were published in 1850, the importance of the Principle was understood by the Marx school as early as 1845, and in a broad and general way had indeed become

the common property of socialists. The historical import- ance and scientific worth of the writings of Rodbertus should not be overlooked ; nor are they likely to be when so much attention has been given to him by A. Wagner and other distinguished German economists. But in the great. work of Marx the socialist theory is elaborated with a fulness of learning and a logical power to which Rodbertus has no claim. With Marx the doctrine of surplus value receives its widest application and develop- ment ; it supplies the key to his explanation of the history and influence of capital, and consequently of the present economic era, which is dominated by it. It is the basis, in fact, of a vast and elaborate system of social philosophy. In any case it is an absurdity as well as an historical error to speak of Marx as having borrowed from Rodbertus. Marx was an independent thinker of great originality and force of character, who had made the economic develop- ment of modern Europe the study of a laborious lifetime, and who was in the habit, not of borrowing, but of strongly asserting the results of his own research and of impressing them upon other men.

The great work of Marx may be described as an exposi- Capital.

tion and criticism of capital. But it is also indirectly an exposition of socialism, inasmuch as the historical evolu- tion of capital is governed by natural laws, the inevitable tendency of which is towards socialism. It is the great aim of Marx to reveal the law of the economic movenient of modern times. Now the economic movement of modern times is dominated by capital. Explain, therefore, thie natural history of capital, the rise, consolidation, and de- cline of its supremacy as an evolutionary process, and you forecast the nature of that into which it is being trans- formed,—socialism, Hence the great task of the Marx school is not to preach a new economic and social gosjel, not to provide ready-made schemes of social regeneration after the fashion of the early socialists, nor to counteract by alleviating measures the wretchedness of our present system, but to explain and promote the inevitable process of social evolution, so that the domination of capital may run its course and give place to the higher system that is to come.

The characteristic feature of the régime of capital, or, as Marx usually calls it, the capitalistic method of produc- tion, is, that industrial operations are carried on by indi- vidual capitalists employing free labourers, whose sole dependence is the wage they receive. Those free labourers perform the function fulfilled in other states of society by the slave and the serf. It is the tendency of the capital- istic system to consolidate those two classes,—the capitalist class, enriching itself on the profits of industry, which they control in their own interest, and the class of workers, nominally free, but without land or capital, divorced, there- fore, from the means of production, and dependent on their wages,—the modern proletariat. The great aim of the capitalist is the increase of wealth through the accumula- tion of his profits. This accumulation is secured by the appropriation of what the socialists call surplus value. The history of the capitalistic method of production is the history of the appropriation and accumulation of surplus value, To understand the capitalistic system is to under- stand surplus value. With the analysis of value, there- fore, the great work of Marx begins.

The wealth of the societies in which the capitalistic method of production prevails appears as an enormous collection of commodities. A commodity

is in the first place an external object adapted to satisfy human wants ;

and this usefulness gives it value in use, makes it a use Value These use values form the material of wealth, 2nd

value. whatever its social form may be. In modern societies, where the business of production is carried on to meet the

Develop- ment of capital- istic régime.

demands of the market, for exchange, these use values appear as exchange values. Exchange value is the pro- portion in which use values of different kinds exchange for each other. But the enormous mass of things that circulate in the world market exchange for each other in the most different proportions. They must, however, have a common quality or they could not be compared. This common quality cannot be any of the natural properties of the commodities. In the business of exchange one thing is as good as another, provided you have it in sufficient quantity. Leaving out of consideration, there- fore, the physical qualities that give commodities use value, we find in them but one common characteristic, — that they are all products of human labour. They are all crystallized forms of human labour. It is labour applied to natural objects that gives them value. What con- stitutes value is the human labour embodied in commo- dities. And the relation of exchange is only a phase of this value, which is therefore to be considered independ- ently of it. Further, the labour-time spent in producing value is the measure of value, not this or that individual labour, in which case a lazy or unskilled man would pro- duce as great a quantity of value as the most skilful and cnergetic. We must take as our standard the average labour-force of the community. The labour-time which we take as the measure of value is the time required to produce a commodity under the normal social conditions of production with the average degree of skill and intensity of labour, Thus labour is both the source and the measure of value.

As we have seen, the characteristic feature of the capitalistic system of production is that industry is con- trolled by capitalists employing free wage-labour ; that 4s, while the capitalist owns and controls the means of

pro- duction, the free labourer has lost all ownership in land and capital and has nothing to depend on but his wage. This condition of things was established only after a long and gradual process of social change, which Marx copiously illustrates from the history of England, as the classic land of the fully developed capitalism. In the Middle Ages the craftsman and peasant were the owners of the small means of production then extant, and they produced for their own needs and for their feudal superior ; only the super- fluity went into the general market. Such production was necessarily small, limited, and technically imperfect. Towards the close of the Middle Ages a great change set in caused by a remarkable combination of circum- stances, —the downfall of the feudal system and of the Catholic Church, the discovery of America and of the sea route to India. Through the breaking up of the feudal houses with their numerous retainers, through the trans- formation of the old peasant-holdings into extensive sheep- runs, and generally through the prevalent application of the commercial system to the management of land instead of the Catholic and feudal spirit, the peasantry were driven off the land, a multitude of people totally destitute of property were thrown loose from their old means of liveli- hood, and were reduced to vagabondage or forced into the towns, It was in this way that the modern proletarians made their tragic entry in history. On the other hand, there was a parallel development of the capitalist class, brought about by the slave trade, the exploitation of the American colonies and of both the Indies, and by the robbery, violence, and corruption which attended the trans- ference of the land from the Catholic and feudal to the inodern régime. The opening and extension of the great world market, moreover, gave a great stimulus to industry at home. The old guilds having already been expropriated and dissolved, the early organization of industry under the control of an infant capitalism passed through its first

form of free contract. labour market with the sole commodity of which he has to dispose, his labour force, at the price it can bring,

painful and laborious stages, till with the great mechanical inventions, with the application of steam as the motive- power, and the rise of the factory system towards the close of the 18th century, the great industrial revolution

was accomplished, and the capitalistic method of production attained to its colossal manhood.

The capitalistic systcm thus established, we have to Capita. remember that in all its forms, and throughout all the istic ap.

stages of its history, the great aim of the capitalist is to a

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‘ncrease and consolidate his gains through the appropria-

tion of surplus value. This appropriation of surplus value is a very old phenomenon in human society. In all the forms of society which depended on slave labour,

and under the feudal régime, the appropriation of the results of other men’s labour was open and undisguised,

Under the capitalistic system it is disguised under the The workman appears on the

and sells it for a specified time which we call his wage, and which is equivalent to the average means of subsistence required to support himself and to provide for the future supply of labour (in his family). But the labour force of the workman as utilized by the capitalist in the factory or the mine produces a net value in excess of his wage. That is, over and above his entire outlay, including the wage paid to his workmen, the capitalist finds himself in possession of a surplus, which can only represent the “unpaid labour” of his workmen. This surplus is the surplus value of Karl Marx, the product of unpaid labour. This it is which the capitalist seeks to obtain and to accumulate by all the methods available. These methods are described by Marx with great detail and elaboration through several hundred pages of his first volume, His account, supported at every step by long and copious citations from the best historical authorities and from the blue-books of the various parliamentary com- missions, is a lurid and ghastly picture of the many abuses of English industrialism. It is the dark and gloomy reverse of the industrial glories of England. The fearful prolongation of the hours of

labour, the merciless exploita- tion of women, and of children from the age of infancy, the utter neglect of sanitary conditions, whatever could lessen the costs of production and swell the profits of the capitalist, though every law of man and nature were violated m the process,—such are the historical facts which Marx emphasizes and illustrates with an overwhelming force of evidence. They receive ample confirmation in the history of the English Factory Acts, imposed on greedy and un- scrupulous capitalists after a severe struggle prolonged for half a century, and required to prevent the moral and physical ruin of the industrial population.

Tt will be seen that the first and most conspicuous result Results | of the capitalistic system is that, while production is aged | social operation carried on by men organized and assocl- system. ated in factories, the product is appropriated by individual capitalists : it is social production and capitalistic appro priation. Another conspicuous and important result is that, while we have this organization in the factories, we have outside of them all the anarchy of competition, We have the capitalistic appropriators of the product of labout contending for the possession of the market, without systematic regard to the supply required by that market— each one filling the market only as dictated by his own interest, and trying to outdo his rivals by all the methods of adulteration, bribery, and intrigue,—an economic wat hurtful to the best interests of society. With the develop- ment of the capitalistic system' machinery is more and more perfected, for to neglect improvement is to succumb in the struggle ; the improved machinery renders labour supe!

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uous, which is accordingly thrown idle and exposed to starvation. But, as the technique improves, the productive power of industry increases, and continually tends more and more to surpass the available needs of the market, wide as it is. 'The consequence is that the market tends to be overstocked even to absolute repletion; goods will not sell, and a commercial crisis is established, in which we have the remarkable phenomenon of widespread panic, jnisery, and starvation resulting from a superabundance of wealth,—a "crise pléthorique," as Fourier called it, a crisis due to a plethora of wealth. These crises occur at periodic intervals,

each one severer and more widespread than the preceding, until they now tend to become chronic and permanent, and the whole capitalistic world staggers under an atlantean weight of ill-distributed wealth. Thus the process goes on in obedience to its own inherent laws. Production is more and more concentrated in the hands of viammoth capitalists and colossal joint-stock companies, under which the proletariat are organized and drilled into yast industrial armies. But, as crisis succeeds crisis, until panic, stagnation, and disorder are universal, it becomes clear that the bourgeoisie are no longer capable of control- ling the industrial world. The incompatibility between social production and anarchic distribution decidedly de- clares itself, With the progress of democracy the prole- tariat seizes the political power, and through it at last takes complete control over the economic functions of society. It expropriates the private capitalist and appropriating le means of production manages them in its own interest, which is the interest of society as a whole; society passes into the socialistic stage through a revolution determined by the natural laws of social evolution, and not by a merely arbitrary exercise of power. It is a result determined by the inherent laws of social evolution, independent of the will and purpose of individual men. All that the most powerful and clear-sighted intellect can do is to learn to divine the laws of the great movement of society, and to shorten and alleviate the birth-pangs of the new era. The efforts of reactionaries of every class to turn the wheel of history backwards are in vain. But an intelligent apprecia- tion of its tendencies and a willing co-operation with them will make progress easier, smoother, and more rapid.

It will have been seen that what Marx and his school contemplate is an economic revolution brought about in accordance with the natural laws of historic evolution. But in order to understand the full import of this revolu- tion in the mind of Marx we must remember that he regards the economic order of society as the groundwork of the same, determining all the other forms of social order. The entire legal and political structure as well as philosophy and religion are constituted and controlled in accordance with the economic basis. This is in harmony with his method and his conception of the world, which is the Hegelian reversed. ‘For Hegel the thought process, which he transforms into an independent subject under the name idea, is the creator of the real, which forms only its external manifestation.

With me, on the contrary, the ideal is nothing else than the material transformed and translated in the human brain." His conception of the world is a frank and avowed materialism. His method is the dialectic applied to a world thus understood ; the busi- ness of inquiry, namely, is to trace the connexion and concatenation in the links that make up the process of historic evolution, to investigate how one stage succeeds another in the development of society, the facts and forms of human life and history not being stable and stereotyped things, but the ever-changing manifestations of the fluent and unresting real, the course of which it is the duty of science to reveal. The whole position of the Marx school may therefore be characterized as evolutionary and revolu-

tionary socialism, based on a materialistic conception of the world and of human history. Socialism is a social revolution determined by the laws of historic evolution— a revolution which, changing the economic groundwork of society, will change the whole structure.

It will be seen that the work of Marx is a natural history of capital, especially in its relation to labour, and in its most essential features is a development of two of the leading principles of the classic economics,— that labour is the source of value, but that of this value the labourer obtains for himself merely a subsistence wage, the surplus being appropriated by the exploiting capitalist. Marx's great work may be described as an elaborate historical de- velopment of this glaring fundamental contradiction of the Ricardian economics, the contradiction between the iron law of wages and the great principle that labour is the source of wealth. Marx's conception of labour is the same as that of Ricardo, and as a logical exposition of the historic contradiction between the two principles on the basis of Ricardo the work of Marx is quite unanswerable. It is obvious, however, that the definition of labour assumed both in Ricardo and Marx is too narrow. The labour they broadly posit as the source of wealth is manual labour. In the early stages of industry, when the market was small and limited and the technique was of the simplest and rudest description, labour in that sense might correctly enough be described as the source of value. But in modern industry, when the market is world-wide, the technique most

complex, and the competition most severe, when inventiveness, sagacity, courage, and decision in ini- tiative, and skill in management, are factors so important, no such exclusive place as has been claimed can be assigned to labour. The Ricardian principle, therefore, falls to the ground, And it is not historically true to maintain, as Marx does, that the profits of the capitalist are obtained simply by appropriating the products of unpaid labour. In initiating and managing the capitalist is charged with the most difficult and important part of the work of pro- duction. As a natural consequence it follows that Marx is also historically inaccurate in roundly explaining capital as the accumulation of unpaid labour appropriated by the capitalist. In past accumulation, as in the control and management of industry generally, the capitalist has had the leading part. Capital, therefore, is not necessarily robbery, and in an economic order in which the system of free exchange is the rule, and the mutually beneficial interchange of utilities, no objection can be raised to the principle of lending and borrowing of money for interest. In short, in his theory of unpaid labour as supplying the key to his explanation of the genesis and development of the capitalistic system Marx is not true to history. It is the perfectly logical outcome of certain of the leading principles of the Ricardian school, but it does not give an adequate or accurate account of the facts of economic evolution.

It may indeed be maintained that in his theory of un- paid labour Marx is not consistent with the gencral principles of his own philosophy of social evolution. With him history is a process determined by material forces, a succession of orderly phenomena controlled by natural laws. Now we may waive the objection suggested by the principle enunciated in the Marx school itself, that it is not legitimate to apply ethical categories in judgment on economic processes that are merely natural, which, how- ever, Marx does with revolutionary emphasis throughout some hundreds of pages of his great work. It is more important to point out, in perfect consistency with the principles of the school, that the energy and inventiveness of the early capitalists especially were the most essential factors in determining the existence and development of a

Criticism of Marx’s

views.

great economic era, and that the assertion of freedom was an indispensable condition in breaking the bonds of the old feudal order, which the new system displaced. In- stead, therefore, of living and growing rich on the produce of unpaid labour, the capitalist had a great social and industrial function to perform, and played a great part in historic evolution. The position and function of the workman was subordinate.

There can be no doubt that in his theory of surplus value obtained from unpaid labour Marx as agitator and controversialist has fallen into serious contradiction with himself as scientific historian and philosopher. The theory that labour is the source of value was widely accepted among economists during his early life, and by its justice and nobleness it was well adapted to the comfortable optimism prevalent among so many of the classical school. The economists, however, did not follow the principle to its obvious conclusion, that if labour is the source of wealth the labourer should enjoy it all. It was otherwise with the socialists, who were not slow to perceive the bearing of the theory on the existing economic order. In his controversial treatise against Proudhon Marx gives a list of writers (beginning with the political economy of Hopkins, published in 1822, only five years after the appearance of Ricardo's great work) by whom the principle was applied to revolutionary purposes. Its simplicity and seeming effectiveness must have made it most attractive. As posited by the classic economy and applied by the socialists Marx accepted the principle. It was an un- answerable argumentum ad hominem when addressed to an economist of the Ricardian school; but it should have broken down when confronted with historical fact. Never- theless it was made and continued to be the foundation stone of the system of Marx, and is really its weakest point. His doctrine of surplus value is the vitiating factor in his history of the capitalistic system. The most obvious excuse for him is that he borrowed it from the classic economists. It would be the greatest possible mistake, however, to make this a reason for undervaluing the re- markable services rendered to economics by Karl Marx. He spent forty laborious years almost wholly in exile as the scientific champion of the proletariat. In the combina- tion of learning, philosophic acumen, and literary power he is probably second to no economic thinker of the 19th cen- tury. He seems to

have been master of the whole range of economic literature, and wielded it with a logical skill not less masterly. But his great strength lay in his knowledge of the technical and economic development of modern industry and in his marvellous insight into the tendencies in social evolution determined by the technical and economic factors. Whether his theories in this department are right or wrong they have suggested questions that will demand the attention of economic thinkers for a long time to come. It is in this department and not in his theory of surplus value that Marx's significance as a scientific economist is to be found.

The great merit of Marx, therefore, lies in the work he has done as scientific inquirer into the economic movement of modern times, as the philosophic historian of the capi- talistic era. It is now admitted by all inquirers worthy of the name that history, including economic history, is a succession of orderly phenomena, that each phase in the line of succession is marked by facts and tendencies more or less peculiar to itself, and that laws and principles which we now condemn had formerly an historical necessity, justifica- tion, and validity. In accordance with this fundamental principle of historical evolution arrangements and institu- tions which were once necessary, and originally formed a stage in human progress, may gradually develop contradic- tions and abuses and thus become more or less antiquated.

SOCIALISM

The economic social and political forms which were the progressive and even adequate expressions of the life of one era become hindrances and fetters to the life of the succeeding times. This, the school of Karl Marx says, is precisely the condition of the present economic order. The existing arrangements of landlord, capitalist, and wage. labourer under free competition are burdened with contra- diction and abuse. The life of society is being strangled by the forms which once promoted it. They maintain that the really vital and powerful tendencies of our time are towards a higher and wider form of social and economic organization,—towards socialism. This we believe to be the central point of the whole question; but the fuller discussion of it can more conveniently be postponed to the close of this article, when we come to consider socialism as a whole.

The opinions of Marx were destined to find expression in two movements, which have played a considerable part in recent history,—the International and the social democracy of Germany. Of the International Marx was the inspiring and controlling head from the beginning ; and the German social democracy, though originated by Lassalle, before long fell under Marx's influence. Marx wrote the famous inau- gural address of the International and drew up its statutes, maintaining a moderation of tone which contrasted strongly with the outspoken vigour of the communist manifesto of 1847. But it was not long before the revolutionary socialism which underlay the movement gained the upper hand. This found. strongest expression in the address drawn up by Marx in 1871 after the suppression of the commune, and entitled Zhe Civil War in France. The International was not responsible for the revolt of the commune, which was a rising for the autonomy of Paris, supported chiefly by the lower classes. It was a protest against excessive centralization raised by the democracy of Paris, which has always been far in advance of the provinces, and which found itself in possession of arms after the siege of the town by the Germans. But, while it was prominently an assertion of local autonomy, it was also a revolt against the economic oppression of the moneyed classes, and thus contained within it strong socialistic tendencies. The socialists properly so called were only a small minority. In this address, however, Marx and his associates made themselves morally solidazre with the commune. They saw in it a great rising against the existing conditions of the Parisian proletariat, which only partially saw the way of deliverance, but was tired of oppression and full of just indignation against the tyrannous upper classes, that controlled the central government of France. This address, if it tended to increase the prestige of the International, greatly reduced 'its real influence. Its last meeting as controlled by Marx took place at The Hague in 1872. The chief himself was present, and succeeded in casting out the anarchist following of Bakunin; but it was the expiring effort. See INTER- NATIONAL.

This loss of influence by Marx was in the meantime more than compensated by his success in gaining control over the social democracy of Germany. Of the workmen's unions which had grown so rapidly in Germany in the years following 1860, and which had first been patronized by the Progressist party, some had attached themselves to the national socialism of Lassalle, but many held aloof from that movement, and under

the influence of Liebknecht and Bebel were gradually drawn over to the views of Marx. At Lassalle's death in 1864 his "general working-men's union of Germany " numbered only 4610 members. After losing its founder the union had a changeful and somewhat precarious career for a time; and it was only under the presidency of Von Schweitzer, which lasted for four years

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(1867-1871), that it began moderately to flourish, In the meantime the adverse party also made considerable progress. The confederation of German unions, which was founded in 1863, declared in 1865 for universal suffrage, pronounced against the Schulze-Delitzsch schemes in 1866, and in the congress at Nuremberg of 1868 by a large majority declared their adhesion to the International. In a great congress at Eisenach in 1869 they founded the "social democratic working-men's party," and in the same year sent repre- sentatives to the International congress at Basel. Great efforts were made for a fusion of the Eisenach and the Lassalle party, and this was effected in a congress at Gotha (May 1875). At this congress 25,000 regular members were represented, of whom 9000 belonged to the Marx party and 15,000 to that of Lassalle. The united body assumed the name of the "socialistic working-men's party of Germany," and drew up a programme, which, as the most important manifesto hitherto published by any socialist body, deserves to be given entire.

I. Labour is the source of all wealth and all culture, and as use- ful work in general is possible only through society, so to society—

pl: that is, to all its members—belongs the entire product of labour by an equal right, to each one according to his reasonable wants, —all

big- being bound to work.

In the existing society the instruments of labour are a monopoly of the capitalist class; the subjection of the working class thus arising is the cause of misery and servitude in every form.

The cmancipation of the working elass demands the transforma- tion of the instruments of labour into the common property of society and the co-operative control of the total labour, with application of the produet of labour to the common good, and just distribution of the same.

The emancipation of labour must be the work of the labouring elass, in contrast to which all other classes are only a reaetionary mass.

II. Proceeding from these prineiples, the socialistie working-men's party of Germany aims by all legal means at the establishment of the free state and the socialistic society, to destroy the iron law of wages by abolishing the system of wage-labour, to put a term to exploitation in every form, to remove all social and political in- equality.

The socialistie working-men's party of Germany, though working first of all within the national limits, is conseious of the inter- national character of the labour movement, and resolved to fulfil all duties which this imposes on the workmen, in order to realize the universal brotherhood of men.

In order to prepare thie way for the solution of the social question, the socialistic working-men's party of Germany demands the estab- lishment of socialistic productive assoeiations with state help under the democratic control of the labouring people. The productive associations are to be founded on such a seale both for industry and agriculture that out of them may develop the socialistic organi- zation of the total labour.

The socialistic working-men's party demands as bases of the state —(1) universal, equal, and direct right of electing and voting, with secret and obligatory voting, of all eitizens from twenty years of age for all elections and deliberations in the state and local bodies ; the day of cleetion or voting mst be a Sunday or holiday; (2) direet legislation by the people ; questions of war and peace to be decided by the people ; (3) universal military duty ; a people's army in place of the standing armies; (4) abolition of all excep- tional laws, especially as regards the press, unions, and meetings, and

generally of all laws which restrict freedom of thought and inquiry ; (5) administration of justice by the people ; free justice ; (6) universal and equal education by the state ; compulsory eduea- tion ; free education in all public places of instruction ; religion declared to be a private concern.

Within the existing society the socialistic working-men's party of Germany demands — (1) greatest possible extension of political rights and liberties in the sense of the above demands ; (2) a single fogressive income-tax for state and local purposes, instead of the existing taxes, and especially of the indireet taxes that oppress the people ; (3) unrestricted right of combination ; (4) a normal work- mg-day corresponding to the needs of society ; prohibition of Sun- day labour ; (5) prohibition of labour of ehildren, and of all women's Work injurious to health and morality ; (6) laws for the protection of the life and health of workmen ; sanitary control of workmen's

Wellings ; inspection of mines, of factories, workshops, and house- labonr, by offieials chosen by the workmen ; an effective employers' hability Act ; (7) regulation of prison labour ; (8) workmen's funds to be under the entire control of the workmen.

By this time the socialism of Germany began to be a

power, which was calculated to excite grave alarm among the ruling classes. The social democrats had returned five members to the North German diet in 1867. For the German diet in 1871 they had counted only 120,000 votes, and returned two members ; but in 1877 they had returned twelve members and polled nearly half a million. In Berlin the socialist voting strength had risen from 6695 in 1871 to 57,511 in 1878,—an increase which was all the more remarkable that Lassalle could hardly obtain a hear- ing in the capital when he commenced his career. A much more significant feature of the movement was the admirable state of organization to which the socialist propaganda had attained. A large number of skilful, intelligent, and ener- getic agitators spread their doctrines throughout Germany ; a whole machinery of newspapers, pamphlets, treatises, social gatherings, and even almanacs diffused the new creed. In all the great centres of population, in Berlin, Hamburg, and the industrial towns in Saxony and on the Rhine, the

socialists were rapidly tending to become the strongest party. The Government accordingly intervened with exceptional legislation, which in 1878 was carried during the excitement occasioned by the attempts on the emperor's life of Hédel and Nobeling. These exceptional laws, though administered with great rigour, have not by any means succeeded in arresting the progress of the move- ment, as at the election to the Reichstag in 1884 the socialists polled about 600,000 votes and returned twenty- four members. Berlin alone counted 68,000 socialist voters. In the last report relating to the anti-socialist law laid before the Reichstag (1885) the continued pro- gress of the party is admitted.

The participation of the Catholic Church of Germany in the social question dates from the period of the Lassalle agitation. In 1863 Déllinger recomniended that the church should intervene in the movement, and Bishop von Ketteler of Mainz lost no time in expressing sympathy with Lassalle. In a treatise entitled Die Arbeiterfrage und das Christenthum (1864) Ketteler criticizes the liberalism of the Manchester school in substantially the same terms as Lassalle, and recommends the voluntary formation of productive associations with capital supplied by the faith- ful. In 1868 the Catholic socialism of Germany took a more practical form: it started an organ of its own and began to organize unions for the elevation of the working men. 'The principles of the movement have been with some precision expounded by Canon Moufang in an elec- toral address at Mainz (1871), and by the writers in their organ. All agree in condemning the principles of liberal- ism, especially in its economic aspects, as destructive of society and pernicious to the working-man, who, under the pretence of freedom, is exposed to all the precariousness and anarchy of competition and sacrificed to the iron law of wages. Self-help as practised in the Schulze-Delitzsch schemes is also considered to be no sure way of deliverance. This general remedy is union on Catholic principles, especially the formation of trade guilds suited to modern exigencies, which some of their leaders would make a compulsory measure enforced by the state. The views of Moufang, which are most definite, may be thus summar- ized; legal protection for the workers, especially as regards hours of labour, wages, the labour of women and children, sanitation ; subventions for workmen's productive associa- tions; lightening of taxes on labour; control of the moneyed and speculating interests. In the organization of unions the

success of Catholic socialism has been great; and the social democrats admit that they can make no progress in Catholic districts where the church has developed its social activity.

The socialist activity of the Protestant Church of Germany Protestant The most important literary product of Socialism.

dates from 1878.

Catholie socialism

of Ger- many.

the movement is a work by Pastor Todt entitled Der radi- kale deutsche Socialismus und die christliche Gresellschaft. In this work Todt condemns the economics of liberalism as unchristian, and seeks to show that the ideals of liberty, equality, and fraternity are entirely Scriptural, as are also the socialist demands for the abolition of private property and of the wage system, that the labourer should have the full produce of his labour, and that labour should be associated. The chief leader of the movement is the court preacher Sticker, the head also of the anti-Semitic agitation, which is largely traceable to economic causes. Stocker founded two associations,—a central union for social reform, consisting of members of the middle classes inter- ested in the emancipation of labour, and a Christian social working-men's party. The former has had considerable success, especially among the Lutheran clergy. The move- ment has met with the most strenuous resistance from the social democratic party and has been greatly hampered by the anti-socialist law of 1878. State go- Little can here be said of the state socialism of Bismarck, cialism. —a very recent movement, which has not yet had time to pass into history. Its leading principles were announced in an imperial message to the Reichstag in November 1881. Besides the repressive measures necessary to restrain the excesses of the social democracy, the emperor declared that the healing of social evils was to be sought in positive measures for the good of the working man. The measures proposed were for the insurance of the workmen against accident, sickness, old age, and inability to work by ar- rangements under state control. "The

finding of the right ways and means for this state protection of the working man is a difficult task, but also one of the highest that concern every society standing on the ethical foundations of the Christian national life.” The message then proceeds to speak of measures for “organizing the life of the people in the form of corporative associations under the protection and furtherance of the state,”—a clause which might be taken as an admission of the collectivist principle. As yet the imperial programme has only been partially realized. It will be obvious that such measures can be rightly appreciated only with reference to the general theory and practice of Prussian government. Anarch- The acknowledged father of anarchism is PRoUDHON (g.%.)3 ism of but the doctrine owes its development chiefly to Russian Bakunin. thinkers who had been trained in the Hegelian left. The great apostle of the system in its advanced and most characteristic stage was Michael Bakunin, Bakunin was sprung from the highest Russian aristocracy, and was born at Torshok, in the government of Tver, in 1814. Leaving the army, in which he served for some time, he visited western Europe, chiefly Paris, where he met George Sand and Proudhon in 1847. For his share in the German disturbances of 1849 he was imprisoned in Russia for several years and then sent to Siberia, from which he escaped, and spent the rest of his life in exile in western Europe, principally in Switzerland. In 1869 he founded the Social Democratic Alliance, which, however, dissolved in the same year and entered the International. In 1870 he attempted a rising at Lyons on the principles afterwards exemplified by the Paris commune, At The Hague congress of the International in 1872 he was outvoted and expelled by the Marx party. Bakunin’s activity was most remarkable as an agitator. ‘The international socialism of the Romance countries, especially that of Spain and Italy, has been largely moulded by him. He died at Bern in 1876. Nothing can be clearer or more frank and comprehensive in its destructiveness than the socialism of Bakunin. It is revolutionary socialism based on materialism and aim- ing at the destruction of external authority by every

available means. He rejects all the ideal systems in every name and shape, from the idea of God downwards; and he rejects every form of external authority, whether emanating from the will of a sovereign or from universal

suffrage. “The liberty of man,” he says in his Diew e L’ Etat, “consists solely in this, that he obey the laws of nature, because he has himself recognized them as such, and not because they have been imposed upon him ex. ternally by any foreign will whatsoever, human or divine, collective or individual.” In this way will the whole problem of freedom be solved : that natural laws be ascer- tained by scientific discovery, and the knowledge of them be universally diffused among the masses. Natural laws being thus recognized by every man for himself, he cannot but obey them, for they are the laws also of his own nature ; and the need for political organization, adminic- tration, and legislation will at once disappear. Nor will he admit of any privileged position or class, for “it is the peculiarity of privilege and of every privileged position to kill the intellect and heart of man. The privileged man, whether he be privileged politically or economically, is a man depraved in intellect and heart.” “In a word, we object. to all legislation, all authority, and all influence, privileged, patented, official, and legal, even when it has proceeded from universal suffrage, convinced that it must always turn to the profit of a dominating and exploiting minority, against the interests of the immense majority enslaved.” The anarchy of Bakunin is therefore essen- tially the same as that of Proudhon, but expressed with- out paradox, and with a destructive revolutionary energy which has seldom been equalled in history. What they both contemplate is a condition of human enlightenment and self-control in which the individual shall be a law to himself, and in which all external authority shall be abolished as a despotic interference with personal freedom. It is an ideal to which the highest religion and philosophy look forward as the goal of man, not as one, however, which can be forthwith reached through the wholesale destruction of the present framework of society, but through a long process of ethical and social improvement. The error of the anarchists consists in their impatient i- sistence on this proclamation of absolute freedom in the present debased condition of the great mass of the people in every class. They insist on taking the last step in social development before they have quite taken the first. The other leading principles of anarchism will be best understood from the following extracts taken from the programme of the International Social Democratic Alliance. The Alliance demands above all things the definitive and complete abolition of classes, and political, economic, and social equality of individuals and sexes, and abolition of inheritance, so that in the future every man may enjoy a like share in the

produce of labour ; that land and soil, instruments of labour, and all other capital, becoming the common property of the whole society, may be used only by the workers, that is, by associations of cultivators and industrialists. It looks forward to the final solution of the social question through the universal and international solidarity of the workers of all countries, and condemns every policy grounded on so-called patriotism and national jealousy. It demands the universal federation of all local associations through the principle of freedom. Bakunin's methods of realizing his revolutionary pro gramme are not less frank and destructive than his principles. The revolutionist, as he would recommend him to be, is a consecrated man, who will allow no private interests or feelings, and no scruples of religion, patriot- ism, or morality, to turn him aside from his mission, the aim of which is by all available means to overturn the existing society. His work is merciless and universal

destruction. The future organization will doubtless pro- ceed out of the movement and life of the people, but it is the concern of coming generations. In the meantime all that Bakunin enables us to see as promise of future re- construction is the free federation of free associations,— associations of which we find the type in the Russian commune.

Bakunin, as we have seen, has had great influence on the socialism of the Romance countries. The important risings in Spain in 1873 were due to his activity ; and the socialism of Italy has been largely inspired by him. In those countries, as well as in France and French Switzer-

of Bakunin are still in vogue, and are advocated by men of mark in literature and science like Kropotkine and Elisée Reclus. The views of the propaganda which they repre- gent were most clearly and distinctly brought out during the great anarchist trial at Lyons in 1883. What they aim at is the most absolute freedom, the most complete satisfaction of human wants, without other limit than the impossibilities of nature and the wants of their neighbours equally worthy of respect. They object to all authority and all government on principle, and in all human rela- tions would in place of

legal and administrative control substitute free contract, perpetually subject to revision and cancelment. But, as no freedom is possible in a society where capital is monopolized by a diminishing minority, they believe that capital, the common inheritance of humanity, since it is the fruit of the co-operation of past and present generations, ought to be at the disposal of all, so that no man be excluded from it, and no man seize part of it to the detriment of the rest. In a word, they wish equality, equality of fact, as corollary or rather as primordial condition of freedom. From each one accord- ing to his faculties; to each one according to his needs. They demand bread for all, science for all, work for all ; for all, too, independence and justice. Even a government based on universal suffrage gives them no scope for effective action in the deliverance of the poor, as they maintain that of the eight million electors of France only some half a million are in a position to give a free vote. In sucha state of affairs, and in view of the continued misery and degradation of the proletariat, they proclaim the sacred right of insurrection as the wltima ratio servorum.

It is an interesting fact that socialism has taken its most aggressive form in that European country whose civilization is most recent. The revolutionary opinions of Russia are not the growth of the soil, and are not the natural and normal outcome of its own social development : they have been imported from abroad. Falling on youth- ful and enthusiastic temperaments which had not previously been inoculated with the principle of innovation, the new ideas have broken forth with an irrepressible and uncom- promising vigour which has astonished the older nations of Europe. Another peculiarity of the situation is that the Government is an autocracy served or controlled by a camarilla largely foreign both in origin and sympathy. In this case, then, we have a revolutionary party inspired by the socialism of western Europe fighting against a Govern- ment which is also in many ways an exotic and is not rooted in the mass of the people. The chief support of the Government is to be found in the reverence of the peasantry for the person and office of the czar, while the nihilists look upon the communal institutions of the country as their great ground of hope. Considered as a national movement, three distinct stages are recognized in the phenomena called Russian nihilism. In its first stage it was a speculative and anti-religious tendency, destructive of all orthodox tradition and

authority. It was the spirit of the Hegelian left frankly accepting the materialism of

Biichner and Moleschott as the final deliverance of philo- sophy ; and the time was the early years of Alexander IL, when the old despotic restraints were so largely removed,— a period of reform and innovation and comparative freedom. Jn a country where religion had little influence among the educated classes, and where philosophy was not a slow and gradual growth of the native mind, but a fashion imported from abroad, the most destructive materialism found an easy conquest. It was the prevalent form among the advanced thinkers; it was clear, simple, and thorough ; and it suited well the anti-religious mood of the time. By the side of this negative speculation, however, the Russian youth became aware of a new creed, destructive also in its beginnings, but full of the positive promise of future recon- struction and regeneration,—socialism. Here they saw the struggle of the proletariat, so terribly conspicuous in the Paris commune, which attracted universal attention in 1871, a proletariat represented in Russia by a nation of peasantry sunk in immemorial ignorance and wretched- ness, At this period hundreds of young Russians of both sexes were studying in western Europe, especially in Switzerland. In 1873 they were by an imperial ukaze recalled home, but they carried the new ideas with them. The period of speculation was succeeded by a period of socialist propaganda, which naturally met with implacable opposition and merciless repression from the Government. As they received no mercy, the nihilists determined to show none; and in 1878 began the terrible duel of the Russian revolutionists against the autocracy and its servants, which culminated in the violent death of Alexander II. in 1881. How far we are to regard the revolutionary movement of Russia as cognate in principle with anarchism is not easy to determine. In despotic countries, where consti- tutional reform and opposition to government are not tolerated, resolute innovators are naturally driven to secret conspiracy and to violent action. What distinguishes the Russian revolutionary party from other movements of a like nature is the intensity of the enthusiastic devotion and self- sacrifice with which they have braved death, imprisonment, exile, and privation in every form and the calculating skill with which they have called the

resources of modern chemistry to their aid. There is no doubt that the doctrines of men like Bakunin have had great influence on Russian socialism; but so have the writings of Marx, as also of J. 8. Mill and other advanced thinkers, who have no connexion with anarchism. It is certain that the leaders of the revolutionary party resorted to violent measures only after their peaceful propaganda was being ruthlessly suppressed. With regard to political reform many of their leaders have declared that they would be satisfied with constitutionalism. In the address sent to the emperor Alexander III. after the death of his father in March 1881, the executive committee of the revolu- tionary party offered to submit unconditionally to a national assembly duly elected by the people. In this recognition of constitutionalism, as well as in the strongly centralized organization of their executive, the Russian revolutionary party are essentially at variance with anarchism. In economics they advocate a thoroughgoing collectivism.

We have now given a brief outline of the various forms Classifi- of socialism as they have historically appeared. It may cation of

be useful to group them as accurately and clearly as possible. (1) Experiments in socialism conducted by private initia- tive, as carried on in the schools of Saint-Simon, Fourier, and Owen; not that they objected to state help, but that, in point of fact, their efforts were conducted by pri- vate means. (2) Productive associations with state help : the programme of economic change favoured by Louis Blanc and Lassalle. (3) The Marx school of socialism, scientific and revolutionary, beyond all comparison the most im- XXII. — 28

portant and most influential of all forms of socialism. (4) Anarchism. (5) Nihilism. (6) Christian socialism ; imasmuch as the various phases of Christian socialism condemn the principle of competition as operating in modern industry, and favour the organization of labour on united principles, and especially of productive associations with a common capital and an equitable system of distri- bution, they must be regarded as true forms of socialism. (7) To these should be added the speculative socialism of which Rodbertus is the most remarkable example ; recog- nizing the fundamental evils of the present system and agreeing with the Marx school in holding

that socialism is the next stage in social evolution, Rodbertus believed that the period of its realization is so remote that any decidedly practical effort towards that end is inapplicable ; hence he could only recommend transitional remedial measures, which will at least circumscribe the mischief inherent in the present economic order and also pave the way towards a better state. (8) And last of all may be added the various forms of state socialism, which are all examples of state action on behalf of the poor, especially of the use of the public resources for that purpose. The word "socialism" is very frequently used in this sense. As the continued use of the word in such a way is almost a certainty, this phase of the subject must be recognized here. It may be described as socialistic inasmuch as it fully admits the responsibility of society for all its members ; but in many respects its tendencies are opposed to true socialism. It is a vague movement which has not yet had time to take shape, and cannot be discussed here. "Socialism of the chair" has already been discussed under PorrricaL Economy, vol. xix. p. 393.

The above classification can of course pretend only to be a rough and general one. The various heads of the classification are not exclusive. The first variety has chiefly an historical interest. The American communities (dis- cussed under Communism) are really cases of the old crude communism. Productive associations with state help stand on the Gotha programme of the social democrats of Germany. They are recommended by Christian socialists, both Catholic and Protestant, and they form an important item in the programme of the "knights of labour" of America. The resemblance in type between the '"com- munity" of Owen, the phalange of Fourier, the mir or commune of Russia, and the free commune of Bakunin is apparent. It is the social unit as determined by obvious economic, local, and historical conditions, and in socialism naturally becomes the point of departure for a new con- struction of society. It will have been noted that most of the important phases of socialism have been and are international in sympathy and activity. The Marx so- cialism is spreading in nearly every country of the civilized world, the doctrine being diffused by energetic agitators, and not seldom by men of philosophic and literary culture. In late years this is true both of France and England. It is well known how active anarchism has been. The Christian socialist

movement is more or less operative in Belgium, France, Germany, Austria, and to some extent in England.

In this article our aim has been to give an expository and historical account of the various phases of socialism. It is impossible even to refer to all the different questions suggested in our sketch; and to discuss the relations of antagonism and affinity between socialism and the pre- vailing social and economic ideas and institutions would require a long and elaborate treatise. In the course of the article many obvious points of relationship, and parti- cularly of contrast, between socialism and political economy have presented themselves. All that we can now do is to emphasize a few of the more important of these. The

scope of the current political economy of Great Britain may be broadly defined as follows :—given the existing arrangements with regard to land, capital, and labour, to determine the economic phenomena and the economic laws that will prevail under a system of free individual competition. As we have abundantly seen, socialism is diametrically opposed to the permanent continuance of these arrangements. It looks forward to the time when the present system of individual property in land and

capital served by wage-labour will pass away, and when

free competition on that basis will cease with the system of which it is a part. It regards the present economic order with the laws and conditions peculiar to it as a pass- ing phase in the historic evolution of mankind, with no greater claim to permanence or finality than other historic eras which have had their day. What enlightened socialism above all demands is that an unprejudiced science should endeavour to distinguish between such economic laws as are permanently grounded in the nature of man and his en- vironment and such as have their validity only in the exist- ing economic order, between such as are enduringly founded on nature and such as are only the accidents or temporary manifestations of a changing civilization. Socialists appeal to history to prove that what the orthodox economy con- sidered the natural and normal order of things, with its dis-

tribution of wealth under the three categories of rent, profit, and wages, is really an exceptional phenomenon limited both in extent and duration. It is therefore an obvious error to speak of socialism as roundly controverting econo- mic law. It is no business of socialism to controvert a law grounded in nature, such as the physiological basis of the law of population; but it denies the applicability of the Malthusian precept under the present condition, when wealth is superabundant, but badly distributed owing to causes for which neither nature nor science, but human selfishness and ignorance are responsible. Nor does it lie in the principles of socialism to question the validity of those special economic laws that hold good under the present economic order. Some of these, such as the iron law of wages, socialism is disposed rather to accentuate unduly as a necessity of the present system. It is the aim of socialism to abolish the conditions under which such laws have their validity. Socialists object to the present economic order because of the necessity of results which are opposed to human wellbeing. They object entirely to the existing order with its distribution of the produce of labour into the three categories of rent, profit, and wages, because on it are founded class distinctions, with the consequent antagonism of classes, and the subjection and degradation of the lower classes,—holding that economic subjection involves all other forms of subjection and degradation. In short, scientific socialism as represented by Marx and Friedrich Engels appeals against the existing economic order, of which the orthodox political economy is an exposition and for which it is so frequently an apology, to the higher laws and principles of social evolu- tion as determined by the nature of man in relation to the environment in which he lives and develops.

There is no space here to trace historically the influence of political economy in the genesis of socialism, nor that of socialism on the recent political economy. It has natu- rally been the tendency of socialism to emphasize the idea of the worth and significance of labour, so prominent in the school of Adam Smith. This was one of the most valuable features of the Saint-Simon school, otherwise so much dis- figured with utopianism and extravagance. As we have seen, the socialism of Marx is in some of its most 1m- portant aspects a development of Ricardian principles. Turning to the influence of socialism on political economists, we need but refer to that exercised by French socialism

Relation to politi. cal eco- omy.

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SOCIALISM

on J. 8. Mill, as described in his Autobiography. The economics of Germany has for the last fifteen years been most powerfully affected by the theories of Lassalle, Marx, and latterly also of Rodbertus. The causes which have produced socialism have also affected economics; but a large part of the change is due directly to the teaching of the socialists, especially of Marx, whose great work is re- cognized as of the first importance. Without commanding assent to its leading conclusions, socialism has given a new direction to most of the recent Continental research in political economy. The German “socialism of the chair,” the influence of which is by no means confined to the country that produced it, is sufficient evidence of this.

As we have already seen, Marx and his school accept in the completest form the doctrine of evolution, which they * learned first in Hegel, but finally hold as taught by Darwin; and, in common with most socialists, from Saint-Simon downwards, they recognize three stages in the economic development of society,—slavery, serfdom, and wage-labour, —which last they believe will be displaced by an era of associated labour with a collective capital. But how, it is asked, does this theory of socialism as the next goal of society consist with the Darwinian doctrine of the struggle for existence and the survival of the fittest? Is not com- petition, this bée noire of the socialists, simply the social and economic form of the struggle for existence? Is not competition, therefore, the very condition of social progress ? Is not socialism, therefore, inconsistent with progress? The question suggested is a large and complicated one, to which we cannot here pretend to give an exhaustive or determinate answer, but can only indicate some of the main lines of discussion. (1) In all periods of human development, and especially in its higher stages, progress consists most essentially in a growing social and ethical virtue and in the cultivation of the beautiful both in sentiment and art. With such an enlarging ideal of progress, how harmonize a system of competition like the present, by which millions in every great European country are effectively deprived of the means of development, and even of bare livelihood? The struggle for

existence has always been modified by social and ethical conditions. If it is to continue, as it will in various forms, it should be carried on under higher conditions, suitable to a higher and less animal stage in the evolution of man. (2) Human progress has undoubtedly been attained through struggle, especially through the struggle for existence; but the struggle has essentially been one of men united in society, of tribe against tribe, of city against city, of nation against nation, and race against race. Thus it is easy to exagger- ate unduly the importance of the struggle of the individual man. History has only too often seen the abnormal de- velopment of private selfishness, so overgrown as to weaken, and finally dissolve and overthrow, the society in which it acted, thereby accomplishing its own destruction. This is indeed the open secret of the ruin of most of the com- munities that have existed. In short, a happy and healthy individual development can be secured only through its due subordination to social virtue and the general welfare. Human progress has been by strong societies with a well- developed social and public virtue. The excessive develop- ment of “individualism” within a society has been its weakness and ruin. (3) While emphasizing the extreme inportance of the hereditary principle, especially as con- nected with the fundamental institution of the family, we should also recognize its tendency to abuse in perpetuating the enormous inequalities of property and condition, many of which originated in a less perfect system of society. The hereditary principle has indeed greatly contributed to the solidity and continuity of the social order; but it also Sives an exceptional advantage in the struggle for existence

to the privileged few. In this point, therefore, the present system does not best fulfil the requirements of the evolution theory as applied to society. The struggle is not one of merit. It is frequently one of merit against hereditary privilege ; not seldom it is one of privilege against privilege without regard to merit at all. (4) In considering the possibilities of human progress afforded by the present system of society in the light of the evolution theory, it is impossible to ignore the fact that the continuance of the race depends most on the less fit members of society, on the lower strata, which are thriftless, the worst fed, and worst educated. While the classes which are most in- telligent and endowed with self-control abstain

from marriage or defer it, those who have the lowest organiza- tion marry early and have large families. Even to per- petuate disease and deformity is not considered wrong. It may be that prohibitory and restrictive laws, even if passed, would prove inoperative and ineffectual in restrain- ing so many hasty and ill-considered unions that only serve to multiply misery and disease; but it is surely excusable at least to inquire whether this abuse of freedom could not be curtailed by strengthening the social union and increasing the pressure of the enlightenment and moral sense of the community. (5) Above all, as the tendency of the present order is to give the victory to cheapness, it may be asked whether competition,—the economic form of the struggle for existence—is really such a sure and potent element of progress, unless most powerfully counteracted by other principles? In short, history is the resultant of many complex forces, and it is easy to push too far the formule of any-system. It is out of the balance and harmony of many principles, of which the struggle for existence is but one, that human progress can proceed. (6) The main point is that in social evolution the widest phase of the struggle for existence is between forms of social organization. Hence the great question as regards socialism is whether it is the fittest form of social organ- ization for the time coming? Is it best adapted to carry forward and develop in wider and more adequate form the progressive life of the future ?

While many socialists have announced lax views regard- ing marriage and the family, it cannot in view of popular misunderstanding be sufficiently emphasized that the essence of socialism is an economic change. It enunciates no special doctrine on the relation of the sexes. In common with other social reformers, socialists generally advocate the equality of the sexes and the emancipation of women ; they object to the mercenary element so common in mar- riage ; and they abhor prostitution as one of the worst and vilest of existing evils, believing, moreover, that it is a necessary result of the present distinction of classes and of the unequal distribution of wealth. The views of the anarchists have already been noted. In the Marx school there is a tendency to denounce the legally binding con- tract in marriage. But such views all belong to the accidents of socialism.

So with regard to religion. Socialism has been and still is very frequently associated with irreligion and atheism. The same remark applies to

Continental liberalism, and partly for a like reason: the absolute Governments of the Continent have taken the existing forms of religion into their service and have repressed re- ligious freedom. On religion as on marriage socialism has no special teaching. While the anarchists of the school of Bakunin would overturn all forms of religion and reject the idea of God, the social democrats of Ger- many in their Gotha programme of 1875 declare religion to be a private concern. As we have seen, Christian socialism is a considerable force in many European coun- tries ; and in many of the other schools, especially that of

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Marriage and family.

Religion.

In rela- tion to politics.

Conclu- sion.

with that of Christianity are unmistakable.

In their revolutionary impatience the anarchists have avowed their hostility to all the existing political forms except the free commune, which alone will be left standing amid the general wreck they contemplate. The Marx school, as represented by its ablest living exponent, Friedrich Engels, also look forward to a period in the evolution of society when the state will become superfluous, and, having no longer any function to perform, will die away. The state they regard as an exploiting institution, an organiza- tion of the ruling classes for retaining the workers in economic subjection. The International was an attempt to supersede the exploiting states by a combination of the workers of all countries without distinction of creed, colour, or nationality. When the workers in the name of the whole society seize political power and take over the con- trol of production, the rule of classes, their conflicts and the excesses of the struggle for existence among them, will cease. Instead of a government over persons we shall have an

administration of things and the control of pro- ductive processes. Obviously the Marx school reserve the realization of this idea till the evolution of society has prepared the way for it. In the conduct of the International they insisted on a strongly centralized form of organization as against the free federalism and the rejection of all authority maintained by Bakunin and his followers. This opposition between centralization and federalism does not concern us here ; it isa question common to theoretical and practical politics. It is necessary, however, to say a word about the opposition between the national tendency of the Lassalle school and the international socialism of Marx. As we have seen, a compromise was effected in the Gotha programme of 1875, in which the importance of the nation as an existing form of human society is amply recognized. The question is still discussed in the organs of the social democrats ; but the international tend- ency is decidedly the prevalent one. “ Want of patriotism ” is one of the current epithets of reproach cast at them. It is needless to point out that as most new movements of importance have been revolutionary, 80 also have they for good or evil been international. In becoming international the labour movement has only followed the example set by commerce, finance, diplomacy, religion, philosophy, art, music.

We have now reviewed the most important aspects of the socialist movement. As we have seen, socialism is a new form of social organization, based on a fundamental change in the economic order of society. Socialists believe that the present economic order, in which industry is carried on by private competitive capital, must and ought to pass away, and that the normal economic order of the future will be one with collective means of production and associated labour working for the general good. This principle of socialism is cardinal and fundamental. All the other theories so often connected with it and so im- portant in relation to religion, philosophy, marriage, patriotism, d&c., are with regard to socialism non-essential. Questions of method, though supremely important, must also be distinguished from the essential principle. At the same time it will be seen that an economic change, such as that contemplated in socialism, would most powerfully affect every other department of human life. Socialism, in short, means that in industry, in the economic arrange- ments of society, the collective or co-operative principle shall become normal or universal, that all who are able should contribute to the service of

society, and that all should share in the fruits of the associated labour according to some good and equitable principle. In such a condition of things the noblest field for ambition will be in the

Louis Blane, the kinship and even identity of ethical spirit

service of society,—an ideal which is already partially real- ized in the democratic state. It is in this fundamental sense that J. S. Mill declared himself a socialist.! It ig in this sense also that Albert Schiafile, one of the first living authorities on economics and sociology, has, after long years of study of the subject, come to the conclusion that “the future belongs to the purified socialism.”?

Scientific socialists strongly insist that this economic order of the future cannot be realized by utopian schemes or arbitrary legislation or mere revolutionary disturbance. Tf it come at all, it must come as the consummation of the dominant tendencies of modern social development ; it must be realized under the conditions prescribed by our nature and environment. In discussing the doctrines of Marx we stated that the central point of the question was

this—do the strongest forces of the social development of

our time really tend towards the superseding of the present economic order and towards the establishment of a new

and wider order based on collective capital and associated labour? Socialists maintain that they do, and that there is at present going forward a double process of dissolution and reconstruction,—the dissolution of individualism with a constructive tendency towards collectivism. From the socialist point of view the following may be signalized as indicative of such a process. | economic anarchy already explained in treating of Marx’s views. crises succeeding each other, resulting in stagnation and depression which now threaten to be chronic and permanent. While the productive forces of the world are enormously increasing, they only tend the more to intensify national and international competition, and to render labour super-

fluous, precarious, and dependent. Under this system the worker has neither freedom nor security. All this variety of symptoms are only a sign of the break-down of the present economic order both in principle and method. They are the necessary results of the competitive system, which has thus finally revealed its real nature and tendency, —economic and social anarchy. (2) The constant and inevi- table tendency towards concentration in industrial opera- tions, which began with the introduction of steam and of the factory system, through which the small producer has

(1) The tendency towards

Over the whole industrial world we see great

been superseded by the capitalist, the smaller capitalist by the larger. And now the single capitalist is being absorbed in the company, a growing proportion of the world's busi- ness being so large that only a great company can provide the requisite capital and organization ; whilst in the large companies there is a tendency, in case they cannot drive each other out of the field, to bring about a fusion of interests. In all this we see a great constructive process inevitably going on as the result of the inherent tendencies of industrial development. Thus the control of industry will be concentrated in a few colossal companies and their chiefs. It is obvious how this process could simplify the transference of the whole to a collective management by society. (3) This leads us toa third important point, the growing tendency towards state control of industry, and the growing sense of the responsibility of society for all its members, observable in German politics, not less than under the more democratic conditions of France and Eng- land. It is apparent how under this influence the existing state might absorb one by one all the large social functions, as has already happened with regard to education, means of communication, &c. Naturally this could be accom- plished only through a most comprehensive development of local and subordinate bodies of every kind. Socialism by no means implies that such an enormous burden of

1 See his Autobiography ; also his Pol. Economy, chapter on the

probable future of the labouring classes. 2 Bau und Leben, vol. ii. 120.

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work should be thrown on the central government. Most socialist schools have contemplated a vast increase of com- munal or local autonomy,—a course which, on the other hand, does not carry with it the subversion of the central government. (4) In England during the last half century we have seen a long succession of efforts, partially success- ful, towards a new organization of society rendered neces- sary by the changes due to the industrial revolution. In economics as in other spheres the watchword of the new era has been freedom, the removal of restraint. But it has been found that positive measures of reconstruction were also necessary. Factory legislation carried in oppo- sition to the prevailing economic theory, trades unions, employers' combinations, industrial partnerships, boards of conciliation, the co-operative system,—all these are real, if partial, endeavours towards a new organization of society suited to the new conditions. Socialism claims to be the comprehensive scheme of organization which embraces in a complete and consistent unity all these partial efforts. (5) But the great social force which is destined to work out the vast transformation consists of the human beings most directly interestedin the colossalstruggle,—the modern democracy. This democracy is marked by a combination of characteristics which are new to history. It is being educated and enlightened in the school and by the cheap press; it is being drilled and organized in large factories, in the national armies, by vast popular demonstrations, in the gigantic electoral struggles of the time. Thus it is becoming conscious of its enormous power, and able to make use of it. It is becoming conscious also of its unsatis- factory social and economic position. The democracy which has become the master-force of the civilized world are economically a mass of proletarians dependent on pre- carious wage-labour. Having transformed the political condition of things, they are ready now for an economic transformation. But the inevitable process of concentra- tion of industrial operations already referred to is entirely against the continuance or restoration of the small producer, whether workman or peasant proprietor. Such efforts of continuance or

restoration are reactionary; they are econo- mically unsound and must fail. Production and distribu-

SOCIETIES. Under Acaprmy will be found an ac- count of the various bodies of which that word forms part of the titles, usually denoting some kind of state support or patronage. The present article is restricted to scien- tific, archeological, and literary societies, chiefly those founded and carried on by private collective effort. Cer- tain academies omitted in the previous article are, how- ever, referred to. Governmental, collegiate, and univer- sity institutions do not come within our scope, neither as a rule do endowed societies, nor yet institutions which, although they bear the name, carry on no kind of joint literary or scientific work. With a few exceptions here and there, the societies mentioned are still flourishing.

In their modern form learned and literary societies have their origin in the Italian academies of the Renaissance ; but private scientific societies have arisen chiefly during the 19th century, being due to the necessity of increased organization of knowledge and the desire among scholars for 2 common ground to meet and compare results and collect facts for future generalization. These bodies rapidly tend to increase in number and to become more and more specialized. Many efforts have been made from time to time to tabulate and analyse the literature pub- lished in their proceedings, as, for instance, in the indexes of Reuss (1801-21) and the Royal Society (1867-79) for physics and natural science, and those of Walther (1845) and Koner (1852-56) for history. A further development

tion ever tend to larger dimensions. The only issue out of the present economic condition is concentrated collect- ive industry under the control of the new democracy and its chosen leaders. On the irresistible momentum of these two inevitable and ever-growing forees—the concen- tration of industry and the growth of the new democracy— socialism depends for the realization of its scheme of trans- formation.

Such are the tendencies to which philosophic socialists point as already working towards a transformation of society of the kind they expect. It is essentially a question of the future, with which we have no concern in this

article. Our duty has simply been to point out the forces which socialists believe to be actually at work for the realization of their theory of social organization ; and here we must leave the subject.

Literature.—The literature of socialism is enormous and rapidly growing ; besides those named under the special articles we now give a list of some of the leading works which are in whole or in part devoted to it :—Karl Marx, Das Kapital (1st vol., 3d ed., Ham- burg, 1883; 2d vol., Ist ed., Hamburg, 1885); Friedrich Engels, Eugen Dithring's Umwileung der Wissenschaft, a controversial work, but containing a remarkably clear and able exposition of the Marx position by its best living exponent (2d ed., Hottingen-Zurich, 1886) : Albert Schiffle, Bau wnd Leben des socialen Kérpers (Tiibingen, 1878 ; the third vol. of this work supersedes his Kapitalisimus und Social- ismus, Tiibingen, 1870), Quintessenz des Socialismus (7th ed., Gotha, 1879) ; Adolf Held, Sozialismus, Sozial-Demokratie, und Sozial- Politik (Leipsic, 1878) ; Von Sybel, Die Lehren des heutigen Social- tsmus und Communismus (Bonn, 1872); Lujo Brentano, Die christ- lich-soziale Bewegung tn England (Leipsic, 1883) ; Von Scheel, Die Theorie der sozialen Frage (Jena, 1871); Alphons Thun, Geschichte der revolutioniren Bewegungen in Russland (Leipsic, 1883); Rudolf Meyer, Der Emaneipations-kampf des vierten Standcs (2d ed., Berlin, 1882); Franz Mehring, Die Deutsche Socialdemokratie, thre Geschichte und thre Lchre (Bremen, 1879); Laveleye, Le Socialisme Contem- porain (2d ed., Paris, 1883); Paul Janet, Les Origines du Socialisme Contemporain (Paris, 1883) ; Paul Leroy- Beaulieu, Le Collectivisme (Paris, 1884); Le Procés des Anarehistes (Lyons, 1883); John Rae, Contemporary Socialism (London, 1884); Stepniak, Underground Russia (London, 1883); Hyndman, Historical Basis of Socialism in England (London, 1884), See also the relative chapters in Roscher's Grundlagen der Nationalékonomie; Adolf Wagner's Lehrbuch der politisehen Oekonomie (vol. i., Grundlegung, 2d ed., Leipsic, 1879) ; Mill's Political Keonomy and Autobiography ; and Sidgwick's Prin- ciples of Political Economy. (IU, Tika)

of the work done by societies was made in 1822, when, chiefly owing to Humboldt, the Gesellschaft deutscher Naturforscher und Aerze first met at Leipsic. This inau- guration of the system of national congresses was followed in 1831 by the British Association for the Advancement of

Science, which has served as the model for similar societies in France, America, and elsewhere. The merit of intro- ducing the idea of migratory congresses into France is due to the distinguished archeologist, M. Arcisse de Cau- mont (1802-73), who established the Association Normande, which since 1845 has held a reunion in one or other of the towns of the province for the discussion of matters relating to history, archeology, science, and agriculture, with local exhibitions. From the same initiation came the Congrés Archéologique de France (1834), which was organized by the Société Prancarse pour la Conservation des Monuments Historiques, the Congrés Scientifique, which held its first meeting at Caen in 1833 (directed by the Jnstitut des Provinces), and the Congrés des Sociétés Savantes des Départements, which for many years after 1850 held its annual sittings at Paris, The idea received the sanction of the French Government in 1861, when a Congrés des Socétés Savantes was first convoked at the Sorbonne by the minister of public instruction. In Italy Charles Bonaparte, prince of Canino, started an association with like objects, which held its first meeting at Pisa in 1839. Russia has had an itinerant gathering of naturalists since

1867. International meetings are a natural growth from congresses in which specialists of one country or speech are alone represented. Two remarkable examples of these cosmopolitan societies are the Congrés International Archéologie et Anthropologie Préhistoriques, founded at Spezzia in 1865, and the Congres International des Orientalistes (1873). Another step towards more com- plete organization was taken when the Smithsonian Insti- tution (Washington, U.S.) developed the admirable system of international exchanges of its publications, as well as of other works and specimens, among societies and indi- viduals. The Institution has agents in every part of the globe, and entertains relations with all the leading societies in the world. The International Scientific Bureau, a pri- vate enterprise, was established at Haarlem by Dr Van Baumhauer to facilitate the sending of parcels among so- cieties and scientific men in Holland. Since 1875 the French ministry of public instruction has organized a distribution of foreign publications among societies in France. In Eng- land local scientific societies are now officially represented at the meetings of the British Association. In 1883 rules were framed for the admission of corresponding

societies and for the institution of a conference of delegates to hold sittings contemporaneously with the annual meeting of the Association, for the purpose of discussing " propositions bearing on the promotion of more systematic observation and plans of operation, and of greater uniformity in the mode of publishing results," as well as for the consideration of "matters in which the co-operation of corresponding societies is desired." A committee was appointed in 1882 at the Montreal meeting of the American Association for the Advancement of Science "to confer with committees of foreign associations for the advancement of science with reference to an international convention of scientific associa- tions ;" and a fund for the purpose has been started.

It has been thought desirable to classify the societies treated of in the present article under the following head- ings, the first of which includes those of the widest scope, dealing with the whole range of natural history, or with archeology and literature as well as science :—I. science generally; II. mathematics ; III. astronomy ; TV. physics ; V. chemistry; VI. geology, mineralogy, and paleontology ; VII. meteorology; VIII. microscopy; IX. botany and horticulture; X. zoology; XI. anthropology; XII. sociology (embracing economic science, statistics, law, and educa- tion); XIII. medicine, surgery, &c.; XIV. engineering and architecture; XV. naval and military science; XVI. agri- culture and trades; XVII. literature, archeology, and history ; XVIII. geography.

I. SclENCE GENERALLY.

Unirep Kincpom.—First in antiquity and dignity among English societies comes the RovaL SocrEty (g.v.) of London, which dates from 1660. In 1683 William Molyneux, the author of The Case of Ireland Stated, exerted himself to form a society in Dublin after the pattern of that of London. In consequence of his efforts and labours the Dublin Philosophical Society was established in January 1684, with Sir William Petty as first president. The members subsequently acquired a botanic garden, a laboratory, and a museum, and placed themselves in communication with the Royal Society of London. Their meetings after 1686 were few and irregular, and came to an end at the commencement of hostilities between James II.and William III. The society was reorganized in 1693 at Trinity College, Dublin, where

meetings took place during several years. On 25th June 1731, chiefly owing to the exertions of Dr 8. M. Madden, the Dublin Socicty for Improving Husbandry, Manufac- turcs, and other Useful Arts came into existence. In January 1737 they commenced to publish the Dublin Society's Weekly Observa- tions, and in 1746 the society was placed on the civil establishment, with an allowance of £500 a year from the Government.

agriculture and manufactures were distributed by the society, which claims to be the oldest scientific body in the United Kingdom after the Royal Society of London. Ithas published Z'ransactions(1799- 1810); and its Proceedings (1764-75; 1848, &c.) and Journal (1858 &e.) are still issued. For the Royal Irish Academy, see AcADEMY.

The Royal Physical Society of Edinburgh was instituted in 1771 and incorporated in 1788 ; it is exclusively devoted to natural his- tory and the physical sciences. With it have been merged many other societies, such as the Chirurgo-Medical in 1796, the American Physical in 1796, the Hibernian Medical in 1799, the Chemical in 1803, the Natural History in 1812 (which brought in Brougham and Mackintosh), and the Didactic in 1818. It issues Proccedings (1858, &e.). From the Philosophical Society of Edinburgh (1739) was de- veloped the Royal Society of Edinburgh, whose charter is dated 29th March 1783. It was to comprise a physical and a literary class; among the members of the latter were Robertson, Hume, Burke, and Reid, and among those of the former Hutton, Black, Playfair, Dugald Stewart, and Watt. The literary division has been much less productive than the other. A second charter was obtained in 1811. The society has published Transactions (4to, 1788, &c.) and Proceedings (8vo, 1845, &c.).

The Linnean Society for the promotion of zoology and botany was founded in 1788 by Dr (afterwards Sir) J. E. Smith, in order to supplement the work of the Royal Society, and obtained a royal charter in 1802. The herbarium and collections of Linnzus, with the founder's additions, were purchased after his death. It re- moved from Sir Joseph Banks's old house in Soho Square to Bur- lington House (London) in 1857, and assumed the apartnients it now occupies in 1873. It has published Proceedings (1849,

&c.). The Journal (8vo, 1857, &c.) and the Transactions (4to, 1791, &c.) are divided into zoological and botanical sections. The Society for the Encouragement of Arts, Commerce, and Manufactures took its origin in 1753 from an academy established in the Strand by the landscape painter William Shipley. Attention was paid to the application of science to practical purposes, a subject passed over by the Royal Society. Exhibitions of pictures by native artists were held, and the first exhibition of the Royal Academy took place in its rooms. A fresh start in a new career was made by the Society of Arts in 1847, when it obtained a charter and the presidency of the Prince Consort. The International Exhibition of 1851 sprang from the smaller exhibitions previously held in its rooms. The East Indian gection dates from 1869, the foreign and colonial and the chemical sections from 1874. Its organs have been Transactions (1783-1849) and the Journal (1853, &c.). Sir Joseph Banks, Count Rumford, and other fellows of the Royal Society started the Royal Institution in 1799, when a site was purchased in Albemarle Street for “an establishment in London for diffusing the knowledge of useful mechanical improvements,” to ‘‘teach the application of science to the useful purposes of life.” The institution was incorporated in the following year. One of the most important epochs in the history of chemistry must be dated from the establishment of the laboratory where Davy and Faraday pursued their investigations. Belonging to the institution are foundations for professorships in natural philosophy, chemistry, and physiology. Courses of lectures on special subjects are given as well as discourses (once a week) of amore general and literary character. Its Jowrnal has been issued since 1802. The London Institution was established on a similar basis in 1805 and incorporated in1807. The building in Finsbury Circus was erected in 1819. The British Association for the Advancement of Science was instituted at York on 27th September 1831 in imita- tion of the itinerant scientific parliament held in Germany since 1822 (already referred to), and arose from a proposal by Sir D. Brewster. A mecting is held annually in one of the chief provincial towns of the United Kingdom. The object of the association is to promote science, to direct general attention to scientific matters, and to facilitate intercourse between scientific workers. Abstracts of the proceedings and reports of committees are published in the annual Report (1833, &c.). The Historical Society of Science (1841) printed a couple of volumes ; and the Ray Society (1844), instituted for the printing of original and scarce old works (38 vols. have

appeared) in zoology and botany, still flourishes. The Royal Colonial Institute was founded in 1868 and incorporated in 1882. It provides a place of meeting for gentlemen connected with the colonies and British India, undertakes investigations into subjects relating to the British empire, has established a museum and library; and gives lectures in its new building in Northumberland Avenue (London). It has published Proceedings since 1870. The Victoria Institute, or Philosophical Society of Great Britain, was founded in 1865 to form a connecting bond between men of seience and. others engaged in investigating important questions of philosophy and science, more especially those bearing upon the truths revealed in Holy Scripture. Its organ is the Journal (1867, &e.), The Balloon Society of Great Britain (1880) is not restricted to aero- nautics, but deals with recent discoveries and inventions, and science generally. The foundation in 1821 of the Socicty for the Encouragement of the Useful Arts in Scotland, now usually known as the Royal Scottish Socicty of Arts, for the promotion of the useful

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arts and such branches of science as bear upon them was due to Sir D. Brewster, Sir J. Mackintosh, and others; it was incorporated in 1841, and has published Z'ransactions since that year.

The leading provincial societies of Great Britain of a general character are as follows. Aberdeen, Nat. Hist. Soc. (1863), Trans.; Phil. Soc. (1840). Alloa, Soc. of Nat. Hist. and Arch, (1863), Proc. (1865, &c.). Banffshire Field Club and Sc. Soc. (1880), Proc. Bath, Nat. Hist. and Antiq. Field Club (1866), Proc. (1867, &c.). Bedfordshire Nat. Hist. Soc. (1875), Trans. Belfast, Nat. Hist. and Phil, Soc. (1821), Proc. (1852, &¢.); Naturalists' Field Club (1863), Proc. (1875, &c.). Berwickshire Naturalists' Club (1831), Proc. (1834, &c.). Birkenhead, Lit. and Se. Soc. (1857). Birmingham, Nat. Hist. and Mier. Soc. (1858), Proc. (1869, &c.); Birmingham and Midland Institute Sc. Soc. (1870), Trans. of archeological sec- tion (1871, &¢c.); Phil. Soc. (1876), has a fund for promotion of original research, Proc.; Midland Union of Nat. Hist. Societies (1877), Midland Naturalist. Bolton, Lit. and Phil. Soc. (1871). Bradford, Phil. Soc. (1865), with various local societies affiliated to it. Brighton, Brighton and

Sussex Nat. Hist. Soc. (1854), Ann. Re- ports (1855, &c.). Bristol, Muscum and Library (formed by the amalgamation of the Institution for the Advancement of Sc., Lit., and the Fine Arts with the Lit. Soc., founded 1772); Naturalists' Soc. (1862), Proc. (1866, &e.). Burnley, Lit. and Se. Club (1873), Trans. Burton-on-Trent, Nat. Hist. and Arch. Soc. (1876). Cambridge, Phil. Soc. (1819 ; incorporated 1832), for the promotion of

hilosophy and natural science, owns museum and library, Proc. (1865, &c.), Trans. 1821, &e.). Cardiff, Naturalists' Soc. (1867), Trans. Chester, Soc. of Nat. Se. (1871), Proc. Cork, Royal Inst. (1807), library ; Cuvierian and Arch. Soc. (1836). Cornwall Royal Inst., at Truro (1818), devoted to natural philosophy, natural history, and antiquities, Jowrnal (1864, &c.); Royal Polytechnic Soc., at Falmouth (1833 ; founded by the daughters of R. W. Fox and others), for the encouragement of science and the fine and iudustrial arts, Trans. (1835, &c.). Cumberland Assoc. for the Advancement of Lit. and Sc. (1876), provides a means of union for the local scientific societies of Cumberland and Westmoreland, Trans. Derry Nat. Hist. and Phil. Soc. (1870). Devonshire Assoc. for the Advance- ment of Sc. (1862). Dorset Nat. Hist. and Antig. Club (1875). Dumfriesshire and Galloway Sc., Nat. Hist., and Antig. Soc. (1876), Trans. Dundee, Natu- ralists' Soc. (1873). Eastbourne, Nat. Hist. Soc. (1867), Proc. (1869, &¢.). East of Scotland Union of Naturalists' Societies (1884), Trans. Ebbw Vale, Lit. and Se. Inst. (1850), owns laboratory. Elgin, Elgin and Morayshire Lit. and Sc. Assoc. (1836). ssea Field Club (1880), at Buckhurst Hill, Trans. Exeter, Naturalists' Cluband Arch. Assoc. (1862). Glasgow, Phil. Soc. (1802), Proc. (1844, dsc.); Nat. Hist. Soc. (1851), Proc. (1868, &c.); Soc. of Field Naturalists (1872), Trans. (1872, &c.). Gloucester, Lit. and Sc. Assoc. (1838). Greenock, Phil. Soc. (1861). Hiali- fax, Phil. and Lit. Soc. (1830), muscum and library. Hereford, Woolhope Natu- ralists Field Club, Hereford Pomona and Trans. (1866, &c.). Hertfordshire Nat. Hist. Soc. and Field Club, formed in 1879 from the Watford Nat. Hist. Soc. (1875), Trans. High Wycombe, Nat. Hist. Soc. (1865), Magazine(1866, &c.). Hull, Lit. and Phil. Soc. (1822), Trans. (1824, &c.). Inverness, Sc. Soc. and Field Club (1875). Isle of Wight Phil. and Sc. Soc. (1850). Kent (East) Nat. Hist. Soc., at Canter- bury (1858), Trans. Leeds, Phil. and Lit. Soc. (1820); Naturalists' Club (1870), Trans. Leicester, Lit. and Phil. Soc. (1837), Trans. Lewes, Lewes and East Sussex Nat. Hist. Soc. (1864). Liverpool, Lit. and Phil. Soc.

(1812; united with Nat. Hist. Soc. in 1844), Proc. (1845, &c.); Philomathic Soc. (1825), Trans. ; Polytechnic Soc. (1838), Journal (1838, &c.); Naturalists' Field Club (1860). Manchester, Lit. and Phil. Soc. oe two sections, one physical and mathematical, the other for microscopy and natural history,—the original statements respecting the atomic theory were given by Dalton in the Memoirs (1789, &c.); Field Naturalists' and Arch. Soc. (1860), Trans.; Scientific Students Assoc. (1861). Montrose, Nat. Hist. and Antig. Soc. (1836), museum. Newbury, District Field Club (1870), Trans. (1871, &c.). Newcastle-on-Tyne, Lit. and Phil. Soc. (1793), library ; Northum- berland, Durham, and Newcastle Nat. Hist. Soc. (1829), a museum (opened in 1884), Trans. Norfolk, Norfolk and Norwich Naturalists' Soc. (1869), Trans. (1870, &c.). Nottingham, Lit. and Phil. Soc. (1864). Orkney Antig. and Nat. Hist. Soc. (1837), museum. Oxford, Ashmolean Soc. (1828), promotes all branches of practical knowledge. Paisley, Phil. Institutton (1808), free library and museum

fr Coats presented his observatory in 1882. Penzance, Nat. Hist. and Antiq.

Soc. (1839), museum, Proc. (1845, &.). Perth, Lit. and Antig. Soc. (1784) 3 Perth- shire Soc. of Nat. Sc. (1867), Proc. (1869, &c.), The Scottish Naturalist 1870, &c.). Plymouth, Plymouth Inst. and Devon and Cornwall Nat. Hist. Soc. (1812), museum, art gallery, and library. Richmond, Richmond and North Riding Naturalists' Field Club (1863), Trans. Ripon, Naturalists' Club and Sc. Assoc. (1882). Scar- borough, Phil. and Arch. Soc. (1831), museum and library. Severn Valley Natu- ralisis Field Club, at Bridgenorth (1863). Sheffield, Lt. and Phil. Soc. (1822). Shetland Lit. and Se. Soc., at Lerwick (1861). Shropshire and North Wales Nat. Hist. and Antig. Soc. (1885), at Shrewsbury. Somersetshire Arch. and Nat. Hist. Soc., at Taunton (1849), Proc. (1851, é&c.), Southampton, Hartley Institution (founded under bequest of H. R. Hartley in 1859, incorporated 1862), for the promotion of scientific, antiquarian, and Oriental studics and the fine arts, owns @museum and library. Staffordshire (North) Naturalists' Field Club and Arch. Soc. (founded as a natural history society in 1865; enlarged 1877), holds movable meetings. Stirling, Nat. Hist. and Arch. Soc. (1878), Trans. \Stock- port, Soc. of Naturalists (1884), Trans. Suffolk Inst. of Arch. and Nat. Hist. ' at Bury St Edmunds' (1848), Proc. (1848, &c.), The Hast Anglian (1859, &c.). Swansea, Royal Institution (founded 1835;

incorporated 1883), with a museum and library, promotes natural history and applied science, literature and fine arts, local history and antiquities. Tamworth, Nat. Hist., Geolog., and Antiq. Soc. (1871). Teign Naturalists' Field Club (1858). Torquay, Nat. Hist. Soc. (1844), museuin and library. Tweedside and Kelso Physical and Antig. Soc. (1834). Warrington, Lit. and Phil. Soc. (founded in 1870 upon the Micr. Soc.). Warwick- shire Nat. Hist. and Arch. Soc. (1836), has a library and geological museum ; vw arwickshire Field Club(1854). Whitby, Lit.and Phil.Soc.(1822), owns a museum. Wiltshire Arch, and Nat. Hist. Soc., at Devizes (1853), Wiltshire Magazine (1853, &c.). Windsor, Windsor and Eton Sc. Soc., Trans. Witney, Nat. Hist. and Lit, Soc. (1858). Yorkshire Phil. Soc. (1822), the museum in the grounds of St Mary's Abbey, York, contains a remarkable collection of Roman remains ; Geolog. and Polytechnic Soc. (1837), quarterly meetings in various Yorkshire towns; Natwralists' Union of the natural history and scieutific societies of the county (founded in 1861 as the West Riding Consolidated Naturalists' Soc. ; Teorganized in 1876), the Naturalist (1876, &c.)

Arrica: Cape Town, South Afr. Phil. Soc., Trans. (1878, &c.); Mauritius, Roy. Soc. of Arts and Sc., Proc. (1846, &c.) and Trans. (1848, &c.). Canapa: Iialifax, Nova Scotian Inst., Proc. (1863, &¢.; 1867, &c.). Montreal, Nat. Iist. Soc., Cana- dian Naturalist (1857, &c.). Ottawa, Lit. and Sc. Soc. Toronto, Canadian Inst., Canadian Journal (1852-76), Proc. (1879, &c.). Winnipeg, Hist. and Sc. Soc. WEST Ixpizs : Kingston, Roy. Soc. of Arts of Jamaica, Trans. (1854, &c.). Port of Spain, Se. Assoc. of Trinidad, Proc. (1866, &c.). AUSTRALIA and New ZEALAND ; Adelaide, Phil. Soc., Trans. (1865, &c.); South Australian Inst. (1836), library ; Roy. Soc. ofS. Australia. Auckland, Auckland Inst. Brisbane, Queensland Phil. Soc, Christchurch, Phil. Inst. Hobart Town, Roy. Soc. of Van Diemen's Land, Papers (1851, &.); Roy. Soc. of Tasmania, Monthly Notices (1869, &c.). Mel- bourne, Roy. Phil. Soc. of Victoria, Trans. (1855, &¢.); Nat. Hist. Soc.: Zoolog. and ae Soc., Proc. (1872). Sydney, Linnean Soc. of N. &. W., Proc. (1876, &c.); a Soc., Trans. (1862, &c.; 1866, &c.); Roy. Soc. of N. S. W., Trans. (1867,

¢), Wellington, New Zealand Inst., Trans. (1869, é&¢.).

Unitep States.—The first scientific society in the United States originated from a Proposal for Promoting Useful Knowledge among the British Plantations, issued by Dr Franklin in 1743, In the following year the American Philo- sophical Society was founded at Philadelphia, with Thomas Hopkinson as pre- sident and Franklin as secretary. With it was united on 2d January 1769 another Philadelphia society, The Junto (1758), the records of which have been preserved. The American Phtlosophical Society is still in vigorous life, and is an exclusively scientific body and the oldest organized society in the United States for the pursuit of philosophical investigation in its broadest sense. It publishes Transactions (4to, 1771, &c.) and Proceedings (Svo, 1840, &c.). Although not a society in the exact sense of the word, the Smithsonian Institution, the inost important scientific body in America, must not be overlooked. It was founded at Washington by James Lewis Macie, afterwards called Smithson, a natural son of Hugh Smithson, duke of Northuinberland. He died in 1829, leaving by will a sum of money which in 1838 amounted to over half a million dollars, ‘‘to found at Washington, under the name of the Smithsonian Institu- tion, an establishment for the increase and diffusion of knowledge among men.” The institution was established by Act of Congress in 1888. The endowment has now been increased to half as much again as the original bequest. ‘The National Museum, founded in 1842, the nucleus of which was the natural history collections brought home by the Wilkes and other exploring expeditions, was given into the custody of the Smithsonian Institution in 1858. It has since been largely increased and is now particularly rich in the ethnology, zoology, and mineralogy of the United States. The chief function of the institution is to assist scientific research and to act as an organized centre for the exchange of books and specimens with scientific bodies and individuals throughout the whole world. The Annual Reports date from 1846 (8vo, 1847, &c.), the Smith- sonian Contributions to Knowledge (4to) from 1848, and the Miscellaneous Collec- tions from 1856 (8vo, 1862, &c.). The Proceedings and Bulletin (1875, &c.) of the National Museum are issued under the authority of the Smithsonian Institu- tion, as well as the publications of the Bureau of Ethnology and the Bulletin of the Philosophical Society of Washington. Second in point of date comes the American Academy of Arts and Sciences

of Boston, incorporated in 1780 with the object of furthering the study of the antiquities and natural history of the country. Its Memoirs (4t0, 1785, &c.) and Proceedings (8vo, 1848, &c.) are still published. The Connecticut Academy of Arts and Sciences was incorporated at New Haven in 1799. At first only devoted to matters connected with the State of Connecticut, it now embraces the whole field of the sciences and useful arts. It has issued Memoirs (1810-16), and now publishes Transactions (1866, &c.). One of the leading societies in the United States, the Academy of Natural Sciences of Philadelphia, founded in 1812 and incorporated in 1817, possesses the best natural history library (35,000 vols.) in the country and one of the largest natural history museums in the world, being especially rich in conchology. It issues a Journal (1817, &c.) and Proceedings (1843, &c.). The American Entomo- logical Society is merged with it. The Franklin Institute of the same city, in- corporated in 1824, possesses a library, gives lectures, and issues a Journal (1826, Bos, The Boston Society of Natural History was founded upon the Linnean Society (1814) in 1830 and incorporated in 1831. It possessesa library and a cabinet of specimens. It published the Boston Journal of Natural History (8vo, 1837-63), followed by Memoirs (4to, 1866, &c.); Procecdings (1844, &c.) are also issued. The Lyceum of Natural History, New York, was incorporated in 1817 and has published Annals from 1823 (1824, &c.) and Proceedings (1870, &.). In 1876 the name was changed to New York Academy of Sciences. A number of American naturalists and geologists, having held meetings in various cities be- tween 1840 and 1847, resolved themselves at their Boston congress in the latter year into the American Association for the Advancement of Science, which was incorporated in 1874, Its object is ‘‘ by periodical and migratory meetings to promote intercourse between American scientists.” Ithas published Proceedings (1849, &c.). The National Academy of Science was incorporated at Washington in 1863 with a view to making the knowledge of specialists available for the service of Government. There are two classes of members, those in mathe- matics and physics and those in natural history. It has issued Annuals (Cambridge, 1865, &c.) and Reports, as well as Memoirs (1866, &c.). The Academies of Sciences at San Francisco (1853), St Louis (1856, incorporated 1857), Chicago (1857, incorporated 1865), and Davenport (1867) deserve special mention.

Among the remaining societies of a general scientific character are—Albany Inst. (1828), Trans. (1830, &c.), Proc. (1870, &c.). Ann Arbor, Se. Assoc, (1875). Baltimore, Maryland Acad. of Se. and Lit., Trans. (1837). Buffalo, Soc. of Nat. Se. (1861), Bulletin (1873, &c.). Charleston, Hlliot Soc. of Nat. Hist. (1853), Proc. (1855, &c.), Journal (4to, 1859, &e.). Cincinnati, Soc. of Nat. Hist. (1870), Proc. (1876, &c.). Cleveland, Acad. of Nat. Sc. (1852), Annals and Proc. Dubuque, Lowa Inst. of Sc. and Arts, Trans. Indianapolis, Acad. of Sc., Trans. (1872, &c.). Madison, Wisconsin Acad. of Sciences, Arts, and Letters (1870), Bulletin (1870, &c.), Trans. (1872, &c.). Minneapolis, Minnesota Acad. of Nat. Se. (1873), Bulletin. New Orleans, Acad. of Sc. (1853), Proc. Portland (Maine), Soc. of Nat. Hist. (1850), Proc. (1862, &c.). Poughkeepsie, Soc. of Nat. Hist. (1874), Proc. (1874, &c.; 1876, &c.). Rochester, Acad. of Nat. Sc. (1881). Salem (Mass.), Lissex County Nat. Hist. Soc. (1833 ; now merged in the Essex Institute), published the American Naturalist (1867-68), afterwards issued by the Peabody Acad. of Science, as well as Proc. (1856, &c.) and Bulletin (1869, &c.). Topeka, Kansas Acad. of Sc. (1867), holds meetings in various cities, Trans. (1872, &c.).

Francr.—The Institut de France (see INSTITUTE OF FRANCE), Which includes five separate acadeinies, stands at the head of all French societies. ‘The Société Philotechnique, founded in 1795 and recognized as of public usefulness by a de- cree of 11th May 1861, has for its object the encouragement and study of litera- ture, science, and the fine arts. Two public meetings are held annually. The Annuaire (1840, &c.) is its literary organ. The Société d’ Encouragement pour UIndustrie Nationale was founded in 1801 for the amelioration of all branches of French industry, and was recognized by the state in1824. Prizes and medals are Offered. It publishes a Bulletin. The Acudémie Nationale, Agricole, Manu- Jacturiére, Commerciale was founded by the duc de Montmorency in 1830, and also offers prizes and medals, and brings out a Bulletin (1830, &c.). The Asso- ciation Francaise pour PT Avancement des Sciences (1871), founded on the model of the British Association, holds migratory meetings and publishes Comptes Rendus. The scientific congresses whose origin was due to the initiation of M. A. de Caumont have been noticed at the beginning of the article.

The departmental societies are very numerous and active. The chief are the following. Abbeville, Soc. d'Emulation (1797), Mém. (1797, &c.). Agen, Soc. d' Agr., Sc., et Aris (1784), Recuetl (1804, &e.). Aix, Acad. des Sc., &c. (1829), based on Soc. des Amis de la Sc. (1808), Mém. (1819, &c.). Alais, Soc. Sc. et Litt. (1868), Bull. (1868, &e.). Amiens, Acad., based on Soc. Litt. (1746), Mém. (1835, &c.); Soc. Linnéenne (1838), Mém. (1866, &c.). Angers, Soc. Acad. de Maine et Lotre (1857), Mém. (1857, &c.); Soc. d'Agr., dc. (1818), Mém. (1881, &c.); Soc. Linn. de Af, et L. (1852), Annales (1853, &c.). Angouléme, Soc. d' Agr., &c., de la Charente (1803), Annales (1819, &e.). Annecy, Soc. Florimontane (1851), Annales (1851, &e.)and Rev. Savoisienne (1860, éc.). Apt, Soc. Litt., Sc., et Art. (1863), Annales (1865, &c.). Arras, Acad. (1738), Mém. (1818, &c.)and other publications. Autun, Soc. Eduenne (1836), Mém. (1837, &c.) and other publications. Auxerre, Soc. dcs Se. (1847), Bull. (1847, &c.). Bar-le-Duc, Soc. des Lettres, &c. (1870), Mém. (1871, &c.), Beauvais, Soc. Acad. (1847), Mém. (1847, &c.). Besancon, Acud. des Sc., &c. (1752; suppressed in 1793; re-established 1805), Séances publ. (1806, &c.); Soc. d' Emulation (1840), Mém. (1841, &e.). Béziers, Soc, Arch., Sc., &c. (1834),

(1845). Metz, Acad., based on Soc. des Lettres, &e. (1819), Mém. (1828, &c.); Soe.

a'Hist. Nat., Mém. (1848) and Bull. (1844, &c.). Nuremberg, Naturhist. Ges, (1801), Abhandl. (1852, &c.) ; German. Museum, Jahresber. (1854, &c.) and Anzeig. (1853, &c.). Pesth, Magyar Tudomdnyos Akademia or Hung. Acad. of Sciences

many publications; Kirdlyrt Magyar Természett. Tarsalat or R. Hung. Soc. of Nat. Sciences, many publications. Prague, K. Bohm. Ges., Abhandl. (1785, &c.) and Sitzungsber. (1859, &e.); Naturhist. Ver. Lotos, Lotos (1851, &c.). Pressburg

Ver. f. Naturk., Verhandl. (1856, &e.). Ratisbon, Zoolog. -mineralog. Ver. (1846, 7 since 1883 called Naturwiss. Ver.), Abhandl. (1849, &c.). Reichenbach (Voigtiand, Saxony), Ver. f. Naturk. (1859), Mittheil. Roveredo, Imp. Accad. (1750), Ath (1826, &c.). Strasburg, Soc. des Sc.

Agr. et Arts (1802), Mém. (1811, &c.) and Bull. (1843, &¢.). Stuttgart, Ver. f. vaterl. Naturk. (1822), Jahresber. (1850, &c.). Thorn

Copernicus Ver. (1839). Trieste, Soc. Adriatica, Boll. Ulm, Ver. f. Mathem. u Naturwiss., Verhandl. Vienna, K. Akad. d. Wiss., Denkschriften (1850, &e.), and Sitzungsber. (1848, &c.); K. k Zoolog.- Bot. Ges., Verhandl. (1851, &e.); Verein g. Verd. Naturwiss. Kentnisse, Schriften (1862, &c.). Wiesbaden, Nas- sawischer Ver. f. Naturk. (1829), Jahrbticher (1844, &e.). Zweibriicken, Naturhist. Ver. (1863), Jahresber. (1864, &C.).

SwiTZERLAND : Basel, Naturforsch. Ges., Ber. (1835, &¢.) and Verhandl. (1857, &e.). Bern, Naturforsch. Ges., Mittheil. (1844, &c.). Chur, Naturforsch. Ges., Jahresber. (1856, &c.). Geneva, Soc. de Phys. et @'Hist. Nat., Mém. (1821, &c.); Inst. des Sc., des Lettres, &c., Mém. and Bull. Wausanne, Soc. Vaudoise des Sc, Nat., Bull. (1842, &c.). Neuchatel, Soc. des Sc. Nat., Mém. (1835, &c.) and Bull. (844, &c.). St Gall, Naturwiss. Ges., Ber. (1860, &c.). Solothurn, Naturhist. Kantonal-Ges., Jahresber. (1825, &e.). Zurich, Naturforsch. Ges., Abhandl. (1761-66), Mitthetl. (1846, &e.), and Vierteljahrschr. (1856, &c.); Allg. Schweizer. Ges. f. d. Naturwiss., Verhandl., Aneeiger, and Denkschr. (1829, &c.).

Iraty: Congresso degli Scienziati Ttaliani, Atti (1844-45); Riwntone degli Se. Ttal., Atti (1839-47 ; 1873, &c.). Bologna, Accad. delle Sc. dell' Istit. di Bologna, Rendic. (1833, &¢c.), and Mem, (1850, &¢.). Brescia, Accad., afterwards Ateneo, Comment. (1808, &c.). Catania, Accad. Gioenia di Sc. Nat., Attt (1825, &c.). Florence, R. Museo dt Fis. e Stor. Nat., Annali (1808, &c.). Lucca, R. Accad. Lucchese, Atti (1821, &c.). Messina, R. Accad. Peloritana. Milan, Accad. Fis.- Med. Statist., Diario ed Atti (1846, &e.); RB. Istit. Lombardo, Mem. (1819, &e.), Giornale (1840, &c.), Atti (1860, &c.), and Rendic. (1864, &c.); Soc. Ital. delle Se. Nat., Atti (1860, &c) and Mem. (1865, &¢.). Modena, R. Accad. di Sc., &c., Mem. (1833, &¢.); Soc. Ital. delle Sc., Mem. (1782, &c.). Naples, R. Istit. d''Incoragg. alle Se. Nat., Atti (1811, &c.). Padua, R. Accad. di Se., Lett., ed Arti, Saggi (1786, &c.) and Revista (1851, &c.). Venice, RB. Istit. Veneto di Sc., &c., Attt (1841, &e.) and Mem. (1843, &c.).

Beucium: Brussels, Acad. Roy. des Sc., des Lettres, et des Beaux Arts founded by Maria Theresa in 1772; reorganized in 1845), Mém. (1818,

&c.), Bull. (1832, &e.), and Annuaire (1835, &e.); Soc. Roy. des Sc. Nat. et Méd. (1822), Journ. de Méd. (1848) and Journ. de Pharm. (1845, &c.) ; Soc. Roy. Linn. (1835), Bull. (1872, &e.). Liége, Soc. Roy. des Se. (1835), Mém. (1843, &c.). Mons, Soc. Prov. des Sc., &c., du Hainaut (1833), Mem. (1839, &c.).

Hortanp: Amsterdam, K. Nederlandsch Institwut, Proc.~~Verb. (1808, &¢.), Verhandel. (1812, &¢.), Tijdschrift (1847); Genootschap ter Bejord. der Natuur~~, &e., Kunde, Maanblad (1807, &c.) and Werken (1870, &c.); Hollandsche Maat- schappij, Werken (1810, &c.); K. Akad. van Wetensch., Verslagen (1853, &c.), Verhandel. (1854, &c.), and Jaarboek (1857, &e.). Arnheim, Natwurkundig Genoot- schap, Tijdschrift (1844, &.). Bois-le-Due, Provinc. Genootschap, Handelingen (1837, &c.). Groningen, Natuurk. Genootschap, Versl. (1862, &c.). Haarlem, Hollandsche Maatschappij der Wetensch., Verhandel. (1754, &c.). The Hague, K. Zoolog.~~Botanisch Genootschap, Versl. (1864, &c.). Luxembourg, Soc. des Se. Nat., Publ. (1853, &¢.). |Middelburg, Zeeuwsch Genootschap der Wetensch., Ver~~handel. (1769, &c.) and Archief (1856, &c.). Utrecht, Provinc. Genootschap van Kunsten en Wetensch., Verhandel. (1781, &c.) and Aanteekeningen (1845, &c.). Batavia: Bataviaasch Genootschap van Kunsten en Wetensch., Verhandel. (1779, &¢.), Tijdschrift (1852, &c.), and Notulen (1864, &e.); Natwurk. Vereeniging in Nederl. Indié, Tijdschrift (1850, &c.) and Verhandel. (1856, &c.).

DENMARK: Copenhagen, K. Danske Videnskabernes Selskab, based on Kjoben- hawnske Selskab (1743-1813), Skrifter (1781, &c.) and Afhandlinger (1824, &e.) ; Naturhist. Forening, Meddelelser (1849, &c.).

SwEDEN : Gottenburg, K. Vetenskaps och Vitterhets Saumhéille, Handlingar 1778, &c.). Stockholm, K. Svenska Vetenskaps Akademi, Handlingar (1740, &c.) and Arberdttelser (1820, &c.). Upsala, K. Vetenskaps Societeten, Acta (1720, &c.).

Norway: Christiania, Phystographiske Forening, Mag. for Natur-Vidensk. (1832, &e.); Videnskabs-Selskabet, Forhandl. (1859, &c.). Throndhjem, K. Norske Vidensk.-Selskab, Skrifter (1817, &c.).

Spain: Madrid, R. Acad. de Cien. Exactas, Fis., y Nat., Mem. (1850, &c.); Soc. Espafi. de Hist. Nat., Anales (1872, &c.). San Fernando, R. Acad., Mem.

Russa: Siczd Russkikh Yestestvoispytately (Meeting of Russ. Naturalists), first meeting at St Petersburg 1867-68, Trudy or Trans. (4to, 1868, &c.). Dorpat, Naturforsch. Ges., Sitzungsber. (1853, &c.) and Archiv (1854, &c.); Gelehrte Estnische Ges., Verhandl. (1846, &c.), Schriften (1863, &c.), and Sitzwngsber. (1866, &c.). Helsingfors, Soc. Scient. Fennica, Acta (1842, &c.). Kaminietz, Naturforsch. Ges. Kazan, Soc. of Naturalists at University, Protokoly (1870, &e.) and Trudy (1872, &c.). Kharkoff, Soc. of Scientists at Univ., Trudy (1870, &e.) and Protokoly (1870, &c.). Kieff, Soc. of Naturalists, Zapiski. Moscow, Imp. Soc. of the Friends of Nat. Hist., Anthrop., &c., Izviestiya or Bull. (1865, &c.) ; Soc. Imp. des Natura- listes, Mém. (4to, 1806) and Bull. (8vo, 1829, &e.). Odessa, Soc. of Naturalists of New Russia, Zapiskt (1872, &c.) and Protokoly (1874, &e.). Riga, Naturforsch. Ver., Corr.-Blatt (1846, &¢.) and Arbetten (1865, &c.). St Petersburg, Soc. of Naturalists, Trudy (1870, &¢.). Warsaw, Soc. of Friends of Sc., Rocentkt (1802-28).

Rovmanta: Bucharest, Soc. Acad. Romdnd, Annalile (1867, &c.). ’

CENTRAL and SouTaH AMERICA: Bogota, Soc. de Naturalistas Neo-Granadinos, Contribuciones (1860, &c.). Buenos Ayres, Soc. Cientifica Argentina. Caracas, Soc. de Ciencias, Boletin (1868, &¢.). Cordova, Acad. Nacion., Bol. (1874 &e.). Guatemala, Instit. Nac. Havana, Acad. de Cien., Anales (1864, &c.). Mexico, Soc. Méx. de Hist. Nat., La Natuwraleza (1869, &c.). Rio de Janeiro, Palestra Cient., Archivos (1858, &¢.). Santiago, Soc. de Hist. Nat.

Bull. (1836, &e.). Blois, Soc. des Se. et Lettres de Lotr-et-Cher (1832), Mem. (1833, &e.). Bordeaux, Acad. (17125 suppressed 1793; re-established 1816), Actes (1839, &c.) 5 Soc. Linn. (1818), Bull. (1826-29) and Actes (1838, &c.); Soc. des Sc. (1850), Mém. (1855, é&c.). Boulogne, Soc. Acad. (1863), Mem. (1864, &c.). Bourg, Soc. d’fmulation (1783), Comptes R. (1802-22) and Annales (1868, &c.). Bourges, Soc. Hist., &c., du Cher (1849), Mém. (1857, &c.). Caen, Acad. Nat. (1652), Mem. (1754-60 and 1822, &¢.); Soc. Linn. (1823), Mém. (1824, &c.), and Bull. (1855,

&¢.). Cambrai, Soc. d'Emvulation (1804), Mém. (1808, &c.). Cannes, Soc. des Se. (1868), Mém. (1869, &c.). Chambéry, Acad. (1819), Mém. (1825, &c.). Chateaudun, Soc. Dunoise (1864), Bull. (1864, &e.). Cherbourg, Soc. Acad. (1755), Mém. (1833, &e.) ; Soc. Nat. (1851), Mém. (1852, &e.). Clermont-Ferrand, Acad. (1747), Annales (1828, &c.) and Mem. (1859, é&c.). Dijon, Acad. (1740; suppressed 1793; re-established 1800), Mém. (1769, &¢.). Douai, Soc. d'Agr., &c., du Dép. du Nord (1799), Mém. (1826, é&c.). Draguinan, Soc. d'Etudes Sc. (1855), Bull. (1856, &c.). Dunkirk, Soc. Dunkerquoise (1851), Mem. (1853, &e.). Epinal, Soc. d@ Emulation. (1825), Annales (1831, &¢.). Evreux, Soc. Libre d'Agr., &c. (1807), Recueil (1830, &e.). Grenoble, Acad. Delphinale (1789), pased on Soc. Litt. (1772), Bull. (1846, &c.). Laon, Soc. Acad. (1850), Bull. (1852, é&c.). La Rochelle, Acad. (1732 ; suppressed 1791; reconstituted in 1803 as Lycée Rochelais and in 1853 under its former name), Annales (1854, &¢.). Le Havre, Soc. des Sc. et Arts (1868), Bull. (1868, &c.). Le Mans, Soc. d' Agr., &c., de la Sarthe (founded in 1761 ; reorganized on several occasions, and finally in 1839), Bull. (1833, &c.). Le Puy, Soc. d'Agr., Sc., &c. (1819), Annales (1826, &c.) and Bull. (1836, &c.). Lille, Soc. des Sc., &c. (founded 1802 as Soc. d' Amateurs), Mém. (1819, &c.). Limoges, Soc. d'Agr., Sc., &e., de la Haute- Vienne (1759), Bull. (1822, &c.). Lons-le-Saunier, Soc. d'Emulation du Jura (1817), Mém. (1818, &c.). Jayons, Acad. (1700), Mém. (1845, &¢.); Soc. d'Agr., Hist. Nat., &¢. (1761), Comptes R. (1806, &c.) and Mém. (1838, &e.); Soc. Linn. (1822), Annales (1836, &c.). Macon, Acad. (1805), Comptes R. (1818-47) and Annales (1853, &¢.). Marseilles, Acad. (1726; in 1766 called Soc. des 'Sciences; suppressed in 1793 ; re- organized in 1799, and finally in 1802), Recueil (1727-86) and Mém. (1803, &c.). Meanx, Soc. Libre d'Agr., Sc., &c. (1798 ; reorganized in 1820), Publ. (1833, &e.). Mende, Soc. d'Agr., &c., du Dép. de la Loztre (1819), Mém. (1827, &c.) and Bull. (1850, &¢.). Montbéliard, Soc. d' Em, (1852), Mém. (1852, &e.). Montpellier, Acad. (founded in 1706 as Soc. Royale ; suppressed in 1793 ; finally reorganized in 1846), Mém. (1846, &c.); Soc. d@Horticult., &e., de U' Hérault (1860), Annales (1860, &e.). Moulins, Soc. d'Hm. de U Allier (1846), Mém. et Bull. (1850, &c.). Nancy, Acad. de Stanislas (1750), Mém. (1754, &c.) ; Soc. des Sc. (1878), founded on Soc. des Se. Nat. de Strasbourg (1828), Mém. (1830, &c.) and Bull. 1866, &¢.). Nantes, Soc. 'Acad. de la Lotre Inf, (1848), founded in 1798 as Institut Déparimental, Annales (1830, &¢.). Nevers, Soc. Nivernaise

(1851), Bull. (1851, &c.). Nice, Soc. des Lettres, &c., des Alpes-Marit. (1861), Annales (1865, &c.). Nimes, Acad. du Gard (1682), Mém. Niort, Soc. de Statist. Sc., &c., des Deux-Sevres (1836), Mém. (1836, &c.) and Bull. (1852, &¢.). Orleans, Acad. de Sainte-Croix (1863), Lect. et Mém. (1865, &c.) ; Soc. d'Agr., Sc., &«. (1809), Bull. (1810-13), Ann. (1818-37), and Mém. (1887, &c.). Pau, Soc. des Sc., Lettres, &c. (1841), Bull. (1841, &c.). Périgueux, Soc. ad Agr., Sc., &e., de la Dordogne (1820), Annales (1840, &c.). Perpignan, Soc. Agr., &c., et Litt. des Pyrénées-Or. (1833), Bull. (1834, &e.). Poitiers, Soc. dAgr., Belles-Lettres, &e. (1789), Bull. (1818, &e.). Privas, Soc. des Sc. Nat. et Hist. (1861), Bull. (1861, &e.). Rheims, Acad. Nat. (1841), Séances (1844, &c.). Rochefort, Soc. ad' Agr., Belles-Lettres, &c. (1806), Travaua (1854, &e.). Rodez, Soc. des Lettres, Sc, &e., de ? Aveyron (1836), Mém. (1838, &c.) and Proces-Verb. (1864, &c.). Rouen, Acad. re Précis Analyt. (1744, &c.); Soc. des Amis des Sc. Nat. (1864), , Bull. (1865,

¢.). Saint-Brieuc, Soc. @km., Bull. et Mém. (1861, &c.). Saint-Etienne, Soc. d' Agr., &c., de la Loire (1856), Bull. Saint-Jean d'Angély, Soc. Hist. et Sc. (1863), Bull. (1863, &c.). Saint-Quentin, Soc. Acad. (1825), Mém. (1830, &c.). Semur, Soc. des Sc. Hist. et Nat. (1842), Bull. (1864, &c.). Soissons, Soc. Arch., Hist., et Sc. (1846), Mém. (1847, &c.). Tarbes, Soc. Acad. des Hautes-Pyrénées (1853), Bull. (1854, &e.). Toulon, Soc. Acad. du Var (1811), Mém. (1832, &c.). Toulouse, Acad. (founded in 1640; known to 1704.as Soc. des Lanternistes and by other names to 1807, when present title was acquired), Hist. et Mém (1782-90) and Mém. (1827, &¢.); Soc. d' Hist. Nat. (1866), Bull. (1867, &c.); Soc. des Sc. (1872), Bull. (1872, &e.). Tours, Soc. d'Agr., &¢., d' Indre-et-Lotre (founded in 1761 as Soc. Roy. ad Agr.), Recueil (1763 and 1803-10) and Annales (1821, &e.). Troyes, Soc. Acad., based on Soc. Acad. de VAube (1801), Mém. (1801, &c.). Valenciennes, Soc. d'Agr., Sc., et Arts (1831), Mém. (1833, &c.; 1865, &e.) and Revue Agricole (1849, &e.) Vannes, Soc. Polymathique du Morbihan (1826), Comptes R. (1827, &c.) and Bull. (1857, &e.). Vendome, Soc. Arch., Se., et Litt. (1862), Bull. (1862, &c.). Verdun, Soc. Philomath. (1822), Mém. (1840). Versailles, Soc. d' Agr. et des Arts (1798), Mém. (1799-1864) and Bull. (1866, d&e.); Soc. des Sc. Nat. et Méd. (1832), Mem. (1835, &e.). Vesoul, Soc. d'Agr., &c., de la Haute-Sadne (1801; reorganized in 1819 and 1832), Recueil Agronom. (1836, &e.), Mém.

(1859, &¢.), and Bull. (1869, &c.). Vitry-le-Frangois, Soc. des Sc. et Arts (1861), Bull. (1867, &c.).

Germany and Avsrria-HunecaRy: Agram, Jugo-slavenska Akademija or South Slav. Acad. (1866), various publications. Altenburg, Naturforsch. Ges. d. Osterlandes (1817), Mittheil. Augsburg, Naturforsch. Ver. (1846), Ber. (1848, &c.). Bamberg, Naturforsch. Ges. (1834), Ber. (1852, &c.). Berlin, Ges. naturf. Freunde (1773), Sitzungsber. (1862, &c.). Blankenburg, Naturwiss. Ver. des Harzes (1831), Ber. (1841, &¢.). Bonn, Naturh. – Verein (1843), Verhandl. (1844, &c.); Gorres Ges. (1876), Hist. Jahrbtich. (1880, &e.); Niederrhein. Ges. (1818 ; reorganized 1839). Bremen, Naturwiss. Ver. (1864), Abhandl. (1868, &c.). Breslau, Schles. Ges. f. vaterl. Kultur (1803), Jahresber. (1804, &c.). Briinn, K. k. Mdhr.-Schles. Ges., Mitthetl. (1821, &c.). Cassel, Ver. f, Naturkunde, Jahresber. (1837, &c.). Colmar, Soc. d'Hist. Nat. (1859), Bull. (1860, &e.). Cracow, Towarzystwo Naukowe, afterwards Akademija Umiejetnosci or Acad. of Science, many publications. Dantzic, Naturforsch. Ges., Versuche (1745-57) and Schriften (1820, &c.); Bot.~~Zoolog. Ver. (1878). Donaueschingen, Ver. f. Gesch. u. Naturgesch. (1801), Schrifien. Dresden, Naturwiss. Ges. Ists (1833), Sitzungsber. (1861, &c.); Ges. f. Natur~~ w. Heil-Kunde (1818), Jahresber. (1848, &c.); Ges. f- Botanik u. Zoologie, Nunquam Otiosus (1870, &c.). Diirkheim, Pollichia, Naturwiss. Ver., Jahresber. (1843, &c.). Elberfeld, Naturwiss. Ver., Jahresber. (1851, &c.). Emden, Naturforsch. Ges. (1814), Jahresber. (1837, &c.). Frankfort, Seckenbergische naturforsch. Ges., Museum (1834-35) and Abhandl. (1854, &c.). Freiburg (in Baden), Naturforsch. Ges. (1821), Ber. (1858, &e.). Fulda, Ver. f. Naturkunde (1865), Ber. (1870, &c.). Giessen, Oberhess. Ges. f. Natur- und Heil-Kunde, Ber. (1847, &¢.). Gorlitz, Ober- lausitzer Ges. d. Wiss. (1779), Magazin ; Naturforsch. Ges., Abhandl. (1827, é&c.). Gorz, Soc. Imp. Reale, Mem. Gottingen, K. Ges. d. Wissensch., Anzeiger (1739, &¢c.), Abhandl. (1845, &c.), and Nachr. (1845, &.). _ Gratz, Naturwiss. Ver., Miitheil. (1863, &c.). Greifswald, Naturwiss. Ver. von Neu-Vorpommern, Mittheil. (1869, &c.). Halle, Naturf. Ges. (1779), Abhandl. (1853, &c.); Naturwiss. Ver., Zeitschrift (1853, &c.). Hamburg, Naturwiss. Ver., Abhandl. (1846, &c.). Hanau, Wetterauische Ges. (1808), Jahresber. (1852, &c.). Heidelberg, Naturhist.~~Med. Ver., Verhandl. (1857, &c.). Hermannstadt, Siebenbiirgisch. med. Ver. f. Natur~~ wiss., Verhandl. (1849, &c.). Innsbruck,

Ferdinandewm, Bettrdge (1825-34) and Neue Zeitschrift (1835, &c.). Jena, K. Leopold.-Carol. Akad., Athenxum (1875, &c.); K. Leopold.-Carol. D. Akad. d. Naturf., Leopoldina (1859, &c.); Med.~~natur~~ wiss. Ges., Jen. Zettschr. (1864, &c.). Karlsruhe, Naturwiss. Ver., Verhandl. (1864, &c.). Klausenburg, Siebendurg. Museum, Annalen. Leipsic, K. Stichs. Ges. d. Wiss., Ber. (1846, &c.) and Abhandl. (1850, &c.). Lemberg, Ges. v. Galizien, Ber. Liineburg, Naturwiss. Ver., Jahresber. (1852, &e.). Magdeburg, Naturwiss. Ver., Abhandl. 1869, &c.). Mainz, Rhein. naturforsch. Ges. (1834). Mannheim, Ver. f. Naturk., Jahresber. (1834, &c.). Marburg, Ges. f. d. Gesch. naturwiss., Schriften (1823, &c.) and Stizungsber. (1866, &c.). Meissen, Ver. f. Erdk. Isis

JI. MATHEMATICS.

Many of the general scientific societics (see class i.) have mathematical and other special sections. Among defunct English societies may be mentione the Mathematical Society, which used to meet in Spitalfields (1717-1845) and possessed a library, and the Cambridge Analytical Society, which published Memoirs (4to, 1813). The London Mathematical Soctety, Proc. (1865, &c.), and the Edinburgh Mathematical Society (1883), Proc. (1883, &c.), are still flourishing,

FRANCE: Paris, Soc. Mathém. de France (1872), Bull. (1873, &c.). GERMANY « Berlin, Mathem. Ver. der Univ. (1861), Ber. (876, &c.). Cassel, Geometer-Ver. (1878). Dresden, Ver. praktisch. Geometer (1854), Jahresber. (1861, &e.). Essen, Feldmesser-Ver. (1869). Frankfort, Phys. Ver. (1824). Gottingen, Mathemat. Ver. (1868). Hamburg, Mathemat. Ges. (1690), Mittheil. Konigsberg, Geometer-Ver- (1872). Strasburg, Geometer-Ver. (881). Stuttgart, Deutscher Geometer-Ver., Zeitschrift (1872, &c.). HOLLAND: Amsterdam, Genootschap der Mathemat. Wetensch. Kunstoefinengen (1782-88), Mengelwerken (1793-1816), and Archief' (1856, &e.). Sparn: Valladolid, R. Acad. de Matematicas (1803, &e.), now dissolve Russia: Moscow, Mathemat. Soc. Japan: Mathemat. Soc. of Tokio, Journa (1878, &¢.).

SOCIETIES

If]. Astronomy.

Astronomical observatorics and their publications have been already treated and enumerated in the article OpseRvaTory. The Royal Astronomical Soctety was founded in 1820 under the title of Astronomical Society of London, and was incorporated on 7th March 1831. It occupies rooms in Burlington House, and has published Memoirs (1822, &c.) and Monthly Notices (1831, &c.). There are also societies at Bristol (1869), Reports; Liverpool (1881); and Leipsic, Astrono- mische Ges. (1863), Publ. (1865, &c.) and Vierteljahrsschrift (1866, &c.).

IV. Puysics,

The Physical Soctety of London was founded in 1874 and registered under the Companies Act ; it has published Proceedings (1874, &c.). The London Electrical Society (1836), did useful work in its Transactions (1837-40, vol. i.) and Proceedings (1841-43). Sir W. Siemens was one of the originators of the Society of Telegraph Engineers and Electricians, which was founded in 1871 and registered in 1883. It owns the Ronalds library of electricity and magnetism and publishes a Journal.

Unitep States: Chicago, Amer. Electrical Soc., Journ. (1875). New York, National Telegr. Union, Telegrapher (1864-70). FRanceE: Cambrai, Soc. Mag- nétique, Archives (1845). Paris, Soc. Frang. de Phys. (recognized as of public utility on 15th January 1881), Bull. Germany: Berlin, Physikalische Ges. (1843), Fortschritte der Physik (1847, &c.); Elektrotechnisch. Ver. (1877), Ztschr. (1880, &e.). Breslau, Physikalischer Ver. Frankfort, Physikalischer Ver., Jahresber. Iraty: Naples, Rk. Accad. delle Sc. Fis. e Matem., Rendic. (1856, &c.) and Atti (1863). Rome, Soc. degli Spettroscopisti Ital. Hottann: Rotterdam, Bataa/sch. Genootschap van Proefondervindelijke Wijsbegeerte, Verhandel. (1774, &€¢.).

Y. CHEMISTRY.

Pharmaceutical socicties are placed in class xiii. (Medicine, &c.). The Chemical Society of London for the promotion of chemistry and the sciences immediately connectcd with it was instituted on 23d February 1841; a charter of incorporation was obtained in 1848. It publishes Memoirs (1843, &c.) and Quarterly Journal (1849, &c.). Chemistry and its connexion with the arts, and agricultural and technical matters, form the subjects of the

Institute of Chemistry, founded on 2d September 1877 and incorporated on 2d October 1877. The Soctety of Chemical Industry (1881) is specially devoted to the branch of chemical engineers. The Society of Public Analysts publishes the Analyst (1876, &c.). The oldest of the numerous photographic societies is the Photographic Society of Great Britain (1853), which issues a Journal. The Royal College of Chemistry was founded in July 1845, and had a brief career; it published Reports (1849). The Cavendish Society was instituted in 1846 for the publica- tion and translation of works and papers on chemistry. It came to an end in 1872 after having issued 30 vols.

Unitep States: New York, American Chemical Soc. (1876), Proc, (1876) and Journ. (1879, &c.), FRANCE: Paris, Soc. Chimique, Bull. (1858, &c.), GERMANY! Berlin, Deutsche Chemische Ges. (1867), Ber. (1868, &c.). Frankfort, Chem. Ges. Jena, Chem. Laborat. Wiirzburg, Chemische Ges. (1872). Bonemra: Prague, Spolek Chemiku Ceskych or Soc. of Bohemian Chemists, Zpravy or Trans. (1872, – a St Petersburg, Russ. Chem. and Phys. Soc. at Univ., Journal 1869, &c.).

VI. GroLooy, MiNERALOGY, AND PALAONTOLOOY.

Among these the Geological Society of London, founded in 1807 and incorporated in 1826, is the largest and most important; it has Paisned Proccedings (1834- 46), Transactions (1811, &c.), and a Quarterly Journal (1845, &c.). The Geologists' Association was instituted in 1858, and issues Proceedings (1859, &c.). The Mineralogical Society (1876) has united with it the Crystallogical Society; it issues the Mineralogical Magazine (1876, &c.). The Palewontographical Society was founded in 1847 for the delineation and description of British fossils ; it issues Publications (39 vols. 4to, 1847, &c.). The Cornwall Royal Geological Society (1814) devotes special attention to the mining interests of the county, and publishes Lransactions (1818, &c.). Itholds its meetings at Penzance. In Scotland there are the Geological Society of Edinburgh (1834), which has Transactions (1870, &c.), and the Glasgow Geological Society (1858), which also has Transactions (1860, &e.). The Royal Geological Society of Ireland (1832) is chiefly directed to the geology of the country. It publishes a Jowrnal (1837, &c.). There are also the Geological Associations of Leeds

(1874) and Liverpool (1880), Trans., the Societies of Liverpool (1859), Proc., Manchester (1838), T'rans., and Norwich (1864), Proc., and the Yorkshire Geological and Technological Society, Proc. (1839, &c.).

Unirep Srares: Louisville, Ky., Ohio Falls Geolog. Soc. San Francisco, California State Geolog. Soc. (1876). FRAaNcE: Lille, Soc. Géol. du Nord (1870), Annales (1874, &e.). Havre, Soc. Géol. de Normandie, Bull. (1873, &c.). Paris, Soc. Géol. de France (1830, recognized 1882), awards the Prix Viquesnel (£40) every three years, Bull. (1830, &c.) and Mém. (1833, &¢.); Soc. Frang. de Minér- alogie (recognized 1886), formerly Soc. Minéral. de France, Bull. Saint-Etienne, Soc. d Ind. Minérale (1855), Bull. (1855, &c.). Germany and AusTRIA-HUNOARY ! Berlin, Deutsche Geol. Ges. (1848), Ztschr. (1849, &e.). Briinn, Wernerscher Geol. Ver., Jahresber. Darmstadt, Mittelrheinischer Geol. Ver. (1851), Mittheil (1855, &c.). Dresden, Gebirgs-Ver. (1855). Pesth, Geol. Ver. f Ungarn, SwitTzERLAND: Schweizerische Geol. Ges. (1882), section of Allg. Schw. Ges. Znrich, Schweiz. Paldontol. Ges. (1874), Abhandl. (1875, &e.). Itary: Soc. Geol. Ital., founded at the second International Geological Congress. Brxcium: Antwerp, Soc. Paléontol. (1857), Bull. Charleroi, Soc. Paléontol. (1863), Documents et Rapports (1866, &¢.). Liége, Soc. Géol. de Belgique, Annales (1874, &c.). Swepen: Stock- holm, Geologiska Forening, Férhandlingar (1872, &c.). Russia: St Petersburg, Imp. Russian Mineralog. Soc., Trans. (1830, &¢.). ARGENTINE REPUBLIC: Buenos Ayres, Soc. Paleontol.

VII. MetTEoro.oey.

The International Meteorological Congress first met at Vienna in 1873. The Royal Metcorological Society (1850) of London was incorporated in 1866 ; its organ 18 Quarterly Journal (1873, &e.). To this must be added the British Rainfall Society and the Scottish Meteorological Society, which holds its Ineetings at Edin- burgh and issues a Journal (1866, &c.). Port Louis (Mauritius), Metcorolog. Soc., Trans. (1853, &c.). Paris, Soc. Météorolog. de France, Annuaire (1849, &c.) and Nouvelles Mééorolog. (1868, &c.). Hamburg, Deutsche Meteorolog. Ges. (1883), Zischr. Magdeburg, Ver. f landwirthsch. Wetterkunde (1881). Meissen,

Gesellsch. Isis. Vienna Ocsterreich. Ges. f. Meteorol., Zeitschrift (1866, &c.). Modena, Soe, Meteorolog. Ital. 5 : a j

VIII. Microscopy.

The Royal Microscopical Society (1839, incorporated 1866), with Transactions Sey) and Journal (1869, &c.); the Quckett Microscopical Club (1865), with a Journal (1868, &c.); and the Postal M icroscopic Society (1873), also with a Journal, are located inLondon. There are suburban societies at Ealing (1877), Hackney a, Highbury (1878), South London (1871), and Sydenham (1871). Amongst

ose in the provinces nay be mentioned the ones at Bath (1859), Birminghain eo) Bolton (1877), Bradford (1882), Bristol (1843), Carlisle, Chichester (Trans.), wo (1870, Trans.), Dublin (1840), East Kent (1858), Liverpool (1868, Trans.), ot (1880), New Cross (1872), and Sheffield (1877). Inthe United States

e State Microscop. Soc. of Illinois publishes the Lens (1872, &c.); Buffalo, Amer.

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Soe. of Microscopists; New York, Microscop. Soc. Brussels, Soc. Belge de Micro- scop. (1875), Proc.~~Verb. (1875, &c.) and Annales (1876, &c.). Berlin, Ges. f. Mikro~~ skop. (1877), Ztschr. (1878, &¢.). Hanover, Ges. f. Mikroskop. (1879), Jahresber,

IX. Borany anp HortTIcULTURE.

Linnzan societies, which usually deal with both zoology and botany, are placed in the general class (No. i.). The Congrés International d' Horticulture first met at Brussels in 1864 and the Congrés International de Botanique at Amsterdam in 1865. The Royal Botanic Society of London (incorporated 1839) has gardens in the inner circle of Regent's Park, and issues a Quarterly Record (1880, &¢.). The Royal Horticultural Society (established in 1804, incorporated in 1809) has gardens at Chiswick, and publishes a Journal (1846, &e.). The chief pro- vincial societies are—Aberdeen, North of Scotl. Hortic, Assoc. (1879), Trans. Ar- broath, Hortic. Assoc. (1880). Birmingham, Bot. and Hortic. Soc. (1830), gardens. Dublin, Roy. Hortic. Soc. (1830). Edinburgh, Bot. Soc. (1836), Proc. (1887, &c.)

and Trans. (1844, &c.); Scottish Arboric. Soc. (1854), Trans.; Cryptogamvic Soc. of Scott. (1875). Canapa: Kingston, Bot. Soc. of Canada (1860), Annals (1861, &c.).

UniTep Staves: Boston, Hortic. Soc. (1829). New York, Torrey Botanical Club, Bull. (1870, &e.). San Francisco, State Hortic. Soc. FRANCE: Beauvais, Soc. d' Hortic. et de Bot. (1864), Bull. (1864, &c.). Bordeaux, Soc. d'Hortic. Chartres, Soe. d' Hortic. et de Viticulture. Chauny, Soc. de Pomologie. Dijon, Soc. d' Hortic. Fontenay-le-Comte, Soc. d'Hortic. Lisieux, Soc. d'Hortic. et de Bot. (1866), Bull. (1866, &c.). Lyons, Soc. d'Hortic. Pratique (1844), Bull. (1844, &e.); Soc. Bot. (1872), Annales (1872, &c.); Soc. Pomologique (1872), Bull. (1872, &c.). Moulins, Soc. d'Hortic. Nimes, Soc. d'Hortic. Niort, Soc. d'Hortic. Orleans, Soc. d' Hortic. (1839), Bull. (1841, &c.). Paris, Soc. Nat. d'Hortic. (1827; declared of public utility 1852), Jowrnal ; Soc. Bot. de France, Bull. (1854, &¢.). Rouen, Soc. Centr. a@Hortic. Saint Germain-en-Laye, Soc. d'Hortic. Senlis, Soc. d'Hortic. Troyes, Soc. d'Hortic. Versailles, Soc. d'Hortic. GERMANYand AUSTRIA-HUNGARY? Berlin, Bot. Ver. (1859), Verhandl. (1859, &c.); Deutsche Bot. Ges. (1882); Horticult. Ges. Blankenburg, Bot. Ver. Bonn, Bot. Ver. (1818), Jahresber. (1887, &c.). Dresden, Flora-Ges. f. Bot., Mittheil. (1841, &c.). Erfurt, Gartenbau Ver. Frankfort, Gartenbau Ges. Freiburg, Bot. Ver. Gérlitz, Gartenbau Ver. Gotha, Thiiringer Gartenbau Ver. Klagenfurt, Kdrninerische Gartenbaw Ges. Landshut, Bot. Ver. (1864). Meiningen, Ver. f. Pomologieu. Gartenbau. Munich, Baierische Gartenbau Ges. Ratisbon, K. Baterische Bot. Ges. (1790), Flora (1818, &c.) and Repertoriwm (1864, &c.). Reutlingen, Pomolog. Inst. Sondershausen, Bot. Ver. Stuttgart, Gartenbau Ges., Flora. Vienna, K. k. Gartenbau Ges.; Botan. Ver., Verhandl. (1851, &e.). Weimar, Ver. f. Blumistik. Wiirzburg, Bot. Inst., Arbeiten (1871, &e.). Iraty: Milan, Soc. Crittog. Ital., Atti (1878, &c.). Briarum: Fédération des Soc. a' flortic. de Belgique (1860), Bull. Antwerp, Soc. Roy. d'Hortic, et d'Agr.; Soc. Phytologique, Annales (1864, &c.). Bruges, Soc. d'Hortic. et dela Bot. Brussels, Soc. Roy. de Bot. (1862), Bull. (1862, &c.); Soc. Roy. de Flore; Soc. Centr. d' Arbvoric., Annales. Liége, Soc. Roy. d'Hortic. HoLuanp: Leyden, Nederl. Bot. Vereen. Luxem- bourg, Soc. de Bot., Recueil (1874, &c.). Nimeguen, Nederl. Bot. Vereen., Archief (1871, &c.). Denmark: Copenhagen, Bot. Forening, Tidsskrift (1866, &c.).

X. Zoouooy.

Societies dealing with natural history in general, or zoology and botany together, are arranged under class i. The Zoological Society of London (founded 1826, incorporated 1829) is famous for its collection of live animals in its gardens at Regent's Park. It publishes Proceedings (Svo, 1830, &c.) and Trans- actions (4t0, 1835, &c.). The other metropolitan societies are—British Ornitho- logists' Union (1859) ; Entomological Society of London (1833), Trans. (1834, &¢.) ; National Fish Culture Association (1883). The Marine Biologtcal Association of Great Britain (1884), for the study of marine food fishes and shell-fish, has a laboratory at Plymouth. The Royal Zoological Society of Ireland (1831) has gardens in the Phoenix Park. There is the British Beekeepers' Association (1874), AusTRaLiA and New Zyatanp: Auckland, Acclimatisation Soc. Bris- bane, Acclimat. Soc. Christchurch, Acclimat. Soc. Melbourne, Zoolog. and Acclimat. Soc. of Victoria, Report (1861, &c.). Sydney, Acclimat. Soc. of N.S. Wales, Report (1862, &c.); Entomolog. Soc. of N.S.W., Trans. (1863, &c.). Wel- lington, Westland Nat. and Acclimat. Soc. Arrica: Cape Town, Zoolog. Soc. Port Louis (Mauritius), Soc. d'Acclimat. Canapa: Toronto, Entomolog. Soc. ; Beekeepers' Assoc.

Unitep States: Cambridge, Nuttall Ornitholog. Club, Quart. Bull. (1876, &c.); and Entomolog. Club, Psyche (1874, &c.). Cincinnati, Zoolog. Soc. (1874), Report (1875, &.). Illinois Central Beekeepers' Association. Philadelphia, Zoolog. Soc. (1873), Report (1874, &c.); and Amer. Entomolog. Soc., merged in the Acad. of Nat. Sc. Washington, Biolog. Soc.; and Entomolog. Soc. FRANCE: Alais, Soc. Séricicole, Bull. (1876, &c.). Amiens, Soc. d'Apiculture, Bull. (1875, &c.). Cler- mont, Soc. Centr. d Apicult., Bull. (1875, &c.). Lille, Inst. Zoolog. & Wimereus, Travaux (1877, &c.). Paris, Soc. Nat. d'Acclimat. (1854), Bull. Mensuel (1854, &c.) and Chron. Bimens. (1875, &c.); Soc. Zoolog. de France, Bull. (1876, &¢.) ; Soc. Entomolog. de France; and Soc. de Biologie, Comptes Rendus (1850, &c.). GeRMAny and AusTRIA-HunGcaRY: Wanderversammlung Deutscher Bienenziichter, Verhandl. (1856, &c.). Bendorf, Akklimat.-Ver. Berlin, Akklimat.-Ver. (1856), Zeitschr. (1858, &c.); Central-Inst. f. Akklimat., Mittheil. (1859, &c.); Deutsche Zoolog. Ges. ; Deutsche Ornithologen-Ges. (1845), Ber. (1850, &c.); Deutsche Fisch- eret Ver.,

Publikat. (1871, &c.); Deutsche Entomolog. Ges. (1856), Entomolog. Zeitschr. (1857, &c.); Ver. zum Beford. des Seidenbaues, Jahresber. (1869, &c.); Physiolog. Ges., Verhandl. (1877, &c.). Breslau, Physiolog. Inst., Studien (1861, &e.); Ver. f. Schles. Insektenkunde, Zeitschr. (1847, &c.). Brunswick, Deutsche Ornitholog. Ges. Carlsruhe, Badischer Ver. f. Gefitigelzucht, Monatsblatt (1872, &c.). Frankenberg, Bienenwirthschaftl. Haupt-Ver., Sdchs. Bienenfreund (1865, &c.). Frankfort, Zoolog. Ges., Der Zoolog. Garten (1860, &c.); Deutsche Malako- zoolog. Ges., Jahrbtich. (1874, &c.) and Nachrichtsblatt (1869, &c.). Halberstadt, Deutsche Ornitholog. Ges.; Halle, Ornitholog. Central-Ver. Hamburg, Zoolog. Ges., Ber. (1862, &c.). Hanover, Bienenwirthschafil. Central-Ver., Centralblatt (1865, &c.). Leipsic, Sdchs. Seidenbau Ver., Zeitschr. (1868, é&c.). Munich, Entomolog. Ver. (1876); Fischereit Ver., Mittheil. (1876, &c.). Nordlingen, Ver. Deutscher Bienenwirthe, B.-Zeitung (1845, &c.). Ratisbon, Zoolog.-Mineralog. Ver. (see class i,). Stettin, Ornitholog. Ver. (1873), Jahresber. (1878, &c.) 3 Entomolog. Ver. (1837), Ent. Zeitung (1840, &c.). Triest, Zoolog. Inst. uw. Zoolog. Station, Arbeiten (1878, &c.). Troppau, Schles. Bienenzucht-Ver. (1873). Vienna, Entomolog. Ver.; Embryolog. Inst., Mittheil. (1871, &c.); Ornitholog. Ver. Wiirz- burg, Zoolog.~~Zootomisches Inst. (1872), Arbeiten (1874, &c.). SwiTZERLAND: Bern, Schweiz. Entomolog. Ges. Geneva, Assoc. Zoolog. du Léman; Soc. Ornith~~ olog. Suisse (1865), Bull. (1866, &¢.). Itauy: Casale, Soc. Bacologica, Boll. (1866, &c.). Florence, Soc. Allantina Ital., La Sericicultura (1865, &c.); Soc. Entomo- log. Ital., Bull. (1869, &c.), Naples, Zoolog. Station, Mittheil. (1878). Palermo, Soc. di Acclimaz., Atti (1861, &c.). Pisa, Soc. Malacolog. Ital., Bull. (1875, &c.). Rome, Soc. di Pisicolt. Ital. (1872). BeLerum: Antwerp, Soc. Roy. de Zoologie. Brussels, Soc. Roy. de Zoologie; Soc. Entomolog. de Belgique (1855), Annales and Bull. (1857, &c.); Soc. Malacolog. (1863), Annales (1863, &c.) and Procés-Verb. (1872, &c.). Hottanp: Amsterdam, K. Zoolog. Genootschap “Natura Artis Magistra,” Jaarboekje (1852, &c.) and Tijdschr. (1863, &c.). The Hague, Nederl. Entomolog. Vereen., Tijdschr. (1857, &c.). Rotterdam, Nederl. Dierkundige Vereen., Tijdschr. (1874, &c.). Norway: Bergen, Selskabet for Norges Fiskerier. SweEpDEN: Stockholm, Entomolog. Forening. Russta: Moscow, Acclimat. Soc. St. Petersburg, Russtan Entomolog. Soc. ARGENTINE REPUBLIC: Buenos Ayres, Soc. Zoolog. Argentina, Period. Zoolog. (1875, &c.); Soe. Entomolog. Argent.

Assoc., Trans. (1877, &c.). Inpra: Bombay, Med. and Physical Soc., Trans, (1838, &¢.). Calcutta, Med. Soc., Trans. (1888, &c.).

Untrep Staves: Amer. Pub. Health Assoc., Reports (1873, &c.); Amer. Dental Asgoc., Trans. (1860, &¢.); and Amer. Inst. of Homeop., Trans. (1878, &¢.). The. State medical associations include those of Alabama, Trans. (1869, &c.); Georgia Trans. (1878, &c.); Maine, Trans. (1853, &c.); Missouri, Trans. (1851, &c.); ant. South Carolina, Trans. The State medical societies include those of Arkansas Trans. (1877, &e.); California, Trans. (1870, &¢.); Illinois, Trans. (1851, &e.): Kansas, Trans. (1867, &¢.); Michigan, Trans. (1869, &c.); Minnesota, Trans. (1874, &c.); Nebraska, Trans. (869, &c.); New Jersey, Trans. (1859, &c.); Pennsylvania, Trans. (1851, &e.); Rhode Island, Trans. (1877, &c.); Texas, Trans. (1874) ; and Wisconsin, Trans. (1880, &¢.). To these have to be added the following town associations, Albany, Med. Soc., Trans. (1807, &c.). Balti- more, Med. and Chirurg. Faculty of Maryland, Trans. (1856, &c.). Boston Amer, Gynecolog. Soc., Trans. (1876, &e.); Mass. Medico-Legal Soc., Z’rans. (1878, &e.). New York, Acad. of Med., Trans. (1847, &c.) and Bull. (1860, &c.); Med. Soc., Trans. (1815, &¢.) ; Medico-Chirurg. Soc., Trans. (1878, &c.); Amer. Surg. Assoc., Trans. (1883, &e.) 5 Medico-Legal Soc., Sanitarian (1873, &c.); Amer, Ophthalmolog. Soc., Trans. (1865, &¢.). Philadelphia, Amer. Med. Assoc., Trans, |

XI. ANTHROPOLOGY.

The Congres International d’ Anthropologie et d’ Archéologie Préhistoriques held its first meeting at Neuchftel in 1866 ; it issues Comptes Rendus (1866, &c.). The Anthropological Institute of Great Britain and Ireland was founded in 1871 upon the Hthnological Society (1843), which published a Journal (1848-56) and Transactions (1859 -69), and the Anthropological Society (1863), which issued Memoirs (1863-69) and the Anthropological Review (1864-70). The Institute brings out a Journal (1871, &c.).

Unirep Staves: Ashtabula Anthropolog. Soc. New York, Amer. Ethnolog. Soc., Trans, (1845-53) and Bull. (1860-61) ; Anthropolog. Inst., Journ. (1871, &c.). Washington, Anthropolog. Soc. France: Paris, Soc. d' Anthropologie (1859 ; re- cognized 1864), Bull. and Mém. (1860, &¢.); Soc. d'Ethnogr., Annuaire (1862, &c.) and Revue (1869, &c.); Soc. des Traditions Populatres (1886), Revue. GERMANY and AUSTRIA-HUNGARY: Berlin, Ges. f Anthropologie, &c. (1869), Zischr. (1870, &e.)and Verhandl. (1871, &e.). Brunswick, Dewtsche Ges. f. Anthropologie, Archiv (1870, &c.) and Corr.-Blatt. (1874, &c.). Gottingen, Anthropolog. Ver., Mittheil. (1874, &c.). Leipsic, Ver. f. Anthropolog., Ber. (1871, &c.), afterwards joined to the Ver. der Erdk. Munich, Ges. f. 'Anthropolog. (1870), Beitr. (1876, &¢.). Stuttgart, Anthropolog. Ges. Vienna, Anthropolog. Ges., Mittheil. (1870, &c.). TraLy: Florence, Soc. Ital. di Antropologia, Archivio (1878, &¢.). SWEDEN: Stockholm, Antropologiska Séllskapet, Tidskr. (1875, &c.). Spain: Madrid, Soc. Antropoldg. Esp., Revista (875, &e.). Havana (Cuba), Soe. Antropoldg. Russra: Imp. Soc. for Friends of Research in Nat. Sc., Anthropology, &c.

(1848, &c.); Med. Soc., Trans. (1850, &¢.); Obstet. Soc., Trans. (1869, &c.); Amer. Pharm, Assoc., Proc. ; Patholog. Soc. Richmond, Med. Soc., Trans. (1871, &c.). FRANCE: Besancon, Soc. de Méd. (1845), Bull. (1845, &c.). Bordeaux, Soc. de Méd. (1798), Journ. (1829, &c.) 5 Soc. de. Pharm. (1834), Bull. (1860, &c.); Soc. de Méd. et de Chirurg. Caen, Soc. de Méd. (1799 ; known by its present name since | 1875), Année Méd. (1876, &c.). Chambéry, Soc. Méd. (1848), Comptes Rend. (1848, &e.) and Bull. (1859, &c.). Grenoble, Soc. de Méd. et de Pharm. Havre, Soc. de Pharm. (1858), Mém. Lille, Soc. Centr. de Méd. (1845), Bull. (1846, &c.). Lyons, Soe. Nat. de Méd. (1789), Le Lyon Méd. (1869, &c.). Marseilles, Soc. de Med, (1800), Comptes Rend. (1826-53) and Le Mars. Méd. (1869, &c.); Soc. Méd.-Chirurg. (1872). Paris, Soc. de Méd. Pratique (1808), Bull. ; Acad. Nat. de Méd. (1820); Soe de Chirurg. (1848, reorganized 1859), Mém. (1847, &c.) and Bull. (1848, &¢.); Soe. | Anat., Bull. (1826, &c.)5 Soc. Clinique, Bull. (1877, &¢.); Soc. Med. des Hopitaun, Bull. (1849, &c.) ; Soc. Méd. Legale; Soc. de Pharm., Journ. (1815, &c.); Soe. de Thérapeutique; Soc. Fran. de Hygitne; Soc. Centr. de Méd. Vétérinaire. Rouen, Soc. de Méd. (1821), Union Méd. (1861, &c.); Soc. Libre des Pharmaciens (1802), Bull. Toulouse, Soc. de Méd. (1804), Bull. and Revue

(1867, &c.). Tours, Soc. Méd. (1801). Grrmany and AUSTRIA-HUNGARY: Deutscher Aeraztevereinsbund (1872), Verhandl. 5 Central Ver. d. Zahndrzte (1859), Mittheil. ; D. Veterinirrath iy D. Apotheker-Ver. (1820), Archiv (1822, &c.). Berlin, Ver. f. Heilkunde eee , Magazin (1835, &c.); Ges. f Geburishiilfe u. Gynakologie (1876), Zischr'. 1877, &c.); Ges. f. Heilkunde (1855); Berl. Med. Ges. (1860), Verhandl. (1865, &¢.); Physiolog. Ges. (1860), Verhandl. (1877, &¢.); D. Ver. f. Med. Statistik (1868); Ver. Homéop. Aerate (1871), Zischr. (1882, &¢c.)3 D. Ges. f. Chirurgie (1872), Verhandl. Bonn, Verband der Aeratl. Vereine (1865). Breslau, Ver. f. Physiolog. Heilkunde (1848), Zéschr. (1850, &c.) 5 Verband d. Schles. Aerzte-Ver. (1878). Cologne, Rhein, Med.~~Chirurg. Ver. (1848), Organ (1852, &c.). Darmstadt, Aerzil. Kreisver. (1844). Dresden, Ges. f, Naiur~~ u. Heil-Kunde (1818), Jalresber. (1848, &c.). Erlangen, Physik.~~Med. Soc. (1808), Sttzungsber. (1870, &c.). Frankfort, Aerzil. Ver. (1845), Jahresber. (1857, &¢.). Hamburg, Aerzil. Ver. (1816). Hanover, Ver. Analyt. Chemiker (1878). Heidelberg, Ophthal. Ges. (1857). Konigsberg, Ver. f. wiss. Heil~~ kunde (1851). Leipsic, Med. Ges. (1829); Ges. f. Geburtshilfe (1854), Mittheil.; Homéop. Central-Ver. (1829). Magdeburg, D. Chirurgen-Ver. (1844), Zéschr. (1847, &c.). Munich, Aerzil. Ver. (1833), Int.-Blatt (1854, &c.). Strasburg, Soc. de Aféd. (1842), Mém. (1850, &c.); Soc. Vétérin. (1864). Stuttgart, Weirtiemb. Aeratl. Ver. (1831), Corr.-Blatt. (1832, &¢.); Hahnemannia (1868), Mittheil. (1873, &c.); Apotheker-Ver. (1822), Pharm. Wochenblatt (1861, &c.). Vienna, K. k. Ges. der 'Aerzate, Ztschr. (1844, &c.). Weimar, Med.-Naturwiss. Ver. (1863). Wiirzburg, Physikal.-Med. Ges. (1849), Verhandl. (1850, &¢c.). SwiTZERLAND: Geneva, Soe. Méd. Zurich, Soc. de Méd. 3 Schweiz. Apotheker-Ver. Itaty: Bologna, Soc. Med.- Chirurg. Genoa, Accad. Med. Chirurg. Milan, Soc. Ital. d'Igiena. Modena, Soc. Med.-Chirurg. Naples, Real. Accad. 'Med.-Chirurg. Rome, &. Istit. Fisico-Pato- logico. Turin, Accad. Real. Med.~~Chirurg. Beucrum: Antwerp, Soc. de Méd. (1839), Annales. Brussels, Acad. Roy. de Méd. (1841), Bull. (1841, &c.) and Mém.; Soc. Roy. de Pharm. (1856), Bull. 5 Soc. Anat. Pathalog. (1857), Annales; Soe. Belge. de Méd..Homeop. Ghent, Soc. de Méd. (1834), Annales. Liége, Soc. Med. Chirurg. HoLuaNnD: Amsterdam, Genootschap ter Bevordering der Genees~~ eit Tleel-Kunde, Verhandel. (1841, &c.)5 Nederl. Maatschappij ter Bevord. der Phar- macie. Batavia (Java), Geneeskundige Vereeniging. DENMARK: Copenhagen, A. Med, Selskab; Veterinaer Selskab. NORWAY: Christiania,

Med. Selskab. SWEDEN: Stockholm, Farmaceutiska Inst. Spain and Porrucau: Lisbon, Soc. de Se. Med.; Soc. Pharm. Lusitana. Russia: Dorpat, Pharm. Soc. Moscow, Phys.- Med. Soc. Riga, Soc. of Practical Physicians. St Petersburg, Soc. of Practical Physictans ; Imp. Pharm. Soc. Warsaw, Med.-Chirurg. Soc. GREECE: Athens, Soc. Méd. Turkey; Constantinople, Soc. Imp. de Méd.; Soc. de Pharm, CENTRAL and Sours AmrErica: Buenos Ayres, Asoc. Med. Caracas, Escuela Med. Guadalajara (Mexico), Soc. Med. Merida (Mexico), Soc. Med. Mexico, Acad. de Med. ; Soc. Mcd. Monte Video, Soc. de Med. Santiago, Soc. Med. JAPAN: Tokio

des Sciences Soctales and the Congres International de Statistique, which first met at Brusselsin 1853. Both have issued Comptes Rendus. The Congres International

migratory meeting, and publishes Transactions (1858, &e.) and Social Science (1866, &c.). The Statistical Soctety (1834), with a Journal (1839, &c.); Political

was appointed registrar of solicitors ten years later, and obtained supple-inentary charters in 1845 and 1878; it has fifty provincial law societies in association. The Verulam Society (1846) published a few books and came to an end. The Selden Society for the promotion of the study of the history of Jaw was established in 1887. The headquarters of the Association for the Reform and Codification of the Law of Nations are in London, but conferences are held in various Continental towns. The Institute of Patent Agents (incor- porated 1882) issues Transactions. The Juridical Society of Edinburgh (1773) has published five editions of a Complete System of Conveyancing. The Ascham Society was founded in 1879 for the improvement of educational methods ; and the Society for the Development of the Science of Education (1875) issues Transactions.

Unirep Srates: Boston, Amer. Assoc. for Promotion of Soc. Se; Amer. Statist. Assoc., Collections (1847, &c.). New York, Soc. for Polit. Education, Publ. FRANCE: Grenoble, Soc. de Statist. (1838), Bull. (1840, &¢.). Marseilles, Soc. de Statist. (1827), Répertoire (1837, &c.). Paris, Soc. Int. des Etudes Pratiques d’ Econ. (1856, recognized 1869); La Réforme Soc.; Soc. Fran. de Statist. Univ. (1829), Journal issued jointly with Acad. Nat. since 1849; Soc. de Statist. de Paris (1860, recognized 1869), Journ.

(1860, &c.); Soc. de Législatton Comparee (1869 recognized 1873), Bull., Annuaire de Lég. Frang., and Ann. de Lég. Biran.; Soc. pour U Instr. Elément. (1815, recognized 1831), Bull. St Maixent, Soc. de Statist. des Deua- Sbures. GERMANY: Berlin, Volkswirths. Ces. (1860), Volkswirths. Zeitfragen (1879, &c.); Ver. f. deutsche Volkswirths. (1876), Zischr. (1880, &c.); Ver. f. Forde- rung d. Handelsfreiheit (1878), Mittheil. (1879, &c.); Ver. f. d. Statist.; Jurist. Ges. (1859), Jahresber. (1863, &c.). Dresden, Statistischer Ver. (1831), Mittheil. Erank- fort, Statistische Ges.; Juristische Ges. (1866), Rundschaw (1867, &c.). Laibach, Jurist. Ges. Leipsic, Ver. f. wiss. Pddagogik, Jahrbuch and Miitheil. Brtcium: Brussels, Ligue del Enseignement (1864), Bull. ; Soc, Centr. des Institutewrs Belges (1860), Le Progrés. HOLLAND: Amsterdam, Ver. voor de Statist. in Nederland, Jaurboekje (1849, &c.) and Jaarcijfers (1882, &c.). Spain: Madrid, Junta Estadist. Russa: Moscow, Juridical Soc, St Petersburg, Pedagogical Soc. Eayrr: Cairo, Bureau Central de Statist. Japan: Tokio, Statist. Soc.

XIII. Mrpicrne, SuRcERY, &c. Soc. for Adv. of Med. Sc., Trans. (1885, &¢.). The first meeting of the Congrés Medical International was held at Paris in 1867 ; a Bulletin has been issued annually since 1868. The Proceedings of the XIV. ENGINEERING AND ARCHITECTURE,

British National Veterinary Congress date from 1881. The Royal Colleges of ee é : : 4 F ; ! – Physicians and of Surgeons of London, Edinburgh, and Dublin do not come | |. The principal English society dealing with, mechanical science is the Institu- within our scope. The Medical Society of London (1773) is the oldest in the | tion of Civil Engineers (established in 1818, incorporated in 1828), which pub- metropolis; it has issued Memoirs (1787-1805), Transactions (1810, &c.), and | lishes Transactions (4to, 1836-42) and Minutes of P roceedings (VO, 1837, &e.). Proceedings (1872, &¢.). The other London societies include the Abernethian | George Stephenson was the first president of the Institution of Mechanteal Society (1795), which issues Proceedings ; British Dental Association (1879), with | Engineers, which was founded at Birmingham in 1847, removed to London in a Journal (1880, &¢.); British Gynacological Society (1884); British Homeopathic 1877, and registered under the Companies Act in 1878. It holds ni ‘Association (1859), with Annals (1860, &c.); British Medical ‘Association (1832), | meetings and publishes Proceedings. The Society of

Engineers (1854), a 1 Which has more than forty home and colonial branches, and publishes British | Transactions (1sél, &c.); the Civil and Mechanical Engineers' Soctety (1854); Medical Jowrnal (1857, &c.); Clinical Society (1867), with Transactions; Dermato- | the Iron and Steel Institute (1869), with Transactions ; the Surveyors bial logical Society (1882); Epidemiological Society (1850), with Transactions (1855, &.), (1868, incorporated in 1881), which publishes Trantarons and holds re Hahnemann Publishing Society (1852), Materia Medica (1852, &c.) ; Harveian | sional examinations; and the Aeronautical Society of Great Britain (1866) a BO Society (1831) ; Homeopathic Association (1845); Hunterian Soctety (1819); New | meet in London. There are institutions in the provinces at Cardiff eel Sydenham Soctety (1858), which publishes Biennial Retrospect (1867, &c.), and incorporated in 1881), Chesterfield (1871), Dublin (1835, incorporated i) translations and reprints of books and papers of value, suececded the Old Syden- | Glasgow (1857, with Transactions), Middlesborough (1864), and Neweastle-on ham Society (1844-57), which issued 40 vols.; Obstetrical Soctety (1858), with Trans- | Tyne (1852, incorporated in 1876, with Transactions). a xitee actions (1860, &¢.); Odontological Society (1856), with Transactions (1858, &c.); The leading architectural society 1s the Royal Institute of British Are , Bee Ophthalmological Society (1880) ; Parkes Musewm (1876), founded in memory of | founded in 1834, incorporated in 1837, and granted a new charter in 1887. the services of Dr. E. A. Parkes to sanitary science ; Pathological Society (1846) i 1 Transactions ; Pharmaceutical Society (1841), with museum, which has a branch | &¢.) and Proceedings (1879, &c.). it 'ate at Edinburgh, Pharmaceutical Journal (1842, &¢.); Physiological Association | (1874), Edinburgh (1850), Exeter (1843), Glasgow (1868), Leeds (1876), Lee (1876), Journ. of Physiology (1878, &c.); Royal Medical and Chirurgical Society | shire (1855), Liverpool (1848), Manchester (1875), Newcastle-on-Tyne, anc Br 1805; charter 1834), with library, and Transactions (1809, &c.) and Proccedings societies of Manchester (1865) and Oxford (1837). 'The Architectural a Pe 1857, &c.); Sanitary Institate (1876), the council of which appoint examiners ; | of London publishes a Sketch Book (1870, &c.). The "Architectural Publishing ociety of Medical Officers of Health (1856), Transactions. The provincial societies Society (1848) has published Essays (1848-52), and since 1852 has are very numerous and include—Birminghamn, Midland

Med. Soc. (1848). Dublin, out a Dictionary of Architecture. There is also a Society of Architects, – vel Acad. of Med. in Ireland (1882), Trans. (1883, &e.). Edinburgh, Roy. Med. Soc. Unirep States: Easton, Pa., Inst. of Mining Engineers. New Yo (1737 ; charter 1778); Harveian Soc. (1752) ; ‘Medico-Chirurg. Soc. (1821), Trans. | Soc. of Civ. Eng., Trans, ; Amer, Inst. of Min. Eng. ; Amer. Inst. of Arch on (1824, &c.); and Obstetrical Soc. (1340). Glasgow, Medico-Chirurg. Soc. (1866), based | FRANCE: Lyons, Soc. Acad. d’ Arch. (1830), Annales (1867, &e.). Paris, a upon Med. Soc. and Med.~~Chirwrg. Soc. (both 1814). Manchester, Med. Soc. (1834). Ingénieurs Civils, Mém. (1848, &c.); Soc. Cent. des Architectes, Bull, (1851, eo ‘AUSTRALIA: Melbourne, Med. Soc. of Victoria, Austr. Med. Journ. (1856, &e.). | and Annales (1875, &¢.); it has held a congress since 1875. Saint~~ noe ne Canapa: Montreal, Union Méd. du Canada, Revue (S72, &c.); Canada Med. de U Industrie Min. (855), Bull. Germany and AustTRiA-HuNGARY: Bertil,

SOCIETIES

Ver. Deutscher Ingenieure, Ztschr. (1857) and Wochenschrift (1877, &c.); Ver. f. Eisenbahnkunde ; Akad. des Bauwesens; Architekten-Ver., Ztschr. Breslau, Ver. f, Ges. der Bild. Ktinste (1862). Constance, Mtinsterbau Ver. (1881). Dres- den, Sachs. Ingen.- u. Architeken-Ver., Protok. Hanover, Arch.- wu. Ingen.-Ver., Zischr. Klagenfurt, Berg-wnd Hutten-Mannischen Ver. Leoben, K. k. Berg-Akad. Munich, Bayr. Arch.- uw. Ingen.~~Ver., Ztschr. Prague, Arch.~~ und Ingen.~~Ver. Vienna, Oesterr. Ingen.~~ u. Arch.~~Ver., Zischr.; Ges. f. Bild. Kiinste. SwitzEr~~ LAND: Lausanne, Soc. Vaudoise des Ingén. et des Arch. Zurich, Ver. Schweiz. Ingen. u. Arch. Ivaty: Turin, Soc. degli Ingenert, Atti (1868-70). BrLcIuM: Brussels, Assoc. des Ingén. Liége, Assoc. des Ingén. (1847), Annuaire (1851, &c.). Hoitianp: Amsterdam, Maatschapptj tot Bevordering der Bowwkunst, Bouwkun- dige Bijdragen (1843, &c.). The Hague, Kon. Inst. van Ingen., Verslag (1848, &c.), Verhandel. (1848, &c.) and Tijdschr. (1870, &c.). Spain and Porrucar: Lisbon, Assoc. dos Engenheiros Civ. Port.; Soc. dos Architectos e Archeologos. Madrid, Soc. Central de Arquitectos.

XV. Nava anp Minirary Scrence.

The Royal United Service Institution, first known as the Naval and Military Library and Musewm (1831), took the name of the United Service Institution in 1839, and was incorporated in 1860; it has a professional museum and publishes 2 Journal (1857, &c.). The home of the society is in London, as is also that of the Institution of Naval Architects (1860), which publishes Transactions (4to, 1860, &e.). The Royal Artillery Institution (1838), which issues Minutes of Proceedings (1858, &c.), is at Woolwich, and the Royal Engineers Institute (1875), which issues Royal Engineers Professional Papers, at Chatham. Canapa: Toronto, Military Inst. Inv1a: Simla, United Service Institution.

Unirep States: New York, Military Scrvice Inst., Journal (1879, &c.). FRANCE: Paris, Réunion des Offciers, now Cercle Militaire, Bull. (1871, &c.). GERMANY and AvusTRIA-Hunaary: Munich, AMilitdr. Ges. (1868), Jahrbiich. (i871, &c.); Vienna, K.k. Milit.~~Geogr. Inst., Arbeiten (1871, &c.). Houuanp: Utrecht, Vereen. tot Verspreiding van Kennis aangaande s'Lands Verdcdiging, Joarsverslag (1872 &c.) and Werken, Norway: Christiania, Militere Samfund, Nordsk Milit. Tidsskrift (1848, &c.). Denmark: Copenhagen, Krigsvidenskab~~ elige Sclskab, Milit. Tidsskrift (1872, &c.).

XVI. AGRICULTURE AND TRADES.

The Royal Agricultural Society of England began as the Engtish Agricultural Society in 1838 and was incorporated in 1840. It holds annually one migratory meeting in some part of England or Wales and two meetings in London, where are its head-quarters; it publishes a Journal (1840, &c.). The leading pro- vincial agricultural societies and associations are—Aberdeen, Roy. Northern Agr. Soc, (1843). Arbroath, Angus Agr. Assoc. Banbury (1834), Basingstoke, Roy. Counties Agr. Soc, (1859). Bath, Bath and West of Engl. Soc. and Southern Counties Assoc. (founded in 1777, enlarged in 1852, and reorganized in 1866), Letters and Papers (1780-1816) and Journal (1852, &c.). Belfast, Chemico-Agr. Soc. of Ulster (1845), Proc.; N. E. Agr. Assoc. of Ireland. Birkenhead, Wirrel and Birkenhead Agr. Soc. (1842). Brecknock (1855). Carluke (1833). Chelmsford, Essex Agr. Soc. (1858). Chertsey (1833). Doncaster (1872). Dublin, Roy. Agr. Soc. of Ireland (1841). Edinburgh, Highland and Agr.

Soc. of Scotland (1784, incorporated in 1787), Trans. (1799, &c.). Halifax (1839, enlarged in 1858).

Ipswich, Suffolk Agr. Assoc. (1831). Otley, Wharfedale Agr. Soc. Paisley, Renfrewshire Agr. Soc. (1802). Warwick. Worcester (1838). Arrica; Cape Town, Agr. Soc. AvusTRALIA: Sydney, Agr. Soc. of N. S. Wales. Britisa

GuIANA: Georgetown, Roy. Agr. and Commercial Soc. CaNnapa: Montreal, Soc. @Agr. Invia: Calcutta, Agr. and Hortic. Soc., Journ. (1842, &c.).

Unirep States; Albany, State Agr. Soc., The Cultivator and Journal. Atlanta, State Agr. Soc. Boston, Inst. of Technology. Hoboken, Stevens Inst. of Technol. Madison, State Agr. Soc., Trans. (1852, &c.). Sacramento, Soc. of Agr. and Hortic. San Francisco, Agr. and Hort. Soc. Troy, Rensselaer Polytechnic Inst. Worcester, Free Inst. of Industry.

France: Algiers, Soc. d' Agr. (1840), Bull. Amiens, Soc. Industrielle (1861), Bull. Angers, Soc. Industr. et Agr. (1830), Bull. Bordeaux, Soc. d Agr. Boujogne, Soc. d'Agr. Caen, Assoc. Normande pour lAgr., Industrie, &c. (1831), Annuaire (1835, &c.); Soc. d'Agr. et de Commerce (1762), Mém. (1853-58) and Bull. (1858, &e.). Chalons-sur-Marne, Soc. d'Agr., &c. (1798), Mém. (1807, &c.). Elbeuf, Soc. Industr. (1858), Bull. Grenoble, Soc. d' Agr. et d'Hortic. (1835), Sud- Est (1855, &c.). Le Mans, Soc. du Matériel Agr. (1857), Bull. Lyons, Soc. des Se. Industr. (1862), Annales. Montpellier, Soc. d' Agr. (1799), Bull. (1808, &c.). Nancy, Soc. Centr. d' Agr. Paris, Soc. Nat. d Agr. de France (1761; reconstructed in 1878 with a view of instructing Government on agricultural matters), Mém. and Bull. Rheims, Soc. Industr. (1833), Bull. (1858, &c.). Rouen, Soc. Industr.

1872), Bull.; Soc. du Commerce et de UInd. Saint-Jean-d'Angély, Soc. d'Agr.

819), Bull. (1833, &c.). St Quentin, Soc. Industr. (1868), Bull. Toulouse, Soc. d' Agr. GERMANY and AusTRIA-HuncaRy: The migratory Congress Deut- scher Volkswirthe first met at Gotha in 1858. Agram, Kroatisch-Slav. Land- wirths, Ges., Bldtter. Augsburg, Landwirths. Ver., Landw. Blatter. Berlin, Vereinigt. Berlinerkanfleute uw. Indusir.; Ver. f: Beford. des

Gewerbeficisses. Bonn, Landwirthsch. Central-Ver. Bremen, Landwirths. Ver. Breslau, Land- wirths. Central-Ver.; Schles. Central Gewerbe-Ver. Cassel, Landwirths. Central- Ver., Mittheil. Cracow, Akerbau Ges., Annalen. Dantzic, Volkswirths. Ges. (1850). Darmstadt, Landwirths. Ver., Ztschr. Dresden, K. Ockonomie Ges. ; K. Sdchs. Polytechnicum. Firth, Gewerbe-Ver. Gratz, K.k. Steiermarkische Laundwirths. Ges. Greifswald, Baltischer Central-Ver. Tlalle, Landwirths. Cen- tral-Ver. Wanover, Gewerbe-Ver. Innsbruck, K. k. Landwirths. Ges., Wochen- schr.; Kdrnt. Industrie- u. Gewerbe-Ver. Jena, Landwirths. Inst. K6nigsberg, Ostpreuss. Landwirths. Central-Ver. Leipsic, Landwirths. Kreis-Ver.; Polytechn. Ges. Linz, K. k. Landwirths. Ges. Liibeck, Landwirths. Ver., Mittheil. Miihl- hausen, Soc. Industr., Bull. Munich, Landwirths. Kreis-Ver.; Polytechn. Ver. Nuremberg, Polytechn. Ver. Pesth, Ungar. Akerbau Ges., Mittheil. ; Industrielle Ges. Prague, Bohmischer Gewerbe-Ver.; Industrie Ges., Mittheil. and Annalen. Ratisbon, Landwirths. Kreis-Ver., Bauernfreund. Stuttgart, K. Wiirttemd. Central-Stelle, Wochenblatt. Trieste, Akerbau Ges. Tiibingen, Landwirths. Ver. Vienna, K. k. Reichs Landwirths. Ges., Ztschr. Wiesbaden, Gewerbe-Ver. Swit- ZERLAND: Bern, Oekonom. Ges. Lausanne, Soc. d’ Agr. de la Suisse Romande. Zurich, Ver. f. Landwirths. u. Gartenbau. Iraty: Bologna, Soc. Agraria, Annali. Cagliari, Soc. Agr. ed Econom. Florence, Soc. Econom. ed Agr., Rendiconti. Milan, Soc. Agr. di Lombardia; Soc. Gen. degli Agricolt. Ital. ; Soc. d’Incoragg. di Artie Mestiert, Discorsi. Perugia, Soc. Econom. ed Agr., Atti. Turin, Accad. Reale di Agricolt.; Assoc. Agr. Ital., Esercitaziont. Verona, Accad. d’Agricolt. BELGIUM : Soc. Centr. d’ Agricult, (1854), Bull. Ghent, Soc. Roy. d’Agr. et de Bot. Liége, Soc. d’Agr., Journ. (1850, &c.). Verviers, Soc. Industr. et Commerc. (1863), Bull. Wouranp: Amsterdam, Aardrijskundig Genootschap ; Vereeniging voor Volksvlijt. DENMARK: Copenhagen,K. Landhwusholdnings Selskab; Det Statist. Tabelverk, Norway: Christiania, Polytekniske Forcening. SwEDEN: K. Landt- bruks Akademien. Spain and PortrucaL: Barcelona, Soc. Econom., Actas. Lisbon, Inst. Real de Agric. ; Soc. Promotora de Industr. Madrid, Soc. Econom. Matritense, Anales, Oporto, Acad. Polytcchn. Russta: Dorpat, K. Livldndische Oekonom. Gcs., Jahrbuch. Kazan, Imp. Econom. Soc., Monthly Reports. Moscow, Imp. Soc. of Agriculturalists. Odessa, Imp. Agronom. Soc. of S. Russia. Riga, Technical Soc. St Petersburg, Imp. Econom. Soc., Trans. ; Technical Soc. Rov- Mania. Bucharest, Soc. Roumaine d’ Agr.

XVII. Literature, History, anD ARCHAOLOGY.

The Congres International des Orientalistes first met at Paris in 1873; it issues Comptes Rendus (1874, &c.). The Congrés Bibliographique International held its first meeting in 1878, and the Congres des Américanistes its first meeting in 1875. The Royal Society of Literature (1823, incorporated in 1826), with Trans- actions (4to, 1829-39; 8vo, 1843, &c.), and the Royal Asiatic Society (1823), with Journal (1834, &c.), have their headquarters in London, as well as the following literary societies and printing clubs, all of which issue publications : —Aristotelian (1879), Authors (1884), Ballad (1868), Browning (1881), Carlyle (1879), Chaucer (1868), Early English Teat (1864), East India Association (1866), English Dialect (1873), Gaelic, Hebrew Literature (1872), Hellenic Studies (1879), Index (1877), Library Association (1877), London Dialectical (1865), New Shakspere (1873), Oriental Translation Fund (1828), Pali Text, Philobiblon (1853), Philological (1842), Roxburghe Club (1812), Shorthand, Wordsworth (1880), Wyclif (1882). ‘The Cambridge Philological Society, the Glasgow Hunterian Club (1871), the Lancashtre and Cheshire Historical Society (1828), at Liverpool, the Manchestcr Literary Club, with Transactions and Papers (1874, &c.), and the Manz Society (1858), at Douglas, may also be mentioned.

The oldest and most important society in England dealing with history and archeology is the Soctety of Antiquaries of London, which enthusiasts trace to an association founded by Archbishop Parker in 1572. The meetings were not publicly recommenced until 1707 ; the present body was incorporated in 1751; it publishes Vetera, Monwmenta (fol., 1747, &c.), Archeologia (4to, 1770, &c.), and Proceedings (8v0, 1849, &c.). The Royal Archexological Institute (1843), issuing the Archeological Journal (1845, &c.); the British Archeological Association (1843), with Journal (1846, &c.); the Numismatic Society (1836), issuing the Numismatic Chronicle (1838, &c.); and the Royal Historical Society (1868), with Transactions, belong to London, as well as the following historical and anti- quarian societies, all of which issue publications :—Arundel (1848), Camden

(1838), Cymmrodorion (1751-73, revived in 1820), Dilettanti (1734), Folk Lore (1877), Harleian (1869), Holbein, Huguenot (1885), London and Middlesex Archeol. (1855), Medallists (1885), Middlesex County Records (1884), Palwographical, Pipe Roll (1883), Rabelais Club (1879), Seal (1883), Soc. Bibl. Arche#ol. (1870), Soc. for Prot. Anc. Buildings (1877), Topographical (1880). The Society of Antiquaries of Scotland (1790), at Edinburgh, and the Irish Archeology and Celtic Society, at Dublin, are the leading associations outside London. Among others are— Aberdeen, New Spalding Club (1886); Bedfordshire Archeol. and Architect. Soc. eed Bristol, Bristol and Gloucester Arch. Soc. (1876); Cambrian Arch. Assoc. 1846) ; Cambridge Antig. Soc. (1840); Dublin, Roy. Hist. and Arch. Soc. ; Durham, Surtees Soc, (1834); Essex Arch. Soc. (1852); Exeter, Diocesan Arch. Soc. (1841); Glasgow Arch. Soc, (1856); Kent Arch. Soc. (1857); Lanc. and Cheshire Antigq. Soc. (1883); Manchester, Chetham Soc. (1843); Newcastle-on-Tyne Soc. of Antig. (1818) ; Norwich, Norfolk and Norwich Arch. Soc. (1846); Oxford, Architect. and Hist. Soc. (1839) and Hist. Soc. (1883); Purbeck Soc.; Sussex Arch. Soc. (1846); Welshpool, Powys Land Club (1867); and Yorkshire Arch. and Topogr. Assoc. (1863).

Canapa: Montreal, Soc, Hist., Mém. (1859, &c.); Numism. and Antiq. Soc., Journ. (1872, &c.). Quebec, Lit. and Hist. Soc., Trans. (1837, &c.). Toronto, Lit. and Hist. Soc. Cutna: Hong Kong, Roy. Asiatic Soc. Shanghai, Roy. Asiatic Soc., Journ. (1858, &c.). Inpra: Bombay, Roy. Asiatic Soc. (1841), Journ. (1844, &c.), Calcutta, Asiatic Soc. of Bengal, Journ. (1832, &c.) and Proc. (1865, &c.). Colombo, Roy. Asiatic Soc., Journ. (1844, &c.). Singapore, Roy. Asiatic Soc. ,

Unirep Starrs: Baltimore, Hist. Soc. Boston, Mass. Hist. Soc., Collections (1792, &c.) and Proc. (1859, &c.); New Engl. Hist.-Gen. Soc, (1846), Proc. ; Amer. Oriental Soc. (1843), Journ. (1849, &c.). Brunswick, Hist. Soc. Chicago, Hist. Soc. Concord, Hist. Soc., Coll. (1824, &c.). Hartford, Amer. Philolog. Soc. ; Hist. Soc., Coll. (1860, &c.). Madison, Hist. Soc., Coll. (1855, &c.). Minneapolis, Hist. Soc., Coll. (1869, &c.). Montpelier, Hist. Soc. of Vermont, Coll. (1869, &c.). New York, Hist. Soc., Coll. (1811, &¢.); Genealog. Soc.; Amer. Library Assoc. (1876), Libr. Jowrn. Philadelphia, Mist. Soc., Mem. (1826, &c.); Nwmism. and Arch. Soc.

1865). Portland, Maine Hist. Soc., Coll. (1831, &c.). Providence, Hist. Soc., Coll. 1827, &¢.). Richmond, Virg. ist. and Phil. Soc., Pubdl. (1874, &c.). St Louis, Missouri Hist. Soc. Savannah, Hist. Soc., Coll, (1840, &c.). Topeka, Hist. Soc., Trans. (1881,&c.). Worcester, Amer. Antig. Soc.,Proc.and Arch. Amer. (1820,&c.).

France: The Congres Archéologique de la France first met in 1834. Algiers, Soc. Iist. (1856), Revue (1856, &c.). Amiens, Soc. des Antiq. (1836), Mém. (1838, &c.) and Bull. Angouléme, Soc. Arch. et Hist. (1844), Bull. Bordeaux, Soc. Archéol. (1873). Caen, Soc. des Antiq. de Normandie (1824), Mém. (1825, &c.) and Bull. (1860, &c.); Soc. Fran. d' Arch. (1834), Comptes Rend. (1834, &c.) and Bull. Mens. (1835, &c.). Constantine, Soc. Arch. (1852), Recueil. Dijon, Comm. des Antiquités (1830), Mém. (1832, &¢.). Limoges, Soc. Hist. et Arch. (1845), Bull. Lyons, Soc. Hist., Litt., et Arch. (1807), Mém. (1861, &c.). Montpellier, Soc. Arch., Mém. (1835, &c.). Nancy, Soc. d'Arch. de Lorraine (1848), Mém. (1850, &c.) and Journ. (1852, &c.). Nantes, Soc. Arch. (1845), Bull. (1859, &e.). Orleans, Soc. Arch. et Hist. (1849), Mém. (1851, &c.) and Bull. Paris, Soc. Nat. des Antiq. de Fr. (based on the Académie Celtique), Mem. (1817, &c.) and Bull. (1857, &c.); Soc. de U Hist. de France (1833), has published about 270 vols. ; Soc. de U'Ecole Nat. des Chartes (1854), Bibliotheque; Soc. Asiatique (1822), Journal Asiat. (1822, &c.), &c.; Soc. Fran. d@ Arch. et dc Numvism. ; Soc. de U' Hist. du Prot. Fran. 5 Soc. de Linguistique ; Soc. Bidliogr. (1868), Polybiblion. Poitiers, Soc. des Antigq. (1834), Mém. Rouen, Soc. de l'Hist. de Norm. (1869), Publ. Toulouse, Soc. Arch. (1831), Tours, Soc. Arch. (1840), Mém. (1842, &c.). GERMANY and AUSTRIA- Hunaary: Gesam. Ver. d. D. Gesch. u. Alt. Vereine (1852). Agram. Ges. fi Stid- Slay. Alterth. Altenburg, Gesch. wu. Alterthums Ges. (1838), Mittheil. (1841, &c.). Augsburg, Hist. Ver. (1820, reorganized in 1834), Jahresber. (1835, &c.). Baden, Alterthwms-Ver. (1844), Schriften. Bamberg, Hist. Ver. (1830), Ber. (1834, &c.). Berlin, Ver. f. Gesch. d. Mark Brandenb. (1836), Forschungen (1841, &c.); Ver. f. d. Gesch. Berlins (1865), Schriften; Hist. Ges. (1872), Mittheil.; Archdolog. Ges. (1841), Archdol. Zeitung; Numism. Ges. (1848), Jahresber. (1845, &c.), Herold (1869) ; Phil. Ges. (1843), Der Gedanke (1861, &c.); Ges. fi D. Philologie (1877), Jahresber. (1879, &¢.). Bonn, Ver. f. Alterth. (1841), Jahresber. ; Soc. Philologa (1854). Bran- denburg, Hist. Ver. (1868), Jahresber. (1870,

&c.). Braunsberg, Hist. Ver. (1856), Ztschr. (1858, &¢.). Breslau, Ver. f. Gesch. u. Alt. Schl. (1846), Zischr. (1856, &c.); Breslawer Dichterschule (1860). Cassel, Ver. f. Hess. Gesch. (1834), Ztschr. (1837, &e.). Cologne, Hist. Ver. (1854), Annalen (1855, &e.). Darmstadt, Hist. Ver. (1834), Archiv (1835, &c.). Dresden, K. Stiehs. Alt, Ver. (1824), Jahresber. (1835, &ec.) and Mittheil. (1835, &c.). Frankfort, Ges. f. Deutschlands dlt. Geschichts- kunde (1819; since 1875 under guidance of Central-Dir. d. Mon. Gcerm.), Mon. Germ. (1826, &¢.); Ges. f. Gesch. u. Kunst (1837), Mittheil. (1858, &c.); Fretes D. Hochstijt in Goethe's Vaterhaus (1859). Halle, Thiir.-Sdchs. Ver. (1819), Mittheil. (1822, &c.); D. Morgenl. Ges. (1844), Ztschr. (1847, &c.) and Abhandl. (1859, &c.). Hanover, Hist. Ver. (1835), Ztschr, Kiel, Ges. f. Gesch. Schl.~~Holst, (1833, re~~ organized in 1873), Archiv (1833, &c.)and Zéschr. (1870, &c.). Leipsic, D. Ges 2. Erforschung vaterl. Spr. u. Alterth. (1697, reorganized in 1824), Jahresber. (1825, &c.) and Mittheil. (1856, &¢.); Ftrstlich Jablonowski's Ges. (1768), Acta (1772 &c.); Borsenver. d. D. Buchhandler (1825), Borsenblatt (1834, &c.) ; Hist. Theolog. Ges. (1814). Liibeck, Hansischer Ges. Ver. (1870), Munich, Hist. Ver. (1837), Archiv (1839, &c.);

Stuttgart, Lit. Ver. (1839), Bibliothek (1843, &c.); Wiirttemb. Alterth. Ver. (1848). Vienna, K. k. Orient. Akad. Weimar, D. Shakespeare Ges. (1864), Jahrbuch (1865, &¢.). Wiesbaden, Ver. f. Nass. Alterth. (1821), Annalen (1830, &c.). Wiirzburg, Hist. Ver. (1830), Archiv (1833). SWITZERLAND: Basel, Hist. w. Antiq. Ges. Bern, Schweiz. Hist. Ges. Freiburg, Soc. d' H ist. Geneva, Soe. d Hist. et d' Arch. Lausanne, Soc. d'Hist. Zurich, Soc. d' Hist. ; Antiq. Ges. Iraty: Genoa, Soc. di Storia Patria. Naples, R. Accad.; R. Accad. Ercolanese. Rome, Accad. Rom. di Arch. ; Soc. Rom. di Storia Patria; Inst. di Corr, Arch.; Brit. and Amer. Arch. Soc. ; K. Deutsch. Archéolog. Inst., Arch. Zing. (1843-85) and Jahrb. Turin, Real Deputaz. di Stor. Pair, BELGIUM: Antwerp, Acad. d'Archéol. (1842), Bull. (1865, &c.). Bruges, Soc. powr U'Hist. ct les Antig. de la Flandre (1839), Publ. Brussels, Soc. de l' Hist. de Belgique (1858), Publ. ; Soc. Roy. de Numism. (1841), Revue; Soc. des Bibliophtles (1865). Ghent, Soc. Roy. des Beaux-Arts et de la Litt. (1808), Annales (1844, &c.); Willems Fond (1851). Liége, Inst. Archéol. (1852), Bult. (1852, &c.). Louvain, Soc. Litt, (1839), Mém.

and Publ. Mons, Cercle Archéol. (1856), Annales (1857, &c.). Tournai, Soc. Hist. et Litt. (1846), Bull. (1849, &c.). Verviers, Soc. Arch. Ypres, Soc, Hist. (1861). Houianp: Leyden, Acad. Lugduno-Batava. Luxembourg, Inst. Archéol. (1846, reorganized in 1862), Annales (1849, &c.). Utrecht, Hist. Genootschap. DENMARK: Copenhagen, Island. Litt. Selskab 3 K. Danske Selskab ; K. Nordisk Oldskrift Selskab. Reykjavik (Iceland), Fornleifarfelag, Norway: Christiania, Norske Hist. Forening ; Norske Oldskrift Selskab. SweDEN: K. Vitterhets Hist. och Antiq. Akad. ; Svenska Akad. Spain: Barcelona, R. Acad. de Buenas Letras; Madrid, R. Acad. de Cienc. Mor. y Pol. ; R. Acad. Esp. Arg. ; R. Acad. de la Hist. Greece: Athens, Soc. Archéol. Russta: Helsingfors, Finska Litt. Sdillskapet. Mitau, Cowrland Soc. of Lit. and Art. Moscow, Imp. Russ. Soc. of Hist. and Antiq.; Archzolog. Soc. Narva, Archeolog. Soc. Odessa, Hist. and Antig. Soc. Riga, Lett. Lit. Ges. ; Hist. and Antiq. Soc. St Petersburg, Russ. Hist. Soc. Turkey: Constantinople, Soc. for Adv. of Turkish Lit.; Hellenic Philolog. Soc. JAPAN: Yokohama, Asiatic Soc. of Japan, Trans. (1874, &¢.). XVIII. Geoerarzy.

The Congres International pour les Progrés des Sciences Géographiques first met in 1871. The Royal Geographical Society of London, founded in 1830, had joined to it in the following year the African Association (1788), the successor of the Saturday Club; the Palestine Association (1805) became merged with it in 1834. 1t publishes Jowrnal (1882, &c.) and Proceedings (1857, &c.). The Hakluyt Society (1846) has printed more than 70 vols. of rare voyages and travels. The Alpine Club (1858). whose publications are Peaks Passes, and Glaciers (1859-62) and Journal (1863, é&c.), and the Palestine Exploration Fund (1865), publishing Quarterly Statement (1869, &c.)and Memoirs, meet in London. The Scottish Geographical Society (1884) has its centre at Edinburgh, and issues the Scottish Geographical Magazine. Manchester has also a Geographical Society. AUSTRALIA: Melbourne, Geogr. Soc. Sydney, Geogr. Inst. CaNaDa: Quebec, Geogr. Soe. Inpia: Bombay, Geogr. Soc., Trans. (1836, &c.).

Unirep States: New York, Amer. Geogr. (and Statist.) Soc., Bull. (1852, &c.), Journ. (1859, &c.), and Proc. (1862, &c.); Palestine Exploration Soc. (1870). France: Bordeaux, Soc. de Géogr. Commerciale (1874), Bull. Lyons, Soc. de Géogr. (1873), Bull. Marseilles, Soc. de Géogr. (1876), Bull.

Paris, Soc. de Géogr. (1821, reorganized in 1827), Bull. (1822, &c.). GerMaNy and AusTRiA-HUNGARY ‘ D. Geographentag (1881), Verhandl. 5 D. Alpen-Ver. (1869), Zischr. u. Jahro. (1869, &e.). Berlin, Ges. f. Erdkunde (1828), Ztschr, (1853, &c.) and Verhandl, (1873,

&e.); Ges. zur Erforschung Aequat. Afrikas (1873), Corr.-Blatt. ; Afrik, Ges. (1878), Mittheil. Bremen, Geograph. Ges. Ges), Geogr. Blatter. Carlsruhe, Badische Geogr. Ges. (1880), Verhandl. Cassel, Ver. f. Erdk. (1882), Darmstadt,

Ver. f. Erdk. (1845), Notizblatt (1854, &c.). Dresden,Ver. f. Erdk. (1863), Jahresber. Frankfort, Ver. f. Geogr. u. Statist. (1836), Jahresber. Halle, Ver. f. Erdk. (1878). Hamburg, Geogr. Ges. (1873), Jahresber. Hanover, Geogr. Ges. (1878), Jahresber. Jena, Geogr. Ges. (1880), Mittheil. Leipsic, Ver. f. Erdk. (1861), Jahresber. Liibeck, Geogr. Ges. (1880). Munich, Geogr. Ges. (1869), Jahresber. Pesth, Hung. Googr. Soc, (1873). Vienna, K. k. Geogr. Ges., Mitth. (1857, &c.); Ver. der Geogr. Weimar, Geogr. Inst. SwirzeRLaNp: Bern, Inst. Geogr.; Schweiz. Alpen- Club. Geneva, Soc. de Géogr., Mém. (1860, &e.). Zurich, Karten-Ver. Iraty: Rome, Soc. Geogr. Ital., Bull, (1868, &c.). Turin, Circolo Geogr. Ital. (1868). Bertaium: Antwerp, Soc. Belge de Géogr. (1870), Bull. Brussels, Soc. Belge de Géogr. Hottanp: Amsterdam, Het Aardrijkskundig Genoot., Tijdschrift (1874, &c.); Landkundige Genootschap. DENMARK: Copenhagen, Geogr. Selskab. SPAIN and PortuaaL: Lisbon, Soc. de Geogr., Bol. (1876, &c.). Madrid, Soc. Geogr., Bol. (1876, &¢.).. Russia: Irkutsk, Geogr. Soc., Bull. (1871, &c.). St Petersburg, Imp. Russ. Geogr. Soc., Mem. (1849, &c.) and Bull. (1865, &c.). Tiflis, Geogr. Soc., Mem. (1852, &¢.). Haypr: Cairo, Soc. Khédiviale de Géogr., Bull. (1876, &c.). Japan: Tokio, Geogr. Soc. CentTRAL and Sourm America: Buenos Ayres, Inst. Geogr. Argent. Mexico, Soc. de Geogr. ed Estad., Bol. (1861, &c.), Rio Janeiro, Roy. Geogr. Soc.

Breui0GRapHy.—The Catal. of Printed Books in the British Museum (1841), folio, s.v. “ Academies,” contains a list of all the publications of societies at that time in the museum. This has been re-arranged and greatly enlarged as Academies (1885-86), 5 parts folio. See also Annuaire des Soc. Sav. de la France et de UEtranger (1846), 8vo; A. d’Héricourt, Annuaire, 1863-66, 3 pts. 8vo; Cat. of Periodicals in Bodleian Lib., pt. iii. Foreign, 1880, 8vo; 8. H. Scudder, Cat. of Scientific Serials, 1633-1876,Camb. (U. 8.),1879, 8vo,very complete; P. E. Richter, Periodica im Besitze des k. off. Bibl. zu Dresden, 1880, 8vo; Cat. of Trans., &c., in Radcliffe Lib., 1884, 8vo; List of Foreign Corr. of the Smithsonian Inst. 1886, 8vo. British societies are now well represented in the Year Book of the Scientific and Learned Societies of Great Brit. and Ireland, 1884, &c. See also Hume’s Learned Societies and Printing Clubs of the U. K., 1853, 8vo; E. Mailly, Inst. Se. de la Grande Bret., 1861-67, 6 pts.; H. G. Bohn, App. to Bibliographer’s Manual, 1864, 8vo; Engl. Catal. of Books, 1864-82, 3 vols. 8vo; and “Sc. Societies and Field Clubs,” in Nature, v., viii. For France, see U. Robert, Bibl. des Soc. Sav de la France, pt. i., 1878; F. Bouillier, L’ Institut et les Acad. de Province, 1879, 8vo ; Bibliogr. des Travaua Hist. et Arch. publ. par les Soc. Sav. de la France, 1885, &c., 4to (in prog.). For Germany and Austria-Hungary, see H. A. Stohr, Allg. Deutsches Vereinshandbuch, 1873, &c., 8vo; J. Miiller, Die wiss. Vereine u. Ges. Deutschiands im 19ten Jahrh. , 1883, 4to (in prog.) ; J. Winckler, Die period. Presse Oesterreichs, 1875, 8vo; and P. A. F. Walther for German historical societies (1845). E. Huth, Verzeichniss, Berlin, 1887, &c. (in prog.), describes publica- tions of societies relating to natural science. See also “‘ Les Congres Scienti- fiques,” by Count de Marsy, in Compte Rendu du Congres Bibliogr., 1879. For Belgium, see Introd. a la Bibl. de la Belgique, 1875. For Italy, see G. Ottino, La Stampa Periodica in Italia, 1875, 8vo. For Russia, consult C, Woldemar, Gesch. d. russ. Gelehrten- und Schul-Anstalten, St Petersburg, 1865, 8vo, and Kawall, Die neuen russ, Naturforschergesellschaften, Riga, 1872-74. (H. R. T.).

SOCIETY ISLANDS. See Tanrri ARCHIPELAGO.

SOCINUS, the Latinized form of the Italian Soccini, Sozini, or Sozzini.

I. Lenio Francesco Maria Sozrnt (1525-1562), theo- logical inquirer, was born at Siena on 29th January 1525. His family descended from Sozzo, a banker at Percena,

whose second son, Mino Sozzi, settled as a notary at Siena in 1304. Mino Sozzi's grandson, Sozzino (d. 1403), was the ancestor of a line of patrician jurists, of whom Mariano Sozzini, senior (1397-1467), was the first and the most famous. Lelio was the sixth son of Mariano Sozzini, junior (1482-1556), by his wife Camilla Salvetti. The family name is variously spelled (usually ''Soccini" by modern writers) ; Lelio invariably uses the form "Sozini," Latin- izing it "Sozinus" ; his nephew Favsro (see below) writes "Sozzini" and "Socinus." Sozini was educated as a jurist under his father's eye at Bologna. According to Melan- chthon, it was his desire to reach the fontes juris which led him to Biblical studies and hence to the rejection of "the idolatry of Rome." Later on he acquired some knowledge of Hebrew and Arabic (he gave to Bibliander a manuscript of the Koran) as well as Greek, but he was never a labori- ous student. His father supplied him with means, and on coming of age he went to Venice, the headquarters of the evangelical movement in Italy. A tradition first published by Sand in 1678, and amplified by subsequent writers, makes Sozini the leading spirit in certain alleged theological conferences at Vicenza, about 1546, which are said to have forecast the main positions of the Unitarian heresy; but the whole account, including the story of the flight of Sozini, must be rejected as mythical. At this period the standpoint of Sozini was that of evangelical Protestantism ; his mental temper presents a singular union of enthusiastic piety with a love for the subtleties of theological speculation. It was at Chiavenna in 1547 that he came under the influence of a gentle mystic, Camillo of Sicily, surnamed " Renato," whose teaching anticipated at many points that of the early Quakers. Pursuing his religious travels, Sozini visited Switzerland, France, England, and Holland, returning to Switzerland at the close of 1548. He had commendatory letters to the Swiss churches from Nicolas Meyer, envoy from Wittenberg to Italy; but his family name was a sufficient passport, and wherever he went his personal charm won friends. We find him in 1549-50 at Geneva and Basel (with Sebastian Mister), but chiefly at Zurich, where he lodges with Pellican. He spends

eleven months (July 1550 to June 1551) at Wittenberg, at first under Melanchthon's roof, then with Johann Forster for the im- provement of his Hebrew. From Wittenberg Sozini re- turned to Zurich (end of 1551) after visiting Prague, Vienna, and Cracow. Political events attracted him back to Italy in June 1552. Two visits to Siena (where free- dom of speech was for the moment possible, owing to the shaking off of the Spanish yoke) brought him into fruitful contact with his young nephew Fausto, He was at Padua (not at Geneva, as is often said) at the date of Servetus's execution (27th October 1553). Thence he made his way to Basel (January 1554), Geneva (April), and Zurich (May), where he took up his abode.

Calvin, as well as Melanchthon, received Sozini with open arms. Melanchthon (though a phrase in one of his letters has been strangely misinterpreted) never regarded him with theological suspicion. To Calvin's keen glance Sozini's over-speculative tendency and the genuineness of his religious nature were equally apparent. A passage often quoted from one of Calvin's letters to Sozini (1st January 1552) has been construed as a breaking off of amicable intercourse; but, while more than once uneasy apprehensions arose in Calvin's mind, there was no breach of correspondence or of friendship. Of all the Reformers Bullinger was Sozini's closest intimate, his warmest and wisest friend. Sozini's theological difficulties turned upon the resurrection of the body, predestination, the ground of salvation (these were the points on which he corresponded with Calvin), the doctrinal basis of the original gospel (queries addressed to Bullinger), the nature of repentance

(to Rudolph Gualther), the sacraments (to Johann Wolff). Not till the fate of Servetus had directed his mind to the question of the Trinity did he throw out any doubts upon this subject. At Geneva, in April 1554, he had uttered incautious remarks on the common doctrine, emphasized in a subsequent letter to Martinengo, the Italian pastor. Bullinger, warned by several correspondents (including Calvin), questioned Sozini as to his faith, and received from him an explicitly orthodox confession, afterwards reduced to writing (15th July 1555), with a frank reserva- tion of the right of further inquiry. A month before this Sozini had been sent with Martino Muralto to

Basel to secure Ochino as pastor of the Italian church at Zurich. There can be little doubt that the minds of Sozini and Ochino (a thinker of the same order as Camillo, but with finer dialectic skill) acted powerfully on each other in the radical discussion of theological problems. Sozini lost his father in 1556, an event which involved him in pecuniary anxieties. ‘To what property he was entitled does not appear ; he got nothing under his father’s will. Fortified with the most influential introductions (including one from Calvin), he visited in 1558 the courts of Vienna and Cracow to obtain support for his appeal to the reigning duke of Florence. His object was to realize his own estate and secure that of his family. It is a sufficiently curious circumstance that Melanchthon’s letter introducing Sozini to Maximilian IJ. invokes the historic parallel of the emperor Constans rendering a hospitable reception to Athanasius, when he fled from Egypt to Treves. Well received out of Italy, Sozini (who does not appear to have got beyond Venice) found he could do nothing at home. The Inquisition had its eye on his family: his brother Cornelio was imprisoned at Romie; his brothers Celso and Camillo and his nephew Fausto were “reputati Luterani” at Siena, and Camillo had taken refuge in flight. In August 1559 Sozini returned to Zurich, and we hear little more of him. His brief career ended on 14th May 1562, at his lodging in the house of Hans Wyss, silk-weaver.

The news of his death reached his nephew at Lyons through Antonio Maria Besozzo. Fausto repaired to Zurich and got his uncle’s papers, comprising very little connected writing, but a good many notes. Fausto has so often been regarded as a plagiarist from Lelio that it may be well here to state that his debt to Lelio, somewhat over-estimated by himself, was twofold. (1) He derived from him in con- versation (1552-53) the germ of his theory of salvation ; (2) Lelio’s paraphrase (1561) of dépy% in John i. 1 as “the beginning of the gospel” gave Fausto a hint of Biblical exegesis by help of which he constructed a new Christology. Apart from these suggestions, Fausto owed nothing to Lelio except a curiously far-fetched interpretation of John viii. 58, and the stimulating remembrance of his pure character and brilliant gifts. The two men were of totally different genius. Lelio, impulsive and inquisitive, was in quest of the spiritual ground of religious truth ; the drier mind of Fausto sought in external authority a basis for the ethical teaching of Christianity.

Sozini’s extant writings are (1) De Sacramentis Dissertatio, four parts, 1560, and (2) De Resurrectione, a fragment. Both were first printed in F. ct L. Socini, item E. Soncri Tractatus, Amsterdam, 1654,16mo. To these may be added his Confession, 1555 (printed in Hottinger, Hist. Eccles. N. 7., vol. ix., sec. 16, part 5, 1667), and about twenty-four Ictters, some still unprinted ; but the most im- portant will be found in Illgen and Trechsel, and (the earliest) in the edition of Calvin’s works by Baum, Cunitz, and Reuss. Sand adds a Rhapsodia in Esatam Prophetam, of which nothing is known. Beza suspected that Sozini had a hand in the De Hereticis, an sint Persequendi, 1553, and to him has also been assigned the Contra Libellum Calvini, 1554; but these ascriptions were not made till his nephew had identified his name with active heresy, and are not supported by internal evidence. To Lelio also Beza assigned

(in 1567) an anonymous Fxplicatio (1562) of the proem of St John’s Gospel, which was the work of Fausto. This error, adopted by

Zanchi, has been the chief source of the misconception which repre- sents Lelio asa heresiarch. In Franc. Guinio’s Defensio Cath. Doct. de S. Trin., 1590-91, is an anonymous enwmeratio of motives for adhering to the doctrine of the Trinity, by some ascribed to Lelio, by others, with somewhat more probability, to Fausto.

For the life of L. Sozinithe best guide is Trechsel, Die Prot. Antitrin. vor F. Socin, vol. ii., 1844; but there are valuable materials in Ilgen, Vita L. Socini, 1814, and especially Symbole ad Vitam et Doctrinam L. Soc., &c., 1826. Wallace (Antitrin. Biog., 1850, ii. 63) gives the ordinary Unitarian view, relying on Bock, Da Porta, and Lubienecki; see also Bonet-Maury’s Early Sources of English Unit. Christ., 1884, chap. 9. Use has been made above -of unprinted sources.

Il. Favsro Paoro Sozzinz (1539-1604), theological writer, was born at Siena on 5th December 1539, the only son of Alessandro Sozzini, “ princeps subtilitatum,” by Agnese, daughter of Borghese Petrucci. He was thus descended on the one side from the long line of great lawyers, of whom Mariano the elder is traditionally said to have been the first heretic of the

family, on the other from Pandolfo Petrucci, the Cromwell of Siena. His father died in 1541 at the early age of thirty-one. Fausto re- ceived no regular education ; he was brought up at home with his sister Fillide. The influence of the able women of his family communicated a strong moral impress to his thought. His youth was spent in desultory reading at Scopeto, the country seat of his family. His early intel- lectual stimulus came from his uncle Celso, an esprit fort, though always nominally a Catholic, and the founder of the Accademia dei Sizienti (1554), of which Fausto was a member. In 1556 his grandfather's will made him inde- pendent by leaving him one-fourth of the family estates. Next year he was enrolled in the famous Accademia degli Intronati, the centre of the intellectual life of Siena. His academic name was "Tl Frastagliato"; he took as his badge 'un mare turbato da venti," with the motto '"turbant sed extollunt." About this time Panzirolo (De Claris Legg. Interpp., not published till 1637) describes him as a young man of fine talent, and bespeaks for him a legal career. But Fausto despised the law, and preferred the writing of sonnets. He was suspected of Lutheranism in 1558-59 ; soon after he came of age (1561) he went to Lyons, being probably employed there in mercantile business; he re- visited Italy after his uncle Lelio's death; we next find him enrolled for a short time in 1562 as a member of the Italian church at Geneva; he returned to Lyons next year. The evangelical position was not radical enough for him. His Hxplicatio (1562) of the proem to St John's Gospel shows that already he attributed to our Lord an official instead of an essential deity; a letter of 1563 rejects the natural immortality of man (a position developed long after in his disputation with Pucci). Towards the end of 1563 he conformed again to the Catholic Church, and spent the next twelve years in Italy, partly at court. Przypkowski, regardless of chronology, places him in the service of Francesco, grand-duke of Tuscany. His unpub- lished letters show that he was in the service only of Isabella de' Medici, Francesco's sister. This portion of his life is obscure, and he afterwards regarded it as wasted. Till 1567 he continued to give some attention to legal studies. He found time to write (1570) his treatise De Auctoritate S. Scripturx. In 1571 he was in Rome, per- haps with his patroness. At the end of 1575 he left Italy, and after Isabella's death (strangled by her husband in 1576) declined the overtures of Francesco, who pressed him to return. Francesco was probably aware of the motives which led Sozzini to quit Italy ; for there is every reason to believe the statement of Przypkowski that the grand- duke

agreed to protect him in the enjoyment of the in- come of his property so long as he published nothing in his own name. Sozzini now fixed himself at Basel, where he gave himself to close study of the Bible, began a poetic version of the Psalms, edited posthumous dialogues of Castellio, and, in spite of his increasing deafness, became a

recognized centre of theological discussion. One of these discussions was on the doctrine of salvation, with Jacques Couet. It resulted in a bulky treatise, De Jesu Christo Servatore (finished 12th July 1578), the circulation of which in manuscript appears to have commended his powers to the notice of Giorgio Biandrata (1515-1588), court physician in Transylvania, and an unscrupulous ecclesiastical wire- puller.

Transylvania had for a short time (1559-71) enjoyed religious liberty under an antitrinitarian prince, John Sigismund. But the existing ruler, Christopher Bathori, favoured the Jesuits, and it was an object with Biandrata to limit the “Judaic” tendencies of the antitrinitarian bishop, Francis David (1510-1579), with whom he had previously acted. By the alleged discovery of a stain upon Biandrata’s morals of the gravest sort his influence with David was destroyed. Now Sozzini’s scheme of doctrine encouraged the use of seemingly orthodox language in an heretical sense. Christ was to be called God, and invoked with divine honours, though without any inherent title to such homage, but as “un Dio subalterno, al quale in un dato tempo il Dio supremo cedette il governo del mondo” (Cant). It occurred to Biandrata that, if Sozzini could convert the eloquent David to this view, all would be well. Accordingly in November 1578 Sozzini reached Kolozsvar (Klausenburg), and did his best, during a visit of four months and a half under David’s roof, to teach him the doctrine of the invocation of Christ. Though Sozzini did not (as Biandrata desired) urge the absolute necessity of this invocation, the result was a public explosion on David’s part against the cultus of Christ in any shape or form. His trial followed, on a charge of innovation. Sozzini hurried off to Poland before it began. He cannot be ac- cused of a guilty complicity with what he calls the rage of Biandrata, for he was no party to the incarceration of David at Déva, where the old man miserably perished in prison. But he was willing that David should be

prohibited from preaching pending the decision of the controversy by a general synod; and his references to the case show that (as in the later instances of Jacobo Paleologo, Christian Franken, and Martin Seidel) theological aversions, though they never made him uncivil, froze up his kindness and blinded his perceptions of character. Biandrata ultimately conformed to the Catholic Church; yet as late as 1584 Sozzini, always constant to the leanings of friendship, sought his patronage for his treatise De Jesu Christi Natura, in reply to the Calvinist Andrew Wolan. The remainder _ (1579-1604) of Sozzini's life was spent in Poland. Excluded at first by his views on baptism from the Minor or Anti- trinitarian Church (anabaptist in its constitution), he ac- quired by degrees a predominant influence in its synods. He converted the Arians from their avowal of our Saviour's pre-existence and their refusal to honour Him by invoca- tion; he repressed the semi-Judaizers whom he could not convince. Through correspondence with his friends in official places he ruled also the policy of the Antitrinitarian Church of Transylvania. Forced to leave Cracow in 1583, he found a home with a Polish noble, Christopher Morsztyn, whose daughter Elizabeth he married (1586). She died in the following year, a few months after giving birth to ~T Biandrata was Sozzini's evil genius. Born of an old family in Piedmont and educated in France, Biandrata had attached himself to the left wing of Protestantism, and had moved here and there among the upper circles of the Reformed, depending for professional advance- ment on a special knowledge of the diseases of women. Driven east- wards a second time in 1558 (after fomenting antitrinitarian heresy in the Italian church of Geneva), he had for twenty years been the confi- dential adviser of ladies of the reigning house, first in Poland and then in Transylvania, In both countries he was a dexterous meddler in church affairs; his policy was the establishment of a kind of broad

church, with a confession nakedly Scriptural in its terms, and a resolute suppression of all compromising extremes.

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a daughter, Agnese, afterwards the wife of Stanislau Wisz. owaty. In 1587 the grand-duke Francesco died, and to this event Sozzini's biographers attribute the loss of his Italian property. But he was on good terms with

Fran- cesco’s successor, and might have continued to receive hig rents had not family disputes arisen respecting the inter- pretation of his grandfather’s will. The holy office at Siena disinherited him in October 1590; but he was allowed a pension, which does not seem to have been paid. The failure of supplies from Italy dissolved the compact under which his works were to remain anonymous. He began to publish under his own name. was that in 1598 a mob expelled him from Cracow, wreck- ing his house and grossly ill-using his person. Friends gave him a ready welcome at Luslawice, 30 miles east from

The consequence

Cracow; and here, having long been troubled with colic

and the stone, he died on 4th March 1604. A limestone

block, with illegible inscriptions, marks his grave. Sozzini’s works, as edited by his grandson Andrew Wiszowaty and the learned printer F. Kuyper, are contained in two closely printed folios, Amsterdam, 1668. They are usually reckoned the first two volumes of the Bibliotheca Fratrum Polonorwm, but in fact the works of Crell and Schlichting preceded them in the series. They include all Sozzini’s extant theological writings,

‘except his essay On Predestination (in which he denies that God

foresees the actions of free agents), prefixed to Castellio’s Dialog: IV., 1578 (reprinted 1618), and his revision of a school manual, Instrumentum Doctrinarum Aristotelicwm, 1586. His pseudonyms, easily interpreted, were Felix Turpio Urbevetanus, Prosper Dysidzus, Gratianus Prosper, and Gratianus Turpio Gerapolensis (=Senensis), Some of his early poetry will be found in Ferentilli’s Sciclia di Stanze di Diverst Autori Toscani, 1579 (reprinted 1594); other specimens are given in Cantu, and in the Athenwum, 11th August 1877. Sozzini himself considered that his Contra Athcos, which perished in the riot at Cracow, was his ablest work. In later life he began, but left incomplete, more than one work intended to exhibit his system as a whole. His reputation.as a thinker must rest on (1) his De Auctoritate S. Seripture, and (2) his De Jesu Christo Servatore. The former was first published at Seville (1588) by Lopez, a Jesuit, who claimed it as

his own, but prefixed a preface in which, contrary to a fundamental position of Sozzini, he maintains that man by nature has a knowledge of God. A French version (1592) was approved by the ministers of Basel; and the English translation (1731) by Edward Coombe was under- taken in consequence of the commendation of the work in a charge (1728) by Bishop Smalbroke, who observes that Grotius had laid it under contribution in his De Veritate Christ. Rel. In a small compass it anticipates the whole argument of the ‘‘ credibility ” writers; but in trying it by modern tests it should be remembered that Sozzini regarded it (in 1581) as not adequately meeting the cardinal difficulties attending the proof of the Christian religion, and subsequently began to reconstruct its argument in his un- finished Lectiones Sacre. His treatise on salvation constitutes his main service to theology, placing orthodoxy and heresy in new relations of fundamental antagonism, and narrowing the conflict to the central interest of religion. Of the person of Christ in this treatise he says nothing; he deals exclusively with the work of Christ, which in his view operates upon man alone; and it is by the persistency with which this idea tends to recur that we must estimate the theological sagacity of Sozzini. Though his name has been attachcd to a school of opinion (Socinianism), he disclaimed the role ofa heresiarch, and declined to give his unreserved adhesion to any one sect. The confidence with which he relied upon the conclusions of his own mind has gained him the repute of a dogma- tist ; but it was his constant aim to reduce and simplify the funda-

mentals of Christianity, and it is not without ground that the memorial tablet at Siena (inscription by Brigidi, 1879) characterizes him as a vindicator of human reason against the supernatural. his non-theological doctrines the most important is his assertion of the unlawfulness, not only of war, but of the taking of human life in any circumstances. Hence the comparative mildness of his pro- osals for dealing with religious offenders; but it cannot be said that he had grasped the full idea of toleration. Hence too his con- tention that magisterial office is unlawful for a Christian.

For the biography of Sozzini the best materials are his letters. There is @ collection in his works; others are given by Cant; some are unpublished. In his ‘correspondence he delineates himself freely, not sparing his weak points of character or of attainment. ‘The earliest life, prefixed (with

engraved por- trait) to the works, is by Przypkowski (1636), translated into English by Bidle (1653). This is the foundation of the article by Bayle, the Memoirs by Toulmin

2 No trace is discoverable on the stone of the alleged epitaph—

‘Tota ruit Babylon: destruxit tecta Lutherus, Calvinus muros, sed fundamenta Socinus.”

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(1777), and_the Life by Wallace (Antitrin. Biog., 1850, ii. 306). The sketch by Cant in Gli Eretici d’Italia, 1866, vol. ii., gives a genealogy of the Sozzini (needing some correction). The best defence of Sozzini in his relations with David is by James Yates, in Christ. Pioneer, February 1834; a less favourable yiew is taken by the Hungarian biographer of David (Jakab, David F. Emleéke, 1879). Of his system, most generally known through the Racovian Catechism, 1605 (planned by Sozzini, but chiefly carried out by others, principally Schmalz; translated by Rees, 1818), there is a special study by Fock, Der Socintanismus, 1847. See also ‘The Sozzini and their School,” in Theol. Rev., 1879 (corrected in Christ. Life, 25th August 1883). Use has been made above of unpublished papers in the archives at Florence, with others in the archives, communal library, and collection of Padre Toti at Siena. (A. GO.)

SOCORRO, a town of the United States, in a county of the same name in New Mexico, 76 miles south of Albu- querque junction on the Atchison, Topeka, and Santa Fé Railroad, is beautifully situated in the Rio Grande valley. It is the centre of a silver and lead mining district, and has a stamp mill and smelting-works, JF ruit-growing and cattle-breeding are prosecuted in the vicinity. The popula- tion, including old and new town, was about 5000 in 1887.

SOCOTRA, or Socotora (Arabic Sokotrd), an island of the Indian Ocean, 150 miles from Cape Gardafui and about 220 from the Arabian coast. Its length from east to west is 71 miles, its greatest breadth 22. A plain 2 to 4 miles wide skirts the greater part of the coast, while the interior is mountainous. The granite peaks behind Tamarida (a village on the north

coast and the chief place in the island, but now much decayed) rise to a height of 4000 feet, and a limestone chain connected with these runs north and south with an average height of about 1900 feet. The climate is moist, but not unhealthy, with much rain, especially during the south-west monsoon. At this season the temperature rises to 80° or even 95°, but on the whole the heat is not excessive. The scenery of the island is very striking, with bare rocky heights and fertile valleys; but there is little cultivation, the inhabitants living mainly by their vast flocks of sheep and goats, or on dates, home- grown and imported. Milch cows are numerous near Tamarida, The population is about 5000, of two distinct types. The nomad inhabitants of the uplands are a peculiar race, well built, with good features and long curling but not woolly hair; they resemble neither the Arabs nor the somal. In Tamarida and other villages and towards the eastern end of the island the population is a mixture of Arab, African, and other elements, even including Portu- guese. The native speech is not intelligible to ordinary Arabs, but Wellsted says that it can sometimes be made out by Arabs from the opposite (Mahra) coast. ‘In fact,

according to Ibn Mojawir and Hamdant, the Socotrans in

the Middle Ages were regarded as Mahra and spoke the Mahra dialect. Their way of life is rude and simple in the extreme, but they are hospitable and generally well- behaved, though they have almost no government; they are nominally dependent on the sultan of Keshin. A certain dependence (at least of places on the coast) on some sove- reign of the Arabian coast has endured for many centuries, except during the short Portuguese occupation of Tamarida by Albuquerque. From 1876 to 1886 the sultan of Keshin was bound by treaty not to cede the island to a foreign power or allow settlements on it without the consent of England. In 1886 it was formally annexed by Great Britain.

The fauna and flora of Socotra are peculiar. As regards mammalia the civet cat is found, but the ordinary wild beasts of Arabia are unknown. The flora was studied by Professor Bailey Balfour in 1880, and his account of it is about to be published by the Royal Society of Edinburgh. The most valuable vegetable products are now, as in the Middle Ages, aloes and dragon’s-blood. The Socotran aloes (the French chicotin) is esteemed the

best in the world When unadulterated. In old times the ambergris of Socotra was also famous.

Socotra was known to the ancients as the isle of Dioscorides ; this name, and that by which the island is now known, are usually

traced back to a Sanscrit form, Dvipa-Sakhddhdra, ‘the island abode of bliss,”” which again suggests an identification with the

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vijoot evdaluoves of Agatharchides (§ 103). The Periplus of the Erythrean Sea speaks of the island as peopled only in one part by a mixed race of Arab, Indian, and Greek traders. It was subject to the king of the Incense Country, and was a meeting-place of Arabian and Indian ships. Cosmas in the 6th century says that the people spoke Greek and were largely Christian, with a bishop sent from Persia. The Arab geographers also had a tradition of an early Greek settlement (which they naturally ascribe to Alex- ander), but also of later Persian influence, followed by a settlement of Mahra tribes, who partly adopted Christianity. The Socotrans remained Nestorian Christians, with a bishop under the metro- politan of Persia, through the Middle Ages (Assemani, B.0., ii. 459 ; comp. Mohallebi, in Abulfeda, p. 871); but in their isolated position they have gradually lost all trace of Christianity except reverence for the cross, and practise the old South Arabian moon worship. ‘There was much more at least of the forms of Christ- ianity when Europeans first visited the island in the 16th century. In the Middle Ages Socotra was a station of the Indian corsairs who harassed the Arab trade with the far East. The population seems then to have been much larger; Arabian writers estimate the fighting men at 10,000.

See, for the history of Socotra, Yule, Marco Polo, ii. 400 sq., and, besides the authorities there cited, Yakut, s.v.; Hamdani, p. 52; Kazwinl, ii. 54. For the state of the island at the beginning of the 18th century, see the account of the French expedition to Yemen in 1708 (Viaggio nell’ Arabia Felice, Venice, 1721) ; and, for the present century, Wellsted, City of the Caliphs, vol. ii. (1840). For the topography, &c., see Red Sea Pilot, 2d ed., 1882.

SOCRATES, son of the statuary Sophroniscus and of the midwife Pheenarete, was born at Athens, not earlier than 471 nor later than May or June 469 B.c. Asa youth he received the customary instruction in gymnastic and music ; and in after years he made himself acquainted with geometry and astronomy and studied the methods and the doctrines of the leaders of Greek thought and culture. He began life as a sculptor; and in the 2d century a.D. a group of the Graces, supposed to be his work, was still to be seen on the road to the Acropolis. But he soon aban- doned art and gave himself to what may best be called education, conceiving that he had a divine commission, witnessed by oracles, dreams, and signs, not indeed to teach any positive doctrine, but to convict men of ignorance mis- taking itself for knowledge, and by so doing to promote their intellectual and moral improvement. He was on terms of intimacy with some of the most distinguished of his Athenian contemporaries, and, at any rate in later life, was personally known to very many of his fellow-citizens. His domestic relations were, it is said, unhappy. The shrewishness of his wife Xanthippe became proverbial with the ancients, as it still is with ourselves. Aristotle, in his remarks upon genius and its degeneracy (/het., ii. 15), speaks of Socrates's sons as dull and fatuous; and in Xenophon's Memorabilia, one of them, Lamprocles, re- ceives a formal rebuke for undutiful behaviour towards his mother. ©

Socrates served as a hoplite at Potideea (432-429), where Public on one occasion he saved the life of Alcibiades, at Delium life.

(424), and at Amphipolis (422). In these campaigns his bravery and endurance were conspicuous. But, while he thus performed the ordinary duties of a Greek citizen with credit, he neither attained nor sought political position. His "divine voice," he said, had warned him to refrain from politics, presumably because office would have en- tailed the sacrifice of his principles and the abandonment of his proper vocation. Yet in 406 he was a member of the senate ; and on the first day of the trial of the victors of Arginusx, being president of the prytanes, he resisted — first, in conjunction with his colleagues, afterwards, when they yielded, alone—the illegal and unconstitutional pro- posal of Callixenus, that the fate of the eight generals should be decided by a single vote of the assembly. Not less courageous than this opposition to the "civium ardor prava jubentium" was

his disregard of the “vultus instantis tyranni” two years later. During the reign of terror of 404 the Thirty, anxious to implicate in their crimes men of repute who might otherwise have opposed their plans, ordered five citizens, one of whom was Socrates, to go to

Authori- ties.

precluded from dogmatic exposition, we have in the “Aropvynpovetpata or Memoirs and other works of Xeno- phon records of Socrates’s conversation, and in the dialogues of Plato refined applications of his method. Xenophon, having no philosophical views of his own to develop, and no imagination to lead him astray,—being, in fact, to

Salamis and bring thence their destined victim Leon. Socrates alone disobeyed. But, though he was exception- ally obnoxious to the Thirty,—as appears, not only in this incident, but also in their threat of punishment under a special ordinance forbidding “the teaching of the art of argument,”—it was reserved for the reconstituted demo- cracy to bring him to trial and to put him to death. In 399, four years after the restoration and the amnesty, he was indicted as an offender against public morality. His accusers were Meletus the poet, Anytus the tanner, and Lycon the orator, all of them members of the democratic or patriot party who had returned from Phyle with Thrasy- pulus. The accusation ran thus: “Socrates is guilty, firstly, of denying the gods recognized by the state and introducing new divinities, and secondly, of corrupting the young.” In his unpremeditated defence, so far from seek- ing to conciliate his judges, Socrates defied them. He was found guilty by 280 votes, it is supposed, against 220. Meletus having called for capital punishment, it now rested with the accused to make a counter-proposition ; and there can be little doubt that, had Socrates without further re- mark suggested some smaller but yet substantial penalty, the proposal would have been accepted. But, to the amaze- ment of the judges and the distress of his friends, Socrates proudly declared that for the services which he had ren- dered to the city he deserved, not punishment, but the reward of a public benefactor,—maintenance in the Pry- taneum at the cost of the state; and, although at the close of his speech he professed himself willing to pay a fine of one mina, and upon the urgent entreaties of

his friends raised the amount of his offer to thirty minas, he made no attempt to disguise his indifference to the result. His attitude exasperated the judges, and the penalty of death was decreed by an increased majority. Then in a short address Socrates declared his contentment with his own conduct and with the sentence. Whether death was a dreamless sleep or a new life in Hades, where he would have opportunities of testing the wisdom of the heroes and the sages of antiquity, in either case he esteemed it a gain to die. Inthe same spirit he refused to take advantage of a scheme arranged by his friend Crito for an escape from prison. Under ordinary circumstances the condemned criminal drank the cup of hemlock on the day after the

trial; but in the case of Socrates the rule that during.

the absence of the sacred ship sent annually to Delos no one should be put to death caused an exceptional delay. For thirty days he remained in imprisonment, receiving his intimates and conversing with them in his accustomed manner. How in his last conversation he argued that the wise man will regard approaching death with a cheer- ful confidence Plato relates in the Phedo; and, while the central argument—which rests the doctrine of the soul's immortality upon the theory of ideas—must be accounted Platonic, in all other respects the narrative, though not that of an eye-witness, has the air of accuracy and truth.

But what were the personal characteristics which won for this man, poor in worldly goods, the affectionate regard of the best of his contemporaries? Why was it that the Athenians, forgetting his loyal performance of civic duties, his virtuous life, and his disinterested anxiety for their welfare, brought him to trial, condemned him, put him to death? What were the principles upon which his teach- ing rested, and what was the message which, instant in season, out of season, he carried to his countrymen? How were his principles interpreted by his followers, and what influence did his teaching exert upon subsequent specula- tion? These are the questions which demand considera- tion in the present article.

Happily, though Socrates left no writings behind him, and indeed, as will hereafter appear, was by his principles

witness. The “Atopvnpovedpara or Memorabilia are in- deed confessedly apologetic, and it is easy to see that nothing is introduced which might embitter those who, hating Socrates, were ready to persecute the Socratics ; but the plain, straightforward narrative of Socrates’s talk, on many occasions, with many dissimilar interlocutors, carries with it in its simplicity and congruity the evidence of sub- stantial justice and truth. Plato, though he understood his master better, is a less trustworthy authority, as he makes Socrates the mouthpiece of his own more advanced and even antagonistic doctrine. Yet to all appearance the Apology is a careful and exact account of Socrates’s habits and principles of action ; the earlier dialogues, those

Socrates what Boswell was to Johnson,—is an excellent

which are commonly called “Socratic,” represent, with such changes only as are necessitated by their form, Socrates’s method ; and, if in the later and more important dialogues the doctrine is the doctrine of Plato, echoes of the master’s teaching are still discoverable, approving themselves as such by their accord with the Xenophontean testimony. In the face of these two principal witnesses other evidence is of small importance.

Personal Characteristics. —What, then, were the personal characteristics of the man? Outwardly his presence was Personal mean and his countenance grotesque. Short of stature, appear thick-necked, and somewhat corpulent, with prominent ®™™ eyes, with nose uptumed and nostrils outspread, with large mouth and coarse lips, he seemed the embodiment of sensu- ality and even stupidity. Inwardly he was, as his friends Moral knew, “so pious that he did nothing without taking qualities counsel of the gods, so just that he never did an injury to any man, whilst he was the benefactor of his associates, so temperate that he never preferred pleasure to right, so wise that in judging of good and evil he was never at fault,—in a word, the best and the happiest of men.” “His self-control was absolute; his powers of endurance were unfailing ; he had so schooled himself to moderation that his scanty means satisfied all his wants.” “To want nothing,” he said himself, “is divine ; to want as little as possible is the nearest possible approach to the divine life”; and accordingly he practised temperance and self- denial to a degree which some thought ostentatious and affected. Yet

the hearty enjoyment of social pleasures was another of his marked characteristics ; for to abstain from innocent gratification from fear of falling into excess would have seemed to him to imply either a pedantic formalism or a lack of real self-control. In short, his strength of will, if by its very perfection it led to his theoretical identification of virtue and knowledge, secured him in practice against the ascetic extravagances of his associate Antisthenes.

The intellectual gifts of Socrates were hardly less re- me markable than his moral virtues, Naturally observant, i. acute, and thoughtful, he developed these qualities bee constant and systematic use. The exercise of the mental powers was, he conceived, no mere occupation of leisure hours, but rather a sacred and ever-present duty ; because, moral error being intellectual error translated into act, he who would live virtuously must first rid himself of ignor- ance and folly. He had, it may be conjectured, but little turn for philosophical speculation; yet by the careful study of the ethical problems which met him in himself and in others he acquired a remarkable tact in dealing with questions of practical morality ; and in the course of

the lifelong war which he waged against vagueness of thought and laxity of speech he made: himself a singularly apt and ready reasoner.

While he regarded the improvement, not only of himself but also of others, as a task divinely appointed to him, there was in his demeanour nothing exclusive or pharisai- cal. On the contrary, deeply conscious of his own hmita- tions and infirmities, he felt and cherished a profound sympathy with erring humanity, and loved with a love \passing the love of women fellow-men who had not learnt, as he had done, to overcome human frailties and weak- nesses. Nevertheless great wrongs roused in him a righteous indignation which sometimes found expression in fierce and angry rebuke. Indeed it would seem that Plato in his idealized portrait gives his hero credit not only for a deeper philosophical insight but also for a greater urbanity than facts warranted. Hence, whilst those who knew him best met his affection with a regard equal to his own, there were, as will be seen hereafter, some who never forgave his stern reproofs, and many who regarded him as an impertinent busybody.

He was a true patriot. Deeply sensible of his debt to the city in which he had been born and bred, he thought that in giving his life to the spread of sounder views in regard to ethical and political subjects he made no more than an imperfect return; and, when in the exercise of constitutional authority that city brought him to trial and threatened him with death, it was not so much his local attachment, strong though that sentiment was, as rather his sense of duty which forbade him to retire into exile before the trial began, to acquiesce in a sentence of banish- ment when the verdict had been given against him, and to accept the opportunity of escape which was offered him during his imprisonment. Yet his patriotism had none of the narrowness which was characteristic of the patriotism of his Greek contemporaries. His generous benevolence and unaffected philanthropy taught him to overstep the limits of the Athenian demus and the Hellenic race, and to regard himself as a "'citizen of the world."

He was blest with an all-pervading humour, a subtle but kindly appreciation of the incongruities of human nature and conduct. In a less robust character this quality might have degenerated into sentimentality or cynicism ; in Socrates, who had not a trace of either, it showed itself principally in what his contemporaries knew as his "accustomed irony." Profoundly sensible of the in- consistencies of his own thoughts and words and actions, and shrewdly suspecting that the like inconsistencies were to be found in other men, he was careful always to place himself upon the standpoint of ignorance and to invite others to join him there, in order that, proving all things, he and they might hold fast that which is good. "' Intel- lectually the acutest man of his age," says W. H. Thompson in a brilliant and instructive appendix to his edition of Plato's Phedrus, "he represents himself in all companies as the dullest person present. Morally the purest, he affects to be the slave of passion, and borrows the language of gallantry to describe a benevolence too exalted for the comprehension of his contemporaries. He is by turns an eparris, a mpoaywy6s, a paotpoTds, a paevtixds, disguising the sanctity of his true vocation by names suggestive of vile or ridiculous images. The same spirit of whimsical paradox leads him, in Xenophon's Banquet, to argue that his own satyr-like visage was superior in beauty to that of the handsomest man present. That this irony was to some extent calculated is more than probable ; it disarmed ridicule by anticipating it; it allayed jealousy and propi- tiated envy ; and it possibly procured him

admission into gay circles from which a more solemn teacher would have been excluded. But it had for its basis a real greatness

of soul, a hearty and unaffected disregard of public opinion, a perfect disinterestedness, an entire abnegation of self. He made himself a fool that others by his folly might be made wise; he humbled himself to the level of those among whom his work lay that he might raise some few among them to his own level; he was ‘all things to all men, if by any means he might win some.’” It would seem that this humorous depreciation of his own great qualities, this pretence of being no better than his neigh- bours, led to grave misapprehension amongst his contem- poraries. That it was the foundation of the slanders of the Peripatetic Aristoxenus can hardly be doubted.

Socrates was further a nian of sincere and fervent piety. Piety.

‘No one,” says Xenophon, “ever knew of his doing or saying anything profane or unholy.” There was indeed in the popular mythology much which he could not accept. It was incredible, he argued, that the gods should have committed acts which would be disgraceful in the worst of men. Such stories, then, must be regarded as the inventions of lying poets. But, when he had thus purified the con- temporary polytheism, he was able to reconcile it with his own steadfast belief in a Supreme Being, the intelligent and beneficent Creator of the universe, and to find in the national ritual the means of satisfying his religious aspira- tions. For proof of the existence of ‘‘the divine,” he appealed to the providential arrangement of nature, to the universality of the belief, and to the revelations and warn- ings which are given to men through signs and oracles. Thinking that the soul of man partook of the divine, he maintained the doctrine of its immortality as an article of faith, but not of knowledge. While he held that, the gods alone knowing what is for man’s benefit, nan should pray, not for particular goods, but only for that which is good, he was regular in prayer and punctual in sacrifice. He looked to oracles and signs for guidance in those matters, and in those matters only, which could not be resolved by experience and judgment, and he further supposed himself to receive special warnings of a mantic character through what he called his “divine sign” (Sarpoviov, Saupdviov onpetov).

Socrates’s frequent references to his “divine sign” were, says Divine Xenophon, the origin of the charge of “introducing new divinities” sign.

brought against him by his accusers, and in early Christian times, amongst Neoplatonic philosophers and fathers of the church, gave rise to the notion that he supposed himself to be attended by a “genius” or “demon.” Similarly in our own day spiritualists have attributed to him the belief—which they justify—in “an intelligent spiritual being who accompanied him through life,—in other words, a guardian spirit” (A. R. Wallace). But the very pre- cise testimony of Xenophon and Plato shows plainly that Socrates did not regard his “customary sign” either as a divinity or as a genius. According to Xenophon, the sign was a warning, either to do or not to do which it would be folly to neglect, not superseding ordinary prudence, but dealing with those uncertainties in respect of which other men found guidance in oracles and tokens ; Socrates believed in it profoundly, and never disobeyed it. According to Plato, the sign was a “voice” which warned Socrates to refrain from some act which he contemplated; he heard it frequently and on the most trifling occasions ; the phenomenon dated from his early years, and was, so far as he knew, peculiar to himself. These statements have been variously interpreted. Thus it has been maintained that, in laying claim to supernatural revelations, Socrates (1) committed a pious fraud, (2) indulged his “accustomed irony,” (3) recognized the voice of conscience, (4) indicated a general belief in a divine mission, (5) described “the inward voice of his individual tact, which in consequence partly of his experience and penetration, partly of his knowledge of himself and exact apprecia- tion of what was in harmony with his individuality, had attained to an unusual accuracy,” (6) was mad (“était fou”), being subject not only to hallucinations of sense but also to aberrations of reason. Xenophon’s testimony that Socrates was plainly sincere in his belief excludes the first and the second of these theories ; the char- acter of the warnings given, which are always concerned, not with the moral worth of actions, but with their uncertain results, warrants the rejection of the third and the fourth; the fifth, while it suffi- ciently accounts for the matter of the warning, leaves unexplained its manner, the vocal utterance; the sixth, while it plausibly ex-

plains the manner of the warning, goes beyond the facts when it attributes to it irrationality of matter. It remains for us, then, modifying the fifth hypothesis, that of Diderot, Zeller, and others, and the sixth, that of Lélut and Littré, and combining the two, to suppose that Socrates was subject, not indeed to delusions of mind, but to hallucinations of the sense of hearing, so that the rational suggestions of his own brain, exceptionally valuable in consequence of the accuracy and delicacy of his highly cultivated tact, seemed to him to be projected without him, and to be returned to him through the outward ear. It appears that, though in some of the best known instances—for example, those of Cowper and Sidney Walker—hallucinations of the sense of hearing, otherwise closely resembling Socrates's "divine sign," have been accompanied by partial derangement of reason, cases are not wanting in which "the thoughts transformed into external scnsorial impressions"

SOCRATIS

and the senate. Again, there were others who saw in Socrates at once master, counsellor, and friend, and hoped by associating with him "to become good men and true capable of doing their duty by house and household, by relations and friends, by city and fellow-citizens" (Xenophon). Finally, there was a little knot of intimates who having something of Socrates's enthusiasm, entered more deeply than the rest into his principles, and, when he died, transmitted them to the next generation. Yet even those who belonged to this inner circle were united, not by any common doctrine, but by a conmmon admiration for their master's intellect and character.

are perfectly rational. The eccentricity of Socrates's life was not less remark- able than the oddity of his appearance and the irony of his

For the paradoxes of Socrates's personality and the Plato's eccentricity of his behaviour, if they offended the many, Pane- fascinated the few. "It is not easy for a man in my con-5!™%

Mode of life.

conversation. His whole time was spent in public,—in the market-place, the streets, the gymnasia. Thinking with Dr Johnson that “a great city is the school for studying life,” he had no liking for the country, and seldom passed the gates. ‘Fields and trees,” Plato makes him say, “‘won’t teach me anything; the life of the streets will.” He talked to all comers,—to the craftsman and the artist as willingly as to the poet or the politician,—questioning them about their affairs, about the processes of their several occupations, about their notions of morality, in a word, about familiar matters in which they might be expected to take an interest. The ostensible purpose of these inter- rogatories was to test, and thus either refute or explain, the famous oracle which had pronounced him the wisest of men. Conscious of his own ignorance, he had at first imagined that the God was mistaken. When, however, experience showed that those who esteemed themselves wise were unable to give an account of their knowledge, he had to admit that, as the oracle had said, he was wiser than others, in so far as, whilst they, being ignorant, sup- posed themselves to know, he, being ignorant, was aware of his ignorance. Such, according to the Apology, was Socrates’s account of his procedure and its results. But it is easy to see that the statement is coloured by the accus- tomed irony. When in the same speech Socrates tells his judges that he would never from fear of death or any other motive disobey the command of the god, and that, if they put him to death, the loss would be, not his, but theirs, since they would not readily find any one to take his place, it becomes plain that he conceived himself to hold a commission to educate, and was consciously seeking the intellectual and moral improvement of his countrymen. His end could not be achieved without the sacrifice of self. His meat and drink were of the poorest; summer and winter his coat was the same; he was shoeless and shirt- less. ‘A slave whose master made him live as you do,” says a sophist in the Memorabilia, “would run away.” But by the surrender of the luxuries and the comforts of life Socrates secured for himself the independence which was necessary that he might go about his appointed business, and therewith he was content.

but in other ways also.

dition,” says the intoxicated Alcibiades in Plato’s Sym- posium, “to describe the singularity of Socrates’s character, But I will try to tell his

praises in similitudes. He is like the piping Silenes in the statuaries' shops, which, when you open them, are found to contain images of gods, Or, again, he is like the satyr Marsyas, not only in out- ward appearance—that, Socrates, you will yourself allow— Like him, you are given to frolic, —I can produce evidence to that; and, above all, like him, you are a wonderful musician. Only there is this difference,—what he does with the help of his instrument you do with mere words ; for whatsoever man, woman, or child hears you, or even a feeble report of what you have said, is struck with awe and possessed with admiration. As for myself, were I not afraid that you would think me more drunk than I am, I would tell you on oath how his words have moved me,—ay, and how they move me still. When I listen to him my heart beats with a more than Corybantic excitement; he has only to speak and my tears flow. Orators, such as Pericles, never moved me in this way,—never roused my soul to the thought of my servile condition ; but this Marsyas makes me think that life is not worth living so long as Iam what Iam. Even now, if I were to listen, I could not resist. So there is nothing for me but to stop my ears against this siren's song and fly for my life, that I may not grow old sitting at his feet. No one would think that I had any shame in me; but I am ashamed in the presence of Socrates."

The Accusation and its Causes.—The life led by Socrates Popular

was not likely to win for him either the affection or the esteem of the vulgar. Those who did not know him per- sonally, seeing him with the eyes of the comic poets, con- ceived him as a "visionary" (uerewpoAdyos) and a "bore" (ad0Aéoxs). Those who had faced him in argument, even if they had not smarted under his rebukes, had at any rate winced under his interrogatory, and regarded him in con- sequence with feelings of dislike and fear. But the eccen- tricity of his genius and the ill-will borne towards him by individuals are not of themselves sufficient to account for the tragedy of 399. It thus becomes necessary to study

judices.

the circumstances of the trial, and to investigate the

Contem- His message was to all, but it was variously received. | motives which led the accusers to seek his death and the eal Those who heard him

perforce and occasionally were apt | people of Athens to acquiesce in it.
vents, +e regard his teaching either with indifference or with irri-| Socrates was accused (1) of denying the gods recog: Theat

tation,—with indifference if, as might be, they failed to | nized by the state and introducing instead of them strange cusation

see in the elenchus anything more than elaborate trifling ; with irritation if, as was probable, they perceived that, in spite of his assumed ignorance, Socrates was well aware of the result to which their enforced answers tended. Amongst those who deliberately sought and sedulously cultivated his acquaintance there were some who attached themselves to him as they might have attached themselves to any ordinary sophist, conceiving that by temporary contact with so acute a reasoner they would best prepare themselves for the logomachies of the law courts, the assembly,

divinities (Sarjdvic), and (2) of corrupting the young. The first of these charges rested upon the notorious fact that he supposed himself to be guided by a divine visitant or sign (Saiudveov). The second, Xenophon tells us, was supported by a series of particular allegations,—(a) that he taught his associates to despise the institutions of the state, and especially election by lot; (6) that he had numbered amongst his associates Critias and Alcibiades, the most dangerous of the representatives of the oligarchical and democratical parties respectively ; (c) that he taught the

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of 403. | idiosyncrasies were more than ever familiar, and when the

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young to disobey parents and guardians and to prefer his own authority to theirs; (d) that he was in the habit of quoting mischievous passages of Homer and Hesiod to the

prejudice of morality and democracy.

It is plain that the defence was not calculated to con- | Nevertheless, it is at first sight * difficult to understand how an adverse verdict became

ciliate a hostile jury.

possible. If Socrates rejected portions of the conventional mythology, he accepted the established faith and performed its offices with exemplary regularity. If he talked of a Sayoviov, the daudviov was no new divinity, but a mantic sign divinely accorded to him, presumably by the gods of the state. If he questioned the propriety of certain of the institutions of Athens, he was prepared to yield an un- hesitating obedience to all. He had never counténanced the misdeeds of Critias and Alcibiades, and indeed, by a sharp censure, had earned the undying hatred of one of them. Duty to parents he inculcated as he inculcated other virtues; and, if he made the son wiser than the father, surely that was not a fault. The citation of a few lines from the poets ought not to weigh against the clear evidence of his large-hearted patriotism ; and it might be suspected that the accuser had strangely misrepresented his application of the familiar words.

To the modern reader Xenophon’s reply, of which the foregoing paragraph is in effect a summary, will prob- ably seem sufficient, and more than sufficient. But it must not be forgotten that Athenians of the old school approached the subject from an entirely different point of view. Socrates was in all things an innovator,—in reli- gion, inasmuch as he sought to eliminate from the theology of his contemporaries “those lies which poets tell”; in politics, inasmuch as he distrusted several institutions dear to Athenian democracy; in education, inasmuch as he waged war against authority, and in a certain sense made each man the measure of his own actions. It is because Socrates was an innovator that we, who see in him the founder of philosophical inquiry, regard him as a great man; it was because Socrates was an innovator that old- fashioned Athenians, who saw in the new-fangled culture the origin of all their recent distresses and disasters, re-garded him as a great criminal. It is, then, after all in no Wise strange that a majority was found first to pronounce

him guilty, and afterwards, when he refused to make any

submission and professed himself indifferent to any miti- gation of the penalty, to pass upon him the sentence of death. That the verdict and the sentence were not in any way illegal is generally acknowledged.

But, though the popular distrust of eccentricity, the irri-

| tation of individuals and groups of individuals, the attitude

of Socrates himself, and the prevalent dislike of the intel- lectual movement which he represented go far to account for the result of the trial, they do not explain the occasion of the attack. Socrates's oddity and brusquerie were no new things; yet in the past, though they had made

_ him unpopular, they had not brought him into the courts. _ His sturdy resistance to the demus in 406 and to the _ Thirty in 404 had passed, if not unnoticed, at all events

unpunished, His political heresies and general unortho- doxy had not caused him to be excluded from the amnesty Why was it, then, that in 399, when Socrates's

constitution had been restored, the toleration hitherto ex- tended to him was withdrawn? What were the special circumstances which induced three members of the patriot

| party, two of them leading politicians, to unite their efforts , 2gainst one who apparently was so little formidable ?

For an answer to this question it is necessary to look to the history of Athenian politics. Besides the oligarchical

4 party, properly so called, which in 411 was represented by

the Four Hundred and in 404 by the Thirty, and the de. mocratical party, which returned to power in 410 and in 403, there was at Athens during the last years of the Peloponnesian War a party of "moderate oligarchs," antagonistic to both. It was to secure the cooperation of the moderate party

that the Four Hundred in 411 promised to constitute the Five Thousand, and that the Thirty in 404 actually constituted the Three Thousand. It was in the hope of realizing the aspirations of the moderate party that Theramenes, its most prominent representative, allied himself, first with the Four Hundred, afterwards with the Thirty. In 411 the policy of Theramenes was temporarily successful, the Five Thousand superseding the Four Hun- dred. In 404 the Thirty outwitted him ; for, though they acted upon his advice so far as to constitute the Three Thousand, they were careful to keep all real power in their own hands. But on both occasions the " polity"—for such, in the Aristotelian sense of the term, the constitution of 411-410 was, and the constitution of 404-403 professed to be—was insecurely based, so that it was not long before the "unmixed democracy " was restored. The programme of the '' moderates "—which included (1) the limitation of

'the franchise, by the exclusion of those who were unable

to provide themselves with the panoply of a hoplite and thus to render to the city substantial service, (2) the abolition of payment for the performance of political functions, and, as it would seem, (3) the disuse of the lot in the election of magistrates—found especial favour with the intellectual class. Thus Alcibiades and Antiphon were amongst its promoters, and Thucydides commends the con- stitution established after the fall of the Four Hundred as the best which in his time Athens had enjoyed. Now it is expressly stated that Socrates disliked election by lot ; it is certain that, regarding paid educational service as a species of prostitution, he would account paid political service not a whit less odious; and the stress laid by the accuser upon the Homeric quotation (Iliad, ii. 188-202) —which ends with the lines damdw', drpéuas foo, Kal dru poOov dxove of o€0 Péprepol cious od S darroXenos Kal avaXdkis, ore ror' év rodgum évaptOpw0s ovr' evi BovrAyn— becomes intelligible if we may suppose that Socrates, like Theramenes, wished to restrict the franchise to those who were rich enough to serve as hoplites at their own expense. Thus, as might have been anticipated, Socrates was a "moderate," and the treatment which he received from both the extreme parties suggests—even if with Grote we reject the story told by Diodorus (xiv. 5), how, when Thera- menes was dragged from the altar, Socrates attempted a rescue—that his sympathy with the moderate party was pronounced and notorious. Even in the moment of

demo- cratic triumph the ‘“ moderates” made themselves heard, Phormisius proposing that those alone should exercise the franchise who possessed land in Attica; and it is reason- able to suppose that their position was stronger in 399 than in 403. These considerations seem to indicate an easy explanation of the indictment of Socrates by the democratic politicians, It was a blow struck at the “moderates,” Socrates being singled out for attack because, though not a professional politician, he was the very type of the malcon- tent party, and had done much, probably more than any man living, to make and to foster views which, if not in the strict sense of the term oligarchical, were confessedly hostile to the ‘‘unmixed democracy.” His eccentricity and heterodoxy, as well as the personal animosities which he had provoked, doubtless contributed, as his accusers had foreseen, to bring about the conviction; but, in the judg- ment of the present writer, it was the fear of what may be called “philosophical radicalism” which prompted the action of Meletus, Anytus, and Lycon. The result did not disappoint their expectations. The friends of Soérates

Theory of educa- tion.

Dialect- ical method.

Its two pro- cesses.

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abandoned the struggle and retired into exile ; and, when they returned to Athens, the most prominent of them, Plato, was careful to confine himself to theory, and to announce in emphatic terms his withdrawal from the practical politics of his native city.

Method and Doctrine.—Socrates was not a “philosopher,” nor yet a ‘‘ teacher,” but rather an “educator,” having for his function ‘* to rouse, persuade, and rebuke ” (Plato, Apology, 30 EK). Hence, in examining his life’s work it is proper to ask, not What was his philosophy ? but What was his theory, and what was his practice, of education? It is true that he was brought to his theory of education by the. study of previous philosophies, and that his practice led to the Platonic revival; but to attribute to him philosophy, except in that loose sense in which philosophy: is ascribed to

one who, denying the existence of such a thing, can give an account of his disbelief, is misleading and even erroneous.

Socrates's theory of education had for its basis a profound and consistent scepticism ; that is to say, he not only rejected the con- flicting theories of the physicists,—of whom ‘‘some conceived existence as a unity, others as a plurality ; some affirmed perpetual motion, others perpetual rest ; some declared becoming and perish- ing to be universal, others altogether denied such things,”—but also condemned, as a futile attempt to transcend the limitations of human intelligence, their ¢:Aocodia, their “ pursuit of knowledge for its own sake.” Unconsciously, or more probably consciously, Socrates rested his scepticism upon the Protagorean doctrine that man is the measure of his own sensations and feelings , whence he inferred, not only that knowledge such as the philosophers had sought, certain knowledge of nature and its laws, was unattainable, put also that neither he nor any other person had authority to overbear the opinions of another, or power to convey instruction to one who haditnot. Accordingly, whereas Protagoras and others, abandoning physical speculation and coming forward as teachers of culture, claimed for themselves in this new field power to instruct and authority to dogmatize, Socrates, unable to reconcile himself to this inconsistency, proceeded with the ‘investigation of prin- ciples until he found a resting-place, a rod o7&, in the distinction between good andevil. While all opinions were equally true, of those opinions which were capable of being translated into act some, he conceived, were as working hypotheses more serviceable than others. It was here that the function of such a one as him- self began. Though he had neither the right nor the power to force his opinions upon another, he might by a systematic inter- rogatory lead another to substitute a better opinion for a worse, just as a physician by appropriate remedies may enable his patient to substitute a healthy sense of taste for a morbid one. lo ad- minister such an interrogatory and thus to be the physician of souls was, Socrates thought, his divinely appointed duty ; and, when he described himself as a ‘‘ talker” or “¢converser,” he not only negatively distinguished himself from those who, whether philosophers or sophists, called themselves ‘‘ teachers ” (S:édexaNor), but also positively indicated the method of question and answer (dcadexrex}) which he consistently preferred and habitually practised.

That it was in this way that Socrates was brought to regard « dialectic," " question and answer," as the only admissible method of education is, in the opinion of the present writer, no matter of mere conjecture. In the review of theories of knowledge which has come down to us in Plato's Theatetws mention is made (172 B) of certain "incomplete Protagoreans," who held that, while all impressions are equally true, one impression is better than another, and that the 'wise man" is one who by his arguments causes good impressions to take the place of bad ones, thus reforming the soul of the individual or the laws of a state by a process similar to that of the physician or the farmer (166 D sq.) ; and these '' incomplete Protagoreans" are identified with Socrates and the Socratics by their insistence (167 D) upon the characteristically Socratic distinc- tion between disputation and dialectic, as well as by other familiar traits of Socratic converse. In fact, this passage becomes intel- ligible and significant if it is supposed to refer to the historical Socrates ; and by teaching us to regard him as an 'incomplete Protagorean " it supplies the link which connects his philosophical scepticism with his dialectical theory of education. It isno doubt possible that Socrates was unaware of the closeness of his rela- tionship to Protagoras ; but the fact, once stated, hardly admits of question.

In the application of the '' dialectical" or "' maieutic" method two processes are distinguishable,—the destructive process, by which the worse opinion was eradicated, and the constructive process, by which the better opinion was induced. In general it was not mere "ignorance" with which Socrates had to contend, but "ignor- ance mistaking itself for knowledge" or "false conceit of wisdom,'— a more stubborn and a more formidable foe, who, safe so long as he remained in his entrenchments, must be drawn from them, circum- vented, and surprised. Accordingly, taking his departure from some apparently remote principle or proposition to which the re-

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spondent yielded a ready assent, Socrates would draw from it an

unexpected but undeniable consequence which was plainly incon-

sistent with the opinion impugned. In this way he brought his interlocutor to pass judgment upon himself, and_reduced lim to a state of "doubt" or

“perplexity” (dwopla). “Before I ever met you,” says Meno in the dialogue which Plato called by his name ° (79 E), “I was told that you spent your time in doubting and lead- ing others to doubt ; and it is a fact that your witcheries and spells have brought me to that condition ; you are like the torpedo: as

‘it benumbs any one who approaches and touches it, so do you.

For myself, my soul and my tongue are benumbed, so that I have no answer to give you.” Even if, as often happened, the respond- ent, baftled and disgusted by the édeyxos or destructive process, at this point withdrew from the inquiry, he had, in Socrates’s judg- ment, gained something ; for, whcreas formerly, being ignorant, he had supposed himself to have knowledge, now, being ignorant, he was in some sort conscious of his ignorance, and accordingly would be for the future more circumspect in action. If, however, having been thus convinced of ignorance, the respondent did not shrink from a new effort, Socrates was ready to aid him by further ques- tions of a suggestive sort. Consistent thinking with a view to con- sistent action being the end of the inquiry, Socrates would direct the respondent’s attention to instances analogous to that in hand, and so lead him to frame for himself a generalization from which the passions and the prejudices of the moment were, as far as might be, excluded. In this constructive process, though the element of surprise was no longer necessary, the interrogative form was studi- ously preserved, because it secured at each step the conscious and responsible assent of the learner. *

Of the two processes of the dialectical method, the édeyxos OF Maieutic destructive process attracted the more attention, both in conse- in Plato quence of its novelty and because many of those who willingly or and nnwillingly submitted to it stopped short at the stage of “ perplex- Xenophon, ity.” But to Socrates and his intimates the constructive process was the proper and necessary sequel. It is true that in the dia- logues of Plato the destructive process is not always, or even often, followed by construction, and that in the Memorabilia of Xenophon construction is not always, or even often, preceded by the destruc- tive process. There is, however, in this nothing surprising. On the one hand, Xenophon, having for his principal purpose the defence of his master against tla calumny, seeks to

show by effective examples the excellence of his positive teaching, and accordingly is not careful to distinguish, still less to emphasize, the negative procedure. On the other hand, Plato's aim being not so much to preserve Socrates's positive teaching as rather by written words to stimulate the reader to self-scrutiny, just as the spoken words of the master had stimulated the hearer, he is compelled by the very nature of his task to keep the constructive element in the background, and, where Socrates would have drawn an w- mistakable conclusion, to confine himself to enigmatical hints. For example, when we compare Xenophon's Memorabilia, iv. 6, 2-4, with Plato's Zuthyphro, we note that, while in the former the in- terlocutor is led by a few suggestive questions to define ' picty" as 'the kuowledge of those laws which are concerned with the gods," in the latter, though on a further scrutiny it appears that "piety" is 'that part of justice which is concerned with the service of the gods," the conversation is ostensibly inconclusive.

In short, Xenophon, a mere reporter of Socrates's conversations, gives the results, but troubles himself little about the steps which led to them ; Plato, who in early manhood was an educator of the Socratic type, withholds the results that he may secure the advan- tages of the elenctic stimulus, . |

What, then, were the positive conclusions to which Socrates Induction carried his hearers? and how were those positive conclusions and de- obtained? Turning to Xenophon for an answer to these questions, finition. we note (1) that the recorded conversations are concerned with practical action, political, moral, or artistic ; (2) that in general there is a process from the known to the unknown through a generalization, 'expressed or implied ; (8) that the generalizations are sometimes rules of conduct, justified by examination of known instances, sometimes definitions similarly established. Thus, 2 Memorabilia, iv. 1, 8, Socrates argues from the known instances of horses and dogs that the best natures stand most in need of training, and then applies the generalization to the instance under discus- sion, that of men; and in iv. 6, 13-14, he leads his interlocutor to a definition of 'the good citizen," and then uses it to decide between two citizens for whom respectively superiority is claimed. Now in the former of these cases the proccss—which Aristotle would describe as ''example" (wapddevyya), aud a modern might regard as ''induction" of an uncritical

sort—sufficiently explains itself. The conclusion is a provisional assurance that im the particular matter in hand a certain course of action is, or 18 not, to be adopted. But it is necessary to say a word of explanation about the latter case, in which, the generalization being a definition, that is to say, a declaration that to a given term the interlocutor attaches in general a specified meaning, the conclusion is a Pr visional assurance that the interlocutor may, or may not, with

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out falling into inconsistency, apply the term in question to a certain person or act. Moral error, Socrates conceived, is largely due to the misapplication of general terms, which, once affixed to a person or to an act, possibly in a moment of passion or prejudice, too often stand in the way of sober and careful reflection. It was ’ in order to exclude crror of this sort that Socrates insisted upon 7d bpltecOar xafddov with émaxrixol Moyo for its basis. By requiring a definition and the reference to it of the act or person in question, he sought to secure in the individual at any rate consistency of thought, and, in so far, consistency of action. Accordingly he spent lis life in secking and helping others to seek ‘‘the what” (rd ri), or the definition, of the various words by which the moral

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and ~~caricatured the austere example; Euclides of Megara prac~~ tised and perverted the elenctic method; Plato the Academic, accepting the whole of the Socratic teaching, first developed it harmoniously in the sceptical spirit of its author, and, afterwards conceiving that he had found in Socrates’s agnosticism the germ of a philosophy, procceded to construct a system which should embrace at once ontology, physics, and ethics. From the four schools thus established sprang subsequently four other schools,— the Epicureans being the natural successors of the Cyrenaics, the Stoics of the Cynics, the Sceptics of the Megarians, and the Peri- patetics of the Academy. In this way the teaching of Socrates made itself felt throughout the whole of the post-Socratic philo-

quality of actions is described, valuing the results thus obtained, | sophy. Of the: influence which he exercised upon Aristippus, not as contributions to knowledge, but as means to right action in | Antisthenes, and Euclides, the ‘incomplete Socratics,” as they the multifarious relations of life. are commonly called, as well as upon the “complete Socratic” leis While, however, Socrates sought neither knowledge, which in | Plato, something must now be said. Vk the strict sense of the word he held to be unattainable, nor yet, The “incomplete Socratics” were, like Socrates, sceptics ; but, Incom-] except as a means to right action, true opinion, the results of ob- | whereas Aristippus, who seems to have been in contact with Pro-’ plete Soc- ; servation accumulated until they formed, not perhaps a system of | tagoreanism before he made acquaintance with Socrates, came to ratics. ; ethics, but at any rate a body of ethical doctrine. Himself blessed | scepticism, as. Protagoras had done, from the standpoint of the \ with a will so powerful that it moved almost without friction, he | pluralists, Antisthenes, like his former master Gorgias, and Euclides, | fell into the error of ignoring its operations, and was thus led to | in whom the ancients rightly saw a successor of Zeno, came to j regard knowledge as the sole condition of well-doing. Where there | scepticism from the standpoint of Eleatic monism. In other words, | is knowledge,—that is to say, practical wisdom (¢pédvyots), the only | Aristippus was sceptical because, taking into account the subjective } knowledge which he recognized,—right action, he conceived, fol- | element in sensation, he found himself compelled to regard what lows of itself; for no one knowingly prefers what is evil ; and, if | are called ‘‘things” as successions of feelings, which feelings are

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there are cases in which men seem ‘to act against knowledge, the inference to be drawn is, not that knowledge and wrongdoing are compatible, but that in the cases in question the supposed know- ledge was after allignorance. Virtue, then, is knowledge, knowledge at once of end and of means irresistibly realizing itself in act. Whence it follows that the several virtues which are commonly dis- tinguished are essentially one. ‘‘Picty,”

‘“‘justice,” ‘‘courage,” and “temperance” are the names which ‘‘ wisdom” bears in differ- ent spheres of action: to be pious is to know what is due to the gods ; to be just is to know what is due to men; to be courageous is to know what is to be feared and what is not ; to be temperate is to know how to use what is good and avoid what is evil. Further, inasmuch as virtue is knowledge, it can be acquired by education and training, though it is certain that one soul has by nature a greater aptitude than another for such acquisition.

But, if virtue is knowledge, what has this knowledge for its object? To this question Socrates replies, Its object is the Good. What, then, isthe Good? Itis the useful, the advantageous. Utility, the immediate utility of the individual, thus becomes the measure of

Accordingly, each precept of which Socrates delivers himself is re- commended on the ground that obedience to it will promote the pleasure, the comfort, the advancement, the wellbeing of the indi- vidual ; and Prodicus’s apologue of the Choice of Heracles, with its commonplace offers of worldly reward, is accepted as an adequate statement of the motives of virtuous action. Of the graver diffi- culties of ethical theory Socrates has no conception, having, as it would seem, so perfectly absorbed the lessons of what Plato calls “‘nolitical virtue” that morality has become with him a second nature, and the scrutiny of its credentials from an external stand- point has ceased to be possible. His theory is indeed so little systematic that, whereas, as has been seen, virtue or wisdom has the Good for its object, he sometimes identifies the Good with virtue or wisdom, thus falling into the error which Plato (Republic, vi. 505 C), perhaps with distinct reference to Socrates, ascribes to certain ‘‘cultivated thinkers.” In short, the ethical theory of Socrates, like the rest of his teaching, is by confession unscientific ; it is the statement of the convictions of a remarkable nature, which statement emerges in the course of an appeal to the individual to study consistency in the interpretation of traditional rules of con- duct. For a critical examination of the ethical teaching which is here described in outline, see ETHIcs.

The Socratics.

conduct and the foundation of all moral rule and legal enactment. °

themselves absolutely distinct from one another ; while Antisthencs and Euclides were sceptical because, like Zeno, they did not under- stand how the saine thing could at the same moment. bear various and inconsistent epithets, and consequently conceived all predica- tion which was not identical to be illegitimate. Thus Aristippus recognized only feclings, denying things; Antisthenes recognized things, denying attributions ; and it is probable that in this matter Euclides was at one with him. For, though since Schlciermacher many historians, unnecessarily identifying the eldav piho of Plato's Sophist with the Megarians, have ascribed to Euclides a theory of ''ideas," and on the strength of this single passage thus con- jecturally interpreted have added a new chapter to the history of Megarianism, it is difficult, if not impossible, to see how, if the founder of the school had broken loose from the trammels of the Zenonian paradox, his successors, and amongst them Stilpo, should have re- conciled themselves, as they certainly did, to the Cynic denial of predication.

While the "incomplete Socratics" made no attempt to overpass the limits which Socrates had imposed upon himself, within those limits they occupied each his department. Aristippus, a citizen of the world, drawn to Athens by the fame of Socrates, and retained there by the sincere affection which he conceived for him, inter- preted the ethical doctrine of Socrates in accordance with his own theory of pleasure, which in its turn came under the refining in- fluence of Socrates's theory of ¢pdvyots. Contrariwise, Antisthenes, a rugged but not ungenerous nature, a hater of pleasure, troubled himself little about ethical theory and gave his life to the imita- tion of his master's asceticism. Virtue, he held, depended upon ''works," not upon arguments or lessons ; all that was necessary to it was the strength of a Socrates (Diog. Laert., vi. 11). Yet here too the Socratic theory of ¢péynois had a qualifying effect ; so that Cyrenaic hedonism and Cynic asceticism sometimes exhibit unexpected approximations. The teaching of Euclides, though the Good is still supposed to be the highest object of knowledge, can hardly be said to have an ethical element ; and in consequence of this deficiency the dialectic of Socrates degenerated in Megarian hands, first into a seyies of exercises in fallacies, secondly into a vulgar and futile eristic. In fact, the partial Socraticisms of the incomplete Socratics necessarily suffered, even within their own narrow limits, by the dismemberment which the system had under- gone. Apparently the maieutic

theory of education was not valued by any of the three; and, however this may be, they deviated from Socratic tradition so far as to establish schools, and, as it would seem, to take fces like the professional educators called Sophists.

Of the relations in which the metaphysic of Plato stood to the Plato's Socratic search for definitions there are of necessity almost as many meta- theories as there are interpretations of the Platonic system. Hence physical in this place the writer must content himself with a summary state- theories.

It has been seen that, so far from having any system, physical or metaphysical, to enunciate, Socrates rejeectd 'the pursuit of knowledge for its own sake" as a delusion and a snare,—a delusion, inasmuch as knowledge, properly so called, is unattainable, and a

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snare, in so far as the pursuit of it draws us away from the study of conduct. He has therefore no claim to be regarded as the founder of a philosophical school. But he had made some tentative contributions to a theory of morality; he had shown both in his life and in his death that his principles stood the test of practical application; he had invented a method having for its end the recti- fication of opinion; and, above all, he had asserted ''the autonomy of the individual intellect." Accordingly, not one school but several schools sprang up amongst his associates, those of thein who had a turn for speculation taking severally from his teaching so much as their pre-existing tendencies and convictions allowed them to assimilate. Thus Aristippus of Cyrene interpreted hedo- nistically the theoretical morality ; Antisthenes the Cynic copied

ment of his own views. Initiated into philosophical speculation by the Heraclitean Cratylus, Plato began his intellectual life as an absolute sceptic, the followers of Heraclitus having towards the end of the 5th century pushed to its conclusion the unconscious scepticism of their master. There would have been then nothing to provoke surprise, if, leaving speculation, Plato had given him- self to politics. In 407, however, he became acquainted with Socrates, who gave to his thoughts a new direction. Plato now found an occupation for his intellectual energies, as Socrates had done,

in the scrutiny of his beliefs and the systematization of his principles of action. But it was not until the catastrophe of 399 that Plato gave himself to his life's work. An exile, cut off from political ambitions, he came forward as the author of dialogues

Plato's ethical theories.

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which aimed at producing upon readers the saine effect which the voice of the master had produced upon hearers. Fora time he was content thus to follow in the steps of Socrates, and of this period we have records in those dialogues which are commonly designated Socratic. But Plato had too decided a bent for metaphysics to linger long over propedeutic studies. Craving knowledge —not merely provisional and subjective knowledge of ethical concepts, such as that which had satisfied Socrates, but knowledge of the causcs and laws of the universe, such as that which the physicists had sought—he asked himself what was necessary that the " right opinion" which Socrates had obtained by abstraction from particular instances might be converted into "knowledge" properly so called. In this way Plato was led to assume for every Socratic universal a corresponding unity, eternal, immutable, suprasensual, to be the cause of those particulars which are called by the common name. On this assumption the Socratic definition or statement of the "what" of the universal, being obtained by the inspection of particulars, in some sort represented the unity, form, or "idea" from which they derived their characteristics, and in so far was valuable; but, inasmuch as the inspection of the particulars was partial and imperfect, the Socratic definition was only a partial and imperfect representation of the eternal, immutable, suprasensual idea. How, then, was the imperfect representation of the idea to be converted into a perfect representation? To this question Plato's answer was vague and tentative. By constant revision of the provisional defini- tions which imperfectly represented the ideas he hoped to bring them into such shapes that they should culminate in the de- finition of the supreme principle, the Good, from which the ideas themselves derive their being. If in this way we could pass from uncertified general notions, reflections of ideas, to the Good, so as to be able to say, not only that the Good causes the ideas to be what they are, but also that the Good causes the

ideas to be what we conceive them, we might infer, he thought, that our definitions, hitherto provisional, are adequate representations of real existences. But the Platonism of this period had another ingredient. It has been seen that the Eleatic Zeno had rested his denial of plural- ity upon certain supposed difficulties of predication, and that they continued to perplex Antisthenes as well as perhaps Euclides and others of Plato's contemporaries. These difficulties must be dis- posed of if the new philosophy was to hold its ground; and ac- cordingly, to the fundamental assertion of the existence of eternal immutable ideas, the objects of knowledge, Plato added two sub- ordinate propositions, namely, (1) ''the idea is immanent in the particular," and (2) ''there is an idea wherever a plurality of particulars is called by the same name." Of these propositions the one was intended to explain the attribution of various and even inconsistent epithets to the same particular at the same time, whilst the other was necessary to make this explanation available in the case of common terms other than the Socratic universals. Such was the Platonism of the Republic and the Phedo, a provi- sional ontology, with a scheme of scientific research, which, as Plato honestly confessed, was no more than an unrealized aspiration. It was the non-Socratic element which made the weakness of this the earlier theory of ideas. Plato soon saw that the hypothesis of the idea's immanence in particulars entailed the sacrifice of its unity, whilst as a theory of predication that hypothesis was in- sufficient, because applicable to particulars only, not to the ideas themselves. But with clearer views about relations and negations the paradox of Zeno ccased to perplex; and with the consequent withdrawal of the two supplementary articles the development of the fundamental assumption of ideas, eternal, immutable, supra- sensual, might be attempted afresh. Inthe more definite theory which Plato now propounded the idea was no longer a Socratic uni- versal, perfected and hypostatized, but rather the perfect type of a natural kind, to which type its imperfect members were related by imitation, whilst this relation was metaphysically explained by means of a "thoroughgoing idealism '' (R. D. Archer-Hind). Thus, whereas in the earlier theory of ideas the ethical universals of Socrates had been held to have a first claim to hypostatization in the world of ideas, they are now peremptorily excluded, whilst the idealism which reconciles plurality and unity gives an entirely new significance to so much of the Socratic element as is still retained. The growth of the metaphysical system necessarily influenced Plato's ethical

doctrines ; but here his final position is less remote from that of Socrates, Content in the purely Socratic period to elaborate and to record ethical definitions such as Socrates himself might have propounded, as soon as the theory of ideas offered itself to Plato's imagination he looked to it for the foundation of ethics as of all other sciences. Though in the earlicr ages both of the indi- vidual and of the state a sound utilitarian morality of the Socratic sort was useful, nay valuable, the morality of the future should, he thought, rest upon the knowledge of the Good. Such is the teaching of the Republic. But with the revision of the metaphysical system came a complete change in the view which Plato took of ethics and its prospects. Whilst in the previous period it had ranked as the first of sciences, it was now no longer a science ; because, though Good absolute still occupied the first place, Good

relative and all its various forms—justice, temperance, courage, wisdom—not being ideas, were incapable of being "known." Hence it is that the ethical teaching of the later dialogues bears an in. telligible, though perhaps unexpected, resemblance to the simple practical teaching of the unphilosophical Socrates.

Yet throughout these revolutions of doctrine Plato was ever true to the Socratic theory of education. His manner indeed changed ; for, whereas in the earlier dialogues the characteristics of the master—

'The soft and intricate discourse,

The wit that makes us tolerant perforce,

The mystic legend, and the verse that drops

As snowflakes shower on wintry forest tops,

The questions working wedge-like to the proof,

The threads of prayer froin old religion's woof,

The courteous skill of keen rebukes that chide

The learner’s folly and the sophist’s pride” — are studiously and skilfully preserved, in the later dialogues Socrates first becomes metaphysical, then ceases to be protagonist, and at last disappears from the scene. But in the later dialogues, as in the earlier, Plato’s aim is the aim which Socrates in his con- versation never lost sight of, namely, the dialectical improvement of the learner.

Bibliography. Of the histories of Greek philosophy enumerated in the article PARMENIDEsS the most important for the study of Socrates’s life and work is Zeller’s Philosophie d. Griechen. The part in question has been translated into English under the title of Socrates and the Socratic Schools, London, 1877. Schwegler’s Geschichte d. griechischen Philosophie will also be found instructive. It is plainly impossible to supply here such a list of special treatises as is given by Ueberweg in his Grundriss d. Geschichte d. Philosophie, and still more so to provide a complete bibliography. But the following sources of informa- tion may be mentioned :—F. Schleiermacher, ‘‘ Veber d. Werth d. Sokrates als Philosophen,” in Abh. d. Berliner Akad. d. Wissensch., 1818, and Werke, iti, 2, 287-308, translated into English by C. Thirlwall, in the Philosophical Museu, Cambridge, 1833, ii. 538-555; L. F. Lélut, Du Démon de Socrate, Paris, 1836, 1856, reviewed by E. Littré in Médecine et Médecins, Paris, 1872; G. Grote, History of Greece, ch. Ixvili., and Plato and the other Companions of Sokrates, London, 1865; C. F. Hermann, De Socratis accusatoribus, Gottingen, 1854; W. H. Thompson, The Phedrus of Plato, London, 1868, Appendix I. ; T. Wildauer, D. Psychologie d. Willens bei Sokrates, &c., Innsbruck, 1877. For the view taken in the present article with regard to the daudéviov, see the writer’s paper “On the datudviov of Socrates,” in the Journal of Philology, v. ; and comp. Chr. Meiners, Vermischte philosophische Schriften, Leipsic, 1776 —‘‘in moments of ‘Schwarmerei’ Socrates took for the voice of an attendant genius what was in reality an instantaneous presentiment in regard to the issue of a contemplated act.” Fora fuller statement of the writer’s view of Plato’s relations to Socrates, see a paper on Plato’s Republic, vi. 509 D sq., in the Journal of Philology, x., and a series of papers on ‘‘ Plato’s later Theory of Ideas,” in vols. x., xi., xiii., xiv. of the same periodical. Comp. Sopuists and (by all meaus) Eruics. (H. JA.)

SOCRATES, church historian. In the course of the last twenty-five years (425-450) of the reign of Theodosius II. (the first thoroughly Byzantine emperor) at least six church histories were written in Greek within the limits of the Eastern empire,—those, namely, of Philostorgius the Arian, of Philippus Sidetes, of Socrates, of Sozomen, of Theodoret, and of Hesychius. Of these the first, no longer extant except in fragments, seems to have been the most important. Those of Philip and of Hesychius (the former an untrustworthy and dreary performance) have also perished. The remaining three are now our main sources for church history from Constantine to Theodosius II. None of them has ventured upon a fresh treatment of the period dealt with by Eusebius; all three begin their narratives about the point where his closes. In the West the Church History of that author had already been continued by Rufinus and his Chronicle by Jerome, and the work of Rufinus was certainly known to the Byzantines. Nor did these write independently of each other, for SozomEN (q.v.) certainly had before him the work of So- crates, and THEODORET (¢.v.) knew one or both of them. The three histories together became known in the West from the 6th century through the selection which Cassio- dorus caused to be made from them, and it is to this selec- tion (if we leave Rufinus and Jerome out of account) that the Middle Ages were mainly indebted for all they knew of the Arian controversies, and of the period generally between the councils of Nice and Ephesus.

The ’ExxXeovacrix ‘Ioropia of Socrates, still complete, in several books, embracing the period from 306 to 489, was written about, or at all events not later than, 440. He was born and brought up at Constantinople; the date of his birth is uncertain, but it can hardly have been be- fore 385. Of the facts of his life we know practically nothing, except that he was not a cleric but a “scholas- ticus” or advocate. Of the occasion, plan, and object of

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his work he has himself informed us in the prologues to It is dedicated

his first, second, fifth, and sixth books. to one Theodorus, who had urged him to write such a his- tory. He had no thorough preparation for the task, and for the period down to the death of Constantius (361) was practically dependent on Rufinus. His work finished, he became a student of

Athanasius and came to see how untrustworthy his guide had been. He accordingly re- wrote his first two books, and it is only this revision that has reached us. The chief sources from which he drew were—(1) the Church History, the Life of Constantine, and the theological works of Eusebius; (2) the Church History of Rufinus ; (3) the works of Athanasius; (4) the no longer extant Dvvaywyi) Tov DvodiKov of the Mace- donian and semi-Arian Sabinus,—a collection with com- mentaries of acts of councils, brought down to the reign of Theodosius I. (this was a main source); (5) collections of letters by members of the Arian and orthodox parties ; (6) the Ancoratus of Epiphanius ; (7) works of Archelaus, Gregory of Laodicea, Evagrius, Palladius, orations of Nes- torius, &c. Theological literature proper—as, for example, the writings of the Cappadocians—he quite neglected. On the other hand, he appears to have known some of Origen's work, and the Apologia pro Origene of Pamphilus. It is to Origen and Origen's immediate disciples that he refers when he speaks of "the old church writers," or of "the Christian philosophers"; the last designation, how- ever, also includes the monks. Jeep alleges, but does not adduce any adequate proof, that Socrates made use of Philostorgius. As regards profane history his materials were exceedingly defective. Thus, for example, he con- fesses his reason for not relating the political history of Constantine to be that he has been unable to ascertain anything about it. Jeep has instituted an examination into the fasti, containing historical notes, made use of by our author with the following results. His chronological data with the facts he appends to them are of the highest value, especially in those cases where, as sometimes hap- pens, data.are preserved which are less precisely given in other fasti and chronicles. Somewhere about the year 395-400 his use of these precisely dated records of profane history comes to an end. From this point his information is purely ecclesiastical (dates of ordination and death of

_, bishops and the like); that is to say, he makes use of

church fasti. The secular fasti of Socrates come down precisely to the same point as those which lay in the first rank before Idatius.! His reckonings by Olympiads are generally wrong, the error arising not from any systematic ' source but merely from carelessness. It is not altogether impossible, however, after all that Socrates may have taken the historical data of his

fasti at second hand from the profane historians. He certainly made use of Eutro- pius; but that he had any recourse to Eunapius and Olympiodorus is more doubtful, and indeed would be quite _ improbable if it could be proved that he had Philostorgius _ before him. There is no evidence of his having known the works of Dexippus and Zosimus. But he is greatly indebted to oral tradition and to the testimony of eye- | witnesses, especially of members of the Novatian com- munity in Constantinople ; something also he has set down from personal knowledge. The contents of the closing books are for the most part derived from oral tradition, | from the narratives of friends and countrymen, from what was still generally known and current in the capital about | past events, and from the ephemeral literature of the day.

_ _ The theological position of Socrates, so far as he can be said to have had one, is at once disclosed in his unlimited admiration for Origen. All the enemies of the great Alexandrian he regards

_ Merely as empty and vain obscurantists ; for the orthodoxy of his

1 See Holder-Egger, Newes Archiv f. deutsche Gesch., ii. 61.

hero he appeals to Athanasius. Closely conncted with his high regard for Origen are his appreciation of science generally and the moderation of his judgment on all dogmatic questions. According to him, éAdnvixh mardela is quite indispensable within the church ; many Greek philosophers were not far from the knowledge of God, as is proved by their triumphant arguments against atheists and gainsayers of divine providence. The apostles did not sct them- selves against the study of Greek literature and science ; Paul had even made a thorough study of them himself. The Scriptures, it is true, contain all that appertains to faith and life, but give no clue to the art of confuting gainsayers. Greek science, therefore, must not be banished from the church, and the tendency within the church so to deal with itis wrong. This point of view was the common one of the majority of educated Christians at that period, and is not to be regarded as exceptionally liberal. The same holds true of the position of Socrates in regard to dogmatic questions. On the one hand, indeed, orthodoxy and heresy are

symbolized to his mind by the wheat and the tares respectively ; he clings to the naive opinion of Catholicism, that contemporary orthodoxy has prevailed within the church from the first; he recognizes the true faith only in the mystery of the Trinity ; he judges heretics who have been already condemned as interlopers, as impudent innovators, actuated by bad and self-seeking motives ; he apologizes for having so much as treated of Arianism at all in his history of the church ; he believes in the inspiration of the ecclesiastical councils as much as in that of the Scriptures themselves. But, on the other hand, he takes absolutely no interest in dogmatical subtleties and clerical disputes ; he regards them as the source of great evils, and expresses his craving for peace: ‘‘one ought to adore the ineffable mystery in silence.” This attitude, which was that of most educated Byzantine laymen, has in particular cases made it possible for him to arrive at very free judgments. Even granting that some feeble remains of antique reserve may have contributed to this, and even although some of it is certainly to be set down to his disposition and temperament, still it was his religious passivity that here determined the character of Socrates and made him a typical ex- ample of the later Byzantine Christianity. If Socrates had lived about the year 325, he certainly would not have ranked himself on the side of Athanasius, but would have joined the party of mediation. But—the duooveros has been laid down, and must be recognized as correctly expressing the mystery ; only one ought to rest satisfied with that word and with the repudiation of Arianism. Anything more, every new distinction, is mischievous. The con- troversy in its details is a vuxrowaxla to him, full of misunder- standings. Sometimes he gives prominence, and correctly, to the fact that the disputants partially failed to understand one another, because they had separate interests at heart,—those on the one side desiring above everything to guard against polytheism, those on the other being most afraid of Sabellianism. He did not fail, how- ever, to recognize also that tle controversies frequently had their root in mere emulation, slander, and sophistry. Not unfrequently he passes very sharp judgments on whole groups of bishops, In the preface to his fifth book he excuses his trenching on the region of political history on the ground of his desire to spare his readers the disgust which perusal of the endless disputes of the bishops could not fail to excite, and in that to his sixth book he prides himself on never having flattered even the orthodox bishops. This attitude of his has given him a certain measure of impartiality. Constantius, and even Julian—

not Valens, it is true—are esti- mated very fairly. The Arian Goths who died for their religion are recognized as genuine martyrs. His characterizations of Cyril and Nestorius, aud his narrative and criticism of the beginnings of the Christological controversy, are models of candour and his- torical conscientiousness. In frequent instances, moreover, he acknowledges his own incompetency to give an opinion and hands the question over to the clergy. For the clergy as a whole, in spite of his criticism of individuals, he has the very highest respect, as also for the monks, without himself making any inordinate religious professions. In a special excursus of considerable length he lias paid a tribute of the highest order to monachism, and in his characterization of Theodosius II. also (where he has made use of the brightest colours) he does not fail to point out that in piety the emperor could almost compete with the monks. But, apart from these two cliapters (iv. 28, vii. 22), it is but seldom that one could learn from the pages of Socrates that there was such a thing as monasticism in those days. To his mind the convent is not far removed from the church, and as a layman he is not at all inclined to accept the principles of monachism as applying to himself or to square his views of history in accordance with them. He has even gone so far as formally to express his sympathy with Paphnutius, the champion of the right of bishops to marry.

As a source for the period within which he wrote, the work of Socrates is of the greatest value, but as ‘‘history” it disappoints even the most modest expectations. Eusebius, after all, had some conception of what is meant by “church history,” but Socrates has none. ‘As long as there is peace there is no material for a history of the church”’; but, on the other hand, neither do heresies by rights

come into the story. What, then, is left for it? A collection of anec- dotes and a series of episodes. In point of fact this is the view actually taken by Socrates. His utter want of care and consistency appears most clearly in his vacillation as to the relations between ecclesiastical and political history. At one time he brings in politics, at another he excuscs himself from doing so. He has not failed to observe that church and state act and react wpon each other ; but he has no notion how the relation ought to be conceived.

Nevertheless his whole narrative follows the thread of political—that is to say, of imperial—history. This indeed is characteristic of his Byzantine Christian point of view; church history becomes metamorphosed into a history of the cmperors and of the state, because a special church history is at bottom impossible. But even so onc hardly hears anything about state or court except great enterprises and anecdotes. Political insight is wholly wanting to Socrates ; all the orthodox emperors blaze forth in a uniform light of dazzling splendour ; even the miserable Arcadius is praised, and Theodosius II. figures as a saint whose exemplary piety turned the capital into a church. If inaddition to all this we bear in mind that in his later books the historian's horizon is confined to the city and patriarchate of Constantinople, that he was exceedingly ill informed on all that related to Rome and the West, that in order to fill out his pages he has introduced narratives of the most unimportant description, that in not a few instances he has evinced his credulity (although when compared with the majority of his contemporaries he is still entitled to be called critical), it becomes sufficiently clear that his History, viewed asa whole and asa literary production, can at best take only a secondary place. One great excellence, however, cannot be denied him, his honest and sincere desire to be impartial. He tried also, as far as he could, to distinguish between the certain, the probable, the doubtful, and the untrue. He made no pretence to be a searcher of hearts and frequently declines to analyse motives. He has made frank confession of his nescience, and in certain passages his critical judgment and sober sense and eircumspection are quite striking. . He writes a plain and unadorned style and shuns super- fluous words. Occasionally even there are touches of good humour and of trenchant satire,—always the sign of an honest writer. In short, the rule to be applied in the criticism of Socrates is that his learning and knowledge can be trusted only a little but his good- will and straightforwardness a great deal. Considering the eircum- stances under which he wrote and the miseries of the time, it can only be matter for congratulation that such a man should have become our informant and that his work has been preserved to us. Finally, it is to be noted that Socrates was either himself origin- ally a Novatianist who had afterwards joined the Catholie Church, or that whether through his ancestors or by education he had stood in most intimate relations with the Novatianist Church. In his History he betrays la sympathy with that body, has gone with exactness into its history in Constantinople and Phrygia, and

is indebted for much of the material of his work to Novatianist tradi- tion and to his intercourse with prominent members of the sect. Both directly and indirectly he has declared that Novatianists and Catholics are brothers, that as such they ought to scek the closest relations with one another, and that the former ought to enjoy all the privileges of the latter. His efforts, however, had only this result, that he himself afterwards fell under suspicion of Nova- tianism. For bibliography, see SoZOMEN. . (A. HA.)

SODIUM anp SODA. Sodium is one of the two prin- cipal alkali metals, regarding the general properties of which the reader is referred to CHEmIstRY (vol. v. p. 524) and the introductory portion of Porassium (vol. xix. p. 588). In combination sodium is a generally diffused and most abundant element. The salt dissolved in sea water consists chiefly of chloride of sodium (NaCl), and according to Dittmar's calculation (see Sea Water) the oceans of the world contain of sodium calculated as chloride not less than 36,000 × 1022 (z.e., 36,000 million million) tons, whilst of potassium calculated as sulphate the amount in sea water is 1141 × 10!2(1141 million million) tons. From sea water have been deposited the enormous beds of rock salt found in many parts of the world (see Satur). Sodium carbonates are also widely dispersed in nature, forming constituents of many mineral waters, and occurring as principal saline components in natron or trona lakes, as efflorescences in Lower Egypt, Persia, and China, and as urao in Mexico, Colombia, and Venezuela. The solid crusts found at the bottom of the salt lakes of the Araxes plain in Armenia contain about 16 per cent. of carbonate and 80 of sulphate of soda. In New Granada there occurs a double salt, Na,CO,+CaCO,+5H,O, known as gay-lussite. In Wyoming, California, and Nevada enormous deposits of

carbonates, mixed in some cases with sulphate and with chloride, occur. over the vast pusztas (steppes) between the Theiss and the Danube, and from the Theiss up to and beyond Debreczin, the soil contains sodium carbonate, which frequently assumes the form of crude alkaline crusts, called " szekso," and of small saline ponds. Debreczin soda was found to contain as much as 90 per cent, of real carbonate (NaCO,) and 4 of common salt. Natural sulphate occurs in an anhydrous condition as thenardite

(Na,SO,) at Tarapaca, Peru, and in the rock- salt deposits at Espartinas near Aranjuez, Spain. Hy- drated sulphates occur at several localities in the province of Madrid and in other provinces of Spain, and at Miihlingen in Aargau, and copious deposits of glauberite, the double sulphate of sodium and calcium, are met with in the salt-mines of Villarrubia in Spain, at Stassfurt, and in the province of Tarapaca, Peru, &c. A native nitrate of soda is obtained in great abundance in the district of Atacama and the province of Tarapaca, and is imported into Europe in enormous quantities as cubical nitre for the preparation of saltpetre (see Nirrocen, vol. xvii, p. 518), Cryolite, a fluoride of aluminium and sodium, AIF, + 3NaF, is extensively mined in Greenland for industrial purposes. These form the principal natural sources of sodium com- pounds,—the chloride as rock salt and in sea water being of such predominating importance as quite to outweigh all the others. together the mass of sodium they represent is as much as

About Szegedin in Hungary and all

A purified specimen of such

But it is questionable whether taken al-

that disseminated throughout the rocky crust in the form of soda felspar (i.e., as silicate of soda) and in other soda- containing rocks. From this source all soils contain small proportions of sodium in soluble forms, hence the ashes of plants, although they preferably imbibe potassium salts, contain traces and sometimes notable quantities of sodium salts. Sodium salts also form essential ingredients in all animal juices.

Considered industrially, by far the most important bodies are the carbonates, the sulphates, and caustic soda (sodium hydrate), the manufacture of which forms the basis of the soda industry. Immense quantities of these bodies are used in the manufacture of soap and glass, and under the name of “washing soda” or “soda crystals ” the consumption of the hydrated carbonate for domestic washing is also very great. There are indeed few chemical industries in which soda in one form or another does not play an important part, and the combinations of economic value into which it enters are numberless. It will be convenient to treat of the

manufacture as a whole by itself, after speaking of sodium and its salts in their chemical relations.

Sodium, in German Natriwm (symbol, Na; atomic weight, 23°053; O = 16), is a univalent metal. It occurs nowhere in nature in an uncombined condition, and was first isola d in 1807 by Sir Humphrey Davy through the mein voltaic electricity. It is prepared by distillation of intimate mixture of carbonate of soda with charcoal. The process is quite analogous to that followed in making metallic potassium (PoTassrum, vol. xix. p. 590), but much easier of execution, and free from certain dangers which attend the preparation of the other. The distillation is con- ducted in cylindrical iron retorts protected against the fire by means of fireclay tubes fitting closely round them. In the charge is included a certain proportion of chalk, which, giving off carbonic acid, aids in driving over the metallic vapour and protects the distillate against oxidation. The metal cast into the form of cakes or ingots is protected from the air by a coating of paraffin and secured in closely fitting soldered-up tinned-iron boxes. Metallic sodium 1s very similar in properties and appearance to potassium. The principal points of difference are its pure white colour,

its specific gravity (0°9735 at 13°°5 C.), and its fusing point (95°°6 C.). In thin layers its vapour is colourless, but dense fumes have a purple tint. It decomposes water violently, but the hydrogen evolved does not take fire, although the reaction is more dangerous than the corresponding pheno- mena developed by potassium, because it leads frequently ‘ to most violent explosions. Yet the process serves in practice for the preparation of pure soda hydrate. In this operation a piece of sodium is placed in a silver basin standing in a shallow cold-water bath. Drop by drop water is added—the metal between the additions being allowed to expend its energy—till the desired quantity of hydrate is formed.. The process, in short, is so conducted that, except at first, the metal never touches water in any other form than that of a strong soda lye. Sodium is largely made for use as an agent in the manufacture of aluminium and magnesium, and asa reagent in laboratory operations. The metal does not affect carbonic oxide at any temperature ; it acts on hydrogen as potassium does ; but the compound is

less stable. On ammonia gas it acts, as in the parallel case of potassium, with the formation of NH,Na, only the reaction is less energetic. Sodium has less powerful affinity to oxygen than potassium ; in dry | air or oxygen it burns into the dioxide Na,O,,—a product obtainable also by heating the nitrate or nitrite. A white solid soluble in cold water, forming a hydrate, Na,O,+8H,O, is obtainable in crystals, the solution of which is strongly alkaline. With acids it yields sodium salts and peroxide of hydrogen. Sodium tetroxide (Na,O,) is not known to exist.

Caustic Soda (NaHO) is prepared from carbonate by means of caustic lime, just as caustic potash is made from its carbonate (see Potassium). The analogy between the two caustic alkalis is so perfect that we need only summarize the points of difference between them. Com- pared with caustic potash, caustic soda is less easily soluble in water, less caustic, less energetically basilous, less prone _ when fused in air to pass into peroxide, hence less de-

structive to platinum, iron, nickel, and silver vessels.

_ Sodium Chloride (NaCl) occurs in nature in a nearly pure state. Absolutely pure salt is made from commercial salt by precipitating from a solution the lime and magnesia by pure carbonate of soda, filtering, neutralizing with pure hydrochloric acid, concentrating by evaporation, and then precipitating the pure salt by a stream of hydrochloric / acid gas. The crystalline precipitate is collected over glass wool, washed with pure fuming hydrochloric acid, and dried by heating in a platinum basin. It forms non- hygroscopic crystals, free from combined water, having a | Specific gravity at 16° C. of 2°162 (Stolba), and according to Carnelley fusing at 776°C. The solubility of pure salt in water is almost independent of temperature ; 100 parts of water dissolve—

at 0° 14° 60° 100° 109°°7 q (boiling) 39°52 = 85°87 = 8725 39°61 40°53 parts of NaCl.

Regarding its commercial relations, &c., see SALT.

_ Chlorate of Soda (NaClO,) is a salt of some industrial Importance, from its use in the manufacture of aniline black. It may be made from the potash

salt (a) by de- _ composing this with hydrofluosilicic acid (which precipi- _ tates the potassium as fluosilicate and yields a solution of _ chloric acid), and neutralizing the chloric acid solution | with soda, or (6) by double decomposition with bitartrate of soda, NaHC,H,O,,—the cream of tartar (KHC,H,O,) | Separating out almost completely, whilst the chlorate of _ Soda remains in solution. According to Weldon, it is best _ manufactured from caustic soda by the direct action of chlorine, the two salts NaCl and NaClO, being separated by erystallization. Chlorate of soda forms cubes which often exhibit tetrahedral faces; 100 parts of water dis-

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solve at 0° 81:9, at 20° 99, and at 100° C. 233 parts of the salt. Hence it is much more soluble than the potash salt, on which account it is preferred for aniline black printing.

Sulphate (Na,SO,) is the most largely produced of all soda salts in manufacturing operations, although it is re- garded principally as an intermediate product. The an- hydrous salt readily combines with water into a crystalline soluble compound, Na,SO,+10H,O, known as Glauber's salt. This forms large transparent monoclinic crystals, and is characteristically prone to form supersaturated solutions. 100 parts of water dissolve—

at 0° 11°67 25°05 3273 38°88 1217 26°38 99°48 3221 312°] parts of Na,SO,+10 H,0,

5°02 10°12 2811 50°65 50:4 parts of NaSO,. As the temperature rises beyond about 33°, the solu- bility decreases (Gay-Lussac). Glauber's salt, when ex- posed to dry air, especially in summer heat, gradually falls into a powder of anhydrous sulphate. It is much less volatile than the chloride. The thiosulphate, Na,S,O, (commercial hyposulphite of soda), and soda salts of other lower sulphur acids, are reserved for SULPHUR.

Of all sodium compounds, except common salt, the car- bonates are by far the most important, both industrially and chemically. These comprise the following.

Normal Carbonate, Na,CO,,—The anhydrous salt usually presents itself in the form of a white opaque porous solid, specific gravity 2°65 (Karsten). According to Carnelley, it fuses at 818° C. (dull red heat) into a colourless liquid. On fusing it loses some of its carbonic acid, and at a bright red heat it volatilizes appreciably. The porous salt absorbs water from the air; when moistened with water it gives off heat and unites into crystalline hydrates, of which the important compound is

Decahydrate, Na,CO,+10H,O.—This salt, known as soda crystals or washing soda, forms large transparent monoclinic rhomboidal prisms or double pyramids. The salt dissolves readily in water, forming strongly alkaline solutions, which emulsionize fats, though less readily than is done by caustic lyes. 100 parts of water dissolve—

at 0° 16° 20° 30° 38° 104° 21°33 63°20 92°82 2736 11422 §89°6 of crystals, 697 1620 21:71 37°24 51°67 46-47 of Na,CO, (Léwel). According to this observer, the dissolved salt

from 38° C. upwards assumes the form of lower hydrates, hence the diminution in solubility at higher temperatures. A saturated solution, when evaporated down ~~by heat, deposits a granular salt of the composition Na,CO,(H,O or 2H,O). The decahydrate, when exposed to dry air even at ordinary temperatures, loses water, with the forma~~ tion of monohydrate, Na,CO,H,O. It also readily takes up carbonic acid with the formation of

Bicarbonate, NaHCO,.—Its formation may be thus for- mulated —Na,CO, + 10H,O + CO, = 2NaHCO, + 9H,0. The bicarbonate remains as a crystalline mass, while the liberated water runs off with more or less of dissolved car- bonate and the saline impurities which may be present. Bicarbonate forms small four-sided monoclinic plates with a feebly alkaline taste and reaction. 100 parts of water dissolve—

at 0° 20° 40° 60° 6:90 9°60 12°70 16°40 of NaHCO, (Dibbits). From about 70° C. upwards the solution gives off carbonic acid with formation of Sesquicarbonate,—2Na,O +3C0, + 4H,O0 = Na,CO,2NaHCO,+3H,O. This salt, found in nature as trona or urao, forms in its pure state crystals which do not lose water in the air. At 20° C. 100 parts of water dissolve 18°3 parts of the salt calculated as anhydride, 2Na,O3CO,. Both bicarbonate and

sesquicar- bonate when heated dry break up readily (below redness) into normal carbonate, water, and carbonic acid. XXII — 31

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Other salts of soda which are of importance on account of their acid constituents—nitrate, silicate, phosphate — are dealt with under NirrocEN, SILica, PHOSPHORUS.

The estimation and analysis of alkalis are sufficiently dealt with at the close of the article PoTassIUM.

3 Soda Manufacture.

The ancients probably did not know soda in other than its native forms, and till about the end of the 18th century potash was, of the two alkalis, the more abundant and generally used substance. In- deed it was not till well into that century that the chemical dis- tinctions of the alkalis were established; they were previously spoken of indifferently as nitrum, natron, kali, alkali, and soda, names simply meaning a fixed alkali. Soda has properly a separate history only from 1736, when Duhamel established the fact that common salt and mineral alkali have the same base,—a body different from the salt of tartar or vegetable alkali. Yet soda, from both mineral and vegetable sources, had long previously been used in Europe, the Arabs having probably brought into Spain a knowledge of the alkali and its sources. Apart from the trona and soda lakes, &c., already alluded to, the only source till the close of the 18th century was the ashes of certain plants which grow on the sea-coast and in salt-impregnated soils. ‘These plants, principally species of Sadsola and a few other genera of the natural order Aériplicew, on incineration yield an ash containing in some cases about 50 per cent. of carbonate of soda. The ash of these plants, fiuxed by red heat into a pasty mass and broken into con- venient lumps, forms the barilla of commerce, which in former times was a product of the first importance on the shores of Spain, Sicily, Sardinia, and other coasts of the Mediterranean. In 1834 as much as 12,000 tons of barilla were introduced into England from Spain alone, and, in spite of the cheapness of artificial soda, the manu- facture of barilla is still—or at least was till recently—carried on at various localities on the Mediterranean. On the west coasts of Scotland and Ireland

large amounts of impure soda carbonate were obtained from the kelp burned from certain sea-weeds; but the introduction of artificial soda early extinguished that industry, although in connexion with the production of iodine and other products a small quantity of sea-weed soda continues to be made in Scotland till the present day.

The increasing price of potash salts and the discovery of Duhamel led to strenuous attempts to produce the carbonate from common salt. In 1775 the French Academy of Sciences offered a prize of 2400 livres for a practical method of converting salt into soda, But it was never awarded, although the problem was soon triumphantly solved. Indeed in that same year Scheele succeeded in making soda from common salt by means of litharge. Several claims were made for the prize, the first being based on a process invented by a Benedictine monk, Malherbe, in 1778, which was worked with some success for several years. Some time about or before 1787 De la Métherie proposed a plan for calcining with charcoal the sulphate prepared from chloride,—an impracticable proposal, because nearly all the resulting product is sulphide.? But this proposal has historical importance, because from the pub- lished account of it Le Blane received in 1787, according to his own statement, the first suggestion of his process,—probably the most valuable and fertile chemical discovery of all times. Nicolas Le Blanc, born at Issoudun (Indre) in 1753, was private surgeon to the duke of Orleans. He was a chemist as well as a surgeon, and the prospect of the Academy prize attracted his attention to the soda problem. He added to the sulphate and charcoal mixture proposed by De la Methérie a certain proportion of chalk, and by fluxing the mixture in crucibles succeeded in effecting the desired transformation. The chemist D'Arcet and his assistant Dizé, having recognized the sounduess of the process, the duke of Orleans, early in 1790, agreed to provide a capital of 200,000 francs for working the process. In September 1791 the National Assembly granted Le Blane a patent for fifteen years, and under the superintendence of Le Blanc himself, with Dizé and Henri Shée, the steward of the duke of Orleans, a work was established at Saint Denis. But on the fall and execution of his patron Le Blanc, and all others owning and working soda processes, were ordered to resign thein to the state for the public benefit, he receiving the miserable compensation of 4000 francs. In 1800 his works were reconveyed to him, but in 1806,

broken in hope, health, spirit, and resource, he perished by his own hand in a workhouse.

Le Blanc's process continued to hold the field against all compet- ing schemes till within the last few years, and that essentially in

1 It is well established, however, that carbonate of soda can be pro- duced in this manner. It was Liebig, we believe, who showed that the first step in the Le Blanc process is approximately thus— 2Na,80,+ 6C=Na,S,+Na,CO,;+5CO, only the disulphide and the carbonate on continued heating act on each other and on the carbon to form Na,S.—— Na,S, + Na,CO3+2C=2Na,S + 3C0.

its original form. Owing to the raw materials employed in it and the products evolved, it became the basis of a serics of import- ant industries, and many interesting collateral processes have been grafted on the manufacture. Its origin was contemporaneous with the introduction of bleaching-powder (see CHLORINE, Vol. y. p- 678), and the hydrochloric acid given off in the conversion of chloride into sulphate of soda became the raw material of that industry, the two processes being worked in conjunction. Since the days of Le Blanc many other methods for more directly manu- facturing artificial soda have been proposed ; but only one— the so- called "ammonia process "—has seriously threatened to supplant it.

Le Blane's Proccss.—This consists of two stages. In the first stage common salt is converted into sulphate of soda by the action of | sulphuric acid. At first acid sulphate of soda is produced thus— 2NaCl+H,SO,=HCl+NaHSO,NaCl; but subsequently at a sufficient temperature the acid sulphate decomposes the remainder of the salt thus— NaHSO, NaCl=Na,SO,+ HCl, so that all the chlorine is expelled as hydrochloric acid with formation of normal sulphate of soda. In the second stage the sulphate mixed with ' limestone and coal (charcoal in Le Blanc's original proposal) is calcined in a reducing flame, whereby a mixture of sulphide of calcium (CaS) and carbonate of soda is formed, oxygen being gen- erally supposed to pass off as carbonic oxide, CO. According to Lunge, however, the gas produced consists chiefly of carbonic acid, so that

the reaction should correspond essentially to the equation Na,SO,+2C +CaCO,=Na,CO,+CaS+2CO, The sulphide of cal- cium being practically insoluble in water and only very slowly acted on by a solution of carbonate of soda at temperatures under 45° C., the carbonate is extracted by systematic lixiviation with water at a temperature under that limit and is recovered froin the solution by evaporation. If an excess of lime is used, more or less of the soda assumes the caustic form (NaHO). All crude soda-ash lyes contain some caustic alkali besides the following impurities :—chloride of sodium, sulphate of soda, sulphide of sodium combined with sulphide of iron into a soluble green compound which occa- . sions much trouble to the manufacturer. This solution contains also occasionally cyanide or ferrocyanide of sodium, produced by the action of cyanide on the soluble form of sulphide of iron.

Salt Cake Making. —The conversion of the salt into sulphate, called ‘* salt cake,” is effected by means of sulphuric acid of about 60 per cent. (chamber acid), and may be, and still very commonly is, carried out in reverberatory furnaces having flat soles of cast iron, attached to one end of which is a pan of the same material. The waste heat froin the reverberatory furnace is utilized to heat the charge placed in the pan, where the first part of the change is effected, the reaction . beginning briskly with evolution of copious fumes of hydrochloric acid immediately the acid and salt are mixed. Before the Alkali Act of 1863 hydrochloric acid was freely allowed to escape through the stalk with the smoke and fire gases, carrying destruction to the vegetation of vast tracts around the works; but now all the acid is everywhere carefully collected, both because it is a source of profit and from sanitary considerations. Hence in modern ‘‘open roasters,” as these reverberatory furnaces are called, the pan and the calcining sole are separated, so that the comiparatively pure and undiluted fumes from the pan can be led away and collected by themselves, leaving the mixed air, fire gases, and acid fumes from the furnace hearth to be separately dealt with. In another class of furnace, called a “blind roaster,” the calcination of the half-finished sulphate is carried out in a muffle, so that none of the hydrochloric acid is mixed with air and fire gases. Certain ad- vantages attend each class of furnace. In working these hand- furnaces there is much unpleasant manual labour, to avoid which inechanical furnaces have been devised, in which the stirring of the charge, &c., isaccomplished by machinery. The

first mechanica roaster actually used was patented by Jones & Walsh in 1875. In it the whole operation from beginning to end is carried out on the sole of a large cast-iron pan heated from above. Through the roof of the chamber enclosing the pan passes a vertical shaft geared to rotate, to which are attached four horizontal arms, and to these slanting rods are fixed which terminate in scrapers. These scrapers are fixed at different lengths from the shaft centre, so that when the shaft is in motion they pass through and turn over the whole of the charge strewn over the sole of the pan. The acid is passed into the pan by a pipe from a tank situated above the roaster. The hot mixture of fire gases and acid fumes is led through a long pipe to cool down before reaching the condensers.

Hargreaves's Process for making sulphate without the direct use of sulphuric acid is based on the employment of sulphurous acid obtained by the ignition of pyrites aided by air and steam. In this way Mr Hargreaves may be said to get his sulphuric acid ex tempore. The process has only been elaborated as thie result of a most extensive series of investigations and experiments carried out in conjunction with Mr Robinson, their first patent having been obtained in January 1870. The reaction on which the process Ge pends may be thus formulated—2NaCl+SO0,+H,0+0 =Na,S0,+ SHC. The salt used is rendered porous by first moistening it with water and then redrying it by passing it through a hot-air channel

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on an endless chain of plates. The salt so prepared is distributed in a range of not less than eight cast-iron cylinders, which are per- yaded successively by a current of mixed superheated steam and sulphurous acid given off by pyrites. The reaction begins at about 400° C. and increases in energy with the rise of temperature, but it is impracticable to force the heat beyond 500° to 550°, as the charge then begins to fuse and ceases to be permeable by gases. The condensation of the hydrochloric acid given off in these processes is effected by a variety of means according to the purpose in view in securing the gas. In Continental works a favourite method is to pass the gas through a range of Woulfe's bottles arranged in an ascending series, — fresh water entering the topmost and passing through the whole, till in the last and lowest, highly charged with acid, it meets the gas coming direct

from the roaster. After leaving the last and highest bottle the gas is generally washed thoroughly out by passing it into a small coke tower, in which it meets a downward trickle of water. In English works Woulfe's bottles are not employed, and the gases are commonly conducted by a long range of piping, in which they are cooled, to one or a series of coke towers, in which they are exposed to an enormously extended condensing surface of water trickling over the coke, stones, or brick with which the interiors of the towers are filled. ~ Black Ash Making.—The conversion of the crude sulphate or salt cake into carbonate of soda, peculiarly the process of Le Blanc, is conducted in what is termed a "balling furnace." In its simplest form this consists of a long reverberatory furnace in which the fuel occupies a lower grating at one extremity of the flat sole, on which the whole reaction is carried out. This sole has usually two beds, that more distant from the fire-bridge being a little higher than the front division ; and on front and back beds two separate charges at different stages of advancement are treated simultaneously. The salt-cake is taken as it comes from the roaster, mixed with lime- stone or chalk (crushed to pieces not bigger than a walnut) and with coal or anthracite in the form of slack or culm. The proportions of these ingredients used in different works vary widely ; but, generally stated, to each 100 parts of sulphate there are added from 100 to 140 parts of chalk or limestone and from 40 to 70 of coal. These ingredients roughly mixed are passed by a hopper into the back bed of the furnace, where they become dried and heated, while a revious charge is being finished on the hot front or working bed. hen the charge on the working bed has been withdrawn, the mixture on- the back bed is pushed forward and spread over the highly heated sole. During the time it is exposed to the flames the ball-furnaceman is constantly at work with a paddle or rake turning over and exposing equally the whole charge to the action of the flame. Very soon the mixture begins to soften and fuse on the surface, and by degrees the whole mass assumes a stiff pasty form. Meantime bubbles of carbonic acid gas are copiously given off, the material becoming of thinner consistence ; but afterwards the charge becomes again stiff, and carbonic oxide instead of carbonic acid is evolved, which as it is given off burns in long pointed flames, called "'pipes" or "candles." The copious appearance of these flames indicates the completion of the operation, and the ball of black ash must now be withdrawn without delay. The time required for working off a charge is from forty to fifty minutes, The manual labour of

black ash balling is extremely hard and trying, while it demands for its success considerable judgment and experience. On these accounts the efforts of manufacturers were early directed to the introduction of mechanical furnaces ; and in 1848 W. W. Pattinson patented a rotating ball-furnace, which, how- ever, owing to severe tear and wear, was unsuccessful. Improve- ments on the revolving furnace were effected by Elliot & Russell, Stevenson & Williamson, Mactear, and others, which have reudered the working of revolvers a complete success. In its general features a revolver consists of a large boiler-like cylinder of cast iron, lined internally with fire-bricks, and suspended horizontally so that it can be made to rotate about its axis. One of the two open ends communicates with a furnace, which sends its flame through the cylinder. From the other end the hot gases are led away for evapo- rating black-ash liquor. The cylinder is surmounted by a platform or railway from which it receives the charge through a manhole in its side. The charge is made in two separate instalments,—the whole of the chalk and two-thirds of the coal being first introduced, and the cylinder slowly rotated till a portion of the chalk has been burned to lime. Then the sulphate and the remainder of the coal, well mixed, are added, the revolver going slowly at first, but more rapidly as the end approaches, the whole balling being completed in from two to two and a half hours. The manhole door being opened, the revolver is turned round to allow the fluid black ash to pour out by it into a series of vessels placed beneath it. Under Mactear's improved process the whole of the charge is introduced into the revolver at first, and after the decomposition is complete a sinall proportion of caustic lime is thrown in and quickly mixed with the charge, which is thereon at once drawn. The lixiviation of the black ash is conducted in a systematic Manner so as to extract all the soda with the minimum of watcr. The apparatus generally employed—the Buff-Dunlop system—

consists of a series of at least four tanks each provided with a false bottom and two outlet pipes, and so arranged that the liquid part of the contents can be made to flow from any one of the tanks into any other. The method of working consists in making fresh water meet nearly exhausted ash, and the liquid, passing on through the series of tanks and becoming gradually stronger, meets ash less and less exhausted, till in the last tank of the series

the watery solution in its most concentrated state comes in contact with fresh black ash. As soon as the ash in the first tank is completely exhausted the waste residue is withdrawn and a fresh charge introduced. It then becomes the last of the series, number two taking the first place ; and so the work goes on in regular rotation, The lye obtained is allowed to clear in large tanks, from which it is drawn for evaporation.

Boiling Down.—The evaporation of the tank-liquor is generally effected in flat iron pans, heated from the top by the waste heat of the black-ash furnaces. So soon as a certain degree of concentra- tion is passed, soda begins to separate out in the form of granular crystals. These are ladled out and allowed to drain for subsequent calcination and conversion into soda ash. The purity of the granular salt decreases as the evaporation proceeds, chloride and sulphate of sodium, with the sulphides of iron and sodium, separat- ing out with the carbonate. The red liquor which remains with the salt owes its colour to the iron sulphide it contaius. It is intensely caustic, containing much caustic soda. In draining from the soda it carries off with it much of the sulphide and minor impurities from the tanks. The impure soda obtained from the evaporating pans is known as black salt and consists essentially of a monohydrate, Na,CO;+H,0O. A process for évaporation from the bottom is also worked in Lancashire and on the Continent.

Carbonating.—Salts that are fished out of the evaporating pan in the early stage of boiling down, being comparatively pure, require little treatment for finishing as soda ash. They have simply to be dried at a moderate heat to expel the water of crystallization. But with the ordinary black salt, which contains a considerable amount of both caustic soda and sodium sulphide, a special purifying and finishing treatment, called “carbonating,” has to be adopted. For carbonating black salt the strong lye in the evaporating tanks is mixed with sawdust and evaporated down to dryness. The mixture is then introduced into a carbonating furnace, where the heat is gradually raised till thé whole of the sawdust it contains is burnt off, and by the agency of the carbonic acid given off in its com- bustion the sulphide of sodium and the caustic soda present are con- verted into carbonate. Mechanical carbonating furnaces have been introduced, the most successful of which is that of Mactear, in which there is a rotating circulat hearth acted on by scrapers or ploughs. Ordinary soda ash is at best an impure product containing always

some caustic soda, which, however, considering the purposes for which it is used, can scarcely be regarded as an impurity or defect. Its value is determined by analysis and is calculated from the amount of anhydrous soda (Na,O) it contains as carbonate or hydrate.

In many soda-works the black-ash process is purposely so con- ducted as to produce much caustic soda, and the red liquor is then worked up into caustic soda in the following manner. It is first highly concentrated by boiling in a deep iron pan. To the con- centrated solution nitrate of soda is added, which decomposes the sulphide present with evolution of ammonia and formation of sulphate, thus Na,S + NaNO,+2H,0 = Na,SO, + NH; + NaHO. The evaporation is continued till practically all the water is ex- pelled, and the heat is forced till fusion sets in. Then the remain- ing sulphide of sodium with the cyanide is oxidized by the nitrate, which breaks up thus—2NaNO,=Na,0 + 2N +50, with formation of sulphate of soda and oxide of iron. Part of the carbon of the cyanogen separates as graphite (Pauli). The fused mass is allowed to stand, when the suspended matter, including, singularly, most of the alumina, settles down, leaving a perfectly clear liquid, which is run into iron drums, where it solidifies. By means of this process, which has been principally elaborated by Herr Ph. Pauli of Hochst near Wiesbaden, a remarkably pure product can be obtained from a very dirty liquor.

Refined Alkali.—Ordinary soda ash is sufficiently pure for most purposes for which the alkali is required in bulk; but for glass making, &c., it is necessary to remove all traces of iron. For this purpose the ash is dissolved in water, and if a well-carbonated ash is under treatment it is merely well agitated and allowed to stand quietly till impurities settle. By some manufacturers a small amount of carbonate of lime is added to the settling tank to carry down the impurities. Ash containing iron salts, sulphide, and coloured impurities is treated with a small proportion of chloride of lime to oxidize the iron and cause its precipitation as hydrated ferric oxide. The settled liquor is boiled down, the crystals drained, dried, and heated in a reverberatory furnace, and finally ground for the market.

Soda Crystals (washing soda) are similarly prepared, by forming a strong solution of soda ash, allowing the liquor to settle, and running it into large

coolers or crystallizing cones, in which the crystals form in from one to two weeks, according to the coolness of the position. When the crystallization is complete the crust is

broken, the mother-liquor, still holding a large amount of soda, is run off for future use, and the crystals are broken up, drained, and dried for packing and use. Soda crystals contain 63 per cent. of water, and their principal employment is for domestic washing, for which their comparative non-causticity well fits then.

Sulphur Reeovery.—Of the several raw materials of the Le Blanc process, sulphur, now always used in the form of pyrites, is by far the most expensive. The sulphuric acid employed passes out in valueless combination as crude sulphide of calcium, and accumulates in huge mounds. Under the influence of rain sulphide of calciuin in these heaps gradually assumes the forms of sulphide of hydrogen and hydrated oxide of calcium,—CaS + 2H,0 =CaOH,0+H,8. The hydrogen sulphide combines in its turn with another quantity of sulphide of calcium into CaS,H., which being soluble in water runs off as yellow liquor to contaminate streams and give off sulphuretted hydrogen gas with its disgusting smell. By the action of atmo- spheric oxygen part of the CaS,H, loses its hydrogen as water, and the remaining CaS, passes into thiosulphate of calcium, CaS,03, with simultaneous formation of polysulphides. Upon this latter tendency Mond founded his original method for recovering sulphur. He hastened the oxidation by blowing air through the moist waste till a certain proportion of the sulphide was converted into thiosul- phate, and the residue into sulphhydrate CaH,S,, or polysulphide. The inass is lixiviated with water, the liquor decanted off, and mixed with excess of hydrochloric acid, which produces H,S, and in general sulphur, from the sulphhydrate and sulphides of calcium, with SO, and sulphur from the thiosulphate. But 2H,S +S0O, decompose each other into 88+2H,0. Hencc it is obvious that, if the process of oxidation is stopped at the right point, the whole of the sulphur will be recovered as such. The precipitated sulphur is mixed with water placed in a closed cylinder and fused by raising the temper- ature of water round it in an outer casing above the melting point of sulphur. The sulphur then runs

together in the lower part of the cylinder, whence it is drawn off by a pipe and cast into rolls. The Mond process, of all the many sulphur-recovery processes yet intro- duced, is the best ; but even it no more than pays working expenses, and enables the manufacturer to end his process with an innocuous chloride of calcium (CaCl,) without actual loss of money.

About 1880 considerable excitement was caused by a sulphur- recovery process patented by Schaffner and Helbig in 1878, which was expected to revolutionize the soda trade. As these hopes have not been realized, we merely state the principle of the process. The soda waste is digested with a solution of chloride of magnesium, which in the first instance leads to the formation of CaCl, and Mgs. But the latter is at once decomposed, with formation of magnesia and sulphuretted hydrogen, —MgS +2H,0=MgOH,0+H,8. The sulphuretted hydrogen is caused to act on sulphurous acid within a solution of chloride of calcium,- when the sulphur settles in a filtrable form. The liquor remaining after the expulsion of H,S from the mixture of waste and chloride of magnesium consists of a precipitate of magnesia and a solution of chloride of calcium. By blowing carbonic acid into the mixture the following decomposi- tion is effected— MgO + CO, + CaCl, = CaCO; + MgCl,—so that the magnesium is recovered in its original form and the calcium of the waste obtained as carbonate, which may again be returned to the black ash roaster. This very pretty and complete process might probably have been worked out as a practical success had the con- viction not arisen that even with profitable sulphur recovery the Le Blanc process will not long be able to hold its own against the ammonia process.

Ammonia Soda Process. —This process is based on the fact that bicarbonate of ammonia, when added to a strong solution of common salt, decomposes the salt with formation of a precipitate of bicar- bonate of soda and a solution of ammonium chloride (sal-ainmoniac), thus NaCl HCO,=NH,Cl NaHCO,. The ammonia is re- coverable from the sal-ammoniac by distillation with lime, and, supposing no waste to occur, is usable ad infinitum. From bicar- bonate the normal salt is easily prepared by the application of heat —2NaHCO,=Na,0O,+CO,+H,0. Thus by theory one-half of the carbonic acid is recovered, and, supposing the quicklime for the decomposition of the sal-ammoniac to be made by heating limestone,

the loss of carbonic acid is made up incidentally from that source. The only waste product which remains for disposal is the entirely innocuous chloride of calcium made in recovering ammonia by means of lime from sal-ammoniac. The ammonia process was first enun- ciated and patented in England by Dyar & Hemming in 1838; and works on the system were established in Cheshire and some localities on the Continent, where it attracted great attention. Numerous patents, both English and Continental, followed, and many experi- mental works were erected, which all failed to sustain themselves in competition with the Le Blanc works. The principal difficulties to be overcome were imperfect conversion of the salt, and more especially the loss of ammonia ; and it was not till 1861 that real economical success in the ammonia recovery apparatus was attained by Ernest Solvay of Couillet near Charleroi, Belgium. Works on the Solvay principle were established at Couillet in 1868 ; and since that date by the inventor and others, among whom ouglit to be men-

tioned Ludwig Mond, the process has been so perfected that its general adoption now appears to be only a matter of time. Already on the Continent it has practically displaced the Le Blanc process

but in the United Kingdom there is as yet only one establishment manufacturing ammonia soda.

The first essential stage in Solvay’s process consists in saturating the brine with ammonia, The brine, treated with milk of lime and ammonium carbonate to precipitate magnesium and calcium salts, and of proper density, is placed in two cylindrical close iron tanks which communicate by pipes at top and bottom with the ammonia dissolver placed between them. The ammonia dissolvecr is a cylin- drical vessel having the same height as the tanks and provided with a perforated false bottom, down to which a tube is led through the centre of the vessel, and by this tube the ainmonia gas is introduced. Coiled within the cylinder is a worm pipe, through which cold water circulates. Each brine tank is put alternately in connexion with the dissolver. Circulation from the brine tank into the dissolver is kept up by mechanical agitation. As the ammonia becomes ab- sorbed by the brine the temperature of the liquid rises rapidly, and the cold water circulating within

the coiled pipe keeps the temper- ature down. As soon as sufficient ammonia has been passed into the brine the stirrers in the brine tank are stopped ; the sludge of lime and magnesia precipitate is drawn off as it settles at the bottom of the brine tank, or when such precipitate is abundant it is settled and withdrawn in a special decanting tank. The decanted liquor is filtered through fine cloth by pressure, and the filtrate is cooled down in a refrigerating apparatus previous to the next operation.

Treating the Ammoniacal Brine with Carbonie Aeid.—For this purpose a cylindrical tower is employed, divided internally into a series of superimposed segments by diaphragms consisting of per- forated dome-shaped plates. The tower is about 40 to 50 feet in height and is kept nearly full of liquid, which is introduced by a pipe half way up its side. Carbonic acid under a pressure 1°5 to 2 atmospheres is forced in at the bottom of the tower and works its way gradually upwards through the perforations in the diaphragms, thus coming into intimate contact with the ammoniacal brine, Every half hour a part of the pasty mixture of bicarbonate of soda and ammonium chloride solution is drawn off and replaced by fresh liquor. The solid bicarbonate is separated out either by centrifugal action or by a vacuum filter; as thus obtained it is still contaminated with ammonia, of which it smells. To free the bicarbonate from this impurity water is squirted over it till the smell almost entirely disappears.

Conversion into Soda Ash of the bicarbonate is essential, because there is a comparatively limited demand for bicarbonate, and that salt, moreover, obstinately retains an ammoniacal odour, which lessens its value. The preparation of soda ash is attended with considerable practical difficulties, owing to the necessity of retain- ing the contained ammonia. comparatively low heat in a closed roaster, after which it is finished in a muffle furnace at a bright red heat. The gases given off are drawn by an air-pump into a washing apparatus, where the ammonia is retained, and the carbonic acid, which passes on, is conducted to the absorption tower for again impregnating the ammoniacal brine. By this process the whole of the chlorine of common salt comes away as waste in the form of chloride of calcium. To obtain

‘that body in combination as hydrochloric acid, Solvay proposed

in his patent of 1872 to employ magnesia in place of lime in the decomposition of the sal-ammoniac, the solution of chloride of magnesium remaining after the distillation is boiled to dryness, and being by the action of steam separated into magnesia and _hydro- chloric acid,—MgCl, + HO=Mg0O+2HCL The magnesia theoreti- cally works in a circle, being changed into chloride on the liberation of the ammonia from the sal-ammoniac, and recovered again as magnesia with the formation of hydrochloric acid, as aboye indi- cated. But the expense of the process has hitherto been greater than the value of the product obtained, and the one weak point of the Solvay process is the loss of the hydrochloric acid, which forms an important element in the Le Blanc cycle. The loss of ammonia calculated as sulphate in the early days of the Solvay process was as much as 9 per cent. on the carbonate of soda pro- duced ; but by successive improvenients it has been reduced to not more than 5 per cent. The Solvay plant is very expensive, amount- ing, according to his own estimatc, to £1600 per ton of soda ash produced daily ; but other authorities put the capital expenditure as high as £2400 per ton worked daily.

Cryolite Soda.—Of the many processes other than those above mentioned, which have been proposed for soda-making, the only one practically employed is that in which cryolite forms the Taw material. Cryolite, a fluoride of aluminium and sodium, AIF3+ 3NaF, is a mineral substance found in extensive deposits at Ivikat (Ivigtut) (61° 34’ N. lat.) in south-west Greenland. For soda- making the mineral is treated by a process discovered in 1850 by Professor Julius Thomsen of Copenhagen. It is ignited with chalk or limestone, whereby carbonic acid is driven off and fluoride of calcium and aluminate of soda are formed—2(AIF,;3NaF) 6CaCO, = 6CaF, + 8Na,0, Al,0,+6CO, The aluminate of soda 18

The bicarbonate is first exposed to a ~

separated from the artificial fluoride of calcium by lixiviation, and the solution so obtained is decomposed by treatment with carbonic acid, which produces a precipitate of alumina available for alum- making, &c., leaving a solution of carbonate of soda. About 8000 tons of cryolite are annually treated in Pennsylvania and in Denmark.

Statistics of Soda Trade.—No means exist for obtaining an accurate statement of the extent of the soda trade; and such estimates as are published can only be accepted as approximations based on knowledge of the productive capacity of existing works and the general course of trade. Speaking at the Society of Chemi- cal Industry (London section) in January 1883, the late Walter Weldon gave the following estimate (in tons) of the soda produc- tion of the world at that date :—

Le Blane Ammonia Soda. Soda. Total. MOR TIBTICAIN 0. cae ewe es ee oe 880,000 432,000 PEE ILC OMPVe oral opel vie av eretisr eves orecete 70,000 127,125 MEPOTMOUATIY. 5c ieie, 8/0. .0.sisi’s.0: sie eieiniese» 56,500 100,500 S01 ge OS TOREs « OR EIR ae tee 89,000 40,000 EME DUITY Byte cteleie «\a pielise aieneies.0% ae 8,000 WMitediStates:.. ..ecccssceecee! a 1,100

545,500 708,725

In these figures the whole of the products made—soda ash crystals, bicarbonate, caustic soda, &c.—are calculated in terms of pure car- bonate, NaCO,. Assuming the fairness of the calculation, we are warranted in stating the present (1887) production of alkali, as pure carbonate, to be not less than three quarters of a million of tons annually. (W. D.—J. PA.)

SODOM anp GOMORRAH. See Duan Sza, vol. vii. pp. 1-3; comp. Pua@nicta, vol. xviii. p. 803, and Lov.

SODOMA, It, or, more properly, Sopona (c. 1479- 1549), Italian painter. Grannanronio Bazzr (who until receut years was erroneously named Razzi) appears to have borne also the name of “Sodona” as a family name ; itis signed upon some of his pictures. While ““Bazzi” was corrupted into “ Razzi,” ‘“Sodona” was corrupted into “Sodoma” ; and Vasari, followed by other writers on art, accounts for the latter nanie by giving various and explicit details which we leave undiscussed, for, if the painter did not really pass by the appellation of ““Sodoma,” we may fairly infer that explanations which would have been ger- mane to that appellation are not germane to the man himself. Bazzi was born at Vercelli in Piedmont towards 1479, and appears to have been in his native place a scholar of the painter Giovenone. Acquiring thus the strong colouring and other distinctive marks of the Lom-

bard school, he was brought to Siena towards the close of the 15th century by some agents of the Spannocchi family ; and, as the bulk of his professional life was passed in this Tuscan city, he counts as a member of the Sienese school, although not strictly affined to it in point of style. He does not seem to have been a steady or laborious student in Siena, apart from some attention which he bestowed upon the sculptures of Jacopo della Quercia. Along with Pinturicchio, he was one of the first to establish there the matured style of the Cinquecento. His earliest works of repute are seventeen frescos in the Benedictine monastery of Monte Oliveto, on the road from Siena to Rome, illus- trating the life of St Benedict, in continuation of the series which Luca Signorelli had begun in 1498; Bazzi completed the set in 1502. Hence he was invited to Rome by the celebrated Sienese merchant Agostino Chigi, and was em- ployed by Pope Julius II. in the Camera della Segnatura in the Vatican. He executed two great compositions and various ornaments and grotesques. The latter are still extant; but the larger works did not satisfy the pope, who engaged Raphael to substitute his Justice, Poetry, and Theology. In the Chigi palace (now Farnesina) Sodona painted some subjects from the life of Alexander the Great; Alexander in the Tent of Darius and the Nuptials of the Conqueror with Roxana are more particu- larly noticed, When Leo X. was made pope (1513) Bazzi presented him with a picture of the Death of Lucretia (or of Cleopatra, according to some accounts) ; Leo gave him

a large sum of money in recompense and created him a cavaliere. Bazzi afterwards returned to Siena, and ata later date went in quest of work to Pisa, Volterra, and Lucca. From Lucca he returned to Siena, not long before his death, which took place on 14th February 1549 (the older narratives say 1554). He had squandered his pro- perty and died in penury in the great hospital of Siena. Bazzi had married in youth a lady of good position, but the spouses disagreed and separated pretty soon afterwards.

_A daughter of theirs married Bartolommeo Neroni, named

also Riccio Sanese or Maestro Riccio, one of Bazai’s princi- pal pupils.

It is said that Bazzi jeered at the History of the Painters written by Vasari, and that Vasari consequently traduced him ; certainly he gives a bad account of Bazzi's morals and demeanour, and is niggardly towards the merits of his art. According to Vasari, the ordinary name by which Sodona was known was "Il Mattaccio" (the Madcap, the Maniac),—this epithet being first bestowed upon him by the monks of Monte Oliveto. He dressed gaudily, like a mountebank ; his house was a perfect Noah's ark, owing to the strange miscellany of animals which he kept there. He was a cracker of jokes and fond of music, and sang some poems composed by himself on indecorous subjects. In his art Vasari alleges that Bazzi was always negligent,—his early success in Siena, where he painted many portraits, being partly due to want of competition. As he advanced in age he became too lazy to make any cartoons for his frescos, but daubed them straight off upon the wall. Vasari admits, nevertheless, that Bazzi produced at intervals some works of very fine quality, and during his lifetime his reputation stood high.

The general verdict is that Sodona was an able master in ex- pression, motion, and colour. His taste was something like that of Da Vinci, especially in the figures of women, which have grace, sweetness, and uncomnion earnestness. He is not eminent for drawing, grouping, or general elegance of form. His easel pictures are rare. His most celebrated works are in Siena. In S. Domenico, in the chapel of St Catherine of Siena, are two frescos painted in 1526, showing Catherine in ecstasy and fainting as she is about to receive the Eucharist from an angel,—a beautiful and pathetic treatment. In the oratory of S. Bernardino, scenes from the history of the Madonna, painted by Bazzi in conjunction with Pacchia and Beccafumi (1536 to 1538)—the Visitation and the Assumption—are noticeable. In §S. Francesco are the Deposition from the Cross (1513) and Christ Scourged ; by many critics one or other of these paintings is regarded as Bazzi's masterpiece. In the choir of the cathedral at Pisa is the Sacrifice of Abraham, and in the gallery of Florence a St Sebastian.

SOEST, an ancient industrial town in Westphalia, Prussia, is situated in a fertile plain (Soester Bérde), 27 miles to the east of Dortmund and 34 to the south- east of Miinster. Its early importance is borne witness to by its six fine churches, of which the most striking are St Peters, St Mary-in-the-

Fields, founded in 1314 and restored in 1850-52, and the Roman Catholic cathedral, founded in the 10th century by Bruno, brother of Otho the Great, though the present building was erected in the 12th century. This last, with its very original facade, is one of the noblest ecclesiastical monuments of Germany. Remains of the broad wall (now partly enclosing gardens and fields) and one of the gates still remain; but the thirty-six strong towers which once defended the town have disappeared and the moats have been converted into promenades. Jron-working, the manufacture of soap, hats, cigars, and bricks and tiles, linen-weaving, tanning, and brewing, together with market-gardening and farming in the, neighbourhood, and trade in cattle and grain, are the leading industries. The population in 1880 was 13,985, and in 1885 14,848, of whom about 6000 were Roman Catholics.

Mentioned in documents as early as the 9th century, Soest was _ one of the largest and most important Hanseatic towns in the Middle Ages, with a population estimated at from 30,000 to 60,000. Tt was one of the chief emporiums on the early trading route be- tween Westphalia and Lower Saxony. Its code of municipal laws (Schran ; jus susatense), dating from 1144 to 1165, was one of the earliest and best, and served as a model even to Liibeck. On the fall of Henry the Lion, duke of Saxony, Soest passed with the rest of Angria to Cologne. In the 15th century the strife between the townsmen and the archbishops broke out in open war, and in 1444

the strong fortifications of the town withstood a long siege by an army of 60,000 men. The women of Soest are said to have distin- guished themselves in this contest (Soester Fehde), Papal interven- tion ended the strife and Soest was permitted to remain under the protection of the dukes of Cleves. The prosperity of the town waned in more modern times: in 1763 its population was only 3800 ; in 1816 it was 6687.

SOFALA, a seaport town on the east coast of Africa, at the mouth of a river of the same name to the south of 20° S. lat., the seat of a Portuguese commandant. It is now

a wretched place of about 1000 inhabitants, with not more

than twenty European residents, and, as its port is ob-

structed with sandbanks, there is only a small coasting trade with Chiluan and Inhambane. But Sofdla was formerly a town of considerable importance, with a harbour capable of holding a hundred large vessels. Previous to its conquest by the Portuguese in 1505 it was the chief and populous centre of a wealthy Mohammedan state ; and the first governors of the Portuguese East African posses- sions were entitled captains-general of Sofala. The identi- fication of Sofdla with Solomon's Ophir, to which Milton alludes (Par. Lost, xi, 399-401), is untenable.

See Bull. Geogr. Soe. Mozambique (1882) for an account of the Sofala mines; and, generally, Edrisi, Climate i., 8th section ; Dapper ; Baines, The Gold 'Regions of South Africa (1877); and Burton's notes to his edition of Camoens.

SOFIA, since 1878 the capital of Bulgaria, though previously only a district town of the Tuna (Danube) vilayet of Turkey, is situated 1755 feet above the sea, in the midst of a dreary plain between the Stara Planina or main range of the Western Balkans and the bare but im- posing granite mass of the Vitosh Mountains (3400 feet). It stands at the meeting of five great routes from Nish and Belgrade, Lom and Vidin, Plevna and Rustchuk, Philip- popolis and Constantinople, and Késtendil and Salonica. At present (1887) it is two days' journey from the nearest railway station (Tatar-bazarjik), and as the seat of govern- ment is inconveniently near the south-west extremity of the kingdom ; but it lies on the prospective great railway route between Constantinople and Belgrade, and was in the eyes of those who selected it the prospective capital of a much more extensive territory. The climate of Sofia is subject to severe seasonal and diurnal changes: in January the thermometer sinks 4° below zero and in August ap- proaches 100°, and the daily range is frequently 27 or 28 degrees. Minarets and gardens give a certain beauty to the aspect of the town itself, but the outskirts are pain- fully destitute of foliage. In an eastern suburb stands the royal palace, a vast building which cost more than 4,000,000 francs ; and in that neighbourhood, on the site of an abandoned Turkish quarter, quite a new " European " town has sprung up. The rest of Sofia retains its Turkish character, with tortuous streets and mean wooden houses. The modern

cathedral and the archbishop's palace are both large edifices of no special note. Of the many mosques the most striking is the Buyuk-Jami, with its nine metal cupolas ; but more historical interest attaches to the Sophia mosque, occupying the highest point in the town to which it gave its name. It is now completely in ruins (the result of an earthquake), but tradition, which in this case is con- firmed by the architecture of the building, asserts that it was a Christian church erected by a certain Byzantine princess Sophia. Kanitz in 1871 still observed remains of old Byzantine frescos in the narthex. The public baths occupy a very extensive building, with separate suites of apartments for different nationalities or rather religions. The water as it issues from the springs has a temperature of 117°. Sofia exports hides and skins to Vienna, &c., and especially goat-skins to Marseilles ; its principal imports are Indian corn, wheat, and alcoholic liquors—the last a very large item. Formerly the popu- lation was 50,000. In 1870 Kanitz found 19,000—a

liberal estiniate—8000 being Bulgarians, 5000 Turks, 5000 Jews (a colony dating from the expulsion from Spain), 900 Gipsies. At present (1887) the total is 20,000. Close to the north of the town are extensive remains of strong Roman fortifications.

Sofia is the Serdica or Sardica of the Romans and Greeks (so called after the Serds or Sards), the Zriaditza of the Byzantine writers, and the Sredee of the Slavs. ‘‘Sardica is my Rome,” said Constantine before he thought of his new capital on the Bosphorus, It had already been made the capital of Dacia Ripensis by Aurelian, and about 343 it became famous as the seat of a church council, The town was plundered by Attila ; and in 809 it was captured by the Bulgarians, who held it until the Turks got possession of it by stratagem in 1878, or more probably 1882. In 1448 Sofia was for a brief period occupied by the Hungarian John Hunyady (Corvinus), and on the defeat of his enterprise was laid waste by the retreating army. In 1829 it was the headquarters of Mustapha Pasha of Scutari, whose ravages have made the name of Albanian a word of terror to the children in Sofia even now. The Russians entered

Sofia on 4th January 1878, after Gourko's passage of the Balkans. See Kanitz, Donaw Bulgarien, 1877; Laveleye, La Péninsule des Balkans, 1886.

SOGDIANA, or Soepraneg, in Old Persian Sughuda, a province of the Achemenian empire, the eighteenth in the list in the Behistun inscription of Darius (i. 16), corresponded to the modern districts of Samarkand and Bokhara; that is, it lay north of Bactriana between the Oxus and the Jaxartes and embraced the fertile valley of the Polytimetus or Zarafshan. Under the Greeks Sogdiana, was united in one satrapy with Bactria, and subsequently it formed part of the Bactrian Greek kingdom till the "Scythians " (the Yue-chi) occupied it in the middle of the _ 2d century B.c. (comp. vol. xviii. pp. 586 sq., 592 sq.). The valley of the Zarafshan about Samarkand retained even in the Middle Ages the name of the Soghd of Samarkand. Arabic geographers reckon it as one of the four fairest spots in the world.

SOHAR, the second port of 'Oman, Arabia, situated on the Gulf of 'Oman in 24° 29' N. lat. and 56° 45' E. long. It is a place of considerable trade and industry, well built, fortified with walls and a castle, and inhabited by a hospitable and far from bigoted population of the 'Ibad{ sect. The anchorage is good, sheltered between two promontories, and the surrounding country is populous and fertile. Indeed the coast-land of 'Oman is naturally

the most favoured part of Arabia.

The town of Sohdr is older than Islam, and its cloths are men- tioned in the life of Mohammed (Ibn Hisham, p. 1019). Before the Moslem conquest it was in the hands of the Persians, and the Persian name Maziin is not uncommonly applied to it by older Arabic writers. Under Islam it became the capital of 'Oman, and it is sonietimes called 'Oman, from which fact it has sometimes, but very precariously, been identified with the Omana of classical writers. In the earlier Middle Ages Sohar was one of the first commercial cities of Islam on the Indian Ocean and had an active part in the China trade. This prosperity was unabated when Mokaddast wrote of it (p. 92) towards the close of the 10th century; in the 12th century, when Edris{ wrote, the China trade was a thing of the past ; and about 1230 Ibn Mojawir describes it as a ruin in- habited by the demons of the desert. Its decay

appears to be connected with the rise of other ports—Kalhat on the Arabian and Ormuz on the Persian side of the Persian Gulf—but more especially with the political convulsions of ‘Oman. This district, which has always had an isolated position in Eastern history, early became a stronghold of the Khawarij (‘Ibadiya) and paid very in- termittent obedience to the caliphs till it was reduced by Mo’tadid about the year 900. Even after this conquest the native imams held their ground in the mountainous inland country at Nazwa (Istakhri, p. 26), and renewed the struggle for independence with the Buwaihid and Seljuk sovereigns of Fars, who succeeded in these regions to the power of the caliphate. Ibn Mojawir connects the destruction of Sohar with these struggles, and, though he seems to imply a later date, it is possible that his statement is to be com- bined with what Ibn al-Athir (ix. 387) tells of the rising of Al-Rashid billdh about 1050. After this event there is a period of obscurity in the annals of ‘Oman; the independence of the country was ultimately secured under the native (Azdite) princes of Nazwa, but Sohar never recovered its importance. It is mentioned, however, by Marco Polo, under the name of Soer, as trading in horses with Malabar, and also by Ibn Batita, and must therefore have been resettled soon after the time of Ibn Mojawir. Sohar was seized by

the Portuguese in 1508 and held by them till about 1650. In the 18th century Niebuhr speaks of it as a quite unimportant place ; Wellsted in 1836 assigned to it a population of 9000; Palgrave in 1863 estimated the population at 24,000, an estimate the more re- markable that in the interval the town had suffered scverely from the Wahhabis. The Red Sea Pilot (1883) gives the more probable figure of 4000 to 5000.

SOISSONS, a city of France, in the department of Aisne, the seat of a bishopric and a fortified post on the left bank of the Aisne at the junction of the Crise, lies 65 miles north-east of Paris by the railway to Laon. The population in 1881 was 10,895 (11,112 in the commune). The cathedral of Notre Dame St Gervais and St Protais, begun in the second half of the 12th century and finished about the end of the 13th, is 328 feet long and 87 wide; the vaulting of the nave is 100 feet above the pave- ment. The single tower dates from the middle -of the 13th century and is a fairly good imitation of

those of Notre Dame of Paris, which it equals in height (216 feet). The transepts are of different dates and dissimilar in their arrangement. In the north transept there is a very fine door on the east; the south transept is the oldest and most graceful portion of the whole edifice. The choir is surrounded with eight square chapels, and the apse with five large polygonal chapels, of which the three in the middle (as well as the high windows of the choir) still retain their fine 13th-century glass. The rose-window of the north transept represents the life of the Virgin in twelve medallions. The high altar is flanked by two marble figures representing the annunciation and above it is an Adoration of the Shepherds ascribed to Rubens ; the cathedral also has some rich 16th-century tapestries. Considerable remains still exist of the magnificent abbey of St Jean des Vignes, where Thomas a Becket resided from 1161 to 1170, and which was rebuilt in the 13th century; these include the ruins of two cloisters (the smaller dating from the Renaissance), the refectory, and above all the cathedral- like facade of the church (recently restored). Of the three portals with twisted columns the central one is adorned with statues ; above them runs a gallery, over which again is a large window; the two unequal towers (230 and 246 feet) of the 15th and 16th centuries are surmounted by beautiful stone spires, which command the town. The ruins of this fine building are unfortunately occupied by the military authorities. The church of St Léger, erected in 1139 and rebuilt at the beginning of the 13th century, was formerly attached to an abbey of the Génové- fains. Beneath are two crypts of the 12th and 13th centuries. Of the abbey church of St Pierre, built in the 12th century in the Romanesque style, the only remains are the facade and two bays of the choir. The royal abbey of Notre Dame was founded in 660 for monks and nuns by Leutrade, wife of Ebroin, the celebrated mayor of the palace. The number of the nuns (216 in 858), the wealth of the library in manuscripts, the valuable relics, the high birth of the abbesses, the popularity of the pilgrimages, all contributed to the importance of this abbey, of which there exist only some inconsiderable remains. The wealthiest of all the abbeys in Soissons and one of the most important of all France during the first two dynasties was that of St Médard, on the right bank of the Aisne, founded in 560 by Lothaire I., beside the villa of Syagrius, which had become the palace of the Frankish kings. St Médard, apostle of Vermandois, and Kings Lothaire and Sigebert were buried in the monastery, which became the residence of 400 monks and the meeting-

place of several councils. It was there that Childeric ITI., the last Merovingian, was deposed and Pippin the Short was crowned by the papal legate ; and there Louis the Pious was kept in captivity in 833. The abbots of St Médard coined money, and in Abelard's time (12th century) were lords of 220 villages,

farms, and manors. At the battle of Bouvines (1214) the abbot commanded 150 vassals. In 1530 St Médard was visited by a procession of 300,000 pilgrims. But the religious wars ruined the abbey, and, although it was restored by the Benedictines in 1637, it never recovered its former splendour. Of the seven churches and the con- ventual buildings of the ancient foundation there hardly remains a trace. The site is occupied by'a deaf and dumb institution, the chapel of which stands over the crypt of the great abbey church, which was altered in the 12th century. In the crypt is a stone coffin, said to have been Lothaire's, and close at hand is an underground chamber, reputed to have been the place of captivity of Louis the Pious. The civil buildings of Soissons are not of much interest. The hétel de ville contains a museum with scientific and archeological collections; the hétel dieu goes back to the 13th century ; the library contains 40,000 volumes and curious manuscripts. . Among the industrial establishments are tanneries, saw-mills, and foundries and factories for the production of stoves, agricultural im- plements, candles, and chocolate. Grain, flour, haricot beans of exceptional quality, pease, wool, hemp, flax, cattle, timber, and charcoal are the principal articles of trade. There is also a large bottle factory, and work is

done for the flannel and blanket factories of Rheims. Soissons is generally believed to occupy the site of the oppidum of Gallia Belgica called Noviodunum by Cesar; but some writers identify this place with Noyon, Noyant, or Nouvion. One thing is clear, that this oppidum was the capital of the Sucssiones, who occupied twelve towns and whose king, Divitiacus, one of the most powerful in Gaul, had extended his authority even beyond the sea among the Britons. In 58 B.c. Galba, king of the Suessiones, separated from the confederation of the Belgians and submitted to the Romans, At the beginning of the empire Noviodunum took the name of

Augusta Suessionum, and afterwards that of Swessiona, and became the second capital of Gallia Belgica, of which Rheims was the metropolis. The town was before long surrounded with a regular wall and defended by a citadel ; and it became the starting- point of several military roads (to Rheims, Chateau-Thierry, Meaux, Paris, Amiens, and St Quentin). Christianity was introduced by St Crispin and St Crispinian, men of noble birth, who, however, earned their livelihood by shoemaking, and thus became patrons of that craft. After their martyrdom in 297 their work was continued by St Sinitius, the first bishop of Soissons. After the barbarians had crossed the Rhine and the Meuse Soissons became the metro- polis of the Roman possessions in the north of Gaul, and on the defcat of Syagrius by Clovis the Franks seized the town. It was at Soissons that Clovis married Clotilde, and, though he afterwards settled at Paris, Soissons was the capital of his eldest son Lothaire, and afterwards of Chilperic I., king of Neustria. It was not till the time of Chilperic's son, Lothaire II., that the kingdom of Soissons was incorporated with that of Paris. In 752 Pippin the Short was at Soissons proclaimed king by an assembly of leudes and bishops, and he was there crowned by the papal legate St Boniface before being crowned at Saint Denis by the pope himself. Louis the Pious did penance there after being deposed by the assembly at Com- piégne. Under Charles the' Vat (886) the Normans failed in an attempt against the town, but laid waste St Médard and the neigh- bourhood. In 923 Charles the Simple was defeated outside the walls by the supporters of Rudolph of Burgundy, and Hugh the Great besieged and partly burned the town in 948. Under the first Capets Soissons was held by hereditary counts, frequently at war with the king or the citizens. Thus the latter bought in 1131 a communal charter from Louis VI. and their bishop. In 1155, at an assembly of prelates and barons held at Soissons, Louis VII. issued a famous decree forbidding all private wars for a space of ten years ; and in 1325 Charles the Fair replaced the mayor of Soissons bya royal provost dcpendenton the bailiwick of Vermandois, the inhabitants retaining only the right of electing four échevins. Louis of Chatillon, count of Soissons, was killed at Crécy, and his son, a hostage for King John in England, sold his countship to Enguerrand de Coucy to obtain money for his ransom in 1367. Finally the last count of Soissons, sprung from a branch of the house of Bourbon, rebelled against Louis XIII., and defeated the royal troops at La Marfée in 1641, but pcrished in the battle. The town had to suffer severely during the war of the Hundred Years ; in

1414, when it was held by the Burgundians, it was captured and sacked by the Armagnacs under the dauphin; and this same fate again befell it six times within twenty years. The treaty of Arras (1435) brought it again under the royal authority. It was sacked by Charles Y. in 1544 and in 1565 by the Huguenots, who

laid the cliurches in ruins and, supported by the prinee of Condé, count of Soissons, kept possession of the town for six months. During the League Soissons eagerly joined the Catholic party. Mayenne made the town his principal residence, and he died there in 1611. A European congress was held there in 1728. In 1814 Soissons was captured and recaptured by the allies and the French. In 1815, after Waterloo, it was a rallying point for the vanquished, and it was not oecupied by the Russians till the 14th of August. In 1870 it capitulated to the Germans after a bombardment of three days.

‘SOKOTO, an important Fulah kingdom or empire in Central Soudan, comprising whiat are frequently called the Haussa states. Its boundaries (see vol. i. pl. IT.) are irregu- larly marked off by the plateau lands of Air or Asben on the north, the kindred Fulah state of Gandu on the west, while the river Binué practically forms its southern limit as far as the nieridian of 10° E.; beyond this it runs south into the Congo basin. On the east lies the kingdom of Bornu. From north-west to south-east Sokoto has a length little short of 900 English miles and its average breadth is about 280. The whole area has been roughly computed to be equal to that of Spain (about 195,000 square miles), and to have a population of from ten to twelve millions. The country may be described as a great undulating plain, rarely exceeding 1000 feet in height, with the exception of the province of Bauchi in the centre, which runs into a highland region with heights of 3000 feet, and the still more imposing masses of Adamawa in the south, which are sald to attain an altitude of 10,000 feet in Mount Alantika, In other respects Sokoto presents more varied features, chiefly determined by the amount of rainfall, though the varying fertility of the soil is a not unimport- ant factor. In the southern parts, where there are almost perpetual rains, large streams and rivers are numerous, —the feeders of the Binué, the great eastern (left-hand) tributary of the Niger. Here grow the virgin forests with giant growths and exuberant

foliage, with creepers, with bananas and plantains, palm-oil trees and yams. In the more temperate— because more elevated —districts of the middle area, with a smaller rainfall, the vegetation is less luxuriant, and such fruits as the date, lime, and pome- granate are cultivated. In the northern parts the climate is still more arid, and the country is burned up for the greater part of the year. This is the region of acacias and

mimosas, of baobabs, of the branching dum palm and the

curiously bulged deléb. Here are no forests nor rank grass, while the exigencies of a dense population have caused the clearing away of the bush except on the most barren spots, where it supplies the necessary fuel for domestic purposes. In this northern district there-are no streams except in the wet season, and the wants of the people are supplied by fountains in the more favoured places, and by wells—frequently very deep—ain those not so advantageously situated. Lying within the tropics, Sokoto is subject to excessive heat,—damp and steamy in the south, dry and furnace-like in the north, where it suffers from the hot winds from the Sahara. In Adamawa the rainy season—or, to be more correct, the season of excessive rains—commences in April and lasts till October or later, while in Gober in the north the rains commence in June and seldom last more than three months, during which the country becomes transformed from a repellent desert into a well-cultivated nursery garden.

For Central Africa Sokoto may be described as fairly healthy, though, as may be expected from a conjunction of excessive heat with exeessive rain, fevers are not uneommon in the southern parts, while ophthalmia is prevalent in the north, especially among the poorer classes, who are compelled to expose themselves to the blind- ing dust from the deserts and the excessive glare of the sun reflected from the burning sands.

The natural produetions of Sokoto are such as are more or less common throughout the whole of the Soupan (q¢.v.). Among cereals rice and wheat are cultivated in many parts, though the staple productions are Kaffre corn, millet, and maize. Sweet potatoes,

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ground nuts, yams, onions, and other vegetables are largely grown, Of fruits dates, pomegranates, citrons, and bananas abound in more restricted areas. The Shea butter tree supplies an excellent oj} for lamps, and also for cooking, though it is only nsed by the poorer classes. The palm-oil tree is only found in the damp basin of the Binué. The most important vegetable products are cotton and indigo, which are universally grown. The cotton is manufactured into cloth, being used by the native population as well as largely exported to neighbouring eountrics. In some parts a species of silk found in the forests is largely used, and the people of Yakoba in Bauchi are said to rear the silkworm. Of mincral products there secm to be few, though it is known that both silver and lead occur in the Binné area, Iron is extensively diffused and of excellent quality.

The inhabitants of this extensive region, held together by a conquering race and not by any natural tie into one common kingdom, are of diverse tribes and affinities. They, however, may be roughly divided into three groups. (1) First come the pure Negro races of Adamawa, of which the chief tribe is the Batta. (2) The Haussa form the mass of the population except in Adamawa. They are pre-eminent among Negroes for their physical appeararice and intellectual abilities. They are wonderfully skilled in various arts and industries and noted for their commercial genius and enterprise, Mohammedanism is their religion, and indeed in all respects they are well advanced on the road to civilization. They are very fond of voluminous elothes. (8) The Fulahs are a Hamitic race, who from being simple herdsmen in the beginning of the 19th century have become the rulers and masters over a hundred alien races be- tween the Atlantic and Lake Tehad. They have not the commercial or industrial skill of the Haussa, but in other respects have reached ahigher level. They are of slender build and are distinguished by their light coppery colour. The inhabitants of Sokoto live mostly in large towns, many of which contain from 10,000 to 20,000 in- habitants. These towns are all protected by strong mud walls and outer dry moats. Their interior is divided into a series of com- pounds, each entered through a flat-roofed audience chamber. Inside are the beehive-shaped huts of the household. The gate- ways are also strongly fortified. The ruler over Sokoto is a Fulah sultan, whose power is absolute, though tempered by a species of feudal system. The governors of some of the larger provinces, though owning allegiance to the sovereign, are mostly hereditary, and

beyond sending a ycarly tribute are practically independent. The tie indeed is more religious than anything else. The great weakness of the empire is its want of coherence and the absence of a strong central Government. Yet, though always appearing to be on the point of falling to pieces, it contrives to keep tonathel The condition in which Barth found it in 1855 was practically the same as when the present writer visited it in 1885,

The chief provinces of Sokoto are Zamphoro, Zaria, Katsena, Bauchi, Kano, and Adamawa. The most important towns are— Sokoto, the acknowledged capital of the empire, famed chiefly for its leather-work and straw hats (it divides with Wurnu the dis- tinction of being the residence of the sultan; Clapperton died here in 1887); Wurnu, about 18 milcs farther east, the present (1887) headquarters of the court ; Kano, the great commercial emporium of Central Soudan ; and Yakoba, chiefly noted for its large size,— said to contain 150,000 inhabitants.

The history of Sokoto may be said to have commeneed with the 19th century. Previous to that date little is known further than that the country was divided among a number of small chiefs, a prey to the powerful kings of Bornu, Kebbi, and Songhwai (Songhai). In 1802 the Fulahs, then little regarded and semi- serfs in position, were scattered all over the country, apparently without any national tie to unite them to common action. At last, however, an imam—one Othman dan Fodio—appeared, who with the watchword of Islam gave a new life to his tribesmen and in an incredibly short time transformed them from peaceable nomads into soldiers of the Crescent, and after a few initial reverses swept like a whirlwind over an enormous area, establishing himself as ruler and Mohammedanism as the religion of the whole of Central Soudan. At his death the parts now known as Sokoto fell to the share of his son Bello, and in the family of Othman the reins of government have since remained, though the descent is not as a rule from father to son, but either to a brother or a brother’s son. The latest phase in the history is the proclaiming of a protector- ate over a part of Sokoto on the Binué by the British Govern- ment, and the handing over of the administration of the Niger region to the Royal Niger Company. To this company the sultan has conceded all his rights on the Binué and a monopoly of trade throughout his dominions, thus making them practically masters of all foreign intercourse.

The most important sources of information regarding Sokoto are—Clapperton's Journeys in the early part of the 19th century ; Barth's Travels in Central Africa between 1849 and 1855—a perfect mine of information ; and Rollfs's Reise durch Nordafrika vom Mittelmeer nach dem Tschad-See in 1866-67. Among later and ininor travellers have been Flegel, who visited Sokoto in 1880, and Thomson, who conducted a commercial and political mission to the court of the sultan in 1885,

SOLAN GOOSE. See Gannet.

SOLARIO, Antonio (c. 1382-1455), a painter of lead- ing importance in the Neapolitan school, is commonly called Lo Zingaro, or The Gipsy. His father is said to have been a travelling smith. To all appearance Antonio was born at Civita in the Abruzzi, although it is true that one of his pictures is signed 'Antonio de Solario Venetus," which may possibly be accounted for on the ground that the signature is not genuine. Solario is said to have gone through a love-adventure similar to that of the Flemish painter, Quintin Massys. He was at first a smith, and did a job of work in the house of the prime Neapolitan painter Colantonio del Fiore; he fell in love with Colantonio's daughter, and she with him; and the father, to stave him off, said if he would come back in ten years an accomplished painter the young lady should be his. Solario studied the art, returned in nine years, and claimed and obtained his bride. The fact is that Colantonio del Fiore is one of those painters who never existed; consequently his daughter never existed, and the whole story, as relating to these particular personages, must be untrue. Whether it has any truth, in relation to some un- identified painter and his daughter, is a separate question which we cannot decide. Solario made an extensive round of study,—first with Lippo Dalmasio in Bologna, and afterwards in Venice, Ferrara, Florence, and Rome. On returning to Naples he rapidly took the first place in his art. His principal performance is in the court of the monastery of S. Severino—twenty large frescos illustrat- ing the life of St Benedict, now greatly decayed; they present a vast variety of figures and details, with dexterous modelling and colouring. Sometimes, however, Lo Zingaro's colour is crude, and he generally shows weakness of draughtsmanship in hands and feet. His

tendency is that of a naturalist,—the heads life-like and individual, and the landscape backgrounds better invented and cared for than in any contemporary. In the Studj gallery of Naples are three pictures attributed to this master, the most remarkable one being a Madonna and Child Enthroned with Saints. The heads here are reputed to be mostly portraits. Solario initiated a mode of art new in Naples ; and the works painted between his time and that of Tesauro are locally termed “Zingareschi.” He had many scholars, but not of pre-eminent standing— Nicola Vito, Simone Papa, Angiolillo Roccadirame, Pietro and Ippolito dal Donzello. It has often been said that Solario painted in oil, but of this there is no evidence.

SOLDER is a metallic alloy or metal employed for cementing or binding together two metallic surfaces. The solder is applied to the surfaces to be united in a molten state, and it is therefore generally either a more fusible body than the metal to be acted on or it is presented in a more fusible condition. The process of autogenous soldering consists in uniting the individual metallic edges themselves by melting and fusing them in the heat of the oxyhydrogen blowpipe or by means of an ignited blast of mixed coal gas and air. Autogenous soldering is extensively used in connexion with large plumber work. Ordinary solders are divided into hard and soft classes, the hard comprising such as require a red heat for their melting. The soft solders used by plumbers and tinsmiths consist of variable mixtures of lead and tin, and for pewterers’ use bismuth is added to these. The hardest brazing solder has equal parts of copper and zinc, and for softer qualities increased amounts of zinc with tin and sometimes antimony are employed. For fine jewellery alloys of gold, silver, and copper are used ; silver solder is employed for inferior qualities, and even common soft solder finds extensive employment in the jewellery trade. Silver is the proper solder for German silver manufactures

also; and gold is the medium for joining the edges of platinum vessels. In soldering, the metallic edges to be united must be free from oxidation and dirt ; and to keep them unoxidized during the operation several fluxes are used, such as borax in brass soldering, rosin and solution of zinc chloride for tin-plate, zinc chloride for zinc, rosin and tallow for lead and tin, and olive oil in pewter work. Special machinery has been devised for the soldering of the tinned cases now so extensively employed in the preserved

food trade. In common soft soldering the solder is melted and applied to the joint by a heated iron or copper soldering bolt, but solders are also applied by being melted on in the open fire, or in the muffle furnace, by immersing the joint in a bath of molten solder, or by pouring the molten material on the joint. In dealing with liard solders the leat of the blowpipe flame is used.

SOLE. Soles are a group of Flat-Fishes (Pleuronec- tudx), which is represented by numerous species in all suit- able localities within the temperate and tropical zones ; they become, however, scarce in the southern parts of the southern temperate zone, and are absent altogether in some districts—for instance, on the coasts of southern Australia. Many of the species enter fresh water freely, and some have become thoroughly acclimatized in it. Soles are a highly specialized type of flat-fish; their mouth is very narrow, twisted round to the blind side, and small teeth are developed on that side only. As they always lie or swim on one side, the pectoral fins have ceased to have a function, and consequently these organs are reduced in size, and in many of the species are mere rudiments or are lost entirely. The eyes are small, invariably on the right side of the fish, the upper occupying a position more or less in advance of the lower. Soles are littoral fishes, inhabiting sandy bottoms, shifting with the season from shallow into somewhat deeper water. Like all flat-fishes they are carnivorous, but feed on small animals only; none attain to a large size, scarcely exceeding that of 2 feet. Of the forty species known of the genus Solea, four are found on the British coast; the one most gene- rally known and commercially most important is the Common Sole (Solea solea) ; it seems to occur in greater or less abundance on all flat coasts of Europe, but its numbers have been considerably thinned within the last quarter of a century, at least on the British coasts, doubt- less in consequence of the introduction of the trawl. At any rate, that over-fishing is the cause of the decrease of this valuable table fish is amply proved by the fact that simultaneously with the quantity the average weight of the fish has been diminished, soles of 12 inches in length and of 8 ounces in weight being now in many localities the largest that can be obtained. At present young specimens form the majority of the soles in the market, and are sold under the names of ‘‘slips” or “ tongues.” During the breeding-season, which falls in the months from February to April, soles lose much of their flavour. It is a singular fact that male soles seem to be almost unknown, and some ichthyologists account for it by sup- posing that the males remain much

smaller than the females, and are overlooked in consequence. The Lemon Sole (Solea aurantiaca) is much less esteemed than the common sole, and more rarely seen in the market, prob- ably because it is locally distributed in deeper water. It is of a yellow colour, marbled with brown and irregularly spotted with black; the pectoral fin is ornamented with an ovate black spot on its hinder half. Even when this bright coloration has disappeared in the fish after death, it may always be distinguished from the common sole by its large dilated nasal opening on the blind side, which is surrounded by a broad fringe. The Variegated Sole (Solea variegata) is at times taken in considerable numbers XXII. — 32

on the south coast by meaus of the trawl, and esteemed as a table fish. It differs from the two preceding species by the rudimentary condition of the pectoral fins, that of the blind side being minute. The colour is brown; darker bands cross the body, and are darkest on the dorsal and anal fins, where they appear as a row of about six large spots. It does not appear to grow to the same size as the common sole. The fourth British species, Solea minuta, is still smaller, not much exceeding 5 inches in length ; it is therefore not of commercial importance, although it may be caught at times in the trawl in large numbers. As in the preceding species, the pectoral on the blind side is minute, but that of the right side is large enough to show a distinct black spot. The colour of the body is brownish or greyish, with small black spots, and every sixth or seventh ray of the dorsal and anal fins is black.

Flat-fishes resembling soles abound on the shores of the Indian Ocean beside the true soles, but they have the eyes on the left side of the head and lack pectoral fins altogether. ‘They have been referred, therefore, to distinct genera, such as Plagusia and Cynoglossus.

SOLEURE, or Sototuurn, is one of the cantons of Switzerland, ranking as tenth in the Confederation, and taking its name from its chief town. As it consists simply of the territories won by the city, its irregular shape is easily accounted for. It takes in most of the valley of the Aar between the towns of Soleure and Olten, but stretches across the eastern Jura to Dornach not far from Basel, while to the south it tends in the direction of Bern. The total

area is 305°9 square miles, of which all but 254 square miles is classed as ‘‘ productive,” 103°3 square miles of this being covered by forests. In other words, 91°7 per cent. is fertile. The highest point in the canton is the Hasenmatte (4754 feet), in the range behind the town of Soleure, in which too is the Weissenstein (4213 feet), so well known as a great centre for the air and whey cure, as also for its fine view. In 1880 the population of the canton was 80,424 (an increase of 5754 on the census of 1870), the women outnumbering the men by 1704. Of these no fewer than 79,514 are German-speaking.

Soleure now includes 63,037 Roman Catholics to 17,114 Protestants, but in the ten years 1870-1880 the latter increased by 4666, the former only by 965. Ecclesiastic- ally the districts now forming part of the canton belonged till 1814 to the dioceses of Lausanne, Basel, and Con- stance; but since the complete reorganization of 1828 it is part of the diocese of Basel, and the bishop of Basel lives in the city of Soleure.

The only places of any size in the canton are its capital, Soleure (7668 inhabitants), which possesses the finest armoury in Switzerland, and Olten (3979). It is counted as one of the most fertile and productive cantons in the Confederation, and exports iron, wood, marl, marble, glass, &e. In educational matters it takes a high place, and its two chief towns are connected by a railway, Olten being one of the principal railway junctions in Switzerland, and the meeting-place of the St Gotthard railway with the main lines branching off to the north, east, and west.

An old rhyme claims for the town of Soleure the fame of being the oldest place in “Gallia” save Treves. Certainly its name “Salodurum” is found in Roman inscriptions (the termination possibly pointing to a Celtic origin), and its position as command- ing the approach to the Rhine from the south-west has led to its being more than once strongly fortified. Situated just on the borders of Alamannia and Burgundy, it seems to have inclined to the latter allegiance, and it was at Soleure that in 1038 the Burgundian nobles made their final submission to the emperor Conrad IJ. The medieval town grew up round the house of secular canons founded in honour of St Ursus and St Victor (two of the Theban legion who are said to have been martyred here in the 3d eentury) by Queen Bertha, either the mother of Charlemagne

and wife of Pippin (8th century) or the more famous wife of Rudolph II., king of Burgundy (10th century), and was naturally in the

diocese of Lausanne. The prior and canons had many rights over the town, but criminal jurisdiction and the “advocatia” of the house remained with the kings of Burgundy, passed to the Ziringen dynasty, and on its extinction in 1218 reverted to the emperor. The city thus became a free imperial city, and in 1252 shook off the jurisdiction of the canons and took them under its protection, In 1295 we find it allied with Bern, and this connexion is the key to its later history. It helped Bern in 1298 in the great fight against the nobles at the Dornbiihl, and again at Laupen in 1339 against the jealous Burgundian nobles. It was besieged in 1322 by Duke Leopold of Austria (the defeated of Morgarten) during the struggle for the empire, but he was eompelled to withdraw. In the 14th eentury the government of the town fell into the hands of the guilds, which practically filled all the public offices. Through Bern (which became a member in 1853) Soleure was drawn into association with the Swiss Confederation. An attempt to surprise it in 1382, made by the decaying Kyburg branch of the Hapsburgs, was foiled, and resulted in the admittance of Soleure in 1385 into the Swabian League and in its sharing in the Sempach war. Though Soleure took no part in that battle, she is included in the Sempach ordinance of 1893 and in the great treaty of 1894 by which the Hapsburgs renounced their elaims to all territories within the Confederation. In 1411 she in vain sought to be admitted into the Confederation, a privilege only granted to her in 1481 at the diet of Stanz, after fie iad taken part in the Aargau, Italian, Toggenburg, and Burgundian wars. It was also in the 15th century that by purchase or eonquest the town acquired the main part of the territories forming the present canton. In 1529 the majority of the “communes” went over to the Reformers, and men were sent to fight on Zwingli’s side at Kappel (1531), but in 1538 the old faith regained its sway, and in 1586 Soleure was a member of the Golden or Borromean League. Though the city ruled the surrounding districts, the peasants were fairly treated, and hence their revolt in 1653 was not so desperate as in other places. Soleure was the usual residence of the French ambassador, and no doubt this helped on the formation of a “ patriciate,” for after 1681 no fresh citizens were admitted,

and later we find only twenty- five ruling families distributed over the eleven guilds. Serfage was abolished by Soleure in 1785. The old system of the city ruling over eleven bailiwicks came to an end in Mareh 1798, when Soleure opened its gates to the French army. She was one of the six “directorial” cantons under the 1808 constitution. In 1814 the old aristocratic government was set up again, but this was finally broken down in 1839, Soleure in 1832 joining the League of the Seven to guarantee the maintenance of the new cantonal constitutions. Though distinctly a Roman Catholic canton, she did not join the “ Sonderbund,” and voted in favour of the federal constitutions of 1848 and 1874. Since 1830 she has revised her constitution in 1840, 1850, 1856, and 1875, besides three partial revisious of 1867, 1869, and 1881. The present constitution may be described as an ultramontane democracy, the priests having very great influence. The “Kantonsrath” or iaeletine assembly is elected by all citizens over twenty years of age, in the proportion of one member to 800 inhabitants. This assembly selects the “ Regierungsrath ” or executive, consisting of five members. In both cases the period of office is five years, though on the demand of 4000 citizens a popular vote must be taken as to whether the existing members shall continue to sit or not. In the eanton the “obligatory referendum” and the “initiative” are legal. By the former all laws passed by the assembly, and all financial resolutions involving the expenditure of 100,000 francs or of an annual sum of 20,000 francs, must be approved by a popular yote. By the latter 2000 citizens can compel the assembly to consider any proposal for making a new law or for amending an old one. Further, the demand of the majority of the assembly or of 3000 citizens 1s sufficient to necessitate a popular vote as to the advisability of revising the constitution, the revised draft itself requiring a further popular vote.

SOLI, an ancient town of Asia Minor, on the coast of Cilicia, between the rivers Lamus and Pyramus, from each of which it is about 62 miles distant. Colonists from Argos in Greece and Lindus in Rhodes are described as the founders of the town, which is first mentioned in history at the time of the expedition of the younger Cyrus. In the days of Alexander the Great it was 80 wealthy that that conqueror exacted from its inhabitants a fine of 200 talents. In the war between Mithradates and the Romans Soli was destroyed by Tigranes, but it was subsequently rebuilt by Pompey, who settled there many of the pirates whom he had captured, and called the town after

himself, Pompeiopolis. Soli was the birthplace of Chrysippus the Stoic and of the poets Philemon and Aratus. The bad Greek spoken there gave rise to the

term coAotxicpos, ‘solecism,” which has found its way into all the modern languages of Europe. Extensive ruins still mark the site of the town; the place is now called Mezetlu.

SOLICITOR. See Arrorney. It should be noticed that by the Supreme Court of Judicature Act, 1873, § 87, all persons admitted as solicitors, attorneys, or proctors of any English court, the jurisdiction of which was transferred by the Act to the High Court of Justice or the Court of Appeal, were thenceforth to be called solicitors of the supreme court. The title of attorney-general, however, still remains as that of the highest law officer of the crown. The Legal Practitioners Act, 1876, and the Solicitors Act, 1877, enabled solicitors to practice as proctors in the eccle- siastical courts (see Procror). The Conveyancing Act, 1881, having made great changes in the practice of con- veyancing, it became necessary to place the remuneration of solicitors upon a new basis. This was done by the Solicitors Remuneration Act, passed on the same day as the Conveyancing Act. It provides for the framing of general orders, fixing the principles of remuneration with reference inter alia to the skill and responsibility involved, not, as was generally the case before, with reference simply to the length of the documents perused or prepared. General orders in pursuance of the Act were issued in

1882.

In Scotland solicitors in the supreme court are not, as in England, the only persons entitled to act as law agents. They share the privilege with writers to the signet in the supreme court, with solicitors at law and procurators in the inferior courts. This difference is, however, now of little importance, as by the Law Agents Act, 1873, any person duly admitted a law agent is entitled to practise before any court in Scotland. In the United States the term solicitor is used in some States in the sense which it bore in England

before the Judicature Act, viz., a law agent practising before a court of equity.

Many of the great public offices in England and the United States have their solicitors. In England the treasury solicitor fills an especially important position. He is responsible for the enforce- ment of payments due to the treasury. The office of queen's proctor is now combined with that of treasury solicitor. Under his powers as queen's proctor the treasury solicitor acts as administrator of the personal estate of an intestate which has lapsed to the crown, and intervenes in cases of divorce where collusion is alleged (see Drvorce). Since the Prosecution of Offences Act, 1884, he has'also acted as director of public prosecutions. In the United States the office of solicitor to the treasury was created by Act of Congress in 1830. His principal duties are to take measures for protecting the revenue and to deal with lands acquired by the United States by judicial process or vested in them by security for payment of debts.

SOLICITOR-GENERAL. See ArrorNey-GENERAL. The position of the solicitor-general for Scotland in the main corresponds with that of the English solicitor- general, He is next in rank to the lord-advocate. In the United States the office of solicitor-general of the United States was created by Act of Congress in 1870.

SOLIMAN, or Sunerman, sultan of the Ottomans, surnamed The Magnificent, born about 1490, was the only son of Selim I., whom he succeeded in 1520. He died while he was besieging Sziget in Hungary, on September 5, 1566. See Turkey.

SOLIMAN, or Suteman, shah of Persia. vol. xviii. p, 639.

SOLINGEN, a Prussian town, in the province of the Rhine, stands on a height near the Wupper, 13 miles east- by-south of Diisseldorf. It is one of the chief seats of the German iron and steel industry, its specialty consisting in all kinds of cutting implements of steel. Solingen sword- blades have been celebrated for centuries, and probably form part of the equipment of every modern army, while bayonets, knives, scissors, surgical instruments, files, steel frames, and the like are also produced in enormous quan- tities.

These articles are largely made by the workmen at their own homes and supplied to the depéts of the large

See Persia,

dealers ; there are about 30,000 workers in steel in Solin- gen and its vicinity. The population of the town in 1885 was 18,643, of whom three-fourths were Protestants.

Solingen is an ancient place, and received its town charter in 1374. Sword-blades have been made here since the early part of the Middle Ages, and tradition affirms that the art was intro- duced during the crusades by smiths from Damascus.

SOLIS, Anronro DE (1610-1686), Spanish dramatist and historian, was born in 1610 at Alcala de Henares, and studied law at Salamanca, where he is said to have produced a comedy which was acted in 1627. About 1640 he became secretary to the duke of Oropesa, whom he accompanied in various official missions; in 1654 he became one of the secretaries of Philip IV., and afterwards he was appointed chronicler. In his later years he joined one of the religious orders. He died at Madrid in 1686.

Of the nine extant plays of Solis two at least haye some place in the history of the drama,—I Amor al Uso (“Love & la Mode”) having afterwards been adapted by T. Corneille, while La Gitanilla de Madrid (“ The Gipsy of Madrid ”), itself founded on the “ novela” of Cervantes, has been made use of by Rowley and Middleton, P. A. Wolff, and, directly or indirectly, by other more recent authors. The titles of the remaining seven are Triunfos de Anvor y Fortuna, Hrudice y Orfeo, El Alcazar del Secreto, Lus Amazonas, Lil Doctor Carlino, Un Bobo haze ciento, and Amparar al Enemigo. The Historia de la Conquista de Mejico, covering the three years between the appointment of Cortes to command the invading force and the fall of the city, deservedly ranks as a Spanish prose classic. It first appeared in 1684; there have been numerous reprints, the most recent being that published with notes by Revilla (Paris, 1858); an English translation by Townshend appeared in 1724. A volume of Poesias sagradas y hwmanas by Solis was

published in 1692, and several unimportant letters of his may be read in the Hpistolario Espaitol of Rivadeneyra.

SOLOMON (Hebrew Mi57¥, Shelamé for Shélomon, “man of peace”; the English form follows the YoAspwv of N.T. and Josephus; the Latin Salomo agrees with YoAduur, one of several variant forms shown in MSS. of the LXX.), son of David by Bathsheba, and his successor in the kingdom of Israel. The reign of Solomon has been sketched in IsraEt (vol. xili. p. 405), and his relation to the philosophical and proverbial literature of the Hebrews, the so-called chokma, or “wisdom,” has been critically considered in the article Proverss. The political system of Solomon fell to pieces at his death, but the fame of his wisdom and splendour in succeeding generations was all the greater that none of his successors at Jerusalem was in a position to rival him. The many floating and frag- inentary notes of various dates that have found a place in the account of his reign in the book of Kings (q.v.) show how much Hebrew tradition was occupied with the monarch under whom the throne of Israel reached its highest glory; and that time only magnified in popular imagination the proportions of so striking a figure appears alike in the unfriendly picture of Solomon in the Song of Solomon (originally, it would seem, sketched in the Northern kingdom, however much it may have been retouched and overlaid by additions of later date—see CanrTictEs) and in the monologue of EcciusiasTes (9.v.) placed in the mouth of the wise king who had tasted all that life can offer by one of the latest writers of the Old Testament. In the apocryphal book of Wisdom, again, the composi- tion of an Egyptian Hellenist, who from internal evidence is judged to have lived somewhat earlier than Philo, Solomon is introduced uttering words of admonition, imbued with the spirit of Greek philosophers, to heathen sovereigns. The so-called Psalter of Solomon, on the other hand, a collection of Pharisee psalms written in Hebrew soon after the taking of Jerusalem by Pompey, and pre- served to us only in a Greek version, has nothing to do with Solomon or the traditional conception of his person, and seems to owe its name to a transcriber who thus distinguished these newer pieces from the older “Psalms

of David.”! In New Testament times Solomon was the current type alike of magnificence and of wisdom (Matt. vi. 29; Luke xi. 31). But Jewish legend was not content with this, and, starting from a false interpretation of Eccles. ii. 8, gave him sovereignty over demons, to which were added (by a perversion of | Kings iv. 33) lordship over all beasts and birds, and the power of understanding their speech. These fables passed to the Arabs before the time of Mohammed (Nabigha, i. 22), found a place in the Koran, and gave Solomon (Suleiman) a lasting fame throughout the Moslem East. The story of Solomon, the hoopoe, and the queen of Sheba in sur. xxvii. of the Koran closely follows the second Targum to Esther i. 2, where the Jewish fables about him may be read at large: Solomon was supposed to owe his sovereignty over demons to the possession of a seal.on which the “‘most great name of God” was engraved. See Lane, Arabian Nights, introd., note 21, and chap, i. note 15.

SOLOMON, Sone or. See CANTICLEs.

SOLOMON, Wispom or. See APocRYPHA.

SOLOMON ISLANDS, an extensive group of islands, the largest and as yet least known of any in the Pacific Ocean, though among the very first that were discovered. They form a double chain of seven large and many small islands, extending for over 600 miles in a north-west and south-east direction between 5° 8. lat., 154° 40’ E. long., and 10° 54’ S. lat., 162° 30’ E. long. The northern extremity stretches to within 120 miles of New Ireland, the south-eastern point to 200 miles west of Santa Cruz, and the nearest portion of New Guinea lies about 400 miles to the south-west of the group.? See vol. xix. Plate ITI.

The Solomon Islands vary considerably both in size and character. It is as yet doubtful which of them is the largest, but seven are from 50 to over 100 miles in length and from 15 to 30 miles in breadth; several must there- fore equal the county of Cornwall in area. They are well watered, though the streams seem to be small; their coasts afford some good harbours.? All the large and some of the smaller islands appear to be composed of ancient volcanic rock, with an incrustation of coral limestone showing here and there along the coast. Their interior is mountainous, and Guadalcanal, where there is an active volcano, reaches an altitude of 8000 feet. Malanta

and Christoval are over 4000, Ysabel and Choiseul 2000 feet high. The mountains of the latter fall steep to the sea, and the whole of its north-east portion forms an elevated wooded plain. There is some level land in Bougainville, which is also said to possess an active volcano. Every traveller has extolled the beauty and fertility of the islands. In San Christoval deep valleys separate the gently-rounded ridges of its forest-clad mountains, lofty spurs descend from the interior, and, running down to the sea, terminate, on the north, in bold rocky headlands 800 to 1000 feet in height, while, on the south, they form and shelter bays of deep water. On the small high island of Florida there is much undulating grass land, interspersed

1 The most ancient tradition, that of the LXX., gives Solomon no part in the authorship of the canonical psalter ; see vol. xx. p. 29.

2 Tslands of the Archipelago.—The larger are—in the eastern chain, Bougainville, Choiseul, Ysabel, Malanta; and in the western chain, New Georgia, Guadalcanal (often misspelt Guadalcanar), San Christoval. The smaller are—Buka (the most northern), Shortland, Treasury, aro, Simba (Eddystone), Rubiana, Hammond, Marsh, Savo, Buena Vista, Anuda, Ngela (Florida), Ulawa (Contrariété), Ugi, Three Sisters, Sta Anna, Sta Catalina, Bellona, Rennel (the most southern). Mendafia mentions seeing near Buena Vista a small island in a state of violent eruption; he named it Sesarga. Ongtong Java is a group of coral islands in the north-east, but it does not, geographically, form part of the group.

3 Blanche Bay, Bougainville; Port Praslin, Ysabel; Maruvo, New . Georgia; Port Wiseman, Florida; Curagoa Harbour in Maran Sound,

Guadalcanal; Recherche Bay, Makira Bay, and Vanga Harbour, San Christoval.

with fine clumps of trees; but patches of cultivated land surround its numerous villages, and plantations on the hill-sides testify to the richness of its soil. To the south of Choiseul lies a small cliff-girt islet, Simba (Shortland’s Eddystone), with a peak ending in acrater 1200 feet high, on

the side of which are a solfatara and two boiling springs. It is inhabited, and has a small safe harbour. Surgeon Guppy, late of H.M.S. ‘“‘ Lark,” has recently made valuable geological observations in the north and south of the group. The whole chain of islands appear to be rising steadily, and traces of ancient upheaval are very general,— for instance, Treasury Island, where a coral-encrusted volcanic peak has been raised 1200 feet, and the atoll of Sta Anna, the ring of which now stands hundreds of feet above the present level of the sea. Some of the smaller islands are of recent calcareous formation. Barrier and fringing reefs, as well as atolls, occur in the group, but the channels between the islands are dangerous, chiefly from the strong currents which set through them.

The climate is very damp and debilitating. The rain- fall is unusually heavy. Fever and ague prevail on the coast, but it is likely that the highlands will prove much more healthy. The dry season, with north-west winds, lasts from December to May.

A comparatively shoal sea—under, 1000 fathoms— surrounds the Archipelago, and, including the New Britain and Admiralty Islands, stretches to New Guinea and thence to Australia. This sufficiently accounts for the Papuan character of its fauna, of which, however, it is the eastern limit, in spite of the fact that this shoal water extends to the extreme south of the New Hebrides. Here the strange little marsupial the cuscus (see PHaLANGER) is still to be met with; the hornbill, the cockatoo, the crimson lory, and birds of a dozen other genera have already been discovered, ‘‘all,” as Wallace remarks, ‘highly characteristic of the Moluccas and New Guinea, and quite unknown in any of the more remote Pacific islands.” But, like the New Hebrides, the Solomon Islands possess a megapode (Jf. brenchleyi) which is peculiar to itself. An alligator frequents the coast, and the sea teems with fish. Insects seem to be fairly well repre- sented. The flora has been even less studied than the zoology, but it also shows strong Papuan affinities. Vege- tation is most luxuriant: unbroken tracts of magnificent forest clothe the mountains, where sandalwood, ebony, and lignum vitee have already been found. Mangrove swamps are common on the coasts.

The Solomon Islanders, excepting those of Bellona and Rennell in the south, and Ongtong Java in the north—who are pure Polynesians—are a small sturdy Melanesian race, taller in the north than in the south, but averaging about 5 feet 4 inches for men, and 4 feet 9 inches for women. They are well proportioned, with nicely rounded limbs. Projecting brows, deeply-sunk dark eyes, short noses, either straight or arched, but always depressed at the root, and moderately thick lips, with a somewhat receding chin, are general characteristics. The expression of the face is not unpleasing. The mesocephalic appears to be the preponderant form of skull, though this is unusual among Melanesian races. In colour the skin varies from a black-brown to a copperish hue, but the darker are the most common shades. The hair is dark, often dyed red or fawn. Crisp, inclining to woolly, it naturally hangs in a mop of ringlets 8 to 8 inches in length; but, when carefully tended, it forms one smooth bush—the usual fashion for

both sexes. Epilation is practised; little hair, as a rule, grows on the face, but hairy men are not rare.4 Skin diseases are pre- valent.

The Solomon Islanders are intelligent, of a quick and nervous temperament, crafty, thievish, and revengeful, yet, quickly amen- able to good treatment, they make faithful servants. They are fond of dancing; their music is a monotonous chant with an

4 On the islands in Bougainville Strait tribes with lank, almost straight, black hair and very dark skin are found. The mountains of the large islands seem to be thinly inhabited by a smaller and ruder race, with whom the coast tribes wage perpetual war and for whom they express great contempt.

accompaniment of bamboo drums. They make pan-pipes and jew’s harps. Of their religion and manners and customs very little is known. Their language is of pure Melanesian type though a number of dialects are spoken throughout the group,—many even on the same island. Broken into numerous clans, they are rarely at peace with each other; but the attention bestowed on planta-. tions proves them good agriculturists. Yams, arum-roots, bread- fruit, cocoa-nuts, and fish constitute the chief of their food. Pigs, dogs, and fowls are also eaten, and, as these are mentioned by Men-

dana, they must have been known in the islands for over three hundred years. The islanders are great betel-chewers, but little palm arrack or kava seems to be drunk. © The respect paid to chiefs and elders varies in different islands, They are cannibals, though to what extent isunknown. Trophics of human skulls are common, and preserved heads—the face inlaid with shell—have been procured in Guadalcanal and Rubiana. They are said to pay honour to departed spirits. Carvings representing both men and animals often form the posts of houses and sheds, and adorn the prows of canoes. Thcir houses are square or oblong, strongly built, with high projecting roofs, which sometimes, as in their canoe-sheds, almost reach to the ground. The floor-mats are very rough. Large halls and spirit-houses exist in some of the villages, and great care and skill are bestowed on their decoration.) Great nicety of finish characterizes their weapons. They are mostly light and graceful, and consist of bows and arrows, spears, and clubs ; the sling seems unknown. Some of the spears have the barbed head carved out of a human leg or arm bone; others, if not cut out of the solid. wood, have bones, thorns, or splinters of wood attached ina most masterly manner. Arrows are similarly fashioned, and their reed shafts ornamented with incised lines. None of them appear to be poisoned. The bows, often large and powerful, are made of palm-wood or a strip of bamboo. Clubs vary considerably in shape; their butts are sometimes covered with finely-plaited coloured grass. Some, which are long and slight, are sickle- or scythe-like, others lanceolate or spoon-shaped ; and some, smaller, resemble a very broad dagger. This is, in the Pacific, the eastern limit of the shield. It is an unknown weapon in the other islands —Melanesian as well as Polynesian, —but to the west, in the New Britain group, and in New Guinea, various forms of it occur, whence, through the Malay islands, it may be traced back to the Asiatic continent. The shield is also used by the Australians. That of the Solomon Islanders is made of reeds, and is of an oval or oblong form. Their canoes are built of planks sewn together and caulked, and are the most beautiful in the Pacific. “They are very light, slim, and taper, 20 to 60 feet in length, with 1 to 3 feet beam, but they balance so well that an outrigger is dispensed with. The high carved prow and stern—which are said to act as a shield from arrows when stem on—give the craft almost a crescent shape. These and the gunwale are tastefully inlaid with mother-of-pearl and wreathed with shells and feathers. Sails are not used, but the narrow pointed paddles propel the canoes with great speed through the

water.2 Graceful bowls, with some bird or animal for model, are also made. They are cut out of the solid, and sometimes measure over 8 feet in length. Stone adzes appear to be now used only in the interior and in the north of the group. They are well ground, flat and pyriform in shape, and very different from any made in the neighbouring groups of islands. Clothing is of the scantiest. Both men and women not unfre- quently go naked ; but, as a rule, some slight covering is worn, and neatly-made fringed girdles are used in some districts. Tattooing and scarring of the body is but slightly practised. Ornaments are used in profusion, and often are very tasteful. Carved wooden belts, coloured shell-bead bands, and a variety of armlets, combs, and feather head-dresses are worn, also shell disks covered with tortoise-shell fretwork. Necklaces of teeth and shell are common and multiform ; one much prized is made of human incisors. The ears, and, in men, the scptum of the nose, are pierced, —frequently, also, the cartilage of one or both nostrils. In these the strangest ornaments are inserted, such as tortoise-shell rings, bones, teeth, shells, crab-claws, and the like.? fistory.—The Spanish navigator Mendafia must be credited with the discovery of these islands, though it is somewhat doubtful whether he was actually the first European who set eyes on them. He sailed from Callao in 1567, by command of the governor of Peru, to discover the southern continent, the presumed existence of which in the then unknown region between America and Asia had already given rise to much speculation ; but he seems to have been strangely unfortunate. Sailing west he discovered only a few coral islets (?Ellice group) until, having crossed more than 7000 miles of ocean, he fell in with an archipelago of large islands. By. their size and position he considered them to form part of the land

1 See frontispiece to Brenchley’s Curacoa.

- Rude outrigger canoes with mat sails are used in some parts of the archipelago.

3 Of the island manufactures fine specimens may be seen in the British, Cambridge, and Maidstone museums.

. two.

he was in search of, and in pleasing anticipation of their natural riches he named them Islas de Salomon. The expedition surveyed the southern portion of the group, and named the three large islands San Christoval, Guadalcanal, and Ysabel. On his return to Peru Mendafia endeavoured to organize another expedition to colonize the islands, but it was not before June 1595 that he, with Quiros as second in command, was enabled to set sail for this purpose. The Marquesas and Santa Cruz Islands were now discovered ; but on these latter islands, after various delays and troubles, Mendaiia died, and the expedition eventually collapsed.

Even the position of the Solomon Islands was now veiled in uncertainty, and they were quite lost sight of until, in 1767, two centuries after their first discovery, Carteret lighted on their eastern shores at Gower Island, and passed to the north of the group, Without, however, recognizing that it formed part of the Spanish discoveries. In 1768 Bougainville found his way thither. He discovered the. three northern islands (Buka, Bougainville, and Choiseul), and sailed through the channel which divides the latter t In 1769 Surville explored the east coast, and was the first, in spite of the hostility of the natives, to make any lengthened stay in the group. He brought home some detailed information con- cerning the islands, which he called Terres des Arsacides; but their identity with Mendafia's Islas de Salomon was soon established by French geographers, In 1788 Shortland discovered New Georgia, with some of the smaller islands ; and in 1792 Manning sailed through the strait which separates Ysabel from Choiseul and now bears his name. In the same year, and in 1798, D'Entrecasteaux surveyed portions of the coast-line of the large islands. In 1794 Butler visited the group, and Williamson in the " Indispensable " explored the channels which divide Guadalcanal from San Christoval and Ysabel from Malanta. There was a break of nearly half a century before D'Urville in 1838 took up the survey.

Traders now endeavoured to settle in the islands, and missionaries began to think of this fresh field for labour, but neither met with

much success, and little was heard of the islanders save accounts

of murder and plunder perpetrated by them. In 1845 the French Marist fathers went to Ysabel, where Mgr Epaulle, first vicar-apostolic of Melanesia, was killed by the natives soon after landing. Three years later

this mission had to be abandoned; but since 1881 work has again been resumed. In 1856 John Coleridge Patteson, afterwards bishop of Melanesia, paid his first visit to the islands, and native teachers trained at the Melanesian mission college have since establishcd themselves there, as well as a few traders. About this date the yacht ‘‘Wanderer” cruised in these seas, but her owner was kidnapped by the natives and never afterwards heard of. In 1878 the “foreign-labour” traffic in plantation hands for Queensland and Fiji extended its baneful influence from the New Hebrides to these islands. Noteworthy recent visits are those of H.M.S. “Curagoa” in 1865, H.M.S. ‘“‘Blanche” and Mr C. F. Wood’s yacht in 1872, the German war-ship “Gazelle” in 1876, and H.M.S. “Lark” in 1881-84.

See Dalrymple, Voyages and Discoveries in the South Pacific Ocean (Spanish

| voyages), 1770, i.; Hawkesworth, Collection of Voyages (Carteret, &c.), 1792,

i.; Fleurien, Decouvertes des Francois en 1768 et 1769 (Spanish voyages and Surville); Labillardiere (D’Entrecasteaux), Recherche de La Pérousé, 1791-9), i.; Dumont d’Urville, Voyage au Pole Sud, d&c., 1837-40, v., and Voyage autour du Monde, ii.; Meade, Ride through the Disturbed Districts of New Zealand, &c.; Brenchley, Cruise of JI.M.S. ‘‘ Curacoa,” 1865; Wood, Yachting Cruise tn the South Seas; Romilly, The Western Pacific, &c.; Schleinitz, ‘‘ Geogr, u. Ethnogr. Beobachtungen auf Neu Guinea, &c.” (S.M.S. Gazelle, 1874-76), Zetts. Ges. Erdkunde, xii., 1877+: Guppy, ‘‘ Recent Calcareous Formations of the Solomon Group,” Z’rans. Roy. Soc. Hdin., xxxii., and “ Physical Characters of the Solomon Islanders,” Journ. Anth. Inst., xv. ; Flower, Cat. Mus. Royal Coll. of Surgeons, pt. 1, Man; Codrington, The Melanesian Language ; Meinicke, Die Inseln des Stillen Oceans; Wallace, Australasia; Yonge, Life of Bishop Patteson; Redlick, “A Cruise among Cannibals,” Geogr. Review, i. (A. v. H.)

SOLON. The legislation of the Athenian Solon, which to a large extent moulded the subsequent political life of Athens, belongs to the early part of the 6th century 3.c.4 It followed almost immediately on an unsuccessful attempt to overthrow the government of the aristocratic families of Attica, one of which, however, that of the Alemzonids, was driven into exile ; and

it preceded by a short interval the famous usurpation of Pisistratus. Solon had won the confidence of his fellow-citizens by having recovered for them the island of Salamis, close to the shores of Attica, an old and valued possession, which their neighbours of Megara had taken from them. Solon, himself a native of

‘Salamis, encouraged them to fight once again for the

“lovely island,” as he called it, in a short poem which he publicly recited, feigning, it is said, the excitement of a madman. Through Spartan intervention in the war between Athens and Megara Salamis was restored to the Athenians, and Solon had the credit of the result. In

4 The dates of his birth and death are approximately 638 and 559.

594 s.c. he was summoned under the constitutional title of ‘‘archon” to undertake the work of sweeping political reforms, which, in consequence of bitter party strifes and the poverty and indebtedness of the small farmers or proprietors of Attica, were sorely needed. The Athenian like the Roman debtor had often sunk, under the legalized oppression of his creditor, into an actual slave, and had from time to time been sold and exported. Many poor creatures had fled away from home, and were supporting themselves by the labour of their hands in foreign countries. Many men who still clung to their little pro- perties could, with all their pinching, barely keep their heads above water. The governing classes themselves felt that a crisis was at hand, and they appealed to Solon and made him practically dictator. Had he chosen to work on the popular discontent, he might have easily crushed the aristocracy and become a despot, or, as the Greeks called it, a tyrant, as many had done in other states of Greece by coming forward as champions of the people against the great ruling families. Solon obeyed a nobler impulse and aimed at saving his country without too violent a revolution. His first step was to give immediate relief to the poor debtor, to the wretchedly impoverished small farmer or proprietor, and to interpose between him and his creditor and landlord. On very many of the little properties of Attica were to be seen stone pillars with the name of the mortgagee and the amount of the mortgage inscribed on them. By a relief

law, ‘‘a shaking-off of burdens” (cewcax6e/a), he annulled all mortgages, justifying no doubt so extreme a measure by the harshness of the contracts imposed by mortgagees on needy tenants and proprietors and by the urgent necessity of prompt release for the multitude of such small debtors. Thus the “mortgage pillars” were swept away and the land was once more free. Such a setting aside of the rights of property, expedient as it may have been under circumstances of acute public distress, must have inflicted a heavy loss on the wealthier class, and the landlord and the mortgagee would also have a fair claim for relief. This, it appears, Solon accomplished by a device which has been variously explained, a deprecia- tion of the currency which relieved to a considerable extent—27 per cent., according to Grote’s! calculation— the wealthier debtors of the landlord and mortgagee class. Grote here remarks that, had Solon cancelled all debts and contracts, there would have been no need to interfere with the currency and lower the standard of money. His relief law could not have been so sweeping and revolu- tionary as it has sometimes been represented. There was no redistribution or confiscation of the land, no universal remission of debts. For the great majority of the people indeed there was substantial relief. The land was free from incumbrance, and the small cultivator had a fresh start in life; there was no imprisonment or slavery for the debtor; and it would seem that debtors who had sought refuge abroad were purchased back and restored to their homes. Such on the whole appears to have been the character of Solon’s first great reform, though some of the details remain obscure. The reconstruction of the political system on the principle that every citizen was to have a share in the government was Solon’s next work. A few noble families, Eupatrids, as they were called, had hitherto had all the power in their own hands. Solon made property the measure of political power, and con- fined the higher offices of state to the wealthiest citizens ; but election to these offices was to be made by the whole body of the people, the tenure of office was limited as to time, and an account had to be rendered publicly as to its exercise. The citizens were distributed into four classes 1 History of Greece, ch. xi.

SOLO”

according to a graduated scale of property, the first class being alone eligible to the archonship or highest office and to military and naval

commands. The actual administra- tion of public affairs was thus restricted to the wealthy few. The second class were the knights or horsemen—the men who could keep a war-horse for the service of the state; these were assessed at three-fifths of the amount of the first class. The third class answered to our yeomen, and had to serve as heavy-armed infantry. These three classes were subject to direct taxation in the form of a graduated income tax, which was, however, simply an extraordinary tax, levied only in special emergencies at varying amounts per cent. on a citizen's rateable property, as set down in a public schedule. The fourth and lowest and most numerous class, which supplied light troops and sailors for the fleet, was exempt from all direct taxation, but paid indirect taxes; it would be made up of small farmers, tradesmen, and artisans, and consist in fact of quite the poorest and humblest class of citizens. Its members could not hold any office ; but they had a large amount of political power through their votes in the popular assembly which elected the magistrates and called them to account, and through the very great judicial powers with which they were intrusted, and in virtue of which the Athenian juror practically decided questions both of fact and of law. Solon's constitution thus gave the people ample means of protecting themselves from mis- government and oppression, every magistrate being directly responsible to them. Not that Solon himself contemplated anything like pure democracy; there is every reason to believe he shrank from it; but pure democracy was pretty sure to follow as soon as the people distinctly realized their power. Solon's council of 400, taken exclusively from the first three classes, must have been meant to furnish the popular assembly with political guidance, and this it did by preparing and introducing measures for discussion and superintending its meetings and exercising some direction over its proceedings. It is impossible for us to define its peculiar functions precisely. It was, how- ever, ultimately under the control of the popular assembly, by which probably it was annually elected, and to which it had annually to render an account. We are not to suppose that either the council or the popular assembly originated with Solon. What he really did was to put them on a new footing, and to the latter, which previously in all probability had hardly any weight or influence, he gave greatly enlarged powers. The archons and magistrates and the council itself were elected by the popular assembly, and were responsible to it for good behaviour during their term of office. In this assembly met the citizens of all four classes, and consequently the great

majority of its members would be poor men and almost peasants. The voting was by show of hands; every voter was allowed to speak ; and in the voting there was no distinction of classes, all being on a perfectly equal footing. Although theoretically they could not originate any measure, but had to accept for discussion what had been prepared for them by the council, they had an absolute power of veto; and, as the election of the council was in their hands, it must have been easy for them to get that body to bring forward any proposal which they might wish to discuss. Thus it may be truly said that Solon laid the foundation of the future democracy. And through the Heliwa, as it was called,—a body of 6000 citizens annually elected by lot to act as jurors for the trial specially of political offences,—the people acquired 4 complete control over public affairs. There was but one proviso: the Athenian juror must be upwards of thirty years of age. In the Athenian courts which were formed out of these 6000 citizens the functions of judge and jury

were united in one and the same person, and political questions were continually decided when, as often happened, a citizen was put on his trial for some alleged illegal or unconstitutional proposal. By such means popular rights and privileges were effectually protected, and the democratic character of the constitution enlarged and confirmed, as we see in the subsequent history of Athens. Solon, indeed, retained (he did not create) the famous senate of the Areopagus, and aimed at making it respected and capable of exercising a general superintend- ence over the morals and social life of the citizens. It was to be an aristocratic body, consisting only of archons who had acquitted themselves well and honourably during their year of office. It seems that he did not attempt to prescribe to it any special or particular duties, but that he rather trusted to its making its influence felt from the fact that it was, as every one knew, composed of men of acknowledged merit and ability. Consequently, as Thirl- wall observes (Hist. of G’r., ch. xi.), “it could only exercise its powers with advantage as long as it retained the confidence of its fellow-citizens; when that was lost it became time that its legal authority should cease.” Solon evidently felt that, for a time at least, there must be checks on popular government. Had it been hinted to him that under his constitution power must finally drift down to

the lowest social stratum, he would perhaps have replied that he had endeavoured to supply the entire people with a political training which should by degrees qualify them for absolute self-government.

Solon encouraged commerce and manufacturing indus- try, and drew a number of settlers from foreign parts to Athens, on condition of their paying an annual tax and putting themselves under the protection of a citizen who was to be their legal representative—their "* patronus," according to Roman phrase. These settlers (eroiKou, "'metics") had none of the political privileges of the Athenian citizen, and they could not acquire landed

property. Many of them, however, flourished and grew

rich, and had every reason to be satisfied with their position, which, ina kindly and tolerant community like that of Athens, was continually improving. Solon, too, like all the legislators of antiquity, endeavoured to regulate every department of life, compelling the attend- ance of the youths from sixteen to eighteen at the public gymnastic schools, and requiring them to serve the next two years on garrison duty. Restraints were put upon Women as to their appearance in public, and even as to their mourning at funerals. Solon's punishments were for the most part rather lenient, and indicated a humane and generous temper. It is of course not to be supposed that all the details of his legislation were maintained, but they undoubtedly left their mark on the Athenian character. Having done his work, Solon left Athens and travelled for ten years in Egypt, Cyprus, and Asia, gathering fresh stores of knowledge for himself and giving counsel to others. One would like to believe the beautiful story Herodotus tells of his interview with Croesus, king of Lydia, whom he warned with the memorable saying that "we must not pronounce any man happy till we have seen his end." Unfortunately, Crcesus did not begin to reign till several years after Solon's travels, and with Grote we must be content to take the story as merely an " illustra- tive fiction." On his return to Athens in his old age he found the old feuds once more raging, and Pisistratus, his kinsman, and his friend in past days, intriguing for power. The two men had, it seems, a sincere respect for one another, but Solon protested against the complete surrender of the government to Pisistratus, the danger of which he publicly pointed out,

though without effect. The crisis ended in the rule, in many respects an enlightened and

beneficent rule, of Pisistratus and his sons, of which Solon lived only to see the first beginning. He died, soon after having made his honourable protest, at the age of eighty, leaving behind him the good effects of a work which only aman of rare intelligence and wide sympathies could have accomplished. He was something of a poet, and several fragments of his poems, written generally with a practical purpose, have come down to us, and throw light on his political aims and sentiments,

Grote and Thirlwall in their histories of Greece give a full ac- count of Solon's legislation. Plutarch's life of Solon, not a very critical performance, is our chief original authority. (W. J.B.)

SOLOTHURN. See Sorzurz,

SOMALI, Som4r, a Hamitic people of east Central Africa, mainly confined to the eastern "horn" of the continent, which from them takes the name of Somali Land, probably the Punt of the ligyptian records. Here they are conterminous towards the north-west with the kindred Afars (Dankali), and elsewhere with the more closely related Gallas, from whom they are separated on the south-west by the river Juba. Tajurra Bay, with the lower course of the Hawash, is usually given as the north- west frontier ; but, according to the recent explorations of Abargues de Sostén in eastern Abyssinia, there appears to be here an overlapping of the three peoples, the Isa Somali encroaching on the Afar domain north of Tajurra Bay nearly to the parallel of Asab Bay (13° N.), while the Dawari Gallas penetrate between this Somali tribe and the lower Hawash eastwards to the coast at Obok (ZS Nt). A line drawn from the Strait of Bab-el-Mandeb through the Harrar district and the headwaters of the Haines river (Webbe-Shebeyli or 'Leopard river") southwards to the equator at the mouth of the Juba will roughly define the landward frontier of the SomAli territory, which is else- where sea-girt,—by the Gulf of Aden on the north, by the Indian Ocean from Cape Guardafui to the equator.

Our first contact with the Somali people may be said to date from the English occupation of Aden in 1839. But, notwithstanding the early visits of Cruttenden, Ch. H. Johnston, Captain Burton, and one or two others, very little was known about them before the seizure of Berberah by the Egyptians in 1874. This event led to the estab- lishment of permanent relations with the coast tribes, and was followed by several excursions into the interior, of which the most fruitful in results have been those of Sacconi, Revoil, F. L. James, Paulitschke, Von Hardegger, and Josef Menge, the last three bringing our information down to the year 1885. From the reports of these ob- servers the true relations of the Somali have been gradually determined, and we now know that they form a distinct branch of the eastern (“ Ethiopic”) Hamitic stock, of which the other chief members are the neighbouring Gallas and Afars, the Abyssinian Agau, and the Bejas (Bishari) of the steppe lands between the Nubian Nile and the Red Sea. Their close affinities both in physical type and in speech with the surrounding Gallas are obvious, and like them they are described as a fine race,} tall, active, and robust, with fairly regular features, but not free from an infusion of Negro blood, as shown both in their dark, often almost black complexion, and still more in their kinky and even woolly hair, sometimes short, sometimes long enough to be plaited in tresses hanging down to the shoulders.2 Like

1 Captain Wharton, who has been recently surveying the Somali seaboard, describes the coast tribes near the equator as “the hand- somest race of men and women he had ever seen,” black in colour, but with magnificent physique (Proc. Roy. Geog. Soc., Oct., 1885). Captain F. M. Hunter also describes them as a tall, fine-looking people, with oval face, high rounded forehead, full lips, strong regular teeth, bright restless eye, but lower limbs seldom well developed (A Grammar of the Somal Language, Bombay, 1880).

- The occasional presence of “ steatopyga” (Topinard) shows that all these features are undoubtedly due to Negro intermixture.

the Gallas also they are still in the tribal state, broken up into an endless number of clans and septs, variously grouped by different writers.

According to Captain Guillain! there are three main divisions-—the Aji on the north and north- east coast, the Hawiya on the south-east coast, and the Rahhanwin in the interior. But these are reduced by James to two, Isak and Darode (apparently the Edur and Darrud of older observers), with several main branches as under :— Habr Gerhaji, south from Berberah, beyond the coast range. Habr Tjaleh, east from Berberah, north of the coast range. (Habr Awal, Berberah district. Mejertain, east coast from Guardafui to 4° north. Dolbohanti, Nogal River. Darode 4 Warsangueli, north coast, west from Guardafui. Marehan, between the Mejertain and Ogadain. Ogadain, Webbe basin, and widespread in interior.

To these, however, must be added the powerful Gadabirsi west from Berberah and the Isa (Issa) of the Hawash basin, besides the three low-caste tribes dispersed amongst the others,—Tomal (ironworkers), Ebir (dealers in charms), and Midgan (ostrich breeders).

The Somali, who are mainly Mohammedans of a somewhat fanatical type, are a fierce lawless people, impatient of control, and yielding a reluctant obedience even to their own rulers. Hence the tribal chiefs enjoy little more than a nominal authority, although some of the more powerful amongst them affect the title of sultan, At present the great Habr Gerhaji nation appears to be split into two sections, each under a chief claiming this rank. All go armed with spear, shield, and short sword, the latter exactly like that of the ancient Egyptians, whom the Somili are otherwise said to resemble more than any other African people. The weapons are freely used in their disputes, although the tribal laws against homicide are severe, heavy fines of camels or other property being imposed, which must be paid either by the criminal or the community. They are great talkers, keenly sensitive to ridicule, and quick-tempered, although amenable to’reason if they can be induced to argue the point. According to the character of the soil and climate they live a settled or nomad life, in some places breeding numerous herds of camels, goats, and fat-tailed

sheep, in others growing large crops especially of durrah, or collect-

ing the gums—frankincense and myrrh—for which the land has always been famous. The Marehan (properly Murreyhan) tribe is said to have given its name to the myrrh, which is obtained in the greatest perfection in their district, although the term seems too old to admit of this derivation, and is more probably conncted with a Semitic root mar, mur=bitter. Through the ports of Ber- berah and Zeyla, a considerable export trade to Arabia, Egypt, and India is carried on with these articles and the other natural pro- ducts of the country, such as hides, horns, ostrich feathers, coffee of a very fine quality, indigo, salt. But the natives take little part in this movement, which from remote times has been in the hands of the Indian banians settled at various points on the coast. In 1879-80 the total value of the exports was estimated at about £140,000. Like many other Mohammedan peoples, the Somali claim Arab descent, their progenitor having been a certain Sherif Ishak b. Ahmad, who crossed over from Hadramaut with forty followers about five hundred years ago. Other traditions go farther back, tracing their origin to the Himyaritic chiefs Sanhdj and Samamah, said to have been coeval with a King Afrikus, who is supposed to have conquered Africa about 400 a.p. These legends should perhaps be interpreted as pointing at a series of Arab immigra- tions, the last two of which are referred to the 18th and 15th centuries. But these intruders seem to have been successively absorbed in the Somél stock; and it is remarkable that the Arabs never succeeded in establishing permanent settled or nomad com- munities in this region, as they have done in so many other parts of the continent. Their influence has been very slight even on the Somal language, whose structure and vocabulary are essentially Hamitic, with marked affinities to the Galla on the one hand and to the Dankali (Afar) on the other. Captain Hunter's Grammar, with exercises and vocabularics (Bombay, 1880), utilizing the materials published by General Rigby in the Proceedings of the Bombay Gcographical Society (1849), is the only comprehensive treatise on the language, which appears to be spoken with great uniformity throughout the whole of Somali Land. Hunter mentions an eastern and a western dialect, differing, however, but little from one another, which is the more remarkable that there is no written standard and little oral literature, beyond some proverbial sayings, short stories inculcating certain moral teachings, and some simple love-songs. Although the rhythm is defective, these chants are

1 Documents sur Uhistoire, &c., de lV Afrique Orientale, 1856-59.

not lacking in poetical ideas, and often betray an unexpeeted refinement of feeling not inferior to that of similar compositions amongst more civilized peoples. (A. H. K.) SOMERS, Jonn (1652-1716), was born on March 4, 1652, at Worcester,—the eldest son of John Somers, an attorney in large practice in that town who had formerly fought on the side of the Parliament, and of Catherine Ceaverne of Shropshire. After being at school at Worcester he was entered as a gentleman commoner at Trinity College, Oxford, and afterwards studied law under Sir Francis Winnington, who became solicitor-general, and joined the Middle Temple. He appears, in addition to his legal studies, to have written several poems and pamphlets. He soon became intimate with the leaders of the country party, especially with Essex, Russell, and Algernon Sidney, but never entered into their plans so far as to commit himself beyond recall. He was the author of the History of the Succession of the Crown of England, collected out of Records, dc., and was reputed to have written the Just and Modest Vindication of the Two Last Parliaments, which was put forward as the answer to Charles II.'s famous declaration of his reasons for dis- solving them. This, however, was by Sidney, though probably Somers was responsible for the final draft. When the grand jury of Middlesex threw out the bill against Shaftesbury, and were vehemently attacked for so doing, Somers wrote in defence of the rights of grand juries. In 1683 he was counsel for the sheriffs Pilkington and Shute before the Court of King's Bench, and secured a reputation which continually increased until the trial of the seven bishops, in which he was junior counsel. "Somers rose last. He spoke little more than five minutes, but every word was full of weighty matter ; and when he sat down his reputation as an orator and a constitutional lawyer was established." In the secret councils of those who were planning the revolution Somers took a leading part, and in the Convention Parliament was elected a member for his native town. He was immediately appointed one of the managers for the Commons in the conferences between the Houses, and in arguing the questions whether James IT. had left the throne vacant by abdication and whether the Acts of the Convention Parliament were legal—that parliament having been summoned without the usual writs—he displayed great

learning and legal subtlety. He was further distinguished by being made chairman of the committee which drew up the celebrated Declaration of Right. On May 9, 1689, Somers was made solicitor-general. He now became William III.'s most confidential adviser. In the controversy which arose between the Houses on the question of the legality of the decision of the Court of King's Bench regarding Titus Oates, and of the action of the Lords in sustaining this decision, Somers was again the leading manager for the Commons, and has left a clear and interesting account of the debates. He was next employed in January 1690 as chairman of the select committee of the House of Commons on the Corporation Bill, by which those corporations which had surrendered their charters to the crown during the last two reigns were restored to their rights; but he refused to associate himself with the violent measures of retaliation which the Whigs on that occasion endeavoured to include in the bill, In April a speech by him carried through the Lower House, without opposition, the bill which declared all the laws passed by the Convention Parliament to be valid. As solicitor-general he had to conduct the prose- cution of Preston and Ashton in 1691, and did so with a moderation and humanity which were in marked contrast to the customs of the former reigns. He was shortly appointed attorney-general, and in that capacity strongly

opposed the bill for the regulation of trials in cases of high treason. On March 23, 1693, the great seal having mean-

while been in commission, Somers was appointed lord- keeper, with a pension of £2000 a year from the day on which he should quit his office, and at the same time was made a privy councillor. He had previously been knighted. Somers now became the most prominent member of the Junto, the small council which comprised the chief members of the Whig party. When William left in May 1695 to take command of the army in the Netherlands, Somers was made one of the seven lords-justices to whom the administration of the kingdom during his absence was entrusted ; and he was instrumental in bringing about a reconciliation between William and the princess Anne.

The question of improving the currency now became pressing, and Somers was the author of the bold sugges- tion that a proclamation should be issued simultaneously all over the kingdom, announcing that henceforth all clipped and hammered coins were to be reckoned only by weight. But all possessors of such coins might, by delivering them up on a certain day, receive a note entitling them to draw from the treasury at a future time the difference between the actual and nominal values. The difficulties of the plan, however, rendered its adop- tion impossible. In April 1697 Somers was made lord chancellor, and was created a peer by the title of Baron Somers of Evesham. When the discussion arose on the question of disbanding the army, he summed up the case against disbanding, in answer to Trenchard, in a remark- able pamphlet called " The Balancing Letter." In August 1698 he went to Tunbridge Wells for his health. While there he received the king's letter announcing the first Partition Treaty, and at once replied with a memorandum representing the necessity in the state of feeling in England of avoiding further war. When the king, on the occasion of the Disbanding Bill, expressed his determination to leave the country, Somers boldly remonstrated, while he clearly expressed in a speech in the Lords the danger of the course that was being taken. Hitherto Somers's character had kept him free from attack at the hands of political opponents ; but his connexion in 1699 with the notorious Kidd, who, being sent out to put down the pirates in the Indian Ocean, turned pirate himself, and to the defraying of whose expedition Somers had given £1000, afforded an opportunity; the vote of censure, however, proposed upon him in the House of Commons for giving Kidd a commission under the great seal was rejected by 199 to 131. The attack was renewed shortly on the ground of his having accepted grants of crown property to the amount of £1600 a year, but was again defeated. On the subject of the Irish forfeitures a third attack was made in 1700, a motion being brought for- ward to request the king to remove Somers from his counsels and presence for ever ; but this again was rejected by a large majority. In consequence, however, of the incessant agitation, William now requested Somers to resign ; this he refused to do, but gave up the seals to William's messenger. In 1701 he was impeached by the Commons on account of the part he had taken in the hegotiations relating to the Partition Treaty in 1698, and defended himself most ably before the House, answering the charges seriatim. The impeachment was voted and sent up to the Lords, but was there dismissed. On the death of the king Somers retired

almost entirely into private life. He was, however, active in 1702 in opposing the Occasional Conformity Bill, and in 1706 was one of the managers of the union with Scotland. In the same year he carried a bill regulating and improving the proceedings of the law courts. He was made president of the council in 1708 upon the return of the Whigs to

power, and retained the office until their downfall in 1710. From this time his powers of mind rapidly declined, and after being almost imbecile for six years he died of apoplexy on April 26, 1716. Somers was never married, but left two sisters, of whom the eldest, Mary, married Charles Cocks, whose grandson, Sir Charles Cocks, Bart., became the second Lord Somers in 1784. ;

For a contemporary character of Somers Addison's paper in the Freeholder for May 14, 1716, should be referred to ; and there is in Macaulay's History (vol. iv. p. 58) an eloquent and worthy tribute to his stainless character and comprehensive learning. A catalogue of his publications will be found in Walpole's Royal and Noble Authors. (O. A.)

SOMERSET, a maritime county in the south-west of Plate England, bounded E. by Wiltshire, S.E. by Dorset, S.W. HI.

and W. by Devonshire, N.W. by the Bristol Channel, and N. by Gloucestershire. The total area of land and water is 1,049,815 acres or 1640 square miles.

The shape of the county is determined by the nearly rectangular bend taken by the coast not far from Bridg- water. It falls into three natural divisions, which answer remarkably to the three waves of West-Saxon conquest and to the parliamentary divisions as they stood till the latest changes. The range of Mendip, breaking off from the high ground in the east of the county, completely shuts off the northern part, between Mendip and Bristol, itself hilly. Mendip itself, running slightly north-west- ward towards the Channel, has for its summit a tableland sloping much more gently to the north than to the south. Its most striking though not its highest points are towards the Channel, where it ends in the promontory of Brean Down, while the Steep

Holm stands as an outpost between the hills of Somerset and those of Glamorgan. The sides of Mendip are broken by many passes or combes, the most marked of which are Ebbor rocks near Wells and the greater pass of Cheddar cliffs, whose varied outlines, in the many turns of the pass, are probably the most noteworthy of their kind in England. Between Mendip and the region of loftier hills in the south lies a great alluvial plain, known generally as Sedgemoor, but with different names in different parts. This plain, intersected by ditches known as rhines, and in some parts rich in peat, is broken by isolated hills and lower ridges, of which the most conspicuous are Brent Knoll near Burnham, the Isle of Avalon, rising with Glastonbury Tor as_ its highest point, and the long low ridge of Polden ending to the west in a steep bluff. In the south is Blackdown on the border of Devonshire, the higher range of Quantock (highest point 1262 feet) stretching to the sea, and to the west again the mountainous region of Brendon and Exmoor, commonly believed by tourists to be part of Devonshire. Here are hills of much greater height and bolder outline, the highest point being that of Dunkery (1709 feet) above Porlock. The two principal rivers are the Lower Avon and the Parret. ‘The Avon, after forming for a short distance the boundary with Wilts, crosses the north-eastern corner of the county, encircling Bath, and forms the boundary with Gloucestershire till it reaches the sea 6 miles beyond Bristol. It is navigable for barges as far as Bath. The Parret from South Perrott in Dorset, on the borders of Somerset, crosses the centre of the county north-westwards by Bridgwater, receiving the Ivel or Yeo and Cary on the right, and the Isle and Tone on the left. Among other streams are the Axe, which rises at Wookey Hole in the Mendips and flows north-westward along their base to the Bristol Channel near Blackrock ; the Brue, which rises to the east of Bruton, near the borders of Wiltshire, and enters the Bristol Channel near the mouth of the Parret ; and the Exe (with its tributary the Barle), which rises in Exmoor forest and passes south- ward into Devon.

The diversified surface of the county is accounted for by the variety and complexity of its geological structure. The Old Red Sandstone, composed

of sandbanks and mud- banks of a land-locked lake, is met with in the Mendip Hills and on the banks of the Avon, but presents no feature of importance. The Devonian rocks, after plunging beneath the Triassic strata of the low ground between Williton and Taunton, rise again to the surface in the well-wooded Quantock Hills. The Carboniferous strata occupy a considerable area between Bristol and the Mendip Hills, forming a portion of the Bristol and Somerset coal- field. The Carboniferous limestone, built up mainly of petrified shells and corals, forms a truncated arch in the Mendip Hills, which owe their steepness and rugged contours to its compact and jointed structure, and their ravines and caves to atmospheric influences and to streams acting on the formation at and below the surface. It overlaps to the south the plain of Somerset, and plunges northwards under the coal-measures and Triassic rocks, reappearing in isolated and picturesque masses. The coal- measures, which have a thickness of about 7000 feet, include an upper and a lower series, separated by beds of grit about 2000 feet in thickness, also containing beds of coal (see Coat, vol. vi. p. 52). It is supposed that similar beds underlie the marshes to the south at a depth of from 1000 to 1200 feet. A large portion of the Carboniferous rocks are covered unconformably with the New Red Sandstone and Liassic and Oolitic strata. Triassic rocks prevail over the whole western area, from the Mendips to Exmoor. The highly fossiliferous Rheetic strata rest on the grey marls of the Trias, and constitute the lower part of the bold scarp of the Lias limestone and clays of the ranges from the sea to the Poldens. Plunging beneath the Oolitic strata, they occupy a large but scattered area in the east between Yeovil and Bath; and these in their turn pass under the Cretaceous strata of the serried Black- down Hills. A large extent of the county is occupied by alluvial deposits. Caves are common in the body of the

From 100 to 800 Acres.

From 50 to 100 Acres.

50 Acres and under.

From 800 to 500

RSET

hills, among which the greatest are the bone cave near Banwell, the stalactite caves at Cheddar, and Wookey Hole. Hard by the last-named is the hyena cave dis- covered in 1852, and explored in 1857-63, when, besides animal remains belonging to a great variety of species, flint and chert implements were also discovered.

Minerals. Though the exposed arca of the coalfield of Somerset is only about 14 square miles, it is estimated to extend over 238 square miles. The amount of coal raised within the county in 1884 was 843,487 tons, valued at £295,202. Spathose iron ore has been long worked in the Brendon Hills, but the industry is declining, —26,041 tons, valued at £13,021, having been obtained in 1858 and only 3582 tons, valued at £2619, in 1884. Lead mining has been carried on in the Mendips from time immemorial, but the industry is of much less importance than it was in earlier times, the amount of dressed lead ore obtained in 1884 being only 664 tons, of lead obtained in smelting 178 tons, of silver obtained from the lead 2760 ounces, and the value of the ore at the mines £1055. Next to coal the most important mineral production is freestone from the Oolitic strata, the largest quarries being in the neighbour- hood of Bath. Copper and manganese are obtaincd in small quanti- ties, as well as fuller's earth, marl, cement from the Lias, and ochre. Railways.—The county is so completely intersected by branches of the Great Western Railway in the north and west, and of the South Western in the south and east, that there is perhaps no hamlet more than seven miles from a railway station. Manufactures. —Woollen and worsted goods are manufactured in a large number of towns; silk at Frome, Taunton, and Shepton Mallet ; gloves at Yeovil, Taunton, and other places; crape at Dulverton and Shepton Mallet. There are large potteries at Bridgwater and Weston-super-Mare; at the former town and at Bath there are extensive carriage-works ; and there are paper-mills on several of the streams. Most of the commerce of the county passes through Bristol, which is situated mainly in Gloucestershire. Agriculture.—In the hilly districts much of the land is unculti- vated and barren, although affording some pasturage for sheep. There are large tracts of rich meadow land along the banks of the rivers, and the vale of Taunton is well adapted for wheat. On account of the extensive damage frequently caused in the lower grounds by floods, the Somerset Drainage Act was passed by parliament 11th June 1877, providing for the appointment of commissioners to take measures for the

drainage of lands in the valleys of the Parret, Ile, Yeo, Brue, Axe, Cary, and Tone, where extensive damage is frequently caused by floods. The following table gives a classification of the holdings in 1875 and 1880:—

From 500 to 1000 | anove 1000 Acres. Total.

Acres. Acres,

No. Acres. >——

1,812

1,750

Acres. Acres.

396,215 402,421

136,068 140,912

132,687 129,838

13,300

Out of a total area of 1,049,815 acres there were 867,469 acres in 1885 under culture, of which 625,957 acres, or nearly three-fourths, were in permanent pasture, 58,863 under clover and rotation grasses, 115,005 undcr corn crops, 61,650 green crops, 560 flax, and 5434 fallow. Of the corn crops the largest area—49,199 acres —was occupied by wheat, barley occupying 27,934 acres, oats 24,783, beans 11,349, pease 1576, and rye 164, About one half of the area under green crops was occupied by turnips, which covered 30,891 acres, mangold coming next with 10,867 acres, while vetches occupied 8881, potatoes only 7517, and carrots 212. Horses in 1885 numbered 34,848, of which 23,229 were used solely for purposes of agriculture. The number of cattle was 236,899, of which 110,068 were cows and heifers in milk or in calf. Cattle- fecding and dairy-farming are the principal branches of husbandry. Large numbers of cattle are brought from Devon to be grazed on the rich Somersctshire meadows. The district cast and west of Wells, with that of Cheddar, is famed for the cheese of that

name, and cheese is also extensively made in other districts. Sheep, chiefly Leicesters and Southdowns, are grazed, the number in 1885 being 601,020. The number of pigs in 1885 was Ti /9) andor poultry 414,803. In the extent of its orchards, chiefly apple trees, Somerset comes next among the counties of England to Hereford and Devon, the area in 1885 being 28,660 acres. The apples arc principally made into cider, which is the common drink of the peasantry. The area under market gardens was 759 acres, and under nursery grounds 170 acres. There were 39,850 acres in 1881 under wood.

According to the Landowners Return Somerset in 1873 was divided among 382,765 owners, possessing 940,483 acres, at an annual value of £2,705,393, 18s., or an average value all over of about £2, 17s. 6d. per acre. There were 20,370 proprietors, or about 62 per cent., who possessed less than one acre, and 19,246

No.

341 358

Acres.

836,401 854,870

No. Acres.

37,966 43,168

Acres.

127,111 62 182,745 72

acres were common land. The following possessed over 9000 acres each:—Viscount Portman, 24,171 ; Sir T. D. Acland, 16,320; Sir J. H. G. Smyth, 13,548; Earl of Ilchester, 13,169; G. F. Luttrell, 12,732 ; Earl of Carnarvon, 12,732; Karl Poulett, 10,118; A. G. Lethbridge, 9108; and Sir A. A. Hood, 9008.

Administration and Population.—Somerset comprises forty hun- dreds, two liberties (Hampton and Claverton, Mells and Leigh), the cities of Bath (population 51,814 in 1881) and Wells (4634), part (38,131) of the city of Bristol, and the municipal boroughs of Bridgwater (12,007), Chard (2411), Glastonbury (3719), Taunton (16,614), and Yeovil (8479). For parliamentary purposes the county, which was formerly divided into East, Mid, and West Somerset, was by the Act of 1885 parted out in seven separate divisions—North, South, East, West (or Wellington), Bridgwater, Frome, and Wells. The borough of Frome was in 1885 merged in its county district. The city of Bath returns two members, and a portion of the East Division of Bristol is within the limits of the county. In addition to the boroughs the following urban sanitary districts are situated within the county:—Burnham (1904), Clevedon (4869), a rising watering-place, Frome (9377), Midsomer- Norton (4422), Radstock (3074), Shepton Mallet (5322), Street (2514), Wellington (6360), Weston-super-Marc (12,884), a favourite watcring-place, and Wiveliscombe (1624). The county has one court of quarter sessions, and is divided into twenty-two petty and special sessional divisions. The city of Bath and the borough of Bridgwater have commissions of the peace and separate courts of quarter sessions ; and the city of Wells and the borough of Yeovil have commissions of the peace. The county contains 489 civil parishes, with parts of three others. Ecclesiastically it corresponds closely to the diocese of Bath and Wells. From 973,577 in 1801 the population had increased in 1831 to 403,795, in 1851 to 443,916, in 1871 to 463,483, and in 1881 to 469,109, of whom 220,582 were

males and 248,527 females. The number of persons to an acre in 1881 was 0°45 and of acres to a person 2°24,

History.—Somerset, the land of the Swmorsetan, is one of the West-Saxon shires which grew by gradual conquest from the Welsh, as opposed to the Mercian shires mapped out round a town and called by itsname. The name may well enough be what it seems at first sight, as it is called in Welsh Wlad-yr-haf, and in Latin some- times xstiva regio, Anyhow the land bears the name of the folk. There has never been any central town or

acknowledged capital, though Somerton bears a name cognate with the land. Assizes, elections, and the like have been held at different places at different times. There is uo distinct name for the land earlier than the English conquest ; it does not preserve the name of any British tribe, like the neighbouring Damnonii and Durotriges. But there are abundance of remains both of prehistoric and of Roman times, beginning with the stones which have given their name to Stanton Drew and the great giant's chamber at Wellow. Many ofthe hills are crowned with camps, as Cadbury, seven acres in extent, the remains on Hampton Down, near Bath, the fortress of Maesbury Castle, remarkably well preserved, the camp on Worlebury Hill, containing a number of hut circles, Dolbury camp on the Mendips, of great extent and sur- rounded by a stone ditch and rampart, and Norton Fitzwarren, near Taunton. At Bath the Romans had an important city, dque Sulis, on the line of the "fosse" which crossed the centre of Somerset, skirting the eastern ridges of the Mendips by Shepton Mallet and Ilchester (Ichalis) to the ancient Mforidunwm. From I\chester an- other Roman road passed to Durnoviwm (Dorchester). From Brean Down, where there was a Roman port, a road crossed south-east- wards by the Mendips and Shepton Mallet to Sorbiodwnwm (Salis- bury). The completeness of the Roman occupation is evidenced not only by the variety and importance of the relics which have been discovered, but by the wide area over which they are spread. That lead was wrought by the Romaus in the Mendips is evidenced by laminw found at various places bearing the imperial stamp ; froni the remains of old pottery kilns that have been discovered it would appear that this industry then as now was of considerable importance ; the foundations of Roman villas are very common, and there arc many remarkably fine specimens of Roman pavements. After the withdrawal of the Roman power, the district formed part of the British kingdom of Damnonia or West Wales, and it plays its part in the legends of Arthur, which seem to have grown out of the history of that kingdom. The religious history gathers round the Isle of Avalon and its monastery, known in Welsh as Ynysvitrin and in English as Glastonbury, names of somewhat uncertain origin and use, and which must not be pressed too strongly. Wild. legends connect the place with Joseph of Arimathea and a crowd of saints from Ireland and elsewhere. It is enough to say that it undoubtedly was a religious house, though perhaps of no very great antiquity, before the English conquest reached so far, and that it was the one great church (as Exeter was the one great city) which lived on

uninterruptedly through the English conquest. That conquest began in 577 with the campaign of Ceawlin, when, after the battle of Deorham, he took Gloucester, Cirencester, aud Bath and advanced his frontier to the Axe. This was the last heathen conquest ; before the second advance under Cenwealh the West-Saxons had become Christians. His two victories in 652 and 658 carried the English frontier to the Parret, and took in Glastonbury. The later stages are less clear; Centwine in 672 '* drove the Bretwealas to the sea," and Ine fought with the Welsh king Gerest in 710 and made Taunton a border fortress at some time before 722. By this time the conquest was complete. In the Danish wars Ailfred in 878 found shelter at Athelney and then went forth to his victory at Ethandun (Edington in Wiltshire), after which peace was made with the Danes at Wedmore. We hear of several later Danish invasions, but the Danes never made any settlements. Under Edward the Confessor Soinerset formed part of the earldom, first of Swegen and then of Harold. 1t prob- ably submitted to the Norman Conqueror after the taking of Exeter in 1068, and an English revolt in the next year was put down. In 1088 Ilchester stood a siege in the cause of William Rufus, and the county plays its part in the wars of Stephen. During the Middle Ages onward to the period of the civil war the historical events of Somerset— with the exception of the episode of Perkin Warbeck, who seized and abandoned Taunton in 1497— are chiefly associated with BrisTot (g.v.). The great mass of the people, especially those in the towns, took the Parliament side in the great conflict, but from 1648 to 1645 the shire was in the hands of the Royalists, with the exception of Taunton, which held out heroically under Blake till relicved by Fairfax on the 11th May of the latter year, which was followed by other successes until the whole district was regained by the Cromwellian party. The continuance of a strong Puritan feeling in the district was evidenced forty years later by the support given to the Monmouth rebellion, the latest historical event of special importance con- nected with the eounty.

The history of the county and its existing remains of antiquity have been largely affected by its ecclesiastical history. First part

of the single bishopric of Wessex at Winchester, then of that of Sherborne, the land of Sumorsetan became a distinct diocese in 909 with its bishopstool at Wells. The seat and style of the bishop have changed several times, but the boundaries of the diocese have changed remarkably little. Nowhere except in Sussex have the shire and the diocese been so nearly the same thing at all times. The great possessions of the bishopric and of the abbey of Glastonbury led to a remarkable lack of castles in the mid part of the county,

and also tended to overshadow all other ecclesiastical foundations.

Even in the other parts of the county castles are not a prominent feature, and no monastic church remains perfect except those of Bath and its cell Dunster. To Bath the bishopstool was removed in 1088, and after some shiftings, including a transfer to Glaston- bury, the double style of Bath and Wells was established, the monks of Bath and the canons of Wells forming two separate chapters for the bishop, At the dissolution of monasteries Bath was suppressed, Wells became the sole chapter, but the name of Bath was still kept in the bishop's style. The monastery of Glaston-

bury was destroyed, as were most of the smaller monasteries also.

Of those which have left any remains, Woodspring, Montacute (Cluniac), Clecve (Cistercian), and Michelney are the most remark- able. Athelney, founded by Alfred on the spot whcre he found shelter, has utterly perished. Montacute and Dunster fill a place in both ecclesiastical and military history. The castle of Robert of Mortain, the Conqueror's brother, was built on the peaked hill (mons acutus) of Leodgaresburh, where the holy cross of Walthem was found. 'The priory arose at the foot. Dunster, one of the few inhabited castles in England, stands on a hill crowned by an English

mound. Besides these there are also remains at Nunney and Castle

Carey; but castles are not a strong point in Somerset antiquities.

In ecclesiastical architecture the two great churches of Wells and Glastonbury supply a great study of the development of the earlier Pointed style out of Romanesque. But the architectural

strength of the county lies in its great parish churches, chiefly in the Perpendicular style, of which they present a characteristic variety. In the same style among greater churches are Bath abbey, Sherborne minster in Dorset, and Saint Mary Redcliff at Bristol (locally in Somerset and till lately in the diocese), a parish church on the type of a minster. Of earlier work there is little Norman, and aly any Primitive Romanesque, but there is a characteristic local style in some of the smaller buildings of the 14th century. The earlier churches were often cruciform, and sometimes with side towers. In domestic remains no district is richer ; Somerset stands alongside of Northamptonshire owing to the abundance of good stone in both. Clevedon Court is a very fine inhabited manor-house of the 14th century, and the houses, great and small, of the 15th, 16th, and 17th centuries are endless, Indeed, the style has never quitc gone out, as the gable and the mullioned window have lingered on to this day. Barrington Court in the 16th century and Montacute House in the 17th are specially fine examples. There are also some very fine barns, as at Glaston-bury, Wells, and Pilton.

Among the more illustrious natives of Somersetshire are Dunstan, Roger Bacon, John Locke, Admiral Blake, Pym, Bishop Ken, Fielding, Cudworth, and the poet Daniel.

See Collinson, History of Somersetshire, 3 vols., 1791; Phelps, Modern Somerset- shire, 18389; Proceedings of the Somersetshire Archxological and Natural History

Society; Eyton, Somerset Survey, 2 vols., 1880; Hunt, Diocesan History of Bath and Wells, 1885; Freeman, English Towns and Districts, pp. 103 sq.

SOMERSET, Epwarp Srymour, DUKE or (c. 1500- 1552), eldest brother of Jane Seymour, Henry VIII.'s third wife, was created earl of Hertford in 1537, on the birth of his nephew, afterwards Edward VI. In 1544 he commanded in the war with Scotland, and sacked Edinburgh. Next year he again commanded against the Scots ; and he was employed by Henry in many important negotiations throughout the latter part of his reign. On the accession of Edward VI. he was made protector by the council, and was soon afterwards created duke of Somerset. He at once made use of his power to encour- age the extreme Reformers, and a general destruction of ecclesiastical works of art was the result. In September 1547, finding the Scots unwilling to listen to his pro- posals for a marriage between Edward and Mary Stuart, he marched an army into Scotland and won the battle of Pinkie Cleugh,—a worthless victory, which only threw Scotland into the arms of France. War with that country followed, and the result was the loss of Boulogne. Equally disastrous was the protector's domestic policy. He was animated by a dislike of arbitrary government, and by a desire to improve the condition of the poor, but was at the same time a slave to his own ambition. He

pushed on the Protestant Reformation with inconsiderate speed, repealed the Treason Acts of Henry VIII.'s reign, and issued a commission to inquire into agricultural distress. The agitation into which these measures threw the country produced insurrections in the west and east, which were with some difficulty suppressed. Irritated by his arrogance, rashness, and incapacity, the council, in October 1549, turned against him, deprived him of the protectorate, and confined him in the Tower. Released in 1550, he recovered much of his influence through the misgovernment of his successors, and~ contemplated a return to power at their expense. His plans being dis- covered, he was tried on a charge of felony, and executed on January 22,

1552. His popularity was immense, and in some respects deserved; but he aspired to a tyranny, and had he retained or recovered power he would have gone far towards ruining the nation.

Authorities. —Holinshed's Chronicle; Calendars of State Papers for the Reign of Edward VI.; Strype's Memorials; Froude's History of England.

SOMERSET, Ropert Carr, Eart or (c. 1590-1645), came of a good Scottish family, the Kers of Ferniehurst. The date of his birth seems uncertain, but he was a lad when James I. ascended the English throne. When this event occurred Carr gave up the position which he had hitherto occupied as page at the Scottish court, and sought for a time to make his fortune in France. Returning to England he entered the service of Lord Hay, and soon attracted the attention of the king. Entirely devoid of all higher qualities, Carr was endowed with good looks, excellent spirits, and considerable personal accomplish- ments. These advantages were sufficient for James, who knighted the young man and at once took him into favour. In 1607 an opportunity enabled the king to con- fer upon him a more substantial mark of his affection. Sir W. Raleigh had through his attainder forfeited his life-interest in the manor of Sherborne, but he had previously executed a conveyance by which the property was to pass on his death to his eldest son. This document was, unfortunately, rendered worthless by a flaw which gave the king eventual possession of the property. Acting on Salisbury's suggestion, James resolved to confer the manor on Carr. The case was argued at law, and judgment was in 1609 given for the crown. Lady Raleigh received some compensation, apparently inadequate, and Carr at once entered on possession. His influence was already such that in 1610 he persuaded the king to dissolve the parhament, which had shown signs of attacking the Scottish favourites. Next year Carr was made an English peer, and took his seat in the House of Lords as Viscount Rochester. Shortly afterwards he became a privy coun- cillor, and in the autumn of 1613 he was created earl of Somerset. In 1614 he became lord chamberlain.

He was now at the zenith of his power, but the event had already occurred which was to prove his ruin. Before 1609, while still only Sir Robert Carr, he had commenced an intrigue with Lady Essex. In 1613 that lady set about procuring a divorce from her husband, with the object of afterwards

marrying Carr. James favoured the cause of Lady Essex; the court pronounced a decree of divorce; and in December 1613 she married the earl of Somerset. Ten days before the court gave judginent, Sir Thomas Overbury, who apparently knew facts concerning Lady Essex which would have been fatal to her success, was poisoned in the Tower. No idea seems to have been entertained at the time that Lady Essex and her future husband were implicated. For two years more Somerset continued to exercise a paramount influence over James, and it was not till 1615 that his arrogant behaviour began to alienate the king. His fall was due, however,

not to the loss of the king's favour nor to the combination at court against him, but to the discovery of the circum- stances of Overbury's death. In July 1615 Somerset obtained a full pardon from the king for all offences which he might have committed. Soon afterwards the truth about the murder came out. Coke and Bacon were set to unravel the plot. After four of the principal agents had been convicted and punished, the earl and countess were brought to trial. The latter confessed, and of her guilt there can be no doubt. Somerset's share is far more diffi- cult to discover, and probably will never be fully known. The evidence against him rested on mere presumption, and he consistently declared himself innocent. Probabili- ties are on the whole in favour of the hypothesis that he was not more than an accessory after the fact. James let matters take their course, and both earl and countess were found guilty. The sentence was not carried into effect against either culprit. The countess was pardoned immediately. The earl appears to have refused to buy forgiveness by concessions, and it was not till 1624 that he obtained his pardon. Thenceforward he disappears from public view. He died, without heirs, in 1645.

Authorities.—State Trials; Carew Letters; Life and Letters of Bacon, ed. Spedding; Spedding, Studies im+ Hnglish History; Gardiner, History of England.

SOMERVILLE, previous to its recent incorporation with Boston a city of the United States, in Middlesex county, Massachusetts, lying on Mystic river, 2 miles north-west of the Boston state-house. It was named in honour of Richard Somers, a naval officer, and was incor- porated as a city in 1872.

The population was 24,933 in 1881. Glass-works, bottle-works, flour-mills, a bleachery, and a brass-tubing factory are among the industrial establishments. .

SOMERVILLE, Mary (1780-1872), scientific writer, was the daughter of Admiral Sir William George Fairfax, and was born 26th December 1780 in the manse of Jed- burgh, the house of her mother's sister, wife of Dr Thomas Somerville, author of Jfy Own Life and Times, whose son was her second husband. She received a rather desultory education, and mastered algebra and Euclid in secret after she had left school, and without any extraneous help. In 1804 she married her cousin Captain Samuel Greig, who died in 1806; and in 1812 she married another cousin, Dr William Somerville, inspector of the army medical board, who encouraged and greatly aided her in the study of the physical sciences. After her marriage she made the acquaintance on the Continent and in London of the most eminent scientific men of the time, among whom her talents had attracted attention before she had acquired general fame, Laplace paying her the compliment of stating that she was the only woman who understood his works. Having been requested by Lord Brougham to translate for the Society for the Diffusion of Useful Know- ledge the Mécanique Céleste of Laplace, she greatly popularized its form, and its publication in 1831 under the title of The Mechanism of the Heavens at once made her famous. She was elected an honorary member of the Royal Astronomical Society, and her bust by Chantrey was placed in the hall of the Royal Society of London. Her other works are the Connection of the Physical Sciences (1834), Physical Geography (1848), and Jfolecular and Microscopie Science (1869). Much of the popularity of her writings is due to their clear and crisp style, and the underlying enthusiasm for her subject which pervades them. In 1835 she received a pension of £300 from Government. She died at Naples 28th November 1872. In the following year there appeared her Personal Recollections, consisting of reminiscences written during her old age, and of great interest both for what they

reveal of her own character and life and the glimpses they afford of the literary and scientific society of bygone

times. SOMME, a department of northern France, formed in

1790 of a large part of the province of Picardy (compris-

ing Vermandois, Santerre, Amiénois, Ponthieu, Vimeu, and Marquenterre) and a small portion of Artois, It is bounded on the N. by Pas-de-Calais and Nord, E. by Aisne, 8. by Oise, and S,W. by Seine-Inférieure, and its sea-coast extends 28 miles along the English Channel, Two streams flowing into the Channel—the Authie on the north and the Bresle on the south-west—bound it in these directions. The surface consists of great rolling plains, generally well-cultivated and very fertile. The highest point, hardly 700 feet above the sea, lies in the south-west, not far from Aumale. From the mouth of the Authie to the Bay of the Somme the coast is lined with a belt of sand-dunes about 2 miles broad, behind which is the Marquenterre, a tract of 50,000 acres reclaimed from the sea by means of dykes and traversed by drainage canals, The Bay of the Somme, obstructed by dangerous sand-banks, but containing the three ports of Crotoy in the north, St Valery in the south, and Hourdel in the south-west, has also been considerably encroached upon by the same methods. Next come the shingle banks, behind which the low fields of Cayeux (25,000 acres) have been reclaimed; and then at the hamlet of Ault commence the chalk cliffs, which continue onwards into Normandy. The river Somme traverses the department from south-east to north-west for a distance of 125 miles, through a marshy valley abounding in peat. Commanded by Ham, Péronne, Amiens, and Abbeville, this valley forms a northern line of defence for Paris, Apart from the water-power it supplies, the Somme is of great com- mercial value, being accompanied by a canal all the way from its source wherever it is not itself navigable. From Abbeville to St Valery its lower course forms a maritime canal 165 feet wide, 13 feet deep, and 8 to 9 miles long, capable of bearing at high tide vessels of 300 tons burden. From St Valery to the open sea the channel is bounded on the south by a towing-path embankment 2 miles long, and on the north by a dyke, capable of being laid under water, 1 mile long, and there the current hollows out a very variable bed accessible at certain tides for vessels of 500 tons. The most important affluents of the Somme—the Ancre from the north-east by way of Albert and Corbie, the Avre from the south-east by Roye, and the Selle from the south by Conty—join the main stream at Amiens. The Authie and the Bresle are respectively

65 and 45 miles loug. The latter ends in a maritime canal about 14 feet deep between Eu and Treport. The mean temperature is lower than that of Paris (49° Fahr. at Abbeville). Rain falls on 175 days per annum (33 inches at Abbeville).

Of the total area of 1,522,520 acres, 1,178,184 acres are under tillage, 68,844 are under meadows and pasture land, 133,837 are occupied by wood, while 30,514 acres are heaths or uncultivated tracts. In 1881 the live stock included 78,069 horses, 940 mules, 6125 asses, 140,512 cattle, £49,675 sheep (wool-clip 1117 tons), 82,755 pigs, 21,726 goats; there were also 27,902 hives (116 tons of honey and 86 of wax), The department, especially in the north-east, is one of the best-cultivated in France, Beetroot for sugar is the staple crop of the Péronne arrondissement ; cercals, fodder, oil plants (especially the poppy), hemp, and potatoes are grown throughout the department, the latter more largely on the

seaboard. No wine is grown, but the cider harvest of 1883 amounted to 8,904,100 gallons, and beer is a common beverage.

In 1884 there were grown 7,072,106 bushels of wheat, 1,810,437 of

meslin, 1,008,932 of rye, 1,789,089 of barley, 4207 of buckwheat, 11,197,392 of oats, 4,930,067 of potatoes, 1,161,665 tons of beetroot for sugar, and 208,686 tons of beetroot for fodder, 40 tons of hops, 242 tons of hempseed, 651 tons of hemp fibre, 1128 tons of flax, 5245 tons of colza seed, and 240,311 tons of fodder. Peat-cutting (84,335 tons in 1882) gives employment to 2640 hands, the best qualities and the deepest workings being in the valley of the Somme, between

Amiens and Abbeville. The peat of inferior quality is burned on the spot and the ashes used as manure. Textile industries employ 36,000 hands. The linen and hemp manufacture is carried on in dressing establishments and spuining and weaving factories with 50,000 spindles, 2250 power-looms, and 4000 hand-looms, and the manufactures comprise canvas for packing and sail-making, and linen (including damask). Cotton is spun by 72,800 spindles and woven by 745 power-looms and 5000 hand-lcoms. Moleskins

and velvets for upholstery and other purposes are among the articles manufactured. Wool is wrought in 44 establishments with 124,000 spindles, 120 power-looms, and 400 hand-looms, pro- ducing yarns of all kinds, “Scotch cashmeres,” ‘* China satins,” Serges, merinos, repps, poplins, &c. Tulles, embroidery, laces, ribbons, plush, carpets, cotton, and woollen hose are also manu- factuted. The last industry employs half the population of Santerre. About 6400 workmen are engaged in the iron and copper industries, steam-engine and boiler inaking, and the pro- duction of spinning-mill machinery, railway plant, and umbrella frames. The arrondissement of Abbeville is the centre of a great lock-manufacture, employing from 4000 to 5000 workmen. There are also chemical factories, bleachcries, tanneries, paper-mills (470 hands, product 6108 tons in 1881), saw-mills, and soap and candle works. Beetroot sugar is manufactured in 66 establish- ments (5090 horse-power and 6450 workmen). In 1881 53,177 tons of sugar were produced and 2,247,146 gallons of spirit distilled from the molasses and the beet. The total number of hands employed in the industries of the department is 64,000, and the total horse-power 13,181. Thirty-seven decked boats with 400 hands are engaged in the deep-sea fisheries, in the coast fishery 182 small boats with 800 hands. Cereals, horses of the Boulogne or Norman breed, cattle, hemp and linen, and the manufactured goods are the exports of the department. Vegetables and other food- stuffs are sent to England, and shingle for the manufacture of earthenware. Besides the raw materials for the manufacturing industries, wines, timber, dye-stuffs, and coal (727,783 tons in 1882) are imported. There are 385 miles of national and 5033 miles of local roads, 119 miles of navigable river or canal, and 379 miles of railway. Administratively the department comprises 5 arrondissements (Amiens, Abbeville, Doullens, Montdidier, and Péronne), 41 cantons, and 836 communes, The population in 1881 was 550,887. The department constitutes the diocese of Amiens, which city (population in 1881, 67,874) is also the seat of a court of appeal and the eae of the 2d corps d’armée, in which the department is included

SOMMERFELD, an industrial town of Prussia, in the province of Brandenburg, lies on the Lubis, 40 miles to the south-east of Frankfort-on-the-Oder. Its manu- factures of woollen cloth are important, —the annual value of the goods produced being upwards of half a million sterling ; and it

also contains finishing and dye works, an iron foundry, boiler-works, &c. The population in 1885 was 11,364, almost all Protestants.

SOMNAMBULISM. See Sieur, supra, p. 157.

SOMNATH, an ancient but decayed city of peninsular Guzerat, India, with a population in 1881 of 6644, mostly Mohammedans, is situated on a bay of the Arabian Sea, in 20° 53’ N. lat. and 70° 24’ E. long. The port, which is called Verdwal, is distinct from the city proper (Deva- Pattan, Somnath-Pattan, or Prabhas). The latter occupies a prominence on the south side of the bay, is surrounded by massive fortifications, and retains in its ruins and numerous tombs many traces of its former greatness as a commercial port. But the city was most famous for the temple just outside its walls in which stood the great idol or rather columnar emblem of Mahadeo called Somnath (Moon’s lord), which was destroyed by Mahmud of Ghazni see the details in vol. xv. p. 287. For the so-called “gates of Somnath,” now at Agra, see Guaznq, vol. x. p. 560. The temple was again plundered by Al4 el-Din in 1300, and appears to have been converted into a mosque. See Yule’s edition of Marco Polo, vol. ii. p. 389 9,

SONDERSHAUSEN. See Scuwarzeurc-Sonpzrs- HAUSEN,

SONNET (Ital. Sonetto, dim. of Suono, Fr. Sonnet). The sonnet in the literature of modern Europe is a brief poetic form of fourteen rhymed verses, ranged according to prescription. It does not, however, belong to what has been called, properly perhaps, under Ronprau (g.v.), the poetry

of ingenuity. Although in a language like the English it does no doubt require considerable ingenuity to construct a satisfactory sonnet of octave and sestet running upon four rhymes, this ingenuity is only a means to an end, the end being properly that a single wave of emotion, when emotion is either too deeply charged with thought, or too much adulterated with fancy, to pass spontaneously into the movements of pure lyric, shall be embodied in a single metrical flow and return. Whether any given sonnet be composed like that of Pier delle Vigne (of two quatrains with rhymes running a, b, a, b, a, b a, b, and of two tercets with rhymes running ¢, d, e, c, d, e), or

whether the verses be arranged (on the authority of Shakespeare and Drayton) in three quatrains of alternate rhymes clinched by a couplet, or, as in the sonnet of Petrarch, in an octave of two rhymes and a sestet of either two or three rhymes, —in each case the peculiar pleasure which the ear derives from the sonnet asa metrical form lies in the number and arrangement of the verses being prescribed, and distinctly recognizable as being prescribed. That the impulse to select for the rendering of single phases of feeling or reflexion a certain recognized form is born of a natural and universal instinct is perhaps evidenced by the fact that even when a metrical arrangement discloses no structural law demanding a prescriptive number and arrangement of verses, the poet will nevertheless, in certain moods, choose to restrict himself to a prescribed number and arrangement, as in the cases of the Italian stornello, the Welsh tvéban, and the beautiful rhymeless short ode of Japanese poetry, for the knowledge of which we are indebted to Mr Chamberlain, And perhaps, if space permitted us to probe the matter deeply, we should find that the recognized prescription of form gives a sense of oneness that nothing else save the refrain can give to a poem which, being at once too long for a stanza in a series and too short to have the self-sustaining power of the more extended kinds of poetic art, suffers by suggesting to the ear a sense of the fragmentary and the inchoate. It is not then merely the number of the verses, it is also their arrangement as to rhymes,—an arrangement leading the ear to expect a prescribed sequence and then satisfying that expectation,—which entitles a form of fourteen verses to be called a sonnet.

Hence the so-called irregular sonnets of 8. T. Coleridge, which lead the ear of the reader to expect the pleasure of a prescribed arrangement when what they have to offer is a pleasure of an exactly opposite kind—the pleasure of an absolute freedom from prescribed arrangement—are un- satisfactory, while (as the present writer has often pointed out) the same poet’s fourteen-line poem, “ Work without Hope,” in which the reader expects and gets freedom from prescription, is entirely satisfactory. This same little poem of Coleridge’s also affords an excellent illustration of another point in connexion with the sonnet. If we trace the history and the development of the sonnet from Pier delle Vigne to Rossetti we shall find that the poet’s quest from the very first has been to write a poem in fourteen verses so arranged that they should, better than any other number and arrangement of

verses, produce a certain melodic effect upon the ear, and an effect, moreover, that should bear iteration and reiteration in other poems similarly constructed. Now if we ask ourselves whether, beautiful as is this poem, ‘“ Work without Hope,” taken as a single and original metrical arrangement, we should get out of a series of poems modelled line for line upon it that pleasure of iteration which we get out of a series of Petrarchan sonnets, we shall easily see why the regular sonnet of octave and sestet on the one hand, and what is called the Shakespearean sonnet on the other, have survived all other competing forms.

In modern Europe the sonnet has always had a peculiar fascination for poets of the first class—poets, that is, in whom what we have called poetic energy (see PorTRy) and

plastic power are equally combined. It would seem that

the very fact that the sonnet is a recognized structure sug-

gestive of mere art—suggestive in some measure, indeed, of

what Schiller would call “sport” in art—has drawn some of the most passionate poets in the world to the sonnet as the medium of their sincerest utterances. Without being coldly artificial, like the rondeau, the sestina, the ballade, the villanelle, &c., the sonnet is yet so artistic in structure, its form is so universally known, recognized, and adopted as being artistic, that the too fervid spontaneity and reality of the poet’s emotion may be in a certain degree veiled, and the poet can whisper, as from behind a mask, those deepest secrets of the heart which could otherwise only find expression in purely dramatic forms.

That the sonnet was invented, not in Provence, as French critics pretend, but in Italy in the 13th century, is pretty clear, but by whom is still perhaps an open question. Mr S. Waddington (Sonnets of Living Writers) and several other contemporary critics attribute to Fra Guittone the

honour of having invented the form. But Mr J. A.

Symonds has reminded us that the sonnet beginning Perd ch' amore, attributed to Pier delle Vigne, secretary of state in the Sicilian court of Frederick, has claims which no student of early Italian poetry can ignore.

As regards English sonnets, whether the Petrarchan and the Shakespearean are really the best of all possible forms we need not inquire. But, inasmuch as they have become so vital and so dominant over other sonnet forms that when- ever we begin to read the first verse of an English sonnet we expect to find one or other of these recognized rhyme- arrangements, any departure from these two arrangements, even though the result be such a magnificent poem as Shelley's "Ozymandias," disappoints the expectation, bafiles the ear, and brings with it that sense of the fragmentary and the inchoate to which we have before alluded. If, however, some writer should arise with sufficient originality of metrical endowment and sufficient poetic power to do what Keats, in a famous experiment of his tried to do and failed,—impress the public ear with a new sonnet structure, impress the public ear so powerfully that a new kind of expectance is created the moment the first verse of a sonnet is recited,—then there will be three kinds of English sonnets instead of two.

With regard to the Petrarchan sonnet, all critics are perhaps now agreed that, while the form of the octave is invariable, the form of the sestet is absolutely free, save that the emotions should govern the arrangement of the verses. Butas regards the division between octave and sestet, Mr Mark Pattison says, with great boldness, but perhaps with truth, that by blending octave with sestet Milton missed the very object and end of the Petrarchan scheme. Another critic, however, Mr Hall Caine, in his preface to Sonnets of Three Centuries, contends that by making "octave flow into sestet without break of music or thought" Milton consciously or unconsciously invented a new form of sonnet; that is to say, Milton, in his use of the Petrarehan octave and sestet for the embodiment of intellectual substance incapable of that partial disin- tegration which Petrarch himself always or mostly sought, invented a species of sonnet which is English in impetus, but Italian, or partially Italian, in structure. Hence this critic, like Mr William Sharp (Sonnets of thes Century), divides all English sonnets into four groups :—(1) sonnets of Shakespearean structure; (2) sonnets of octave and sestet of Miltonic structure ; (3) sonnets of contemporary structure, 4.¢, all

sonnets on the Petrarchan model in which the metrical and intellectual "wave of flow and

SO P—SOP

ebb" (as originally formulated by the present writer in a sonnet on the sonnet, which has appeared in most of the recent anthologies) is strictly observed, and in which, while the rhyme-arrangement of the octave is invariable, that of the sestet is free; (4) sonnets of miscellaneous structure.

With regard to what is called the contemporary form, —a Petrarchan arrangement with the sestet divided very sharply from the octave,—the crowning difficulty and the crowning triumph of the sonnet writer has always been to so handle the rhythm of the prescribed structure as to make it seem in each individual sonnet the inevitable and natural rhythm demanded by the emotion which gives the individual sonnet birth, and this can perhaps only be achieved when the richness and apparent complexity of the rhyme-arrangement is balanced by that perfect lucidity and simplicity of syntax which is the special quest of the "sonnet of flow and ebb."

The wave theory has found acceptance with most recent students of the sonnet, such as Rossetti and the late Mark Pattison, Mr J. A. Symonds, Mr Hall Caine, and Mr William Sharp. Mr Symonds, indeed, seems to hint that the very name given by the Italians to the two tercets, the volta or turn, indicates the metrical meaning of the form. 'The striking metaphorical symbol," says he, 'drawn from the observation of the swelling and declining wave can even in some examples be applied to sonnets on the Shakespearean model; for, as a wave may fall gradually or abruptly, so the sonnet may sink with stately volume or with precipitate subsidence to its close. Rossetti furnishes incomparable examples of the former and more desirable conclusion; Sydney Dobell, in Home in War Time, yields an extreme specimen of the latter."

And now as to the Shakespearean sonnet. Some very acute critics have spoken as if this form were merely a lawless succession of three quatrains clinched by a couplet, and as if the number of the quatrains might just as well have been two or four as the present prescribed number of three. If this were so, it would unquestionably be a serious impeachment of the

Shakespearean sonnet, for save in the poetry of ingenuity no metric arrangement is otherwise than bad unless it be the result of a deep metrical necessity.

If the prescriptive arrangement of three quatrains clinched by a couplet is not a metrical necessity, if it is not demanded in order to prevent the couplet from losing its power, such an arrangement is idle and worse than idle ; just as, in the case of the Petrarchan sonnet, if it can be shown that the solid unity of the outflowing wave can be maintained as completely upon three rhymes as upon two, then the restriction of the octave to two rhymes is sunple pedantry. But he who would test the metrical necessity of the arrangement in the Shakespearean sonnet has only to make the experiment of writing a poem of two quatrains with a couplet, and then another poem of four quatrains with a couplet, in order to see how inevitable is the metrical necessity of the Shakespearean number and arrangement for the achievement of the metrical effect which Shakespeare, Drayton, and others sought. While in the poem of two quatrains the expected couplet has the sharp epigrammatic effect of the couplet in ordinary stanzas (such as that of oftava rima, and as that of the Venus and Adonis stanza), destroying that pensive sweet- ness which is the characteristic of the Shakespearean sonnet, the poem of four quatrains is just sufficiently long for the expected pleasure of the couplet to be dispersed and. wasted.

The quest of the Shakespearean sonnet is not, like that of the sonnet of octave and sestet, sonority, and, so to speak, metrical counterpoint, but sweetness ; and the sweetest of

all possible arrangements in English versification is a succession of decasyllabic quatrains in alternate rhymes knit together and clinched by a couplet—a couplet coming not so far from the initial verse as to lose its binding power, and yet not so near the initial verse that the ring of epigram disturbs the “linked sweetness long drawn out” of this movement, but sufficiently near to shed its influence over the poem back to the initial verse. A chief part of the pleasure of the Shakespearean sonnet is the expectance of the climacteric rest of the couplet at the end (just as a chief part of the pleasure of the sonnet of octave and sestet is the expectance of

the answering ebb of the sestet when the close of the octave has been reached); and this expectance is gratified too early if it comes after two quatrains, while, if it comes after a greater number of quatrains than three, it is dispersed and wasted altogether.

The French sonnet has a regular Petrarchan octave with a sestet of three rhymes beginning with a couplet. The Spanish sonnet is also based on the pure Italian type, and is extremely graceful and airy. The same may be said of the Portuguese sonnet—a form of which the illustrious Camoens has left nearly three hundred examples. (T. W.)

SOPHIA DOROTHEA (1666-1726), the daughter and heiress of Duke George William of Brunswick-Liineburg- Celle, was born on September 15, 1666. On November 21, 1682, she was married to Prince George Louis of Hanover, afterwards George I. of England, to whom she bore in 1683 a son, afterwards King George II., and in 1687 a daughter, Sophia Dorothea, afterwards the wife of Frederick William I. of Prussia and the mother of Frede- rick the Great. For her illicit relations with Count Philip Christopher von Kénigsmark (see vol. x. p. 420) Sophia Dorothea was divorced from her husband the elector in December 1694, and the remainder of her life was spent in a dignified captivity under a military guard at her ancestral seat of Ahlden. She died on November 13, 1726. Her correspondence with Kénigsmark was dis- covered at Lund by Prof. Palmblad, and published by him in 1847; see also the Count von Schulenburg's Her- zogin von Ahiden (Leipsic, 1852).

SOPHISTS. Sophist, or"manof wisdom," was the name given by the Greeks about the middle of the 5th century B,C, to certain teachers of a superior grade who, distinguish- ing themselves from philosophers on the one hand and from artists and craftsmen on the other, claimed to prepare their pupils, not for any particular study or profession, but for civic life. For nearly a hundred years the sophists held almost a monopoly of general or liberal education. Yet, within the limits of the profession, there was con- siderable diversity both of theory and of practice, Four principal varieties are distinguishable, and may be described as the sophistries of culture, of rhetoric, of politics, and of eristic or disputation. ach of these predominated in its turn, though not to the exclusion of others, the sophistry of culture

beginning about 447, and leading to the sophistry of eristic, and the sophistry of rhetoric taking root in central Greece about 427, and merging in the sophistry of politics. Further, since Socrates and the Socratics were educators, they too might be, and in general were, regarded as sophists ; but, as they conceived truth—so far as truth was attainable—rather than success in life, in the law court, in the assembly, or in debate, to be the right end of intellectual effort, they were at variance with their rivals, and are commonly ranked by historians, not with the sophists, who confessedly despaired of knowledge, but with the philosophers, who, however unavailingly, continued to seek it. With the establishment of the great philosophical schools—first, of

the Academy, next of the Lyceum—the philosophers took the place of the sophists as the educators of Greece.

The sophistical movement was then primarily an attempt to provide a general or liberal education which should supplement the customary instruction in reading, writing, gymnastic, and music, But, as the sophists of the first period chose for their instruments grammar, style, literature, and oratory, while those of the second and third developments were professed rhetoricians, sophistry exercised an important influence upon literature. Then again, as the movement, taking its rise in the philoso- phical agnosticism which grew out of the early physical systems, was itself persistently sceptical, sophistry may be regarded as an interlude in the history of philo- sophy. Finally, the practice of rhetoric and eristic, which presently became prominent in sophistical teaching, had, or at any rate seemed to have, a mischievous effect upon conduct ; and the charge of seeking, whether in exposition or in debate, not truth but victory—which charge was impressively urged against the sophists by Plato—grew into an accusation of holding and teaching immoral and unsocial doctrines, and in our own day has been the subject of eager controversy. In the present article the matters above indicated will be dealt with under the following heads:—(1) the genesis and development of sophistry ; (2) the relations of sophistry to education, literature, and philosophy ; (3) the theory of Grote.

(1) Genesis and Development of Sophistry.—Sophistry arose out of a crisis in philosophy. The earlier Ionian physicists,;—Thales, Anaximander, and Anaximenes,—in their attempts to trace the multiplicity of things to a single material element, had been troubled by no misgivings about the possibility of knowledge. But, when Heraclitus to the assumption of fire as the single material cause added the doctrine that all things are in perpetual flux, he found himself obliged to admit that things cannot be known. ‘Thus, though, in so far as he asserted his funda- mental doctrine without doubt or qualification, he was a dogmatist, in all else he was a sceptic. Again, the Eleatic Parmenides, deriving from the theologian Xenophanes the distinction between émornyn and dda, conceived that, whilst the One exists, and is the object of knowledge, the Multiplicity of things becomes, and is the object of opinion ; but, when his successor Zeno provided the system with a logic, the consistent application of that logic resolved the fundamental doctrine into the single proposi- tion “One is One,” or, more exactly, into the single identity “One One.” Thus Eleaticism, though professedly dogmatic, was inconsistent in its theory of the One and its attributes, and openly sceptical in regard to the world of nature. Lastly, the philosophers of the second physical succession,—Empedocles and Anaxagoras,—not directly attacking the great mystery of the One and the Many, but in virtue of a scientific instinct approaching it through the investigation of phenomena, were brought by their study of sensation to perceive and to proclaim the inade- quacy of the organs of sense. Thus they too, despite their air of dogmatism, were in effect sceptics. In short, from different standpoints, the three philosophical succes- sions had devised systems which were in reality sceptical, though they had none of them recognized the sceptical inference.

Towards the middle of the 5th century, however, Protagoras of Abdera, taking account of the teaching of the first, and possibly of the second, of the physical successions, and Gorgias of Leontini, starting from the teaching of the metaphysical succession of Elea, drew that sceptical inference from which the philosophers had shrunk. If, argued Protagoras in a treatise entitled Z’ruth, all things are in flux, so that sensation is subjective, it

follows that ‘‘ Man is the measure of all things, of what is, that it is, and of what is not, that it is not”; in other words, there is no such thing as objective truth. Simi- larly, Gorgias, in a work On Nature, or on the Nonent, maintained (a) that nothing is, (0) that, if anything is, it cannot be known, (c) that, if anything is and can be known, it cannot be expressed in speech; and the sum- maries which have been preserved by Sextus Empiricus (Adv. Math., vii. 65-87) and by the author of the De Melisso, &c. (cc. 5, 6), show that, in defending these pro- positions, Gorgias availed himself of the arguments which Zeno had used to discredit the popular belief in the exist- ence of the Many; in other words, that Gorgias turned the destructive logic of Zeno against the constructive ontology of Parmenides, thereby not only reducing Eleaticism to nothingness, but also, until such time as a better logic than that of Zeno should be provided, precluding all philosophical inquiry whatsoever. Thus, whereas the representatives of the three successions had continued to regard themselves as philosophers or seekers after truth, Protagoras and Gorgias, plainly acknowledging their defeat, withdrew from the ungrateful struggle.

Meagre as were the results which the earlier thinkers had obtained, the extinction of philosophy just at the time when the liberal arts became more technical, and consequently less available as employments of leisure, threatened to leave a blank in Hellenic life. Accordingly Protagoras, while with the one hand he put away philo- sophy, with the other offered a substitute. Emphasizing the function of the teacher, which with the philosophers had been subordinate, and proclaiming the right end of intellectual endeavour to be, not “truth” (éA7Gea) or “wisdom” (codia), which was unattainable, but “virtue” or “excellence” (dperj), he sought to communicate, not a theory of the universe, but an aptitude for civic life. ‘The lesson which I have to teach,” Plato makes him say (Prot., 318 E), “is prudence or good counsel, both in respect of domestic matters, that the man may manage his household aright, and in respect of public affairs, that he may be thoroughly qualified to take part, both by deed and by word, in the business of the state. In other words, I profess to make men good citizens.” As instruments of education Protagoras used grammar, style, poetry, and oratory. Thus, whereas hitherto the young Greek, having completed his elementary training in the schools of the ypoppatioTys, the KOapiorys, and the adorpifns, was left to prepare himself for his life’s work as best he

might, by philosophical speculation, by artistic practice, or otherwise, one who passed from the elementary schools to the lecture-room of Protagoras received from him a “higher education.” The programme was exclusively literary, but for the moment it enabled Protagoras to satisfy the demand which he had discovered and evoked. Wherever he went, his lecture-room was crowded with admiring pupils, whose homage filled his purse and enhanced his reputation.

After Protagoras the most prominent of the literary sophists was Prodicus of Ceos. Establishing himself at Athens, he taught “virtue” or “excellence,” in the sense attached to the word by Protagoras, partly by means of literary subjects, partly in discourses upon practical ethics. It is plain that Prodicus was an affected pedant. Yet Ins simple conventional morality found favour, and Plato (Rep., 600 C) couples him with Protagoras in his testi- mony to the popularity of the sophists and their teaching.

At Athens, the centre of the intellectual life of Greece, there was soon to be found a host of sophists: some of them strangers, others citizens; some of them bred under Protagoras and Prodicus, others self-taught. ih the teaching of the sophists of this younger generation

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two points are observable. First, their independence of philosophy and the arts being assured, though they continued to regard “civic excellence ” as their aim, it was no longer necessary for them to make the assertion of its claims a principal element in their exposition. Secondly, for the sake of novelty they extended their range, includ- ing scientific and technical subjects, but handling them, and teaching their pupils to handle them, in a popular way. In this stage of sophistry then, the sophist, though not a specialist, trenched upon the provinces of specialists ;

and accordingly Plato (Prot. 318 E) makes Protagoras’

pointedly refer to sophists who, “‘ when young men have made their escape from the arts, plunge them once more into technical study, and teach them such subjects as arithmetic, astronomy, geometry, and music.” The sophist of whom the Platonic Protagoras is here thinking was Hippias of Elis, who

gave popular lectures, not only upon the four subjects just mentioned, but also upon grammar, mythology, family history, archeology, Homerology, and the education of youth. In this polymath we see at once the degradation of the sophistry of culture and the link which connects Protagoras and Prodicus with the eristics, who at a later period taught, not, like Hippias, all branches of learning, but a universally applicable method of dis- putation.

Meanwhile, Gorgias of Leontini, who, as has been seen, had studied and rejected the philosophy of western Greece, gave to sophistry a new direction by bringing to the mother country the technical study of rhetoric, —especially forensic rhetoric (Plato, Gorg., 454 B; cf. Aristotle, Rhet., 1354 b 26),—which study had begun in Sicily with Corax and Tisias nearly forty years before. Gorgias was already advanced in years and rich in honours when, in 427, he visited Athens as the head of an embassy sent to solicit aid against Syracuse. Received with acclamation, he spent the rest of his long life in central Greece, win- ning applause by the display of his oratorical gifts and acquiring wealth by the teaching of rhetoric. There is no evidence to show that at any period of his life he called himself a sophist; and, as Plato (Gorg., 449 A) makes him describe himself as a fyjrwp, it is reasonable to sup- pose that he preferred that title. That he should do so was only natural, since his position as a teacher of rhetoric was already secure when Protagoras made his first appear- ance in the character of a sophist; and, as Protagoras, Prodicus, and the rest of the sophists of culture offered a comprehensive cducation, of which oratory formed only a part, whilst Gorgias made no pretence of teaching ‘civic excellence” (Plato, Afeno, 95 C), and found a substitute for philosophy, not in literature generally, but in the professional study of rhetoric alone, it would have been convenient if the distinction between sophistry and rhetoric had been maintained. But, though, as will be seen hereafter, these two sorts of education were some- times distinguished, Gorgias and those who succeeded him as teachers of rhetoric, such as Thrasymachus of Chalce- don and Polus of Agrigentum, were commonly called by the title which Protagoras had assumed and brought into familiar use.

Rhetorical sophistry, as taught by Gorgias with special reference to the requirements of the law courts, led by an easy transition to political sophistry. During the century which had elapsed since the expulsion of the

Pisistratids and the establishment of the democracy, the Athenian constitution had developed with a rapidity which produced an oligarchical reaction, and the discussion of constitu- tional principles and precedents, always familiar to the citizen of Athens, was thus abnormally stimulated. The Peloponnesian War too not only added a deeper interest to ordinary questions of policy, but also caused the

relations of dissentient parties, of allied and belligerent states, of citizens and aliens, of bond and free, of Greeks and barbarians, to be eagerly debated in the light of present experience. It was only natural then that some of those who professed to prepare young Athenians for public life should give to their teaching a distinctively political direction; and accordingly we find Isocrates recognizing teachers of politics, and discriminating them at once from those earlier sophists who gave popular Instruction in the arts and from the contemporary eristics. To this class, that of the political sophists, may be assigned Lycophron, Alcidamas, and Isocrates himself. For, though that celebrated personage would have liked to be called, not "'sophist," but 'political philosopher," and tried to fasten the name of "sophist" upon his opponents the Socratics, it is clear from his own statement that he was commonly ranked with the sophists, and that he had no claim, except on the score of superior popularity and success, to be dissociated from the other teachers of political rhetoric. It is true that he was not a political sophist of the vulgar type, that as a theorist he was honest and patriotic, and that, in addition to his fame as a teacher, he had a distinct reputation asa man of letters ; but he was a professor of political rhetoric, and, as such, in the phraseology of the day, a sophist. He had already reached the height of his fame when Plato opened a rival school at the Academy, and pointedly attacked him in the Gorgias, the Phxdrus, and the Republic. Thenceforward there was a perpetual controversy between the rhetorician and the philosopher, and the struggle of educational systems continued until, in the next generation, the philosophers were left in possession of the field.

While the sophistry of rhetoric led to the sophistry of politics, the sophistry of culture led to the sophistry of disputation. It has been seen that the range

of subjects recognized by Protagoras and Prodicus gradually extended itself, until Hippias professed himself a teacher of all branches of learning, including in his list subjects taught by artists and professional men, but handling them from a popular or non-professional point of view. The successors of the polymath claimed to possess and to com- municate, not the knowledge of all branches of learning, but an aptitude for dealing with all subjects, which aptitude should make the knowledge of any subject superfluous. In other words, they cultivated skill in disputa- tion. Now skill in disputation is plainly a valuable accomplishment ; and, as the Aristotelian logic grew out of the regulated discussions of the eristics and their pupils, the disputant sophistry of the 4th century deserves more attention and more respect than it usually receives from historians of Greek thought. But when men set them- selves to cultivate skill in disputation, irrespective of the matter debated, when men regard the matter discussed, not as a serious issue, but as a thesis upon which to practise their powers of controversy,—they learn to pursue, not truth, but victory ; and, their criterion of excellence having been thus perverted, they presently prefer in- genious fallacy to solid reasoning, and the applause of bystanders to the consciousness of honest effort. Indeed, the sophists generally had a predisposition to error of this sort, not only because sophistry was from the beginning a substitute for the pursuit of truth, but also because the successful professor, travelling from city to city, or settling abroad, could take no part in public affairs, and thus was not at every step reminded of the importance of the “material” element of exposition and reasoning. Paradox, however, soon becomes stale, and fallacy wearisome. Hence, despite its original popularity, eristical sophistry could not hold its ground. The man of the world who had cultivated it in his youth regarded it in riper years asa

foolish pedantry, or at best as a propedeutic exercise ; while the serious student, necessarily preferring that form of disputation which recognized truth as the end of this as of other intellectual processes, betook himself to one or other of the philosophies of the revival.

In order to complete this sketch of the development of sophistry in the latter half of the 5th century and the earlier half of the 4th, it is necessary next to take account of Socrates and the Socratics. A foe to philosophy and a renegade from art, Socrates took his departure from the same point as Protagoras, and moved in the same direc- tion, that of the education of youth. Finding in the cul- tivation of “virtue” or “excellence” a substitute for the pursuit of scientific truth, and in disputation the sole means by which “virtue” or “excellence” could be attained, he resembled at once the sophists of culture and the sophists of eristic. But, inasmuch as the “virtue” or “excellence” which he sought was that of the man rather than that of the official, while the disputation which he practised had for its aim, not victory, but the elimination of error, the differences which separated him from the sophists of culture and the sophists of eristic were only less considerable than the resemblances which he bore to both ; and further, though his whole time and attention were bestowed upon the education of young Athenians, his theory of the relations of teacher and pupil differed from that of the recognized professors of education, inasmuch as the taking of fees seemed to him to entail a base surrender of the teacher’s independence. The principal character- istics of Socrates’s theory of education were accepted, mutatis mutandis, by the leading Socratics. With these resemblances to the contemporary professors of education, and with these differences, were Socrates and the Socratics sophists or not? To this question there is no simple answer, yes or no. It is certain that Socrates’s contem- poraries regarded him as a sophist; and it was only reasonable that they should so regard him, because in opposition to the physicists of the past and the artists of the present he asserted the claims of higher education. But, though according to the phraseology of the time he was a sophist, he was not a typical sophist,—his principle that, while scientific truth is unattainable by man, right opinion is the only basis of right action, clearly differentiat- ing him from all the other professors of “virtue.” Again, as the Socratics—Plato himself, when he established him- self at the Academy, being no exception—were, like their master, educators rather than philosophers, and in their teaching laid especial stress upon discussion, they too were doubtless regarded as sophists, not by Isocrates only, but by their contemporaries in general ; and it may be con- jectured that the disputatious tendencies of the Megarian school made it all the more difficult for Plato and others to secure a proper appreciation of the difference between dia-

lectic, or discussion with a view to the discovery of truth, and eristic, or discussion with a view to victory. Changing circumstances, however, carry with them changes in the meaning and application of words. Whereas, so long as philosophy was in abeyance Socrates and the Socratics were regarded as sophists of an abnormal sort, as soon as philo- sophy revived it was dimly perceived that, in so far as Socrates and the Socratics dissented from sophistry, they preserved the philosophical tradition. This being so, it was found convenient to revise the terminology of the past, and to include in the philosophical succession those who, though not philosophers, had cherished the sacred spark. As for Socrates, he ranked himself neither with the philosophers, who professed to know, nor with the sophists, who pro- fessed to teach ; and, if he sometimes described himself as a iAdcodos, he was careful to indicate that he pretended to no other knowledge than that of his own limitations.

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It would seem then, (1) that popular nomenclature included under the term "'sophist" all teachers—whether professors, or, like Socrates, amateurs—who communi- cated, not artistic skill, nor philosophical theory, but a general or liberal education ; (2) that, of those who were commonly accounted sophists, some professed culture, some forensic rhetoric, some political rhetoric, some eristic, some (2¢., the Socratics) dialectic; (3) that the differences between the different groups of sophists were not inconsiderable, and that in particular the teaching of the rhetoricians was distinct in origin, and, in so far as its alm was success in a special walk of life, distinct in character, from the niore general teaching of the sophists of culture, the eristics, and the dialecticians, while the teaching of the dialecticians was discriminated from that of the rest, in so far as the aim of the dialecticians was truth, or at least the bettering of opinion; and, conse- quently, (4) that, in awarding praise and blame to sophistry and its representatives, the distinctive characteristics of the groups above enumerated must be studiously kept in view.

Lapse of time and change of circumstances brought with them, not merely changes in the subjects taught, but also changes in the popular estimate of sophistry and sophists. The first and most obvious sentiment which

sophistry evoked was an enthusiastic and admiring interest. The sophist seemed to his youthful hearers to open a new field of intellectual activity and thereby to add a fresh zest to existence. But in proportion to the fascination which he exercised upon the young was the distrust which he inspired in their less pliable elders. Not only were they dismayed by the novelty of the sophistical teaching, but also they vaguely perceived that it was subversive of authority, of the authority of the parent over the child as well as of the authority of the state over the citizen. Of the two conflicting sentiments, the favour of the young, gain- ing as years passed away, naturally prevailed; sophistry ceased to be novel, and attendance in the lecture-rooms of the sophists came to be thought not less necessary for the youth than attendance in the elementary schools for the boy. The lively enthusiasm and the furious opposition which greeted Protagoras had now burnt themselves out, and before long the sophist was treated by the man of the world as a harmless, necessary pedagogue.

That sophistry must be studied in its historical development was clearly seen by Plato, whose dialogue called the Sophist con- tains a formal review of the changing phases and aspects of sophistical teaching. The subject which is discussed in that dialogue and its successor the Statesman being the question “Are sophist, statesman, and philosopher identical or different ?” the Eleate who acts as protagonist seeks a definition of the term “sophist”” by means of a series of divisions or dichotomies. In this way he is led to regard the sophist successively—(1) as a practitioner of that branch of mercenary persuasion in private which professes to impart ‘‘virtue” and exacts payment in the shape of a fee, in opposition to the flatterer who offers pleasure, asking for sustenance in return; (2) as a practitioner of that branch of mental trading which purveys from city to city dis- courses and lessons about “virtue,” in opposition to the artist who similarly purveys discourses and lessous about the arts; (3) and (4) as a practitioner of those branches of mental trading, retail and wholesale, which purvey discourses and lessons about ‘virtue ” within a city, in opposition to the artists who similarly purvey discourses and lessons about the arts; (5) as a practitioner of that branch of eristic which brings to the professor pecuniary emolument, cristic being the systematic form of antilogic, and dealing with justice, injustice, and other abstractions, and antilogic being that form of disputation which uses question and answer in private, in opposition to

forensic, which uses continuous discourse in the law-courts; (6) as a practitioner of that branch of education which purges away the vain conceit of wisdom by means of cross-exainination, in opposition to the traditional method of reproof or admonition. These definitions being thus various, the Elcate notes that the sophist, in consideration of a fee, disputes, and teaches others to dispute, about things divine, cosmieal, metaphysical, legal, political, technical, —in fact, about everything,

—not having knowledge of them, becausc universal knowledge is unattainable ; after which he is in a position to define the sophist (7) as a couscious impostor who, in private, by discontinuous discourse, compels his interlocutor to contradict himself, in opposi- tion to the dyuodroyinds, who, in public, by continuous discourse, imposes upon crowds.

It is elear that the final definition is preferred, not because of any intrinsic superiority, but because it has a direct bearing upon the question “Arc sophist, statesman, and philosopher identical or different?” and that the various definitions represent different stages or forms of sophistry as conccived from different points of view. Thus the first and second definitions represent the founders of the sophistry of culture, Protagoras and Prodicus, from the respective points of view of the older Athenians, who disliked the new culture, and the younger Athenians, who admired it; the third and fourth definitions represent imitators to whom the note of itinerancy was not applicable; the fifth definition represents the carlier eristics, contemporaries of Socratcs, whom it was necessary to distinguish from the teachers of forensic oratory; the sixth is framed to meet the anomalous case of Socrates, in whom many saw the typical sophist, though Plato conceives this view to be unfortunate ; and the seventh and final definition, having in view eristical sophistry fully developed, distinguishes it from dnuoroyirh, i.¢., political rhetoric, but at the same time hints that, though gopiorixy and Syuoroyin may be discriminated, they are neverthe- less near akin, the one being the ape of philosophy, the other the ape of statesmanship. In short, Plato traccs the changes which, in less than a century, had taken place in the meaning of the term, partly through changes in the practice of the sophists, partly through changes in their surroundings and in public opinion, so as to show by a familiar instance that general terms which do not describe natural kinds eannot have a stable connotation.

Now it is easy to see that in this careful statement Plato recognizes three periods. The first four definitions represent the period of Protagoras, Prodicus, and their immediate successors, when the object sought was “virtuc,” ‘‘excellence,” ‘ culture,” and the means to it was literature. The fifth and sixth definitions represeut the close of the 5th century, when sophistry handled eristically, and perhaps, though Plato demurs to the inclusion, dialectically, questions of justice, injustice, and the like, dinaverct or forensic rhetoric being its proximate rival. The seventh definition represents the first half of the 4th century, when sophistry was eristical in a wider field, having for its rival, not forensic rhetoric, but the rhetoric of the assembly. Plato’s classi- fication of educational thcories is then substantially the classifica- tion adopted in this article, though, whereas

here, in accordance with well-attested popular usage, all the educational theories mentioned are included under the head of sophistry, Plato allows to rhetoric, forensic and political, an independent position, and hints that there are grounds for denying the title of sophist to the dialectician Socrates. Incidentally we gather two important facts,— (1) that contemporary with the dialectic of Socrates there was an eristic, and (2) that this eristic was mainly applied to ethical ques- tions. Finally, we may be sure that, if Plato was thus careful to distinguish the phases and aspects of sophistical development, he could never have fallen into the modern error of bestowing upon those whom the Greeks called sophists either indiscriminate censure or indiscriminate laudation.

(2) Relations of Sophistry to Education, Literature, and Phalosophy.—If{ then the sophists, from Protagoras to Isocrates, were before everything educators, it becomes necessary to inquire whether their labours marked or pro- moted an advance in educational theory and method. At the beginning of the 5th century 3.c. every young Greek of the better sort already received rudimentary instruction, not only in music and gymnastics, but also in reading and writing. Further, in the colonies, and especially the colonies of the West, philosophy and art had done some- thing for higher education. Thus in Italy the Pytha- gorean school was, in the fullest sense of the term, an educational institution ; and in Sicily the rhetorical teach- ing of Corax and Tisias was presumably educational in the same sense as the teaching of Gorgias. But in central Greece, where, at any rate down to the Persian Wars, politics, domestic and foreign, were all-engrossing, and left the citizen little leisure for self-cultivation, the need of a higher education had hardly made itself felt. The overthrow of the Persian invaders changed all this. Henceforward the best of Greek art, philosophy, and literature gravitated to Athens, and with their concentra- tion and consequent development came a general and

growing demand for teaching. As has been seen, it was just at this period that philosophy and art ceased to be available for educational purposes, and accordingly the literary sophists were popular precisely because they offered advanced teaching which was neither philosophical nor artistic.

Their recognition of the demand and their attempt to satisfy it are no small claims to distinction. That, whereas before the time of Protagoras there was little systematic education in the colonies and less in central Greece, after his time attendance in the lecture- rooms of the sophists was the customary sequel to attend- ance in the elementary schools, is a fact which speaks for itself.

But this is not all. The education provided by the sophists of culture had positive merits. When Protagoras included in his course grammar, style, interpretation of the poets, and oratory, supplementing his own continuous expositions by disputations in which he and his pupils took part, he showed a not inadequate appreciation of the requisites of a literary education; and it may be conjectured that his comprehensive programme, which Prodicus and others extended, had something to do with the develop- ment of that versatility which was the most notable element in the Athenian character.

There is less to be said for the teachers of rhetoric, politics, and eristic, who, in limiting themselves each to a single subject,—the rhetoricians proper or forensic rheto- ricians to one branch of oratory, the politicians or political rhetoricians to another, and the eristics to disputation,— ceased to be educators and became instructors. Neverthe- less, rhetoric and disputation, though at the present day strangely neglected in English schools and universities, are, within their limits, valuable instruments; and, as specialization in teaching does not necessarily imply specialization in learning, many of those who attended the lectures and the classes of a rhetorician or an eristic sought and found other instruction elsewhere. It would seem then that even in its decline sophistry had its educational use. But in any case it may be claimed for its professors that in the course of a century they discovered and turned to account most of the instruments of literary education.

With these considerable merits, normal sophistry had one defect, its indifference to truth. Despairing of philosophy,—that is to say, of physical science,—the sophists were prepared to go all lengths in scepticism. Accordingly the epideictic sophists in exposition, and the argumentative sophists in debate, one and all, studied, not matter but style, not accuracy but effect, not proof but persuasion. In short, in their hostility to science

they refused to handle literature in a scientific spirit. That this defect was serious was dimly apprehended even by those who frequented and admired the lectures of the earlier sophists; that it was fatal was clearly seen by Socrates, who, himself commonly regarded as a sophist, emphatically reprehended, not only the taking of fees, which was after alla mere incident, objectionable because it seemed to preclude independence of thought, but also the fundamental disregard of truth which infected every part and every phase of sophistical teaching. To these contemporary censures the modern critic cannot refuse his assent.

To literature and to oratory the sophists rendered good service. Themselves of necessity stylists, because their professional success largely depended upon skilful and effective exposition, the sophists both of culture and of rhetoric were professedly teachers of the rules of grammar and the principles of written and spoken discourse. Thus, by example as well as by precept, they not only taught their hearers to value literary and oratorical excellence,

but also took the lcad in fashioning the style of their time. Their influence in these respects was weighty and import- ant. Whereas when sophistry began prose composition was hardly practised in central Greece, the sophists were still the leaders in literature and oratory when Plato wrote the Republic, and they had hardly lost their position when Demosthenes delivered the Phzlippics. In fact, it is not too much to say that it was the sophists who provided those great masters with their consummate instrument, and it detracts but little from the merit of the makers if they were themselves unable to draw from it its finer tones. The relation of sophistry to philosophy was throughout one of pronounccd hostility. From the days of Protagoras, when this hostility was triumphant and contemptuous, to the days of Isocrates, when it was jealous and bitter, the sophists were declared and consistent sceptics. But, al- though Protagoras and Gorgias had examincd the teaching of their predecessors so far as to satisfy themselves of its futility and to draw the sceptical inference, their study of the great problem of the day was preliminary to their sophistry rather than a part of it; and, as the overthrow of philosophy was complete and the attractions of

sophistry were all-powerful, the question, ‘“‘What is knowledge?” ccased for a time to claim or to reccive attention, There is then no such thing as a “sophistical theory of know- ledge.” Similarly, the recognition of a ‘sophistical ethic” is, to say the least, misleading. It may have been that the sophists’ preference of seeming to reality, of success to truth, had a mischievous effect upon the morality of the time; but it is clear that they had no common theory of ethics, and there is no warrant for the assumption that a sophist, as such, specially interested himself in ethical questions. When Protagoras asserted “civic excellence” or “virtue” to be the end of education, he neither expressed nor implied a theory of morality. Prodicus in his platitudes reflected the customary morality of the time. Gorgias said plainly that he did not teach “virtue.” Jf Hippias, Polus, and Thrasymachus defied conventional morality, they did so independently of one another, and in this, as in other matters, they were disputants maintaining paradoxical theses, rather than thinkers announcing heretical convictions. The morality of Isocrates bore a certain resemblance to that of Socrates. In short, the attitude of the sophists towards inquiry in general precluded them, collectively and individually, from attachment to any particular theory. Yet among the so-called sophists there were two who had philosophical leanings, as appears in their willingness to be called by the title of philosopher. First, Socrates, whilst he conceived that the physicists had mistaken the field of inquiry, absolute truth being unattainable, maintained, as has been seen, that one opinion was better than another, and that consistency of opinion, resulting in consistency of action, was the end which the human intellect properly proposes to itself. Hence, though an agnostic, he was not unwilling to be called a philosopher, in so far as he pursued such truth as was attainable by man. Secondly, when sophistry had begun to fall into contempt, the political rhetorician Isocrates claimed for himself the time- honoured designation of philosopher, “herein,” says Plato, “resembling some tinker, bald-pated and short of stature, who, having made money, knocks off his chains, goes to

the bath, buys a new suit, and then takes advantage of.

the poverty and desolation of his master’s daughter to urge upon her his odious addresses” (Rep., vi. 495 E). It will be seen, however, that neither Socrates nor Isocrates was philosopher in any strict sense of the word, the

speculative aims of physicists and metaphysicians being foreign to the practical theories both of the one and of the other.

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As for the classification of sophistical methods, so for their criticism, the testimony of Plato is all-important. It may be conjectured that, when he emerged from the purely Socratic phase of his earlier years, Plato gave himself to the study of contemporary methods of cducation and to the elaboration of an educational system of his own, and that it was in this way that he came to the inetaphysical speculations of his maturity. It may be imagined further that, when he established himself at the Academy, his first care was to draw np a scheme of education, including arithmetic, geometry (plane and solid), astronomy, harmonics, and dialectic, and that it was not until he had arranged for the carrying out of this programme that he devoted himself to the special functions of professor of philosophy. However this may be, we find amongst his writings, —intermediate, as it would secm, between the Socratic conversations of his first period of literary activity and the meta- physical disquisitions of a later time,—a serics of dialogues which, however varied their ostensible subjects, agrec in having a direct bearing upon education. Thus the Protagoras brings the educa- tional theory of Protagoras and the sophists of culture face to face with the educational theory of Socrates, so as to expose the limita- tions of both; the Gorgias deals with the moral aspect of the teach- ings of the forensic rhctorician Gorgias and the political rhetorician Isocrates, and the intellectual aspect of thcir respective theories of education is handled in the Phedrus; the Afeno on the one hand exhibits the strength and the weakuess of the teaching of Socrates, and on the other brings into view the makeshift method of those who, despising systematic teaching, regarded the practical poli- tician as the true educator; the Huthydemus has for its subject the eristical method; finally, having in these dialogues characterized the current theories of education, Plato procecds in the Republic to develop an original scheme. Plato’s criticisms of the sophists are then, in the opinion of the present writer, no mere obiter dicta, introduced for purposes of literary adornment or dramatic effect, but rather the expressions of profound and reasoned convic- tion, and, as such, entitled at any rate to respect. For the details of Plato’s critique, the reader should go, not to the summaries of

commentators, but to the dialogues themselves, In this place it is sufficient to say that, while Plato accounts no education satis- factory which has not knowledge for its basis, he emphatically prefers the scepticism of Socrates, which, despairing of knowledge, seeks right opinion, to the scepticism of the sophists, which, de- spairing of knowledge, abandons the attempt to better cxisting beliefs.

(3) The Theory of Grote.—The post-Platonic historians and critics, who, while they knew the earlier sophistry only through tradition, were eye-witnesses of the sophistry of the decadence, were more alive to the faults than to the virtues of the movement. Overlooking the differences which separated the humanists from the eristics, and both of these from the rhetoricians, and taking no account of Socrates, whom thcy regarded as a philosopher, they forgot the services which Protagoras and Prodicus, Gorgias and Isocrates, had rendered to education and to literature, and included the whole profession in an indiscriminate and contemptuous censure. This prejudice, establishing itself in familiar spcech, has descended from antiquity to modern times, colouring, when it does not distort, the narratives of biographers and the criticisms of commentators. ‘The sophists,” says Grote, “are spoken of as a new class of men, or sometimes in language which implies a new doctrinal sect or school, as if they then sprang up in Grecce for the first time—ostentatious impostors, flattering and duping therich youth fortheir own personal gain, under- mining the morality of Athens, public and private, and encouraging their pupils to the unscrupulous prosecution of ambition and cupidity. They are even affirmed to have succeeded in corrupting the general morality, so that Athens had become miserably degenerated and vicious in the latter years of the Peloponnesian War, as compared with what she was in the time of Miltiades and Aristeides ;” and, although amongst the pre-Grotian scholars there were some who saw as clearly as Grote himself that “the sophists are a much-calumniated race” (G. H. Lewes), it is certain that historians of philosophy, and editors of Plato, especially the ‘acumen plumbeum Stallbaumii,” had given ample occasion for the energetic protest contained in the famous sixty-seventh chapter of Grote’s History of Greece. Amongst the many merits of that admirable

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scholar, it is one of the greatest that he has laid “the fiend called die Sophistck,” that is to say, the theory that sophistry was an organized conspiracy against law and morals. Nevertheless, in this matter he is always an advocate; and it may be. thought that, while he success- fully disposes of the current slander, his description of his clients needs correction in some important particulars. Hence the following paragraphs, while they will resume and affirm his principal results, will qualify and impugn some of his positions.

In so far as he is critical, Grote leaves little to be desired. That the persons styled sophists ‘‘ were not a sect or school, with common doctrines or method,” is clear. Common doctrine, that is to say, common doctrine of a positive sort, they could not have, because, being sceptics, they had nothing which could be called positive doctrine; while there was a period when even their scepticism was in no wise distinctive, because they shared it with all or nearly all their contemporaries. Neither were they united by a common educational method, the end and the instru- ments of education being diversely conceived by Prota- goras, Gorgias, and Isocrates, to say nothing of the wider differences which separate these three from the eristics, and all the four normal types from the abnormal type represented by Socrates.

Again, it is certain that the theoretical and practical morality of the sopliists, regarded as a class, was “neither above nor below the standard of the age.” The taking of fees, the pride of professional success, and the teaching of rhetoric are no proofs either of conscious charlatanism or of ingrained depravity. Indeed, we have evidence of sound, if conventional, principle in Prodicus’s apo- logue of the “Choice of Heracles,” and of honourable, though eccentric, practice in the story of Protagoras’s treatment of defaulting pupils. But, above all, it is antecedently certain that defection from the ordinary standard of morality would have precluded the success which the sophists unquestionably sought and won. In fact, public opinion made the morality of the sophists, rather than the sophists the morality of public opinion. Hence, even if we demur to the judgment of Grote that “Athens at the close of the Peloponnesian War was not more corrupt than Athens in the days of Miltiades and Aristeides,” we shall not “consider the sophists as the cor- ruptors of Athenian morality,” but rather with Plato lay

the blame upon society itself, which, “in popular meet- ings, law-courts, theatres, armies, and other great gather- ings, with uproarious censure and clamorous applause” (Zeep., vi. 492), educates young and old, and fashions them according to its pleasure.

Nor can we regard “Plato and his followers as the authorized teachers of the Greek nation and the sophists as the dissenters.” On the contrary, the sophists were in quiet possession of the field when Plato, returning to Athens, opened the rival school of the Academy; and, while their teaching in all respects accommodated itself to current opinion, his, in many matters, ran directly counter to it.

But if thus far Grote’s protest against prevalent assumptions carries an immediate and unhesitating con- viction, it may be doubted whether his positive statement can be accounted final. ‘‘The appearance of the sophists,” he says, ‘was no new fact….. The paid teachers— whom modern writers set down as the sophists, and denounce as the modern pestilence of their age—were not distinguished in any marked or generic way from their predecessors.” Now it is true that before 447 B.c., besides the teachers of writing, gymnastic, and music, to whom the young Greek resorted for elementary instruc- tion, there were artists and artisans who not only practised

their crafts but also communicated them to apprentices and pupils, and that accordingly the Platonic Protagoras recognizes in the gymnast Iccus, the physician Herodicus, and the musicians Agathocles and Pythoclides fore- runners of the sophists. But the forerunners of the sophists are not to be confounded with the sophists them- selves, and the difference between them is not far to seek. Though some of those who resorted to the teachers of rudiments and the artists derived from them such sub- stitute for “higher education” as was before 447 generally obtainable, it was only incidentally that the teachers of rudiments and the artists communicated anything which could be called by that name. Contrariwise, the sophists were always and essentially professors of the higher education ; and, although in process of time specialization assimilated sophistry to the arts, at the outset at any rate, its declared aim—the cultivation of the civic character— sufficiently

distinguished sophistical education both from rudimentary instruction and from artistic training. It is true too that in some of the colonies philosophy had busied itself with higher education; but here again the forerunners of the sophists are easily distinguished from the sophists, since the sophists condemned, not only the scientific speculations of their predecessors, but also their philosophical aims, and offered to the Greek world a new employment for leisure, a new intellectual ambition.

Nor is it altogether correct to say that "the persons styled sophists had no principles common to them all and distinguishing them from others." Various as were the phases through which sophistry passed between the middle of the 5th century and the middle of the 4th, the sophists— Socrates himself being no exception—had in their declared antagonism to philosophy a common characteristic ; and, if in the interval, philosophical speculation being tempor- arily suspended, scepticism ceased for the time to be peculiar, at the outset, when Protagoras and Gorgias broke with the physicists, and in the sequel, when Plato raised the cry of "'back to Parmenides," this common characteristic was distinctive.

Further, it may be doubted whether Grote is sufficiently careful to distinguish between the charges brought against the sophists personally and the criticism of their educa- tional methods. When the sophists are represented as conscious impostors who " poisoned and demoralized by corrupt teaching the Athenian moral character," he has, as has been seen, an easy and complete reply. But the question still remains—Was the education provided by Protagoras, by Gorgias, by Isocrates, by the eristics, and by Socrates good, bad, or indifferent? And, though the modern critic will not be prepared with Plato to deny the name of education to all teaching which is not based upon an ontology, it may nevertheless be thought that normal sophistry—as opposed to the sophistry of Socrates—was in various degrees unsatisfactory, in so far as it tacitly or confessedly ignored the "material" element of exposition or reasoning.

And if Grote overlooks important agreements he seems also to understate important differences. Regarding Pro- tagoras, Gorgias, and Isocrates as types of one and the same sophistry (pp. 487, 493, 495, 499, 544, 2d edition), and neglecting as slander or exaggeration all the evidence in

regard to the sophistry of eristic (p. 540), he conceives that the sophists undertook “ to educate young men so as to make them better qualified for statesmen or ministers,” and that ‘‘that which stood most prominent in the teach- ing of Gorgias and the other sophists was, that they cultivated and improved the powers of public speaking in their pupils.” Excellent asa statement of the aim and method of Isocrates, and tolerable as a statement of those of Gorgias, these phrases are inexact if applied to

Protagoras, who, making “civic virtue” his aim, regarded statesmanship and administration as parts of “civic virtue,” and consequently assigned to oratory no more than a subordinate place in his programme, while to the eristics—whose existence is attested, not only by Plato, but also by Isocrates and Aristotle—and to Socrates— whom Grote himself accounts a sophist—the description is plainly and palpably inappropriate.

Grote’s note about the eristical sophists is perhaps the least satisfactory part of his exposition. That ‘there were in Athens persons who abused the dialectical exereise for frivolous puzzles ” he admits; but ‘‘to treat Euthydemus and Dionysodorus as samples of ‘The Sophists’ is,” he continues, “altogether un- warrantable.” It would seem then that, while he regards rhetoric as the function of normal sophistry, taking indifferently as his types Protagoras, Gorgias, and Isocrates, he accounts Euthydemus and Dionysodorus (together with Socrates) as sophists, but as sophists of an abnormal sort, who may therefore be neglected. Now this view is inconsistent with the evidence of Plato, who, in the Sophist, in his final and operative definition, gives prominence to the eristical element, and plainly accounts it the main character- istic, not indeed of the sophistry of the 5th century, but of the sophistry of the 4th. It must be presumed then that, in virtue of his general suspicions of the Platonie testimony, Grote in this matter leaves the Sophist out of account. Thcro is, however, another theory of the significance of Plato’s allusions to eristical sophistry, that of Prof. H. Sidgwick, whose brilliant defence of Grote is an indispensable supplement to the original document. Giving a hearty general assent to Grote’s theory, Sidgwick never- theless introduces qualifications similar to some of those which are suggested in this article. In particular he allows that ‘there was at

any rate enough of charlatanism in Protagoras and Hippias to prevent any ardour for their historical reputation," that the sophists generally ''had in their lifetime more success than they deserved," that it was ''antagonism to their teaching which developed the genius of Socrates," and, above all, that, 'in his anxiety to do justice to the Sophist, Grote laid more stress than is at all necessary on the partisanship of Plato." Now this last admission precludes Sidgwick from neglecting, as Grote had done, the evidence of the Huthydemus. Pointing out that the sophists of that dialogue "profess eis dperijs émiméAciay mpotpévar by means of dialogue," that "they challenge the intcrlocutor éméyeuw Adyov," that '' their examples are drawn from conmon objects and vulgar trades," that ''they maintain positions that we know to have been held by Megarians and Cynics," he infers that '' what we have here presented to us as 'sophistic' is neither more nor less than a caricature of the Megarian logic ;" and further, on the ground that ''the whole conception of Socrates and his effect on his eontemporaries, as all authorities combine to represent it, requires us to assume that his manner of discourse was quite novel, that no one before had systematically attempted to show men their ignorance of what they believed themselves to know," he is "disposed to think that the art of disputation which is ascribed to sophists in the Huthydemvus and the Sophistes (and exhaustively analysed by Aristotle in the wep) Sopiortedv "EAéyxwv) originated eutirely with Socrates, and that he is altogether responsible for the form at least of this second species of sophistic." 'To this theory the present writer is unable to subscribe. 'That Plato was not care- ful to distinguish the Megarians and the Cynics from the eristical sophists, and that the disputants of the 4th century affected some of the mannerisms of the greatest disputant of the 5th century, he willingly concedes. But he cannot allow either that the Megarians and the Cynics were the only eristics, or that eristical sophistry began with Socrates. Plainly this is not the place fora full exa- mination of the question ; yet it may be remarked—(1) that the previous history of the sophists of the Luthydemus, who had been professors of tactics (Xenophon, Mfem., iii. 1, 1), swordsmanship, and forensic argumentation, implies that they came to eristic, not from the sophistry of Socrates, but from that of the later human- ists, polymaths of the type of Hippias; (2) that the fifth and sixth definitions of the Sophist, in which 'that branch of eristic which brings pecuniary gain to the practitioner" is opposed to the "'patience-trying, purgative elenchus" of Socrates, indicate that contemporary with Socrates

there were eristics whose aims were not his ; (3) that, whereas the sophist of the final definition ‘disputes, and teaches others to dispute, about things divine, cosmical, meta- physical, legal, political, technical, in fact, about all things,” we have no ground for supposing that the Megarians and the Cynics used their eristic for any purpose. except the defence of their logical heresies.

Nor is it possible to accept the statements that “the splendid genius, the lasting influence, and the reiterated polemics of Plato have stamped the name sophist upon the men against whom he wrote as if it were their

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recognized, legitimate, and peculiar designation,” and that “Plato not only stole the name out of general circulation, in order to fasten it specially upon his opponents the paid teachers, but also connected with it express discreditable attributes which formed no part of its primitive and recognized meaning and were altogether distinct from, though grafted upon, the vague sentiment of dishke associated with it.” That is to say, Grote supposes that for at least eight and forty years, from 447 to 399, the paid professors had no professional title ; that, this period having elapsed, a youthful opponent succeeded in fastening an uncomplimentary title, not only upon the contemporary teachers, but also, retrospectively, upon their predecessors; and that, artfully enhancing the indignity of the title affixed, he thus obscured, perverted, and effaced the records and the memories of the past. Manifestly all three propositions are antecedently im- probable. But more than this: whereas in the nomen- clature of Plato’s contemporaries Protagoras, Gorgias, Socrates, Dionysodorus, and Isocrates were all of them sophists, Plato himself in his careful investigation sum- marized above limits the meaning of the term so that it shall include the humanists and the eristics only. Now, if his use of the term was stricter than the customary use, he can hardly be held answerable for the latter.

Nor is Grote altogether just in his account of Plato’s attitude towards the several sophists, or altogether judicious in his appreciation of Plato’s testimony. How- ever coutemptuous in his portraiture of Hippias and Dionysodorus, however severe in his polemic against Isocrates, Plato regards Protagoras with admiration and Gorgias with respect. While he

emphasizes in the later sophists the consequences of the fundamental error of sophistry,—its indifference to truth,—he does honour to the genius and the originality of the leaders of the movement. Indeed, the author of this article finds in the writings of Plato a grave and discriminating study of the several forms of sophistry, but no trace whatsoever of that blind hostility which should warrant us in neglecting his clear and precise evidence.

In a word, the present writer agrees with Grote that the sophists were not a sect or school with common doctrine or method; that their theoretical and practical morality was neither above nor below that of their age, being, in fact, determined by it; and that Plato and his followers are not to be regarded as the authorized teachers of the Greek nation, nor the sophists as the dissenters, but vice versa. At the same time, in opposition to Grote, he maintains that the appearance of the sophists marked a new departure, in so far as they were the first professors of “higher education” as such; that they agreed in the rejection of ‘‘philosophy ”; that the education which they severally gave was open to criticism, inasmuch as, with the exception of Socrates, they attached too much import- ance to the form, too little to the matter, of their discourses and arguments; that humanism, rhetoric, politic, and disputation were characteristic, not of all sophists collectively, but of sections of the profession; that Plato was not the first to give a special meaning to the term “sophist” and to affix it upon the professors of education ; and, finally, that Plato’s evidence is in all essentials trustworthy.

Bibliography.—On the significance of the sophistical move- ment, see E. Zeller, Philosophie d. Griechen, 4th ed., Leipsic, 1876, i, 932-1041 (Presocratie Philosophy, London, 1881, ii. 394-516); G. Grote, History of Greece, London, 1851, &c., ch. Ixvii.; E. M. Cope, “On the Sophists,” and ‘‘ On the Sophistical Rhetoric,” in Jour. Class. and Sacr. Philol., Cambridge, ii. 1855, and iit. 1857, an erudite but inconclusive reply to Grote; H. Sidgwick, ‘‘ The Sophists,” in Jour. of Philol., Cambridge, iv. 1872, and v. 1874, a brilliant defence of Grote; A. W. Benn, The Greek Philosophers, London, 1882, i. 53-107. Compare Eruics, vol. viii. pp. 576-577.

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For lists of treatises upon the life and teaching of particular sophists, see Ueberweg, Grundriss d. Gesch. d. Philos., i. §§ 27-32 (History of

Philosophy, London, 1880). On the later use of the term **sophist," see RHETORIC. (H. JA.)

SOPHOCLES, the most perfect, and next to fEschylus the greatest, of Greek tragic poets, was born 495 zc, and died 406 B.c. As in the case of other Athenian cele- brities, various particulars of his life are handed down, few of which, however, deserve much attention, even the reports attributed to contemporaries being mostly trivial if not puerile. He is known to have reached old age, and his career as a dramatist is believed to have extended over more than sixty years (468-406). His father's name was Sophillus, of the deme Colonus Hippius, the aristocratic quarter, where the Government of the Four Hundred was afterwards constituted. The family burial-place is said by the anonymous biographer to have been ten stadia from the city, on the Decelean Way. 'These facts run counter to the tradition, which seems to have been already discredited by Alexandrian critics, that Sophillus was an artisan, The date assigned for the poet's birth is in accordance with the tale that young Sophocles, then a pupil of the musician Lamprus, was chosen to lead the chorus of boys (7Oéwv Acxrot, Hd. Tyr., 18) in the celebration of the victory of Salamis (480 3.c.). The time of his death is fixed by the allusions to it in the Frogs of Aristoplianes and in the Muses, a lost play of Phrynichus, the comic poet, which were both produced in 405 B.¢., shortly before the capture of the city. And the legend which implies that Lysander allowed him funeral honours is one of those which, like the story of Alexander and Pindar's house at Thebes, we can at least wish to be founded on fact, though we should probably substitute Agis for Lysander. Apart from tragic victories, the event of Sophocles's life most fully authenticated is his appointment at the age of fifty-five as one of the generals who served with Pericles in the Samian War (440-439 B.C.). Conjecture has been rife as to the possibility of his here improving acquaintance with Herodotus, whom he probably met some years earlier at Athens (see HeEroporvus). But the distich quoted by Plutarch—

'Qidhy Hpoddry redtev Soponags et éwy dy Nlévr' ém) wevthxovta—

is a slight ground on which to reject the stronger tradition according to which Herodotus was ere this established at Thurii; and the coincidences in their writings may be accounted for by their having drawn from a common

source, The fact of Sophocles’s generalship is the less sur- prising if taken in connexion with the interesting remark of his biographer (whose Life, though absent from the earliest MS. through some mischance, bears marks of an Alexandrian origin) that he took his full share of civic duties, and even served on foreign embassies :—KaAds 7° eraidev6n Kal éerpddn ev eéropla, Kab év mwoAtreia Kal év mpeaBetars eEnrdtero. The large acquaintanceship which this implies, not only in Athens, but in Ionic cities generally, is a point of main importance in considering the opportunities of information at his command. And, if we credit tlis assertion, we are the more at liberty to doubt the other statement, though it is not incredible, that his

- appointment as general was due to the political wisdom of

the Antigone.

The testimony borne by Aristophanes to the amiability of the poet’s temper (6 & edxodos ev evOdS’, ebkodos & éxet) agrees with the record of his biographer that he was universally beloved. And the anecdote recalled by Cephalus in Plato’s Republic, that Sophocles welcomed the release from the passions which is brought by age, accords with the spirit of his famous Ode to Love in the Antéi- gone. The Sophocles who, according to Aristotle (Rhet.,

iii, 18), said of the Government of the Four Hundred that it was the better of two bad alternatives (probably the same who was one of the probuli) may or may not have been the poet. Other gossiping stories are hardly worth repeating,—as that Pericles rebuked his love of pleasure and thought him a bad general, though a good poet; that he humorously boasted of his own “ generalship ” in affairs of love; or that he said of 4ischylus that he was often right without knowing it, and that Euripides represented men as they are, not as they ought to be. Such trifles rather reflect contemporary or subsequent impressions of a superficial kind than tell us anything about the man or the dramatist. The gibe of Aristophanes (Pax, 695 sq.), that Sophocles in his old age was become a very Simonides in his love for gain, may turn on some perversion of fact,! without being altogether fair to either

poet. It is certainly irreconcilable with the remark (Vit. Anon.) that in spite of pressing invitations he refused to leave Athens for kings' courts. And the story of his indictment by his son Iophon for incompetence to manage his affairs,—to which Cicero has given some weight by quoting it in the De Senectute,—appears to be really trace- able to Satyrus (flor. c. 200 B.c.), the same author who gave publicity to the most ridiculous of the various absurd accounts of the poet's death,—that his breath failed him for want of a pause in reading some passage of the Antigone. Satyrus is at least the sole authority for the defence of the aged poet, who, after reciting passages from the Gd. Col., is supposed to have said to his accusers, "Jf I am Sophocles I am no dotard, and if I dote I am not Sophocles." On the other hand, we need not the testimony of biographers to assure us that he was devoted to Athens and renowned for piety. He is said to have been priest of the hero Alcon (or Halon) in his old age, and himself to have received divine honours after death.

That the duty of managing the actors as well as of training the chorus belonged to the author is well known. But did Aischylus act in his own plays? This certainly is implied in the tradition that Sophocles, because of the weakness of his voice, was the first poet who desisted from doing so. In his Thamyras, however, he is said to have performed on the lyre to admiration, and in his Nausicaa (perhaps as coryphzus) to have played gracefully the game of ball. Various minor improvements in decora- tion and stage carpentry are attributed to him,—whether truly or not who can tell? It is more interesting, if true, that he wrote his plays having certain actors in his eye; that he formed an association (G/acov) for the pro- motion of liberal culture; and that he was the first to introduce three actors on the stage.2 It is asserted on the authority of Aristoxenus that Sophocles was also the first to employ Phrygian melodies. And it is easy to believe that Aj., 693 sqg., Zrach., 205 sq., were sung to Phrygian music, though there are strains in Aschylus (e.g., Choeph., 152 sg., 423 sq.), which it is hard to distinguish essentially from these. Ancient critics had also noted his familiarity with Homer, especially with the Odyssey, his power of selection and of extracting an exquisite grace from all he touched (whence he was named the " Attic Bee"), his mingled felicity and boldness, and, above all, his subtle delineation of human nature and feeling. They observed that the balanced proportions and fine articula- tion of his work are such that in a

single half line or phrase he often conveys the impression of an entire character.

1 Tf any of Sophocles's elegies or odes were ' pot-boilers," this might be duc rather to his easy temper (ebxoAfa) in yielding to a prevalent habit of the time than to any meanness (Bavavala or yAtoxpérys).

? If this was so, it must have been previous to the appearance of the Orestean trilogy.

Nor is this verdict of antiquity likely to be reversed by modern criticism. The object of the present article, however, is not to praise Sophocles, but rather to describe him. And it is time to turn from Alexandrian or Byzantine fancies and judgments to the poet's extant works.

His minor poems, elegies, pans, &c., have all perished ; and of his hundred and odd dramas only seven remain. These all belong to the period of his maturity (he had no decline) ; and not only the titles (as Lessing said) but some scanty fragments of more than ninety others have been preserved. Several of these were, of course, satyric dramas. And this recalls a point of some importance, which has been urged on the authority of Suidas, who says that "Sophocles began the practice of pitting play against play, instead of the tetralogy." If it were meant that Sophocles did not exhibit tetralogies, this statement would have simply to be rejected. For the word of Suidas (950 A.D.) has no weight against quotations from the lists of tragic victories (dtdacKaAiar) which there is no other reason for discrediting. The remark might be due to the impression made on some critics by the greater complexity and completeness of a play of Sophocles—say the Hdipus Tyrannus or Antigone—as compared, say, with the Persx or the Septem contra Thebas. It is distinctly asserted, for example, on the authority of the ddackadia, that the Bacche of Euripides, certainly as late as any play of Sopho- cles, was one of a trilogy or tetralogy. And if the custom was thus maintained for so long it was clearly impossible for any single competitor to break through it. But it seems probable that the trilogy had ceased to be the continuous development of one legend or cycle of legends,—'" pre- senting Thebes or Pelops' line,"—if, indeed, it ever was so exclusively ;

and if, as Scholl and others have suggested, a Sophoclean tetralogy was still linked together by some subtle bond of tragic thought or feeling, this would not affect the criticism of each play considered as an artistic whole. At the same time it appears that the satyric drama lost its grosser features and became more or less assimilated to the milder form of tragedy. And _ these changes, or something like them, may have given rise to the statement in Suidas.!

If the diction of Sophocles sometimes reminds his readers of the Odyssey, the subjects of his plays were more frequently chosen from those later epics which subse- quently came to be embodied in the epic cycle,—such as the dthiopis, the Little Iliad, the Iliupersis, the Cypria, the Wosti, the Zelegonia (all revolving round the tale of Troy), the Zhebaica, the Oiyadlas dAwors, and others, in- cluding probably, though there isnomention of such athing, some early version of the Argonautic story. In one or other of these heroic poems the legends of all the great cities of Hellas were by this time embodied; and, though there must also have been a cloud of oral tradition floating over many a sacred spot, the dramatic poet does not seem, unless in the Gdipus Coloneus, to have directly drawn from this. He was content to quarry from the epic rhapsodies the materials for his more concentrated art, much as Shakespeare made use of Hollingshed or Plutarch, or as the subjects of Tennyson's Jdylls of the King have been taken from Sir Thomas Malory. As Sophocles has been accused of narrowing the range of tragic sympathy from Hellas to Athens, it deserves mention here that, of some hundred subjects of plays attributed to him, fifteen only are connected with Attica, while exactly the same

1 The advantages and defects of the trilogy as a dramatic form are admirably stated by G. Giinther, Grundziige der Trugischen Kunst, Berlin, 1885, The small number of victories attributed to Sophocles, in proportion to the number of his plays, is only intelligible on the supposition that these were presented in groups.

number belong to the tale of Argos, twelve are Argonautic, and thirty Trojan. Even Corinthian heroes (Bellerophon, Polyidus) are not left out. It seems probable on the whole that, within the limits allowed by convention,

Sophocles was guided simply by his instinctive perception of the tragic capabilities of a particular fable. This was evidently Lessing's view, and may be confirmed by quoting his striking remarks upon the subject of one of the lost tragedies, the Thyestes at Sticyon :—

"Nach der abschculichen Mahlzeit, die ihm scin Bruder bereitete, flog er nach Sicyon. Und hier war es wo er, auf Befragung des Orakels, wie cr sich an seinem Bruder richen sollte, die Antwort bekam, er sollte seine eigne Tochter cntehren. Er iiberfiel dies auch unbekannter Weise; und aus diesem Beischlafe ward Agisth, der den Atreus hernach umbrachte, erzeugt. Die Verzweiflung einer geschindeten Prinzessin! Von einem Unbekannten! In welchem sie endlich ihren Vater erkennt! Eine von ihrem Vater entehrte Tochter! Und aus Rache entehrt! Geschindet, einen Morder zu gebiren! Welche Situationen ! welche Scenen !"

To say that subsidiary or collateral motives were never present to Sophocles in the selection of a subject would, however, be beyond the mark. His first drama, the Triptolemus, must have been full of local colouring ; the Ajax appealed powerfully to the national pride; and in the Wdipus Coloneus some faint echoes even of oligarch- ical partisanship may be possibly discerned. But, even where they existed, such motives were collateral and subsidiary ; they were never primary. All else was sub- ordinated to the dramatic, or, in other words, the purely human, interest of the fable. This central interest is even more dominant and pervading in Sophocles than the otherwise supreme influence of religious and ethical ideas. The idea of destiny, for example, was of course inseparable from Greek tragedy. Its prevalence was one of the conditions which presided over the art from its birth, and, unlike A'schylus, who wrestles with gods, our poet simply accepts it, both as a datum of tradition and a fact of life. But in the free handling of Sophocles even fate and providence are adminicular to tragic art. They are instruments through which sympathetic emotion is awakened, deepened, intensified. And, while the vision of the eternal and unwritten laws was holier yet, for it was not the creation of any former age, but rose and culminated with the Sophoclean drama, still to the poet and his Periclean audience this was no abstract notion, but was inseparable from their impassioned contemplation of the life of man—so great and yet so helpless, aiming so high and falling down so far, a plaything of the gods and

yet essentially divine. This lofty vision subdued with the serenity of awe the terror and pity of the scene, but from neither could it take a single tremor or a single tear. Emotion was the element in which Greek tragedy lived and moved, albeit an emotion that was curbed to a serene stillness through its very depth and intensity.

The final estimate of Sophoclean tragedy must largely depend upon the mode in which his treatment of destiny is conceived. That AXschylus had risen on the wings of faith to a height of prophetic vision, from whence he saw the triumph of equity and the defeat of wrong as an eternal process moving on toward one divine event,—that he realized sin, retribution, responsibility, as no other ancient did,—may be gladly conceded. But it has been argued ? that because Sophocles is saddened by glancing down again at actual life,—because in the fatalism of the old fables he finds the reflexion of a truth,—he in so far takes a step backward as a tragic artist. Now is this altogether just? His value for what is highest in man is none the less because he strips it of earthly rewards, nor is his reverence for eternal law less deep because he knows that its workings are sometimes pitiless. Nor, once more,

2 Giinther, op. cit.

does he disbelieve in providence, because experience has shown him that the end towards which the supreme powers lead forth mankind is still unseen. We miss some- thing of the exultant energy of the Marathonian man, but under the grave and gentle guidance of his successor we lose nothing of the conviction that, “because right is right, to follow right were wisdom in the scorn of conse- quence.” Not only the utter devotion of Antigone, but the lacerated innocence of Cidipus and Deianira, the tempted truth of Neoptolemus, the essential nobility of Ajax, leave an impress on the heart which is ineffaceable, and must elevate and purify while it remains. In one respect, however, it must be admitted that Sophocles is not before his age. There is an element of unrelieved vindictiveness, not merely inherent in the fables, but inseparable from the poet’s handling of some themes, which is only too consistent with the temper of the “tyrant city.” /lschylus

represents this with equal dramatic vividness, but he associates it, not with heroism, but with crime.

Sophocles is often praised for skilful construction. But the secret of his skill depends in large measure on the profound way in which the central situation in each of his fables has been conceived and felt. Concentration is the distinguishing note of tragedy, and it is by greater concentration that Sophocles is distinguished from other tragic poets. In the Septem contra Thebas or the Prometheus there is still somewhat of epic enlargement and breadth; in the Hecuba and other dramas of Euripides separate scenes have an idyllic beauty and tenderness which affect us more than the progress of the action as a whole, a defect which the poet sometimes tries to compensate by some novel denouement or catastrophe. But in following a Sophoclean tragedy we are carried steadily and swiftly onward, looking neither to the right nor to the left; the more elaborately any scene or single speech is wrought the more does it contribute to enhance the main emotion, and if there is a deliberate pause it is felt either as a welcome breathing space or as the calm of brooding expectancy.

The result of this method is the union, in the highest degree, of simplicity with complexity, of largeness of design with absolute finish, of grandeur with harmony. Superfluities are thrown off without an effort through the burning of the fire within. Crude elements are fused and made transparent. What look like ornaments are found to be inseparable from the organic whole. Each of the plays is admirable in structure, not because it is cleverly put together, but because it is so completely alive.

The spectator of a Sophoclean tragedy was invited to witness the supreme crisis of an individual destiny, and was possessed at the outset with the circumstances of the decisive moment. Except in the Vrachiniz, where the retrospective soliloquy of Deianira is intended to emphasize her lonely position, this exposition is effected through a brief dialogue, in which the protagonist may or may not take part. In the Wdipus Tyrannus the king’s entrance and his colloquy with the aged priest introduce the audicnce at once to the action and to the chief person. In the Ajax and Philoctetes the entrance or discovery of the hero is made more impressive by being delayed. Immediately after the prologos the chorus enter, number- ing

fifteen, either chanting in procession as in the Antigone and Gd. Tyr., or dispersedly as in the Gd. Col. and Philoctetes, or, thirdly, as in the Electra, where, after entering silently during the monody of the heroine, and taking up their position in the orchestra, they address her one by one. With a remarkable exception, to be noted presently, the chorus having once entered remain to the end. They always stand in some carefully adjusted

relation to the principal figure. The elders of Thebes, whose age and coldness throw into relief the fervour and the desolation of Antigone, are the very men to realize the calamity of CEdipus, and, while horror-stricken, to lament his fall. The rude Salaminian mariners are loyal to Ajax, but cannot enter into his grief. The Trachinian maidens would gladly support Deianira, who has won their hearts, but they are too young and inexperienced for the task. The noble Argive women can sympathize with the sorrows of Electra, but no sympathy can soothe her distress.

The parodos of the chorus is followed by the first scene or epeisodion, with which the action may be said to begin. For in the course of this the spectator’s interest is strongly roused by some new circumstance involving an unforeseen complication,—the awakening of Ajax (Aj.), the burial of Polynices (Ant.), the dream of Clytzmnestra (Z/.), the dark utterance of Tiresias (d. Tyr.), the arrival of Lichas with Tole (Z'rach.), the report of Ismene announcing Creon’s coming (Gd. Col.), the sudden entreaty of Philoctetes crossed by the entrance of the pretended mariner (Phil.). The action from this point onwards is like a steadily flow- ing stream into which a swift and turbulent tributary has suddenly fallen, and the interest advances with rapid and continuous climax until the culmination is reached and the catastrophe is certain. The manner in which this is done, through the interweaving of the pyoes and ortxouvOia, of the dialogue with the ordow.a of the chorus, and the xoupot and kouparixd (where there is interchange between the chorus and the persons), is very different in different dramas, one of the principal charms of Sophocles being his power of ingenious variation in the employment of his

resources. Not less admirable is the strength with which he sustains the interest after the peripeteia,! whether, as in the Antigone, by heaping sorrow upon sorrow, or, as in the first dipus, by passing from horror to tenderness and unlocking the fountain of tears. The extreme point of boldness in arrangement is reached in the Ajax, where the chorus and Tecmessa, having been warned of the impending danger, depart severally in quest of the vanished hero, and thus leave not only the stage but the orchestra vacant for the soliloquy that precedes his suicide.

No such general description as has been here at- tempted can give even a remote impression of the march of Sophoclean tragedy,—by what subtle yet firm and strongly marked gradations the plot is unfolded ; how stroke after stroke contributes to the harmonious totality of feeling; what vivid interplay, on the stage, in the orchestra, and between both, builds up the majestic, ever- moving spectacle. Examine, for example, the opening scene or mpoXoyos of the Wdipus Tyrannus. Its function is merely to propound the situation; yet it is in itself a miniature drama. First there is the silent spectacle of the eager throng of suppliants at the palace gate,—young children, youths, and aged priests. To them the king appears, with royal condescension and true public zeal. The priest expresses their heartfelt loyalty, describes the distress of Thebes, and, extolling CEdipus's past services, implores him to exercise his consummate wisdom for the relief of his people. The king's reply unveils yet further his incessant watchfulness and anxious care for his subjects. And he discloses a new object to their expect- ancy and hope. Creon, a royal person, had been sent to Delphi, and should ere then have returned with the response of Apollo. At this all hearts are trembling in suspense, when a figure is seen approaching. He is wreathed with Apollo's laurel ; he looks cheerfully. What has Phoebus said? Another moment of suspense is interposed. Then the oracle is repeated,—so thrilling to

1 A tragic action has five stages, whence the five acts of the modern drama :—the start, the rise, the height, the change, the close.

Xo, = 36

the spectator who understands the story, so full of doubt and hope and dread to all the persons of the drama: “Ttis for the blood of Laius—his murderers are harboured in the land of Thebes. The country must be purged.” That is the culminating point of the little tragedy. While CEdipus asks for information, while in gaiety of heart he undertakes the search, while he bids the folk of Cadmus to be summoned thither, the spectators lave just time to take in the full significance of what has passed, which every word that is uttered sends further home. All this in 150 lines !

Or, once more, consider the employment of narrative by this great poet. The Zyrannus might be again adduced, but let us turn instead to the Antigone and the Trachiniz. The speech of tlie messenger in the Axtzgone, the speeches of Hyllus and the Nurse in the Zrachinix, occur at the supreme crises of the two dramas. Yet there is no sense of any retardation in the action by the report of what has been happening elsewhere. Much ratlier the audience are carried breathlessly along, while each speaker brings before their mental vision the scene of which he had himself been part. Itis a drama within the drama, an action rising from its starting point in rapid climax, swift, full, con- centrated, until that wave subsides, and is followed by a moment of thrilling expectation. Nor is this all. The narrative of the messenger is overheard by Eurydice, that of Hyllus is heard by Deianira, that of Nurse by the chorus of Maidens. And in each case a poignancy of tragic significance is added by this circumstance, while the pnow in the Antigone, and that of Hyllus in a yet higher degree, bind together in one the twofold interest of an action which might otherwise seem in danger of distract- ing the spectator.

So profound is the contrivance, or, to speak more accur- ately, such is the strength of central feeling and conception, which secures the grace of unity in complexity to the Sophoclean drama.

The proportion of the lyrics to the level dialogue is considerably less on the average in Sophocles than in ‘ Aischylus, as might be expected from the development of the purely dramatic element, and the consequent subord- ination of the chorus to the protagonist. In the seven extant plays the lyrical portion ranges from one-fifth to nearly one-third, being highest in the Antigone and lowest in the Wdipus Tyrannus. The distribution of the lyrical

parts is still more widely diversified. In the Lectra, for instance, tle chorus has less to do than in the Wdipus Tyravnus, although in the former the lyrics constitute one-fourth, and in the latter only one-fifth of the whole. But then the part of Electra is favourable to lyrica] out- bursts, whereas it is only after the tragic change that Cidipus can appropriately pass from the stately senarius to the broken language of the dochmiac and the “lamenting” anapest. The protagonists of the Ajax and the Phzloctetes had also large opportunities for vocal display.

The union of strict symmetry with freedom and variety which is throughout characteristic of the work of Sophocles is especially noticeable in his handling of the tragic metres. In the iambics of his dialogue, as compared with those of Auschylus, there is anadvance which may be compared with the transition from ‘“ Marlowe’s mighty line ” to the subtler harmonies of Shakespeare. Felicitous pauses, the linking on of line to line, trisyllabic feet introduced for special effects, alliteration both hard and soft, length of speeches artfully suited to character and situations, adaptation of the cesura to the feeling expressed, are some of the points which occur most readily in thinking of his senarti. A minute speciality may be noted as illustrative of his manner in this respect. a line is broken by a pause towards the end, and the latter

Where.

SO P—S8 OP

phrase runs on into the following line, elision sometimes takes place between the lines, eg. (Gd. Tyr., 332-3) :—

“Eye ob éuavtoy obte @ aGAyuve. rt Trader’ AAws €A€yxELS 5

This is called synaphea, and is peculiar to Sophocles.

He differentiates more than Aischylus does between the metres to be employed in the xoypoi (including the Kopparixa) and in the choral odes. ‘The dochmnius, cretic, and free anapzest are employed chiefly in the koppot. In the stasima he has greatly developed the use of logacedic and particularly of glyconic rhythms, aud far less fre- quently than his

predecessor indulges in long continuous runs of dactyls or trochees. The light trochaic line 4 J v4. —, so frequent in Atschylus, is comparatively rare in Sophocles. If, from the very severity with which the choral element is subordinated to the purely dramatic, his lyrics have neither the magnificent sweep of A'schylus nor the "linked sweetness" of Euripides, they have a concinnity and point, a directness of aim, and a truth of dramatic keeping, more perfect than is to be found in either. And even in grandeur it would be hard to find many passages to bear comparison with the second stasimon, or central ode, either of the Antigone (eddaipoves otot kaxov) or the first Cdipus (et pou gvvetn épovrr). Nor does anything in Euripides equal in grace and sweet- ness the famous eulogy on Colonus (the poet's birthplace) in the @dipus Coloneus.

Sophocles was cdited (probably from the Venetian MSS.) by Aldus Manutius, with the help of Musurus, in 1502. The Juntine editions, in which the text of Aldus was slightly modificd with the help of Florentine MSS., were published in 1522, 1547, respectively. An edition of the Scholia, very ncarly corresponding to those on the margin of the Mcdicean or chief Laurentian MS. (La or L) had previously appeared at Rome in 1518. The first great modification of the text was duc to Turnebus, who had access to the Parisian MSS.; but he was not fortunate in his selection. The earliest editors had been aware that the traditional arrange- ment of the metres was faulty, but little way had bcen made towards a readjustment. Now it so happens that the Parisian MS. T, which is a copy of the recension of 'Triclinius, an early 14th- century scholar, contains also the metrical views of the same editor ; and, having found (as he erroneously supposed) a sound authority, Turnebus blindly adopted it, and was followed in this by H. Stc-

hanus (1568), Capperonier, and Vauvillers in France, and Canter in Holland (who was the first to mark the eorrespondenee of strophe and antistrophe). This error was to a large extent corrected by Brunck (1786), who rightly preferred Par. A (2712), a 13th-century MS., belonging, as it happened, to the same family with Ven. 467, which Aldus had mainly followed. Thus after nearly three centuries the text returned (though with many conjectural varia- tions, some of which were due to Scaliger, Auratus, and other earlier scholars) into nearly the same channel as at first. Meanwhile the study of Greek metres had greatly advaneed, and, while much licence was given to

conjecture (in which Valcknaer and Porson were especially happy), documentary evidence was also better weighed and sifted. The collation of the Laurentian MS. by Peter Elmsley in 1825 (with his transcription of the Scholia) may be _ said to mark the most important epoch in the textual criticism of Sophocles. But the great work of Gottfried Hermann, whiose editions (1823-1830), which are critical in every sense of the word, are adorned with an ample Latin commentary, made perhaps the longest step in advance. Since Hermann the editors of Sophocles have been very numerous. The list, from Schneidewin to Wecklein and Pappageorgius amongst Continental scholars and from Linwood to Jebb (who is last, not least) amongst our own, is too long for insertion here. (L. C.)

SOPHRON of Syracuse, next to Epicharmus the greatest representative of Sicilian comedy, flourished about 430 B.c. He was the author of mimes, written in prose, containing both male and female characters—Mipor dvdpetor and Mtyou yuvarxetor—and depicting scenes from the daily life of the Sicilian Greeks. From the extremely scanty fragments which remain of his writings we can only see that he used the local dialect, frequently sacrificing refine- ment to vigour; he sometimes reminds us of Plautus in his employment of bold and expressive figures and turns of expression. But we can judge of the dramatic power

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and vivacity of his compositions from the story that Plato first introduced them to Athens, and studied them in order to give animation to his own dialogues; and some idea of the general character of his mimes may be derived from the 2d and 15th idyls of Theocritus, which are said to have been imitated from the “Axéorpi and “IoOuclovoo of his Syracusan predecessor.

The fragments of Sophron, most of which have been preserved to illustrate some point of grammar or dialect, are collectcd in Ahrens, De Grace Lingux Dialectis, vol. ii. pp. 464-476.

SOPRON. See OzpENBURG.

SORA, a city of Italy, at the head of a circondario in the province of Caserta (Terra di Lavoro), is built in a plain on the banks of the Garigliano and on the highway from Rome via Tivoli and Avezzano to Naples. It is the seat of important manufactures,—wool-spinning, cloth- weaving, and paper-making,—this last industry dating from the time of Murat. The original cathedral, conse- crated by Pope Adrian IV. in 1155, was destroyed by the earthquake of 1634. The population of the city was 8768 in 1861 and 5411 (commune 13,208) in 1881.

Sora, an ancient Volscian town, was thrice captured by the Romans, in 345, 314, and 305 B.c., before they managed, in 303, by means of a colony 4000 strong, to confirm its annexation. In 209 it was one of the colonies which refused further contributions, By the lex Julia it became a municipium, but under Augustus it was colonized by soldiers of the 4th legion. The castle of Sorella, built on the rocky height above the town, was in the Middle Ages a stronghold of some note; on one occasion it held out successfully against a whole year's vigorous siege by William II. of Sicily. Alfonso of Aragon made Sora a duchy for the Cantelmi; it was afterwards seized by Pius II., but, being restored to the Cantelmi by Sixtus IV., it ultimately passed to the Della Rovere of Urbino. Against Cxsar Borgia the city was heroically defended by Giovanni di Montefeltro. Captured by the marquis of Pescara for Charles V., it was by him bestowed on Carlo Ceares, duke of Croy and Arescot, but, Ceares being afterwards bought out, the duchy was restored to the dukcof Urbino. By Gregory XIII. it was purchased for 11,000 ducats and bestowed on his son Buoncompagni, the aucestor of the line of Buoncompagni-Ludovisi. In ancient times Sora was the birthplace of the Decii, Attilius Regulus, and Lucius Mummius ; and of its modern celebrities Cardinal Baronius is one. The uow ruined abbey church of San Domenico, founded in 1104 on the left bank of the Liri above the town, is believed to occupy the site of Cicero's family villa and birthplace. It consisted of a nave and two aisles, all ending in circular apscs.

SORAU, an industrial town and railway junction in the south of Brandenburg, Prussia, is situated 54 miles to the south-east of Frankfort-on-the-Oder, and not far from the Silesian border. Said to be one of the oldest towns in Lower Lusatia, Sorau contains a number of ancient buildings, among which the most prominent are several of the churches (one dating

from 1204), the town-house, built in 1260, and the old palace of 1207. The new palace was erected in 1711. The varied manufactures of the town comprise cloth, linen, wax candles, starch, bone-meal, &c. The population, 3764 in 1816, was 13,668 in 1885, up- wards of 12,000 of them being Lutherans.

Sorau is said to have existed in 840 and to have belonged to the abbey of Fulda till the 12th century. It received town-rights in 1260. With the surrounding district, known as the barony of Sorau, it became the seat of successive noble families ; and in 1400 it was united with the barony of Triebel. The last count of Promnitz, whose ancestor had purchased both baronies from Frederick of Bohemia in 1556, sold them to the elector of Saxony for an annuity of 12,000 thalers (£1800). In 1815 Saxony had to cede them to Prussia, after holding them for fifty ycars.

SORBONNE, the name formerly borne by the old faculty of theology in Paris, and now applied to the seat of the académie of that city and of the three faculties of theology, science, and literature. (See FRANCE, vol. ix. p. 513; Paris, vol. xviii. p. 281; and UNiversiTiEs.) The Sorbonne owes its origin and its name to Robert de Sorbon, a poor priest of Champagne, who, arriving in Paris about the beginning of the reign of St Louis, attained high repute by his sanctity and eloquence, and was

appointed by the king to be his chaplain. Assisted by royal liberality, he built upon Mont Sainte-Geneviéve a modest establishment in which were accommodated seven priests charged with the duty of teaching theology gratuit- ously ; to this he added a college of preparatory studies, all under the direction of a provisor, under whom was an annual prior who had the actual management. The new institu- tion was authorized by letters patent of 1255, and canonic- ally sanctioned by Pope Alexander IV. in 1259. Destined originally for poor students, the Sorbonne soon became a meeting-place for all the students of the university of Paris, who resorted thither to hear the lectures of the most learned theologians of the period,—Guillaume de Saint- Amour, Eudes de Douai, Laurent PAnglais, Pierre d’Ailly. At the close of the century it was organized into a full faculty of theology, and under this definitive form it con- ferred bachelor’s, licentiate’s, and doctor’s

degrees, and the severity of its examinations gave an exceptional value to its diplomas. The so-called “thdse Sorbonique, ” instituted towards the beginning of the 14th century, became the type of its order by the length and difficulty of its tests. Ultimately the professors of the Sorbonne came to be resorted to, not only for lectures and examinations, but also for dogmatic decisions and judgments in canon law; the clergy of France and of the whole Catholic world had recourse to them in difficult cases, and the Curia Romana itself more than once laid its doubts before them, giving them the title of “Concilium in Gallia subsistens.” The Sorbonne took a leading part in the religious discussions which agitated France during the 16th and 18th centuries, and its influence thus inevitably extended to political questions. During the insanity of Charles VI. it helped to bring about the absolution of Jean Sans-Peur for the assassination of the duke of Orleans. Shortly afterwards it demanded and supported the condemnation of Joan of Arc; during the Reformation it was the animating spirit of all the persecutions directed against Protestants and unbelievers : without having advised the massacre of St Bartholomew, it did not hesitate to justify it, and it inflamed the League by its vigorous anathemas against Henry ITI. and the king of Navarre, hesitating to recognize the latter even after his abjuration. From this point dates the beginning of its decadence, and, when Richelieu in 1629 ordered the reconstruction of its church and buildings, the following prophetic couplet was circulated— Instaurata ruet Jamjam Sorbona. Caduca Dum fuit, inconcussa stetit ; renovata peribit.

The declaration of the clergy in 1682, which it subscribed, proved fatal to its authority with the Curia Romana; it revived for a short time under Louis XV. during the struggle against Jansenism, but this was its last exploit ; it was suppressed like the old universities in 1790. To the Sorbonne belongs the glory of having introduced printing into France in 1469: within its precincts it assigned quarters for Ulric Gering and two companions in which to set up their presses.

When the university of France was organized in 1808 the Sorbonne became the seat of the académie of Paris ; and between 1816 and 1821 the faculties of theology, science, and literature were installed there with their libraries. All the great university functions are held within its great amphitheatre. Since 1861 there has annually been held in the Sorbonne at Easter an

official congress in which are represented the learned societies of the departments; there are five sections—those of archeology, history, the moral and political sciences, the physical sciences, geography,—which hold separate sittings. The fine arts form a sixth section, with a special organization.

A reconstruction of the buildings of the Sorbonne, pro-

jected by Napoleon III., was begun in 1884, under the architectural direction of Nénot. The old church con- taining the tomb of Richelieu is to be retained on account of its artistic merit.

SORGHUM. See Mitter.

SORIA, a province of Spain, in Old Castile, bounded on the N. by Logrofio, E. by Saragossa, 8S. by Guadalajara, and W. by Segovia and Burgos; the area is 3836 square miles. It isa bleak and lofty region, being bounded on three sides by mountains. A range of low sierras on the north, and the great Sierra de Moncayo on the east, separate the valley of the Duero (Douro) from that of the Ebro, while on the south it is divided from that of the Tagus by a continuation of the Sierra Guadarrama. The whole of the province belongs to the region watered by the Duero and its affluents. This river rises in the northern mountains, and traverses the province in a circuitous course, first to the south and then to the west. The other rivers are mostly affluents of the Duero, such as the Tuerto, San Pedro, &c.; but a few of the tributaries of the Ebro have their sources within the limits of the province. The soil is not remarkable for fertility ; on the contrary, a large proportion of the area is occupied with barren mountains, which are covered with snow for a great part of the year. There are, however, in some places extensive forests of pine, oak, and beech; while in others there are large tracts of pasture land, on which numbers of cattle, sheep, and swine are reared. Grain and veget- ables are raised, but neither of very good quality nor in sufficient quantities to supply the wants of the population. The climate is cold and dry, and the scenery grand, but not very pleasing in its character. Most of the people are employed in farming and rearing cattle; but the cutting and sawing of timber and the preparation of charcoal also

occupy a considerable number. ‘There is a great want of roads in this part of the country; and commerce is consequently very limited. Fine wool was formerly an important production of the province ; but of late years it has considerably fallen off. The only important article of trade at present is timber, which is sent to Madrid and Aragon. Soria is divided into five partidos judiciales and 345 ayuntamientos. The population was returned in 1877 as 153,654. There is a bishop (suffragan of Burgos), resi- dent at Osma. The only town of more than 5000 inhab- itants is Soria.

SORIA, the capital of the above province, on a hill on the right bank of the Duero, 113 miles north-east of Madrid, is an ancient town, still surrounded by walls which were built in the 13th century. It contains several squares, in one of which stand the court-house and prisons and in another the spacious palace of the dukes of Go- mara. ‘T’he churches of Santo Domingo and San Nicolas, the cloisters of the convent of San Juan, and several other ecclesiastical buildings are fine specimens of Romanesque work of the 12th and 13th centuries. The population is chiefly agricultural; but there are also flour-mills, tanneries, potteries, é&c.; and some trade in timber, wool, and fruit is carried on. Three and a half miles distant is the site of the ancient Numantia. But few traces of the old city, however, remain. A railway has long been pro- jected between Soria and Calatayud, upon the Madrid and Saragossa line. The population in 1877 was 6286.

SORREL. See Horricunrurg, vol. xii. p. 288.

SORRENTO, a city of Italy, in the province of Naples, on the north side of the peninsula that separates the Bay of Naples from the Bay of Salerno, about 14 miles to the east of Capo di Sorrento, crowned by the ruins of a temple of Neptune. Sorrento contains only a few unimportant remains of the magnificent buildings which made it in the time of Augustus a finer city than N aples ; and its present

genes, he settled the chronological question.

prosperity depends mainly on the reputation it enjoys as a summer watering-place, with a delightful and healthy climate, and situated amid

picturesque coast scenery. The chief local industry is the inlaying of wood. In ancient times the Surrentine wines had a great repute. The population was 4254 in 1861 and 6089 ir 1881.

Surrentum was of very ancient origin, but it does not appear frequently in history. A famous temple of Minerva stood on the Promontorium Surrentinum (now Punta della Campanella). In 1558 the corsair Pialy attacked the town and carricd off 2000 prisoners. Statius celebrated the delights of the Surrentine villa owned by his friend Pollius Felix; it was at Sorrento that Bernardo Tasso wrote his Amadigi ; and Torquato Tasso was born in the town in 1544.

SOSIGENES, the astronomer who was employed by Julius Cesar to reform the Roman calendar, 46 B.c. (see CALENDAR). Of his life nothing further is known, with the exception of two references to him by Pliny, which show that he left some astronomical treatises. The chief one is as follows :—

‘‘Tres autem fuere sect, Chaldea, Agyptia, Greca. His addidit quartam apud nos Cesar dictator annos ad solis cursum redigens singulos, Sosigene perito scientiz ejus adhibito ; et ea ipsa ratio postea comperto errore correcta est, ita ut XII. annis con- tinuis non intercalaretur, quia cceperat sidera annus morari qui prius antecedebat. Et Sosigenes ipse trinis commentationibus, quamquam diligentior ceteris, non cessavit tamen addubitare ipse semet corrigendo.”—A. N., xviii. 25.

From another passage (H. W., ii. 8) we infer that Sosigenes maintained that Mercury moved in an epicycle about the sun; this doctrine is referred to by his contem- porary Cicero, and it was also that of the Egyptians (see Protemy). Sosigenes is commonly called an Egyptian and a Peripatetic, but this has arisen from his having been confounded with a Peripatetic philosopher of the same name who lived in the 2d century of the Christian era, and who will be briefly noticed below. It is most probable, however, that he was a Greek of Alexandria, for the follow- ing reasons. (1) Czesar had just returned victorious from his Alexandrian expedition, which occupied parts of the years 48 and 47 B.c., when, with the assistance of Sosi- (2) We learn from Plutarch (Cexs., 59) that ‘“Czesar laid the problem (viz., the correction of the calendar) before the ablest philosophers and mathematicians,” and at that time the school of Alexandria was world-

famous. (3) We know that Caesar was himself a diligent student of astronomy. Lucan, in a passage which refers to his correction of the calendar, represents him as saying that even in the midst of his campaigns he had always found time for astrono- mical pursuits :—

‘‘ media inter prelia semper

Stellarum celique plagis superisque vacavi ;

Nec meus Eudoxi vincetur Fastibus annus.” —x. 185-7. (4) Macrobius says that Cesar wrote a work on the motion of the stars, and expressly states, moreover, that he derived from the Egyptian schools his information on this sub- ject, and also what he required for the correction of the calendar.! (5) Ceesar’s arrangement was substantially the same as the reform of the Egyptian calendar in the year 238 B.c. under Ptolemy ITI. Euergetes, a fact which remained unknown until the discovery of the Decree of Canopus by Lepsius at Sanor Tanis in Egypt in the year 1866.

Zeller (Phil. d. Gr., vol. iii. part 1, 2d ed., p. 705-6, note of p. 708, and p. 694, note 3), and after him, but in a more complete manner, Th. H. Martin (Annales de la Faculté des Lettres de Bordeaux, 2° fasc., 1879), have shown, in opposition to the prevail- ing opinion, which had been formerly held by Zeller himself, that

1 ‘Nec mirum si hee digeries morsum reprehensionis evasit, cui arcessita est ab Algypto postreme correctionis auctoritas. Nam Julius Cesar, ut siderum motus, de quibus non indoctos libros reliquit, ab Aigyptiis disciplinis hausit, ita hoe quoque ex eadem institutione mutuatus est, ut ad solis cursum finiendi anni tempus extenderet.”— Sls, lal.

SO T—SOU

the subject of this article has nothing in common but the name with Sosigenes the Peripatetic philosopher, author of a work on restituent spheres (Swovyévns wep) rav dvedrrtrovoay [cpaipay)), which is referred to by Proclus (Hypotyp., p. 111, ed. Halma) and followed by Simplicius in his Commentary on the treatise of Aristotle, De Cxlo, author also of some other works, and master of Alexander of Aphrodisias, who lived at the end

of the 2d and beginning of the 3d century after Christ, and who was the most celebrated of the commentators on Aristotle.

SOTO. See Dr Soro.

SOUBISE, Benszamin DE Rowan, Duc pz (c. 1589- 1641), was the second son of René IL, Vicomte de Rohan, and Catherine de Parthenay, and the younger brother of the soldier-writer Henri de Rowan (¢.v.). The seigneury of Soubisc came to the Rohans through Catherine, and Benjamin took the title as her second son. The exact date of his birth does not seem to be known, but it is believed to be 1589. He served his apprentice- ship as a soldier under Prince Maurice of Orange in the Low Countries. But he hardly becomes an historical character before 1621, when the religious wars once more broke out in France. He and his brother Rohan were the soul of the Huguenot party,—the elder brother chiefly taking command on land and in the south, Soubise in the west and along the sea-coast. His exploits in the conflict have been sympathetically related by his brother, who, if he was not quite an impartial witness, was one of the best military critics of the time. Soubise's chief performance was a singularly bold and well-conducted attack (in 1625) on the royalist fleet in the river Blavet (which included the cutting of a boom in the face of superior numbers after a style suggestive of the best days of the English navy) and the occupation of Oleron. Soubise commanded at Rochelle during the famous siege, and if we may believe his brother the failure of the defence and of the English attack on Rhé was mainly due to the alternate obstinacy of the townsfolk and the English commanders in refus- ing to listen to Soubise's advice. When surrender became inevitable he fled to England, which he had previously visited in quest of succour. He died in 1641, and lus title afterwards served as the chief second designation (not for heirs-apparent, but for the chief collateral branch for the time being) of the house of Rohan-Chabot, into which the older Rohan honours were carried by his niece Marguerite four years after his death.

SOUBISE, Cuaries DE Ronan, Prince DE (1715- 1787), peer and marshal of France, grandson of the Prin- cesse de Soubise, who is known to history as one of the mistresses of Louis XIV., was born in Paris on July 15, 1715. He accompanied Louis XV. in the campaign of 1744-48, and attained high

military rank, which he owed more to his courtiership than to his generalship. Soon after the beginning of the Seven Years' War, through the influence of Madame de Pompadour, he was put in com- mand of a corps of 24,000 men, and on 4th November 1757 he sustained the crushing defeat of Rossbach (see vol. ix. pp. 588-591, where also some subsequent and more favourable episodes of his military career are briefly indicated). After 1763 he lived the life of an ordinary courtier in Paris, dying on July 4, 1787.

SOUDAN, or Stpan (Bildd es-Stidan, "Country of the Blacks "), a term applied by medizeval Arab geographers to the region of Africa south of the Sahara mainly inhabited by peoples of Negro blood, hence corresponding to the ex- pressions Nigritia, Negroland, at one time current amongst European writers. It lies mainly between 5° and 18° N. lat., consequently entirely within the tropics, and in its widest sense stretches right across the continent from Cape Verd on the Atlantic to Massowah on the Red Sea. But the term is more usually restricted to the region bounded N. by the Sahara, 8. by Upper Guinea and the

lands draining to the Congo basin, W. and E. by Sene- gambia and the Abyssinian highlands respectively (see vol. i. plate II.). Within these limits it has an extreme length of about 3000 miles between the Senegal river and Abyssinia, extending southwards at some points 660 miles, with a total area of perhaps 2,000,000 square miles, and a population approximately estimated at from 80 to 90 millions. From the arid and sandy northern wastes to the well-watered and arable Soudanese lands the transi- tion is effected by an intermediate zone of level grassy steppes, partly overgrown with mimosas and acacias, with a mean breadth of about 60 miles, between 17° and 18° N. lat., but towards the centre reaching as far south as 15° N. Excluding this somewhat uniform transitional zone, the Soudan, properly so called, may be described as a moderately elevated region, diversified with extensive open or rolling plains, level plateaus, and even true high- lands, especially in the south-west. It constitutes three distinct hydrographic systems, corresponding to the three main physical divisions of Western Soudan, draining through the Niger southwards to the Atlantic; Central Soudan, draining to the great central depression and land- locked basin 6f

Lake Tchad; and Eastern (Egyptian) Soudan, draining through the Nile northwards to the Mediterranean. Between these systems the chief water-partings are—(1) the Marrah Mountains of Dar-Fur, whence flow the Bahr es-Salamat west to the Shari, and numerous intermittent wadies east to the Nile; (2) the Monbuttu uplands (Mount Baginze), separating the western head- streams of the White Nile from the Welle (Bahr Kuta), which, according to the latest information, flows, not to the Shari as Schweinfurth supposed, but to the Congo through the Mbangi; (3) the so-called "Kong" Moun- tains, dividing the Niger basin from the Volta and other streams flowing in independent channels south to the Gulf of Guinea. The Adamawa highlands, culminating in Mount Alantika (9000 to 10,000 feet), do not form a divide, as was supposed, between the Binue (the main eastern tributary of the Niger) and the Logon and other streams flowing east to the Shari (the great southern afflu- ent of Lake Tchad). Flegel, who has recently explored the upper course of the Binue, found that it sweeps right round the east foot of Mount Alantika, and is even navigable round this bend and some way southwards. On the other hand, the central hydrographic system of Lake Tchad has been greatly reduced in size since Lupton, Grenfell, and other recent explorers have made it evident that the Bahr- Kuta (Welle) flows not to the Shari but to the Congo basin. The Shari basin, which is now known not to reach farther south than about 6° N. lat., may even be almost considered, physically as well as politically, as subsidiary to the Niger hydrographic system, for there are.indications that the Logon once flowed into the Binue by the Mayo- Kebbi, The Mayo-Kebbi is a long flat trough or valley in 9° 30' N, lat., with a level swamp at the bottom receiving as a backwater the overflow of the Logon, and also draining through the Binue to the Niger. By canalizing the Mayo- Kebbi the Binue and Shari basins might be permanently connected, in which case the Niger system would afford a navigable waterway from the Gulf of Guinea to the southernmost limits of Baghirmi.

From the Kong highlands, some of whose peaks appear to attain elevations of 6000 to 7000 feet, Western Soudan falls gradually towards the north and north-east down to the Great Desert, where the city of Timbuktu still main- tains an altitude of 770 feet above sea-level (Lenz). South- east of the Niger the land rises in terraces of 1000 and even 3000 feet, above which isolated

crests range from 5000 to 9000 feet. This little-known western highland region, comprised between the Binue and the lower Niger,

and extending from Adamawa to the Cameroons on the Bight of Biafra, corresponds with the eastern highland region of Abyssinia, lying between the Blue Nile and the Tagazze and dominating the Red Sea. North of Adamawa the land falls rapidly down to the vast depression of Central Soudan, whose lowest part is flooded with the waters of Lake Tchad (Chad or Tsad), the largest area of inland drainage, next to the Aral-Caspian basin, in the eastern hemisphere. This freshwater lacustrine de- pression, usually 10,000 square miles in extent, expands to 40,000 and even 50,000 square miles when swollen by the flood-waters of its great feeders,—the Logon-Shari from the south and the Komadugu from the west. From the Tchad depression, which is still 1150 feet above the sea, the ground rises again eastwards in the direction of Wadai and Dar-Fur, to heights of 3000 feet and upwards, culminating in the voleanic Jebel Marrah (6000 feet), which forms the natural eastern limit of Central Soudan, and the great divide between the Tchad and Nile basins. But politically the line between Central and Eastern Soudan is usually drawn more to the west along the con- ventional frontiers of Wadai and Dar-Fur, the latter pro- vince, although never completely reduced, being claimed as part of Egyptian Soudan. This region constitutes two distinct physical divisions,—the first comprising the pro- vinces of Dar-Fur and Kordofan, bounded E. by the White Nile and S. by the Bahr el-Arab, a tableland in which the steppe formation predominates, while the second is skirted east by the Bahr el-Jebel and stretches from the Bahr el-Arab southwards to the Monbuttu uplands, a vast plain watered by the numerous south-western headstreams of the White Nile. This plain rises gradually towards the south and south-west to the highlands, which appear to culmin- ate in Mount Baginze, and which form the water-parting between the Nile and Congo basins. Included in Eastern Soudan is also the extensive plain of Senaar, stretching from the Nile eastwards to the Abyssinian uplands, and rising southwards to the Fazokl and Berta highlands.

The prevailing geological formations are the crystalline rocks, such as granites, diorites, slates, gneiss, underlying the old and new alluvia of the

plains, aud found associated with sandstones in the highlands. In the Kong Mountains the granites underlie the sandstoucs, but in the Tagalé group (South Kordofan) they pass over to porphyries and syenites, interspersed with extensive diorites and auriferous quartz veins. Volcanic rocks (basalts, lavas, tufas) appear to be restricted to the isolated Defafaung and Alantika Mountains (Adamawa), although solfataras occur in the Tagalé district, where sulphur abounds. Mineral waters are also found in Dar-Fur and Adamawa. The most widely diffused minerals are iron and copper, the oxides of iron occurring almost everywhere from the White Nile to the Niger, while pure copper is met espe- cially in Dar-Fur and Fertit. Gold is chiefly restricted to the Tagalé and Kong Mountains, Bambarra, and Adamawa; and lead, antimony, and tin are confined to a few isolated districts. Characteristic is the apparently total absence of limestones, coal, salt, and natron, the supplies of salt being imported mainly from the Sahara. Report, however, speaks of a large lake in the Jebel Marrah, from which salt is obtained.

The climate of Soudan is distinctly tropical, with two well-defined seasons, hot and rainy from April or May to October, warm and dry for the rest of the year. The former is accompanied by tremendous thunderstorms and continuous downpours flushing all the khors, wadies, and other watercourses, flooding large tracts along the lower courses of the Shari, Logon, Komadugu, and Niger, and interrupting the eommunications for weeks together in Baghirmi and Bornu. Before the rains set in the glass seldoni falls below 98° or 100° F., rising at noon to 104°, while the mean annual temperature at Kuka (Bornu) is about 82°F. But in the dry season it is often lowered to 58° or 60°, and under the influence of the cool north-east winds water often freezes on the uplands, snow falls in Dar-Fur, and fires are kept up in the houses in the central districts of Kano. The chief ailments are ague and other marsh fevers in the low-lying tracts subject to inundations, the Guinea-worm, cutaneous diseases, and leprosy. The fevers are dangerous alike to Europeans and natives.

An exuberant forest vegetation is favoured by the rich alluvial soil and tropical heat wherever moisture abounds. Of large growths the

most characteristic and widespread are—the baobab (Adansonia), reaching north to the 18th parallel and attaining a girth of 80 feet ; the superb deleb palm, covering extensive tracts especially in the east, where it grows to a height of over 120 feet; the shea or butter tree (Bassia butyracca), in the Niger basin and Kong uplands; the cotton-tree, dum palm, tamarind, several varieties of euphorbias, acacias, and mimosas, the heglyg (Balanites egyptiaca), and jerjak of Wadai, which yields a kind of vegetable honey. Owing to the absence of salt the date-palm is very rare. The chief cultivated plants are cotton, maize, several kinds of durrah (Sorghum vulgare, S. cernuum, &c.), hemp, tobacco, gourds, water-melons, indigo (of excellent quality and growing everywhere, wild and cultivated), and lastly the guru or kola nut (Sterculia acwminata and 8. macro- carpa), which in Soudan takes the place of the coffee berry. Cotton of the finest quality has been raised on the rich alluvial plain of Taka and Senaar.

The beasts of prey, nowhere very numerous, are chiefly repre- sented by the lion, panther, hyena, and jackal. Elephants in herds of 400 or 500 frequent the swampy districts about Lake Tchad, but are not found farther north than the 12th or 13th parallel. The ordinary African rhinoceros is common, and the rare one- horned species appears to have been met with in Wadai. The wild ass, zebra, giraffe, and antelopes iu considerable variety abound on the eastern steppe lands, and endless species of monkeys in the forest districts. Crocodiles, some of great size, from 16 to 18 feet long, infest all the large rivers, the sangwai,—a web-footed variety, occurring in the Niger. The hippopotamus also abounds in these waters, which teem with fish, mostly of unknown species. These attract numerous flocks of waterfowl,—pelicans, spoonbills, cranes, ducks, and many unknown species. In the Tchad, Fittri, and other districts the fish are captured, dried, and exported in large quantities to Fezzan and the countries beyond the Niger. Flies and mosquitoes swarm in the marshy, and locusts in the dry districts ; and in the woodlands insect life is represented by inyriads of ter- mites and some very large species of bees, wasps, and ants, besides beetles and butterflies in considerable variety.

The term Bilad es-Sudan is fully justified by the ethnical con- ditions of this region, which may be regarded as the true home of the Negro variety of mankind. Here this still everywhere forms the substratum of the population,

constituting the distinct aboriginal element, in many places exclusively, in others intermingled with foreign intruders from the north and cast. As far as ean now be determined, these intruders belong to two separate branches of the Caucasic stock—the Hamitic and the Semitic. The Hamitic is represented by three divisions—Fulahs,! Tibus, and Berbers—all of whom arrived in remote prehistoric times; the Semitic by one division—the Arabs, who arrived at various periods since the spread of Islam in North Africa. The bulk of the Arab tribes appear to have penetrated from the Nile basin through Kordofan to Dar-Fur and Wadai, or from the Mediterranean seaboard through Fezzan and across the Sahara to the T'chad basin, and henceare still mostly restricted to the central and eastern districts. Owing to their later appearance and stronger racial sentiment they have kept more aloof from the surrounding populations than the Hamites, who have everywhere intermingled with the aboriginal Negro element. The result is that the preseut inhabitants of Soudan are of a very mixed character,—more or less pure Negro peoples predominating in the Niger basin, in Adamawa, Baghirmi, Wadai, parts of Dar- Fur and Kordofan, and in the Nile basin south of 10° north latitude; half-caste Negroes and Fulahs especially in Western Soudan ; half-caste Negroes and Berbers in the northern districts of Western and Central Soudan ; half-caste Negroes and Tibus (Dasas) mainly in Kanem and Bornu; true Fulahs scattered in isolated groups between the Niger and Tehad basins; true Berbers (Tuaregs) in the Timbuktu and Moassina distriets ; true Arabs chiefly in Baghirmi, Wadai, Dar-Fur, and Kordofan.

In the subjoined table of the chief Soudanese raccs the Negro divisions have little more than a linguistic value.

Negro and Negroid Peoples.

Mandingoes : Mandinka, Malinka, and in the east Vangarawa, the dominant race between the Joliba (Upper Niger) and Kong Mountains, where their simple and harmonious speech is everywhere eurrent as the chief medium of intercourse 3 fine Negro type, tall, very dark eomplexion from eoffee-brown to black, long frizzly and woolly hair; agriculturists and traders; mostly Mohammedans out-

wardly; population six to eight millions. Chief subdivision the Bambarras, whose eapital is Sego on the Joliba ; population 2,000,000.

1 Most ethnologists, adopting Fr. Miiller's general elassification, group the , Fulahs with the Nubians in a separate division ("Nuba-Fulah family"), and elass the Tibus as Negroes, But more reeent researeh has shown—(1) that the Fulahs and Nubians differ fundamentally in speeeh and physique, the former being of Caneasic and the latter of Negrotype (Krause, Riippel), and (2) that the true Tibus, the Tedas of Tibesti as distinguished from the Dasas or southern group, are not Negroes but Hamites, akin to the Tuaregs of the Western Sahara, , although the two languages are totally distinet (Nachtigal). The Tibu language has been deseribed as a Negro form of speech; but this is also a mistake. It forms an independent linguistie group, the oldest and purest braneh of whieh is that of the Northern Tedas. From Tibesti it appears to have spread southwards to Kanem and Bornu, where the Dasa, Kanuri, and other dialeets have been exposed to Negro influences. Had Tibu been originally a Negro language, its most primitive form would be found, not in Tibesti, but in Soudan. and its pro-

gress would have been thenee northwards, not from the Sahara southwards.

bOU—SOU

Sonrhai or Songhai: An historical race whose empire stretehed in the 16th century from the northern bend of the Niger to the Atlantie and Moroeco; speech of a monosyllabie type, still eurrent in the Timbuktu district and oases of Western Sahara; population 2,000,000.

Tombo, Mosso, Gurma: Three little known Negro peoples west of the Niger, within the great bend; affinities uncertain ; form semi-independent petty states, apparently tributary to Moassina and Gando.

Nupe or Nufe: Large Negro nation along both sides of the Niger from Rabba to the Binue eonfluenee, subject to Gando.

Yoruba: Powerful Negro people between lower Niger and Dahomey ; eapital Tlosin; Mohammedans, pagans, and Christians (Protestant),

Batta: The ehief Negro people in Adamawa, now subjeet to the Fulahs; pagans and Mohammedans,

Haussa: Largest, most widespread, and intelligent of all the Sudanese Negro peoples, mainly between the Niger and Bornu ; speeeh very musieal, the ehief eommercial medium in Western and Central Soudan, and current in parts of Tripolitana; shows distinct traces of Hamitic influenees (Krause); mostly Mohammedans.

Mosgu or Masa: Widespread Negro family between Lake Tchad and Adamawa and stretching east to the Shari; chief subdivisions—Mandara, Margi, Logon, Gamergu, Margomi, Keribina; mostly pagans and uneultured,

Yedina (Buduma) and Kuri: Predatory Negro tribes in the islands of Lake Tehad; appear to be related to the Kolokos or Mekari of Logon and Bornu; nominal Mohammedans; population 30,000,

Baghirmi: The dominant people in Baghirmi; eultured Mohammedans; very industrious and skilled weavers and dyers; population over a million.

Maba: The chief Negro nation in Wadai, mainly in the Wara and Abeshr districts, about the headstreams of the Batha.

Fur or For: The dominant race in Dar-Fur, which takes its name from them 5 akin to the Nubas; chief subdivision Kunjara,

Nubas ; Large Negro nation; Jebel Nuba, and other parts of Kordofan, the orig- inal stock of the Nile Nubians; ehief subdivisions—Kargo, Kulfan, Kolaji, Tumali.

Nilotic Negroes: Shilluks, Dinkas, Bongos, Baris, A-Madi (Mittu), and many others about the Bahr el-Jebel and south-western tributaries of the White Nile.

Funj; A very mixed Negroid race, Senaar, :

Hamites—Pure and Mixed,

Tuaregs : A main braneh of the Berber race, dominant throughout the Western Sahara and southern steppes ; powerful, especially in the Timbuktu district and on the north frontier of Bornu.

Sorinka or Assuanek: Called also Serckuli or Serrakolet, ¢.¢., “ white people ”; half-caste Tuareg and Negro nation scattered in small communities from the Niger to the Atlantic, and numerous especially in Senegambia and Moassina ; cultured Mohaminedans, and aetive traders. ;

Fulahs : The most powerful, intelligent, and widespread of all the Soudanese peoples; from their original home in Senegambia (Futa-Toro, Futa-Jallo) have spread since the 18th century throughout Western and Central Soudan, and as far cast as Dar-Fur, everywhere propagating Islam, overthrowin g the native Haussa and other states, and founding new kingdoms in the Niger basin, in Adamawa, and Central Soudan; are called Fellani by the Haussas, Fuldu by the Arabs, Felldta by the Kanuri, the term meaning “fair” or “light coloured ”; pure type, distinctly Caucasic, regular f eatures, long blaek hair, brown or ruddy complexion, slim well-proportioned figures; but the language, which presents several remark- able features, shows only faint traees of Berber influence, and appears on the whole to be essentially a Negro form of spcech, adopted probably during residence from the remotest times in Negroland; population seven to eight millions,

Dasas: The southern branch of the Tibns, ehiefly in Kanem and northern Bornu; type and speeeh show distinct Negro-influenees,

Kanembu: The people of Kanem, with settlements in eastern Bornu ; also originally Tibus, but betraying still more decided Negro influenee,

Kanuri: The ruling vaee in Bornu ; speech a development of the Dasa and Kanem; type half-easte Tibu and Negro.

Zoghawa, Baele, Ennedi: Mixed Tibu and Negro trihes; northern Dar-Fur, origin- ally from Borku and Wanganya, Eastern Sahara > Speech akin to Dasa.

Semites,

Auldd Soleimdn Arabs; In Kanem,

Auldd Rashid, Mahdmid: South-east of Borku, and in Dar-Fur.

Salémdt, Aulad Tamed: Between the lower Shari and Bahr el-Ghazdl.

Hamr, Hamrén: Kordofan,

i al “Goatherds ;” widespread along west side Nile, from Kordofan to ongola,

Bakkdra: “ Cowherds;” south of tle Kababish to left bank of Bahr el-Arab.

Politically Western and Central Soudan are divided into eight independent and semi-independent states, which in their order from west to east are as under :— :

Bambarra, divided into two nearly equal sections py the J. oliba, which traverses it from south-west to north-east, is ruled by the Negro Bambarras of Mandingo stock. It has recently been brought under the influence of the French penetrating eastwards from their possessions on the Senegal. The capital is Sego, on the right bank of the Joliba.

Moassina, Gando, Sokoto, Adamawa, the four so-called “Fulah States,” occupy the Niger basin between Bambarra and the Binne confluence, the whole of the Binue basin, and the region lying betwecn the Niger and Bornu. Afoassina (Massina) lies on both banks of the N iger from Bambarra to Kabara, the port of Timbuktn, and is peopled by Fnlahs, Bambarras, and Sonrhais ; capital Hamda-Alahi, on the right bank of the N iger, below Jenne, which is its chief trading place. Timbuktu, with surrounding district constitutes a Separate territory governcd by a kadia, or hereditary inayor, who lately sent an envoy to Paris for the purpose of seeking French protection against the rival Tuareg and Fulah tribes. Gando, so called from its capital on an eastern tributary of the Niger, stretches along the main stream southwards to the Binue confluence, including the Nufe territory and part of Yoruba. The lower part is extremely fertile, abounding in cotton, indigo, rice, and all varieties of African grains. It comes within the limits of the region over which the British protectorate has recently been extended.

Besides the capital, there are several large towns, such as Bida (30,000 to 50,000 inhabitants) in the north ; Rabba (40,000 to 50,000), head of the stcam navigation on the Niger, and a chief station on the great trade route running from Lagos on the

ginger, melons,

| officers of the khedive.

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Guinea Coast northwards to Gando and Sokoto ; Egga (8000), on the left bank of the N iger, centre of the British trade ; Lokoja, facing the Binue confluence, an English factory, headquarters of an Anglican mission and seat of a N egro bishop. Sokoto, sometimes spoken of as the “empire of Sokoto,” is the largest and most power- fnl of all the Soudanese states, stretching from Gando to Bornu, and from the Binue northwards to the Sahara (see Soxoro), In it are absorbed all the former “ Haussa States,” and to it Adamawa is also tributary. The inhabitants are chiefly Fulahs and Haussas, intermixed with many aboriginal Negro peoples, especially in the south and south-east. The land is generally fertile, yielding rich crops of cereals, cotton, tobacco, indigo, sugar, yams, black pepper, The capital and residence of the sultan is Sokoto, in the extreme north-west. Other large towns are—Katsena, before the Fulah invasion a place of 100,000 inhabitants, now reduced to 7000; Kano, in Barth’s time the “ London of Soudan,” and still with 50,000 souls (Matteucci); Wurnu (15,000) ; Gombe, in the province of Calam (20,000) ; Yakoba, or Garu n-Bauchi (150,000) ; Keffi Abd es-Senga (30,000), in Zegzeg, a great centre of the ivory trade, and converging point of the two great caravan routes from the north (Kano) and the west (Egga). Adamawa, so named from its Fulah conqueror Adama, and formerly known as Fumbina, or “Southland,” is ruled by a Fulah vassal of Sokoto, who keeps in subjection the Battas and innumerable other N egro peoples; it lies between Sokoto, Bornu, and Baghirmi, merging southwards in the unexplored equatorial region back of the Cameroons. The capital is Yola, at the northern foot of Mount Alantika. Adamawa appears to be one of the finest and healthiest regions in Africa, splendidly diversified with lofty highlands, fertile valleys, and grassy plains, overgrown in some places with forests of bananas, baobabs, and plantains, in others yielding abundant

harvests of cereals, cotton, and indigo. The horses and cattle introduced by the Fulahs thrive well on the rich pastures, and elephants abound in the woodlands,

Bornu, with Kanem, in the north, now reduced, and the tributary state of Logon in the south, completely encircles Lake Tchad, except at the south-east corner, where Baghirmi is wedged in between Logon and Wadai ; it is mostly a flat low-lying region with fertile plains yielding durrah, maize, cotton, and indigo, watcred by the Komadugn, Logon, and Shari, all of which flood their banks for miles during the rainy season. The ruling race are the Kanuri, cultured but fanatical Mohammedans of mixed Tibu and Negro stock. The capital of Bornu is Kuka (50,000 to 60,000 in- habitants), near the west coast of Lake Tchad, a great centre of the Soudanese trade with the Sahara and Tripolitana, and terminus of the main caravan route from Murznk (Fezzan) across the desert to the Tchad basin ; the capital of Logon is Logon-birni, residence of a vassal prince. Population of Bornu estimated at 5,000,000.

Baghirmi, a Negro state, since 1871 tributary to Wadai, comprises the rich and well-watered plains of the lower Shari, with undefined southern limits. Capital Masena 3 population about 1,500,000, of whom three-fourths Baghirmi, the rest Kotokos, Fulahs, and Arabs.

Wadai, a powerful Mohammedan state occupying the whole region between Baghirmi and Kanem in the west and Dar-Fur in the east, and claiming exclusive ivory and slave-hunting rights in the southern (upper) Shari basin. The capital is Abeshr, on a head-stream of the Batha. The country is mainly a hilly plateau rising to 3000 feet above the sea, and yielding good crops of maize, dukhn, durrah, cotton, indigo. Population four to six millions, chiefly Mabas and other Negroes, and numerous Arab tribes, with some scattered Baghirmi, Fulah, and Kanuri settlements.

Eastern Sondan, comprising Dar-Fur, Kordofan, Senaar, Taka, and the Negro countries on the White Nile and its south-western tributaries, respectively called the Equatorial and Bahr-Gazal Pro- vinces, belonged politically to Egypt till the rebellion of the late Mahdi. Since his death in 1885 most of these provinces appear to have lapsed into a state of anarchy and barbarism, in which few vestiges remain of the peace and order

introduced by the European The Equatorial Province, however, and the Suakin district have been exempt from these troubles,—the former being still held till 1886 by the governor, Emin Bey, for the khedive, while in the latter the natives themselves succecded in the same year in putting down the ‘‘rebels” or party of Osman Digma. For details of Eastern Soudan, see articles N ILE, Nupia, and SENAAR, (AoE, ee)

SOULT, Nicotas Jean pe Dinu, duke of Dalmatia and marshal of France (1769-1851), was born at Saint- Amans-la-Bastide (now in department of the Tarn), on March 29, 1769, and was the elder son of a country notary at that place. He was fairly well educated, and intended for the bar, but his father’s death when he was still a boy made it necessary for him to seek his fortune, and he enlisted as a private in the regiment of royal infantry in 1785. His superior education ensured his promotion to the rank of sergeant after six years’ service, and in July

1791 he became instructor to the first battalion of volunteers .

of the Bas-Rhin. He served with his battalion in 1792, and rapidly rose to the position of adjutant-general, colonel, and chief of the staff to General Lefebvre. Soult it was who practically directed the operations of Lefebvre’s divi- sion in 1794, and after the battle of Fleurus he was pro- moted general of brigade by the representatives on mission. For the next five years he was constantly employed in Germany under Jourdan, Moreau, Kléber, and Lefebvre. The attack of the French left at the battle of Altenkirchen, which won the day, was directed by Soult, and in 1799 he was promoted general of division and ordered to proceed to Switzerland. It was at this time that he laid the foundations of his military fame, and he particularly dis- tinguished himself in Masséna’s great Swiss campaign, and especially at the battle of Zurich. He accompanied Masséna to Genoa, and acted as his principal lieutenant throughout the protracted siege of that city, during which he operated with a detached force without the walls, and after many successful actions he was wounded and taken prisoner at Monte Cretto on 13th April 1800. The victory of Marengo restoring his freedom, he received the command of the southern part of the kingdom of Naples, and in 1802 he was appointed one of the four generals commanding the guard of the

consuls. Though he was one of those generals who had served under Moreau, and who therefore, as a rule, disliked and despised Napoleon, Soult had the wisdom to show his devotion to the ruling power ; in consequence he was in August 1803 appointed to the command in chief of the camp of Boulogne, and in May 1804 he was made one of the first marshals of France. When Napoleon decided to lead the troops of the camp of Boulogne into Germany, Soult took the command of the right wing, and it was by his capture of the heights of Pratzen that the great battle of Austerlitz was decided. He played a great part in all the famous battles of the grand army, except the battle of Friedland, and after the conclusion of the peace of Tilsit he returned to France and was created duke of Dalmatia. In the following year he was appointed to the command of the 2d corps of the army with which Napoleon intended to conquer Spain, and after winning the battle of Gamonal he was detailed by the emperor to pursue Sir John Moore, whom he only caught up at Corufiia. For the next four years Soult remained in Spain, but it is impossible to do more than allude to his most important feats of arms. In 1809, after his defeat by Sir John Moore, he invaded Portugal and took Oporto, but, deluded by the idea of becoming king of Portugal, he neglected to advance upon Lisbon, and was eventually dislodged from Oporto by Sir Arthur Wellesley. After the battle of Talavera he was made major-general of French troops in Spain, and on 12th November 1809 won the great victory of Ocafia. In 1810 he invaded Andalusia, which he speedily reduced, with the exception of Cadiz. In 1811 he marched north into Estremadura, and took Badajoz, and when the Anglo- Portuguese army laid siege to it he marched to its rescue, and fought the famous battle of Albuera (16th May). In 1812, however, he was obliged, after Wellington’s great victory of Salamanca, to evacuate Andalusia, and was soon after recalled from Spain at the request of Joseph Bonaparte, with whom he had always disagreed. In March 1813 he assumed the command of the 4th corps of the grand army and commanded the centre at Liitzen and Bautzen, but he was soon sent, with unlimited powers, to the south of France to try and repair the damages done by the great defeat of Vittoria. His campaign there is the finest proof of his genius as a general, although he was repeatedly defeated by the English under Wellington, for his soldiers were but raw conscripts, while those of Wellington were the veterans of many campaigns.

Such was the military career of Marshal Soult. His political career was by no means so creditable. After the first abdication of Napoleon he declared himself a royalist, received the order of St Louis, and acted as minister for war from 3d December 1814 to 11th March 1815. When Napoleon returned from Elba Soult at once declared him- self a Bonapartist, and acted as major-general to the emperor in the campaign of Waterloo. For tls conduct he was exiled, but not for long, for in 1819 he was recalled and in 1820 again made a marshal of France. He once more tried to show himself a fervent royalist and was made a peer in 1827. After the revolution of 1830 he made out that he was a partisan of Louis Philippe and constitutional royalty, and served as minister for war from 1830 to 1834, as ambassador extraordinary to London for the coronation of Queen Victoria in 1838, and again as minister for war from 1840 to 1844. In 1848, when Louis Philippe was overthrown, Soult again declared himself a republican. He died at his castle of Soultberg near his birthplace in 1851.

SOUND. See Acoustics.

SOUNDING to ascertain the depth of the sea has been practised from very early times for purposes of navigation, but it is only since the introduction of submarine tele- graphy that extensive efforts have been made to obtain a complete knowledge of the contour of the ocean-bed. As early as the middle of last century a few deep soundings were recorded in various parts of the world: Ellis made one in 1749 of 891 fathoms off the north-west coast of Africa. But these early results must be accepted only with great caution, for the methods then in use were not such as to ensure accuracy at any depth greater than a few hundred fathoms. Sir John Ross, the arctic explorer, was much in advance of his times as regarded such investiga- tions ; he invented a “deep-sea clamm” for bringing up a portion of the bottom, and on September 1, 1819, in Possession Bay, made a successful sounding at a depth of 1000 fathoms, which is especially memorable because it was clear, from the organisms which came up entangled in the line, that animal life existed at that depth.

The Operation of sounding is readily performed in shallow water by letting down a weight attached to a cord, which is marked off into fathoms by worsted tucked under the strands, the tens and hundreds being indicated by

different colours. The bottom of the weight usually presents a hollow, which is filled with tallow, so that a portion of the material from the bottom may be brought up and give an indication of its nature. Some- times a valved cavity is used instead of the tallow. It is easy to see that the longer the line let out the greater will be its friction in passing through the water, the more slowly the weight will descend, and the slighter will be the shock transmitted to the upper extremity when it reaches the bottom; indeed, at what are now considered very moderate depths this becomes quite imperceptible : hence in deep-sea sounding the line is carefully watched as it runs out, and the time each 100-fathom mark enters the water is noted down. Owing to the increasing friction these intervals gradually lengthen, but any sudden incre- ment indicates that the bottom has been reached, for it shows that the weight has ceased to act, and that further descent of the line is due merely to its own gravitation. For instance, in one of the "Challenger" soundings, with a line 1 inch in circumference, and with a weight of 4 ewts. attached, the time occupied in descending from 2900 to 3000 fathoms was 2 m. 10 s.; from 3000 to 3100 fathoms 2 m. 13 s., and from 3100 to 3200 fathoms 3 m. 14 s., this sudden increase showing that the bottom had been reached in the interval.

Furthermore, the weight required to sink a line in deep

water with sufficient rapidity for purposes of accurate ob- servation is so great that it is found impracticable to bring it up again without putting an undue

strain upon the rope or seriously pro-

longing the operation. Hence in 1854

Brooke, an American, devised an ap-

paratus by which the weight was de-

tached when it reached the bottom and only a small tube containing a sample of the bottom was brought up. This was in fact a modifica- tion of

an apparatus which had been devised by Hooke in the 17th century ; he made an arrangement in which a light sphere was sunk by a heavy weight, but was liberated on reach- ing the bottom,—the depth being then de- duced from the time which elapsed between the sinking of the globe and its reappearance at the surface. Of the f various modifications of Brooke's sounding ma- chine, perhaps the most MA famous is that con- structed by the black- sinith of H.M.S. " Hy- dra," and commonly known as the " Hydra sounding rod." It was used on the cruises of the "Lightning" and "Porcupine" and dur- ing the earlier part of ; the "Challenger" expe- Fis: 1. Fig. 2.

dition. This apparatus is shown in fig. 1, where AB is the rod, terminating in a tube below so that it may bring up a sample of the bottom ; the weights F fit loosely round it and are supported by the wire E which passes over the stud D, where a spring presses against it, the strength of which is so adjusted that it is unable to displace the wire as long as the strain of the weights

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Hig. 3. Fig. 4. Fig. 5.

is upon it, but so soon as this is relieved by their rest- ing on the bottom the wire is thrust off the stud, and

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when the line is hauled in the weights and wire are left behind.

An improved apparatus has recently been invented by Mr J. Y. Buchanan, and used by him on board the tele- graph ships " Dacia" and " Buccaneer," which can be used either in shallow or deep water, and has the advantage of

bringing up samples both of the water and of the mud from the bottom. It consists of a hollow cylinder A, fig. 2, at the top and bottom of which are india-rubber valves HK, opening upwards, so that water passes freely through them during the descent but is retained as soon as a plug of mud occupies the tube B. The weight EE which sur- rounds the cylinder is supported by a wire F passing over a peculiar hook D, shown separately in figs. 3, 4,5; when sounding in shallow water it is not necessary to detach the weight, and the wire is therefore placed as in fig. 3; when working at greater depths the wire rests on the other side of the hook, as in fig. 4,—the result being that on the bottom being reached it falls into the upper part of the notch, fig. 5, and continues to press the tube into the mud, but when hauling up commences the wire slips out alto- gether and the weight is left at the bottom. A valve L, M, N is sometimes used to retain the sample of the bottom,

At the present time deep-sea sounding is extensively practised for telegraphic purposes, and is almost entirely conducted by means of wire instead of rope, a method introduced by Sir William Thomson. The friction of the wire in passing through the water is of course very much less than that of rope, and hence it runs out and can be hauled in much more rapidly; a smaller sinker may be used, and in very many instances it can be recovered, It is customary in sounding for cables to make very frequent obser- vations (once in from 1 to 50 miles), for it is found that the laying can be accomplished with much less risk of accident if the contour of the ocean-bed be accurately known. The saving of time by the use of wire is very considerable; but the advantage is not so obvious in running out as in hauling in, because a heavier weight is used to increase the rate, this of course involving a loss of iron sinkers. For instance, an apparatus similar to that mentioned above as being used by the “Challenger” took on an average 24 m. 22s. to sink 2000 fathoms, whilst in a recent sounding by the ‘* Albatross” the weight ran out 2000 fathoms in 20 m. 30s. and was hauled in in 21 m. 9 s.,a rate which would have been quite unattainable by the aid of rope. The saving in the matter of sinkers is by no means inconsiderable; instead of 8 or 4 ewts. , only 50 to 60 Ib are used, and Sigsbee has calculated that this difference is sufficient to pay for any extra loss there may be by the breaking of the wire. Captain Magnaghi of the Italian navy and Captains Sigsbee and Belknap of the American Survey have

successfully developed the method of sounding with wire, and owing to its use the last-mentioned officer was able to survey the route from San Francisco to Japan, doing all his sounding by hand, which would have been quite impossible had hempen rope been used. When soundings are made for scientific purposes it is customary to ascertain the temperature, both at the bottom and at intermediate depths, by a thermometer of special construction.

For further information, see Sir Wyville Thomson, The Depths of the Sea (London, 1874); Warrative of thé Cruise of H.M.S. ‘‘ Chailenger” (London, 1885); Sigsbee, Deep-Sea Sounding and Dredging (Washington, 1880); Wille, Norwegian North Atlantic Expedition, pt. iv., ‘Apparatus and how used,’ 1876-78; Mill, The Scottish Marine Station (Edinburgh, 1885) 5 and, for an improved apparatus used on board the ‘‘Talisman,” La Nature, xii. p. 120, 1884; also the annual Reports of the U.S. Fish Commission. (W. E. HO.)

SOUTH, Rozserr (1633-1716), one of the wittiest of English divines, was the son of a London merchant, and was born at Hackney, Middlesex, in 1633. He was educated at Westminster school, whence in 1651 he was elected to Christ Church, Oxford. He became B.A. in 1654, and the same year wrote several Latin verses to congratulate Cromwell on concluding peace with the Dutch, which were published in a collection of university poems. The following year he published a Latin poem, entitled Musica Incantans. After commencing M.A. in 1657 he was in the habit before obtaining orders in 1658 of preaching as the champion of Calvinism against Socinianism and Arminianism. He was also at this time a strong supporter of Presbyterianism, but on the approach of the Restoration his views on church government under-

went a change. In fact he adhered successively to the triumphant party as represented by Cromwell, Charles, James, and William, and there are substantial grounds for the assertion of Anthony Wood that he was much indebted for his preferments to his zeal for “the powers that be.” On 10th

August 1660 he was chosen public orator of the university, and in 1661 domestic chaplain to Lord Clarendon. In March 1663 he was made prebend of Westminster, and shortly afterwards he received from his university the degree of D.D. In 1667 he became chaplain to the duke of York. He was a zealous advocate of the doctrine of passive obedience, and also strongly opposed the Toleration Act, declaiming in unmeasured terms against the various nonconformist sects. In 1676 he was appointed chaplain to Lawrence Hyde (afterwards earl of Rochester), ambassador-extraordinary to the king of Poland, and of his visit he sent an interesting account to Dr Edward Pocock in a letter, dated Dantzic, 16th December 1677, which was printed along with South's Posthumous Works in 1717. In 1678 he was promoted by the chapter of Westminster to the rectory of Islip, Oxfordshire. Owing, it is said, to a personal grudge, South in 1693 published Animadversions on Dr Sherlock's Book, entitled a Vindication of the Holy and Ever Blessed Trinity, in which the views of Sherlock were attacked with much sarcastic bitterness. Sherlock, in answer, published a Defence in 1694, to which South replied in Tritheism Charged upon Dr Sherlock's New Notion of the Trinity, and the Charge Made Good. The controversy was carried by the rival parties into the pulpit, and occasioned such keen feeling that the king interposed to stop it. During the greater part of the reign of Anne South re- mained comparatively quiet, but in 1710 he showed himself a keen opponent of Sacheverell. He died 8th July 1716, and was buried in Westminster Abbey.

The style of South is vigorous, pungent, and brilliant, though tending to exuberance. His sermons are strongly practical, but his theory of life is not ascetic. His wit gencrally inclines towards sarcasm, and it was probably the knowledge of his quarrelsome temperament that prevented his promotion to a bishopric. If he sacrificed principle to his desire for preferment, his ambition was not of a sordid kind, for he was noted for the extent of his charities. He published a large number of single sermons, and they appeared in a collected form in 1692 in six volumes, reaching a second edition in his lifetime in 1715. His Opera Posthuma Latina, including his will, his Latin poems, and his orations while public orator, with memoirs of his life, appeared in 1717. His Works were published with a memoir by the Clarendon press in 1823, and have been several times reprinted. The contemporary notice of South by Wood in his Athen is characterized by a

strongly hostile tone, partly to be explained by a criticism of South at Wood's expense.

SOUTH AFRICAN REPUBLIC. See Transvaat.

SOUTHAMPTON, a municipal and parliamentary borough, which gives name to Hampshire, or the county of Southampton, and one of the principal seaports on the south coast of England, is beautifully situated at the head of Southampton Water, forming the mouth of the Test, on a sloping peninsula, bounded on the east by the Itchen, at the terminus of the South-Western Railway, 79 miles south-west of London, 13 south-south-west of Winchester, and 24 west-north-west of Portsmouth. Southampton is also a county of itself,—the county of the town of Southampton. It preserves much of its antique ap- pearance, but, although in the older parts the streets if picturesque are narrow and irregular, it may still claim the distinction it enjoyed in Leland's time of ranking "as one of the fairest that is in England," handsome and. spacious shops lining the principal streets, while the suburbs are studded with numerous villas and mansions embosomed in woods. There are still considerable remains of the old town walls built in the time of Richard II., the most remarkable being a portion of the west walls, with an

arcade on its exterior face. Four of the seven gates are comparatively well preserved—North or Bar Gate, South Castle Gate, Westgate, and Blue Anchor Gate. The finest of these is Bargate, in a room above which is the ancient Guildhall, where the quarter sessions are held. The representations of Sir Bevis of Hampton and the giant Ascupart which formerly stood on each side have recently been obliterated. The castle, originally a Saxon fortress, and rebuilt when the walls were erected, was partly demolished in 1650. After its rebuilding had been begun by the marquis of Lansdowne in 1805, it was sold, and in 1818 the site was parcelled out for building plots. In the vicinity of the castle there are some houses of very ancient date, including King's House (Early Norman). The two old churches, St Michael's (originally Norman about the date of 1080) and Holyrood, have been in a great degree modernized ; the former contains a beautiful Byzantine font and a monument to Sir R. Lyster, chief- justice in the 16th

century. The French chapel of St Julien, originally attached to the hospital of God’s House, founded by Henry VIII. for eight poor persons, is of Norman architecture ; it contains the burial-place of the

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JBartholomon Edit Plan of Southampton.

earl of Cambridge, Lord Scrope, and Sir Thomas Grey, who in 1415 were executed outside the Bargate for con- spiring against Henry V. Among the modern public buildings are the Watts memorial hall, erected in 1876 at a cost of £8000, the municipal office, occupying the old audit-house, the custom-house, the philharmonic hall, the assembly rooms, the county court-house, the corn exchange and chamber of commerce, and two theatres. The educa- tional institutions include the Hartley Institution, founded by bequest for the advancement of natural history, astro- nomy, antiquities, and classical and Oriental literature, and now embracing a library, reading-room, museum, art gallery, laboratories, and schools of science and art associated with South Kensington ; the Edward VI. grammar school,

founded in 1550, and reorganized in 1875; and Alderman Taunton's school, founded in 1752, and lately remodelled. The school board was established in 1871. The benevolent and charitable institutions are numerous, embracing the dispensary (1809), the royal South Hants infirmary (1838), the female orphan asylum, the homeopathic dis- pensary (1873), St Mary's cottage hospital (1873), and the Palk memorial home (1876). To the north of the town is Southampton Common, formerly part of the manor of Shirley ; and adjoining the town to the north of Above Bar Street is the Public Park, prettily laid out and containing statues of Lord Palmerston, Dr Watts, and Mayor Andrews. The town is supplied with water partly from artesian wells and partly from reservoirs. The population of the muni- cipal borough (area 2004 acres) in 1871 was 53,741, and in 1881 it was 60,051. In 1885 the area of the parlia- mentary borough, formerly coextensive with that of the municipal borough, was extended to include the parish of Millbrook, the ecclesiastical district of the Holy Saviour, Bitterne, the parish of St Mary Extra, and the detached portion of Hound included within St Mary Extra. The population of this area in 1881 was 84,384. It is repre- sented by two members.

The importance of the port dates from the Norman Conquest, and was originally due to its relation to Winchester. It had a con- siderable trade in wine as early as 1152, and from Queen Mary it obtained a monopoly in the importation of sweet wines from the Grecian islands. With Venice and Italy it had a large trade as early as the 14th century, and in the subsequent century it had a eounexion with Newfoundland, while its Channel trade and its shipbuilding were also of importance. About the end of the 16th century its trade had, however, begun to decline, and the visitation of the plague in 1665 tended still further to aid its retrogression. Some improvement took place in its prospects by the creation of a Pier and Harbour Commission in 1803, and the erection of the Royal Victoria pier in 1831 was a further step towards prosperity, but its modern trade really dates from the opening up of railway communication with London in 1840. It possesses one of the finest natural harbours and has the advantage of a double tide, a second high tide oecurring two hours after the first. While largely dependent for its import trade on its connexion with London and its easy communication with France, it has become an outlet for the manufactures of the midland and northern towns. Its great tidal dock, completed in 1842 at a cost of

£140,000, has an area of 16 acres with a depth of 18 feet at low water, and the inner dock, completed in 1851, an area of 10 acres and a depth of 28 feet. Two other docks embracing an area of 50 acres are being con- structed. ‘There are also four dry docks, capable of receiving vessels of the largest tonnage at all tides. Within recent years the port has lost the overland trade between London and India by the removal to London of the headquarters of the Peninsular and Oriental Steam Navigation Company. At present itis the head- quarters of the Royal Mail Steam Packet Company for the West Indies and the Pacific (via Panama) and for Brazil and the River Plate, the Union Line for the Cape of Good Hope, Natal, and East Africa, and the London and South Western Railway Company’s steamers to the French coast. Steamers also sail regularly for Ireland and various ports on the west coast of England; and the steamers of the North German Lloyd Company touch at the port on the way to and from New York, and also to and from Asiatic and Australian ports. The total number of vessels that entered the port in 1876 was 7840 of 1,201,301 tons, of whieh 3780 with a tonnage of 201,434 were sailing vessels, and 4060 with a tonnage of 999,867 were steamers. T’he number that cleared in the same year was 8047 of 1,174,365 tons, of which 3994 (196,064 tons) were sailing vessels, and 4053 (978,301 tons) were steamers. In 1885 the number of vessels that entered the port was 9768 of 1,539,357 tons, of which 3456 (175,900 tons) were sailing vessels, and 6312 (1,363,457 tons) were steamers. The number that eleared in the same year was 9641 of 1,523,759 tons, of which 3350 (182,688 tons) were sailing vessels, and 6291 (1,341,071 tons) were steamers. Since 1845 the trade has increased more than tenfold, although within recent years the port has suffered from the prevailing dulness. The total value of imports and exports in 1845 was £1,475,000 ; in 1880 the value of the imports was £9,205,183 and in 1884 it was £7,544,354 ; for these last years the value of the exports of United Kingdom produee was £9,306, 326 and £6,909,072; while the value of the exports of foreign and colonial produce and manufactures in 1882 was £1,589, 652 and in 1884 £1,150,954. Among the principal in1ports are cocoa, coffee, corn (including maize), apples, provisions (especially butter, eggs, and potatoes from France and the Channel

Isles), rum and brandy, sugar, wine, wool, and rags. Among the prineipal exports of the produce of the United Kingdom are apparel, cottou goods, leather, linen goods, machinery, copper and iron goods, woollen and worsted goods. ‘The number of ships built at the port in 1885 was 19, of 17,875 tons burden.

The Roman station of Clausentum was situated at Bitterne on the opposite side of the Itchen, where extensive Roman remains have been found. The present town was founded by the West Saxons, probably soon after their landing under Cerdic and Cynric on the shores of Southampton Water in 495. The name Hantun-scire (Hamptonshire) oeeurs in the Saxon Chronicle under date 7 55, and Hamtuu is first mentioned separately in 837. The prefix ‘‘South” was probably added after the annexation of Wessex to Merciain 920, to distinguish it from the Hampton in Mercia afterwards called Northampton. The town was frequently ravaged by the Danes in the 9th and 10th centuries. Canute, after his establishmeut on the throne, made it his occasional residence, and Southampton beach is reputed to have been the seene of his rebuke to the flattery of his courtiers, by the demonstration of his powerlessness to control the waves. Southampton is mentioned in Domesday as Hantune. It possessed a mint as early as 925. It was frequently visited by successive monarehs from the time of Henry I. In 1338 it repulsed an attaek of the French and Genoese. – In 1415 it was the rendezvous of the army of Henry V. for France, and during his stay in the town he detected the conspiracy against him of the earl of Cambridge, Lord Scrope, and Sir Thomas Grey, who were exeeuted outside the Bargate. In 1512 the marquis of Dorset embarked from the port with 10,000 men to the aid of

| Ferdinand of Spain against France, aud in 1522 the earl of Surrey

set out from it with a large fleet to eseort Charles V. Queen Elizabeth held a court at Southampton in 1569. On aecount of the outbreak of the plague in London in 1625 the council was transferred by the king to Southampton, where on the 7th September a treaty was signed with the United Provinces. The town received its first charter from Henry IJ., and a charter of incorporation from Henry VI. in 1445 under the style of ‘‘ mayor, bailiff, and burgesses.” This charter was somewhat modified by that granted by

Charles I. which remained the governing charter till the passing of the Municipal Act. The corporation act as the urban sanitary authority. The town first returned members to parliament in 1295. Among eminent persons connected with Southampton are Dibdin the song writer, Bishop Peaeoeke, Thomas Fuller, and Dr Watts. See History of Southampton, by J. Sylvester Davies, 1883.

SOUTH AUSTRALIA, which lies between 129° and Plate 141° E. long., has New South Wales and Victoria on lV.

the E., Western Australia on the W., and the Southern Ocean on the S. Originally its northern line was 26° S. lat., but by the addition of the Northern Territory, or Alexandra Land, the area has been extended from 380,070 square miles to 903,690, and the northern border carried to the Indian Ocean. The length is therefore from lat. 38° 8. to 11° S., nearly 2000 miles. Being much more northern and less southern than the neighbouring colony, its present designation is incorrect in point of fact.

The southern coast-line shows two large gulfs, Spencer and St Vincent,— the first 180 miles long, the other 100. Spencer Gulf is open to the ocean, while St Vincent Gulf is partly shielded by Kangaroo Island, with Investigator Straits as its westerly entrance and Backstairs Passage for an easterly one. Yorke Peninsula separates the two gulfs. Port Lincoln and Sleaford Bay are at the south-west of Spencer Gulf. On the western side of Eyria Peninsula— the land westward of Spencer Gulf—are the following bays :—Coffin, Anxious, Venus, Streaky, Denial, and Fowler. The junction of South and Western Australia is on the Australian Bight. Encounter Bay is on the Victo- rian side, with Lacepede, Guichen, Rivoli, and Macdonnell Bays to the south-east. Flinders, Investigator, and Nuyt Islands are south-west. Cape Jervis is at the eastern entrance of St Vincent Gulf, Spencer at the western. In Northern Territory are Melville, Adam, Arnhem, and Raffles Bays, Van Diemen's Gulf, Port Essington, and Port Darwin (lat. 12° §.). The Gulf of Carpentaria divides the territory from Cape York Peninsula of Queens- land. Melville, Bathurst, and Groote-Eylandt are northern islands. The ranges of hills are few, rarely reaching 3000 feet. One chain runs north from Cape Jervis. Flinders range has Brown and Arden, 3000 feet. Lofty,

near Adelaide, is 2330 feet. Volcanic cones, as Gambier and Schanck, are south-east, near Victoria. In general the country is level, where not slightly undulating. It is far from being well watered, especially to the west- ward and in the interior. The Murray, passing through Lake Victoria, had previously received most of the drain- age of the three eastern colonies. The Torrens flows by Adelaide. Few streams reach the ocean. Cooper's Creek drains part of Western Queensland. The Indian seas receive the Alligator, Liverpool, Roper, Macarthur, Daly and Victoria rivers. Albert and the Coorong are lakes at the Murray mouth. The depressed area northward con- tains Lakes Torrens, Eyre, Gairdner, Blanche, Hope, and Amadeus. The overland telegraph to Port Darwin passes mostly through an ill-watered country, with oases around springs. The population, 330,000, is principally within 100 miles of Adelaide, the capital, in lat. 35° S. The leading places north of Adelaide are Gawler, 25 miles, Barossa 38, Kapunda 49, Angaston 51, Port Wakefield 60, Clare 90, Kooringa of Burra Burra 100, Moonta 100 north-west, Kadina 96 north-west, Blyth 100, Morgan or North-West Bend 105, Broughton 150, St Petersburg 154, Port Pirie 155 north-west, Port Augusta 240 north- west, Colton 320, Blinman 350. 'To the east are Barker 21, Echunga 23, Nairne 25, Kingston or Port Caroline 170 south-east, Narracoorte 220, Penola 250, Gambier 290, Macdonnell 304. Lincoln is 210 west. Adelaide Port is 7, Glenelg 7, Brighton 10, Willunga 30 south; Goolwa, the Murray port, is 60 south. Palmerston of Port Darwin is the chief town of Northern Territory; Southport is 25 miles south of it. Other settlements are inland mining townships. There are 36 counties, 4 pas- toral districts, 23 municipalities, and 112 district councils in South Australia proper.

Climate.—Excepting Western Australia, this is the driest portion of the island continent. The rain clouds from the Pacific or the Indian Ocean have little store left on reach- ing the South Australian districts. The north-west summer monsoons favour the northern coast-lands, though the rains penetrate but few miles inland. The trade-winds bring only dry blasts from the Queensland side. A large propor- tion of the south-western shore has a very partial deposi- tion, and even the southern Yorke Peninsula, laved by two great gulfs, seldom shows any surface water. The conflict between the polar and equatorial currents occasionally throws down rain in the interior, though many a thunder- storm fails to let fall more than a few drops. But the

south-eastern coast catches a fair amount of rain from the western breezes off the Southern Ocean. The settled districts have winter rains, when Adelaide plains are transformed from parched sterility to luxuriant vegetation. The average annual rainfall there is but 20 inches, with an evaporation of three times that amount. In 1885 (a dry year) Adelaide had only 16 inches. In some years only 5 inches have fallen, even on parts of the sea-shore. The interior, however, has been known to have extensive floods after sudden storms. The northern coast, as at Port Darwin, has from 50 to 70 inches, though for several months without a shower. The heat is considerable during the dry summer time, though cold is felt severely on winter mornings and nights, even in the tropics, when a dozen degrees of frost may be followed in a few hours by a tem- perature of 80° or 90°.

The health conditions of the colony are but little inferior, except in Adelaide and Port Darwin, to those ‘ruling in Tasmania and New Zealand, which are so much cooler and wetter. Dry heat is never so prejudicial as a moist heat. A raging hot wind from the north and north-west, to which Adelaide is so unpleasantly exposed, is trying to young children, though it never brings noxious

gases. On the contrary, when passing over eucalyptus forests it brings down health-giving airs, in spite of 160° in the sun, or even 120° in the shade. Diarrhoea may trouble in summer, and catarrh in winter; but, with a birth-rate of 39 in the thousand and a death-rate of from 12 to 17, South Australia stands more favourably than England in relation to health. Recently, several town- ships had for the year but seven deaths in the thousand, exhibiting a freedom from mortality three times greater than London. The death-rate of the colony during 1885 was only 12°48 to the thousand, while the birth-rate was 37°70. One-third of the deaths were in Adelaide. Reports from the tropical Northern Territory speak of fever and ague, especially among imprudent gold-miners.

Geology.—The few mountain ranges scattered throughout the colony were once, in all probability, but islands rising in a mediterranean sea that connected the Indian Ocean and Java Sea with the Southern Ocean. Over at least the southern half of South Australian territory the water flowed in

Tertiary times. The elimatic effect of such an archipelago of islands must have been very different from what now is realized in that region. The rise of the country displayed that vast extent of arenaceous limestone forming the southern coast floor, and extending westward hundreds of miles in Western Australia, and far eastward in Victoria. The south coast is still rising. The Murray cuts its channel through this vast coralline formation. According to the Rev. J. Tenison Woods, the newer Pliocene is near Adelaide, while the older is at Mount Gambier. The Murray cliffs are Upper Miocene, and the Murray flats are Lower Miocene. He anes little or none of Eocene. Flint bands occur in this lime- stone, particularly at Gambier. The Biscuit country, south-east, has flat limestone concretionary cakes on the surface, more or less rounded. Beds of sand cover large areas of the recent rock. Caves abound in the Gambier district, provided with stalactites and stalagmites. Subterranean rivers flow through some of the caverns, and are occasionally reached by natural sloping wells. Gambier exhibits much Bryozoan limestone. Its 40 species and 16 genera of Polyzoa are in Lower Crag. The coral limestone there has extensive flint bands. Foraminifera are of many kinds; some of the Rhizopods are still existing in Australian waters. Sharks' teeth and large nautili are frequently met with. Most fossils are in casts, except Pecten, Bryozoa, Echini, &c. The Murray cliffs mark the remains of an extensive formation, since largely denuded. The Gambier deposits prove the presence of an ancient deep sea, when little of Australia, as we now perceive it, had any existence. The South Australian ranges are generally of Primary order, the Silurian formation being often pierced or flooded by igneous rocks, which have transmuted the strata. While granites and granitoids are in great masses, the basalts and greenstones of a later age are not wanting in the ranges. The Primary rocks are observed, also, in Eyria Peninsula, Port Lincoln, the central continental districts, and very prominently in the Northern Territory. Flat-topped sandstone hills prevail north- ward. Westward and south-eastward the Tertiary rests on a granite floor. Eastward there is the same Primary presence, with erystalline mountains developing silver mines just over the border. Mctamorphic rocks, rising amidst Tertiary beds, are strong in Yorke Peninsula, producing much copper. The tablelands are of horizontal sandstone, often on spirifcrous limestone. Desert sand- stone may be Miocene. Near the Victorian boundary, in the south-east corner of South Australia, recent volcanic action is apparent. Several of the lakes there were ouce craters. The deep Blue

Lake, or Devil’s Inkstand, occupies the centre of Mount Gambier. The banks are nearly 300 feet high, and are formed of lavas and volcanic ashes. Cinder walls are detected, and other varieties of volcanic products. Scveral smaller cones surround the great mount. The country itself is of the usual Tertiary lime- stone, more or less covered with ashes. Mount Schanck, between Gambier and the sea, is known as the Devil’s Punchbowl. This cone of lava has an empty crater 200 feet deep. Gambier and Schanck are landmarks to passing mariners. Among the fossil forms in Tertiary Pliocene strata are those of the huge Diprotodon, a marsupial vegetable feeder 16 fect in height, with gigantic kangaroos, emus, wombats, &c.

Minerals.—South Australia, though without coal, was the first Australian colony to have a metallic mine, and the first to possess a gold mine. In 1841 the wheel of a dray, going over a hill near Adelaide, disclosed to view silver-lead ore. In the midst of the bad times in 1843 the Kapunda copper mine was found. In 1845 the wonderful Burra Burra copper was first wrought. The land, 10,000 acres, cost £10,000; and for several years the dividends to shareholders were 800 per cent. perannum. The first colonial mineral export was 30 tons of lead ore, value £128, in

1843. The copper declined as prices fell. It was £322,983 in 1885, when rates were £50 a ton, but £762,386 ten years before with over £90. In 1886 most of the mines were closed. Between 250 and 400 miles north of Adelaide a very rich copper district exists. Lead is very abundant. Manganese, nickcl,- bismuth, antimony, and silver have been mincd. ‘Tin is seen in granitic places. Iron occurs in almost all formations and in all conditions. There is abundance of hematite, micaceous, bog, and other ores rieh in the metal. Talisker and other mines paid in silver. The wonderful Silverton, of Barrier Ranges, in a desert, is just outside the boundary, though 300 miles only from Adclaide while 600 from Sydney. Gold was got from a quartz vein at the Vietoria mine, near Adelaide, as early as 1846, but did not pay the company. Partial gold working has been conducted at Echunga, &c., in southern hills. There are rich alluvial and quartz gold mines in Northern Territory, at from 100 to 150 miles south of Port Darwin. For the year 1884 the yield was £77,935. Of 1849 miners 1205 were

Chinese. Gold is now worked at Waukaringa, 225 miles north of Adelaide. Copper, tin, and silver are found in Northern Territory. Among other minerals asbestos, roofing slates, and fine marbles may be named. Some forty years ago precious stones, especially garnets and sapphires, were gathered in the Barossa Hills. Carbonaceous material is found at the Coorong, &c., yielding 50 per cent. of oil. Lake Eyre has a rnde coal. Kapunda marble quarry is a success. In 1885 there were 16,493 acres leased for minerals. The value of minerals exported in 1885 was £338,132.

Agricultwre.—This is essentially an agricultural colony. In its first establishment, farming was intended as the main occupation.

The land was cut up for sale into eighty-acre lots with the view of scttling the people on arrival, and concentrating them, instead of

having them scattered as in the neighbouring colonies, in which pastoral pursuits completely dwarfed the farming industry. This wise provision made the eolony for years the supplier of breadstuffs to Sydney, Melbourne, Brisbane, Perth, and Auckland. As neigh- bours became wheat-producers, Adelaide merchants had to seek markets in Natal, Mauritius, the Cape, or even Europe. At all times the state has lent every assistance to agriculture. As the colony suffers more from drought than anything else, public reser- voirs are constructed and artesian wells are sunk. Forest culture has especially attracted Government attention. Reforesting and the establishment of nurseries for the trees, fruits, and vegetables of other lands go handinhand. Forest reserves already amount to 150,000 acres. Hundreds of thousands of trees are annually planted.

The land system, sound at the beginning, has been repeatedly amended, especially with a view to the advancement of pastoral interests. Instead of cash sales, as formerly, conditional purchases may be made, extending over a long period, subject to conditions of residence and cultivation. At the end of 1884 only ten million aeres had been purchased. There were, however, 53,000,000 acres enclosed, chiefly for pasturage, and 2,785,490 under cultivation. The crop for March 1885 was as follows :—wheat, 1,942,653 acres ; fallow, 450,536; hay, 308,429; artificial grasses, 28,217; barley, 15,697; lucerne, 8649; oats, 7264; orchard, 5825; potatoes, 5666 ; pease, 4601; vineyard, 4590. The culture indicates a warm and dry climate,

different from New Zealand or the tropical coast of Queensland. The product of South Australian fields is so much smaller per acre than in any of the neighbouring colonies that only an open level country of cheap land, with effective machinery at moderate cost, could be managed at a profit. Going northward from Adelaide the country becomes too dry for roots, and then too precarious even for wheat. The county of Adelaide is very favourably placed for vineyards, oliveyards, and orchards. About half the olive trees and a third of the almond trees are there. Of 3,704,107 grape vines in the colony, Adelaide county had 2,158,468, and Light, in the neighbouring hills, had 860,356. There were in 1884 478,535 gallons of wine made. The commissioners lately reported that the light white wines kept sound and good, while full-bodied red wines continue to improve with age. The Water Conservation Department is of great service to agriculture. Tropical cultivation receives some attention already in Northern Territory. The Chinese raise rice crops, there being heavy rains near the coast. Daly river has excellent soil and climate for sugar and coffee.

The pastoral progress has been considerable, notwithstanding want of moisture. In 1885 there were 1528 leases over 214,916 square miles, besides 257 annual leases with 11,214 square miles. There were then 168,420 horses, 389,726 catztle, 163,807 pigs, 6,696,406 sheep (twenty sheep per head of population). Of these the settled counties had 151,058 horses, 179,206 cattle, and 4,995,394 sheep. In Northern Territory, with 136,000 cattle, there were in December 1885 6000 horses and 40,000 sheep, that country, excepting in the dry interior, being unfitted for wool- bearers. The total export of wool grown in South Australia had only the value of £1,671,775 in 1885. The prices obtained were a fourth less than ten years before. The rabbit pest is felt as seriously in pastoral as in agricultural operations. Kangaroos are far less troublesome to stockholders than in Queensland. Where water can be procured by dams, reservoirs, or wells stock can be kept,

- is well represented in South Australia.

since, where, the grass fails, cotton bush and various saline plants supply sufficient food. An artesian well lately was sunk 1220 feet, Wool is

remarkably fine there. While a South Australia merino has 2720 serrations to an inch of wool, a Leicester sheep has but 1850.

Founa.—South Australia is not separated from the neighbour- ing colonies by any natural boundaries ; hence the fauna ineludes many animals which are also to be found in the land lying to the east and west. The northern half of the colony lies within the tropies, and possesses a tropical fauna, which is, however, practic- ally identieal with that of northern Queensland, In spite of its immense extent north and south, and a corresponding diversity in climate, the eolony is poorer in animal life than its neighbours. It possesses thirty-five genera of mammals. These include both genera of the order Monotremata,—the Echidna, or spiny ant- eater, and the Ornithorhynchus, or duck-billed platypus, both of which are found also in eastern Australia and Tasmania, The other order of Mammalia associated with Australia, the Marsupialia, It contains seven genera of Macropodidx or kangaroos, including the wallaby and kangaroo rat, four genera of Phalangistidx, or opossums, and five species of Dasyuridx, or ‘native eats.” Two genera of this family are peculiar to the region—the Chatocercus and the Antichinomys ; the latter is found in the interior. It is a mouse-like animal with large ears, and is remarkable for the elongation of its fore-arm and hind-foot and for the complete absence of the hallux. The Phascolomys, or wombat, onc of the largest of the marsupials, is also found in South Australia, and the curious Myrmccobius, or ant- eater of Western Australia. This remarkable animal is about the size of a squirrel ; it possesses fifty-two teeth (a greater number than any known quadruped), and, unlike the other members of its order, the female has no pouch, the young hanging from nipples concealed amongst the hair of her abdomen. The Cheropus, with peculiarly slender limbs and a pouch opening backwards, is found in the interior. The remaining Mammalia consist of the dingo, or native dog, and a few species of Muridx, the mouse family, and Cheiroptera, or bats. There are about 700 specics of birds, including 60 species of parrots. Of the 9 families peculiar to the Australian region, 5 are well represented, including the Meliphagidex (honey-suckers), Cacatwide (cockatoos), Platycercidzx (broad-tailed and grass parroquets), Megapodide (mound-makers!) and Casuaridx (cassowaries), The last-named family is represented by the Dromeus, or emu, which is hunted in some parts of the colony. Reptiles are fairly represented: there are fifteen species of poisonous snakes. The lizards

are very peculiar; South and Western Australia contain twelve peculiar genera. No tailed Amphibia exist in the continent, but frogs and toads are plentiful.

Flora.—The plant species resemble those of the eastern colonies and Western Australia, but are more limited in variety. The

‘colony, from its dryness, lacks a number known elsewhere.

Enormous areas are almost destitute of forests or of timber trees. The Hucalyptus family, so valuable for timber and gum as well as for sanitary reasons, are fairly represented. Acacias arc abundant, the bark of some being an article of commerce. Flinders range has much of the valuable sugar-gum, Zucalyptus Corynocalyz, which is being now preserved in forest reserves. Its timber is very hard and strong, not warping, resisting damp and ants. The head-flowered stringybark, Huc. capitellata, has a persistent bark. A sort of stringybark, uc. tetrodonta, is found in Northern Territory. The gouty-stem trce (Adansonia) or monkey-bread of the north is a sort of baobab. About 500 northern plants are Indian. The Tamarindus indica occurs in Arnhem land, with native rice, rattans, and wild nutmeg. The cedar is of the Indiau variety. Pines are numerous in the south, palms in the north; among the most beautiful is the Kentia-acwminata. Banksias are very common in sandy districts. Flowering shrubs are common in the south, There are 180 known grasses in Northern Territory.

Fisheries.—Whaling was formerly an importaut industry about Encounter Bay, as sealing was in Kangaroo Island. The whales have migrated, and the’seals are exterminated. On the northern side trepang or béche-de-mer fishery has commenced, and pearl fisheries have been established. Of fish within colonial waters there are forty-two peculiar genera. The tropical north has similar fish to those of North Queensland, while those of southern bays resemble many of the species of Victoria, Tasmania, and New South Wales. There are the barracouta, bonito, bream, carp, catfish, rock eod and Murray cod, conger, crayfish, cuttle, dogfish, eel, flatfish, flat- head, flounder, flying-fish, gadfish, grayling, gurnard, hake, John Dory, ray, salmon (so-called), schnapper, seahorse, shark, sole, squid, swordfish, whiting, &. Though called by English names, the fish do not always correspond to those in Europe. The Murray cod is a noble freshwater fish,

Commerce. —There is little speculative trade, the shipping being employed in the conveyance of the exports of the colony and the introduction of needful supplies. The imports during 1884 amounted to £5,749,3538, of which £2,983,296 came from the United eee ee eee

1 One genus of this remarkable family—the Zipoa—is confined to the district. –

Kingdom, £997,785 from New South Wales, £714,272 from Victoria, £38,460 from Tasmania, £34,675 from New Zealand, £97,230 from India, £28,011 from Natal, £55,598 from Hongkong, £19,201 from Canada, £239,093 from Mauritius, £54,945 from China, £49,028 from France, £61,727 from Germany, £72,214 from Norway and Sweden, £186,236 from the United States. Of the exports, £6,623,704, there went to the United Kingdom £4,081,864; New South Wales, £773,240; Victoria, £651,019; Queensland, £255,746; Cape Colony, £249,844; India, £144, 287 ; Western Australia, £132,554; Natal, £78,118; France, LOT, 000% Mauritius, £52,010; Belgium, £33,092. Among the exports during 1884 were wool, £2,616,626; wheat, £1,694,005; flour, £794,812; copper, £469,231; sheepskins, £87,455; silver-lead, £66,592; bark, £45,049; jams, £35,338; horses, £30,845; tallow, £28,403; wine, £17,061; gold, £15,469. There were imported overland 411,307 sheep, and exported 168,770. Of shipping, there entered 1120 vessels of 909,335 tons, and eleared 1111 of 925,197. The British amounts were 768,301 and 783,121 tons vespeetively. In the Northern Territory the imports were £140,229, exports £90,411; the gold export for the last six months of 1885 was £33,869. The assets of the eleven banks at the close of 1885 were £13,380,716,—total deposits £5,880,950. The Govern- ment savings banks, on June 30, 1885, had 53,164 depositors, with £1,571,283 as balances—five per cent. interest being allowed. Manufacturcs.—Inereased attention has been lately directed to local industries, and a more protective tariff has been enforced with a view to their development. The official returns for March 31, 1886, gave 640 works, employing 7952 men and 1350 women. Communication.—The district councils have charge of many of the roads. The general dryness of the country is favourable to the condition of roads. Railways have been

constructed for the con- veyance of farming produce to market, the carriage of minerals to port, and the tapping of the Murray river traffic from the east. At the beginning of 1886 there were 1211 miles of railway open, and 570 in course of construction. The working expenses during 1885 came to £386,000, and the revenue to £556,000. There are several tramways, supplementing railway traffic. Water-Supply.—The Government is aiding the railway movement for opening out the interior by the construction of waterworks and public reservoirs. Tosupply Adelaide, independently of the Torrens river, there has been an expenditure of £866,942. “Kapunda has a reservoir of 41,200,000 gallons; Port Pirie of 25,700,000; Mount Barker of 6,000,000; Port Augusta of 666,000; Mount Gambier and Gawler each of 279,000. There are large storage tanks at many places, e.g., for 810,000 gallons at Moonta. Administration.—The governor is the representative of the crown. The legislative council, of twenty-four members, one third retiring every three ycars, is chosen by 32,000 electors. The house

of assembly, of fifty-two members, is appointed for three years by

60,000 electors. Responsible government dates from 1856. The public debt, contracted for useful public works, was £18,000,000 in 1886. For the year 1884-85 the revenue was £2,157,931, but expenditure was £2,430,518. A revision of the tariff was necessary. Customs yielded £511,280; railways, £662,455, against working expenses £411,850; land sales, £333,369; land rents, £132,013; waterworks, £72,366. The expenditure included £811,189 for public works, besides loans; police, £102,784; civil establish- ments, £73,828 ; legal, £50,051; charitable institutions, £86,968 (there being no poor law); military defences, £39,478 ; immigra- tion, £31,129, &e. The Northern Territory gave £71,518 as re- ceipts to the state, but with £85,000 charges. The revenue for 1885-86 was £2,279,039, and the expenditure £2,383,290. No Australasian colony has done so much for the good of the aborigines and the advance of good morals as South Australia. The adminis- tration is just and firm, being well sustained by public sentiment. Education.—Not being so wealthy as its eastern neighbours, the colony has not been able to devote so large an amount to schools ; still, a grant of £126,000 was made during 1884-85 towards the instruction of 50,000 pupils. Of 450 schools, half are called publie, half provisional for thinly-peopled districts. Payment from scholars is not dispensed with as in

Victoria. Lands are being set apart as educational grants for the future. All religious denominations are equal in the sight of the law, none receiving any state aid. Bible reading is sanctioned before school hours, and any religious lessons may be given at the close of school time. The Adelaide university, so richly endowed by the colonists, re- ceives an annual grant of £2550 from the local parliament. Population.—Ineluding the Northern Territory, the population was returned in 1881 as 279,865 (149,530 males, 180,335 females), in addition to 6346 aborigines (3478 males, 2868 females), The births during 1885 were 12,046, and the deaths 3987 (2205 males and 1782 females). Classed at the last census according to religion, the population may be thus stated :—Church of England, 76,000 ; Roman Catholie, 42,920 ; Wesleyans, 42,103 ; Lutherans, 19,617 ; Presbyterians, 17,917 ; Baptists, 14,000 ; Bible Christians, 10,500; Primitive Methodists, 10,350 ; Congregationalists, 9908. The population in the Northern Territory, 3500, eontains only about

a hundred females, but has 3000 Chinamen. More than half the people of South Australia, whether of English or German parentage, are native-born. In 1886 the population was 325,000. History.—Though the coast of Northern Territory was well known to Portuguese and Spanish navigators as early as perhaps 1530, being ealled Great Java, it was not surveyed till 1644, when Tasman laid down the line of shore pretty accurately. The western part of the southern coast had been seen and named Nuyt's Land in 1627. But Flinders, by his discovery of the two great gulfs, Kangaroo Island, and Encounter Bay, in 1802, was the first to reveal South Australia proper. Captain Sturt deseended the Murray in 1830, and looked over the hills near Adelaide. The first to direct attention to a settlement there was Major Baron, who communicated with the eolonial offiee in February 1831, His suggestion was to establish, at no charge to the British Government, a private company, that should settle a party on Yorke Peninsula. He believed a large river entered Spencer Gulf. In August Colonel Torrens and others proposed to purehase land between 132° and 141°—500,000 acres at 5s. an acre. Some were in favour of Speneer Gulf, others of Kangaroo Island, and a few for the mainland towards the Murray. Memorialists in 1832 sought a charter for the South Australian Association, giving extensive powers of self-government. Land sales were to pay the passages of free labour, chiefly young married people, and no con- victs were ever to be sent thither. Lord Goderich did not favour the scheme, and thought a colony with free institutions might prejudice the interests of New South Wales, while free trade would interfere with the English navigation laws. After much negotiation, the English authorities regarded the scheme more favourably, but would not consent to give the company the powers they sought. The company receded in their demands, and offered security for the proper observance of law and order, while deposit- ing cash for the purchase of land. Captain Sturt in 1834 informed the colonial secretary that Spencer Gulf and Kangaroo Island were objectionable, but that the eastern side of St Vineent Gulf was the best locality. In 1835 the ministry got an Act passed for the erection of a colony, under commissioners appointed by the crown, who would be responsible for their acts to the British Government. It was arranged that a local government should be established when the settlement had 50,000 people. Mr George Fife Angas advanced a large sum as security to the state. Though the first settlers were sent to Kangaroo Island, all were

afterwards gathered on the Adelaide plains. The colony was proclaimed under a gum tree, December 28, 1836. Great delay took place in the survey of land. The South Australian Company purchased large tracts from the commissioners at 12s. per acre and sold at 20s. A general speculative spirit arrested progress. Governor Gawler went into extravagant outlay on public buildings, &e., and drew against orders upon the English treasury. Such difficulties arose that the British rulers had to suspend the charter in 1841 and make South Australia a crown colony. A revival of prosperity took place when the farms were tilled and poverty had taught prudenee. Copper and lead mines were subsequently discovered. Kapunda in 1843, and the Burra Burra copper mine in 1845, greatly aided in the restoration of commercial credit. The gold fever in Victoria drew off numbers in 1852; but the good prices then realized for breadstuffs gave a great impetus to farming. It deserves to be mentioned that rarely if ever has a colony been so favoured as South Australia in the character of its early settlers. (J. BO.)

SOUTH BEND, a city of the United States, the county seat of St Joseph county, Indiana, received its name from its position at a great bend of the St Joseph river, which is navigable to this point from its mouth at St Joseph on Lake Michigan. By railway the city is 85 miles east of Chicago. It is a great manufacturing centre, with iron- works, carriage, waggon, plough, and sewing machine factories, flour-mills, paper-mills, &c. The court-house is one of the best buildings in the State; and the Roman Catholic university of Notre Dame, St Mary’s academy, and St Joseph’s academy are institutions of some import- ance. The population of the city numbered 1652 in 1850, 7206 in 1870, and 13,280 in 1880.

SOUTH CAROLINA, one of the original thirteen Plate V.

States of the American Union, commonly known as the Palmetto State, from the abundance of this kind of palm on the coast, once formed a part of that vast territory of the New World claimed by the Spaniards under the name of Florida and by the French under that of New France ; or, to be more concise, it comprised the southern or lower portion of what was formerly styled Carolina, and subse- quently divided into North and South Carolina. It lies

between 32° 4’ 30” and 35° 12’ N. lat. and between 78° 25’ and 83° 49’ W. long. In shape it is an irregular triangle, the vertex resting upon the Blue Ridge Mountains in the extreme north-west, while the Atlantic forms its base. It is bounded N. and N.E. by North Carolina, 8.E. by the Atlantic, and S.W. by the Savannah river, which, with its tributaries the Tugaloo and Chatauga, separates it from Georgia. The state is 189 miles long and 160 broad, containing 30,961 square miles or 19,815,040 acres, and is divided into thirty-four counties (formerly districts). At the census of 1880 the population nunibered 995,577, of whom 391,105 were white, the rest coloured. Very few Indians are to be found. The surface may be about equally divided into high, middling, and low land, the last-named rising from the sea-coast, where it is very flat and level, and gradually increasing in elevation towards the interior, where it attains a mean of 250 feet, continuing to the north line, where, after varying from 300 to 800 feet it reaches its highest elevation of 1000 feet. The land along and near the coast is low, marshy, and swampy, especially on the rivers’ banks, rolling and diversified towards the centre, and undulating near the mountain slope, but in places abrupt, King’s Mountain rising almost perpendicularly 500 feet. The chief eleva- tions in this section are the Saluda Mountains, spurs of the Blue Ridge, King’s Mountain (1692 feet), Paris Mountain (2054 feet), Table Rock (3000 feet), Ceesar’s Head (3118 feet), and Mount Pinnacle (3436 feet). This region abounds in beautiful and picturesque scenery, rendering it attractive to tourists, and making it a great summer resort.

The land is irrigated and well-drained by numerous rivers, the largest of which is the Santee, formed by the Saluda, Congaree, Catawba, and Wateree, uniting at the centre of the State. The other rivers of any size are the Waccamaw, Lynch’s, Great and Little Peedee, forming the Peedee, Black, Wando, Ashley, Cooper, Edisto, Combahee, Ashepoo, Coosaw, Port Royal, and Broad (on the coast), this last being more of a bay. The sea-coast is fringed by numerous islands, and indented by bays and inlets,— Winyaw and Bull’s Bays, Charleston Harbour, Stono Inlet, North and South Edisto Inlets, St Helena Sound, and Port Royal,—the last one of the finest harbours in the world, as its name, said to have been given on this account by the early discoverers and explorers, would imply. The entire coast south of Winyaw is composed of a network of creeks and sounds, so that, for small craft, navigation inland may be had from this point to the mouth of the

Savannah on the extreme south-west. Most of the rivers rising in the mountains are navigable nearly to the foot-slope. Here numerous rapids and waterfalls afford excellent mill-power. Canals throughout the State are not numerous, the few formerly in use having been abandoned in favour of the railroads. The Santee Canal, connecting that river with the headwaters of the Cooper, 22 miles in length, has given place to the North-Eastern Railway.

The climate of South Carolina is mild and genial, snow falling in the mountains but rarely in the middle sections, and seldom or never along the coast. The sea islands generally, as well as the pine barrens, are healthy, furnish- ing the planter with a summer home and safe retreat from the malaria of the rice lands. These regions were formerly innocuous to the whites, as they still are to the negroes, but subsequent clearance and cultivation have rendered them fatal in summer. The midlands are considered healthy in all parts except here and there along the creeks, while the mountain region is unexceptionable.

The eoast of South Carolina, like places in the same latitude, is subject to violent storms, tornadoes, and cyelones, which make their annual visits on or about the autumnal equinox, doing much

damage. Till quite recently the district has never bcen seriously troubled with earthquakes, Slight tremors have indeed been felt

and recorded since 1754, without, however, causing serious injury. But on the night of the 81st August 1886 Charleston was visited by an earthquake which was followed by other shocks and tremors, which continued night and day at intervals with greater or less violence, as the following list shows :—

August 27…1 shock, slight. Sept. 8…1 shock, slight. August 28…1 shoek, slight. Sept. 10…1 shock, slight. August 31…5 shocks, destructive. Sept. 12…1 shock, slight.

Sept. 1…8 shoeks, severe. Sept. 15…2 shocks, moderate. Sept. 2…3 shocks, severe. Sept. 21…1 shoek, severe.

Sept. 8…2 shocks, severe. Sept. 22…1shock,moderate, local. Sept. 4…2 shoeks, slight. Sept. 27…1 shock, severe.

Sept. 5…1 shock, moderate. |Sept. 28…1 shock, moderate. Sept. 7…2 shocks, slight. Sept. 30…1 shock, slight.

The main shock was very destructive to property, while about forty lives were lost, and many more were injured. Creviees

‘several yards in length and varying from onc to four inches in

width appeared, and in some places in the suburbs of the city fissures of much larger proportions threw up water to the height of several fect. There was no warning given except that in the small town of Summerville, about 22 miles to the north, eonsider- able disturbance was caused by thuds and tremors with detona- tions on the 27th and 28th, felt on the latter date to some extent in Charleston. The violence of these shocks was confined almost exclusively to this State, though they were felt in a slighter degrce in Georgia and North Carolina.

The soil in the low country is remarkably fertile, the river swamps and reclaimed marshes being admirably adapted to the cultivation of rice, while the sandy loam of the sea islands and surrounding main produces the finest long staple, black seed, or sea island cotton of silky fibre. As we recede from the salt the staple becomes shorter and the plant has a less luxuriant growth. The rice produced here, noted abroad as Carolina rice, is considered first in the markets of the world. The State was the first to introduce rice culture in America, the seed having been brought in 1693 by a vesscl from Madagascar. Abundant crops are raised of wheat, rye, maize, oats, barley, buckwheat, pease, beans, sugar, tobacco, indigo, sorghum, broom-corn, sunflower, guinea-corn, sweet and Irish potatoes, hemp, flax, and hops. Numerous orchards, all over the State, furnish quantities of apples, pears,

uinces, plums, peaches, nectarines, apricots, cherries, and along

the coast figs, oranges, lemons, olives, and pomegranates. The raspberry, blackberry, mulberry, and whortleberry are produced, The strawberry is extensively cultivated along the coast, and shipped in immense quantitics to the northern markets. Of nuts, the walnut, pecan, chestnut, hickory, shell-bark, hazel nut, and chinquapin may be mentioned. The grape grows wild in many portions of the State, and in great varieties, which, when culti- vated, yield adelicious wine. In certain sections hundreds of aeres arc devoted to the culture. The gardens and farms produce in abundance turnips, beets, parsnips, carrots, artichokes, mustard, benne, rhubarb, arrowroot, water and musk melons, eucumbers, cabbages, kale, lettuce, eayenuc pepper, squashes, okra, pumpkins, onions, lecks, beans, radishes, celery, grcen pease, and tomatoes, — the last two from early spring to mid-winter. The jasmine, Cherokee rose or nondescript, wild honeysuckle, and sweet-brier perfume the woods ; the dog-wood and fringe tree abound in the forest ; and garden flowers in the cities, especially Charleston, Columbia, and Beaufort, are the admiration of strangers. Con- spicuous among these are the Camellia japonica of all varieties and shades, azalea in every hue, roses of numberless descriptions, hyacinth, snowdrop, violet, dahlia, tulip, verbena, sweet olive, and heliotrope. Valuable and almost inexhaustible forests extend over the greater part of the State, the long leaf or ycllow pine, confined chiefly to the low country, covering 10,000,000 acres, and furnishing immense quantities of timber, tar, pitch, turpentine, and rosin. Here and elsewhere are found the magnolia, sweet and blaek gum, white, water, red, and live oak, black walnut, elm, hickory, maple, syeamore, ash, cypress, chestnut, beeeh, locust, persimmon, dogwood, poplar. ‘The palmetto is peculiar to the coast.

The forests abound in deer, wild turkeys, foxes, wild eats, raccoons, opossums, rabbits, and squirrels; and along the water- courses are found the musk otter, &. Among the birds are pigeons, doves, partridges, woodcock, snipe, immense floeks of wild dueks, including the English or canvas-back, teal, blackhead, &c. Freshwater fish of every variety are taken in all the streams in the interior, and the bays and inlets furnish whiting, mackerel, bass, flounder, sheephead, shad, mullet, blackfish, sturgeon, terrapin, turtle, shrimps, crabs, and oysters. Quantities of salmon and carp have been furnished by the fish commissioners for stocking the waters,

Minerals are liberally diffused over the State. Gold is found in Lancaster, York, Union, Spartanburg, Greenville, Pickens, and Abbeville counties ; copper in York, Spartanburg, and Pickens ; lead in the last; iron of a superior quality in Union, Spartanburg, Greenville, and Pickens ; manganese in Lancastcr, York, Chester,

Vegeta- tion.

Animals,

Minerals,

Railways.

In- dustries,

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Union, Spartanburg, Greenville, Pickens, Anderson, Abbeville, and Edgefield ; bismuth in Chesterfield and Lancaster ; plumbago in Spartanburg ; soapstone in Fairfield, Chester, York, burg, Laurens, Greenville, Pickens, Abbeville, and Edgefield ; coal in Chesterfield and Marlboro. Limestone abounds in nearly all the upper counties, but chicfly in Laurens and Spartanburg. The finest blue and grey granite is found in the middle and upper sections ; sandstone, burrstone, and flagstone in Edgefield, Pickens, York, and Fairfield. Pottery and poreelain clay, quartz, and sand for glass exist in many places. Tuomey states that “the aluminous formations that oceur in immense beds of the finest porcelain clay are oftcn exposed by the denuding effects of water and lie in rich strata upon the very surface, ready to the hand of the manufacturer. Between Aiken and Graniteville the beds are in many cases 60 feet thick, while those in the Savannah river near Hamburg are from 10 to 15 feet and of unsurpassed purity.” The Aiken council committee report in this vicinity immense beds of different kinds of clay, from the purest and whitest kaolin to the dark-coloured mud of which bricks are made, sands of all hues, some as fine as flour, others with large coarse crystals, siliceous earths of many kinds, ferru- ginous sandstones, conglomerate shell, burrstone, mica, feldspar, and ochres of different colours. Buta short distance off a deposit of magnesia is

found, and potash can readily be made in the surrounding forests. Experts have pronounced the sands to be admirably adapted for making glass and crystal, and the quality of the kaolin is admitted to be equal, if not superior, to that of which Staffordshire ware is made. It is doubtful if the combination of the ingredients of glass and earthenware can be found in such immediate proximity anywhere else. Mineral springs exist in several of the upper counties.

Railroads are on the increase. The South Carolina Railway, between Charleston and Augusta, Ga., was, at the time of its com- pletion, the longest continuous railroad in the world.

Manufactures are growing in importance; chief among them are cotton yarn and cloth, flour, lumber, turpentine, and fertilizers, The capacity of twenty-nine mills now in operation is estimated at 14,821,166 tb of yarn, 79,442,327 yards of cloth, and the value of product $9,097,464. In 1880 there were 82,324 spindles and 1676 looms; in 1884 195,112 spindles and 3652 looms. The number of lumber mills at work is 729, employing 5894 hands and a capital of $2,920,870. The value of their annual production is $5,592,565. Of turpentine stills there are 291, with 6991 hands and a capital of $1,454,800, with an annual production to the value of $2,912,271. These figures show an increase of 100 per cent. in less than four years. The fertilizers are valucd at $3,346,400, and the miscellaneous manufactures at $2,114,680. The whole value of manufactured products was in 1860 $8,615,195; in 1870, $9,858,981; in 1880, $16,738,008; in 1884, $32,324,404. South Carolina phosphates are of recent date, but their importance may be shown by stating that they pay yearly, by direct taxation, an amount for royalty which is 20 per cent. of the whole income of the State. The value of this rock was first pointed out by Mr Jonathan Lucas, a planter, who afterwards materially assisted in developing its usefulness. The first company, the Charleston South Carolina Mining and Manufacturing Company, was formed in 1867, There are now fourteen land and eleven river mining companies with capital ranging from $10,000 to $200,000, In addition to these there are a number of individuals who are licensed by the State to mine in the navigable streams, employing an estimated capital of about $50,000. The total amount of phosphate rock mined and shipped in 1868-70 was 20,000 tons; in 1871, 50,000 tons; in

1875, 115,000 tons; in 1880, 190,000 tons; and in 1883, 355,000 tons,—the total since 1868 being 2,290,000 tons. Of this amount 1,078,070 tons were river and 1,211,830 land rock. The capital invested in the former is $525,000, and 649 hands are employed (wages $259,300), with an annual production of $907,170; in the latter the corresponding figures are—capital $1,980,000, hands 1286, wages $363,560, production $1,283, 830.

The six gold-mining counties report eleven mines in operation, employing 600 hands, with a capital of $440,000 and an annual production of $90,000. The same counties report eighteen gold mines or gold-bearing areas not now worked; one of the mines has a capital of $40,000. Ten counties report quarries or kaolin beds. Worked and unworked, there are twenty-five granite quarries, five kaolin beds, and one soapstone quarry. ‘There are also in the State large unworked deposits of mica, pyrites, corundum, and marl, with some silver. The quarries and’ kaolin works, with a capital of $96,350, have an annual production of $220,000.

The upland cotton crop of 1883 was 468,227 bales of 400 ib. The corn area was 1,359,593 acres, and the production 10,876,744 bushels. 321,958 acres in oats yielded a crop of 4,187,082 bushels. Of wheat (182,215 acres) the yield was 1,388,731 bushels. The rice crop of 1883-84 was 33,600 tierces. The sea-island cotton crop was 9500 bags. This last, as well as the small grain and subsidiary crops, has suffered a decline in the last few years of 25 to 35 per cent.

The proportions of white and coloured labour in the State are about 30 per cent. and 70 per cent. respectively. The rate of wages

paid is from $8 to $9 a month for men and $6 for women, with board. About 28 per cent. of white women and children work on the farms, and about 61 per cent. of the coloured. The systems used are—the contract, in which services rendered are paid by giving the labourer the use of the land and house, or where the wages are paid monthly, or a portion monthly and the remainder at the end of the year; and the tenant system, in which the

labourer rents the land, and from the crop pays the landlord the rent and for the use of the animals. Land varies in price from 50 cents for pine barren to $100 for ehoice farming land. Horses and mules are raised at very little cost.

herded for branding or for driving to market. Sheep thrive away from: the salt, and are profitable in the mountains. Hogs, not improved breeds, like cattle, have the liberty of the woods, and are taken with dogs when needed. According to estimates of im- proved stock, there are 792 Jerseys, 177 Ayrshires, 50 Devons, 33 Holsteins, 1 Guernsey, besides a number of Shorthorns and Brahmins. Merino, South Down, Oxford Down, and Broad-Tail sheep are raised in many parts of the State, with Essex and Berkshire hogs.

Free schools trace their origin as far back as 1710. of free schools was inaugurated in 1811. school system was established in 1868. It provides free instruction to pupils of both races, in primary and intermediate grades. Their management is under the direction of the State board of examincrs, consisting of the State superintendent of education, and four other persons appointed by the governor. In each county the school commissioner is elected by the people for two years. The schools are supported entirely by taxation. There are 3562 public schools in the State. The number of persons in the State between the ages of six and sixteen is 281,664, of whom 51,440 are white males, 49,749 white females, 90,897 coloured males, 89,578 coloured females, The number of pupils enrolled is 178,023 (41,819 white males, 36,6389 females, 48,418 coloured males, 51,147 females). The number of male whitc teachers cm- ployed is 1137, females 1205; coloured males 982, females 449,— making a total of 3773. There are 3562 public schoolhouses, valued at $405,097.31. Institutions for higher edueation, sup- ported by the State, are the South Carolina College and South Carolina Military Academy for white males, and the Claflin College for coloured persons of both sexes, There is an institution for the education of the deaf, dumb, and blind. There are, besides, numerous private schools and colleges.

Churches of all denominations multi colonial period, and subsequently Episcopalians, Presbyterians, Independents, Baptists, and French Protestauts established congre- gations in Charleston just after 1680.

Methodists and Romanists came a century later, Jews in 1756, German Lutherans in 1759. The coloured people are for the most part Methodists, some being Baptists and Presbyterians, a few Episcopalians,

CHARLESTON (g.v.) is the largest city of the State. (g.v.), the capital, has (1886) a population of 20,000, while that of Charleston is 60,000. Greenville, in the north-west portion of the State, is a growing railway centre and manufacturing city, with a population of 10,000. Georgetown and Beaufort on the coast doa good shipping business in lumber and other exports. Spartanburg and Aiken are important places, the former as a railway centre, the latter as a health resort for invalid strangers in winter, when the population is more than doubled. Other towns are Newberry, Orangeburg, Florence, Camden, Suinter, Graniteville, Chester, Anderson, Abbeville, Winnsboro, Yorkville, Union, Cheraw, Wal- halla, Piedmont, Port Royal, Marion, Darlington, Lancaster.

Ordinary scrub Live cattle are seldom housed, roaming the forests at will, except when stock.

A system Educa- The present public- tion,

lied in the State during the Religion.

CoLUMBIA Cities,

The executive department consists of a governor, licutenant- Govern- governor, who is ex oficto president of the senate, comptroller- ment,

general, treasurer, secretary of state, attorney-general, and a superintendent of education ; these are elected by the people, to serve two years. The legislative department embraces a senatc and a house of representatives, which together are called the gencral assembly. The former is composed of thirty-seven members, elected for four years, one from each county, except Charleston, which sends two. The house of representatives consists of 124 members, elected for two years. The judicial department consists of a supreme court and of circuit, probate, and justices' courts. The supreme and circuit court judges are elected by the general assembly,—the former for six

years, the latter for four. The probate judges for each county are elected by the people, and the Justices of the peace are appointed by the goveruor.

The first attempt to settle Carolina was in 1562, when Admiral History.

Coligny obtained from Charles IX. of France permission to plant a colony of Protestants on the coast of Florida. An expedition was fitted out at the expensc of the crown, and placed under the command of Jean Ribault. Fear of the Spaniards perhaps induced them to change their plans, and, entcring Port Royal, they landed on Lemon Island, where they erected a pillar, and afterwards a fort, which they named, in honour of the king, Arx Carolina. Leaving a sufficient number to garrison the fort, Ribault returned to France. Two years later a second expedition under Laudonniete,

one of Ribault's men, was fitted out, but on landing at Port Royal it found no traces of the former. This colony likewise met with disaster, being massacred by the Spaniards from Florida. It was not until a century later that a permanent settlement was made by the English, who, after the Restoration, began to recognize their claim to a large territory in the southern district of North America. In 1662 a grant was obtained from Charles II., and in 1667 an expedition sailed under command of Capt. William Sayle. They reached Port Royal, where they made a settlement, but a few years after removed to the west bank of the Ashley, and built a town which they called, after the English monarch, Charlestown. Subsequently they again removed to Oyster Point, the present site of Charleston. (W. SL)

SOUTHCOTT, Joanna (1750-1814), was born in Devonshire about 1750, and was for a considerable time a domestic servant. She was originally an adherent of the Methodists, but, becoming persuaded she possessed supernatural gifts, she wrote and dictated prophecies in rhyme, and announced herself as the woman spoken of in the Apocalypse (ch. xii.), affirming, when beyond the age of sixty, that she would be delivered of Shiloh on the 19th October 1814. For some days previous tc this she was attended by her followers night and day, but Shiloh failed to appear, and it was given out that she was in a trance. She died of dropsy on the 29th of the

same month. Her followers are said to have numbered over 100,000, and so late as 1860 they were not extinct.

Among her publications, which number over sixty, and are all equally incoherent in thought and grammar, may be mentioned Strange Hffects of Faith, 1801-2; Free EKaxposition of the Bible, 1804 ; The Book of Wonders, 1813-14 ; and Prophecies annowneing the Birth of the Prinee of Peace, 1814. A lady named Essam left large sums of moncy for printing and publishing the Sacred Writings of Joanna Southcott. The will was disputed by a niece on the ground that the writings were blasphemous, but the Court of Chanecry sustained it.

Sce Roberts, Observations on the Divine Mission of Joanna Southcott, 1807;

Reece, Correct Statement of the Circumstances attending the Death of Joanna Southcott, 1815.

SOUTHEND, a watering-place of Essex, is situated on the north bank of the Thames, 5 miles west of Shoeburyness, and by the London, Tilbury, and Southend Railway, 42 miles east of London, with which it is also connected by steamer. It first sprang into notice from a visit of Queen Caroline in 1804, and, as it is the nearest watering-place to London, it is much frequented by excursionists, espe- cially by the poorer classes. It is clean and well built, and at Cliff Town there are a number of large villas. Opposite Cliff Town there is a public garden called the Shrubbery. The bathing is good, but the tide recedes with great rapidity and for nearly a mile. The pier, which is 14 miles in length, and on which there is a tram-way, permits the approach of steamers at all tides. The public hall was erected in 1872 at a cost of £3000, and a mechanics' institution dates from 1881. The Rochford county court is held every alternate month in the public hall. A local board of health was established in 1866. The population of the urban sanitary district (area 3441 acres) in 1871 was 4561, and in 1881 it was 7979.

SOUTHERNE, Tuomas (1660-1746)—'" Honest Tom Southerne," to give the author of The Fatal Marriage the name by which his contemporaries usually called him— was a clever craftsman for the stage, according to the

degenerate tradition of the Restoration dramatists, —with the eye of a born opportunist for the popular interests of the hour in so far as they could be turned to histrionic account, but without deeper seeing of the functions of the drama. Born in Dublin in 1660, he came to London and entered the Middle Temple in 1678, but only to desert law very Speedily for dramatic authorship. His first play, The Persian Prince, or the Loyal Brother, is a good example, in its diplomatic reference to passing events and its veiled compliment to James, duke of York, of his ready tact as a playwright. The most important practical result of the play, which was remarkably successful on the stage, was

an ensign's commission, noteworthy in that it supplied Southerne with materials for later dramatization. After an interval of active service more plays followed, and were produced with equal success ; of these The Fatal Marriage (1694), known also by the name of its heroine, Isabella, has the best claim to remembrance. Its strain of pathetic quality echoes the later Elizabethans in a way that con- trasts suggestively with the shallow, if spirited, indecencies of Southerne's comedies, which, although their author was commended by Dryden for his purity as a playwright, are certainly not overweighted with delicacy. Sir Anthony Love, or the Rambling Lady, in which the hero assumes female disguise without accession of modesty, is a good example of the rest; one utterance of its hero, "Every day a new mistress and a new quarrel," might indeed serve as a good motto of Restoration comedy in general. Except to the student, Southerne's work, however, is hardly of permanent interest. The Southerne of whom Pope, who ranked him as friend and praised him for his sterling qualities, remarked in some lines that "Heaven sent down to raise The price of prologues and of plays"

exemplifies what business tact and dramatic ingenuity can accomplish, for of real artistic faculty he had little. His plays resulted, through ingenious management, in a pecun- iary return which dazzled Dryden and made their author a wealthy citizen, but they have not the quality of work which endures. He died in 1746.

SOUTHEY, Carotine (1786-1854), the second wife of Robert Southey, was born at Lymington, Hants, on December 6th, 1786. As a girl Caroline Ann Bowles showed a certain literary and artistic aptitude, the more remarkable perhaps from the loneliness of her early life and the morbidly delicate condition of her health,—an aptitude, however, of no real distinction. When money difficulties came upon her in middle age she determined to turn her talents to account in literature. Her first venture was the sending anonymously of a narrative poem called Ellen Fitzarthur to Southey, and this led to the acquaintanceship and lifelong friendship which in 1839 culminated in their marriage. len Fitzarthur (1820) may be taken as typical, in its prosy simplicity, of the rest of its author's work, which reproduced the studied unadornment of certain portions of Southey's and Words- worth's poetry without that glamour which, especially with the second of these writers, so often redeemed simplicity from mere baldness. Mrs Southey's poems were published in a collected edition in 1867. Her prose is on the whole more interesting than her verse, though— with rare exceptions— infected with like dulness. Among her prose writings may be mentioned Chapters on Church- yards (1829), her best work ; Zales of the Moors (1828) ; and Selwyn in Search of a Daughter (1835). Her most interesting memorial is her correspondence with Southey, which, somewhat unfairly overlooked in the edition of the poet's Life and Letters edited by his son, has been pub- lished by Prof. Dowden in the Dublin University Press Series. It was soon after her marriage that her husband's mental state became hopeless, and from this time till his death in 1843, and indeed till her own, her life was one of much suffering. Mrs Southey died at Buckland Cot- tage, Lymington, on July 20th 1854, two years after the queen had granted her an annual pension of £200.

Besides the works already mentioned, she wrote The Widow's Tale, and other Poems, 1822; Solitary Hours (prose and verse), 1826; Tales of the Factories, 1833; The Birthday, 1836; Robin Hood, written in conjunction with Southey, at whose death this metrical production was incomplete.

SOUTHEY, Roserr (1774-1843), was born in Bristol on the 12th of August 1774. His father, a native of Somerset, was an unsuccessful draper. To his mother,

Margaret Hill, Southey owed his buoyant spirits, his practical sense, and his earliest friends. The first of these, Miss Tyler, his mother's half-sister, took possession of him when he was three; under her care he saw and heard a great deal of theatres and of acting. His solitary life in an old maid's household threw him upon his own resources and developed a taste for reading. He was sent to several private schools, and had good fortune at none of them; in 1788 he went to Westminster, where he was scarcely more fortunate. After a brief sojourn he was expelled in 1792, because an essay of his on flog- ging, in a school magazine called The Mlagellant, was resented by Dr Vincent, the head-master. At West- minster he gained the friendship of two boys who were faithful to him and helpful throughout his life; these were Charles Winn and Grosvenor Bedford. About this time his father died; his aunt, however, determined that he should go to Oxford. He was refused at Christ Church on account of the essay in The Plagellant; but Balliol gave him a home. At Oxford he led his own life, lived in his own thoughts, and got little or nothing from the university. In 1794 Coleridge dashed at Southey, took him by storm, and filled his head with plans for an ideal colony in the wilds. The new society, whose members were to have all things in common, was to be called "The Pantisocracy." Their life was to com- bine manual labour and domestic bliss; to attain the latter, Southey set his affections on a Miss Edith Fricker, whose sister married Coleridge. All this was intolerable to Miss Tyler, and Southey was banished. He and Coleridge then tried, by lecturing and journalism, to raise money for their American schemes ; but luckily Southey's uncle, who had educated him,—Mr Hill, the English chaplain at Lisbon,—advised him to travel. On the 14th of November 1795, before he started, he was secretly married to Edith Fricker. On his return from Lisbon the marriage was acknowledged, and Southey wandered from one house to another in the south of England. He tried, or was urged to try, the three professions which are by courtesy styled "learned"; it might be more true to call them the technical, the stereotyped professions. Southey was scared from all three,—from clericalism by dogma, from medicine by the dissecting-room, from law by its crabbed dulness. In literature alone he found his proper sphere; and in 1803 he

settled down in his life- long home, Greta Hall, near Keswick. Henceforth his years were even and uneventful. He wrote and read with mechanical, with appalling regularity; his library grew to fourteen thousand volumes. He had children, and lost several; and his house was a refuge for the wife and family of Coleridge. With Wordsworth and Landor he formed close friendships. In 1813 he was made poet- laureate ; and some years before his death he was offered a baronetcy—which, however, he with good reason declined. Two great sorrows embittered his life: in 1809 he lost his eldest boy Herbert, and in 1834 his wife was taken to a madhouse, whence she came back to die. In 1839 he married Caroline Bowles. That same year his memory failed, his speech became uncertain, and his power of writing soon went; softening of the brain had taken irre- mediable hold of the once tireless intellect. To the last he would hover round his books and handle them lovingly. He died on the 21st of March 1843; he is buried, near his first wife and her children, in Crosthwaite churchyard.

The amount of Southey's work in literature is enormous. His collected verse, with its explanatory notes, fills ten volumes; his prose occupies about forty. But his greatest works were left un- completed, and this, in some sense, is typical of Southey's whole achievement in the world of letters; there is always something

unsatisfying, disappointing, about him. He seldom realized or seldom found scope for his true bent in literature. This is most

true of his efforts in verse, In his childhood Southey fell in with Tasso, Tasso led him to Ariosto, and Ariosto to Spenser. These beautiful, these luxuriantly imaginative poets captivated the boy; and Southey mistook his youthful enthusiasm for an abiding, a life- long inspiration. His inspiration was not genuinely imaginative ; he had too large an infusion of prosaic commonplace in his nature to be a true follower of Ariosto and Spenser. Southey, quite early in life, resolved to write a series of epics on the chief religions of the world. The subject was dangerous, and one epic is a life's work; it is not surprising that the too ambitious poet failed. His failure is twofold: he was wanting in artistic power and in poetic sympathy. With regard to the first, he says of himself, "It was long before I acquired this

power,”—the power of plan and con- struction, —‘‘not fairly, indeed, till I was about five or six and thirty.” The fact is, he never acquired it; he never could con- struct a dramatic plot or mould it into artistic details. When his epics are not wildly impossible they are incurably dull; at the best their interest is extrinsic rather than intrinsic, pervaded by the glamour of historic romance rather than the light of pure poetry. And a man is not fit to write epics on the religions of the world when he can say of the prophet who has satisfied the gravest races of mankind,—Mohammed was ‘‘far more remarkable for audacious profligacy than for any intellectual endowments.” Southey’s age was bounded, and had little sympathy for anything beyond itself and its own narrow interests; it was violently Tory, narrowly Protestant, defiantly English. And in his verse Southey truthfully reflects the feeling of his age. This led him to say dreadful things about the Eastern religions in his prefaces to Kehama and Thalaba; it made Joan of Are an incongruous blend- ing of Rousseau, of Horace Walpole’s romanticism, of the Surrey theatre, and of Lady Huntingdon; it gave Madoc, a Celt of the 12th century, the mind of a cold middle-class Saxon evangelical of the regency. In the shorter pieces Southey’s commonplace asserts itself, and if that does not meet us we find his bondage to his gener- ation. This bondage is quite abject in The Vision of Judgment ; Southey’s heavenly personages are British Philistines from Old Sarum, magnified but not transformed, engaged in endless placid adoration of an infinite George III. When Southey sets himself to fondle the regent, he loses all sense of measure and propriety. In the Funeral Ode to the Princess he can assert of her father— “Such the proud, the virtuous story, Such the great, the endless glory Of her father’s splendid reign! ”

This famous ode, ‘‘with the grace and beauty of which,” Sir Henry Taylor thinks, ‘‘no facts could compete,” is, it must be said, in many of its couplets, too like the average hymn. The twang of the hymn spoils two of Southey’s best pieces. The Holly Tree ends—

“That in my age as cheerful 1 might be As the green winter of the holly tree.” The last lines of Stanzas Written in his Library, a poem dear to the book-lover, are painfully like a rhyme on a tomb-stone :— ‘Yet leaving here a name, I trust, That will not perish in the dust.” Some of his subjects, The Poct’s Pilgrimage, for instance, he would have treated delightfully in prose;

others, like the Botany Bay Eelogues, Songs to American Indians, The Pig, The Daneing Bear, should never have been written. The Retrospect, of which this is a fair specimen, — “There where my little hands were wont to rear With pride the earliest salad of the year,”— a living critic and biographer of Southey has compared to The Deserted Village. Southey was not in the highest sense of the word a poet ; but if we turn from his verse to his prose we are in a different world ; there Southey is a master in his art, who works at ease with grace and skill. “Southey’s prose is perfect,” said Byron ; and, if we do not stretch the “ perfect,” or take it to mean the supreme perfection of the very greatest masters of style, Byron was right. For good prose, plain, unassuming, natural, he is not surpassed in English. In his charming story of The Three Bears a phrase is often used which exactly describes his style ; when the old lady finds what is neither too hot nor too cold, too large nor too small, she says it is “just right.” Southey’s prose is ‘‘just right,”—it expresses his meaning with simple and admirable precision. In his prose and in his criticism we of a later generation could do worse than learn from Southey ; his sober writing is an excellent corrective for our prevailing faults. In prose the real Southey emerges from his conventionality. His interest and his curiosity are unbounded, as his Common-Place Book will prove; his stores of learning are at his readers’ scrvice, as in The Doetor; his patriotism is vigorous and healthy, as in the Lie of Nelson ; his criticism is sound, as in the Lives of Cowper and of Wesley. But the truest Southey is in his Letters: the loyal, gallant, tender-hearted, faithful man that he was is revealed in them. Southey’s fame will not rest, as he supposed, on his verse ; all his faults are in that,—all his own weakness, and all the false taste of his age. But his prose assures him a high place in English literature, though not a place in the first rank even of prose writers.

SO U—SO0OZ

SOUTHPORT, a municipal borough of Lancashire, England, and a favourite seaside resort, is situated between the estuaries of the Mersey and the Ribble, 18 miles north of Liverpool, and is a terminal] station of three railway systems. Its foreshore consists of a great expanse of firm, bright sands, to the radiation of heat from which is attributed the mildness of its winter climate. Its proximity to Liverpool, Manchester, and other large

manufacturing towns has drawn to it a large resident population, and its visitors, in quest of health and pleasure, number many thousands annually. Its spacious streets, laid out at right angles to each other, are bordered with trees and ornamental gardens. The promenade along the shore is two miles in length; in its centre is the pier, a mile long, down which tramcars are drawn by a stationary steam-engine. Other facilities for outdoor enjoyment are provided in Hesketh Park (presented to the town by the late Rev. Charles Hesketh, rector of North Meols, and one of the lords of the manor), the Botanic Gardens, Kew Gardens, and the Winter Gardens. The last, laid out at a cost of £130,000, include a large conservatory, a fine enclosed promenade, a theatre, and an aquarium, There is also a glaciarium, or skating and curling hall, in which those amusements may be practised on real ice all the year round. The Victoria baths were erected in 1870 at an expenditure of £50,000. The principal public buildings are the town-hall, the Cambridge hall (used for concerts &e.), and an extensive range of markets, erected in 1881 at a cost of £40,000. Among the benevolent institutions are a general infirmary, a convalescent hospital, a sana- torium for children, and a neuro-hydropathic hospital. Southport has also a free library and art gallery (the gift of the late William Atkinson), a literary and philosophical institute, and a college (Trinity Hall) for the education of the daughters of Wesleyan ministers; and the town council are now (1886) engaged in building a museum and schools of scienceand art. The first house in Southport (an inn for the reception of sea-bathers) was built in 1791, and soon after other houses were erected on the site now known as Lord Street. The population, which in 1809 was 100, had increased in 1851 to 4766, and in 1861 to 10,097. In 1867 the town received a charter of incorporation, and since then its progress has been remarkable. In 1871 the population of the borough (area 7526 acres) was 18,086 ; in 1881 this had grown to 32,206, and in 1886 it was estimated at 36,596. Its sanitary arrangements are very perfect, and the water supply is abundant and excellent. Southport gives its name to one of the parlia- mentary divisions of South-West Lancashire.

SOUTH SHIELDS. See Suretps, Souru.

SOUTHWARK. See Lonpon.

SOUVESTRE, Emirz (1806-1854), a French novelist of merit, was born on April 15, 1806, and died on July 5, 1854, He was a native of Morlaix, and his affection for Brittany coloured most of his best work in after life. He had rather a chequered career of employment besides his literary pursuits. He was by turns a bookseller's assistant, a private schoolmaster, a journalist, and professeur at the grammar schools of Brest and Mulhouse. In 1848 he received what may sound to English ears the odd appoint- ment of "professor of administrative style" in a school founded for the instruction of civil servants. His literary work, however, was his labour of love. He began like most Frenchmen with the drama, but was never very successful with it. In novel-writing he did much better, and with Jules Sandeau (though on a somewhat lower level of writing, construction, and grasp of character) may be said to rank as the chief recent French novelist who deliberately aimed at making the novel an engine of moral Instruction. With less genius and less sense of art than

Sandeau, he did not always escape the reproach of dulness. His best work is undoubtedly to be found in the charming Dermers Bretons (1835-1837) and Foyer Breton (1844) (where the folklore and natural features of his native province are worked up into story form, with a success hardly excelled by any other writer), and in Un Philosophe sous les Torts, which received the honour of an academic prize in the year 1851. This Souvestre deserved, not merely for his sentiments, but for his easy and agreeable style. He also wrote a not inconsiderable number of other works—novels, dramas, essays, and miscellanies. SOWERBY, Jamus (1757-1822), was at first a painter, but soon applied his art to the illustration of botanical and conchological works, which are still highly valued,

especially his Hnglish Botany (12 vols. 8vo, 1846). His

son George (1788-1854) followed in his father's steps, and produced a monumental work on conchology.

SOWERBY BRIDGE, a manufacturing town in the West Riding of Yorkshire, is situated on both sides of the river Calder, at the termination of the Rochdale Canal, and on the Lancashire and Yorkshire Railway, 2 miles

south-west of Halifax, and 8 north-west of Huddersfield. Christ church, dating from 1526, was rebuilt in 1819. The other public buildings include the town-hall (1857) and the local board offices, opened in 1878, attached to which are the public baths and the slaughter-houses. The town is almost entirely the growth of the last fifty years. It possesses worsted and cotton mills, iron-works, dye- works, and chemical works. The population of the urban sanitary district (area 536 acres) in 1871 was 7041, and in 1881 it was 8724.

SOZOMEN, church historian. Hermias Salamanes (Salaminius) Sozomenus came of a wealthy family of Palestine, and it is exceedingly probable that he himself was born (not later than 400 a.p.) and brought up there, —in Gaza or the neighbourhood. What he has to tell us of the history of South Palestine was derived from oral tradition. His grandfather, as he himself tells us, lived at Bethel near Gaza, and became a Christian, probably under Constantius, through the influence of Hilarion, who among his other miracles had miraculously healed an acquaintance of the grandfather, one Alaphion. Both men with their families became zealous Christians and conspicu- ous for their virtues. The historian's grandfather became within his own circle a highly esteemed interpreter of Scripture, and held fast his profession even in the time of Julian. The descendants of the wealthy Alaphion founded churches and convents in the district, and were particularly active In promoting monasticism. Sozomen himself had conversed with one of these, a very old man. He was brought up under monkish influences; so he expressly states, and his history bears him out. As a man he retained the impressions of his youth, and his great work was to be also a monument of his reverence for the monks in general and for the disciples of Hilarion in particular. He became a lawyer and advocate in Constantinople, where as such he wrote his "ExxAyovacrixy Iotwpia about the year 440. The nine books of which it is composed begin with Constantine and come down to the death of Honorius (423); but according to his own statement the author intended to continue it as far asthe year 439. From Sozomen himself (iv. 17), and statements of his excerptors Nicephorus and Theophanes, it can be made out that the work did actually come down to that year, and that consequently it has reached us only in a somewhat mutilated condition, at least half a book being wanting. A flattering and bombastic dedication to Theodosius II. is prefixed. When

compared with the history of SocRaTESs (q.v.), it is plainly seen to be a plagiarism from that work, and that on a large scale. Some three-fourths of the

materials, essentially in the same arrangement, have simply been appropriated from his predecessor without his being so much as named even once, the other sources to which Sozomen was indebted being, however, expressly cited. All that can be said to the credit of Sozomen is that he has been himself at the trouble to refer to the principal sources used by Socrates (Rufinus, Eusebius, Athanasius, Sabinus, the collections of epistles, Palladius), and has not unfrequently supplemented Socrates from them, and also that he has adduced some new authorities, in particular sources relating to Christianity in Persia, Arian history, monkish histories, the Vita Martini of Sulpicius, books of Hilarius; the whole of the ninth book is entirely drawn from Olympiodorus.

It is difficult to discern the motive for a work which was merely an enlarged edition of Socrates. But it is probable that Sozomen did not approve of Socrates's freer attitude towards Greek science, and that he wished to present a picture in which the clergy should be still further glorified, and, above all, monasticism brought into still stronger prominence. In Sozomen everything is a shade more ecclesiastical—but only a shade—than in Socrates. Perhaps also he wrote for a different circle,— say, the monks in Palestine,—and could be sure that in it the work of his predecessor would not be known.

Sozomen is everywhere an inferior Socrates. What in Socrates still betrays some vestiges of historical sense, lis moderation, his reserve in questions of dogma, his impartiality,—all this is wanting in Sozomen. In many cases he has repeated the exact words of Socrates, but with him they have passed almost into mere phrases. The inferiority of Sozomen to Socrates as an historian appears as much in the manner in which he transcribed him as in those passages where he introduces something new. The chronological scrupulosity of the earlier writer has made no impression on his follower; he has either wholly omitted orinaccurately repeated the chronological data. He writes more wordily and difluscly. In his characterizations of persons,

borrowed from Socrates, he is more dull and colonrless. After Socrates he has indeed repeated the caution not to be too rash in discerning the fiuger of God ; but his way of looking at things is throughout mean and rustic. Two souls inhabit his book : one, the better, is borrowed from Socrates ; another, the worse, ishisown. Wherever he abandons his leader he frequently falls into mere retailing of stories, and prostrates him- self in reverence before the poorest products of the religious fantasy of a degenerating age. Evidence of a boundless credulity with regard to all sorts of monkish fables is to be mct with everywhere. Raisings of the dead are quite common occurrences with him, and he repeatedly gives accounts of enormous dragons. In the finding of the bones of saints he takes the highest interest, and even be- lieves in the rediscovery of the tombs of the Old Testament prophets.

Where we still possess Socrates's account that of Sozomen very sel- dom has any consequence, but some of the additions he has made are instructive and important. The number of new acts of councils introduced by him is small. His monkish histories are as sources almost utterly valueless ; his account of the Christians in Persia absolutely swarms with mistakes. It must, however, be noted that for the period from Theodosius I. onward he has emancipated himself more fully from Socrates and has followed Olympiodorus in part, partly also oral tradition ; here accordingly his statements possess greater Value.

Editions and Literature.—Soerates and Sozomen have been edited by Stephanus (Paris, 1544; Geneva, 1612), Valesius (Paris, 1659-73), Reading (Cambridge, 1720), Hussey (Oxford, 1853, 1860), They are also to be found in vol. Ixvii. of Migne's Patrologia, and there is an Oxford school edition (1844) after Reading. Bright edited Socrates according to the text of Hussey in 1878. There are "'Testimonia Veterum" in Valesius; and Nolte's papers in Tubing. Quartalschr., (1859) p. 518 sq., (1861) p. 417 sg., contain emendations in Hussey's text, and notes towards the history of the text and editions ; see also Overbeck, in Theol. Lit. Ztung. (1879), No. 20.

Special studies have been made by Baronius, Mirzus, Labbé, Valesius, Halloix, Scaliger, Ceillier, Cave, Dupin, Pagi, Ittig, Tillemont, Waleh, Gibhon, Schroeckh, Lardner. See also Voss, De Histor. Grecis; Fabricius-

Harless, Biblioth. Gr. vol. viis Rossler, Bibliothek d. Kirchenvdter; Holzhausen, De Fontibus quibus Socr., Soz., ac Theod. in scribenda Historia Sacra ust sunt, (Gottingen, 1825; Stiudlin, Gesch. u, Lit. d@. A.-G., Hanover, 1827; Baur, Epochen (1825); Harnack, ‘‘Socr. u. Soz.,” in Herzog-Plitt’s Theol. Encykl. Detached details are given also in works upon Constantine (Manso), Julian (Miicke, Rode, Neumann, Rendall), Damasus (Rade), Arianism (Gwatkin’s Studies of Arianism, 1882, gives a severe but trustworthy eritieism of Rufinus and discusses the manner in which Soerates was related to him), the emperors after Julian (De Broglie, Richter, Clinton, the Weltgeschichte of Ranke, the Gesch, d, Kaiser Arcadius u. Theod, 1I,, 1885, of Giildenpenning, and the Kaiser Theodostus d. Gr., Halle, 1878, of 1ffland, the last-named work diseussing the relation of Socrates to Sozomen), the barbarian migrations (Wietersheim, Dahn), the Goths (Waitz, Besscl, Kauffmann, and Scott’s Ulfilas, 1885). Lastly, reference may be made to Rosenstein, Forsch. z. deutsch. Gesch., vol. i.,—Arit.

SPA—SPA

Untersuch. tib. d. Verhdltniss zu Olympiodor, Zosimus, u. Soz.; Sarrazin, De Theodoro Lectore, Theophanis Fonte Precipuo, 1881 (treats of the relation between

Soerates and Sozomen, and of the completeness of the former’s work); Jeep,

Quellenuntersuch. z. d. griech. Kirchenhistorikern, Leipsic, 1884. (A. HA.)

SPA, a watering-place of Belgium, in the province of

Liége, 20 miles by rail from Liége via Pepinster, is beauti- fully situated, at a height of 814 feet above the sea, in the valley of the Wayai (a small sub-tributary of the Meuse).

On the north and north-east it is protected by the wooded

range of hills known as the Spaloumont, or in its several parts as Bois de la Reid, Bois du Chiencul, &c.; and on the south are a number of beautiful

ravines cut in the Primary rocks of the district by small affluents of the Wayai. Much

of the charm of the place is due to the promenades and drives along the sides and crests of the hills. The principal mineral spring called the Pouhon (a local word for “ well ”) is enclosed in a pump-room in the centre of the Place Pierre le Grand. Public baths, fed by chalybeate streams collected in a remarkable reservoir at the hamlet of Nivesé, occupy a large building in Place Royale, erected in 1868 ; and in the same neighbourhood is the casino, with ball and concert rooms. An English church was built in 1872-76. A local industry is the production of fancy articles in lacquered wood (bois de Spa). A liqueur resembling Chartreuse is also manufactured under the name of “elixir de Spa.” The population of the commune was 6930 in 1884. Several springs in the neighbouring district are nearly as celebrated as those of Spa proper; the Sauveniére waters, supposed to be effective against sterility, are half a mile distant.

Spa, said to derive its name from a Walloon word, Espa, for “fountain,” was practically founded by a certain Wolf, or Collin le Loup, iron-master of Breda, who had obtained benefit from the waters, and purchased the piece of ground containing the Pouhon spring from Erard de la Marck, bishop of Liége, in 1826. At the beginning of the 15th century the little town numbered 250 houses, The European celebrity of the waters dates from the 16th century, when they were drunk by the duke of Nevers, Margaret of Valois, Henry III. of France, and Alexander Farnese, and the fashion of visiting Spa became thoroughly established in the 18th century. The French Revolution, and, as far as English visitors were con- cerned, the attractions of the German watering-placcs made known by Sir Francis Head, for a time turned the tide elsewhere ; but since the middle of the century Spa has taken a new lease of prosperity.

SPAGNA, Lo (? ~-c. 1529), the usual designation (due to his Spanish origin) of Giovanni di Pietro, one of the chief followers of Perugino. Nothing whatever is known of his early life, or of the circumstances under which he became a member of the Perugian school. A large number of panel pictures by him exist, of which some are painted with much grace and refinement of touch. There is, however, a very marked absence of

individuality about his style, which seems like an imitation of the earliest inanner of Raphael and that of Pinturicchio in a weaker and less virile form. The chief of his numerous panel paintings are the Nativity, in the Vatican, and the Adoration of the Magi, at Berlin. In 1510 Lo Spagna executed many frescos at Todi, and in 1512 several other mural paintings in and near Trevi. His most important works were frescos at Assisi and Spoleto, of which some exist in good preser- vation. He received the freedom of the city of Spoleto in 1516, as a reward for his work there. As is so often the case, Lo Spagna's frescos reach a much higher standard of merit than his panel pictures. The museum of the Capitol in Rome now possesses a very beautiful series of life-sized fresco figures by him, representing Apollo and the Nine Muses. 'These are drawn with a strong feeling for grace of pose and beauty of expression, and are very remarkable for the delicate refinement of their colouring ; in style they strongly recall Raphael's earliest manner. Lo Spagna was alive in 1528, but he appears to have died before 1530, as in that year a pupil of his named Doni completed a fresco in 8. Jacopo, near Spoleto, which Lo Spagna had begun.

SPAGNOLETTO. See Riper.

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ij urface,

SPAIN

PART IL—GEOGRAPHY AND STATISTICS.

PAIN, a country rather more than twice the size of Great Britain including the adjacent small islands, constitutes in its mainland portion about eleven-thirteenths of the Iberian Peninsula, and has in addition an insular area (in the Balearic and Canary Islands) of nearly 5000 square miles. On all sides except that of Portugal the boundaries are natural, the Peninsula being separated from France by the Pyrenees and on every other side being surrounded by the sea. On the side of Portugal a tract of inhospitable country led originally to the separa- tion between the two kingdoms,

inasmuch as it caused the reconquest of the comparatively populous maritime tracts from the Moors to be carried out independently of that of the eastern kingdoms, which were also well peopled. The absence of any such means of intercom- inunication as navigable rivers afford has favoured the continuance of this isolation. The precise line of this western frontier is formed for a considerable length by portions of the chief rivers or by small tributaries, and on the north (between Portugal and Galicia) it is determined to a large extent by small mountain ranges. The British rock of Gibraltar, in the extreme south of the peninsula, is separated from Spain by a low isthmus known as the Neutral Ground. The coast-line on the north and north-

“west is everywhere steep and cliffy. On the north there

are numerous small indentations, many of which form more or less convenient harbours, but the current flowing along the coast from the west often leaves in the stiller water at their mouths obstructive bars. The best harbours are to be found on the vias or fiord-like indenta- tions in the west of Galicia, where high tides keep the inlets well scoured; here occur the fine natural harbours of Pontevedra and Vigo, Corufia and Ferrol, the last one of the chief stations of the Spanish fleet. Less varied in outline but more varied in character are the Spanish coasts on the south and east. Flat coasts prevail from the frontier of Portugal to the Straits of Gibraltar. Between the mouth of the Rio Tinto and that of the Guadalquivir they are sandy and lined by a series of sand- dunes (the tract known as the Arenas Gordas). Next follows a marshy tract at the mouth of the Guadalquivir, after which the coast-line becomes more varied, and includes the fine Bay of Cadiz. From the Straits of Gibraltar a bold and rocky coast is continued almost right round to Cape Palos, a little beyond the fine natural harbour of Cartagena. North of Cape Palos a line of flat coast, beginning with the narrow strip which cuts off the lagoon called the Mar Menor from the Mediterranean, bounds half of the province of Alicante, but in its northern half this province, becoming mountainous, runs out to the lofty headland of Cape Nao. The whole coast of the Bay of Valencia is low and ill-provided with harbours; and along the east of Catalonia stretches of steep and rocky coast alternate with others of an opposite character.

The surface of Spain is remarkable at once for its strik- ing contrasts and its vast expanses of dreary uniformity. There are mountains rising with Alpine grandeur above the snow-line, but often sheltering rich and magnificent valleys at their base. Naked walls of white lmestone tower above dark woods of cork, oak, and olive. In other parts, as in the Basque country, in Galicia, in the Serrania de Cuenca (between the head waters of the Tagus and those of the Jucar), in the Albarracin (between the head Waters of the Tagus and those of the Guadalaviar), there are extensive tracts of undulating forest-clad hill country,

and almost contiguous to these there are apparently boundless plains, or tracts of level tableland, some almost uninhabitable, and some streaked with canals and richly cultivated—like the Requena of Valencia. While, again, continuous mountain ranges and broad plains and table- lands give the prevailing character to the scenery, there are here and there, on the one hand, lofty isolated peaks, landmarks for a wide distance round, such as Monseny, Monserrat, and Mont Sant in Catalonia, the Peiia Golosa in Valencia, Moncayo on the borders of Aragon and Old Castile, and, on the other hand, small secluded valleys, such as those of Vich and Olot among the Catalonian Pyrenees.

The greater part of the interior of Spain is composed of Central a tableland bounded by the Cantabrian Mountains in the tableland.

north and the Sierra Morena in the south, and divided into two by a series of mountain ranges stretching on the whole from east to west. The northern half of the table- land, made up of the provinces of Leon and Old Castile, has an average elevation estimated at about 2700 feet, while the southern half, made up of Estremadura and New Castile, is slightly lower—about 2600 feet. On all sides the tableland as a whole is remarkably isolated, and hence the passes on its boundary and the river valleys that lead up to it from the surrounding plains are geographical features of peculiar importance. The isolation on the side of Portugal, where the tableland gradually sinks to the sea in a succession of terraces, has already been referred to. On the north-west the valley of the Sil and a series of valleys further south, along both of which military roads have been carried from an early period, open up communication between Leon and the hill country of Galicia, which

explains why this province was united to Leon even before the conquest of Portugal from the Moors. The passes across the Cantabrian Mountains in the north are tolerably numerous, and four of them are already crossed by railways. The two most remarkable are the Pass of Pajares, across which winds the railway from Leon to Oviedo and the seaport of Gijon, and that of Reinosa leading down to the deep valley of the Besaya, and now crossed by the railway from Valladolid to Santander. In its eastern section the chain is crossed by the railways from Burgos to Bilbao and San Sebastian, the latter of which winds through the wild and romantic gorge of Pancorbo (in the north-east of the province of Burgos) before it traverses the Cantabrian chain at Idiazabal.

On the north-east and east, where the edge of the tableland sweeps round in a wide curve, the surface sinks on the whole in broad terraces to the valley of the Ebro and the Bay of Valencia, and is crowned here and there by more or less isolated mountains, some of which have been already mentioned. On the north-east by far the most important communication with the Ebro valley is formed by the valley of the Jalon, which has thus always formed a mihtary route of the highest consequence, and which is now traversed by the railway from Madrid to Saragossa. Further south the mountains clustered on the east of the tableland (Albarracin, Serrania de Cuenca) render direct communication between Valencia and Madrid extremely difficult, and the principal communica- tions with the east and south-east are effected where the southern tableland of La Mancha merges in the hill country which connects the interior of Spain with the Sierra Nevada,

In the south the descent from the tableland to the

Can- tabrian Moun- tains.

Central moun- tain chains.

valley of the Guadalquivir is again comparatively gradual, but even here in the eastern half of the Sierra Morena the passes are few, the most important being the Puerto de Despefiaperros, where the Rio Magafa has cut for itself a deep gorge through which the railway now ascends from Andalusia to

Madrid. Between Andalusia and Fstremadura farther west the communication is freer, the Sierra Morena being there broken up into series of small chains.

Of the mountains belonging to the tableland the most continuous are those of the Cantabrian chain, which stretches for the most part from east to west, parallel to the Bay of Biscay, but ultimately bends round towards the south between Leon and Galicia. Almost everywhere it consists of two parallel ranges, the higher of which, the more southerly, is the immediate continuation of the Pyrenees. The highest summits of the chain belong to the Jura limestones of the Pefias de Europa, on the borders of the provinces of Santander, Oviedo, Leon, and Palencia. The highest of all is the Torre de Ceredo, which attains the height of at least 8750 feet, and next is the Pefia Prieta (8300 feet). At the sources of the Si] the main chain divides into two branches, enclosing the fertile and thickly-populated district known as El Vierzo, once the bed of a lake, now watered by the stream just mentioned and its tributaries. The whole chain is remarkable for its intricate ramifications and its wild grandeur, but, as already indicated, is not so much of a barrier to communication as might be expected from its general aspect. Besides the railways above mentioned it is crossed at many points by bridle-paths and roads.

A peculiar feature of the chain and the neighbouring parts of the tableland is formed by the parameras or isolated plateaus, surrounded by steep rocky mountains, sometimes even by walls of naked rock. Among the larger of these are the bleak districts of Siguenza and Soria, round the headwaters of the Duero,—districts which separate the mountains of the so-called Iberian system on the north-east of the tableland from the eastern. portion of the central mountain chains of the peninsula. Of these chains, to which Spanish geographers give the name Carpetano-Vetonica, the most easterly is the Sierra de Guadarrama, the general trend of which is from south- west to north-east. It is the Montes Carpetani of the ancients, and a portion of it (due north of Madrid) still bears the name of Carpetanos. Composed almost entirely of granite, it has an aspect when seen from a distance highly characteristic of the mountains of the Iberian Peninsula in general, presenting the appearance of a saw- like ridge (sierra) broken up into numerous sections. Its mean height is about 5250 feet, and near its centre it

has three summits (the highest named the Pico de Pefialara) rising to the height of nearly 8000 feet.

A region with a highly irregular surface, filled with hills and parameras, separates this sierra from the Sierra de Gredos farther west. This is the loftiest and grandest sierra in the whole series. Its culminating point, the Plaza de Almanzor, attains the height of 8725 feet, not far short of that of the highest Cantabrian summits. Its general trend is east and west; towards the south it sinks precipitously, and on the north it descends with a somewhat more gentle slope towards the longitudinal valleys of the Tormes and Alberche which separate it from another rugged mountain range, forming the southern boundary of the paramera of Avila. On the west another rough and hilly tract, similar to that which divides it from the Sierra de Guadarrama in the east, separates it from the Sierra de Gata, the westernmost and the lowest of the Spanish sierras belonging to the series. These hilly intervals between the more continuous sierras greatly facilitate the communica-

tion between the northern and southern halves of the Spanish tableland. The Guadarrama is indeed crossed by three good pass-roads, and even the Sierra de Gredos has a road across it connecting Avila with Talavera de la Reina by the Puerto del Pico; but for the most part there are only bridle-paths across the sierras, and up to the present date not a single railway crosses any one of the sierras directly. The only railway crossing the central system of mountains is that from Madrid to Avila, which traverses the interval between the Sierras de Gredos and Guadarrama, passing through numerous tunnels on the way.

Morena—is even less of a continuous chain than the two systems last described. As already intimated, its least continuous portion is in the west. In the east and middle portion it is composed of a countless number of irregularly- disposed undulating mountains all nearly equal in height.

Even more important than the mountains bounding or crossing the tableland are those in the north-east and in the south, which are connected with the tableland only at their extremities. The former are the PYRENEES (¢.2.),

the latter are the Sierra Nevada, and the coast ranges still Sierra farther south. The Sierra Nevada, or “snowy sierra,” is Nevada.

a well-defined chain, between 50 and 60 miles in length, and about 25 miles in breadth, situated to the south of the valley of the Guadalquivir, and stretching from the upper part of the valley of the Jenil in the west to the deep valley of the Almeria in the east. It is composed chiefly of soft micaceous schists, sinking precipitously down on the north, but sloping more gently to the south and south-east. Its culminating summit, the Cerro de Mulahacen (11,660 feet), is the highest in Spain, and the range contains several other peaks upwards of 10,000 feet in height, and above the limit of perpetual snow. On both sides deep transverse valleys (barrancas) follow one another in close succession, in many cases with round basin-shaped heads, like the cirques of the Pyrenees. In many of these cirques repose alpine lakes, and in one of them, the Corral de Veleta, there is even a small glacier, the most southerly in Europe. On the south the transverse valleys of the Sierra Nevada open’ into the mountainous longitudinal valley of the Alpujarras, into which open also on the other side the transverse valleys from the most easterly of the coast sierras, the Sierra Contraviesa and the Sierra de Almijara. The latter are continued farther west by the Sierra de Alhama and Sierra de Abdalajiz. Immediately to the west of the latter sierra lies the gorge of the Guadal- horce, which now affords a passage for the railway from Malaga to Cordova; and beyond that gorge, to the west and south-west, the Serrania de Ronda, a mountain group difficult of access, stretches out its sierras in all directions. To Spanish geographers the coast ranges just mentioned are known collectively as the Sierra Penibetica. North- east of the Sierra Nevada two small ranges, Alcaraz and La Sagra, rise with remarkable abruptness from the plateau of Murcia, where it merges in that of the interior.

The only two important lowland valleys of Spain are Lowland The former Valleys |

those of the Ebro and the Guadalquivir. occupies the angle in the north-east between the Pyrenees

1 About 3700 feet above the level of Madrid, 2700 feet above that of Segovia.

The southern system Sierra of mountains bounding the Iberian tableland—the Sierra Morena.

Sierras of south

coast.

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MOUNTAINS AND RIVERS. |

and the central tableland, and is divided by ranges of heights proceeding on the one side from the Pyrenees, on the other from the base of the Moncayo, into two portions. The uppermost of these, a plateau of between 1000 and 1300 feet above sea-level, is only about one-fourth of the size of the remaining portion, which is chiefly lowland, but is cut off from the coast by a highland tract connect- ing the interior tableland with spurs from the Pyrenees. The Guadalquivir basin is likewise divided by the con- figuration of the ground into a small upper portion of con- siderable elevation and a much larger lower portion mainly lowland, the latter composed from Seville downwards of a perfectly level and toa large extent unhealthy alluvium (las marismas). The division between these two sections is indicated by the change in the course of the main stream from a due westerly to a more south-westerly direction.

The main water-parting of the peninsula is everywhere near the edge of the tableland on the north, east, and south, and hence describes a semicircle with the convexity to the east. The Ebro alone of the great rivers flows into the Mediterranean. The following table gives the length of the principal Iberian rivers, with the area of their basins,—the length according to

different authorities, the area of the basins according to Strelbitsky, whose measure- ments of area appear to be more trustworthy than those made by him of the length of rivers :—

Length in English Miles. Area in

<> = = jenn Square

Wagner. | Ritter. | Strelbitsky. Miles.

[ELRO) » cote dO Seo ee Rene 442 416 470 38,580 Duero (Douro)..... 452 507 485 36,710 ‘IN227018 ,9t50;on0 eee oEeEEEee 565 5538 566 31,865 (EMMA CAMA <...-. 02000600 510 490 316 25,300 Guadalquivir…..... 337 350 374 21,580

With the exception of the Guadalquivir, none of the Iberian rivers is of great service for inland navigation, so far as they lie within the Spanish frontier. On the other hand, those of the east and south are of great value for irrigation, and the Jucar and Segura in the south-east are employed in floating timber from the Serrania de Cuenca.

The Epro and Tacus are described in separate articles (¢.v.). }

The Mito (Portug. Minho, the Minius of the Romans) is formed by the union of two small streams in the north of the province of Lugo, and flows first southwards, then on the whole south-westwards to the Atlantic, forming in the lower part of its course the boundary between Spain and Portugal. It becomes navigable for small vessels at Salvaterra, 25 miles above its mouth. Large vessels cannot cross the bar at its moyth. Its only important tributary is the Sil (left), which at the confluence is the larger river of the two.

The Duero (Portug. Dowro, the Durius of the Romans) emerges from the rock as a small stream among the mountains of Urbion on the borders of the provinces of Logrofio and Soria, and, after deseribing a wide sweep to the east, flows westwards across the northern half of the Spanish tableland and across Portugal. For a distance of nearly 60 miles it forms the boundary between the two countries. It begins to be navigable 80 miles above its

mouth, but sea-going vessels ascend only to Oporto, and even so far, on aecount of a bar at the mouth, only at high tide. The principal tributaries on the right are the Pisuerga and Esla, on the left the Adaja, Tormes, and Coa (the last in Portugal).

The Guadiana (i.e… Wadi Ana, the Anas of the ancients) was long believed to take its rise in the district known as the Campo de Montiel, where a string of small lakes known as the Lagunas de Nuidera (partly in Ciudad Real, partly in Albacete) are connected by a stream which, on leaving the last of them, flows north-westwards towards the Zancara and then disappears within two or three miles of that river. About 22 miles to the south-west of the point of

slisappearance the stream was believed to re-emerge in the form of several large springs which form a number of lakes at no great

‘stance from the Zancara, and these lakes are hence known as the “eyes of the Guadiana” (los ojos de Guadiana). The small stream issuing from them is known as the Guadiana and soon joins the Zancara, It has now been ascertained, however, that the stream

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which disappears higher up can have no such course, but that in fact its waters flow or trickle underground to the Zaneara itself, which is therefore entitled to be regarded as the upper Guadiana. It has its source not far from that of the Jucar in the east of the plateau of La Mancha, and flows westwards till, under the name of the Guadiana, it turns south-south-west on the Portuguese frontier. In piercing the Sierra Morena it forms a series of foam- ing rapids, and it begins to be navigable only at Mertola, about 42 miles above its mouth.

The Guadalquivir (i.¢c., Wadi-el-Kebir, “the great river,” the Betis of the ancients), though the shortest of the great rivers of the Peninsula, is the only one that at all seasons of the year is a full- bodied stream, being fed in winter by the rains, in summer by the melting of the snows on the Sierra

Nevada. What is regarded as the main stream rises in the Sierra de Cazorla in the east of the province of Jaen, but it does not beconte a considerable river till after it is joined by the Guadiana Menor (from the Sierra Nevada), on the left bank and the Guadalimar on the right. Lower down the principal tributary which it receives is the Jenil (left). In the days of the Moors the Guadalquivir was navigable for large vessels to Cordova, but, having been allowed to become silted up in the lower part of its course, it has only recently again been made navigable for vessels of 1200 tons burden to Seville.

The only considerable lakes in Spain are three coast Lakes.

lagoons,—that of Albufera in the province of Valencia, the Mar Menor in Murcia, and the Laguna de la Janda in Cadiz behind Cape Trafalgar. Small alpine and other lakes are numerous, and small salt lakes are to be found in every steppe region.

The geological structure of the Spanish Peninsula is Geology.

comparatively simple. Upon a fundamental platform of ancient crystalline rocks, which had previously been upraised into detached ridges, a series of sedimentary formations was laid down, among which occur representa-tives of most of the geological systems from the older Palzeozoic rocks up to those of Quaternary date. Arranged in order of age, with their respective areas, these various groups of rock are shown in the subjoined table :—

QUATCINGTY:. .ccscsesscesesess covering 49,477 sq. kilom., or 10°00 °/, of whole surfacc. WPIOCCHEN ss ..cseuesvseresses 9,064 5 1°80 7% Miocene and Oligocene, », 187,867 4 27°85 i) IDOAEING: cy apeenbanoudecsbodenan 3 23,564 > 5 4°80 i Cretaceous….. 9 47,002 op 9°50 5 Jurassic…..... 00 0 22,697 Pr 4°45 i UTE 5) |@honapaggoonsiapsnasogndd rf 22,443 6 4°45 re Carboniferous …..... A 11,301 0 2°22 i DGYONIAN ccs scecseesnases . 5,780 is 1:40 a Silurian (and Cambrian) », 114,382 00) 23°18 4 ATCHEAMN.....s.000sscerersees ’ nig 0°35 – Eruptive rocks of vari-

OMSTAIBES Ia ehsevernserersice », 49,665 55 10°00 a

Archean rocks are exposed in the northern half of the Peninsula, particularly along the great Pyrenean axis, in Galicia, Estremadura, the Sierra Morena, the Sierra Nevada, and Serrania de Ronda. They consist of granites, gneisses, and mica-schists, with tale- schists, amphibolites, and crystalline limestones. The oldest Paleozoic strata are referred, from their included fossils, to the Cambrian and Silurian divisions. They range through a vast region of Andalusia, Estremadura, Castile, Salamanca, Leon, and Asturias, and along the flanks of the Pyrenean and Cantabrian chain. They consist of slates, reywackes, quartzites, and diahases. Grits, quartzites, and shales referable to the Devonian system occur in a few scattered areas, the largest and most fossilifcrous of these occurring in the Asturias. The Carboniferous rocks of Spain are divisible into three groups, the lowest consisting of limestones with sandstones and shales, the middle of conglomeratcs and sandstones, and the upper of sandstones, conglomerates, shales, and coals. They lie in detached basins, and have not yct been well explored. One of these areas covers a considerable space in the Asturias, whence it stretches more or less continuously through the provinces of Leon, Palencia, and Santander, covering altogether an area of 6500 square kilometres. Another tract occurs at San Juan de las Abadesas in Catalonia, where it occupies about 200

_ square kilometres ; while a third, about 500 square kilometres in

exteut, runs from the province of Cordova into that of Badajoz. There are other smaller areas containing little or no coal, but showing by the included plant-remains that the strata undoubtedly belong to the Carboniferous system.

The Triassic system is well developed in the north of the Peninsula along the Cantabrian chain and eastwards to the Meditcrranean. It is composed of red and variegated sandstones, dolomitcs, and marls, traversed in some places by ophitic rocks, and containing deposits of gypsum, aragonite, and rock-salt. These strata are overlain by members of the Jurassic series, which

| are especially conspicuous in the eastern part of the Peninsula

Climate.

between Castile and Aragon, along the Mediterranean border, in Andalusia, and likewise along the flanks of the Pyrenees. The Lias is best represented. The Cretaceous system is distributed in four great districts: the largest of these extends through the kingdoms of Murcia and Valencia; a second stretches betwcen the two Castiles; a third is found in the Basque Provinces and the Asturias; and a fourth spreads out along the southern slopes of the Pyrenees from Navarre to the Mediterrancan. The lower members of the Cretaceous series include an important freshwater formation (sandstones and clays), which extends from the Cantabrian coast through the provinces of Santander, Burgos, Soria, and Logrofio, and is supposed to represent the English Wealden series. The higher members comprise massive hippurite limestones, and in the Pyrenean district representatives of the upper subdivisions of the system, including the Danian.

Deposits of Tertiary age cover rather more than a third of Spain. They are divisible into two great series, according to their mode of origin in the sea or in fresh water. The marine Tertiary accumula- tions commence with those that are referable to the Eocene series, consisting of nummulitic limestones, marls, and siliceous sand- stones. These strata are developed in the basin of the Ebro, and in a belt which extends from Valencia through Murcia and Andalusia to Cadiz. Marine Miocene deposits occupy some small tracts, especially on the coast of Valencia. But most of the sandy Tertiary rocks of that district are Pliocene. The Tertiary masses of Andalusia have coarse conglomerates (Middle Miocene) at their base, followed by thick beds of Bryozoan molasse and younger (Pliocene) beds. These strata are specially noteworthy for con- taining an important metalliferous deposit, that of the native silver of Herrerias, which is found in a Pliocene bed in the form of flakes, needles, and crystals. But the most extensive and interesting Tertiary accumulations are those of the great lakes which in Oligocene and Miocene time spread over so large an expanse of the tableland. These sheets of fresh water covered the centre of the country, including the basins of the Ebro, Jucar, Guadalaviar, Guadalquivir, and Tagus. They have left behind them thick de- posits of clays, marls, gypsum, and limestone, in which numerous remains of the land-animals of the time have been preserved.

Quaternary deposits spread over about a tenth of the area of the country. The largest tract of them is to be seen to the south of the Cantabrian chain; but another, of hardly inferior extent, flanks the Sierra de Guadarrama, and spreads out over the great plain from Madrid to Caceres. Some of these alluvial accumula- tions indicate a former greater extension of the snowfields that are now so restricted in the Spanish sierras. Remains of the reindeer are found in caves in the Pyrenees. ;

Eruptive rocks of many different ages occur in different parts of Spain. The most important tract covered by them is that which stretches from Cape Ortegal to Coria in Estremadura and spreads over a large area of Portugal. They likewise appear in Castile, forming the sierras of Gredos and Guadarrama; farther south they rise in the mountains of Toledo, in the Sierra Morena, and across the provinces of Cordova, Seville, Huelva, and Badajoz as far as Evora in Portugal. Among the minor areas occupied by them may be especially mentioned those which occur in the Triassic districts. Of rocks included in the eruptive series the most abundant is granite. There occur also quartz-porphyry (Sierra Morena, Pyrenees, &c.), diorite, porphyrite, diabase (well developed in the north of Andalusia, where it plays a great part in the structure of the Sierra Morena), ophite (Pyrenees, Cadiz), serpentine (forming an enormous mass in the Serrania de Ronda), trachyte, liparite, andesite, basalt. The last four rocks occur as a volcanic series distributed in three chief districts—that of Cape Gata, including the south-east of Andalusia and the south of Murcia, that of Catalonia, and that of La Mancha.

Climate. —In accordance with its southerly position, its differences of elevation, and the variety in its superficial configuration in other respects, Spain presents within its borders examples of every kind of climate to be found on the northern hemisphere, with the sole exception of that of the torrid zone. As regards temperature, the heart of the tableland is characterized by extremes as great as are to be met with in almost any part of central Europe. The northern and north-western maritime provinces, on the other hand, have a climate as equable, and, it may be added, as moist, as that of the west of England or Scotland.

Four zones of climate are distinguished. The first zone may be called that of the tableland, although to it also the greater part of the Ebro basin may be referred. This is the zone of the greatest extremes of temperature. Even in summer the nights are often decidedly cold, and on the high parameras it is not a rare thing to see hoar-frost in the morning. In spring cold wetting mists occasionally envelop the land for entire days, while in summer the sky is often perfectly clear for weeks together. At all seasons of the year sudden changes of teinperature, to the extent of from 30° to 50° F., are not infrequent. The air is extremely dry, which is all the more keenly felt from the fact that it is almost constantly in motion, At Madrid (2150 feet above sca-level) it regularly

freezes so hard in December and January that skating is carried on on the sheet of water in the Buen Retiro ; and, as winter through- out Spain, except in the maritime provinces of the north and north-west, is the season of greatest atmospheric precipitation, snowfalls are frequent, though the snow seldom lies long except at high elevations. The summers, on the other hand, are not only extremely warm but almost rainless, the sea-winds being deprived of their moisture on the edge of the plateau. In July and August the plains of New Castile and Estremadura are sun- burnt wastes ; the roads are several inches deep with dust; the leaves of the few trees are withered and discoloured ; the atmo- sphere is filled with a fine dust, producing a haze known as calina, which converts the blue of the sky into a dull grey. In the greater part of the Ebro basin the heat of summer is even more intense. The treeless mostly steppe-like valley with a bright- coloured soil acts like a concave mirror in reflecting the sun’s rays, and, moreover, the mountains and highlands by which the valley is enclosed prevent to a large extent the access of winds, and thus hinder the renewal of the air, which in the lowest parts is little disturbed.

The second zone is that of the Mediterranean provinces, exclusive of those of the extreme south. In this zone the extremes of teniperature are less, though the summers here also are warm, and the winters decidedly cool, especially in the north-east.

The southern zone, to which the name of African has been given, embraces the whole of Andalusia as far as the Sierra Morena, the southern half of Murcia, and the province of Alicante. In this zone there prevails a genuine subtropical climate, with extremely warm and alinost rainless summers and mild winters, the temperature hardly ever sinking below freezing-point. The hottest part of the region is not the most southerly district but the bright-coloured steppes of the coast of Granada, and the plains and hill terraces of the south-east coast from Almeria to Alicante. Snow and frost are here hardly known. It is said that at Malaga snow falls only about once in twenty-five years. The winter, in fact, is the season of the brightest vegetation : after the long drought of summer the surface gets covered once more in late autumn with a fresh green varied with bright-coloured flowers, and so it remains the whole winter through. On the other hand, the eastern part of this zone is the part of Spain which is liable to be visited from time to time by the scorching and blasting Jewche, the name given in Spain to the sirocco, as well as by the solano, a moist and less noxious east wind.

The fourth zone, that of the north and north-west maritime provinces, presents a marked contrast to all the others. The temperature is mild and equable ; the rains are abundant all the year round, but fall chiefly in autumn, asin the west of Europe

enerally. Monthly roses bloom in the gardens at Christmas as peanieliblly and as plentifully asin summer. The chief drawback of the climate is an cxcess of rain in some parts, especially in the west. Santiago de Compostella, for example, has one of the highest rainfalls on the mainland of Europe (see table below). he figures given in the following table ({.),! although based only on data of short periods (from 34 to 20 years), will help to illustrate the preceding general remarks. Greenwich is added for the sake of comparison.

/Mean Temperature, F.| pa;

/ Height) fail ne

oe al Jan. | July. | Year. | inches. Tableland TDG, oooenanon oa ASN | ie Tai || fae || Ue zone Mia cliicl eer. 2150 | 41 76 | 56 15 oauiiienn come San Fernando 90 | 52 75 | 68 30 Malaga…..... 75 | 54 vo || ee Br Mediterranean

| Murcia……..... 140 | 49 79 63 14 zone Mehon……..... apa |) (52 77 | 64 oF Neesweetacs Bilbao……..... 50 | 46 70 | 58 46 diate Bete OVAEMO. ose sccne 750 | 48 66 | 54 36 Santiago…..... 750 | 45°5 | 66 | 55 66 Greenwich…... 39 63 | 50 25

Vegetation.—The vegetation of Spain exhibits a variety in keeping Flora.

with the differences of climate justdescribed. Thenumber of endemic species is exceptionally large, the number of monotypic genera in the Peninsula greater than in any other part of the Mediterranean domain. The endemic species are naturally most numerous in the mountains, and above all in the loftiest ranges, the Pyrenees and the Sierra Nevada ; but it is a peculiarity of the Spanish tableland, as compared with the plains and tablelands of central Europe, that it also possesses a considerable number of endemic plants and plants of extremely restricted range. This fact, however, is also in harmony with the physical conditions above described, being explained by the local varieties, not only of climate, but also of

1 By conversion from Th. Fischer’s Klima der Mittelmeerldnder.

soil. Altogether no other country in Europe of equal extent has so great a wealth of species as Spain. According to the Prodromus Flore Hispanice of Willkomm and Lange (completed in 1880), the number of species of vascular plants then ascertained to exist in the country was 5096. a ‘ ;

Spain may be divided botanically into four provinces, corre- sponding to the four climatic zones.

In the tableland province (including the greater part of the Ebro valley) the flora is composed chiefly of species characteristic of the Mediterranean region, generally of species eonfined to the Peninsula. A peculiar character is imparted to the vegetation of this province by the growth over large tracts of evergreen shrubs and large herbaceous plants belonging to the Cistinew and Labiate. Areas covered by plants of the former group are known to the Spaniards as jarales, and are particularly extensive in the Mancha Alta and on the slopes of the Sierra Morena, where the ladanum busli (Cistus

ladaniferus) is specially abundant ; those covered by plants of the latter group are known as tomillares (from tomillo, thyme), and occur chiefly in the south, south-west, and east of the table- land of New Castile. In the central parts of the same tableland huge thistles (such as the Onopordum nervoswm), centaureas, artemisias, and other Compositz are scattered in great profusion. Fron the level parts of these tablelands trees are almost entirely absent. On the lofty parameras of Soria and other parts of Old Castile the vegetation has an almost alpine eharacter.

The southern or African province is distinguished chiefly by the abundance of plants which have their true home in North Africa (a fact easily understood when we consider the geologieally recent land connexion of Spain with that continent), but is also remarkable for the oceurrenee within it of numerous Eastern plants (natives of Syria and Asia Minor), and plants belonging to South Africa and the Canaries, as well as natives of tropical America which have become naturalized here (see below under Agriculture). In this province the maritime parts of Malaga and Granada present scenes of almost tropical riehness and beauty, while, on the other hand, in Murcia, Alicante, and Almeria the aspect is truly African, fertile oases appearing in the midst of rocky deserts or barren steppes. A peculiar vegetation, consisting mainly of low shrubs with fleshy glaucous leaves (Inula crithmoides, &e.), covers the marisimas of the Guadalquivir and various parts of the south-west coast where salt-marshes prevail. Everywhere on moist sandy ground are to be seen tall thickets of Arwndo Donazx.

The Mediterranean province is that in which the general aspect of the vegetation agrees most closely with that of southern France and the lowlands of the Mediterranean region generally. On the lower slopes of the mountains and on all the parts left uncultivated the prevailing form of vegetation consists of a dense growth of shrubs with thick leathery leaves, such as are known to the French as magquis, to the ltalians as macchic, and are called in Spanish monte bajo,1 shrubs which, however much they resemble each other in external appearance, belong botanically to a great variety of families,

The northern maritime province, in accordance with its climate, has a vegetation resembling that of central Europe. Here only are to be found rich grassy meadows adorued with flowers sueh as are seen in Nnglish fields, and here only do forests of oak, beech, and ehestnut cover a large proportion of the area, The extra- ordinary abundance of ferns (as in western France) is likewise charaeteristic.

The forest area of Spain generally is relatively small. The whole extent of forests is estimated at little more than 3 millions of hectares (74 million acres), or less than 6 per cent. of the area of the kingdom. Evergreen oaks, chestnuts, and conifers are the prevailing trees, The cork oaks of the southern provinees and of Catalonia are of immense value, but the groves containing this tree have suffered greatly from the reckless way in whieh the product is colleeted. Among other characteristic trees are the Spanish pine (Pinus hispanica), the Corsican pine (P. Laricio), the Pinsapo fir (Abics Pinsapo), and the Quercus Tozza, the last belonging to the slopes of the Sierra Nevada. Besides the date- palm the dwarf-palm grows spontaneously in some parts of the south, but it nowhere makes up a large element of the vegetation.

The Spanish steppes deserve a special notice, since they are not confined to one of the four botanieal provinces, but are found in all of them exeept the last. Six considerable steppe regions are counted :—(1) that of Old Castile, situated to the south of Valladolid, and composed chiefly of hills of gypsum ; (2) that of New Castile, In the south-east (the district of La Mancha); (3) the Aragonese, Oeeupying the upper part of the basin of the Ebro; (4) the littoral, Stretehing along the south-east coast from Alicante to the neighbourhood of Almeria; (5) the Granadine, in the east of Upper Andalusia (the former kingdom of Granada); and (6) the Beetie, in Lower Andalusia, on both sides of the valley of the Jenil. All of these are originally salt-steppes, and, where the soil is still highly

mostly members of the Salsolaccw, with thick, greyish green, often downy leaves. A different aspect is presented by the grass steppes of Murcia, La

Mancha, the plateaus of Guadix and Huescar in the province of Granada, &c., all of which are covered chiefly with the valuable esparto grass (Macrochloa tenacissima).

Fauna,—The Iberian Peninsula belongs to the Mediterranean Fauna.

subregion of the Palearetic region of the animal kingdom, a division which includes also the north of Afriea. The forms that betray African affinities are naturally to be found chiefly in the south. Among the mammals that fall under this head are the common genet (Genetta vulgaris), which extends, however, pretty far north, and is found also in the south of France, the fallow-deer, the porcupine (very rare), and a species of ichneumon (Herpestcs widdringtonii), whieh is confined to the Peninsula, and is the only European species of this characteristically African genus. The magot or Barbary ape (Inwus ecaudatus), the only species of inonkey still found wild in Europe, is also a native of Spain, but the only flock still surviving, on the rock of Gibraltar, has often been on the point of extinetion, and has to be renewed from time to timie by importations from the north of Africa. Of the mammals in which Spain shows more affinity to the fauna of central and northern Europe, some of the most characteristic are the Spanish lynx (Lynx pardinus), a species confined to the Peninsula, the Spanish hare (Lepus madritensis), and the species mentioned in the article Pyrenrrs. The birds of Spain are very numerous, partly no doubt in consequence of the fact that the Peninsula lies in the route of those birds of passage which eross from Afriea to Europe or Europe to Afriea by way of the Straits of Gibraltar. Many species belonging to central Europe pass the winter in Spain, especially on the south-eastern coasts and in the valley of the Guadalquivir. Innumerable, for example, are the snipes which in that season are killed in the latter district and brought to the market of Seville. Among the birds of prey may be mentioned, besides the cinereous and bearded vultures, the Spanish vulture (Gyps occidentalis), the African or Egyptian vulture (Neophron percnoptcrus), which is found among att the mountains of the Peninsula, the Spanish imperial eagle (Aguila adaibcrti), the short-toed eagle (Circactus gallicus), the southern eagle-owl (Bubo atheniensis), besides various kites and falcons. Among gallinaceous birds, besides the red-legged partridge, which is met with every- where on the steppes, there are found also the Pteroclcs alchita and P. arenarius; and from among the

birds of other orders the southern shrike (Lantus meridionalis), the Spanish sparrow (Passer cyaneus), and the blue magpie (Cyanopica cooki) may be singled out as worthy of mention. The last is highly remarkable on account of its distribution, it being confined to Spain while the species most closely allied to it (Cyanopica cyanea) belongs to the east of Asia. The flamingo is found native in the Balearic Islands and on the southern coasts, and oceasionally a stray specimen is to be seen on the tableland of New Castile. Other birds peculiar to the south are two specics of quails, the Andalusian hemipode (Turnix sylvatica), confined to the plains of Andalusia, the southern shearwater (Pufinus cinereus), and other water-birds. Amphibians and reptiles are particularly numerous in the southern provinces, and among these the most remarkable are the large southern or eyed lizard (Lacerta ocellata), whieh sometimes attains 8 feet in length and is very abundant, the Platydactylus saccicularis, the grey amphisbena (Blanus cinereus), the European pond-tortoise (Emys curopea), and another species, Emys sicgrizti. Insect life is remarkably abundant and varied. More than 350 species of butterflies, many of them endemic, have been counted in the province of Madrid alone. Besides the ordinary European scorpion, which is generally distributed in southern Europe, there is another species, the sting of whicli is said to be still more severe, found chiefly in the basin of the Ebro. Trout abound in the mountain streams and lakes, barbel and many other species of Cyprinide in the rivers of the plains. For the sea fauna, see under Fisherics below.

Extent.—The total area of the mainland of Spain, according to Extent.

the calculations of Strelbitsky, is 495,612 square kilometres or 191,365 square miles, that of the Balearic Islands 4982 square kilometres or 1923 square miles, and that of the Canary Islands, which, though belonging geographically to Africa, are admin- istratively associated with the kingdom of Spain, 7611 square kilometres or 2939 square miles; so that the total area of the kingdom is 508,205 square kilometres or 196,225 square miles. This total agrees pretty closely with that in Justus Perthes’s table given below (Table I1.), although eonsiderable differences will be observed in the arcas assigned to the mainland provinces and the two island groups respeetively. The length of the coast-line of the mainland, aecording to Strelbitsky, is 2662 miles, which is equivalent to 1 mile of coast for every 72 square miles

of area, about the same proportion as in France, The greatest length from north-east to south-west is 420 miles,

impregnated with salt, liave only a sparse covering of shrubs, Territorial Divisions and Population,—For administrative pur- Admin- % ae 2 : oe poses the kingdom of Spain has since 1833 been divided into forty- istrative ‘ As distinguished from monte alto, the collective name for forest trees, nine provinces, forty-seven of which belong to the mainland. divisions.

Sl — 35

Popula- tion.

298

Before 1833 the mainland was divided into thirteen provinces, also enumerated below, whichtook their namesfrom theancient kingdoms and principalities out of which the modern kingdom was gradually builtup. The present provinces are subdivided into judicial districts (partidos judiciales) and eommunes (ayuntamientos). Per

It is probable that the population of Spain attained its highest development during the period of the early Roman empire, when it has been estimated, though of course on imperfect data, to have numbered forty or fifty millions. The best evidence of a dense population in those days is that afforded by the specific estimates of ancient writers for some of the larger cities. The population of Tarraco (Tarragona) was estimated at 2} millions, and that of Nova Carthago (Cartagena), Italica (Sevilla la Vieja), and others at several hundreds of thousands. Emerita Augusta (Merida) had a Roman garrison of 90,000 men, which also implies a large population.’

Table II.—Area and Population of the Former and Present

Provinces.

Area in Pooulats Population | Increase a

Provinces. Square Bes7 on Dec. 31, or : a Miles. 1877. Decrease. ae

1877.

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1,945 173,812 174,425 + 0-4 89

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Presidios of North Africa (exclusive of Ccuta)... 2,476

16,634,345

1 Garrido, La Espafia Contemporanea, i. 489.

Sral

[STATISTICS.

Tho first Spanish census was made in 1594, but some of the provinces now included in the kingdom were for one reason or another not embraced in the enumeration, so that the total popula- tion assigned to Spain within its present limits for that date is obtained by adding the results of enumerations at different dates in the provinces then excluded. The total thus arrived at is 8,206,791. No other census took place till 1787, when the total was found to be 10,268,150; and this census was followed by another in 1797, when the population was returned as 10,541,221. Various estimates were made within the next sixty years, but the census of 1857 proved that some of these estimates must have been greatly below the truth. The total population then ascertained to exist in Spain was 15,464,340, an increase of not much less than 50 per eent. since the census of 1797. The last census took place on December 31, 1877, and the total population then ascertained, 16,631,869, shows an increase of only 74 per cent., equal to an annual increase at the rate of 0°35 per cent.—lower than in any other country in Europe except France.

As Table lI. shows, the density of population in Spain as a whole is little more than that of the most thinly peopled county of England in 1881 (Westmoreland, 82 to the square inile), Looking at the old provinces, we find that the most thickly peopled are all maritime, and that all the maritime provinces except Andalusia and Murcia have a density exceeding 100 to the square mile. The most densely peopled province of all is not Catalonia, in which manufacturing industries are so highly de- veloped, nor the Basque Provinces with their great iron industry, but Galicia, where there are neither manufactures nor minerals to speak of, but where tillage occupies a relatively larger area than anywhere else in Spain. Of the modern provinces the most thinly peopled are Cuenca and Ciudad Real, in the barren region of

the east and south of New Castile, and Albacete in the Murcian steppe, in each ease the density being less than half of that of the most thinly peopled English county. The column indicating the increase (or decrease) per cent. of the population between 1857 and 1877 shows that, outside of the province in which the capital is situated, the increase points chiefly to the reeent development of manu- factures and mining,—to the development of eopper mines in Huelva, lead mines in Jaen, iron mines in Vizcaya, cotton manu- factures in Barcelona. In Murcia it points no doubt to the San development of the trade in esparto as well as in southern fruits. On the other hand the decrease in Lerida and Gerona indicates how the attraction of higher wages in the manufacturing districts of Catalonia tends to deplete the neighbouring country districts.

As regards the distribution of population between town and country, Spain contrasts in a marked manner with Italy, Spain having but few large towns and a relatively large country popula- tion. In 1877 there were only five towns with more than 100,000 inhabitants :—Madrid (397,816), Barcelona (248,943), Valencia (143,861), Seville (134,318), and Malaga (115,882). Only uine had a population between 50,000 and 100,000, and besides these only 171 had a population above 10,000.

The birth-rate in Spain is 33°9 per thousand as against 35°1 in England and Wales, the death-rate 29°1 (21°4 in England and Wales); the number of marriages per thousand inhabitants was 7°32? (8-08 in England and Wales). The percentage of illegitimacy is 5‘6.. The number of males born for every 100 females averages 107, a higher proportion than in any other eountry of Europe for which statistics are obtainable except Greece (112) and Roumania (111).

Foreign Possessions.—The population of the principal foreign Foreign

possessions of Spain in 1877 numbered 7,822,128, made up as follows :— : @ubarereeee: Berens ,... 1,521,684 Philippine Islands 5,567,685 Rorvowicor sac 731,648 Her aMdOwl Opsess. si fccter 1,106

Besides the Philippine Islands in the Eastern Archipelago, Spain possesses the greater part of the Sulu Archipelago, and, in the Pacific, the Marianne, Pelew, and Caroline Islands. Off the Guinea coast she possesses the Island

of Annobon as well as that of Fernando Po, and on the coast itself the district round Corisco Bay. She has likewise declared a protectorate over the West African coast between Capes Bojador and Blanco (desert of Sahara). The presidios, whose population is given in Table II., are Pefion de Velez, Alhucemas, and Melila (besides Ceuta).

Agriculture.—Agriculture is by far the most important Spanish Agri- industry, nearly 73 per cent. of those whose occupations were clas- culture,

sified at the census of 1877 being entered under that head. In general it is in a backward condition, and is now much less pro- ductive than in the time of the Romans and again under the Moors. The expulsion of the latter people in many places inflicted upon agriculture a+ blow from which it has not recovered to this day. Aragon and Estremadura, the two most thinly peopled of all the old provinces, and the eastern half of Andalusia (above Seville),

i

2 In all these cases the figures for Spain are the means of the years 1865-70 and 1880-83 inclusive.

Cereals.

AGRICULTURE. |

have all suffered particularly in this manner, later occupiers never having been able to rival the Moors in overcoming the sterility of nature, as in Aragon, or in taking advantage of its fertility, as in Andalusia and the Tierra de Barros. The implements in general use are of the rudest description. The plough is merely a pointed stick shod with iron, crossed by another stick which serves as a share, scratching the ground to the depth of afew inches. But the regular import now of agricultural implements (chiefly from Eng- land and France) betokens an improvement in this respect. In general there has been considerable improvement in the condition of agriculture since the introduction of railways, and in every province there is a royal commissioncr entrusted with the duty of supervising and encouraging this branch of industry. Among other institutions for the promotion of

agriculture the royal central school at Aranjuez, to which is attached a model farm, is of special importance.

The provinces in which agriculture is most advanced are those of Valencia and Catalonia, in both of which the river valleys are thickly seamed with irrigation canals and the hill-slopes carefully terraced for cultivation. In neither province is the soil naturally fertile, and nothing but the untiring industry of the inhabitants, favoured in the one case by the rivers which traverse the province from the tableland of New Castile and the numerous small streams (nacimientos) that issue from the base of the limestone mountains of which the province is largely composed, and in the other case by the numerous torrents from the Pyrenees, has converted them into two of the most productive regions in Spain. In the Basque Provinces and in Galicia the cultivable area is quite as fully utilized, but in these the difficulties that have to be contended with are not so great. The least productive tracts, apart from Aragon and Estremadura, are situated in the south and east of New Castile, in Murcia, and in Lower Andalusia—the marshes or marismas of the lower Guadalquivir and the arenas gordas between that river and the Rio Tinto. By far the greater part of the tableland, however, is anything but fertile, the principal exceptions being the Ticrra de Campos, said to be the chief corn-growing district in Spain, occupying the greater part of Palencia in the north-west of Old Castile, and the Tierra de Barros, in the portion of Badajoz lying to the south of the Guadiana in Estremadura, another district noted for its corn.

Except in Leon and the ‘provinces bordering on the Bay of Biscay and the Atlantic irrigation is almost everywhere necessary for cultivation, at least in the case of certain crops. Almost all kinds of vegetables and garden-fruits, oranges, rice, hemp, and other products are generally grown solely or mainly on irrigated land, whereas most kinds of grain, vines, and olives are eultivated chiefly on dry soil. The water used for irrigation is sometimes derived from springs and rivers in mountain valleys, whence it is conveyed by long canals (acequias) along the mountain sides and sometimes by lofty aqueducts to the fields on which it is to be used. Sometimes the water of entire rivers or vast artificial reservoirs (pdntanos) is used in feeding a dense network of canals distributed over plains many square miles in extent. Such plains in Valencia and Murcia are known by the Spanish name

of hucrtas (gardens), in Andalusia by the Arabic name of vegas, which has the same meaning. Many of the old irrigation works,—such, for example, as those of the plain of Tarragona,—date from the time of the Romans, and many others from the Moorish period, while new ones are still being laid out at the present day. Where no running water is available for irrigation, water is often obtained from wells by means of waterwhcels (norias) of simple construction. In most cases such wheels merely have earthenware pitchers attached to their cireumfcrence by means of wisps of esparto, and are turned by a horse harnessed to a long arm fitted to a revolving shaft. In recent years many artesian wells have been sunk for irrigation. According to Higgin (see Bibliography), the total area of irrigated land in Spain amounts to 4439 square miles. The effect of irrigation is shown by the fact that the irrigated portion of Murcia has a population of 1681 to the square mile as against 101 for the whole province, and Orihuela a population of 767 to the square mile as against 194 for the whole province of Alicante to which it belongs.

Cereals constitute the principal object of cultivation, and among these wheat ranks first, the next in importance being barley, the ehief fodder of horses and mules. Both of these grains are cultivated in all parts—on the plains as well as among the mountains, but chiefly on the more level parts of the two Castiles and Leon, and on the plains of the basin of the Guadalquivir. Oats and rye are cultivated only inthe higher parts of the mountains, the former as a substitute for barley in feeding horses and mules, the latter as a breadstuff. Maize also is cultivated in all the provinces; nevertheless the total extent of its cultivation is limited, since, being a summer crop, it requires irrigation except in the Atlantic provinces, and other products generally yield a more profitable return where irrigation is pursued. Rice is cultivated on a large scale only in Valencia. Among cereals of less importance are buckwheat (in the mountainous regions of the

north), millets, including both the common millet (Panicum miliaceum) and the so-called Indian millet (Sorghum vulgare, the jodri of India, the durrah of Africa), and even (in La Mancha) guinea-corn (Penicillaria spicata). As

to the quantity of cereals produced in the country we are without official informa- tion, and the estimates of the average annual production of cereals of all kinds are very discrepant, varying from 250 to 430 million bushels. The average production of wheat alone has been esti- mated! at 177 million bushels, and the average produce of that crop per acre at 11°13 bushels (that of England being about 29 bushels). If these figures can be taken as approximately correct, it follows that the average acreage under wheat in Spain is nearly 16 million acres, or between five and six times the average in Great Britain, which has less than half the area of Spain, The produce per acre just indicated places Spain among those countries of Europe in which the return is least, which is probably fully accounted for by the backward state of cultivation generally and in particular by the small expenditure on manure. Asa rule, in fact, the straw left on the ground is the only manure which the land receives.

The cereal and especially the wheat production of the country regularly furnishes a considerable export. During the five years 1879-83 the value of the export of cereals and pod-fruits of all kinds was nearly 8 per cent. of the total value of the exports; but this export is balanced by a large import, especially of wheat flour. In bad years, indeed, the value of the import under this head greatly exceeds that of the export.

In the production of pod-fruits and kitchen vegetables Spain is ahead of all other countries in Europe. The chick pea forms part of the daily food of all classes of the inhabitants; and among other

od-fruits largely cultivated are various kinds of beans and pease, entils (Zrvwm Icns), Spanish lentils (Lathyrus sativus) and other species of Lathyrus, lupines, &c. The principal fodder-crops are lucerne (Medicago sativa) and esparcette (a variety of sainfoin). Clover, particularly crimson clover (Trifoliwm incarnatwm), is grown in the northern provinces. Among vegetables garlic and onions take the chief place, and form an indispensable part of the diet of all Spaniards ; besides these, tomatoes and Spanish pepper are the principal garden crops. It is upon such crops that the Spanish peasant in general bestows his chief care.

As regards the quantity of the product wine comes next after cereals among the objects of cultivation in Spain. Here again we are dependent only upon

vague estimates of the average amount produced, but usually the average annual Spanish production of wine is estimated at between 440 and 500 million gallons, an estimate which places Spain third (next after France and Italy) among the wine-producing countries of Europe. So faras quantity is concerned the principal wine-producing districts are in the north- east, but the only wines of Spain which have a world-wide reputation are those of the south, and more particularly those which take the name of ‘‘sherry,” from the town of Jerez, in the neighbourhood of which they are grown. The total area under the vine is estimated at about 3,480,000 acres (or about 2°8 per cent. of the entire surface), and of this total about 772,700 acres belong to the Catalonian provinces, chiefly Barcelona, The provinces which produce most wine are Barcelona, Saragossa, Cadiz, and Malaga, the annual amount of the production being in the order in which the provinces are mentioned.

The official tables distinguish the wines exported from Spain as common wines, sherry and similar wines, and other full-bodied wines (vino generoso). ‘The returns of recent years, as will be seen from Table III. given below, show that of late an enormous increase has taken place in this export both as regards quantity and value, this increase being chiefly due to the extension of the export of the commoner wines to France by way of Barcelona.

Average of Five} Average of Five

Years 1874-78. | Years 1879-83. —— man , ‘3 Nn -s 3 Dw – 3 on Bes | 298 | B83 | fo | 283 | fee 35/222 | 235/285 | 935 | 285 26 oy pad =] a, at = Ss ae! S oom aes | GOR seo | cor | aes Hos cg ii Hs 3 ae Guo ae wey re) 2a Common wine…….....+6 40,524 2,547 | 183,562 | 7,748 | 135,452 | 8,865 Sherry and similar)| ¢ 446 | 9,466| 5,874 5,368| 1,465 WIMES . wcccccccccccce tees Other full – oni 2,044) 470] 3,388 2,420} 498

There is also a large export of grapes and raisins, especially from

the southern provinces (Malaga and Almeria). The average quantity of the two together exported in each of the five years

1 In an article by M. P. A. Delboy in the Journal of the Statistical Society for Mareh 1884, translated from the Journal de la Société de Statistique de

Paris, September 1883.

Fruits.

Sugar.

Live stock.

300

1879-83 was about 50 millions of kilogramines (110 million tb), the average value about £1,560,000. The vines whose fruit is intended for table use as grapes or raisins are trained on espaliers or on trees, especially the nettle-tree (Celtis australis). ; ae 3

Among fruit-trees the first place belongs to the olive, which is estimated to cover about 8 per cent. of the surface, and accordingly about an equal area to that occupied by the vine. Its range in Spain embraces the whole of the southern half of the tableland, the greater part of the Ebro valley, aud a small strip on the west coast of Galicia. Along the base of the Sierra Morena from Andujar to the vicinity of Cordova there run regular forests of olives, embracing hundreds of square miles. The annual production of oil is estimated at 55 millions of gallons, and might be greatly increased in quantity and improved in quality if more attention were bestowed upon the cultivation of the trees and the prepara- tion of the oil. Oranges, excluded from the plateau by the severity of the winter cold, are grown in great quantity on the plains of Andalusia and all round the Mediterranean coast; and figs, almonds, pomegranates, carobs, and other southern fruits are also grown abundantly in all the warmer parts, the first two even in central Spain and the more sheltered parts of the northern maritime provinces. In these last, however, the prevailing fruit- trees are those of central Europe, and above all the apple, which is very extensively cultivated in Asturias, the Basque Provinces, and Navarre. ‘The date-palm is very general in the south-castern half of the kingdom, but is cultivated for its fruit only in the province of Alicante, in which lics the celebrated date-grove of Elche. In the southern provinces flourish also various subtropical exotics, such as the banana, the West Indian cherimoya, and the prickly pear or Indian fig (Opuntia vulgaris), the last frequently grown as a hedge-plant, as in other

Mediterranean countries, and extend- ing even to the southern part of the tableland. It is specially abundant on the Balearic Islands. The agave or American aloe is cultivated in a similar manner throughout Andalusia. Cotton is now cultivated only here and there in the south; but, on the other hand, sugar-cane, the cultivation of which was introduced by the Arabs in the 12th century or later, and was of great importance in the kingdom of Granada at the time of the expulsion of the Moors at the close of the 15th century, but has since undergone great vicissitudes, first in consequence of the introduction of the cane into America, and afterwards because of the great development of beet- sugar in central Europe, is now becoming every year more and more ofa staple in the provinces of Granada, Malaga, and Almeria. The annual production on the Spanish mainland is estimated at about 75,000,000 1b. Such prosperity as this branch of agriculture at present enjoys is largely due to the protection which it receives at the hands of the Spanish Government. A duty imposed on all imported sugars in 1876, while inflicting a severe blow on the Spanish colony of Cuba, has had the desired effect of stimulat- ing the native production, but according to the law at present in force (passed on June 80, 1882) the amount of this duty, as far as regards the produce of the Spanish colonies, is being gradually reduced, and the duty will be entirely abolished on July

1, 1892.

Among the vegetable products not yet mentioned the most important are the mulberry, grown in almost all provinces, but principally in those bordering on the Mediterranean, and above all in Valencia, the chief seat of the Spanish silk production and manufacture; hemp and flax, grown chiefly in Galicia and other northern provinces; among dye-plants, madder, saffron, woad (Isatis tinctoria), and wild woad or dyer’s weed (Reseda lutcola) ; ground-nuts (Arachis hypogexa), grown for their oil, for the pre- paration of which the nuts are exported in considerable quantity to France; liquorice, cummin, colocynth, &c.

The rearing of animals has likewise been recciving in recent ycars increased attention at the hands of both Government and people, though here also we are without recent official statistics to show the consequent advance. The middle of the present century appears to have been the time when this industry was at its lowest point, and the following table (IV.) shows the increase in numbers that has taken place at certain subsequent dates for which official returns or estimates are obtainable :—

1858. Sout aL, 1G88. Estimate 1878.

IIOMSCS sans ceecscce sues 298,722 672,559 700, 000 Mules. .....c0ccccscss ee. 499,172 | 1,001,878 | 1,200,000 EASES SR ene ce 496,516 1,290,814 1,300,000 1 1,557,033 | 2,904,598 | 3,000,000 Sheep. ...cccsecseseceees 16,443,950 | 227054967 | 23,000,000 ee 3,034,701 | 4,429,576 | 4,500,000 Swine ..occcscecsseee. 1,272,978 | 4.264.817 | 4,500,000 (amie Ss ee semeceone ce 3,104 ee

In 1865 horses were reared chiefly in the provinces of Seville, Corufia, and Cadiz, mules in Toledo, Cuenca, Teruel, Saragossa,

and Badajoz, asses in Badajoz, Toledo, Murcia, Seville, and Granada, cattle in Oviedo, Corufia, Leon, and Pontevedra, sheep in Badajoz, Leon, Teruel, Soria, and Saragossa, goats in Caceres and Badajoz, camels mainly on the Canary Islands, the total number on the Spanish mainland at the date of the enumeration being less than a hundred. Badajoz was the richest of the provinces in live-stock of all kinds, containing about one-fourteenth of the total number of domestic animals in the kingdom.

The only animals belonging to Spain still noted for their excellence are mules and asses, which are recognized as the best to be found anywhere. The quality of the horses has been greatly improved, however, since the establishment of Government studs more than forty years ago. Besides the cattle reared throughout the kingdom for field-labour and (in the northern

provinces) for regular dairy farming, bulls for the great national pastime of bull- fighting are specially reared in many parts of the country, par- ticularly in the forests of Navarre, the mountains separating the two Castiles, the Sierra Morena, and the Serrania de Ronda in Granada, and also in separate enclosures on the islands of the Guadalquivir. Spanish sheep, which in former times enjoyed so high a reputation and formed so important a part of the national wealth, are far from having the same relative importance at the present day, though sheep-rearing also is sharing in the general rise of agricultural and other industries. The most famous breeds of Spanish sheep are the merinos or migrating shcep, which once brought immense revenues to the state as well as to the large proprietors to whom they mostly belonged. These sheep, which are distinguished by their long slim legs and still more by their long wool, are pastured in different districts in sumuner and winter. Their winter quarters are in the lower parts of Leon and Estremadura, La Mancha, and the lowlands of Andalusia, their summer quarters the more mountainous districts to the east and north (Plasencia in the province of Caceres, Avila, Segovia, Cuenca, Valencia), which are not so much affected by the summer droughts of the Peninsula. The mode of the migration and the routes to be followed are prescribed by law. Each herd consists of about 10,000 individuals, under the command of a mayoral, and is divided into sections containing about 1000 each, each section under the charge of an overseer (capataz), who is assisted by a number of shepherds (pastores) attended by dogs. The shepherds, rudely clad in a sleeveless sheepskin jacket, the wool outside, and leather breeches, and loosely wrapped in a woollen mantle or blanket, are one of the most striking and characteristic objects in a Spanish landscape, especially on the tableland. The migration to the summer quarters takes place at the beginning of April, the return at the end of September. At one time the owners of merino herds enjoyed the right of pasturing their herds during their migrations on a strip of ground about 100 yards in breadth bordering the routes along which the migrations took place, a strip which had accordingly to be left uncultivated; but this right (the mesta, as it was called) was abolished in 1836 as prejudicial to cultivation. Since that date the migrating sheep have been compelled to keep the roads. The average quantity of wool exported in the five years 1879-83 was about 9,000,000 tb. Even in the best of the years (1883-84) the total export of Spanish wool to all countries was only about

one-thirtieth of the total average import of that commodity into the United Kingdom during the corresponding

eriod,

. Bees are reared chiefly on the cistus heaths and the districts abounding in tomillares (see p. 297), The rearing of the silkworm on the mulberry trees of the Mediterranean provinces has already been referred to; the total annual production of raw silk in Valencia is estimated at 1,500,000 tb, in Murcia at 500,000 tb, and in Cata- lonia at 200,000 tb. The rearing of the cochineal-insect, which was introduced into southern Spain in 1820, is being carried on with more and more success, especially round Malaga, Velez-Malaga, and Motril.

Fisheries. —The catching of tunnies, sardines, anchovies, and Fisheries, salmon on the coasts employs large numbers of fishermen, and the –

salting, smoking, and packing of the first three give employment to many others. Spanish fishermen likewise dive for coral on the coasts of Andalusia and the north of Africa. The fishermen of Catalonia and Valencia have the greatest reputation for their skill. The centre of the principal tunny fisheries of Spain is a small rocky islet called Cristina about three leagues from the mouth of the Guadiana. The fishing lasts from May to August, that of sardines from August to the end of January. The average value of the export of fish in 1879-83 was nearly £120,000.

Minerals.—The mineral resources of Spain are vast and varied, Minerals.

but are as yet far from being adequately turned to account. No European country produces so great a variety of minerals in large amount, and in the production of copper ore, lead orc, and quick- silver Spain heads the list. In the production of salt and silver it is excelled only by Austria-Hungary, and, as regards silver, not always even by it. The following table (V.) gives particulars regarding the production of some of the principal minerals in the years named :—

INDUSTRIES. |

1863, 1883.

ial Persons employed. 2 a Valter) | ee S| ae Thousands | Thousands chousands ais f Metric | of Metrie : r= ee 1 T of Pounds 8 2 ge ens we at the : g 3 e 5 produced. | produced. ines s 5 a Bg x elo |40 ROTOVGN. cceecs os 223 4,526 506°1 12,157 | 472 | 2,550 | 766 Lead ore…....-+ 270 “280 1,405-2 | 14,874 | 110| 2,538 | 871 an pentiferous 40 25 1575 | 8,578} 72| 192; 92 lead ore, ... SiIVOE ONC ss c1+.~~- ee 88°3 539 2 14| 16 Copper ore…...~~ 246 2,455 1,094°5 9,716 | 684; 1,265 | 38 MEMCULY ..cvcssers 169 23 209°1 Bee 1 309’| 12 7803s oper Co EDC 481 54 56°4 Wan) 92370) 97. Common salt…. ae 202 17°4 871) 94) 108/ 53 Cialis 1,044 463-6 7,235 680 | 1,865 | 465

Of the minerals mentioned in the preceding table it will be seen that iron and copper orcs are those which show the greatest advance as eompared with 1863. The production of these two orcs advaneed with rapid strides during the ten years 1874-1883. In the former year the production of both stood at about 500,000 tons. ‘The iron ore is chiefly obtained in Vizcaya and Murcia, the former yielding by far the greatest quantity (in 1883 four-fifths of the total production of Spain), but the latter yielding the best quality (average value of Murcian iron in 1883, 5 pesetas=4s. per ton at the mine, as against 2°25 pesetas, or 1s. 9}d., the average for the Vizcayan ore). All except a small fraetion of the copper ore is obtained from the province of Huelva, in which lie the well-known mines of Rio Tinto. The lead ore is obtained chiefly in Murcia and Jacn. Thé famous mines of Linares belong to the latter province. Argentiferous lead is chiefly produccd in Almeria, which also produces most of the silver ore of other kinds except argentifcrous copper ore, which is entirely obtained from Ciudad Real. The still miore cclebrated cinnabar (mercury) mines of Almaden, the richest in the world till the discovery of the Californian mines of New Almaden, belong to Ciudad Real, and this province, together with that of Oviedo, furnishes the whole of the Spanish production of this mineral. Spanish salt is partly marine, partly derived from brine-springs and partly from rock-salt, of which last there is an entire mountain at Cardona in Barcelona. Coal is chiefly obtained in Oviedo, Palencia, and Cordova. The production is quite insignificant compared with the extent of the coal-bearing beds, whieh are estimated to cover an area of about 3500 square miles, of which nearly a

third belongs to Oviedo, between one- eighth and one-seventh to Burgos and Soria, and about one-tenth to Tcruel and Cordova. Among the less important Spanish minerals are manganese (chiefly in Ciudad Real), antimony, gold, cobalt, sodic sulphate, sulphate of barium (barytes), phosphorite (a valu- able manure, a variety of apatite found in Caccres), alum, sulphur, kaolin, lignite, asphalt, besides a variety of building and orna- mental stones.

The total number of mines (including springs for the production of mineral waters) in operation in Spain in 1883 was 2620, and the total number of labourers employed in them in that year was 57,626. The working of the mines is carried on under state supervision. For this purpose the whole kingdom, including the Balearic and Canary Islands, is divided into three sections, and each of these into four districts. Each section is under the eharge of an inspector-general of the first class, and each of the districts under an inspector of the second class. By the law of July 6, 1859, a large number of important mines, including all tle salt-works and rock-salt mines, were reserved as state property, but financial necessities have compelled the Government to sur- render one mine after another, so that at present the state possesses ouly the cinnabar mines and some salt-works. Many of the mines have been granted to foreign (principally English) companies.

Of the metallic ores produced in Spain, those of lead and mercury are the only ones which are chiefly reduced in the country. Though the working of iron is an industry of old standing in Spain, and a primitive kind of forge takes its name from Catalonia (see Iron), the total production of iron, refined and unrefined, in Spain in 1883 was only 200,000 tons, and by far the greater part of the Spanish ore is exported, as will be seen by comparing Tables V. and VI. The production of iron in Spain is, however, rapidly and steadily increasing, the total amount in the first year of the decade ending in 1883 having been less than 60,000 tons. During the same decade the amount of copper produced in the kingdom increased from about 5000 to 32,000 tons, The amount of stecl produced in the kingdom is quite insignificant (little more than 400 tons in 1883). The following table (VI.) gives partieulars regarding the export of the chief mineral products of Spain in 1883 :—

1A metrie ton=1000 kilogrammes=2205 Ibs., or 35 Ibs. less than a ton avoirdupois.

- Exclusive of 100,000 tons produced in the state salt works of Torrevieja (Alicante).

ep Pars

301

Minerals. To United | 1) prance. | Total export to

Kingdom. all Countrics. Metrie Tons.| Metric Tons.| Metric Tons.

TrOMkOne eee. teaser eee 2,895,000 511,000 4,226,0008 Argentiferous galena.. 2,400 2,000 13,000 Lead! one: ccs. ceesssac cee ae 1,400 2,500 COPPEINOLGresccsrcersescceccccecconaseesecers 555,000 565,000 Zine ores—

GalbImitiessssesccssetosscsvessesseieeees 20,000 30,0004

Blend es sesereeeereteeivass ete ee es 15,0004 PATSEMIMOWYAORC rs cccecsecceescocerecistr ce: 70 ae Oe | INAIIBANEBeRC cor eco e esc sehesceccnecs 3,300 4,500 IPNOSPNOUILCssc21 cc osssevtsececccscevceoe nc 1,000 5 56,0005 TONE wcscestvanecesaccutesosas i seecvensesas sacs A 13,000 30,000 Argentiferous lead…….....ssssccssesee 31,000 20,000 51,000 Non-argentiferous lead(unwrought)| 51,000 25,000 77,000

Z. Ze Oz. Olde esccarescassssssescscseseternes ccasececeut 243, 522 765 TLV Oliessaeescecsseseevesseecssicerncerecticen 190,595 549,090 739,686 Lbs. Lbs. Lbs.

RON CUR Vanes. cscocsesnuieecnksaussvenrnetne 910,037 23,924 1,189,932 Wrought-iron and steel…....cc0..000 7,440 68,708 186,510 Lead in tubes and other forms…... ip 305 546,4257

opper, brass, and bronze in :

plates, tubes, and other et 171,408 187,844 atta)

Manufactures.—At the census of 1877 only about 3 per cent. of Manu- the classified population was returned as engaged in manufactur- factures.

ing industries. The principal manufacture is that of cotton, and the following table, which shows the position of Spain relatively to the other countries of Europe with reference to this branch of manufacturing industry, will also serve to some extent as an index of the rank belonging to Spain in mechanical industries generally :—

TABLE VII.—Average Import of Raw Cotton for Home Consumption in the Prineipal Countries of Hurope during 1879-1883.

Millions of tb. | Millions of tb.

United Kingdom..| 1460°8 Sygalllresncecesncee eee 100°3 GOMMOMY s.avansvans: 336°9 [EL 260 ene = 94°8 IEPATICOR <.. scacaceare 309°6 Belgien.

The average import per head of population during the same period was as follows:—United Kingdom, 41:7 tb; Holland,.23°6; Switzerland, 18°7; Belgium, 9°9; France, 8°2; Germany, 8°92; Spain, 6:0; Austria-Hungary, 46; Sweden, 4°6; Italy, 4:0; Russia, 2°9. It thus appears that Spain occupies the seventh placc in the consumption of raw cotton, both in absolute amount and relatively to population. In the five years 1874-78 the average import of raw cotton into Spain was 79,690,000 tb, so that the increase of the average in the succeeding period of five years amounted to 25°8 per cent. Nevertheless the products of this branch of industry in the country do not yet suffice to meet the wants of the population. There is every year a considerable import of cotton manufactures, while the export of this commodity is too trifling to be included in the list of chief exports. The maritime provinces, being those most favourably situated for the import of coal, and, where necessary, of raw material, are the chief seats of Spanish manufactures, and the cotton industry is principally centred in Catalonia and, above all, in Barcelona and the surround- ing district. This region is indeed the only distinctively manu- facturing portion of Spain, and in it also the manwtactures of linen and woollen goods and of lace are mainly carried

on. Flax- spinning and the manufacture of linen goods are pursued to a considerable extent in Galicia and Asturias. The silk industry, which is likewise of high importanee, but inadequate to meet the home demand for silk fabrics, is chiefly centred in Valencia, next to which come Murcia and Seville. Metal industries are ehiefly carried on in the Basque Provinces, where various articles in iron and copper are made. A royal factory for the making of artillery and other weapons of war exists at La Trubia, in Asturias. Toledo is still noted, as it has been from the earliest times, for the excellence of its sword-blades. The manufacture of leather, another Spanish industry of old renown, is still extensively carried on in Catalonia and elsewhere, but the making of cordwain has long ceased to be a specialty of Cordova, from which it takesits name. Boots and shoes and other articles in leather form the only considerable ex- port of manufaetured goods. Gloves are made in great quantity in Madrid, shoes in the Balearic Islands. _The paper industry is very flourishing, especially in Catalonia and Valencia. Esparto is twisted into cords and ropes, and plaited into a variety of other articles, in Murcia and Alicante and elsewhere. The refining of cane-sugar is largely carried on in Barcelona, Malaga, Almeria, and Granada, and

3 Of this total 478,000 tons were exported to Holland, 142,000 to Belgium, and 199,000 to the United States.

4 All the blende and one-third of the ealamine were exported to Belgium.

5 Chiefly to Portugal.

8 Of this total 158,760 lbs. were exported to Belgium. 7 Chiefly to Cuba.

the making of olive oil and brandy is general. So also is the making of charcoal, which in most parts of Spain takes the place of coal for all ordinary heating purposes, and even in some cases In mechanical industries. ‘The large furnaees for the distillation of mereury at Almaden were at one time, if they are not still, heated solely with charcoal obtained from the Cistus ladaniferus. Among manufac- turing industries of less importance are the making of porcelain (at the royal factory of Moncloa, near Madrid), glass and earthenware, soap, choeolate, and cork-stoppers. The manufacture

of tobacco, which is a royal monopoly, is carried on at seven factories—at Seville, Madrid, Santander, Gijon, Coruiia, Valencia, and Alicante, —that of Seville being the largest.

Foreign Commerce.—Possessing such varied resources as it does, and being peculiarly favourably situated for commerce, Spain might be expected to take a leading place among the trading communities of Europe. This it did at one time hold, when the treasure acquired by the discovery of America and the conquest of Mexico and Peru was squandered in the purehase of various commodities from England, the Netherlands, and other countries. This period of outward prosperity, however, was also that in which the seeds of decline were planted. The expulsion of the Moors from Granada was contemporaneous with the discovery of the New World. Hundreds of thousands of Moors were driven out from the country on subsequent occasions, and in the aet Spain lost the best of her agriculturists and handicraftsmen. For the stay-at- home industry by which the resources of the land could be de- veloped as they had been by the Moors the Spaniards of that day had no taste. Excited by the hope of rapidly-acquired wealth and the love of adventure, the more enterprising spirits embarked upon a career of discovery, and agriculture and manufacturing industry fell into contempt. ‘The mercantile supremacy of the eountry was thus short-lived. Political causes supervened to hasten the country’s decline, and it is only within recent times, since the in- troduction of railways, that the commerce of the country has begun to revive. Theaverage value of the imports and exports combined during the period of ten years from 1875 to 1884 was equal to rather less than £2 per head, asagainst about £18 per head during the same period in the United Kingdom ; but even this state of matters shows a considerable advance compared with 1859, when the total value of the exports and imports was equal to only about £1, 12s. per head. The following table (VIII.) gives total value in round numbers of imports and exports, with percentages from and to Great Britain and France, at various dates from 1849 (the year after the opening of the first railway in Spain) to 1884 :—

ales Pac from from Britain. | France.

Value of Exports.

Value of

Years. Imports.

t Britain. | France.

£6,360,000

14,833,000 16,262,000

£5,240,000

10,982,000 12,864,000 15,982,000 18,081,000 25,999,000 26,836, 000 30,615,000 23,779,000 24,768,000

32,667,000 35,738,000 31,186,000

_ On the average of the five years 1879-83 the principal exports, in the order of their importance, were wine, metals and mineral ores, fruit, oil, and cork,—wine being by far the most valuable ; the principal imports, in the order of their importance, raw cotton, brandy and spirits, sugar, machinery, tobacco, coal and coke, timber, eod-fish, iron (wrought and unwrought), hides and skins, ehemical products, cocoa, cotton manufactures, and mineral oils. The large imports of cod-fish (from Norway and British North America) are due to the large consumption of fish, especially during Lent; the great demand for mineral oil as a source of light is a consequence of the dearness of coal. Itis interesting to note the high place which cocoa takes among the imports. The average import of that commodity is nearly double that of coffee, and that of tea is quite insignificant (in 1884 only 155,777 Ibs.).

The foreign ecommerce of Spain is chiefly earried on with the United Kingdom, France, Cuba, and the United States. In the ten years 1873-82 France, the United Kingdom, and the United States together (in the order named) furnished on an average rather more than 67 per cent. of the imports, and the United King- dom, Franee, and Cuba (also in the order named) reeeived on an average during the same period 75 per cent. of the exports. Next to the three countries mentioned, those which had the largest

share in the import trade during the same period were Cuba Portugal, and the Argentine Confederation, and in the export trade Portugal, the United States, and the Argentine Confederation. From the United Kingdom Spain received in 1884 chiefly coal and eoke, iron and articles in iron (articles in wrought-iron and steel however, in rather greater amount from Belgium), locomotives

1 An increasc of the population since 1877 at the rat ; ry allowed for in making the calculation, ae ae

(also from Belgium), jute and jute yarn, hemp and flax yarn, sulphur (for use in the vineyards), and alkaline carbonates ; from France, chiefly wool and woollen goods, silk and silk goods, and wheat flour; from the United States, petroleum, raw cotton, and tobacco (also from the Philippine Islands) ; from Cuba chiefly sugar and fine woods ; from the Argentine Confederation chiefly untanned hides and skins and animal fats. Wheat was received chiefly from Russia, and spirits from Germany, which also supplied a large pro- portion of the sugar consumed in the country.

Of the principal export of Spain—wine—by far the greater proportion goes to France. In 1884 that country received four- fifths of the conimon wine, and the quantity is rapidly inereasing. The wine classed as full-bodied also went chiefly to France, but that entered under the head of sherry and similar wines was imported chiefly by the United Kingdom. The destination of the minerals is shown above (‘Table V1.). Oranges were sent mainly to the United Kingdom, France, the United States, and Germany ; raisins ehiefly to the United States and the United Kingdom ; olive oil chiefly to Cuba, Denmark, and France, but in considerable quantity also to other eountries ; esparto grass almost entirely to England; cork and wool chiefly to Portugal and France ; cattle chiefly to Portugal and England ; raw silk mainly to France ; and wheat flour and chickpease chiefly to the Spanish West Indies.

The foreign trade of the country is of course carried on mainly by sea. In 1884 more than 80 per cent. both of the imports and exports were

transmarine, and of the land commerce by far the largest proportion is with or through France. The smallness of the trade with Portugal, which on an average furnished less than 14 per cent. of the imports and received less than 5% per eent. of the exports during 1873-82, is partly due no doubt to the similarity of the chief products of the two countries, but also to the defective- ness of the communications between the two countries, a circum- stance largely accounted for by the physical conditions already alluded to. The introduction of railways has as yet only partially served to bring the countries into more intimate relations. On the first of January 1885 not a single line connected with the general system of Spanish railways entered Portugal north of the Tagus, though Lisbon was connected by rail both with Madrid by way of Caceres and with Valencia by way of Ciudad Real and Albacete. At the date mentioned, however, a railway intended to eonnect Salamanca with the mouth of the Mondego was in course of con- struction, and a branch from the Portuguese coast-line in the north was in process of being connected with the Spanish railway to Corufia, and by way of Leon with other northern seaports.

The foreign commerce of Spain is greatly hampered by the number and amount of the custom duties, which are imposed on all the principal articles both of export and import. On imports the duties vary from 6 to 28°33 per cent. of the value of the eom- modities, the highest duties being upon cotton yarn, sugar, and cocoa (to protect home or eolonial industries). For protectivo reasons high import duties are levied also on iron manufactures, woollen manufactures, live animals, eoffee, and wine. Export duties are levied mostly in proportion to quantity. In the case of sherry it amounts to 200 pesetas (£8) per hectolitre (22 gallons); full-bodied wines pay 112 pesetas per hectolitre, and ordinary wines 33 pesetas per hectolitre. In the case of “the most favoured” nations slight reductions are made in the amount of the duties, and under a treaty which eame into operation on the 15th of August 1886 Great Britain enjoys the benefit of the most favoured nation treatment in consideration of a reduction in the import duties levied at British ports on Spanish wines.

Shipping and Navigation.—Relatively to the extent of its coast- Ship- line and the number and excellence of its seaports (of which there ping?

are sixty on the Mediterranean coast, fifty-six on the Atlantic), tho amount of shipping belonging to Spain is small. In 1884 the total register tonnage was 524,000 tons, not much more than that of Sweden at the same date, and only about half that of Italy. The number of vessels was 1803, including 301 steamers. Nearly half the transmarine imports (reckoned by value) and 58 per cent. of the transmarine exports were carried under a foreign flag. The following table (IX.) gives further particulars as to the shipping of 1884 :—

Metric Tons (in Thou-

> sands) of Cargo. Percentage of Total.

Flag. 2 Seseaien: Sa eeees Discharged.| Loaded, | Imports. | Exports..

National….. 623 766 22°6 13°0 British… 1394 8866 50°5 65°7 Dutch . i 54 0°3 0°9 French… 174 666 6°3 11:3
Germaiiacscscscceesscccesserssanssecass 76 123 27 2°1
(GQiGCleerereretesecseeseuoseessesenes: 41 2 15 es

Wt ligvitccs css cssccsscsesnescerasasieaese 131 165 4:7 2°38
NOLWCEIANL ....-eceaseessseeeceeereenes 121 67 43 11 RUSSiaihse-
csess ses erences 2s asasesuces 60 27 2:1 0-4
SWe1SHvecccscssccsessccsssaseseses sss 57 39 2-1 0°7

Total (under all flags)..... 2760 5880

Roads.

ways.

Post offiee,

Tele-

graphs,

Army,

STATISTICS. |

The following table (X.) gives the number, &c., of ships entered and cleared with cargo at Spanish ports in 1884 :—

Under the Spanish Flag. Under Foreign Flags. : Metric Metric Entered from No. of | Capacity] Tons | No. of | Capacity! Tons Vessels.| in Tons.| Dis- | Vessels.| in Tons. Dis- charged. charged. 74,122| 17,888| 140 | 69,360| 4,937, Pa ie 288 | 191,122] 54,587

199,744 87,522 11 29,121 498

711,241 | 140,055 | 1,058 | 452.970| 169,631 3,551} 2,635| 261 81,796| 35,850 194,278 | 19,256] ... see he 712,363 | 240,368 | 1,721 960,135 | 1,256,285 Total from all — S eouttries:::; 5,652 | 2,376,861 | 623,156 | 5,470 | 2,694,876 2,137,222 Under the Spanish Flag, Under Foreign Flags. Cleared for No. of Capacity cay No. of Capacity a Vessels.| in Tons, Loaded, Vessels.} in Tons. Loaded: 536 | 76,585| 13,476] 36 | 49,198 621 86 60,548 | 17,893 145 110,538 | 119,105 * 439 612,258 | 97,553 7 14,854 171 France …. ~~| 2,847 | 1,126,607 | 226,713 | 1,858 936,247| 695,408 NOrway…..~~.seceeeerere roy sek aoe 73 28,524 24,167 Philippine Islands…. 94 243,245 8,849 a ey sua United Kingdom…... 907 638,518 | 200,570 | 3,790 2,988,857”| 3,132,671 ope al} 5,966 | 3,500,207 | 766,208 | 7,844 | 5,638,259 | 5,114,082

The total number of vessels entered with cargo under the national and foreign flags in 1884 was thus 11,122, and the total quantity of cargo discharged by them at Spanish ports 2,760,378 metric tons, the total number of vessels cleared with cargo 13,110, and the total quantity of cargo taken on board by them at Spanish ports 5,880,385 metric tons. Of the total number of vessels entered with cargo 6768 were steamcrs, which discharged 2,052,937 tons of cargo, and 4354 were sailing vessels, which discharged 707,441 tons of cargo. Of the number of vessels cleared with cargo 9506 were steamers, which took on board at Spanish ports 5,300,866 metric tons of cargo, and 3604 were sailing vessels, which took on board 580,019 metric tons of cargo.

Communication.—The communications in Spain have been greatly improved since the beginning of the present century. In 1808 there were little more than 500 miles of carriage roads, but now there are over 28,000.

At the end of 1882 14,600 miles were state roads, all well built and well maintained, and 3027 miles of state roads were in course of construction. The aggregate length of the provincial roads then completed was 2714 miles, and that of the communal roads 10,760 miles. In the mountainous districts, where there are only narrow paths, frequently rather steep, it is still not uncommon to meet long trains of mules.

Railways have made great advance since the middle of the century. The oldest line is that from Barcelona to Mataro, 173 miles, which was opened on the 28th of October 1848. Of late years railway construction has been going on pretty rapidly. In 1880 the number of miles open for traffic was 4645, and in the four succeeding ycars it was 4800, 4867, 5118, and 5386. All the Spanish railways belong to private companies, but most of them have obtained subventions from the Government, to which most of the Spanish railways will revert at the end of a term of ninety- nine years. In granting a concession for a new railway the regular practice is to give it to whatever company offers to construct it with the lowest subvention. The total amount of the subventions for railway construction up to the end of 1884 was £25, 676,690. For strategical reasons the Spanish gauge was made different from that of France.

The postal and telegraphic systems have been placed on the same footing as in other eivilized countries. The total number of letters, post-cards, and samples (including official and international letters, &c.) that passed through the post office in 1882-83 was 111 millions. The length of state telegraphic lines on January 1, 1883 was 10,664 miles, and of wires 25,989 miles. The number of messages in 1883 was 3,020,000, nearly 80,000 being transit mes- sages and 654,000 from or to foreign countries.

Army and Nawy.—Military (or naval) service is obligatory on all Spaniards, but in certain cases recruits are allowed to buy themselves off. According to the law of January 8, 1882, the period of service for all arms is twelve years, of which three years tnust be passed with the colours, three years in the active reserve, and six years in the second reserve. The minister of war is empowered, however, on financial grounds to transfer troops Serving with the eolours to the aetive reserve before the period of three years’ service has been fulfilled. Liability to service begins with the first

day of the ealendar year in which the twentieth ycar 1s completed. Persons holding a civil appointment or pursuing

any handicraft independently are allowed to buy themselves off for 1500 pesetas (£60), and brothers are allowed to take each others' place in service, or to exchange the numbers that have fallen to them by lot in the raising of the recruits for the year. For carry- ing out the law Spain is divided into fourteen milftary districts, the boundaries of which do not at all coincide with those of pro- vinces.

The actual strength of the regular army is fixed at about 94,000 men for the kingdom (including the Balearic and Canary Islands), but this number may be brought up to 400,000 in time of war. The strength of the regular army in Cuba is about 22,500 men, in Porto Rico about 3200, and on the Philippine Islands about 8200. The active army is divided into 140 battalions, besides the same number of depét and reserve battalions ; 24 cavalry regiments, and the same number of depét squadrons and reserve cavalry regiments ; 9 regiments of field artillery, and 3 of mounted artillery, besides 6 reserve regiments of artillery, and 10 battalions of engineers. There are also 18 battalions of fortress artillery.

The following statement shows the strength of the navy in Navy.

1885 :—First Class—4 ironclad frigates (55 guns), 4 screw frigates (97 guns), 6 eruisers (48 guns); Second Class—5 frigates (104 guns), 3 cruisers, 12 corvettes aud troopships (89 guns); Third Class—1 ironclad monitor (8 guns), 1 floating battery, 79 gunboats, trans- ports, &c. (124 guns).

There were at the same time building one ironclad of the first class, five cruisers of the second class, besides torpedo boats, tugs, and other vessels. For the defence of the colonies, and more par- ticularly those of the West Indies, there are thirty-five screw gunboats, all of the same size (about 5 feet draught), and each carrying a 100-pounder pivot-gun at the bow.

The navy is manned by conscription in the maritime districts, In 1885 the number of seamen was about 14,000, that of marines about 7000.

Religion.—Roman Catholicism is the established religion, and Religion.

the church and clergy are maintained by the state. The immense majority of the people (in 1877 16,603,959. out of a total of 16,634,345) are professed adherents of this faith, so that, so far as numbers go, Spain is still the most ‘‘ Catholic” country in the world, as it has long been styled. According to Willkomm, how- ever, religious indifferentism is now very general, not only among the educated but also among the lower classes ; and of the bigotry and fanatieism whieh in former times led to the destruction of hundreds of thousands of vietims at the hands of the Inquisition the only traces at the present day are to be found, says the same authority, in the provinces of Aragon, Navarre, and Estremadura, where the clergy still exereise a considerable influence over the lower orders. By the constitution of 1876 non-Catholics are per- mitted to exereise their own forms of worship, but they must do so in private and without making any public anuouneement of their services. At the census of 1877 the total number of Pro- testants was 6654, a number below that of those entered as rationalists (9645). There are nine archbishopries (Toledo, Madrid, Burgos, Granada, Santiago, Saragossa, Seville, Tarragona, Valencia, and Valladolid) and forty-five bishoprics. The archbishop of Toledo is primate.

Edwcation.—By the law of July 17, 1857, primary education was Educa- declared eompulsory on all children of school age (originally fixed tion.

at six to nine) and made free to the poor, but the results of the census of 1877, though showing an advance in elementary educa- tion as eompared with previous years, makes it clear that this law is far from being efficiently carried out. At that date the total number who eould both read and write was 4,071,828, equal to 24°48 per cent. of the population, as against 19°97 per cent. in 1860. The provinces in which the percentage of those able to read and write was greatest were Alava, Burgos, Pontevedra, Madrid, Santander; those in which it was least were the Canary Islands, Granada, Malaga, Almeria, Alicante, Castellon.

There are ten universities—those of Madrid (founded in 1836 to replace the long-celebrated university of Alcala), Barcelona, Granada, Salamanca, Seville, Valencia, Santiago, Saragossa, Valladolid, and Oviedo ; that of Madrid is now the most celebrated and the best attended, while that of Salamanca, so renowned in the Middle Ages, is now in least repute.

Political Administration,—Spain is an hereditary monarchy, the Adminis- constitution of which rests on the fundamental law of June 30, tration.

1876. The sovereign becomes of age on completing his or her six- teenth year. The sovereign is grand-master of the eight Spanish orders of knighthood, the principal of which is that of the Golden Fleece (Toison de Oro), founded in 1481 by Philip of Burgundy. The chain of this order surrounds the royal arms, in which are included, besides the arms of Castile, Leon, Granada, and the lilies of the royal house of Bourbon, the arms of Austria, Sicily, Savoy, Brabant, and others. The national colours are red and yellow. The flag is divided into three horizontal stripes—two red stripes, with a yellow one between bearing the royal arms.

The legislative authority is exercised by the sovercign in con- junction with the cortes, a body composed of two houses—a senate

Justice.

Finance.

Plate VII.

and a chamber of deputies. The senate is composed of members of three classes :—(1) members by right of birth or office—princes, the wealthier nobles holding the rank of grandee (grande), a dignity conferred by the king either for life or as an hereditary honour, and the highest state officials ; (2) members nominated by the king for life; and (3) members elected by the state corporations and by the most highly taxed subjects of the state for a period of five years. The members belonging to the first two classes must not excced 180 in number, and there may be the same number of members

of the third class) ‘The chamber of deputies consists of members elected for five years, in the proportion of one deputy for every 50,000 of the population. The electors must be twenty-five years of age and must have paid land-tax of twenty-five pesetas (£1) for one year, or an industrial tax of fifty pesetas for two years. — The executive administration is entrusted to a responsible minis- try (consejo de ministros), in which the presidency belongs either to one of the ministers or to a president without portfolio. There are eight ministerial departments—the first secretaryship of state, to which belongs the management of foreign affairs, the secretary- ships of grace and justice, finance, and the interior, the department for the promotion of material and intellectual interests (seeretaria de fomento), and the secretaryships of war, marine, and the colonies. The civil administration is under the secretary for the interior. In each province is a civil governor nominated by the crown, and the governor presides over a council, the members of which are elected by the representatives of each commune (ayuntamiento). Law and Justice. —Spanish law is founded on the Roman law, the Gothic common law, and the national code proclaimed at the meeting of the cortes at Toro in 1501 (the leyes de Toro). There is a court of first instance in each of the 501 partidos judietales into which the kingdom is divided; and a court of second instance in each of 15 audteneias territoriales into which the partidos judiciales are grouped; and there sits at Madrid a supreme court modelled on the French cour de eassation. The administration of justice is public. Except in commercial cases the parties to a suit must

always be represented by sworn counsel (abogados fiseales).

Finance.—The following statement (Table XI.) shows the equi- valent in English money of the budget estimates for the years noted ; it should be explained, however, that these estimates have only a limited value, inasmuch as the public accounts of Spain have not been audited since 1870, and have not been passed by the cortes since 1867 :—

Years. Revenue. | Expenditure. |! Years.

Revenue. | Expenditure.

1860-61

£18,923,440 | £18,773,698 | 1881-82 | £31,492,920 | £32,584,598 1870-71 | 277901,746 | 32,819,424 |; 1882-83 | 31,259,769 | 31,573,083 1874-75 | 21,792000 | 20,821,000 | 1883-84 | 32,095,075 | 32,053,999 1877-78 | 29,433,000 | 29,480,000 | 1884-85 | 31,444,682 | 31,003,969 1880-81 | 31,666,031 | 33,466,047 || 1885-86 | 34,900,575 | 35,885,869

The chief heads of revenue, according to the budget estimates of 1885-86, were—excise (including stamp duties and government monopolies), £10,534,480; direct taxes on land, trade, mines, &c., £10,393,920; taxes on Government salaries, registration, &c.,

£5,362,000; customs, £5,360,000. The chief items of expenditure were—the charges of the public debt, £10,966,937; the charges of the ministry of war, £6,050,944; those connected with the adminis- tration of state property, £5,748,593; the charges belonging to the ministerto de fomento, £4,177,983; those of grace and justice, £2,237,844; those of marine, £1,756,022.

The expenses of quelling the insurrection in Cuba of 1868-78, and those subsequently arising out of a civil war in the Peninsula,

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[HISTORY.

raised the total amount of the Spanish debt on the Ist of January 1881 to about £512,000,000 ; but, as it was by that time manifest that Spain was unable to meet the obligations thus incurred, an arrangement was come to by which the capital and interest of the debt were reduced. The bulk of the debt now bears interest at the rate of 4 per cent., and on the Ist of October 1884 the capital stood at 6356 million pesetas, or £254,250,000, and the total anriual charge was 238 million pesetas, or £9,522,857. The principal items are the perpetual foreign debt, amounting in October 1884 to £78,840,000, a perpetual internal debt, amounting in October 1884 to £77,840,000, and a redeemable debt (internal and external) amounting to £70,480, 000.

Currency, Weights, and Mcasures.—The French monetary system and the metric system of weights and measures have been intro- duced—the latter in 1859, the former in 1871. In the case of the weights and measures the French names also have been adopted, with only the necessary linguistic changes. In the case of the currency the old Spanish name of peseta was retained for the unit (the franc), and the peseta is divided into 100 centimos. According to the present value of the peseta, therefore, 25 pesetas may be taken as about equal to £1. Previously to the introduction of the French monetary system the peseta was the fifth part of a peso duro, which was equal to 20 reales de vellon, or rather more than a five-franc piece. The only paper money in Spain consists of the notes of the Banco de Espatia.

Bibliography.—The most comprchensive work on the geography of Spain fs the Diccionario Geografico-historico e Statistico de las Provincias de Espana of Madoz, 16 vols., 1846-50. A more summary account is contained in the Resefias Geografica, Geologica, y Agricola de Espafia, by D. Fr. Coello, &c., Madrid, 1859; and in Die Pyrendische Halbinsel, by Dr Moritz Willkomm, Leipsic, 3 vols., 1884-86. Numerous notices regarding the geography of Spain arc to be found in the Boletin de la Sociedad Geografica de Madrid. See also F. Garrido, La Espawia Contemporanea, Barcelona, 2 vols., 1865-67 (the French edition, Brussels, 1862, is comparatively meagre) ; Davillicr, L'Espagne, Paris, 1873: A. J. C. Hare, Wanderings in Spain; A. Gallenga, Iberian eminiscences, London, 1883; Webster, Spain, London, 1882; Harrison, Spain, Boston, 1852; Higgin, Commercial and Industrial Spain, London, 1886; together with the guide-books of Ford (Murray) and O'Shea (Black).

The botany of Spain is very fully treated in various works by Willkomm, Besides the Prodromus Flore Jlispanice, Stuttgart, 8 vols. 4to, 1861-80, the most important are Jllustrationes Flore Jitspanizx, Stuttgart, 1831, &c., fol., and Die Strand- und Steppengebiete der iber. Halbinsel,,Leipsic, 1852, 8vo, Of another flora by Don M. Colmciro, entitled Znumeracion de las Plantas de la Peninsula Hispano-Lusitana e Islas Baleares, one volume has been published (Madrid, 1885). It is expected to be completed in 4 vols.

There is no recent general work on the zoology of Spain.

The geology of the Iberian Peninsula is treated ina series of articles, illustrated by several inaps, by D. Federico de Botclla, in the above-mentioned Boletin, vol. ii., 1877. Sec also Macpherson, Succession Estratigrayica de los Terrenos Arcatcos de Espafia; W. K. Sullivan, Notes on the Geology and Mineralogy of the Spanish Provinces of Santander and Madrid. The geological maps of Spain already com- pleted are those of De Verneuil and Collomb, Paris, 1864, 2d ed. (now out of print) 1868, and De Botella y de Hornos, Madrid, 1879. A geological survey of the provinces of Spain is now in progress, and on the conclusion of the survey a map will be published in sixteen sheets on the scale of 1: 400,000.

Among the more important annual or periodical official statistical publications are the Estadistica General del Comercio Exterior de Espaita; Boletin Mensual de Estadistica Demografico-Sanitaria; Situacion de los Ferrocarriles ; and Esta- distica Minera de Espatia,

The best topographical map of Spain is that of C. Vogcl, in four sheets, in Sticler's Hand Atlas, on the scale of 1: 1,500,000. Among other maps that may be referred to are that of D. Fr. Coello, scale 1: 1,000,000, Madrid, 1561, and the Mapa Itinerario Militar de Espaiia Formado por el Cuerpo de Estado Mayor del Ejercito &t 1865, scale 1: 500,000. An excellent map, on the scale of 1: 50,000, indicating the clevations by means of contour lines at intervals of 20 mctres, and by figures for particular spots (the clevations reduced to the mean level of the Mediterranean at the port of Alicante), and distinguishing cultivated and un- cultivated ground, and in the former distinguishing hucrtas, gardens, oliveyards, vineyards, orangeries, &c., where they excecd an area of 10 hectares, is now being published by the Instituto Geografico y Estadistico de Madrid. Of this map, however, only about 20 out of 1080 shcets have as yet been issued. Among those which have already appeared is that containing Madrid. (G. G. C.)

PART IL—HISTORY.

Section I.—ANcIENT History.

Hispania was the name by which the Romans called the great peninsula made up of Spain and Portugal, but we know nothing certain as to the origin

of the name, or whether it was in general use among the ancient inhabit- ants of the country.!

To the Greeks Spain, or rather its coastline on the Mediterranean, was known vaguely as Iberia, a name we meet with in Herodotus (i. 163) in connexion with the Pheenician Tartessus, which is generally understood to have been the country about the mouth of the Guadal- quivir and to be the Tarshish of Scripture. It was the Phoczeans, a branch of the Ionian Greeks settled in Asia Minor, who according to Herodotus first opened up to the

1 Humboldt derives it from the Basque espana (border), as signifying

the part of Europe bordering on the ocean, but his conjecture seems strained and fanciful.

Greek world this remote region of the extreme West, which had hitherto been a land of mystery and enchantment, imagined to be the home of the setting sun, and known only by the reports of adventurous Phoenician mariners. The hero-god Hercules, it was fabled, had left traces of his presence and mighty working here, and the twin rocks at the entrance of the Mediterranean were called by his name, 'the Pillars of Hercules,"—the "world's end" to the Greeks, nothing but the all-encircling ocean-river lying beyond. The Greeks seem to have planted no colonies in Spain, with the exception of Emporium, on the coast just under the eastern spur of the Pyrenees, founded probably from Massilia (Marseilles) by the Phoczans, and perhaps of Saguntum. In fact they had but very hazy notions about the country, and Iberia, as they called it, was to them little more than a name for an indefinite extent of territory in the Far West, in the occupation of

Cartha- ginian ascend- ency.

UNDER CARTHAGINIANS. |

barbarous Celts and Iberians, with some Phoenician settle- ments for the purposes of trade on its southern coasts. Several of these places were just known to them by name ; but even of Gades, rich and populous as it seems to have been in quite early days, nothing but vague hearsay had reached them, and Herodotus, who mentions it as Gadeira (iv. 8), merely defines its

position as ‘on the ocean outside of (beyond) the Pillars of Hercules.” Tarraco, one of the oldest and most important of the cities of Spain, and one of which we hear continually in the subscquent history of the country, was also in all probability a Phcenician colony. Thereare still here remains of very ancient walls, possibly Pheenician work. Gades, Tartessus, Tarraco, all seem to have been of Phoenician origin! and of unknown antiquity, and they were flourishing places in the 7th century B.c., when the Greeks first made a slight acquaint- ance with them,—an acquaintance, however, which they did not follow up. The result is that we really know nothing about Spain till the first war between Rome and Carthage (264-241 B.c.). There was indeed, in the 4th century B.C., an embassy to Alexander the Great from the remote West, of Gauls and Iberians, and from that time learned Greeks began to discuss the geography of Spain. But again the country drops out of sight till the 3d century B.c., when we find a close connexion established between it and Carthage, which, being itself a Phoenician colony, would feel itself almost at home on the southern shores of Spain. According to Polybius, Carthage (before the First Punic War) had acquired at least something like a protectorate over the Iberian tribes as far as the Pyrenees, the then recognized boundary between the Iberians and Celts,—between, in fact, Spain and Gaul. Spanish troops served as volunteers in Carthaginian armies. There must have been a good deal of Phcenician blood in the south of Spain for many centuries, and this no doubt prepared the way for Carthaginian ascendency in the country. Not, however, till after the First Punic War and the loss of Sicily was there anything that could be called a Carthaginian empire in Spain. It was in 237 B.c. that Hamilcar Barca, the father of Hannibal, crossed the Straits of Gibraltar and set foot in Spain, not, how- ever, with any commission from the home Government at Carthage, but with the deliberately formed design of making the country, with its warlike population and great mineral wealth, into a Carthaginian province, and ulti- mately into a basis of operations in a future war with Rome (see Hamitcar, Hasprusat, Hannipat). There were rich mines in the mountains, which had drawn the Pheenicians sonie way into the interior, and among the native tribes there were the elements of a brave and hardy soldiery. A good army might very well be organized and paid out of the resources of Spain. All this Hamilcar clearly saw, and in the true spirit of a statesman he set himself to the work, not merely of subjugating the coun- try, but of making the Spaniards into loyal subjects of Carthage. He

encouraged marriages between his officers and soldiers and the native women : his own son Hannibal married a Spanish woman. He showed them how to work their gold and silver mines to the best advantage ; in every way, in short, he made them feel that he was their friend. The great work of which he had laid the foundation was carried on after his death in 228 by his son-in-law Hasdrubal, under whom New Carthage, with its fine harbour, founded probably by Hamilcar, became the capital of the country. It would seem that by this time the Carthaginian empire in Spain was as firmly established over the southern half of the country as the fickle and uncertain temper of the native tribes would admit. The

CIR ee 1 For the Pheenician colonization of Spain, see PHa@nicia, vol. xviii. p. 806.

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Spaniard of that day, as indeed more or less throughout his whole history, was particularly amenable to personal influence, and an Hamilcar or a Hannibal could sway him as he pleased. From 228 to 221 Hasdrubal was extending and strengthening the Carthaginian rule in Spain, while the Romans were fighting in Cisalpine Gaul. One pre- caution, indeed, they had taken, an understanding with Hasdrubal, which might be regarded as a treaty, that the Carthaginian conquests were not to be pushed east of the Ebro. West of that river there was one town, Saguntum, a Greek colony, in alliance with Rome; this Hasdrubal had spared. His successor, Hannibal, after two years' continuous fighting, which resulted in the submission of hitherto unconquered tribes and the undisputed supremacy of Carthage throughout almost all Spain, attacked and took the place in 218.

This was the beginning of the Second Punic War. Spain was now for the first time entered by Roman armies, under the command of the two Scipios, —the brothers Cneius and Publius. Six years of hard fighting ended in the defeat and death of these two brave men, but in 210 the son of Publius, the elder Africanus, struck a decisive blow at the Carthaginian power in Spain by the sudden capture of New Carthage. The war, however, still dragged on

till 205, in which year it may be said that Spain, or at least that part of it which had been

under Carthage, was fairly conquered by the arms of Roman

Rome. Andalusia, Granada, Murcia, Valencia, Catalonia, Aragon, may be said to have become Roman territory. Rome had now to deal simply with the native Spaniards, without the fear of any foreign interference. Hence from 205 the reduction of the country into a Roman province was only a matter of time. It proved, however, to be a tedious and troublesome work, and more than once Rome's hold on Spain was seriously imperilled. An oppressive governor, or a governor without tact and sympathy, was sure to unsettle the restless and impressionable tribes, and to stir up all manner of dangerous jealousies and heart-burnings. The Scipios, the elder Africanus espe- cially, knew how to manage the people, and yet even in 205, the year of those brilliant successes of Africanus, there was a great rising of several of the tribes, headed by a local chieftain, against the dominion of Rome. It was quelled after a sharp engagement; there was a general submission on the part of the Spaniards, and many of them became Roman tributaries. . It was some time, however, before the country, or even the southern half of it, was really subdued into complete peace and order. The moun- tains and the forests were a formidable obstacle to the Roman legions, and favoured that guerilla warfare which makes conquest slow and laborious. For a long period many of the tribes were rather the allies and dependants of Rome than her subjects, and might at any moment be roused into war. In fact, Rome's dominion west of the Ebro—Further Spain (Hispania Ulterior), as the province was called—must for very many years have been little more than nominal. Rome's policy was to keep the native tribes disunited, and to have as many of them as possible under a friendly protectorate. There seem to have been wide differences between these tribes,—some, especially those in the interior and in the north, being fierce and utterly barbarous, and others in the south and south-west comparatively mild and civilized. The Celtiberi, in the interior, were a group of warlike tribes, and were always uncertain and intractable. At one time they would fight for Rome; at another they would serve as meicenaries for Rome's bitter foe, the Carthaginian. Continually were they breaking out into revolt and defying the arms of

Rome. The “Celtiberian War” often figures in the pages of Roman histories, and it generally meant a war XXII. — 39

Cato.

Gracchus.

Mum. mius.

Mar- cellus.

Viri- athus.

Siege of Nu- mantia.,

Scipio.

306

involving the greater part of Spain. In 195 the elder Cato had to put down a rising in the country, In which the Celtiberi took the lead, but he offered them favour- able terms, and showed himself particularly anxious to conciliate them. His Spanish campaigns were so far a success as to establish the Roman power east of the Ebro, and along with peace and order came better administra- tion and a development of the resources of the district now known as Hither Spain (Hispania Citerior). Cato is said to have disarmed the inhabitants of this part of Spain, and to have even compeiled the Spaniards, from the Pyrenees to the Guadalquivir, to pull down their fortifications, but still the smouldering fires of rebellion were not trampled out. Some few years afterwards, in 179 and 178, we find the father of the famous Gracchi governor of Hither Spain, and fighting with the troublesome Celtiberi, win- ning victories over them, capturing one hundred and three of their towns, and then securing his conquests by show- ing himself as great in peace as he had been in war. He seems to have anticipated in Spain the work attempted by his sons in Italy, making grants of land on favourable conditions to the poorer natives. Much must have been accomplished by Gracchus towards producing contentment with the Roman rule, but in the west, in the valleys of the Douro and the Tagus, and

in the region known as Lusitania, answering to Portugal, there seems to have been almost incessant fighting, and what one general won another general often lost. Under Mummius, a governor of Further Spain (154),—the Mummius who in 146 took and sacked Corinth,—the Romans suffered a disastrous defeat from the Lusitanians, of which the Celtiberi took prompt advantage, and there was another Roman defeat, with a massacre of Roman citizens in one of the towns of the interior. These losses were avenged in 152 by Claudius Marcellus, grandson of Hannibal's illustrious antagonist, during whose command in Spain Corduba is said to have been established as a Roman colony. Marcellus was too humane and considerate to the Spaniards to suit the ideas of the Roman senate, which we may well suppose to have been greatly provoked by the trouble which Spain had given them. The new governors, Lucius Lucullus and Servius Galba, by a combination of perfidy and extortion, drove the country into a most formidable revolt, with which the Romans, whose hands were tied by the Third Punic War, could not for some time effectually deal. A guerilla chief of Lusitania (which had been specially ill-treated by the Romans), Viriathus, headed the revolt, and from 147 to 140 army after army of the Romans was cut to pieces; the formidable Celtiberi had joined his standard, and Spain seemed well-nigh lost to Rome.

before had (see Scrp1o). The province of Hither Spain was rendered safe from Celtiberian incursions. Shortly afterwards Lusitania and its towns, after some obstinate fighting, were reduced to submission by the consul Junius Brutus, and thus Spain, with the exception of its northern coasts, the home of its most barbarous tribes, was nomin- ally Roman territory. There must have been by this time a considerable mixture of Roman blood with the native population; there were several towns—Carteia, Valentia, Tarraco especially among them—with a Latin municipal constitution and with a number of Latin- speaking people. The growth of Roman civilization had fairly begun, and it was promoted by a commission sent out by the senate after Scipio's victories. Piracy in the Mediterranean was checked in the interest of native Spanish commerce, and the Roman administration gene-

rally favoured the development of the country's prosperity. The extensive mountain districts were still the shelter of banditti, but, on the whole, order was well maintained, and Spain from this time flourished under Roman rule. It abounded in flocks and herds, and had a number of thriving populous towns, particularly on its Mediterranean shores. It seems, too, that it was never oppressed and impoverished by some of those forms of tribute, —such as the exaction of a tenth of the produce,—under which many of Rome's provincials smarted. Fixed money payments, and military service in the Roman armies, were the chief burdens which the conquered Spaniards had to bear. Rome on the whole, by comparison, dealt tenderly with them. Several of their towns had the privilege of coining the silver money of Rome; and the flourishing cities along the Mediterranean coast, which were so many centres of civilization to the adjacent districts, were treated rather as allies than as subjects. In these parts the Romanizing process went on rapidly and under favourable

'conditions, while the west and the north and a great

portion of the interior remained barbarous, and Roman merely in name. In 105 it seemed possible that the Romans might be utterly swept out of the country; in that year a great wave of invasion passed over the inland regions from the Cimbri, who had destroyed two Roman consular armies on the Rhone. Spain toa great extent was cruelly ravaged, and Rome was too seriously menaced by the barbarians nearer home to be able to protect her. The country was saved by the brave Celtiberi, whose determined resistance forced the Cimbri back upon Gaul. Again in 97 and 96 we hear of arising of these same Celtiberians against Rome, and of campaigns in the interior, in which for the first time we meet the name of

the famous Sertorius, a name almost as conspicuous in Sertorius

ancient Spanish history as that of Hamilcar or Hannibal. For the remarkable episode of the eight years' wars of Sertorius in Spain against the generals of Sulla and against the great Pompey, and his almost successful attempt to render the country independent of the home Government at Rome, we must refer the reader to the article Serrorius. It was to his skill in winning the hearts of the Spaniards, more even than to his very considerable military ability, that he owed his successes. Rome was financially most grievously

embarrassed by this tedious and difficult war, and Spain, with its Roman civilization and its Latinized towns on the Mediterra- nean, suffered severely. By the year 71 the country had

been reconquered by Pompey for Rome, and the two Pompey.

provinces of Hither and Further Spain were reorganized under a somewhat more stringent rule, the tribute in some districts of the latter province being raised, and some of the towns in both losing their municipal inde- pendence. Further Spain, and carried the arms of Rome into the

In 61 the great Cesar was governor of Cesar.

UNDER ROMANS. |

imperfectly conquered regions of the west and north-west, the country of the Lusitanians and of the Galleci, and with a fleet from Gades is said to have occupied a point in the north-west answering to Corufia. But he was too short a time in Spain to reduce these barbarous regions to permanent subjection, and the work still remained to be accomplished. In the civil war with Pompey in 49 he was in Hither Spain, winning decisive victories over Pompey's generals, Afranius and Petreius. Once more, in 45, he had to enter Further Spain at the head of an army, and to defeat his rival's sons at Munda, some- where probably in the neighbourhood of Cordova, a victory which made him undisputed master of the Roman

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Portugal. The centres of administration were—for Tarra- conensis, Tarraco; for Beetica, Corduba; for Lusitania, Emerita Augusta. We may see, in part, on what prin- ciples this division of the country was adopted. Lusitania and Betica had tolerably distinct features, the latter having been from the earliest times the most civilized and the most tractable district of Spain. came a much wilder region, the home of excitable and warlike tribes; this in great part, so as to include the country of the Celtiberi, was thrown into Tarraconensis, which, and also Lusitania, were under the empire "Ceesaris

provinciz," the governors of them being nomin- ated by the emperor. The smaller and quieter province

North of the Tagus ©

The world. Spain, however, the northern part at least, was | of Batica wasa "senate's province"; and its finances were

north not thoroughly subdued—" pacified," in Roman phrase, | under the charge of the old republican official known as a

| am —till the reign of Augustus, whose ambition it was to | " queestor." The governor of Tarraconensis seems to have

ame advance the boundaries of empire to the ocean. In the | held decidedly the first position in the country ; he had as north was a wild and warlike highland population, a | a matter of course the greater part of the army under his collection of tribes known as the Astures in the north- | command, and he was usually, it may be presumed, an west, and their neighbours the Cantabri to the east, | ex-consul. The governorship, indeed, of this province between a mountain range and the coast, 'the last," as | must have been one of the best appointments in the Gibbon says (Decline and Fall, ch. i.), "to submit to the | emperors' gift. arms of Rome and the first to throw off the yoke of Under the empire Spain was divided for the general Spain the Arabs." Ovesar's flying visit in 61 had done some- | purposes included under the head of local administration under thing to cow these tribes, but ever and again they | into fourteen "conventus," that is, provincial parliaments **° , would assert their independence. In 27 the emperor | or assemblies made up of a union or combination of so "™P™**

Augus- Augustus himself penetrated their strongholds, and he | many communities or townships. 'The town or city which

tus, passed two years in Spain; decisive victories were won | was the centre of each "conventus" was the place where over the northern tribes, and their towns and villages | justice was administered to the inhabitants of the district, were converted into military posts in the occupation of | and would, so far, answer to our assize-town. In Tarra- the legionary veterans. Such was

the origin of Saragossa, | conensis there were seven of these
"'conventus,"—'Tarraco, a modern survival of the name of Cesar Augusta
then | New Carthage, and Cesar Augusta being the chief : dim given to an
old town on the Ebro, henceforth an important | Bzetica, four,—Gades and
Corduba being of the number ; Roman centre in Spain. The successes of
Augustus were | in Lusitania, the least populous and civilized district, three
commemorated by the same title bestowed on other | —Emerita Augusta
the principal, Pax Julia, perhaps the ancient Spanish towns, Bracara
Augusta (Braga) in the | modern Beja, and Scalabis not far from the mouth
of the north-west, Asturica Augusta (Astorga) still further north, | Tagus.
Pliny (the elder), to whom we are indebted for Emerita' Augusta (Merida)
on the Guadiana, which | these details, enumerates 360 cities in Spain in the
time became a Roman city of the first class;—"the Rome of | of Vespasian.
These included every variety of township,— Spain," as it has been called,
—and Pax Augusta, perhaps | the "colonia" which originated in a camp or a
settlement the modern Badajoz. The work of consolidating the | granted to
old soldiers, the town whose inhabitants had Roman dominion in Spain was
completed in 19 by his | all been made Roman citizens in the fullest sense
("muni- friend and minister, Marcus Agrippa, and now at last | cipium" in
Roman phrase, under the empire), the town the '"Cantaber non ante
domabilis," as Horace has it, | that had the inferior franchise ("jus Latii"),
the "free

Roman acknowledged Rome's supremacy. Spain was fairly con- | town,"
which might at any time have its freedom taken

conquest quered ; the warlike peoples of the north were cowed and

com- plete.

broken ; the south was thoroughly Romanized, the popula- tion having
adopted Latin manners and the Latin tongue. Some of the best specimens of
Roman architecture, some of the finest Roman coins, have been discovered
in the cities of Spain, which from the time of Augustus became rapidly
prosperous, and were famous for their schools and their scholars. Spain, in
fact, was more completely

from it, and the “tributary” town (“ civitas stipendiaria”). Spain presented types of all these various communities till Vespasian, it is said, gave them all the “jus Latii,” which opened an easy door for the provincials to the full privileges of citizenship. A native-born Spaniard might now rise to the imperial dignity, as Trajan did ; and the Spaniards generally must have felt themselves to all intents and purposes Romans.

The provincial constitution of Spain was revised and Re- modified to some extent in the 2d century in the ae time, it would seem, of the Antonines and Hadrian. The ™*t°

Roman than any province beyond the limits of Italy. The country which had hitherto harassed Rome with

incessant risings and insurrections was at last peaceful pt

and contented, a happy land which for the next 400 years may be said to have had at least no military history.

vast and unwieldy province of Tarraconensis was sub- divided, and the divisions distinguished as Gallecia (the

Three Under Augustus the old political constitution into two | north-west), Carthaginiensis with New Carthage for its Roman provinces, Further and Hither Spain, of which the Ebro | capital, Tarraconensis (the old name being then stall Tc had been the boundary, was set aside, and exchanged for | retained for one division) with Cesar Augusta for its

a division into the three provinces of Lusitania, Beetica, and ‘Tarraconensis, sometimes spoken of as the “Three Spains.” Of these Betica, so called from the Betis (the Guadalquivir), and answering nearly to Andalusia inclu- sive of Granada, was the smallest ; Tarraconensis, which embraced Hither Spain and the interior and all the north, was much the largest. Lusitania corresponds to modern

7 Emerita, from ‘‘emeriti,” soldiers whose term of service had expired, —in fact, “ veterans from the legions.”

capital, and the Balearic Isles, which had always been regarded as Spanish territory. Constantine accepted this arrangement, including, however, in it a strip of the western coast of Africa, part of the old Mauritania, which, from an ancient Moorish town, Tinge (Tangier), took the name of Tingitana among the later Roman provinces.

vinces.

Spain in 256 a.D. was invaded and ravaged by the Frankish Franks; Tarraco was almost destroyed, and _ several invasion.

flourishing towns reduced to mere villages. It was, how-

Jnroad of bar- barians.

Walia.

Theo- doric.

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ever, but a passing storm,—the only interruption, in fact, to the peace and prosperity of the country during 400 years. With the departure of the Franks Spain soon recovered herself, and when we next hear of her early in the 5th century we find commerce and civilization well established, and cities ranking among the finest and richest in the Roman world, In 409, however, the year of the sack of Rome under Alaric, a tide of barbarism swept over the country , Suevi, Alani, Vandals ‘‘ ravaged,” says a writer of the time, quoted by Gibbon (ch. 31), “with equal fury the cities and the open country.” Spain, long so quiet and prosperous, was brought down to the lowest depth of misery. At this point the precise order of events is not quite clearly ascertainable. It seems that in 414 or 415 a Visigothic host entered Spain under their king, Ataulphus, Alaric’s successor by election, who had married Placidia, the sister of Honorius, emperor of the West, son of the great Theodosius. Ataulphus was now Rome’s ally, and fought as her champion in Spain against Suevi and Vandals. A new era seemed to have opened, and we may see in this alliance a prophecy of the ultimate fusion of Latin and German peoples,—the beginnings, in fact, of the modern world.

To Ataulphus, who was murdered at his new capital Barcelona, succeeded after a brief interval in 415 Walia, a warlike and ambitious chief, who may be said to have established the Visigothic or West-Gothic kingdom in Spain on the ruins of the old Roman province. Walia concluded a treaty with the emperor Honorius, and, putting himself at the head of his brave Goths, in a three years' war he destroyed or drove 'nto remote corners the barbarous hordes of Vandals, Alani, and Suevi that had settled down in the country. Spain, thus reconquered, was nominally subject to Rome, but soon became really independent and began to be the seat of a Christian civilization.

Section II.—SPaIN UNDER THE West-Gortus.

The West-Gothic or Visigothic kingdom in Spain, founded by Walia, lasted for nearly three centuries, from 418 to 711, when it fell before the Arab or Saracen inva- sion. 'Toulouse was its headquarters ; here was held the court of the West-Gothic kings, while Toledo became the centre of administration for Spain. The relations of the West-Goths with Rome varied from time to time: some- times they were her friendly allies, sometimes, nominally at least, her dependants ; sometimes they rose in revolt and were her open enemies. Walia, after his victories in Spain, professed to restore the country as once more a Roman pro- vince to the rule of the emperor Honorius, and again we hear of the oppressions of imperial officers and functionaries, which seem to have been even more intolerable to the Spaniards than the strifes and wars of Vandals, Alani, and Suevi. Nor were these troubles finally ended ; Walia had by no means thoroughly consolidated his conquests ; and the West-Gothic kingdom in Spain cannot be said to have been firmly established till the 6th century. In northern Spain, in Galicia more especially, the Vandals and Suevi still had settlements, and were quarrelsome neighbours. In 428 they routed an allied army of Romans and Goths, and overran the southern districts, plundering some of the chief cities on the coast before they quitted the country for Africa under their king, the famous and savage Gen- seric. The Suevi yet remained, but at the solicitation of the Romauized Spanish provincials of the southern cities, who felt themselves threatened with utter extinction by these barbarians, Rome offered its intervention, which was effectually carried out by the king of the West-Goths, Theodoric IT., grandson of Alaric. Crossing the

Pyrenees in 456, as Rome's representative and ally, Theodoric crushed the Suevi by a decisive victory in the north-west of Spain,

near Astorga. It would seem that from this time the Suevic power was confined within the limits of Galicia, which became in fact a mere dependency of the West- Gothic kingdom. Theodoric's victories, so far from strengthening Rome's hold on Spain, greatly weakened it ; and this was what he himself really intended. He did not even make a pretence of restoring the country to the imperial rule. persistently defied the empire, completing Theodoric's work, and establishing by further successes in Spain, carried into its remotest western districts, the West-Gothic kingdom in that country in full and avowed independence. Euric was something more than a successful warrior : he aspired to be a legislator, and he had the ''customs of the Goths" recorded in writing and embodied in a code. The work was continued by his successor Alaric II. in the beginning of the 6th century, under the superintendence of civil and ecclesiastical lawyers, and it was based mainly on what was known as the Theodosian code (see Brevt- artuM ALARICANUM). The result was that a thoroughly Roman character was impressed on the West-Gothic legis- lation, and that Roman institutions, ideas, and manners long survived in Spain. With the conversion of the West- Goths from Arianism to the orthodox faith in the latter

part of the 6th century, under their king Recared (586— Recared.

589), came in new influences and a great accession of power to the ecclesiastics. 'Recared was the first Catholic king of Spain. With the zeal of a convert he set himself to root out Arianism, burning Arian books of theology and frightening his Arian bishops into the profession of the Catholic belief. He seems to have been thoroughly suc- cessful, and richly endowed churches and monasteries grew up in every part of Spain. Pope Gregory the Great acknowledged the good work of Recared by a gift of sacred relics.

7th century came a savage persecution of the Jews, multi- tudes of whom had long been settled in Spain and had thriven, as elsewhere, by trade and industry. The Jew up to this time seems to have found in Spain a particularly safe and comfortable home. Now, at the instance of a West-Gothic king, he was so cruelly ? oppressed and per- secuted that even the Catholic clergy interposed to some extent on his behalf. A decree for the expulsion of the entire Jewish community was promulgated on one occasion with the sanction of the council of Toledo; but the Jew still held his ground in Spain and prospered and grew rich, and his presence in the country contributed to the rapid spread of Arab conquest in the next century.

Among the most conspicuous features of the West- Features @ 3 of West-

Gothic kingdom in Spain we may note electiv

monarchy, the great and indeed overshadowing pOWET rule,

of the church, an aristocracy which had in its hands a very large part of the administration, a uniform code of laws for all Spaniards, with both a distinctly Roman and ecclesiastical impress on it. The church on the whole seems to have been the guiding spirit, and the Spanish bishops and clergy were held in high esteem for their learning and virtue. It was they who mainly inspired the legislation of the great national councils of Toledo, which to the West-Goths of Spain were what the Witena- gemot was to our Saxon ancestors. The church was the centre round which the whole of society moved. In this fact we see foreshadowed much of the future of Spanish history, the supremacy of ecclesiastics, the extraordinary powers of the Inquisition. It had from the first its evil

1 Furic is said to have assassinated his brother Theodoric.

2 Ninety thousand Jews were compelled to receive baptism (Gibbon’s Decline and Fall, ch. 37).

3 Limited, however, to pure Gothic blood.

His brother and successor Euric! (466-485) Euric.

Unhappily the seeds of bigotry and religious The J ews intolerance had been sown, and with the beginning of the ™ Spall

Decline and fall of the West- Gothic power,

The Arab invasion.

UNDER VISIGOTHS, |

it the same time the means of giving Spain laws very far above the average ideas of a barbarous people,—laws indeed which in many respects were rational, humane, enlightened, often combining the wisdom of old Rome with the kindly spirit of Christianity. The West-Gothic code recognized the equality of all men in the eye of the law; such bar- barisms as the assessment of a man's value according to his rank and position, or judicial combat or trial by ordeal, find no place in it. It had certainly great merits; its weakness seems to have been in leaving too much scope on one side to the king, on the other to the clergy. Between the royal and the ecclesiastical powers individual freedom was liable to disappear. There was a danger, too, of human thought and speculation being wholly absorbed into theology. In anything like general litera- ture Spain seems to have been decidedly poor during this period, while among her neighbours in the south of Gaul Greek philosophy was a fashionable study, testifying to the presence of considerable intellectual activity. Spain under its West-Gothic kings and its Catholic clergy may have been a fairly well governed country, but long before the end came there must have been languor and decay amongst its people. After the conquest of Africa by Belisarius for the emperor Justinian, it seemed possible that the country might be. once again annexed to the empire as a province; and an unsuccessful candidate for the throne,— which, it will be remembered, was elective,— went so far as to conclude a treaty of alliance, and actually to cede to the troops of the empire several towns on the Mediterranean coast. That a Gothic king should con- descend to ask support from such a quarter, and allow himself to be spoken of as in any sense the empire's vassal, marks a very decided decline in the old inde- pendent spirit of the nation. We may certainly assume that repeated disputes as to the royal succession had undermined its power for resistance, and the numerous and not very well affected Jewish colony in their midst must have been a permanent source of danger. By the end of the 7th century northern

Africa to the Straits of Gibraltar had passed wholly under Saracenic dominion. The struggle had been long and hard, and the West- Gothic kings, who had recovered the towns on the southern coasts, and even made some small conquests on the African shores, had done something to prolong it ; but in 710 a little band of Saracens landed unopposed at Gibraltar, returned in safety, and urged their brethren at once to cross the straits and take possession of the country. In the following year (711) Tarik, at the head of about 5000 Saracen volunteers, entered Spain.

Section II].—MeEp124vau History.

The Arab invasion of Spain had been intended by Musa, the governor of Africa, to be merely a plundering raid (compare MoHAMMEDANISM, vol. xvi. p. 573). A single

1 For the West-Gothic kingdom in Spain, Gibbon's Decline and Fall should be consulted, chapters 31, 36, 37, 38, 41, 51. In note 122 (ch. 38) he remarks on the obscurity of the subject, Spain having had during this period no chronicler like Bede for the Saxons or Gregory of Tours for the Franks. As to the West-Gothic laws, there is a good deal of easily accessible information in Guizot's History of Civilization, lectures 3, 6, 10, 11. Compare Roman Law, vol. xx. p. 712, and Satic Law, vol. xxi. p. 216, section (11).

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side in tendeucies to bigotry and persecution, but it was | unexpected success turned it into a conquest.

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Tarik had already made himself master of Cordova and Toledo when Musa arrived from Africa and rewarded his too successful lieutenant by consigning him to prison. But his military ability was too valuable to be dispensed with, and he was speedily released to aid in completing the conquest. Within four years the whole Peninsula, except the mountainous districts in the north, had submitted to the invaders. It was now Musda's turn to suffer from the jealousy of his superior. Recalled to Damascus by

Walid, he arrived just after the caliph's death, and at once fell under the dis- pleasure of his successor Suleimdn. His sons, who had been left to rule in Spain, were involved in his disgrace, and the father aied broken-hearted on a pilgrimage to Mecca.

Few things in history are more remarkable than the Causes ease with which Spain, a country naturally fitted for of its defence, was subdued by a mere handful of invaders, SU°°°S*

The usual causes assigned are the misgovernment of the Visigoths, the excessive influence enjoyed by the clerical caste, internal factions and jealousies, and the discontent of numerous classes, and especially of the Jews. All of these doubtless co-operated to facilitate the conquest and to weaken the power of resistance, but the real cause is to be sought in the fact that the Visigoths had never really amalgamated with the conquered population. The mass of the inhabitants regarded their rulers as aliens, and had no reason to resent a change of masters. This feeling was strengthened by the conduct of their new conquerors. The Arab invasion undoubtedly brought with it consider- able bloodshed and destruction of property, but it was merciful when compared with the previous inroads of the German tribes, and in the end it proved a blessing rather than a curse to the country. To all who submitted the Arabs left their laws and customs, and allowed them to be administered by their own officials. The cultivation of the fields was left to the natives, and the overthrow of the privileged classes gave rise to a system of small hold- ings or properties, which was one of the causes of the flourishing condition of agriculture under Arab rule. The slaves found their lot much improved under a religion which taught that the enfranchisement of a slave was a meritorious action. The Jews, as they had suffered most under the Visigoths, were the chief gainers from a con- quest which they had greatly contributed to bring about.

But nothing was so influential in securing ready submission Toler- Even ance,

to the Arabs as their tolerance in religious matters. the most bigoted adherents of Islam found a practical check to their zeal for proselytism in the loss that would accrue to the exchequer. The Christians had to pay a poll-tax, which varied according to the class to which they belonged. All

property was subject to the khardj, a tax proportioned to the produce of the soil, but converts to Mohammedanism were excused from the poll-tax. A cleri- cal chronicler of the 8th century, while bewailing the sub- jection of Spain to an alien race, says nothing against the conquerors as the professors of a hostile religion. His silence is an eloquent testimony to the haughty tolerance of the Arabs.

As time went ou, and the Arabs felt more secure in their position, their rule became not unnaturally harsher. Many of the treaties which had secured favourable terms to the conquered were broken, and the Christians were provoked to resistance by persecution. A notable instance of this was the edict making circumcision compulsory for Christians as well as Moslems. Greater hardships still were endured by the ‘ renegades,” most of whom had embraced Mohammedanism from a desire for safety or for temporal gain, and who found that return to the old faith was blocked both to themselves and to their children by

Moham- medan discords.

OMAY- YADS.

“Abd al- Rahman.

the law which punished a perverted Mussulman with death. At the same time their social position was intoler- able, and they were excluded from all lucrative offices and from all share in the government. Their discontent led to numerous and stubborn rebellions, but they belong to a later period, and in the 8th century the chroniclers record only a single rising, that of the Christians of Beja, and they seem to have been merely the tools of an ambitious Arab chieftain.

Tt was fortunate for the Arabs that they succeeded at first in conciliating the natives, as otherwise their rule in the Peninsula would have been short-lived. Internal discord offered the Christians an easy opportunity for suc- cessful revolt if they had chosen to avail themselves of it. The conquerors were united by religion but not by race. When the task of conquest was

achieved, and the need for unity was removed by the submission of the vast majority of the natives, quarrels arose between the various races which had taken part in the invasion. Besides the Arabs proper, who regarded themselves as the true conquering race, there were Berbers or Moors, Egyptians, and Syrians. So difficult was it to prevent their quarrels that it was found necessary to subdivide the conquered territory and to allot separate settlements to the different tribes, a measure which only tended to perpetuate their differences. Matters were made worse by the constant efforts of ambitious chieftains to raise themselves to power or to ruin their more successful equals. The first forty years of Arab rule in Spain are a period of woeful confusion, and it is difficult even to enumerate the names of the emirs who followed each other in rapid succession. The great empire of the Arabs began to fall to pieces as soon as it had reached its greatest extent. A movement whose end was conquest began to fail directly it ceased to conquer. The overthrow of the Omayyad dynasty by the Abbasids was a proof that disorder prevailed at the centre. The extremities inevitably displayed the same symptoms. Each new caliph sent a fresh emir to Spain; the governor of Africa claimed to interfere in the affairs of a province which had been conquered by one of his predecessors ; and the native chiefs were often unwilling to submit to a new ruler whose arrival was the result of a revolution in which

they had no share and which they would have prevented |

if they could. A capable and energetic governor, con- fronted with internal dissension and always dreading the arrival of a successor to supersede him, could only devise one way of solving the problem. The Arabs were unable to live at peace, and the one means of preventing them from warring with each other was to find them new lands to conquer. now ruled by the degenerate Merwings, which resulted in the conquest of the provinces of Septimania and Nar- bonne, and at one time threatened to subject the whole of western Europe to the successor of Mohammed. But the battles of Toulouse (721) and of Tours (732) checked the advance of the Moslems, and by 759 they had been com- pelled to retire from all possessions beyond the Pyrenees. Thus thrown back upon the peninsula, it seemed probable that their empire in Spain would speedily succumb to the disruptive forces which had no longer any external outlet.

From this fate the Arab power was saved by ‘Abd al- Rahman (Abderame), the one survivor of the Omayyad dynasty, who succeeded after a long series of romantic adventures in escaping from the general massacre of his family (see vol. xvi. p. 578). His arrival in the Peninsula was welcomed by those Arab chieftains who had ends of their own to gain or who saw how impossible it was for Spain to be ruled from a distant centre like Damascus or Baghdad. The resistance of the Abbasid emirs, Yusuf and ‘Ali b. Moghith, was overcome. and ‘Abd al-Rahmdn was

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Hence came the frequent invasions of Gaul, |

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enabled to found a new Omayyad dynasty at Cordova. He and his immediate successors seem to have contented themselves with the title of emir, but all connexion with the eastern caliphate was cut off, and Spain became inde- pendent under its new rulers. The reign of ‘Abd al- Rahman J. was spent in almost constant warfare. No sooner had he reduced the southern provinces than a revolt broke out in Saragossa under Hosein b. Yahya. Driven from Spain, where he had raised the black standard of the Abbasid caliph, Hosein fled to the court of Charlemagne and implored his assistance. The Frankish army restored Hosein to power, but on its return was almost destroyed by the Basque mountaineers in the famous valley of Ronces- valles (778). After a siege of two years Saragossa was taken, Hosein was put to death as a rebel, and the whole country up to the Pyrenees was compelled to submit to the Omayyad. A formidable rising of the sons of Yusuf was put down in 786, and ‘Abd al-Rahmaan was enabled to devote the last two years of his life to the arts of peace and to the construction of his famous mosque at Cordova. Before his death he settled the succession on his third son, Hisham, who had been born in Spain, and compelled his followers and his elder sons to swear fealty.

Hish4m’s reign, which lasted only eight years (788- Hishdm.

796), was comparatively uneventful. He was successful in foiling the attempt of his elder brothers to seize the throne, but a projected invasion of

Gaul was repulsed by the courage of the count of Toulouse. Hish4m was a devotee, —strict in the performance of religious duties and absorbed in works of charity. He completed the mosque which his father had begun, and endeavoured to make Cordova the educational centre of Islam. His son and

successor, Al-Hakam, was of a very different temperament. AI- With a keen enjoyment of the pleasures of life, Al-Hakam Hakam.

disregarded the precepts of the Koran which forbade the use of wine, and his lax practices irritated the fakths, the “scribes” of Mohammedanism. The inability of the Arabs to adapt themselves to a life of peace found expres- sion in a number of isolated risings, of which the most notable took place in Toledo and Cordova. The inhabit- ants of Toledo had never forgotten that their city had once been the capital of Spain, and most of them belonged to the class of ‘‘renegades,” who had no real attachment to the dominant faith. Al-Hakam determined to suppress their discontent by a notable act of cruel treachery. Feigning the most complete goodwill, he invited the chief citizens to a banquet in honour of the presence of his son in Toledo. As they entered the door they were conducted to an inner chamber and massacred by a band of assassins. More than seven hundred are said to have perished on this “day of the fosse” (807), and the citizens, deprived of their leaders, submitted with the torpor of despair. The fate of Toledo terrified the Cordovans, and postponed their rising for seven years. But in 814 the murder of a blacksmith by one of Al-Hakam’s bodyguard provoked a terrible outbreak. Besieged in his palace by the infuriated mob, Al-Hakam only escaped death by his own coolness and presence of mind. A detachment of his guard was sent to fire the houses of the citizens ; the mob hurried off to save their families and goods; and a sudden charge of the emir and his soldiers threw them into complete disorder. With politic severity Al-Hakam destroyed a whole quarter of the city and condemned all the inhabitants to exile. Part of them found a new home in Africa, but others, after a temporary sojourn in Alexandria, conquered Crete, where they founded a dynasty, which lasted till 961, when the island was recovered by the Greeks. The fakihs, the real instigators of the rebellion, were treated with con- spicuous leniency, and their leader, Talit, was even admitted to Al-Hakam’s favour.

CHRIS- TIAN STATES.

RISH OF CHRISTIAN STATES. |

By the end of the 8th century it had become evident that the Arabs had committed a great error in not reduc- ing the whole Peninsula, and that the contemptuous indifference with which they had left the northern mountains to a handful of refugees was destined to bring its own punishment. The early history of the Christian states of Spain is wrapped in a mist of fable and legend, but it is not hard to discern the main outlines. A scanty band of warriors, headed by Pelayo, probably a member of the Visigothic royal family, found refuge in the cave of Covadonga, aniong the inaccessible mountains of Asturias. Their own bravery and the difficulties of the country enabled them to hold their own, and they became the rallying point for all who preferred a life of hardship to slavish submission. The formation of a Christian kingdom was the work of Pelayo's grandson, Alfonso I., who seized the opportunity when the Arabs were occupied in the disputes attending the accession of 'Abd al-Rahman I. After driving the Berbers from Galicia, Alfonso advanced with his victorious troops as far asthe Douro. But he had not followers enough to colonize the conquered territory, and contented himself with the northern districts, leaving a desert to form a natural boundary between himself and the Moors. Alfonso's son and successor, Fruela I. (765-775), fixed his capital at Oviedo, but the greater part of his reign was occupied with the suppression of internal disorders, and he ultimately fell a victim to assassination. His throne was successfully usurped by his cousin Aurelia and his nephew Silo, both of whom sought security against domestic enemies in an alliance with 'Abd al-Rahman. On the death of Silo (784) a party among the nobles elected Fruela's son, Alfonso II., but for six years the western half of the kingdom obeyed a bastard son of Alfonso I. by a Moorish captive, nicknamed from his origin El Maurecato. Under Alfonso the Chaste, whose long reign lasted till 842, the Christian kingdom of Oviedo was firmly established. It is impossible to find any accurate account of his achieve- ments. 'The monkish chroniclers are hardly trustworthy authorities for military history, and they prefer to confine themselves to the more congenial subject of the found- ing and endowment of churches. The discovery of the pretended tomb of St James at Compostella is in their eyes the greatest event of the reign, and it

undoubtedly aided to give a religious character to the war which was destined to be the great crusade of the west.

Alfonso IL.'s reign witnessed the establishment of another Christian state in Spain. Charles the Great had been too much occupied elsewhere to avenge the great disaster at Roncesvalles, but he was only waiting for his opportunity. This was offered in 800 by the treachery of another governor of Saragossa, who had revolted against Al-Hakam and sought assistance from the Franks. Charles himself was on his way to Italy to assume the imperial crown, but he sent his son Louis across the Pyrenees. In his first campaign Louis reached the Ebro, but he had to return in 801 to vanquish the obstinate resistance of Barcelona. The administration of the "Spanish mark" was entrusted to Bera, a man of Gothic descent, who proved fully capable of the task imposed upon him. The attacks of the Arabs were repulsed, and their last possessions beyond the Ebro were lost in 811, when Tortosa, after a siege of two years, succumbed to the forces which Louis the Pious had again led over the mountains. Henceforth the province was ruled by the counts of Barcelona, as representatives of the Frankish kings.

To avoid the difficulty of frequent transitions, it will be best to sketch in advance the main outlines of the history of the Christian states down to the formation of the three

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kingdoms of Aragon, Castile, and Navarre, leaving their relations with the Moors to be narrated in connexion with the caliphate of Cordova. It is impossible to do much more than trace the dynastic and geographical changes, as their mutual quarrels are intricate and wearisome, and of little importance except as prolonging the rule of the Arabs in the Peninsula. The county of Barcelona may be dismissed with a few words. It continued for some time to be subject to Frankish suzerainty, and it suffered from the disorders that followed the break-up of Charles the Great's empire. Bera, its first count, was exiled, and his successor, Bernhard, played a prominent part in the intrigues of that troubled period. At one moment he added Septimania to the Spanish mark, at another he was disgraced and exiled ; and finally he

was treacherously murdered. In the later part of the 9th century all connexion with Septimania was cut off, and Wilfrid the Hairy (d. 907) was able to make the county hereditary in his family. With its mixed population and its long line of coast the county of Barcelona, or Catalonia as it came to be called, was more involved in the affairs of Gaul than of Spain. Berengar I. annexed the county of Carcassonne and other districts north of the Pyrenees (about 1050-1076), and Berengar III. (1092-1131) obtained Provence by marriage. On the latter's death Catalonia and the transmontane territories were divided between his two sons, and in 1150 Berengar IV., by marriage with Queen Petronilla, obtained the kingdom of Aragon, with which Catalonia was henceforth united.

The history of Oviedo is more important and more complicated. Alfonso II.'s successors, Ramiro I. (842- 850) and Ordofio I. (850-866), had to contend both with the great nobles, who aimed at independence, and with the Basques, who had never learnt to submit to orderly rule. Alfonso III., in a long reign of nearly fifty years (866-910), won the title of "The Great" from the suc- cess which attended his arms. While his plundering raids extended as far as Coimbra and Lisbon, he really advanced his frontiers to the Douro, and in order to defend these more exposed territories he transferred his capital from Oviedo to Leon, on the further side of the mountains. In accordance with the universal custom of the Germans, Alfonso divided his territories among his three sons, Garcia receiving the southern districts with Leon as a capital, Ordofio II. western Galicia, and Fruela II. the original district round Oviedo. In 931, however, the kingdom was again united under Ramiro IL. a son of Ordono II., and henceforth called after the new capital, Leon. Under Ramiro, a great warrior against the Arabs, we first hear of a district that was destined to become the most important in Spain. The border territory, a march to the south-east of Leon, previously Bardulia, was now known as Castile, from the number of castles that had been raised to hold it against the infidels. Its count, Fernan Gonzales, was the most powerful noble in the kingdom of Leon, and sought to make himself inde- pendent. Ramiro reduced him to submission and then bound him to his side by marrying his eldest son to the count's daughter. Ordofio III. (950-957) sought to emulate his father's achievements against the Arabs, but was hampered by the revolt of his brother Sancho and his father-in-law Fernan Gonzales. Sancho I. (957-966) found an enemy in his

recent ally, who attempted to place a rival king upon the throne, and he could only procure restoration to his kingdom by an alliance with the caliph of Cordova. This alliance lasted during the minority of his son, Ramiro III. (966-982), who was deposed by the malcontent nobles in favour of his uncle, Bermudo II. (982-999). The latter, too mild a ruler for such troubled times, had a hard struggle against domestic

County of Barcelona,

(813- 1150).

Kingdom of Oviedo or Leon.

Rise of Navarre, Castile, and Aragon.

treachery and foreign enemies, and left a desolate kingdom to his son Alfonso V. Alfonso succeeded in restoring order, and to his reign are attributed the most important of the fueros, on which were based the local institutions of his kingdom.

Meanwhile a new kingdom had sprung up to the east of Leon, which for a time seemed likely to become the chief state of Christian Spain. The district in the western Pyrenees bordering on the Bay of Biscay was the most defensible position in the Peninsula. It was there that the Basques had held out against the German invaders, and that the Suevi had found a refuge from the Visigoths. The sovereignty of the Moslems and of the Franks had been in turn acknowledged, but had never been more than nominal. About the beginning of the 10th century Sancho founded here the kingdom of Navarre, and he succeeded in extending his rule as far as the lower Ebro. His means of defence were primitive but efficient. When attacked by the infidels in overwhelming numbers he retired to the inaccessible mountains, and recovered the lost ground as soon as the enemy had turned his back. His grandson, Sancho the Great (970-1035), profited by the disasters which befel Leon. He married the sister of Garcia, count of Castile, and when his brother-in-law fell a victim to a conspiracy he seized the opportunity to avenge his death by annexing the northern portion of his country. In 1034

he picked a quarrel with Bermudo Te (1028-1037), the son and successor of Alfonso V., and conquered eastern Leon as far as the river Cea. More important still were his acquisitions in the south-east of Navarre. Partly by marriage connexions, and partly by the sword, he obtained possession of the counties of Aragon, Sobrarbe, and Ribagorga, which had for years been struggling to maintain their independence against the Mussulman governor of Saragossa. These consider- able territories Sancho divided on his death (1035) among his four sons, and the division is an important event in the history of Spain. Garcia, the eldest, received Navarre, with a small district on the right bank of the Ebro ; Ferdinand, the second son, obtained Castile, with the addition of the district of Palencia, which had been wrested from Leon; the counties of Ribagorca and Sobrarbe passed to Gonzalo, and that of Aragon to Ramiro, a bastard.

The death of Sancho the Great seemed to offer Bermudo TIT. an opportunity for recovering his lost territories, and he at once collected his forces to attack Ferdinand. Ina pitched battle near the river Carrion, Bermudo was defeated and killed, and the conqueror at once annexed Leon with its dependencies— Galicia and Asturias—to his new kingdom of Castile (1037). The eldest brother, Garcia, resented a change which threatened to deprive Navarre of the pre-eminence which it had enjoyed under his father. To gratify his jealousy he did not scruple to ally himself with the emirs of Saragossa and Tudela. But in the battle of Atapuerca (1054) the unnatural coalition was defeated, Garcia lost his life on the field, and Ferdinand added to Castile the district on the right of the Ebro, leaving the rest of Navarre to his nephew, Sancho IV. Meanwhile Ramiro, equally ambitious and successful, got rid of his brother Gonzales, and seized upon Sobrarbe and Ribagorga to form, with his own inheritance, the kingdom of Aragon. Henceforth the history of Christian Spain centres round the two great states of Castile and Aragon. Leon, much to the disgust of its inhabitants, becomes a province of the former, and Navarre is soon afterwards deprived of independence by its more powerful neighbour.

We must now return to the history of the Arabs. Under “Abd al-Rahman II. (822-852), one of the mildest

and most cultivated of the Omayyad dynasty, began a period of disorder and anarchy which might have ruined his power if the northern states had been prepared to take advantage of it. Toledo, which had recovered its independence soon after the ‘‘day of the fosse,” was not reduced until after a desperate struggle of eight years, and then its fall was mainly due to internal quarrels. More serious was the growing spirit of insubordination among the Christian population of the south. In spite of the tolerance with which they were treated, the priests persisted in preaching against the rule of the infidel. Under the leadership of Eulogius and his friend Alvaro, a fanatical sect was formed which sought to emulate the glory of the early martyrs. So averse was the Govern- ment to resort to persecution that it was only by publicly blaspheming Mohammed that they could bring themselves under the penalties of the law. Eleven persons were put to death for such conduct, who are celebrated in Spanish history as the “martyrs of Cordova.” It was in vain that the moderate party denounced their conduct as wanton suicide; the enthusiasts persisted in their defiant conduct. Mohammed (852-866), sterner and more nar- row-minded than his predecessor, was not unwilling to take repressive measures, and the execution of Eulogius, who had been chosen archbishop of Toledo, seems to have checked for a time the thirst for martyrdom. But the movement had succeeded in provoking a feeling of dis- trust between the two religions, and it was difficult to return to the old attitude of easy tolerance. The “rene- gades” found their position altered for the worse, and under Mohammed they were jealously excluded from all the higher offices of state.

A series of revolts showed how prevalent was the feel- ing of discontent. The Gothic family of Beni-Cas{, which

-had embraced Mohammedanism in order to advance itself,

had become extremely powerful in Aragon. Mus4, the head of this family, made himself master of Saragossa, Tudela, and Huesca, concluded a close alliance with Toledo, which had again recovered its independence, and claimed to be the “third king in Spain.” Musd’s death in 862, in a war with Ordofio I. of Oviedo, enabled Mohammed to regain Tudela and Saragossa, but his troops were soon expelled by Musé’s sons, and the Bent- Casi, with

the help of Alfonso IIL, were for a long time able to bid defiance to the authority of the emir. About the same time an independent state was formed in the west by Ibn-Merwan, a renegade of Merida. But by far the most formidable of these risings was that of ‘Omar b. Hafstin, who began as a brigand in the mountains of Andalusia, but whose castle at Bobastro became the centre of all the dissatisfied Christians and renegades of the south. Neither Mohammed nor his son and successor Mondhir (886-888) could reduce this impregnable fortress, and for years ‘Omar was the real ruler of Andalusia, His authority was far greater than that of the emirs had ever been; his administration of justice was rude but efficient; and the Arab historians maintain that a girl laden with treasure could in his time cross the mountains in safety. The premature death of Mondhir, a brave and chivalrous prince, gave the succession to his brother “Abdallah (888- 902), who ascended the throne at a very critical moment. Not only had the rising of the Christians and renegades assumed an almost national character, but the Arab nobles had taken advantage of the general disorder to assume the independence that was so congenial to them. ‘Abd- allah, considering the latter danger the nore formidable, sought to gain over the Spaniards, and even offered Ibn Hafsin the government of Regio, on condition that he would acknowledge himself as sovereign. But the negotiation came to nothing, and the only result was to

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‘Abd al- Rahman.

OMAYYADS, 822-1031. |

provoke the indignation of his own race against the emir. Luckily for him the Spaniards had an old debt to pay off against the Arabs, who had long treated them with insufferable contempt. In various districts a desperate civil war broke out, which was destructive of all law and order, but was not directly aimed against the central Government. The most violent struggle was in the pro- vince of Elvira, where for a time the natives got the upper hand, and it was only after a desperate conflict that the Arab domination was maintained by the heroism of two successive leaders, Sauwar and Said. In Seville a similar contest arose, and ‘Abdallah, after attempting in vain to hold the balance between the two parties, was at last compelled to espouse the cause of the Arabs. An insurrection, in which the life of Mohammed, the emir’s eldest son, was in imminent danger, was punished with ruthless severity; but it was the Arab nobles who profited by the success to make themselves absolute masters of the province. The central authority was almost powerless. Most of the provincial governors had thrown off all con- nexion with Cordova, and the others only rendered obedience when it was convenient to themselves. But at the moment when matters seemed at their worst the tide turned. In 890 ‘Abdallah won his first victory over Ibn-Hafstin, and during the remainder of his reign he gradu- ally recovered power in the revolted provinces. The work was continued by his son and successor, “Abd al- Rahman (or Abderame) III. (912-961), the greatest of the rulers of Cordova. Under this prince, who at last assumed the title of caliph, the unity of Mussulman Spain was for the time restored.

No sooner had ‘Abd al-Rahman completed the first part of his task by the reduction of the family of Ibn-Hafstin than he found himself confronted by two dangers. In Africa the Fatimites were establishing a great empire, and it

was almost certain that they would turn their attention to Spain as soon as their power was secure in the southern continent. In the north the Christian states had profited by the long anarchy among their old foes and were assuming a very threatening attitude. Alfonso III. had moved his capital across the mountains to Leon, and Sancho had recently created the kingdom of Navarre. As regards Africa, ‘Abd al-Rahman contented himself with encouraging aud subsidizing the princes that still held out against the Fatimites, and with obtaining possession of Ceuta, so as to have complete command of the straits. The northern danger was the more pressing. In 914 Ordotio II. made a successful raid into the territory of Merida, and two years later he defeated the army which had been sent to avenge the insult. Although Merida had not yet returned to submission, “Abd al-Rahman was determined to conciliate his subjects by proving his ability to defend them. He spared no pains to collect a magni- ficent army, and his efforts were rewarded in 918 bya great victory over the combined forces of Leon and Navarre. This was the first of a series of successful campaigns, in the course of which he penetrated as far as Sancho’s capital, Pamplona. But his victories brought him little beyond glory and revenge. As soon as his troops were withdrawn, the enemy showed himself to be really unconquered. In 921 Ordofio is said to have advanced within a day’s journey of Cordova, and in 923 Sancho excited a panic in Mussulman Spain by the cap- ture of Viguera. But the disorders in Leon that followed Ordojio II.’s death were a great blow to the Christians, and enabled ‘Abd al-Rahmdn to complete his work of internal reorganization and to turn his attention to resist- ing the Fatimite conquest of Mauretania. On the death of Sancho, his widow Tota recognized the caliph as suze- rain of Navarre.

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In his later years “Abd al-Rahman was less uniformly successful. The Arabs were disgusted by his policy of excluding the nobles from all share in the government and of filling the chief offices with ‘‘Slavs,” the generic title for all foreign servants of the court. Ramiro II. had succeeded in restoring unity to Leon, and resumed the warlike policy of his predecessors.

In 939 he inflicted a serious defeat upon the army of the caliph at Alhandega, and was only prevented from following up his victory by a quarrel with the famous count of Castile, Fernan Gon- zales. The divisions which followed Ramiro's death were an additional advantage to "Abd al-Rahman; and in 960 he gained the most conspicuous success of his reign when his troops restored the deposed Sancho J. to the throne of — This was almost his last act, as he died in October

961.

"Among the Omayyad princes of Spain 'Abd al-Rahman III. incontestably holds the first place. His achievements bordered on the fabulous. He had found the empire in a state of anarchy and civil war, divided amongst a crowd of chiefs of different race, exposed to constant raids from the Christians of the north, and on the verge of being absorbed either by Leon or by the Fatimites. In spite of innumerable obstacles he had saved Andalusia both from itself and from foreign rule. He had given to it internal order and prosperity and the consideration and respect of foreigners. He found the treasury in disorder ; he left it in the most flourishing condition. A third of the annual revenues, which amounted to 6,245,000 pieces of gold, sufficed for the ordinary expenditure; another third was kept as a reserve; tle rest was devoted to buildings. The condition of the country was equally prosperous. Agriculture, industry, commerce, the arts and sciences, flourished together. The foreigner was lost in wonder at the scientific system of irrigation, which gave fertility to lands that appeared most unpromising. He was struck by the perfect order which, thanks to a vigilant police, reigned in the most inaccessible districts. Commerce had developed to such an extent that, accord- ing to the report of the superintendent of the customs, the duties on imports and exports constituted tlle most con- siderable part of the revenue. A superb navy enabled 'Abd al-Rahman to dispute with the Fatimites the empire of the Mediterranean, and secured him in the possession of Ceuta, the key of Mauretania. A numerous and well-disciplined army, perliaps the best in the world, gave him a preponder- ance over the Christians of the north. The most haughty sovereigns were eager for his alliance. Ambassadors were sent to him by the emperor of Constantinople and by the sovereigns of Germany, Italy, and France."— Dozy, iii. 90.

The new caliph, Al-Hakam II. (961-976), was distin- Al- guished as a patron of literature and a collector of books. Hakam The number of volumes in his library was reckoned at ~”

400,000, and he is said to have read and annotated them all. For politics he had comparatively little taste. Naturally averse to war, he was only forced into hostilities by the obstinate refusal of Sancho I. to fulfil the treaty which he had signed on his restoration, and he hastened to conclude peace on an empty renewal of the treaty. The disorders which arose during the minority of Ramiro III. put an end to all danger on the side of Leon, and the death of Fernan Gonzales in 970 removed a ruler who had always been a thorn in the side of the infidel. The most notable event of Al-Hakam’s reign is the rise to influence of a man who was destined to play a more prominent part in the history of Spain than any of the caliphs, not exclud- ing “Abd al-Rahman III. Mohammed Ibn-abi—Amir was the descendant of a family which had long been distin- guished in the civil administration, but had never been admitted to the higher nobility of the sword. From his XXII. — 40

Hisham it,

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earliest youth he was inspired with the thought that he was destined to rule. His ability and the favour of Al-Hakam’s favourite wife, Sobh, combined to bring about his speedy advance, and by the time of the caliph’s death he held a high office in the court. Al-Hakam had done all in his power to secure the succession of his son by Sobh, Hisham, a boy of ten years of age. But the chief eunuchs, dreading the influence which a minority would give to Moshafi, the Adjib or chief minister, sought to give the crown to Moghira, a brother of Al-Hakam. With the help of Ibn-abi-“Amir, Moshafi defeated the plot; Moghira was put to death, and Hisham succeeded to his father’s throne. But he never really ruled. Ibn-abi-“Amir, still aided by Sobh, whose lover he was popularly supposed to be, gradu- ally rose to absolute power. Moshafi, a man of little real ability, was charged with peculation and deposed, and his younger rival was appointed Adib in his place. To free himself from all danger fro the mob at Cordova, the all-

powerful minister transferred the government and the court to Zahra, which he built for the purpose. There the young caliph was immured in a magnificent palace, and was carefully secluded from' all contact with public affairs. His education was purposely neglected, and he never made the slightest effort to free himself from his gilded imprisonment. To remove all obstacles to his authority, Ibn-ab{-"Amir reorganized the army. He filled the ranks with Moors from Africa and with Spaniards from Leon, Castile, and Navarre, whom he bound to his cause by lavish generosity. The old tribal distinctions among the Arabs, so long the source of jealousy and quarrels, he completely disregarded in the forming of regiments, and thus completed the work of assimilation which 'Abd al-Rahmin III. had commenced. Though trained to the study of the law and experienced only in civil affairs, he speedily mastered the art of war and con- ciliated the popular favour by victories such as no caliph had ever won. In 981 he defeated Ramiro III. and his allies in a pitched battle, took Zamora and Simancas, and was only prevented by a storm from capturing Leon. On his return he assumed the name of Almansér (victorious by the help of God), by which he is usually known in history. Bermudo II., whom the nobles of Leon raised to the throne in place of the defeated Ramiro, could only secure himself by paying tribute to the ruler of Cordova. In 985 Almansér invaded Catalonia, which had hitherto been respected as a Frankish fief, drove the count Borrel into exile, and took and sacked Barcelona. When Bermudo II. sought to free himself from the harsh conditions that had been imposed upon him and drove the Moslem troops from his kingdom, Almansér took a terrible revenge. In 987 he stormed Coimbra and razed it to the ground. In the next year he advanced into the heart of the kingdom. Leaving Zamora, where Bermudo awaited him, on one side, he marched against the city of Leon, and took it after an obstinate resistance. The fortifications were utterly destroyed, with the exception of one gate, which was left to commemorate the victor's triumph. Zamora was then attacked, and Bermudo fled fe his northern territories, which were all that were left to im.

In spite of these successes Almansér had to face more than one conspiracy on the part of those who were jealous of his pre-eminence. The most formidable of these was fomented by his former patroness, Sobh, who found her- self more and more thrust into the background. She succeeded in gaining over her son, but Almansér soon recovered his ascendency over the

feeble caliph, from whom he extorted a document transferring all powers to himself. A refusal of Bermudo II. to continue the payment of

tribute led to the last and most famous of his campaigns, |

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in which he took Compostella and carried off the gates and bells from the shrine of St James, the patron saint of the Christians. At the same time his generals were gaining victories in Mauretania, and his power was almost equally dreaded on both sides of the straits. His death in 1002 deprived the Spanish Moslems of the greatest ruler and warrior, considering his origin, that their race had pro- duced. His campaigns against the Christians, which are reckoned by the Arab historians as more than fifty, were almost uniformly successful. Three capitals—Leon, Pam- plona, and Barcelona—had been conquered by him. His home administration was as successful as his generalship, and much of his attention was devoted to the construction of roads and bridges, so as to facilitate communication between all parts of Spain. He was a zealous, if not an intelligent, patron of literature, but his real interests were always practical. Finding that he was suspected by the people of a laxness in religious belief, he did not hesitate to prove his orthodoxy by an act of politic vandalism. Taking the chief ‘wlemd into the library of Al-Hakam IL, he begged them to collect all the books on philosophy, astronomy, and other prohibited sciences; and when they had completed their task he ordered the condemned books to be burnt on a vast pile.

Almansér had been absolute in everything but name. He had desired at one time to take the final step and to supersede the incapable Hish4m II. in the caliphate, but he dreaded the inveterate attachment of the people to the Omayyad dynasty. He had, however, taken steps to secure the continuance of his family in power. His son, “Abd al-Melik Mozaffar succeeded to the office of Adjib, and ruled with the same authority and success as his father. But the position was really untenable. An _ hereditary monarchy is intelligible, but an hereditary line of chief ministers is not. The early death of ‘Abd al-Melik (1008) gave the government to the weaker hands of his

brother ‘Abd al-Rahman. The latter was hated by the Moham- medan clergy, partly because he indulged in the use of wine, and partly because his mother had been born a Christian. She was the daughter of a Sancho, either the king of Navarre or the count of Castile, and her son was nicknamed Sanchol, or the little Sancho. The Amirids were not popular. Their exaltation irritated, not only the families that claimed a higher rank by birth, but also those who thought themselves their equals. Without having any actual grievance to complain of, the people vaguely desired a change of rulers. It was easy under the circumstances to effect a revolution. When Sanchol returned from a campaign against Leon in 1009 he found that his power had been completely overthrown. Moham- med, a great-grandson of “Abd al-Rahmaan ITI., had headed an insurrection in the capital and had gained possession of the caliph’s person. Sanchol was put to death, and the magnificent palace which his father had erected at Zahra was razed tothe ground. The Amirids fell, and with them ended the grand period in the history of Moslem Spain.

Mohammed was not long content with the office of Moham- Scrupling to kill the unfortunate Hisham, who had med.

hajrb. never made any opposition to the acts that had been com- mitted in his name, he closely imprisoned him, and buried the corpse of a Christian who bore a strong personal resemblance to the caliph. Mohammed was now raised to the caliphate, and assumed the title of Al-Mahd{ (guided by God). But his reign was not destined to be long or un- troubled. He had been raised to power by a combination of orthodox Moslems, of the so-called “Slavs” (foreign slaves serving in the royal harem and in the army of the caliph) and of Berbers, and he alienated each in turn. The Berbers, who formed an important part of the army, were the first to revolt. Raising the standard of Solei-

Soleiman.

Ham- tZ . mudites.

Decline of the Omay- yads.

OMAYYADS, 822-1031. |

man, a member of the Omayyad family, they obtained assistance from Count Sancho of Castile, marched upon Cordova, and inflicted a serious defeat upon the troops which Mohammed imprudently led out to meet them. Mohammed endeavoured to strengthen his position by producing Hisham II., whom he had given out as dead. But the Berbers refused to be turned from their purpose, and occupied Cordova in November 1009. The wretched Hisham was compelled to abdicate in favour of Soleiman, and returned to his prison. Mohammed, who had escaped to Toledo, now turned for assistance to the Christians, who, by a sudden change of circumstances, had become the arbiters of Mohammedan affairs. With the help of troops from Catalonia he recovered Cordova, which had to pay in constant sieges a terrible penalty for the levity with which it had welcomed the fall of the Amirids. In pursuing the Berbers, however, Mohammed was again defeated. The Slavs, who had hitherto supported him for their own ends, determined to desert the unsuccessful caliph. Hisham IJ. was again dragged from prison to assume the throne, and Mohammed was murdered in his presence. Wadih, the leader of the Slavs, was now Adjib, and aspired to play the part of Almansér. But his resources were at an end. An attempt to increase the taxes roused general indignation, and he was put to death by his own followers (1011). Two years later the nominal reign of Hisham II. came to an end. Cordova was taken by Soleiman and the Berbers, and the caliph disappeared

(1013). His fate remains one of the unsolved secrets of history. Soleiman was now formally proclaimed caliph, but his

power was more nominal than real. The provincial governors had taken advantage of the civil war to make themselves independent, and Soleiman's authority was only recognized by five towns—Cordova, Seville, Niebla, Oksonoba, and Beja. Even within this district he soon found an opponent. The Slavs were unwilling to submit to the domination of the Berbers, whose excesses the caliph was unable to chéck. Their most powerful leader, Khairén, had been badly wounded in the late struggle, but on his recovery he determined to avenge his defeat. He found a capable ally in 'A b. Hammid, a descendant of the famous son-in-law of the Prophet, but whose family had almost ceased to be Arab in their long residence in Africa. 'Alf relied not only upon the Slavs but also upon the Berbers, who regarded

Soleiman with contempt, and looked upon ‘Alf as a fellow-countryman. Soleiman’s government was easily overthrown (1016), but Khairdn’s attempt to discover Hish4m II. was unsuccessful, and he had to acknowledge ‘Ali as caliph and to content himself with the office of hdjib. The Hammiudite dynasty, thus established in Cordova, was not destined to enjoy a long tenure of power. Khairdén revolted against a sovereign who was too able and spirited for the part of a Hisham II, and set up an anti-caliph in the person of another Omayyad, “Abd al-Rahman IV., a great-grandson of ‘Abd al-Rahman III., who took the name of Mortadé. ‘Ali was murdered in his bath (1017), but his supporters rallied round his brother Kasim. For five years a confused civil war raged which was complicated by the hostility to Kasim of ‘Ali’s son, Yahyé. In 1023 Mortada was slain in battle, and the Omayyad party gave the crown to another ‘bd al-Rahman, a brother of the detestable Mahdi. Two months later the young prince was murdered, but his successful rival, Mohammed b. ‘Abd al-Rahmdn was driven from Cordova in 1025. The Hammuidite caliph, Yahya, now occupied the capital, but was slain in attempt- ing to reduce the rebellious wdli of Seville to obedience. Hisham III., a brother of ‘Abd al-Rahmdn Mortad4, was now raised to the throne. But all central government

was by this time at an end; no revenues could be drawn from the rebellious provinces; and in 1031 Hisham abdicated a title which had ceased to have any meaning, and sought peace and retirement in the neighbourhood of Saragossa. His death five years later was almost unnoticed even in Cordova. With him ended the Omayyad dynasty, which had ruled in Spain for nearly three centuries, and which had produced princes worthy to be ranked with the greatest of their contemporaries. Its decline dates from the time when it allowed power to slip from its hands and to be wielded by ambitious ministers.

Ever since the death of Almansér Moslem Spain had been gradually splitting up into a number of independent principalities. With the extinction of the Omayyads the last semblance of unity disappeared. ‘The Berber generals shared the south; the Slavs ruled in the east; the rest was divided

either among successful adventurers or among the small number of noble families who had been fortunate enough to escape the blows which ‘Abd al-Rahman and Almansér had struck at the aristocracy. Finally, the two most considerable towns, Cordova and Seville, were organized as republics” (Dozy). Into the history of the numerous dynasties which were established during this period it is impossible to enter here, but the reader will find the subject not only fully but attractively treated in the fourth volume of Dozy’s Histoire des Musulmans d@’Es- pagne. See also Plate VII.

It was of additional moment that this disruption of the States of Mussulman power was contemporary with the formation Castile

of the great Christian states of Aragon and Castile. They were not slow to profit by the opportunity held out to them. It was in this century that the Christian cause found a champion in the famous Ruy Diaz Campeador, who under the name of “The Cid” became the traditional hero of Spanish medieval history. Ferdinand I. of Castile (1037-1067) captured the strong places of Viseu, Lamego, and Coimbra, and was only diverted from the conquest of Toledo by the humble submission of the emir, who undertook to pay tribute to the Christian king. The unfortunate division of his territories between his three sons gave occasion to civil wars, which were only ter- minated in 1072 by the reunion of the whole kingdom under Alfonso VI. Following up his father’s successes, Alfonso made himself master of Toledo, which once more became the capital of a Christian state. Meanwhile Ramiro I. of Aragon (1035-1063) drove the Moors from their last possessions in the counties of Aragon and Sobrarbe. His son, Sancho Ramirez (1063-1094), joined Alfonso VI. in an attack on Navarre which resulted in the partition of that state between the two kings, and commenced a war against the emir of Saragossa which ended, under his successors Pedro (1094-1104) and Alfonso I. (1104-1136), in the conquest of Huesca and Saragossa. The latter town became henceforth the recog- nized capital of Aragon.

This period is also important in another aspect. Relations Hitherto the Christian kingdoms of Spain had _ been with But the Rome,

naturally isolated from the rest of Europe. papacy, under the guiding hand of Hildebrand (Gregory VII.), was now making its ecclesiastical supremacy

a reality, and was not likely to tolerate independence even in the most distant members of the church. Aragon, which lay nearest to the other states of Western Christen- dom, made little difficulty about complying with the papal demands. Ramiro not only agreed to adopt the Roman ritual in his kingdom, but even sent tribute to Alexander II. Castile, lying farther distant, was more inclined to resent dictation. At a council at Burgos (1077) it was formally decided to retain the Gothic ritual. But Alfonso VI. realized the danger of isolating his state from the rest

Almor- The Christian victories of the 11th century seemed | gloriously begun by the capture of Tudela and Saragossa,

avid likely at one time to annihilate the Mohammedan power | but in 1134 he was completely defeated in the battle of

ae in Spain. From this fate, however, it was saved, not by | Fraga, a disaster which hastened his death. As he had

e Spain any internal strength, but by the arrival of assistance | no children, he bequeathed his territories to the great

(1069- from Africa. The emir of Seville, Al-Mo‘tamid, the most crusading order of the Templars. The Aragonese, however,

91). powerful of the Moslem princes, watched with profound refused to recognize this testament, and gave the crown to misgiving the progress of the Castilian arms. When | his brother, Ramiro IT. (1134-1137), who was brought out Toledo fell before Alfonso VI. he determined to appeal to | of a monastery to continue the dynasty. Ramiro fulfilled Yusuf b. Tashufin, the king of the Almoravids,—a con- | his duties by marrying a sister of the duke of Aquitaine, fedcration of Berber sectaries that had recently established | who bore him a daughter, Petronilla. At the age of two a vast empire reaching from the Senegal to Algiers. | the child was betrothed to Raymond Berengar IV. of Yusuf, who had established his capital at Morocco in | Barcelona, and Ramiro, leaving the administration of the 1069, was at this time eighty years of age, but he did not kingdom to his son-in-law, hastened to return to his hesitate to accept the prospect of a new field of conquest | cloister. Thus a permanent union was effected between and adventure. In

1086 he sailed from Ceuta to | Aragon and Catalonia, both of which passed in 1162 to Algesiras, the cession of which he had demanded as the | Petronilla's son, Alfonso II. But, if Catalonia was gained, price of his aid, and was at once joined by the forces of | another province, Navarre, was lost. The Navarrese had Navarre the emirs of Andalusia. Alfonso VI. hastened to obtain | long desired to recover their independence, and on the independ: j assistance from the king of Aragon and the count of | death of Alfonso I. they refused to acknowledge Ramiro, eit Barcelona, and witha larger force than had ever before | and chose a ruler of their own, Garcia Ramirez. Ramiro, been assembled in the Christian cause he met the Moors | who needed Garcia's generalship against a threatened in the battle of Zalldka (Sacralias), a few miles from | attack from Castile, recognized him, first as a vassal of Badajoz (October 1086). After an obstinate struggle | Aragon and afterwards as an independent king. Thus victory declared for the infidels, and Alfonso had great | Navarre regained its place among the kingdoms of Spain, difficulty in escaping with his life. Luckily for the | though it never enjoyed its old importance.

Castilians, Yusuf was recalled to Africa by the death of The main interest of Spanish history in the 13th Crusading his eldest son, whom he had left at Ceuta, and his victory, | century centres round the war against the Moors, which o'er. which might have been as decisive as that of Tarik, was | was beginning to attract the interest and assistance of the

not followed up. Alfonso even ventured to resume his | other European states. It was the age of the great ageressions, and laid siege to the important towns of | crusades, and Christendom was absorbed in the struggle

Murcia and Almeria. Mo'tamid, seeing that the danger | against the infidel, both in the East and West. Spain, like

was as great as ever, proceeded to Africa in person in order | Palestine, had its crusading orders, which vied with the

to urge the return of Yusuf. The Almoravid prince, on | Templars and Hospitallers both in wealth and military

whom the attractions of Andalusia had made a profound | distinction. The order of Calatrava was founded in 1158, impression, crossed again to Algesiras (1090), and this | that of St James of Compostella in 1175, and the order

time the predictions of the princes who had foreseen the } of Alcantara in 1176. The kingdom of Portugal, which

risk of calling in so powerful an ally were fully verified. | had risen with great rapidity in the 12th century, had a Postponing the task of resisting Alfonso, Yusuf set to work | no less distinguished order, that of Evora. These military

to make himself master of Andalusia. Mo‘tamid himself | priests, debarred by their profession from the ordinary

had to fly from his territories, after a futile appeal for aid | interests of humanity, gave a firmness and consistency to

to the king of Castile. Captured by the Africans, the | the Christian cause which had too often been sacrificed to

emir of Seville was condemned to end his life in close | the dynastic quarrels of the temporal princes. imprisonment. In the course of a few years the whole of The empire of the Almoravids, like so many of its Struggles } Moslem Spain was reunited under the king of Morocco, | predecessors, had soon begun to fall to pieces. It was too of Almor- and the death of the Cid in 1099 enabled the Moors to | large and unwieldy for permanence. Its real centre was Pilate | recover Valencia, which he had taken in 1094. This was | at Morocco, and the attention of the caliphs was absorbed hades. the last event of the reign of Yusuf, who in 1103 handed | in the affairs of Africa, while the extortion and misgov-

over the government to his son ‘Ali and returned to Africa, | ernment of their viceroys excited discontent among the

where he died three years later at the ripe age of a | Mohammedans of Spain. This state of things gave a hundred years. great advantage to Alfonso

VII. of Castile, who revived

Alfonso Alfonso VI. of Castile had raised his kingdom to such | the title of emperor of Spain, allied himself with Raymond

pre-eminence in the Peninsula that he had assumed the | Berengar of Barcelona and Aragon, and sought to emulate

asile. title of ‘ emperor of Spain.” Buta great disaster clouded | the achievements of his grandfather. For the second time his later years. In 1108 his only son Sancho perished | the Moorish power in Spain was only saved from dissolu- with the flower of the Castilian chivalry on the fatal field | tion by the arrival of reinforcements from Africa. As of Ucles, and most of Alfonso’s conquests passed into the | happened so often in Mussulman history, a movement hands of the victorious “Ali, In 1109 the emperor died, | which began with religious reform ended with the forma- leaving the succession to his daughter Urraca, the widow | tion of an empire. Mohammed b. ‘Abdallah, an Arab

Tempo- of Count Raymond of Burgundy. In order to secure the | from Mount Atlas, gave himself out as the expected

Aaah ‘i unity of the Christian kingdoms, Urraca was married to | Mahdi, and formed a sect known as the Almohades

Castile Alfonso il of Aragon (1104-1134), who imitated his | (Unitarians). His disciple, “Abd al-Mu’min, was chosen

and father-in-law in assuming the imperial title. But the | as his successor, and soon overthrew the power of the

Aragon. marriage failed to produce the desired result. Urraca | Almoravids. TAshufin, ‘Ali’s son, made a vigorous but

of Europe, and of his own accord conceded the demands of Gregory VII. From this time Christian Spain was directly

connected with Rome, and became the most faithful, if not the most servile, of Roman Catholic countries.

induced the Castilian nobles to revolt against the Aragonese rule and to set up Alfonso VII., her son by her first marriage. A civil war ensued, which was only ended

Sor 2 ie

in 1127 by the separation of the kingdoms. Alfonso I. retained Aragon and Navarre, while Castile, with Leon and Galicia, passed to Alfonso VII. Alfonso of Aragon renewed the war against the Moors which he had so

ineffectual resistance, and the conqueror crossed the sea to complete his work by the reduction of Spain (1146). The success of ‘Abd al-Mu’min, if less rapid than that of Yusuf,

Separa- tion of Castile and Leon.

Downfall of the Almo- hades,

Castile and Leon reunited,

was quite as complete. The Almoravids appealed to the Christians, and both Castile and Aragon came to their aid. Alfonso VII, with the help of the Genoese and Pisan fleets, besieged and took Almeria, while Raymond Berengar captured Tortosa. But tliese successes were only teniporary. In ten years the Almoravids had been driven from the mainland, and only a small remnant found refuge in the Balearic Islands. Almeria was again wrested from the Castilians, and in 1157 Alfonso VII. died, the last of the series of ‘emperors of Spain.” His territories were divided between his two sons, the elder, Sancho, succeed- ing to Castile, while Leon went to his brother Ferdinand. The quarrels which resulted from this: partition would probably have been fatal to the Christian cause but for the exertions of the great

knightly orders. The successors of ‘Abd al-Mu’min (d. 1163), Yusuf and Ya‘kib Almansér, continued to advance the power of the Almohades, and the latter inflicted a crushing defeat at Alarcos (1195) upon Alfonso VIII. of Castile, who had succeeded his father Sancho in 1158. Castile was at this time dis- tracted by the feuds of the great families of Lara and Castro, and the count of Castro, who had been worsted by his rival, rendered conspicuous service to the infidels in the battle. Even Sancho of Navarre, out of jealousy of the rival kings, concluded an alliance with the Almo- hades.

Luckily for the Christians Ya‘kub, the most formidable opponent they had had to face since the great Almansér, died in 1199, and his death was followed by a rising of the Almoravids which took five years to suppress. Mean- while successful efforts had been made by the pope and clergy to arrange the differences among the Christian states, and a confederation was formed between the five kings of Castile, Aragon, Leon, Navarre, and Portugal. When Ya‘ktib’s successor, Mohammed al-N4sir, had suc- ceeded in restoring order in Andalusia and prepared to march against the Christians, he was confronted by the allies in the famous battle of Las Navas de Tolosa, in the Sierra Morena (July 16, 1212). After an obstinate struggle the Christians gained a decisive victory, and their success decided the fate of Spain. The religious impulse which had constituted the original strength of the Almohades had come to an end; they were regarded as infidels by the orthodox Moslems, and the first failure necessarily led to their downfall. The cruelties with which they sought to repress the rising discontent only excited popular feeling against them, and when Al-Mota- wakkil, a descendant of the family of Ibn Héd which had once ruled in Saragossa, raised the standard of revolt in Andalusia, the bulk of the population joined him, and Al-Ma’mun, the last of the Almohades who held any power in Spain, fled to Africa in 1232. The chief result of their rule was to depress the Arab element in the Mus- sulman population of Spain. Hitherto the Arabs, though numerically in a minority, had retained the preponderance due to their original prestige. Henceforth the infidels of Spain can only be considered and spoken of as Moors.

After the fall of the Almohades the triumphs of the Christian arms were rapid and decisive. The separation of Castile and Leon, which had been

productive of so much disaster, was finally terminated in 1230 by the accession of Ferdinand IIT., the son of Alfonso IX. of Leon and Berengaria of Castile. The province of Estre- madura had been annexed to Leon by Alfonso IX., and now formed part of the united kingdom which under Verdinand III. rapidly extended itself southwards. In 1233 the Castilian army won a great victory over the Moors under Al-Motawakkil, and three years later Ferdin- and himself captured Cordova, so long the capital of the Mohammedan rulers and one of the most wealthy and

beautiful cities of Europe. In 1237 Al-Motawakkil was assassinated, and with him perished the last semblance of Moorish unity. The numerous emirs became independent rulers, and the most powerful of them, Mohammed Ibn al-Ahmar of Granada, became a tributary of Castile and ceded the strong town of Jaen (1246). In 1248 Seville, the second of the Mohammedan cities, submitted to Ferdinand, who within a few years annexed Xerez de la Frontera, Medina Sidonia, and Cadiz. By these acquisitions the frontier of Castile was extended to the southern coast before Ferdinand ITI.'s death in 1252. A considerable number of Moors submitted to the rule of Castile, but the Christians had become intolerant during the long war, and most of the conquered population sought a new home either in Granada or in Africa.

Meanwhile Aragon had taken a no less important part Successes

in the struggle. Pedro I. (1196-1213), the successor of Alfonso II., had excited the discontent of his subjects, partly by seeking coronation from Pope Innocent IIL, and partly by his excessive taxation. The "union" of nobles and towns compelled the king to diminish his ex- actions. Pedro took part in the battle of Navas de Tolosa, but his attention was diverted from Spanish affairs by his relationship with Raymond of Toulouse, which involved him in the Albigensian crusade, where he met his death. His son James I. (1213-1276), however, resumed the war against the infidels, and won in it the title of 'The Conqueror." With the help of his Catalonian subjects, at that time perhaps the most accomplished sailors in the world, he conquered the Balearic Islands (1229-1233), which had long been a

stronghold of the Moslem and a centre for piratical attacks upon the Christian states. Still more important was his reduction of Valencia (1238), which had once before been conquered by Ruy Diaz. The last achievement of the great king was the conquest of the province of Murcia (1266), the last of the Moorish territories in Spain except Granada. Murcia, though reduced by Aragon, was handed over to Castile. By the acquisition of Algarve Portugal had already acquired frontiers which correspond roughly to those which it has at the present day.

From the latter half of the 13th century the crusading energy of the Spaniards came to a sudden standstill, and the Moors were allowed to retain possession of Granada for more than two centuries. The causes of this abrupt termination of the war before it had reached what seemed to be its natural and legitimate end have often been dis- cussed. In the first place Castile was henceforth the only state which was directly interested in the war. By the acquisition of Sevilleand Murcia it had separated Granada both from Portugal and Aragon, neither of which states had henceforth any conterminous frontier with the Moors. The state of Granada, though small when compared with Castile, was by nature easily defensible, as was made amply apparent in the last campaigns under Ferdinand and Isabella. The attention of Castile was often distracted by foreign interests or by internal dissensions. Again, the Moors were more concentrated and homogeneous in Granada than they had been when their rule was more extensive. The large subject population, many of whom were Christians or renegades, had been a great source of weakness, and this no longer existed. They, like their opponents, had given up the tolerance that had once dis- tinguished them, and hardly any but true Mohammedans can have remained in Granada. Something, too, must be attributed to the wily policy and well-timed submission of Mohammed Ibn al-Ahmar, who even gave assistance to Ferdinand III. against the other Moorish emirs.

With the termination of the crusade Spanish history loses what little unity it had possessed for the last two

of Aragon.

Cessation of the crusade,

Moorish

Granada.

CASTILE

(1252- 1479).

Consti- tution of the king- dom.

centuries, and it becomes necessary to follow the fortunes of each state separately. Into the history of Granada it is as impossible as it would be tedious to enter within the limits of this article. It is a long record of revolution and civil war, in which nothing above the most petty personal interests are concerned. There is no change of dynasty, but one perpetual struggle between members of the same family. It would not be easy to enumerate even the names of the successive rulers, many of whom were several times deposed and restored to power. Even during the final struggle, when the existence of the king- dom was at stake and the one hope of resistance lay in unity, the national cause was sacrificed to the jealous rivalry of three claimants of the throne. The history of Castile and Aragon, on the other hand, assumes a new character and interest when the attention of kings and people ceased to be absorbed in the overwhelming excite- ment of a great religious war.

The constitution of Castile traced its origin back to the institutions of the Visigoths, which had been carried by the original refugees into the mountains of Asturias, but it had been profoundly modified by the circumstances under which the kingdom had risen to greatness. The war with the infidel, while it had given strength and unity to the monarchy, had at the same time compelled the granting of considerable independence to the nobles and the great towns. ‘The religious character of the war had enabled the clergy to retain greater powers than they possessed in any other European country, though they had lost that omnipotence which they had enjoyed under the Visigoths. Their councils and synods, which had once formed the sole constitutional machinery of the country, had been

superseded by the secular assembly of the cortes. The early' history of the cortes is wrapped in great obscurity, but its main outlines are fairly discernible. Originally a meeting of the great nobles and royal house- hold, it had attained the position of a national assembly in 1162, when the deputies of the chief towns were admitted to membership. Its powers and procedure developed gradually, and naturally varied according to the character of the different kings. Its first functions were the approval of legislation and the granting of extraordinary taxation, though it is difficult to say when its sanction of such measures was regarded as essential. The assembly consisted of the three estates—clergy, nobles, and citizens —who deliberated sometimes separately and sometimes together. Representation existed only in the case of the third estate, whose members were elected at first by all free citizens and afterwards by the municipal magistrates. The number of cities which sent deputies varied very much at different times. As to what constituted the right of attendance in the case of the nobles and clergy there is great obscurity, but it probably depended partly upon tenancy-in-chief and partly upon royal summons. As both classes were exempt from taxation, their functions were less important than those of the third estate, and on more than one occasion we find meetings of the cortes in which the upper orders took no part. The weakness of the assembly, as contrasted with the English parliament, lay mainly in the absence of any class like the knights of the shire to form a link between the burgesses and the great nobles. In early times, probably the most effective check upon the royal power lay in the independent §privi- leges claimed and exercised by the chief feudatories. Their tenants were bound to feudal service; and the right of private war made them petty sovereigns on their own estates. The long feud of the families of Castro and Lara is only a notable example of the difficulties which the central power had to contend with. For the protec- tion of their privileges, both nobles and towns claimed

the right of forming an armed union or hermandad, which resembled the right of "confederation" exercised in later times by the nobles of Poland. The ordinary adminis- tration, except when war was going on, was local

rather than central. The nobles had judicial powers within their domains, though it appears that these were granted by the crown rather than derived from their territorial position. The bishops and higher clergy administered ecclesiastical jurisdiction as in other countries, and at the same time exercised the same powers as the secular lords over the large estates which the piety or superstition of generations of benefactors had conferred uponthem. ‘The connexion with Rome, though established in the 11th century, had not become very close before the middle of the 12th century ; the appointment to most of the benefices was in the hands of the crown, and the church of Castile was more independent even than that of England. In the cities and great towns, most of which included a consider- able extent of adjacent territory, the administration both of justice and of local affairs was in the hands of elected corporations, which had received grants of liberties at the time when they had served as important outposts against the attacks of the infidel. In theory, probably, there existed in all cases a right of appeal to the crown, but this was a right which, in the nature of things, was rarely exercised. The attempt of subsequent kings to control or supersede the local administration of justice by the appointment of corregidores was always resisted as an encroachment upon traditional liberties. Even the taxes, though granted by a central assembly, were assessed and collected by the local officials, and jealous care was taken to secure that they should only be applied to the purpose for which the grant had been made.

Ferdinand [IL, “The Saint,” was succeeded in 1252 Alfonso The new king gave the Wise, |

by his son, Alfonso X., ‘The Wise.” up the military policy of his father, and the only territorial acquisition of his reign, the province of Murcia, was won for him by the arms of Aragon. On the other hand, he was a great student and patron both of literature and science, especially of astronomy. He invited to his court the most distinguished scholars not only in Christian but also in Arabic lore, and he raised the university of Salamanca to rank with the great schools of Paris and Oxford. He also turned his attention to legislation, and his code, the Svete Partidas, is one of the great legislative monuments of an age which produced the L¢ablissements of St Louis and the great statutes of Edward I. Com- piled under the influence of the civil and canon laws, the Stete Partidas was in some respects disadvantageous,

especially as admitting papal encroachments upon the ecclesiastical power of the crown. Though drawn up under Alfonso X., it did not finally supersede the ancient fueros until 1348, when it was formally approved by the cortes. But Alfonso's reign, though distinguished in the history of literature and law, was not on the whole a prosperous period for Castile, and it was to a great extent his fault that the opportunity of driving the Moors from the Peninsula was allowed to slip. On the fall of the Hohenstaufen he came forward as a candidate for the imperial dignity, and through the period known as the "oreat interregnum " he and Richard of Cornwall, chosen by rival parties among the electors, bore the empty title of king of the Romans. The expense of bribing the electors and of maintaining a magnificent court involved Alfonso in pecuniary difficulties and compelled him to alienate his subjects by imposing heavy taxes and by debasing the coinage. But the hardships inflicted on the country by the king's futile ambition were as nothing compared with those which arose from a disputed succes- sion to the crown. By the old custom of Castile nearness

Sancho IV.

Ferdinand infant son Ferdinand IV. (1295-1312).

| TA

CASTILE, 1252-1479. |

of blood gave a superior claim to priority of descent, so that the second son of a king would be preferred to the children of the eldest son. The Siete Partidas recognized the more modern rule of succession ; but, as that code had not yet been accepted by the cortes, its ruling had no bind- ing force. The question arose in 1275, when Alfonso's eldest son, Ferdinand de la Cerda, perished in a campaign against the Moors, leaving two sons, Ferdinand and AI- fonso. The king's second son, Sancho, was at once declared heir to the crown, but the widow, Blanche, announced her intention to uphold the rights of her children, and she received support both from Pedro IIL. of Aragon and from her brother, Philip III. of France. A long war followed, which was further complicated when Alfonso X., having quarrelled with his son, proposed a partition between the rival claimauts. So far did the dispute go that the Moors, instead of being attacked in Granada,

were called upon to give their assistance to the factions among their enemies.

The result of these internal quarrels was to increase the already excessive power of the noble families, and this was productive of further disturbances in the reign of Sancho IV. (1284-1295). The family of Castro seems to have sunk into comparative insignificance, but the Laras had found a new rival in the house of Haro. The whole state was divided by their feuds, and the king found himself degraded from the position of arbiter to that of a partisan. The condition of affairs became even worse when the death of Sancho gave the crown to his In an early stage of society a minority is always an evil, and Castile at this period had more than a fair share of such misfortunes. The crown was contested, not only by the late king's brother John, but also by Alfonso de la Cerda, who returned from France to maintain a claim which had already been negatived by the accession of Sancho. The king of Aragon supported Alfonso, while the rulers of Portugal and Granada mixed themselves up in the quarrel to obtain advantages for themselves. The regency had been bequeathed by Sancho to his widow, Maria de Molina, but her marriage had been declared uncanonical by the pope, so that a slur was cast upon the legitimacy of her son. Nothing but the great skill and capacity dis- played by the regent could have secured victory under such discouraging circumstances. By mingled submission and defiance she disarmed one opponent after another, induced the pope to ratify her marriage, and finally suc- ceeded in transferring the government to her son on his coming of age. Ferdinand's harshness provoked a renewal of the conflict ; but ultimately the treaty of Camillo (1305) put an end to the struggle, and compensated the princes of La Cerda with lavish cessions of territory. Alfonso preferred to remain an exile rather than to abandon his claims, but his son accepted the proffered conditions and became the founder of the great house of Medina Sidonia. But the treaty made little difference to the country. Disorder and civil war had become a chronic disease in Castile, and Ferdinand IV. was himself too deeply imbued with the spirit of the age to maintain peace with a strong hand. The story that is told about his death illustrates his character. In spite of a solemn promise made twice during his reign that every accused person should have a fair trial, he ordered two brothers of the name of Carvajal to be put to death without the pretence of judicial forms. They summoned him to appear

before the supreme tribunal within thirty days, and on one morning within that period he was found dead in his bed. ‘The cause of his death was never ascertained, but the people regarded the event as a judgment, and he has received from this story the name of “The Summoned” (Zl Emplazado).

Ferdinand IV.’s death was followed by another and still

longer minority, as his son, Alfonso XI. (1312-1350), Alfonso The regency was XL

was only two years old at the time. claimed by the late king’s brother Don Pedro and by his uncle Don John, and from this dispute arose a civil war fiercer and more destructive than any of its predecessors. The central authority ceased to exist; both nobles and towns had to protect themselves as best they could; the royal domains were seized upon by rapacious neighbours, and the person of the young king was only saved by his being concealed in the cathedral of Avila. At last the mediation of the pope and of Maria de Molina brought about a compromise, and the administration was divided between the two regents,—Pedro taking the south-eastern and John the north-western provinces (1315). But a few years later they were both killed in a joint campaign against the emir of Granada, and the disorders broke out with worse violence than ever (1319). Four “ infants,” as the members of the royal family were called, contended for the government, and the assumption of power by the king himself at the age of fifteen failed to put a stop to their feuds. The character of Alfonso XI. was as harsh and brutal as was to be expected in a man who had been educated in such troubled times. He invited his cousin, a younger Don John, to a banquet in the royal palace, and treacherously murdered him. His treatment of his first wife, whom he divorced in order to marry a daughter of the king of Portugal, provoked her father, Don John Emanuel, a nephew of Alfonso X., to head a rising which took years to suppress. The Portuguese princess was also repudiated by her husband, who had been inspired with a passion for the beautiful Eleanor de Guzman, and the forces of Portugal were added to those of the Castilian rebels. After a long struggle (1335-1337) Alfonso XI.

succeeded in reducing his opponents to submission, while he conciliated Alfonso IV. of Portugal by restoring his daughter to her position as queen. The restoration of unity was extremely opportune, as Spain was threatened at this moment by a new invasion from Africa. Abu ’] Hakam, the head of the Merinids and emir of Fez, crossed over to Gibraltar with a huge army in 1339, and was acknowledged as suzerain by the ruler of Granada. Assistance was obtained both from Aragon and Portugal, and in 1340 Alfonso XI. marched to the relief of Tarifa, which was besieged by the Moors. On the banks of the Salado the Christians won a great victory, which destroyed the last chance of a revival of the Mohammedan power in Spain. Abu 7] Hakam fled to Africa, and in 1344 Alfonso concluded a glorious war by the reduction of Algesiras. . In the hope of cutting off all connexion between Granada and Africa, Alfonso laid siege to Gibraltar in 1350, but before he could accomplish his design he was carried off by the Black Death. His victories over the infidel have led the Spanish historians to gloss over the acts of cruelty and treachery which have left an ineffaceable stain upon his character. His reign, troubled as it was, constitutes an important epoch in the history of Castilian liberties. In 1328 he issued two laws which formed the firmest basis of the powers of the cortes. He recognized the right of that assembly to be consulted in all important matters of state, and he solemnly pledged himself and his successors not to impose any new tax without its approval and consent. These concessions were to some extent counterbalanced by his restriction of the right of electing deputies to the regidores or magistrates of each city. This narrowing of the franchise was a great blow to the popular rights, and it gave the crown facilities for tamper- ing with the elections which were frequently abused in later days. But at the time the municipal magistrates enjoyed considerable independence, and for several genera- tions the cortes showed no signs of subservience. In fact

Alfonso’s position made him dependent upon the support of the citizens against the great lords, so that he was not likely to aim at diminishing the power of the former class. Another important event of the reign was the

granting by the cortes, for the expenses of the Moorish war, of the alcavala, a tax of a twentieth upon every sale of real or personal property. This tax, one of the most ruinous that can be conceived, illustrates the want of economical insight in the 14th century, and was destined in later times to seriously impede the industrial and commercial development of Spain.

The atrocities of Alfonso XI.'s reign sink imto insignifi- cance when compared with those committed by his son and successor, Pedro I. (1850-1369). The story of the latter's rule is mainly derived from the narrative of his avowed enemies, but there is no reason to doubt the substantial accuracy of the charges which have given him the name of "The Cruel." Some of his actions may perhaps be attri- buted to a politic desire to destroy the ascendency of the great nobles, whom the priuces of the royal house had often headed against the crown; but most of them can only be explained by a thirst for bloodshed which almost amounted to mania. He ascended the throne at the age of sixteen, and was at once urged by his mother Maria of Portugal to avenge the wrongs which she had endured at the hands of her rival, Eleanor de Guzman. 'The unfortunate Eleanor was strangled in prison, and her sons could only secure safety by flight. The eldest, Henry of Trastamara, found a refuge first in Portugal and afterwards in France. A wife was now found for the young king in Blanche, daughter of the duke of Bourbon, in the hope of strengthening his throne by a French alliance. But Pedro had formed a connexion with Maria de Padilla ; and, when he was at last induced to go through the marriage ceremony with Blanche, he quitted her immediately to return to his mistress, whose brothers he advanced to the chief offices of state. A conspiracy of nobles, headed by Alfonso of Albuquerque, lately the king's favourite, was suppressed with ruthless severity. Pedro now concluded a second marriage with Juana de Castro, although Blanche was still living, but he again returned to Maria de Padilla. Another conspiracy, backed up by the pope and the French king, was more successful. After standing a long siege in Tordesillas, Pedro was compelled to concede the demands of the coalition and to acknowledge Blanche as his lawful queen. But his submission was only feigned. Seizing the opportunity of a hunting-party to escape from the imprisonment in which he was kept at Toro, he rallied a mercenary arnly round him and took terrible vengeance upon his opponents (1355-56). Henry of Trastamara, who had joined in the rising, escaped to France, where he took part in the war against the English.

It would be wearisome to catalogue the long list of cruelties, begin- ning with the murder of the unfortunate Blanche of Bour- bon, of which Pedro was guilty during the next ten years. It seems almost incredible that such a monster should have been allowed to reign in a country which had already shown so much independence as Castile. But several causes combined to secure him against deposition. In the first place, it was upon the nobles and the Jews that his hand fell with such severity, while to the citizen class he was on the whole a lenient ruler. This explains why it was that the cortes made little or no opposition when he endeavoured to secure the succession to his own children. In 1362 he solemnly swore that he had been lawfully married to Maria de Padilla, and his four children by her were recognized as heirs to the crown. His son Alfonso, however, died in the same year, and only two daughters, Constance and Isabella, survived their father. Another point in Pedro's favour was the outbreak in 1356 of a war

with Aragon, which lasted almost without intermission for the rest of the reign, and in the course of which the Aragonese king was joined by Henry of Trastamara. Much as the Castilian nobles hated Pedro, they hated Aragon still more, and they were unwilling to accept a king who might seem to be forced upon them by the neighbouring kingdom. 'This war was ina way harmful to the interests of both kings. They were both eager to depress the powerful nobles in their territories, but their continued hostilities only enabled these nobles to extend their power. On more than one occasion this community of interest was on the verge of leading to an agreement which would probably have excluded the house of Trasta- mara for ever from Castile, but each time national and personal enmity combined to revive the quarrel. Though Castile was larger and possessed of more resources than. its rival, the presence of a large number of Castilian exiles in Aragon made the combat fairly even. But in 1365 Henry of Trastamara obtained new and more formidable auxiliaries. Charles V. of France, who was now beginning to reorganize that country after the English wars, was only too glad to allow the disorderly bodies of disbanded soldiers to seek employment in Spain under the leadership of Bertrand du Guesclin. To these formidable enemies

Pedro did not venture to offer resistance, and fled to Bayonne, while his half-brother Henry was everywhere acknowledged as king (1366). But Pedro succeeded in convincing the Black Prince of the justice of his cause and of the impolicy of allowing the French king to gain over- whelming influence in the Peninsula. Before the end of the year Edward's army had crossed the Pyrenees, a number of English mercenaries in Du Guesclin's service deserted to the banner of their old leader, and in April 1367 was fought the great battle of Najera or Navarrete, near Logrofio. Du Guesclin was taken prisoner; Henry of Trastamara fled to France; and Pedro was restored to his throne. But the Castilian king had learnt no wisdom from adversity. His barbarity disgusted his allies, who were further alienated by his failure to furnish his promised supplies. The fever had already begun to decimate his troops and to weaken his own health when the Black Prince quitted Castile. His departure gave another opportunity to Henry of Trastamara, who had obtained fresh reinforcements from Charles V. In 1369 the battle of Montiel was decided in Henry's favour. Pedro was taken prisoner, and was killed in a personal struggle with his rival, into whose tent he was brought. His two surviving daughters had been left as hostages at Bordeaux, and were married to two brothers of the Black Prince, —John of Gaunt, and Edmund Langley, duke of York.

Henry II. (1369-1379) was of illegitimate birth, and Henry II

his marriage with the heiress of the La Cerdas was hardly sufficient to remove all doubts as to his claim to the succession. But within his kingdom he met with little opposition. The Castilians were glad to settle down under an orderly government after the late reign, and the few malcontents exiled themselves to join the foreign claimants of the throne. The most important of these was Pedro I. of Portugal, whose grandmother belonged to the legitimate line of Castile, and John of Gaunt, who came to Spain to vindicate the rights of his wife Constance. Pedro I. proved for a time a formidable enemy. He allied him- self with the Moors, who seized the opportunity to recover Algesiras, and with the king of Aragon, who annexed the border districts of Castile. But Pedro was an incapable warrior, and soon abandoned his own claim to obtain the English support by acknowledging John of Gaunt. But this enabled Henry to renew his alliance

with France, and with the help of French troops he invaded Portugal, besieged Lisbon, and compelled Pedro to make peace.

John I.

Henry TKI,

CASTILE, 1252-1479. |

Two years later a treaty was concluded with the king of Aragon, by which his conquests were restored. For the remainder of his reign Henry's throne was secure, and he left the kingdom in peace to his son John I. (1379-1390). The chief interest of the new reign centres round the relations with Portugal. The first renewal of the war was the work of the Portuguese king Ferdinand, who again supported the English claims upon Castile. But the alliance with England was not popular in Portugal, and in 1383 a treaty was concluded, which, however, proved productive rather of evil than of good. Beatrix, the only daughter of Ferdinand, was married to the Castilian king , and it was agreed that her children, whether male or female, should succeed to the throne of Portugal. A few months later Ferdinand died. Beatrix was at once pro- claimed queen, and her mother undertook the regency. But the idea of union with Castile, which would involve the subordination of the smaller kingdom, was intensely unpopular at Lisbon. A rising overthrew the authority of the queen-inother, and the administration was entrusted to John, a brother of the late king. John of Castile at once entered Portugal to enforce what he considered to be the rights of his wife. But his high-handed measures only added strength to the opposition, and made the new regent the leader of a national movement. In 1384 the Castilian forces laid siege to Lisbon, which held out with obstinate resolution for five months, when the besiegers retired. Exulting in their success, the Portuguese determined to have nothing more to do with Beatrix; and an assembly of the cortes gave the crown to the regent John. The Castilian king now made a determined effort to uphold his failing cause, but at the great battle of Aljubarrota (August 1385) his army suffered a crushing defeat. It was now the turn of the Portuguese to take the aggressive, and the arrival of Jolin of Gaunt enabled them once more to take up his cause. Jt was only the aid of France and the dislike of the Castilians for the foreign-bred Constance and her husband that enabled John to make head against his numerous enemies. In

1387 he succeeded in termin- ating the English part of the quarrel. His eldest son Henry, the first heir to the crown who received the title of prince of Asturias, was betrothed to Catherine, daughter of Constance, in whose favour John of Gaunt renounced all claims on behalf of his wife (1387). The war with Portugal now sunk into a chronic struggle on the frontier, but was still going on when John I. died in 1390.

With the accession of Henry ITI. (1390-1406), a boy of eleven, Castile was again face to face with the difficulties of a minority, and these were the more formidable on account of the absence of any prince of the blood-royal to assume the regency. By the will of the late king the administra- tion was entrusted to a council to be formed by joint representation of the three estates. But the composition of this body was altered so as to give more power to the great nobles and prelates, and their quarrels soon involved the kingdom in the troubles of a civil war, from which it had been comparatively free in the last two reigns. Luckily for Castile, the young king, who assumed the government in 1393, showed himself to be a man of equal insight and resolution. By throwing himself boldly upon the support of the third estate, and by giving them the predominance in the cortes, he succeeded in taking efficient measures against the nobles. All domain-lands which had been alienated during his minority had to be restored, and all confederations among the barons were

declared illegal and dissolved. The discontent which

these measures provoked was promptly suppressed before it could develop into insurrection. At the same time the country enjoyed the blessings of external peace. Henry’s marriage with Catherine of Lancaster secured him against

hostilities not only from England but also from Portugal, whose queen was Catherine’s sister. Unfortunately for the kingdom which he ruled with such wisdom and success, Henry III. died in 1406 at the early age of twenty-seven, leaving an infant son to succeed him.

The minority of John II. was the most orderly period John II.

of his reign (1406-1454). The government was wielded by the able hands of his uncle Ferdinand, to whom the Castilians would have given the crown if he had been willing to supplant his nephew. Even after his accession to the throne of Aragon in 1412 he continued to give his advice to the queen-mother. The administration during these years was strong and orderly. The fortress of Antequera was taken from the Moors, and the Castilian nobles were kept in the same subjection as in the late reign. A new and disastrous period commenced in 1417, when the death of his mother transferred the reins of government to John II. at the age of fourteen. Averse to the cares of business and absorbed in personal pleasures, the young king was only too ready to allow himself to be guided by any one who would take the responsibility of rule upon his own shoulders. Before many years had elapsed he had fallen completely under the influence of Alvaro de Luna, grandmaster of the order of St James and constable of Castile. The minister, possessed of all the qualities which would have endowed a great monarch, set himself to increase the royal power. Not only were the nobles depressed to a condition of impotence which they had never yet experienced, but steps were also taken to diminish the powers of the third estate. Many of the lesser towns in Castile, as in England at the same period, found that the right of representation involved pecuniary burdens which they were eager to get rid of. This made it easy for the minister to reduce the number of towns sending deputies to the cortes to some seventeen or eighteen of the larger cities. This diminution of the third estate, though not resented, was an insidious blow at its real interests, and made it easy for Charles V. and his successor to reduce the cortes to impotence. The arbitrary government of John II., which might have been endured if it had been really directed by the king himself, was intolerable to the nobles when it was known to be inspired by his minister. The reign is filled by a series of conspiracies, in which the domestic malcontents found powerful allies in John II.’s cousins, Jolin and Henry of Aragon. But Alvaro de Luna was a warrior as well as a politician, and succeeded in foiling all direct attempts to effect his overthrow. His ultimate fall was due to the ingratitude of the king whom he had served too well. John’s second wife, Isabella of Portugal, disgusted at the small amount of influence which the minister allowed her to exercise, set herself to effect his overthrow. Once deprived of the royal favour, Alvaro de Luna had no further support to rest upon. The very absolutism which he himself had built up was turned against him, and he was executed

after a trial which was notoriously unfair. A year later John II. followed him to the grave, and the

crown passed to his son, Henry I’V., the feeblest sovereign Henry that ruled in Castile before the 17th century. His mind IV.

was as feeble as his body, and the contempt of his sub- jects has fixed upon him the title of “The Impotent.” His first favourite, the marquis of Villena, was supplanted, after Henry’s marriage with Joanna of Portugal, by Beltran de la Cueva, whom scandal declared to be the queen’s paramour. The birth of a daughter did nothing to check these rumours, and the unfortunate infanta was only known as “la Beltraneja.” The government was not exactly oppressive, but it failed to command respect, and personal jealousies and ill-feeling were sufficient to pro- duce a revolt. The leaders were the marquis of Villena XXIL — 41

Isabella.

ARAGON

(1213- 1479).

Consti- tution.

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and Carillo, archbishop of Toledo, both of whom had objects of their own to serve. In 1465 the rebellion broke out, and its first act was the formal deposition of Henry at Avila, after an absurd ceremony in which the king was represented by a puppet. The conspirators denounced the infanta Joanna as illegitimate, and offered the crown to Henry’s brother Alfonso. In the course of the civil war which followed, Alfonso died (1468), and his partisans at once put forward the claims of his sister Isabella. But the infanta, who already displayed a wisdom and moderation beyond her years, refused to be involved in hostilities with her elder brother, and she succeeded in arranging a treaty by which she was recog- nized as Henry IV.’s heiress. The king himself struggled

hard to evade these conditions, and after his death in _

1474 Joanna’s cause was espoused by her uncle, Alfonso V. of Portugal. But Isabella succeeded in securing her accession to the throne, and her marriage with Ferdinand of Aragon, by paving the way for the union of the two kingdoms, begins a new period in which for the first time there is a real history of united Spain.

The kingdom of Aragon which we left in the reign of James the Conqueror (1218-1276), consisted of the three provinces of Aragon, Catalonia, and Valencia. ach pro- vince retained its own laws and institutions, and Valencia and Catalonia regarded with the keenest jealousy any attempt to govern them on the principles which prevailed in Aragon. The powers of the crown were far more limited than in the neighbouring kingdom of Castile. The great nobles, or 7%cos hombres, formed a small and exclusive class, whose privileges made them almost the equals of the monarch. All conquests had to be divided between them, and the king was forbidden to confer a fief or honour upon any person outside their ranks. They possessed and exercised the right of private war, and were entitled at will to renounce their allegiance to their sovereign. ‘The smallness of their numbers made them much more united than the nobles of Castile, and propor- tionately more formidable. The difference between the two kingdoms was recognized by Ferdinand the Catholic with his usual acuteness when he said that “it was as difficult to divide the nobles of Aragon as it was to unite those of Castile.” But the privileges of the nobles, great as they were, were not the only check upon the royal power. Each province had its own cortes, which possessed from a very early date the right of granting taxes and approving legislation. In Valencia and Catalonia the cortes consisted, as in Castile, of the ordinary three estates ; but in Catalonia, where a maritime life had in- spired the inhabitants with a passionate love of freedom, the commons enjoyed a predominance which was hardly to be paralleled in any other country in the Middle Ages. The cortes of Aragon, which were more important, and whose history has been more carefully elucidated, consisted of four estates or arms (brazos). Besides the great prelates and the ricos hombres, both of whom had the right of appearing by proxy, there was a separate chamber of smaller landholders. This contained the infanzones, or lesser tenants-in-chief, and the caballeros or knights, who were tenants of the greater barons

but whose military rank gave them the right of personal attendance. The fourth chamber alone was representative, and consisted of the deputies of the towns. Their presence is first men- tioned in 1133, thirty years before anything is heard of popular representation in Castile. Their numbers were naturally small, as the kingdom was of very limited extent, but it seems to have been early established that a town which had once sent deputies was permanently entitled to the privilege, and this preserved them from having their rights tampered with by the crown as was

done in Castile. Besides their legislative and taxative functions, the Aragonese cortes were also a supreme court of justice, and in this capacity were presided over by the justiciar, an official whose unique powers have attracted the attention of all writers on Spanish history. In its origin the office had nothing very remarkable about it, and it is only the peculiar circumstances of the kingdom which forced it into such prominence. The justiciar was not at first entrusted with any political functions, but the difficulty of adjusting the relations between the king and the barons led to his being called in as mediator. By the 14th century he had become almost the supreme arbiter in all constitutional questions. To him the people could appeal against any infraction of their liberties, while the king regarded him as his chief councillor and as the most efficient barrier against armed rebellion, which was the only alternative method of settling disputes between his subjects and himself. As the justiciar thus became the pivot of the constitution, it was of great importance to secure that he should exercise his functions with firmness and impartiality. As the ricos hombres were exempted from corporal punishment, he was always chosen from the lesser nobles or knights, and was made responsible to the cortes under penalty of death. The dignity of the office was enhanced by the character of its successive holders ; and the medieval history of Aragon abounds with instances of their fearless opposition to the crown and of their resolute resistance to despotism on the one hand and to anarchy on the other.

The glorious reign of James (I.) the Conqueror was disturbed towards its close by quarrels which arose from his scheme of partitioning his conquests

among his children. The death, however, of his youngest and favourite son put an end to these projects, and the most

important of the provinces passed into the hands of Pedro Pedro Under Pedro and his son and suc- IIL

III. (1276-1285). cessor Alfonso III. (1285-1291), attention was almost wholly diverted from internal affairs to the conquest of Sicily. By his marriage with Constance, the daughter of Manfred, Pedro could put forward a claim to succeed to the Hohenstaufen in Naples and Sicily, but it is not probable that he would have been able to make any use of the claim if the Sicilian Vespers (1283) had not thrown that island into his hands. The result was a long series of wars with the Angevin rulers of Naples, but the hold upon Sicily was steadily retained. These wars had a notable influence upon Aragonese history, as they compelled the kings to purchase the support of their subjects by concessions which could only with great difficulty have been extorted from them. Thus in 1283 Pedro III. granted the famous ‘‘ General Privilege,” the Magna Carta of Aragon. By this the crown formally laid down a number of rules to secure all classes against oppression. The General Privilege is quite as important a document as the English charter ; it is even more full and precise, and its numerous confirmations show that it was as highly prized. It had the additional advantage of being issued to a people already possessed of institutions sufficiently developed to employ and defend the national liberties. But if Pedro’s concessions were for the advantage of his country, his successor went to an extreme which was equally harmful.

In 1287 Alfonso III. signed the famous ‘Privilege of Alfonso Union,” by which his subjects were formally authorized to 11.

take up arms against their sovereign if he attempted to infringe their liberties. The right of revolt, while it is and must be the ultimate safeguard against oppression, becomes at once liable to abuse when it is formulated and discussed. The act of 1287 gave an unlimited licence to disorder, which could always disguise itself under the pretence of defending liberty. Until it was repealed

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James IJ.

Alfonso IV.

| Pedro | IV.

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ARAGON, 1213-1479. |

SPAIN

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there was always a danger that the constitution would | from this moment the rebellion began to be split up by

succumb, not to the tyrannical usurpations of the crown, but to the selfish interests of the nobles.

On the death of Alfonso III. the crown passed to his brother James II. (1291-1327). The new king handed over Sicily to his younger brother Frederick, thus creating a separate dynasty in that island. In the hope of depressing the greater barons, James IT. strengthened the hands of the justiciar and sought to conciliate the clergy and citizens to the crown. By these steps he succeeded in avoiding any open conflict during his reign, and at the same time he sought to secure external unity by an edict which declared the three provinces of Aragon, Catalonia, and Valencia to be for ever indivisible (1319). But his successor, Alfonso IV. (1327-1336), did not hesitate to break this edict, in spirit if not in letter, by carving out great fiefs for his second wife, Eleanor of Castile, and her children. By this measure he gave rise to the difficulties, and indirectly to the triumphs, of his son, Pedro IV. (1336-1387). Pedro’s reign is a great epoch in Aragonese history, as to him is due the arrest of the tendencies which threatened to divide and destroy the kingdom. He began by recalling his father’s excessive grants to

his stepmother and his half-brothers. The intervention of Alfonso XI. of Castile on behalf of his sister failed to make any impres- sion upon the king, and it was only the pressing danger from the Moors, which was removed in 1340 by the Castilian victory on the Salado, that induced him at last to consent to a compromise. The same desire to unite all the possessions of the Aragonese crown is apparent in his treatment of the king of Majorca, James II., the descendant of James I.'s younger son, who had received from his father the Balearic Islands with Roussillon and Cerdagne as a vassal kingdom. As James If. showed inclination to evade his legal duties towards his suzerain, Pedro seized the first opportunity to pick a quarrel with him. In 1344 all the territories of the king of Majorca were declared to be united to Aragon; and, though James II. made an obstinate resistance, he met with little sup- port from his former subjects, and the hopeless struggle was ended by his death in 1348.

These high-handed measures not unnaturally excited the misgivings of the nobles of Aragon, whose privileges. were not likely to be very scrupulously respected by a prince with such an obvious sense of his own rights and duties. In 1347 chance gave them an eminent and capable leader. There was no law against female succession in Aragon, and there was the precedent of Queen Petronilla in its favour. On the other hand, there was a strong prejudice against it, and as arule preference had been given to males, although further removed from the direct line. Pedro IV. had an only daughter, Constance, and he was eager to secure the succession to her in preference to his brother James, who was popularly regarded as the heir to the throne. This unconcealed intention excited the indignation of James, who was already discontented at the harsh treatment of the king of Majorca. He had no difficulty in inducing most of the chief nobles, including his half-brothers, to form a "Union," which was also joined by several of the towns in their discontent at the projected settlement of the succession (1347). Pedro was taken by surprise and could only gain time by concessions. He promised to convoke annual meetings of the cortes, to choose his councillors with the approval of the estates, to revoke his will in favour of his daughter, and to recognize his brother as his heir. Soon after this agreement, which left the Union master of the situation, James died; and men were not slow in attributing his death to the machinations of the king.

This event was of the greatest advantage to Pedro, as it deprived his opponents of their leader, and

personal rivalries. The king and his advisers were not slow to avail themselves of the opportunity thus offered. The opposition was strongest in Aragon and Valencia, and Pedro succeeded in gaining over the Catalonians, who were always prone to act in isolation from the other provinces. With the troops thus acquired he met the army of the Union at Epila (1348) and won a complete victory. He followed up his success by destroying all the charters which gave any sanction to armed resistance to the crown, and especially the Privilege of Union of 1287. His elder half-brother Ferdinand, who had succeeded James as leader of the revolt and as heir-apparent to the throne, fled to Castile, but the chief nobles were severely punished, and the power of the crown was raised to a height which it had never before attained.

Thus Aragon, following the tendencies of the age, became centralized under a powerful monarchy, and the forces of feudal disunion received a final check. But Pedro IV. was far from establishing anything like a despotism. While destroying the Privilege of Union, he took a solemn oath to respect the political and personal liberties of his subjects, and enjoined the same oath upon his successors. At the same time he strengthened the powers of the justiciar, whose pre-eminence dates from this reign. The position of the king was immensely strengthened by the birth of a son, which destroyed the claims of his half-brothers. The later part of his reign was occupied with a war against Henry II. of Castile, which has been referred to above, and with resistance to James III. of Majorca, who made an unsuccessful effort to recover the territories of his father. Pedro concluded a second marriage with Sibilla, daughter of a Catalonian knight, and her influence involved him in a quarrel with his eldest son, whom he attempted to deprive of the office of lieutenant-general, which custom assigned to the heir to the throne. But he found that the authority of the justiciar was now strong enough to restrain the crown as well as the nobles. Dominic de Cerda, who now held the office, pronounced that the infant was legally entitled to the dignity from which he had been ousted, and compelled

the king to restore him. The brief reign of John [. John I.

(1387-1395) was mainly occupied with wars in Sicily and Sardinia. The expense which these involved, which was increased by the luxury of a magnificent court, excited the most lively discontent on the part of the cortes. The remonstrances of his subjects were resented by the king, but they were backed up by the authority of the justiciar, and John I. gave way so far as to banish the unpopular favourites from the court. On the king's death his daughters were passed over, and the crown was transferred

to his brother Martin, who was occupied in restoring the Martin.

Aragonese supremacy in Sicily. Under Martin a private war between the great families of Urrea and Luna was put down, and the dependence of the great nobles was more firmly secured. But the death in 1409 of the king's only son, Martin the younger, brought the kingdom face to face with the difficulty of a disputed succession. There were two male claimants,—the count of Urgel, a great- grandson of Alfonso IV., and the duke of Gandia, a grandson of James IJ. The former was the undoubted heir if the succession was absolutely limited to males, while the latter was advanced in years and could only bring forward the old contention of nearness to the royal stock. But, although precedent was in favour of the exclusion of females, there was no definite rule to prevent the succession of their male descendants. Of such claimants there were two,—Louis of Calabria, the son of John I.'s daughter Violante, and Ferdinand, infant of Castile, the son of Martin's sister Eleanor. Moreover.

Martin the younger had left an illegitimate son, Frederick, count of Luna, and if the question had arisen a century earlier, before the clergy had obtained so much power, it is probable that his claims would have been preferred. The question was still unsettled on the death of the elder Martin in 1410, with whom ended the male line of the counts of Barcelona, A prolonged civil war seemed inevitable, and for two years the kingdom endured the evils of an interregnum. If the dispute was to be settled by force of arms, the count of Urgel seemed likely to carry all before him, as he had the pretty unanimous support both of the Catalans and of the powerful family of Luna. But his followers, confident in their superiority, allowed themselves to indulge in acts of violence which alienated the more orderly

part of the population. The justiciar, Juan de Cerda, who had acted with such impartial firmness in the reign of John J., succeeded in forming a patriotic party which determined to settle the dispute by a legal decision. Jealousy of the De Lunas gave to this party the support of the rival house of Urrea. ‘hey succeeded in procuring the appointment of a joint commission of nine members,—three from the cortes of each province. After a careful examination of all the claims, the commissioners decided, on what principle it is difficult to determine, in favour of the infant Ferdinand, who was then acting as regent of Castile for his nephew John II. (1412). As far as ability and merit went, the choice was probably the best that could have been made. By mingled firmness and concession Ferdinand succeeded in restoring order and unity to the kingdom and its dependencies. A revolt headed by the disappointed count of Urgel in the next year was suppressed, and its leader was punished with the confiscation of his territories and perpetual imprisonment.

Thus the house of Trastamara succeeded in obtaining the crown of Aragon as well as that of Castile. Ferdinand 1., the first king of the new dynasty, did not live long to wield the sceptre which he had so fortunately acquired. On his death in 1416 the crown passed to his son Alfonso V. (1416-1458). The new prince played little part in Aragonese history, as his attention was almost wholly absorbed in the affairs of Italy. To his inherited posses- sions of Sicily and Sardinia he added the kingdom of Naples after a seven years’ contest with the Angevin claimant, René le Bon of Provence (1435-1442). From this time he never quitted his new kingdom, where his politic rule and his patronage of literature acquired for him the name of ‘The Magnanimous.” During his absence the government of Aragon was entrusted to his brother John, as lieutenant-general. The arbitrary char- acter of this prince, which is so clearly visible in his subsequent history, seems to have been foreseen by his subjects. In order to secure the justiciar from undue influence on the part of the crown, a law was made in 1442 that the office should be held for life, and that its occupant could only be dismissed by the king with the express approval of the cortes. In 1461 this provision was followed up by another law which directed that all complaints against the justiciar should be heard before a commission regularly chosen from the four estates.

The history of John, both as regent for his brother and later as king in his own right, centres round the family quarrels which finally led to a formidable rebellion against him. His first wife was Blanche, widow of Martin of Sicily and heiress of Navarre. This little kingdom, which comprised territory on both sides of the Pyrenees, had been more closely connected with France than with Spain since its separation from Aragon on the death of Alfonso I. (1134). In the 13th century it was united to the French crown by the marriage of Jeanne of Navarre with

the French king, Philip IV., but it again became independent on the death of Louis X. in 1315. His daughter Jeanne was the undoubted heiress of Navarre, and, though she was kept out of her rights by her uncles, Philip V. and Charles IV., she was allowed to succeed after their death. In 1329 she was crowned at Pamplona with her husband, Philip of Evreux. Her son, Charles the Bad (13849-1387), obtained an unenviable notoriety for the part which he played in French history during the troublous period of the English wars. His son, Charles III. (1387-1425), was a peace-loving prince, who devoted more attention to art and literature than to politics. The marriage of his daughter Blanche with John of Aragon brought the mountain-kingdom once more into close connexion with the western peninsula. By her marriage contract, Navarre was to pass on her death to her children and not to her husband, but a later agreement cnjoined her son, before assuming the sovereignty, to obtain “‘ the goodwill and approbation of his father.” When Blanche died in 1442, John seems to have considered that this later stipulation justified him in retaining the title of king of Navarre, though he entrusted the administration of the kingdom to his son, Charles of Viana. For some time no difficulty was made about this arrangement. Butin 1447 John married a second wife, Joanna Henriquez, a de- scendant of the royal family of Castile, and a few years later he sent Joanna to share the government of Navarre with his son. This appointment, coupled with the arrogant conduct of his stepmother, was regarded as an insult by Charles of Viana, who was not slow to remember that by right he was entitled to the crown. The old parties of Navarre, the Beaumonts and

Agramonts, seized the opportunity to renew their feuds,—the former espous- ing the cause of the prince, the latter that of the queen. Before long the dispute developed into civil war, and John marched into Navarre to assist his wife, who was besieged in Estella by her stepson. At Aybar the hostile forces met in open conflict, but the superior discipline of the royal troops gave them a complete victory, and Charles fell a prisoner into his father's hands (1452). The prince was released after a short imprisonment, but the recon- ciliation was only a hollow one. The birth of a son to Joanna Henriquez (1452), afterwards famous as Ferdinand the Catholic, was a serious blow to the interests of the elder son. The queen scarccly concealed her desire to secure the succession to her own child, and her influence over her husband was unbounded. Charles found that his defeat had given the supremacy in Navarre to the hostile party, and after a vain attempt to recover his power he went to Naples to appeal to his uncle Alfonso V. But his hopes in this quarter were destroyed by Alfonso's death in 1458. Sicily, and Sardinia passed to his brother John II., while Naples, as a private acquisition of his own, was bequeathed to his natural son Ferdinand. The Neapolitan barons, dreading the gloomy and tyrannical character of their new ruler, offered to support Charles of Viana as a candidate for the throne, but he refused to oppose his cousin, and retired to Sicily, where he spent the next two years in seclusion. In 1460 he was induced to return by the solicitations of his father, who seems to have been dis- quieted by the popularity which the prince had obtained among the Sicilians. The intrigues of Joanna were not long in exciting the old mistrust between father and son, and her hostility towards Charles was increased by his attempts to obtain the hand of Isabella of Castile, whom she had already fixed upon as a suitable bride for her own son Ferdinand. In 1461 Charles was induced to meet his father at Lerida, and was at once imprisoned. When asked about the cause of this arbitrary proceeding, John

Of his possessions, Aragon, John 1

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ARAGON, 1213-1479.]

only replied with obscure hints at a conspiracy. But his subjects were not prepared to acquiesce in this unnatural treatment of a prince whom they had learned to love and whom they regarded as their future ruler. The Catalans, always easily moved, rose in arms and marched upon Lerida, and it was only by a hasty retreat that John was able to escape with his court to Saragossa. But the revolt speedily spread from Catalonia to the other pro- vinces, and even to Sicily and Sardinia, while it found supporters in the king of Castile and in the faction of the Beaumonts in Navarre. Surrounded by enemies, John II. found it necessary to yield. He not only released his son, professing that he did so at his wife's request, but appointed him lieutenant-general of Catalonia and pro- mised not to enter that province without the permission of the cortes. But no sooner had Charles of Viana regained his liberty than he died, on September 23, 1461; and the circumstances led ready credence to be given to the suspicion that he had been poisoned during his captivity. The crown of Navarre now devolved by right upon Charles's elder sister Blanche, who had been married to and afterwards repudiated by Henry IV. of Castile. But she had incurred her father's enmity by the support which she had given to her brother; and John II. was not unwilling to curry favour with France by securing Navarre to his second daughter Eleanor of Foix, whose son Gaston had married a sister of Louis XI. The unfortunate Blanche was committed to the guardianship of her younger sister, and after two years of imprisonment in the castle of Orthez she died of poison. But Eleanor reaped little advantage from the crime which all historians impute toher. Her father retained the crown of Navarre till his death, and she only survived him a few weeks. She was succeeded by her grandson Francis Phoebus, but he only lived for four years, and his sister and heiress Catherine brought the crown of Navarre by her marriage to the French house of D'Albret, from which it was wrested by Ferdinand the Catholic in 1512. This third union with Aragon proved permanent, although the district north of the Pyrenees was subsequently annexed to France. Meanwhile the troubles of John II. were by no means removed by his son's death. In Aragon the young Fer- dinand was acknowledged as heir, and was then sent with his mother to Catalonia to receive the oath of allegiance from that province. But the Catalans rose again in rebel- lion, and besieged Joanna and her son in the fortress of Gerona. As John II. was unable to advance through the revolted province to his wife's relief, he purchased the assistance of Louis XI. by a promise of

200,000 gold crowns, as security for which he pledged the counties of Roussillon and Cerdagne (1462). The Catalans replied to this alliance by throwing off their allegiance to John and proclaiming a republic. As, however, Gerona was relieved by the French, and the royal troops succeeded in reducing several of the chief towns, they determined to appeal for foreign aid. The crown was offered first to Henry IV. of Castile and then to the constable of Portugal, who was descended from the old counts of Barcelona. On the death of the latter in 1466 the rebels turned to the traditional rivals of the house of Aragon, and offered the crown to René le Bon, the head of the Angevin house. René, whose life had been spent in putting forward claims which he had never been able to enforce, accepted the offer and sent his chivalrous son John of Calabria to assist the Catalans (1467). John II's fortunes were now at their nadir. He had lost his eyesight, and the death of his wife in 1468 deprived him of the companion and adviser who had for years directed and inspired his policy. John of Calabria, whose enterprise was secretly encouraged by the treacherous king of France, was steadily regaining

much of the ground which had been lost by the Catalans before his arrival. But the old king, whose sight was restored by a surgical operation, fought on with a dogged obstinacy worthy of a better cause. The death of the duke of Calabria in 1469 deprived his opponents of their leader, and from this moment their ultimate defeat was inevitable. The fall of Barcelona (1472) completed the reduction of Catalonia. But John did not venture to abuse the victory which he had so hardly won. He granted a general amnesty, and took a solemn oath to respect the constitution and liberties of the conquered province. The only notable event of the remaining years of John IT.'s reign was an attempt to recover Roussillon and Cerdagne. But Louis XI. kept a firm hold by arms upon the provinces which his diplomacy had won, and they were only restored to Aragon in 1493 when Charles VIII.

ceded them to Ferdinand the Catholic. In 1479 the death Ferdinand

of John IL., at the ripe age of eighty-two, transferred the 4 crown to his son Ferdinand, who ten years before had con- cluded his marriage with Isabella of Castile.

Literature.—Lafuente, Historia General de Espatia; Ortiz, Compendio General de la Historia de Espatia; Mariana, Historia General de Espatia; Lembke, Schafer, and Schirrmacher, Gesehichte von Spanien (down to 1295); Dozy, Histoire des Musulmans @ Espagne (to 1110); Desormeaux, Abrégé Chronologique de U Histoire d'Espagne. For the constitutional history the chief books of reference are—for Castile, Marina, 7'corta de las Cortes, and Sempére, Histoire des Cortés d' Espagne, and for Aragon, Blancas, Commentartt Rerum Aragonensium ; but a fair summary of their conclusions may be found in chapter iv. of Hallam's Middle Ages and in the introduction to Prescott's Ferdinand and Isabella. The history of the Castilian cortes has been recently elucidated by Don Manuel Colmeiro in his Cortes de los Antiguos Reinos de Leon y de Castilla (Madrid, 1883). The chief medieval chroniclers may be found, though not well edited, in Florez, Espatta Sagrada, and Schott, Hispania Jilustrata. (R. L:)

Section IV.—MopERN History.

The history of Spain asa united state dates from the Ferdinand

union of Castile and Aragon by the marriage of Isabella and Ferdinand. The marriage took place in 1469, before the accession of either sovereign. In 1474 the crown of Castile was claimed by Isabella on the death of her brother Henry IV., whose daughter Joanna was uni- versally believed to be illegitimate. It was contended by the partisans of Ferdinand that female succession was prohibited in Castile, and that he was entitled to the crown as the nearest male heir after his father. Ulti- mately the question was settled in Isabella's favour, and she obtained the most important rights of sovereignty, though the government was carried on in their joint names. It is possible that Ferdinand would have refused to accept this arrangement, if concerted action had not been necessary to oppose the party which espoused the cause of Joanna. A number of the Castilian nobles, headed by the marquis of Villena, dreaded the danger to the privileges of their order that might arise from the establishment of a strong government. They found an ally in Alfonso V. of Portugal, who was Joanna's uncle by the mother's side, and who cherished the design of obtaining the Castilian throne by a marriage with his niece. In 1476 the confederates were routed in the battle of Toro, and Alfonso departed to France with the chimerical plan of seeking

assistance from Louis XI. The treaty of St Jean de Luz between France and Castile in 1478 ruined these hopes, and in the next year Alfonso was compelled, by the treaty of Lisbon, to abandon the cause of his niece. This terminated the war of succession in Castile; and Joanna, known from her reputed father as La Beltraneja, retired into a convent. A few months before the treaty of Lisbon the death of John IL (January 20, 1479) gave to Ferdinand the succession to Aragon, | Sicily, and Sardinia. Navarre, which had been brought

Adminis- trative reforms.

to John II. by his first wife, passed to his daughter by that marriage, Eleanor, countess of Foix. Two provinces of the Aragonese crown, Roussillon and Cerdagne, had been pledged by John to Louis XI. of France, and were still retained by that monarch. The union of Castile and Aragon effected in 1479 was merely a personal union. Each province retained its own institutions and its own laws, and each would have resented the idea of absorption in the other.

The first care of the two sovereigns was to reform the system of government, especially in Castile, where the recent civil wars had given rise to serious disorders. One of their chief objects was to depress the nobles, whose privileges, acquired during the long struggle against the Moors, were inconsistent with a strong centralized govern- ment. In accordance with true policy and with the spirit of the age Ferdinand and Isabella sought to counterbalance the nobles by relying upon the burgher class. The Santa Hermandad, or Holy Brotherhood, which was organized in 1476, was a popular confederation of the whole kingdom for police and judicial purposes. Its affairs were managed by local courts,—from which appeals could be made to a supreme tribunal,—and by a general junta composed of deputies from all cities, which was convened once a year.

The increased prosperity of the country is well illus- trated by the steady rise of the revenue. “In 1474, the year of Isabella’s accession, the ordinary rents of the Castilian crown amounted to 885,000 reals; in 1477 to 2,390,078; in 1482, after the resumption of the royal grants, to 12,711,591;

and finally, in 1504, when the acquisition of Granada and the domestic tranquillity of the kingdom had encouraged the free expansion of all its resources, to 26,283,334, or thirty times the amount received at her accession. All this was derived from the customary established taxes, without the imposition of a single new one" (Prescott, ii. 575). No attack was made upon the liberties of the subjects; the cortes of Castile were frequently convened; the same towns were called upon to send deputies ; and the only innovation was the frequent neglect to summon the nobles. The numerous pragmaticas, or royal ordinances, were mostly limited to administrative matters or to the interpretation of the law. The credit for the domestic administration rests mainly with Isabella. Ferdinand busied himself more with military and diplomatic affairs, and comparatively few innovations were made in Aragon. The Hermandad was introduced, and in some other points the example of Castile was followed. But the advanced constitutional liberties of Aragon were uncongenial to Ferdinand. He summoned the cortes as rarely as possible ; and when that assembly

met he spared no pains to influence its composition and its decisions. The centralizing tendencies of the reign were carried still further in both provinces in the later period when Ximenes, who became archbishop of Toledo in 1495, exercised the chief influence. Five councils were entrusted with the administration of affairs :—the "royal council," the chief court of justice; the 'council of the supreme" for ecclesiastical business ; the "council of the orders" for the great military fraternities; the "council of Aragon" for the management of that kingdom and of Naples; and the "council of the Indies" for the great discoveries of Columbus and his companions.

The political unity of Spain was to be based upon its religious unity. Both Ferdinand and Isabella were imbued with that stern spirit of orthodoxy with which the Spaniards were inspired by their long crusade against the infidel. No institution of their reign was so important as the Inquisition, which was authorized by a bull of Sixtus IV. in 1478, and constituted for the two kingdoms in 1483 under the presidency of Torquemada. Its extension to

Aragon was bitterly protested against by the liberty- loving people, but was forced upon them by the iron will of Ferdinand. The activity of the Holy Office was at first directed against the Jews, whose obstinate adherence to their faith in spite of persecution was punished by an edict for their expulsion in 1492. Their departure deprived Spain of many industrious inhabitants ; but its importance has been much exaggerated by authors who have failed to notice that it was followed, not by the decline of Spain, but by the period of its greatest pro- sperity. In spite of their orthodoxy, however, Ferdinand and Isabella were by no means slavish adherents of the papacy. The claim of the popes to appoint to important benefices was strenuously resisted, and the chief control of ecclesiastical affairs was successfully vindicated for the crown.

The steady extension of the royal power in Spain was due in no small degree, as Machiavelli has pointed out, to the constant succession of enterprises in which the attention of the nobles was absorbed. These enterprises may be summarized under three heads :—(1) the union of the Peninsula ; (2) the extension of colonial empire ; and (3) the acquisition of foreign territories.

(1) Under the first head the most important achievement was the final extinction of the Moorish power in Spain. The war which began in 1481 was carried on in a desultory manner for ten years, and was completed in 1492 by the conquest of Granada. The Moors, who had fought with the courage of despair, received very lenient terms from their conquerors. They were secured in the free exercise of their religion, and were allowed to retain their own laws, customs, and language. In some points, such as the trade with Africa, they obtained privileges which were not even shared by the Castilians. But the spirit of proselyt- ism was too strong in Spain to allow this treaty to be observed. The measures taken by Ximenes to bring about the conversion of the Moors provoked a revolt in 1500, which was put down with great severity. They were com- pelled to choose between conversion or banishment, and, although most of them accepted the former alternative, the Moriscoes, as they were now called, found themselves henceforward in the hopeless position of a proscribed and hated minority. In 1493 Ferdinand extorted from the fears and hopes of Charles VIII. of France the restoration of Roussillon and Cerdagne by the treaty of

Barcelona. In 1512, after Isabella's death, he annexed Navarre. 'The whole Peninsula was now united, with the exception of Portugal, and steps had been taken for the acquisition of that kingdom by marriage. Isabella, Ferdinand's eldest daughter, was married to Alfonso, the son and heir of

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FERDINAND AND ISABELLA.|

John IT. of Portugal. After the death of that prince his widow married Emanuel, who succceded to the Portuguese erown in 1495. Isabella herself died in giving birth to a son, but the connexion was still maintained by the marriage of Emanuel to her younger sister Mary. The fruits of this persistent policy were not reaped, however, till the reign of Philip IT.

(2) Maritime discovery was the task of the age, a task

. forced upon it by the Turkish occupation of the Levant,

which had closed the old commercial routes to the East. The foremost pioneers in the work were the Portuguese and Spaniards, whose efforts brought them into rivalry with each other. The treaty of Lisbon in 1479 secured the western coast of Africa to Portugal, but enabled Spain to complete the annexation of the Canaries. The Spaniards now turned further westwards, and a wholly uew problem was created by Columbus's discovery of the West Indies in 1492. His voyage had been undertaken under the patronage of Isabella, and the new territories were regarded as pertaining to Castile. To solve any difficulties that might arise, a bull was obtained from Alexander VI. in 1493, which granted to Spain all dis-

coveries west of an imaginary line drawn 100 leagues to the west of the Azores and the Cape Verd Islands. As this arrangement excited Portuguese discontent, it was modified by a treaty at Tordesillas in 1494, which removed the boundary line to 370 leagues west of the Cape Verd Islands. This modification had important results for the Portuguese, as giving them their subsequent claim to Brazil. In the meanwhile Spain redoubled its exertions. In 1498 Columbus landed on the continent of South America, and in a few years the whole western coast was explored by subsequent adventurers. In 1512 Ponce de Leon dis- covered Florida, and in the next year Balboa crossed the Isthmus of Darien and gazed for the first time upon the Pacific. No exertions were spared by the Government to encourage settlement in its new territories; but the regu- lations of colonial trade, and especially the provision that it should pass through the single port of Seville, were con- ceived in a narrow and selfish spirit which prevented the full development of their resources.

(3) The foreign affairs of the reign, which were almost wholly connected with Italy, were conducted by Ferdinand

- on behalf of Aragon, just as the extension of the colonies

was directed for the benefit of Castile. Charles VITII.'s invasion of Naples, which was ruled by an illegitimate branch of the house of Aragon, was undertaken in the full belief that the support or at least the neutrality of Spain was secured by the treaty of Barcelona. But Ferdinand, jealous of the rapid success of the French, seized the first pretext to disregard the treaty, and became a member of the league which was formed at Venice in 1495 against Charles. His troops, under the famous Gonsalvo de Cordova, took a prominent part in restoring Ferdinand Il. to the Neapolitan throne. With the accession of Louis XII. came a great change in Ferdinand's policy, and he determined to advance the claim to Naples which he himself possessed as the legitimate head of the Aragonese house. By the treaty of Granada in 1500 Naples was to be divided between France and Spain, and the reigning king Frederick could make no resistance to such over- whiclming forces. But a quarrel naturally arose about the terms of the partition, and by 1504 Gonsalvo de Cordova succeeded in expelling the French from Naples, which was henceforth annexed to the crown of Aragon.

In 1504 the unity of Spain was interrupted for a The successive deaths of the infant John (1497), of Isabella of Portugal (1498), and of her infant son Miguel (1500) had left the succes- sion in Castile to the second daughter, Joanna; she was

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married to the archduke Philip, con of Maximilian I, and ruler, through his mother Mary of Burgundy, of the Netherlands and Franche-Comté. Unfortunately Joanna, who was the mother of two sons, Charles and Ferdinand, had already given signs of that insanity which was to cloud the whole of her subsequent career. Philip, who had visited Spain in 1502, had then excited the distrust of his wife's parents, and Isabella by her will left the regency in Castile to her husband until the majority of their grandson Charles. But Ferdinand, in spite of his brilliant successes, was not popular among the Castilian nobles, who seized the opportunity to support the more natural claims of Philip to govern on behalf of his wife. Ferdinand showed his disgust by actions which threatened to undo all the previous objects of his policy. He con- cluded a treaty with Louis XII. in 1505, by which he undertook to marry the French king's niecc, Germaine de Foix. To her Louis resigned his claims upon Naples, but in case of her death without issue his share in the kingdom by the treaty of Granada was to revert to Irance. Thus Ferdinand was willing to gratify his spite and to perpetuate the division between Aragon and Castile, under the penalty of forfeiting his recent conquests in Italy. His second marriage was concluded in March 1506, and two months later he resigned the regency in Castile to Philip, and soon afterwards sailed to Naples.

But the division of the Peninsula was not destined to last long. On September 25 Philip died at the age of twenty-eight, and the devotion of Ximenes secured the restoration of the regency to Ferdinand. Joanna, who had been devotedly attached to her husband, lost all semblance of reason aftcr his death, and made no attempt to exercise any influence over the conduct of affairs. The remaining part of Ferdinand's reign is uneventful in the history of Spain. The government was carried on on the same system, but with more avowed absolutism, as during the lifetime of Isabella.

Ximenes, whose energies found insufficient occupation in the compilation of his Polyglott Bible and in the foundation of the university of Alcala de Henares, fitted out and headed an expedition to Oran in 1509, which resulted in extensive but short-lived con- quests in northern Africa. Ferdinand threw himself with more energy than ever into the current of European polli- tics. By joining the league of Cambray he wrested from Venice five important towns in Apulia which had been pawned to the republic by Ferdinand II. Asa member of the Holy League against France he succeeded in con- quering Navarre in 1512. Navarre had passed to the French family of Albret by the marriage of Catharine de Foix with Jean d'Albret, and it was the close connexion with France which gave Ferdinand a pretext for its invasion. In 1515 his new conquest was formally in- corporated with the kingdom of Castile. This was Ferdi- nand's last success; and he died on January 23, 1516. His will recognized Joanna as his heiress in Aragon, an his grandson Charles as the regent in both kingdoms. Until his arrival, the administration of Castile was entrusted to Cardinal Ximenes and that of Aragon to his own natural son, the archbishop of Saragossa.

With the death of Ferdinand begins the period of uninterrupted Hapsburg rule in Spain, which lasted for nearly two centuries. In the course of this period the monarchy obtained absolute authority, and Spain, after rising for a time to be the foremost state in Europe, sank to the position of a second- rate power, from which it has never since emerged. At first the condition of affairs was by no means promising for the crown. The unity of Spain, which had advanced with such rapid strides after the marriage of Ferdinand and Isabella, had been seriously shaken by the selfish policy pursued by the king since his

Death of

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(1516- 1700)

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wife’s death. Aragon and Castile were distinct kingdoms, and the former was again divided into the three provinces of Aragon, Catalonia, and Valencia, each of which had its own cortes, its own privileges, cherished traditions of independence. where divided against each other, and within each class jealousies and quarrels were frequent. The foreign possessions of the two crowns were a source of weakness rather than of strength. earliest opportunity to contest the possession of Navarre with Castile, and that of Naples with Aragon.

Charles The difficulties of domestic government were increased

1 by the fact that the prospective ruler was a youthful

(emperor foreigner, who had never visited Spain, and who was

oe completely ignorant of the customs and even of the language of the country. Charles had been born and

educated in the Netherlands, of which he had been nominal ruler ever since the death of his father in 1506. All his friends and advisers were Flemings, who cared nothing for Spanish interests and had already acquired an evil reputation for selfish greed. The first symptom of discontent in Spain was excited by Charles’s demand to be recognized as king, in utter disregard of his unfortunate mother. In Aragon the demand was unhesitatingly refused, but in Castile the vigorous measures of Ximenes secured Charles’s proclamation. ‘The regent, however, had great difficulties to face. The nobles, delighted to be rid of the strong government of Ferdinand, wished to utilize the opportunity to regain the privileges and independence they had lost. In this crisis the loyal devotion of Ximenes saved the monarchy. Throwing himself upon the support of the citizen class, he organized a militia which overawed the nobles and maintained order. A French invasion of Navarre was repulsed, and to avoid any danger from the discontent of the inhabitants all the fortresses of the pro- vince, with the single exception of Pamplona, were dis- mantled. These distinguished services were rewarded

with more than royal ingratitude by Charles, who came to Spain in 1517, and who allowed the aged cardinal to die on November 8 without even granting him an interview.

The young king soon felt the loss of so able and experi- enced an adviser. His Flemish ministers, with Chiévres at their head, regarded Spain as a rich booty to be plundered at will. The Castilians, the proudest nation in Europe, found all the places of honour and profit seized by greedy foreigners. The cortes had shown their loyalty by acknowledging Charles as joint-king with his mother and by granting him an unprecedented service of 600,000 ducats. But they had accompanied their grants with eighty-eight significant demands, which the young king accepted but made no pretence of fulfilling. In Aragon and Catalonia more difficulty was experienced. Nearly two years were wasted in obtaining the recognition of the royal title, and no supplies were forthcoming. Valencia was not visited at all, and the attempt to induce the people to do homage to a viceroy was a failure. A civil war broke out in the province between the privileged nobles and a germandada, or brotherhood, of the burgher class. ‘The Government exasperated parties by supporting each in turn, but ultimately threw in its lot with the nobles.

Meanwhile the death of Maximilian had given Charles the succession to the considerable Hapsburg territories in Germany, and in 1519 the German electors had chosen him to be king of the Romans. He was now the first prince in Europe; and it was necessary for him to leave Spain to look after his interests in Germany and to cement there alliances which he needed against the inevit- able hostility of France. But his elevation by no means increased his povularity in Castile. The Castilians had

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already plenty of grounds for complaint in the rapacity of the Flemings and in Charles’s failure to perform his promises to the cortes. But these were as

nothing com- pared with the prospect that Castile might no longer be the primary state of their king, and that their revenues might be employed in the attainment of objects in which they had not the slightest interest. While opinions were thus excited, Charles, who had been reduced to great straits by his military preparations and his promises to the German electors, summoned the cortes to meet at Santiago (Compostella) in Galicia, and thence transferred them to Coruiia in order to embark as soon as he had obtained the supplies he needed. The place of meeting was carefully chosen so as to isolate the assembly and to expose it to royal influence or intimidation. The lead of

‘the opposition was taken by Toledo, which refused to

send its two deputies, as being too favourable to the crown, but sent other representatives to remonstrate with Charles and to encourage the other cities. They were driven from Corufia, and the deputies of Salamanca were excluded from the cortes. By these and similar means the desired grant was extorted. Charles hastened to quit Spain with the first favourable wind, leaving Adrian of Utrecht. as regent in Castile, and two native nobles in Aragon and Catalonia. His departure was really neces- sary for his other interests; but it must have seemed reckless to the Spaniards at a time when Valencia was in the flames of civil war and Castile was on the verge of rebellion. Before starting he had ordered the removal of the magistrates of Toledo, and had sent a new governor to reduce the city to obedience. The citizens, headed by a young noble, Juan de Padilla, resisted this order and raised the standard of insurrection. Other cities hastened to join the movement, and a central committee, known as the “Holy Junta,” established itself at Avila. The unfor- tunate regent, a churchman of distinguished piety and gentle character, found himself face to face with difficul- ties that would have taxed all the resources of Ximenes. His attempt to reduce Segovia by arms was a lamentable failure, and he had to confess his utter defeat by disband- ing his forces. The nobles, alienated by the appointment of a foreigner to the regency, made no attempt to check a movement against a Government they detested. The insurgents had matters their own way, and Padilla, advancing to Tordesillas, made himself master of the person of Joanna, in whose name it was intended to con- duct the government. But this move was less advan- tageous than it at first appeared. Joanna refused

to transact any business or to sign any document, and this public proof of her incapacity served to justify Charles's contention that he was the only possible ruler. The Castilians were not prepared to get rid of the monarchy, so that it was necessary for the rebels to consider the possibility of coming to terms with Charles. The " Holy Junta," which had moved from Avila to Tordesillas, drew up a series of demands, which, if acceded to, would have established a constitutional monarchy in Spain. But their envoys to Germany found it impossible even to secure an audience from the king, and meanwhile the failure of the insurrection was decided. The very ease with which the rebels had triumphed proved an evil, because it encouraged internal dissensions which opposition might have healed. Especially Burgos showed its jealousy of the leading position which had been assumed by Toledo. Class differences, the bane of every country in the Middle Ages, supplied the final stumbling-block. Many of the demands of the communes were diametrically opposed to the interests of the nobles, whose eyes were at last opened to the danger of their attitude of neutrality. Their chief grievance had been removed by Charles's appointment of

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the admiral and constable of Castile as joint-regents with Adrian. An army was raised, and on the field of Villalar the forces of the communes were utterly defeated (April 23, 1522). Padilla, who had shown more enthusiasm than ability, was executed, and one city after another was reduced to submission. A portion of the victorious army was sent to the assistance of the nobles in Valencia, where the germandada was at last crushed. The return of Charles to Spain in June 1522 completed the triumph of the monarchy. In 1523 he convened the Castilian cortes, and compelled them to grant supplies before presenting their petitions for redress, thus establishing a precedent which was conclusive for the future.

Charles's reign belongs to the history of Europe rather than to that of Spain, and has been sufficiently treated else- where (see Cuarues V.). His enormous inheritance was increased by the successes of Cortes in Mexico

and of Pizarro in Peru, by his own annexation of the Milanese, and by his conquests in northern Africa. In the government of this vast empire Spain played an important but on the whole a subordinate part. Its soldiers and its subsidies were Charles's most effective weapons, and to render them more readily available it was necessary to depress still further the liberties of the country. The independence of the towns had been crushed at Villalar, but only by the intervention of the nobles; and these had now to pay the penalty of their selfish loyalty. In 1538, after Charles had for a time concluded his struggle with France by the truce of Nice, he proposed to raise supplies in Castile by an excise upon commodities. The nobles objected on the ground of their exemption from taxation, and the emperor had to give way. But he took his revenge by excluding them altogether from the cortes, which henceforth consisted only of thirty-six deputies from eighteen towns, a body that was powerless to oppose the wishes of the crown.

The vast enterprises in which Charles was involved ex- hausted his energies, and the failure of his policy in Ger- many reduced him to despair. In 1555-56 he resigned all his dignities, and ended his life in 1558 in retirement at Yuste. From this time the house of Hapsburg is divided into the two branches of Spain and Austria. Charles's brother Ferdinand became king of the Romans and obtained the German territories of the family, to which he

- had added the crowns of Bohemia and Hungary. Philip IL, Charles's only legitimate son, succeeded to the Spanish and Burgundian inheritance, with the addition of Milan. Philip IL, like his father, played a great part in European history (see Puinip II.), but with this important differ- ence that Castile was definitely the central point of his monarchy, and that his policy was absolutely directed by Spanish interests. In character and education he was a Spaniard of the Spaniards, and after 1559 he never quitted Spain. He gave the country a capital, which it had never yet possessed, by fixing his residence at Madrid. Castile, under the direct supervision of the king, was sub- jected to the most crushing despotism. Aragon, Catalonia, and Valencia were governed as mere provinces, in the same manner as Milan, Naples, and Sicily. The con- tinuance of the old divisions of the country, while it lessened its strength, was an immense advantage to the royal power. It was easy for the king to employ the forces of one province to crush the liberties

of the others. And Philip possessed a formidable weapon in the Inquisition, which he did not scruple to use for secular purposes. Political independence was crushed with the same relent- less severity as religious dissent. Hitherto Aragon had preserved its medieval privileges almost intact. The king was not entitled to the allegiance of the province until he had solemnly sworn to observe its “fueros.” For the decisions of the cortes unanimity was required, so

that each deputy had a practical right of veto. The authority of the justiciar rivalled that of the crown. It was natural that Philip should seize the first opportunity of attacking institutions which could thwart his will. In 1590 Antonio Perez (see Perrz), a minister who had incurred the king’s displeasure, fled to Aragon and appealed to its fueros for protection. Philip had him brought before the Inquisition, and when the people rose in defence of their liberties they were crushed by troops fron Castile. The justiciar was put to death, and his successors became nominees of the crown. The cortes were assembled in 1591 at Tarragona, and compelled to abolish the most obnoxious fueros. Their control over the judicial administration was abrogated, and the necessity of unanimity was only retained in certain specified cases, notably the granting of supplies. To avoid any danger from the few privileges that were left, a citadel was built in Saragossa for the reception of a royal garrison. The creation of a regular standing army completed the edifice of absolutism, while the militia which had been established by Ximenes was retained and extended for the suppression of local disorders.

Philip’s internal administration was everywhere success- ful in obtaining the objects which he set before himself, A rising of the Moors in the Alpujarras was crushed by the military ability of his famous half-brother, Don John of Austria. In 1580 a claim to the crown of Portugal, which Philip derived from his mother, was successfully asserted. Thus the unity of the Peninsula was at last completed, while the colonial territories of Spain were

immensely extended. Unfortunately, no attempt was made to conciliate the Portuguese to their new ruler. The kingdom was treated as a conquered province; all who had resisted the Spanish invasion were punished as traitors ; the native nobles were excluded from all share in the government, which was entrusted solely to Spaniards ; the commerce of the country was ruined by provisions which conferred a practical monopoly upon Spain. The result of this short-sighted policy was that the Portuguese stifled their discontent, and eagerly awaited the first opening for the recovery of their independence.

Outside Spain Philip's policy proved a complete failure. His religious: intolerance excited the revolt of the Nether- lands, which ended in the loss of the seven northern provinces. His grand schemes against England were utterly ruined by the destruction of the Spanish Armada. And, finally, his endeavour to establish a preponderant Spanish influence over France was foiled by the accession and triumph of Henry IV. The treaty of Vervins, by which he acknowledged his humiliating defeat, was almost the last act of Philip IL's reign, which ended with his death on September 13, 1598.

Philip II. left to his son and successor, Philip III., an empire which was noninally undiminished, as the inde- pendence of the United Provinces had never been recog- nized, and the war for their reduction was still going on. But the unwieldy mass was suffering from internal exhaustion. The resources of Spain and the New World had been squandered in the prosecution of schemes of ambition which had ended in failure. The attention of the people had been distracted from peaceful industry to the unprofitable occupation of war. The soldiery of Spain, once reckoned invincible, had lost their prestige in the marshes of Holland. The enormous taxes, from which nobles and clergy were exempted, fell with ruinous severity upon the productive classes. Castile had suffered most, because it was most completely subject. The provinces which retained their liberties longest were more prosperous, even though they had no share in the riches that were poured into Castile from the western colonies. But they,

too, had suffered from the king's reckless ambition and from an economic policy which followed the most glaring errors of the Middle Ages. Every other consideration had been sacrificed to the accumulation of specie, with the result that prices were forced up to an abnormal height, while the wealth of the country bore no proportion to the currency. The nobles were carefully excluded from all political affairs and ceased to take the slightest 'nterest in the administration. When this exclusion came to an end after Philip II.'s death, they appear as mere courtiers, rivalling each other in the extravagance of their expenditure, but contributing nothing to the efficiency of the state. The government had been centralized by suc- cessive kings, but it was carried on without either wisdom or impartiality. The administration of justice was venal and incompetent. The people had been deprived of their liberties, but they failed to receive compensation in increased order and security. Spain had to pay dearly for its period of glory. Its rapid decline in the 17th century was the inevitable penalty for the faults and errors of the 16th.

"God," said Philip IL, "who has been gracious in giving me so many States, has capable of governing them." His successor was the natural product of his father's system : the exhaustion of Spain was inevitably accompanied by the degeneracy of its rulers. Philip IZ, who was twenty-one years old at his accession, had been brought up among priests and women, and showed all the defects of his education. Spanish writers are never weary of dilating upon his piety and his devotion. to his favourite, the duke of Lerma, while he contented himself with the performance of religious duties and the ceremonies of a stately court. The change of rulers was significantly marked in a quarrel with the province of Biscay, which still retained its ancient privileges intact. An attempt was made in 1601 to impose new duties by a royal ordinance; the Biscayan deputies protested vigorously against this encroachment upon their liberties, and openly threatened to seek another ruler. Philip ITI. hastened to avert the storm by withdrawing the obnoxious ordinance. Thus the policy of centralization was abandoned, and the tendencies to division and isolation were confirmed.

The piety of Philip ITI, which was as disastrous to Spain as the more masculine bigotry of his predecessors, found characteristic expression in the persecution of the Moriscoes. Ever since the suppression of their first revolt in 1502,—a revolt which was provoked by the breach of the compact made on the fall of Granada,—the conquered Moors had been cruelly oppressed. Charles V. renewed the edict of 1502 in 1526, and the overt profession of Mohammedanism was extinguished in Spain. But in secret they continued to cherish the faith of their ancestors, and this was enough to exasperate a monarch who preferred to have no subjects at all rather than to rule over heretics. An edict of Philip II. in 1566 forbade them to speak or write in Arabic, and ordered them to renounce all their traditional habits and ceremonies. Futile remonstrances were followed by a desperate rising, which was quelled in 1570. The most obstinate of the rebels were exiled to Africa, but most of them sullenly submitted. Philip III. determined to prove his zeal for orthodoxy by completing the work which his father had left unfinished. In 1609 all the Moriscoes were ordered to depart from the Peninsula within three days, and the penalty of death was decreed against all who failed to obey, and against any Christians who should shelter the recalcitrant. The edict was obeyed, but it was the ruin of Spain. The Moriscoes were the backbone of the industrial population, not only in trade and manufactures, but also in agriculture. The haughty and indolent

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Spaniards had willingly left what they considered degrad- ing employments to their inferiors. The Moors had intro- duced into Spain the cultivation of sugar, cotton, rice, and silk. They had established a system of irrigation which had given fertility to the soil. The province of Valencia in their hands had become a model of agricul- ture to the rest of Europe. In manufactures and com- merce they had shown equal superiority to the Christian inhabitants, and many of the products of Spain were eagerly sought for by other countries. All these advant- ages were sacrificed to an insane desire for religious unity.

The resources of Spain, already exhausted, never recovered from this terrible blow. Under these circum- stances it was an absolute necessity that the ambitious schemes of previous rulers should be abandoned ; and it was fortunate that Lerma was personally inclined to a policy of peace and that events occurred to favour its The accession of James I. in England gave a convenient opportunity for concluding the long war that had been carried on with Elizabeth. English mediation brought about a twelve years' truce in 1609 with the United Provinces, which amounted to a practical recogni- tion of their independence. The death of Henry IV. and the regency of Mary de' Medici enabled Lerma to arrange an alliance with France, which was cemented by a double marriage. Louis XIII. married the infanta Anne of Austria, and Elizabeth of France was betrothed to the son and heir of Philip III. For the moment Spain occupied a higher position in Europe than it had held since the defeat of the Armada. James I. was weakened by quarrels with his parliament and by the want of a definite policy. France under the regency had abandoned the attitude of Henry IV. and was distracted by internal squabbles. The empire was in the feeble hands of Mathias, and the Austrian Hapsburgs were still divided by the family jealousies that had arisen from the deposi- tion of Rudolph II. The Turks had declined since the days of Soliman the Magnificent with a rapidity char- acteristic of Oriental powers. In the midst of these states Spain, subject to an apparently absolute monarchy, enjoyed much the same prestige as in the best days of Philip II. With the consciousness of power the old ambitions revived. An arrangement was being discussed for the recognition of the archduke

Ferdinand as the successor of Mathias in the Austrian territories. Philip IIL, however, advanced a claim to Hungary and Bohemia on the ground that his mother was a daughter of Maximilian II., whereas Ferdinand was only descended from that emperor's brother. The claim was by no means indisputable, but it was inconvenient to Ferdinand to have to discuss it. He agreed therefore to purchase the support of Spain by ceding Alsace, and the vacant imperial fief of Finale in Italy (1617), and on these terms he succeeded in effecting his designs. Thus a prospect was opened to Spain of connecting its Italian possessions with the Netherlands and of forming a compact Spanish dominion in central Europe. At the same time the old policy of advancing Roman Catholicism was resumed, as the success of Ferdinand promised to secure a signal victory for the Counter-Reformation in Germany. But this forward policy was distasteful to Lerma, who found it necessary to retire in 1618. His withdrawal from affairs was not accompanied by any loss of the royal favour, and the offices which he had held were conferred upon his son, the duke of Uzeda.

The alliance between the two branches of the house of Hapsburg was not finally completed by the arrangement with Ferdinand. It was vigorously urged by Oftate, the Spanish representative at Vienna, by Khevenhiiller, the

Austrian envoy at Madrid, and by the Spanish party, headed by Zufiiga, which had always opposed the policy of Lerma. But neither Uzeda nor the royal confessor Aliaga was in favour of an alliance by which Spanish blood and treasure were to be expended in securing the interests of Austria. Philip IIL, however, was gained over by an appeal to his religious feelings, and in January 1620 he undertook to send assistance in men and money to Ferdinand II. Thus Spain was involved in the Thirty Years' War, which had been commenced in 1618 by the revolt of Bohemia against Ferdinand, and the acceptance of the crown by the elector-palatine Frederick V. Spanish troops from Italy aided Tilly to win the battle of the White Hill, and Spinola led an army from the Netherlands against the Palatinate. But the party of peace was still strong in Spain. Frederick V. was the son-in-law of James L, and his complete humiliation would hinder the long-cherished project of a marriage between Prince Charles and the Spanish infanta. The truce with

Holland would expire in April 1621, and if the war was to be resumed with the Dutch it was essential to isolate them by concluding the alliance with England. Moreover, the finances of Spain were by no means in a condition to support the extraordinary expenses of a European war. All these considerations pointed to peace, and Philip III. was on the point of recalling Lerma, when he died in March 1621. His reign had not been glorious or advantageous to Spain, but it contrasts favourably with those of his successors. Spanish literature and art, which had received a great impulse from the intercourse with foreign countries under previous rulers, reached their zenith during his lifetime. Three writers have obtained European fame-—Cervantes, who produced the immortal Don Quixote between 1605 and 16138, and two of the most fertile of romantic dramatists, Lope de Vega and Calderon. In the domain of art Spain produced two of the greatest masters of the 17th century, Velazquez and Murillo.

The time which Philip ITI. had spent on his devotions was given by his successor to the more secular pleasures of hunting and the theatre. But Philip IV. shared to the full his father's disinclination to burden himself with the cares of government. The office of first minister was given to Zufiiga, the chief advocate of an aggressive policy in the late reign. Lerma and Uzeda were banished from the court. But the chief influence over the adminis- tration was exercised from tle first by the royal favourite, the count of Olivares, who succeeded to Zuiiiga's office on the latter's death. Olivares was a man of considerable industry and ability, though his reputation has suffered from the inevitable comparison with his great contem- porary and rival, Richelieu. He conceived the plan of restoring Spain to its former greatness by returning to the policy of Philip II., regardless of the change in the internal resources of the country. All ideas of peace were abandoned, and Spain plunged headlong into the European struggle. The truce with the United Provinces was unpopular because the commercial progress of the Dutch was fatal to the trade of the Spanish Netherlands, and Amsterdam had already begun to take the place of Ant- werp. The expiration of the truce in April 1621 was followed by an immediate renewal of the war. To make the war successful it was imperative to secure the alliance with England, but this was sacrificed because the emperor insisted upon confiscating the Palatinate, which was conferred upon Maximilian of Bavaria. The match with the Spanish infanta

was broken off, and Prince Charles married Henrietta Maria of France. The alienation of England was enough in itself to ensure the ultimate failure of the Dutch War. On the mainland the succes-

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sive stadtholders, Maurice and Frederick Henry, held their own even against the experienced Spinola, and after the latter's recall in 1629 had a distinct advantage. But it was by sea that the Dutch gained their most con- spicuous successes. In 1628 the Spanish treasure-fleet was captured by Admiral Hein, whose booty was estimated at seven millions of guilders. The greater part of Brazil, together with Malacca, Ceylon, Java, and other islands, were conquered by the Dutch sailors. Instead of con- quering the northern provinces, Spain had to make great mo to defend the frontiers of the southern Nether- ands.

In central Europe the fortune of war was more favour- able to Spain and her allies. The crushing defeat of the elector-palatine was followed by the humiliation of the Protestant champion, Christian IV. of Denmark. Ferdinand II. enjoyed for a moment greater power than any other successor of Charles V., and the Edict of Restitution seemed to complete the triumph of the Catholic reaction in Germany. But the revival of the Hapsburg power awakened the jealousy of France, which in 1624 had fallen under the strong rule of Richelieu. The Spaniards had occupied the Valtelline, an" important pass which connected Lombardy with Tyrol. A French army expelled the conquerors in 1624, and the treaty of Mongon restored the pass to the community of the Grisons. For a time France was occupied with the suppression of a Huguenot rising, but no sooner had La Rochelle fallen than Richelieu again interfered to thwart the designs of Spain in the question of the Mantuan succession. The Spaniards endeavoured to exclude the duke of Nevers, the rightful heir to the duchy, on account of his connexion with France. But Richelieu forced the Spanish troops to raise the siege of Casale, and ultimately extorted the treaty of Cherasco (1631), by which the emperor recognized the succession of the duke of Nevers in Mantua. The occupation of Pinerolo in this war gave the French an opening into Italy and threatened the ascendency which Spain had so long exercised in the Peninsula. Mean-

while the victories of Gustavus Adolphus had destroyed the imperial and Catholic ascendency in Germany. The Spaniards were ignominiously driven from the positions which they occupied on the Rhine.

The death of Gustavus Adolphus at Liitzen inspired the Roman Catholic powers with new hopes. Spain determined to strain every nerve to turn the tide of victory. Philip IV.'s brother Ferdinand, the cardinal- archbishop of Toledo, was sent to raise troops in Italy and to lead them through Germany into the Netherlands. In 1634 Ferdinand effected a junction with the imperial forces, and their combined efforts won a signal victory at Nordlingen. The Lutheran princes, headed by John George of Saxony, hastened to make terms with the emperor in the treaty of Prague (1635). The Swedes were left almost isolated in Germany, and a speedy termination of the war seemed inevitable. At this crisis Richelieu decided to embark in the war as a principal, and concluded a close alliance with the Dutch against Spain. For two or three years the new policy of France seemed likely to be attended with failure. The French troops, unaccustomed to war, were no match for the trained veterans of Spain. Not only were they repulsed from the Netherlands, but the cardinal-infant actually invaded France (1636) and inspired a panic in the capital itself. His success, however, was only temporary, and before long the superior policy of Richelieu gave France the upper hand. The occupation of Alsace, which fell into French hands after the death of Bernhard of Saxe- Weimar, interrupted the connexion between the Nether- lands and Italy. In the latter peninsula the French

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gained ground and restored the regent of Savoy, whom the Spaniards had expelled. Finally, more important than all, the alliance with Holland gave France the superiority by sea. The destruction of a great Spanish fleet in the Downs, where it had taken refuge under the neutral flag of England, made it almost impossible to send reinforce- ments from Spain to Brussels. By striking at the points of connexion, Richelieu was breaking the unwieldy Spanish empire to pieces. At this moment his task was imniensely facilitated by the outbreak of internal dissensions.

Olivares had been inspired by the success of his great rival with the idea of strengthening Spain by a vigorous policy of centralization. The monarchy

consisted of a number of scattered provinces, each ruled by a separate council at Madrid, and each possessed of its own separate institutions. They were held together only by the pre- dominance of Castile and by religious unity. This systent Olivares determined to abolish by elevating the royal power to equal absolutism in all the provinces. The dangers from foreign enemies were to be met by forming Spain into one indissoluble whole. But the spirit of pro- vincial independence was still strong, and it was artfully encouraged by the intrigues of Richelieu, who wished to absorb the attention of Spain in its domestic affairs. An edict ordering all able-bodied men to arm for the war, under penalty of confiscation, provoked a revolt in 1640 among the Catalans, who were jealously attached to their old privileges, and whose proximity to the French frontier had already exposed them to intolerable hardships. The Castilian troops were driven from the province, and Catalonia formed itself into a republic under the protection of France. This event exerted a magical influence upon Portugal, where Richelieu's emissaries had also been active, and where the antipathy to Castile was national rather than provincial. In December 1640 a revolution was successfully accomplished in Lisbon, and the crown was assumed by a native noble, John of Braganza, in whose veins ran the blood of the ancient kings. These disasters were fatal to Olivares, to whose system of government they were not unnaturally attributed. In 1643 he was compelled to resign his post, and Philip IV. announced his intention of ruling alone.

The revolt of Catalonia and Portugal, together with the undisguised discontent shown by several of the other provinces, could not but hamper Spain in the conduct of the European War. The conquest of Roussillon in 1642 enabled the French to give effectual assistance to the Catalans, who acknowledged Louis XIII. as count of Barcelona. The successive deaths of Richelieu (1642) and Louis XIII. (1643) made no difference to the policy of France, which was directed by Mazarin under the regency of Anne of Austria. The French had now completely made up the military inferiority which had foiled their efforts at the beginning of the war. In 1643 Enghien (afterwards the great Condé) won the first of a brillant series of victories at Rocroi, and his success was the more important because it placed the domestic authority of the regent upon a firm footing. The disasters of Spain were increased by the formidable rising of Masaniello in Naples (1647), which was carried on by the duke of Guise and was suppressed with

difficulty in 1648. This was fol- lowed by the loss of the Austrian alliance through the treaty of Westphalia. As it would have been impossible for Spain to contend single-handed against the hostile coalition, the opportunity was seized to make terms with Holland. This was only achieved by consenting to great sacrifices. Not only did Spain surrender all claims to sovereignty over the northern provinces, but it also ceded to them the northern districts of Brabant, Flanders, and Limburg, with the strong fortresses of Maestricht, Her-

togenbosch (Bois-le-Duc), Bergen-op-Zoom, and Breda. ite Dutch retained all their conquests in America and the Indies, and secured themselves from the rivalry of Ant- werp by a clause which enjoined the permanent closing of the Scheldt. This marks the final recognition of the United Provinces as an independent state, and also the transference to the northern powers of the maritime supremacy hitherto claimed by Spain.

France and Spain were now left face to face with each other. For the next four years the disturbances of the Fronde gave the Spaniards a great opportunity, of which they were not slow to avail themselves. In the Nether- lands they recovered Gravelines, Ypres, and Dunkirk, while Don John of Austria, a natural son of Philip IV., took Barcelona and reduced the Catalans to submission. But the triumph of Mazarin in 1653 enabled France once more to devote itself to the war, although at the same time it drove the great Condé into the Spanish service. The military operations now reduced themselves to a duel in the Netherlands between the rival generals Condé and Turenne. ‘The old tactics, which were adhered to with Spanish obstinacy, were now out of date, and the once invincible infantry was almost useless against the quick movements of light-armed troops which had been intro- duced by Gustavus Adolphus. The struggle was finally decided by the intervention of England. Both powers had earnestly sued for the support of Cromwell. The rapid advance of the French power was a cogent reason for England to assist Spain, but the religious bigotry that still prevailed at Madrid made the alliance impossible. At last Mazarin gained over the Protector by promising to banish the Stuarts from France and to

cede Dunkirk. Reinforced by 6000 Ironsides, probably the best soldiers in Europe, Turenne was irresistible. Dunkirk was re- duced after an obstinate defence and handed over to the English, to the great scandal of Roman Catholic Europe. One after another the fortresses of Flanders fell into the hands of the French, and, though the death of Cromwell lost them the support of England, it was impossible for Spain to continue the war. In 1659 Mazarin and Don Luis de Haro, the successor of Olivares, met on a small island in the Bidassoa, and there arranged the treaty of the Pyrenees. Spain had again to make great sacrifices. Besides Artois and several fortresses in the Netherlands, Roussillon and Cerdagne were ceded to France, and thus the Pyrenees were fixed by law as the boundary between the two countries. Louis XIV. was to marry the infanta Maria Theresa, who was to receive a large dowry, but was to renounce all eventual claims to the Spanish crown. The only concessions made by France were the pardon of Condé, the recognition of Catalonia as a province of Spain, and the promise to give no more assistance to the Portuguese.

Now that Spain was freed from external hostilities, it scemed possible that the reduction of Portugal might be at last accomplished. But the alliance of France was speedily replaced by that of England, and Catherine of Braganza was married to Charles II. Louis XIV., too, tried to obtain from the Spanish Government an acknowledgment of his wife's claims to the succession, and failing in this he continued to send secret assistance to the Portuguese. A French general, Schomberg, defeated Don John of Austria in 1663, and two years later routed the Spanish forces at the battle of Villa Viciosa. This final disaster crushed the declining energies

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the government to his widow Maria Anna of Austria, with a special junta to advise her in the conduct of affairs. As the Spanish monarchy had declined, its

CHARLES I1.]

authority had been exercised by a series of chief ministers, —Lerma, Olivares, and Haro,—and this was the only way in which the unity of the executive power could now be maintained. The favour of the queen-mother

raised to this position her confessor, Father Nithard, a native of Styria. He was a man of ability and experience, and set himself to cope with the most glaring evils of the state. He endeavoured to dimininish the public expenditure by limiting the salaries of officials, and by putting an end to the abuses which hindered the commerce with the colonies. But he was soon called upon to face unexpected difficulties. Louis XIV. advanced a claim, on behalf of his wife, to certain territories in the Nether- lands in virtue of the so-called “law of devolution.” This was an old custom by which the children of the first marriage succeeded, to the exclusion of all later descendants. As Spain resisted the claim, the French invaded Flanders and overran Franche-Comté. The regent was compelled to purchase the restoration of the latter province by ceding part of Flanders to France in the treaty of Aix- la-Chapelle (1668). At the same time the independence of Portugal was finally acknowledged. These disasters increased the jealousy with which the Spanish nobles regarded the rule of a Jesuit anda foreigner. A strong opposition party was formed under the leadership of Don John of Austria, and in 1669 Nithard was compelled to resign. But ainong the nobles themselves there was little unity, and a difference arose as to the policy to be pursued when Louis XIV. attacked Holland in 1672. The queen- mother was naturally on the side of Austria, and her influence was sufficient to secure the adhesion of Spain to the first European coalition against France. This success she followed up by obtaining the post of chief minister for another favourite, Fernando de Valenzuela, who was appointed marquis of Villafierra and raised to the rank of a grandee of Spain. This revived the jealousy of the nobles, who again formed a league for the maintenance of their privileges under Don John of Austria. This time they were completely successful. Not only was Valenzuela banished, but Maria Anna herself was compelled to retire from the court and to take up her residence in Toledo. Don John was now all-powerful. A natural antipathy to the policy of the regent led him to draw aloof from the Austrian alliance and to attach himself to France. A marriage was concluded between Charles II. and Maria Louisa of Orleans. It was hoped that by this means better terms would be obtained from Louis XIV., but in the treaty of Nimeguen Spain had to surrender Franche- Comté and fourteen fortresses in Flanders. This treaty marks the complete loss by Spain of its position as a first-rate power. Henceforth it could only exist by the support of those states which resented the aggrandizenient of France. Don John was no more successful

in his domestic than in his foreign policy. His industry was as unwearying as that of Philip IL. himself, and he deter- mined to rule independently of all interested advisers. The reform from which he hoped most was a revocation of the crown domains which had passed into private hands. But the scheme met with natural opposition from the nobles, and he died in 1679 without having accomplished anything. Fora year Charles II. endeavoured to rule in person with the help of the ordinary council, but the attempt only showed how the strength of the monarchy was bound up with the personal character of the ruler. “Charles V.,” says Mignet, “had been both general and king; Philip II. was merely king, Philip III. and Philip IV. had not been kings; Charles II. was not even a man.” From infancy Charles’s health had been so defective that his death had appeared an imminent contingency, and his intellect was as feeble as his body. It was impossible for

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hini to exercise any effective control over the government, and he was little more than a tool in the hands of the nobles, who, under Don Luis de Haro, had recovered much of the political influence from which Olivares had excluded them. In 1680 the office of first minister was given to the greatest of Spanish magnates, the duke of Medina- Celi. It was at this time that Louis XIV. was conducting his famous réunions, and the weakness of Spain enabled him to annex without opposition Courtrai, Dixmude, and the great fortress of Luxemburg. Medina-Celi, dis- gusted with his thankless task, resigned in 1685, and his place was taken by Count Oropesa. The new minister revived the alliance with Austria, and Spain became a member of the league of Augsburg in 1686. The success of the league seemed to be almost assured by the Revolution which gave the crown of England to William III., the leader of the opposition to Louis XIV. But in spite of apparently overwhelming odds France more than held her own, and Spain was humiliated by the capture of Urgel and Barcelona. Ministers held office only at the will of court factions, and the first disaster was fatal to Oropesa. Spain continued to play a secondary part in the war, which was concluded in 1697 by the treaty of Ryswick, the first for many years in which France

did not obtain any addition of territory. The chief motive for Louis XIV.'s moderation was the desire to devote his attention to the approaching question of the Spanish succession.

The decline. of Spain in the 17th century is not to be measured by its territorial losses. Holland had extorted a tardy recognition of its independence; Portugal was once more a separate kingdom; Catalonia was reduced only to very doubtful submission; France had seized upon Roussillon and Cerdagne, Franche-Comté, and great part of the southern Netherlands; French influence had been established in Italy as a counterpoise to that of Spain. But the weakness of the extremities, to which these facts bear conclusive testimony, was the result of still greater weakness at the centre. The population of the peninsula, estimated at twenty millions under the Arabs and at twelve under Ferdinand and Isabella, had fallen to less than six millions in the reign of Charles II. This decrease of numbers was doubtless due in the first place to the religious bigotry which had condemned thousands of Jews and Moriscoes to death or exile, but it is partly traceable to a fatal decline in the economic prosperity of the country. Agriculture, for which many parts of Spain were peculiarly fitted, had suffered from the departure of the Moriscoes and from a number of other causes. The want of any law of mortmain had led to the accumulation of at least one-fourth of the land in the hands of the monasteries, the most charitable but the most careless and conservative of landlords. Thanks to their obstinate adherence to obsolete methods of cultiva- tion, their estates produced little more than one per cent. on the outlay. The system of entail, which earlier monarchs had striven to restrict, made enormous strides in the 16th century, and most of the secular estates were inalienably concentrated in the hands of a few great nobles, who lived at Madrid and spent their revenues in lavish extravagance without any regard to the interests of their tenants. In the fertile provinces of Andalusia and Estremadura agriculture was entirely ruined by the system of sheep-farming. In the 12th century, when the country was exposed to the destructive forays of the Moors, the inhabitants had been forbidden to enclose their lands with either hedges or ditches, and successive kings had encouraged the rearing of huge flocks of sheep which could easily be driven over the open country into a place of safety. In the 16th and 17th centuries the condition

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of things had entirely changed, but the old regulations were jealously maintained by the company of La Mesta, one of the most powerful and independent corporations in Spain. This body, which derived large revenues from the sale of wool, was enabled to retain its privileges intact until the reign of Charles [1]. Every summer their flocks poured down the northern mountains, and the absence of enclosures made it impossible to defend the crops from their ravages. Besides making agriculture impossible, the exclusive attention to sheep-rearing led to the gradual disappearance of the old forests, and, as no one ventured to plant new trees, great parts of Castile became an arid desert. Every kind of industry suffered in the same way as agriculture. The true Spaniard despised all who earned a living by handicraft, and when the Moriscoes had been banished it was impossible to obtain skilled artisans except by importing them. The Spaniards could not even cut their own timber into ships or construct fortifications for their own towns. Madrid and other cities were crowded with foreigners, who hastened to make a fortune that they might carry it back to their native land. The Government was quite as much to blame as individuals. The gold from the New World would have enabled Spain to command the markets of Europe, but the medizval restrictions on the exportation of the precious metals were strictly enforced. The high price of commodities was attributed, not to the superfluity of the medium of exchange, but to the competition of foreign and colonial markets. It was forbidden to export one article after another, and the colonies were expected to send gold without receiving anything in exchange. A more ruinous policy could hardly be conceived; but it was supported by the merchants themselves, who refused to fill their vessels with anything but gold and silver, and left the indigo, cotton, and other commodities to the English and the Dutch. Domestic production, crippled by these restrictions, was almost destroyed by the exces- sive taxation rendered necessary by the ambitious schemes of Philip II. and his descendants. It is notorious that Austria could never have carried on the Thirty Years’ War so long but for the supplies received from Spain. Spain,

in fact, was the great subsidizing power in the 17th century, as England was in the 18th. The enormous expenditure thus necessitated was wrung from the classes least able to pay it, as the Government was not strong enough to attack the exemption of the nobles and clergy. The alcavala, the tax on sales which Ximenes had abolished, was restored under Philip IL, and in the 17th century reached the enormous amount of 14 per cent. The traders naturally sought to evade a tax which it was impossible to pay. But this only increased the vigilance of the revenue officers, who endeavoured to collect the tax at every opportunity, on the raw material, on the manu- factured product, and again every time that it changed hands. ‘Taxation in Spain was a caricature of Alva’s system in the Netherlands, and was even more ruinous than that had been. Foreign nations reaped all the advantages which the short-sighted policy of the Spaniards threw away. It has been calculated that five-sixths of the manufactured commodities consumed in Spain were provided by foreigners, and that they carried on nine- tenths of the commerce with the Spanish colonies. By law all foreign trade with the colonies was prohibited, but the decline of native industry made it impossible to enforce the laws, and the Spanish Government had to con- nive at acontraband trade of which other countries gained all the profit. The policy of the earlier kings had made the colonies dependent upon European products, and

when Spain could no longer supply them they had to be obtained elsewhere.

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[HISTORY.

the 17th century allied Spain with England and Holland against France, and the English and Dutch founded their commercial supremacy upon the trade which Spain threw into their hands. The country which had sent a hundred vessels to Lepanto, and which in 1588 had despatched the great Armada against England, was reduced under Charles II. to borrowing Genoese vessels to maintain its con- nexion with the New World. The army, which had once been the terror of Europe, had sunk at this time to an effective force of little more than 20,000 men. In litera- ture and art the decadence of

Spain was equally con- spicuous and complete. The religious unity of the country was preserved, but all touch with the intellectual advance of Europe was deliberately sacrificed.

In spite of its loss of power and prestige, the crown of The ff Spain was still regarded as a prize well worth winning. Spanish |

Ever since Charles IT.'s accession the Spanish succession had been a prominent question for European diplomacy, and from 1697 it became the pivot on which international relations turned. Charles II.'s first wife, Maria Louisa of Orleans, had died childless in 1689, and his second marriage to Maria Anna of Neuburg was equally unfruit- ful. The male line of the Spanish Hapsburgs was evidently on the verge of extinction, and by law and tradition the crown would pass to the nearest female or her heir. But the question was complicated in many ways. Of Charles II.'s two sisters, the elder, Maria Theresa, had married Louis XIV., and had renounced her claims, but her husband had always protested against the renunciation, and the non-payment of the stipulated dowry gave him an argument for its nullity. The younger, Margaret Theresa, had married the emperor Leopold I., and had made no renunciation ; but she had since died, leaving an only daughter, Maria, who married the elector of Bavaria. Going a generation back, the two sisters of Philip IV. had also married into the houses of Bourbon and Hapsburg. Anne of Austria, whose renunciation of the Spanish crown was undisputed, was the mother of Louis XIV., while Maria Anna was the mother of Leopold I. Ever since the division of the house of Hapsburg into two branches it had been agreed

by a family compact that if either became extinct the

other should succeed to its territories. Leopold I. was extremely anxious to restore the unity of the family by securing the observance of this compact, and he had a great advantage in the fact that Charles IL.'s mother was his own sister, and Charles's second wife was his sister- in-law. The will of Philip IV. had arranged that, after Charles IL and his descendants, the crown should pass, first to Margaret Theresa and her children, and secondly to Leopold and his children. It was a great disappointment to Leopold that his first wife left him only a daughter, but he tried to secure the claims of his family by extort- ing from her on her marriage a renunciation of her rights

to the crown of Spain. This renunciation the Spanish Government had never recognized, and the queen-mother, whose adherence to the Hapsburg interests was overcome by her feelings for her own family, induced Charles II. to make a will in 1696 in which he named Joseph Ferdinand, the infant electoral prince of Bavaria, as his heir. But the queen-mother's death withdrew the dominant influence at the court of Madrid and enabled the Austrian envoy, Count Harrach, with the help of the queen, to procure the revocation of this will. The succession now became the subject of party quarrels and intrigues, in which the rival envoys of Austria and France took a prominent part. The aim of Leopold I. was to obtain the succession of his second son, the archduke Charles, while Louis XIV. hoped to procure the Spanish crown, if not for his son, at The office of first minister

successid question|}

THE SPANISH SUCCESSION. |

in Spain had not been filled up since the fall of Oropesa, and the most influential man in the kingdom was Cardinal Portocarrero, archbishop of Toledo. He was a bitter opponent of the queen, who was extremely unpopular, and all his efforts were directed to thwart the schemes of Austria. To depress the cardinal, Maria Anna induced Charles II. to recall Oropesa, but the latter declined to return to the Austrian alliance which he had previously championed, and espoused the cause of the electoral prince. There was no semblance at this time of a French party in Madrid, but Louis XIV. availed himself of the cessation of hostilities to send thither an able diplomatist, Count Harcourt, who speedily contrived to exercise considerable influence over the course of events.

Too many European interests were involved in the succession to allow it to be settled as a mere question of doniestic politics. The idea of the balance of power dominated European diplomacy at this time, and William III. of England was its avowed and recognized champion. England and Holland, the two countries with which William was connected, were vitally interested in the Spanish trade. The accession of a French prince in Spain would almost inevitably transfer to France all the advantages which they at present enjoyed It was obvious that William III. must have a voice in the settle- ment of this succession, and Louis XIV., whe had no desire for a new

European war, was willing to recognize this. The negotiations between England and France resulted in the first treaty of partition (October 11, 1698). The electoral prince was to receive the bulk of the Spanish empire, viz., Spain itself, the Netherlands, Sardinia, and the colonies; the dauphin was to have Naples, Sicily, Finale, and Guipuzcoa ; while Lombardy was to go to the archduke Charles. This treaty had one fatal defect—that it was based solely on the interests of the contracting powers and took no account of the wishes of the Spaniards, who resented any proposal for tle division of the empire. The first hint of the treaty irritated Charles II. into making a second will in November in favour of the electoral prince, and all parties in Spain agreed in its approval. But within three months both treaty and will were rendered null by the sudden death of the infant prince (February 1699), and the question, thus reopened, became more thorny than ever, as the choice now lay definitely between Austria and France. It seemed almost impossible to prevent the outbreak of a general war, but William III. patiently reunited the broken threads of his diplomacy, and arranged with France a second treaty of partition. The Spanish monarchy was to be divided into two parts. The larger, consisting of Spain, the Netherlands, Sardinia, and the colonies, was to go to the archduke Charles. The dauphin was to receive the share stipulated in the former treaty, with the material addition of Lorraine. The duke of Lorraine was to be compensated with the Milanese. This treaty, unlike the first, was communicated to Austria; but the emperor, who was now confident of securing the whole inheritance, refused to accept it.

Meanwhile the death of the electoral prince had de-

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Spaniards. The Austrian party hoped to utilize the popular feeling against Louis XIV. as a party to the hated treaty. But Harcourt adroitly contrived to suggest that the best way of annulling the partition project was to enlist Louis’s own interests against it. The view steadily gained ground that the house of Bourbon was the only power strong enough to secure the unity of the Spanish empire. Portocarrero succeeded in inducing Pope Innocent XII. to support the French claim. Charles IL, feeble to the last, succumbed to

this combination of influences, and signed a testament bequeathing the succession to Philip of Anjou, the second grandson of Louis XIV., on condition that he would renounce all claims to the crown of France (October 3, 1700). Thus his last act was to disinherit his own family in favour of the enemy with whom he had been at war almost all his reign. He died on the lst of November 1700.

Everything now depended upon the decision of Louis XIV. ‘The treaty of partition offered substantial advant- ages to France ; Charles I1.’s will would exalt the honse of Bourbon above every other family in Europe. His hesitation, whether real or feigned, did not last long. On November 16 he introduced his grandson to the French court as Philip V. of Spain. the king was also based upon sound policy. In the face of Spanish opinion and of the emperor’s refusal it was impossible to carry out the partition treaty. And for the moment it appeared that the accession of a Bourbon prince would be secured without difficulty. Philip V. was proclaimed in all parts of the Spanish monarchy amid popular acclamations. Leopold I. protested and prepared to attack Lombardy, but he could not hope to obtain the whole succession for his son without the assistance of the maritime powers. William III., who saw the aims of his life threatened with ruin, was eager for war, but his subjects, both in England and Holland, were resolute to maintain peace. In these circumstances Louis XIV. played into the hands of his enemies. He expelled the Dutch garrisons from the fortresses of the Netherlands which they had occupied since the treaty of Ryswick, and replaced them by French troops. He showed a cynical intention to regard Spain as a province of France, and he took measures to secure for the French the commercial advantages hitherto enjoyed by England and Holland. William III. was thus enabled to conclude the Grand Alliance (September 7, 1701), by which the contracting powers undertook to obtain the Netherlands and the Italian provinces of Spain for the archduke Charles and to preserve the mercantile monopoly of the English and Dutch. A few days afterwards James II. died at St Germains, and Louis XIV. was injudicious enough to acknowledge his son as king of England. This insult exasperated public opinion in that country; the Tory parliament was dissolved; and the last obstacle to William’s warlike policy was swept away. William him- self died in March 1702, but he left the continuance of his policy to the able hands of Marlborough and Heinsius. The war which the

emperor had commenced single-handed in 1701 became general in the next year.

The dynastic ambition of Philip V.

stroyed the temporary unanimity at Madrid. Portocarrero and his partisans were gained over to the side of France by Harcourt. Oropesa fell back upon a scheme of his own for uniting the whole Peninsula under the king of

It is needless to follow the military operations of the War of War of the Spanish Succession, which have been rendered the | famous by the exploits of Eugene and Marlborough. The SP22’sh

chief scenes of hostilities were the Netherlands, Germany, a

Portugal. The queen returned to her old allegiance to her brother-in-law, and formed a close alliance with Harrach for the advancement of the interests of the arch- duke Charles. A popular rising overthrew Oropesa and enabled Portocarrero to regain his ascendency. At this juncture came the news of the second partition treaty, which again irritated the tender susceptibility of the

and Italy, in each of which the French suffered fatal and humiliating reverses. At first the peninsula of Spain was not directly concerned in the war. The Grand Alliance did not aim at excluding Philip from the Spanish monarchy as a whole, but only from those parts which the maritime powers wished to preserve from French influence. But in 1703 Pedro IL. of Portugal deserted the cause of

France and concluded the Methuen treaty with England. This opened the Peninsula to the allied forces and necessitated a revision of the terms of the alliance. Pedro’s support could only be purchased by the expulsion of the French from Spain, and the allies now determined to claim the whole Spanish inheritance for the archduke Charles. In 1704 the archduke appeared in Portugal, and the English fleet, under Sir George Rooke, captured Gibraltar. As the assistance of the Portuguese was only half-hearted, it was decided in 1705 to seek a new open- ing in the east.

Catalonia, always inclined to revolt against its rulers, and recently irritated by the conduct of Philip V., offered a convenient base of operations. The brilliant but eccentric earl of Peterborough succeeded in capturing Barcelona, and by the end of the year the arch- duke was acknowledged as Charles III. in Catalonia, Valencia, and Aragon. A great effort on the part of Philip to recover the lost provinces was repulsed, and a simultaneous advance of the allies from the east and from Portugal compelled him to evacuate Madrid, where Charles III. was formally proclaimed. But the provincial dis- union, which had so often hampered the Hapsburg kings, proved the salvation of their Bourbon successor. The Castilians refused to obey a king who was forced upon them from Aragon, and their religious instincts were offended by the alliance of Charles with the heretics of England and Holland. Disunion among the allies aided the revolt of Castile, and by the end of 1706 Charles III. found himself compelled to evacuate his recent conquests and to return to Barcelona. In 1707 the allies attempted another invasion of Castile, but they were routed by the duke of Berwick at Almanza, and Aragon and Valencia were forced to return to their allegiance to Philip V. For the next two years the war in the Peninsula languished. Charles III. received reinforcements from Austria under Stahremberg, but he was unable to do more than retain his hold upon Barcelona. In 1710 the cause of the allies received a new impulse from the arrival of Stanhope with supplies of men and money from England. Under the joint command of Stanhope and Stahremberg the army advanced westwards from Barcelona, defeated Philip V. at Almenara and Saragossa, and for the second time occupied Madrid. The disasters which the French had experienced in other parts of Europe had broken the pride of Louis XIV., and he was prepared to purchase peace by sacrificing his grandson. A treaty would have been concluded to this effect at Gertruydenburg, if the allies had not insisted that the French troops should be employed in forcing Philip V. to accept it. Louis XIV. refused to take arms against his own family, and a sudden change in the current of fortune saved him from the humiliation which his enemies wished to force upon him. Charles III. found it impossible to maintain Madrid in face of the enthusiasm of the Castilians for his rival. The capital of Spain was of no importance from a military point of view, and the allies determined on its evacuation. On their retreat they were followed by Vendéme, whom Louis XIV. had sent to his grandson’s assistance. Stan- hope, attacked at Brihuega, was compelled to capitulate

with all his forces before Stahremberg could arrive to his assistance. The latter was defeated after an obstinate struggle at Villa Viciosa. Aragon and Valencia again submitted to Philip, and the archduke was once more confined to Catalonia.

At this juncture two events occurred which completely altered the balance of the contending powers. The fall of the Whig ministry through a court intrigue gave the con- trol of English policy to the Tories, who had always been hostile to the war. The death of Joseph I. in April 1711 left the Austrian territories to his brother, the archduke

Charles, who was soon afterwards elected emperor as Charles VI. To allow him to obtain the Spanish succes- sion would be to revive the empire of Charles V., and would be even more dangerous to the balance of power than the recognition of Philip V. with adequate securities against the union of France and Spain. The object for which the allies had been making such immense exertions was now a result to be averted at any cost.

Tn these altered circumstances, Bolingbroke, the English Treaty «

minister, hurried on the negotiations with France which resulted in the treaty of Utrecht between England, France, Spain, and Holland. Philip V. was acknowledged as king of Spain, on condition that he should formally renounce all eventual claims to the crown of France. But the partition of the Spanish monarchy was insisted upon by the allies. The Netherlands were to be handed over to Austria, on condition that the Dutch should garrison the barrier fortresses. Austria was also to receive the Italian provinces of Spain, with the exception of Sicily, which was given to the duke of Savoy with the title of king. England naturally obtained considerable advant- ages from a war in which she had borne so prominent a part. The acquisition of Gibraltar and Minorca gave her the control of the Mediterranean. The asiento conferred upon her the privilege of importing slaves into the Spanish colonies, and she also obtained the right of sending a single vessel into the South Seas. France had to recog- nize the Protestant succession,

and to cede Newfoundland, Acadia (Nova Scotia), and Hudson's Bay. Charles VI. refused to accept the terms offered to him at Utrecht, but he found it impossible to carry on the war by himself, and in 1714 he made peace with France by the treaty of Rastatt. But he still retained the title of king of Spain, and showed no willingness to acknowledge Philip V.

The great blot on the conduct of the allies in arranging

the treaty of Utrecht was the desertion of the Catalans, who had rendered such loyal services during the war. They were left to the tender mercies of Philip V., who sent Berwick to reduce the rebellious province. Barcelona resisted for many months with the heroism of despair, and was well-nigh reduced to ashes before it could be taken (September 1714). With its fall all resistance came to anend. 'The three Aragonese provinces were deprived of the last remnants of their ancient privileges, and were henceforth ruled from Madrid under Castilian laws. With the final accession of a Bourbon king Spain entered upon a new period of history, in which it once more played a considerable part in European politics. The death of Louis XIV. (1715), and the acquisition of the regency in France by the duke of Orleans, destroyed the close connexion that had hitherto existed between France and Spain. Philip V. was hypochondriacal and bigoted, the slave of his wife and his confessor, but he had certain definite schemes to which he clung with the obstinacy of a weak character. In spite of his solemn renunciations and the guarantee of the European powers, he never relinquished the idea of ultimately succeeding to the French throne. In what was regarded as the probable event of Louis XV.'s death, he was determined to enforce his hereditary claim, even if he had to resign the crown of Spain. His interests were diametrically opposed to those of the duke of Orleans, who was, after Philip's family, the natural heir to Louis XV. Philip V. had one other guiding passion, enmity to Charles VI., who had robbed the Spanish monarchy of its fairest provinces in Italy. These provinces he set his heart upon regaining, and in this project he was encouraged by the two people who had most influence over him,—his wife and his minister.

Philip V.'s first wife, Maria Louisa of Savoy, had died in 1714, leaving him two sons, Louis and Ferdinand. A suc-

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dminis- on the French throne. ration of Spanish affairs for a short period to her countryman }iberoni. Ajberoni, one of the strangest personages of the 18th -century. The son of a gardener at Piacenza, he had

cessor was speedily found for her in the person of Elizabeth Farnese, niece of the duke of Parma, who was suggested by Alberoni, at that time agent for Parma at Madrid.

The new queen speedily obtained unlimited ascendency

over her husband's mind, and she displayed an unbridled ambition and a capacity for intrigue astounding in one who had been brought up in complete retirement. As Philip's sons by his first wife would exclude her own children from the Spanish throne, she was anxious to obtain for the latter the reversion of the duchies of Parma and Tuscany, to which she had an eventual claim. With this end in view she encouraged her husband's designs in Italy, while personal ambition made her eager to see him Her favour gave the conduct of

sought a career in the church, and had come to Spain in the suite of Vendéme, whose favour he had won by com- bining the functions of a cook and a buffoon. After the death of his patron he remained in Spain, and conceived an ardent affection for the country of his adoption. to power by the part he had played in effecting the king's marriage, he determined to exalt Spain from its long de- pression to the position it had once occupied in Europe. His domestic reforms showed that he had a real capacity for government. Commerce and industry revived under his patronage ; the army was reorganized, and the revenue increased. But his chief attention was given to the navy, the real foundation of the former greatness of Spain. Foreigners who had known the country under Charles II. or during the Succession War were astounded at the strides which it had made under the new administration. Alberoni himself is said to have assured Philip that with five years of peace he would make him the most powerful sovereign of Europe. But these years of peace he was not destined to have. Alberoni cordially approved the Italian designs of Philip, and hoped to employ the

restored might of Spain in freeing his native country from the hated rule of Austria. He had less sympathy with the

king’s hankering after the French crown and his enmity |

to the regent Orleans. But he held office only by the royal favour, and could not venture to set up his own will against that of his master. He was convinced, and not without reason, that everything would go well if he could secure the English alliance.

But the attitude of Spain had already awakened sus- picion in France, and the ready mind of Dubois had conceived a plan for thwarting Alberoni. He determined to desert the policy of Louis XIV. and to conclude a close alliance between France and England. This was to be based upon the common danger from rival pretenders, which urged the houses of Orleans and Hanover to main- tain the provisions of the treaty of Utrecht. An agree- ment was arranged between the two states in 1716, and, being joined by Holland in January 1717, was known as the Triple Alliance. This was a great blow to Alberoni, and made him anxious to postpone all hostilities until his preparations were complete. But his hand was forced by the indignation excited in Philip V.’s mind by an insult offered to him by the emperor. The grand inquisitor of Spain was arrested in Lombardy as a rebel against Charles III., his lawful king. Philip V. decided for an immediate rupture, and Alberoni against his will had to send an expedition to Sardinia, which overran the island in 1717. The enthusiasm excited in Spain by the unwonted news of a military success was increased in 1718 when another Spanish force occupied Sicily. But meanwhile Charles VI. had appealed to France and Eng- land for assistance against this rupture of the treaty of

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Utrecht. The Triple Alliance, reinforced by the junction of Austria, became the Quadruple Alliance (August 1718). The resolution of the allies was

convincingly displayed in a naval encounter in which Admiral Byng destroyed the Spanish fleet off Cape Passaro.

Hitherto the only fault to be found with Alberoni's schemes is that they were attempted prematurely, and this was the fault of the king rather than of the minister. But the Quadruple Alliance drove him in despair to form those far-reaching projects which are generally associated with his name, and which have given rise to the unjust impression that his whole policy was chimerical and unsound. To meet the hostility of England and France he must make use of internal divisions. He invited the Pretender to Spain, prepared an expedition in his behalf, and concerted with Count Gérz, the minister of Charles XIL., a grand scheme by which Sweden and Russia were to combine in supporting the Jacobites against George I. At the same time, through the Spanish envoy Cellamare, he organized a conspiracy among the numerous opponents of the regent. All these schemes broke down simul- taneously. Charles XII. was killed at the siege of an obscure town in Norway; Gorz was executed by his successor ; the Spanish fleet which was to carry the Pre- tender to England was wrecked; the conspiracy of Cel- lamare was discovered and suppressed. France declared war, and sent an army under Berwick across the Pyrenees. An English fleet gratified the national love of a maritime monopoly by burning along the Spanish coast the vessels and docks which Alberoni had created. The emperor, who had just ended a war with Turkey by the treaty of Passarowitz, was able to send a force which succeeded in recovering Sicily. Alberoni was sacrificed to appease the enemies of Spain, and was exiled ,from the kingdom he had served so loyally in December 1719. A month later Philip V. accepted the terms imposed upon him by the Quadruple Alliance. He had to confirm his renunciation of the French crown, and also to abandon all claims on

the provinces of Spain which had been ceded to Austria

by the treaties of Utrecht and Rastatt. He also allowed the emperor to retain Sicily, the duke of Savoy being compensated with Sardinia. On the other hand Charles VI's pretensions to the Spanish crown were definitely abandoned, and the allies recognized the eventual claims to Parma and Tuscany of Philip's children by his second marriage, on condition that those duchies should never be united with Spain.

In spite of the conclusion of peace, Philip coutinued to cherish his animosity against Charles VI., especially as the latter showed an inclination to evade the condition about Parma and Tuscany by encouraging other claimants to come forward. ‘To gratify this passion, Philip went so far as to lay aside his old enmity against the duke of Orleans, and to authorize the negotiation of a close alliance with France. His eldest son, Don Luis, was married to a daughter of the regent, and Louis XV. was betrothed to the infanta Maria Anna. But the death of Orleans in 1723 gave a new direction to the king’s policy. In 1724 Europe was astounded by the news that Philip had abdicated in favour of Don Luis, and had gone into retirement at San Ildefonso. This act was generally attri- buted to the indolence and superstition which formed the basis of his character, but the real motive was undoubtedly a desire to remove tle chief obstacle to his accession in France. Louis XV., however, disappointed his expecta. tions by continuing to live, and the queen soon wearied of her unwonted seclusion. Luis only survived his accession eight months, and to the surprise of the world Philip V. emerged from his retreat to resume the crown which he had laid down of his own accord.

XXII. — 43

Ripperda.

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The queen returned to power more determined than ever to carry out her favourite scheme of obtaining an Italian principality for her eldest son Don Carlos. As France and England had shown themselves lukewarm in the matter, she resolved to turn to her husband’s enemy, Charles VI. This scheme was suggested by a Dutch adventurer, Ripperda, who inspired Elizabeth with a belief that the Austrian alliance would enable her not only to effect her object in Italy, but also to regain Gibraltar and Minorca for Spain. This was rendered the more probable by the fact that Charles VI. had quarrelled with England about the foundation of the Ostend Com- pany. ‘The conduct of the affair was entrusted to Rip- perda himself, and while he was at Vienna a great impulse was given to the negotiation by a complete rupture between Spain and France. The duke of Bourbon, who had become chief minister in France after the death of Orleans, had set himself to

reverse the policy of his pre- decessor. To complete this, he sent the infanta back to Spain and married Louis XV. to Maria Leczinska, daughter of the ex-king of Poland. This insult removed the last scruples of Philip V. about the Austrian alliance, and in April 1725 Ripperda concluded the treaty of Vienna. The mutual renunciations arranged by the Quadruple Alliance were confirmed : Spain recognized the settlement of the Austrian succession by the Pragmatic Sanction and promised great commercial privileges to the Ostend Company, while Charles VI. pledged himself to secure the succession of Don Carlos in Parma and Tuscany and to use his influence with England to obtain the restitu- tion of Gibraltar and Minorca. By a secret treaty Charles further undertook, in the case of England's refusal, to assist Spain with arms and also to send aid to the Jacobites. These terms were soon divulged by the indis- creet vanity of Ripperda himself, and England and France formed the counter-league of Hanover (September 1725), which was also joined by Frederick William I. of Prussia, though only for a short time.

Ripperda returned to Spain, to be rewarded with the office of chief minister. But his success seems to have turned his head; his boasts about the grand results to be expected from the Austrian alliance proved to be ill- founded, and his fall was as sudden as his rise had been. After a brief period of exile in England, he sought a new home in Morocco, where he became a convert to Islam and died in 1737. But his policy was continued by his successor, Don Joseph Patiiio, who sent a fleet to lay siege to Gibraltar. Europe was now divided into two hostile leagues, but the outbreak of a general war was averted, partly by the pacific inclinations of Walpole in England and Fleury in France, and partly by the growing coolness between Austria and Spain. Charles VI. had been led into the treaty of Vienna by a momentary pique against England, but he soon realized that he had more to lose than to gain by favouring the Spanish designs upon Italy. Accordingly, in May 1727, while the siege of Gibraltar was proceeding, he threw over his obligations to Spain and signed the preliminaries of a peace with England and France. The Ostend Company was suspended, and the questions about Parma, Tuscany, and Gibraltar were referred to a European congress at Soissons. The Spanish Government found it impossible to hold out in isolation, and accepted these terms by the convention of the Pardo (March 1728).

The congress of Soissons was a complete failure, and the irrepressible energy of the Spanish queen discovered a new method of obtaining her ends. The birth of a son to Louis XV. removed into the background all idea of the succession in France, and the attitude of Charles VI. proved that he would do nothing for Don Carlos.

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these circumstances there was no alternative but to sacri- fice the prospect of recovering Gibraltar and Minorca and to seek the alliance of England and France. By the treaty of Seville (November 1729) these powers, with Holland, concluded an offensive and defensive alliance with Spain. The privileges which the latter country had conferred upon the Ostend Company were revoked. Don Carlos was recognized as the heir to Parma and Tuscany, and to enforce his claims these provinces were to be occupied by 6000 Spanish troops. Charles VL., astounded at this sudden change in the aspect of affairs, took active steps to oppose this occupation of the duchies. He collected 30,000 troops in Italy, and when the old duke of Parma died in January 1731 he seized his territories as an imperial fief. Elizabeth called upon her allies to carry out the treaty of Seville, but Walpole and Fleury were unwilling to resort to hostilities. Luckily Charles VI. thought more of securing his daughter’s succession in Austria than of anything else. By promising that Eng- land would guarantee the Pragmatic Sanction, Walpole induced the emperor to conclude the second treaty of Vienna (March 1731), which dissolved the Ostend Com- pany and confirmed the provisions of the treaty of Seville. In 1732 English ships conveyed Don Carlos and the Spanish troops to Italy. Parma and Piacenza were immediately occupied, and the grand-duke of Tuscany acknowledged Don Carlos as his heir.

In the long and intricate series of negotiations of which we have given a brief summary the guiding thread is the grasping ambition of the queen of Spain. That ambition was by no means satisfied by the results obtained in the treaty of Vienna. Austria still held the Italian provinces of Spain and was looking out for an opportunity to expel Don Carlos from central Italy.

England retained her hold upon Gibraltar and Minorca, and claimed a maritime and colonial supremacy which threatened to thwart all schemes for the revival of Spanish commerce. Elizabeth never relinquished for a moment the hope of humiliating England and expelling the Hapsburgs from Italy. Cir- cumstances at this time were more favourable than they had ever been before. The able administration of Patiiio, “the Colbert of Spain,” had restored order in the Spanish finances, and had already made considerable strides towards the creation of a formidable fleet. But the great advantage lay in the fact that the death of Orleans and the birth of children to Louis XV. had removed all obstacles in the way of an alliance between Spain and France. The close union between the two branches of the house of Bourbon, which the Grand Alliance had endeavoured to avert, and which circumstances had post- poned for twenty years, was now to become an accom- plished fact. In 1733 “an eternal and irrevocable family compact” was signed by the Count Rottembourg and Don Joseph Patifio. France and Spain pledged themselves to pursue a common policy in regard both to Austria and England, the object of which was to destroy the Italian ascendency of the one and the commercial monopoly of the other. This treaty, which constituted a danger to Europe hardly less than the aggressions of Louis XIV., was kept a profound secret, and, though its existence was more than suspected at the time, its full importance has not been apprehended until recent times.

The first opportunity for carrying out this common policy was offered by the dispute about the Polish succes- sion which broke out in 1733 between Stanislaus Leczin- ski and Augustus III. of Saxony. Austria and Russia supported the latter prince, while Louis XV. espoused the cause of his father-in-law. But the war in Poland itself was of very secondary importance compared with the

Under | hostilities to which it gave rise in southern Europe.

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PHILIP V. |

France, Spain, and Sardinia concluded the league of Turin (October 1733) for the partition of Charles VI.'s Italian provinces. The chief events of the war, from the Spanish point of view, were the occupation of Naples and Sicily by Don Carlos. It was intended that he should keep these kingdoms, and that Parma and Tuscany should be transferred to his younger brother Don Philip. But Fleury, seeing an opportunity of securing his own ends, refused to continue the war for the aggrandizement of Spain. In 1735 he concluded the preliminaries of a peace with Austria by which Don Carlos was to be recognized as king of the Two Sicilies, Charles VI. was to be com- pensated with Parrna, and his son-in-law was to receive Tuscany in exchange for Lorraine, which was eventually to pass to France. The Spanish queen was bitterly indig- nant at the desertion of her ally, at the cession of her native Parma to Austria, and at the failure to provide anything for her second son. She struggled hard to pro- long the war, but the only result of her manceuvres was to postpone the conclusion of the definitive treaty until 1739, when the preliminaries were confirmed.

Meanwhile Spain had become involved in a maritime quarrel with England. The restrictions imposed by the treaty of Utrecht upon English trade with the Spanish colonies had been systematically evaded by the develop- ment of a system of organized smuggling on the part of the British traders. The Spaniards, encouraged by the secret compact with France, refused to tolerate an abuse which their weakness had compelled them to connive at in the previous century. To puta stop to it they rigidly enforced their right of search, often seizing British vessels on the high seas and treating the crews with gross brutality. This gave rise to great ill-feeling between the two nations, which was increased by other colonial dis- putes about the right of gathering logwood in Campeachy Bay and on the frontiers of Florida. The popular indigna- tion in England, which Walpole's opponents fanned for their own purposes, was raised to fever-heat by the story of Jenkins, an English captain, who maintained that he had been tortured and his ears cut off by a Spanish guarda costa. Walpole, who had refused to believe in the

Family Compact, and had steadily adhered to a policy of peace, was compelled by the popular clamour to declare war in October 1739. The maritime operations which followed were insignificant. Admiral Vernon took Porto Bello, and Anson plundered Payta; but England was distracted by party jealousies and her naval organization had fallen into disorder during the long peace. Luckily for her, Patiiio had died in 1736, and the impulse which he had given to the Spanish navy ended with him. But before long the quarrel was absorbed in the great European war which arose about the Austrian succession.

Charles VI. had persuaded almost every European power to guarantee the Pragmatic Sanction, but the suc- cession of Maria Theresa to his territories was not in the least facilitated by the paper promises to support her. England was almost the only power that adhered to its engagements. Frederick of Prussia advanced an obsolete claim to Silesia, and France seized the. opportunity to humiliate the house of Hapsburg. Spain hastened to join the coalition against the unfortunate heiress. Philip V. claimed to represent the Spanish branch of the Hapsburgs, and pleaded the old family agreement by which they were to succeed on the extinction of the Austrian line. There was no possibility of so absurd a claim being recognized, but it opened the prospect of recovering the lost provinces in Italy. Sardinia was gained over by the promise of part of Lombardy. Naples and Sicily were already in the hands of Don Carlos. It seemed hardly possible that

Maria Theresa, pressed by enemies on every side, could | brother.

successfully defend her Italian territories. A Spanish army under Montemar was embarked in French vessels, and, after evading the English fleet, landed in the Gulf of Genoa in 1741. The first news was discouraging, as Charles Emmanuel of Sardinia, ready like his predecessors to sell his alliance to the highest bidder, had been bought off by Maria Theresa. It was not till 1742 that the campaign began with an advance upon Modena, where the duke had promised his support to Spain. But the Austrians and Sardinians were the first in the field. They expelled the duke of Modena

from his territories, and drove Montemar to retreat towards Naples. At the same time the English fleet appeared before Naples, and the threat of an immediate bombardment compelled Don Carlos to promise a strict neutrality during the rest of the war. Count Gages, who was sent to supersede the unsuccessful Montemar, was unable to recover the lost ground, and the first campaign ended without any serious advantage to either side beyond the Austrian occupation of Modena. In 1743 Gages again attempted the invasion of Lombardy, but was defeated at Campo Santo and repulsed. Austria and Sardinia concluded a close alliance in the treaty of Worms (September 1743), which was negotiated by England. France and Spain sought to meet this coalition by renewing the Family Compact at Fontainebleau (October 1743). France undertook to aid in conquering the Milanese for Don Philip, to declare war against England, and not to make peace until Gibraltar, and if possible Minorca too, had been restored to Spain. Don Philip himself was sent with a Spanish army through southern France, but he failed to force a passage through the Alps. The campaign of 1744 was indecisive, but in the next year the great efforts made by Maria Theresa to recover Silesia gave her opponents in Italy an opportunity of which they were not slow to avail theniselves. Gages effected a junction at Genoa with the combined French and Spanish troops under Maillebois and Don Philip. Advancing into Piedmont the allies took Tortona, and after occupying Parma and Piacenza they invaded Lom- bardy. This move effected the desired object of separat- ing the Austrians and Sardinians. Schulenburg hurried off to the defence of his mistress's territories, and the allies at once turned upon Charles Emmanuel and defeated him at Bassignano. The French wished to complete the conquest of Piedmont, but the Spaniards insisted upon renewing the invasion of Lombardy. That province was now entirely undefended, as the Austrians had returned to the assistance of Charles Emmanuel, who detained them by the threat that if he were deserted he would make terms with the allies. One town after another surrendered or was taken, and in December Don Philip entered Milan in triumph. But meanwhile Maria Theresa had ended the Silesian War by the treaty of Dresden, and was thus enabled to send reinforcements into Italy. The tide of success turned with marvellous rapidity. The Spaniards evacuated Lombardy, and were soon driven from all their conquests in Piedmont except Tortona. At Piacenza, to which the Bourbon army had retreated, it was completely defeated by the Austrians.

At this juncture the news arrived from Spain that Ferdi- Philip V. had died on July 9, and had been succeeded by nand VI.

Ferdinand VL., the only surviving son of his first marriage. Elizabeth Farnese, “the termagant,” as Carlyle calls her, whose ambition had kept Europe embroiled for thirty years, went into retirement at San Ildefonso. This event naturally influenced the war in Italy. It was not likely that the new king, who had never been on good terms with his stepmother, would expend more of his country’s blood and treasure to obtain a principality for his half- His first act was to supersede Gages by the

Charles III.

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marquis of Las Minas, who found the Spanish army at Tortona and hastened to withdraw it from Italy into Savoy, which Don Philip had occupied since 1742. The Austrians at once besieged and captured Genoa, thus cutting off the possibility of a renewed invasion of Italy, except through the well-guarded passes of the Alps. From this time the military operations ceased to have any direct importance for Spain, and all interest centred in the negotiations which were carried on at Breda in 1747 and transferred to Aix-la-Chapelle in the next year. The chief obstacle to peace was the demand of a principality for Don Philip, which Ferdinand VI. persisted in as necessary for the honour of Spain. Maria Theresa had already made sacrifices to Prussia and to Sardinia, and resented the idea of ceding any more of her territories. But the persistence of England carried the day, and in the treaty of Aix-la-Chapelle (October 1748) Don Philip obtained Parma, Piacenza, and Guastalla as an hereditary principality, on condition that they should revert to Austria on extinction of his male descendants. This was the sole advantage gained by Spain. Austria retained Lombardy, shorn of the portion promised to Charles Emmanuel; and the commercial and naval ascendency of England remained unshaken. The recovery of Gibraltar, which at one time Philip V. had confidently expected, was now further off than ever.

Ferdinand VI. was as feeble in health and as averse to business as his father had been, but he was equally obstinate on certain points. He would have nothing to do with the aggressive policy of his stepmother or with the

Bourbon schemes for the humiliation of England. His accession broke off the Family Compact, and gave to Spain the unaccustomed boon of thirteen years' peace. His aim was to hold the balance between the rival powers of western Europe, and in this he was aided by the discord between his two ministers, Ensenada and Carvalho, of whom the former favoured France and the latter England. When Kaunitz, the Austrian envoy at Versailles, was endeavouring to negotiate an alliance between the Haps- burgs and Bourbons, Ferdinand seized the opportunity to conclude the treaty of Aranjuez, which guaranteed the neutrality of the Italian provinces of the two families. On the outbreak of the Seven Years' War in 1756 great efforts were made to draw Spain into the struggle. France offered Minorea, which had been lost by Byng at the first outbreak of hostilities, and England hastened to make the counter-proposition of a cession of Gibraltar. Ferdinand, however, refused both bribes, and maintained his policy of peace till his death in 1759.

This event gave the Spanish crown to Charles III., who had ruled the Two Sicilies since 1735. His accession threatened a speedy reversal of Spanish policy. The new king was a true Bourbon, and naturally inclined to the French alliance. He had an old grudge against England for the treatment he had received in the War of the Austrian Succession. He also owed a debt of gratitude to Maria Theresa for enabling him to transfer the crown of Naples to his third son, whereas by the treaty of Aix- la-Chapelle it ought to have passed to his brother, Philip of Parma. In spite of these motives, he hesitated for two years to take a decisive step. Spain was not pre- pared for war, and Charles had never cordially approved the change of policy at Versailles which had united France with its old rival Austria. But the rapid successes of England under Pitt's administration, and the danger of a vast extension of the maritime and colonial ascendency of that country, soon overcame his scruples. In 1761 the third Family Compact was concluded, and Spain under- took to give active assistance to France unless peace were concluded within a year. Pitt, suspecting the existence

of this agreement, proposed an immediate declaration of war against Spain, but he failed to convince his cabinet and resigned. His successors, however, were driven to adopt his policy, and in January 1762 hostilities com- menced between the two countries. But Spain only entered the war to share the disasters which France had already begun to suffer. An invasion of Portugal, which had been regarded as a defenceless prey, was foiled by English assistance, and the English fleet captured Mar- tinique and Havana. The Bourbon powers found it neces- sary to implore peace, and it was fortunate for them that the English government had passed into the hands of Bute, who was eager to diminish the influence of Pitt by terminating the war. By the treaty of Paris (February 1763) England recovered Minorca, extended its colonies in every direction at the expense of France, and rejected all the demands which Charles JIJ. had advanced on behalf of Spain.

In spite of the treaty Charles III.'s foreign policy continued to be guided by jealousy of England, and he clung to the French alliance as the only means by which he could avenge his recent humiliation. In this he was encouraged by his foreign minister, Grimaldi, who was so devoted to France that Choiseul declared himself to be more powerful at Madrid than at Versailles. In 1770 a dispute about the Falkland Islands, from which the English settlers had been expelled by a Spanish force, would probably have led to a renewal of war if a domestic intrigue had not succeeded at this juncture in overthrow- ing Choiseul. For the next few years a marked coolness grew up between France and Spain, which was increased when Louis XVI. disappointed the hopes that had been formed of his accession and left Choiseul in retirement. Grimaldi, chagrined at the failure of an alliance on which all his schemes were based, resigned office in 1777 and was succeeded by Count Florida Blanca, one of the most distinguished of the able ministers who ruled Spain during this period. The change of ministers made no difference to the policy of Charles III., whose obstinacy was in no way inferior to that of his predecessors. For many years Spain and Portugal had been engaged in disputes about the frontiers of their territories in South America, disputes which were rendered more bitter by the arrogance of Pombal, the Portuguese minister. The death of Joseph I. in 1777 and the consequent dismissal of Pombal enabled Florida Blanca to negotiate the treaty of San Ildefonso, by which Sacramento and the navigation of the Rio

de la Plata were ceded to Spain, and a definite boundary was drawn between Brazil and Paraguay on the one side and Peru on the other. This was followed in March 1778 by the conclusion of a perpetual alliance at the Pardo, by which Portugal was attached to the interests of the Bourbon states. These treaties, which Florida Blanca regarded as among the most signal successes of his ministry, came very opportunely to enable Charles III. to resume the schemes that had lain in abeyance since 1763. England was involved in a desperate struggle with the revolted colonies of North America, and this offered the Bourbons the long-desired opportunity for revenge. In 1778 France entered into close alliance with the colonists, and in the next year Spain followed her example. Every- thing seemed to favour the allies. The Northern powers, irritated by the high-handed way in which England had asserted and exercised her maritime supremacy, formed the "armed neutrality" under the lead of Catherine II. of Russia. Even Holland, the oldest and most constant ally of England, was involved in the general coalition. England, which had failed single-handed to coerce its own subjects, was now face to face with the whole maritime power of Europe, and was also hampered by domestic and

Trish troubles. Spain succeeded in capturing Minorca and laid close siege to Gibraltar. Many of the West- Indian islands were captured from the English, and the surrender of Cornwallis at Yorktown destroyed the last hope of restoring American dependence. The most con- fident hopes were entertained of stripping England of the great bulk of its colonial possessions. But in 1782 the tide of success turned. Rodney, by the novel manceuvre of breaking the line, destroyed the French fleet in the West Indies, while the heroic defence of General Elliott and the opportune arrival of supplies under the convoy of Lord Howe saved Gibraltar from overwhelming odds. The want of unanimity among the allies, each of whom thought only of its own interests, hastened the conclusion of peace in 1783. The treaty of Versailles, by which Spain kept Minorca and obtained the Floridas, was the most honourable which that country had concluded since Catcau Cambrésis. But the failure to recover Gibraltar was a bitter

disappointment to Charles III, who con- tinued till his death (December 14, 1788) to cherish the scheme of renewing the war, though the growing disorders in France made it more and more certain that he could no longer rely upon the assistance of that country.

The reigns of the first three Bourbon kings form a period of great importance in Spanish history. At the end of the 17th century Spain appeared to be a lifeless corpse, over which the other powers of Europe could con- tend at will. In the 18th century men were astounded to see that country rise with renewed vigour to play once more an independent part on the international stage. This revival was due in the first place to the change of dynasty. Another Hapsburg would probably have con- tinued the obsolete policy of his predecessors, The accession of the Bourbons introduced into Spain the methods and ideas of government which had raised France to greatness under Richelieu, Mazarin, and Colbert. The two great problems to be grappled with were the profound depression of trade and agriculture and the fatal wealth and ascendency of the church. Philip V., feeble as he was personally, began the movement in advance even during the Succession War. ‘The abolition of the old provincial independence rendered possible a more regular and centralized government, an increase of the revenue, and the removal of the old impediments to trade between the various provinces. The French officers who accom- panied the king gave a new organization and new tactics to the Spanish army. Under the influence of the princess Orsini Philip seemed inclined to attack even the prescrip- tive privileges of the clergy. His marriage with Elizabeth Farnese saved the hierarchy and diverted his attention to wars of aggrandizement. But these wars were directed by purely political motives; the old Hapsburg idea of a religious propaganda was for ever abandoned. And even during the war the task of internal reform was hindered rather than neglected. The efforts of Alberoni and Patifio gave Spain a navy more powerful than that of Philip II. The conquest of the Two Sicilies and the acquisition of Parma, though they brought little direct advantage to Spain, yet gave conclusive evidence that the old lethargy had been shaken off and that the country was capable of exertions and sacrifices which had long appeared impossible. The period of peace under Ferdi- nand VI. was an inestimable boon to Spain. Taxation was lightened, production was facilitated by the removal of the most crushing burdens, yet at the same time the revenue improved and the

chronic deficit of previous reigns was replaced by a surplus. And this prince took a step which no one would have expected from him. The concordat of 1753 was the first vindication of the political interests of Spain against the pretensions of Rome. The crown

asserted its right to appoint to all important benefices, and the number of papal presentations was reduced from twelve thousand to fifty-two. The revenue derived by the curia from Spain was proportionately diminished, and the clergy were compelled to recognize their obligations as members of the body politic. This measure was followed by an edict that henceforth papal bulls should not be obeyed until they had received the royal sanction.

The work of reform, thus tentatively commenced under Philip V. and Ferdinand VI., was carried still further by Charles ITI., whose reign is regarded with more pride by the Spaniards than any other since that of Philip II. Charles had served an apprenticeship in the art of govern- ment in Naples, where, with the help of his minister Tanucci, he had successfully grappled with evils similar to those from which Spain was suffering. He would have been a prince quite after the heart of the 18th century if he had not retained too large a share of the superstition of his family. He shared to the full that conception of the rights and duties of monarchy which inspired the reforms of Frederick the Great and Joseph IL, and his allegiance to the church was fortunately counterbalanced by his desire for absolutism. His greatest work, the expulsion of the Jesuits, would never have been carried out if he had not been persuaded of its political necessity. The order had already been driven by Pombal from Portugal and by Choiseul from France, when Charles III. was convinced that a riot in Madrid, provoked by the financial measures of Squillaci, had been promoted by the Jesuits. This conviction overpowered all scruples; the fathers were promptly removed from the country, and Spain joined the other Bourbon courts in demanding that suppression of the order which was finally decreed by Clement XIV. in 1773. The Rubicon once crossed, Charles’s ministers urged him on in the

path of ecclesias- tical reform. The increase of lands in mortmain was restricted; the number of monasteries was diminished; and the Inquisition was compelled to moderate its procedure and to subordinate its independence to the royal will. For the papal jurisdiction was substituted a national — court, the Rota, established at Madrid.

These measures, of which the importance in a country like Spain can hardly be over-estimated, were accompanied by others no less notable for the development of trade and agriculture. The colonial trade was freed from the old restriction which compelled it to pass through Cadiz, and other ports were opened for its reception. Native manu- factures were encouraged in every way, and a famous ordinance in 1773 endeavoured to remove the old pre- judice against trade by declaring that the engaging in industrial occupations should not involve any loss of rank or its privileges. Internal communication was facilitated by the construction of canals. Agriculture was revived by the removal of the old prohibition against enclosures, — so long maintained by the selfish influence of the Mesta, —by the planting of trees in the arid deserts of central Spain, and by the rapid growth of population, which rose in the course of the century from 5,700,000 to 10,541,000. These measures, which are only selected from a large number tending in the same direction, are to be credited to three ministers, whose names reflect its chief lustre upon Charles III.'s reign. D'Aranda, who succeeded the Italian Squillaci as finance minister, was an Aragonese noble who had imbibed the spirit of philosophical speculation from France. He was the first layman who presided in the council of Castile, and he introduced into the Spanish administration a liberal tendency quite opposed to the traditions of the country. His views, however, were not congenial to the king, and, after completing his work with regard to the Jesuits and the Inquisition, he retired to the

'clerical schemes of D'Aranda.

embassy in Paris and was succeeded by Campomanes. The latter was not only a distinguished statesman but also one of the foremost representatives

of Spanish litera- ture. He was one of the earliest students of political economy, and many of the most enlightened measures for the relief and encouragement of trade are to be assigned to him. But his administration, which aimed at educat- ing the people to a share in political life, was almost as alien to the wishes of Charles IIL. as the liberal and anti- A far more congenial minister was found in Florida Blanca, whose aim was to promote the material interests of Spain by the supervision of an internal despotism, who stopped the attack on the church when its subordination was secured, who supported the economic reforms of Campomanes, but would only carry them out bya rigid bureaucracy, and who conciliated the king by falling in with his foreign policy even when it conflicted with the national welfare.

Meritorious as Charles III.'s reforms were, it would give a false impression to represent them as completely successful. The regeneration of Spain was by no means accomplished, and many of the abuses which had been growing for centuries survived the attempt to effect their annihilation. One of the chief causes of this failure was the corruption and ignorance of the lower officials. The reforming impulse was confined to the educated classes, and made little impression upon the bulk of the people. It was of little use to devise the most enlightened measures when there was no efficient machinery to carry them out. Many of the most promising reforms remained mere paper schemes. The methods employed, too, were not always the best calculated to obtain their end. The state took too much upon itself, and attempted to dis- charge functions which would have been better left to local enterprise. Roads were constructed on a magnificent scale, but only too often in directions where they were not wanted, and they remained almost unused. Thus the debt was increased without any improvement of the revenue. The return of Charles III. toa military policy imposed serious burdens upon the country, and it would have been better to have prolonged the peace of Ferdi- nand VI.'s reign, inglorious as it appeared to an ambitious king. Undoubtedly a great advance was made, but equal exertions would have produced a greater result in any other country. The population of Spain remained to a great extent sunk in sloth and superstition. Much might be hoped from a steady persistence in ameliorative measures, but unfortunately the work of reform was interrupted just at the moment when success appeared to be within reach.

The death of Charles III. and the accession of Charles IV. were contemporary with the outbreak of the French Revolution, which was destined to exercise a decisive influence over the fortunes of the adjacent peninsula. Florida Blanca, who continued to hold office during the first three years of the new reign, found it impossible to continue his policy. The revival of Spain could only be effected by the restoration of its naval and colonial ascendency at the expense of England, and for the carry- ing out of this scheme the support of France was impera- tively necessary. But the French alliance rested upon the relationship between the two branches of the house of Bourbon, and the Family Compact ceased to exist when Louis XVI. was deprived of power by his subjects. Of this conclusive evidence was given in 1791. Some English merchants founded a settlement at Nootka Sound on the west coast of America, which provoked an indignant protest from Spain. But the French national assembly refused to send any assistance, and Florida Blanca was compelled to conclude a humiliating treaty and to give up

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all hope of opposing the progress of England. This failure was attributed by the minister to the Revolution, of which he became the uncompromising opponent. The reforms of Charles III.'s reign were abandoned ; all liberal tend- encies in Spain were suppressed ; and the Government set itself to restore the old lethargy under absolute rule from which the country had been gradually awakened. The movement of reform had made so little progress among the mass of the people that reaction was really easier than progress, But Florida Blanca was not content with suppressing liberalism in Spain; he was eager to avenge his disappointment by crushing the Revolution in France. He opened negotiations with the emigrants, urged the European powers to a crusade on behalf of legitimacy, and paraded the devotion of Charles IV. to the head of his family. This bellicose policy, however, brought him into collision with the queen. Maria Louisa of Parma, a woman whose real abilities were perverted to the gratification of sensual lusts, was unwilling to allow the minister to share her ascendency over the

feeble mind of her husband, and she feared that the outbreak of war would diminish the revenues which she squandered in self-indulgence. She. had already removed from the ministry Campomanes and other supporters of Florida Blanca, and had compelled the latter to restrict himself to the single department of foreign affairs. Early in 1792 she completed her task by inducing Charles IV. to banish Florida Blanca to Murcia, and his place was entrusted to the veteran D'Aranda. But the new minister found that he held office only at the favour of the queen, and that this had to be purchased by a disgraceful servility to her paramour, Emanuel Godoy. Spain withdrew from the projected coalition against France, and sought to maintain an attitude of neutrality, which alienated the other powers, while it failed to conciliate the republic. The repressive measures of Florida Blanca were withdrawn; society and the press regained their freedom; and no opposition was offered to the propaganda of French ideas. D'Aranda's policy might have been successful if it had been adopted earlier, but the time for temporizing was now past, and it was necessary for Spain to choose one side or the other. But the decision was not allowed to rest with the man who had always shown a sympathy with the revolutionary prin- ciples. In November 1792 the queen felt herself strong enough to carry out the scheme which she had been long maturing. D'Aranda was dismissed, and the office of first minister was entrusted to Godoy, who had recently received the title of duke of Alcudia. Godoy, who was at once the queen's lover and the personal favourite of the king, had had no education for the part which he was called upon to play. Though endowed with a natural quickness of parts and a capacity for intrigue, he had no habits of application, no experience of the routine of office, and above all no settled policy. His appointment was regarded with jealousy by the grandees of Spain, while his undisguised relations with the queen outraged the moral feelings of the best part of the nation. Luckily for Godoy, the course to be pursued was decided for him. The execution of Louis XVI. (January 21, 1793) made a profound impression in a country where loyalty was a superstition. Charles IV. was roused to demand ven- geance for the insult to his family, and from one end of Spain to the other a cry resounded for immediate war with the impious rebels who had shed the blood of an anointed king. Godoy had nothing to do but to follow the national impulse, and Spain became a member of the first coalition against France. Everything seemed to promise a rapid and complete success. The number of volunteers who offered their services

rendered conscription unnecessary ; and the southern provinces of France were so preponder-

atingly royalist that they were ready to welcome the Spaniards as deliverers. These advantages, however, were nullified by the shameful incompetence and carelessness of the Government. The troops were left without supplies ; no plan of combined action was imposed upon the com- manders ; and each regiment was left to act of its own will. The military action of Spain provoked the contempt of Europe. The two campaigns of 1793 and 1794 were one long catalogue of failures. The bravery of the soldiers was rendered useless by the incapacity of their officers, and the maladministration of the central Government excited such disgust that an outbreak of revolutionary disturbance in Spain itself seemed more than possible. Instead of reducing the southern provinces of France, the Spaniards were driven from the strong fortresses that guarded the Pyrenees, and the French advanced almost to the Ebro. And at the same time the English, the hated rivals of Spain, were utilizing the war to extend their colonial power and were establishing more firmly that maritime supremacy which the Spanish Government had been struggling for almost a century to overthrow. Under the circumstances it is no wonder that the queen and Godoy hastened to follow the example set by Prussia, and concluded the treaty of Basel with France. The terms were unexpectedly favourable. Spain purchased the evacuation of her territories and fortresses by the cession of her share of St Domingo, which had little but a sentimental value as the first discovery of Columbus, and which had already been occupied by the English. So great was the joy excited in Madrid that popular accla- ination greeted the bestowal upon Godoy of the title of “Prince of the Peace.” But the moderation of the treaty was only a flimsy disguise of the disgrace that it involved. Spain found herself tied hand and foot to the French republic. Godoy had to satisfy his allies by the encourage- ment of reforms which both he and his mistress loathed, and in 1796 the veil was removed by the conclusion of the treaty of San Ildefonso. This was a virtual renewal of the Family Compact of 1761, but with far more dis- advantageous terms to Spain. Each power was pledged to assist the other in case of war with

twenty-five ships, 18,000 infantry, and 6000 cavalry. The real object of the treaty, which was to involve Spain in the war against

England, was cynically avowed in the eighteenth article, |

by which, during the present war, the Spanish obliga- tions were only to apply to the quarrel between England and France. A scheme was prepared for a joint attack on the English coast, but it was foiled by the battle of St Vincent, in which Jervis and Nelson forced the Spanish fleet to retire to Cadiz. This defeat was the more disastrous because it cut off the connexion with the colonies and thus deprived Spain of the revenues derived from that quarter. The finances, already exhausted by extravagance and maladministration, were in no con- dition to meet the expenses of a naval war. England seized the opportunity to punish Spain for its conduct in the American War by encouraging discontent in the Spanish colonies, and in the Peninsula itself both nobles and people were bitterly hostile to the queen and her favourite. It was in vain that Godoy sought to secure the friendship of the reforming party by giving office

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to two of its most prominent members, Jovellanos and |

Saavedra, the French occupation of Rome and the erection of a republic in the place of the papal government. The treatment of the duke of Parma by the Directory was keenly resented by the queen. Godoy found himself between two parties, the liberals and the ultramontanes, who agreed only in hatred of himself. At the same time the Directory, whose mistrust was excited by his attitude

Spanish pride and bigotry were offended by |

in the question of Parma, insisted upon his dismissal. Charles IV. could not venture to refuse a demand from France ; the queen was alienated by Godoy's notorious infidelities ; and in March 1798 he was compelled to resign his office. But he did not forfeit his hold on the king's favour, and he only waited for a favourable opportunity to emerge from his retirement.

Godoy's office was entrusted to Saavedra, but the reformers did not obtain the advantages which they expected from the change. Jovellanos was compelled in August to retire on account of ill-health,—the result, it was rumoured, of attempts on the part of his opponents to poison him. His place was taken by Caballero, an ardent opponent of reform, who restored all the abuses of the old bureaucratic administration and pandered to the most bigoted prejudices of the clergy and the court. The ministry was hopelessly divided, and the policy of the country was directed by the basest and most paltry intrigues. The only advantage which Spain enjoyed at this period was comparative independence of France. The military plans of the Directory were unsuccessful during the absence of their greatest general in Egypt, and the second coalition gained successes in 1799 which had seemed impossible since 1793. But the return of Bona- parte, followed as it was by the fall of the Directory and the establishment of the Consulate, commenced a new epoch for Spain. As soon as the First Consul had time to turn his attention to the Peninsula, he determined to restore Godoy, who had already regained the affection of the queen, and to make him the tool of his policy. Maria Louisa was easily gained over by playing on her devotion to the house of Parma, and on October 1, 1800, a secret treaty was concluded at San Ildefonso. Spain undertook to cede Louisiana and to aid France in all her wars, while Bonaparte promised to raise the duke of Parma to the rank of king and to increase his territories by the addition either of Tuscany or of the Roman Legations. This was followed by Godoy's return to power, though he left the department of foreign affairs to a subordinate. Spain was now more servile to France than ever, and in 1801 was compelled to attack Portugal in the French interests. Bonaparte was indignant against Portugal, partly because its fleet had aided his enemies in Egypt, and partly because its harbours offered great naval advantages to the English. The Spanish invasion, which was commanded by Godoy in person, met with no resistance, and the prince ventured to conclude a peace on his own authority by which Portugal promised to observe a strict neutrality on coudition that

its territories were left undiminished. But Bonaparte resented this show of independence, and compelled Charles IV. to refuse his ratification of the treaty. Portugal had to submit to far harsher terms, and could only purchase peace by the cession of territory in Guiana, by a disadvantageous treaty of commerce, and by a payment of twenty-five millions of francs. This insult to his ally Bonaparte followed up by others. In the preliminary treaty with England he ceded the Spanish colony of Trinidad without even consulting the court of Madrid, while he sold Louisiana to the United States in spite of his promise not to alienate it except to Spain. For these humiliations Spain had to console itself with the empty honour of being the first signatory of the treaty of Amiens.

For nearly three years Spain was allowed to remain at peace. Its finances were partially revived by the restora- tion of free intercourse with the colonies and by the pay- ment of the supplies which had been withheld for the last six years. But the administration was as incompetent and misdirected as ever. Godoy, since his return to office, had abandoned all connexion with the reforming party

and had thrown himself into the reactionary policy of Caballero. The Spanish church was once more placed in

strict subjection to the Roman see, from which for a short time it had been freed. But the worst evil lay in the

undisguised domination of France, which the Government |

was wholly incapable of shaking off. As soon as Bona- parte saw himself involved in a new war with England,

he turned to Spain for assistance and extorted a new |

treaty (October 9, 1803), which was still more burdensome than that of 1796. Spain had to pay a monthly subsidy of six million franes, and to pledge itself to enforce a strict neutrality upon Portugal. Thus the country was involved in a new and still more disastrous war with England. The last

remnants of its maritime power were shattered in the battles of Cape Finisterre and Trafalgar, and the English seized Buenos Ayres. The popular hatred of Godty was roused to passion by these disasters, and many competent observers believed that Spain stood on the brink of revolution. At the head of the opposition was the crown prince Ferdinand, as insignificant as his rival, but endowed with all good qualities by the credulous favour of the people. To maintain himself against his domestic enemies Godoy turned to France, where Bona- parte, now the emperor Napoleon I., was irritated by the crown prince's marriage with a daughter of the king of Naples. The court quarrels at Madrid were fomented from Paris in order to complete the subordination of Spain. Napoleon was at this time eager to humble Eng- land by excluding it from all trade with Europe. The only country which had not accepted his "continental system " was Portugal, and he determined to reduce that kingdom by force. It was not difficult to bribe Godoy, who was conscious that his position could not be main- tained after the death of Charles IV. In October 1807 Spain accepted the treaty of Fontainebleau, which arranged a partition of Portugal into three parts. The northern provinces were to be given to the young king of Etruria, who was to purchase them by the cession of Tuscany. In the south a principality was to be carved out for Godoy himself. The central district was to be kept in pledge by France until the conclusion of a general peace. 'The treaty was hardly concluded when a French army under Junot marched through Spain to Portugal, and the royal family of that country fled to Brazil. But Spain was destined to share the same fate as its neigh- bour. The crown prince, whose wife had died in 1806, determined to imitate his rival by bidding for French support. He entered into secret relations with Beauhar- nais, Napoleon's envoy at Madrid, and went so far as to demand the hand of a Bonaparte princess. Godoy, who discovered the intrigue, induced Charles IV. to order his son's arrest. Napoleon at once seized the opportunity to make himself absolute master of Spain, and ordered French troops to cross the Pyrenees in support of the prince. This act terrified Godoy into a reconciliation with his opponents, but the French invasion was not delayed by the removal of its pretext. Charles IV. and his minister, conscious that they could expect no support from the people, determined on flight. The news of this intention, however, excited a popular rising in Madrid, and the king was compelled to abdicate in favour of his son Murat, however, who commanded the French, refused to be turned aside by this

change of circumstances. He obtained from Charles IV. a declaration that his abdica- tion had been involuntary, and occupied Madrid (March 23, 1808). Meanwhile Napoleon advanced to the frontier, and Ferdinand was lured by French agents to an interview with the emperor at Bayonne. There he was confronted with his parents and Godoy, and was intimidated into restoring the crown to his father, who at once made a

second abdication. Napoleon now divulged the real inten- tion of his actions, and the crown of Spain was formally

conferred upon his brother Joseph Bonaparte, who two Joseph Bona- parte,

years before had been made king of Naples.

But Spanish loyalty was too profound to be daunted even by the awe-inspiring power of the French emperor. For the first time Napoleon found himself confronted, not by terrified and selfish rulers, but by an infuriated people. The rising in Spain commenced the popular movement which ultimately proved fatal to his power. At first he treated the novel phenomenon with contempt, and thought it sufficient to send his less prominent generals against the rebels. Madrid was taken without difficulty, but the capital was absolutely devoid of military importance, and the Spaniards showed great capacity for the guerilla warfare in the provinces. The French were repulsed from Valencia; and Dupont, who had advanced into the heart of Andalusia, was compelled to retreat and ultimately to capitulate with all his forces at Baylen (July 10). The Spaniards now advanced upon Madrid and drove Joseph from the capital, which he had just entered. Unfortun- ately the insurgents displayed less political ability than military courage. The government was entrusted in Ferdinand’s name toa central junta of thirty-four members, a number which was far too large for the conduct of executive business. Napoleon’s arrival in Spain was enough to restore victory to the French. In less than a week the Spanish army was broken through and scattered, and Napoleon restored his brother in Madrid. Sir John Moore, who had advanced with an English army to the relief of the

capital, retired when he found he was too late, and an obstinate battle, in which the gallant general lost his life, had to be fought before the troops could secure their embarkation at Corufia. Napoleon, thinking the work accomplished, had quitted the Peninsula, and Soult and Victor were left to complete the reduction of the provinces. The capture of Seville resulted in the dis- solution of the central junta, and the Peninsula was only saved from final submission by the obstinate resistance of Wellington in Portugal and by dissensions among the French. The marshals were jealous of each other, and Napoleon's plans were not approved by his brother. Joseph wished to restore peace and order among his subjects in the hope of ruling an independent nation, while Napoleon was determined to annex Spain to his own overgrown empire. So far did these disputes go that Joseph resigned his crown, and was with difficulty induced to resume it. Meanwhile Cadiz became the capital of what was left of independent Spain, and there the cortes met in 1810 for the purpose of drawing up a new constitution. The fall of the old monarchy and thie exigencies of self-defence had given to the reforming party an ascendency which they had never before possessed. In the constitution which was promulgated early in 1812 the – principles of the French constituent assembly were closely followed. The Inquisition had already perished, and the last relics of the old autocratic government shared its fate. Supreme legislative power was placed in the hands of a single national assembly, and effective checks were devised to restrict the power of the monarchy whenever it should

"be revived. The freedom of the press was established, and

the property of the clergy was confiscated to defray the expenses of the war. The great defect of the constitution was that it was the work of one party, to which circum- stances had given a temporary supremacy, and it failed to command the support of the united nation. The nobles and priests were bitterly hostile, and the latter bad more influence in Spain than in any European country except Treland.

The restoration of Spanish independence could hardly

have been accomplished without the assistance of England. Wellington had already made two attempts to advance from Portugal into the adjacent kingdom, but had been foiled by superior forces. In 1812 he determined on a great effort. He secured his base of operations by the capture of Ciudad Rodrigo and Badajoz, and at Salamanca he completely routed the opposing army of Marmont. This victory enabled the English general to enter Madrid (August 12), and Joseph retreated to Valencia. But further advance was prevented by the concentration of the French forces in the east, and Wellington found it advisable to retire for the third time to winter-quarters on the Portuguese frontier. It was during this winter that Napoleon suffered his first and greatest reverse in the retreat from Moscow and the destruction of his grand army. This was the signal for the outbreak of the “ war of liberation” in Germany, and French troops had to be withdrawn from Spain to central Europe. For the first time Wellington found himself opposed by fairly equal forces. In the spring of 1813 he advanced from Ciudad Rodrigo and defeated Jourdan at Vittoria, the battle which finally decided the Peninsular War. Joseph retired altogether from his kingdom, and Wellington, eager to take his part in the great European contest, fought his way through the Pyrenees into France. Napoleon, who had suffered a crushing defeat at Leipsic, hastened to recognize the impossibility of retaining Spain by releasing Ferdinand VII., who returned to Madrid in March 1814. After the convulsions it had endured Spain required a period of firm but conciliatory government, but the ill-fate of the country gave the throne at this crisis to the worst of her Bourbon kings. Ferdinand VII. had never pos- sessed the good qualities which popular credulity had assigned to him, and he had learnt nothing in his four years’ captivity except an aptitude for lying and intrigue. He had no conception of the duties of a ruler; his public conduct was regulated by pride and superstition, and his private life was stained by the grossest sensual indulgence. Spain was still governed under the constitution of 1812, but the king’s first act was to dissolve the cortes and to abrogate the constitution, promising, however, to grant a new one inits place. But no sooner was he established on the throne, and conscious of the strong reaction in favour of the monarchy, than he threw his promises to the wind and set himself to restore the old absolutism with all its worst abuses. The nobles recovered their privileges and their exemption from taxes; the monasteries were restored ; the Inquisition resumed its activity; and the Jesuits returned to Spain. The liberals were

ruthlessly per- secuted, together with all who had acknowledged Joseph Bonaparte. A camarilla of worthless courtiers and priests conducted the government, and urged the king to fresh acts of revolutionary violence. For six years Spain groaned under a royalist “reign of terror,” and isolated revolts only served as the occasion for fresh cruelties. The finances were squandered in futile expeditions to recover the South American colonies, which had taken advantage of Napoleon’s conquest of Spain to establish their independence. In his straits for money Ferdinand ventured to outrage national sentiment by selling Florida to the United States in 1819. Discontent found expres- sion in the formation of secret societies, which were especially powerful among the neglected and _ ill-paid soldiers. At last, in 1820, Riego and Quiroga, two officers of an expedition which had been prepared for South America, raised the standard of revolt in Cadiz. Ferdinand and his advisers proved as incapable as they were tyrannical, and their feeble irresolution enabled the movement to spread over the whole country. In March the king gave way and accepted the constitution of 1812.

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The royalists or serviles, as they were called, were dismissed from office and their places taken by liberals. The cortes met in July, and at once proceeded to dissolve the monasteries and the Inquisition, to confiscate the clerical tithes, to abolish entails, and to secure the freedom of the press and of popular meetings. Great results might have been achieved if the moderate party, under Martinez de la Rosa, had been able to grapple with the task of suppress- ing disorder and establishing a permanent constitution. But this was the last thing which the king desired, and the moderates were defeated by a factious combination of the serviles and the radicals. Risings took place among the loyal and bigoted peasants of the provinces, and their suppression contributed to the victory of the extreme party, which seemed to be secured in 1822 by the election of Riego as president of the cortes.

But Spain was not allowed to work out its own salva- tion. Europe was dominated at this time by the Holy Alliance, which disguised a resolution to repress popular liberties and to maintain despotism under a pretended zeal for piety, justice, and brotherly love. At the con- gress of Verona (October

1822) France, Austria, Russia, and Prussia agreed upon armed intervention in Spain, in spite of the protest of Canning on the part of England. Spain was to be called upon to alter her constitution and to grant greater liberty to- the king, and if an unsatis- factory answer were received France was authorized to. take active measures. The demand was unhesitatingly refused, and a French army, 100,000 strong, at once entered Spain under the duke of Angouléme (April 1823). No effective resistance was made, and Madrid was entered by the invaders (May 23). The cortes, however, had carried off the king to Seville, whence they again retreated to Cadiz. The bombardment of that city terminated the revolution and Ferdinand was released (October 1). His first act was to revoke everything that had been done since 1819. The Inquisition was not restored, but the secular tribunals took a terrible revenge upon the lcaders of the rebellion, The protest of the duke of Angouléme against these cruelties was unheeded. Even the fear of revolt, the last check upon despotism, was removed by the presence of the French army, which remained in Spain till 1827. But Spain had to pay for the restoration of the royal absolutism, as Canning backed up his protest against the intervention of France by acknowledging the independence of the Spanish colonies.

Ferdinand VII. was enabled to finish his worthless and disastrous reign in comparative peace. In 1829 he married a fourth wife, Maria Christina of Naples, and at the same time he issued a “Pragmatic Sanction” abol- ishing the Salic law in Spain. No one expected any practical results from this edict, but a formal protest was made against it by the king’s brothers, Carlos and Francisco, and also by the French and Neapolitan Bour- bons. toa daughter, Isabella, who was proclaimed as queen on H. her father’s death in 1833, while her mother undertook the office of regent. Don Carlos at once asserted his intention of maintaining the Salic law, and rallied round him all the supporters of absolutism, especially the inhab- itants of the Basque Provinces. Christina was compelled to rely upon the liberals, and to conciliate them by the grant of a constitution, the estatuto real, which established two chambers chosen by indirect election. But this con- stitution, drawn up under the influence of Louis Philippe of France, failed to satisfy the advanced liberals, and the Christinos split into two parties, the moderados and pro- gresistas. In 1836 the latter party extorted from the

regent the revival of the constitution of 1812. All this time the Government was involved in a desperate struggle

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In the next year, however, the queen gave birth Isabella

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with the Carlists, who at first gained considerable successes under Zumalacarregui and Cabrera. But the death of Zumalacarregui in 1835 and the support of France and England ultimately gave the regent the upper hand, and in 1839 her general, Espartero, forced the Basque Pro- vinces to submit to Isabella. claims in favour of his eldest son, another Carlos, and retired to Trieste, where he died in 1855. Christina now tried to sever herself from the progresistas, and to govern with the help of the moderate party who enjoyed the patronage of Louis Philippe. But England, jealous of

French influence at Madrid, threw the weight of her in-|

fluence on to the side of the radicals, who found a powerful leader in Espartero. In 1840 Christina had to retire to France, and Espartero was recognized as regent by the cortes. But his elevation was resented by the other officers, while his subservience to England made him un- popular, and in 1843 he also had to go into exile. Isabella was now declared of age. and the moderados under Narvaez obtained complete control over the government. This was a great victory for France, and Louis Philippe abused his success by negotiating the infamous “Spanish marriages.” A husband was found for Isabella in her cousin, Francis of Assis, whose recommenda- tion in French eyes was the improbability of his begetting children. On the same day the queen’s sister, Maria Louisa, was married to Louis Philippe’s son, the duke of Mont- pensier. By this means it was hoped to secure the reversion of the Spanish throne for the house of Orleans. The scheme recoiled on the heads of those who framed it. The aliena- tion of England gave a fatal impulse to the fall of Louis Philippe, while the subsequent birth of children to Isabella deprived the Montpensier marriage of all importance. Spanish history during the reign of Isabella II. presents a dismal picture of faction and intrigue. The queen herself sought compensation for her

unhappy marriage in sensual indulgence, and tried to cover the dissoluteness of her private life by a superstitious devotion to religion and by throwing her influence on to the side of the clerical and reactionary party. Every now and then the progre- sistas and moderados forced themselves into office, but their mutual jealousy prevented them from acquiring any permanent hold upon the government. In 1866 Isabella was induced to take vigorous measures against the liberal opposition. Narvaez was appointed chief minister; and the most prominent liberals, Serrano, Prim, and O'Donnell, had to seek safety in exile. The cortes were dissolved, and many of the deputies were transported to the Canary Islands. The ascendency of the court party was main- tained by a rigorous persecution, which was continued after Narvaez's death (April 1868) by Gonzales Bravo. Common dangers succeeded at last in combining the various sections of the liberals for mutual defence, and the people, disgusted by the scandals of the court and the

contemptible camarilla which surrounded the queen, |

rallied to their side. In September 1868 Serrano and Prim returned to Spain, where they raised the standard

Don Carlos renounced his |

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Christina returned to Madrid, |

[LANGUAGE.

of revolt and offered the people the bribe of universal suffrage. The revolution was speedily accomplished, and Tsabella fled to France, but the successful rebels were at once confronted with the difficulty of finding a successor for her. During the interregnum Serrano undertook the regency, and the cortes drew up a new constitution, by which an hereditary king was to rule in conjunction with a senate and a popular chamber. As no one of the Bourbon candidates for the throne was acceptable, it became neces- sary to look round for some foreign prince. The offer of the crown to Leopold of Hohenzollern-Sigmaringen excited the jealousy of France, and gave

Napoleon III. the oppor- tunity of picking a quarrel, which proved fatal to himself, with the rising state of Prussia. (1870) in Amadeus of Aosta, the second son of Victor Eni- manuel, who made an honest effort to discharge the diffi- cult office of a constitutional king in a country which was hardly fitted for constitutional government. But he found the task too hard and too distasteful, and resigned in 1873. A provisional republic was now formed, of which Castelar was the guiding spirit. But the Spaniards, trained to regard monarchy with superstitious reverence, had no sympathy with republican institutions. Don Carlos seized the opportunity to revive the claim of inalienable male succession, and raised the standard of revolt in the Basque Provinces, where his name was still a power. The dis- orders of the democrats and the approach of civil war threw the responsibility of government upon the army. The cortes were dissolved by a military coup Wétat; Castelar threw up his office in disgust; and the administra- tion was undertaken by a committee of officers. Anarchy was suppressed with a strong hand, but it was obvious that order could only be restored by reviving the monarchy. Foreign princes were no longer thought of, and the crown

was offered to and accepted by Alfonso XII., the young Alfons son of the exiled Isabella (1874). His first task was to XII

terminate the Carlist War, which still continued in the north, and this was successfully accomplished in 1876. Time was required to restore the prosperity of Spain under a peaceful and orderly government and to consolidate by prescription the authority of the restored dynasty. Unfortunately a premature death carried off Alfonso XII. in 1885, before he could complete the work which circum- stances laid upon him. The regency was entrusted to his widow, Christina of Austria, and the birth of a post- humous son (May 17, 1886), who is now the titular king of Spain, has excited a feeling of pitying loyalty which may help to secure the Bourbon dynasty in the last kingdom which is left to it.

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PART IIL—LANGUAGE.

The Iberian Peninsula is not a linguistic unity. Not to speak of the Basque, which still forms an island of some importance in the north-west, three Romance languages

share this extensive territory :—(1) Portuguese-Galician, | spoken in Portugal, Galicia, and a small portion of the |

province of Leon ; (2) Castilian, covering about two-thirds of the Peninsula in the north, centre, and south; (3)

Catalan, occupying a long strip of territory to thie east and south-east.

These three varieties of the Romana Rustica are marked

off from one another much more distinctly than is the case with, say, the Romance dialects of Italy ; they do not interpenetrate one apother, but where the one ends the other begins. It has only been possible to establish at the points of junction of two linguistic regions the exist- ence of certain mixed jargons in which certain forms of each language are intermingled; but these jargons,

| called into existence for the necessities of social relations

by bilinguists, have an essentially individualistic and artificial character. The special development of the vulgar

At last a king was found Amade

CATALAN. |

Latin tongue in Spain, and the formation of the three linguistic types just enumerated, were promoted by the peculiar political circumstances. From the 9th century onwards Spain was slowly recaptured from the Moham- medans, and the Latin spoken by the Christians who had taken refuge on the slopes of the Pyrenees was slowly carried back to the centre and ultimately to the south of the Peninsula, whence it had been driven by the Arab invasion. Medieval Spain divides itself into three con- quistas—that of Castile (much the most considerable), that of Portugal, and that of Aragon; and to these three political conquests correspond an equal number of linguistic varieties. Ifa given province now speaks Catalan rather than Castilian, the explanation is to be sought simply and solely in the fact that it was conquered by a king of Aragon and peopled by his Catalan subjects.

J. CaraLan.—This domain now embraces, on the main- land, the Spanish provinces of Gerona, Barcelona, Tarragona, and Lerida (the old principality of Catalonia), and of Cas- tellon de la Plana, Valencia, and Alicante (the old kingdom of Valencia), and, in the Mediterranean, that of the Balearic Islands (the old kingdom of Majorca). Catalan, by its most characteristic features, belongs to the Romance of southern France and not to that of Spain; itis legitimate, therefore, to regard it as imported into Spain by those Hispani whom the Arab conquest had driven back beyond the mountains into Languedoc, and who in the 9th century regained the country of their origin; this conclusion is confirmed by the fact that the dialect is also that of two French provinces on the north of the Pyrenees—Roussillon and Cerdagne. From the 9th to the 12th century Catalan spread further and further within the limits of Catalonia, properly so called; in 1229 it was brought to Majorca by Jaime el Conquistador, and in 1238 the same sovereign carried it to Valencia also. Even Murcia was peopled by Catalans in 1266, but this province really is part of the Castilian conquest, and accordingly the Castilian element took the upper hand and absorbed the dialect of the earlier colonists. The river Segura, which falls into the

Mediter- ranean in the neighbourhood of Orihuela, a little to the north of Murcia, is as nearly as possible the southern boundary of the Catalan domain ; westward the boundary coincides pretty exactly with the political frontier, the provinces of New Castile and Aragon not being at all encroached on. Catalan, which by the reunion of Aragon and the countship of Barcelona in 1137 became the official language of the Aragonese monarchy,—although the king- dom of Aragon, consisting of the present provinces of Saragossa, Huesca, and Teruel, has always been Castilian in speech,—established a footing in Italy also, in all parts where the domination of the kings of Aragon extended, viz., in Sicily, Naples, Corsica, and Sardinia, but it has not maintained itself there in modern times except in a single district of the last-named island (Alghero) ; every- where else in Italy, where it was not spoken except by the conquerors, nor written except in the royal chancery, it has disappeared without leaving a trace.

From the 13th century the name given to the vulgar tongue of eastern Spain has been Catalanesch (Cata- laniscus) or Catalé (Catalanus),—the idiom of the Cata- lans! By Catalanesch or CatalA was understood, essen- tially, the spoken language and the language of prose, while that of poetry, with a large admixture of Provencal forms, was early called Lemosi, Limosi, or language of Limousin,—Catalan grammarians, and particularly the most celebrated of them, Ramon Vidal de Besalu, having adopted Lemost as the generic name of the language of the troubadours. These grammarians carefully distinguish the vulgar speech, or pla Catald, from the refined trobar

1 The origin of the name Catalanus is unknown.

O47 idiom, which originally is simply a more or less modified form of Provengal. Afterwards, and especially in thesc parts of the Catalan domain outside of Catalonia which did not care to acknowledge that they derived their language from that province, Zemosi received a more extensive signification, so as to mean the literary language in general, whether of verse or of prose. To this hour, particularly in Valencia and the Balearics, Zemosi is em- ployed to designate on the one hand the old Catalan and on the other the very artificial and somewhat archaizing idiom which is current

in the “jochs florals”; while the spoken dialect is called, according to the localities, Valencia (in Valencia), Majorqué and Menorqui (in Majorca and Minorca), or Catald (in Catalonia); the form Cata- lanesch is obsolete.

The principal features which connect Catalan with the Romance of France and separate it from that of Spain are the following. (1) To take first its treatment of the final vowels,—Catalan, like French and Provencal, having only oxytones and paroxytones, does not tolerate more than one syllable after the tonic accent: thus anima gives arma, cdmera gives cambra. All the proparoxytones of modern Catalan are of recent introduction and due to Castilian influence. Further, the only post-tonic Latin vowel pre- served by the Catalan is, as in Gallo-Roman, a: mare gives mar, gratu(s) gives grat, but anima gives arma; and, when the word terminates in a group of consonants requir- ing a supporting vowel, that vowel is represented by an e: arb(o)rem, Cat. abre (Prov. and Fr. arbre, but Cast. drbol) ; pop(u)l(us), Cat. poble (Prov. poble, Fr. peuple, but Cast. pueblo) ; sometimes, when it is inserted between the two consonants instead of being made to follow them, the supporting vowel is represented by an o: escdéndol (sc4ndalum), frévol (frivolus), cércol (circulus). In some cases a post-tonic vowel other than a is preserved in Catalan, as, for example, when that vowel forms a diphthong with the tonic (Deu, Deus; Hbriu, Hebreus); or, again, it sometimes happens, when the tonic is followed by an 7 in hiatus, that the 7 persists (ddldvi, diluvium ; servict, servicium ; ldbi, labium; ciri, cereus); but in many cases these ought to be regarded as learned forms, as is shown by the existence of parallel ones, such as servey, where the atonic 7 has been attracted by the tonic and forms a diphthong with it (servici, servi, servey). What has just been said as to the treatment of the final vowels in Catalan must be understood as applying only to pure Catalan, unaltered by the predominance of the Castilian, for the actual language is no longer faithful to the principle we have laid down; it allows the final o atonic in a number of substantives and adjectives, and in the verb it now con- jugates canto, temo, sento,—a thing unknown in the ancient language. (2) As regards conjugation, only two points need be taken up here :—(a) it employs the form known as the inchoative, that is to say, the lengthening of the radical of the present in verbs of the third conjugation by méans of the syllable ex or 2x, a proceeding common to Italian, Walachian, Provengal, and French, but altogether unknown in Hispanic Romance; (0) the

formation of a great number of past participles in which the termination is added, as in Provengal, not to the radical of the verb, but to that of the perfect : tingut formed from tinch, pogut from poch, conegut from conech, while Castilian says tenido (formerly also tenudo), podido, conocido, that is to say, it forms those participles from the infinitive.

As for features common alike to Catalan and Hispanic (Castilian and Portuguese) Romance, on the other hand, and which are unknown to French Romance, there is only one which possesses any importance, the conservation, namely, of the Latin w with its original sound, while the same vowel has assumed in French and Provencal, from a

very early period,—earlier doubtless than the oldest exist- ing monuments of those languages, —a labio-palatal pro- nunciation (7). It is not to be supposed that the separa- tion of Catalan from the Gallo-Roman family should have occurred before the transformation had taken place ; there is good reason to believe that Catalan possessed the & at one time, but afterwards lost it in its contact with the Spanish dialects. The question, however, is one for further examination.

Catalan being a variety of the langue doc, it will be convenient to note the peculiarities of its phonetic and inflexion as compared with ordinary Provengal.

Tonic Vowels. —With regard to a, which is pronounced alike in open and close syllables (amar, amare ; abre, arbor), there is nothing to remark. The Latin , whieh is treated like %, gives ¢, sometimes close, sometimes open. On this point Catalan is more hesitating than Provengal; it does not distinguish so clearly the pronunciation of ¢ according to its origin ; while é (2) is capable of yielding an open ¢, the is often pronounced close, and the poets have no difficulty in making words in ¢ close and_in e open rhyme together, which is not the case in_Provengal. The Latin 2 never yields ze in Catalan as it does in French and occasionally in Pro- vengal; sedet becomes sew (where w represents the final d), pedem makes peu, and ego ew; in some words where the tonic éis followed by a syllable in which an ¢ occurs, it

may become ¢ (77, héri; mig, médius; mils, mélius); and the same holds good for éin a similar situation (ciri, cérius, céreus; fira, féria), and for ¢ in a close syllable before a nasal (ewimpli, exemplum ; mintré for mentiré, gint for gent). Itonic longand ¢ short, when in hiatus with another vowel, produce % (amich, amicus; via, via). O tonic long and o short are represented by 0 close aud 0 open (amor, amorem; pobdie, populus). O short is never diphthongized into wo or we; such a treatment is as foreign to Catalan as the diphthongization of 2 into te. Just as ¢ before a syllable in which an ¢ occurs is changed into 4, so in the same circumstances 0 becomes wv (full, folium ; vil, volio for voleo) and also when the accented vowel precedes a group of consonants like cl, pl, and the like (ull, oc' lus; escull, scop'lus). Latin w persists with the Latin pronunciation, and, as already said, does not take the Franco-Provengal ronunciation i. Latin aw becomes o (cosa, causa; or, aurum); Old Catalan has kept the diphthong better, but possibly we should attribute the examples of aw which are met with in texts of the 13th and 14th centuries to the literary influence of Provence. Latin wa tends to become o (cor, quare).

Atonic Vowels.—As for the Latin post-tonic vowels already spoken of, it remains to be noted that a is often represented in writing by e, especially before s; in old Catalan, the substantives, adjectives, and participles readily form their singular in a and their plural in es: arma, armes (anima, animas); bona, bones (bona, bonas); amada, amades (amata, amatas). This ¢ is neither open nor close, but a surd ¢ the pronunciation of which comes very near a. In the same way the supporting vowel, which is regularly an e in Catalan, is often written a, especially after 7 (abra, arborem; astra, astrum; para, patrem); onc may say that in the actual state of the language post-tonic ¢ and become indistinguishable in a surd sound inter- mediate between the French a and mutee. Before the tonic the same change between and e¢ constantly takes place; one finds in manuscripts enar, emor for anar, amor (the same manner of writing extends even to the case of the tonic syllable, ten and sent from tantum and sanctum being far from rare), and, on the other hand, antre, arrar, for entre, crrar. JI atonic is often represented by ¢ even when it is long (vehi, vicinus). O atonic close, which in genuine Catalan exists only before the tonic, has become w; at the present day truvar, cuntradir is the real prouunciation of the words spelt trovar, contradir, and in the final syllables, verbal or other, where under

Castilian influence an o has come to be added to the normal Catalan form, this o has the value of a w: trovo (genuine Catalan, trop) is pronounced trovw ; bravo (genuine Catalan, braw) is pronounced bravu. U atonic keeps its ground.

The only strong diphthongs of the spoken language are di, dw (rather rare), éi, éu, éu, 6i, du, ui, uu. At produced by a + 7% or by a + a palatal consonant has for the greater part of the time become an ¢ in the modern language ; factwm has yielded fait, fett, and then jet, the last being the actual form ; arius has given er alongside of aire, ari, which are learned or scmi-learned forms. Of the two weak diphthongs 76 and wd, the latter, as has been secn, tends to become o close in the atonic syllable, and is pronounced w: quaranta has become coranta, then cwranta. After the tonic ua often becomes @ in the Catalan of the mainland (ayga, aqua, ilenga, lingua), while in Majorca it becomes o (aygo, llengo).

Consonants.—Final t readily disappears after 7 or / (tan, tantum; aman, venin, partin, for amant, venint, &c.; mol, multum; ocul, ocultum); the ¢ reappears in composition before a vowel (fon, fontem, but Font-alba). On the other hand, a ¢ without etymo-

logical origin is frequently added to words ending in 7 (cart for car, quare; mart for mar, mare; amart, ohirt, infinitive for amar, ohir), and even to some words terminating in a vowel (gentt, ingenium;

premit, premium), or the addition of the ¢ has taken place by

assimilation to past participles in 74. The phenomenon occurs also in Provengal (sce Romania, vii. 107, viii. 110). Mcdian intervocal d, represented by s (z) in the first stage of the language, has dis- appeared: fidelis gave fesel, then feel, and finally fel; videtis became vezets, then veets, vets, and vew. Final d after a vowel has produced w (pew, pedem; niu, nidum; mou, modum); but, when the d, in consequence of the disappearance of the preceding vowel, rests upon a consonant, it remains

and passes into the correspond- ing surd : frigidus gives fred (pronounced fret). The group dr, when produced by the disappearance of the intermediate vowel, becomes us (creure, credere; ociwrc, occidere; veure, vidére; seure, sedére). Final n, if originally it stood between two vowels, falls away (bo, bonum; vt, vinum), but not when it answers to mn (thus donum makes do, but domnum don; sonum makes so, but somuum son). Nd is reduced to 22 (demanar, comanar for demandar, comandar). Assibilated c before e,7 is treated like d; within a word it disappears after having becn represented for a while by s (lucere gives llusir, lluhir; recipere gives rezcbre, reebre, rebre); at the end of a word it is replaced by wu (vew, vicem; few, fecit). The group c'r gives ur, just like d'r (jawre, jacére; naure, nocére; plaure, placére; but facere, dicere, ducere, make far (fer), dir, dur. Initial 7 has been preserved only in certain monosyllables (the article Jo, los); everywhere else it has been replaced by 7 mouillée (Prov. 7), which in the present ortho- graphy is written 77 as in Castilian, but formerly used to be repre- sented by ly or yl (lletra, litera; Wengua, lingua). JP readily disappears after m, like ¢ after n (cwm, campum ; tems, tempus). B is replaced by the surd p at the end of a word (¢robar in the in- finitive, but trop iu the present tense) ; so also in the interior of a word when it precedes a consonant (supvenir, subvenire, sopte, sub'to). Median intervocalic f gives v (Estéve, Stephanus); it has disappeared from profundus, which yiclded the form preon, then pregon (g being introduced to obviate the hiatus). V, wher- ever it has been preserved, has the same pronunciation as } ; at the end of a word and between vowels it becomes vocalized into w (swau, suavis; viure, vivere). C guttural, written gw before ¢ and i, keeps its ground as a central and as a final letter ; in the latter position it is generally written ch (amich, amicum ; joch, jocum). @G guttural is replaced as a final letter by surd c (longa, but lone ; trigar, but trich). Tj after a consonant gives ss (cassar, captiare) ; between vowels, after having been represented by soft s, it has disappeared (rationem gave razd, raysd, then rahd) ; at the end of every word it behaves like ts, that is to say, changes into w (pre, pretium); instead of ts the second person plural of the verb —at(i)s, et(i)s, it(i)s—now has au, en, tu after having had ats, ets, its. Dj gives g between vowels (verger, viridiarum), and é asa terminal (written either zg or tx: goig, gaudium, mig, mita, medium). St and sc before ¢ and ¢, as well as « and ps, yield the sound sh, represented in Catalan by « (angoxa, angustia ; concixer, cognoscere; dix, dixit; mateix,metipse). Jalmost everywhere has taken the sound of the French j

(jutgc, &c.). Lj and Il give 1 mouillée (22 in the present orthography: ili, filium ; consell, con- silium; null, nullum). In the larger portion of the Catalan domain this 7 mouillée has become y ; almost everywhere iy is pro- nounced for fill, consey for consell. Nj and nn give n mouillée (ny in both old and modern spelling: senyor, seniorem; any, anuum). Sometimes the ny becomes reduced to y; one occasionally meets in manuscripts with scyor, ay, for senyor, any, but this pronunciation has not become general, as has been the case with the y having its origin in 72, Lingual r at the end of a word has a tendency to dis- appear when preceded by a vowel: thus the infinitives amare, temere, *legire are pronounced amd, temé, llegt. It is never pre- served except when protected by the non-etymological ¢ already spoken of (Jlegirt or liegt, but never Jegir) ; the r reappears, never- theless, whenever the infinitive is followed by a pronoun (donarme, dirho). Rs is reduced to s (cos for cors, corpus). H is merely an orthographic sign ; itis used to indicate that two consecutive vowels do not form a diphthong (vehi, raho), and, added to c, it denotes the pronunciation of the guttural ¢ at the end of a word (amich). Inflecion.—Catalan, unlike Old Provengal and Old French, has never had declensions. It is true that in certain texts (cspecially metrical texts) certain traces of case-endings are to be met with, as for example Deus and Deu, amors and amor, clars and clar, forts and fort, twyt and tots, abdwy and abdos, senyer and senyor, emperaire and emperador; but, since these forms are used convertibly, the nominative form when the word is in the objective, and the accusative form when the word is the subject, we can only recog- nize in these cases a confused recollection of the Provengal rules known only to the literate but of which the transcribers of manu- scripts took no account. Catalan, then, makes no distinctions save in the gender and the number of its nouns. As regards the forma- tion of the plural only two observations are necessary. (1) Words which have their radical termination in but which in the singular

drop that , resume it in the plural before s: homin-em makes ome in the singular and omens in the plural; asin-wm makes ase and asens. (2) Words terminating in s surd or sonant and in z anciently formed their plural by adding to the singular the syllable es (bras, brasses ; pres, preses; mateiaz, mateixes), but subsequently, from about the 15th century, the Castilian

influence substituted os, so that one now hears brassos, presos, mateixos. The words in tw, se, st have been assimilated to words in s (x); from bosch we originally had the plural bosches, but now boscos; from trist, tristes, but now ¢ristos. or these last in s¢ there exists a plural formation which is more in accordance with the genius of the language, and consists in the suppression of the s before the ¢; from aquest, for example, we have now side by side the two plurals aquestos, in the Castilian manner, and aguets. The article is lo, los (pro- nounced Ju, dus in a portion of the domain), fem. Ja, les (las). Some instances of /¢ occur in the ancient tongue, applying indif- ferently to the nominative and the objective case; ef applying to the singular is also not wholly unknown. .On the north-western border of Catalonia, and in the island of Majorca, the article is not a derivative from ile but from ipse (sing. masc. es or so, fem. sa; pl. masc. es, and also ets, which appears to come from istos,—ets for ests, like aquets for aquests,—fem. sas). Compare the corresponding Sardinian forms sw, sa, pl. sos, sas. On the pronouns it has only to be remarked that the modern language has borrowed from Castilian the composite forms nosaltres and vosaltres (pronounced also nosaltros and nosatrus), as also the form vostd, vusté (Castilian wsted for vuestra mereed).

Conjugation.—Catalan, and especially modern Catalan, has greatly narrowed the domain of the 2d conjugation in Gre ; a large number of verbs of this conjugation have been treated as if they belonged to the 8d in ére ; debere makes deure, videre, veure, and alongside of haber, which answers to habére, there is a form heure which points to habére. A curious fact, aud one which has arisen since the 15th ceutury, is the addition of a paragogic 7 to those infinitives which are accented on the radical ; in a portion of the Catalan domain one hears erewrer, veurer. Some verbs origin- ally belonging to the conjugation in ére have passed over into that ini; for example tenére gives tenir alongside of tindre, remanére romanir and romandre. In the gerundive and in the present participle Catalan differs from Provengal in still distinguishing the conjugation in ir from that in er, re,—saying, for example, sentimt. As in Provengal, the past participle of a large number of verbs of the 2d and 8d conjugations is formed, not from the infinitive, but from the perfect (pogut, volqut, tingut suggest the perfects poch, voleh, tinch, and not the infinitives poder, voler, tenir). In the present indicative and subjunctive many verbs in ir take the inchoative form already

described, by lengthening the radical in the three persons of the singular and in the third person of the plural by means of the syllable ese (ise) ; agrahir has the present indicative agraeseh, agrahcixes, agraheiz, agrahetixen, the present subjunctive agraesea, -as, -a, -an (or more usually now agraesqui, -1s, -t, -in). The old perfect of the conjugation in ar had ¢ (also 7) in the Ist pers. sing. and -d in the 3d; alongside of the -d, which is proper to Catalan exclusively, we also find, in the first period of the language, -ct as in Provencal. Subsequently the perfect of the three conjugations has admitted forms in -r (amdres, amirem, amdreu, amaren), derived from the ancient pluperfect amara, &¢., which has held its ground down to the present day, with the meaning of a conditional in some verbs (one still hears fora, haguera). But the simple perfect is no longer employed in the spoken language, which has substituted for it a periphrastic perfect, composed of the infinitive of the verb and the present of the auxiliary anar: vaig pendre, for example, does not mean ‘I am going to take,” but ‘‘I have taken.” The earliest example of this periphrastic perfect carries us back to the 15th century. The most usual form of the subj. pres. in spoken Catalan is that in -i for all the three conjugations (amt, -ts, -t, -em, -cu, -in; temi, -is, &e.; senti, -is, &c.) ; it appears to be an abbreviation from ~~ta, and in effect certain subjunctives, such as cdntia, témia, tinguia, vinguia (for cante, tema, tinga, vingia), evidently formed upon sia (subj. of esser), have been and still are used. The same? of the present sub~~ junctive, whatever may be its origin, is still found in the imper- fect : amés, -essts, -e8, -essim, &c.

Catalan Dialect of Alghero (Sardinia).—As compared with that of the mainland, the Catalan of Alghero, introduced into this portion of Sardinia by the Aragonese conquerors and colonists, does not present any very important differences ; some of them, such as they are, are explicable by the influence of the indigenous dialects of Sassari and Logudoro. In phonetics one observes—(1) the change of Yj into y as an initial before 7 (yitx, yigis ; lego, legis), a change Which does not take place in the Catalan of the mainland except in the interior, or at the end of the word 3 (2) the frequent change of 1 between vowels and of J after é, 9,f, p or b into r (taura, tabula; candera, candela; sangrot, singultum ; frama, flama). In conjuga- tion there are some notable peculiarities. The 1st pers. sing. does hot take the o which continental Catalan has borrowed from Castilian (cant, not canto, &c.); the imp. ind. of verbs of the 2d

and 8d eonjugations has eva, iva instead of ta, a form which also occurs in the conditional (cantariva, drumiriva) ; the simple per- fect, of which some types are still prescrved in the actual language (¢.g., anighé, aghé), has likewise served for the formation not only of tho past participle but also of the infinitive (agher, habere, can only be explained by aeh, 3d person of the perfect); the infinitives with r paragogic (viurer, seurer, plourer) are not used (viure, secure, ploure instead); in the conjugation of the present of the verb essar or esser, the 2d pers. sing. ses formed upon the persons of the plural, while continental Catalau says ets (anciently est), as also, in the plural, sem, sew, instead of som, sow, are to be noted ; tenere has passed over to the conjugation in re (trenda=tendre), but it is at the same time true that in ordinary Catalan also we have tindrer alongside of tenir the habitual form; diccre gives not dir but diwre, which is more regular.

II. Castitran,—This name (derived from the kingdom of Castile, the most powerful element in the Spanish monarchy) is the most convenient designation to apply to the linguistic domain which comprises the whole of central Spain and the vast regions of America and Asia colonized from the 16th century onwards by the Spaniards. We

‘might also indeed call it the Spanish domain, narrowing

the essentially geographical meaning of the word Espaiiol (derived, like the other old form Hspaiion, from 1 ispania), and using it in a purely political sense. But the first expression is to be preferred, all the more because it has been long in use, and even the inhabitants of the domain outside the two Castiles fully accept it and are indced the first to call their idiom Castellano. It is agreed on all hands that Castilian is one of the two branches of the vulgar Latin of Spain, Portuguese-Galician being the other ; both idioms, now separated by very marked differ- ences, can be traced back directly to one common source —the Hispanic Romance. One and the same vulgar tongue, diversely modified in the lapse of time, has pro- duced Castilian and Portuguese as two varieties, while Catalan, the third language of the

Peninsula, connects itself, as has already been pointed out, with the Gallo-Roman.

Within the Castilian domain, thus embracing all in Spain that is neither Portuguese nor Catalan, there exist linguistic varieties which it would perhaps be an exag- geration to call dialects, considering the meaning ordinarily attached to that word, but which are none the less worthy of attention. Generally speaking, from various circum- stances, and especially that of the reconquest, by which the already-formed idiom of the Christian conquerors and colonists was gradually conveyed from north to south, Castilian has maintained a uniformity of which the Romance languages afford no other example. We shall proceed in the first instance to examine the most salient features of the normal Castilian, spoken in the provinces more or less closely corresponding to the old limits of Old and New Castile, so as to be able afterwards to note the peculiarities of what, for want of a better expression, we must call the Castilian dialects.

In some respects Castilian is hardly further removed from classical Latin than is Italian; in others it has approximately reached the same stage as Provencal. As regards the tonic accent and the treatment of the vowels which come after it, Castilian may be said to be essentially a paroxytonic language, though it does not altogether refuse proparoxytonic accentuation and it would be a mistake to regard vocables like lémpara, ldgrima, rapido, &c., as learned words. In this feature, and in its almost universal conservation of the final vowels e, 7, w (0), Castilian comes very near Italian, while it separates from it and approaches the Gallo-Roman by its modification of the consonants.

Vowels.—Normal Castilian faithfully preserves the vowels é, 7, 6, %; the comparatively infrequent instances in which @ and 6 are

treated like 2 and 6 must be attributed to the working of analogy. It diphthongizes % in ze, o in we, which may be regarded as a

weakening of uo (see Romania, iv. 30). Sometimes te and wc in the modern language are changed into 7 and e: silla from s¢lla (Old Cast. siella),

vispera from véspera (Old Cast. viespera), castillo from castéllum/(Old Cast. castiello), frente from frontem (Old Cast. fruente), fleco from floccus (Old Cast. flueco). The words in which %and Jv have kept their ground are either learned words like médico, mérito, or have been borrowed from dialects which do not suffer diphthongization. In many cases the old language is more rigorous ; thus, while modern Castilian has given the preference to mentc, como, modo, we find in old texts miente, cuemo, muedo. Lat. au makes 0 in all words of popular origin (cosa, oro, &c.).

Consonants. —On the liquids J, m, n, 7 there is little to be re- marked, except that the last-named letter has two pronunciations— one soft (voiced), asin amor, burla, the other hard (voiceless), as in rendir, tierra (Old Cast. in this case goes so far as to double the initial consonant : rrcndir)—and that is often inserted before s and d: ensayo, mensage, rendir (reddere), L mouillée (written 77) re- presents not only the Latin J, 1, , but also, at the beginning of words, the combinations cl, gl, pl, bl, fl: llama (flamima), llave (clavis), Ulorar (plorare); the tendency of the modern language is, as in Catalan, to reduce JJ to y; thus one readily hears yeno (plenum). NV mouillée (7) corresponds to the Latin xn, mn, nj, and sometimes to initial n: afo (annum), dafio (damnum), fiudo (nodum). Passing that are popularly current and belong to the old stoek of the language, can only be derived from Lat. ét, pt, and sometimes ct, as in meter (mittere), catar (captare), punto (punctum); but it is to be observed that the habitual mode of representing c in normal Castilian is by ch (prou. tch), as in derecho (directum), pecho (pectus), so that we may take those words in which ¢ alone represents cf as secondary forms of learned words; thus we have bendito, otubre, santo as secondary forms of the learned words bendicto, octubre, sancto, alongside of the old popular forms bendicho, ochubre, sancho. D corresponds in Castilian to Latin ¢ between vowels, or ¢ before 7: amado (amatus), padre (patrem), At the present day the d of the suffixes ado, ido is no longer pronounced throughout the whole extent of the domain, and the same holds good also of the final d: salw, poné, for salud, poned (from salutem, ponite). Sometimes d takes the interdental sound of z (English th), or is changed into J; witness the two pronuuciations of the name of the capital—Madriz and Madril (adj. Madrileno). The study of the spirants c, 2, 3; 9, j is made a very delicate one by the circumstance that the interdental pronunciation of ¢, 2 on the one

hand, and the guttural pronunciation of g, j on the other, are of comparatively recent date, and convey no notion of the value of these letters before the 17th century. It is admitted, not without reason, that the spirants c, z, which at present represent but one interdental sound (a lisped s, or a sound between s and Eng. th in thing), had down till about the middle of the 16th century the voiceless sound ¢s and the voiced sound dz respectively, and that in like manner the palatal spirants g, j, 2, before assuming the uniform pronunciation of the guttural spirant (=Germ. ch in Buch), had previously represented the voiced sound of % (Fr. 7) and the voiceless sound of § (Fr. ch), which are still found in Portuguese and in the Castilian dialects of the north-west. The substitution of these interdental and guttural sounds for the surd and sonant spirants respectively did certainly not take place simul- taneously, but the vacillations of the old orthography, and afterwards the decision of the Spanish Academy, whieh suppressed x (=3; x was retaincd for cs) and allows only c and g before e and 7, z and j before a, 0, «, make it impossible for us to follow, with the help of the written texts, the course of the transformation. S uow has the voiceless sound even between vowels: casa (pronounced cassa) ; final s readily falls away, especially before liquids: todo dos for todos los, vamono for vamos nos. The principal sources of j (g) are—Lat. y and g before e and 7 (juego, jocum ; gente, gentem); Lat. initial s (jabon, saponem); Lat. x (cojo, coxum); J, ol (consejo, con- silium; ojo, oc'lum). The sources of z © are Lat. cc, gy, Y, 8 (cielo, caclum; calza, ealcea; razon, rationem; zampona, sym- phonia). As regards the spirants fand 4, itis to be observed that at the beginning of a word f has in many instances been replaced by the aspirated / (afterwards silent), while in others no less current among the people the transformation has not taken place; thus we have Azjo (filium) alongside of fiesta (festa). In some cases the iP has been preserved in order to avoid confusion that might arise from identity of sound: the fin fied (fidelis) has been kept for the sake of distinction from hiel (fel). As for v, it has a marked tendency to beeome confounded, especially as an initial letter, with the sonant explosive 0; Joseph Scaliger's pun—bibere est vivere—is applicable to the Castilians as well as to the Gaseons. fH is now uothing more than a graphie sign, except in Andalusia, where the aspirate sound represented by it comes very near j. Words be- ginning in hue, where the h, not etymologically derived, marks the inseparable aspiration of the initial diphthong we, are readily pronounced giie throughout almost the whole

extent of the domain : giele for hucle(olet); giieso for hweso (os). This gie extends also to words beginning with bwe: gieno for bucno (bonum).

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LANGUAGE.

Inflewion.—There is uo trace of declension either in Castilian or in Portuguese. Some nominative forms—Diés (anciently Déos, and in the Castilian of the Jews Dio), Cdrlos, Marcos, sastre (sartor)— have been adopted instead of forms derived from the accusative, but the vulgar Latin of the Peninsula in no instance presents two forms (subjective and objective case) of the same substantive. The article is derived from ille, as it is almost everywhere throughout the Romance regions: el, Ja, and a neuter lo; los, las. The plural of the first and second personal pronoun has in the modern language taken a composite form—zosotros, vosotros—which has been initated in Catalan. Quien, the interrogative pronoun which has taken the place of the old qui, seems to come from quem,

Conjugation.—The conjugation of Castilian (and Portuguese) de- rives a peculiar interest from the archaic features which it retains. The vulgar Latin of Spain has kept the pluperfeet indicative, still in eurrent use as a secondary form of the conditional (cantdra, ven- diéra, partiéra), and, what is more remarkable still, as not occurring anywhere else, the future perfect (cantare, vendiére, partiérc, formerly cantéro, vendiéro, partiéro). The Latin future has been replaced, as everywhere, by the periphrasis (eantare habeo), but it is worth noticing that in certain old texts of the 13th century, and in the popular songs of a comparatively ancient date which have been preserved in Asturias, the auxiliary can still precede the infinitive (habeo cantare), as with the Latin writers of the decadence: ‘“‘Mucho de mayor pregio a seer el tu manto Que non serd el nuestro a (Berceo, S. Lawr., str. 70), where a seer (habet sedere) corresponds exactly to serd (sedere habet). The vulgar Latin of the Peninsula, moreover, has preserved the 2d pers. pl. of the imperative (cantad, vendcd, partid), which has disappeared from all the other Romance languages.. Another special feature of Castilian-Portuguese is the complete absence of the form of conjugation known as

inchoative (intercalation, in the present tense, of the syllable ise or csc between the radical and the inflexion), although in all the other tenses, except the present, Spanish shows a tendency to lay the accent upon the same syllable in all the six persons, which was the object aimed at by the inchoative form, Castilian displaces the accent on the Ist and 2d pers. pl. of the imperfeet (cantdbamos, cantdbais), of the pluperfect indicative (cantdramos, cantdrais), and of the imperfect subjunctive (cantdsemos, cantdseis) ; possibly the impulse to this was given by the forms of future perfect cantdremos, cantdrets (cantartmus, cantaritis). The 2d persons plural were formerly (except in the perfect) -ades, -cdes, ~~ides ; it was only in the course of the 16th century that they got reduced, by the falling away of d, to ais, eis, and ts, The verb essere has been mixed, not as in the other Romance languages with stare, but with sedere, as is proved by older forms seer', sicdes, sieden, seyendo, obviously derived from sedere, and which have in the texts sometimes the meaning of 'to be seated," sometimes that of 'to be," and sometimes both. In old Latin charters also sedere is frequently met with in the sense of esse: c.g., "sedeat istum meum donativum quietum et securum" (anno 1134), where sedeat=sit, The 2d pers. sing. of the present of ser is eres, which is best explained as borrowed from the imperfect (eras), this tense being often used in Old Spanish with the meaning of the present; alongside of cres one finds (but only in old documents or in dialects) sos, formed like sois (2d pers, pl.) upon somos, The aceentuation in the inflexion of perfects in the conjugation called strong, like hubiéron, hiziéron, which cor~~ respond to habuérunt, fecérunt (while in the other Romanee lan- guages the Latin type is érunt: Fr. curent, firent), may be regarded as truly etymological, or rather as a result of the assimilation of these perfects to the perfects known as weak (amdron), for there are dialectic forms having the aceent on the radical, such as dixon, hizon. The past participle of verbs in e7 was formerly wdo (utus) in most cases ; at present do serves for all verbs in er and ir, except some ten or twelve in which the participle has retained the Latin form accented on the radical : dicho, hecho, visto, &e. It ought to be added that the past participle in normal Castilian derives its theme not from the perfect but from the infinitive: habido, sabido, from haber, saber, not from hubo, sipo.

CastitIAN DrALEcrs.—To discover the features by which these are distinguished from normal Castilian we must turn to old charters aud to

certain modern compositions in which the provincial forms of speech have been reproduced more or less faithfully.

Asturian.—The Asturian idiom, called by the natives bable, is differentiated from the Castilian by the following characters. Je oceurs, as in Old Castiliau, in words formed with the suffix cllum (castiellu, portiellw, while modern Castilian has reduced ze to 7. E, i, uw, post-tonic for a, ¢, 0: penes (penas), gracics (gracias), esti (este), frenti (frente), lecht (leche), nuecht (noche), wnu (uno), primeru (primero). There is no guttural spirant, j, but, according to circumstances, y or # (8); thus Lat. cl, j gives y: vey (*veelus), espeyu (spec'lum), conseyw (consilium); and after an @ this y is hardly perceptible, to judge by the forms fiw (filium), escoidos (Cast. escogidos), Castia (Castilla) ; Lat. g before c and 7, Lat. initial j, aud Lat. ss, a, give x ($)—«iente (gentem), wudiu (Judaeus), baxu (bassus), cou (coxus), floxu (fluxus). Lat. initial / has | kept its ground, at least in part of the province: jiu, fucya (Cast.

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hijo, hoja). Avery marked feature is the habitual ‘‘mouillure” of Zand m as initial letters : leche, lleer, lluna, llutu; fion, fiunca, fiueve, fiube. With respect to inflexion the following forms may be noted :—personal pronouns : 7 (¢2/2), yos (dllos); possessive pro- nouns: mid, pl. mids; to, tos; so, sos for both masc. and fem.; verbs: 8d pers. pl. imp. of the 2d and 8d conjugations in in for ien (Cast. ian); train, tenin, facin (from facer), fiin (from fer), and even some instances of the 2d pers. sing. (abis; Cast. habias) ; instances of pres. subj. in ia for a (strvia, métia, sépia). The verb ser gives yes (sometimes yeres) in the 2d pers. sing., ye in the 8d. Facere appears under two forms—/acer and fer,—and to the abridged form correspond /fcis, fiendo, fiin, ke. Ire often appears under the form dir (antes de diros=antes de iros), which it is not neeessary to explain by de-ire (see Schuchardt, Ztschr. f. rom. Philol., v. 312).

Navarrese-Aragonese.—In its treatment of the post-tonic vowels this dialect parts company with normal Castilian and comes nearer Catalan, in so far as it drops the final ¢, especially after nt, rt (mont, plazient, muert, fuert,

parents, gents); and, when the atonic ehas dropped after a v, this v becomes a vowel—brew (brevem), gricu (*grevem), nucw (novem). Navarrese-Aragonese has the diphthongs ze, wc from tonic % and 8, and adheres more strictly to them than normal Castilian does,—cwende (cSmitem), huey (hodie), pucyo (podium), yes (Est), yeran (érant), while Castilian says conde, hoy, poyo, cs, cran. The initial combinations cl, pl, fi, have withstood the transformation into Z/ better than in Castilian : plano, pleno, plega, clamado, flama are current in old documents ; and at the present day, although the 7 has come to be *‘mouillée,” the first consonant has not disappeared (pllwma, pllord, pllano— pronounced pijuma, &c.). Lat. ct gives it, not ch as in Castilian : nucyt (noctem), destruito (destructum), proveito (provectum), dito for diito (dictum). D between vowels kept its ground longer than in Castilian : documents of the 14th century supply such forms as vidieron, vido, hudio, provedir, redemir, prodeza, Benedit, vidiendo, &c.; but afterwards y came to be substituted for d or dj: veyere (videre), seyer (sedere), seya (sedeat), goyo (gaudium), enueyo (inodium). Initial fdoes not change intoh: jillo, feito. Navarrese- Aragonese does not possess the guttural spirant (j) of Castilian, which is here rendered according to circumstances either by g (Fr. Jj) or by i (7 mouillée), but never by the Asturian x Certain forms of the conjugation of the verb differ from the Castilian: dar, cstar, haver, saber, poner readily form their imperfects and imperfect subjunetives like the regular verbs in ar and er,—havicron (Cast. hubieron), estaron (Cast. estubieron), sabié (Cast. supo), dascn (Cast. diesen), ponicse (Cast. pusiesc) ; on the other hand, past participles and gerundives formed from the perfect are to be met with, —fisiendo for faciendo (perf. fiso), tuviendo and tuvido for teniendo, tenido (perf. twvo). In the region bordering on Catalonia the simple perfect has given way before the periphrastic form proper to Catalan: voy cayer (I fell), va fé (he has done), vamos ir (we went), &e.; the imperfects of verbs in er, ir, moreover, are found in eba, tba (comeba, subiba, for comia, subia), and some presents also occur where the Catalan influence makes itself felt : estigo (Cat. cstich), vaigo (Cat. vaig), veigo (Cat. veig). Navarrese-Aragonese makes use of the adverb cn asa pronoun: no les en daren pas, non hi ha.

Andalusian.—The word “dialect” is still more appropriately applied to Andalusian than either to Asturian or Navarrese- Aragonese. Many

peculiarities of pronunciation, however, are commonly called Andalusian which are far from being confined to Andalusia proper, but are met with in the vulgar speech of many parts of the Castilian domain, both in Europe and in America. Of these but a few occur only there, or at least have not yet been observed elsewhere than in that great province of southern Spain. They are the following. JL, n, 7, d between vowels or at the end of a word disappear: sd (sal), sé (sol), vice (viene), tiec (tienc), paa and pa (para), mia (mira), naw and na (nada), too and to (todo). D is dropped even from the beginning of a word: e (de), inero (dinero), on (don). Before an explosive, 2, r, d are often represented

Y 4: saiga (salga), vaiga (valga), laigo (largo), maire (madre), paire (padrc). Lat. f is more rigorously represented by h than in normal Castilian, and this A here preserves the aspirate sound which it has lost elsewhere ; habld, horma (forma), hoder, are pronouneed with a very strong aspiration, almost identical with that of 7. The Andalusians also very readily write these words jabld, jorma, joder. This aspirate, expressed by 7, often has no etymologieal origin; for example, Jdéndalo, a nickname applied to Andalusians, is simply the word Andaluz pronounced with the strong aspiration characteristic of the inhabitants of the province. C, 2 are seldom pronounced like s; but a feature more peculiar to the Andalusians is the inverse process, the softened and interdental ee non of the s (the so-called ceceo): zefior (sefior), &c.

efore a consonant and at the end of a word s becomes a simple aspiration : mihmo (mismo), Dioh (Dios), do reales (dos reales). In the inflexion of the verb there is nothing speeial to note, except Some instances of 2d pers. sing. of the perfect in tes for te: estuvistes, estuvites, for estuviste,—evidently a formation by analogy from the 24 pers. of the other tenses, which all have:s.

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It is with the Andalusian dialect that we can most readily asso- ciate the varieties of Castilian which are spoken in South America. Here some of the most characteristic features of the language of the extreme south of Spain are reproduced,—either because the Cas- tilian of America has spontaneously passed throngh the same phonetic transformations or because

the Andalusian element, very strongly represented in colonization, suceeeded in transporting its local habits of speech to the New World.

Leonesc. —Proceeding on inadequate indications, the existence of a Leonese dialect has been imprudently admitted in some quarters ; but the old kingdom of Leon cannot in any way be considered as constituting a linguistic domain with an individuality of its own. The fact that a poem of the 13th century (the Alexandro), and certain redactions of the oldest Spanish code, the Fuero Juzgo, have a Leonese origin has been made too much of, and has led to a tendency to localize excessively certain features common to the whole western zone where the transition takes place from Castilian to Galician- Portuguese,

Ill. Porrucursr.—Portuguese-Galician constitutes the second branch of the Latin of Spain. In it we must dis- tinguish—(1) Portuguese (Portuguez, perhaps a contraction from the old Portugalez = Portugalensis), the language of the kingdom of Portugal and its colonies in Africa, Asia, and America (Brazil) ; (2) Galician (Gallego), or the language of the old kingdom of Galicia (the modern provinces of Pontevedra, La Corufia, Orense, and Lugo) and of a portion of the old kingdom of Leon (the territory of Vierzo in the province of Leon). Portuguese, like Castilian, is a literary language, which for ages has served as the vehicle of the literature of the Portuguese nation constituted in the be- ginning of the 12th century. Galician, on the other hand, which began early in the Middle Ages a literary life,—for it was employed by Alfonso the Wise in his cantigas in honour of the Virgin,—decayed in proportion as the monarchy of Castile and Leon, to which Galicia had been annexed, gathered force and unity in its southward conquest. At the present day Gallego, which is simply Portuguese variously modified and with a development in some respects arrested, is far from having as a dialect the same importance as Catalan, not only because the Spaniards who speak it (1,800,000) number much less than the Catalans (3,500,000), but also because, its literary culture having been early abandoned in favour of Castilian, it inevitably fell into the vegetative condition of a provincial patois. Speaking generally, Portuguese is further removed than Castilian from Latin; its development has gone further, and its actual forms are more worn out than those of the sister language, and hence it has, not with- out reason, been compared to French, with which it

has some very notable analogies. But, on the other hand, Portuguese has remained more exclusively Latin in its vocabulary, and, particularly in its conjugation, it has managed' to preserve several features which give it, as compared with Castilian, a highly archaic air. Old Portuguese, and more especially the poetic language of the 13th century, received from the language of the trouba- dours, in whose poetry the earlier Portuguese poets found much of their inspiration, certain words and certain turns of expression which have left upon it indelible traces.

Vowcls.~~—Lat. @, 6 with the aceent have not been diphthongized into te, wo, ue: pé (pedem), dez (deeem), bom (bonus), pode (potet). On the other hand, Portuguese has a large number of strong diphthongs produced by the attraction of an 7 in hiatus or the resolution of an explosive into 7: raiba (rabia), feira (feria), feito (factum), seéxo (saxum), otto (oeto). A quite peculiar feature of the language occurs in the ''nasal vowels," which are formed by the Latin accented vowels followed by m, n, or nt, nd: bz (bene), gra (grandem), 66(bonum). These nasal vowels enter into com~~ bination with a final atonic vowel: irma&o (germanus); also amdo (amant), sermdo (sermonem), where the 0 is a degenerated repre- sentative of the Latin final vowel. In Old Portuguese the nasal vowel or diphthong was not as now marked by the il (~), but was expressed indifferently and without regard to the etymology by m or n: bem (bene), tan (tantum), disscrom (dixerunt), sermom (sermonem). The Latin diphthong aw is rendered in Portuguese by ow (owro, aurum ; powco, paucum), also pronounced of. With regard to the atonic vowels, there is a tendency to reduce a into a

vowel resembling the Fr. ¢ ' muet," to pronounce o as u, and to drop ¢ after a group of consonants (dent for dente).

Consonants. —Here the most remarkable feature, and that which most distinctly marks the wear and tear through which the language has passed, is the disappearance of the median consonants J and 7: eoréa (corona), lua (luna), pér formerly poer (ponere), conego (canonieus), vir (venire), dér, formerly door (dolorem), paco (palatium), saude (salutem), pego (pelagus). Latin b passes regularly into Uv: cavallo (caballus), fava (faba), arvore (arborem) ; but, on the other hand, Latin initial v readily tends to become 6:

bexiga (vesica), bodo (votum). Latin initial 7 never becomes h: fazer (facere), filo (filum). Latin c before ¢ and i is represented either by the hard sibilant s or by the soft z. Latin g between vowels is dropped before ¢ and 4: ler for leer (legere), dedo (digitum); the same is the case with d, of eourse, +n similar circumstances: remir_ (redimere), rir (ridere), Latin j has assumed the sound of the French 7. The Latin combinations cl, fl, pl at the beginning of words are transformed in two ways in words of popular origin. Either the initial consonant is retained while the 7 is changed into r: eravo (clavum), prazer (placere), fror (florem); or the group is changed in ch (=Fr. ch, Catal. 2) through the intermediate sounds kj, fj, wi: chamar (clamare), chao (planus), chamma (flamma). Within the word the same group and other groups also in which the second consonant is an / produce / mouillée (written 7h, just as mouillée is written nh, as in Provengal): ovelha (ovic'la), velho (*veclus); and sometimes ch: facho (fac'lum), ancho (a mplum). Lat. ss or s¢ before e and 4 gives a (Fr. ch): batmo (bassus), faa (fascia). The group cf is reduced to tt: letto (lectum), pedto (pectus), notte (noctem); sometimes to ut: dowto (doctus). Such words as fruto, reto, dileto are modern derivatives from the learned forms /ructo, recto, dilecto. Latin cs becomes 1s: seis (sex); or isc, @ (=Fr. ich, ch): seiaxo (saxum), Jwao (luxum); or even ss: disse (dixi).

Inflexion.—The Portuguese article, now reduced to the vocalic form 0, @, 08, as, was lo (exceptionally also el, which still survives in the expression El-Rei), la, los, las in the old language. Words ending in / in the singular lose the 7 in the plural (because it then becomes median, and so is dropped): sod (solem), but soes (soles); those having do in the sing. form the plural either in des or in des aceording to the etymology: thus cao (canem) makes cdes, but ra¢do makes racdes. As regards the pronoun, mention inust be made of the non-etymological forms of the personal mim and of the feminine possessive minha, where the second 7 has been brought in by the initial nasal. Portuguese conjugation has more that is interesting. In the personal suffixes the forms of the 2d pers. pl. in ades, edes, ides lost the d in the 15th century, and have now become ats, ets, ts through the intermediate forms aes, ces, eis. The form in des has persisted only in those verbs where it was protected by the eon- sonants 7 or 7 preceding it: pondes, tendes, vindes, amardes, and also no doubt in some forms of the present of the imperative, where the theme has been reduced to an extraordinary degree

by the disappear- ance of a consonant and the contraction of vowels: ddes, credes, ledes, &e. Portuguese is the only Romance language which possesses a per- sonal or conjugated infinitive: amar, amar-es, amar, amar-mos, amar-des, amar-em ; &g., antes de sair-mos, ‘““before we go out.” Again, Portuguese alone has preserved the pluperfect in its original meaning, so that, for example, amara (amaveram) signifies not merely as elsewhere ‘‘I would love,” but also ‘‘l had loved.” The future perfect, retained as in Castilian, has lost its vowel of in- flexion in the 1st and 3d pers. sing. aud consequently becomes liable to be confounded with the infinitive (amar, render, partir). Portuguese, though less frequently than Castilian, employs ter (tenere) as an auxiliary, alongside of aver ; and it also supplements the use of essere with sedere, which furnished the subj. sea, the imperative se, sede, the gerundive sendo, the participle sido, and some other tenses in the old language. Among the peculiarities of Portuguese conjugation may be mentioned—(1) the assimilation of the 3d pers. sing. to the 1st in strong perfects (howve, pude, qwiz, fez), while Castilian has hube and hubo; (2) the imperfeets punha, tinha, vinha (from por, ter, and vir), which are accented on the radical in order to avoid the loss of the 2 (ponta would have made pota), and which substitute w and 7 for o and ¢ in order to dis- tinguish from the present subjunctive (ponha, tenha, venha).

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Galictan.—Almost all the phonetic features which distinguish Portuguese from Castilian are possessed by Gallego also. Portu- guese and Galician even now are practically one language, and still more was this the ease formerly: the identity of the two idioms would become still more obvious if the orthography employed by the Galicians were more strictly phonetic, and if certain trauscrip- tions of sounds borrowed from the grammar of the official language (Castilian) did not veil the true pronunciation of the dialect. It is stated, for example, that Gallego does not possess nasal diph- thongs ; still it may be conceded once for all that such a word as planus, which in Galician is written sometimes chau and sometimes chan, cannot be very remote from the Portuguese nasal pronuncia- tion chao. One of the most notable differences between normal Portuguese and Galician is the

substitution of the surd spirant in place of the sonant spirant for the Lat. j before all vowels and g before ¢ and i: xuez (judicem), Port. juiz; aunto (junctum), Port. junto; xente (gentem), Port. gente. In eonjugation the peculiarities of Gallego are more marked ; some find their explana- tion within the dialect itself, others seem to be due to Castilian influence. The 2d persons plural have still their old form ades, edes, ides, so that in this instance it would seem as if Gallego had been arrested in its progress while Portuguese had gone on pro- gressing ; but it is to be observed that with these full forms the grammarians admit contracted forms as well: ds (Port. ais), és (Port. eis), és (Port. 1s). The Ist pers. sing. of the perfect of conjugations in er and ir has come to be complicated by a nasal resonance similar to that which we find in the Portuguese mim ; we have vendin, partin, instead of vendi, parti, and by analogy this form in in has extended itself also to the perfect of the con- jugation in ar, and falin, gardin, for falet, gardei are found. The second persons of the same tense take the endings che, ches in the singular and ehedes in the plural: falache or falaches (fabulasti), falachedes as well as faldstedes (fabulastis), bateche or batiche, pl. hatestes or batechedes, &c. Ti (tibi) having given che in Galician, we see that falasti has become falache by a phonetic process. The 3d pers. sing. of strong perfect is not in ¢ as in Portuguese (houve, pode), but in o (houbo, puido, sorbo, coubo, &e.) ; Castilian influence may be traceable here. If a contemporary grammarian, Saco Arce, is to be trusted, Gallego would form an absolute exception to the law of Spanish accentuation in the imperfect and pluperfect indica- tive: falabdémes, falabddes ; batidmos, batiddes; pididmos, pididdes ; and falardmos,falarddes, baterdmos, baterddes; pidirdmos, pidirddes. ‘The future perfect indicative and the imperfect subjunctive, on the other hand, would seem to be accented regularly : faldremos, Sald- semos. The important question is worth further study in detail.

Bibliography.—On the general subject the only books to be mentioned are the Grammatik der romanischen Sprachen and the Ltymologisches Worterbuch of Diez. 1. CaTaLAn. On the old language see Manuel Mild y Fontanals, De los Trovadores en Espafia, Barcelona, 1861, and several essays by the same author in the Revue des Langues Romanes, the Janrb. f. roman, u. engl. Literatur, vol. y., and the Revista Histérica of Barcelona; P. Meyer in Romania; A. Mussafia inthe introduction to Die Catalanische

metrische Version der sieben wetsen Meister, Vienna, 1876; and Morel-Fatio in Romania, Yor modern Catalan, see Ballot y Torres, Gramatica y Apologia de la Llengua Cathalana, Barcelona, 1814; A. de Bofarull, Estudios, Sistema Gramatical y Crestomatia de la Lengua Catalana, Barcelona, 1864; and, before all, Manuel Mild y Fontanals, Estudios de Lengua Catalana, Barcelona, 1875. The dialectic varieties of Valencia and the Balearics have not yet been sufficiently investigated. Onthe Catalan of Alghero (Sardinia) there is a memoir by G. Morosi in the Miscellanea di Filologia dedicata alla Memoria dei Prof. Caix e Canello, Florence, 1885, 2. CasTitian. Since Diez's time no general work upon Castilian has been published, with the exception of a treatise on Spanish "doublets" by Mme. Carolina Michaelis, Studien zur ronan- ischen Wortschépfung, Leipsic, 1876, and a Spanische Sprachlehre, by Paul Forster, Berlin, 1880, which leayes much to be desired. On the grammar of Old Castilian the remarkable articles of Cornu in Romania must be consulted. Hitherto the dialects have received but little attention, For Asturian there is a Coleccion de Poesias en Dialecto Asturiano, published at Oviedo in 1839, and some lexico-graphical notes ("Apuntes Lexicograficos sobre una Rama del Dialecto Asturiano") Navarrese-Aragonese has 2d ed.,

in Portuguese to the pages of Romania. For Galician Saco Arce's Gramatica Gallega, Lugo, 1868, and A. Fernandez y Morales i Berciano, with introduction and glossary by Mariano Cubf y Soler, Leon, ought to be consulted, (A, M.

PART IV.—LITERATURE.

_ The name Spanish is now generally restricted to the literature of the Castilian tongue. In the present article it is taken in the wider sense as embracing the literature of the whole Iberian Peninsula, with the exceptions of Por- TUGAL (q.v.) and of Galicia, the latter of which as regards language and literature belongs to the Portuguese domain. Spanish literature thus considered falls into two divisions —Castilian and Catalan.

L. Castitian LrreraturE.—Of the Castilian texts now extant none are of earlier date than the 12th century, and very probably none go farther back than 1150. That accepted as the oldest—the Mystery of the Magian Kings, as it is rather inappropriately designated—is a fragment of a short semi-liturgical play meaut to be acted in the church of Toledo at the feast of Epiphany. Manifestly an imita- tion of the Latin Judi represented in France in the 12th

Poems of 13th jeentury,

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century, the Spanish piece cannot have been composed much before 1150.

The great national hero Rodrigo Diaz de Bivar (died 1099), better known in history by the Arabic surname of the Crp (q.v.), was celebrated in the vulgar tongue less than a century after his death in two poems, neither of which, however, has come down to us in its entirety. The first cantar, usually entitled Poema del Cid since the first edition by Tomas Antonio Sanchez, relates in its first part the valiant deeds (/a gesta) of the Cid subse- quent to his quarrel with King Alfonso VI.; in the second the capture of Valencia, the reconciliation of the hero with the king, and the marriage of his daughters with the “infantes” of Carrion;! and then in the third the treason of the infantes, the vengeance of the Cid, and the second marriage of his daughters with the infantes of Navarre and Aragon. The narrative of the last years of the Cid, which closes this third part, is very much curtailed. Whilst in the Poema the Cid appears as the loyal vassal, faithful to his king and deploring the necessity of separ- ating from him, the Cid of the second poem, Crdnica

rimada del Cid, is almost a rebel and at least a refractory vassal who dares treat his sovereign as an equal. The por- tion of the Crdénica which has been preserved deals in the main with the youth (mocedades) of Rodrigo ; it contains the primitive version of his quarrel with the Count Gomez de Gormaz, and the marriage of the slayer of the count with Ximena, his daughter, and also a series of fabulous episodes, such as the Cid's journey to France to fight with the twelve peers of Charlemagne, &c. If the Poema really belongs to the 12th century, some doubt attaches to the date of the Crénica; it would seem that the form under which this latter text has reached us is more recent than that of the Poema, but, on the other hand, several tradi- tions collected by the author bear an incontestable stamp of antiquity. The versification of both poems is very barbarous, the metre very irregular. Normally this great epic measure ought to be divided into two hemistichs of seven or eight syllables each; but here the lines some- times fall short of this number and sometimes exceed it. Instead of rhyme, assonance steadily prevails throughout ; the strophes follow the model of the laisses of the French chansons de geste,—that is, they have a single assonance and vary greatly in extent.

The other heroes of Spanish history, such as the last Gothic king Roderick, Bernardo del Carpio, the infantes of Lara, have not given rise to long poems; at least we are acquainted with none cf which they are the subject. Still some may have existed; and in fact the frequent allusions in the chronicle of Alfonso the Wise (13th century) to the narratives of the juglares suggest that Castilian heroic poetry was richer than the scarcity of the monuments still extant would lead us to believe. Fernan Gonzalez, first independent count of Castile (10th century), has alone been celebrated in a poem of the 13th century, composed in single-rhyme quatrains.

With the heroic poetry which takes its themes from the national history and legends, there grew up in the 13th century a religious and didactic poetry, the most eininent representative of which is Gonzalo de Berceo (1198-1268). This poet, born at Berceo in the province of Logrofio, composed several lives of Spanish saints (St Domingo de Silos, St Millan de la Cogulla, St Oria), and also devotional poems, such as the Miracles and the Praises of the Virgin, and some religious hymns. Berceo names his poems

prosa, decir, dictado, indicating thereby that he intended them to be read and recited, not sung like the cantares, They are written in single-rhyme

Carrion de los Condes is a district in the province of Valencia.

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quatrains and in verses of twelve to fourteen syllables, according as the ending of each hemistich is masculine or feminine. In the same kind of versification were composed, also in the 13th century, two long poems,—one on Alexander the Great, the other on Apollonius of Tyre, —after Latin and French sources. The author of the first of these poems contrasts his system of versification, which he calls mester de clerecia, with the mester de joglaria, the one of the heroic poetry, intended to be sung, and declares that this singlerhyme quatrain (curso rimado por la quaderna via) consists of counted syllables. The composer of Appolonio calls this same versification nueva maestria. The single-rhyme quatrain, introduced in imitation of the French poetry of the 12th century into Castilian literature, became from the time of Berceo and the Alexandro and Appolonio the regular form in Castilian narrative and didactic poetry, and prevailed down to the close of the 14th century.

To the 13th century seem also to belong a Life of St Mary the Egyptian, translated from the French, perhaps through a Provengal version, and an Adoration of the Three Kings, in verses of eight or nine syllables rhyming in pairs (aa, bb, cc, &c.), as well as a fragment of a Debate between Soul and Body, in verses of six or seven syllables, evidently an imitation of one of those medizval Latin poems entitled Rixa Animi et Corporis. Mention may here also be made of the cantigas (“songs”) of Alfonso the Wise in honour of the Virgin, although, being in the Galician dialect, these properly belong to the history of Portuguese literature.

The 14th century saw the birth of the most original Poetry medizval Spanish poet. Juan Ruiz (1300-1350), arch- of 14th has left us a poem of century.

priest of Hita (near Guadalajara), rather irregular composition, in which, while reproducing apologues translated from the Latin or French fabulists, and extracts from Ovid's Art of Love, or from a poem entitled Pamphilus de Amore, or, lastly, from fabliaux and dits, such as the Bataille de Karesme et de Charnage, the author frequently gives way to his own inspiration. Ruiz celebrates love and woman ; his book is of buen amor, that is, he shows by his own experience and the example of the authors whom he follows how a man ought to set to work to be a successful lover. The character of the female go-between, named " Trota-Conventos," here plays an im- portant part ; it was suggested to Ruiz by the Pamphilus, but he has greatly strengthened the characteristics and thus prepared the way for the Celestina of the close of the 15th century. By way of precaution, the author repre- sents himself as one who has survived his illusions, and maintains that carnal love (/oco amor) must in the long run give place to divine love ; but this stratum of devotion is a thin one and ought not to disguise the real character of the work. His form of versification is the single-rhyme quatrain in the narrative portions; as to the "songs" (cantigas) which sometimes interrupt the narrative, and of which the most successful are a "song of scholars" and a "song of the blind," their rhythm is different and much more varied. The Rimado de Palacio of the grand chan- cellor of Castile, Pedro Lopez de Ayala (1332-1407), does not exclusively refer to court life ; the author takes up all classes of laymen and churchmen, whose vices he depicts in jocular style. Amid the tirades of this long moral poem there occur occasionally some cantares or even decires in strophes of eight lines of twelve syllables. Akin to this Rimado de Palacio are the Proverbios Morales of the Jew Santob (Shemtob) of Carrion, dedicated to King Pedro the Cruel, who reigned from 1350 to 1369, as well as the General Dance of Death and a new version of the Debate between Soul and Body, both in eight-line strophes of arte mayor (verses of twelve syllables), and both imitations of XXIL — 45

French originals.) The 14th century also produced a long historical composition in verse, the Rhymed Chronicle of Alfonso XI, (died 1350), by Rodrigo Yanez, important fragments of which have come down to us; the versifica- tion of this chronicle is similar to that of Santob's Proverbs

(strophes of four octosyllabic verses rhyming abab). Ro- The word romance not only signifies in Spain, as in mances. ther Romanic countries, the vulgar tongue, but also bears the special meaning of a shiort epic narrative poem (historic ballad) or, at a later date, a short lyric poem. As regards the form, the ‘“‘ romance” (Spanish e/ romance, in contrast to French, &c., Ja romance) is a composition in long verses of fourteen syllables ending with one rhyme, or assonance, which have been generally, but wrongly, divided into two short lines, the first of which, naturally, is rhymeless. This being the form of the romance verse, the Cronica rumada del Cid, and even the Poema (though in this case the in- fuence of the French alexandrines is perceptible), might be considered as a series of romances tagged on one after the other ; and in fact several of the old romances of the Cid, which form each an independent whole and have been printed as separate poems in the 16th century, are partly to be found in the Crénica. Other romances, notably those dealing with the heroes of the Carlovingian epic, so popular in Spain, or with the heroes which Spanish patriot- ism opposed at a certain period to the French paladins,— as, for example, Bernardo del Carpio, the rival and the conqueror of Roland in Castilian tradition,—seem to be portions severed from those cantares de gesta composed. by juglares of which Alfonso X. makes mention. It is only at the close of the 15th century, and especially during the 16th, that the romances, which had previously passed from mouth to mouth by song and recitation, began to be written down and afterwards to be printed, at first on broadsheets (pliegos sueltos) and subsequently in collections (roman- ceros), either general, in which romances of very different date, character, and subject are mixed up, or restricted to a single historical or legendary episode or to a single per- sonage (for example, the Romeancero del Cid). In those collections the epic verse is always regarded as octosyllabic and printed as such ; occasionally certain editions divide the romance into strophes of four verses (cwartetas). Prose King Alfonso X. (died 1284), under whose patronage or sae were published the memorable code entitled Las Siete coftiites! Partidas and great scientific compilations, such as the Libros de Astronomia and the Lapidario, was also the founder of Spanish historiography in the vulgar tongue. The Crénica General, composed under his direction, con- sists of two distinct parts: the one treats of universal history from the creation of the world to the first centuries of the Christian era (La General é Grant Listoria), the other exclusively of the national history (La Cronica 6

Historia de Espaiia) down to the death of Ferdinand III. (1252), father of Alfonso. The main sources of the Cronica General are two Spanish chroniclers of the 13th century,—Lucas of Tuy and Rodriguez of Toledo,—who wrote in Latin, but whose works were early translated into the vernacular. In the Historia de Espaiia of Alfonso X., which has collected many legends and which occasionally refers to the songs of the juglares (for the purpose, however, of refuting them), the narrative relating to the Cid is partly based on an Arabic text. This portion has frequently been printed by itself, under the title of Cronica del Cid. Alfonso's example bore fruit. In the 14th century we find another Cronica General de Espana or de Castilla, constructed on the model of the first and embracing the years 1030-1312; next, the Grant Crénica de Espana and the Grant Crénica de los Conqueridores, compiled by command of the grandmaster of the order of St John of Jerusalem, Juan Fernandez de Heredia, about

1390. Special chronicles of each king of Castile were soon written. Our information is at fault in regard to the authorship of the chronicles of Alfonso X., Sancho IV., Ferdinand IV., and Alfonso XI.; but the four following reigns—those of Pedro I., Henry II., John J., and Henry TIL—were dealt with by Pedro Lopez de Ayala, and here we can recognize the man of literary culture, who had acquired some knowledge of ancient history, for the form of the narrative becomes freer and more personal and the style rises with the thought. Several authors had a hand in the chronicle of John IL, but the final redaction was by Fernan Perez de Guzman. The sad reign of Henry IV. was related by Diego Enriquez del Castillo and Alfonso de Palencia, the glorious reign of the Catholic sovereigns Ferdinand and Isabella by Fernando del Pulgar and Andrés Bernaldes. Along with those royal chronicles must be mentioned some biographies of important persons. Thus in the 15th century the chronicle of Pedro Niiio, count of Buelna (1379-1452), by Gutierre Diez de Gamez ; that of Alvaro de Luna, constable of Castile (died 1458) ; also a very curious book of travels, the narrative of the embassy sent by Henry III. of Castile to Timur in 1403, written by the head of the mission, Ruy Gonzalez de CLAviso (q.v.).

The other productions of Castilian prose in the 13th and 14th centuries are for the most part didactic and senten- tious compositions, which, however, contain illustrations or tales of Eastern origin. The Spanish translation of

Kalida and Dimna, made direct from an Arabic text, dates from the middle of the 13th century, and the romance of the Seven Sages (Sindibad), published under the title of En- gatos @ Assayamientos de las Mugeres, must be referred to almost the same period. From the second half of the 13th century the collections of sentences, dits, apologues, and moral tales become very numerous: first of all, ver- sions of the Secretum Secretorum, attributed in the Middle Ages to Aristotle, one of which is entitled Poridat de las Poridades, next the Proverbios Buenos, the Bocados de Oro or Libro de Bonium, Rey de Persia, the Libro de los Gatos, which is derived from the Narrationes of Eudes of Cheriton. But the most celebrated is the Libro de los Castigos y Documentos of King Sancho IV. (died 1295), who also composed a Lucidario, a kind of encyclopedia of theology, morals, and natural history. It was during the first half of the 14th century that the uephew of Alfonso X., the infant Juan Manuel (1282-1349), wrote those various works which place him in the first rank of medi- eval Spanish prose writers. Tho best known is the collection of tales, many of them borrowed from Oriental sources, entitled Hl Conde Lucanor ; but besides this con- tribution to light literature he wrote graver and more specially instructive works, notably the Libro de los Estados or Libro del Infante, a kind of manual of education, domestic economy, and politics ; the Libro del Caballero é del Escudero, a practical treatise on chivalry somewhat re- sembling a work of Raymond Lully on the same subject. Unfortunately Juan Manuel's poems, which he had col- lected ina Libro de las Cantigas or de los Cantares, have been lost. The knowledge of antiquity, previously so poor and vague, made remarkable progress in the 14th century. It was thought desirable to learn more about certain epi- sodes of ancient history, such as the War of Troy, and therefore the poem on that subject by the Frenchman Benoit de Sainte-More and the Latin narrative of Guido de Columna were both translated. Pedro Lopez de Ayala translated or caused to be translated Pierre Bersuire's French version of Livy, Boetius, and various writings of Isidore of Seville and Boccaccio.

While the Carlovingian cycle is mainly represented in Spain by romances, of which the oldest seem to be frag-

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ments of lost poems of the juglares, the British cycle (Lancelot, Tristram, Merlin, &c.) is represented almost exclusively by works in prose (compare Romance). Those narratives are known, it is true, only by 15th and 16th century editions in which they have been more or less modified to suit the taste of the time, but it is impossible not to recognize that books such as £7 Baladro del Sabio Merlin and La Demanda del Sancto Grial (1515) presup- pose a considerable antecedent literature of which they are only the afterglow. The principal French romances of the Round Table were translated and imitated in Spain and in Portugal as early as the first half of the 14th century at least; of that there is no doubt. And, even if there was not on this point satisfactory testimony, the prodigious development in Spanish literature of the caba- llerias or “book of chivalry,” incontrovertibly derived from fictions of British origin, is proof enough that the Spaniards have at an early date been familiarized with this romance from France. The first book which begins the series of strictly Spanish caballerias is the Amadis de Gaula (1.e., of Wales, not France). We know the Amadis only by the version made about 1480 in four books by Garci Ordojiez de Montalvo (the oldest edition extant is dated 1508), but the work in its original form (three books), already widely distributed and celebrated by various Castilian poets from about 1350, must have been composed at the latest in the second third of the 14th century. A few rather vague hints and certain senti- mental considerations lead one to seek for the unknown author of the first Amadis in Portugal, where the romances of the Round Table were even more highly appreciated than in Spain, and where they have exercised a deeper influence on the national literature. To Mont- alvo, however, falls the honour of having preserved the book by republishing it; he only made the mistake of diluting the original text too much and of adding a poor continuation, Las Sergas de Esplandian. Allied to Montalvo’s Amadis with its Esplandian appendage are the Don Florisando and the Lisuarte de Grecia, the Amadis de Grecia, the Don Florisel de Niquea, &c., which form

what Cervantes called the ‘‘Amadis sect.” Along with the Amadises range the Palmerines, the most celebrated of which are the Palmerin de Oliva, the Primaleon, and the Palmerin de Inglaterra. None of those caballerias inspired by the Amadis were printed or even written before the 16th century; and they bear in language and style the stamp of that period; but they cannot be separated from their medizeval model, the spirit of which they have pre- served intact. Among the caballerias we may also class

some narratives belonging to the Carlovingian epic,—the |.

Mistoria del Emperador Carlomagno y de los Doce Pares, a very popular version still reprinted of the French romance of Merabras, the Espejo de Caballerias, into which has passed a large part of the Orlando Innamorato of Boiardo, the Mistoria de la Reina Sibilla, &e. The first half of the 15th century, or, what comes almost to the same thing, the reign of John II. of Castile ‘ (1407-1454), is as regards its literature characterized by three facts —(1) by the development of a court poetry, . artificial and pretentious; (2) by the influence of Italian literature on Castilian prose and poetry, the imitation of Boccaccio and Dante, especially of the latter, which intro- duced into Spain a liking for allegory; and (3) by more assiduous intercourse with antiquity—a fuller understand- Ing of the Latin writers who had been brought to the front by the Italian renaissance. After the example of the Pro- vencals, whose literary doctrines had made their way into Castile through Portugal and Catalonia, poetry is now styled the arte de trobar. The arte de trobar is strictly “court” poetry, which consists in short pieces of rather

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complicated versification,—love plaints, debates, questions, and repartees, motes with their glosas, burlesque and satirical songs,—a poetry wholly “occasional,” and which when separated from its natural environment loses great part of its charm. In order to understand and appreciate those pieces they must be read in the collections made by the poets of the time, and the one must be brought to throw light on the other. The most celebrated cancionero of the 15th century is that compiled for the amusement of his

sovereign by Alfonso de Baena (who has not designated him- self a Jew, as has been supposed, the word judino attached to his name in the preface being nothing but indino); it is, so to say, the official collection of the poetic court of John II., although it also contains some pieces by poets of earlier date. After Baena's collection may be mentioned the Cancionero de Stufiiga, which contains the Castilian poems of the trobadores who followed Alfonso V. of Aragon to Naples. Those cancioneros, consisting of the productions of a society, a group, were succeeded by collections of a more general character in which versifiers of very different periods and localities are jumbled together, the pieces being classed simply according to their type. The earliest Cancionero General is that compiled by Juan Fernandez de Constantina, which appears to have issued from the Valencia press in the very beginning of the 16th century ; the second, much better known, was published for the first time at Valencia in 1511; its editor was called' Fernando del Castillo. The other poetic school of the 15th century, which claims to be specially related to the Italians, had as its leaders Juan de Mena (1411-1456), author of the Coro- nacion and the Labirinto or Las Trecientas (a long poem so called because of the number of stanzas which, accord- ing to the scheme, were to compose it), and the marquis of Santillana, D. Iiigo Lopez de Mendoza (1398-1458), who in his sonnets was the first to imitate the structure of the Italian endecasillabo. Along with those two, who may be designated poetas, in distinction from the decidores and the trobadores of the cancioneros, must be ranked Francisco Imperial, a Genoese by descent, who also helped to acclimatize in Spain the forms of Italian poetry. The marquis of Santillana occupies a considerable place in the literature of the 15th century, not only by reason of his poems, but quite as much if not more through the support he afforded to all the writers of his time, and the impulse he gave to the study of antiquity and to the labours of translators who at his request turned Virgil, Ovid, Seneca, &e., into Castilian. He himself was not acquainted with Latin; but the generous efforts he made to stir up his fellow-countrymen to learn it have justly procured him the title of father of Spanish humanism. That he had an extensive knowledge of the national literature and of the literatures of France and Italy he has shown in the preface to his works, which is a sort of avs poetica as well as an historical exposition of the kinds of poetry cultivated in the Middle Ages by the Spaniards and the neighbouring nations.

With the exception of the chronicles and some caballerias, the prose of the 15th century contains nothing very striking. The translation of Virgil by Enrique de Villena (died 1434) is very clumsy and shows no advance on the versions of Latin authors made in the previous century ; better worth reading is the 7'rabajos de Hercules, a whimsical production but with some savour in its style. A curious and amusing book, full of details about Spanish manners, is the Corbacho of the archpriest of Talavera, Alonso Martinez de Toledo, chaplain to King John II. ; the Corbacho belongs to the numerous family of satires against women, and its title ("The Lash" or " Whip ") borrowed from a work of Boccaccio's, with which it has otherwise nothing akin, correctly indicates that he has not spared them.

Prose of 15th century.

Dra- matic litera- ture.

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The ancient liturgical Spanish theatre is known to us only by fragments of the play of the Magian Kings, of which mention has already been made ; but certain regulations of the code of the Siete Partidas (compiled be- tween 1252 and 1257) prove that this theatre existed, and that at the great festivals, such as Christmas, Epiphany, and Easter, dramatic representations were given in church. These representations, originally a mere com- mentary on the liturgy, grew more complicated in course of time ; they were gradually adulterated with buffoonery, which frequently brought down the censure of the clergy. Alfonso the Wise even thought it necessary formally to forbid the "clerks" playing juegos de escarnios, and per- mitted in the sanctuary only dramas destined to conmem- orate the principal episodes of the life of Christ. Of all the church festivals, the most popular in Spain was that of Corpus Christi, instituted by Urban IV. in 1264. At an early date was introduced the custom of accompanying the celebration of this festival with dramatic representa- tions intended to explain to the faithful the Eucharistic mystery. Those dramas, called autos sacramentales, ac- quired more and more importance ; in the 17th century, with Calderon, they become grand allegorical pieces, regular theological dissertations in the form of dramas. To the auto sacramental corresponds the auto al nacimiento, or drama of the Nativity. 'The secular theatre is in Spain as elsewhere a product of the

religious theatre. Expelled from the church, the juegos de escarnios took possession of the public squares and there obtained a free development ; they cease to be a mere travesty of dogma to become a separate type, a drama whose movement is no longer determined by the liturgy, and whose actors are bor- rowed from real life in Spanish society. This new theatre starts about the close of the 15th century with the little pastoral pieces of Juan del Encina (died 1534), which, after Virgil's example, he calls eglogas. Genuine shep- herds, clumsy, rude, and long-haired (melenudos), are the interlocutors of those bucolics, into which are also sometimes introduced students, and even, by Lucas Fernandez, a contemporary and pupil of Encina's, gen- tlemen (caballeros) and soldiers. A book which, strictly speaking, does not belong to the theatre, the Tragicomedia de Calixto y Melibea, by Fernando de Rojas, much better known as La Celestina, and dating from about 1492, caused the new theatre, still so childish in the attempts of the school of Encina, to make a gigantic step onwards. The history of two lovers, who are brought together by a go-between (Celestina), and who after various vicissitudes ultimately commit suicide,—this astonishing novel taught the Spaniards the art of dialogue, and for the first time exhibited persons of all classes of society (particularly the lowest) speaking in harmony with their natural surround- ings, thinking and acting in accordance with their con- dition of life. The progress caused by the Celestina may be estimated by means of the Propaladia of Bartolomé Torres Naharro (Naples, 1517), a collection of pieces represented at Rome in presence of Leo X. and distri- buted by their author into two groups—comedias a noticia, those treating of things really known and seen, and comedias a fantasia, those bringing fictions on the stage, though it may be with the appearance of reality. The most interesting, if not the best composed, are the comedia soldadesca, depicting to the life the Spanish man-at-arms of the time, and the comedia tinelaria, a picture of the manners of the menials of the pontifical court. Torres Naharro is the first Spaniard who borrowed from France the division of the play into "days" (jornadas) ; shortly after Naharro we find the comedy of manners in Lope de Rueda, goldbeater of Seville (died about 1566), whose dramatic work is composed of regular comedies constructed

on the model of Naharro and Italian authors of the begin- ning of the 16th century, and also of little pieces intended for performance in the intervals between the larger plays (entremeses and pasos), some of which, such as El Con- vidado, El Rufian Cobarde, Las Aceitunas, are storehouses of sprightliness and wit. Some of Naharro's and espe- cially of Rueda's pieces have already the character of the comedy of intrigue, which is emphatically the type of the classic stage. But to reach Lope de Vega the Spanish stage had to be enlarged in relation to national history. A poet of Seville, Juan de la Cueva (born about 1550), first brought on the boards subjects such as the exploits of the Cid, Bernardo del Carpio, and others, which had previously been treated of only in the " romances." Toa poet called Berrio, of whose work nothing has been pre- served, are attributed the comedias of Moors and Christians, in which were represented famous episodes of the age-long struggle against the infidel. And it is at this period that Cervantes (1585) experimented in the dramatic line ; in his Tratos de Argel he gives us a picture of galley-life, painful recollections of his long captivity in Algiers. There is no need to linger over certain attempts at tragedy of the ancient type by Geronimo Bermudez (born 1530), Cristobal de Virues (born about 1550), Lupercio Leonardo Argensola (1562-1613), &e., the only successful specimen of which is the Numancia of Cer- vantes; these works in fact, cold and manneristic, mere exercises in style and_versification, remained without influence on the development of the Spanish stage. The pre-classic period of this stage is, as regards dramatic form, one of indecision. Some write in prose, like Rueda; others, like Naharro, show a preference for the redondillas of popular poetry ; and there are those again who, to elevate the style of the stage, versify in hendeca- syllabics. Hesitation is also evident as to the mode of dividing the drama. At first a division into five acts, after the manner of the ancients, is adopted, and this is still followed by Cervantes in his first pieces ; then Juan de la Cueva reduced the five acts to four, and in this he is imitated by most of the poets to the close of the 16th century (Lope de Vega himself in his youth composed pieces in four acts). It was only at this time that the custom which is still maintained of dividing all dramatic works into three acts or days was introduced,—exception of course being made of short pieces like the loa (pro- logue), the entremes, the paso, the baile (different kinds of entr'acte).

The golden age of Spanish literature,

ing, only a Castilian literature, not very self-reliant and largely influenced by imitation first of France and then of Italy ; the union of the two crowns of Aragon and Castile, and afterwards the advent of the house of Austria and the king of Spain's election as emperor, proved the creation at once of the political unity of Spain and of Spanish literature. After the death of Philip IV. (1665) this fair- shining light went out ; the nation, exhausted by distant expeditions, the colonization of America, Continental wars, and bad administration, produced nothing; its literary genius sank in the general decline, and Spain is destined ere long to be subjected again to the influence of France, to which she had submitted during all the first period of the Middle Ages. In the 16th and 17th centuries the literature is eminently national. Of course all is not equally original, and in certain kinds of literature the Spaniards continue to seek models abroad.

Lyric poetry, cspecially that always inspired by the Italian masters.

as it is called, Clas: belongs to the 16th and the 17th centuries, extending 98° approximately from 1550 to 1650. Previous to the reign ya), of the Catholic sovereigns there exists, strictly spceak- turie

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tendency leads the Spanish poets to rhyme in hendeca- syllabics—as the marquis of Santillana had formerly done, though his attempts had fallen into oblivion—and to group their verses in tercets, octaves, sonnets, and canciones (canzont). Garcilaso de la Vega (1503-1536), Juan Boscan (1493-c. 1550), and Diego de Mendoza (1503— 1575) are the recognized chiefs of the school al italzco modo, and to them belongs the honour of having successfully transplanted to Spain those different forms of verse, and of having enriched and improved the poetic language of their country. The few uncouthnesses of which Mendoza and Boscan more especially are guilty (such as certain faults of rhythmic accentuation) were corrected by their

disciples Gutierre de Cetina, Gregorio Silvestre, Hernando de Acuiia, by the poets of the so-called school of Seville, headed by Fernando de Herrera (died 1597), and also by those of the rival school of Salamanca, rendered famous mainly by the inspired poetry of Fr. Luis de Leon (1528-1591). Against those innovators the poets faithful to the old Castilian manner, the rhymers of redondillas and romances, hold their own; under the direction of Cristébal de Castillejo (1556) they carry on a fierce war of the pen against the ‘ Petrarchists.” But by the last third of the 16th century the triumph of the new Italian school is assured, and no one any longer thinks of reproaching it for its foreign flavour. Only a sort of schism is effected from that period between the higher poetry and the other varieties: the former employs ouly the hendecasyllabic and the heptasyllabic (quebrado), while the popular poets, or those who affect a more familiar tone, preserve the national metres. Almost all the poets, however, of the 16th and 17th centuries have tried their powers in both kinds of versification, using them in turn according to the nature of their subjects. Thus Lope de Vega, first of all, who wrote La Jerusalem Conquistada (1609), La Dragontea (1602), La Hermosura de Angélica (1602), in Italian verses and in octaves, composed his long narrative poem on Isidore, the husbandman patron of Madrid (1599), in quintils of octosyllabic verse, not to mention a great number of “romances.” As regards this last form, previously disdained or almost so by artistic poets, Lope de Vega gave it a prestige that brought it into favour with the literates of the court. A host of poets were pleased to recast the old “‘romances” or to compose new ones. The 17th century, it may be said, is characterized by a regular surfeit of lyric poetry, to which the establish- ment of various literary academies in the Italian style con- tributed not a little. Of this enormous mass of verses of all sorts and sizes very little still keeps afloat: the names of three-fourths of the versifiers must be forgotten, and in addition to those already cited it will be sufficient to mention Luis de Gdéngora (1561-1626) and Francisco de Quevedo Villegas (1580-1645). Géngora is especially famous as the founder of the “cultist ” school, as the intro- ducer into Castilian poetry of a flowery, bombastic, and periphrastic style, characterized by sonorous vocables and artificial arrangements of phrase. The Spaniards have given the name of culto to this pompous and manneristic style, with its system of inversions based on Latin syntax. The Soledades of Géngora are the monument par excellence of Spanish mannerism, which made numerous victims and inflicted on the poetry of

the Peninsula irreparable injury. But Géngora, a poet of really great powers, had started better, and as often as he cares to forget about being sonorous and affected, and is contented to rhyme romances, he finds true poetic accents, ingenious ideas, and felicitous expressions. Quevedo, much greater, moreover, in his prose works than in his verse, displays real power only in Satire, epigram, and parody. ‘There are in some of his Serious pieces the stuff of a Juvenal, and his satiric and

burlesque romances, of which several are even written in slang (yermania), are in their way little masterpieces. Another commonplace of Spanish poetry at this period was epic poetry after the style of Tasso’s Gerusalemme. None of those interminable and prosaic compositions in octavas reales come near their model ; none of them could even be compared in style, elevation of thought, and beauty of imagery to the Lusiadas. They are in reality only rhymed chronicles, and consequently, when the author happens to have taken part in the events he narrates, they have a genuine historical interest. Such is the case with the Araucana of Alonso de Ercilla (1533-1594), of which it may be said that it was written less with a pen than with a pike. In burlesque poetry the Spaniards have been rather more successful: La Gatomaguia of Lope de Vega and La Mosquea of Villaviciosa (died 1658) are somewhat agreeable pieces of fun.

The departments of imaginative literature in which the Ro- genius of the new Spanish nation revealed itself with most ™ances.

vigour and originality are the novela and the drama. By novela must be understood the novel of manners, called pearesca (from picaro, a rogue or “picaroon”) because of the social status of the heroes of those fictions; and this kind of novel is quite an invention of the Spaniards. Their pastoral romance, on the other hand-—the best known examples of which are the Diana Hnamorada of Jorge de Montemayor (died 1561), continued by Alonso Perez and Gaspar Gil Polo, the Galatea of Cervantes, and the Arcadia of Lope de Vega, as well as their novel of adventure, started by Cervantes in his Vovelas Ejemplares (1613), and cultivated after him by a

host of writers—is directly derived from Italy. The Arcadia of Sannazaro is the source of the Diana and of all its imitations, just as the Italian novelliert alone are the masters of the Spanish novelistas of the 17th century. The picaresque novel starts in the middle of the 16th century with the Vida de Lazarillo de Tormes, sus Fortunas y Adversidades (1554), the work of a very bold intellect whose personality un- fortunately remains unknown, there being no satisfactory reason for assigning this little book, which is as remarkable for the vigour of its satire as for the sobriety and firmness of its style, to Diego Hurtado de Mendoza. A supple- ment to the adventures of Lazarillo appeared at Antwerp in 1555 ; it is probably, however, not the production of the author of the original romance. The impetus was given, and the success of Lazarillo was so great that imitators soon appeared. In 1599 Mateo Aleman published, under the title of Atalaya dela Vida Humana, the first part of the adventures of another picaroon, Guzman de Alfarache; and, as he was in no hurry to finish this narrative, another writer, jealous of his success, took possession of it and issued in 1603, under the pseudonym of Mateo Luxan, a continuation of the first Guzman. Aleman, not to be thwarted, resumed his pen, and published the second part of his romance in 1605. Quite unlike that of the Lazarillo, the style of Mateo Aleman of Seville is eloquent, full, with long and learned periods, sometimes diffuse. Nothing could be more extravagant and more obscure than the history of Justina the beggar woman (La Picara Justina) by Francisco Lopez de Ubeda (1605), an assumed name which concealed the person of the Dominican Andrés Perez de Leon. The other picaresque romances are— Alonso Mozo de muchos Amos, by Geronimo de Alcal4 (two parts, 1624 and 1626) ; the Historia y Vida del Gran Tacato Pablo de Segovia (1626), in which Quevedo has made his most brilliant display of style and wit; the Garduiia de Sevilla (1634) of Alonso de Castillo Solor- zano; La Vida y Hechos de Estebanillo Gonzalez (1646), described as compuesto por el mesmo, but an Estéban Gonzalez is unknown in the literary history of the 17th century.

Drama of 17th century.

By degrees the picaresque romance was combined with the novel of Italian origin and gave rise to a new type,— half novel of manners, half romanceof adventure,—of which the characteristic example appears to be the Relacion de la Vida y Aventuras del Escudero Marcos de Obregon (1618), by Vicente Espinel, one of the most genial and best written works of the 17th century. To the same class belong almost all the novels of Alonso Gerdénimo de Salas Barbadillo, such as La Ingentosa Helena, Don Diego de Noche, El Caballero puntual, &c. ; Luiz Velez de Gue- vara's Diablo Cojuelo (1641), the model of Lesage's Diable Boiteux ; and Francisco Santos's highly popular pictures of life in Madrid, Dia y Noche de Madrid (1663), Periquulo, el de las Gallineras, &c. Tirso de Molina (Los Cigarrales de Toledo, 1624), Perez de Montalban (Para Todos, 1632), Maria de Zayas (Novelas,

1637),

of Cervantes, and consequently of the Italian type.

Among the so-called historical romances one only deserves

to be mentioned,—the Guerras Civiles de Granada by

Cines Perez de Hita, which deals with the last years of

the kingdom of Granada and the insurrection of the

Moors of the Alpujarras in the time of Philip II. Don

Quixote, the masterpiece of Miguel Cervantes de Saavedra (1547-1616), is too great a work to be treated along with others ; and, besides, it does not fall strictly within the limits of any of the classes just mentioned. If it has to be defined, it may be described as the social romance of 16th and 17th century Spain. Cervantes undoubtedly owed much to his predecessors, notably to the picaresque romancers, but he considerably enlarged the scope of the

type, and, what had as yet been done by no one, supported

the framework of the story by a lofty moral idea. His main purpose was, turn into ridicule the books of chivalry, which were already out of fashion by his time, but to show by an example pushed to absurdity the danger of hidalgism, of all those deplorable prejudices of pure blood and noble race with which three-fourths of the nation were imbued, and which, by the scorn of all useful labour which they involved, were destined to bring Spain toruin. The lesson is all the more effective as his /idalgo, although ridiculous, was not put beyond the pale of the reader's sympathy, and the author condemns only the exaggeration of the chivalrous spirit, and not true courage and devotion when these virtues have a serious object. The same thing happened to Don Quixote which had happened to Guzman de Alfarache. After the publication of the first part (1605), Cervantes allowed his pen to lie too long idle ; and so it occurred to some one to anticipate him in the glory of completing the story of the heroic deeds of the knight of La Mancha, In 1614 a second part of the adventures of Don Quixote made its appearance—the work of a certain Avellaneda, a pseudonym under which people have sought to recognize the inquisitor Luis de Aliaga. Cervantes was thus roused from inactivity, and the following year gave to the world the true second part, which soon effaced the bad impression produced by Avellaneda's heavy and exaggerated imitation.

The stage in the 17th century in some measure took the place of the romances of the previous age ; it is, as it were, the medium of all the memories, all the passions, and all the aspirations of the Spanish people. Its style, being that of the popular poetry, made it accessible to the most illiterate classes, and gave it an immense range of subject. From the books of the Bible, the acts of the martyrs, national traditions, the chronicles of Castile and Aragon, and foreign histories and novels, down to the daily incidents of contemporary Spanish life, the escapades and nightly brawls of students, the gallantries of the Calle

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as we are beginning to realize, not to

Mayor and the Prado of Madrid, balcony escalades, sword thrusts and dagger strokes, duels and murders, fathers befooled, jealous ladies, pilfering and cowardly valets, inquisitive and sprightly waiting-maids, sly and tricky peasants, fresh country girls,—all are turned to dramatic account. The enormous mass of plays with which the literature of this period is inundated may he divided into two great classes—asecular and a religious, the latter again subdivided into (1) the liturgical play, @.¢., the auto either sacramental or al nacimiento, and (2) the comedia divina and the comedia de santos, which have no liturgical element and differ from a secular play only in the fact that the subject is religious, and frequently, as one of the names indicates, derived from the history of a saint. In the secular drama, classification might be carried almost to any extent if the nature of the subject be taken as the criterion. It will be sufficient to distinguish the comedia (i.e, any tragic or comic piece in three acts) according to the social types brought on the stage, the equipment of the actors, and the artifices resorted to in the representa- tion. We have (1) the comedia de capa y espada, which represents any everyday incident, the actors belonging to the middle class, simple caballeros, and consequently wearing the garb of ordinary town_life, of which the chief items were the cloak and the sword, and (2) the comedva de teatro or de ruido, or again de tramoya or de aparencias (i.e. the theatrical, spectacular, or scenic play), which prefers kings and princes for its dramatis persone and makes a great display of mechanical devices and deco- rations. Besides the comedia, the classic stage has also a series of little pieces subsidiary to the play proper: the Joa or prologue, the entremes, a kind of interlude which afterwards developed into the saynete, the bade, or ballet accompanied with singing, and the zarzuela, a sort of operetta thus named after the royal residence of La Zarzuela, where the kings of Spain had a theatre. As to the dramatic poets of the golden age, even more numerous than the lyric poets and the romancers, it is rather difficult to group them. All are more or less pupils or imitators of the great chief of the new school, Lope Felix de Vega Carpio (1562-1635); everything has ultimately to be brought back to him whom the Spaniards call the “monster of Nature.” Among Lope’s contemporaries, only a few poets of Valencia (Gaspar de Aguilar, Fran- cisco Tarrega, Guillem de Castro (1569-1631), the author of the Mocedades del Cid (from

which Corneille derived his inspiration), formed a small school, as it were, less subject to the master than that of Madrid, which was bound to merit the applause of the public by copying as exactly as possible the manner of the great initiator. Lope left his mark on all varieties of the comedia, but did not attain to equal excellence in all, He was especially successful in the comedy of intrigue (enredo), of the capa y espada class, and in dramas whose subjects are derived from national history. His great and most incontestable merit is to have given the Spanish stage a range and scope of which it had not been previously thought capable, and of having taught his contemporaries to find dramatic situations and to carry ona plot. It is true he wrote nothing perfect: his prodigious productiveness and facility allowed him no time to mature anything; he wrote negligently, and, besides, he considered the stage an inferior department, good for the vulgo, and consequently did not judge it worthy of the same regard as lyric or narrative poetry borrowed from the Italians. Lope's first pupils exag- gerated-some of his defects, but, at the same time, each, according to his own taste, widened the scope of the comedia. Antonio Mira de Amescua and Luis Velez de Guevara (died 1644) were successful especially in tragic histories and comedias divinas. Fr. Gabriel Tellez (1570-

1648), better known under the pseudonym of Tirso de Molina, one of the most flexible, ingenious, and inventive of the dramatists, displayed no less talent in the comedy of contemporary manners than in historical drama. Z/ Burlador de Sevilla (Don Juan), the most celebrated of his plays since the Italians and the French have taken possession of the subject, is reckoned his masterpiece ; but he showed himself a much greater poet in Zl Vergonzoso en Palacio, Don Gil de las Calzas Verdes, Marta la Pia- dosa. Finally Juan Ruiz de Alarcon (died 1639), the most serious and most observant of Spanish dramatic poets, successfully achieved the comedy of character in La Verdad Sospechosa, closely followed by Corneille in his Menteur. The remaining play-writers hardly did anything but increase the number of the comedias; they added nothing to the real elements of the drama. The second epoch of the classical drama is represented mainly by Pedro Calderon de la Barca (1600-1681), the Spanish dramatist who has obtained most celebrity abroad, where his pieces have been studied and admired (perhaps extra-

vagantly) by certain critics who have not feared to rank him with Shakespeare. It is Calderon who first made honour, or more correctly the point of honour, an essen- tial motive in the conduct of his personages (e.g., ZI Médico de su Honra) ; it is he also who made the comedia de capa y espada uniform even to monotony, and gave the comic “part” of the gracioso (confidential valet of the caballero) a fixity which it never previously possessed. There is depth and poetry in Calderon, but vagueness also and much bad taste. His most philosophic drama, La Vida es Suciio, is a bold and sublime idea, but indistinct and feebly worked out; that his autos sacramentales give evidence of extensive theological knowledge is all that can be said in their favour. Calderon was imitated, as Lope had been, by exaggerating his manner and perverting his exccllencies. Two poets only of the second half of the 17th century deserve to be cited along with him—Francisco de Rojas, author of the fine historic play Del Key abajo ninguno, and Agustin Moreto (1618-1662), author of some pleasant comedies. Among those who worked in secondary forms mention must be made of Luis Quijiones de Benavente, a skilful writer of entremeses, and in fact the greatest master of the form.

A new manner of writing appears with the revival of learning: the purely objective style of the old chroniclers, with their tagging on of one fact after another, without showing the logical connexion or expressing any opinion on men or things, begins to be thought puerile. An attempt is now made to treat the history of Spain in the manner of Livy, Sallust, Tacitus, whose methods of narra- tion were directly adopted. The 16th century, however, still presents certain chroniclers of the medieval type, with more erudition, precision, and a beginning of the critical element. La Cronica General de Espaia by Ambrosio de Morales, the Compendio Historial of Estéban de Garibai, the Historia General de las Indias Occidentales by Antonio de‘Herrera, are, as far as the style is concerned, continuations of the last chronicles of Castile. Gerdénimo de Zurita (1512-1580) is emphatically a scholar ; no one tm the 16th century knew as he did how to turn to account documents and records for the purpose of completing and correcting the narratives of the ancient chronicles; his Anales de la Corona de Aragon is a book of great value, though written in a painful style. With Juan de Mariana (1536-1623) history ceases to be a mere compilation of facts or a work of pure erudition, in order to become a work of art and of thought. The

Historia de Espaia by the celebrated Jesuit, at first written in Latin in the interest especially of foreigners, was afterwards rendered by

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its author into excellent Castilian ; as a general survey of

its history, well-planned, well written, and well thought out, Spain possesses nothing that can be compared with it; it 1s eminently a national work, steeped throughout in the prejudices of therace. Various works of less extent, — accounts of more or less important episodes in the history of Spain,—may take their place beside Mariana's great monument: for example, the Guerra de Granada by Diego Hurtado de Mendoza (a history of the revolt of the Moors of the Alpujarras under Philip IT.), written about 1572, immediately after the events, but not published till about thirty years later, after the anthor's death ; the narrative of the expedition of the Catalans in the Morea in the 14th century by Francisco de Moncada (died 1635); that of the revolt of the same Catalans under the reign of Philip IV. by Francisco Manuel de Melo (died 1666), a Portuguese by birth; and that of the conquest of Mexico by Antonio de Solis. Each of these writers has been more or less inspired by some Latin author, one pre- ferring Livy, another Sallust, &c. These imitations, it must be admitted, have something artificial and stilted, which in the long run proves as fatiguing as the unskilfulness and heaviness of the chroniclers of the Middle Ages. On the other hand, the historians of the wars of Flanders, such as Carlos Coloma, Bernardino de Mendoza, Alonso Vazquez, Francisco Verdugo, are less refined, and for that very reason are more vivid and more thoroughly interest us in that struggle of the two races, so foreign to each other and of such different genius. As for the accounts of the trans-Atlantic discoveries and conquests, they are of two kinds,—either (1) memoirs of the actors or witnesses of those great dramas, as, ¢.g., the M/istoria Verdadera de la Conquista de la Nueva Espatia by Bernal Diaz del Castillo, one of the companions of Cortes, and the Historia de las Indias by P. Bartolomé de las Casas, the apostle of the Indians; or (2) works by professional writers, such

as Francisco Lopez de Gomara,—official his- toriographers who wrote in Spain on information sent to them from the newly-discovered lands.

Letter writers, a rather numerous body in Spanish Letter

literature, are nearly related to the historians; in fact, letters written to be read by others than the persons addressed, or in any case revised afterwards, are only another method, a little more familiar, of writing history. Fernando del Pulgar appended to his Claros Varones a series of letters on the affairs of his time; and at the commencement of the 16th century Antonio de Guevara (died 1545) collected, under the title of Epistolas Fami- liares, his correspondence with his contemporaries, which throws a great light on the early part of the reign of Charles V., although it must be used with caution because of the numerous 7ifacimentos it has undergone. A cele- brated victim of Philip II, Antonio Perez (died 1611), revenged himself on his master by relating in innumer- able letters, addressed during his exile to his friends and protectors, all the incidents of his disgrace, and by selling to the ministers of France and England the secrets of the Spanish policy in which he had a hand; some of these letters are little masterpieces of sprightliness and gallantry.

Philosophy is rather poorly represented in the 16th and Philo- The sophy.

17th centuries in the literature of the vernacular. greater number of the Spanish thinkers of this epoch, whatever the schoo] to which they belonged, —scholastic, Platonic, Aristotelian, or independent,—wrote in Latin.

Ascetic and mystical authors alone made use of the vulgar Mysti- tongue for the readier diffusion of their doctrine among cism.

the illiterate, from whose ranks a good number of their disciples were recruited. Fr. Luis de Granada (died 1588) the great preacher, Juan de la Craz (1542-1591), Fr, Luis de Leon (1528-1598), Teresa de Jesus (1515-

Moralists.

18th century.

1582), and Malon de Chaide are the brighter lights of |

this class of writers. Some of their books, like the Guia de Pecadores of Fr. Luis de Granada, the Confessions of St Teresa, Malon de Chaide's Conversion of the Magdalen, have obtained a brilliant and lasting success beyond the limits of the Peninsula, and have not been without some 'nfluence on the development of mysticism in France. The Spanish mystics are not only remarkable for the depth or subtlety of their thoughts and the intensity of the divine love with which they are inspired ; many of them are masters of style; some, like Juan de la Cruz, have composed verses which rank with the most delicate in the language. A notable fact is that those men who are regarded as illuminati profess the most practical ideas +n the matter of morality. Nothing is more sensible, nothing less ecstatic, than the manual of domestic economy by Fr. Luis de Leon—La Perfecta Casada. Lay moralists are very numerous in the 16th and 17th centuries. Some write long and heavy treatises on the art of governing, the education of princes, the duties of subjects, &c. Pedro Fernandez de Navarrete's Conservacion de Monarquias, Diego de Saavedra Faxardo's Idea de un Principe Cris- tiano, Quevedo's La Politica de Dios y Gobierno de Cristo, give a correct idea of the ability which the Spaniards have displayed in this kind of didactic and preceptorial literature,—ability of no high order, for the Spaniard, when he means to teach and work out a doctrine, loses himself in distinctions and rapidly becomes diffuse, pedantic, and obscure. But there isa kind of morality in which he indubitably excels, namely, in social satire, which, under all its forms,—dialogue and dream in the style of Lucian, epistle after the manner of Juvenal, or pamphlet,—has produced several masterpieces and a host of ingenious, caustic, and amusing compositions. Juan de Valdes, the most celebrated of the Spanish Protestants, led the way by his Dialogo de Mercurio y Caron, where all the great political and religious questions of the first half of the 16th century are discussed and resolved with admir- able vigour and freedom. The king in the department of social satire, as in those of literary and political satire, is Quevedo. Nothing escapes his scrutinizing spirit and pitiless irony. All the vices of the society of his time are, in his Suetos and many other little pamphlets, remorse- lessly placed in the pillory and cruelly cut to pieces. While this great satirist, in philosophy a disciple

of Seneca, imitates his master even in his style of writing, he ig none the less one of the most vigorous and original writers of the 17th century. The only serious defect in his style is that it is too full, not of figures and epithets, but of thoughts. His phrases are of set purpose charged with a double meaning, and we are never sure On reading whether we have taken in all that the author meant to convey. Conceptism is the name that has been given to this vefinement of thought, which was doomed in time to fall into the ambiguous and equivocal; it must not be con- founded with the cultism of Géngora, the artifice of which lies solely in the choice and arrangement of words. This new school, of which Quevedo may be regarded as the founder, had its Boileau in the person of Baltasar Gracian, who in 1642 published his Agudeza y Arte de Ingenio, in which all the subtleties of conceptism are very exactly reduced to @ code. Gracian, who had the gift of senten- tious moralizing rather than of satire, produced in his Criticon animated pictures of the society of his own day, while he also displayed much ingenuity in little collections of political and moral aphorisms which have procured him a great reputation abroad,—H/ Leroe, H1 Politico er- nando el Catolico, Oraculo Manual y Arte de Prudencia. Spanish thought as well as public spirit and all other forms of national activity began to decline towards the

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close of the 17th century. The advent of the house of Bourbon, and the increasing invasion of French influence in the domain of politics as well as in literature and science, confirmed this decay by rendering abortive the efforts of a few writers who had remained faithful to the pure Spanish tradition. In the hands of the second-rate ‘mitators of Calderon the stage sank ever lower and lower ; lyric poetry, already compromised by the pomp and gali- matias of Géngora, was abandoned to wretched rhymsters, who tried without success to make up by extravagance of style for meanness of thought. In a word, everything was suffering from anemia. The first symptoms, not of a revival, but of a certain resumption of intellectual production appear in the department of linguistic study. In 1714 there was

created, on the model of the French academies, La Real Academia Espaiiola, intended to main- tain the purity of the language and to correct its abuses. This Academy set itself at once to work, and in 1726 was able to commence the publication of its dictionary in six volumes folio, the best title of this association to the | gratitude of men of letters. The Gramatica de la Lengua Castellana, drawn up by the Academy, did not appear till 1771. For the new ideas which were introduced into Spain as the result of more intimate relations with France, and which were in many cases repugnant to a nation for two centuries accustomed to live a self-contained life, it was necessary that fully sanctioned patrons should be found. D. Ignacio de Luzan, well read in the literatures of Italy and France, a disciple of Boileau and the French rhetoricians, yet not without some originality of his own, undertook in his Poetica (1737) to expound to his fellow- countrymen the rules of the new school, and, above all, the principle of the famous “ynities” accepted by the French stage from Corneille’s day onward. What Luzan had ~ done for letters, Benito Feyjoo (167 6-1764), a Benedictine of good sense and great learning, did for the sciences. His Teatro Critico (1726-1729) and Cartas Eriditas y Curiosas (1742-1760), collections of dissertations in almost every department of human knowledge, intro- duced the Spaniards to the leading scientific discoveries of foreign countries, and helped to deliver them from many superstitions and absurd prejudices. The study of the ancient classics and the department of learned research in the domain of national histories and literatures had an eminent representative in Gregorio Mayans y Siscar (died 1782), who worthily carried on the great traditions of the renaissance ; besides publishing good editions of old Spanish authors, he gave to the world in 1757 a Retérica which is still worth consulting and a number of learned memoirs. What may be called the littérature @agrément did not recover much lost ground ; it would seem as if

the vein had been exhausted. Something of the old Rom |

picaresque novel came to life again in the Historia del Famoso Predicador Fray Gerundno de Campazas of the Jesuit José Francisco de Isla, a biographical romance which is also and above all—to the detriment, it is true, of the interest of the narrative—a satire on the follies of the preachers of the day ; the history of Fray Clerundio is merely a pretext, as it were, for displaying and holding up to ridicule the eloquence of the pulpit at the sorry

pass to which it had then been brought by the ignorance and bad taste of the Spanish clergy. Isla is known also by his translation of Gal Blas, a» work which he professed to restore to his native country, trying to make out—unsuccessfully, of course—that Le Sage had no other merit than that of rendering it into French. The lyric poetry of this period is very when compared with its dazzling splendour in the preced- ing century. Nevertheless one or two poets can be named refinement of taste, and whose

pale and colourless Poe}

collections of verse, though wanting in genuiue inspiration, at least show respect for the language and will always meet with some appreciation. At the head of the new school is Juan Menendez Valdés (1754-1817), and with his are associated the names of P. Diego Gonzales (1733- 1794), José Iglesias de la Casa (1748-1791), known especially by his letrillas, Nicasio Alvarez de Cienfuegos (1764-1809), and some others. of the 18th century who produced odes and didactic poetry it is only necessary to mention Leandro Fernandez de Moratin (1760-1828) and Manuel José Quintana (1772-1857), but the latter belougs rather to the present century, during the first half of which he published his most important works. The poverty of the period in lyric poetry is even exceeded by that of the stage. Here no kind of comedy or tragical drama arose to take the place of the ancient comedia, whose platitudes and absurdities of thought and expression had ended by disgusting even the least exacting portion of the public. The attempt was indeed made to introduce the comedy and the tragedy of France, but the stiff and pedantic adaptations of such writers as Agustin de Montiano y Luyando (1697-1764), Tomas de Iriarte (1750-1791), Garcia de la Huerta, and the well-known economist Gaspar de Jovellanos (1744-1811) were unable to interest the great mass of play- goers. The only one who was really successful in com- posing on the French pattern some pleasant comedies, which owe much of their charm to the great purity of the language in which they are written, is Leandro Fernandez de Moratin; his best pieces are La Nueva Comedia, a parody on the extravagant work of Comella, a playwright of the period, Hl Vigo y la Nita, El Baron, and parti- cularly HZ Si de las Niitas. It has to be added that the saynete was

cultivated in the 18th century by one writer of genuine talent, Ramon de la Cruz; nothing helps us better to an acquaintance with the curious Spanish society of the reign of Charles IV. than the intermezzos of this genial and light-hearted author.

The terrible struggle of the War of Independence – (1808-1814), which was destined to have such important consequences in the world of politics, did not exert any immediate influence on the literature of Spain. One might have expected as a consequence of the rising of the whole nation against Napoleon that Spanish writers would have given up seeking their inspiration from those of France, and would ‘shave tried to resume the national traditions which had been broken at the end of the 17th century. But nothing of the sort occurred. Not only the afrancesados (as those were called who had accepted the new régime), but also the most ardent partisans of the patriotic cause, continued in literature to be the submis- sive disciples of France. Quintana, who in his inflam- matory odes preached to his compatriots the duty of resistance and revenge, has nothing of the innovator about him; by his education and by his literary doctrines he remains a man of the 18th century. The same may be said of Francisco Martinez de la Rosa (1789-1848), who, however, from his intercourse with Horace, whom he trans- lated with skill into good Castilian verse, had a greater independence of spirit and a more highly trained and classical taste. And, when romanticism begins to find its way into Spain and to enter into conflict with the spirit and habits of the 18th century, it is still to France that the poets and prose writers of the new school turn, much more than either to England or to Germany. The first decidedly romantic poet of the generation which flourished about 1830 was the duke of Rivas, Angel de Saavedra (1791-1856) ; no one succeeded better in reconciling the genius of Spain and the tendencies of modern poetry ; his

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Among the verse writers [

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6 la Fuerza del Sino belong as much to the old romances and old theatre of Spain as to the romantic spirit of 1830. On the other hand, José de

Espronceda (1808-1842), who has sometimes been called the Spanish Musset, savours much less of the soil than the duke of Rivas; he isa quite cosmopolitan romanticist of the school of Byron and the French imitators of Byron; an exclusively lyric poet, he did not live long enough to give full proof of his genius, but what he has left is certainly exquisite. José Zorrilla (born 1817) has a more flexible and exuberant but much more unequal talent than Espronceda, and if the latter has written too little it cannot but be regretted that the former should have produced too much; nevertheless, ainong a multitude of hasty performances, brought out before they had been matured, his Don Juan Tenorio, a new and fantastic version of the legend treated by Tirso de Molina and Moliére, will always remain as one of the most curious specimens of Spanish romanticism. In the dramatic literature of this period it is noticeable that the tragedy more than the comedy is modelled on the examples furnished by the French drama of the Restoration ; thus, if we leave out of account the play of Garcia Gutierrez (born 1813) entitled £7 Trovador, which inspired the well-known opera of Verdi, and Los Amantes de Teruel of Juan Eugenio Hartzenbusch (born 1806), and a few others, all the dramatic work belonging to this date recalls more or less the manner of the professional playwrights of the boulevard theatres, while on the other hand the comedy of manners still preserves a certain originality and a genuine local colour. Manuel Breton de los Herreros (1796-1873), who wrote as many as a hundred comedies, some of them of the first order after their kind, apart from the fact of their being written in language of great excellence, adheres with great fidelity to the tradition of the 17th century; he is the last of those writers who have preserved the feeling of the ancient comedia. One prose writer of the highest talent must be mentioned along with Espronceda, with whom he has in the moral aspect several features in common,—namely, D. José de Larra (1809-1837), so famous by his pseudonym of “Figaro,” with which he signed the greater number of his works. Caustic in temper, of a keenly observant spirit, remarkably sober and clear as a writer, he was specially successful in the political pamphlet, the article @actualités ; to this category belong his Cartas de un Pobrecito Hablador, in which he ridicules without pity the vices and oddities of his contemporaries ; his reputation is much more largely due to these letters than either to his somewhat feeble play of Macias or to his not very attractive novel £7 Doncel de Enrique el Doliente. With Larra must be associated two other humoristic writers. The first of these is Ramon Mesonero

Romanos, “El Curioso Parlante” (born 1803), whose Lscenas Matritenses, although not possessed of the literary value of Larra’s articles, give pleasure by their good-natured gaiety and by the curious details they furnish with regard to the contemporary society of Madrid. The other is Serafin Estébanez Calderon, ‘El Solitario ” (1799-1867), who in his Hscenas Andaluzes sought to re- vive the manner of the satirical and picaresque writers of the 17th century ; in a uselessly archaic language of his own, patched up from fragments taken from Cervantes, Quevedo, and others, he has delineated with a peculiar but somewhat artificial grace various piquant scenes of Anda- lusian or Madrilenian life. The most prominent literary critics belonging to the first generation of the century were Alberto Lista (1775-1848), whose critical doctrine may be described as a compromise between the ideas of French classicism and those of the romantic school, and Agustin Duran (died 1862), who made it his special task to restore

epic poem LE Moro Esposito and his drama of Don Alvaro | to honour the old literature of Castile, particularly its

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romances, which he had studied with unequalled thorough- ness, and of which he published highly esteemed collections.

If the struggle between classicists and romanticists continued even after 1830, and continued to divide the literary world into two opposing camps, it is plain that the new generation—that which occupied the scene from 1840 till about 1868—had other preoccupations. The triumph of the new ideas is now assured ; only a few reactionaries are still seen to cling to the principles bequeathed by the 18th century. What was now being aimed at was the creation of a new literature which should be truly national and no longer a mere echo of that beyond the Pyrenees. To the question whether contem- porary Spain has indeed succeeded in calling into exist- ence such a literature, we may well hesitate to give an affirmative answer. It is true that in every species of com- position, the gravest as well as the lightest, it can show works of genuine talent; but many of them are strik- ingly deficient in originality ; all of them either bear un- mistakable traces of

imitation of foreign models, or show (more or less happily) the imprint of the older literature of the 17th century, to which the historical criticism of Duran and the labours of various other scholars had given a flavour of novelty. With this observation before him, the student can divide the authors of this period into two groups,——the one composed of those who, won by modern ideas, are more or less liberal in politics, and draw their inspiration in all they write from France or from what they are able to assimilate of other literatures through France ; the other consisting of ultra-conservatives, whose dream in every sphere—letters, art, and politics—is the restoration of the Spain of the past. Nowhere does this antagonism manifest itself more clearly than in the drama. A play of Aureliano Fernandez Guerra might have been conceived and written by a contemporary of Lope or of Calderon, while a comedy of Adelardo Lopez de Ayala is moulded in the pattern given by the younger Dumas and by Augier. In the department of romance, on the other hand—much neglected by the writers of the first half of the century— the Spaniards have recovered something of the genius of Cervantes and their 17th century novelas picarescas, The art of constructing a story and of telling it in an agreeable way, which seemed for a long time to have been lost, is recovered in such authors as Fernan Caballero, Antonio de Trueba, Pedro Antonio de Alarcon, Juan Valera, Perez Galdos, and Pereda. These novelists are far from alike in method or in spirit ; how widely separated, for example, are the somewhat banal facility and the sentimental catholicism of Fernan Caballero on the one hand, and the searching psychological analysis and the fine scepticism of Juan Valera on the other. But all have this in common, that they understand how to interest their readers, and how to make their characters live and speak. Incontestably the novel is the triumph of contemporary Spanish literature ; it is almost the only kind of composition that actually lives with a life of its own and makes steady progress. One cannot say as much of lyric poetry, represented feebly enough by Ramon de Campoamor, Nufiez de Arce, and some others. Deficient inspiration, diffuseness of style, and want of precision in language characterize them all ; it is unfortunately very easy to make mediocre verses in Spanish, and too many people give themselves over to the pursuit. Passing from the literature of amusement, we have still some very distinguished names to enumerate. Philosophy, indeed, has but one representative of merit, the traditionalist Jaime Balmes,—for the Krausist school, an importation from Germany, may be ignored here,— but

history and literary criticism have been cultivated during the last thirty years or so with genuine success. Modesto Lafuente is in some sort the Mariana of the 19th

century; much inferior as a writer to the celebrated Jesuit, he has, however, always manifested the same passion for his subject, the same persevering determination to raise &

worthy monument of his fatherland; his Historia de Espaia, in spite of all its defects, deserves respect, and is at least readable. Although primarily a politician, Antonio Cano- vas del Castillo has many of the qualities which go to the making of a good historian ; he has evinced greater acute- ness and larger acquirements than Lafuente, and his Lnsayo sobre la Casa de Austria en Espana, founded upon a careful examination of a large number of documents, gives evidence of a correct judgment and praiseworthy impartiality. The literary history of old Spain has been treated in a masterly manner by Aureliano Fernandez Guerra in various studies devoted to the great writers of the 17th century, notably Quevedo, and also quite recently by a young and talented scholar, Marcelino Menéndez Pelayo, whose Historia de las Ideas Estéticas en Espata, a work as solid in its substance as it is pure in its style, would do honour to any veteran in literature. As regards criticism of contemporary litera- ture, no one shows more spirit and taste than Juan Valera, whose delicate Andalusian nature has been matured by a refining education and by an adequate knowledge of foreign literatures.

Bibliography.—The base of the student’s operations is always the great work of Nicolas Antonio, Bibliotheca Hispana Vetus aud Bibliotheca Hispana Nova, in the revised and completed edition of Francisco Perez Bayer, Tomas Antonio Sanchez, and Juan Antonio Pellicer (Madrid, 1783-88, 4 vols. fol.). The student can afford to disregard all the general histories which preceded Ticknor’s History of Spanish Literature (New York, 1849, 3 vols. 8vo; 4th ed., Boston, 1872, 3 vols. 8vo), a work of solid value, especially from the pe ie a point of view; it is quite indispensable that the

reader should consult also the Spanish translation by D. Pascual de Gayangos and Enrique de Vedia (Madrid, 1851-56) and the German translation of Julius with some important additions by Ferdinand Wolf (Leipsic, 1852-67). Nothing can be said in favour of the French translation by J. G. Magnabal (Paris, 1864— 72), The Historia Critica de la Literatura Espatiola of José Amador de los Rios (Madrid, 1861-65, 7 vols. 8vo), although de- ficient in criticism and full of errors in fact, supplies some useful information as to the period prior to the 15th century, with which it exclusively deals. Menendez Pelayo's Historia de las Ideas Esté- ticas en Espatta (Madrid, 1884-86, 3 vols. 8vo), already referred to, is very instructive. For the 18th century, Leopoldo A. de Cueto's " Bosquejo Histdrico-Critico de la Poesia Castellana en el Siglo xviii.," prefixed to the first vol. of Rivadeneyra's Poetas Ltricos del Siglo wviit., is indispensable. For the 19th century there is not as yet any satisfactory work dealing with the literature as a whole ; that of M. G. Hubbard, Histoire de la Littérature Contenyporaine en Espagne (Paris, 1876, 1 vol. 8vo), although superficial and inaccurate, is useful in the absence of anything better. Some descriptions of Castilian literature have been specially studied with care and competence, notably the drama, on which we have two thorough works,— Frederick von Schack's Geschichte der drama- tischen Literatur wu. Kunst in Spanien (Frank fort-on-the-Main, 1846-54, 3 vols. 8vo), unfortunately now much behindhand, and in no way improved in this respect in the Spanish translation now in course of publication at Madrid under the superintendence of Eduardo de Mier, and Cayetano Alberto de la Barrera's excellent Catdlogo Bibliografico y Biogrdfico del Teatro Antiguo Espatiol (Ma- drid, 1860, large 8vo). On the Castilian literature of the Middle Ages, the works to be consulted are Ferdinand Wolf's Studien zur Geschichte der Spanischen u. Portugicsischen Nationallitcratur (Berlin, 1859, 1 vol. 8vo) and Manuel Mila y Fontanals's De la Poesia Heroico-Popular Castellana (Barcelona, 1874, 1 vol. 8vo).

IL Caranan Lrrerature.—Although the Catalan lan- Poet} guage is simply a branch of the southern Gallo-Roman, M44 the literature, in its origin at least, ought to be considered * Bf as a mere appendix of that of Provence. Nay more, until about the second half of the 13th century there existed in the Catalan districts no other literature than the Provencal, and the poets of north-eastern Spain used no other language than that of the troubadours.

Guillem de Bergadan, Uc de Mataplana, Ramon Vidal de Besalu, Guillem de Cervera, Serveri de Gerona, and several other verse writers of a still more recent date are all genuine Provencal poets, in the same sense as are those of

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Limousin, Quercy, or Auvergne, since they write in the langue doc and make use of all the forms of poetry culti- vated by the troubadours north of the Pyrenees. Ramon Vidal (end of 12th century and beginning of 13th) was a grammarian as well as a poet; his Rasos de Trobar became the code for the Catalan poetry written in Pro- vengal, which he called Lemosi, a name still kept up in Spain to designate, not the literary idiom of the trouba- dours only, but also the local idiom—Catalan,—which the Spaniards choose to consider as derived from the former. The influence of R. Vidal and other grammarians of his school, as well as that of the troubadours we have named, lasted for a very long time; and even after Catalan prose—an exact reflexion of the spoken language of the south-east of the Pyrenees—had given evidence of its vitality in some considerable works, the Catalan poetry remained faithful to the Provencal tradition. From the combination of spoken Catalan with the literary language of the troubadours there arose a sort of composite idiom, which has some analogy with the Franco-Italian current in certain parts of Italy in the Middle Ages, although in the one case the elements of the mixture are more distinctly apparent than are the romance of France and the romance of Italy in the other. The poetical works of Raymond Lully (Ramon Lull) (died 1315) are among the oldest examples of this Provengalized Catalan ; one has only to read the fine piece entitled Lo Desconort (“Despair”), or some of his stanzas on religious subjects, to apprehend at once the eminently composite nature of that language. Muntaner in like manner, whose prose is exactly that spoken by his contemporaries, becomes troubadour when he writes in verse ; his Sermé on the conquest of Sardinia and Corsica (1323), introduced into his Chronicle of the kings of Aragon, exhibits linguistically quite the same mixed character as is found in Lully, or, we may venture to say, in all the Catalan verse writers of the 14th century. These are not very numerous, nor

are their works of any great merit. The majority of their compositions consist of what were called noves rimades, that is, stories in octosyllabic verse in rhymed couplets. There exist poems of this class by Pere March, by a certain Torrella, by Bernat Metge (an author more celebrated for his prose), and by others whose names we do not know; among the works belonging to this last category special mention ought to be made of a version of the romance of the Seven Sages, a translation of a book on good breeding entitled Facetus, and certain tales where, by the choice of subjects, by various borrowings, and even occasionally by the whole- sale introduction of pieces of French poetry, it is clearly evident that the writers of Catalonia understood and read the langue dow. Closely allied to the noves rimades is

tends to become the same as that of prose and of ordinary conversation. With Pere and Jaume March, Jordi de Sant Jordi, Johan de Masdovelles, Francesch Ferrer, Pere Torroella, Pau de Bellviure, Antoni Vallmanya, and, above all, the Valencian Auzias March (died 1459), there flourished a new school, of which the éclat lasted till the end of the 15th century, and which, as regards the form of its versi- fication, is distinguished by its almost exclusive employ- ment of eight-verse cobles of ten syllables, each with ‘crossed ”” or “chained” rhymes (cobla crohada or encade- nada), each composition ending with a tornada of four verses, in the first of which the “device” (divis or senyal) of the poet is given out. The greater number of these poems are still unedited or have only recently been extracted from the cangoners, where they had been col- lected in the 15th century. Auzias March alone, the most inspired, the most profound, but also the most obscure of the whole group, had the honour to be printed in the 16th century ; his cants @amor and cants de mort contain the finest verses ever written in Catalan, but the poet fails to keep up to his own high level, and by his studied obscurity occasionally becomes unintelligible to such a degree that one of his editors accuses him of having written in Basque. Of a wholly different class, and in quite another spirit, is the Libre de les Dones of Jaume Roig (died 1478), a Valencian also, like March ; this long poem is a

nova rimada, only comediada, that is to say, it is in quadrisyllabic instead of octosyllabic verse. A bitter and caustic satire upon women, it purperts to be a true history,—the history of the poet himself and of his three unhappy marriages in particular. Notwithstanding its author's allegations, however, the Libre de les Dones does not seem to be other than a fiction; but it derives a very piquant interest from its really authentic element, its vivid picture of the Valencia of the 15th century and the details of the manners of that time. After this bright period of efflorescence Catalan poetry rapidly fell off, a decline duc more to the force of circumstances than to any fault of the poets. The union of Aragon with Castile, and the resulting predominance of Castilian throughout Spain, inflicted a death blow on Catalan literature, especially on its artistic poetry, a kind of composition more ready than any other to avail itself of the triumphant idiom which soon came to be regarded by men of letters as the only noble one, and alone fit to be the vehicle of elevated or refined thoughts. The fact that a Catalan, Juan Boscan, inaugurates in the Castilian language a new kind of poetry, and that the Castilians themselves regard him as the head of a school, is important and characteristic ; the date of the publication of the works of Boscan (1543) marks the end of Catalan poetry.

another analogous form of versification—that of the codo- lada, consisting of a series of verses of eight and four syllables, rhyming in pairs, still made use of in one por-

The earliest prose works in Catalan are later indeed than Prose of the poems of the oldest Catalan troubadours of the Pro- holo vencal school, not dating farther back than from the close °&t™es.

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tion of the Catalan domain (Majorca).

The 15th century is the golden age of Catalan poetry. At the instigation and under the auspices of John I. (1387-1395), Martin I. (1395-1410), and Ferdinand I. (1410-1416), kings of Aragon, there was founded at Barcelona a consistory of the "Gay Saber," on the model of that of Toulouse, and this

official protection accorded to poetry was the beginning of a new style much more emancipated from Provencal influence. It cannot be denied, indeed, that its forms are still of foreign importa- tion, that the Catalan verse writers accept the prescrip- tions of the Leys d@'Amor of Guillaume Molinier, and the names which they gave to their cobles (stanzas) are all borrowed from the same art de trobar of the school of Toulouse ; but, a very noteworthy fact, their language begins to rid itself more and more of Provengalisms and

of the 13th century, but they have the advantage of being entirely original ; their language is the very language of the soil which we see appearing in charters from about the time of the accession of James I. (1213). This is true especially of the chronicles, a little less so of the other writings, which, like the poetry, have difficulty in escaping the influence of the more polished dialect of the country to the north of the Pyrenees. Its chronicles are the best ornament of medieval Catalan prose. Four of them,—that of James I., apparently reduced to writing a little after his death (1276) with the help of memoirs dictated by himself during his lifetime; that of Bernat Des Clot, which deals chiefly with the reign of Pedro III. of Aragon (1276-1286); that of Ramon Muntaner (first half of the 14th century), relating at length the expedition of the Catalan company to the Morea and the conquest

of Sardinia by James II.; finally that of Pedro IV., The Ceremonious (1336-1387), genuine commentaries of that astute monarch, arranged by certain officials of his court, notably by Bernat Des Coll,—these four works are distinguished alike by the artistic skill of their narration and by the quality of their language ; it would not be too much to liken these Catalan chroniclers, and Muntaner especially, to Villehardouin, Joinville, and Froissart. The Doctor Illuminatus, Raymond Lully, whose acquaintance with Latin was very poor,—his philosophical works were done into that language by his disciples,—wrote in a some- what Provencalized Catalan various moral and propagandist works,—the romance Blanquerna in praise of the solitary life, the Libre de les Maravelles, into which is introduced a '"bestiary" taken by the author from Kalilah and Dim- nag, and the Libre del Orde de Cavalleria, a manual of the perfect knight, besides a variety of

other treatises and opuscula of minor importance. The majority of the writings of Lully exist in two versions,—one in the vernacular, which is his own, the other in Latin, originating with his disciples, who desired to give currency throughout Christendom to their master's teachings. Lully—who was very popular in the lay world, although the clergy had a low opinion of him and in the 15th century even set themselves to obtain a condemnation of his works by the Inquisition—had a rival in the person of Francesch Ximenez or Eximeniz, a Franciscan, born at Gerona some time after 1350. His Crestid (printed in 1483-84) is a vast encyclopedia of theology, morals, and politics for the use of the laity, supplemented in various aspects by his three other works—Vida de Jesu Christ, Libre dels Angels, and Libre de les Dones; the last-named, which is at once a book of devotion and a manual of domestic economy, con- tains a number of curious details as to a Catalan woman's manner of life and the luxury of the period. Lully and

in fact, furnishes literary history with hardly more than a single poet at all worthy of the name—Pere Serafi, some of whose pieces, in the style of Auzias March, but less obscure, are graceful enough and deserve to live; his poems were printed at Barcelona in 1565. Prose is somewhat better represented, but, to tell the truth, it is only the erudite who persist in writing in Catalan,—antiquaries and historians like Pere Miguel Carbonell, compiler of the Chroniques de Espanya (1547), Francesch Tarafa, Pere Anton Beuter, also chroniclers, and some others not so well known. In the 17th and 18th centuries the decadence becomes still more marked. A few scattered attempts to restore to the Catalan, now more and more ueglected by men of letters, some of its old life and brilliance, fail miserably. Neither Hieronim Pujades the historian, author of a Coronica Universal del Principat (Barcelona, 1609), nor even Dr Vicens Garcia, rector of Vallfogona (1582-1623), a verse-writer by no means destitute of verve or humour, but whose literary talent and originality have been very greatly exaggerated by the Catalans of the present day, was able to bring back his countrymen to a cultivation of the local idiom. Some sermons, some lives of saints, some books of devotion, some relations and complaints for the

use of the people, exhaust the catalogue of everything written in Catalan throughout the whole area of its domains down to the beginning of the present century; not a single book of importance can be mentioned. Writers who were Catalan by birth had so completely unlearned their mother-tongue that it would have seemed to them quite inappropriate, and even ridiculous, to make use of it in serious works, so profoundly had Castilian struck its roots in the eastern provinces of Spain, and so thoroughly had the work of assimilation been carried out to the advantage of the official language of the court and of the Government.

Eximeniz are the only Catalan authors of the 14th century In 1814 appeared the Gramdtica y Apologia de la Reviv whose works written in a vulgar tongue had the honour of | Llengua Cathalana of Joseph Pau Ballot y Torres, which Ff |

may be considered as marking the origin of a genuine ae oS

renaissance of the grammatical and literary study of andij

being translated into French shortly after their appearance. We have chiefly translators and historians in the 15th

centuries. literary independence in the Catalonian countries.

century. Antoni Canals, a Dominican, who belongs also to ‘the previous century, translates into Catalan Valerius Maximus and a treatise of St Bernard; Bernat Metge, himself well-versed in Italian literature, presents some of its great masters to his countrymen by translating the Griselidis of Petrarch, and also by composing Lo Sompni (“The Dream ”), in which the influence of Dante, of Boccac- cio, and, generally speaking, of the Italy of the 13th and 14th centuries is very perceptible. The Feyts d’ Armes de Catalunya of Bernat Boades, a knightly chronicle brought to a close in 1420, reveals a spirit of research and a con- scientiousness in the selection of materials which are truly remarkable for the age in which it was written. On the other hand, Pere Tomich, in his //istories é Conquestes del Reyalme d’Arago (1438), carries us back too much to the manner of the medizval chroniclers ; his credulity knows no bounds, while his style has altogether lost the naive charm of that of Muntaner. To the list of authors who

represent the leading tendencies of the literature of the 15th century we must add the name of Johanot Martorell, a Valencian, author of the celebrated romance of chivalry Tirant lo Blanch (finished in 1460), which the reader has nowadays some difficulty in regarding as that “treasury of contentment” which Cervantes will have it to be.

With the loss of political was bound to coincide that of Cata- lan fell to the rank of a patois and was written less and less; lettered persons ceased to cultivate it, and the upper classes, especially in Valencia, owing to the proximity of Castile, soon affected to make no further use of the local speech except in familiar conversation. Tle 16th century,

Catalan. Although the author avows no object beyond ture. |

the purely practical one of giving to strangers visiting Barcelona for commercial purposes some knowledge of the language, the enthusiasm with which he sings the praises of his mother-tongue, and his appended catalogue of works which have appeared in it since the time of James I, sufficiently show that this was not his only aim. In point of fact the book, which is entitled to high consideration as being the first systematic Catalan grammar, written, too, in the despised idiom itself, had a great influence on the authors and literary men of the principality. Under the helping influence of the new doctrines of romanticism twenty years had not passed before a number of attempts in the way of restoring the old language had made their appearance, in the shape of various poetical works of very unequal merit. The Oda dé la Patria (1833) of Buenaven- tura Carlos Aribau is among the earliest if not actually the very first of these, and it is also the best ; the modern Catalan school has not produced anything either more inspired or more correct. Following in the steps of Aribau, Joaquin Rubid y Ors (Lo Gayter del Llobregat), Antonio de Bofarull (Lo Coblejador de Moncada), and soon afterwards a number of other verse writers took up the lyre which it might have been feared was never to sound again since it fell from the hands of Auzias March. The movement spread from Catalonia into other provinces of the ancient kingdom of Aragon ; the appeal of the Catalans of the principality was responded to at Valencia and in the Balearic Isles. Later, the example of Provence, of the felibritge of the south of France,

accelerated still further this renaissance movement, which received official recogni-

gay saber.

tion in 1859 by the ereation of the jochs florals, in which prizes are given to the best competitors in poetry, of whom some sueeeed in obtaining the diploma of mestre en It is of course impossible to foresee the future of this new Catalan literature,—whether it is indeed destined for that brilliant eareer which the Catalans them- selves anticipate. In spite of the unquestionable talent of poets like Mariano Aguilé (Majorea), Teodoro Llorente (Valencia), and, among the younger of them, Jacinto Verdaguer (Catalonia), author of an epic poem Atlantida and of very faseinating Cants Mistichs, it is by no means eertain that this generation will be succeeded by another to follow in its footsteps, or that such a restoration of a provincial literature has much chanee of permanenee at the very moment when all the peoples of Europe are tend- ing rather towards unity and centralization in the matter of language. At all events, in order to secure even a comparative suecess for sueh a revival, it would be well if the language serving as its instrument were some- what more fixed, and if its writers would no longer

arehaism and the incorrectness of the most vulgar col- loquialism. The few attempts of modern Catalans in the direction of romance writing and dramatic composition have not hitherto been particularly felicitous, and have not led to anything noteworthy.

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Ebert in the Jahrb. f. romanische uw. englisehe Literatur, it. 241) 3 Manual Mila y Fontanals, De los Trovadores en Espana, Barcelona, 1861; Id., “Catalanische Dichter” (14th and 15th centurics), in Jahrb. f. rom. Lit., v. 187; Id., “Resenya Histérica Critica dels Antichs Poetas Catalans,” in the Jochs Florals of Barcelona for 1865; Id., various articles in the Revue des Langues Romanes; P.

| Meyer in Romania, passim; Morel-Fatio, ibid. For the modern

period see Joaquin Rubid y Ors, Breve Resefia del Actual Renact- miento de la Lengua y Literatura Catalanas, Barcelona, 1877, and Tubino, Historia del Renacimiento Literario Contemporaneo en

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SPALATIN, Grorce (1484-1 545). George Burkhardt, a subordinate figure of some interest in the history of the Reformation in Germany, was born on January 17, 1484, at Spalt (whence he assumed the name Spalatinus), about 25 miles from Nuremberg, where his father was an artisan.

He went to Nuremberg for edueation when he was thirteen years of age, and two years afterwards to the university of Erfurt, where he took his bachelor's degree within a year, in 1499. There he attraeted the notice of Marschalk, the most influential professor, who made Spalatin his amanu-

ensis and took him to Wittenberg. In 1505 Spalatin went to Erfurt to study jurisprudence, was recommended to Mutianus, and was welcomed by the little band of German humanists of whom Mutianus was chief. His friend got him the post of teacher of young monks in a convent in the Georgenthal and pastor in the high church there. In 1508 he was ordained priest by Bishop John von Laasphe, who had ordained Luther. He had no great love for convent or pastoral work, and in 1509 Mutianus recommended him to Frederick the Wise, the elector of Saxony, who employed him to act as tutor to his son, the future elector, John Frederick. This appointment really determined Spalatin's life and work. He speedily gained the confidence of the famous elector, who employed him in many affairs. He gent him to Wittenberg in 1511 to act as tutor to his nephews, and procured for him a canon's stall in Altenberg. In 1512 the elector made him his librarian. This brought him into correspondence with a large number of literary men, and

he began to collect all kinds of literary and espe- cially of historical information, of which he made extensive use later in his chronicles. He was promoted to be court chaplain and confidential secretary to the elector, and took charge of all his private and public correspondence. He thus became one of the most important men at the elec- toral court, which then was the centre of German life.

Spalatin had never cared for theology, and, although a priest and a preacher, had been a mere humanist. It was to Luther that he owed his awakening to the reality of a spiritual life. How he first became acquainted with the reformer it is impossible to say—probably at Wittenberg ; but Luther from the first exercised a great power over him, and became his chief counsellor in all moral and religious matters. His letters to Luther have been lost, but Luther's answers remain, and are extremely interest- ing. Spalatin was Luther's devoted friend during the stormiest days of the Reformation, and was the means of bringing the great elector to take the side of the out-spoken professor in his university of Wittenberg. He read Luther's writings to the elector, and translated for his benefit those in Latin into German. He accompanied Frederick to the diet of Augsburg, and shared in the negotiations with the papal legates, Cajetan and Miltitz. He was with the elector when Charles was chosen emperor and when he was crowned. He was with his master at the diet of Worms. In short, he stood beside Frederick as his confidential adviser in all the troubled diplomacy of the earlier years of the Reformation. Singularly cautious, perhaps timid, before the crisis came and while it could be averted, Spalatin found courage when the crisis had come. He would have dissuaded Luther again and again from publishing books or engaging in overt acts against the papacy, but, when the thing was done, none was so ready to translate the book, or to justify the act.

On the death of Frederick the Wise, Spalatin was as much engaged in diplomatic service as before, but he no longer lived at court. He went into residence as canon at Altenberg, and incited the chapter to institute reforms some-

what unsuccessfully. He married in the same year. During

the later portion of his life, from 1526 onwards, he was chiefly engaged in the visitation of churches and schools in electoral Saxony, reporting on the confiscation and applica- tion of ecclesiastical revenues. His practical experience in German affairs made him very successful in his delicate task, and he was asked to undertake the same work for Albertine Saxony. He wasalso permanent visitor of Wittenberg uni- versity, and made an annual report of its condition to the elector. Shortly before lis death he fell into a state of pro- found melancholy, and died January 16, 1545, at Altenberg.

Spalatin left behind him a large number of literary remains, both published and unpublished. His original writings are almost

all historical. Spalatin als stéchs. Historiograph, 1878. Spalatin, nor can there be until his letters have been collected and edited, a work still to be done.

SPA—SPA

A list of them may be found in Scclhcim's George There is no good life of

SPALATO (Slav. Split), a city of Dalmatia, at tho

head of one of the thirteen departments (area 730 square miles; population in 1880 31,003), is situated on the seaward side of a peninsula lying between the Gulf of

Braza and the Gulf of Salona. Though not the capital, it

is the most important city in the principality, is the sec of a bishop, has a valuable museum of antiquities, and carries on an extensive trade in wine and oil. been the terminus of a railway running northwards to

Since 1879 it has

Sebenico and Siveric. Built on the low ground at the

head of a beautiful bay, and thrown into relief by a back-

ground of picturesque hills rising close behind, Spalato

has a striking sea-front, in which the leading feature is

still the ruined facade of the great palace of Diocletian, erected in 303 A.D., to which the city owes its origin. In ground plan this is almost a square, with a quadrangular tower at each of the four corners. ‘Its faces correspond nearly with the four points of the compass. The south front (towards the harbour) measures 521 feet, or, with the towers, 598 feet 8 inches, and the eastern and western sides are each 705 feet 8 inches” (Wilkinson). The area included is 348,175 square feet, or, comprising the towers, 352,614 square feet, a little more than eight acres, or rather less than the area of the Escorial. There were four principal gates, with four streets meeting in the middle of the quadrangle, after the style of a Roman camp. The eastern gate (Porta Aenea) is destroyed ; but, though the side towers are gone, the main entrance of the building, the beautiful Porta Aurea, in the west front, is still in fairly good preservation. The streets were lined with massive arcades. The vestibule now forms the Piazza del Duomo or public square ; to the north-east of this lies the mausoleum (not, as the older antiquaries had it, the temple of Jupiter), which has long been the smallest and darkest of cathedrals; and to the south-east is the temple of Asculapius, which served originally as a kind of court chapel and has long been transformed into a baptistery. Architecturally the most important of all the many striking features of the palace is the arrangement in the vestibule by which the supporting arches spring directly from the capitals of the large granite Corinthian columns. This, as far as the known remains of ancient art are concerned, is the first instance of such a method; and thus, in Mr Freeman’s words, “all Gothic and Romanesque architecture was in embryo in the brain of Jovius or his architect.”

The name Spalato, or Spalatro (a very old spelling), which used to be explained as a corruption of Salonx Palatium, is pretty cer- tainly of different origin—the oldest form extant being Aspalathum (Constantine Porphyrogenitus) and early variants Spalathon, Spa- lathron, Spalatrum (Geogr. Rav.). Dr Evans suggests a connexion with Aspalathus (the name of a prickly shrub) or perhaps with Asphaltus. Not long after Diocletian’s death the buildings seem to have been turned into an imperial cloth factory, and as most of the workers were women we find it called a gynaciwm (Notitta). About 4 miles from the palace lay the ancient city of Salona

(Zadava or Sad@va), which consisted of two parts, the earlier Roman city to the west and a later portion incorporated previous to the time of the Antonines. There are still remains at Salona of ancient city walls, an amphitheatre, &., and a long line of walls extending ‘from the western side of the city for a mile and more nearly along the present road to Trau (Tragurium).” The purpose of this line of walls is not evident, and the date of its construction has been the subject of much discussion. Mr Freeman is disposed to consider them Roman workmanship.

Salona in its best days was onc of the chief ports of the Adriatic, on one of the most central sites in the Roman world. Madea Roman colony after its second capture by the Romans (B.c. 78), it appears as Colonia Martia Julia and Colonia Claudia Augusta Pia Veteranorum, and bears at different periods the titles of respublica, conventus, metropolis, prefectura, and_pretorium. In Christian times it became a bishop’s sec ; and St Doimo or Domninus, its first bishop, still gives his name to the cathedral of Spalato. The city

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was taken by Odoacer in 481 and by Totila in the 6th century. Recovered by Justinian in 535, it was in 544 and 552 the starting-

oint of Belisarius and Narses for tlcir Italian expeditions. In the 7th century Salona was completely destroyed by the Avars ; but the empty palace of Diocletian afforded an asylum for its inhabitants. The limits of the building proved sufficient for the new city up to the time that it passed under Hungarian and Venctian protection. Hungarian additions may still be seen above the Porta Aurca ; and the large octagonal tower bears the name of Torre d’Harvoye from the Bosnian general who was created duke of Spalato by Ladislaus. The Venetians enclosed the town with regular curtains and bastions in 1645-1670. About 1807-1809 the castle was dismantled and parts of the walls were thrown down.

See Robert Adam, Ruins of the Palace of Diocletian, 1764; Cassas and Lavallée, Voyage Pittoresque et Historique de I’Istrie, 1802; Wilkinson,

Dalmatia and Montenegro, 1848; Freeman, Historical Essays, 3d series, 1879, and Subject and Neighbour Lands of Venice, 1881. Both the first-mentioned works contain magnificent views and restorations of the arehitecture of the palaee.

SPALDING, a market-town of Lincolnshire, England, in the Parts of Holland, is situated on the river Welland, and on the Great Northern and Great Eastern Railways, 93 miles from London. The town, standing in the heart of the Fens, is the centre of a rich agricultural district. Amongst the public buildings are five churches, the John- son hospital (1881), the corn exchange (1856-57), the buildings of the mechanics' institute and of the Christian association and literary institute, and the district union- house. The parish church of St Mary and St Nicholas was built in 1284 and restored in 1865-66. The adjoining lady chapel (St Mary and St Thomas a Becket) was built in 1315; in 1588 it was appropriated for the grammar school endowed in 1568 by John Blanke and again in 1588 by John Gamlyn. A new grammar school was erected in 1881. Spalding has had a prison for upwards of 600 years; the present building, erected in 1824—25, was closed in 1884. The Welland is crossed at Spalding by two stone bridges. The existing high bridge, con- structed in 1838, tvuok the place of a wooden erection dating from the end of the 17th century ; this last was built on the site of an older Roman bridge of two arches, the foundations of the centre pier of which were disclosed when the wooden bridge was constructed. The popula- tion of the town in 1871 was 9111, and in 1881 9260.

In 1051 Thorold of Bockenhale (now Bucknall, near Horncastle) gave his castle of Spalding and the chapel attached to itas a cell or monastery for the Benedictines of Geeviand. Out of this grew the priory, which, however, was dissolved in 1535 ; the last fragments of its ruins were removed in 1832. About two miles north-east of Spalding stands the ruined chapel of Wykeham, dedicated to St Nicholas and built in 1811 by Prior Clement Hatfield. The build- ing is of the Decorated period, and has been roofless since 1782; its interior dimensions are 48 feet long by 22 fect wide ; the walls are 44} feet high. ach side contains three three-light windows with moulded flowing tracery, and each cnd one four-light window of similar character. The only one which retains its original mullions and tracery is the

centre window on the south side. After the Con- quest the estates and priory of Spalding were given by William I. to Ivo Tailbois, who found such a stout antagonist in Hereward the Wake, lord of Brunne or Bourn.

SPALDING, Wituram (1809-1859), logician and literary historian, was born in Aberdeen in 1809. After @ thorough education at the grammar school and at Marischal College there, he came to Edinburgh in 1830, where he was called to the bar in 1833. In that year he published a Letter on Shakespeare's Authorship of the Two Noble Kinsmen, which, by its critical acumen and the knowledge of the old dramatists which it displayed, attracted the notice of Jeffrey and procured the author an invitation to become a contributor to the Hdinburgh fteview. Before settling down to the business of the bar he undertook a prolonged Continental tour. He was absent fifteen months, the greater part of the time being spent in Italy, and in 1841 the fruits of his stay appeared mn three volumes entitled Jtaly and the Italian Islands Jrom the Earliest Ages to the Present Time. This learned and Comprehensive work went through five editions in a few years. His attempts to gain a legal practice not proving

successful, he became a candidate in 1838 for the chair of rhetoric in Edinburgh university, which he held till 1845, when he was appointed professor of logic in the

university of St Andrews. He held the latter post till his death on the 16th November 1859.

Besides the works already mentioned, and various articles contributed to the Edinburgh Review and Blackwood's Magazine, he was the author of a concise History of English Literature, which has many merits and has been much used as a text book. He also wrote the articles " Logic" and '' Rhetoric" (as well as a number of literary biographies) for the eighth edition of the Eneyclopaxdia Britannica. 'he former article, written mainly on Hamiltonian lines, constitutes a systematic treatise on Formal Logic, and is honourably distinguished by its clear scientific exposition. By these two

artieles and his History of English Literature Spalding is chiefly remembered.

SPALLANZANT, Lazaro (1729-1799), is one of the most important and certainly also one of the most pictur- esque figures in the history of science during the 18th cen- tury. Born at Scandiano in Modena in 1729, he was at first educated by his father, who was an advocate. At the age of fifteen he was sent to the Jesuit college at Reggio di Modena, and was pressed to enter that body. He went, however, to the university of Bologna, where his famous kinswoman Laura Bassi, was professor, and it is to her influence that his scientific impulse has been usually attributed. With her he studied natural philo- sophy and mathematics, and gave also great attention to languages, both ancient and modern, but soon abandoned the study of law, and afterwards took orders. His reputation soon widened, and in 1754 he became professor of logic, metaphysics, and Greek in the university of Reggio, and in 1760 was translated to Modena, where he continued to teach with great assiduity and success, but devoted his whole leisure to natural science. He declined many offers from other Italian universities and from St Petersburg until 1768, when he accepted the invitation of Maria Theresa to the chair of natural history in the uni- versity of Pavia, which was then being reorganized. He also became director of the museum, which he greatly enriched by the collections of his many journeys along the shores of the Mediterranean. In 1785 he was invited to succeed Vallisneri at Padua, but to retain his services his sovereign doubled his salary and allowed him leave of absence for a visit to Turkey, where he remained nearly a year, and made many observations, among which may be noted those of a copper mine in Chalki and of an iron mine at Principi. His return home was almost a triumphal pro- gress: at Vienna he was cordially received by Joseph IT, and on reaching Pavia he was met with acclamations outside the city gates by the students of the university. During the following year his students exceeded five hundred. His integrity in the management of the museum was called in question, but a judicial investigation speedily cleared his honour, to the satisfaction even of his accusers. In 1788 he visited Vesuvius and the volcanoes of the Lipari Islands and Sicily, and embodied the results of his researches in a large work published four years later. He died from an apoplectic seiZure, in 1799, at the age of seventy.

His indefatigable exertions as a traveller, his skill and good for- tune as a collector, his brilliance as a teacher and expositor, and his keenness as a controversialist no doubt aid largely in accounting for Spallanzani's exceptional fame among his contemporaries, yet greater qualities were by no means lacking. His life was one of incessant eager questioning of nature on all sides, and his many and varied works all bear the stamp of a fresh and original genius, capable of stating and solving problems in all departments of sclence,—at one time finding the true explanation of ‘‘ ducks and drakes ” (formerly attributed to the elasticity of water) and at another helping to lay the foundations of our modern vulcanology and meteorology. His main discoveries, however, were in the ficld of physiology: he wrote valuable and suggestive papers on respira- tion, on the senses of bats, &c., while his highly important con- troversy with Needham and Buffon, in which he experimentally disproved the occurrence of spontaneous gencration, has been already

referred to under AbilocENrsiIs. In this regard also he was led to pay considerable attention to the infusorial animalcules. His great work, however, is the Dissertationt de Fisica Animale e Vegetale (2 vols., 1780). Here he first interpreted the process of digestion, which he proved to be no mere mechanical process of trituration, but one of actual solution, taking place primarily in the stomach, by the action of the gastric juice. Verifying this by the important

experiment of artificial digestion outside the stomach in sealed tubes, he was attacked by John Hunter, but emerged victorious from the encounter. Of no less importance are his researches on reproduc- tion, in which he experimentally settled the relative functions of the ovum and the spermatozoon. Sec REPRODUCTION.

SPANDAU, a strongly-fortified town in the province of Brandenburg, Prussia, is situated at the confluence of the Havel and Spree, 8 miles to the north-west of Berlin. It has recently been converted into a fortress of the first class, and is now the key of the defences of the capital. The Julius tower in the citadel, which is surrounded by water, contains the imperial war treasure (Reichskriegs- schatz),—a sum of £6,000,000 in gold, kept in

readiness for any warlike emergency. Besides numerous barracks, Spandau contains various military establishments appro- priate to an important garrison town ; and its chief industries are connected with the preparation of munitions of war. The Government factories for the manufacture of small arms, artillery, gunpowder, &c., cover upwards of 200 acres, and employ about 4000 workmen. The other industries are not very important ; they comprise miscellaneous manufactures, fishing, boat-building, and some shipping on the Havel. The population in 1885, including the garrison of nearly 4000 men, was 31,463.

Spandau is one of the oldest places in the Altmark, and received town-rights in 1232. It afterwards became a favourite residence of the Hohenzollern electors of Brandenburg, and was fortified in 1577-83. In 1635 it surrendered to the Swedes, and in 1806 to the French. A short investment in 1813 restored it to Prussia. The population in 1816 was 6250.

SPANGENBERG, Aveust Gorriimp (1704-1792), Count Zinzendorf's successor, and bishop of the Moravian Brethren, was born July 14, 1704, at Klettenberg, on the south of the Harz Mountains, where his father was court- preacher, and ecclesiastical inspector of the grafschaft of Hohenstein. Left an orphan at the early age of ten, he was sent to the excellent high school at Ilefeld, and passed thence (1722), in poorest circumstances, to Jena to study law. Prof. Buddeus received the poor youth into his family, and a "stipendium" was procured for him. Theology rather than law was his natural destination, and it needed only the impulse of the remark of Buddeus that the inevitable prospect before a true theologian is ignominy and trial to convert the student of law, who was pro- foundly exercised with religious conflicts, into a student of theology. Somewhat after the manner of the Wesleys at Oxford a little later, he studied the mystics, read the Bible, observed rigid devotional exercises, sought to quicken his sense of sin, avoided taking the Lord's Supper with unbelievers in the Lutheran Church, and took an active part in a religious union of students and in schools for poor children just outside Jena. He took his degree in 1726, and began to give free lectures on theo- logy. In 1727 he made the acquaintance of the Moravian colony at Herrnhut and its head, Count Zinzendorf. A "collegium pastorale practicum" for the care of the sick and poor was in consequence founded by him at Jena, which the authorities at once broke up as a

‘“Zinzen- dorfian institution.” But Spangenberg’s relations with the Moravians were confirmed by several visits to the colony, and the accident of an unfavourable appeal to the lot alone prevented his appointment as chief elder of the community, March 1733. Meanwhile his free lectures in Jena met with much acceptance, and led to an invitation from Gotthelf Francke to the post of assistant professor of theology and superintendent of the educational depart-

ment of his orphanage at Halle. He accepted the invitation, and entered on his duties in September 1732. But it soon appeared that the differences between the Pietists of Halle and himself were far too serious to admit of any harmonious .co-operation. He found their religious life too formal, legal, external, and worldly ; and they could not sanction his comparative indifference to doctrinal correctness and his incurable tendency to separatism in church life. Spangenberg’s participation in private obser- vances of the Lord’s Supper brought matters to a crisis. His intimate connexion with Count Zinzendorf was made a further charge against him. His preaching was pro- nounced “singular,” and an “affected humility towards common people” obnoxious. He was offered by the senate of the theological faculty of Halle the alternative of doing penance before God, submitting to his superiors, and separating himself from Zinzendorf, or leaving the matter to the decision of the king, unless he preferred to “leave Halle quietly.” The case came before the king, and on April 8, 1733, Spangenberg was conducted by the military outside the gates of Halle. At first he bent his steps to Jena, but Zinzendorf at once sought to secure him as a fellow-labourer, though, with that ‘“jesuitry” of which Wesley subsequently complained, the count wished to obtain from him a declaration which would remove from the Pietists of Halle all blame with regard to the disruption. Spangenberg found amongst the Moravians his life-work. He could amongst them carry out his fundamental principle that the churches are but spheres in all of which Christians are to be found, and that the one church of Christ is only where believers live in Christian fellowship. He joined the Moravians at a momeut when the stability of the society was threatened, and a wise organizer, enterprising missionary, and theo- logical teacher was imperatively required. He became its theologian,

its apologist, its statesman and corrector, through sixty long years of incessant labour. For the first thirty years (1733-62) his work was mainly devoted to the superintendence and organization of the extensive missionary enterprises of the body in Germany, England, Denmark, Holland, Surinam, Georgia, and elsewhere. His missionary work tended to still further modify and broaden his theological opinions, unsatisfactory as the Pietists of Halle had found them in 1733, It was on an island off Savannah that Spangenberg startled John Wesley with his questions and profoundly influenced his entire future career. One special endeavour of Spangen- berg in Pennsylvania was to bring over the scattered Schwenkfeldians to his faith In 1741-42 he was in England collecting for his mission and obtaining the sanc- tion of the archbishop of Canterbury. During the second half of this missionary period of his life he superintended as bishop the churches of Pennsylvania, defended the Moravian colonies against the Indians at the time of war between France and England, became the apologist of his body against the attacks of the Lutherans and the Pietists, and did much to moderate the mystical extravagances of Zinzendorf, with which his simple, practical, and healthy nature was out of sympathy. The second thirty years of his work (1762-92) were devoted to the consolidation of the German Moravian Church. Zinzendorf's death (1760) had left room and need for his labours at home. At Herrnhut there were conflicting tendencies, doctrinal and practical extravagances, and the organization of the brethren was very defective. Spangenberg proved him- self to be the man required. In 1777 he was commiis- sioned to draw up an idea fidei fratrum, or compendium of the Christian faith of the United Brethren, which was published two years afterwards and became the accepted declaration of the Moravian belief. As compared with

Zinzendorf's own writings, this book exhibits the finer balance and greater moderation of Spangenberg's nature, while those offensive descriptions of the relation of the sinner to Christ in which the Moravians at first indulged are almost absent from it. In his last years Spangenberg devoted special attention to the education of the young, in which the Moravians have since been so successful. He died at Berthelsdorf, September 18, 1792. In addition to the Idea Fidet Fratrum, Spangenberg wrote, besides other

apologetic books, a Declaration tiber die zeither gegen uns ausgegangenen Beschuldigungen (Leipsic, 1751), an Apologetische Schlussschrift (1752), Leben des Grafen Zin- zenilorf (1772-75) ; and his hymns are well known beyond the Moravian circle.

See Risler, Leben Spangenbergs, Barby, 1794; K. F. Ledderhose, Das Leben Spangenbergs, Heidelberg, 1846; Frick, Beitrdge zur

Lebensgeschichte A. G. Spangenberg's, Halle, 1884; Herzog-Plitt's Realeneyklopidie, s.v. " Spangenberg."

SPARROW (A.8. Spearwa; Icel. Spérr; Old High Germ. Sparo), a word perhaps (like the equivalent Latin Passer) originally meaning almost any small bird, but gradually restricted in signification and nowadays in common English applied to only four kinds, which are further differentiated as Hedge-Sparrow, House-Sparrow, Tree-Sparrow, and Reed-Sparrow—the last being a BUNTING (vol. iv. p. 525)—though when used without a prefix the second of these is usually intended.

1. The Hepce-Sparrow, called "Dunnock" in many parts of Britain, the

2. The Housr-Sparrow, the Fringilla domestica of Linneus and Passer domesticus of modern authors, is far too well known to need any deseription of its appearance or habits, being found, whether In country or town, more attached to human dwellings than any other wild bird; nay, more than that, one may safely assert that itis not known to thrive anywhere far away from the habitations or works of men, extending its range insuch countries as Northern Scandinavia and many parts of the Russian empire as new settle- ments are formed and land brought under cultivation. Thus eons arise as to whether it should not be considered a parasite throughout the greater portion of the area it now occupies, and as to what may have been its native country. Moreover, of late years it has been inconsiderately introduced to several of the large towns of North America and to many of the British colonies, in nearly all of which, as had been foreseen by ornithologists, it has multi- plied to excess and has become an intolerable nuisance, being Unrestrained by the natural checks which partly restrict its merease in Europe and Asia. Whether indeed in the older seats of civilization the House-Sparrow is not decidedly injurious to the agriculturist

and horticulturist has long been a matter of dis- Cussion, and no definite result that a fair judge can accept has yet been reached. It is freely admitted that the damage done to sowing crops is often enormous, but as yet the service frequently tendered by the destruction of insect-pests cannot be calculated.

oth friends and foes of the House-Sparrow write as violent parti- sans, and the truth will not be known until a series of experiments,

1 The most recent attacks upon it are contained in the various issues of the Report of Observations of Injurious Insects and Common Crop Pests, annually made by Miss Eleanor Ormerod, and iu a little volume bearing the title of The House Sparrow, published in 1885,

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conducted by scientifically-trained investigators, has been in- stituted, which, to the shame of numerous agricultural and horti- cultural societies, has not yet been done. It is quite likely that the result will be unfavourable to the House-Sparrow, from whet has been said above as to its being so dependent on man for its subsistence ; but, while the evil it does is so apparent, —for instance, the damage to ripening grain-crops,—the extent of the counter- balancing benefit is quite uncertain, and from the nature of the case is often overlooked. In the South of Europe the House- Sparrow is in some measure replaced by two allied species, P. laspaniolensis and P, italiz, whose habits are essentially identical with its own ; and it is doubtful whether the Sparrow of India, P. indicus, is specifically distinct ; but Africa has several members of the genus which are decidedly so.

3. The TrEE-Sparrow, the Fringilla montana of Linneus and Passer montanus of modern writers, in appearance much resembling the House-Sparrow, but easily distinguishable by its reddish-brown crown, the black patch on the sides of its neck, and its doubly- barred wings,” isa much more local species, in England generally frequenting the rows of pollard-willows that line so many rivers aud canals, in the holes of which it breeds ; but in some Eastern countries, and especially in China, it frequents houses, even

in towns, and so fills the place of the House-Sparrow. Its geogra- phical distribution is extensive, and marked by some curious characters, among which may be mentioned that, being a great wanderer, it has effected settlements even in such remote islands as the Feroes and some of the Outer Hebrides.

That the genus Passer properly belongs to the /ringill- idx is admitted by most ornithologists, yet there have been

some who would refer it to the Weaver-birds, Ploceide, if

_ they are to be accounted as forming a distinct Family,—a

matter which is not at all clear. The American birds called “Sparrows” have little in common with the members of the genus Passer, and probably belong rather to the family Emberizide than to the Fringillide, (A. N.)

SPARROWHAWK. See Haws.

SPARTA, after Athens, was the most powerful and important of the Greek states. Her fame rested mainly cn her soldiers, her military discipline, her somewhat narrow patriotism, and her intense political conservatism; in general intellectual culture, in art and in everything con- nected with it, she was immeasurably inferior to Athens, and even to some of the other Greek states, though there is evidence to show that a genius and a taste for sculpture and music were by no means wanting to her citizens. Her eminent men were almost all eminent as soldiers, and few of them had any pretensions to rank as able and en- lightened statesmen. No such man as Themistocles or Pericles ever appeared in Sparta; she produced no great thinkers or philosophers ; the typical Spartan, in short, was a brave and well-trained soldier, with a decided simplicity of character and strong religious scruples, amounting to what we must call superstition, which from time to time were a hindrance to prompt action and discredited the state in the public opinion of Greece.

Sparta was not so much a city as a cluster of open villages in a plain in the heart of Laconia (see vol. xi. plate I.), in the middle valley of the Eurotas, on the west bank of the river, between the ranges of Taygetus and Parnon,

and built in part on the spurs of these mountains. Its situation was very picturesque: ‘hollow, lovely Lacedeemon”? is Homer’s description. Taygetus on the west rises to its greatest height of nearly 8000 feet just above the city, with primeval forests on its lower slopes, in which Spartans hunted the stag and the wild boar. Sparta seems to have been about six miles in circuit; it was not, like most Greek cities, near the coast,—
Gythium, and consisting chiefly of three essays by Mr J. H. Gurney, jun., Lieut.~~Col, C. Russell, and Prof. Coues, but the last has only refer~~ ence to the behaviour of the bird in the United States of America, where, from the reason above assigned, its presence was expected by almost all well-informed persons to be detrimental.

? A more important difference is that the two sexes have almost the same plumage, while in the House-Sparrow they are unlike in this respect.

3 Lacedemon was simply another name for Sparta, though some- times it seems to stand for the surrounding district.

at = 44

370

the chief port of Laconia, being 30 miles distant ; nor was it built with anything like the compactness of an Athens or a Corinth. The houses for the most part stood in spacious gardens, an open-air life being altogether to the Spartan taste, and well suited to the pleasant genial climate of the valley. The olive still grows to great per- fection in the neighbourhood, and the silk is said to be of particularly fine quality. The mountain ranges round the city gave it a very strong defensive position, and for a long period Sparta was without walls or fortifications, trusting exclusively to the prowess of her citizens till she was seriously menaced by the victorious Macedonians in the 4th century B.c. The city was never a very splendid one; the houses were plain and simple and there seem to have been no public buildings of striking magnificence. There was the so-called Brazen House of Athene on a hill within a large enclosure, with plates of bronze which gave it its name, on which, among other mythological scenes, were represented the labours of Hercules and the exploits of the great twin brethren, Castor and Pollux, who were specially honoured at Sparta. There was the theatre, still to be traced

in huge quadrangular blocks of stone, and there were porticos and colonnades, and the chapels and tombs of Spartan heroes, such as Lycurgus, Leonidas, Brasidas. Sparta delighted to honour her worthy citizens, and paid them divine honours after death. The site of the city has not been thoroughly investigated, but it is a question whether much remains worth bringing to light. What has hitherto been discovered is poor and disap- pointing. Sparta's greatness as a city, as Thucydides (i. 10) clearly implies, fell very far short of her political importance as a state.}

Sparta's history, passing over her share in the prehistoric Trojan War under her king Menelaus, the brother of Agamemnon, begins with the legislation of Lycurgus in the 9th century B.c. It was this, as has been explained in the article Lycuraus, which made Sparta what she was, a state whose aim it was rather to hold her own within the Peloponnesus than to launch out into doubt- ful enterprises far away from home. Sparta was not naturally aggressive or ambitious; she was not easily roused to action even in great emergencies. She was safe amid her mountains from the perils to which other Greek cities were exposed. It would seem that in early days Argos lad been decidedly the first power in the Pelopon- nesus, Sparta being second to her by a long interval. The relative position of the two states was reversed soon after the time of Lycurgus. The spirit and vigour which his discipline infused no doubt enabled Sparta, after two severe wars in the 8th and 7th centuries, to accomplish at last the complete conquest of Messene, the south-western portion of the Peloponnesus, and so to become the undis- puted mistress of at least two-fifths of the whole penin- sula. By the year 600 B.c. Sparta was quite in the first rank of Greek states, and it was generally felt that she had a right to take the lead in Greek politics. In the 6th century she put down the tyrants, the heads of the democratic and popular party, in several Greek cities, and drove, for a time at least, the reforming and innovating Clisthenes from Athens. Sparta was the steady foe of democracy and popular government. The Spartans were themselves a small landowning aristocracy, in the midst of a comparatively numerous population, consisting of so-called Periceci (dwellers round about), the aboriginal inhabitants, in fact, of Laconia, and of Helots or serfs, taken to a great extent from the conquered Messenians. i

1 For topographical details we must refer the reader to the elabo- rate works of the German scholar Curtius on the Peloponnesus and

works based on them. Mure’s Greece and Leake’s Morea should be consulted.

» PARTS

The government was highly centralized; it was wholly in the hands of the Spartans, the Periceci having no share in it, though many of them may have themselves been land- owners, or at any rate have held land under Spartan land- lords, and been well-to-do and prosperous. The Helots were farm labourers bound to the soil, slaves in every sense of the word, anything like self-respect being studiously made impossible for them. Spartans could put down a popular rising or a slave insurrection with cold- blooded cruelty, and in a panic following on an earthquake of unusual violence in 464 there was a deliberately- planned massacre of a multitude of Helots for the safety of Sparta, carried out and executed by Spartans in person. A calculating selfishness was a marked trait in Spartan character. Sparta seems always to have put her own interests before those of Greece, though she claimed to be the leading and representative Greek state. She was cautious and even timid, though the courage of her indi- vidual citizens in war was unsurpassed. Every Spartan was a hero on the battlefield, and a Spartan army was long assumed to be invincible. Sparta was not much of a colonizing state, but she could point to the famous city of Tarentum in southern Italy as her offspring, and to Lyctus (Z/., ii. 647; xvii. 611) in Crete, whence came warriors to the Trojan War. In 491, when Greece was threatened with invasion by Persia, we find Athens appealing to Sparta and urging a complaint against the AXginetans as traitors to Greece for having given earth and water, the symbols of submission, to the emissaries of the great king. In 480 a Spartan admiral commanded the Greek fleet off Artemisium against Xerxes, and in the following year a Spartan general, Pausanias, commanded the united forces of Greece in the famous battle of Platea. All this implies a distinct recognition of Sparta as the head of Greecc. The Persian War over, Athens under Cimon and Pericles developed extraordinary energy and took Sparta’s place. Sparta indeed seems to have retired upon her laurels, and it was not without reluctance and much urgent

pressure that she embarked in the Pelopon- nesian War, which, after twenty-eight years of hard fighting, ended in the overthrow of the Athenian empire and the capture of Athens by Lysander in 405. Sparta contributed greatly to the final result by despatching an able officer, Gylippus, to the relief of Syracuse in 414, when the city was on the point of surrendering to the Athenian armament. It was the decisive success of Gylippus in Sicily which turned the scale against Athens. The crushing blow of Aigospotami in 405, which annihilated her fleet and left her defenceless, and the subsequent surrender of the city transferred the supremacy of Greece once more to Sparta, but not for much more than thirty years. Sparta's policy was ungenerous and short-sighted ; it consisted in establishing little oligarchical factions under Spartan control in the Greek cities, and soon degenerated into a tyranny which became utterly odious. All Sparta's worst qualities came out during this period: ''autonomy," which had been her watchword throughout the war against Athens, became a dead letter under her rule; and the freedom of city life, so dear to a Greek, was crushed out under her officials and commis- sioners, whom she thrust on a number of Greek cities. Still more did she disgust all the better men of Greece by concluding, after a series of intrigues for her own selfish ends, a peace with Persia in 387, known as the peace of Antalcidas, the Spartan through whom it was negotiated. It was a dishonourable peace for Greece, as its effect was to facilitate Persian intervention in Greek affairs and make the king of Persia the arbiter of Greek disputes and differences. Meanwhile Athens was recovering herself; the tables were soon turned on Sparta, and her maritime

power collapsed before the united action of Athens and Persia. In the Peloponnesus Sparta was still supreme, but Thebes, she felt, might become a dangerous rival and must be humbled. She insisted that the townships of Beeotia must be "autonomous " and independent of Thebes, and so contrived to pick a quarrel with that state, which to Sparta's cost had at that time the famous Epaminondas, the greatest, perhaps, of Greek generals, among her lead- ing citizens. In 371 came Sparta's crushing defeat at Leuctra, a blow from which she never really recovered, though her courage and military discipline long survived it. But her prestige was gone. Epaminondas carried the war into the heart of Laconia and penetrated to

Sparta itself. His victory at Mantinea in 362 gave independence to Messene, and Sparta was now politically ignored by her old allies.

From this time Sparta almost drops out of Greek his- tory. She took no part in the struggle against Macedon ; no Spartan soldier stood by the side of the Athenians and Thebans at Cheronea. She seems to have sunk into polit- ical apathy; very possibly she may have had to concentrate all her remaining strength and energy in keeping down her Helots and the native population of Laconia. When Alexander was winning his victories in Asia, she intrigued feebly against Macedon, and she would take no part in the congress of the Greek states at Corinth which declared Alexander "' Leader of the Greeks."

She appears once again, but as not much more than the ghost of her former self, in the 3d century B.c., attempting vainly in 281 to unite Greece against the Macedonian Antigonus, and repulsing Pyrrhus from her walls in 272, Spartan women working at the city's defence, and a few Spartan warriors driving back the formidable soldier- king. There was still the old spirit about her, but the number of her citizens is said to have dwindled down to 700, and in her last days, with a wealthy few in the midst of a poor and needy people, Sparta had shrunk into the narrowest and feeblest of oligarchies. In the latter half of the 3d century B.c., in the days of the Achean league, a vigorous but unsuccessful attempt at internal reforms and a restoration of the old discipline of Lycurgus was made by two of her kings, Cleomenes and Agis. She sank finally, we know not how, under the degrading dominion of a sort of robber chief, Nabis, who fastened his tyranny upon her by the support of emancipated slaves and mercenaries of the lowest class. Her best citizens were put to death or banished, and she was debased into a refuge of pirates and robbers. Nabis and his vile gang were put down by Philopcemen in the name of the Achzean league, and Philopcemen completed his work by razing the walls of Sparta and abolishing her old institutions. Rome simply looked on, knowing well that she was mistress of the situation, and let matters drag on till 146, when she captured Corinth, and closed the page of Greek history. (w. J. B.)

SPARTACUS, the leader of a formidable insurrection of slaves against Rome in the Ist century B.c., was a Thracian by birth, and perhaps a

descendant of the kings of Panticapseum whose name he bore. He served in the Roman army, but seems to have deserted, for we are told that he was taken prisoner and sold asa slave. Destined for the arena, he, with a band of his fellow-gladiators, broke out of a training-school at Capua and took refuge on Mount Vesuvius (73 B.c.). Here he maintained himself as a captain of brigands, his lieutenants being Crixus and (nomaus, who like himself had been gladiators. Their numbers soon swelled through the. accession of runaway Slaves and desperados from the neighbourhood. A hastily- collected force of 3000 men under Claudius endeavoured to besiege and starve out the rebels, but the latter clambered down the precipices and put the Romans to

flight. Swarms of hardy and desperate men now joined the rebels, and when the praetor Publius Varinius took the field against them he found them entrenched like a regular army on the plain. But they gave him the slip, and when he advanced to storm their lines he found them deserted. From Campania the rebels marched into Lucania, a country better suited for guerilla warfare. Here, in spite of the commands and entreaties of Spartacus, the slaves committed excesses of lust andcruelty. Varinius followed him, but was defeated in several engagements and narrowly escaped being taken prisoner. Spartacus, whose heart was “where his rude cottage by the Danube lay,” now endeavoured to push northward. His object was to cross the Alps and allow the slaves, who were mostly Thracians, Germans, and Gauls, to disperse to their homes, But intoxicated by success his wild followers refused to listen to him ; their thoughts were all of plunder, and their track was marked by the devastation of Italy. Vola, Nuceria, Thurii, Metapontum, were sacked with every circumstance of savage cruelty. In this serious position of affairs the senate despatched both consuls against the rebels (72 3.0.). The German slaves under Crixus, who had separated from the rest, were defeated and cut in pieces at Mount Gargarus in Apulia by the preetor Arrius. But Spartacus overthrew both consuls, one after the other, and then pressed towards the Alps. Cassius, governor of Cisalpine Gaul, and the preetor Manlius flung themselves in his way at the head of 20,000 men, but were trampled under foot. Freedom was within sight, but with fatal infatuation the slaves declined to abandon Italy.

Spartacus led them against Rome, but their hearts seem to have failed them, for the capital was not attacked. Spartacus then occu- pied the port of Thurii and tried to procure supplies of iron and bronze, probably through the pirates. He also endeavoured by means of the herds of horses captured in southern Italy to form a body of cavalry. The conduct of the war against Spartacus, together with eight legions, was now committed to the pretor Marcus Crassus. Te restored discipline by decimating the first troops that ran before the enemy. In the next battle Spartacus was worsted and retreated towards the straits of Messina, intending to cross into Sicily, where he would have been welcomed by fresh hordes of slaves; but the pirates who had agreed to transport his army proved faithless, Crassus endeavoured to shut in the rebels by carrying a ditch and rampart right across the peninsula, a distance of: 32 miles. But on a wintry night Spartacus forced the lines, and once more Italy lay at his feet. Disunion, however, was at work in the rebel camp. The Gauls and Germans had again drawn off from the main body. Crassus attacked and destroyed them. Spartacus was now fain to secure a retreat into the mountains of Petelia (near Strongoli in Calabria), and succeeded in inflicting a reverse on the pursuing army. But his men refused to retreat farther, and in a pitched battle which followed soon afterwards the rebel army was annihilated. Spartacus, who had stabbed his horse before the battle began, fell sword in hand. A body of the rebels which had escaped from the field was met and cut in pieces by Pompey, who, with his usual knack of reaping where other men had sowed, claimed and received the credit of having put an end to the war (71 3.c.). Six thousand slaves, who had not found a soldier’s death, were crucified along the high road from Capua to Rome.

A history of the war against Spartacus has to be pieced together with much uncertainty from the vague, scrappy, and somewhat dis- crepant accounts of Plutarch (Crassus, 8-11), Appian (Bell. Civ., i. 116-120), Florus (ii. 8 [iii. 20]), Livy (Zpit., xev., xcvi., xcvii.), and Sallust (fragments of the Histories). ‘Sallust’s description seems

to have been full and graphic, but unfortunately only a few frag- ments of it remain.

SPECIES. In logic the term “species” is applied to any group of individuals agreeing in some common attribute or attributes, and included along with other groups in a higher category, that of “genus,” which comprehends the fewer and more general attributes in which all agree and ignores those in which they differ. The application of these terms in logic is thus purely relative ; any genus, however large, may be but a species of a still larger genus. But in arranging the innumerable objects of the natural sciences the naturalist finds it necessary to restrict the terms “species” and “ genus” to the two lowest groupings and to distinguish the higher aggregates by special terms, as “family,” “order,” “class,” &c. Early writers had but a loose conception of many different “kinds” of animals and plants, and spoke only of species and genus in their purely logical relations, with varying breadth of content. The term “species” was limited to its natural history usage in the end of the 17th century by John Ray. His con- ception of ‘specific characters” rested, not only on close and constant resemblance in outward form, but also on the likeness of offspring to parent, a considerable measure of variability being, however, recognized. Amongst sub- sequent authors this conception of common descent or parentage became more and more prominent, while the progress of successful definition of species made the limits of their variability seem always narrower and of less im- portance ; and in this way the useful working conception of the tolerable definiteness of species gradually crystallized into the absolute dogma of their fixity. Then Linneus in his Philosophia Botanica gave the aphorism ‘species tot sunt diverse, quot diversee forme ab initio sunt create” (we reckon just as many species as there were forms created at the beginning), which was generally accepted. Buffon’s obstinate rejection of the Linnzean classification was asso- ciated with a belief in the modifiability of species, and showed some foresight of the doctrine elaborated soon afterwards by LAMARCK (q.v.). The general acceptance of this dogma was, however, effected by the influence of Cuvier ; its overthrow dates only from the publication of Darwin’s Origin of Species (1859), of which the argument need not be here repeated. (See EvoLution, Morpxo- Locy.) The genealogical conception of species was thus established more firmly than ever, though cleared from its former associations ; in Haeckel’s phrase, the species is the whole succession of organisms which exhibit the same form in the same environment. The rash generalization, that distinct species are to be recognized by their inca- pacity for the production of fertile hybrids,

was next over- thrown, while closer study has cleared away the notion of the equal definiteness of all specific forms. We now know that, while many forms, like the pearly nautilus or the Venus's fly-trap, do indeed exhibit the most perfect specific definiteness, the demarcation of equally definite species in other genera is rendered impossible by the existence of the most complete series of transitional forms, and the number of the species defined thus comes to depend simply on the personal equation of the systematist, on his predilection for "lumping" or '"'splitting," as the case may be. Thus, for example, the number of described German species of hawkweed (Hieracium) has ranged from 300 for one author, through 106 for another and 52 for a third, to less than 20 fora fourth. Similar instances of variable genera are afforded by the willows and the brambles, and many other common forms. This wide variability, as might be expected, seems to be more pre- valent among the lowest forms of life, and the classical example of the relativity and variability of species has been furnished by Haeckel's beautiful monograph on the calcareous sponges (Monographie der Kalkschwiémme, Jena, 1872), in which he offers twelve distinct arrangements of

the same set of forms from various points of view, among which the two most nearly conventional propose respect- ively 21 genera and 111 species and 39 genera and 289 species. All such variable forms are in fact species in the making, which become definite in proportion as certain varieties become especially adapted to their environment, and become isolated by the dying out of the intermediate forms. With these limitations, however, the working use- fulness of the morphological conception of species remains undiminished. The want of any absolute standard of specific difference is largely made up by practical experi- ence and common sense; and the evolutionary systematists are less in danger than were their predecessors of either exaggerating or understating the importance of mere varieties. (See VARIATION.)

SPECIFIC GRAVITY. See Hyprometer, vol. xii. p. 536 sq.

SPECTACLES are flat glasses, prisms, spherical or cylindrical lenses, employed to detect and correct defects of the eyes. They are made usually

of crown glass or rock crystal (“‘‘ pebbles”), the latter being somewhat lighter and cooler to wear. They are mounted in the well-known rigid spectacle frame when for continuous use,—eye-glasses being preferable where they are worn intermittently, and hand- glasses or lorgnettes where they are required to supplement temporarily the spectacles usually worn, or where, as with extreme shortness of sight, no glass could be employed with comfort for any length of time.

Preserves.—Preserves are used to conceal deformities or to protect the eyes in the many conditions where they cannot tolerate bright light, such as ulceration and inflammation of the cornea, certain diseases of the iris, ciliary body, choroid, and retina. They are made of bluish, “smoked,” or almost black coloured glass, and are of very various shapes, according to the amount of obscuration necessary.

Prisms.—Prisms are of great value in cases of double vision due to a slight tendency to squinting, caused by weakness or over-action of the muscular apparatus of the eyeball, Prisms deflect rays of light towards their bases. Hence, if a prism is placed in front of the eye with its base towards the nose, a ray of light falling upon it will be bent inwards, and seem to come from a point further out from the axis of vision, Conversely, if the base of the prism is turned towards the temple, the ray of light will seem to come from a point nearer the axis, and will induce the eye to turn inwards, to converge towards its fellow. In cases of myopia or short-sight owing to weakness of the internal recti muscles, the eyes in looking at a near object, instead of converging, tend to turn outwards, and so double vision results. If a suitable prism is placed in front of the eyes the double vision may be prevented. These prisms may be combined with concave lenses, which correct the myopia, or, since a concave lens may be considered as composed of two prisms united at their apices, the same effect may be obtained by making the distance between the cen- tres of the concave lenses greater than that between the centres of the pupils. Again, to obviate the necessity for excessive convergence of the eyes so common in hyper- metropia, the centre of the pupil should be placed outside the centre of the corrective convex lenses; these will then act as prisms with their bases inwards. Where, on the other hand, there is no tendency to squinting, care must be taken in selecting spectacles that the distances between the centres of the

glasses and the centres of the pupils are quite equal, otherwise squinting, or at any rate great fatigue, of the eyes may be induced.

Spherical Lenses.—Biconcave, biconvex, and concayvo- convex (meniscus) lenses are employed in ophthalmic prac- tice in the treatment of errors of refraction. Until recently these spherical lenses were numbered in terms of their focal

| ngth, the inch being used as the unit. Owing principally t) differences in the length of the inch in various countries, this method had great inconveniences, and is now giving place to a universal system, in which the unit is the refrac- tive power of a lens whose focal length is one metre. This unit is called a “dioptric” (usually written ““D”). A lens of twice its strength has a refractive power of 2 D, anda focal length of half a metre, and so on.

Concave lenses are used in the treatment of myopia or short-sight. In this condition the eye is elongated from before backwards, so that the retina lies behind the principal focus. All objects, therefore, which lie beyond a certain point (the conjugate focus of the dioptric system of the eye, the far point) are indistinctly seen; rays from them have not the necessary divergence to be focused in the retina, but may obtain it by the interposition of suitable concave lenses. Concave lenses should never be used for work within the far point ; but they may be used in all cases to improve distant vision, and in very short-sighted persons to remove the far point so as to enable fine work such as sewing or reading to be done at a convenient distance. The weakest pair of concave lenses with which one can read clearly test types at a distance of 18 feet is the measure of the amount of myopia, and this fully correcting glass may be worn in the slighter forms of short-sight. In higher degrees, where full correction might increase the myopia by inducing a strain of the accommodation, somewhat weaker glasses should be used for near work. In the highest degrees the complete correction may be employed, but lorgnettes are generally preferred, as they can be removed when the eyes become fatigued. It must be remembered that short-sight tends to increase during the early, especially the school, years of life, and that hygienic treatment, good light, good type, and avoidance of stooping are important for its prevention.

Convex Lenses.—In hypermetropia the retina is in front of the principal focus of the eye. Hence in its condition of repose such an eye cannot distinctly see parallel rays from a distance and, still less, divergent rays from a near object. The defect may be overcome more or less com- pletely by the use of the accommodation. In the slighter forms no inconvenience may result ; but in higher degrees prolonged work is apt to give rise to aching and watering of the eyes, headache, inability to read or sew for any length of time, and even to double vision and internal strabismus. Such cases should be treated with convex lenses, which should be theoretically of such a strength as to fully correct the hypermetropia. Practically it is found that a certain amount of hypermetropia remains latent, owing to spasm of the accommodation, which relaxes only gradually. At first glasses may be given of such a strength as to relieve the troublesome symptoms; and the strength may be gradually increased till the total hypermetropia is corrected. Young adults with slighter forms of hypermetropia need glasses only for near work ; elderly people should have one pair of weak glasses for distant and another stronger pair for near vision. These may be conveniently combined, as in Franklin glasses, where the upper half of the spectacle frame contains a weak lens, and the lower half, through which the eye looks when reading, a stronger one.

Anisometropia.—lIt is difficult to lay down rules for the treatment of cases where the refraction of the two eyes is tmequal. If only one eye is used, its anomaly should be alone corrected ; where both are used and nearly of equal Strength, correction of each often gives satisfactory results.

Presbyopia.—Where distant vision remains unaltered, but, owing to gradual failure of the accommodative appa- ratus of the eye, clear vision within 8 inches becomes im- possible, convex lenses should be used for reading of such

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a strength as to enable the eye to see clearly about 8 inches distance. Presbyopia is arbitrarily said to commence at the age of forty, because it is then that the need of spectacles for reading is generally felt ; but it appears later in myopia and earlier in hypermetropia. It advances with years, re- quiring from time to time spectacles of increasing strength.

Cylindrical Lenses.—In astigmatism, owing to differ- ences in the refractive power of the various meridians of the eye, great defect of sight, frequently accompanied by severe headache, occurs. This condition may be cured completely, or greatly improved, by the use of lenses whose surfaces are segments of cylinders. They may be used either alone or in combination with spherical lenses. The correction of astigmatism is in many cases a matter of con- siderable difficulty, but the results to vision almost always reward the trouble.

Convex spectacles were invented towards the end of the 18th century, perhaps by Roger Bacon. Concave glasses were intro- duced soon afterwards. Airy, the astronomer, about 1827, corrected his own astigmatism by means of a cylindrical lens. Periscopic glasses were introduced by Dr W. H. Wollaston. (A. BR.)

SPECTROSCOPY. The spectroscope is an instrument which separates luminous vibrations of different wave- lengths, as far as is necessary for the object in view. It consists of three parts,—the collimator, the prism or grat- ing, and the telescope. The collimator carries the slit through which the light is admitted and a lens which con- verts the diverging pencil of light into a parallel pencil. The pencils carrying light of different wave-lengths are turned through different angles by the prism or grating, which is therefore the essential portion of the spectro- scope. The telescope serves only to give the necessary magnifying power, and is dispensed with in small direct vision spectroscopes. For a description of the different kinds of prism used, see Orrics ; and for an explanation of the action of the grating, see UNDULAToRY THEORY. The most important adjustment in the spectroscope is that of the collimator. Especially in instruments of large re- solving power it is essential for good definition that the light should enter the prism or fall on the grating as a parallel pencil. For a method allowing an easy and accurate adjustment for each kind of ray, see an article in Phil. Mag., vol. vii. p. 95 (1879).

Prisms are nearly always used in the position of mini- mum deviation, but, if the collimator is properly adjusted, this is by no means a necessary condition for good defini- tion. Prisms as generally cut, with an isosceles base, give the greatest resolving power in the position of minimum

deviation, but the loss in resolving power is not great for a small displacement. The dispersion and magnifying power of a prism can be considerably altered by a change of its position, and a knowledge of this fact is of great value to an experienced observer. The use of a prism in a position different from that of minimum deviation is, however, a luxury which only those acquainted with the laws of optics can indulge in with safety.

Lord Rayleigh has given the theory of the spectro- scope under Optics, and shown on what its resolving power depends. There is no connexion between resolving power and dispersion, any value of resolving power being consistent with any value of dispersion. To obtain large resolving power with small dispersion requires, however, the use of inconveniently large telescopes and prisms or gratings. It is easy, on the other hand, to obtain small resolving power together with large dispersion.

The following definitions would be found of general use if adopted. Resolving Power.—The unit resolving power of a spectroscope in any part of the spectrum is that resolving power which allows the separation of two lines differing by the thousandth part of their own wave-length or wave-number,—the wave-number being the number

of waves in unit length. Purity—The unit purity of a spectrum is that purity which allows the separation of two lines differing by the thousandth part of their own wave-length or wave-number. We speak of the resolving power of a spectroscope and of the purity of a spectrum. The resolving power is a constant for each spectroscope, and independent of the width of the slit. The purity of a spectrum, on the other hand, depends on the width of the slit, unless that width is small compared toa certain quantity presently to be mentioned. The resolving power of a spectroscope is numerically equal to the greatest purity of spectrum obtainable by it. ; Adopting these definitions, we get from Lord Rayleigh’s equations for the resolving power & of a grating

1000 R=mn,

where 2 is the total number of lines used on the grating and m the order of the spectrum. For a spectroscope with simple prisms we get

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1000 R= — (t,-t,) a?

where ¢, and ¢, are the greatest and smallest lengths of paths in the dispersive medium. If we put for the re- fractive index of the medium = A + B/A? we may write 1000 R=2B(t, —t,)/r.

It will be seen that, while the resolving power of a spectro- scope with grating depends only on the order of the spec- trum and is independent of the wave-length for each order, the resolving power of a spectroscope with prism will vary inversely as the third power of the wave-length X, so that the resolving power will be about eight times as great in the violet as in the red (see Optics). If compound prisms are used we must write

1000 R=2(Byty — Byty)/d’, where ¢, is the greatest effective length of path in one medium, ¢, in the other medium, B, and B, being the dis- persive constants for the two media.

The purity P of a spectrum is given by the equation

r

l= nan”

where d denotes the width of slit and y is the angle sub- tended by the collimator lens at the slit. If the slit is sufficiently narrowed, dy may be made small compared to A, and in that case the purity of the spectrum is independ- ent of the width of slit and equal to the resolving power. If, on the other hand, a wide slit is used, so that d yw is large compared to A, the purity becomes inversely pro- portional to the width of slit. In actual work the slit is generally of such width that neither term in the denomi- nator of the expression for purity can be neglected.

There is a necessary limit to the resolving power of all optical instruments, depending on the fact that light con- sists of a series of groups of waves incapable of interfering with each other. If it is true, as is generally believed, but without sufficient reason, that a retardation of 50,000 wave-lengths is sufficient to destroy the capability of interfer- ence—that is to say, that the groups consist on the average of approximately 50,000 waves —the maximum purity ob- tainable in any spectroscope is 50. The closest line resolved with a grating, as far as the present writer is aware, requires a resolving power of about 100. Professor Piazzi Smyth has with prisms realized a purity of 50. It would seem, therefore, that the theoretical limit of purity has very nearly been reached, for, though the estimate of 50,000 waves to the group is in all probability too small, there are other considerations which render it highly improbable that the total number of waves to the group should, for sunlight at any rate, be more than two or three times larger. The limit of possible purity will very likely depend on the temperature of the luminous body.

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Almost the greatest practical difficulty which the spectro- scopist has to contend with generally is the want of suffi- cient light. The following remarks apply to line spectra principally, but they hold also almost entirely for the spectra of fluted bands, which break up into lines under high resolving power. The maximum illumination for any line is obtained when the angular width of the slit is equal to the angle subtended by one wave-length at a distance equal to the collimator aperture. In that case d y=A and the purity is half the resolving power. Hence when light is a consideration we shall not, as a rule, realize more than half the resolving power of the spectroscope. If the visual impression depended only on the intensity of illumination, a further widening of the slit should not increase the visi- bility of a line. As a matter of fact spectroscopists gener- ally work with slits wider than that which theoretically gives full illumination, The explanation of the fact is physiological, visibility depending on the apparent width of the object. If different spectroscopes have their slits of such width that the apparent width of a line as seen by the eye is the same, and if the magnifying power is such that the pupil is just filled with light, the purity of the spectrum is directly proportional to the resolving power. We come to the

conclusion, therefore, that for both narrow and wide slits the efficiency of a spectroscope depends ex- clusively on its resolving power. It has been pointed out by Lord Rayleigh that, owing to the want of definition in the optical images on the retina when the full aperture of the pupil is used, the pencil must be contracted to a third or a quarter of its natural width, if full resolving power is to be obtained. This is accompanied with a serious loss of light, which can be partly obviated by contracting the horizontal aperture only (the refracting edge being supposed vertical). There are two ways of doing this. One con- sists in the use of magnifying half prisms. But the loss of light by reflexion in simple half prisms more than counterbalances the advantage ; compound half prisms like those used by Christie may, however, be employed. We may also use prisms of three or four times the height of the effective horizontal aperture, with correspondingly large telescopes, and then by the eye-piece contract the beam until its vertical section fills the pupil. The latter plan, though theoretically best, involves more expensive appa- ratus and prisms of very homogeneous material.

The question of illumination is important also when photography is used for spectroscopic analysis. For a given intensity of the source of light the intensity of the image on the sensitive film will be directly proportional to the solid angle of the cone of light forming the last image, and will be independent of the arrangement of inter- mediate lenses. Hence lenses with as short a focus com- pared to aperture as is consistent with good definition should be used in the camera.

The methods of recording and reducing spectroscopic observations are described in all books and treatises on the subject and may therefore be passed over here.

A lens is often used to concentrate the light of the source on the slit. There is some loss of light due to reflexion from the surface of the lens, but its position, aperture, and focal length do not affect the luminosity of the spectrum seen as long as the whole collimator is filled with light.

Bodies are rendered luminous for spectroscopic investi- gation either by being placed in the Bunsen flame or by the help of the electric current. A little difficulty may arise where the body is given in solution and does not show its characteristic lines in the flame. Lecoq de Bois- baudran takes the

spark from the surface of the solution. The present writer has found the tube sketched in the figure on the next page a great improvement on those commonly used, if a sufficient quantity of the solution is at

hand ; otherwise the method is too wasteful. The current is brought into the solution by a platinum wire, sealed into a small glass tube; the platinum wire reaches about to the level of the open end f of the tube. A capillary of thick-walled glass tubing is placed over the platinum wire; the liquid rises in the capillary and sparks can be taken as from a solid. The lines due to the glass are easily eliminated. If a small quantity of material only is available, the plan adopted by Bunsen and ex- | tensively used by Hartley! seems the most successful. Pointed pieces of charcoal (Bun- sen) or pieces of graphite pointed to a knife edge (Hartley) are impregnated with the liquid, and the spark is taken from them.

Some sub- stances, when introduced into a vacuum tube, especially near the negative pole, and under great exhaustion, show

a characteristic phosphorescence. Becquerel was the first to examine the spectra shown under these circumstances, and Crookes has lately used the same method with great

success. Spectra of Metalloids.

A good deal of discussion has taken place on the spectra of the metalloids, owing to the fact that they seem to be able to give different spectra under different circumstances, Spectra have occa- sionally been assigned to the elements which on further investiga- tion were found to belong to some compound present. According to the general opinion of spectroscopists at present, different spectra of the same elements are always due to different allotropic condi- tions. If a complex molecule breaks up into simpler molecules the breaking up is always accompanied by a change of spectrum.

Nitrogen.—({a) The line spectrum appears whenever a strong spark (jar discharge) is taken in nitrogen gas. It is always present when metallic spectra are examined by the ordinary method of allowing the jar discharge to pass between metallic poles.2 Hartley (Phil. Trans., 1884, part i.) has measured the ultra-violet lines of the air spectrum, but has not separated the

oxygen from the nitrogen lines. (6) The band spectrum of the positive discharge, which is generally called the band spectrum of nitrogen, always appears when the discharge is sufficiently reduced in intensity. The spectrum con- sists of two sets of bands of different appearance, one in the less re- frangible part and one in the more refrangible part of the spectrum, —the two sets of bands overlapping in the green. Hence some observers believe the spectrum to be made up of two distinct spectra. Pliicker and Hittorf (Phil. Trans., 1865) give a coloured drawing of this spectrum, which is one of the most beautiful that can be observed. The most complete drawing of it is given by Piazzi Smyth (Trans. Roy. Soc. Edin., vol. xxxii. part iii.), and there is also a good drawing by Hasselberg (Mém. Acad. Imp. de St. Pétersb., vol. xxxii.). (c) The glow which surrounds the negative electrode in an exhausted tube shows in many cases a spectrum which, as a tule, is not seen in any other part of the tube. The memoir of Hasselberg contains a drawing of it. The spectrum seen when a weak spark is taken in a current of ammonia is neither that of nitrogen nor that of hydrogen, but must be due toa compound of these gases. When the pressure of the gas is reduced, a single band 1s seen having a wave-length from 5686 to 5627 Xth metres (Nature, vi. p. 359). When a spark is taken from a liquid solution of ammonia a more complicated spectrum appears (Lecoq de Bois- baudran), and, if ammonia and hydrogen are burnt together either In alr or oxygen, a complicated spectrum is obtained the chemical origin of which has not been satisfactorily explained. Drawings of It are given by Dibbits (Pogg. Ann., cxxii. p. 518) and by Hofmann (Pogg. Ann., cxlvii. p- 95). The absorption spectrum of the red fumes of nitrogen tetroxide has often been mapped ; the most per- fect drawing is given by Dr B. Hasselberg (Mém. Acad. Imp. de St. Pét., xxvi.). According to Moser (Pogg. Ann., clx. p. 177), three bands close to the solar line C disappear when the vapour is heated. Recently Deslandes has obtained in vacuum tubes some ultra- violet bands which seem to be due to a compound of nitrogen and oxygen (C. R., chap. i. p. 1256, 1885).

Oxygen.—(a) The elementary line spectrum of oxygen is that which appears at the highest temperature to which we can subject oxygen, that is, whenever the jar and air break are introduced into the electric circuit. It consists of a great number of lines, especially in the more refrangible part of the spectrum. (5) The compound

; Phil. Trans., elxxv. p. 49 (1884). We may refer onee for all to Watts, Index of Spectra, for a list of wave-lengths of the different speetra.

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line spectrum of oxygen appears at lower temperatures than the first. It consists, according to Piazzi Smyth, of six triplets and a number of single lines. This spectrum corresponds to the band spectrum of nitrogen. (c) The continuous spectrum of oxygen appears at the lowest temperature at which oxygen is luminous. The wide part of a Pliicker tube, for instance, filled with pure oxygen generally shines with a faint yellow light, which gives a continuous spectrum. Even at atmospheric pressure this spectrum can be ob- tained by putting the contact breaker of the induction coil out of adjustment, so that the spark is weakened. (d) The spectrum of the negative glow was first aecurately described by Wiillner, and is always seen in the glow surrounding the negative electrode in oxygen. It consists of five bands, three in the red and two in the green. For further information respecting these spectra, see Schuster (Phil. Trans,, clxx. p. 37,1879) and Piazzi Smyth (Trans, Roy. Soc. Edin., vol. xxxii. part iii.), According to Egoroff, the A and B lines of the solar spectrum are due to absorption by oxygen in our atmosphere, and some recent observations of Janssen seem to support this view.

Carbon. —(a) The line spectrum appears when a very strong spark is sent through carbonic oxide or carbonic acid. The ultra-violet lines observed by Hartley when sparks are taken from graphite electrodes also belong probably to this spectrum. () Considerable discussion has taken place as to the origin of the spectrum seen at the base of a candle or a gas flame. At first observations seemed to point to the fact that it was due toa hydrocarbon. It has been ascertained, however, that sparks taken in cyanogen gas, even when dried with all care, show the spectrum, and a flame of cyanogen and oxygen gives the same bands brilliantly. These facts have convinced the majority of observers that the spectrum is a true carbon spectrum. The best drawing is given by Piazzi Smyth, who ascribes the spectrum, however, to a hydrocarbon. The flame of cyanogen, which had already been examined by Faraday and 3 og before the days of spectrum

analysis, shows a series of bands in the red, reaching into the green. There is no doubt that they are due to a compound of nitrogen and oxygen. Another series of bands in the blue, violet, and ultra-violet have been also proved by Liveing and Dewar to be due to a compound of nitrogen and carbon. If the discharge is passed at low pressure through carbonic acid or carbonic oxide a spectrum is seen which seems to belong to earbonic oxide. A very beautiful and remarkable drawing of this spectrum, especially of its most brilliant band, has been published by Piazzi Smyth.

Very little need be said of the remaining metalloids, as we do not possess a sufficiently careful examination of their spectra. Chlorine, bromine, and iodine show bands by absorption. If a spark is passed through the gases line spectra appear. Sulphur volatilized in a vaeuum tube inay show either a line or a band spectrum under the influence of the electric discharge. The absorption through the vapour of sulphur is continuous at first on volatilization, but as the vapour is heated to 1000° the continuous spectrum gives way to a band spectrum. A spark through the vapour of phosphorus gives a line spectrum. We may obtain the spectra of fluorine, silicon, and boron by comparing the spectra given by sparks taken in atmospheres of fluoride of boron and fluoride of silicon.

Spectra of Metals and their Compounds.

Hydrogen.—If sparks are taken through hydrogen, four well- known lines appear in the visible region of the spectrum. The remarkable series of ultra-violet lines photographed by Dr Huggins in the spectra of some stars which in their visible part show hydro- gen chiefly has suggested the question whether the whole series is not due to that gas. This has now been proved to be the case by Cornu, who has recently examined the hydrogen spectrum with great care. In vacuum tubes filled with hydrogen a complicated spectrum often appears which is so persistent that nearly all ob- servers have ascribed it to hydrogen (though Salet had given reasons against that conclusion). According to Cornu, the purer the gas the feebler does this spectrum become, so that the above-mentioned line spectrum seems to be the only true hydrogen speetrum. A flame of hydrogen in air or oxygen shows a number of lines in the ultra-violet belonging apparently to an oxide

of hydrogen (Live- ing and Dewar, Huggins). Aqueous vapour gives an absorption spectrum principally in the yellow.

Alkali Metals.—The metals of the alkali group are distinguished by the fact that their salts give the true metal spectra when ren- dered luminous in the Bunsen burner ; that is to say, their salts are decomposed and the radiation of their metallic base is sufficiently powerful to be visible at the temperature of the flame. Their spectra are not so easily seen if sparks are taken from the liquid solution, but Lecoq de Boisbaudran has obtained fine spectra of sodium and potassium by taking the spark from a semi-fiuid bead of the sulphates. The most complete description of the spectra of sodium and potassium seen when the metals are heated up in the voltaic arc is given by Liveing and Dewar (Proc. Roy. Soc., xxix. p. 378, 1879), who have also mapped their ultra-violet lines (PAdd. Trans., 1883, pt. i.). Abney has found a pair of infra-red lines

belonging to sodium, with wave-lengths 8187 and 8199 (Proc. Roy. Soc., xxxli. p. 448, 1881). Becquerel finds lines in the infra-red at 11,420. he vapour of sodium and potassium heated up in a tube is coloured and shows a spectrum of fluted band; but in the case of sodium the yellow line is always present at the saine time. It is probable that the band spectrum belongs to the vapour, con- taining two atoms in each molecule, and that at higher tempera- tures the molecules are split up, the single atoms showing the line spectra. Both potassium and sodium show an additional absorption line (5510 for Na and 5780 for Ka) at the temperature at which the fluted bands appear. According to a suggestion of Liveing and Dewar, these lines may depend on the presence of hydrogen, which it is very difficult to exclude. These expcrimenters have also de- scribed interesting but complicated absorption phenomena depend- ing on the simultaneous presence of two or more metals. Thus sodium and magnesium show a band in the green (A=5300), which does uot appear when sodium alone or magnesium alone is volati- lized. Potassium and magnesium show similarly two lines in the red (Proc. Roy. Soc., xxvii. p. 850, 1878). Ifa spark is taken from potassium in an atmosphere of carbonic oxide a band appcars (5700) depending probably on a combination between the potassium and the

carbonic oxide. Lockyer has observed certain curious phenomena (Proc. Roy. Soc., vol. xxii. p. 378) taking place at the temperature at which the band spectrum of sodium changes into the line spectrum ; these phenomena deserve a fuller investigation. Lithium furnishes a good example of a change in the relative in- tensity of lines at different temperatures. At the temperature of the flame the red line is the most powerful, an orange line being also seen. When aspark is taken from a liquid solution the orange line is far the strongest, and a blue line is scen, which in its turn rapidly gains in intensity as the temperature is raised. When the spark is taken from solutions of different strengths the more con- centrated solution shows a change in relative intensity of lines in the direction in which an increase of temperature would act. Com- bination of the metals with transparent acids does not when in solution show any appreciable absorption in the visible part of the spectrum ; but Soret has mapped their ultra-violet absorption.

Metals of Alkaline Earths.—Calcium, strontium, and barium are distinguished by the fact that their volatile compounds give fine spectra in the Bunsen flame. The more stable salts, as the phos- phates and silicates, give the reaction only feebly or not at all. When a salt like the chloride of barium is introduced into the flame the spectrum is seen to change gradually; the spectrum seen at first is different according as the chloride, bromide, or iodide is used, while the spectrum which finally establishes itself is the same for the different salts of the same metal. Mitscherlich, who was the first to investigate carefully these phenomena (Pogg. Ann., cxxi. p. 459, 1864), ascribes the spectra seen at first to the compound placed in the flame, while gradually the oxide spectrum gets the upper hand. This explanation has always .been waagol, and receives support froin the fact that the bromide spectrum is strengthened by introducing bromine vapour into the flame, and the other compound spectra can be similarly strengthened by introducing suitable vapours. There is an observation, however, made by Pro- fessors Liveing and Dewar which in one casc is not compatible with Mitscherlich's explanation, ''A mixture of barium carbonate, aluminium filings, and lamp-black heated in a porcelain tube gave two absorption lines in the green, corresponding in position to bright lines seen when sparks are taken from a solution of barium chloride, at wave-lengths 5242 and 5136, marked a and B by Lecoq de Boisbaudran." These two lines, or rather bands, are the brightest in the spectrum

commonly ascribed to barium chloride. In addi- tion to the compound spectra the brightest of the metallic lines seen at a low temperature appear in the flame. The metallic line is in the violet with calcium, in the blue with strontium, and in the green with barium. Sparks taken from a solution of the metallic salts show the compound spectra well, and in addition more of the true metallic lines than the flame. The best drawings of the compound spectra are those given in Lecoq de Boisbaudran's Atlas ; but measurements with higher resolving powers are much wanted. When the salts are introduced into the voltaic arc numer- ous metallic lines appear which have been mapped by Thalén. Liveing and Dewar have investigated those lines which can be reversed and have also mapped the ultra-violet spectra. Captain Abney has mapped a pair of infra-red lines belonging to calcium between 8500 and 8600, and, according to Becquerel, with the help of a phosphorescent screen bands or lines appear of still lower refrangibility (8880 to 8880). Lockyer (Phil. Trans., clxiii. p. 253, 1873, and clxiv. p. 805, 1874) has measured and mapped as regards their length the lines of these as well as of many of the other metals.

_ Mctals of Magnesium Group.—Beryllium presents comparatively simple spectroscopic phenomena, as far as it has hitherto been in- vestigated. Two green lincs were mapped by Thalén and five in the ultra-violet by Hartley (Jowr. Chem. Soc., June 1883). The Spectrum of magnesium is well known from its green triplet ; but the vibrations of the metal seem very sensitive to a change of

| temperature a spectrum of fluted bands (Lockyer).

conditions. Full details are given by Liveing and Dewar in Proe, Roy. Soe., xxxii. p. 189. These authors have found that some of the bands seen occasionally, when magnesium wire is burned in air, are due to a compound of magnesium and hydrogen. 'The spec- trum appears when sparks are taken from magnesium poles in an atmosphere containing hydrogen. For a description of the pccu- liarities of the flame, arc, and spark spectrum, the reader is referred to the original paper. The ultra-violet spectrum, which contains several repetitions of the green triplet, has also been mapped and measured by Hartley and Adeney (Phil. Trans., clxxv., 1874, pt. i). The

spectra of zinc and cadmium are obtained either by sparks from liquid solution or by the spark, with Leyden jar, from the metal poles. The ultra-violet spectra show for both elements a remarkable scries of triplets, the lines of the cadmium triplet being about three times as far apart as those of the zinc triplets. The least refrangible of the series is in the blue with wave-lengths 5085°1, 4799°1, 4677-0 for cadmium, and 4809°7, 4721°4, 4679°5 for zine.

Lead Group.—The spectrum of lead is best obtained by taking the spark from the metallic poles. Care must be taken, however, to renew the surface frequently, otherwise the oxide spectrum will gradually make its appearance. The oxide itself shows its spectruin, according to Lecog de Boisbaudran, in the Bunsen burner, ‘Ihe salts of thallium show the principal metal line at the temperature of the flame. The spark spectrum is more complicated. The ultra- violet spectra of both lead and thallium have been mapped.

Copper Group.—The spectra of the metals belonging to this group are easily obtained in the ordinary way. When copjer chloride is introduced into the Bunsen flame a fine spectrum of bands is seen. It is the same spectrum which is found when com- mon salt is thrown upon white hot coals. This rcaction for copper chloride is very sensitive, but it has never been satisfactorily decided whether the presence of copper is really necessary for its production or whether the spectrum belongs to a peculiar condition of chlorine vapour. Silver when first volatilized gives a green vapour, which at a low temperature shows continuous absorption, but at a higher Mercury shows its lines with great brilliancy if introduced and heated in a vacuum tube. Some of the lines widen easily, and at higher pressures a con- tinuous spectrum completely covers the background. The copper salts in aqueous solution absorb principally the red end of the spectrum, the green salts also the violet end. The glass, coloured green with oxide of copper, transmits through sufficient thickness exclusively the yellow and green rays between D and E (H. W. Vogel),

Canin Group.— Yttrium gives a good spark spectrum from the solution of the chloride ; the salts show no absorption bands. Crookes has found, however, that a certain substance yields brilliant phosphorescent bands

under the influence of the negative pole in a vacuum tube. These bands he has, after a lengthy investigation, put down to yttrium compounds, and explained the changes they undergo in different compounds and the sensitiveness of the reaction. Lecoq de Boisbaudran, who obtains the same spectrum by taking a spark (without Leyden jar) from solutions, making the solution the positive pole, has expressed au opinion that the bands are not due to yttrium but to two substances provisionally called by him Za and ZS. He has also under certain conditions seen a higher temperature spectrum, which he ascribes to Zy, leaving it undecided whether Zy is a new substance or identical with Za (Phil. Trans., 1883, p. 891, and C.R., ci. p. 552, cii. p. 153). —Lanthanum is easily recognized by a strong spark spectrum.—Ceriwm, like yttrium and lanthanum, has no peculiar absorption spectrum when in combin- ation and solution ; although the salts are strongly coloured yellow, its line spectrum has characteristic lines in the blue.—Didymiun is characterized spectroscopically by the fine absorption spectra of its salts. Different salts show slightly different spectra, but they can be recognized at first sight as didymium spectra. The crystals of didymium salts show remarkable differences in the absorption spectra according to the direction in which the ray traverses the crystal. Light reflected from the powdered salts shows the character- istic spectrum. According to Auer von Welsbach (Monatsschr. We Chemie, vi. p. 477), didymium has lived up to its name didupor, “twins,” for by fractional crystallization he has found it to be an intimate mixture of two substances, each of them giving half the ab- sorption spectrum and half the emission spectrum of didymium. —Terbium has a characteristic line spectrum when the spark is taken from a solution of the salts.—The salts of erbiwm give a characteristic absorption spectrum, but till recently the drawings of it contained also absorption bands due to thulium and holmium. The spectrum of erbium, as previously mapped by Thaleén, belongs almost exclusively to ytterbium; but he has recently mapped the lines belonging to what is now known as erbium (C.2., xcl. p- 326). Erbium salts heated in the Bunsen burner show a spectrum of bright bands without apparent volatilization. —Véterbium, discovered by Marignac (atomic weight 17°38, Nilson), gives an ab- sorption band in the ultra-violet. Its luminous spectrum 1s rich in lines (Thalén, C.R., xci. p. 826).—Samarium, also discovered by

Marignac and called by him originally Yf, gives absorption bands in the visible part and in the ultra-violet (Soret, C.R., xc. p. 212). It frequently occurs with didymium, and most of the maps of the didymium spectrum contain the samarium bands. When pre- cipitated with another metal it shows a brilliant phosphorescent spectrum (Crookes), which, however, is slightly different accord- ing to the metal. The peculiar yttrium spectrum is very weak even when it is mixed in considerable quantities with samarium. 3ut when the quantity of yttrium is increased to about 60 per cent. a very rapid change takes place, and afterwards it is the samarium spectrum which is very weak. A band in the orange peculiar to the mixture, weak in pure sainarium and absent in yttrium, is strongest in a mixture containing about 80 per cent. of samarium and 20 per cent. of yttrium.—Holmium, identified as a separate element by Soret (C.#., xci. p. 378), has absorption bands in the visible part of the spectrum (6405, 5363, 4855 on Lecoq's map of chloride of erbium), and also a strongly marked ultra-violet absorption spectrum. —Thuliwm, likewise first recognized by Soret, is band 6840 on Lecoq's drawing of chloride of erbium, and also possesses a band at 4645. Thalén has measured the bright linc spectrum (C.2., xci. p. 876, 1880).—Scandiwm is characterized by a bright line spectrum (Thalén, C.R., xci. p. 48, 1880).—Gadoliniwm (Marignac's Ya) has a weak absorption spectrum in the ultra- violet and a characteristic phosphorescent spectrum (Proc. Roy. Soc., February 1886); but the latest researches of Crookes have rendered it probable that it is a mixture of several new clements (Proc. Roy. Soc., 10th June 1886).—The mosandrium of Lawrence Smith scems a mixture of gadolinium and terbium. The philippium of De la Fontaine was a mixture of yttrium and terbium ; and the latest decipium of the same chemist is probably holmium.

Aluminium Growp.—The spectra of the metals belonging to this group can be obtained in the ordinary way by means of the electric spark. The chloride of indium shows the two strongest metallic lines, one in the indigo and one in the violet, when intro- duced into the Bunsen flame. According to Claydon and Heycock, a number of other lines appear when the spark is

taken from the metal electrodes. When a weak spark is taken from aluminium electrodes in air a band spectrum is often seen belonging apparently to the oxide, for it disappears when the spark is taken in hydrogen. Gallium, anothcr metal belonging to this group, was first discovered by means of its spectroscopic reaction. The chloride shows two violet lines feebly in the Bunsen flame, but strongly if a spark is taken from the liquid solution. The ultra-violet lines of indium and of aluminium have been photographed by Hartley and Adeney, as well as by Liveing and Dewar. Some of the lines had been pre- viously mapped by Cornu, whose researches extend furthest into the ultra-violet. According to Stokes, aluminium shows lines more refrangible than those of any other metal, and the wave-lengths of their lines as measured by Cornu are for one double line 1934, 1929, and for another 1860, 1852.

Metals of the Iron Group.—The spectroscopic phenomena of this group are somewhat complicated. The line spectra can be obtained either by taking sparks from the metal or from the solution of a salt, aud also by placing the metal in the voltaic are. The lines are very numerous and very liable to alter in relative intensity under different cireumstances. The great difference shown, for instance, between the are and spark spectra of iron in the ultra-violet region is shown in the map by Liveing and Dewar in Phil. T’rans., 1885, pt. i. The visible part has also been investigated by the same authors and by Lockyer, and much information has thus been added to the knowledge previously obtained by Kirchhoff,

ngstrom, and Thalén. That part of the iron spectrum lying between a wave-length of 4071 and 2947 has been mapped by Cornu ; Liveing and Dewar’s observations refer chiefly to the more re- fraugible region. Considering the very important part which the iron spectrum plays in solar observations, a full investigation of its ehanges by a variation of temperature would at the present time be of great value. If observations with the method adopted by Lecoq de Boisbaudran were repeated with higher resolving powers they would add much to our knowledge. Some of the manganese salts, such as the chloride or carbonate, secm to be the only salts belonging to this group which show a characteristie spectrum when heated in the Bunsen burner or the oxyhydrogen flaine. The Spectrum observed in these cases is, according to Watts, the charaeteristic speetrum of the Bessemer flame, whieh

disappears at the right moment for stopping the blast ; it is probably due to an oxide of manganese. When a spark spectrum is taken from a solution of the chloride the same spectrum is seen, but the relative mitensity of the lines depends on the length and the strength of the spark. The green-coloured manganates show a continuous absorption at the two ends of the spectrum, transmitting in con- centrated solutions almost exclusively the green part of the spec- trum. The absorption bands of permanganate of potassium are Well known and seem to be due to the permanganic acid, as they appear also with other permanganates. The green salts of nickel show a continuous absorption at the two ends of the spectruin.

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The eobalt salts show well-defined absorption bands. Their careful

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investigation by Dr W. J. Russell deserves special notice (Proc. Roy. Soc., XXxii. p. 258, 1881).

Metals of Chromium Group.—The metallic spectra of this group have been measured principally by Thalén in the usual way. Lockyer and Roberts have obtained a channelled spectrum of chromium by absorption. As regards the spectra of compounds of chromium, the absorption of the vapour of chloro-chromic anhydride has been measured by Emerson and Reynolds (Phil. Mag., xlii. p. 41, 1871), and consists of a series of regularly dis- tributed bands. The chromium salts all possess a decided colour and show interesting absorption phenomena. The chromates ab- sorb the violet and blue completely, also the extreme red, and transmit only the orange, yellow, and in dilute solutions part of the green. The most complete investigation of the salts in which chromium plays the part of a base is due to Erhard in a dissertation published at Freiburg. Potassium ehrom-alum, am- monia chrom-alum, sulphate of chromium, when in solution, give an identical absorption for the same amount of chromium. The extreme red is freely transmitted by the violet solution, but the absorption grows rapidly towards the yellow. An indistinct absorption band (A=6790 to \=6740) is seen when the layer is thick or the solution concentrated. The strongest absorption takes place for a wave-length of 5800. The green is transmitted again more

freely, the minimum absorption taking place for a wave-length 4880; the absorption then grows rapidly towards the violet. When the solutions are heated the colour changes to green, the absorp- tion is increased throughout the speetrum, except in the green, where it remains nearly unchanged, and the minimum of absorption shifts to a wave-length of 5090. The solution, which remains green on cooling, has, when compared with its original state, an increased absorption in the red and bluc and a slightly diminished absorption in the grcen. When light is sent through plates cut out of crystals of potassium chrom-alum or ammonia chrom-alum, three absorption bands (6860, 6700, 6620) are seen in the red. The green and blue show the same absorption as the solution. The chloride in solution gives the same absorption as the chrom-alums,—transmitting, how- ever, slightly more light for the same quantity of chromium. The hot solution also shows the same changes, but with this difference that colour and absorption phenomena are almost entirely recovered on cooling. The nitrate (solution of chromic hydroxide in nitric acid) agrees with chrom-alum, but transmits more light. Red erystals of potassic chromic oxalate only transmit the red with an absorption band slightly less refrangible than B (A=6867). The blue salt has the absorption band at a wave-length of 7040 and transmits part of the light in the green and blue. The solutions of the salts show the sane absorption as the crystals, with the position of the absorption band apparently unchanged. The warm solutions absorb more than the cold ones. The oxalate of chromium gives an absorption band of 6910 to 6860 and transmits the green and blue more freelythan the double salt. The tartrate only shows the absorp- tion band in the red very weakly and absorbs more red than the previously mentioned solutions. The acetate transmits more yellow than the other salts and has some broad absorption bands near a wave-length of 7170. When the solution is heated it becomes green, absorbing the red more than when cold, but leaving the green and blue absorption unchanged. The absorption phenomena shown by uranium salts are more complieated than those of the chromium salts, but they are at the same time more characteristic, as the spectra are inore definitely broken up into bands. According to Vogel, the uranic and uranous salts behave differently (Praktische Spectral-Analyse, p. 247), but a more careful investigation is de- sirable. Sorby finds that a mixture of zirconium and uranium dissolved in a borax bead shows characteristic bands, which are visible neither with uranium nor with zirconium alone.

There is little to be said as regards the remaining groups of metals (tin, antimony, gold). Their spectra are best obtained by taking the spark from metallic electrodes or by volatilization in the voltaic are.

Influence of Temperature and Pressure on Spectra of Gases.

If the spectrum of an element is examined under different con- ditions of temperature or pressure, it is often found to differ con- siderably. The change may be simall—that is to say, the lines or bands may only show a different distribution of relative intensity— or it may be so large that no relationship at all can be discovered between the spectra. It has been pointed out by Kirchhoff that a change in the thickness of the luminous layer may produce a change in the appearance of the spectrum, and Zollner and Wiillner have endeavoured to explain in this way a number of important varia- tions of spectra. But their explanation does not stand the test of close examination. The thickness of layer cannot be neglected in the discussion of solar and stellar spectra, or in the comparison of absorption spectra of liquids; but none of the phenomena which we shall notiee here are affected by it.

Widening of Lines.—The lines of a spectrum are found to widen under certain conditions, and, although probably all spectra are subject to this change, some are much more affected by it than

others. The lincs of hydrogen and sodium, for instance, widen so easily that it is sometimes difficult to obtain them quite sharp. When a system of lines widens it is generally found that the most refrangible lines widen most easily. A line may expand equally towards both sides or chiefly towards one side ; in the latter case the expansion towards the less refrangible side preponderates pretty nearly in every case. It is the almost unanimous opinion of spectro- scopists that the widening is produced by an increase of pressure. If sparks are passed through gases, the lines are always broader at high than at low pressures, and the metallic lines are also broader when a spark is taken from them at higher pressures. Without altering the pressure,

we may often produce a widening of lines by an increase in the, intensity of the discharge, but here the pressure is indirectly increased by the rise of temperature. According to the molecular theory of gases, the following explanation might be given for the widening of lines. As long asa molecule vibrates by itself uninfluenced by any other molecule, its vibrations will take place in regular periods. The lines of its spectrum will couse- quently be sharp. But, if the molecule is placed in proximity with others, its vibrations will be disturbed by occasional encounters. During each encounter forces may be snpposed to act between the molecules, and these forces will affect the regularity of the vibra- tion. The question arises, whether for a given temperature and pressure a line may be of different width according as the molecule is placed in an atmosphere of similar or dissimilar molecules. Such a difference exists in all probability. If gases are mixed in differ- ent proportions, the lines are sharper when an element is present in small quantities, although the total pressure may be the same. There is one cause which limits the sharpness of spectroscopic lines: the molecules of a gas have a translatory motion. Those molecules which are moving towards us will send us light which is slightly more refrangible than those which move away from us ; hence each line ought to appear asa band. In reality the width of lines generally is greater than that due to this cause.

Spectra of Different Orders.—Spectra may be classified according to their general appearance. The different classes have been called orders by Pliicker and Hittorf. At the highest temperature we always obtain spectra of lines which need no further description. Ata lower temperature we often get spectra of channelled spaces or fluted bands. When seen in spectroscopes of small resolving power these seem made of bands which have a sharp boundary on one side and gradually fade away on the other. With the help of more perfect instruments it is found that each band is made up of a number of lines which lie closer and closer together as the sharp edge is approached. Occasionally the bands do uot present a sharp edge at all, but are made up of a number of lines of equal intensity at nearly equal distances from each other. Continuous spectra, which need not necessarily extend through the whole range of the spectruin, form a third order, and appear generally at a lower temperature than either band or line spectrum. Oncand the same element may at different temperatures possess spectra of different orders. A discussion has naturally arisen as to the cause of these remarkable

changes of spectra, and it is generally believed that they are due to differences of molecular structure. Thus sulphur vapour when volatilized shows by absorption a continuous spectrum until its temperature is raised to 1000°, when the continuous spectrum gives way to a spectrum of bands. We know that the molecule of sulphur is decomposed as the temperature is raised, and we are thus justified in saying that the band spectrum belongs to the molecule containing two atoms, while the continuous spectrum belongs to the more complex molecule which first appears on volatilization. When a strong electric spark is passed through the vapour of sulphur a bright line spectrum is seen, and this is believed to be due to a further splitting up of the molecule into single atoms.

Long and Short Lines.—If the spectrum of a metal is taken by passing the spark between two poles in air the pressure of which 1s made to vary, the relative intensity of some of the lines is often secn to change. Similar variations take place if the intensity of the discharge is altered, as, for instance, by interposing or taking out a Leyden jar. It is a matter of importance to be able to use a method which in the great majority of cases will give at once a sure indication how each line will behave under different cireum- stances. This method we now proceed to describe. It has often been remarked, even by the earlicst observers, that the metallic lines when seen in a spectroscope do not always stretch across the field of view, but are sometimes confined to the neighbourhood of the metallic poles. Some observations which Lockyer made jointly with Professor Frankland led him to conclude that the distance which each metallic line stretched away from the pole could give some clue to the behaviour of that line in the sun. In 1872 Lockyer worked out his idea. An image of the spark was formed on the slit of the spectroscope, so that the spectrum of each section of the spark could be examined. Some of the metallic lines were then seen to be confined altogether to the neighbour- hood of the poles, while others stretched nearly across the whole field. The relative length of all the lines was estimated. Tables

and maps are added to the memoir.! The longest lines (that is, those which stretch away farthest from the pole) are by no means always the strongest ;

and there are many instances where a faint line is seen to stretch nearly across the whole field of view, while a strong line may be confined to the neighbourhood of the pole, or is reduced sometimes to a brilliant point only. We give a few conspicuous examples of lines which are long and weak or short and strong. In lithium the blue line (4602-7) is brilliant but short. In lead 4062°5, one of the longest lines, is faint and according to Lockyer difficult to observe. In tin 5630-0 is the longest line, but it is faint, while the stronger lines near it (5588°5 and 5562°5) are shorter. The zinc lines 4928°8, 4911-2, 4809°7, 4721°4, 4679°5 are given by Thalén as of equal intensity, but the three most refrangible ones are longer. On reduction of pressure Lockyer found that some of the shorter lines rapidly decreased in length, while the longer lines remained visible and were some- times hardly affected. When the spark was taken from a metallic salt instead of from the metal the short lines could not be seen, but only the long lines remained. An alloy behaves in the same manner as a compound, and by gradually reducing one constituent of an alloy we may gradually reduce the number of lincs, which disappear in the inverse order of their length. Subsequent work has shown that the longest lines are also generally those which are most persistent on reduction of temperature, so that in the voltaic arc the longest lines seen in the spark are absent. In order to explain these facts it scems necessary in the first place to assume that the short lines are lines coming out at a high temperature only ; but this explanation is not sufficient. Why should a mixture of different elements only show the longest lines of that constituent which is present in small quantities? In the case of chemical combinations we might assume that, the spark having to do the work of decomposition, the temperature of the metal is lowered, and that therefore the short lines are absent. But this cannot be if a chemical compound is replaced by a mechani- cal mixture. All these facts would be explained, however, if we assume that the spectrum of a molecule that is excited by molecules of another kind consists of those lines chiefly which a molecule of the same kind is already capable of bringing out at a lower temperature. It would follow from this that the effects of dilution are the same as those of a reduction of temperature,— which is the case.

Other Changes in Relative Intensity of Lines.— Besides the changes we have noticed, there are others which have not been brought under any rule as yet. Lines appear sometimes at a low temperature which behave

differently from the proper low-tem- perature lines. These require further investigation. They may, in some cases at least, be due to some compound of the metal with other elements present. We give some examples. Ifa spark is taken from lead without the condenser the line 5005 appears, and Huggins has found it to be sensibly coincident with the chief line of the nebule. It is given as a strong line by Lecoq de Bois- baudran, who used fecble sparks, and in many cases it seems to behave as a low-temperature line; it ought to be a long line therefore, but it is in reality short. In line 6100 of tin, Salet noticed that when a hydrogen flame contains a compound of tin an orange line appears, which is apparently coincident with the orange line of lithium. This line does not figure on any of the maps of the tin spectrum. Lockyer found that zinc, volatilized in an iron tube, showed by absorption a green line. It is very likely the line 5184 scen by Lecoq de Boisbaudran in sparks taken from solution of zinc salts. In the absorption spectra of sodium and potassium lines appear in the green which were shown by Liveing and Dewar not to be coincident with any known line of these metals. It was suggested by them that they are due to hydrogen compounds. The wave- length of the sodium line is 5510 and that of the potassium line 57380. Lecoq de Boisbaudran mentions that an increase of tempcrature is often accompanied by a relatively greater increase in the bril- liancy of the more refrangible rays. It is often said that such an increase is a direct consequence of the formula established by Kirchhoff. If the absorbing power of a molecule remains the same while the temperature is increased, it follows that the blue rays gain more quickly in intensity than the red ones, but the less refrangible rays ought never to decrease in intensity, the quantity of luminous matter remaining the same. Now such a decrease is actually observed in many cases when there is no reason to suppose that the quantity of luminous matter has been reduced. We must conclude, therefore, that the observed differences in the spectra are not solely regulated by Kirchhoff’s law; but it is a perfectly plausible hypothesis that a higher temperature is in general accompanied by a decrease in the absorbing power of the less refrangible rays. Asa stronger impact often brings out higher tones, stronger molecular shocks may bring out waves of smaller length. There are several instances of a regular increase in the relative intensity of the blue rays which may be ascribed to this cause. The most remarkable instance is perhaps seen in the spec-

1 Phil. Trans., clxiii. p. 253 (1873).

trum of phosphoretted hydrogen. If a little phosphorus is intro- duced into an apparatus generating hydrogen, the flame will show a series of bands chiefly in the green. The spectrum gets more brilliant if the flame is cooled. This can be done, according to Salet,! by pressing the flame against a surface kept cool by means of a stream of water or by surrounding the tube, at the orifice of : which the gas is lighted, by a wider tube through which cold air is blown. The process of cooling the flame, according to Lecoq,? chauges the relative intensity of the bands in a perfectly regular ; manner. The almost invisible least refrangible band becomes strong, and the second band, which was weaker than the fourth, now becomes stronger. Another example of a similar change is the spectrum shown bya Bunsen burner. By charging the burner with an indifferent gas' (N, HCl, CO,) the flame takes a greenish colour, and, though the spectrum is not altered, the least refran- gible of the bands are increased in intensity. While in these in- stances the changes are perfectly regular, the more refrangible rays gaining in relative intensity as the temperature is increased, there are other cases, some of which have already been mentioncd, in which the changes are very irregular ; such are those which take place in the spectra of tin, lithium, and magnesium. In the case of zinc the less refrangible of the group of blue rays gains in relative intensity. We cannot, therefore, formulate any general law.

Numerical Relations between the Wave-lengths of Lines belonging to the Spectrum of a Body.

It seems @ priori probable that there is a numerical relation be- tween the different periods of the same vibrating system. In certain sounding systems, as an organ-pipe or a stretched string, the relation is a simple one, these periods being a submultiple of one which is called the fundamental period. The harmony of a com- pound sound depends on the fact that the different times of vibra- tion are in the ratio of small integer numbers, and hence two vibrations are said to be in harmonic relation when their periods are in the ratio of integers. We may with advantage extend the expression "harmonic relation" to the case of light, although the so- called harmony of colours has nothing to do with such connexions. We shall therefore define an ‘‘

harmonic relation ” between different lines of a spectrum to be a relation such that the wave-lengths or wave-numbers are in the ratio of integers, the integers being sufti- ciently small to suggest a real connexion. Some writers use the word in a wider sense and call a group of lines harmonics when they show a certain regularity in their disposition, giving evidence of some law, that law not being in general the harmonic law. We shall here use the expression in its stricter sense only. We begin hy discussing the question whether there are any well-ascertained cases of harmonic relationship between the different vibrations of the same inolecule. The most important set of lines exhibiting such a relationship are three of the hydrogen lines which, when pro- perly corrected for atmospheric refraction, are, as poiuted out by Johnstone Stoney, very accurately in the ratio of 20 : 27 : 32 (Phil. Mag., xli. p. 291, 1871). Other elements also show such ratios ; but when a spectrum has many lines pure accident will cause several to exhibit whatever numerical relations we may wish to impose on them. If we calculate the number of harmonic ratios which, with an assumed limit of accuracy, we may expect in a spectrum like that of iron, we find that there are in reality fewer than we should have if they were distributed quite at random (Proc. Roy. Soc., Xxxi. p. 337, 1881). With fractions having a denominator smaller than seventy the excess of the calculated over the observed values is very marked, while there are rather more coincidences than we should expect on the theory of probability if we take fractions having a denominator between seventy and a hundred. The cause of this, probably, is to be sought in the fact that the lines of an clement are liable to form groups and are not spread over the whole spectrum, as they would be if they were distributed at random. This increases the probability of coincidence with fractions between high numbers, and diminishes the probability of coincidence with fractions between lower numbers. There is one point which deserves renewed investigation. When the limits of agreement between Which a coincidence is assumed to exist are taken narrower, there 1s an increased number of observed as compared with calculated coincidences in the iron spectrum ; and this would seem to point to the existence of some true harmonic ratios. With the solar maps and gratings put at our disposal by Professor Rowland, we may hope to obtain more accurate measurements, and therefore more definite information. Even if the wave-lcngths of two lines are found to be occasionally in the ratio of small integer numbers, it does not follow that the vibrations of

molecules are regulated by the same laws as those of an organ-pipe or of a stretched string. E. J. Balmer* has indeed lately suggested a law which differs in ‘1 important manner from the laws of vibration of the organ-

1 Ann. Chim. Phys., xxviii. p. 57 (1878). 2 Spectre Lumineua, p. 188 (1874).

3 Op. cit., p. 48 (1874).

4 Wied. Ann., xxv. p. 80 (1885).

pipe and which still leaves the ratios of the periods of vibration integer numbers. According to him, the hydrogen spectrum can be represented by the equation

m2

m4 =’

where \, is some wave-length and m an intcger number greater than 2. The following table (I.) shows the agreement between the calculated and observed hydrogen lines. And the agreement is a very remarkable one, for the whole of the hydrogen spectrum is re- presented by giving to m, successive integer values up to sixteen.

Ay =3645.

Np =3645. |

Observed Observed

: > | Hydrogen || |. | £Hydrogen

m-. | m2Xo/(m2—4). Spectrum. ™. | m2No/(m2 — 4). | Spectrum.

| 8 6561-0 65621 | 10 3796‘9 3795-0 4 4860°0 4860-7 ie: 3769°6 3767 ‘5

5 4339°3 4340°1 ae 3749-1 3745°5

6 4100°6 4101°2 a8 3733°3 3780°0

7 3969-0 3968-1 | 14 3720°9 8717°5

8 3888-0 3887 °5 | 15 3711-0 3707°5

9 3834°3 3834:0 | 16 3702°9 3699-0

The differences between the observed and the calculated numbers show a regular increase towards the ultra-violet. It might be thought that a better agreement could be obtained by taking a number slightly different from four in the denominator; but this is not the case. On the contrary, the agreement in the visible part is at once destroyed if we make the ultra-violet lines fit better. The agreement is not improved but rendered slightly worse if we take account of atmospheric refraction.

As a first approximation Balmer's expression gives a very good account of the hydrogen spectrum. If the law was general we should find that in the iron spectrum, for instance, which is the only spectrum carefully examined, those fractions would occur more frequently than others which cau be put into the form m?/(m? ~ n2), that is to say, 2 and $ for fractions made up of numbers smaller than 10. A reference to the table in Proc. Roy. Soc., vol. xxxi. p. 337, shows that these fractions do not occur more frequently than others, But, if we change the sign of n? in the denominator, we find § and 35 as the only fractions falling within the range of spectrum examined, and these two fractions are indeed those which occur more frequently than any others made up of uumbers smaller than 10.

It might be worth trying to see whether the wave-lengths of lines

2

making up a fluted band can be put into the form a Xo 3 accord-

ing to the sign chosen in the denominator, the band would shade off towards the blue or red. The form of expression seems at first sight well adapted, for

it shows how by giving m gradually in- creasing numbers the lines come closer and closer together towards what appears in the spectrum as the sharp edge of the band. If we take periods of vibration instead of wave-lengths Balmer's expression would reduce to

r=nfs-(2)]

where T, is a fixed period of vibration, a constant integer, and m an integer to which successive values are given from » upwards.

It is often observed, and has already been mentioned, that the spectrum of some elements contains in close proximity two or three lines forming a characteristic group. Such doublets or triplets are often repeated, and if the harmonic law was a general one we should expect the wave-lengths of these groups to be ruled by it ; but such is not the case. The sodium lines which lie in the visible part of the spectrum are all double, the components being the closer to- gether the more refrangible the group. But neither are the lines themselves in any simple ratios of integers, nor do the distances between the lines show much regularity. The ultra-violet lines of sodium as photographed by Liveing and Dewar are single, with the exception of the least refrangible of them (3301). But this line is a very close double, and it may be that the others will ultimately be resolved. Some elements, such as magnesium, calcium, zinc, cadmium, show remarkable series of triplets; and the relative dis- tances of the three lines seem well maintained in each of them. Even the distances when mapped on the wave-number scale are so nearly the same for each element that it would be a matter of great importance to settle definitively whether the slight variations which are found to exist are real or due to errors of measurement. In the following table (II.) we give the position of the least refrangible line of each triplet together with the distances between the first and second (column B) and between the second and third line of each triplet (column C). The figures in column A represent the number of waves in one millimetre. For the zine and calcium triplets the measurements of Liveing and Dewar are given; the magnesium triplets are put down as measured by Cornu as well as by Hartley and Adeney. The differences in these measurements will give au idea of the degree of uncertainty. The triplets of cadmium are farther apart and are mixed up with a greater number of single lines.

Zine Triplets. Calcium Triplets.

A. B. C:

2245 10 5

2517 alg 5

2744 10 6 2868 10 6 2977 10 5 3044 11 6 3101 11 5

‘8174 10 5 3208 10 on

Magnesium Triplets. Cornu. Hartley and Adeney.

A. B. C. A. B. C. 1929°31 4°2 1°9 2605°6 3°9 20 2605°8 41 n Oy § 2997-4 4°0 24 2999°2 3°8 2°7 8229°8 4°5 aL 8230-4 3°9 1°9 8399-0 2 41 ee

Relation between Spectrum of a Body and Spectra of its Compounds.

The spectrum of a body is due to periodic motion within the molecules. If we are justified in believing that the molecule of mercury vapour contains a single atom, it follows that atoms are capable of vibration under the action of internal forces, for mercury vapour has a definite spec- trum. We may consider, then, the spectrum to be de- termined in the first place by forces within the atom, but to be affected by the forces which hold together the different atoms within the molecule. The closer the bond of union the greater the dependence of the vibrations on the forces acting between the different atoms. Experimental evidence seems to favour these views, for we observe that whenever elements are loosely bound together we can recognize the influence of each constituent, while in the compounds which are sufficiently stable to resist the temperature of incandes- cence the spectrum of the compound is perfectly distinct from the spectra of the elements. The oxides and haloid salts of the alkaline earths, for instance, have spectra in which we cannot trace the vibrations of the component atoms; but the spectra of the different salts of the same metal show a great resemblance, the bands being similar and similarly placed. The spectrum

seems displaced towards the red as the atomic weight of the haloid increases. No satisfactory numerical relationship has, however, been traced between the bands. The number of compounds which will endure incandescence without decomposition is very small, and this renders an exhaustive investigation of the relationship between their spectra very difficult.

The compounds whose absorption spectra have been investigated have often been of a more unstable nature, and, moreover, dis- sociation seems going on in liquid solutions to a large extent; the influence of the component radicals in the molecule is more marked in consequence. Dr Gladstone,' at an early period in the history of spectrum analysis, examined the absorption spectra of the solu- tion of salts, each constituent of which was coloured. He concluded that generally, but not invariably, the following law held good: "When an acid and a base combine each of which has a different influence on the rays of light a solution of the resulting salt will transmit only those rays which are not absorbed by either, or, in other words, which are transmitted by both." He mentions as an important exception the case of ferric ferro-cyanide, which, when dissolved in oxalic acid, transmits blue rays in great abundance, though the same rays are absorbed both by ferro-cyanides and by ferric salts. Soret has confirmed, for the ultra-violet rays, Dr Gladstone's conclusions with regard to the identity of the absorption spectra of different chromates. The chromates of sodium, potassium, and ammonia, as well as the bichromates of potassium and ammonia, were found to give the same absorption spectrum. Nor is the effect of these chromates confined to the blocking out simply of one end of the spectrum, as in the visible part, but two distinct absorption bands are seen, which seem unchanged in position if one of the above-mentioned chromates is replaced by another. Chromic acid itself showed the bands, but less distinctly, and Soret does not ee a ee

1 Measured by Thalén. 2 Measured by Liveing and Dewar.

% Phil. Mag., xiv. p. 418 (1857).

SPECTROBSBECUFE

consider the purity of the acid sufficiently proved to allow him to draw any certain conclusion from this observation. Erhard's work on the absorption spectra of the salts in which chromium plays the part of base has already been mentioned. Nitric acid dnd the nitrates of transparent bases, such as potassium, sodium, and ammonia, show spectra, according to Soret, which are not only qualitatively but also quantitatively identical; that is to say, a given quantity of nitric acid in solution gives a characteristic absorption band of exactly the same width and darkness, whether by itself alone or combined with a transparent base. It also shows a continuous absorption at the most refrangible side, beginning with each of the salts mentioned at exactly the same point. The ethereal nitrates, however, give different results. In 1872 Hartley aud Huntington examined by photographic methods the absorption spectra of a great number of organic compounds. The normal alcohols were found to be transparent to the ultra-violet rays, the normal fatty acids less so. In both cases an increased number of carbon atoms increases the absorption at the most refrangible end. The fact that benzene and its derivatives are remarkable for their powerful absorption of the most refrangible rays, and for some characteristic absorption bands appearing on dilution, led Hartley to a more extended examination of some of the more complicated organic substances. He determined that definite absorption bands are only produced by substances in which three pairs of carbon atoms are doubly linked together, as in the benzene ring. More recently ' he has subjected the ultra-violet absorption of the alkaloids to a careful investigation, and has arrived at the conclusion that the spectra are sufficiently characteristic to "offer a ready and valuable means of ascertaining the purity of the alkaloids and particularly of establishing their identity." "In comparing the spectra of substances of similar constitution it is observed that in such as are derived from bases by the substitution of an alkyl radical for hydrogen, or of an acid radical for hydroxyl, the curve is not altered in character, but may vary in length when equal weights are examined. This is explained by the absorption bands being caused by the compactness of structure of the nucleus of the molecule, and that equal weights are not molecular weights, so that by substituting for the hydrogen of the nucleus radicals which exert no selective absorption the result is a reduction in the ab- sorptive power of a given weight of the substance…. Bases which contain oxydized radicals, as hydroxyl, methoxyl, and

carboxyl, increase in absorptive power in proportion to the amount of oxygen they contain.”

It would seem, however, by comparing the above results with those obtained by Captain Abney and Colonel Festing® that the absorption of a great number of organic substances is more char- acteristic in the infra-red than in the ultra-violet. Some of the conclusions arrived at by these experimentalists are of great im- portance, as the following quotations will show :—“ Regarding the general absorption we have nothing very noteworthy to remark, beyond the fact that, as a rule, in the ate den of the same series those of heavier molecular constitution seem to have less than those of lighter.” This effect agrees with the observations inade by Hartley and Huntington in the ultra-violet, in so far as a general shifting of the absorption towards the red seems to take place as the number of carbon atoms is increased. Such a shifting would increase the general absorption in the ultra-violet as observed by Hartley and Huntington, and decrease it in the infra-red as observed by Abney and Festing. Turning their atten- tion next to the sharply defined lines, the last named, by a series of systematic experiments, concluded that these must be due to the hydrogen atoms in the molecule. ‘‘A crucial test was to observe spectra containing hydrogen and chlorine, hydrogen and oxygen. and hydrogen and nitrogen. We therefore tried hydrochloric acid and obtained a spectrum containing some few lines. Water gave lines, together with bands, two lines being coincident with those in the spectrum of hydrochloric acid. In ammonia, nitric acid, and sulphuric acid we also obtained sharply marked lines, coincidences in the different spectra being observed, and nearly every line mapped found its analogue in the chloroform spectrum, and usually in that of ethyl iodide. Benzene, again, gave a spectrum consisting prin- cipally of lines, and these were coincident with some lines also to be found in chloroform. It seems, then, that the hydrogen, which is common to all these different compounds, must be the cause of the linear spectrum. In what manner the hydrogen annihilates the waves of radiation at these particular points is a question which is, at present at all events, an open one, but, that the linear absorp- tions, common to the hydrocarbons and to those bodies in which hydrogen is in combination with other elements, such as oxygen and nitrogen, are due to hydrogen, there can be no manner of doubt. The next point that required solution was the effect of the presence of oxygen on the body under

examination. . . . It appears that in every case where oxygen is present, otherwise than as a part of the radical, it is attached to some hydrogen atom in such a way that

4 Phil. Trans., part ii. (1885). 5 Phil. Trans., iii. p. 887 (1881).

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it obliterates the radiation between two of the lines whieh are due to that hydrogen. . . . If more than one hydroxyl group be pre- sent, we doubt if any direct effect is produeed beyond that produeed by one hydroxyl group, exeept a possible greater general absorption ; a good example of this will be found in einnamie aleohol and phenyl- propyl alcohol, which give the same spectra as far as the special absorptions are eoncerned. . . . Hitherto we have only taken into account oxygen whieh is not eontained in the radieal ; when it is so contained it appears to aet differently, always supposing hydrogen to be present as well. We need only refer to the speetrum of aldehyde, whieh is inclined to be linear rather than banded, or rather the bands are bounded by absolute lines, and are more defined than when oxygen is more loosely bonded.”

“An inspeetion of our maps will show that the radieal of a body is represented by eertain well-marked bands, some differing in position aceording as it is bonded with hydrogen, or a halogen, or with carbon, oxygen, or uitrogen. There seem to be eharaeteristie bands, however, of any one series of radieals between 1000 and about 1100, which would indieate what may be ealled the central hydroearbon group, to whieh other radieals may be bonded. The clue to the eomposition of a body, however, would seem to lie between A 700 and A 1000. Certain radieals have a distinetive absorption about 700 together with others abont A 900, and if the first be visible it almost follows that the distinetive mark of the radical with whieh it is connected will be found. Thus in the ethyl series we find an absorption at 740, and a charaeteristie band, one edge of whieh is at 892 and the other at 920. If we finda body containing the 740 absorption and a band with the most refrangible edge commencing at 892, or with the least refrangible edge terminating at 920, we may be pretty sure that we have an ethyl radieal

present. So with any of the aromatie group; the crucial line is at 867. If that line be eonneeted with a band we may feel certain that some derivative of benzine is present. The benzyl group show this remarkably well, since we see that phenyl is present, as is also methyl. It will be advantageous if the spectra of ammonia, benzine, aniline, and dimethy] aniline be com- pared, when the remarkable eoineidenees will at once beeome apparent, as also the different weighting of the moleeule. The spectrum of nitro-benzine is also worth comparing with benzine and nitrie acid. . . . In our own minds there lingers no doubt as to the easy deteetion of any radical whieh we have examined, .. . and it seems highly probable by this delicate mode of analysis that the hypothetieal position of any hydrogen whieh is replaced may be identified, a point which is of prime importanee in organie ehemistry. The deteetion of the presence of ehlorine or bromine or iodine in aeompound is at present undeeided, and it may well be that we may have to look for its effects in a different part of the speetrum. The only traee we ean find at present is in ethyl bromide, in whieh the radical band about 900 is curtailed in one wing. The difference between amyl iodide and amyl bromide is not sufficiently marked to be of any value."

The absorption speetra of the didymium and cobalt salts afford many striking examples of the eomplieated effects of solution and combination in the spectra. It is impossible to explain these with- out the help of illustrations, and we must refer the reader, therefore, to the original papers.! Some very interesting ehanges have been notieed in the position of absorption bands when eertain colouring matters are dissolved in different liquids. Charaeteristie absorp- tion bands appear for each colouring matter in slightly different positions aeeording to the solvent. Hagenbach, Kraus, Kundt,? and Claes* have studied the question. In a preliminary examina- tion Professor Kundt had eome to the eonelusion that solvents displaeed absorption bands towards the red in the order of their dispersive powers; but the examination of a greater number of cases has led him to recognize that no generally valid rule ean be laid down, At the same time highly dispersive media, like bisul- phide of earbon, always displace a band most towards the red end, while with liquids of small dispersion, like water, aleohol, and ether, the band always appears more refrangible than with other solvents ; and asa general rule the order of displacement is approximately that of dispersive power.

Relations of the Spectra of Different Elements.

Various efforts have been made to connect together the Spectra of different elements. In these attempts it is generally assumed that certain lines in one spectrum corre- Spond to certain lines in another spectrum, and the ques- tion is raised whether the atom with the higher atomic weight has its corresponding lines more or less refrangible.

_1 Bunsen, “On the Inversion of the Bands in the Didymium Absorp- tion Speetra,” Phil. Mug., xxviii. p. 246 (1864), and xxxii. p. 177 (1866); Russell, “On the Absorption Speetra of Cobalt Salts,” Proc. Roy. Soe., xxii. p. 258 (1881). 2 Wied. Ann., iv. p. 34 (1878).

- Wied. Ann., iii. p. 389 (1878).

No definite judgment can as yet be given as to the success of these efforts. Lecoq de Boisbaudran has led the way in these speculations, and some of the similarities in different spectra pointed out by him are certainly of value. But whether his conclusion, that “the spectra of the alkalis and alkaline earths when classed according to their refran- gibilities are placed as their chemical properties in the order of their atomic weight,” will stand the test of further research remains to be seen. Ciamician* has also pub- lished a number of suggestive speculations on the question, and Hartley’ has extended the comparison to the ultre- violet rays.

When metallic spectra are examined it is often found that some line appears to belong to more than one metal. This is often due to a common impurity of the metals; but such impurities do not account for all coincidences. The question has been raised whether these coincidences do not point to a common constituent in the different elements which show the same line. If this view is correct, we should have to assume that the electric spark decom- poses the metals, and that the spectrum we observe is not the spectrum of the metal but that of its constituents, Further investigation has shown, however, that in nearly all cases the assumed coincidences were apparent only. With higher resolving powers it was found that the lines did not occupy exactly the same place. With the large numbers of lines shown

by the spectra of most of the metals some very close coincidences must be expected by the doctrine of chances. The few coincidences which our most powerful spectroscopes have not been able to resolve are in all probability accidental only. A. 8*,

SPEECH-SOUNDS, the sounds actually used for the conveyance of thought by speech. See PHONETICS,

1. Symbolization.—It is necessary to have some system of writing speech-sounds, in order to talk of them. The system used in the present article is the palaeotype of the present writer's Zarly English Pronunciation. All letters or words thus written will be enclosed in (). The following preliminary list of the ordinary sounds, with examples, will render what follows intelligible. For an alphabetical list, see art. 20.

English.—1. beet bait baa bought boat boot (biit beet baa baat boot buut). 2. knit net gnat knot nwt nook (nit net net not not nuk). 3. file fozl fowl fuel (fa'il fo'dl fa'ul fiuurdl). 4. hay (hee). 5. pea bee, toe doe, cape gape (pii bii, too doo, kecp geep). 6. whey way, feel veal, thin then, seal zeal, rush rouge, hue you (whee wee, fil viil, thin dhen, siil ziil, resh ruuzh, shiuu gun). 7. ear ring, gull little (iia réq, gol lit'l). 8. sum ehasm, sun open, sung (som kez'm, son oop'n, seq). 9. chest jest (tyest djest).

Foreign.—¥ Freneh, G German, 1T Italian. 10. béte ¥, ldehe F, nd IT, dé F, few ¥, veuf ¥, vin F, vent F, vont F, un F, soin F, sot ¥, lui ¥ (bEEt, laash, no, dyy, fa, voef, ves, vaa, vo, ced, silea, stia, lyt). 11. dach teich, tage siege, wahl, all c (dakh taikjh, itaaghe, ziigjhe, bhaal). 12. pagdia rr, besogne F (pa']ja, bgzonj).

2. Nature of Speech-Sounds.—Speech-sounds result from shocks given to the air by the organs of speech, received by the drumskin of the ear, and transmitted to the auditory nerves in the cochlea. The apparatus is explained by Helm- holtz, who deals with musical sounds. But speech is not musical, and its sounds are much obliterated when rendered musical.° An original quality of tone generated by the vocal chords is modified by the cavities through which it passes, as explained by Helmholtz (Sensations of Tone) cn the principle of resonance. There are tliree ways in which speech-sounds may be produced—(1) by the air in the mouth, without additional breathing,

by smacks and clicks ; (2) by drawing in air, as orally in chirps, whistles, sobs, gasps, and nasally in snuffles, snores ; (3) by expelling air, as in the greater number of speech-sounds. The last are

4 Wien. Ber., lxxviii. (1878). ® Journul Chem. Soc,, September 1883. 8 Ellis, Speech in Song, sect.. iv.

either flated, the vocal chords being wide apart and hence not vibrating, but allowing breath to pass freely, or voiced, the vocal chords being close together and vibrating fully, or else whispered, the vocal chords approximating but not touching, and their edges only vibrating. The last 1s only a variation of the second and needs no further consideration. Flated and voiced sounds are either jixed, the position of the vocal organs remaining unchanged throughout, or changing, the position constantly altering from one fixed position to another, forming “ glides.”

3. Generic and Specific Speech-Sounds.—Fixed speech- sounds, intended to be the same, vary from speaker to speaker, and in the same speaker at different times. Those who attempt to write sounds from dictation rapidly find that they have to disregard these specific differences, and simply discriminate genera. And much difference of opinion has always existed as to the discrimination and number of genera.

4, Vowels, that is, vocals, are so called because their positions allow the voice-sounds to pass with least obstruc- tion. The three genera (ii, aa, uu), which have always been distinguished, differ greatly in the positions of the tongue and lip, that is, in their mouth cavities, and hence resonance. The usual method of describing speech-sounds is by the shape of the cavity, which, however, could be shown to be insufficient for many reasons. As differently shaped cavities resound to a note of the same pitch, Helmholtz proposed the last for discrimination. The pitches of (ii, aa, uu) are widely different, (ii) having the highest and (uu) the lowest ; but the extreme diversity of results in attempting to assign the actual pitch of vowel cavities shows that this will not suffice. Resonance cavities do not create but merely modify original vowel qualities of tone, and these last seem to depend upon the will of the speaker, guided by his powers of appreciation and imitation,

both extremely variable, partly hereditary, partly depending on conformation of brain, and partly acquired during adolescence.

Melville Bell, Sweet, Storm, and Sievers, and all who have latterly examined the subject distinguish at least two series of vowel genera, that is, two forms of each genus, called “narrow” and “wide”; but they are far from being agreed as to what the difference consists in and how it is produced. Sweet differs from Bell, and Sievers does not wholly agree with Sweet. All, however, call (ii, uu) narrow, and (7, «) wide.

Besides these two series Bell introduced another distinc- tion applying to both, termed “rounding,” consisting in a greater or less closure of the lips, slight for (aa), much for (uu), and intermediate for (00). But this character is not scientifically precise, because all the vowels can be produced with the mouth wide open (by means of a com- pression of the arches of the palate), and still more easily with the mouth at least as much closed as ordinarily for (uu). Other phonetists wish to introduce distinctions based upon the shape of the apertures between the lips.

There is also a feeling of intermediateness between vowel- sounds. Thus (yy) is felt by many to lie “ between ” (ii, uu), and (cece) between (00, ce). But we also have other intermediates which arise spontaneously when listening to new languages and dialects. Thus in west Somerset there is a vowel between (9, i), one between (y, 2), and another between (a, oc), and the positions for these vowels have not been ascertained. These are only specimens of numerous cases. Hence the positional discrimination breaks down at present. Nevertheless it is very good so far as it goes, but must not be pressed to extremes.

All the vowels may be also flated and whispered ; that is, the position and dictating vowel-intention remaining, the totally or partially open vocal chords forbid voice and

produce sound more or less recognized as substitutes for the true vowels. Write (ii) voiced, (‘ii) whispered, (*41i) flated. This distinction becomes of more importance for consonants.

5. Glottids and Physems.—A glottid is the action of the vocal chords in altering the form of the glottis or tongue- shaped space between them. (1) The glottid is clear when there is no attempt to utter the vowel until the chords are brought together, yet the utterance takes place at that instant. This may be written (,ii) initial. Similarly, a vowel may end with a clear glottid (,1i,), no flatus escaping after the vowel ceases. This clear glottid is usually inferred and not written. (2) The glottid is gradual, written (1), when flatus passes through the vowel position before the chords are sufficiently approximated for voice, or after they are separated, thus (iit) is really (“Gi+ Gi+ii+ i+ “4i). This is an exceedingly common habit with some speakers. (3) The check glottid (;), Arabic hamza +, arises from keep- ing the chords tightly closed so that they cannot vibrate, and then releasing them with an explosion. It may be final in reverted order in Arabic, and it is common as an initial in German, as ;eine ;er,innerung, and is used as the catch accent in Danish, as ma,nd, a man, distinct from man =F on. (4) An exaggeration of (;) gives Arabic (gain) & the bleat, with a rattle in the cartilaginous glottis.

Physems are the bellows-actions of the lungs. (1) The jerk (a) or sudden puff of either vocalized or flated breath, accompanying either clear or gradual glottid. The first, with voice only, is the singer’s and Bengali aspirate ; the second, with flatus, is the Scotch or German aspirate. (2) The wheeze (h), Arabic O° stated by Czermak to arise from

suddenly forcing breath through the cartilaginous glottis.

6. Vowel Glides and Vanishes.—So far the positions of the vowel above the larynx have been supposed to remain unchanged. In this case many degrees of length may be distinguished, as (&) very short, (a) short, (&) medium, (aa) long, (a&) drawled, (aaa) extravagantly prolonged. If the vowel sign consists of two parts, as (ah), only the first is marked doubled or tripled for these lengths, as (ah, aah), &c. In English it is felt very difficult to pre- serve the positions for long (ee, aa, 00), and these vowels gravitate to, without by any means reaching, (i, 9, u). The first and last may be written (eej, oo’w), implying what are termed vanishes or gliding alterations of

sound, accom- panied by alterations of position as the vowel ceases. This change is generally unintended and mostly used uncon- sciously.

7. Diphthongs.—But there are conscious changes to quite different positions. The first and last vowels are then taken as fixed, one of them having the chief stress, and there is a vowel glide between them. These form diph- thongs; the stress and glide being the chief characteristics are marked by (’), and the two elements are juxtaposed. The glide is generally short and close in English, longer in German, still longer and looser, or “slurred,” in French and Italian. There are many typical classes. 1. With weak final (i), unanalysed (ai), analysed (ai, 47, 0%, a7, éi, ei, Bd, w’t), &e., all common. ii. With weak final (u), unanalysed (a’u), analysed (Au, au, o’u, a’u, éu, éu, EU, ze’u), &e., all very common. iii, Weak final (y), theoretic German ew (dy, ay), Devonshire ow (a’y,°). iv. Weak initial (i) or (i), used for (3) in Italy, France, Wales, &e. v. Weak initial (y) in Fr. vi. Weak initial (u) or (it), used for (w) in Italy, Spain, France, Wales, &c. vii. Murmur diphthongs ending in weak (%), common in English, but generally with the option of trilling an (x) after it, and hence written (1), as in ear, air, oar, lord, poor, pure, pyre, power (ii1, eed, ood, LAAtd, puus, piwud, pa’ts, pa’us); ther is always trilled in Scotland. viii. The vanish diphthongs

(céj, 00’), just considered. ix. Inchoant diphthongs, first grave, where the speaker begins too low and corrects him- self, as (4i, du), and secondly acute, where he begins with the mouth too open and corrects himself as he proceeds, as (a0); both are common in English dialects.

8. Glides from and to Mutes, Post-Aspirates, Sonants.— The essence of the diphthongal character was the glide, which was independent of the sounds of the first and last elements. These might be absolutely mute, as in (piip, taat, kook) peep, taught, coke, in which (p, t, k) are mere positions without sounds. But the results are quite dif- ferent from (ii, AA, 00), because while the consonant positions are opened out the vowel is at the same time sounded. Similarly in the reverse order, when final. But here the enclosure of the breath is felt to be uncomfortable, and, if there is no vowel to fall upon, the mouth is opened and a puff of flatus (‘), called the “recoil,” is heard in England, as (piip‘) peep! Using then (+) for the gliding sounds, we

have (p+iit+p+‘); but there is no recoil in (p+ii+p+7 +q) or (pt+ii+pb-+o00’w!) peeping, peep-bo! Various nations have very different habits in this respect. In Indian languages (p‘) would be felt as a final post-aspirated mute. So initially in Germany, the (p) position is usually released, not on a vowel with a clear glottid, as in England and Italy, but on a vowel with a gradual glottid, as (pyii), and hence flatus is heard before the vowel. When this is exaggerated, as (pthii) or (puyhii), we have the true Indian post-aspirated mute.

But an attempt to utter the vowel through a mute position may be made before the position is quite opened out, or the vowel may be continued into it after it has been assumed. This gives the English, Italian, and Indian “sonant,” as in (beeb) babe. The German is not quite the same. Here the glides are (b+ee+b), with possibly a voiced recoil (b+ee+b-+’), where (’) represents the most amorphous voice. This voiced recoil is strong in French, but seldom heard in English, except in declamation, is regular in modern Indian, and impossible to a German, who says at most (beebp‘) or (beep‘) ; also Indians and Irish sometimes jerk out their vowel after sonants, as (bueebH‘), producing the sonant post-aspirates. The ancient Indian never ended words in the pause with sonants, post-aspirated mutes, or post-aspirated sonants, but only with simple mutes, and avoided the recoil.

9. Glides to and from Hisses, Buzzes.—In the case of a hiss, flatus passes through the consonant position and is continued part of the time during which the vowel position is assumed, but towards the end of that time voice is put on. Hence in (s+ii) see, the glide (+) is partly flated and partly voiced, so that (s) acts in much the same way as a gradual glottid ; similarly when final, as (s+ii+s) cease, where thie hiss replaces the recoil, But the proportion of voice and flatus in the glide may vary. The voice may be put on during the hiss, and then the change takes place in the hiss position. The result, far less clear than a vowel, is a hiss (s), followed without a positional glide by the buzz (z), then an entirely vocal glide, the vowel, and a vocal glide, a buzz, and a hiss, as (sziizs) seize, sees. The initial (sz) is regular in Germany, where no vowel precedes, as sie sehen (szii zee’n), they or you see ; and the reverse (zs) is regularly in English seize (siizs) in the pause, and similarly (haavf, briidhth, ruuzhsh, djoadjshj) halve, breathe, rouge,

judge. In the south-west of England Saxon Words beginning with s, f are pronounced with (z, v) initial, Which passes through (sz-, fv-) to (s, f).

10. Glides to and Jrom Flaps.—F laps are consonants Where there is a slack organ which flaps with the breath aS It passes. The r is very varied, but properly voiced, though the flated form occurs. The flap may be made (1) With the lips, as (brh), used in Germany to stop horses ; (2)

with the tip of the direct tongue, (r, ,r), used in Italy; with the tip of the reverted tongue, (r), used in the south of Eng- land and in modern (not ancient) Indian, where it is called “cerebral” ; (3) with the uvula, (7), common in France and north Germany, labialized (7w) in Northumberland, and harsher in Greek and Arabic; (4) with the glottis, (a), usual in Denmark; and soon. In the educated south of England the tongue is often raised to the ® position, but not allowed to flap, and is treated as a buzz (ES):

The above form the central flaps; if the point of the tongue is fixed and the voice escapes by the side it causes minute lateral flaps of the tongue. The place of the point of the tongue discriminates the various sounds which differ but slightly—(,1), advanced tongue at gums, Continental ; (1), coronal, tongue near the crown of the palate, English ; (L), reverted, in connexion with ® in south-west England.

Both flaps, especially the latter, are extremely vocal, and the glides from and to them are like those from and to vowels, while they glide readily to and from mutes, sonants, hisses, and buzzes.

ll. Glides to and from Hums, Orinasals.—For (p, t,k) both nasal or oral passages are cut off, the former by press- ing the uvula against the back of the pharynx. Let this pressure be relaxed so that the nasal passage is opened, the oral passage remaining closed. The voice passes through the nose, forming the three hums (m, n, q). The glide from these to ordinary vowels is the same as from (b, d, g), and the peculiarity consists in the preceding hum and the closing of the nasal passage as the vowel position is assumed. If the nasal passage is left open at all the vowel is “nasalized,” and as it resounds partly in the nose and partly in the mouth it becomes an

“orinasal.” Four principal orinasals exist in French, as an, on, un, vin (aa, OA, cea, ves); there are more in Portuguese, and many others in the modern Indian languages. The oral vowel is altered in character by nasalization, and it is not possible to assign the oral to the orinasal form precisely. If the oral passage is only slightly open, a “nasalized tone” is produced, as in Gaelic, some south German, and American dialects, written as (a,). The hum also may be prolonged, and (’mpaa, ’mbaa, ’ntaa, ‘ndaa, ’qkaa, ’qgaa) result. These forms exist in South African languages.

The final hum may be continued like a vowel. If the nose entrance is closed and the voice continued (lim, lem, koom) become (Icimb, leemb, koomb), which, as the ordinary spelling shows, were probably once pronounced. But not only the nasality, the voice itself may be cut off, and then we have the mere stops (p, t, k), thus (lémp, lint, Iqk), which in the pause have the recoil. Some phonetists consider (m, n, q) to become flated in this case, as (mh, nh, qh). This is no more necessary than to suppose a vowel to be flated before a mute, so that (lep, meet, hak) lap, mat, hack should be (I‘ep, m‘“et, h‘ek), a usage unknown.

12. Palatalization and Labialization.—When a conso- nant precedes a diphthong of classes iv, v, vi, in art. 7 begin- ning with weak (i, y, u), there is a tendency to take these vowels as nearly as possible simultaneously with the con- sonant, expressed by writing (j, wj, w) after the consonant. To say (tj) at least two-thirds the length of the tongue from the tip backwards must lie against the palate, for (kj) two- thirds from the root forwards. The first occurs in Hun- garian ; the second was very common among older speakers of English before (2), as (kjend’l). Both (tj, kj) are apt to develop into (ty); compare nature, kirk, say (neetj va, kjoorkj), with colloquial modern (neetye, tyooty). Similarly the voiced sounds (dj, gj) become (dj), compare rig, ridge. These (ty, dj) are consonantal diphthongs = (tjshj, djzhj), as in chest, Jest, and are distinct from the Indian sounds (kj, gj) ™% ¥, which are true mutes, produced by bringing the tongue from

the position for (3) tight up against the extreme back of the hard palate so as to produce a complete stop. The most important of the palatalized letters are (Ij, nj), the Italian gli, gn in miglior, ognor (miljo’r, onjo’r), where the

palatal- ization brings the Italian advanced (,1, \n) to the position of the English (1, n). The (Ij) has degenerated to (i) or (3) in France during the 19th century. It exists in Spanish 7/, Portuguese /h. The (nj) exists as gn in French, #% in Spanish, and nA' in Portuguese.

Parallel to the palatal are the labial forms, of which English queen, guano (kwiin, gwaa'no) are examples. They seem to exist in abundance in French, as in toi, doigt (,twa, dwa). The palato-labial form (wj), as in jucn (zhujea), is uch disputed, and a diphthong (zhyéa) is usually assumed.

13. Syllables—A group of speech-sounds increasing in volume from a mute, sonant, hiss, buzz, or flap to a full vowel and decreasing again to one of the former constitutes the ideal syllable (rvAAaB%, collection), The initial and final parts may sink to clear glottids, and the middle part toa simple vowel. The type of a syllable is then < >, crescendo followed by diminuendo, as in (,aa, iaai, tiaait', stlaaits), theoretical, and (dyodjd, streqkth, teelfths), actual syllables. The hisses or recoil before or after a stop are not felt as belonging to fresh syllables, because they have uo vowel, which is the soul of the syllable. Monosyllables present no difficulty, but the division of syllables in poly- syllables is not easy to understand. In (pii+p+7q) the middle (p) ends one set of glides and begins another. One syllable ends and the other begins with the assump- tion of the (p) position which is absolutely mute, so that the end of the first and the beginning of the second syllable are simultaneous, as the end of one hour and the beginning of the next. In this case (p) is said to be "'medial." But there may be and often is a sensible pause between the two syl- lables, and then (p) is said to be '" double," as (pii + pp +79, piippiq), in which case no recoil can be used, as (piip'pzq). In "syllabizing," a totally artificial process, doubling is necessary, and very frequently the recoil is used, but it never is inspeech. In (sii+s+7q) ceasing, there is a sens- ible hiss between the glides which end the first syllable and those which begin the second, and the syllable divides during that hiss. If we wished to produce the effect of doubling, we must break the hiss into two either by a silence or a diminution of force, as (mzssent). The same remarks hold for sonants, buzzes, and flaps, where we have a sensible voice sound during which the syllable divides. Syllables may even divide during a vowel, as French payen, Fayence, vaillant (paiea, faiaas, vaiaa), where the syllable divides during (i), which may even be

lengthened to show the two syllables ; but, if the syllables have to be sung to notes with a pause between them, we must double the (i), thus (pai ies, fai iaas), as either (pai ea, fai aas) or (pa iea, faiaas) would be unintelligible. The sensation of separate syllables is always easy. It is the essence of versification, the oldest form of literature.

14. Accent and Emphasis.—Generally several syllables form a single word, and in many languages—by no means all languages—one syllable in a word is rendered conspicu- ous. Several plans have been adopted for this purpose. (1) Quantity or length of syllables, which seems to be all that is known to modern Indians, Arabs, and Persians. (2) Heightened or lowered or descending gliding pitch (con portamento) of one syllable, which were the acute, grave, and circumflexed syllables of Sanskrit, Latin, and Greek, the position of these syllables in a word there depending partly on the quantity of the syllables and partly on sense ; this pitch difference remains in a more complicated form in Norwegian and Swedish. (3) Greater force given to one syllable ; this is the English, German, and Italian “stress,” and from the end of the 3d century a.p., when the feeling

for quantity faded, was used instead of high pitch in Latin and Greek. The modern Italian and modern Greek as a general rule preserve the memory of the syllable which had the high pitch by giving it greater force, with but few exceptions, as Italian cade’re ri‘dere, to fall, to laugh. (4) By a peculiar pronunciation, as the “catch” of the Danes. In French none of these methods seem to be consciously adopted. Some declare that the last syllable (not counting mute e) always has the stress, others that it never has the stress ; others, again, consider the stress to be intentionally even, and when altered to depend mainly on grammatical construction, while there is certainly a raised pitch, fre- quently towards the close of a phrase or sentence, but sometimes on a penultimate syllable. Turks and Japanese have also even stress. All these modes of rendering a syllable conspicuous are apt to be called “accent,” the Latin translation of tpoa@dia, the song added to the word, which properly applied to class (2) only. Where pitch accent prevailed there may have been also stress, but that stress was probably as

little subject to strict rule as altera- tion of pitch is in English speech, where it undoubtedly exists, without properly affecting signification. Hence we may say roughly that in Latin and Greek pitch was fixed and stress free, but in English and German stress is fixed and pitch free.

What accent is to a word, emphasis is to a sentence. But there is this difference. Accent always falls on a fixed syllable of a word. Emphasis varies with the word to be made conspicuous. Emphasis does not consist merely in making the stressed syllable of a word louder. It depends upon a number of most subtle varieties of qualities of tone, length, and pitch of utterance,—in short, of those tricks and wiles of spcech which form the stock-in-trade of actors and orators. The same words will mean totally different things according to the place and nature of the emphasis used. Different nations emphasize differently. To an Englishman French emphasis is apt to seem placed on the wrong word.

15. Intonation.—Although musical accent does not exist in English, almost every county has its peculiar sing-song mode of utterance. And even among educated men the sing-song may frequently be heard in public speaking, or in declaiming poetry, or recitation, or reading aloud generally. For these things no invariable rule exists. But in England questions require the pitch of the voice to be raised, and affirmations to be lowered, towards the end of a clause. In Scotland the pitch is raised in both cases, so that to an Englishman a Scotchman seems to be always asking questions.

16. Analysis of Speech-Sounds.—What is heard are sentences consisting of various fixed sounds cemented by gliding sounds, which act one on the other, and thus become greatly modified. To construct an alphabet it is necessary from this mass to separate the fixed elements and the changing glides, to crystallize them into symbols, and finally to make the value of those symbols known to the reader. The last cannot be done satisfactorily except by viva voce instruction, but much can be accomplished by a review of the relations of sounds, made dependent on the relations of the motions of the organs of speech by which they are produced. There is a preliminary difficulty in defining an element. Perhaps position, flatus, whisper, and voice are the only ultimate elements. But it is usual to be very lax. Thus (p, t, k) have position only, (f, s, sh, kh) position and flatus, (i, a, u, w, z, zh, gh)

position and voice. The analysis is therefore only into “proximate” and not “ultimate” elements. Again, when a new mass of sound is presented to the ear, a long time passes before the ear becomes sufficiently accustomed to the sound to distinguish the proximate elements and their combinations,

Sp frHEC Ee

and therefore before the voice can imitate them at all satisfactorily. Hence the best phonetists differ. It may certainly be considered impossible from a knowledge of a few languages to construct an alphabet which will serve for all. Nevertheless a consideration of some partial schemes is of great value as a stepping-stone. We give Mr Melville Bell’s vowel system and Mr Henry Sweet’s alteration of Mr M. Bell’s consonant system, both supposed to be universal, but neither properly appreciating Asiatic, African, and American-Indian languages and habits of speech. After these follows a modification of a confessedly partial system by the present writer, applying chiefly to English, German, Italian, Spanish, and French, with a few partly theoretical sounds, introduced to show connexions. In all these the sounds will be expressed by palaeotype symbols without any explanation in the tables themselves, because that is furnished at better length than would there be possible in the alphabetical list of art. 20.

17. Mr Melville Bell’s‘ Visible Speech” Vowels.—These arearranged primarily according to the height of the tongue, which is supposed to be divided into ‘‘back”’ and ‘‘front”’ or central part, beyond which lies the ‘‘ point.” The heights refer first to the ‘‘ back” and lastly to the ‘‘ front,” and between them lie the “mixed,” for which both back and front are more raised than the “front,” so that there is generally a hollow between them. Each set is then divided into “narrow” and ‘‘ wide,” the precise meaning of which, as stated in art. 4, is not settled. Finally come the ‘‘rounded” vowels, there being three degrees of rounding,—one for ‘‘ high,” one for ‘‘ mid,” and one for “low” tongue. For convenience here the back, the mixed, and the front are formed into separate groups, and all the vowel signs are numbered, being referred to in the following lists by V and the nuniber, thus V4 is (w), which in Mr Bell’s nomencla- ture would be called ‘‘ high-back wide-round.” The letters », w, nr, wr at the heads of columns mean “ narrow, wide, narrow-round, wide-round.”

Mr. Melville Bell’s ‘‘Visible Speceh”” Vowel Table.

Tongue Tongue Back. | Mixed. | Tongue Front.

Height. w. | nr. | wr. || m | w. | mr} wr. jj nm | w. | nr | wr. Wigh..|1@| 2e| 3u/ 4u/13¥ |14y 115 v [16 uh| 25 | 264 |271 28 y Mid ../5a | 6a| 70) 80/170 |18ah|19oh/20 oh) 29¢ | 30€|31 \32@

Low..|9@ 10a{11a/120 i2 ahj 22.0 |23.ah 24 oh] 33 B34 35 0h 36h)

These positions being insufficient, although supposed to be pre- cisely known, may be ‘‘ modified” by raising the tongue more (a!) or lowcring it more (a,), or bringing it nearer the teeth (,a) or nearer the throat (a,). And, even this not sufficing, Mr Sweet has contrived a uumber of new inodifiers, here passed over. And with all this none of the sounds ean be produced purely through any position without an effort of will dependent on a conception of the sound. The characteristic of the vowel notation contrived by Mr Bell is that each sign shows at once the position of the sound in the Table.

18. Mr. Henry Sweet’s ‘‘ Sound Notation” Consonant Table.

. a. b. C. a4 e. Bi g. h. t. ongue | Tongue | Tongue | Point Blade] ; « Lip | Li Back. | Front. | Point. Teeth. Blade. Point. Lips. Back. Teeth.

Voiceless Consonants. 1. Open..! kh gh rh th s | sh ph wh if 2. Divided! Th yh lh dh ph) | .. ad 3. Shut .. | k kj t . p 4, Nasal..| qh qjh nh nh mh

Voiced Consonants.

5. Open .. gh J Ts dh Zz zh | bh w v 6. Divided} 7 y 1 i el a 7. Shut .. g} d id | b 8. Nasal..} q qj n \n | ™

These signs will be referred to as S8e, or Sweet, line 8, col c, giving (n). The consonants are modified in a similar manner to the vowels. Columns a, b, ¢ indicate straits or contacts between the palate and the parts of the tongue named. By the “‘ blade” is meant the part of the tongue between the ‘‘front” and the ‘‘point.” Mr Sweet’s substitutes for glottids and physems,

and his and Mr Bell’s notation of glides are omitted for brevity. Their notation throughout is entirely different from that here used.

19, A. J. Ellis’s partial schemes, modified from his Speech in Song. ME Sacer. ee

Vowel Trigram. j

my OP 3e | 4e 5H | 62 | Fah oo l16y 17 a 18 ce Ug ae | 20a 2a |—8= 224 lou | 4u |] 130 | 120 Ta) STOR 9a

(oar ee

you, DS 385

The meaning of this arrangement is that, if we pronounce the vowels in the order of the numbers, they will form a sufficiently unbroken series of qualities of tone, or, if each line be so pronounced leading to 8=22a, three series of the same kind are produced, and also that the speaker feels that the vowels in the middle line lie ‘‘between ” the vowels in the first and third lines between which they are written. These intermediate characters refer only to qualities of tone and not to the vowel positions, as they apparently did in the older ‘‘vowel triangles” from which the trigram is adapted. The arrangement of Mr Bell is excellent for showing the relations of the positions, but gives no more clue to the relations of sound than the indispensable ratios 1: 2,2:8,3:4,4:5,5:6give to the musical sensations of the intervals known as the octave, fifth, fourth, major third, and minor third. Hence the advantage of this additional arrangement. It will be referred to as T‘6, that is, trigram, vowel 6, or (e).

Consonant Table.

files 18 RAESES EAR SEE OE) § ‘ Bi a ae A III. | IV. SPER ac ee Ton \ Tongue Point | Lips % | Con- | i : i aa 2 sagmor | | at a) e | g [Stites +] 228 Ise 8./e8l2./6‘8. Id formed alae am ||ES| o ES Sa) FS| 2| Fe |8)// = by [Ei Aes “a g ga om 8 = Be oH! 3 5 PEE 8° (se) 8 sd es) Fa) oi ee SF 2 asa (2 ism Fea | Sla ie ee ee eee eS || ORAL. ConTacts.| ij Mute ..‘x\kw k ki | ke itj i it th P |p, |p ii| Sonant ..|a\gw g gj |gi’ dj jip jdr, ja B |b, jb STRAITS.

Fized. iii] Flated ..!../kwh kh kjh| gh! sj jsh_ jshj s,s th, th |) f |ph|wh iv} Voiced..|,./gwh gh r,|/gjh|} 3 | 2j |‘zhR,‘zh) 2,z dh, dh’|v|bhiw Flaps. | Central. | ; v| Flated .. |. mene | ae || ee | +s rh rh fo Wesliac \ienee vi| Voiced ..|.. serh‘7 |} ..|..!.. jm it an +. |j..fa |brh | Lateral. | | } | vais elatedsc | ct ae as we leee |e. Jhon gilhel Shlain: Willi] VOICE eels) | ce or foo Hable tS lhl NASAL. | | || ix| Flated .. |..| .. lqh ore oem eee, a oh jh}... j!..|.. jimh 5a] Weel on eal! na Kel qj |} nN 2 (in ‘ged bere pen { ‘ i i

This table will be referred to as C iv 7, or consonant table, class iv, column 7 = (zh). The glottids and physems are sufficiently explained in art. 5, and are here omitted.

20. Alphabetical List and Explanation of the Palacotype Symbols.— Small letters, italics, small capitals, and the forms resulting from turning them must be sought under the large capital of the same class, where the order of all the letters is specified. Explanations are greatly condensed and often confined to references to the preced- ing articles and tables, or to an example. The notation for differ- ences of length is explained in art. 6.

Abbreviations. Abbreviations.

AR. Arabic. PL. Polish.

B. Melville Bell. pr. Portuguese.

(OL A. J. Ellis’s consonant | S. Sweet’s consonants table (art. 19). (art. 18).

DN Danish. sn. Sanskrit.

E. A.J. Ellis. sp. Spanish.

EK. English. St. Stori.

F. French. Sv. Sievers.

G. German. Sw. Sweet.

Tee: Italian. swD. Swedish.

LLB. Prince Louis- Lucien | T. A. J. Ellis’s vowel Bonaparte. trigram (art. 19).

ts. Lowland Scotch. Vv Bell’s visible speech

mc. Modern Greek. vowels (art. 17).

oce. oecasionally.

A. (a ah ai at aa a’y, a}, a ah, A, 2). (a) V6, T8=T 22, short c mann, long E father, art. 6. (ah) V 18, T7, occ. E pass, path. (ai) art. 7i, unanalysed diphthong, E eye, e7. (au) art. 7ii, unanalysed diphthong, E how, & bau. (aA) art. 11, F vent, a conventional form. (a’y) art. 7 iii, unanalysed G freude, often (0‘2). (a!) or (a) with higher tongue, 17 and F short a, nearly = (ah). (2) V10,T 9. B. hears it in & father, arms, alms; FE. docs not. Sw. and E. hear it in us father, E. and LLB. in F diable, E. in F péte, pas. (ah) V 23. B. says (A) with advanced tongue = (A), (A) on the road to (a). (A) Vil, T10, short open in E authority, long closed k azul, alinost peculiarly E. XXII. — 49

(ev) V2,T19. B. hears it in dungeon, motion, conscious, aban- don, honowr, bellows. E. hears it in these syllables and in E parental, capable, eapacious, China, and & gabe. Sw. and Sv. hear (9) in all these cases.

Zi. (e, eh).

(e) V34, T6, E gnat, almost peculiarly E. ;

(eh) V 36. B. hears it as a Cockney substitute for ow, ow in out, now, which E., a born Londoner, does not know. Sv. finds it to be ‘“‘open” G 4G, see (y).

B. (b bh brh, b,, bh,, B).

(b) S7g, Cii 18, art. 8, H bee, edd. i.e

(bh) S5g, Civ 12, c w, lips flat, not touching teeth, see (ph).

(brh) C vi 18, used by Germans to stop horses, as wo / is in England.

(b,) Ciil2, sonant of (p,), which see, theoretical.

(bh,) S 6g, sonant of (ph,), which see, theoretical.

(ps) Ciill, sonant of (Pp), which see, theoretical.

C. @9h,37, ¢ Ge cc:

(0) V12, T11, = knot, almost peculiarly £, replaced on the Continent by (0, oh, oh), which see.

(oh) V24. 8B. calls it an advanced (0), that is (0), and hears it as regular short Irish-English 0, Cockney ask, American Chicago. Sw. hears it inswp son. Sv. gives no example. E. does not know it.

(o’t) art. 7i, diphthong E fozl, by some taken as (A’2). ;

(¢) reverted (s), the under part of the point of the tongue against the palate. St.) hears it in East Norwegian bérse and also in SWD.

(gh) reverted (sh), sN. Y, the under part of the point of the tongue against the palate, but lower than for (¢) and pointing further back, see (7).

(c) buzz of (¢), theoretical.

(ch) reverted (zh), buzz of (ch), see (DJ).

D. (d dj dh dj, d, dh, d, D Dj Dh, B 4).

(d) S7c, Cii8, E doe, sonant of (t), which see.

(dj) art. 12, E judging, consonantal diphthong = (djzhj), usually assumed as (dzh), and also as sn §, for which see (gj), and AR », which Lepsius thinks was also once (gy).

(dh) S5d, Civ 10, & then, mc 6, AR 5, buzz of (th), see (dh,).

(dj) Cii6, Hungarian gyongy, pearl, art. 12.

(d) S7d, Cii9, Fdoux, tip of tongue against gums, used in some midland and northern E dialects before 7, -er.

(dh,) Civ 10, sp lid, lisped (z), retracted (dh).

(@) AR, J (daad), described by Lepsius as close emphatic (.,1), see (s, t, 2) and especially (K).

(p) Cii7, reverted or cerebral sN Z, common in south-west Eng- land, in connexion with (Rr), which see, by some taken to be retracted (d,), parent of B (d).

(Dj) a reverted consonantal diphthong = (p+¢h), heard in Wilt- shire (aRDj) ridge.

(ph) reverted (dh), under part of point of tongue against teeth, theoretical.

(0) Irish Gaelic dair, an oak, ‘‘ broad” post-aspirated sonant. The place of tip of tongue unimportant, but generally taken as dental or interdental. Essential points, tongue laterally expanded and slack, back raised, leaving a hollow ‘‘front.” Followed by a slow voice glide, resembling a preponderating E (sh) mixed with (gh). This glide, occur- ring between a sonant and a vowel, is closer at first than for an ordinary buzz and then more open. Constantly used for (dh) by Irish speakers of E. [Lecky, MS. communi- cation.]

(dj) Irish Gaelic deas, palatalized or slender (3); glide from it like preponderating (J) mixed with (z). [Lecky, MS. communication.]

E. (e ea, ¢, E, 9 oh, a, a ch, a,, g, a’0).

(e) Y 30, T 4, & net, spe, medial between F and IT close and open (¢, E), often (£) in dialectal E. B. hears it only long in E there. Sw. gives F pére, which E, hears with (EE). Sv. gives E men, G mdnner, dhre, DN tre. LLB. hears it always and only in unaccented 1T syllables.

(eA) art. 11, orinasal, F vin, conventional symbol.

(e) V 29, T 3, F dé, G ehre. B. says it is found in E always and only in the vanish (ce'j), art. 6; but E. hears the vanish from received speakers only in the pause, otherwise he fre- quently hears (ee) without vanish. Sw., Sv., and St. do not admit (ee) in E without vanish.

(rz) ViS3s1 5: _B, considers it the regular E sound in net, see (e). E hears it long in @ sprdche, F béte, rr open e. Sw. hears it in E air, Ls men, F vin (vEA). Sv. also in DN lara.

(2) V 17, T 20. E. hears it in his E nut, which B. wrote (nat) from

1 Englische Philologie – I. Die lebende Sprache, p. 42.

E.'s dictation ; many think (a,9) are used respectively in 5 accented and unaccentcd syllables where E. hears (9, v), and he is very familiar with (a) in dialects. Sv. gives 'stage G" gabe, DN normal gave, SWD gosse.

V 21. Sw. gives E bird, where E hears (a). B. heard it only in Somerset sir and Cockney penny; the whole effect of the first appears to E. due to Somerset ®, the second he does not know.

intermediate between (a) and (2), written % in Mr Elworthy's West-Somerset graminar, a very common and characteristic sound in the dialect, but difficult and strange beyond it.

V 31, T 17, F feu, pew. B. hearsit in F dd, bdt and in ts. E. hears it long in eG héhle. Sv. says the & sound is (cece), not (29), see (y).

V 35. 3B. hears it long in F peur, G schéne, &c., short in F jewne, co stécke. E. hears (a2) in schéne and (ce) in the rest. See Sv. in (y).

intermediate between (a) and (ce), a common west Somerset sound ; possibly Sv.'s ''open G i." See under (y).

V5,T21. B. hears it in E done, young, wp, twopence, where it sounds dialectal to E., who hears (9), which see.

art. 7 ix, acute inchoant diphthong.

(f, 3).

81 7, C iii 11, E fecl, lower lip against upper teeth.

a turned f,a modifier, laxly used ; see mute and sonant (kj, 23), lateral flap (1j), nasals (nj, dj) and consonant diphthongs (ty dj, TJ Dj).

(g gy gh gj gjh grh gw gwh, c ch).

S7a, C ii 3, art. 8, E gape, egg.

S 7b, Cii 5, sn ‘§, sonant of (kj), which see, and also (dj).

S 5a, Civ 3, mid e tage, buzz of (kh), which see, and also (gjh, gwh).

C ii 4, 1r la ghianda, sonant of (kj), which see, formerly common in E before (a,), as guard, garrison, now generally preserved in girl, even in the vulgar form (gjel).

Civ 4, mid G siege, buzz of (kjh), which see, confused by Germans themselves with (5), palatalized (gh).

Cvi3, AR Sean), or (gh) with the uvula slightly trilled,

frequent Dutch g, Me y before (a, 0, u) in a mild form; Lepsius takes the Ar sound to be (ch), which see.

art. 12, C ii 2, E guano, sonant of (kw), which see ; the posi- tions for (¢) and (w) are assumed at the same time.

Civ 2, c auge, fuge, sonant of (kwh), which see; labialized (gh) after (2).

C ii 1, sonant of (kK), which see, theoretical.

buzz of (G), see above under (grh).

. (hh ph, Bea).

when no letter, and, at most, some sign precedes, used for the unanalysed physem, art. 5; after a letter very laxly used asa modifier of vowels (ah oh), and consonantal hisses or buzzes (th dh sh zh kh gh), &e.

simple flatus, the (h) omitted when another letter preccdes, as in the recoil (hep‘) hap, art. 8.

the crudest voice producible, opposed to (‘h), the (h) omitted in the voiced recoil (ded’) dead, art. 8, and in (‘l, ’m, ’n, ’r) syllabic.

smack or click, art. 2, (1), the (h) is omitted after consonants showing theclicking parts, as (Kt, tjf, tj8t, tt, rt) guttural, palatal, unilateral, dental, and reverted click, see the turned numerals (g # 4 ¢ Z), which are used for brevity.

art. 5, physem (2), the AR » (haa), or ‘‘ wheeze.”

art. 5, physem (1), the ‘‘jerk” or unflated aspirate, used as post-aspirate after Indian sonants, as sN a (bHo).

jerked flatus with gradual glottid, art. 5, physem (1), the usual aspirate of Scotland and Germany, and the Indian post-aspirate after mutes, thus sN Ware (kujh, tnyh,

(puyh), usually written kh, th, ph, but not to be confused with the palaeotype (kh, th, ph).

(i ia iis, ¢ 4i, 2).

V 25, T1, short F fil (very different from & fill), loug B feel.

art. 7 iv, typical initial weak (i) diphthong, often confused with (Ja).

art. 7 vii, typical murmur diphthong with following per- missive trill.

V 26, T2, £ knit, almost peculiarly E and Icelandic, but often heard in Germany ; long & (ii) is often replaced by (zz), especially before and after ® and in singing.

art. 7 ix, typical grave inchoant diphthong.

V.27. B. hears it in G éiber, glick ; Sw. in F lune, where B. hears (y); E. inclines to (1) in Gc, but Sv. thinks differ- ently, see (y).

7

|

SrPEE C H-

J. G iJ, 3 sb). i oe (j) a modifier, symbol of palatalization, art. 12, but this simul- taneous palatal action is constantly confused with success- ive (J, i). jy art. 7 Ze to express tlie vanish of (ce, e) towards (i), ending in an approach to the consonant (J), thus (cc'j, e'j). (J) or (j) without a dot, marks a semipalatalization, the tongue being only approximated to the palatalizing position, ob- served in several Uralie languages by LLB. (3) $50, Civd, E yea. $10, Ciii5, n hew, hue (shin), hiss of (s) very close to flated ("i1), art. 4. K. (k kj kh kj kjh krh kw kwh, K Kh). (k) S8a, Ci, © cape, perfectly mute, art. 8.

(kj) S86, Ci5, sw ~, the "back" and ''front" of the tongue

brought closely into the (k) and (3) positions, forming a complete stop; the ''point" may rest against the lower guins, and had better do so to avoid the jump up to (tj) chest, with which this mute is constantly confused ; but (tz) is more like wy (kynqh) or post-aspirated (ky), which supplies the necessary hiss.

Sla, C iii 3, a dach, sp 7, see (kjh kwh).

(kj) Ci4, rr la chiave, palatalized (k), art. 12. In the 17th and 18th centuries constantly used in E before (a, x), it may be now constantly heard in

London before ow in count, called (kjz’unt), or finer (kjéunt) for (ka’unt).

(kjh) Ciii4, @ teich, palatalized (kh), confused with (sh) by German theorists, but the back of the tongue is higher for (kjh). English people confuse it with concave (sh), which it ought never to approach, though it comes near convex (shj). Either (kjh) or (kgh), the hiss of (kj), which was not dis-

tinguished from (sh), was the original sv yy, now called (sh) and confused with y, properly (gh), see under C. (krh) Cv3, aR ‘é a (kh) with the uvula slightly trilled, as in

Dutch ch ; Lepsius considers both to be (kh). (kw) Ci2, art. 12, © queen (kwiin), not (kwiin). (kwh) C iii 2, Ls guhat (kwhat), G auch, buch, art.12 labialized (kh). (k) Cil, ar G (Kaaf), the tongue greatly retracted and wedged

against the uvula. Lepsius considers the proper sound of AR; to be (a), the sonant of (k). By Syrian Moham-

medans and often by Egyptians the ; is lost or rather

becomes hamza (;), as (;aa‘la) for (Kaa‘la) said. ‘‘Em- phatic” character attaches to aR 5.56 (6 (yo is, here

written (K krh grh ¢ ds z), which Lepsius takes to have the values (¢ KH Gh .d!, .1}, .s!, .dh!) respectively; this ‘‘consists in a modification of the vowel by narrowing [the passage below] the soft palate”; these letters are called “high” by the Arabs because of this very high back of the tongue. They call the emphatic pronunciation ‘‘ thick, rough, fatty.” In fact (a) becomes (a), (0) remains, (e, i) become (8, 2,), (u) is scarcely changed. Europeans recog- nize the consonants mainly by this vowel change.

hiss of (kK), considered by Lepsius to be the proper sound of

what is here written as (krh). eet ly Iph 1h Jj 18 18h, ’1, 1 Jh, Z dh, u xh, | hj, { 1h, 2).

(1) S6c, Cviii8, art.10, © gull, tip of the tongue far behind the gums, replaced on the Continent by (1).

(j) S60. Sw. says ‘‘(1) formed in the place of (s),” and hears

it in 1T giz, sp 11, pR dh, where LLB. and E. hear (1)).

S20. B. says it is ‘‘a variety of defective s,” theoretical.

(Ih) S2c, C vii 8, flated (1), not Welsh 22. B. hears it before (t) in fe/t, as (felht). E. hears no trace of it, any more than he

; hears (‘‘e) in (wet).

(lj) Cviii6, art. 12, 17 gli, sp 7, pr 7h. LLB. and E. hear this asa palatalized © (1), not Continental (1), the palatalization having retracted the (\1).

(IS) C viii 8, voiced form or buzz of unilateral Welsh JZ, see (18h).

Cvii 8, or more conveniently (Ihh), Welsh @dad/; put tongue

in position for (1), raise the left side to touch the palate, let flatus escape by the right side. The tongue is then in the position assumed after making the unilateral click (tjSt), see (th) under H. This unilaterality is insisted on by Salesbury,! and E. was thus taught in Wales. Sw.? also insists on it. Some Welshmen do not.

(1) __& littZe, syllabic (1), the voice of the lateral flap sufficing to form a syllable when final.

(1) S6d,C viii 9, ¥ ait, the tip of the tongue against the gums, as is usual out of England.

(lh) S2d, Cvii9, flated (1), occ. F peuple.

1 Welsh Pronunciation, 1550. 2 “Spoken North Welsh,” in Trans. Philol. Soc., 1882-84, p. 418.

(2) S6a, pu guttural or ‘‘barred” 7, that is, 7 with a slanting line drawn through it. The back of tongue is raised as high as for (k). St.? finds B/ after a vowel in the same syllable half guttural; this is unknown to Englishmen.

S2a. B. calls it ‘the hiss of a water-fowl,” the hiss of (2), theoretical.

(tL) Cviii7, reverted /, the underpart of the point of the tongue

coming against the hard palate, used in conjunction with (R) in south-west England, as world (warD’L). Those who used retracted ‘(r,) say (war,d,’1,).

(th) Cvii7, flated form of (1), theoretical.

(1) Irish Gaelic ‘‘ broad ” 2, as in alt (the 2 being written singly because of the following ¢; at the end of a word it is always written 71), tongue in the same position as for (3), which see, but with the lateral emission of the Z class. [Lecky, MS. communication. }

(Ij) Irish Gaelic “slender” 2/, as in Irish Gaelic, milZ; this bears the same relation to (1) as (tj) does to (t), see (tj). [Lecky, MS. communication.]

(1) turned 1, the gradual glottid, art. 5. :

(th) an exaggerated form of the gradual glottid, art. 5, and see (ayh) under H.

(1) turned L, DN ret, glottal 7. Donders says ‘‘sing a note as deep as possible, and then try to sing a lower one, the voice will be replaced by a peculiar crackling noise,” which is (1); it is the common form of DN 7.

M. (m mh ’m, 3).

(zh)

(m) S8g, Cx18, art. 11, E mumming.

(mh) S4g, Cix 18, flated form of (m). B. hears it before mutes in place of (m), as camp (kemhp); E. does not, art. 11.

(‘m) syllabic m, B chasm (keez’m).

(w) turned m, Cvil2, & defective 7 in vewy (ven?) very, differ- ing from (brh) by having tight and flat in place of loose and round lips, with minute instead of considerable excur- sions of the te

N. (n nj nh nj, .n nh, ’n, N, 10 nj). (n) S8c, Cx8, EB no, tongue as for (t), mouth open or closed indifferently, as the tongue is an effectual stop, art. 11.

(nj) a nasalized (lj), which those take to be IT gn who assume 1T gi to be (lj), see (nj, qj).

(nh) S4e, Cix8, flated (n), used in Cumberland for initial kn, in know (nhoo). B. hears it before mutes, as in bent (bEnht) ; E. does not, see art. 11.

(nj) nasalized (dj), the tongue lies along the palate.in the same

way as for (dj), but the nasal passages are nowopen, LL). and E. hear it as palatalized E (n), not (\n), IT gn, sP #, PR nh, F gn. St.4 takes the F sound to be (qj). E. has not detected (qj) in native ¥ speakers, after long- continued express observation.

(n) S8d, Cx9, ¥F nain, tongue on gums.

84d, Cix9, flated (n), theoretical.

(n) syllabic (n), E open (oop’n).

(N) Cx7, reverted (n), tongue as for (T), SN Uf, south-west zn

in connexion with (k), as (haRN) ran.

(t) Irish Gaelic ‘‘ broad” nn, as in drant (the n not doubled because of following ¢), tongue as for (t, 3), which see, but with nasal passages open. [Lecky, MS. communica- tion.]

this bears the same relation to (1) that (tj) does to (t), Irish Gaelic ‘‘slender” nn, as in binn. [Lecky, MS. com- munication.]

O. (0 oh oa dy, 0 oh).

(0) V 8, T 12, short 17 open o, nd, long in E ore (001), which is fast degrading in London to (AA’8).

V 20. Sw. and Sy. hear (oh) and neither (0) nor (oh) in ¥ homme, which E. hears as (om), very different from E (om). B. hears (oh) in colloquial eloquence, philosophy, opinion, and American whole, in all of which E. hears (0).

art. 11, F vont, a conventional form, not to be confused with (aA).

art. 7 iii, theoretic form of G eu, see (a’y).

(0) V7, 1-13. B. hears it short in B goer, mower ; E. in poetic, following. B. hears it when long in £ always and only with the vanish (00’w), art. 6, art. 7 viii. EE. hears (00’w) in the pause, but otherwise generally (00), and (dow) is always erroneous.

V 19. B. says this is a mixture of (0) with (1) or is (0) with advanced tongue, that is, (o); he hears it in F homme (ohm), where E. hears (om), see (oh).

CE. (ce ca c’y, @ eu, &, 0 WD).

(ew) V82,T18, F veuf, G bécke. See Sv. under (y).

(ced) art. 11, orinasal F wn, chacwn, conventional symbol.

(o’y) art. 7 iii.

3 Englische Philologie: I. Die lebende Sprache, p. 74. 4 Ibid., p. 47.

(oh)

Ve

SPEHCH-3 OR Ws

Vi. B.hears it in Scotch Gaelic laogh ; it may be produced by saying (uu) and suddenly opening the mouth, see (@’u).

acute inchoant diphthong, art. 7 ix, or (uu), begun with the mouth open and without internal rounding, very common in south Lancashire and Cheshire.

V9. B. makes it the ‘‘narrow” form of (a), and the regular form of Ls wp, come; Sw. occ. Ls form.

V 22. B. hears it as the regular E sound of cr, ir, yr. Sw. hears it in the first element of how (he’w), which E. finds dialectal.

a dialectal south-west English sound of (a) through which a sound of (A, 9) seems to run, and usually appreciated as the latter.

(p ph prh, p,, phy, P).

S3g, Cil3, E peeping, perfectly mute, art. 8.

S 1g, Ciii12, Hungarian f, Mc ¢, an (f) spoken by the lips only without the teeth, mouth in position for blowing to cool, flated forin of (bh), whicli see.

Cv 13, flated form of (brh), common with babies before they can speak.

Cil2, mute of (ph), the lips closed flat to form a complete stop, theoretical.

S2g, middle of lips in contact, flatus expelled from each corner of the mouth, theoretical.

Cill, mute of (f), lower lip forming a complete stop with upper teeth, theoretical.

Q. (q qj qyh gh qj).

S8a, Cx3, E singer, finger, (g) with nasal passages open. S86, Cx5, sn ¥, nasal of the palatal series, see (kj gj).

Bopp considers it to be F gn, and Sw. hears it in F and IT gn, SP fi, PR mh, in all of which LLB. and E. hear (nj) only.

844, flated (qj), theoretical.

S4a, Cix3, flated (q). B. hears it before mutes, as sink (stqhk) ; E. does not, art. 11.

Cx4, palatalized (q), different from (qJ).

(ares Per rh, rh a el)

Cvi8, E ring, tip of tongue far behind gums, flap weak in England, strong in Scotland and Italy.

Cv 8, flated form of ®.

PL przez, tongue in position for (sh) with point flapped.

85 c, Cii 8, imperfect (d), the tongue not quite in contact, almost (zhj) ; imperfect ®, the flap being omitted, con- sidered by B. and Sw. as normal ®, a sign for flapping being added whiere a trill is used. Sv. makes Er before a vowel regularly (.r,). To E.,a born Londoner, (r,) before a vowel is very difficult to utter.

Sic, flated (r,), theoretical.

Cvi9, sp rey, 1T ré, fully trilled r with the point of the tongue advanced to the gums.

Cv9, flated (,r), occ. F nétre.

alveolar unflapped ®, see (r,), possibly the “soft” sp vr in amar, arado, breve.

Cvi3, Parisian Paris, uvular 7, art. 10 (3), resembling (grh).

Cv 8, flated (7), common as a G final 7 in the pause, and then greatly resembling a faint (krh).

C vi 2, labialized uvular ®, regular in Northumberland.

untrilled uvular (7), heard faintly between vowels in North- umberland, in very, merry (valr,z, mair,z), almost (v’at, m/’at), like IT vat, maz. ’

Cvi7, reverted or cerebral 7, the underpart of the point of the tongue brought near the palate, and, according to E.’s observations, allowed to flap, but constantly asserted to be unflapped, see (x,). Common in modern Indian, not in sN, and found in Norway and Sweden.! The charac- teristic of south of England dialectal speech, and parent of received & 7 and the vocal degeneration of 7, art. 7 vii. By some considered as greatly retracted (r,).

Civ7, unflapped variety of ®, supposed to prevail for ®, which see.

art. 7 vii, fully degencrated vocal (Rr), which may be followed permissively by a trilled or flapped ®, forming the mur- mur diphthongs,

(s sh shj sj, \s \sh, s, 8)).

Sle, Ciii 9, & seal, hissing, with a convex tongue forming a central strait, the sides being held firmly by the palate and teeth, poiut tense and unruffled, with many uncon- scious varieties.

$1/, Ciii7, © rush, tongue retracted in respect to (s), upper surface rather hollowed than convex, see (gh, shj) and oce. lips projected, as & hush (hoash®),

Ciii8, (sh) with convex tongue, tip somewhat depressed,

1 Englische Philologie: I. Die lebende Sprache, p. 4.

(sj) (\s)

(sh)

(tj)

(v)

second element in (tj=tjshj), High G s initial before p, f, as spielen, stellen, where (sh) is not admissible.

Ciii6, pu kos’, palatalized (s), art. 12.

Ciui 9, point of tongue advanced nearly to teeth. LLB. hears it in Tuscan sharp IT lo zio, usually taken as (,t,sio).

advanced (shj), tongue convex aud nearer the palate. LLB. hears it in Tuscan pece (pé‘she), and considers it the only proper sound of 17 ¢ before ¢ and 7, which is usually assumed to be (t\sh) or (,ty) ; but an Englishman’s (tJ) is quite in- telligible.

AR. (yo (saad), according to Lepsius a close emphatic s or(.s’),

see (K) and (d, #, z). Irish Gaelic ciste (kjisjtje,) treasure, s of the same series as (tj), which see. [Lecky, MS. communication.]

» {tty thidy & thy tpt wayek If):

S 3c, Ci 8, £ éoo, tip of the tongue far behind the gums, generated by reverted (T), with which it is confused by

Indians, who use their cerebral g & for E(t, d).

E chest =(tjshj), art. 12, uot to be confounded with (kj), which see,

Sid, Ciiil0, & thin, Icelandic p, Ma 0, aR &, point of tongue against back of front teeth, hiss produced by flatus escaping between tongue and teeth, not necessarily be- tween the interstices of the teeth, as Sw. says.

Ci6, Hungarian ty, palatalized (t), art. 12, sce (dj).

S3d, Ci9, F éas, usual Continental alveolar ¢, with the

tongue against gums, SN q, found in some midland and

northern E dialects before 7 or -e7, see (,d).

Ciiil0, sp z everywhere, and c before e,7, voz zopo, cecéo cinto, lisped (s), tongue against gums, and hence a retracted (th), see (dh,). LLB. hears it in 1r vizio, where it is gener- ally assumed to be (,t,s).

AR lb (faad), which Lepsius describes as a close emphatic (..d4), see (K).

Ci7, reverted or cerebral sn %, with underpart of the point

of the tongue against the palate, common in south-west E in connexion with ®, parent of received & (t).

consonantal diphthong=(r¢h), heard in Wiltshire in con- nexion with (Rk), as (€RTJ) rich.

Irish Gaelic “ broad” post-aspirated mute, as in Irish Gaelic alt, ta, ti. The place of the tip of the tongue is apparently unimportant, but it is generally assumed to be dental or interdental. The cssential points are that the tongue is laterally expanded and slack, while the back is raised, leaving a hollow in the “front.” It is followed by a slow flated glide, while the position changes to that of the vowel, resembling a greatly predominating (th) mixed with (kh). The voice is not put on till the vowel position is reached. This is constantly uscd for (th) by Ivish speakers of English. [Lecky, MS. communication.]

Irish Gaelic ‘‘slender” form of post-aspirated mute, as in ailé, of a knuckle ; the tongue is spreading and slack ; the part nearest to the palate is about an inch on the inner side of the tip, being more towards the back than in the position for (s), the ‘‘ front” being also raised ; the tip is not turned up and its position is unimportant. The glide of the post-aspiration sounds like a predominating (sh) mixed with (s), being tigliter at first and looser afterwards than the E(sh). [Lecky, MS. communication.]

. (u ta, w vh du, u,, U).

V3, T15, short & to unemphatic, ¥ pouwle, replaced by (w) inE; long Etoo. Some phonetists make the E long (uu) to be always (au) or (ww).

art.7 vi, where (ii) replaces (w), F ove (tia), oui (iti), in soz, dozgt, &c. LLB. cousiders that (s, \d), &c., are labialized, art. 12.

V 4, T14, © full, wood, woman, could, ‘‘ wide” form of (u).

V 16. B. hears it in the ‘‘colloquial” use of E awful, fissure, nature, fortwne (which E. does not understand), but says also that it is (w) with a raised tongue, and hence=(w’) Sw. hears it in sw upp, Sv. and St. in Norwegian hwska.

art. 7 ix, grave inchoant diphthong, possibly Sw.’s (ww), com- mon dialectally in Cumberland and Westmorland.

midland & vowel replacing (9, a). E. feels it to be near (01), or to be a ‘‘thickened” (w); Mr Hallam, to whom it is native, considers it to have the tongue intermediate to its position for (0, u), and the closure of the jips equal to that for (0), but made with flattened lips. In Yorkshire, Cumberland, and Westmorland it is replaced by (w), with which most received speakers confound it.

V15. Sw. hears it long in Norwegian and swp hws, wt, and says it is not far from ¥F lwne, but sce (y). St.? considers it intermediate between (u, y).

8 Tbid., p. 328.

he –

Sr EC aa

i GesA): (vy) $57,Civ11, E veal, voiced (f), easy for E, F, IT, hopeless to «, sp, AR, MG, and Hungarian. Indians use (v) with lower lip against upper teeth, but the dentality is not prominent ;

they read sN q in this fashion when not following a con- sonant; when it does, it reverts to (i) rather than to (w),

as (anustiaara), not (anuswaara). In Bengali both qq are called (b), which may be compared with sp (bh) for (b, v). (s) a turned v, regarded as an imperfect N, without the last upstroke, y, after a vowel represents F nasality,

art. 11, and used also for that of PR and modern Indian, in which the nasality seems much harsher, written like Greek 7.

W. (w wh, w wij, ’w).

(w) S5h, Civ 18, E we (wii), with which compare F vie (vii), oui (ati) and @ wie (bhii); possibly AR 9.

(wh) S14, Ciii18, E whey, which, wheel, whale, as distinct from way, witch, weal, wail; the distinction, however, is nearly obliterated by received speakers, who use (w) for both (w, wh), which is like saying veal, vale, vile for feel, fail, file ; yet they laugh at the Somersetshire pcasant for using initial (v) for (f). Some consider (wh) to be (hw), meaning (whw), and others to be (hi).

(w) a modifier to show labialization, art. 12, see (kw).

(wj) art. 12, symbol of LLB.’s presumed palato-labialization, by attempting to pronouazce (y) at the same time as a preceding consonant, as F dui, nwit, which on this hypothesis are (leeji, nji), and not (Lyi, nyt).

(w) an indefinite vowel sound approaching to (u), towards which E (00) vanishes, art. 6.

(y yl, yy y ¥): os ;

(y) V28,T16. B.and E. hear thisin F wne. Sw. thinks the F sound to be (1). Sv., speaking of the two series of vowels (1 2 ah) and (y ce eh), says what is equivalent to close c a in tiber = (2), the lips being often pressed against the teeth ; open a in hatte =(9,), somewhat more open than (a) ; close G6in schén = (ce); open 6 in bécke=(eh). Sv. also makes F u in lwne and DN y in lys = (1); F ew in pew = (2) ; sw 6 in fér = (ah), which last he believes to be the vowel nasalizedin Fw. Sw. also makes DN y in lyst = (y) and F ew in peuple = (ce)

(yi) art. 7 v, F hwile, see also (2j).

(y;) intermediate between (y, a), frequent in west Somerset and Devon, where it replaces the received long (uu) and the received diphthong (iu).

(y) V414. B. considers that & (i, 7, e e) when unaccented tend to (y), as in return, limit, Sazut Paul's, captain, there is, and regularly unaccented the. Sw. hears it as occ. E in pretty. E. has not observed this change.

(y) V413. B. hears it long in American sir. Sw.!says ‘‘the only Russian vowel which offers any special difficulty is the bl, first correctly identified by B. as (y).” Lepsius? de- scribes it as having (u)-tongne and (i)-lips, which would give (@), and not (y). Sw.* also identifies both North Welsh « and occ. y, as in swt, ty, with (y), replaced by (7) in South Wales. The pt and Bohemian y have the same sound.

Z. (z zh zhj zj, z zh, 2).

(2) S5e, Civ9, u zeal, buzz, not in sp or Indian.

(zh) S5/f, Civ 7, Edivision, F 7, St.4 says the E and F sounds are different, the F being more dental.

(zhj) Civ 8, voiced (shj), found in © (dj = djzhj).

(2j) ‘ Civ6, PL lez’, voiced (sj), palatalized (z), art. 12.

(2) Civ9, rr lo zelo, according to LLB. Usually conceived as (dz), voiced (\s), which see.

(zh) voiced (sh), which see, heard by LLB. in rr regio, usually accepted as (zh), for which the Englishman's (dj) is sufficiently intelligible.

(2) ar & (zaa). Lepsius considers this to bea close and emphatic (dh)—that is, (.dh?), see (k)—but that in some places it is incorrectly pronounced as an emphatie (.z) and in others as an emphatic (. d).

Noumerats. (Z ¢ eh7¢49,!, 45). (2) Kaffre reverted click = (r+), see (th) under H, Appleyard's q. (8) AR ¢ (gain), see art. 5 (4).

(gh) ‘‘trilled wheeze,” differing from (hk) solcly by a rattle of mucus.

(6) Hottentot bilateral palatal click, Boyce’s ge = (tjt), see (th).

(2) Kaffre dental click, Appleyard’s c = (tt), see (th).

A ., Russian Pronunciation,” in Trans. Philol. Soc., 1877-79, p. 544. .. _Die Arabischen Sprachlaute und Sclavisches y,” in Trans. Berlin Acad. Bet., 1861, p. 150.

3 “Spoken North Welsh,” in Trans. Philol. Soc., 1882-84. 4 Ibid., p. 48.

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(2) Kaffre unilateral palatal click, Appleyard’s x = (tj8t), E click to start a horse, see ({h) and (Ish).

(g) Waco (North-American Indian) guttural click = (Kt), see (th).

@) modifier, meaning properly “with raised tongue,” used laxly, see (K).

(x) modifier, meaning properly ‘‘ with lowered tongue,” used very laxly, as in (4, 1, %1, Py, by, pl,, bh,), which see.

() modifier, meaning ‘‘internally rounded” by compressing arches of palate, art. 4, as in a parrot’s puss (p*z4s).

) modifier, meaning ‘‘ with projecting lips,” compare (pus, pws, puts), and Devon (o’y,°), art. 7 iii.

omer. (, 55 237 oy.

) clear glottid, art. 5 (1).

) check glottid, ar hamza, art. 5 (8).

) suddenly stop, orabsencc of recoil inthe pause, as (:serae’wak‘), not (:seraa’wak‘),

) (1) after a vowel shows that the syllable has a secondary stress, as (nd:minee‘shen) nomination; (2) before a whole word indicates the

secondary emphasis usually shown by a capital, as (paal, :paal) pall, Paul.

(G)) before a letter shows that it is especially strongly uttered,

emphasis on a single element, as(. het, h.et, he.t) hat, hat, hat, as distinct from ‘‘at, hot, had,” see (x).

(‘) (1) after a vowel shows that the syllable containing it has the principal stress ; (2) prefixed to a word shows it to be emphatic, a substitute for italics, as (wil) kom? wil ‘hii kem?) will he come? will he come? art. 14.

(’) (1) before (h), see (’h) under H, crude voice; (2) before voiced letters, rendering the voice syllabically prominent, see (’] ’m ’n), &c.; (3) more laxly used in (j, ’w) for indefinite vowels near (i, u); (4) after sonants, voiced recoil, as (ded’) dead, art. 8.

@} (1) abbreviation for (‘h) flatus, which see under H ; (2) before voiced letters indicates whisper, art. 4; (8) after mutes, flated recoil, as (det‘) debt, not written unless it is neccs- sary to call attention to it.

(‘*) before voiced letters, reduces them to flated, as (‘‘ii), art. 4.

(.) after a vowel or consonant nasalized by partial opening of nasal passages, in Gaelic, south G, oce. American.

ACCENTS. (‘ a ou ‘ iwayy mr

(’) (1) mark of diphthongization, placed over or after stressed element, art. 7; (2) after (a) and not over it, as (a’i), dis- tinct from (4i), mark of unanalysed diphthong, art. 7.

(“) in place of (‘), mark of slurred diphthongs, art. 7.

@) (1) after a letter shows retraction, as (d, dh,), &c.; (2) (,) more retraction.

6) (1) over or after a vowel denotes medial length, often united with diphthongal (’) forming a circumflex, as (a7, 0%); (2) after a consonant shows that it is held, the position being maintained throughout even when

mute, as (det); used for the north of England definite article (t'man) the man, distinctly different from (tman, teman, etman). (,) pre- fixed to a letter means ''with tongue advanced towards the teeth," see (t d n); (8, 4) (,, \,,) more advanced, as (t) tongue point some way behind gums, (t) tongue point on gums, (,,t) tongue point on tecth, (,t) tongue point on

upper lip. . Stews. (fii +))1)

@: abridgment of (fh), which see under H.

(3) mark of trill or flap, used in transliterating B. and Sw., thus their equivalent of (1,3) = (r).

(i) symbol of inspiration, art. 2 (2).

(+) symbol of glide or speech-sound with changing position, when simple juxtaposition is insufficient, arts. 2, 8.

()) the second half of a parenthesis ()) eut at the height of a non-ascending letter, symbol of "break," showing that there is no glide between the letters juxtaposed. Thus (s+ii) is usually written (sii), but (sil) are the two letters and their sounds (s,ii) without any glide, of great use in theo- retical discussions.

()) the second half of a parenthesis placed between two letters shows that, though they belong to different words, they run on with a glide as if they belonged to the same word, very convenient in dialect writing, as (ool')d)a*mvn) old woman, usually written ole dumman by dialect writcrs ; here (') shows that (1) is held, but ()) marks that it does not run on to the (d), which, however, is shown by ()) to belong to the same word with (1), but to run on to (a) in the next word.

(.) is [cut at the height of a non-ascending letter and shows that the letter it precedes is scarcely perceptible in speech, as (:madhyijdh,) Madrid.

There are many more palaeotype letters and signs, here omitted

for brevity, but found necessary for phonetical discussions.

21. Practical Alphabets.—The above alphabetical list comprises

243 symbols, made up of 192 elements, 14 vowel diphthongs, 4 consonant diphthongs, 19 modifiers, and 11 other signs. It has been reduced to the smallest possible number suitable for giving a notion of the kind of symbolization required for universal alpha- bets. The list from which it was extracted contained double the number and was still incomplete, even so far as the writer's in- vestigations had extended. A universal alphabet would probably require a thousand cases to be provided for. It would be difficult for even the inventors to use such an alphabet, and absurd to present it for practical use. Inventors have therefore had recourse to radical signs symbolizing what they consider the principal relations and modifiers of these radicals. Some, as Briicke, Merkel, Bell, and Sweet, use entirely new characters, of which Bell's and Sweet's are intended by their shape to recall the positions of the organs of speech in uttering the sounds represented. But these writers are not agreed either as to the shape or valuc of the radicals themselves. The modifiers are very various, and when more than one modifier is required the characters become too complicated for the eye and hand to deal with them rapidly. Universal writing is still a philosopher's stone, though much has been learned in its pursuit. Palacotype is of course a mere typographical makeshift.

Fortunately writing long preceded phonetic knowledge. The number of distinct sounds in any one language seldom exceeds fifty, and practically fewer still are needed, for a native needs only a broad hint of the sound to reproduce it. The signs for English in art. 1 are rather superabundant than deficient, and the small ad- ditions of foreign signs suffice for French, German, and Italian practically, though very deficient scientifically. In fact, the modes of combining sounds in those three languages and English are so different that the alphabet has to be differently conceived for each. This is the final breakdown of universal writing. An English, German, French, and Italian reader, cach requires an alphabet founded on his own linguistic habits, and very insufficiently com- prehends any other. But even a rough appreciation for linguistic purposes is better than the thoroughly false appreciations now ewrent. To obtain a scientific foundation for erecting an

alphabet of any language which shall have scientific valuc, five stages are needed :—(1) the perfect acquisition of a series of words containing every sound used; (2) variation of each word by involving its sounds in different combinations to appreciate the effects of gliding juxtaposition ; (3) the perfect acquisition of short sentences of different characters to understand the effects of construction and emotion; (4) the study of unrestrained conversation between natives from the phonetic point of view ; (5) frequent writing from the dictation of natives and teaching others to read by the signs adopted after the first four stages are passed. How far the charac- ters should indicate the positions of the organs of speech is another point, which need not be considered at first, and can only be ac- complished with extreme roughness even at last. Thus Bell's capi- tally conceived and executed ‘‘ visible speech” requires much ex- planation to be intelligible and after all tells but little. Any signs easy to write and distinct to read without wearying the eye will suffice, provided each be furnished with a full cxplanation (much longer and more explicit than the greatly condensed explanations of art. 20) not only of its separate but its combined power, and the requisite knowledge for furnishing these cannot be obtained without much and long-continued labour. Mr Sweet's studies of Danish, Swedish, Russian, Portuguese, and North Welsh pronuncia- tion are models in their way, especially the last, but suffer from extreme conciselless. ;

The use of such phonetic studies is principally philological, a much smaller amount of precision sufficing for all the purposes of ordinary life,—understanding speech and speaking intelligibly, writing speech from dictation and reading what is written. Our scientific knowledge of speech-sounds has really only just com- menced, and is therefore extremely incomplete and confined to very few people. But what has as yet been learned is of great practical value in the reduction of unwritten dialects and languages to writ- ing, in exhibiting the actual speaking habits of existent written tongues, in divining the intention of systems of writing employed in extinct languages, and hence in historically tracing the cogna- tion and filiation of one language to another and the successive forms assumed in the gradual development of a single form of speech. These great applications of the study of speech-sounds, as well as the practical introduction of systems of spelling easier to read and write than those now found in most of Europe (including European America) and Asia, lic beyond the scope of this article,

which only aims at showing in extremely condensed terms the foundations of the theory of their combinations and some of their most important and best known forms.

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Ohr. .J.#. SPEKE, Joun Cannine (1827-1864), an eminem African explorer, who was the first European to cross Central Africa from north to south and to determine the existence and position of the great water basin from which the Nile proper issues full formed. He was born on 4th May 1827 at Jordans near Ilchester, in Somersetshire. Entering the Indian army in 1844, he served in Sir Colin Campbell’s division in the Punjab campaigns, and gradu- ally acquired no small repute both as a military officer and as a sportsman and naturalist. When on furlough Captain Speke often advanced into unexplored portions of the Himalayas, and even crossed the frontier into Tibet; but his attention was at an early date turned to the great problems not of Asiatic but of African geography, and in 1854 he commenced his brief and brilliant African career by an expedition along with Captain Burton into Somali land, the incidents of which are narrated in What led to the Discovery of the Source of the Nile (London, 1864). It was along with the same explorer that the expedition of 1857-59 was undertaken, in the course of which Captain Speke, leaving Captain Burton, unfortunately invalided, at Kazé, struck northwards and reached the shores of Lake Victoria Nyassa in the neighbourhood of a nullah, which he named Jordans after his birthplace. Convinced though he was that this lake belonged to the Nile system, he had no absolute proof to offer to the scepticism of his fellow-traveller and many stay-at-home geographers, until in 1863 he returned from another expedition along with Captain James Augustus Grant, in which he struck the Nile at its exit from the lake, and proved its identity with the river of Egypt by following it most of the way down. Captain Speke was expected to hold a public discussion with Captain Burton as to certain disputed points in the history of his discoveries at the British Association in Bath (1864); but on the very morning (15th September)

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fixed for the tournament he was killed by the accidental discharge of his own gun as he was crossing a fence while out shooting.

See Speke, Journal of the Discovery of the Source of the Nile, 2 vols., 1863; J. A. Grant, 4 Walk across Africa, 1864.

SPENCER, Joun CHARLES SPENCER, THIRD Hart (1782- 1845), better known by his courtesy title of Lord Althorp, had the good fortune to be acquainted, through his father's official position in the ministries of Pitt and Grenville, with both Pitt and Fox, and to be the confidential ally, through his own sound judgment and political honesty, of the leaders of the Whig party immediately before and after the Reform Bill of 1832. His father, the second earl, was well versed in books. His mother, the eldest daughter of Lord Lucan, was conspicuous in London society for her gaiety and brightness. Their eldest son, John Charles, was born at Spencer House, London, on 30th May 1782, and sent to Harrow for his education when less than eight years old. At school he was chiefly remarkable for his love of sports and for a shyness which accompanied him throughout life, but fortunately did not prevent him whilst at Harrow from forming two or three acquaintances which proved useful in parliamentary life. In January 1800 he took up his residence at Trinity College, Cambridge, and for some time applied himself energetically to mathematical studies; but during the last year of his life at college he surrendered himself a captive to the pleasures of hunting and racing. Almost immedi- ately after taking the degree of M.A., in June 1802, he set out on a Continental tour, which was cut short, after he had passed some months in the chief cities of Italy, by the renewal of war. Through the influence of Pitt's Government he was returned to parliament for the borough of Okehampton in Devonshire in April 1804, and, although he vacated his seat in February 1806 to contest the uni- versity of Cambridge against Lord Henry Petty and Lord Palmerston (when he was hopelessly beaten), he was re- clected in the same nonth for Okehampton, and rewarded with the emoluments of a lord of the treasury. At the general election in November 1806 the freeholders of Northamptonshire selected him as their representative, and he continued to sit for the county until he succeeded to the peerage. His tastes were then, as ever, for country life, but his indignation at the duke of York's conduct at the Horse Guards led him to move a resolution of the House of Commons

in 1809 for the duke's removal from his post. For the next few years after this speech Lord Althorp occasionally spoke in debate and always on the side of Liberalism, but from 1813 to 1818 he rarely entered the doors of the House of Commons. His absence was partly due to a feeling that it was hopeless to struggle against the will of the Tory ministry, but more particularly to his marriage on 14th April 1814 to Esther, only daughter of Richard Acklom of Wiseton Hall, Notting- hamshire. In 1819, on his return to political life after the death of his wife, and for many years after that date, he pressed upon the attention of the House the necessity of establishing a more efficient bankruptcy court, and of expediting the recovery of small debts; and, although his name is not associated with the attainment of either of these objects, he saw both accomplished before 1825. During the greater part of the reign of George IV. the Whigs lost their legitimate influence in the state from their want of cohesion, but this defect was soon remedied when Lord Althorp was chosen their leader in the Lower House, and his capacity for the position was proved by experience. When Lord Grey's administration was formed at the close of 1830 the chancellorship of the exchequer combined with the leadership of the House of Commons Was naturally entrusted to Lord Althorp, and to him more

aol than to any other man, with the exception of the prime minister and the lord chancellor, may be attributed the success of the Government measures. The budget, it is true, was a failure, but this misfortune was soon forgotten in the struggles over the Reform Bill. The consideration of the preliminaries of this measure was assigned to four ministers, two in the cabinet and two outside that body ; but their proposals were, after careful examination, approved or rejected by Lord Grey and Lord Althorp before they were brought under the notice of the cabinet. When the Bill was ready for introduction to the House of Commons its principles were expounded by Lord John Russell ; but from the commencement of the protracted discussion over its details he had the assistance of Lord Althorp, and after some weeks of incessant toil, which the physique of Lord John Russell could not sustain any longer, the whole responsibility was cast on Lord Althorp. To combat the objections of three such pertinacious oppo- nents as Croker, Sugden, and Wetherell required both skill and courage, and in Lord Althorp these qualities were found. He was constantly on his legs, and on one evening he made as many as twenty speeches. The Reform Bill was

carried at last, and popular instinct was right in assigning to the leader of the House a credit only second to that earned by Lord John Russell. After the dissolution the Whigs returned to power with augmented numbers ; but differences soon showed themselves ainong both leaders and followers, and their majority crumbled away. Their position was strengthened for a time by triumphantly carrying a new poor law Bill ; and even their keenest critics would now allow that, had the Whig propositions on tithes and church-rates been carried into effect, many years of passionate controversy would have been spared. The ministry of Lord Grey was shattered to pieces by difficulties over an Irish coercion Bill,.in which O'Connell thought that he had been unfairly treated. Although Lord Melbourne became premier (14th July 1834), the fortunes of the ministry rested on Lord Althorp's presence in the House of Commons. 'The death of Lord Spencer on 10th November 1834 called his son to the Upper Hause, and William IV. took advantage of this event to summon a Tory cabinet to his side. The new Lord Spencer abandoned the cares of office and returned to country life with un- alloyed delight. Often as he was urged by his political friends to come to their assistance, he rarely quitted the peaceful pleasures which he loved. He died at Wiseton on Ist October 1845. The Whigs required, to carry the Reform Bill, a leader of unstained character, one to whom party spirit could not attach the suspicion of greed of office, and against Lord Althorp malevolence was powerless. No stronger proof of his pre-eminence could be given than the oft-quoted saying of Lord Hardinge that one of Croker's ablest speeches was demolished by the simple statement of Lord Althorp that he had collected some figures which entirely refuted it, but had lost them. The trust which the House put in him then was never wanting.

SPENER, Puttrpp Jaxon (1635-1705), "the father of Pietism," was born 13th January 1635, at Rappoltsweiler in Upper Alsace. He received his earliest education from his subsequent brother-in-law, Joachim Stoll, chaplain to the count of Rappoltstein, whose wife was Spener's god-mother. Aftera brief stay in the grammar-school of Colmar he entered the university of Strasburg in 1651 as a student of theology,—living there with an uncle, and holding quite aloof from the student-life of the place. He devoted him- self to philology, history, and philosophy, and won his degree of master (1653) by a disputation against the phi- losophy of Hobbes. He then became private tutor to the princes Christian and Charles of the

Palatinate, and lectured in the university on philology and history. From 1659 to

oon

1662 he visited the universities of Basel, Tiibingen, and Geneva, and commenced the study of heraldry, which he pursued throughout his life. In Geneva especially his religious views and tendencies were turned in the direction of his subsequent Pietism. He returned to Strasburg in 1663, where he was appointed preacher without pastoral duties, with the right of holding lectures in the university. Three years afterwards he was invited to become the chief pastor in the Lutheran church at Frankfort-on-the-Main. He had previously married a lady of his mother's choice, who made him-an excellent wife and bore him eleven children. Immediately after his removal to Frankfort he commenced that line of pastoral work which issued in the movement called Pretism (g.v.). In 1686 he accepted the invitation to the first court chaplaincy at Dresden. But the elector John George III., at whose personal desire the post had been offered to him, was soon offended at the fearless conscientiousness with which his chaplain sought to dis- charge his pastoral duties ; and the opposition of the Saxon university of Leipsic to the Pietistic movement and to Spener personally served to render the chaplain more de- cidedly a persona ingrata to tlre elector. Spener refused to resign his post, and the Saxon Government hesitated to dismiss him. But in 1691 the Saxon representative at Berlin induced the court of Brandenburg to offer him the rectorship of St Nicolas in Berlin with the title of "con- sistorialrath." In Berlin Spener was held in high honour, though the tendencies of the court and the Government officials were rather rationalistic than pietistic. One of the most important works of this period of his life was the foundation of the university of Halle (1691), which he directed. All his life long Spener had been exposed to the incessant attacks and abuse of the orthodox Lutheran theologians, who generally charged him with the errors in doctrine and extravagances in practice of followers who had borrowed from him everything rather than his wisdom and caution. With his years his opponents multiplied, and the movement which he had inaugurated presented increasingly matter for hostile criticism. In 1695 the theological faculty of Wittenberg formally laid to his charge 264 errors, and only his death (5th February 1705) released him from these fierce conflicts.

Though Spener has been justly called “ the father of Pietism,” hardly any of the errors and none of the extravagances of the movement can be ascribed to him personally. So far was he from sharing them that Ritschl maintains (ii. p. 163) that “ he was him- self not a Pietist,” as he did not advocate the quietistic, legalistic, and semi-separatist practices of Pietism, though they were more or less involved in the positions he assumed or the practices which he encouraged or connived at. The only two points on which he departed from the orthodox Lutheran faith of his day were the requirement of regeneration as the sine gua non of the true theo- logian, and the expectation of the conversion of the Jews and the fall of Papacy as the prelude of the triumph of the church. He did not, like the later Pietists, insist on the necessity of a conscious crisis of conversion, nor did he encourage a complete breach be- tween the Christian and the secular life.

Spener was a voluminous writer. The list of his published works comprises 7 vols. folio, 63 quarto, 7 octavo, 46 duodecimo ; and in one year he had answered 622 and had still to answer 300 letters. The most important of his works for their bearing on his history are Theologisehe Bedenken, in 4 parts, Halle, 1700-1702 ; Letztc theologische Bedenken, with a life of Spener by Canstein, Halle, 1711; Coneilia et judicia theologica Latina (posthumous), Frank- fort, 1709.

See Hossbach, Philipp Jakob Spener und seine Zeit (Berlin, 1828, 2d ed. 1853, 81 ed. 1861); Tholuck, in Herzog-Plitt’s Real-Encyklopddie (2d ed., vol. xiv.); Gass, Protestantische Dogmatik (Berlin, 1857); Ritschl, Gesch. des Pietismus, ii.

. 97, sq. (Bonn, 1884); and Sachsse, Ursprung und Wesen des Pietismus (Wies-

agen, 1884).

_ SPENNYMOOR, a market town of Durham, England, is situated on the Ferryhill and Bishop Auckland branch of the North-Eastern Railway, 34 miles north-west of Ferry- hill and 6 south of Durham by road. Within recent years it has increased with great rapidity owing to the production of coal and iron, and in 1865 it was formed into a market

town under a local board of health. It possesses a town- hall, a mechanics' institute and reading room, and two market halls. A school board was formed in 1875. The population of the urban sanitary district (area 176 acres) in 1871 was 4627, and in 1881 it was 5917.

SPENSER, Epmunp (c. 1552-1599), Elizabethan poet, was born in London about the year 1552. The received date of his birth rests on a passage in sonnet Ix. of the Amoretti. He speaks there of having lived forty-one years; the Amoretti was published in 1595, and described on the title-page as "written not long since"; this would make the year of his birth 1552 or 1553. We know from the Prothalamion that London was his birthplace. This at least seems the most natural interpretation of the words—

'* Merry London, ny most kindly nurse, That to me gave this life's first native source."

It would appear from a recent discovery by Mr R. B. Knowles! that the relationship of the poet to the noble family of Spencer, if it existed at all—and official names such as Spenser (Dispenser) or Stewart (Steward) carry no proof of consanguinity—was remote, and that the poet's kinsmen must be sought among the humbler Spensers of north-east Lancashire. Robert Nowell, a London citizen, left a sum of money to be distributed in various charities, and in the account-books of his executors Mr Knowles has discovered among the names of other beneficiaries "Edmund Spensore, scholar of the Merchant Taylor School, at his going to Pembroke Hall in Cambridge." The date of this benefaction is 28th April 1569. As the poet is known to have been a sizar of Pembroke, the identification is beyond dispute. Till this discovery it was not known where Spenser received his school education. The speculations as to the poet's parentage started by the Nowell-MS. are naturally more uncertain. Mr Knowles found three Spensers in the books of the Merchant Taylors, and concluded that the poorest of them, John Spenser, a "free journeyman" in the "art or mystery of clothmaking," might have been the poet's father, but he afterwards abandoned this theory. Mr Grosart, however, adheres to it, and gives a confident solution of Mr Knowles's difficulties. Nothing approaching certainty can be reached on the point, which is not itself of much

importance. The connexion of Spenser with Lan- cashire is also supported by the Nowell MS. Several Spensers of that county appear among the “poor kins- folk” who profited by Nowell’s bounty.

It is natural that a poet so steeped in poetry as Spenser should show his faculty at a very early age; and there is strong reason to believe that verses from his pen were published just as he left school at the age of sixteen or seventeen. Certain pieces, translations from Du Bellay and Petrarch, afterwards included in a volume of poems by Spenser published in 1591, are found in a miscellany, Theatre for Worldings, issued by a Flemish Protestant refugee, John van der Noodt, on the 25th of May 1569. The translations from Du Bellay appear in blank verse in the miscellany, and are rhymed in sonnet form in the later publication, but the diction is substantially the same ; the translations from Petrarch are republished with slight variations. Poets were so careless of their rights in those days and publishers took such liberties that we cannot draw for certain the conclusion that would be inevitable if the facts were of more modern date ; but the probabilities are that these passages in Van der Noodt’s Theatre, although the editor makes no acknowledgment, were contributed by the schoolboy Spenser. As the exercises of a schoolboy writing before our poetic diction was enriched by the great Elizabethans, they are remarkable for a sustained command of expression which many schoolboys might ex-

1 See The Spending of the Money of Robert Nowell, privately printed, 1877.

hibit in translation now, but which was a rarer and more significant accomplishment when Surrey and Sackville were the highest models in post-Chaucerian English.

Little is known of Spenser’s Cambridge career, except that he was a sizar of Pembroke Hall, took his bachelor’s degree in 1572, his master’s in 1576, and left Cambridge without having obtained a fellowship. Mr Grosart’s inquiries have elicited the fact that his health was not good,—college

allowances while he was in residence being often paid “Spenser zgrotanti.” One of the fellows of Pembroke strongly influenced his destiny. This was Gabriel Harvey, a prominent figure in the university life of the time, an enthusiastic educationist, vigorous, versa- tile, not a little vain of his own culture and literary powers, which had gained him a certain standing in London society. The revival and advancement of English literature was a passion of the time, and Harvey was fully possessed by it. His fancy for reforming English verse by discarding rhyme and substituting unrhymed classical metres, and the tone of his controversy with Thomas Nash, have caused him to be regarded as merely an obstreperous and pragmatic pedant; but it is clear that Spenser, who had sense enough not to be led astray by his eccentricities, received active and generous help from him and probably not a little literary stimulus. Harvey’s letters to Spenser! throw a very kindly light on his character.

Three years after leaving Cambridge, in 1579, Spenser issued his first volume of poetry, the Shepherd’s Calendar. Where and how he spent the interval have formed subjects for elaborate speculation. ‘That most of it was spent in the study of his art we may take for granted. That he lived for a time in the “north parts” of England; that there or elsewhere he fell in love with a lady whom he celebrates under the anagram of “Rosalind”; that his friend Harvey urged him to return south, and introduced him to Sir Philip Sidney ; that Sidney took to him, dis- cussed poetry with him, introduced him at court, put him in the way of preferment,—are ascertained facts in his personal history. Mr Grosart conjectures with consider- able plausibility that he was in Ireland in 1577 in the service of Sir Henry Sidney, Philip’s father, and returned to England with that administrator in 1578.

The interest of the Shepherd’s Calendar is mainly personal to Spenser. Its twelve poems continue to be read chiefly becausc they were the first published essays of the author of the Faery Queen, the poems in which he tried and disciplined his powers. They mark no stage in the history of pastoral poetry. Spenser had too strong a genius not to make his own individuality felt in any form that he attempted, and his buoyant dexterity in handling various schemes of verse must always afford dclight to the con- noisseur in such things. Buta reader not already interested in Spenser, or not already familiar with the artificial eclogue, would find little to attract him in

the Shepherd's Calendar. The poems need a special education ; given this, they are felt to be full of charm and power, a fresh and vivid spring to the splendid summer of the Faery Queen. The diction is a studiously archaic artificial compound, partly Chaucerian, partly North Anglian, partly factitious; and the pastoral scenery is such as may be found in any eountry where there are sheep, hills, trees, shrubs, toadstools, and running streams. That Spenser, having been in the north of England, should have introduced here and therc a touch of north eountry colour is natural enough, but it is not sufficient to give a character to the pocms as pastoral poems. As such they follow eontinuously and do not violently break away from Latin, Italian, and French predecessors, and Mr George Saintsbury is undoubtedly right in indicating Marot as the most immediate model. At the same time one can quite understand on historical grounds why the Shepherd's Calendar was hailed with enthusiasm as the advent of a "new poct." Not only was it a complete work in a form then new to English literature, but the execution showed the hand of a master. 'There had been nothing so finished, so sustained, so masterful in grasp, so brilliant in metre and phrase, since Chaucer. It was felt at once that the poct for whom the age had been waiting had come. The little coterie of friends whose admiration the young poet had won in private were evidently concerned lest the wider

1 Letter-Book of Gabriel Harvey, Camden Society.

public should be bewildered and repelled by the unfamiliar pastoral form and rustic diction. To put the public at the right point of view the poems were published with a commentary by ''E. K.,"— supposed to be one Edward Kirke, who was an undergraduate with Spenser at Pembroke. This so-called ''glosse" explained the archaic words, revealed the poet's intentions, and boasted that, as in the case of Virgil, the pastoral poetry of the ''new poct" was but ''a proving of the wings for higher and wider flights." The '*new poct's" name was withheld ; and the identification of the various ''shepherds''—of Cuddie and Roffy and Diggon Davie, and the beauteous golden-haired " widow's daughter of the glen "— was fortunately reserved to yield delight to the ingenious curiosity of a later age."

The Shepherd's Calendar was published at Gabriel Harvey's instance, and was dedicated to Sir Philip Sidney. It was one out of many poetical schemes on which the young poet was busy in the flush of conscious power and high hopes excited by the admiration of the literary authorities whose approval was then most to be coveted. His letters to Harvey and Harvey's letters to him fur- nish hints for a very engaging fancy picture of Spenser at this stage of his life,—looking at the world through rose-coloured spectacles, high in favour with Sidney and Leicester, dating his letters from Leicester House, gaily and energetically discussing the technicalities of his art, with some provision fron: his powerful friends—certain, but the form of it delightfully uncertain, —going to court in the train of Leicester, growing pointed beard and mustachios of fasliionable shape, and frightening his ever-vigilant friend and mentor Harvey by the light courtier-like tone of his references to women. The studious pastoral poet from 'north parts'' had blossomed with surprising rapidity in the image of the gay fortune-seeking adventurers who crowded the court of the virgin queen in those stirring times. Some of the poems which he mentions to Harvey as then completed or on the anvil—his Dreams, his Nine Comedies, his Dying Pelican, and his Stemmata Dudleiana (singing the praises of the noble family which was be- friending him)—have not been preserved, at least in any form that can be certainly identified. He had sent Harvey a portion of the Faery Queen, which he was eager to continue ; but Harvey did not think much of it—a judgment for which Harvey is often ridiculed as a dull pedant, as if we knew for certain that what was submitted to him was identical with what was published ten years later.

Spenser was appointed secretary to the lord-deputy of Ireland in 1580, and was one of the band of adventurers who, with mixed motives of love of excitement, patriotism, piety, and hopes of forfeited estates, accompanied Lord Arthur Grey of Wilton to Ireland to aid in the suppression of Desmond's rebellion. Regret is sometimes expressed that the author of the Faery Queen, who ought to have been dreamy, meditative, gentle, and refined, should have been found in sucli company, and should have taken part in the violent and bloody scenes of Lord Grey's two years' attempt at ''pacification." But such things must be judged with reference to the circumstances and the spirit of the time, and it must be remembered that England was then engaged in a fierce struggle for existence against the

Catholic powers of the Continent. Of Lord Grey's character his secretary was an enthusiastic admirer, ex- hibiting him in the Faery Queen as Arthegal, the personi- fication of justice; and we know exactly what were his own views of Irish policy, and how strongly he deplored that Lord Grey was not permitted to carry them out. Spenser's View of the State of Ireland, drawn up after fourteen years' experience, is not the work of a gentle dreamer, but of an energetic and shrewd public official.

The View is nota descriptive work ; there is nothing in the style to indicate that it was written by a poet; it is an elaborate state paper, the exposition in the form of a dialoguc of a minutely considered plan for the pacification of Ircland, written out of zeal for the public service for the eyes of the Government of the day. A very thoroughgoing plan it is. After passing in review the history and character of the Irish, their laws, customs, religion, habits of life, armour, dress, social institutions, and finding “evil usages” in every department, he propounds his plan of “ reforma- tion.” Reformation can be effected only by the sword, by the strong hand. The interlocutor in the dialogue holds up his hands in horror. Does he propose extermination? By no means; but he would give the Irish a choice between submission and exter- mination. The Government had vacillated too long, and, fearing the cost of a thorough operation, had spent twice as much without

2 See Mr Grosart’s Complete Works of Spenser, vol. i. XXIT. — 50

in any way mending matters. Let them send into Ireland 10,000 foot and 1000 horse, disperse them in garrisons—a complete scheme of localities is submitted,—give the Irish twenty days to come in ; if they did not come in then, give no quarter afterwards, but hunt them down like wild beasts in the winter time when the covert is thin; ‘‘if they be well followed one winter, ye shall have little work to do with them the next summer”; famine would complete the work of the sword; and in eighteen months’ time peace would be restored and the ground cleared for plantation by English colonists. There must be no flinching in the execution of this plan, —‘‘no remorse or drawing back for the sight of any such rueful object as must thereupon follow, nor for compassion of their calamities, seeing that by no other means it is possible to recover them, and that these are not of will but of very urgent necessity.” The Government had out of foolish compassion drawn back before when Lord Grey had brought the recalcitrant Irish to the necessary extremity of famine ; the gentle poet warns them carnestly against a repetition of the blunder.

Such was Spenser’s plan for the pacification of Ireland, propounded not on his own authority, but as having support in “the consultations and actions of

very wise governors and counsellors, whom he had sometimes heard treat thereof.” He knew that it was “bloody and cruel”; but he contended passionately that it was necessary for the maintenance of English power and the Protestant religion. Commentary on the plan, which has been so much and so warmly discussed, would be out of place here. The method was repugnant to the kindly nature of aver- age Englishmen ; from the time of Lord Grey no English authority had the heart to go through with it till another remorseless zealot appeared in the person of Cromwell. That Cromwell knew the treatise of “the sage and serious Spenser,” perhaps through Milton, is probable from the fact that the poet’s Irish estates were secured to his grandson by the Protector’s intervention in 1657. These estates had been granted to Spenser as his share in the redistribution of Munster,—3000 acres of land and Kilcol- man castle, an ancient seat of the Desmonds, in the north of the county of Cork. The elaborate and business-like character of the View shows that the poet was no sinecur- ist, but received his reward for substantial political ser- vices. He ceased to be secretary to the lord-deputy when Lord Grey was recalled in 1582; but he continued in the public service, and in 1586 was promoted to the onerous position of clerk to the council of Munster.

Amidst all the distractions of his public life in Ireland, Spenser seems to have proceeded steadily with the com- position of the Maery Queen, translating his varied ex- perience of men and affairs into the picturesque forms of his allegory, and expressing through them his conception of the immutable principles that ought to regulate human conduct. He had, as we have seen, conceived a work of the kind and made a beginning before he left England. The conception must have been very much deepened and widened and in every way enriched by his intimate daily contact with the actual struggle of conflicting individuals and interests and policies in a great crisis. Some four or five years later, being asked in a mixed company of English officials in Ireland (as recorded in Lodowick Bryskett’s Discourse of Cwil Life) to give offhand a short sketch of “the ethical part of moral philosophy” and the practical uses of the study, Spenser explained to these simple- minded men that the subject was too intricate for an im- promptu exposition, but that he had in hand a work called the Laery Queen in which an ethical system would be ex- hibited inaction. The respect paid by his official brethren to Spenser as a man, “not only perfect in the Greek tongue,

but also very well read in philosophy, both moral and natural," is an interesting item in his biography. Some years later still, when Spenser was settled at Kil- colman castle, Sir Walter Raleigh found him with three books of the Maery Queen completed, and urged him to come with them to London. London accordingly he re-

visited in 1589, after nine years' absence. There is a very pretty record of this visit in Colin Clout's Come Home Again, published in 1595, but written in 1591, immediately after his return to Kilcolman. The incidents of the visit, by that time matters of wistful memory, are imaged as a shepherd's excursion from his quiet pastoral life into the great world. Colin Clout calls round him once again the masked figures of the Shepherd's Calendar, and describes to them what he saw, how he fared, and whom he met at the court of Cynthia, and how through the influence of "the Shepherd of the Ocean" he was admitted at timely hours to play on his oaten pipe in the great queen's presence.

How much is pure fiction and how much veiled fact in this picture cannot now be distinguished, but it is un- doubted that Spenser, though his chief patrons Leicester and Sidney were now dead, was very graciously received by the great world on his return to London. Not only did the queen grant him an audience, but many ladies of the court, several of whom he afterwards honoured with dedications, honoured him with their patronage. The first three books of the Faery Queen, which were entered at Stationers' Hall on the lst December 1589, were pub- lished in 1590, and he was proclaimed at once with re- markable unanimity by all the writers of the time as the first of living poets.

From the first week of its publication the literary world has con- tinued unanimous about the Faery Queen, except on minor points. None of our great poets has been welcomed with such universal acclaim and upheld without loss of favour through so many changes of fashion. When romanticism was at its lowest cbb Pope read Spenser in his old age with as much delight asin his boyhood. He speaks himself of having had his detractors, of having suffered from the venomous tooth of the Blatant Beast, and he sceims to have had in more than ordinary share the poet's

sensitiveness to criticism ; but the detractors or indifferentists have generally been found among men who, like the lord high treasurer Burghley, have no liking for poetry of any kind. The secret of Spenser's enduring popularity with poets and lovers of poetry lies specially in this that he excels in the poet's peculiar gift, the instinct for verbal music. Shakespeare, or the author of the sonnet usually assigned to him, felt and expressed this when he drew the parallel between 'music and sweet poetry "—

'* Thou lovest to hear the sweet melodious sound

That Phebus' lute, the queen of music, makes ;

And I in deep delight am chiefly drowned

Whenas himself to singing he betakes." This is an early word in criticism of Spenser, and it is the last word about his prime and unquestionable excellence,—a word in which all critics must agree. Whether he had imagination in the highest degree or only luxuriant fancy, and whether he could tell a story in the highest epic manner or only put together a richly varied scries of picturesque incidents, are disputable points; but about the enchantment of his verse there can be no difference of opinion. It matters not in the least that he gains his melody often by archaic affectations, licences of diction that should make Dr Richard Morris '' stare and gasp"; there, however purchased, the marvellously rich music is. In judging of the structure of the Faery Queen we must always remember that, long and diffuse as it is, what we have is but a fragment of the poet's design, and that the narrative is regulated by an allegorical purpose ; but, however intricate, however confuscd, the reader may feel the succession of incidents to be, when he studies the succession of incidents, it is only at the call of duty that he is likely to occupy himself with such a study in reading Spenscr. ;

The ethical value of the allegory has been very variously esti- mated. The world would probably never have divined that there was any allegory if he had not himself drawn attention to it ina prose dedication and in doggerel headings to the cantos, It was apparently at his friend Ralcigh's suggestion that the poet conde- scended to explain his ethical purpose ; otherwise it would have been as problematical as the similar intention in the case of the

Idyls of the King before that intention was cxpressly declared. It is almost to be regretted, as far as the allegory is concerned, that the friendly ‘‘K. K.” was not employed to furnish a ‘‘glosse” to the Faery Queen as he had done to the Shepherd’s Calendar. Un- doubtedly the peculiar “‘ poetic luxury” of the Faery Queen can be enjoyed without any reference to the allegory; even Professor Dowden, the most eloquent champion of Spenser’s claims as a ‘*teacher,” admits that it isa mistake to look for minute corre- spondence between outward syinbol and underlying sense, and that the poet is least enjoyable where he is most ingenious. Still the

allegory governs the structure of the poem, and Spenser himself attached great importance to it as determining his position among poets. The ethical purpose is distinctive of the poem as a whole ; it was foremost in Spenser’s mind when he conceived the scheme of the poem, and present with him as he built up and articulated the skeleton ; it was in this respect that he claimed to have ‘‘ over- passed” his avowed models Ariosto and Tasso. If we wish to get an idea of Spenser’s imaginative force and abundance, or to see his creations as he saw them, we must not neglect the allegory. It is obvious from all that he says of his own work that in his eyes the ethical meaning not only heightened the interest of the marvellously rich pageant of heroes and heroines, enchanters and monsters, but was the one thing that redeemed it from romantic commonplace. For the right appreciation of many of the characters and incidents a knowledge of the allegory is indispensable. For example, the slaughter of Error by the Red Cross knight would be merely dis- gusting but for its symbolic character ; the iron Talus and his iron flail is a revolting and brutally cruel monster if he is not regarded as an image of the executioner of righteous law ; the Blatant Beast, a purely grotesque and ridiculous monster to outward view, ac- quires a serious interest when he is known to be an impersonation of malignant detraction.

After the publication of the Faery Queen Spenser seems to have remained in London for more than a year, to enjoy his triumph. It might be supposed, from what he makes the Shepherd of the Ocean say in urging Colin Clout to quit his banishment in Ireland, that Raleigh had encour- aged him to expect

some permanent provision in London. If he had any such hopes they were disappointed. The thrifty queen granted him a pension of £50, which was paid in February 1591, but nothing further was done for him. Colin Clout's explanation that the selfish scrambling and intriguing of court life were not suited to a lowly shepherd swain, and that he returned to country life with relief, may be pastoral convention, or it may have been an expression of the poet's real feelings on his return to Kaleolman, although as a matter of fact there seems to have been as much scrambling for good things in Munster asin London. Certain it is that he did return to Kilcol- man in the course of the year 1591, having probably first arranged for the publication of Daphnaida and Com- plaints. Daphnaida is a pastoral elegy on the death of the niece of the mistress of the robes. The fact implied in the dedication that he was not personally known to the lady has more than once provoked the solemn remark that the poet's grief was assumed. Of course it was assumed ; and it is hardly less obvious that sincerity of personal emotion, so far from being a merit in the artificial forms of pastoral poetry, the essence of which lies in its dreamy remoteness from real life, would be a blemish and a discord. Any suggestion of the poet's real personality breaks the charm; once raise the question of the poet's personal sincerity and the pastoral poem may at once be thrown aside. The remark applies to all Spenser's minor poetry, including his love-sonnets ; the reader who raises the question whether Spenser really loved his mistress may have a talent for disputation but none for the full enjoyment of hyperbolical poetry. Complaints, also pub- lished in 1591, is a miscellaneous collection of poems Written at different periods. The volume contained Zhe Ruins of Time; The Tears of the Muses; Virgil's Gnat; Mother Hubbard's Tale ; The Ruins of Rome; Muiopotmos ; Visions of the World's Vanity ; Bellay's Visions ; Petrarch's Visions. Some of these pieces are translations already alluded to and interesting only as the exercises of one of our greatest masters of melodious verse ; but two of them, The Tears of the Muses and Mother Hubbard's Tale, have greater intrinsic interest. The first is the complaint of the decay of learning alluded to in Midsummer Night's Dream, v. 1, 52—

'The thrice three Muses mourning for the death Of Learning late deceased in beggary." The lament, at a time when the Elizabethan drama was "mewing its mighty youth," was not so happy as sone

of Spenser’s political prophecies in his View of Ireland; but it is idle work to try to trace the undercurrents and personal allusions in such an occasional pamphlet. Jother Hubbards Tale, a fable in Chaucerian couplets, shows a keenness of satiric force not to be paralleled in any other of Spenser’s writings, and suggests that he left the court in a mood very different from Colin Clout’s.

Spenser returned to London probably in 1595. He had married in the interval a lady whose Christian name was Elizabeth,—Mr Grosart says Elizabeth Boyle. The mar- riage, celebrated on the 11th of June 1594, was followed by a rapid succession of publications. The first was a volume (entered at Stationers’ Hall, 19th November 1594, published 1595) containing the Amoretti, a series of ex- quisite sonnets commemorative of the moods and incidents of his courtship, and the magnificent Epithalamion, in- comparably the finest of his minor poems. As in the case of the Complaints, the publisher for obvious reasons issued this volume nominally without his authority. Colin Clout’s Come Home Again was published in the same year, with a dedication to Sir Walter Raleigh, dated 1591. Early in 1596 the second three books of the Faery Queen were entered in the register of Stationers’ Hall; and in the course of the same year were published his Your Hymns, his Prothalamion, and his Astrophel, a pastoral lament for Sir Philip Sidney, which he dedicated to the countess of Essex.

That Spenser wrote more of the Faery Queen during the last two years of his life, and that the MS. perished in the sack of Kilcolman castle by the rebels, nay plausibly be conjectured, but cannot be ascertained. During those years he would seem to have been largely occupied with political and personal cares. He describes himself in the Prothalamion as a disappointed suitor at court. He drew up his View of Ireland in 1596 when he was in London, and from various circumstances it is evident that he had hopes of some kind from the favour of Essex. The View, with its urgent entreaty that Essex should be sent to Ire- land, was entered at Stationers’ Hall in April 1598, but he did not obtain leave to publish it. Burghley, who had long stood in his way, died in August of that year, and next month Spenser was appointed sheriff of Cork. In October Tyrone’s rebellion broke out, and

Spenser’s house was sacked and burned. The poet himself escaped, and in December was sent to London with despatches. Again he ventured to urge upon the queen his plan for the thorough “reformation” of Ireland. But his own end was near. On 16th January 1599 he died at Westminster, ruined in fortune, if not heart-broken, and was buried in Westminster Abbey, near his master Chaucer.

There have been many editions of Spenser’s works. The most available and complete is the Globe edition, with a carefully edited text by Dr R. Morris, and a memoir by Professor J. W. Hales. Mr Grosart’s edition, with its kecnly argumentative biography and copious collection of variorum researches and critical opinions, is printed for private circulation. (W. M.)

SPERMACETI is a solid waxy body found in special cavities in the head of the sperm whale (Physeter macro- cephalus), where it is held in solution by sperm oil while the creature is in life. At a temperature of about 6° C. the solid matter separates in a crystalline condition, and when purified by pressure and treatment with weak solu- tion of caustic alkali it forms brilliant white crystalline scales or plates, hard but unctuous to the touch, and desti- tute of taste or smell. It is quite insoluble in water, very slightly affected by boiling alcohol, but easily dissolved in ether, chloroform, and carbon bisulphide. Spermaceti

consists principally of cetin or cetyl palmitate, gitin? O, 16°” 33

—an ether composed of cetyl alcohol combined with palmi- tic acid. Spermaceti candles of definite size are employed

as a standard for illuminants on account of the uniform steady light they afford. The substance is further used in the dressing of fabrics and in medicine and surgery, especially in cerates, bougies, ointments, and in cosmetic preparations. For sperm oil, see WHALE OIL.

SPEUSIPPUS, son of Eurymedon and Potone, is sup- posed to have been born about 407 B.c. He was bred in the school of Isocrates; but, when his maternal uncle, Plato, returned to Athens about 387, he yielded to his

influence and became a member of the Academy. In 361, when Plato undertook his third and last journey to Sicily, Speusippus accompanied him. In 347 the dying philo- sopher nominated his nephew to succeed him as scholarch, and the choice was ratified by the school. Speusippus held the office for eight years, and died in 339 after a paralytic seizure. According to some authorities he com- mitted suicide. There is a story that his youth was riotous, until Plato's example led him to reform his ways. In later life he was conspicuously temperate and amiable. He was succeeded by Xenocrates.

Of Speusippus's many philosophical writings nothing survives except a fragment of a treatise On Pythagorean Numbers. Nor have secondary authorities preserved to us any general statement or conspectus of his system. In- cidentally, however, we learn the following details. (A) In regard to his theory of being,—(1) whereas Plato postu- lated as the basis of his system a cause which should be at once Unity, Good, and Mind, Speusippus distinguished Unity, the origin of things, from Good, their end, and both Unity and Good from controlling Mind or Reason ; (2) whereas Plato recognized three kinds of numbers— firstly, ideal numbers, the formal causes of the ideas ; secondly, mathematical numbers, the abstractions of mathematics ; and thirdly, sensible numbers, numbers em- bodied in things —Speusippus rejected the ideal numbers, and consequently the ideas; (3) Speusippus traced number, magnitude, and soul each to a distinct principle of its own. (B) In regard to his theory of knowledge,—(4) he held that a thing cannot be known apart from the knowledge of all things besides; for, that we may know what a thing is, we must know how it differs from other things, which other things must therefore be known ; (5) accord- ingly, in the ten books of a work called "Opowa, he attempted a classification of plants and animals; (6) the results thus obtained he distinguished at once from "'know- ledge" (érictHun) and from "sensation" (aia yous), hold- ing that "scientific observation" (erurtypoviKi ais nots), though it cannot attain to truth, may nevertheless, in virtue of a certain acquired tact, frame "definitions" (Adyoz). (C) In regard to his theory of ethics,—(7) he denied that pleasure was a good, but seemingly was not prepared to account it an evil.

In default of direct evidence, it remains for us to com- pare these scattered notices of Speusippus's teaching with what we know of its original, the teaching of Plato, in the hope of obtaining at least a general notion, firstly, of Speusippus's system, and, secondly, of its relations to the systems of Plato, of contemporary Platonists, such as Aristotle, and of the later Acadeniy.

It has been suggested elsewhere (SocRATES, p. 238 supra) that the crude and unqualified "realism" of Plato's early manhood gave place in his later years to a theory of natural kinds founded upon a " thoroughgoing idealism," and that in this way he was led to recognize and to value the classi- ficatory sciences of zoology and botany. More exactly, it may be said that the Platonism of Plato's maturity included the following principal doctrines :—(i.) the supreme cause of all existence is the One, the Good, Mind, which evolves itself as the universe under certain eternal immutable forms called "ideas"; (ii.) the ideas are apprehended by

finite minds as particulars in space and time, and are then called "things"; (iii.) consequently the particulars which. have in a given idea at once their origin, their being, and their perfection may be regarded, for the purposes of scientific study, as members of a natural kind ; (iv.) the finite mind, though it cannot directly apprehend the idea, may, by the study of the particulars in which the idea is revealed, attain to an approximate notion of it.

Now when Speusippus (1) discriminated the One, the Good, and Mind, (2) denied the ideas, and (3) abandoned the attempt to unify the plurality of things, he explicitly rejected the theory of being expressed in (i.) and (ii.); and the rejection of the theory of being, 2.¢., of the conception of the One evolving itself as a plurality of ideas, entailed consequential modifications in the theory of knowledge conveyed in (iii.) and (iv.). For, if the members of a natural kind had no common idea to unite them, scientific research, having nothing objective in view, could at best afford a Adyos or definition of the appropriate particulars ; and, as the discrimination of the One and the Good im- plied the progression of particulars towards perfection, such a Adyos or definition could have only a temporary value. Hence, though, like Plato, Speusippus (4) studied the differences of natural products (5) with a

view to classification, he did not agree with Plato in his conception of the significance of the results thus obtained ; that is to say, while to Plato the definition derived from the study of the particulars included in a natural kind was an ap- proximate definition of the idea in which the natural kind originated, to Speusippus the definition was a definition of the particulars studied, and, strictly speaking, of nothing else.. Thus, while Plato hoped to ascend through classifi- catory science to the knowledge of eternal and immutable laws of thought and being, Speusippus, abandoning onto- logical speculation, was content to regard classificatory science not as a means but as an end, and (6) to rest in the results of scientific observation. In a word, Speusippus turned from philosophy to science.

It may seem strange that, differing thus widely from his master, Speusippus should have regarded himself and should have been regarded by others as a Platonist, and still more strange that Plato should have chosen him to be his successor. It is to be observed, however, firstly, that the scientific element occupied a larger place in Plato's later system than is generally supposed,! and, secondly, that the only Academics who came into competition with Speusippus agreed with him in his rejection of the theory of ideas. Hence Plato, finding in the school no capable representative of his ontological theory, might well choose to succeed him a favourite pupil whose scientific enthusiasm and attainment were beyond question ; and Speusippus's rivals, having themselves abandoned the theory of ideas, would not be in a position to tax him with his philosophi- cal apostasy.

In abandoning the theory of ideas—that is to say, the theory of figures and numbers, the possessions of universal mind, eternally existent out of space and time, which figures and numbers when they pass into space and time as the heritage of finite minds are regarded as things— Speusippus had the approval, as of the Platonists gener- ally, so also of Aristotle. But, whereas the new scholarch, confining himself to the detailed examination of natural kinds, attempted no comprehensive explanation of the uni- verse, Aristotle held that a theory of its origin, its motions,

1 That Plato did not neglect, but rather encouraged, classificatory science is shown, not only by a well-known fragment of the comic poet Epicrates, which describes a party of Academics engaged in investi- gating, under the

eye of Plato, the affinities of the common pumpkin, but also by the Timeus, which, while it carefully discriminates science

from ontology, plainly recognizes the importance of the study of natural kinds.

SPE—SPH

and its order was a necessary adjunct to the classificatory

sciences; and in nearly all his references to Speusippus

he insists upon this fundamental difference of procedure. Conceiving that the motions of the universe and its parts are due to the desire which it and they feel towards the supreme external mind, so that the cosmical order is initial in the divine mind, final in the phenomenal universe, Aristotle supposes himself thus to secure the requisite unification of the variety of things. Contrariwise, when Speusippus distinguishes One, Good, and Mind, so that Mind, not as yet endowed with an orderly scheme, adapts the initial One to a variety of particular Goods, his theory of nature appears to his rival "'episodical," ae, to consist of a series of tableaux wanting in dramatic unity, so that it reminds him of Homer's line—ovx« dyafov rodAvKorpavin ° els Koipavos «orw, The theory propounded by Aristotle himself is not perhaps impeccable in this respect, but at any rate he does not, like Speusippus, despair of a solution of the traditional problem of the One and the Many.

Speusippus and his contemporaries in the school exer- cised an important and far-reaching influence upon Aca- demic doctrine. When they, the immediate successors of Plato, rejected their master's ontology and proposed to themselves as ends mere classificatory sciences which with him had been means, they bartered their hope of philo- sophic certainty for the tentative and provisional results of scientific experience. Xenocrates indeed, identifying ideal and mathematical numbers, sought to shelter himself under the authority of Plato; but, as the Xenocratean numbers, though professedly ideal as well as mathematical, were in fact mathematical only, this return to the Platonic termino- logy was no more than an empty form. It would seem, then, that Academic scepticism began with those who had been reared by

Plato himself, having its origin in their acceptance of the scientific element of his teaching apart from the ontology which had been its basis. In this way, and, so far as the present writer can see, in this way only, it is possible to understand the extraordinary revolution which converted Platonism, philosophical and dogmatic, into Academicism, scientific and sceptical. It is as the official representative of this scientific and sceptical depart- ure that Speusippus is entitled to a place in the history of philosophy.

Libliography.—J. G. F. Ravaisson, Speusippi de primis rerum principiis placita, Paris, 1888 ; Chr. Aug. Brandis, Gesch. d. Griech- isch-Romischen Philosophie, Berlin, 1853, II. ii. 1, pp. 6-19 ; Zeller, Dic Philosophie d. Gricchen, Leipsic, 1875, II. i. 839, 840, 847-862 ; Mullach, Hragmenta Philosophorwm Grecorum, Paris, 1881, iii. 62.99, (H. JA.)

SPEY, a river in the north of Scotland, rises in the south-east of Inverness-shire from a small tarn called Loch Spey, 5 miles east of the Caledonian Canal, and flows north-eastwards by Kingussie to Grantown in Elginshire, 10 miles below which it reaches Banffshire. After forming for about 15 miles the boundary between Elginshire and Banffshire, it again enters the former county, through which it flows for about 10 miles past Fochabers to the Moray Firth. In the earlier part of its course it is fed by a large number of mountain streams, its principal tribu- taries being, in Inverness-shire, the Tromie and the Feshie from the right and the Dulnain from the left, and on the boundaries of Banff and Elgin the Avon (Aven) and the Fiddich from the right. Its entire length is 96 miles, and it drains an area of about 1200 square miles. The flow of the river is very rapid, and, being fed largely by mountain Streams, it is subject to sudden freshets, which sometimes occasion extensive floods, the greatest being that of 1829. The Spey is, next to the Tay and the Tweed, the most mportant salmon river in Scotland. The scenery in its upper courses is occasionally bare and bleak, but some- times finely picturesque, especially where, as in Elginshire

and Banffshire, its bold and rocky banks are clothed by forests of birch and pine.

See L. Shaw, History of the Province of Moray (1st ed. 1775, 3d ed. 1882), and Sir Thomas Dick Lauder, Account of the Moray Floods (1st’ed. 1830, 4th ed. 1873).

SPEZIA, a city of Italy, in the province of Genoa, 56 miles south-east of Genoa by the railway to Pisa, which has become since the unification of the kingdom one of the principal Italian ports and the seat of a great Government arsenal. It is situated at the north-west angle of the Gulf of Spezia, formerly known as Lunz Portus, the western side of which is formed by a rocky promontory about 4 miles long, terminating in the picturesque little town of Portovenere and the islands of Palmaria and Tino. A great breakwater, constructed about 1860, stretches across the gulf from Santa Maria Point to Santa Tercsa Point for a distance of 7220 feet; and the outer harbour to the south-west of the town, excavated in 1865 to a depth of 32 feet, has an area of 247 acres. The arsenal has a length of 3937 feet and an average breadth of 2460 feet. The first dock covers an area of 20 acres and the second 17 acres ; and there are besides two careening basins, 433 and 354 feet long. Farther south le the extensive mili- tary establishments of San Vito, with storehouses, reser- voir, &c.; and almost right opposite, on the other side of the gulf, are the dock (14 acres), shipbuilding yards, and repair- ing docks of San Bartolomeo. Some of the largest vessels of the Italian navy have been constructed at Spezia. As a commercial centre Spezia suffers from the lack of railway communication with the interior,—the range of the Apen- nines lying between it and the more productive regions of Northern Italy. The whole movement of the port in 1884 was reprasented by 38 vessels engaged in foreign trade (tonnage, 29,251) and 1333 engaged in the coasting trade (tonnage, 198,447). Though the town itself, with the barracks and military hospital as its principal buildings, presents little to attract the foreign visitor, the beauty of the gulf and of the neighbouring country has brought Spezia into some repute as a watering-place, and there are several excellent hotels in the Corso. The walls and gates of the old city are for the most part destroyed. In one of the public squares is a statue of Admiral Chiodo, the founder of the arsenal. The population of the city was 6105 in 1861 (commune 11,556) and 19,864 in 1881 (commune 30,732).

The origin of Spezia is doubtful ; but it probably rose after the destruction of Luna. Sold by one of the Fieschi in 1276 to Genoa, the town was fortified by its new possessors and made the seat of a governor of some importance. It became a city in the 16th cen- tury. The idea of making the Gulf of Spezia a great naval centre was first broached by Napoleon I.

SPHEROMETER, an instrument for the precise mea- surement of the radius of a sphere or the thickness of a thin plate. The usual form consists of a fine screw moving in a nut carried on the centre of a small three-legged table. The lower end of the screw and those of the table legs are finely tapered and terminate in hemispheres, so that each rests ona point. If the screw has two turns of the thread to the millimétre, the head is usually divided into 500 equal parts, so that differences of 0°001 millimetre may be measured without using a vernier. A vertical scale fastened to the table indicates the number of whole turns of the screw and serves as a fixed point for reading the divi- sions on the head. In order to measure the thickness of a plate the instrument is placed on a level plane surface and the screw turned until the point just touches; the exact instant when it does so is defined by a sudden diminution of resistance succeeded by a considerable in- crease. The divided head and scale are read ; the screw is raised ; the thin plate slipped under it ; and the process isrepeated. The difference between the two readings gives

the required thickness. A contact-lever, delicate level, or electric contact arrangement may be attached to the sphero- meter in order to indicate the moment of touching more precisely than is possible by the sense of touch. To mea- sure the radius of a sphere—e.g., the curvature of a lens— the spherometer is levelled and read, then placed on the sphere, adjusted until the four points exert equal pressure, and read again. The difference gives the thickness of that portion of the sphere cut off by a plane passing through the three feet ; and, since the feet are equidistant, this dis- tance (a) being known gives the value (A) of the radius a

3h the lenticular segment. The well spherometer} is adapted for measuring small spherical lenses. The true plane on which the instrument stands is perforated by a cylindrical well of known diameter. A plate applied to the

lower edge of the well by a spring is adjusted to be parallel to the large plane, and the spherometer screw, being centred over the well, is run down until it touches the plate, and then read. The plate is removed; the lens put in its place; the point—still accurately centred—is brought down ; and the screw is read again. The difference be- tween these readings gives the height of the section of the lens above the lower edge of the well. Calling this height hand the radius of the cylindrical well 7, the radius & of

2

the sphere is got by the formula 2.4 = . +h. The sphero-

from the formula 2k == +h, where h is the thickness of

meter can be applied to test the sphericity of a globe, and may be used on either a convex or a concave surface.

SPHINX, a hybrid creature of Egyptian and Greek art and mythology. In Egypt the sphinxes are colossal images of granite or porphyry, with a human head and breast and the body of a lion (wingless) lying down. The largest and most famous is that of Gizeh, described in vol. vii. p. 772. The head of the sphinx is usually that of a man, but female heads are said to occur occasionally. From Egypt the figure of the sphinx passed to Assyria, where it appears with a bearded male head on cylinders; the female sphinx, lying down and furnished with wings, is first found in the palace of Esarhaddon (7th century B.c.). Sphinxes have been found in Pheenicia, one at least being winged and another bearded. In Asia Minor an ancient female sphinx, but wingless, stands on the sacred road near Miletus. Sphinxes of the usual Greek type (female heads with bodies of winged lions) are represented seated on each side of two doorways in an ancient frieze found by Sir Charles Fellowes at Xanthus in Lycia, and now in the British Museum. The same type appears on the early sculptures of the temple at Assus. In the early art of Cyprus—that half-way house between Asia and Greece— sphinxes of this type are not uncommon. On the other hand, on a gem of Pheenician style found at Curium in Cyprus there appear two male (bearded) sphinxes, with the tree of life between them. With regard to Greece proper, in the third tomb on the acropolis of Mycenz were found six small golden sphinxes; they are beardless, but the sex is doubtful. In the

ancient tomb discovered in 1877 at Spata near Athens (which represents a kindred but somewhat later art than the tombs at Mycenze) were found female winged sphinxes carved in ivory or bone. Sphinxes on glass plates have been found in graves at Camirus in Rhodes and on gold plates in Crimean graves. Sphinxes were represented on the throne of Apollo at Amycle ; in the best period of Greek art a sphinx was sculptured on the helmet of the statue of Athene in the Parthenon at Athens; and sphinxes carrying off children were sculptured

on the front feet of the throne of Zeus at Olympia. ee 1 A.M. Meyer, in American Journal of Science, 1886, xxxii. p. 61.

In Greek mythology the most famous sphinx was that of Thebes in Beotia. She is first mentioned by Hesiod (Theog., 326), who calls her the daughter of Orthus and Chimera. According to Apollonius (iii. 5, 8), she was the daughter of Typhon and Echidna, and had the face of a woman, the feet and tail of a lion, and the wings of a bird. She dwelt on a bald rocky mountain at the south- east corner of the Copaic lake; the name of the mountain was Phicium (now Fagas), which was derived from Phix, the Aolic form of sphinx. The Muses taught her a riddle and the Thebaus had to guess it. Whenever they failed she carried one of them off and devoured him. The riddle was this: What is that which is four-footed, three-footed, and two-footed? At last Gidipus guessed correctly that it was man; for the child crawls on hands and feet, the adult walks upright, and the old man supports his steps with a stick, Then the sphinx threw herself down from the mountain.

The story of the sphinx’s riddle first occurs in the Greek tragedians. Milchhofer believes that the story was a mere invention of Greek fancy, an attempt to interpret the mysterious figure which Greek art had borrowed from the East. On the other hand, hc holds that the destroying nature of the sphinx was much older, and he refers to instances in both Egyptian and Greek art where a sphinx is seen seizing and standing upon a man. And, whereas the Theban legend is but sparingly illustrated in Greek art, the figure of the sphinx appears more commonly on tombs, sculptured either in the round or in relief. From this Milchh6fer seems to infer that the sphinx

was a symbol of death. The word “sphinx” is Greek, being derived from o¢iyyew, ‘to draw tight.”

See Brugsch, History of Egypt, vol. i. pp. 79 sq., 414 sq.; Cesnola, Cyprus, pp. 110, 114 sg., 263 sq., and plate xxxvii. No. 13; Schliemann, Mycene, pp.

xly., 184; and especially Milchhofer, in Mitth. d. deutsch. archdol. Instit. in Athen, 1879, p. 46 sq.

SPHYGMOGRAPH. See Vascunar System.

SPICE ISLANDS. See Moruccas.

SPIDER. See Aracunipa, vol. ii. p. 290 sg.

SPIKENARD, or Narp (Hebrew nérd; Gr. vdpdos, from Sanskrit naladwitha, the change from “‘r” to “1” seeming to indicate that the word came through Persia),? a celebrated perfume which seems to have formed one of the most durable aromatic ingredients in the costly un- guents used by the Romans and Eastern nations. The oint- ment prepared from it (“ointment of pistic nard”®) is mentioned in the New Testament (Mark xiv. 3-5; John xii. 3-5) as being ‘very costly,” a pound of it being valued at more than 300 denarii (over £10). This appears to represent the prices then current for the best quality of nard, since Pliny (/.W., xii. 26) mentions that nard spikes reached as much as 100 denarii per tb, and, although he does not mention the price of nard ointment, he states (xiii, 2) that the “unguentum cinnamominum,” a similar preparation, ranged from 25 to 300 denarii according to its quality. Nard ointment also varied considerably in price from its liability to sophistication (Id., xii. 26, 27; xii. 2). The ingredients of the genuine ointment (wn- guentum nardinum swe foliatum), Pliny tells us (xiii. 2), were Indian nard, juncus (the leaves of Andropogon Schoen- anthus, L.), costus (the root of Aplotaxis auriculata, DC.), amomum (the fruits of Amomum Cardamomum, L.), myrrh (the gum-resin of Balsamodendron Myrrha, Nees), balm (the oleo-resin of Balsamodendron Opobalsamum), ompha- cium or oleum omphacinum (the oil expressed from unripe olives), and balaninum (derived from Balanites egyptiaca). Dioscorides (i. 75) also remarks that malabathrum (the leaf of

Cinnamomum Tamala, Nees) was sometimes added. Of these ingredients costus and amomum were most relied upon for increasing the fragrance aud the nard for the stimulating and other virtues of the unguent.4

2 See Fick, in Orient u. Occident, iii. p. 364. The Syrians and Arabs simply call it “spike ’’ (shebalta, sunbul) or “the Indian spike.”

3 The meaning of the word ‘“pistic” is uncertain, some rendering it ‘‘ genuine,” others “liquid,” and others taking it for a local name.

4 The use of alabaster vessels for preserving these fragrant unguents

The exact botanical source of the true or Indian nard was long a matter of uncertainty, the descriptions given by ancient authors being somewhat vague. Theophrastus (De Odor., 28) classes nard amongst roots, and states that it came from India (Hist. Plant., ix. 7, 2), had a biting and hot taste, and resembled iris root in perfuming the air near it (De Odor., 12, 56). He also remarks (0.c., 42) that the ointment was one of the most durable of perfumes. Pliny (H.W., xii. 26, 27) gives a somewhat confused ac- count, from which it appears that both “spike” and leaf were in use, although it is not clear whether the spike (spica) consisted of the flower-head or the fibrous lower portion of the stem. The only definite statement he makes concerning it is that the “sincere” nard is known by its red colour, sweet smell, and especially taste, “for it drieth the tongue and leaveth a pleasant relish behind it.” Dioscorides (i. 6) states that the true nard came fron: India and was collected on mountains beside which the river Ganges flowed. He describes it as blackish with short spikes, smelling something like cyperus. Linnzeus, Blane, Hatchett, and other writers have supposed that spikenard was an Indian grass of the genus Andropogon (A. Nardus, L.); but Sir W. Jones (As. Res., ii. 416, iv. 97) has given convincing reasons for identifying it with Wardostachys Jatamansi,’ a plant of the Valerian order, the fibrous root- stocks or “‘spikes” of which are still collected in the mountains of Bhotan and Nepal. Further evidence is afforded by Lambert (Zlustr. of the Genus Cinchona, App., p. 177), who found the root under the name of “spike- nard” in one of the oldest chemist’s shops in London, also by Dymock (Mat. Med. W. India, 2d ed., p. 347), who states that the principal

use of the drug at the present time is for making hair washes and ointments, the popular opinion being that it promotes the growth and blackness of the hair. The name of “spike” applied to the Indian nard appears to be derived from its resemblance in shape toa spike or ear of bearded corn. The root is crowned by the bases of several stems, each about 2 inches or more in length and as thick as the finger. To these the fibrous tissue of former leaves adheres and gives them a peculiar bristly appearance. It is this portion that is chiefly collected.

Other and inferior varieties of nard are mentioned by Dioscorides and subsequent writers. Celtic nard, obtained from the Ligurian Alps and Istria, consisted of the roots of plants also belonging to the Valerian order (Valeriana celtica and V. salieina). This was exported to the East and thence to Egypt, and was used in the preparation of baths. Mountain nard was collected in Cilicia and Syria, and is supposed to have consisted of the root of Valeriana tubcrosa. The false nard of Dauphiné, used in later times, and still employed as a charm in Switzerland, is the root-stock of Allium Victorialis, It presents a singular resemblance to the spikes of Indian nard, but is devoid of fragrance. It is remarkable that all the nards belong to the natural order Valerianacex, the odour of valerian being considered disagreeable at the present day; that of Nardostachys Jatamansi is intermediate betwecn valerian and patchouli, eae more agreeable than either.

The name “spikenard” has also been applied in later times to several plants. The spikenard of the United States is Aralia racemosa, and another species of the same genus, A. nudicaulis, is SPINACH. See Horricutrvrg, vol. xii. pp. 285, 288. SPINAL CORD. See PuysroLoey, vol. xix. p. 34 sq. For the diseases affecting the spinal cord, see ATAXY ee Was customary at a very early period. Theophrastus (c. 314 B.c.) States that vessels of lead and alabaster were best for the purpose, on account of their density and coolness, and their power of resisting the penetration of the ointinent into their substance, Pliny also recom- mends alabaster for ointment vases. For small quantities onyx vessels a to have been used (Horace, Carm. ivanele2 sel Ten MO sele74): The plant figured by Sir W. Jones is Valeriana Hardwickit (prob- ably the inferior Gangetic nard of Dioscorides and the ozenitis of Pliny); the true plant is figured by Royle and Lambert.

(Locomotor), Paratysis, ParHonoey (vol. xviii. p. 392), and SURGERY.

SPINEL. See Mrveraxoey, vol. xvi. p. 386, and Rusy.

SPINELLO ARETINO (c.1330-c.1410), painter, the son of a Florentine named Luca, who had taken refuge in Arezzo in 1310 when exiled with the rest of the Ghibel- line party, was born at Arezzo about 1330. Spinello was a pupil of Jacopo di Casentino, a follower of Giotto, and his own style was a sort of link between the school of Giotto and that of Siena. In the early part of his life he worked in Florence as an assistant to his master J ACOpo while painting frescos in the church of the Carmine and in Sta Maria Novella. Between 1360 and 1384 he was occupied in painting many frescos in and near Arezzo, almost all of which have now perished.2 After the sack of Arezzo in 1384 Spinello returned to Florence, and in 1387-88 with some assistants covered the walls and vault of the sacristy of S. Miniato near Florence with a series of frescos, the chief of which represent scenes from the life of St Benedict. These still exist, though in a sadly restored condition ; they are very Giotto-like in composition, but have some of the Siena decorative brilliance of colour, In 1391-92 Spinello was painting six frescos, which still re- main on the south wall of the Pisan Campo Santo, repre- senting miracles of St Potitus and St Ephesus. For these he received 270 gold florins. Among his later works the chief are the very fine series of frescos painted in 1407-8 on the walls and vault of a chapel in the municipal build- ings of Siena ; these also have suffered much from repaint- ing, but still are the finest of Spinello's existing frescos. Sixteen of these represent the war of Frederick Barbarossa against the republic of Venice. Spinello died at Arezzo about 1410.

Spinello's frescos are all strong and highly decorative works, drawn with much spirit, and are very superior in style to his panel pictures, many of which appear to be mere bottega produc- tions. The academy of Florence possesses a panel of the Madonna and Saints, which is chiefly interesting for its signature—" Hoc opus pinxit Spinellus Luce Aritio D.I.A.1391." The easel pictures which are to be found in the various galleries of Europe give little or no notion of Spinello's power as a painter.

SPINET. See Pranororte, vol. xix. p. 67 sg.

SPINNING. See Yarn.

SPINOLA, Amprocio Spryoza, Marcuese 1 (c, 1571- 1630), a celebrated general, belonged to a noble and wealthy Italian family, and was born at Genoa about 1571. After the siege of Ostend had languished for more than two years under the direction of the archduke Albert, Spinola, who, though not a soldier by profession, had seen something of campaigning during a season or two, came upon the scene as a condottiere and received charge of the works. He entered upon his task in October 1603, and his courage and vigour were rewarded by the surrender of the place on 20th September 1604. During the next five years, until the conclusion of the armistice of 1609, he frequently encountered Maurice of Orange, but on the whole with undecisive results. In 1620 he was sent by Spain into the Palatinate of the Rhine, and took many places; in the following year, on the renewal of the war with Holland, he returned to the scenes of his earlier campaigns, where his principal exploits were the capture of Jiilich in February 1622 and of Breda after a ten months' siege in June 1625. His health now began to give way; and his spirits are said to have been further de- pressed by Philip's disregard of his pecuniary claims. He died at Castel-Nuovo di Scrivia on 25th September 1630.

SPINOZA, Barucn (1632-1677), or, as he afterwards signed himself, Benedict de Spinoza, philosopher, was born at Amsterdam on 24th November 1632. His parents be-

2 The fine fresco of an Apocalyptic scene which still exists in S, Maria degli Angeli at Arezzo belongs to about 1400.

longed to the community of Jewish emigrants from Portugal and Spain who, fleeing from Catholic persecution in the Peninsula, had sought refuge in the nearly emancipated Netherlands. The name, variously written De Spinoza, D'Espinoza, and Despinoza, probably points to the pro- vince of Leon as the previous home of the family; there are no fewer than five townships so called in the neigh- bourhood of Burgos. Of the philosopher's

parents nothing is known. His father is said to have been a tradesman in fair circumstances, and the house is still shown upon the Burgwal where his son Baruch was born; two sisters, Rebekah and Miriam, formed the remainder of the family. Spinoza received his first training under the senior rabbi, Saul Levi Morteira, whose most promising pupil he soon became. Under Morteira he became familiar with the Talmud and, what was probably more important for his own development, with the philosophical writings of Ibn Ezra and Maimonides, Levi ben Gerson, Chasdai Creskas, and other representatives of Jewish medizeval thought, who aim at combining the traditional theology with ideas got from Aristotle and his Neoplatonic commentators. Latin, still the universal language of learning, formed no part of Jewish education; and Spinoza, after learning the elements from a German master, resorted for further in- struction to a physician named Franz van den Ende, who eked out an income by taking pupils. Van den Ende appears to have been distinctly a man of parts, though of a somewhat indiscreet and erratic character. He was eventually hanged in Paris as a conspirator in 1674. His enthusiasm for the natural sciences may have been the only ground for the reputation he had acquired of instilling atheistic notions into the minds of his pupils along with the Latin which he taught them. But it is quite possible that his scientific studies had bred in him, as in many others at that time, a materialistic, or at least a naturalistic, turn of mind ; indeed we should expect as much in a man of Van den Ende's somewhat rebellious temperament. We do not know whether his influence was brought to bear in this sense upon Spinoza; but it has been suggested that the writings of Bruno, whose spirit of enthusiastic natural- ism and fervid revolt against the church would be especially dear to a man of Van den Ende's leanings, may have been put into the pupil's hand by the master. Latin, at all events, Spinoza learned from Van den Ende to use with correctness, freedom, and force, though his language does not, of course, conform to classical canons. The only romance of Spinoza's life is connected with Van den Ende's household. The physician had an only daughter, Clara Maria by name, who, besides being a proficient in music, understood Latin, it is said, so perfectly that she was able to teach her father's pupils in his absence. Spinoza, the story goes, fell in love with his fair instructress; but a fellow-student, called Kerkering, supplanted him in his mistress's affections by the help of a valuable necklace of pearls which he presented to the young lady. Chronology unfortunately forbids us to

accept this little episode as true. Recent investigation has proved that, while the marriage with Kerkering, or rather Kerckkrink, is a fact, it did not take place till 1671, in which year the bride, as appears by the register, was twenty-seven years of age. She cannot, therefore, have been more than eleven or twelve in 1656, the year in which Spinoza left Amsterdam; and as Kerckkrink was seven years younger than Spinoza, they cannot well have been simultaneous pupils of Van den Ende and simultaneous suitors for his daughter's hand. But, though the details of the story thus fall to pieces, it is still possible that in the five years which followed his retirement from Amsterdam Spinoza, who was living within easy distance and paid visits to the city from time to tie, may have kept up his connexion with Van den

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The mastery of Latin which he acquired from Van den Ende opened up to Spinoza the whole world of modern philosophy and science, both represented at that time by the writings of Descartes. He read him greedily, says Colerus, and afterwards often declared that he had all his philosophical knowledge from him. The impulse towards natural science which he had received from Van den Ende would be strengthened by the reading of Descartes; he gave over divinity, we are told, to devote himself entirely to these new studies. His inward break with Jewish orthodoxy dated, no doubt, farther back,—from his ac- quaintance with the philosophical theologians and com- mentators of the Middle Ages; but these new interests combined to estrange him still further from the traditions of the synagogue. He was seldomer seen at its services,— soon not at all. The jealousy of the heads of the synagogue was easily roused. An attempt seems to have been made to draw from him his real opinions on certain prominent points of divinity. Two so-called friends endeavoured, on the plea of doubts of their own, to

lead him into a theo- logical discussion ; and, some of Spinoza's expressions being repeated to the Jewish authorities, he was summoned to give an account of himself. Anxious to retain so promising an adherent, and probably desirous at the same time to avoid public scandal, the chiefs of the community offered him a yearly pension of 1000 florins if he would outwardly conform and appear now and then in the synagogue. But such deliberate hypocrisy was abhorrent to Spinoza's nature. Threats were equally unavailing, and accordingly on the 27th of July 1656 Spinoza was solemnly cut off from the commonwealth of Israel. The curses pronounced against him may be read in most of the biographies. While negotiations were still pending, he had been set upon one evening by a fanatical ruffian, who thought to expedite matters with the dagger. Warned by this that Amsterdam was hardly a safe place of residence for him any longer, Spinoza had already left the city before the sentence of excommunication was pronounced. He did not go far, but took up his abode with a friend who lived some miles out on the Old Church road. His host belonged to the Col- legiants or Rhijnsburgers, a religious society which had sprung up among the proscribed Arminians of Holland. The pure morality and simple-minded piety of this com- munity seem early to have attracted Spinoza, and to have won his unfeigned respect. Several of his friends were Collegiants, or belonged to the similarly-minded community of the Mennonites, in which the Collegiants were after- wards merged. In this quiet retreat Spinoza spent nearly five years. He drew up a protest against the decree of excommunication, but otherwise it left him unmoved. From this time forward he disused his Hebrew name of Baruch, adopting instead the Latin equivalent, Benedictus. Like every Jew, Spinoza had learned a handicraft; he was a grinder of lenses for optical instruments, and was thus enabled to earn an income sufficient for his modest wants. His skill, indeed, was such that lenses of his making were much sought after, and those found in his cabinet after his death fetched a high price. It was as an optician that he was first brought into connexion with Huygens and Leibnitz; and an optical J'reatise on the Rainbow, written by him and long supposed to be lost, has been recently

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discovered and reprinted by Dr Van Vloten. He was also fond of drawing as an amusement in his leisure hours; and Colerus had seen a sketch-book full of such drawings representing persons of Spinoza's acquaintance, one of them being a likeness of himself in the character of Masaniello. oe. The five years which followed the excommunication must have been devoted to concentrated thought and study. Before their conclusion Spinoza had parted company from Descartes, and the leading positions of his own system were already clearly determined in his mind. A number of the younger men in Amsterdam—many of them students of medicine or medical practitioners—had also come to regard him as their intellectual leader. A kind of philosophical club had been formed, including among its members Simon de Vries, John Bresser, Louis Meyer, and others who appear in Spinoza's correspondence. Originally meet- ing in all probability for more thoroughgoing study of the Cartesian philosophy, they looked naturally to Spinoza for guidance, and by-and-by we find him communicating systematic drafts of his own views to the little band of friends and students. 'The manuscript was read out and discussed at their meetings, and any points remaining obscure were referred to Spinoza for further explanation. An interesting specimen of such difficulties, propounded by Simon de Vries and resolved by Spinoza in accordance with his own principles, is preserved for us in Spinoza's correspondence. This Simon de Vries was a youth of generous impulses and of much promise. Being in good circumstances, he was anxious to show his gratitude to Spinoza by a gift of 2000 florins, which the philosopher half-jestingly excused himself from accepting. De Vries died young, and would fain have left his fortune to Spinoza ; but the latter re- fused to stand in the way of his brother, the natural heir, to whom the property was accordingly left, with the con- dition that he should pay to Spinoza an annuity sufficient for his maintenance. The heir offered to fix the amount at 500 florins, but Spinoza accepted only 300, a sum which was regularly paid till his death. The written communica- tions of his own doctrine referred to above belong to a period after Spinoza had removed from the neighbourhood of Amsterdam ; but it has been conjectured that the Short Treatise on God, on Man, and his Wellbeing, which repre- sents his thoughts in their earliest systematic form, was left by him as a parting legacy to this group of friends. It is at least certain, from a reference in Spinoza's first letter to Oldenburg, that such a systematic exposition was in existence before September 1661.1 There are two dialogues somewhat

loosely incorporated with the work which probably belong to a still earlier period. The short appendix, in which the attempt is made to present the chief points of the argument in geometrical form, is a fore- tunner of the Hthics, and was probably written somewhat later than the rest of the book. The term “Nature” is put more into the foreground in the Treatise, a point which might be urged as evidence of Bruno’s influence,—the dialogues, moreover, being specially concerned to establish the unity, infinity, and self-containedness of Nature? s but

1 Various manuscript copies were apparently made of the treatise in question, but it was not printed, and dropped entirely out of knowledge till 1852, when Edward Bohmer of Halle lighted upon an abstract of it attached to a copy of Colerus’s Life, and shortly afterwards upon a Dutch MS. purporting to be a translation of the treatise from the Latin original, This was published in 1862 by Van Vloten with a re-transla- tion into Latin, Since then a superior Dutch translation has been discovered, which has been edited by Professor Schaarschmidt and translated into German. Another German version with introduction and notes has been published by Sigwart based on a comparison of the two Dutch MSS,

- The fact that Spinoza nowhere mentions Bruno would not imply, according to the literary habits of those days, that he was not acquainted with his speculations and even indebted to them. There is no mention,

the two opposed Cartesian attributes, thought and exten- sion, and the absolutely infinite substance whose attributes they are—substance constituted by infinite attributes— appear here as in the Hthics. The latter notion—of sub- stance—is said to correspond exactly to “the essence of the only glorious and blessed God.” The earlier differs from the later exposition in allowing an objective causal relation between thought and extension, for which there is substituted in the Zthics the idea of a thoroughgoing parallelism,

Karly in 1661 Spinoza’s host removed to Rhijnsburg near Leyden, the headquarters of the Collegiant brother- hood, and Spinoza removed with

him. The house where they lived at Rhijnsburg is still standing, and the road bears the name of Spinoza Lane. Very soon after his settlement in his new quarters he was sought out by Henry Oldenburg, the first secretary of the Royal Society.2 Olden- burg became Spinoza's most regular correspondent, —a third of the letters preserved to us are to or from him; and it appears from his first letter that their talk on this occasion was "fon God, on infinite extension and thought, on the difference and the agreement of these attributes, on the nature of the union of the human soul with the body, as well as concerning the principles of the Cartesian and Baconian philosophies." Spinoza must therefore have unbosomed himself pretty freely to his visitor on the main points of his system. Oldenburg, however, was a man of no speculative capacity, and, to judge from his subsequent correspondence, must have quite failed to grasp the real import and scope of the thoughts communicated to him. From one of Oldenburg's early letters we learn that the treatise De Intellectus Emendatione was probably Spinoza's first occupation at Rhijnsburg. The nature of the work also bears out the supposition that it was first undertaken. It is, in a manner, Spinoza's " organon,"—the doctrine of method which he would substitute for the corresponding doctrines of Bacon and Descartes, as alone consonant with the thoughts which were shaping themselves or had shaped themselves in his mind. It is a theory of philosophical truth and error, involving an account of the course of philosophical inquiry and of the supreme object of know- ledge. It was apparently intended by the author as an analytical introduction to the constructive exposition of his system, which he presently essayed in the Zthics. But he must have found as he proceeded that the two treatises would cover to a large extent the same ground, the account of the true method merging almost inevitably in a state- for example, of Hobbes throughout Spinoza's political writing, and only one casual reference to him in a letter, although the obligation of the Dutch to the English thinker lies on the surface. Accordingly full weight must be allowed to the internal evidence brought forward by Sigwart and others to prove Spinoza's acquaintance with Bruno's writings. But in regard to this question, and in regard to the elaborate researches directed to prove that the main determinations of Spinoza's thought are anticipated in the medieval philosophers of his own race, it must be said that these investigations are of comparatively little vital interest. Doubtless Spinoza's thought was coloured by his Hebraic origin and his Hebraic studies ; from these sources, above

all, he may have brought with him to the study of the dualistically expressed philosophy of Descartes the need, and the profound conviction, of unity. But the main strain of Spinoza's thought is sufficiently explained by reference to the Cartesian philosophy itself, the intellectual miliey of the time. Descartes's metaphysics can be shown to lead us to the very threshold of Spinoza's system ; not only the general form, but the very terminology—substance, attributes, and modes—lay waiting to be appropriated by an independent student.

3 Henry Oldenburg (c. 1626-1678) was a native of Bremen, but had settled in England in the time of the Commonwealth. Though hardly a scientific man himself, he had a genuine interest in science, and must have possessed social gifts. He was the friend of Boyle, and acquainted with most of the leaders of science in England as well as with many on the Continent. He delighted to keep himself in this way au courant with the latest developments, and lost no opportunity of establishing relations with men of scientific reputation. It was probably at the suggestion of Huygens that he bent his steps towards Spinoza's lodging.

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discovered and reprinted by Dr Van Vloten. He was also fond of drawing as an amusement in his leisure hours; and Colerus had seen a sketch-book full of such drawings representing persons of Spinoza's acquaintance, one of them being a likeness of himself in the character of Masaniello.

The five years which followed the excommunication must have been devoted to concentrated thought and study. Before their conclusion Spinoza had parted company from Descartes, and the leading positions of his own system were already clearly determined in his mind. A number of the younger men in Amsterdam—many of them students of medicine or

medical practitioners—had also come to regard him as their intellectual leader. A kind of philo- sophical club had been formed, including among its members Simon de Vries, John Bresser, Louis Meyer, and others who appear in Spinoza's correspondence. Originally meet- ing in all probability for more thoroughgoing study of the Cartesian philosophy, they looked naturally to Spinoza for guidance, and by-and-by we find him communicating sys- tematic drafts of his own views to the little band of friends and students. 'The manuscript was read out and discussed at their meetings, and any points remaining obscure were referred to Spinoza for further explanation. An interesting specimen of such difficulties, propounded by Simon de Vries and resolved by Spinoza in accordance with his own principles, is preserved for us in Spinoza's correspondence. This Simon de Vries was a youth of generous impulses and of much promise. Being in good circumstances, he was anxious to show his gratitude to Spinoza by a gift of 2000 florins, which the philosopher half-jestingly excused himself from accepting. De Vries died young, and would fain have left his fortune to Spinoza; but the latter re- fused to stand in the way of his brother, the natural heir, to whom the property was accordingly left, with the con- dition that he should pay to Spinoza an annuity sufficient for his maintenance. The heir offered to fix the amount at 500 florins, but Spinoza accepted only 300, a sum which was regularly paid till his death. The written communica- tions of his own doctrine referred to above belong to a period after Spinoza had removed from the neighbourhood of Amsterdam ; but it has been conjectured that the Short Treatise on God, on Man, and his Wellbeing, which repre- sents his thoughts in their earliest systematic form, was left by him as a parting legacy to this group of friends. It is at least certain, from a reference in Spinoza's first letter to Oldenburg, that such a systematic exposition was in existence before September 1661.1 There are two dialogues somewhat loosely incorporated with the work which probably belong to a still earlier period: The short appendix, in which the attempt is made to present the chief points of the argument in geometrical form, is a fore- Tunner of the Lthics, and was probably written somewhat later than the rest of the book. The term "Nature" is put more into the foreground in the 7'reatise, a point which might be urged as evidence of Bruno's influence,—the dialogues, moreover, being specially concerned to establish the unity, infinity, and self-containedness of Nature? ; but Sareea ie calle Maa

1 Various manuscript copies were apparently made of the treatise in question, but it was not printed, and dropped entirely out of knowledge till 1852, when Edward Bohmer of Halle lighted upon an abstract of ib attached to a copy of Colerus's Life, and shortly afterwards upon a Dutch MS. purporting to be a translation of the treatise from the Latin original, This was published in 1862 by Van Vloten with a re-transla- tion into Latin. Since then a superior Dutch translation has been discovered, which has been edited by Professor Schaarschmidt and translated into German. Another German version with introduction and notes has been published by Sigwart based on a comparison of the two Dutch MSS.

- The fact that Spinoza nowhere mentions Bruno would not imply, according to the literary habits of those days, that he was not acquainted with his speculations and even indebted to them, 'There is no mention,

the two opposed Cartesian attributes, thought and exten- sion, and the absolutely infinite substance whose attributes they are—substance constituted by infinite attributes— appear here as in the Ethics. The latter notion—of sub- stance—is said to correspond exactly to "the essence of the only glorious and blessed God." 'The earlier differs from the later exposition in allowing an objective causal relation between thought and extension, for which there is substituted in the Lthics the idea of a thoroughgoing parallelism.

Early in 1661 Spinoza's host removed to Rhijnsburg near Leyden, the headquarters of the Collegiant brother- hood, and Spinoza removed with him. The house where they lived at Rhijnsburg is still standing, and the road bears the name of Spinoza Lane. Very soon after his settlement in his new quarters he was sought out by Henry Oldenburg, the first secretary of the Royal Society.2 Olden- burg became Spinoza's most regular correspondent, —a third of the letters preserved to us are to or from him; and it appears from his first letter that their talk on this occasion was 'on God, on infinite extension and thought, on the difference and the agreement of these attributes, on the nature of the union of the human soul with the body, as well as concerning the principles of the Cartesian and Baconian

philosophies.” Spinoza must therefore have unbosomed himself pretty freely to his visitor on the main points of his system. Oldenburg, however, was a man of no speculative capacity, and, to judge from his subsequent correspondence, must have quite failed to grasp the real import and scope of the thoughts communicated to him. From one of Oldenburg’s early letters we learn that the treatise De Intellectus Emendatione was probably Spinoza’s first occupation at Rhijnsburg. The nature of the work also bears out the supposition that it was first undertaken. It is, in a manner, Spinoza’s “ organon,”—the doctrine of method which he would substitute for the corresponding doctrines of Bacon and Descartes, as alone consonant with the thoughts which were shaping themselves or had shaped themselves in his mind. It is a theory of philosophical truth and error, involving an account of the course of philosophical inquiry and of the supreme object of know- ledge. It was apparently intended by the author as an analytical introduction to the constructive exposition of his system, which he presently essayed in the Zthics. But he must have found as he proceeded that the two treatises would cover to a large extent the same ground, the account of the true method merging almost inevitably in a state- for example, of Hobbes throughout Spinoza’s political writing, and only one casual reference to him in a letter, although the obligation of the Dutch to the English thinker lies on the surface. Accordingly full weight must be allowed to the internal evidence brought forward by Sigwart and others to prove Spinoza’s acquaintance with Bruno’s writings. But in regard to this question, and in regard to the elaborate researches directed to prove that the main determinations of Spinoza’s thought are anticipated in the medieval philosophers of his own race, it must be said that these investigations are of comparatively little vital interest. Doubtless Spinoza’s thought was coloured by his Hebraic origin and his Hebraic studies ; from these sources, above all, he may have brought with him to the study of the dualistically expressed philosophy of Descartes the need, and the profound conviction, of unity. But the main strain of Spinoza’s thought is sufficiently explained by reference to the Cartesian philosophy itself, the intellectual miliey of the time. Descartes’s metaphysics can be shown to lead us to the very threshold of Spinoza’s system; not only the general form, but the very terminology—substance, attributes, and modes—lay waiting to be appropriated by an independent student.

3 Henry Oldenburg (c. 1626-1678) was a native of Bremen, but had settled in England in the time of the Commonwealth. Though hardly a scientific man himself, he had a genuine interest in science, and must have possessed social gifts. He was the friend of Boyle, and acquainted with most of the leaders of science in England as well as with many on the Continent. He delighted to keep himself in this way aw courant with the latest developments, and lost no opportunity of establishing relations with men of scientific reputation. It was probably at the suggestion of Huygens that he bent his steps towards Spinoza's lodging.

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ment of the truth reached by its means. The Amendment of the Understanding was therefore put aside unfinished, and was first published in the Opera Posthuma. Spinoza meanwhile concentrated his attention upon the Hthies, and we learn from the correspondence with his Amsterdam friends that a considerable part of book i. had been com- municated to the philosophical club there before February 1663. It formed his main occupation for two or three years after this date. Though thus giving his friends freely of his best, Spinoza did not cast his thoughts broad- cast upon any soil. He had a pupil living with him at Rhijnsburg whose character seemed to him lacking in solidity and discretion. This pupil (probably Albert Burgh, who afterwards joined the Church of Rome and penned a foolishly insolent epistle to his former teacher) was the occasion of Spinoza's first publication,—the only publi- cation indeed to which his name was attached. Not deeming it prudent to initiate the young man into his own system, he took for a text-book the second and third parts of Descartes's Principles, which deal in the main with natural philosophy. As he proceeded he put Descartes's matter in his own language and cast the whole arguinent into a geometric form. At the request of his friends he devoted a fortnight to applying the same method to the first or metaphysical part of Descartes's philosophy, and the sketch was published in 1663, with an appendix entitled Cogitata Metaphysica, still written from a Cartesian standpoint (defending, for example, the freedom of the will), but con- taining hints of his own doctrine. The book was revised by Dr Meyer for

publication and furnished by him, at Spinoza's request, with a preface, in which it is expressly stated that the author speaks throughout not in his own person but simply as the exponent of Descartes. A Dutch translation appeared in the following year.!

In 1663 Spinoza removed from Rhijnsburg to Voor- burg, a suburban village about 2 miles from The Hague. His reputation had continued to spread. From Rhijnsburg he had paid frequeut visits to The Hague, and it was prob- ably the desire to be within reach of some of the friends he had made in these visits—among others the De Witts —that prompted his change of residence. He had works in hand, moreover, which he wished in due time to publish ; and in that connexion the friendly patronage of the De Witts might be of essential service to him. The first years at Voorburg continued to be occupied by the composition of the Hthics, which was probably finished, however, by the summer of 1665. A journey made to Amsterdam in that year is conjectured to have had reference to its publication. But, finding that it would be impossible to keep the authorship secret, owing to the numerous hands through which parts of the book had already passed, Spinoza determined to keep his manuscript in his desk for the present. In September 1665 we find Oldenburg twit- ting him with having turned from philosophy to theology and busying himself with angels, prophecy, and miracles. This is the first reference to the Z'ractatus Theologico- Politicus, which formed his chief occupation for the next four years. The aim of this treatise may be best under- stood from the full title with which it was furnished— 7Z'rac- tatus Theologico-Politicus, continens dissertationes aliquot, quibus ostenditur libertatem philosophandi non tantum salva pretate et reipublice pace posse concedi sed eandem nisi cum pace reipublice ipsaque pietate tolli non posse. It is, in fact, an eloquently reasoned defence of liberty of thought and speech in speculative matters. The external side of religion—its rites and observances—must of necessity be

1 The title of the Latin original ran—Renati des Cartes Prineipiorum Philosophixw pars i. et ii. more geometrico demonstrate per Benedictum de Spinoza Amstelodamensem. Accesserunt ejusdem Cogitata Meta- physica.

subject to a certain control on the part of the state, whose business it is to see to the preservation of decency and order. But, with such obvious exceptions, Spinoza claims complete freedom of expression for thought and belief ; and he claims it in the interests alike of true piety and of the state itself. The thesis is less interesting to a modern reader—because now generally acknowledged—than the argument by which it is supported. Spinoza's position is based upon the thoroughgoing distinction drawn in the book between philosophy, which has to do with knowledge and opinion, and theology, or, as we should now say, reli- gion, which has to do exclusively with obedience and con- duct. The xgis of religion, therefore, cannot be employed to cover with its authority any speculative doctrine; nor, on the other hand, can any speculative or scientific investiga- tion be regarded as putting religion in jeopardy. Spinoza undertakes to prove his case by the instance of the Hebrew Scriptures. Scripture deals, he maintains, in none but the simplest precepts, nor does it aim at anything beyond the obedient mind ; it tells us nought of the divine nature, but what men may profitably apply to their lives. The greater part of the treatise is devoted to working out this line of thought ; and in so doing Spinoza consistently applies to the interpretation of the Old Testament those canons of historical exegesis which are often regarded as of compara- tively recent growth. The treatise thus constitutes the first document in the modern science of Biblical criticism. It was published in 1670, anonymously, printer and place of publication being likewise disguised (Hamburgi apud Hein- ricum Kiinraht). The storm of opposition which it encoun- tered showed that these precautions were not out of place, It was synodically condemned along with Hobbes's Lewa- than and other books as early as April 1671, and was con- sequently interdicted by the states-general of Holland in 1674; before long it was also placed on the Index by the Catholic authorities. But that it was widely read appears from its frequent re-issue with false title-pages, represent- ing it now as an historical work and again as a medical treatise. Controversialists also crowded into the lists against it. A translation into Dutch appears to have been proposed; but Spinoza, who foresaw that such a step would only increase the commotion which was so distasteful to him, steadily set his face against it. No Dutch translation appeared till 1693.

The same year in which the Zreatise was published Spinoza removed from his suburban lodging at Voorburg into The Hague itself. He took rooms first

on the Veerkay with the widow Van de Velde, who in her youth had assisted Grotius to escape from his captivity at Loewenstein. This was the house afterwards occupied by Colerus, the worthy Lutheran minister who became Spinoza's biographer. But the widow insisted on boarding her lodger, and Spinoza presently found the expense too great for his slender purse. He accordingly removed to a house on the Pavelioen Gracht near at hand, occupied by a painter called Van der Spijck. Here he spent the remaining years of his life in the frugal independence which he prized. Colerus gives particulars which enable us to realize the almost incredible simplicity and economy of his mode of life. He would say sometimes to the people of the house that he was like the serpent who forms a circle with his tail in his mouth, meaning thereby that he had nothing left at the year's end. His friends came to visit him in his lodgings, as well as others attracted by his reputation—Leibnitz among the rest—and were courteously entertained, but Spinoza preferred not to accept their offers of hospitality. He spent the greater part of his time quietly in his own chamber, often having his meals brought there and sometimes not leaving it for two or three days together when absorbed in his studies. On one occasion he did not leave the house for three

months. '" When he happened to be tired by having applied himself too much to his philosophical meditations, he would go downstairs to refresh himself, and discoursed with the Van der Spijcks about anything that might afford matter for an ordinary conversation, and even about trifles, He also took pleasure in smoking a pipe of tobacco ; or, when he had a mind to divert himself somewhat longer, he looked for some spiders and made them fight together,

or he threw some flies into the cobweb, and was so well"

pleased with the result of that battle that he would some- times break into laughter" (Colerus). He also conversed at times on more serious topics with the simple people with whom he lodged, often, for example, talking over the sermon with them when they came from church. He occasionally went himself to hear the Lutheran pastor preach—the predecessor of Colerus—and would advise the Van der Spijcks not to miss any sermon of so

excellent a preacher. The children, too, he put in mind of going often to church, and taught them to be obedient and dutiful to their parents. One day his landlady, who may have heard strange stories of her solitary lodger, came to him in some trouble to ask him whether he believed she could be saved in the religion she professed. ‘‘Your religion is a good one,” said Spinoza; ‘you need not look for another, nor doubt that you will be saved in it, provided that, while you apply yourself to piety, you live at the same time a peace- able and quiet life.” Only once, it is recorded, did Spinoza’s admirable self-control give way, and that was when he received the news of the murder of the De Witts by a frantic mob in the streets of The Hague. It was in the year 1672, when the sudden invasion of the Low Countries by Louis XIV. raised an irresistible clamour for a military leader and overthrew the republican constitution for which the De Witts had struggled. John De Witt had been Spinoza’s friend, and had bestowed a small pension upon him ; he had Spinoza’s full sympathy in his political aims. On receiving the news of the brutal murder of the two brothers, Spinoza burst into tears, and his indignation was so roused that he was bent upon publicly denouncing the crime upon the spot where it had been committed. But the timely caution of his host prevented his issuing forth to almost certain death. Not long after Spinoza was himself in danger from the mob, in consequence of a visit which he paid to the French camp. He had been in correspondence with one Colonel Stoupe, a Swiss theologian and soldier, then serving with the prince of Condé, the commander of the French army at Utrecht. From him Spinoza received a communication enclosing a passport from the French commander, who wished to make his acquaintance and promised him a pension from the French king at the easy price of a dedication to his majesty. Spinoza went to Utrecht, but returned without seeing Condé, who had in the meantime been called elsewhere ; the pension he civilly declined. There may have been nothing more in the visit than is contained in this narra- tive; but on his return Spinoza found that the populace of The Hague regarded him as no better than a spy. The town was full of angry murmurs, and the landlord feared that the mob would storm his house and drag Spinoza out. Spinoza quieted his fears as well as he could, assuring him that as soon as the crowd made any threatening move- ment he would go out to meet them, “though they should Serve me as they did the poor De Witts. I am a good tepublican and have never had any aim

but the honour and welfare of the state.” Happily the danger passed off without calling for such an ordeal.

In 1673 Spinoza received an invitation from the elector palatine to quit his retirement and become professor of philosophy in the university of Heidelberg. The offer Was couched in flattering terms, and conveyed an express

assurance of ‘‘ the largest freedom of speech in philosophy, which the prince is confident that you will not misuse to disturb the established religion.” But Spinoza’s experience of theological sensitiveness led him to doubt the possibility of keeping on friendly terms with the established religion, if he were placed in a public capacity. Moreover, he was not strong; he had had no experience of public teaching ; and he foresaw that the duties of a chair would put an end to private research. For all these reasons he court- eously declined the offer made to him. There is little more to tell of his life of solitary meditation. In 1675 we learn from his correspondence that he entertained the idea of publishing the Hthics, and made a journey to Amsterdam to arrange matters with the printer. “But, whilst I was busy with this,” he writes, “the report was spread everywhere that a certain book of mine was in the press, wherein I endeavoured to show that there was no God; and this report found credence with many. Where- upon certain theologians (themselves perhaps the authors of it) took occasion to complain of me to the prince and the magistrates ; moreover, the stupid Cartesians, because they are commonly supposed to side with me, desiring to free themselves from that suspicion, were diligent without ceasing in their execrations of my doctrines and writings, and are as diligent still.” As the commotion seemed to grow worse instead of subsiding, Spinoza consigned the manuscript once more to his desk, from which it was not to issue till after his death. His last literary work was the unfinished Zractatus Politicus and the preparation of notes for a new edition of the Z’ractatus Theologico-Politi- cus, in which he hoped to remove some of the misunder- standings which the book had met with. The Zractatus Politicus develops his philosophy of law and government on the lines indicated in his other works, and connects itself closely with the theory enunciated by

Hobbes a generation before. Consumption had been making its insidious inroads upon Spinoza for many years, and early in 1677 he must have been conscious that he was seriously ill. On Saturday the 20th of February he sent to Amsterdam for his friend Dr Meyer. On the following day the Van der Spijcks, having no thought of immediate danger, went to the afternoon service. When they came back Spinoza was no more; he had died about three in the afternoon with Meyer for the only witness of his last moments. Spinoza was buried on the 25th of February "in the new church upon the Spuy, being attended," Colerus tells us, "by many illustrious persons and followed by six coaches." He was little more than forty-four years of age.

Spinoza's effects were few and realized little more than was re- quired for the payment of charges and outstanding debts. '' One need only cast one's eyes upon the account," says his biographer, '*to perceive that it was the inventory of a true philosopher. It contains only some small books, some engravings, a few lenses, and the instruments to polish them." His desk, containing his letters and his unpublished works, Spinoza had previonsly charged his landlord to convey to Jan Rienwertz, a publisher in Amsterdam. This was done, and the Opera Posthuma appeared in the same year, without the author's name, but with his initials upon the title- page. They were furnished with a preface written in Dutch by Jarig Jellis, a Mennonite friend of Spinoza's, and translated into Latin by Dr Meyer. Next year the book was proscribed in a violently worded edict by the states of Holland and West Friesland. The obloquy which thus gathered ronnd Spinoza in the later years of his life remained settled upon his memory for a full hundred years after his death. Hume's casual allusion to ''this famous atheist " and his '' hideous hypothesis" is a fair specimen of the tone in which he is usually referred to; people talked about Spinoza, Lessing said, ''as if he were a dead dog." The change of opinion in this respect may be dated from Lessing's famous con- versation with Jacobi in 1780. Lessing, Goethe, Herder, Novalis, and Schleiermacher, not to mention philosophers like Schelling and Hegel, united in recognizing the unique strength and sincerity of Spinoza's thought, and in setting him in his rightful place among the speculative leaders of mankind. Transfused into their writings, his spirit has had a large share in moulding the philosophic thought

of the 19th century, and it has also been widely influential beyond the schools. Instead of his atheism Hegel speaks of his acosmism, and Novalis dubs him a God-intoxicated man. Schleiermacher's fine apostrophe is well known, in which he calls upon us to ‘‘ offer a lock of hair to the manes of the holy and excommunicated Spinoza.”

Spinoza's personal appearance is described by Colerus from the accounts given him by many people at The Hague who knew him familiarly. ‘‘Hce was of a middle size, and had good features in his face, the skin somewhat dark, black curled hair, and the long eyebrows of the same colour, so that one might easily know from his looks that he was descended from the Portuguese Jews.” Leibnitz also gives a similar description: ‘‘The celebrated Jew Spinoza had an olive complexion and something Spanish in his face.” These characteristics are preserved in a portrait in oil in the Wolfenbiittel library, which was probably the original of the (in that case unsuccessfully rendered) engraving prefixed to the Opera Posthuma of 1677. This portrait has recently been photo- graphed for Dr Martineau's Study of Spinoza. In 1880 a statue was erected to Spinoza at The Hague by international subscription among his admirers.

Spinoza's philosophy is a thoroughgoing pantheism, which has both a naturalistic and a mystical side. The foundation of the system is the doctrine of one infinite substancc, of which all finite existences are modes or limitations (modes of thought or modes of extension). God is thus the immanent cause of the universe ; but of creation or will there can be no question in Spinoza's system. God is used throughout as equivalent to nature (Deus sive natura). The philosophical standpoint comprehends the necessity of all that is—a necessity that is none other than the necessity of the divine nature itself. To view things thus is to view them, according to Spinoza's favourite phrase, swb specie xternitatis. Spinoza's philo- sophy is fully considered in the article CARTESIANISM (see vol. v. p. 152 sq.).

Literature.—The contents of the Opera Posthuma included the Ethies, the Traetatus Politicus, and the De Intelleetus Emendatione (the last two unfinished), a selection from Spinoza's correspondence, and a Compendium of Hebrew Grammar. The Treatise on the Rain- bow, supposed to be lost, was published anonymously in Dutch in 1687. The first collected edition of

Spinoza’s works was made by Paulus in 1802 ; there is another by Gfrorer (1830), and a third by Bruder (1843-46) in three volumes. Van Vloten’s volume, published in 1862, dd Benedicti de Spinoza opera que supersunt omnia supple- mentum, is uniform with Bruder’s edition so as to complete it by a supplementary volume. It contained the early treatise De Deo et homine, the Treatise on the Rainbow, and several fresh letters.

SPIRES (Germ. Speyer or Speier), the chief town of the Rhenish palatinate, Bavaria, and formerly a free im- perial city, is situated on the left bank of the Rhine, at the mouth of the Speyerbach, 21 miles to the south of Worms. The principal streets are broad but irregular, and the general appearance of the town little corresponds to its high antiquity, owing to the fact that it was burned by the French in 1689. The only important ancient build- ing that has survived the flames is the cathedral, a very large and imposing basilica of red sandstone, and one of the noblest examples of Romanesque architecture now extant. Beyond the general interest attaching to it as one of the old

Romanesque churches of the Rhineland, Spires cathedral has a peculiar importance in the history of architecture as probably the earliest Romanesque basilica in which the nave as well as the side arcades was vaulted from the first. Built in 1030-61 by Conrad IT. and his successor, this church has had a chequered history, its disasters culminat- ing in 1689, when the soldiers of Louis XIV. burned it to the bare walls and scattered the ashes of the eight German emperors who had been interred in the kings’ choir. Re- stored in 1772-84 and provided with a vestibule and facade, it was again desecrated by the French in 1794; but in 1846-53 it was once more thoroughly restored and adorned in the interior with gorgeous frescos at the expense of the king of Bavaria. The large cathedral bowl (Domnapf) in front of the west fagade formerly marked the boundary between the episcopal and municipal territories. Each new bishop on his election had to fill the bowl with wine, while the burghers emptied it to his health. The heathen tower to the east of the church, on foundations supposed to be Roman, was probably part of the town wall built in 1080 by Bishop Rudger. Of the Retscher, or imperial palace, so called because built after the model

of the Hradschin at Prague, only a mouldering fragment of wall remains. It was in this palace that the famous diet of Spires met in 1529, at which the Reformers first received the name of Protestants. The Altpértel (alta porta), a fine old gateway of 1246, is a relic of the free imperial city. Among the modern buildings are several churches and schools, a museum and picture gallery, &c. Spires, although rebuilt in 1697, has never recovered from the cruel injuries inflicted by the French in 1689. Its trade is insignificant, although it still has a free harbour on the Rhine. Its manufactures include paper, tobacco and cigars, sugar, sugar of lead, vinegar, beer, and leather. Vines and tobacco are grown in the neighbourhood. The population in 1880 was 15,589 and in 1885 16,228. Spires, known to the Romans as Augusta Nemetwm or Nemete, and to the Gauls as Naviomagus, is one of the oldest towns on the Rhine. The modern name appears first, under the form Spira, about the 7th century. Captured by Julius Cesar in 47 B.¢., it was repeatedly destroyed by the barbarian hordes in the first few centuries of the Christian era. The town had become an episcopal seat in the 4th century; but heathenism supervened, and the present bishopric dates from 610. In 830 Spira became part of the Frankish empire, the emperors having a “palatium” here; and it was especi- ally favoured by the Salic imperial house. The contentions between the bishops and the citizens were as obstinate and severe as in any other city of Germany. The situation of the town opposite the mouths of several roads through the Rhine valley early fostered its trade ; in 1294 it rose to be a free imperial city, although it owned no territory beyond its walls and had a population of less than 80,000. It enjoyed great renown as the seat of the imperial supreme court from 1527 till 1689; it was fifth among the free citics of the Rhine, and had a vote in the Upper Rhenish diet. Numerous imperial diets assembled here. From 1801 till 1814 it was the capital of a department of France ; but it was restored to Bavaria

in the latter year. By the peace of Spires in 1544 the Hapsburgs renounced their claims to the crown of Sardinia.

SPIRITUALISM. The term “spiritualism ” is used by philosophical writers to denote the opposite of materialism. It is also used in a narrower sense to describe the belief that the spiritual world manifests itself by producing in the physical world effects inexplicable by the known laws of nature. The

belief in such occasional manifestations has probably existed as long as the belief in the existence of spirits apart from human bodies, and-a complete exa- mination into it would involve a discussion of the religions of all ages and nations. In 1848, however, a peculiar form of it, believed to be based on abundant experimental evidence, arose in America and spread there with great rapidity and thence over the civilized world. To this movement, which has been called ‘modern spiritualism,” the discussion in the present article is confined. The movement began in a single family. In 1848 a Mr and

PPIRITUALISM

Mrs Fox and their two daughters, living at Hydeville (Wayne), New York, were much disturbed by unexplained knockings. At length Kate Fox discovered that the cause of the sounds was intelligent and would make raps as re- quested, and, communication being established, the rapper professed to be the spirit of a murdered pedlar. An in- vestigation into the matter seemed to show that none of the Fox family were concerned in producing the rappings; but the evidence that they were not concerned is insuffi- cient, although similar noises had been noticed occasionally in the house before they lived there. It was, however, at Rochester, where the two Fox girls soon afterwards went to live with a married sister (Mrs Fish) that modern spirit- ualism assumed its present form, and that communication was, as it was believed, established with lost relatives and deceased eminent men. The presence of certain “‘mediums” was required to form the link between the worlds of the living and of the dead, and Kate Fox and her sister were the first mediums. Spiritualists do not as yet claim to know what special qualities in mediums enable spirits thus to make use of them. The earliest communications were car- ried on by means of “‘raps,” or, as Mr Crookes calls them, “percussive sounds.” It was agreed that one rap should mean “no” and three “‘ yes,” while more complicated mess- ages were—and are —obtained in other ways, such as calling over or pointing to letters of the alphabet, when raps occur at the required letters.

The idea of communicating with the departed was natur- ally attractive even to the merely curious, still more to those who were mourning for lost friends, and most of all to those who believed that this was the commencement of a new revelation. The first two causes have attracted

many inquirers; but it is the last that chiefly gives to modern spiritualism its religious aspect. Many came to witness the new wonder, and the excitement and interest spread rapidly. families, and other mediums discovered, exhibiting pheno- mena of various kinds (see below). The interest in mes- merism and the phenomena of hypnotic trance, which was widely diffused at this time both in America and Europe (see Macnetism, ANIMAL, vol. xv. p. 277 sq.), was favour- able to the new idea. Information about other worlds and from higher intelligences was thought to be obtained from persons who could be put into the sleep-waking state, of whom Andrew Jackson Davis was in America the most prominent example. His work, Wature's Divine Revela- tions (New York, 1847), was alleged to have been dictated in "clairvoyant" trance. Many reputed "clairvoyants" developed into mediums. The movement spread like an epidemic. There is very little evidence to show that it arose anywhere spontaneously!; but those who sat with the Foxes were often found to become mediums them- selves and then in their turn developed mediumship in others. The mere reading of accounts of seances seemed to develop the peculiar susceptibility in some persons, while others, who became mediums ultimately, did so only after prolonged and patient waiting.

There seems to have been little practical interest in spiritualism in Europe till Mrs Hayden, a professional medium from Boston, came over in 1852. It spread like wildfire within a few months of her arrival,—its first de- velopment being in the form of a mania for table-turning, which seems to have prevailed all over Europe in 1853.

Y 1 It is possible that the family of Dr Phelps were unaware of the

Rochester knockings" when the disturbances began in his house at Stratford, Connecticut, in 1850 (see Capron's Modern Spiritualism, its Facts, &e.) ; but these disturbances, as recorded, have a closer re- semblance to the ordinary occurrences at a spiritualistic seance than those which took place at Tedworth in 1661 (see Glanvill's Sadducis- mus Triumphatus) and at Slawensik in 1806 (see Kerner's Seherin von Prevorst), and others too numerous to mention.

"Spirit-circles" were formed in several

Daniel Dunglas Home, the next medium of importance who appeared in London, came over from America in 1855. But it was at Keighley in Yorkshire that spiritual- ism as a religious movement first made any mark in Eng- land, and it was there that the first English spiritualistic periodical, the Yorkshire Spiritual Telegraph, was started in 1855. The extent to which the movement has spread and the present number of spiritualists are very difficult to estimate. Vague calculations have from time to time been attempted: in 1867 one spiritualist estimated the number in America at 11,000,000 or two-fifths of the population, and another has held 3,000,000 to be an ex- treme estimate (see Spiritual Magazine for 1867). The periodicals devoted to spiritualism may perhaps be taken to indicate the present state of the movement. There are in England two weekly newspapers, Light and The Medium and Daybreak; one of these has advertisements of Sunday meetings in sixty different towns and in eighty different rooms. The spiritualistic journals outside Great Britain number about 100, though probably only about a quarter of these are of any importance. Of these 30 are in English (26 published in America and 4 in the Australian colonies), 15 to 20 in French, and 6 in German. But nearly 40 are published in Spanish in Spain and South America. Private circles which meet regularly are believed to be numerous in England ; and there are numerous public and semi-public trance-speaking and clairvoyant mediums, especially among the miners in the north.

In the present article it is impossible to give an ex- haustive catalogue of the phenomena and modes of com- munication of modern spiritualism. Many have not now appeared for the first time in history, though it is difficult to suppose any historical connexion between the new de- velopments and the old. Perhaps the most striking paral- lelism is that between the proceedings at modern seances and those connected with the later Greek oracles.2 The greater part of the phenomena may be divided into two classes. To the first and earliest developed class belong what may be called the physical phenomena of spiritual- ism,—those, namely, which, if correctly observed and due neither to conscious or unconscious trickery nor to hallu- cination

on the part of the observers, exhibit a force hitherto unknown to science, acting in the physical world otherwise than through the brain or muscles of the medium. The earliest of these phenomena were the raps already spoken of and other sounds occurring without apparent physical cause, and the similarly mysterious movements of furni- ture and other objects; and these were shortly followed by the ringing of bells and playing of musical instruments. Later followed the appearance of lights; quasi-human voices ; musical sounds, produced, it is supposed, without instruments; the ‘‘ materialization ” or presence in material form of what seem to be human hands and faces, and ultimately of complete figures, alleged to be not those of any person present, and sometimes claimed by witnesses as deceased relatives ; ‘“‘psychography,” or “direct writing and drawing,” asserted to be done without human inter- vention; ‘‘spirit-photography,” or photographing of human and other forms invisible to all but specially endowed seers ; unfastening of cords and bonds; elongation of the medium’s body; handling of red-hot coals; and the ap- parent passage of solids through solids without disinte- gration. The phenomena observed at Tedworth belong to this class. Somewhat similar was the Cock Lane ghost in 1762.3 A practice of causing heavily loaded tables to rise by “magic” seems to have existed among the German Jews in the 17th century.4 Kerner records movements

2 See Essays Classical, by F. W. H. Myers, 1883.

3 See Gentleman’s Magazine, 1762. 4 Von Harless, Aegyptische Mysterien, 1856, pp. 180-182.

of objects in connexion with Madame Hauffe in 1825-28,! and such movements also occurred in presence of the so- called electric girl in 1846.2 The second class of phenomena, which we may call the automatic, consists in table-tilting and turning with contact ; writing, drawing, &c., through the medium’s hand; convulsive movements and involuntary dancing ; entrancement, trance-speaking, and personation by the medium of deceased persons, attributed to temporary “possession ”; seeing spirits and visions and hearing phan- toi voices. This class bears affinity to some of the pheno- mena of hypnotism and of certain nervous complaints, to certain epidemics of the Middle Ages,? and to phenomena that have occurred at some

religious revivals. According to quotations given by Chevreul,* the divining-rod was used at the end of the 17th century for obtaining answers to ques- tions, as table-tilting now is. Ina third class must be placed the cure of disease by healing mediums. This cannot well be treated apart from mesmeric healing and “faith cures” and ‘mind cures,” and belongs to medical psychology.

The class of automatic phenomena are much the common- est. The investigations of Carpenter on unconscious cerebra- tion and of Faraday on unconscious muscular action > have shown that it is not necessary to look outside the medium’s own brain and organism for the explanation of such things as automatic writing and table turning. It is about the matter communicated by these means that the controversy now turns. Spiritualists maintain that true information is thus given, provably unknown to the medium or other persons present, or at least expressed in a way obviously beyond their powers to originate. Another view, which is now gaining ground, is that the information in some excep- tional cases does not come from the mind of the medium, but is due to the influence wrought on his mind by that of other persons, and more than this is not proved.®

At no period of the spiritualistic movement has the class of physical phenomena been accepted altogether with- out criticism. Most spiritualists know that much fraud in connexion with them has been discovered—frequently by spiritualists themselves—and that the conditions favour- able to obtaining them are often such as favour fraud. It is with a full knowledge of these difficulties in the way of investigation that they maintain that unmistakably genuine phenomena are of constant occurrence. Many volumes containing accounts of such phenomena have been printed, and appeal is often made to the mass of evidence so accumulated. ‘No physical science can array a tithe of the mass of evidence by which psychism” (z.¢., what is usually called spiritualism) ‘‘is supported,” says Serjeant Cox.’ But the majority of these accounts have scarcely any scientific value. Spiritualists have, as a rule, sought to convince not by testimony but by ocular demonstration. Yet, if there is not a mass of scientific evidence, there are a number of witnesses—among them distinguished men of science and others of undoubted intelligence—who have convinced themselves by observation of the genuineness of the phenomena,—a fact of undeniable

importance, even without careful records, when the witnesses are otherwise known to be competent and trustworthy observers. Mr Maskelyne has affirmed® that he has witnessed table- turning where he was satisfied that there was neither trickery nor unconscious muscular action. Moreover, if

1 Seherin von Prevorst.

? Tanchou, Enquéte sur Vauthenticité des phénomenes électriques @ Angélique Cottin, Paris, 1846.

3 See Hecker, Hpidemics of the Middle Ages, 1859.

4 De la baguette divinatoire, &ec., 1854.

5 Atheneum, 2d July 1853 ; see also on this subject Chevreul, op. cit.

5 See Ch. Richet, “La Suggestion Mentale,” in Revue Philosophique, December 1884, and Proc. Soc. for Psychical Research, vols. ii. and iii.

7 Mechanism of Man: What am I? vol. ii. p. 313, 1879.

8 See Pall Mall Gazette, 18th, 20th, and 23d April 1885.

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the phenomena are not genuine, we have to assume a large amount of apparently aimless fraud.

Amongst the proposed explanations of these phenomena that of hallucination need not detain us long. Sensory hallucination of several persons together who are not in a hypnotic state is a rare phenomenon, and therefore not a probable explanation. Moreover, it cannot be regarded as being generally applicable, partly because material traces of what occurs often remain, and partly because of the general agreement not only of all the witnesses but of all the senses as to what is perceived, as distinguished from what is inferred. Nevertheless something of the kind may occasionally have happened, especially at some of the seances of Home. If collective hallucination really occurs at seances, it is a very interesting fact, and deserves to be carefully studied.

What may broadly be called conjuring is, however, a much more probable explanation of most of the recorded phenomena; and in the vast majority of cases the wit- nesses do not seem to have duly appreciated the possibili- ties of conjuring, nor to have taken sufficient precautions to exclude it. Besides, not even a conjuror knows all the possibilities of his art and can describe in detail all the accidental circumstances which may on any particular occasion favour deception, and perhaps never exactly recur, We require, therefore, to know not only that the witness is careful and accurate but that he has allowed a suffi- ciently wide margin for the possibilities of conjuring; and some leading spiritualists do not allow this. It is often urged that mediums are not conjurors because they fre- quently fail, whereas "imposture can be reproduced at will," and because they can produce the phenomena in private rooms, and under conditions which exclude the possibility of conjuring. But the phenomena produced by mediums in private rooms would generally be uninteresting and unsuited to public performance, so that it would not pay a professional conjuror to practise them. Amateur con- jurors might do something in this way, and the present writer has seen one imitate successfully some of the phenomena of professional mediums for " direct writing"; but to compete with mediums on really equal terms the con- juror must have the same conditions throughout, and this is difficult to arrange, since it involves securing witnesses who are doubtful as to whether what they see is conjuring or not. Still more important to the conjuror is that very privilege of failing whenever he pleases, so largely used by mediums, that he may avail himself of accidental oppor- tunities for trickery, which would be interfered with by a settled programme. The extent to which the absence of programme obtains at seances appears from the following statement by a leading spiritualist who writes under the nom de plume of 'M.A. (Oxon.)": "In 99 out of every 100 cases people do not get what they want or expect. Test after test, cunningly devised, on which the investi- gator has set his mind, is put aside, and another sub- stituted."!0 In other words, the evidence is rarely strictly experimental, and this not only gives facilities for fraud but makes it necessary to allow a much larger margin for accidents, mistakes, and mal-observation. It must be borne in mind that the most excellent moral character in the medium is no guarantee against trickery, unless it can be proved that he was in no abnormal mental condition when the phenomena

occurred; for extraordinary deceptions have been carried on by hysterical patients and others with no apparent motive but a desire to secure attention.

One of the possibilities to be allowed for is that of un-

9 See, e.g., Report on Spiritualism of the Committee of the London Dialectical Society, 1871, pp. 867-869, 207. See also Guldenstubbe, De la réalité des esprits, 1857, p. 66.

10 Human Nature, 1876, p. 267.

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usual muscular endowment in the medium. For instance, in 1851, the remarkable loud double raps occurring in the presence of the Fox girls, which in 1849 had puzzled several investigating committees at Rochester, were explained by Professors Flint, Lee, and Coventry of Buffalo as produced by rapidly partially dislocating and restoring the knee and other joints. They stated that they had experimented with another lady who could do the same; and, challenged by Mrs. Fish, they tried some experiments with her and Margaretta Fox which strongly supported their view. Besides the general arguments for supposing that the physical phenomena of spiritualism may be due to con- juring, there are two special reasons which gain in force as time goes on. (1) Almost every medium who has been prominently before the public has at some time or other been detected in fraud, or what cannot be distinguished from fraud except on some violently improbable hypo- thesis ; and (2), although it is easy to devise experiments of various kinds which would place certain phenomena above the suspicion of conjuring, by eliminating the neces- sity for continuous observation on the part of the investi- gators, there is no good evidence that such experiments have ever succeeded. Nevertheless there does exist evi- dence for the genuineness of the physical phenomena which deserves consideration. Count Agénor de Gasparin, in his Tables Tournantes (Paris, 1854), gives an account of what seem to have been careful experiments with his own family and friends, which convinced him that by some unknown force tables could be got to move without con- tact. He did not

believe that spirits had anything to do with it. His experiments were conducted in broad day- light and with sceptical witnesses (whose testimony, how- ever, he does not give) looking on outside the circle. The minutes of the sub-committee No. 1 of the committee of the Dialectical Society (op. cit., pp. 373-391) report that tables moved without contact, whilst all the persons present

knelt on chairs (the backs of which were turned to the

table), with their hands on the backs. The report, how- ever, would be of greater value if the names of the medium and of the working members of the committee were given —we only know that of Sergeant Cox—and if they had written independent accounts of what they witnessed. The conditions of some of Mr Crookes's experiments with D. D. Home on alterations in the weight of a partially sus- pended board} appear to have been so simple that it is difficult to imagine how the witnesses can have been deceived. Some very remarkable evidence is contained in "Researches in Spiritualism during the Year 1872-3," by "M.A. (Oxon.)," published in a spiritualistic periodical called Human Nature, March and August 1874. The papers give accounts of phenomena obtained through the writer's own mediumship, generally in the presence of one or two friends, and extending over almost the whole range of spiritualistic manifestations.

But what chiefly interests spiritualists is the assurance of life and progress after death, and the moral and reli- gious teaching, which they obtain through automatic writ- ing and trance-speaking. It was discovered very early in the movement that the accuracy of these communications could not always be relied on; but it is maintained by Spiritualists that by the exercise of the reason and judg- ment, by prolonged acquaintance with particular com- municating intelligences, and by proofs of identity with persons known to have been trustworthy on earth, it is possible to obtain valuable information from beings not infallible, but with the knowledge of spirit life superadded to their earthly experience. Still the agreement between

1 Quart. Journ. of Science, July and October 1871; republished, with

other papers by Mr Crookes, under the title of Researches on the Pheno- mena of Spiritualism, 1874-76.

communications so received has not been sufficiently great for anything like a universal spiritualistic creed to have been arrived at. In France the doctrine of successive reincarnations with intervals of spirit life promulgated by Allan Kardec (Léon Hippolyte Denisart Rivail) forms a prominent element of spiritualistic belief. This view has, however, made but little way in England and America, where the opinions of the great majority of spiritualists vary from orthodox Christianity to Unitarianism of an extreme kind. Probably it would be impossible to unite spiritualists in any creed, which, besides the generally accepted belief in God and immortality, should postulate more than the progress of the spirit after death, and the power of some of the dead to communicate with the living by means of mediums.

Spiritualism has been accused of a strong tendency to produce insanity ; the charge, however, seems to be in the main a mistaken inference from the fact that the delusions of the insane not unfrequently take the form of supposed converse with invisible beings. It is, however, probable that the spiritualistic theories of possession and obsession sometimes injure persons with incipient insane impulses, by weakening their sense of responsibility for these and their efforts to control them. Spiritualism has also been accused of fostering free love and other doctrines subver- sive of society. But this charge too has been made without adequate grounds ; for, though certain spiritualistic bodies have at times taught such doctrines, they have always been repudiated by the mass of spiritualists. The great.scandal of spiritualism is undoubtedly the encouragement it gives to the immoral trade of fraudulent mediumship.

In addition to the works already mentioned, the student, for a general idea of the whole subject, should consult the following :— E. W. Capron, Modern Spiritualism, its Facts, &c., Boston, 1855, for the early history of the movement in America ; Edmonds and Dexter, Spiritualism, New York, 1854-55; R. Hare, Huperimental Investigations of the Spirit Manifestations, New York, 1856 ; Allan Kardec, Livre des Esprits, Ist ed. 1853; Mrs De Morgan, From Matter to Spirit, London, 1863, with preface by Professor De Mor- gan; Alfred Russel Wallace, Afiracles and Modern Spiritualism, 1876;

M.A. (Oxon.), Spirit Identity and Spirit Teaching; Zollner, Wissenschaftliche Abhandlungen (the part relating to spiritualism has been translated into English under the title Transcendental Physics by ©. C. Massey). A succinct account of typical frauds of spiritualism is contained in D. D. Home's Lights and Shadows of Spiritualism, 2d ed., 1877-78. (E. M. 8.)

SPITZBERGEN. This group of rocky, barren, and Situa.

snowclad islands, lost in the solitudes of the Arctic Ocean, 400 miles north-north-west of the North Cape of Norway (see vol. xix. pl. II.), but nevertheless well known for at least four centuries to European whalers and seal-hunters, has of late acquired new interest from the scientific expeditions by which it has been selected either as a base for attempts to reach the north pole or as a field in which to inaugurate a new era of scientific exploration in the arctic regions. From Spitzbergen Parry started in 1827 on the sledge journey which brought him within 480 miles of the pole ; it was the starting-point of the investigations which led Charles Martins to his brilliant generalizations of the flora, present and past, of the earth ; and numerous Swedish expeditions from 1858 onwards have accumulated an amount of knowledge, so vast and so important, as to be comparable only with the results of the great equatorial and arctic journeys of the first years of the 19th century.

The Spitzbergen archipelago, lying between 76° 30' and Islands.

80° 30' N. lat. and 10° and 30° E. long.—half-way between Greenland and Nova Zembla—consists of six large and a great number of smaller islands. The chief, that of West Spitzbergen, shaped like a wedge pointed towards the south, and deeply indented on the west and north by long branching fjords, has an area of nearly 15,200 square miles, High mountains, reaching 4560 feet in the Horn Sound Tind, cover its southern parts; while a wide plateau,

with an altitude of from 1500 to 2000 feet and covered by a thick ice-sheet, occupies the north. Several fjords— Horn Sound, Bel Sound, Ice Fjord (15

miles wide and 80 long), and the double fjord of King’s Bay and Cross Bay on the west, and Liefde, Wiide, and Lomme Bays on the north—deeply penetrate the island. One of the ramifica- tions (Dickson Bay) of the beautiful Ice Fjord, 150 fathoms deep, nearly reaches the head of Wiide Bay, so as almost to divide the island. A long narrow island, Prince Charles’s

pelago, and this land, which may perhaps be a link between the Spitzbergen archipelago and that of Franz-Josef, has been again sighted by Norwegian seal-hunters. Numerous small islands lie around the larger :—the Danes and Nor- wegians Islands on the north-west, the Seven Islands on the north, Outger Reps, Brock, and Charles XII. Island on the north-east, Waygat Islands and William I. Island in Hinlopen Strait, the Ryk Yse Archipelago, Hope Island, and the Thousand Islands (about a hundred small rocks) to the east and south of Stans Foreland, and many other

smaller ones. Many of these small islands rise toa height | of 1500 to 1700 feet.?

The archipelago, which has the Greenland Sea to the Seas west and Barents Sea to the east, rises from a submarine tound | platform that extends from Bear Island north-eastwards ‘Pi

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Map of Spitzbergen.

Foreland, with peaks of nearly 5000 feet high, runs parallel to part of the west coast of West Spitzbergen, from which it is separated by a narrow

strait. The broad Stor (Great) Fjord, or Wiide Jans Water, separates the main island from two others to the east,—Stans Foreland (2500 square miles) and Barents Land (580 square miles). Formerly these were considered as one, and named Edge Island, until the narrow Walter Thymen Strait which parts them was discovered. A few peaks, estimated at from 1600 to 2000 feet high, protrude above the snow and ice by which these two imperfectly explored islands are covered. To the north-east of West Spitzbergen, separated from it by Hinlopen Strait (7 to 60 miles in breadth) lies North-East Land, with an area of about 6200 square miles. Its western and northern coasts are indented by several bays and fjords ; the southern and eastern shores, on account of the masses of ice by which they are constantly girt, remain unexplored. This island appears like a broad plateau covered by an ice- sheet 2000 to 3000 feet in thickness, from which a few peaks protrude. Slowly moving towards the east, this immense sheet of ice discharges into the sea by a huge ice-wall, unbroken by promontories for 150 miles, thus forming the broadest glacier known,—Dickson's glacier. Eastwards from this group of islands, 100 miles to the north-east of Stans Foreland, rises another island, measur- ing 90 miles from west to east. Marked either Gillis's Land or Wiche's Land in earlier maps, it was seen from Spitzbergen as a snow-clad mass mingling with the fogs of the sea by a Swedish expedition, and later on by Heuglin and Zeil; but it was not until 1872 that the Norwegian whalers Altman, Johnsen, and Nilsen reached it from the east and nearly circumnavigated it. After some discussion about its name, it has received from Pro fessor Mohn the name of King Charles Land, which is now generally accepted. The wide strait which separates it from Spitzbergen is called Olga Strait. It is now established that Gillis saw Gillis's Land to the north-east of the archi-

to Franz Joseph Land, and probably was an immense arctic continent connected with Greenland during the middle of the Tertiary period. The sea around Spitzbergen has a depth of less than 100 fathoms. Owing to this circumstance the ice readily accumulates round the shores; and, although the glaciers of Spitzbergen do not give origin to icebergs so huge as those of Greenland, the smaller icebergs and the pack-ice are thick enough to prevent access to the shores except for a few months in the year. Happily the Gulf Stream, which washes the shores of Norway, after sending a branch to the east, flows north to the western shores of Spitzbergen,

moderating its climate, and leaving an open passage which permits whalers to approach the western coast even under the most unfavourable conditions of ice in the arctic regions, Drift-wood brought from lower latitudes, glass-floats of the Norwegian fishermen, and even the large seeds of the Entada Gigalobium, carried by the Gulf Stream from the Gulf of Mexico, are found at the northern extremity of Spitzbergen. On the other hand, a cold current charged with ice descends from higher latitudes along the eastern coast, rendering approach extremely difficult. On this account King Charles Land remained unknown until 1872, and the eastern coast of North-East Land still continues unexplored.

Owing to the warm current, the climate of Spitzbergen is less Climate)

severe than in the corresponding latitudes of Greenland and Smith Sound. The isotherm of 23° Fahr. (-—5° C.), which crosses the middle of Eastern Siberia, touches its southern extremity, and only the north-east coasts of West Spitzbergen and North-East Land have an average yearly temperature so low as 14° to 10°5 (—10° to-—11°9 C.). At Mussel Bay (79° 53’) the average yearly tem- perature is 16° (January 14°71, July 39°°3). Bear Island, notwith- standing its more southerly position, has a lower temperature, as the Gulf Stream does not touch it. Even in the coldest months of the winter a thaw may set in for a few days; but, on the other hand, snow sometimes falls in July and August. Spring comes in June ; the snow becomes saturated with water and disappears in places, and scurvy grass and the polar willow open their buds. By the end of June the thermometer has ceased to sink below the freezing-point at night; July, August, and September are the best months. In September, however, autumn sets in on shore, though the whalers continue cruising until the end of the month and even reach the highest latitudes. By the end of September the pack-ice rapidly freezes into one solid mass. To move on this mass, however, is exceedingly difficult, for the ice, owing to its contraction and expansion, is either intersected by mA fissures or broken up and piled into heaps, which puts insuperable difficulties in the way of sledge expeditions.

Glaciers are largely developed. On the high grounds the snow Glaciers.

under a level of from 1200 to 1500 feet disappears every year ; but on the plateaus it continually accumulates, so as to cover them with an immense

ice-sheet, like that of Greenland, which slowly discharges by the valleys towards the sea in the form of immens® glaciers. All North-East Land and the interior of West Spitz- bergen are covered with such ice-sheets, which descend to King’s

1 Bear Island, half-way between the North Cape and Spitzbergen, can hardly be reckoned to the Spitzbergen archipelago. It was for- merly renowned for its hunting grounds, but is very seldom visited now. Lying outside the course of the Gulf Stream, it is almost entirely ice-bound.

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Bay by a glacier 15 miles wide, or by that already alluded to in North-East Land, where the ice-cliffs are from 200 to 400 feet high. These glaciers, however, discharging into comparatively shallow yaters, do not produce such icebergs as those of Greenland. The glaciers of the present epoch are but trifling in comparison with what they were during the Glacial period, when the entire country was buried under an ice-sheet, which probably connected all the archipelago into one ice-bound continent and spread far beyond to northern Europe. : ; ;

The backbone of the islands consists of thick layers of granite, gneiss, and other archaic schists. But more recent formations bear- ing witness to a much more genial climate are not wanting. The Carboniferous period is represented by extensive coal-bearing strata, the lowest of which are intermediate with the Devonian (Liefde Bay strata). The Trias, also containing a rich fossil flora, is represented by black clay slate. The J nrassic deposits are widely spread ; they mostly belong to the Kelloway, and many of them are coal- pearing. To the same period belong the frequently occurring layers of what was formerly called hypersthenite, but has now been proved to be (according to Zirkel’s classification) diabase and dolerite. The most interesting formation is, however, the Miocene. At a

period close, geologically speaking, to the subsequent Glacial period, and even to our own, Spitzbergen was covered with a luxuriant vegetation the like of which is now found only in the 60th parallel in Scandinavia. The shores of Bel Sound, Ice Fjord, and Cape Starostine in 78° N. lat. were covered with extensive peat bogs, on the edges of which the marsh cypress flowered, dropping its leaves and blossoms into the marshes. Seqwoix, poplars, birches, planes, and large oaks also grew there, while ivy and thick under- wood freely developed under their shadow, and thousands of insects swarmed in the thicket. The most striking feature of this Miocene vegetation—a feature conclusively established by the researches of Oswald Heer—is that Spitzbergen, Greenland, Franz-Josef Land, and Nova Zembla were at that time parts of one immense con- tinent, thus realizing the very conditions for the coldest climate, if climate had to depend on telluric causes only. Heer has shown, moreover, in a manner that hardly admits of doubt that the luxuri- ant vegetation so unmistakably borne witness to by the Miocene strata of the arctic regions could not have developed had it been condemned to endure the long arctic night it now undergoes. This feature of the arctic Miocene flora is unexplained, and will remain so until higher cosmical laws are formulated to explain changes of climate. A change in the position of the earth's axis of rotation (recently the subject of a serious discussion in England and on the Continent) would seem to be the only adequate hypothesis by which to account for the warm vegetation of the period in ques- tion in such proximity to the pole; but this hypothesis would be so much at variance with the present state of our knowledge that we may well hesitate to advance it. A brief recurrence of a warmer climate —not nearly so warm as the Miocenc, yet somewhat warmer than the present—was also experienced by Spitzbergen after the long period of glaciation as is proved by the occurrence of beds with mussels, which are now fonnd only in much warmer latitudes. This warmer Post-Glacial period —traces of which have been met with throughout the arctic and subarctic regions—was followed by a period of slow upheaval, which still continues.

The flora is of course poor. The only tree is the polar willow, which does not excced 2 inches in height and bears a few leaves not larger than a man's finger-nail ; and the only bush is the crowberry (Empetrum nigrum), to which the recently discovered cloudberry (Rubus Chamexmorus) may be added. But at the foot of the warmer cliffs some loam has been formed

notwithstanding the slowness of putrefaction, and there, in contrast with the brownish lichens that cover the hills, grows a carpet of mosses of the brightest green, variegated with the golden-yellow flowers of the ranunculus (/. sulphureus and hyperboreus), the Silenex, the reddish heads of the Pedicularis, the Oxyria reniformis (a foot high), the large-leaved scurvy grass (Cochlcaria fenestrata), several saxifrages, Ccrastiwm alpinum, Potentilla emarginata, fox-tail grass (Alopecurus alpinus), Dupontia Fischeri, Poa cenisia, pratensis, and stricta, with a few large-flowered Polygona and Andromede ; while on the driest spots yellow poppies and whitlow grasses (Drab), Cardamine bellidifolia, several Dryadex, &c., are found. Even on the higher slopes, 1500 feet above the sea, the poppy, Luzula hyperborea, and Stellaria Edwardsii are occasionally met with. Mosses, mostly European acquaintances, cover all places where peat has accumulated. The slopes of the crags and the blocks of stone on the beach are some- times entirely covered with a luxuriant moss and lichen vegetation, among the last being the so-called ‘‘famine bread” (Umbilicaria aretiea), which has maintained the life of so many arctic travellers. Flowering plants are represented by as many as ninety-six species, of which eighty-one grow in Greenland and sixty-nine in Scan- dinavia ; forty-three species are alpine cosmopolites, and have been inet with on the Himalayas. The ferns are represented by two Species.1 Although thus limited in number, the flora is suggestive ee eee Eee oe

; 1 According to Mr Naathorst’s researches in 1882 (Sv. Vetenskaps Akad. Hand- Ungar, xx.; Botanisches Jahrbuch, iv.), the flora of Spitzbergen is composed

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in its distribution. The vegetation of the south has a decidedly Lappish or European alpine character, while that of the north coast is decidedly American, and recalls that of Melville Island. Many flowering plants which are common in north-west Spitz- bergen are absent from the east coast, where the cold current is inimical to both flora and fauna; but, on the other hand, one moss (Pottia hyperborea) and one lichen (Usnea melaxantha) are found there which are of American origin and grow both in North America

and on the Cordilleras. Alg# are most numerous, many, like the brown Laminaria and Nostoc communis, which fill all pools and are the chief food of many birds, being familiar in Europe. Protococcus nivalis covers the snow with its reddish powder.

The fauna, although not very rich in species, is exceedingly rich Fauna.

in individuals. It includes fifteen mammals, only two of which are terrestrial —the reindeer and the ice-fox—besides the usual in- habitant of the arctic regions, the polar bear.2 The number of reindeer is really puzzling. Ina single summer, or rather in the course of a few weeks, no fewer than from 1500 to 2000 reindeer were killed by huntcrs for several consecutive years previous to 1868. Much emaciated in June, they grow very fat towards the end of the autumn, after feeding on the mosses. Great numbers are “marked” (that is, have both ears cut at the same height), and the hunters are persuaded that these individuals come from an un- known continent in the north-east, where they have been marked by the hand of man. However strange this hypothesis, it must be acknowledged that the objections urged against it by the Swedish explorers are not conclusive, and that frost-bite attacking young calves could hardly account for the symmetrical markings on both ears. The immense numbers of the reindeer strongly support the idea of their migration, and the only question is whether they came from Siberia via Nova Zembla, or whether they did not rcally come from the unknown archipelagoes on the north-east, the existence of which is supported by so many other data (immobility of the ice to the east of Spitzbergen, dirty ice, birds met with off North-East Land, as well asseveral other considerations of a more general character).

Eight Cetaceans are met with in the seas off Spitzbergen, viz.,— Balznoptera boops, 80 to 110 feet long; B. gigas and B. rostrata, 30 feet long; the white whale (Beluga catodon), three species of seals (Phoca barbata, grenlandica, and hispida), and the walrus (Trichechus or Odobenus rosmarus). The Greenland whale has completely disappeared in consequence of the great havoc made during the last two centuries: according to Scoresby, no less than 57,590 individuals were killed between 1669 and 1775. A perfectly reckless extermination of seals is still going on. Numberless wal- ruses tumble about in the water, or lie in crowds on the

floating ice; and their number further increases when the flocks of Greenland seals arrive in August.

Birds visit the archipelago in such vast flocks that the cliffs are literally covered with them. The fulmar petrel (Procellaria glacialis)—a herald of polar regions—meets the ships approaching Spitzbergen far away from the coasts. Its colonies cover the cliffs, as also do those of the glaucous gull (Larus glaucus), or the “ burgo- master.” Rotches (AMergulus alba), black guillemots (Uria grylia), ivory gulls (Larus ebwrnews), auks, and kittiwake gulls (Larus tridactylus) breed extensively on the cliffs, while geese, looms, and snipe swarm on and about the lagoons and small freshwater ponds. The bernacle goose (Anser bernicla) is only a bird of passage, as it goes farther north-east to nest. The eider breeds in large colonies on the islands, where its young are safe from the ice-fox, only the glaucous gull and the brent goose (Bernicla brenta) being admitted to keep them company, while the lumme (Mormon arcticus) and the tern confine themselves to separate cliffs. These birds, how- ever, are only guests in Spitzbergen, the snow-bunting (Emberiza nivalis) being the only species which stays permanently; twenty- three species breed regularly on Spitzbergen, and four others (the falcon, snowy owl, swan, and skua) come occasionally.

There are twenty-three species of fishes, but no reptiles. Insects are few : Lepidoptera (one species), Newroptcra (one), Hymenoptera (four), and Diptera (twenty) have been met with by the Swedish expeditions. Arachnids, and especially Pantopods, on the other hand, are very common. Molluscs arealso very numerous, embracing no less than 130 species. In June several Limacince are met with in such numbers on the coast and at the mouth of the glacier streams as to constitute the chief food of the gulls. At some places the mussels and univalves reach a comparatively colossal size and appear in ineredibleabundance. Of Crustaceans no fewer than 100 species have been recognized in the waters of the archipelago.

The marine fauna is exceedingly rich in the bluish warmer waters of the Gulf Stream, and the dredgings of the Swedish expeditions, which were prosecuted even under the ice, never failed to bring to the surface a rich variety of remarkable or new forms. From a depth of 8400 feet the “bull-dog” machine lifted mud of a tempera- as follows :—Rosacea, 7 species ;

Sawifragex, 10; Crucifere, 15; Ranunculacee, 8; Silene and Alsinex, 12; Salia, 2; Composite, 5; Scrophulariacer, 2; Ericacex, 2; Graminex, 23; Cyperacex#, 12; Juncacev, 6; Filices (Ferns), 2; Lyco- podiacew,1. The whole of this flora immigrated during the Post-Glacial period, which was warmer than the present.

2 The existence of the Arvicola hudsonia is not quite proved.

ture of 33° Fahr. (0°3 C.) charged with Radiolarians, Polythalame, Globigering, Biloeuline, Dentalia, and Nonioning, together with some Annelids (Spioehxtopterus and Cirratulus), two Crustaceans (Cuma rubiewnda and Apseudes), one Mollusc, two Holothuriz, one Gephyrea, and one Sponge. Even at a depth of 15,900 feet animal life was found in unexpected profusion, the mud consist- ing almost entirely of brown and white Foraminiferx, among them one Crustacean (a species of Cuma). But marine life is much poorer on the east coast, resembling that of Greenland.

Man does not live on Spitzbergen, and the attempts of the Swedes to winter there have for the most part proved failures, except in the case of the ‘‘Sofia” expedition, which succeeded in wintering without great loss, though not without suffering from scurvy. None but the Russian “Pomory” (inhabitants of the Murman coast) have succeeded in enduring the arctic winters. The patriarch of Spitzbergen, the Pomor Staraschin (Starostine), spent no less than thirty-two winters (fifteen being consecutive) on the islands, dying of old age in 1826. There was a time in the 17th and 18th cen. turies when thousands of Dutch, Danes, and others were attracted to Spitzbergen by the whale-fishing. Whole villages sprang up on the shores, the best being that of the Dutch—Smeerenberg—which is said to have been visited by 18,000 men ina single summer. The ‘fright whale” having disappeared, the whalers ceased to visit Spitzbergen, and ouly quite recently an attempt has been made to renew the pursuit of the Balxnoptera boops.

The chief object of pursuit is the walrus, carried on by Norwegians ; sea-birds and eider are also occasionally sought.

History.—Spitzbergen was discovered in 1596 by William Barents, and his companion, Cornelius Rijp, is believed to have circumnavi- gated the archipelago. Nevertheless it was long considered as a part of Greenland, and described under the names of East Green- land, Newland, King James's Land, until the old name of Spitz- bergen gained the ascendency. But long before Barents discovered it the Russians had known it under the name of Grumant (a word of unknown origin), and when Chancellor arrived at Archangel in 1553 he learned that the Russians visited Grumant for hunting purposes. After the 17th and 18th century whalers, the Russians began to visit the group, chiefly for walruses, seals, foxes, rein- deer, bears, and birds ; their huts and crosses are met with at very many places on the coast. Many wintered for several consecutive winters. Since 1830 their visits have almost ccased. The Nor- wegians began to visit the archipelago about 1795, and their small vessels now visit the Spitzbergen waters in considerable numbers. In 1822 a party wintered successfully, but later attempts have for the most part proved fatal on account of scurvy. 'To these ex- perienced arctic navigators—assisted by Norwegian savants—we are indebted for so many important discoveries in the Barents, Kara, and Siberian Seas.

Several expeditions have made Spitzbergen their base in attempts to reach the north pole. The Russian admiral Tchitchagoff visited it twice, in 1765 and 1766, and reached 80° 28' N. lat. John Phipps mapped the north of Spitzbergen in 1773, and reached 80° 37' N. lat. In 1818 Buchan and Franklin reached 80° 34' to the north of the archipelago. Clavering and Sabine in 1823 explored the islands, and Sabine made his remarkable magnetic observations, while Clavering reached 80° 20' N. lat. Parry, shortly after his return from his third voyage, went to Spitzbergen and reached 82° 44' N. lat. on sledges. In the same year the Norwegian geologist Keilhau visited the group and has related his experiences in a remarkable book, Resa i Ost og West Finmarken. The Swedish pro- fessor Lovén was the first to undertake, in 1837, dredging and geological explorations in Spitzbergen and its vicinity. Next year a body of French, Swedish, Danish, and Norwegian naturalists, among whom was Charles Martins, visited the western coast. From 1858 onwards the archipelago has

been the object of a series of scientific expeditions. At the suggestion of Lovén, Otto Torell, accompanied by Nordenskjéld and Quennerstedt, opened the series, making many important observations and bringing home rich geological collections. In 1861 a larger expedition led by Torell, Nordenskjold, Malmgren, Chydenius, and Petersen set out with the object of finding how far it was possible to obtain a measurement of an arc of meridian of sufficient extent. This aim was only partly accomplished, but the expedition returned with an invaluable stock of various observations. The work of the measurement of the arc was completed in 1864 by another expedition conducted by Nor- denskjéld, assisted by Malmgren and Dunér, who returned again With a vast number of new and important observations. This ex- pedition was followed in 1868 by that of the “Sofia,” under Nor- denskjéld, having on its scientific staff Holmgren, Malmgren, and F. Smitt, zoologists ; Berggren and Fries, botanists ; Lemstrém, physicist ; and Nauckhoff, geologist. They were prevented by ice from getting higher than 81° 42’ N, lat. ; but, to use Oswald Heer’s words, the expedition “achieved more and gave a wider extension to the horizon of our knowledge than if it had returned merely with the information that the ‘Sofia’ had hoisted her flag on the north pole.” In 1870 two young Swedish savants, Nauckhorst and Wilander, visited Spitzbergen in order to examine the phosphoric

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deposits, and two years later a colony was formed in Ice Fjord, and a small railway constructed to work the beds. The attempt, how- ever, did not prove successful. Mr Leigh Smith and the Norwegian Captain Ulve visited and mapped parts of East Spitzbergen in 1871, returning with valuable information. They reached 81° 24’ N. lat. In the same year Mr Lamont visited the archipelago. In 1872a great polar expedition set out to winter on Spitzbergen with the intention of attempting in the spring to advance towards the pole on sledges drawn by reindeer. But the expedition encountered a series of misfortunes. The ships were beset in the ice very early in Mussel Bay, and, six Norwegian fishing vessels having been like- wise overtaken and shut in, the expedition had to feed the crews on its provisions and thus to reduce the rations of its own men, The reindeer all

made their escape during a snow-storm ; and, when the sledge party reached the Seven Islands, they found the ice so packed that all idca of going north had to be abandoned. Instead of this, Nordenskjild explored North-East Land and crossed the vast ice-sheet which covers it. The expedition returned in 1873 with a fresh store of important scientific observations, especially in physics and submarine zoology. In 1873 Drasche, the geologist, paid a short visit to Spitzbergen, and the Dutch polar expedition approached it in 1882. In 1882 the Swedish geologists Naathorst and De Geer made a journey to which we are indebted for most interesting data about the flora of the islands. In the same year a polar meteorological station was established at Cape Hordsen for carrying on the observations desired by the international polar committee. The year 1883 being very favourable, the Norwegian walrus-hunters Andreasen and Johannesen pushed to the north-east of Spitzbergen and discovered new land to the north-east of the archipelago apparently extending as far as 39° BE. long.

Bibliography.—The literature of the subject is very voluminous, and for full bibliographical details reference must be made to such works as Chydenius's Svenska Hxpeditionen til Spetsbergen, translated into German by Passarge (Jena, 1869); A. Leslie's Arctic Voyages of A. E. Nordenskjéld_ (London, 1879); and Chavanne's Bibliographie der Polar-Regionen, 1878. The earliest maps of Spitzbergen up to 1864 have been reprinted in a Dutch publication (Tijdschrift van het Aardrijkskundig Genotschap te Amsterdam, pt. iii.); it contains the maps of 1596, 1612, 1625, 1634, 1642, 1648, and soon, Petermann's Mittheilungen, with Ergdnzungshefte, the Geographische Jahrbiicher, the Imer (journal of the Swedish Geographical Society), and the Journal of the Roy. Geog. Society con- tain more or less detailed accounts of all the Swedish expeditions up to date. The scientific results of the Swedish expeditions are embodied in very many papers, amounting to from 6000 to 7000 printed pages, reference to which will be found in the above-mentioned works and periodicals. Oswald Heer's Flora Fossilis Arctica deserves special mention. Every volume of the memoirs and proceedings (Handlingar and Forhandlingar) of the Swedish Academy of Sciences contains some remarkable contributions to our scientific knowledge of the far north, and the same can be said of many volumes of the Christiania Academy of Sciences and the Swedish Geological, Botanical, and Zoological Societies. ING 1))

SPLEEN. See Vascutar System. For diseases of the spleen, see Parnonoey, vol. xviii, p. 376 s9.; also Mauarra and Woot-Sorrer's DIsEASE.

SPOHR, Lupwie (1784-1859), violinist and composer, was born at Brunswick on 25th April 1784, but spent his childhood at Seesen, where in 1789 he began to study the violin, and worked so industriously that at six years old he was able to take the leading part in Kalkbrenner's trios. He received his general education at the Brunswick gram- mar-school,—taking lessons on the violin from Kunisch and studying composition under Hartung. The little he learned from the last-named professor was the only theoreti- cal instruction he ever received, for, as he himself tells us, he taught himself to compose by studying the scores of Mozart. ~ After playing a concerto of his own at a school concert with marked success, he was placed for a time under Maucourt, the leader of the duke's band ; and so rapid was his progress that in 1798 he was able to start on his first artistic tour. This proved a failure 3 but on his return to Brunswick the duke gave him an appointment in his band, and defrayed the expense of his future educa- tion under Franz Eck, in company with whom he visited St Petersburg and other European capitals. His first violin concerto was printed in 1803. In that year Spohr returned to Brunswick and resumed his place in the duke's band. A visit to Paris was prevented by the loss of his favourite violin,—a magnificent Guarnerius, presented to him in Russia. Having played in Berlin, Leipsic, Dresden, and other German towns, his increasing reputation gained for him in 1805 the appointment of leading violinist at the court of the duke of Gotha. Soon after this he married his first wife, Dorette Scheidler, a celebrated harpist. At Gotha he composed his first opera, Die Priifung, but did

not succeed in placing it on the stage. Alruna was equally unfortunate, though it was rehearsed with approval at Weimar in 1808. During this year Spohr accomplished one of the most extraordinary musical exploits on record. Hearing that Talma was performing at Erfurt before the reigning princes assembled for the famous congress, and failing in his attempt to obtain admission to the theatre, he bribed a horn-player to send him as his deputy ; and, though he had never touched a horn in his life, he learned in a

single day to play it so well that in the evening he was able to fulfil his self-imposed duty without excit- ing suspicion or remark. Spohr's third opera, Der Zwei- kampf mit der Geliebten, written in 1809, was successfully performed at Hamburg in the following year. In 1811 he produced his (first) Symphony in Hp, and in 1812 composed his first oratorio, Das jiingste Gericht.1 It was while employed in the preparation of this work that he first felt the inconvenience inseparable from an imperfect theoretical education ; and, with characteristic energy, he set about the diligent study of Marpurg's Abhandlung von der Fuge.

In 1812 Sphor visited Vienna, where his splendid violin- playing created a profound sensation, and he was induced to accept the appointment of leader of the orchestra at the Theater na der Wien. He then began the preparation of his greatest dramatic composition, /aust, which he com- pleted in 1813, though it was not performed until five years later. His strength as a composer was now fully developed; and the fertility of his imagination enabled him to produce one great work after another with aston- ishing rapidity. He resigned his appointment at Vienna in 1815, and soon afterwards made a tour in Italy, where he performed his eighth violin concerto, the Scena Cantante nello Stilo Drammatico,—the finest of his compositions for his favourite instrument. The performer was described by the leading critics of the country as "the finest singer on the violin that had ever been heard." On Spohr's return to Germany in 1817 he was appointed conductor of the opera at Frankfort; and in that city in 1818 he first produced his dramatic masterpiece, Faust. The favour with which this was received led to the composition of Zemire und Azor, a romantic piece founded on the story of Beauty and the Beast, which, though by no means equal to its predecessor in merit, soon attained a much higher degree of popularity. There can, indeed, be no doubt that Maust suffered from the very first from the weakness of its miserable libretto. Had the words been worthy of the music Faust would have taken rank among the finest German operas in existence.

Spohr first visited England in 1820, and on 6th March played his Scena Cantante with great success at the first Philharmonic concert. At the third he produced a new Symphony (No. 2) in D minor, written expressly for this occasion, which is remarkable as the first on. which the conductor's bdton

was used at a concert of the Philharmonic Society. Spohr's new symphony met with an enthusiastic reception, as did the earlier one (No. 1, in Eb), which was played, together with his Wonetto, at the last concert of the series. Indeed he had a triumphant success both as com- poser and as virtuoso; and he on his side was delighted with the performances of the Philharmonic orchestra. Before leaving London he gave a farewell concert, at Which Madame Dorette Spohr played on the harp for the last time. Her health at this period was so delicate that she was recommended to exchange her favourite instru- ment for the less fatiguing pianoforte ; and Spohr, with his accustomed facility, wrote a number of pieces for planoforte and violin, which the husband and wife played

1 Literally The Last Judgment, but not to be confounded with the oratorio now so well known by that name in England.

All

together with perfect artistic sympathy. After supple- menting his visit to England by a short sojourn in Paris, Spohr returned to Germany and settled for a time in Dresden, where German and Italian opera were flourishing side by side under the direction of Weber and Morlacchi. His artistic relations with the composer of Der Freischiitz were not altogether satisfactory ; nevertheless Weber did not hesitate to recommend him strongly to the elector of Hesse Cassel as "'kapellmeister." Spohr entered upon his duties at Cassel on 1st January 1822, and soon afterwards began the composition of his sixth opera, Jessonda, which he produced in 1823. This work—which he himself always regarded as one of his best productions—marks an important epoch in his career as a dramatic composer. It was the first opera he ever wrote with accompanied recitative throughout in place of the usual spoken dia- logue ; and by a remarkable coincidence it was produced in the same year as Weber's Luryanthe, a work charac- terized by the same departure from established custom. Unhappily Weber's early death prevented him from making a second essay in the same direction ; but Spohr consist- ently carried out the idea in his later operas, and always with marked success.

Spohr's appointment at Cassel gave him the opportunity of bringing out his new works on a grander scale and with more careful attention to detail than

he could have hoped to attain in the service of a less generous patron than the elector. And he never failed to use these privi- leges for the purpose of doing justice to the works of other composers. Soon after his instalment in his new office Mendelssohn, then a boy of thirteen, visited Cassel with his father ; notwithstanding the disparity of their years, a firm and lasting friendship sprang up between the rising genius and the already famous composer, which ceased only with Mendelssohn's death in 1847; and in other similar cases Spohr always proved himself ready to ap- preciate and foster the talent displayed by others, though it must be admitted that as a critic he was very difficult to please. The success of Jessonda led him to produce in 1825 a seventh opera—Der Berggevst—founded upon the old German legend of Riibezahl, the ruling spirit of the Riesengebirge. Though less popular than its predecessor, this fine work attained a very fair success. But a far greater triumph awaited the composer at the Rhenish musical festival held at Diisseldorf in 1826. On this occasion his oratorio Die letzten Dinge met with so en- thusiastic a reception that it had to be repeated a few days later for the benefit of a charity. This work, known in England as The Last Judgment, is undoubtedly the greatest of Spohr's sacred compositions, and is remarkable as the first oratorio in which the romantic element is freely introduced, with marked success throughout, and without detriment either to the solemnity of the subject or the sobriety of style which has always been regarded as an indispensable characteristic of sacred music of the highest order. In 1827 Spohr produced his eighth opera, Pietro von Abano, the plot of which depends for its chief interest upon the resuscitation by the famous necromancer of a lady long since dead and committed to the tomb. The work met with a fair, though not a lasting, success; and the same may be said of a much finer opera, Der Alchymist, produced in 1830. Spohr's next publication was of a very different character. His Violin School, produced in 1831, is so useful as a code of instruction for advanced students that there is probably no great violinist now living who has not been more or less indebted to it for the perfection of his technique. It holds with regard to the violin a position no less important than that which Cramer's Studies has so long held in connexion with the pianoforte.

The year 1833 Spohr spent in the preparation of a new

oratorio—Des Heiland's letzte Stunden, known in England as Calvary or The Crucifixion—which was performed at Cassel on Good Friday 1835, and sung in English at the Norwich festival of 1839, under Spohr's own direction, with such unexampled success that he was accustomed to speak of this event as the greatest triumph of his life. For the Norwich festival of 1842 he composed The Fall of Babylon, which also was a perfect success. His last opera, Die Kreuzfahrer, was produced at Cassel in 1845. Of his nine symphonies the finest, Die Weihe der Tone, was produced in 1832. His compositions for the violin include concertos, quartetts, duets, and other concerted pieces and solos, adapted for the chamber and the concert room, and among these a high place is taken by four double quartetts,—a form of composition of which he was both the inventor and the perfecter. He was, indeed, very much inclined to explore new paths, notwithstanding his attachment to classical form, and his freedom from prejudice was proved by the care with which he produced Wagner's Flying Dutchman and Tannhdéuser at Cassel in 1842 and 1853, in spite of the elector's opposition. Spohr retained his appointment until 1857, when, very much against his wish, he was pensioned off. In the same year he broke his arm, but he was able to conduct Jessonda at Prague in 1858. This, however, was his last effort. He died at Cassel on 16th October 1859. (W. S. R.) SPOLETO (Lat. Spoletium), a city of Italy, in Umbria, placed in a commanding position near the Via Flaminia, between Rome and Perugia, is said to have been colonized in 240 B.c, (Liv., Hpit., xx.; Vell. Pat., i. 14), and is called by Cicero (Pro Balb., 21) "colonia Latina in primis firma et illustris." After the battle of Trasimenus (217 B.C.) Spoletium was attacked by Hannibal, who was repulsed by the inhabitants (Liv., xxii. 9). During the Second Punic War the city was a useful ally to Rome. It suffered greatly during the civil wars of Marius and Sulla. The latter, after his victory over Crassus, confiscated the terri- tory of Spoletium and reduced it to the rank of a military colony. Under the empire it again became a flourishing town (Strabo, v. p. 227; Plin., H.M., iii. 14; Ptol., iii,

1, 54). Owing to its elevated position it was an important stronghold during the Vandal and Gothic wars ; its walls were dismantled by Totila (Procop., Bell. Get., iii. 12), Under the Lombards Spoleto became the capital of an independent duchy (from c. 570), and its dukes ruled a considerable part of central Italy. Together with other fiefs, it was bequeathed to Pope Gregory VIL. by the empress Matilda, but for some time struggled to maintain its inde- pendence. In 1881 it had a population of 7969 (commune, 21,507), many of whom are occupied in the weaving of woollen stuffs. It is the seat of an archbishopric for the three dioceses of Spoleto, Bevagna, and Trevi.

The city contains many interesting ancient remains,—traces of an early polygonal wall, a Roman theatre, and parts of three temples, built into the churches of 8, Agostino, 8. Andrea, and §. Giuliano, Remains of a fine Roman bridge were found a few years ago buried in the former bed of a torrent, which now runs along a different line, These remains have recently been buried again under a newly made road. On the citadel, which commands the town, still stands an ancient castle, originally built by Theodoric. This castle was mostly destroyed by the Goths, but was afterwards re- built and enlarged at many different times, especially by Pope Nicholas V. The existing building contains work of many different dates. The cathedral of S. Maria Assunta dates partly from the time of the Lombard duchy, but was much modernized in 1644. Over the main entrance is a very interesting and large mosaic of Christ in Majesty signed “Salsernus,” 1207; at the sides are figures of the Virgin and St John. In the choir and on the half cupola of the apse are some of the finest frescos of Lippo Lippi, represent- ing scenes from the life of the Virgin. Lippo died in 1469, leaving part of the work to be completed by his assistant Fra Diamante. The fine stalls and panelling in the choir are attributed to Bramante. The church of S. Pietro is a fine early example of Lombard archi- tecture, though much modernized. The facade is remarkable for its rich sculptured decorations of grotesque figures, dragons, and foliage. S. Domenico is a fine example of later Italian Gothic with bands of different coloured stones. ‘The three-apsed crypt of the church of S. Gregorio is of great interest ; it probably dates from the found- ing of the church in the 9th century. S$. Niccolo is a beautiful example of Pointed Gothic.

The city is still supplied with water by a grand aqueduct (seo vol. ii. pl. IV.) across the adjacent gorge; it has stone piers and brick arches, and is about 268 feet high and 676 feet long. It is said to have been built in 604 by Theodelapius, the third Lombard duke, and the stone piers belong probably to that time. The brick arches are later restorations.

SPONGES

ye great advance which has been made during the

past fifteen years in our knowledge of the sponges is due partly to the vivifying influence of the evolutional hypothesis, but still more to the opportunities afforded by novel methods of technique. To the strength and weak- ness of the deductive method Haeckel's work on the Kalk-schwémme (6)} is a standing testimony, while the slow but sure progress which accompanies the scientific method is equally illustrated by the works of Schulze (20), who by a masterly application of the new processes has more than any one else reconstructed on a sure basis the general morphology of the sponges. In the general progress the fossil sponges have been involved, and the application of Nicol's method of studying fossil organisms in thin slices has led, in the hands of Zittel and others (24, 35), toa complete overthrow of those older classifications which relegated every obscure petrifaction to the fossil sponges and consigned them all to orders no longer existing. But, whilst many problems have been solved, still more have been suggested. An almost endless diversity in details

differentiates the sponges into a vast number of specific |

forms; the exclusive possession in common of a few simple characters closely unites them intoa compact group, sharply marked off from the rest of the animal kingdom.

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1 These numbers refer to the bibliography at the end of the article. |

Structure and Form.

Description of a Simple Sponge.—As an example of one Simple

of the simplest known sponges we select Ascetta primordialis (fig. 1), Haeckel. This is a hollow vase-like sac closed at the lower end, by which it is attached, opening above by a comparatively large aperture, the osculum or vent, and at the {f sides by numerous smaller apertures or pores, which perforate the walls. Ex- : cept for the absence of tentacles and § the presence of pores it offers a general resemblance to some simple form of Hydrozoon. Histologically, however, it presents considerable differences, since, in addition to an endoderm and an ecto- derm, a third or mesodermic layer con- tributes to the structure of the walls; and the endoderm consists of cells (see fig. 21g) each of which resembles in all essential features those complicated uni- cellular organisms known as choano- flagellate Infusoria (see Protozoa, vol. xix. p. 858). With this positive charac- ter 18 associated a negative one: nemato- 61 ee cysts are entirely absent. The activity “~~”

SPONGES

of the Ascetta, as of all sponges, is most obviously mani-

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Canal System.—We shall now trace the several modifi-

fested, as Grant (5) first observed, by a rapid outflow of | cations which the Olynthus has undergone as expressed in water from the oscule and a gentle instreaming through | the different types of canal system.

the pores,—a movement brought about by the energetic action of the flagella of the WW ia. ff endodermic cells. The in- a i streaming currents bear with WN\\ them into the cavity of the sac (paragastric cavity) both protoplasmic particles (such as Infusoria, diatoms, and other small organisms) and dissolved oxygen, which are ingested by the flagellated cells of the en- doderm. ‘The presence of one or more contractile vacuoles in these cells suggests that they ~ extricate water, urea, and car- bonic acid. The insoluble re- sidue of the introduced food, together with the fluid excreta,

is carried out through the os- cule by the excurrent water. New individuals are produced from the union of ova and spermatozoa, which develop from wandering amceboid cells in the mesoderm. The walls of Ascetta are strengthened by calcareous scleres, more especi- = ally designated as spicules, Mc. 2—Homoderma sycandra, Lfd. Maen eve the form of tri- Ons, half cut sway by o vertical radiate needles. If we make feld (xabout 6).

abstraction of these we obtain an ideal sponge, which Haeckel has called Olynthus (6), and which may be re-

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Fic. 8.—Homoderma sycandra, Lfd. Transverse section, showing radial tubes opening

into central paragastric cavity. After V. Lendenfeld (xabout 12).

garded as the ancestral form from which all other sponges have been derived. To give greater exactness to our ab- Straction we should perhaps stipulate for the Olynthus a somewhat thicker mesoderm and more spherical form than a decalcified Ascon presents.

The simple paragaster of Ascetta may become compli- Ascon cated in a variety of ways, such as by the budding off type.

from a parent form of stolon-like extensions, which then give rise to fresh individuals, or by the branching of the Ascon sac and the subsequent anastomosis of the branches; but in no case, so long as the sponge remains within the Ascon type, does the endoderm become differentiated into different histological elements. The most interesting modification of the

Ascon form occurs in Homoderma sy- candra (z2), in which from the walls of a simple Ascon czecal processes grow out radiately in close regular whorls, each process reproducing the structure of the parent sponge (figs. 2, 3). From this it is but a short step to

the important departure which gives rise to the Sycons.

In the simplest examples of this type the characters of Sycon Homoderma sycandra are reproduced, with the important type. exception that the endoderm lining the paragastric cavity of the original Ascon form loses its primitive character,

Fic. 4.—Heteropegma nodus-gordii, Pol. Part ofa transverse section. The straight lines indicate spicules ; the poriferous surface is uppermost; the branching radial tubes are rendered dark by numerous small circles representing choanocytes. After Polejaeff, ‘‘ Challenger” Report (x50).

and from a layer of flagellated cells becomes converted

into a pavement epithelium, not in any distinguishable

feature different from that of the ectoderm. The

~~_ flagellated cells are thus restricted to the cacal outgrowths or radial tubes. Concurrently with this differentiation of the endoderm a more abun~~ dant development of mesoderm occurs. In some

Sycons (Sycaltis, Hk.) the radial tubes remain

separate and free; in others they lie close together

and are united by trabecule, or by a trabecular network, consisting of mesodermic strands sur- rounded by ectoderm (fig. 4). The spaces between the contiguous radial tubes thus become converted into narrow canals, through which water passes from the exterior to enter the pores in the walls of the radial tubes. These canals are the “inter- canals” of Haeckel, now generally known by their older name of incurrent canals. The openings of the incurrent canals to the exterior are called pores, a term which we have

also applied to the openings which lead directly into the radial tubes or paragastric cavity; to avoid ambiguity we shall for the future distinguish the latter kind of open- ing asa prosopyle. The term “pore” will then be restricted to the sense in which it was originally used by

Grant. The mouth by which a radial tube opens into the

paragaster is known as a gastric ostiwm. In the higher

forms of Sycons the radial tubes nolonger arise as simple out- growths of the whole sponge-wall, but rather as outgrowths

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of the endoderm into the mesoderm, which, together with the ectoderm, exhibits an independent growth of its own; and this results in the formation of a thick investment, known as the cortex (fig. 5), to the whole exterior of the

Fic. 5.—Ute Argentea, Pol. Part ofa transverse section. The concentric circles, indicating transverse sections of spicules, lie within the cortex. After Bole- jaeff, “ Challenger” Report (x100).

sponge. The radial tubes may branch, Heteropegma (fig.

4). Ifthe branches are given off regularly, as the radial

tubes were in the first plan, and if at the same time the

original radial tube exchanges its flagellated for a pave- ment epithelium, a structure as shown in fig. 6 (Polejna

Rhagon type.

Fia. 6.—Polejna connexiva, Pol. canals, into which the flagellated chambers open. After Polejaeff, ‘‘ Challenger” Report (x 50).

Part of a transverse section. 2, excurrent

connexiva, Pol.) will result. This form might also be brought about by unequal growth of the gastral endoderm leading to a folding of the inner part of the sponge-wall. Very little direct evidence exists as to which of these two plans has actually been followed. Phylogenetically the transition from a simple Ascon to the most complicated Sycon can be traced step by step; and ontogeny shows that such a Sycon form as Grantia raphanus passes through an Ascon phase in the course of its larval development. Returning to the ancestral form of sponge, Olynthus, let us conceive the endoderm growing out into a number of approximately spherical chambers, each of which com- municates with the exterior by a prosopyle and with the paragastric cavity by a comparatively large aperture, which we may term for distinction an apopyle; at the same time let the endoderm lose its flagellated character and become

converted into a pavement epithelium, except in the spherical chambers. Such a form, called by Haeckel “dyssycus,” may be more briefly named a Rhagon from the grape-like form of its flagellated chambers, which differ from those of a Sycon both by their form and their smaller dimensions. The Rhagon occurs as a stage in the early development of Plakina monolopha (Schulze) and Reniera Jertilis (9) (fig. 7); a calcareous sponge which appears to

Fie. 7.—Vertical section of a Rhagon, partly diagrammatic.

0, oscule; p, After Keller (x about 100).

approach it somewhat is Leucopsis pedunculata, Lid. By the folding of the wall of a Rhagon, or by its outgrowth into lobes, a complicated structure such as that of Plakina monolopha (20) (see fig. 26 f) results. This is character-

Fic. 8.—Transverse section across an excurrent canal and surrounding choano- some of Cydoniwm eosaster, Soll. e, excurrent canal; /, flagellated chambers communicating with it by aphodal canals; 7, an incurrent canal cut across; s, a sterraster ; 0, an oxea cut across. After Sollas, “‘ Challenger” Report (x 125).

ized by the chambers retaining their immediate communi- cation with the incurrent and excurrent canals, opening into the latter by the widely open apopyle and receivin the former by one or A¥pai.ox.rprq ay several prosopyles. This ~ may be termed the eury- + pylous type of Rhagon canal system. The fold- ing of the sponge-wall may be simple, as in the example given, or too complex to unravel. In higher forms of sponges (Geodinide, Stellettide) the chambers cease to open abruptly into the excurrent canals: each is = prolonged into a narrow $% canal, aphodus, or abitus, which usually directly,

sometimes after uniting “a! ay with one or more of its yy. 9.—Diplodal canal system in Cortictwm fellows, opens into an candelabrum, 0.8. e, excurrent canal; the

incurrent canal is shown on the left-hand excurrent canal. The side, near its commencement in the cortex.

prosopyles, now restrict- After F. E. Schulze (x 200). ed to one for each chamber, may remain unchanged in character, or at the most be prolonged into very short

one,

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This may be | Jettidx, an early form of the sponge (fig. 11), shows the

tubes, each a prosodus or aditus (fig. 8). termed the aphodal or racemose type of Rhagon system, since the chambers at the ends of the aphodi radiating from the excurrent canal look like grapes ona bunch. As Haeckel, however, has used ‘“‘racemose” in a different sense, we shall adopt here the alternative term. By the exten- sion of the prosodal or adital canals into long tubes a still higher differentiation is reached (fig. 9). This, which from the marked presence of both prosodal and aphodal canals may be termed the diplodal type of the Rhagon canal system, occurs but rarely. Chondrosia is an example.

The following scheme will render clear the foregoing

distinctions :—

1. Ascon type: simple, ex. Ascetia, Hk. ; strobiloid, ex. Homo- derma, Lfd.

2. Sycon type: simple radial tubes, ex. Sycetta, Hk. ; branched radial tubes (cylindrical chambers), ex. Heteropegma, FI.; chamber-layer folded, ex. Polejna, Pol.

3. Rhagon type: eurypylous, with several prosopyles to each chamber, ex. Spongelia; with a single prosopyle to each chamber, ex. Osearella, Thenea; aphodal, aphodal canals well developed, ex. Geodia, Lmk.; diplodal, with both aphodal and prosodal canals well developed, ex. Chondrosia, O.S.

Tn the case of the calcareous sponges Polejaeff has argued forcibly that the eurypylous type arises directly from the Sycon and not from the Rhagon. It is therefore doubtful how far the Rhagon in other sponges is a primitive form derived directly from an Olynthus, or whether it may not be a secondary larval state resulting from the abbreviated development of a former Sycon predecessor. Whatever may have been its past history, the Rhagon serves now at all events as a starting-point for the development of the higher forms of canal system.

In the higher Rhagons, as in the Sycons, further com- plications ensue, owing to an independent growth of the external ectoderm and the adjacent mesoderm. While the endoderm, with its associated mesoderm, is growing out or folding to form the excurrent canal system, the super- ficial mesoderm increases in thickness, and the ectoderm, extending laterally from the sides of the incurrent sinuses, burrows into it, parallel to the surface of the sponge. Thus it forms beneath the skin (7.c., the layer of superficial mesoderm and investing ectoderm) cavities which may be either simple and spacious or be broken up into a number of labyrinthine passages by a network of mesoblastic strands (invested with ectoderm) which extend irregularly from roof to floor of the chamber. ‘These cavities are known as subdermal chambers.

With the appearance of subdermal chambers the sponge becomes differentiated into two almost independent regions, an outer or ectosome and an inner or choanosome, which is

’ characterized by the presence of flagellated chambers.

The ectosome forms the roof and walls of the subdermal chambers, and is in its simplest form merely an investing skin; but in a large number of sponges it acquires con- siderable thickness and a very complicated histological structure. It is then known as a cortex. The thickening which gives rise to a cortex takes place chiefly beneath those parts of the skin which are not furnished with pores. Beneath the pores—in this case collected into sieve-like areas—dome-like cavities are left in the cortex; they open freely into the subdermal cavities below and their roof is formed by the cribriform pore membrane above. In many Sponges (Geodia, Stelletta) the cortical domes are constricted near their communication with the subdermal cavity (sub- cortical crypt) by a transverse muscular sphincter, which defines an outer division or ectochone from an inner or endochone (fig. 10), the whole structure being a chone. The endochone is frequently absent (fig. 10). The early development of the cortex has scarcely yet been studied. In Stelletta phrissens (Soll.), one of the “Challenger” Stel-

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choanosome already characteristically folded within the cortex, which forms a com- plete not-folded envelope – around it. The roots of the incurrent sinuses form : widely open spaces imme- – diately beneath the cortex – and are the rudiments of subcortical crypts. Again, <% in some sponges a part of the endoderm and asso- ciated mesoderm may like- || wise develop independ-|/ ently of the rest of the sponge, as in the Hexac- tinellida, where the choa- nosome forms a middle layer between a reticula- tion of ectosome on the one side and of endoderm and mesoderm, 1.¢., endo- some, on the other. Fin-

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Fre. 10.—Section through the cortex of C . Endo- ally, the attached or lower donium eosaster, Soll., showing the a some.

sieve overlying the chone, which com- municates through a sphinctrate aperture with the subcortical crypt, lying in the choanosome with its

flagellated chambers. The dotted circles in the cortex are sterr- asters connected by fibrous strands. After Sollas, ‘‘ Challenger” Report (x78).

half of a Rhagon may de- velop in an altogether dif- ferent manner from the other or upper half, the endoderm not producing any flagellated chambers. In this case the upper portion alone is characterized by the flagellated chambers, which are the distinctive mark of a sponge, and hence may be

Fic. 11.—Young sponge of Stelletta phrissens, Soll. tion, showing the choanosome folded within the cortex. Sollas, ‘‘ Challenger” Report (x 50).

called the spongomere ; the lower half, which consists of all three fundamental layers, may be called the hypomere.

The form and general composition of sponges are ex- ceedingly various and often difficult to analyse, presenting, along with some important differences, a remarkable general resemblance to the Ccelentera in these respects. them, some sponges are simple, and others, through asexual multiplication, compound. The only criterion by which the individual sponge can be recognized is the oscu- lum ; and, as it is frequently difficult, and in many cases impossible, to distinguish this from the gastric opening of a large excurrent canal, there are many cases in which the simple or compound nature of the sponge must remain open to doubt. The oscule may also fail (Jipostomosis), and so may the paragastric cavity (lipogastrosis); the problem then becomes insoluble. The loss of the oscule

Longitudinal median see- o, oseule. After

Like Oscule.

may in some cases be due to the continued growth of several endodermal folds towards the exterior, with a corresponding absorption of the mesoderm and ectoderm which lie in the way, till the folds penetrate to the ecto- derm and open at the exterior, thus giving rise to excurrent openings, which are not readily distinguishable from pores. At the same time the original osculum closes up and entirely disappears. Lipogastrosis, on the

other hand, may be produced by the growing together of the roots of the choanosomal folds, thus reducing the paragastric cavity to a labyrinth of canals, which may easily be confounded with the usual form of excurrent canals. While in some sponges the original oscule is lost, in others secondary independent openings, deceptively like oscules, are added. This pseudostomosis is due to a folding of the entire sponge, so as to produce secondary canals or cavities, which may be incurrent (vestibular) or excurrent (cloacal), the opening of the latter to the exterior being termed a false oscule or pseudostome. ‘The faulty use of the term oscule for what is neither functionally nor morphologically a mouth is here obvious, for in one sense the oscule is always a pseudostome ; it would be better if the term pseudoproct could be substituted.

Skeleton.—All sponges, except three or four genera be- longing to the Myxospongiz, possess some kind of skeletal structures. They may be either calcareous or silicious or horny scleres, the latter usually having the form of fibres, which sometimes enclose silicious needles (spicules) or foreign bodies introduced from without. Foreign bodies also contribute to the formation of the skeleton of some silicious sponges, and occasionally form the entire skeleton, no other hard parts being present.

Mineral scleres usually occur in the form of spicules. The spicules of calcareous sponges consist of carbonate of lime, having the crystalline structure and other properties of calcite (29). Each spicule, so far as its mineral com- ponent is concerned, is a single crystal, all the molecules of calcite of which it is built up being similarly oriented. On the other hand, its form and general structure are purely organic. Its surfaces are always curved, and usually it has the form of a cone or combination of cones, each of which consists of concentric layers of calcite surrounding an axial fibre of organic matter,—probably of the same nature as spongiolin or spongin, the chief constituent of the fibres of horny sponges. A thin layer of organi matter, known as the spicule sheath, forms an outer investment to the spicule and is best rendered visible as a residue by removing the calcite with weak acid. Silicious spicules consist of colloid silica or opal, and hence can be distin- guished from calcareous by having no influence upon polar- ized light, Structurally the two kinds of spicules present no important difference. The spicules of different sponges differ greatly both in form and

in size. They may be conveniently divided into two groups,—minute or flesh spicules, which usually serve as the support of a single cell only (mzcroscleres), and larger or skeletal spicules, which usually contribute to the formation of a more or less con- sistent skeleton (megascleres). The distinction is not one that can be exactly defined, and must so far be regarded as of a provisional nature. There is usually but little diffi- culty in applying it in practice, except in some doubtful cases where large spicules do not form a continuous skeleton, or in others where flesh spicules appear to be passing into those of larger size. It is indeed highly probable that all large spicules have originated from flesh spicules (72).

(1) Monaxon Biradiate Type (rhabdus).—By far the commonest form is the oxea, a needle-shaped form pointed at both ends and produced by growth from a centre at the same rate in opposite directions along the same axis. It is therefore uniaxial and equibiradiate (fig.12a). (2) Mon-

axon Uniradiate Type (stylus).—By the suppression of one of the rays of an oxea, an acuate spicule or stylus results — (fig. 126). (3) Lriaxon Triradiate Type.—Linear growth

Fic. 12.—Typical megascleres. a, rhabdus (monaxon diactine); b, stylus (monaxon monactine); ¢, triod (triaxon triactine); d, calthrops (tetraxon tetractine); e, triaxon hexactine; f, desma of an anomocladine Lithistid pein g, sterraster (polyaxon); h, radial section through the outer part of g, showing two actines soldered hhc by intervening silica, the ee terminating in recurved spines and the axis traversed by a central

from a centre in three directions inclined at an angle of

120° to each other gives rise to the primitive form of tri- radiate spicule so eminently characteristic of the calcareous

sponges, but by no means confined to them (fig. 12). (4)

Tetraxon Quadriradiate Type (Calthrops).—Growth from a

centre in four directions inclined at about 110° to each

other produces the primitive quadriradiate form of the

Tetractinellida and of some calcareous sponges (fig. 12 d).

(5) Searadiate Type.—Growth in six directions along three

rectangular axes produces the primitive sexradiate spicule

of the Hexactinellida sponges (fig. 12). (6) Multiradiate

Type.— Extensions radiating in many directions from a

centre produce a stellate form (fig. 12 f). (7) Spherical

Scleres.—Concentric growth of silica about an organic

particle produces the sphere, which occurs as a reduction

of the rhabdus in some species of Pecillastra, or as an overgrown globule (flesh spicule) in Caminus.

Usually conical, the spicular rays often become cylindrical ; usu- Uniax ally pointed (oweate) at the ends, they are also frequently rounded type. off (strongylate), or thickened into knobs (tylotate), or branched (eladose).

Their growth is not always rigorously confined to a

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Fic. 13.—Modifications of monaxon type. a, strongyle; b, tylote; c, oxea; d, tylotoxea; e, tylostyle; f, style; g, spined tylostyle; h, sagittal triod @ triaxon form derived from the monaxon); j, oxytylote; k, anatriene; J, pro- triene; m, orthotriene; n, dichotriene; 0, centrotriene; p, amphitrisene (this is trichocladose) ; g, crepidial strongyle (basis of Rhabdocrepid Lithistid desma); r, young form of Rhabdocrepid desma, showing crepidial strongyle coated with successive layers of silica; s, Rhabdocrepid desma fully grown. The dotted line through the upper figures marks the origin of the actines.

straight line: frequently they are curved or evenundulating. They are also liable to become spined, either by mere superficial thicken- ing or by a definite outgrowth involving the axial fibre (fig. 13 g, 4).

The rhabdus if pointed at both ends is known as an owea (fig. 18¢); if rounded at both ends as a strongyle (fig. 18a) ; if knobbed

at both ends as a tylote (fig. 138 6); the tylote if pointed at one end is a tylotoxea (fig. 18d); the strongyle similarly becomes a strongyl- oxea. ‘These last two forms are with difficulty distinguished from the stylus, which is usually pointed at the end, and strongylate (fig. 13/) or tylotate (fig. 13 e) about the origin. A particular case of the cladose rhabdus, but one of the most frequent occurrence, is the trizne; in this form one ray of a rhabdus ends in three branches, which diverge at equal angles from each other. The rhabdus then becomes known as the shaft or rhabdome, and the secondary rays are the arms or cladi, collectively the head or cladome of the spicule. The arms make different angles with the shaft: when recurved a grapnel or anatriane is produced (fig. 18 &), when projecting forwards a protrizne (fig. 137), and when extended at right angles an ortho- triwne (fig. 18m). The arms of a triene may bifurcate (dichotriane) once (fig. 18 2), twice, or oftener, or they may trifurcate. Again, they may extend laterally into undulating lamelle, or unite to form a disk, the triene character of which is indicated by the included axial fibre. The shaft may also become trifid at both ends, amphi- triene (fig. 13 p), and the resulting rays all bifurcate, or the cladome may arise from the centre of the rhabdome, centrotriwne (fig. 13 0). Amongst one group of Lithistid sponges (Rhabdocrepida) the normal growth of a strongyle is arrested at an early stage ; it then serves as a nucleus upon which further silica is deposited, and in such a manner as to produce a very irregularly branching sclere or desma (fig. 18 s), within which the fundamental strongyle can be seen en- closed. In such a desma no axial fibre besides that of the enclosed strongyle is formed.

The chief modification of the triradiate spicule is due to an elonga- tion of one ray, distinguished as apical, the shorter paired rays being termed basa/, and the whole spicule a sagittal triradiate. The ‘ angle included by the basal

rays is usually over 120° (fig, 14 a). ‘Some or all of the rays of the primitive calthrops (fig, 14 >) may

Fia. 14.—Modifications of the triaxon and tetraxon types. a, sagittal triradiate or triod; 0, calthrops; c, candelabra (a polycladose microcalthrops); d, a spined microcalthrops ; ¢, Tetracladine Lithistid desina.

subdivide into a number of terminal spines candelabra (fig. 14 ¢) ; or some or all of them may bifurcate once or twice and finally terminate by subdividing into numerous variously oe 7 processes ; such a tetracladine desma (fig. 14) eharacterizes one division of the Lithistid sponges.

By the excess or defect of one or more rays a series of forms such as are represented in fig. 15 arise. In the oxea, which results from

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Fic. 15.—Modifications of the triaxon hexactine type. a, dagger ; b, c, two varieties of pinnulus; d, amphidisk; e, pentactine; f, staurus; g, dermal thabdus. After Schulze.

the suppression of all rays but two, the sexradiate character is some- times preserved by the axial fibre, which gives off two or four pro- cesses in the middle of the spicule where the defective arms would arise. Let fig. 12 ¢ represent a regular sexradiate spicule with its four horizontal arms extended beneath the dermis of its sponge ; the over-development of the proximal ray and a reduction of the distal ray produce a form known as the dagger (fig. 15 a); the suppression of the proximal ray and the development of spines pro- jecting forwards on the distal ray produce the yinnulus (fig. 15 8, c) ; the suppression of both proximal and distal rays gives the stawrus (fig. 15 7), and the suppression of two of the remaining horizontal rays a dermal rhabdus (fig. 15g). The suppression of a distal ray, excessive development of a proximal ray, and recurved growth of the remaining rays produce an anchor. In Hyalonema (glass rope sponge) anchors over a foot long occur, but their arms or teeth are not restricted to four, and the axial fibre gives off its processes before reaching the head of the spicule. Such a grapnel helps to support the sponge in the ooze of the sea-bed. Other character-

on

Fra. 16.—a, uncinaria ; 0, clavula; c, scopularia. After Schulze.

istic spicules belonging to sponges distinguished by sexradiate spicules are the following :—the wnceinaria (fig. 16 a), a spinose

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oxea with the spines all pointing one way; the clavula, a tylotate form with a toothed margin to the head (fig. 16 0); the scopularia (fig. 16 c), a besom-shaped spicule with tylotate rays, which vary in number from two to eight; the amphidisk (fig. 15 d), a shaft terminating at each end in a number of recurved rays. When the sexradiate spicules of the Hexactinellida unite together in a manner to be described later, the rays may be bent in a variety of ways out of the triaxial type, so that the sexradiate character alone remains,

Multiradiate Type.—The rays of an aster as of other spicules may be spined or tylotate. In one remarkable form known as a sterraster (fig. 12 9, h), and characteristic of the family Geodinida, the rays are almost infinite in number, and coalesced for the greater part of their length ; the distal ends, however, remain separate, and, becoming slightly tylotate, are produced into four or five re- curved spines, which give attachment to connective tissue fibres by which adjacent sterrasters are united together.

In one aberrant group of Lithistid sponges (Anomocladina) the skeleton is formed of desmas, which are multiradiate, each present- ing a massive centrum (with an included cavity) produced into a variable number (4 to 8) of rays, which rays terminate in expanded ends (fig. 12, f).

Multi- radiate

type.

It is doubtful whether a distinction between megascleres and Micro-microscleres can be maintained in the calcareous sponges, unless scleres.

the minute oxeas which occur in Hilhardia schulzei, Pol. (76), are to be referred to this group. They are widely distributed through- out the silicious sponges, and by their different forms afford charac- ters of the highest importance in classification.

One of the simplest forms is the sigmaspire (fig. 17 a, b); it looks like the letter C or S, according to the direction in which it is

Fig. 17—Microscleres. a, 6, sigmaspire viewed in different directions,—a, along axis, and }, obliquely ; c, toxaspire; d, spiraster; e, sanidaster; f, amphi- aster ; g, sigma or cymba ; h, cymba, with three ptera at each end,—the central one a proral pteron and the lateral, pleural ptera ; 7, one end of another form of cymba, showing seven ptera; k, monopteral cymba,—proral ptera only, developed at ends, tropidial ptera much enlarged ; 1, oocymba, in which proral and pleural ptera have grown towards each other and coalesced ; m, spher- aster; 7, oxyaster; 0, the same, with six actines; p, the same, with four actines ; g, the same, with two actines (a centrotylote microxea); 7, micro- tylote ; s, microxea (q, r, and s are reduced asters); ¢, rosette.

viewed, its actual form being that of a single turn of a cylindrical

spiral, A turn and a part of a turn of a spiral of somewhat higher

pitch than that of a sigmaspire gives the toxaspire (fig. 17¢); a con- tinued spiral growth through several revolutions gives the poly- spire. The sigmaspire becoming spined produces the spiraster or spinispirula (fig. 17 d); this, by losing its curvature, becomes the sanidaster (fig. 17 e), and by simultaneous concentration of its spines into a whorl at each end, the amphiuster (fig. 17 f). By reduction

of the spire the spiraster passes into the stellate or aster (fig. 17 n).

A thickening about the centre of the aster produces the spherastcr

(fig. 17 m), allied to which is the sterraster. By a reduction in the

number of its rays the aster becomes a minute calthrops, from which,

by increased growth, the skeletal calthrops may very well be derived ; by further reduction to two rays a little rhabdus or microrabd re- sults, and of this numerous varieties exist, of which the oxeate microrabd is the most interesting, since it only differs in size from the commonest of all skeletal spicules, the oxeate or acerate rhab- dus. The sigmaspire is formed as a superficial spiral thickening in the wall ofa spicule cell or scleroblast ; as superficial deposits also the next group of spicules, the so-called anchorates, arise.

Take a hen’s egg as the model of a scleroblast, draw round it a

broad meridional band, interrupted only on one side, for 30° above

and below the equator; this will represent a truly C-shaped spicule, which differs from a sigmaspire by the absence of spiral twist.

It may be termed a cymba (fig. 179). The back of the “C” is the

keel or tropis; the points are the prows or prorwx. Now broaden out

the prora on the eggshell into oval lobes (proral pteres) ; and from each pole draw a lobe midway between the prora and the tropis

(pleural pteres), and a common form of anchorate, the pterocymba

results (fig. 17 2). The pterocymba is subject to considerable modi- fications: the prows may be similar (homoproral) or dissimilar

(heteroproral); the pteres may be lamellar or ungual ; additional lamella (tropidial pteres) may be produced by a lateral outgrowth of the keel (fig. 17 &); and by growing towards the equator the opposed proral and pleural pteres may conjoin, producing a spicule of two meridional bands (oocymba ; fig. 177). A curious group of flesh spicules are the trichites. In this group silica, instead of being deposited in concentric coatings around an axial fibre, forms within the scleroblast a sheaf of immeasurably fine fibrille or trichites, whieh may be straight (fig. 17 m) or twisted. The trichite sheaf may be regarded as a fibrillated spicule. Trichite sheaves form in some sponges, as Dragmastra (25), a dense accumulation within the cortex. In Hexactinellid sponges the rays of the aster are limited to six, arranged as in a primitive sexradiate spicule, but divided at the ends into an indefinite number of slender filaments, which may or may not be tylotate, rosettes (fig. 17 t).

Spongin is a horny substance, most similar to silk in chemical composition, from which it differs in being in- soluble in an ammoniacal solution of copper sulphate (cuproso-ammonium sulphate). In Darwinella aurea, F. Miiller, it occurs in forms somewhat resembling tri-, quadri-, and sex-radiate spicules. But usually the spongin skeleton takes the form of fibres, consisting of a central core of soft granular substance around which the spongin is disposed in concentric layers, forming a hollow cylinder (fig. 23 6). The relative diameters of the soft core and of the spongin cylinder differ greatly in different sponges. The fibres branch so as to form antler-like twigs or bushy tree-like growths, or anastomose to form a continuous net-work, as in the bath sponge (Zuspongia officinalis). The detailed characters of the network differ with the species, and are useful in classification. In Janthella certain cells (sponginblasts) become included between the successive layers of the spongin cylinder, and their deep violet colour, contrasting with the amber tint of the spongin, renders them very conspicuous.

In some sponges the scleres are simply scattered through the mesoderm and do not give rise to a continuous skeleton, —Corticiwm, Chondrilla, Thrombus. In the Calcarca and many silicious sponges they are dispersed through the mesoderm, but so numerously that by the overlapping of their rays a loosely felted skeleton is pro- duced. In the calcareous sponges the

spicules are frequently regu- larly disposed ; and in the Sycons in particular a definite arrange-

Fia. 18, —Articulate and inarticulate tubar skelctons of calcisponges. a, artieu-

late; 6, inarticulate skeleton. After Haeckel.

ment, on two plans, the articulate and inarticulate, can be traced in the skeleton of the radial tubes. On the latter plan the triradi- ate or quadriradiate spicules, the apical rays of which are of con- siderable length, are arranged in two sets, one having the basal rays lying in the mesoderm of the paragastral wall and the other with the corresponding rays in the dermal mesoderm. The apical rays of each set lie in the mesoderm of the radial tubes parallel to their length, but pointing in opposite directions (fig. 18 6). In the articulate division numerous spicules, small in comparison with the size of the radial tubes, form a series of rows round the tubes, their basal rays lying parallel to the paragastric surface and the apical pointing towards the ends of the radial tubes (fig. 18 a).

In the Silicispongia sheaves of long oxeate spicules radiate from the base of the sponge if of a plate-like form, or from the centre if globular, and extend to the surface. If triznes are present their arms usually extend within the mesoderm immediately below the

dermal surface (fig. 19). Single spicules reach from centre to sur- face only in small sponges. As the sponge increases in size the spicules must either correspondingly lengthen, or fresh spicules must be added, if a continuous skeleton is to be formed. The latter is the plan fol- lowed in fact: the ad- ditional spicules over- lap the ends of those first formed like the fusiform cells in a woody fibre. With the formation of a fibre, often strengthened by spongin or bound to- gether with connective tissue, there appears to be a tendency for the constituent spicules to diminish in size, and the length of each in the most markedly Fic. 19.—Mode of arrangement of spieules in a fibrous sponges is in- Ce ae, Dragmastra norman, significant when com- pared with the length of the fibre. The spicular fibre thus formed may be

simple or echinated by spicules either similar to those which form its mass or different. More usually they are different, and generally styles, often spinose about their origin. The spongin which sometimes cements together the spicules of a fibre may progressively increase in quantity and the spicules di- minish in number, till a horny fibre containing one or more rows of small oxeas results. In an echinated fibre the axial spicules may disappear and the eehinating spicules persist. Finally all spieules may be suppressed and the horny fibre of the Ceratose sponges results. The horny fibres may next acquire the habit of einbedding foreign bodies in their substance, though foreign en- closures are not confined to the Ceratosa but occur in some Silici- spongiz as well. The included foreign bodies may increase in uantity out of all proportion to the horny fibres ; and finally the skeleton may consist of them alone, all spongin matter having disappeared.

In the Lithistid sponges a skeleton is produced by the articula- tion of desmas into a network. The rays of the desmas (figs. 12/, 13 s, 14) terminate in apophyses, which apply themselves to some part of adjacent desmas, either to the centrum, shaft, arms, or similar apophyses, and then, growing round them like a saddle on a horse’s baek, elasp them firmly without anehylosis. Thus they give rise to a rigid network, in conjunction with which fibres com- posed of rhabdus spicules may exist. In the Hexactinellida both spicular felts and fibres occur, and in one division (Dictyonina) a rigid network is produced, not, however, by a mere clasping of apophyses, but by a true fusion. The rays of adjacent spicules overlap and a common investment of silica grows over them.

Mistology.

The ectoderm usually consists of simple pavement Eeto- | epithelial cells (pinnacocytes), the margins of which can de™.|

be readily rendered visible by treatment with silver nitrate, best by Harmer’s method. The nucleus and nucleolus are usually visible in preparations made from spirit speci- mens, the nucleus being often readily recognizable by its characteristic bulging beyond the general surface. In some sponges (Thecaphora) the epithelium may be replaced locally by columnar epithelium, and the cells of both pave- ment and columnar epithelium may bear flagella (Aplysilla

wolacea, Oscarella lobularis). The endoderm presents the Endo- same characters as the ectoderm, except in the Ascons and 4e™. |

the flagellated chambers of all other sponges, where it is formed of collared flagellated cells or choanocytes,—cells with a nearly spherical body in which a nucleus and nucleo- lus can be distinguished and one or more contractile vacu- oles. The endoderm extends distally in a cylindrical neck or collum, which terminates in a long flagellum surrounded by a delicate protoplasmic frill or collar (fig. 21g). In Tetractinellida, and probably in many other sponges—cer- tainly in some—the collars of contiguous choanocytes coalesce at their margins so as to produce a fenestrated membrane, which forms a second inner lining to the flagel-

1 §. F. Harmer, ‘‘On a Method for the Silver Staining of Marine Objects,” Mitth. Zoolog. Station zu Neapel, 1884, p. 445.

lated chamber (fig. 20, ii.). The presence of this membrane | enters abruptly. This abrupt termination of the incurrent

Fic. 20.—Choanocytes with coalesced collars. (i.) Longitudinal section through two flagellated chambers of Anthastra communis, Soll.; i, prosopyles; ¢, aphodal canals leading from the flagellated chambers ; e, excurrent canal ; the tissue surrounding the chambers is sarcenchyme (X3860). (ii.) Diagram showing the fenestrated membrane (m) produced by coalesced collars of choanocytes. After Sollas, “ Challenger” Report.

incurrent face of the chamber, since its convex surface is always turned towards the prosopyle. In sponges with an

Fig. 21.—Histological elements. a, collencytes, from Thenea muricata; 6, chondrenchyme, from cortex of Corticium candelabrum (the unshaded bodies are microscleres); c, cystenchyme, from Pachymatisma johnstoni (partly dia- grammatic); d, desmacyte, from Dragmastra normani; e,

myocytes in con- hexion with collencytes, from Cinachyra barbata ; f, thesocyte, from Thenea

icata; g, choanocyte, from Sycandra raphanus; h-n, scleroblasts—h, of & young oxea, froin an embryo of Craniella cranium; 1, of a fully grown oxea, from an adult C. cranium; j, orthotriene, with associated scleroblast from Stelletta, ; k, of a tetracladine desma, from Theonella swinhoet ; 1, of a sigma- spire, from Craniella cranium; m, of an orthodragma, from Disyringa dis- similis; n, of a sterraster, from Geodia barretti. Figs. b and g after Schulze, the others after Sollas.

aphodal canal system the flagellated chambers usually pass gradually into the aphodal canal, but the incurrent canal

enables us readily to distinguish the excurrent from the | canal appears to mark the termination of the ectoderm

and the commencement of the endoderm. The flagellated chambers differ greatly in size in different sponges, and evidently manifest a tendency to become smaller as the canal system increases in complexity; thus Sycon are always larger than Rhagon chambers, and eurypylous than aphodal Rhagon chambers. In most sponges except the Ascons the

mesoderm is largely developed, and in many it undergoes Meso- In its com- derm.

a highly complex histological differentiation. monest and simplest form it consists of a clear, colourless, gelatinous matrix in which irregularly branching stellate cells or connective tissue corpuscles are embedded ; these may be termed collencytes (fig. 21 a) and the tissue collen- chyme. In the higher sponges (Geodia, Stelletta) it consists of small polygonal granular cells either closely contiguous or separated by a very small quantity of structureless jelly, and in this form may be termed sarcenchyme (fig. 20). Collenchyme does not originate through the transformation of sarcenchyme, as one might expect, for it precedes the latter in development. Schulze (20), who has compared collenchyme to the gelatinous tissue which forms the chief part of the umbrella of “‘jelly-fish,” describes it as becoming granular immediately in the neighbourhood of the flagel- lated chambers in the bath

sponge, the granules becoming more numerous in sponges in which the canal system acquires a higher differentiation, till at length the collen- cytes are concealed by them. According to this view, sarcenchyme would appear to originate from a densely granular collenchyme. Amceboid wandering cells or arche- ocytes (fig. 22) are scattered through the matrix of the collenchyme. They evidently serve very different purposes : some appear to act as carriers of nourishment or as scavengers of useless or irritant foreign matter; others may possibly contribute to the formation of higher tissues, some certainly becoming converted into sexual products.

Their parentage and early history are unknown.

A tissue (cystenchyme) which in some respects resembles certain forms of vegetable parenchyme occurs in some sponges, particularly Geodinide and other Tetractinellida, It consists of closely ad- jacent large oval cells, with thin well-defined walls and fluid contents. Somewhere about the middle of the cell is the nucleus with its nucleolus, supported by protoplasm, which extends from it in fine threads to the inner side of the wall, where it spreads out in a thin investing film (fig. 21¢). Cystenchyme very commonly forms a layer just below the skin of some Geodinida, particularly of Pachymatisma, and, as on teasing the cortex of this sponge a large number of refringent fluid globules immiscible with water are set free, it is just possible that it is sometimes a fatty tissue, and if so the contained oil must be soluble in alcohol, for alcoholic prepara- tions show no trace of it. A tissue resembling cartilage, chondren- chyme, occurs in Corticid# (fig. 21 b).

Connective-tissue cells or desmacytes are present in most Desma- sponges ; they are usually long fusiform bodies, consisting cytes.

of a clear, colourless, often minutely fibrillated sheath, surrounding a highly refringent axial fibre, which stains deeply with reagents (fig. 21d). In other cases the des- macyte is simply a fusiform granular cell, with a nucleus in the interior and a fibrillated appearance towards the ends. The desmacytes are gathered together, their ends overlapping, into fibrous strands or felted sheets, which in the ectosome of some sponges may acquire a considerable thickness, often constituting the greater part of the cortex. The spicules of the sponge often furnish them with a sur- face of attachment, especially in

the Geodinidx, where each sterraster of the cortex is united to its neighbours by des- macytes, in the manner shown in fig. 10.

Contractile fibre cells or myocytes occur in all the higher Myo- sponges. They appear to be of more than one kind. Most cytes.

usually they are fine granular fusiform cells with long filiform terminations, and with an enclosed nucleus and nucleolus (fig. 21 ¢). In the majority of sponges both ex- current and incurrent canals are constricted at intervals

by transverse diaphragms or vela, which contain myocytes concentrically and sometimes radiately arranged. The excessive development of myocytes in such a velum gives rise to muscular sphincters such as those which close the chones of many corticate sponges, such as Pachymatisma. In this sponge, which occurs on the British shores, the function of the oscular sphincters can be readily demon- strated, since irritation of the margin of the oscule is invariably followed after a short interval by a slow closure of the sphincter.

those cases in which it would be most interesting to find such a connexion absolute proof of it is wanting.

The colour of sponges usually depends on the presence Pigmen of cells containing granules of pigment ; though dispersed cells, | generally through the mesoderm, these cells are most richly developed in the ectosome. Pigment granules also occur in the choanocytes of some sponges,— Oscarella lobularis and Aplysina aerophoba, for instance. In the latter the pigment undergoes a remarkable change of colour when the sponge is exposed to the air, and finally fades away.

Aistha- Supposed sense-cells or xsthacytes (fig. 22) were first | In many cases sponges borrow their colours from parasitic cytes. observed by Stewart and have since been described by | algee (Oscillatoria and Nostoc) with which they are infested, Von Lendenfeld (z2). According to the latter, they are | The colours of sponge-pigments are very various. They spindle- shaped. cells, 0°01 mm. long by 0°002 thick ; the | have been examined by

Krukenberg and Merejknovsky. distal end projects beyond the ectodermal epithelium in a Zoonerythin, a red pigment of the lipochrome series, is one fine hair or palpocil ; the body is granular and contains a | of the most widely diffused ; it is regarded as having a large oval nucleus; and the inner end is produced into respiratory function. Reserve cells or thesocytes (fig. 21 f) fine threads, which extend into the collenchyme and are | have been described in several sponges as well as amylin supposed—though this is not proved—to become con- | and oil-bearing cells, tinuous with large multiradiate collencytes, which Von Each spicule of a sponge originates in a single cell Sclero. Lendenfeld regards as multipolar ganglion cells (fig. 22). | (fig. 21 hn), within which it probably remains enclosed blasts. | : SS me Tt until it has completed its full growth; the cell then prob- Vy ably atrophies. During its growth the spicule slowly passes from the interior to the exterior of the sponge, and Ry is finally (in at least some sponges, Geodia, Stelletta) cast out as an effete product. The sponge is thus constantly producing and disengaging spicules; and in this way we may account for the extraordinary profusion of these struc- tures in some modern marine deposits and in the ancient stratified rocks. Within the latter these deciduous spicules have furnished silica for the formation of flints, which have been produced by a silicious replacement of carbonate of lime (26), F1a. 22.—Transverse section through the edge of a pore in Dendrilla cavernosa, Lfd.; cells in the middle to the right, archocytes; fusiform cells on each side of them, myocytes; g, above and below these, with processes terminating against the epithelium, gland cells; fusiform cells terminating against the epithelium at s, esthacytes; at their inner ends these are con- tinuous with ganglion cells, After Von Lendenfeld (x 800). More recently he has described an arrangement of these cells curiously suggestive of a sense-organ. Numerous esthacytes are collected over a small area, and at their inner ends pass into a granular mass of .cells with well- marked nuclei, but with boundaries not so evident ; these he regards as ganglion cells. From the sides of the gan- OSDORS glion other slender fusiform cells, which Von Lendenfeld is “Felt regards as nerves, pass into the mesoderm, running tan- oy gentially beneath the skin. The inner end of the ganglion is in communication with a membrane formed of fusiform cells which Von Lendenfeld regards as muscular. If his observations and inferences are confirmed, it is obvious that we have here a complete apparatus for the conversion of external impressions into muscular movements. Proto- In most sponges a direct

connexion can be traced by as means of their branching processes between the collen- ; tnuity, SYS OF (ihe mesoderm tnd the cells of the ectodermal | Fs. 28seetin, trough the homy fre and asiolted tienes ofa homy

and endodermal epithelium and the choanocytes of the flagellated chambers. As the collencytes are also united amongst themselves, they place the various histological constituents of the sponge in true protoplasmic continuity. Hence we may with considerable probability regard the

at the sides by the lateral mantle of sponginblasts, and at the ends by the terminal cap. A desmachymatous sheath, a, surrounds the whole (X 150). B, transverse section; in the centre is the soft core, surrounded by wavy spongin layers, the outermost being surrounded by sponginblasts, and these by a fibrous sheath; 4, part of an incurrent canal lined by flagellated epi-thelium ; ¢, part of an excurrent canal; f, part ofa flagellated chamber (x 150). After Von Lendenfeld.

collencytes as furnishing a means for the transmission of impulses: in other words, we may attribute to them a rudimentary nervous function. In this case the modifica- tion of some of the collencytes in communication with the ectoderm might readily follow and special zesthacytes arise. Fusiform collencytes perpendicular to the ectoderm, and with one end touching it, are common in a variety of sponges ; but it is difficult to trace the inner end into connexion with the stellate collencytes, so that precisely in

lateral sponginblasts are elongated radially to the fibre; the terminal cells are polygonal and depressed. The latter give rise to the soft granular core and the former to the spongin-walls of the fibre. Cells similar to the lateral sponginblasts, and regarded as homologous with them, occur in a single layer just below the outer epithelium of some horny sponges (Aplysilla and Dendrilia), and under certain circumstances secrete a large quantity of slimy mucus (77).

Classification.

het. The phylum Parazoa or Spongiz consists of two main tion. branches, as follows :—

Branch A.— MHGAMASTIC- Branch B. — MICROMASTIC- TORA. TORA. Class CALCAREA, Grant. Class I. — Myxosroncia, Order 1.— Homocela, Pol. Haeckel.

Order 1.—Halisancina. Order 2.—Chondrosina. Class II. - SILICISPONGIZ.

Sub-class i.— HEXACTINELLIDA, O. Schmidt. Order 1.—Lyssacina, Zittel. Order 2.—Dictyonina, Zittel.

Sub-class ii.—DE=MosPoNGIaz,

Order 2.—Heterocela, Pol.

Sollas.

Tribe a.—Monaxonida. Order 1.—Monaxona. Order 2.—Ceratosa, Grant.

Tribe 6. — Tetractinellida, Marshall. Order 1.—Choristida, Sollas. Order 2. —Lithistida, O.S. Tlition By the possession of both sexual elements and a complex histo- j/nimal logical structure, and in the character of their embryological devel- dom. opment, the sponges are clearly separated from the Protozoa ; on the other hand, the choanoflagellate character of the endoderm,

which it retains in the flagellated chambers throughout the group without a single exccption, as clearly marks them off from the Metazoa. They may therefore be regarded as a separate phylum derived from the choanoflagellate Infusoria, but pursuing for a certain distance a course of development parallel with that of the Metazoa. : Different views have been propounded by other authors. Savile Kent regards the sponges as Protozoa (ro); Balfour suggested that { they branched off from the Metazoan phylum at a point below the Celentera, and considered them as intermediate between Protozoa and Metazoa; Schulze regards them as derived from a simple ancestral form of Celentera (27) ; Marshall advocates the view that they are degraded forms derived from Ccelenterates which were already in possession of tentacles and mesenteric pouches (74). ohdivi. Asa phylum the Spongix are certainly divisible into two branches, 1in one including the

Calcarea and the other the remaining sponges, ps, Which Vosmaer has termed Non-Calcarea, and others Plethospongiz. | Since, however, the choanocytes of the Calcarca are usually, if not universally, larger than those of other sponges, we may make use of this difference in our nomenclature, and distinguish one branch as the Megamastictora (uacrlkrwp, ‘‘scourger”) and the other as the Micromastictora.

Branch A.—MHGAMASTICTORA.

Sponges in which the choanocytes are of comparatively large size, 0°005 to 0009 mm. in diameter (Haeckel, 6).

Class CALCAREA.

tore in which the skeleton is composed of calcareous spicules.

Order 1. Homocaia.—Calcarea in which the endoderm consists wholly of choanocytes. Examples: Zeucosolenia, Bwk.; Homo- derma, Lfd.

Order 2. HrTreroca1ia.—Calcarea in which the endoderm is dif- ferentiated into pinnacocytes, which line the paragastric cavity and excurrent canals, and choanocytes, which are restricted to special recesses (radial tubes or flagellated chambers). Examples: Sycon, 0.8.; Grantia, Fl.; Leuconia, Bwk.

Branch B.—MICROMASTICTORA.

(Non-Calearea, Vosmaer; Picthospongixv, Sollas.) Sponges in peich the choanocytes are comparatively small, 0°003 mm. in | ameter,

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Class I. MYXOSPONGIZA

Micromastictora in which a skeleton or scleres are absent.

_ Order 1. Hanisancina.—Myxospongix in which the canal system Is simple, with simple or branched Sycon or eurypylous Rhagon chambers.

An ectosome sometimes and a cortex always absent. Examples: Halisarca, Duj.; Oscarella, Vosm.; Bajalus, Lfd.

Order 2. Cuonprosina.— Myxospongie in which the canal system is complicated, with diplodal Rhagon chambers and a well-developed cortex. Example: Chondrosia, 0.8.

The Halisarcina are evidently survivals from an ancient and primitive type. The simplicity of the canal system is opposed to the view that they are degraded forms; we may therefore regard the absence of scleres as a persistent primary and not a secondary acquired character. They are as interesting, therefore, from one

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point of view (absence of scleres) as the Ascons are from another (undifferentiated endoderm). With the Chondrosina the case is different ; they differ only from Chondrilla and its allies by the absence of asters; these differ only from the Z'ethyidw by the absence of strongyloxeas ; and we may very reasonably assume that in these three groups we have a series due to loss of characters, the Chondrille being reduced Tethyidew and the Chondrosina reduced Chondrillz. Still, as Huxley has well remarked, "classification should express not assumptions but facts"; and therefore till we are in possession of more direct evidence it will be well to exclude the Chondrosina from the Silicispongix.

Class II. SILICISPONGLE.

Micromastictora possessing a skeleton or scleres which are not calcareous.

Sub-class i, HEXACTINELLIDA.

Silicispongiz characterized by sexradiate silicious spicules. Hexacti Canal system usually simple, with Sycon chambers. Sponge nedlida. differentiated into ecto-, choano-, and endo-some.

Order 1. Lyssacina.—Hexactinellida in which the skeleton is formed of separate spicules, or, if united, then by a subsequent not a contemporaneous deposit of silica. Examples: Huplectella, Owen ; Asconema, 8. Kent ; Hyalonema, Gray ; Rossella, Ortr.

Order 2. Dicryonina. — Hexactinellida in which sexradiate spicules are cemented together by a silicious deposit into a con- tinuous network part passu with their formation. Examples: Farrea, Bwk.; Hurete, Marshall; Aphrocallistes, Gray 3 Myliusia, Gray ; Dactylocalyx, Stutchbury.

The Hexactinellida are a very sharply defined group, impressed with marked archaic features. No other Silicispongix# possess, so far as is known, so simple a syconate canal system. ‘The oldest known fossil sponge is a member of the Lyssacina (7 and 24), viz., Protospongia, Salter, from the Menevian beds, Lower Cambrian, St David’s Head, Wales. The group is almost world-wide in distri- bution, chiefly affecting deep water, from 100 to 300 fathoms, but often extending into abyssal depths ; occasionally, however, though rarely, it frequents shallow water (Cystispongia superstes dredged off Yucatan in 18 fathoms).

Sub-class ii. DEMOSPONGIZA, Stlicispongi# in which sexradiate spicules are absent Tribea. MONAXONIDA.

Demospongiz in which the skeleton consists either of silicious py which are not quadriradiate, or of horny scleres or in- cluded foreign bodies, or of one or more of these constituents in conjunction.

Order 1. Monaxona.—The skeleton is characterized by either uniaxial or polyaxial spicules. Examples: Amorphina, O.S. (“crumb of bread” sponge); Spongilla, Lmk. (‘‘ freshwater” sponge); Chalina, Bwk.; Tethya, Lmk.

Order 2, CuratTosA.—The skeleton consists of horny scleres which never include ‘‘ proper” spicules, or of introduced foreign bodies, or of both these

in conjunction. Examples: Darwinella, F, Miiller ; Zuspongia, Bronn (the ‘‘ bath” sponge).

Tribe 6. TETRACTINELLIDA.

Demospongiz possessing quadriradiate or triene spicules or Lithistid scleres (desmas).

Order 1. CHorisTipa.— Tetractinellida with quadriradiate or triene spicules, which are never articulated together into a rigid network. Examples: Tctilla,O.8.; Thenea, Gray; Geodia, Lmk.; Dercitus, Gray.

Order 2. LirHistipa.— Tetractinellida with branching scleres (desmas), which may or may not be modified tetrad spicules, arti- culated together to form a rigid skeleton. Trine spicules may or may not be present in addition. Examples: Theonella, Gray ; Coral- listes, O.S.; Azorica, Crtr.; Vetulina, O.S.

Thislarge sub-class embraces the great majority of existing sponges. Its external boundaries are fairly well defined, its internal divisions much less so, as its various orders and families pass into each other at many points of contact. Although there does not appear to be much resemblance between a Lithistid sponge, such as 7’heonella, a Monaxonid such as Amorphina, and an ordinary ‘‘ bath” sponge (Euspongia), yct between thesc extremes a long series of inter- mediate forms exists, so nicely graduated as to render their dis- ruption into groups by no means an casy task. If the delimitation of orders is difficult, that of genera is often impossible, so that they are reduced to assemblages depending on the tact or taste of the author. Thus Polejaeff states that with a single exception “none of the genera of Ceratosa are separable by absolute charac- ters.” The chief spicules of Mfonaxona are uniaxial, often accom- panied by characteristic microscleres. Although distinguished as a group by the absence of quadriradiate or triene spicules, two ex- ceptions are known in which these occur (T’ricentrion, Ehlers, and Acarnus, Gray); these, however, present unusual characters which suggest an independent origin. The canal system of Jfonaxona has not yet been fully investigated ; it appears usually to follow the

Demo- spongizx

Classifi- cation in families,

eurypylous Rhagon type, but the aphodal is not unknown. The Ceratosa contain all sponges with a horny skeleton, except those in which the horny fibres are cored or spined with silicious spicules secreted by the sponge (“ proper” spicules) ; these are arbitrarily assigned to the A/onaxona. There is convenience in this proceed- ing, for horny matter is widely disseminated throughout the Demo- spongix, occurring even in the Lithistida, and it frequently serves to cement the oxeate spicules of the Mfonaxona into a fibre, without at the same time forming a preponderant part of the skeleton. It would be wellnigh impossible to say where the line should be drawn

between a fibre composed of spicules cemented by spongin and one ” consisting of spongin with embedded spicules, while there is com-

paratively no difficulty in distinguishing between fibres containing spicules and fibres devoid of them. That the distinction, however, is entirely artificial is shown by the fact that, after spicules have disappeared from the horny fibre, they may still persist in the mesoderm ; thus Von Lendenfeld announces the discovery of micro- scleres (cymba) in an Aplysillid sponge and of strongyles in a Cacospongia, both horny sponges. (A form intermediate between this Aplysillid and the Desmacidonidx would appear to be Tomo- chalina, Ridley.) The Ceratosa frequently enclose sand, Fora- minifera, deciduous spicules of other sponges and of compound Ascidians, and other foreign bodies within the horny fibres of their

skeleton ; they also sometimes attach this material, probably by a _

secretion of spongin, to their outer surface, and thus invest them- selves in a thick protective crust. In some Ceratosa no other skeleton than that provided by foreign enclosures is present. The canal system is syconate or eurypylous in the simpler forms and diplodal in the higher. The Monaxonida make their earliest ap- pearance in the Silurian rocks (Climacospongia, Hinde), and are now found in all seas at all depths. The only sponges inhabiting fresh water belong to this group. The Tetractinellida adhere to the Monaxonida at more than one point, and one of

these groups has probably been a fruitful parent to the other, but which is offspring and which parent is still a subject for discussion. The Choristida in its simplest forms presents a eurypylous Rhagon system, in the higher an aphodal system. It is in this group that the most highly complex cortex is met with; in the Geodinide, for instance, it consists usually of at least five distinct layers. Thus, proceeding outwards, next to the choanosome is a layer of thickly felted desmachyme, passing into collenchyme on its inner face ; then follows a thick stratum of sterrasters united together by desmacytes ; this is succeeded by a layer of cystenchyme or other tissue of variable thickness ; external to this is a single layer of small granular cells and associated dermal asters; and finally, the surface is invested by a layer of pavement epithelium. The Lithistida, like the Ceratosa, are possibly of polyphylitic origin ; in one group (Zetracladina) the articulated scleres are evidently modified calthrops spicules (see fig. 14), and associated with them are free triwnes, which support the dermis and resemble precisely the trienes of the Choristida. In another group (Rhabdocrepida) the scleres are moulded on a Monaxonid base (see fig. 18 g-s); but, associated with them, trienes sometimes occur similar to those of

the Tetracladina. Both these groups are in all probability derived

from the Choristida, and a distinct passage can be traced from the Tetracladose to the Rhabdocrepid group. In the Rhabdocrepida we find forms without trienes; these may possibly be degenerate forms. The third group of Lithistids is derived from the Rhabdo- crepida, the Anomocladine desma being derivable from the Rhabdo- crepid by a shortening of the main axis into a centrum. The thick centrum, from which the arms, variable in number, ori- ginate, is hollowed out by a cavity, which appears during life to have been occupied by a large nucleus, like that of a scleroblast, and it is quite conccivable that the scleroblast, which in the Tetracladine Lithistids lies in an angle between the arms, may have become enclosed in an overgrowth of silica, from which addi- tional arms were produced. The eonstancy with which spicules in other sponges maintain their independence is very striking. When once a persistent character like this is disturbed, excessive variability may be predicted, as in the Anomocladine scleres,

The classification of the sponges into families is shown in the following scheme.

Class CALCAREA. Order 1. Homoceia, Pol.

Family 1. Asconips, Hk.—Homocela which are simple or com-

posite, but never develop radial tubes. Examples: Ascctta, Hk. (fig. 1) ; Leueosolenia, Bwk.

Family 2. Homoprrmipm, Lfd.—Homocela with radial tubes. Example: Homoderma, Lfd. (figs. 8, 4).

Order 2, HETEROCGLA, Pol. Tribe a. tSyconaria.2

The flagellated chambers are either radial tubes or cylindrical sacs.

Family 1. Syconrpm.—The radial tubes open directly into the paragastric cavity.

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Sub-family a. Syconina.—The radial tubes are free for their whole length, or at least distally, Examples ; Sycetia, Hk.; Syeon, O.S,

Sub-family 6. Uteina, Lfd.—The radial tubes are simple and entirely united. The ectosome is differentiated from the choanosome and sometimes develops into a cortex. Examples: Grantissa, Lfd. ; Ute, O.S. (fig. 5); Syeortusa, Hk.; Amphoriscus, Pol.

Sub-family ce. Grantina, Lfd.—The radial tubes are branched. The incurrent canal system is consequently complicated. An ecto- some is present. Examples: Grantia, FI. ; Hetcropegma, Pol. (fig. 4); Anamacxilia, Pol.

Family 2. SyiLersipa, Lfd.—The choanosome is folded. The flagellated chambers (which are partly rhagose in Vosmaeria) communicate with the paragastric cavity by excurrent canals, Examples: Polejna, Lfd. (fig. 6) ; Vosmacria, Lfd.

Family 3. TEIcHonELuip”, Carter.—Composite Syllcibide with the oscules and pores occurring on different parts of the surface, Example: Zeichonclla, Crtr.

Tribe 6. +LEUCcONARIA.

The canal system belongs to the eurypylous Rhagon type.

Family 1. Levconipa, Hk.—The outer surface is not differentiated into osculiferous and poriferous areas, Examples: Leucetta, Hk.; Lcuealtis, Hk.; Leucortis, Hk,

Family 2. ErnHarpipa, Pol.—Composite Leuconaria, with the outer surface differentiated into spccial osculiferous and poriferous areas. Example: Hilhardia, Pol.

The arrangement adopted above is founded on Von Lendenfeld’s revision (77) of the elassification propounded by Polejaeff (76), who in a masterly survey has thrown an unexpected light on the struc- ture and inter-relationships of a group which Haeckel has rendered famous. It should not be overlooked that Vosmaer (37) had pre- viously explained the structure of the Leucones. However errone- ous in detail, Haeckel’s views are confirmed in their broad outlines, and it was with true insight that he pronounced the Calearca to offer one of the most luminous expositions of the evolutional theory. In this single group the development in general of the canal system of the sponges is revealed from its starting-point in the simple Ascon to its almost eompleted stage in the Leucon, with a complete-ness that leaves little further to be hoped for, unless it be the re- quisite physiological explanation.

Class MY XOSPONGLA. Order 1. HALISARCINA.

Family 1. Hatisarcipa, Lfd.—The flagellated chambers are syconate. Examples: Halisarca, Duj. (with branched chambers) ; Bajatus, Lfd. (with simple chambers),

Family 2. OscarELiips, Lfd.— The flagellated chambers are eurypylous and rhagose, Example: Oscarelia, Vosm.

Order 2. CHONDROSINA.

Family 1. CHonprosi1pm.—With the characters of the order. Example: Chondrosia, 0.8 Class SILICISPONGL&. Sub-class I. HEXACTINELLIDA. Order 1. HLYSSACINA,

Family 1. Evprecreriipa.—The spicules of the dermal mem- brane are ‘‘daggers” (fig. 15 a). Examples: Euplectelia, Owen ; Hotlascus, E. Sch.; Habrodictyum, W.T

Family 2. AsconematTIp#.—The dermal spicules are “ pinnuli” (fig. 15 6,c). Examples: Asconema, 8S. Kent ; Sympagella, 0.8.; Caulopheus, Schulze.

Family 8. HyALoNEMATIDa’.—The dermal spicules are pinnuli and amphidisks (fig. 15 d). Example: Hyalonema, Gray.

Family 4, }RossuL1pa#.—The dermal spicules are gomphi, stauri (fig. 15 f), and oxeas. Examples: Rossella, Crtr.; Cratcromorpha, Gray ; Aulochona, E. Sch.

Family 5. *Recepracutipa, Hinde,—The distal ray of the dermal spicules is expanded horizontally into a polygonal plate. Example : *Reccptaculites, Defy.

Order 2. +DICTYONINA,

Sub-order 1. UNCINITARLIA. Uncinate spicules are present.

Tribe a CLAVULARIA. Clavulz (fig. 16 c) are present. Family 1. Farreip#. —Characters those of the tribe. Example : Farrea, Bwk. Tribe 6. ScoPULARIA. The dermal spicules are scopularie (fig. 16 3). Family 1. +Evretip#.—Branched anastomosing tubes, or goblet- shaped, with lateral outlets. Examples: Hurete, Marshall; Pert-

phragella, Marshall; Lefroyella, Schulze.

Family 2. {MEtiirronip2,—Tubular or goblet-shaped, with honeycomb-like walls. Example: Aphrocallistes, Gray.

1 An* indicates that the

group is only known in the fossil state, a + that it is both recent and fossil.

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Family 3. +CHONELASMATID&.—F lat or beaker-shaped; straight funnel-shaped canals perforating the wall perpendicularly and opening laterally on each side. Kxample: Chonclasma, Schulze.

Family 4. +VOLVULINIDZ.—Tubular, goblet-shaped, or massive ; crooked canals more or less irregular in their course. Examples: Volvulina, Schulze ; Fieldingia, 8. Kent.

Family 5. ScLeRoTHAMNID#.—Arborescent body ; perforated at the ends and sides by round narrow radiating canals. Example: Sclerothamnus, Marshall.

Sub-order 2, INERMTA.

Dictyonina without uncinati, clavule, or scopularie.

Family 1. tMyxiustp“.—Depressed cup-shaped; a complex folding of the wall produces lateral excurrent tubes. Example: Myliusia, Gray. ‘

Family 2. tDActyLocaLyc1pz.—Goblet-shaped_ or pateriform, with a thick wall consisting of numerous parallel anastomosing tubes, of uniform breadth, which terminate at the same lcvel within and without. Examples: Dactylocalyx, Gray ; Scleroplegma, 0.8.; Margaritclla, O.S.

Family 8. tEvrypLecMAtip#2.—Goblet-shaped or resembling ear-shaped saucers ; the wall decply folded longitudinally so as to produce a number of dichotomously branched canals or covered-in grooves. Example: Hurypicgma, Schulze.

Family 4. tAvLocyst1pz.—Of massive rounded form, with an axial cavity ; wall consisting of a system of obscurely radiating anastomosing tubes and intervening inter-canals ; both inter-canals and the external terminations of the tubes are covered by a thin membrane, which is perforated by slit-like

openings over the lumina of the tubes, and thus assumes a sieve-like character. Examples: Aulocystis, Schulze ; Cystispongia, Roemer.

This arrangement of the Hewactinellida is taken from the latest work on the subject, Schulze's Preliminary Report on the "Challcn- ger" Hexactinellida. The reference of fossil forms to the families here instituted is rendered difficult by the disappearance of the requisite ‘‘ guiding" spicules in the process of mineralization. A revision of the fossil familics to bring them into harmony with the recent has certainly been rendered necessary, but this is too large a task to undertake in this place.

Sub-class II. DEMOSPONGIA. Tribe a. MoNAXONIDA. Order 1. MONAXONA.

Family 1. Teruyip#.—Skeleton consisting of radiately arranged strongyloxeas (except in the genus Chondrilla, which is without megascleres) and large spherasters. The ectosome isa thick fibrous cortex. Example: Zethya, Lmk.; Chondrilla, O.S.

Family 2. PotyMAstip#£.—Skeleton consisting of styles radiately arranged and cortical tylostyles. The oscules in many cases open at the ends of long papille. Examples: Polymastia, Bwk.; Theca- phora, O.S.; Trichostenma, Sars.

Family 8. Susrriripa2.—Skeleton consisting of strongylate or tylotate styles, arranged to forma felt. The flesh spicules when

resent are usually microrabds or spirasters. Examples: Suberites,

ardo ; Cliona, Grant; Potcrion, Schlegel.

Family 4. DrsMAcIDoNID#.—The flesh spicules are cymbas. Examples: Espercila, Vosm.; Desmacidon, Bwk.; Cladorhiza, Sars.

Family 5. THaticHonpripaz.—The flesh spicules when present are never cymbas. Examples: Halichondria, Fl.; Reniera, O.S.; Chalina, Bwk.; *Pharetrospongia, Soll.

Family 6. Ecryonipa#.—The skeleton consists of fibres echinated by projecting spicules. Examples: Plocamia, 0.8.3; Eetyon, Gray ; Clathria, O.S.

Family 7. tSroncittipa#.—Halichondrideg which are reproduced both sexually and by statoblasts. Habitat freshwater. Examples: Spongilla, Lmk.; Hphydatia, Lmk.; Parmula, Crtr.; Potamolepis, Marshall.!

The foregoing classification is purely provisional ; the group re- quires a complete revision.

Order 2. CERATOSA.

Family 1. DarwinrLLipa2.—Canal system of the eurypylous Rhagon type. Flagellated chambers, pouch-shaped, large; the sur- Tounding collenchyme not granular. Horny fibres with a thick core. Examples: Darwinella, Fritz Miiller; Aplysilla, F.ES.; Janthella, Gray.

Family 2. Sponcrnipz.—Canal system as in the Darwinellida, but the flagellated chambers more or less spherical. Horny fibres with a thin core, and usually containing foreign enclosures. Examples: Velinca, Vosm. ; Spongelia, Nardo; Psammoclema, Marshall ; Psammopemma, Marshall.

Family 3. Sponcipm.—Canal system aphodal. Chambers small and spherical ; surrounding collenchyme granular. Fibres with a thin core. Examples: Huspongia, Bronn; Coscinoderma, Crtr.; Phyllospongia, Ehlers. C—O

1 Z Freshwater sponges without statoblasts are excluded from this family, and eft for distribution amongst allied marine genera.

Family 4. Apiystnipa.—Canal system diplodal ; collenchyme surrounding the fiagellated chambers densely granular. Fibres with a thick core. Examples: Zuffaria, Duch. and Mich.; Veron- gia, Bwk.; Aplysina, Nardo.

The species of sponge in common use are three,—Huspongia officinalis (Linn.), the fine Turkey or Levant sponge; H. zimocca (O.8.), the hard Zimocca sponge ; and Aippospongia equina (O.8.), the horse sponge or common bath sponge. The genus Huspongia is distinguished by the regular development of the skeletal network throughout the body, its narrow meshes, scarcely or not at all visible to the naked eye, and the regular radiate arrangement of its chief fibres. I2ippospongia is distinguished by the thinness of its fibres and the labyrinthic character of the choanosome beneath the skin. Asa consequence its chief fibres have no regular radiate arrangement. The species of Huspongia are distinguished as fol- lows. In EF. officinalis the chief fibres are of different thicknesses, irregularly swollen at intervals, without exception cored by sand grains; in 2. zimocca they are thinner, more regular, and almost free from sand. In J&. officinalis, again, the uniting fibres are soft, thin, and elastic; whilst in #. zimocca they are denscr and thicker, to which difference the latter sponge owes its characteristic hard- ness. Finally, the skeleton of Z. officinalis is of a lighter colour than that of £. ztmocca. The common bath sponge (Hippospongia equina) has almost always a thick cake-like form ; but its specific characters are not yet further defined.

Tribe 6. TETRACTINELLIDA. Order 1. CHORISTIDA. Sub-order 1. SIGMA TOPHORA.

The microsclere is a sigmaspire.

Family 1. Terittrpa.—The characteristic megasclere is a pro- triene. Canal system in the lower forms eurypylous, in the higher aphodal. The ectosome in the simpler forms is a dermal membrane, in the higher a highly differentiated cortex. Examples: Tetilla, 0.8.; Cranielia, O.S8. (fig. 21 h, 7).

Family 2. Samipa#.—The characteristic megasclere is an amphi- triene. Example: Samus, Gray.

Sub-order 2. ASTHROPHORA.

The microsclere is an aster.

Group 1. SprrasTrosa.—aA spiraster is usually present.

Family 1. Turnripa, Carter.—The flesh spicule is a spiraster. Canal system eurypylous. Ectosome not differentiated to form a cortex. Exaimples: Z'henea, Gray (fig. 21a, f); Pecillastra (Nor- mania), Bwk.

Family 2, tPACHASTRELLIDZ.—Canal system eurypylous in the . lower, aphodal in the higher forms. Examples: Plakortis, F.E.S.; Dercitus, Gray.

Group 2. EvastrossA.—Spirasters are absent. ;

Family 1. tSTELLETTIDZ.—Canal system aphodal, but approach- ing the eurypylous in the lower forms. The cortex chiefly consists of collenchyme in the lower forms; in the higher it is highly differ- entiated. Example: Stelletta, O.S. (fig. 11); Ancorina, O.8. ; Myriastra, Soll.

Family 2. Trrayip2.—Although this family has been placed in the Monaxonida, this seems to be its more natural position.

Group 8. SrERRAsTROsA.—A sterraster is present, usually in addition to a simple aster.

Family 1. tGropin1pa.—The megascleres are partly trines. Canal system always aphodal. Cortex highly differentiated. Ex- amples: Geodia, Lmk. (fig. 21"); Pachymatisma, Bwk. (fig. 21 c); Cydonium, Miiller (fig. 10); Hrylus, Gray.

Family 2. PLAcosponcipa.—The megasclere is a tylostyle. Trizenes are absent. Example: Placospongia, Gray.

Sub-order 8. MICROSCLEROPHORA.

Microscleres only are present.

Family 1. Puaxinip#, Schulze.—Canal system very simple, belonging to eurypylous Rhagon type. Characteristic spicules candelabra. Examples: Plakina, F.E.S. (fig. 26).

Family 2. Cortictpz.—Canal system aphodal or diplodal. Mesoderm a collenchyme crowded with oval granular cells; the spicules either

candelabra, amphitrisenes, or trianes irregularly dispersed in it. Example: Corticiwm, O.S. (figs. 9, 21 0).

Family 8. THromBip#.—Canal system diplodal. Spicules tricho- trienes. Example: Zhrombus, Soll.

The Pachastrellide or the Corticide ave probably the families from which the Tetracladine Lithistids have been derived. In the Tctillide the characteristic microsclere may occasionally fail, but there is never any difficulty in identifying the sponge in this case, as the trienes are of a very characteristic form: the arms of the protrienes are slender, simple, and directed very much forwards, making a very large angle with the shaft. Microscleres, having the form of little globules, are sometimes present with the sigmaspires,

Order 2, LITHISTIDA, O.S. Sub-order 1. TETRACLADINA, Zittel. The desmas are modified calthrops spicules.

Asexual multipli- cation.

Sexual repro- duction,

Family 1. TerracLaApIpz.—With the characters of the sub- order. Examples: Theonella, Gray (fig. 21k); Discodermia, Boeage; * Siphonia, Parkinson. :

Sub-order 2. RHABDOCREPIDA.

The desmas are of various forms, produced by the growth of siliea over a uniaxial spicule.

Family 1. Mrcamorintipa.—The desmas are comparatively large. ‘Trisenes, usually dichotrienes, help to support the ecto- some. Microscleres usually spirasters. Examples: Corallistes, 0.8.; *Hyalotragos, Zittel; Lyidium, O.8.; *Dorydermia, Zittel.

Family 2. Mickomorinipa.—The desmas are eomparatively small. Triznes and microscleres are both absent. Examples: Azoriea, Crtr.; *Verruelina, Zittel.

Sub-order 3. AVOMOCLADINA. Desmas with a massive nucleated centrum, from which a variable

number of arms (28) extend radiately (see fig. 12 7). Examples: Vetulina, O.8.; *Astylospongia, Roemer.

Reproduction and Embryology.

Fresh individuals arise by asexual gemmation, both external and internal, by fission, and by true sexual repro- duction.

Fission is probably one of the processes by which com- pound sponges are produced from simple individuals. Artificial fission has been practised with success in the cultivation of commercial sponges for the market. Ex- ternal gemmation has been observed in Thenea, Tethya, Polymastia, and Oscarella. A mass of indifferent sponge- cells accumulates at some point beneath the skin, bulges out, drops off, and gives rise to a new individual. Internal gemmation, which results in the formation of a statoblast, is only known to occur in the freshwater Spongillide. The statoblasts consist of a mass of yolk-bearing mesoderm cells, invested by a capsule, which in Lphydatia flunatilis is composed of an inner cuticle of spongin separated from a similar outer layer by an intermediate zone of amphidisks and interspersed protoplasmic cells. On one side of the capsule is a hilum which leads into the interior.

Their development has recently been studied by Gétte, with results that confirm the conclusions of Carter (3) and Lieberkiihn (z3). The process eommences with an accumulation of amceboid cells within the mesoderm to form a globular cluster; yolk granules develop within them, especially in those that lie nearer the centre. The external eells give rise to the investing capsule; some resemble sponginblasts and secrete the inner and outer horny euticle ; others give rise to the amphidisks and interspersed cells of the middle layer. Under favourable conditions the interior cells creep out through the pore of the capsule, and form a spreading heap, which by

subsequent differentiation gives rise to a young Spongilla. Since the freshwater sponges can only be regarded as modified descendants of ancient marine species (prob- ably of the family Haliehondridx), we may consider the internal gemmules, like the similar statoblasts of the freshwater Polyzoa, as special adaptations to a changed mode of life. They appear primarily to serve a protective purpose, ensuring the persistence of the race, since they only appear in extreme climates on the approach of drought,.and in cold ones on the approaeh of winter. As a secondary function they serve for the dispersal of the species; some are light enough to float down a stream, but not too far, so that there is no danger of their being carried to sea; others, which are character- ized by large air-chambers, are possibly distributed by | the wind.

Both sexual elements may be formed in the same individual, e.g., Oscarella lobularis, Grantia raphanus, and many others; but even in herm- aphrodites one or other element usually occurs to excess in different individuals, so that some are Fie. 25.

granules ; at first they exhibit lively amceboid movements, but later pass into a resting stage. The cavity of the mesoderm within which they are situated becomes lined

Fia. 24.—Spermatozoa. a-h, Development of spermatozoa in Sycandra raph- anus, highly magnified ; h, mature spermatozoa. After Polejaeff (x 792). j, Asperm ball in Oscarella lobularis (500); %, an isolated mature spermatozoon. After Schulze (x 800).

by a layer of epithelium, which may not appear, however,

till a late stage of segmentation. In Luspongia officinalis

the ova occur congregated in groups within the mesoderm, thus presenting an early form of ovary. The spermatozoa, which also develop from wandering amceboid cells, are

minute bodies with an oval or pear-shaped head and a

long vibratile tail (fig. 24%). Each ameeboid cell produces

a large number of spermatozoa, which occur in spherical

clusters or sperm-balls. The heads of the spermatozoa,

as in the Metazoa, are produced from the nucleus of the mother-cell, the tails from the surrounding protoplasm. The development in detail is upon two plans. In Grantia

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—Development of a caleareous sponge (Sycandra raphanus), a, ovum; b,c, ovum seg-

predominantly male and others predominantly female. Polejaeff found only one such male form

mented,—d, as seen from above, ¢, lateral view; d, blastosphere ; e, amphiblastula; 7, com- mencement of the invagination of the flagellated cells of the amphiblastula; g, gastrula attached by its oval face; h, j, young sponge (Ascon stage),—h, lateral view, j, as seen from

to 100 female forms in Grantia raphanus. In above. other sponges—Reniera fertilis, Euspongia officinalis—the sexes are distinct. The ova develop from archzocytes or wandering amceboid cells, which increase in size and ac- quire a store of reserve nourishment in the form of yolk

After Schulze.

raphanus (z5) the nueleus of the mother-eell divides into two fig. 24 b); one of the resulting daughter nuclei undergoes no further change, but with a small quantity of peripheral protoplasm forms a “cover-eell” to the other or primitive sperm nucleus and its associated protoplasm. The sperm nucleus repeatedly divides, with-

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out involving the surrounding protoplasm (fig. 24 c-f). The result- ing nuclei at length cease to exhibit a nucleolus, and become directly transformed into the heads of spermatozoa; the tails are appropriated by each head from the common protoplasmic residue. The mother- cell in this case undergoes no increase in volume as development proceeds, and itis not enclosed within an ‘‘endothelial” layer. In the second and apparently more usual case (20) no ‘‘ cover- cell” is formed, but the mother-cell divides and subdivides,

rotoplasm as well as nuclei, till a vast number of minute cells results; the nucleus of each becomes the head of a spermatozoon and the protoplasm its tail. In this case the sperm-ball does increase in bulk: it grows as it develops, and the cavity containing it becomes lined by epithelium, or so-called ‘‘endothelium ” (fig. 247). No doubt (zs) the development of the epithelium stands in direct physiological

connexion with the growth of the sperm-ball. a) bees Oq06

Obscure as are the details of this subject, suffi- Base

cient is known to enable us to make out two chief ‘“esGoovs types of development. One, common amongst the “ceed

calcareous sponges, and possibly occurring in a single genus (Gummina) of the Micromastictora, is char- ¢ acterized by what is known as the “amphiblastula ” stage; the other, widely spread amongst the Micromastictora (Reniera, Desmacidon, Huspongta, Spongelia, Aplysilla, Oscarella), is characterized by a “planula” stage.

The first has been most thoroughly investigated in Grantia raphanus by Schulze (20). The ovum by repeated segmentation gives rise to a hollow vesicle, the wall of 7 which is formed by a single layer of cells— dblastosphere ANS & (fig. 25 d). Hight cells at one pole of the blastosphere % now become differentiated from the rest; they remain =) rounded in form, comparatively large, and become filled with granules (stored nutriment), while the others, rapidly > multiplying by division, become small, clear, columnar, and flagellated. By further change the embryo becomes egg-shaped; the granular cells, now increased in number Sie to

thirty-two, form the broader end, and the numerous “X small flagellated cells the smaller end. Of the granular % cells sixteen are arranged in an equatorial girdle adjoin- ing the flagellate cells. A blastosphere thus differen- » tiated into two halves composed of different cells is > known as an amphidlastula. The amphiblastula (fig. 25 ¢) ~ now perforates the maternal tissue, and is borne along an —

excurrent canal to the oscule, where it is discharged to Ryo, 26.— Development of a Demospongia (Plakina should be shaded). 0, Section through side of planula; ec, flagellated cells; fi, their flagella; col, coenoblast. Section across the foregoing. fully grown sponge; the attached basal layer is the hypomere; the spongomere is folded so as to produce incurrent and excurrent canals; the canal system is eurypylous ; ov, ova (a segmented ovum lies between two of them); 07, blastospheres. After Schulze.

the exterior and swims about in a whirling lively dance. It then assumes a more spherical form, a change premoni- tory of the next most remarkable phase of its career. In this the flagellated layer becomes flattened, depressed, and finally invaginated within the hemisphere of granular cells, to the inner face of which it (ape itself, thus entirely obliterating the cleavage cavity, but by the same process originating another (the invagination cavity) at its expense (fig. 25 f). The two-layered sac thus produced is a paragastrula ; its outer layer, known as the epiblast, gives rise to the ectoderm, the inner layer or hypoblast to the endoderm. The paragastrula next becomes somewhat beehive- shaped, and the mouth of the paragastric cavity is diminished in size by an ingrowth of the granular cells around its margin. The larva now settles mouth downwards on some fixed object, and ex- changes a free for a fixed and stationary existence (fig. 25 g). The granular cells completely obliterate the original mouth, and grow along their outer edge over the surface of attachment in irregular pseudopodial processes, which secure the young sponge firmly to its seat (fig. 25). The granular cells now become almost trans- parent, owing to the exhaustion of the yolk granules, and allow the a within to be readily seen; a layer of jelly-like material, the rudimentary mesoderm, is also to be discerned between the two layers. The spicules then become visible; slender oxeas appear first, and afterwards tri- and quadri-radiate spicules. The larva

now elongates into a somewhat cylindrical form ; the distal end flattens ; and an oscule opens in its midst. Pores open in the walls; the endodermal cells, which had temporarily lost their flagella, reacquire them, at the same time extending the character- istic collar, In this stage (fig. 25 h, 7) the young sponge corresponds to a true Ascon, no trace of radial tubes being visible ; but as they characterize the parent sponge they must arise later, and thus we have clear evidence through ontogeny of the development of a Sycon sponge from an Ascon.

The three most striking features in the history of this larva are, first, the amphiblastula stage ; next the invagination of the flagel- late cells within the granular, instead of invagination in the reverse order ; and third the attachment of the larva by the oral instead of the aboral surface. Should Schulze be correct in deriving the Sponges from the Celentera, it is probable that the reversal of the

Sk eee

Ceelenterate history as exemplified in the last two events will furnish an explanation of the remarkable divergencies which distinguish the two phyla. The history of the second or planula type has been thoroughly worked out by Schulze (20) in a little incrusting Tetrac- tinellid sponge (Plakina monolopha, Schulze). The ovum by regu- lar segmentation produces a blastosphere, the blastomeres of which

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tr Aas e monolopha). a, planula (the central part

c, Attached gastrula (the paragaster is formed by fission). 4d, e, Young sponge (Rhagon). jf, Part ofa section through

increase in number by further subdivision till they become con- verted into hyaline cylindrical flagellated cells (fig. 267). Thus a blastosphere is produced consisting wholly of similar flagellated cells. It becomes egg-shaped, and, hitherto colourless, assumes a rose-red tint, which is deepest over the smaller end. The larva (now a planula, fig. 26 a, by the filling in of the central cavity) escapes from the parent and swims about broad end foremost. In this stage thin sections show that the cleavage cavity is obliterated, its place being occupied by a mass of granular gelatinous material contain- ing nuclei (fig. 26 5). In from one to three days after hatching the larva becomes attached. It then spreads out into a convex mass, and a cavity is produced within it by the splitting of the central jelly (fig. 26 c,d; compare Hucope and others amongst the Ccelen- terates). This cavity becomes lined by short cylindrical cells (endo- derm), while the flagellated cells of the exterior lose their flagella and become converted into pinnacocytes (ectoderm). The gelatin- ous material left between the two layers now formed acquires the characters of true collenchyme and thus becomes the mesoderm. The endoderm then sends off into the mesoderm, as buds, rounded chambers, which communicate with the paragastric cavity by a wide mouth and with the exterior by small pores (fig. 26¢). An oscule is formed later, and the sponge enters upon the Rhagon phase. Subsequent foldings of the sponge-wall give rise to a very simple canal system (fig. 26 7). In addition to these two well-ascertained modes of development others have been described which at present appear aberrant. In Oscarella lobularis, O.S. (27), a curious series of early developmental changes results in the formation of an irregular paragastrula, the walls of which become folded (while still within the parent sponge) in a complex fashion, so as to produce a form in which the incurrent and excurrent canals appear to be already sketched out before the flagellated chambers are differenti- ated off. In Spongilla Gotte describes the ectoderm as becoming entirely lost on the

attachment of the larva, so that the future sponge proceeds from the endoderm alone. As Spongilla, however,

XXII. — 54

Asexual multipli- cation.

Sexual repro- duction.

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Family 1. TeTrRaAcLaADID#.—With the characters of the sub- order. Examples: Theonella, Gray (fig. 21k); Discodermia, Bocage; *Siphonia, Parkinson. ;

Sub-order 2. RHABDOCREPIDA.

The desmas are of various forms, produced by the growth of silica over a uniaxial spicule.

Family 1. MzecAmMoRINIDAZ.—The desmas are comparatively large. ‘Trienes, usually dichotriznes, help to support the ecto- some. Microscleres usually spirasters. Examples: Corallistes, 0.8.; *Hyalotragos, Zittel; Lyidium, O.8.; *Dorydermia, Zittel.

Family 2. MicroMoRINIDZ.—The desmas are comparatively small, Triznes and microscleres are both absent. Examples: Azorica, Crtr.; * Verruclina, Zittel.

Sub-order 8. ANOMOCLADINA.

Desmas with a massive nucleated centrum, from which a variable number of arms (28) extend radiately (see fig. 12,7). Examples: Vetulina, O.8.; * Astylospongia, Roemer.

Reproduction and Embryology.

Fresh individuals arise by asexual gemmation, both external and internal, by fission, and by true sexual repro- duction.

Fission is probably one of the processes by which com- pound sponges are produced from simple individuals. Artificial fission has been practised with success in the cultivation of commercial sponges for the market. Ex- ternal gemmation has been observed in Thenea, Tethya, Polymastia, and Oscarella, A mass of indifferent sponge- cells accumulates at some point beneath the skin, bulges out, drops off, and gives rise to a new individual. Internal gemmation, which results in the formation of a statoblast, is only known to occur in the freshwater Spongillide. The statoblasts consist of a mass of yolk-bearing mesoderm cells, invested by a capsule, which in Ephydatia fluviatilis is composed of an inner cuticle of spongin separated from a similar outer layer by an intermediate zone of amphidisks and interspersed protoplasmic cells. On one side of the capsule is a hilum which leads into the interior.

Their development has recently been studied by Gatte, with results that confirm the conclusions of Carter (7) and Lieberkiihn (73). The process commences with an accumulation of amceboid cells within the mesoderm to form a globular cluster; yolk granules develop within them, especially in those that lie nearer the centre. The external cells give rise to the investing capsule; some resemble sponginblasts and secrete the inner and outer horny cuticle ; others give rise to the amphidisks and interspersed cells of the middle layer. Under favourable conditions the interior cells creep out through the pore of the capsule, and form a spreading heap, which by subsequent differentiation gives rise to a young Spongilla. Since the freshwater sponges can only be regarded as modified descendants of ancient marine species (prob- ably of the family Halichondridx), we may consider the internal gemmules, like the similar statoblasts of the freshwatcr Polyzoa, as special adaptations to a changed mode of life. They appear primarily to serve a protective purpose, ensuring the persistence of the race, since they only appear in extreme climates on the approach of drought,.and in cold ones on the approach of winter. As a secondary function they serve for the dispersal of the species; some are light enough to float down a stream, but not too far, so that there is no danger of their being carried to sea ; others, which are character-

ized by large air-chambers, are possibly distributed by | the wind.

Both sexual elements may be formed in the same individual, ¢.g., Oscarella lobularis, Grantia raphanus, and many others; but even in herm- aphrodites one or other element usually occurs to excess in different individuals, so that some are predominantly male and others predominantly female. Polejaeff found only one such male form to 100 female forms in Grantia raphanus. In above. other sponges—Reniera fertilis, Huspongia officinalis —the sexes are distinct. The ova develop from archzocytes or wandering amceboid cells, which increase in size and ac- quire a store of reserve nourishment in the form of yolk

granules ; at first they exhibit lively amceboid movements, but later pass into a resting stage. The cavity of the mesoderm within which they are situated becomes lined

Fia. 24.—Spermatozoa. a-h, Development of spermatozoa in Sycandra raph- anus, highly magnified ; 4, mature spermatozoa. After Polejaeff (x 792). j, Asperm ball in Oscaretla lobularis (500) ; &, an isolated mature spermatozoon, After Schulze (x 800).

by a layer of epithelium, which may not appear, however,

till a late stage of segmentation. In Luspongia officinalis

the ova occur congregated in groups within the mesoderm, thus presenting an early form of ovary. The spermatozoa, which also develop from wandering amceboid cells, are

minute bodies with an oval or pear-shaped head and a

long vibratile tail (fig. 24%). Each amceboid cell produces

a large number of spermatozoa, which occur in spherical

clusters or sperm-balls. The heads of the spermatozoa,

as in the Metazoa, are produced from the nucleus of the mother-cell, the tails from the surrounding protoplasm. The development in detail is upon

two plans. In Grantia

y PCM ek Ny. PS

\ ats, SREY [ele

Fia. 25.—Development of a calcareous sponge (Sycandra raphanus). a, ovum; b,c, ovum seg- mented,—®, as seen from above, c, lateral view ; d, be igri ¢e, amphiblastula ; jf, com- mencement of the invagination of the flagellated cells o attached by its oval face; h, j, young sponge (Ascon stage),—A, lateral view, j, as seen from

After Schulze.

the amphiblastula; g, gastrula

raphanus (z5) the nucleus of the mother-cell divides into two (fig. 24 6); one of the resulting daughter nuclei undergoes no further change, but with a small quantity of peripheral protoplasm forms a “ cover-cell”’ to the other or primitive sperm nucleus and its associated protoplasm. The sperm nucleus repeatedly divides, with-

out involving the surrounding protoplasm (fig. 24 c-f). The result- ing nuclei at length cease to exhibit a nucleolus, and become directly transformed into the heads of spermatozoa; the tails are appropriated by each head from the common protoplasmic residue. The mother- cell in this case undergoes no increase in volume as development proceeds, and it is not enclosed within an ‘‘endothelial” layer. In the second and apparently more usual case (20) no ‘‘ cover- cell” is formed, but the mother-cell divides and subdivides,

rotoplasm as well as nuclei, till a vast number of minute cells results; the nucleus of each becomes the head of a spermatozoon and the proto lasm its tail. In this case the gperm-ball does increase in bulk: it grows as it develops, and the cavity containing it becomes lined by epithelium, or so-called ‘‘endothelium”’ (fig. 247). No doubt (zs) the development of the

epithelium stands in direct physiological connexion with the growth of the sperm-ball.

Obscure as are the details of this subject, suffi- cient is known to enable us to make out two chief types of development. One, common amongst the calcareous sponges, and possibly occurring in a single genus (Gummina) of the Micromastictora, is char- acterized by what is known as the “amphiblastula ” stage; the other, widely spread amongst the Micromastictora (Reniera, Desmacidon, Euspongia, Spongelia, Aplysilla, Oscarella), is characterized by a “planula” stage.

The first has been most thoroughly investigated in Grantia raphanus by Schulze (20). The ovum by repeated segmentation gives rise to a hollow vesicle, the wall of

‘7 Xe > ; se which is formed by a single layer of cells—dlastosphere fe |

(fig. 25 d). Hight cells at one pole of the blastosphere % now become differentiated from the rest; they remain =| rounded in form, comparatively large, and become filled er with granules (stored nutriment), while the others, rapidly —) multiplying by division, become small, clear, columnar, ** and flagellated. By further change the embryo becomes egg-shaped; the granular cells, now increased in number to thirty-two, form the broader end, and the numerous “xy small flagellated cells the smaller end. Of the granular <™

cells sixteen are arranged in an equatorial girdle adjoin- ing the flagellate cells. A blastosphere thus differen- @ tiated into two halves composed of different cells is 7 known as an amphiblastula. The amphiblastula (fig. 25 e) now perforates the maternal tissue, and is borne along an +

Ceelenterate history as exemplified in the last two events will furnish an explanation of the remarkable divergencies which distinguish the two phyla. The history of the second or planula type has been thoroughly worked out by Schulze (20) in a little incrusting Tetrac- tinellid sponge (Plakina

monolopha, Schulze). The ovum by regu- lar segmentation produces a blastosphere, the blastomeres of which

excurrent canal to the oscule, where it is discharged to Pye, 26.—Development of a Demospongia (Plakina monolopha). a, planula (the central part

the exterior and swims about in a whirling lively dance. It then assumes a more spherical form, a change premoni- tory of the next most remarkable phase of its career. In this the flagellated layer becomes flattened, depressed, and finally invaginated within the hemisphere of granular cells, to the inner face of which it applies itself, thus entirely obliterating the cleavage cavity, but by the same proccss originating another (the invagination cavity) at its expense (fig. 25 f). The two-layered sac thus produced is a paragastrula ; its outer layer, known as the epiblast, gives rise to the ectoderm, the inner layer or hypoblast to the endoderm. The paragastrula next becomes somewhat beehive- shaped, and the mouth of the paragastric cavity is diminished in size by an ingrowth of the granular cells around its margin. The larva now settles mouth downwards on some fixed object, and ex- changes a free for a fixed and stationary existence (fig. 25 g). The granular cells completely obliterate the original mouth, and grow along their outer edge over the- surface of attachment in irregular pseudopodial processes, which secure the young sponge firmly to its seat (fig. 25). The granular cells now become almost trans- parent, owing to the exhaustion of the yolk granules, and allow the hypoblast within to be readily seen; a layer of jelly-like material, the rudimentary mesoderm, is also to be discerned between the two layers. The spicules then become visible ; slender oxeas appear first, and afterwards tri- and quadri-radiate spicules. The larva now elongates into a somewhat cylindrical form; the distal end flattens ; and an oscule opens in its midst. Pores open in the walls; the endodermal cells, which had temporarily lost their flagella, ge gi them, at the same time extending the character- istic collar. In this stage (fig. 25 h, 7) the young sponge corresponds to a true Ascon, no trace of radial tubes being visible ; but as they characterize the parent sponge they must arise later, and thus we have clear evidence through ontogeny of the development of a Sycon sponge from an Ascon.

The three most striking features in the history of this larva are, first, the amphiblastula stage ; next the invagination of the flagel- late cells within the granular, instead of invagination in the reverse order ; and third the attachment of the larva by the oral instead of the aboral surface. Should Schulze be correct in deriving the Sponges from the Celentera, it is probable that the reversal of the

should be shaded). 0, Section through side of planula; ec, flagellate flagella ; col, ccenoblast. Section across the foregoing. fully grown sponge ; the attached basal layer is the hypomere ; the spongomere is folded soas to produce ineurrent and excurrent canals; the canal system is eurypylous ; ov, ova (a segmented ovum lies between two of them); 61, blastospheres. After Schulze.

cells; fl, their c, Attached gastrula (the paragaster is formed by fission). d, e, Young sponge (Rhagon). jf, Part of a section through

increase in number by further subdivision till they become con- verted into hyaline cylindrical flagellated cells (fig. 26/). Thus a blastosphere is produced consisting wholly of similar flagellated cells. It becomes egg-shaped, and, hitherto colourless, assumes a rose-red. tint, which is deepest over the smaller end. The larva (now a planula, fig. 26a, by the filling in of the central cavity) escapes from the parent and swims about broad end foremost. In this stage thin sections show that the cleavage cavity is obliterated, its place being occupied by a mass of granular gelatinous material contain- ing nuclei (fig. 26 b). In from one to three days after hatching the larva becomes attached. It then spreads out into a convex mass, and a cavity is produced within it by the splitting of the central jelly (fig. 26 c,d; compare Lucope and others amongst the Ccelen- terates). This cavity becomes lined by short cylindrical cells (endo- derm), while the flagellated cells of the exterior lose their flagella and become converted into pinnacocytes (ectoderm). The gelatin- ous material left between the two layers now formed acquires the characters of true collenchyme and thus becomes the mesoderm. The endoderm then sends off into the mesoderm, as buds, rounded chambers, which communicate with the paragastric cavity by a wide mouth and with the exterior by small pores (fig. 26¢). An oscule is formed later, and the sponge enters upon the Rhagon phase. Subsequent

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is a freshwater form, anomalies in its development (which remind us of those in the development of the freshwater Hydra) might almost be expected. . ‘

Probably in no other single group is the doctrine of homoplasy enunciated by Lankester more tellingly illus- trated than in the sponges. The independent develop- ment of similar types of canal system in different groups, sometimes within the limits of a single family, is a remark- able fact. In’the following table the sign x shows inde- pendent evolution of similar types of canal system in different groups:—

Rhagon.

Ascon, | Sycon. ee. Aphodal.|Diplodal.

Class Calcarea …..... x x x nag Order Halisarcina…... x x wee Order Monazxona …... — x x Order Ceratosa …..... x x x x Sub-order Microsclero-

SDHOTO ac enters x x 5 Order Choristida …... x x Family Tetillidz …... x x

In the gross anatomy of the canal system similar homo- plasy obtains; thus, to cite one case amongst many, a peculiar type of canal system characteristic of Siphonia (Lithistid) occurs also in Hmploca (Hexactinellid), Schmidtia (Monaxonid), and other apparently unrelated genera. The development of a cortex has likewise taken place inde- pendently, but on parallel lines, in the Syconidx, Leu- conidx, Monaxona, Tetillide, and Stellettide. Calcareous and silicious spicules have evidently an independent his- tory, and yet all the chief forms of the former are repeated in the latter. Quite as remarkable is the similarity of the independently evolved horny spicules of Darwinella aurea to the quadri- and sex-radiate silicious spicules. We have now sufficient knowledge of the morphology and evolu- tion of the sponge to furnish the physicist with data for an explanation of the skeleton, at least in its main outlines, The obvious conclusion from this is that variation does not depend upon accident, but on the operation of physical laws as mechanical in their action here as in the mineral world. Another important consequence follows: if homo- plasy —.e., the independent evolution of similar structures —is of such certain and quite common occurrence in the case of the sponges, it is also to be looked for in other groups, and polyphylitic origin, so far from being improb- able, is as likely an occurrence as monophylitic origin.

Physiology and Atiology.

Under the head of “physiology” we have almost a blank. At present we do not even know what cells of the sponge are primarily concerned in the ingestion of food. If a living sponge, such as Spongilla, be fed with carmine for a few minutes, then immersed in dilute osmic acid, and examined in thin sections, its flagellated chambers are found to be all marked out as red circular patches, and a closer investigation shows that the choanocytes, and they alone, have ingested the carmine. In this way we con- firm the earlier observations of Carter made by teasing carmine-fed sponges. This might be thought to decide the question ; but, though it effectually disposes of Pole- jaeff’s argument that the choanocytes do not ingest nutri- ment because mechanical disadvantages (conceived a prior) make it impossible, it has not

proved a final solution, Von Lendenfeld, by feeding sponges such as Aplysilla with carmine for a longer interval—a quarter of an hour—finds that amceboid cells crowd about the sides and particularly the floor of the subdermal cavities, and are soon loaded with carmine granules ; after a time they wander away to the flagellated chambers and there cast out into the ex-current canals the carmine they have absorbed, apparently

in an altered state. On the other hand, the choanocytes, though they at first absorb the carmine, soon thrust it out, apparently in an unaltered state. Hence Von Lendenfeld concludes that it is the epithelium of the subdermal cavities which is charged with the function of ingestion, and that the amceboid cells subsequently digest and distribute ita and finally cast out the worthless residues, There may be much truth in this view, but it requires to be supported by further evidence. (1) Sufficient proof is not adduced to show that the carmine granules expelled from the amc- boid cells are really more decomposed than those rejected by the choanocytes. (2) There is at present no proof that carmine is a food, or that if it is sponges will readily feed upon it. In either case one would expect the ameboid cells to play the part which they perform in other organisms and to remove as soon as possible useless or irritant matter from the surface which it encumbers; at the same time the choanocytes, not having found the food to their liking, would naturally eject it. (3) If the choanocytes do not ingest food, how does the Ascon feed, since in this sponge

all the pinnacocytes are external? It is, however, a very

noticeable fact that, as the organization of a sponge increases in complexity, the choanocytal layers become reduced in volume relative to the whole bulk of the individual; and it is quite possible that as histological differentiation proceeds it may be accompanied by physio- logical differentiation which relieves the choanocytes to some extent of the ingestive part of their labours.

The origin of the sponges is to be sought for among Aiid! the choanoflagellate Jnfusoria; and Savile Kent has de- logy!

scribed a colonial form of this group which is suggestively similar to a sponge. Its differences, however, are as marked as its resemblances, and have been sufficiently pointed out by Schulze (23). Kent has called this form Protospongia, a name already made use of, and fortunately, as the organism is not in any sense a true sponge ; the present writer proposes, therefore, to call it Savillia, in honour of its discoverer. It consists of choanoflagellate Infusoria (see Prorozoa, vol. xix. p. 858, fig. XXT., 15} half projecting from and half embedded in a structureless jelly or blastema, within which other cells of an amoeboid character and reproductive function are immersed, Pro- fessor Haddon arrives at the generalization that conjuga- tion amongst the Protozoa always takes place between individuals of the same order: flagellate cells conjugate with flagellate, amceboid with amceboid, but never with flagellate ; while in true sexual reproduction the conjuga- tion occurs between two individual cells in different stages of their life cycle: a flagellate cell conjugates with a resting amoeboid cell. Now Savillia would appear to be extremely near such a true sexual process, since the simultaneous coexistence of cells in two different stages of life and within easy reach of each other—a necessary preliminary, one would think, to the union—has already been brought about. That coalescence between two different histological elements should result in products similarly histologically differentiated (compare amphiblastula stage of Calcarea) has in it a certain fitness, which, however, has still to be: explained. The mode by which an organism like Savillia might become transformed into an Ascon cannot be sug- gestively outlined with any satisfactory results till our knowledge of the embryology of sponges is more advanced. The minute characters of the flagellate cells of the amphi- blastula and other sponge larvee are still a subject for research. They often possess a neck or collum; but the existence of a frill or collar is disputed. Kent asserts that it is present in several embryos which he figures; and Barrois makes the same assertion in respect to the larva of Oscarella, and illustrates his description with a figure. On the other hand, Schulze and Marshall both

deny its existence, and the former attributes Kent’s observations to error. One constant character they do possess: they are provided with flagella at some stage of their existence, but never with cilia. Ciliated cells, in- deed,

are unknown amongst the sponges, and, when pinna- cocytes exceptionally acquire vibratile filaments, as in Oscarella and other sponges, these are invariably flagella, never cilia. An Ascon stage having been reached at some point in the history of the sponges, the Sycon tubes and Rhagon chambers would arise from it by the active pro- liferation of choanocytes about regularly distributed centres, possibly as a result of generous feeding. Vosmaer recog- nized as the physiological cause of Sycon an extension of the choanocytal layer. Polejaeff, relying on Von Lenden- feld's experiments, which seem to prove that it is the pinnacocytes and not the choanocytes which are concerned in the ingestion of nutriment, argues that, as in Sycon the pinnacocytal layer is increased relatively to the choano- cytal, we have in this a true explanation of the transition. The existence of Homoderma, Lfd., however, shows that in the first stage there was not a replacement of choano- cytes by pinnacocytes, but that this was a secondary change, following the development of radial tubes, and therefore cannot be relied upon to explain them. The radial tubes having been formed by a proliferation of choanocytal cells, the reduction of those lining the para- gastric cavity to pinnacocytes would follow in consequence of the poisonous character of the water delivered from the radial tubes to the central cavity, since this water not only parts with its dissolved oxygen to the choanocytes it first encounters, but receives from them in exchange urea, carbonic acid, and fecal residues. The development of subdermal cavities is explicable on Von Lendenfeld's hypothesis,

Distribution.

Our knowledge of this subject is at present but frag- mentary ; we await fuller information in the remaining reports on the sponges obtained by the "' Challenger." The sponges are widely distributed through existing seas, and freshwater forms are found in the rivers and lakes of all continents except Australia, and in numerous islands, in- cluding New Zealand. Many genera and several species are cosmopolitan, and so are most orders,

As instances of the same species occurring in widely remote localities we take the following from Polejaeff :—Sycon arcticwm is found at the Bermudas and in the Philippine Islands, as also are Leuconia muiltiformis and Leucilla uter ; Sycon raphanus occurs at Tristan da Cunha and the

Philippines ; Heteropegma nodus-gordii and Leuconia dura at the Bermudas and Torres Straits. We do not know, however, whether these species are isolated in their distribu- tion or connected by intermediate localities. Of the Calcarca about eighty-one species have been obtained from the Atlantic, twenty- two from the Pacific, and twenty-two from the Indian Ocean ; but these numbers no doubt depend largely on the extent to which the several oceans have been investigated, for the largest number of species has been found in the ocean nearest home. Schulze states that the Heaactinellida brought home by the 'Challenger " were obtained at seventeen Atlantic stations, twenty-seven Pacific, and nineteen in the South Seas. In the last the number of species Was greatest, in the Atlantic least. They flourish best on a bottom of diatomaceous mud. The Calcarea and Ceratosa are Most abundant in shallow water and down to 40 fathoms, but they descend to from 400 to 450 fathoms. The Hexactinellida are most numerous over continental depths, z.¢., 100 to 200 fathoms; but they extend downwards to over 2500 fathoms and upwards mto shallow water (10 to 20 fathoms). The Lithistida are not such deep-water forms as the Hexactinellida, being most numerous from 10 to 150 fathoms. Only one or two species have been dredged from depths greatcr than 400 fathoms, and none from 1000 fathoms. The Choristida range from shallow water to abyssal depths.

Until about 1876 one of the chief obstacles to the inter-

pretation of fossil sponges arose from a singular mineral replacement which most of them have undergone, leading to the substitution of calcite for the silica of which their skeletons were originally composed. This change was de- monstrated by Zittel (35) and Sollas (2¢), and, though it was at first pronounced impossible, owing to objections founded on the chemical nature of silica, it has since be- come generally recognized. These observers also showed that the fossil sponges do not belong to extinct types, but are assignable to existing orders. Zittel in addition sub- jected large collections to a careful analysis and marshalled them into order with remarkable success. Since then several paleeontologists have worked at the subject, — Pécta, Dunikowski, and Hinde (7), who has published a Cata- logue— which is much more than a catalogue—of the sponges preserved in the

British Museum. The result of their labours is in general terms as follows. Fossil sponges are chiefly such as from the coarseness or consistency of their skeletons would be capable of preservation in a miner- alized state. Thus the majority are Hexactinellida, chiefly Dictyonina ; Tetractinellida, chiefly Lithistida ; and Cal- cared, chiefly Leuconaria. Monaxonid sponges rarely occur; the most ancient is Climacospongia, Hinde, found in Sil- urian rocks. A very common Halichondroid sponge of this group (Pharetrospongia strahani, Soll.) occurs in the Cam- bridge greensand; it owes its preservation to the collection of its small oxeate spicules into dense fibres. The Choristida, though not so common as the Lithistids, are commoner than the Monaxonids, particularly in Mesozoic strata.

The distribution of fossil sponges in the stratified systems may be summarized as follows, CALcCAREA.—Homoce@la, none. Hetero- cela, a Syconid, in the Jurassic system. Numerous Leuconaria from the Devonian upwards. Myxosponera.—None ; not fitted for preservation. HEXACTINELLIDA.—Lyssacina, from the Lower Cambrian upwards. Dictyonina, commencing in the Silurian ; most numerous in the Mesozoic group; still existing. Monaxonrpa.— Monaxona, from the Silurian upwards. Ccratosa, none; few are fitted for preservation. TETRACTINELLIDA.— Choristida, from the Carboniferous upwards ; most numerous in the Cretaceous system. Lithistida, from the Silurian upwards; most numerous in the Mesozoic group. In ancient times the Hexactinellids and Lithistids seem not to have been so comparatively uncommon in shallow water as they are at the present day. Thus, in the Lower Jurassic strata of the south-west of England we find Dictyonine Hexactinel- lids, Lithistids, and Leuconarian Calcarea associated together in a shelly breccia and in company with littoral shells, such as Patella and T’rochus. Several Paleozoic Hexactinellids actually occur in a fine-grained sandstone. Of the Chalk, which is the great mine of fossil sponges, we must speak with caution, owing to the insufficient evidence as to the depth at which it was deposited.

As shown by Protospongia, the phylum of the sponges was in existence in very early Cambrian times, and probably much earlier. Before the end of the Silurian period its main branches had spread themselves out, and, developing fresh shoots since then, they have extended to the present day. Of the offshoots none of higher value than families are known to have

become extinct, and of these decayed branches there are very few. The existence in modern seas of the Asconid#, which must surely have branched off very near the base of the stem, is another curious instance of the persistence of simple types, which would thus appear not to be so vastly worse off in the struggle for existence than their more highly organized descendants.

Bibliography.—A fairly complete list of works on sponges published before 1882 will be found in Vosmaer's article ‘‘ Poriferc," in Bronn's Klassen und Ordnungen, vol. ii. D'Arcy Thompson's Catalogue of Papers on Protozow and Coelenterata, a still more complete list, extends to 1884.

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Commerce.

When the living matter is removed from a Ceratose sponge a network of elastic horny fibres, the skeleton of the animal, remains behind. This is the

sponge of com- merce. Of such sponges the softest, finest in texture, and most valued is the Turkey or Levant sponge, Huspongia officinalis, Lin. The other two varieties are the Hippo- spongia equina, O. Schmidt, and the Zimocca sponge, Huspongia zimocca, O.S., which is not so soft as the others (see p. 423 above). All three species are found at from 2 to 100 fathoms along the whole Mediterranean coast, includ- ing its bays, gulfs, and islands, except the western half of its northern shores as far as Venice and the Balearic Isles, Corsica, Sardinia, and Sicily. Bath sponges occur around the shores of the Bahamas, and less abundantly on the north coast of Cuba. They are of several kinds, one not dis- tinguishable from the fine Levant sponge; others, the “yellow” and “hardhead” varieties, resemble the Zimocca sponge ; and of horse sponges there appear to be several varieties, such as the “lamb’s-wool” and the “velvet” sponge (Hippospongia gossypina and ZH. meandriformis). The fine bath sponge occurs on the shores of Australia (Torres Straits, the west coast, and Port Phillip on the south coast). A sponge eminently adapted for bathing purposes (Coscinoderma lanuginosum, Crtvr.; Euspongia mathewsi, Lfd.), but not yet brought into the market, occurs about the South Caroline Islands, where it is actu- ally in use, and at Port Phillip in Australia. The fine bath sponge occurs in the North Pacific, South Atlantic, and Indian Oceans, so that its distribution is world-wide.

The methods employed to get sponges from the bottom of the sea, where they grow attached to rocks, stones, and other objects, depend on the depths from which they are to be brought. In comparatively shallow water they may be loosened and hooked up by a harpoon ; at greater depths, down to 30 or 40 fathoms, they are dived for 3 and at depths of from 50 to 100 fathoms they are dredged with a net. The method of harpooning was the earliest practised, and is still carried on in probably its most primitive form by the Dalmatian fishermen. Small boats are used, manned by a single harpooner with a boy to steer ; when, however, the expedition is to extend over night the crew is doubled. The harpoon is a five-pronged fork with a long wooden handle, and if this is not long enough another harpoon is lashed on to it. The Greek fishers use a large boat furnished with two or three smaller ones, from which the actual harpooning is carried on; the crew numbers seven or eight. One of the chief difficulties is to see the bottom

distinctly through a troubled surface. The Dalmatian fishers throw a smooth stone dipped in oil

a yard or so in front of the boat; the stone scatters drops of oil as it flies and so makes a smooth track for the “look- out.” The Greeks use a zinc-plate cylinder about 14 feet long and 1 foot wide, closed at the lower end by a plate of glass, which is immersed below the surface of the sea; on looking through this the bottom may be clearly seen even in 30 fathoms. This plan is also adopted in the Bahamas, where harpooning carried on after the Greek system gives employment to over 5000 men and boys.

The primitive method of diving with no other apparatus than a slab of stone to serve as a sinker and a cord to communicate with the surface is still practised in the Mediterranean. The diver carries a net round his neck to hold the sponges. On reaching the bottom he hastily snatches up whatever sponge he sees. After staying down as long as he is able—an interval which varies from two: to at the most three minutes—he tugs violently at the cord and is rapidly drawn up. On entering the boat from depths of 25 fathoms he quickly recovers from the effects of his plunge after a few powerful respirations ; but after working at depths of 30 to 40 fathoms or more he reaches the surface in a swooning state. At the beginning of the season blood usually flows from the mouth and nose after a descent ; this is regarded as a symptom of good condition ; should it be wanting the diver will scarcely venture a second plunge for the rest of the season. The work is severe, and frequently the diver returns empty-handed to the boat. Diving is usually carried on in the summer months; in winter it is too cold, at all events without a diving-dress, The ordinary diver’s dress with pumping apparatus is largely used by the Greeks. The diving is carried on from a ship manned by eight or nine men, including one, or rarely two, divers. At a depth of from 10 to 15 fathoms the diver can remain under for an hour, at greater depths up to 20 fathoms only a few minutes ; the consequences of a longer stay are palsy of the lower extremities, stricture, and other complaints. Dredging is chiefly carried on along the west coast of Asia Minor, principally in winter after the autumn storms have torn up the seaweeds covering the bottom. The mouth of the dredge is 6 yards wide and

1 yard high; the net is made of camel-hair cords of the thickness of a finger, with meshes 4 inches square. It is drawn along the bottom by a tow-line attached to the bowsprit of a sailing vessel or hauled in from the shore.

of Lesina, off the Dalmatian coast, and experiments were carried on there for six years (1867-72) under the super- intendence of Von Buccich. The results were on the whole successful, but all expectations of creating a new source of income for the sponge-fishers of Dalmatia were defeated by the hostility of the fishers themselves.

The details of the method of sponge-farming as practised by Von Buccich are briefly as follows. The selected speci- mens, Which should be obtained in as uninjured a state as possible, are placed on a board moistened with sea water and cut with a knife or fine saw into pieces about 1 inch square, care being taken to preserve the outer skin as in- tact as possible. The operation is best performed in winter, as exposure to the air is then far less fatal than in summer. The sponge cuttings are then trepanned and skewered on bamboo rods; the rods, each bearing three cuttings, are secured in an upright position between two parallel boards, which are then sunk to the bottom of the sea and weighted with stones. In choosing a spot for the sponge-farm the mouths of rivers and proximity to submarine springs must be avoided ; mud in this case, as in that of reef-building

repara- on for s

corals, is fatal. A favourable situation is a sheltered bay with a rocky bottom overgrown with green seaweed and freshened by gentle waves and currents. So favoured, the cuttings grow to a sponge two or three times their original size in one year, and at the end of five to seven years are large enough for the market. Similar experi- ments with similar results have more recently been carried on in Florida. The chief drawback to successful sponge-farming would appear to be the long interval which the cultivator has to wait for his first crop.

After the sponge has been taken from the sea, it is ex- posed to the air till signs of decomposition set in, and then without delay either beaten with a thick stick or trodden by the feet in a stream of flowing water till the skin and other soft tissues are completely removed. If this process is postponed for only a few hours after the sponge has been exposed a whole day to the air it is almost impossible to completely purify it. After cleaning it is hung up in the air to dry, and then with others finally pressed into bales. If not completely dried before pack- ing the sponges “heat,” orange yellow spots appearing on the parts attacked. The only remedy for this is to unpack

SPONSOR. The presence of some suitable sponsor or sponsors to give the answers required and undertake the vows involved would seem to be almost essential to the right administration of the sacrament of baptism, in the case of infants at least. In this aspect, however, as in many others, the early history of the development of the rite of baptism remains obscure. The Greek word for the person undertaking this function is dvadoyos, to which the Latin susceptor is equivalent. The word “sponsor” in this ecclesiastical sense occurs for the first time, but incidentally only, and as if it were already long familiar, in Tertullian’s treatise De Baptismo (c. 18), where, arguing that in certain circumstances baptism may conveniently be postponed, especially in the case of little children, he asks, ‘“ For why is it necessary that the sponsors likewise should be thrust into danger, who both themselves by reason of mortality may fail to fulfil their promises, and may also be disappointed by the development of an evil disposition [in those for whom they become sponsors]?” There is nothing to make it unlikely that the sponsors here alluded to may have been in many cases the actual parents, and even in the 5th century it was not felt to be inappropriate that they should be so; Augustine, indeed, in one passage appears to speak of it as a matter of course that parents should bring their children and answer for them “ tanquam fidejussores” (Hpist. . . . ad Bonif., 98). The compara- tively early appearance, however, of such names as com- patres, commatres, propatres, promatres, patrim, matrine is of itself sufficient evidence, not only that the sponsorial rela- tionship had come to be regarded as a very close one, but also that it was not usually assumed by the natural parents. How very close it was held to be is shown by the Justini- anian prohibition of marriage between godparents and godchildren. On the other hand, the anciently allowable practice of parents becoming sponsors

for their own children seems to have lingered until the 9th century, when it was at last formally prohibited by the council of Mainz (813). For a long time there was no fixed rule as to the necessary or allowable number of sponsors, and sometimes the number actually assumed was large. By the council of Trent, however, it was decreed that one only, or at most two, these not being of the same sex, should be permitted. The tubric of the Church of England according to which " there shall be for every male child to be baptized two godfathers and one godmother, and for every female one godfather and two godmothers," is not older than 1561; in the

the bale and remove the affected sponges. The orange- coloured spots produced by this "pest," or "cholera" as the Levant fishermen term it, must not be confounded with the brownish red colour which many sponges naturally possess, especially near their base. The sponges on reaching the wholesale houses are cut to a symmetrical shape and further cleaned. The light-coloured sponges often seen in chemists' shops have been bleached by chemical means which impair their durability. Sponges are sold by weight ; sand is used as an "adulteration."

It is difficult to obtain recent statistics as to the extent of the sponge trade ; the following table gives a summary of the sponges sold in Trieste, the great European sponge market, in the year 1871 :—

For Export. For Home Consumption. Description of Sponge. ; r ; 4 Mean price ° Mean price Value in £ per pound. Value in £ per pound, Horse sponge……..... £60,000 6s. £4400 6s. Zimocca sponge …... 20,000 6s. 650 6s. Fine Levant sponge…. 20,000 14s. 950 14s. Fine Dalmatian sponge 2,000 8s. me 00 rrr

Catechism the child is taught to say that he received his name from his ''godfathers and godmothers." At the Reformation the Lutheran churches retained godfathers and godmothers, but the Reformed churches reverted to what they believed to be the more primitive rule, that in ordi- nary circumstances this function should be undertaken by a child's proper parents. All churches, it may be added, of course demand of sponsors that they be in full communion. In the Church of Rome priests, monks, and nuns

are dis- qualified from being sponsors, either "'because it might involve their entanglement in worldly affairs," or more probably because every relationship of fatherhood or motherhood is felt to be in their case inappropriate.

SPONTINI, Gasparo Luicr Pacirico (1774-1851), dramatic composer, was born at Majolati (Ancona) in Italy, 14th November 1774, and educated at the Conservatorio de' Turchini at Naples under Sala, Tritto, and Salieri. After producing some successful operas at Rome, Florence, Naples, and Palermo, he settled in 1803 at Paris. His reception in the French capital was anything but flatter- ing. His first comic opera, Jule, proved a failure; his second, La Petite Maison, was hissed. Undaunted by these misfortunes, he abandoned the light and somewhat frivolous style of his earlier works, and in Ailton, a one- act opera produced in 1804, achieved a real success. Spontini henceforth aimed at a very high ideal, and during the remainder of his life strove so earnestly to reach it that he frequently remodelled his passages five or six times before permitting them to be performed in public, and wearied his singers by introducing new improvements at every rehearsal. His first masterpiece was La Vestale, completed in 1805, but kept from the stage through the opposition of a jealous clique until 15th December 1807, when it was produced at the Académie, and at once took rank with the finest works of its class. The composer's second opera, ferdinand Cortez, was received with equal enthusiasm in 1809; but his third, Olympia, was much less warmly welcomed in 1819.

Spontini had been appointed in 1810 director of the Italian opera; but his quarrelsome and grasping disposi- tion led to his summary dismissal in 1812, and, though reinstated in 1814, he voluntarily resigned his post soon afterwards. He was in fact very ill fitted to act as director; yet on 28th May 1820, five months after the failure of Olympia, he settled in Berlin by invitation of Frederick William ITI., commissioned to superintend all

music performed at the Prussian court and compose two new grand operas, or three smaller ones, every three years. But he began by at once embroiling himself with the in- tendant, Count Brithl. Spontini's life at Berlin may be best described as a ceaseless struggle for precedence, under circumstances

which rendered its attainment impossible in the sense in which he desired it. Yet he did good work, and did it well. Dze Vestalin, Ferdinand Cortez, and Olympia—the last two entirely remodelled—were produced with great success in 1821. A new opera, Vourmahal, founded on Moore's Lalla Rookh, was performed in 1822, and another, entitled Alcidor, in 1825; and in 1826 Spontini began the composition of Agnes von Hohenstaufen, a work planned on a grander scale than any of his former efforts. The first act was performed in 1827, and the complete work in three acts graced the marriage of Prince William in 1829. Though the German critics abused it bitterly, Agnes von Hohenstaufen is undoubtedly Spontini's greatest work. In breadth of conception and grandeur of style it exceeds both Dze Vestalin and Ferdinand Cortez, and its details are worked out with untiring conscientious- ness; yet Spontini was utterly dissatisfied with it, and at once set to work upon an entire revision, which on its repre- sentation in 1837 was in many parts scarcely recognizable by those who had heard the opera in its original form.

This was his last great work. He several times began to rewrite his early opera, Jfilton, and contemplated the treatment of many new subjects, such as Sappho, La Colére d'Achille, and other classical myths, but with no definite result. He had never been popular in Berlin ; and he has been accused of endeavouring to prevent the performance of Huryanthe, Oberon, Die Hochzeit des Camacho, Jessonda, Robert the Devil, and other works of genius, through sheer envy of the laurels won by their composers. But the critics and reviewers of the period were so closely leagued together against him that it is difficult to know what to believe. After the death of Frederick William III. in 1840, Spontini's conduct became so violent and imperious that in 1842 Frederick William IV. dismissed him, with power to retain his titles and live wherever he pleased in the enjoyment of his full salary. He elected to settle once more in Paris, after a short visit to Italy ; but beyond conducting occasional per- formances of some of his own works he made but few attempts to keep his name before the public. In 1847 he revisited Berlin and was invited by the king to conduct some performances during the winter. In 1848 he became deaf. In 1850 he retired to his birthplace, Majolati, and died there on 14th January 1851, bequeathing all he pos- sessed to the poor of his native town.

SPOONBILL. The bird now so called was formerly known in England as the Shovelard or Shovelar, while that which used to bear the name of Spoonbill, often amplified into Spoon-billed Duck, is the SHoVELER (see vol. xxi. p. 842) of modern days—the exchange of names having been effected, as already stated (Joc. cit.) about 200 years ago, when the subject of the present notice—the Platalea leucorodia of Linnzeus as well as of recent writers—was doubtless far better known than now, since it evidently was, from ancient documents, the constant concomitant of Herons, and with them the law attempted to protect it.) Mr Harting (Zoologist, 1886, pp. 81 et seg.) has cited a case from the ‘ Year-Book” of 14 Hen. VIII. (1523),

1 Nothing shows better the futility of the old statutes for the protection of birds than the fact that in 1534 the taking of the eggs of Herons, Spoonbills (Shovelars), Cranes, Bitterns, and Bustards was visited by a heavy penalty, while there was none for destroying the parent birds in the breeding-season. All of the species just named, except the Heron, have passed away, while there is strong reason to think that some at least might have survived had the principle of the Levitical law (Deut. xxii. 6) been followed.

wherein the then bishop of London (Cuthbert Tunstall) maintained an action of trespass against the tenant of a close at Fulham for taking Herons and ‘“Shovelars” that made their nests on the trees therein growing, and has also printed (Zoologist, 1877, pp. 425 et seg.) an old document showing that ‘‘Shovelars” bred in certain woods in west Sussex in 1570. Nearly one hundred years later (circa 1662) Sir Thomas Browne, in his Account of Birds found in Norfolk (Works, ed. Wilkin, iv. pp. 315, 316), stated of the “Platea or Shouelard” that it formerly ‘built in the Hernerie at Claxton and Reedham, now at Trimley in Suffolk.” This last is the latest known proof of the breeding of the species in England ; but more recent evidence to that effect may be hoped for from other sources. That the Spoonbill was in the fullest sense of the word a “‘native” of England is thus incontestably shown; but for many years past it has only been a more or less regular visitant, though not seldom in con- siderable numbers, which would doubtless, if allowed, once more make their home there ; but its conspicuous appear- ance renders it an easy mark for the greedy gunner and

the contemptible collector. What may have been the case formerly is not known, except that, according to Belon, it nested in his time (1555) in the borders of Britanny and Poitou; but as regards north-western Europe it seems of late years to have bred only in Holland, and there it has been deprived by drainage of its favourite resorts, one after the other, so that it must shortly become merely a stranger, except in Spain or the basin of the Danube and other parts of south-eastern Europe.

The Spoonbill ranges over the greater part of middle and southern Asia,? and breeds abundantly in India, as well as on some of the islands in the Red Sea, and seems to be resident throughout Northern Africa. In Southern Africa its place is taken by an allied species with red legs, P. cristata or tenwirostris, which also goes to Madagascar. Australia has two other species, P. regia or melanorhynchus, with black bill and feet, and P. flavipes, in which those parts are yellow. The very beautiful and wholly diffcrent P. ajaja is the Roseate Spoonbill of America, and is the only one found on that continent, the tropical or juxta-tropical parts of which it inhabits. The rich pink, deepening in some parts into crimson, of nearly all its plumage, together with the yellowish green of its bare head and its lake-coloured legs, sufficiently marks this bird; but all the other species are almost wholly clothed in pure white, though the English has, when adult, a fine buff pectoral band, and the spoon-shaped expanse of its bill is yellow, contrast- ing with the black of the compressed and basal portion. Its legs are also black. In the breeding season, a pendent tuft of white plumes further ornaments the head of both sexes, but is longest in the male. The young of the year have the primary quills dark- coloured.

The Spoonbills form a natural group, Platalerdz, allied, as before stated (Izis, vol. xii. p. 606), to the Ibididz, and somewhat more distantly to the Storks (see Stork), —all belonging to the Pelargomorphe of Prof. Huxley. They breed in societies, not only of their own kind, but in company with Herons, either on trees or in reed-beds, making large nests in which are commonly laid four eggs, —white, speckled, streaked, or blotched, but never very closely, with light red. Such breeding-stations have been several times described, and among the more recent accounts of one of them are those of Messrs Sclater and W. A. Forbes (Zbis, 1877, p. 412), and Mr Seebohm (Zoologist, 1880, p. 457), while a view of another has been

attempted by Schlegel (Vog. Wederland, taf. xvii.). The latest systematic revision of the group is by Dr Reichenow (Journ. fiir Ornithologie, 1877, pp. 156-159), but his views have not been wholly accepted in the

present article. (A. N.)

2 Omithologists have been in doubt as to the recognition of two species from Japan described by Temminck and Schlegel under the names of P. major and P, minor. Lately it has been suggested that the former is only the young of P. lewcorodia, and the latter the young of the Australian P. regia.

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SPO—SPO

SPORADES, the islands “scattered” (as the name, from ovefpewv, ‘to sow,” imports) about the Greek Archi- pelago, are distinguished on the one hand from the Cyclades, which are grouped around Delos, and on the other from the islands attached, as it were, to the mainland of Europe and Asia. The distinction is not in either case a very definite one, and hence both ancient and modern writers differ as to the list of the Sporades. Details of classifi- cation are given by Bursian (G’riechenland, ii. 348 sq.). The Doric Sporades—Melus (MeEtos),! Pholegandrus, Sicinus, THERA, Anaphe, Astypalea, and Cos—were by some considered a southern cluster of the Cyclades. In modern times the name Sporades is more especially applied to two groups—the Northern Sporades, which lie north-east of Negropont (Eubcea), along with which they constitute a nomarchy of the kingdom of Greece ; and the Southern Sporades, lying off the south-west of Asia Minor, and included in the Turkish vilayet of the ‘Islands of the White Sea.” The Northern, which have altogether an area of 180 square miles and a population of 13,394 (1879), comprise Skiatho, Khiliodromi or Ikos, Skopelo, Pelagonisi, Giura, Pipari, and Skiro (Scyros), with their adjacencies. The Southern are as follows :—TIcaria, Patmos, Leros, Calymno, Astypalea (Stampalia), Cos (Stanko), Nisyros, Tilos or Episcopi, Sime, Khalki, RuopeEs, Crere, and a multitude of lesser isles.

SPORTS, Tue Book or, or more properly the Duciara- TION OF SPoRTs, was issued by James I. in 1617 on the recommendation of Thomas Morton,

bishop of Chester, for use in Lancashire, where the king on his return from Scotland found a conflict on the subject of Sunday amuse- ments between the Puritans and the gentry, many of whom were Roman Catholics. Permission was given for dancing, archery, leaping, vaulting, and other harmless recreations, and of “having of May games, Whitsun ales, and morris dances, and the setting up of May-poles and other sports therewith used, so as the same may be had in due and con- venient time without impediment or neglect of divine service, and that women shall have leave to carry rushes to church for the decorating of it.” On the other hand, “bear and bull baiting, interludes, and (at all times in the meane sort of people by law prohibited) bowling” were not to be permitted on Sunday (Wilkins, Concilia, iv. 483). In 1618 James transmitted orders to the clergy of the whole of England to read the declaration from the pulpit ; but so strong was the opposition that he prudently withdrew his command (Wilson, in Kennet, ii. 709; Fuller, Church History, v. 452). In 1633 Charles I. not only directed the republication of his father’s declaration (Rush- worth, ii. 193) but insisted upon the reading of it by the clergy. Many of the clergy were punished for refusing to obey the injunction. With the fall of Laud all attempt to enforce it necessarily came to an end.

SPOTSWOOD, or Spotiswoop, Joun (1565-1639), archbishop of St Andrews, was the son of John Spotswood, minister of Calder and “superintendent” of Lothian, and was born in 1565. He was educated at Glasgow, and suc- ceeded his father in the parish of Calder when but eighteen years of age. In 1601 he attended Ludowick, duke of Lennox, as his chaplain, in an embassy to the court of France, and returned in the duke’s retinue through Eng- land. In 1603 he was nominated by the king to the see of Glasgow, but his consecration (in London) did not take place until October 1610. In 1615 he was translated as Successor of Gladstanes to St Andrews, and thus became primate and metropolitan of Scotland. In this capacity he presided in several assemblies of the Church of Scotland.

4 The names of those Sporades which are treated under separate headings are printed in small capitals.

A431 At that of Perth, in 1618, over which he presided, he used. his influence to obtain a reluctant assent to the Five Articles. He continued in

high esteem with James VI. and Charles I., who was crowned by him in 1633 at Holyrood. In 1635 Spotswood was advanced to the chancellorship, but the increasing strength of the Covenanters compelled his resignation in 1638. He was deposed and excommunicated by the Glasgow assembly in that year ; charges affecting his moral character were brought against him, but no attempt was made to substantiate these. He died in London on 26th December 1639 and was buried in Westminster Abbey.

In 1620 he published Refutatio Libelli de Regimine Ecclesizx Scoticane—an answer to a tract of Calderwood, who replied in the Vindicie subjoined to his Altare Damascenum. The only other writing of Spotswood published during his lifetime was the sermon he preached at the Perth assembly. His most considerable work appeared posthumously—The History of the Church and State of Scotland, beginning the year of our Lord 203 and continued to the end of the reign of James VI. of ever blessed memory, London, 1655, fol. It displays considerable research and sagacity, and even when dealing with contemporary events gives a favourable impression, upon the whole, of the author's candour and truth. An appendix was afterwards added by Thomas Middleton.

Spotswood left two sons,—Sir John Spotswoode of Dairsie in Fife, where the archbishop erected a church and bridge, which are still extant, and Sir Robert, a lawyer of great learning, who became president of the Court of Session, and was executed in 1646 for taking part in the expedition of Montrose.

SPOTTISWOODE, Wititam (1825-1883), mathe- matician and physicist, was born in London, 11th January 1825. His father, Andrew Spottiswoode, who was de- scended from an ancient Scottish family, represented Colchester in parliament for some years, and in 1831 became junior partner in the firm of Eyre & Spottiswoode, printers. William was educated at Laleham, Eton, Harrow, and Balliol College, Oxford. His bent for science showed itself while he was still a schoolboy, and indeed his re- moval from Eton to Harrow is said to have been occasioned by an accidental explosion which occurred whilst he was performing an experiment for his own amusement. At Harrow he obtained in 1842 a Lyon scholarship, and at Oxford in 1845 a first-class in mathematics, in 1846 the junior and in 1847

the senior university mathematical scholarship. In 1846 Spottiswoode left Oxford to take his father's place in the business, in which he was engaged until his death. In 1847 he issued five pamphlets entitled Meditationes Analytice. This was his first publication of original mathematical work ; and from this time scarcely a year passed in which he did not give to the world further mathematical researches. In 1856 Spottiswoode travelled in eastern Russia, and in 1860 in Croatia and Hungary; of the former expedition he has left an interesting record entitled A Yarantasse Journey through Eastern Russia in the Autumn of 1856 (London, 1857). In 1870 he was elected president of the London Mathematical Society. In 1871 he began to turn his attention to experimental physics, his earlier researches bearing upon the polarization of light and his later work upon the electrical discharge in rarefied gases. He wrote a popular treatise upon the former subject for the ‘‘ Nature" series (1874). In 1878 he was elected president of the British Association, and in the same year president of the Royal Society, of which he had been a fellow since 1853. He died of fever on 27th June 1883, and was buried in Westminster Abbey.

As a mathematician he occupied himself with many branches of lis favourite science, more especially with higher algebra, in- cluding the theory of determinants, with the general calculus of symbols, and with the application of analysis to geometry and mechanics. The following brief review of his mathematical work is quoted from the obituary notice which appeared in the Procecd- ings of the Royal Society (vol. xxxviii. p. 34): —‘“‘ The interesting series of communications on the contact of curves and surfaces which are contained in the Philosophical Transactions of 1862 and

subsequent years would alone account for the high rank he obtained asa mathematician. . . . The mastery which he had obtained over the mathematical symbols was so complete that he never shrank from the use of expressions, however complicated—nay, the more complicated they were the more he seemed to revel in them—pro- vided they did not sin against the ruling spirit of all his work, — symmetry. To a mind imbued with the love of mathematical symmetry the study of determinants had naturally every attraction. In 1851 Mr Spottiswoode published in the form of a

pamphlet an account of some elementary theorems on the subject. This having fallen out of print, permission was sought by the editor of Credle to reproduce it in the pages of that journal. Mr Spottiswoode granted the request and undertook to revise his work. The sub- ject had, however, been so extensively developed in the interim that it proved necessary not merely to revise it but entirely to re- write the work, which became a memoir of 116 pages. To this, the first elementary treatise on determinants, much of the rapid development of the subject is due. The effect of the study on Mr Spottiswoode's own methods was most pronounced ; there is searcely a page of his mathematical writings that does not bristle with determinants." The Royal Society's Catalogue of Scientific Papers (vols. i.~~viii.) shows a list of 49 papers by Spottiswoode, to which must be added about 66 more, the titles of which have not yet been printed in that catalogue. These were published princi~~ pally in the Philosophical Transactions, Proceedings of the Royal Society, Quarterly Journal of Mathematics, Proceedings of the London Mathematieal Soeiety, and Crelle, and one or two in the Comptes Rendus of the Paris Academy. Another list of his papers, arranged according to the several journals in which they originally appeared, with short notes upon the less familiar memoirs, is given in Nature, vol. xxvii. p. 599.

SPRAIN. See Surcsry, p. 682, infra.

SPRAT, a marine fish (Clupea sprattus), named "garvie" in Scotland, one of the smallest species of the genus Clupea or herrings, rarely exceeds 5 inches in length, and occurs in large shoals on the Atlantic coasts of Europe. It is found also in the southern hemisphere, on the coasts of Tasmania and New Zealand, where, however, it seems to be less abundant, since its presence at the antipodes has been discovered only recently, and it does not seem to be the object of a regular fishery. Sprats are very often con- founded with young herrings, which they much resemble, but can always be distinguished by the following characters: they do not possess any teeth on the palate (vomer), like herrings ; their gill-covers are smooth, without the radiat- ing strize which are found in the shad and the pilchard ; the anal fin consists of from seventeen to twenty rays, and the lateral line of forty-seven or forty-eight scales. The ven- tral fins are even with the origin of the dorsal fin; and the spine consists of from forty-seven to forty-nine vertebree. The sprat is

one of the more important food-fishes on account of the immense numbers which are caught when the shoals approach the coasts. They are somewhat capri- cious, however, as regards the place and time of their appearance, the latter falling chiefly in the first half of winter. They are caught with the sein or.with the bag- net in the tideway. Large quantities are consumed fresh, but many are pickled or smoked, and others prepared like anchovies. Frequently the captures are so large that the fish can be used as manure only.

SPREMBERG, a small town of Prussia, in the province of Brandenburg, is situated about 75 miles to the south- east of Berlin, partly on an island in the river Spree and partly on the west bank. It carries on considerable manu- factures of woollen cloth, and has greatly advanced in importance and population since the beginning of the 19th century. In 1885 its population numbered 11,011. The only building of note is the chateau, built by a son of Elector John George about the end of the 16th century.

SPRENGEL, Kurr (1766-1833), German botanist and physician, was born on 3d August 1766 at Boldekow in Pomerania. His father, a clergyman, provided him with a thorough education of wide scope; and the boy at an early age distinguished himself as a linguist, not only in Latin and Greek, but also in Arabic. He appeared as an author at the age of fourteen, publishing a small work

called Anlettung zur Botamk fiir Frauenzsimmer in 1780. In 1784 he commenced in the university of Halle to study theology and medicine, but soon relinquished the former, He graduated in medicine in 1787. In 1789 he was ap- pointed an extraordinary professor of medicine in his alma mater, and in 1795 was promoted to an ordinary profes- sorship. He devoted much of his time to medical work and to investigations into the history of medicine; and he published several very valuable works in this department of knowledge, and made himself well known as one of the ablest medical men in Germany. He held a foremost rank in medicine and in botany as an original investigator, and in both published works of great value, besides numer- ous articles in scientific journals and in the proceedings of learned societies. His accomplishments as a linguist probably, in part at least,

determined him in the choice of the department to which he most fully devoted himself, and in which he stood facile princeps. Among the more important of his many services to the science of botany was the part he took in awakening and stimulating micro- scopic investigation into the anatomy of the tissues of the higher plants, though defective microscopic appliances rendered the conclusions arrived at by himself unreliable. He also made many improvements in the details of both the Linnzan and the “natural” systems of classification, His life passed quietly at Halle in the pursuit of the studies dear to him, and in the enjoyment of the honours bestowed upon him by over seventy learned societies, and also by monarchs. In 1828 the death of a son, professor of surgery at Greifswald, was felt by him very severely. He experienced several apoplectic seizures, and died in one on 15th March 1833.

Subjoined is a list of the more important of his works:—Bettrdge zur Geschichte d. Pulses, 1787; Galens Fieberlehre, 1788; Apologie des Hippokrates, 1789; Versweh einer pragmatisehen Geschichte der Arzneikunde, 1792-99; Handbuch der Pathologie, 1795-97; In- stitutiones Mediew, 1809-16 (in 6 vols.); Gesehichte der Mediein, completed in 1820; Antiquitatwm botaniearwm specimen, 1798; Historia ret herbariw, 1807-8; Anleitung zur Kennéiniss der Gewiiehse, 1802-4, and again 1817-18; Geschichte der Botanik, 1817- 18; Von dem Baw und der Natur der Gewétiehse, 1812; Flora Halensis, 1806-15, and in 18382; Speetes umbelliferarum minus cognite, 1818; Neue Entdeekung im ganzen Umfang der Pflanzen- kunde, 1820-22. He edited an edition of Linneus’s Systema vegeta- biliwm in 1824 and of the Genera plantarum in 1830. His short papers are too numerous to be quoted; a list of those in botany, from 1798 onwards, will be found in the Royal Society’s Catalogue of Setentifie Papers.

SPRINGBOK. See AnTELop#, vol. ii. p. 101.

SPRINGFIELD, a city of the United States, capital of Illinois and the county seat of Sangamon county, 185 miles south-west of Chicago and 95 north-east of St Louis, at the intersection of the main lines of the Chicago and Alton and the Wabash, St Louis, and Pacific Railways. It is situated in 39° 48’ N. lat. and 89° 33’ W. long., on a plateau 4 miles south of the

Sangamon river. The State capitol (1868-1886) is constructed of Joliet marble in the form of a Greek cross, with porticos of granite; it 1s 385 feet long and 296 wide, and has a central dome surmounted by a lantern with a ball on the pinnacle (360 feet). It contains a general library, a law library, geological and agricultural museums, and a memorial hall of the Civil War, as well as the usual Government offices. Other buildings of note are the United States executive mansion, custom-house and post-office (1866-68), and the house formerly occupied by Lincoln. In Oak Ridge cemetery, adjacent to the city, is the Lincoln monument (1874), beneath which that president was buried. The monument, designed by Larkin G. Mead, consists of a granite obelisk, reaching a height of 984 feet from the centre of a spacious basement (1194 feet long and 724 wide), which contains a catacomb and a memorial hall,—the latter a museum of Lincolniana.

of figures in bronze, symbolizing the army and navy of the United States, are arranged round the foot of the obelisk. The town has a public library, two hospitals, two orphan- ages, and various other charitable institutions. Extensive deposits of bituminous coal occur in and near Springfield, which is the seat of extensive iron-rolling mills, watch factories, railway machine shops, plough works, and wool- len, paper, and flour mills. It is also the headquarters of six of the principal live-stock associations of the country. The population was 4533 in 1850, 9820 in 1860, 17,364 in 1870, 19,743 (1328 coloured) in 1880, and in 1887 it was estimated at 25,000. .

Laid out in 1822, Springfield was selected as State capital in 1837, and was inade a city in 1840.

SPRINGFIELD, a city of the United States, the county seat of Hampden county, Massachusetts, on the east bank of Connecticut river, opposite West Springfield, with which it is connected by road and railway bridges. By rail it is 98 miles west by south of Boston on the route to Albany, and it forms a very important railway junction. The western part of Springfield is built on low and level ground, the eastern on the ascent from the river valley. The streets are wide and well shaded with elm and maple. A United States arsenal (founded 1777) and armoury (1794), employing some 460 hands, is the largest in the republic. The Springfield breech-loading rifle of 45 calibre has been the regulation pattern in the United States army since 1873. A

pistol-factory, car-works, manufactories of cotton and silk goods, buttons, needles, envelopes, paper, watches, skates, and brass-work may be mentioned among the industrial establishments. The city hall (1855), a Romanesque building with an audience-room capable of holding 2700 persons; the city free library (1871), a Gothic building of brick, which contains 56,000 volumes and a museum; the granite court-house; the Roman Catholic cathedral of St Michael; Christ Church, Epis- copal; the Church of the Unity, a fine Gothic structure in brown stone; the South Congregational church ; the office of the Boston and Albany Railroad, a niassive granite block; and the high school areamong the chief architectural features of the city. Races are held in Hampden Park by the river side. The population was 15,199 in 1860, 26,703 in 1870, 33,340 in 1880 (775 coloured), and 37,577 in 1885.

Springfield was settled in 1636 by William Pynchon and emi-

rants from Roxbury,—the determination of the founder being to imit the "town" to forty or at most fifty families. The name was at first Agawam ; but the present designation was adopted in 1641 in memory of Springfield (Essex), Pynchon's residence in his native country, England, to which he was obliged to return in 1652 to escape the clerical persecution called forth by his book on the Meritorious Price of Christ's Redemption. The town was burned by the Indians in 1675 ; and in 1787 the arsenal was attacked by Shays's rebels. The opening of the Boston and Albany Railroad In 1839 was the beginning of rapid development, and the town was made a city in 1852. The manufacture of firearms carried on here during the Civil War, 1861-65, gave the city a great impulse.

SPRINGFIELD, a city of the United States, county seat of Greene county, Missouri, occupies a pleasant and healthy site on the Ozark Hills, 238 miles by rail south- west of St Louis by the St Louis and San Francisco Rail-road, which here joins with the Kansas City, Fort Scott, and Gulf Railroad. Springfield is the chief commercial centre of south-west Missouri, one of the great lead and zinc miming districts of the States. It contains a number of factories (cotton, wool, waggons, furniture, tobacco, &c.), and is the seat of a court-house and of Drury College (1873), Which provides scientific and classical training and has a musical conservatory attached. The

population was 5555 in 1870, 6522 in 1880, and in 1886 was estimated at 18,000.

Originally an Indian trading post and frontier village, Springfield Was incorporated in 1830 and began to be a prosperous place at the close of the Civil War, during which it had several times changed hands and been the scene of hostilities.

SPRINGFIELD, a city of the United States, county seat of Clarke county, Ohio, lies at the confluence of Mad river and Lagonda Creek (sub-tributaries of the Ohio through the Miami), 84 miles north-east of Cincinnati. It has a large trade in the agricultural produce of the fertile and populous district in which it is pleasantly situated, and is the seat of a very large manufactory of agricultural machinery, which turns out 75,000 reapers and mowers per annum, besides grain-drills, steam-engines, cider-mills, and a great variety of articles. In 1870 the population of the city was 12,652, in 1880 20,730 (township, 24,455), and 33,484 in 1886. Among the public institutions are Wittenberg College (Lutheran), founded in 1845, and a small public library.

SPRINGS. See GxEoLoay, vol. x. pp. 223, 269 sq., and MINERAL WATERS.

SPRUCE. See Fir, vol. ix. p. 222.

SPURZHEIM, Kaspar, phrenologist, was born at Longwich near Treves on 31st December 1776, and died at Boston, United States, on 10th November 1832. See PHRENOLOGY.

SQUARING (or QuapRaTURE) OF THE CIRCLE is the problem of finding a square equal in area toa given circle. Like all problems, it may be increased in difficulty by the imposition of restrictions ; consequently under the designation there may be embraced quite a variety of geometrical problems. It has to be noted, however, that, when the “squaring” of the

circle is especially spoken of, it is almost always tacitly assumed that the restrictions are those of the Euclidean geometry.

Since the area of a circle equals that of the rectilineal triangle whose base has the same length as the circum- ference and whose altitude equals the radius (Archimedes, KvxAov pérpyots, prop. 1), it follows that, if a straight line could be drawn equal in length to the circumference, the required square could be found by an ordinary Euclid- ean construction ; also, it is evident that, conversely, if a square equal in area to the circle could be obtained, it would be possible to draw a straight line equal to the circumference. Rectification and quadrature of the circle have thus been, since the time of Archimedes at least, practically identical problems. Again, since the circum- ferences of circles are proportional to their diameters—a proposition assumed to be true from the dawn almost of practical geometry —the rectification of the circle is seen to be transformable into finding the ratio of the cir- cumference to the diameter. This correlative numerical problem and the two purely geometrical problems are inseparably connected historically.

Probably the earliest value for the ratio was 3. It was so among the Jews (1 Kings vii. 23, 26), the Babylonians (Oppert, Journ. Asiatique, August 1872, October 1874), the Chinese (Biot, Journ. Asiatique, June 1841), and probably also the Greeks. Among the ancient Egyptians, as would appear from a calculation in the Rhind papyrus, the number (4)4, ie. 3°16…, was at one time in use.! The first attempts to solve the purely geometrical problem appear to have been made by the Greeks (Anaxagoras, &c.),2 one of whom, Hippocrates,? doubtless raised hopes of a solution by his quadrature of the so-called menzscoz, As for Euclid, it is sufficient to recall the facts that the original author of prop. 8 of book iv. had strict proof of the ratio being <4, and the author of prop. 15 of the ratio being >8, and to direct attention to the importance

1 Hisenlohr, Hin math. Handbuch d. alten Aegypter, iibers. u. erklaért, Leipsic, 1877 ; Rodet, Bull. de la Soc. Math. de France, vi. pp. 139-149.

2? Hankel, Zur Gesch. d. Math. im Alterthum, &c., chap. v., Leipsic, 1874; Cantor, Vorlesungen iiber Gesch. d. Math., i., Leipsic, 1880 ; Tannery, Mém. de la Soc., &c., @ Bordeaux; Allman, in Hermathena.

3 Tannery, Bull. des Sc. Math., [2], x. pp. 213-226.

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of book x. on incommensurables and props. 2 and 16 of book xii., viz., that “circles are to one another as the squares on their diameters” and that “in the greater of two concentric circles a regular 27-gon can be inscribed which shall not meet the circumference of the less,” how- ever nearly equal the circles may be. With Archimedes (287-212 B.c.) a notable advance was made. Taking the circumference as intermediate between the perimeters of the inscribed and the circumscribed regular n-gons, he showed that, the radius of the circle being given and the perimeter of some particular circumscribed regular polygon obtainable, the perimeter of the circumscribed regular polygon of double the number of sides could be calculated ; that the like was true of the inscribed polygons; and that consequently a means was thus afforded of approximating to the circumference of the circle. As a matter of fact, he started with a semi-side AB of a circumscribed regular hexagon meeting the circle in B (see fig. 1), joined A and B with O the centre, bisected the ~AOB by OD, so that BD became the semi-side of a circumscribed regular

12-gon; then as AB: BO: OA::1: /3:2 he sought an approximation to V3 and found that AB: BO>158 : 265. Next he applied his theorem!
BO+OA:AB::OB: BD

to calculate BD ; from this in turn he cal- culated the semi-sides of the circumscribed a regular 24-gon, 48-gon, and 96-gon, and ©

so finally established for the circumscribed 6 a) regular 96-gon that perimeter : diameter Fig 1. < 34:1. Ina quite analogous manner he proved for the inscribed regular 96-gon that perimeter : diameter > 332: 1. The conclusion from these therefore was that the ratio of cir- cumference to diameter is <3? and >3%°. This is a most notable piece of work ; the immature condition of arith- metic at the time was the only real obstacle preventing the evaluation of the ratio to any degree of accuracy whatever.” No advance of any importance was made upon the achievement of Archimedes until after the revival of learn- ing. His immediate successors may have used his method to attain a greater degree of accuracy, but there is very little evidence pointing in this direction. Ptolemy (fl. 127- 151), in the

Great Syntawis, gives 3°141552 as the ratio; and the Hindus (c. 500 a.p.), who were very probably indebted to the Greeks, used 62832/20000, that is, the now familiar 3°1416.4 It was not until the 15th century that attention in Hurope began to be once more directed to the subject, and after the resuscitation a considerable length of time elapsed before any progress was made. ‘The first advance in accuracy was due to a certain Adrian, son of

Anthony, a native of Metz (1527), and father of the better- .

known Adrian Metius of Alkmaar. In refutation of Duchesne (Van der Eycke) he showed that the ratio was <3;45 and >3,4,°,, and thence made the exceedingly lucky step of taking a mean between the two by the quite unjusti- fiable process of halving the sum of the two numerators for a new numerator and halving the sum of the two denomi- nators for a new denominator, thus arriving at the now well-known approximation 354%, or #38, which, being equal to 3°1415929…, is correct to the sixth fractional place.® The next to advance the calculation was Viéte (De Viette, Vieta), the greatest mathematician of his age. By finding the perimeter of the inscribed and that of the circumscribed regular polygon of 393216 (a.e., 6 × 21°) sides, he proved

1 In modern trigonometrical notation, 1+sec @:tan 0::1: tan 30.

? Tannery, ‘‘Sur la mesure du cercle d’Archiméde,” in Mém. . . .

Bordeaux, [2], iv. pp. 318-339 ; Menge, Des Archimedes Kreismessung, Coblentz, 1874.

3 De Morgan, in Penny Cyclop., xix. p. 186.

4 Kern, Aryabhatttyam, Leyden, 1874, trans. by Rodet, Paris, 1879.

® De Morgan, art. ‘‘ Quadrature of the Circle,” in English Cyclop. ; Glaisher, Mess. of Math., ii. pp. 119-128, iii, pp. 27-46 ; De Haan, Nieww Archief v. Wisk., i. pp. 70-86, 206-211.

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that the ratio was >3°1415926535 and <3°1415926537, so that its value became known (in 1579) correctly to 10 fractional places. The theorem for angle-bisection which Viete used was not that of Archimedes, but that which would now appear in the form 1 — cos 6=2 sin? 46. With Viéte, by reason of the advance in arithmetic, the style of treatment becomes more strictly trigonometrical ; in- deed, the Universatles Inspectiones, in which the calculation occurs, would now be called plane and spherical trigono- metry, and the accompanying Canon Mathematicus, a table of sines, tangents, and secants.6 Further, in comparing the labours of Archimedes and Viéte, the effect of increased power of symbolical expression is very noticeable. Archi- medes's process of unending cycles of arithmetical opera- tions could at best have been expressed in his time by a "rule" in words; in the 16th century it could be condensed into a "formula." Accordingly, we find in Viéte a formula for the ratio of diameter to circumference, viz., the intermi- nate product 7—

WES EAE Eta E From this point onwards, therefore, no knowledge what- ever of geometry was necessary in any one who aspired to determine the ratio to any required degree of accuracy: the mere arithmetician's art and length of days were the only requisites. Thus in connexion with the subject a genus of workers became possible who may be styled "-computers,"—a name which, if it connotes anything uncomplimentary, does so because of the almost entirely fruitless character of their labours. Passing over Adriaan van Roomen (Adrianus Romanus) of Louvain, who pub- lished the value of the ratio correct to 15 places in his Idea Mathematica (1593),8 we come to the notable com- puter Ludolph van Ceulen (d. 1610), a native of Germany, long resident in Holland. His book, Van den Circkel (Delf, 1596), gave the ratio correct to 20 places, but he continued his calculations as long as he lived, and his best result was published on his tombstone in St Peter's church, Leyden. The inscription, which is not known to be now in existence,® is in part as follows:— | . . » Qui in vita sua multo labore circumferentiae circuli proxi- mam rationem ad diametrum invenit sequentem— quando diameter est 1 tum circuli circumferentia plus est

3141592653589793238462643383279502 88

4N2™ 100000000000000000000000000000000000 et minus

81415926535897 9323846264338327950289

IN2™ 1000000000000000000000000000000000000.. . This gives the ratio correct to 35 places. Van Ceulen’s process was essentially identical with that of Viete. Its numerous root extractions amply justify a stronger expres- sion than ‘“multo labore,” especially in an epitaph. In Germany the “Ludolphische Zahl” is still a common naine for the ratio,!° Up to this point the credit of most that had been done may be set down to Archi- medes. A new departure, c however, was made by Willebrord Snell of Ley- den in his Cyclometria, 4 0 8 a published in 1621. His Fig. 2. achievement was a closely approximate geometrical solu- 6 Vieta, Opera Math., Leyden, 1646; Marie, Hist. des Sciences Math., iii. p. 27 sqg., Paris, 1884. * Kliigel, Math. Worterb., ii. pp. 606, 607. 8 Kastner, Gesch. d. Math., i., Gottingen, 1796-1800. 9 But see Les Délices de Leide, Leyden, 1712; or De Haan, Mess. of Math., iii. pp. 24-26. 10 For minute and lengthy details regarding the quadrature of the circle in the Low Countries, see De Haan, “ Bouwstoffen voor de geschie- denis, &c.,’’ in Versi. en Mededeel. der K. Akad. van Wetensch., ix., X.5

xi., xii, Amsterdam ; also his “ Notice sur quelques quadrateurs, &c.,” in Bull. di, Bibliogr. e di Storia delle Sci. Mat. e Fis., vii, pp..99-144.

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tion of the problem of rectification (see fig. 2). ACB being a semicircle whose centre is O, and AC the arc to be rectified, he produced AB to D, making BD equal to the radius, joined DC, and produced it to meet the tangent at Ain E; and then his assertion (not established by him) was that AE was nearly equal to the arc AC, the error being in defect. For the purposes of the calculator a solution erring in excess was also required, and this Snell gave by slightly varying the former construction. Instead of producing AB (see fig. 3) so that BD e! was equal to 7, he pro- duced it only so far that, when the extremity D’ was A c B D! joined with C, the part of Fig. 3.

D’C outside the circle was equal to 7; in other words, by a non-Euclidean construction he trisected the angle AOC, for it is readily seen that, since FD’= FO=OC, the angle FOB=4AOC.! This couplet of constructions is as im-

portant from the calculator’s point of view as it is interest- ing geometrically. To compare it on this K score with the fundamental proposition of C

Archimedes, the latter must be put into a form similar to Snell’s. AMC being an arc of a circle (see fig. 4) whose centre is O, AC its chord, and HK the tangent «+ 4 drawn at the middle point of the arc and Fag, 4

bounded by OA, OC produced, then, according to Archi- medes, AMCAC. In modern trigonometrical notation the propositions to be compared stand as follows :—

2tan$0>0>2sin40 (Archimedes) ;

; 3 sin tan 40+2sin 10>0> crane (Snell).

uM

It is readily shown that the latter gives the best approxi-

mation to ; but, while the former requires for its applica- tion a knowledge of the trigonometrical ratios of only one angle (in other words, the ratios of the sides of only one right-angled triangle), the latter requires the same for two angles, and 40. Grienberger, using Snell’s method, cal- culated the ratio correct to 39 fractional places.2 Huy- gens, in his De Circuli Magnitudine Inventa, 1654, proved the propositions of Snell, giving at the same time a number of other interesting theorems, for example, two inequalities which may be written as follows 3— 4 chd 6 +sin 6

cd 0+ chd 6+ Sein 6?

As might be expected, a fresh view of the matter was taken by Descartes. The problem he set himself was the exact converse of that of Archimedes. A given straight line being viewed as equal in ; length to the circumference of a circle, he sought to find the dia- meter of the circle. His con- struction is as follows (see fig. 5). Take AB equal to one-fourth of the given line; on AB describe a square ABCD; join AC; in AC produced find, by a known process, a point O, such that, when O,B, ¢ ae is drawn perpendicular to AB pro- Fig. 6. duced and C,D, perpendicular to BC produced, the rect- angle BC, will be equal to ABCD; by the same process find a point C, such that the rectangle B,C, will be equal to tBC,; and so on ad infinitum. The diameter sought is the

It is thus manifest that by his first construction Snell gave an approximate solution of two great problems of antiquity.

2 Elementa Trigonometrica, Rome, 1680; Glaisher, Messenger of Math., iii. p. 35 sq.

® See Kiessling's edition of the De Circ. Magn. Inv. , Flensburg, 1869 ;

or Pirie's tract on Geometrical Methods of Approx. to the Value of 7, London, 1877.

(chd 6 — sin 0)>6>chd 6 + 4(chd 6 — sin 0).

straight line from A to the limiting position of the series of B's, say the straight line ABw. As in the case of the process of Archimedes, we may direct our attention either to the infinite series of geometrical operations or to the corresponding infinite series of arithmetical opera- tions. Denoting the number of units in AB by 4c, we can express BB,, B,B,,...in terms of 4c, and the identity ABo =AB+BB,B,B, ... gives us at once an expres- sion for the diameter in terms of the circumference by means of an infinite series. The proof of the correctness of the construction is seen to be involved in the following theorem, which serves likewise to throw new light on the subject :—AB being any straight line whatever, and the above construction being made, then AB is the diameter of the circle circumscribed by the square

ABCD (self-evi- dent), AB, is the diameter of the circle circumscribed by the regular 8-gon having the same perimeter as the square, AB, is the diameter of the circle circumscribed by the regular 16-gon having the same perimeter as the square, and so on. Essentially, therefore, Descartes's process is that known later as the process of csoperimeters, and often attributed wholly to Schwab.°

In 1655 appeared the Arithmetica Infinitorum of Wallis, where numerous problems of quadrature are dealt with, the curves being now represented in Cartesian coordinates, and algebra playing an important part. In a very curious manner, by viewing the circle y=(1—«)t as a member of the series of curves y=(1 —«?)!, y=(1 —«?)?, &e., he was led to the proposition that four times the reciprocal of the ratio of the circumference to the diameter is equal to

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and, the result having been communicated to Lord Broun- ker, the latter discovered the equally curious equivalent expression J

The work of Wallis had evidently an important influence on the next notable personality in the history of the sub- ject, James Gregory, who lived during the period when the higher algebraic analysis was coming into power, and whose genius helped materially to develop it. He had, however, in a certain sense one eye fixed on the past and the other towards the future. His first contribution® was a variation of the method of Archimedes, The latter, as we know, calculated the perimeters of successive polygons, passing from one polygon to another of double the number of sides; in a similar manner Gregory calculated the areas. The general theorems which enabled him to do this, after a start had been made, are Ay, =VA,A', (Snell's Cyclom.), it u ey ae or a a (Gregory),

where A, A', are the areas of the inscribed and the circum- scribed regular 2-gons respectively. He also gave approxi- mate rectifications of circular arcs after the manner of Huy- gens; and, what is very notable, he made an ingenious and, according to Montucla, successful attempt to show that quadrature of the circle by a Euclidean construction was impossible." Besides all this, however, and far beyond it in importance, was his use of

infinite series. This merit he shares with his contemporaries Mercator, Newton, and Leibnitz, and the exact dates of discovery are a little uncertain. As far as the circle-squaring functions are con-

4 See Euler, “ Annotationes in Locum quendam Cartesii,” in Mov. Comm. Acad. Petrop., viii.

5 Gergonne, Annales de Math., vi.

8 See Vera Circuli et Hyperbole Quadratura, Padua. 1667; and the Appendicula to the same in his Hzercitationes Geometric, London, 1668.

7 Penny Cyclop., xix. p. 187.

cerned, it would seem that Gregory was the first (in 1670) to make known the series for the arc in terms of the tangent, the series for the tangent in terms of the are, and the secant in terms of the arc; and in 1669 Newton showed to Barrow a little treatise in manuscript containing the series for the arc in terms of the sine, for the sine in terms of the arc, and for the cosine in terms of the arc. These discoveries formed an epoch in the history of mathematics generally, and had, of course, a marked influence on after investigations regarding circle-quadrature. Even among the mere computers the series O=tan 6-4 tan? 0+4 tan’ A-...,

specially known as Gregory’s series, has ever since been a necessity of their calling.

The calculator’s work having now become easier and more mechanical, calculation went on apace. In 1699 Abraham Sharp, on the suggestion of Halley, took Gregory’s series, and, putting tan 0 =}./3, found the ratio equal to

= ul 1 1 :

ViB(1-ggtzg—pgt-) from which he calculated it correct to 71 fractional places. About the same time Machin calculated it correct to 100 places, and, what was of more importance, gave for the ratio the rapidly converging expression, 16 1 il 1 4 il 1 F-gatperet) = Seepage which long remained without explanation.? Fautet de Lagny, still using tan 30°, advanced to the 127th place.®

Euler took up the subject several times during his life, effecting mainly improvements in the theory of the various series. With him, apparently, began the usage of denot- ing by 7 the ratio of the circumference to the diameter.® The most important publication, however, on the subject in the 18th century was a paper by Lambert,® read before the Berlin Academy in 1761, in which he demonstrated the irrationality of z. The general test of irrationality which he established is that, if

aa b,4£% iia;

as a

be an interminate continued fraction, a), ay…, b), b)...

be integers, ih 7 … be proper fractions, and the value of

2 9

, , tu every one of the interminate continued fractions +

tly Gy Bad x

=

represents an irrational quantity. If this be applied to _the right-hand side of the identity

... be < 1, then the given continued fraction

ee

SN… it follows that the tangent of every arc commensurable with the radius is irrational, so that, as a particular case,

an arc of 45°, having its tangent rational, must be incom-

mm tan —=— ma 2 nm = m

; , , a : mensurable with the radius; that is to say, 7 18 an Incom-

mensurable number.’ This incontestable result had no

effect, apparently, in repressing the 7-computers. Vega

1 See Sherwin’s Math. Tables, London, 1705, p. 59.

2 See W. Jones, Synopsis Palmariorum Matheseos, London, 1706 ; Maseres, Scriptores Logarithmici, London, 1791-96, vol. iii. pp. 159 sq. ; Hutton, Tracts, vol. i. p. 266.

3 See Hist. de? Acad., Paris, 1719; 7 appears instead of 8 in the 118th place.

- Comment. Acad. Petrop., ix., xi.; Nov. Comm. Ac. Pet., xvi. ; Nova Acta Acad. Pet., xi.

5 Introd. in Analysin Infin., Lausanne, 1748, chap. viii.

8 Mém. sur quelques propriétés remarquables des quantités transcend- antes, circulatres, et logarithmiques.

7 See Legendre, Eléments de Géometrie, Paris, 1794, note iv.; Schlé- milch, Handbuch d. algeb. Analysis, Jena, 1851, chap. xiii.

in 1789, using series like Machin’s, viz., Gregory’s series and the identities ‘

que tan-!4+2 tan-!.8, (Euler, 1779),

7 tan-144+2tan-14 (Hutton, 1776),

neither of which was nearly so advantageous as several found by Hutton, calculated w+ correct to 136 places.® This achievement was anticipated or outdone by an un- known calculator, whose manuscript was seen in the Rad- cliffe Library, Oxford, by Baron von Zach towards the end of the century, and contained the ratio correct to 152 places. More astonishing still have been the deeds of the m-computers of the 19th century. A condensed record compiled by Mr Glaisher (Messenger of Math., ii. p. 122) is as follows :—

No. of | No. of Date. | Computer. (fr.digits fr.digits caled. |correct.

1842| Rutherford | 208 | 152 | Trans. Roy. Soc., Lond., 1841, p.

283.

1844|Dase …... 205 | 200 | Crelle's Jowrn., xxvii. p. 198.

1847 | Clausen …| 250 | 248 | Astron. Nachr., xxv. col. 207.

1853|Shanks …| 318 | 318 | Proc. Roy. Soc., Lond.,1853, p.273.

1853} Rutherford | 440 | 440 | Zbid.

Place of Publication.

1853|Shanks …| 530 0 | 2bed.

1853|Shanks …| 607 … |W. Shanks, Rectification of the Circle, London, 1858.

1853 | Richter …| 333 | 330 | Grunert's Archiv, xxi. p. 119.

1854| Richter …| 400 | 330 | Lbid., xxii. p. 473.

1854 | Richter …) 400 | 400 | Zdid., xxiii. p. 476.

1854| Richter …) 500 | 500 | Jdid., xxv. p. 472. 1873] Shanks …) 707 iu. | PFoe. Roy. Soe.) Mond. xxt

By these computers Machin's identity, or identities ana- logous to it, ¢.g.,

= tan- +tan—},

ee |

=4 tan~!4- tan 7, 4+tan-! y,

and Gregory's series were employed.?

A much less wise class than the 7-computers of the 19th century are the pseudo-circle-squarers, or circle-squarers technically so called, that is to say, persons who, having obtained by illegitimate means a Euclidean construction for the quadrature or a finitely expressible value for 7, insist on using faulty reasoning and defective mathematics to establish their assertions. Such persons have flourished at all times in the history of mathematics ; but the interest at- taching to them is more psychological than mathematical.!

It is of recent years that the most important advances in the theory of circle-quadrature have been made. In 1873 Hermite proved that the base ¢ of the Napierean logarithms cannot be a root of a rational algebraical equation of any degree.!4 To prove the same proposition regarding 7 is to prove that a Euclidean construction for circle-quadrature is impossible. For in such a construction every point of the figure is obtained by the intersection of two straight lines, a straight line and a circle, or two circles ; and, as this implies that, when a unit of length is introduced, numbers employed, and the problem trans- formed into one of algebraic geometry, the equations to be solved can only be of the first or second degree, it follows that the equation to which we must be finally led is a rational equation of even degree. Hermite'? did not

8 Nova Acta Petrop., ix. p. 41; Thesaurus Logarithm. Completus,

. 638.

; 9 On the calculations made before Shanks, see Lehmann, " Beitrag zur Berechnung der Zahl 7," in Grunert's Archiv, xxi. pp. 121-174.

10 See Montucla, Hist. des rech. sur la quad. du cercle, Paris, 1754, 2d ed, 1831; De Morgan, Budget of Paradoxes, London, 1872.

11 “Sur la fonction exponentielle,” Comptes Rendus, Paris, 1xxvii. pp. 18, 74, 226, 285.

2 See Crelle’s Journal, lxxvi. p. 342.

succeed in his attempt on 7; but in 1882 Lindemann, following exactly in Hermite’s steps, accomplished the desired result.) Mathematicians are agreed that the full demonstration leaves something to be desired in the matter of simplicity, and attempts at simplification have already been made by Markoff and Rouché.?

Besides the various writings mentioned, see for the early history of the subject, Montucla, Hist. des Math., 6 vols., Paris, 1758, 9d ed. 1799-1802 ; Murhard, Bibliotheca Mathematica, ii. pp. 106- 128, Leipsic, 1798; Reuss, Repertoriwm Comment., vil. pp. 42-44, Gottingen, 1808. Fora few approximate geometrical solutions, see Leybourn’s Math. Repository, vi. pp. 151-154; Grunert’s Archiv, xii. p. 98, xlix. p. 3; Mieuw Archicf v. Wisk., iv. pp. 200-204. For experimental determinations of 3, dependent on the theory of prob- ability, see Mess. of Math., ii. pp. 118, 119; Casopis pro pitstovdnt math. a fys., X. pp. 272-275; Analyst, ix. p. 176. (T. MU.)

SQUASH (Cucurbita Melopepo). See Gourn.

SQUILL, the name under which the bulbous root of Urginea maritima, Baker, is used in medicine. The plant was formerly placed in the genus Scilla, from which it has been separated because the seeds are flat and discoid in- stead of triquetrous, as in the latter genus. The name of “squill” is also applied by gardeners to the various.species of Scilla. The medicinal squill is a native of the countries bordering the Mediterranean, and grows from the sea-level up to aa elevation of 3000 feet. The bulbs are globular and of large size, often weighing more than 4 fb. Two varieties are met with, the one having white and the other pink scales. They are collected in August, when they are leafless, the membranous outer scales being removed and the fleshy portion cut transversely into slices and dried in the sun. These are then packed in casks for exportation. They are chiefly

imported into the United Kingdom from Malta. When reduced to powder and exposed to the air the drug rapidly absorbs moisture and cakes together into ahard mass. Squill has been used in medicine from a very early period. The ancient Greek physicians pre- scribed it with vinegar and honey almost in the same manner as it is used at present. Its medicinal properties are expectorant and diuretic. It is chiefly prescribed in bronchitis when the phlegm is tenacious and expectorated with difficulty, and in cardiac dropsy. When given in large doses it acts as an irritant poison, and its use is therefore contra-indicated in active inflammatory conditions of the mucous membrane or of the kidneys. The fresh bulb rubbed on the skin causes redness and irritation, due in part to the presence of minute crystals of oxalate of calcium.

The aetivity of the drug appears to be due to the active principles, scillipicrin, scillitoxin, and scillin, which were first obtained by Merck in 1878. The first has a bitter and burning taste, powerfully uritating the mucous membrane of the nose. It is soluble in alcohol and ether and partly in alkalis, but insoluble in water ; if mixed with sugar it dissolves readily and can then be absorbed if Injected subeutaneously. Scillitoxin is hygroscopie, very soluble m water, and has a bitter taste. These two principles have an action on the heart resembling that of Digitalis; in large doses the former stops its action in systole and the latter in diastole. Scillin 18 crystalline, tasteless, and soluble in alcohol, though only with difficulty in water. It is present only in very small quantity in squill, and appears to be the cause of the subsidiary effects of that drug, such as vomiting, &c.

An allied species, Urginea indica, Baker, is used in India in the same manner as the European species. The true squills are repre- sented in Great Britain by two species, Scilla autwmnalis and S. verna. The former has a racemose inflorescence ; the latter has the flowers arranged in a corymbose manner, and is confined to the sea- Coast. Several species are cultivated in gardens, S. bifolia and 8. sibiriea being remarkable for their beautiful blue flowers, which are produced in early spring. The name of Chinese squill is applied by

gardeners to Barnardia scilloides and that of Roman squill to species of Bellevalia. :

SQUINT. See OpHrHatmotoey, vol. xvii. p. 785. SQUIRREL. In the article MarMor (vol. xv. p. 559) an account was given of the three genera forming the Ce ‘ See “‘ Ueber die Zahl +,” in Math. Annalen, xx. p. 213. * Nouv. Annales, 8d ser., ii. p. 5.

Arctomyina, or Marmot sub-family of the large family Sciuridx, and in the present article the members of the other and more typical sub-family, the Sciwrina, are noticed. The systematic position of the Sciwride as a whole and their relations to other rodents are shown in the article Mammatta (vol. xv. p. 418); so it is merely with the component genera of the group that we now have to deal.

Of the Scitwrina six genera are commonly recognized, the first being the typical one, Sciwrus, in which the common English squirrel is included. The characters of the genus are—form slender and agile; tail long and bushy; ears generally well developed, pointed, often tufted ; feet adapted for climbing, the anterior pair with four toes and a rudimentary thumb, and the posterior pair with five toes, all the toes having long, curved, and sharp-pointed claws; mamme from four to six in number ; skull (see fig. 1) lightly built, very similar in

Fie, 1.—Skull of Sciwrus bicolor; natural size.

shape throughout the genus; post-orbital processes long and curved ; incisors narrow and compressed ; premolars either one or two above and one below; when two are present above, the anterior one is quite minute and very different from the corresponding tooth in the marmots ; molars three on each side above and below.

True squirrels are found throughout the greater part of the tropical and temperate regions of both hemispheres, although they are absent both from Madagascar and the Australian region. The species are both largest and most numerous in the tropics, and reach their greatest develop- ment in the Malay parts of the Oriental region.

Squirrels vary in size from animals no larger than a mouse, such as Sciurus soricinus of Borneo, or S. minu- tus of West Africa, to others as large as a cat, such as the black and yellow S. bicolor of Malaysia (see fig. 1). The very large squirrels, as might be expected from their heavier build, are somewhat less strictly arboreal in their habits than the smaller ones, of which the common English species may be looked upon as typical. The Common Squirrel, S. vulgaris, whose general habits are too well known to need special description, ranges over the whole of the Palearctic region, from Ireland to Japan, from Lapland to North Italy ; but specimens from different parts of this wide range differ so much in colour as to have been often looked upon as different species. Thus, while the common squirrels of north and west Europe are of the bright red colour we are accustomed to see in England, those of the mountainous regions of southern Europe are nearly always of a deep blackish grey ; those from Siberia again are a clear pale grey colour, with scarcely a tinge of rufous. These last supply the squirrel fur used for lining cloaks. The pairing time of the squirrel is from February to April, and after a period of gestation of about thirty days it brings forth from three to nine young. In addition to all sorts of vegetables and fruits the squirrel is exceedingly fond of animal food, greedily devouring mice, small birds, and eggs.

Although the English squirrel is a most beautiful little

animal, it is far surpassed by many of the tropical mem- bers of the group, and especially by those of the Malayan region, where nearly all the numerous species are bril- liantly marked, and many are ornamented with variously coloured longitudinal stripes along their bodies. One of the commonest and best known of the striped species is the little Indian Palm Squirrel (S. palmarum), which in large numbers runs about every Indian village. Another Oriental species (S. caniceps) presents almost the only known instance among mammals of the temporary assump- tion during the breeding season of a distinctly ornamental coat, corresponding to the breeding plumage of birds. For the greater part of the year the animal is of a uniform grey colour, but about December its back becomes a brilliant orange-yellow, which lasts until about March, when it is again replaced by

grey. The squirrel shown in fig. 2 is a native of Burmah and Tenasserim, and is

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Fie. 2.—Burmese squirrel.

closely allied to S. caniceps, but goes through no seasonal change of colour.

The number of species in the genus Sciwrus is about 75, of which 3 belong to the Palearctic, 15 to the Ethiopian, about 40 to the Oriental, and 16 to the combined Nearctic and Neotropical regions.

Genus Rheithrosciurus.

A single very striking species of squirrel, confined to Borneo, and as yet only known from three or four examples, has been separated generically under the above name. The ae shape of its skull is very different from that of other squirrels; but its most peculiar characteristic is the presence of from seven to ten minute parallel vertical grooves running down the front face of its incisors, both above and below, no other squirrel having really grooved incisors at all, and no other member of the whole order of rodents incisor grooves resembling these. Its premolars only number }, and its molars are stmpler and less ridged than in the other genera. This squirrel (2h. macrotis) is a magnificent animal, far larger than the English species, with an enormously long bushy tail, long tufted ears, and black and white bands down its sides.

Genus Xerus.

Fur coarse and spiny. Claws long and comparatively straight. Ear-conches minute or entirely absent. Skull with the post-orbital processes short and directed backwards, the bony palate prolonged considerably behind the tooth-row, and the external ridge on the

front face of the anterior zygoma-root more developed, and con- tinued much further upwards, than in Sciurws. Premolars ?; molars as in Sctwrus. This genus contains four well-marked species, known as Spiny Squirrels, all natives of Africa. They are terrestrial in their habits, living in burrows which they dig for themselves, X. getulus, a striped species of North Africa, has much the size and appearance of the Indian palm squirrel ; the others are all a little larger than the English squirrel.

Genus Tamias.

The members of this genus are characterized by the possession of internal cheek-pouches, and by their style of coloration, all being ornamented on the back with alternate bands of light and dark colour. Their skulls are slenderer and lighter than those of the true squirrels, from which they differ in several unimportant details. There is only one functional premolar,—the small anterior one usually found in Seiwrus being either absent altogether or quite small and functionless. There are four species, all found in North America, one extending also through Siberia into eastern Europe. They are known in America as ‘‘ Chipmunks,” and are among the commonest and best known of the indigenous rodents. The members of this group seem rather to lead into the genus Spermo- philus (see MarMor) of the sub-family Arctomyina, so that the division of the Scetwride into two sub-families, although very con- venient for classification and description, is rather of an artificial nature, there being no well-defined line of scparation between them.

Genera Pteromys and Sciuropterus.

The Flying Squirrels, although they cannot fly in the true sense of the word, can yet float through the air for considerable distances by the aid of an extension of skin connecting their fore and hind limbs, and forming a sort of parachute. This parachute is merely a lateral extension of the ordinary skin of the body, which passes outwards between the limbs and terminates at the wrists and ankles. In addition to the lateral membrane there is a narrow and in- conspicuous one passing from the cheek along the front of the shoulder to the front of the wrist, and another—at least in the larger species—stretching across behind the body from ankle to ankle and

involving the base of the tail. he flying squirrels are divided into two genera, of which Pteromys contains the larger and Scturopterus the smaller species. The two differ in certain details of dentition, and in the greater development in the former of the expanded membranes, especially of the ‘‘interfemoral ” or posterior membrane, which is in the latter almost wholly absent. In Pteromys the tail is cylindrical and comparatively thin, while in Sciwropterus it is broad, flat, and laterally expanded, and evidently compensates for the absence of the interfemoral membrane by acting as a supplementary parachute. In appearance flying squirrels resemble the non-flying forms, although they are even more beau: tifully coloured than the latter. Their habits, food, &c., are also very similar to those of the true squirrels, except that they are more decidedly nocturnal, and are therefore less often seen by the ordinary observer. Their method of leaping from tree to tree and floating long distances on their extended parachutes is precisely similar to that of the flying phalangers of Australia, a graphic description of which is quoted in PHALANGER (vol. xviii. p. 729). Of each of the two genera there are about thirteen or fourteen species, all natives of the Oriental region, except that one of Sciwropterus is found in North America, and another in Siberia and eastern Europe,—the latter, the Secwrus volans of Linneus’s Systema Nature, being the first flying squirrel that was known to European naturalists. (0.

SRINAGAR. See Kasumir, vol. xiv. p. 11.

SRIRANGAM, or SrrmncHam, a town of India, in Trichinopoli district, Madras presidency, situated in 10° 51°50” N, lat. and 78° 43’ 55” E. long., 2 miles north of Trichinopoli city and almost in the centre of the island of Srirangam. The island is formed by the bifurcation of the river Kaveri (Cauvery) and by the channel of the Colerun. The town is celebrated for its great temple dedicated to Vishnu, composed of seven square enclosures, 350 feet distant from each other. Each enclosure has four gates with high towers, placed one in the centre of each side opposite to the four cardinal points. The outer wall of the temple is not less than 4 miles in circumference. From 1751 to 1755 the island and its pagodas were the object of frequent contests between the French and the British. Srirangam was constituted a municipality in 1871, and since then much has been done

to improve the place. In 1881 the population was 19,773 (9330 males and 10,443 females).

SRIRANGAPATAM. See SzRINGAPATAM.

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STA—STA

STAAL, MarcusrITE JEANNE CorpiER DrLauNay, BaronneE DE (1684-1750)—often called in history and literature Madame de Staal-Delaunay, to distinguish her more completely from Madame de Stael-Holstein—was born at Paris on May 30, 1684. Her father wasa painter named Cordier. He seems to have deserted her mother, whose name was Delaunay, and who made her daughter take that surname instead of Cordier. She was well-educated, and entered the household of the Duchesse du Maine at Sceaux, at first in no higher capacity than that of femme de chambre. She was, however, promoted before long to the office of amanuensis and (practically) companion to her mistress. Her literary talent soon manifested itself in the literary court of the duchess, who is said, but chiefly on the waiting lady's own authority, to have been not a little jealous of her attendant. Enough, however, is known of the duchess's imperious and capricious temper to make it improbable that her service was agreeable. Madame Delaunay, however, was a sufficiently devoted swvante, and in the affair: of the Cellamare conspiracy had to endure a visit to the Bastille, where she remained for two years. Even here, however, she represents herself as having made conquests, though she was far from beautiful. She returned on her liberation

to the service of the ducliess, refused, it is said, Dacier, the

widower of.a wife more famous than himself, and in 1735, being then more than fifty, married the Baron de Staal. She continued, however, to form part of the duchess's household. She died on June 16,1750. Her Memoirs appeared about five years later, and have often been reprinted, both separately and in collections of the memoirs of the 17th and 18th centuries,

to both of which the author belonged both in style and character. She has much of the frankness and seductive verve of Madame de Sévigné and her contemporaries, but a little alloyed with the sensibilité of a later time. It may be doubted whether she does not somewhat exaggerate the discomforts of her position and her sense of them. But her book is an ex- tremely aniusing one to read, as well as not a little instruc- tive. The humours of the "court of Sceaux" are depicted as hardly any other society of the kind has ever been. Besides her Memoirs Madame de Staal left two comedies and some letters, the answers to which are in some cases extant, and show, as well as the references of contemporaries, that the writer did not exaggerate her power of attracting men.

STADE, a small commercial town in the province of Hanover, Prussia, is situated on the navigable Schwinge, 3} miles above its confluence with the Elbe, and 20 miles to the north-west of Hamburg. It carries on a number of small manufactures and has some shipping trade, chiefly with Hamburg, but the rise of Harburg has deposed it from its former position as the chief port of Hanover. There are several brickfields in the neighbourhood, and deposits. of gypsum and salt. The fortifications, erected in 1755 and strengthened in 1816, began to be demolished in 1882. Population in 1885, 10,003.

According to the legend, Stade was the oldest town of the Saxons and was built in 321 B.c. Historically it cannot be traced farther back than the 10th century, when it was the capital of a line of counts. In the 12th century it passed to the archbishopric

of Bremen. Subsequently entering the Hanseatic League, it rose to some commercial importance.! In 1648 Stade became the eS

1 The Stade Elbe-dues (Stader Elbezoll) were an ancient impost upon all goods carried up the Elbe, and were levied at the village of Bruns- hausen, at the mouth of the Schwinge. The tax was abolished in 1267 by the Hanseatic League, but it was revived by the Swedes in 1688, and confirmed by Hanover. The dues were fostered by the srowing trade of Hamburg, and in 1861, when they were redeemed (for £427,600) by the nations trading in the Elbe, the exchequer of Hanover was in the yearly receipt of about £45,000 from this source.

Hamburg and Great Britain each paid more than a third of the redemp- tion money,

capital of the principality of Bremen under the Swedes ; and in 1719 it was ceded to Hanover, the fate of which it has since shared. The Prussians occupied it without resistance in 1866. STAEL, MapameE pe (by her proper name and title Anne Louise GerMAInE NEcKER, BARONESS oF STAEL-HOLsTEIN), was born at Paris on April 22, 1766, and died there on July 14, 1817. Her father was the famous financier Necker, her mother Suzanne Curchod, who is almost equally famous as the early love of Gibbon, as the wife of Necker, as the mistress of one of the most popular salons of Paris, and as the mother of Madame de Stael. Between mother and daughter there was, however, little sympathy. Madame Necker, despite her talents, her beauty, and her fondness for philosophe society, was strictly decorous, somewhat reserved, and disposed to carry out in her daughter's case the rigorous discipline of her own childhood. The future Madame de Stael was from her earliest years a romp, a coquette, and passionately desirous of prominence and attention. There seems more- over to have been a sort of rivalry between mother and daughter for the chief place in Necker's affections, and it is not probable that the daughter's love for her mother was increased by the consciousness of her own inferiority in personal charms. Madame Necker, if her portraits as well as verbal descriptions may be trusted, was of a most refined though somewhat lackadaisical style of beauty, while her daughter was a plain child and a plainer woman, whose sole attractions were large and striking eyes and a buxom figure. She was, however, a child of unusual intellectual power, and she began very early to write though not to publish. She is said to have written her father a letter on his famous Compte-Rendu and other inatters when she was not fifteen, and to have injured her health by excessive study and intellectual excitement. But in reading all the accounts of Madame de Stael's life which come from herself or her intimate friends it must be carefully remembered that she was the most dis- tinguished and characteristic product of the period of sensibilité—the singular fashion of ultra-sentiment which required that both men and women, but especially women, should be always palpitating with excitement, steeped in melancholy, or dissolved in tears. Still, there is no

doubt that her father's dismissal from the ministry, which followed the presentation of the Compte, and the con- sequent removal of the family from the busy life of Paris, were beneficial to her. During part of the next few years they resided at Coppet, her father's estate on the Lake of Geneva, which she herself made famous, But other parts were spent in travelling about, chiefly in the south of France. They returned to Paris, or at least to its neigh- bourhood, in 1785, and Mademoiselle Necker resumed literary work of a miscellaneous kind, including two plays, Sophie and Jane G'rey, which were printed sooner or later. It became, however, a question of marrying her. Her want of beauty was compensated by her fortune, for she was the only child of one of the richest bankers in Europe. But her parents are said to have objected to her marrying a Roman Catholic, which, in France, consider- ably limited her choice. There is a legend that William Pitt the younger thought of her; the somewhat notorious lover of Mademoiselle de Lespinasse, Guibert, a cold- hearted coxcomb of some talent, certainly paid her addresses. But she finally married Eric Magnus, Baron of Stael-Holstein, who was first an attaché of the Swedish legation, and then minister. For a great heiress and a very ambitious girl the marriage scarcely seemed brilliant, for Stael had no fortune and no very great personal dis- tinction. A singular series of negotiations, however, secured from the king of Sweden a promise of the ambassadorship for twelve years and a pension in case of

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its withdrawal, and the marriage took place on January 14,1786. The husband was thirty-seven, the wife twenty. Madame de Stael was accused of extravagance, and latterly an amicable separation of goods had to be effected between the pair. But this was a mere legal formality, and on the whole the marriage seems to have met the views of both parties, neither of whom had any affection for the other. They had three children ; there was no scandal between them ; the baron obtained money and the lady obtained, as a guaranteed ambassadress of a foreign power of con- sideration, a much higher position at court and in society than she could have secured by marrying almost any Frenchman, without the inconveniences which might

have been expected had she married a Frenchman superior to herself inrank. The particular fancy of Marie Antoinette for Sweden, caused by the fantastic devotion of Count Fersen and the king himself to her, secured moreover a reception which might have been otherwise difficult to gain. Madame de Stael was not a persona grata at court, but she seems to have played the part of ambassadress, as she played most parts, ina rather noisy and exaggerated manner, but not ill. Then in 1788 she appeared as an author under her own name (Sophie had been already published, but anonymously) with some Lettres sur J. J. fousseau, a fervid panegyric showing a good deal of talent but no power of criticism. She was at this time, and indeed generally, enthusiastic for a mixture of Rousseauism and constitutionalism in politics, and her father's restora- tion to power excited extravagant hopes in her, though Necker himself knew better. She exulted more than ever in the meeting of the states-general, and most of all when her father, after being driven to Brussels by a state intrigue, was once more recalled and triumphally escorted into Paris. Every one knows what followed. Her first child, a boy, was born the week before Necker finally left France in unpopularity and disgrace ; and the increasing disturbances of the Revolution made her privileges as ambassadress no mere matters of ornamental distinction gratifying to vanity, but very important safeguards. She visited Coppet once or twice, but for the most part in the early days of the revolutionary period she was in Paris taking an interest and, as she thought, a part in the councils and efforts of the Moderates. At last, the day before the September massacres, she fled, befriended by Manuel and Tallien. Her own account of her escape is, as usual, so florid that it provokes the question whether she was really in any danger. Directly it does not seem that she was; but she had generously strained the privi- leges of the embassy to protect some threatened friends, and this was a serious matter,

She. betook herself to Coppet, and there gathered round her a considerable number of friends and fellow- refugees, the beginning of the quasi-court which at inter- vals during the next five-and-twenty years made the place so famous. In 1793, however, she made a visit of some length to England, and established herself at Mickleham in Surrey as the centre of the Moderate Liberal emigrants, —Talleyrand, Narbonne, Jaucourt, Guibert, and others. There was not a little scandal about her relations with Narbonne; and it is

very much to be doubted whether this can safely be set down, as her panegyrists usually set it, to the mere spite of the first or royalist emigrants, to whom she and her party were almost more obnoxious than the Jacobins. It is certain that this Mickleham sojourn (the details of which are known from, among other sources, the letters of Fanny Burney) has never been altogether satisfactorily accounted for. In the summer she returned to Coppet and wrote a pamphlet on the queen's execution. The next year her mother died, and the fall of Robespierre opened the way back to Paris. M. de Stael (whose mis-

sion had been in abeyance and himself in Holland for three years) was accredited to the French republic by the regent of Sweden; his wife reopened her salon and fora time was conspicuous in the motley and eccentric society of the Directory. She also published several small works, the chief being an essay De I''Injfluwence des Passions (1796), and another De la Littérature Considérée dans ses Hapports avec les Institutions Sociales (1800). It was during these years that Madame de Stael was of chief political importance. Narbonne's place had been supplied by Benjamin Constant, who had a very great influence over her, as in return she had over him. During the Directory she had some real and more imaginary power as a politician, and both personal and political reasons threw her into opposition to Bonaparte. Her own pre- ference for a moderate republic or a constitutional mon- archy was quite sincere, and, even if it had not been so, her own character and Napoleon's were too much alike in some points to admit of their getting on together. For some years, however, she was able to alternate between Coppet and Paris without difficulty, though not without knowing that the First Consul disliked her. In 1797 she, as above mentioned, separated formally from her husband. In 1799 he was recalled by the king of Sweden, and in 1802 he died duly attended by her. Besides the eldest son Auguste Louis, they had two other children,—a son Albert, and a daughter Albertine, who afterwards became the Duchesse de Broglie.

The exact date of the beginning of what Madame de Stael's admirers call her duel with Napoleon is not easy to determine. Judging from the title of

her book Diz Années d’Hxil, it should be put at 1804; judging from the time at which it became pretty clear that the first man in France and she who wished to be the first woman in France were not likely to get on together, it might be put several years earlier. ‘The whole question of this duel, however (marked as it was by Napoleon’s unscrupu- lous exercises of power, which reached a climax in the suppression of the De l’Allemagne after it had been carefully submitted to his censorship), requires considera- tion from the point of view of common sense. It dis- pleased Napoleon no doubt that Madame de Stael should show herself recalcitrant to his influence. But it prob- ably pleased Madame de Stael to quite an equal degree that Napoleon should apparently put forth his power to crush her and fail. Both personages had the curious touch of charlatanerie so common in the late 18th century, and ‘‘made believe” in a fashion bewildering and a little incredible to posterity. If Madame de Stael had really desired to take up her parable against Napoleon seriously, she need only have established herself in England at the peace of Amiens and have lived quietly there. She did nothing of the kind. She lingered on at Coppet, con- stantly hankering after Paris, and acknowledging the hankering quite honestly. In 1802 she published the ~ first of her really noteworthy books, the novel of Delphine, in which the “femme incomprise” was in a manner intro- duced to French literature, and in which she herself and not a few of her intimates appeared in transparent dis- guise. In the autumn of 1803 she returned to Paris. Whether, if she had not displayed such extraordinary anxiety not to be exiled, Napoleon would have exiled her remains a question; but, as she began at once appealing to all sorts of persons to protect her, he seems to have thought it better that she should not be protected. She was directed not to reside within forty leagues of Paris, and after considerable delay she determined to go to Germany. She journeyed by Metz and Frankfort to Weimar, and arrived there in December. There she stayed during the winter, and then went to Berlin, where she

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made the acquaintance of August Wilhelm Schlegel, who afterwards became one of her intimates at Ceppet. Thence she travelled to Vienna,

where, in April, the news of her father's dangerous illness and shortly of his death (April 8) reached her. She returned to Coppet, and found her- self its wealthy and independent mistress, but her sorrow for her father was deep and certainly sincere. She spent the summer at the chateau with a brilliant company ; in the autumn she journeyed to Italy accompanied by Schlegel and Sismondi, and there gathered the materials of her most famous work, Corinne. She returned in the summer of 1805, and spent nearly a year in writing Corinne ; in 1806 she broke the decree of exile and lived for a time undisturbed near Paris. In 1807 Corinne, the first esthetic romance not written in German, appeared. It is in fact, what it was described as being at the time of its appearance, ''a picturesque tour couched in the form ofa novel." The publication was taken as a reminder of her existence, and the police of the empire sent her back to Coppet. She stayed there as usual for the summer, and then set out once more for Germany, visiting Mainz, Frankfort, Berlin, and Vienna. She was again at Coppet in the summer of 1808, and set to work at her book De PAllemagne, It took her nearly the whole of the next two years, during which she did not travel much or far from her own house. She had bought property in America and thought of moving thither, but chance or fatality made her determine to publish De (Allemagne in Paris. The submission to censorship which this entailed was sufficiently inconsistent, and she wrote to the emperor one of the unfortunate letters, at once undignified and provok- ing, of which she had the secret. A man less tyrannical or less mean-spirited than Napoleon would of course have let her alone, but Napoleon was Napoleon, and she perfectly well knew him. The reply to her letter was the condemna- tion of the whole edition of her book (ten thousand copies) as "not French," and her own exile, not as before to a certain distance from Paris, but from France altogether. The act was unquestionably one of odious tyranny, but it is impossible not to ask why she had put herself within reach of it when her fortune enabled her to reside any- where and to publish what she pleased. She retired once more to Coppet, where slie was not at first interfered with, and she found consolation in a young officer of Swiss origin named Rocca, twenty-three years her junior, whom she married privately in 1811. The intimacy of their relations

could escape no one at Coppet, but the fact of the marriage.

was not certainly known till after her death.

The operations of the imperial police in regard to Madame de Stael are rather obscure. She was at first left undisturbed, but by degrees the chateau itself became taboo, and her visitors found themselves punished heavily. Mathieu de Montmorency and Madame Récamier were exiled for the crime of seeing her; and she at last began to think of doing what she ought to have done years before and withdrawing herself entirely from Napoleon's Sphere. In the complete subjection of the Continent which preceded the Russian War this was not so easy as it would have been earlier, and she remained at home during the winter of 1811, writing and planning. On May 23 she left Coppet almost secretly, and journeyed y Bern, Innsbruck, and Salzburg to Vienna. There she obtained an Austrian passport to the frontier, and after some fears and trouble, receiving a Russian passport in Galicia, she at last escaped from the dungeon of Napo- leonic Europe, swearing never to return thither. It Seemed likely that the proclamation of war between oa and Russia, on June 22, would help her to keep

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She journeyed slowly though Russia and Finland to

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Sweden, making some stay at St Petersburg, spent the winter in Stockholm, and then set out for England. Here she received a brilliant reception and was much lionized during the season of 1813. She published De Allemagne (a book much more really remarkable than Corinne) in the autumn, was saddened by the death of her second son Albert, who had entered the Swedish army and fell in a duel brought on by gambling, under- took her Considérations sur la Révolution Francaise, and when Louis XVIII. had been restored returned to Paris, Both in the summer and in the winter of 1814 she visited Coppet, and was meanwhile a prominent figure in Parisian society. She was in Paris when the news of Napoleon's landing arrived and at once fled to Coppet, but a singular story, much discussed, is current of her having approved Napoleon's return, There is no direct evidence of it, but the conduct of her close ally Constant may be quoted in its support, and it is certain that she had no affection for the Bourbons. In October, after

Waterloo, she set out for Italy, not only for the advantage of her own health but for that of her second husband, Rocca, who was dying of consumption. Her daughter married Duke Victor de Broglie on February 20, 1816, at Pisa, and became the wife and mother of French statesmen of distinction. The whole family returned to Coppet in June, and Byron now frequently visited Madame de Stael there. He had quizzed her a good deal in London, but liked her better in her own house, though even there he noticed her constant straining to be something different from herself. Despite her increasing ill-health she returned to Paris for the winter of 1816-17, and her salon was much frequented. But in March she is spoken of as “dying,” and she had already become confined to her room, if not to her bed. She died on the 14th of July, and Rocca survived her little more than six months. Nor was her eldest son long- lived. After editing a collected edition of his mother’s works he died at the age of thirty-seven in 1827.

Madame de Stael occupies a singular position in French liter- ature. The men of her own time exalted her to the skies, and the most extravagant estimates of her (as “the greatest woman in literary history,” as the ‘‘foundress of the romantic movement,” as representing ‘‘ideas,” while her contemporary Chateaubriand only represented words, colours, and images, and so forth) are to be found in those histories of literature which faithfully repeat second- hand and traditional opinions. On the other hand, it is acknow- ledged that she is now very little read. Sainte-Beuve, who professes a “‘culte” for her, and who has treated her at great length and with much indulgence ; M. Scherer, a compatriot and co-religionist, whois strongly prejudiced in her favour ; Doudan, a kind of literary retainer of her connexions,—all allow this, and any one who speaks with an intimate knowledge of current French literature must agree that since they spoke neglect of her has increased. No writer of such eminence is so rarely quoted ; none is so entirely destitute of that tribute of new and splendid editions which France pays to her favourite classics more lavishly than any other nation ; none is so seldom the subject of a literary causeric. The abundant docu- ments in the hands of her descendants, the families of Broglie and Haussonville, have indeed fnrnished material for papers recently, but these are almost wholly on the social aspect of Madame de Stael, not on her literary merit. Nor when the life and works come to be examined independently is the neglect seen to be without excuse. ,An ugly coquctte,

an old woman who made a ridiculous marriage, a blue-stocking who spent much of her time in pestering men of genius, and drawing from them sarcastic comment behind her back,—these things arc not attractive. Hcr books are seen to be in large part merely clever reflexions of other people's views, or views current at the time, and the famous ''ideas" turn out to be chiefly the ideas of the books or the men with whom she was from time to time in contact. The sentimentality of her sentiment and the florid magniloquence of her style equally disgnst the reader ; and, when it is suggested to him that the revolution of taste and manners hurts novels more than anything else, he is tempted to reply that it has not hurt Don Quéxote, or Gil Blas, or Lobinson Crusoe, or Tom Jones, or Manon Lescaut, or The Antiquary, and that if it has hurt Corinne it is simply because these are great books and Corinne is not a great book. There is truth in this, but to state it alone would be in the highest degree unfair. Madame de Stael's faults are great ; her style is of an age not for

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all time; her ideas are mostly second-hand and frequently super- ficial, But nothing save a very great talent could have shown itself so receptive. Take away her assiduous frequentation of society, from the later phtlosophe coteries to the age of Byron,—take away the influence of Constant and Schlegel and her other literary friends,—and probably little of her will remain. But to have caught from all sides in this manuer the floating notions of society and of individuals, to reflect them with such vigour and clearness, to combine them with such not inconsiderable skill into connected books, is not anybody's task. Her two best books, Corinne and De lV' Allemagne, are in all probability almost wholly unoriginal, a little sentiment in the first and a little constitutionalism in the second being all that she can claim. But Corinne is still a very remarkable exposition of a certain kind of estheticism, and De l' Allemagne is still perhaps the most remarkable account of one country by a native and inhabitant of another which exists in literature. This praise, and it is very high praise, can be given to Madame de Stael. But the merits which it allows are not merits of

the class which secure readers for ever. Neither in style nor in thought was she of the first class or perhaps of the second ; and

besides thought and style nothing will save books.

Baron Auguste de Stael edited, as has been said, the complete works of his mother in seventeen volumes (Paris, 1820-1), and the, edition was afterwards re- published in a compacter form, and, supplemented by some uvres Inédites, is still obtainable in 3 vols. large 8vo (Didot). The Considérations and the Dix Années 'Exil had been published after Madame de Stacl's death. There is no recent reissue of the whole, and the minor works have not been reprinted, but Corinne, Delphine, and De l Allemagne are easily accessible in cheap and separate forms. Of recent works on Madame de Stael, or rather on Coppet and its society, those of MM. Caro and Othenin d'Haussonyille may be mentioned. In English there is an elaborate biography by A. Stevens (London, 1880), full of information, but unluckily not at all critical, (G. SA.)

STAFFORD, an inland county of England, is bounded on the §.E. by Warwickshire, 8. by Worcestershire, W. by Shropshire, N.W. by Cheshire, and E. by Derbyshire, just touching Leicestershire. It is of irregular outline, and has been likened to an elongated and compressed pear, somewhat tapering at both ends. Its greatest length from north to south is 53 miles, and its greatest breadth is 35 miles. The area is 748,433 acres—about 1170 square miles.

Surface and Geology.—Although the general aspect of the county is that of a plain, it has been pronounced "rather a subalpine or hilly district"; but its highest hill, Axe Edge, is only 1756 feet above the level of the sea. In the north the land is undulating and very picturesque ; the hills here are the loftiest in the county, as Axe Edge, Cloud Thorpe, Mow Cop, and other hillocks and mounds called "edges." These are mostly composed of millstone grit. In the south we have sandstone, gravel, limestone, and basalt, represented respectively by Kinfare Edge, Barr and Cannock Chase, Sedgley, and Clent. The prin- cipal rivers are the Trent, the Tame, the Sow, the Penk, the Stour, the Blythe, the Tern, the Churnet, the Lyme, the Smestow, and the Manyfold ; of these the Trent is the most important. The Severn has a short part of its course within the county, traversing the coal-

field at Arley. The Dove separates Staffordshire from Derby- shire. Several of the rivers are well supplied with fish.

Geologically the county is included in the New Red Sandstone district of England, and is of the Carboniferous, Permian, and Triassic systems of formation. It is rich in limestone and coal. According to Mr Garner (Natural History of the County of Stafford), the following is a sum- mary of its geological characters :—the Polley coal-field occupies 51 square miles; the South Staffordshire coal- field (excluding about 11 miles of it situated in other counties), 65; the Silurian limestone, &c., in the south of the county, 16; the Rowley basalt, 1; the Clent basalt, 2; the Arley coal-field, basalt, cornstone, &c., 7; the mountain limestone, 40; the Cheadle coal-field, 18; the Chiddleton coal-field, 1; the Meerbrook coal-field, 4; the millstone grit, 100 ; the New Red Sandstone (marl, gravel, rock, sand, and peat), 825.

The county is very rich in fossils. In the coal, the limestone, and the Silurian deposits the remains of marine animals and plants are especially numerous. The museums in several towns have good collections of corals, calamites,

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and ferns ; and probably the finest examples of trilobites and encrinites have been found in this part of England. The teeth of the Megalichthys have been found in the coal strata, and the Dudley museum contains a specimen of A. hibberti, nearly entire. The county is very rich in mineral productions. In a single year 12,000,000 tons of coal and 1,173,866 tons of iron have been obtained. The greatest quantity of iron is raised in the north and of coal in the south. Of the places at which the various products are found may be named—Birch Hills for anthra- cite coal; Hanley Green for peacock coal; Longton for cannel coal; Wednesbury for hematite iron ore ; Langley Close for grey marble; the Rowley Hills for basalt. At Bilston casting sand, at Kingswinford fire-clay and fire bricks, at Tutbury alabaster, at Powke Hull black marble, and at Hemley Green red ochre are produced. In December 1885 an important discovery of coal was made near Dudley. Mr 8. Blewitt has driven from tlie Grace Mary pits about 250 yards towards the Ivy House estate, through the igneous rocks, and come upon a large area of

the best hard coal, about thirty feet in thickness, and some thirty acres in area.

Climate and Agriculture.—As regards climate the county shares the characteristics common to the midland district of England. Agriculture, though not its distinctive feature, forms a very import- ant item in the industry and wealth of Staffordshire. The returns for 1886 furnish the following report: in corn crops there were 94,273 acres ; roots, artificial grasses, &c., 48,343; clover and grasses, 46, 832; permanent pasture, 412,566; fallow, 7203; orchards, 1188; market gardens, 866; nursery grounds, 233; woods and plantations, 34,91L From the same returns we learn that tle number of horses em- ployed in agriculture was 16,031; unbroken horses and brood mares, 7802; cows in milk or in calf, 74,868; cattle under two years old, 56,224; two years and upward, 25,922; one-year-old sheep, 142,955; sheep under one year, 106,950; and pigs, 48,569. The total number of proprietors in the county was returned in 1873 as 43,371, possessing 638,084 acres, producing an annual rental of £3,630,254. The estimated extent of waste or common land was 7809 acres. Of the owners 38,672 owned less than one acre each, Eight proprietors were owners of more than 10,000 acres each, viz., Earl of Lichfield, 21,433; Earl of Shrewsbury, 18,954; Lord Hatherton, 14,901; Marquis of Anglesey, 14,344; Sir J. H. Crewe, 14,256; Duke of Sutherland, 12,744; Lord Bagot, 10,993; Sir T. F, F. Boughey, 10,505.

Manufactures.—The manufactures of Staffordshire are of a very varied character. Almost everything which is made of iron is manufactured in one town or another; and it would only be tedious to enumerate the almost infinite variety of goods produced. Wolverhampton and Willenhall are famous for locks, Cradley for nails, Oldbury for railway carriages, Walsall for spurs, bits, and saddlery, Tipton for anchors, Smethwick for glass, Soho for steam engines and hydraulic jacks, Wednesfield for keys, Bilston for tinplate wares, and Bloxwich for bits, Thanks to the labours of Josiah Wedgwood and Flaxman, the pottery work of Stafford- shire ranks among the most famous manufactures of the kingdom, and Etruria is a household word wherever the admirable and artistic Wedgwood ware is known. The ale produced at Burton- on-Trent finds a market in almost every civilized country in the world, and in some that can scarcely be so described.

Communication.—The county is admirably provided with rail- ways, canals, and tramways. The main roads are excellent, and are well maintained and kept in capital condition.

Administration and Population.—The population in 1861 was 746,948; in 1871 858,326; and in 1881 981,013 (males 492,009, females 489,004), an average of 1°31 persons to an acre. Stafford- shire is in the Oxford circuit, and is nearly all in the diocese of Lichfield. The seat of the bishopric and the will courts are at Lichfield. The assize town is Stafford. There are five hundreds, each having two divisions :—North Totmonslow (Leek) and South Totmonslow (Cheadle), North Pirehill (Potteries) and South Pirehill (Stone), North Offlow (Burton-on-Trent) and South Offlow (Walsall), East Cuttlestone (Rugeley) and West Cuttlestone (Gnosall), North Seisdon (Sedgley) and South Seisdon (Kinfare). The county has one court of quarter sessions, and is divided into twenty-two petty and special sessional divisions; and there are 247 civil parishes and sixteen poor law unions. The municipal boroughs number twelve: —Bursleni, population 26,522; Burton-on-Trent (partly in Derby- shire), 39,288; Hanley, 48,361; Lichfield, 8349 ; Longton, 18,620; Newcastle-under-Lyme,. 17,508; Stafford, 19,977; Stoke-on-Trent, 19,261 ; Tamworth (partly in Warwickshire), 4891; Walsall 58,795 5 West Bromwich, 56,295 ; Wolverhampton, 75,766.

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By the Redistribution of Seats Act, 1885, the parliamentary representation of Staffordshire was arranged as follows:—seven boroughs each returning one member, oue borough returning three, and seven county divisions with one member to each,—making seventeen meinbers for the whole county. The county divisions are named respectively Burton, Handsworth, Kingswinford, Leek, Lichfield, North-West, and West. The following is a list of the boroughs, with populations given by or based on the census of 1881 :— Wolverhampton (three members), 164,332; Hanley, 75,912; Newcastle-under-Lyme, 49,293; Stafford, 19,977; Stoke-on-Trent, 64,091; Walsall, 59,402; Wednesbury, 68,142; West Bromwich,

56, 295.

History and Antiquities.—Much antiquarian learning has been employed in showing that Staffordshire was in early ante-Roman days famous for the presence and power of the Druids. Cannock Chase has been described as their headquarters in Britain; and Barr Beacon has been generally accepted as one of their principal plaees of worship, of which Drood or Druid Heath by its name stil] preserves the tradition. At the time of Cssar's arrival in the island this part of England was peopled by tribes whom the Roman authors designate as Cornavii or Carnabii. The conquerors named the central part of the country, which included Stafford- shire, Flavia Cesariensis. Two of their most famous roads, Watling Street and Icknield Street, passed through the county, —the first-named from Fazeley through Wall (Htocetwm) to Wroxeter (Uriconiwm), and the Icknicld Street through Birming- ham to Wall, and by Burton-on-Trent to Derby. In Saxon times Staffordshire formed part of the great kingdom of Mercia, which was remarkable for the tenacity with which the people clung to their old faith and resisted the introduction of Christianity. 'The new faith, however, prevailed over paganism, and a cathedral was founded at Lichfield. Through the influence of Offa, Pope Adrian in 786 made the see an independent archbishopric, but this honour was only possessed for a short period. Mercia was frequently invaded by the Danes, and several battles were fought in Staffordshire, notably at Tettenhall and Wednesfield (Woden's Field), and a large number of Dancs settled in this part. So rapidly did they occupy the land that in 1016, when the Danish king Canute divided his conquests into four earldoms, Mercia was believed to have as many Danish as Saxon inhabitants. After the Norman Conquest the county was divided among the Conqueror's retainers, the barons De Torri, De Montgomery, Fitz-Ansculf, and De Ferrers coming in for the lion's share. Of after historical events the most noted are the defeat and execution of the earl of Lancaster by Edward IT. in 1322, and the battle at Blore Heath in 1459, in which the Yorkists were victorious over the Lancasterians. During the Civil War Lichfield cathedral was besieged in 1643, and Lord Brook was killed by a shot fired from the battlements of the great tower. Mary queen of Scots was imprisoned in Tutbury Castle from 1569 to 1572. In 1745 Charles Edward, the Young Pretender, in his attempt to win the crown of England, penetrated as far as Leek,

Early British remains exist in various parts of the county; and a large number of barrows have been opened in which human bones, urns, fibule, stone hammers, armlets, pins, pottery, and other articles have been found. In the neighbourhood of Wetton no fewer than twenty-three barrows have been opened, and British ornaments have been found in Needwood Forest. Several Roman eamps also exist in different parts. But of medimval times the chief legacy is the cathedral at Licurre.p (q.v.), one of the most beautiful in the kingdom. Of other interesting places the most worthy of notice are Beaudesert, Bentley Hall, Chillington, Dudley Castle, Enville Hall, Ingestre, Stafford Castle, Tamworth Castle, Tixall, and Wrottesley Hall. More modern mansions are Tlam all, Alton Towers, Shugborough, Patteshull, Keele Hall, and Trentham. Of famous personages belonging to the county are John Dudley (duke of N orthumberland), Cardinal Pole, Archbishop Sheldon, Col. John Lane, General Harrison, Lord Anson, Earl St Vineent, Izaak Walton, Dr Samuel J ohnson, David Garrick, Josiah Wedgwood, Miss Seward, Mary Howitt.

See Plot, Vatural History of Staffordshire, 1686; Erdeswick, Survey of Stafford- shire, 1717; Shaw, History and Antiquities of Staffordshire, 1798-1801; Pitt, Topographical History of Staffordshire, 1817; Garner, Natural History of the County of Stafford, 1844; Langford, Staffordshire and Warwickshire, 1874; and the publications of the Salt Archeological Society.

STAFFORD, a parliamentary and municipal borough of England, and the county town of Staffordshire, is situated on the left bank of the river Sow, almost in the heart of England. It is 123 miles from London and 29} from Birmingham, and is in the southern division of the hundred of Pirehill. The principal trades of the town are tanning and the manufacture of boots and shoes, more especially for ladies, The oldest church is that of St Chad, said to be originally of Saxon origin. It was formerly a large and beautiful church, with chancel, nave, aisles, transepts, and

a central tower, but has suffered severely from time, neglect, and rough treatment. Restoration was begun in 1855, and the operations led to the discovery of some fine interlacing Norman arches anda beautiful Norman archway with some rich sculptured work between the nave and tower.

These were restored in 1856 and a new roof was put on the chancel in memory of Izaak Walton. In 1874, the nave, arcades, and open-timbered roof were restored in memory of Mr Thomas Salt ; in 1874-75 the south aisle was rebuilt, and in 1884-85 the tower. The finest of the churches in Stafford is undoubtedly St Mary's, which was admirably restored in 1844-45 by Sir Gilbert Scott, at a cost of £30,000. It contains some good monuments, and seve- ral very fine memorial windows of stained glass. Other churches worthy of mention are Christ Church, St Paul's, and St Thomas's. The grammar school is a very old foundation, enlarged by Edward VI.; the present building was erected in 1862. The free library was opened in 1882, and is now fairly well supplied with books, The William Salt library contains a unique collection of books, deeds, autographs, engravings, and drawings relating to the county, collected by Mr Salt and presented by his widow. It contains some 7000 volumes, between 2000 and 3000 deeds, and more than 9000 drawings, auto- graphs, and valuable MSS., mostly relating to the history, topography, &c., of the county. The town also possesses a good museum, collected principally by Mr Clement L. Wragge, and called by his name ; specially interesting is its almost perfect collection of fossils. Stafford also contains a good school of art and a mechanics' institute. Other prominent buildings are the shire hall, in which the assizes and quarter sessions are held, and the borough hall; the latter contains the municipal offices, and also has a large hall for public meetings. Stafford is well supplied with charitable institutions, among which may be mentioned the general infirmary, built in 1766; the county lunatic asylum in 1818; and the Coton Hill institution for the insane in 1854, beautifully situated on rising ground, which commands extensive views of some of the loveliest country in the county, while its own grounds are tastefully laid out. The householders of Stafford formerly possessed the right of using some very extensive common land situated north of the town; in 1880, however, all that remained (134 acres) was enclosed, and is now held for the people by a committee of house- holders elected annually. A part of this land, called Stone Flat, is preserved as a public recreation ground. Of another common named Coton Field, consisting of about 180 acres, 70 acres were in 1884 transferred abso- lutely to the freemen, and have been divided into 401 garden allotments, which are let at a small rental to resident freemen or their widows. The parliamentary borough (area 774 acres, with population of 18,904 in 1881) was extended in 1885, and is now

identical with the municipal borough. The area of this is 1012 acres, and the population, 14,437 in 1871, was in 1881 19,977. The Act of 1885 reduced the parliamentary representation from two members to one.

Stafford was of considcrable importance before the Conquest. The site was at first known as Berteliney or Betheney, from the island on which the earliest houses were built. As the town grew its name was changed into that of Statford or Stadford. In

913 Ethelfleda, sister of Edward the Elder, erected a fortification here, generally called a castle, but doubtless one of those de-

‘fensive mounds which from their admirable positions were after-

wards selected by the Normans as the sites of their castles and strongholds, About a year and a half afterwards Edward the Elder built a tower, with walls and a fosse round it. Pennant says this was on the mount called Castle Hill by Speed. Stafford is mentioned in Domesday as a city paying £9 in customs. There © were 18 royal burgesses, and the earls of Mercia possessed twenty mansions. ‘The number of houses entered is 178. William built a castle on the old site, of which he appointed Robert de Torri

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governor, who took the name De Stafford from that of the town, and was the originator of the great family of the Staffords. At this time it contained a royal mint ; some of the coins are still extant, bearing on the obverse the head and name of the king, and on the reverse ‘‘Godwinne on Staef.” Godwinne was the ‘‘king’s moneyer.” The castle of Robert de Torri was rebuilt by Ralph de Stafford in the reign of Edward III.; during the Civil War it was held for the Royalists by the earl of Northampton, but was taken for the Parliament by Sir William Brereton in May 1648. The castle was soon afterwards demolished by order of the Parliament. When fortified, Stafford had four gates. That on the south, near the river bridge, called the Green-gate, was taken down in 1780. The arch of the East-gate was standing a few years ago. The Gaol-gate was in ruins in 1680. The site of the fourth gate is unknown. King John confirmed and enlarged the privileges granted by the old charter. This was again confirmed by Edward

VI., and on August 6, 1575, Elizabeth visited the town. Stafford adopted the Local Government Act, 1858, on April 23, 1872; and in 1876 an Act was obtained for extending the borough boundaries. The corporation now consists of a mayor, eight aldermen, and twenty-four councillors.

STAG. See DEER.

STAHL, Grore Ernst (1660-1734), chemist, was born on 21st October 1660 at Ansbach, studied at Jena, and became court-physician to the duke of Weimar in 1687. In 1694 he was appointed professor of medicine in Halle and in 1716 physician to the king of Prussia. He died at Berlin on May 14, 1734. His Theoria Medica Vera appeared at Halle in 1707 (see MeEpicINE, vol. xv. p. 812), and his Lapervmenta et Observationes Chemice at Berlin in 1731 (see Cuumistry, vol. v. pp. 460-61).

STAIR, James Datrympie, First Viscount (1619- 1695), was born in May 1619 at Drummurchie in Ayrshire. He was descended from a family for several generations in- clined to the principles of the Reformation, and had ances- tors both on the father's and the mother's side amongst the Lollards of Kyle. His father James Dalrymple, laird of the small estate of Stair in Kyle, died when he was an infant ; his mother, Janet Kennedy of Knockdaw, is described as "a woman of excellent spirit," who took care to have him well educated. From the grammar school at Mauchline he went in 1633 to the university of Glasgow, where he graduated in artson July 26, 1637. Next year he went to Edinburgh, probably with the intention of studying law, but the troubles of the times then approaching a crisis led him to change his course, and we next find him serving in the earl of Glencairn's regiment in the war of the Covenant. What part he took in it is not certainly known, but he was in command of a troop when recalled in 1641 to compete for a regency (as a tutorship or professorship was then called) in the university of Glasgow. He was elected in March. Mathematics, logic, ethics, and politics were the chief subjects of his lectures, and a note- book on logic by one of his students has been preserved. His activity and skill in matters of college business were praised by his colleagues, who numbered amongst them some of the leading Covenanting divines, and his zeal in teaching was gratefully acknowledged by his students. After nearly seven years' service he resigned his regency, and removed to Edinburgh, where he

was admitted to the bar on February 17, 1648. This step had probably been rendered easier by his marriage four years before to Margaret Ross, co-heiress of Balneil in Wigtown. Stair's practice at the bar does not appear to have been large ; his talents lay rather in the direction of learning and business than of oratory or advocacy. His reputation and the confidence reposed in him were shown by his appoint- ment in 1649 as secretary to the commission sent to The Hague to treat with Charles II. by the parliament of Scotland. The negotiation having been broken off through the unwillingness of the young king to accept the terms of the Covenanters, Stair was again sent in the following year to Breda, where the failure of Montrose's expedition forced Charles to change his attitude, and to return to

Scotland as the covenanted king. Stair had preceded him, and met him on his landing in Aberdeenshire, probably carrying with him the news of the execution of Montrose, which he had witnessed. During the Commonwealth Stair continued to practise at the bar; but like most of his brethren he refused in 1654 to take the oath of allegiance to the Commonwealth and abjuration of royalty. Three years later, on the death of Lord Balcomie, Stair was appointed one of the commissioners for the administration of justice in Scotland on the recommendation of Monk. His appointment to the bench on Ist July 1657 by Monk was confirmed by Cromwell on the 26th. Stair's association with the English judges at this time must have enlarged his acquaintance with English law, as his travels had extended his knowledge of the civil law and the modern European systems which followed it. He thus acquired a singular advantage when he came to write on law, regarding it from a cosmopolitan or international rather than a merely local 'or national point of view. His actual discharge of judicial duty at this time was short, for after the death of Cromwell the courts in Scotland were shut,—a new commission issucd in 1660 not having taken effect, it being uncertain in whose name the commission ought to run. It was during this period that Stair became intimate with Monk, who is said to have been advised by him when he left Scotland to call a full and free parliament. Soon after the Restoration Stair went to London, where he was received with favour by Charles, knighted, and included in the new nomination of judges in the Court of Session on 13th February 1661. He was also put on various

important commissions, busied himself with local and agricultural affairs, and, like most of the Scottish judges of this anc the following century, acted with zest and credit the part of a good country gentleman. In 1662 he was one of the judges who refused to take the declaration that the National Covenant and the Solemn League and Covenant were unlawful oaths, and, forestalling the deposition which had been threatened as the penalty of continued non-compliance, he placed his resignation in the king's hands. The king, however, sum- moned him to London, and allowed him to take the decla- ration under an implied reservation. The next five years of Stair's life were comparatively uneventful, but in 1669 a family calamity, the exact facts of which will probably never be ascertained, overtook him. His daughter Janet, who had been betrothed to Lord Rutherfurd, was married to Dunbar of Baldoon, and some tragic incident occurred on the wedding night, from the effects of which she never recovered. As the traditions vary on the central fact, whether it was the bride who stabbed her husband, or the husband who stabbed the bride, no credence can be given to the mass of superstitions and spiteful slander which surrounded it, principally levelled at Lady Stair. In 1670 Stair served as one of the Scottish commissioners who went to London to treat of the Union; but the project, not seriously pressed by Charles and his ministers, broke down through a claim on the part of the Scots to what was deemed an excessive representation in the British par- liament. In January 1671 Stair was appointed president of the Court of Session. In the following year, and again in 1673, he was returned to parliament for Wigtownshire, and took part in the important legislation of those years in the department of private law. During the bad time of Lauderdale's government Stair used his influence in the privy council and with Lauderdale to mitigate the severity of the orders passed against ecclesiastical offenders, but for the most part he abstained from attending a board whose policy he could not approve. In 1679 he went to London to defend the court against charges of partiality and injustice which had been made against it, and was

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STATIR

thanked by his brethren for his success. When in the following year the duke of York came to Scotland, Stair distinguished himself by a bold speech, in which he con- gratulated the duke on his coming amongst a nation which was entirely Protestant. This speech can have been little relished, and the duke was henceforth his implacable enemy. His influence prevented Stair from being made. chancellor in 1681, on the death of the duke of Rothes.

The parliament of this year, in which Stair again sat, was memorable for two statutes, one in private and the other in public law. ‘The former, relating to the testing of deeds, was drawn by Stair, and is sometimes called by his name. Although it is susceptible of some improve- ment, the two centuries during which it has regulated this important branch of practical conveyancing is a testimony to the skill of the draftsman. The other was the infamous Test Act, probably the worst of the many measures devised at this period with the object of fettering the conscience by oaths. Stair also had a minor share in the form which this law finally took, but it was confined to the insertion of a definition of “the Protestant religion” ; by this he hoped to make the test harmless, but his ex- pectation was disappointed, and the form in which it emerged from parliament was such that no honest man could take it. Yet, self-contradictory and absurd as it was, the Test Act was at once rigidly enforced. Argyll, who declared he took it only in so far as it was consistent with itself and the Protestant religion, was tried and condemned for treason, and narrowly saved his life by escaping from Edinburgh Castle the day before that fixed for his execution. Stair, dreading a similar fate, went to London to seek a personal interview with the king, who had more than once befriended him, perhaps remembering his services in Holland; but the duke of York intercepted his access to the royal ear, and when he returned to#cot- land he found a new commission of judges issued, from which his name was omitted. He retired to his wife’s estate in Galloway, and occupied himself with preparing for the press his great work, Zhe Institutions of the Law of Scotland, which he published in the autumn of 1681, with a dedication to the king.

He was not, however, allowed to pursue his legal studies in peaceful retirement. His wife was charged with attending conventicles, his factor and tenants severely fined, and he was himself not safe from prosecution at any

moment. A fierce dispute arose between Claverhouse and his son, the master of Stair, relative to the regality of Glenluce ; and, both having appealed to the privy council, Claverhouse, as might have been expected, was absolved from all the charges brought against him, and the master was deprived of the regality. Stair had still powerful friends, but his opponents were more powerful, and he received advice to quit the country. He repaired to Holland in October 1684, took up his residence, along with his wife, some of his younger children, and his grandchild, afterwards the field-marshal Stair, at Leyden. While there he published the Decisions of the Court of Session between 1666 and 1671, of which he had kept a daily record, and a small treatise on natural philosophy, entitled Physiologia Nova Experimentalis.

In his absence a prosecution for treason was raised against him and others of the exiles by Sir G. Mackenzie, the lord advocate. He was charged with accession to the rebellion of 1679, the Ryehouse plot, and the expedition of Argyll. With the first two he had no connexion; with Argyll's unfortunate attempt he had no doubt sympa- thized, but the only proof of his complicity was slight, and was obtained by torture. The proceedings against him were never brought to an issue, having been continued by successive adjournments until 1687, when they were

dropped. The cause of their abandonment was the ap- pointment of his son, the master of Stair, who had made his peace with James II., as lord advocate in room of Mackenzie, who was dismissed from office for refusing to relax the penal laws against the Catholics. The master only held office as lord advocate for a year, when he was "degraded to be justice clerk ""—the king and his advisers finding him nota fit tool for their purpose. Stair remained in Holland till the following year, when he returned under happier auspices in the suite of William of Orange. William, who had made his acquaintance through the pensionary Fagel, was ever afterwards the firm friend of Stair and his family. The master was made lord advocate; and, on the murder of President Lockhart in the following ycar, Stair was again placed at the head of the Court of Session. An unscrupulous opposition, headed by Montgomery of Skelmorlie, who coveted the office of secretary for Scot-

land, and Lord Ross, who aimed at the presidency of the court, sprang up in the Scottish parliament ; and an anony- mous pamphleteer, perhaps Montgomery himself or Fer- guson the Plotter, attacked Stair in a pamphlet entitled The Late Proceedings of the Parliament of Scotland Stated and Vindicated. He defended himself by publishing an Apology, which, in the opinion of impartial judges, was a complete vindication. Shortly after its issue he was created Viscount Stair. He had now reached the summit of his prosperity, and the few years which remained of his old age were saddened by private and public cares. In 1692 he lost his wife, the faithful partner of his good and evil fortune for nearly fifty years. ‘The massacre of Glencoe, which has marked the master of Stair with a stain which his great services to the state cannot efface,—for he was undoubtedly the principal adviser of William in that treacherous and cruel deed,—was used as an opportunity by his adversaries of renewing their attack on the old president. His own share in the crime was remote; it was alleged that he had as a privy councillor declined to receive Glencoe’s oath of allegiance, though tendered, on the technical ground that it was emitted after the day fixed, but even this was not clearly proved. But some share of the odium which attached to his son was naturally reflected on him. Other grounds of complaint were not difficult to make up, which found willing supporters in the opposition members of parliament. A disappointed suitor brought in a bill in 1693 complaining of his partiality. He was also accused of domineering over the other judges and of favouring the clients of his sons. Two bills were introduced without naming him but really aimed at him,—one to disqualify peers from being judges and the other to confer on the crown a power to appoint temporary presidents of the court. ‘The complaint against him was remitted to a committee, which after full inquiry completely exculpated him; and the two bills, whose incompetency he demonstrated in an able paper addressed to the commission and parliament, were allowed to drop. He was also one of a parliamentary commission which prepared a report on the regulation of the judicatures, afterwards made the basis of a statute in 1695 supple- mentary to that of 1672, and forming the foundation of the judicial procedure in the Scottish courts down to the present century. On November 29, 1695, Stair, who had been for some time in failing health, died in Edinburgh, and was buried in the church of St Giles.

In the same year there was published in London a small volume with the title 4 Vindication of the Divine Perfections, Illustrating the Glory of God in them by Reason and Revelation, methodically digested, By a Person of Honowr. lt was edited by the two Nonconformist divines, William Bates and John Howe, who had been in exile in Holland along with Stair, and is undoubtedly his work. Perhaps it had been a sketch of the ‘‘ Inquiry Concerning Natural Theology” which he had contemplated writing in 1681.

It is of no value as a theological work, for Stair was no more a theologian than he was a man of scienee, but it is of interest as showing the serious bent of his thoughts and the genuine piety of his character.

It is as a legal writer and a judge that he holds a pre-eminent place amongst many distinguished countrymen belonging to his profession. The full title of lus great work, which runs as follows— The Institutions of the Law of Scotland, deduced from its Originals, and collated with the Civil, Canon, and Feudal Laws and with the Customs of Neighbouring Nations—is fully borne out by the contents, and affords evidence of the advantage Stair had enjoyed from his philosophical training, his foreign travels, and his intercourse with Continental jurists as well as English lawyers. It is no narrow technical treatise, but a comprehensive view of jurisprudence as based on philosophical principles and derived from a Divine Author. But neither docs it lose itself in generalities; for it is the work of a lawyer and judge intimately acquainted with every detail in the practical application of law in his native country. Unfortunately for its permanent fame and use, much of the law elucidated in it has now become antiquated through the decay of the feudal part of Scottish law and the large introduction of English law, especially in the departments of commercial law and equity. But its spirit still animates Scottish law and educates Scottish lawyers, and it may be hoped will continue to do so, saving them from being the slaves of precedent or the victims of the utilitarian philosophy whieh regards all positive law as conventional and destitute of necessary principles derived from the nature of the world and man.

The Physiologia was favourably noticed by Byyle, and is inter- esting as showing the activity of mind of the exiled judge, who returned to the

studies of his youth with fresh zest when physical science was approaching its new birth. But he was not able to emancipate himself from formule which had cramped the educa- tion of his generation, and had not caught the light which Newton spread at this very time by the communication of his Principia to the Royal Socicty of London.

Stair was fortunate in his descendants. “The family of

Dalrymple,” observes Sir Walter Scott, ‘‘ produced within two j}

centuries as many men of talent, civil and military, of literary, political, and professional eminence, as any house in Scotland.” His five sons were all remarkable in their professions. The master of Stair, who became the first earl, was an able lawyer, but still abler politician. Sir James Dalrymple of Borthwick, one of the principal clerks of session, was a very thorough and accurate historical antiquary. Sir Hew Dalrymple of North Berwick suc- ceeded his father as president, and was reckoned one of the best lawyers and speakers of his time. Thomas Dalrymple became physician to Queen Anne. Sir David Dalrymple of Hailes was lord advocate under Anneand George I. Stair’s grandson the field- inarshal and second earl gained equal credit in war and diplomacy. His great-grandson Sir David Dalrymple, Lord Hailes, also rose to the bench, where he had an honourable character for learning as a civil and humanity as a criminal judge. But his literary exceeded his legal fame. As an honest and impartial historian he laid the foundations of the true narrative of Scottish history, from which all his successors have largely borrowed.

For a fuller account of the life of Stair, see Annals of the Viscount and First and

Second Earls of Stair, by J. Murray Graham, and Memoir of Sir James Dalrymple, First Viscount Stair, 1875, by A. J. G. Mackay. (4. M.)

STALYBRIDGE, a municipal and parliamentary bor- ough of England, partly in Lancashire but principally in Cheshire, is situated on the Tame, 1 mile east of Ashton- under-Lyne, and 74 east of Manchester. The Tame is crossed by bridges connecting the counties of Chester and Lancaster. The principal public buildings are the town- hall (1831), the Foresters’ hall

(1836), the district infir- mary, the mechanics' institute (1861), the people's institute (1864), the market-hall (1866), and the Oddfellows' hall (1878). Stamford park, extending to about 60 acres, and lying between Stalybridge and Ashton, was opened 12th July 1873. The town is one of the oldest seats of the cotton manufacture, the first cotton mill having been erected in 1776 and the first steam engine in 1795. In addition to extensive cotton mills, it possesses woollen factories, iron and brass foundries, machine works, nail works, and paper mills. Stalybridge was created a market- town in 1828, was incorporated as a municipal borough in 1857, and obtained the privilege of returning a mem- ber to parliament in 1867. The municipal borough (area 806 acres) had a population of 21,092 in 1871, and 22,785 in 1881; its limits were extended in 1881] to 3120 acres, with a population of 25,977. The population

of the parliamentary borough (area 2214 acres) in 1871 was 35,114 and in 1881 it was 39,671. The area added to the municipal borough in 1881 was in 1885 included in the parliamentary borough also,—the population of this extended area being 42,863 at the census of 1881.

STAMFORD, a municipal borough and market-town, chiefly in Lincolnshire but partly in Northamptonshire, is situated on the river Welland, and on branches of the Midland, the London and North Western, and the Great Northern railway lines, 89 miles north of London and 55 south of Lincoln. The ancient bridge over the Welland was in 1849 superseded by a new structure of stone, erected at a cost of £8500. The town formerly possessed fourteen parish churches, but now has only six, viz., St Mary's, erected at the end of the 13th century, possessing an Early English tower, with Decorated spire, the princi- pal other parts of the building being Perpendicular; All Saints, also of the 13th century, the steeple being built at the expense of John Brown, merchant of the staple at Calais, in the beginning of the 15th century ; St Michael's, rebuilt in 1836 on the site of one erected in 1269; St George's, Early English, Decorated, and Perpendicular, for the most part rebuilt in 1450 at the expense of Willian Bruges, first garter king-at-arms; St John Baptist's, Per- pendicular, erected about 1452; and St Martin's, Perpen- dicular, in which Lord Treasurer Burghley is buried. Formerly there were several religious houses : —the Bene- dictine monastery of St Leonard's, founded in the 7th century,

of which there are still some remains; the Car- melite monastery (1291), of which the west gate still stands ; and houses for grey friars (time of Henry IIL), Dominicans (1240), Gilbertines (1291), and Augustinians (1316). The prir-ipal secular buildings are the town-hall (rebuilt 1776), the corn exchange (1859), and the literary and scientific institute (1842), with a library of 6000 volumes. There are a large number of charitable institu- tions, including the Stamford and Rutland infirmary (1828), Browne's hospital, founded in the time of Richard ITI., Snowden's almshouses (1604), Truesdale's almshouses (1700), and Burghley hospital, founded by Lord Treasurer Burghley (1597). Ratcliffe's and Browne's high school for boys was lately erected at a cost of £7000 on the site of Ratcliffe's free school; and Brown's school for girls in St Martin's was erected in 1876 at a cost of £5000. The prosperity of the town depends chiefly on its connexion with agriculture. It possesses iron foundries, agricultural implement works, waggon factories, and breweries. There is also some trade in coal, timber, stones, and slates. The population of the municipal borough (area 1766 acres) in 1871 was 7846 and in 1881 it was 8773; that of the parliamentary borough (area 1894 acres) in the same years was 8086 and 8993. The latter was merged in the counties in 1885, giving its name to a parliamentary division of Lincolnshire.

The town is of very remote antiquity, and is supposed to have grown into importance after the decay of the Roman village of Bridge Casterton two miles distant. Its name, an early form of which was Staenford, was derived from a passage at the town across the Welland by stone. It was the scene of the first battle of the Picts and Scots against the Britons and Saxons in 449, and subsequently became one of the five great Danish boroughs. A castle was built early in the 10th century on the south bank of the river opposite the town, but has long disappeared ; and of another on the north-west of the town, fortified by Stephen, only the foundations now remain. The town was at one time enclosed by walls, and there are still traces of gateways on the east and west sides. Inthe reign of Henry III. the lectures of the Carmelites on divinity and the liberal arts led to the erection of colleges, and Stamford beeame celebrated as a place of education. When dissen- sions arose among the students of Oxford in the reign of Edward III. many removed thither, and ultimately the universities both of Oxford and Cambridge thought it necessary to pass statutes prohibiting their students from proceeding to

other places for any part of their education, Stamford being specially mentioned in the

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Oxford statute. At the time of the Conquest Stamford was governed by aldermen. It was incorporated by charter in the reign of Edward IV. In 1668 it received a charter from Charles II., constituting its chief magistrate a mayor. It returned two members to parliament from the reign of Edward I. till 1867, and one from 1867 to 1885. The deanery of Stamford is an ancient neculiar, the appointment being vested in the bishop of Lincoln.

STAMFORD, a borough of the United States, in t Fairfield county, Connecticut, is situated on Long Island Sound, 35 miles north-east of New York city, on the New York, New Haven, and Hartford Railroad. It has a small harbour accessible to steamboats by means of a canal ; and among its public buildings are the town-hall and several handsoine churches. Locks, carriages, stoves, fire-bricks, edge-tools, cranes, hardware, hosiery, and especially log- wood extract and liquorice are manufactured in the | borough. The population was 9714 in 1870 and 11,297 in 1880. * STAMMERING, or Srurrerine, designates a spas- modic affection of the organs of speech in which the | articulation of words is suddenly checked and a pause ensues, often followed by a repetition in rapid sequence of the particular sound at which the stoppage occurred. Of this painful affection there are many grades, from a slight inability to pronounce with ease certain letters or syllables, or a tendency to hesitate and to interject unmeaning sounds in a spoken sentence, to the more severe condition in which there is a paroxysm of spasms of the muscles, not only of the tongue and throat and face, but even of those of respiration and of the body generally. To under- stand in some degree the explanation of stammering it is ; necessary to consider shortly the physiological mechanism of articulate speech. Speech is the result of various muscular movements affecting the current of air as it passes in expiration from the larynx through the mouth. If the vocal cords are called into action, and the sounds thus produced are modified by the muscular movements of the tongue, cheeks, and lips, we have vocal speech ; but if the glottis is widely open and the vocal cords relaxed the current of

air may still be moulded by the muscular apparatus so as to produce speech without voice, or whisper- ing (see Voicz). In both cases, however, the mechanism is very complicated, requiring a series of nervous and Inuscular actions, all of which must be executed with pre- cision and in accordance. In vocal speech, for example, it is necessary that the respiratory movements, more espe- cially those of expiration, occur regularly and with nice adjustment to the kind of articulate expression required ; that the vocal cords be approximated and tightened by the muscles of the larynx acting with delicate precision, So as to produce the sound of the pitch desired; that the rama glottidis (or aperture of the larynx) be opened so as to produce prolonged sounds, or suddenly closed so as to cut off the current of air; that the movements of the muscles of the tongue, of the soft palate, of the jaws, of the cheeks, and of the lips occur precisely at the right time and to the requisite extent; and finally that all of these muscular adjustments take place with rapidity and Smoothness, gliding into each other without effort and without loss of time. Exquisite co-ordination of muscular movement is therefore necessary, involving also complicated hervous actions. Hence is it that speech is acquired by long and laborious effort. A child possesses voice from the beginning ; it is born with the capacity for speech ; but articulate expression is the result of education. In Infaney, not only is knowledge acquired of external objects, and signs attached in the form of words to the ideas thus awakened, but the nervous and muscular mechanisms by which these signs or words receive vocal expression are trained by long practice to work harmoniously. It is not surprising, therefore, that in certain cases,

owing to soine obscure congenital defect, the co-ordination is not effected with sufficient precision, and that stammer- ing is the result. Even in severe cases no appreciable lesion can be detected either in the nervous or muscular mechanisms, and the condition is similar to what may affect all varieties of finely co-ordinated movements. The mechanism does not work smoothly, but the pathologist is unable to show any organic defect. Thus the co-ordinated moveinents necessary in writing are disturbed in scrivener’s palsy, and the skilful performer on the piano or on any instrument requiring minute manipulation may find that he is losing the power of delicate adjustment. Stammer- ing is occasionally hereditary. It rarely shows itself

before the age of four or five years, and asa rule it is developed between this age and puberty. Men stammer ina much larger proportion than women. It may occur during the course of nervous affections, such as hysteria, epilepsy, or tabes dorsalis; sometimes it follows febrile disorders ; often it develops in a child ina feeble state of health, without any special disease. In some cases a child may imitate a stammerer and thus acquire the habit. Any general enfeeblement of the health, and especially nervous excitement, aggravates the condition of a con- firmed stammerer.

Stammerers, as a rule, find the explosive consonants 3, p, d, t, k, and hard g the most difficult to articulate, but many also are unable easily to deal with the more con- tinuous consonants, such as 2, f, th, s, z, sh, m,n, y, and in severe cases even the vowels may cause a certain amount of spasm. Usually the defect is not observed in whispering or singing; but there are exceptions to this statement. In pronouncing the explosive sounds the part of the oral apparatus that ought suddenly to open or close remains spasmodically closed, and the stammerer remains for a moment voiceless or strives pitifully to overcome the obstruction, uttering a few successive pufis or sounds like the beginning of the sound he wishes to utter. The lips thus remain closed at the attempted utterance of } and p; the tip of the tongue is pressed against the hard palate or the back of the upper front teeth ind and ¢; and the back of the tongue presses against the posterior part of the palate in pronouncing g hard and &. In attempting the continuous consonants, in which naturally the passage is not completely obstructed, the stammerer does not close the passage spasmodically, but the parts become fixed in the half-opened condition, or there are intermittent attempts to open or close them, causing either a drawling sound or coming to a full stop. In severe cases, where even vowels cannot be freely uttered, the spasm appears to be at the rima glottidis (opening of the larynx). Again, in some cases, the spasm may affect the respiratory muscles, giving rise to a curious barking articulation, in consequence of spasm of the expiratory muscles, and in such cases the patient utters the first part of the sentence slowly, grad- ually accelerates the speed, and makes a rush towards the close. In the great majority of cases the spasm affects the muscles of articulation proper, that is, those of the pharynx, tongue, cheeks, and lips. In the most aggravated cases the condition of the patient is pitiable. .It has thus been well described by Dr Bristow in an article full of inter- esting details :—

‘The most distressing cases are those in which the spasm extends to parts unconnected with speech,—it may be to nearly the whole muscular organism. In snch a case the spasm com- mences, let us assume, at the base of the tongue; the mouth opens widely and remains in that position; the muscles of expiration work convulsively ; the glottis contracts; respiration becomes arrested ; the face becomes congested and the veins dilated; violent spasmodic movements involve the trunk and limbs; and only after some time, either when the paticnt becomes exhausted, or when

he resolutely restrains his attempts to articulate, does his paroxysm come to an end.”—Quain’s Dictionary of Medicine, p. 1518.

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Such a case is not common; it is more paroxysmal than habitual ; and in ordinary conversation, when the patient is free from nervous excitement, the defect may be scarcely observed. STAMPS. The stamp duty is a tax imposed upon a great variety of legal and other documents, and forms a branch of the national revenue. The stamp is a cheap and convenient mode of certifying that the revenue regula- tions have been complied with. Stamp duties appear to have been invented by the Dutch in 1624. They were first imposed in England in 1694 by 5 and 6 Will. and Mary, c. 21, as a temporary means of raising funds for carrying on the war with France. They now depend upon a very large number of statutes, the principal one being the Stamp Act, 1870, 33 and 34 Vict. ¢ 97 (which extends to the United Kingdom). The amount of stamp duty varies from one halfpenny (postage) to thousands of pounds (probate or succession). It appears scarcely

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necessary in this place to set out at length the various stamp duties payable in the United Kingdom, inasmuch as those of the most usual occurrence will readily be found in ordinary books of reference.

Stamp duties are either fixed, such as the duty of one penny on every cheque irrespective of its amount, or ad valorem, as the duty on a colveyance, which varies according to the amount of the purchase money. The duty is denoted generally by an impressed, less frequently by an

adhesive, stamp, sometimes by either at the option of the person stamping. Thus an inland bill of exchange (unless payable on demand) must have an impressed stamp, a foreign bill of exchange an adhesive stamp, while an agreement or receipt stamp may be of either kind. It should be noticed that cer- tain documents falling within a class which as a rule is subject to stamp duty are for reasons of public policy or encouragement of trade exeinpted from the duty by special legislation. Examples of such documents are Bank of England notes, agreements within § 17 (but not those within § 4) of the Statute of Frauds (see Fraup), agreements between a master of a ship and his crew, transfers of ships or shares in ships, indentures of apprenticeship for the sea service, petitions forwarded by post to the crown or a House of Parliament, and most instruments relating to the business of building and friendly societies.

As a general rule a document must be stamped at the time of execution, or a penalty (remissible by the commissioners of inland revenuc) is incurred. The penalty isin most cases £10, sometimes much more; in the case of policies of marine insurance it is £100. Some instruments cannot be stamped at all after execution, even with payment of the penalty. Such are bills of exchange and promissory notes (whcre an impressed stamp is necessary), bills of lading, proxies for voting at meetings of proprietors of joint-stock companies, and receipts after a month from date. An unstamped instrument cannot be pleaded or given in evidence except in criminal proceed- ings or for a collateral purpose. If an instrument chargeable with duty be produced as evidence in a court, the officer whose duty it is to read the instrument is to call the attention of the judge to any omission or insufficiency of the stamp, and if the instrument is one which may legally be stamped after execution, it may, on payment of the amount of the unpaid duty and the penelty payable by law, and a further sum of £1, be received in evidence, saving all just exceptions on other grounds. The rules of the Supreme Conrt, 1883 (Ord. xxxix. r. 8, re-enacting a provision of the Common Law Procedure Act), provide that a new trial is not to be granted by reason of the ruling of a judge that the stamp upon any document is sufficient or that the document does not require a stamp. The stamp upon a document subject to the stamp laws of a foreign state is usually admissible in evidence in a court of the United Kingdom if it conform in other respects to the rules governing the admissibility of such documents, even though it

be improperly stamped according to the law of the foreign country. The admissibility of documents helongs to the ordinatoria litis rather than the decisoria litis, and is governed by the lex fort rather than the lex loci contractus, unless indeed that law makes a stamp necessary to the validity of the instrument. As to bills of exchange, the Bills of Exchange Act, 1882, 45 and 46 Vict. c. 61, § 72, provides that where a bill is issued out of the United Kingdom it is not invalid by reason only that it is not stamped in accordance with the law of the place of issue, and that where a bill issued out of the United Kingdom conforms as regards requisites in form to the law of the United Kingdom it may for the purpose of enforcing payment thereof be treated as valid as between all persons who negotiate, hold, or become parties to it in the United Kingdom.

By the Stamp Dutics Management Act, 1870, 38 and 384 Vict. c. 98, the stamp duties are put under the management of the commissioners of inland revenue, who are empowered to grant licences to deal in stamps, and to make allowance for spoiled or misused stamps. Certain offences, such as forging a die or stamp, selling or using a forged stamp, &c., are made felonies punishable with penal servitude for life as a maximum.

United States. —The subject of stamp dutics is of unusual historical interest, as the passing of Grenville's Stamp Act of 1765 (5 Geo. III. c. 12) directly led to the American revolution. The Act was, indeed, repealed the next year as a matter of expediency by 6 Gco. III. c. 11, but 6 Geo, III. c. 12 declared the right of the British legislature to bind the colonies by its Acts. The actual yield of the stamp duties under the Act of 1765 was, owing to the opposition in the American colonies, only £4000—less than the expenses of putting the Act into force. The stamp duties of the United States are now under the super- intendence of the commissioner of internal revenue. 'These duties, which depend upon a great body of statutory law, will be found in the Revised Statutes, tit. xxxv.

The principal authorities on the subject of this article are Tilsley, Stamp Laws, and Dowell, Stamp Duties.

STANDARDS. See WEIGHTS AND MEASURES.

STANFIELD, Wittiam CrarKson (1794-1867), marine ainter, was born of Irish parentage at Sunderland in 1794. As a youth he was a sailor, and during many long voyages he acquired that intimate acquaintance with the sea and shipping which was admirably displayed in his subsequent works. In his spare time he diligently occupied himself in sketching marine subjects, and so much skill did he acquire that, after having been incapacitated by an accident from active service, he received an engagement, about 1818, to paint scenery for the “Old Royalty,” a sailor’s theatre in Wellclose Square, London. Along with David Roberts he was afterwards employed at the Cobourg theatre, Lambeth ; and in 1826 he became scene-painter to Drury Lane theatre, where he executed some admirable. work, especially distinguishing himself by the production of a drop-seene, and by decorations for the Christmas pieces for which the house was celebrated. Meanwhile he had been at work upon some easel pictures of small dimensions, and was elected a member of the Society of British Art- ists. Encouraged by his success at the British Institution, where in 1827 he exhibited his first important picture— Wreckers off Fort Rouge —and in 1828 gained a premium of 50 guineas, he before 1830 abandoned scene-painting, and in that year made an extended tour on the Continent. He now produced his Mount St Michael, which ranks as one of his finest works; in 1832 he exhibited his Opening of New London Bridge and Portsmouth Har- bour—commissions from William IV.—in the Royal Academy, of which he was elected an associate in 1832 and an academician in 1835; and until his death on the 18th of May 1867 he contributed to its exhibitions a long series of powerful and highly popular works, dealing mainly with marine subjects, but occasionally with scenes of a more purely landscape character.

Among these may be named—the Battle of Trafalgar (1836), executed for the United Scrvice Club; the Castle of Ischia (1841), Isola Bella (1841), among the results of a visit to Italy in 1839; French Troops Fording the Margra (1847), the ‘‘ Victory” Bearing the Body of Nelson owed into Gibraltar (1853), the Abandoned (1856). He also cxecuted two notable series of Venetian subjects, one for the banqueting-hall at Bowood, the other for Trentham. He was mueh employed on the illustrations for The Picturesque Annual, and published a collection of lithographic views on the Rhine, Moselle, and Meuse; and forty of his works were en- graved in line

under the title of ‘‘Stanfield’s Coast Scenery.” Four of his engraved pictures are in the National Gallery, and his works may also be studied in the South Kensington Museum. A large collection of his productions were ineluded in the Royal Academy’s Winter Exhibition for 1870. The whole course of Stanfield’s art was powerfully influenced by his early practice as a scene-painter. But, though there is always a touch of the spectacular and the scenic in his works, and though their colour is apt to be rather dry and hard, they arc large and effective in handling, powerful in their treatment of broad atmospheric effects, and telling in composition, and they evince the most complete knowledge of the artistic materials with which their painter deals.

STANHOPE, Cuaries Stanwopr, THIRD Fart (1753- 1816), was born on 3d August 1753, and educated under the opposing influences of Eton and Geneva, devoting himself whilst resident in the Swiss city to the study of mathematics, and acquiring from the associations con- nected with Switzerland an intense-love of liberty. He contested the representation of the city of Westminster without success in 1774, when only just of age; but from the general election of 1780 until his accession to the peerage on the 7th of March 1786 he represented through the influence of Lord Shelburne the Buckinghamshire borough of High Wycombe, and during the sessions of 1783 and 1784 he gave his support to the administration of William Pitt, whose sister Lady Hester Pitt he married on 19th December 1774. When Pitt ceased to be inspired by the Liberal principles of his early days, his brother-in- law severed their political connexion and opposed with all

the impetuosity of his fiery heart the arbitrary measures which the ministry favoured. Lord Stanhope’s character was without any taint of meanness, and his conduct was marked by a lofty consistency never influenced by any petty motives; but his speeches, able as they were, had no weight on the minds of his compeers in the upper chamber, and, from a disregard of their prejudices, too often drove them into the opposite lobby. He was the chairman of the ‘‘ Revolution Society,” founded in honour of the Revolution of 1688, the members of which in 1790 expressed their sympathy with the aims of the French republicans. He brought forward in 1794 the case of Muir, one of the Edinburgh politicians who were trans-

ported to Botany Bay, and in 1795 he introduced into the Lords a motion deprecating any interference with the internal affairs of France. In all of these points he was hopelessly beaten, and in the last of them he was in a "minority of one"—a sobriquet which stuck to him throughout life,—whereupon he seceded from _parlia- mentary life for five years. The lean and awkward figure of Lord Stanhope figured in a host of the caricatures of Sayers and Gillray, reflecting on his political opinions and his personal relations with his. children. His first wife died on 20th July 1780, and he married on 17th March 1781 Louisa, daughter and sole heiress of the Hon. Henry Grenville (governor of Barbados in 1746 and ambassador to the Porte in 1762), a younger brother of the first Earl Temple and George Grenville. Through his union with this lady, who survived until March 1829, he was doubly connected with the family of Grenville. By his first wife he had three daughters, one of whom was Lady Hester Stanhope (see below), and his second wife was the mother of three sons. Lord Stanhope died at the family seat of Chevening, Kent, on 15th December 1816.

Earl Stanhope was elected a fellow of the Royal Society so carly as November 1772, and devoted a large part of his ineome to experiments in science and philosophy.. He invented a method of securing buildings from fire (which, however, proved impracticable), the printing press and the lens which bear his name, and a monochord for tuning musical instruments, suggested improvements in canal locks, made experiments in steam navigation in 1795-97, and contrived two calculating machines. When he acquired an extensive property in Devonshire, he projected a canal through that county from the Bristol to the English Channel and took the levels himself. Electricity was another of the subjects which he studied, and the volume of Principles of Electricity which he issued in 1779 contained the rudiments of his theory on the "return stroke" resulting from the contact with the earth of the electric current of lightning, which were afterwards amplified in a contribution to the Philosophical Transactions for 1787. His principal labours in literature consisted of a reply to Burke's Reflections on the French Revolution (1790) and an Essay on the rights of juries (1792), and he long meditated the compilation of a digest of the statutes. His scientific theories, his mechanical experiments, and his studies in music absorbed all his thoughts, and for them he neglected his wives and his children. His youngest daughter, Lady Lucy Rachael Stanhope, eloped with Mr Thomas

Taylor of Sevenoaks, the family apothecary, and her father refused to be reconciled to her, an inconsistency in a republican which subjected him to a caricature from Gillray. Lady Hester Stanhope abandoned her home and went to live with her mother's relations. Lord Stanhope's high qualities were marred by an impracticable disposition.

STANHOPE, Lapy Hxster Lucy (1776-1839), the eldest child of the third Earl Stanhope (noticed above), by his first wife Lady Hester Pitt, eldest daughter of the first earl of Chatham, lived for the earlier part of her life amid the surroundings of a noble mansion, or in close com- munion with her uncle William Pitt, the most prominent minister of his age, and on his early death withdrew whilst still young to brood over the past in the solitudes of Pales- tine. She was born on 12th March 1776, and dwelt at ' her father's seat of Chevening in Kent until early in 1800, when his excitable and wayward disposition drove her to her grandmother's house at Burton Pynsent. A year or

two later she travelled abroad, but her cravings after distinction were not satisfied until she became the chief of her uncle's household in August 1803. She sat at the head of his table and assisted in welcoming his guests, gracing the board with her stately beauty and enlivening the company by her quickness and keenness of conver- sation. Although her brightness of style cheered the declining days of Pitt and amused most of his political friends, her satirical remarks sometimes created enemies when more consideration for the feelings of her associates would have converted them into friends. Lady Hester Stanhope possessed great business talents, and when Pitt was out of office she acted as his private secretary. She was with him in his dying illness, and some of his last thoughts were concerned with her future, but any anxiety which might have arisen in her mind on this point was dispelled through the grant by a nation grateful for her uncle's qualities of a pension of £1200 a year, dating from 30th January 1806, which Lady Hester Stanhope enjoyed for the rest of her days. On her uncle's death she lived in Montague Square, London, but life in London without the interest caused by associating with the principal politicians of

the Tory party proved irksome to her, and she sought relief from lassitude in the fastnesses of Wales. Whilst she remained on English soil happiness found no place in her heart, and her native land was finally abandoned for the East in February 1810. After many wanderings she settled on Mount Lebanon, and from this solitary position she wielded an almost absolute authority over the surrounding districts. Her control over the natives was sufficiently commanding to induce Ibrahim Pasha, when about to invade Syria in 1832, to solicit her neutrality, and this supremacy was maintained by her commanding character and by the belief that she possessed the gift of divination. Her cherished companion Miss Williams, and her trusted physician Dr Charles Lewis Meryon, dwelt with her for some time; but the former died in 1828, and the latter was not with Lady Hester when she died. In this lonely residence, the villa of Djoun, 8 miles from Sidon, in a house "hemmed in by arid mountains," and with the troubles of a household of twenty-three servants, unregulated by a single English attendant or friend and only waiting for her death to plunder the house, Lady Hester Stanhope's strength slowly wasted away, and at last she died on 23d June 1839, aged sixty-three. The disappointments of her life, and the necessity of overaweing her servants as well as the chiefs who surrounded Djoun, had intensified a temper naturally imperious. In appearance as in voice she resembled her grandfather, the first Lord Chatham, and like him she domineered over the circle, large or small, in which she was placed.

Some years after her death there appeared three volumes of Memoirs of the Lady Hester Stanhope as related by herself in Con- versations with her Physician (i.e, Dr Meryon), 1845, and these were followed in the succeeding year by three volumes of Z'ravels of Lady Hester Stanhope, forming the Completion of her Memoirs narrated by her Physician. They presented a lively picture of this strange woman's life and character, and contained many

anecdotes of Pitt and his colleagues in political life for a quarter of a century before his death,

STANHOPE, Puitre Dormer, fourth earl of Chester- field. See CHESTERFIELD.

STANISLAU (Pol. Stanislavof’), the chief town in the district of the same name in Galicia, Austria, on the Albrecht and Lemberg-Czernowitz railways, in 49° 4’ N, lat., 24° 30’ E. long., has two real-schools, a gymnasium, and large ironworks. It has also a good trade in corn. The population (1885) numbers 18,626:

STANISLAUS (1677-1766), king of Poland. Stanislaw Leszezynski or Leszinski was horn at Lemberg on October

20, 1677. His father, Raphael Leszezynski, was a Polish nobleman, distinguished by his rank and the important offices which he held, but still more by his personal qualities. Stanislaus, after visiting the courts of Vienna, Paris, and Rome, was raised to the dignity of voivode of Posen, and in 1704 was sent as ambassador by the assembly of Warsaw to Charles XII. of Sweden, who had just declared the deposition of the recently elected Augustus II. The king was so greatly taken with the ambassador that he recommended him to the diet as a suitable candidate for the vacant throne; the election accordingly followed on 12th July 1704, but the corona- tion of Stanislaus and his wife Catharina Opalinska did not take place until 4th October of the following year (compare PoLAND, vol. xix. p. 297). After the reverse of Pottava in 1709 Augustus returned to Poland, and, assisted by the Russians, compelled Stanislaus to leave the country. The next five years saw him leading a wander- ing and somewhat adventurous life in Europe, one of his objects being to procure a favourable peace for Charles (compare CHARLES XII.). He then settled on Charles's estate at Zweibriicken, and after Charles's death in 1718 had a residence assigned to him by the French court at Weissenburg in Alsace. In 1725 his daughter Maria became the wife of Louis XV. of France. On the death of Augustus in 1733 Stanislaus once more returned to Poland, where a majority declared for him, but his com- petitor, the young elector of Saxony, had the advantage of the support of the emperor Charles VI., and also of the empress of Russia. Dantzic, to which Stanislaus had retired, was quickly taken by the Russians and the Saxons, and with great difficulty the unfortunate prince succeeded in making good his escape in disguise, after hearing that the Russians had set a price on hishead. In 1736, when peace was concluded between the emperor and France, it was agreed that Stanislaus should abdicate the throne, but that he should be acknowledged king of Poland and grand-duke of Lithuania, and continue to bear these titles during life, and further, that he should be put in peaceable possession of the duchies of Lorraine and Bar, but that immediately after his death those duchies should be united for ever to the crown of France. The remaining years of his life were prosperous and happy. He died at Lunéville on February 23, 1766, in consequence of injuries received from his nightdress accidentally taking fire. Stanislaus,

who wasa patron of thearts and sciences, wrote several works in politics and philosophy, which were collected and published at Paris in 1763, in 2 vols. 8vo, under the title @uwvres du Philosophe Bienfaisant. The Guvres Choisies de Stanislas, Roi de Pologne, Duc

de Lorraine et de Bar, with an historical notice by Madame de Saint-Ouen, were published in an 8vo volume at Paris in 1825.

STANISLAUS AUGUSTUS, the last king of Poland, was born at Wolczyn in Lithuania in 1732 and died at St Petersburg in 1798. See PontatowskI, vol. xix. p. 453, and PoLAND, vol, xix. pp. 297-8.

STANLEY, Arruur Penruyn (1815-1881), dean of Westminster from 1863, was born at Alderley in Cheslure on December 13, 1815. His father, the Rev. E. Stanley, rector of Alderley, bishop of Norwich from 1837 to1849, was the younger brother of Sir John Stanley of Alderley Park, seventh baronet, who in 1839 was created Baron Stanley of Alderley, and was the representative of a branch of the same family as that of the earls of Derby. His mother, Catherine Stanley, was the daughter of the Rev. Oswald Leycester, rector of Stoke-on-Tern. Both parents were persons of remarkable force and individuality of character. The influence of each is to be traced in the career of their son. It was his father's prayer as bishop of Norwich "that he might be an instrument in God's providence of extending more enlarged and more Christian views among the clergy, and thus the means of disseminating a wider

and more comprehensive spirit of Christianity throughout the land." Of his mother her son not only spoke, after her death in 1862, as "the guardian genius" that "had nursed his very mind and heart," but described her as "sifted with a spiritual insight which belonged to that larger sphere of religion which is above and beyond the passing controversies of the day." Arthur was their third child. His elder brother, Owen, died in 1850 at Sydney, after concluding, as commander of the "Rattlesnake" frigate, the survey of the Coral Sea. His sister Mary, well known for her work in the hospitals at Scutari and among the poor in London, died in 1880. Arthur was a child of highly sensitive organization and precocious intel- lectual

activity. His boyish letters, journals, and poems were singularly like in their characteristic points to his later writings. But his extreme shyness and silence gave no promise of the social gifts which afterwards added so largely to his influence. At theage of fourteen his health, at one time alarmingly delicate, so far improved as to warrant his parents in sending him to Rugby, where Dr Arnold had been recently appointed head master. He remained at Rugby from 1829 to 1834, and of all Arnold's pupils may be said to have been the one who most fully responded to the influence of his master's teaching and character. In 1834 he became an undergraduate of Balliol College, Oxford, having obtained a scholarship in the pre- vious year. Among his tutors at Balliol was Mr Tait, afterwards archbishop of Canterbury, and among his junior fellow scholars Benjamin Jowett, afterwards professor of Greek and master of Balliol. Arthur Stanley, after obtain- ing the Ireland scholarship and Newdigate prize for a remarkable English poem (on the Gipsies), was placed in the first class in 1837. In 1839, after a period of residence and study at Oxford, he was elected fellow of University College, and in the same year was admitted to holy orders. In 1840 he left England fora prolonged tour in Greece and Italy, and on his return settled at Oxford, where he resided from October 1841 for the next ten years, being actively engaged during term time as tutor of his college. He very shortly became an influential element in univer- sity life. His personal relations to his pupils were of a singularly close and affectionate nature, and the charm of his social gifts and genial character won him friends on all sides. His literary reputation was early established by the profound impression made by his Life of Arnold, whose sudden death had occurred in 1842, and whose biography, published in 1844, at once secured for its young author a high place among English writers. In 1845 he was appointed select preacher, and published in 1847 a volume of Sermons and Essays on the Apostolic Age, which not only laid the foundation of his fame as a preacher, but also marked his future position as a theologian. In university politics, which at that time wore mainly the form of theological controversy, he from the first took the place which he always retained of an uncompromising advocate of comprehension and toleration. As an undergraduate he had entirely sympathized with Dr Arnold in resenting the agitation led by, but not confined to, the High Church party in 1836 against the appointment of Dr Hampden to the regius professorship of divinity. As a young M.A, during the long-continued agitation which followed the

publication in 1841 of Tract No. 90, and which ended in the withdrawal of the present Cardinal Newman from the English Church, he used all his influence to protect from formal condemnation the leaders and tenets of the “Tractarian” party. In 1847 he did his utmost to resist the movement set on foot at Oxford against Dr Hampden’s appointment to the bishopric of Hereford. Finally, in 1850, in an article published in the Edinburgh Review in defence of the ‘Gorham judgment,” which had secured

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the position in the English Church of the Evangelical clergy, he asserted two principles which he maintained to the end of his life,—first, “ that the so-called supremacy of the crown in religious matters was in reality nothing else than the supremacy of law,” and, secondly, “that the Church of England, by the very condition of its being, was not High, or Low, but Broad, and had always included, and been meant to include, opposite and contradictory opinions on points even more important than those at present under discussion.”

It was not only in theological but in academical matters that his sympathies were on the liberal side. Though on many points of essentially conservative tendencies, he was greatly interested in university reform, and towards the end of his residence at Oxford acted as secretary to the royal commission appointed in 1850 to report on and to suggest improvements in the administrative and educa- tional system of the university. Of the important changes in both these respects which, in the face of much opposi- tion at the university, were carried out in due time under the sanction of parliament by an executive commission, Stanley, who took the principal share in drafting the report printed in 1852, was a strenuous advocate. These changes included the transference of the initiative in university legislation from the sole authority of the heads of houses to an elected and representative body, the open- ing of college fellowships and scholarships to competition by the removal of local and other restrictions, the non- enforcement at matriculation of subscription to the Thirty- nine Articles, and various steps taken to increase the usefulness and influence of the professoriate.

Before the report was issued, Stanley, who had lost his father in 1849, and both his brothers, Captain Stanley mentioned above, and Charles, secretary

to the governor of Van Diemen's Land, within a few months of the same date, was appointed to a.canonry in Canterbury cathedral. He held the office from 1851 till his return to Oxford. During his residence at Canterbury he published his Memoir of his father Bishop Stanley (1851), and completed his Commentary on the Epistles to the Corinthians (1855). In the winter and spring of 1852-53 he made the tour in Egypt and the Holy Land, the result of which was his well-known volume on Sinai and Palestine, first published in 1856. In 1857 he travelled in Russia, and collected much of the materials for his subsequent Lectures on the Greek Church, published in 1861. His Memorials of Canterbury, published in 1855, displayed the full maturity of his power of dealing with the events, scenes, and characters of past history which had marked him from childhood. Towards the close of the same period he accepted the office of examining chaplain to Dr Tait, his former tutor at Balliol and afterwards successor to Arnold at Rugby, on his transference from the deanery of Carlisle to the see of London.

At the close of 1856 Stanley was appointed by the crown to the professorship of ecclesiastical history, a post which, with the canonry at Christ Church attached to the office, he held till 1863. In the first of three inaugural lectures the new professor announced his intention of beginning his treatment of the subject with "the first dawn of the history of the church," the call of Abraham; and the first two volumes of his History of the Jewish Church, published in 1863 and 1865, consist of the substance of lectures delivered by him in his capacity as professor. In 1861 he published the volume on the Greek Church already referred to. His second residence at Oxford was marked by the same power of winning per- sonal influence which had distinguished him as a college tutor, and by the efforts which he made, in his wider sphere as professor, to bring together in social intercourse

the leaders of the divergent and hostile parties between which the residents at the university were mainly divided.

Much, however, of his time and efforts was given to religious controversy. From 1860 to 1864 academical and clerical circles were agitated by the storm which followed the publication of Essays and Reviews, a volume to

which two of his most valued friends—Benjamin Jowett and Mr Temple, the former professor of Greek at Oxford, the latter head master of Rugby and afterwards bishop in succession of Exeter and London—had been contributors. For the exceedingly prominent part taken by Stanley in this excit- ing controversy the reader is referred to the second and third of his Lssays on Church and State, collected and published in 1870. The result of his action was greatly to alienate the leaders of the High Church party, who had joined a large portion of the clergy in their efforts to procure the formal condemnation of the views advanced in Essays and Reviews. In this and other questions, such as in the growing controversy on the position of Prof. Maurice at King's College, Cambridge, and on that caused by Bishop Colenso's work on the Pentateuch, he had taken up a position which brought him into conflict with a large portion of the religious public. It should be added that in the last year of his professoriate (1863) he had published a Letter to the Bishop of London, strongly advocating a large relaxation of the terms of clerical subscription to the Thirty-nine Articles and Prayer-book. An important Act amending the Act of Uniformity, and carrying out in some degree Stanley's proposals, was passed in the year 1865.

In the spring of 1862 Stanley, at the queen's desire, had accompanied the prince of Wales on a tour in Egypt and the Holy Land. During his absence he lost his mother, the heaviest domestic bereavement that had yet befallen him. His sense of his debt towards her has been already indicated. It stands recorded in his volume of Memorials of Edward and Catherine Stanley.

Towards the close of the following year he was appointed by the crown to the deanery of Westminster, in succession to Dean Trench, raised to the seeof Dublin. In December he married Lady Augusta Bruce, sister of Lord Elgin, then governor-general of India, herself one of the queen's most trusted friends. In January 1864 he entered on the duties of his new post.

His tenure of the deanery of Westminster was memor- able in many ways. He recognized from the first two im- portant disqualifications,— his indifference to music and his slight knowledge of architecture. he availed himself largely of the aid of others, and threw himself with characteristic energy and entire success into the task of rescuing from neglect, preserving

from decay, and commending to the interest of all classes of his countrymen the treasure of historic monuments in which the abbey is so rich. No visitor can pass through the building, now so often thronged with crowds of the work- ing classes, the mere possibility of attracting whom was spoken of before a royal commission so lately as 1841 as quite chimerical, without recognizing the successful result of his indefatigable labours. The monument to the brothers Wesley, the inscription on the gravestone of Liv- ingstone, and the restored altar in her husband's chantry in which he placed the neglected remains of Catherine of Valois, the queen of Henry V., may be named among the innumerable and ubiquitous records of his wide sympathy and historic ardour. 'Within three years of his appointment he published his Memorials of Westminster Abbey, a work which, although not free from occasional inaccuracies, is a mine of information conveyed in the most picturesque and impressive form. He was a constant

preacher, and gave a great impulse to the practice already —

begun of inviting distinguished preachers to the abbey

On both these subjects

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pulpit, especially to the evening services in the nave, which had been established under his predecessor. It is to him that is largely due the vast increase in the number not of visitors only but of worshippers in the abbey. He began the practice, since continued by others of the abbey clergy, of devoting his Saturday afternoons to conducting parties of working men round the abbey and collegiate buildings. His social and personal influence, already unique of its kind, was enormously increased by his removal to London. His circle of friends was constantly widening, and extended from the queen and royal family to the working men of London and elsewhere, some of whom he inspired with a singular devotion. It included men of every denomina- tion, every class, every part of the United Kingdom, and almost of every nation. He was untiring in literary work, and, though this consisted very largely of occasional papers, . lectures, articles in reviews, addresses, and sermons, it in- cluded a third volume of his History of the Jewish Church, a volume on the Church of Scotland, another of Addresses

and Sermons preached in America, and an exceedingly important volume, completed within a few months of his death, on Christian Institutions.

He was continually engaged in theological controversy, and, if his advocacy of all efforts to promote the social, moral, and religious amelioration of the poorer classes and his chivalrous courage in defending those whom he held to be unjustly denounced won him the warm admiration of many of his countrymen, he undoubtedly incurred much and growing odium in influential circles. Among the causes of offence might be enumerated, not only his vigorous defence of one from whom he greatly differed, Bishop Colenso, but his invitation to the holy communion of all the revisers of the translation of the Bible, including a Unitarian among other Nonconformists, as well as the whole tone and teaching of almost every page of his publications. Still stronger was the feeling caused by his efforts to make the recital of the Athanasian Creed optional instead of imperative in the English Church.

In 1874 he spent part of the winter in Russia, whither he and Lady Augusta had gone to take part in the marriage of the duke of Edinburgh. In the spring of 1876, after a long and lingering illness, he lost his wife, the zealous partner of all his social and charitable efforts, and the con- — stant cheerer and sympathizer in his many labours and conflicts. It was a terrible blow, and one from which he never entirely recovered. But in 1878 he was deeply inter- ested by a tour in America, and in the following autumn visited for the last time, with his sister, Mary Stanley, who died before the close of the same year, northern Italy and Venice.

In the spring of 1881 he preached funeral sermons in the abbey on Mr Carlyle and Lord Beaconsfield, winding up with the latter a series of Sermons preached on Public Occasions, mainly on the death or funeral of eminent Englishmen, which form a volume singularly characteristic of his special gifts. He saw also the completion of the latest of his volumes, that already mentioned on Christian Institutions, and was in the course of the summer correct- ing for the press a paper on the Westminster Confession, and preaching in the abbey a course of Saturday Lectures on the Beatitudes. On July 10 he was attacked by a sudden illness, which in a few daysassumed a more alarm- ing character, and ended fatally on the 18th.

The sensa- tion caused by his death was profound and widespread. He was buried in Henry VII.'s chapel, in the same grave as his wife. His pall-bearers comprised representatives of literature, of science, of both Houses of Parliament, of theology, Anglican and Nonconformist, and of the universities of Oxford and Cambridge. The recumbent monument placed upon the spot, and the windows in the

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chapter house of the abbey, one of them a gift from the queen, were a tribute to his memory from friends of every class in England and America.

The influenee of Dean Stanley was no doubt largely due to his marvellous social gifts. His affectionate naturc, his quick and yeady sympathy, his kcen interest in almost every field of know- ledge, his own mental resources, drawn from incessant reading and enriched by travel, observation, and conversation, his familiarity with the persons, places, events, and scenes of history, his tenacious yet discriminating memory, his vivacity and humour, the very charm of his countenance and manner, the delicately sensitive face, "the eye now beaming with sympathy, now twinkling with humour," acted like a spell in winning friends and even in con- eiliating opponents. The courage and fearlessness with which he was always ready to uphold the cause of those whom he held to be unjustly attacked by a powerful or dominant majority was duly appreciated by his countrymen. It may probably be said that no one in the present century was so endeared to so large a circle of

~ personal friends in all parts of the civilized world. His writings

also, apart from their controversial aspect, were of a singularly attractive kind. His Life of Arnold, his Sinai and Palestine, his Lectures on the Jewish Chureh, his Memorials of Canterbury and of Westminster Abbey, would alone have made him one of the most delightful and popular of English authors. His sermons, always interesting and attractive, were at times

singularly eloquent and impressive. His occasional hymns and short poems, full of grace and force, and occasionally of a profound pathos, were fully worthy of his literary position. Throughout all that he ever wrote there is an individuality and a characteristic flavour whieh is saved from manucrism by an inexhaustible freshness of view and a marvellous fertility of illustration. His power of painting the scenes, events, and persons of past history, ‘‘the picturesque sensibility,” to use a phrase applicd to him by Lord Beaconsfield, with which he at once fastened on the main features of an historic building or a famous locality, amounted to genius; they were as marked at the close of his life as in the earliest of his schoolboy letters. They won him readers of every class.

But it would be impossible to speak even briefly of his literary position by itself. To write his life in full would be to give a sketch of English ecclesiastical history for a long generation. Though he resolutely stood aloof from all connexion with party, it is impossible not to recognize even in his least controversial writings the position which he held as, in the eyes of the greatest portion of his countrymen, the leading liberal theologian of his time in England. Throughout his writings in prose or poetry, on almost every subject which he touched, we see the impress, not only of his distinctive genius and of his extraordinary gifts, but also of his speeial views, aims, and aspirations. It may be well to describe these as nearly as possible in his own words. He looked on the age in which he lived as one of mingled hope and gloom, as

_ aperiod of transition, to be followed either by an “ eclipse of faith ”

—a “winter of unbelief’—or by a “revival of Christianity in a wider aspect,” a ‘‘catholic, comprehensive, all-embracing Christi- auity” that ‘‘might yet overeome the world.” He believed, and was never tired of asserting his belief, “that the Christian church had not yet presented its final or its most perfect aspect to the world”; that ‘‘the belief of each successive age of Christendom had as a matter of fact varied enormously from the belief of its predecessor”; that ‘all confessions and similar documents are, if taken 4% final expressions of absolute truth, misleading”; that each “successive form of theology is but the approximation to the truth, not the whole truth itself”; that it was ‘‘the glory of the church to be always

advancing to perfection”; and that ‘‘ there still remained, behind all the controversies of the past, a higher Christianity which neither assailants nor defenders had fully exhausted.”

Already even in his early Sermons on the Apostolic Age, as in Sinai and Palestine, as in the volumes on the Jewish Church, “one increasing purpose” may be recognized. Everywhere we see the sustained effort to ‘‘ bring the events, places, and characters of sacred history within the domain of actual observation and history,” and to reseue them from ‘‘the conventional haze in whieh they had been veiled by a misplaced reverence.” ‘‘ The first duty of a modern theologian” he held to be ‘‘to study the Bible, not for the sake of making or defending systems out of it, but for the sake of discovering what it actnally contains.” “In a faithful study of that virgin mine, the yet insufficiently explored records of the Old and New Testament, lay,” he held, “the best hope of the church of Christ,” and another and a different estimate “of the points on which Scripture lays its most emphatic stress.” To this study he looked for the best hope of such a progressive develop- ment of Christian theology as should avert the danger arising from “the apparently increasing divergence between the intelligence and the faith of our time,” “and should enable the church to deal wisely with new questions which ancient theology had for the most part not even considered.” On the direetion which this develop- ment of theology should assume the last word had not, he knew,

been spoken; but he enforced the duty “of placing in the back- ground whatever was accidental, temporary, or sccondary, and of bringing into due prominence what was primary and essential.” In the former group Stanley would, without doubt or hesitation, have placed:all questions connected with Episcopal or Presbyterian orders, or that deal only with the outward forms or ceremonies of religion, or with the authorship or age of the books of the Old Testament. Even to the question of miraculous and external evidence he would have been inclined to assign a secondary place, as well as to the most elaborate statemeuts of Christian doctrine.

The foremost and highest place, that of the ‘‘ essential and supernatural ” elements of religion, he would have reserved for its moral and spiritual

truths, ‘‘its chief evidence and ehief essence,” ‘the truths to be drawn from the teaching and from the life of Christ,” in whose character he did not hesitate to recognize ‘‘ the greatest of all miracles.” On a large development of Christian teaching in this direction he based all his hopes alike of the pro- gress of the world and of the restitution to Christian theology— “fas something greater and vaster than the theology of. each particular chureh or age,” ‘‘as comprehending all the wholesome elements of thought at work in the world ”—of ‘‘ its natural aseend- ency over the minds of educated men,”

With such views it was not to be wondered at that, from first to last, he never lost an opportunity of supporting a policy of width, toleration, and comprehension in the Church of England. The view which he took in his earliest directly controversial work, his Essay on the Gorham Judgment (1850), as regards both the protec- tion offered by the law to the clergy against “the inquisition of arbitrary prelates and of tumultuous synods,” and ‘‘on the designedly mixed and comprehensive character of the English formularies and English Church,” has already been fully indicated. The same spirit and the same aims guided his line of conduct in other controversies, such asin that on the Lssays and Reviews, on the ritualistic movement, on the question of subscription, on the successive attacks made on men so wholly different from each other as Prof. Maurice, whose influence on the mind of his gene- ration has yet to be fully cstimated, and Bishop Colenso, and in his vain but earnest advocacy of the optional instead of the com- pulsory use of the Athanasian Creed. So again he was always eager to insist on the essential points of union between various denominations of Christians, however apparently divided or estranged; and to recognize the special services conferred on the world, not only by the Eastern, the Roman, the Lutheran, and the Reformed Churches, not only by the Presbyterian Churches of Scotland, but also by the Baptist and Congregational Churches of England and America, and by the community of Quakers. And, while in this respeet he was keen almost to exeess to note points of agreement, so in the very latest volume which’ he published one of his main aims was “‘to look the facts of history in the face” and to point out ‘‘the almost universal departure from primitive usage,” ‘‘the transformation both of letter and spirit through whieh the greatest Christian ordinances had already passed,”’ and ‘‘to fix the cye steadily on the germs

of trnth that were conmmon to the. different forms which the ordinances wore, the moral and spiritual realities for the sake of whieh alone (if Christianity be the universal religion) such forms exist." He was throughout his life an unflinching advocate of the connexion between church and state. By this he understood—(1): ''the recognition and support on the part of the state of the religious expression of the faith of the community," and (2) ''that this religions expression of the faith of the community on the most sacred and most vital of all its intcrests should be controlled and guided by the whole community through the supremacy of law." In the supremacy of the crown, #.e., of law, "over all causes and all persons, ecclesiastical as well as civil," so far from finding "' galling ehains" or ''ignominious bondage," he welcomed it not only as being '' the most powerful and intelligent organ of the whole com- munity," but on two other grounds. First, he considered that supremacy more likely '' to be truly wise and truly just and there- fore truly Christian than the headship either of a bishop or of a synod of any clerical or sectional body," and, secondly, ''as the best security for that gradual growth of religious forms and religious opinions, and for that free expression of individual belief, which is indispensable to any healthy development of religions life and religious truth." At the same time he was in favour of making the ereed of the church as wide as possible,—'' not narrower than that which is even now the test of its membership, the Apostles' Creed,"—and of throwing down all barriers which could be wisely dispensed with to adinission to its ministry. As an immediate step he even advocated as '"'an unmixcd good" "the admission under due restrictions of our nonconforming brethren of England, and our Presbyterian brethren of the Scottish Church," to preach in Anglican pulpits. To the last hour of his life he looked with dismay to the prospect of a combined assault by a triple alliance of the representatives ''of the Puritans, of Voltaire, and of Land" on ''that rare combination which with all its shortcomings exhibits one of the noblest works which God's providence, through a long

course of years, has raised up in Europe," ''ou the most venerable growth of English history, the framework which has sheltered down to this time the freedom of the freest, the teaching of the most learned, and the reason of the

most rational church in Christendom." He believed that the ''success of such an attack would result in throwing away the best opportunity which the world affords for the growth side by side of intellectual activity and religious earnestness"; that to destroy it would be, as he said of the Established Church of Scotland, ''to destroy, so far as human efforts can destroy, the special ideas of freedom, of growth, of comprehension, which are inherent in the very existence of a national churcli"; that its destruction would only produce ''an enslaved clergy amidst an indifferent laity," and tend to degrade the Church of England from its historic position "'to that of an illiterate sect, or a satellite of the Church of Rome."

With such views it was impossible that Stanley could have found much sympathy from either of the two great parties among the English clergy. Indeed it was impossible that any party, or any community, which placed the essence of Christianity in the careful guardianship of any circle of theological doctrines could feel in harmony with one who dwelt with such exceeding and growing emphasis on the secondary nature, not only of all that was cere- monial, but on much that was dogmatic, as compared with that which was spiritual and moral.

By the '' Evangelical" section of the religious world the bio- grapher of Arnold had been looked on from the first with more than suspicion. Later on, even the mode and form of his defence of their own side in the Gorham controversy, his avowed advocacy of a wide freedom of thought on many questions, especially those connected with Biblical criticism, his attitude towards such sub- jects as inspiration, justification, and future punishment, were more than distasteful. His loud acknowledgment of the debt owed by Christendom to German theology, ''to the most laborious, truth- seeking, and conscientious of Continental nations," his persistent claims for a place within the Church of England for views that "went to the verge of Rome," the more than width—the universality —of his religious sympathies, his delight in placing, not Walter Scott only, or Tennyson, or the author of Hece Homo, but Goethe, and Burns, and Matthew Arnold, and J. Stuart Mill in the ranks of religious teachers, were naturally repugnant to those who cared to read his works, and were not content to shrink in silent dismay from the warm sympathizer with Professor Maurice, the enthusi- astic admirer of F.

Robertson, and the apologist in turn of Essays and Reviews and of Bishop Colenso.

Against the feelings provoked by this aspect of his theological position, neither his acknowledged services to Biblical study, nor his profound and entire belief in the true key to the difficulties of the future being involved in the prosecution of that study, nor his sympathy with their own views as to the relation of the individual soul to God, nor his repeated, his almost daily assertions of the sacredness and value of the gospel history, or of the regenerative power of the Divine life and person of Christ as the ‘‘one Master worth living for, worth dying for,” could avail much. Whatever the feelings of individuals, the organs of the party of whose once imperilled claim to remain within the fold of the Church of England he had been the staunchest upholder spoke of him from first to last with almost unqualified aversion. He was, or became in due time, even more obnoxious to at least the more advanced section of the High Church party. Nor was this to be wondered at. The differences between him and them were vital and funda- meutal; and, even where he defended their right—at one time repeatedly challenged—to maintain their distinctive views and observances in the Church of England, he rested their claim on grounds which would hardly win their approval or gratitude. The more clear-sighted of their leaders felt that, if the points of ceremonial, of dress, posture, attitude, ritual, on which they laid exceeding stress, were treated by him with toleration, they were regarded with an indifference that verged upon contempt, as tolerabiles ineptiw, and that he delighted to trace their historical development, and to strip them of all that was essential, signi- ficant, or primitive. They felt even more strongly that in that which, to the leaders at least, gave their real interest and im- portance to all questions of vestments or observances, and even underlay some of the most important questions of religious doc- trine, —the very cxistence of an order of priesthood as the divinely and exclusively commissioned channel of communication between God and man,—the rejection on the part of Stanley of their most cherished and central dogma was absolute and uncompromising. And the difference of view was vital. Much else in his writings might have been welcomed or condoned. His love for the past, his deep and full synipathy with much in the medieval church, his warm admiration for many of its saints and heroes, his aversion to mere iconoclasm, his poetic and imaginative sensibility, had

much to attract them. Even in his treatment of many important religious subjects it was often not so much his actual sentiments as the tendency—the more than tendency, the avowed aim—of all his writings to promote freedom of inquiry and of thought, rather

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than submission to church authority, which provoked hostility. But on this question there was no room for compromise. That which they and he alike recognized as the fundamental tenet to which all their distinctive teaching pointed he spoke of as a belief ‘*that they (the clergy) were the depositaries of mystical, super- natural, almost magical influence, independent of any moral or spiritual graces,” and on this point he spoke with no doubtful voice, It was, he said, this belief in a “‘ fixed, external, necessary medium on earth between the soul and God which, if he had rightly read the Psalms of David, the epistles of Paul and the gospel of Christ, true religion is always striving to dispense with,” and “‘the more it can be dispensed with, the nearer and the higher is the com- munion of the human spirit with its Maker and its Redecmer.” And this language (used in 1867) was in entire accordance with the manner in which in his latest volume (1881) he hinted at the possi- bility of ‘‘the growing materialism of the ecclesiastic sacristy so undermining the spiritual element of almost the only external ordinance of Christianity (the Eucharist), unquestionably the greatest religious ordinance in the world,” ‘‘as even to endanger the ordinance itself.” In addition to this fundamental divergence of view, it must be remembered that it was to this party, as the representatives of one ‘‘always forgetful in its gratitude and im- placable in its vengeance,” that he looked for the main danger to freedom of thought and width of comprehension in the future, and that he did not hesitate to remind them, even as he supported their claims to the largest possible interpretation of the Articles, that they ‘‘claimed a latitude themselves which they constantly refused to others.” It will be easily understood therefore that whatever influence Stanley wielded in the church was wholly in- dependent of either of the two great parties into which he found it mainly divided, above all of that which at the time of his death appeared to be every year growing in power and confidence.

What was the extent, what the permanent force of his own influence, is a question not easily answered at present. ‘‘ Dean Stanley,” said Dr Story, “stood higher in the respect and affection of a larger and more varied circle of members of many churches than any ecclesiastic in the world.” It is not easy to disengage his personal and social charm, the affection borne him by all who had even momentarily passed within the circle of his striking and attractive individuality, the warm feelings which much in his life, much in his writings, had called forth from multitudes who never saw him, from the more abiding impression made during his lifetime and after his death by the writings which he has left behind him. Yet if, setting aside one single name, that of Prof. Maurice, he be taken as the most prominent, the most fertile, the most gifted, and the most impressive exponent and defender of liberal theology, some estimate may be formed even now of the mark which he made upon his age. It would be easy to under- value the effect of the work which he did. It might seem at first sight as if his own gloomier anticipations had been fulfilled. He spoke from time to time of a danger of the age being overwhelmed, now by ‘‘a general return of forgotten superstitions,” now “bya general chaos of incredulity,” and of himself as ‘‘having perhaps done no more than make good a starting point for those who come after us, perhaps in the 20th or 2ist century.” He might have seemed to enter into the spirit of his father’s words, ‘‘ My only hope and consolation is that I am a pioneer for better days, and that the seed which I aim, as far as can be, at sowing may bring forth fruit when I am gone to a better and more peaceful world.” But such a view would be to a large extent superficial. If the success achieved by the cause of which Stanley was the main representative is carefully weighed, it will be found to be great in solid and direct results, far greater probably in those which are less easily summed up and tabulated. On the questions which he had most at heart, the real and careful and critical study of the sacred records, the progress made since he first lectured as a tutor at Oxford on the Old and New Testaments has been enormous. The large majority of the works published have been written more or less in the spirit in which he would have largely or entirely sympathized. It may be added that of these there are few which would not have encountered, if not fierce criticism, yet at least grave suspicion, some forty years ago. The combination of a reverent treatment of Holy Scripture with fearless inquiry into all questions connected with its criticism is a new birth im English literature. It is one in which he took a leading part, and in

the defence of which he bore, sometimes in his own behalf, oftener in chivalrous defence of others, much of the brunt of the earlier and later contests. The impulse which he gave to the study alike of the Bible and church history was a great one. In each he may be recognized, not of course as the originator, but as the representative, of a new school of thought and of treatment, and those who are most familiar with his writings can hardly open a new book by any English theologian, hardly read_a sermon of many preachers, above all on any portion of the Old Testament, in which they do not trace his immediate influence. He may be said in a very true sense to colour the writings of many of those who most differ from him, The subjects to which he looked as

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the most essential of all—the universality of the Divine love, the supreme importance of the moral and spiritual elements of religion, the supremacy of conscience, the sense of the central citadel of Christianity as being contained in the character, the history, the spirit of its Divine Founder—have beyond doubt, if not yet taken fully the place which he claimed for them, yet impressed them- selves more and more on the teaching and the preaching of every elassof clergy inthe church. They have lifted the teaching of those who most differed from him far above the level of a mechanical or merely ceremonial form of medieval worship. The great cause too for which he strove so hard, that of comprehension and mutual toleration, the true ‘‘enlargement of Christ’s church,” has gained much from his efforts,—much in the present, and perhaps, in spite of some appearances to the contrary, more in the future. What- ever storms of party strife may be in store for the church, active and energetic Christians of opposite parties no longer waste their energies in mutual attacks, but have lcarned to work together in Christian teaching and in works of Christian beneficence. His surviving friends may rejoice to remember that no one person had, for, it may be, many generations, done so much as Stanley to draw together in friendly and social intercourse the leaders of various religious partics and of different denominations of Christians. Those who live, and feel that they live, in an age of transition eannot venture to prophesy the precise form and

colour of the religious movement which will in due time succeed that which now seems to be the most prevalent and the most outwardly active. But they may be permitted to hold that its main features were descried and anticipated, even if dwelt on with excessive emphasis, by Stanley, to believe that the next phase of a Christian theology which shall regain a due ascendency over the thought and intell1- gence of the civilized world will be embodied in some larger realization of ‘‘the one unchangeable element in Christianity,” of the witness borne by the teaching and life of Christ to the higher and spiritnal nature and destinies of man and to the “principles of freedom, justice, toleration, beneficence, self-denial, universal sympathy, and fearless love of truth, in which all the hopes of a true and permanent development of Christian theology must take their stand.” None will have laboured more earnestly in this cause than Arthur Stanley. (G. G. B.)

STANTON, Epwin M‘Masters (1833-1869), American statesman, was born in Ohio, December 19, 1814, graduated at Kenyon College in 1833, and was admitted to the bar of his native State. Just at the end of Buchanan’s ad- ministration in 1860-61, Stanton was called upon to act as attorney-general. In 1862, after the inauguration of Lincoln, the new president, who had had great difficulties with his war office, placed Stanton at its head, where he was at home at last. His intense vigour, excellent organ- izing powers, and scrupulous honesty were the life of the Federal war department throughout the Civil War; and it may be worth while to note that, after living through boundless opportunities of peculation, he died, like most of the public servants of the United States, a poor man. In spite of his many services to the country, it was not always easy for his associates to get on with him com- fortably ; and his quarrels with President Johnson were especially bitter in 1867-68, ending in the impeachment of Jonson by the House of Representatives. On the acquittal of the president Stanton resigned, and resumed the practice of law. President Grant, in 1869, made him @ justice of the supreme court; but his work during the war had worn him out, and he died December 24, 1869.

STARAYA RUSSA, a district town of Russia, in the government of Novgorod, 62 miles to the south of that city, on the river Polist, by means of which and Lake Ilmeii it is brought into easy steamer communication with St Petersburg. Some brine springs, of no great strength, on the eastern side

of the town, were used as a source for the supply of salt as late as 1865, yielding about 50,000 ewts. annually ; at present they are used only as mineral waters, having a great resemblance to those of Kreuznach. Some thousands of visitors resort to them every summer, and owing to this circumstance Staraya Russa is better built and kept than any other town in Novgorod. The 13,100 inhabitants are supported chiefly by the summer-visitors. About 100 individuals in all employ theinselves in brick-making, tanning, and sawing timber, and there

is a trade in rye, oats, and flax shipped to St Petersburg to the value of about £50,000 per annum.

The name of Staraya Russa occurs in the Russian annals as far back as 1167. It was one of the minor towns of the republic of Novgorod, and suffered continually in the wars for possession of the region between Russia, Lithuania, and Livonia. It was after- wards annexed to Moscow.

STARCH is an organized product of the vegetable kingdom, forming one of the most important and characteristic elements of plant life, and an abundantly stored reserve material for the discharge of vegetative functions. It originates within the living vegetable cell through the formative activity of chlorophyll under the influence of light, and is consequently an unfailing characteristic of all plants containing that body (compare PuysIoLocy, vol. xix. p. 54). Starch found within leaves and other green parts of plants is assimilated and trans- formed with great rapidity; accumulations of it are carried as starch-formers, and redeposited as starch in special reservoirs or portions of plants as the period of maturity approaches. In this way the body is found to gorge the stems of certain palms—the sago, &c.—just before these plants begin to form their fruit; it is the principal con- stituent of the underground organs of biennial and peren- nial plants, tap-roots, root-stocks, corms, bulbs, and tubers ; and it is abundantly stored in many fruits and seeds, as in the cereals and pulses, in bananas, bread-fruit, &c. It occurs in minute granules varying in diameter from 1 to 100 and even 200 micromillimetres; and the granules from different sources have each a distinct microscopic character, their forms and size being, however, affected according as they are aggregated in clusters or individually formed (see vol.

ii. p. 631, figs. 3 to 6). Under the micro- scope these granules are seen to consist of a nucleus or hilum surrounded by layers arranged concentrically or ex- centrically, and the relations of hilum and layers are the most distinctive features of individual starches. Whether the hilum point bears to the granule the relation of a nucleus is a matter of dispute, the general opinion being that the grains are formed from without inwards, the centre being invariably the softest and most soluble portion, while the outer layers are most closely related to cellulose. Starch consists of a white or yellowish-white glistening powder, which on being rubbed between the fingers emits a crackling sound. It is only slightly acted on by cold water, but under the influence of heat in water it swells up, forming according to the proportions of starch and water a clouded opalescent paste. Iodine acts on it in water by producing a brilliant blue coloration, this reaction forming a very delicate and characteristic test. Diastase and dilute boiling sulphuric acid convert starch into a form soluble in hot water, whence it passes into a series of easily soluble dex- trins, and finally into the condition of the sugars, dextrose and maltose. In its chemical relations starch consists of an intimate mixture of two isomeric bodies,—granulose and starch cellulose, —or rather of a series of gradations from the one to the other, the starch cellulose being principally in the external layers, while the granulose is found in the central portions of the granules. Starch cellulose is a body intermediate between granulose and ordinary cellulose ; from the latter it is distinguished by being reducible to soluble starch by boiling in water and by digesting in caustic alkali. Together, the substances consist of a com- bination of carbon with hydrogen and oxygen, the com- monly received formula being C,H,0,+2H,O; but Nageli, Sachsse, and many other recent investigators show reason why the molecule should be regarded as consisting Of Cg Oneal 2,0.

As an economic product starch in its separate condition is a most important alimentary substance, the chief pure

food starches being ARRowRoorT, Saco, Tapioca (9q-0-); and corn-flour, the starch of the Maize (q.v.). In its combined condition, in cereals, &c., starch is certainly the greatest and foremost of all the elements of nutrition

(com- pare Dinrerics and Nurririon). In its. other industrial relations starch is used—(1) directly, as a thickening material in calico printing, for the dressing and finishing of many textiles, for laundry purposes, adhesive paste, and powder ; and (2) indirectly, for the preparation of dextrin and British gum and starch sugar. Maize, wheat, and rice starch are principally employed for the direct applications ; and for the dextrin and starch-sugar manufacture potato starch is almost exclusively selected.

Iu the preparation of starch the object of the manufacturer is to burst the vegetable cell walls, to liberate the starch granules, and to free them from the other cell contents with which they are associated. When, as in the case of the potato, the associated cell contents, &c., are readily separated by solution and levigation the manufacture is exceedingly simple. Potato starch is prepared principally by carefully washing the potatoes and in a kind of rasping machine reducing them toa fine pulp, which is deposited in water as raw starch. The impurities of this starch—cellulose, albuminoids, fragments of potato, &c.—are separated by washing it in fine sieves, through the meshes of which the pure starch alone passes. The sieves are variously formed, some revolving, others moving horizontally or in such manner as to keep the material in agitation. Thestarch is then received in tanks, in which it settles, and so separates from the soluble albuminoids and salts of the potatoes. The settling of the starch is much retarded by the dissolved albuminoids, and to hasten the separation small quanti- ties either of alum or of sulphuric acid are employcd. Alum coagulates the albumen and to that extent contaminates the starch, while the acid acts on the starch itself and is difficult of neutralization. After the starch has settled, the brown-coloured supernatant liquor is drawn off and the starch again washed either in tanks or in a centrifugal machine. Finally it is dried by spreading it in layers over porous bricks (a process not required in the case of starch washed in a centrifugal machine) and by exposure to the air, after which it still retains a large proportion of water, but is in a condition for making dextrin or starch-sugar. For further drying it is ground to a rough powder, and dried thoroughly in a hot chamber, then reduced to a powder and sifted. A method of reducing potatoes to a pulp by slicing and heaping them up till fermentation takes place is said to give a large yield of starch, but it is not much practised.

In dealing with the starches of the cereals, there is greater difficulty, owing to the presence of gluten, which with water forms a tough elastic body difficult of solution and removal. The difficulty is experienced in greatest measure in dealing with wheat, which contains a large proportion of gluten. Wheat starch is separated in two different ways—(1) the fermentation method, which is the original process, and (2) by mechanical means without preliminary fermentation. In the fermentation process whole wheat or wheaten meal is softened and swollen by soaking in water. Wheat grains are, in this condition, ground, and the pulp, mixed to a thickish finid with water, is placed in tanks, where it ferments, developing acctic and volatile acids which dissolve the gummy constituents of the wheat, with part of the gluten, and render the whole less tenacious. After full fermentation, the period of which varies with the weather and the process employed, the starch is separated in a washing drum. It is subsequently washed with watcr, which dissolves out the gluten, the starch scttling in two layers,—one comparatively pure, the other mixed with gluten and some branny particles. These layers are separated, the second undergoing further washing to remove the gluten, &c., and the remaining operations are analogous to those employed in the preparation of potato-starch. By the mechanical process wheaten flour is kneaded into a stiff paste, which, after resting for an hour or two, is washed over a fine sieve so long as the water passing off continues milky, whereby the starch is liberated and the greater part of the gluten retained as a gluey elastic mass in the sicve. The starch is subsequently purified by fermentation, washing, and treatment in centrifugal machines. The gluten thus preserved is a useful food for diabetic patients, and is made with flour into artificial macaroni and pastes, besides being valuable for other industrial purposes.

Maize starch is obtained by analogous processes, but, the pro- portion of gluten in the grain being smaller, and less tenacious in its nature, the operations, whether chemical or mechanical, present fewer difficulties. Under one method the separation of maize starch is facilitated by steeping, swelling, and softening the grain ina weak solution of caustic soda, and favourable results are also obtained by a process in which the pulp from the crushing mill is treated with water acidulated with sulphurous acid.

In the preparation of rice-starch a weak solution of caustic soda is also employed for softening and swelling the grain. It is then washed with pure water, dried, ground, and sifted, and again treated with alkaline water, by which the whole of the nitrogenous — constituents are taken up in soluble form. An acid process for obtaining rice-starch is also employed, under which the grain, swollen and ground, is treated repeatedly with a solution of hydrochloric acid, which also dissolves away the non-starchy con- stituents of the grain. The laundry starches now in_ use are principally made from rice and from pulse. (J. PA.)

STAR-CHAMBER, the name given in the 15th, 16th, and 17th centuries to an English high court of justice, consisting of the members of the ordinary council, or of the privy council only, with the addition of certain judges, and exercising jurisdiction, mainly criminal, in certain cases, The origin and early history of the court are somewhat obscure. The Curia Regis of the 12th century, combining judicial, deliberative, and administrative functions, had thrown off several offshoots in the Court of King's Bench and other courts, but the crown never parted with the supreme jurisdiction whence the subsidiary courts had emanated. When in the 13th century the council became a regular and permanent body, practically distinct from the parliament of estates, this jurisdiction continued to be exercised by the king in council. As the ordinary law- courts became more systematic and important, the inde- finite character of the conciliar jurisdiction gave rise to frequent complaints; and efforts, for the most part fruitless, were made by the parliaments of the 14th century (eg., in 15 Edw. II. and 2 Edw. IIL) to check it. The equitable jurisdiction of the chancellor, which grew up during the reign of Edward III., flowed from this supreme judicial power, like the common law- courts under Henry II., but without drying up the original source. It is in the reign of Edward ILI. that we first hear of the 'chancellor, treasurer, justices, and others" exercising jurisdiction in the "star-chamber" or "chambre de estoiles" at Westminster. In Henry VI's reign one Danvers was acquitted of a certain charge by the king's council "in camera stellata." Hitherto such Acts of Parliament as had recognized this jurisdiction had done so only by way of limitation or prohibition, but in 1453, about the time when the distinction between the ordinary and the privy council first became apparent, an Act was passed by which the chancellor was empowered to enforce the attendance of all persons summoned by the privy

seal before the king and his council in all cases not determinable by common law. At this time, then, the jurisdiction of the council was recognized as supplementary to that of the ordinary law-courts. But the anarchy of the Wars of the Roses, and the decay of provincial justice owing to the influence of great barons and the turbulence of the lower classes, obliged parliament to entrust wider powers to the council. This was the object of the famous Act of 3 Hen. VII., which was quoted by the lawyers of the Long Parliament as creating the court of star- chamber. This, however, as is shown above, it was far from doing. The Act of 3 Hen. VII. empowered @ committee of the council, consisting of the chancellor, treasurer, privy seal, or any two of them, with the chief justices, or in their absence two other justices, a bishop, and a temporal lord, to act as a court of justice for enfore- ing the law in cases where it was thwarted by bribery, intimidation, or partiality. The jurisdiction thus entrusted to a committee of the council was not, therefore, like that granted in 1453, supplementary, but superseded the ordinary law-courts in cases where they were too weak to act. The Act simply supplied machinery for the exercise under special circumstances of that extraordinary penal jurisdiction which the council had never ceased to possess. This jurisdiction, Bacon tells us, was still further developed and organized by Wolsey. The court established by the

Act 3 Hen. VII. continued to exist for about fifty years, but disappeared towards the end of Henry VIII.’s reign. Its powers were not lost, but fell back to the general body of the council, and were among the most important of those exercised by the council sitting in the star- chamber. A court not unlike that created in 3 Hen. VII. was erected in 1540. The Act of 31 Hen. VIII., which gave the king’s proclamations the force of law, enacted that offenders against them might be punished by the usual officers of the council, together with some bishops and judges, “in the star-chamber or elsewhere.” These powers also came after a time, like those granted in 1488, to be exercised by the council at large instead of by certain members of it. It is clear, however,—and this was one of the chief complaints against the court,—that the jurisdic- tion which belonged by law or custom to the whole body of the king’s council was usurped at this time by the inner body of advisers called the privy council, which had engrossed all the other

functions of the larger body. Sir T. Smith (temp. Eliz.) tells us that juries misbehaving “were many times commanded to appear in the star- chamber or before the privy council for the matter.” The uncertain composition of the court is well displayed by Coke, who says that the star-chamber is or may be com- pounded of three several councils—(1) the lords and others of the privy council, (2) the judges of either bench and the barons of the exchequer, (3) the lords of parliament, who are not, however, standing judges of the court. Hudson (temp. Car. I.), on the other hand, considers that all peers had a right of sitting in the court. The latter class had, however, certainly given up sitting in the 17th century. The jurisdiction of the court was equally vague, and, as Hudson says, it was impossible to define it without offending the supporters of the prerogative by a limitation of its powers, or the common lawyers by attributing to it an excessive latitude. In practice its jurisdiction was almost unlimited. It took notice of maintenance and liveries, bribery or partiality of jurors, falsification of panels or of verdicts, routs and riots, murder, felony, forgery, perjury, fraud, libel and slander, offences against proclamations, duels, acts tending to treason, as well as of a few civil matters,—disputes as to land between great men or corporations, disputes between English and foreign merchants, testamentary cases, &c.,—in fact, ‘all offences may be here examined and punished if the king will” (Hudson). Its procedure was not according to the common law; it dispensed with the encumbrance of a jury ; it could proceed on mere rumour or examine wit- nesses ; it could apply torture ; it could inflict any penalty short of death. It was thus admirably calculated to be the support of order against anarchy or of despotism against individual and national liberty. During the Tudor period it appeared in the former light, under the Stuarts in the latter. It was abolished by the Long Parliament in 1641, and was never afterwards revived.!

Authoritics.—Smith, Commonweaith of England; Bacon, Reign of Henry VII.; Hudson, Treatise of the Court of Star-Chamber (Col- lectanea Juridica, vol. ii.); Hallam, Const. Hist. of England ; Gneist, Engl. Verfassungsgeschichte; Dicey, The Privy Cowncil (Arnold Prize Kssay), ‘The pleadings in the star-chamber are in the Record Office ; the decrees appear to have been lost. (G. W. P.)

STARGARD, an ancient manufacturing town in eastern Pomerania, Prussia, is situated on the left bank of the navigable Ihna, 20 miles to the east of Stettin. Formerly a member of the Hanseatic League, the town retains memorials of its early importance in the large church of

‘ The name is probably derived from the stars with which the roof of the chamber was painted; but it has also been derived from a Hebrew word shetar, or sh’tar, a bond, on the supposition that the room was that in which the legal documents connected with the Jews were kept prior to their expulsion by Edward I.

St Mary, built in the 14th and 15th centuries, the 16th- century town-house, and the well-preserved walls with gateways and towers dating from the 14th century. The extensive new law-courts and three large barracks are among the modern buildings. Stargard has a consider- able market for cattle and horses, and carries on trade in grain, spirits, and raw produce. Its manufactures include cigars, tobacco, wadding, and stockings; and there are also iron-foundries and linen and woollen factories in the town. The population in 1885 was 22,109 (in 1816 8706), of whom about 730 were Roman Catholics and about 560 Jews.

Stargard, mentioned as having been destroyed by the Poles in 1120, received town-rights in 1229, and became the capital of eastern Pomerania. As a Hanseatic town it enjoyed considerable commercial prosperity, but had also to undergo siege and capture in the Middle Ages and during the Thirty Years’ War. In 1807 it was taken by Schill. The name Stargard (from the Slavonic Starograd or Starigrod, meaning “old town”) is common to several other towns in the north of Germany, of which the chief are Prussian Stargard, near Dantzic, and Stargard-in-Mecklenburg.

STARLING (A.S. Ster, Stearn, and Sterlyng; Lat. Sturnus; Fr. Etourneau), a bird long time well-known in most parts of England, and now, through the exten- sion of its range within the present century, in the rest of Great Britain, as well as in Ireland, where, though not generally distributed, it is very numerous in some districts. It is about the size of a Thrush, and, though at a distance it appears to be black, when near at hand its plumage is

seen to be brightly shot with purple, green, and steel-blue, most of the feathers when freshly grown being tipped with buff. These markings wear off in the course of the winter, and in the breeding-season the bird is almost

spotless. It is the Stwrnus vulgaris of ornithologists.

To describe the habits of the Starling® within the limits here allotted is impossible. A more engaging bird scarcely exists, for its familiarity during some months of the year gives opportunities for observing its ways that few others afford, while its varied song, its sprightly gestures, its glossy plumage, and, above all, its character as an insecticide—which last makes it the friend of the agriculturist and the grazier—render it an almost universal favourite. The worst that can be said of it is that it occasionally pilfers fruit, and, as it flocks to roost in autumn and winter among reed-beds, does considerable damage by breaking down the stems.* The congrega- tions of Starlings are indeed very marvellous, and no less than the aerial evolutions of the flocks, chiefly before settling for the night, have attracted attention from carly times, being mentioned by Pliny (Hist. Naturalis, x. 24) in the 1st century. The extraordi- nary precision with which the crowd, often numbcring several hundreds, not to say thousands, of birds, wheels, closes, opens out, rises, and descends, as if the whole body were a single living thing— all these movements being executed without a note or cry being uttered—must be seen to be appreciated, and may be seen repeatedly with pleasure. For a resident, the Starling is rather a late breeder. The nest is commonly placed in the hole of a tree or of a building, and its preparation is the work of some little time. The eggs, from 4 to 7 in number, are of a very pale blue, often tinged with green. As the young grow they become very noisy, and their parents, in their assiduous attendance, hardly less so, thus occasionally making themsclves disagreeable in a quiet neighbourhood. The Starling has a wide range over Europe and Asia, reaching India; but examples from Kashmir, Persia, and Armenia have been considered worthy of specific distinction, and the resident Starling of the countries bordering the Mediterranean is generally regarded as a good species, and called S. wnicolor from its unspotted plumage.

Of the many forms allied to the genus Sturnus, some of

which have perhaps been needlessly separated therefrom, those known as Grackies (vol. xi. p. 26) have been already mentioned, and there is only room here to notice one other, Pastor, containing a beautiful species P. rosews,

2 They are dwelt on at some lengthin Yarrell's British Birds, ed, 4, vol. ii. pp. 229-241.

3 A most ridiculous and unfounded charge has been, however, more than once brought against it—that of destroying the eggs of Skylarks. There is little real evidence of its sucking eggs, and much of its not doing so; while, to render the allegation still more absurd, it has been brought by a class of farmers who generally complain that Skylarks themselves are highly injurious.

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the Rose-coloured Starling, which is not an unfrequent visitor to the British Islands.

the chemical factories are in private hands. About 2000

It isa bird of most irregular | workmen are employed in the Stassfurt salt-industry, and

and erratic habits—a vast horde suddenly arriving at some | about 490,000 tons of raw salt are annually excavated, place to which it may have hitherto been a stranger, and | The population of the town, which contains one or two

at once making a settlement there, leaving it wholly deserted as soon as the young are reared. 'This happened in the summer of 1875 at Villafranca, in the province of Verona, the castle of which was occupied in a single day by some 12,000 or 14,000 birds of this species, as has been graphically told by

Sig. de Betta (Ati del FR. Ist. Veneto, ser. 5, vol. ii.);+ but similar instances have been before recorded,—as in Bulgaria in 1867, near Sniyrna in 1856, and near Odessa in 1844, to mention only some of which particulars have been published.? (A. N.)

STARODUB, a district town of Russia, in the govern- ment of Tchernigoff, 116 miles to the north-east of that town, on the marshy banks of a small tributary of the navi- gable Sudost. It is regularly built, with broad straight streets, the houses being surrounded by large gardens. Its 23,890 inhabitants —Little Russian descendants of former Cossacks, with about 5000 Jews— support themselves chiefly by gardening and agriculture. Tanning is also carried on, and the trade in corn and hemp exported to Riga and St Petersburg has some importance.

Starodub at one time played a prominent part in the history of the Ukraine. As early as the 11th and 12th centuries it was a bone of contention between different Russian princes, who appre- ciated the value of its strategic position. Thc Mongols seem to have destroyed it, and its name does not reappear till the 14th century. During the 15th and 16th centuries the Russians and Lithuanians were continually disputing the possession of its fortress, a a the beginning of the 17th century it became a stronghold of

oland.

STARO-KONSTANTINOFF, a district town of Russia, in the government of Volhynia, situated 121 miles to the west-south-west of Zhitomir. It is an old-fashioned, poorly built town, dating from the 16th century, and is often mentioned in history in connexion with the rising of Cossacks under Bogdan Khmeluitzky. Owing to its excellent position close to the Austrian frontier and its railway communication with south-west Russia, it has a very active trade in corn, cattle, and salt with Austria, Prussia, and Poland. Its population (17,980 in 1884, of whom two-thirds were Jews) is rapidly increasing.

STASSFURT, a town in the Prussian province of Saxony, and one of the chief seats of the German salt- producing industry, is situated on both sides of the Bode, 19 miles to the south-west of Magdeburg. Although saline springs are mentioned here as early as the 13th century, the first attempt to

bore for salt was not made until 1839, while the systematic exploitation of the salt- beds, to which the town is indebted for its prosperity, dates only from 1856. The shafts reached deposits of salt at a depth of 850 feet, but the finer and purer layers lie more than 1100 feet below the surface. Besides the rock-salt, which is excavated by blasting, the saline deposits of Stassfurt yield a considerable quantity of deliquescent salts and other saline products, which have encouraged the foundation of numerous chemical factories in the town and in the neighbouring village of Leopolds- hall, which stands upon Anhalt territory. The formation of the Stassfurt salt-beds and the composition of the rock- salt are described under Sar (vol. xxi. pp. 231, 232). The rock-salt works are mainly Government property, while

1 A partial translation of this paper is given in the Zoologist for 1878, pp. 18-22.

? It is remarkable that on almost all of these occasions the locality pitched upon has been, either at the time or soon after, ravaged by locusts, which the birds greedily devour. Another fact worthy of attention is that they are often observed to affect trees or shrubs bearing rose-coloured flowers, as Neriwm oleander and Robinia viscosa,

among the blossoms of which they themselves may easily escape notice, for their plumage is rose-pink and black shot with blue.

miscellaneous factories, was 16,457 in 1885.

STATE, Great Orricers or. All the principal ministers of the British crown are popularly called the great officers of state. Under this designation are more or less accur- ately included the premier for the time being, the other members of the cabinet, and the leading functionaries of the court. But properly speaking the great offices of state are only nine in number, and it is to the holders of them alone that the description of “the great officers of state” strictly and distinctively applies. They are the lord high steward, the lord high chancellor, the lord high treasurer, the lord-president of the privy council, the lord-keeper of the privy seal, the lord great chamberlain, the lord high constable, the earl marshal, and the lord high admiral. Of these, three—the lord chancellor, the lord-president of the council, and the lord privy seal— are the first and second always and the third almost always

cabinet ministers. ‘The offices of two more—those of the lord treasurer and the high constable—are now executed by commission, the chief of the lords commis- sioners, known severally as the first lord of the treasury and the first lord of the admiralty, being likewise members of the cabinet, while the first lord of the treasury is usually at the head of the Government, But, although it has become the rule for the treasury and the admiralty to be put in commission, there is nothing except usage of longer or shorter duration to prevent the crown from making a personal appointment to either of them, and the functions which formerly appertained to the lord treasurer and the high admiral are still regularly performed in the established course of the national administration. The four offices of the high steward, the great chamberlain, the high constable, and the earl marshal stand on a different footing, and can be regarded at the present day as little else than survivals from an earlier condition of society. They have practically ceased to have any relation to the ordinary routine of business in the country or of cere monial in the palace, and the duties associated with them have either passed entirely into abeyance or are restricted within extremely narrow limits, save on certain occasions of exceptional pomp and solemnity. All of them were once hereditary, and, taking the three kingdoms together, they or their counterparts and equivalents continue to be held by right of inheritance in one or other of them even now. ‘The prince of Wales is the hereditary great steward of Scotland, and the earl of Shrewsbury is the hereditary grand seneschal of Ireland. The great chamberlainship of England is held jointly by Lady Willoughby de Eresby and Lord Carrington on the one part and on the other part by the marquis of Cholmondeley. The hereditary high constable of Scotland is the earl of Erroll, and the hereditary earl marshal of England is the duke of Norfolk. It is of the great offices of the steward, the chamberlain, the constable, and the marshal that we shall at present speak, the rest of those we have mentioned being dealt with under their proper headings, or in the articles CABINET, Ministry, Privy Councit, and Rovant HousEHoLp.

The lord high steward of England ranks as the first of Lord His office is called out of #¥4

the great officers of state. abeyance by commission under the great seal only for coronations and for trials by the House of Lords. At the former he

bears the crown of St Edward immediately before the sovereign in the procession to Westminster Abbey, and he presides at the latter on the arraignment of a peer or a peeress for treason or felony. From the reign of Richard II. to that of Henry VIL. it was the duty of the

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lord high steward to sit judicially in the court of claims to hear and determine all claims to render services of grand serjeanty to the king or queen at his or her coronation. Since the accession of the house of Tudor, however, this function has generally been discharged by a specially appointed commission, or a committee of the privy council. According to the tradition once current among lawyers and antiquaries, the steward of England was, under the Norman and Angevin kings, the second personage in the realm, the viceroy in the absence and the chief minister in the presence of the sovereign. Coke says, on the more than doubtful authority of an ancient manuscript, that his office was to superintend under the king and next after the king the whole kingdom and all the ministers of the law within the kingdom in time of both peaceand war. But of this there is no satisfactory evidence. It is not improbable that the steward of England may for a short period after the Con- quest have occupied a position analogous to that of the Saxon heah-gerefa or that of the Norman seneschal, or of the two in combination. But, as Stubbs points out, the chief minister and occasional viceroy, either alone or with others, of the Conqueror and his earlier successors was the person to whom the historians and the later constitutional writers give the name of justiciarius with or without the prefix “summus” or “capitalis.” He adds that most likely the Norman seneschalship was the origin of the English justiciarship, that under Henry II. the seneschal of Nor- mandy receives the name of justiciar, and that it is only in the same reign that the office in England acquires the exclusive right to the definite name of “summus” or “capitalis justitiarius” or ‘“‘justitiarius totius Angliz.” But whatever may have been his original condition the steward had been by that time at the latest eclipsed in his most important functions by the justiciar, and he makes, as Stubbs observes, in his official capacity no great figure in English history. By the reign of Henry II. at any

rate all connexion between the stewardship and the justiciar- ship had come to an end; and, while the second retained its authority unimpaired until its extinction, the first be- came a grand serjeanty, primarily annexed to the barony of Hinckley, it is said, and afterwards to the earldom of Leicester. On the attainder of Simon de Montfort the earldom and stewardship were forfeited, and both were granted by Edward I. to his brother Edmund Plantagenet, earl of Lancaster, from whom they descended to the daughter and eventual heiress of Henry Plantagenet, duke of Lan- caster. She was the first wife of John of Gaunt and the mother of Henry IV. On the accession of her son to the throne they became merged in the crown, from which period the stewardship has been revived only hac vice from time to time as occasion required. It is indeed to John of Gaunt that the pre-eminent position accorded to the office since the end of the 14th century is really due. It emerged from the comparative obscurity in which it had rested for nearly three hundred years as soon as he became the tenant of it by courtesy in right of his deceased wife. As far as any records show to the contrary he was the first steward of England who took part in the coronation of a king or queen, and he was certainly the first steward of England who sat in the court of claims or who presided at a trial by the House of Lords. It seems to have been by him also that the precedence of the stewardship before all the other great offices of state was secured, a restoration or aug- mentation of rank which is the more remarkable in that the steward of Scotland gave place to the chamberlain and the seneschal of Ireland gave place to the constable of the two kingdoms respectively. John of Gaunt may be regarded, In fact, as the creator of the lord high stewardship and all its privileges and prerogatives as they have existed from 18 days to our own.

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The lord great chamberlain of England ranks as the sixth great officer of state. Whenever the sovereign attends the palace of Westminster the keys are delivered to him, and he is for the time in command of the building. At the opening or closing of the session of parliament by the sovereign in person he disposes of the sword of state to be carried by any peer he may select, and walks him- self in the procession on the right of the sword of state, a little before it and next to the sovereign. He assists at the introduction of all peers into the House of Lords on their creation, and at the

homage of all bishops after their consecration. At a coronation he receives the regalia from the dean and chapter of Westminster, and distributes them to the personages who are to bear them in the cere- mony. On that day it is his duty to carry the sovereign his shirt and wearing apparel before he rises and to serve him with water to wash his hands before and after dinner. The chamberlain was originally a financial officer; his work, Stubbs says, was rather that of auditor or accountant than that of treasurer; he held a more definite position in the household than most of the other great officers, “and in the judicial work of the country he was only less im- portant than the justiciar.” The office was hereditary in the Veres, earls of Oxford, from the reign of Henry I. to the reign of Charles I., when it passed through an heiress to the Berties, Lords Willoughby de Eresby, and after- wards earls of Lindsey and dukes of Ancaster, and from the Berties it was transmitted through coheiresses to the present inheritors of the dignity. The Stuarts, dukes of Lennox, were hereditary great chamberlains of Scotland in the 16th and 17th centuries. The office on their ex- tinction was granted by Charles II. to James, duke of Monmouth and Buccleuch, on whose attainder it passed to Charles, duke of Richmond and Lennox, by whom it was surrendered to the crown in 1703.

The lord high constable of England ranks as the seventh of the great officers of state. His office is called out of abeyance for coronations alone, when it is his duty to assist in the reception of the regalia from the dean and chapter of Westminster, and during the coronation ban- quet to ride into Westminster Hall on the right hand of the champion. The constable was originally the com- mander of the royal armies and the master of the horse. He was also one of the judges of the court of chivalry or court of honour. The constableship was granted as a grand serjeanty with the earldom of Hereford by the empress Maud to Milo of Gloucester, and was carried by his heiress to the Bohuns, earls of Hereford and Essex. Through a coheiress of the Bohuns it descended to the Staffords, dukes of Buckingham ; and on the attainder of Edward Stafford, third duke of Buckingham, in the reign of Henry VIII. it became merged in the crown. The Lacys and Verduns were hereditary constables of Ireland from the 12th to the 14th century; and the Hays, earls of Erroll, have been hereditary constables of Scotland from early in the 14th century until the present time.

Lord great chamber-

Lord

high con-

stable.

The earl marshal of England ranks as the eighth of the Earl

great officers of state. arms, and has the appointment of the kings-of-arms, her- alds, and pursuivants at his discretion. He attends the sovereign in opening and closing the session of parliament, walking opposite to the lord great chamberlain on his or her right hand. It is his duty to make arrangements for the order of all state processions and ceremonials, espe- cially for coronations and royal marriages and funerals. Like the lord high constable he rides into Westminster Hall with the champion after a coronation, taking his place on the left hand, and with the lord great chamberlain he assists at the introduction of all newly-created peers into the House of Lords. The marshal appears in the feudal

He is the head of the college of marshal.

armies to have been in command of the cavalry under the constable, and to have in some measure superseded him as master of the horse in the royal palace. He exercised joint and co-ordinate jurisdiction with the constable in the court of chivalry, and afterwards became the sole judge of that tribunal. The marshalship of England was made hereditary in the Clares and Marshals, earls of Pembroke, in the reign of Stephen or Henry IT., and through a co- heiress passed to the Bigots, earls of Norfolk, and by

Roger Bigot, fifth earl of Norfolk, it was surrendered |

with his other dignities to Edward I. It was granted by Edward II. to his brother Thomas of Brotherton, earl of Norfolk, and, after it had been variously disposed of by Edward IIL, was by Richard II. erected into an

earldom and conferred on Thomas Mowbray, duke of Norfolk, who was the great-grandson and heir of Thomas of Brother- ton. One of the coheiresses of the Mowbrays was the mother of John Howard, duke of Norfolk, who was created earl marshal by Richard III. After several attainders and partial restorations in the reigns of the Tudors and the Stuarts, the earl marshalship was finally entailed by Charles II. on the male line of the Howards, with many specific remainders and limitations, under which settlement it has regularly descended to the present duke of Norfolk. The Clares and Marshals, earls of Pembroke, and the Lords Morley appear to have been hereditary marshals of Ireland from the invasion of the island until the end of the 15th century. The Keiths were Earls Marischal of Scotland from the institution of the office by James II. in 1458 until the attainder of George, the tenth earl, in 1716. On the subject of the great offices of state generally, see Stubbs, Constitutional History, ch. xi.: Freeman, Norman Conquest, ch. xxiv.; Gneist, Constitution of England, ch. xvi., xxxv., and liv.; also Gibbon, Decline and Fall, ch. liii., and Bryce, Holy Roman Empire, ch. xiv. (F. DR.)

STATEN ISLAND, an island of New York State, forming, with some adjacent islands, Richmond county, with a population of 38,991 in 1880, is situated about 5 miles south of New York city, from which it is separated by New York Bay, while the Narrows, commanded by Forts Wadsworth and Tompkins and a line of water- batteries, separate it from Long Island on the north-east, Staten Island Sound from New Jersey on the west, and Newark Bay and the Kill van Kull from the same State on the north. It is of an irregular triangular shape, its greatest length being about 13 miles, its greatest breadth about 8, and the total area 584 square miles. The surface is gently undulating, but a range of hills attaining 310 feet in height extends across the northern portion. Iron

ore is found. The island contains many detached villa }

residences of persons in business in New York. On an artificial island off the east shore is the New York quarantine establishment, and Staten Island is the seat of the “ Sailors’ Snug Harbour,” a retreat for superannuated seamen. Steam ferries ply half-hourly to New York, and on the island there is a railway line from Tompkinsville to Tottenville.

STATE PAPERS. See Recorps, PuBtic.

STATES OF THE CHURCH, or Parat Srarzs (Ital. Stato della Chiesa, Stato Pontificio, Stato Romano, Stato Ecclesiastico ; Fr. Etats de V Eglise, Pontificat Sowverain de Rome, &e.; Germ. Kirchenstaat; in ecclesiastical Latin often Patrimonium Sancti Petri), that portion of central Italy which, previous to the unification of the kingdom, was under the direct government of thesee of Rome. The territory stood at the close as in the annexed table.

With the exception of Benevento, surrounded by the Neapolitan province of Principato Ulteriore, and the small state of Pontecorvo, enclosed within the Terra di Lavoro, the States of the Church formed a compact territory, bounded on the N.W. by the Lombardo-Venetian kingdom,

on the N.E. by the Adriatic, on the S.E. by the kingdom of Naples, on the 8.W. by the Mediterranean, and on the W. by the grand-duchy of Tuscany and the duchy of

Area in

English Square 7 Pree Miles. ;

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20,701 Frosinone, with Pontecorvo…..... 739 °9 154,559 (Benevento…..... Pres os 613 23,176

3,124,758

Modena. On the Adriatic the coast extended 140 miles,

from the mouth of the Tronto (Truentus) to the southern mouth of the Po, and on the Tyrrhenian Sea 130 miles, from 41° 20’ to 42° 22’ N. lat. See vol. xiii. Plate VL

The divisions shown above were adopted on December 21, 1827, the legations being ruled by a cardinal and the delegations by a prelate. Previously the several districts formally recognized were Latium, the Marittima (or sea- board) and Campagna, the Patrimony of Saint Peter, the duchy of Castro, the Orvietano, the Sabina, Umbria, the Perugino, the March of Ancona, Romagna, the Bolognese, the Ferrarese, and the duchies of Benevento and of Pontecorvo.

The question of the origin of the territorial jurisdiction of the pope has been treated under Poprpom (vol. xix. p. 495). With the moral and ecclesiastical decay of the papacy in the 9th and 10th centuries much of its territorial authority slipped from its grasp; and by the middle of the 11th century its rule was not recognized beyond Rome and the immediate vicinity. By the treaty of Sutri (February 1111) Paschal II. was eompelled by the emperor Henry V. to surrender all the possessions and royalties of the church; but this treaty was soon afterwards repudiated, and by the will of Matilda, countess of Tuscany, the papal see was enabled to lay claim to new territories of great value. By the capitulation of Neuss (1201) Otto IV. recognized the papal authority

over the whole tract from Radicofani in Tuscany to the pass of

Ceperano on the Neapolitan frontier—the exarchate of Ravenna, the Pentapolis, the March of Ancona, the bishopric of Spoleto, Matilda’s personal estates, and the countship of Brittenoro ; but a good deal of the territory thus described remained for centuries an object of ambition only on the part of the popes. The actual annexation of Ravenna, Ancona,

Bologna, Ferrara, &c., dates from the 16th century. The States of the Church were of course sub- merged for a time by the ground-swell of the French Revolution, but they appeared again in 1814. In 1849 they received a consti- tution. On the formation of the kingdom of Italy in 1860 they were reduced to the Comarca of Rome, the legation of Velletri, and the three delegations of Viterbo, Civita Vecchia, and Frosinone; and in 1870 they disappeared from the political map of Europe.

STATICS. See Mecuanics.

STATIONERY. Under the name of stationery are embraced all writing materials and implements, together with the numerous appliances of the desk and of mercantile and commercial offices. In addition to these, the term fancy stationery covers a miscellaneous assemblage of leather and other goods, such as pocket-books, purses, bags, card-cases, and many kindred objects which cannot be classified. The principal articles and operations of the stationery trade are dealt with in detail under separate headings—BooxkBInDING, Empossine, Ink, LITHOGRAPBY,

Paper, Pen, Pencit, SEALING-wAx, &c.; but in connexion with the separate industry of a conimercial stationer there are a number of special operations and machines to which brief allusion may be made.

Paper-Ruling.—The ruling of blue and other coloured lines is usually done on a self-feeding machine provided with as many ruling pens as there are lines to be made, and these fixed in parallel order at intervals the width of the ruled spaces. The pens consist of grooved slips of sheet brass coming to a fine point, which in their upper part are covered by a sheet of felt saturated with a flowing ink, whence each pen obtains the supply required for tracing its line. The paper is carried forward by endless tapes or threads whieh pass around cylinders. In a recent form of machine the rulers consist of metal disks with thin edges, which take up printing ink from an india-rubber cylinder, and print the lines on the paper as it passes around a revolving cylinder.

Paper-Folding machinery is used for numerous purposes in the stationery trade, apart from its application to the folding of sheets for the bookbinder. Devices for folding come most prominently forward-in connexion with the envelope manufacture, an industry which received an enormous development by the introduction of uniform postage rates. In envelope-making the folding is com- monly associated with gumming, and sometimes with embossing, in the same system of machinery. The first efficient automatic machine for envelope manufacture was devised by Edwin Hill and Warren de la Rue,land by them patented in 1845. Many forms of envelope folding and gumming machine now exist. In making envelopes the blanks are first cut out by shaped cutters or punches acting at one stroke on a thickness of froin 200 to 300 sheets of paper. These blanks in the latest form of machine are gummed by a pad which takes gum from a roller and presses it on the edges of the paper, just as printing ink is received from cylinders and pressed on paper in printing. The gummed surface of the pad lifts each blank separately, places it under a plunger, which, descend- ing, passes it to folders, whencc it is ere into a clip in an endless band of considerable length. The envelopes are delivered into the elips in the band at the rate of about 100 to 150 per minute.

Perforating and Punching give rise to a range of machines of varied form and complexity. The idea of perforating paper so as to allow of the ready detaching of portions by tearing was conceived and patented in 1848 by Mr Henry Archer. Of such utility was Mr Areher’s conception deemed by the post-office authorities as a con- venience for detaching stamps from sheets that in 1853 he was awarded £4000 for his patent rights. The applications of perfora- tion are now very numerous, but its value still remains most obvious in connexion with the detachment of adhesive stamps from sheets.

Numbering and Paging constitute another series of stationery operations, for which ingenious machines have been devised. For consecutive numbering a series of printing disks are employed, on the spy phery of which the series of digits 1 to 0 are ~ The outer

isk moves a number after each impression, the second disk moves

onee in ten times, and so on, thus automatically imprinting consecu-

tive numbers up to the limit of the disks on the machine. Such a machine prints only on one side of the paper, and where the numbering is required on both sides the disks must be geared to move two places, numbering only odd or even numbers, two print- ings being thus required. For printing right and left consecutively an endless band machine is used, which prints alternately below and above for the two sides of the sheet.

STATISTICS. The word “statistic” is derived from the Latin status, which, in the so-called Middle Ages, had come to mean a “state” in the political sense. “ Statis- tic,” therefore, originally denoted inquiries into the con- dition of a state. Since the beginning of the 18th century the denotation of the word has been extended so as to melude subjects only indirectly connected with political organizations, while at the same time the scope of the Investigations it implies has become more definite, and at the present day may be said, for practical purposes, to be fixed, though there are still controversies as to the position of statistical studies in relation to other departments of Scientific procedure.

History.—The origin of what is now known as “statistic” (Ger. Die Statistik; Fr. La Statistique; Ital. Statistica) can only be referred to briefly here. As M. Maurice Block has observed in commencing his admirable treatise,

‘It is no exaggeration to say that statistic has existed ever since there were states.” For the first administra- tive act of the first reeular Government was probably to

some degree of accuracy what amount of taxation could be levied on the remainder of the community. As human societies became more and more highly organized, there can be no doubt that a very considerable body of official statistics must have come into existence, and been con- stantly used by statesmen, solely with a view to adminis- tration. The Romans, who may be described as the most business-like people of antiquity, were careful to obtain accurate information regarding the resources of the state, and they appear to have carried on the practice of taking the census, a very comprehensive statistical operation, with a regularity which has hardly been

surpassed in modern times. As to the efficiency of the work done we have unfortunately very little information, but those who are curious on the subject may be referred to an article by Dr Hildebrand, entitled ‘‘Die amtliche Bevolkerungs- statistik im alten Rom,” printed in the Jahrbuch fiir Nationalikonomie und Statistik, 1866, p. 82.

Statistics, or rather the material for statistics, therefore existed at a very early period, but it was not until within the last three centuries that systematic use of the informa- tion available began to be made for purposes of investiga- tion and not of mere administration. According to M. Block, the earliest work in which facts previously known only to Government officials were published to the world was a volume compiled by Francesco Sansovino, entitled Del Governo et Amministrazione di Diversi Regmi et Repub- liche, which was printed in Venice and bears the date 1583. Other works of a similar kind were published towards the end of the 16th century in Italy and France. Regarding these and other early books on the subject reference may be made to Fallati’s Hinleitung in die Wissenschaft der Statistik, Dr G. B. Salvioni’s preface and notes to his translation into Italian of Dr Mayr’s work on statistics, and other authors mentioned at the close of this article.

Works on state administration and finance continued to be published during the first half of the 17th century, and the tendency to employ figures, which were hardly used at all by Sansovino, became more marked, especially in England, where the facts connected with “bills of mortality” had begun to attract attention.

In the year 1660 Hermann Conring, “professor of medicine and politics,” a rather odd combination, in the university of Helmstidt, was in the habit of giving lectures in which he analysed and discussed the circum- stances existing in various countries, in so far as they affected the happiness of the inhabitants. Conring’s example was followed by other writers, in Germany and elsewhere, to whom reference is made by Block (Z’raité, pp. 5, 6) and Haushofer (Lehr- und Handbuch, p. 10, note).

ue best-known member of the ‘‘descriptive” school was Achenwall (1719-1772), who is sometimes spoken of as “the father of modern statistics,” but, as his procedure was essentially the same as that of Conring, though it was

carried out more fully, the title has not been unanimously granted. It is generally admitted, however, that Achen- wall's work gave a great impulse to the pursuit of the studies which are now included under the title of statis- tics. He called his book Staatsverfassung der ewropdischen Reiche in the first two editions (1749, 1752), meaning "Constitution of the States of Europe." Subsequently he added "vornehmsten" and then "heutigen" before " europaischen," evidently with the desire of bringing his work, which may be regarded as the germ of such volumes as the Statesman's Year-Book, "up to date." Achenwall is usually credited with being the first writer who made use of the word "statistics," which he applied to his

number its fighting men, and its next to ascertain with | collection of "noteworthy matters regarding the state"

(Staatsmerkwiirdigkeiten), but the claim has been disputed by M. Block, who points out that the term collegiwm statisticum had been previously employed by Schmeitzel, a follower of Conring, whose lectures at Jena were no doubt attended by Achenwall.

In any case statistics, in the modern sense of the word, did not really come into existence until the publication by J. P. Siissmilch, a Prussian clergyman, of a work entitled Die gittliche Ordnung in den Verdnderungen des Mensch- lichen G'eschlechts aus dem Geburt, dem Tode, und der Lortpflanzung desselben erwiesen. In this book a system- atic attempt was made to make use of a class of facts which up to that time had been regarded as belonging to "political arithmetic," under which description some of the most important problems of what modern writers term 'vital statistics" had been studied, especially in England. Siissmilch had arrived at a perception of the advantage of studying what Quetelet subsequently termed the "laws of large numbers." He combined the method employed by the Conring-Achenwall school of 'descriptive statistics," whose works were not unlike modern school-books of geo- graphy, with that of the " political arithmeticians," who had confined themselves to investigations into the facts regarding mortality and a few other similar subjects, without much attempt at generalizing from them.

Political arithmetic had come into existence in England in the middle of the 17th century, or about the time when Conring was instructing the students of Helmstidt. The earliest example of this class of investigation is the work of Captain John Graunt of London, entitled Natural and Political Annotations made upon the Bills of Mortality, which was first published in 1666. This remarkable work, which dealt with mortality in London only, ran through many editions, and the line of inquiry it sug- gested was followed up by other writers, of whom the most distinguished was Sir William Petty, whose active mind was naturally attracted by the prospect of making use of a new scientific method in the class of speculations which occupied him. Sir William was the first writer to make use of the phrase which for nearly a century after- wards was employed to describe the use of figures in the investigation of the phenomena of human society. He called his book on the subject, which was published in 1683, Five Essays in Political Arithmetick. Other writers, of whom Halley, the celebrated mathematician and astronomer, was one, entered on similar investigations, and during the greater part of the 18th century the num- ber of persons who devoted themselves to “arithmetical ” inquiries into problems of the class now known as statis- tical was steadily increasing. Much attention was given to the construction of tables of mortality, a subject which had a great attraction for mathematicians, who were eager to employ the newly-discovered calculus of probabilities on concrete problems. Besides Halley, De Moivre, Laplace, and Kuler busied themselves with this branch of study. Attempts were also made to deal with figures as the basis of political and fiscal discussion by Arthur Young, Hume, and other historical writers, as well as by the two Mirabeaus.

It is now necessary to return to Siissmilch, who, as already mentioned, endeavoured to form a general theory of society, based on what were then termed “arithmetical ” premisses, treated nearly on the lines laid down by Achen- wall. In modern language, he made use of quantitative aggregate-observation as an instrument of social inquiry. It is true he did not enter on his investigation with an ‘‘open mind.” He desired to support a foregone conclu- sion, as the title of his work already mentioned shows. But nevertheless his work was a most valuable one, since it pointed out a road which others who had no desire to

procure evidence in favour of a particular system of thought were not slow to follow. M. Block makes the following remarks on the influence exercised on his con- temporaries by the work of Siissmilch :—“ If the author of the Géttliche Ordnung had been a professor his influence would have been much greater than it was. In maintain- ing that the movement of population is subject to law, that there is a regularity in the recurrence of such pheno- mena which allows of their being foreseen, he cast into the public mind a leaven which has evidently contributed to the progress of science.” Although for many years after the appearance of Stissmilch’s book there was a good deal of resistance to the introduction of “arithmetic” as the coadjutor of moral and political investigations, yet, practi- cally there was a tacit admission of the usefulness of figures, even by the chiefs of the so-called “ descriptive” school. On the other hand Siissmilch’s success was the origin of a “mathematical” school of statisticians, some of whom carried their enthusiasm for figures so far that they refused to allow any place for mere “ descriptions ” at all. These two schools have now coalesced, each admitting the importance of the point of view urged by the other. They were, however, still perceptibly distinct even as late as 1850, and the ignorant hostility with which many people even among the cultivated classes still regard statistical inquiries into the nature of human society may be re- garded as a survival of the much stronger feeling which showed itself among ‘‘orthodox” professors of law and economics on the publication of Siissmilch’s treatise.

M. Block is of opinion that the descriptive school, by whom figures are regarded merely as accessories to and illustrations of the text, would have maintained its position even now but for the establishment of official statistical offices and the influence of the great Belgian Quetelet. Quetelet’s work was certainly ‘“ epoch-making” in a far higher degree than that of any of his predecessors. To the impulse created by him must be attributed the founda- tion in 1835 of the Statistical Society of London, a body which, though it has contributed little to the discussion of the theory of statistics, has had a considerable and very useful influence on the practical work of carrying out statistical investigations in the United Kingdom and elsewhere. Quetelet’s works were numerous and mullti- farious, but his most important

contribution to the growthof statistical inquiry was his investigation of the theory of pro- babilities as applied to the “ physical and social ” sciences, contained in a series of letters to the duke of Saxe-Coburg and Gotha, and published in 1846. Quetelet was above all things an exponent of the “laws of large numbers.” He was especially fascinated with the tendency to relative constancy of magnitude displayed by the figures of moral statistics, especially those of crime, which inspired him with a certain degree of pessimism. His conception of an average man (l’homme moyen) and his disquisition on the “curve of possibility” were most important contribu- tions to the technical development of the statistical method, though, as M. Block observes, their value may have been somewhat exaggerated by subsequent writers (Block, ch. i. p. 16, and ch. v. p. 112 sg.). It is ge possible to enter at length into Quetelet’s work in con- nexion with statistical science. At the close of this article will be found a list including those of his works which are likely to be of use to students of statistics.

The influence exercised by Quetelet on the development of statistics is clearly seen from the fact that, though there is still considerable controversy among statisticians, the old controversy between the ‘‘descriptive” and arith- metical schools has disappeared, or perhaps we should say has been transformed into a discussion of another kind, the question now at issue being whether there is a science

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of statistics as well as a statistical method. It is true that a few books were published between 1830 and 1850 in which the politico-geographical description of a country is spoken of as “statistics,” which is thus distinguished from “political arithmetic.” The title of Knies’s great work, Die Statistik als selbstandige Wissenschaft (Cassel, 1850), is especially noteworthy as showing that the nature of the controversy was changing. The opponents of Siissmilch maintained that ‘‘ political arithmetic” ought not to be spoken of as statistics at all. They clung to the concep- tions of Conring and Achenwall, to whom “statistics ” represented ‘“‘Staatenkunde” or “ Staatszustandskunde,” or, as Herzberg, one of Achenwall’s followers, called it, “die Kenntniss von der politischen Verfassung der Staaten.” Knies claimed that the really ‘‘scientific” portion of statistics consisted of the

figures employed. As Haushofer says, “his starting point is political arithmetic.”

Some eminent statisticians of the latter half of the present century agree with Knies, but the majority of the modern writers on the theory of statistics have adopted a slightly different view, according to which statistics is at once a scvence relating to the social life of man and a method of investigation applicable to all sciences. This view is ably maintained by Mayr, Haushofer, Gabaglio, and Block, who may be taken to represent the opinions held by the majority of statisticians on the Continent.

Having dealt as far as was possible, within the limits of this article, with the history of statistics, we may here enter a little more minutely into the views of the existing Continental school. This is all the more necessary because, singular to say, there has been no systematic exposition of the subject in England. Isolated dicta have been furnished by high authorities, such as the late Dr W. A. Guy, Prof. Ingram, Sir Rawson W. Rawson, Mr Robert Giffen, and to some extent also by John Stuart Mill, Buckle, Sir George Cornewall Lewis, and other historical and economic writers. There are also monographs on particular points connected with the technique of statistical investigation, such as the contribution made by Mr F. Y. Edgeworth to the discussions at the jubilee of the Statistical Society in 1885, and some of the observations contained in @ paper by Mr Patrick Geddes, entitled An Analysis of the Principles of Economics, read before the Royal Society of Edinburgh in 1884. Prof. Foxwell has also lectured on the subject of statistics in his capacity of Newmarch lecturer at University College, London. But there has been no attempt to deal with the subject in a systematic way. The practice of statistical inquiry, on the other hand, has been carried on in England with a high degree of success.

With regard to the few invasions of the domain of theory attempted by English writers, it may be observed that the authorities above mentioned are not unanimous. Dr Guy as well as Sir Rawson Rawson, who handled the subject with great ability at the jubilee meeting of the London Statistical Society in June 1885, both claim that Statistics is to be regarded as an independent science, apart from sociology, while Prof. Ingram, who presided over Section F at the Dublin meeting of the British Association in

1878, maintained that statistics cannot Occupy a position co-ordinate with that of sociology, and went on to say that they ‘constitute only one of the aids oradminicula of science.” Mr Giffen has also expressed himself adversely to the Continental doctrine that there 1s an independent science of statistics, and this opinion appears to be the correct one, but, as Dr Guy and Sir Rawson Rawson have the support of the great body of systematic teaching emanating from distinguished Con- lnental statisticians in support of their view, while their Opponents have so far only the od:ter dicta of a few eminent men to rely upon, it appears needful to examine closely

the views held by the Continental authorities, and the grounds on which they are based.

The clearest and shortest definition of the science of statistics as thus conceived is that of M. Block, who describes it as “la science de ’homme vivant en société en tant qu’elle peut étre exprimée par les chiffres.” He proposes to give a new name to the branch of study thus defined, namely, “Demography.” Mayr’s definition is longer. He defines the statistical science as “ die systema- tische Darlegung und Erérterung der thatsichlichen Vor- gange und der aus diesen sich ergebenden Gesetze des gesellschaftlichen menschlichen Lebens auf Grundlage quantitativer Massenbeobachtungen” (the systematic state- ment and explanation of actual events, and of the laws of man’s social life that may be deduced from these, on the basis of the quantitative observation of aggregates). Gabaglio’s view is practically identical with those adopted by Mayr and Block, though it is differently expressed. He says “ statistics may be interpreted in an extended and in a restricted sense. In the former sense it is a method, in the latter a science. As a science it studies the actual social-political order by means of mathematical induction.”

This discussion regarding the nature of statistics is to a large extent a discussion about names. There is really no difference of opinion among statistical experts as to the subject-matter of statistics, the only question being— Shall statistics be termed a science as well as a method? That there are some investigations in which statistical procedure is employed which certainly do not belong to the domain of the supposed statistical science is

generally admitted. But, as already shown, an attempt has been made to claim that the phenomena of human society, or some part of those phenomena, constitute the subject- matter of an independent statistical science. It is not easy to see why this claim should be admitted. There is no reason either of convenience or logic why the use of a certain scientific method should be held to have created a science in one department of inquiry, while in others the said method is regarded merely as an aid in investigation carried on under the superintendence of a science already in existence. It is impossible to get over the fact that in meteorology, medicine, and other physical sciences statist- ical inquiries are plainly and obviously examples of the employment of a method, like microscopy, spectrum analysis, or the use of the telescope. Why should the fact of their employment in sociology be considered as authorizing the classification of the phenomena thus dealt with to form a new science ?

The most effective argument put forward by the advo- cates of this view is the assertion that statistics are merely a convenient aid to investigation in the majority of sciences, but are tle sole method of inquiry in the case of sociology. Dr Mayr especially (Gesetzmdssigkeit, &c., p. 14 sq.) makes use of this argument, and illustrates it with his usual ability; but his reasoning is very far from being conclusive. When, indeed, it is tested by reference to the important class of social facts which are named economic, it becomes obvious that the argument breaks down. Economics is a branch—the only scienti- fically organized branch—of sociology, and statistics are largely used in it, but no one, so far as we are aware, has proposed to call economics a department of statistical science. Sir Rawson W. Rawson, it is true, has boldly proposed to throw over the term “sociology” altogether, and to describe the study of man in the social state as “statistics,” but common usage is too firmly fixed to make this alteration of nomenclature practicable even if it were desirable. The existence of the works of Mr Herbert Spencer and Dr Schafile alone would render the attempted alteration abortive.

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Although, however, the above considerations forbid the acceptance of the Continental opinion that the study of man in the social state is identical with statistics, it must be admitted that without statistics the nature of human

society could never become known. For society is an aggregate, or rather a congeries of aggregates. Not only that, but the individuals composing these aggregates are not in juxtaposition, and what is, from the sociological point of view, the same aggregate or organ of the “ body politic” is not always composed of the same individuals. Constancy of sucial form is maintained concurrently with the most extensive changes in the collocation and identity of the particles composing the form. A “nation” is really changed, so far as the individuals composing it are con- cerned, every moment of time by the operation of the laws of population. But the nation, considered sociologically, remains the same in spite of this slow change in the particles composing it, just as a human being is considered to be the same person year by year, although year by year the particles forming his or her body are constantly being destroyed and fresh particles substituted. Of course the analogy between the life of a human being and the life of a human community must not be pressed too far. Indeed, in several respects human communities more nearly resemble some of the lower forms of animal life than the more highly organized forms of animal existence. There are organisms which are fissiparous, and when cut in two form two fresh independent organisms, so diffused is the vitality of the original organism ; and the same phenomenon may be observed in regard to human communities.

Now the only means whereby the grouping of the individuals forming a social organism can be ascertained, and the changes in the groups year by year observed, is the statistical method. Accordingly the correct view seems to be that it is the function of this method to make perceptible facts regarding the constitution of society on which sociology is to base its conclusions. It is not claimed, or ought not to be claimed, that statistical inves- tigation can supply the whole of the facts a knowledge of which will enable sociologists to form a correct theory of the social life of man. The statistical method is essentially a mathematical procedure, attempting to give a quantitative expression to certain facts; and the resolu- tion of differences of quality into differences of quantity has not yet been effected even in chemical science. In sociological science the importance of differences of quality is enormous, and the effect of these differences on the con- clusions to be drawn from figures is sometimes neglected, or insufficiently recognized, even by men of unquestionable ability and good

faith. The majority of politicians, social ‘‘reformers,” and amateur handlers of statistics generally are in the habit of drawing the conclusions that seem good to them from such figures as they may obtain, merely by treat- ing as homogeneous quantities which are heterogeneous, and as comparable quantities which are not comparable. Even to the conscientious and intelligent inquirer the difficulty of avoiding mistakes in using statistics prepared by other persons is very great. There are usually “ pit- falls” even in the simplest statistical statement, the position and nature of which are known only to the persons who have actually handled what may be called the “raw material” of the statistics in question; and in regard to complex statistical statements the “ outsider” cannot be too careful to ascertain from those who com- piled them as far as possible what are the points requir- ing elucidation.

The Statistical Method.—This method is a scientific pro- cedure (1) whereby certain phenomena of ageregation not perceptible to the senses are rendered perceptible to the intellect, and (2) furnishing rules for the correct perform-

ance of the quantitative observation of these phenomena, The class of phenomena of aggregation referred to includes only such phenomena as are too large to be perceptible to the senses. It does not, ¢.g., include such phenomena ag are the subject-matter of microscopy. Things which are very large are often quite as difficult to perceive as those which are very small. A familiar example of this is the difficulty which is sometimes experienced in finding the large names, as of countries or provinces, on a map. Of course the terms ‘‘large,” “too large,” “small,” and “too small” must be used with great caution, and with a clear comprehension on the part of the person using them of the standard of measurement implied by the terms in each particular case. A careful study of the first few pages of De Morgan’s Differential and Integral Calculus will mate- rially assist the student of statistics in attaining a grasp of the principles on which standards of measurement should be formed. It is not necessary that he should become acquainted with the calculus itself, or even possess any- thing more than an elementary knowledge of mathematical science, but it is essential that he

should be fully conscious of the fact that “large” and “small” quantities can only

be so designated with propriety by reference to a common standard.

Sources whence Statistics are Derived.—The term “statistics” in the concrete sense means systematic arrangements of figures representing “primary statistical quantities.” A primary statist- ical quantity is a number obtained from numbers representing phenomena, with a view to enable an observer to perceive a certain other phenomenon related to the former as whole to parts. They represent either a phenomenon of existence ata given point of time or a phenomenon of accretion during a given period. As examples may be mentioned the number of deaths in a given district during a given time, the number of pounds sterling reccived by the London and North Western Railway during a given time, and the number of ‘inches of rain” that fell at Greenwich during a given time. Other examples are the number of tons of pig-iron lying in a par- ticular store at a given date, the number of persons residing (the term ‘‘residing” to be specially defined) in a given territory ata given date, and the number of pounds sterling representing the ‘‘ private deposits” of the Bank of England at a given date.

Primary Statistical Quantities are the result of labours carried on either (A) by Governments or (B) by individuals or public or private corporations.

A. Government Statistics. —(1) A vast mass of statistical material of more or less value comes into existence automatically in modern states in consequence of the ordinary administrative routine of departments. To this class belong the highly important statistical information published in England by the registrar-general, the returns of pauperism issued by the Local Government Board, the reports of inspectors of prisons, factories, schools, and those of sanitary inspectors, as well as the reports of the commissioners of the customs, and the annual statements of trade and navigation prepared by the same officials. There are also the various returns compiled and issued by the Board of Trade, which is the body most nearly resembling the statistical bureaus with which most foreign Governments are furnished. Most of the Government departments publish some statistics for which they are solely responsible as regards both matter and form, and they are very jealous of their right to do so, a fact which is to some extent

detrimental to that uniformity as to dates and periods which should be the ideal of a well-organized system of statistics. Finally may be mentioned the very important set of statistical quantities known as the budget, and the statistics prepared and published by the commissioners of inland revenue, by the post office, and by the national debt com- missioners. All these sets of primary statistical quantities arise out of the ordinary work of departments of the public service. Many of them have bcen in existence, in sone form or other, ever since a settled Government existed in the country. There are records of customs receipts at London and other ports of the time of Edward III., covering a period of many years, which leave nothing to be desired in point of precision and uniformity. It may be added that many of these scts of figures are obtained in much the same form by all civilized Governments, and that it is often possible to compare the figures relating to different countries, and thus obtain evidence as to the sociological phenomena of each, but in regard to others there are differenccs which make comparison difficult.

(2) Besides being respousible for the issue of what may be called administration statistics, all Governments are in the habit of ordering from time to time special inquiries into special subjects

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of interest, either to obtain additional information needful for administrative purposes, or, in countries possessed of representative institutions, to supply statistics asked for by parliaments or con- gresses. It is not necessary to refer particularly to this class of” statistical information, except in the case of the census. This is an inquiry of such great importance that it may be regarded as one of the regular administrative duties of Governments, though as the census is only taken once in a series of years it must be mentioned under the head of occasional or special inquiries undertaken by Governments. In the United Kingdom the work is donc by the registrars-general who are in office when the period for taking the census comes round. On the Continent the work is carried out by the statistical bureaus of each country,—except France, where it is under the supervision of the minister of the interior. For further information on this subject reference

may be made to the excellent chapter in M. Maurice Block's Traité entitled ‘‘ Recense- ment.” Sce also “Instructions to the Superintendent Registrar of Births and Deaths as to his duties in taking the Census,” 1871; also Census, vol. v. p. 334 sq.

B. The primary statistical quantities for which individuals or corporations are responsible may be divided into three categorics.

(1) Among those which are compiled in obedience to the law of the land are the accounts furnished by municipal corporations, by railway, gas, water, banking, insurance, and other public companies making returns to the Board of Trade, by trades unions, and by other bodies which are obliged to makc returns to the registrar of friendly societies. The information thus obtained is published in full by the departments receiving it, and is also furnished by the companies themselves to their proprietors or members.

(2) An enormous mass of statistical information is furnished voluntarily by public companies in the reports and accounts which, in accordance with their articles of association, are pre- sented to their proprietors at stated intervals. With these statistics may be classed the figures furnished by the various trade associations, some of them of great importance, such as Lloyd's, the London Stock Exchange, the British Iron Trade Association, the London Corn Exchange, the Institute of Bankers, the Institute of Actuaries, and other such bodies too numerous to mention.

(3) There are cases in which individuals have devoted themselves with more or less success to obtaining original statistics on special points. The great work done by Messrs Behm and Wagner in arriving at an approximate estimate of the population of the earth does not belong to this category, though its results are really primary statistical quantities. Many of these results have not been arrived at by a direct process of enumeration at all, but by ingeni- ous processes of inference. It need hardly be said that it is not easy for individuals to obtain the materials for any primary statistical quantity of importance, but it has been done in some cases with success.

Operations Performed on Primary Statistical Quantities. —Only a brief description of matters connected with the technique of the statistical method can be given in this article. In order to form statistics properly so called the

primary statistical quantities must be formed into tables, and in the formation of these tables lies the art of the statistician. It is not a very difficult art when the prin- ciples relating to it have been properly grasped, but those who are unfamiliar with the subject are apt to underrate the difficulty of correctly practising it.

Simple Tables.—The first thing to be done in the construction a table is to form a clear idea of what the table is to show, and to express that idea in accurate language. This is a matter which is often neglected, and it is a source of much waste of time and occasionally of misapprehension to those who have to study the figures thus presented. No table ought to be eonsidered complete Without a ‘‘ heading” accurately describing its contents, and it is frequently necessary that such headings should be rather long. It has been said that ‘you can prove anything by statistics.” This statement is of course absurd, taken absolutely, but, like most

- assertions which are widely believed, it has a grain of truth in it. If this popular saying ran ‘‘you can prove anything by tables with slovenly and ambiguous headings,” it might be assented to without hesitation. The false “ statistical” facts which obtain a hold of the public mind may often be traced to’some widely circulated table, to which either from stupidity or carelessness an erroneous or inaccurate ‘‘ heading” has been affixed.

A statistical table in its simplest form consists of ‘‘ primaries ” representing phenomena of the same class, but existing at different points of time, or coming into existence during different portions of time. This is all that is essential to a table, though other things are usually added to it as an aid to its comprehension. A table Stating the number of persons residing in each county of England on a given day of a given year, and also, in another column, the Corresponding nuinbers for the same counties on the corresponding day of the tenth year subsequently, would be a simple tabular Statement of the general facts regarding the total population of those counties supplied by two successive censuses. Various figures might, however, be added to it which would greatly add to

its clearness. There might be columus showing the increase or decrease for each county and for the whole kingdom during the ten years, and another column showing what proportion, expressed in percentages, these increases or decreases bore to the figures for the earlier of the two ycars. Then there might be two columns showing what proportions, also expressed as percentages, the figures for each county bore in each year to the figures for the whole kingdom. The nine-column table thus resulting would still be simple, all the figures being merely explicit assertions of facts which are contained implicitly in the original ‘‘ primaries.”

_ Complex Tables.—Suppose now we have another table precisely similar in form to the first, and also relating to the counties of England, but giving the number of houses existing in each of them at the same two dates. A combination of the two would form a complex table, and an application of the processes of arithmetic would make evident a number of fresh facts, all of which would be implied in the table, but would not be obvious to most people until explicitly stated.

The technical work of the statistician consists largely in opera- tions of which the processes just referred to are types.

Proportions. —The most usual and the best mode of expressing the proportion borne by one statistical quantity to another is to state it as a percentage. In some cases another method is adopted —namely, that of stating the proportion in the form ‘‘one in so many.” This method is generally a bad one, and its use should be discouraged as much as possible, the chief reason being that the changing portion of this kind of proportional figure becomes greater or less inversely, and not directly, as the phenomenon it represents increases or diminishes.

Averages.—Averages or means are for statistical purposes divided into two classes, the geometrical and arithmetical. An arithmetical mean is the sum of all the members forming the series of figures under consideration divided by their number, without reference to their weight or relative importance among themselves. A geometrical mean is the sum of such figures divided by their number, with due allowance made for their weight. An example will make this clear, and the simplest exam- ple is taken from a class of statistical quantities of a peculiar kind —namely, prices. The price of a

given article is the approximate matheniatical expression of the rates, in terms of money, at which exchanges of the article for money were actually made at or about a given hour on a given day. A quotation of price such as appears in a daily price list is, if there has been much fluctuation, only a very rough guide to the actual rates of exchange that have been the basis of the successive bargains making up the day's business. But let us suppose that the closing price each day may be accepted as a fair representative of the day's transactions, and let us further suppose that we desire to obtain the average price for thirty days. Now the sum of the prices in question divided by thirty would be the arithmetical mean, and its weak point would be that it made no allowance for the fact that the business done ou some days is much larger than that done on others; in other words, it treats them as being all of equal weight. Now if, as is actually the case in some markets, we have a daily account of the total quantities sold we can weight the members accurately, and can then obtain their geometrical mean. There are cases in which the careless use of arithmetical means misleads the student of the social organism seriously. It is often comparatively easy to obtain arithmetical means, but difficult to obtain geometrical means. Inferences based on the former class of average should be subjected to the most rigid investigation.

Before closing this short survey of the very important subject of averages or means, it is needful to discuss briefly the nature of the phenomena which they may safely be regarded as indicating, when they have been properly obtained. Given a geometric mean of a series of numbers referring to no matter what phenomenon, it is obvious tliat the value of the mean as a type of the whole series will depend entirely on the extent of divergence from it of the members of the series asa body. If weare told that there are in a certain district 1000 men, and that their average height is 5 feet 8 inches, and are told nothing further about them, we can make various hypotheses as to the structure of this body from the point of view of height. It is possible that they may consist of a rather large number of men about 6 feet high, and a great many about 5 feet 5 inches. Or the proportions of relatively talland short men may be reversed, that is, there may be a rather large number of men about 5 feet 4 inches, and a moderate number of men about 5 feet 11 inches. It is also possible that there may be very few men whose height is exactly 5 fect 8 inches, and that the bulk of the whole body con- sists of two

large groups—one of giants and the other of dwarfs. Lastly, it is possible that 5 feet 8 inches may really give a fair idea of the height of the majority of the men, which it would do if (say) 660 of them were within an inch of that height, either by excess or deficiency, while of the remainder one half were all above 5 feet 9 inches and the other half all below 5 feet 7 inches. This latter supposition would most likely be found to be approximately correct if the men belonged to a race whose average height was 5 feet 8

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inches, and if they had been collected by chance. The extent of the divergence of the items composing an average from the average itself may be accurately measured and expressed in percentages of the average, the algebraic signs + and — being employed to indicate the direction of the variation from the mean, An average may, therefore, advantageously be supplemented—(1) by a figure showing what proportion of the members from which it is derived differ from the average by a relatively small quantity, and (2) by fignres show- ing the maximum and minimum deviations from the average. The meaning of the term ‘‘ relatively small” must be considered inde- pendently iu each investigation. Further remarks on averages will be found in the works mentioned at the conclusion of this article.

Priccs.—Reference has already becn made to the peculiar class of statistical quantities known as prices, Prices in their widest sense include all figures expressing ratios of exchange. In modern society the terms of exchange are always expressed in money, and the things for which money is exchanged are—(1) concrete entities with physical attributes, such as iron or wheat; (2) immediate rights, such as those given by intcrest-bearing securities of all kinds, by bills of exchange, by railway or steamship contracts to carry either passengers or goods, and by bargains relative to the foreign exchanges; (3) contingent rights, such as those implied in policies of insurance. All these rates of exchange belong to the same category, whether they are fixed within certain limits by law, as in the case of railway charges,

or are left to be determined by the ‘“‘higgling of the market.” All these cases of price may con- ceivably come within the operation of the statistical method, but the only matter connected with price which it is necessary to refer to here is the theory of the index number.

Index Numbers.—The need for these became conspicuous dur- ing the investigations of Tooke, Newmarch, and others into the general cyclical movements of the prices of commodities; and to construct a good system of thesc may be said to be one of the highest technical aims of the statistical method. In comparing the prices of different years it was soon observed that, though whole groups of articles moved upwards or downwards simultancously, they did not all move in the same proportion, and that there were nearly always cases in which isolated articles or groups of articles moved in the opposite direction to the majority of articles. The problem aerate to statisticians therefore was and is to devise a statistical expression of the general movement of prices, in which all prices should be adequately represented. The first rough approximation to the desired result was attained by setting down the percentages representing the movements, with their proper algebraic signs before them, and adding them together algebraically. The total with its proper sign was then divided by the number of articles, and the quotient represented the movement in the prices of the whole body of articles during the period under considera- tion. It was soon seen, however, that this procedure was fatally defective, inasmuch as it treated all prices as of equal weight. Cotton weighed no more than pimento, and iron no more than umbrellas. Accordingly an improvement was made in the pro- cedure, first by giving the prices of several different articles into which cotton, iron, and other important commodities entered, aud only one price each in the case of the minor articles, and secondly by fixing on the price of some one article representing iron or cotton, and multiplying it by some number selected with the view of assign- ing to these articles their proper weights relatively to each other and to the rest. The objection to both these plans is the same,—that the numbers attached to the various articles or groups of articles are purely arbitrary; and of late years attempts have been made to obtain what may be called natwral index numbers, the most suc- cessful so far being that of Mr Robert Giffen, whose index numbers are obtained from the declared values of the imports or exports into or from the United Kingdom of the articles whose prices are dealt with. In the case of

both imports and exports Mr Giffen worked out the proportion borne by the value of each article to the total value for a series of years. Deducting the ‘‘unenumerated”’ articles, a series of nunibers was thus obtained which could be used as the means of weighting the prices of the articles in an investigation of a movement of prices. This procedure is no doubt susceptible of further improvement, like its predecessors, but it isa great advance on the arbitrary systems of index numbers employed in them.

The Desirability of Inereased Uniformity in Statistics.—One of the most serious difficulties in connexion with statistical investigations is the variety of the modes in which primaries of the same order are obtained, as regards dates and periods. This is a matter of which all persons who have occasion to use statistics are made painfully aware from time to time. Some attempts have Iately been made to introduce more harmony into the official statistics of the United Kingdom, and some years ago a committee of the Treasury sat to inquire into the matter. The committee received a good deal of evidence, and presented a report, from which, how- ever, certain members of the committee dissented, preferring to express their views separately. The evidence will be found very interesting by all who wish to obtain an insight into the genesis of the official statistics of the country. The report and evidence

were published in the June number of the Journal of the Statistical Soeicty for 1881, as well as in the usual official form.

The International Institute of Statisties.—The absence of uni- formity in statistics which is felt in England is not so marked in foreign countries, where the principle of centralization in arrange. inents of a political character is more powerful than it is here. In several Continental countries and in the Unitcd States there are statistical burcaus with definite dutics to perform. In the United Kingdom, as already remarked, the nearest approach to a central statistical office is the Commercial and Statistical Department of the Board of Trade, on which the work of furnishing such statistics as are not definitely recognized as within the province of some other state department usually falls. Various attempts have been made to introduce more uniformity into the statistics of all countries, It was with this object

that statistical congresses have met from time to time since 1853. An endeavour was made at the congress held in 1876 at Budapest to arrange for the publication of a system of international statistics, each statistical burcau nndertaking a special branch of the subject. The experiment was, however, foredoomed to be only a very partial success, first because all countries were not then and are not yet furnished with central statistical offices, and secondly because the work which fell on the offices in existence could only be performed slowly, as the ordinary business of the offices necessarily left them little leisure for extra work. In 1885, at the jubilee of the London Statistical Society, a number of eminent statistical officials from all parts of the world except Germany were present, and the opportunity was taken to organize an International Institute of Statistics with a view to remedying the defects already ascertained to exist in the arrange- ments made by the congresses. The only obstacle to securing a proper representation ofall countries was the absence of any German delegates, none of the official heads of the German statistical office being allowed to attend,—apparently on political gronnds. Since then assurauces of a satisfactory kind have been given to the German Government that their servants would be in no way committed to any course disapproved by that Government if they gave their assistance to the institute, from the formation of which it is hoped that much advantage may resnIt. For information as to the constitution and objects of the institute reference may be made to a paper by Dr F. X. von Neumann-Spallart in vol. i (1886) of the Bulletin de UInstitut International de Statistique (Rome, 1886).

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socialen Kérpers, Tiibingen, 1881; Herbert Spencer, Principles of Sociology, especially part ii. pp. 465 sq.; Adolf Wagner, article ‘‘ Statistik” in Buntschili-Brater’s Staatsworterbuch, vol. x. (W. HO.)

STATIUS, Pusiius Papinivs, Roman poet, lived from about 45 to 96 a.D., so far as can be judged from indications afforded by his poems. He was, to a great extent, born and trained to the profession of a poet. The Statii were of Greeco-Campanian origin, and were gentle, though impoverished, and the family records were not without political distinctions. The elder Statius, our poet’s father, was the Orbilius of his time, and taught with distinguished success at Naples and Rome. From boy- hood to age he proved himself a champion in the poetic tournaments which formed an important part of the amuse- ments of the early empire. The younger Statius declares that his father was in his time equal to any literary task, whether in prose or verse. Probably our poet inherited a modest competence and was not under the necessity of begging his bread from wealthy patrons. So far as appears he never pursued any occupation but that of poet, as poor an occupation in those days as in ours, if we may believe Juvenal and Martial. Statius certainly wrote poems t0 order (as Stlvae, i. 1, 2, ii. 7, and iii. 4), but there 1s no indication that the material return for them was im- portant to him. In his seventh satire Juvenal speaks of the immense public enthusiasm which attended the recita- tion of the Z’hebais, when the benches “were breaking” with applause; but the poet, he says, might have starved had not Paris, the favourite comedian of the day, bought from him the libretto of a comic opera. This reference

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of Juvenal deserves, however, as little to be accepted literally as his misleading allusions to Quintilian in the same satire. Of events in the life of Statius we know little. He married early a young widow, for whom he expresses tender affection in some of the few obviously sincere verses he ever wrote. From his boyhood he was victorious in poetic contests,—many times at his native city Naples, thrice at Alba, where he received the golden crown froin the hand of the emperor. But at the great Capitoline competition (probably on its third celebration in 94 A.D.) Statius failed to win the

coveted chaplet of oak leaves. No doubt the extraordinary popularity of his Thebais had led him to regard himself as the supreme poet of the age, and when he could not sustain this reputation in the face of rivals from all parts of the empire he accepted the judges' verdict as a sign that his day was past, and retired to Naples, the home of his ancestors and of his own young days. We still possess the poem he addressed to his wife on this occasion (Silv., iii. 5). It was a hard task to overcome her objections to turning her back upon the great capital. Chief among them was that which arose from a fear lest it should prove difficult to find in Naples a husband for her daughter (by her first marriage; she had no children by Statius). There are hints in this poem which naturally lead to the surmise that Statius was suffering from a loss of the emperor's favour; he may have felt that a word from Domitian would have won for him the envied garland, and that the word ought to have been given. In the preface to book iv. of the Silvae there is mention of detractors who hated our poet's style, and these may have sueceeded in inducing a new fashion in poetry at court. Such an eclipse, if it happened, must have cut Statius to the heart. He appears to have relished thoroughly the role of court-poet. The statement sometimes made that the elder Statius had been the emperor's teacher, and had bestowed many favours on him, so that the son inherited a debt of gratitude, seems to have no solid foundation. Statius lauds the emperor, not to discharge a debt, but rather to create an obligation. His flattery is as far removed from the gentle propitiatory tone of Quintilian as it is from the coarse and crawling humiliation of Martial. It isin the large extravagant style of a nature in itself healthy and generous, which has accepted the theme and left scruples behind. In one of his prefatory epistles Statius declares that he never allowed any work of his to go forth without invoking the godhead of the divine emperor. The poem on the equestrian statue of Domi- tian set up on the Capitol (Stv., i. 1) is such colossal rodomontade that if the emperor had had a grain of humour in his composition he must have died of merri- ment on receiving it. Statius had taken the full measure of Domitian's gross taste, and carefully puts conscience and sincerity out of view, lest some uneasy twinge should mar his master's enjoyment. But in one poem, that in which the poet pays his due for an invitation to the im- perial table, we have sincerity enough. Statius clearly feels all the raptures he expresses. He longs for the power of him who told the tale of Dido's banquet, and for the voice of him who sang the feast of Alcinous, that he may give forth utterance

worthy of the lofty theme. The poet Seemed, he says, to dine with great Jove himself and to receive nectar from Ganymede the cup-bearer (an odious reference to the imperial favourite Earinus). All his life hitherto has been barren and profitless. Now only has he begun to live in truth. “O ruler over all the lands, and mighty father of the world which thou hast conquered, do I, recumbent, see thee, thou hope of all mankind, and nursling of all the gods? Is it mine to gaze from near at

nd on thy features, with the wine-cup and the feast

beside me, while I am forbidden to rise?” The palace struck on the poet’s fancy like the very hall of heaven; nay, Jove himself marvels at its beauty, but is glad that the emperor should possess such an earthly babitation; he will thus feel less desire to seek his destined abode among the immortals in the skies. Yet even so gorgeous a palace is all too mean for his greatness and too small for his vast presence. ‘But it is himself, himself, that my eager eye has alone time to scan. He is like a resting Mars or Bacchus or Alcides.” Martial too swore that, were Jove and Domitian both to invite him to dinner for the same day, he would prefer to dine with the greater potentate on the earth. Pliny, however, has sketched for us the state dinners of Domitian, where the coarse contempt of the tyrant overclouded the guests, and where a man who still respected himself had torments to endure. Martial and Statius were no doubt supreme among the imperial flatterers. Each was the other’s only serious rival. It is therefore not surprising that neither should breathe the other’s name. Even if we could by any stretch excuse the bearing of Statius towards Domitian, he could never be forgiven the poem entitled ““‘ The Hair of Flavius Earinus,” Domitian’s Ganymede (Stv., iii. 4), a poem than which it would be hard to find a more repulsive example of real poetical talent defiled for personal ends. Well for Statius that he did not, like Martial, live on into the days of Nerva to write sorry palinodes! Everything points to the con- clusion that he did not survive his emperor—that he died, in fact, a short time after leaving Rome to settle in Naples. Apart from the emperor and his minions, the friendships of Statius with men of high station seem to have been maintained on fairly equal

terms. He was clearly the poet of society in his day as well as the poet of the court.

As poet, Statius unquestionably shines in many respects when compared with the other post-Augustans. He was born with exceptional talent, and his poetic expression is, with all its faults, richer on the whole and less forced, more buoyant and more felic- itous, than is to be found elsewhere in the Silver Age of Latin poetry. Statius is at his best in his occasional verses, the " St/vae," which have a character of their own, and in their best parts a charm of their own. 'The title was proper to verses of rapid workmanship, on everyday themes. Statius prided himself on his powers of improvisation, and he seems to have been quite equal to the Horatian feat of dictating two hundred lines in an hour, while standingon one leg. Theimprovisatore was in high honour among the later Greeks, as Cieero's speech for the poet Arehias indicates ; and the poetic contests common in the early empire did much to stimulate ability of the kind. Statius speaks of his ''Silvae" (preface to book i.) as having ''streamed from him under the influence of sudden inspiration, and with a certain pleasure due to their rapidity." No one poem occupied more than two days ; some eame to birth at the dinner table ; many while the poet's friend Pollius sat by his side, and shuddered at the audacity of his pen (preface to book iii.). It is to this velocity that the poems owe their comparative freshness and freedom, along with their loose texture and their inequality. There are thirty-two poems, divided into five books, each with a dedicatory epistle. Of nearly four thousand lines which the books contain, more than five-sixths are hexameters. Four of the pieces (containing about 450 lines) are written in the hendecasyllabic metre, the " tiny metre of Catullus," and there is one Aleaic and one Sapphic ode. But the pocms in these metres are merely the experiments of a poet who knows well that his strength lies in the hexameter, which in his hands shows greater frecdom, variety, and music than it exhibits when handled by other poets of the Silver Latin Age. The subjects of the '€ Silvae" are very various. Five poems are devoted to flattery of the emperor and his favourites; but of these enough has already been said. Six are lamentations for deaths, or consolations to survivors. Statins seems to have felt a special pride in this class of his produetions; and certainly, notwithstanding the excessive and conventional employment of pretty mythological pictures, with other affeetations, he sounds notes of pathos such as only come from

the true poet. There are oftentimes traits of an almost modern domesticity in these verses, and Statius, the childless, has here and there touched on the charm of childhood in lines for a parallel to which, among the ancients, we must go, strange to say, to his rival Martial. One of the epicedia, that on Priscilla the wife of Abascantus, Domitian's freedman (Silv., v. 1), is full of interest for the picture it presents of the official activity of a high

officer of state. Another group of the "' Silvae" give picturesque descriptions of the villas and gardens of the poet's friends. In these we have a more vivid representation than elsewhere of the surroundings amid which the grandees of the early empire lived when they took up their abode in the country. It was of these pieces that Niebuhr thought when he said that the poems of Statius are charming to read in Italy. They exhibit, better even than Pliny's well-known Ictters, the passion of the rich Roman for so constructing his country house that light, air, sun, and leafage should subserve his luxury to the utmost, while scope was Icft for displaying all the resources of art which his wealth enabled him to command. As to the rest of the " Silvae," the congratulatory addresses to friends are graceful but commonplace, nor do the jocose pieces call for special mention here. Jn the '* Kalendae Decembres " we have a striking description of the gifts and amusements provided by the emperor for the Roman popula- tion on the occasion of the Saturnalia. In his attempt at an epithalamium (Silv., 1. 2) Statius is forced and unhappy. But the birthday ode in Lucan's honour (Si/v., ii. 7) has, along with the accustomed exaggeration, many powerful lines, and shows high appreciation of preceding Latin pocts. Some phrases, such as "the untaught muse of high-souled Ennius" and " the lofty passion of sage Lucretius," are familiar words with all scholars. The ode ends with a great picture of Lucan's spirit rising after death on wings of fame to regions whither only powerful souls can ascend, scornfully surveying earth and smiling at the tomb, or reclining in Elysium and singing a noble strain to the Pompeys and the Catos and all the " Pharsalian host," or with proud tread exploring Tartarus and listening to the wailings of the guilty, and gazing at Nero, pale with agony as his mother's avenging torch glitters before his eyes. It is singular to observe how thoroughly Nero had been struck out of the imperial succession as recognized at court, so that the 'bald Nero" took

no umbrage when his flatterer-in-chief profanely dealt with his predecessor’s name.

The epic poems of Statius are less interesting because cast in a commoner mould, but they deserve study in many respects. They are the product of long elaboration. The ‘‘ Thebais,” which the poet says took twelve years to compose, is in twelve books, and has for its theme the old ‘‘tale of Thebes ”—the deadly strife of the Theban brothers. There is also preserved a fragment of an ‘ Achilleis,” consisting of one book and part of another. In the weary length of these epics there are many flowers of pathos and many little finished gem-pictures, but the trammels of tradition, the fashionable taste, and the narrow bars of education check con- tinually the poet’s flight. The public idea of what an epic poem should be was firmly fixed, and Statius would not have towered above the thousand poets of his day in the estimation of his countrymen had he not given full embodiment to the idea. Not merely were the materials for his epics prescribed to him by rigid custom, but also to a great extent the method by which thcy were to be treated. All he could do was to sound the old notes with a distinctive ¢imbre of his own. The gods must needs wage their wonted epie strife, and the men, their puppets, must dance at their nod ; there must needs be heavenly messengers, portents, dreams, miracles, single combats, similes, Homerie and Virgilian echoes, and all the other paraphernalia of the conventional epic. But Statius treats his subjects with a boldness and freedom which contrast pleasingly with the timid traditionalism of Silius Italicus and the stiff scholasticism of Valerius Flaccus. The vocabulary of Statins is conspicuously rich, and he shows audacity, often successful, in the use of words and metaphors. At the same time he carried certain literary tricks to an aggravating pitch, in parti- cular the excessive use of alliteration, and the misuse of mytho- logical allusion, The most well-known persons and places arc described by epithets or periphrases derived from some very remote connexion with mythology, so that many passages are as dark as Heraclitus. The hebais is badly constructed. The action of the epie is hindered and stopped by enormous episodes, one of which fills one sixth of the poem. Nor had Statius a firm grasp or clear imagina- tion of character. So trying are the late ancient epics to a modern reader that he who has read any one of the three—Statius, Silus, and Valerius (Lucan stands apart)—will with difficulty be persuaded to enter on the other two. Yet, if he honestly reads

them all, he can hardly fail to rank Statius the highest of the three by a whole sphere,

The editio princeps of the epics is dated 1470, of the Silvae 1472. Notable editions since have been those of Bernartius (Antwerp, 1595), Gronovius (1653), and Barth (1664). The best text is the Teubner (the Achilleis and Thebais by Kohlmann, the Silvae by Baehrens). Among editions of portions of Statius's works, that of the Sélvae hy Jeremiah Markland, fellow of Peterhouse in Cam- bridge (1728), deserves special attention. The brilliance and erudition of the work mark him out as one of the best Latin scholars who ever lived. A critical edition of the Thebats and Achilleis was begun by O. Miiller (1870) but not completed. The condition of the text of the S¢ivae is one of the most curious facts in the history of ancient literature. Poggio discovcred a MS. at St Gall and brought it into ltaly. This MS. has disappeared, but from it are derived all our existing MSS., except one of the birthday ode to Lucan, now at Florence, and of the 10th century. Politian collated Poggio's MS. with the editio princeps, and the collation has come down to us, and is the principal basis of the text. The MSS. of the cpics are numerous, as was to be expected from thcir great popularity in the Middle

Ages, to which Dante is witness (see Purg., xxi., where an intervi ith shade of Statius is described at some iinet s "G S R)

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STATUTE, or Act of Parliament, is a law made by the sovereign power in the state, that is, the king, by and with the advice and consent of the lords spiritual and temporal and commons in parliament assembled. It forms a part of the lex scripta, or written law, which by English legal authorities is used solely for statutory law, a sense much narrower than it bore in Roman law. To make a statute the concurrence of the crown and the three estates of the realm is necessary. Thus a so-called statute of 5 Ric. II. c. 5, directed against the Lollards, was afterwards repudiated by the Commons as passed without their assent. The validity of a statute was indeed at times claimed for ordinances such as that just mentioned, not framed in accordance with constitutional rule, and was actually given to royal proclamations by 31 Hen. VIII. c, 8. But this Act was repealed by 1 Edw. VI. c. 12, and since that time nothing but a statute has possessed the force of a statute, unless

indeed certain rules or orders depending ultimately for their sanction upon a statute may be said to have such force. Examples of what may be called indirect legislation of this kind are orders in council (see Privy Counctt), by-laws made under the powers of the Public Health Act, and rules of court such as those made under the powers of the Judicature Acts and Acts of Sederunt of the Court of Session.

The history of statutory legislation and the modern procedure by which bills become statutes are sufficiently treated under AcT oF PARLIAMENT and PARLIAMENT. It is proposed in this place to deal with the legal rather than the political aspect of the subject, and to give a short list of some of the more important statutes which have been passed by the legislature.

The list of statutes as at present existing begins with the Statute of Merton, 1235.1 Many of the earlier statutes are known by the names of the places at which they were passed, ¢.g., the Statutes of Merton, Marlbridge, Gloucester, Westminster, or by their initial words, ¢.9., Quia Hmptores, Circumspecte agatis. The earliest existing statute roll is 6 Edw. I. (the Statute of Gloucester). After 4 Hen. VIL the statute roll ceased to be made up, and enrolments in Chancery (first made in 1485) take its place. Some of the Acts prior to the Statute of Gloucester are of question- able authority, but have gained recognition by a kind of prescription.

All statutes were originally public, irrespectively of their subject matter. The division into public and private dates from the reign of Richard III. At present statutes are of four kinds—public general Acts, public local and personal Acts, private Acts printed by the queen’s printers, and private Acts not so printed. The division into public general and public local and personal rests upon a reso- lution of both Houses of Parliament in 1798. In 1815 a resolution was passed in accordance with which private Acts are printed, with the exception of name, estate, naturalization, and divorce Acts. The last two are now practically superseded by the provisions of the Divorce Act, 1857, and the Naturalization Act, 1870. Since 1815 it has been usual to refer to public general Acts by Arabic numerals, ¢.g., 5 and 6 Vict. c. 21, public local and per- sonal Acts by small Roman numerals, ¢.g., 5 and6 Vict. ce. xxi. Each Act is strictly but a chapter of the legisla- tion of the session, which is regarded as composing a single Act divided into

chapters for convenience, the chapters themselves being also called Acts. The citation of previous Acts is provided for by 13 and 14 Vict. c. 2], § 3. It is now usual for each chapter or Act to contain

1 Ruffhead's edition of the statutes begins with the Magna Carta of 1225. But in the Revised Statutes that form of Magna Carta which is now law appears as a statute of the year 1297. It is often known

as Confirmatio Cartarum, and is a recital and confirmation by Edward I. of the chief provisions of John's charter.

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a short title by which it may be cited, e.g., the Elementary Education Act, 1870. Sometimes a series of Acts is grouped under a generic title, ¢.., the Merchant Shipping Acts, 1854 to 1883.1 8 and 9 Vict. c. 113, § 3, makes evidence the queen's printers' copies of private and local and personal Acts. A private Act not printed by the queen's printers is proved by an examined copy of the parliament roll. A public Act binds all subjects of the realm, and need not be pleaded (except where the law from motives of policy specially provides for pleading certain Acts, as in the defences of not guilty by statute, the Statnte of Frauds, and the Statute of Limitations). A private Act must generally be pleaded, and does not asa rule bind strangers to its provisions. Formerly an Act took effect from the first day of the session in which it was passed. The hardship caused by this technical rule has been obviated by 33 Geo, III. ¢. 13, by which an Act takes effect from the day on which it receives the royal assent, where no other date is named. This has been held to mean the beginning of the day, so as to govern all matters occurring on that day. An Act cannot in the strict theory of English law become obsolete by disuse. Nothing short of repeal can limit its operation. The law has, however, been interpreted in some recent cases with somewhat less rigour. In the case of a prosecution for blasphemy in 1883 (Reg. v. Ramsay) Lord Coleridge said, "though the principles of law remain unchanged, yet (and it is one of the advantages of the common law) their application is to be changed with the changing circum- stances of the times." This would be applicable as much to the interpretation of statutes as to other parts of the common law. The title, preamble, and marginal notes

are strictly no part of a statute, though they may at times aid in its interpretation.

Besides the fourfold division above mentioned, statutes are often classed according to their subject-matter, as perpetual and temporary, penal and beneficial, imperative and directory, enabling and disabling. Temporary Acts are those which expire at a date fixed in the Act itself. Thus the Army Act is passed annually and continues for a year; the Ballot Act, 1872, expired at the end of 1880, and the Regulation of Railways Act, 1873, at the end of five years. By means of these temporary Acts experimental legislation is rendered possible in many cases where the success of a new departure in legislation is doubtful. In every session an Expiring Laws Continuance Act is passed for the purpose of continuing (generally for a year) a con- siderable number of these temporary Acts. By 48 Geo. IIf. c. 106 a continuing Act is to take effect from the date of the expiration of a teniporary Act, where a bill for continuing the temporary Act is in parliament, even though it be not actually passed before the date of the expiration,

Penal Acts are those which impose a new disability, beneficial those which confer a new favour. An imperative Statute (often negative or prohibitory in its terms) makes a certain act or omission absolutely necessary, and sub- Jects @ contravention of its provisions to a penalty. A directory statute (generally affirmative in its terms) recommends a certain act or omission, but imposes no

’ A short title has been occasionally given by retrospection to an Act which did not originally possess it. For instance, the Conveyanc- Ing Act, 1881, enacts that the Act of 5 and 6 Will. IV. c. 62, the original title of which is of unwieldy length, may be cited for the future as the Statutory Declarations Act, 1835. In some cases the title has been changed. Thus the name of the Summary Procedure (Scotland) Act, 1864, was changed in 1881 to that of the Summary Jurisdiction Act, 1864.

. This opinion carries out to a certain extent the view of Locke, Who in Article 79 of his Carolina Code recommended the determination

of Acts of the legislature by effluxion of time after a hundred years from their enactment.

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penalty on non-observance of its provisions. To deter- mine whether an Act is imperative or directory the Act itself must be looked at, and many nice questions have arisen on the application of the rule of law to a particular case.

Enabling statutes are those which enlarge the common law, while disabling statutes restrict it. This division is to some extent coincident with that into beneficial and penal. Declaratory statutes, or those simply in affirmance of the common law, were at one period not uncommon, but they are now practically unknown. The Statute of Treasons of Edward III. is an example of such a statute. Statutes are sometimes passed in order to overrule specific decisions of the courts. Examples are the Factors Act, 1877, the Territorial Waters Jurisdiction Act, 1878, the Sale of Food and Drugs Act, 1879.

The construction or interpretation of statutes depends partly on the common law, partly on statute. The main rules of the common law, as gathered from the best authori- ties, are these. (1) Statutes are to be construed, not accord- ing to their mere letter, but according to the intent and object with which they were made. (2) The relation of the statute to the common law is to be considered. In the words of the resolution of the Court of Exchequer in Heydon's Case, 3 Coke's Rep., 7, the points for considera- tion are—"l, What was the common law before the making of the Act? 2, What was the mischief and defect against which the common law did not provide? 3, What remedy the parliament hath resolved and appointed to cure the disease of the Commonwealth? 4, The true reason of the remedy." (3) Beneficial or remedial statutes are to be liberally, penal more strictly, construed. (4) Other statutes in pari materia are to be taken into con- sideration. (5) A statute which treats of persons of inferior rank cannot by general words be extended to those of superior rank. (6) A statute does not bind the crown, unless it be named therein. (7) Where the pro- vision of a statute is general, everything necessary to make such provision effectual is implied. (8) A later statute repeals an earlier, as far as the two are repugnant, but, if they may stand together, repeal will not be pre- sumed. (9) There is a

presumption against creation of new or ousting of existing jurisdictions, against impairing obligations, against retrospective effect, against violation of international law, against monopolies, and in general against what is inconvenient or unreasonable. (10) Ifa statute inflicts a penalty, the penalty implies a prohibition of the act or omission for which the penalty is imposed. Whether the remedy given by statute is the only one depends on the words of the particular Act. In some cases an action or an indictment will lie; in others the statutory remedy, generally summary, takes the place of the common law remedy. In some few instances the courts have construed the imposition of a penalty as operating not to invalidate a contract but to create a tax upon non-compliance with the terms of the statute. What may be called the statutory rules of construction provide, inter alia, that any Act referring to England includes Wales and Berwick-upon-Iweed (20 Geo. II. ¢. 42), and that all words importing the masculine gender shall be taken to include females, and the singular to include the plural and the plural the singular (13 & 14 Vict. c. 21, § 4). The same Act further provides that, where any Act repealing in whole or in part any former Act is itself repealed, such last repeal shall not revive the Act or provisions before repealed unless words be added to that effect (§ 5), and that, wherever any Act shall be made repealing in whole or in part any former Act and substituting some provision or provisions instead of the provision or provisions repealed, such provision or pro-

visions so repealed shall remain in force until the sub- stituted provision or provisions shall come into operation by force of the last Act (§ 6). Numerous interpretations of particular words are contained in Acts of Parliament, either general, as “month,” ‘‘county,” “land,” and other words in 13 and 14 Vict. c. 21, § 4, or for the purposes of the Act, as “settlement” for the purposes of the Settled Land Act, 1882.

The earlier Acts are generally simple in character and language, and comparatively few in number. At present the number passed every session is enormous; in the session of 1885 it was 80 general and 190 local and personal Acts. Without going as far-as to concede with an eminent legal authority that of such legislation three- fourths is unnecessary and the other

fourth mischievous, it may be admitted that the immense library of the statutes would be but a trackless desert without trust- worthy guides. Revision of the statutes was evidently regarded by the legislature as desirable as early as 1563 (see the preamble to 5 Eliz. c. 4). It was demanded by a petition of the Commons in 1610. Both Coke and Bacon were employed for some time on a commission for revision. At times Consolidation Acts in the nature of digests of law (generally amending as well as consolidating) were passed, such as the Merchant Shipping Act, 1854, and the Criminal Law Consolidation Acts of 1861. The most important action, however, was the nomination of a revision committee by Lord Chancellor Cairns in 1868, the practical result of which has been the issue of an edition of the Revised Statutes in eighteen volumes, bringing the revision of statute law down to 1878. This edition is of course subject to the disadvantage that it becomes less accurate every year as new legislation appears. An index to the statutes which are still law is published about every three years by the Council of Law Reporting.

The principal statutes may be classified under various heads according to the matter with which they deal. It should be remembered at the same time that many of them—Magna Carta, for example—might fall with equal correctness under more than one head. A division, con- venient, if not exhaustive, would be into historical, con- stitutional, legal, and social.

Listorical.—Under this head would come those Acts which to a greater or less extent mark important epochs in the national history, such as the Statute of Rhuddlan, the Acts of Union defining the relations of Wales, Scotland, and Ireland to England, the Act of Settlement, the Stamp Act of 1765—the proximate cause of the revolt of the American colonies,—the Acts abolishing the slave trade and the corn laws, and those defining the position of dependencies, such as the Act for the Better Government of India, 1858, and the British North America Act, 1867.

Constitutional.—The principal Acts of this class would be Magna Carta, the statutes De Tallagio non Concedendo and De Prerogativa Regis and those dealing with mort- main and treason, the Petition of Right, the Bill of Rights, the Septennial Act, the Royal Marriage Act, the Mutiny, Militia, Naval Discipline, and Foreign Enlist- ment Acts, and the Acts affecting the

parliamentary franchise from the time of Henry VI. to the Redistri- bution of Seats Act, 1885. Under this head too might be placed the numerous Acts dealing with the question of religion. Some of the more interesting of these are the Articult Cleri, the Statutes of Provisors, the Acts of Henry VIII. abolishing monasteries, the Acts of Supremacy and Uniformity of Henry VIII., Elizabeth, and Charles ‘i. the Toleration, Catholic Emancipation, Tithe Commuta- tion, Church Discipline, Public Worship Regulation, Irish Church, and Scottish Patronage Abolition Acts.

Legal.—The most important of this class are perhaps

the Statutes of Quia Hmptores and De Donis, the Statutes of Uses and of Wills, the Statutes of Limitation, the Statute of Frauds and its amendments, the Fines and Recoveries Act, the Conveyancing, Settled Land and Settled Estates, and Married Women’s Property Acts, and the Acts for the amendment of procedure, e.g., the Chancery Amendment, Common Law Procedure, Judica- ture, and Appellate Jurisdiction Acts.

Social.—Social legislation (other than mere sumptuary laws) is of comparatively modern introduction. Among earlier instances are the Statute of Labourers of Edward III. and the Poor Law of Elizabeth. More modern examples are the Factory, Public Health, and Artisans’ Dwellings Act, and, perhaps greatest of all, the Education Acts. Besides these there are the Acts dealing with patent, copyright, summary jurisdiction, friendly and building societies, trades unions, savings banks, theatres, commons preservation, and agricultural holdings. Acts which have trade for their special object are the Bank Charter, Merchant Shipping, Bills of Lading, Bills of Exchange, Crossed Cheques, Factors, Stamp, Licensing, Bankruptcy, and Trade Marks Acts.

The chief editions of the statutes are the Statutes of the Kealm printed by the queen’s printers, Ruffhead’s, and the fine edition issued from 1810 to 1824 in pursuance of an address from the House of Commons to George III. The safest authority is of course the Revised Statutes. Chitty’s collection of statutes of practical utility is a use- ful compilation. Among the earlier works on statute law may be mentioned the readings on statutes by great

lawyers, such as the second volume of Coke's Institutes, Bacon's Reading on the Statute of Uses, Barrington's Observations on the more Ancient Statutes from Magna Carta to the 21 Jac. I. c. 27 (5th ed. 1796), and the Introduction to Blackstone's Commentaries. Among the later works are the treatises of Dwarris (2d ed. 1848) and Sir P. B. Maxwell (2d ed. 1883) on the interpretation of statutes, and Sir H. Thring's Practical Legislation, or the Composition and Language of Acts of Parliament.

Scotland.—The statutes of the Scottish parliament before the Union differed from the English statutes in two important respects, —they were passed by the estates of the kingdom sitting together and not in separate Houses, and from 1367 to 1690 they were dis- cussed only after preliminary consideration by the Lords of Articles. An Act of the Scottish parliament may in certain cases cease to be binding by desuetude. ''To bring an Act of Parlia- ment like those we are dealing with" (i.c., the Sabbath Profana- tion Acts) ''into what is called in Scotch law the condition of desuetude, it must be shown that the offence prohibited is not only practised without being checked, but is no longer considered or dealt with in this country as an offence against law' (Lord Justice General Inglis in Bute's Case, 1 Couper's Rep., 495). Acts of the imperial parliament passed since the Union extend in general to Scotland, unless that country be excluded from their operation by express terms or necessary implication.

Ireland.—Originally the lord deputy appears to have held parliaments at his option, and their Acts were the only statutory law which applied to Ireland, except as far as judicial decisions had from motives of policy extended to that country the obliga- tion of English statutes. In 1495 the Act of the Irish parliament known as Poyning's Law or the Statute of Drogheda enacted that all statutes lately made in England be deemed good and effeetual in Ireland. This was construed to mean that all statutes made in England prior to the 18 Hen. VII. were valid in Ireland, but none of later date were to have any operation unless Ireland were specially named therein or unless adopted by the Irish parliament (as was done, for instance, by Yelverton's Act, 21 and 22 Geo. III. c. 48, i.) Another article of Poyning's Law secured an initiative of legislation to the English privy council, the Irish parliament having simply a power of acceptance or rejection of proposed legislation. The power of the parliament of Great Britain to make laws to bind the people of

Ireland was declared by 6 Geo. I. c. 5. This Act and the article of Poyning's Law were repealed in 1782, and the short-lived independence of the parliament of Ireland was recognized by 28 Geo. III. c. 28. The application of Acts passed since the Union is the same as in the case of Scotland.

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Colonies and Dependencies.—Acts of the imperial parliament do not extend to the Isle of Man, the Channel Islands, or the colonies, unless they are specially named therein. By 28 and 29 Vict. e. 63 any colonial law repugnant to the provisions of any Act of Parliament extending to the colony is void to the extent of such yepugnancy, and no colonial law is to be void by repugnancy to the law of England unless it be repugnant to such an Act of Parliament. For colonics without representative legislatures the crown usually legislates, subject to the consent of parliament in particular cases. For instance, it was the opinion of the judicial committee of the privy council in 1876 that a cession of British territory in India to a native state would probably need the con- eurrence of the imperial parliament (Damodhar Gordhan v. Deoram Kanji, Law Rep., 1 Appeal Cases, 332). :

United States.—By the constitutions of many States English

statute law, as it existed at the time of the separation from England, and as far as it is applicable, has been adopted as part of the law of the States. The United States and the State are not bound by an Act of Congress or a State law unless specially named. The States legislate for themselves within the limits of their own constitution and that of the United States. Here appears the striking difference between the binding force of a statute of the United Kingdom and an Aet passed by congress or a State legis- lature. In the United Kingdom parliament is supreme; in the United States an Act is only of authority if it is in accordance with the constitution. The courts may declare an Act void if it contravene the constitution of the United States or of a State, so that practically the Supreme Conrt of the United States is the ultimate legislative authority. Examples of recent eases where the constitutionality of an Act has been contested will be found under PAyMunt and Privitecr. The restrictions upon legisla- tion contained in the constitution of the United States provide against the suspension of the writ of habeas corpus, except in case of rebellion or invasion, the passing of a

bill of attainder or ex post facto law, the imposition of capitation or other direct tax, unless in accordance with a previous article of the constitution, or of a tax or duty on exports, the preference of the ports of one State over those of another, the drawing of money from the treasury except by appropriations made by law, and the grant of a title of nobility. The amended constitution contains further limitations, ¢.g., the taking of private property for public use without just compensa- tion, and the abridging of the right of citizens on account of race, colour, or previous condition of servitude. State legislation is limited by § 10:—‘‘ No State shall. .... make anything but gold and silver coin a tender in payment of debts, pass any bill of attainder, ex post facto law, or law impairing the obligation of eon- tracts, or grant any title of nobility.” The section further forbids imposition of duties on imports or exports or any duty of tonnage without consent of congress. State constitutions often contain further restrictions ; among the more usual are provisions against laws with a retrospective operation, or impairing the obligation of contracts, or dealing with more than one subject to be expressed in the title. The time when a statute is to take effect Sher its passing is often fixed by State constitutions. The statutes of the United States were revised under the powers of an Act of Congress passed in 1874 (sess. i. c. 333), and the volume of Revised Statutes (frequently amended since) was issued on February 22, 1875. Many of the States have also issued revised editions of their statutes. The rules of construction arc in general agreement with those adopted in England. See Sedgwick, Statutory Law. _ International Law.—The term statute is used by international Jurists and eivilians to denote the whole body of the municipal law of the state. In this sense statutes are either real, personal, or mixed, A real statute is that part of the law which deals directly with property, whether movable or immovable. A personal statute has for its object a person, and deals with questions of status, such as marriage, legitimacy, or infancy. A mixed statute affects both property and person, or, according to some authorities, it deals with acts and obligations. Personal statutes are of universal valid- ity; real statutes have no extra-territorial authority. The deter- mination of the class under which a particular law ought to fall is one of great difficulty, and one in which there is often a conflict of legal opinion. On the whole the division appcars to have created more difficulties than it has solved, and it is rejected by Savigny a3 unsatisfactory. Sce Story, Conflict of Laws, §§ 12-16; Philli- more, International Law, vol. iv. ch. xvi. (J. Wt.)

STATUTE MERCHANT anp STATUTE STAPLE were two old forms of security, long obsolete in practice, though references to them still occur in some modern statutes. They were originally permitted only among traders, for the benefit of commerce, but afterwards extended by 23 Hen. VIII. c. 6 to all subjects, whether traders or not. The creditor under either form of security was allowed to seize the goods and hold the lands of a

defaulting debtor until satisfaction of his debt. While he held the lands he was termed tenant by statute mer- chant or by statute staple. In addition to the loss of his goods and lands the debtor was liable to be imprisoned.

STAUNTON, a city of the United States, the county- seat of Augusta county, Virginia, lies at the foot of the Blue Ridge Mountains, on the Lewis Creek (a tributary of the Shenandoah), 136 miles west-north-west of Richmond. It is the seat of the State lunatic asylum and of the State institution for the deaf and dumb and blind, and has besides an unusual number of important educational establishments. Jron-works, planing-mills, and flour-mills represent the manufacturing interest. The population was 5120 in 1870 and 6664 in 1880.

STAUNTON, Howarp (1810-1874), Shakespearean scholar and writer on chess, was born about 1810. He was educated at Eton and Oxford, but left the university without taking a degree and settled in London, devoting much of his attention to the study of the English drama- tists of the Elizabethan age. In conjunction with this he also took a great interest in the stage, and as an amateur once played Lorenzo to the Shylock of Edmund Kean. Between 1857 and 1860 he edited in monthly parts an edition of Shakespeare published by Routledge, which has been several times reissued, and must be ranked as superior, as regards both text and notes, to any previously published. His skill as a Shakespearean commentator, combining in a remarkable degree the acuteness and caution which qualified him to excel in chess, and dis- ciplined to rare perfection by a thorough mastery of the literature of the period, is still more strikingly shown in his papers in the Atheneum on “ Unsuspected Corruptions of Shakespeare’s Text,” commenced in October 1872. These formed part of the materials intended to be made use of in an improved edition of

Shakespeare’s works which he proposed to prepare, but which for a variety of reasons was never published. In 1864 he published a facsimile of the Shakespeare folio of 1623, and a finely illustrated work entitled Memorials of Shakspeare. He was also the author of the Great Schools of England,—an Account of the Foundation, Endowments, and Discipline of the Chief Seminaries of Learning in England, 1865. An account of his career as a chess-player, and a notice of his chief publications on the game, will be found under the heading Cuxss (vol. v. pp. 601, 603). He died in London 22d June 1874.

STAVANGER, a seaport town of Norway, the adminis- trative centre of an ‘‘amt” of the same name (population 114,164 in 1876), is situated on the west coast, on the south side of a beautiful fjord, about 127 miles north-west of Christiansand. A railway to connect Stavanger with Christiania has been planned, but as yet only the terminal portions have been constructed, the Stavanger portion, which runs south to Ekersund for 47 miles, being opened in 1878. The town is for the most part a collection of narrow and irregular streets, but signs of the wealth acquired by its shipping trade and herring fishery appear in the well-built stone houses erected since the great fire of 1860. In 1884 314 vessels (70,006 tons) entered the harbour and 267 (57,479 tons) cleared. Though the bishop’s see was removed from Stavanger to Christiansand in 1685, the old cathedral of St Swithun’s, founded by the English bishop Reinald in the end of the 11th century, and rebuilt after being burned down in 1272, still remains, and, next to the cathedral of Trondhjem, is the most interesting piece of Gothic architecture in Norway. The old episcopal palace of Kongsgaard is nowa Latin school. The com- munal hospital is an important institution. The town dates from the 8th or 9th century and became the seat of a bishopric in the 13th. In 1801 the population of

Stavanger was only 2500; by 1855 it was 12,000, and by 1875 20,350.

STAVROPOL, a government of Northern Caucasia, Russia, having an area of 26,530 square miles, and a population (rapidly increasing by Russian immigration) last returned at 637,893. It is bounded by Astrakhan and the province of the Don Cossacks on the N., Kubaji on the W., Terek on the 8.,

and the Caspian Sea on the E,, occupying the eastern part of the broad plains and steppes which fringe the main chain of Caucasus (g.v.) on the north. In the western part of the government a broad undulating swelling, ranging from 1500 to 2000 feet above sea-level, extends northwards from the central mountain chain ; in the southern part of this swelling, in the vicinity of Pyatigorsk, there is a group of sixteen mountains, 2800 to 4600 feet in height—the Beshtau,— which, as shown by Abich, ought to be considered as a porphyritic upheaval which took place at a point where the two predominant directions in Caucasus (south-west to north-east and south-east to north-west) meet. Northward and eastward of the above plateau are extensive steppes, from 400 to 200 feet above the sea, having gentle slopes both to the north (to the depression of the Manytch) and to the east (towards the low and dry steppes of the Caspian littoral). The geological structure of Stavropol is most interesting. The mountains in the southern parts of _ Pyatigorsk consist of trachytic porphyries and volcanic rocks. Numberless hot mineral springs (see PyaTicorsk) occur in this group, and earthquakes are most common in the region. A broad belt of Miocene deposits, represented by the “steppe limestone” with Mactra podolica, girdles the hilly tracts, attaining a breadth of 40 miles or rather more ; while the remainder of the steppes, which gently slope towards the Manytch and the Caspian, are occupied by the Post-Tertiary Caspian formation (loess),

Stavropol is chiefly watered by the Kuma and its tributaries (Podkumok, Karamyk, Buivola, &c.), its basin bemg the most fertile part of the province, but the evaporation is so great that the Kuma never reaches the Caspian except in spring. The Manytch is less a river than a series of lakes occupying a depression which formerly was a connecting channel between the Black Sea and the Caspian. This channel has two slopes, the eastern some- times discharging its scanty water-supply into the Kuma, while on the western slope the elongated lakes which fill up the depression drain into the Don, reaching it, however, only during spring. Two Yegorlyks (Great and Middle), the Kalaus, and the Tchogra (temporary tributaries of the Manytch) water the west part of Stavropol; while the Yeya and the Barsukly —a tributary of the Kubafi—rise in the district of Pyatigorsk. On the whole, irrigation is scanty, and in the eastern steppes water is supplied only by cisterns. Besides the few lakes of the Manytch depres- sion, there are many

smaller salt lakes around the Caspian. Timber is scarce, even in the hilly tracts.

The climate is severe. Although Stavropol and Pyati- gorsk both have an average yearly. temperature of 48° Fahr., frosts of -22° Fahr. are not uncommon, and the average winter temperature is only 28°-7 at Stavropol (January, 25°; July, 71°). Yellow and other endemic fevers, sometimes very severe, are common on the low banks of the Kuma and Manytch.

The region is traversed by both the great highways along the western shore of the Caspian (the Vladikavkaz and the Derbent routes), and accordingly several nations in their migrations have left stragglers on the steppes of Stavropol. Thus we now find in these steppes Lamaite Kalmucks (about 10,000), Mohammedan Turcomans and Nogais (together about 60,000), as well as less con- siderable remains of several other tribes. On the other

hand, immigrants from Great and Little Russia, Poles, Germans, Esthonians, Greeks, and even a few Scots (in a colony close to Pyatigorsk) have settled in the most fertile and best watered parts of Stavropol in the course of the present century. The Russian population is grow-

ing very rapidly, and already numbers upwards of

500,000.

There are three administrative districts, the chief towns of which are Stavropol (35,470 inhabitants in 1884), Pyati- gorsk (11,115), and Alexandrovskaya (8710), and a terri- tory of nomad natives which occupies more than two-fifths of the entire area of the government,

The educational returns for 1883 show 7 gymnasiums and “real schools,” with 1081 boys and 491 girls, and 139 elementary schools, with only 5310 boys and 1034 girls,

Agriculture is the chief occupation of the settled population, and so large is the harvest that no less than 16,000 labourers, attracted by high wages, come annually from European Russia to assist in gathering in the crops. Large amounts of corn are exported both to the mountainous districts of Caucasus and to Russia (Rostoff- on-the-Don). Cattle-breeding is engaged in very largely, not only by the Kalmucks, Turcomans, and Nogais, but also by the Russians, In 1884 Stavropol had 154,000 horses, 808,500 cattle, 2,540,000 sheep, 45,000 goats, 75,000 pigs, and 7500 camels. Cattle and horses, as also wool, hair, hides, and sheepskins, are exported in considerable quantities. A remarkable feature of Stavropol is the rapid

growth among the Russian peasant population of a great variety of domestic trades both for local supply and for exportation, Silk wares are now woven in the villages to such an extent as to become an important article of export to Russia. Many other petty trades have also grown up of late, such as various kinds of cotton- weaving, the manufacture of leather wares, small metallic wares, and so on, Manufactures proper (chiefly distillation) employed some 1000 persons in 1870, and their produce was estimated at about £140,000 per annum. Since that time they have slowly expanded. A brisk trade is carried ou in the above-mentioned articles of export, and twenty-nine village fairs show an aggregate annual return of nearly £300,000.

History.—The northern slopes of Caucasus began to be colonized by Russians at a very early period, and as early as the 11th cent- ury part of the territory now occupied by Stavropol was known to Russian annalists as the Tmutarakaii principality, which had Russiau princes. A new attempt to colonize North Caucasus was made in the 16th century, under Ivan the Terrible, who married a Kabardian princess. This was again unsuccessful, and it was not till 1711 that Russia began regularly to colonize the territory by Cossack settlements. The military colonization was continued during the whole of last century; Kizlar was founded in 1736, Stavropol in 1776 or 1777. Immense tracts were given by Catherine II. to her courtiers, who began to people them with serfs brought from Russia. The flow of immigrants rapidly increased as soon as peace was firmly established, and it is still on the increase, especially since the emancipation of the serfs, so that Stavropol is rapidly becoming a Russian province, with a comparatively limited number of natives in the steppes of its eastern part.

STAVROPOL, capital of the above province, is situated on a plateau 2000 feet above the sea, on the northern slope of the Caucasus, 360 miles to the north-west of Tiflis and 914 miles from Moscow. It is connected by rail with Rostoff-on-the-Don. Although founded only in 1776 for military purposes, it has rapidly grown, and has now a population of 35,500, while it is one of the best built provincial towns of the Russian empire. It has wide streets, and its houses are mostly of stone; large gardens surround the houses; and numerous farms and gardens occupy the territory (nearly 50,000 acres) belonging to the town. It is well provided with educational

institu- tions, there being four gymnasia for boys and girls and several primary schools, Nearly all the manufactures of the province are concentrated in Stavropol. The trade is considerable, large numbers of cattle (more than 35,000 head annually) being sent to Moscow and St Petersburg, while tallow and more than 15,000 sheepskins are exported via Rostoff to Russia. Corn is also exported to the value of nearly £300,000, while manufactured wares are imported to the value of nearly £150,000. Armenian, Georgian, and Persian merchants carry on a lively trade in local wares.

nie 1. A Heat-ENGINE isa machine in which heat is employed of todo mechanical work. In all practical heat-engines, t- work is done through the expansion by heat of a fluid which nes. overcomes resistance as it expands —in steam-engines by the expansion of water and water-vapour, in air-engines by the expansion of hot air, in gas-engines by the expansion of a burnt mixture of air and gas. One of the most simple and historically one of the oldest types of heat-engines are guns, in which heat, generated by the combustion of an ex- plosive, does work in giving energy of motion to a projec- tile. But guns differ so widely from all other types, both in their purpose and in their development, that it is con- venient to leave them out of account in treating of engines which may serve as prime movers to other mechanism.

In 1615 Solomon de Caus gives a plan of forcing up water De Caus. by a steam fountain which differs from Della Porta’s only

in having one vessel serve both as boiler and as displace- ment-chamber, the hot water being itself raised.

4. Another line of invention was taken by Giovanni Branca, Branca (1629), who designed an engine shaped like a 1629. water-wheel, to be driven by the impact of a jet of steam on its vanes, and, in its turn, to drive other mechanism for various useful purposes. But Branca’s suggestion was

unproductive, and we find the course of invention revert to the line followed by Della Porta and De Caus.

5. The next contributor is one whose place is not easily Marquis assigned. To Edward Somerset, second marquis of Wor- of Wor- cester, appears to be due the credit of making the first ay useful steam-engine. Its object was to raise water, and it ;

I. Eagty History oF THE STEAM-ENGINE.

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BO. Pneumatica of Hero of Alexandria (c. 130 B.c.).

la ta,

2. The earliest notices of heat-engines are found in the Two contrivances described there deserve mention. One is the eolipile, a steam reaction-turbine consisting of a spherical ‘vessel pivoted on a central axis and supplied with steam through one of the pivots. The steam escapes by bent pipes facing tangentially in opposite directions, at opposite ends of a diameter perpendicular to the axis. The globe revolves by reaction from the escaping steam, just as a Barker’s mill is driven by escaping water. Another apparatus described by Hero (fig. 1)! is interesting as the prototype of a class of engines which long after- wards became practically important.

3. From the time of Hero to the 17th century there is no progress to record, though here and there we find evidence that appliances like those described by Hero were used for trivial purposes, such as organ-blowing and the turning of spits. The next distinct step was the publica- tion in 1601 of a treatise on pneumatics by Giovanni Bat- tista della Porta, in which he shows an apparatus similar to Hero’s fountain, but with steam instead of air as the displacing fluid. Steam generated in a separate vessel passes into a closed chamber containing water, from which @ pipe (open under the water) leads out. He also points out that the condensation of steam in the closed chamber may be used to produce a vacuum and suck up water from a lower level. In fact, his suggestions anticipate very fully the engine which a century later became in the hands of

Savery the earliest commercially successful steam-engine. ita ana altuna dill

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Fig. 1.—Hero’s Apparatus, 130 B.c.

- From Greenwood’s translation of Hero’s Pneumatica.

worked probably like Della Porta’s model, but with a pair of displacement-chambers, from each of which alternately water was forced by steam from an independent boiler, or perhaps by applying heat to the chamber itself, while the other vessel was allowed to refill. Lord Worcester’s de- scription of the engine in his Century of Inventions (1663) is obscure, and no drawings are extant. It is therefore . difficult to say whether there were any distinctly novel features except the double action; in particular it is not clear whether the suction of a vacuum was used to raise water as well as the direct pressure of steam. An engine of about two horse-power was in use at Vauxhall in 1656, and the walls of Raglan Castle contain traces of another, but neither Worcester’s efforts nor those of his widow were successful in securing the commercial success of his engine.

6. This success was reserved for Thomas Savery, who Savery, in 1698 obtained a patent for a water-raising engine, 1698.

shown in fig. 2. Steam is admitted to one of the oval vessels A, displacing water, which it drives up through the check-valve B. When the vessel A is emptied ~ of water, the supply of steam is stopped, and the steam al- ready there is con- densed by allowing a jet of cold water from a cistern above to stream over the outer surface of the vessel. This pro- duces a vacuum and causes water to be sucked up through the pipe C and the valve D. Mean-while, steam has been displacing — water fromtheother * vessel, and is ready to be condensed there. The valves B and D open only upwards. The supplementary boiler and furnace E are for feeding water to the main boiler; E is filled while cold and a fire is lighted under it; it then acts like the vessel of De Caus in forcing a supply of feed-water into the main boiler F. The gauge-cocks G, G are an interesting feature of detail. Another form of Savery’s engine had only one displacement- chamber and worked

intermittently. In the use of arti- ficial means to coudense the steam, and in the application XXII. — 60

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Engine, 1698.

Cylinder and piston engine.

Papin.

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level lower than that of the engine, Savery’s engine was probably an improvement on Worcester’s ; in any case it found what Worcester’s engine had failed to find,—consider- able employment in pumping mines and in raising water to supply houses and towns, and even to drive water- wheels. A serious difficulty which prevented its general use in mines was the fact that the height through which it would lift water was limited by the pressure the boiler and vessels could bear. Pressures as high as 8 or 10 atmospheres were employed—and that, too, without a safety-valve—but Savery found it no easy matter to deal with high-pressure steam ; he complains that it melted his common solder, and forced him, as Desaguliers tells us, “to be at the pains and charge to have all his joints soldered with spelter.” Apart from this drawback the waste of fuel was enormous, from the condensation of steam which took place on the surface of the water and on the sides of the displacement-chamber at each stroke ; the consumption of coal, was, in proportion to the work done, some twenty times greater than in a good modern steam- engine. In a tract called The Muiner’s Friend, Savery alludes thus to the alternate heating and cooling of the water-vessel: ‘On the outside

of the vessel you may see how the water goes out as well as if the vessel were trans- parent, for so far as the steam continues within the vessel so far is the vessel dry without, and so very hot as scarce to endure the least touch of the hand. SBut as far as the water is, the said vessel will be cold and wet where any water has fallen on it; which cold and moisture vanishes as fast as the steam in its descent takes place of the water.” Before Savery’s engine was entirely displaced by its suc- cessor, Newcomen’s, it was improved by Desaguliers, who applied to it the safety valve (invented by Papin), and substituted condensation by a jet of cold water within the vessel for the surface condensation used by Savery.

7. So early as 1678 the use of a piston and cylinder (long before known as applied to pumps) in a heat-engine had been suggested by Jean Heautefeuille, who proposed to use the explosion of gunpowder either to raise a piston or to force up water, or to produce, by the subsequent cooling of the gases, a partial vacuum into which water might be sucked up. ‘Two years later Huygens described an engine in which the explosion of gunpowder in a cylinder expelled part of the gaseous contents, after which the cooling of the remainder caused a piston to descend under atmospheric pressure, and the piston in descending did work by raising a weight.

8. In 1690 Denis Papin, who ten years before had invented the safety-valve as an adjunct to his “ digester,” suggested that the condensation of steam should be em- ployed to make a vacuum under a piston previously raised by the expansion of the steam. Papin’s was the earliest cylinder and piston steam-engine, and his plan of using steam was that which afterwards took practical shape in the atmo- spheric engine of Newcomen. But

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Fie, 3.—Papin, 1705

his scheme was made unworkable by the fact that he pro- posed to use but one vessel as both boiler and cylinder.

of the vacuum so formed to raise water by suction from a { A small quantity of water was placed at the bottom of ~

-densing single-acting steam-pump, with steam-cylinder and

cylinder and heat was applied. When the piston had risen the fire was removed, the steam was allowed to cool, and the piston did work in its down-stroke under the pressure of the atmosphere. After hearing of Savery's engine in 1705 Papin turned his attention to improving it, and devised a modified form, shown in fig. 3, in which the displacement-chamber A was a cylinder, with a floating diaphragm or piston on the top of the water to keep the water and steam from direct contact with one another. 'The water was de- livered into a closed air-vessel B, from which it issued in a continuous stream against the vanes of a water-wheel. After the steam had done its work in the displacement- chamber it was allowed to escape by the stop-cock C instead of being condensed. Papin's engine was in fact a non-con-

pump-cylinderinone. A curious feature of it was the heater D, a hot mass of metal placed in the diaphragm for the pur- pose of keeping the steam dry. Among the many inventions of Papin was a boiler with an internal fire-box, —the earliest example of a construction that is now almost universal.! |

9. While Papin was thus going back from his first New. | notion of a piston-engine to Savery's cruder type, a new coma inventor had appeared who made the piston-engine a – : practical success by separating the boiler from the cylinder = and by using (as Savery had done) artificial means to con- 1705, dense the steam. This was Newcomen, who in 1705, with his assistant Cawley, gave the steam-engine the form shown in fig. 4. Steam admitted from the boiler to the cylinder allowed the piston to be raised by a heavy counterpoise on the other side of the beam. Then the steam- valve was shut and a jet of cold water entered the cylinder and condensed the steam. The piston was consequently forced down by the pressure of the at- mosphere and did work on the pump. The next entry of steam expelled the

condensed — water from the cylinder through an escape valve. The piston was kept tight by a layer of water on its upper surface. Condensation was at first effected by cooling the outside of the cylinder, but the accidental leak- age of the packing water past the piston showed the advan- tage of condensing by a jet of injection water, and this plan took the place of surface condensation. The engine used steam whose pressure was little if at all greater than that of the atmosphere ; sometimes indeed it was worked with the manhole lid off the boiler.

10. About 1711 Newcomen's engine began to be intro- Self | duced for pumping mines; and in 1713 a boy named a Humphrey Potter, whose duty it was to open and shut the | valves of an engine he attended, made the engine self- Potter] acting by causing the beam itself to open and close the Beigh!) valves by suitable cords and catches. Potter's rude device | was simplified in 1718 by Henry Beighton, who suspended from the beam a rod called the plug-tree, which worked the valves by means of tappets. By 1725 the engine was in common use in collieries, and it held its place without material change for about three-quarters of a century 10

1 For an account of Papin's inventions, see his Life and Letters, by Dr E. Gerland, Berlin, 1881.

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Fic. 4.—Neweomen's Atmospherie Engine, 1705.

EARLY HISTORY. |

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comen's engine obsolete had been taken by James Watt. –

Compared with Savery’s engine, Newcomen’s had (as a pumping-engine) the great advantage that the intensity of pressure in the pumps was not in any way limited by the It shared with Savery’s, in a scarcely less degree, the defect already pointed out, that steam was wasted by the alternate heating and cooling of the vessel into which it was led. Though obviously cap- able of more extended uses, it was in fact almost exclu- sively employed to raise water,—in some instances for the

pressure of the steam.

purpose of turning water-wheels to drive other machinery.

Even conteniporary writers complain of its ‘‘ vast con- sumption of fuel,” which appears to have been scarcely

smaller than that of the engine of Savery.

t, 11. In 1763 James Watt, an instrument maker in

. Glasgow, while engaged by the university in repairing a

model of Newcomen’s engine, was struck with the waste of steam to which the alternate chilling and heating of

the cylinder gave rise. He saw that the remedy, in his own words, would lie in keeping the cylinder as hot as the steam that entered it. With this view he added to the engine a new organ—an empty vessel separate from the cylinder, into which the steam should be allowed to escape from the cylinder, to be condensed there by the application of cold water either outside or as a jet. To

preserve the vacuum in his condenser he added a pump,

called the air-pump, whose function was to pump from it the condensed steam and water of condensation, as well as the air which would otherwise accumulate by leakage or by being brought in with the steam or with the injection water. Then as the cylinder was no longer used as a condenser he was able to keep it hot by clothing it with non-con- ducting bodies, and in

particular by the use of a steam- jacket, or layer of hot steam between the cylinder and an external casing. Further, and still with the same object, he covered in the top of the cylinder, taking the piston-rod out through a steam-tight stuffing-box, and allowed steam instead of air to press upon the piston's upper surface. The idea of using a separate condenser had no sooner occurred to Watt than he put it to the test by constructing the apparatus shown in fig. 5. There A is the cylinder, B @ surface condenser, and C the air-pump. The cylinder was filled with steam above the piston, and a vacuum was formed in the sur- face condenser B. On opening the stop-cock D the steam rushed over from the cylinder and was condensed, while the piston rose and lifted a weight. After seve- ral trials Watt patented his im- Provements in 1769; they are ~ 3.0 5 —wat's Ex sales described in his specification in "apparatus,

the following words, which, apart from their immense historical interest, deserve careful study as a statement of principles which to this day guide the scientific develop- ment of the steam-engine :—

e "My method of lessening the consumption of steam, and conse- "a- quently fuel, in fire-engines, consists of the following principles :—

"First, That vessel in which the powers of steam are to be employed to work the engine, which is called the cylinder in Common fire-engines, and which I call the stcam-vessel, must, during the whole time the engine is at work, be kept as hot as the steam that enters it; first by enclosing it in a case of wood, or any other materials that transmit heat slowly ; secondly, by surround- Ing it with steam or other heated bodies; and, thirdly, by suffering neither water nor any other substance colder than the steam to enter or touch it during that time.

STEAM-ENGINE

Near the close of its career the atmospheric engine was much improved in its mechanical details by Smeaton, who built many large engines of this type about the year 1770, just after the great step which was to make New-

“Secondly, In engines that are to be worked wholly or partially by condensation of steam, the steam is to be condensed in vessels distinct from the steam-vessels or cylinders, although occasionally communicating with them; these vessels I call condensers; and, whilst the engines are working, these condensers ought at least to be kept as cold as the air in the neighbourhood of the engines, by application of water or other cold bodies.

“Lhirdly, Whatever air or other elastic vapour is not condensed by the cold of the condenser, and may impede the working of the engine, is to be drawn out of the steam-vessels or condensers by means of pumps, wrought by the engines themselves, or otherwise.

“Fourthly, I intend in many cases to employ the expansive force of steam to press on the pistons, or whatever may be used instead of them, in the same manner in which the pressure of the atmo- sphere is now employed in common fire-engines. In cases where cold water cannot be had in plenty, the engines may be wrought by this force of steam only, by discharging the steam into the air after it has done its office. . . .

“Sixthly, Lintend in some cases to apply a degree of cold not capable of reducing the steam to water, but of contracting it con- siderably, so that the engines shall be worked by the alternate expansion and contraction of the stcam.

‘Lastly, Instead of using water to render the pistons and other parts of the engine air and steam tight, I employ oils, wax, resin- ous bodies, fat of animals, quicksilver and other metals in their fluid state.”

The fifth claim was for a rotary engine, and need not be quoted here.

The “common fire-engine” alluded to was the steam- engine, or, as it was more generally called, the “atmo- spheric” engine of Newcomen. Enormously important as Watt’s first patent was, it resulted for a time in the production of nothing more than a greatly improved engine of the Newcomen type, much less wasteful of fuel, able to make faster strokes, but still only suitable for pumping, still single-acting, with steam admitted during the whole stroke, the piston, as before, pulling the beam by a chain working on a circular arc. The condenser was generally worked by

injection, but Watt has left a model of a surface condenser made up of small tubes, in every essential respect like the condensers now used in marine engines.

12. Fig. 6 is an example of the Watt pumping-engine Watt's of this period. It should be noticed that, although the pumping top of the cylinder is 1789." closed and steam has ac- ; cess to the upper side of the piston, this is done only to keep the cylinder and _ piston warm. 'The | engine is still single-acting ; the steam in the upper side merely plays the part which was played in Newcom- en's _— engine by the atmo- sphere; and it is the lower end of the cylinder alone that is ever put in commu- nication with the condenser. Thereare three valves, — the "steam" valve a, the "equilibrium " valve 4, and the "ex- haust" valvec. At the beginning of the down-stroke c is opened to produce a vacuum below the piston and a is

Fie, 6.—Watt's Single-Acting Engine, 1769.

Rotative engine.

Double action.

Expan- sion of steam.

Parallel motion.

Gover: nor.

- pendulum, which con-

Indica- tor.

opened to admit steam above it. At the end of the down- stroke a and care shut and bis opened. This puts the two sides in equilibrium, and allows the piston to be pulled up by the pump-rod P, which is heavy enough to serve as a counterpoise. © is the condenser, and A the air-pump, which discharges into the hot well H, whence the supply of the feed-pump F is drawn.

13. In a second patent (1781) Watt describes the “sun- and-planet” wheels and other methods of making the engine ‘give continuous revolving motion to a shaft pro- vided with a fly-wheel. He had invented the crank and connecting-rod for this purpose, but it had meanwhile been patented by one Pickard, and Watt, rather than make terms with Pickard, whom he regarded as a plagiarist of his own ideas, made use of his sun-and-planet motion until the patent on the crank expired. The reciprocating motion of earlier forms had served only for pumping ; by this invention Watt opened up for the steam-engine a thousand other channels of usefulness. The engine was still single-acting ; the connecting rod was attached to the far end of the beam, and that carried a counterpoise which served to raise the piston when steam was admitted below it.

14. In 1782 Watt patented two further improvements of the first importance, both of which he had invented some years before. One was the use of double action, that is to say, the application of steam and vacuum to each side of the piston alternately. The other (invented as early as 1769) was the use of steam expansively, in other words the plan (now used in all engines that aim at economy of fuel) of stopping the admission of steam when the piston had made only a part of its stroke, and allow- ing the rest of the stroke to be performed by the expan- sion of the steam already in the cylinder. To let the piston push as well as pull the end of the beam Watt devised his so-called parallel motion, an arrangement of links connecting the piston- rod head with the beam in such a way as to guide the rod to move ina very nearly straight line. Hefurtheradded the throttle-valve, for regulating the rate of admission of steam, and the centrifugal gover- nor, a double conical

zg

trolled the speed by acting on the throttle- valve. The stage of de- velopment reached

at this time is illus- m1 | trated by the en- F = gine of fig. 7 (from F = Stuart’s History of HH = the Steam-Engine), 5 which shows the yee = 4,

parallel motion pp, the governor g, the throttle-valve ¢, and a pair of steam and exhaust valves at each end of the cylinder. Among other inventions of

Watt were the “indicator,” by which diagrams showing the relation of the steam-pressure in the cylinder to the movement of the piston are automatically drawn ; a steam tilt-hammer ; and also a steam locomotive for ordinary roads,—but this invention was not prosecuted.

In partnership with Matthew Boulton, Watt carried on in Birmingham the manufacture and sale of his engines with the utmost success, and held the field against all

Fie. 7.—Watt’s Double-Acting Engine, 1782.

STEHEAM-ENGINE

[EARLY HISTORY,

rivals in spite of severe assaults on the validity of his patents. Notwithstanding his accurate knowledge of the advantage to be gained by using steam expansively he continued to employ only low pressures—seldom more than 7 ib per square inch over that of the atmosphere, His boilers were fed, as Newcomen’s had been, through an open pipe which rose high enough to let the column of . water in it balance the pressure of the steam. He intro- Rating | duced the term “horse-power” as a mode of rating engine | engines, defining one horse-power as the rate at which | work is done when 33,000 tb are raised one foot in one a minute. This estimate was based on trials of the work | done by horses ; it is excessive as a statement of what an average horse can do, but Watt purposely made it so in order that his customers might have no reason to complain on this score. 15. In the fourth claim in Watt’s first patent, the Non second sentence describes a non-condensing engine, which ‘etsing | would have required steam of a higher pressure. This, “8 | however, was a line of invention which Watt did not follow up, perhaps because so early as 1725 a non-con- densing engine had been described by Leupold in his Lenpoi Theatrum Machinarum. Teupold’s proposed engine is 172. shown in fig. 8, which makes its action sufficiently clear. ! Watt’s aversion to high-pressure steam was @p strong, and its influence on steam-engine practice long sur- vived the expiry of his patents. So much indeed was this the case that the terms “high- pressure” and ‘non-condens- ing” were for many years synonymous, in contra-

distinction to the ‘‘low- pressure” or condensing Ff __ engines of Watt. This hy nomenclature no longer

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holds ; in modern practice F546 4 . . eeu ei ee

many condensing engines 5 4 2 2et (oe See a FT

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use as high pressures as non-condensing engines, and by doing so are able to take advantage of Watt’s great invention of expansive working to a degree which was impossible in his own practice.

16. The introduction of the non-condensing and, at High- that time, relatively high-pressure engine, was effected in St England by Trevithick and in America by Oliver Evans qyovi: about 1800. Both Evans and Trevithick applied their jek au engines to propel carriages on roads, and both used for Evans, boiler a cylindrical vessel with a cylindrical flue inside — |] the construction now known as the Cornish boiler. In | partnership with Bull, Trevithick had previously made direct-acting pumping-engines, with an inverted cylinder set over and in line with the pump-rod, thus dispensing with the beam that had been a feature in all earlier forms. But in these “Bull” engines, as they were called, a con- denser was used, or, rather, the steam was condensed by @ jet of cold water in the exhaust-pipe, and Boulton and Watt successfully opposed them as infringing Watt’s patents. To Trevithick belongs the distinguished honour of being the first to use a steam-carriage on a railway ; 10 1804 he built a locomotive in the modern sense, to run on what had formerly been a horse-tramway in Wales, and it is noteworthy that the exhaust steam was discharged into the funnel to force the furnace draught, a device which, 25 years later, in the hands of George Stephenson, went far to make the locomotive what it is to-day. In this con- nexion it may be added that as early as 1769 a steam

Fre. 8.—Leupold’s You ca Engine,

1725,

_BARLY HISTORY. |

carriage for roads had been built by Cugnot in France, who used a pair of single-acting high-pressure cylinders to turn a driving axle step by step by means of pawls and ratchet-wheels. To the initiative of Evans may be ascribed the early general use of high-pressure steam in the United States, a feature which for many years distin- guished American from English practice.

17. Amongst the contemporaries of Watt one name deserves special mention. In 1781 Jonathan Hornblower ‘ gonstructed and patented what would now be called a compound engine, with two cylinders of different sizes. Steam was first admitted into the smaller cylinder, and then passed over into the larger, doing work against a piston in each. In Hornblower’s engine the two cylinders were placed side by side, and both pistons worked on the same end of a beam overhead. This was an instance of the use of steam expansively, and as such was earlier than the patent, though not earlier than the invention, of ex- pansive working by Watt. Hornblower was crushed by the Birmingham firm for infringing their patent in the use of a separate condenser and air-pump. The compound engine was revived in 1804 by Woolf, with whose name it is often associated. Using steam of fairly high pressure, and cutting off the supply before the end of the stroke in the small cylinder, Woolf expanded the steam to several times its original volume. Mechanically the double-cylinder compound engine has this advantage over an engine in which the same amount of expansion is performed ina single cylinder, that the sum of the forces exerted by the two pistons in the compound engine varies less throughout the action than the force exerted by the piston of the single-cylinder engine. This advantage may have been clear to Hornblower and Woolf, and to other early users of compound expansion. But another and probably a more important merit of the system lies in a fact of which neither they nor for many years their followers in the use of compound engines were aware—the fact that by dividing the whole range of expansion into two parts the cylinders in which these are separately performed are subject to a reduced range of fluctuation

in their tempera- ture. This, as will be afterwards pointed out, limits to a great extent a source of waste which is present in all steam-engines, the waste which results from the heating and cooling of the metal by its alternate contact with hot and cooler steam. The system of compound expansion is now used in nearly all large engines that pretend to economy. Its introduction forms the only great improve- ment which the steam-engine has undergone since the time of Watt; and we are able to recognize it as a very important step in the direction set forth in his “ first principle,” that the cylinder should be kept as hot as the steam that enters it.

18. Woolf introduced the compqund engine somewhat widely about 1814, as a pumping engine in the mines of Cornwall. But here it met a strong competitor in the high-pressure single-cylinder engine of Trevithick, which had the advantage of greater simplicity in construction. Woolf’s engine fell into comparative disuse, and the single- cylinder type took a form which, under the name of the Cornish pumping engine, was for many years famous for its great economy of fuel. In this engine the cylinder was set under one end of a beam, from the other end of which hung a heavy rod which operated a pump at the foot of the shaft. Steam was admitted above the piston for a short portion of the stroke, thereby raising the pump- rod, and was allowed to expand for the remainder. Then an equilibrium valve, connecting the space above and below the piston, as in fig. 6, was opened, and the pump-rod descended, doing work in the pump and raising the engine piston. The large mass which had to be started

and stopped at each stroke served by its inertia to counter- balance the unequal pressure of the steam, for the ascend- ing rods stored up energy of motion in the early part of the stroke, when the steam pressure was greatest, and gave out energy in the later part, when expansion had greatly lowered the pressure. The frequency of the stroke was controlled by a device called a cataract, consisting of a small plunger pump, in which the plunger, raised at each stroke by the engine, was allowed to descend more or less slowly by the escape of fluid below it through an adjustable orifice, and in its descent liberated catches which held the steam and exhaust valves from opening. A

similar device controlled the equilibrium valve, and could be set to give a pause at the end of the piston's down-stroke, so that the pump cylinder might have time to become completely filled. The Cornish engine is interesting as the earliest form which achieved an efficiency coniparable with that of good modern engines. For many years monthly reports were published of the "duty" of these engines, the "duty" being the number of foot- pounds of work done per bushel or (in some cases) per ewt. of coal. The average duty of engines in the Corn- wall district rose from about 18 millions of foot-pounds per cwt. of coal in 1813 to 68 millions in 1844, after which less effort seems to have been made to maintain a high efficiency.!. In individual cases much higher results were reported, as in the Fowey Consols engine, which in 1835 was stated to have a duty of 125 millions. This (to use a more modern mode of reckoning) is equivalent to the consumption of only a little more than 1? tb of coal per horse-power per hour—a result surpassed by very few engines in even the best recent practice. It is diffi- cult to credit figures which, even in exceptional instances, place the Cornish engine of that period on a level with the most efficient modern engines—in which compound expansion and higher pressure combine to make a much more perfect thermodynamic machine; and apart from this there is room to question the accuracy of the Cornish reports. They played, however, a useful part in the process of steam-engine development by directing atten- tion to the question of efficiency, and by demonstrating the advantage to be gained by high pressure and expan- sive working, at a time when the theory of the steam- engine had not yet taken shape.

19. The final revival of the compound engine did not Com- occur until about the middle of the century, and then pound several agencies combined to effect it. In 1845 M'Naught "5

introduced a plan of improving beam engines of the original Watt type, by adding a high-pressure cylinder whose piston acted on the beam between the centre and the fly-wheel end. Steam of higher pressure than had formerly been used, after doing work in the new cylinder, passed into the old or low-pressure cylinder, where it was further expanded. Many engines whose power was proving insufficient for the extended machinery they had to drive were "M'Naughted" in this way, and after conversion were found

not only to yield more power but to show a marked economy of fuel. The compound form was selected by Mr Pole for the pumping engines of Lambeth and other waterworks about 1850; in 1854 John Elder began to use it in marine engines; in 1857 Mr Cowper added a steam-jacketed intermediate reservoir for steam between the high and low pressure cylinders, which made it unnecessary for the low-pressure piston to be just beginning when the other piston was just ending its stroke. As facilities increased for the use of high-pressure steam, compound expansion became more and more general, its advantage becoming more conspicuous with every

1 Min. Proc. Inst. C.H., vol. xxiii., 1863.

Applica- tion to loco- motives.

Applica- tion to steam- boats.

Theory

Carnot,

increase in boiler pressure—until now there are few large land engines and scarcely any marine engines that do not employ it. In marine practice, where economy of fuel is a much more important factor in determining the design than it is on land, the principle of compound expansion has lately been greatly extended by the intro- duction of triple and even quadruple expansion engines, in which the steam is made to expand successively in three or in four cylinders. Even in the building of locomotive engines, where other considerations are of more moment than the saving of coal, the system of com- pound expansion is beginning to find a place.

The growth of compound expansion has been referred to at some length, because it forms the most distinctive improvement which the steam-engine has undergone since the time of Watt. For the rest, the progress of the steam- engine has consisted in its adaptation to particular uses, in the invention of features of mechanical detail, in the recognition and

application of thermodynamical _ prin- ciples, and in improved methods of engineering construc- tion by which it has profited in common with all other machines. These have in particular made possible the use of steam of eight or ten times the pressure of that employed by Watt.

20. The adaptation of the steam-engine to railways, begun by Trevithick, became a success in the hands of George Stephenson, whose engine the " Rocket," when tried along with others on the Stockton and Darlington road in 1829, not only distanced its competitors but settled once and for all the question whether horse traction or steam traction was to be used on railways. The principal features of the "Rocket" were an improved steam-blast for urging the combustion of coal and a boiler (suggested by Booth, the secretary of the railway) in which a large heating surface was given by the use of many small tubes through which the hot gases passed. Further, the cylinders, instead of being vertical as in earlier locomotives, were set in at a slope, which was afterwards altered to a position more nearly horizontal. To these features there was added later the "link motion," a contrivance which. enabled the engine to be easily reversed and the amount of expansion to be readily varied. In the hands of George Stephenson and his son Robert the locomotive took a form which has been in all essentials maintained by the far heavier locomotives of to-day.

21. The first practical steamboat was the tug "Char- lotte Dundas," built by William Symmington, and tried in the Forth and Clyde Canal in 1802. A Watt double- acting condensing engine, placed horizontally, acted directly by a connecting-rod on the crank of a shaft at the stern, which carried a revolving paddle-wheel. The trial was successful, but steam towing was abandoned for fear of injuring the banks of the canal. Ten years later Henry Bell built the "Comet," with side paddle- wheels, which ran as a passenger steamer on the Clyde; but an earlier inventor to follow up Symmington's success was the American Robert Fulton, who, after unsuccessful experiments on the Seine, fitted a steamer on the Hudson in 1807 with engines made to his designs by Boulton and Watt, and brought steam navigation for the first time to commercial success.

22. The early inventors had little in the way of theory to guide them. Watt had the advantage, which he acknowledges, of a knowledge of Black's

doctrine of latent heat; but there was no philosophy of the relation of work to heat until long after the inventions of Watt were complete. The theory of the steam-engine as a heat-engine dates from 1824, when Carnot published his Reflections sur la Puissance Motrice du Feu, and showed

that heat does work only by being let down from a higher to a lower temperature. But Carnot had no idea that any of the heat disappears in the process, and it was not until the doctrine of the conservation of energy was

established in 1843 by the experiments of Joule that the Jou ||

theory of heat-engines began a vigorous growth. From 1849 onwards the science of thermodynamics was devel- oped with extraordinary rapidity

in 1859 of Rankine's Manual of the Steam Engine formed an epoch in the history of the subject by giving inventors a new basis, outside of mere empiricism, from which they could push on the development of the steam-engine. Unfortunately, however, for its bearing on practice, the theory of the steam-engine was to a great extent founded on certain simplifying assumptions which experience has now shown to be far from correct. It was assumed that the cylinder and piston might be treated as behaving to the steam like non-conducting bodies,—that the transfer of heat between the steam and the metal was negligibly small. Rankine's calculations of steam-consumption, work, and thermodynamic efficiency involve this assumption, except in the case of steam-jacketed cylinders, where he estimates that the steam in its passage through the cylinder takes just enough heat from the jacket to prevent a small amount of condensation which would otherwise occur as the process of expansion goes on. If the transfer of heat from steam to metal could be overlooked, the steam which enters the cylinder would remain during admission as dry as it was before it entered, and the volume of steam consumed per stroke would correspond with the volume of the cylinder up to the point of cut-off. It is here that the actual behaviour of steam in the cylinder diverges most widely from the behaviour which the theory assumes. When steam enters the cylinder it finds the metal chilled by

the previous exhaust, and a portion of it is at once condensed. This has the effect of increasing, often very largely, the volume of boiler steam required per stroke. As expansion goes on the water that was condensed during admission begins to be re-evaporated from the sides of the cylinder, and this action is often prolonged into the exhaust. In a later chapter the effect which this exchange of heat between the metal of the cylinder and the work- ing fluid produces on the economy of the engine will be discussed, and an account will be given of experimental means by which we may examine the amount of steam that is initially condensed and trace its subsequent re-evaporation. It is now recognized that any theory which fails to take account of these exchanges of heat fails also to yield even comparatively correct results in calculating the relative efficiency of various steam pressures or various ranges of expansion. But the exchanges of heat are s0 complex thaé there seems little prospect of submitting them to any comprehensive theoretical treatment, and we must rather look for help in the future development of engines to the scientific analysis of experiments with actual machines. Much careful work of this kind has already been done by Hirn and others, and there is room for much more. Questions relating to the influence (on heat-engine economy) of speed, of pressure, of ratio of expansion, of jacketing, of compound expansion, or of superheating must in the main be settled by an appeal to experiment,—experiment guided and interpreted at every step by reference to the principles of thermodynamics and the theory of steam.

References.—Stuart, Descriptive History of the Steam-Engine, 1825; Farey, Treatise on the Steam-Engine, 1827; Tredgold, The Steam-Engine, 1838; Muir- head’s Mechanical Inventions of James Watt, and Life of Wait; Galloway, The Steam-Engine and tts Inventors; Thurston, IZistory of the Grouth of the Steam- Engine; Cowper on the Steam-Engine (Heat Lectures Inst, C.H,, 1884), Tait, Sketch of Thermodynamics,

by Clausius, Rankine, Clansins,| | and Thomson, and was applied, especially by Rankine, to Rankine, | practical problems in the use of steam. The publication Thomm

IJ. Turory oF HEAT-ENGINEs. djs of jmo- the heat received into mechanical energy, which appears as the f – work done by the engine, and rejecting the remainder, still in the : form of heat. the amount of work done, in its relation to the heat supplied and

thermodynamics, which may be stated here as follows :—

mechanical energy, 1 thermal wit every 772 foot-pounds of work spent. The "thermal unit" is the heat required to raise the tempera-

of heat comes into existence for

ture of 1 ib of water 1 degree Fahr. when at its temperature of

maximum density. The equivalent quantity of work, 772 foot-

ounds, was determined by the experiments of Joule, and is called feulk's equivalent. Later researches by Joule and others have indicated that this number is probably too small; it should perhaps be as much as 774 foot-pounds. Joule's original value is still generally used by engineers; and as it enters into many published tables it may conveniently be adhered to until its accuracy is more definitely disproved. Since a definite number of foot-pounds are equivalent to 1 thermal unit, we may, if we please, express quantities of work in thermal units, or quantitics of heat in foot-pounds; the latter practice will frequently be found useful.

Law 2. It is impossible for a self-acting machine, wnaided by any external agency, to convey heat from one body to another at a higher temperature.

This is the form in which the second law has been stated by Clausius. Another statement of it, different in form but similar in effect, has been given by Thomson. Its force may not be immediately obvious, but it will be shown below that it introduces a most important limitation of the power which any engine has

of converting heat into work. So far as the first law shows, there is nothing to prevent the whole heat taken in by the engine from changing into mechanical energy. In consequence of the second law, however, no heat-

engine converts, or can convert, more than a small fraction of the heat supplied to it into work; a large part is necessarily rejected as heat. The ratio Heat converted into work Heat taken in by the engine

is a fraction always much less than unity. This ratio is called the eficiency of the engine considered as a heat-engine. King 24. In every heat-engine there is a working substance which takes | im and rejects heat, thereby suffering changes of form, or more up, commonly of volume, and does work by overcoming resistance to these changes of form or volume. The working substance may be gaseous, liquid, or solid. We can, for example, imagine a heat- engine in which the working substance is a long metallic rod, arranged to act as the pawl of a ratchet-wheel with fine teeth. Let the rod be heated so that it elongates sufficiently to drive the wheel forward through the space of one tooth. Then let the rod be cooled (say by applying cold water), the wheel being meanwhile held from returning by a separate click or detent. The rod, on | cooling, will retract so as to engage itself with the next succeeding | tooth, which may then be driven forward. by heating the rod again, and soon. To make it cvident that such an engine would do work, we have only to suppose that the ratchet-wheel carries round with it a drum by which a weight is wound up. We have, then, a complete heat-engine, iu which the working substance is a solid rod, which receives heat by being brought into contact with some source of heat at a comparatively high temperature, transforms a small part of this heat into work, and rejects the remainder to what we may call a receiver of heat, at a comparatively low qyla- temperature. The greater part of the heat may be said simply to ot pass through the engine, from the source to the receiver, becoming Mra-degraded as regards temperature as it goes. We shall see presently ‘| that this is typical of the action of all heat-engines; when they are doing work, the heat which they reject is rejected at a tempera- ture lower than that at which it is taken in. They convert some | heat into work only by letting down a much larger quantity of

heat from a high to a relatively low temperature. The action is

analogous to that of a water-wheel, which does work by letting

down water from a high to a lower level, but with this important

difference that in the transfer which occurs in heat-engines an

amount of heat disappears which is equivalent to the work done.

25. In almost all actual heat-engines the working substance is a

g fluid. In some it is air, in some a mixture of several gases. In the steam-engine the working fluid is a mixture (in varying proportions) m of water and steam. With a fluid for working substance, work is iby done by changes of volume only ; its amount depends solely on the “ps telation of pressure to volume during the change, and not at all on \ im.) ‘he form of thevessels in which the change takes place. Letadiagram “be drawn (fig. 9) in which the relation of the intensity of pressure

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STEHEAM-ENGINE

23. A heat-engine acts by taking in heat, converting a part of

The theory of heat-engines comprises the study of to the heat rejected. The theory is based on the two laws of Law 1. When mechanical energy is produced from heat, 1 thermal

unit of heat goes out of cwistence for every 772 foot-pounds of work done; and, conversely, when heat is produced by the expenditure of

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to the volume of any supposed working substance is graphically exhibited by the line ABC, where AM, CN are pressures and AP, CQ are volumes, then the work done by the substance in expand- ing from A to C is the area of the figure MABCN, And similarly, if the substance be compressed from C back to its original volume in such a manner that the line CDA repre- sents the relation of pressure and volume during compression, the work done upon the substance is the figure NCDAM. Taking the two operations together, we find that the substance has done a net amount of work equal to the arca of the shaded figure ABCDA, or /PdV. This is an ex-

ample and a generalization of the method of representing work which Watt introduced by his inven-

tion of the indicator ; the figure ABCDA may be called the indicator

diagram of the supposed action.

26. Generally in heat-engines the working substance returns Cycle of periodically to the same state of temperature, pressure, volume, operation and physical condition. When this has occurred the substance is of work- said to have passed through a complete cycle of operations. For ing sub- example, in a condensing steam-engine, water taken from the hot- stance. well is pumped into the boiler; it then passes into the cylinder as steam, passes thence into the condenser, and thence again into the hot-well; it completes the cycle by returning to the same con- dition as at first. In other less obvious cases, as in that of the non-condensing steam-engine, a little consideration will show that the cycle is completed, not indeed by the same portion of working substance being returned to the boiler, but by an equal quantity of water being fed to it, while the steam which has been discharged into the atmosphere cools to the temperature of the feed. In the theory of heat-engines it is of the first importance to consider (as was first done by Carnot in 1824) the cycle of operations per- formed by the working substanee as a complete whole. If we stop

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Fig. 9.

.short of the completion of a cycle matters are complicated by the

fact that the substance is in a state different from its initia] state, and may therefore have changed its stock of internal energy. After a complete cycle, on the other hand, we know at once that, since the condition is the same, the internal energy of the substance is the same as at first, and therefore—

Heat taken in=work done + heat rejected.

27. It will serve our purpose best to approach the theory of Engine heat-engines by considering, in the first instance, the action of working an engine in which the working substance is any one of the witha so-called permanent gases, or a mixture of them, such as air. The perfeet word permanent, as applied to a gas, can now? be understood only gas. as meaning that the gas is liquefied with difficulty—either by the use of extremely low temperature or extremely high pressure or both. So long as gases are under conditions of pressure and tem- perature wklels different from those which produce liquefaction, they conform very approximately to certain simple laws—laws which may be regarded as rigorously applicable to ideal substances called perfect gases. After stating these laws briefly we shall examine the efficiency of a heat-engine using a gas in a certain manner as working substance, and then show that the conclusion so derived has a general application to all heat-engines whatsoever. In this procedure there is no sacrifice of generality, and a part of the process is of independent service in the discussion of actual air-engines. ;

28. The laws of the permanent gases are the following :— Laws of

Law 1 (Boyle). Zhe volume of a given mass of gas varies the per- inversely as the pressure, the temperature being kept constant. manent

Thus, if V be the volume of 1 fb of a gas in cubic feet, and P gases, the pressure in pounds per square foot, so long as the temperature Boyle's is unchanged— law.

Poc V-}, or PV=constant. For air the value of the constant is 26220 when the temperature is 32° F.

29. Law 2 (Charles). Under constant pressure equal volumes of Charles's different gases increase equally for the same increment of tempera- law.

ture. Also, if a gas be heated wnder constant pressure, equal inere- ments of its volume correspond very nearly to equal intervals of tem- perature as determined by the seale of a mercury thermometer.

Thus, let us take, say, 493 cubic inches of hydrogen, also of oxygen, of air, &., all at 32° F., and, keeping each at a constant pressure (not necessarily the same for all), heat all so that their temperature rises 1° F. We shall find that each has expanded by sensibly the same amount and now occupies 494 cubic inches.

And further, if we heat any one through another 1° F. to 34° F., we shall find that its volume is now 495 cubic inches, and so on. Thus for any gas, kept at constant pressure, if the volume was

1 Since the liquefaction of hydrogen and other gases by MM. Cailletet and Pictet.

498 at 82° F., it would be 499 at 3178. 461 at 0°F.,

and finally 0 at ~~461°F., provided the same law were to hold at indefinitely low temperatures. This we may assume to be the case with a perfect gas, although any actual gas would change its physical state long before so low a temperature were reached. Absolute This result may be concisely expressed by saying that if we tempera~~ reckon temperature, not from the ordinary zero but from a point ture. 461° below the zero of Fahrenheit's scale, the volume of a given quantity of a gas, kept at constant pressure, is proportional to the temperature reckoned from that zero. Temperatures so reckoned are called absolute temperatures, and the point — 461° F. is called the absolute zero of temperature. Denoting any temperature according to the ordinary scale by ¢, and the corresponding absolute temperature by 7, we have +=t+461 on the Fahrenheit scale, and +=t+274 on the Centigrade scale. Charles's law shows that if temperatures be measured by thermo- meters in which the expanding substance is air, hydrogen, oxygen, or any other permanent gas, and, if those intervals of temperature be called equal which correspond to equal amounts of expansion, then the indications of these thermometers always agree ver closely with each other, and also agree, though less

closely, with the indications of a mercury thermometer. We shall see later that the theory of heat-engines affords a means of forming a thermometric scale which is independent of the properties, as to expansion, of any substance, and that this scale coincides with the scale of a perfect gas thermometer, a fact which justifies the use of the term absolute, as applied to temperatures measured by the expansion of a gas. 30. Combining laws 1 and 2, we have, for a given mass of any gas, PV = cr, where c is a constant depending on the specific density of the gas and on the units in which P and V aremeasured. In what follows we shall assume that P is measured in pounds per square foot, that V is the volume of 1 tb in cubic feet, and that 7 is the absolute temperature in Fahrenheit degrees… In air, with these units, PV=53‘18r. Regn- The specific heat at constant pressure 4s ault’s law. Specifie

31. Law 8 (Regnault). constant for any gas.

By specific heat at constant pressure is meant the heat taken in by 1 Ib of a substance when its temperature rises 1° F., while the heat at pressure remains unchanged—the volume of course increasing. constant The law states that this quantity is the same for any one gas, no pressure. matter what be the temperature, or what the constant pressure,

at which the process of heating takes place.

Specifie _ 32, Another important quantity in the theory of heat-engines is heat at the specific heat at constant volume, that is, the heat taken in by constant 1 Ib of the substance when its temperature rises 1° F. while the volume. volume reniains unchanged—the pressure of course increasing. We shall denote specific heat at constant pressure by Kp and specific heat at constant volume by Ky. Let 1 tb ofa gas be heated at constant pressure P from temperature 7, to temperature 7) (abso- lute). Let V, be the volume at 7, and V, the volume at To. Heat is taken in, and external work is done by the expansion of the gas, namely—

Heat taken in=K,(r.— 7).

Work done=P(V,- V,)=¢(t2—- 7). The difference between these quantities, or (Kp—c)(t.— 7), 18 the amount by which the stock of internal energy

possessed by the gas has increased during the process. We shall see presently that this gain of internal energy would have been the same had the gas passed in any other manner from 7, to T,.

33. Law 4 (Joule). When a gas expands without doing external work, and without taking in or giving out heat, its temperature does not change.

To prove this, Joule connected a vessel containin, compressed gas with another vessel that was empty, by means ol a pipe with a closed stop-cock. Both vessels were immersed in a tub of water and were allowed to assume a uniform temperature. Then the stop-cock was opened, the gas expanded without doing external work, and finally the temperature of the water in the tub was found to have undergone no change. The temperature of the gas was unaltered, and no heat had been taken in or given out by it, Internal 34. Since the gas had neither gained nor lost heat, and had done energy no work, its internal energy was the same at the end as at the ofa gas beginning of the experiment. The pressure and volume had depends changed, but the temperature had not. We must therefore con- only on elude that the internal energy of a given mass of a gas depends tempera- only on its temperature, and not upon its pressure or volume; in ture. other words, a change of pressure and volume not associated with a change of temperature does not alter the internal energy. Hence

Joule’s law.

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in any change of temperature the change of internal energy is inde- pendent of the relation of pressure to volume throughout the opera. ~ tion. Now we have seen above that the quantity ; = (Kp —¢)(t2- 7) – | measures the gain of internal energy when 1 fb of a gas has its temperature changed from 7, to 7. in one particular way, namely, at constant pressure. Henee this same quantity also measures the gain of internal energy when 1 tb of a gas has its temperature

changed from 7, to 7, in any manner whatsoever.

35. Next consider the case of 1 tb of a gas heated from 7, to 7, at Relation constant volume. ‘The heat taken in is of the | K.(t.— 71): two speci | Since no work is done, this is all gain of internal energy, and is fic heats, | therefore (§ 34) equal to

|

Kp — ¢)(T2—- 73).

K,-c=Ky. The ratio K,/K» will be denoted by y; obviously Ky=e/(y-1). The following table of values of Kp, Ky, ¢, andy will be found useful in dealing with air and gas engines.

Hence in any gas

TABLE I.—Properties of Gases.

Kp. Ke. Cc. Y: Foot-lbs. | Foot-lbs., | Foot-lbs,

DDG WAITS soniye, ast wena 183°4 130°2 53°2 1°409 ORY GONG. c:panesereaeeaslaene’s 167°9 119°8 48°1 1°402 INTENO BON sevaces on tose eseeed 188°2 183°4 54°8 1‘411 ByGrOROt 05 otis ¥ «coe, 600-55 26382 1864 768 1412 Carbonic oxide…….06+ 189°1 133°4 55°7 1‘418 Carbonie aGidiis.ciccssoitanes 1674 1382°6 34°8 1°263 Marah G06 ois.5530s.20iecrangs 457°7 | 363°1 94°6 | 1°261 Olefant Bas caacocsyco.sane oe 311°9 257 “7 54:2 1:2138 Steam gas, or highly|| 971 | 9855 | 85°5 | 1:80

superheated steam …

that of § 25, which exhibit the action of a working substance by curves show- ing the relation of P to V during ex- pansion or compression. In most of the instances which occur in the theory of heat-engines such curves may be ex- actly or approximately represented by equations of the form

PV”=constant, where the index 7 has various numer- h ical values. Let AB, fig. 10, be a curve aS ae ” of expansion (of any substance) in Fig. 10. which

PV” is constant, from pressure P, and volume V, at A to pressure P, and volume Vz at B. We have, by assumption,

P,V;” — P,V 3″ .

MY y hfs,

‘DM ib rtete tet tries de Hy, MEE OTS URMILA

The work done is – Vs dV _ PLV”(Vs-*- Ve) = n ee NS 74 PAV=PV “T – This may also be written BY gier**) ~ n—1 : j where r is the ratio V./V,, which may be called the ratio of expansion. ‘ Still another form of the above expression for the work done is The ee PoV5 a-1 — 37. Applying this result to the case of an expanding gas, we have Work done=c(r,— 72) /(n- 1). The loss of internal energy during expansion is, by § 34, K.(7- T.), OF c(T1 — Te) / iy> 1), by § 35. Suppose now that the mode of expansion is such that the loss of internal energy is equal to the external work done, then c(t, —T.)__ (71 — To) nm-1l y-l and the law of expansion is PV =constant. The same formula applies when a gas is being compressed in such a manner that the work spent upon the gas is equal to the ain of internal energy by the gas. . _ . 38. This mode of axpendltl (or compression) is termed adi | batie. It occurs when the working substance is neither gainin, of A nor losing heat by conduction or radiation or internal chemica = | action. It would be realized if we had a substance expanding or sion. being compressed, without chemical change, in a eylinder —_ (with the piston) was a perfect non-conductor of heat, In adiaba

, oOrn=y;

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expansion the external work is done entirely at the expense of the substance’s stock of internal energy. Hence in the adiabatic expan- sion of a gas the temperature falls, and in adiabatic compression it To find the change of temperature in a gas when expanded

ae adiabatically we have only to combine the equations Pave x, Y ee ae ERE ESV so and pays

nd we find : : ‘ig d (V,/V.)” –

It is clear from the above that if, during expansion, ” is less than 7 the fluid is taking in heat, and if m is greater than y the fluid is rejecting heat. ; ,

39. Another very important mode of expansion or compression is that called csothermal, in which the temperature of the working substance is kept constant during the process.

In the case of a gas the curve of isothermal expansion is a rectangular hyperbola, having the equation

PV =constant=cr. When a gas expands (or is compressed) isothermally at tempera- tare r from V, to V, the work done by (or upon) it (per Ib) is

V VedV Y; *pav=Pif, work log r=crlog.r ,

1

where r is the ratio V,/V, as before.!

During isothermal expansion or compression a gas suffers no change of internal energy (by § 34, since r is constant’. Hence during isothermal expansion a gas must take in an amount of heat just equal to the work it does, and during isothermal compression it must reject an amount of heat just equal to the work spent upon it. The expression crlog ,7 con-

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original value 7,. [In other words, the third operation must be stopped when a point d@ is reached such that an adiabatic line drawn through d@ will pass through a.] This completes the cycle.

To find the proper place at which to stop the third operation, we have, by § 38, 7,/7.=(V-/Vs)Y~1 in the second operation, and again T;/T.=(V a/Va)¥~1

in the fourth operation. Hence V./Vs=Va/Va; and Vs/Va, the ratio of isothermal expansion, is equal to V,/Ve, the ratio of isothermal compression. For brevity we shall denote either of these last ratios by 7.

41. The following aro the transfers of heat to and from the working fluid, in successive stages of the cycle :—

(1) Heat taken in from A=cz, log ,r (by § 39).

(2) No heat taken in or rejected.

(8) Heat rejected to C=crelog ,r (by § 39).

(4) No heat taken in or rejected.

Hence, by the first law of thermodynamics, the net external work done by the gas is

c(t ~- 7.) log, r} and the efficiency of the engine (§ 23) is c(7,-7T2)log.r 11-7,

crylog.r TC

This is the fraction of the whole heat given to it which an engine following Carnot's cycle converts into work. The engine takes in an amount of heat, at the temperature of the source, pro- portional to 7, ; it rejectsan amount of heat, at the temperature of the receiver, proportional tor,. It works within a range of tem- perature extending from 7, to T., by letting down heat from 7, to T. (§ 24), and in the process it converts into work a fraction of that heat, which fraction will be greater the lower the temperature t, at which heat is rejected is below the temperature 7, at which heat is received,

sequently measures, not only the work done by or upon the gas, but also the heat taken in during isothermal expan-

42. Next let us consider what will happen if we reverse Carnot's Carnot's cycle, that is to say, if we force this engine to act so that the same cycle indicator diagram as before is traced out, but in the direction reversed.

sion or given out during isothermal compression. In the diagram, fig. 11,
Fig. 11.

the line AB is an example of a curve of isothermal expansion for a perfect gas, called for brevity an isothermal line, while AC is an Gaitatic line starting from the same point A.

40. We shall now consider the action of an ideal engine in which tho working substance is a perfect gas, and is caused to pass through a cycle of changes each of which is either isother- mal or adiabatic. The cycle to be described was first exa- mined by Carnot, and is spoken of as Carnot's cycle of opera- tions. Imagine a cylinder and piston composed of a perfectly non-conducting material, exceptasregardsthebottom 4 | of the cylinder, which is a " conductor. Imagine also a hot body or indefinitely ca-

acious source of heat A, ept always at a tempera- Te

D. . B. -. of a ae eae on

ture 7,, a perfectly non- ¢ conducting cover B, anda . cold body or indefinitely

capacious receiver of heat C, kept always at a temperature T,, which is lower than 7. It is supposed that A, B, or C can be applied to the bottom of the cylinder. Let the cylinder contain 1 tb of a ' perfect gas, at temperature 7,, volume Va, and pressure Pq to begin _. The suffixes refer to the points on the indicator diagram,

Fig. 12,—Carnot's Cycle, with a gas for working substance.

_ (1) Apply A, and allow -the piston to rise' The gas expands isothermally at 7,, taking heat from A and doing work. The pressure changes to P; and the volume toVs.

(2) Remove A and apply B. Allow the piston to go on rising. the gas expands adiabatically, doing work at the expense of its Internal energy, and the temperature falls. Let this go on until the temperaturo is tT 'The pressuro is then P., and the volume V,. _ (8) Remove Band apply C. Force

the piston down. The gas 1s compressed isothermally at 7,, since the smallest increase of

opposite to that followed in § 40, Starting as before from the point a and with the gas at 7,, we shall require the following four

‘ operations :—

(1) Apply B and allow the piston to rise. The gas expands adiabatically, the curve traced is ad, and when d is reached the temperature has fallen to 7».

(2) Remove B and apply ©. Allow the piston to go on rising. The gas expands isothermally at 7), taking heat from C, and the curve dc is traced.

(8) Remove C and apply B. Compress the gas. The process is adiabatic. The curve traced is cb, and when 0D is reached the temperature has risen to 7,.

(4) Remove B and apply A. Continue the compression, which is now isothermal, at 7, Heat is now rejected to A, and the cycle is completed by the curve ba.

In this process the engine is not doing work ; on the contrary, work is spent upon it equal to the area of the diagram, or e(r,—T.) log, 7. eat is taken in from C in the first operation,

to the amount cr,log,r. Heat is rejected to A in the fourth operation, to the amount er,log,r. In the first and third opera-

tions there is no transfer of heat.

The action is now in every respect the reverse of what it was before. The same work is now spent upon the engine as was formerly done by it. The same amount of heat is now given to the hot body A as was formerly taken from it. The same amount of heat is now taken from the cold body C as was formerly given to it, as will be seen by the following scheme :—

Carnot’s Cycle, Direct. Work done by the engine =c(7, — 72) log, 7 ; Heat taken from A=cr,log,7 ; Heat rejected to C=cr,log,7.

Carnot’s Cycle, Reversed. Work spent upon the engine =c (7, — 7,) log,7; Heat rejected to A=cr,log,r ; Heat taken from C=cr,log,7.

The reversal of the work has been accompanied by an exact reversal of each of the trausfers of heat.

temperature above zr, causes heat to pass into C. Work is spent upon the gas, and heat is rejected toC. Let this be continued until a certain point d (fig. 12) is reached, such that the fourth operation will complete the cycle.

43. An engine in which this is possible is called, from the Revers- thermodynamic point of view, a reversible engine. In other words, ible a reversible heat-engine is one which, if forced to trace out its engine.

=f) Removo C and apply B. Continue the compression, which 18 now adiabatic, The pressure and temperature rise, and if the point d has been properly chosen, when the pressure is restored to its original value P,, the temperature will also have risen to its eee re See

im In calculations where this expression is Involved it is convenient to remem- thatlog., the hyperbolic logarithm, of any number is 2°3026 times the common logarithm of the number,

indicator diagram reversed in direction, so that the work which would be done by the engine, when running direct, is actually spent upon it, will reject to the source of heat the same quantity of heat as, when running direct, it would take from the source, and will take from the receiver of heat the same quantity as, when running direct, it would reject to the receiver. By ‘‘ the source of heat” is meant the hot body which acts as source, and by ‘‘ the receiver ” is meant the cold body which acts as receiver, when the

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Reversi- bility the test of per- fection ina heat- engine,

Effi-

engine is runuing direct. Carnot's engine is one example of a reversible engine. The idea .of thermodynamic reversibility is highly important, for the reason that no heat-engine can be more efficient than a reversible engine, if both take in and reject heat at the same pair of temperatures.

44, To prove this, let it be supposed that we have two engines M and N, of which N is reversible in the above sense, and that we have a hot body A capable of acting as a source of heat, and a cold body C capable of acting as a receiver of heat. The engine M is set to work as a heat-engine, taking heat from A and rejecting heat to C. To prove that M cannot be more efficient than the reversible engine N, we shall assume that it ¢s more efficient, and trace the consequences of that assumption.

Let M, working direct, be coupled so as to work N reversed ; if we suppose that the engines are without mechanical friction, and can be coupled up without loss of power, the work represented by the indicator diagram of M is spent on N, and N will therefore reject to Aan amount of heat which we will call Qa and take from B an amount of heat which we willcall Qp. Now, since N is reversible, if it worked direct, taking Qa from A, 1t would do the same amount of work as, in the supposed circumstances, is spent upon it. Hence, if M is more efficient than N it is taking from A an amount of heat less than Qa, and consequently also is giving to B an amount of heat correspondingly less than Qg. The joint effect, therefore, of M working direct and N working reversed is that the heat taken from A by M is less than the heat given to A by N, while the heat given to B by M is less (to an equal extent) than the heat taken from B by N. The consequence is that the hot body A is gaining heat on the whole, and the cold body B is losing an equal amount of heat ; in other words, with the continucd action of the double system heat passes, in indefinitely large quantity, from a cold body to a hot body, by means of an agency which, it is to be observed, is purely self-acting, for if we suppose there is no mechanical friction the system requires no help from without. Now this result is, by the second law of thermodynamics (§ 23), contrary to all experience ; and we are forced to conclude that the assumption that M is more efficient than the reversible engine N, when both take in and reject heat at the same two temperatures, is false. Hence, with given temperatures of source and receiver of heat no engine is more efficient than a reversible engine.

Next, let M and N both be reversible and both work between the same limits, but be different in any other respect. Then by the foregoing argument M cannot be more efficient than N, neither can N beiore efficient than M. Hence all reversible heat- engines taking in and rejecting heat at the same temperatures are equally eflicient.

45, These results imply that reversibility, in the thermodynamie sense, is the criterion of what may be called perfection in a heat- engine. A reversible engine is perfect in the sense that it cannot be improved on as regards efficiency: no other engine, taking in and rejecting heat at the same temperatures, will convert into work a greater fraction of the heat which it takes in. Moreover, if this criterion be satisfied, it is as regards efficiency a matter of complete indifference what is the nature of the working substance, or what, in other respects, is the mode of the engine's action.

46. Further, since all engines that are reversible are equally

ciency of efficient, provided they work between the same temperatures, an

a perfect heat- engine,

Sum- mary of the argu- ment.

expression for the efficiency of one will apply equally to all. Now, the engine whose efficiency we have found in § 41 is one example of a reversible engine. Hence its efficiency

; (11-7) /7y

is the efficiency of any reversible heat-engine whatsoever taking in heat at 7, and rejecting heat at 7,. And, as no engine can be more efficient than one that is reversible, this expression is the measure of perfeet efficiency. We have thus arrived at the immensely important conclusion that no heat-engine can convert into work a greater fraction of the heat which it receives than is expressed by the excess of the temperature of reception above that of rejection divided by the absolute temperature of reception.

47. Briefly recapitulated, the steps of the. argument by which this result has been reached are as follows. After stating the experimental laws to which gases conform, we examined the action of a heat-engine in which the working substance took in heat when at the temperature of the source and rejected heat when at the temperature of the receiver, the change of temperature from one to the other of these limits being accomplished by adiabatic expansion and adiabatic compression. Taking a special case in which this engine had for its working substance a perfect gas, we found that its efficiency was (r,— 7.) /7 ($ 41). We also observed that it was, in the thermodynamic sense, a reversible engine (§ 43). Then we found, by an application of the second law of thermodynamics, that no heat-engine can have a higher efficiency than a reversible engine, when taking in and giving out heat at the same two temperatures 7, and 7,; this was shown by the fact that a contrary assumption leads to a violation of the second law (§ 44). Hence, we concluded that all reversible heat- engines receiving and rejecting heat at the saine temperatures 7,

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and 7, respectively are equally efficient, and hence that the efficiency (71-72) /7), already determined for one particular reversible engine, measures the efficiency of any reversible engine, and is a limit of efficiency which no engine whatever can exceed.

very similar to that of Sir W. Thomson. Rankine, to whom with dynan

Thomson and Clausius is due the development of the theory of heat- { engines from the point at which Carnot left it, has stated the second law in a form which is neither easy to understand, nor obvious, as an experimental result, when understood. His statement runs ;—

“Tf the absolute temperature of any uniformly hot substance be divided into any number of equal parts, the effects of those parts in causing work to be performed are equal.”!

To make this intelligible we may suppose that any quantity q ot heat from a source at temperature 7, is taken by the first of a series of perfect heat-engines, and that this engine rejects heat at a temperature 7, less than 7, by a certain interval Ar. Let the heat so rejected by the first engine form the heat supply of a second perfect engine working from 7, to 73 through an equal inter- val Av; let the heat which it in turn rejects form the heat-supply of a third perfect engine working again through an cqual interval from rz to 74; and so on. The efficiencies of the several engines

are (by § 46) a“ , AE A a , &c. The amounts of heat supplied to

1 3

Te

them are q, 972, 73, &c. Hence the amount of work done by oT TT,

eT A z each engine is the same, namely, g—~. Thus Rankine’s statement Ti

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is to be understood as meaning that each of the equal intervals into which any range of temperature may be divided is equally effective in allowing work to be produced from heat when heat is made to pass, doing work in the most efficient possible way, through all the intervals from the top to the bottom of the range.

49, A point of much theoretical interest may be noted in pass- Then ing. In place of measuring temperature, as we have done, by the dyna expansion of a perfect gas, a scale of temperature night be formed absol thus. Starting from any one temperature, let a series’ of intervals measi be taken sucli that a serics of reversible engines, each working ment | with one of the intervals for its range, in the manner described in tempé § 48 (so that the heat rejected by the first forms the supply of the ture.] second, and so on), will each do the same amount of work ; then eall these intervals equal. This gives a scale of temperature (origin- ally suggested by Sir W. Thomson) which is truly absolute in the seuse of being peng a of the properties of any substanee ; it coincides, as is evident from § 48, with the scale we have

been using, in which equal intervals of temperature are defined as those corresponding to equal amounts of expansion of a perfect gas under constant pressure ; and it coincides approximately with the scale of a mercury thermometer when that is graduated to read from the absolute zero by the addition of a suitable constant (§ 29).

50. ‘The availability of heat for transformation into work Cond) depends essentially on the range of temperature through which the tions } heat is let down from the hot source to the cold body into which maxi) heat is rejected ; it is only in virtue of a difference of temperature mum) between bodies that conversion of any part of their heat into work effi- } becomes possible. If 7, and 7, are the highest and lowest tem- cienc} peratures of the range through which a heat-engine works, it is clear that the maximum of efficiency can be reached only when the engine takes in all its heat at 7, and rejects at 7, all that is rejected. With respect to every portion of heat taken in and rejected the greatest ideal efficiency is

_ Temperature of reception — temperature of rejection Temperature of reception :

Any heat taken in at a temperature below 7, or rejected at a temperature above 7, will have less availability for conversion into work thanif taken in at r, and rejected at 7, and hence, with a given pair of limiting temperatures, it is essential to maximum efficiency that no heat be taken in by the engine except at the top of the range, and no heat rejected except at the bottom of the range. Further, as we have secn in § 45, when the temperatures at which heat is received and rejected are assigned, an engine attains the maximum of efficiency if it be reversible,

51. It is therefore important to inquire more particularly what Cond kinds of action are reversible in the thermodynamic sense. A little tions\| consideration will show thata transfer of heat from the source or to never the receiver is reversible only when the working substance is at bility | sensibly the same tempcrature as the source or the receiver, as the case may be, and an expansion is reversible only when it occurs by the gradual displacement of some part of the containing envelope m such a manner that the expanding fluid does external work on the envelope, and does not waste energy to any sensible extent in setting

itselfin motion. This excludes what may be termed free expansion, ——— ae i

1 Manual of the Steam Engine and other Prime Movers, § 243.

such as that of the gas in Joule's experiment, § 33, and it excludes also what may be called imperfectly-resisted expansion, such as would occur if the fluid were allowed to expand into a closed chamber in which the pressure was less than that of the fluid, or if the piston in a cylinder rose so fast as to cause, through the inertia of the ex- panding fluid, local variations of pressure throughout the cylinder.

To make a heat-cngine, working within given limits of tempera- ture, as efficient as possible we must therefore strive—(1) to take in uo heat except at the highest temperature, and to reject no heat except at the lowest temperature ; (2) to secure that the working substance shall, when receiving heat, be at the temperature of the body from which the heat comes, and that it shall, when giving up heat, be at the temperature of the body to which heat is given up ; (3) to avoid free or imperfectly-resisted expansion. If these conditions are fulfilled the engine is a perfect heat-engine.

The first and second of these conditions are satisfied if in the action of the engine the working substance changes its tempera- ture from 7, to t2 by adiabatic expansion, and from rt, to 7, by adiabatic compression, thereby being enabled to take in and reject heat at the ends of the range without taking in or rejecting any by the way. This is the action in Carnot's engine (§ 40).

52. But if we can cause the working substance to deposit heat in some body within the engine while passing from 7, to 72, in such a manner that the transfer of heat from the substance to this body is reversible (satisfying the second condition above), then when we wish the working substance to pass from 7, to tr, we may reverse this transfer and so recover the heat that was deposited in this body. This alternate storing and restoring of heat may then take the place of adiabatic expansion and compression, in causing the tem-

perature of the working substance to pass from 7, to r, and from >

rT, to 7, respectively. The alternate storing and restoring is an action occurring wholly within the engine, and is therefore distinct from the taking in and rejecting of heat by the engine.

53. In 1827 Robert Stirling designed an apparatus, called a re- . generator, by which this process of alternate storing and restoring of heat could be actually performed. For the present purpose it will suffice to describe the regenerator as a passage through which the working fluid can travel in either direction, whose walls have a very large capacity for heat, so that the amount alternately given to or taken from them by the working fluid causes no more than an insensible rise or fall in their temperature. The temperature of the walls at one end of the passage is 7,, and this tapers continuously down to r,at the other end. When the working fluid at tempera-

other way of using it in air-engines was designed by Ericsson, and attempts have been made by C. W. Siemens and F. Jenkin to apply it to steam-engines and to gas-engines. But almost all actual engines, in so far as they can be said to approach the condition of reversibility, do so, not by the use of the regenerative principle, but by more or less nearly adiabatic expansion and compression after the manner of Carnot’s ideal engine.

III. PRopeRTIES oF STEAM AND THEORY OF THE STEAM- ENGINE.

55. We have now to consider the action of heat-engines in which the working substance is water and water-vapour or

Forma- tion of

steam. The properties of steam are most conveniently stated by steam

referring in the first instance to what happens when steam is formed under constant pressure. This is substantially the process which occurs in the

boiler of a steam-engine when the engine is at work. To fix the ideas we may suppose that the vessel in which steam is to be formed is a long upright cylinder fitted with a piston which may be loaded so that it exerts a constant pressure on the fluid below. Let there be, to begin with, at the foot of the cylinder a quantity of water (which for convenience of numerical statement we shall take as 1 fb), at any temperature ¢; and let the piston press on the surface of the water with a force of P ib per square foot. Let heat now be applied to the bottom of the cylinder. As it enters the water it will produce the follow- ing effects in three stages :—

(1) The temperature of the water rises until a certain tempera- ture ¢ is reached, at which steam begins to be formed. The value of ¢ depends on the particular pressure P which the piston exerts. Until the temperature ¢ is reached there is nothing but water below the piston.

(2) Steam is formed, more heat being taken in. The piston (which is supposed to exert a constant pressure) rises. No further increase of temperature occurs during this stage, which continues until all the water is converted into steam. During this stage the steam which is formed is said to be satwrated. The volume which the piston encloses at the end of this stage, — the volume, namely, of 1 Tb of saturated steam at pressure P (and temperature ¢),—will be denoted by V in cubic feet.

(8) If after all the water is converted into steam more heat be allowed to enter, the volume will increase and the temperature will rise. The steam is then said to be superheated.

under

constant pressure.

56. The difference between saturated and superheated steam Saturated may be expressed by saying that if water (at the temperature of and super- the steam) be mixed with steam some of the water will be evaporated heated if the steam is superheated, but none if the steam is saturated. steam.

ture 7, enters the hot end and passes through, it comes out at the cold end at temperature 7, having stored in the walls of the regenerator an amount of

heat which it will pick up again when

sed through in the opposite direction. During the return journey its temperature rises from 7, to 7,. The process is strictly reversible, or rather would be so if the regenerator had an unlimited capacity for heat, if no conduction of heat took place along its walls from the hot to the cold end, and if no loss took place by conduction or radiation from its external surface.

54. Using air as the working substance, and employing his regenerator, Stirling made an engine (to be described later) which, allowing for practical imperfections, is the earliest example of a truly reversible engine. The cycle of operations in Stirling's engine is substantially this :—

(1) Air (which has been heated to 7, by passing through the regenerator) is allowed to expand isothermally through a ratio 7, bing in heat from a furnace and raising a piston. Heat taken in (per tb of air)=cr, log er.

(2) The air is caused to pass through the regenerator from the hot to the cold end, depositing heat and having its temperature lowered to r,, without change of volume. Heat stored in regenerator =K,(7,—- 7). The pressure of course falls.

(3) The air is then compressed isothermally to its original volume at 7, in contact with a refrigerator (or receiver of heat). Heat rejected =cr, log er.

(4) The air is again passed through the regenerator from the cold to the hot end, taking up heat and having its temperature raised to7,. Heat restored by the regenerator =K,,(7, — 72).

em log r—cr,log.7 71-7 Efficiency = lll th lO,

er, log .r Ty

Any vapour in contact with its liquid and in thermal equilibrium is necessarily saturated. When saturated its properties differ con- siderably, as a rule, from those of a perfect gas, but when super- heated they approach those of a perfect gas more and more closely the farther the process of

superheating is carried, that is to say, the more the temperature is raised above #, the temperature of saturation corresponding to the given pressure P.

57. The temperature ¢ at which steam is formed depends on the value of P. Their relation was determined with great care by Regnault, in a series of classical cxperiments on which our knowledge of the properties of steam chiefly depends! The pressure of saturated steam rises with the temperature at a rate which increases rapidly in the upper regions of the scale. This will be apparent from the first and second columns of Table II., given on next page, which is compiled from Rankine's reduction of Regnault's results. The first column gives the temperature on the Fahr. scale; the second gives the corresponding pressure in pounds per square inch. Rankine has also expressed the relation of temperature and pressure in saturated steam by the following formula (which is applicable with other constants to other va- pours ?):—

log p= 6'1007 — a oo ; where p is the pressure in pounds per square inch, and' is the absolute temperature in Fahr. degrees. [or most purposes, how- ever, it is more convenient to find the pressure corresponding to a given temperature, or the temperature corresponding to a given pressure, from the table by interpolation.

Relation

of pres-

sure and tempera~

ture in

saturated

steam.

58. The same table shows the volume V, in cubic feet, occupied Relation by 1 Tb of saturated steam at each pressure, This is a quantity of pres- the

direct experimental measurement of which is of very great sure and difficulty. It may, however, be calculated, from a knowledge of volume.

_ The indicator diagram of the action is shown in fig. 13, and a diagram of the engine is given inchap. XIV. Stirling's engine is important, not as a present-day heat-cngine (though it

has recently been revived in small forms after a long interval of disuse), but because it is typical of the only mode, other than Carnot's plan of adiabatic expansion and compression, by which the action of a heat-engine can be Inade reversible. Valuable as the regenerator has proved in metallurgy and other industrial processes, its actual appheation to heat-engines has hitherto been very limited. An-

Fie. 18.—Air-Engine with Regenerator (Stirling).

other properties of steam, by a process which will be described later (§ 75). The values of V given in the table were determined by Rankine by means of this process; they agree fairly well with such direct observations of the density of steam as have been hitherto

1 Mem. Inst. France, 1847, vol. xxi. An account of Regnault's methods of experiment and a statement of his results expressed in British measures will be found in Dixon's Treatise on Heat.

2 Phil. Mag., Dec. 1854, or Manual of the Steam-Engine, p. 237.

made.! Therelation of P to V may be approximately expressed by the formula? a PV?* =constant = 68500 (nearly),

when P is stated in ib per sq. ft. and V in cub. ft. per Ib.

TasiE 11.—Properties of Saturated Steam.

Heat of Formation.

Temperature.| Pressure. Me oe F WG A. Degrees F. | ib per sq. in. Cub. Ft. Thermal Units. | Thermal Units.

32 0-085 | 3390 1091°8 0 41 0122 | 2406 1094°5 90 50 0173 | 1782 1097°3 18-0 59 0-241 | 1264 1100-0 27:0 68 0°333 935 1102°8 36-0 77 0°452 | 699 1105°5 45-0 86 0°607 529 11082 54:0 95 0°806 405 1111-0 63:0 104 1:06 313 1113°7 720 113 «| 188 244 1116°5 81°0 122. | 1-78 192 1119-2 901 131 2°27 152°4 “1121°9 99°1 140 2°88 122°0 1124°7 1081 149 3°62 98°45 1127°4 71 158 4°51 80°02 1130°2 126-2 167 5°58 65°47 1132°9 135°2 176 6°87 53°92 1135°6 | 144°3 185 8°38 44°70 11384 |) 153-3 194 10°16 37°26 11411 +! 162°4 203 _ 12°26 31°26 | 1143°9 171°4 212 14°70 26:36 1146°6 180°5 221 17°58 2234 1149°3 189°6 20°80 19°08 1152°1 198°7 24°54 | 16:28 1154°8 207°8 28°83 14-00 1157°6 216°9 33°71 12:09 1160°3 2260 39°25 10°48 1163°1 235°2 45°49 9124 1165°8 244°3 52°52 7973 1168°6 2585 60°40 6-992 1171°3 262°7 69°21 6°153 11741 271°9 79°03 5433 1176°8 281°1 89°86 4°816 1179°5 290°3 101°9 4280 1182°2 299°5 115‘1 3°814 1185°0 308°7 129°8 3-410 1187°7 318-0 145°8 3-057 1190°4 327°3 163°3 2-748 1193:2 3366 182°4 2476 1195°9 345°9 203°3 2-236 1198°6 352-2 2259 2-025 120174 364°5 250°3 1838 1204°1 373°9 276°9 1°672 1206°9 383°2 305°5 1°525 1209°6 392°6 336°3 13938 1212°4 402°0

Supply 59. We have next to consider the supply of heat. During the of heat first stage, until the temperature rises from its initial value ¢, to ¢,

informa- the temperature at which steam begins to form under the given

tion of pressure, heat is required only to warm the water. Since the steam _ specific heat of water is nearly constant, the amount of heat taken under in during the first stage is approximately ¢-¢ thermal units or constant J(t—t,) foot-pounds, J being Joule’s equivalent (§ 23), and this

pressure. expression for it will generally serve with sufficient accuracy in practical calculations. More exactly, however, the heat taken in is somewhat greater than this, for Regnault’s experiments show that the specific heat of water increases slightly as the temperature rises. In stating the amount of heat required for this first stage, t) must be taken as a known temperature; for convenience in numerical statement the temperature 32° F. is usually chosen as an arbitrary starting-point from which the reception of heat is to

be reckoned. We shall employ the symbol % to designate the heat required to raise 1 tb of water from 32° F. to the temperature ¢ at which steam begins to form. The value of # in thermal units is given, approximately, by the equation h=t—32.

More exact values, which take account of the variation in the specific heat of water, will be found in the last column of Table II. During the first stage, sensibly all the heat supplied goes to increase the stock of internal energy which the fiuid possesses, the amount of external work which is done by the expansion of the fluid being negligible.

60. The heat taken in during the second stage is what is called the latent heat of steam, and is denoted by L. Of it a part is spent

1 See Fairbairn and Tate, “On the Density of Steam at Different Temperatures,” Phil, Trans., vol. cl., 1860,

2 This is Rankine’s formula,

Latent heat.

Zeuner gives PV1:°646=eonstant.

during evaporation.

in doing external work,—namely, P multiplied by the excess of the volume of the steam over the volume of the water,—and the remainder is the difference of internal energy between 1 Ib of steam at tand 1 tb of water até The volume of 1 tb of water, at sueh temperatures as are usual in steam-engines, is nearly 0°017 cubic feet. We may therefore write the external work (in foot-pounds) done during the production of 1 Ib of steam under constant pressure P,— External work =P(V —0:017).

61. Adding together the heat taken in during the first and second Tota | stages we have a quantity designated by H and called the total heat heat ot ||

of 1 tb of saturated steam :— steam, |

H=A+L. Regnault’s values of II are very accurately expressed (in thermal units) by the formula H=1082 +0°305¢.

They are given in the fourth column of Table IT. A similar for- mula gives approximate values of L, exact enough for use in prac- tical calculations, —

L=1114-0°7¢. The total heat of formation of 1 Ib of steam, when formed under constant pressure from water at any temperature fy, is of course H-hp», where hy corresponds to fp.

62. Of the whole latent heat of stcam, L, the part P(V —0°017) Internal | is, as has been said above, spent in doing external work. The energy. || remainder (in foot-pounds)—

JL-P(V -0:017)— ‘ is the change of internal energy which the substance undergoes This quantity, for which it is convenient to have a separate symbol, will be denoted by p in thermal units, or Jp in foot-pounds. In dealing with the heat required to produce steam we adopted the state of water at 32° F. as an arbitrary start- ing-point from which to reckon the reception of heat. In the same way it is convenient to use this arbitrary starting-point in reckoning what imay be called the internal energy of the substance, which is the excess of the heat taken in over the external work done by the substance during its reception of heat. Thus the internal cnergy I of 1 tb of saturated steam at pressure P is equal to the total heat H, less that part of the total heat which is spent in doing external work, or (in foot-pounds)

JI=JH-P(V-0°017),

or I=L+h-P(V-0°017)/J=h+p. The notion of internal energy is useful in calculating the heat taken in or rejected by steam during any stage of its expansion or compression in an engine. Whena working substance passes from one condition to another, its gain or loss of heat is determined by the equation

Heat taken in =inerease of internal energy + external work. Any of the terms of this equation may be negative; the last term is negative when work is done, not by, but upon the substance.

63. The same equation gives the means of finding the amount Heat oj of heat required to form steam under any assigned conditions, in format | place of the condition assumed at the beginning of this ehapter, under ¢ where the formation of steam under constant pressure was eon- condi- sidered. Whatever be the condition as to pressure under which tions. || the process of formation is carried on, the total heat required is the sum of the internal energy of the steam when formed and the work done by the substance during the process. Thus in general

Heat of formation=I+J~ Je Pav, ; the limits of integration being the final volume of the steam and the original volume of the water. When steam is formed in @ closed vessel of constant volume no external work is done; the heat of formation is then equal to the internal encrgy, and is less than the total heat of formation (H) of steam, when formed at a constant pressure equal to the pressure reached in the vessel, by the quantity P(V -0°017).

ro In caiottieniet which relate to the action of steam in engines Wet | we have generally to deal, not with dry saturated steain, but with steam. wet steam, or steam which either carries in suspension, or 18 otherwise mixed with, a greater or less proportion of water. In every such mixture the steam and water have the same temperature, and the steam is saturated. The dryness of wet steam is measurct by the proportion g of dry steam in each pound of the mixed substance. When that is known it is casy to determine the other physical constants: thus— Latent heat of 1 tb of wet steam=qL; Total heat of 1 tb of wet steam =A+qL; Volume of 1 tb of wet steam =gV+ (1-9q)0‘017 =qV very nearly, unless the steam is so wet as to consist mainly of water; Internal energy of 1 tb of wet steam=/+ gp. ; 65. Steam is superheated when its temperature is raised, in any ol manner, above the temperature corresponding to saturation at the ll actual pressure. When much superheated, steam behaves like a steam. |

oy sTEAM.]

perfect gas, and may be called ‘‘steam gas.” It then follows the equation PV =85‘57,

and the specific heat at constant pressure, K,, is 371 foot-pounds or 0°48 thermal unit. At very low tempcratures steam approximates closely to the condition of a perfect gas when very slightly super- heated, and even when saturated ; at high temperatures a much ater amount of superheating is necessary to bring about an approach to the perfectly gaseous state. The total heat required for the production of superheated steam under any constant pressure, when the superheating is sufficient to bring the steam to the state of steain gas, may therefore be reekoned by taking the total heat of saturated steam at a low temperature and adding to it the product of K, into the excess of temperature above that. Thus Rankine, treating saturated steam at 32° F. as a gas, gives the formula H’=1092 + 0°48(¢’ — 32) , to express the heat of formation (under any constant pressure) of superheated steam, at any temperature ¢ which is so much above the temperature of saturation corresponding to the actual pressure that the steam may be treated as a perfect gas. Calculated from its chemical composition, the density of steam gas should be 0°622 times that of air at the same pressure and temperature. The value of y or K,/K, for steam gasis1°3. These formulas, dealing as they do with steam which is so highly superheated as to be perfectly aseous, fail to apply to high-pressure steam that is heated but Tittle above its temperature of saturation. The relation of pressure to volume and temperature in the region which lies between the saturated and the perfectly gaseous states has been experimented on by Hirn.t Formulas whieh are applicable with more or less accuracy to steam in either the saturated or superheated condition have been devised by Hirn, Zeuner,? Ritter,? and others.

66. The expansion of volume which occurs during the conversion of water into steam under constant pressure—the second stage of the process described in § 55—is isothermal. From what has been already said it is obvious that steam, or any other saturated vapour, can be expanded or compressed isothermally only when wet, and that evaporation (in the one case) or condensation (in the other) must accompany the process. stance which consists of a liquid and its vapour are straight lines of uniform pressure.

67. The form of adiabatic lines for substances of the same class depends not only on the particular fluid, but also on the propor- tion of liquid to vapour in the mixture. In the case of steam, it has been shown by Rankine and Clausius that if steam initially dry be allowed to expand adiabatically it becomes wet, and if initially wet (unless very wet*) it becomes wetter. A part of the steam is condensed by the process of adiabatic expansion, at first in the form of minute particles suspended throughout the mass, The temperature and pressure fall; and, as that part of the sub- stance which remains uncondensed is saturated, the relation of =” to temperature throughout the expansion is that which

olds for saturated steam. The following formula, proved by Rankine® and Clausius® (see § 75), serves to calculate the extent to which condensation takes place during adiabatie expansion, and so allows the relation of pressure to volume to be determined.

Before expansion, let the initial dryness of the steam be g, and its absolute temperature 7,. Then, if it expand adiabatically until its temperature falls to 7, its dryness after expansion is

wo (OFS «then, 22 q at v1 + loge a1). L, and L are the latent heats (in thermal units) of 1 Ib of steam before and after expansion respectively. When the steam is dry to begin with, g,=1.

This formula is easily applied to the construction of the adiabatic eurve when the initial pressure and the pressure after expansion are given, the corresponding values 7 and L being found from the table. It is less convenient if the data are the initial pressure and the Initial and final volumes, or the initial pressure and the ratio of expansion 7, An approximate formula more appropriate in that case is

Pv” =constant, or P/P,=(v/v,)”=7”. Here v and v, denote the volume of 1 tb of the mixture of steam and water before and after expansion respectively, and are to be distinguished from V and V,, which we have already used to denote the volume of 1 fb of dry saturated steam at pressures P

and P;. The index 2 has a value which depends on the degree of |.

initial dryness q,.

Théorie Mécanique de la Chaleur. 7 4ischr. d. Vereins deutscher Ingenteure, vol. xi.

Wied. Ann., 1878. For a discussion of several of these formulas, see a paper by H. Dyer, Trans. Inst. of Engineers and Shipbuilders in Scotland, 1885,

Prof. Cotterill, in his 7reatise on the Steam-Engine, § 79, has calculated (using the equation which follows in the text) that, when a mixture of steam and water expands adiabatically, steam condenses if the proportion of steam be, roughly, hd 50 per cent., but water is evaporated if the proportion of steam be less than al “oe 50 per cent. The exact proportion depends on the initial pressure.

Steam-Engine, § 281,

6 Mechanical Theory of Heat (tr. by W. R. Browne), chap. vi. § 12.

STEAM-ENGINE

Isothermal lines for a working sub-:

485

According to Zeuner,” 7=1°035+0’lg,, so that for

gd 095 09 085 O08 O75 O07

wal ‘Ta5- £130 P25 2100 Tile 1710 1108, Rankine gave for this index the value 4°, which is too small if the steam be initially dry. He determined it by examining the expansion curves of indicator diagrams taken from working steam- engines; but, as we shall sce later, the expansion of steam in an actual engine is by no means adiabatic, on account of the transfer of heat which goes on between the working fluid and the metal of the cylinder and piston. When it is desired to draw an adiabatic eurve for steam, that value of n must be chosen which refers to the degree of dryness at the beginning of the expansion.

68. Weare now in a position to study the action of a heat-engine employing steam as the working substauce. To simplify the first consideration as far as possible, let it be supposed that we have, as before, a long eylinder eomposed of non-conducting material except at the base, and fitted with a non-conducting piston; also a source of heat A at some temperature 7,; a recciver of heat, or, as we may now eall it, a condenser C, at a lower temperature 7,; and a non-con- ducting cover B (as in § 40). Then we ean perform Carnot's cycle of operations as follows. 'T''o fix the ideas, suppose that there is 1 tb of water in the cylinder to begin with, at the temperature r,:—

(1) Apply A, and allow the piston to rise. The water will take in heat and be converted into steam, expanding isothermally at constant pressure P,;. This part of the operation is shown by the line ad in fig. 14.

(2) Remove A and apply B. Allow the expan- sion to continue adiabatically (bc), with falling pressure, until the temperature falls to 7». The pressure will then be P,, corresponding (in Table II.) to r9.

q@ SOTWERmat 3B

(3) Remove B, apply C, and compress. Steam is condensed by rejecting heat to C. The action is iso- thermal, and the pressure remains P,, Let this be continued until a certain Fic, 14.—Carnot's Cycle with water and pores q – reached, after

steam for working substance. which adiabatic compression will complete the cycle.

(4) Remove C and apply B. Continue the eompression, which is now adiabatic. If the point d has been rightly chosen, this will complete the cycle by restoring the working fluid to the state of water at temperature 7}.

The indicator diagram for the cycle is given in fig. 14, as cal- culated by the help of the equations in § 67 and of Table II. fora particular example, in which y,=90 fb per square inch (7,=781), and the expansion is coutinued down to the pressure of the atmo- sphere, 14°7 tb per square inch (7,—673). Since the process is reversible, and since heat is taken in only at7, and

rejected only at ro, the efficiency is (r;—7.)/T.. The heat taken in per tb of the fluid is L,, and the work done is L, (7,- 72)/7, a result which may be used to check the calculation of the diagram.

69. If the action here deseribed eould be realized in practice, we should have a thermodynamically perfect steam-engine using saturated steam. The fraetion of the heat supplied to it whieh such an engine would eonvert into work would depend simply on the temperature, and therefore on the pressure, at which the steam was produced and condensed. The temperature of con- densation is limited by the eonsideration that there must be an abundant supply of some substance to absorb the rejected heat ; water is actually used for this purpose, so that 7, has for its lower limit the temperature of the available water-supply.

To the higher temperature 7, and pressure P, no limit can be set except such as is brought about in practice by the meehanical diffi- culties, with regard to strength and to lubrication, which attend the use of high-pressure steam. By a very special construction of engine and boiler Mr Perkins has been able to use steam with a pressure as high as 500 ib per square inch ; with engines of the usual construction the value ranges from 190 ib downwards.

If the temperature of condensation be taken as 60° F., as a lower limit, the efficiency of a perfect steam-engine, using saturated steam, would depend on the value of P,, the absolute pressure of production of the steam, as follows :—

For perfect steam-engine, with condensation at 60° F.,

P, in Ib per square inch being 40 80 120 160 200

Highest ideal efficiency “284 °326 469°350 49868 86°38 81

But it must not be supposed that these values of the efficiency are actually attained, or are even attainable. Many causes conspire to prevent steam-engines from being thermodynamically perfect, and some of the causes of imperfection cannot be removed. These num- bers will serve, however, as a standard of comparison in judging of

7 Grundztige der Mech. Warmetheorie, p 342. Sce also Grashof, Resultate aus der Mech. Warmetheorte, § 37. In the adiabatic compression of wet steam n=1°034+0 lig,, where g, 1s the dryness at the beginning of compresslon,

Carnot’s eycle with steam for working substance,

Efficiency of a perfeet stean- engine, Limits of tempera- ture

the performance of actual engines, and as setting forth the advan- tage of high-pressure steam from the thermodynamie point of view. Effieieney 70. As a contrast to the ideally perfect steam-engine of § 68

of an we may next consider a eyelic action such as occurred in the early engine engines of Newcomen or Leupold, when steam was used non- using expansively,—or rather, such an action as would have occurred in steam engines of this type had the cylinder been a perfect non-conductor non- of heat. Let the eycle of operations be this :— expan- (1) Apply A and evaporate the water as before at Pj). Heat sively. taken in=1y. (2) Remove A and apply C. This at once condenses a part of the steam, and reduces the pressure to P,. (3) Compress at P,, in contact with C, till condensation is complete, and water at rz is left. | (4) Remove Band apply A. This heats the water again to 7, and completes the cycle. Heat taken in=A, — hy. The indicator diagram for this series of * : E C f Fig. 15. operations is shown in fig. 15. Here the action is not reversible. To caleulate the efficiency, we have Work done _ (P, — P,)(V, — 0°017) Heat takenin J(L,+/,—-/e) The values of this will be.found to range from 0°067 to 0°072 for the values of P, which are stated in § 69, when the temperature of condensation is 60° F. ; Engine 71. In the ideal engine represented in fig. 14 the functions of with boiler, cylinder, and condenser are combined in a single vessel; but separate after what has been said in chap. II. it is scarcely necessary to re- organs, mark that, provided the working substance passes through the same cycle of operations, it is indifferent whether these are performed in several vessels or in one. To approach a little more closely the conditions that hold in practice, we may think of the engine which performs the eyele of § 70 as consisting of a boiler A (fig. 16) kept at 7), a non-conducting cylin- der and piston B, a

surface con- denser C kept at 7,, and a feed-pump D which restores the condensed water to the boiler. Then for every pound of steam supplied and used non-expansively as in § 70, we have work doneonthe piston =(P,—P,) Vj; but an amount of work has to be ex- pended indriving the feed- pump = (P,-P,) 0-017. Dedueting this, the netf- work done per Ib of steam \= is the same as before, and = the heat-taken in is also Fic. 16.—Organs of a Steam-Engine. | the same. An indicator diagram taken from the cylinder would — give the area efgh (fig. 17), where oc=Py, ef=Vj, oh =P, ; an indi- cator diagram taken from the pump would , _ give the negative area hjic, where ci is the « volume of the feed-water, or 0°017 cub. ft. The difference, namely, the shaded area, is the diagram of the complete cycle gone | through by each pouud of the working substance. In experimental measurements of the work done in steam-engiues, only Fig. 17. the action which occurs within the eylinder ~~s shown on the indi~~ cator diagram. Jrom this the work spent on the feed-pump is to be subtracted in any accurate determination of the thermodynamic efficiency. If the feed-water is at any temperature rt, other than that of the condenser as assumed in § 70, it is clear that the heat taken in is H, —/,y instead of H, — hy. How 72, We have now to inquire how nearly, with the engine of fig. nearly 16 (that is to say, with an engine in which the boiler and condenser may the are separate from the cylinder), we can approach the reversible process cycle of § 68. The first stage of that eycle corresponds to the be re- admission of steam from the boiler into the cylinder. Then the versible ? point kuown as the point of ewé-off is reached, at which admis-

sion ceases, aud the steam already in the cylinder is allowed to expand, exerting a diminishing pressure on the piston. This is the second stage, or the stage of expansion. The process of expansion may be carried on until the pressure falls to that of the condenser, in which ease the expansion is said to be complete.

At the end of the expansion release takes place, that is to say, com- –

munication is opened with the condenser. Then the return stroke begins, and a period termed the exhaust occurs, that is to say, steam passes out of the eylinder, into the condenser, where it is condensed at pressure P,, which is felt as a back pressure opposing the return of the piston. So far, all has been

essentially reversible, and identical with the corresponding parts of Carnot's eycle.

But we cannot complete the cycle as Carnot's eycle was com- pleted. The existence of a separate condenser makes the fourth stage, that of adiabatic compression, impracticable, and the best we can do is to continue the exhaust until condensation is com-

plete, and then return the condensed water to the boiler by meang of the feed-pump. a

It is true that we may, and in actual practice do, stop the — exhaust before the return stroke is complete, and compress that portion of the steam which remains below the piston, but this does not materially affect the thermodynamie efficiency; it is done partly for mechanical reasons, and partly to avoid loss of power through clearance (see chap. IY.). – In the present instance it is supposed that there is no elearance, in which case this compression is out of the question. The indicator diagram given bya cylinder in which steam goes through the action de- scribed above is shown to scale in fig. 18 for a par- ticular example, in which it is supposed that 1 cubie

foot of dry saturated steam

is admitted at an absolute

pressure of 90 ib per square . Inch, and is expanded twelve times, or down to a pressure of 5:4 tb per square inch, at which pressure it is dis- charged to the condenser, As we have assumed the cylinder to be non-conducting, and the steain to be initially dry, the expansion follows the law PV!:45— constant. The advantage of expansion is obvious, that part of the diagram which lies under the curve being so much clear gain,

73. To calculate the efficiency, we have

Work done per tb during admission=P,V, ;

‘BGy ws Oe wee wet ws BWnestHY

St PR ses EF ge we wee VO.tuws

Fig. 18.—Ideal Indieator Diagram for Steam used expansively.

of engine |

P,V, ~ P.rV, working n-r1 ” expan- sively,

during expansion to volume 7V,=

(by § 36), =(P,V,— Por V,)/0°185 ;

Work spent during return stroke = P,7V, ;

+ 3, On the feed-pump=(P, ~ P,)0°017;

Heat taken in=H,-Apy.

74, These expressions refer to complete expansion. When the Incon- expansion is incomplete, as it generally is, the expression given plete ex above for the work done during expansion still applies if we take pansion, P, to be the pressure at the end of expansion, while the work spent on the steam during the back-stroke is PyrV, and that spent on the feed-pump is (P, —P.)0°017, P, being the back pressure. Incomplete expansion is illustrated by the dotted line in fig. 18.

It is easy, by the aid of §§ 64 and 67 to extend these calcula- tions to cases where the steam, instead of being initially dry, is supposed to have any assigned degree of wetness. The efficiency which is ealeulated in this way, which for the present purpose may be ealled the theoretical efficiency corresponding to the assumed conditions of working, is always much less than the ideal efficiency of a perfect engine, since the cycle we are now — dealing with is not reversible. But even this theoretical efficiency, short as it falls of the ideal of a perfect engine, is far greater than ean be realized in practice when the same boiler and condenser tem- peratures are used, and

the same ratio of expansion. The reasons for this will be briefly considered in the next chapter; at present the fact is mentioned to guard the reader from supposing that the results which the above formulas give apply to actual engines. » |

75. The results of § 68 have been turned to account by Rankine Caleula- | and Clausius for the purpose of deducing the density of steam tion of from other properties which admit of more exact direct measure- density (meut. Let the perfect steam-engine there described work through saturate/] avery small interval of temperature Ar between two temperatures 7 steam. | andt- Ar. The efficiency is At/r, and the work done (in foot-lbs.) | is JLAc/r. The indicator diagram is now reduced to a long narrow strip, whose length is V -—0°017 and its breadth AP, the difference in pressure between steam at temperatures r and r-—Ar. Hence the work done is also AP(V – 0‘017), and therefore

>? 3)

ne or (in the limit) os is the rate of increase of tempera- ture with increase of pressure in saturated steam at the particular temperature r. It may be found roughly from Table IIL., p. 484, oF more exactly by differentiating the equation given in§ 57. Lisalso known, and hence the value of V corresponding to any assigne temperature may be calculated with a degree of accuracy which it would be difficult to reach in direct experiment. The volumes given in the Table are determined in this way.!

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1 The result of § 75 may be applied as follows to give the formula of § 67 for the adiabatie expansion of wet steam. For brevity we may write V—0°017=u, In adiabatie expansion the work done is equal to the loss of internal energy, or

: Pd(qu) =—Jd1 =—Jd(h-+qp). Since dh=dr, and p=L—Pu/J, this may be written Jdr + Jd(gL)—quaP=0.

JL d £ By § 75, udP=”— dr; henee1 + 4- Ce =0;

Ifere —

and by integration, loge t-+qL/r=eonstant=loge 71+9,Ly/71, whieh is the equation of § 67.

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re-

(lar-

ale,

STEAM IN CYLINDER. |

TV. AcTuAL BEHAVIOUR OF STEAM IN THE CYLINDER.

76. In fig. 18 we have what may be called a first approximation

cator to the theoretical indicator diagram of a steam-engine. In the

y-nal i.) zram.

action then described it was assumed—({1) that the steam supplied was dry and saturated, and had during admission the full (uniform) ressure of the boiler P,; (2) that there was no transfer of heat to or from the steam except in the boiler and in the condenser ; (3) that after more or less complete expansion all the steam was discharged by the return stroke of the piston, during which the back pressure was the (uniform) pressure in the condenser P, ; (4) that the whole volume of the cylinder was swept through by the piston. It remains to be seen how far

=f these assumptions are un- true in practice, and how far

=: Absolute Vacuum > the efficiency is affected in

Fic. 19.—Actual Indicator Diagram froma consequence.

Condensing Steam-Engine. The actual conditions of working differ from these in the following main respects, some of which are illustrated by the practical indicator diagram of fig. 19, which is taken from an actual engine.

77. Owing to the resistance of the ports and passages, and to

Boler Pressure

Atmospheric. Pressure

wing. the inertia of the steam, the pressure within the cylinder is less

than P, during admission and greater than P, during exhaust.

Moreover P, and P, are themselves not absolutcly uniform, and P, is greater than the pressure of steam at the temperature of the condenser, on account of the presence of air in the condenser.

During admission the pressure of steam in the cylinder is less than the boiler pressure by an amount which increases as the piston advances, on account of the increased velocity of the piston's motion and the consequent increased demand for steam. When the ports and passages offer much resistance the steam is expres- sively said to be throttled or "wire-drawn." Wire-drawing of steam is in fact acase of imperfectly-resisted expansion ($51). The steain is dried by the process to a small extent, and if initially dry it becomes superheated. causes the line of admission to lie below a line drawn at the boiler pressure, and to slope downwards. In fairly good practical instances the mean absolute pressure during admission 1s about nine-tenths of the pressure in the boiler.

In the same way, during the exhaust the actual back pressure exceeds the pressure in the condenser (shown by a dotted line in fig. 19) by an amount depending on the freedom with which the steam makes its exit from the cylinder. In condensing engines with a good vacuum the actual back pressure is from 3 to 5 ib per square inch, aud in non-condensing engines it is 16 to 18 Ibin place of the mere 14°7 tb which is the pressure of the atmosphere. The excess of back pressure may be greatly increased by the pre- seuce of water in the cylinder. The effects of wire-drawing do not stop

here. The valves open and close more or less slowly; the points of cut-off and release are therefore not absolutely sharp, and the diagram has rounded corners at 6 and ¢ in place of the sharp angles which mark those events in fig. 18. For this reason release is allowed in practice to occur a little before the end of the forward stroke, hence the toe of the diagram takes a form like that shown in fig. 19. The sharpness of the cut-off, and to a less extent the sharpness of the release, depends greatly on the kind of valves and valve-gear used; valves of the Corliss type (to be described later), which are noted for the suddenness with which admission of steam is stopped, have the merit amongst others of producing a very sharply defined diagram.

78. When the piston is at either end of its stroke there is a small space left between it and the cylinder cover. This space, together with the volume of the passage or passages leading thence to the steam and exhaust valves, is called the clearance. It con- stitutes a volume through which the piston does not sweep, but which is uevertheless filled with steam when admission occurs, and the steam in the clearance forms a part of the whole steam which expands after the supply from the boiler is cut-off. 1f AC be the volume swept through by the piston up to re- lease, OA the volume of the elearance, and AB the volume swept through during admission, the apparent ratio of expansion is AC/AB, but the real i ratio is (OA+AC)/(OA + AB).

i Clearance must obviously be taken account of in any calculation of curves i of expansion. It is conveniently al- lowed for in indicator diagrams by shifting the line of no volume back through a distance corresponding to the clearanee (fig. 20). Tn actual engines OA is from zy to Ay of the volume of the cylinder. _ 79. Clearance affects the thermodynamie efficiency of the engine chiefly by altering the consumption of steam per stroke, and its Influenee depends materially on the compression (§ 72). If during

oa r) _ Fic. 20,—Effect of Clearance,

STEHEAM-ENGINE

In an indicator diagram wire-drawing .

the back stroke the process of exhaust is discontinued before the end, and the remaining steam is compressed, this cushion of steam will finally fill the volume of the clearance ; and by a proper selection of the point at which compression begins the pressure of the cushion may be made to rise just up to the pressure at which stcam is admitted when the valve opens. This may be called eomplete compression, and when it occurs the existence of clearance has no direct effect on the consumption of steam nor on the efficiency ; the whole fluid in the cylinder may then be thought of as consisting of two parts,—a permanent cushion which is alternately expanded and compressed without net gain or loss of work, and the working part proper, which on admission fills the volume AB (fig. 20), and which enters and leaves the cylinder in each stroke. But if eom- pression be incomplete or absent there is, on the opening of the admission valve, an inrush of steam to fill up the clearance space. This increases the consumption to an extent which is only partly counterbalanced by the increased area of the diagram, and the result is that the efficiency is reduced. The action is, in fact, a case of unresisted expansion (§ 51), and consequently tends, so far as its direct effects go, to make the engine less than ever reversible. It is to be noted, however, that by such unresisted expansion the entering steam is dried to some exteut, and this helps in a measure to counteract the cause of loss which will be described below. Compression has the mechanical advantage that it obviates the shock which the admission of steam would otherwise cause, and that by giving the piston work to do while its velocity is being rapidly reduced it reduces those stresses in the mechanism which are due to the inertia of the reciprocating parts.

80. The third and generally by far the most important element Influenee

Compres- sion and eushion-

i

ng.

of difference between the action of a real engine and that of our of

hypothetical engine is that alluded to at the end of chap. I., the cylinder difference which proceeds from the fact that the cylinder and piston walls,

are not non-conductors. As the steam fluctuates in temperature there is a complex give-and-take of heat between it and the metal it touches, and the effects of this, though not very conspicuous on the indicator diagram, have an enormous influence in reducing the efficiency by increasing the consumption of steam. Attention was drawn to this action by Mr D. K. Clark as early as 1855 (Railway Machinery, ov art. STEAM-ENGINE, Ency. Brit., 8th edition?), and the results of his experiments on locomotives were confirmed some years later by Mr Isherwood's trials of the engines of the United States steamer " Michigan." Rankine in his classical work on the steam-engine notices the subject only very briefly, and takes no account of the action of the cylinder walls in his calculations. Its importance has now been established beyond dispute, notably by the experiments of Messrs Loring and Emery on the engines of certain revenue steamers of the United States," and by a protracted series of investigations carried out by M. Hallauer and other Alsatian engineers under the direction of Hirn,? whose name should be specially associated with the rational analysis of engine tests. In the next chapter some account will be given of how steam- engines are experimentally examined and how (following Hirn) we may deduce the exchanges of heat which occur between the steam and the cylinder throughout the stroke. The following is, in gene- ral terms, what experiments with actual engines show to take place.

81. When steam is admitted at the beginning of the stroke, it Initial finds the metallic surfaces of the cylinder and piston chilled by conden- having been in contact with low-pressure steam during the exhaust sation.

of the previous stroke. A portion of it is therefore liquefied, and, as the piston advances, more and more of the chilled cylinder surface is exposed and more and more of the hot steam is con- densed. Atthe end of the admission, when communication with the boiler is cut off, the cylinder consequently contains a film of water spread over the exposed surface, in addition to saturated steam. The boiler has therefore been drawn upon for a supply greater than that corresponding to the volume of steam in the admission space. The importance of this will be obvious from the fact,

demonstrated by experiment, that the steam which is thus condensed during admission frequently amounts to 30 and even 50 per cent. of the whole quantity that comes over from the boiler.

82. Then, as expansion begins, more cold metal is uncovered, Re-

and some of the remaining steam is condensed upon it.

But the evapora-

pressure of the steam now falls, and the layer of water which has tion,

been previously deposited begins to be re-evaporated as soon as the temperature of the expanding steam falls below that of the liquid layer. On the whole, then, the amount of water present will increase during the earliest part of the expansion, but a stage will soon be reached when the condensation which occurs on the newly exposed metal is balanced by re-evaporation of older portions of the layer. The percentage of water present is then a maximum ; and from this point onwards the steam becomes more and more dried by re-evaporation of the layer.

83. If the amount of initial condensation has been small this

1 See also Min. Proc. Inst. C.E., vol. 1xxii. p. 275.

2 A useful abstract of Messrs Loring and Emery's reports is given in Engineer: ing, vols, xix. and xxi., and in Mr Maw's Recent Practice in Marine Engineering,

3 Bull. Soc. Industr. de Mulhouse, from 1877. For other references, see chap. V.

re-evaporation may be complete before release occurs. Very usually, however, there is still an undried layer at the end of the forward stroke, and the process of re-evaporation continues during the return stroke, while exhaust is taking place. In extreme cases, if the amount of initial condensation has been very great, the cylinder walls may fail tp become

quite dry even during the exhaust, and a residue of the layer of condensed water may either be carried over as water into the condenser, or, if the exhaust valves are so badly arranged as to prevent its discharge, this unevaporated residue may gather in the cylinder, requiring perhaps the drain-cocks to be left open to allow of its escape. When any water is retained in this way the initial condensation is enormously increased, for the hot steam then meets not only cold metal but cold water. The latter causes much condensation, partly becauso of its high specific heat, and partly because it is brought into intimate mixture with the entering steam. ;

84. Apart, however, from this extreme case, whatever water is re-evaporated during expansion and exhaust takes heat from the metal of the cylinder, and so brings it into a state that makes con- densation inevitable when steam is next admitted from the boiler. Mere contact with low-pressure steam during the exhaust stroke would cool the metal but little; the cooling which actually occurs is due mainly to the re-evaporation of the condensed water. Thus if an engine were set in action, after being heated beforchand to the boiler temperature, the cylinder would be only slightly cooled during the first exhaust stroke, and little condensation would occur during tho next admission. But the metal would be more cooled in the subsequent expansion and exhaust, since it would part with heat in re-evaporating this water. In the third admission more still would be condensed, and so on, until a permanent régime would be established in which condensation and re-evapora- tion were exactly balanced. The same permanent régime is reachod when the engine starts cold.

85. The wetness of the working fluid to which the action of tho walls of the cylinder gives rise is essentially superficial. A film of wator forms on the walls, but except for this the body of the steam remains dry, until (by adiabatic or nearly adiabatic expansion) it becomes wet throughout its volume. The water formed by the act of expansion takes form as a mist diffused throughout the steam, and on it the sides of tho cylinder exert practically no influence. This latter wetness is in fact increasing while the substance, as a whole, is getting dried by the re-evapora- tion of the liquid film. During expansion the working substance may be regarded as made up of two parts,—a core of steam, which is expanding adiabatically but is at

the same time receiving addi- tions to its amount in the form of saturated steam from the liquid layer, and a liquid layer which is turning into steam.

86. From a thermodynamic point of view all initial condensation of the steam is bad, for, however early the film be re-evaporated, this can take place only after its temperature has cooled below that of the boiler. The process consequently involves a misappli- cation of heat, since the substance, after parting with high tempera- ture heat, takes it up again at a temperature lower than the top of its range. This causes a loss of efficiency (chap. II.), and the loss is greater the later in the stroke re-evaporation occurs. The heat that is drawn from the cylinder by re-evaporation of the condensed film becomes less and less effective for doing work as the end of the expansion is approached, and finally, whatever evaporation continues during the back stroke is an unmitigated source of waste. The heat it takes from the cylinder does no work ; its only effect, indeed, is to increase the back pressure by augmenting the volume of steam to be expelled. A small amount of initial condensation reduces the efficiency of the engine but little; a large amount causes a much more than proportionally larger loss.

87. The action of the cylinder walls is increased by any loss of heat which the engine suffers by radiation and conduction from its external surface. The entering steam has then to give up enough heat to provide for this waste, as well as enough to produco the subsequent re-evaporation of the condensed film. The consequence is that more steam is initially condensed. The loss of efficiency due to this canse will therefore be greater in an unprotected cylinder than in one which is well lagged or covered with non-conducting material. On the other hand, if the engine have a steam-jacket the deleterious action of the walls is reduced. The working substance is then on the whole gaining instead of losing heat by conduction during its passage through the cylinder. The jacket accelerates the process of re-evaporation and tends to make it finish at a point in the stroke when the temperature of the stean is still comparatively high. When the process is complete the cylinder walls give up very little additional heat to the steam during the remainder of the expansion and exhaust, for conduction and radiation between dry steam and the metal of the cylinder are incompetent to cause any considerable exchange of heat. The earlier, therefore, that evaporation is complete the less is the metal chilled, and the less is the

subsequent condensation. Moreover, after this stage in the stroke has passed, a steam-jacket continues

Cooling effect

of re- evapora- tion.

Wetness of steam during expan- sion,

Waste of heat.

Effect of jacket.

to give heat to the mctal during the remainder of the double stroke, and so warms it to a temperature more nearly equal to that of — the boiler steam before the next admission takes place. :

88. Thus a steam-jacket, though in itself a thermodynamically imperfect contrivance, inasmuch as its object is to supply heat to the working substance at a temperature lower than the source, acts beneficially by counteracting, to some extent, the more serious misapplication of heat which occurs through the alternate cooling and heating of the cylinder walls. The heat which a jacket com- municates to working steam often increases the power of an engine to an extent far greater than corresponds to the extra supply of heat which the jacket itself requires. Besides its thermodynamic effect a jacket has the drawback that it increases waste by external radiation, since it both enlarges the area of radiating surface and raises its temperature; notwithstanding this, however, many ex- periments have shown that in large and especially in slow-running engines, the influence of a steam-jackct on the efficiency is, in general, good; and this is to be ascribed to the fact that it reduces, though it does not entirely remove, the evils of initial condensation. To be effective, however, jackets must be well drained and kept full of “live” steam, instead of being, as many are, traps for con- densed water or for air.

89. It is interesting to notice, in general terms, the effects which certain variations of the conditions of working may be expected to produce on the loss that occurs through the action of the cylinder walls. Initial condensation will be increased by anything that augments the range of temperature through which the inner surface of the cylinder fluctuates in each stroke, or that exposes a larger surface of metal to the action of a given quantity of stcam, or that prolongs the contacts in which heat is exchanged. The influence of time is specially important; for it must be borne in Influeno mind that the whole action depends on the rate at which heat of speed is conducted into the substance of the metal. The changes of temperature which the metal undergoes are in every case mainly superficial; the alternate heating and cooling of the inner surface initiates waves of high and low temperature in the iron whose effects are sensible only to a small depth ; and the faster the alter- nate states succeed each other the more superficial are the effects, In an engine making an indefinitely large number of strokes per minute the cylinder sides would behave like non-conductors and the action of the working substance would be adiabatic.

We may conclude, then, that in general an engine running at a high speed will have a higher thermodynamic efficiency than the same engine running at a low speed, all the other conditions of working being the saine in both cases.

Again, as regards range of temperature, the influence of the cylinder walls will be greater (other things being equal) with high than with low pressure steam, and in condensing than in non- condensing engines. On the other hand, high pressure has the good effect of reducing the surface of metal exposed to the action of each pound of steam.

In large engines the action of the walls will be less than in small Influen’| engines, since the proportion of wall surface to cylinder volume is of size. less. This conclusion agrees with the well-known fact that no small engines achieve the economy that is easily reached with larger forms, especially with large marine engines, which eclipse all others in the matter of size.

Cylinder condensation is increased when the ratio of expansion Influen| is increased, all the other circumstances of working being left of vari } unaltered. The metal is then brought into more prolonged tionin contact

with low-temperature steam. The volume of admission is cut-off. | reduced to a greater extent than the surface that is exposed to the entering steam, since that surface includes two constant quantities, the surface of the cylinder cover and of the piston. For these and perhaps other reasons, we may conclude that with an early cut- off the initial condensation is relatively large ; and this conclusion is amply borne out by experiment. An important result is that increase of expansion does not, beyond a certain limit, involve increase of thermodynamic efficiency ; when that limit is passed the augmentation of waste through the action of the cylinder walls more than balances the increased economy to which, on general principles, expansion should give rise, and the result is a net loss. With a given engine, boiler pressure, and speed, a certain ratio of expansion will give maximum efficiency. But the conditions on which this maximum depends are too complex to admit of theoretical solution; the best ratio can be determined only by experiment, It may even happen that an engine which is required to work at a specified power will give better results, in point 0 efficiency, with moderate steam-pressure and moderate expansion, than with high steam-pressure and a very early cut-off. / |

90. The effect of increased expansion in augmenting the action Exper! | of the sides and so reducing the efficiency, when carried beyond a am certain moderate grade, is well illustrated by the American and results. | Alsatian experiments alluded to above. The following figures (Table III.), relating to a single-cylinder Corliss engine, are re uced from one of Hallauer's papers :!\—

1 Bull. Soc. Industr. de Mulhouse, May 26, 1880.

isolated instances to the contrary) experience bears out this con- clusion. In large engines, working with high pressure, much

OF STEAM IN CYLINDER. |

Percentage of Water present Consumption of

Ratio – Steam per Indi- expansion, and a slow stroke, the fact that compound engines are Expansion. a End of * End of oe ee in general more efficient than single engines cannot be doubted. — cei sill ais tahiti Additional evidence to the same effeet is furnished when a com-

pound engine is tested first with compound expansion and then as a

73 24-2 17°8 simple engine with the same grade of expansion in the large cylinder 9-4 308 18°6 alone. Thus inthe American experiments the compound engine of 1B-1 37°5 the ‘‘ Bache” when worked as a simple engine used 24 tb of steam

per I.H.P. per hour, as compared with about 20 fb when the engine worked compound, with the same boiler pressure, the same total expansion, and steam in the jacket in both cases. The necessity for compounding, if efficiency is to be secured, becomes greater with every increase of boiler pressure. So long as the initial pres- sure is less than about 100 tb per square ineh (absolute) it suffices to reduce the range of temperature into two parts by employing two-eylinder compound engines; with the higher pressures now eommon in marine practice triple and even quadruple expansion is being introduced.

The action of the cylinder walls would be greatly reduced if 20° it were practicable to use a non-conducting material as an internal

Here a maximum of efficiency lies between the extreme grades of expansion to which the test extends. In the American experi- ments the best results were ob- tained with even more moderate TABLE IV. ratios of expansion. The com-

ound engines of the United

tates revenue steamer “ Bache,” when tested with steam in the jacket of the large cylinder, with tb the boiler pressure nearly uni- form at 80 tb by gauge, or 95 ib

Consumption of Steam per I.H.P. per Hour.

Ratio of Total Expansion.

per square inch absolute, and 20°3 lining to the cylinder and to the exposed surfaces of the piston. the speed not greatly varied, 20°7 No cure for the evils of initial condensation would be so effectual 25° as this; and in view of the economy of heat which would result,

ave the results shown in ‘Table 1 iv. Mere the efiiciency is very ———_- – little affected by a large variation in the cut-off, but when the ratio of expansion becomes exeessive a distinct loss is incurred. Experiments with engines, in the conditions which hold in ordinary practice, show that it is not unusual to find 20 or 80 per cent. of the steam that comes over from the cylinder condensed during admission. In favourable cases the amount is less than

it is a matter of some surprise that the use of a non-conducting lining has not reeeived more serious attention.

94. The principal reasons have now been named which make Actual the actual results of engine performance differ from the results effi- which wonld be obtained if the steam conformed in every respect cieney to the simple theory stated in chap. III. It remains to state, of steam- very shortly, a few of the results of recent practice as to the actual engines.

filt of

this ; occasionally, on the other hand, the amoun: condensed is as much as half, or even more than half, the whole steam supply.

91. The action of the cylinder walls is reduced—(1) by jacketing, (2) by superheating, and (3) by using compound expansion. The advantage of the steam-jacket has been already mentioned. In high-speed engines its

beneficial effect is necessarily small, and in certain cases the benefit may be even more than neutralized by the drawbacks which have been alluded to above (§ 88). In general, however, the steam-jacket forms a valuable means of reducing the wasteful aetion of the cylinder walls, especially when the ratio of expansion is considerable. Experiments made with and without a jaeket, on the same engine, have shown that jacketing may increase the efficiency by 20 or 25 per cent. When a jacket is working pro- perly it uses, in a single-cylinder engine, 4 or 5 per cent., and in a compound engine 8 to 12 per eent., of the whole steam supply.

92. Superheating the steam before its admission reduces the amount of initial condensation, by lessening the quantity of steam needed to give up a specified amount of heat, and this in its turn lessens the subsequent cooling by re-evaporation. That it has a marked advantage in this respect has been experimentally demonstrated by Hirn. On general thermodynamic grounds superheating is good, because it extends the range of temperature through which the working substance is carried. In modern practice superheating (to any considerable extent) is seldom attempted. It occurs to a small extent whenever dry steam is throttled, and a slight superheating is occasionally given to steam in its passage from the high-pressure to the low-pressure cylinder ofa compound engine. In former years superheated steam was a eommon feature of marine practice, but serious practical difficulties caused engineers to abandon its use and to seek economy rather by increasing the initial pressure and using compound expansion. In those days, however, the theoretical advantage of superheating was less understood than it is now. The economy of fuel whieh its oo would probably secure is so great as to warrant a fresh and energetic attempt to overcome the mechanical difficulties of construction and lubrication that have hitherto stood in the way.

_93. The most important means of preventing cylinder condensa- tion from becoming excessive is the use of compound expansion. If the vessels were non-conductors of heat it would be, from the thermodynamic point of view, a matter of indifference whether expansion was completed in a single vessel or divided betwcen two or more, provided the passage of steam from one to the other was performed without introdueing unresisted expansion (§ 51). But with actual materials the compound system has the important merit that

it subjects each cylinder to a greatly reduced range of temperature variation. For this reason the amount initially condensed in the high-pressure cylinder is greatly less than if admission were to take place at once into the low-pressure cylinder and the whole expansion were to be performed there. Further, the steam which is re-evaporated from tho first cylinder during its exhaust does work in the second, and it is only the re-evaporation that occurs during the exhaust from the second cylinder that is absolutely wasteful. The exact advantage of this division of range, a8 compared with expansion (through the same ratio) in a single eylinder, would be hard to calculate ; but it is easy to see in a general Way that an advantage is to be anticipated, and (though there are

efficiency of steam-engines considered as heat-engines.

The performance of a steam-engine, as regards economy in its consumption of heat, may be stated in a number of ways. In some of these the engine alone is treated as an independent machine ; in others the engine, boiler, and furnace are considered as a whole.

The performance of the engine alone is best expressed by stating Modes of either (1) the thermodynamic “efficiency” or (2) the number of state- These terms re- ment.

thermal units used per horse-power per minute. quire a short explanation. ‘The “efficiency” of a heat-engine has already been defined as the ratio of the work done to the heat sup- plied. The “work done” ought in strietness to be reckoned as the net work done by the working substance in passing through a complete cycle of apne ; it should therefore be determined by subtracting from the work which the substance does in the cylin- der the work whieh is spent upon the substance in the feed-pump. The latter is a comparatively small quantity, and engineers gene- rally neglect it in their calculations of thermodynamic efficiency. In making comparison, however, between the efficiency which is actually realized and the efficiency of a perfect engine or of an engine working under any assumed conditions, account should be taken of the negative work done in the feed-pump, Account should also in strictness be taken of that part of the work spent in driving the air-pump which is done upon the working substance, as dis- tinguished from the water of injection. The “heat supplied” is the total heat

of the steam delivered to the engine, less the heat con- tained in the corresponding amount of feed-water. This quantity depends on the amount of steam used, on the temperature of the feed, on the boiler pressure, and on the extent to which the boiler “primes.” Priming is the delivery by the boiler of water mixed with the steam. Except where there is actual superheating the steam supply is always more or less wet; in a badly designed or overworked hedler large volumes of water may be carried over with the steam, but in a good boiler of adequate size the amount of priming is less (often much less) than 5 per cent. of the whole supply. The effect of priming is, of course, to reduce the supply of heat per Ib of the working substance.

One horse-power is the meehanical equivalent of 42°75 thermal units per minute. The relation between the above two methods of stating engine performance is therefore eee by the equation

c 42°75 Bineleaey amber of TU. per I.H.P. per minute *

Another very common mode is to give the number of pounds of steam supplied per horse-power per hour. This is unsatisfactory, even as a method of stating the comparative economy of different engines, or of one engine in different conditions, for several reasons. It ignores variations in boiler pressure, in feed-water temperature, and in the dryness of the supply, although each of these things affects the amount of heat required for the production of a pound of steam. But the total heat of production of dry steam does not vary greatly within the limits of practical pressures ; moreover, since (in condensing engines) feed-water is generally taken from the hot-well, its temperature does not differ much from that of the air-pump discharge, or (say), 100°F. Finally, in many comparative trials the amount of priming is nearly if not quite constant. Henee it happens that this mode of statement often furnishes a fairly accurate test of the economy of engines, and it

Effi- ciency of boiler and. furnace,

“Duty.”

Results of trials,

has the advantage of putting results in a way that is easy to under- stand and remember.

95. None of these modes of statement include the efficiency of the boiler and furnace. The performance of a boiler is most usnally expressed by giving the number of pounds of water at a stated temperature converted into steam at a stated pressure by the conibustion of 1 tb of coal. The temperature commonly chosen is 212° F., and the water is supposed to be evaporated under atmo- spheric pressure; the result may then be stated as so many pounds of water evaporated from and at 212° F. per 1 tb ofcoal. But the term “efficiency” may also be applied to a boiler and furnace (considered as one apparatus) in the sense of the ratio between the heat that is utilized and the potential energy that is contained in the fuel. This ratio is, in good boilers, about 0°7. Thus, for example, 1 ib of Welsh coal contains about 15,500 thermal units of potential energy, an amount which is eqnal to the heat of pro- duction (L) of about 16 tb of steam from and at 212°. In practice, however, 1 1b of coal serves to evaporate only about 11 ib of water under these conditions, or about 9°5 tb when the feed-water enters at 100° F. and the absolute pressure is 100 1b per square inch.

The efficiency of the engine multiplied by that of the furnace and boiler gives a number which expresses the ratio between the heat converted into work and the potential energy of the fuel,—a number which is, in other words, the efficiency of the system of engine, boiler, and furnace considered as a whole. Instead, how- ever, of expressing this idea by the use of the term efficiency, engineers are more usually in the habit of stating the performance of the complete system by giving the number of pounds of coal consumed per horse-power per hour, It must be borne in mind that this quantity depends on the performance of the boiler as much as on that of the engine, and that the difference in thermal value between one kind of coal and another makes it, at the best, a rough way of specifying economy. It is, however, an easy quantity to measure ; and to most users of engines the size of the coal-bill is a matter of greater interest than any results of thermodynamic ana- lysis. Still another expression for engine performance,

siniilar to this last, is the now nearly obsolete term “duty,” or number of foot-pounds of work done for every 1 cwt. of coal consumed. Its relation to the pounds of coal per horse-power per hour is this—

112 × 33000 × 60

Dashy ™ Number of bs. of coal per I.H.P. per hour’ A good condensing engine of large size, supplied by good boilers, consumes about 2 tb of coal per horse-power per hour; its duty is then about 110 millions.

96. To illustrate the subject of this chapter more fully the follow- ing summary is given of the results of tests of pnmping engines by Mr J. G. Mair, described in two excellent papers in Min. Pro. Inst. Civ. Eng. (vols. xx. and Ixxix.). The first group (Table V.) refers to single cylinder beam rotative engines, all of the same type, working at about 120 horse-power (in all except the last trial there were steam-jackets in use) :-—

Boiler Total Percentage Lbs. of Dry

Pressure Ratio of of Water (Abs.). Expansion. Present at

In these engines, which ran at the slow speed of about 20 revolu- tions per minute, the influence of steam jacketing was very marked. In the trials made with jackets in action, the percentage of water present at cut-off, when plotted in relation to the ratio of expan- sion, gives a diagram which is sensibly a straight line ; by drawing this line it may be seen that with an expansion of 3°8 in a similar jacketed cylinder there would be about 25 per cent. of initial con- densation instead of the much greater amount (37 per cent.) which the absence of a jacket caused in the last trial.

The next group of tests (Table VI.) refer to compound engines, of the types named (for explanation of the terms see chad. VI.) 2—

f|

Sd iuaslo P. § ‘ g |B8/522\2e3.. 08s | 2 Type. ye [Se leed eae lse™ | 8 eh4|$8/ 855/55 88 |2sh8) « Aad)/FA AR alas Ad aad]! a Woolf beam, without jackets..| 58 9:3] 18 51 26°6 | 0°082 a with jackets…... 62 15°8| 20

41 17:3 | 07126 ‘A without jackets..! 89 78} 34 34 19°2 | 0113 9 with jackets…...| 88 96) 34 38 17-4 | 07125 ” ty tenes 68 11°9; 18 25 15°6 0-139 ” oe eee 78 16°5 | 23 31 15°5 =| 0°140 ” ~ sareca| eke 13:2} 27 ae) 15°1 0144 Woolf tandem, without jackets} 86 11°5; 80 43 21°6 | 0°101 Receiver beam, with jackets…| 76 13°6| 24 34 148 | 0°147

1 For other comparative trials, see Hallauer’s papers, especially Bull. Soc. Ind. de Mulhouse, Dec. 30, 1878, and May 26, 1880.

| of indicator lighter linkages are adopted, and other changes have

V. Tue Testine oF STEAM-ENGINES.

97. Under this head we may include experiments made to Objects determine—(a) the horse-power of an engine; (b) the thermody- of tas | namic efficiency, or some more or less nearly equivalent quantity, such as the relation of power to steam supply or to coal consump- tion (§ 95); (c) the distribution of steam, that is, the relation which the several events of steam-admission, expansion, exhaust, and compression bear to the stroke of the piston ; (d) the amount of initial condensation, the wetuess of the steam throughout the stroke, and the transfer of heat between it and the cylinder walls ; (e) the efficiency of the mechanism, or the ratio which the work done by the engine on the machinery it drives bears to the work done by the steam in the cylinder.

Tests (a) and © are of common application ; test (6), in the simple form of a comparison of horse-power with coal burnt per — hour, is not unusual. The actual measurement of efficiency, whether thermodynamic (6) or mechanical (e), and the analysis involved in (ad) have been carried out in eomparatively few instances.

98. In all these operations the taking of indicator diagrams forms The _ a principal part. The indicator, invented by Watt and improved jndj by M‘Naught and by Richards, consists of a small steam cylinder, fitted with a piston which slides easily within it and is pressed down by a spiral spring of steel wire. The cylinder of the indicator is connected by a pipe below this piston to one or other end of the cylinder of the engine, so that the piston of the indicator rises and falls in response to the fluctuations of pressure which

occur in the engine cylinder. The indicator piston actnates a pencil, which rises and falls with it and traces the diagram on a sheet of paper fixed to a drum that is caused to rotate back and forth through a certain arc, in unison with the motion of the engine piston. In M‘Naught’s inticator the pencil is directly attached to the indicator piston, in Richards’s the pencil is movéd by means of a system of links so that it copies the motion of the piston on a magnified scale. This has the advantage that an equally large diagram is drawn with much less movement of the piston, and errors which are caused by the piston’s inertia are consequently reduced. In high-speed engines especially it is important to minimize the inertia of the indicator piston and the parts con- nected with it. In Richards’s indicator the linkage employed to multiply the piston’s motion is an arrangement similar to the parallel motion introduced by Watt as a means of guiding the piston-rod in beam engines (see § 188). In several recent forms

been made with the object of fitting the instrument better for high- speed work. One of these modified forms of Richards’s indicator (the Crosby) is shown in fig. 21. The pressure of steam in the engine cylinder raises the piston P, compressing the spring S and causing the pencil Q to rise ina nearly straight line through a distance proportional, on a magnified scale, to the com- pression of the spring and therefore

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Fie. 21.—Crosby Indicator.

to the pressure of the steam. At the same time the drum D, which carries the paper, receives motion through the cord C from alii the crosshead of the engine. Inside this drum there is a spiral spring which becomes wound up when the cord is pulled, and serves to turn the drum im the reverse direction during the back stroke. The cap of the indi- cator cylinder has holes in it which admit air freely to the top of the piston, and the piston has room to descend, extending the spring S, when the pressure of the steam is less than that of the atmosphere. The spring is easily taken out and replaced by a more or less stiff one when higher or lower pressures have to be dealt with.
99. To register correctly, an indicator must satisfy two conditions: Errors | (1) the motion of the piston must be proportional to the change indies? of steam pressure in the engine cylinder; and (2) the motion of diagra? the drum must be proportional to that of the engine piston. The first of these requires that the pipe which connects the

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indicator with the cylinder should be short and of sufficient bore, and that it should open in the cylinder at a place where the

ressure in it will not be affected by the kinetic action of the inrushing steam. Frequently pipes are led from both ends of the

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100. To determine the indicated horse-power, the mean effective Measure- pressure is found by dividing the area of the diagram by the length ment of of its base. This gives a mean height, which, interpreted on the horse- scale of pressures, is the mean effective pressure in pounds per power.

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cylinder to a central position where the indicator is set, so that diagrams may be taken from either end without shifting the instrument ; much better

results are obtained, especially when the cylinder is long, by using a pair of indicators, each fixed with the shortest possible connecting pipe, or by taking ie ent succes- sively from the two ends of the cylinder with a single instrument set first at one end and then at the other. The general effect of an insufficiently free connexion between the indicator and the engine cylinder is to make the diagram too small. The first con- dition is also invalidated to some extent by the friction of the indicator piston, of the joints in the linkage, and of the pencil on the paper. The piston must slide very freely ; nothing of the nature of packing is permissible, and any steam that leaks past it must have a free exit through the cover. The pencil pressure must not exceed the minimum which is necessary for clear marking. By careful use of a well-made instrument the error due to friction in the piston and connected parts need not be serious. Another source of disturbance is the inertia of these parts, which tends to set them into oscillation whenever the indicator piston suffers a comparatively sudden displacement. These oscillations, superposed upon the legitimate motions of the piston, give a wavy outline to parts of the diagram, especially when the speed is great and when the last-named source of error (the friction) is small. When they appear on the diagram a continuous curve should be drawn mid- way between the crests and hollows of the undulations. To keep them within reasonable compass in high-speed work a stiff spring must be used and an indicator with light parts should be selected. Finally, to secure accuracy in the pencil's movement, the strain of the spring must be kept well within the limit of elasticity, so that the strain may be as nearly as possible proportional to the steam pressure. Care must be taken that the spring is graduated to suit the temperature (about 212° F.) to which it is exposed when in use ; its stiffness at this temperature is about 8 per cent. less than when cold.

With regard to the motion of the drum, it is, in the first place, necessary to have a reducing mechanism which will give a sufficiently accurate copy, on a small scale, of the engine piston's stroke. Many contrivances are used for this purpose; in some a rigorous geometrical solution of the problem is aimed at, in others a close approximation only. Fig. 22 shows a good form of indicator gear. A pendulum rod AB is pinned at one end to the crosshead A (the end of the piston-rod) of the engine. Its upper end is carried by a pin which is free to turn and slide in the fixed slot B, A cord from an

intermediate point C leads over pulleys to the indicator drum. The pendulum rod should be much longer than the piston stroke, and the cord should lead off for a con- siderable distance in the direction sketched, at —.é right angles to the mean position of the rods. The accuracy of the drum's motion does not, how- 16? ~Indicator ever, depend merely on the geometrical condition ' of the gear. It depends also on the rigidity of the parts, and especially on the stretching of the cord. The elasticity of the cord will cause error if it is not maintained in a state of uniform tension throughout the double stroke, and this error will be greater the longer and the more extensible the cord is. Hence short cords are to be preferred ; and fine wire, which stretches much less, may often be substituted for cord with great advantage. The stretching of the cord is perhaps the most scrious and least noticed source of error the indicator is subject to in ordinary practice. The tension of the cord varies for three reasons,—the inertia of the drum, the varying resistance of the drum spring, and the friction of the drum, which has the effect of increasing the tension during the forward stroke and of reducing it during the back stroke. This last cause of variation can be minimized only by good construction and careful use of the instrument ; but the other two causes can be made to neutralize one another almost completely. Since the motion is nearly simple harmonic, the acceleration of the drum varies in a nearly uniform manner from end to end of the stroke. The resist- ance of the drum spring also varies uniformly ; and it is therefore only necessary to adjust the stiffness of the drum spring so that the increase in its resistance as the motion of the drum proeeeds may balance the decrease in the force that the cord has to exert in setting the drum into motion. This adjustment will secure an almost uniform tension in the cord throughout the whole stroke ; it mhust, of course, be altered to suit different engine speeds. The indicator plays so important a part in the testing of heat-engines, Whether for practical or scientific purposes, that no pains should be spared to avoid the numerous and serious sources of error to which it is liable through faulty construction or unintelligent use.!

. Valuable discussion and experimental investigation of the errors of the cator will be found in papers by Prof. Osborne Reynolds and Mr H. W.

Linton path

square inch. This has to be multiplied by the effective area of the piston in square inches and by the length of the piston stroke in feet, to find the work done per stroke in foot-pounds on that side of the piston to which the diagram refers. Let A, be the area of the piston on one side and A, on the other; p, and p, the mean effective pressures on the two sides respectively; L the length of the stroke in feet; and m the number of complete double strokes or revolutions per minute. Then the indicated horse-power _2L(pA; + PoAs) ew 33000 F

In finding the mean pressure the area of the diagram may be con- veniently measured by a planimeter or calculated by the use of Simpson's rule. A less accurate plan, frequently followed, is to divide the diagram by lines drawn at the middle of strips of equal width, as in figs. 23 and 24, and to take the mean pressure as the average height of these lines.

101. Space admits of no more than a few illustrations of actual Examples Fig. 23 is a diagram taken from an antiquated of indi-

indicator diagrams. non-condensing engine working without ex- ~__—s—s pansion. The line AB has been drawn ata height which represents the boiler pressure, in order to show the loss of pressure in admission, The line CD.is drawn at atmospheric pressure by the indicator itself. In this engine ad- mission continues till the end of the forward. ——T stroke, and as a result the back pressure is 'nip Sinaeedd great, especially during the first stage of the Hig. @. exhaust. The diagram shows a slight amount of oscillation pro- duced by the sudden admission of steam. This feature, however, is better illustrated by fig. 24, which is another diagram taken from the same engine, at the } same boiler pressure, but with the steam much |! | throttled. } oe

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Fig. 25 shows a pair of diagrams taken from. {ii i'! a condensing engine in which the distribution *~ of steam is effected by a common slide valve

(chap. VIII). The two diagrams refer to opposite ends of the cylin- der and are taken on the same paper by the plan already alluded to (§ 99) of fixing the indi- , 4 – cator about midway be- . tween the ends of the cylinder, with a pipe leading from it to each end. Steam is cut off. ata anda', release occurs

at band 6’, and compres- sion begins at ¢ and ¢’. The gradual closing of theslide valves throttles the steam considerably before the cut-off is complete. The line of no pressure EF is drawn 14°7 Ib per square inch below CD, which is the atmospheric line; and the line of no volume AE or BF is drawn (for each end of the cylinder) at a distance (from the end of the diagram) equal to the volume of the clearance. Fig. 26 is a diagram taken from a Corliss engine working with a large ratio of expansion. The Corliss valve-gear, which will be described in chap. IX., causes the admission valve to close suddenly, and consequently defines the point of cut-off pretty sharply in the diagram. Through this point a dotted curve has been drawn (by aid of the equation PV”=const., § 67), which is the curve that would be fol- _ lowed if the expansion were ~ adiabatic. In drawing this Fie. 26,—Indicator Diagram from curve it has been assumed that nie Bape at the end of admission the steam contains 25 per cent. of water. The actual curve first falls below and then rises above this adiabatic curve, in conse- quence of the continued condensation which takes place during the early stages of the expansion and the re-evapora- tion of condensed water during later stages (§ 82). Fig. 27 is another diagram from a Corliss ae, engine, running light, and with ——————_”” the condenser not inaction. Dia- grams of this kind are often taken = when engines are first erected, for ig. H. the purpose of testing the setting of the valves. Other indicator diagrams, for compound engines, will be given in chap. VI.

PRESSURE BY GAUE r)

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Fic, 25,—Indicator Diagram from Condensing Engine, with Slide-Valve.

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Pressure by Gauge

eee Brightmore (Min. Proc. Inst. C.L., vol. 1xxxiii,, 1886). In the discussion which followed the reading of the papers a description will be found of an ingenious apparatus which the makers of the Crosby indicator employ to test the uniform- ity of the cord's tension throughout the stroke.

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In place of the ordinary indicator an apparatus is occasionally used which integrates the two coordinates which it is the business of the indicator diagram to represent, and exhibits the power developed from stroke to stroke by the progressive movement of an index round a dial.

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Results. Dryness of boiler steam, g=0°96. Supply to eylinder, Mc =M—Mj=1°028 fb per rev. Injection water per rev. =51:1—1-208=49°9 ib. L,=898, hy=278, he=18, hy=41°4, ho=27. Gross supply of heat from boiler to eylinder per revolution

Tests of 102. In tests of thermodynamic efficiency we may measure cither ee

‘ 7 4 : = 96 × 8984-278) =1377 T.U. thermo- the heat supplied or the heat rejected, and compare it with the work | gross supply of heat from = to jackets ri Seveliitien dynamic done. The heat supplied is on the whole capable of more exact =M (gL) A) efficiency, casurement, but in any casc a determination of the heat rejected =0°186 (0°96 × 898-278)=212 T.U.

furnishes a valuable check on the accuracy of the result. The trial must be continued for a period of some hours at least, during which the engine and boiler are to be kept working as uniformly as possible in all respects. The power is determined by taking indicator diagrams at short intervals. The heat supplied is found by noting the amount of feed-water required to keep the water- level in the boiler constant during the trial, the temperature of the

feed, and the pressure of the steam. The only uncertainty which attaches to the measurement of heat-supply is due to priming. Every pound of water that passes over unevaporated to the engine takes less heat by the amount L (§ 60) than if it went over in the state of steam. To measure the degree of wetness in steam is a

- matter of some difficulty ; it may be done by passing the steam

into a known quantity of cold water, so as to condense it, and observing the rise of temperature which has taken place when the whole quantity of water present has increased by a measured amount.

i leave a balance of 93 units unaccounted for.

Total gross supply per revolution=1377 4-212 =1589 T. U. leat restored to boiler per revolution, By feed water=Mh p=1°394 × 27=38 T.U By jaeket drains=0. Net supply of heat per revolution =1589—38 =1551 T.U. Heat eonverted into work, per revolution ts 42 75 oot TU. Total heat rejeeted per revolution =1551—227 = 1824 T.U.

The rejected heat is accounted for as follows :— Net heat rejected in air-pump diseharge=Gross heat rejeeted in air-pump dis- eharge—heat in injection water— heat restored to the boiler by the feed =51‘1× 41°4—49-9 × 18—38=1179 T.U.

Heat rejeeted in jacket drains= Mjh, =0°186 ×278 =52 T.U.

These two items account for 1231 units of rejected heat and unit The balance is made

up of heat rejected in air and vapour by the air-pump, heat lost

by radiation, &c., and errors of experiment. In the example con-

sidered the loss by radiation was estimated at 45 thera units,

[TESTING op

Heat If L, be the latent heat of steam at the boiler pressure, h, the | Which reduces the discrepancy between the two sides of the account sup- heat in the feed-water per tb, /, the heat in the boiler water per tb, | to 48 units, or only about 3 per cent. of the whole heat supplied. plied. and gq the dryness of the steam as it leaves the boiler, the heat The efficiency of the engine is 745 or 0146, The efficiency of a taken in per tb of the substance supplied to the cylinder is perfect engine working between the same limits of temperature, gly +h —hy. 308° F. and 50° F., would be 0°335. To this must be added, in the case of a jacketed engine, the heat | 104. When it is desired to deduce from the test of an engine not Caleyla.. supplied to the jacket, a quantity which depends on the amount of | only the thermodynamic efficiency but also the amount of initial tion of steam condensed there, and also on whether the water that gathers | condensation and the subsequent changes of wetness which the wetney in the jacket is drained back into the boiler or allowed to escape | Working fluid undergoes during expansion, it is necessary to know, of the ll into the hot-well. | in addition to the above data, the volume of cylinder and clearance, steam, Heat re- The heat rejected by an engine fitted with an injection condenser | the relation of pressure to volume during the several stages of the jected. is made up of the following parts :—(a) heat rejected in the con- | stroke, and the whole amount of working substance present in the densed water, less the heat returned to the boiler in the feed (if | cylinder. This last is a quantity whose precise value is not easily the feed is directly drawn from the hot-well without giving the | ascertained. Assuming that the point at which compression begins water time to cool sensibly, this quantity vanishes ; iu a jacketed | can be distinguished on the diagram, we have the pressure and the engine this item must include the heat rejected in the jacket drains); | volume of the steam that is afterwards compressed into the clear- (>) heat used in warming the condenser water from the temperature | ance space. From its pressure and volume we can infer its amount, of injection to the temperature of the air-pump discharge ; (c) heat | if only its degree of dryness be known. The assumption usually rejected in air and vapour from the air-pump; (d@) heat lost by | made is that at the beginning of compression the steam shut up in radiation, conduction to supports, and acrial convection,—or, more | the cylinderis dry. This assumption is to a certain extent supported properly, the excess of this heat over the heat developed within | by the fact that re-evaporation has been going on during

expansion the engine by the friction of piston, valves, &. Of these quanti-
and exhaust ; in good engines it is probably not far from the truth, ties, (a) is
found without difficulty from a knowledge of the amount | though there are
cases where, owing to excessive initial condensa- of the feed-water, its
temperature, the temperature of the air-pump | tion and to the exhaust ports
being badly situated for draining discharge, and amount and temperature of
watcr drained from the | the cylinder, water may accumulate in considerable
quantities. jacket ; (6) is measured by gauging the whole discharge from the
| Except in extreme cases of this kind, however, the assumption that pump,
deducting from it the amount returned to the boiler as feed- | the steam is
dry when compression begins does not introduce an water, and measuring
its temperature and that of the injection | error which can seriously affect the
subsequent calculations. Hav- water; (c) does not admit of direct
measurement; (d) may be | 1ng found the quantity shut up in the clearance,
we add to it the approximately estimated for a jacketed engine by filling the
jacket | quantity delivered from the boiler per single stroke, to find the with
steam while the engine is out of action, and observing the | whole quantity
of working substance in the cylinder. The sub- amount of steam condensed
in the jacket during a long interval, | stance is, and continues, a mixture in
varying proportions of steam through radiation, &c., from the external
surface. and water. Its volume may practically be taken as the volume of In
calculating the supply of heat by the boiler it is convenient | the dry steam it
contains, the volume of the water being compara- to take the temperature
32° F. as a starting point from which to tively small. Taking any point of the
stroke, and measuring the reckon what may be termed the gross supply, and
then to deduct | pressure and the volume there, we can say how much steam
(at from this the heat which is restored to the boiler in the feed-watcr. | that
pressure) would be required to fill the volume which the mix- The
difference, which may be called the net supply, is the true | ture then
occupies. This quantity will always be less than the consumption of heat,
and is to be used in calculating the efficiency | actual amount of the
mixture; and the difference between them 1s of the engine. A similar
convention may be followed in dealing | the amount of water that is present.
This calculation is of special with the heat rejected. interest at two places in
the strokc—the point of cut-off and the Example. 103. This subject is most
easily made intelligible by help of a | point of release. |

numerical example. For this purpose the following data of an actual engine-test have been taken from one of Mr Mair’s papers! ; the data have been independently reduced, with results that differ only to a small and unimportant extent from those stated by Mr Mair. The engine under trial was a compound beam engine, steam- jacketed, with an intermediate receiver between the cylinders. The cylinders were 21 inches and 36 inches in diameter, and the stroke 5} feet. The total ratio of expansion was 13°6. Data.

Boiler pressure, absolute, 76 tb per sq. in.

105. To illustrate it we may continue the numerical example Examp

quoted above. In the high-pressure cylinder of the engine to which the test refers the volume at the beginning of com- pression (including clearance) was 1°52 cubic fect. The pressure, just before compression began, is shown by the indicator diagram (of whieh fig. 28 is a copy) to have been 14°8 Ib per square inch. At this pres-

sure the density (or mass of 1 cubic foot)

of steam is 0‘038 Ib, Hence (on the above , assumption that the steam was then dry) ==

TN OMOR NEM aseuvers cseoesensadtiseseseeess-y0- te 6 hours. the quantity shut up in the clearance was ; q y P RevolUthomsiesor-nsessssecsseearseers +o 8632, or 24-0 per min. 1°52 × 0‘038 =0°058 ib – . ee ee eet | eee : ‘i

BOWIE or cdsrveemmaserccrssserire-cometoa 12,032 tb, or 1°394 tb per rev. (ML). The amount delivered to the cylinder per — ‘ eiregeap area Seems = tb per min., or 51°1 tb per rev single stroke (or half revolution) was 0°604 1b. The whole Sipe

ater drained from jaekets…….s00006. 1605 Ib, or 0°186 Ib per rey. (Mj). “ki issi € Percentage of priming a kh co pe OG of working substance present from the end of the admission to t

“bo”

PiealcciowcadWanssls 50°. Temperature of air-pump diseharge, ¢3 …73°-4, Fe a Ee ee a ee

1 Min. Proc. Inst. C. E., vol. 1xx.

beginning of the exhaust was therefore 0°662 ib.

At the point of cut-off the pressure is shown by the diagram to have been 64 fb per square inch (absolute), and the volume, includ- ing clearance, was 2°92 cubic feet. The density of steam for this

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pressure is 0°151 tb per cubic foot. Hence, out of the whole mixture, the amount of steam was 2°92 × 0‘151=0°440 ib. The water present at the point of cut-off was thercfore 0°662—0°440 or 0-222 ib. This is 88°5 per cent. of the whole amount of the mix- ture, and shows (after allowing for the priming water) that about 32 per cent. of the steam adinitted was condensed on admission. Next, to find the amount of water present at the end of the expansion. The diagram shows that at this point the pressure was 15:2 tb per square inch and the volume 18:235 cubic fect. Steam of this pressure has a density of 0°0392 Ib per cubic foot. The quan- tity of steam at release was therefore 18°2385 × 0°0892, or 0°519 fb, and the quantity of water 0°662—0°519=0°143 Ib. It appears

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in the jacket, if there is one. Then, as the cylinder neither gains nor loses heat on the whole, after a uniform régime has been arrived

at, we h ditt Qzne= Qen + Qna + Qs — Qr.

The quantity Qpc may also be calculated directly from a know- ledge of the gross heat rejected to the condenser, since the gross

heat rejected i pee aa Ip+ Wace + Qse,

Ip being the internal energy of the mixture at release and Wne being the work done upon the steam in expelling it from the cylinder.

108. This heat Qzc, which is taken up by the steam from the Waste of

therefore that re-evaporation from the cylinder walls during ex- pansion reduced the amount of water present by 0°079 Tb, so that the percentage of water fell from 33°5 at the point of cut-off to 21°6 at the point of rclease. The same method of calculation can

cylinder walls during exhaust, is a part of the heat deposited there heat by during admission. It has passed through the cylindcr without con- action of tributing in the smallest degree to the work of the engine. Prob- cylinder ably for this reason it is treated by some writers as a quantity walls.

obviously be applicd to any other point in the expansion curve, and can be extended to the low-pressure cylinder of an engine which (like the one in this example) is compound. The amount of dry steam present at the point of release is sometimes spoken of as the “stcam accounted for by the indicator diagram.”

106. Having completed this analysis of the working-substance, we may proceed to find the quantity of heat which it gives to or takes from the walls of the cylinder during any stage of its action, by considering the changes of internal cnergy which the working substance undergoes, along with the external work done, from stage to stage. If we write m for the amount of steam and m’ for the amount of water present in the cylinder at any one stage, the internal energy of the mixture is (§ 62)

(m+m’\h+mp. Let the value of this quantity be denoted by I, at any one stage in the cxpansion or compression of the mixture, such as the point of cut-off A, and by Ig at a later stage, such as the point of release B, the corresponding volumes of the whole mixture being Va and Vz respectively.

Then in passing from the first condition to the second the substance loses I, —Is of internal aeeey: It also does an amount of external work Wap measured by PdV, or the area A of the figure ABab. If Was is equal to I,— Ig the process is adiabatic ; otherwise the amount of heat taken up (from the cylinder walls) during the process is Qan= Was-(Ia-Iz).

If A is the point of cut-off and B that of release, the quantity so calculated is the heat taken up from the cylinder walls during the whole process of expansion. The calculation applies equally, how- ever, in determining the heat taken up during any stage of the process. When this has a negative value heat has been given up by the substance to the cylinder walls. In the numerical example which has been cited above the internal energy of the mixture at the beginning of expansion was 540 thermal units. At the end of expansion the internal energy was 584 thermal units. Between these points the indicator diagram (fig. 28) shows that the work done was cquivalent to 55 thermal units. 44+55=99 units of heat were therefore taken from the cylinder walls during the process of expansion. A similar calculation, applied to the compression curve, shows that in that part of the operation heat was given up to the cylinder walls. During compression W is of course nega- tive, since work is then spent upon the steam.

107. During admission and also during exhaust another item enters into the account,—the amount of the working substance is then undergoing change. To find the heat given up by the steam during admission we have first to calculate (by the method already described) the internal energy of the mixed steam and water that is shut into the clearance space at the end of the previous stroke; this may be called Ip. The steam which then enters brings with it an additional amount of internal energy which we may calculate froma knowledge of the quantity of steam, its pressure at admission, and its dryness. Let Io denote this additional supply of internal energy. At the end of admission the state of the mixture is known from the indicator diagram; hence its internal energy I, may be found. The work done during admission, Wpa, is also determined ‘from the diagram. Then we have, for the heat given up by the steam during admission,

Qpa=Ip+Io—Ia- Woa.

In attempting to apply the same method of calculation to de- termine the heat taken up from the cylinder walls during exhaust (Qzc), we are met by the difficulty that we do not know the state, as regards dryness, of the mixture during its expulsion from the cylinder. We may, however, estimate the value of Quc as follows. Let Qep and Qpa be, as before, the heat given up by the steam to the cylinder walls during compression and admission respectively, and let Qan be the heat taken from the cylinder walls during ex- haust ; also let Qx be the heat which the cylinder loses (per single stroke) by radiation (less the heat produced by piston and valve friction), and Q; the heat which it gains by condensation of steam

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which measures the wasteful influence of the cylinder walls. This, however, is not strictly the case. The magnitude of Quc is certainly in some sense an index of the extent to which the alternate heating and cooling of the metal causes inefficiency ; it is so much heat absolutely lost, and lost by the action of the walls. [In the high- pressure cylinder of a compound engine this loss is, of course, absolute only as regards that cylinder ; the heat represented by Qne assists in the work of the low-pressure cylinder.] But besides this loss there is another which the walls cause by taking heat from the steam on admission and restoring it during the later stages of expausion. That part of the heat abstracted during adinission which is restored before the point of release does not appear in Qzc ; nevertheless it is a source of inefficiency. With steam that is dry at the end of the expansion the value of Qzc is almost negligible ; still the cylinder walls may cause a very sensible loss by abstracting heat from the hot steam as it enters and restoring it as the mixture expands. The quantity which has been denoted here by Qpc— that heat, namely, which the steam takes up from the cylinder walls after release and during exhaust—appears in the writings of Hirn and his followers under the symbol R,. He terms it “le re- froidissement au condenseur,”’ and refers to it, somewhat inexactly, as ‘‘l’effet réel des parois.”! Prof. Cotterill applies the name **exhaust waste” to the sum of the two quantities Qzc and Qr.?”
109. It is obvious that the above analysis depends fundament- ally on the strict accuracy with which the indicator diagram not only gives a measure of the work done by the engine under test, but shows the relation of pressure to volume at each stage in the process. Engine tests of a complete

kind have now been made and discussed by a number of independent observers, working with widely different data. The results are in good general agreement. They demonstrate the influence of the sides beyond question, show- ing that 30 per cent. is no unusual amount of water to be present in the mixture at the point of cut-off, even in compound engines of the best types; that half of this water, or even more, is frequently found at the end of expansion ; and that the heat denoted above by Qne ranges from about 10 to 20 per cent. of the whole heat supplied.*

110. An engine employed to drive other machinery delivers to Efficiency it an amount of power less than the indicated power by an amount of the which is wasted in overcoming the friction of piston and piston- mechan- The efficiency of the mechanism ism.

rod, slides, valves, journals, &c. is the ratio of the “effective” or ‘‘brake” horse-power to the indicated horse-power. It may be tested by measuring the power delivered by the engine when at work, either by using a transmission dynamometer or by substituting an absorption dynamometcr for the mechanism usually driven. In the case of a pumping engine the efficiency of the engine and pumps together may be determined by observing the actual work done in raising water or in delivering a measured volume against a known pressure. Attempts are sometimes made to find the amount of power wasted in engine friction by testing the indicated power necded to drive the engine against no other resistance than its own friction. This, however, fails to show the power which will be spent in overcoming friction when the engine runs under ordinary conditions, since the pressures at the slides, the journals, and elsewhere are then widely different from what they are when the engine is running without load. Experiments with large engines show that the efficiency of the mechanism may, in favourable cases, be 0°85 or even 0°9; in small engines, or in large engines running under light loads, it is generally much less than this.

1 Bull. Soc, Ind, de Mulhouse, 1881.

2 The Steam Engine considered as a Heat Engine, p. 54.

3 In this connexion reference should be made to the data supplied by the American experiments (of Messrs Emery and Loring), some of which are

dis- cussed fully by Prof. Cotterill; also to the writings of Hirn and the extensive researches of the Alsatian engineers alluded to in chap. IV. ; also to Mr Mair's paper (§ 96) and to Mr M. Longridge's Reports, as engineer to the Engine, Boiler, and Employers Liability Association, for 1880, 1881, and 1884. The Report for 1884 especially exhibits the results of a test with unique fulness and clearness. The Journal of the Franklin Institute for 1885 contains an account of experiments by Messrs Gately and Kletzsch on one engine, under varied conditions of boiler pressure, expansion, and speed; these, so far as they go, confirm the conclusions stated, on general grounds, inchap. IV. Fora synopsis of Hirn's method of ana-

lysis reference should be made to a paper by M. Poupardin, Bull. Soc. Ind. de Mul- house, March 81, 1875.

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VI. CompounD EXPANSION.

STHAM-ENGINE

[coMPOUND EXPANSION,

pressure in consequence of the increase of volume which the steam

is then undergoing through the advance of the low-pressure piston, —

Woolf 111. In the original form of compound engine, invented by | EFGH is the diagram of the low-pressure cylinder drawn alongside engine. Hornblower and revived by Woolf, steam passed directly from the | of the other for convenience in the construction which follows, 1t first to the second cylinder; the exhaust from the first and | has no point of cut-off; its admission line is the continuous curve admission to the second went on together throughout the whole of | of expansion EF, which is the same as the high-pressure exhaust the back stroke. This arrangement is possible only when the | line CD, but drawn to a different scale of volumes.' At any point high and low pressure pistons begin and end their strokes together, | K, the actual volume of the steam is KL+ MN. By drawing OP that is to say, when their movements either coincide in phase | equal to KL+MN, so that OP

represents the whole volume, and or differ by half a revolution, Engines of the ‘‘tandem” type | repeating the same construction at other points of the diagram, we satisfy this condition—engines, namely, whose high and low | may set out the curve QPR, the upper part of which is identical pressure cylinders are in one line, with one piston-rod common to | with BC, and so complete a single diagram which exhibits the both pistons. Engines in which the high and low pressure equivalent expansion in a single cylinder. cylinders are placed side by side, and act either on the same crank In a tandem compound engine of the receiver type the diagrams or on cranks set at 180° apart, may also discharge steam directly | resemble those shown in fig. 30. During CD (which corresponds from one’to the other cylinder; the same remark applies to beam to FG) expansion is taking place into the large or low- engines, whether of the class in which both pistons act on one end pressure cylinder. D and G mark the point of cut-off in of the beam, or of the class introduced by M‘Naught, in which the the large cylinder, after which GH shows the independent high and low pressure cylinders stand on opposite sides of the expansion of the steam now shut within the large cylinder, centre. By a convenient usage which is now pretty general the x and DE shows the compression of name ‘‘ Woolf engine” is restricted to those compound engines | ~ al E steam by continued discharge from which discharge steam directly from the high to the low pressure the small cylinder into the receiver. cylinders without the use of an intermediate receiver. # At the end of the stroke the receiver Receiver 112. An intermediate receiver becomes necessary when the phases J 7 pressure is OE, and this must be engine, of the pistons ina compoundengine donotagree. With twocranks “s “— apa , the same as the pressure at C, if at right angles, for example, a portion of the discharge from the ee Recelver type. ~Sstthere is to be no “drop.” Dims high-pressure cylinder occurs at a time when the low-pressure cylin- grams of a similar kind may be der cannot properly receive steam. The receiver is in some cases an | sketched without difficulty for the case of a receiver engine with entirely independent vessel connected to the cylinders by pipes; very | any assigned phase relation between the pistons.? often, however, a sufficient amount of receiver volume is afforded by 114. By making the cut-off take place earlier in the large cylinder “Drop’ the valve casings and the steam-pipe which connects the cylinders. | we increase the mean pressure in the receiver; the work done in inthe } The receiver, when it is a distinct vessel, is frequently

jacketed. the small cylinder is consequently diminished. The work done in receiver The use of a receiver is of course not restricted to engines in | the large cylinder is correspondingly increased, for the total work which the “Woolf” system of compound working is impracticable. | (depending as it does on the scudsal piosatnee and the total ratio of On the contrary, it is frequently applied with advantage to beam | expansion) is unaffected by the change. The same adjustment and tandem compound engines. Communication nced not then be | serves, in case there is “drop,” to remove it. By selecting a maintained between the high and low pressure cylinders during the | suitable ratio of cylinder volumes to one another and to the volume whole of the stroke; admission to the low-pressure cylinder is stopped | of the receiver, and also by choosing a proper point for the low- before the stroke is completed ; the steam already admitted is allowed | pressure cut-off, it is possible to secure absence of drop along with to expand independently ; and the remainder of the discharge from | equality in the division of the work between the two cylinders. the high-pressure cylinder is compressed into the intermediate re- To determine that point of cut-off in the low-pressure cylinder ceiver. ach cylinder has then a definite point of cut-off, and by | which will prevent drop when the ratio of cylinder and receiver varying these points the distribution of work between the two cylin- | volumes is assigned is a problem most casily solved by a graphic ders may be adjusted at will. In general it is desirable to make | process. The process consists in drawing the curve of pressure both cylinders of a compound engine contribute equal quantities of | during admission to the low-pressure cylinder until it meets the work. If they act on separate cranks this has the effect of giving | curve of expansion which is common to both cylinders.? Thus in the same value to the mean twisting moment on both cranks. fig. 81 (where for the sake of simplicity the effects of clearance are Con- 118. Wherever a receiver is used, care should be taken that neglected) AB represents the pound there is no unresisted expansion into it; in other | words, the admission line and BC the ex- diagrams, PTessure in the receiver should be equal to that in the high-pressure ansion line in the small cylin-

cylinder at the moment of release. Jf the receiver pressure is less than this there will be what is termed a “drop” in the steam pressure between the high-pressure cylinder and the receiver, which will show itself in an

indicator diagram by a sudden fall at the end of the high-pressure expansion. This “drop” is, from the

er. Release occurs at C, and from C to D steam is being Sas taken by the large cylinder. S D

corre-

thermodynamic point of view, irreversible, and therefore wasteful. the cut- It can be avoided by selecting a proper point of cut-off in the low- SS off in the pressure cylinder. When there is no ‘‘drop” the expansion that Fig. 31. Fig. 32. largecylin- occurs in a compound engine has precisely the same effect in doin, Figs. 31 and 32.—Determination of the point of cut-offin the ger which work as the same amount of expansion in a simple engine sontid TOE SPE EERIE Oh, CNL Olea isthepoint

have, provided the law of expansion be the same in both and the waste of energy which occurs by the friction of ports and passages in the transfer of steam from one to the other cylinder be negligible. The work done in either case depends merely on the relation of pressure to volume throughout the process; and so long as that relation is unchanged it is a matter of indifference whether the expansion be performed in one vessel orin more than one. It has, however, been fully pointed out in chap. IV. that in general a compound engine has a thermodynamic advantage over a simple engine using the same pressure and the same expansion, inasmuch as it reduces the exchange of heat between the working substance and the cylinder walls and so makes the process of expansion more neatly adiabatic. The compound engine has also a mechanical advantage which will be presently described. The ultimate ratio

2 of expansion in any com- pound engine is the ratio of the volume of the low- pressure cylinder to the , volume of steam admitted to the high- pressure cylin- der. Fig. 29 illustrates the combined action of the two cylinders in a hypothetical compound engine of the Woolf type, in which for simplicity the effect of clearance is neglected and also the loss of pressure which the steam undergoes in transfer from one to the other cylinder. ABCD is the indicator diagram of the high-pressure cylinder. The exhaust line CD shows a falling

Fig. 29.—Compound Diagrams: Woolf type.

to be found. From D to E steam is being compressed into the receiver. To avoid drop the receiver pressure at His to be the same as the pressure at C. 4 is therefore known, and may be employed as the starting-point in drawing a curve EF which is the admission line of the low-pressure diagram EFGHI. This line is drawn by considering at each point in the low-pressure piston's stroke what is then the whole valgeas of the steam. The place at which EF intersects the continuous expansion curve BCG determines the proper point of cut-off. The sketch (fig. 31) refers to the case of a tandem receiver engine; but the process may also be applied to an engine with any assumed phase relation between the cranks. Fig. 32 shows a pair of theoretical indicator diagrams determined in the same way for an engine with cranks at right angles, the high-pres- sure crank leading. In using the graphic method any form may be assigned to the curve of expansion. Generally this curve may be treated without serious inaccuracy as a' common hyperbola, in which the pressure varies inversely as the volume.

115. If this simple relation between pressure and volume be assumed, it is practicable to find algebraically the low-pressure cut- off which will give no drop, with assigned ratios of cylinder and

1 An intermediate receiver has the thermodynamic advantage that it reduees the range of temperature in the high-pressure cylinder, and so helps to prevent initial condensation of the steam. This will be made obvious by a comparison of fig. 29 and fig. 30. The lowest temperature reached in the high-pressure cylinder is that corresponding to the pressure at D, and is materially higher in fig. 30 than ales i paper by Prof. R. H. Smith, "On the Cut-off in the Large Cylinder of Compound Engines," Zhe Engineer, November 27, 1885. '

receiver volumes. Taking the simplest case—that of a tandem engine, or of an engine with parallel cylinders whose pistons move together or in opposition—we may proceed thus. Since the point of cut-off to be determined depends on volume ratios we may for brevity treat the volume of the small cylinder as unity. Let R be the ratio to it of the receiver's

volume, and L that of the low- pressure cylinder. Let x be the required fraction of the stroke at whieh cut-off is to oecur in the large cylinder; and let p be the ressure at release from the small cylinder. As there is to be no bes, p is also the pressure in the receiver at the beginning of admission to the large cylinder. During that admission the volume changes from 1+R to 1-—2%+R+

¢=(R+1)/(RL+1).

therefore The steam that remains is now com-

pressure therefore rises to

whenco

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high-pressure diagram. There is some drop at the high-pressure

oe release, and, apart from this, there is a loss Ss 80

through friction of the passages, which shows = itself by the admission line to the large cylinder > lying below the exhaust line from the small one. . 118. Fig. 34 is a pair of diagrams taken from #”? a compound tandem re- hey ceiver engine running at hd 50 revolutions per minute, e

with cylinders 30 inches and 52 inches in diameter, and with a 6-feet stroke, The ratio of cylinder vol- umes is therefore 3 to 1. The capacity of the receiver is nearly 14 times that of the small cylinder. There Fig. 34, is a comparatively early cut-off in both cylinders, and a nearly complete absence of drop. The small cylinder, however, does more work than the large one, in the ratio of nearly 3 to 2.

Aa7

Fig. 35 shows the same pair of diagrams combined Combina- by drawing both to the same scale of volume and tion of dia- of pressure, and by setting

out each by an amount grams from equal to the clearance space from the line of no compound volume. This makes the expansion curve in each engines.

Thus, with R=1 and L=3, cut-off should occur in the large cylinder at half-stroke ; with a greater cylinder ratio the cut-off should be earlier.

A similar calculation! for a compound engine whose cranks are at right angles, and in which cut-off occurs in the large cylinder before

half-stroke, shows that the condition of no drop is secured when 2R(wL—1)=1-2a/x(1 -2).

In some compound engines a pair of high-pressure cylinders dis-

charge into a common receiver; in some a pair of low-pressure

cylinders are fed from a receiver which takes steam from one high-

pressure cylinder, or in some instances from two. With these

arrangements the pressure in the receiver may be kept much more

~ nearly constant than is possible with the ordinary two-cylinder type.

116. An important mechanical advantage belongs to the com- pound engine in the fact that it avoids the extreme thrust and pull which would have to be borne by the piston-rod of a single-cylinder engine working at the same power with the same initial pressure and the same ratio of expansion. If all the expansion took place in the low-pressure cylinder, the piston at the beginning of the stroke would be exposed to a thrust much greater than the sum of the thrusts on the two pistons of a compound engine in which a fair proportion of the expansion is performed in the small cylinder. Thus in the tandem engine of fig. 29 the greatest sum of the thrusts will be found to amount to less than two-thirds of the thrust whieh the large piston would be subjected to if the engine were

diagram represent correctly the relation of the pres- sure to the absolute volume of the expanding steam. The broken line is a continuous curve of

adiabatic expansion, drawn from the point of high-pressure cut-off, on the assumption that the steam then con- tained about 25 per cent. of condensed water. If the expansion were actually adiabatic, and if there were no loss in the transfer of the steam, ; the expansion curves ge ee ‘eee -—-—- = for both eylinders would fall into this ==> line. ° ———. 119. Fig. 36 exhi- Fig. 35.—Diagrams of fig. 34 combined. bits, in the same manner as fig. 35, a set of diagrams taken by Mr Kirk from the triple expansion engines of the S.S. ‘‘ Aber- deen.” Hach diagram is set out from the line of no volume by a distance which represents the clearance in the corresponding cylinder. The boiler pressure is 125 Ib per square inch.

Lbs

120

100

simple. The mean thrust throughout the stroke is of course not The cylinders are 32 inches, 46 inches, and 70 affected by compounding; only the range of variation in the thrust ae Bo in diameter, and Sag stroke is 44 feet is reduced. The effort on the crank-pin is consequently made 36 The cranks make 120° ich mach ahh. Tee more uniform, the strength of the parts may be reduced, and the | » means of the diagrams for the two aaide. af friction at slides and journals is lessened. The advantage in this 5 each eylinder have been used in drawing this respeet is obviously much greater when the cylinders are placed | °& ,, \ ail oe next fioure, a practice which ahould side by side, instead of tandem, and work on cranks at right angles. | % \ be followed in deareits tinea diagrams of As a set-off to its advantage in giving a more uniform effort, the | 3 6 the kind here ex- compound engine has the drawback of requiring more working parts | & |, emplified

than a simple engine with one cylinder. But in many instances—as | & 120 Fig 37 in marine engines—two cranks and two cylinders are almost indis- shows in the same pensable, to give a tolerably uniform effort and to get over the dead \-~. way a set of dia- points; and the comparison should then be made between a pair of rg pana ames. D grams taken by

simple cylinders and a pair of compounded cylinders. Another point in favour of the compound engine is that, although the whole ratio of expansion is great, there need not be a very early cut-off in either cylinder ; hence the common slide-valve, which is unsuited to give an early cut-off, may be used in place of a more complex

small to the large cylinder. The diagrams are drawn to the same seale of stroke and therefore to different scales of volume, and the low-pressure diagram is turned round so that it may fit into the

1 Examples of calculations dealing with particular arrangements of two and three cylinder compound engines will be found in an Appendix to Mr R, Sennett's Treatise on the Marine Steam Engine.

-® See a paper by Dr W. Pole, **On the Double Cylinder Expansive Engine," Proc. Inst. M.E., 1862.

BB Stel 8 Mr Brock from the

quadruple expan- Fig. 36. i

sion engines of the 8.8. '*Lohara" (by Messrs Denny & Co.). Here the boiler

arrangement. 'The mechanical advantage of the compound engine (ae has long been recognized, and had much to do with its adoption in ; aging ei me the early days of high-pressure steam.?_ Its subsequent development mo inches, 34inches, 48 inches has been due in part to this, but probably in much greater part to the 2 dad 68 iadhaw in diameter, thermodynamic advantage which has been discussed above (§ 93). Ibs, oh the stroke was 4 feet, and icator 117. Indicator diagrams taken from compound engines show that aii alt & 100 the number of revolutions – the transfer of steam from ON€ ff¢ pserapsssnnsessasseupsoe sss geecigen pT ——_ 3 65 per minute. ms, ¢ylinder to another is never, 8} feck gs aware Tee. Ae 5 1 ss 121. In all of these cases under the most favourablecon- 3[(: a ". ~ 60 a continuous curve, shown ditions, performed without loss 3, a. oe i | 5 ofenergy. Fig. 33 showsa pair Fy BPR gah fb te ory £g 7 of diagrams from the two Gylifia SB 33 een 3 20 ders of atandem Woolfengine, "#%t77= 7 Peet oes 8 20 sy im

which the steam passed ag Oe S directly as possible from the Fig. 83. re Ae Fig. 37.

sack ies Seas eds _. by a broken

line, has been ~drawn to re- present the re- sult of adia- batic expansion, on the same assumption as before—that the steam contains about 25 per cent. of water at the point of cut-off in the

Fig. 38.

Furnace efficiency.

Heating surface,

Draught.

first cylinder. The equation to the curve may then be taken as

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PV ® =constant (§ 67). In the absence of data regarding the wet- ness of the steam this assumption may be considered fair.

122. Lastly, fig. 38 shows a pair of diagrams, treated in the same manner, for a two-cylinder compound engine with cranks at right angles to each other, the ya 9 aes crank being 90° in advance. During the back stroke of the high-pressure piston there is at first compression into the receiver until the large cylinder opens; the high-pressure diagram consequently takes a peculiar form, which should be compared with the diagram already given for a tandem engine (§ 118). In this example there is a considerable amount of drop and also of loss between the two cylinders.

VII. Tur Propvuction or STEAM.—BOILERS.

128. The first step in the production of steam is to convert the potential energy of fuel into actual heat; the second step is to transfer the heat to

water in the boiler. The efficiency of furnace and boiler is the ratio which the amount of heat taken up by the water bears to the whole potential energy of the fuel. In good boilers this efficiency is about 0°7. The loss is due partly to incomplete combustion of the fuel and partly to incomplete trans- fer of heat from the products of combustion to the boiler water. Under the first head may be classed—(1) waste of fuel in the solid state by bad stoking, and (2) waste of fuel in the gaseous and smoky states by imperfect combustion. Under the second head are comprised—(1) waste by external radiation and conduction, and (2) waste by heat contained in the hot gases which escape by the chim- ney, due (a) to their still high temperature and (0) to the fact that they contain as one of the products of conjbustion steam-gas which passes away uncondensed. Loss of heat by the hot gases is the most important source of waste. Not only are the actual products of combustion rejected at a high temperature, but along with them goes the nitrogen of the air whose oxygen has been used, and also a quantity of additional air which is needed to dilute the products in order that combustion may be fairly complete. Roughly speak- ing, about 12 Ib of air are required to supply oxygen enough for the combustion of 1 tb of coal. Over and above this quantity, about 12 Ib more generally pass through the furnace as air of dilution. In furnaces with forced draught, in which the consumption of coal per square foot of grate surface is much more rapid, the air of dilu- tion may be reduced to half or less than half of this quantity, though to some extent at the expense of completeness in the combustion.

124. The extent to which heat is taken from the hot gases depends on the heating surface through which heat passes into the water. The heating surface is made up of the surface of the fur- nace or combustion-chamber, so far as that is brought into con- tact with the water, and of the flues or tubes through which the hot gases pass on their way to the chimney. Its efficiency depends on the conductivity of the metal, on the difference in temperature between the gases on one side and the water on the other, and on the freedom with which steam, when formed, can escape from the surface. Differences in specific conductivity and in thickness of metal affect the result less than might be expected, on account of the resistance which is offered to the passage of heat through the film of scale and also through the film of water vapour which forms on the metallic surface.

By extending the heating surface sufficiently the hot gases may be deprived of heat to an extent which is only limited by the tempera- ture of the boiler water. This temperature, however, need not form a limit, for after leaving the boiler the gases may be further cooled by being brought into contact with a vessel termed a feed-water heater, through which the feed-water passes on its way to the boiler. Even with a feed-water heater, however, the temperature of the hot gascs is never, in practice, reduced so low as that of the boiler.

125. In nearly all land engines and most marine engines the draught is produced by means of a chimney, which acts in virtue of the column of air within it being specifically lighter than the air outside, so that the pressure within the chimney at its base is less than the atmospheric pressure at the same level outside. The composition of the chimney gases is such that they are heavier than air at the same temperature, and to make them sufficiently lighter to cause a draught they must retain a certain considerable portion of their heat. On the other hand, if they are left too hot the mass of air drawn through the furnace is actually diminished, since then the chimney gases are so much expanded that the increased volume of the draught does not compensate for its diminished density. With a given chimney and furnace the maximum draught is obtained when the gases escape at a tempera- ture about that of melting lead ; by making the chimney more capacious a lower temperature will suffice to give the same draught, and this will of course increase the efficiency of the boiler.

126. In place of using a chimney draught depending merely on the temperature of the rejected hot gases, the air required for com- bustion and dilution may be forced through the furnace either by producing a partial vacuum in the chimney or by supplying air to the grate at a pressure higher than that of the atmosphere. In

locomotives, for example, a partial vacuum is produced in the chimney by means of a blast of exhaust steam from the engine ; and in many naval and a few mercantile steamers a forced draught is produced by having a closed stokehole or a closed ashpit, which is supplied with air at a pressure above that of the atmosphere by the use of a blowing fan.

If heat were thoroughly extracted from the products of com- bustion, a forced draught would be more efficient, from the thermo- dynamic point of view, than a chimney draught, for a chimney is in fact an extremely inefficient heat-engine, and requires a very large amount of heat to be expended in order to effect the comparatively trifling work of maintaining the draught. But where forced draught has been substituted for chimney draught this has hitherto been done for the purpose of increasing not the efficiency but the power of boilers. The motive has been to burn more coal per square foot of grate surface and so to evaporate more water with a boiler of given weight. This is incompatible with very high efficiency. When more coal is burnt by forcing the draught it is true that the products of combustion have a higher temperature (since less air is required for dilution) and the effective- ness of the heating surface is therefore increased. But the heat- ing surface has more hot gas to deal with, and the result is that the boiler is less efficient than when the draught is not forced. The same efficiency could be secured, with forced draught, by increasing the heating surface to a sufficient extent ; and a still greater efficiency could be realized if the heating surface were still further enlarged so that the gases left the flues at a temperature lower than would be needful if the draught depended on the light- ness of the chimney's contents. The most efficient boiler would be one in which the draught was forced by mechanical means, and the gases were then cooled as far as possible by contact with a very extensive heating surface, first in the boiler itself and then ina feed-water lieater. None of the forced draught boilers that have hitherto been introduced have a heating surface so large as to make them more efficient than good ange Rete #5 boilers (in which the rate of combustion is much slower), although the heatin surface bears a much larger ratio to the grate area than is usua. with chimney draughts.

127. Most modern boilers are internally fired; that is to say, the Boilers furnaces are more or less completely enclosed within the boiler. for sta- Externally fired boilers are for the most part much less efficient tionary than internally fired boilers ; they are, however, used to a consider- engines,

able extent where fuel is specially cheap or where the waste heat of other furnaces is to be utilized. Their usual form is that ofa horizontal cylinder

with convex ends; the strength both of the main shell and the ends is derived from their curvature, and no

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Fann Oat Fie. 39.—Cornish Boiler: longitudinal section.

staying is necessary. The heating surface is entirely external and is of very limited extent.

In large stationary boilers the forms known as the ‘‘ Lancashire” Cornis

(or double flue) and the “ Cor- nish” (or sin- gle flue) are most common. Figs. 39 and 40 show in section a Cor- nish boiler by Messrs Gallo- way, and fig. 41 a Lanca- shire boiler by the same mak- ers. In both the shell is a round horizon- tal cylinder with flat ends. In theCornish boiler there is one internal flue, at the yy, 40,—Cornish Boiler: transverse section, showing flues.

front end of

which is the furnace. The hot gases pass through the flue to the back ; they then return to the front end by two external side flues

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(A, A, fig. 40), and finally pass to the back again by an underneath flue B. ‘The arrangement in the Lancashire boiler is the same, ex- cept that there are two internal flues, each with its own furnace. The shell is made up of rings of riveted plates, larger and smaller in diameteralteruately to :

allow the circumferen- tial seams to be made without bending the edges. The flue is made up of a series of welded rings, joined to each other by a flanged joint with a stiffening ring. This form of joint was in- troduced by Mr Adam- son to stiffen the flue against collapse un- der external pressure. Other joints, designed with the same object, are shown in figs. 42 and 43. The grate is all

made up of firebars, 1c. 41.—Lancashire Boiler: Transverse Section. sloping down towards the back, where they terminate at the “bridge” of fire-brick (C, fig. 39). Beyond the bridge the flue is crossed by a number of tapered ‘‘ Galloway” tubes D, D, which increase the heating surface, promote circulation of the water, and stiffen the flue. ‘The end plates are strengthened by gusset stays

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Fires. 42 and 43.—Joints for Furnace Tubes.

EK, E, riveted to them and to the circumference of the shell by means of angle-irons. The gusset-stays do not extend so far in as to the circumference of the flue (fig. 40), in order that the end plates may retain enough flexibility to allow the flue to “nent 4 and contract under change of temperature. To provide for unequal expansion is one of the most important points in the design of boilers; when it is neglected the boiler is subjected to a racking action which induces leakage at joints and tends to rupture the plates. For this reason the flue is attached to the boiler shell at the ends only, so that it may be free to take an upward camber in consequence of the greater heating of the upper side.

Mild steel is now very generally used for boiler plates, being superior even to the best Yorkshire iron in the qualities of ductility and tensile strength. The following particulars refer to the Lanca- shire boiler of fig. 41, which may be taken as representative of a large number of stationary boilers.

128. The shell is 28 feet long and 7 feet in diameter, and is made up of 9 rings, each of two semi-cylindrical plates. The shell plates are § inch thick ; their edges are planed and fullered, and the rivet holes are drilled. The longitudinal seams, which break joint from ring to ring, are lap-joints double-riveted; the circular seams are Single-riveted. Each end plate is a solid piece of steel 4 inch thick ; the front plate is attached to the shell by riveting to an angle ring ; the back plate is flanged. The flues are each 2 feet 94

inches in diameter, way tubes, tapering from made up of rings of 104 inches diameter at steel § inch thick; the top to 54 inches at bot- longitudinal joints tom. On the top of the are welded and the boiler is the manhole, circular joints are covered with a cast-iron flanged and strength- plate; also a nozzle for ened with stiffening the steam-pipe and two rings. The flues are others for safety-valves. tapered somewhat at One of the safety-valves the back end to facil- is connected with a float itate expansion, and so that it opens if the are attached to the water-level becomes too end plates by welded low. At the bottom, in tac Each front, is another nozzle

ue contains 5 Gallo- for the blow-out tap ; and

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in the front plate below the flues is another manhole. Feed-water 18 supplied by a pipe which enters through the front plate on one side, near the top of the water, and extends for a considerable dis-

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tance along the boiler, distributing the water by holes throughout the length. A pipe at the same level on the other side serves to collect scum. The fire doors are pro- vided with sliding shutters by means of which the amouut of air admitted above

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the fire may be regulated. On the top of each fur- nace is fitted a fusible plug which melts if the furnace crown becomes overheated. No separate steam dome is used ; the steam is collected by an ‘‘anti-priming” pipe shown in fig. 44, which also illustrates the stop- valve by which the delivery of steam from the boiler is started or stopped at will. On the front plate are a pair of glass gauge- tubes for showing the water-level, and a Bourdon pres- sure-gauge. ‘This last important fit- ting consists of a bent tube of oval section, one end of which is closed and free to move while the other is open to the steam and is fixed. The pres- & sure within thetube ~~

tends to straighten ye, 4¢.—Galloway Boiler : Section beyond the Bridge. it, and the extent

to which this takes place is shown by a pointer which travels over a circular dial. A common lever safety-valve is shown in fig. 45. In other forms the valve is kept down by a weight directly applied to it, or by means of springs. Spring safety-valves are liable to the objection that when the valve opens the load on it increases; to remedy this, forms have been proposed in which the spring acts through a bent lever in such a way that when the strain on it increases the leverage at which it acts is re- duced. Ifthespring is of reasonable length, however, the objection is not seri- ous.

129. A modifica- tion of the Lanca- shire type—the ‘* Galloway” boiler — is shown in sec- tional elevation in fig. 46. In it the two flues are joined beyond the bridge into a single flue, of the form shown in the figure, which is traversed by nu- merous Galloway tubes and is also fitted with water- = pockets at its sides. Fie. 47.-Vertical Boiler

130. In other a Ml Water types of boiler an extensive heating surface is obtained by the use of a large number of small tubes through which the hot gases pass. This construc- tion is universal in locomotive and marine boilers. It is applied in some instances to boilers of the ordinary cylindrical form by making small tubes take the place of that part of the flue or flues which lies behind the bridge, or by using small tubes as channels through

which the gases return from back to front after passing through the main flue. Another form of tubular boiler is an exter- nally fired horizontal cylinder fitted with tubes which carry the hot gases from the back to the front.

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Fie. 48.—Vertical Boiler

with Horizontal Water Tubes,

Galloway boiler.

Multi- tubular boilers.

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Vertical 131. Vertical boilers are extensively used in connexion with small | clined welded tubes up which water circulates. These are joined boilers. engines. Examples are shown in figs. 47-49. Fig. 48 isan ordinary | at their ends by cast-iron connecting boxes to one another and toa vertical boiler filled with cross tubes of the Galloway type. Fig. | horizontal drum on the top in which the mixture of steam and water 47 (by Messrs Davey, Paxman, & Co.) is a boiler with | which rises from the tube undergoes separation. At the lowest point curved water tubes, each of which has fitted in the top a | of the boiler is another drnm for the collection of sediment. Root’s” loose cap whose function is to deflect the | boiler is another in which water is heated by circulating through stream of water which circulates up the | inclined tubes exposed to the fire ; it differs from the above form tubes. Fig. 49 isa form of multitubular | chiefly in having the water-level below the top of the tube, boiler by the same makers, in which the | Harrison’s boiler is a group of small globular vessels of cast-iron hot gases escape at the side after passing | strung like beads on rods which tie them together. Sectional from the smoke-box through horizontal | boilers may be constructed without difficulty to bear pressures tubes grouped in circular arcs. In all | greatly in excess of those for which other types are suited. Mr these boilers the grate

is at the foot, and | Perkins has employed a tubulous boiler to deliver steam at a the fire-door is at a mouthpiece in the side | pressure of 500 tb per square inch.! The Herreshof boiler is a of the boiler near the base. In other | continuous coil of tube, arranged as a dome over the fire. Feed- forms of vertical boiler the water is pumped slowly through the coil, and turns to steam heating surface is increased before it reaches the end. by water tubes (fig. 50) which ~ 133. The locomotive boiler consists of a nearly rectangular fire- Loco. hang from the crown of the box, enclosed above and on the sides by water, and a cylindrical motive fire-box, closed at the lower part called the barrel extending horizontally from the fire-box to boilers, end but fitted internally with the front part of the locomotive and filled with numerous tubes, | smnaller tubes which are open Figs. 51 aud 52 show in longitudinal and transverse section a at the bottom. Water circu- boiler of the London and North Western Railway, which may be lates down the inner tubes taken as typical of modern English practice. and up between them and the The barrel is 10 feet long and a little more than 4 feet in outer. Tubes of this kind diameter, and is made up of three rings of steel plates, $$ inch (called Field tubes) are used thick, arranged telescopically. It contains 198 brass tubes, each | in fire-engine boilers and in 12 inches in external diameter. The front tube-plate in which the other cases where it is neces- tubes terminate is of steel ? inch thick; it is stayed to the back sary to get up steam with the tube-plate by the tubes themselves, and the upper part of the front least possible delay. Vertical tube-plate is also tied by longitudinal rods to the back end-plate. wsaiap —Nenaal Boller: boilers of large size are some- a The fire-box is of copper 4 inch thick. It is nearly rectangular, ‘Tubular Form, times used for utilizing the picid Tube, with a horizontal grate. (A grate sloping down in front is often waste heat of iron furnaccs. preferred.) Round its sides, front, and back (except where the Sectional 132. A great variety of boilers have been designed in which the | fire-door intcrrupts) is a water space about 3 inches wide, which or firing is external, and the water space consists of groups of tubes or | narrows slightly towards the bottom. The flat sides of the fire-box tubulous other small sections whose outer surface isexposed to heat. Boilers | are tied to the flat sides of the shcll by copper stay-bolts, 4 inches boilers. of this type are called sectional or tubulous boilers, in distinction to | apart, which are seenred by screwing them into both plates and

tubular boilers, or boilers with tubes in which the hot gases circu- late. A successful example of the tubulous or sectional type is the Babcock & Wilcox water- tube boiler, which consists of a series of in-

riveting over the ends. The roof of the fire-box is stiffened bya number of girders on the top, to which the plates are secured by short bolts. The girders are themselves hung from the top of the shell above them by slings which are secured to angle-irons riveted

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Fie, 51.—Locomotive Boiler.

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on the inside of the shell plates. A sloping bridge of fire-brick partially separates the upper part of the fire-box from the lower and prevents the flame from striking the tubes too directly. Under the grate is an ashpan, to which the supply of air is regulated by a damper in front. The fire-door opens inwards, and can be set more or less open, to regulate the amount of air admitted above the fire. On top of the barrel is a steam-dome, from which

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Fig. 62.

the steam supply is taken through a pipe S traversing the forward part of the steam space and passing down to the valve-chest throngh the smoke-box. The stop-valve or ‘‘regulator” R is situ- ated in the smoke-box, and is worked by a rod through the boiler from the cab at the back. Above the fire-box end of the shell are a pair of Ramsbottom safety-valves, V, V—two valves pressed down by a single spring attached to the middle of a cross bar, which is prolonged to form a hand lever by which the valves may be lifted. In front of the forward tube-plate is the smoke-box, containing the blast-pipe B by which the exhaust steam is used to produce a partial vacuum and so force a draught through the furnace.

134. Instead of stiffening the fire-box roof by the use of girder stays, the plan is sometimes followed of staying it directly to the shell above. The outer shell above the fire-box is generally eylindrical; but to facilitate this method of staying it is sometimes made flat. This construction is not unusual in American loco- motive boilers, another feature of which is that the grate is made

much larger than in English practice, for the purpose of butning anthracite coal. An extreme instance is furnished by the Wooton engines of the Philadelphia and Reading Railroad, which burn small coal of poor quality in a fire-box 94 feet long by 8 feet wide, extending over the trailing wheels of the engine. In some cases the fire-box is divided by a sloping partition of plates with water between, which crosses the fire-box diagonally from front to back and has in its centre an opening resembling a fire-door mouthpiece to allow the products of combustion to pass. In others the fire-bridge is supported by water tubes, and water tubes are also used as grate- bars. This is done rather to promote circulation of the water than to give heating surface. The practice of American and English locomotive engineers differs widely as regards the materials of con- struction. American shells are of mild steel, English shells gene-

1 Proc. Inst. Mech. Eng., 1877. See also a paper by Mr Flannery, “On High-Pressure Steam Boilers,” Min. Proc. Inst. C.£., 1878. – 7

BOILERS. |

rally of mild steel but often of wrought-iron. In English practice the fire-boxes are of copper and the tubes of brass; in America the fire-boxes are of mild steel and the tubes of wrought-iron.!

The locomotive type of boiler is used for stationary engines of the portable, semi-portable, and semi-fixed types, and also to a limited extent for marine engines in cases were lightness is of special advantage.

135. So long as marine engines used steam of a pressure less

nl than about 35 Ib per square inch the marine boiler was generally a

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box with flat sides, elaborately stayed, with a row of internal furnaces near the bottom opening into a spacious combustion- chamber enclosed within the boiler at the back, and a sct of return tubes leading from the upper part of the chamber to the front of the boiler, where the products of combustion entered the uptake and passed off to the funnel. The use of higher pressures has made this form entirely obsolete. The normal marine boiler is now a short circular horizontal cylinder of steel with flat ends, with internal furnaces in cylindrical flues, internal combustion-

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chambers, and return tubes above the flues. In one variety, called the double-ended boiler, there are furnaces at both ends of the shell; each pair leading to a combustion-chamber in the centre that is common to both, or to separate central chambers with a water space between them.

Figs: 58 and 54 show with some completeness a double-ended marine boiler of the most modern construction for high-pressure

- steam. At each end there are three furnaces in flues made of

welded corrugated steel plates. The use of corrugated plates for flues, introduced by Mr Fox, makes thin flues able to resist collapse, and allows the flues to accommodate themselves easily to changes of temperature. One combustion-chamber is common toeach pair of furnaces. It is strengthened on the top by girder Stays and on the sides by stay-bolts to the neighbouring chamber and to the shell, The tubes are of iron, and a certain number of them are fitted with nuts so that they serve as stays be- tween the tube-plate of the combustion-chamber and the front of the boiler. ‘The upper part of the front plate is tied to the opposite end of the boiler by long stays. The uptakes from both ends converge to the funnel base above the centre of the boiler’s length. The boiler shown is one of a pair, which lie side by side In the vessel, the uptake at each end being common to both. Each boiler has a steam-dome, from which the steam-pipce leads to the engine; this consists of a small cylindrical vessel, with flat ends tied together by a central stay. Short pipes connect the dome near each end with the steam space of the main shell. The boilers of figs. 58 and 54, which are by Messrs Gourlay Brothers of Dundee, work at a pressure of 165 ib per square inch above the atmosphere, and are used with triple expansion engines. The shell is 12}

fect in diameter, and 164 feet long. The plates are of mild steel 14 inches thick round the shell and 1 inch in the ends. The tube plates are $ inch and 3 inch thick, and ne corrugated flues 4 inch. The longitudinal seams are treble- Niveted, with inside and outside covering plates. The circum-ferential seams are lap-joints double-riveted. There are 127 tubes at each end, 46 of which are stay-tubes. ‘The tubes are of iron, 34 inches in external diameter. Above these are 18 longitudinal steel 1 See a paper by Mr Fernie, Min. Proc. Inst. C.Z, 1883.

Figs. 53, 54.—Double-Ended Marine Boiler,

stays 2¢ inches in diameter. The steam-dome is a cylinder 24 feet in diameter and 8 feet long, stayed by a central 34-inch rod of steel. The short fire-box stays are also of steel 14 ,, inches in diameter, of 7? inches pitch, and are secured by nuts and washers at both ends. The central combustion-chamber has a round and unstayed roof. The top of each side & combustion – chamber is stayed by three eh steel girders 83 inches * x 24 inches in sec-tion, secured by four © bolts to the roof- plate below. A single- ended marine boiler . by the same makers is shown in fig. 55. Boilers of this class are in some instances set athwartship in- stead of longitudin- ally, and bevelled on the bottom, at the back, to accommo- date them to the shape of the hull. A modification of the cylindrical form is occasionally used, in which the section is an oval, with round top and bottom and flat sides. – The combustion-chambers are sometimes made with rounded tops, which are tied to the back plate by gusset-stays and angle- irons. In naval practice the tubes are frequently of Muntz metal in place of iron.

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Fig. 55.—Single-Ended Marine Boiler.

Another form of boiler, used to a considcrable Navy extent in the British navy, is a long horizontal eylinder with two type.

Loeo- motive type of marine boiler.

Feeding boilers. Injector.

Hydro- kineter.

Feed- water heaters.

internal furnaces opening into a large combustion-chamber about the middle of the length. From this a set of tubes distributed over nearly the whole water space extend to the back, where the uptake is situated.

136. The locomotive type of boiler has been successfully adap- ted to marine use by Mr Thornycroft and others, especially for torpedo boats. This form gives much greater heating surface than others in proportion to its weight, and allows, especially when worked with forced draught, a large amount of power to be got from a small boiler. Itis probable that, if any further rise is to occur in the steam pressure used in marine engines, comparable to that which has occurred during the last two or three years, the present normal marine boiler will give place to a form more nearly resembling the locomotive type.

137. Boilers are usually fed either by a feed-pump driven by the engine, or by a distinct auxiliary engine called a “donkey,” or by an injector. The injector, invented by the late M. Giffard, and now very generally used on locomotive and other boilers, is illustrated in fig. 56. Steam enters from the boiler at A and blows through an annular orifice B, the size of which is regulated by the handle C. The feed-water flows in at D, and meeting the steam at B causes it to condense. This produces a vacuum at B, and consequently the water rushes in with great velocity, and streams down through the combining nozzle I, its velocity being augmented by the im- pact of steam on the back of the column. In the lower part of the nozzle E the stream expands ; it there- fore loses velocity, and, by a well- known hydrodynamic principle, gains pressure, until at the bottom its pres- sure is so great that it enters the boiler through a check-valve which opens only in the direction of the stream. The escape orifice F and the overflow pipe G

allow the injector to start into action, by providing a channel through which steam and water niay escape be- fore the stream acquires enough energy to force its way into the boiler. The opening for admitting water between D and B is regulated by the wheel H. The exhaust-steam injector works by steam from the exhaust of non-con- densing engines, instead of boiler steam. The steam orifice is then larger in proportion to the other parts, and the steam supply more liberal. In self-starting injectors an arrangement is provided by which overflow will take place freely until the injector starts into action and then the openings are auto- matically adjusted to suit delivery into the boiler. One plan of doing this is to make the combining nozzle under the steam crifice in a piece which is free to slide in the outer casing. Until the injector starts it lies at some distance from the steam orifice, and allows free overflow ; but when the vacuum forms it rises, in conse- quence of pressure at the base. In self-adjusting injectors this rise of the combining nozzle is made use of to contract the water-way round the steam orifice. In another form of sclf-starting injector one side of the combining nozzle is in the form of a hinged flap, opening backwards to allow overflow, but closing up when a vacuum is formed and the injector starts into action.! Weir's hydrokineter for large marine boilers is another apparatus in which the principle of the injector is made use of, with the object of promoting circula- tion of the water during the time steam is being raised. It con- sists of a series of nozzles, with water-inlets between them, through which water is drawn by means of a central jet of steam supplied from a donkey boiler.

138. In stationary engine boilers the feed-water is frequently heated by the products of combustion before these reach the chimney, in what is virtually an extension of the boiler itself. Green's economizer is a contrivance for this purpose, in which the water passes through tubes whose outer surface is exposed to the hot gases and kept clear of deposited soot by the continuous action of a mechanical scraper. In locomotives and other non- condensing engines a portion of the exhaust steam is frequently made use of to heat the feed-water. When an exhanst-steam injector is employed it serves the purpose of a feed-water heater as

Fig, 56.—Giffard's Injector.

well as that of a feed-pump. Besides increasing the efficiency of

the boiler by utilizing what would otherwise be waste heat, a feed-water heater has the advantage that by raising the tempera- ture of the water it removes air, and also, in the case of hard water, causes lime and other substances held in solution to be

1 See papers in Proc, Inst. Mech. Eng., 1860, 1866, 1884.

deposited in the heater instead of being carried into the boiler, where they would form scale. In Weir's feed-heater for marine engines the temperature of the feed-water is raised to about 200° Fahr. by injecting steam from the intermediate receiver.

139. In stationary and marine boilers the steam, after leaving ga)... the boiler, is frequently taken through a separator, the function to, — of which is to separate the dry steam from particles of water held ~ in suspension. Steam is led round a sharp corner, and the water particles thrown off by centrifugal force collect in a trap below, Steam. from which they are discharged by a pipe which is kept open so trap, long as the trap contains watcr, but is closed by a valve at the foot when the trap is empty. 'Traps are also fitted in many cases to steam-pipes for the purpose of returning condensed water to the boiler.

140. To prevent corrosion in boilers it is very usual to introduce Use ot | blocks of zinc in metallic connexion with the shell. These are set zinc in | in the water space, preferably at places where corrosion has been boilers, found specially liable to occur. Their function is to set up a galvanic action, in which zine plays the part of the negative element, and is dissolved while the metal of the shell is kept electro-positive. Otherwise there would be a tendency for difference of electric quality between different parts of the shell to set up galvanic actions between the parts themselves, by which some parts, being negative to others, would be attacked. The zinc raises the potential of the whole shell enough to make all parts positive.

141, Allusion has already been made to the system which is Forced | universal in locomotive boilers of forcing the draught by a blast of draught} | exhaust steam in the chimney. A jet of boiler steam is occasion- | ally used in marine furnaces for the same purpose; but of late years the system which has found most favour is to box in the stokehole and keep the air in it at a pressure of from 1 to 3 inches of water by the use of blowing fans. This system has been applied largely in naval practice, with the result that the power of the boiler is increased in the ratio of about 3 to 2, or even more, as compared with its power under chimney draught. The efficiency of the boiler is, in general, slightly but not very materially reduced. An ordi- nary marine boiler burns 16 to 20%b of coal per hour per square foot of grate with natural draught, and 30 Tb or more with forced draught. In torpedo-boat boilers of the locomotive type the con-

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sumption has in sonie cases been forced to more than 100 Tb,

In Mr Howden's system of forced draught the stokehole is enclosing the ashpit and also to another reservoir from which it gets access to the grate above and through the fire-door, On its the uptake in which the hot gases from the furnace are led through tubes. This method of restoring to the furnace what would other- of restoring heat to the boiler by passing the hot gases through a fced-water heater; it is in fact an application to boiler furnaces of

j142. Many appliances have been devised for the mechanical we Mecha ply of coal to boiler furnaces, but these have hitherto taken the cal furnace the fire-bars are in short lengths, jointed by bars to form a continuous chain or web, which rests on rollers and is caused to round which the web is carried at the front and back. Coal is allowed to drop continually on the travelling grate from a hopper is a reciprocating shovel or ram, supplied from a coal-hopper, which throws or pushes a small quantity of coal into the fire at each self-cleansing, by giving alternate fire-bars a rocking or sliding . motion through a limited range. In Mr Crampton's dust-fuel fur- Dust | which it is blown into the furnace by an air-blast, The mixture of fuel and air is so

intimate that the excess of air required for A similar advantage attends the use of gaseous fuel, and of liquid fuel that is blown into the furnace in the form of spray. siderable importance in connexion with the discovery of crude fuel petroleum, in large quantity, at Baku on the Caspian Sea. The crude oil forms an exceedingly cheap fuel, with a calorific value per lb about one-third greater than that of coal. It has now super- employed for locomotives in the south-eastern part of Russia. The oil is injected in the form of spray near the foot of the fire-box by furnace along with the petroleum. In the arrangement for burn- ing petroleum used in iamln locomotives by Mr T. Urquhart “2 The methods and results of these systems of forcing draught are described in Papers read before the Institution of Naval Architects, April 1886.

open, and air is supplied by a blowing fan to a reservoir formed by | way to the reservoir the air is heated by passing across a part of wise be waste heat forms an interesting alternative to the method | the regenerative principle alluded to in chap, II.? | place of hand-firing to only a very limited extent. In Juckes’s stokers| travel slowly in the direction of the furnace’s length by pin-wheels in front of the furnace. A more usual form of mechanical stoker stroke. Along with this devices are employed for making the grate nace the coal is ground to powder and fed by rollers into a pipe from fuel. | dilution is only one-fifth of the amount required for combustion.®

143, The use of liquid fuel for boilers has of late acquired con- Liquid petroleum refuse which is left after distilling paraffin from tho seded coal in the steamers of the Caspian, and has been largely a steam jet arranged in such a way that air will be drawn into the the flame impinges on a structure of fire-brick, built in the fire-box

Proc. Inst. Mech. Eng., 1869.

DISTRIBUTION OF STEAM. |

with numerous openings to allow the products of combustion to dif- fuse themselves throughout the combustion-chamber. This guards against too intense action on the metallic surfaces, and at the same time serves as a rescrvoir of heat to rekindle the flame if combustion

ig intermittent. In getting up steam an auxiliary boiler is used to supply the jet.*

VIII. Tue DistrisuTion oF STEAM.—VALVES AND VALVE MorIONS.

144. Incarly steam-engines the distribution of steam was effected by means of conical valves, worked by tappets from a rod which hung from the beain. The slide-valve, the invention of which in the form now known as the long [-slide is credited to Murdoch, an assistant of Watt, cume into general use with the introduction of locomotives, and is now employed, in one or other of many forms, in the great majority of engines.

The common or locomotive slide-valve is illustrated in fig. 57. The seat, or surface ou which the valve slides, is a plane surface formed on or ee fixed to the side of the eylinder, with three portsor openings, which extend across the great- : er part of the cylin- Fie. 57.—Common Slide-Valve. ; der's width. The central opening is the exhaust-port through which the steam escapes ; the others, or steam ports, which are narrower, lead to the two ends of the cylin- der respectively. The fe is a box-shaped cover which slides over the seat, and the whole is en- closed in a cham- ber called the valve-chest, to which steam from the boiler is ad- mitted. When the valve moves a sufficient distance

oO of tho piston; in other words, the eccentric radins would make a right angle with the crank. Expansive working, however, becomes possible when we give the valve what is called "lap," by making it project over the edges of the steam ports, as in fig. 61, where ois the " outside lap" and zis the "inside lap." Admission of steam (to either side) then begins only when the displacement of the valve from its middle position exceeds the ainount of the outside lap, and continues only until the valve has returned to the same dis- tance from its middle position. Further, exhaust begins only when the valve has moved past the middle by a distance equal to z, and continues until the valve has again returned toa distance 7 from its middle position. Thus on the diagram of the eccentric's travel (fig. 62) we find, by setting off o and 7

on the two sides of the centre, the posi-

tions a, 6, c, and @ of the eccentric

radius at which the four events of ad-

mission, cut-off, release, and conipres-

sion occur for one side of the piston.

As to the other side of the piston, it is 8 only necessary to set off o to the right and z to the left of the centre, but for the sake of clearness we may confine our attention to one of the two sides. Of the whole revolution, the part from a to b is the are of steam admission, from & to ¢ is the are of expansion, from ¢ to d the arc of exhaust, and from d to a the arc of compres- sion. Thorelation of these, however, to the piston's motion is still undefined. If the eccentric were set in advance of the crank by an angle equal to ACa, the opening of the valve would be coincident with the beginning of the piston's stroke. It is, however, desirable, in order to allow the steam free entry, that the valve be already some way open when the piston stroke begins, and thus the eccentric may be set to have a position Ca' at the beginning of the stroke. In that case the valve is open at the beginning of the stroke to the extent mm', which is called the "lead." The amount by which the angle between Ca' (the eccentric)-and CA (the crank) exceeds a right angle is called the angular advance, this being the angle by which the eccentric is set in advance of the position it would occupy if the primitive arrangement without lap were adopted. The quantities lap, lead, and angular advance (0) are connected by the equation

outside lap +lead = half travel x cos 6.

i Compression Fig.' 62,

to either side of the central posi- tion, steam enters one end of the cylinder from the valve-chest and escapes from the other end of the eylinder through the cavity of the valve into the exhaust-port. The valve is generally moved by an eeeentric on the cngine-shaft (fig. 58), which is mechanically equiva- lent to a crank whose radius is equal to the eccentricity, or distance of O, the

centre of the shaft, from P, the centre of the eccentric sheave. The sheave is encircled by a strap forming the end of the eeeentric rod, and the rod is connected by a pin-joint to the valve- rod, which comes out of the valve-chest through

a steam-tight stuffing-box. The eccentric rod

is generally so long that the motion of the

valve is sensibly the same as that which it , a would receive were the rod infinitely long. Thus if a circle (fig. 59) be drawn to represent the path of the eccentrie centre during a revolu- tion of the engine, and a perpendicular PM be : drawn from any point P on a diameter AB, Hig, #8.

the distance CM is the displacement of the valve from its middle position at the time when the eccentric centre is at P, AB is the whole travel of the valve.

145. If the valve when in its middle position did not overlap the steam ports (fig. 60), any movement to the right or the left would admit steam, and the admission would continue until the valve had returned to its middle position, or, in other words, for half a revolution of

An effect of lead is to cause preadmission, that is to say, admis- Graphic sion before the end of the back stroke, which, together with the method compression of steam left in the cylinder when the exhaust port of find- closes, produces the mechanical effect of ‘‘ cushioning,” to which ing the reference has already been made. To examine the distribution of distribu- steam throughout the piston’s stroke, we may now draw a circle to tion of represent the path of the crank pin (fig. 63, where the dotted lines steam.

Fic. 58.—Eccentric.

have been added to show the assumed configuration of piston, con- necting-rod, and crank) and transfer to it from the former diagram the angular positions a, b, c, and d at which the four events oceur. To facilitate this transfer the diagrams of eccentric path and of crank-pin path may by a suitable choice of scales be drawn of the same actual size. Then by

projecting these points on a diameter which represents the piston’s path, by circular arcs drawn with a radius equal to the length of the con- necting-rod, we find p, the position of the piston at which admission oceurs during the back stroke, also qand 1, the position at cut-off and re- lease, during the stroke which takes place in the direction of the arrow, and s, the point at which coinpression begins, It is obviously unnecessary to draw the two circles of figs. 62 and 63 separately; the single diagram

and Path of Piston

the engine. Such a valve would not Serve for expansive working, and as re- gards therelative po- Sition of the crank and eecentrie it would have to be

=O FM

Fig. 60.—Slide-Valve without Lap.

Fie, 61.—Slide-Valve with Lap.

aed wo eee _ Mr T. Urquhart, Mén. Proc. Inst. C.E., 1884; also Engineering,

(fig. 64) contains the solution of the steam distribution with a slide-valve whose laps, travel, and angular advance are known, the same circle serving, on two scales, to show the motion of the crank and of the eccentric.

146. A method of representing graphically the relations of valve Oval and piston motion, sometimes convenient in dealing with valve- diagram.

gears of a more complex character than the single eccentric, is to set off the valve’s and the piston’s simultaneous displacement at right angles to each other, as in fig. 65, the valve’s motion being exaggerated by using a coarser scale for it than for that of tho piston. The result is an oval curve, from which the events in the

Zeuner’s diagram.

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steam distribution are determined by drawing lines parallel to the piston's path and dis- ;~ sysees tant from it by the amount of the outside and inside lap respectively. ~~' i ie Then a, b, c, and d, and the corre~~ §) NOU giviadeesenn dg Be sponding points 7, g, 7, and s deter- 'S mine the four events as in former y 7 diagrams, Fig. 65 showsataglance the amount of steam-opening at any part of the period of admission. Fig. 65,.—Oval Diagram of Slide- AE is the lead. The events for the Valve Motion. other side of the piston are determined by drawing AB above and CD below the middle line. : 147. The graphic construction most usually employed in slide- valve investigations is the ingenious diagram published by Dr G. Zenner in the Civilingenteur in 1856.1 On the line AB (fig. 66), which represents the travel of the valve, let a pair of circles (called valve- circles) be drawn, each with diameter equal to the half travel. A radius vector CP, drawn in the direction of the eccentric at any instant, is cut by one of the circles at Q, so that CQrepresents the corresponding displace- ment of the valve from its middle position.

AB and CD

ee ers

ag Piston Travel

Fig, 66, That this is so will be seen by drawing PM (as in fig. 59) and join- ing QB, when it is obvious that CQ=CM, which is the displace-

ment of the valve. The line AB with the circles on it may now be turned back through an angle of 90°+6 (@ being the angular advance), so that the valve-circles take the position shown to a larger scale in fig. 67. This makes the direction of CQ (the

~~ ~~

Fia. 67,—Zeuner's Slide-Valve Diagram,

eccentric) coincide on the paper with the simultaneous direction of the crank, and hence to find the displacement of the valve at any position of the crank we have only to draw CQ in fig. 67 parallel to the crank, when CQ

represents the displacement of the valve to the scale on which the diameter of each valve circle represents the half-travel of the valve. CQ, is the valve displacement at the

position of the crank, as cb’, the intercept pg between the circles ig easily seen to be equal to aa’, and is therefore the distance by which the piston has moved from its extreme position at the beginning of the stroke. In practice this diagram is combined with that of fig. 67, by drawing both about the same centre and using different scales for valve and piston travel. A radius vector drawn from the centre parallel to the crank in any position then shows the valve’s displacement from the valve’s middle position by the intercept CQ of fig. 67, and the piston’s displacement from the beginning of the piston’s motion by the intercept pq of fig. 68.

149. In all the figures which have been sketched the events refer to the front end of the cylinder, that is the end nearest to the crank (see fig. 63). To determine the events of steam distribution at the back end, the lap circles shown by dotted lines in fig. 67 must also be drawn, Ca’ being the outside lap for the back end, and Ce’ the inside lap. ‘These laps are not necessarily equal to those at the other end of the valve. From fig. 65 it is obvious that, especially with a short connecting-rod, the cut-off and release occur earlier and the compression later at the front than at the back end if the laps are equal, and a more symmetrical steam distribution can be produced by making the inside lap greater and the outside lap less on the side which leads to the front end of the cylinder. On the other hand, an unsymmetrical distribution may be desirable, as in a vertical engine, where the weight of the piston assists the steam during the down-stroke and resists it during the up-stroke, and this may be secured by a suitable inequality in the laps.

150. By varying the ratio of the laps o and 7 to the travel of the valve, we produce effects on the steam distribution which are readily traced in the oval diagram of fig. 65 or in the other figures, Reduction of travel (which is equivalent to increase of both o and 2) gives later preadmission, earlier cut-off, later release, and earlier compression; the ratios of expansion and of

compression are both increased. The effect of a change in the angular advance is more easily seen by reference to Zeuner’s diagram, which shows that to increase 6 accelerates all the events and causes a slight increase in the ratio of expansion.

151. In designing a slide-valve the breadth of the steam ports in the direction of the valve’s motion is determined with reference to the volume of the exhaust steam to be discharged in a given time, the area of the ports being generally such that the mean velocity of the steam during discharge is less than 100 feet per second. The travel is made great enough to keep the cylinder port fully open during the greater part of the exhaust; for this purpose it is 24 or 8 times the breadth of the steam port. To facilitate the exit of steam the inside lap is always small, and is often wanting or even negative. During admission the steam port is rarely quite un- covered, especially if the outside lap is large and the travel mode- rate. Large travel has the advantage of giving freer ingress and egress of steam, ; with more sharp- £ ly-defined cut- off,compression, ~ and ne sm but a. { 3 ‘ this advantage AS is secured at the : cost of more Fia. 69,— work spent in Trick Valve, moving the valve and more wear of the faces. To lessen the necessary travel without reducing the area of steam ports, double- and even treble- ported valves are often used. An example of a double-ported valve is shown in fig, 85. Fig. 69 shows the Trick valve, an ingenious device for the same purpose.

152. The eccentric must stand in advance of the crank by the Revers}

angle 90° +, as in fig. 70, where CK is the crank, and CE the corre- of mot} sponding position of the eccentric when the engine ‘ with 5! is running in the direction of the arrowa. Toset 9%

beginning of the stroke shown by the arrow. Draw circular arcs ab and cd with C as centre and with radii equal to the outside lap

o and the inside lap 7 respectively. Ca is the position of the crank at which preadmission occurs. The lead is aQ). The greatest steam opening isa,B. The cut-off occurs when the crank has the direction Cd. Cc is the position of the crank at release, and Cd marks the end of the exhaust.

the engine in gear to run in the opposite direction (0) le it is only necessary to shift the eccentric into the ae position CK’, when it will still be 90°+ 6 in advance asain of the crank, In the older engines this reversal was _—*Fig. 70. effected by temporarily disengaging the eccentric-rod from the valve-rod, working the valve by hand until the crank turned back through an angle equal to ECE’, the eccentric meanwhile remaining

148. In this diagram radii drawn from C mark the angular positions of the crank, and their intercepts by the valve circles determine the corresponding displacement of the valve. It remains to find the corre- sponding displacement of the piston. For this Zeuner employs a supple- mentary graphic construction, shown in fig. 68. b’c the crank. With centre ¢ and radius aca circle ap is drawn, and with centre 6 and radius ab another eircle aq. Then for any

1 Zeuner, Treatise on Vaive Gears, transl, by M, Miiller, 1868.

at rest, and then re-engaging the gear. The eccentric sheave,

instead of being keyed to the shaft, was driven by a stop fixed to

the shaft, which abutted on one or other of two shoulders projecting

from the sheave. In some modern forms of reversing gear means

are provided for turning the eccentric round on the shaft, but the

arrangement known as the link-motion is now the most usual gear

in locomotive, marine, winding, and other engines which require to

be often and easily reversed. 4 153. In the link-motion two eccentrics are used, and the ends of Link-

their rods are connected by a link. In Stephenson’s link-motion— moto”)

the earliest and still the most usual form—the link is a slotted bar Stephe||

or pair of bars curved to the same radius as the eccentrie rods (fig. son’s |

71), and capable of being shifted up or down by a suspension

Fig. 68. Here ab or a’b’ represents the connecting rod, and b¢ or

i. 2

_ VALVE MoTIoNs. |

The valve-rod ends in a block which slides within the link, and when the link is placed so that this block is nearly in line with the . forward eccentric rod (R, fig. 71) the valve moves in nearly the same way as if it were driven directly by a single eccentric. This is the position of ‘‘ full forward gear.” In “full backward gear,” on the other hand, the

een enemere

Fie. 71.—Stephenson’s Link-Motion.

link is pulled up until the block is in nearly a line with the back- ward eccentric rod R’. The link-motion thus gives a ready means of reversing the engine,—but it does more than this. By setting the link in an intermediate position the valve receives a motion nearly the same as that which would be given by an eccentric of shorter radius and of greater angular advance, and the effect is to ive a distribution of steam in which the cut-off is earlier than in ull gear, and the expansion and compression are greater. In mid gear the steam distribution is such that scarcely any work is done in the cylinder. The movement of the link is effected by a hand lever, or by a screw, or (in large engines) by an auxiliary steam-engine. A

Fic, 72.—Gooch’s Link-Motion.

to the phrase ‘‘ notching up,” to describe the setting of the link to give a greater degree of expansion. h’s 154. In Gooch’s link-motion (fig. 72) the link is not moved up

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Fig. 73.—Allan’s Link-Motion.

in shifting from forward to backward gear, but a radius rod between the valve-rod and the link (which is curved to suit this radius rod) is raised or lowered—a plan which has the advantage that the lead ’s. is the same in all gears. In Allan’s motion (fig. 73) the change of gear is effected partly by shifting the link and partly by shifting a radius rod, and the link is straight. ‘

phic 155. The movement of a valve driven by a link-motion may be “jfion_very fully and exactly analysed by drawing with the aid of a tem- ok. plate the positions of the centre line of the link corresponding to a 00. number of successive positions of the crank. Thus, in fig. 74, two direular arcs passing through ¢ and ¢’ are drawn with E and E’ as centres and the eccentric rods are radii. These are loci of two known points of the link, and a third locus is the circle a in which the point of suspension must lie. By placing on the paper a tem- plate of the link, with these three points marked on it, the position

usual arrangement of hand lever, sketched in fig. 71, has given rise |

of the link is readily found, and by repeating the process for other positions of the eccentrics a diagram of positions (fig. 74) is drawn for the assigned state of the gear. A line AB drawn across this dia- gram in the path of the valve’s travel determines the displacements of the valve, and enables the oval diagram to be drawn (as in fig. 65), which is shown to a larger scale in another part of fig.74. The example refers to Stephenson’s link-motion in nearly full forward gear; with obvious modification the same method may be used in the analysis of Gooch’s or Allan’s motion. The same diagram deter- mines the amount of slotting or sliding motion of the block in the link. Ina well-designed gear this sliding is reduced to a minimum for that position of the gear in which the engine runs most usually. In marine engines the suspension-rod is generally connected to the link at the end of the link next the forward eccentric, to reduce this

sliding when the engine is in forward gear. A less laborious, but an less accurate, solution of link-motion problems is reached by the ort

use of what is called the equivalent eccentric—an imaginary eccen- tric, which would give the valve nearly the same motion as it gets from the joint action of the actual eccentrics. The following rule for finding the equivalent eccentric, in any state of gear, is duc to Mr M‘Farlane Gray :—

Connect the eccentric centres E and EH’ (fig. 75) by a circular arc

ee ene EE’ x length of eccentric rod _ £

2 x ee! é) Then, if the block is at any point B, take g EF such that EF: EE’::eB: ee’. CF then “a es represents the equivalent eccentric both in Fig. 75 radius and in angular position. If the rods of the link-motion are crossed instead of open,—an arrangement scldom used,—the arc EFF’ is to be drawn convex towards C.

156. Many forms of gear for reversing and for varying expansion Other have been devised with the object of escaping the use r revers- of two cccentrics, and of obtaining a more perfect | ing gears. distribution of steam than the link-motion can often . j be made to give. Hackworth’s gear, the parent of several others, has a single eccentric E (fig. 76) oppo- : site the crank, with an eccentric-rod EQ, whose mean position is perpendicular to the travel of the valve. The rod ends in a block Q, which slides on a fixed inclined guide-bar or link, and the valve-rod receives its motion through a connecting rod from an inter- mediate point P of the eccentric-rod, the locus of which is an ellipse. To reverse the gear the guide- bar is tilted over to the position shown by the dotted lines, and inter- mediate inclinations give various degrees of expan- ses PE sion without altering the lead. The steam distribu- tion is excellent, and the cut-off is sharper than in Fig. 76.—Hackworth’‘s Valve- Gear. the usual link-motion, but an objection to the gear is the wear ; of the sliding-block and guide. In Bremme’s or Marshall’s form Bremme s this objection is obviated with some loss of sym- @ or Mar- metry in the valve’s motion by constraining the shall’s. motion of the point Q, uot by a sliding-guide, but a suspension-link, . ince makes the —“4*2 path of Q a circular are instead of a F straight line; to reverse : the gear the centre of sus- . pension R of this link is : thrown over to the posi- : tion R’ (fig. 77). In the \ example sketched P is ‘ beyond Q, but P may be ry between Q and the crank (as in fig. 76), in which ease the eccentric is set at 180° from the crank. This gear has been applied in a number of marine

engines. In Joy’s gear, which is extensively used in locomotives, no eccentric is required; and the rod corresponding to the eccentric rod in Hackworth’s gear receives its motion from a point in the connecting rod by the linkage shown in fig. 78, and is either suspended, as in Marshall’s form, by a rod whose suspension centre R is thrown over to reverse the motion, or constrained, as in Hackworth’s, by a slot- guide whose inclination is reversed. Fig. 79 shows Joy’s gear as

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Pedr

Piston Path

Connecting Rod ton

Fic. 77.—Bremme’s or Marshall’s Valye-Gear.

Separate expan- sion valves.

applied toa locomotive. A slot-guide E is used, and it is curved to allow for the obliquity of the valve connecting-rod AE. C is the crank-pin, B the _ path, and

a fixed centre. The

reversing gears of Wal- schaert, Brown, aud Kitson also dispense with eccentrics, and are closely related to the invention of Hackworth.! A method of reversing with a common slide-valve, which is used in steam steering engincs? and some others, is to supply steam to

Piston Path

Fired Centre

Fig. 78.—Diagram of Joy’s Valve-Gear.

oe ; o Fic. 79.—Joy’s Gear as applied to a Locomotive.

what was (before reversal) the exhaust side of the valve and con- nect the exhaust to what was the steam side. This is done by means of a separate reversing valve through which the steam and exhaust pipes pass,

157. When the distribution of steam is effected by the slide- valve alone the are of the crank’s motion during which compression occurs is equal to the are during which expansion occurs, and for this reason the slide-valve would give an excessive amount of com- pression if it were made to cut off the supply of steam earlier than about half-stroke. Hence, where an early cut-off is wanted it is necessary either to use an entirely different means of regulating the distribution of steam, or to supplement the slide-valve by another valve,—called an expansion-valve, usually driven by a separate eccentric, —whose function is to effect the cut-off, the other events being determined as usual by the slide-valve. Such expansion- valves belong generally to one or other of two types. In one the expansion-valve cuts off the supply of steam to the chest in which the main valve works. This may be done by a disk or double- beat valve (§ 163), as in the Proéll gear mentioned in § 175 below, or by a slide-valve working on a fixed scat (furnished with one or more ports), which forms the back or side of the main valve-chest. Valves of this last type are usually made in the “gridiron” or many-ported form to combine large steam-opening with small travel. Expansion-valves working in a fixed scat may be arranged so that the ports are either fully open (fig. 80) or

closed (fig. 81) when the valve is in its middle pan a position. In the latter case Valve eel the expansion-valve eccentric S is set in line with or oppo- ear ake

site to the crank, if the en- Fig. 80. Fig. 81.

gine is to run in either direction with the same grade of expansion. Cut-off then occurs at P, fig. 82, when the shaft has turned through an angle ¢ from the beginning of the stroke. The expansion valve reopens at Q, and the slide-valve must therefore have enough lap to cut off earlier than 180°—¢ from the beginning of the stroke, in order to prevent a second admis- sion of steam to the cylinder. In : the valve of fig. 80 the expansion r=.

eccentric is set at right angles to the crank, if the action is to be the same in both directions. If not, these angles may be deviated

Fig, 83.—Expansion-Valve on back of Main Slide-Valve.

from, and in this way a more rapid travel at the instant of cut-off may be secured for one direction of running.

1 Reversing gears of this type are generally termed radial gears. A discussion of Mr Joy's and other arrangements will be found in Proc. Jnst. Mech. Eng., 1880. Mr Kirk, Mr Bryce- Douglas, and others have designed forms which more or less resemble those mentioned in the text, 2 Proc. Inst, Mech. Eng., 1867.

STEHEAM-ENGINE

[VALvEs,

158. The other and much commoner type of expansion-valve jg ‘ one sliding on the back of the main slide-valve, which is provided _ with through ports which the expansion- valve opens and closes. Fig. 83 shows one form of this type. Here the resultant rela- tive motion of the expansion-valve and main-valve has to be considered. If ra and rp (fig. 84) are the eccentrics working the main and expansion valves respectively, then CR drawn equal and parallel to ME is the resultant eccentric which determines the motion of the expansion-valve rela- tively to the main-valve. Cut-off occurs at Q, when the shaft has turned through an angle ¢, which brings the resultant eccentric into the direction CQ and makes the relative displacement of the two valves equal to the distance 7. Another form of this valve (corresponding to fig. 81) cuts off steam at the inside edges of the expansion-slides.

159. Expansion-valves furnish a convenient means of varying Variatiy | the expansion, which may be done by altering their lap, travel, or Beato angular advance. Alteration of lap, or rather of the distance Z in the figures, is often effected by having the expansion-valve in two parts (as in fig. 83) and holding them on one rod by right- and left- handed screws respectively ; by turning the valve-rod the parts are made to approach or recede from each

other. In large valves the adjustment is more conveniently made by varying the travel of the valve, which is done by con- necting it to its eecentrie through a link which serves as a lever of variable length.

160. To relieve the pressure of the valve on the { seat, large slide-valves are generally fitted with .% a steam-tight ring, which excludes steam from the ‘ greater part of the back of the valve. The ring fits steam-tight into a recess in the cover of the steam- chest, and is pressed by springs against the back of the valve, which is planed smooth to slide under the ring. Fig. 85 shows a relief ring of this kind fitted on the back of a large double-ported slide-valve for a marine engine. Another plan is to fit the ring into a recess on the back of the valve, and let it slide on the inside of the steam-chest cover. Steam is thus excluded from the space within the ring, any steam that leaks in being allowed to escape to the condenser (or to the intermediate receiver when the arrangement is fitted to the high-pressure cylinder of a compound engine). A flexible diaphragm has also been used, instead of a recess, to hold the ring.

161. The pressure of valves on ; cylinder faces is still more com- pletely obviated by making the back i of the valve similar to its face, and i

Fig. 84.

Fig. 85.

Piston slide. | valve, |

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Fic. 86.—Piston Slide-Valve.

Fie. 87,—Piston Slide-Valve. causing the back to slide in contact with the valve-chest cover,

which has recesses corresponding to the cylinder ports. This arrangement is most perfectly carried out in the piston slide-valves now very largely used in the high-pressure cylinders of marine engines. The piston slide-valve may be described as a slide-valve

in which the valve face is curved to form a complete cylinder, round whose whole circumference the ports extend. The pistons are packed like ordinary cylinder pistons by metallic rings, and the ports are crossed here and there by diagonal bars to keep the rings from springing out as the valve moves over them. Figs. 86 and 87 show two forms of piston valve designed by Mr Kirk for the supply of high-pressure steam to large marine engines. P, P are the cylinder ports in each.

Fig. 85 illustrates an arrangement common in all heavy slide- valves whose travel is vertical—the balance-piston, which is pressed up by steam on its lower side and so equilibrates the weight of the valve, valve-rod, aud connected parts of the mechanism.

162. The slide-valve sometimes takes the form of a disk revolving or oscillating on a fixed seat, and sometimes of a rocking cyl- inder (fig. 88). This last kind of sliding motion is very usual in stationary engines } fitted with the Corliss gear, which will be described in the next chapter, in which

Fig. 88.—Rocking Slide- Valve. ease four distinct rocking slides are commonly employed to effect thesteam distribution, one giving admission and one giving exhaust at each end of the cylinder (see fig. 127). 163. In many stationary engines Zit or disk valves are used,

ble- worked by tappets, cams, or eccentrics. Lift valves are generally e, of the Cornish or double-beat type (fig. 89), in which equilibrium is secured by the use ~ two ne faces which open or close together. i In Cornish i ee oname, wa ee which retain the single action of Watt’s carly engine, three double- beat valves are used, as steam- valve, equilibrium-valve, and ex- haust-valve respectively. These are closed by tappets on a rod moving with the beam, but are opened by means of a device called a cataract, which acts as follows. Se The cataract is a small pump with cluract, &@ we

ighted plunger, discharging fluid th

desired to alter the speed of the engine. The weighted plunger is raised by a rod from the beain, but is free in its descent, so that it comes down at a rate depending on the extent to which the stop- cock is opened. When it comes down a certain way it opens the steam and exhaust valves, by liberating catches which hold them closed; the ‘‘out-door” stroke then begins and admission continues until the steam-valve is closed: this is done directly by the motion of the beam, which also, at a later point in the stroke, closes the exhaust. Then the equilibrium-valve is opened, and the “in-door”’ stroke takes place, during which the plunger of the cataract is raised. When it is completed, the piston pauses until the cataract causes the steain-valve to open and the next “out-door” stroke begins. By applying a cataract to the equilibrinm-valve also, a

ause is introduced at the end of the “out-door” stroke, Pauses

ave the advantage of giving the pump time to fill and of allowing the pump-valves to settle in their seats without shock.

Fig. 89.—Double-Beat Lift-Valve. rough a stop-cock which can be adjusted by hand when it is

IX. GovEeRNING.

Ithods 164. To make an engine run steadily an almost continuous pro- (regu. cess of adjustment must go on, by which the amount of work done Wing. by the steam in the cylinder is adapted to the amount of external work demanded of the engine. Even in cases where the demand for work is sensibly uniform, fluctuations in boiler-pressure still make regulation necessary. Generally the process of government aims at regularity of speed; occasionally, however, it is some other condition of running that is maintained constant, as when an engine driving a dynamo-electric machine is governed by an electric regula- tor to give a constant difference of potential between the brushes.

The ordinary methods of regulating are either (a) to altcr the eee at which steam is admitted by opening or closing more or ess a throttle-valve

between the boiler and the engine, or (2) to alter the volume of steam admitted to the cylinder by varying the point of cut-off. The former plan was introduced by Watt and is still common, especially in small engines. From the point of view of heat economy it is wasteful, since the process of throttling is essen- tially irreversible, but this objection is to some extent lessened by the fact that the wire-drawing of steam dries or superheats it, and consequently reduces the condensation which it suffers on coming into contact with the chilled cylinder walls. On the other hand, to hasten the cut-off involves a gain rather than a loss of efficiency unless the ratio of expansion is already very great. The second plan of regulating is much to be preferred, especially when the engine is subject to large variations of load, and is very generally ollowed in stationary engines of the larger types.

165. Within certain limits regulation by either plan can be

effected by hand, but for the fiuer adjustment of speed some form Centri- of automatic governor is necessary. Speed governors are commonly fugal of the centrifugal type: a pair of masses revolving about a spindle speed which is driven by the engine are kept gover- from flying out by a certain controlling nors. force. When an increase of speed occurs this controlling force is no longer able to keep the masscs revolving in their former path; they move out until the coutrolling force is sufficiently increased, and in moving out they act on the regu- lator of the engine, which may be a throttle-valve or some form of automatic expansion gear. In the conical pendu- lum governor of Watt (fig. 90) the re- volving masses are balls attached toa vertical spindle by links, and the con- trolling force is furnished by the weight of the balls, which, in receding from the spindle, are obliged to rise. When the speed exceeds or falls short of its normal value they move out or in, and so raise or lower a collar C which is in connexion by a lever with the throttle-valve. The suspension-links may be hung from a cross-bar (figs. 94, 95) instead of being pivoted in the axis of the spindle.

166. In a modified form of Watt’s governor, known as Porter’s, or the loaded governor, a sup- plementary controlling force is given by placing a

weight on the sliding collar (fig. 91). This is equivalent to increasing the weight of the balls without altering their mass. In other governors the controlling force is wholly or partly produced by springs. Fig. 92 shows a gover- nor by Messrs Tangye in which the balls are controlled partly by their own weight and partly by a spring, the tension of which is regulated by turning the cap A.

Fig. 90.—Watt’’s Governor.

Load gover- nor.

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Fig. 91.—Loaded Governor. Fic. 92.—Spring Governor (Tangye).

167. In whatever way the revolving masses are controlled, the Equi- controlling force may be treated as a force F acting on each ball librium of in the direction of the radius towards the axis of revolution. governor. Then, if M be the mass of the ball, 2 the number of revolutions per second, and r the radius of the ball’s path, the governor will revolve in equilibrium when F =47?n?rM (in absolute units), or

wee. we Dar Mr

In order that the configuration of the governor should be stable, F Condition must increase more rapidly than 7, as the balls move outwards. of sta- In the simple conical pendulum governor, any of the three forms bility. shown in figs, 93, 94, and 95, where the balls have no load to raise

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Fig. 94, Fig. 96.

Fig. 93. Fig. 95.

but their own weight, the controlling force F is the resultant of Gravity T, the tension in the link, and Mg, the weight of the ball (fig. 96). governor, Let the height of the pendulum, that is, the distance above the

plane of the balls of the point where the suspending-link, or the link produced, cuts the axis, be called hk. Then F:Mg::r:h. Hence

_ Mgr ly: oa pandna=z./f.

Any change of m tends to produce a change of f, and, if the governor itself and the regulating mechanism attached to it were free

XXII. — 64

sensi- bility.

Loaded gravity governor.

Power.

General solution: graphie method.

Isoehron- ism,

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from friction, only one position of the governor would be possible for any one value of n. It is obvious that neither this governor nor any other stable

governor maintains a strictly constant speed in the engine which it controls. If the boiler pressure or the demand for work is changed, a certain amount of permanent displacement of the balls is necessary to alter the steam supply, and the balls ean retain their displaced position only by virtue of a permanent change in the speed. The maximum range of speed depends on that amount of ehange of 2 which suffices to alter the configuration of the governor from the position whieh gives no steam-supply to the position which gives full steam-supply ; and the governor is said to be sensitive if this range is a small fraction of n,

168. If the governor is loaded, let M’ be the amount of the load per ball, and g the velocity ratio of the vertical movement of the load to the vertical movement of the ball. Then gM’g is the equi- valent increase in the weight of each ball. The effeet of the load is to inerease the controlling force F from Mgr/h to (M+gqM’)gr/h, and the speed at which the governor must now turn, to maintain any assigned height h, is ne ey era)

Qa Mh ; The speed of the loaded governor must therefore be greater than that of an unloaded governor of the same height in the ratio A/(M+qM’) to 4/M.

The sensibility is then the same as that of an unloaded governor of the same height h, but the loaded governor has an important advantage in another respeet—namely, its power or eapability of overcoming frictional resistance to a change of configuration. This quality in a governor is increased whenever the controlling foree F is increased, whether by the addition of a load or by the use of springs.

For let f be the frictional resistance to be overcome per ball, resolved as a force resisting the displacement of each ball in the direetion of the radius 7, Then if m be the speed normal to any configuration this speed must change by a certain amount An before frietion is overeome and the balls begin to be displaced. The controlling foree is now F+/ when the balls are moving out-

wards, and F —/ when the balls are moving inwards. Hence er D F+f mt An=o, \/ Mr’ eee fe and n An= > Mw:

From this, if An be small compared with n, we have An/n=//2F.

Thus, when a given amount of frictional resistanee is to be over- come before the governor ean act, the limits within which this frietion allows the speed to vary are less the greater is the eon- trolling foree F. A loaded governor is more powerful in this respect than an unloaded governor of the same configuration in the

roportion in which F is greater—namely, as M+qM’istoM. A oaded governor may therefore have much lighter revolving masses without loss either of sensibility or of power.

169. The same results are applicable to governors in which the controlling foree is supplied by springs as well as by gravity, or by springs alone. To find the euihigatabiod which the governor will assume at any particular speed, or the speed corresponding to a particular configuration, it is only necessary to determine the whole eontrolling foree F per ball acting along the radius towards the axis for various values of r. Let a curve gb (fig. 97) be drawn showing the relation of F to r, At any assigned value of 7 sct up an ordinate QO=49°n’rM. Join OC. The point c, in which OC euts the curve, de- termines the value of r at which the balls will revolve at the assigned speed n. Or, if that is * given, and the value of m is to be found, the line Oc produced will determine C, and then n?=QOC/49rM. The sensibility of the governor is determined by ° te

é 5 é ig. 97. taking points @ and b corresponding to full steam and no steam respectively, and drawing lines through them to de- termine the eorresponding values of QA and QB.1_ When the fric- tional resistanee / is known, an additional pair of eurves drawn above and below ad, with ordinates F+f and F—f respectively, serve to show the additional variations in speed which are caused by friction. The governor is stable throughout its whole range when the ue ab has a steeper gradient than any line drawn from O to meet it.

170. By § 167 itis evident that, if, when the balls are displaced, the controlling force F changes proportionally to the radius 7, the speed is constant. In other words, the equilibrium of the gover- nor is then neutral; it ean revolve in equilibrium at one, and only at one, speed. At this speed it assumes, indifferently, any one of its possible configurations. The slightest

variation of speed drives it to the extremity of its range ; henee its sensibility is indefinitely ca a ene le eg a

1 See a paper by Mr W. Hartnell, ‘‘On Governing Engi Expansion,” Proc, Inst, Mech. oe, 1882. materi! guises tige/

great. Such a governor is called dsochronous. A gravity governor is isoehronous when f/ is eonstant for all positions of the balls (since noc /g/h). This will be the case if the balls are constrained — to move ina parabolie path (fig. 98), it bein . < a property of the parabola that the subnorma

QM, which is h, is constant. A useful ap- proximation to the same condition, through a limited range, is seeured in Fareot’s gover- nor by the device of hanging the balls by crossed links from the distant ends of a J piece (fig. 95). If each centre of suspension were at the eentre of curvature of a parabolic are which coineided with the aetual circular loeus of the balls at the position of normal speed, the governor would be sensibly isochronous at that speed ; by taking the centres of suspension rather nearer the axis, a suitable

margin of stability is se- cured, but the governor is by! still nearly enough iso- chronous to be exceedingly sensitive.2 Where springs furnish the eontrolling foree, an approach to iso- ehronism can be secured by adjusting the initial tension of the springs, and this forms a convenient means of regulating the sensibility. Thus, in Mr Hartnell’s apparatus (fig. 99), where the balls move in a nearly horizontal di- reetion, and gravity has little to do with the con- trol, the governor ean be made isoehronous byserew- ing down the spring, so that the initial force ex- erted by the spring is to its increase by displace- ment of the balls as the initial radius of the balls’ path is to the inerease of radius by displacement. When the initial foree is increased beyond this the governor beeomesunstable. In fig. 97 the condition of isochronism is secured when the line

ab coineides with a straight line through O.

Fig. 98.

Fic. 99.—Hartnell’s Governor,

171. In practice no governor can be absolutely isochronous, It Huntirl)

is indispensable to leave a small margin of stability for the sake of preventing violent change in the supply of steam, especially when there is much frictional resistance to fe overcome by the governor, or where the influenee of the governor takes much time to be felt by the engine. An over-sensitive governor is liable to fall intoa state of oscillation called hunting. When an alteration of speed begins to be felt, however readily the governor alters its form, the engine’s response is more or less delayed. If the governor aets by elosing a throttle-valve, the engine has stilla capacious valve-ehest on which to draw for steam. Ifit acts by changing the eut-off, its opportunity is passed if the cut-off has already occurred, and the control only begins with the next stroke. This lagging of effect is specially felt in compound engines, where that portion of the steam which is already in the engine continues to do its work for nearly a whole revolution after passing beyond the governor’s control. The result of this storage of energy in an engine whose governor is too nearly isochronous is that, whenever the demand for power suddenly falls, the speed rises so much as to force the gover- nor into a position of over-control, such that the supply of steam is no longer adequate to meet even the redueed demand for power. Then the speed slackens, and the same kind of excessive regulation is repeated in the opposite direction. A state of forced oscillation is consequently set up. The effect is aggravated by the momen- tum whieh the governor balls acquire in being displaced, and also, to a very great degree, by the friction of the governor and the regulating mechanism. Hunting is to be avoided by giving the governor a fair degree of stability, by reducing as far as possible the static frictional resistances, and by introducing a viscous resistance — to the displacement of the governor, which prevents the displace-_ ment from oceurring too suddenly, without affeeting the ultimate

position of equilibrium. For this purpose many governors are Dash-P}

furnished with a dash-pot, which is an hydraulie or pneumatic brake, consisting of a piston connected to the governor, workmg loosely in a eylinder which is filled with oil or with air.

172. In some high-speed engines the governor balls or blocks re-_ aN Alt MT lke an

2 See also a paper by Mr J. Head Proce. Inst. Mech. Eng., 1871.

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GOVERNORS. |

yolve in a vertical plane, about a horizontal axis, and the control is given wholly by ae An example is shown in fig. 100, which is the governor o the Armington and Sims ine referred to in § 197 below. Another example is furnished by the governor of Brotherhood's engine (§ 208, fig. 128).

178. The throttle- valve, as introduced by Watt, was origin- ally a disk turning on a transverse axis aeross theeenitre of the steam- pipe. Itis now usually a double-beat valve (ig 89) or a piston- valve. When regula- tion is effected by varying the eut-off, and an expansion-valve of the slide-valve type is used, the governor generally acts by changing the travel of the valve. Fig, 99 illustrates a common mode of doing

Fie. 100.—Govyernor of Armington & Sims Engine.

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this, by giving the expansion-valve its motion from an eecentric-rod

through a link, the ries of whieh is varied by the displacement

of the governor balls. In fig. 100, the governor acts on the main Auto- slide-valve of the engine (there being no separate expansion-valve), matic and the displacement of the revolving masses M, M ehanges both variation the throw and the angular advance of the eecentrie, thereby pro- of eut-off. ducing a ehange in the steam supply similar to that-produced by ‘“‘notehing up” a link-motion. The eceentrieity B is altered by

the relative displacement of two parts C, D into which the eeeentric

sheave is divided. In other forms of automatie expansion-gear the

lap of the valve is altered ; in others the governor aets by shifting

the expansion-valve eceentric round on its shaft, and so changing

its angular advance.

174. In large stationary engines the most usual plan of automati- Corliss eally regulating the expansion is to employ some form of trip-gear, gear. the earliest type of which was introdueed in 1849 by G. H. Corliss of Providenee, U.S. In the Corliss system the valves whieh admit steam are distinct from the exhaust-valves. The latter are opened and elosed by a reeiprocating pieee which takes its motion from an eecentrie. The former are opened by a reeiproeating piece, but are elosed by springing back when released by a trip- or trigger-aetion.

The trip oecurs earlier or later in the piston’s stroke aeeording to the position of the governor. The admission-valve is opened by the reeiprocating pieee with equal rapidity whether the eut-off is going to be carly or late. It remains wide open during the admis-

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Fre. 101.—Corliss Engine, with Spencer Inglis Trip-Gear.

sion, and then, when the trip-action comes into play, it closes ; through the link E in such a way that wher the speed of the

suddenly. The indicator diagram of a Corliss engine eonsequently has a nearly horizontal admission-line and a sharply defined cut-off. Generally the valves of Corliss engines are eylindrical plates turn- ing in hollow eylindrieal seats whieh extend across the width of the eylinder. Often, however, the admission-valves are of the disk or double-beat type, and spring into their seats when the trip-gear acts. Many forms of Corliss gear have been invented by Corliss himself and by others. One of these, the Speneer Inglis! trip-gear, by Messrs Hick, Hargreaves, & Co., is shown in figs. 101 and 102. A wrist-plate A, which turns on a pin on the outside of the eylinder, receives a motion of oscillation from an eecentric. It opens the cylindrical rocking-valve B by pulling the link C, which eonsists of two parts, conneeted to each other by a pair of spring Bo a,a. Between the clips there is a rocking-eam 0, and as the

k is pulled down this eam places itself more and more athwart the link, until at a eertain point it forces the elips open. Then the ehper part of the link springs back and allows the valve B to elose by the action of a spring in the dash-pot D. When the wrist-plate makes its return stroke the clips re-engage the upper ee of the link C, and things are ready for the next stroke.

e rocking-cam 6 has its position controlled by the governor

1 Proc, Inst. Mech. Eng., 1868.

engine increases it stands more athwart the link C, and therefore

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Fre. 102,—Corliss Valve-Gear, Spencer Inglis form.

causes the clips to be released at an carlicr point in the stroke. A precisely similar arrangement governs the admission of steam to the other end of the cylinder. The exhaust-valves are situated on the

Proéll’s trip-gear.

Disen- gagement gover- nors,

Knowles’s supple- mentary governor.

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bottom of the cylinder, at the ends, and take their motion from a separate wrist-plate which oscillates on the same pin with the late A.! : 175. Fig. 103 shows a compact form of trip-gear by Dr Proéll. A rocking-lever a) is made to oscillate on a fixed pin through its centre by a connexion to the crosshead of the engine. When the end a rises, the bell-crank lever c engages the lever d, and when a is de- presscd the lever a is forced down and the valve ¢ is opened to ad- mit steam toone

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end of the cylin- Y der. As Pion’ IK Dy tinues moving DU down a point is ‘ reachedat which

the edge of ¢ slips past the _. edge of d, and b(*¥ the valve is then forced to its seat by a spring in the dash-pot /. This disengage- ment occurs early or late ac- cording to the © position of the fulcrum piece g, on which the heel of the bell- crank crests dur- ing the opening – of the valve. The -position of g is determined by the governor. A similar action, occurring at the other end of the rocking-bar ad, gives steam to the other end of the cylinder. In one form of Proéil’s gear both ends of ab act on the same steam-valve, which is then a separate expansion-valve fixed on the back of a chest in which an ordinary slide-valve works. 176, In the ordinary form of centrifugal governor the position of the throttle-valve, or the expansion-link, or the Corliss trigger de- pends on the configuration of the governor, and is definite for each position of the balls. In disengagement governors, of which the governor A shown on the right-hand side in fig. 104 is an example, any reduction of speed below A a certain value sets the regu- lating mechanism in motion, and the adjustment continues until the speed has been re- stored. Similarly a rise of speed above a certain value sets the regulating mechan- ism in motion in the other direction. If the spindle a (fig. 104) is connected to the regulator so as to give more steam if it turns one way and less if it turns the other, the speed at which the engine will run in equilibrium must lie between narrow limits, since at any speed high enough to keep 6 in gear with a the supply of steam will go on being reduced, and at any speed low enough to bring c into gear with a the supply will go on being increased. This mode of governing, besides being sensibly isochronous, has the advantage that the power of the governor is not limited by the controlling force on the balls, since the governor acts by deflecting a portion of the power that is being developed by the engine to the work of moving the regulator. It is rarely sce to steam-engines, probably because its

action is too slow. This defect has been ingeniously remedied in the supple- mentary governor of Mr W. Knowles, who has combined a dis- engagement governor with one of the ordinary type in the manner shown in fig. 104.2 Here the spindle a@, driven by the supple- mentary or disengagement governor A, acts by lengthening the rod d which connects the ordinary governor B with the regulator. It does this by turning a coupling nut ¢ which unites two parts of d, on which right- and left-handed screws are cut. Any sudden 1 Numerous forms of Corliss gears are illustrated in W. H. Uhland's work on Corliss engines, translated by A. Tolhausen (London, 1879). A more recent form

of gear by Mr Inglis is described in Engineering, vol. xl. p. 251. 2 Proc. Inst, Mech. Eng., 1884,

Fig, 104,—Knowles's Supplementary Governor.

fluctuation in speed is immediately responded to by the ordinary governor. Any more or less permanent change of load or of steam- pressure gives the supplementary governor time to act. It goes on adjusting the supply until the normal speed is restored, thereby converting the control of the ordinary governor, which is stable, and therefore not isochronous, into a control which is isochronoug as regards all fluctuations of long period. The power of the com- bination is limited to that of the common governor B.

177. Other governors which deserve to be classed as disengage- Relay! ment governors are those in which the displacement of the gover| governor affects the regulator, not directly by a mechanical con- now, | nexion, but by admitting steam or other fluid into what may be called a relay cylinder, whose piston acts on the regulator. In order that a governor of this class should work without hunting, the piston and valve of the relay cylinder should be connected b what is termed differential gear, the effect of which is that for cach displacement of the valve by the governor the piston moves through a distance proportional to the displacement of the valve. An example of differential gear is shown in fig. 105. Suppose that the rod is

connected with the governor e so that it is raised by an acceleration of the engine's speed. The rod c which leads from the relay piston b to the regulator serves as a fulcrum, and the valve-rod d is consequently raised. This admits steam to the upper side of the piston and depresses the piston, } which pulls down d with it, since the end of @ now serves as a fulcrum. Thus by the downward movement of the piston the valve is again restored to its middle posi- tion and the action of the regulator then ceases until a new change of speed occurs. A somewhat similar differential contriv- ance is used in steam-steering engines to make the position of the rudder follow, step by step, every movement of the hand- Fie. 105.—Differential Gear wheel ;3 also, in the steam reversing gear 7 Relay Governor. which is applied to large marine engines, to make the position of the drag-link follow that of the hand-lever ; and also in certain electrical governors.4 The effect of adding a differential gear such as this to a relay governor or other disengagement governor is to convert it from the isochronous to the stable type. \|

178, Another group of governors is best exentplified by the Diffe) } "differential" governor of the late Sir W. Siemens? (fig. 106), A entia| spindle @ driven by the engine drives a piece dyna b (whose rotation is resisted by a friction brake) through the dynamometer coupling c, consisting of a nest of bevel-wheels and a loaded lever d. So long as the speed re- mains constant the rate at which work is done on the brake is constant and the lever dis steady. If the speed accelerates, more power has to be communicated to b, partly to overcome the inertia and partly to meet the increased resistance of the brake, and the lever d is displaced. The lever d works the throttle-valve or other regulator, either directly or by a steam relay. The governor is isochronous when the force employed to hold d in position does not vary ; if the force increases when d is displaced, the governor is stable. A governor of this class may properly be called a dynamometric governor, since it regulates by endeavour- ing to keep constant the rate at which energy is transmitted to the piece b, In one form of Siemens's governor the friction-brake is replaced by a sort of centrifugal pump, consisting of a para- boloidal cup, open at the top and bottom, whose rotation causes a fluid to rise in it and escape over the rim when the speed is sufficiently great. Any increase in the cup's speed augments largely the power required to turn it, and consequently affects the position of the piece

which corresponds tod.® Siemens’s governor is not itself used to any important extent, but the principle it em- bodies finds application in a number of other forms.

179. The ‘‘velometer” or marine-engine regulator of Messrs Durham and Churchill? is a governor of the same type. In it the rotation of a piece corresponding to 6 is resisted by means of a fan revolving in a case containing a fluid, and the coupling piece which is the mechanical equivalent of d in fig. 106 acts on the throttle valve, not directly but through a steam relay. In Silver’s marine governor ® the only friction-brake that is provided to resist the rotation of the piece which corresponds to 6 is a set of air-vanes. The inertia is, however, very great, and any acceleration of the engine’s speed consequently displaces the dynamometer coupling,

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Fig. 106.—Siemens’s Governor.

3 See a paper by Mr J. MacFarlane Gray, Proc. Inst. Mech. Eng., 1867. 4 Willans, Min. Proc, Inst. C.£., vol. 1xxxi. p. 166.

5 Proc. Inst. Mech. Eng., 1853.

6 Proc, Inst. Mech, Eng., 1866; or Phil. Trans., 1866.

7 Proce. Inst. Mech, Eng., 1879.

8 Brit. Ass. Rep., 1859, p. 123.

WORK ON CRANK-SHAFT. |

and so acts on the regulator in its effort to increase the speed f .

; Another example of the differential type is the Allen! governor, which has a fan directly geared to the engine, revolving in a case containing a fluid. The case is also free*to turn, except that it is held back by a aoe’ or spring and is connected to the regulator. So long as the speed of the fan is constant, the moment required to keep the case from turning does not vary, and consequently the position of the regulator remains unchanged. When the fan turns faster the moment increases, and the case has to follow it (acting on the regulator) until the spring which holds the case from turn- ing is sufficiently extended, or the weight raised. The term “dy- namometric governor” is equally applicable to this form; the power required to drive the fan is regulated by an absorption-dynamometer in the case instead of by a transmission-dynamometer between the engine and the fan. In Napier’s governor the case is fixed, and the reaction takes place between one turbine-fan which revolves with the engine and another close to it which is held from turning by a spring and is connected with the regulator.

180. Pump governors form another group closely related to the differential or dynamometric type. An engine may have its speed regulated by working a small pump which supplies a chamber from which water is allowed to

escape by an orifice of constant size. When the engine quickens its speed water is pumped in faster than it can escape, and the accumulation of water in the chamber may be made to act on the regulator through a piston controlled by a spring or in other ways, This device has an obvious analogy to the cataract of the Cornish pumping-engine (§ 168), which has, however, the somewhat different purpose of introducing a regulated pause at the end of each stroke. The “differential valve-gear” invented by Mr H. Davey, and successfully applied by him to modern pumping-engines, combines the functions of the Cornish cataract with that of a hydraulic governor for regulating the expansion.? In this gear, which is shown dia- gramatically in fig. 107, the valve- rod of the engine (a) receives its motion from a lever }, one end of which (¢) copies, on a reduced scale, the motion of the engine piston, while the other (@), which forms (so to speak) the fulcrum, has its position regulated by at- tachment to a subsidiary piston- rod, which is driven by steam in a cylinder e, and is forced to travel uniformly by a cataract f. The point of cut-off is determined by the rate at which the main piston overtakes the cataract piston, and consequently comes early with light loads and late with heavy loads,

181. The government of marine engines is peculiarly difficult on account of the sudden and violent fluctuations of load to which they are subjected by the alternate uncovering and submersion of the screw in a heavy sea. However rapidly the governor responds to increase of speed by closing the throttle-valve, an excess of work is still done by the steam in the valve-chest and in the high-pres- sure cylinder. To check the racing which results from this, it has been proposed to supplement the control which the throttle-valve on the steam-pipe exercises by throttling the exhaust or by spoilin the vacuum. Probably a better plan is that of Messrs Jenkins al Lee, who give supplementary regulation by causing the governor to open a shunt-valve which connects the top and bottom of the low- pressure cylinder, thus allowing a portion of the steam in it to pass the piston without doing work. In Dunlop’s pneumatic governor® an attempt is made to anticipate the racing of the screw by caus- ing the regulator to be acted on by the changes of pressure on a diaphragm which is connected by an air-pipe with an open vessel fixed under the stern of the ship. A plan has recently been intro- duced by Mr W. B. Thompson to prevent the racing of marine engines by working the valves from a lay shaft which is driven at a uniform speed by

an entirely independent engine. So long as this lay shaft is not driven too fast the main engine is obliged to follow it; if the lay shaft is driven faster than the main engine can follow the main engine pauses so as to miss a stroke, and then goes on. Reversing the motion of the lay shaft reverses the

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Fic. 107.—Davey's Differential Valve-Gear.

minimum, within the limits of each single stroke, which will be discussed in the next chapter.

X. THe Work on THE CRANK-SHAFT.

183. Besides those variations of speed which occur from stroke Use of to stroke, which it is the business of the governor to check, there fiy-wheel.

are variations within each single stroke over which the governor has of course no control. These are due to the varying rate at which work is done on the crank-shaft during its revolution. To limit them is the function of the fly-wheel, which acts by forming a reservoir of energy to be drawn upon during those parts of the revolution in which the work done on the shaft is less than the work done by the shaft, and to take up the surplus in those parts of the revolution in which the work done on the shaft is greater than the work done by it. This alternate storing and restoring of energy is accomplished by slight fluctuations of speed, whose range depends on the ratio which the alternate excess and defect of energy bears to the whole stock the fly-wheel holds in virtue of its motion. The effect of the fly-wheel may be studied by drawing a diagram of crank-effort, which shows the work done on the crank in the same way that the indicator diagram shows the work done on the piston. The same diagram serves another useful purpose in determining the twisting and bending stress in the crank.

184. The diagram of crank-effort is best drawn by representing, Diagram in rectangular co-ordinates, the relation between the moment which of crank-the connecting-rod exerts to turn the crank and the angle turned effort.

through by the crank. When the angle is expressed in circular measure, the area of the diagram is the work done on the crank. Neglecting friction, and supposing in the first place that the engine runs so slowly that the forces required for the acceleration of the moving masses are negligibly small, the moment of crank- effort is found by resolving the thrust P of the piston-rod into a

Fig. 108.

component Q along the connecting-rod and a coinpanent O normal to the surface of the guide (fig. 108). The moment of crank- effort is

7COSa JP = aan) : where CN is drawn perpendicular to the centre linc or travel of the piston, ris the crank, / the connecting rod, and a the angle ACB which the crank makes with the centre line. A graphic deter- mination of CN is the most convenient in practice, unless the con- necting rod is so long that its obliquity is negligible, when the second term in the above expres- sion vanishes. Fig. 109 shows the diagram of 8 crank-effort de- $ termined in this

1 v) 3 fy € 7 way for an engine tee tonsa yo whose connect-

ing-rod is 34 Fic. 109.—Diagram of Crank-Effort.

times the length of its crank, and in which steam is cut off at half-stroke. The thrust P is determined from the indicator dia- grams of fig. 108 by taking the excess of the forward pressure on one side of the piston over the back pressure on the other side, and multiplying this effective pressure by the area of the piston. The area of the diagram of crank-effort is the work done per revolution.

Q:OM=P-ON=Prsina(1+

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main engine. a 182. In connexion with governors mention may be made of an order. apparatus introduced by Mr Moscrop to give a continuous record

185. The friction of the piston in the cylinder and the piston- Effect of rod in the stuffing-box is easily allowed for, when it is known, by friction. making a suitable deduction from P. Friction at the guides, at

of fluctuations in the speed of engines. It resembles a small centrifugal governor, but the displacement of the balls actuates, not a regulator, but a pencil which moves transversely on a ribbon of paper that is moved continuously by clockwork. The recorder responds so rapidly to changes of speed as to show not only the comparatively slow changes which occur from stroke to stroke, but also those short-period fluctuations between a maximum and

? Proc, Inst. Mech. Eng., 1873. .

a. 2 Proc. Inst. Mech. Eng, 1874. Ibid., 1879.

4 Tbid., 1884.

the crosshead, and at the crank-pin has the effect of making the stress at each of these places be inclined to the rubbing surfaces at an angle ¢, the angle of repose, whose tangent is the coefficient of friction. Hence O, instead of being normal to the guide, is inclined at the angle ¢ in the direction which resists the piston's motion (fig. 110); and the thrust along the connecting-rod, instead of passing through the centre of each pin, is displaced far enough to make an angle ¢ with the radius at the point where it meets the pin's surface. 'T'o satisfy this condition let a '' friction-circle" be drawn about the centre of each pin, with radius equal to a sin ¢,

Effect of inertia,

where a is the actual radius of the pin. Any line drawn tangent to this circle will make the angle ¢ with the radius of the pin at the surface of the pin. The thrust of the connecting-rod must be tangent to both circles; it is drawn as in fig. 110, so that it resists the rota- . tion of the pins relatively to the rod. The direction of ro- tation of the pins is shown

Fig. 110. by curved arrows in the figure, where the friction-circles are drawn

to a greatly exaggerated scale. Finally, P (after allowing for the friction of piston-packing and stuffing-box) is resolved into O and Q, and Q°CM, the moment of Q on the shaft, is determined. This gives a diagram of crank-effort, correct so far as friction affects it, whose area is no longer equal to that of the indicator diagram. The difference, however, does not represent the whole work lost through friction of the mechanism, since the friction of the shaft itself, and of those parts of the engine which it drives, has still to be allowed for if the frictional efficiency of the engine as a whole is in question.

186. The diagram of crank-effort is further modified when we take account of the inertia of the piston and connecting-rod. For the purpose of investigating tle effects of inertia, we may assume that the crank is revolving at a sensibly uniform rate of » turns per second, Let M be the mass of the piston, piston-rod, and crosshead in pounds, and a@ its acceleration at any instant in feet per second per second. The force required to accelerate it is Ma/g, in pounds-weight, and this is to be deducted in estimating the effective value of P. The effect is to reduce P during the first part of the stroke and to increase it towards the end, thereby compensating to some extent for the variation which P undergoes in consequence of an early cut-off. If the connecting-rod As so long that its obliquity may be neglected the piston has simvle harmonic motion, and

a= — 42°n?rcosa= — 4r?n®z, where x is the distance of the piston from its middle position. More generally, whatever ratio the length J of the connecting-rod bears to that of the crank 7,

2cos2a+73sin4 a= —da?n’r (cosa+ coset Tats

(12 — r°sin 2a)?

The effect is to make, on the diagram of P, a correction of the character shown in fig. 111, where the broken line cd refers to the case of an indefinitely long con- necting-rod and the full line ab to the case of a

connecting-rod 34 times the length of the crank, In a vertical engine’ the weight of the piston and piston-rod is to be added to or subtracted © from P.

To allow for the inertia of the connecting-rod is a matter of somewhat greater difficulty. Its motion may conveniently be analysed as consisting of translation with the velocity of the crosshead, combined with rota- tion about the crosshead as centre. Hence the force required for

Fig. 111.

its acceleration is the resultant of three components—F,, the force dans

required for the linear ac- celeration a (which is the same as that of the piston); F,, the force required to cause angular acceleration about the crosshead; and F;, the force towards the centre of rotation, which depends on the angular velocity, and is equal and opposite to the so-called centrifugal force. Let be the angle BAC (fig. 112), the angular velocity of the rod about A, and @ its angular acceleration, and let M’ be the mass of the rod. Then F, = M’a/g ?

and acts through the centre of gravity G, parallel to AC;

F,=M’. AG. 6/9, and acts at right angles to the rod through the centre of per- cussion H; i

F3;=M’. AG. 6/9, aud acts along the rod towards A. Also,

/ 27Nr COS @

/? ~r?sin2e’ — 4x°nrsin af]? ~ 7?) Bee SM age),

Fig. 112.

@=

oie (2—72sin a)!

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The moments of these forces about © are next to be found, aid

to be deducted from the moment of the thrust in the connecting-rod

(and, if the weight of the rod is to be considered, its moment abont C is to be added) in finding the resultant moment of crank-effort, 187. If, however, the friction at the crosshead and crank-pin is to be taken account of, the whole group of forces acting on the rod must be considered as follows. Compound forces equal and oppo- site to F,, F,, and F; into a single force R (fig. 113), which may be called the resultant resistance to acceleration of the connecting. rod. If the weight of the rod is to be considered, let it also be taken

Fig. 113.

Fig. 114.

as a wl aie in reckoning R. Then the rod may in any position

be regarded as in ep on under the action of the forces Q, R, and 8, where Q and S are the forces exerted on it by the crosshead and crank-pin respectively. These three forces meet in a point p in R, which is to be found by trial, the condition being that in the diagram of forces, fig, 114, after the triangle POQ has been drawn, and the force R set out, the force-line S shall be parallel to a line drawn from p tangent to the friction-circle of the crank-pin, as in fig. 118. When this condition has been satisfied by trial, the value of S, which is the thrust on the crank-pin, is determined, and §.CM is the moment of crank-effort. This method is due to the late Prof. Fleeming Jenkin, who has applied it with great generality to the determination of the frictional efficiency of ma- chinery in two important papers,! the second of which deals in detail with the dynamics of the steam-engine. Fig. 115, taken

Fig. 115.

from that paper, shows the diagram of crank-effort in a horizontal —

direct-acting engine,—the full line with friction, and the dotted line without friction,—the inertia of the piston and connecting rod being taken account of, as well as the weight of the latter. It exhibits well the influence which the inertia of the reciprocating parts has in equalizing the crank-effort in the case of an early cut- off. ‘The cut-off is supposed to occur pretty sharply at about one- sixth of the stroke. The engine considered is of practical propor- tions, and makes four turns per second; and the initial steam pressure is 50 tb per square inch. It appears from the diagram that, with a slightly higher speed, or with heavier rods, a better balance of crank-effort might be secured, especially as regards the stroke towards the 7 crank, which comes first in the dia- gram; on the other hand, by unduly increasing the mass of the reciprocat- ing pieces or their speed the inequal- ity due to expan-

Fig. 116.—Crank-Effort Diagram for Two Cranks. — sion would be over-corrected and a new inequality would come in.

188. When two or more cranks act on the same shaft, the

joint Combine | |

moment of crank-effort is found by combining the diagrams for diagra

the separate cranks, in the manner illustrated by fig. 116, which refers to the case of two cranks at right angles.

Another graphic method of exhibiting the variations of moment Cireuler exerted on the crank-shaft during a revolution is to draw a circular diagram.

diagram of crank-effort, in which lines proportional to the moment are set off radially from a circular line which represents the zero of moment. An example of this plan is given in fig. 117, which shows the resultant moment determined by Mr A. ©. Kirk for one of his triple-expansion engines with three cranks set at 120 from cach other. Curves arc drawn for various speeds, giving in each case the resultant moment due to the steam pressure (as

! Trans. Roy. Soc. Edin., vol. xxviii. p. 1 and p. 703.

determined from actual indicator diagrams) combined with the moments due to the inertia of the reciprocating parts. The line marked 0 is the steam line without inertia—or, in other words,

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Fi¢, 117,—Cireular Diagram of Crank-Effort for a Three-Cylinder Engine.

the curve corresponding to an indefinitely slow speed. The other curves refer to the number of revolutions per minute marked on them.

189, To determine the fluctuations of speed during a revolution, the resultant diagram of work done on the crank-shaft is to be compared with a

similar diagram drawu to show the work done by the shaft in overcoming its own friction, and in overcoming the resistance of the mechanism which it drives. In general the re- sistance may be taken asconstant, and the diagram of effort exerted by the crank-shaft is then a straight line, as EFGHIJKL in fig. 118. At ¥F, G, H, I, J, and K the rate at which work is being done on and by ; the shaft is the ion same; hence at + these points the

fly- wheel _ is | neither gaining nor losing speed. The shaded area above FG is an exeess of work

Fig. 118.

done on the crank, and raises the speed of the fly-wheel from a mini- mum at F to a maximum at G. From G to H the fly-wheel supplies the defect of energy shown by the shaded area below GH, by which the demand for work exceeds the supply ; its speed again reaches a

minimum at H, and again a maximum at I. The excesses and de- fects balance in each revolution if the engine is making a constant number of turns per second, In what follows it is assumed that they are only a small fraction of the whole energy held by the fly-wheel.

Let AE be the greatest single amount of energy which the fly- Wheel has to give out or absorb, as determined by measuring the shaded areas of the diagram ; and let w, and w, be the maximum and minimum values of the wheel’s angular velocity, which occur at the extremes of the period during which it is storing or sup- plying the energy AE. The mean angular velocity of the wheel @o Will be sensibly equal to 4(w,+,) if the range through which the speed varics is moderate. Let Ey be the energy of the fly-wheel at this mean speed. Then

Ey = $1w,? ?

where I is the moment of inertia of the fly-wheel.

They Bis yg’? Apa ser) Tayo — @.) = 2E,.

(; – g) Wo 3 which we may write g, is the ratio of the

The quantity °— “2 | Wy extreme range of specd to the mean speed, and measures the degree of unsteadiness which the fly-wheel leaves uncorrected. If the problem be to design a fly-wheel which will keep g down to an assigned limit, the energy of the wheel must be such that AE

| t Ey= 29 .

The Moserop recorder, alluded to in § 182, exhibits the degree of Unsteadiness during a single revolution by the width of the line

oll

which it draws. On the other hand, any bending of the line implies the quite independent characteristic of unsteadiness from one revolution to another. ‘he former is due to insufficient fly-whecl energy, the latter to imperfect governing.

190. An interesting consequence of the periodic alternations in crank-effort which occur in each revolution has been pointed out by Mr M. Longridge.t_ The fly-wheel receives its alternate ac- celeration and retardation through changes of the torsional stress in the shaft. If these occur at intervals nearly equal to the period of free torsional vibration which the fly-wheel possesses in virtue of the torsional elasticity of the shaft between it and the crank, strains of great amplitude will arise; and Mr Longridge has suggested that this may account for the observed fact that engine- shafts have been ruptured when running so that the fluctuations of crank-effort occurred with one particular frequency, although the pares effort was itself much less than the shaft would safely

ear.

XI. EXAMPLES oF STEAM-ENGINES. STATIONARY ENGINES.

191. In classifying engines with regard to their general Deserip- arrangement of parts and mode of working, account has tive to be taken of a considerable number of independent %™* characteristics. We have, first, a

general division into condensing and non-condensing engines, with a subdivision of the condensing class into those which act by surface condensation and those which use injection. Next there is the division into compound and non-compound, with a further classification of the former as double-, triple-, or quadruple-expansion engines. Again, engines may be classed as single or double-acting, according as the steam acts on one or alternately on both sides of the piston. Again, a,few engines—such as steam-hammers and certain kinds of steam-pumps—are xon-rotative, that is to say, the reciprocating motion of the piston does work simply on a reciprocating piece; but generally an engine does work on a continuously revolving shaft, and is termed rotative. In most cases the crank-pin of the revolving shaft is connected directly with the piston-rod by a con- necting-rod, and the engine is then said to be direct-acting ; in other cases, of which the ordinary beam-engine is the most important example, a lever is interposed between the piston and the connecting-rod. The same distinction applies to non-rotative pumping engines, in some of which the piston acts directly on the pump-rod, while in others it acts through a beam. The position of the cylinder is another element of classification, giving horizontal, vertical, and inclined cylinder engines. Many vertical engines are further distinguished as belonging to the inverted cylinder class ; that is to say, the cylinder is above the connecting- rod and crank. In oscillating cylinder engines the connect- ing-rod is dispensed with; the piston-rod works on the crank-pin, and the cylinder oscillates on trunnions to allow the piston-rod to follow the crank-pin round its circular path. In trunk engines the piston-rod is dispensed with ; the connecting-rod extends as far as the piston, to which it is Jointed, and a trunk or tubular extension of the piston, through the cylinder cover, gives room for the rod to oscillate. In rotary engines there is no piston in the ordinary sense ; the steam does work on a revolving piece, and the necessity is thus avoided of afterwards converting reciprocating into rotary motion.

192. In the single-acting atmospheric engine of New- comen the beam was a necessary feature; the use of water- packing for the piston required that the piston should move down in the working stroke, and a beam was needed to let the counterpoise pull the piston up. Watt’s improve- ments made the beam no longer necessary ; and in one of the forms he designed it was discarded—namely, in the form of pumping-engine known as the Bull

engine, in which a vertical inverted cylinder stands over and acts directly on the pump-rod. But the beam type was generally

1 Proc. Inst. Mech. Eng., May 1884, p. 163.

Parallel motion in beam- engines.

retained by Watt, and for many years it remained a favourite with builders of engines of the larger class. The beam formed a convenient driver for pump-rods and valve- rods; and the parallel motion invented by Watt as a means of guiding the piston-rod, which could easily be applied to a beam-engine, was, in the early days of ergine- building, an easier thing to construct than the plane surfaces which are the natural guides of the piston-rod in a direct-acting engine. In modern practice the direct- acting type has to a very great extent displaced the beam type. For mill-driving and the general purposes of a rota- tive engine the beam type is now rarely chosen. In pumping engines it is more common, but even there the tendency is to use direct-acting forms.

193. The only distinctive feature of beam-engines requir- ing special notice here is the “ parallel motion,” an ordinary form of which is shown diagram- I matically in fig. 119. There MN is the path in which the piston- * rod head, or crosshead, as it is <5". often called, is to be guided. ; ABC is the middle line of half “ j the beam, C being the fixed centre yg, 119,-watt’s Parallel about which the beam oscillates. Motion.

A link BD connects a point in the beam with a radius link ED, which oscillates about a fixed centre at E. A point P in BD, taken so that BP: DP :: EN : CM, moves in a path which coincides very closely with the straight line MPN. Any other point F in the line CP or CP produced

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ore ae”

below it, the guiding surfaces at Q are avoided, but the path of P is then only very nearly straight. An example of the linkage in this form, with the further modification that A is shifted out, and B is brought nearer to P, occurs in the pumping engine of fig. 130 below.

In by far the greater number of modern steam-engines the crosshead is guided by a block sliding on planed sar- faces. In many beam-engines, even, this plan of guiding the piston has taken the place of the parallel motion.

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Fig. 121.—Small Horizontal Direct-Acting Steam Engine: Side Elevation.

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is made to copy this motion by means of the links AF and FG, parallel to BD and AC. In the ordinary application of — the parallel motion a point such as F is the point of attach- ment of the piston-rod, and P is used to drive a pump-rod, Other points in the line CP produced are occasionally made use of, by adding other links parallel to AC and BD. Watt's linkage gives no more than an approximation to straight-line motion, but in a well-designed example the amount of deviation need not exceed one four-thousandth of the length of stroke. It was for long believed that the production of an exact straight-line motion by pure linkage was impossible, until the problem was solved by the invention of the Peaucellier cell.2 The Peaucellier linkage has not been applied to the steam-engine, except in isolated cases. | 194. Another " parallel motion" which has been used in gyott, steam-engines is shown in fig. 120. AB is a link pivoted Russel | on a fixed centre at A, and connected to the middle of Patil another link PQ, which is twice tn the length of AB. Q is guided j to move in a straight line in the | direction of AQ. P then moves ! in an exact straight line through *" A. This is not a pure linkage, ; since Q slides in a fixed guide, j, but the distance through which Fig. 120. Q has to be guided is small compared with

the stroke of P. If Q is guided to move in the arc of a circle of large radius, by using a radius rod from a fixed centre above or

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Fig. 122.

Fig. 122,—Plan. Fig. 128.—Section on AB in fig. 121,

195. No type of steam-engine is so common as the horizontal Hor- | direct-acting. A small engine of this type, made by Messrs zontal | Tangye, and rated as a 10-horse-power engine, is illustrated in figs. direct- | 121 to 124. It furnishes a good example of a very numerous class, acting } and serves to illustrate the principal parts of a complete engine. engin) Fig. 121 is a side elevation, fig. 122 a plan, fig. 123 a transverse section through the bedplate in front of the cylinder, on the line

1 The kinematics of the parallel motion are discussed in Rankine's Magkiae and Mill Work, p. 275, and rules are given for the proportions and positions 0 the parts.

2 See Kempe's How to Draw a Straight Lina ("Nature Serles,"), 1877

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ENGINES. |

AB ; and fig. 124 is a horizontal section through the cylinder, valve- chest, valve, stuffing-boxes, piston, and crosshead. The bedplate

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Fig, 124.—Horizontal Seetion through Cylinder and Valve-Chest.

is a single hollow casting, with two surfaces planed on it to serve as guides (see fig. 123). At one end the bedplate forms a pillow- block for the shaft, which has another main bearing independently supported beyond the fly-wheel. At the other end the bedplate is shaped so as to form the cylinder cover ; the cylinder is bolted to this and overhangs the bed. =

The cylinder (of 10 inches diameter and 20 inches stroke) con- sists of an internal ‘‘ liner” of cast-iron, exactly bored, and fitted within an external cylindrical casting, of which the ports and sides of the valve-chest form part. The space between the liner and the external cylinder serves as a steam-jacket. The use of a separate liner within the main cylinder is now general in large engines. In the front cylinder cover there is a stuffing-box through which the piston-rod passes. The stuffing-box is kept steam-tight by a soft packing which is pressed in by a gland. In some in- stances the packing consists of metallic rings. The cylinder cover and gland are lined with a brass ring in the hole through which the piston-rod passes. The valve-rod is brought out of the valve- chest in the same way. The piston is a hollow casting into which the piston-rod is screwed and riveted over. It is packed by two * rings of cast-iron, which are sprung into recesses turned in the circumference of the piston. This mode of packing is used in locomotives and small engines. For large pistons the usual plan is to employ wider split rings, called floating rings, pressed against the sides of the cylinder, not by their own elasticity, but by sepa- rate springs behind them in the body of the piston ; they are held in place by a movable flange called a junk-ring on one face of the

iston, One example of the packing of a large piston is shown in fig. 134. The crosshead consists of a steel centre-piece with a round boss, in which the piston-rod is secured by a cotter, and a forked front, where the end of the connecting-rod works on a pin. A pair of pins at top and bottom carry the steel shoes or sliding- blocks, whose distance from the centre is

adjustable by nuts to take up wear. There is no crank; the connecting-rod works on a pin

fixed in a disk on the end of the shaft in front of the main bear-

water streams continuously through perforations in the pipe B, which has a cock outside to regulate the supply. The pump draws condensed water down to the lower part of the vessel] at either end alternately through the valves C, and forces it up thence through the valves D to a chamber E, from which the delivery-pipe leads out. The pump is a gun-metal piston working in a cylinder fitted with a gun-metal liner. The valvesare flat india-rubber rings held down in the centre by a spring, which allows them to open by rising bodily, as well as by bending.

197. The engine of figs. 121-4 makes 85 revolutions per minute, and its mean piston speed is consequently about 280 feet per minute. In some special forms of small horizontal engine the design is adapted to a much more rapid reciprocation of the moving masses, and the piston speed is raised to a valueseldom exceeded in the largest land engines, although still higher values are now cominon in marine practice. Experience shows that the weight of engines of any one type varies roughly as the piston area. Their power depends on the product of piston area, piston speed, and pressure; and hence, so long as the pressures are similar, the ratio of power to weight is nearly proportional to piston speed. Cases present themselves in which it is desirable to make this ratio as great as possible; and, apart from this, an enginc making a large number of re- volutions per minute is a convenient motor for certain high-speed machines.

A good example of a small horizontal engine, specially designed Arming-

by the symmetry and balance of its parts, by tee of the ton and bearing surfaces, and by very perfect lubrication, to stand the Sims strains which are caused by high speed, is the Armington & Sims engine. engine, made in America by the patentees and in England by Messrs Greenwood & Batley.

The bedplate is symmetrical about the line of motion of the crosshead; it supplies two very long main bearings for the shaft, at each end of which there is an overhung fly-wheel. The bearings have an adjustable side-block to take up wear. They are formed entirely of white-metal, cast on to the cast-iron pillow-blocks. In the middle are two disks, forming crank-cheeks, which are weighted opposite the crank-pin, so that they balance the pin and that part of the connecting-rod which may be treated as having its mass applied there. The crank-pin and the crosshead-pin are wide enough to give a large bearing area. The crosshead-block is a hollow bronze casting, giving an excep- tionally large surface of contact with the guides. The valve is a piston-valve of the Trick type, which works sufficiently tight without packing. The valve-rod and eccentric-rod are connected through a block which slides on a fixed guide. The governor, which has been already illustrated in fig. 100, is contained within one of the fly-wheels. An engine of this type, with a cylinder 12 inches in diameter and a stroke of 12 inches, makes 275 revo- lutions per minute, has a piston speed of 550 feet per minute, and indicates about 80 horse-power. Other good examples of high speed combined with double action are furnished by the Porter- Allen engine! and by the very light engines which Mr Thorneycroft and others have introduced for driving fans to supply air to the closed stokeholes of torpedo-boats. In these a speed of 1000 revolutions per minute is made possible by the use of light recipro- cating parts and large bearing surfaces.

198. Fig. 127 shows a large non-compound horizontal Corliss Large

High- speed

engines.

horizontal

engine for mill-driving, by Messrs Hick, Hargreaves, & Co. The horizontal cylinder is 34 inches in diameter, the stroke 8 feet, and the speed Corliss 45 revolutions per minute, giving a mean piston speed of 720 feet engine.

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Fig. 125, Fig. 126.

Condenser and Air-Pump.

Within the condenser, is a horizontal plunger or piston-pump worked by a ‘‘tail-rod”—that is, a continuation of the piston-rod past the piston and through the back cover of the cylinder. Figs. 125 and 126 show in section one of Messrs Tangye’s small condensers fitted with a double-acting air-pump to be driven by a tail-rod. The condenser proper is the chamber A, and into it the injection-

per minute. The cylinder is steam-jacketed round the barrel in the space between the liner and the outer cylinder, and also at the ends, which arc cast hollow for this purpose. In large horizontal engines the weight of the piston tends to cause excessive wear on the lower side of the cylinder. In the example shown a part of the weight is borne by a tail-rod, ending in a block, which slides on a fixed guide behind the cylinder. _ To further diminish wear the piston is sometimes made much wider from front to back than the one shown here; and the device is sometimes resorted to of giving the piston- rod “‘ camber”’—that is to say, an upward curvature in the middle – portion, which the weight of the piston reduces to straightness. Fig. 127 illustrates a common method of attaching the air-pump and condenser in large horizontal engines. The condenser is placed in a well in front of the cylinder, and the air-pump, which is a vertical bucket-pump, is worked by a bell-crank lever, connected with the crosshead by a link. The fly-wheel of this engine is grooved for ee it is cast in segments, which are bolted to one another and to the spokes, and the spokes are secured by cotters in tapered sockets in the nave. It is large and heavy, to suit the inequality of driving effort which is caused by the use of a single cylinder and a very early cut-off in engines of this class. To facili- tate startiug and valve-setting, mill engines are often provided with an auxiliary called a “‘ barring” engine. The barring engine turns a toothed pinion, which gears into a toothed rim in the fly-wheel, and is contrived to fall automatically out of gear as soon as the main engine starts.

1 Proc. Inst. Mech. Eing., 1868.

XXIL — 65

Coupled engines,

Con- pound horizontal engines.

Direct- acting vertical cylinder engine,

514

199. When uniformity of driving effort or the absence of dead- points is specially important, two independent cylinders are often coupled to the same shaft by cranks at right angles to each other, an arrangement which allows the engine to be started readily from any position. The ordinary locomotive is an example of this form. Among fixed engines of the larger kind, winding engines, in which ease of starting, stopping, and reversing is essential, are very gene- rally made by coupling a pair of horizontal cylinders, with cranks at right angles to each other, on opposite sides of the winding-drum, with the link-motion as the means of operating the valves.

200. Non-compound engines of so large a size as that of fig. 127 are comparatively uncommon. Horizontal engines of the larger class are generally compounded either (1) by having a high and a low pressure cylinder side by side, working on twocranks at exactly or nearly right angles to each other, or (2) by placing one cylinder behind the other, with the axes of both in the same straight line. The latter is called the tandem arrangement. In it one piston-rod is generally common to both cylinders; occasionally, however, the piston-rods are distinct, and are connected to one another by a framing of parallel bars outside of the cylinders. Another con-

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Fie. 127.—-Horizontal Corliss Condensing Engine,

of compound engines, the cut-off is usually effected either by an expansion slide-valve or by some form of Corliss or other trip- ear.

For mill engines the compound tandem and compound coupled types are now the most usual, and the high-pressure cylinder is very generally fitted with Corliss gear. In the compound coupled arrangement the cylinders are on separate bedplates, and the fly- wheel is between the cranks.

201. The general arrangement of vertical engines differs little from that of horizontal engines. The cylinder is usually supported above the shaft by a cast-iron frame resembling an inverted A, whose sides are kept parallel fora part of their length to serve as guides for the crosshead. Sometimes one side of the frame only is used, and the engine is stiffened by a wrought-iron column be- tween the cylinder and the base on the other side. Wadll-engines are a vertical forin with a flat frame or bedplate, which is made to be bolted against a wall ; in these the shaft is generally at the top. Vertical engines are compounded, like horizontal engines, either by coupling parallel eylinders to cranks at right angles (as in the ordinary marine form, which will be illustrated later, § 218), or, tandem fashion, by placing the high-pressure cylinder above the other. In vertical condensing engines the condenser is situated at the base, and the air-pump, which has a vertical stroke, is gene- rally worked by a lever connected by a short link to the cross- head. In some cases the pump is horizontal, and is worked by a crank on the main shaft.

202. Engines making 400 to 1600 revolutions per minute have been extensively applied, in recent years, to the driving of dynamos and other high-speed machines. These are for the most part single-

position, with its connecting-rod working on the same crank.

struction, rarely followed, is to have parallel cylinders with both piston-rods acting on one crank by being joined to opposite ends of one long crosshead.

In some recent compound engines the large cylinder is horizontal, and the other lies above it in an inclined

pin.

In tandem engines, since the pistons move together, there ig no need to provide a receiver between the cylinders. It is practic- able to follow the ‘‘ Woolf” plan of allowing the steam to expand directly from the small into the large cylinder; and in many instances this is done. In point of fact, however, the connecting. pipe and steam-chest form an intermediate receiver of considerable size, which will cause loss by ‘‘ drop” (§ 118) unless steam be cut off in the large cylinder before the end of the stroke. Hence it is more usual to work with a moderately early cut-off in the low-pressure cylinder than to use the ‘* Woolf” plan of admitting steam to it throughout the whole stroke. Unless it is desired to make the cut-off occur before half-stroke, a common slide-valve will serve to distribute steam to the large cylinder. For an earlier cut-off than this a separate expansion-valve is required on the low-pressure cylinder, to supplement the slide-valve ; and in any case, by providing a separate expansion-valve, the point of cut- off is made subject to easy control, and may be adjusted so as to avoid drop or to divide the work as may be desired between the two cylinders.! For this reason it is not unusual to find an expan- sion-valve, as well as a common slide-valve, on the low-pressure cylinder even of tandem engines. In many cases, however, the common slide-valve onlyis used. On the high-pressure cylinder

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| acting ; steam is admitted to the back of the piston only, and the High-| connecting-rod is in compression throughout the whole revolution. speed | Besides simplifying the valves, this has the important advantage single | that alternation of strain at the joints may be entirely avoided, acting} with the knocking and wear of the brasses which it is apt to cause. engin

To secure, however, that the connecting-rod shall always push, there must be much cushioning during the back or exhaust stroke. From a point near the middle of the back stroke to the end the piston is being retarded ; and, as this must not be done by the rod (which would thereby be required to pull),

cushioning must begin there, and the work spent upon the cushion must at every stage be at least as great as the loss of energy on the part of the piston and rod. In some single-acting engines this cushioning is done by compressing a portion of the exhaust steam ; in others the rod is kept in compression by help of a supptementary piston, on which steam from the boiler presses ; in Mr Willans's engine the enshion- ing is done by compressing air.

203. A very successful example of the multiple-cylinder single- Broth

acting high-speed type is the three-cylinder engine introduced by hood

in figs. 128 and 129. Fig. 128 isa longitudinal and fig. 129 a trans verse section. Three cylinders, set at 120° apart, project from 4 closed casing, the central portion of which forms the exhaust The pistons are of the trunk type —that is to say, there is a jot in the piston itself which allows the piston-rod to oscillate, and s0 makes a separate connecting-rod unnecessary. The three rods work on a single crank-pin, which is counterbalanced by masses

1 Or, alternatively, the adjustment may be made so that the steam undergoes ‘ equal changes of temperature in both cylinders.

Mr Brotherhood in 1873, the most recent form of which is show” engin’

fixed to the crank checks on the other side of the shaft. Steam is admitted to the back of the pistons only. It passes first through athrottle-valve, which is controlled by a centrifugal spring-governor (fig. 128), and is then distributed to the cylinders by three piston-

ENGINES. | O15 valves A, worked by an eccentric, the sheave of which is mado hollow so as to overhang one of the main bearings (fig. 128). Release takes place by the piston itself uncovering exhaust ports in the circumference of the cylinder, and the rocking motion of the

Fie. 128,—Brotherhood’’s Three-Cylinder Engine: longitudinal section.

piston-rod is taken advantage of to open a supplementary exhaust port (B, fig. 129), which remains open during a sufficient portion of the back stroke. The flexible coupling C shown in fig. 128, in which the twisting moment of the shaft is transmitted throngh disks of leather, prevents straining of the shaft and bearings through any want of alignment between the shaft of the engine and that of the mechanism it drives. Besides its use as a steam-engine, Mr Brotherhood's pattern has been extensively applied in driving torpedoes by means of compressed air. As a steam-engine it is compounded by placing a high-pressure cylinder outside of and tandem with cach low-pressure cylinder.

204. In other engines of this type a pair of cylinders, or a high and a low pressure cylinder, are set vertically side by side, to work on cranks opposite each othcr. The cranks and connecting-rods are completely enclosed, and are lubricated by dipping into a mixture of oil and water with which the lower part of the casing is filled. In the Westinghouse engine, where there are two vertical cylin- ders to which steam is admitted by a piston-valve, the crank-shaft is situated half a crank's length out of the line of stroke, to reduce the effects of the connecting-rod's obliquity during the working stroke.1 In Mr Willans's latest form of engine the high and low

ressure cylinders are tandem, and the space between the piston orms an intermediate receiver. The piston-rod is hollow, and has a piston-valve in it which controls the admission of steam to the high-pressure cylinder and its transfer to the low-pressure cylinder. The piston-valve within the rod takes its differential motion from an eccentric on the crank-pin. The crosshead is itself a piston working in a cylindrical guide, in which it compresses air as it rises during the back stroke in order to cushion the reciprocating parts."

205. 1n engines for pumping or for blowing air it is not essential to drive a revolving shaft, and in many forms the reciprocating motion of the steam-piston is applied directly or through a beam to produce the reciprocating motion of the pump-piston or plunger. On the other hand, pumping engines are frequently made rotative for the sake of adding a fly-whecl. When the level of the suction water is sufficiently high, horizontal engines, with the pump behind the cylinder and in line with it, are gencrally preferred ; in other cases a beam-engine or vertical direct-acting engine is more common.

Horizontal engines are, however, employed to pump water from any depth by using triangular rocking frames, which serve as bell- crank levers between the horizontal pistou and vertical pump-rods.?

Fig. 180 shows a compound inverted vertical pumping engine of the non-rotative class, by Messrs Hathorn, Davey, & Co. Steam is distributed through lift valves, and the engine is governed by the differential gear illustrated in fig. 107, in conjunction with a cataract, which makes the pistons pause at the end of each stroke. The pistons are in line with two pump-rods, and are coupled by an inverted beam which gives guidance to the crossheads by nieans of an approximate straight-line motion, which is a modification of that of fig. 120. Surface condensers are frequently used with pumping engines, the water which the engine pumps serving as circulating water.

206. In a very numerous class of direct-acting steam-pumps, the Steam-piston and the pump-piston or plunger are on the same piston-rod. In some of these a rotative element is introduced, partly to secure uniformity of motion, and partly for convenience of working the valves ; a connecting-rod is taken from some point

5 oe Engineering, August 13, 1886.

; See “Discussion on High Speed Motors,” Min. Proc. Inst. C.E., Nov. 1885.

For an account of beam and other forms of rotative pumping engines, see a

Paper by Mr Rich, and remarks by Mr J. G. Mair, in Min. Proc. Inst. C.E., April 1884,

Fig, 129.—Brotherhood’s Three-Cylinder Engine: transyerse section.

slotted crosshead fixed to the rod gives rotary motion to a crank- pin gearing into the slot, the line of the slot being perpendicular to that of the stroke. Many other steam-pumps are strictly non-rota- tive. In some the valve is worked by tappets from the piston-rod. In the Blake steam-pump a tappet worked by the piston as it reaches each end of its stroke throws over an auxiliary steam-valve, which

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Fic. 180,—Vertical Non-Rotative Pumping Engine.

admits steam to one or other side of an auxiliary piston carrying the main slide-valve. In Cameron & Floyd’s form one of a pair of tappet-valves at the ends of the cylinder is opened by the piston as it reaches the end of the stroke, and puts one or other side of an auxiliary piston, which carries the slide-valve, into communication with the exhaust, so that it is thrown over. In the Worthington engine—a design which has had much success in America, and is now being introduced in England by Messrs Simpson—two steam cylinders are placed side by side, each working its own pump-piston. The piston-rod of each is connected by a short link to a swinging bar, which actuates the slide-valve of the other steam-cylinder. In this way one piston begins its stroke when the motion of the other is about to cease, and a smooth and continuous action is secured.

207. The Worthington engine has been extensively applied, on a Worth- large scale, to raise water for the supply of towns and to force oil ington In the larger sizes it is engines.

through ‘‘ pipe-lines”’ in the United States. made compound, each high-pressure cylinder having a low-pressure cylinder tandem with it on the same rod. Owing to the lightness of the reciprocating asses, and their comparatively slow accelera- tion, their inertia does not compensate, to any great extent, for the inequality of pressure on the pump-piston that would be caused by an early cut-off in the steam cylinder (see § 186). To meet this difficulty, and make high expansion practicable, an ingen- ious addition has recently been made to the cngine.* A cross- head A (fig. 181) fixed to each of the piston-rods is connected to the piston-rods of a pair of oscillating cylinders B, B, which contain water and communicate with a reservoir full

of air compressed to a pressure of about 300 Ib per square inch. When the stroke (which

4 Min. Proc. Inst. C_E£., 1886, part iv. ; Engineering, August 20, 1886,

The pulso- meter,

Davey’s safety motor,

first forced in, and work is at first done by the main piston-rod, through the compensating cylinders B, B, on the compressed air in the reservoir. This continues until the crosshead has advanced so that the cylinders stand at right angles to the line of stroke. Then for the re- mainder of the stroke the compen- ~~~ sating eylinders assist in driving the main piston, and the compressed air gives out the energy which it stored in the earlier portion. The volume of the air reservoir is so much greater than the volume of the cylinders B, B that the air pressure remains nearly constant throughout the stroke. Any leak- age from the cylinder or reservoir is made good by a small pump which the engine drives. One advantage which this method of equalizing the effort of a steam-engine piston has (as compared with making use of the inertia of the reciprocating masses) is that the effort, when adjusted to be uniform at one speed, remains uniform although the speed be changed, provided the inertia of the recipro- cating parts be small. In the Worthington ‘‘ high-duty” engine, where this plan is in use, the high and low pressure cylinders are each provided with a separate expansion-valve of the rocking- cylinder type, as well as a slide-valve ; the cut-off is early, and the efficiency is as high as in other pumping engines of the best class.

208. Mr Hall’s ‘‘pulsometer” is a peculiar pumping engine without cylinder or piston, which may be regarded as the modern representative of the engine of Savery (§ 6). The sectional view, fig. 182, shows its prineipal parts. There are two chambers A, A’, narrowing towards the top, where the steam-pipe Benters. A ball-valve C allows steam to pass into one of the chambers and closes the other. Steam entering (say) the right-hand chamber forces water out of it past the clack-valve V into a delivery pas- sage D,

whieh is connected with an air- vessel. When the water-level in A sinks so far that steam begins to blow through the delivery-passage, the water and steam are disturbed and so brought into intimate contact, the steam in A is condensed, and a partial vacuum is formed. This causes the ball-valve C to roek over and close the top of A, while water rises from the suc- tiou-pipe H to fill that chamber. At the same time steam begins to enter the other chamber A', discharging water from it, and the same series of actions is repeated in either chamber alternately. While the water is being driven out there is comparatively Fie. 132.—Pulsometer. little condensation of steam, partly because the shape of the vessel does not promote the formation of eddies, and partly because there is a cushion of air betweeu the steam and the water. Near the top of cach chamber is a small air-valve opening inwards, which allows a little air to enter each time a vacuum isformed. When any steam is condensed, the air mixed with it remains on the cold surface and forms a non-con- ducting layer. The pulsometer is, of course, far from effieient as a thermodynamic engine, but its suitability for situations where other steam-pumps cannot be used, and the extreme simplicity of its working parts, make it valuable in certain cases.

209. We have seen that the tendency of modern steam prac- tiee is towards higher pressures, and that this means a gain both in effieiency and in power for a given weight of engine. High pressure, or indeed any pressure materially above that of the atmosphere, is out of the question when engine and boiler are to work without the regular presence of an attendant. Mr Davey has recently introduced a domestie motor which deserves notice from the fact that it employs steam at atmo- spheric pressure. One form of this successful little engine is shown in fig. 133. The boiler—whieh serves as the frame of the engine —is of east-iron, and is fitted with a cast-iron internal fire-box, with a vertical flue which is traversed by a water-bridge. The

Fig. 181.

Fig. 133,—Davey Motor.

takes place in the direetion of the arrow) begins the pistons are at

| walls the shafts project.

| will suffer a periodic increase and diminution of volume, between

cylinder, which is enclosed within the upper part of the boiler, and the piston are of gun-metal, and work without lubrication, Steam is admitted by an ordinary slide-valve, also of gun-metal, worked by an eecentric in the usual way. The condenser stands behind the boiler ; it consists of a number of upright tubes in a box, through which a current of cold water circulates from a supply-pipe at the bottom to an overflow-pipe at the top. In larger sizes of the motor the cylinder stands on a distinct frame, and the boiler has a hopper fire-box, whieh will take a charge of coke sufficient to drive the engine for several hours without attention. About 6 or 7 bof coke are burned per horse-power per hour. 210. From the earliest days of the rotative engine attempts have Rota, | been made to avoid the intermittent reciprocating motion which an eno 3 ordinary piston-engine first produces and then converts into motion of rotation. Murdoch, the contemporary of Watt, proposed an engine consisting of a pair of spur-wheels gearing with one another in a chamber through which steam passed by being carried round the outer sides of the wheels in the spaces between successive teeth,! In a more modern wheel-engine (Dudgeon’s) the steam was admitted by ports in side-plates into the elearance space be- hind teeth in gear with one another, just after they had passed the line of centres. From that point to the end of the are of contaet the clearance space increased in volume; and it was there- fore possible, by stopping the admission of steam at an intermediate point, to work expansively. The difficulty of maintaining steam- tight eonnexion between the teeth and the side-plates on which the faces of the wheels slide is obvious; and the same difficulty has Pw the success of many other forms of rotary engine. These ave been devised in immense variety, in many cases, it would seem, with the idea that a distinct mechanical advantage was to be secured by avoiding the reciprocating motion of a piston.? In point of faet, however, very few forms entirely escape having pleces with reciprocating motion. In all rotary engines, with the exeep- tion of steam turbines, —where work is done by the kinetic impulse of steam,—there are steam chambers which alternately expand and contract in volume, and this

action usually takes place through a more or less veiled reciprocation of working parts. §8o long as engines work at a moderate speed there is little advantage in avoid- ing reciprocation ; the alternate starting and stopping of piston and piston-rod does not affect materially the frictional efficiency, throws no deleterious strain on the joints, and need not disturb the equi- librium of the machine asa whole. The case is different when very high speeds are concerned ; it is then desirable as far as possible to limit the amount of reciprocating motion and to reduce the masses that partake in it. \4 211. A recent interesting and successful example of the rotary Tower's| type is the spherical engine of Mr Beauchamp Tower,' which, like spherice| several of its predecessors,' is based on the kincmatic relations of engine | the moving pieces in a Hooke's joint. Imagine a Hooke's joint, uniting two shafts set obliquely to one another, to be made up of a central disk to which the two shafts are hinged by semicircular plates, each plate working in a hinge which forms a diameter of the central disk, the two hinges being on opposite sides of the disk and at right angles to one another. Further, let the disk and the hinged pieces be enclosed in a spherical chamber through whose As the shafts revolve each of the four spaces bounded by the disk, a hinged piece, and the chamber wall

limits which depend on the angle at which the shafts are set. In Mr Tower's engine this arrangement is modified by using spherieal sectors, each a quarter sphere, in place of semicircular plates, for the pieces in which the shafts terminate. The shafts are set at 135°. Each of the four enclosed cavitics then alters in volume from zero to a quarter sphere, back to zero, again to a quarter sphere, and again back to zero, in a complete revolution of the shafts. In practice the central disk is a plate of finite thickness, whose edge is kept steam-tight in the enclosing chamber by spring-packing, and the sectors are reduced to an extent corresponding to the thickness of the central disk. One shaft is a dummy and runs free, the other is the driving-shaft. Steam is admitted and exhausted by ports in the spherical sectors, whose backs serve as revolving slide-valves. It is admitted to each cavity during the first part of each periodical increase of the cavity's volume. It 1s then cut off and allowed to expand as the cavity further enlarges, and is exhausted as the cavity contracts. If the working shaft, to which the driven mechanism serves as a fly-wheel, revolves unl formly, the dummy shaft is alternately accelerated and retarded. Apart from this, the only reciprocating

motion is the small amount of oscillation which the comparatively light central disk undergoes. ; Another rotary engine of the Hooke’s-joint family is Mr Field- 1 See Farey’s Treatise on the Sieam Engine, p. 676. 2 A large number of proposed rotary engines are described, and their kine- matic relations to one another are discussed, in Reuleaux’s Ainematics of Machinery, translated by Prof. Kennedy. 3 Proc. Inst, Mech. Eng., March 1885. Ss 4 One of these, the disk-engine of Bishop, was used for a time in the printing office of The Times, but was discarded in 1857.

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MARINE ENGINES. |

ing’s,! in which a gimbal-ring and four eurved pistons take the place of the disk. ‘Iwo curved pistons are fixed on each side of the gimbal-ring, and as the shafts revolve these work in a correspond- ing pair of cavities, which may be called curved cylinders, fixed

to each shaft. A 212. Attempts have been made from time to time to devise

steam-engines of the turbine class, where rotation of a wheel is pro- duced either by reaction from a jet of escaping steam or by impact of a jet upon revolving blades. A revolving piece which is to extract even a respectable fraction of the kinetic energy of a steam jet must move with excessive velocity. In Mr C. A. Parsons’s steam-turbine this difficulty is overcome and a moderate degree of efficiency is secured by using a series of central-flow turbine wheels, in the form of perforated disks, all on one shaft, with fixed disks between which are perforated to serve as guide-blades. Steam

asses from end to end of the series, giving up a small portion of its energy to each, but retaining little at the end.

XII. Marine ENGINES,

213. The early steamers were fitted with paddle-wheels, and the engines used to drive them were for the most part modified beam-engines. Bell's "Comet" (§ 21) was driven by a species of inverted beam-engine, and another form of inverted beam, known as the side-lever engine, was for long a favourite with marine engineers. In the side-lever engine the cylinder was vertical, and the piston-rod pro- jected through the top. From a crosshead on the rod a pair of links, one on each side of the cylinder, led' down to the ends of a pair of horizontal beams or levers below, which oscillated about a fixed gudgeon at or near the middle of their length. The two levers were joined at their other ends by a crosstail, from which a connecting- rod was taken to the crank above. The side-lever engine is now obsolete.

In American practice, engines of the beam type, with a braced-beam supported on A frames above the deck, are still common in river-steamers and coasters.

914, An old form of direct-acting paddle-engine was the steeple-engine, in which the cylinder was set vertically below the crank. Two piston-rods projected through the top of the cylinder, one on each side of the shaft and of the crank. They were united by a crosshead sliding in vertical guides, and from this a return-connecting-rod led to the crank.

215. Modern paddle-wheel engines are usually of one of the following types. (1) In oscillating cylinder engines

- the cylinders are set under the crank-shaft, and the piston-

rods are directly connected to the cranks. The cylinders are supported on trunnions which give them the necessary freedom of oscillation to follow the movement of the crank. Steam is admitted through the trunnions to slide-valves on the sides of the cylinders. In some instances the mean position of the cylinders is inclined instead of vertical; and oscillating engines have been arranged with one cylinder before and another behind the shaft, both pistons working ononecrank. The oscillating cylinder type is best adapted for what would now be considered comparatively low pres- (2)

Diagonal engines are direct-acting engines of the ordinary connecting-rod type, with the cylinders fixed on an inclined bed and the guides sloping up towards the shaft.

216. When the screw-propeller began to take the place of paddle-wheels in ocean-steamers, the increased speed which it required was at first supplied by using spur-wheel gearing in conjunction with one of the forms of engines then usual in paddle steamers. After a time types of engine better suited to the screw were introduced, and were driven fast enough to be connected directly to the screw-shaft. The smallness of the horizontal space on either side of the shaft formed an obstacle to the use of horizontal engines, but this difficulty was overcome in several ways. In Penn's trunk-engine, still used in the

Atin, Proc. Inst. C.#., November 1885,

navy, the engine is shortened by attaching the connecting- rod directly to the piston, and using a hollow piston-rod, called a trunk, large enough to allow the connecting-rod to oscillate inside it. The trunk extends through both ends of the cylinder and forms a guide for the piston. It has the drawback of requiring very large stuffing-boxes, of wasting cylinder space, and of presenting a large surface of metal to alternate heating by steam and cooling by con- tact with the atmosphere. The use of high-pressure steam is likely to make the trunk-engine obsolete.

217. The return-connecting-rod engine is another hori- zontal form much used in the navy. It is a steeple-engine placed horizontally, with two, and in some cases four, piston-rods in each cylinder. The piston-rods pass clear of the shaft and the crank, and are joined beyond it ina guided crosshead, from which a connecting-rod returns.

Ordinary horizontal direct-acting engines with a short stroke and a short connecting-rod are also common in war- ships, where the horizontal is frequently preferred to the vertical type of engine for the sake of keeping

the machinery below the water-line. In horizontal marine engines the air-pump and condenser are generally placed on the oppo- site side of the shaft from the cylinder, which balances the weight and allows the air-pump to be driven direct.

218. In merchant ocean-steamers one general type of en- gine is universal, and the same type is now to an increasing extent adopted in naval practice. This is the inverted verti- cal direct-acting engine, generally with two or more cylinders placed side by side directly over the shaft. In exceptional cases a single cylinder has been used, with a fly-wheel on the shaft. Two, three, and four cylinders are common.

The most usual form of existing marine engine is the two- eylinder eompound arrangement, with cranks at right angles or nearly at right angles, of which figs. 135, 136, 187 (pp. 518-20) show a characteristic example (the engines of the s.s. ‘‘Tartar,” by Messrs John & James Thomson, Glasgow).

Fig. 135 is an end elevation, fig. 186 a longitudinal section through the centre of the engines, and fig. 187 a thwart-ship section through the condenser and air-pump. The cylinders are 50 and 94 inches in diameter, and the stroke is 5 feet. Both eylinders are fitted with liners, and are steam-jacketed. Double-ported slide- valves are used on both, and the high-pressure valve has a relief- ring. The crosshead guides are fitted on the side on which the

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hollow box behind the guiding surface, and cold water is kept circulating in this to prevent the guides from heating.

a The crank-shaft is of Vicker’s Zi” lj

steel, 174 inchesin diameter. The eondenser is in the place it usually has in engines of this type,— in the lower part of the back frame, with its tubes running horizon- tally from end to end of the engine. There are 1400 tubes, of 1 inch diameter and 14 inch pitch. The air-pumps are of the single- acting bucket kind, and are driven by a lever from the erosshead. Centrifugal

circulating pumps are used, driven by a pair of independent small vertical engines. The link-motion is worked by steam starting and reversing gear, which appears on the left side of the engine in fig. 185. These engines work with a boiler pressure of 90 tb, and indicate 3560 horse-power. Fig. 134 shows, on @ larger scale, the piston packing, which consists of a pair of floating rings, pressed out by a spiral spring behind them.

219. Two other arrangements of double compound (as distin- guished from triple-expansion) marine engines of the inverted vertical type require notice. One is the tandem arrangement, largely adopted in the steamers of the ‘‘ White Star” line. In these each crank is operated by an independent pair of eompound cylinders, the high-pressure eylinder being on top of the low-pressure eylinder, with one piston-rod common to both. The valves of both are worked by a single pair of eccentrics with a link-motion ; the valve-rod of the low-pressure cylinder extends through the top of its valve-chest, and is joined either directly or by a short lever with the valve-rod of the high-pressure eylinder. Generally two pairs of tandem cylinders are placed side by side, one pair abaft the other, to work on cranks at right angles, In exceptionally large engines three pairs have been used, working ou

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Fig. 134,—Piston Packing.

Trunk engiues.

Return- connect- ing-rod engines.

Horizon-

tal direct-

acting engines.

Inverted vertical engines,

Example.

Tandem vertical engines.

Three- cylinder arrange- ment.

Triple- expan- sion engines.

cranks 120° apart,! an arrangement greatly superior to that of two cranks in uniformity of effort on the shaft. To facilitate removing the pistons from the cylinders, the large cylinder has in some cases been set above the other.

220. The other arrangement of double compound marine engine has three cylinders set in line fore aud aft. The middle one is the high-pressure cylinder ; the other two receive steam from it, and form together the equivalent of one large low-pressure cylinder. The three work on cranks at 120° apart. Besides securing the advantage in uniformity of effort which three cranks have over two, this form avoids the use, in very powerful engines, of a low- pressure cylinder of excessive size. On the other hand, the three- cylinder form takes up more space, and has a larger number of working parts. In the most powerful engines that have yet been constructed this three-cylinder arrangement is followed. The “Umbria” and ‘‘ Etruria” have a 71-inch high-pressure cylinder between two 105-inch low-pressure cylinders, with a stroke of 6 feet. These engines, which were built just before the introduction of triple expansion, are supplied with steam at a pressure of 110 Ib by gauge, and indicate 14,300 horse-power.

In this and in the ordinary two-cylinder form of marine engine, the low-pressure valve-chest and the casing of the engine be- tween the cylinders form an intermediate receiver for the steam.

221. During the last two or three years a great advance has taken place in marine engineering by the general introduction of triple-expansiou engines, and by an increase in steam pressure which the system of triple expansion makes practicable. In 1874 the steamer ‘‘ Propontis” was fitted with a set of three-crank triple-expansion engines, de- signed by Mr A. C. Kirk. The experiment was prevented from being fully successful by the failure of the boilers, which were of a special type. Another experiment with triple engines in the yacht ‘‘Isa” in 1877 prepared the way for their application to regular ocean service. In 1882 the steam- ship ‘‘Aberdeen,” with triple

engines, de- signed by Mr Kirk, to work with steam of 125 ib pressure, supplied from double-ended steel boilers of the ordinary marine type, demon- strated the advantage and safety of the system. Since then its use has become general in new steamers, and in many cases the older double engines are being removed to give place to engines of the triple-expansion type, with the effect of reducing the consumption of coal by about 25 per cent.?

222. In the most common ar- rangement of triple-expansion |)# engines three cylinders are ranged in line, fore and aft, working on cranks at 120° apart. Piston-valves are generally pre- ferred, and these are not un- cominonly worked by some form of radial valve-gear instead of the ordinary link-motion. An advantage of this is that the space which would be taken up by eccentrics upon the shaft is saved, and longer main bearings are in consequence possible, without spreading the engines in the fore-and-aft direction. An objectionable feature of the three-cylinder triple engine is its length; on the other hand, the high speed and high pressure which are features of modern practice make long bearings indis- pensable,

1 See description of the engines of the ‘‘ City of Rome,” with three 46-inch and three 86-inch cylinders, with a stroke of 6 feet, working up to 11,890 I. H. P., Proc. Inst. Mech. Eng., 1880. 3

2 The rapid progress of the system of triple expansion may be judged from the fact mentioned by Mr W. Parker of Lloyds in a recent paper (Engineering, July 30, 1886), that, out of 199 engines then being built for merchant steamers, 128 sets were of the triple-expansion type. For war- ships also triple engines are bmn mt bee up to aver “ipod nic no For a discussion of several import-

nt points in the design of triple-expansion engines, see r by R. i Proc. Inst. Mech. Eng., Oct. 1886, r ae ane

STEAM-ENGINE

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223. To avoid the length of the three-crank engine, Mr Brock and others have made engines of the triple-expansion type with _ two cranks, by putting the high and the intermediate pressure cylinders above and tandem with two low-pressure cylinders. Mr

Brock has also built daurieylindbe quadruple-expansion Qyaq.

working with the same pressure of steam.

224. Steam-jackets are retained by some but not by all builders ; where they are employed the boiler steam is usually reduced in pressure before admission to the intermediate and low-pressure cylinder jackets and to the receiver-jackets. The feed-water is frequently heated to about 200° F. by Weir's plan of condensing in it, by common injection, a quantity of steam taken from the second receiver; this has the advantage of freeing it of air, and of preventing local chilling in the boiler. In present-day prac- tice the boiler pressure, for a triple- expansion engine, ranges from 120 to 170 tb per square inch (by gauge), and it does not appear that any material increase of this is possible without a complete de- parture from the present type of marine boiler, On the other hand, with- out a material increase of pressure there is little advantage in quadruple expansion.

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mest i marine engines by S. Hall sers, in 1831, but was not brought into general use until much later. Pre- vious to this it had been necessary, in order to avoid the accumulation of too dense brine in the boiler, to blow off a por-

Fig. 135,—End Elevation of Marine Engine.

tion of the brine at short intervals and replace it by sea water, a process which of course involved much waste of heat. By the use of surface condensers it became possible to use the same portion of water over and over again. The very freedom of the condensed water from dissolved mineral substances was for a time an obstacle to the adoption of surface

condensers, for it was found that the boiler, no longer protected by a deposit of scale, became rapidly corroded through the action of acids formed by the decomposition of the lubricating oil. This objection was overcome by introducin

a sufficient amount of salt watcr to allow some scale to form, an

the use of surface condensers soon became universal on steamers plying in sea water. The marine condenser consists of a multitude

engines of a similar form (with two cranks), and esti- rypla. mates that they show an economy in coal consumption Pansion | of 5 per cent. as compared with triple-expansion engines engines, |

225. Surface condensa- Surface tion was introduced in conden

ENGINES. |

of tubes, generally of brass, about # of an inch in diameter. Through these cold sca-water is made to circulate, while the steam is brought into contact with their outside surfaces. In some cases, especially in Admiralty practice, cold water circulates outside the tubes and the steam passes inside.

226, The ordinary marine engine has four pumps:—the air-pump, which is made large enough to serve in case injection instead of surface-coudensation should at. any time be resorted to; the feed- pump; the circulating-pump, which maintains a current of sea- water through the tubes of the condenser; and the bilge-pump, which discharges any water accumulated by leakage or otherwise in the bilge of the ship. The pumps are so arranged that in the event of a serious leak the circulating-pump ean also draw its sup- ply from the bilge. In most engines, especi-

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over 1000 feet per minute. The economy in coal consumption brought about by the change from double-expansion engines work- ing at (say) 80 Ib to triple engines at 160 Ib or more is variously estimated at from 18 to 25 per cent. Much of this is due simply to the increased range of temperature through which the working substance is carried ; but it appears that the actual performance of the triple engine is better than that of the double compound ina ratio greater than that by which its ideal efficiency—as an engine using a wider range of temperature—exceeds that of the other; and this is to be ascribed to the same causes as i have been already dis- | cussed in speaking of the advantage of the compound over the simple engine. Apart from its greater eco- nomy of coal, the triple engine owes some of its practical success to the mechanical superiority of three driving cranks over two.

ally those of less re- cent construction, the four pumps are placed.

228. The relation of Relation weight of machinery of weight to power developed, to power.

behind the condenser, and are worked by a single crosshead driven by a lever, the other end of which is con- nected by a short link with one of the cross- heads of the engine. It is now becoming common to usea smal! engine, distinct from the main engine, to drive the feed-pump, and to supply circulat- ing water by a centri- fugal pump also driven by a separate engine. 227. Inthe improve- ment of the marine en- gine two points are note- worthy,—reduction in the rate of consump- tion of cval per horse- ower, and reduction in the weight of the machine (comprising the engine proper and the boilers) per horse- power. The second consideration isinsome cases of even more moment than the first, especially in war-ships. Progress has been made, in both respects, by increase of steam pressure, and, in the second respect espe- cially, by increase of piston speed. Fifty years ago the boilers of marine engines made steam at a pressure of about 5 Ib per square inch above that of the atmosphere. By 1860 compound engines were in use with pressures ranging from 25 to 40 tb. In 1872 statistics collected for nineteen ocean steamers showed that the average con- sumption of coal was then 2°11 tb per H.P. per hour, the boiler- pressure 45 to 60 Ib, and the mean piston speed about 375 feet per minute.’ These were for the most part two-

cylinder compound engines of the vertical inverted type. Nine years later statistics for thirty engines of the same type showed a consumption of 1°83 Tb of coal, a mean boiler pressure of 774 tb, and a mean piston speed of 467 ~ feet per minnte.? In recent triple-expansion engines the pressure is as hgh as 165 Ib; a piston speed of 700 or 800 feet per minute is not uncommon in naval engines, and in some cases it has risen to

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1 Sir F. J. Bramwell, Proc, Inst. Mech. Eng., 1872. 2 F.C. Marshail, Proc. Jnst. Mech. Eng., 1881.

Fig. 136.—Longitudinal Section of Marine Engine.

and the causes which ® affect this ratio, have p, receutly been discussed ‘ by Messrs Marshalland $ Weighton,*from whose paper the following figures are taken. Be- » fore the introduction of triple expansion and forced draught the weight of engines in the mercantile marine, including the boilers and the water in them, was 480 tb per I.H.P. In the navy this was reduced, chiefly by the use of lighter framing, with the object of minimizing weight, to 3601b. Triple-engines of the merchant type, without forced dranght, areonly slightly lighter than double engines ; but in naval practice, where forced draught, greatly increased speed, and the nse of steel for frames and working parts have combined to reduce the ratio of weight to power, a marked reduction in weight is apparent. A recent set of vertical triple engines, whicli with natural draught indicate 2200 H.P., and with a draught forced by pressure in the stokehole equal to 2 inches of water indi- cate 4000 H.P., weigh under the latter condi- tion (along with the boilers) only 155 tb per I.H.P. In another set, in which the draught is forced by a pres- sure of 3 inches, and the cylinders are only 153, 24, and 37 inchies in diameter, with a stroke of 16 inches, the indicated horse-power is 4200, and the weight of engines and boilers is 136 tb per I.H.P. In these the boilers are of the locomotive type, and the mean piston speed is 1066 feet per minute. Even these light weights are sur- passed in smaller engines, such as those of torpedo boats. In so far as this immense development of power from a small weight of machinery is duc to high piston speed, it is secured without loss —indeed with some gain—of thermodynamic efficiency ; forced

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draught, however, without a corresponding extension of the heating el ma ee A a A Se

3 Marshall and Weighton, Proc. North-East Coast Jnst. Engineers and Ship-butiders, 1886. Loc, cit.

Loco- motive engines.

Driving- wheels.

Inside and outside cylinder engines,

520

surface, leads to a less efficient expenditure of fuel. With a given type of engine there is a certain ratio of expansion which gives a minimum in the ratio of weight to power ; when this ratio of expan- sion is exceeded the engines have to be enlarged to an extent that

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Fia. 137.—Section through Condenser and Air-Pump.

more than counterbalances the saving in boiler weight; when a less ratio of expansion is used the boilers have to be enlarged to an extent that more than counterbalances the reduction of weight in the engine proper.!

XIII. Locomotrvz Enatnes.

229. The ordinary locomotive consists of a pair of direct acting horizontal or nearly horizontal engines, fixed in a rigid frame under the front end of a boiler of the type described in § 133, and coupled to the same shaft by cranks at right angles, each with a single slide-valve worked by a link-motion, or by a form of radial gear. The engine is non-condensing, except in special cases, and the exhaust steam, delivered at the base of the funnel through a blast-pipe, serves to produce a draught of air through the furnace. In some instances a portion of the exhaust steam, amounting to about one-fifth of the whole, is diverted to heat the feed-water. In tank engines the feed-water is carried in tanks on the engine itself ; in other engines it is carried behind in a tender.

230. On the shaft are a pair of driving-wheels, whose frictional adhesion to the rails furnishes the necessary tractive force. In some engines a single pair of driving- wheels are used ; in many more a greater tractive force is secured by having two equal driving-wheels on each side, connected by a coupling-rod between pins on the outside of the wheels. In goods engines a still greater proportion of the whole weight is utilized to give tractive force

by coupling three and even four wheels on each side. These arrangements are distinguished by the terms “ four- coupled,” ‘‘six-coupled,” and “ eight-coupled ” applied to the engines. In inside-cylinder engines the cylinders are placed side by side within the frame of the engine, and their connecting-rods work ou cranks in the driving shaft. In outside-cylinder engines the cylinders are spread apart far enough to lie outside the frame of the engine, and to work on crank-pins on the outsides of the driving wheels. This dispenses with the cranked axle, which is the weakest part of a locomotive engine. Owing to the frequent

10n the general subject of marine engines, reference should be made to Mr A. E, Seaton’s Manual of Marine Engineering ; to Mr R. Sennett’s Treatise on the Mar- tne Steam Engine; andto Mr W.H. Maw’s Recent Practice in Marine Engineering.

alternation of strain to which it is subject, a locomotive crank axle is peculiarly liable to rupture, and has to be removed after a certain amount of use.

In some locomotives the leading wheels are coupled to Ip J driving wheels behind them, but it is now generally pre- whee || ferred to have under the front of the, engine two or four smaller wheels which do not form part of the driving | system. These are carried in a bogie, that is, a small truck 4 upon which the front end of the boiler rests by a swivel- pin or plate which allows the bogie to turn, so as to adapt itself to curves in the line, and thus obviate the grinding of tyres and danger of derailment which would be caused — by using a long rigid wheel-base. The bogie appears to have been of English origin ;? it was brought into general use in America, and is now common in English as well ag in American practice. Instead of a four-wheeled bogie,

a single pair of leading wheels are also used, carried bya Bissel pony truck, which has a swing-bolster pivoted by a Pony radius bar about a point some distance beliind the axis of truck, the wheels. This has the advantage of combining lateral with radial movement of the wheels, both being required if the wheel base is to be properly accommodated to the curve. Another

method of getting lateral and radial Radial freedom is the plan used by Mr Webb of carrying the axle leading axle in a box curved to the arc of a circle, and free to slide laterally for a short distance, under the con- trol of springs, in curved guides.®

231. In inside-cylinder engines the slide-valves are fre- Valves, quently placed back to back in a single valve-chest between the cylinders. The width of the engine within the frame leaves little room for them there, and they are reduced to the flattest possible form, in some cases with split ports, half above and half below a partition in a central hori- zontal plane. In some of Mr Stroudley's engines the valves are below the cylinders, with faces sloping down towards the front, while the cylinders themselves slope slightly up. In many engines the valves work on hori- zontal planes above the cylinders ; this position is specially suitable when Joy's or some other form of radial gear is used instead of the link-motion. Radial valve-gears have the advantage, which is of considerable moment in inside-cylinder engines, that the part of the shafts' length which would otherwise be needed for eccentrics is : available to increase the width of main bearings and crank-pins, and to ! strengthen the crank-cheeks. Wal- | shaert's gear is very extensively used on Continental locomotives, and Joy's ! % has now been applied toa large num- 4 ber of British engines. tp

232. In a powerful locomotive of '— the ordinary type the cylinders are 17 to 19 inches in diameter, with a stroke of about 26 inches. 'The steam pressure is 130 to 175 hb. The horse-power ranges up to about 700. A passenger engine for express | service has driving-wheels from 7 to i 8 feet in diameter, and weighs, with- out the tender, about 40 tons. Of this nearly 15 tons is borne by each + driving axle.4 i

Fig. 138 shows a half section } through the smoke-box and one cyl- F inder of an inside-cylinder engine (of the Midland Railway), and illustrates how in an engine of

Tnside-

1G. 188.—Inside-Cylinder eylinder | Loeomotive. engine,

2 Min. Proc. Inst. C.E., vol. liii. 8, p. 50. 3 Proc. Inst. Mech, Eng., 1883. 4 For aceount of many details in recent English practice in locomotive building, reference should be made to a valuable paper by Mr Stroudley, and a discus-

sion upon it (Afin, Proc. Inst. C. E., 1xxxi.).

this type the cylinders are situated with regard to the frame, which consists of a single pair of steel plates, ex- tending from end to end and united by other transverse plates, one of which, called the motion-plate, gives support to the guide-bars, and another holds the draw-bar. Another form of frame is built up of two longitudinal plates on each side. In the engine illustrated the valves are above the cylinders, and are worked by Joy's gear. A bogie truck ap- pears in section below the engine. S is the steam-pipe, and B the blast-pipe, which is tapered in the fore-and-aft plane. 933. The outside-cylinder type is adopted by several British makers; in America it is universal. There the cylinders are in castings which are bolted together to form a saddle on which the bottom of the smoke-box sits. The slide-valves are on the tops of the cylinders, and are worked through rocking levers from an ordi- nary link-motion. Other features by which American practice is dis- tinguished are the use of bars in- stead of plates for the frames, of cast-iron wheels with chilled rims instead of wrought-iron wheels with 5 steel rims shrunk or forced on, and : steel fire-boxes and wrought-iron ; tubes instead of copper fire-boxes ; and brass tubes. Fig. 139, which is a half section through one cyl- inder of an American locomotive, by the Balwin Company of Phila- delphia, shows the position of the cylinders and valves. 234. Locomotive engines have been compounded in

Fic. 139.—American Outside- Cylinder Locomotive.

several ways. In 1876 M. A. Mallet! introduced, on the Bayonne and Biarritz Railway, a type of compound loco- motive in which one small

high-pressure cylinder and one large low-pressure cylinder were used in place of the two equal cylinders of a common locomotive. Outside cylinders were used in the first instance, but Mallet's system is also applied to inside-cylinder engines. The pipe from the high to the low-pressure cylinder takes a winding course through the smoke-box ; this gives a sufficient volume of intermediate receiver, and also dries the steam before it enters the large cylinder. A reducing valve is provided through which steam of a pressure lower than that of the boiler can be admitted direct to the low-pressure cylinder to facilitate starting. The reversing gear is arranged to act on both cylinders by one movement, and also to permit a separate adjustment of the cut-off in each. Engines on Mallet's system have been successfully used on other Con- tinental railways and in India, in some instances by con- version from the non-compound form.? His plan has the advantage of permitting this (in certain cases), and of re- quiring scarcely any more working parts than are needed in a common locomotive ; but it gives an unsymmetrical engine. He has also proposed an engine with four cylinders,—one high-pressure cylinder tandem with one low-pressure cylinder on each side. Another symmetrical form has been used, in which a pair of outside high- pressure cylinders are compounded with a pair of inside low-pressure cylinders.

235. The most important experiment yet made in the compounding of locomotives is that which Mr F. W. Webb, of the London and North-Western Railway, has been conducting on a large scale since 1881.3 In Mr Webb's

system three cylinders are used. Two equal high-pressure

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Fie. 140.—Webb's Compound Locomotive.

cylinders are fixed outside the frames, and drive the rear driving axle by crank-pins at right angles to one another. A single low-pressure cylinder of very large size is set beneath the smoke-box, and drives a crank in the middle of the forward driving axle. The driving axles are not coupled, and the phase-relation of the low-pressure to the high-pressure stroke is liable to alter through unequal slip on the part of the wheels, This, however, is of no material consequence, on account of the large size of the intermediate receiver and the uniformity with which the two high-pressure cylinders deliver steam to it. The receiver is formed, as in M. Mallet's arrangement, by lead- ing long connecting pipes through the smoke-box. All three slide-valves are worked by Joy's gear. Those of the low-pressure cylinders are placed below the cylinders (an arrangement which has the advantage of letting the valve fall away from the port-face when the engine is running down hill with the steam-valve closed); the valve of the large cylinder is above it. The arrangement is completely symmetrical ; it has the important mechanical advantage of dispensing with coupling rods, while retaining the

greater tractive power of four drivers; only one axle is cranked, and that with a single crank in the centre, which leaves ample room for long bearings. A plan of Mr Webb's engine, half in section, is given in fig. 140. The results of Mr Webb's experiments have been, in his judg- ment, so satisfactory that for express passenger service he is now building engines only of the compound type. In some recent examples the small cylinders are 14 inches, and the large cylinder 30 inches in diameter, with a stroke of 24 inches, and the boiler pressure is 175 ib. Engines of the same type are also being introduced in India, South America, and the continent of Europe.

236. Experiments on the saving of fuel by compound- ing locomotives point to an economy of from 10 to 20 per cent. It may be expected, for reasons which have been discussed above, that a compound engine, even when working at the high speed of a locomotive, will have a somewhat higher efficiency than a non-compound engine,

1 Proc. Inst. Mech, Eng., 1879.

2 Von Borries, Ztschr. des Ver. deutscher Ingenieure, 1880; Sandiford, Proc. Inst. Mech. Eng., 1886.

3 See Proc. Inst. Mech. Eng., 1883 ; also Engineering, May 1885,

XXIT. — 66

Com- pound loco- motives

Webb’s system.

Tramway

loco- motives.

Fireless loco- motive.

522

But, apart from this, an important merit of the compound system is that, while it absolutely prevents the grade of expansion from being reduced below a certain minimum, depending on the ratio of cylinder volumes, it also permits a comparatively high degree of expansion, which in an ordinary locomotive would involve the use of specially large cylinders and a separate cut-off valve. Experiments on the steam-jacketing of locomotive cylinders have not hitherto been attended by success.

237. Tramway locomotives for the most’ part resemble railway locomotives in the general features of their design. The boiler is of the usual locomotive type. A pair of cylinders in front, either inside or outside the frames, are connected directly to the hindmost of two coupled driving axles. Owing to the smallness of the driving-wheels, the axles lie near the road, and the cylinders are set sloping at a considerable angle upwards to keep them clear of dirt. To prevent the discharge of steam into the atmosphere, the exhaust steam is often led into an atmospheric con- denser, consisting of a large number of pipes set on the top of the engine, and exposed to free contact with the air. In some instances the common locomotive type is widely departed from: a mixed vertical and horizontal boiler is used, and the engine is connected to the driving axle by worm-wheel or other gear, or by a rocking lever between the connecting-rod and the crank.!

238. In the “ fireless ” tramway locomotive of M. Léon Francq, a reservoir which takes the place of an ordinary boiler is charged at the beginning of the journey with water heated under pressure by injecting steam from stationary boilers at a pressure of 15 atmospheres. The thermal capacity of the water is sufficient—without further addition of heat—to supply steam to the engine during the journey, at a pressure which gradually falls off.2. The system has not come into general use.

239. Several forms of tramway engine have been devised in which the motive power is supplied by compressed air.® In the Mekarski system the compressed air, on its way from the reservoir to the cylinders, passes through a vessel containing hot water and steam under pressure (charged, as in Francq’s system, by injecting steam at a station). In this way the air is heated, and may then expand in the

by Mr R. W. Thomson’s plan of surrounding each wheel

with a thick tyre of india-rubber, protected on the outside

by an armour of small plates. In most modern traction- engines the rim is itself rigid, but is connected to the nave through a system of springs which allow it to take up an eccentric position, and the tyres have skew bars on the surface to increase their adhesion to the road.

XIV. Arr AND Gas ENGINES.

[AIR AND Gag

241. Under this head we may include all heat-engines Aira;

in which the working substance is air, or the gaseous pro-gas_ | ducts of the combustion of fuel and air, whether the fuel gine

be itself solid, liquid, or gaseous. When air alone forms the working substance, it receives heat from an external furnace by conduction through the walls of a containing vessel, as the working substance in the steam-

engine takes in heat through the shell of the boiler. An engine sup- plied with heat in this way may be called an external- combustion engine, to distinguish it from a very important class of engines in which the combustion which supplies heat occurs within a closed chamber containing the work- ing substance. The ordinary coal-gas explosive engine is the most common type of ¢nternal-combustion engine.

242. Compared with an engine using saturated steam, air and gas engines have the important advantage that the temperature and the pressure of the working substance are independent of one another. Hence it becomes pos- sible to use an upper limit of temperature greatly higher than in the ordinary steam-engine, and if the lower limit is not correspondingly raised an increase of thermodynamic efficiency results. It is true that the same advantage might be obtained in the case of steam, by excessive super- heating; but this would mean substantially the conversion of the engine into the type we are now considering, the working substance being then steam gas.

243. A simple, thermodynamically perfect form of external- combustion air-engine would be one following Carnot's cycle (§ 40), in which heat is received while the air is at the highest tempera- ture 7,, the air meanwhile expanding isothermally. After this the supply of heat is stopped, and the air is allowed to expand adia- batically until its temperature falls to the lower extreme 7» At this it is compressed isothermally, giving out heat, and finally the cycle is completed by adiabatic compression, which restores the initial high temperature 7.

cylinder without having its temperature lowered to an

mer , iabati i ing the Stirlin objectionable degree. 244. In place of adiabatic expansion as a means of changing the ptiring |

temperature from 7, to rz we may follow Stirling's plan (§ 54) of air-

Traction engines.

240. Steam road-locomotives or traction-engines have usually a boiler of the locomotive type, with a cylinder or compound pair of cylinders,

generally on the top, driving a shaft from which motion is taken by a gearing chain or spur-wheels toa single driving axle at the fire-box end. The engine is steered by means of a leading axle, whose direction is controlled by a hand-wheel and chain-gear. To facilitate rapid turning the driving-wheels are connected to their axle by a differential or compensating gear which allows them to revolve at different speeds. This is a set of four bevel-wheels like White's dynamometer coupling : the outside bevel-wheels are attached to the driving- wheels ; the intermediate ones, which gear with these, turn in bearings in a revolving wheel driven by the engine. So long as both driving-wheels are equally resisted both are driven at the same speed, but if one is retarded (as the inner wheel is in turning a curve) it acts to some extent as a fulcrum to the bevel gear, and the outer wheel takes a greater share of the motion. An important feature in traction engines is the elasticity of the driving-wheels. Many devices have been employed, partly to give the wheels an extended tread, or arc of contact with the ground, and partly to avoid shocks in passing overrough ground. Both objects are accomplished

1 See Min. Proc. Inst. C.E., vol. xxix., 1884; also Proc. Inst. Mech. Eng., 1880. 2 Proc. Inst. Mech. Eng., 1879. 3 Proc. Inst. Mech. Eng., 1878, 1881.

storing the heat in a re- engine. ||

generator, from which it will afterwards be taken up and so produce the elevation of temperature from 2 to 7, which in the above cycle was per-formed by adiabatic com- pression.

Stirling's air-engine, in which the action approximated to the perfect cycle described in § 54, is diagramatic- ally shown in fig. 141. A is a closed vessel containing air, externally heated by a furnace beneath it. A pipe from the top of A leads to the working cyl- inder B. At the top of A isa refr-gerator C, consisting of pipes through which cold water circulates. In there is a displacer plunger D, which is driven vy the engine; when this raised the air in A is heated, whereas when D is lowered the air in A is brought into contact with the refriger- ator and cooled. On its way from the bottom to the top of A, or vice versa, the air must pass through an annular lining of wire-gauze BE. This is the regenerator. At the beginning of the cycle D is up.

The air is then receiving heat at 7,, and is expanding isothermally; this is the first stage in § 54. Then the plunger D descends. The at

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Engine.

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is driven through the regenerator, where it deposits heat, and its —

temperature on emerging at the top is tz. Next, the working:

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on.

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ENGINES. |

piston makes its down-stroke (in the actual engine the working cylinder was double-acting, another heating vessel, precisely like A, being connected with the cylinder B above the piston); this com- presses the air isothermally, the heat produced by compression being taken up by C. Finally the plunger is raised, and the working air again passes through the regenerator, taking up the -heat it left there, and rising tor, The theoretical indicator diagram has been given in fig. 13.

245. The actual forms in which Stirling's engine was used are described in two patents by R. & J. Stirling (1827 and 18401). An important feature in them was that the air was compressed (by means of a pump) to a pressure greatly above that ~~of the atmo~~ sphere. Stirling's cycle is theoretically perfect whatever the density

of the working air, and compression did not in his case increase what

may be called the theoretical thermodynamic efficiency. It did, however, very greatly increase the mechanical efficiency, and also, what is of special importance, it increased the amount of power yielded by an engine of given size. To see this it is sufficient to consider that with compressed air a greater amount of heat was dealt with in each stroke of the engine, and thercfore a greater amount of work was produced. Practically it also increased the thermodynamic efficiency by reducing the ratio of the heat wasted by external conduction and radiation to the whole heat.

A double-acting Stirling engine of 50 I.H.P., used in 1848 at the Dundee foundry, appears to have realized an efficiency of 0°8, and, notwithstanding very inadequate means of heating the air, con- sumed only 1°7 fb of coal per J.H.P. per hour.? This engine re- mained at work for three years, but was finally abandoned on account of the failure of the heating vessels. In some forms of Stirling's engine the regenerator was a separate vesscl; in others the plunger D was itself constructed to serve as regenerator by filling it with wire-gauze and leaving holes at top and bottom for the passage of the air through it.

246. Another mode of using the regenerator was introduced in America by Ericsson, in an engine which also failed, partly because the heating surfaces became burnt, and partly because their area was insufficient. In Ericsson's engine the temperature of the working substance is changed (by passing through the regenerator) while the pressure remains constant. Cold air is compressed by a pump into a receiver, from which it passes through a regenerator into the working cylinder. In so passing it absorbs heat from the regene- ratorand expands. The air in the cylinder is then further expanded by taking in heat from a furnace under the cylinder. The cycle is completed by the discharge of the air through the regenerator. The indicator diagram approximates to a form bounded by two isother- mals and two lines of constant pressure.

247. Externally-heated air-engines are now employed only for very small powers—from a fraction of 1 H.P. up to about 3 H.P. Powerful engines of this type are impracticable on account of their relatively enormous bulk. Those that are now manufactured resemble the original Stirling engine very

closely in the main features of their action, and comprise essentially the same organs.

248. Internal-combustion engines form a far more important class of motors. The earliest example of this class appears to have been the hot-air engine of Sir George Cayley,® of which Wenham's® and Buekett's' engines are recent forms. In these engines coal or coke is burnt under pressure in a closed chamber, to which the fuel is fed through a species of air-lock. Air for combustion is supplied by a compressing pump, and the engine is governed by means of a distributing valve which supplies a greater or less proportion of the air below the fire as the engine runs slow or fast. The products of combustion, whose volume is increased by their rise in tempera- ture, pass into a working cylinder, raisiug the piston. When a certain fraction of the stroke is over the supply of hot gas is stopped, and the gases in the cylinder expand, doing more work and becoming reduced in temperature. During the return stroke they are discharged into the atmosphere, and the pump takes in a fresh supply of air. Fig. 142 is a diagram section of the Buckett engine. A is the working piston, the form of which is such as to protect the tight sliding surface (at the top) from contact with the hot gases; B is the compressing pump, C the valve by which the governor regulates the rate at which fuel is consumed, and D the air-lock through which fuel is supplied.

249. In engines of this class the degree to which the action is thermodynamically efficient depends very largely on the amount of cooling the gases undergo by adiabatic or nearly adiabatic expansion under the working piston. Without a large ratio of expansion the thermodynamic advantage of a high initial tem-

1 The 1827 patent is reproduced in F, Jenkin's Lecture on Gas and Caloric

Engines, Inst. Civ. Eng., Heat Lectures, 1883-84, See also Min. Proc. Inst. C.E, 1845 and 1854,

2 See Rankine's Steam Engine, p. 367. The consumption per brake H.P. was much greater,

3 For a diagram of Ericsson’s engine see Rankine’s Steam Engine, or Proc. Inst. Mech. Eng., 1873,

4 For description of Robinson’s, Bailey’s, and Rider’s hot-air engines see F. Jenkin’s lecture, loc. cit,

5 Nicholson’s Art Journal, 1807.

7 6 Proc. lst, Mech. Eng., 18738.

F, Jenkin, Joc. eit, Fig, 142 is taken from this paper.

was that of Lenoir (1860).

perature is lost ; but, as the gases have to be discharged at atmo- spheric pressure, a large ratio of expansion is possible only when there is much initial compression. Compression is therefore an

Fig, 142.—Buckett Engine.

essential condition, without which a heat-engine of this type can- not be made efficient. It is also, as has already been pointed out, essential in all air-engines to the development of a fair amount of power by an engine of moderate bulk.

250. Internal-combustion engines using solid fuel have hitherto been little used, and that only for small powers. Several small engines employ liquid fuel (namely, petroleum) injected in a state of spray, or even vaporized before entering the combustion-chamber. In some forms, of which the Brayton petroleum engine is a type, combustion occurs as the fuel is injeeted ; in others the action approaches closely that of gas-engines, that is to say, of engines in which fuel (generally coal-gas) is supplied in a perfectly gaseous state, and is burnt in a more or less explosive manner. These last are the only heat-engines that have as yet entered into serious competition with steam-engines.

251. The earliest gas-engine to be brought into practical use

During the first part of the stroke air and gas, in proportions suitable for combustion, were drawn into the cylinder. At about half-stroke the inlet valve closed, and the mixture was immediately exploded by an electric spark. The heated products of combustion then did work on the piston during the remainder of the forward stroke, and were expelled during the back stroke. The engine was double-acting, and the cylinder was prevented from becoming excessively heated by a casing through which water was kept circulating. The water-jacket has been re- tained in nearly all later gas-engines.

An indicator diagram from a Lenoir engine is shown in fig. 143.8 After explosion the line falls, partly from expansion, and partly from the cooling action of the cylinder walls ; on the other hand, its level is to some extent maintained by the phenomenon of after-burn- ing, which will be discussed later. In this engine, chiefly because there was no compres- Fig. 143.—Lenoir Engine sion, the heat removed by the water-jacket Diagram. bore an exceedingly large proportion to the whole heat, and the efficiency was comparatively low; about 95 cubic feet of gas were used per horse-power per hour. Hugon's engine, introduced five years later, was a non-compressive engine very similar to Lenoir's. A novel feature in it was the injection of a jet of cold water to keep the cylinder from becoming too hot. These engines are now obsolete ; the type they belonged to, in which the mixture is not compressed before explosion, is now represented by one small engine—Bischoff's—the mechanical simplicity of which atones for its comparatively wasteful action in certain cases where but little power is required.

252. In 1866 Otto and Langen introduced a curious en- gine,® which, as to economy of gas, was distinctly superior to its predecessors. Like them it did not use compression. The explosion occurred early in the stroke, in a vertical cylinder, under a piston which was free to rise without doing work on the engine shaft. The piston rose with great velocity, so that the expansion was much more nearly adiabatic than in earlier engines. Then after the piston had reached the top of its range the gases cooled, and their pressure fell below that of the atmosphere ; the piston consequently

8 Slade, Jour. Franklin Inst., 1866. » Proc. inst. Mech. Eng., 1875.

Petro- leum engines.

Gas- engines,

Lenoir.

Hugon.

Bischoff,

Otto and

Langen.

Otto’s engine.

Clerk’s engine.

came down, this time in gear with the shaft, and doing work. The burnt gases were discharged during the last part of the down-stroke. A friction-coupling allowed the piston to be automatically thrown out of gear when rising, and into gear when descending. This “atmospheric” gas engine used about 40 cubic feet of gas per horse-power per hour, and came into somewhat extensive use in spite of its noisy and spasmodic action. After a few years it was displaced by a greatly improved type, in which the direct action of Lenoir’s engine was restored, but the gases were compressed before ignition.

253. Dr Otto’s “silent” engine, introduced in 1876, was the first successful motor of the modern type. It isa single-acting engine, generally horizontal in form, and the explosive mixture is compressed in the working cylinder itself. This is done by making the cycle of the action extend through two revolutions of the engine. During the first forward stroke gas and air are drawn in by the piston. During the first back-stroke the mixture is compressed into a large clearance space at the end of the cylinder. The mixture

is then ignited, and the second forward stroke (which is the only working stroke in the cycle) is performed under the pressure of the heated pro- ducts of combustion. During the second back-stroke the products are discharged, with the exception of so much as remains in the clearance space, which serves to dilute the explosive mixture in the next cycle. The principal parts of Otto's engine (as made by Messrs Crossley) are shown in the diagram section, fig. 144. The cylinder is kept

Fig, 144.—Otto's Gas Engine.

cool by a water-jacket AA. B is the clearance space into which the mixture is compressed before explosion. Its volume is usually about two-thirds of the stroke, or 40 per cent. of the whole volume to which the gases afterwards expand. Cis the exhaust-valve, which is opened during the second back-stroke of each cycle. Gas and air are admitted at D, through a slide-valve E, which reciprocates once in each complete cycle of two revolutions. This slide-valve is shown toa larger scale in fig. 145, in the position it occupies while gas meen ford oy IS entering from g and air from LZiidded aia Ga. 1. To ignite the mixture a gas- \ "CAS jet is kept burning atc. In the a slide-valve there is an igniting pe port d, which is supplied with gas from a groove in the cover. As the slide moves towards the right, the igniting port d carries a flame from c¢ to D. Just before reaching D a little of the compressed mixture from the cylinder enters the igniting port by a small open- ing which does not appear in the figure, and by the time D is reached the contents of d are so much raised in pres- sure by their own combustion that a tongue of flame shoots into the cylinder, firing the mixture there. The speed is regulated by a centrifugal governor, which cuts off the sup- ply of gas when the speed exceeds a certain limit. In some small Otto engines of recent construction the inertia of a reciprocating piece is used instead of the inertia of revolving pieces to effect the same end. 254. In Mr Clerk's engine the cycle of operations is essentially the same as in Otto's, but a charging cylinder

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is introduced, with the effect of allowing an explosion to take place in the working cylinder once in every revolution, — As in Otto's, there is a large clearance space behind the piston, and the mixture is compressed into this space by the backward movement of the working piston. The peculiar- ity of the engine lies in the manner in which the charge is introduced. As the piston advances after an explosion it uncovers exhaust ports in the sides of the cylinder, close to the end of its forward stroke. "While it is passing the dead-point there the plunger of the charging cylinder (which has meanwhile taken in a mixture of gas and air) delivers this mixture into the cylinder, driving the products of the previous combustion out of the cylinder through the exhaust ports. The charging cylinder is so arranged that the first part of the charge consists almost wholly of air,gnd this is followed by the explosive mixture of gas and air. The working piston then returns, closing the exhaust ports and compressing the mixture, which is – ignited after compression by means of a slide-valve similar to Otto's. In Otto's engine the explosive mixture is diluted, and the sharpness of the explosion thereby reduced, by the residue of burnt products which fill the clearance space at the end of the discharge stroke. In Clerk's en- gine the mixture is diluted by an excess of air. It does not appear that this difference has any material effect on the action.

255. Over 20,000 Otto engines are now in use, of power ranging up to about 40 H.P. Besides the engines which have been named, others are manufactured in which the operations are essentially of the same kind, though in some cases the mechanical details are widely varied. In one of these, Mr Atkinson's ingenious '" differen- tial" engine, the working chamber consists of the space between two pistons working in one cylinder. During exhaust the pistons come close together ; they recede from each other to take in a fresh charge; they approach for compression ; and finally they re- cede again very rapidly and farther than before, after — ignition of the mixture, thus giving a comparatively large ratio of expansion. At the same time, by mov- ing bodily along through the cylinder, the pistons uncover admission and exhaust ports and an ignition- tube, which is kept permanently incandescent.

256. If the explosion of a gaseous mixture were practi- Theo- cally instantaneous, producing at once all the heat due totes! | the chemical

reaction, and if the expansion and compres- i sion were adiabatic, the theoretical indicator diagram of of dito | an engine of the Otto type would have the form shown in engine o, fig. 146. OA represents the volume of clearance; AB is the admission, at atmo- spheric pressure; BC is the compression (which is assumed to be adiabatic) ; CD is

the rise of pressure caused by —

explosion ; DE is adiabatic ex- £ pansion during the working stroke ; and EBA is the exhaust. a 77 a The height of the point D above Fig. 146. C may be calculated when we know the temperature at C (an element of considerable uncertainty in practice), the specific heat (at constant vol- ume) of the burnt mixture, the amount of heat evolved by explosion, and the change of specific density due to the change of chemical constitution which explosion brings about. With the proportion of coal-gas and air ordinarily employed this last consideration may generally be neg- lected, as the volume of the products would differ by less than 2 per cent. from the volume of the mixture before explosion if both were reduced to the same pressure and temperature. 257. The rise of pressure observed in the indicator

diagrams of gas-engines is found to be in all cases much less than the calculated rise of pressure which would be caused by a strictly instantaneous explosion. An actual diagram from an Otto engine working in its normal manner is given in fig. 147, where the reference letters distinguish the parts of a complete cycle, as in fig. 146. It shows a rapid rise of pressure on explosion, so rapid that the vol- ume has not very materially altered when the maximum of pressure is reached ; and the specific heat at constant volume may therefore be used without serious error in calculating the amount of heat which this rise accounts for. When ’ this calculation is made,! it turns out that only about 60 or 70 per cent. of the potential heat of combustion in the mixture is required to produce the rise of temperature corresponding to the point of greatest pressure. The re- mainder continues to be slowly evolved during the subse- quent expansion of the hot gases. The process of com- bustion—a term evidently more appropriate than explosion —is essentially gradual ; when ignition takes place it be- gins rapidly, but it continues to go on at a diminishing rate throughout the stroke. That part which takes place after the maximum pressure is passed is the phenomenon of after-burning to which allusion has been made above. 258. The existence of “‘after-burning” is proved not only : by the fact that the maximum pressure after ignition is much less than it would be if

combustion were then com- plete, but also by the form which the curve of subsequent expansion takes. During expansion the gases are losing much heat by conduction through the cylinder walls. The water-jacket absorbs rather more than half of the whole heat developed in the engine,? and the greater part of this is of course taken up from the gases during the working stroke. Notwithstanding this loss, the curve of expansion does not fall much below the adiabatic curve ; in some cases it even lies higher than the adiabatic curve. This shows that the loss to the sides of the cylinder is being made up by continued development of heat within the gas. The process of combustion is especially protracted when the explosive mixture is weak in gas ; the point of

— Rano

late in the stroke ; and it is probable that the products Hie. 148.—Otto Engine Diagram with Which are discharged in the weak explosive mixture. exhaust contain some incom- pletely-burnt fuel. Fig. 148 is the indicator diagram of an Otto engine supplied with a mixture containing an ex- ceptionally large proportion of air: it exhibits well the very gradual character of the explosion in such a case. 259. Much light has been thrown on this subject by the experiments of Mr Clerk, who has exploded mixtures of gas and air, and also mixtures of hydrogen and air, in a closed vessel furnished with an apparatus for recording the time-rate of variation of pressure. In these experi- ments the pressure fell after the explosion only on account of the cooling action of the containing walls. The tem- perature before ignition being known, it became possible to calculate from the diagrams of pressure the highest temperature reached during combustion (on the assump- tion that the specific heat of the gases remained unchanged

1 See two important papers by Mr Dugald Clerk, ‘‘On the Theory of the Gas- Engine,” and “On the Explosion of Homogeneous Gaseous Mixtures,” Min. Proc. Inst. C.E., 1882 and 1886. Reference should also be made, on the subject of gas- engines generally, to Mr Clerk’s book, The Gas-Engine, 1886.

2 Clerk, loc. cit. Also, Brooks and Steward, Van Nostrand’s Eng. Mag., 1883; Ayrton and Perry, Phil. Mag., July 1884; Slaby, Report quoted in F. Jenkin’s Lecture, Inst, C.E., 1884.

4)

Fig. 147.—Otto Engine Diagram.

STEAM-ENGINE

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at high temperatures), and to compare this with the tem- perature which would have been produced had combustion been at once complete. Mixtures of gas and air were exploded, the proportion of gas varying from }; to }, and the highest temperature produced was generally a little more than half that which would have been reached by instantaneous combustion of the mixture. With the best proportion of coal-gas to air (1 to 6 or 7) the greatest pressure and hottest state was found one-twentieth of a second after ignition, and the temperature was then 1800° C.,— instead of 3800°, which would have been the value had all the heat been at once evolved. With the weakest mixtures about half a second was taken to reach a maxi- mum of temperature, and its value was 800° C., instead of 1800° C. In this case, however, the degree of com- pleteness of the combustion is not fairly shown by a com- parison of these temperatures, since much cooling occurred during the relatively long interval that preceded the instant of greatest pressure.

260. To explain the phenomenon of after-burning or Dissocia- delayed combustion, it has been supposed that the high tion.

temperature to which the gases are raised in the first stages of the explosion prevents union from being com- pleted,—just as high temperature would dissociate the burnt gases were they already in chemical union,—until the fall of temperature by expausion and by the cooling action of the cylinder walls allows the process of union to goon. The maximum temperature attained in the gas- engine is high enough to cause a perceptible amount of dissociation of the burnt products; it may therefore be admitted that this explanation of delayed combustion is to some extent true. On the other hand, the phenomenon is most noticeable with mixtures weak in gas, in

which the maximum temperature reached is low, and the dis- sociation effect is correspondingly small. It appears, therefore, that dissociation is not the main cause of the action; apart from it the process of combustion of a gaseous mixture is gradual, beginning fast and going on at a continuously-diminishing rate as the combustible mixture becomes more and more diluted by the portions already burnt. If the mixture is much diluted to begin with, the process is comparatively slow from the first.

261. Much stress has been laid by some makers of gas- engines on the desirability of having a stratified mixture of gases in the cylinder, with a part rich in gas near the ignition port and a greater proportion of residual product or air near the piston. It has even been supposed that stratification of the gases is the cause of their gradual combustion. Mr Clerk's experiments are conclusive against this; the mixtures he used, which gave in some cases very gradual explosions, were allowed to stand long enough to become sensibly homogeneous. In dealing with weak mixtures it is no doubt of advantage to have a small quantity of richer fluid close to the igniting port to start the ignition of the rest,—but beyond this stratification has probably little or no value. And it may be questioned whether, in the ordinary working of a gas-engine, any general stratification can occur, when account is taken of the commotion which the air and gas cause as they rush into the cylinder at a speed exceeding that of an express train.

Stratifi- cation,

262. A compression gas-engine of the Otto type burns Efficiency

from 20 to 25 cubic feet of coal-gas per hour per indicated horse-power. Good coal-gas has a heating power equiva- lent to about 500,000 foot-pounds per cubic foot, and hence, with a consumption of 20 cubic feet the efficiency which the engine realizes is nearly 0:2. The efficiency of a large steam-engine is about 0°14, and in steam-engines that are small enough to be fairly compared with actual gas-engines the efficiency is not more than 0-1, The superiority of gas-engines over steam-engines, from the

of gas- engines,

thermodynamic point of view, is well shown by comparing their consumption of fuel. In the steam-engine we find in good engines of large size a consumption of 2 tb or 1f bb of coal per I.H.P. per hour, and by triple expansion this is reduced in large marine engines to about 14 ib. On the other hand, in small-power engines the consumption is at least 24 tb, and is generally 3 Ib or more. When Mr Dowson's cheap gas,! which is produced by passing a mixture of superheated steam and air through red-hot anthracite, is used to drive an Otto engine, the consump- tion of coal has been found to be only 1:1 fb per I-H.P. per hour, or less than half the amount used by a steam- engine of similar size. What gives this comparison additional interest is the fact that the gas-producer for a 40 or 50 H.P. engine need not take up more space than the boiler of a steam-engine of the same power.

263. In another sense the gas-engine is much less perfect than the steam-engine. The actual efficiency of the latter is about half the ideal efficiency which a perfect engine would show when working through the same range of temperature. In the gas-engine the actual is less than one-fourth of the ideal efficiency. Taking the highest temperature as 1900° C.—a value reached in some of Mr Clerk's experiments—and the lowest temperature as 15° C., the efficiency of a perfect engine would be 0:87, while that of the actual engine is 0-2. This only means that the gas-engine has all the greater margin for future improvement.

264. At present the main causes of waste in gas-engines are the action of the sides of the cylinder and the water-

1 Min. Proc. Inst. C.H., vol. \xxiii. p. 311.

jacket, and the high temperature of the exhaust gases. The water-jacket absorbs about half the whole heat, only to keep the cylinder cool enough to permit of lubrication, The waste gases are discharged at a temperature of about 420° C., and so carry away a large amount of heat which might in part be saved by having a greater ratio of expan- sion, or by the use of a

regenerator. Another source of thermodynamic imperfection is the after-burning, which gives heat to the working substance at a temperature lower than the maximum.

In an engine constructed by the late Sir William Siemens it was attempted to do away with or reduce the two main causes of loss—(1) by using a separate combustion-chamber, distinct from the cylinder in which the piston worked, and (2) by passing the exhaust gases through a regenerator, which afterwards gave up heat to the incoming air and gas,? The late Prof. Fleeming Jenkin endeavoured to attain the same ends by adapting the Stirling type of engine to inter- nal combustion, a mixture of gas and air being exploded under a displacer like that of fig. 141. Practical difficulties have hitherto prevented regenerative internal-combustion engines from coming into use, but it can scarcely be doubted that their development is only a question of time. With regard to the probable future of heat-engines, it is important to notice that the internal-combustion engine using gaseous fuel, though already much more efficient than the steam- engine, is crude and full of defects which further inven- tion ought to remove, while the steam-engine has been improved so far that little increase in its efficiency can be expected, and more than a little is impossible. _ (J. A. E.)

“2 Siemens, “Discussion on the Theory of the Gas-Engine,” Min, Proc. Inst. C.E., 1882. ‘

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STE—STE

STEAM HAMMER. See Hammer. ;

STEARINE, in commerce, designates a solid mixture of fatty acids (chiefly palmitic and stearic) which is being produced industrially from animal fats and used largely for the making of candles. In chemistry it is a generic term for the three "esters " derivable from glycerin, C,H;(OH),, by the replacement of one or more of the three (OH)'s by the residue C,,H.,O,, which, in stearic acid, is combined with ""H." Of these tri-stearine, C,H; (C,.H,O.)., is the most important ; it occurs in animal fats only, largely in tallow. It crystallizes from ether in white pearly nodules, insoluble in cold but easily soluble in boiling alcohol. It can be distilled undecomposed im vacuo. On gradual ex- posure to higher temperatures it fuses at 55° C.; it then resolidifies, and then fuses again (permanently) at 71°:5 (Heintz). The specific gravity of the liquid is 0°9245 at 65°'5 C. (Duffy).

STEEL. See Iron.

STEELE, Str Ricwarp (1672-1729), one of the most active and prominent men of letters in the reign of Queen Anne, inseparably associated in the history of literature with his personal friend Addison. He cannot be said to have lost in reputation by the partnership, because he was far inferior to Addison in purely literary gift, and it is Addison's literary genius that has floated their joint work above merely journalistic celebrity ; but the advantage was not all on Steele's side, inasmuch as his more brilliant coadjutor has usurped not a little of the merit rightly due to him. Steele's

often-quoted generous acknowledgment of Addison's services in The Tatler has proved true in a somewhat different sense from that intended by the writer :—''I fared like a distressed prince, who calls in a powerful neighbour to his aid; I was undone by my auxiliary; when I had once called him in I could not subsist without dependence on him." The truth is that in this happy alliance the one was the complement of the other; and the balance of mutual advantage was much more nearly even than Steele claimed or posterity has generally allowed.

The famous literary pair were born in the same year, 1672,—Steele in Dublin, the senior by less than two months. Steele's father, who is said to have been a lawyer, died before he had reached his sixth year, but the boy found a protector in his maternal uncle, Henry Gascoigne, secretary and confidential agent to two suc- cessive dukes of Ormonde. Through his influence he was nominated to the Charterhouse in 1684, and there first met with Addison. Five years afterwards he pro- ceeded to Oxford, and was a postmaster at Merton when Addison was a demy at Magdalen. Their schoolboy friendship was continued at the university, and probably helped to give a more serious turn to Steele's mind than his natural temperament would have taken under different companionship. Addison's reverend father also took an interest in the warm-hearted young Irishman; but their combined influence did not steady him sufficiently to keep his impulses within the lines of a regular career ; without waiting for a degree he volunteered into the army, and served for some time as a cadet "under the command of the unfortunate duke of Ormonde." This escapade was Inade without his uncle's consent, and cost him, according to his own account, "the succession to a very good estate in the county of Wexford in Ireland." Still, he did not lack advancement in the profession he had chosen. A poem on the funeral of Queen Mary (1695), dedicated to Lord Cutts, colonel of the Coldstream Guards, brought him under the notice of that nobleman, who took the gentleman trooper into his household as a secretary, made him an officer in his own regiment, and ultimately pro- cured for him a captaincy in Lord Lucas's fusiliers.

His name was noted for promotion by King William, but the king's death took place before anything had been done for Captain Steele. He would seem to have remained in the army, though never on active service, for several years longer.

Steele probably owed the king's favour to honest admira- tion of the excellent principles of The Christian Hero, his first prose treatise, published in 1701. The "reforma- tion of manners" was a cherished purpose with King William and his consort, which they tried to effect by proclamation and Act of Parliament; and a sensible well- written treatise, deploring the irregularity of the military character, and seeking to prove by examples—the king himself among the number—'that no principles but those of religion are sufficient to make a great man," was sure of attention. Steele complained that the reception of Lhe Christian Hero by his comrades was not so respect- ful; they persisted in trying him by his own standard, and would not pass "the least levity in his words and actions" without protest. The sensitive and hot-headed "hero" would seem to have been teased into fighting a duel,—his first and last, for he wounded his antagonist dangerously, and from that time was a staunch opponent of affairs of honour. His uneasiness under the ridicule of his irreverent comrades had another curious result: it moved him to write a comedy. 'It was now incumbent upon him," he says, ''to enliven his character, for which reason he writ the comedy called The Funeral." Although, however, it was Steele's express purpose to free his character from the reproach of solemn dulness, and prove that he could write as smartly as another, he showed greater respect for decency than had for some time been the fashion on the stage. The purpose, afterwards more fully effected in his famous periodicals, of reconciling wit, good humour, and good breeding with virtuous conduct was already deliberately in Steele's mind when he wrote his first comedy. It was produced and published in 1701, was recelved on the stage with favour, and owing to its comparative purity helped, along with The Christian Hero, to commend its author to King William. In his next comedy, Zhe Lying Lover, or the Ladies' Friendship, pro- duced two years afterwards, in 1703, Steele's moral purpose was directly avowed ; and the play, according to his own statement, was ''damned for its piety." The Tender Hus- band, produced eighteen months later (in April 1705), though not less pure in tone, was more successful ; in this play he gave unmistakable evidence of

his happy genius for conceiving and embodying humorous types of character, putting on the stage the parents or grandparents of Squire Western, Tony Lumpkin, and Lydia Languish. It was seventeen years before Steele again tried his fortune on the stage with The Conscious Lovers, the best and most successful of his comedies, produced in 1722.

Meantime the gallant captain had turned aside to another kind of literary work, in which, with the assistance of his friend Addison, he obtained a more enduring reputation. There never was a time when literary talent was so much sought after and rewarded by statesmen. Addison had already been waited on in “his humble lodgings in the Haymarket,” and advanced to office, when his friend the successful dramatist was appointed to the office of gazetteer. This was in May 1707. It was Steele’s first connexion with journalism. The periodical was at that time taking the place of the pamphlet as an instrument for working on public opinion. The Gazette gave little opening for the play of Steele’s lively pen, his main duty, as he says, having been to “keep the paper very innocent and very insipid”; but the position made him familiar with a new field of enterprise in which his inventive mind soon discerned materials for a project of

his own. 12th of April 1709. It was partly a newspaper, a journal of politics and society, published three times a week. Steele’s position as gazetteer furnished him with special advantages for political news, and as a popular habitué of coffee-houses he was at no loss for social gossip. But Steele not only retailed and commented on social news, a function in which he had been anticipated by Defoe and others; he also introduced into The Tatler as a special feature essays on general questions of manners and morality. It is not strictly true that Steele was the inventor of the English “essay,”—there were essayists before the 18th century, notably Cowley and Temple ; but he was the first to use the essay for periodical pur- poses, and he and Addison together developed a distinct species, to which they gave a permanent character and in which they had many imitators. As a humbler motive for this fortunate venture Steele had the pinch of im- pecuniosity, due rather to excess of expenditure than to smallness of income. He had £300 a year from his gazetteership, £100 as gentleman usher to Prince George, £500

from the Barbados estates of his first wife,! and some fortune by his second wife—Mrs Mary Scurlock, the “Dear Prue” of his charming letters. But Steele lived in considerable state after this second marriage, and was reduced to the necessity of borrowing before he started Z’he Tatler. The assumed name of the editor was Isaac DBickerstaffe, but Addison discovered the real author in the sixth number, and began to contribute in the eighteenth. It is only fair to Steele to state that the success of The Tatler was established before Addison joined him, and that Addison contributed to only forty-two of the two hundred and seventy-one numbers that had appeared when the paper was stopped in January 1711.

Only two months elapsed between the stoppage of The Tatler and the appearance of The Spectator, which was the organ of the two friends from March 1, 1711 till December 6, 1712. Addison was the chief contributor to the new venture, and the history of it belongs more to his life. Nevertheless it is to be remarked as characteristic of the two writers that in this as in The Tatler Addison generally follows Steele’s lead in the choice of subjects. The first suggestion of Sir Roger de Coverley was Steele’s, although it was Addison that filled in the outline of a good-natured country gentleman with the numerous little whimsicalities that convert Sir Roger into an amiable and exquisitely ridiculous provincial oddity. Steele had neither the fineness of touch nor the humorous malice that gives life and distinction to Addison’s picture; the Sir Roger of his original hasty sketch has good sense as well as good nature, and the treatment is comparatively common- place from a literary point of view, though unfortunately not commonplace in its charity. Steele’s suggestive vivacity gave many another hint for the elaborating skill of his friend.

The Spectator was followed by The Guardian, the first number of which appeared on the 12th of March 1713. It had a much shorter career, extending to only a hundred and seventy-five numbers, of which Steele wrote eighty-two and Addison fifty-three. This was the last of his numerous periodicals in which he had the assistance of the great essayist. But he continued for several years to project journals, under great variety of titles, some of them political, some social in their objects, most of them very short-lived. Steele was a warm partisan of the principles of the Revolution,

ardent and earnest in his political as in his other convictions. The Englishman

1 The name of this lady—a widow, Mrs Margaret Stretch—and

some facts abou: her have been ascertained by Mr George A. Aitken. See Athen#um, May 1, 1886, and Mr Dobson's Steele, pp. 51, 218.

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The Tatler made its first appearance on the | was started in January 1714, immediately after the

stoppage of 7'he Guardian, to assail the policy of the Tory ministry. Zhe Lover, started some six weeks later, was more general in its aims; but it gave place in a month or two to The Reader, a direct counterblast to the Tory Examiner. The Englishman was resuscitated for another volume in 1715; and in the same year he projected in rapid succession three unsuccessful ventures,—Zown Talk, The Tea Table, and Chit-Chat. Three years later he started his most famous political paper, The Plebeian, rendered memorable by the fact that in it he had to contend against his old ally Addison. The subject of controversy between the two life-long friends was Sunder- land's Peerage Bill. Steele's last venture in journalism was The Theatre, 1719-20, the immediate occasion of which was the revocation of his patent for Drury Lane. So ready was Steele in this kind of enterprise, which he could always conduct single-handed, that apparently whenever he felt strongly on any subject he at once started a journal to give vent to his feelings. Besides these journals he wrote also several pamphlets on passing questions,—on the disgrace of Marlborough in 1711, on the fortifications of Dunkirk in 1713, on the "crisis" in 1714, An Apology for himself and his Writings (important biographically) in the same year, on the South Sea mania in 1720.

The fortunes of Steele as a zealous Whig varied with the fortunes of his party. He lost his gazetteership when the Tories came into power in 1710. Over the Dunkirk question he waxed so hot that he threw up a pension and a commissionership of stamps, and went into parliament as member for Stockbridge to attack the ministry with voice and vote as well as with pen.

But he had not sat many weeks when he was expelled from the House for the language of his pamphlet on Zhe Crisis, which was stigmatized as seditious. The Apology already mentioned was his vindication of himself on this occasion. With the accession of the house of Hanover his fortunes changed. Honours and substantial rewards were showered upon him. He was made a justice of the peace, deputy-lieutenant of Middlesex, surveyor of the royal stables, governor of the royal company of comedians—the last a lucrative post, and was also knighted (1715). After the suppression of the Jacobite rebellion he was appointed one of the commis- sioners of forfeited estates, and spent some two years in Scotland in that capacity. He obtained a patent for a plan for bringing salmon alive from Ireland. Differing from his friends in power on the question of the Peerage Bill in 1718, he was deprived of some of his offices, but when Walpole became chancellor of the exchequer in 1721 he was reinstated. But with all his emoluments the imprudent, impulsive, ostentatious, and generous Steele could never get clear of financial difficulties, and he was obliged to retire from London in 1724 and live in the country. He spent his last years on his wife's estate of Llangunnor in Wales, and, his health broken down bya paralytic seizure, died on the lst of September 1729.

A selection from Steele's essays has been edited by Mr Austin Dobson, who prefixes a careful and sympathetic memoir. Mr Dob-

son has since written a fuller biography in Mr Lang's series of English Worthies. (W. M.)

STEELYARD, MercHants or THE, were Hanse mer- chants who settled in London in 1250 at the steelyard on the river side, near Cosin Lane, now Iron Bridge Whari. Henry III. in 1259, at the request of his brother Richard, earl of Cornwall, conferred on them important privileges, which were renewed and confirmed by Edward I. It was chiefly through their enterprise that the early trade of London was developed, and they continued to flourish till, on the complaint of the Merchant Adventurers in the reign

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of Edward VI., they were deprived of their privileges. Though Hamburg and Liibeck sent ambassadors to inter- cede for them, they were not reinstated in their monopolies, put they succeeded in maintaining a footing in London till expelled by Elizabeth in 1597. Their beautiful guild- hall in Thames Street, described by Stow, was made a naval store-house. It contained two famous pictures, painted in distemper by Holbein, representing Poverty and Riches, which were presented by the Hanse merchants to Henry, prince of Wales, and came into the possession of Charles I., but are supposed to have perished in the fire which destroyed Whitehall.

STEEN, Jan Havicxsz (1626-1679), subject-painter, was born at Leyden in 1626, the son of a brewer of the place. He studied at Utrecht under Nicholas Knuffer, an historical painter, and about 1644 went to Haarlem, where he worked under Adrian van Ostade and under Jan van Goijen, whose daughter he married in 1649. In the previous year he had joined the painters' guild of the city. In 1667 he is said to have been a brewer at Delft, and in 1672 he received municipal authority to open a tavern. The accounts of his life, however, are very con- fused and conflicting. Some biographers have asserted that he was a drunkard and of dissolute life, but the number of his works—Van Westrheene, in his Jan Steen, Biude sur VArt en Holland, has catalogued nearly five hundred—is sufficient in itself to disprove the charge. His later pictures bear marks of haste and are less care- fully finished than those of his earlier period. He died at Leyden in 1679.

The works of Jan Steen are distinguished by correct- ness of drawing, admirable freedom and spirit of touch, and clearness and transparency of colouring. But their true greatness is due to their intellectual qualities. In the wide range of his subjects, and their dramatic charac- ter, he surpasses all the Dutch figure-painters, with the single exception of Rembrandt. His productions range from the stately interiors of grave and wealthy citizens to tavern scenes of jollity and debauch. He painted cliem- ists in their laboratories, doctors at the bedside of their patients, card-parties, marriage feasts, and the festivals of St Nicholas and Twelfth Night,—even religious

subjects, though in these he was least successful. His rendering of children is especially delightful. Dealing often with the coarser side of things, his work is full of humour; he de- picts the comedy of human life in a spirit of very genial toleration, but now and again there appear keenly telling touches of satire which recall such a pictorial moralist as Hogarth.

The National Gallery contains one picture by Jan Steen,—the Music Master; and other excellent examples of his art are pre- served in the Royal, the Bute, the Ashburton, and the Northbrook collections, at Apsley House and Bridgewater House, and in the oes of The Hague, Amsterdam, and the Hermitage, St Peters-

urg.

STEFFANI, Acosrino (1655-1730), ecclesiastic, diplo- matist, and musical composer, was born at Castelfranco in 1655, and at a very early age was admitted as a chorister at St Mark's in Venice. In 1667 the beauty of his voice attracted the attention of Count Tattenbach, by whom he was taken to Munich, where his education was completed at the expense of Ferdinand Maria, elector of Bavaria, who-appointed him '" Churfiirstlicher Kammer- und Hof- musikus," and granted him a liberal salary. After receiving instruction from Johann Kaspar Kerl, and possibly Ercole Bernabei, he was sent in 1673 to study in Rome, where, among other works, he composed six motets, the original MSS. of which are now in the Fitzwilliam Museum at Cambridge. On his return to Munich in 1674 he pub- lished his first work, Psalmodia Vespertina, a part of which Was reprinted in Martini's Saggio di Contrappunto in 1674.

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In 1675 he was appointed court organist, and in 1680 he was ordained priest, with the title of abbate of Lepsing. His ecclesiastical status did not, however, prevent him from turning his attention to the stage, for which, at different periods of his life, he composed works which un- doubtedly exercised a potent influence upon the dramatic music of the period. Of his first opera, Marco Aurelio, produced at Munich in 1681, the only copy known to exist is a MS. score preserved in the royal library at Buckingham palace. It was followed by Solone in 1685, Servio Tullto in 1686, Alarico in

1687, and Niobe in 1688 ; but of these four last-named works no trace can now be discovered. Nzobe was the last opera Steffani composed at Munich. Notwithstanding the favour shown to him by the elector Maximilian Emanuel, he accepted in 1689 the appointment of kapellmeister at the court of Hanover, where he speedily gained the goodwill of Ernest Augustus, duke of Brunswick-Liineburg (afterwards raised to the dignity of elector of Hanover), the duchess Sophia Charlotte (afterwards electress of Brandenburg), the philosopher Leibnitz, the abbate Ortensio Mauro, and many men of letters and intelligence, and where, in 1710, he showed great kindness to Handel, who was then just entering upon his glorious career. He inaugurated a long series of triumphs in Hanover by composing, for the opening of the new opera-house in 1689, an opera called Enrico il Leone, which was produced with extraordinary splendour and achieved an immense reputation. For the same theatre he composed La Lotta d'Ercole con Achilleo in 1689, La Superbia d Alessandro in 1690, Orlando Generoso in 1691, Le Rivali Concordi in 1692, La Liberta Contenta in 1693, I Trionfi del Lato and I Baccanali in 1695, and Briseide in 1696. 'The libretto of Brvserde is by Palmieri. 'Those of most if not all the others are by the abbate Mauro. The scores are preserved at Buck- ingham palace, where, in company with five volumes of songs and three of duets, they form part of the collec- tion brought to England by the elector of Hanover in 1714. But it was not only asa musician that Steffani distinguished himself in his new home. The elevation of Ernest Augustus to the electorate in 1692 led to difficul- ties, for the arrangement of which it was necessary that an ambassador should visit the various German courts, armed with a considerable amount of diplomatic power. The accomplished abbate was sent on this delicate mission in 1696, with the title of envoy extraordinary ; and he fulfilled his difficult task so well that Pope Innocent XI, in recognition of certain privileges he had secured for the Hanoverian Catholics, consecrated him bishop of Spiga in partibus infideium. In 1698 he was sent as ambas- sador to Brussels ; andafter the death of Ernest Augustus in the same year he entered the service of the elector palatine, John William, at Diisseldorf, where he held the offices of privy councillor and protonotary of the holy see. Invested with these high honours, Steffani could scarcely continue to produce dramatic compositions in public with- out grievous breach of etiquette. But his genius was too real to submit to repression ; and in 1709 he ingeniously avoided the difficulty by producing

two new operas—Lnea at Hanover and Zassilone at Diisseldorf—in the name of his secretary and amanuensis Gregorio Piva, whose sig- nature is attached to the scores preserved at Buckingham palace. Another score—that of Arminto—in the same collection, dated Diisseldorf, 1707, and evidently the work of Steffani, bears no composer's name.

Steffani did not accompany the elector George to Eng- land; but in 1724 the Academy of Antient Musick in London elected him its honorary president for life; and in return for the compliment he sent the association a

magnificent Stabut Mater, for six voices and orchestra, AXXIT. — 67

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aud three fine madrigals. The MSS. of these are still in existence ; and the British Museum possesses a very fine Conjitebor, for three voices and orchestra, of about the same period. All these compositions are very much in advance of the age in which they were written ; and in his operas Steffani shows an appreciation of the demands of the stage very remarkable indeed at a period at which the musical drama was gradually approaching the character of a mere formal concert, with scenery and dresses. But for the MSS. at Buckingham palace, these operas would be utterly unknown ; but Steffani will never cease to be remembered by his beautiful chamber duets, which, like those of his contemporary Carlo Maria Clari (1669-1745), are chiefly written in the form of cantatas for two voices, accompanied by a figured bass. The British Museum possesses more than a hundred of these charming compositions,! some of which were published at Munich in 1679. Steffani visited Italy for the last time in 1729, in which year Handel, who always gratefully remembered the kindness he had received from him at Hanover, once more met him at the palace of Cardinal Ottoboni in Rome. This was thie last time the two composers were destined to meet. Steffani returned soon afterwards to Hanover, and died in 1730 while engaged in the transaction of some diplomatic business at Frankfort.

STEIBELT, Dantet (c. 1760-1823), pianist and com- poser, was born between the years 1755 and 1765 at Berlin, where he studied, at the expense of the crown prince Frederick William, under Kirnberger. Very little is known of his artistic life before 1790, when he settled in Paris, and attained

great popularity as a virtuoso by means of a pianoforte sonata called La Coquette, which he composed, in conjunction with Hermann, for Queen Marie Antoinette, and almost equal credit as a dramatic composer by an opera entitled Lomeo et Juliette, produced at the Theatre Feydeau in 1793. In 1796 Steibelt re- moved to London, where his pianoforte playing attracted an amount of attention which in 1798 was raised to an absolute furore by the production of his concerto (No. 3, in E>) containing the famous “Storm Rondo”—a work that ensured his popularity, in spite of the far higher claims of Clementi, Dussek, and John Baptist Cramer, whose attainments as virtuosi, composers, and thoroughly accomplished artists were infinitely superior to his own. In the following year Steibelt started on a professional tour in Germany ; and, after playing with sonie success in Hamburg, Dresden, Prague, and Berlin, he arrived in May 1800 at Vienna, where, with the arrogance which formed one of the most prominent characteristics of his nature, he challenged Beethoven to a trial of skill, which naturally resulted in his irretrievable discomfiture. His position in Germany being no longer tenable after’ this pitiful failure, he retired to Paris, and during the next eight years lived alternately in that city and in London, where his reputation continued undiminished. In 1808 he was invited by the emperor Alexander to St Peters- burg, and there he resided, in the enjoyment of a lucrative appointment, until his death on September 20, 1823.

Besides his dramatic music, Steibelt left behind him an enormous number of compositions for the pianoforte, many of which exhibit a certain amount of originality, though they can scarcely be regarded as works of genius. His playing, though exceedingly brilliant, was wanting in the higher qualities which so strikingly characterized that of his contemporaries, John Cramer and Muzio Clementi; but he was undoubtedly gifted with talents of a very high order, and the reputation he enjoyed was fairly earncd and honourably maintained to the end.

STEIN, Hermvricn Frrepricu Kart, BARON VOM UND zUM (1757-1831), one of the greatest of German statesmen, and perhaps the most influential forerunner of Bismarck in

1 Add. MSS. 5055 sq.

the creation of German unity, was born at Nassau on October 26, 1757. He was a member of the independent noblesse or knighthood of the German empire (Reichsritter. schaft), and his ancient family seat, Burg Stein, lies on a hill rising above the Lahn opposite Nassau. In his auto. biography he speaks of his parents as “ pious and genuinely German,” and ascribes to their teaching his own religious and patriotic feelings, his sense of the dignity of his family and order, and his conviction of the duty of devoting his life to the public weal. Though the youngest but one of ten children, Stein was selected by his parents as the ‘‘Stammhalter,” or representative and maintainer of the family name and dignity, and ‘his elder brothers acqui- esced in this arrangement.

From 1773 to 1777 Stein studied political economy, jurisprudence, and history at the university of Gottingen, where he made his first acquaintance with English insti- tutions, his knowledge and appreciation of which are often manifest in his later career. His original intention was to qualify for an appointment in the imperial courts, but this sphere of work was little to his taste, and in 1780 he took the step, somewhat unusual for an imperial knight, of entering the service of Prussia. He became an official in the mining department, and by 1784 had risen to be head of the administration of mines and manufactures for Westphalia. In 1796 he was made supreme presi- dent of the provincial chambers of Westphalia, an appoint- ment which gave him opportunity to evince his great administrative talents. In 1785 his administrative career was interrupted for a short time by a diplomatic mission to the elector of Mainz, and in 1786-87 he made a long professional tour in England, chiefly in the mining districts.

In 1804 Stein was created a minister of state, with the portfolio of excise, customs, manufactures, and trade. In this capacity he abolished the internal customs duties throughout Prussia, and effected several other needed reforms ; but he was unable to modify the general disas- trous tenour of the Prussian policy, which was now ripen- ing for the catastrophe of Jena. Stein’s remonstrances with the king and his strictures upon the course of the administration were couched in the most open and unspar- ing language, and they were specially directed against the system of government through

privy cabinet counsellors, who had practically come to supplant the ministers with- out possessing either an official knowledge of affairs or a ministerial responsibility. He refused to join in the reconstituted ministry after Jena unless this abuse were done away with, and Frederick William III., already wounded by the frankness of Stein's criticism, sent him his dismissal in a most ungracious form (January 3, 1807), When the king, however, found himself left in the lurch by his ally Russia, at the peace of Tilsit (July 9, 1807), he turned in despair to the strong and candid counsellor he had dismissed half a year before, and invited Stein to re-enter his service, practically on his own terms. Curiously enough Stein's appointment as minister pre- sident was encouraged by Napoleon, who seems to have seen in him merely the clever organizer and financier, who would most easily put Prussia in a position to pay the enormous war indemnity levied on it. Stein took office on October 4, 1807, and at once began that weighty series of organic reforms with which his name is most indis- solubly connected. The emancipation edict appeared on October 9, 1807, a few days after the formal receipt of his powers, and the municipal ordinance was published on November 19, 1808. In the interim he co-operated zealously with Scharnhorst in the reconstitution of the army, carried out a number of important financial and ad- ministrative reforms, and prepared the way for a thorough

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reconstruction of the whole framework of government, which, however, he himself was not to have an opportunity to effect.

Stein's momentous ministry did not last much more than a year. Napoleon soon awoke to the eminently patriotic and energetic character of the man he had incautiously re- commended, and an intercepted letter gave him the oppor- tunity to demand Stein's dismissal. Frederick William had no option but to comply, as he shrank from the only possible alternative of an open breach with the French emperor. Stein was proscribed by Napoleon, his property in Westphalia was confiscated, and he himself had to take refuge in Austria from the French troops.

Tn 1812 the czar Alexander invited Stein to St Peters- burg, where he filled the post of unofficial adviser to his imperial majesty on German or rather on anti-Napoleonic affairs; and it would perhaps be difficult to overestimate the influence of the proximity of such a man in keeping Alexander's courage screwed to the sticking-point. When the scene of the campaign of 1812 was transferred to Germany, Stein was entrusted witli the administration of the Prussian districts occupied by the Russian troops, and he shares with Yorck the merit of arousing East Prussia to take arms against the French, and so of calling the "Landwehr" into existence for the first time. To Stein also mainly belongs the credit of effecting that union of Russia and Prussia (treaty of Kalisch, February 27, 1813) which was perhaps the main factor in the over- throw of Napoleon. After the battle of Leipsic Stein became supreme president of a central commission appointed to administer the lands occupied by the allied armies, in which post he was indefatigable in providing the men and material necessary for a successful prosecu- tion of the war. When the military struggle was over Stein's work was practically done. The two tendencies of absolutism on the one hand and particularism on the other which determined the tone of the Vienna congress were equally repugnant to him, and he took little part in its deliberations. He also refused the invitations of Austria and Prussia to represent them at the Frankfort diet, a makeshift in which he had no confidence or hope. The rest of his life he spent in retirement, sharing his time between Frankfort and his property in Westphalia, and the only office he ever again filled was that of marshal of the provincial estates. In 1819 he founded the society for the publication of the Monumenta Germamix Historica, which has since done such admirable work. He died on June 29, 1831, in his seventy-fourth year, on his estate of Cappenberg in Westphalia, leaving a family of three daughters. His wife was Countess von Walmoden-Gim- born of Hanover, a granddaughter of George II.

Stein's distinguishing merit as a statesman is that he was practically the first to see the urgent necessity of German unity, to contemplate its realization as possible, and to inaugurate a policy likely to bring it about. That which, now that it has been accomplished by Stein's great successor, seems to us almost a matter of course, was a merc chimera to most of our forefathers, and it required the faculty of a political seer to attain Stein's clear views of future possibilities. Stein saw, too, that the only hope of salvation lay in the

people as such,—that he must enlist the sympathies of the nation and raise its moral tone. To this end a series of great and just reforms was necessary. If a dcep national Sentiment was to be evoked, the people must be freed from feudal burdens; if they were to carry on an effective struggle for Independence, they must first acquire personal liberty. His emancipation edict, therefore, which has becn called the habeas corpus act of Prussia, abolished serfdom, did away with the dis- tinctions of caste, and abrogated the feudal restrictions upon the free disposition of person and property (compare PRusstA, vol. xx.

‘ The belief that Stein occupied himself during his retirement in propagating his opinions through the ‘‘ Tugendbund ” seems from recent vestigations to be erroneous. He had no sympathy with secret Societies, and all indications go to show that he rather disapproved of the league than otherwise.

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pp. 11, 12). This reform, however, Stein found, in a sense, ready to his hand ; it was demanded by the spirit of the times, and can hardly be looked on as a purely individual achievement. His most distinctive work was a great scheme of political reform, in which he contemplated the conversion of the absolute monarchy of Prussia into a free representative state. He wisely began the process by introducing the principle of free local government in his Stadte-Ordnung, or municipal ordinance. The people had to be roused to take an interest in governing themselves, and it was easier to expand this interest from the local to the national than to work down from the national to the local. Stein did not see much more than this beginning of his plans, but the famous “ Political Testament ” he drew up on leaving office shows how wide-sweeping were the reforms he contemplated. The right of self-government was to be extended to the rural communes, and a thorough reform of every branch of the administration was to be effected, while the coping-stone of the new edifice was to take the form of a free representative parliament. Time, however, has been on his side, and it is not too much tosay with Prof. Von Treitschke that every advance Germany has since made in political life has brought it nearer the ideals of Stein.

The standard work on Stein is the biography by G. H. Pertz, 6 vols., 1849-55, but few English readers will feel the need of going beyond Prof.

Seeley’s ad- mirable Life and Times of Stein, London, 1879, which also contains a full biblio- graphy, (J. F. MM.)

STEINAMANGER (Hung. Szombathely ; Lat. Sabaria), the chief town of the trans-Danubian county of Vas, Hungary, is an old place of some interest. Though it has only 12,000 inhabitants, it is the seat of a Roman Catholic bishop, and has a Dominican convent, a seminary, gymna- sium, chamber of advocates, large orphanage, fine theatre, and a number of superior Government offices. The in- terior of the cathedral is of great beauty, in the Italian style. The town is at the junction of four different rail- ways, and is rapidly rising in importance.

STEINER, Jaxos (1796-1863), one of the greatest geometricians of all ages, was born on the 18th of March 1796 at the Swiss village of Utzendorf (canton Bern). Here he grew up helping his father in his agricultural pursuits, learning to write only at the age of fourteen. At eighteen he became a pupil of Pestalozzi, and_after- wards studied at Heidelberg. Thence he went to Berlin, earning a livelihood here as in Heidelberg by giving private lessons. Here he became acquainted with Crelle, who, encouraged by his ability and by that of Abel, then also staying at Berlin, founded his famous Journal (1826). After Steiner’s publication (1832) of his Systematrsche Entwickelungen he got, through Jacobi’s exertions, who was then professor at Kénigsberg, an honorary degree of that university ; and through the influence of Jacobi and of the brothers Alexander and Wilhelm von Humboldt a new chair of geometry was founded for him at Berlin (1834). This he occupied till his death, which took place in Bern on April 1, 1863, after years of bad health.

Steiner’s mathematical work was confined to geometry. This he treated synthetically, to the total exclusion of analysis, which he hated, and he is said to have considered it a disgrace to synthetical geometry if equal or higher results were obtained by analytical methods. In his own field he surpassed all his contemporaries. His investiga- tions are distinguished by their great generality, by the fertility of his resources, and by a rigour in his proofs which rivals that of the ancients, so that he has been considered the greatest geometrical genius since the time of Apollonius.

In his Systematische Entwickelung der Abhdngigkett geometrischer Gestalten von einander he laid the foundation on which synthetic geometry in its present form rests. He introduces what are now called the geometrical forms (the row, flat pencil, &c.), and estab- lishes between their elements a one-one correspondence, or, as he calls it, makes them projective. He next gives by aid of these projective rows and pencils a new generation of conics and ruled quadric surfaces, “which leads quicker and more directly than former methods into the inner nature of conics and reveals to us the organic connexion of their innumerable properties and mysteries.”

In this work also, of which unfortunately only one volume ap- peared instead of the projected five, we see for the first time the

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principle of duality introduced from the very beginning as an im- mediate outflow of the most fundamental properties of the planc, the line, and the point, so that a proof of its correctness is not required.

In a second little volume, Die geometrisehen Construetionen ausge- fihrt mittelst der geraden Linie und eines festen Kreises (1833), he shows, what had becn already suggested by Poncelet, how all prob- lems of the second order can be solved by aid of the straight-edge alone without the use of compasses, as soon as one circle is given on the drawing paper.

The rest of Steiner’s writings are found in numerous papers mostly published in Crelle’s Journal, the first volume of which contains his first fonr papers. The most important are those relating to algebraical curves and surfaces, especially the short paper Allgemeine Eigenschaften algebraischer Curven. This contains only results, and there is no indication of the method by which they were obtained, so that, according to Hesse, “ they are, like Fermat’s theorems, riddles to the present and future generations.” Eminent analysts succeeded in proving some of the theorems, but it was reserved to Cremona to prove them all, and that by a uniform synthetic method, in his book on algebraical curves. Other import- ant investigations relate to maxima and minima. Starting from simple elementary propositions, Steiner advances to the solution of problems which analytically require the calculus of variation, but which at the time altogethcr surpassed the powers of that

cal- culus. Connected with this is the paper Vom Kriimmingsschwer- punete ebener Curven, which contains numerous properties of pedals and roulettes, especially of their areas.

Steiner's papers have been collected and published in two volumes by the Berlin Academy. His lectures on synthetic geometry, con- taining the theory of conics, have been published since his death, edited by Gciser and Schroter. Biographical notices are contained in Geiser's pamphlet Zur Erinnerung an J. Steiner (Schaffhansen,

1874).

STENDAL, a manufacturing town and important rail- way junction in Prussian Saxony, and the former capital of the Altmark, is picturesquely situated on the Uchte, 33 miles to the north-east of Magdeburg. Among the relics of its former importance are the cathedral, built in 1420-24 (though originally founded in 1188) and restored in 1857, the Gothic church of St Mary, founded in 1447, a " Roland column" of 1535, and two fortified gateways, dating from the 13th century. The last form the chief remains of the ancient fortifications, the site of which is now mostly occupied by promenades. A monument to the archzologist Winckelmann (1717-68) commemorates his birth in the town. Stendal is the seat of a large railway workshop, and carries on various branches of textile industry, besides the manufacture of tobacco, machinery, stoves, gold-leaf, &c. The earliest printing-press in the Altmark was erected here, and published an edition of the Sachsenspiegel in 1488 as its first book. The population in 1885 was 16,186.

Stendal was founded in 1151 by Albert the Bear, on the site of a Wendish settlement, and soon afterwards acquired a municipal charter. Becoming capital of the Altmark and a frequent imperial residence, it rose to a considerable degree of prosperity, in part recently restored to it by its railway connexions. When the mark was divided in 1258, Stendal became the seat of the elder or Stendal branch of the house of Ascania, which, however, became extinct in 1820. The original Wends were gradually fused with the later Saxons, although the Platea Slavonica, mentioned in 1475, was still distinguished as the Wenden Strasse in 1567. The population still exhibits a marked Slavonic element.

STENOGRAPHY. See SHortTHAND.

STEPHANUS BYZANTIUS, the author of a geo- graphical dictionary entitled “Evid, of which, apart from some fragments, we possess only the beggarly epitome of one Hermolaus. This work was first edited under the title epi wéAewv (Aldus, Venice, 1502); there are modern editions by Dindorf (1825), Westermann (1839), and Meineke (vol. i., 1850). Even in the imperfect form in which we have it the book is of great value from the references to ancient writers which it preserves. Her- molaus dedicates his epitome to Justinian; whether the first or second emperor of that name is meant is disputed, but it seems probable that Stephanus flourished in the earlier part of the 6th century.

STEPHEN, St, described in late MSS. of Acts xxii. 20 and in subsequent ecclesiastical tradition as mpwrépaprtvs,

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was one of the first seven deacons who were chosen by the church in Jerusalem at the instance of the apostles, He is spoken of as “a man full of faith and the Holy Spirit,” and, though his official function was rather the “serving of tables” than the ministry of the word, the narrative of the book of Acts shows him to have been principally and pre-eminently a preacher. After a brief period of popularity he was accused before the sanhedrin as a blasphemer, and, without being allowed to finish his speech in his own defence, he was hurried without the city walls and stoned to death (c. 37 a.D.). “Devout men ”— an expression apparently used to denote the uncircumcised adherents of the synagogue (see Acts x. 2)— buried Stephen and made great lamentation over him. His martyrdom igs commemorated in the Latin Church on December 26 and in the Greek on December 27. Ecclesiastical tradition tells that in the year 415 his remains were discovered by Lucian, priest of Caphar-Gamala near Jerusalem ; after being deposited for some time in Jerusalem, they were removed by the younger Theodosius to Constantinople, and thence by Pope Pelagius to Rome. Some relics of Stephen were also brought from Palestine to the West by Orosius. Their discovery is commemorated on August 3.

The ministry and martyrdom of Stephen marked a great crisis in the history of the relations of the Christian church to the Gentile world. At first, we are informed, the early disciples, numbering three thousand souls, “had favour with all the people” (Acts ii. 47), who protected them against the rulers, elders, and scribes ; “for all men glori- fied God for that which was done” (Acts iv. 21), and the people “‘magnified” the apostles (v. 13). It was this great popularity of the disciples of Jesus in Jerusalem that led to the ordination of the deacons. Soon a great revulsion of feeling took place. Stephen, “‘full of grace and power,” had wrought “great wonders and signs among the people” (vi. 8); then suddenly arose “certain of the synagogue,” disputing with Stephen, and were “unable to withstand the wisdom and spirit by which he spoke.” What was the new and offensive element intro- duced by Stephen into the apostolic preaching? The accusations against him, and his speech in his own de- fence, alike show that he was the first to realize with any clearness the greatness of the Christian revolution,—the incompatibility of the Mosaic institutions with the spiritu- ality and freeness of the gospel and with its destiny to become a message of salvation for the whole world. The entire drift of his speech is to show the progressive character of revelation, and to show that, as God had often manifested Himself apart from the forms of the law and the synagogue, these could not be held to be of the essence of religion. The seed of much that is most distinctive of the Pauline epistles was sown by the preaching of Stephen.

STEPHEN I., bishop of Rome from about 254 to 257, followed Lucius I. He withdrew from church fellowship with Cyprian and certain Asiatic bishops on account of their views as to the necessity of rebaptizing heretics (Euseb., H. #., vii. 5; Cypr., Epp., 75). He is also mentioned as having insisted on the restoration of the bishops of Leon and Astorga, who had been deposed for unfaithfulness during persecution but afterwards had repented. He is commemorated on August 2. His successor was Sixtus IT.

STEPHEN II., pope from March 752 to April 757, was in deacon’s orders when chosen to the vacant see within twelve days after the death of Zacharias! The main

1 Zacharias died March 15, 752, and a presbyter named Stephen was forthwith chosen to succeed him, who, however, dicd four days afterwards

and before consecration. This Stephen is occasionally called Stephen II., the number of popes of the name being thus raised to ten,

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difficulty of his pontificate was in connexion with the ageressive attitude of Aistulf, king of the Lombards. After unsuccessful embassies to Aistulf himself and appeals to the emperor Constantine, he, though in feeble health, set out to seek the aid of Pippin, by whom he was received in the neighbourhood of Vitry le Brulé in the beginning of 754. He spent the greater part of that year at St Denis. The result of his negotiations was the Frankish invasion of Aistulf's territory and the famous " donation " of Pippin (see Popgpom, vol. xix. p. 495; and compare France, vol. ix. p. 531). The death of Stephen took place not long after that of Aistulf. He was succeeded by Paul I.

STEPHEN IIL., pope from August 1, 768 to January 94, 772, was a native of Sicily, and, having come to Rome during the pontificate of Gregory III., gradually rose to high office in the service of successive popes. On the deposition of Constantine II., Stephen was chosen to succeed him. Fragmentary records are preserved of the council (April 769) at which the degradation of Con- stantine was completed, certain new arrangements for papal elections made, and the practice of image-worship confirmed. The politics of Stephen's reign are obscure, but he inclined to the Lombard rather than to the Frankish alliance. Ile was succeeded by Adrian I.

STEPHEN IV., pope from June 816 to January 817, succeeded Leo III., whose policy he continued. Immedi- ately after his consecration he ordered the Roman people to swear fidelity to Louis the Pious, to whom he found it prudent to betake himself personally in the following August. After the coronation of Louis at Rheims in October he returned to Rome, where he died in the beginning of the following year. His successor was Paschal I.

STEPHEN V., pope from 885 to 891, succeeded Adrian III., and was in turn succeeded by Formosus. In his dealings with Constantinople in the matter of Photius, as also in his relations with the young Slavonic church, he pursued the policy of Nicholas I. His pontificate was otherwise unimportant.

STEPHEN VI., pope from May 896 to July-August 897, succeeded Boniface VI., and was in turn followed by Romanus. He is remembered only in connexion with his conduct towards the remains of Formosus, his last pre- decessor but one (see Formosvus). It excited a tumult, a ended in his imprisonment and his death by strang- ing.

STEPHEN VII. (February 929 to March 931) and STEPHEN VIII. (July 939 to October 942) were virtually nonentities, who held the pontificate during the so-called “ornocracy” of Theodora and Marozia (see Roms, vol. xx. p. 787-8).

STEPHEN IX., pope from August 1057 to March 1058, succeeded Victor II. (Gebhard of Hichstaédt). His baptisnial name was Frederick, and he was a younger brother of Godfrey, duke of Upper Lorraine, who, as marquis of Tuscany (by his marriage with Beatrice, widow of Boniface, marquis of Tuscany), played a prominent part in the politics of the period. Frederick, who had been raised to the cardinalate by Leo IX., discharged for some time the functions of papal legate at Constantinople, and was with Leo in his unlucky expedition against the Normans. He shared the vicissitudes of his brother’s fortunes, and at one time had to take refuge from Henry Tif, in Monte Cassino. Five days after the death of Victor II. (who had made him cardinal-priest and abbot of Monte Cassino), he was chosen to succeed him. He showed great zeal in enforcing the Hildebrandine policy as to clerical celibacy, and was planning large schemes for the expulsion of the Normans from Italy, and the eleva-

tion of his brother to the imperial throne, when he was seized by a severe illness, from which he only partially and temporarily recovered. He died at Florence March 29, 1058, and was succeeded by Benedict X.

STEPHEN (1105-1154), king of England, the second son of Stephen, earl of Blois, and Adela, daughter of William the Conqueror, was born at Blois in 1105. He obtained the county of Mortain by the gift of his uncle Henry I. and that of Boulogne by marriage with Maud, daughter of Count Eustace. As one of the chief barons of Normandy he had sworn to aid in securing the succession to the crown of England for his cousin the empress Matilda and

her infant son, afterwards Henry IJ. Never- theless, on the death of Henry I. in 1135, Stephen at once crossed over to England, and was welcomed by the citizens of London as king. Aided by his brother Henry, bishop of Winchester, and the justiciar, Bishop Roger of Salis- bury, he made himself master of the royal treasure, and was formally elected and crowned on St Stephen's day, December 26, 1135. In a brief charter issued at the time of his coronation he promised to observe the laws and liberties of the land. A fuller charter, the second of our great charters of liberties, was issued early in 1136. In this document, which was based on that of Henry I., each of the three estates came in for its share of promises, but the leading position of the church and the importance of the aid which it gave the king are shown by the pre- dominant attention paid to ecclesiastical privileges. So far all seemed going well, but the troubles of the reign soon began. A false report of Stephen's death in the summer of 1136 caused revolts to break out in the east and west of England. Roger Bigot seized Norwich, and Baldwin of Redvers occupied Exeter. Stephen, who possessed considerable military skill, speedily put down these rebellions, but the outbreak showed the lightness of the feudal bond and the defectiveness of Stephen's title. In 1137 he crossed over into Normandy to defend his dominions there from Geoffrey of Anjou, and was success- ful enough to make a satisfactory peace, but he returned to find England aflame. A mysterious conspiracy was hatched in the diocese of Ely, where the fenlands may have still concealed some remnants of the opposition to Stephen's grandfather. David, king of Scotland, who had already taken up arms on behalf of his niece Matilda, but had been bought off by the surrender of Carlisle, marched an army into England and advanced as far as Yorkshire. Robert, earl of Gloucester, the strongest of the English nobles, raised the standard of rebellion at Bristol. Against these numerous enemies Stephen contrived at first to make head. The conspiracy at Ely was nipped in the bud; the Scotch invasion was checked in the battle of the Standard, near Northallerton, in 1138, and even against Robert of Gloucester Stephen won some success. But his own weakness and folly proved his ruin. In order to conciliate the barons who remained true to him, he allowed them to build castles, each of which became a centre of petty but intolerable tyranny. Instead of relying on the support of his English subjects, Stephen surrounded himself with a body of foreign mercenaries, who pillaged all alike. He granted earldoms at random, thereby splitting up the royal authority and diminishing the royal revenues.

Lastly,—and this was the worst mistake of all,—he broke with the church, and especially with the great family of Bishop Roger, who had the administrative machinery in their hands. On the ground that they had no right to fortify their castles he arrested the bishops of Lincoln and Salisbury, together with Roger the chancellor, son of the latter. He thus enforced the surrender of the castles, but the church, with the new archbishop, Theobald, and Stephen's brother, Henry of Winchester, now legate, at its

head, declared against him. Henry called a council, laid formal charges against the king, and threatened to appeal to Rome. In the midst of this crisis Matilda and her half-brother, Robert of Gloucester, landed in the south of England, and a civil warbegan. From this time forward, for fourteen dismal years, the land knew no peace. It is needless to go into details. Neither party was strong enough to deal a final blow at the other. The nobility changed sides as they pleased, fighting generally for their own interests or for plunder; bands of freebooters wandered up and down the country ; upwards of a thousand castles, each of which was a den of robbers, were erected; the church found threats and persuasion equally ineffective to restore peace and order. ‘‘Men said openly," we are told by the chronicler, "that Christ and His saints slept." At the battle of Lincoln in 1141 Stephen was taken prisoner. After this Matilda was elected queen, but she soon forfeited the allegiance of her supporters. The Londoners revolted, the empress fled to Oxford, and the earl of Gloucester was taken prisoner. He was exchanged for Stephen, and matters went on as before. About 1147 there came a change. Matilda left the country, and her son Henry took the lead. His predominance was further secured by the death of Robert of Gloucester in 1148. Three years later Henry became count of Anjou on the death of his father, while his marriage with Eleanor of Aquitaine made him one of the most powerful princes in Europe. This great accession of strength enabled him to meet Stephen on more than equal terms, and Stephen on the death of his son Eustace was more inclined to peace. In November 1153 the treaty of Wallingford brought the long struggle toanend. It was agreed that Stephen should reign till his death, and that Henry should succeed him. A scheme of reform was drawn up, which Stephen endeavoured, during the short remainder of his reign, to carry out. He died on October 25, 1154. A

brave man, a good soldier, merciful and generous, but devoid of moral strength and political insight, he was utterly incapable to discharge a task which demanded all the skill and energy of his great successor. His nominal reign was a period of anarchy in English history, important only as a full justification for the tyrannies of Henry I. and Henry II.

Authorities. —Ordericus Vitalis, ed. Le Prévost; William of Malmesbury, ed. Hamilton (Rolls Series); Gesta Stephani, ed. Sewell (Engl. Hist. Soe.); Gervase of Canterbury, ed. Stubbs (Rolls Series); Henry of Huntingdon, ed. Arnold (Rolls Series) ;

English Chronicle, ed. Thorpe (Rolls Series); Freeman, Norman Conquest, vol. v.; Lappenberg, Gesch. Englands, vol. iii. (G. W. P.)

STEPHEN, Sir James (1789-1859), historian, was the son of James Stephen, master in chancery, author of Zhe Slavery of the West India Colonies and other works, and was born in London 3d January 1789. He was educated at Trinity Hall, Cambridge, graduating B.A. in 1812, after which he studied for the bar and was called at Lincoln’s Inn. He obtained an extensive practice as a chancery barrister, being ultimately counsel to the colonial depart- ment and counsel to the Board of Trade. In 1834 he be- came assistant under-secretary for the colonies, and shortly afterwards permanent under-secretary. On his retirement in 1847 he was made a knight commander of the Bath. In 1849 he was appointed regius professor of modern history in the university of Cambridge, having already distinguished himself by his brilliant studies in ecclesi- astical biography contributed to the Edinburgh Review, which were published that year under the title Essays in Ecclesiastical Biography and Other Subjects ; a 4th edition, with a short memoir, appeared in 1860. He was also the author of Lectures on the History of France, 2 vols., 1851, 3d ed. 1857, and Desultory and Systematic Reading, a lecture, 1853. He died at Coblentz on the 15th of September 1859.

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STEPHENS, the incorrect English form of the name of Lstienne, the distinguished French family of scholars and printers.

The founder of the race was Henri EStiEnNE (d. 1520), the scion of a noble family of Provence, who came to Parig in 1502, and soon afterwards set up a printing establish- ment at the top of the Rue St Jean de Beauvais, on the hill of Sainte-Geneviéve opposite the law school. He died in 1520, and, his three sons being minors, the business was carried on by his foreman Simon de Colines, who in 152] married his widow.

Ropert Estrenne (1503-1559) was Henri's second son, After his father's death he acted as assistant to his step- father, and in this capacity superintended the printing of a Latin edition of the New Testament in 16mo (1523). Some slight alterations which he had introduced into the text brought upon him the censures of the faculty of theology, It was the first of a long series of disputes between him and that body. It appears that he had intimate relations with the new Evangelical preachers alinost from the beginning of the movement, and that soon after this time he definitely joined the Reformed Church. In 1526 he entered into pos. session of his father's printing establishment, and adopted as his device the celebrated olive-tree (a reminiscence doubtless of his grandmother's family of Montolivet), with the motto from the epistle to the Romans (xi. 20), Noli altwm sapere, sometimes with the addition sed time. In 1528 he married Perrette, a daughter of the scholar and printer Josse Bade (Jodocus Badius), and in the same year he published his first Latin Bible, an edition in folio, upon which he had been at work for the last four years. In 1532 appeared his Thesaurus Lingue Latine, a dictionary of Latin words and phrases, upon which for two years he had toiled incessantly, with no other assistance than that of Thierry of Beauvais. A second edition, greatly enlarged and improved, appeared in 1536, and a third, still further improved, in 3 vols. folio, in 1543. Though the 7hesaurus is now superseded, its merits must not be forgotten. It was vastly superior to anything of the kind that had ap- peared before ; it formed the basis of future labours, and even as late as 1734 was considered worthy of being re- edited. In 1539 Robert was appointed king's printer for

'Hebrew and Latin, an office to which, after the death of

Conrad Neobar in 1540, he united that of kiny's printer for Greek. In 1541 he was entrusted by Francis I. with the task of procuring from Claude

Garamond, the engraver and type-founder, three sets of Greek type for the royal press. The middle size were the first ready, and with these Robert printed the editio princeps of the Lcclesiasticex Historie of Eusebius and others (1544). The smallest size were first used for the 16mo edition of the New Tes- tament known as the O mirificam (1546), while with the largest Size was printed the magnificent folio of 1550. This edition involved the printer in fresh disputes with the faculty of theology, and towards the end of the following year he left his native town for ever, and took refuge at Geneva, where he published in 1552 a caustic and effec- tive answer to his persecutors, under the title Ad Censuras Theologorum Parisiensium, quibus Biblia a R. Stephano, Lypographo Regio, excusa calumniose notarunt, eiusdem R. S. Responsio. A French translation, which is remarkable for the excellence of its style, was published by him in the same year (printed in Rénouard's Annales de Imprimerie des Estienne). At Geneva Robert proved himself an ardent partisan of Calvin, several of whose works he published. He died there September 7, 1559.

It is by his work in connexion with the Bible, and especially as an editor of the New Testament, that he is on the whole best known. The text of his New Testament of 1550, either in its original form

or in sueh slightly modified form as it assumed in the Elzevir text of 1634, remains to this day the traditional text. But, as modern

scholars have pointed out, this is due rather to its typographieal beauty than to any critical merit. The readings of the fifteen MSS. which Robert's son Henri had collated for the purpose were merely introduced into the margin. The text was still almost exactly that of Erasmus. It was, however, the first edition ever published with a critical apparatus of any sort. Of the whole Bible Robert printed eleven editions, —eight in Latin, two in Hebrew, and one in French ; while of the New Testament alone he printed twelve, —five in Greek, five in Latin, and two in French. In the Greek New Testament of 1551 (printed at Geneva) the present division into verses was introdueed for the first time. The cditiones principes which issued from Robert's press wero eight in number, viz., Husebius, includ- ing the Preparatio Evangelica and the Demonstratio Evangelica as well as the Historia Ecclesiastica

already mentioned (1544-46), Moschopulus (1545), Dionysius of Halicarnassus (February 1547), Alexander Trallianus (January 1548), Dio Cassius (January 1548), Justin Martyr (1551), Xiphilinus (1551), Appian (1551), the last being completed, after'Robert's departure from Paris, by his brothcr Charles, and appearing under his name. These editions, all in folio, except the Moschopulus, which is in 4to, are unrivalled for beauty. Robert also printed numerous editions of Latiu classics, of whieh perhaps the folio Virgil of 1532 is the most noteworthy, and a large quantity of Latin grammars and other educational works (many of them written by his friend Maturin Cordier) in the interests of that cause of which he proved himself so stout a champion,—the new learning.

Cuarzes Estrenne (1504 or 1505-1564), the third son of Henri, was, like his brother Robert, a man of con- siderable learning. After the usual humanistic training he studied medicine, and became a doctor of that faculty in the university of Paris. In 1540 he accompanied the French ambassador Lazare Baif to Italy in the capacity of tutor to his natural son Antoine, the future poet. In 1551, when Robert Estienne left Paris for Geneva, Charles, who had remained a Catholic, took charge of his printing establishment, and in the same year was appointed king's printer. He died in 1564, according to some accounts in prison, having been thrown there for debt.

His principal works are Preadiwm Rusticwm, a collection of tracts which he had conzpiled from aneient writers on various branches of agriculture, and which continued to be a favourite book down to the end of the 17th century; Dictionarium Historicum ac Pocticum (1558), the first French eneyclopedia; Thesaurus Ciccronianus ; and Paradoxes, a free version of the Paradossi of Ortensio Landi, with the omission of a few of the paradoxes and of the iinpious and indecent passages (Paris, 1553; Poitiers, 1553). He was also the author of a treatise on anatomy and of several small cducational works,

Henri Estrenne (1528-1598), sometimes called "Henri II.," was the eldest son of Robert. In the preface to his edition of Aulus Gellius (1585), addressed to his son Paul, he gives an interesting account of his father's household, in which, owing to the various nationalities of those who were employed on the press, Latin was used as a common lan- guage, being

understood and spoken more or less by every member of it, down to the maid-servants. Henri thus picked up Latin asa child, but at his special request he was allowed to learn Greek as a serious study before Latin. At the age of fifteen he became a pupil of Pierre Danés, at that time the first Greek scholar in France. Two years later he began to attend the lectures of Jacques Toussain, one of the royal professors of Greek, and in the same year (1545) was employed by his father to collate a MS. of Dionysius of Halicarnassus. In 1547, after attending for a time the lectures of Turnébe, Toussain's successor, he went to Italy, where he spent two years in hunting for and collating MSS. and in intercourse with learned men. In 1550 he was in England, where he was favourably received by Edward VI. Thence he went to Flanders, where he learnt Spanish. In 1551 he joined his father at Geneva, which henceforth became his home. In 1554 he gave to the world, as the firstfruits of his researches, two first editions, viz., a tract of Dionysius of Halicarnassus and Anacreon, both printed by his uncle Charles. In 1556 Henri was again in Italy, where he discovered at Rome ten new books (xixx.) of Diodorus Siculus. In 1557 he issued

from the press which in the previous year he had set up on his own account at Geneva three first editions, viz., Athena- goras, Maximus Tyrius, and some fragments of Greek his- torians, including Appian's 'AvviBadixy and "TBypicy, and an edition of Aischylus, in which for the first time the Aga- memnon was printed in entirety and as a separate play. In 1558 he was appointed printer to Huldrich Fugger, one of the celebrated family of Augsburg bankers, a post which he held for ten years. In 1559 he printed a Latin transla- tion from his own pen of Sextus Empiricus, and an edition of Diodorus Siculus with the new books. In 1566 he published his best known French work, the Apologie pour Hérodote, or, as he himself called it, Z'Lntroduction au Traté de la Conformité des Merverlles Anciennes avec les Modernes ou Traité preparatif a? Apologie pour Hérodote. Some passages in the original edition being considered objectionable by the Geneva consistory, he was compelled to cancel the pages containing them. The book became highly popular. Within sixteen years twelve editions were printed. In 1572 Henri published the great work upon which he had been labouring for many years, the Z'he- saurus Grece Linguex, in 5 vols. folio,

The publication in 1578 of his Dialogues du nouveau Frangois Italianizé brought lim into a fresh dispute with the consistory. To avoid their censure he went to Paris, and resided at the French court for the whole of 1579. On his return to Geneva in the spring of 1580 he was summoned before the consistory, and, proving contumacious, was imprisoned for a week. From this time his life became more and more of a nomad one. He is to be found at Basel, Heidelberg, Vienna, Pesth, everywhere but at Geneva, these journeys being undertaken partly in the hope of procuring patrons and purchasers for his books (for the large sums which he had spent on such publications as the Thesaurus and the Plato of 1578 had almost ruined him), partly from the increasing restlessness of his disposition. But the result of these long absences was that his press stood nearly at a standstill. A few editions of classical authors were brought out, but each successive one showed a falling off. Such value as the later ones had was chiefly due to the notes furnished by Casaubon, who in 1586 had married Henri's daughter Florence. Henri's last years were marked by ever-increasing infirmity of mind and temper. In 1597 he left Geneva for the last time. After visiting Montpellier, where Casaubon was now professor, he made for Paris, but was seized with sudden illness at Lyons, and died there in his seventieth year, at the end of January 1598. Few men have ever served the cause of learning more devotedly. For over thirty years the amount which he produced, whether as printer, editor, or original writer, was enormous. The productions of his press, though printed with the same beautiful type as his father's books, are, owing to the poorness of the paper and ink, inferior to them in general beauty. The best, perhaps, froma typographical point of view, are the Poctxw Greci Principes (folio, 1566), the Plutarch (13 vols. 8vo, 1572), and the Plato (8 vols. folio, 1573). It was rather Henri Estienne's scholarship which gave value to his editions. He was not ouly his own press-corrector but his own editor. Though by the latter half of the 16th century nearly all the important Greek and Latin authors that we now possess had been published, his untiring aetivity still found some gleanings. Eighteen first editions of Greek authors and one of a Latin author are due to his press. The most important have been already mentioned. Henri's reputation as a scholar and editor has increased of late years. His familiarity with the Greek language has always been admitted to have been quite exceptional ; but he has been accused of want of taste and judgment, of carelessuess and rashness. Special censure has been passed on his Plutarch,

in which he is said to have intro- duced conjectures of his own into the text, while pretending to have derived them from MS. authority. But a recent editor, Sintenis, has shown that, though like all the other editors of his day he did not give references to his authorities, every one of his supposed eonjectures can be traced to some MS. Whatever may be said as to his taste or his judgment, it seems that he was both careful and scrupulous, and that he only resorted to conjecture when authority failed him, And, whatever the merit of his conjectures,

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he was at any ratc the first to show what conjecture could do towards restoring a hopelessly corrupt passage. The work, how- ever, on which his fame as a scholar is most surely based is the Thesaurus Greee Linguxz. After making due allowance for the fact that considerable materials for the work had been already collected by his father, and that he received considerable assistance from the German scholar Sylburg, he is still entitled to the very highest praise as the producer of a work which was of the greatest service to scholarship and which in those early days of Greek learning could have been produced by no one buta giant. Two editions of the Thesaurus have been published in this century—at London by Valpy (1815-25) and at Paris by Didot (1831-63). It was one of Henri Estienne's great merits that, unlike nearly all the French scholars who preceded him, he did not neglect his own lan- guage. While Budé wrote French with difficulty and considered it hardly a fit language for a scholar to use, Henri Estienne was loud in its praises and gave practical proof of its capabilities. Of his French writings three were devoted to this theme :—(1) Conformité du Langage Frangois avec le Gree (published in 1575, but without date; ed. L. Feugére, 1850), in which French is shown to have, among modern languages, the most affinity with Greek, the first of all languages ; (2) Dewx Dialogues du nouveau Francois Italianizé (Geneva, 1578 ; reprinted, 2 vols., 1883), directed against the fashion prevailing in the court of Catherine de' Medici of using Italian words and forms; (3) Project du Livre Intitulé de la Pre- cellence du Langage Francois (Paris, 1579; ed. Feugére, 1853), which treats of the superiority of French to Italian. An interesting feature of this tract is the account of French proverbs, and, Henry III. having expressed some doubts as to the genuineness of some of them, Henri

Estieune published, in 1594, (4) Les Premices ou le J. livre des Proverbes Epigrammatizez (never reprinted and very rare). Finally, there remains (5) the Apologie pour Hérodote, the work by virtue of which Henri Estienne belongs to literature. The ostensible object of the book is to show that the strange stories in Herodotus may be paralleled by equally strange ones of modern times. Virtually it is a bitter satire on the writer's age, especially on the Roman Church. Put together without any method, its extreme desultoriness makes it difficult to read continuously, but the numer- ous stories, collected partly from various literary sources, notably from the preachers Menot and Maillard, partly from the writer's own multifarious experience, with which it is packed, make it an interesting commentary on the manners and fashions of the time. But satire, to be effective, should be either humorous or righteously indignant, and, while such humour as there is in the Apologie is decidedly heavy, the writer's indignation is generally forgotten in his evident relish for scandal. The style is, after all, its chief inerit. Though it bears evident traces of hurry, it is, like that of all Henri Estienne's French writings, clear, easy, and vigorous, uniting the directness and sensuousness of the older writers with a suppleness and logical precision which at this time were almost new elements in French prose. An edition of the Apologie has recently been published by Liseux (ed. Ristelhuber, 2 vols., 1879), after one of the only two copies of the original uncancelled edition that are known to exist. The very remarkable political pamphlet en- titled Discours Mervetlleux dela Vie et des Déportements de Catherine de Médicis, which appeared in 1574, has been ascribed to Henri Estienne, but the evidence both internal and external is conclusive against his being the author of it. Of his Latin writings the most worthy of notice are the De Latinitate falso suspecta (1576), the Pscudo-Cicero (1577), and the Nizoliodidascalus (1578), all three written against the Ciceronians, and the Francofordiense Emporium (1574), a panegyric on the Frankfort fair (reprinted with a French translation by Liseux, 1875). He also wrote a large quantity of indifferent Latin verses, including a long poem entitled Musa Monitrix Principum (Basel, 1590).

The primary authorities for an account of the Estiennes are their own works. In the garrulous and egotistical prefaces which Henri was in the habit of pre- fixing to his editions will be found many scattered biographical details. Twenty- seven letters from Henri to John of Crafftheim (Crato) (ed. F.

Passow, 1830) have been printed, and there is one of Robert's in Herminjard's Correspondance des Reéformateurs dans les Pays de Langue Frangaise (7 vols. published), while a few other contemporary references to him will be found in the same work. The secondary authorities are Janssen van Almelovecn, De Vitis Stephanorum (Amst., 1683); Maittaire, Stephanorum Historia (Lond., 1709); A. A. Rénouard, Annales deU Imprimerie des Estienne (2d ed., Paris, 1843); the article on Estienne by A. F. Didot in the Nouv. Biog. Gén.; and an article by Mark Pattison in the Quart. Rev.

for April 1865. There is a good account of Henri's Thesaurus in the Quart. Rev. for January 1820, written by Bishop Blomfield. NGA)

STEPHENS, A.exanper Hamitton (1812-1883), American statesman, was born in Georgia, February 11, 1812. In spite of many difficulties imposed by poverty and ill-health, he became a lawyer and politician of great reputation and popularity. He was one of the Whig leaders of his State until about 1850, and then drifted into the Democratic party through the rising discussions of slavery, serving in Congress from 1843 until 1859. In 1860 he opposed secession warmly ; but when his State

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had seceded he "' followed his State," and was elected vice- president of the Confederate States. Whatever there wags of opposition to the despotic tendencies of Jefferson Davis gathered around Stephens as a centre; and the vice-pre- sident was never an influential member of the Confederate administration. His popularity in Georgia was unbounded, and he was elected representative in Congress in 1877-82, and governor, 1882-83, dying in office. In person he was small and extremely emaciated, seldom weighing more than 90 pounds, and always in delicate health; but his powers as an orator were remarkable.

Cleveland's A. H. Stephens in Public and Private and Johnston and Browne's Life of A. H. Stephens are the main authorities for

Stephens's life. His political opinions are fully given in his work, The War between the States.

STEPHENS, Joun Luoyp (1805-1852), traveller, was born 28th November 1805, at Shrewsbury, N.J., United States. Having been admitted to the bar, he practised his profession for about eight years in New York city, In 1834, the state of his health rendering it advisable that he should travel, he visited Europe, and for two years made a tour through many countries of that continent, extending his travels to Egypt and Syria. On his return to New York he published (under the name of “George” Stephens) in 1837 Incidents of Travel in ELgypt, Arabia Petrxa, and the Holy Land. This work was followed next year by the publication, also in two volumes, of Incidents of Travel in Greece, Turkey, Russia, and Poland. In 1839 Stephens arranged with Frederick Catherwood of London, who had accompanied him on some of his travels, and illustrated the above-mentioned publications, that they should make an exploration together in Central America, with a view to discovering and examining ancient art said to exist in the dense forests of that tropical region. Stephens, meantime, was appointed United States minister to Central America. The joint travels of Stephens and F. Catherwood occupied some eight months in 1839 and 1840. As the result of these researches Stephens published in 1841 Jncidents of Travels in Central America, Chiapas, and Yucatan. In the autumn of 1841 the two travellers made a second explora- tion of Yucatan, the fruits of which were gathered up in a work published by Stephens in 1843,—Jncidents of Travel in Yucatan. This work describes the most exten- sive travels executed till that date by a stranger im the peninsula, and, as the author claims, “contains account of visits to forty-four ruined cities or places in which remains or vestiges of ancient populations were found.” It fixed the sites of many prehistoric cities and supplied correct delineations of their existing monuments. This publica- tion enjoyed a wide popularity, and made such an impres- sion on Prescott the historian that he urged Stephens to prosecute his researches of American antiquities in Peru. Stephens was, however, disinclined to so distant an expedi- tion. He became a director of the newly-formed American Ocean Steam Navigation Company, which established the first American line of trans-Atlantic steamships, He visited Panama to reconnoitre the ground with a view to the construction of a railway across the isthmus, and, first as vice-president and then as president of the Panama Rail- way Company, spent the greater part of two years In superintending the project. His health was, however, entirely undermined

by his long and incautious exposure to the deadly climate of Central America, and he died at New York on the 10th October 1852.

Stephens made no pretensions to the title of a scientific traveller. He had, however, a natural curiosity after all kinds of human knowledge, shrewd and accurate powers of observation, and a more than common measure of per- severance, tact, and resource.

Ss T E—

STEPHENSON, Grorce (1781-1848), perfecter of the locomotive, was the son or Robert Stephenson, fireman of a colliery engine at Wylam, near Newcastle, where he was born 9th June 1781. In boyhood he was employed as a cowherd, and occupied his leisure in erecting clay engines and sinilar mechanical aniusements. Afterwards he drove the ginhorse at a colliery, and in his fourteenth year became assistant to his father in firing the engine at 9 shilling a day. He set himself diligently to qualify himself for higher duties, and in his seventeenth year was appointed engineman or plugman. As yet he was unable to read, but, stimulated by the desire to obtain fuller information regarding the wonderful inventions of Boulton and Watt, he began in his eighteenth year to attend a night school, and soon made remarkably rapid progress. In 1801 he obtained the situation of brakesman, and in 1812 was appointed engine-wright at Killingworth high pit at a salary of £100 a year. Meantime he had been employing his leisure in watch and clock cleaning, in studying mechanics, and in various experiments with a yiew of solving the difficulties connected with the con- struction of a satisfactory locomotive. Having obtained permission from Lord Ravensworth, the principal partner of the Killingworth colliery to incur the outlay for con- structing a “travelling engine” for the tramroads between the colliery and the shipping port nine miles distant, he made a successful trial with the engine, which he named “My Lord,” 25th July 1814. Setting himself diligently to improve his invention, he thoroughly satisfied himself that for the proper success of the locomotive a railway as nearly as possible level was an essential condition. In 1822 he succeeded in impressing with the importance of his invention the projectors of the Stockton and Darlington Railway, who had contemplated using horses for their waggons, and was appointed engineer of the railway, with liberty to carry out his own

plans, the result being the opening, 27th September 1825, of the first railway over which passengers and goods were carried by a locomotive. The success of the Stockton and Darlington Railway led to the employment of Stephenson in the construction of the Liverpool and Manchester Railway, which, notwithstanding prognostications of failure by the most eminent engineers of the day, he carried successfully through Chat Moss. He also succeeded in persuading the directors to give the locomotive a trial; and, as his improved invention, the “Rocket,” during her trial trip made 29 miles an hour, his suggestion met with complete approval; with the opening of the line, 15th September 1830, the modern era of railways may be said to have been definitely inaug- urated. While his experiments in connexion with loco- motives were in progress, the construction of a safety lamp for use in mines occupied much of his attention. There can be no doubt regarding the justice of his claims to be considered the first inventor of the tube safety lamp, not- withstanding that the name of Sir Humphry Davy has been chiefly associated with the discovery. In recognition of the “valuable service he had thus rendered to man- kind,” subscriptions were in 1815 collected in behalf of Stephenson which amounted to £1000, a sum which he found of great convenience in connexion with his locomo- tive experiments. Stephenson was closely connected with the more important of the railway projects which the success of the Liverpool and Manchester line called into existence, but he strongly disapproved of the railway mania which ensued, and predicted that only ruin could result from the prevalent disposition towards railway speculation. He was frequently consulted in regard to the construction of foreign railways, and in this connexion visited Belgium and Spain in 1845. Towards the close of his life he retired from active duties, and at his residence at Tupton House,

Chesterfield, interested himself chiefly in farming and horticultural pursuits. He died 12th August 1848.

See Story of the Life of George Stephenson, by Samuel Smiles, 1857, new ed. 1873 ; and Smiles’s Lives of British Engincers, vol. iii.

STEPHENSON, Roserr (1803-1859), engineer, son of the preceding by his first wife Fanny Henderson, was born at Willington Quay, 16th October

1803. Remembering his own early difficulties owing to deficient instruction, his father bestowed special care on his education, sending him in his twelfth year to attend Mr Bruce's school in Percy Street, Newcastle, where he remained about four years. In 1819 he was apprenticed to a coalviewer at Killingworth to learn the business of the colliery, after which, to perfect his training in technical science, he was sent in 1822 to attend the science classes at the university of Edinburgh. On his return he assisted his father in the survey of various railway lines, but in 1824 he accepted an engage- ment to take charge of the engineering operations of the Columbian Mining Association of London. On account of the harassing difficulties of the situation he resigned it in 1827, and after his return to England undertook the management of his father's factory in Newcastle, greatly aiding him in the improvement of his locomotives, the result being the construction of the "Rocket," which firmly established the practicability of steam locomotion on railways. Subsequently his services were in great request as a railway engineer, and after the retirement of his father he was regarded as the chief authority on the subject. In this connexion his most remarkable achieve- ments were his railway viaducts on the tubular system, constructed with the aid of the practical knowledge of Sir William Fairbairn, and justly characterized as 'the greatest discovery in construction in our day." Among his more notable bridges are the Royal Border bridge at Berwick-on-Tweed, the high-level bridge at Newcastle-on- Tyne, the Britannia tubular bridge over the Menai Straits, the Conway tubular bridge, and the Victoria tubular bridge over the St Lawrence, Canada. In 1847 he entered the House of Commons as member for Whitby. He was frequently consulted in the construction of foreign railways, and was decorated for his services by the king of Belgium, the king of Sweden, and the emperor of the French. In 1855 he was elected president of the Institute of Civil Engineers. He died 12th October 1859, and was buried in Westminster Abbey.

See The Story of the Life of George Stephenson, including a Memoir of his Son Robert Stephenson, by Samuel Smiles, 1857, new ed. 1873; Jeaffreson, Life of Robert Stephenson, 2 vols., 1864; and Smiles's Lives of British Engineers, vol. iii.

STEREOCHROMY. See Sizica.

STEREOSCOPE is an optical instrument for repre- senting in apparent relief and solidity all natural objects by uniting into one image two representations of these objects as seen by each eye separately. That the two eyes form different images of any objects which are near enough to have dissimilar perspective projections has been long known, and may be readily tested by any one. Euclid proved it geometrically with reference to a sphere (26th, 27th, and 28th theorems of his Treatise on Optics) ; Galen showed how the demonstration might be made.! Porta (q.v.), in his work on Refraction, also writes on the subject, and Leonardo da Vinci adduced the want of correspond- ence between the parts of the background intercepted by a near object seen by the two eyes singly "as the reason why no painting can show a rilievo equal to that of natural objects seen by both eyes within a moderate distance."2 In 1613 Aguilonius, a Jesuit, in his work on Optics, attributed the union of the two unlike pictures into

1 De Usu Partium Corporis Humant, Lyons, 1550, p. 598. 2 Trattata della Pietura, Scultura, ed Architettwra, Milan, 1584.

a clear image to a 'common sense" which gave its aid equally to each eye, —this common sense being specially exerted when the object is placed much nearer to one eye than to the other, so that the sizes as well as the forms of the two retinal pictures are sensibly different. The sub- ject was merely touched by various other writers after Aguilonius until 1775, when Harris! observes: "We have other helps for distinguishing prominences of small 'parts besides those by which we distinguish distances in general, as to their degrees of light and shade, and the prospect we have round them. Again, by the parallax, on account of the distance betwixt our eyes, we can distinguish, besides the front part, the two sides of a near object not thicker than the said distance, and this gives a visible rilievo to such objects, which helps greatly to raise or detach them from the plane in which they lie. Thus the nose on a face is the more remarkably raised by our seeing both sides of it at once." This was undoubtedly a con- siderable step towards a sound theory of binocular vision, but it cannot be said to have anticipated the invention of the stereoscope. This instrument owes its origin entirely to the

experimental researches of Sir Charles Wheatstone on binocular vision, and the following passage from Mayo's Outlines of Human Physiology, p. 288, published in 1833, is the first clear enunciation of the principle on which it is constructed :—" A solid object, being so placed as to be regarded by both eyes, projects a different per- spective figure on each retina; now if these two perspect- ives be actually copied on paper, and presented one to each eye, so as to fall on corresponding parts, the original solid figure will be apparently reproduced in such a manner that no effort of the imagination can make it appear as a representation on a plane surface." Sir Charles Wheat- stone's 'Contributions to the Physiology of Vision, Part the First" appeared in the Philosophical Transactions of 1838, but this paper was the result of investigations extending over a period of years, and there is evidence that reflecting stereoscopes were constructed for Wheat- stone by Newman, a well-known philosophical instrument maker, so early as the winter of 1832. Wheatstone no doubt also, as early as 1845, employed photographic pictures for his reflecting stereoscope. The subject was taken up by Sir David Brewstcr, and was developed more particularly in two papers read to the Royal Society of Kdinburgh in January 1843 and April 1844. These re- searches led Brewster to the invention of the lenticular or refracting stereoscope. The discoveries of Daguerre and Talbot, and the rapid development of the art of photo- graphy, enabled photographs to be taken suitable for the Stereoscope, thus superseding the geometrical drawings previously employed, and in 1849 Duboscq, a Parisian optician, began the manufacture of lenticular stereoscopes and executed a series of binocular daguerrotypes of living individuals, statues, bouquets of flowers, and objects of natural history. For many years the refracting stereoscope of Brewster was one of the most popular of scientific in- struments, and was to be found, along with an appropriate collection of pictures, in every drawing-room, but of late years it has somewhat fallen into the background, and the manufacture by photographers of stereoscopic views now forms but a small portion of their work. Whilst much credit is due to Brewster for his writings on binocular vision, and for the efforts he made to introduce the stereo- scope to the public, there is no doubt that Wheatstone was not only the real inventor of the instrument but he also laid down in his paper published in 1838, and in a second con- tribution which appeared in the Philosophical Transactions in 1852, the true principles of binocular vision.2

1 Opticks, vol. ii. pp. 41 and 245.

2 See Brewster on the Stereoscope, 1856 ; Wheatstone’s Scientific

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When we look at an external object with both eyes it is seen generally as a single object, although there must be two retinal pictures, one for each eye. This depends on the fact that the excitation of certain associated spots on the two retin is referred to the same point in space, or, in other words, that the luminous impression which originates by the irritation of two associated points appears as one point in the visual field. Such associated points or areas of the retina are said to be corresponding or identical, When an object is seen single by two eyes, the two images must fall on corresponding points of the retina. If one eye be pushed to the side, the image on the retina of that eye is displaced from its appropriate identical point, and a double image is the result. Now the term horopter ig applied to represent an imaginary surface containing “all those points of the outer world from which rays of light passing to both eyes fall upon identical points of the retina, the eyes being in a certain position.” The horopter varies with the different positions of the eyes (see Eyx, vol. vill. p. 826). But it is a familiar experience that we not only see a single object with two eyes, but the object, say a cube or a book lying on the table, is seen in relief, that is, we take cognizance of the third dimension occupied by the body in space, although the two retinal pictures are ona plane. Itis clear that the two images of the object which do not coincide with the horopter cannot be completely united so as to furnish one single visual impres- sion, Further, it can readily be demonstrated that the two retinal pictures are dissimilar, and yet the two images are fused into one and give the impression of a single object occupying three dimensions. To explain these phenomena, Wheatstone put forward the theory that the mind completely fused the dissimilar pictures into one, and that whenever there occurs such complete mental fusion of images really dissimilar, and incapable of mathematical coincidence, the result is a perception of depth of space, or solidity, or relief. The objection to this theory as stated by Wheatstone is that complete fusion does not take place. It is always possible by close analysis of visual perceptions to distinguish between the two retinal pictures. Further, if the

fusion is mental, as stated by Wheatstone, it is an example of unconscious cerebration. Another explanation has been suggested by Briicke.? When we look at objects near at hand the optic axes are converged strongly, and they become less and less converged as we gaze at objects farther and farther away. There is thus a series of axial adjustments, the necessary muscular movements giving rise to definite sensations, by which we estimate the relative distance of objects in the field of view. A man with one eye cannot judge by this method. We habitually depend upon binocular vision for the guidance of all such movements as require an exact estimate of the respective proximity of two or more objects. ‘A very good test experiment is to suspend a curtain ring in such a manner as to present its edge at the distance of four or five feet from the eye, and then to try to push sideways through its hoop the curved handle of a walking stick held by the lower end ; in this

Papers, published by the Physical Society of London, 1879; and an article by the late Dr William Carpenter in Hdinburgh Review for

1858.

3 This theory is usually attributed to Briicke, but something very similar to it was taught by Brewster. Brewster, however, did not attach importance to muscular sensations as an element in the question, and was content with pointing out that, in looking at the stercoscopice pictures of a bust, for example, “the cyes will instantly, by means of their power of convergence, unite the separated points of the eyes, and then the still more separated points of the ears, running over each part of the bust with the rapidity of lightning, and uniting all the corresponding points in succession, precisely as it does in looking at the bust itself.” See his article ‘‘ Stcreoscope,” in Hneye. Britan.; 8th ed., vol. xx. p. 689.

feat, which can be readily accomplished under the guidance of binocular vision, large odds may be laid that success will not be attained when one eye is closed, until a suc- cession of trials shall have enabled the experimenter to measure the distance of the ring by the muscular move- ments of his arm.”! According to Briicke, the two eyes are continually in a

state of motion, and their position of convergence, now greater now less, passes from one side to the other, so that the observer combines successively the different parts of the two pictures, thus giving rise to sensations of depth of space and of subjects stand- ing out in relief. Briicke's theory, in short, is that our perception of depth depends on the fusion of muscular sensations, or rather of nervous impressions arising from the muscles of the eyeballs. It was, however, pointed out by Dove that the sensation of relief, solidity, or per- spective is perfect even when natural objects or stereoscopic pictures are seen momentarily by an electric flash lasting only yz,t-yp of a second, during which time it is in- conceivable that there can be any change in the degree of convergence of the optic axes. This experiment is fatal to Briicke's theory, and Wheatstone was right in asserting that the sensation of relief is instantaneous. A third theory is that of Joseph Le Conte, advanced in 1871, and thus stated by himself :—" All objects or points of objects either beyond or nearer than the point of sight are doubled, but differently,—the former homonymously, the latter hetcronymously. The double images in the former case are united by less convergence, in the latter case by greater convergence, of the optic axes. Now, the observer knows instinctively and without trial, in any case of double images, whether they will be united by greater or less optic convergence, and therefore never makes a mistake, or attempts to unite by making a wrong movement of the optic axes. In other words, the eye (or the mind) in- stinctively distinguishes homonymous from heteronymous images, referring the former to objects beyond, and the latter to objects this side of, the point of sight." Thus, according to Le Conte, the mind perceives relief znstantly but not zmmediately, and it does so by means of double images. This theory does not possess the merit of simpli- city, and, whilst it may explain the phenomenon of relief as experienced by those who have been specially trained to the analysis of visual perceptions, it does not satis- factorily account for the experience of everyday life. We are therefore obliged to fall back on the theory of Wheatstone, somewhat modified, namely, that there are, behind the phenomena referred to the retina, psychical operations, unconsciously performed, which fuse together the results of the retinal impressions. In the language of Hermann, "corresponding points are therefore such points as furnish images, which, as experience teaches, are habitually combined or fused. But, as it appears necessary to effect these combinations in order to obtain correct impressions of objects, we get into

the habit of fusing also the images of the two not perfectly corresponding points which, under ordinary circumstances, we should perceive as double. It can easily be demonstrated that simultaneous images which fall upon corresponding points are not united, although it is true that they do not form second images. When the mind must unite images which do not fall upon corresponding points, the process must be associated with the conception that the corresponding points in the object occupy the situation for which the eye would have to be arranged, in order that the image should coincide.”*

To dbtain binocular pictures suitable for the stereoscope, the camera must be placed successively in two points of the circum-

Carpenter, Edinburgh Review, 1858. 2 American Journal of Science and Arts, vol. ii., 1871. 8 Hermann’s Physiology, translated by Gamgee, p. 480.

ference of a circle of which the object is the centre, and the points at which the camera is so placed must have the angular distanco representing the convergence of the optic axes when the object is to be vicwed in the stereoscope. For example, if the pictures are to be seen in the stereoscope at a distance of 8 inches before the eyes, the convergence will be 18°, and the camera must be stationed at two points on the circle at the same angular distance. This distance of the camera from the object only affects the magnitude of the picture. Usually two cameras are employed, fixed at the proper angular positions. Wheatstone gives the following table of the inclination of the optic axes at different distances, and it also shows “ the angular positions of the camera required to obtain binocular pictures which shall appear at a given distance in the stereoscope in their true relief.” ee CO Oe We i ie we rer we we Distance in inches 71:5 35°7 23-8 17-8 13-2 11:8 10-1 8°8 7°8 7°0 6-4 5°8 5:4 5°0 4°6 “The distance is equal to 4a cotang 4 6,—a denoting the distance between the two eyes and @ the inclination of the optic axes” (Wheatstone, Scientific Papers, p. 270).

Suppose two stereoscopic pictures thus taken are presented to

the two eyes; ; C)

it is possible by an effort so to converge the eyes as to throw the im- anne ou corres- onding points, ad “

The principle of Wheatstone’s reflecting stereoscope is illustrated in fig. 2. It consisted of two plane mirrors, about 4 inches square, fixed in frames B and so adjusted that their backs form an angle of 90° with each \ other. These mirrors | \ /

Fig. 1.—Stereoscopic figures. pyramid.

A, cone; B, ten-sided

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are fixed to an upright against the middleline of a vertical board cut Ss away so as to allow the

eyes to be placed be-a fore the mirrors. On each side there is a panel bearing a groove above and below into which the correspond- , } ing pictures can be?* slid. Mechanical ar- rangements also exist for the purpose of moving the pictures to or from the mirrors and also for inclining the pictures at any ft angle (fig.3). There is one position in which the binocular image will be immediately seen single, of its pro- per size, and without fatigue, “because in this position only the

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Fic. 2.—Diagram of Wheatstone’s Reflecting Stereo- scope. K, K, right and left eyes; S, 8’, 8S”, mirrors; L, R, panels for holding pictures; a@ 0, picture on

_left side; a, b,, picture on right side; a, 8, A and a, B, p are corresponding points on retine; ALB, object as seen in relief in mirrors; 6, seen by left eye in position B, and image on retinaat 8; Lsecn at LR, and retinal image at A; @ seen at A, and retinal image at a; a’ seen at A, and retinal image

5 : ata; Rscenat RL, and retinal image atp; 6’ seen

ordinary relations be- atB, and retinal image at 6.—Landois and Stirling’s

tween the magnitude Physiology.

of the pictures in the retina, the inclination of the optic axes, and

the adaptation of the eye to distinct vision at different distances

are preserved ” (Wheatstone). Although somewhat cumbrous, the

reflecting stereoscope is a most useful instrument, and enables one

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to perform a greater variety of experiments on binocular vision than can be carricd out easily with the more common form.

Fic. 3.—Wheatstone’s Reflecting Stereoscope.

Wheatstone also invented a form of stereoscope in which the pic- tures were brought on corresponding points of the retina by refrac- tion instead of by reflexion. This had a form very like the ordinary stereoscope, but, instead of lenses in the apertures to which the eyes are directed, it had “a pair of glass prisms having their faces inclined 15° and their refractive angles turned towards each other… . A pair of plate-glass prisms, their faces making with each other an angle of 12°, will bring two pictures, the corresponding points of which are 23 inches apart, to coincide at a distance of 12 inches, and a pair with an angle of 15° will occasion coincidence at 8 inches,’

The form of stereoscope generally used is that invented by Sir David Brewster, and is known as the refracting stereoscope. The arrangement is shown diagrammatically in fig. 4. Let the left eye be at A and the right at B; let @ and b be the corresponding pic- tures for each eye, and Pi, Po, two prisms of glass. A prism refracts rays of light so that the object seen through the prism appears to be nearer to the refracting edge; the prism 7, therefore refracts the ray ap, in the direction pA, as if it proceeded from ¢. The prism p, refracts the ray bp, so that to the eye at B it ae ‘i also appears to proceed ss from “5 The effect of cata i . es: this is that the object Fig. 4.—Diagram of the Refracting Stereoscope. really appears to be atc. Andas the points a and b combine to form the point c, sod and ¢ unite to form the point /, and g and hk to form the point 4 (Weinhold). This stereoscope consists of a pyramidal box blackened inside and having a lid for the admission of light (fig. 5). At the narrow end of the box are two tubes carrying the lenses. The tubes move up and down to suit eyes of different focal lengths, and sometimes convex or concave lenses are in- serted over the prisms to meet the wants of long-sighted or short-: sighted persons. Fig.6 shows the upper end of the stereoscope, with the lenses in position.

A. Stroh (without knowing that H. Grubb

Fie. 5.—Sir David Brewster’s Stereoscope. had described the essentials of the apparatus in 1879) has recently invented a new form of stereoscope based on the well-known effects

1 Wheatstone’s Scientific Papers, p. 267.

of the persistence of vision. T’wo stereoscopic pictures are simul. taneously projected by two lanterns on a screen so as to overlap, — and disks having suitable slits : are rotated in front of the lan- q@me== terns and also in front of the eyes of the observer, in such a way that only one picture is thrown on the screen at a time, and also that the view of the picture is seen with the right and left eyes alternately. Further, the eonnexion between the disks is so arranged that the time of © obscuring the view of the observer’s right eye or left eye coincides with the time when the light is shut off from the right or left lantern, and thus the left eye sees the picture of the left lanten _ and the right eye that of the right lantern. The two eyes never see at the same time, and each eye views its picture after the other, but the impressions come so fast as to be fused in consciousn and the result is, the image stands out “in solid relief” (Prog, Roy. Soc., No. 244, vol. xl., April 1, 1886). a

During his researches into the physiology of vision, Wheatstone was led to study what he termed conversions of relief. Sometimes when we look at a geometrical figure such as a cube or rhom- boid it may be imagined to represent one of two dissimilar figures. In fig. 7 the rhomboid AX is drawn so that the solid angle A should be scen nearest, and solid angle X farthest, and face ABCD foremost, while XDC is behind. Look steadily and the posi- tion will change: X will appcar nearest, solid angle A farthest; face ACDB will recede behind XDC.? The effects are most obvious when seen with one eye, and ‘‘no illusion of this kind can take place . when an object of three dimensions is seen with both eyes while the optic axes make a sensible angle Fig. 7. with each other, because the appearance of two dissimilar figures, one to each eye, prevents the possibility of mistake” (Wheat- stone). The conversion of a cameo into an intaglio and of an in- taglio into a cameo is a well-known instance of this illusion, Wheatstone observed the conversion of relief exhibited by binocular

ictures in the stereoscope when they are transposed, reficcted, or inverted, and this led him to the invention of the Psewdoscope, an instrument which conveys to the mind false perceptions of all ex- ternal objects. “Two rectangular prisms of flint glass, the faces of which are 1‘2 inch square, are

placed in a frame with their hypo- thenuses parallel and 271 inches from each other; each prism has a motion on an axis corresponding with the angle nearest the cyes, that they may be adjusted so that their bases may have any inclination towards each other” (Wheatstone’s Scientific Papers, p. 275). In fig. 8 there is a diagram of the instrument. Ifa spherical surface be exa- mined with this instrument, it will appear hollow; whilst a hollow surface will appear convex, It is remarkable, however, that the converting powers of this instrument are greatest where the new forms can be conceived without effort. Thus a cameo and an intaglio, a plaster cast in relief and its mould, or any object similar in its op- posite relicfs is at once changed by the pseudoscope into the converse form. As A pointed out by Dr Carpenter, by gazing we can reverse the interior of a mask so as to see the countenance stand out in relief; it is more difficult to throw the features of a bust into the shape of a mould; whilst it is impossible to effect any conversion upon , the features of the living face. “The op- tical change is identically the same in its nature in every one of these cases; and there is nothing in the form of the features which refuses to present a converse, this converted shape being presented by the mask; but the mind, which will admit the . conception of the converted form when suggested by the inanimate mask or bust, is steeled by its previous experience against the notion that actual flesh and blood can undergo such a metamorphosis” (Car- penter, Hdinburgh Re- view, 1858, p. 460).

A little consideration will show that the pic-

. Fig. 6.—Lenses m Refracting Stereoscope.

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Fic. 8.—Diagram of Wheat- stone’s Pseudoscope. A,B, tubes containing prisms; a, 6;, and a, B, corre- sponding points; 4a, 8 ¢, positlon of points in visual field.

tures of objects placed © o 0 Os ata great distance from lic, 9.—-Diagram of Von Helmholtz’s Telestereoscope.

the eye are practically

if not wholly identical. Here there is scarcely any stereoscopic

2 Necker, Phil. Mag., 3d series, vol. i. p. 357,

effect, and the landscape may appear to be flat, as in a picture. To obtain a stereoscopic view of a landscape Von Helmholtz invented the Telestercoscope, an instrument which places as it were the point of view of both eyes wide apart. It consists of two mirrors L and R, cach of which projects its image upon 1 and 7, to which the eyes O and o are directed. The eyes O and o are placcd as it were at O, and 0,, according to the distance between L and R; consequently two dissimilar pictures are obtained ; these are mentally combined, with the result that the landscape is seen like a stereoscopic view. The principle of the stereoscope was successfully applied by Wenham in 1854 to the construction of the binocular microscope. See Microscove (vol. xvi. p. 272), and also two papers in the Jour. Roy. Micr. Soc., 1884 :—(1) “On the Mode of Vision with Objectives of Wide Aperture,” by Prof. E. Abbe, p. 20; and (2) “On the Physiology of Binocular Vision with the Microscope,” by Dr Carpenter, p. 486. Prof. Abbe shows, however, that “oblique vision in the microscope is entirely different from that in ordinary vision, inasmuch as there is uo perspective, so that we have no longer the dissimilarity which is the basis of the ordinary stercoscopic effect, but an essentially different mode of dissimilarity between the two pictures.” In the microscope there is no per- spective foreshortening. There is no difference in the outline of an object viewed under the microscope by an axial or by an oblique pencil. There is simply a lateral displacement of the image—an entircly different phenomenon to that which occurs in non-micro- scopic vision, ‘Thus, whilst the mode of formation of dissimilar pictures in the binocular microscope is different from the production of ordinary stereoscopic pictures, the brain mechanism by which they are so fused as to give rise to sensations of solidity, depth, ‘and perspective is the same. (J. G. M.)

STEREOTYPE. See TypoGRAPHY.

STERLING, a city of the United States, in White- side county, Illinois, on Rock River (a tributary of the Mississippi), 110 miles west of Chicago. Mainly on account of the abundant water-power produced by the natural rapids of the river and a dam 1100 feet long, it has become the seat of the most varied manufacturing industry. An artesian well 1000 feet deep, discharging 18,000 gallons per hour, contributes to the water-supply of the town. The population was 5312 in 1870 and 5087 in 1880. Sterling was laid out in 1836 and incorporated in 1857.

STERLING, Joun (1806-1844), author, was descended from a family of Scottish origin which had settled in Treland about the Cromwellian period. His father, Edward Sterling, born at Waterford 27th February 1773, had been called to the Irish bar, but, having fought as a militia captain at Vinegar Hill, afterwards volunteered with his company into the line. On the breaking up of his regiment he went to Scotland, and took to farming at Kames Castle in Bute, where John, the second son, was born 20th July 1806. In 1810 the family removed to Llanblethian, Glamorganshire, and during his residence there Edward Sterling, under the signature of ‘“‘ Vetus,” contributed a number of letters to the Z’%imes, which were reprinted in 1812, and a second series in 1814. In the latter year he removed to Paris, but, the escape of Napoleon from Elba in 1815 compelling him to return to England, he took up his permanent residence in London, obtaining a connexion with the Zimes newspaper, and ultimately being promoted editor. Carlyle, who allows him the dubious credit of being one of the best of newspaper editors, represents him as manifesting “a thoroughly Irish form of character, fire and fervour, vitality of all kinds in genial abundance, but in a much more loquacious, ostentatious, much louder style than is freely patronized on this side of the Channel.” His fiery, emphatic, and oracular mode of writing conferred those characteristics on the Times which were recognized in the sobriquet of the “Thunderer.” The frequent changes of the family residence during the early years of young Sterling rendered his education somewhat desul- tory, but on the settlement in London it became more systematic. After studying for one year at the univer- sity of Glasgow, he in 1824 eutered Trinity College, Cam- bridge, where he had for tutor Julius Charles Hare. At Cambridge he did not distinguish himself except in the

debates of the union, where, “none,” it was related, “ever came near him except the late Charles Buller.” He removed to Trinity Hall with the intention of graduating in law, but left the university without taking a degree. During the next four years he resided chiefly in London, employing himself actively in literature. Along with Frederick Maurice he purchased the Atheneum from J. Silk Buckingham, but the enterprise was not a pecuniary success. Through Maurice he became an “assiduous pilgrim” to the shrine of Coleridge at Hampstead. He also formed an intimacy with the Spanish revolutionist General Torrijos, in whose unfortunate expedition he took an active interest. Shortly after his marriage in 1830, symptoms of pulmonary disease induced him to take up his residence in the island of St Vincent, where he had inherited some property, but after fifteen months he returned to England. After spending some time on the Continent he found his health so much re-established that in June 1834 he accepted a curacy at Hurstmonceaux, where his old tutor Julius Hare was vicar. Acting on the advice of his physician he resigned his clerical duties in the following February, but according to Carlyle ill-health was only the external occasion of his resignation, the primary cause being a partly unconscious divergence from the opinions of the church. Be this as it may, the threaten- ing progress of the insidious disease under which he laboured soon rendered “public life in any professional form” quite impossible. There remained to him the “resource of the pen,” but, having to “live all the rest of his days as in continual flight for lis very existence,” his literary achievements were necessarily fragmentary, and cannot be regarded asa criterion of his capabilities. He published in 1833 Arthur Coningsby, a novel, which at- tracted little attention, and his Poems (1839), the Election, a Poem (1841), and Strafford, a tragedy, were not more successful. He had, however, established a connexion with Blackwood’s Magazine, to which he contributed a variety of papers and several tales, which gave proiise that under more favourable conditions he might have “achieved greatness.” He died at Ventnor 18th September 1844. His father survived him till 1847.

Sterling’s papers were entrusted to the joint care of Thomas Carlyle and Archdeacon Hare, aud it was agreed that the selection of his writings for publication and the preparation of a memoir should be undertaken by the

latter. Essays and Tales, by John Sterling, collected and edited, with a memoir of his life, by Julius Charles Hare, appeared therefore in 1848 in two volumes. So dissatisfied was Carlyle with the memoir, chiefly because it unduly maguified the ecclesiastical side of Sterling's life, that he resolved to give his own "testimony " about his friend, and 'record clearly" what his 'knowledge of him was." His vivid portraiture of Sterling in the Life which appeared in 1851 has perpetuated the memory of Sterling after his writings have ceased to be of interest on their own account,

STERNBERG, a manufacturing town in Moravia, Aus- tria, is situated 9 miles to the north of Olmiitz and 47 miles to the north-east of Briinn. It is the chief seat of the Moravian cotton industry, and it also carries on the manufacture of linen, stockings, liqueurs, sugar, and bricks. Its six suburbs and the surrounding districts are also en- gaged in the textile industry. Fruit, especially cherries, and tobacco are grown in the neighbourhood. The popu- lation in 1880 was 14,243. Sternberg is said to have grown up under the shelter of a castle founded by Yaroslaff of Sternberg on the site of his victory over the Mongols in

1241,

STERNE, Laurence (1713-1768), one of the greatest of English humorists, was the son of an English officer, and great-grandson of an archbishop of York. Nearly all our information about the first forty-six years of his life before he became famous as the author of Tristram Shandy is derived from a short memoir jotted down by

himself for the use of his daughter. It gives nothing but the barest facts, excepting three anecdotes about his in- fancy, his school-days, and his marriage. The date of his birth coincides with the close of the Marlborough wars. He was born at Clonmel, Ireland, on November 24, 1713, a few days after the arrival of his father's regiment from Dunkirk. The regiment was then disbanded, but very soon after re-established, and for ten years the boy and his mother moved from place to place after the regiment, from England to Ireland, and from one part of Ireland to another. The familiarity thus acquired with military life and character stood Sterne in good stead when he

drew the portraits of Uncle Toby and Corporal Trim, and the influence of the excitements, shifts, and hardships of this life of vagabond gentility may also be traced in his own character. To its hardening effect we may fairly refer some part of his later reckless defiance of clerical proprieties and comical persistence in self-conscious eccen- tricity. After ten years of wandering, he was fixed for eight or nine years at a school near Halifax in Yorkshire. His father died when he was in his eighteenth year, and he was indebted for his university education to one of the members of his father's family. His great-grandfather the archbishop had been master of Jesus College, Cambridge, and to Jesus College he was sent in 1732. He was ad- mitted to a sizarship in July 1733, and took his B.A. degree in 1736. One of his uncles was a prominent church dignitary in Yorkshire. Young Sterne took orders, and through his influence obtained in 1738 the living of Sutton, some 8 miles north of York. On his marriage three years afterwards he was presented to the neighbour- ing living of Stillington, and did duty at both places. He was also-a prebendary of York.

Sutton was Sterne's residence for twenty uneventful years—years at least concerning which his biography is silent. The only ascertained fact of consequence is that he kept up an intimacy which had begun at Cambridge with John Hall Stevenson, a witty and accomplished epicurean, owner of Skelton Castle in the Cleveland dis- trict of Yorkshire. Skelton Castle is nearly 40 miles from Sutton, but Sterne, in spite of his double duties, seems to have been a frequent visitor there, and to have found in his not too strait- laced friend a highly congenial companion. Stevenson's various occasional sallies in verse and prose—his ables for Grown Gentlemen, his Crazy Tales, and his numerous skits at the political opponents of Wilkes, among whose "'macaronies" he numbered himself,—were collected after his death, and it is impossible to read them without being struck with their close family resemblance in spirit and turn of thought to Sterne's work, inferior as they are in literary genius. Without Stevenson Sterne would probably have been a more decorous parish priest, but he would probably never have written Z'ristram Shandy or left any other memorial of his singular genius. The two friends began to publish late in life and in the same year. The first two volumes of Tristram Shandy were issued on the Ist of January 1760, and at once made a sensation. York was scandal- ized at its clergyman's indecency and indignant at his caricature of a local physician; London was charmed

with his audacity, wit, and graphic unconventional power. He went to London early in the year to enjoy his triumph, and found himself at once a personage in society,—was called upon and invited out by lion-hunters, was taken to Windsor by Lord Rockingham, and had the honour of supping with the duke of York.

For the last eight years of his life after this sudden leap out of obscurity we have a faithful record of Sterne's feelings and movements in letters to various persons,

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end of the famous Sermon on Conscience in vol. ii. of Tristram he had intimated that, if this sample of Yorick's pulpit eloquence was liked, "there are now in the posses- sion of the Shandy family as many as will make a hand- some volume at the world's service—and much good may they do it." Accordingly, when a second edition of the first instalment of Z'ristram was called for in three months, two volumes of Sermons by Yorick were announced, Although they had little or none of the eccentricity of the history, they proved almost as popular. Sterne's clerical character was far from being universally injured by his indecorous freaks as a humorist: Lord Faulconberg presented the author of Z'ristram Shandy with the living of Coxwold. To this new residence he went in high spirits with his success, "fully determined to write as hard as could be," seeing no reason why he should not give the public two volumes of Shandyism every year and why this should not go on for forty years. By the beginning of August he had another volume written, and was "so delighted with Uncle Toby's imaginary character that he was become an enthusiast." The author's delight in this wonderful creation was not misleading; it has been fully shared by every generation of readers since. For two years in succession Sterne kept his bargain with himself to produce two volumes a year. Vols. iii. and iy. appeared in December 1760; vols. v. and vi. in January 1762. But his sanguine hopes of continuing at this rate were frustrated by ill-health. He was ordered to the south of France; it was two years and a half before he returned ; and he came back with very little accession of strength. His reception by literary circles in France was very flattering. He was overjoyed with it. ''Tis comme & Londres," he wrote to Garrick from Paris ; "TI have

just now a fortnight's dinners and suppers upon my hands." And again, "Be it known I Shandy it away fifty times more than I was ever wont—talk more nonsense than ever you heard me talk in your days, and to all sorts of people." 'Through all his pleasant experiences of French society, and through the fits of dangerous illness by which they were diversified, he continued to build up his history of the Shandy family, but the work did not progress as rapidly as it had done. Not till January 1765 was he ready with the fourth instalment of two volumes ; and one of them, vol. vii., leaving the Shandy family for a time, gave a lively sketch of the writer's own travels to the south of France in search of health. This was a digression of a new kind, if anything can be called a digression in a work the plan of which is to fly off at a tangent whenever and wherever the writer's whim tempts him. In the first volume, anticipating an obvious complaint, he had protested against digressions that left the main work to stand still, and had boasted—not without justice in a Shandean sense —that he had reconciled digressive motion with progres- sive. But in vol. vii. the work is allowed to stand still while the writer is being transported from Shandy Hall to Languedoc. The only progress we make is in the illustra- tion of the buoyant and joyous temper of Tristram himself, who, after all, is a member of the Shandy family, and was due a volume for the elucidation of his character. Voll. viii. begins the long-promised story of Uncle Toby's amours with the widow Wadman. After seeing to the publication of this instalment of Zristram and of another set of sermons,—more pronouncedly Shandean in their eccentri- city,—he quitted England again in the summer of 1768, and travelled in Italy as far as Naples. The ninth and last and shortest volume of Tristram, concluding the episode of Toby Shandy's amours, appeared in 1767. This despatched, Sterne turned to a new project, which had probably been suggested by the ease and freedom with

published after his death by his daughter. At the | which he had moved through the travelling volume im

Tristram. The Sentimental Journey through France and Italy was intended to be a long work: the plan admitted of any length that the author chose, but, after seeing the first two volumes through the press in the early months

of 1768, Sterne's strength failed him, and he died in his London lodgings on the 18th of March, three weeks after the publication. The loneliness of his end has often been commented on; it was probably due to its unexpectedness. He had pulled through so many sharp attacks of his " vile influenza" and other lung disorders that he began to be scriously alarmed only three days before his death. Sterne's character defies analysis in brief space. It is too subtle and individual to be conveyed in general terms. For comments upon him from points of view more or less diverse the reader may be referred to Thackeray's Humorists, Prof. Masson's Novelists, and Mr H. D. Traill's sketch -in the "English Men of Letters" series. The fullest biography is Mr Percy Fitzgerald's. But the reader who cares to have an opinion about Sterne should hesitate till he has read and re-read in various moods considerable portions of Sterne's own writing. This writing is so singularly frank and unconventional that its drift is not at once apparent to the literary student. The indefensible indecency and overstrained sentimentality are on the

surface ; but after a time every repellent defect is forgotten

in the enjoyment of the exquisite literary art. In the delineation of character by graphically significant speech and action, introduced at unexpected turns, left with happy audacity to point their own meaning, and pointing it with a force that the dullest cannot but understand, he takes rank with the very greatest masters. In Toby Shandy he has drawn a character universally lovable and admirable; but Walter Shandy is almost greater as an artistic triumph, considering the difficulty of the achieve- ment. Dr Ferriar, in his Z//ustrations of Sterne (published in 1812), pointed out several unacknowledged plagiarisms from Rabelais, Burton, and others; but it is only fair to the critic to say that he was fully aware that they were only plagiarisms of material, and do not detract in the slightest from Sterne's reputation as one of the greatest of literary artists. (w. M.) STESICHORUS of Himera, a very famous lyric poet, lived between 630 and 550 B.c. His name was originally Tisias, if we may trust Suidas, but it was changed to Stesichorus on account of his eminence in choral poetry. He was famed in antiquity for the richness and splendour of his imagination and his style, although Quintilian censures his redundancy and Hermogenes remarks on the excessive sweetness that results from his abundant use of epithets. We

are told that he warned his fellow-citizens against Phalaris, whom they had chosen as their general, by relating to them the well-known fable of the horse and the stag. The story that he was struck blind for slandering Helen in a poem, and afterwards recovered his sight when he had sung a recantation, is told first by Plato, and afterwards, with many additions, by Pausanias and others. We possess some fragments of the former poem, censuring the daughters of Tyndarcus, who ‘“‘ wed two, nay three husbands, and leave their lords” (Fr. 26), and three lines from the palinode, “This is no true tale, nor yet wentest thou in the strong benched ships, or camest to the tower of Troy” (Fr. 32). It seems probable that Stesichorus did really write his recantation in consequence of a dream which he had soon after composing his poem on Helen ; and his is not the only case in literature where an apparently miraculous cure is said to have followed some such act of atonement. We possess about thirty fragments of his poems, not counting single words, pre- served in Athenzeus and elsewhere. None of them is longer than six lines. They are written in the Doric

dialect, with epic licences and occasional Molisms; the metre is dactylico-trochaic. Brief as they are, they show us what Longinus meant by calling Stesichorus ‘“ most like Homer”; they are full of epic grandeur, and have a stately sublimity that reminds us of Pindar. Stesichorus indeed made a new departure by using lyric poetry to celebrate gods and heroes rather than human feelings and passions ; this is what Quintilian means by saying that he “sustained the burden of epic poetry with the lyre.” Several of his poems sung of the adventures of Heracles ; one dealt with the siege of Thebes, another with the sack of Troy. The-last—to which the Zabula Iliaca (see Otto Jahn’s Griechische Bilderchroniken, ed. A. Michaelis) is a sort of commentary—possesses an interest for us as the first poem in which occurred that form of the story of fEneas’s flight to which Virgil afterwards gave currency in his 4ineid. Stesichorus also completed the choral ode by adding to the strophe and antistrophe the epode; and not to know “‘Stesichorus’s three” passed into a proverbial expression for unpardonable ignorance.

Bergk, Poetw Lyrict Greet, vol. iii. pp. 205-234, Leipsic, 1882.

STETHOSCOPE. See AuscuLrarion,

STETTIN, the chief town of Pomerania, and the leading seaport in Prussia, is situated on the Oder, 17 miles to the south of the Stettiner Haff and 30 miles from the Baltic Sea. The main part of the town occupies a hilly site on the left bank of the river, BALTIC SEA and is connected by four bridges (includingamass- ive railway swing-bridge) with the suburbs of La- stadie ("lading place," from lastadium, " bur- A& den,") and Silberwiese, P™" on an island formed by the Parnitz and Dunzig, which here diverge from the Oder to Dammsche- See. Until 1874 Stettin was closely girdled by very extensive and strong fortifications, which pre- vented the expansion of the town proper, but the steady growth of its commerce and manufactures en- couraged the foundation of numerous industrial suburbs beyond the line of defence. Some of these are themselves "towns," as Grabow, with 13,672 inhabitants in 1880, and Bredow with 11,255 inhabitants ; but all combine with Stettin to form one industrial and commercial centre. Since the removal of the fortifications their site has begun to be built upon. Apart from its commerce, Stettin is a comparatively uninteresting city. The church of Sts Peter and Paul, originally founded in 1124 and restored in 1816- 17, was the earliest Christian church in Pomerania. St James's church, dating from the 13th and the two follow- ing centuries, is remarkable, like several other Pomeranian churches, for its size. The old palace, now occupied by Government offices, is a large unattractive edifice, scarcely justifying the boast of an old writer that it did not yield in magnificence even to the palaces of Italy. Among the more modern structures are the theatre and the new town-house, superseding an earlier one of 1245. Statues of Frederick the Great and of Frederick William ITI. adorn one of the five open squares of the old town. Asa prosperous commercial town Stettin has numerous educa- tional, benevolent, and scientific institutions.

The manufactures are very important; many of the largest factories are in the neighbouring villages, beyond Stettin proper. The shipbuilding yards (among which

Environs of Stettin.

that of the Vulcan Company deserves mention) have com- paratively recently attained some reputation for their iron- clads and war-vessels. Machinery, cement, chemicals, and soap are produced in large quantities, and there are also

REFERENCES

5 Kreisgericht

6 Post Office

7 Old Town House

1 Exchange

2 St James‘Ch.

3 §t John’s Ch.

4% Qhof $.S.Peter&Paul 8 New Town House 9 Palace

Plan of Stettin.

large sugar-refineries, besides a vast miscellany of other smaller industrial establishments. The trade of Stettin is very flourishing. More than any other harbour it may be regarded as the port of Berlin, from which it is 93 miles north-east by railway; and a larger number of vessels enter and clear at Stettin than at any other German port except Hamburg and Bremerhaven. SwineminpE (¢.v.) serves as its fore-port. The forest and river scenery of the neighbourhood of Stettin is picturesque, but the low level and swampy nature of the soil render the climate bleak and unhealthy. In 1885 the population was 99,475; in 1880 it was 91,756, of whom 85,727 were Protestants, 3112 Roman Catholics, and 2388 Jews.

In 1885 3809 ocean vessels (2207 steamers) and 1965 coasting and river eraft, besides 10,089 Oder barges, entered the port. In 1885 Stettin possessed (besides a large number of river craft) a fleet of 127 sea-going ships, with a burden of 47,066 tons, of which 26,754 tons were distributed in 59 steamers. The chief exports are grain, spirits, and wood; the chief

imports petroleum, train-oil, wine, and herrings. The annual value of the former is about £7,500,000 and of the latter about £6,000,000.

Stettin is said to have existed as a Wendish fishing-village as early as 830 A.D., and it appears as Stedyn in the time of the Saxon emperors. From the 12th century it was the seat of the dukes of Pomerania, who became extinct in 1637. Passing then to Sweden, it remained united with that kingdom for eighty-three years, with one brief interval, but in 1720 it was ceded to Prussia. Gustavus Adolphus undertook to improve its fortifications in 1630, but Frederick the Great was the first to convert it into a strong modern fortress. From 1806 till 1818 it was held by the French, to whom it was surrendered without a blow. Known even in the 12th century as the leading trading-town on the Oder, Stettin entered the Hanseatie League in 1360, The development of its trade in modern times dates chiefly from the deepening and pro-

tection of the Swine in the former half of last century. See ODER.

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STEUART, Str James Dennam (1712-1780), Barr, author of An Inquiry into the Principles of Political Eco- nomy (see PoLtiTicaAL Economy, vol. xix. p. 365), was the only son of Sir James Steuart, solicitor-general for Scotland under Queen Anne and George I., and was born at Edin- burgh on October 21, 1712. After passing through the university of Edinburgh he was admitted to the Scottish bar at the age of twenty-four. He then spent some years on the Continent, and while in Rome entered into relations with the Pretender. He was in Edinburgh in 1745, and so compromised himself that after the battle of Culloden he found it necessary to return to the Continent, where he remained until 1763. It was not indeed until 1771 he was fully pardoned for any complicity he may have had in the rebellion. He died at his family seat, Coltness, in Lanarkshire, on November 26, 1780.

The Works, Political, Metaphysieal, and Chronological, of the late Sir James Steuart of Coltness, Bart., now first collected, with Aneedotes of the Author, by his Son, General Sir James Denham Steuart, were eae in 6 vols. 8vo in 1805. Besides the Jn- quiry (originally published in 2 vols. 4to in 1767), they inelude— A Dissertation upon the Doetrines and Prineiples of

Money applied to the German Coin (1758), Apologie du Sentiment de M. le Chevalier Newton sur 0 Anetenne Chronologie des Grecs (4to, Frankfort-on-the- Main, 1757), The Prineiples of Money applied to the Present State of Bengal, published at the request of the East India Company (4to, 1772), A Dissertation on the Poliey of Grain (1783), Plan for Introdueing Uniformity in Weights and Measures within the Limits of the British Empire (1790), Observations on Beattie's Essay on Truth, A Dissertation coneerning the Motive of Obedience to the Law of God, and other treatises.

STEUBENVILLE, a city of the United States, county seat of Jefferson county, Ohio, lies 43 miles west of Pitts- burgh, on the west bank of the Ohio river, here a third of a mile wide and crossed by a railway bridge. Built above a productive coalfield, and with an abundant supply of natural gas for fuel purposes, Steubenville has naturally become a manufacturing centre (foundries, rolling-mills, nail and glass factories, potteries, machine-shops, flour- mills, &c.), and as the surrounding district is a good farming, wool-growing, and stock-raising country it is the seat of considerable commercial activity. The court-house is a particularly fine building. In 1870 the population was 8107, in 1880 12,093. Steubenville, so called after Baron Steuben, one of Washington's generals, grew up round a fort erected in 1787. It became a city in 1851.

STEVENS, AtFrep. See ScuLprourg, vol. xxi. p. 561.

STEVENS, Tuapprvs (1792-1868), was born at Peacham, Vermont, U.S., April 4, 1792, graduated at Dartmouth College in 1814, and then settled in Penn- sylvania. He soon became a leading lawyer of Lancaster, Pa., so far interested in politics as to be elected by the Whig party to the State legislature for several terms and to the federal house of representatives 1849-63. When the mass of the Northern Whig party went into the new Republican party he went with it, and returned to Wash- ington as a Republican representative in 1859, just before the outbreak of the Civil War. This position he retained until his death, just outlasting the Civil War and recon- struction. During this period of American history he was one of the leading characters. The methods on which he proposed to conduct the war were always drastic: the wholesale confiscation of lands in the seceding States, the disfranchisement of insurgent citizens, the emancipation and

enfranchisement of the negroes, all found in him their earliest and warmest advocate. While other parties and leaders were continually shifting their ground, changing their theories of the relations of the Union to the seceding States as the struggle grew more intense, Stevens was con- sistent from beginning to end. The almost universal theory was that the war was prosecuted only to enforce the constitution ; it was therefore incumbent on those who prosecuted it to obey the constitution punctiliously, how-

ever puzzling might be the difficulties into which it led them. Stevens, on the contrary, insisted that armed resistance to the constitution had the effect of suspending the constitution within the area of the resistance ; that the success of the resistance would show whether the suspen- sion was to be temporary or permanent ; and that, in the meantime, those who resisted the constitution were entitled to no rights under it,—in fact, to no rights except those reserved under the laws of war. This was too radical even for the war party; but, at the end of the war, Stevens's pronounced ability gave him the leadership of the house committee on reconstruction. Even in this position, he never obtained a formal endorsement of his theory; but the practical management of reconstruction shows its strong influence in many features otherwise inexplicable. He lived to take a leading part in the unsuccessful impeachment of President Johnson, and to see the admis-) gion of the first instalment of reconstructed States, and , died at Washington, August 11, 1868. | Stevens's life has been written from a friendly and from a hostile point of view,—the former in the volume entitled Thaddeus Stevens, | Commoner, the latter in Harris's Political Conflict in America.

STEVENSON, Rosert (1772-1850), civil engineer, was the only son of Alan Stevenson, partner in a West Indian house in Glasgow, and was born in that city 8th June 1772. Having lost his father in infancy, he removed with his mother to Edinburgh. In his youth he assisted his step- father, Thomas Smith, in his lighthouse schemes, and at the early age of nineteen was sent to superintend the erection of a lighthouse on the island of Little Cumbrae. During successive winters he attended classes at Anderson's ' College, Glasgow, and at Edinburgh university. He suc- ceeded his stepfather, whose daughter he married in 1799, as engineer to the Board of Northern Lighthouses, and at the same time began general practice as a civil

engineer. – During his period of office from 1797 to 1843, he designed and executed no fewer than eightcen lighthouses, the most ’ important being that on the Bell Rock, begun in 1807 and completed in 1810, in which he improved considerably on the designs of Smeaton for the Eddystone lighthouse (see LigutHouse, vol. xiv. p. 616). For its illumination he introduced an improved apparatus ; he was also the author | of various other valuable inventions in connexion with lighting, including the intermittent and flashing lights, and the mast lantern for ships. In his general practice as a civil engineer he was employed in the construction of many county roads, in various important improvements in connexion with the approaches to Edinburgh, including that by the Calton Hill, in the erection of slips at ferries, in the construction of harbours, docks, and breakwaters, in the improvement of river and canal navigation, and in the construction of several important bridges. It was he that brought into notice the superiority of malleable iron rods for railways over the old cast iron, and he was the inventor of the movable jib and balance cranes. It was chiefly througli his interposition that an Admiralty survey was established, from which the Admiralty sailing direc- tions for the coasts of Great Britain and Ireland have been preparéd. Stevenson was elected a fellow of the Royal Society of Edinburgh in 1815, and afterwards became a member of the Geological and Astronomical Societies of London and the Wernerian and Antiquarian Societies of Scotland. He published an account of the Bell Rock lighthouse in 1824, and, besides contributing important articles on engineering subjects to Brewster’s Zdinburgh Encyclopedia and the Encyclopedia Britannica, was the author of various papers read before the societies he was connected with. He died at Edinburgh 12th July 1850.

A Life of Robert Stevenson, by his son David Stevenson, appeared in 1878. David Stevenson (1815-86), who along with

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his brother Alan succeeded to his father’s business, was the author of a Sketeh of the Civil Engineering of North America (1888, re- published in “ Weale’s Series,” 1859), Marine Surveying (1842), Canal and River Engincering (1858; 2d ed. enlarged, 1872; 3d ed. 1886), and of various papers read before learned societies.

STEVINUS, Simon (1548-1620). This great mathe- matician was born in 1548 at Bruges (where the Place Simon Stevin contains his statue by Eugen Simonis) and died in 1620 at The Haguc or in Leyden. Of the circum- stances of his life very little is recorded ; the exact day of his birth and the day and place of his death are alike uncertain. It is known that he left a widow with two children ; and one or two hints scattered throughout his works inform us that he began life as a merchant's clerk in Antwerp, that he travelled in Poland, Denmark, and other parts of northern Europe, and that he was intimate with Prince Maurice of Orange, who asked his advice on many occasions, and made him a public officer,—at first director of the so-called ‘‘ waterstaet," and afterwards quartermaster-general. The question whether Stevinus, like most of the rest of the prince's followers, belonged to the Protestant creed hardly admits of a categorical answer. A Catholic, it may be said, would never in those times have risen' to so high a position. A Catholic would per- haps not have been.so ready as Stevinus to deny the value of all authority, whether of an Aristotle, of an Euclid, or of a Vitruvius. A Catholic could not well have boasted, as Stevinus in a political pamphlet did, that he had always been in harmony with the executive power. But against these considerations it might be urged that a Protestant had no occasion to boast of a harmony most natural to him, while his further remark, in the same pamphlet, to the effect that a state church is indispensable, and that those who cannot belong to it on conscientious grounds ought to leave the country rather than show any opposition to its rites, seems rather to indicate the crypto-Catholic, who wishes for reasons of his own to remain in the Netherlands. The same conclusion is supported by the ascertained fact that Stevinus, a year before his death, bequeathed a pious legacy to the church of Westkerke in Flanders, out of the revenues of which masses were to be said. But, however it may be answered, the question is fortunately of little importance to us, as Stevinus was neither a political personage nor did he engage in religious controversy. He was mainly, as already said, a great mathematician, and it is chiefly in this quality that we must try to get acquainted with him. His claims to fame are most varied. Some of them appealed strongly to the men of his time, but many were such as could not well be understood by most of his contemporaries, and have found due acknowledgment only in later times.

His contemporaries were most struck by his invention of a carriage with sails, a little model of which was pre- served at Scheveningen till 1802. The carriage itself had been lost long before; but we know that about the year 1600 Stevinus, with Prince Maurice of Orange and twenty- six others, made use of it on the sea-shore between Scheven- ingen and Petten, that it was propelled solely by the force of the wind, and that it acquired a speed which exceeded that of horses. Another idea of Stevinus, for which even Grotius gave him great credit, was his notion of a bygone age of wisdom. Mankind once knew everything knowable, but gradually forgot most of it, till a time came when little by little the forgotten knowledge was reacquired ; the goal to be aimed at is the bringing about of a second age of wisdom, in which mankind shall have recovered all its early knowledge. The fellow-countrymen of Stevinus were proud that he wrote in their own dialect, which he thought fitted for a universal language, as no other abounded like Dutch in monosyllabic radical words.

History has been much less enthusiastic than his con-

temporaries in admiring these claims to fame, but it has discovered in Stevinus's works various inventions which did not at once receive the notice they deserved, He was the first to show how to fashion regular and semiregular polyhedra by delineating their frames ina plane. Stev- inus also distinguished stable from unstable equilibrium. He proved the law of the equilibrium on an inclined plane. He demonstrated before Varignon the resolution of forces, which, simple consequence of the law of their com-position though it is, had not been previously remarked. He discovered the hydrostatic paradox that the downward pressure of a liquid is independent of the shape of the vessel, and depends only on its height and base. He also gave the measure of the pressure on any given portion of the side of a vessel. He had the idea of explaining the tides by the attraction of the moon.

It reniains to enumerate those claims of Stevinus to immortality which were recognized from the first and which succeeding ages have not lessened,— his writings on military science, on book-keeping, and on decimal fractions.

That the man who was quartermaster-general to Maurice of Orange should have been possessed of more than ordinary merit, and have left behind him military papers of lasting value, is hardly more than might have been expected. This expectation, in the case of Stevinus at least, is fully borne out in the opinion of competent judges. Prince Maurice is known as the man who con- quered the greatest number of fortresses in the shortest time, and fortification was the principal aim of his adviser. Stevinus seems to be the first who made it an axiom that strongholds are only to be defended by artillery, the defence before his time having relied mostly on small fire-arms. He wrote upon temporary fortifications, but the excellence of his system was-only slowly discerned. He was the inventor of defence by a system of sluices, which proved of the highest importance for the Netherlands. His plea for the teaching of the science of fortification in universities, and the existence of such lectures in Leyden, have led to the impression that he himself filled this chair ; but the belief is quite erroneous, as Stevinus, though living at Leyden, never had direct relations with its uni- versity.

Book-keeping by double entry may have been known to Stevinus as clerk at Antwerp either practically or through the medium of the works of Italian authors like Paccioli and Cardan. He, however, was the first to recommend the use of impersonal accounts in the national household. He practised it for Maurice, and recommended it in a small pamphlet to Sully the French statesman ; and, if public book-keeping has grown more and more lucid by the intro- duction of impersonal accounts, it is certainly to Stevinus that the credit of the improvement is due.

His greatest success, however, was a small pamphlet, first published in Dutch in 1586, and not exceeding seven pages in the French translation (which alone we have seen). This translation is entitled La Disme, enseign- ant facilement expédier par Nombres Entiers sans rompuz, tous Comptes se rencontrans aux Affaires des LHommes. Decimal fractions had been employed for the extraction of square roots some five centuries before his time, but nobody before Stevinus established their daily use; and so well aware was he of the importance of his innovation that he declared the universal introduction of decimal coinage, measures, and weights to be only a question of time. His notation is rather unwieldy. The point separating the

integers from the decimal fractions seems to be the invention of Bartholomeus Pitiscus, in whose trigonometrical tables (1612) we have found it, and it was accepted by Napier in his logarithmic papers (1614 and 1619). Stevinus printed little circles round the ex-

ponents of the different powers of one-tenth. For instance, 237,%58, was printed 237 (°) 4) Q) 7 @) 8 (2); and the fact that Stevinus meant those encircled numerals to de- note mere exponents is evident from his employing the very same sign for powers of algebraic quantities, C9,

9 ()-14)+6)-5 to denote 9a! — 140 + 6m — 5, He does not even avoid fractional exponents (‘Racine cubique de (2) serait 3 en circle”), and is ignorant only of negative exponents. Powers and exponents have also been carried back toa period several centuries earlier than Stevinus, and it is not here intended to give him any undue credit for having maintained them ; but we believe it ought to be recognized more than it generally is, that for our author there was a connexion between algebraic powers and decimal fractions, and that even here Stevinus the pro- found theorist is not lost to view behind Stevinus the man of brilliant practical talents. (M. CA.)

STEWART, or Stuart. For the royal house of this name, see STUART.

STEWART, Ducatp (1753-1828), one of the most influential of the Scottish philosophers, was born at Edinburgh on the 22d of November 1753. His father, Matthew Stewart (1715-85), was professor of mathematics in the university of Edinburgh from 1747 till 1772, and was an enlinent investigator in his own department, applying the geometrical methods of Simson, who had been his teacher in Glasgow. Dugald Stewart’s early years were passed partly in Edinburgh and partly at Catrine in Ayrshire, where his father had a small property, to which the family removed every summer on the close of the academical session. Burns was an occasional visitor at Catrine, which is only a few miles from Mossgiel ; and the philosopher and the poet had various meetings as well as some slight correspondence in later years. Dugald Stewart was educated at the high school and university of his native town. At school he laid the foundation of the classical knowledge and literary taste which are con- spicuous in his works, and which lent a

charm to his prelections. At the university his chief subjects were the mathematical sciences—in which he attained great pro- ficiency—and philosophy. Adam Ferguson, the historian of the Roman republic, was then professor of moral philo- sophy in Edinburgh, and his bracing ideal of ethical and political virtue commended itself highly to Stewart. In 1771, having thoughts of entering the English Church, Stewart proceeded to Glasgow with a view to the Snell exhibitions tenable by Glasgow students at Oxford. Here he listened to the lectures of Reid, whose Inquiry, pub- lished seven years before, had laid the effective founda- tion of what is called distinctively the Scottish philosophy. Reid became Stewart's acknowledged master and also his friend, while Stewart's academic eloquence and powers of elegant exposition gained for their common doctrines @ much wider acceptance than they could have secured in the clumsier and less attractive presentation of Reid him- self. In Glasgow Stewart boarded in the same house with Archibald Alison, afterwards author of the Hssay on Taste, and a close friendship sprang up between them, which remained unbroken through life. After no more than a single session in Glasgow, Dugald Stewart was summoned by his father, whose health was beginning to fail, to conduct the mathematical classes in the university of Edinburgh. Though only nineteen years of age he discharged his duties with marked ability and SUCCESS 5 and after acting three years as his father's substitute he was elected professor of mathematics in conjunction with him in 1775. Three years later Adam Ferguson was appointed secretary to the commissioners sent out to the American colonies, and at his urgent request

Stewart lectured as his substitute. Thus during the session 1778-79, in addition to his mathematical work, he delivered an original course of lectures on morals. 'To this season," says his son, "che always referred as the most laborious of his life; and such was the exhaustion of the body from the intense and continued stretch of the mind that on his departure for London at the close of the academical session it was necessary to lift him into the carriage." In 1783 Stewart married Helen Banna- tyne, who died in 1787, leaving an only son, Colonel Matthew Stewart, from whose short memoir of his father the above is a quotation.

In 1785, on the resignation of Ferguson, he was trans- ferred to the chair of moral philosophy, which he filled for a quarter of a century and made a notable centre of intel- lectual and moral influence. Young men of rank and of parts were attracted by his reputation from England, and even from the Continent and America. A very large number of men who afterwards rose to eminence in litera- ture or in the service of the state were thus among his students. Sir Walter Scott, Jeffrey, Cockburn, Francis Horner, Sydney Smith, Lord Brougham, Dr Thomas Brown, James Mill, Sir James Mackintosh, and Sir Archi- bald Alison may be mentioned among others. There is a unanimous testimony to the attractive eloquence of Stewart's lectures and the moral elevation of his teaching. "Dugald Stewart," says Lord Cockburn, 'was one of the greatest of didactic orators. Had he lived in ancieut times, his meniory would have descended to us as that of one of the finest of the old eloquent sages. No intelligent pupil of his ever ceased to respect philosophy, or was ever false to his principles, without feeling the crime aggra- vated by the recollection of the morality that Stewart had taught him." Dr John Thomson, afterwards medical professor in Edinburgh, was accustomed to say that the two things by which lie had been most impressed in the course of his life were the acting of Mrs Siddons and the oratory of Dugald Stewart. Lord Cockburn, in his Memorials, has left an interesting portraiture of Stewart's appearance and manner :—" Stewart was about the middle size, weakly-limbed, and with an appearance of feebleness which gave an air of delicacy to his gait and structure. His forehead was large and bald, his eyebrows bushy, his eyes grey and intelligent, and capable of conveying any emotion from indignation to pity, from serene sense to hearty humour, in which they were powerfully aided by his lips, which, though rather large perhaps, were flexible and expressive. The voice was singularly pleasing ; and, as he managed it, a slight burr only made its tones softer. His ear, both for music and for speech, was exquisite ; and he was the finest reader I have ever heard. His gesture was simple and elegant, though not free from a tinge of professional formality ; and his whole manner was that of an academical gentleman, ... calm and expository, but rising into greatness or softening into tenderness whenever his subject required it." The course on nioral philosophy embraced, besides ethics proper, lectures on political philosophy or the. theory of govern- ment, and from 1800 onwards a separate course of lectures was delivered on political economy. These last were extremely

important in spreading a knowledge of the fundamental principles of the science at a time when they were still almost unknown to the general public. Stewart's enlightened political teaching was sufficient, in the times of reaction succeeding the French Revolution, to draw upon him the undeserved suspicion of disaffection to the constitution.

In 1790 Stewart married a second time. Miss Cran- stoun, who became his wife, was a lady of birth and accom- plishments, and he was in the habit of submitting to her

criticism whatever he wrote. A son and a daughter were the issue of this marriage. The death of the former in 1809 was a severe blow to the failing health of his father, and was the immediate cause of his retirement from the active duties of his chair. Before that, however, Stewart had not been idle as an author. In 1792 he published the first volume of the Llements of the Philosophy of the Human Mind ; the second volume appeared in 1814, and the third not till 1827. In 1793 he printed a text-book, Outlines of Moral Philosophy, which went through many editions ; and in the same year he read before the Royal Society of Edinburgh his account of the Life and Writings of Adam Smith. Similar memoirs of Robertson the historian and of Reid were afterwards read before the same body and appear in his published works. In 1805 Stewart took an active part in what was known as the Leslie case, that is to say, the public controversy arising out of the appointment of Mr (afterwards Sir John) Leslie to the chair of mathe- matics in the university of Edinburgh. Leslie was attacked by the presbytery of Edinburgh, ostensibly on account of his views on the nature of causal connexion, which were said to approximate to Hume's. In two pamphlets Stewart defended Leslie's doctrine as_philo- sophically tenable and theologically innocuous. In 1806 he received in lieu of a pension the nominal office of the writership of the Hdinburgh Gazette, with a salary of £300. When the shock of his son's death incapacitated him from lecturing during the session of 1809-10, his place was taken, at his own request, by Dr Thomas Brown, who in 1810 was appointed conjoint professor. On the death of Brown in 1820, Stewart, who had taken no further active part in lecturing, retired altogether from the professorship, which was conferred

upon John Wilson, better known as “Christopher North.” From 1809 onwards Stewart lived mainly at Kinneil House, Linlithgowshire, which was placed at his disposal by the duke of Hamilton. From this retirement he continued to send forth a succes- sion of works. In 1810 appeared Philosophical Essays, in 1814 the second volume of the Zlements, in 1815 the first part and in 1821 the second part of the “ Dissertation” written for the Encyclopedia Britannica “Supplement,” entitled ““A General View of the Progress of Metaphysi- cal, Ethical, and Political Philosophy since the Revival of Letters.” In 1822 he was struck with paralysis, but re- covered a fair degree of health, sufficient to enable him to resume his studies. In 1827 he published the third volume of the Zlements, and in 1828, a few weeks before his death, Zhe Philosophy of the Active and Moral Powers. He died in Edinburgh after a short illness on the 11th of June 1828. A monument to his memory was erected on the Calton Hill by his friends and admirers.

An edition of his Collected Works, in eleven volumes (1854-58), was edited by Sir William Hamilton, on whose death in 1856 it was carried to completion and furnished with a memoir of Stewart by Prof. Veitch. Stewart was an elegant writer rather than a profound or original thinker, and he cannot be said to have added much to the philosophy of Reid (see Rurp), though he contributed very largely to its dissemination. His psychological observations, however, are acute and varied, and his general powers of mind contributed largely to elevate the study of philosophy in the United Kingdom. His reputation rests more upon the tradition of his inspiring and elevating cloquence than upon any definite achieve- ments within the province of philosophy proper. (A. SE.)

STEYR, Srermr, or SrevEeR, an industrial town in Upper Austria, is situated on an island at the junction of the Steyr and Enns, 20 miles to the south of Linz and 92 miles to the west-south-west of Vienna. The main town is connected by two bridges with the suburbs of Steyrdorf and Ennsdorf. The Gothic parish church was built in 1443; the town-house is modern. The interest- ing old castle of the princes of Lamberg, dating from the 10th century, rises on an eminence near the town. Steyr

is one of the chief seats of the iron and steel industry in Upper Austria (AustRiA, vol. iii. p. 120), and very large quantities of cutlery, scythes, sickles, and edge-tools are annually produced in the town and neighbourhood. The Werndl small-arms factory, now carried on by a joint-stock company, and employing 4500 hands, is the largest in Austria. The population in 1880 was 17,199. Steyr was the capital of an early countship or grafschaft, at first belonging to Styria, but annexed to Austria in 1192.

STICKLEBACK is the name applied to a group of small fishes (Gastrosteus) which inhabit the fresh and brackish waters as well as the coasts of the temperate zone of the northern hemisphere. Although some of the species live chiefly cither in fresh or in salt water, they readily accommodate themselves to a change, and, as far as the European

kinds are concerned, all may be met with in the brackish

water of certain littoral districts. The majority have a compressed well-proportioned body, which in the marine species is of a more elongate form, leading to the allied group of Flute-Mouths (Mistulariidx), which are, in fact, gigantic marine sticklebacks. Their mouth is of moderate width, oblique, and armed with small but firmly set teeth. But their most distinctive characteristic consists in the armature of their head and body. The head is nearly entirely protected by hard bone; even the cheeks, which in the majority of fishes are covered with a naked or scaly skin, are in this genus cuirassed by the dilated infraorbital bones. There are no scales developed on any part of the body, but a series of hard and large scutes protects a greater or lesser portion of the sides. The first dorsal fin and the ventrals are transformed into pointed formidable spines, and joined to firm bony plates of the endoskeleton. With regard to the degree in which this armature is developed, not only do the species differ from each other, but almost every species shows an extraordi- nary amount of variation, so that some older naturalists have distinguished a multitude of species, whilst the majority of the present day are inclined to reduce their number considerably. About ten kinds may be taken to be specifically distinct.

So far as is known at present, all sticklebacks construct a nest for the reception of the spawn, which is jealously guarded by the male until the young are hatched, which event takes place in from ten to eighteen days

after oviposition. He also protects them for the first few days of their existence, and provides them with food, until they gradually stray from their home. The construction of the nest varies in the different species.

Sticklebacks are short-lived animals; they are said to reach an age of only three or four years; yet their short life, at least that of the males, is full of excitement. During the first year of their existence, before the breed- ing-season begins, they live in small companies in still pools or gently flowing brooks. But with the return of the warmer season each male selects a territory, which he fiercely defends against all comers, especially against intruders of his own species and sex, and to which he invites all females, until the nest is filled with ova. At this period he also assumes a bridal dress, painted with blue and red tints. The eggs are of comparatively large size, one female depositing only from 50 to 100; but, as the females deposit their spawn in nests of different males, the number of ova contained in one nest does not exceed one hundred.

Of the species known not one has so wide a geographical range, and has so well been studied, as the common British Three- Spined Stiekleback (Gastrosteus aculeatus). It is found everywhere in northern and eentral Europe, northern Asia, and North America. The development of its scutes and spines varies exceedingly, and

specimens may bc found without any lateral scutes and with short spines, others with only a few scutes and moderately sized spines,

and again others whieh possess a complete row of scutes from the head to the caudal fin, and in which the fin-spines are twice ag

long and strong as in other varieties. On the whole, the smooth —

varieties are more numerous in southern than in northern local. ities. This species swarms in some years in prodigious num.

Gastrosteus aculeatus, var. noveboracensis, Three-Spined Stickleback,

bers; in Pennant’s time amazing shoals appeared in the fens of Lincolnshire every seven or eight years, ‘Their numbers may perhaps be conceived from the fact that a man employed in eollecting them gained, for a considerable time, four shillings a day by sclling them at the rate of a halfpenny a bushel. No instance of a similar increase of this fish has been observed in our time, and this possibly may be due to the diminished number of suitable breeding-places in consequence of the general introdue- tion of artificial drainage. This species usually constructs its nest on the bottom, excavating a hollow in which a bed of grass, rootlets, or fibres is prepared; walls are then raised, and the whole is roofed over with the like material. The nest is an inch and more in diameter, with a small aperture for an entrance. ;

The Ten-Spined Stickleback (Gastrosteus pungitius) is so called from the number of spines nsually se Scan its first dorsal fiu, which, however, may be sometimes reduced to cight or nine or increased to eleven. It is smaller than the three-spined species, rarely exceeding 2 inches in length. Its geographical range nearly coincides with that of the other species, but it is move locally distributed, and its range in northern Asia is not known. With regard to its habits, it differs from the common species only in the selection of the site for its nest, which is generally placed among weeds above the bottom of the water. Breeding males are readily recognized at a distance by the intensely black colour of the lower parts of their body. ‘ ;

Both these species are for their size extremely voracious, causing no sinall amount of injury if allowed in breeding-ponds in which valuable fish are preserved. During the whole time they are not engaged in their brecding operations they are in pursuit of food. A small stickleback kept in an aquarium devoured, in five hours’ time, seventy-four newly-hatched dace, which were abont a quarter of an inch long. Two days after it swallowed sixty-two, and would probably have caten as many every day, could they have been procured. ;

The Sea Stickleback (Gastrosteus spinachia) is a much larger and more slender species than those mentioned; it attains to a length of 7 inches, and is armed with fifteen short spines on the back. It is extremely common round the British coasts, but never con- gregates in large shoals, At suitable localities of the coast which are sheltered from the waves and overgrown

with sea-weed, .espe- cially in rock-pools, one or two males establish themselves with their harems, and may be observed without difficulty, being quite as fearless as their freshwater cousins. Harbours and shallows covered with Zostera are likewise favourite haunts of this species, although the water may be brackish. The nest is always firmly attached to sea-weed, and sometimes suspended from an over- hanging frond. This species inhabits only the northern coasts of Europe.

STIGMATIZATION, literally the infliction of stagmata, i.e., marks tattooed or branded on the person, the term used with specific reference to the infliction of wounds like those of Christ.

An ancient and widespread method of showing tribal connexion, or relation to tribal deities, is by marks set upon the person; thus Herodotus, in describing a temple of Hercules in Egypt (ii. 113), says that it is not lawful to capture runaway slaves who take refuge therein if they receive certain marks on their bodies, devoting them to the deity. Some such idea is perhaps alluded to by Paul (Gal. vi. 17) in the words, “from henceforth let no man trouble me, for I bear branded on my body the stigmata of Jesus”; and some few authors have even understood the passage as referring to stigmatization in the modern sense (Molanus, De Historia SS. Imaginum et Preturarum, Ce. Paquot, iii. 43, p. 365). Branding, as indicative of servi

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tude, is mentioned in many of the classics (Pliny, Z/. V., xviil. 3; Varro, De Ke [ustica, i. 18 ; Suetonius, Caligula, xxvii. &c.), and was forbidden by Constantine.

In the period of persecution Christian martyrs were sometimes branded with the name of Christ on their fore- heads (Pontius, “De Vit. 8. Cypriani,” Biblioth. Veterum Patrum, iii. p. 472, § vii.). This was sometimes self-inflicted as a disfigurement by nuns for their protection, as in the case of St Ebba, abbess of Coldingham (see Baronius, Annales, xv. p. 215, anno 870, also Tert., De Vel. Virg.). Some Christians likewise marked themselves on their hands or arms with the cross or the name of Christ (Procopius, Jn

Hsaam, ed. Curterius, p. 496), and other voluntary mutilations for Christ's sake are men- tioned (Matt. xix. 12; Fortunatus, Life of St Rhadegund, ed. Migne, col. 508; Palladius, Lausiac History, cxii. ; Jerome's Letter to St Hustochium, &c.).

In the life of St Francis of Assisi we have the first example of the alleged miraculous infliction of stigmata (see vol. ix. p. 692). While meditating on the sufferings of our Lord, in his cell on Mount Alverno, we are told by his biographers, Thomas of Celano and Bonaventura, that the Lord appeared to him as a seraph and produced upon his body the five wounds of Christ; of these we are told that the side wound bled occasionally, though Bonaven- tura calls it a scar, and the wounds in the feet had the appearance and colour of nails thrust through. After his death St Clare endeavoured but in vain to extract one of these. Pope Alexander IV. and other witnesses declared that they had seen these marks both before and after his death (Raynaldus, ad annum 1255, p. 27). . The divinely- attested sanctity of their founder gave to the newly- established order of Franciscans a powerful impulse, so that they soon equalled and threatened to overshadow in influence the previously-founded order of St Dominic.

The reputation of the latter order was, however, equally raised in the next century by the occurrence of the same wonder in the case of a sister of the third rule of St Dominic, Catherine Benincasa,—better known as St Catherine of Siena. From her biographer's account we gather that she was subject to hystero-epileptic attacks, in one of which, when she was twenty-three years old, she re- ceived the first stigma (see vol. v. p. 230). In spite of her great reputation, and the number of attesting witnesses, this occurrence was not universally believed in. Pope Sixtus IV, published a bull in 1475 ordering, on pain of anathema, the erasure of stigmata from pictures of St Catherine, and prohibiting all expressions of belief in the occurrence. Pope Innocent VIII. similarly legislated "ne de cetero 8. Catherina cum stigmatibus depingatur ; neve de ejus stigmatibus fiat verbum, aut sermo, vel pr- dicatio ad tollendam omnem scandali occasionem" (see references in Raynaud, De Stigmatisme, cap. xi., 1665). In the years which followed, cases of stigmatization occurred thick and fast,—now a Franciscan, now a Dominican, very rarely a religieuse of another order, showing the marks. Altogether about ninety instances are on record, of which eighteen were

males and seventy-two females. Most of them occurred among residents in religious houses, and took place after the austeritics of Lent, usually on Good Friday, when the mind was intently fixed on our Lord's Passion ; and, from their occurrence being for the most part among members of the two orders to which St Francis and St Catherine belonged, the possibility of the recep- tion of the marks was constantly before their eyes and thoughts. The order of infliction in the majority of cases was that of the crucifixion, the first token being a bloody Sweat, followed by the coronation with thorns; after- wards the hand and foot wounds appear, that of the side being the last. The grade of the infliction varied in

individual cases, and they may be grouped in the follow- ing series :—

I. As regards full stigmatization, with the visible production of the five wounds, and generally with the mark of the crown as well, the oldest case, after St Francis, is that of Ida of Louvain (1800), in whom the marks appeared as coloured circles; in Gertrude von Oosten of Delft (1344) they were coloured scars, and disappeared In auswer to prayer as they also did on Dominica de Paradis; in Sister Pierona, a Franciscan, they were blackish grey. They were true wounds in Margaret Kbnerin of Nuremberg (d. 1851), but

'they also disappeared in answer to her prayer (see her Life, Augs-

burg, 1717), as was the case with Brigitta, a Dominican tertiary (1890), and also with Lidwina. An intermission is described in the marks on Johanna della Croce of Madrid (1524), in whom the wound in the side was large, and the others were rose-coloured circular patches. The marks appeared on each Friday and vanished on Sunday. These emitted an odonr of violets; but in Sister Apol- lonia of Volaterra they were fetid while she lived. Angela della Pace (1634) was fully stigmatized at nine years of age, being even marked with the sponge and hyssop on the mouth; while Joanna de Jesu-Maria at Burgos (1618), a widow, who had entered the convent of Poor Clares, was marked in her sixtieth year. To her in vision two crowns were offered,—one of flowers and one of thorns; she chose the latter and immediately was seized with such pain that her confessor heard her skull

cracking. This case was investigated by the officers of the Inquisition. The stigmatization of Veronica Giuliani (1696) was also the subject of inquiry, and in this case the nun drew on a paper a representation of the images which she said were engraved on her heart. On a post-mortem examination being made in 1727 by Prof. Gentili and Dr Bordiga, the image of the cross, the scourge, &c., were said to have been impressed on the right side of the organ (Vita della Veronica Giuliant, by Salvatori, Rome, 1803). The case of Christina Stun- belen, a Dominican at Cologne, is noteworthy, as on her skull there was fonnd a raised ridge or crown which was at first green, with red dots. This relic is still preserved. In Lucia di Narni (1546) the marks were variable, as they also were on Sister Maria di S. Dominico. On the body of St Margaret of Hungary the stigmata were found fresh and clear when her body was exhumed some time after her death for transportation to Presburg. Other stigmatized persons were Elizabeth von Spalbeck, a Cistercian; Sister Coleta, a Poor Clare; Matilda von Stanz; Margaret Bruch of Endringen (1508); Maria Razzi of Chios (1582); Catharina Januensis; KEliza- beth Reith of Allgau; Stieva zu Hamm in Westphalia; Sister Mary of the Incarnation at Pontoise; Archangela Tardera in Sicily (1608) ; Catharina Ricci in Florence (1590); and Joanna Maria della Croce, a Poor Clare at Roveredo (d. 1678), upon whom the inarkings of the thorn crown and spear wound were especially deep.

Ik. In some cases, although the pains of stigmatization were felt, there were no marks apparent. This occurred to Helen Brumsen (1285); Helena of Hungary (1270); Osanna of Mantua (1476); Columba Rocasani; Magdalena de Pazzis; Anna of Vargas; Hiero- nyma Carvaglio; Maria of Lisbon, a Dominican; Joanna di Ver- celli; Stephania Soncinas, a Franciscan; Sister Christina, a Car- thusian ; and Joanna Rodriguez, a Poor Clare. In the case of Ursula Aguir de Valenza, a tertiary of St Dominic (1608), and Catharine Cialina (d. 1619) the pain was chiefly that of the crown of thorns, as it was also in Ainelia Bicchieri of Vercelli, an Augustinian.

III. In a third series some of the marks were visible on the body, while others were absent or only subjectively indicated by severe pains. ‘Ihe crown of thorns only was marked on the head of Vincentia Ferreria at Valencia (d. 1515) and Philippa de Santo Tomaso of Montemor (1670), while according to Torellus the Augustinian Ritta von Cassla (d. 1430) had

a single thorn wound on the forehead. The crown was marked on Catharina of Raconizio (b. 1486), who also suffered a severe bloody sweat. In the case of Stephano Quinzani, in Soncino (1457), there was a profuse bloody sweat and the wounds were intermitting, appcaring on Friday and Saturday, vanishing on Snnday. Blanche Gazinan, daughter of Count Arias de Sagavedra (1564), was marked only on the right foot, as also was Catherine, a Cistercian nun. The heart wound was visible in Christina Mirabilis (1282). Gabrielda de Piezolo (d. 1478) died from the bleeding of such a wound, and similar wounds were described in Maria de Acosrin in Toledo; Eustochia, a tertiary of St Francis; Clara de Bngny, a Dominican (1514); Cecilia Nobili, a Poor Clare of Nuceria (d. 1655). In the last instance the heart wound was found after death—a three-cornered puncture. A similar wound was seen in the heart of Martina de Arilla (d. 1644). Maria Villana, a Poor Clare, daughter of the margrave of La Pella, was marked with the crown and the spear thrust, and after death the impresses of the spear, sponge, and reed were found on her heart (d. 1670). The wound was usually on the left side, as in Sister Masrona of Grenoble, a tertiary of St Francis (1627); it was on the right in Margareta Columna, also a Clare. In Maria de Sarmiento it was said to have been inflicted by a seraph in a vision.

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IV. In a fourth set of cases the imprints were said to have been found on the heart, even thongh there was no surface marking. Thus the Dominican Paula de St Thomas was said to have had the stigmata on her heart. The heart of Clare of Montfancon (1308) was said to have been as large as a child’s head and impressed with the cross, the scourge, and the nails. Similar appearances were found in Margaret of Citta di Capello and Johanna of Yepes

(1591).

The instances of masculine stigmatization are few. Benedict di Rhegio, a Capuchin at Bologna, had the marks of the crown (1602); Carolus Sazia, an ignorant lay brother, had the wound in his side. Dodo, a Pre- monstratensian lay brother, was fully stigmatized, as also was Philip de Aqueria. The marks after death were found on the heart of Angelos del Pas, a minorite of Perpignan, as also on Matheo Carery in Mantua, Melchior of Arazel in

Valentia, Cherubin de Aviliana (an Augustinian), and Agolini of Milan. Walter of Strasburg, a preaching friar (1264), had the heart-pain but no mark, and the same was the case with a Franciscan, Robert de Malatestis (1430), and James Stephanus. On Nicholas of Ravenna the wounds were seen after death, while John Gray, a Scotsman, a Franciscan martyr, had one wound on his foot.

Within the last hundred years several cases have occurred. Anna Katharina Emmerich, a peasant girl born at Minster in 1774, afterwards an Augustinian nun at Agnetenberg, was even more famous for her visions and revelations than for the stigmata. Biographies, with records of her visions, have been published by Brentano at Munich in 1852 and the Abbé Cazalés at Paris (1870). Colombe Schanolt of Bamberg (1787) was fully stigma- tized, as also was Rose Serra, a Capuchin of Ozieri in Sardinia (1801), and Madeleine Lorger (1806). Two well- known cases occurred in Tyrol,—one " L'Ecstatica " Maria von Mérl of Caldaro, a girl of noble family, stigmatized in 1839, the other "L'Addolorata" Maria Dominica Lazzari, a miller's daughter at Capriana, stigmatized in 1835 (see Boré, Les Stigmatisées du Tyrol, Paris, 1846). A case of the second class is that of Elizabeth Eppinger of Niederbrunn in Bavaria (1814), reported on by Kuhn. An interesting example of stigmatic trance also occurred in the case of a Protestant young woman in Saxony in 1820, who appeared as if dead on Good Friday and Satur- day and revived on Easter Sunday.

The last case recorded is that of Louise Lateau, a peasant girl at Bois de Haine, Hainault, upon whom the stigmata appeared April 24, 1868. This case was investi- gated by Professor Lefebvre of Louvain, who for fifteen years was physician to two lunatic asylums. In her there was a periodic bleeding of the stigmata every Friday, and a frequent recurrence of the hystero-cataleptic condition. Her biography has been written by Lefebvre and published at Louvain (1870).

On surveying these ninety cases, we may discount a certain number, including all those of the second class, as examples of subjective sensations suggested by the con- templation of the pains of crucifixion. A second set, of which the famous case of Jetzer (Wirz, /Telvetische Kirchen- geschichte, 1810, iii. p. 389) is a type, must be also set aside as obvious and intentional

frauds produced on victims by designing persons. A third series, and how large a group we have not sufficient evidence to decide, we must regard as due to the irresponsible self-infliction of injuries by persons in the hystero-epileptic condition, those perverted states of nervous action which Charcot has done so much to elucidate. To any experienced in this form of disease, many of the phenomena described in the records of these examples are easily recognizable as characteristic of the hystero-epileptic state.

There are, however, some instances not easily explained, where the self-infliction hypothesis is not quite satisfactory.

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Parallel cases of physical effects due to mental suggestion are well authenticated. Beaunis vouches for rubefaction and vesication as produced by suggestion in the hypnotic state, and Bourru and Burot describe a case, still under observation, of bloody sweat, and red letters marked on the arm by simple tracing with the finger. See Congrés Screntifique de Grenoble, Progrés Medicale, 29 Aug. 1885, and Berjon's La Grande Hystérie chez 1 Homme, Paris, 1886. We know so little of the trophic action of the higher nerve centres that we cannot say how far tissue nutrition can be controlled in spots. That the nerve centres have a direct influence on local nutrition is in some cases capable of experimental demonstration, and, in another sphere, the many authenticated instances of connexion between maternal impression and congenital deformity seem to indicate that this trophic influence has wider limits and a more specific capacity of localization than at first sight seems possible. There is no known pathological condition in which blood transudation can take place through an unbroken skin.

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STILICHO, Fiavius, Roman general and statesman, was of Vandal origin, and was born about 359 a.p. Atan early age he entered the imperial army, where his father before him had served under Valens; and he speedily attained high promotion. He had already become magister equitum when in 384 he was sent by Theo- dosius as his ambassador to Persia; his mission was very successful, and soon after his return he was made comes domesticus and commander-in-chief, receiving also in marriage Serena, the emperor's niece and adoptive daughter. Theodosius, when dying, made Stilicho and Serena the guardians of Honorius and his other children. Honorius, in 398, was married to Stilicho's daughter Maria, and in 408 to her sister Thermantia. It was by Stilicho that Alaric in 396 was compelled to quit the Peloponnesus (see Atartc), and that in 398 the revolt of the Mauretanian prince Gildo was repressed. Stilicho again encountered Alaric at Pollentia in 402, and at Verona in 403, compelling his retreat into Illyria, and was rewarded with a triumph on his return to Rome. In 405 he almost annihilated the army of Radagaisus, the leader of the Ostrogoths, at Fiesole. The arrangements into which he subsequently entered with Alaric (see ALARIc) were made use of by his enemies to alienate the emperor from him, and when at last revolt was the only course that might possibly have saved him his continued loyalty proved fatal. Abandoned by his troops he fled to Ravenna, and, having been induced by false promises to quit the church in which he had taken sanctuary, he was beheaded on August 23, 408. Stilicho is the hero of much of the poetry of CLAUDIAN (¢q.v.).

STILL, Joun (c. 1543-1607), bishop of Bath and Wells, and now best known as the probable author ("Mr 8. Master of Arts") of Gammer G'urton's Needle, the earlies comedy but one in the English language (see Drama, vol. vii. p. 428), was a native of Grantham, Lincolnshire, and

was born about 1543. He became a student of Christ's College, Cambridge, where he duly graduated and took orders. He was appointed in 1570 Lady Margaret's pro- fessor of divinity in his university, subsequently held livings in Suffolk and Yorkshire, and was master successively of St John's College (1574) and of Trinity College (1577). Still was raised to the bishopric of Bath and Wells in 1592, and, after enjoying considerable fame as a preacher and disputant, he died on February 26, 1607, leaving a large fortune from lead mines discovered in the Mendip Hills. STILLING, Hernricu. See June. STILLINGFLEET, Epwarp (1635-1699), a con- spicuous figure in the church of the Restoration, was descended from the Stillingfleets of Stillingfleet, in the neighbourhood of York, and was born at Cranbourne in Dorset on the 17th April 1635, There and at Ringwood he received his preliminary education, and at the age of thirteen was entered at St John's College, Cambridge, as Isaac Barrow five years before and at the same age had been entered at Peterhouse. He took his bachelor's degree in 1652, and in the following year was elected to a fellowship. After residing as tutor first in the family of Sir Roger Burgoin in Warwickshire and then with the Hon. Francis Pierrepont in Nottingham, he was in 1657 presented by the former to the living of Sutton in Bed- fordshire. Here he brought to completion and published (1659) his Zrenicum, in which he sought to give expression to the prevailing weariness of faction and to find some ecclesiastical compromise in which all could conscientiously unite. Schemes of comprehension were then the most familiar topics of conversation. There seemed every probability that a moderate Episcopacy might attract all parties ; and it was to be expected that a learned and able scholar fresh from the atmosphere of Cambridge Platonism should desire to help present entanglements towards a liberal solution. Much may still be learned from his cogent and earnest exposition of the great principle that it is unwarrantable for the church to make other conditions of her communion than our Saviour did of discipleship. In 1662 he reprinted the Zreniewm with an appendix, in which he sought to prove that "the church is a distinct society from the state, and has divers rights and privileges of its own, .. . resulting from its constitution as a Christian society, and that these rights of the church cannot be alienated to the state after their being united in a Christian country." In the same year the country gave its answer to his and

all similar proposals in the Act of Uniformity, which, by requiring that all clergymen should be episcopally ordained and should use the revised liturgy, lost to the church of England such men as Richard Baxter, John Howe, and Philip Henry. Stillingfleet's actions were as liberal as his opinions. He sheltered in his rectory at Sutton one ejected minister and took for another a large house to be used as a school. But, as time wore on, his liberalism degenerated and gave occasion to Hovwe's remark that the rector of Sutton was a very different person from the dean of St Paul's. But, though in 1680 he published his Unreasonableness of Separation, his willingness to serve on the ecclesiastical commission of 1689, and the interpretation he then proposed of the damnatory clauses of the Athanasian creed, are proof that to the end he leaned towards toleration. Another work which Stillingfleet published in 1662 won for him the confidence and admiration of his church. This was his Origines Sacre, or a Rational Account of the Christian Faith as to the Truth and Divine Authority of the Scriptures and the Matters therein contained. Rendered Obsolete though it be by the general advance of the discussion, this apologetic made a deep impression at the time, and rapid preferment followed its publication.

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Henchman, bishop of London, employed him to write a vindication of Laud's answer to Fisher the Jesuit. In 1665 the earl of Southampton presented him to St Andrew's, Holborn; two years later he became prebendary of St Paul's, in 1668 chaplain to Charles IL, in 1670 canon residentiary and in 1677 dean of St Paul's. Finally, but under different auspices, he was consecrated bishop of Worcester 13th October 1689. During these years he was ceaselessly engaged in controversy with Nonconformists, Romanists, Deists, and Socinians. His unrivalled and various learning, his dialectical expertness, and his massive judgment rendered him a formidable antagonist; but the respect entertained for him by his opponents was chiefly aroused by his recognized love of truth and superiority to personal considerations. He had the courage, along with the saintly and noble-minded Ken and the other six bishops, to incur the anger of James II. by resisting his proposed Declaration of Indulgence (1688). Strangely enough, he crossed swords both with Dryden and Locke,—with Dryden in connexion with the papers favourable to the authority of the Church of

Rome which were found in the strong box of Charles II. and were supposed to have been written by him, and with Locke because the theologian considered that the philosopher's definition of substance was prejudicial to the doctrine of the Trinity. In most of his writings there is a small residuum of permanent value. The range of his learning is most clearly seen in his Bishops' Right to Vote in Parliament in Cases Capital. His Origines Britannice, or Antiquities of the British Church (1685), is a surprising mixture of critical and uncritical research; and his Discourse concerning the True Reason of the Sufferings of Christ (1669), written in answer to Crellius, contains a most forcible statement of the doctrine of Christ's substi- tution. So handsome in person as to have earned the sobriquet of "the beauty of holiness," Stillingfleet was twice married,—first to Andrea, daughter of William Dobbyns of Wormington, by whom he had two danghters, who died in infancy, and one son; afterwards to Eliz- abeth, daughter of Sir Nicholas Pedley, by whom he had seven children. He died in his house at Westminster, 28th March 1699, and was buried in his own cathedral, where a handsome monument briefly records his virtues. His library was bought by Marsh, archbishop of Armagh, to form the foundation of a public library in Dublin.

A collected edition of his works, with life prefixed, was published in London (1710); and a most useful edition of The Doctrines and Practices of the Church of Rome Truly Represented was published in 1845 by Dr Cunningham.

STILLWATER, a city of the United States, at the head of Washington county, Minnesota, on the west bank of the St Croix river, 18 miles north-east of St Paul. It is a great centre of the lumber trade, contains a State prison, a high school, and a public library, and increased its population from 4124 to 9055 between 1870 and

1880.

STILT, or Lone-LeEGGED PLovER, a bird so called for reasons obvious to any one who has seen it, since, though no bigger than a Snipe, the length of its legs (their bare part measuring 8 inches), in proportion to the size of its body, exceeds that of any other bird's. The first name (a translation of the French Echasse, given in 1760 by Brisson) seems to have been bestowed by

Rennie only in 1831; but, recommended by its definiteness and brevity, it has wholly supplanted the second and older one. The bird is the Charadrius himantopus! of Linneus, the Himantopus Hexmatopus has been already mentioned (OYSTERCATCHER, vol. xviii. p. 111, note 2). Mimantopus, with its equivalent Loripes, “by an

awkward metaphor,” as remarked by Gilbert White, ‘‘ implies that the legs are as slender and pliant as if cut out of a thong of leather.”

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candidus or melanopterus of modern writers, and belongs to the group Limicolx, having been usually placed in the Family Scolopacide, though it might be quite as reason- ably referred to the Charadriidx, and, with its allies to be immediately mentioned, would seem to be not very distant from Hematopus, notwithstanding the wonderful development of its legs and the slenderness of its bill.

The very peculiar form of the Stilt naturally gave Buffon occasion (ist. Nat. Oiseaux, viii. pp. 114-116) to lament the shortcomings of Nature in producing an animal with such “ enormous defects,”— its long legs in particular, he supposed, scarcely allowing it to reach the ground with its bill. But he failed to notice the flexibility of its proportionately long neck, and admitted that he was ill-informed as to its habits. No doubt, if he had enjoyed even so slight an opportunity as occurred toa chance observer (/dis, 1859, p. 397), he would have allowed that its structure and ways were in complete conformity, for the bird obtains its food by wading in shallow water and seizing the insects that fly over or float upon its surface or the small crustaceans that swim beneath, for which purpose its slender extremities are, as might be expected, admirably adapted. Widely spread over Asia, North Africa, and Southern Europe, the Stilt has many times visited Britain—though always as a straggler, for it is not known to breed to the northward of the Dannbe valley,—and its occurrence in Scotland (near Dumfries) was noticed by Sibbald so long ago as 1684. It chiefly resorts to pools or lakes with a margin of mud, on which it constructs a slight nest, banked round or just raised above the level so as to keep its eggs dry (bis, 1859, p. 860); but sometimes they are laid in a tuft of grass. They are four in number, and, except in size, closely resemble those of the

OYSTERCATCHER (vol. xviii. p. 111). The bird has the head, neck, and lower parts white, the Lack and wings glossy black, the irides red, and the bare part of the legs pink. In America the genus has two representatives, one! (fig. 1) closely resembling that just described, but rather smaller and with a black crown and nape.

Fig. 1.—Black-Necked American Stilt. (After Gosse.)

This is H. nigricollis or mexicanus, and occurs from New England to the middle of South America, beyond which it is replaced by H. brasiliensis, which has the crown white. The Stilt inhabiting India is now recognized to be H. eandidus, but Australia possesses a distinct species, H. nove-hollandiz#, which also occurs in New Zealand, though that country has in addition a species peculiar to it, H. nove-zelandiz, differing from all the rest by assuming in the breeding-season an altogether black plumage. Australia, however, presents another form, which is the type of the genus Cladorhynchus, and differs from Himantopus both in its style of plumage (the male having a broad bay pectoral belt), in its shorter tarsi, and in having the toes (though, as in the Stilt's feet, three in number on each foot) webbed.

Allied in many ways to the Stilts, but differing in many undeniably generic characters, are the birds known as

Avosets,? forming the genus Recurvirostra of Linneus.

1 This species was made known to Ray by Sloane, who met with it in Jamaica, where in his day it was called ‘‘ Longlegs.”

? This word is from the Bolognese Avosetta, which is considered to be derived from the Latin avis—the termination expressing a diminu- tive of a graceful or delicate kind, as donnetta from donna (Prof. Salvadori tm epist.).

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Their bill, which is perhaps the most siender to be seen in the whole Class, curves upward towards the end, and has given the oldest known species two names which it formerly bore in England,—‘ Cobbler’s-awl,” from its likeness to the tool so called, and ‘‘Scooper,” because it resembled the scoop with which mariners threw water on their sails. The legs, though long, are not extraordinarily so, and the feet, which are webbed, bear a small hind toe,

This species (fig. 2), the 2. avocetta of ornithology, was of old time plentiful in England, though doubtless always restricted to certain

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not a few on the Severn, and Plot mentions it so as to lead one to suppose that in his time (1686) it bred in Staffordshire, while Willnghby (1676) knew of it as being in winter on the eastern coast, and Pennant in 1769 found it in great numbers opposite to Fossdyke Wash in Lincolnshire, and described the birds as hovering over the sportsman’s head like Lapwings. _In this district they were called “ Yelpers” from their cry ;3 but whether that name was elsewhere applied is uncertain, At theend of the last century they frequented Romney Marsh in Kent, and in the first quarter of the present century they bred in various suitable spots in Suffolk and Norfolk, —the last place known to have been inhabited by them being Salthouse,

where the people made puddings of their eggs, while the birds were killed for the sake of their feathers, which were used in making artificial flies for fishing. The extirpation of this settlement took place between 1822 and 1825 (ef. Stevenson, Birds of Norfolk, ii. pp. 240, 241).4 The Avosct's mode of nesting is much like that of the Stilt, and the eggs are hardly to be dis- tinguished from those of the latter but by their larger size, the bird being about as big asa Lapwinc (vol. xiv. p. 308), white, with the exception of its crown, the back of the neck, the inner scapulars, some of the wing-coverts and the primaries, which are black, while the legs are ofa fine light blue. It seems to get its food by Mie its bill from side to side in shallow pools, and catching the smal crustaceans or larvie of insects that may be swimming therein, but not, as has been stated, by sweeping the surface of the mud or sand —a process that would speedily destroy the delicate bill by friction. Two species of Avoset, 2. americana and FR. andina, are found in the New World ; the former, which ranges so far to the northward as the Saskatchewan, is distinguished by its light cinnamon-coloured head, neck, and breast, and the latter, confined so far as known to the mountain lakes of Chili, has no white in the upper parts except the head and neck. Australia produces a fourth species, 2. nove- hollandiw or rubrieollis, with a chestnut head and neck ; but the European 2. avocctia extends over nearly the whole of middle and southern Asia as well as Africa.

A recent proposal (Ibis, 1886, pp. 224-239) to unite the Avosets and Stilts in a single genus seems to have little to recommend it but its novelty, and will hardly meet with acceptance by systematists. (A. N. i ae OT —™

3 Of, '*Yarwhelp" (Gopwit, vol. x. p. 720) and ''Yaup … '"Whaup * (CURLEW, vol. vi. p. 711). "Barker" and " Clinker seem to have been names used in Norfolk. 'ed

4 The same kind of lamentable destruction has of late been cart on in Holland and Denmark, to the extirpation probably of the species in each country,

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STIRLING, a midland county of Scotland, is bounded N. by Perthshire, N.E. by Clackmannan and the Firth of Forth, S.E. by Linlithgowshire, 8. by

Lanarkshire and a detached portion of Dumbartonshire, and S.W. and W. by Dumbartonshire. In the north-east there are two isol- ated portions,—one forming the parish of Alva, bounded partly by Clackmannan and partly by Perthshire, and the other forming part of the parish of Logie and bounded by Perthshire. The outlines of the main portion are ex- tremely irregular, the boundary on the north following for the most part the windings of the Forth, while on the west it passes through the middle of Loch Lomond, and on the south coincides to a considerable extent with various streams. The extreme length of the county from north-west to south-east is about 45 miles, and the great- est breadth from north to south about 18 miles. The land area is 286,338 acres, and the total area 298,579 acres, or about 466 square miles. Apart from the district round Loch Lomond, the principal charm of the scenery of Stirlingshire is in the views of the valley of the Forth with the winding river, and for background the distant peaks of the Grampians, or the nearer ranges of the Ochils, which encroach on the north-eastern corner and detached sections of the county. The valley of the Forth runs along nearly the whole of the northern border, widening towards the cast. ‘The centre of the county from north-east to south-west is occupied by the broad irregular ranges of the Lennox Hills, which are known under four different names, according to the parishes in which they are principally situated,—the Gargunnock Hills (attaining a height of 1591 feet), the Fintry Hills (1676), the Kilsyth Hills (1393), and the Campsie Fells (1894). Nearly the whole of the county to the north-east of Loch Lomond is occu- pied by a spur of the Grampians, reaching in Ben Lomond a height of 3192 feet. Besides Loch Lomond, situated partly in Dumbartonshire, and Loch Katrine, which bounds the county at its north-western corner, the prin- cipal lakes are Loch Arklet to the south of Loch Katrine, Loch Coulter, in the south of St Ninians parish, Loch Ellrig in Falkirk parish, and Black Loch partly in Lanark- shire. he river Forth, from its junction with the Kelty near Gartmore, forms the northern boundary of the county, except where it bounds on the north the part of Kippen parish which is in Perthshire and separates a portion of Lecropt parish from that of St Ninians and a portion of Logie from that of St Ninians and Stirling. It receives from the north the Teith, which touches the county at Lecropt parish, and the Allan, which separates the parishes of Lecropt and Logie, and from the south the Boquhan burn, the Touch burn, and the Bannock burn. The Carron water flows eastwards from the Fintry Hills to the Firth of Forth at Grangemouth.

On the south there are a number of streams which form at various places the boundary of the county,—the Endrick water flowing west- wards from the Fintry Hills to Loch Lomond, the Kelvin from near Kilsyth flowing south-westwards to the Clyde, and the Avon from Lanarkshire flowing north-eastwards to the Firth of Forth. The Forth and Clyde Canal crosses the south-eastern corner of the county from Castlecary to Grangemouth.

_ The whole of the district to the north of Loch Lomond Is occupied by the crystalline schists of the Highlands, which, by the existence of a great fault, are connected on the east with the Old Red Sandstone, which occupies the broad valley between the base of the Highland hills and the chain of the Ochils. These latter heights, portions of which are included in detached areas of the county, con- sist of volcanic rocks associated with the Old Red Sand- Stone (see vol. x. p. 343). The Lennox Hills in the centre of the county are formed by volcanic rocks of Carbonifer-

ous age resting on strata of red and white sandstone (see vol. x. p. 346). The lower grounds are deeply buried under glacial drifts, and conspicuously marked by broad terraces that represent former sea-margins. On one of these, at a height of 50 feet above the present sea-level, lies the Carse of Falkirk. Another stands at an elevation of about 100 feet. There are saline mineral springs at Bridge of Allan.

The coalfield runs obliquely along the south-east of the county, the principal seams being in Denny, Kilsyth, Larbert, Falkirk, and Slamannan parishes. Ironstone, fire- clay, and oil-shale are also found. Limestone is extensively wrought in the Campsie district, and there are a number of sandstone quarries in various parts of the county. The total output of coal in 1884 was 1,182,891 tons, of iron- stone 75,351 tons, of fireclay 15,872, and of oil-shale 4535.

Agriculture.—According to the landowners return of 1872-78 the land was held by 4257 proprietors, possessing 284,751 acres, at an an- nual valuation of £521,407, an average value all over of £1, 16s. 33d. Of the proprietors 3409 possessed less than one acre. The follow- ing possessed over 5000 acres each:—Duke of Montrose, 68,878 ; William Forbes, 18,041; Rear-

admiral Sir William Edmonstone, 9778 ; Hon. Mrs. Margaret Lennox, 7606; Alex. Graham Speirs, 7172; W. C. G. Bontine, 6981; Lieutenant-Col. John Murray, 6818 ; Sir Alex. C. R. Gibson-Maitland, 6023 ; Henry Fletcher Campbell, 5679; and James Johnstone, 5840. The two arable soils of Stirling- shire arc distinguished locally as carse and dryfield, the remainder of the county being occupied by mountain pasture land, moor, and moss. The Carsc of Stirling extends along the banks of the Forth from Buchlyvie to the eastern extremity of the county,— a length of about 28 miles, with a breadth varying from 1 to 4 miles, the total area being about 30,000 acres. ‘The carse soil consists of the finest clays, without stones, but interspersed with strata of marine shells. It has been partly reclaimed from superincumbent peat moss, of which there are still considerable areas adjoining it. It requires a great deal of labour, but, by means of draining, subsoil ploughing, and the use of lime, has been rendered oue of the most fertile mi in Scotland, being specially well adapted for wheat and beans. The dryfield occupies the slopes of the hills above the carse and the valleys in the interior of the county, which constitute the more fertile portions, the crops for which it is best suited being potatoes and turnips. A great part of the dryfield has been re- claimed from moor within the present century. The Lennox Hills, occupying about a fourth of the total area of the county, form one of the most valuable tracts of pasture land in Scotland. The follow- ing table gives a classification of the holdings in 1875 and 1885 :—

50 acres | 50 to 100 | 100 to 300: 300 to 500| 500 to | Above andunder.| acres. acres. | acres. | 1000 ac./1000 ac.

Ac. | No.| Acres. 1418}1537)| 109,831

1418/1492 115,076)

Total.

Acres. |No.| Ac. |No.

10,411| 7 |4299| 1 10,825, 5 |3489) 1

Acres.|No.

28, 493/329

27,876|370

No./Acres. No,

1875 |789 | 1885 |725

13,130)382

12,550|363

peal ak

52,080′ 29

59,418 | 28

According to the agricultural returns for 1886, out of a total of 295,285 acres 115,477, or nearly 39 per cent., were arable land, the arca under corn crops amounting to 29,306 acres, undcr green crops to 8752, rotation grasses 30,664, permanent pasture 45,232, flax 15 and fallow 1508. Oats, the principal corn crop, occupied 19,662 acres, wheat 2065 acres (a decrease of about one half within twenty years), barley 4297 acres, rye 30, beans 8221, and pease 3]. Of green crops the principal are potatoes (3500 acres) and turnips (4623 acres). Considerably more than half of the arable area is occu- pied by rotation grasses and permanent pasture, and their acreage is constantly increasing, which is sufficiently accounted for by the steady increase in the numbers of sheep and cattle. The number of horses in 1886 was 4616, of which 3176 were used solely for purposes of agriculture, and 1440 were unbroken horses and mares kept solely for purposes of breeding. The Clydesdale breed are in general use on the largerfarms, Cattle in 1886 numbered 29,422, of which 10,745 were cows and heifers in milk or in calf, aud 8684 were other cattle two yearsold and above. Butter-making is largely prac- tised on the dryfield farms, the Ayrshire being the principal breed of cows, but cattle-feeding is also an important industry, for which Irish cattle and cross breeds are frequently bought, a considerable number of shorthorns being also reared. Sheep, chiefly blackfaced, for

which there is extensive pasturage on the Lennox Hills and the slopes of the Grampians, numbered 109,897 in 1886, and pigs 1775.

Though, as is evident from the remains of trees in the mosses, an extensive district of the county was at one time occupied by forest, it is now comparatively devoid of timber, the area under woods in 1881 being only 12,483 acres. There is a natural tendency to the growth of birch on the lower slopes of the mountains in the parishes

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of Buchanan and Drymen, and oaks grow extensively on the borders of Loch Lomond. Larch and Scotch firs principally occupy the modern plantations in the other parts of the county. In 1886 there were only 31 acres under orchards, 27 under market gardens, and 53 under nursery grounds,

Manufactures. —The Carron ironworks, founded in 1760, fora long time led the van in British iron manufacture, and are still among the most extensive in the kingdom. The Falkirk ironworks, founded in 1819, are the next to them in importance in the county, but there are many others in the same district. The woollen manufacture is next to iron in importance, It includes carpets, tartans, shawls, and tweeds, the principal seats of the industry being Alva, Bannock- ‘burn, Cambusbarron, and Stirling. Calico printing is carried on in the western part of the county, especially at Campsie and Milngavie. There are chemical works at Stirling, Falkirk, Denny, and Campsie. Throughout the county there are a considerable number of breweries and distilleries. At Grangemouth, the principal . port in the county, shipbuilding is carried on.

Administration and Population.—Stirling is included with Dumbarton and Clackmannan in the same sheriffdom, but has two sheriff-substi- tutes, who sit at Stirling and Falkirk respect- ively, and there are prisons in both towns. The high court of justiciary holds circuit courts at Stirling. There are 21 entire civil parishes within the county and parts of 5 others. Stir- ling (population 12,194) is a royal and police burgh, Falkirk (13,170) a police burgh and burgh of regality, Kilsyth (5405) a police burgh and burgh of

barony, and Alva (4961), Bridge of Allan (3005), Denny and Dunipace (4080), Grange- mouth (4424), and Milngavie (2686) police burghs. In addition to these the following ia had each upwards of 2000 inhabitants:

annockburn (2549), Lennoxtown (3249), and Stenhousemuir (2617). From 39,761 in 1765 the population of the county had by 1801 increased to 50,825, by 1831 to 72,621, by 1861 to 91,926, by 1871 to 98,176, and by 1881 to 112,443, of whom 56,147 were males and 56,296 were females. The number of persons to the square mile is 251, and in point of density Stirling |y ranks ninth among the counties of Scotland. One member is returned to parliament by the county, and Stirling and Falkirk are members of separate districts of burghs, which are' re- spectively named from them, each returning one member.

History.—In 81 A.D. the Romans under Agri- cola penetrated as far north as the firths of Clyde (Clota) and Forth (Bodotria). To secure their conquests they erected between these a line of forts or presidia, generally two miles apart. In 139 Lollius Urbicus erected along the line of the forts the rampart of Antoninus's wall, afterwards known as Graham's dyke. The wall, after crossing the parish of East Kilpatrick, passed outside the present county of Stirling, tillit reached Castlecary, whence it oth by Camelon and Falkirk to Carriden in Linlithgowshire. Castlecary, where many Roman remains have been found, was perhaps the principal Roman station on the line of the wall, and there was another important one at Camelon. A Roman road, the Camelon causeway, passed east- wards from Castlecary to the south of the rampart, and after two miles crossed it and held on to Camelon, whence it went northward by Bannockburn, St Ninians, and Stirling to the Forth, where there was an important station near the present bridge of Drip. Thence it passed north by Keir to Dunblane. To the north-east of the Carron ironworks there was at one time a finely-preserved circular Roman building, called Arthur's Oon (oven) or Julius's Hof, which was demolished in 1748, but of which a drawing is pre- served in Camden's Britannia. In the parish of Dunipace are two beautiful mounds called "the Hills of Dunipace," which some have supposed to have been erected as monuments of peace between the Romans and Caledonians, but which are more probably of natural origin. The remains of what was supposed to have been an early British stronghold were discovered at Torwood in 1864, A group of

cairns at Craigmaddie, near Milngavie, is supposed to mark the scene ofa battle between the Picts and Danes. Among the remains of old feudal castles may be mentioned Graham's castle, among the Fintry Hills, which belonged to Sir John de Graham, who was killed in the battle of Falkirk in 1298 ; Herbertshire, on the north bank of the Carron near Denny, originally a royal hunting seat, and still one of the finest embattled residences in the county (now a boarding school); the ancient keep of Castlecary, partly destroyed by the Highlanders in 1715 ; Torwood, surrounded by the remains of the Caledonian forest, in one of the oaks of which Wallace took refuge ; and the round tower of Carnock, called Bruee's castle, of unknown history. Sir William Wallace lived occasionally with his uncle, the parson of Dunipace, and the county is specially associated with

his exploits and those of Robert Bruce, being the scene of some of the prineipal battles in the struggle for Scottish independengg (Stirling bridge, September 10, 1297; Falkirk, July 22, 1298; Ban. nockburn, June 24, 1314). At Sauchieburn, 11th June 1488, Jameg III. was defeated by his insurgent nobles, and during his flight, having stopped at a cottage in the village of Milton, was there stabbed to death. Kilsyth saw the defeat of the Covenanters by Montrose, 15th August 1645, a result which for a time laid Scotlan

at Montrose's feet ; and a hundred years afterwards—17th January 1746—the Highlanders under Prince Charles Edward routed tho Hanoverians at Falkirk.

See Sir Robert Sibbald's Description of Stirlingshire,

I : 1710; and Nimmo's His. tory of Stirlingshire, 1777 (MacGregor Stirling's edition

is the best). (T. F, H.)

Plan of Stirling. of an isolated eminence overlooking the valley of the Forth and abruptly precipitous towards the north-west, at the junction of several railway lines, 36 miles west-north-west of Edinburgh and 30 north-north-east of Glasgow. Ori- ginally the town was protected on all the accessible sides of the rock by a wall, of which there are still some remains at the southern end of the Back Walk. There were two principal entries to the town,—the South Port, originally 100 yards more to the west of the present line of Port Street, and the bridge over the Forth to the north. The earliest bridge was at Kildean, a mile to the west ; the existing old bridge, now disused, probably dates from about the end of the 13th century ; the new bridge was erected in — 1829, from the designs of Stevenson, at a cost of £17,000, The streets of the old town are for the most part steep, narrow, and irregular, and contain a large number of quaint and antique dwellings. The town has now much outgrown its ancient limits, and the surrounding suburbs on the low grounds contain numerous villas. The castle crowning the eminence, and commanding a splendid pano- ramic view of the wide valley between the Lennox Hills and the Highland mountains and Ochils, with the links of the Forth and the widening estuary to the east, is of unknown antiquity, but from the time that Alexander I. died within its walls in 1124 till James VI. ascended the

throne of England it was intimately associated with the

fortunes of the Scottish monarchs, and after the accession of the Stuarts it became a favourite royal residence, The building was extended by James IIL, who erected the parliament hall, now used as a barrack-room. The palace, begun by James V. and finished in the reign of Mary, is

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at the south-west of the fortress, and forms a quadrangle, the front and pillars of which are adorned by quaintly sculptured figures. ‘The royal chapel founded by Alex- ander I., rebuilt in the 15th century, and again by James VI., was subsequently converted into an armoury and is now used as a store. ‘To the west of it is the Douglas room, the scene of the treacherous murder of William, eighth earl of Douglas, by James II. in 1452. Below the castle on the north-east is the road of Ballangeich, which supplied a fictitious title to James V. when wandering in disguise. Beyond it is the Gowan or Gowlan Hill, at the west corner of which is Mote Hill or Heading Hill, where Murdoch, duke of Albany, and several of his relatives were beheaded in 1425. On the north-east side of the esplanade a statue of King Robert Bruce was erected in 1877. Below the castle rock to the south-west were the king’s gardens, now laid out in grass, with an octagonal mound, called the King’s Knot, in the centre. Farther south is the King’s Park, now used for recreation, and as a drill ground. In the cemetery to the south of the castle esplanade there are a number of interesting monuments. Near the main entrance to the esplanade is the building called Argyll’s Lodging, erected by the poet, Sir William Alexander, who was created carl of Stirling by Charles I. It passed into the possession of the Argylls in 1640, and was the head- quarters of John, duke of Argyll, during the rebellion of 1715. South-west of it is Mar’s Work, the ruins of the palace built as a residence by the earl of Mar about 1570, from the ruins of Cambuskenneth Abbey. Next to the castle the most interesting public building is the Greyfriars church, some portions of which date from the 13th century, although the monastery with which it was connected was not founded till 1494. The greater part of it is in the Later Pointed style. The church was the scene of the coronation of James VI., 29th July 1567, when John Knox preached the coronation sermon. The site of the Dominican monas- tery founded by Alexander ITI. in 1223 is now occupied by the National Bank. In the immediate neighbourhood of Stirling, on the other side of the Forth, in Clackmannan county, is the beautiful ruin of Cambuskenneth Abbey, chiefly Early English or First Pointed, founded by David I. in 1147 for canons regular, associated with the meeting of parliaments and other interesting events in Scottish history, and the burial-place of James III. and his queen, Margaret of Denmark.

The principal secular buildings are the old town-house, erected in 1701; the new town buildings ; the jail, ereeted in 1848 at a cost of £12,000 ; the county buildings (1875, £15,000); the Smith institute, founded by the bequest of £22,000 and a valuable collec- tion of paintings by Thomas Stewart Smith, and embracing a picture gallery, a museum, and a reading room; the public halls (1883, £12,000); and the high school (1855, £5600 ; now being extended ata cost of £8000). Aimong the benefactions are Cowane's hospi- tal, founded by the bequest of John Cowane, dean of guild in 1638, for twelve decayed members of the guildry, but the distribution of the charity has since been altered, and the building erected in 1639 now forms the guild hall; Spittal's hospital, founded by Robert Spittal, tailor to James IV., about 1530 for decayed tradesmen; Allan's hospital, founded in 1725 for the maintenance of children of poor townsmen; and Cunningham's mortification, founded in 1808 with an endowment of £4000 for the clothing and schooling of sons of mechanics, By the operation of the Endowed Schools and Hospitals Act the charities are now largely devoted to education.

As early as the 15th century Stirling had a trade with the Nether- lands in worsted cloth, shalloons, stockings, and thread, but the manufactures afterwards declined. The cotton manufacture carried on in the beginning of the present century has now entirely ccased. During the last century the manufacture of tartans and carpets was earried on, but this also languished about the end of the century, and was not revived till about 1820. The woollen manufacture is now the staple industry, the principal goods being carpets, tartans, tweeds, andshawls. There are also breweries, coachbuilding works, and agricultural implement works. The population of the royal burgh in 1871 was 10,873, and in 1881 12,194. The population of the parliamentary burgh, which includes the village of St Ninians, in 1871 was 14,279, and in 1881 it was 16,001.

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The town is of unknown antiquity, and undoubtedly owed its origin to the fortress on the rock, which became one of the most important strongholds in Scotland and the centre of the struggle between Scotlaud and England. As carly as 1119 the town was a royal burgh, and under Alexander I. it became

one of the four towns which constituted the Court of the Four Burghs, superseded under James III. by the Convention of Royal Burghs. — Its earliest charter was that of Alexander II. in 1226, who first made the castle a royal residence. Its last governing charter was obtained from Charles I. in 1641. On account of a combination of three members of the council to retain themselves in office it was deprived of its corporate privileges in 1773, and they were not restored till 1781. The castle was held by William the Lion before 1174, was occupied by Edward I. with his army in 1296, and was burned with the town in 1298 by the Scots on their retreat from the battle of Falkirk. Between this time and 1841 it was frequently besieged and taken by the English, the longest period during which it remained in their hands being from its capture by Edward I. in 1304 till his son's defeat 10 years afterwards at the battle of Ban- nockburn. It was the birthplace of James II. in 1480, and, it being

'the jointure house of his mother, lie was removed to it in 1438

from Edinburgh to thwart the ambitious purposes of Sir William Crichton. It was in one of its rooms that James, as stated above, slew the earl of Douglas, after which the town was burned by the earl's brothers. James V. took refuge in it after his escape from Falkland in 1528. During the reign of Mary and the period of the Reformation, Stirling occupied a position of almost as great prominence as during the wars of Scottish independence. Fo the infant queen was crowned by the cardinal's party in 1543; here her son, afterwards James VI., was baptized according to the Roman Catholic ritual, 17th December 1566; and here he was crowned by the leaders of the congregation on July 29th of the following year. In 1571 rival parliaments were held by the queen's party in Edinburgh and the king's lords at Stirling, shortly after which an attempt was made by the queen's adherents to surprise Stirling castle, which was almost successful, the regent (Lennox) being slain in the fray. On the 26th April 1578 the castle was surprised by Morton, after which a reconciliation took place between the two parties, In 1584 the castle was occupied by the earls of Angus and Mar, the Protestant leaders, but on the approach of the king with a large force they fled to England. Returning with a formidable army collected in the south in the following year, they compelled James after the flight of Arran to open the gates to them, safety to his person having been guaranteed. The town was

the scene of the baptism of Prince Heury with great pomp in August 1594, for which purpose the ehapel royal was rebuilt on a larger scale “to entertain the great number of strangers expected.” The meetings of the privy council and court of session were held in 1637 at Stirling on account of the disturbed condition of Edinburgh, and a parliament was held at it in 1645, on account of Edinburgh having been visited by the plague, but the outbreak of the disorder in Stirling caused an adjournment to Perth. During the Civil War Stirling was held by the Covenanters, and the committees of ehurch and state adjourned to it after the victory of Cromwell at Dunbar 3d September 1650. In August of the following year the castle was taken by General Monk. In 1715 it was held by Argyll to prevent the passage of the Forth by the Jacobites ; and during the rebellion of 1745 it was unsuccessfully besieged by the Highlanders.

See History of the Chapel Royal of Stirling, Grampian Club, 1882; Local Notes and Queries relating to Stirling, 1883; Charters of Stirling, 1884; Burton, History of Scotland. (T. F. 1.)

STIRLING, Eart or. vol. i. p. 493.

STIRLING, Jamus (1692-1770), mathematician, third son of Archibald Stirling of Garden, and grandson of Sir Archibald Stirling of Keir (Lord Garden, a lord of session), was born at Garden, Stirlingshire, in 1692. Part of his early education was probably obtained at Glasgow, but at eighteen years of age he went to Oxford, where, chiefly through the influence of the earl of Mar he was nominated (1711) one of Bishop Warner’s exhibitioners at Balliol. During his residence at Oxford he made for himself considerable reputation as a student of mathe- matics. In 1715, however, he was expelled on account of his correspondence with members of the Keir and Garden families, who were noted Jacobites, and had been accessory to the ‘Gathering of the Brig of Turk” in 1708. From Oxford he made his way to Venice, where he occupied himself as a professor of mathematics. In 1717 appeared his’ Linee Tertu Ordinis Newtonianz, sive… . (8vo, Oxford), which contained one or two notable additions

See ALEXANDER, SiR WILLIAM,

‘ to the theory. While in Venice, also, he communicated,

through Sir Isaac Newton, to the Royal Society a paper entitled "' Methodus Differentialis Newtoniana illustrata " (Phil. Trans., 1718, p. 1050; Abridg., vi. p. 428). Fear- ing assassination on account of having discovered a trade secret of the glass-makers of Venice, he returned with Newton's help to London about the year 1725. In London he remained for ten years, being most part of the time connected with an academy in Tower Street, and devoting his leisure to mathematics and correspondence with eminent mathematicians, In 1730 his most im- portant work was published, the Methodus Differentialis, swe Tractatus de Summatione et Interpolatione Serierum Infintarum (4to, London), which, it must be noted, is something more than an expansion of the paper of 1718. In 1735 he communicated to the Royal Society a paper "'On the Figure of the Earth, and on the Variation of the Force of Gravity at its Surface" (Phil. Trans., Abridg., vill. pp. 26-30). In the same year his worldly fortunes changed permanently for the better, through his appoint- ment to be manager for the Scots Mining Company at Leadhills, an appointment which gave scope both to his scientific talents and to his great, though hitherto latent, administrative ability, and which was eminently fortunate for his employers. We are thus prepared to find that his next paper to the Royal Society was concerned, not with pure, but with applied science—* Description of a Machine to blow Fire by the Fall of Water" (Phil. Trans., 1745, p. 815; Abridg., ix. pp. 109, 110). His name is also con- nected with another practical undertaking since grown to vast dimensions. The accounts of the city of Glasgow show that the very first instalment of ten millions sterling spent in making Glasgow a seaport, viz.,a sum of £28, 4s. 4d., was for a silver tea-kettle to be presented to "James Stirling, mathematician, for his service, pains, and trouble in surveying the river towards deepening it by locks." This was in 1752. Stirling died in Edinburgh on 5th December 1770.

See W. Fraser, The Stirlings of Keir, and their Family Papers, Edinburgh, 1858; " Modern History of Leadhills," in Gentleman's Magazine, June 1858; Brewster, Memoirs of Sir Isaac Newton, ii, pp. 300, 307, 411, 516; J. Nicol, Vital Statistics of Glasgow, 1881-5, p. 70; Glasgow Herald, 5th August 1886.

Another edition of the Linew Tertii Ordinis was published in Paris in 1797; another edition of the Methodus Differentialis in London in 1764; and a translation of the latter into English by Halliday in London in 1749, A considerable collection of literary remains, consisting of papers, letters, and two manuscript volumes of a treatise on weights and measures, are still preserved at Garden by Stirling's great-grandson and namesake.

STOAT. See Ermine.

STOBAUS, Joannes, a native of Stobi in Macedonia,— whence the surname Stobzeus or Stobensis,—is known to us as the compiler of a very valuable series of extracts from Greek authors. Of his life nothing is known, but he probably belongs to the latter half of the 5th century. From his silence in regard to Christian authors, it is in- ferred with some probability that he was not a Christian; that he was a man of wide culture and general reading is clear from the anthology which bears his name.

The extracts were intended by Stobeeus for his son Septimius, and were preceded by a letter briefly explaining the purpose of the work and giving a summary of the contents. From this summary (which is preserved in Photius's Bibliotheca) we learn that Stobseus divided his work into four books ; the first contained sixty chapters, the second forty-six, the third forty-two, and the fourth fifty-eight. In most of our MSS. the work is divided into three books, of which the first and second are generally called "ExAoyal pvoixal cai #O.xat, and the third 'AvOo- Adyvov (Morilegium or Sermones). As each of the four books is sometimes called *AvOoAdyiov, it is probable that this name originally belonged to the entire work :

the full title, as we know from Photius, was "Ex)oyéy atopbeypatav brobykav BuBria rértapa. Between the account which Photius gives of Stobecus's work and the form in which we have it there are several marked discre- pancies. The second book in particular is little more than a fragment. From this and other indications Wachsmuth has made it probable that our Stobzeus is only an epitome of the original work, made about the end of the 11th century at Byzantium, "ab homine Platonis Aristotelisque amantissimo."

The didactic aim of Stobzeus's work is apparent throughout. The first book teaches physics—in the wide sense which the Greeks assigned to this term —by means of extracts. Itis often untrustworthy : Stobzeus betrays a tendency to confound the dogmas of the early Ionic — philosophers, and he occasionally mixes up Platonism with Pythagoreanism. For part of this book and much of book ii, he depended on the works of Aetius, a Peripatetic philosopher, and Didyinus. The third and fourth books, like the larger part of the second, treat of ethics; the third, of virtues and vices, in pairs; the fourth, of more general ethical and political subjects, frequently citing extracts to illustrate the pros and cons of a question in two successive chapters. In all, Stobszeus quotes more than five hundred writers, generally beginning with the poets, and then proceeding to the historians, orators, philosophers, and physicians. It is to him that we owe many of our most important fragments of the dramatists, particularly of Euripides.

The first complete edition of Stobeus was published at Geneva in 1609; the last is Mcineke's (Leipsic, 1855-1864). The best critical edition of books i. and ii. is by Wachsmuth (Berlin, 1884) ;

a companion cdition of books iii. and iv. (the Florilegiwm) is pro- mised by Otto Hense.

STOCK EXCHANGE, a market for the purchase or sale of all descriptions of public securities. Previous to 1773 the London stockbrokers conducted their business in and about the Royal Exchange, but in that year, having formed themselves into an association under the designation of the Stock Exchange, they, after temporarily locating their headquarters in Sweeting Ally, Threadneedle Street, removed to Capel Court, Bartholomew Lane. The growth of business necessitating improved accommodation, a capital of £20,000 in four hundred shares of £50 each was raised in 1801 for the purpose of erecting a new building in Capel Court, which was finished and occupied in the following year, the members at that date number- ing about five hundred. With the occupation of the new building new rules came into force; all future members were admitted by ballot, while both members and their authorized clerks were required to pay a subscription of ten guineas each. As only the wealthier members of the association had provided the capital for the new building, the Stock Exchange henceforth consisted of

two distinct bodies—proprietors and subscribers. In 1854, the member- ship having increased to about one thousand persons, an extension of the premises in Capel Court was effected at a cost of £16,000. A further and very extensive increase in the accommodation was made in 1885, the number of members and authorized clerks having risen at that date to above two thousand five hundred. The extended build- ings now occupy the whole of a triangle to the east of the Bank of England, having as its base Bartholomew Lane, its north side Throgmorton Street, and its south side por- tions of Threadneedle Street and Old Broad Street. The completed buildings comprise two large halls, where the various markets are held, settlement rooms, reading room, committee rooms, managers' rooms, and various other offices. It is intended ultimately to remove the partition between the two halls, when a vast business apartment,

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having an area of about 16,000 square feet, will be avail- able for the use of members. The immensely valuable property of the Stock Exchange is now owned by about 1050 proprietors, additions both to the proprietary and to the capital invested in the buildings having been from time to time effected during the past fifty years. The interests of the proprietors are attended to by nine of their number, who are termed managers, and by a secretary and staff of clerks. The income of the association now amounts to about £130,000 per annum, and is derived from the annual subscriptions of members and their clerks, from entrance fees paid by new members, and from rents and investments. All members of the Stock Exchange are not proprietors, neither are all proprietors necessarily members. Admission as a member is open to any person not engaged in another business. He must, however, be recommended by three members, who each guarantee to the committee of the house payment of £750 in the event of the new member being declared a defaulter within two years of his election. A personal guarantee of this de- scription is imperative, the object being to exclude all persons of doubtful character. Elections are by ballot, and for one year only, all members being theoretically liable to exclusion at the expiry of that period.

The stock exchange opens every morning at 11 o’clock and closes at 4, except on Saturday, on which day the doors are shut at 2 o’clock. All members of the house are either jobbers or brokers, the former term being applied to those who are dealers in stocks. It is contrary to the etiquette of the London Stock Exchange for brokers to deal with brokers, and all transactions are accordingly effected between brokers (representing their clients) and jobbers. Brokers’ charges vary from one-sixteenth to as much as one-half per cent., and the jobbers’ “turn” or profit from one-eighth to two or three per cent., according to the character of the stock dealt in. The turn of the jobber amounts in the aggregate to an enormous tax upon the British public, and the question of the utility of this inter- mediary has been much discussed at various times. On buyers and sellers the tax operates in this way :—A wishes to buy and B wishes to sell £1000 of Caledonian Railway stock, but, brokers being forbidden to deal with brokers, recourse is had to the jobber C, who makes a price to the brokers of say 98 to 984, that is to say, he offers to buy at 98 or to sell at 984; the buyer A accordingly pays 984 plus his broker’s commission, and the seller B receives 98 minus his broker’s commission, the jobber C pocketing the difference or “turn” of 4 per cent. The argument in favour of the jobber is that he supplies at all times and in all circumstances a ready market, and it must be allowed that in ordinary times he is a very convenient functionary. But, as a matter of fact, in excited times the system often breaks down, as the jobbers frequently shut their books and refuse to deal at the very moment when their help is most needed. What are known as the ‘‘markets” in the stock exchange are simply groups of jobbers distributed here and there on the floor of the house. Habit or con- venience seems to have determined the particular spots occupied, which are known as the consol market, the Eng- lish railway market, the foreign stock market, and so on.

In active times the business transacted daily on the London stock exchange amounts to an enormous total. Yet no written contracts or notes pass between jobbers and brokers, verbal communications being alone in use. Notwithstanding this apparent looseness of practice where millions of property are bought and sold almost hourly, there is hardly a single instance of attempted repudiation on record. All transactions are entered into for the fortnightly settlements, the precise dates for which are always fixed a few weeks in advance by the committee of

the house. Each fortnightly settlement includes three days: the first is the continuation or contango day, when all transactions of a merely speculative description are continued for another fortnight, the second the ticket day, when names are passed for actual purchases or sales, and the third the pay day, when all amounts or balances are paid or received. As the great bulk of business is purely speculative, the contango or continuation day is by far the busiest of the entire fortnight. The floor of the house is then crowded with an eager throng of from 2000 to 3000 brokers, jobbers, and clerks, and during the greater part of the day little is done beyond arranging the account. Con- tinuation rates or contangos vary with the value of money and the state of the account. When money is dear, or speculative buying active, rates are high, but when specula- tive selling has preponderated, and the account has become what is called a ‘“‘bear” account, rates are light. An enormous amount of capital is engaged in stock exchange speculation in London. Banks, financial companies, and private firms and individuals lend freely on stock exchange securities, and thus encourage, if they do not initiate, most of the great speculative movements. Besides the great central institution in London, stock exchanges exist in nearly all the large cities of the United Kingdom. The principal are those of Glasgow, Liverpool, and Manchester, which provide excellent markets for local stocks and shares.

On the Continent the two chief centres for the transaction of stock exchange business are Paris and Berlin. In Paris the business can be traced back for about five hundred years, but it was not until 1726 that the Bourse was legally recognized, sixty agents de change for the transaction of business being appointed in that year by the king. The Bourse now consists of two distinct bodies, known as the parquet and the coulisse. The parquet is composed of the sixty official’ brokers or agents de change appointcd by the Government, who alone are admitted to the inner business ring of the Bourse. The cowltsse arc the outside dealers or brokers, but, unlike the same class in London, these comprise firms of solid standing, bankers, and arbitrage houses. Although a partial settle- ment occurs once a fortnight, the great bulk of the business on the Paris Bourse is settled for once a month, the arrangements con- nected therewith occupying no less than six days. Another pecu- liarity in the mode of conducting business in Paris is that

sellers can be compelled to deliver stock at any time during the currency of the account. At Berlin the Bourse is not under Government control, and although a certain number of licences are issued any one may act as a broker. The Bourse can be used by the public on payment of an annual subscription, and all debts incurred there are as obligatory in law as ordinary commercial debts. The scttle- ment occupies three days, and occw's at the end of each month.

Although stock exchange business in the United States has now attained enormous proportions, it is of comparatively recent origin. The first organization of brokers in New York dates from about 1820. The mode of conducting business in Wall Street differs in some respects from both the English and the Continental procedure, Transactions entered into on one day are settled on the following, and the full amounts involved, and not the mere differences, are paid and received. The jobber, who is of so much importance under the English system, is unknown in New York, as in all cases brokers deal direct with brokers. While stock exchange business in London is of immense variety, and comprises all descriptions of home and foreign Government bonds, railway stocks, and miscella- neous shares, in New York it is confined almost entirely to American railway bonds and shares. In these securities, however, the volume of business in active times is enormous, the vast railway system of the United States providing an ample choice for the investor and a wide field for speculative manipulation. (We Pcie)

STOCKHOLM, the capital of Sweden, is situated at the point where Lake Malar mixes its waters with those of the Baltic, and at the meeting-place of two provinces, Upland and Sédermanland. The old cities of Sweden are regularly found in places where in early times the inhabitants of neighbouring districts came together for purposes of ex- change or sometimes of worship, or where a river brought the interior of the country into closer connexion with the coast. By the passages that wind among the numerous isles off Stockholm ships at an early date came to the mouth of the lake, only to continue their voyage into its

remoter parts. The two provinces mentioned were densely peopled, and the cultivated regions extended to the mouth of the lake, as is shown by groups of tumuli still to be seen in the immediate neigh- |2 23 bourhood of the present city. [25 Still Stockholm does not rank among the oldest cities of Sweden; the exceedingly eligible site had long been neglected owing to its exposure to the incursions of pirates.!

Stockholm was first founded by Birger Jarl, it is said, in the middle of the 13th century, at a time when pirate

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5. Mint. 6. Church of St Nicholas.

1. Chureh of St John. |

3. Kungstradgard. 2, Humlegard.

4, Carl XII. Torg.

which had been enclosed was found to be insufficient, and houses were built outside the walls, which thus lost their defensive character. The castle, two towers belonging to the older works, and some newer walls nearer the water became the sole fortifications. The citizens began also to build on the neighbouring shores, though there, in the event of a siege, all houses had to be destroyed, so as not to give shelter to the enemy. A tendency to increased

1 Before the rise of Stockholm Bjorké, Sigtuna, and Upsala were places of great importance. Bjérké (“ the isle of birches”), by foreign authors called Birca, was a kind of capital where the king lived ocea- sionally at least ; history speaks of its relations with Dorestad in the Netherlands, and the extensive refuse heaps of the old city, as well as the numerous sepulchral

monuments, show that the population must have been large. But, though situated at a central point on the Malar Lake, it was destroyed, apparently before the beginning of the 11th century, we do not exactly know when nor by whom; and, once de- stroyed, it never recovered. Sigtuna, lying on the shore of a far-reaching northern arm of Lake Malar, also a royal residence and the scat of the first mint in Sweden, where English workmen were employed by King Olaf at the beginning of the 11th century, was, thongh much more sheltered than Bjérk6, destroyed in the course of the 12th century.

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STOCKHOLM

fleets were less common than they had been, and the

Government was anxious to establish commercial relations —

with the towns which were now beginning to flourish on the southern coast of the Baltic. The city was originally founded as a fortress on an island at the mouth of Lake Miilar ; this island, which is not large, consists of a hill of gravel resting upon rocky ground, having its highest side towards the north, and sloping in the other directions, The castle was erected on the north-eastern corner, and the city was surrounded with walls having fortified towers on the north and south. It came to be called Stockholm (“the isle of the log,” Lat. Zolmia, Germ. Holm) ; the true explanation of the name is not known. Soon the space

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7. Stortorg. 8. Riddarhustorg. development has steadily showed itself throughout the Middle Ages and in modern times. On an islet in the stream, between the original Stockholm and the northern shore, was founded, in the 14th century, a hospital of the Holy Ghost, and a new tower was erected to defend the approach to the city. On another islet closely adjoining the original Stockholm on the west, a Franciscan monas- tery was founded towards the end of the 13th century. The present city has an area of 12°6 square miles (44 being water) ; its extreme length from north to south is » about 3°8 miles and its circumference 14}. The different parts of the actual city are the following. (1) Staden is the old “city”; its ancient origin is apparent in the narrow and winding streets. The individual houses are not very old, owing to the ravages of frequent fires ; still, some are to be seen with very narrow frontage and gables turned towards the street, asin North Germany. The old market, still called Stortorget (‘the great market”), is now one of the smallest in Stockholm. The royal palace, dating from

the Middle Ages, but enlarged and partly rebuilt ata later”

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period, was destroyed by fire in 1697, the body of Charles XI. being with difficulty rescued from the flames. A new palace, after plans by Nicodemus Tessin, was not com- pleted (owing to wars and the general distress) until 1754 ; it is a quadrangular structure on the summit of the hill, with two wings towards the east and four towards the west (two straight and two in a semicircle). The style of the building is noble and refined, the royal apartments rich in treasures of art. In the immediate vicinity of the palace is the church of St Nicholas, the oldest in Stockholm, but in many parts changed from what it was; the chancel was demolished in the 16th century to give more room for the palace. Staden is the commercial centre of the city, containing the exchange, the bank of Sweden, and the custom-house, as well as the offices of many merchants. On the eastern side a very large quay, called the Skeppsbro (“the bridge of ships”), extends from the statue of Gus- tavus III. opposite the palace to where the traffic between Lake

Malar and the Baltic is carried on through a sluice or lock. ‘The Skeppsbro is the landing-place for steamers to the northern provinces of Sweden and foreign ports. On the other side of the palace is the Kanslihus, con- taining the offices of most of the ministries; and a little farther on is a market, named from the palace on its northern side, the Riddarhus, belonging to the Swedish nobility. The principal hall of the Riddarhus has its walls adorned with the armorial bearings of the noble families of Sweden. The representatives of these families meet here every third year for consultation as to their common interests. In front of the building stands the statue of Gustavus I. The town-hall stands in the same square. (2) Liddarholmen contains the old Franciscan church, which, however, is not now used for divine service. Since the time of Gustavus Adolphus it has been the burial-place of the royal family ; it also contains many trophies from the European wars of Sweden. On one side of the church stand the houses of parliament ; on the other is the statue of Birger Jarl, the founder of Stockholm. A large part of the island is occupied by Government offices, including the record office. Along the shore most of the steamers for different parts of Lake Malar and farther on through the canal of Sédertelge, for the Baltic, have their landing- places. (3) Helgeandsholmen (“the isle of the Holy Ghost”) is at present occupied by the royal stables. The Norrbro (“north bridge”), connecting the old town with the northern shore, passes the eastern extremity of the island. (4) Vorrmalmen (“the northern suburb”) begins at the Norrbro with the market of Gustavus Adolphus, where his statue stands between the theatre royal and the crown prince’s palace. Norrmalmen is one of the best- built parts of the city, with broad straight streets; it contains four parish churches and also the English church, the Roman Catholic church, and the Jewish synagogue. In the south-eastern corner is a large open space, Kungs- tridgairden (“the royal garden”), with the statues of Charles XII. and Charles XIIL. and a fountain, one of the prin- cipal playgrounds for children. Near it is another park, with the statue of Berzelius. Norrmalmen has several public buildings, such as the post-office, the principal rail- way station, the academy of art, the academy of sciences, the high technical school, and the school of metallurgy, the technical school, the observatory, &c. On the northern side of Norrmalmen lies the principal cemetery. (5) Blasie- holmen, united with Norrmalmen since the filling up of the canal which formerly separated them, contains the national Museum, the academy of music, &c. (6) Skeppsholmen (“the isle of ships”) and (7) Castellholmen

both belong to the admiralty. (8) Kwngsholmen (“the isle of the king”), to the west of Norrmalmen, contains a parish church, the mint, the high school of medicine, several hospitals, and

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many factories. (9) Ladugardslandet takes its name from the farm yard (/adugdard) of the royal castle, which formerly occupied a great part of its area. It became a part of the city in the middle of the 17th century, but until recently played a very subordinate part, owing to want of water. Since the introduction of the new water-supply this part of Stockholm ‘has grown wonderfully, and is now the finest part of the city, with more than 40,000 inhabitants. It has a fine park, Humlegarden (“hop garden”), with the royal library and the statue of Linneus. Most of the barracks of Stockholm, as well as the high military school, are situated in this quarter of the town. (10) Djurgarden (‘deer garden”) is a royal park, with villas, restaurants, shipbuilding yards, &e. (11) Sédermalmen (‘the southern suburb”) is separated from Staden by the sluice already mentioned. On an open space at the side of the channel stands the statue of Charles XIV. (Bernadotte). The larger part of this suburb, with its two parish churches, chapels, hospitals, &c., stands at a considerable elevation, and com- munication has been facilitated by the construction of two elevators. On the outskirts are factories, foundries, &c.

A glance at the map at once shows how important have been its water-facilities in forming the character of Stockholm. From all sides the water permeates the different parts of the city, separating them, yet at the same time helping to unite them. Stretching far away to east and to west between shores and islands sometimes open and cultivated, sometimes rocky and covered with trees, the water entices the inhabitants to make excursions and to reside for a part of the year in the country; in the summer the city is largely deserted. The site is universally recognizcd as extremely picturesque. The great water-surface has also a beneficent influence upon the climate. In 1884 the mean temperature was 42°°47 Fahr., the highest temperature of the year being 72°°4 Fahr. (2nd and 5th July), the lowest -0°:4 Fahr. (80th November). The year’s rainfall amounted to 18°3 inches, the number of rainy days being 129. The best time for visiting Stockholin is

the latter half of June, when the evening and morning lights, reflected from the water and scen through the young and luxuriant verdure, produce singularly beautiful and varied effects.

In Sweden the cities formerly played a comparatively subordinate part. During the Swedish Middle Ages the prominent classes were the nobility, the clergy, and the peasantry. The anti-aristocratic revolution of the 14th and the 15th centuries had in Sweden its principal supporters among the peasants. But the importance of the cities has gradually increased, and recent times have witnessed an accelerated development, which is best exemplified by the history of Stockholm. The number of inhabitants was, in 1800, 75,517; in 1825, 79,478; in 1850, 98,070; in 1860, 112,391; in 1870, 186,016; in 1880, 168,775; in 1884, 205,123; and in December 1885, 215,688. In 1884 11,916 were qualified to take part in the election of members of the lower house of parliament. Along with the rapid increase of population went a correspondingly increased industrial activity and a considerable development in the means of communication. The number of mechanics in 1884 was 11,064 (8716 of the wage-earning class), the corresponding numbers for 1880 being 9664 and 7483. The number of factories in 1884 was 275, employing 9810 workpeople (including 2638 women), and producing to the value of 32,355,565 Swedish crowns (£1,797,5381). The merchants in 1884 numbered 3828, with 6554 assistants. In the same year 87,561 vessels entered (21,460 steamers), while 37,699 (21,565 steamers) cleared. Of these 1688 entered from and 1159 cleared for foreign ports. In former times Stockholm had the com- mand of all the foreign commerce for the country round Lake Malar, and for the whole of northern Sweden; but more recently the northern cities have: made themselves to a certain extcnt inde- pendent of the capital.

For communication between the different parts of Stockholm omnibuses and small rowing boats have now given place to small steamers; in 1884 sixty-three of these were in use in the city and its immediate vicinity. In 1880 tramways were constructed for Staden, Norrmalmen, Kungsholmen, and Ladugardslandet.

The city forms a separate administrative district under a gov- crnor (éfverstéthallare). In ecclesiastical matters it belongs to the archbishopric of

Upsala, and the archbishop has the right to preside in its consistory, of which the president generally is the pastor primarius, the rector of St Nicholas. The members of this consistory are the rectors of the other seven territorial parishes and the rectors of the Finnish and German congregations. There is also a court consistory, presided over by the chief court preacher.

It was not until modern times that Stockholm became the capital of Sweden. The medieval kings visited year by year

different parts of the kingdom, where they lived for a shorter or longer time. When, from the development of state affairs, the need of a capital came to be felt, no city could compete with the claims of Stockholm. It is the usual residence of the king; in the summer he lives generally in one of the palaces in the neighbour- hood ; some part of every year he passes in his Norwegian eapital. The supreme court of justiee has its seat in Stockholm, as well as the Svea Hofratt, the next highest tribunal for central and northern Sweden. It is also the seat of all the other central governmental boards.

Stockholm is also the seat of seven academies. (1) The Swedish Academy, with cighteen members, founded in 1786, deals with the language and literature of Sweden. It is engaged upon a Swedish dictionary, and celebrates every year the memory of some renowned Swede. (2) The academy of sciences, founded in 1739, with 100 ordinary members, distributed into nine classes, and 75 foreign members, has charge of the royal museum of natural history, the physical, astronomical, and meteorological institutes, and the botanieal garden. (3) The academy of belles lettres, history, and antiquities, founded in 1753, reformed in 1786, now occuples itself only with history and antiquities; it has 14 honorary members, 20 ordinary members, 16 foreign members and corre- spondents. The seeretary of this academy is, at the same time, as royal antiquary of Sweden and garde des médailles, director of the archeological, historical, aud numisniatical state collections, and inspector of the antiquities of the kingdom. (4) The academy of agriculture, founded in 1811, with 24 honorary members, 136 ordinary and 75 foreign members, occupies itself with agriculture and fisherics. It has an experimental institution for agricultural chemistry, physiology of plants, gardening, and practical

agricul- ture. (5) The academy of fine arts, founded in 1735, has charge of the official school of art. (6) The academy of music, founded in 1771, has the care of the state conservatory of music. (7) The academy of military sciences was founded in 1796. Each: of these academies is a distinct body; most of them publish their trans- actions, and eacli has its own library.

There are several private societies of a scientific character, such as the society for publication of historical documents, the historical society, the society of anthropology and geography, the society of national antiquities, the geological society, the society of natural sciences, the entomological society, &c.

Stockholm has no state university, but there is a high school of medicine (Carolinska Institute), which has several professors of mathematics and natural science. The city has also a high tech- nical school, a technical school, a high military school, and a military school (in the palace of Carlberg, outside of the city), a veterinary school, a school of pharmacy, seven more or less complete secondary schools, and two seminaries for female teachers, besides private schools. The number of pupils in the secondary schools in 1884 was 2294 and in the primary schools 14,351.

The following are the principal public collections. (1) The royal historical museum (in the national museum) contains a remarkably rich series of the prehistoric antiquities of the country. Founded in the 17th century, it has made greatest progress since 1837. (2) The royal numismatical collection (in the national museum) contains about 90,000 coins and medals. The series of Anglo-Saxon coins found in Sweden is very important. (3) The numismatical collec- tion of the Bank of Sweden (in the bank offices) contains very good series of Swedish coins and medals. (4) The royal collection of armour and royal dresses (in the royal palace) is very rich in speci- mens of the 17th and 18th centuries. (5) The royal museum of fine and industrial arts (in the national museum) contains sculptures, pictures, engravings, drawings, &e. The collection of Swedish art is, of coursc, very rich. Of foreign schools that of the Netherlands is best represented. The collection illustrating the development of industrial arts consists principally of gifts of Charles XV. and Count A. Bjelke. (6) The royal museum of natural history (in the palace of the academy of sciences), with very rich

zoological, botanical, palzontological, and mineral series, is exceedingly rich in objects from the arctic regions. Other collections deserving mention are (7) the museum of the geological survey of Sweden ; (8) the museum of the school of medicine ; (9) the northern museum, a private institution, a very rich collection representing the life of all social classes of the north ; (10) the royal library, very rich in books and manuseripts ; and (11) the royal archives.

See Elers, Stockholm, 4 vols., 1800-1801 ; Ferlin, Stockholms Stad; Berdttelser angaende Stockholms Kommunalférvaltning. (H. T1.).

STOCKINGS. See Hosiery.

STOCKPORT, a market-town and municipal and parliamentary borough of England, in Cheshire and partly in Lancashire, is situated on an elevation above the Mersey at the junction of the Tanie and Goyt, and of a number of railway lines, 46 miles east-north-east of Chester, 37 east of Liverpool, and 6 south-south-east of Manchester. Owing to the lie of the ground the streets are very irre-

gular and uneven, and occasionally precipitous, while in the south they rise above the river in tiers. The Mersey is crossed by a number of bridges, including one of eleven arches opened in 1826 at a cost of £40,000. None of the ecclesiastical buildings are of special interest, the principal being the church of St Mary, erected in 1817, at a cost of £30,000, on the site of one of the 15th century, of which the chancel and vestry remain. The free grammar school was founded and endowed in 1487 by Sir Edward Shaa or Shaw, knight. The present building was erected in 1831 by the Goldsmiths' Company, who further endowed it with £290 a year, and handed it over to the corpora- tion. The Stockport Sunday school, erected in 1805, has accommodation for 4000 scholars. There is a free public library, established in 1875. The principal public build- ings are the court-house, the market-house, the union workhouse, the mechanics' institute, the infirmary, the institution for the blind and deaf and dumb, and the fine new public baths. In St Peter's Square there is a statue, unveiled 27th November 1886, of Richard Cobden, who was elected member for the borough in 1841 and

1847, Vernon Park, finely situated about a mile from the town, contains a free museum, built in 1858 at the expense of the members for the borough, and since enlarged by the corporation. The staple industries are the spinning and weaving of cotton and felt-hat making, There are also breweries, foundries, machine-works, and flour-mills. The limits of the municipal and parliamentary boroughs are co-extensive. The area is 2200 acres, with a population in 1871 of 53,014 and in 1881 of 59,553.

Thongh not referred to in any of the Roman itineraries, and possessing neither Roman nor Saxon remains, Stockport is supposed. to have been a Roman camp or outpost, which occupied the hill on which the Normans afterwards built a baronial castle. It is not mentioned in Domesday. The castle was held in 1178 by Geoffrey de Costentyn against Henry JJ., but whether in his own right or not is uncertain. In the beginning of the 13th century it was possessed by the first Baron Ranulf de Dapifer, progenitor of the Despensers, from whom it passed to Robert de Stockeport, who in the reign of Henry III. made the town a free borough, and in 1260 received for it from the earl of Chester the grant of a market. The town was visited by the plague in 1605-6. It was of some import- ance during the Civil War, and was taken by the Royalists under Prince Rupert in May 1644. During the insurrection of 1745 Prince Charles Edward rested at the town-on the 28th November. The town was enfranchised in 1882, with the right, which it still retains, of returning two members, and was incorporated under the Corporations Act in 1835.

STOCKS, as a form of punishment, are now quite obsolete. They were originally established in England after the passing of the Statute of Labourers, 23 Edw. If. c. 1. That Act enjoined that stocks (ceppes) should be made in every town between the passing of the Act and Pentecost of that year (1350). By numerous other statutes, until comparatively modern times, the punish- ment of the stocks was inflicted for offences of a less heinous kind, e.g., breaches of the Sunday Observance Acts of Charles I. and Charles II. In the United States the stocks were formerly used as a means of punishing slaves.

STOCKTON, a city of the United States, county seat of San Joaquin county, California, at the head of the Stockton navigable channel which joins the

San Joaquin river, and 48 miles south-south-east of Sacramento, by the western division of the Central Pacific Railroad. It is the business centre of the San Joaquin valley, a great wheat market, and the seat of the State lunatic asylum (founded in 1853). Artesian wells 80 to 1000 feet deep provide the city with a perennial supply of water. Two public libraries, several public schools, and a convent may be mentioned among its important institutions; and it manufactures leather, agricultural implements, paper, flour, &c. The population was 10,066 in 1870 and 10,282 in

1880. Stockton was laid out in 1849, and was incor- porated as a city in 1850.

STOCKTON-ON-TEES, a market-town and municipal and parliamentary borough and seaport of Durham, on the borders of the North Riding of Yorkshire, into which the parliamentary borough extends, is situated on the Tees, which is crossed by an iron bridge (completed in 1887 at a cost over £80,000, to supersede the stone bridge of 1769) leading to South Stockton, and on the Stockton and Dar- lington and the Sunderland and West Hartlepool branches of the North-Eastern Railway, 20 miles south-south-east of Durham, and 4 miles west-south-west of Middlesborough. The principal street is about a mile in length. Of the ancient castle commanding the Tees, which was destroyed in 1652, the last remains were removed in 1865. Among the principal public buildings are the town-hall, with a clock-tower and spire, the borough hall (erected in 1852 at a cost of £32,000), the freemasons' hall, the temperance hall, the theatre, the exchange hall, the literary institute, the hospital, the dispensary, the free library, and the blue-coat school. Stockton is a seaport of considerable importance. The management of the Tees, vested in 1808 in the Tees Navigation Company, was in 1852 vested in the Tees Conservancy Commissioners, incorporated by Act of Parlia- ment, under whose auspices the river has been greatly improved. 'The trade of the port is chiefly with Holland and the ports of the Baltic, and there is a considerable coasting trade with the Tyne ports and with Hull and London. Its chief exports are iron manufactures, coal, coke, and agricultural produce, the average annual value for the five years 1880-84 being about £72,000. The principal imports are timber, iron, grain, and

provisions, the average annual value for the five years 1880-84 being about £240,000. In 1885 the number of vessels that entered the port was 649, of 149,628 tons, the number that cleared 700, of 175,647 tons. The rapid increase of the town within the last quarter of a century is largely owing to the development of the iron and steel trade in the district. There are extensive steel works, blast- furnaces, iron and brass foundries, and rolling-mills, and iron-shipbuilding is also an important industry. There are also sailcloth works, potteries, breweries, and brick and tile works. The population of the municipal borough (area 1189 acres) in 1871 was 27,738, and in 1881 it was 41,015. The population of the parliamentary borough (area 7157 acres) in the same years was 37,612 and 55,457. The parliamentary borough includes the suburb of South Stockton on the opposite side of the river, forming @ separate urban sanitary district (area 1052 acres), with a population in 1871 of 6794 and in 1881 of 10,665, It has a temperance hall, a mechanics' institute, and a national school, and its manufactures are similar to those of Stockton.

The place is of great antiquity, and is supposed to have been occupied bythe Romans. Before the Conquest the manor belonged to the see of Durham. It was probably first.incorporated by Bishop Hugh de Pudsey, who in the reign of Richard I. occupied the castle. The castle, which was for a long time the residence of the bishops, stood on the north bank of the Tees. The town was destroyed by the Scots in 1822, but the castle seems to have escaped. During the Civil War it was garrisoned for the king, but was afterwards delivered up to the Parliamentary party, and in 1645 was held by the Scots. The town suffered severely from inundations of the Tees in 1771, 1788, and 1822. Though Stockton was placed under the Municipal Act of 1835 it remained divided into two parts, the one called the "borough," where the land was freehold, governed by the corporation, and the other called the "town," where the land was copyhold or leasehold, held under the vicar and vestry- men, and outside the corporate jurisdiction. To remedy this state of matters an " Extension and Improvement Act" was passed in 1852. The town was enfranchised in 1867, and returns one member.

STOICS, a school of philosophers founded at the close of*the 4th century B.c. by Zeno of Citium, and so called from the Stoa or painted corridor (crod mouxidy) on the

north side of the market-place at Athens, which, after its restoration by Cimon, the celebrated painter Polygnotus had adorned with frescos representing scenes from the Trojan War. But, though it arose on Hellenic soil, from lectures delivered in a public place at Athens, the school is scarcely to be considered a product of purely Greek intellect, but rather as the firstfruits of that interaction between West and East which followed the conquests of Alexander. Hardly a single Stoic of eminence was a citizen of any city in the heart of Greece, unless we .make Aristo of Chios, Cleanthes of Assus, and Panetius of Rhodes exceptions. Such lands as Cyprus, Cilicia, and Syria, such cities as Citium, Soli, Heraclea in Pontus, Sidon, Carthage, Seleucia on the Tigris, Apamea by the Orontes, furnished the school with its scholars and presi- dents; Tarsus, Rhodes, and Alexandria became famous as its university towns. As the first founder was of Phe- nician descent, so he drew most of his adherents from the countries which were the seat of Hellenistic (as distinct from Hellenic) civilization; nor did Stoicism achieve its crowning triumph until it was brought to Rome, where the grave earnestness of the national character could appreciate its doctrine, and where for two centuries or more it was the creed, if not the philosophy, of all the best of the Romans. Properly therefore it stands in marked antithesis to that fairest growth of old Hellas, the Academy, which saw the Stoa rise and fall,—the one the typical school of Greece and Greek intellect, the other of the Hellenized East, and, under the early Roman empire, of the whole civilized world. The transcendent genius of its author, the vitality and romantic fortunes of his doctrine, claim our warmest sympathies for Platonism. But it should not be forgotten that for more than four centuries the tide ran all the other way. It was Stoicism, not Platonism, that filled men’s imaginations, and exerted the wider and more active influence upon the ancient world at some of the busiest and most important times in all history. And this was chiefly because before all things it was a practical philosophy, a rallying point for strong and noble spirits contending against odds. Nevertheless, in some departments of theory, too, and notably in ethics and jurisprudence, Stoicism has dominated the thought of after ages to a degree not easy to exaggerate.

The history of the Stoic school may conveniently be divided in the usual threefold manner: the old Stoa, the middle or transition period (Diogenes of Seleucia, Boethus of Sidon, Panzetius, Posidonius), and the later Stoicism of Roman times. By the old Stoa is meant the period (c. 304-205 B.c.) down to the death of Chrysippus, the second founder ; then was laid the foundation of theory, to which hardly anything of importance was afterwards added. Confined almost to Athens, the school made its way slowly ainong many rivals. Aristo of Chios and Herillus of Carthage, Zeno's heterodox pupils, Perszus, his favourite disciple and housemate, the poet Aratus, and Spherus, the adviser of the Spartan king Cleomenes, are noteworthy minor names; but the chief interest centres about Zeno, Cleanthes, Chrysippus, who in succession built up the wondrous system. What originality it had—at first sight it would seem not much—belongs to these thinkers ; but the loss of all their works except the hymn of Cleanthes, and the inconsistencies in such scraps of information as can be gleaned from unintelligent witnesses, for the most part of many centuries later, have rendered it a peculiarly difficult task to distinguish with certainty the work of each of the three. The common standpoint, the relation to contemporary or earlier systems, with all that goes to make up the character and spirit of Stoicism, can, fortunately, be more certainly established, and may with reason be attributed to the founder. Zeno's residence at Athens

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Zeno.

Cleanthes.

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fell at a time when the great movement which Socrates originated had spent itself in the second generation of his spiritual descendants. Neither Theophrastus at the Lyceum, nor Xenocrates and Polemo at the Academy, nor Stilpo, who was drawing crowds to hear him at Megara, could be said to have inherited much of the great reformer's intellectual vigour, to say nothing of his moral earnestness. Zeno visited all the schools in turn, but seems to have attached himself definitely to the Cynics ; as a Cynic he composed at least one of his more important works, "the much admired

Republic," which we know to have been later on a stumbling-block to the school. In the Cynic school he found the practical spirit which he divined to be the great need of that stirring troublous age. For a while his motto must have been "back to Socrates," or at least "back to Antisthenes." The Stoics always counted themselves amongst the Socratic schools, and canonized Antisthenes and Diogenes; while reverence for Socrates was the tie which united to them such an accom. plished writer upon lighter ethical topics as the versatile Perseus, who, at the capital of Antigonus Gonatas, with hardly anything of the professional philosopher about him, reminds us of Xenophon, or even Prodicus. Zeno com- menced, then, as a Cynic; and in the developed system we can point toa kernel of Cynic doctrine to which various philosophemes of other thinkers (more especially Hera- clitus and Aristotle, but also Diogenes of Apollonia, the Pythagoreans, and the medical school of Hippocrates in a lesser degree) were added. Thus, quite apart from the general similarity of their ethical doctrine, the Cynics were materialists ; they were also nominalists, and combated the Platonic ideas ; in their theory of knowledge they made use of "reason" (Adyos), which was also one of their leading ethical conceptions. In all these particulars Zeno followed them, and the last is the more important, because, Chrysippus having adopted a new criterion of truth,—a clear and distinct perception of sense,—it is only from casual notices we learn that the elder Stoics had approxi- mated to Cynicism in making right reason the standard. At the same time, it is certain that the main outlines of the characteristic physical doctrine, which is after all the foundation of their ethics and logic, were the work of Zeno. The Logos, which had been an ethical or psycho- logical principle to the Cynics, received at his hands an extension throughout the natural world, in which Hera- clitean influence is unmistakable. Reading the Ephesian doctrine with the eyes of a Cynic, and the Cynic ethics in the light of Heracliteanism, he came to formulate his distinctive theory of the universe far in advance of either. In taking this immense stride and identifying the Cynic "reason," which is a law for man, with the "reason" which is the law of the universe, Zeno has been compared with Plato, who similarly extended the Socratic " general notion " from the region of morals,—of Justice, temperance, virtue,—to embrace all objects of all thought, the verity of all things that are. If the recognition of physics and logic as two studies co-ordinate with ethics is sufficient to differentiate the mature Zeno from the Cynic author of the Lepublic, no less than from his

own heterodox disciple Aristo, the elaboration on all sides of Stoic natural philo- sophy belongs to Cleanthes, who certainly was not the merely docile and receptive intelligence he is sometimes represented as being. He carried on and completed the assimilation of Heraclitean doctrine; but his own contributions were more distinctive and original than those of any other Stoic. Zeno's seeming dualism of God (or force) and formless matter he was able to transform into the lofty pantheism which breathes in every line of the famous hymn to Zeus. Heraclitus had indeed declared all to be in flux, but we ask in vain what is the cause for the

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unceasing process of his ever-living fire. It was left for Cleanthes to discover this motive cause in a conception familiar to Zeno, as to the Cynics before him, but restricted to the region of ethics,—the conception of tension or effort, The soul of the sage, thought the Cynics, should be strained and braced for judgment and action; his first need ig firmness (edrovia) and Socratic strength. But the mind is a corporeal thing. Then followed the flash of genius; this varying tension of the one substance everywhere present, a purely physical fact, accounts for the diverse destinies of all innumerable particular things; it is the veritable cause of the flux and process of the universe, Herein lies the key to the entire system of the Stoics, as Cleanthes's epoch-making discovery continually received fresh applications to physics, ethics, and epistemology, Other of his innovations, the outcome of his crude materialism, found less favour with his successor, who declined to follow him in identifying the primary substance with fire, or in tracing all vitality to its ultimate source in the sun, the "ruling power" of the world,—a curious anticipation of scientific truth. Yet under this poetical Heraclitean mystic the school was far from flourishing, The eminent teachers of the time are said to have been Aristo, Zeno's heterodox pupil, and Arcesilas, who in Plato's name brought Megarian subtleties and Pyrrhonian agnosticism to bear upon the intruding doctrine; and after a vigorous upgrowth it seemed not unlikely to die out. From all danger of such a fate it was rescued by its third great teacher, Chrysippus ; "but for Chrysippus there had been no Porch." Zeno had caught the practical spirit of his age,—-the desire for a popular philosophy to meet individual needs. But there was another tendency in post-

Aristotelian thought,—to lean upon authority and substitute learning for independent research,—which grew stronger just in proportion as the fresh interest in the problems of the universe and the zeal for discovery declined, —a_ shadow, we may call it, of the coming Scholasticism thrown a thousand years in advance. The representative of this tendency, Chrysippus addressed Chryip himself to the congenial task of assimilating, developing, pus systematizing the doctrines bequeathed to him, and, above all, securing them in their stereotyped and final form, not simply from the assaults of the past, but, as after a long and successful career of controversy and polemical author- ship he fondly hoped, from all possible attack in the future. To his personal characteristics can be traced the hair- splitting and formal pedantry which ever afterwards marked the activity of the school, the dry repellent technical pro- cedure of the Dialecticians par excellence, as they were called. He created their formal logic and contributed much that was of value to their psychology and epistem- ology ; but in the main his work was to new-label and new-arrange in every department, and to lavish most care and attention on the least important parts,—the logical terminology and the refutation of fallacies, or, as his opponents declared, the excogitation of fallacies which even he could not refute. In his Republic Zeno had gone so far as to declare the routine education of the day (eg., mathematics, grammar, dc.) to be of no use. Such Cynic crudity Chrysippus rightly judged to be out of keeping with the requirements of a great dogmatic school, and he laboured on all sides after thoroughness, erudition, and scientific completeness. In short, Chrysippus made the

Stoic system what it was, and as he left it we proceed to

describe it. And first we will inquire, What is philosophy? No || idle gratification of curiosity, as Aristotle fabled of his mio life intellectual (which would be but a disguise for refined sophy. pleasure), no theory divorced from practice, no pursuit of science for its own sake, but knowledge so far forth as it

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can be realized in virtuous action, the learning of virtue by exercise and effort and training. So absolutely is the “rare and priceless wisdom ” for which we strive identical with virtue itself that the three main divisions of philo- sophy current at the time and accepted by Zeno,—logic, physics, and ethics,—are defined as the most generic or comprehensive virtues. How otherwise could they claim our attention? Accordingly Aristo, holding to Cynicism when Zeno himself had got beyond it, rejected two of these parts of philosophy as useless and out of reach,— a divergence which excluded him from the school, but strictly consistent with his view that ethics alone is scientific knowledge. Of the three divisions logic is the least important; ethics is the outcome of the whole, and historically the all-important vital element; but the foundations of the whole system are best discerned in the science of nature, which deals pre-eminently with the macrocosm and the microcosm, the universe and inan, including natural theology and an anthropology or psycho- logy, the latter forming the direct introduction to ethics. The Stoic system is in brief—(a) materialism, (6) dynamic mnaterialism, lastly © monism or pantheism. (a) The first of these characters is described by anticipation in Plato’s Sophist (246 © sq.), where, arguing with those “ who drag everything down to the corporeal” (cdpa), the Eleatic stranger would fain prove to them the existence of some- thing incorporeal, as follows. ‘‘ They admit the existence of ananimatebody. Is soul then something existent (oicia) ? Yes. And the qualities of soul, as justice and wisdom — are they visible and tangible? No. Do they then exist? They are in a dilemma.” Now, however effective against Plato’s contemporary Cynics or Atomists, the reasoning is thrown away upon the Stoics, who take boldly the one horn of this dilemma. That qualities of bodies (and therefore of the corporeal soul) exist they do not deny ; but they assert most uncompromisingly that they are one and all (wisdom, justice, &c.) corporeal. And they strengthen their position by taking Plato’s own definition (247 D), namely, “being is that which has the power to

ial- act or be acted upon,” and turning it against him. Tor

this is only true of Body; action, except by contact, is inconceivable ; and they reduce every form of causation to the efficient cause, which implies the communication of motion from one body to another. Again and again, therefore, only Body exists. The most real realities to Plato and Aristotle

had been thought and the objects of thought, vots and vonrd, whether abstracted from sensibles or inherent in “matter,” as the incognizable basis of all concrete existence. But this was too great an effort to last long. Sucli spiritualistic theories were nowhere really maintained after Aristotle and outside the circle of his immediate followers. The reaction came and left nothing of it all; for five centuries the dominant tone of the older and the newer schools alike was frankly materialistic. “Tf,” says Aristotle, “there is no other substance but the organic substances of nature, physics will be the highest of the sciences,” a conclusion which passed for axiomatic until the rise of Neoplatonism. The analogues therefore of metaphysical problems must be sought in physics; particularly that problem of the causes of things for which the Platonic idea and the Peripatetic “constitutive form ” . had been in turn received solutions. (b) But the doctrine that all existence is confined within the limits of the sensible universe,—that there is no being save corporeal being or body,—does not suffice to characterize the Stoic system; it is no less a doctrine of the Epicureans. It is the idea of tension as the essential attribute of body, in contradistinction to passive inert matter, which is dis- tinctively Stoic. The Epicureans leave unexplained the primary constitution and first movements of their atoms

or elemental solids; chance or declination may account for them. Now, to the Stoics nothing passes unexplained ; there is a reason (Adyos) for everything in nature. Every- thing which exists is at once capable of acting and being acted upon. In everything that exists, therefore, even the smallest particle, there are these two principles. By virtue of the passive principle the thing is susceptible of motion and modification ; it is matter which determines substance (otoia). The active principle makes the matter a given determinate thing, characterizing and qualifying it, whence it is termed quality (zoidrys). For all that is or happens there is an immediate cause or antecedent ; and as “cause” means “cause of motion,” and only body can act upon body, it follows that this antecedent cause is itself as truly corporeal as the matter upon which it acts. Thus we are led to regard the active principle “force” as everywhere co-extensive with “matter,” as pervading and permeating it, and together with it occupying and filling space. This is that famous doctrine of universal permea- tion (kpaous 5:

ddov), by which the axiom that two bodies cannot occupy the same space is practically denied. Thus that harmony of separate doctrines which contributes to the impressive simplicity of the Stoic physics is only attained at the cost of offending healthy common sense, for Body itself is robbed of a characteristic attribute.

Matter and force,

between matter and its cause, which is always a corporeal Monism.

current, and therefore matter, although the finest and subtlest matter. In fact they have reached the final result of unveiled hylozoism, from which the distinction of the activé and passive principles is discerned to be a merely formal concession to Aristotle, a legacy from his dualistic doctrine. His technical term Form (edos) they never use, but always Reason or God. This was not the first time

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that approaches had been made to such a doctrine, and Diogenes of Apollonia in particular was led to oppose Anaxagoras, who distinguished Nous or Thought from every other agent within the cosmos which is its work, by postulating as his first principle something which should be at once physical substratum and thinking being. But until dualism had been thought out, as in the Peripatetic school, it was impossible that monism (or at any rate materialistic monism) should be definitely and consciously maintained. One thing is certain: the Stoics provided no loophole of escape by entrenching upon the “ purely material” nature of matter; they laid down with rigid accuracy its two chief properties,—extension in three dimensions, and resistance, both being traced back to force. There were, it is true, certain inconsistent concep- tions, creations of thought to which nothing real and external corresponded, namely, time, space, void, and the idea expressed in language (Aexrdév). But this inconsist- ency was covered by another: though each of these might

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civilized men connects vitality with the air inhaled in respira- tion; the disciples of Hippocrates, without much modifying this primitive belief, explained the maintenance of vital warmth to be the function of the breath within the organism. In the time of Alexander the Great Praxagoras discovered the distinction between the arteries and the veins. Now in the corpse the former are empty; henee in the light of these preconceptions they were declared to be vessels for conveying Pneuma to the different parts of the body. A generation afterwards Erasistratus made this the basis of a new theory of diseases and their treatment. Vital spirit, inhaled from the outside air, rushes through the arteries till it reaches the various centres, especially the brain and the heart, and there causes thought and organic movement. But long before this the peculiar character of air had been recognized as something intermediate to the corporeal and the ineorporeal: wher Diogenes of Apollonia revived the old Ionian hylozoism in opposition to the dualism of Anaxagoras, he made this, the typical example of matter in the gaseous state, his one clement. In Stoicism, for the moment, the two conceptions arc united, soon, however, to diverge, —the medical conception to receive its final development under Galen, while the philosophical conception, passing over to Philo and others, was shaped and modified at Alexandria under the influence of Judaism, whence it played a great part in the develop. ments of Jewish and Christian theology.

be said to be something, they could not be said to exist. The distinction of force and matter is then something transitory

and relative. Its history will serve as a sketch of the eosmogony

of the Stoics, for they too, like earlier philosophers, have their

The influenee upon Stoicism of Heraclitus has been differently Contras: | conceived. Siebeck would reduce it within very small dimensions, to Hera. | but this is not borne out by the concise history found at Hercula- ¢litns,

Cosmo- gony.

Pneuma.

‘*fairy tale of science.” Before there was heaven or earth, there was prinuitive substanee or Pneuma, the everlasting presupposition of particular things. This is the totality of all existence; out of it the whole visible universe proceeds, hereafter to be again resolved into it. Not the less is it the creative force, or deity, which develops and shapes this universal order or cosmos. To the question, What is God? Stoicism rejoins, What is God not? In this original state of Pneuma God and the world are absolutely identical. But even then tension, the essential attribute of matter, is at work. Though the force working everywhere is one, there are diversities of its operation, corresponding to various degrees of tension. In this primitive Pneuma there must reside the utmost tension and heat ; for it is a fact of observation that most bodies expand when heated, whence we infer that there is a pressure in heat, an expansive and dispersive tendency. The Pneuma cannot long withstand this intense pressure. Motion backwards and forwards once set up goes to cool the glowing mass of fiery vapour and to weaken the tension. Hereupon follows the first differentia- tion of primitive substance,—the separation of force from matter, the emanation of the world from God. The germinal world-making powers (omepuarixol Adyor), which, in virtue of its tension, slumbered in Pneuma, now procecd upon their creative task. The primitive substance, be it remembered, is not Heraclitus’s fire (though Cleanthes also called it flame of fire, @Adt) any more than it is the air or “breath” of Anaximenes or Diogenes of Apollonia. Chrysippus determined it, following Zeno, to be fiery breath or ether, a spiritualized sublimed intermediate element. The cycle of its transformations and successive condensations constitutes the life of the universe, the mode of existence proper to finite and particular being. For the universe and all its parts are only different embodiments and stages in that metamorphosis of primi- tive being which Heraclitus had called a progress up and down (650s &yvw xdrw). Out of it is separated, first, elemental fire, the fire which we know, which burns and destroys; and this, again, condenses into air or aerial vapour ; a further step in the downward path derives water and earth from the solidification of air. At every stage the degree of tension requisite for existence is slackened, and the resulting element approaches more and more to “inert” matter. But, just as one element does not wholly pass over into another (¢.g., only a part of air is transmuted into water or earth), so the Pneuma itself does not wholly pass over into the elements. The residue that remains in original purity with its

tension yet undiminished is the ether in the highest sphere of the visible heavens, encircling the world of which it is lord and head. From the elements the one substance is transformed into the multitude of individual things in the orderly universe, which again is itself a living thing or being, and the Pneuma pervading it, and con- ditioning life and growth everywhere, is its soul. But this pro- cess of differentiation is not eternal; it continues only until the times of the restoration of all things. For the world which has grown up will in turn decay. The tension which has been relaxed will again be tightened ; there will be a gradual resolution of things into elements, and of elements into the primary substance, to be consummated in a general conflagration when once more the world will be absorbed in God. Then in due order a new cycle of development begins, reproducing the last in every minutest detail, and so on for ever.

The doctrine of Pneuma, vital breath or “spirit,” arose in the medical schools. The simplest reflexion among savages and half-

neum (Index Here., ed. Comparetti, col. 4 sg.). They substituted primitive Pueuma for his primitive fire, but so far as they are hylo- zoists at all they stand upon the same ground with him. Moreover, the commentaries of Cleanthes, Aristo, and Spheerus on Heraclitean writings (Diog. L., vii. 174, ix. 5, 15) point to common study of these writings under Zeno. Others again (¢.g., Lassalle) represent the Stoies as merely diluting and distorting Heracliteanism. But this is altogether wrong, aud the proofs offered, when rightly sifted, are often seen to rest upon the distortion of Heraclitean doctrine in the reports of later writers, to assimilate it to the better known but essentially distinct innovations of the Stoics. In Heraclitus the constant flux is a metaphysical notion replaced by the inter- change of material elements which Chrysippus stated ‘as a simple proposition of physics. Heraclitus offers no analogy to the doctrine of four (not three) elements as different grades of tension; to the conception of fire and air as the ‘‘form,” in Aristotelian terminology, of particulars; nor to the function of organizing fire which works by methodic plan to produce and preserve the world (mip rexvikdy 63¢ BadiCoy él yéveoty xdcuov). Nor, again, is there any analogy to the peculiar Stoic doctrine of universal intermingling (xpaots 6¢ 8Aov). The two active elements interpenetrate the two lower or more relaxed, winding through all parts of matter and so pervading the greater masses that

there is no mechanical mixture, nor yeta chemical combination, since both ‘‘force” and ‘‘matter” retain their relative characters as before. Even the distinction between “force” and “matter”—so alien to the spirit of Heraclitus—is seen to be a necessary consequence. Once assume that every character and property of a particular thing is determined solely by the tension in it of a current of Pneuma, and (since that which causes currents in the thing cannot be absolutely the same with the thing itself) Pneuma, though present in all things, must be asserted to vary indefinitely in quantity and intensity. So condensed and coarsened is the indwelling air-current of inorganic bodies that no trace of elasticity or life remains; it cannot even afford them the power of motion ; all it can do is to hold them together (auvextue} ddvauts), and, in technical language, Pneuma is present in stone or metal as a retaining principle (2s =hold), explaining the attri- butes of continuity and numerical identity (cuvexH ka qyvwpeva) which even these natural substances possess. In plants again and all the vegetable kingdom it is manifest as something far purer and possessing greater tension, called a ‘‘nature,” or principle of growth (gvois). Further, a distinction was drawn between irra- tioual animals, or the brute creation, and the rational, 7.e., gods and men, leaving room for a divergence, or rather development, of Stoic opinion. The older authorities conceded a vital principle, but denied a soul, to the brutes: animals, they say, are (ga but not gupvxa. Later on much evidence goes to show that (by a divergence from the orthodox standard perhaps due to Platonic influence) it was a Stoic tenet to concede a soul, though not a rational soul, throughout the animal kingdom. To this higher manifestation of Pneuma can be traced back the “‘ esprits animaux ” of Descartes and Leibnitz, which continue to play so great a part even in Locke. The universal presence of Pneuma was confirmed by observation. A certain warmth, akin to the vital heat of organic being, seems to be found in inorganic nature: vapours from the earth, hot springs, sparks from the flint, were claimed as the last remnant of Pneuma not yet utterly slackened and cold. They appealed also to the velocity and dilatation of aeriform bodies, to whirlwinds and inflated balloons. The Logos is quick and power- ful, and sharper than any two-edged sword, piercing even to the

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dividing asunder of the jointsand marrow. Tension itself Cleanthes defined as a fiery flash (Anyi updos). Take the fundamental pro- perties of body—extension and resistance. The former results from distance; but distanees, or dimensions, are straight lines, 7.¢., lines of greatest tension (e%s &kpov TETAMEVN). ; Tension produees dila- tation, or increase in distanee. Resistance, again, is explained by cohesion, whieh implies bindiug force. Again, the primary substance has reetilinear motion in two directions, backwards and forwards, at onee a condensation, which produces cohesion and substance, and ‘ adilatation, the cause of extension and qualities. How near this comes to the scientific truth of attraction and repulsion need hardly be noted. From the astronomers the Stoics borrowed their picture of the universe, —a plenum in the-form of a series of layers or con- centric rings, first the elements, then the planetary and stellar spheres, massed round the eartli as centre,—a picture which dominated the imagination of men from the days of Eudoxus down _ to those of Dante or cven Copernicus. As to the physieal consti- tution of bodies, they were content to reproduce the Peripatetic doctrine with slight modifications in detail, of hardly any import- ‘ ance when compared with the change of spirit in the doctrine taught. But they rarely prosecuted researches in physics or | astronomy, and the newly created sciences of biology and compara- tive anatomy reccived no adequate recognition from them.

no- Lf, however, in the science of nature the Stoics can | lay claim to no striking originality, the case is different when we come to the science of man. In the rational creatures—man and the gods—Pneuma is manifested in a high degree of purity and intensity as an emanation from the world-soul, itself an emanation from the primary substance of purest ether,—a spark of the celestial fire, or, more accurately, fiery breath, which isa mean between fire and air, characterized by vital warmth more than by dryness. The pliysical basis of Stoic psychology deserves the closest attention. On the one hand, soul is corporeal, else it would have no real existence, would be incapable of extension in three dimensions (and therefore of equable diffusion all over the body), incapable of holding the body together, as the Stoics contended that it does, herein pre- , senting a sharp contrast to the Epicurean tenet that it is _ the body which confines and shelters the light vagrant | atoms of soul, On the other hand, this corporeal thing is | veritably and identically reason, mind, and ruling principle (Adyos, vois,

wyeuovixdv) ; in virtue of its divine origin Cleanthes can say to Zeus, “ We too are thy offspring,” and a Seneca can calmly insist that, if man and God are not on perfect equality, the superiority rests rather on our) side. What God is for the world that the soul is for man. The Cosmos must be conceived as a single whole, its variety being referred to varying stages of condensation in ‘ Pneuma. So, too, the human soul must possess absolute simplicity, its varying functions being conditioned by the degrees or species of its tension. It follows that of _ “parts” of the soul, as previous thinkers imagined, there can be no question; all that can consistently be main- tained is that from the centre of the body—the heart—seven | distinct air-currents are discharged to various organs, which are so many modes of the one goul’s activity! The _ ethical consequences of this position will be seen at a later stage. With this psychology is intimately connected the iW Stoic theory of knowledge. From the unity of soul it follows ‘ that all psychical processes, —sensation, assent, impulse,— _ proceed from reason, the ruling part ; that is to say, there is no strife or division: the one rational soul alone has sensations, assents to judgments, is impelled towards _ objects of desire just as much as it thinks or reasons. Not that all these powers at once reach full maturity. The soul at first is void of content; in the embryo it has | not developed beyond the nutritive principle of a plant _ (dtors): at birth the “ruling part” is a blank tablet, | ‘ These derivative powers inelude the five senses, speech, and the Teproductive faculty, and they bear to the soul the relation of qualities to a substanee. The ingenious essay of Mr R. D. Archer Hind on the Platonic psychology (Jour. of Phil., vol. x. p. 120)

aims at establishing « parallel unification ou the spiritualistie side; comp. Rep., x. 612 A,

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although ready prepared to receive writing. This excludes all possibility of innate ideas or any faculty akin to intuitive reason. The source of all our knowledge is experience and discursive thought, which manipulates the materials of sense. Our ideas are copied from stored-up sensations. No other theory was possible upon the found- ation of the Stoic physics.

Note the parallel between the macrocosm and the microcosm. The soul of the world fills and penetrates it: in like manner, the human soul pervades and breathes through all the body, informing and guiding it, stamping the man with his essential character of rational. There is in both alike a ruling part, though this is situate in the human heart at the centre,—not in the brain, as the analogy of the celestial ether would suggest. Finally, the same cause, a relaxation of tension, accounts for sleep, decay, and death of man and for the dissolution of the world ; after death the dis- embodied soul can ouly maintain its separate existence, even for a limited time, by mounting to that region of the universe which is akin to its nature. It was a moot point whether all souls so sur- vive, as Cleanthes thought, or the souls of the wise and good alone, which was the opinion of Chrysippus ; in any case, soouer or later individual souls are merged in the soul of the universe, from which they proceeded. The relation of the soul of the universe to God is quite clear: it isan inherent property, a mode of His activity, an effluence or emanation from the fiery ether which surrounds the universe, penetrating and permeating it. A Stoic might consist- ently maintain that World-Soul, Providence, Destiny, and Germinal Reason are not mere synonyms, for they express different aspcets of God, different relations of God to things. We find ourselves on the verge of a system of abstractions, or ‘‘attributes turned into entities,” as barren as any excogitated in medieval times. In a certain sense, Seholasticism began with Chrysippus. To postulate different substances as underlying the different forces of nature would have been to surrcuder the fundamental thought of the system. What really is—the Pncuma—neither increases nor diminishes ; but its modes of working, its different currents, can be conveniently distinguished and enumerated as evidence of so many distinet attributes.

Oue inevitable consequence of materialism is that subject and Pereep- object can no longer be regarded as one in the act of perception, as tion.

Plato and Aristotle tended to assume, however imperfectly the assumption was carried out. The presumption of some merely external connexion, as between any other two corporeal things, is alone admissible, and some form of the representative hypothesis is most easily called in to account for perception. The Stoics explained it as a transmission of the perceived quality of the object, by means of the sense organ, into the percipient’s

mind, the quality transmitted appearing as a disturbance or impression upon the corporeal surface of that ‘‘thinking thing,” the soul. Sight is taken as the typical sense. A conical pencil of rays diverges from the pupil of the eye, so that its base covers the object seen. In sensation a presentation is conveyed, by an air-current, from the sense organ, here the eye, to the mind, i.¢., the soul’s “ruling part” in the breast ; the presentation, besides attesting its own existence, gives further information of its object,—visible colour or size, or whatever be the quality in the thing seen. That Zeno and Cleanthes crudely compared this presentation to the impres- sion which a seal bears upon wax, with protuberances and inden- tations, while Chrysippus more prudently determined it vaguely as an occult modification or ‘‘mode” of mind, is an interesting but not intrinsically important detail. But the mind is no mere passive recipient of impressions from without, in the view of the Stoics. Their analysis of sensation supposes it to react, by a variation in tension, against the current from the sense-organ ; and this is the mind’s assent or dissent, which is inseparable from the sense presentation. The eontents of experience are not all alike true or valid : hallucination is possible ; here the Stoics join issue with Epicurus. It is necessary, therefore, that assent should not be given indiscriminately ; we must determine a criterion of truth, a special formal test whereby reason may recognize the merely plausible and hold fast the true. In an earlier age such an inquiry would have seemed superfluous. To Plato and Aristotle the nature and operation of thought and reason constitute a sufficient criterion. Since their day not only had the opposition between sense and reason broken down, but the reasoned secpticism of Pyrrho and Arcesilaus had made the impossibility of attaining truth the primary condition of wellbeing. Yet the standard which ultimately found acceptance in the Stoic school was not put for- ward, in that form, by its founder. Zeno, we have reason to believe, adopted the Cynic Logos for his guidance to truth as well as to morality. Asa disciple of the Cynics he must have started with a theory of knowledge somewhat like that developed in the third part of Plato’s Theetetus (201 C sg.),—that simple ideas are given by sense, whereas “opinion,” which is a complex of simple ideas, only becomes knowledge when joined with Logos. We may

Criterion of truth.

Degrees of know- ledge.

further suppose that the more obvious of Plato's objections had led to the correction of "reason" into ''right reason." However that may be, itis certain from Aristotle (Vie. Eth., vi. 18, 1144b, 17) that virtue was defined as a ''habit" in accordance with right reason, and (Diog. Laer., vii. 54) from that the earlier Stoics made right reason the standard of truth. The law which regulates our action is thus the ultimate criterion of what we know, — practical knowledge being understood to be of paramount importance. But this criterion was open to the persistent attacks of Epicureans and Academics, who made clear (1) that reason is dependent upon, if not derived from, sense, and (2) that the utterances of reason lack consistency. Chrysippus, therefore, conceded something to his opponents when he substituted for the Logos the new standards of sensation (afc@nors) and general conception (mpéanyis =anticipa- tion, z.¢., the generic type formed in the mind unconsciously and spontaneously). At the same time he was more clearly defining and safeguarding his predecessors' position. For reason is con- sistent in the general conceptions wherein all men agree, because in all alike they are of spontaneous growth. Nor was the term sensation sufficiently definite. The same Chrysippus fixed upon a certain characteristic of true presentations, which he denoted by the much disputed term "apprehensive" (xatadnatixh pavracta). Provided the sense organ and the inind be healthy, provided an external object be really seen or heard, the presentation, in virtue of its clearness and distinctness, has the power to extort the assent which it always lies in our power to give or to withhold.

Formerly this technical phrase was explained to mean "the perception which irresistibly compels the subject to assent to it as true." But this, though apparently supported by Sextus Empiricus (4dv. Math., vii. 257), is quite erroneous ; for the presentation is called xaraAnmrdy, as well as karadnmtixh gavracta, so that beyond all doubt it is something which the percipient subject grasps, and not that which grasps or ''lays hold of" the percipient. Nor, again, is it wholly satisfactory to explain Karadnm@rTixy as virtually passive, ''apprehcnsible," like its opposite axatdAnmros ; for we find ayTiAnmrixh tay broKxeméevwy used as an alternative phrase (7b., vii. 248). It would seem that the perception intended to constitute the standard of truth is one which, by producing a mental counterpart of a really

existent external thing, enables the percipient, in the very act of sense, to ‘‘lay hold of” or apprehend an object in virtue of the presentation or sense impression of it excited in his own mind. The reality of the external object is a necessary condition, to exclude hallucina- tions of the senses; the exact correspondence between the external object and the internal precept is also necessary, but naturally hard to secure, for how can we compare the two? The external object is known only in perception. However, the younger Stoics endeavoured to meet the assaults of their persistent critic Carneades by suggesting various modes of testing a single presentation, to see whether it were eonsistent with others, especially such as occurred in groups, &c.; indeed, some went so far as to add to the definition “coming from a real object and exactly corresponding with it” the clause ‘‘ provided it encounter no obstacle.”

The same criterion was available for knowledge derived more –

directly from the intellect. Like all materialists, the Stoics can only distinguish the sensible from the intelligible as thinking when the external object is present (aic@dvec@a:) and thinking when it is absent (évvoeiv). The product of the latter kind includes memory (though this is, upon a strict analysis, something intermediate) and conceptions or general notions, under which were confusedly elassed the products of the imaginative faculty. The work of the mind is seen first in ‘‘assent”; if to a true presenta- tion the result is ‘‘simple apprehension ” (xardantis : this stands in close relation to the xaraAnmrixh pavracta, of which it is the necessary complement) ; if to a false or unapprehensive presentation, the result is “ opinion ” (dda), always deprecated as akin to error and ignorance, unworthy of a wise man. ‘These processes are conceivable only as ‘‘modes” of mind, changes in the soul’s substance, and the same is true of the higher conceptions, the products of generalization. But the Stoics were not slow to exalt the part of reason, which seizes upon the generic qualities, the essential nature of things. Where sense and reason conflict, it is the latter that must decide. One isolated ‘‘ apprehension,” however firm its grasp, does not constitute knowledge or science (émothun) ; it must be of the firmest, such as reason cannot shake, and, further, it must be worked into a system of such apprehensions, which can only be by the mind’s exercising the “habit” (és) of attaining truth by continuous tension. Here the work of reason is

assimilated to the force which binds together the parts of au inorganic body and resists their separation. There is nothing more in the order of the universe than extended mobile bodies and forces in tension in these bodies. So, too, in the order of knowledge there is nothing but sense and the force of reason maintaining its tension and connecting sensations and ideas in their proper sequence. Zeno compared sensation to the out- stretched hand, flat and open; bending the fingers was assent; the clenched fist was ‘‘simple apprehension,” the mental grasp of

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an object ; knowledge was the clenched fist tightly held in the other hand. The illustration is valuable for the light it throws on the essential unity of diverse intellectual operations, as well ag for enforcing once more the Stoic doctrine that diffcrent grades of knowledge are different grades of tension. Good and evil, virtues and vices, remarks Plutarch, are all capable of being ‘ perceived”; sense, this common basis of all mental activity, is a sort of touch by which the ethereal Pneuma which is the soul’s substance recognizes and measures tension.

With this exposition we have already invaded the logic. To this the Stoics assigned a miscellany of studies— rhetoric, dialectic, including grammar, in addition to formal logic, —to all of which their industry made contributions. Some of their innovations in grammatical terminology have lasted until now : we still speak of oblique cases, genitive, dative, accusative, of verbs active (ép04), passive (Sra), neutcr (oddérepa), by the names they gave. Their corrections and fancied improvements of the Aristotelian logic are mostly useless and pedantic. Judgment (aéiwma) they defined as a complete idea capable of expression in language (Aexrdy abroreAgs), and to distinguish it from other enunciations, as a wish or a.command, they added ‘‘ which jg either true or false.” From simple judgments they proceeded to compound judgments, and declared the hypothetical syllogism to be the normal type of reason, of which the categorical syllogism is an abbreviation. Perhaps it is worth while to quote their treatment of the categories. Aristotle made ten, all co-ordinate, to serve as ‘‘heads of predication” under which to collect distinct scraps of information respecting a subject, probably a man. For this the Stoics

substituted four swmma genera, all subordinate, so that each in turn is more precisely determined by thc next. They are Something, or Being, determined as (1) substance or subject matter, (2) essential quality, ¢.¢., substance qualificd, (3) mode or chance attribute, 7.e., qualified substance in a certain condition (mas éxov), and, lastly, (4) relation or relative mode (in full broxefnevoy mowdy pds th wws €xov). The zeal with which the school prosecuted logical inquiries had one practical result,—they could use to perfection the unrivalled weapon of analysis. Its chief employ- inent was to lay things bare and sever them from their surround- ings, in order that they might be contemplated in their simplicity, with rigid exactness, as objects of thought, apart from the illusion and exaggeration that attends them when presented to sense and imagination. The very perfection and precision of this method constantly tempted the later Stoics to abuse it for the systematic depreciation of the objects analysed. :

The practical philosophy of: the Stoics stands in the Bihia,

closest connexion with their physics and psychology. Holding that man is a being who acts as well as thinks, and that this is the all-important side of his life, they find the link between the two in the mind's assent ; for, when impelled towards certain objects by a prompting or "impulse" (épuy= movement of the soul seeking to possess itself of certain external things), whether of nature or reason, 2 man must needs judge the objects to be desirable ; the subsequent movement, as it were, translates this judgment into action. Against the sceptical position it was necessary to maintain—(1) that motion, and there- fore moral action, cannot follow upon the mere present- ment of an idea, unless the idea so suggested receive assent, and (2) that assent alone does not suffice without the motive faculty which is found in all animals. Of our various impulses, some in the mature man are (a) rational ; some, as in the child, are (@) non-rational, because anterior to reason ; while (y) the impulse of the man may be contrary to reason, under the influence of the affections or passions.

proceeding upon a single plan (16 doAoyoupévus Liv, TovTO d éort Kaif? eva Adyov Kal cuudaves Ljv) : in this there 1s a certain symmetry or beauty, the attraction which excites rational impulse towards it. Clearly this definition of the end of action comes from the Cynics, who pithily

expressed it by saying that in order to live man needs either reason or a halter (Setv Adyov } Bpdxov). But during Zeno’s early studies another conception had been current, that of agree- ment with nature. Apparently it had been started by the Old Academy, where probably the technical phrase “ first pasteeeteienebinhedee_ A smmesshcinier tibet iia mttaer

= \ y l wdoas 5¢ Tas Sppas cuyxatabérers elvat, Tas 5é mpaKTUas ral

7d KivnTixey Tepiexery,—Stobeus, Hcl. Hth., ii. 164.

province of Logie,

(2) Now reason, as a spring of a action, has for its aim harmony or self-consistency, a life ™?”’

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objects according to nature,” ra rpdra kara dicw, had its origin. Now the slightest acquaintance with Stoic physics shows that reason and nature are at one; we may there- fore well believe that Zeno himself had explained his harmonious or self-consistent life to mean a life in harmony with nature (Diog. Laer., vii. 87, quoting Zeno, ‘“‘On the Nature of Man”). At all events that was the orthodox formula adopted and interpreted by Cleanthes and Chry- sippus,—the former, as we might have expected from his Heraclitean tendencies, representing it to mean “ harmony with the universal nature,” the latter emphasizing that not only is it the nature of the universe, but the particular nature of man, that ismeant. Cleanthes’s interpretation is at once novel and fruitful: reason being the true self or nature of man, and being essentially the same in him with the reason in the All, its procedure in him should corre- spond to and reproduce its procedure in the All. It is reasonable, therefore, for the individual to submit to and co-operate with the indwelling reason, or law of the universe, and in obedience to this universal law (xowds vouos) imitate the uniform methodic march of the divine creative fire. Here we note the conception of morality as obedience to an objective law, though, as reason attains to consciousness of itself only in man, it is a law of which he himself, gua rational, is lawgiver.

But Chrysippus, in his reading of the formula, had no intention of relaxing the close dependence of ethics upon physics. A new light is thrown upon the study of external nature by the essential unity of reason in the macrocosm and in the microcosni : what we learn of its operations there is pro- fitable for instruction here, and life should be directed in accordance with the experience we have acquired of the course of nature (iv kar' éurepiay trav dice ocupPBouvédv- tov, Chrysippus ap. Stob., Hcl., ii. 134), Whether man will comply with the commands of the universal law or not, whether therefore the ethical end is realized in him, must depend upon himself. The whole tendency of the physical theory is towards a system of rigid determinism, nay, almost of fatalism; but, so soon as we reach the ethical region, the problem of indeterminism is forced upon us in all its perplexity.

(8) Having determined the end of rational action, we must now give a glance at the earlier, instinctive activity of beings properly without reason (i.e., of children and the brute creation) ; this too has its importance, since before reason is developed the agent follows the " uncorrupted impulses" of nature. Here we come upon a controversy which still has an interest for the psychologist, for Epicurus had declared pleasure to be the end of all instinctive activity, while the Stoics combated his position and sought to prove that not pleasure but self-preservation is really sought. According to them, the child or the animal would speedily be crushed out of existence if it did not move at all or if its movements were not governed by some plan ; a vague consciousness of itself and a love for its own constitution must be postulated to account for the impulse which, together with sensation, distinguishes animal life from the life of the plant.1 That all motion is excited by pleasure in prospect, or the hope of cessation from pain, is (they argue) contrary to fact. Efforts to Move are made perseveringly even where they occasion pain. The whole life of unreasoning infancy and of the brutes can be satisfactorily explained on the assumption

1 prov oixeioy elvar mayr) (Om thy adtod atoracw Kal Thy tatrns oweldnow. The oboracis of an organic being is an outcome of internal forces, a mutual relation of varying elements,—in man, a relation of the ruling part of the soul, ¢.e., the rational soul, to the rest. By oixelwous is

meant that nature inspires this self-love, “ for it is improbable that nature should estrange the living thing from

itself, or that she should leave the creature she had made without either estrangement from, or affection for, its own constitution.”

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of sense and impulse acting mechanically, somewhat after the fashion indicated rather than worked out in detail in the Peripatetic application of the practical syllogism to the motion of animals. the Stoics approximate very decidedly to Aristotle. It is, as he said, a concomitant (érvyévympa), but not of all activities; on the contrary, the highest are without it, and it is invariably of no significance where it is found. Moreover, while Aristotle had asserted that it adds a certain zest or finish to natural activity, the Stoics declared that it never appears at all except as a mark of the decline or relaxation of vital energy, the bloom which is indeed a mark of ripeness but also the certain precursor of decay.

(y) To return to impulse,—there remains the case of The affec- action against reason under the influence of the passions, tions.

Although nature may guide man towards the right objects, she does not control the impetus or velocity of the soul’s movement. If this be in excess, the rational soul is hurried into an inflamed disorderly condition, the source of which is an erroneous judgment or false opinion, though its effects are seen in the evident elation or depression, and the stings of excitement, which are the symptoms of mental disorder. Anxious to uphold individual respon- sibility, the Stoics pronounced the false opinion to be voluntary ; that once granted, the subsequent reaction of the mind (ze, the emotional effects on which Zeno especially dwelt), the compulsion and extravagance which are characteristic of the passions, may be said to follow inevitably, so that under the sway of blind impulses the man is still acting voluntarily. This sets in a striking light the close dependence of ethics upon psychology. The Peripatetics had made the intellectual soul with virtues of its own something altogether distinct from the lower nature, the seat of the emotions and of the moral virtues which consist in their regulation. The Stoic doctrine of the essential unity of soul is a vehement protest against all

this: the soul’s unity is shown in a unity of activity, whether it be in a healthy or a disordered state. As all virtues are essentially one, though they differ according to the different relations to which the knowledge of good and evil is applied, so, too, emotion is not something antagonistic to reason, but perverted reason. There is no such struggle of vicious inclinations against virtue, a contest waged by two separate powers, as Aristotle had imagined in his account of moral weakness ; the proper simile isa mutiny or revolt in one and the same city, Mansoul now in allegiance to the rightful authority and now in open rebellion. The lower animals and children are incapable of emotion; it is only found where reason is fully developed. The analysis and classi- fication of these affections start with the false opinion or judgment or imagination, which may relate to the present or the future, to fancied good or fancied ill. Hence there are four types of the affections: all are grouped around pleasure, an impulse towards present fancied good ; desire, an impulse towards future fancied good ; grief, an impulse to shun fancied evil in the present ; fear, an impulse to shun fancied evil in the future. On the analogy of bodily disease, these disorders of the mind are further divided into (1) chronic ailments (voojara), such as avarice, where the belief that money is a good is persistent and deep-seated, leading to a habit of feeling and acting, or ambition, a similar erroneous judgment in respect of public honours, and (2) infirmities (éppworyjpara), sud- den attacks of error to which the patient momentarily succumbs. This remarkable development of Stoic prin- ciples leads to the demand for the entire suppression of the affections (drdfem), in contradistinction to that regulation and governance of them for which Plato and

In their theory of pleasure itself Pleasure.

Right reason.

Virtue.

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the Old Academy contended (erpiordGe). Further, it explains the incessant war which the later Stoics waged with imagination.

The end of action has then been explained to be a con- sistent life, a rational life, and, lastly, a life according to nature. Now the Cynics had already traced back con- sistency to a certain Herculean strength or force of will, which again is an effect of the bracing or tension of the soul's substance, so that this ever-recurring attribute is as available to explain will as intelligence. Herein we discover, as it were, an internal source of the external harmony and regularity of a consistent life. Our will should be directed to this source rather than to its manifestations,—to "right" (¢., inflexible and straight) "reason," which has attained a character of intense rigidity, an intensive energy raised to an impassable degree. For this infallible firmness of the reason the technical term is did6ects, a '* disposition " which, like straightness or crookedness in a line, admits of no degrees of less or more; thence comes harmony, regularity, and consistency in all our acts, which alone is truly beautiful (kaAdvy= fair or noble ; for which tlle Romans characteristically said honestwm = honourable). Not even Christianity laid more stress upon inwardness, or taught more explicitly that motive counts for every- thing and external performance for very little. Once let the reason become "right" and it imparts this same character to all that it affects. First the soul is made strong, healthy, beautiful ; when, therefore, it thus fulfils all the conditions of its being, it is absolutely perfect. Now the perfection of anything is called its virtue; the virtue of man, then, is the perfection of his soul, 2.¢., of the ruling part or rational soul. But 'out of the heart are the issues of life": make the soul perfect and you make the life perfect. From such a " disposition " must proceed a life which flows on smoothly and uniformly, like a gentle river (evpoia Biov). No longer is there anything to hope or fear ; this harmonious accord between impulses and acts is itself man's wellbeing or welfare (eddaipovia). Cleanthes scouts the notion of adding to such perfection that occasional result of a decaying activity entitled pleasure ; Chrysippus remonstrates indignantly with Plato for appealing to the "moral bugbears" of future rewards or punishments. There is no '" wages of virtue," not even the continuance of her activity ; for lapse of time can add nothing to perfect wellbeing ; it is complete, whole, and indivisible now.

Virtue, then, as right reason, is at once knowledge and strength of will; for a right comprehension of Stoic psychology shows that these two are identical, The unity of all virtue is sufficiently apparent, but the Stoics also

acknowledged a plurality of specific virtues grouped round the four cardinal virtues of Plato. Wisdom (¢pdvnots) was, according to Zeno and Cleanthes, the common element ; according to Aristo, it should rather be termed knowledge (émiorhun); and this view was adopted in the school to avoid the awkwardness of using the same term (¢pdévnois) both for a special virtue and for the generic attribute of them all. Wisdom or knowledge in distributing to others is justice, in endeavour it is temperance, in endurance it is courage or fortitude; but in every virtuous act all four of the virtues are implicit. Virtue is thns the unconditional good ; it is at once the absolute end and the means to the end.

Goodness must be interpreted, as Socrates used to interpret it, that which furnishes some advantage or true utility; its opposite, evil, as that which produces harm or disadvantage. Obviously only virtue, and that which comes from virtue, confers any real advantage; only vice can really do harm. Goodness is a wider genus than virtue; all virtue is good, but not all goods are virtnes. There are goods of soul, such as habits and happy aptitudes which may be acquired in varying degrees (i.e, they are ers not diabéces); others are only single actions (évépyeim). A friend again may be a means to good (moimrikdy réAous). All these goods are utilities (@peAfuara), and therefore deserve to be sought (aiperd). Similarly evils may be classified as—(1) vices, settled dispositions contrary to rightreason, proceeding from that ignorance which infallibly attends on a slackening of the soul’s fibre; (2)

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evil habits or inclinations (edxaragopiat); (3) isolated vicious All these evils alike are to be shunned (fevxrd); all alike are harmful (SAdupara) ; the moral responsibility rests with

actions.

the individual, in so far as he is ignorant or has his soul relaxed,

Good and evil, however, is not an exhaustive classifica:

tion. There isa large class of things which are neither

the one nor the other; which do not conduce to ogp tt

attainment of the end, nor hinder us therefrom ; which are neither to be pursued nor shunned, but are simply in- different (aduaopa). To all these objects the attitude of the Cynics was complete indifference, wherein they were followed by Aristo; that of the sceptics professedly utter insensibility. Now the most original feature of the Stoic ethics is the classification of things indifferent and their arrangement in a certain scale in accordance with the value, positive or negative (dia, dmragia), to be assigned to them either intrinsically or in certain circumstances (kata repioracv). Some objects are so unimportant that in regard to them Aristo's attitude of complete indiffer- ence is justified. Placing them at the zero point, we may advance in both directions, assigning to all the objects of instinctive natural impulses a positive value, in virtue of which they are to be picked out (Ayra) in preference to other indifferent things not of this description. Thus bodily health, though not a good, is entitled to a certain value ; disease, though not an evil, has a certain negative value. The former class is according to nature, the latter contrary to nature ; the former are instinctively sought by children as tending to maintain their "constitution" or nature ; the latter their 'uncorrupted impulses" (ddu- atpopor adoppat) lead them to shun as tending to mar, cripple, or destroy life. Similarly, actions may be classi- fied : all virtuous actions are right actions (xaropOapara) ; all vicious actions are wrong actions or "sins" (dpapri- para). The attainment of any one of the objects in the class of things indifferent, looked at in itself, is neither right nor wrong. But, if the object picked out be that object out of all at the moment present to us which has the highest value, then the action of selecting it admits

of being defended on probable grounds, and as such is Fitnes entitled to be called (quite apart from the agent's disposi ore | tion, whether virtuous or vicious), materialiter, an act™™

"meet and fit" to do (kajxov). Such an act need not be preceded by any reasoning at all ; in the case of the brutes and of children it is always instinctive, yet in all cases it is capable of being justified on grounds of probability (8 mpaxOev evrAoyov exer drodoyiav). Similarly with the selection of an object which has less value in preference to one of higher

value: such a blunder is not, taken in itself, a wrong action, but it violates fitness (rapa ro xabijxor). Amongst fitting actions, some are always fitting, others only at times, under given circumstances ; some indifferent objects we select for their own sakes, others merely as means. The range of such human functions is wide enough to include the acquisition of information, the exercise of temperance and courage, even altruistic con duct. And yet some actions in man are on a level with the nutritive functions of the plant (Diog. Laer., vii. 86). Again, our human functions compose our whole conscious life ; even life, then, considered in itself, has in it n0 moral good ; we may, if need be, under certain circum- stances, voluntarily withdraw from it.

The Stoics maintain that the variety of things indifferent is essential to virtue, because it is the ficld upon which reason 18 exercised. Virtue is a body, therefore it is corporeal ; therefore its active principle needs a passive material to act upon. Things indifferent are capable of being put to a good or a bad use, though some lend themselves to use more easily than others. Nor does virtue merely avail itself, now and then, of things indifferent,—tl can do nothing else than avail itself of them. Though they are not goods, and though their attainment does not confer wellbeing, yet all virtue is the selection or choice of them. For how is 4

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‘virtuous life manifested? In a series of external acts, each one of which is the choice of some natural end, some object according to ‘nature, as possessing at the moment the highest value. ‘The samc external act may be done by an irrational agent, and in his ease the act is not virtuous. For there is as great a gulf fixed between fitting and virtuous actions as between things indifferent having positive value and the good. No increase of value can raise a thing indifferent to the class of good; no degree of fitness in the external ‘et done can render it virtuous. As right actions consist in following reason in the selection of things according to nature, it follows that such right actions (as distinct from the fitting actions of which all living things are capable) are the exclusive privilege f rational beings. So, too, with wrong actions: only rational eings can perform them ; although children or the brutes may “un counter to fitness, and pursue objects contrary to nature,

they annot be said to sin or do wrong. All actions, then, of rational peings must be either virtuous or vicious; there is no mean etween the two. But what of fitting actions? Are not they also lone by rational agents? Is not the distinction between right sonduct and mere external fitness continually drawn when the toies are referring to the activity of rational human beings ?

nquestionably so; but in examining a given act it is necessary ~~o view it on the formal as well as on the material side,—as pro~~ weding from a virtuous or vicious disposition, and again as tend- ng, when taken in itself and apart from this disposition, to pro- ‘note or destroy the agent’s nature or constitution, ¢.e., as some- ‘hing “‘meet and fit” to do, or as contrary to fitness (or, in rare bases, as having no tendency in either direction), Lastly, the hnalysis of conduct is incomplete unless the external object which she agent aims at attaining by the act is also taken into account: t+ may be natural, and may therefore excite desire ; or it may be sxontrary to nature, and excite aversion ; or it may be absolutely ndifferent. Now the Stoic classifications of (a) external objects and (0) actions (as they have come down to us from not very dis- sriminating sources) are hampered by the inclusion of right actions ind wrong actions, which are made species of the wider genera, Under objects according to nature come (a) fitting actions, (8) right ietions, () virtues ; z.¢., conduct which is perfect contains all that ‘n the imperfect imitates perfection: a right action has ipso facto ull the fitness of a fitting action, and all the accord with nature of a ching according to nature. So with the opposite class: the vicious nan, by the very fact of not having the tension of soul which is virtue, commits a sin in his every action ; all that he does, there- ore, is on this ground contrary to fitness and contrary to nature. Any defect in external conduct proves it to be a sin ; the mere ab- ‘sence of defect does not establish its claim to be right conduct. It \9 aS easy to prove a given person is unwise (and therefore a sinner) asitis hard to prove him a sage. Virtue is one, vice is manifold. _ No act in itself is either noble or base; even the grossest violation f fitness, if it could be done with the right intention, would count 1s virtue, and the most fitting deeds without that intention are iaught (see Orig., C. Cels., iv. 45; Sext. Emp., Adv. Math., xi. 190; Pyrrh. Hyp., iii. 245, is therefore wrong). It does not ppear, then, that there is any divergence in principle between the loctrine of the end of action and the doctrine of fitness or relative uty; nor should the lattcr be regarded (as is done by Cicero and some modern expositors) as au

afterthought, intended to soften the too rigorous demands of the Stoic ideal. For from the first it was an integral part of the system: Zeno wrote a treatise ep) rod aéqkovros ; indeed he adopted it as a technical term. That this loctrine was a stumbling-block to the small band of his early liseiples seems not unlikely; for Aristo and Herillus, who left aim, asis believed, on independent grounds, modified it in their own ethical theories aftcrwards put forth. According to Hirzel Untersuch., ii. p. 54), however, the views of these two heterodox Stoics more closcly approximated than at first sight appears: Herillus, as well as Aristo, maintained that all actions intermed- ate to vice and virtue are absolutely indifferent (Diog. Laer., vii. 155); and Aristo, like Herillus, defined virtue as knowledge, aud neld that the wise man will never form opinions, i.e., will not act pon anything short of knowledge.

| In their view of man's social relations the Stoics are Zreatly in advance of preceding schools. We saw that virtue is a law which governs the universe: that which 'heason and God ordain must be accepted as binding upon the particle of reason which is in each one of us. Human law comes into existence when men recognize this obli- gation ; justice is therefore natural, and not something merely conventional. The opposite tendencies, to allow 'to the individual responsibility and freedom, and to demand of him obedience to law, are both features of the ystem ; but in virtue even of the freedom which belongs

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to him gua rational, he must recognize the society of |

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rational beings of which he is a member, and subordinate his own ends to the cnds and needs of this society. Those who own one law are citizens of one state, the city of Zeus, in which men and gods have their dwelling. In that city all is ordained by reason working intelligently, and the members exist for the sake of one another ; there is an intimate connexion (cvpadfea) between them which makes all the wise and virtuous friends, even if

personally unknown, and leads them to contribute to one another's good. Their intercourse should find expression in justice, in friendship, in fanuly and political life. But practically the Stoic philosopher always had some good excuse for withdrawing from the narrow political life of the city in which he found himself. The circumstances of the time, such as the decay of Greek city-life, the foundation of large territorial states under absolute Greek rulers which followed upon Alexander's conquests, and afterwards the rise of the world-empire of Rome, aided to develop the leading idea of Zeno's Republic. There he had anticipated a state without family life, without law courts or coins, without schools or temples, in which all differences of nationality would be merged in the common brotlierhood of man. This cosmopolitan citizenship remained all through a distinctive Stoic dogma ; when first announced it must have had a powerful influence upon the minds of men, diverting them from the distractions of 'almost parochial politics to a boundless vista. There was, then, no longer any difference between Greek and barbarian, between male and female, bond and free. All are members of one body as partaking in reason, all are equally men. Not that this led to any movement for the abolition of slavery. For the Stoics attached but slight importance to external circumstances, since only the wise man is really free, and all the unwise are slaves. Yet, while they accepted slavery as a permanent institution, philosophers as wide apart as Chrysippus and Seneca sought to mitigate its evils in practice, and urged upon masters humanity in the treatment of their slaves.

The religious problem had peculiar interest for the Religion.

school which discerned God everywhere as the ruler and upholder, and at the same time the law, of the world that He had evolved from Himself. The physical groundwork lends a religious sanction to all moral duties, and Cleanthes's noble hymn is evidence how far a system of natural religion could go in providing satisfaction for the cravings of the religious temper : —

''Most glorious of immortals, O Zeus of many names, almighty and everlasting, sovereign of nature, directing all in _accord- ance with law, thee it is fitting that all mortals should address. . . Thee all this universe, as it rolls circling round the earth, obeys wheresoever thou dost guide, and

gladly owns thy sway. Sucha minister thou holdest in thy invincible hands, —the two-edged, fiery, ever-living thunderbolt, under whose stroke all nature shudders. No work upon earth is wrought apart from thee, lord, nor through the divine ethereal sphere, nor upon the sea; save only whatsoever decds wicked men do in their own foolishness. Nay, thou knowest how to make even the rough smooth, and to bring order out of disorder ; and things not friendly are friendly in thy sight. For so hast thou fitted all things together, the good with the evil, that there might be one eternal law over all… Deliver men from fell ignorance. Banish it, father, from their soul, and grant them to obtain wisdom, whereon relying thou rulest all things with justice.”

To the orthodox theology of Greece and Rome the sys- tem stood in a twofold relation, as criticism and rational- ism. That the popular religion contained gross errors hardly needed to be pointed out. The forms of worship were known to be trivial or mischievous, the myths un- worthy or immoral. But Zeno declared images, shrines, temples, sacrifices, prayers, and worship to be of no avail. A really acceptable prayer, he taught, can only have re- ference to a virtuous and devout mind: God is best woi- shipped in the shrine of the heart by the desire to know

and obey Him. At the same time the Stoics felt at liberty to defend and uphold the truth in polytheism. Not only is the primitive substance God, the one su- preme being, but divinity must be ascribed to His mani- festations, —to the heavenly bodies, which are conceived, like Plato’s created gods, as the highest of rational beings, to the forces of nature, even to deified men ; and thus the world was peopled with divine agencies. Moreover, the myths were rationalized and allegorized, which was not in either case an original procedure. The search for a deeper hidden meaning beside the literal one had been begun by Democritus, Empedocles, the Sophists, and the Cynics.

It remained for Zeno to carry this to a much greater extent, and to seek out or invent “natural priu- ciples ” (Adyot dvorkot) and moral ideas in all the legends and in the poetry of Homer and Hesiod. In this sense he was the pattern if not the “father” of all such as allegorize and reconcile. Etymology was pressed into the service, and the wildest conjectures as to the meaning of names did duty as a basis for mythological explanations. The two favourite Stoic heroes were Hercules and Ulysses, and nearly every scene in their adventures was made to disclose some moral significance. Lastly, the practice of divination and the consultation of oracles afforded a means of communication between God and man,—a con- cession to popular beliefs which may be explained when we reflect that to the faithful divination was something as essential as confession and spiritual direction to a devout Catholic now, or the study and interpretation of Scripture texts to a Protestant. Chrysippus did his best to recon- cile the superstition with his own rational doctrine of strict causation. Omens and portents, he explained, are the natural symptoms of certain occurrences. There must be countless indications of the course of Providence, for the most part unobserved, the meaning of only a few having become known to men. His opponents argued, “if all events are foreordained, divination is superfluous”; he replied that both divination and our behaviour under the warnings which it affords are included in the chain of causation. Even here, however, the bent of the system is apparent. They were at pains to insist upon purity of heart and life as an indispensable condition for success in prophesying and to enlist piety in the service of morality.

When Chrysippus died (Ol. 143 =208-204 B.c.) the structure of Stoic doctrine was complete. With the Middle Stoa we enter upon a period at first of compara- tive inaction, afterwards of internal reform. Chrysippus’s immediate successors were Zeno of Tarsus, Diogenes of Seleucia (often called the Babylonian), and Antipater of Tarsus, men of no originality, though not without ability ; the two last-named, however, had all their ener- gies taxed to sustain the conflict with CARNEADES (¢.v.). This was the most formidable assault the school ever encountered ; that it survived was due more to the fore- sight and elaborate precautions of Chrysippus than to any efforts of that “pen-doughty” pamphleteer, Antipater (xoAawoBdas), who shrank from opposing himself in per- son to the eloquence of Carneades. The subsequent his- tory testified to the importance of this

controversy. The special objects of attack were the Stoic theory of knowledge, their theology, and their ethics. The physical basis of the system remained unchanged but neglected ; all creative force or even original research in the departments of physics and metaphysics vanished. Yet problems of interest bearing upon psychology and natural theology continued to be discussed. Thus the cycles of the world's existence, and the universal conflagration which terminates each of them, excited some doubt. Diogenes of Seleucia is said to have wavered in his belief at last ; Boethus, one of his pupils, flatly denied it. He regarded the Deity as

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the guide and upholder of the world, watching over it from the outside, not as the immanent soul within it, for according to him the world was as soulless as a plant, We have here a compromise between Zeno's and Aristotle's doctrines. But in the end the universal conflagration was lianded down without question as an article of belief. Jf is clear that the activity of these teachers was chiefly directed to ethics: they elaborated fresh definitions of the chief good, designed either to make yet clearer the sense of the formulas of Chrysippus or else to meet the more urgent objections of the New Academy. Carneades had emphasized one striking apparent inconsistency: it had been laid down that to choose what is natural is man's highest good, and yet the things chosen, the " first objects according to nature," had no place amongst goods, Antipater may have met this by distinguishing "the attainment" of primary natural ends from the activity directed to their attainment (Plut., De Comm. Not., 27, 14, p. 1072 F) ; but, earlier still, Diogenes had put forward his gloss, viz., " The end is to calculate rightly in the selection and rejection of things according to nature." Archedemus, a contemporary of Diogenes, put this in plainer terms still: '* The end is to live in the performance of all fitting actions " (rdvra Ta Kabjxovra eritehotvras Civ). Now it is highly improbable that the earlier Stoics would have sanctioned such interpretations of their dogmas. The mere performance of relative or imperfect duties, they would have said, is something neither good nor evil; the essential constituent of human good is ignored. And similar criticism is actually passed by Posidonius: " This is not the end, but only its necessary concomitant ; sucha mode of expression may be useful for the refutation of objections put forward by the Sophists"

(Carneades and the New Academy 2), “but it contains nothing of morality or wellbeing” (Galen, De Plac. Hipp. et Plat., p. 470 XK), There is every ground, then, for concluding that we have here one concession extorted by the assaults of Carneades. For a sinilar compromise there is express testimony: “‘good repute” (eddogia) had been regarded as a thing wholly indifferent in the school down to and including Diogenes. Antipater was forced to assign to it “ positive value,” and to give it a place amongst “ things preferred ” (Cic., De Fin., iii. 57). These modifications were retained by Antipater’s successors. Hence come the increased im- portance and fuller treatment which from this time for- ward fall to the lot of the “external duties ” (ka@mxovra). The rigour and consistency of the older system became sen- sibly modified.

To this result another important factor contributed. The In all that the older Stoics taught there breathes that %%* enthusiasm for righteousness in which has been traced the earnestness of the Semitic spirit; but nothing presents more forcibly the pitch of their moral idealism than the doctrine of the Wise Man. All mankind fall into two classes,—the wise or virtuous, the unwise or wicked,— the distinction being absolute. He who possesses virtue possesses it whole and entire ; he who lacks it lacks it altogether. To be but a hand’s-breadth below the surface of the sea ensures drowning as infallibly as to be five hundred fathoms deep. Now the wise man is drawn as perfect. All he does is right, all his opinions are true ; he alone is free, rich, beautiful, skilled to govern, capable of giving or receiving a benefit. And his happiness, since length of time cannot increase it, falls in nothing short of that of Zeus. In contrast with all this, we have a picture of universal depravity. Now, who could claim to have attained to the sage’s wisdom? Doubtless, at the first founding of the school Zeno himself and Zeno’s pupils were inspired with this hope ; they emulated the Cynics Antisthenes and Diogenes, who never shrank out

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modesty from the name and its responsibilities. But the development of the system led them gradually and reluct- antly to renounce this hope, as they came to realize the arduous conditions involved. Zeno indeed could hardly have been denied the title conferred upon LEpicurus. Cleanthes, the ‘‘

second Hercules," held it possible for man to attain to virtue. From anecdotes recorded of the tricks played upon Aristo and Spherus (Diog. Laer., vii. 162, 117) it may be inferred that the former deemed himself infallible in his opinions, 7.e., set up for a sage; Perszeus himself, who had exposed the pretensions of Aristo, is twitted with having failed to conform with the perfect generalship which was one trait of the wise man, when he allowed the citadel of Corinth to be taken by Aratus (Athen., iv. 102 D). The trait of infallibility especially proved hard to establish when successive heads of the school seriously differed in their doctrine. The prospect became daily more distant, and at length faded away. Chrysippus declined to call himself or any of his contem- poraries a sage. One or two such manifestations there may have been—Socrates and Diogenes ?'—but the wise man was rarer, he thought, than the phoenix. If his suc- cessors allowed one or two more exceptions, to Diogenes of Seleucia at any rate the sage was an unrealized ideal, as we learn from Plutarch (De Comm. Not., 33, 1076 B), who does not fail to seize upon this extreme view. Posi- donius left even Socrates, Diogenes, and Antisthenes in the state of progress towards virtue. Although there was in the end a reaction from this extreme, yet it is impos- " gible to mistake the bearing of all this upon a practical system of morals. So long as dialectic subtleties and exciting polemics afforded food for the intellect, the gulf between theory and practice might be ignored. But once let this system be presented to men in earnest about right living, and eager to profit by what they are taught, and an ethical reform is inevitable. Conduct for us will be separated from conduct for the sage. We shall be told not always to imitate him. There will be a new law, dwell- ing specially upon the 'external duties" required of all men, wise or unwise ; and even the sufficiency of virtue for our happiness may be questioned. The introducer and expositor of such a twofold morality was a remarkable man. Born at Rhodes c. 185 B.c., a citizen of the most flourishing of Greek states and almost the only one which yet retained vigour and freedom, Paneetius lived for years in the house of Scipio Africanus the younger at Rome, accompanied him on embassies and campaigns, and was perhaps the first Greek who in a private capacity had any insight into the working of the Roman state or the character of its citizens. Later in life, as head of the Stoic school at Athens, he achieved a reputation second only to that of Chrysippus. He is the earliest Stoic author from whom we have, even indirectly, any consider- able piece of work, as

books i. and ii. of the De Officiis are a réchauffé, in Cicero's fashion, of Panetius " Upon External Duty " (zept tod xaOyjKovtos). } The introduction of Stoicism at Rome was the most 'momentous of the many changes that it saw. After the first sharp collision with the jealousy of the national authorities it found a ready acceptance, and made rapid progress amongst the noblest families. It has been well said that the old heroes of the republic were unconscious Stoics, fitted by their narrowness, their stern simplicity, and devotion to duty for the almost Semitic earnestness of the new doctrine. In Greece its insensibility to art and the cultivation of life was a fatal defect ; not so with the shrewd men of the world, desirous of qualifying as advocates or jurists. It supplied them with an incentive to scientific research in archeology and grammar; it penetrated jurisprudence until the belief in the ultimate

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identity of the jus gentium with the law of nature modified the preetor's edicts for centuries. Even to the prosaic religion of old Rome, with its narrow original conception and multitude of burdensome rites, it became in some sort a support. Sceevola, following Paneetius, explained that the prudence of .statesmen had established this public institution in the service of order midway between the errors of popular superstition and the barren truths of enlightened philosophy. Soon the influence of the pupils reacted upon the doctrines taught. Of specula- tive interest the ordinary Roman had as little as may be ; for abstract discussion and controversy he cared nothing. Indifferent to the scientific basis or logical development of doctrines, he selected from various writers and from dif- ferent schools what he found most serviceable. All had to be simplified and disengaged from technical subtleties.

To attract his Roman pupils Panzetius would naturally Panetius,

choose simple topics susceptible of rhetorical treatment or of application to individual details. He was the represen- tative, not merely of Stoicism, but of Greece and Greek literature, and would feel pride in introducing its greatest masterpieces: amongst all that he studied, he valued most the writings of Plato. He admired the classic style, the exquisite purity of language, the flights of imagination, but he admired above all the

philosophy. He marks a reaction of the genuine Hellenic spirit against the narrow austerity of the first Stoics. Zeno and Chrysippus had in- troduced a repellent technical terminology ; their writings lacked every grace of style. With Panetius the Stoa became eloquent: he did his best to improve upon the uncouth words in vogue, even at some slight cost of accu- racy, ¢.g., to discard zponypévoy for evypyorov, or else de- signate it “so-called good,” or even simply “ good,” if the context allowed.

The part Panetius took in philological and historical studies is characteristic of the man. We know much of the results of these studies ; of his philosophy technically we know very little. He wrote only upon ethics, where historical knowledge would be of use. Crates of Mallus, one of his teachers, aimed at fulfilling the high functions of a “ critic ” according to his own definition,—that the critic must acquaint himself with all rational knowledge. Panetius was competent to pass judgment upon the critical ‘* divination” of an Aristarchus (who was perhaps himself also a Stoic), and took an interest in the restoration of Old Attic forms to the text of Plato. Just then there had been a movement towards a wider and more liberal cducation, by which even contemporary Epicureans were affected. Diogenes the Babylonian had written a treatise on language and one entitled The Laws. Along with grammar, which had been a prominent branch of study under Chrysippus, philosophy, history, geography, chronology, and kin- dred subjects came to be recognized as fields of activity no less than philology proper. It has been recently established that Polybius the historian was a Stoic, and it is clear that he was greatly influ- enced by the form of the system which he learned to know, in the society of Scipio and his friends, from Panetius.! Nor is it im- probable that works of the latter served Cicero as the originals of his De Republica and De Legibus.2 Thus the gulf between Stoicism and the later Cynics, who were persistently hostile to culture, could not fail to be widened.

A wave of eclecticism passed overall the Greck schools in the Ist Eclectic- Platonism and scepticism had left undoubted traces ism.

century B.C. upon the doctrine of such a reformer as Panetius. He had doubts about a general conflagration ; possibly (he thought) Aristotle was right in affirming the eternity of the present order of the world. He doubted

the entire system of divination. On these points his disciples Posidonius and Hecato seem to have reverted to orthodoxy. But in ethics his innovations were more suggestive and fertile. He separated wisdom as a theoretic virtue from the other three which he called practical. Hecato slightly modified this: showing that precepts (ewphuara) are needed for justice and temperance also, he made them scientific virtues, rescrving for his second class the unscientific virtue (&4Gedpyntos aperh) of courage, together with

2 Hirzel, Untersuch., ii. p. 841 sq. Polybius's rejection of divina- tion is decisive. See, ¢.g., his explanation upon natural causes of Scipio the elder's capture of New Carthage, " by the aid of Neptune, : x. 11 (ef. x. 2). P. Voigt holds that in vi. 5, 1, riow Erépas trav girocddpey is an allusion to Panetius.

2 This, at least, is maintained by Schmekel.

Posi- donius.

The later Stoics,

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health, strength, and such like ‘‘ excellencies.” Further, Panetius had maintained that pleasure is not altogether a thing indifferent: there is a natural as well as au unnatural pleasure. But, if so, it would follow that, since pleasure is an emotion, apathy or eradica- tiou of all emotions cannot be unconditionally required. The gloss he put upon the definition of the end was “a life in accordance with the promptings given us by nature”; the terms are all used by older Stoics, but the individual nature (juiv) seems to be emphasized. From Posidonius, the last representative of a com- prehensive study of nature and a subtle erudition, it is not surpris- ing that we get the following definition: the end is to live in con- templation of the reality and order of the universe, promoting it to the best of our power, and never led astray by the irrational part of the soul. The heterodox phrase with which this definition ends points to innovations in psychology which were undoubtedly real and important, suggested by the difficulty of maintaining the essential unity of the soul. Panetius had referred two faculties (those of speech and of reproduction) to animal impulse and to the vegetative ‘‘naturc” (@dors) respectively. Yet the older Stoics held that this Pdo1s was changed to a true soul (Wuxh) at birth. Posidonius, unable to explain the emotions as “judgments ” or the effects of judgments, postulated, like Plato, an irrational principle (including a concupiscent and a spirited element) to account for them, although he subordinated all these as faculties to the one substance of the soul lodged in the heart. This was a serious departure from the principles of the system, facilitating a rcturn of later Stoicism to the dualism of God and the world, reason and the irrational part in man, which Chrysippus had striven to surmount.!

Yet in the general approximation and fusion of opposing views which had set in, the Stoics fared far better than rival schools. Their system became best known and most widcly used by indi- vidual eclectics, All the assaults of the sceptical Academy had failed, and within fifty years of the death of Carneades his degener- ate successors, unable to hold their ground on the question of the criterion, had capitulated to the enemy. Antiochus of Ascalon, the professed restorer of the Old Academy, taught a medley of

Stoic and Peripatetic dogmas, which he boldly asserted Zeno had first borrowed from his school. The wide diffusion of Stoic phraseology and Stoie modes of thought may be secn on all hands,—in the language of the New Testament writers, in the compendious ‘histories of philosophy” industriously circulated by a host of writers about this time (of. H. Diels, Doxographi Greci).

The writings of the later Stoics have come down to us, if not entire, in great part, so that Seneca, Cornutus, Persius, Lucan, Epictetus, Marcus Aurelius are known at first hand. They do not profess to give a scientific exposi- tion of doctrine, and may therefore be dismissed somewhat briefly (see Eprcrerus and Auretius). We learn much more about the Stoic system from the scanty fragments of the first founders,” or even from the epitomes of Diogenes Laertius and Stobseus, than from these writers. They tes- tify to the restriction of philosophy to the practical side, and to the increasing tendency, ever since Panztius, towards a relaxation of the rigorous ethical doctrine and its approxi- mation to the form of religious conviction. This finds most marked expression in the doctrines of submission to Providence and universal philanthropy. Only in this way could they hold their ground, however insecurely, in face of the religious reaction of the first century. In passing to Rome, Stoicism quitted the school for actual life. The fall of the republic was a gain, for it released so much intellec- tual activity from civic duties. The life and death of Cato fired the imagination of a degenerate age in which he stood out both as a Roman and a Stoic. To a long line of illus- trious successors, men like Peetus Thrasea and Helvidius Priscus, Cato bequeathed his resolute opposition to the dominant power of the times ; unsympathetic, impractic- able, but fearless in demeanour, they were a standing re- proach to the corruption and tyranny of their age. But eee ee ee eee ee

‘ Works of Posidonius and Hecato have served as the basis of extant Latin treatises, Cicero, De Divinatione, perhaps De Natura Deorum, i., ii., comes in part from Posidonius ; Cicero, De Finibus, iil,, and Seneca, De Benefictis, i.-iv., from Heeato, who is also the source of Stobeus, Eel. Hth., ii, 110. Cf H. H. Fowler, Panztii et Lecatonis Fragmenta, Bonn, 1885.

2 Cf. C. Wachsmuth, Commentationes Ll, de Zenone Citiensi et Cleanthe Assio, Gottingen, 1874, Baguet's Chrysippus, Louvain, 1822, is unfortunately very incomplete.

crowds of hearers.

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when at first, under Augustus, the empire restored order, philosophy became bolder and addressed every class in society, public lectures and spiritual direction being the two forms in which it mainly showed activity. Books of direction were written by Sextius in Greek (as afterwards by Seneca in Latin), alinost the only Roman who had the ambition to found a sect, though in ethics he mainly followed Stoicism. was the popular lecturer of that day, producing a powerful effect by his denunciations of the manners of the time,

His contemporary Papirius Fabianus

Under Tiberius, Sotion and Attalus were attended by In Sencca's time there was a professor, badly attended it is true, even in a provincial town like Naples. At the same time the antiquarian study of Stoic writings went on apace, especially those of the earliest teachers,—Zeno and Aristo and Cleanthes.

Seneca is the most prominent leader in the direction a

which Roman Stoicism now took. His penetrating intellect had mastered the subtleties of the system of Chrysippus, but they seldom appear in his works, at least without apology. Incidentally we meet there with the doctrines of Pneuma and of tension, of the corporeal nature of the virtues and the affections, and much more to the same effect. But his attention is claimed for physics chiefly as a means of elevating the mind, and as making known the wisdom of Providence and the moral govern- ment of the world. To reconcile the ways of God to man had been the ambition of Chrysippus, as we know from Plutarch's criticisms. He argued plausibly that natural evil was a thing indifferent,—that even moral evil was required in the divine economy as a foil to set off good, The really difficult problem why the

prosperity of the wicked and the calamity of the just were permitted under the divine government he met in various ways: some- times he alleged the forgetfulness of higher powers ; some times he fell back upon the necessity of these contrasts and grotesque passages in the comedy of human life, Seneca gives the true Stoic answer in his treatise On Pro- wdence : the wise man cannot really meet with misfortune; all outward calamity is a divine instrument of training, designed to exercise his powers and teach the world the indifference of external conditions. In the soul Seneca recognizes an effluence of the divine spirit, a god in the human frame ; in virtue of this he maintains the essential dignity and internal freedom of man in every human being. Yet, in striking contrast to this orthodox tenet is his vivid conception of the weakness and misery of men, the hopelessness of the struggle with evil, whether in society or in the individual. Thus he describes the body (which, after Epicurus, he calls the flesh) as a mere husk or fetter or prison of the ‘soul; with its departure begins the soul’s true life. Sometimes, too, he writes as if he accepted an irrational as well as a rational part of the soul. In ethics, if there is no novelty of doctrine, there is a surprising change in the mode of its application. The ideal sage has receded ; philosophy comes as a physician, not to the whole but to the sick. We learn that there are various classes of patients in “ progress ” (apoxory), 1.¢., OM their way to virtue, making painful efforts towards it. The first stage is the eradication of vicious habits: evil tendencies are to be corrected, and a guard kept on the corrupt propensities of the reason. Suppose this achieved, we have yet to struggle with single attacks of the passions : irascibility may be cured, but we may succumb toa fit of rage. To achieve this second stage the impulses must be trained in such a way that the fitness of things indifferent may be the guide of conduct. Even then it remains to give the will that property of rigid infallibility without which we are always liable to err, and this must be effected by the training of the judgment. Other

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peculiarities of the later Stoic ethics are due to the con- dition of the times. Ina time of moral corruption and oppressive rule, as the early empire repeatedly became to the privileged classes of Roman society, a general feeling of insecurity led the student of philosophy to seek in it a refuge against the vicissitudes of fortune which he daily beheld. The less any one man could do to interfere in the government, or even to safeguard his own life and prop- erty, the more heavily the common fate pressed upon all, levelling the ordinary distinctions of class and character. Driven inwards upon themselves, they employed their energy in severe self-examination, or they cultivated resig- nation to the will of the universe, and towards their fellow- men forbearance and forgiveness and humility, the virtues of the philanthropic disposition. With Seneca this resig- nation took the form of a constant meditation upon death. Timid by nature, aware of his impending doom, and at times justly dissatisfied with himself, he tries all means of reconciling himself to the idea of suicide. The act had always been accounted allowable in the school, if circum- stances should call for it: indeed, the first three teachers had found such circumstances in the infirmity of old age. But their attitude towards the “way out” (é6aywyj) of incurable discomforts is quite unlike the anxious senti- inentalism with which Seneca dwells upon death.

From Seneca we turn, not without satisfaction, to men of sterner mould, such as Musonius Rufus, who certainly deserves a place beside his more illustrious disciple, Epictetus. As a teacher he commanded universal respect, and wherever we catch a glimpse of his activity in these perilous times—whether banished by Nero, or excepted from banishment by Vespasian, as the judicial prosecutor of that foul traitor Egnatius Celer, or as thrusting himself between the ranks of Vespasianists and Vitellianists, to preach conciliation on the eve of a battle—he appears to advantage. His philosophy, however, is yet more con- centrated upon practice than Seneca’s, and in ethics he is almost at the position of Aristo. Virtue is the sole end, but virtue may be gained without many doctrines, mainly by habit and training. Epictetus testifies to the powerful hold he acquired upon his pupils, each of whom felt as if Musonius spoke to his heart. Amongst a mass of his practical precepts, we come across an original thought, the

famous distinction between “things in our power,” we, our ideas and imaginations, and “things beyond our power,” 2.¢., the course of events and external advantages. The practical lesson drawn from it is, that we must school ourselves to accept willingly the inevitable.

In the life and teaching of Epictetus this thought bore abundant fruit. The beautiful character which rose superior to weakness, poverty, and slave’s estate is also presented to us in the Discourses of his disciple Arrian as a model of religious resignation, of forbearance and love towards our brethren, that is, towards all men, since God 1S our common father. With him even the “ physical basis” of ethics takes the form of a religious dogma, ——the providence of God and the perfection of the world. We learn that he regards the Sauer or “ guardian angel” as the divine part in each man ; sometimes it is more nearly conscience, at other times reason. His ethics, too, has a religious character. He begins with human weakness and man’s need of God: whoso would become good must first be convinced that he is evil. an argument which almost amounts to a retractation of

the difference between things natural and things contrary | _ two members, but by the Act of 1885 a large part of this | went to form the new borough of Hanley. The population

to nature, as understood by Zeno. Would you be cut off from the universe? he asks. Go to, grow healthy and rich. But if not, if you are a part of it, then become resigned to your lot. Towards this goal of approximation to Cynicism the later Stoics had all along been tending.

Submission is enforced by |

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Withdrawal from the active duty of the world must lead to passive endurance, and, ere long, complete indifference. Musonius had recommended marriage and condemned unsparingly the exposure of infants. Epictetus, however, would have the sage hold aloof from domestic cares, another Cynic trait. So, too, in his great maxim “ bear and forbear,” the last is a command to refrain from the external advantages which nature offers.

_ Epictetus is marked out amongst Stoics by his renuncia- Aure- tion of the world. He is followed by a Stoic emperor, M. lius.

Aurelius Antoninus, who, though in the world, was not of it. The Meditations give no systematic exposition of belief, but there are many indications of the religious spirit we have already observed, together with an alinost Platonic psychology. Following Epictetus, he speaks of man as a corpse bearing about a soul; at another time he has a threefold division—(1) body, (2) soul, the seat of impulse (xvevpariov), and (3) vods or intelligence, the proper ego. Tn all he writes there is a vein of sadness: the flux of all things, the vanity of life, are thoughts which perpetually recur, along with resignation to the will of God and for- bearance towards others, and the religious longing to be rid of the burden and to depart to God. These peculiarities in M. Antoninus may perhaps be explained in harmony with the older Stoic teaching; but, when taken in con- nexion with the rise of Neoplatonism and the revival of superstition, they are certainly significant. None of the ancient systems fell so rapidly as the Stoa. It had just touched the highest point of practical morality, and in a generation after M. Antoninus there is hardly a professor to be named. Its most valuable lessons to the world were preserved in Christianity ; but the grand simplicity of its monism slumbered for fifteen centuries before it was re- vived by Spinoza.

Literature. —The best modern authority is Zeller, Phil. d. Griech., iii. pt. i. (8d ed., 1880), —Eng. transl. Stoics, by Reichel (1879), and Eelectics, by 8. F. Alleyne (1883). Of the 214 numbers to which the bibliography of Stoicism extends in Ueberweg-Heinze, Grund- riss dcr Gesch. der Phil. (7th ed., 1886), may be cited F. Ravaisson, Essai sur ‘e Stoicismce, Paris, 1856; M. Heinze, Die Lehre vom Logos, Oldenburg, 1872; H. Siebeck, Untersuchungen zur Phil. d. Grtechen, Halle, 1873, and Gesch. d. Psychologie, i. 2, Gotha, 1884; R. Hirzel, “Die Entwicklung der stoisch. Phil.,” in Untcrsuch- ungen zu Ciccros Schriften, li. pp. 1-566, Leipsic, 1882; Ogereau, Essai sur le Systeme des Stoicicns, Paris, 1885; L. Stein, Die Psy- chologie der Stoa, i., Berlin, 1886. (R. DHE.)

‘ STOKE-UPON-TRENT, a market-town and municipal and parliamentary borough of Staffordshire, is situated on the Trent, on the Trent and Mersey Canal, where it unites with the Cauldon Canal, and on the London and

North- Western and North Staffordshire railway lines, 2 miles east of Newcastle-under-Lyme, and 15 north of Stafford. It is connected with Burslem and other places by steam tramway. The principal public buildings are the town- hall (1835), with assembly rooms, the new market-hall (1883), the Minton memorial building (1858), containing rooms for art and science classes, the free library and museum (1878), and the North Staffordshire infirmary, founded in 1815 and removed to its present site in 1868. A cemetery 21 acres in extent was laid out in 1883. There are statues of Josiah Wedgewood (1863) and of Colin Minton Campbell (1886). The head offices of the North Staffordshire Railway Company are in the town. Stoke has no antiquarian interest, and owes its importance to the porcelain and earthenware manufactures. It may be regarded as the centre of the " Potteries" district. Stoke was created a parliamentary borough in 1832, with

of the municipal borough (formed in 1874, with an area of 1660 acres) was 19,261 in 1881; the area has since been increased to 1720 acres. The population of the

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parliamentary borough (area 9081 acres) in 1571 was 130,985, and in 1881 it was 152,394; the population of the borough as adjusted in 1885, which returns only one member, is estimated at 65,000.

STOLBERG, or STOLLBERG, an industrial and mining town in Rhenish Prussia, is situated on the Vicht, 7 miles east of Aix-la-Chapelle. It is the centre of a very active and varied industry, exporting its produce to all parts of the world. The leading branch is metal-working, which is here carried on in important zinc, brass, and iron foundries, smelting-works of various kinds, puddling and rolling works, and manufactories of needles, pins, and other metal goods. The ore is mostly found in the mines around the town, but some is imported from a considerable distance. In or near the town there are also large chemical works, glass- works, a mirror-factory, and various minor establishments. Extensive coal-mines in the neiglibourhood provide the enormous supply of fuel demanded by the various indus- tries. The population in 1885 was 11,841.

The industrial prosperity of the town was founded in the middle of the 17th century by French religious refugees, who introduccd

the art of brass-founding. An ancient castle in the town is popu- larly believed to have been a hunting-lodge of Charlemagne.

STOLBERG, Count Curist1an (1748-1821), German poet, was born at Hamburg on the 15th October 1748. His father, Count Christian Giinther, was a privy councillor in Denmark. Stolberg studied at Gottingen, where he formed one of a ‘ Dichterbund,” which afterwards became famous. It included, besides Stolberg and his brother, Boie, Biirger, Miller, Voss, Hélty, and Leisewitz. In 1777 he became an official in the civil service at Tremsbiittel in Holstein, and married Louise, the countess of Reventlow, whose beauty he had often celebrated in his verses. He resigned his office in 1800, and afterwards lived upon his estate in Schleswig. He died January 18, 1821.

Stolberg was not a poet of high originality, but in some of his poenis he gave vigorous expression to sincere and ardent feeling. He excelled, too, in the utterance of gentle and delicate sentiment. Much of his work appcared in association with that of his brother, whose genius was bolder and more impressive than his own. They published together a volume of poems in 1779, and Schauspiele mit Chéren in 1787, their object in the latter work being to revive a love for the Greek drama. The dramas contributed to this volume by Christian Stolberg are Balsazar and Otanes. In 1815 the brothers issued a volume of Vaterldéndische Gedichte. Christian Stolberg was the sole author of Gedichte aus dem Griechischen (1782) and of a translation of the works of Sophocles (1787). All his poetical works are included in the Werke der Briider Stolberg (20 vols., 1820-25).

STOLBERG, Count FrepErick Leopotp (1750-1819), the brother of the preceding, was born on the 7th November 1750, at Bramstedt in Holstein. Like his brother he studied at Géttingen, and was a member of the “ Dichter- bund.” In 1776 he went to Copenhagen as ambassador of the prince-bishop of Liibeck, and in 1789 he was sent to Berlin as the ambassador of the king of Denmark. His first wife, whom he had married in 1782, having died, he married the Countess Sophia von Redern in 1790, and in the following year he was appointed president of the government of the

prince-bishop at Eutin. In 1800 he resigned his office, and at Miinster joined the Church of Rome, taking with him all the members of his family except his eldest daughter Agnes, who had married Count Ferdinand von Stolberg-Wernigerode. Stolberg's friends and admirers were astonished by his conversion to the Roman Church, and he was hotly attacked by Voss, whose intervention gave rise to a bitter controversy. After his change of faith Stolberg issued an elaborate Geschichte der Religion Jesu Christi, in which he hardly even attempted to write with impartial judgment. He died near Osna- briick on the 5th December 1819.

In association with his brother he published Gedichte ; Schau- spicle mit Choéren; and Vaterldéndische Gedichte. He also wrote

LIamben (1784), a series of satires on the vices and prejudices of his time; and he translated the Jiiad, some of Plato's dialogues, four tragedies of Aischylus, and Ossian's poems. Among his prose writings may be mentioned Die Insel, a romance (1788); Eine Reise in Deutschland, der Schweiz, Italien, und Sicilien (1794); and his Leben Alfred's des Grossen (1815). He was a master' of man forms of poetical expression, and in his best period he produced a strong impression on his contemporaries by his passion for nature and freedom.

Biographies of Stolberg have been written by Nicolovius, Menge, Wiedel, Hennes, and Janssen.

STOLP, or STOLPE, an ancient trading-town in the bleak coast-plain of eastern Pomerania, Prussia, is situated on the Stolpe, 10 miles from the Baltic Sea and 64 miles to the west of Dantzic. The large church of St Mary, with a lofty tower, dating from the 14th century, the Renaissance castle of the 16th century, now used as a prison, and one of the ancient town-gates restored in 1872 are memorials of the time when Stolp was a prosperous member of the Hanseatic League. The manufacture of amber articles, tobacco and cigars, cigar-boxes, &c., with some iron- founding, linen-weaving, and salmon-fishing in the Stolpe, are the chief industrial occupations of the inhabitants, who also carry on trade in grain, cattle, spirits, fish, and geese. Stolpmiinde, a fishing-village and summer resort, at

the mouth of the river, is the port of Stolp. The population of Stolp in 1885 was 22,431 (in 1816 5260), about 600 being Roman Catholics and about 1000 Jews.

Stolp, mentioned in the 11th century, received town-rights in 1273. From the 14th to the 16th century it was a member of the Hanseatic League. Until 1637, when it passed to Brandenburg, the town was generally in the possession of the dukes of Pomerania,

STOMACH. See DicEstrvE ORGANS.

STOMACH, Disrasses or THE. Only the more com- mon and serious varieties of gastric disease can be here referred to. The majority of them exhibit, as their most marked and sometimes their only feature, the symptoms of DyspEpsia (q.v.). Hence the diagnosis of the forms of stomach disease is frequently a matter of much difficulty. Nevertheless a careful consideration of the history and the manifested phenomena of a given case may often lead toa correct identification of its nature. The present notice refers in general terms to the most prominent symptoms which usually characterize the chief gastric disorders.

The stomach is liable to inflammatory affections, of which the condition of catarrh, or irritation of its mucous membranc, is the most frequent and most readily recognized. This may exist in an acute or a chronic form, and depends upon some condition, either local or general, which produces a congested state of the circula- tion in the walls of the stomach. ;

Acute Gastrie Catarrh may arise from various causes, of which the most important are—(1) coustitutional conditions, such as the gouty or rheumatic, or an inherited tendency to irritability of the digestive organs; (2) errors in diet, particularly excessive quantity, indigestible quality, imperfect mastication, extremes of temperature of the food, toxic agents, especially alcohol, in excess, or food in a state of decomposition; (8) atmospheric influences, as appears evl-

_dent from its tendeucy to occur in very warin or very cold weather

or in the case of sudden temperature alternations.

The chief change the stomach undergoes affects its mucous membrane, which is in a state of congestion, either throughout or in parts. It is more than probable that this condition produces au alteration in the secreting function of the organ, and that its peptic juices become less potent, the effect of which will be to retard the process of digestion and favour the occurrence of decomposl- tion and fermentation in its contents, thus aggravating the original evil. The symptoms are those well known as characterizing an acute ‘‘bilious attack,” consisting in loss of appetite, sickness or nausea, and headache, frontal or occipital, often accompanied with giddiness. The tongue is furred, the breath fcetid, and there 1s pain or discomfort in the region of the stomach, with sour eructa- tions, and frequently vomiting, first of food and then of bilious matter. An attack of this kind tends to subside in a few days, especially if the exciting cause be removed. Sometimes, howevel, the symptoms recur with such frequency as to lead to the more serious chronic form of the disease.

The treatment bears reference, in the first place, to any known source of irritation, which, if it exist, may be expelled by an emetic or purgative. This, however, is seldom necessary, since vomitmg is usually present. For the relief of sickness and pain the sucking

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of ice and counter-irritation over the region of the stomach are of service. Further, remedies whieh exercise a soothing effect upon an irritable mucous membrane, such as bismuth or weak alkaline fluids, and along with these the use of a light milk diet, are usually sufficient to remove the symptoms.

Ohronic Gastric Catarrh may result from the acute or may arise independently. It is not unfrequently connected with antecedent disease in other organs, such as the lungs, heart, liver, or kidneys, and it is specially common in persons addicted to aleoholic excess. In this form the texture of the stomach is more seriously affected than in the acute. It is permanently in a state of congestion, and its mucous membrane and muscular coat undergo thickening and other changes, which, besides markedly affecting the funetion of digestion, may lead to stricture of the pyloric orifice of the

stomach and its results, to be subsequently referred to. The symptoms are those of dyspepsia in an aggravated form (see Dyspepsia), of whieh discomnfort and pain after food, with distension and frequently vomit- ing, are the chief ; and the treatment must be condueted in reference to the eauses giving rise to it. The careful regulation of the diet (see Drererics), both as to the amount, the quality, and the inter- vals between meals, demands special attention. Of medicinal agents, bismuth, arsenic, nux vomica, and the mineral acids are all of acknowledged efficacy, as are also preparations of pepsin.

Uleer of the Stomach (gastric ulcer, perforating ulcer) is of not unfrequent occurrence, and is a disease of much gravity. Its causes are probably not fully understood, yet the following points may be regarded as generally admitted :—(1) that the disease is twice as common in females as in males, and that it is found to affect domestie servants more frequently than any other class; (2) that it occurs for the most part in early life, the period from twenty to thirty including the great majority of the cases; (8) that it appears to be connected in many instances with:impairment of the circulation in the stomach and the formation of a clot in a small blood-vessc] (thrombosis) ; (4) that such an occurrence may arise in connexion with an impoverished state of the blood (anemia), which is actually the condition present in many of the eases, but that it may also arise from diseased blood-vessels, the result of long-con- tinued catarrh, or from the irritation and debilitating effects of hot or cold substances.

It is held that when any such obstruction takes place in a blood- vessel the nutrition of a limited area of the stomach is cut off, and the part is apt to undergo disintegration all the more readily from the unresisted action of the gastric juices upon it. Hence an ulcer is formed. This ulcer is usually of small size (} to 1 inch in diameter), of round or oval form, and tends to advance, not superficially, but to penetrate through the coats of the stomach. Its most usual site is upon the posterior wall of the upper or lesser curvature of the stomach and near to the pyloric oritiee. It may undergo a healing process at any stage, in which case it may leave but little trace of its existence ; while, on the other hand, it may in the course of cieatrizing produce such an ainount of contraction as to lead to stricture of the pylorus. But, again, perforation may take place, which in most cases is quickly fatal,

unless previously the stomach has become, as it may, adherent to another organ, by which the dangerous effects of this occurrence may be averted. Usually there is but one ulcer, but sometimes there are more.

The symptoms to which this disease gives rise are often exceed- ingly indefinite and obscure, and in some cases the diagnosis has been first made out by the sudden occurrence of a fatal perforation. Generally, however, there are certain evidences more or less distinct which tend to indicate the probable presence of a gastric ulcer. First among these is pain, which is in some measure present at all times, but is markedly inereased after food. This pain is situated either in front, at the lower end of the sternum, or fully more commonly behind, about the middle of the back. Sometimes it is felt at one or both sides. It is often extremely severe, and is usually accompanied with much tenderness to touch, and also with a sense of oppression and inability to wear tight clothing. The pain is probably largely due to the active movements of the Stomach set up by the presence of the food. Accompanying the pain there is frequently vomiting, either very soon after the food is swallowed or at a later period. This tends in some measure to relieve the pain and discomfort, and in many instances the patient rather encourages this act. Vomiting of blood (heamatemesis) is a frequent symptom, and is most important diagnostieally. It may show itself either to a slight extent, and in the form of a brown or coflee-like mixture, or as an enormous discharge of pure blood of dark colour and containing elots. The source of the blood is some vessel or vessels whieh the ulcerative process has ruptured. Blood is also found mixed with the discharges from the bowels, rendering them dark and tarry looking. The general eondition of a patient with gastric ulcer is as a rule that of ill-health, showing pallor, more or less emaciation, and debility. The tongue presents a red irritable appearance, and there is usually constipation of the bowels. _ The course of a case of gastric ulcer is very variable. In some Instances it would appear to be acute, making rapid progress to a favourable or unfavourable termination. In most, however, the

disease is chronic, lasting for months or years; and in those cases where the ulcers are multiple or of extensive size ineomplete healing may take place

and relapses of the symptoms occur from time to time. Ulcers are sometimes present and give rise to no marked symptoms; and it has occurred to the writer to see more than one instance of this kind where fatal perforation suddenly took plaee, and where post-mortem examination revealed the existence of long- standing ulcers which could not possibly have been made out by any evidences furnished during life. While gastric ulcer is always to be regarded as a dangerous disease, its termination, in the great majority of cases, is in recovery. It frequently, however, leaves the stomaeh in a delicate condition, necessitating the utmost care as regards diet. Occasionally, though rarely, the disease proves fatal by sudden hemorrhage but a fatal result is more frequently due to perforation and the extrusion of the contents of the stomach into the peritoneal cavity, in whieh case death usually oecurs in from twelve to forty-eight hours, either from shock or from peri- tonitis. Should the stomaeh become adherent to another organ, and fatal perforation be thus prevented, there may remain as the result of this a permanent condition of dyspepsia, owing to inter- ference with the natural movements of the stomach during diges- tion ; while again stricture of the pylorus and consequent dilatation of the stomach is an occasional result of the cicatrization of an ulcer in its neighbourhood,

Of prime importanee in the treatment of this disease is the careful adjustment of the diet, the conditions existing in the stomach obviously requiring that the food administered should be of as bland and soft a character as possible. Of all substances inilk forms the most suitable aliment, and, while there may be instances in which it fails to agree, even when mixed with lime water or previously boiled, these are comparatively few. The peptonized foods originally suggested by Sir Wm. Roberts of Manchester are frequently found of mueh service in this disease. Light soups as well as milk may sometimes be administered in this way with benefit. The quantity, the intervals between the times of ad- ministration, and the temperature, as well as the quantity, of the food demand careful attention. In severe cases, where the pre- sence of food in the stomach gives rise to much suffering, nourish- ment by the bowel may be given for a time with great advantage. Of medicinal remedies the most serviceable are large doses of bismuth, with whieh it may be necessary to conjoin small doses of opium or of hydrocyanic acid for the relief of pain. The eareful administration of nitrate of silver has been reeommended as a means of

promoting the healing of the ulcers, but this end is pro- bably more readily accomplished by the remedies and especially by the method of diet already referred to, combined with rest. When hemorrhage occurs it is relieved by ice and by such stypties as gallic aeid, ergot of rye, lead, alum, &c., while in the dread event of perforation the only means of affording relief is opinm.

Cancer of the Stomach is one of the most common forms of internal cancerous disease. It occurs for the most part in persons at or after middle life, and in both sexes equally. Hereditary tendency may not unfrequently be traced.

The most common varieties of cancer affecting the stomach are scirrhus, medullary, and eolloid, and the parts affeeted are usually the inlet or ontlet orifices ; but the morbid process may spread widely in the stomach wall. When in the neighbourhood of the pylorus a stricture is frequently produced as the disease advances. The eancerous growth usually commences in the submucous tissue, but as it progresses it tends to uleerate through the mucous mem- brane, and in this process hemorrhage and hematemesis may occur. The symptoms of this disease are in many instances so indefinite as to render the diagnosis for a long time conjectural. They are mostly those of dyspepsia, with more or less pain, dis- comfort, and vomiting, particularly after meals. The vomited matters are often of coffee-ground appearanee, due to admixture with blood, but copious hematemesis is less frequent than in cases of gastric ulcer. The patient loses flesh and strength and soon comes to acquire the cachectie aspeet eommonly associated with cancer. The diagnosis is rendered all the more certain when, as is frequently the case, a tumour can be detected on examination over the region of the stomach, but there are many instances where no sueh evidence is obtained and where the nature of the disease is left to be made out by the age of the patient and by the intract- able and progressive character of the symptoms. Cases of eancer of the stomaeh advance with more or less rapidity to a fatal termination, which is usually quickest in the medullary form. In most instances death takes place in from six to twelve months. The treatment can only be palliative, but much relief may often be afforded by a careful attention to diet, by the treatment appli- cable to dilatation of the stomach, and by the use of opium.

Stricture of the Pylorus may, as has been already indicated, result from the various morbid conditions affecting the stomach to whieh reference has been made, namely, catarrh, uleer, and cancer. By whatever means produced, the effect is an obstruction to the trans- mission through the pylorie orifice into the intestines of the con- tents of the stomach, the oecurrence of dilatation of the organ, with

weakening of its walls, and the consequent accumulation and fer- mentation of partially digested food. ‘his condition gives rise to much discomfort, heartburn, and pain, and to the occurrence every few days of a copious vomiting of fermenting matcrial, in which may be found on microscopic examination the fungoid growths of Sarcina aud Torul#. With: the continuance of the disease the syinptoms tend to increase and to wear out the patient’s strength, since little or no assimilation is possible, and death sooner or later takes place from inanition. For a long time this condition was regarded as incurable in every casc, till the method of treatinent, originally suggested by Kiissmaul, of washing out the stomach daily or less frequently was found to yield remarkably beneficial results in almost all cases, and, in many instances of non-cancerous disease, to accomplish an actual cure. This plan of treatment is now largely resorted to, and it has proved to be a valuable addition to the therapeutics of gastric diseascs. @ Or A.)

STONE, a market-town of Staffordshire, England, on the river Treut, and on the North Staffordshire Railway, 7 miles south of Stoke and 7 north of Stafford. Part of the walls remain of an abbey which dates from the foun- dation of a college of canons in 670. The present church was openedin 1750. The inhabitants are employed chiefly in shoemaking, but malting, brewing, and tanning are also carried on. The population of the urban sanitary district (estimated area 1000 acres) was 5669 in 1881.

STONE. See VesicaL DIsEAsEs.

STONEHENGE, one of the most remarkable examples of the ancient stone circles, is situated in Salisbury Plain, Wiltshire, about 7 miles north of Salisbury. It consists of two circles aud two ovals with a large stone in the

centre. The outer circle, about 300 feet in circumference, is composed of upright stones about 16 feet in height and 18 feet in circumference, with others of similar size placed horizontally on their tops. Originally there were thirty uprights and thirty imposts, but now only seventeen uprights and seven imposts retain their position. The inner circle, which is about 9 feet distant from the outer circle, consisted originally of forty single stones, much smaller in size, and, unlike those of the outer circle, showing no evidence of having been hewn. The larger of the ovals was composed of five pairs of trilithons standing separate from each other, and rising gradually in height from east to west. Only two of these now remain entire ; one of the uprights of the grand central trilithon has fallen, and is broken in two pieces; the impost though fallen is entire, and the other impost is 9 feet out of the perpendicular ; another trilithon fell outward on the 3d June 1797; and of a third one of the uprights is still standing, the other upright and the impost having in their fall been broken into three pieces. The inner oval con- sisted originally of nineteen stones, of which there are remains of eleven, tapering in form and taller than those of the inner circle. In the centre of the smaller oval is the supposed altar stone, 15 feet in length. The whole is surrounded by a vallum and ditch about 370 yards in circumference. From the north-east an avenue, marked by a bank and ditch on each side, proceeds for a distance of 594 yards, after which it divides into two branches, one going eastwards up a hill between two groups of barrows, and the other north-westwards about 300 yards to the cursus orrace-course. The cursus, which is enclosed between two parallel banks and ditches running east and west, is a mile and 176 yards in length, with a breadth of 110 yards. There is a smaller cursus a little to the north. In the avenue there is a cromlech or bowing-stone 16 feet in length, called the Friar’s Heel, and in a line with it, within the area of the work, there is a large prostrate stone on which it is supposed the victims were immolated. Barrows lie around on all sides.

Stonehenge is first mentioned by Nennius, in the 9th century, who asserts that it was erected in commemoration of the 400 nobles who were treacherously slain near the spot by Hengist in 472. A similar account of its origin is given in the triads of the

Welsh bards, where its erection is attributed to King Merlin, the |

successor of Vortigern. Inigo Jones, in his work on Stonehenge, published in 1655, endeavours to prove that it was a temple of the Romans, but later writers of authority are generally agreed that it is of Druidical origin, although there are differences of opinion as to its probable date, some placing it at 100 years before Christ and others in the 5th century. It seems most probable that the inner circle and inner oval, constructed of smaller stones of granite, which must have been brought from a distance, is of earlier origin than the outer circle and oval.

Among numerous writings on Stonehenge may be mentioned Stonehenge and Abury, by Dr William Stukeley, 1740, reprinted in 1840; Davies's Celtic Researches, 1804, and Mythology of the Druids, 1809; Hoare's Ancient Wiltshire, vol. i., 1812; Browne, An Illustration of Stonehenge and Abury, 1823; the article on Stonehenge in the Quarterly Review for July 1860; Long's Stonehenge and its Barrows, 1876; Gidley, Stonehenge Viewed in the Light of Ancient History and Modern Ubserva- tion, 1877

STONE MASONRY. See Buizping, vol. iv. p. 468.

STONINGTON, a borough and seaport of the United States, in New London county, Connecticut, is situated on Long Island Sound, 139 miles from New York by the railway to Providence and Boston. It is built on a narrow rocky point, and is a quiet quaint-looking town, largely fre- quented as a summer watering-place. Its industries com- prise silk-throwing and the manufacture of silk machinery, and it has a considerable interest in sealing. Here and there may still be seen traces of the bombardment by the British under Sir Thomas Hardy in August 1814. The har. bour is protected by two breakwaters; it is the terminus of a daily line of steamers from New York. The popula- tion of the township was 6313 in 1870, and 7355 in 1880. Settled in 1649, the borough was incorporated in 1801.

STORACE, StrepHen (1763-1796), dramatic composer, was born in London in 1763. His father, Stefano Storace, an Italian contrabassist, taught him the violin so well that at ten years old he played successfully the most difficult music of the day. After completing his educa- tion at the Conservatorio di Sant' Onofrio at Naples, he produced his first opera, Gla

Sposi Malcontentt, at Vienna, in 1785. Here he made the acquaintance of Mozart, in whose iVozze di Ligaro his sister, Anna Selina Storace, first sang the part of Susanna. Here also he produced a second opera, Gli Hqguivoci, founded on Shakespeare's Comedy of Errors, and a " Singspiel" entitled Der Doctor und der Apotheker. But his greatest triumphs were achieved in England, whither he returned in 1787. After creating a favourable impression by bringing out his "Singspiel" at Drury Lane, under the title of Zhe Doctor and the Apothecary, Storace attained his first great success in 1789, in The Haunted Tower, a genuine English opera, which ran for fifty nights in succession, and retained its popularity long after the opening of the present century. No Song No Supper was equally successful in 1790; and The Siege of Belgrade scarcely less so in 1791. The music of The Pirates, produced in 1792, was partly adapted from Gli Equivoct, and is remarkable as affording one of the earliest instances of the introduction of a grand finale into an English opera. These works were followed by some less successful productions; but Zhe Cherokee (1794) and The Three and the Deuce (1795) were very favourably received, and the music to Colman's play, The Iron Chest, first performed March 12, 1796, created even a greater sensation than Zhe Haunted Tower. This was Storace's last work. He caught cold at the rehearsal, and died in consequence, March 19, 1796.

The character of Storace's music is pre-eminently English; but his early intercourse with Mozart gave him an immense advantage over his contemporaries in his management of the orchestra, while for the excellence of his method of writing for the voice he was no doubt largely indebted to the charming vocalization of his sister Anna. This lady, who has attained lasting honour as te original representative of Susanna in Le Nozze di Figaro, was born in London in 1766, completed her education at Venice under Sacchini, sang for Mozart at Vienna, and first appeared at the King's Theatre in London in 1787. After contributing greatly to the success of The Haunted Tower and her brother's later operas, she crowned a long and brilliant career by winning great laurels at

the Handel Commemoration at Westminster Abbcy in 1791, retired from public life in 1808, and died August 24, 1817. During her stay in Vienna

she married John Abraham Fisher, a celebrated ey, ce but he used her so cruelly that she refused to bear his

name, and in her will—bequeathing property to the amount of

£50,000—styled herself ‘‘ spinster.”

STORAX. It has been explained in INcENsE (vol. xii. p. 718) and LiquipaAMBAR (vol. xiv. p. 687) that the storax of commerce and the pharmacopceia (used as an emollient) is derived from the Oriental liquidambar tree. The storax of the ancients, on the other hand, a solid gum which does not now occur in commerce, appears to have been the product of the beautiful white-flowered shrub Styrax officinalis, which is still common on Carmel and elsewhere in Syria. It was much used as an incense, and formed an early and important article of Phoenician trade (see Movers, Phénizier, ii. 3.101, 223 sq.). It is probable that the Greek word orvpaég is of Semitic origin, represent- ing the Hebrew “y, which the English version renders “balm” (Lagarde, Mittheilungen, p. 234 sq.).

STORK (A.S8. Store ; Germ. Storch), the Ciconia alba of ornithology, and, through picture and story, one of the best known of foreign birds; for, though often visiting Britain, it has never been a native or even inhabitant of the country. It is a summer-visitant to most parts of the European continent,—the chief exceptions being France (where the native race has been destroyed), Italy, and Russia,—breeding from southern Sweden to Spain and Greece, and being especially common in Poland.’ It reappears again in Asia Minor, the Caucasus, Persia, and Turkestan, but further to the eastward it is replaced by an allied species, C’. boyciana, which reaches Japan. Though occasionally using trees (as was most likely its original habit) for the purpose, the Stork most generally places its nest on buildings,’ a fact familiar to travellers in Denmark, Holland, and Germany, and it is nearly everywhere a cherished guest, popular belief ascribing good luck to the house to which it attaches itself? Its food, consisting mainly of frogs and insects, is gathered in the neighbouring pastures, across which it may be seen stalking with an air of quiet dignity; but in the season of love it indulges in gestures which can only be called grotesque,—leaping from the ground with extended wings in a kind of dance, and, absolutely voiceless as it is, making a loud noise by the clattering of its mandibles. At other times it

may be seen gravely resting on one leg on an elevated place, thence to sweep aloft and circle with a slow and majestic flight. Apart from its considerable size,—and a Stork stands more than three feet in height,— its contrasted plumage of pure white and deep black, with its bright red bill and legs, makes it a conspicuous and beautiful object, especially when seen against the fresh green grass of a luxuriant meadow. In winter the Storks of Europe retire to Africa,—some of them, it would seem, reaching the Cape Colony,— while those of Asia visit India. _A-second species, with much the same range, but with none of its relative's domestic disposition, is the Black Stork, C. nigra, of which the upper parts are black, bril- liantly glossed with purple, copper, and green, while it is white beneath,—the bill and legs, with a patch of bare skin round the eyes, being red. This bird breeds in lofty , 1 In that country its numbers are said to have greatly diminished since about 1858, when a disastrous spring-storm overtook the home- ward-bound birds. The like isto be said of Holland since about 1860.

- To consult its convenience a stage of some kind, often a cartwheel,

is in many places set up and generally occupied by successive gener- ations of tenants.

3 Its common Dutch name is Ooijevaar, which can be traced through many forms (Koolmann, Wéorterb. d. Ostfries. Sprache, i. p. 8 sub voce '"Adebar") to the old word Odeboro (" the bringer of good"). In countries where the Stork is abundant it enters largely into popular tales, songs, and proverbs, and from the days of Alsop has been a favourite in fable.

trees, generally those growing in a large forest. Two other dark-coloured, but somewhat abnormal, species are the purely African C. abdimii, and the C. episcopus, which has a wider range, being found not only in Africa but in India, Java, and Sumatra. The New World has only one true Stork, C. maguari,* which inhabits South America, and resembles not a little the C. boyciana above mentioned, differing therefrom in its greenish-white bill and black tail. Both these species are very like C. alba, but are larger, and have a bare patch of red skin round the eyes.

The Storks form the Pelargi of Nitzsch, as separated by him from the Herons and the Ibises, but all three are united by Prof. Huxley in his group Pelargomorphe. The relations of the Storks to the Herons may be doubt- ful; but there is no doubt that the former include the JaBIRU (vol. xiii. p. 529) and its allies, as well as the curious genus Anastomus (with its lower mandible hol- lowed out so as only to meet the maxilla at the base and the tip), of which there are an African and an Asiatic species. Two other remarkable forms probably belong to the Pelargi. These are Baleniceps rex and Scopus

Shoe-Bill or Whale-Headed Stork. (After Wolf in Trans. Zool. Soc.)

umbretta, each the sole member of its own genus, and both from Africa. The former, first brought to Europe by Mr M. Parkyns from the White Nile, was regarded by Gould, who described it in the Zoological Proceedings (1851, pp. 1, 2, pl. xxxv.), as an abnormal Pelican. This view was disputed by Reinhardt (op. cit., 1860, p. 377), and wholly dispelled by Prof. Parker in the Zoological

4 This was formerly believed to have occurred in Europe, but errone- ously, as was shewn by Schlegel (Rev. Critique, p. 104). XXIL — 45

Transactions (iv. pp. 269-351), though these two authors disagreed as to its affinities, the first placing it with the Storks, the last assigning it to the Herons. In singularity of aspect few birds surpass Saleniceps, with its gaunt grey figure, some five feet in height, its large head sur- mounted by a little curled tuft, the scowling expression of its eyes, and its huge bill in form not unlike a whale’s head—this last suggesting its generic name—but tipped with a formidable hook. The shape of the bill has also prompted the Arabs to call it, according to their idiom, the “Father of a Shoe,” and it has been designated “Shoe-bill” in English! The other form that remains to be noticed is the Scopus wmbretta of ornithologists, called the “Umbre” by Pennant. This was discovered by Adanson the French traveller in Senegal about the middle of the last century, and was described by Brisson in 1760. It has since been found to inhabit nearly the whole of Africa and Madagascar, and is the ‘ Hammerkop” (Hammerhead) of the Cape

colonists. Though not larger than a Raven, it builds an enormous nest, some six feet in diameter, with a flat-topped roof and a small hole for entrance and exit, and placed either on a tree or a rocky ledge.2 The bird, of an almost uniform brown colour, slightly glossed with purple, and its tail barred with black, has a long occipital crest, generally borne horizontally, so as to give rise to its common name. It is somewhat sluggish by day, but displays much activity at dusk, when it will go through a series of strange performances. In all the Storks, so far as is known, the eggs are white, and in most forms distinguishable by the grain of their shell, which, without being rough, is closely pitted with pore-like depressions. (A. N.)

STORMS. See MrtEorooey, vol. xvi. p. 154.

STORY, Joseru (1779-1845), was born at Marble- head, Massachusetts, September 18, 1779, graduated at Harvard in 1798, and was admitted to the bar in Massa- chusetts in 1801. He was a member of the Democratic party, then weak in New England but all-powerful in the rest of the Union; and his district made him its repre- sentative in Congress for 1808-9. In 1811 one of the associate-justiceships of the United States supreme court became vacant, and Story was appointed to it, retaining the office for life. Here he found his true sphere of work. The traditions of the American people, their strong pre- judice for the local supremacy of the States and against a centralized government, had yielded reluctantly to the establishment of the federal legislative and executive in 1789. The federal judiciary had been organized at the same time, but had never grasped the full measure of its powers. Soon after Story’s appointment the supreme court began to bring out into plain view the powers which the constitution had given it over State courts and State legislation, The leading place in this work belongs to Chief-Justice John Marshall, but Story has a very large share in that remarkable series of decisions and opinions, from 1812 until 1832, by which the work was accom- plished. In addition to this he built up the department of admiralty law in the United States courts; and his Commentaries on the American Constitution are still the leading authority on the interpretation of that instrument. He died at Cambridge, Massachusetts, where he was the head of the Harvard law school, September 10, 1845.

See Story’s Life and Letters of Joseph Story; Story’s Miseel- laneous Works; Story’s Commentaries on the Constitution of the eee oe

1 Under one or other of these names it is meutioned by many African travellers ; but the best account of it is that given by Von Heuglin (Orn. Nordost-Afrika’s, pp. 1095-1099). In 1860 two living birds

were brought to England by Mr Petherick and exhibited in the Zoological Gardens.

® Two figures of the nest are given by Holnb and Von Pelzeln (Beitr. Orn. Siidafrikas, p. 279).

‘and librarian in 1817.

United States, and a great number of standard law-books of which he was the author. His supreme court decisions are in Cranch’g Wheaton’s, and Peters’s Reports; his circuit decisions in Gallison’s. Mason’s, Sumner’s, and Story’s Reports. :

STOTHARD, Cuartzes Aurrep (1786-1821), antiqua- rian draughtsman, son of Thomas Stothard, noticed below. was born in London on July 5, 1786. After studying i the schools of the Royal Academy, he began, in 1810, his first historical piece, the Death of Richard II. in Pomfret Castle. Having taken a strong interest from an early period in the costumes of different ages and nations, he published in 1811 the first part of his valuable work, The Monumental Kfigies of Great Britain. He was appointed historical draughtsman to the Society of Antiquaries, and was deputed by that body to visit Bayeux, to make draw. ings of the well-known tapestry. He was made a fellow of the society in 1819, and subsequently engaged in numer. ous journeys with the view of illustrating the works of D, Lysons. While engaged in tracing a portrait from one of the windows of the church of Beer-Ferrers, Devonshire, he fell and was killed on the spot (May 27, 1821). His widow (afterwards Mrs Bray), along with her brother, completed his Monumental Efigzes, left unfinished at his death. A biography, by his widow, was published in 1823.

STOTHARD, Tuomas (1755-1834), subject painter, was born in London on August 17, 1755, the son ofa

well-to-do innkeeper in Long Acre. Being a delicate child,

he was sent at the age of five to a relative in Yorkshire, and attended school at Acomb, and afterwards at Tad castle and at Ilford in Essex. Showing a turn for draw- ing he was apprenticed to a draughtsman of patterns for brocaded silks in Spitalfields, and during his leisure hours he attempted illustrations to the works of his favourite poets. Some of these drawings were praised by Harrison, the editor of the Wovelist's Library, and, Stothard's master having died, he resolved to devote himself to art. In 1778 he became a student of the Royal Academy, of which he was elected associate in 1791, full academician in 1794, He married before he was thirty ; and it is recorded that, after attending the wedding ceremony, he spent the afternoon in quietly drawing in the schools, and, on leaving, requested a fellow student to accompany him ''to a family party." 'Do come," he said, "for I have this day taken unto myself a wife." He died in London on the 27th of April 1834.

Among his earliest book illustrations are plates engraved for Ossian and for Bell's Poets; and in 1780 he becaine a regular con- tributor to the Novelist's Library, for which he executed one hundred and forty-eight designs, including his eleven admirable illustrations to Peregrine Pickle and his graceful subjects from Clarissa and Sir Charles Grandison. Soon his hands were full of work, for all commissions were welcome to him. He contentedly designed plates for pockct-books, tickets for concerts, illustrations to almanacs, portraits of popular players,—and into even the slightest and most trivial sketches he infused a grace and distine- tion which render them of value to the collectors of the present time. Among his more important series are the two sets of illustra- tions to Robinson Crusoe, and the plates to The Pilgrim's Progress (1788), to The Rape of the Lock (1798), to the works of Gessner (1802), to Cowper's Poems (1825), and to The Decameron; while his figure-subjects in the superb editions of Roger's Jtaly (1830) and Poems (1834) prove that even in latest age his fancy was still unexhausted and his hand hardly at all enfeebled. He is at his best in subjects of a domestic or a gracefully ideal sort; the heroic and the tragic

were beyond his powers. The designs by Stothard have been estimated by Mr Wornum to number five thousand, and of these about three thousand have been engraved. His oil pictures are usually small in size, and rather sketchy in handling. Their colouring is often rich and glowing, being founded upon the prac- tice of Rubens, of whom Stothard was a great admircr. He was 4 contributor to Boydell's Shakespeare Gallery, but his best-known painting is the Procession of the Canterbury Pilgrims, the engravm, from which, begun by Schiavonetti and finished by Heath, attaine an immense popularity. It was followed by a companion work, the Flitch of Bacon, which was drawn in sepia for the engraver, but was never carried out in colour. d

In addition to his easel pictures. Stothard adorned the gran

staircase of Burleigh Housc with subjects of War, Intemperance, and the Descent of Orpheus in Hell (1799-1803); the mansion of Hafod, North Wales, with a series of scenes from Froissart and Monstrelet (1810) ; the cupola of the upper hall of the Advocates' Library, Edinburgh (now occupied by the Signet Library), with Apollo and the Muses, and figures of poets, orators, &c. (1822) ; and he prepared designs for a frieze and other decorations for St James's Palace. He also designed the magnificent shield pre- sented to the duke of Wellington by the merchants of London, and executed with his own hand a series of eight etchings from the various subjects which adorned it.

An interesting, but most indiscriminately eulogistie biography of Stothard, by his daughter-in-law Mrs Bray, was published in 1851.

STOURBRIDGE, a market-town of Worcestershire, England, stands on an eminence on the south bank of the Stour, and on the Great Western Railway, on the borders of Staffordshire, 4 miles south-west of Dudley and 10 west of Birmingham. A branch canal connects the town with the Staffordshire and Worcestershire Canal. The Stour is crossed by a railway viaduct erected in 1882 at a cost of £13,835. The town possesses a corn exchange, a mechanics' institute, an Edward VI. grammar school, a Government school of art, and a blue-coat or hospital school. The manufacture of glass was

established in 1556 by emigrants from Hungary, the place where they erected their manufactory being still known as Hungary Hill. Valuable fire-clay is obtained in the neighbourhood, and a great variety of fine bricks are made. There are also large iron and leather works. ‘The town was originally called Bedcote, a name which the manor still retains. The population of the urban sanitary district (area 450 acres) in 1871 was 9376, and in 1881 it was 9757.

STOVES anp FIREPLACES are structures of iron and other materials in which fuel is burned for heating and ventilating apartments and for cooking food. Follow- ing the primitive open hearth, the first separate heating apparatus used by Egyptians, Greeks, and Romans was the brazier, an open basin of metal in which charcoal was consumed. The brazier is still in common use for industrial purposes, and in Continental countries it is widely employed both for cooking and for domestic heating. The Romans further were acquainted with the hypocaust, a separate chamber under the floor of the apartment to be heated (see Barus, vol. iil. p. 434). In an improved form of hypocaust, flues were provided which conveyed the heat and products of combustion to the floors of other apartments at some distance from the fire. In the remains of Roman villas found in Britain the hypocaust is an invariable feature. The introduction of chimneys into houses in the early part of the 14th century opened the way to all modern improvements in the heating arrangements of apartments, and the efforts of inventors have been devoted to the securing of the thorough combustion of the fuel used, and to the utilization of the maximum amount of heat therefrom in the most healthful and agreeable manner. Compare SMokE ABATEMENT.

The stove or close range, as distinguished from the open fire- place, distributes the largest amount of heat from the fuel it burns. In its simplest form the common stove consists of a case of iron, closed above, with its sole raised from the floor on which it stands. It has two small openings in one side, one on the level of the fire- bars for draught, and the other above for supplying fuel; and on the opposite side the products of combustion are carricd away by a flue-pipe passing into a chimney. In a more complex form the height of the case or body is increased, and a series of horizontal flues or spaces are formed inside, through which the heated air and smoke pass,

thus extracting more thoroughly the heat before it enters the chimney, and giving a greatly increased heating surface. Such stoves overdry the air in rooms, and, when they are externally heated to ahigh degree, floating particles are burned by falling on their surfaces, whence arises the disagreeable stuffy smell almost inseparable from their use. To mitigate this evil of overheating, linings of tiles, firebricks, and other non-conducting materials are with great advantage introduced between the heated iron and the air of the apartment. In ventilating stoves the outside casing of Iron is entirely protected from the direct action of fire by a lining of firebrick. The inside is divided into several spaces or flues, and

_ grates made entirely of iron.

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air drawn from without enters by a separate flue, and passing through these spaces is heated and delivered into the apartment as a warm current. In another class, of which the gill stove is the type, there radiates from the fire-case a range of flanges or gills a few inches apart, which conduct the heat outwards and enormously extend the heating surface, counteracting at the same time the tendency to overheating. Cooking stoves or ranges have in their centre a fire space covered above with a removable top-plate, in which are circular openings whereby the cooking vessels can be brought into direct contact with the fire. At both sides there arc one or more compartments which form ovens, and around these the heat from the fire is carried by flues; or at onc side a water boiler may be placed, although generally a high-pressure boiler occupics a spacc Immediately behind the fire. The flues which pass around all these spaces, and that also leading directly to the chimney, are controlled by dampers, so that the heat can be directed along any desired course.

Both as a heating and cooking agent coal gas is now being largely used, and many forms of stoves have been devised to meet its peculiar conditions as a gaseous fuel, Gas stoves present the obvious advantages of cleanliness, comparative freedom from smoke, and immediate readiness for use; and the flame and heat are under the most perfect control. Gas is used in open fireplaces as well as in stoves, a most cflicient open heating arrangement being that deviscd by the late Sir Chas. W. Siemens, in which a combined

fire of charcoal and coal gas is made. Small lamp stoves for burning mineral oils are also in use ; but they share the serious disadvantage of certain simple gas stoves, from which the whole pro- ducts of combustion pass into the room in which they are placed.

Fireplaces are cntirely open in front ; they radiate heat into the apartment ; aud flame, smoke, &c., pass direct into the chimney, The rapid passage of the heated air into the chimney carries away a large proportion of the heat, and this loss is particularly great in In modern grates of good quality the sides and back of the fire-basket are of fire-brick, which retains and throws out much heat. In slow-combustion grates the fire-basket is sct low on the hearth, and air is admitted to the fuel only through the fire-bars in front. The back of the grate slopes in towards the hearth, where the fire space is comparatively narrow. By means of a door sliding down over the front from the upper part of the grate, the indraught of air can be modified at pleasure, In ventilating fireplaces the fire-basket is of iron lined with fire- brick, and in the space between the back of the grate and the wall flues are formed which are heated from the fire. Into these flues air from without is introduced, which, after being there warmed, passes into the apartment at suitable openings.

STOW, Joun (1525-1605), historian and antiquary, was the son of Thomas Stow, a tailor, and was born in London, in the parish of St Michael, Cornhill, in 1525. His parents do not appear to have been rich, for his father’s whole rent for his house and garden was only 6s. 6d. a year, and Stow himself in his youth went every morning to fetch the milk for the family from a farm belonging to the nunnery of Minories. He learned the trade of his father, but possibly did not practise it much after he grew up to manhood. In 1549 he “kept house” near the well within Aldgate, but afterwards he removed to Lime Street ward, where he resided till his death. His first publication was A Summary of Englische Chronicles in 1561, which was frequently reprinted, with slight variations, during his lifetime. Of the first edition a copy was said to have been at one time in the Grenville library. In the British Museum there are at present copies of the editions of 1567, 1573, 1587, 1590, 1598, and 1604. Stow having in his dedication of 1567 referred to the rival publication of Richard Grafton in contemptuous terms, the dispute between them became extremely embittered. Stow’s anti-

quarian tastes brought him under ecclesiastical suspicion asa person “ with many dangerous and superstitious books in his possession,” and in 1568 Grindal, bishop of London, caused his study to be searched. An inventory was taken of certain books he possessed ‘in defence of Papistry,” but he was apparently able to satisfy his interrogators of the soundness of his Protestantism. A second attempt to incriminate him in 1570 was also without result. In 1580 Stow published his Annales, or a Generale Chronicle of England from Brute until the present yeare of Christ 1580; it was reprinted in 1592, 1601, and 1605, the last being continued to the 26th March 1605, or within ten days of

his death ; editions “‘amended” by Howes appeared in 1615 and 1631. The work by which Stow is best known is his Survey of London, published in 1598, not only interesting from the quaint simplicity of its style and its amusing descriptions and anecdotes, but of unique value from its minute account of the buildings, social condition, and customs of London in the time of Elizabeth. A second edition appeared in his lifetime in 1608, a third with addi- tions by Anthony Munday in 1618, a fourth by Munday and Dyson in 1633, a fifth with interpolated amendments by Strypein 1720, and a sixth by the same editor in 1754. The edition of 1598 was reprinted, edited by W. J. Thoms, in 1842, in 1846, and with illustrations in 1876. Through the patronage of Archbishop Parker Stow was enabled to print the (lores Historiarum of Matthew of Westminster in 1567, the Chronicle of Matthew Paris in 1571, and the Historia Brevis of Thomas Walsingham in 1574. At the request of Parker he had himself compiled a “ farre larger volume,” but circumstances were unfavourable to its publi- cation and the manuscript is now lost. Additions to the previously published works of Chaucer were twice made through Stow’s “own painful labours ” in editions of 1561 and 1597. A number of Stow’s manuscripts are in the Har- leian collection in the British Museum. Some are in the Lambeth Library (No. 306); and from the volume which includes them were published by the Camden Society, edited by James Gairdner, Three Pifteenth-Century Chron-

acles, with Historical Memoranda by John Stowe the Anti—

quary, and Contemporary Notes of Occurrences written by him (1880). Stow's literary labours did not prove very remunerative, but he accepted poverty in a cheerful spirit. Ben Jonson relates that once when walking with him Stow jocularly asked two mendicant cripples ‘‘ what they would have to take him to their order.” This favour he, however, obtained from King James, who in March 1604 authorized him and his deputies to collect ‘amongst our loving sub- jects their voluntary contributions and kind gratuities,” and himself began “ the largesse for the example of others.” If the royal appeal was successful Stow did not live long to enjoy the increased comfort resulting from it, as he died on the 6th April following. He was buried in the church of St Andrew Undershaft, where the monument erected by his widow, exhibiting a terra-cotta figure of him, still remains.

STOWELL, Wirt1am Scott, Baron (1745-1836), one of the ablest and most accomplished of English judges, especially in international law, was born at Heworth, a village about four miles from Newcastle, on 17th Octo- ber 1745. His father was a “ coalfitter” (or tradesman engaged in the transport of coal); his mother was the daughter of a small tradesman, Atkinson by name; his younger brother John became the famous Lord Chancel- lor Expon (¢.v.). Scott was educated at the Newcastle grammar school under the able tuition of the Rev. Hugh Moises. In February 1761 he gained a Durham scholar- ship at Corpus Christi College, Oxford, and was imme- diately admitted as a student of the university. In 1764 he graduated as bachelor of arts, and became first a pro- bationary fellow and then—as successor to William (after- wards the well-known Sir William) Jones—a tutor of University College. In 1767 he took his M.A. degree. In 1772 he graduated as bachelor of civil law. As Camden reader of ancient history he rivalled the reputation of Black- stone (1774). Although he had joined the Middle Temple in 1762 (June 24), it was not till 1776 that Scott devoted himself to a systematic study of law. In 1779 (June 23) he graduated as doctor of civil law, and, after the customary “year of silence,” commenced practice in the ecclesiastical courts. His professional success was rapid. In 1783 he became registrar of the Court of Faculties, and

in 1788 judge of the Consistory Court and advocate. general, in that year too receiving the honour of knight. hood ; and in 1798 he was made judge of the High Court of Admiralty. Sir William Scott twice contested the representation of Oxford university,—in 1780 without success, but successfully in 1801. He also sat for Downton jn 1790. Upon the coronation of George IV. (1821) he was raised to the peerage as Baron Stowell. After a life of distinguished judicial service Lord Stowell retired from the bench,—from the Consistory Court in August 182], and from the High Court of Admiralty in December 1827. His mental faculties became gradually feebler in his old age, and he died on January 28, 1836. Lord Stowell was twice married,—on April 7, 1781, to Anna Maria, eldest daughter and heiress of John Bagnall of Early Court, Berks, and on April 10, 1813, to the dowager marchioness of Sligo. By his first marriage he had four children, of whom two (a son and a daughter) died in infancy, a third (a son) died unmarried in middle life, while the eldest (a daughter) was twice married and sur- vived her father.

Lord Stowell's judgments are models alike of literary execution and of judicial reasoning. His style is chaste yet not inornate, nervous without abruptness, and perfectly adjusted in every instance to the subject with which he deals. His decisions in the cases of Dalrymple v. Dalrymple (Dr Dodson's Report) and Evans v. Evans (1 Hagg., 35)—from their combined force and grace, from the steadiness with which every collateral issue is set aside, from their subtle insight into human motives, and from the light which they cast on the philosophy and dark history of marriage law—deserve and will repay attentive perusal, Lord Stowell composed with great care, and some of the MSS. which he revised for Haggard and Phillimore's Reports were as full of interlineations as a bill of the Lower House corrected by the Lords. Stowell's mind was judicial rather than forensic,—reasoning, not as for a dialectic victory nor so as to convince the parties on whose suit he was deciding, but only with sufficient clearness, fulness, and force to justify the decision at which he had arrived.

The chief doctrines of international law with the assertion and illustration of which the name of Lord Stowell is identified are these :—the perfect equality and entire independence of all states (Le Louis, 2 Dod., 243)—a logical deduction from the Austinian philosophy and still one of the fundamental principles of English Jurisprudence ; that the elementary rules

of international law bind even semi-barbarous states (Hurtige Hans, 2 Rob., 325); that blockade to be binding must be effectual (The “ Betsey,” 1 Rob., 98); that there cannot bea legal where there is no actual blockade; and that contraband of war is to be determined by “ probable destina- tion” (The “Jonge Margaretha,” 1 Rob., 189). In the famous Swedish convoy case (The “ Maria,” 1 Rob., 350; see too The “Recovery,” 6 C. Rob., 348-9) Lord Stowell, in defiance of the complaints of those greedy merchants who, as Pufendorf, himself by choice a Swedish civilian, tells us, cared not how things went pro- vided they could but satisfy their thirst of gain, asserted that “a prize court is a court not merely of the country in which it sits but of the law of nations.” ‘The seat of judicial authority,” he added, in words which have become classic, ‘‘is indeed locally here, in the belligerent country, but the law itself has no locality.”

The judgments of Lord Stowell were, almost without excepton, confirmed on appeal, are to this day the international law of England, and have become presumptive though not conclusive evidence of the international law of America. “I have taken care, wrote Justice Story, “ that they shall form the basis of the maritime law of the United States, and I have no hesitation in saying that they ought to do so in that of every civilized country in the world.

See Townsend, Lives of Twelve Eminent Judges, vol. ii.; Quarterly Review, yol, Ixxv.; W. E. Surtees, Skeich of Lords Stowell and Eldon; Creasy, First Platform of International Law; Decisions, by Dodson and Haggard.

STRABISMUS. See OpHTHaLmozoey, vol. xvii. p. 785.

STRABO, the famous geographer and historian, was born at Amasea in Pontus, a city which had been Hellenized toa great extent. Of his father’s family we know nothing; but several of his mother’s relations, who were probably Greeks, had held important posts under Mithradates Euer- getes and his famous son Mithradates Eupator. Dorylaus, a distinguished general of Mithradates Euergetes, was the great-grandfather of Strabo’s mother. After the murder of that king, Dorylaus, who at that time was collecting mercenaries in Crete, where he had obtained the command

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~ in a successful war of the Cnossians against Gortyn, settled – at Cnossus. By Sterope, a Macedonian, he had a daughter and two sons,—Lagetas and Stratarchus. Dorylaus had a brother Phileteerus, whose son Dorylaus was brought up – with Mithradates Eupator. This king, at the instance of his friend invited back to Pontus the family of Dorylaus, who was himself now dead, as was also his son Lagetas. Strabo saw Stratarchus in extreme oldage. The daughter of Lagetas was the mother of Strabo's mother. Moaphernes, an uncle of Strabo's mother, probably on the father's side, was governor of Colchis under Mithradates Eupator. His mother's father must have held an important position, for, seeing the impending downfall of the king, and also in anger against him for having put to death his kinsmen Tibius and Theophilus, he handed over fifteen forts to Lucullus. In spite of this, with the ruin of the king the fortunes of the family fell, since Pompey refused to ratify the rewards promised by Lucullus.

Life.—Though the exact date of Strabo's birth is unknown, a close approximation is possible. Clinton places it not later than 54 8.c. The most probable date lies between 64 and 62, since he speaks of certain events occurring at the former as "a little before my time," whilst he describes an occurrence in the latter year as "in my own time," phrases which he uses elsewhere with great exactness in speaking of persons and events. He received | a good education in the Greek poets, especially Homer ; he studied at Nysa under the grammarian Aristodemus, under Tyrannio the grammarian at Rome, under the philosopher Xenarchus either at Rome or Alexandria, and he had studied Aristotle along with Boethus (possibly at Rome under Tyrannio, who had access to the Aristotelian writings in Sulla's library). It is to be noted that from none of those teachers was he likely to learn mathematics or astronomy. He was at Corinth in 29 B.c., where he saw Octavian on his return from Egypt to celebrate his triumph for Actium. He was in Egypt in 24 B.c., and took the opportunity of ascending the Nile in company with the prefect A'lius Gallus. He was at Rome after 14 A.D., for he describes (v. 236) as an eyewitness the place where the body of Augustus was burnt in the Campus. He was still writing in 21 a.p. The date of his death is unknown. Strabo's statement that he saw P. Servilius Isauricus has caused some difficulty. This Servilius died at Rome in 44 B.c. at an advanced age. Some suppose that Strabo confused him with P. Servilius Casca, also called Isauricus, or some other distinguished Roman

whom he had seen in Asia, but by his words he clearly means the conqueror of the Isaurians. This difficulty only arises from an entirely unwarranted assumption that Strabo was on his way to Rome for the first time in 29 B.C. We have seen that he studied under Tyrannio in that city; if he did so after 29 B.c. Tyrannio must have _ been very old, which Strabo would probably have men- tioned, as he does in the case of Aristodemus. Although he had seen a comparatively small portion of the regions which he describes, he had travelled much, as he states himself ; “Westward I have journeyed to the parts of Etruria opposite Sardinia; towards the south from the Euxine to the borders of Ethiopia; and perhaps not one of those who have written geographies has visited more _ places than I have between those limits. For those who have gone farther west have not gone so far eastward, and the case is the same with the regions between the northern and southern limits.” The fulness of his descrip- tion in certain places, contrasted with the meagreness and maccuracy in others, seems to indicate that in the former cases he had actually visited the places, but that he is | dependent on second-hand information for the latter. He

and Philz, Comana in Cappadocia, Ephesus, Mylasa, Nysa and Hierapolis in Phrygia, Gyarus, and Populonia. Of Greece proper he saw but little; he visited Corinth, Athens, Megara, and places in their vicinity, and perhaps Argos, although he was not aware that the ruins of Mycenz still existed; he had seen Cyrene from the sca, probably on his voyage from Puteoli to Alexandria. He remained at the latter place a long time, probably amassing materials, and studying astronomy and mathematics. For nowhere could he have had a better means of consulting the works of historians, geographers, and astronomers, such as Eratosthenes, Posidonius, Hipparchus, and Apollodorus. When and where he went from Egypt we know not. It has been commonly assumed that he returned home to Amasea. For this there are no grounds. Probabilities are in favour of his having returned to Rome, where he undoubtedly resided in his old age. The place of his death is unknown; but, since we find him at Rome in what must in the course of nature have been the closing years of his life, it is not unreasonable to suppose that there he died. Various passages in his work indicate that he held by the Stoic rule.

Works.—His earliest writings were two (not one, as commonly stated) historical works now lost, which he himself describes (xi. 515) as his Hestorical Memoirs and his Continuation of Polyhius. There can be no doubt but that these were two distinct works ; for he speaks (ii. 70) of having treated of the exploits of Alexander in his Memoirs, a topic which could not have found a place in a work which began where that of Polybius ended (146 B.c.). According to Suidas, the continuation of Polybius was in forty-three books. Plutarch, who calls him " the Philosopher," quotes Strabo's Memoirs (Luc., 28), and cites him as an historian (Sud/a, 26). Josephus, who constantly calls him "the Cappadocian," often quotes from him, but does not mention the title of the work.

The Geography is the most important work on that science which antiquity has left us. It was, as far as we know, the first attempt to collect all the geographical knowledge at the time attainable, and to compose a general treatise on geography. It must not be regarded as nothing more than a new edition of Eratosthenes. In general outline it follows necessarily the work of the last-named geographer, who had first laid down a scientific basis for geography on which his successors could not help building. Strabo made considerable alterations, but not always for the better. The three books of the older work formed a strictly technical geographical treatise. Its small size prevented it from containing any such general description of separate countries as Strabo rightly conceived to fall within the scope of the geographer. "Strabo indeed appears to be the first who conceived a complete geo- graphical treatise as comprising the four divisions of mathematical, physical, political, and historical geography, and he endeavoured, however imperfectly, to keep all these objects in view." Moreover, the incidental historical notices, which are often of great value and interest, are all his own. These digressions at times interrupt the sym- metry of his plan; but Strabo had all the Greek love of legendary lore, and he discusses questions relating to the journeyings of Heracles as earnestly as if they were events within recent history. He regarded Homer as tlie source of all wisdom and knowledge, and consequently accepted the Homeric geography in its entirety, as needing only proper explanation for the removal of all difficulties. On the other hand, he treats the work of Herodotus with undeserved contempt, and classes him with Ctesias and

other “marvel-mongers”; and yet in some respects Herodotus had better information—for instance, in regard

tells us that he had seen Egypt as far south as Syene| to the Caspian—than that possessed by Strabo himself.

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Again, Strabo may be censured for discarding the state- ments of Pytheas respecting the west and north of Europe, accepted as they had been by Eratosthenes. But in this he relied on Polybius, whom he might justly consider as having from his position at Rome far better means of gaining accurate information about those regions. A critical sagacity far stronger than that of Strabo might well have erred at a time when the data for forming accurate judgments on such questions were so meagre and chaotic. It must be admitted that the statements of Pytheas did not accord with the theory of Strabo just in those very points where he was at variance with Erato- sthenes. He showed likewise an unwarranted scepticism in reference to the island of Cerne on the west coast of Africa, which without doubt the Carthaginians had long used as an emporium. Strabo has been censured for not making a greater use of Roman authorities. Although the Roman arms had opened up much of the north and west, he follows the Greek writers almost exclusively in his description of Spain, Gaul, Britain, Germany, and even Italy. For, although he refers to Cesar’s Commentaries once by name, and has evidently made use of them in other passages, he but imperfectly availed himself of that work. He designed his geography as a sequel to his his- torical writings, and it had as it were grown out of his historical materials. Such materials were chiefly Greek. We cannot wonder if a man who at an advanced age has commenced a new work utilizes his old material, and has not the energy to undertake fresh researches. Again, if Strabo amassed his material in the library of Alexandria, Greek authorities would naturally furnish the great bulk of his collections. This involves the questions—When and where did he compose the work? He began it probably later than 9 s.c. For he says that, just as Alexander had opened up knowledge of the East, so the Roman arms had now opened up the geography of the West as far as the Elbe. This Drusus accomplished in 9 B.c. Strabo was still engaged on the work, or certain parts of it, in 19 a.p.,

for he mentions in the fourth book the conquest of the Taurisci as having taken place thirty-three years before ; he also speaks, in the sixth book, of Germanicus, who died in 20 a.p., as still alive, and in the seventeenth book he speaks of the death of Juba II. (21 a.p.) as a recent event. As it is not probable that he wrote for the first time all of his work except the first three books between 19 and 21 A.D., we must not make use of these passages as data for determining the date of composition of the whole work, or even of particular books, but rather ought we to regard them as insertions. Strabo, as already pointed out, was at Rome after the death of Augustus (14 a.D.); in book vii. 290 and in book xiii. 609 he uses the terms “here” and “hither” in reference to Rome. It may be inferred from these passages that Strabo certainly revised, if he did not write, the entire work at Rome. If he returned to Rome after a long sojourn in Alexandria, this explains the de- fectiveness of his information about the countries to the east of his native land, and renders it possible for him to have made use of the chorography of Agrippa, and to have obtained the few incidents from Roman sources which here and there appear in his work.

He designed the work for the statesman rather than for the student. He therefore endeavours to give a general sketch of the character, physical peculiarities, and natural productions of each country, and consequently gives us much valuable information respecting ethnology, trade, and metallurgy. It was almost necessary that in such an attempt he should select what he thought most important for description, and at times omit what we deem of more importance. With respect to physical geography, his work is a great advance on all preceding ones. Judged

by modern standards, his description of the direction of rivers and mountain-chains seems defective, but allowance must be made for difficulties in procuring information, and for want of accurate instruments. In respect of mathematical geography, his want of high scientific train. ing was of no great hindrance. He had before him the results of Eratosthenes, Hipparchus, and Posidonius. The chief conclusions of astronomers concerning the spherical figure and dimensions of the earth, its relation to the heavenly bodies, and the great circles of the globe—the equator, the

ecliptic, and the tropics—were considered ag well established. He accepted also the division into five zones ; he quotes approvingly the assertion of Hipparchus that it was impossible to make real advances in geography without astronomical observations for determining lati-

tudes and longitudes.

The work consists of seventeen books, of which the seventh is imperfect. The first two books form a general introduction; the next ten deal with Europe, the four following with Asia, and the last with Africa. The first two books are meant to comprise a general survey of the progress of geography from the earliest times down to his own day. Unmethodical though they are, we owe to these books almost all we know of the geographical systems of his predecessors, especially that of Eratosthenes. Unfortunately he contents himself with disjointed criticism of detail instead of giving us an orderly statement of the previous systems. ‘The first book begins with his claim to have geography regarded as a branch of philosophy, and he supports this elaim by enumerating the philo. sophers who have studied it, beginning from Homer, as proofs of whose knowledge he adduces his acquaintanee with the Ocean, the Ethiopians, and the Seythians. This discussion of Homer’s geogta- phy takes up more than half the book. Passing over the early geo- graphers, not even mentioning Herodotus, he censures Eratosthenes for using unreliable authorities, and for casting doubts on the voyages of Jason and other early navigators. He next criticizes the physical views of Eratosthenes concerning the changes in the ails surfaee, and especially the hypothesis, adopted from Strato, that by sudden disruptions of land the Euxine and Mediterranean had become united to the ocean, and had sunk to their present level, which theory they supported by pointing to sea shells at places high above the sea. This doctrine Strabo rightly rejected, and referred sueh phenomena to those changes which with constant operation produce subsidences and elevations of the land ; and he quotes many instances of places engulfed by earthquakes, the disappearance of some islands, and the appearing of others. Hence he thinks it possible that even Sieily has been thrown up by the fires of Etna. Sir ©. Lyell eulogizes Strabo’s geological speculations for a soundness of view very unusual on sueh subjects amongst the ancients. Examining the second book of Eratosthenes, he discusses the length and

breadth of the inhabited world, and its division into three continents. He blames Eratosthenes for believing Pytheas, and denies tle existence of Thule, consequently rejecting the latitude assigned to it by Eratosthenes, who had taken it as the northernmost limitof the inhabited world. Strabo holds Ierne (Ireland), which lies north of Britain, to be the farthest land in that direction, and brings the northern limit much farther south. As he adopts Eratosthenes's southern limit,—that through the Cinnamon Region and Taprobane (Ceylon),—it follows that in his view Eratosthenes had made the inhabited world too broad. As the Greeks assumed that the world was twice as long as it was broad, Eratosthenes accordingly had made it too long likewise ; but, though Strabo shortens it on the west, there is no material difference between him and Eratosthenes. In this con- nexion he gives his remarkable speculation that, as the inhabited world was only one-third of the globe's circumference, there might be two or more inhabited worlds besides. In the second book he discusses the ehanges introduced by Eratosthenes, and rightly defends him from the attaeks of Hipparchus. He adopts for Asia the map of Eratosthenes as a whole, for little additional knowledge had been gained in the interval. He even still regards the Caspian as opening into the Northern Ocean, as stated by Patrocles. In the general outline of Africa he makes no change, but he rejects the statement of Eratosthenes about Cerne. It is with respect to western and northern Europe that Strabo had knowledge denied to Eratosthenes. Roman conquest had opencd up many places and peoples, yet his general map of Europe is inferior to that of his predecessor. After discussing the "seals" of Eratosthenes, he considers the views of Posidonius and Polybius, and recounts the voyages of Eudoxus of Cyzicus. Then having dealt with the division into zones, due to Parmenides, he states his own Views, discussing briefly the mathematical geography: the earth 18 spherical and placed in the centre of the universe ; he assumes five zones, and the circles on the sphere —the equator, the ecliptic oF

zodiac, the tropics, and the arctic circles ; he assumes the earth's circumference as given by Eratosthenes, 252,000 stades (= 25,200 geographical miles), and his division of the great eircle into sixtieth parts; the habitable world, the geographer's proper province, shaped like a

chlamys, occupies a quadrilateral space in the northern hemi- sphere, filling little more than one-third of the north temperate zone ; its maximum length is 70,000 stades, its breadth less than 30,000 stades. Whilst correcting the error by which his predecessors placed Massilia and Byzantium in the same latitude, he falls into an equal mistake by placing the former city two degrees south, instead of two degrees north of Byzantium. As Massilia is his cardinal point for measurements, this error distorts his whole map of the Mediterranean and western Europe, the mouths of the Rhine and Danube being in the same latitude. He next gives directions for making a plane map of the world, as a globe of sufficient size, like that of Crates, is too cumbrous. All lines that are circles on a globe must be straight lines on the map. Before describing each country in detail, he gives a general sketch of the habitable world with reference to seas, continents, and peoples, and explains the doctrine of climate and of the shadows projected by objects in consequence of the sun's varying position with respeet tothem. In the third book, starting from the Straits, he begins his description with Iberia, which he likens in shape to a bull's hide. His chief authorities were Artemidorus, whom he uses for the coasts of the Mediterranean and ocean generally, Eratosthenes, Posidonius, Polybius, Pherecydes, Timosthenes, Asclepiades, Myrleanus, and Dicearchus. He gives a valuable aceount of the Roman administrative system, probably gained from his own inquiries, also of the native tribes, of the mines and methods of mining, and of the remains of the Greek and Pheenician settle- ments; he describes the Balearic Isles, following Artemidorus, and at the end of the book mentions the Cassiterides, which he seems to have identified with the Scilly Isles, poy erroneously, and describes their inhabitants as wearing long black garments, and walking about with long wands in their hands, looking like the Furies of tragedy. It is remarkable that he has no notion of the proximity of the Tin Islands to Britain, but treats them in connexion with Spain. The fourth book deals with Gaul in its fourfold division under Augustus, gives a meagre account of Britain, its trade and relations with Rome, and mentions Ireland, the natives of which were said to be cannibals and to hold their women in common, and finally treats of the Alps. His authorities were Posidonius, who had travelled in Gaul and Britain, Artemidorus, Ephorus, Timagenes, Aristotle, Polybius, Asinius Pollio, and Cesar. For Britain Pytheas, as quoted by others, furnished some important details. His description of Gallia Narbonensis is fuller than that of the rest of Gaul. He mentions the

four great Roman roads converging at Lyons, prob- ably following the chorography of Agrippa. He conceives the Pyrenees as running north and south, and parallel to the Rhine, aud Britain as lying north of Gaul, extending from the Pyrenees to the Rhine's mouths. Of the Alpine region he gives an excellent description. He undoubtedly must have gathered much informa- tion for this book at Rome. The fifth and sixth books contain an accurate description of Italy and the adjacent islands. Besides his own observation he used Eratosthenes, Polybius, Artemidorus, Ephorus, Fabius Pictor, Coelius, Antiochus of Syracuse for south- ern Italy, and the ''chorographer," who was certainly a Roman, as he gave his distances in miles, and who probably was Agrippa, the chief objection to such an authorship being the wrong assump- tion that Strabo was not in Italy after 24 B.c., whilst Agrippa's work was not published until after his death 12 p.c. The sixth book ends with a short but valuable sketch of the extent and con- dition of the Roman empire. The seventh comprises northern and eastern Europe, both north and south of the Danube, Illyricum, Pannonia, Dalmatia, the coast of Thrace and the Euxine, and Epirus. The part which dealt with Macedonia and Thrace is only known to us from the epitomes. We do not know his authorities for the German tribes, but he probably used Roman materials. For the other northern tribes he had Posidonius, whilst for the region south of the Danube he had Aristotle's lost work on Polities, Polybius, Posidonius, Theopompus, and Ephorus. The eighth, uinth, and tenth books contain his description of the mainland of Greece and the islands, which he treats rather as an antiquarian than a geographer, using chiefly, besides Homer, Apollodorus, Demetrius of Scepsis, Ephorus, and Endoxus. Personally he had but little knowledge. With the eleventh begins Asia. © Divided from Europe by the Don, it is split up into two large masses by the Taurus. Beginning with the region bounded by the Taurus,

aspian, and Euxine, he next describes the part east of the Caspian, then those south of the Caucasus, Media, and Armenia. His authorities are Artemidorus, Eratosthenes, Theophanes, Herodotus, Apollodorus of Artemita, Patrocles, Metrodorus of Scepsis,

ypsicrates of Amisus, Posidonius, and Aristobulus. In the twelfth he describes Asia Minor, basing his description on oral Information, personal

observation, and the Greek writers. In the thirteenth he continues with Asia Minor, devoting mucli space to

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| the Troad, his sources being Demetrius, Menecrates, and the

Greek mythographers. With the fourteenth he ends Asia Minor and the islands lying off it, using, in addition to the authorities for the last, Pherecydes, Thucydides, Anaximenes of Lampsacus, Herodotus, Ephorus, Artemidorus, Eratosthenes, and Posidonius. The fifteenth deals with India and Persia, giving much valuable information from Patrocles, Aristobulus, Nearchus, the historians of the campaigns of Alexander and Seleucus, and with reserve from Megasthenes, Onesicritus, Deimachus, and Clitarchus. In the sixteenth he treats of Assyria, under which he includes Babylonia and Mesopotamia, Syria, Phenieia, Palestine, the Persian Gulf, the Red Sea and the coast of Ethiopia, and Arabia. For Asia he used the historians of Alexander, Eratosthenes and Herodotus; for Judea and Syria probably Posidonius, himself a native of Apamea; for Arabia and the eoast of Libya Eratosthenes and Artemidorus, the latter of whom followed Agatharchides of Cnidus. Strabo must have got many details about Arabia from Alius Gallus and the Stoic Athenodorus. The last book comprises Egypt, Ethiopia, and the north coast of Libya. He describes Egypt from his own observation, having gained much information at Alexandria in addition to that of Eudoxus, Aristo, Eratosthenes, Polybius, and Posidonius, using the last three with the addition of Iphicrates for Libya, and for Ethiopia Petronius, Herodotus, and Agatharchides. Though probably acquainted with the work of Juba, he did not make mueh use of it. The book concludes with a summary of the provinces of the Roman empire, as organized by Augustus into senatorial and imperial.

Epitions.—Aldus, Venice, 1516, Hopper and Heresbach, Basel, 1549; Xylander, Basel, 1571; Casaubon, Geneva, 1587, Paris, 1620 (Casaubon revised the text) ; Almeloveen, Amsterdam, 1707, reprinted Casaubon’s text; Falconer, Oxford, 1807, reprinted Almeloveen’s text; Siebenkees and Tzschucke, Leipsic, 1811; Koray, Paris, 1815-18, the first really critical edition; Kramer, Berlin, 1844-52; C. Muller, Paris, 1853; Meineke, Leipsic, 1877. TraNsLATIoNs.—Zatin : Guarini and Gregorio, 1471; Xylander,

1571. /rench: Koray and Letronne, 1805-19. German: Groskurd, 1833 (with dissertations), J¢alian: Ambrosoli, 1828. Dis- SERTATIONS, &c.—Bunbury, Ancient Geography; Heercn; Hasenmiiller ; Niese, Hermes, 1878. (W. RI.)

STRADELLA, ALzEssaNnDRO, composer, singer, and performer on various instruments, was one of the most accomplished Italian musicians of the 17th century. The generally accepted statement that he was born at Naples about 1645 rests upon no trustworthy founda- tion; and the few biographical notices that we possess savour so strongly of romance that we can only be said to know him truly through his works, which show extra-ordinary genius, and have exercised a highly beneficial influence upon Italian art. The story of his life was first circumstantially narrated in Bonnet-Bourdelot's Histovre de la Musique et de ses Effets (Paris, 1715). According to this account, Stradella not only produced some successful operas at Venice, but also attained so great a reputation by the beauty of his voice that a Venetian nobleman engaged him to instruct his mistress, Ortensia, in singing. Stradella, the narrative goes on to say, shamefully betrayed his trust, and eloped with Ortensia to Rome, whither the outraged Venetian sent two paid bravi to put him to death. On their arrival in Rome the assassins learned that Stradella had just completed a new oratorio, over the performance of which he was to preside on the following day at 8. Giovanni in Laterano. Taking advantage of this circumstance, they determined to kill him as he left the church ; but the beauty of the music affected them so deeply that their hearts failed them at the critical moment, and, confessing their treachery, they entreated the composer to ensure his safety by quitting Rome immediately. Thereupon Stradella fled with Orten-sia to Turin, where, notwithstanding the favour shown to him by the regent of Savoy, he was attacked one night by another band of assassins, who, headed by Ortensia's father, left him on the ramparts for dead. Through the connivance of the French ambassador the ruffians suc- ceeded in making their escape; and in the meantime Stradella, recovering from his wounds, married Ortensia, by consent of the regent, and removed with her to Genoa. Here he believed himself safe; but a year later he and Ortensia were murdered in their house by a third party of assassins in the pay of the implacable Venetian.

Bonnet-Bourdelot gives 1670 as the date at which the assassina-

tion actually took place; but the oratorio San Giovanni Battista, assumed to be that which saved its author's life, is dated "Roma,

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1676"; and a cantata, called 2 Barcheggio, is known to have been composed by Stradella for the marriage of Carlo Spinola and Paola Brignolo in 1681. These discrepancies are not, however, of suffieient moment to justify the rejection of Bonnet-Bourdelot's aceount, which has been accepted as genuine by Burney, Hawkins, Fétis, and many other careful writers, including the remarkably accurate and conscientious Wanley.4 And it must be remembered, in its defence, that Pierre Bourdelot, by whom the materials for the Histoire de la Musique et de ses Effets were originally compiled, was an actual contemporary of Stradella, and died as early as 1685, when a host of the composer's friends must still have been living, and able to give evidence on the subject of his fate. It seems there- fore only reasonable to assume that the main facts of the narrative are correctly given, though the dates may need confirmation; while for the embroidered versions of later writers the authors of the Histotre are certainly not responsible.

The finest collection of Stradella's works extant is that at the Biblioteca Palatina at Modena, which contains 148 MSS., includ- ing eleven operas and six oratorios. A collection of canti a voce sola was bequeathed by the Contarini family to the library of St Mark at Venice; and some MSS. are also prescrved at Naples and in Paris. Eight madrigals, three duets, and a sonata for two violins and bass will be found among the Additional MSS. at the British Museum, five picces among the Harleian MSS., and eight cantatas and a motet among those in the library at Christ Church, Oxford. Very few of thesc compositions have been published; but an extremely beautiful aria di chiesa, entitled Pieta Signore,? has been frequently printed, under the name of Stradella, and popularly accepted as the air which produced so marvellous an effect upon the assassins. The piece, however, is not to be found in San Giovanni Battista; and its style so little resembles that of Stradella's other works that no less decisive evidence than the discovery of an undoubted autograph could justify its ascription to him. On

the other hand, no more extravagant mistake could be made than that of deseribing it, as some have done, as a forgery, perpetrated either by Fétis, Rossini, or Niedermeyer. Not one of these great musieians could have written it; and it is certainly no forgery, but a genuine work of the 17th century or the opening decade of the 18th. In the absenee of trustworthy doeumentary evidence, all attempts to ascertain the real authorship of the piece must necessarily end in mere conjecture; but the extraordinary similarity of its style to that cultivated by Francesco de' Rossi, who is known to have been flourishing at Bari at the time of Stradella's death, is very significant.

Mueh controversy has also been excited by another work, lately attributed to Stradella, viz., a serenata for voices and instruments, of which two copies only are known to exist,—one at the Con- servatoire at Paris, and the other, a late transeript, now at the Royal College of Music in London. The date of this screnata is absolutely unknown. Of evidence proving it to be a genuine work by Stradella there is none in existence. Yet the question of its authenticity is a most important one, for upon the strength of it Handel may perhaps be some day gravely accused of having stolen from the Italian composer some of the finest passages in Israel in Egypt.

The compositions of Stradella are remarkable for their graceful form and the tenderness of their expression. Detached move- ments will be found in Burney's History of Music and the modern collection called Gemme @' Antichita.

STRADIVARIUS. See Viotry.

STRAFFORD, Tuomas WenrwortH, EARL oF (1593-1641), son of Sir William Wentworth, of Went- wortl Woodhouse, near Rotherham, was born in 1593 in Chancery Lane, London. He was educated at St John's College, Cambridge, and in 1611 was knighted, and mar- ried Margaret, daughter of Francis, earl of Cumberland. In 1614 he represented Yorkshire in the Addled Parlia- ment, but, as far as is now known, it was not till the parliament of 1621 that he took part in the debates. His position towards the popular party was peculiar. He did not sympathize with their eagerness for war with Spain, and he was eager, as no man of that time except Bacon was eager, for increased activity in domestic legislation. He was what, in

modern times, would be called a reformer, and in those days a reformer was necessarily an upholder of the authority of the crown, in whose service the most experienced statesmen might be expected to be found, whilst the members of a House of Commons only sum-

1 See No. 1272 in Cat. Harl. MSS., Brit. Mus. Wanley, how- ever, believed Stradella alone tv have been murdered and the lady to have eseaped. Called in some editions Se ¢ miei sospiri.

moned at considerable intervals would be deficient in the qualities necessary for undertaking successful legislation.. On the other hand, James's conduct of the diplomatic struggle with Spain was not such as to inspire confidence, and Wentworth's bearing was therefore marked by a certain amount of hesitation. He was, however, more than most men prone to magnify his office, and James's contemptuous refusal to allow the House of Commons to give an opinion on foreign politics seems to have stung him to join in the vindication of the claims of the House of which he was a member. He was at all events a warm supporter of the protestation which drew down a sentence of dissolution upon the third parliament of James.

In 1622 Wentworth's wife died, and in February 1625 he married Arabella Holles, the daughter of the earl of Clare. Of the parliament of 1624 he had not been a member, but in the first parliament of Charles I. he again represented Yorkshire, and at once marked his hostility to the proposed war with Spain by supporting a motion for an adjournment before the House proceeded to business, His election was declared void, but he was re-elected, When he returned to parliament he took part in the op- position to the demand made under the influence of Buckingham for war subsidies, and was consequently, after the dissolution, made sheriff of Yorkshire, in order to exclude him, as hostile to the court, from the parliament which met in 1626. After the dissolution of that par- liament he was dismissed from the justiceship of the peace and the office of custos rotulorum of Yorkshire.

Wentworth's position was very different from that of the regular opposition. He ~~was anxious to serve the crown, but he disapproved of the king's policy. "My rule," he wrote December 1625, "which I will never transgress, is~~

~~never to contend with the prerogative out of parliament, nor yet to contest with a king but when I am constrained thereunto or else make shipwreck of my peace of conscience." In January 1626 he had asked for the presidency of the Council of the North, and had visited and made overtures to Buckingham. His subse~~ quent dismissal was probably the result of his resolution not to support the court in its design to force the country to contribute money without a parliamentary grant. At all events, he refused in 1627 to contribute to the forced loan, and was placed in confinement in Kent for his refusal.

Wentworth's position in the parliament of 1628 was a striking one. He joined the popular leaders in resistance to arbitrary taxation and imprisonment, but he tried to obtain his end with the least possible infringement of the prerogative of the crown, to which he looked as a reserve force in times of crisis. With the approbation of the House he led the movement for a bill which would have secured the liberties of the subject as completely as the Petition of Right afterwards did, but in a manner less offensive to the king. The proposal was wrecked upon Charles's refusal to make the necessary concessions, and the leadership was thus snatched from Wentworth's hands by Eliot and Coke. Later in the session he fell into conflict with Eliot, as, though. he supported the Petition of Right in substance, he was anxious to come to a compro- mise with the Lords, so as to leave room to the king to act unchecked in special emergencies. f

On July 22, 1628, not long after the prorogation, Wentworth was created Lord Wentworth, and received @ promise of the presidentship of the Council of the North at the next vacancy. Even on political matters he had never been quite at unison with the parliamentary opposition, and in church matters he was diametrically opposed to them. Since the close of the discussion on the Petition of Right, church matters had come into greater prominence

than ever, and Wentworth was therefore thrown strongly on the side of Charles, from whom alone opposition to

Puritanism could possibly come. This attachment to

Charles was doubtless cemented by Buckingham's murder,

but, if he took the king’s part with decision and vigour, it

must be remembered that, as has been already said, he _ was above all a man prone to magnify his office, and that things would look differently to him than they had done before he was in his new position. For the charge of apostasy in its ordinary meaning there is no foundation.

As yet Wentworth took no part in the general govern- ment of the country. In December he became Viscount _ Wentworth and president of the Council of the North. In the speech delivered at York on his taking office he announced his intention of doing his utmost to bind up the prerogative of the crown and the liberties of the subject in indistinguishable union. ‘‘ Whoever,” he said, “ravels forth into questions the right of a king and of a people shall never be able to wrap them up again into the comeliness and order he found them.”

The session of 1629 ended in a breach between the king and the parliament which made the task of a moderator hopeless. Wentworth had to choose between helping a Puritan House of Commons to dominate the king and helping the king to dominate a Puritan House of Commons. He instinctively chose the latter course, and he threw himself into the work of repression with characteristic energy, as if the establishment of the royal power was the one thing needful, Yet even when he was most resolute in crushing resistance he held that he and not his antagonists were maintaining the old constitution which they had attempted to alter by claiming supremacy for _ parliament.

In November 1629 Wentworth became a_ privy councillor. In October 1631 he lost his second wife, and in October 1632 he married Elizabeth Rhodes. In January 1632 he had been named lord-deputy of Ireland, having performed his duties at York to the king’s satis- faction, though he had given grave offence to the northern gentry by the enforcement of his authority. It was a _ cardinal point of his system that no wealth or station _ should exempt its possessor from obedience to the king. ‘ Not only was the announcement of this principle likely to | give offence to those who were touched by it, but in its

application Wentworth was frequently harsh and over- bearing. In general he may have been said to have _ worked rather for equality under a strong Government than for liberty.

In Ireland Wentworth would have to deal with a people which had not arrived at national cohesion, and amongst which had been from time to time introduced _ English colonists, some of them, like the early Norman _ settlers, sharing in the Catholicism of the natives, whilst _ the later importations stood aloof and preserved their ‘ Protestantism. There was also a class of officials of English derivation, many of whom failed to reach a high standard of efficiency. Against these Wentworth, who arrived in Dublin in July 1633, waged war sometimes with scanty regard to the forms of justice, as in the case of Lord Mountnorris, whom he sent before a court-martial on a merely formal charge, which necessarily entailed a death sentence, not because he wanted to execute him, but because he knew of no other way of excluding him from official life.

__ The purifying of official life, however, was but a small part of Wentworth’s task. In one way, indeed, _ he conceived his duty in the best spirit. He tried at the same time to strengthen the crown and to benefit gy the poor by making the mass of the nation less dependent _ on their chiefs and lords than they had been before, and,

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though Wentworth could not do away with the effects of previous mistakes, he might do much to soften down the existing antagonism between the native population and the English Government. Unhappily his intentions were frustrated by causes resulting partly from his own character and partly from the circumstances in which he was placed. :

In the first place, Wentworth's want of money to carry on the Government was deplorable. In 1634 he called a parliament at Dublin, and obtained from it a consider- able grant, as well as its co-operation in a remarkable series of legislative enactments. The king, however, had previously engaged his word to make certain concessions known as the ‘‘ graces,” and Wentworth resolved that some of these should not be granted, and took upon himself to refuse what his master had promised. The money granted by parliament, however, would not last for ever, and Wentworth resolved to create a balance between revenue and expenditure before the supply was exhausted. This he succeeded in doing, partly by making a vast improve- ment in the material condition of the country, and partly by the introduction of monopolies and other irregular payments, which created wide dissatisfaction, especially amongst the wealthier class.

Towards the native Irish Wentworth's bearing was benevolent but thoroughly unsympathetic. Having no notion of developing their qualities by a process of natural growth, his only hope for them lay in converting them into Englishmen as soon as possible. They must be made English in their habits, in their laws, and in their religion. “T see plainly,” he once wrote, “that, so long as this kingdom continues Popish, they are not a people for the crown of England to be confident of.” It is true that he had too much ability to adopt a system of irritating persecution, but from time to time some word or act escaped from him which allowed all who were concerned to know what his real opinion was. For the present, however, he had to content himself with forging the instrument by which the hoped-for conversion was to be effected. The Established Church of Ireland was in a miserable plight, and Wentworth busied himself with rescuing from the hands of such men as the earl of Cork the property of the church, which had in troublous times been diverted from its true purpose, and with enforcing the strict observance of the practices of the English Church, on the one hand upon recalcitrant Puritans, and on the other hand upon lawless disregarders of all decency. In this way he hoped to obtain a church to which the Irish might be expected to rally.

Till that time came, he must rely on force to keep order and to prevent any understanding growing up between the Irish and foreign powers, With this object in view he resolved on pouring English colonists into Connaught as

James had poured them into Ulster. To do this he had taken upon himself to set at naught Charles's promise that no colonists should be forced into Connaught, and in 1635 he proceeded to that province, where, raking up an obsolete title, he insisted upon the grand juries in all the counties finding verdicts for the king. One only, that of Galway, resisted, and the confiscation of Galway was effected by the Court of Exchequer, whilst he fined the sheriff £1000 for summoning such a jury, and cited the jurymen to the castle chamber to answer for their offence. He had succeeded in setting all Ireland against him.

High-handed as Wentworth was by nature, his rule in Treland made him more high-handed than ever. As yet he had never been consulted on English affairs, and it was only in February 1637 that Charles asked his opinion on a proposed interference in the affairs of the Continent. In reply, he assured Charles that it would be unwise to

undertake even naval operations till he had secured –

absolute power at home. The opinion of the judges had given the king the right to levy ship-money, but, unless his Majesty had ''the like power declared to raise a land army, the crown" seemed "to stand upon one leg at home, to be considerable but by halves to foreign princes abroad." The power so gained indeed must be shown to be beneficent by the maintenance of good government, but it ought to exist. A beneficent despotism supported by popular gratitude was now Wentworth's ideal.

In his own case Wentworth had cause to discover that Charles's absolutism was marred by human imperfections. Charles gave ear to courtiers far too often, and frequently wanted to do them a good turn by promoting incom- petent persons to Irish offices. To a request from Went- worth to strengthen the position of the deputy by raising him to an earldom he turned a deaf ear. Yet to make Charles more absolute continued to be the dominant note of his policy, and, when the Scottish Puritans rebelled, he advocated the most decided measures of repression, and in February 1639 he offered the king

£2000 as his contri- bution to the expenses of the coming war. He was, how- ever, too clear-sighted to do otherwise than deprecate an invasion of Scotland before the English army was trained.

In September 1639, after Charles's failure in the first Bishops' War, Wentworth arrived in England to conduct in the star-chamber a case in which the Irish chancellor was being prosecuted for resisting the deputy. From that moment he stepped into the place of Charles's prin- cipal adviser. Ignorant of the extent to which opposition had developed in England during his absence, he recom- mended the calling of a parliament to support a renewal of the war, hoping that by the offer of a loan from the privy councillors, to which he himself contributed £20,000, he would place Charles above the necessity of submitting to the new parliament if it should prove restive. In January 1640 he was created earl of Strafford, and in March he went to Ireland to hold a parliament, where the Catholic vote secured a grant of subsidies to be used against the Presbyterian Scots. An Irish army was to be levied to assist in the coming war. When in April Strafford returned to England he found the Commons holding back from a grant of supply, and tried to enlist the peers on the side of resistance. On the other hand, he attempted to induce Charles to be content with a smaller grant than he had originally asked for. The Commons, however, insisted on peace with the Scots, and on May 9, at the privy council, Strafford, though reluctantly, voted for a dissolution.

After this Strafford supported the harshest measures. He urged the king to invade Scotland, and, in meeting the objection that England might resist, he uttered the words which cost him dear, ‘‘ You have an army in Ire- land,”—the army which, in the regular course of affairs, was to have been employed to operate in the west of Scotland,—‘‘ you may employ here to reduce this king- dom.” He tried to force the citizens of London to lend money. He supported a project for debasing the coinage and for seizing bullion in the Tower, the property of foreign merchants. He also advocated the purchasing a loan from Spain by the offer of a future alliance. He was ultimately appointed to command the English army, but he was seized with illness, and the rout of Newburn made the position hopeless. In the great council at York he showed his hope that if Charles maintained the defen- sive the country would still rally round him, whilst he proposed, in order to secure

Ireland, that the Scots of Ulster should be ruthlessly driven from their homes.

When the Long Parliament met it was preparing to impeach Strafford, when tidings reached its leaders that

Strafford, now lord-lieutenant of Ireland, had come to |

London and had advised the king to take the initiative by accusing his chief opponents of treason. On this the impeachment was hurried on, and the Lords committed Strafford to the Tower. At his trial in Westminster Hal] he stood on the ground that each charge against him, even if true, did not amount to treason, whilst Pym urged that, taken as a whole, they showed an intention to change the Government, which in itself was treason. Undoubtedly the project of bringing over the Irish army, probably never seriously entertained, did the prisoner most damage, and when the Lords showed reluctance to condemn him the Commons dropped the impeachment and brought in a bil] of attainder. The Lords would probably have refused to pass it if they could have relied on Charles's assurance to relegate Strafford to private life if the bill were rejected, Charles unwisely took part in projects for effecting Strafford'

escape and even for raising a military force to accomplish

that end. The Lords took alarm and passed the bill. Op May 9, 1641, the king, frightened by popular tumults, reluctantly signed a commission for the purpose of giving to it the royal assent, and on the 12th Strafford was executed on Tower Hill. (8. Raga

STRAITS SETTLEMENTS, the collective name given to the British possessions in the MaLay PENINSULA (see vol. xv. p. 320, and Plate VI.), derived from the straits which separate the peninsula from Sumatra and which form so important a sea-gate between India and China. The Straits Settlements are defined, by letters patent 17th June 1885, as consisting of the island of Singapore (which contains the seat of government), the town and province of Malacca, the territory and islands of the Dindings (off

Perak), the island of Penang, and Province Wellesley, with their dependencies actual or prospective. The Cocos or Keexine Istanps (9.v.), formerly attached to Ceylon, were transferred to the Straits Settlements in 1886, These possessions have formed a crown colony since 1867, previous to which they were administered as a presidency of the Indian empire. The governor, appointed for six years, is assisted by an executive and a legislative council. Resident councillors are stationed at Penang and Malacca, and since 1874 British residents have exercised supervision at the native courts of Perak, Selangor, and Sungei Ujong, and are assisted by a staff of European officials.

The following are the area and population (with details of race divisions) of the settlements :—

Population in 1881.

Area Population

alee in 1871 Euro- A Natives

miles : Total peans. Malays, Chinese. |) inaia, Singapore…| 206 97,181 139,208 | 2,769 | 22,155] 86,766 | 12,058 Penang…... 107 90,951 612 | 21,772) 45,185 | 15,7380 Province 131,889

Wellesley.| 270 97,324 76 | 58,723 | 21,687 | 10,616

Malacca….| 659 77,755 93,579 40 | 67,518 | 19,741 | 1,891 Dindings…. 00s eee 2,322 Sat ar S08 os

‘he population, which thus was 306,775 in 1871 and 423,384 im 1881, was estimated at 473,000 in 1884. The increase is solely produced by immigration of Chinese and natives of India; for, while the total number of births registered in Singapore, Penang, Province Wellesley, and Malacca was in the threc years 1881-88 only 21,184, the deaths were 37,151.! In 1883 61,206 Chinese landed at Singapore and 48,419 in Penang; and, though the influx of Indian coolies has been retarded by the stringent protective laws of the Indian Government, the stream of immigration has been steadily increasing in volume. The number of Chinese 1 probably

below the truth, as they were very reluctant to fill up the returns. In 1867, the date of the transfcr to the crown, the colony had, it was estimated, not more than 283,384 inhabitants.

The revenue, which was in 1868 only about 1,301,843 dollars, had risen by 1886 to 8,710,639, a large proportion being derived ee Eee eee

1 The number of hospital cases, and consequently the death-rate, is affected, however, by the fact that natives from the rest of the penii sula, whose diseases prove beyond native skill, are often brought to the colonial hospitals.

from opium and spirit taxation (712,600 dollars in 1868 and

The expenditure in the same period increased from 1,197,177 to 3,652,771 dollars. In 1868 12,400 dollars were devoted to education (95,600 in 1884). Public works were credited with 146,800 dollars in 1868 but with 1,170,000in 1884. The ports of the Straits Settlements are all free. In 1867 the total burden was 1,237,700 tons, in 1873 2,507,000 tons, and in 1883 4,290,600. The value of the united imports and exports was in 1867 about

2,152,700 in 1884).

. £14,040,000, and in 1883 it was estimated by Sir Frederick Weld at £38, 624, 200.

The imports usually somewhat exceed the exports. MaxaccA.—The territory of Malacca lies between the river

. Linggi and the Kesang, which separate it respectively from Sungei

Ujong to the north-west and the Moar district of Johor to the east. ‘To the north it marches with Negri Sembilan. Forest conservancy is beginning to be carefully attended to, and pepper growing has recently been started with success at Arra Kudah by Achinese settlers. Tapioca and tin are among the exports, the latter, brought from the Selangor mines, being smelted in

Malacca. The average birth-rate in 1881-83 was 2046 and the death-rate 2642. The city of Malacca has already been described, vol. xv. p. 312.

Prince or WALES IsLAND (or Penang) and SINGAPORE are treated in separate articles.

Province WELLESLEY, which lies opposite Penang, was at one time part of the Kedah territory, from which it is now separated by the Kwala Muda river. Southwards it extends (since 1874) a little to the south of the Krian river and marches with Perak. The boundary was rectified by treaty with Siam in 1867. Butter- worth is the seat of the Government headquarters. The country consists for the most part of fertile plain, and the remainder, about one-eleventh of the whole, is low wooded hills (highest 1843 feet). Some of the low land is rich dark alluvial soil, and much of it is sandy; in the hills a ferruginous sandy loam of rather poor quality prevails. Sugar-growing has long been a staple industry, and tca plantations began to be formed in 1869-70.

Tur Dinpines belonged originally to the state of Perak. The British territory extends some 26 miles from north to south. Though it hasa magnificent natural harbour, “it has not hitherto,” says Sir Frederick Weld, ‘‘been a progressive district. But [think its time is at hand. It produces tin, timber, and ebony, and turtles frequent the neighbouring islands.” Dinding Island lies off the mouth of the river of the same name.

PERAK is an extensive tract of country, comprising the grcat part of the basin of the Perak river (which runs north and south, almost parallel with the coast of the peninsula, for upwards of 130 miles, excluding the windings, before it turns abruptly west to the Strait) and all the basin of the Bernam river. The boundary towards Patani cuts the Perak river at the rapids of Jeram Panjang. The population of the states is about 110,000, among the more noteworthy tribes being the Sakeis. Perak was brought into closer relation to Britain by the treaty signed at Pankor (Pangkore) in the Dindings, 20th January 1874, which authorized the appointment of a British resident and assistant resident. The first resident, J. W. Birch, was murdered in November 1875; but British troops from India and China, under General (Sir Francis) Colborne, soon suppressed the insurrectionary movement. One column crossed from Larut to Kwala Kungsa and defeated the rebels at

Kotah Lamah, Enggar, and Prek, and another advanced from Banda Baru (where Mr Birch was buried) to Blanja, the residence of the ex-sultan Ismail, and thence to Kinta on the Kinta river, the capital of Perak. As it was discovered that Abdullah, the ruling sultan, had been accessory to the murder of Mr Birch, he was deposed in 1877 and banished to Mahe (Sey- chelles). he residency of Lower Perak was removed from Banda Baru to Durian Sabatang, the place where the Bidor and Batang Padang join the main stream of the Kungsa or Perak, and it has again been removed to Teluk Anson (Teluk Mah Intan), lower down, the centre of the inland trade. ‘The residency of Upper Perak is at Kwala Kungsa. Perak has made wonderful advance since the war. Jts revenue was 312,875 dollars in 1877, and in 1884, at a moderate estimate, 1,435,697. In 1877 there was only one line of good road in the country,—from Larut through the pass of Bukit Berapit to Kwala Kungsa; now large tracts have been opened up with roads and bridle-paths. ‘‘Rivers have been cleared of ob- structions, telegraph lines laid down, court-houses, hospitals, police-stations, &c., built, and a line of railway (8 miles) cou- structed from Port Weld, the port of Larut, at Teluk Kartang, where vessels drawing 13 to 15 feet can enter to Taipeng (Thai- peng).” The revenue is mainly derived from a duty on tin, which is largely mined in Larut, &. The mines of the Capitan China in 1883 produced to the value of £105,000. Coffee and tea plant- Ing seem to promise well.

SELANGOR lics to the south of Perak, and consists mainly of the basins of the Selangor, the Klang, and the Langat, of which the last two meet in a common delta to the south of 3° N. lat. Previous to 1880 the seat of the British resident and staff was at Klang, at the head of 13-feet navigation on the Klang river; at that date it was transferred to Kwala Lumpur, at the junction of the Gombah

with the Klang, the highest point reached by the cargo boats which bring up provisions for the tin-miners and return with tin, gutta- percha, and other produce. There are tin mining settlements at Kanching, Ulu Selangor, Ulu Bernam, Ulu Gombah, Ulu Klang, Ulu Langat, Sungie Pateh Reeko, Kajang, Ampagnan, &c. The mine at Ampagnan was bought for 170,000

dollars by Singapore merchants. The population of Selangor (50,000,—29,000 of them Chinese) is rapidly increasing by immigration from China, India, and Sumatra. Since the close of the civil war (1867-74) and the acceptance of the British resident the country has rapidly devel- oped. At the mouth of the Selangor lies the town of that name, with ruins of an old Dutch fort and the stone on which the sultans of Selangor receive investiture. At Klang, up the Klang river, lies the principal port of the country, now connected by railway with Kwala Lumpor (22 miles distant), the capital, which has grown into a considerable town, with a hospital, Government house, residency, &c. The sultan resides at Jugra, on a deltaic branch of the Langat. The revenue of Selangor was estimated at 596,877 dollars in 1884; but the war debt was still 259,000 dollars in 1883.

SunceI Usone (500 square miles, including Lukut and Sungei Riah ; population 14,000, the greater part being Chincse) also shows steady progress. Its revenue rose from 67,000 dollars in 1874-75 to 121,176 in 1884. European coffee and cocoa plantations and Chinese tapioca, pepper, and gambier plantations are at work.

The interference of the British Government is frequently sought in the territory of the Negri Sembilan (the so-called ‘‘ Nine States,” which are now really seven in number), Sri Menanti, Numbaw, Johole, Jellye, Muar, Jempolt, Segamet.

See Journal of the Straits Asiatic Society, Singapore; Dowden, The Malay Peninsula, 1882; Vacher, Zwelve Years in Malaya; M‘Nair, Perak and the Malays, 1878; W. B. D’Almeida, “ Geography of Perak and Salangore,” in J. Roy. Geog. Soc., 1876; Sir Frederick Weld, ‘‘ Straits Settlements,” in Proceedings of Royal Colonial Institute, 1883-84; The Straits Directory, 1886; and the works mentioned in the article MaLay Pxninsuwa,

STRALSUND, a seaport and small manufacturing town in Western Pomerania, Prussia, is situated on the Strelasund, an arm of the Baltic Sea, 2 miles wide, which separates the island of Rtigen from the mainland, 115 miles to the north of Berlin and 85 miles to the north- west of Stettin. The position of the town on a small triangular islet, only connected with the mainland by moles and bridges at the angles, has always rendered its fortification comparatively easy, and down to 1873 it was a fortress of the

first rank. The quaint architecture of the houses, many of which present their curious and handsome gables to the street, gives Stralsund an interesting and old-fashioned appearance. The three vast Gothic churches of St Nicholas, St Mary, and St James, erected in the 14th and 15th centuries, and the town-house, dating in its oldest part from 1316, are among the more striking buildings. The public library, founded in 1709, contains 60,000 volumes. The manufactures of Stralsund. are more miscellaneous than extensive; they include machinery, beer, oil, paper, playing-cards, and sugar. The trade is chiefly confined to the shipping of grain, malt, and timber, with some cattle and wool. In 1884 542 sea-going ships and 1964 river-craft entered the har- bour, which is protected by the fortified island of Dan- holm, and 513 ships and 1964 river-craft cleared. In 1882 the port owned a fleet of 247 sea-going ships, with a burden of 41,176 tons, besides numerous smaller craft below 60 tons. The population in 1880 was 29,481, in 1885 28,981. More than a fourth of the inhabitants re- side in the Knieper, Tribseer, Franken, and Harbour sub- urbs on the mainland. About 1000 are Roman Catholics and 140 Jews.

Stralsund was founded in 1209 by Jaromar I., prince of Riigen, and, though several times destroyed, steadily prospered. It was one of the five Wendish towns whose alliance extorted from King Eric of Norway a favourable commercial treaty in 1284-85 ; and in the 14th century it was second only to Liibeck in the Hanseatic League. Although under the sway of the dukes of Pomerania, the city was able to maintain a marked degree of independence, which is still apparent in its municipal privileges; it is also the only town in Prussia, with the exception of Breslau, which has an independent municipal ecclesiastical consistory. Its carly Protestant sympathies placed it on the side of Sweden during the Thirty Years' War; and in 1628 it successfully resisted a siege of eleven weeks by Wallenstein, who had sworn to take it ''though it were chained to heaven." He was forced to retire with the loss of

12,000 men; and a yearly festival in the town still celebrates the occasion. After the peace of Westphalia Stralsund was ceded with the rest of Western Pomerania to Sweden; and for more than a ccntury and a half it was

exposed to attack and capture as the téte-de-pont of the Swedes in Continental Europe. In 1815 it passed to Prussia. In 1809 it was the scene of the death of Major Schill, in his gallant though ineffectual attempt to rouse his countrymen against the French invaders.

STRANGE, Sir Ropert (1721-1792), an eminent line engraver, was descended from the Scottish family of Strange, or Strang, of Balcasky, Fife, and was born in the Mainland of Orkney, on July 14, 1721. In his youth he spent some time in an attorney's office; but, having mani- fested a taste for drawing, he was apprenticed, in 1735, to Richard Cooper, an engraver in Edinburgh. After leaving Cooper in 1741, he started on his own account as an en- graver, and had attained a fair position when, in 1745, he joined the Jacobite army as a member of the corps of life guards. He engraved a half-length of the Young Pre- tender, and also etched plates for a bank-note designed for the payment of the troops. He was present at the battle of Culloden, and after the defeat remained in hiding in the Highlands, but ultimately returned to Edinburgh, where, in 1747, he married Isabella, only daughter of William Lumisden, son of a bishop of Edinburgh.

In the following year he proceeded to Rouen, and there studied drawing under J. B. Descamps, carrying off the first prize in the Academy of Design. In 1749 he removed to Paris, and placed himself under the celebrated Le Bas. It was from this master that he learned the use of the dry point, an instrument which he greatly improved, and employed with excellent effect in his own engravings. In 1750 Strange returned to England. Presently he settled in London along with his wife and daughter, and super- intended the illustrations of Dr William Hunter's great work on the Gravid Uterus, published in 1774. The plates were engraved from red chalk drawings by Van Rymsdyk, now preserved in the Hunterian Museum, Glas- gow, and two of them were executed with great skill by Strange's own hand. By his plates of the Magdalen and Cleopatra, engraved after Guido in 1753, he at once established his professional reputation.

He was invited in 1759 to engrave the portraits of the prince of Wales and Lord Bute, by Allan Ramsay, but declined, on the ground of the insufficient remunera- tion offered and of the pressure of more congenial work after the productions of the Italian masters. His refusal was attributed to his Jacobite

proclivities, and it led to an acrimonious correspondence with Ramsay, and to the loss, for the time, of royal patronage. In 1760 Strange started on a long-meditated tour in Italy. He studied in Florence, Naples, Parma, Bologna, and Rome, execut- ing innumerable drawings, of which many—the Day of Correggio, the Danae and the Venus and Adonis of Titian, the St Cecilia of Raphael, and the Barberini Magdalen of Guido, &c.—were afterwards reproduced by his burin. On the Continent he was received with great distinction, and he was elected a member of the academies of Rome, Florence, Parma, and Paris. He left Italy in 1764, and, having engraved in the French capital the Justice and the Meekness of Raphael, from the Vatican, he carried them with him to London in the following year.

The rest of his life was spent mainly in these two cities, in the diligent prosecution of his art. In 1766 he was elected a member of the Incorporated Society of Artists, and in 1775, piqued by the exclusion of engravers from the Royal Academy, he published an attack on that body, entitled An Enquiry into the Rise and Progress of the Royal Academy of Arts at London, and prefaced by a long letter to Lord Bute. In 1787 he engraved West's Apotheosis of the Princes Octavius and Alfred, and was

rewarded with the honour of knighthood. He died jp London on the 5th of July 1792.

_In the technique of engraving Strange was a master. His line is tender and flowing, without monotony or confusion, and his expression of flesh is characterized by uncommon delicacy and transparency. In draftsmanship his works are often defective,

After his death a splendid edition of reserved proofs of his engravings was issued; and a catalogue of his works, by Charles Blanc, was published in 1848 by Rudolph Weigel of Leipsic, forming part of Le Graveur en Taille Douce. Sec Memoirs of Sir Robert Strange, Knt., and his Brother-in-law Andrew Lumisden, by James Dennistoun of Dennistoun, 1855,

STRANRAER, a royal burgh of Wigtownshire, Scot. land, is situated on the North Channel, at the head of Loch Ryan, 7 miles north-east of Portpatrick,

and 59 miles south-south-west of Ayr. In the centre of the town is the old baronial castle of the 15th century occupied by Claverhouse when he held the office of sheriff of Galloway, The principal public buildings are the old town-hall, the new town-hall and court-house (1873), and the academy (1845). A reformatory provides accommodation for 100 boys, and there is a combination poorhouse for the county and a few parishes beyond it. The town possesses a library and public reading-room. ‘The harbour, which is tidal, only admits the entrance of vessels of 150 tons, but there is good anchorage in the loch, and the east pier permits of the approach of large steamers, which ply in connexion with the railway daily to Larne in Ireland, There is also steam communication with Glasgow, Liver- pool, and other towns; but since the construction of the Girvan and Portpatrick Railway the trade of the port has been on the decline. The principal import is coal, and the principal exports are agricultural produce. The town is chiefly dependent on agriculture. The fishing industry is of minor importance. The population in 1881 of the royal burgh (area 55 acres) was 3455, and of the police burgh 6342. The town was created a burgh of barony in 1596, and a royal burgh in 1617. In 1885 its parlia- mentary representation (it had been one of the Wigtown burghs) was merged in that of the county.

STRASBURG (Germ. Strassburg, Fr. Strasbourg), the principal town of Alsace, and a fortress of the first rank, is situated at the junction of the Ill and the Breusch, about two miles to the west of the Rhine, in one of the most fertile districts in the upper Rhenish plain. It lies about 90 miles to the north of Basel, 250 miles to the east of Paris, and 370 of Berlin. Since 1871 Te it has been the seat pZ2ePs<'l of government for the Beats German crownland of Alsace-Lorraine (Elsass- Lothringen) ; and it is also the see of a Roman Catholic bishop

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Environs of Strasburg.

and the headquarters of the 15th corps of the German

army. The town proper is divided by the arms of the III into

three parts, of which the central is the largest and most

important. Most of the streets are narrow and irregular, and the quaint aspect of a free medizval town has to a considerable extent been maintained. The quarters which suffered most in the bombardment of 1870 have, how- ever, been rebuilt in a more modern fashion, and the recent widening of the circle of fortifications, with the destruction of the old walls, has given the city opportunity to expand in all directions, ;

By far the most prominent building is the minster, or cathedral, which in its present form represents the activity of four centuries. Part of the crypt dates from about 1015; the apse shows the transition from the Romanesque to the Gothic style; and the nave, finished

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in 1275, is a fine specimen of pure Gothic. Of the elaborate west facade, with its singular screen of double tracery, the original design was furnished by Erwin of Steinbach (c. 1318). The upper part of the facade and the towers were afterwards completed in accordance with a different plan, and the intricate open-work spire on the north tower, 465 feet high, was added in 1435. The sculptural ornamentation both without and within is very rich. The astronomical clock in the south tran- sept, constructed in 1838-42, contains some fragments of the famous clock built by Dasypodius in 1571. The church of St Thomas, a Gothic building of the 13th and 14th centuries, contains a fine monument to Marshal Saxe, considered the chef d’ccuvre of the sculptor Pigalle. Other notable buildings are the Temple-Neuf, or Neukirche, re- built since 1870; the old episcopal palace (1731-41), now the library; the old prefecture; the theatre; the town- house ; and the so-called “aubette,” containing the conser- vatorium of music. The university of Strasburg, which was suppressed in the French Revolution as a stronghold of German sentiment, was reopened in 1872, and now occupies

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Plan of Strasburg.

I, Cathedral, 6, 6. Barracks, 10. Imp. Palace. | 15. Prot. Gymna- 2. Library. 7. Akademie. 11. Theatre. sium. 3. St Thomas's Ch. | 8. Govt. Tobacco | 12. Law Courts. | 16. Arsenal. 4, Hospital. Factory. 13. Aubette. 17, Military Hos- 5,5. Univ.Med.Fac.| 9. University. 14, Neukirche. pital.

a handsome new building erected for it in 1884. The university and town library, containing about 600,000 volumes, consists largely of the books sent from all parts of Germany to compensate for the town library destroyed in the bombardment of 1870. The precious incunabula and manuscripts which then perished are, however, irre- placeable. General Kleber, who was a native of Strasburg, and Gutenberg, who spent part of his life here, are both commemorated by statues. Many private houses are most quaint and interesting illustrations of timber architecture. Pleasant public parks and gardens fringe the town.

The population in 1880 was 104,471, including 51,859 Roman Catholics, 48,691 Protestants, and 3521 Jews. In 1885 the total population had risen to 112,091, showing an Increase of 7:29 per cent. The town, strictly so called, does not contain more than 90,000 inhabitants, the rest belong- ing to the suburban villages. Even before the war of 1870- 71 More than half of the inhabitants spoke German as their mother-tongue, and this proportion has probably been Somewhat increased since. The sympathies of the people, however, like those of most of the Alsatians, lay with France, and it will require the growth of a new generation to bring about a complete reconciliation to German rule.

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The chief industries of Strasburg are tanning, brewing, and the making of steel goods, machinery, and tobacco. To these must be added the stall-fattening of geese for its celebrated pdtés de foie gras, an occupation which forms a most uscful source of income to the poorer classes. The annual value of these ‘‘ fat liver pies” sent out from Strasburg is over £100,000. The position of the town at the intersection of natural highways between France and Germany, Switzerland and Belgium, early made it a place of considerable commercial importance, and it now carries on a brisk trade in agricultural produce, hams, sausages, sauerkraut, and hops. Its full development in this direction, though favoured by the canals connecting the Rhine with the Rhone and the Marne, has been somewhat hampered by the iron girdle of fortifications.

Strasburg has always been a place of great strategic importance, and as such strongly fortified. The pentagonal citadel constructed by Vauban in 1682-84 was destroyed during the siege of 1870. The new German system of fortifications consists of a girdle of fourteen detached forts, at a distance of three to five miles from the centre of thetown. Kehl, the éte-de-pontof Strasburg, and several villages are included within this enceinte, and three of the outworks lie on the right bank of the Rhine, in the territory of Baden. In case of need a great part of the environs can be laid under water by the garrison.

The site of Strasburg seems to have been originally occupied by a Celtic settlement, which the Romans conquered and replaced by the fortified station of Argentoratum, afterwards the headquarters of the eighth legion. In the year 357 the emperor Julian saved the frontier of the Rhine by a decisive victory gained here over the Alemanni, but about half a century later the whole of the district now called Alsace fell into the hands of that Teutonic people. Towards the end of the 5th century the town passed to the Franks, who named it Strataburgum. The famous “Strasburg oaths ” (see GERMANY, vol. x. p. 480) were taken here in 842 ; and in 923, through the homage paid by the duke of Lorraine to Henry I., began the connexion of the town with the kingdom of Germany which was to last for more than seven centuries. The bishopric of Strasburg was founded in the Merovingian period, and soon attained great wealth and importance. The early history of Strasburg, as in the case of most episcopal citics, consists mainly of a record of the struggle between the bishops and the citizens,—the latter, as they grew in wealth and power, feeling the fetters of ecclesiastical rule inconsistent with their full development. The conflict was finally decided in favour of the citizens by the battle of Oberhausbergen in 1262; and the position of free imperial city, which had been conferred upon Strasburg by Philip of Swabia, was not again disputed. The throwing off of the episcopal yoke was followed by an internal revolution (1332), which admitted the guilds to a share in the government of the city and impressed upon it the democratic character that it bore down to the French Revolu- tion. Strasburg now became one of the most flourishing of all the imperial towns, and the names of natives or residents like Sebastian Brant, Tauler, Fischart, and Geiler von Kaysersberg show that its pre-eminence was not confined to the material sphere. On the other hand, its fair fame is sullied by such acts as the burning in 1349 of 2000 Jews, accused of causing a pestilence by poisoning the wells. In 1381 Strasburg joined the Stadtebund, or Swabian League, and about a century later it rendered efficient aid to the Swiss confeder- ates at Granson and Nancy. The Reformation found ready accept- ance at Strasburg, its foremost champion here being Martin Bucer, and the city was skilfully piloted through the ensuing period of religious dissension by its ‘‘stadtmeister’’ Jacob Sturm, who se- cured for it very favourable terms at the end of the Schmalkald War. Inthe Thirty Years’ WarStrasburg escaped without molesta- tion by observing a prudent neutrality. In 1681, during a time of peace, it was suddenly seized by Louis

XIV., and this unjustifiable action received formal recognition at the peace of Ryswick in 1697. The immediate effect of the change of superiors was a partial reaction in favour of Roman Catholicism, but the city remained essentially German until the French Revolution, when it was deprived of its privileges as a free town and sank to the level of a French provin- cial capital. It was at Strasburg that Louis Napoleon made his first ineffectual attempt to grasp power. In the war of 1870 Stras- burg, with its garrison of 17,000 men, surrendered to the Germans after a siege of seven weeks. The town and cathedral suffered con- siderably from the bombardment, but all traces of the havoc have now disappeared.

STRASS, or Paste. See Gass, vol. x. p. 665.

STRATEGY. See War.

STRATFORD, usually designated StraTFoRD-on-AVoN, a market-town and municipal borough of England, in War- wickshire, near the Gloucestershire border, is pleasantly situated on the Avon, and on the Great Western and Mid- land Railway lines, 26 miles south of Birmingham and 8 south-west of Warwick. The Avon is crossed by a stone bridge of fourteen arches, built by Sir Hugh Clopton in the

reign of Henry VIL, and widened in 1814; by a bridge of nine arches, built of brick in 1826 ; and by a foot-bridge erected in 1867, at a cost of £500, on the site of a foot- bridge originally erected in 1599, and rebuilt in1812. The streets are wide and regular, crossing each other generally at right angles, and, says J. O. Halliwell-Phillipps, “ with the exception of a few diffused buildings, scarcely one of which is in its original condition, there is no resemblance between the present town and the Shakespearean borough ” (compare article SHAKESPEARS, vol. xxi. pp. 741 sg.). The church of the Holy Trinity occupies the site of a Saxon monastery, which existed before 691, when the bishop of Worcester received it in exchange from Ethelred, king of Mercia, It is a fine cruciform structure, partly Early English and partly Perpendicular, with a central tower and lofty octagonal spire. It was greatly improved in the reign of Edward ITI. by John de Stratford, who rebuilt the south aisle. He also in 1332 founded a chantry for priests, and in

1351 Ralph de Stratford built for John's chantry priests "a house of square stone," which came to be known as the college, and in connexion with which the church became collegiate. The present beautiful choir was built by Dean Balshall (1465-91), and in the reign of Henry VII. the north and south transepts were erected. The mural monu- ment of Shakespeare, who is buried in the chancel, is of special interest from its effigy of the poet, undoubtedly an authentic representation, though somewhat altered and damaged by time. The foundation of the chapel of the guild of the Holy Cross was laid by Robert de Stratford, The guild, to which both sexes were admitted, was in exist- ence early in the 13th century, and it was incorporated by a charter from Edward III. in 1322. It was dissolved in 1547. The house in which Shakespeare was born still

stands, —although its external appearance is much altered, |

—and an apartment is by immemorial tradition pointed out as his birth-room. In 1597 Shakespeare purchased New Place for his residence (see vol. xxi. p. 765). Shakespeare's house was pulled down by Sir John Clopton in 1702, and the large new mansion erected on its site was pulled down by Sir Francis Gastrell in 1759. Chiefly through the exer-

tions of J. O. Halliwell-Phillipps, the site of New Place was.

purchased by public subscription, and in 1876 handed over to the trustees of the birthplace. The old theatre, which had occupied part of the ground, was taken down in 1872, and in 1877 a new memorial theatre was erected at a cost of £30,000. The other principal buildings of the town are the town-hall, originally erected in 1633, almost entirely rebuilt in 1767-68, after having been severely injured by an explosion, and greatly altered in 1863 at a cost of £2000; the market-house (1820) ; the corn exchange (1850) ; the children's hospital (1871); and the new hospital (1884). The Edward VI. grammar school, where Shakespeare re- ceived his education, was founded in 1553. The town is chiefly dependent on the agriculture of the neighbourhood. The population of the borough in 1871 was 7183, and in 1881 (area extended in 1879 to 3865 acres) it was 8054.

There is no authentic mention of Stratford earlier than the 7th century. It received a charter for a market in the-reign of Richard I., but was not

incorporated till the reign of Edward VI. The charter of Charles II., granted in his 26th year, remained the governing charter of the town till the passing of the Municipal Act in 1835. The town suffered from a severe epidemic in 1564, from inundations in 1588, and from fire in 1598.

See S. L. Lee, Stratford-on-Avon, 1884; J. O. Halliwell-Phillipps, Outlines of

the Life of Shakspeare, sixth edition (with a history of New Place), 1886; and the article SHAKESPEARE. ;

STRATFORD, a town of Canada, capital of Perth county, Ontario, lies on the river Avon (a tributary of the Thames which discharges into Lake St Clair), about 45 miles by rail south-east of Goderich, at the junction of the Goderich and Buffalo division with the main line of the Grand Trunk Railway. In 1849 it was a village of only

200 inhabitants; but between 1871 and 1881 its popu- lation rose from 4313 to 8239. It hasa town-hall, ex. tensive repairing shops, and several manufactures. STRATFORD DE REDCLIFFE, Stratrorp CANNING, Viscount (1786—1880), diplomatist, was the first cousin of George Canning the statesman, and the youngest son of Stratford Canning, who, having been disinherited for marrying beneath his rank, settled in London as a mer- chant in Clement’s Lane, where young Canning was born 4th November 1786. Shortly afterwards the father died, and the family removed to Wanstead, the boy attending the village school and afterwards a school at Hackney until 1794, when he went to Eton. Ultimately he became captain of the school, and he also manifested his literary predilections by publishing, in conjunction with Wellesley and others, a collection of essays entitled The Miniature. In 1805 he was elected scholar of King’s College, Cambridge, and, while still attending the univer- sity, became in 1807 précis writer to his cousin, who had been appointed foreign minister. At the close of the year he went to Copenhagen as one of the secretaries of a special diplomatic mission, and after his return he was appointed in June 1808 first secretary at Constantinople, On the. removal of his chief Mr Adair to Vienna in July 1810, Canning remained minister plenipotentiary, making

use of the opportunity to give indications of that over- mastering purpose and bold yet subtle diplomacy which were to have such an important influence on the history of the Eastern question. In 1812 he succeeded in effecting the treaty of Bucharest between Russia and Turkey, which was signed on the 12th May, shortly before the arrival of his successor. This was properly the inaugura- tion of that English influence in Turkey which did not cease until within recent years. The treaty was also of immense immediate advantage by freeing the Russian army to act against Napoleon, and on his return to Eng- land Canning was rewarded bya pension of £1200 a year. He remained in London, occupying himself with litera- ture, and contributing some articles to the Quarterly Leview, then newly founded, until in May 1814 he was appointed by Lord Castlereagh minister plenipotentiary to Switzerland, where he succeeded in effecting the federa- tion of the cantons as a neutral state. He returned to England in 1817, and in August 1820 was sent as pleni- potentiary to the United States, to arrange certain out- standing differences between the States and England ; but, although a convention was signed 13th March 1824, this was rejected by the American senate, and matters for several years remained, so far as any actual arrangement was concerned, im statu quo. In October 1825 Oanning was sent on a second commission to Constantinople, chiefly to promote the independence of Greece, but after long and complicated negotiations the attack, without the knowledge of the ambassadors, on the Turkish fleet by the allies under Sir E. Codrington at Navarino, 20th October 1827, caused a conference then being held to be suddenly broken up, and rendered necessary the with- drawal of the ambassadors from Constantinople. They, however, again met at Poros towards the close of the following year, and ultimately Turkey was compelled, by the treaty of Adrianople, 14th August 1829, following @ short war with Russia, to loose her grasp on Greece, and consent to the arrangement of a frontier limit. On his return to England Canning was made G.C.B. In 1828 he had been elected to the House of Commons for Old Sarum, and he sat for different boroughs until 184], when he again accepted the office of ambassador to Turkey. During the next twelve years he gradually suc ceeded in winning the confidence of the sultan, as well as awakening his wholesome awe, by convincing him, nob

merely of his sincere interest in the welfare of Turkey, put of his sole ability to thwart the wiles of the Russian emperor. There is no doubt a certain degree of exaggera- tion in Kinglake's description of Canning as the " Great Elchi," at whose slightest frown the Turks were ready to quail, and by whose matchless skill and coolness the em- peror Nicholas was placed at his wits' end; but the con- summate ability with which he managed the negotiations connected with the question of the Holy Places, so as to place the emperor as much as possible in the wrong, and to render his act of hostility on 3d July 1853—which led to the Crimean war—unjustifiable, cannot be denied. During the war he retained his position at Constantinople, but at its conclusion he returned in 1858 to London. In 1852 he had been raised to the peerage with the title Viscount Stratford de Redcliffe. His later years were spent chiefly in retirement, and, except when the Eastern question came prominently into notice, he took little part in political dis- cussion. On Eastern politics he contributed several papers to the Times and the Nineteenth Century. He died with- out surviving male issue 14th August 1880.

His essays were collected and published in 1881 under the title of the astern Question, with a memorial preface by Dean Stanley. A memoir by Stanley Lane Poole is in preparation.

STRATO. See PERIpaTETics, vol. xviii. p. 545.

STRAUBING, an ancient town in the most fertile part of Lower Bavaria, is situated on the right bank of the Danube, 25 miles to the south-east of Ratisbon. Its oldest and most characteristic building is the tall square tower of the town-hall, with its five pointed turrets, dating from 1208. The church of St James is a good Late Gothic edi- fice (1292-1512), with some paintings ascribed to Wohl- gemuth, and the old Carmelite church contains a handsome monument to Duke Albert II. of Bavaria. The industries of Straubing are tanning, brewing, and trade in grain and cattle. The population in 1880 was 12,625, nearly all Roman Catholics.

Straubing isa town of remote origin, believed to be identical with the Koman station of Serviodwrum. In definite history, however, it is known only asa Bavarian town, and from 1333 to 1425 it was the seat of the collateral ducal line of Baiern-Straubing. Its chief historical interest attaches

to its connexion with the unfortunate Agnes Bernauer, who lived at the chateau here with her husband Duke Albert IIT. During the latter's absence his father, Duke Ernest, exasperated at the mesalliance, cruelly and unjustly con- demned his son's low-born wife to death, and caused her to be hurled into the Danube from the bridge (1485). A chapel in the church- yard of St Peter's is said to cover her remains. Fraunhofer the optician was born at Straubing in 1787.

STRAUSS, Davin Frieprica (1808-1874), author of the Leben Jesu, was born at Ludwigsburg, near Stuttgart, January 27, 1808. He was the son of a small tradesman who loved literature and thought more than business, and his mother was a bright intelligent woman whose piety was practical rather than meditative, while she had an open eye for the beauties of art and nature. In his thirteenth year the boy was sent to the evangelical seminary at Blau- beuren, near Ulm, to be prepared for the study of theo- logy. Amongst his school-fellows were youths destined to become equally distinguished with himself, of whom he has given sketches in his Christian Marklin. Amongst the principal masters in the school were Professors Kern and F. C. Baur, who infused into their pupils above all a deep love of the ancient classics. In 1825 Strauss passed from school to the university of Tiibingen. The course of study was two years of philosophy and history and three of theology. The professors of philosophy failed to interest him, and he accordingly followed pretty much his own devices in this field, devoting himself especially to Schelling, the writers of the romantic school, Jacob Bohme, and even to somnambulistic and other modern supersti- tions. In 1826 his previous teachers, Kern and Baur,

removed to Tiibingen, and the latter introduced him to the writings of Schleiermacher, which awoke his keen dialectical faculty and delivered him from the 'vague- ness and exaggerations of romantic and somnambulistic mysticism, while for a time he found satisfaction for his religious nature in Schleiermacher's idea of religion. In the last year of his stay at Tiibingen he read with Marklin Hegel's Phdnomenologie, which was the beginning of his abandonment of Schleiermacher for Hegel. In 1830 he passed his examination brilliantly, and became assistant to a country clergyman, and

was greatly beloved as preacher and pastor by the parishioners. After nine months in this position he accepted the post of professor in the high school at Maulbronn, having to teach Latin, history, and Hebrew. Here also he was most successful and highly valued. But in October 1831 he resigned his office in order to study under Schleiermacher and Hegel in Berlin. Hegel died just as he arrived, and, though he regularly attended Schleiermacher's lectures, it was only those on the life of Jesus which exercised a very powerful influence upon him. It was amongst the followers of Hegel that he found kindred spirits. Under the leading of Hegel's distinction between " Vorstellung" and " Begriff," he had already conceived the idea of his two principal

| theological works—the Life of Jesus and the Christian

Dogmatics. In 1832 he returned to Tiibingen and became repetent in the university, lecturing on logic, history of philosophy, Plato, and history of ethics, with great success. But in the autumn of 1833 he resigned this positton in order to devote all his time to the completion of his pro- jected Life of Jesus. In a year the manuscript was fin- ished, and in 1834 the first volume and in 1835 the second were given to the world. The work produced an immense sensation and created a new epoch in the treatment of the rise of Christianity. The chief replies to it were by Tholuck, Neander, A. Schweizer, Ullmann, and Bruno Bauer. In 1837 Strauss replied to his critics (Streitschriften zur Vertheadigung meiner Schrift tiber das Leben Jesu). In the third edition of the work (1839), and in Zwei Sriedliche Blitter, he made important concessions to his critics, which he withdrew, however, in the fourth edition (1840, translated into English by George Eliot, with Latin preface by Strauss, 1846). In 1840 and the following year he published his Christliche Glaubenslehre (2 vols.), the principle of which is that the history of Christian doctrines is their disintegration. Between the publication of this work and that of the Mriedliche Bldtter he had been elected to a chair of theology in the university of Zurich. But the appointment provoked such a storm of popular ill-will in the canton that the authorities considered it wise to pension him before he entered upon his duties, although this concession came too late to save the Govern- ment. With his Glaubenslehre he took leave of theology for upwards of twenty years. In August 1842 he married Agnes Schebest, a cultivated and beautiful opera singer of high repute, but

not adapted to be the wife of a scholar and literary man like Strauss. Five years afterwards, when two children had been born, a separation by arrange- ment was made. Strauss resumed his literary activity by the publication of Der Romantiker auf dem Throne der Cexsaren, in which he drew a satirical parallel between Julian the Apostate and Frederick William IV. of Prussia (1847). In 1848 he was nominated as member of the Frankfort parliament, but was defeated. He was elected for the Wiirtemberg chamber, but his action was so con- servative that his constituents requested him to resign his seat. He forgot his political disappointments in the prot duction of a series of biographical works, which secured for him a permanent place in German literature (Schubar?'s Leben, 2 vols., 1849; Christian Marklin, 1851; Frischlin,

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1855 ; Ulrich von IHutten, 3 vols., 1858-60, 4th ed., 1878 ; Hf. S. Reimarus, 1862). With this last-named work (see REIMARUS) he returned to theology, and two years after- wards (1864) published his Leben Jesu fiir das Deutsche Volk (4th ed., 1877). It failed to produce an effect com- parable with that of the first Z2fe, but the replies to it were many, and Strauss answered them in his pamphlet Die Halben und die Ganzen (1865), directed specially against Schenkel and Hengstenberg. His Christus des Glaubens und der Jesus der Geschichte (1865) is a severe criticism of Schleiermacher's lectures on the life of Jesus, which were then first published. From 1865 to 1872 Strauss resided in Darmstadt, where he made the personal acquaintance of the princess Alice and the crown-princess of Germany, receiving from both ladies many marks of esteem. In 1870 he published his lectures on Voltaire (3d ed., 1872), which were written for the princess Alice and delivered before her. In the works of these years it seemed that the truth of Christianity had become still more problematic to Strauss, and this was more obvious than ever in his next and last important work, his confession, and final summary answer to the four great questions —Are we Christians ? Have we still religion? What is our conception of the world? How are we to regulate our lives? (Der Alte und der Neue Glaube, 1872, 11th ed., 1881, English translation by M. Blind, 1873). The work produced a greater sensa- tion than his first Lzfe of Jesus, and not least amongst Strauss's own friends, who wondered at his one-sided view of

Christianity, his professed abandonment of all spiritual philosophy, the strange inconsistencies of his thought, his scientific credulity, and the offensive form of his negations. To the fourth edition of the book he added a Nachwort als Vorwort (1873). The same year symptoms of a fatal malady appeared, and death followed February 7, 1874. Though his last book renounced in almost frivolous lan- guage the hope of immortality, he read Plato's Phedo in the Greek during his last days, and Zeller says "his friends bade him adieu with feelings such as Plato has described at the end of that dialogue."

Strauss's mind was almost exclusively analytical and critical, without depth of religious feeling, or philosophical penetration, or historical sympathy. His work was accordingly rarely construct- ive, and, save when he was dealing with a kindred spirit, he failed as an historian, biographer, and critic, strikingly illustrating Goethe's profoundly true principle that loving sympathy is essential for productive criticism. His first Life of Jesis was directed against not only the traditional orthodox view of the Gospel narratives, but likewise the rationalistic treatment of them, whether after the manner of Reimarus or that of Paulus. The mythical theory that the Christ of the Gospels, excepting the most meagre outline of personal history, was the unintentional creation of the early Christian Messianic expectation he applied with merciless rigour and mechanical inconsideration to the narratives. But his opera- tions were based upon fatal defects, positive and negative. He held a narrow theory as to the miraculous, a still narrower as to the relation of the divine to the human, and he had no true idea of the nature of historical tradition, while, as C. F. Baur complained, his critique of the Gospel history had not been preceded by the essential preliminary critique of the Gospels themselves. With a broader and deeper philosophy of religion, juster canons of historical criticism, with a more exact knowledge of the date and origin of the Gospels, his rigorous application of the mythical theory with its destructive results would have been impossible. In his second Life of Jesus, though conceding something to C. F. Baur, he adhcres substantially to his mythical theory, while he seeks to make good one defect of the first Life by supplying a previous examination of the Gospels. But this examination shows little independent research, being searcely more than the adoption of the conclusions of C. F. Baur and his earlier disciples. Another advance on the first work is the addition of a

sketch of the historical facts of the life of Jesus and of his religious character, but he adheres to his early limited and shallow view of the relation of the divine and the auman, and still fails to apprehend the true mission of the founder of the Christian religion. But the estimate of the religious mission of Jesus, and of the historical trustworthiness of the Gospels, is far higher in this Zife than the final one in Der Alte und der Neue Glaube. As in his philosophical development he exhibited waver-

ing uncertainty, so it is impossible to reconcile his views of Christ and Christianity at different periods of his life. Some of the expressions of his last book in this respect are in glaring zontrast with the positions he maintained in earlier years.

Strauss's works are published in a collected edition in 12 vols., by Zeller Bonn, 1876-78, without bis Christliche Dogmatik. On his life and works see Zeller's David Friedrich Strauss in seinem Leben und seinen Schriften, Bonn 1874; A. Hausrath's D. F. Strauss und die Theologie seiner Zeit, 2 vols., Heidel: berg, 1876-78; his own essay on Julius Kerner; F. J. Vischer's Kritische Géinge, i. 3. Karl Schwarz, Zur Geschichte der neuesten Theologie, 4th ed., 1869; Hein. rich Lang, Meligiése Reden, vol. ii.; Dorner, Geschichte der protestantischen Theologie, 1876; Nippold, Handbuch der neuesten Kirchengeschichte, 1868; J. Scholten, "Strauss and Christianity," in Theological Review, 1874, Jan. and April; Hase, Geschichte Jesu, 1876, give critiques from different points of view of Strauss's theological works, particularly his Lives of Jesus. (J. F.S.)

STRAUSS, Jonann (1804-1849), orchestral conductor and composer of dance-music, was born at Vienna, March 14, 1804. In 1819 he obtained his first engagement as a violinist in a small band then playing at the Sperl, in the Leopoldstadt. Shortly afterwards he joined Lanner, with whom he remained associated as deputy-conductor until 1825, when he organized a little band of fourteen performers on his own account. It was during the carnival of 1826 that Strauss inaugurated his long line of triumphs by introducing his band to the public of Vienna at the Schwan, in the Rossau suburb, where his famous Taziberl- Walzer (op. 1) at once established his reputation as the best composer of dance-music then living, Upon the

strength of this success he was invited back to the Sperl, where he accepted an engagement, with an increased orchestra, for six years. Soon after this he was appointed kapellmeister to the lst Biirger regiment, and entrusted with the duty of providing the music for the court balls ; while the number of his private engagements was so great that he found it necessary to enlarge his band from time to time until it consisted of more than two hundred performers. In 1833 he began a long and extended series of tours throughout northern Europe, eventually visiting England in 1838. In Paris he associated himself with Musard, whose quadrilles became not much less popular than his own waltzes; but his greatest successes were achieved in London, where he arrived in time for the coronation of Queen Victoria, and played at seventy-two public concerts, besides innumerable balls and other pri- vate entertainments. The fatigue of these long journeys seriously injured Strauss's health; but he soon resumed his duties at the Sperl; and on May 5, 1840 he removed with his band to the Imperial '' Volksgarten," which thence- forth became the scene of his most memorable successes. Those who enjoyed the privilege of hearing him conduct there could never forget the wonderful delicacy of the per- formance, over which the master presided with a quiet power which ensured the perfection of every minutest nuance. In 1844 Strauss began another extensive series of tours. In 1849 he revisited London, and, after his fare- well concert, was escorted down the Thames by a squadron of boats, in one of which a band played tunes in his honour. This was his last public triumph. On his return to Vienna he was attacked with scarlet fever, of which he died, Sep- tember 25, 1849.

Strauss was survived by three sons, Johann (born 1825), Joseph (1827-1870), and Edward (born 1835), all of whom have distin- guished themselves as composers of dance-music, and assisted mm recruiting the ranks and perpetuating the traditions of the still famous band.

STRAUSS-DURCKHEIM, Hercuts (b. 1790, d. 1865), an eminent French entomologist, was the author of ana tomical works of exquisite precision and fulness of detail. Two of these (his monographs of the anatomy of the cock- chafer and of the cat) are permanent classics, of which the influence has aided greatly in raising the standard of zoological works. i

STRAWBERRY (Fragaria). Apart from its interest as a dessert fruit (see HortTIcULTURE, vol. xii. p. 276), the strawberry has claims to attention by reason of the pecu-

jiarities of its structure and the excellent illustrations it offers of the inherent power of variation possessed by the plant and of the success of the gardener in availing himself of this tendency. The genus /ragaria consists of a small number (three to four, according to Hooker) of species, native of the temperate regions ®f both hemispheres, as | well as of mountain districts in warmer climes. The tufted ‘character of the plant, and its habit of sending out long slender branches (runners) which produce a new bud at | the extremity, are well known. The leaves are usually palmately three-parted, but the number of leaflets may be increased to five or reduced to one. While the flower has the typical Rosaceous structure, the so-called fruit is very peculiar, but it may be understood by the contrast it pre- sents with the “hip” of the rose. In the last-named plant the top of the flower-stalk expands as it grows. into a vase- shaped cavity, the “hip,” within which are concealed the | true fruits or seed-vessels. In the rose the extremity of the floral axis is concave and bears the carpels in its interior. In the strawberry the floral axis, instead of becoming concave, swells out into a fleshy, dome-shaped or flattened mass in which the carpels or true fruits, commonly called pips or seeds, are more or less imbedded but never wholly concealed. A ripe strawberry in fact may be aptly compared to the “fruit” of a rose turned inside out.

The common wild strawberry of Great Britain, which indeed is found throughout Europe and great part of North America, is /”. vesca, and this was the first species brought under cultivation in the early part of the 17th century. Later on other species were introduced, such as _F. elatior, a European species, the parent stock of the hautbois strawberries, and especially 7’. virginiana from the United States and F. chiloensis from Chiloe. From these species, crossed and recrossed in various manners, have sprung the vast number of different varieties now enumerated in catalogues, whose characteristics are so inextricably blended that the attempt to trace their exact parentage or to follow out their lineage has become impos- sible.

It must suffice to say that the varieties at present cultivated vary in the most remarkable degree in size, colour, flavour, shape, degree of fertility, season of ripen- ing, liability to disease, and constitution of plant. Some, as previously stated, vary in foliage, others produce no runners, and some vary materially in the relative develop- ment of their sexual organs, for, while in most cases the flowers are in appearance hermaphrodite, at least in struc- ture, there is a very general tendency towards a separation of the sexes, so that the flowers are males or females only as to function, even although they may be perfect in con- | struction. This tendency to dicecism is a common charac- _ teristic among Rosacex, and sometimes proves a source of disappointment to the cultivator, who finds his plants

barren where he had hoped to gather a crop. This happens in the United States more frequently than in Britain, but | when recognized can readily be obviated by planting male

varieties in the vicinity of the barren kinds. Darwin, in . alluding to the vast amount of variability in the so-called

“ fruit,”—a change effected by the art of the horticulturist

in less than three centuries,—contrasts with this variability _ the fixity and permanence of character presented by the true fruits, or pips, which are distributed over the surface of the swollen axis. The will and art of the gardener have been directed to the improvement of the one organ, while he has devoted no attention to the other, which conse- | quently remains in the same condition as in the wild plant. _ Too much stress is not, however, to be laid on this point, _ for it must be remembered that the foliage, which is not

Specially an object of the gardener’s “selection,” neverthe- _ less varies considerably.

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STRAW MANUFACTURES. Straw forms the raw

material of some not unimportant industries. It serves for the thatching of roofs, for a paper-making material, for or- namenting small surfaces as a "'straw mosaic," for plaiting into door and table mats, mattresses, &c., and for weaving and plaiting into light baskets, artificial flowers, &c. These applications, however, are insignificant in comparison with the place occupied by straw as a raw material for the straw bonnets and hats worn by both sexes. Of the various materials which go to the fabrication of plaited head-gear the most important is wheaten straw. It is only in certain areas that straw suitable for making plaits is produced. The straw must have a certain length of "pipe" between the knots, must possess a clear delicate golden colour, and must not be brittle. The most valuable straw for plaits is grown in Tuscany, and from it the well-known Tuscan plaits and Leghorn hats are made. The straw of Tuscany, specially grown for plaiting, is distinguished into three qualities, Pontederas Semone being the finest, IMazzuolo the second quality, from which the bulk of the plaits are made, while from the third quality, Santa fFioro, only "Tuscan pedals" and braids are plaited. The wheat-seed for these straws is sown very thickly on comparatively elevated and arid land, and it sends up long attenuated stalks. When the grain in the ear is about half developed the straw is pulled up by the roots, dried in the sun, and subsequently spread out for several successive days to be bleached under the influence of alternate sunlight and night-dews. The pipe of the upper joint alone is selected for plaiting, the remainder of the straw being used for other purposes. These pipes are made up in small bundles, bleached in sulphur fumes in a closed chest, assorted into sizes, and so prepared for the plaiters. Straw plaiting is a domestic industry among the women and young children of Tuscany and some parts of Emilia. Tuscan plaits and hats vary enormously in quality and value; the plait of a hat of good quality may represent the work of four or five days, while hats of the highest quality may each occupy six to nine months in making. The finest work is excessively trying to the eyes of the plaiters, who can at most give to it two or three hours' labour daily. The exports of plaits and manufactured hats from Leghorn average in value £480,000 annually, about one half of the goods going to America.

The districts around Luton in Bedfordshire and the neighbouring counties have, since the beginning of the 17th century, been the British home of the straw-plait industry. The straw of certain varieties of wheat culti- vated in

that region is, in favourable seasons, possessed of a fine bright colour and due tenacity and strength. The straw is cut as in ordinary harvesting, but is allowed to dry in the sun before binding. Subsequently straws are selected from the sheaves, and of these the pipes of the two upper joints are taken for plaiting. The pipes are assorted into sizes by passing them through graduated openings in a grilled wire frame, and those of good colour are bleached by the fumes of sulphur. Spotted and dis- coloured straws are dyed either in pipe or in plait. The plaiters work up the material in a damp state, either into whole straw or split straw plaits. Split straws are pre- pared with the aid of a small instrument having a project- ing point which enters the straw pipe, and from which radiate the number of knife-edged cutters into which the straw is to be split. The plaiting of straw in the Luton district formerly gave employment to many thousands of women and young children; but now vast quantities of plaits are imported at a very cheap rate from Canton in China. The result is that, while the Luton trade is extending, the number of persons it there gives occupation is greatly diminished. In 1871 about 50,000 persons

Stress.

State of stress,

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powerful pressure, according to the dictates of fashion. The annual output of the straw-plait industry in England is estimated to amount in value to about £4,000,000.

In the United States straw-plait work is principally

centred in the State of Massachusetts.

Many substances besides straw are worked into plaits and braids for bonnets. Among these may be noticed thin strips of willow

and cane, and the fronds of numerous palms. “Brazilian” hats made from the fronds of the palmetto palms, Sabal Palmetto and S. mexicana, are now largely made at St Albans. The famous Panama hats, fine qualities of which at one time were worth £20 to £30 each, are made from the leaves of the screw pine, Carludovica palmata. They are now manufactured at Dresden, Strasburg, and Nancy, and can be purchased at 30s, on ea

STREET, Grorcz Epmunp (1824-1881), one of the ablest architects of the present century, was born at Woodford in Essex in 1824. He obtained his archi- tectural education in the office of Mr Owen Carter at Winchester, and afterwards worked for five years as an “improver” with Sir G. G. Scott in London. At an early age Street became deeply interested in the principles of Gothic architecture, and devoted an unsparing amount of time and labour to studying and sketching the finest examples of medizval buildings in fngland and on the Continent. He was a draughtsman of a very high order ; his sketches are masterpieces of spirit and brilliant touch. In 1855 he published a very careful and well illustrated work on Zhe Brick and Marble Architecture of Northern

Jtaly, and in 1865 a book on The Gothic Architecture of

Spain, with very beautiful drawings by his own hand. Street’s personal taste led him in most cases to select for

his design the 13th-century Gothic of England or France, ;

STRENGTH OF MATERIALS

aie HE name “strength of materials” is given to that

part of the theory of engineering which deals with the nature and effects of stresses in the parts of engineering structures. Its principal object is to determine the proper size and form of pieces which have to bear given loads, or, conversely, to determine the loads which can be safely applied to pieces whose dimensions and arrangement are already given. It also treats of the relation between the applied loads and the changes of form which they cause. The subject comprises experimental investigation of the properties of materials as to strength and elasticity, and mathematical

discussion of the stresses in ties, struts, beams, shafts, and other elements of structures and machines.

2. Stress is the mutual action at the surface of contact between two bodies, or two imaginary parts of a body, whereby each of the two exerts a force upon the other. Thus, when a stone lies on the ground there is at the surface of contact a stress, one aspect of which is the force directed downwards with which the stone pushes the ground, and the other aspect is the equal force dirccted upwards with which the ground pushes the stone. A body is said to be ina state of stress when there is a stress between the two parts which lie on opposite sides of an imaginary surface of section. A pillar or block supporting a weight is ina state of stress be- cause at any cross section the part above the section pushes down against the part below, and the part below pushes up against the part above. A stretched rope is in a state of stress, because at any cross section the part on each side is pulling the part on the other side with a force in the direction of the rope's length. A plate of metal that is being cut in a shearing machine is in a state of stress, because at the plane which is about to become the plane of actual section the portion of metal on each side is tending to drag the portion on the other side with a force in that plane.

were employed in the straw industry, and in 1881 the number was only about 31,000. The plaits are sewed partly by hand and in a special sewing-machine, and the hats or bonnets are finished by stiffening with gelatin size, and blocking into shape with the aid of heat'and

his knowledge of which was very great, especially in the skilful use of rich mouldings. By far the majority of the buildings erected by him were for ecclesiastical uses, the chief being the convent of East Grinstead, the theological college at Cuddesden, and a very large number of churches, such as St Philip and St James's at Oxford, St John's at Torquay, All Saints at Clifton, St Saviour's at Hast bourne, St Margaret's at Liverpool, and St Mary Mag. dalene, Paddington. His largest works were the nave of Bristol cathedral, the choir of the cathedral of Christ Church in Dublin, and, above all, the new Courts of Justice in London, second only in architectural import- ance (during this century) to the Houses of Parliament, After a

prolonged competition Street was appointed architect to the Courts of Justice in 1868 ; but the building was not complete at the time of his death in December 1881. A great deal of somewhat unfair criti. cism has been lavished on this building; but it should be remembered that Street was much hampered both by want of a sufficiently large site and by petty economies in money insisted on by the commissioner of works. Though perhaps deficient in unity of composition, this great build- ing possesses much grace in its separate parts, and hag great refinement of detail throughout. Street was elected an associate of the Royal Academy in 1866 and R.A. in 1871; at the time of his death he was professor of history to the Royal Academy, and had just finished a very interesting course of lectures on the development of medi- eeval architecture. He was also a member of the Royal Academy of Vienna, and a knight of the Legion of Honour, His somewhat sudden death, on December 18, 1881, was hastened by over-work and professional worries connected with the erection of the law courts. He was buried in the nave of Westminster Abbey, where his grave is marked by a handsome sepulchral brass designed by Mr Bodley. STREETS. See Roans.

8. In a solid body which is in a state of stress the direction of Yom stress at an imaginary surface of division may be normal, oblique, and ta. or tangential to the surface. When oblique it is often con- gential veniently treated as consisting of a normal and a tangential com- she, ponent. Normal stress may be either push (compressive stress) of pull (tensile stress). Stress which is tangential to the surface is called shearing stress. Oblique stress may be regarded as so much push or pull along with so much shearing stress. The amount of stress per unit of surface is called the intensity of stress, Stress is said to be uniformly distributed over a surface when each fraction of the area of surface bears a corresponding fraction of the whole stress. Ifa stress Pis uniformly distributed over a plane surface of area 8, the intensity is P/S. If the stress is not uniformly distrib- uted, the intensity at any point is 8P/8S, where dP is the amount of stress on an indefinitely small area 88 at the point considered.

For practical purposes intensity of stress is usually ex ressed in tons weight per square inch, pounds weight per square inch, or kilo- grammes weight per square millimetre or per square centimetre,’ –

4. The simplest possible state of stress is that of a short pillar Simple or block compressed. by opposite forces applied at its ends, or that long | of a stretched rope or other tie. In these cascs the stress is wholly tudinal | in one direction, that of the length. These states may be distin- sits. guished as simple longitudinal push and simple longitudinal pull.

In them there is no stress on planes parallel to the direction of the applied forces.

A more complex state of stress occurs if the block is compressed Com or cxtended by forces applicd to a pair of opposite sides, as well as pout by forces applied to its ends,—that is to say, if two simple longi- stress | tudinal stresses in different directions act together. A still more complex state occurs if a third stress be applied to the remaining pair of sides. It may be shown that any state of stress which can possibly exist at any point of a body may be produced by the joint action of three simple pull or push stresses in three suitably chosen directions at right angles to cach othcr.2 These three are

1 One ton per sq. in.=2240 ib per sq, in.=1°511 kilos. per sq. mm. 2 See Evasticiry, vol. vii. p. 819.

_ along another it is less, than in any other direction.

called principal stresses, and their directions are called the axes of principal stress. These axes have the important property that the intensity of stress along one of them is greater, and cee

These are called respectively the axes of greatest and qT

— least principal stress.

5. Returning uow to the case of a single simple longitudinal stress, let AB (fig. 1) be a portion of a tie or a strut which is being pulled or pushed in the direction of the axis AB with a total stress P. On any plane CD taken at right angles to the axis_we have a normal pull or push of intensity p=P/S, a?

being the area of the normal cross-section. Ona plane EF whose normal is inclined to the axis at an anglo we have a stress still in the direction of the axis, and i therefore oblique to the plane EF, of intensity P/S′, i where 9′ is the area of the surface EF, or S/cosé. The 4 whole stress P on EF may be resolved into two com- Fig. 1 ponents, one normal to EF, and the other a shearing oi stress tangential to EF. The normal component (Pp, fig. 2) is Pcos@; the tangential component (P;) is Psin@. Hence the inten- sity of normal pull or push on EF, or pn, is pcos? 6, and the intensity of shearing stress EF, or gy, is psin@cosé. This expression makes p, a maximum when @=45°: p planes inclined at 45° to the axis are called planes of maximum shearing stress; the intensity of shearing stress on them is $p. P 6. Shearing stress in one direction is necessarily ac- ” companied by an equal intensity of shearing stress in Fie 2 another direction at right angles to the first. To provo * this it is sufficient to consider the equilibrium of an indefinitely small cube (fig. 8), with one pair of sides parallel to the direc- tion of the shearing stress P;. This stress, act- ing ou two opposite sides, produces a couple which tends to rotate the cube. No arrange- ment of normal stresses on any of the three pairs of sides of the cube can balance this couple ; that ean be done only by a shearing stress Q; whose direction is at right angles to the first stress P, and to the surface on which P; acts, and whose intensity is the same as that of P, The shearing stresses P; and Q; may exist alone, or Fig. 3.

as components of oblique stress.

7. lf they exist alone, the material is said to be in a state of simple shearing stress. This state of stress may be otherwise described

| by reference to the stresses on diagonal planes of the cube ABCD. | Thus P; and Q; produce a nornial stress R on a diagonal plane,

and the equilibrium of

: : A Cy the triangular prism * P.2%

(fig. 4) requires that R=Pr/2. But Racts % . _on a surface which is / greater than each of _ the sides in the ratio R of4/2:1. The inten- Pe= Qe D sity of normal stress Fig, 4 on the diagonal plane aes AC is therefore the same as

the intensity of shearing stress on AB or BC. The same considerations apply to the other diagonal plane BD at right angles to AC, with this difference, that the stress on it 1s normal pull instead of push. Hence we may regard a state of simple shearing stress as compounded of two simple longitudinal stresses, one of push and one of pull, at right angles to each other, of equal intensity, and inclined at 45° to the direction of the shcar- | Ing stress.

8. StRAIN is the change of shape produced by stress. If the stress is a simple longitudinal pull, the strain consists of lengthen- ing in the direction of the pull, accompanied by contraction in

both directions at right angles to the pull. If the stress is a simple

_ push, the strain consists of shortening in the direction of the push

and expansion in both directions at right angles to that; the stress and the strain are then exactly the reverse of what they are in the case of simple pull. If the stress is one of simple shearing, the strain consists of a distortion such as would be produced by the sliding of layers in the direction of the shearing stresses. | A material is clastic with regard to any applied stress if the strain disappears when the stress is removed. Strain which per- _ sists after the stress that produced it is removed is called perma- _ nent set. For brevity, it is convenient to speak of strain which , disappears when the stress is removed as elastic strain.

| 9 Actual materials are generally very perfectly elastic with

) Yegard to small stresses, and very imperfectly elastic with regard

to great stresses. If the applied stress is less than a certain limit, the strain is in general small in amount, and disappears wholly or almost wholly when the stress is removed. If the applied stress exceeds this limit, the strain is, in general, much greater than before, and the principal part of it is found, when the stress

is removed, to consist of permanent set. The limits of stress within which strain is wholly or almost wholly elastic are called limits of elasticity.

For any particular mode of stress the limit of elasticity is much more sharply defined in some materials than in others. When well defined it may readily be recognized in the testing of a sample from the fact that after the stress exceeds the limit of elasticity the strain begins to-increase in a much more rapid ratio to the stress than before. This characteristic goes along with the one already mentioned, that up to the limit the strain is wholly or almost wholly elastie.

10. Within the limits of elasticity the strain produced by a Hooke's stress of any one kind is proportional to the stress producing it. law, This is Hooke's law, enunciated by him in 1676.

In applying Hooke's law to the case of simple longitudinal stress,

-—such as the case of a bar stretched by simple longitudinal pull,— we may measure the state of strain by the change of length per unit of original length which the bar undergoes when stressed. Let the original length be 7, and let the whole change of length be 37 when a stress is applied whose intensity p is within the elastic limit. Then the strain is measured by 8//l, and this by Hooke's law is proportional to y, This may be written Se isia: HE,

where E is a constant for the particular material considered. The same value of E applies to push and to pull, these modes of stress being essentially continuous, and differing only in sign.

11. This constant E is called the modulus of longitudinal Young's extensibility, or Young's modulus. Its value, which is expressed modulus, in the same units as are used to express intensity of stress, may be measured directly by exposing a long sample of the material to longitudinal pull and noting the extension, or indirectly by measuring the flexure of a loaded beam of the material, or by ex- periments on the frequency of vibrations. It is frequently spoken of by engineers simply as the modulus of elasticity, but this name is too general, as there are other moduluses applicable to other modes of stress. Since E=p//8/, the modulus may be defined as the ratio of the intensity of stress p to the longitudinal strain 57/2.

12. In the case of simple shearing stress, the strain may be Modulus measured by the angle by which cach of the four originally right of angles in the square prism of fig. 3 is altered by the distortion of rigidity, the prism. Let this angle be ¢ in radians; then by Hooke's law p/p=C, where p is the intensity of shearing stress and C is a con- stant which measures the rigidity of the material. C is called the modulus of rigidity, and is usually determined by experiments on torsion,

13. When three simple stresses of equal intensity y and of the Modulus same sign (all pulls or all pushes) are applied in three directions, of eubic the material (provided it be isotropic, that is to say, provided its compres- properties are the same in all directions) suffers change of volume sibility. only, without distortion of form. Ifthe volume is V and the chango of volume 3YV, the ratio of the stress p to the strain 5V/V is called the modulus of cubie compressibility, and will be denoted by K.

The state of stress here considered is the only one possible in a fluid at rest. The intensity of stress is equal.in all directions.

14. Of these three moduluses the one of most importance in engineering applications is Young's modulus E. When a simple longitudinal pull or push of intensity p is applied to a piece, the longitudinal strain of extension or compression is p/E. This is accompanied by a lateral contraction or expansion, in each trans- verse direction, whose amount may be written »/oE, where o is the ratio of longitudinal to lateral strain. It is shown in the article

Exasriorry, § 47, that E= °C 2(3K + C)

a+ 0 M19″ "3K-90 ;

15. Beyond the limits of elasticity the relation of strain to stress Plastic becomes very indefinite. Materials then exhibit, to a greater or Strain. less degree, the property of plasticity. The strain is much affected by the length of time during which the stress has been in opera- tion, and reaches its maximum, for any assigned stress, only after a long (probably an indefinitely long) time. Finally, when the stress is sufficiently increased, the ratio of the increment of strain to the increment of stress becomes

indefinitely great if time is given for the stress to take effect. In other words, the substance then assumes what may be called a completely plastic state ; it flows under the applied stress like a viscous liquid.

16. The ultimate strength of a material with regard to any stated Ulti- mode of stress is the stress required to produce rupture. In reckon- mate ing ultimate strength, however, engineers take, not the actual in- strength, tensity of stress at which rupture occurs, but the value which this intensity would have reached had Ss og ensued without previous alteration of shape. Thus, if a bar whose original cross-section is 2 square inches breaks under a uniformly distributed pull of 60 tons, the ultimate tensile strength of the material is reckoned to be 30 tons per square inch, although theactual intensity of stress which produced rupture may have been much greater than this, owing to the con- traction of the section previous to fracture. The convenience of this usage will be obvious from an example. Suppose that a piece

Factor of

safety.

of material of the same quality be used in a structure under con- ditions which cause it to bear a simple pull of 6 tons per square inch ; we conclude at once that the actual load is one-fifth of that which would cause rupture, irrespective of the extent to which the material might contract in section if overstrained. The stresses which occur in engineering practice are, or ought to be, in all cases within the limits of elasticity, and within these limits the change of cross-section caused by longitudinal pull or push isso small that it may be neglected in reckoning the intensity of stress.

Ultimate tensile strength and ultimate shearing strength are well defined, since these modes of stress (simple pull and simple shearing stress) lead to distinct fracture if the stress is sufficiently increased. Under compression some materials yield so continu- ously that their ultimate strength to resist compression can scarcely be specified ; others show so distinct a fracture by crushing (§ 43 below) that their compressive strength may be determined

with some precision. In what follows, the three kinds of ultimate strength will be designated by the symbols f;, fs, and /., for tension, shearing, and crushing respectively.

Some of the materials used in engineering, notably timber and wrought-iron, are so far from being isotropic that their strength is widely different for stresses in different directions. In the case of wrought-iron the process of rolling develops a fibrous structure on account of the presence of streaks of slag which become inter- spersed with the metal in puddling ; and the tensile strength of a rolled plate is found to be considerably greater in the direction of rolling than across the plate. Steel plates, being rolled from a nearly homogeneous ingot, have nearly the same strength in both directions.

17. In applying a knowledge of the ultimate strength of materials to determine the proper sizes of parts in an engineering structure, these parts are proportioned so that the greatest intensity of stress (which for brevity is called the working stress) will be only a cer- ultimate strength

working stress is called the factor of safety.! The choice of a factor of safety depends on many cousiderations, such as the probable accuracy of

tain fraction of the ultimate strength. The ratio

the theory on which the calculation of working stress has beep based; the uniformity of the material dealt with, and the extent to which its strength may be expected to conform to the assumed value or to the values determined ‘by experiments on samples; the deviations from the specified dimensions which may be caused by bad workmanship ; the probable accuracy in the estimation of loads ; the extent to which the materials will deteriorate in time, The factor is rarely less than 3, is very commonly 4 or 5, and ig sometimes as much as 12, or even more.

The ultimate strength for any one mode of stress, such as simple pull, has been found to depend on the time rate at which stress is applied ; this will be noticed more fully later (§§ 28-34). It has also been found to depend very greatly on the extcnt and frequency of variation in the applied stress. A

stress considerably Jess than the normal ultimate strength will suffice to break a piece when it is frequently applied aud removed; a much smaller stress will cause rupture if its sign is frequently reversed ; and hence in a structure which has to bear what is called live load the permis. sible intensity of stress is less than in a structure which has to bear only load and also on its frequency of variation (8§ 45, 46 below).

18. From an engineering point of view, the structural merit of a material, especially when live loads and possible shocks have to be sustained, depends not only on the ultimate strength but also on the extent to which the material will bear deformation without rupture. This characteristic is shown in tests made to determine tensile strength by the amount of ultimate elongation, and also by the contraction of the cross-section which occurs through the flow of the metal before rupture. It is often tested in other wa' such as by bending and unbending bars in a circle of specified radius, or by examining the effect of repeated blows. Tests by impact are generally made by causing a weight to fall through a regulated distance on a piece of the material supported as a beam.

19. Ordinary tests of strength are made by submitting the piece Tests of | Testing strength, |

to direct pull, direct compression, bending, or torsion. machines are frequently arranged so that they may apply any of these four modes of stress ; tests by direct tension are the most common,

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Fig. 5.

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and next to them come tests by bending. When the samples to be tested for tensile strength are mere wires, the stress may be applied directly by weights ; for pieces of larger section some mechanical multiplication of force becomes necessary. Owing to the plasticity of the materials to be tested, the applied loads must be able to follow considerable change of form in the i : thus in test- ing the tensile strength of wrought-iron or steel provision must be made for taking up the large extension of length which occurs before fracture. In most modern forms of large testing machines the loads are applied by means of hydraulic pressure acting on a piston or plunger to which one end of the specimen is secured, and the stress is measured by connecting the other end to a lever or system of levers provided with adjustable weights. In small

1 French engineers usually estimate the permissible working stress as a certain fraction of the elastic strength (that is, of the stress which reaches the

limit ba elasticity), instead of estimating it as a certain fraction of the ultimate strength.

Scale of Feet

ot

Fig. 6.

Wicksteed’s Single-Lever Testing Machine.

machines, and also in some large ones, the stress is applied by screw gearing instead of by hydraulic pressure. Springs are sometimes used instead of weights to measure the stress, and another plan 1s to make one end of the specimen act on a diaphragm forming part of a hydrostatic pressure-gauge (§ 23 below).

20. Figs. 5 and 6 show an excellent form of single-lever testing Single

machine designed by Mr J. H. Wicksteed,? in which the stress is lever applied by an hydraulic plunger and é : at steelyard and a movable weight. The illustration shows ae 30-ton machine, but machines of similar design have been built to exert a force of 100 tons or more. AA is the lever, on which there is a graduated scale. The stress on the test-plece T 1s measured by a weight W of 1 ton (with an attached vermer scale), which is moved along the lever by a screw-shaft 8; this screw' shaft is driven by a belt from a parallel shaft R, which takes jceminahdmendimpensieneseimmnt Minedamesere arin

2 Proc. Inst. Mech. Eng., August 1882.

is measured by a lever or testité

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- axis of the fulcrum, jou

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tion in fig. 5, exerts its thrust.

STRENGTH OF MATERIALS

through bevel-wheels and a Hooke's joint in the from the hand-wheel H. (The Hooke's nt in the shaft R is shown in a separate sketch above the lever in fig. 6.) The holder for the upper end of the sample hangs from a knife-edge three inches from the fulcrum of The lower holder is jointed to a crosshead C, which is connected by two vertical screws to a lower cross-

its motion,

ead B, upon which the hydraulic plunger P, shown in sec-

G is a counterpoise which ushes up the plunger, when the water is allowed to escape. Hydraulic pressure may be applied to P by pumps or by an accumulator. In the present instance it is applicd by means of an auxiliary plunger Q, which aera by screw gearing into an auxiliary cy- tiller. bis ea by a belt on the pulley D. This puts stress on the specimen, and the weight W is then run out along the lever so that the lever is just kept floating between the stops E, E. Before the test-piece is put in, the distance between the holders is regulated by means of the screws con- necting the upper and lower cross- heads C and B, these screws being turned by a handle applied at F. Fig. 7 is a section of one of the holders, showing how the test-piece T is gripped by serrated wedges. The knife-edges are made long enough to prevent the load on them ever exceeding 5 tons to the linear inch.

91. Another example of the single-lever type is the Werder testing machine, much used on the continent of Europe. In it the specimen is horizontal ; one end is fixed, tho other is at- tached to the short vertical arm of a bell-crank lever, whose ful- crum is pushed out horizontally by an hydraulic ram.t In

Fig. 7.

itij)- many other testing machines a system of two, three, or more

jis. was that of Major

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levers is employed to reduce the force between the specimen and the measuring weight. Probably the earliest machine of this class ade,? in which one end of the specimen was held in a fixed support, and the stretch was taken up by screwing up the fulcrum plate of one of the levers. In most multiple-lever machines, however, the fulcrums are fixed, and the stress is applied to one end of the specimen by hydraulic power or by screw gearing, which of course takes up the stretch, as in the single-lever machines already described. Mr Kirkaldy, who was one of the earliest as well as one of the

most assiduous workers in this field, applies in his 1,000,000 tb machine a horizontal hydraulic. press directly to one end of the horizontal test-piece. The other end of the piece is connected to the short vertical arm of a bell-crank lever; the long arm of this lever is horizontal, and is connected to a second lever to which weights are applied. In some of Messrs Fairbanks's machines the multiple-lever system is carried so far that the point of application of the weight moves 24,000 times as far as the som of attachment to the test-piece. The same makers have emp oyed a plan of adjusting automatically the position of the measuring weight, by making the scale lever complete an electric circuit when it rises or falls so that it starts an electric engine which runs the weight out orin.? Generally the measuring weight is adjusted by hand. In some, chiefly small, machines, the weight adjusts itself by means of another device. It is fixed at oue point of a lever which is arranged as a pendulum, so that, when the test-piece is pulled by force applied at the other end, the pendulum lever is de- flected from its originally vertical position and the weight acts with increasing leverage.

Multiple-lever machines have the advantage that the measuring weight is reduced to a conveniently small value, and that it can be easily varied to suit test-pieces of different strengths. On tho other hand, their multiplicity of joints makes the leverage some- what uncertain and increases friction. Another drawback is the inertia of the working parts. It is impossible to avoid oscilla- tions of the levers ; and, to prevent them from producing important errors in the recorded stress, the inertia of the oscillating system should be minimized. In a testing machine in which the specimen is directly loaded the inertia is simply that of the suspended weight M. In a lever machine, which multiplies the weight " times, the weight applied to the lever is reduced to M/n, but its inertia, when iors to the test-piece, is(M/n) x or Mn. The inertia which is effective for producing oscillation is thus increased m times, so far as the weight alone is concerned, and this detri- mental effect of leverage is increased by the inertia of the levers Eaeenelres. The effect will be more serious the greater is the everage 1.

22. Whitworth and others employ machines in which one end of the specimen is held in a fixed support; an hydraulic press acts ieee ila lat ila AT a

1 Maschine zum Priifen d. Festigkeit d. Materialen, &c., Munich, 1882.

2 Report of Experiments on Metals for Cannon, Philadelphia, 1856 ; also Ander- son's Strength of Materials, p. 15. _ 3 Abbott, On Testing Machines, New York, 1884, or Van Nostrand's Engineer- tng Mag., 1884.

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on the other end, and the stress is calculated from the pressure of fluid in the press, this being observed by a pressure-gauge. Machines of this class are open to the obvious objection that the friction of the hydraulic plunger causes a large and very uncertain difference between the force exerted by the fluid on the plunger and the force exerted by the plunger on the specimen. It appears, however, that in the ordinary conditions of packing the friction is very nearly proportional to the fluid pressure, and its effect may therefore be allowed for with some exactness. The method is not to be recommended for work requiring precision, unless the plunger be kept in constant rotation on its own axis during the test, in which case the effects of friction are almost entirely eliminated.

23. In another important class of testing machines the stress Dia- (applied as before to one end of the piece, by gearing or by phragm

hydraulic pressure) is measured by con- necting the other end to a flexible dia- phragm, on which a liquid acts whose eee is deter- mined by a gauge. Fig. 8 shows : sone ple machine of this class (used in 1873 for testing wire by Sir W. Thomson and the late Prof. F. Jenkin). The wire is stretched by means of a screw at the top, and pulls up the lower side of a hydrostatic bellows ; water from the bel- lows rises in the gauge-tube G, and its height measures the stress. Fig. 9 is Thomasset's testing machine, in which one end of the specimen is pulled by an hydraulic press A. The other end acts through a bell-crank lever B on a horizontal diaphragm C, consist-

Fie. 8,—Hydraulic Machine for Testing Wire.

ing of a metallic plate and a flexible ring of india-rubber. The pressure on the diaphragm causes a column of mer- cury to rise in the gauge-tube D.

The same principle is made use of in the testing machines of Chauvin and Marin-

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Fia. 9.—Thomasset's Testing Machine.

Darbel, Maillard,* and Bailey.

Emery. This is a horizontal machine, taking specimens of any length up to 30 feet, and exerting a pull of 860 tons or a push of 480 tons by an hydraulic press at one end. The stress is taken at the other end by a group of four large vertical diaphragm presses, which communicate by small tubes with four similar small dia- phragm presses in the scale case. The pressure of these acts on a system of levers which terminates in the scale beam. The joints and bearings of all the levers are made frictionless by using flexible steel connecting plates instead of knife-edges. The total multipli- cation at the end of the scale beam is 420,000.°

24. The results of tests are very commonly exhibited by means Stress- or diagrams showing the relation of strain

A few typical diagrams for wrought-iron and diagrams.

of stress-strain diagrams,

strain to stress. 1 steel in tension are given in fig. 10, the data for which are taken

from tests of long rods by Mr Kirkaldy.® Up to the elastic limit these diagrams show sensibly the same rate of extension for all the materials to which they refer. Soon after the limit of elasticity is passed, a point, which has been called by Prof. Kennedy the yield- point, is reached, which is marked by a very sudden extension of

4 For descriptions of several of these machines, see a paper by MM. Denizeau

and Lechien, Mémorial de U Artillerie et de la Marine, 1883. 5 See Report of the U.S. Board appointed to test Iron, Steel, and other Metals, 2 vols., 1881. For full details of the Emery machine, see Report of the U.S. Chief

of Ordnance, 1883, appendix 24. ’ ; : 6 Experiments on the ‘Mechanical Properties of Steel by a Committee of Civil

Engineers, London, 1868 and 1870.

It has found its most important ap- Water- plication in the remarkable testing machine of Watertown arsenal, town built in 1879 by the U.S. Government to the designs of Mr A. H. machine.

Auto- graphic re- corders,

the point of rupture the metal again begins to draw out rapidly.

PER SQUARE

TONS

STRESS.

EXTENSION, PER CENT.

Fig. 10,

When this stage is reached rupture will occur through the flow of the metal, even if the load be somewhat decreased. The diagram may in this way be made to come back towards the line of no load, by withdrawing a part of the load as the end of the test is

approached (§ 29 below).

25. Fig. 11 is a stress-strain diagram for cast-iron in extension The

and compression, taken from Hodgkinson’s experiments.1 extension was mea- – ;

sured on a rod 50 feet long ; the com- pression was also measured on a long rod, which was pre- vented from buckl- ing by being sup- ported in a trough with artitions, The full line gives the strain produced by loading ; it is continuous through the origin, showing that Young’s mod- ulus is the same for pull and push. (Similar experi- ments on wrought- iron and steel in extension and com- pression have given ; the same result.) wigs

The broken line shows the set produced by each load. Hodgkinson found that some set could be detected after even the smallest loads had been applied. This is probably due to the existence of initial internal stress in the metal, produced by unequally rapid cooling in different portions of the cast bar. ‘A second loading of the same piece showed a much closer approach to perfect elasticity. The elastic limit is, at the best, ill defined ; but by the time the ultimate load is reached the set has become a more considerable part of the whole strain. The pull curves in the diagram extend to the point of rupture; the compression curves are drawn only up to a stage at which the bar buckled (between the partitions) so much as to affect the results.

26. Testing machines are now frequently fitted with autographic appliances for drawing strain diagrams. When the load is meas- ured by a weight travelling on a steelyard, the diagram may be drawn by connecting the weight with a drum by means of a wire or cord, so that the drum is made to revolve through angles proportional to the travel of the weight.

fg ; tiie of the Commissioners on the Application of Iron to Railway Structures,

STRENGTH OF

the specimen. After this the extension becomes less rapid; then it continues at a fairly regular and gradually increasing rate; near

At the same time

MATERIALS

another wire, fastened to a clip near one end of the specimen, and passing over a pulley near the other end, draws a pencil through distances proportional to the strain, and so traces a diagram of stress and strain on a sheet of paper stretched round the drum, Apparatus of this kind has been used by Messrs Fairbanks, Unwin, Aspinall, and others.2 In Mr Wicksteed's autographic recorder the stress is determined by reference, not to the load on the lever, but to the pressure in the hydraulic cylinder by which stregg is applied. The main cylinder is in communication with a small auxiliary hydraulic cylinder, the plunger of which is kept rotati to avoid friction at its packing. This pene abuts against a spring, so that the distance through which it is pushed out varies with the pressure in the main cylinder. A drum covered with paper moves with the plunger under a fixed pencil, and is algo caused to rotate by a wire from the specimen through distances propor. tional to the strain. The scale of loads is calibrated by occasional reference to the weighted lever.? In Prof. Kennedy's machine autographic diagrams are drawn by applying the stress to the test. piece through an clastic master-bar of larger section. The master- bar is never strained beyond its elastic limit, and within that limit its extension furnishes an accurate measure of the stress; this gives motion to a pencil, which writes on a paper moved by the extension of the test-piece.4 In Prof. Thurston's pendulum machine for — torsion tests, a cam attached to the pendulum moves a panel ; through distances proportional to the stress, while a paper drum attached to the other end of the test-piece turns under the pencil through distances proportional to the angle of twist.®

27. The elastic extension or compression of a test-piece of ordinary Measyy, dimensions is so small as to require for its measurement refined me methods which are seldom employed in everyday practical testing, ¢ Measurements of this class must be made simultaneously on oppo strajp, site sides of the test-piece, to guard against error through the bend- ing of the piece. Microscopes and also various forms of micro- meter calipers are used for the purpose. A method capable of great delicacy, which has been used by Bauschinger' and others, is to measure the strain by light reflected from a pair of small mirrors attached to rollers which turn as the specimen extends or contracts. With apparatus of this kind it may be shown that iron, steel, or other materials with a well-defined yield-point begin to show a marked defect of elasticity at a somewhat lower stress, The true elastic limit

comes considerably earlier in the test than the point which usually passes by that name.8

28. In testing a plastic material such as wrought-iron or mild Viscosity, | steel it is found that the behaviour of the metal depends very materially on the time rate at which stress is applied. When once the elastic limit is passed the full strain corresponding to a given load is reached only after a perceptible time, sometimes even a long time. If the load be increased to a value exceeding the elastic limit, and then kept constant, the metal will be seen to draw out (if the stress be one of pull), at first om and then more slowly. When the applied load is considerab y less than the — ultimate strength of the piece (as tested in the ordinary way by steady increment of load), it appears that this process of slow extension comes at last to an end. On the other hand, when the M4 gee load is nearly equal to the ultimate strength, the flow of the metal continues until rupture occurs. Then, as in the former case, extension goes on at first quickly, then slowly, but, finally, instead of approaching an asymptotic limit, it quickens again as the piece approaches rupture. The same phenomena are observed in the beniling of timber and other materials when in the form of beams. If, instead of being subjected to a constant load, a test- piece is set in a constant condition of strain, it is found that the stress required to maintain this constant strain gradually decreases.

29. The gradual flow which goes on under constant stress— approaching a limit if the stress is moderate in amount, and con- tinuing without limit if the stress is sufficiently great—will still go on ata diminished rate if the amount of stress be reduced. _ Thus, in the testing of soft iron or mild steel by a machine in which the stress is applied by hydraulic power, a stage is reached soon after the limit of elasticity is passed at which the metal begins to flow with great rapidity. The pumps often do not keep pace with this, and the result is that, if the lever is to be kept floating, the weight on it must be run back. Under this reduced stress the

2 For descriptions of these and other types of autographic recorder, see a paper by Prof. Unwin, ‘‘On the Employment of Autographic Records in Testing Materials,” Jour. Soc. Arts, Feb., 1886; also Prof. Kennedy’s comprehensive paper, ‘‘On the Use and Equipment of Engineering

Laboratories,” Min. Proc. Inst. C.E., 1886, which contains much valuable information on the whole sub- ject of testing and testing machines. 3 Proc. Inst. Mech. Eng., 1886. An interesting feature of this apparatus is a device for preventing error in the diagram through motion of the test-piece a8 & whole. 4 Proc. Inst. Mech. Eng.,1886; also Min. Proc. Inst, C.E., vol. Ixxxviii., 1886, pl.1. 5 Thurston’s Materials of Engineering, part ii. For accounts of work — with this machine, see Zrans. Amer. Soc. Civ. Eng., from 1876; also, Report 0 the American Board, cited above. : 6 See a paper by Prof. Unwin, Phil. Mag., March, 1887, : 7 Mitth. aus dem Mech.-Tech. Lab. in Miinchen, Heft 5, ,~ 8 Cf. Bauschinger, loc. cit.; Kennedy, loc. cit.; Jenny Festigkeits Versuché, Vienna, 1878,

flow continues, more slowly than before, until presently the pumps recover their lost ground and the increase of stress is resumed. Again, near the point of rupture, the flow again be- comes specially rapid ; the weight on the lever has again to be run back, and the specimen finally breaks under a diminished load. These features are well shown by fig. 12, which is copied from ie a aphic diagram of a test ¥ of anil steel.} ud

30. But it is not only through what we may call the viscosity of matcrials that the time rate of load- ing affects their behaviour under test. In iron and steel, and probably in some other metals, time has an- other effect of a very re- markable kind. Let the test be carried to any point a (fig. 13) pe the original limit of elasticity. Let the load then) be removed ; during the first stages of this removal the matcrial

continues to stretch slightly, as has been explained above. Let

the load then he at once replaced and loading continued. It will

then be found that there is a new yield-point 6 at or near the value

of the load formerly reached ; up to this point there is little other ‘than clastic strain. 30-— The full line bc in fig. 13 shows the sub- sequent behaviour of the piece. But now let the experiment be repeated on another sample, with this dif- ference, that an inter- val of time, of a few hours or more, is al- lowed to elapse after the load is removed and before it is re- placed. It will then be found that a process of hardening has been going on

during this ° 5 interval of rest; for, when the loading is ‘eontinued, the new – yield-point appears, Oo 5 0 JS a> te Ts not at > as formerly, Extension, Per Cent. Extension. Per Cent but at a higher load d. Fig. 13 Fig. 14 Other evidence that a — ong change has taken place is afforded by the fact that the ultimate a) is reduced and the ultimate strength is increased (e,

g. 18).

81. A similar and even more marked hardening occurs when a load (exceeding the origina elastic limit), instead of being removed and replaced, is kept on for a sufficient length of time without change. When loading is resumed a new yield-point 1s found only after a considerable addition has been made to ‘the load. The result is, as in the former case, to give greater ‘ultimate Strength and less ultimate elongation, Fig. 14 exhibits two ee ments of this kind, made with annealed iron wire. A load of 234 tons per square inch was reached in both cases; ab ‘shows the result of continuing to load after an interval of five jminutes, and acd after an interval of 454 hours, the stress of 234 tons being maintained during the interval in both cases. 32. It must not be supposed that in a material hardened by strain the elasticity is perfect up to the yield-points which are : shown. in fig. 13 at 6 and dor in fig. 14atc. In experiments made for this article, it has been found that, after a piece of very soft /}ron wire has been hardened (as in fig. 14) by the continued appli-

ation of a load which had caused stretching, if a small addition /be made to the load (bringing it to a value between a and the a ew yield-point), although there is at first no apparent drawing out, ‘. if time be given the wire begins again to draw, and |a large amount of stretching at an increased pace may ensue. In this way wires have been broken with loads considerably short of

EXTENSION

Fig. 12.—Autographie Diagram for a test of mild steel.

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STRESS tN TONS PER SQ INCH.

| , The increase of strain without increase of stress, which goes on without mit when a test-piece under tension approaches rupture, is a special case of the general phenomenon of “ flow of solids,” which has been exhibited, chiefly for Compressive stresses, in a series of beautiful experiments by Tresca (Mémoires sur coulement des Corps Solides, also Proc. Inst. Mech. Eng., 1867 and 1878).

those which would have been required had the process of loading, from the point a onward, been continued at a moderately rapid rate. A slow process of viscous deformation may in fact be occur- ring at the same time that the metal shows a quasi-elasticity with respect to rapid alteration of stress. Bauschinger’s micrometric experiments have shown that after a piece has been hardened by rest the true limit of elasticity, or the point at which Hooke’s law begins to fail, comes far short of the yield-point. He has also shown that a long interval of rest after the set has taken place produces a slow rise of the true limit of elasticity,? apparently a mie rise than the lapse of time causes in the yield-point itself.

33. In the testing of iron and steel the time during which any state of (pull) stress (exceeding the original elastic limit) exists affects the result in two somewhat antagonistic ways. It augments exten- sion, by giving the metal leisure to flow. This may be called the viscous effect. But, on the other hand, it reduces the amount of extension which subsequent greater loads will cause, and it increases the amount of load required for rupture in the way which has just been described. This may be called the hardening effect. When a piece is broken by continuous gradual increment of load, these two effects are occurring at all stages of the test. If the viscous effect existed alone, or if the hardening effect were small, the material would show to greater advantage as regards elongation, and to less advantage as regards ultimate strength, the more slowly the load were applied. ‘Tin and lead may be cited as mate- rials for which this is the case. But when the hardening effect is relatively great, as in iron and steel, the material shows less

elongation and a higher breaking strength the more slowly it is tested. An excellent illustration of this is given by the following experiment of Mr Bottomley. Pieces of iron wire, annealed and of exceptionally soft quality, when loaded at the rate of 1 Ib in 5 minutes, broke with 443 fb and stretched 27 per cent. of their original length. Other picces of the same wire, loaded at the rate of 1 Tb in 24 hours, broke with 47 tb and stretehed less than 7 per cent.? Again, it has been found that an excessively rapid application of stress (by the explosion of gun-cotton) makes soft steel stretch twice as much as in ordinary testing.4 The case is very different, however, if the material has been previously hard- ened by strain. It does not appear that such varia- tions in the rate of loading as are liable to occur in practical tests of iron or steel have much influence on the extension or thestrength, great as the effects of time are when the metal is loaded either much more slowly or mueh more quickly. In fig. 15 the results are shown of tests of two similar pieces of soft iron wire, one loaded to rupture in 4 – minutes and the other at a rate about 5000 times 5 10 is 20. 2s 30 slower. e

34. The hard- EXTENSION, PER CENT. ening effect whieh Fig. 15. intervals of rest from load or of constant load produce, once the primitive elastic limit is passed, has been examined by Beardsley,> Thurston,® Bauschinger,® Ewing,’ and others. The effect of even a few minutes’ pause is perceptible, an hour or two of constant stress has a very marked influence, and after 24 hours or so there appears to be little further hardening. The Ameriean Board found that iron bars, previously stressed to about 50,000 fb per square inch, gained in strength, by intervals of rest from stress, to the extent of about 9 per cent. in one day, 16 per cent. in three days, and 18 per cent. in six months.§

35. It may be concluded that, when a piece of metal has in any way received a permanent set by stress exceeding its limits of

2 Mitth. aus dem Mech.-Tech. Lab. in Miinchen, Heft 13, 1886.

3 Proc, Roy. Soc., 1879, p. 221. See also Exasticity, § 80.

4 See remarks by Col. Maitland, Min. Proc. Inst. C.E., vol. Ixxvi. p. 104, 5 See Report of the U.S. Board on Tests of Metals, vol. i. section 4,

§ Loc. cit.

7 Proc. Roy, Soc., June 1870. The autographic diagrams given in figs. 13 and 14 are taken from these tests. 8 Loc. cit., p. 111.

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TONS PER SQUARE INCH.

STRESS,

Anneal- ing.

Harden- ing and temper- ing of steel,

Contrac- tion of section at rup- ture.

600

elasticity, it is hardened, and (in some cases at least) its physical properties go on slowly changing for days or even months. Instances of the hardening effect of permanent set occur when plates or bars are rolled cold, hammered cold, or bent cold, or when wire is drawn. When a hole is punched in a plate the material contiguous to the hole is severely distorted by shear, and is so much hardened in consequence that when a strip containing the punched hole is broken by tensile stress the hardened portion, being unable to cxtend so much as the rest, receives an undue proportion of the stress, and the strip breaks with a smaller load than it would have borne had the stress been uniformly distributed. This bad effect of punching is especially noticeable in thick plates of mild steel. It disappears when a narrow ring of material surrounding the hole is removed by means of a rimer, so that the material that is left is homogeneous. Another remarkable instance of the same kind of action is seen when a mild-steel plate which is to be tested by bending has a piece cut from its edge by a shearing machine. The result of the shear is that the metal close to the edge is hardened, and, when the plate is bent, this Liesl being unable to stretch like the rest, starts a crack or tear which quickly spreads across the plate on account of the fact that in the metal at the end of the crack there is an enormously high local intensity of stress

(see ELAsTiIcity, § 72). By the simple expedient of planing off the hardened edge before bending the plate homogeneity is restored, and the plate will then bend with- out damage.

36. The hardening effect of strain is removed by the process of annealing, thatis, by heating to redness and cooling slowly. In iron, very mild steel, and most other metals the rate of cooling is a matter of indifference; but in steel that contains more than about 0°2 per cent. of carbon another kind of hardening is produced if the metal, after being heated to redness, is cooled suddenly. When the hones of carbon is considerably greater than this, steel may

e rendered excessively hard and brittle (‘‘ glass-hard ”) by sudden cooling from a red heat. Further, by being subsequently heated to a moderate temperature, it may be deprived of some of this hardness and rendered elastic through a wide range of strain. This process is called the tempering of steel ; its effects depend on the temperature to which the steel is heated after being hardened, and the grade of temper which is acquired is usually specified by the colour (blue, straw, &c.) which appears on a clean surface of the metal during this heating, through the formation of a film of oxide. In the ordinary process of rolling plates or bars of iron or mild steel the metal leaves the rolls at so high a temperature that it is virtually annealed, or pretty nearly so.1 The case is different with plates and bars that are rolled cold: they, like wire sup- plied in the hard-drawn state (that is, without being annealed after it leaves the draw-plate), exhibit the higher strength and greatly reduced plasticity which result from. permanent set.

87. The extension which occurs when a bar of uniform section is pulled is at first general, and is distributed with some approach to uniformity over the length of the bar. Before the bar breaks, however, a large additional amount of local extension occurs at and near the place of rupture. The material flows in that neighbour- hood much more than in other parts of the bar, and the section is much more contracted there than elsewhere. The contraction of area at fracture is frequently stated as one of the results of a test, and is a useful index to the quality of materials. Ifa flaw is pre- sent sufficient to determine the section at which rupture shall occur the contraction of area will in general be distinctly diminished as compared with the contraction in

a specimen free from flaws, although little reduction may be noted in the total extension of the piece. Local extension and contraction of area are almost

absent in cast-iron and hard steel ; on the other hand they are specially prominent in wrought-iron, mild steel, and other metals

Fig. 16,

that combine plasticity with high tensile strength. An example is shown in fig. 16, which is copied from a photograph of a broken test-piece of Whitworth soft fluid-compressed steel.

38. Experiments with long rods show that the general extension which occurs in parts of the bar not near the break is somewhat irregular ;? it exhibits here and there incipient local stretching, which has stopped without leading to rupture. This is of course due in the first instance to want of homogeneity. It may be

_ 1 In several of Mr Kirkaldy's papers, a comparison is given of the elastic limit, ultimate strength, and ultimate extension of samples which were annealed before testing, and of samples which were tested in the commercial state; in general the annealed samples are distinctly, though not very materially, softer than the others (On the Relative Properties of Wrought-Iron Plates from Essex and Yorkshire, London, 1876; also Experiments on Fagersta Steel, London, 1878).

2 See Kirkaldy's Experiments on Fagersta Steel, London, 1873; also Report of the Steel Committee, part i.

supposed that when local stretching begins at any point in the earlier stages of the test it is checked by the hardening effect of the strain, until, finally, under greater load, a stage is reached in which the extension at one place goes on so fast that the hardenin

effect cannot keep pace with the increase in intensity of stresg which results from diminution of area; the local extension is then unstable, and rupture ensues. Even at this stage a pause in the loading, and an interval of relief from stress, may harden the locally stretched part enough to make rupture occur somewhere

else when the loading is continued. i¢

89. Local stretching causes the percentage of elongation which Info, a test-piece exhibits before rupture (an important quantity in en. of ly gineers' specifications) to vary greatly with the length and section stp, of the piece tested. It is very usual to specify the length which ing is to exhibit an assigned percentage of elongation. This, however, total is not enough ; the percentage obviously depends on the relation elony of the transverse dimensions to the length. A fine wire' of iron tion, or steel, say 8 inches long, will stretch little more in proportion to its length than a very long wire of the same quality. An 8-inch bar, say 1 inch in diameter, will show something like twice as much the percentage of elongation as a very long rik The ex. periments of M. Barba*® show that, in material of uniform quality, the percentage of extension is constant for test-pieces of similar form, that is to say, for pieces of.various size in which the transverse dimensions are varied in the same proportion as the length. It is to be regretted that in ordinary testing it is not practicable to reduce the pieces to a standard form, with one proportion of transverse dimensions to length, since an arbitrary choice of length and cross-section gives results which are incapable of direct comparison with one another.

40. The form chosen for test-pieces in tension tests affects not Influen only the extension but also the ultimate strength. In the first on place, if there is a sudden or rapid change in the area of cross strength section at any part of the length under tension (as at AB, fig. 17), the stress will not be uniformly distributed there. The intensity will be greatest at the edges A and B, and the piece will, in consequence, pass its elastic limit at a Jess value of the total load than would be the case if the change from the larger to the smaller section were gradual. In a non-ductile material, rup- ture will for the same reasou take place at AB, with a less total load than would otherwise be borne. On the other hand, with a sufficiently ductile material, although the

section AB is the first to be permanently deformed, rupture will preferably take place at some section not near AB, because at and near AB the contraction of sectional area which precedes ruptnre is partly prevented by the presence of the projecting portions Cand D. Hence, too, with a ductile material samples such as those of fig. 18, in which the part of smallest section between the shoulders or enlarged ends of the piece is short, will break with a greater load than could be ‘Y borne by long uni- form rods of the same section. In good wrought-iron and mild steel the flow of metal pre- ceding rupture and causing local con- traction of section =. extends over a length six or eight times the width of the piece; and, if the length throughout which the section is uniform be materially less than this, the process of flow will be rendered more difficult and the breaking load of the sample will be raised.*

These considerations have of course a wider application than to the mere interpretation of special tests. An important practical case is that of riveted joints, in which the metal left between the rivet-holes is subjected to tensile stress. It is found to bear, per square inch, a greater pull than would be borne by a strip of the same plate, if the strip were tested in the usual way with uniform section throughout a length great enough to allow complete freedom of local flow.®

41, The tensile strength of long rods is affected by the Jength eis in quite a different way. With a perfectly homogeneous matert » para

no difference should be found in the strength of rods of equal ae ee ee 3 Mém. de la Soc. des Ing. Civ., 1880; see also a paper by Mr W. Hackney, and “On the Adoption of Standard Forms of Test-Pieces,” Min. Proc. Inst. CB. short

1884.

4 The greater strength of nicked or grooved specimens seems to have been rods, first remarked by Mr Kirkaldy (Experiments on Wrought Iron and Steel, p. 14, also Experiments on Fagersta Steel, p. 27). See also a paper by Mr E. Richards, on tests of mild steel, Jour. Iron and Steel Inst., 1882. 5 5 See Kennedy’s “‘ Reports on Rivetted Joints,” Proc. Inst. Mech. Eng., 1881-5. In the case of mild stecl plates a drilled strip may have as much as

12 per cent, more tensile strength per square inch than an undrilled strip. With punch holes, on the other hand, the remaining mctal is much weakened, for the reason referred to in § 35.

Tig. 17.

|

sectional area and of different lengths, proviced the length of both were great enough to prevent the action described in § 40 from affect- ing the result. But, since no material is perfectly homogeneous, ‘the longer rod will in general be the weaker, offering as it does ‘more chances of a weak place; and the probable defect of strength ‘in the long rod will depend on the degree of variability of the material. When this has becn established by numerous tests of short samples, the strength whieh a rod of any assigned length may be expected to possess can be calculated by an appli- ‘cation of the theory of probabilities. A theory of the ; strength of long bars has been worked out on this basis by Prof. Chaplin,’ and has been experimentally eonfirmed by tests of long and short samples of wire. The theory does not apply when the length is so small that the action of § 40 enters into the case, and the experimental data on which it is based must be taken from tests of samples long enough to exclude that action.

42, In tension tests, rupture may occur, as in fig. 19, by direct separation over a surface which is nearly ylane and normal to the line of stress. This is usual in hard steel and other comparatively non-ductile mate- rials, Or it may occur by shearing along an oblique

plane, as in fig. 20, which shows the fracture of a piece of steel softer than the speci- men of fig. 19. In very duc- tile samples these two modes of rupture are frequently found in com- bination, as in fig. 21, where a central core # is broken by direct tension while round it $ isariug over which separation has taken place by shearing. In this instance the Fig. 20, Mg. 21. ring is in two parts, one above and one below the surface of rupture of the central flat core. In other instances, such as that of the sample shown in fig. 16, the shorn ring forms a continuous cone or crater round a flat core. 48, In compression tests of a plastic material, such as mild steel, _ a process of flow may go on without limit; the piece (which must ® of course be short,

to avoid buckling) shortens and bulges out in the form of acask. This is illustrated

by fig. 22 (from one of Fairbairn's expe- _ riments), which shows the compression H _ of a round block of steel (the original height and diameter of which are shown : by the dotted lines) by a load equal to ;

100 tons per square inch of original sec- f i" tional area. The surface over which the q | stress is distributed becomes enlarged, ¥ (_ and the total load must be increased in CLL a corresponding degree to maintain the Fig. 22. | process of flow.?. The bulging often produces longitudinal cracks, | asin the figure, especially when the material is fibrous as well as plastic (asin the case of wrought-iron), A brittle material, such as cast-iron brick, or stone, yields by shearing on inelined planes as in figs. 23 and 24, which are taken from Hodgkinson's experiments on cast-iron.? \ The simplest fracture of this kind is exem-

plified by fig. 23, where a single surface (ap-

Sesh aciacaset

| |

ah

Fig, 23,

| proximately a plane) of shear divides the compressed block into two wedges. With cast-iron the slope of the plane is such that this og mode of fracture can take place only if the height of the block is not less than about 3 the width of the base. When the height is less the action is more complex. Shearing must then take place over more than one plane, as in fig. 24, so that cones or wedges are formed by which the surrounding portions of the block are split off. The stress required to erush the block is eon- ee eee ee

' Van Nostrand's Engineering Magazine, Dec. 1880; Proc. Engineers' Club of Philadelphia, March, — : : For examples, see Fairbairn's experiments on steel, Rep. Brit, Ass., 1867. Report of the Royal Commissioners on the

Application of Iron to Ratiway Structures, 1849; see also Brit, Ass, Rep., 1837,

sequently greater than if the height were sufficient for shearing in a single plane.

44, The inclination of the surfaces of shear, when fracture takes place by shearing under a simple stress of pull or push, is a matter of mueh interest, throwing some light on the question of how the resistance which a material exerts to stress of one kind isaffected by the presence of stress of another kind,—a question scarcely touched by direct experiment. At the shorn surface there is, in the ease of tension tests, a normal pull as well as a shearing stress, and in the case of compression tests a normal push as well as shearin

Plane of shear.

stress. If this normal eomponent were absent the materia (assuming it to be isotropic) would shear in the surface of greatest shearing stress, which, as we have seen in § 5, is a surface inclined at 45° to the axis. In fact, however, it does not shear on this surface. Hodgkinson's experiments on the compression of cast- iron give surfaces of shear whose normal is inclined at about 55° to the axis of stress,4 and Kirkaldy's, on the tension of steel, show that when rupture takes place by shear the normal to the surface is inclined at about 25° to the axis. These results show that normal pull diminishes resistance to shearing and normal push increases resistance to shearing. In the ease of cast-iron under eompression, the material prefers to shear on a section where the intensity of shearing stress is only 0°94 of its value on the surface of maxinium shearing stress (inclined at 45°), but where the normal push is reduced to 0°66 of its value on the surface of maxi- mum shearing stress.

Fatigue of metals.

45. Fatigue of Metals,—A matter of great practical as well as scientific interest is the weakening which materials undergo by

repeated changes in their state of stress. It appcars that in some if not in all materials a limited amount of stress-variation may be repeated time after time without appreciable deterioration in the strength of the piece; in the balanee-spring of a watch, for instance, tension and compression suceeed each other some 150 millions of times in a year, and the spring works for years without apparent injury. In sueh eases the stresses lie well within tho elastic limits. On the other hand, the toughest bar breaks after a smal] number of bendings to and fro, when these pass the elastic limits, although the stress may have a value greatly short of the normal ultimate strength. A laborious research by Wohler,® ex- tending over twelve years, has given much important information regarding the effects on iron aud steel of very numerous repeated alternations of stress from positive to negative, or between a higher and a lower value without change of sign. By means of ingeniously contrived machines he submitted test-pieces to direct pull, alter- nated with complete or partial relaxation from pull, to repeated bending in one direetion and also in opposite directions, and to re- peated twisting towards one side and towards opposite sides. The results show that a stress greatly less than the ultimate strength (as tested in the usual way by a single application of load continued to rupture) is suffieient to break a pieee if it be often enough removed and restored, or even alternated with a less stress of the same kind. In that case, however, the variation of stress being less, the number of repetitions required to produce rupture is greater. In general, the number of repetitions required to produce rup- ture is increased by reducing the range. through whieh the stress is varied, or by lowering the upper limit of that range. If the greatest stress be chosen small enough, it may be reduced, re- moved, or cven reversed many million times without destroying the piece. Wohler’s results are best shown by quoting a few figures selected from his experiments. The stresses are stated in eentners per square zoll;® in the case of bars subjected to bending they refer to the top and bottom sides, which are the most stressed parts of the bar.

I. Iron bar in direct tension :—

Stress. Number of Applications ; Stress. Number of Applications Max. Min causing Rupture. Max. Min. causing Rupture.

480 0 800 320 0 10,141,645

440 0 106,901 = ae

400 0 340,853 440 209 2,373,424

360 0 480,852 440 £40 Not broken with 4 millions.

II. Iron bar bent by transverse load :—

Stress, Number of Bendings Stress. Number of Bendings Max. Min. causing Rupture. Max, Min. causing Rupture.

550 0 169,750 400 0 1,320,000

500 0 420,000 350 0 4,035,400

450 0 481,950 300 0 Not broken with 48 millions.

1IJ. Stecl bar bent by transverse load: —

Stress. Number of Bendings Stress. Number of Bendings Max. Min. causing Rupture. Max. Min. causing Rupture.

900 0 72,459 900 400 225,300

900 200 81,200 900 500 764,900—mean of two trials. 900 3800 156,200 900 600 Not broken with 332 mills. 4 Op. ctt.

5 Die Festigketts-Versuche mitt Etsen und Stahi, Berlin, 1870, or Zettschn. fur Bauwesen, 1860-70; see also Engineering, vol. xi., 1871. For early experiments by Fairbairn on the same subject, see Phil. Trans., 1864,

6 According to Bauschinger (loc. cit., p. 44), the centner per square zoll in which Wohier gives his results is equivalent to 6°837 kilos per square cm., or 0°0434 ton

er square inch. 7 XXII. — 76

Wohler’s experi- ments.

IV. Iron bar bent by supporting at one end, the other end being loaded ; altcrnations of stress from pull to push caused by rotating the bar :—

Stress, Number of Rotations Stress, Number of Rotations From + to — causing Rupture. From + to — causing Rupture.

320 ; 220 3,632,888 200 99,000 200 4,917,992 280 183,145 180 19,186,791

260 479,490 160 Not broken with 1323 240 909,810 millions,

46. From these and other experiments Wohler concluded that the wrought-iron to which the tests refer could probably bear an indefinite number of stress changes between the limits stated (in round numbers) in the following table (the ultimate tensile strength

was about 194 tons per square inch) :— Stress in Tons per Sq. Inch.

+7

From pull to push…….0.00 to —7

From pull to no StTCS8. ese. sccercsseccre, 13 to 0 From pullitojless pulll…..ccccssesseees 19 to 10%

Hence it appears that the actual strength of this material varies in a ratio which may be roughly given as 8 : 2 : 1 in the three cases of (a) steady pull, (6) pull alternating with no stress, very many times repeated, and (¢) pull alternating with push, very many times repeated, Factors of safety applicable to the three cases might therefore rationally stand to one another in the ratio of 1:2; 8. For steel Wohler obtained results of a generally similar kind. His experiments were repeated by Spangenberg, who extended the inquiry to brass, gun-metal, and phosphor-bronze.!_ On the basis of Wohler’s results formulas have been devised by Launhardt, Weyrauch, and others to express the probable actual strength of metals under assigned variations of stress; these are, of course, of a merely cmpirical character, and the data are not yet extensive enough to give them niuch value.?

47. Wchler’s cxperiments, dealing, as all experiments must, with a finite number of stress-changes, leave it an open question whether there are any limits within which a state of stress might be indefinitely often varied without finally destroying the material. It is natural to suppose that a material possessing perfect elasticity would suffer no deterioration from stress-changes lying within limits up to which the elasticity is perfect. But these limits, if they exist at all, are probably very narrow. Indeed, in the case of iron, there is indirect evidence that all alteration of stress whatso- ever affects the molecular structure in a way not consistent with the notion of perfect elasticity. When the state of stress in iron is varied, however slowly and however little, the magnetic and thermo-electric qualities of the metal are found to change in an essentially irreversible manner.? Every variation leaves its mark on the quality of the picce; the actual quality at any time is a function of all the states of stress in which the piece has previously becn placed. It can scarcely be doubted that sufficiently refined mcthods of experiment would detect a similar want of reversibility in the mechanical effects of stress, even when alterations of stress occur slowly enough to escape the effects of viscosity which have been examined by Sir William Thomson and discussed under ELASTICITY (vol. vii. pp. 802 sq.). In any case, the viscosity investi- gatcd by Thomson causes such stress-changes as occur rapidly to do work on the material, and the destructive cffect of repeated changes may be due in great part to this causc. His experiments show that rapid stress-changes often repeated do produce a cumulative effect in reducing the modulus of elasticity; and it is very probable that this fatigue of elasticity is associated with fatigue of strength.

There are as yet no experiments showing how far fatigue of strength is affected by the frequency, as distinguished from the mere number, of the stress-changes, nor whether a pcriod of rest, after fatigue has been induced, restores strength. That it does so may be conjectured from Thomson’s discovery that rest restores elasticity after elastic fatigue. The conjecture is strengthened by Bauschinger’s discovery that, after a permanent set has been pro- duced and a period of rest follows, the apparent limit of elasticity (in the strict sense of that term) rises slowly with the lapse of time. Both questions are of obvious practical interest. 4

48. When a strain is produced within the limits to which Hooke's law applies, the work done in producing it is half the product of the stress into the strain. A load applied to a piece suddenly, but without impact, does an amount of work in straining the piece which is measured by the weight of the load into the distance it sinks in consequence of the strain. Hence, provided

1 Ueber das Verhalten der Metalle bet weiderholten Anstrengungen, Berlin, 1875,

2 See Weyrauch, "On the Calculation of Dimensions as depending.on the Ultimate Working Strength of Materials," Min. Proc. Inst. C.E,, vol. lxiii. p. 275; also a correspondence in Zngineering, vol. xxix., and Unwin's Machine Design, chap. ii, 3 Ewing, Phil. Trans, , 1885, 1886.

4 For interesting notices of the fatigue of metals in railway axles, bridge ties, &c., and results of expcriments showing reduced plasticity in fatigued metal, see Mr B, Baker's address to the Mechanical Section of the British Association, 1885. In most cases where the fatigue of metals occurs in engineering practice the phenomenon is complicated by the occurrence of blows or shocks whose energy is absorbed in producing strains often excceding the elastic limits, sometimes of a very local character in consequence of the inertia of the strained pieces, Such shocks may cause an accumulation of set which finally leads to rupture in a way that is not to be confused with ordinary fatigue of strength. It appears that the effects of fatigue may be removed by annealing.

this strain falls within the elastic limit, the strain and the stress are twice as great as the same load would produce when in equi- librium. Instances of load applied with complete suddenness, and Spi, yet without shock, are rare; but it is a common case for loads to i be applied so rapidly that the stress reaches a value intermediate } between that due to a static load and the double stress due to the lo same load applied at once. Thus the Railway Commissioners found that certain bridges were Weflected by a train passing at a speed of 50 miles per hour + more than by the same load at rest. The fact that a "live" load produces greater stress than a dead load ig of course

to be distinguished from the question Wéohler’s experi. ments deal with— the greater destructiveness of the intermitted or varied stress which a live load causes. In many cases engineers allow in one operation for these quite independent influences of g live load by choosing a higher factor of safety for the live than for the dead part of the whole load on a structure, or (what is the same thing) by multiplying the live load by a coefficient (often 13), adding the product to the dcad load, and treating the sum as if all were dead load.

49. A useful application of diagrams showing the relation of Resili strain to stress is to determine the amount of work donc in strain. ence ing a picce in any assigned way. The term “resilience” is conven. iently used to specify the amount of work done when the strain just reaches the corresponding elastic limit. Thus a rod in simple tension or simple compression has a resilience per unit of volume =/?/2H, where fis the greatest elastic pull or push. A blow whose energy exceeds the resilience (reckoned for the kind of stress to which the blow gives rise) must in the most favourable case pro- duce a permanent set; in less favourable cases local permanent set will be produced although the energy of the blow is less than the resilience, in consequence of the strain being unequally dis- tributed. In a plastic material a strain excceding the limit of elasticity absorbs a relatively large amount of cnergy, and generally incrcases the resilience for subsequent strains. Fracture uuder sue- cessive blows, as in the testing of rails by placing them as beams — on two supports, and allowing a weight to fall in the middle from a given height, results from the accumulated set which is brought about by the energy of each blow exceeding the resilience

50. In an important paper® which is reprinted in the article Inter

EasticiTy, and should be carefully studied in this connexion, stress, Prof. James Thomson has pointed out that the effect of any externally applied load depends, to a very material extent, on whether there is or is not initial internal stress, or, in other words, whether the loaded piece is initially in what Prof. Hearson has called a state of ease. . Internal stress, existing without the application of force from without the piece, must satisfy the con- dition that its resultant vanishes over any complete cross-section. It may exist in consequence of sct causcd by previously applied forces (a case

of which instances are given below), or in conse- quence of previous tempcrature changes, as in cast-iron, which is thrown into a state of internal stress by uncqually rapid cooling of the mass. Thus in (say) a spherical casting an outside shell solidifies first, and has become partially contracted by cooling by the time the inside has become solid. The inside then contracts, and its contraction is resisted by the shell, which is thereby compressed in a tangential direction, while the metal in the interior is pulled in the direction of the radius. Allusion has already been made to the fact, pointed out by J. Thomson, that the defect of elasticity under small loads which Hodgkinson discovered in cast-iron is probably due to initial stress. In plastic metal a nearly complete state of case is brought about by annealing; even annealed pieces, however, sometimes show, in the first loading, small defects of elasticity, which are probably due to initial stress, as they disappear when the load is reapplied.

51, Little is exactly known with regard to the effect of tempera- Effect of ture on the strength of materials. Some mctals, notably iron or tempet steel containing much phosphorus, show a marked increase im brittle- ture om ness at low temperatures, or ‘cold shortness.” Experiments on the strength. tensile strength of wrought-iron and steel show in general little variation within the usual atmospheric range of heat and cold.

The tensile strength appears to be slightly reduced at very low temperatures, and to reach a maximum when the metal is warmed to a temperature between 100° C. and 200°C. When the tempera- ture exceeds 300° C. the tensile strength begins to fall off rapidly, and at 1000° C. it is less than one-tenth of the normal value. Reference may be made, in this connexion, to the effect which a “blue heat,” or temperature short of red heat, is believed to have on the plasticity and strength of iron, and more especially of mild stcel. It appears that steel plates and bars bent or otherwise ee ee

5 Report of Commissioners on the Application of Iron to Railway Structures, 1849, A mathematical investigation of this effect of rolling load is given in an appendix to the Report.

§ Camb. and Dub. Math. Journ., Nov., 1848. . :

7 See Report of a Committee of the Pranklin Institufe, 1837 ; Fairbairn, Brit. Ass. Rep,, 1856 ; Styffe on Iron and Steel, trans. by C. P. Sandberg. Notices 0 these and other experiments will be found in Thurston's Materials of Engineer at if, chap. x., and in papers by J. J. Webster, Min. Proc. Inst. C.H., vol. 1X. a0 4 A, Martens, Zeitschr. des Ver. Deutsch. Ing., 1883.

Young's! Mod. of| | Stress the intensity Moduius| Rigidity| | y at any point P is | je Se | Js BE. C. eR to the | a 54 t0103125 to 65|9to13 |) |, ~~+| | distance of P from Se | gee) asec: || a tare MN. 'called ,, Ameriean (ordnance) 2 14 | 36 to 58 -, La the neutral axis, which lies in the plane of the stressed surface and | . Be vasenaies Funtcas, 15 to 20] 60 to 75 = | al at right angles to the direction AB, which is assumed to be that in Wrought-iron— which the intensity of stress varies Finest Lowmoor and York- {| 27 to 29 along the fibre nee most rapidly. There is novaria- , _ shire Plates…,...cceserreees . "= tion of stress along lines parallel 4 Staffordshire…..ssressersevers 24 across 5, 18 to to MN. If MN passes through J along 4, 22, or oe 5000 C, the centre of gravity of the sur- Bea MOH .ewsscietveonesvsessnss 19 a about 13,000 face, as in fig. 27, it may easily be shown that the total pull stress ed 25 20 | ms | on one side of the neutral axis is equal to the total push stress on Soft DI decisis 19 to 24} the other side, whatever be the form of the surface AB. The re- Wrought-iron wire… } 25 to 50 one sultant of the whole stress on AB is in that case a couple, whose " 1 'average about) 35 ' moment may be found as follows. Let dS be an indefinitely small Stecl— ; 26 to 82]) 5 \ part of the surface at a distance x from the ncutral axis through C, | eee Pinics (Siemens OF |) average|> ... about | and let p be the intensity of stress on dS. The moment of the Bessemer) ...+ereeererees U! apout 30 j $ of fe stress on d& is ds. But v= e/a = ac] (see fig. oF). The Axle and rail stect (do.)...../30 to 45}... CPand. D=PyX[X = Py Med 218 —p,l fac Crucible tool steel .e..sescseessees 40 to 65 whole moment of the stress on AB is /xpdS =(p,/a\/2*dS =p, l/r Steel castings…....cssssceceseee about 28 ea 00 | | or pal/a, where I is the moment of inertia of the surface AB about Chrome SteCl .seseererserrreeseres 80 13,000 | | 5200 the neutral axis through C. r ee eee) 55. A stress such as that shown in fig. 26 or fig, 28 may be steel (mild)..... regarded as a uniformly distributed i; no (hard).....| 48 to 68 | stress of intensity p, (which is the Steel wire, ordinary, about…) 70 J intensity at the centre of gravity a… 124 13,000 |... of the surface C) and a stress of @ | Pianoforte steel wire…....06 150 — | 18,000] the kind

shown in fig, 27, The | COPPET, CASE... sserseeereveereeseeserees a eee resultant is y)S, where S is the | ite, hardcdrawnece| 28″ | | i | sido | aio [| whole area of the surface, and | eee acssouessecesseoees 8 to 18 5 5500 | 1500 it acts at a distance CD from C | e Asal seeeseeseeercesonsenaeenaens i we on 6400 | 2200 such that the moment pS. tats | PEPER SUR Ss csisctecesys eo euse uses = * a Pz Po)1/2 = (Py t+Po)1/%q. Hence | GUM MEAL... ces. sssercccrsesserseeenes 11 to 23)... v0 ny 1700 “ a pr(l ifm S . CD/I), / and p= Phosphor bronze…....s00. wu.| 15 to 26 6000 |” 2400 po(l-x,S. 6 I). » » Wir vos] 88 to ea co ve we ee 56. Simple bendingoccurs when a Simple eee es | | beam is in equilibrium under equal . bending, NM ccc cccscascscsessnssevsss, TWO snc 5500 and opposite couples in the plane of the beam. Thus if a beam | eee 2 ss ss (fig. 29), supported at its ends, be loaded at two points so that eyes ss isschisieaitsoeaseaesee>. 0°9 3 . 1000 W.l=W.l. the por- | | Timber— V4] 2f9s Pp ss. ccisseccosteeesse 3to7 4 1 800 tion of the beam lying BPG ose. cescsssiesescesseees. 1} to 34] 23 9 600 between W, and W, is | a aa cox, 2} Kae “ _ ~ subjected to a simple er sis) P| Bo bending stress. On , “oo 4to6| 4 oc iis any section AB the idee We eceeserecancccsesseoveccsunes soces 4to7 ‘ 950 only stress consists of ; ig MANOPANY wcrc eveeeseeees 4to7 4 650 pull and push, and has Fig. 29, :~ for its resultant a couple whose moment M=W,h,= Wels. This is called the bending moment at the section. If the stress be within the elastic limits it will be distributed as in fig. 4 30, with the neutral axis at the centre of gravity of the section. The greatest intensities of push i 53. Space admits of no more than a short and elementary and of pull, at the top and bottom edge respect- Jb, e) account of some of the more simple straining actions that occur in ively, are (by § 54) P= My/ I and Po =My,/I, Hn machines and engineering structures. and the intensity at any point at a distance y i- The stress which acts on any plane surface AB (fig. 25), such as | above or below C is p=My/I. : ; an imaginary cross-section of a strained 57. Let the bending moment now be increased ; Bending piece, may be represented by a figure b non-elastic strain will begin as soon as either Dy beyond formed by setting up ordinates Aa, Bd, OF Do exceeds the corresponding limit of elasticity, elastic &c., from points on the surface, the % and the distribution of stress will be ehanged in limits, length of these being made proportional consequence of the fact that the outer layers of iB to the intensity of stress at each point, the beam are taking set while the inner layers Fig. 30. This gives an ideal solid, which may be are still following Hooke’s law. As a

simple in- called the stress figure, whose height stance we may consider the case of a material strictly elastic up to shows the distribution of stress over the a certain stress, and then so plastic that a relatively very large surface which forms its base. A line 4 B amount of strain is produced without further change of stress, a drawn from g, the centre of gravity of case not very far from being realized by soft wrought-iron and mild _ the stress figure, parallel to the ordinates Fig. 25. steel. The diagram of stress will now take the form sketched in f Aa, &c., determines the point C, which is called the centre of stress, | fig. 81. If the elastic limit is (say) less for compression than for and is the point through which the resultant of the distributed stress | tension, the diagram will be as in fig. 32, with the neutral axis acts. In the case of a uniformly distributed stress, ab is a plane | shifted towards the tension side. When the beam is relieved from

worked at a blue heat not only run a much more serious risk of fracture in the process than when worked either cold or red-hot, but become deteriorated so that brittleness may afterwards show itself when the metal is cold.

52. The following table gives a few representative data regarding

| the strength of the more important materials uscd in engineering

(the figures are gathered from the writings of Barlow, Hodgkinson, Kirkaldy, Thurston, Rankine, Unwin, Clark, and others) :—

. ” Elasticity. Ultimate Strength. Tons. per sq. in.

Tons per Square Inieh,

surface parallel to AB, and C is the centre of gravity of the surface

AB._When a bar is subjected to simple pull applied axially—that

’ Stromeyer, “The Injurious Effect of a Blue Heat on Steel and Iron,” Min. Inst. C.E., vol. Ixxxiv., 1886,

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is to say, so that the-resultant stress passes through the centre of gravity of every cross-section, —the stress may be taken as (sensibly) uniformly distributed over any section not near a place where the form of the cross-section changes, provided the bar is initially in a state of ease and the stress is within the limits of elasticity.

54. Uniformly varying stress is illustrated by fig. 26.

It occurs Uni-

(in each ease for stresses within the elastic limit) in a bent beam, formly

in a tie subjected to non-axial pull, and in a long strut or column where buckling makes the stress become non-axial, In uniformly varying

external load it will be left in a state of internal stress, repre-

sented, for the case of fig. 31, by the dotted lines in that figure. 58. In consequence of the action which has been illustrated (in

a somewhat crude fashion) by figs. 31 and 32, the moment required

varying stress,

Modulus of rup- ture.

Strain produced by bend- ing.

Ordinary bending of beams.

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to break the beam (M,) cannot be calculated from the ultimate tensile or compressive strength of the material by using the for- mula M,;=/,I/y,, or M;=f.l/y.. When experiments are made on the ultimato strength of bars to resist bending, it is not unusual to apply a formula of this form to calculate an imaginary stress /, which receives the name of tho modulus of trans-

verse rupture. Let the section be such that y, = y Then the modulus of transverse rupture is defined as /=My,y,/I. This mode of stating the results of experiment on transverse strength is unsatisfactory, inasmuch as the modulus of rup- ture thus determined will vary with different

Ai

8B

8B Fig. 31, forms of section. Thus a plastic material for which /, and f; aro

equal, if tested in the form of an I beam in which the flanges form practically the whole area of section, will have a modulus of rupturo

Fig. 32.

sensibly equal to f, orf On the other hand, if the material be tested in the form of a rectangular bar, the modulus of rupture may approach a value one and a half times as great. For in the latter case the distribution of stress may approach an ultimate con- dition in which half the section is in uniform tension f, and tho other half in uniform compression of the same intensity. The mo- ment of stress is then 4 /,bh?, b being the breadth and fA the depth of the section ; but by definition of the modulus of rupture f, M= %/oh?. In tables of the modulus of transverse rupture the values aro generally to be understood as referring to bars of rectangular section. Values of this modulus for somo of the principal materials of engineering are given in the article BripcEs, vol. iv. p. 292.

59. The strain produced by bending stress in a bar or beam is, as regards any imaginary filament taken along the length of the piece, sensibly the same as if that filament were | directly pulled or compressed by itself. The resultin deformation of the piece consists, in the first place au chiefly, of curvature in the direction of the length, due to the longitudinal extension and compression of the filaments, and, in the second place, of transverso flex- ure, due to the lateral compression and extension which go along with their longitudinal extension and com- pression (see Exasrroiry, § 57). Let J,, fig. 88, bea short portion of the length of a beam strained by a bend- ing moment M (within the limits of elasticity). The bean, which we assume to

be originally straight, bends in the dircction of its length to a curve of radius R, such that R/2=y,/8/, 82 being the change of Z by exten- sion or compression, at a distance y, from the neutral axis, But 5/—dp,/E by § 10, and p,=My,/I. Hence R=EI/M. The transverse flexure is not, in general, of practical importance. The centre of curvature for itis on the opposite side from the centre for longitudinal flexure, and the radius is Ro, where ¢ is the ratio of longitudinal extension to lateral contraction under simple pull. Fig. 83.

60. Bending combined with shearing is the mode of stress to which beams are ordinarily subject, the loads, or externally applied forces, being applied at right angles to the direction of the length. Let AB, fig. 34, be any cross-section of a beam in equilibrium. The portion V of the beam, which lies on one side of AB, is in equi- librium under the joint action of the external forces F,, Fy, F, &c., and the forces which the other por- tion U exerts on V in consequence of the state of stress at AB. The forces F,, F., F;, &c. may be referred to AB by introducing couples whose moments are Fya, Fev, Fxg, &c. Hence the stress at AB must equilibrate, first, a couple whose moment is 2a, and, second, a forco whose value is SF, which tends to shear V from U. In these summations regard must of course be had to the sign of each force; in tho diagram tho sign of F, is opposite to the sign of F, and F,. Thus the stress at AB may be regarded as that due toa bending moment M equal to the sum of the moments about the section of the externally applied forces on one side of the section (2F a), and a shearing force equal to the sum of the forces about one side of the section (ZF). It is a matter of convenience only whether the forces on V or on U be taken in reckoning the bending moment and the shearing force. The bending moment causes a uniformly vary- ing normal stress on AB of the kind already discussed in § 56; tho shearing force causes a shearing stress in the plane of the section, the distribution of which will be investigated later. This shearing stress in the plane of the section is (by § 6) accompanied by an

equal intensity of shearing stress in horizontal the length of the beam.

61. The stress due to the bending moment, consisting of longi. tudinal push in filaments above the neutral axis and longitudinal pull in filaments below

the neutral axis, is the thing chiefly to be considered in practical problems relating to the strength of beams, The general formula »,= My,/I becomes, for a beam of rectangular section of breadth 6 and depth h, p,=6M/bh? =6M/SA, 8 being the area of section. For a beam of circular section it becomes P,=32M/rh?=8M/Sh. Tho material of a beam is disposed to the greatest advantage as regards resistance to bending when the form is that of a pair of flanges or booms at top and bottom, held apart by a thin but stiff web or by cross-bracing, as in I beams and braced trusses. In such cases sensibly the whole bending momentis taken by the flanges; the intensity of stress over the section of each flange is very nearly uniform, and the areas of section of the ten- sion and compression flanges (S, and S, respectively) should be proportioned to the value of the ultimate strengths %; and f,, so that S,f¢=S8,fc. Thus for cast-iron beams Hodgkinson has recommended that the tension flange should have six times the sectional area of the compression flange. The intensity of longitudinal stress on the two flanges of an I beam is approximately M/S,/ and M/S,A, h being the depth from centre to centre of the flanges.

62. In the examination of loaded beams it is convenient to re- Diam present graphically the bending moment and the shearing force at of by various sections by setting up ordinates to represent the values of ing m these quantities. Curves of bending moment and shearing force for a number of important practical cases of beams supported at the ends will bo found in the article BripeEs, with expressions for fone, the maximum bending moment and maximum shearing force under various distributions of load. The subject may be briefly illustrated

planes paralle} to

Fig. 87,

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here by taking the caso of a cantilever or projecting bracket—(1) loaded at the end only (fig. 85); (2) loaded at the end and at another point (fig. 86); (3) loaded over the whole length witha uniform load per foot run, Curves of bending moment are given in full lines and curves of shearing force in dotted lines in the diagrams.

The area enclosed by the curve of shearing force, up to any ordinate, such as ab (fig. 37), is equal to the bending moment at the same section, represented by the ordinate ac. For let a be increased to «+z, the bending moment changes to SF(x+6z), or 5M=dx3F, Henco the shearing force at any section is equal to the rate of change of the bending moment there per unit of the length, and the bending moment is the integral of the shearing force with respect to the length. In the case of a continuous dis- tribution of load, it should be observed that, when x is increased to w+ dx, the moment changes by an additional amount which depends on (5x)? and may therefore be neglected.

63. To examine the distribution of shearing stress over any Distribi. —

vertical section of a beam, » & tion of we may consider two gw Wrrt a 7 shearing closely adjacent sections ay “stress.

AB and DE (fig. 38), on which tho bending mo- ments are M and M+8M respectively. The result- ant horizontal force due to the bending stresses on a piece ADHG enclosed be- tween tho adjacent sec- tions, and bounded by the horizontal plane GH at a distance y) from the neutral axis, is shown by the shaded figure. This must be equilibrated by : the horizontal shearing

stress on GH, which is the lie , only other horizontal force acting on the piece. At any height y the intensity of resultant horizontal stress due to the difference of the bending moments is y3M/I, aud the whole horizontal force

on GH is os “Wedy, z being the breadth. If q be the intensily

ee ee ee

&

: I Yo ‘ ° dth ig of horizontal shearing stress on the section GH, whose brea Zo, we have sM ny . qede = > – yody . Yo

But 8M/8x is the whele shearing force Q on the section of the beam. Hence Q . al/yo ~ and this is also the intensity of vertical shearing stress at the dis- tance 7/) from the neutral axis. This expression may couveniently be written

g=QAy/zol, where A is the area of the surface AG and y the distance of its centre of gravity from the neutral axis. The intensity gis a maximum at the neutral axis and ‘diminishes to zero at the top and bottom of the beam. In a beam of rectangular section the value of the shearing stress at the neutral axis is g max. =8Q/bh. In other words, the maximum intensity of shearing stress on any section is § of the mean intensity. Similarly, in a beam of circular section the maximum is § of the mean. This result is of seme importance in application to the pins of pin-joints, which may be treated as very short beams liable to give way by shearing, In the case of an J beam with wide flanges and a thin web, the above expression shows that in any vertical section q is nearly con- stant in the web, and insignificantly small in the flanges. Practi- cally all the shearing stress is borue by the web, and its intensity is very nearly equal to Q divided by the arca of section of the web. 64. The erating analysis of the stresses in a beam, which resolves them into longitudinal pull and push, due to bending mement, along with shear in longitudinal and transverse planes, is generally sufficient in the treatment of practical cases. If, how- ever, it is desired to find the direction and greatest intensity of stress at any point in a beam, the planes of principal stress passing

Myedy ;

uniform section subjected to a uniform bending moment) bend into a circular arc. In other cases the form of the bent beam, and the resulting slope and deflexion, may be determined by integrating the curvature throughout the span, or by a graphic process (see Brinces, § 25), which consists in drawing a curve to represent the beam with its curvature greatly exaggerated, after the radius of curvatnre has been determined for a sufficient number of sections. In all practical cases the curvature is so small that the arc and chord are of sensibly the same length. Calling 7 tho angle of slope, and w the dip or deflexion from the chord, the equation to the curve into which an originally straight beam bends may be written du_.,@u_di_ KEI | da”? de? de M * Integrating this for a beam of uniform section, of span L, supported at its ends and loaded with a weight W at the centre, we

have, for the greatest slope and greatest deflexion, respectively, 7, = WL?/16EI, w= WL3/48EI. If the load W is uniformly distributed over L, a= WL?/24EI and uw, =5WL?/384EI, For other cases, see BRIDGES, § 24,

The additional slope which shearing stress produces in any originally horizontal layer is g/C, where q is, as before, the intensity of shearing stress and Cis the modulus of rigidity. In a round or rectangular bar the additional deflexion due to shearing is scarcely appreciable. In an I beam, with a web only thick enough to resist shear, it may be a sonicwhat considerable proportion of the whole.

67. Torsion occurs in a bar to which equal and opposite couples Torsion are applied, the axis of the bar being the axis of the couples, and of solid gives rise to shearing stress in planes perpendicular to the axis, and Let AB (fig. 40) be a uniform circular shaft held fast at the end A, hollow and twisted by a shafts.

through the point must be found by an application of the general method given in the article ELastioiry, chapter oe =

iii. In the present case the problemi is excep- A 2 tionally simple, from the fact that the stresses

en two planes at right angles are known, and the stress on one of these planes is wholly tan- gential. Let AC (fig. 39) be an indefinitely g small portion of the horizontal section of a beam, en which there is only shearing stress, and let AB be an indefinitely small portion of the vertical section at the same place, on which there is shearing and normal stress. Let q be the intensity of the shearing stress, which is the same on AB and AC, and let p be the in- tensity of normal stress on AB: it is required te find a third plane BC, such that the stress i en it is wholly normal, and to find 7, the in- Pig. 30. tensity of that stress. Let bo the angle (to be determined) which BC makes with AB. Then the equilibrium of the triangular wedge | ABC requires that 7rBCcos0=p. AB+q. AC, and rBCsing=q. AB; (r-p)cos=qsiné@, and rsin@=qcos 6.

g=r(r-p),

tan 20=2q/p ,

rah g+ hp.

The positive valuc of 7 is the greater principal stress, and is of the same sign asp. The negative value is the lesser principal stress, | which occurs on a plane at right angles to the former. ‘The equa- tien for @ gives two values corresponding to the two planes of principal stress, The greatest intensity of shearing stress occurs en the pair of planes inclined at 45° to the planes of principal tress, and its value is\V g?+ 4p? (by § 5).

65. The above determination of 7, the greatest intensity of stress due te the cembined effect of simple bending and shearing, is of some practical importance in the case of the web of an J beam. We have seen that tho web takes practically the whole shearing ferce, distributed over it with a nearly uniform intensity g. If | there were no normal stress on a vertical section of the web, the | shearing stress g would give rise to two equal principal stresses, of | pull and push, each equal to g, in directions inclined at 45° to the _ section. But the web has further to suffer normal stress due to _ bending, the intensity of which at points near the flanges approxi- mates to the intensity on the flanges themselves. Hence in these) regions the greater principal stress is inereased, often bya consider- able amount, which may easily be calculated from the foregoing | fermula. What makes this specially important is the fact that _ one of the principal stresses is a stress of eompression, which tends te make the web yield by buckling, and must be guarded against | by a suitable stiffening of the web.

__ The equatien for @ allows the lines of principal stress in a beam to _ be drawn when the form of the beam and the distribution of loads _ are given. An example has been shown in the article Bripazs

_ G18, fig. 12), vol. iv. p. 290.

66. The deflexion of beams is due partly to the distortion caused by shearing, but chiefly to the simple bending which occurs at each vertical section, As regards the second, which in most cases is the only important cause of deflexion, we have seen (§ 59) that the radius of curvature R at any section, due to a bending moment M, is EI/M, which may also be written

Ey,/p,. Thus beams of | uniform strength and depth (and, as a particular casc, beams of

ee

———

— na

couple applied in the plane BB, As- suming the strain to be within the limits of elasticity, a radius CD turns round to CD’, and a line AD drawn at any dis- tance r from the axis, and originally straight, changes into the helix AD’. Lct be the augle which this helix makes with lincs parallel to the axis, or in other words the angle of shear at the distance r from the axis, and let ¢ be the angle of twist DCD’. Taking two sections at a distance dx from one another, we have the arc dx=rdi. Hence qg, the intensity of shearing stress in a plane of cross-section, varies as r,

since g=CO=Cr – . The resultant moment of the whole shearing

stress on each plane of cross-section is equal to the twisting

moment M. Thus SimPedr

Calling r, the outside radius (where the shearing stress is greatcst) and q, its intensity there, we have g=71q,/7,, and hence, for a solid shaft, g;=2M/rr,3. For a hollow shaft with a central hole of radius 7, the same reasoning applies: the limits of integration are now 7, and 7,, and = Mis,

a(1*— 79*)

The lines of principal stress are obviously helices inclined at 45° to the axis.

If the shaft has any other form of section than a solid or sym- metrical hollow circle, an originally straight radial line becomes warped when the shaft is twisted, and the shearing stress is no longer proportional to the distance from the axis. The twisting of shafts of square, triangular, and other sections has been investigated by M. de St Venant (see ELastioiry, § 66-71,

where a comparison of torsional rigidities is given). In a square shaft (side=h) the stress is greatest at the middle of each side, and its intensity there is g, = M/0°281h8,

For round sections the angle of twist por unit of length is joo 0 2M in solid and ——”;-—z in hollow shafts.

Cr, «Cr,* aCO(7r,4 — 794)

.,68. In what has been said above it is assumed that the stress is within the limit of elasticity. When the twisting couple is increased so that this limit is passed, plastic yielding begins in the outermost layer, and a larger proportion of the whole stress falls to be borne by layers nearer the centre. The case is similar to that of a beam bent beyond the elastic limit, described in § 57. If we suppose the process of twisting to be continued, and that after passing the limit of elasticity the material is capable of much distortion without further increase of shearing stress, the distribu- tion of stress on any cross section will finally have an approximately

‘, Qar*q’dr

r =2nq(r}3—7,2). In the case of a solid shaft this gives for Ma

%

uniform value q’, and the moment of torsion will be

1 Rankine, Applted Mechanics, § 324,

Torsion and

cranks,

Strength of struts.

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value greater than it has when the stress in the outermost layer only reaches the intensity q/, in the ratio of 4 to 3.1 It is obvious from

this consideration that the ultimate strength of a shaft to resist torsion is no more deducible from a knowledge of the ultimate shearing strength of the material than the ultimate strength of

a beam to resist bending is deducible from a knowledge of f; and fe. It should be noticed also that as regards ultimate strength a solid shaft has an important advantage over a hollow shaft of the same elastic strength, or a hollow shaft so proportioned that the greatest working intensity of stress is the same as in the solid shaft.

69. Twisting combined with Longitudinal Stress. —When a rod is twisted and pulled axially, or when a short block is twisted and com- pressed axially, the greatest intensity of stress (the greater principal stress) is to be found by compounding the longitudinal and shearing stresses as in § 64, In a circular rod of radius 7,, a total longitudi- nal force P in the direction of the axis gives a longitudinal normal stress whose intensity p,=P/r?. A twisting couple M applied to the same rod gives a shearing stress whose greatest intensity M=2M/rr,3. The two together give rise to a pair of principal

stresses of intensities r= P/2mr?+/(2M/wr 5)? + (P/2ar,*), their

inclinations to theaxis being defined by the equation tan 26 = 2M/7,P, and the term under the square root is the shearing stress.

70. Z'wisting combined with Bending.—This important practical case is realized in a crank-shaft (fig. 41). Leta force P be applied at the crank-pin A at right angles to the plane of the crank.

At any section of the shaft C ,_ (between the crank and the bearing) there is a twisting mo- ment M,=P. AB, and a bend- ing moment M,=P.BC. There

is also a direct shcaring force P, but this docs not require to be taken into account in calculating . the stress at points at the top or bottom of the circumference (where the intensity is greatest), since (by § 63) the direct shearing stress is dis tributed so that its intensity is zero at these points. The stress there is consequently made up of longitudinal normal stress (due to bending), p,=4M.,/mr,3, and shearing stress (due to torsion), m= 2M,/rr3.

Combining these, as in § 64, we find for the prin- cipal stresses r= 2(M,4/M,? M,*)/w7,3, or r=2P(BC+AC)/ar,3. The greatest shearing stress is 2P.AC/mr3, and the axes of principal stress are inclined so that tan 20=M,/M,=AB/BC. The axis of greater principal stress bisects the angle ACB.

71. Long Columns and Struts—Compression and Bending.—A long strut or pillar, compressed by forces P applicd at the ends in the direction of the axis, becomes unstable as regards flexure when P exceeds a certain value. Under no circumstances can this value of P be excecded in loading a strut. But it may happen that the intensity of stress produced by smaller loads exceeds the safe com- pressive strength of the material, in which case a lower limit of load must be chosen. If the applied load is not strictly axial, if the strut is not initially straight, if it is subject to any deflexion by transverse forces, or if the modulus of elasticity is not uniform over each cross-section, —then loads smaller than the limit which causes instability will produce a certain deflexion which increases with increase of load, and will give rise to a uniformly varying stress of the kind illustrated in figs. 26 and 28. We shall first consider the ideal case in which the forces at the ends are strictly axial, the strut perfectly straight and free from transverse loads and perfectly symmetrical as to elasticity. Two conditions have to be distinguished—that in which the ends are left free to bend, and that in which the ends are held fixed. In what follows, the ends are supposed free to bend. ‘The value of the load which causes instability will be found by considering what force P applied to each end would suffice to hold an originally straight strut in a bent state, supposing it to have received a small amount of elastic curvature in any way. Using w as before to denote the deflexion at any part of the length, the bending moment is Pu, and (taking the origin at the middle of the chord) the equation to the elastic curve is

Fig. 41.

du —-Pu

dat ET * from which, for a strut of uniform section, U=U, cos #r/P/ET, uy being the deflexion at the centre, Now w=0 when x=4L (the half length), and therefore 4L,/P/EI=4m or an integral multiple of 4m. The smallest value (4) corresponds to the least force P. Thus the force required to

maintain the strut in its curved state is P=7°EI/L?, and is independent of uw. This means that with this particular value of P (which for brevity we shall write P,) the strut will be in neutral equilibrium when bent; with a value of P less than P, it will be stable: with a greater value it will be unstable. Henco a load exceeding P, will certainly cause rupture. The value

1See ELAsticiry, $$ 10-20.

greatest intensity of

- EL/La,

EI/L? applies to struts with round ends, or ends free to turn. If the ends are fixed the effective length for bending is reduced by one half, so that P, then is 4m°EI/L?, When one end is fixed and the other is free P, has an intermediate value, probably about 9m? EI/4L?,

72. The above theory, which is Euler's, assigns P, asa limit to} the strength of a strut on account of flexura instability; but a stress less than P, may cause direct crushing. Let S$ be the area of section, and f, the strength of the material to resist crushing. | Thus a strut which conforms to the ideal conditions specified above will fail by simple crushing if 7,8 is less than P,, but by | bending if 8 is greater than P,. Hence with a given material and form of section the ideal strut will fail by direct crushing if the length is less than a certain multiple of the least breadth (easil calculated from the expression for P,), and in that case its strengi | will be independent of the length ; when the length is greater than this the strut will yield by bending, and its strength diminishes rapidly as the length is increased.

But the conditions which the above theory assumes are never | realized in practice, The load is never strictly axial, nor the strut absolutely straight to begin with, nor the elasticity uniform. | The result is that the strength is in all cascs less than either 4

or P,. The effect of deviations from axiality, from strai htness, and from uniformity of elasticity may be treated by intro ucing a term ee an

imaginary initial deflexion, and in this way |. Euler’s theory may be so modified as to agree well with experimental | results on the fracture of struts,? and may be reconciled with the | observed fact that the deflexion of a strut begins gradually and passes through stable values before the stage of instability is reached. In consequence of this stable deflexion the stress of | compression on the inside edge becomes greater than P/S, the stress | on the outside edge becomes less than P/S, and may even change | into tension, and the strut may yield by one or the other of these | stresses becoming greater than f, or /; respectively. As regards | the influence of length and moment of inertia of section on the – deflexion of struts, analogy to the case of beams suggests that the | greatest deflexion consistent with stability will vary as L2/b, 6 being the least breadth, and the greatest and lcast stress, at opposite — edges of the middle section, will consequently be Nl P aL?

na=g(1455), where a is a coefficient depending on the material and the form | of the section. This gives, for the breaking load, P=Sf,/(1 + aL?/b2) or — Sf,/(1 – aL2/b?), the smaller of the two being taken.

This formula, which is generally known as Gordon’s, can be made to agree fairly with the results of experiments on struts of ordinary proportions, when the values of fas well as @ are treated as empirical constants to be determined by trial with struts of the same class | as those to which the formula is to be applied. Gordon’s formula may also be arrived at in another way. For very short struts we have seen that the breaking load is /.8, and for very long struts itis If we write P=/,S/(1+/,SL*/r2EI), we have a formula which gives correct values in these two extreme cascs, and inter- mediate values for struts of medium length. By writing this P—=/S/(1+eSL? /I), and treating f and ¢ as empirical constants, we have Gordon’s formula in a slightly modified shape. Gordon’s formula is largely used; it is, however, essentially empirical, and it is only by adjustment of both constants that it can be brought into agreement with experimental results.? For values of the constants, see Bripezs. In the case of fixed ends, ¢ is to be divided by 4. i “3. Bursting Strength of Circular Cylinders and Spheres. —Space Singl remains for the consideration of only one other mode of stress, of oftell great importance from its occurrence in boilers, pipes, hydraulic and steam cylinders, and guns. The material of a hollow cylinder, subjected to pressure from within, is thrown into a stress of circumferential pull. When the

thickness ¢ is small compared with the radius R, we may treat this stress as uniformly distributed over the thickness. Let p be the intensity of fluid pressure within a hollow circular cylinder, and let Jf be the intensity of circumferential stress. Consider the forces on a small rectangular plate (fig. 42), with its sides parallel and perpen- dicular to the direction of the axis, of length 7 and width Rd, 36 being the small angle it ; subtends at the axis. Whatever forces act on this plate in the direction of the axis are equal and opposite. The remaining forces, which are in equilibrium, are P, the total pressure from within, an a force T at each side due to the circumferential stress. P=plR9

2 See papers by Profs. Ayrton and Perry, The Engineer, Dec. 10 and 24, 1886, and by T. C. Fidler, Min. Proc. Inst. C.E., vol. xxxvi. p. 261.

3 For experiments on the breaking strength of struts, see papers by Hodgkin- son, Phil, Trans., 1840; Berkeley, Min. Proc. Inst. C.E., vol. XxX.; Chri Trans. Amer. Soc, Civ, Eng., 1884.

Fig. 42.

Pnath thn © ‘Thick Isheg cylinder.

Yad T=/lt, But by the triangle of forces (fig. 43) P=T3¢. Hence

= ph/t. f Pi ends of the cylinder may or may not be held together by

itudinal stress in the cylinder sides : ny are, then, whatever be the form of : the ends, a transverse section, the area eG of whieh is 27Rt, has to bear a total force Tr

R, Hence, if /” be the intensity of Fig. 43, longitudinal stress, /” =pR/2t=1

74, A thin hollow sphere under internal pressure has equal eireumiferential pull in all directions. To find its value consider the plate of fig. 42. There are now four equal forces T, on each of the four sides, to equilibrate the radial force P. Hence P=2T60 and f= pR/2¢.

75. When the thickness is not small compared with the radius, the radial pressure is transmitted from layer to layer with reduced intensity, and the circumferential pull diminishes towards the out- side. In the case of a thick cylinder with free ends! we have to deal at any point with two principal stresses, radial and circum- ferential, which may be denoted by p and p’ respectively. _Sup- posing (as we may properly do in dealing with a cylinder which is not very short) that a transverse section originally plane remains plane, the longitudinal strain is uniform. Since there is no lougi- tudinal stress this strain is due entirely to the lateral action of the stresses p and p’, and its amount is (p + Pick. Hence atall points p+p’=constant.? Further, by considering the equilibrium of any

thin layer, as we have already considered that of a thin cylinder, we have £ (pn) =p’,

These two equations give by inte ration, p=C+C/7?2, and genre give by integ

however thick the cylinder is. In the construction of guns various devices have been used to With cast guns a chilled core has been employed to make the inner layers solidify aud cool first, sa that they are afterwards compressed by the later coutrac- tion of the outer layers. In guus built up of wrought-iron or stecl hoops the hoops are bored small by a regulated amount and are shrunk on over the barrel or over the inner hoops. In Mr Loug- ridge’s system, now under trial, the gun is made by winding steel wire or ribbon, with suitable initial tension, on a central barrel. 76. The circumferential stress at any point of a thick hollow sphere exposed to internal fluid pressure is found, by a process like that of the last paragraph, to be ~ pyr,3(1 + 113/275) /(r,3 — 7,3), which gives, for the greatest tension, the value

— Pol Ty? + 2r.8)/2(7,8 — 7,3) , (J. A. E.)

STRICKLAND, Acnzs (1806-1874), a popular his- torical writer, was born in 1806, the third daughter of Thomas Strickland, of Roydon Hall, Suffolk. Her first literary efforts were historical romances in verse in the style of Walter Scott,— Worcester Pield (published without date), Demetrius and other Poems (1833). From this she passed to prose histories, written in a simple style for the young. A picturesque sketch of the Pilgrims of Walsingham appeared in 1835, two volumes of Zales and Stories from History in the following year. Then with the assistance of her sister she projected a more ambitious work, The Lives of the Queens of England, from Mathilda of Flanders to Queen Anne. The first volume appeared in 1840, the twelfth and last in 1849. – Miss Strickland was a warm partisan on the side of royalty and the church, but she made industrious study of "official records and other public documents," gave copious extracts from them, and drew interesting pictures of manners and customs. While engaged on this work she found time to edit (in 1843) the Letters of Mar , Queen of Scots, whose innocence she championed with enthusiasm. In 1850 she followed up her Queens of England with the Lives of the Queens of Scotland, completing the series in eight volumes in 1859. Unresting in her industry, she turned next to the Batchelor Kings of England, about whom she published a volume in P61. The Lives of the Seven Bishops followed in 1866— after a longer interval, part of which was employed in producing an abridged version of her Queens of England. Her last work was the Lives of the Last Four Stuart Princesses, published in 1872. Tn 1871 she obtained a civil list pension of £100 in recognition of her merits. She died at Roydon Hall on the 8th of J uly 1874.

A Life by her sister, Jane Margaret Strickland, appeared in 1887, STRIEGAU, an industrial town of Prussia, in the pro- vince of Silesia, is situated on a small tributary of the Weistritz, 30 miles to the south-west of Breslau, In 880 it contained 11,470 inhabitants, 6928 of whom Were Protestants and 4379 Roman Catholics. Their chief Occupations are tanning and the manufacture of albums, portfolios, and other articles in leather. Granite is

: dinal Stress, provided that the longitudinal stress is uniformly distributed ver each transverse section,

rie a ofp +(p+p’Viok,

quarried in the neighbourhood, and a trade is carried on in grain. It was near Striegau that Frederick the Great gained the important victory usually named after the village of Hohenfriedberg (June 4, 1745),

STROMBOLI. See Lrpart Isnanps.

STRONTIUM, a metallic chemical element intermedi- ate in its character between barium and calcium, with which it forms a natural “ triad,” Though widely diffused as a frequent companion of calcium (including oceanic), it occurs nowhere in abundance. Its most important mineral forms are the sulphate, SrSO,, known as Celestine (from the sky-blue colour of certain varieties), and the carbonate, SrCO,, called Strontianite because it was discovered first at Strontian, in Argyllshire, Scotland. Crawford and (independently of him) Cruickshanks in 1790 were the first to recognize the latter mineral as a thing of its own kind and different from witherite (BaCO,). Hope, in 1793, proved it to be the carbonate of a new earth, which discovery was confirmed by Klaproth.

Regarding metallic strontium, see CHEMISTRY, vol. y. pp. 525-6, For the making of strontium preparations strontianite, of course, is the handier raw material, being readily convertible into (for instance) nitrate by treatment with dilute nitric acid. From the nitrate the oxide, SrO, is obtained by prolonged calcination at ultimately a bright red heat, as a greyish-white absolutely infns- ible and non-volatile mass, which acts violently on water with formation of the hydrate, S1(OH),, which latter readily takes up 8H,0 of water to form crystals soluble in fifty parts of cold and far less of boiling water. “An impure oxide is obtainable directly from stroutianite by strong ignition with charcoal; and from such crude oxide pure crystals of the hydrate are easily produced by obvious operations.

In the working up of cclestine the first step is to reduce it to sulphide, SrS, by means of charcoal at a red heat. The sulphide when boiled with water is decomposed thus :—

2SrS + 2H,O =Sr0H,0 + SrSH,S. d Hydrate. Sulph-bydrate, Both products dissolve in the hot water; from the solution the § of the SrH,§, is easily

eliminated, by treatment with oxide of copper or oxide of zinc, as insoluble metallic sulphide; the filtrate on cooling gives erystals of pure hydrate. From it any strontia salt of course is easily made by means of the respective acid ; in many cases the salt wished for can be obtained similarly from the sulphide.

Nitrate of strontia from hot solutions erystallizes in anhydrous octahedra, SrN,O,, soluble in about % part of boiling and in 5 parts of cold water. From colder solutions hydrated crystals, SrN,O, + 4H.0, separate out. The anhydrous salt is used largely by pyrotechnists for the making of ‘‘red fire.”

The hydroxide some years ago part in the sugar industry as a known to be present largely in uncrystallizable molasses (see SuGar), but the process so far has failed to take root in industry.

Analysis.—To detect strontium in a salt-solution, we first eliminate the heavy metals by the successive application of sulphuretted hydrogen (and free acid) and of sulphide of ammonium in the presence of ammonia and sal-ammoniae. From the filtrate earbonate of amnionia (in the heat) precipitates only the barium, strontium, and ealeium as carbonates, whieh aro filtered off and washed with hot water. The analysis of the precipitate is diffieult ; but any strontia in it is easily detected by means of the speetroseope (seo SPECTROSCOPY).

STROPHANTHUS, a genus of plants of the natural order Apocynex, deriving its name from the long twisted thread-like segments of the corolla, which in one species attain a length of 12 or 14 inches, The genus at present comprises about 18 species, confined to tropical Africa and Asia, only one species, indigenous to the former continent, being known outside the tropics. Several of the African species furnish the natives of the countries in which they grow with the principal ingredient in their arrow poisons. The inée or onaye poison of the Gaboon, the kombé poison of equatorial North Africa, the arquah poison of the banks of the Niger, and the wanika poison of Zanzi- bar are all derived from members of this genus, The exact species used in each case cannot be said to be

1304,

in 1871 was 7082, and in 1881 it was 7848. STRUENSEE, Jowann Friepricu, Count (1737 1772), Danish statesman, was of German extraction, and was born August 5, 1737, at Halle, where his father Adam Struensee, of some eminence as a hymn writer, was pastor,

office of physician to the town of Altona through the influence of his father, who had removed thither. On

quarrelled with his father, and for some time he led an unsettled life, until in 1768 he was appointed personal physician to the young king, Christian VII. of Denmark, whom he accompanied on a tour through England, France, Holland, and Germany. The influence he exercised over the almost imbecile king awakened at first the jealousy of the queen, Caroline Matilda, a daughter of George IL, but, having had occasion to attend her for a severe

and flour-mills. Stroud at the time of the Norman survey was part of Bisley parish, from which it was separated in The local board was established in 1857. The population of the urban sanitary district (area 999 acres)

He graduated M.D. at Halle in 1756, and obtained the

account, however, of a change in his religious views he

accurately known. S. hispidus, D.C., is the one most frequently employed.

Two of the arrow poisons have been ehemieally and physio- The kombé poison was subjeeted to some preliminary experiments in 1862 by Prof. Sharpey, but was

logically examined.

more fully examined a few years subsequently by Pref 1. R.

Fraser. From the investigations of the latter! it appears that the kombé arrow poison, when given in fatal doses, paralyses the aetion of tho heart. In minute doses, however, it possesses a tonic aetion on that organ. Sinee the practieal value of

strophanthus asa medieinal agent has been pointed out by Prof.

Fraser, it has been used with considerable success in some forms of heart-disease. The chemical examination showed that its activity

is due to a glueoside, which has been named strophanthin. The wanika arrow poison has been examined physio ogieally by Dr Sydney Ringer and chemically by Mr A. W. Gerrard. its active principle, a glucoside, was found to resemble strophanthin in its action. Chemieally also, as obtained by Mr Gerrard, it scems to be identieal with strophanthin.? It is soluble in alcohol and water, but insoluble in ether and chloroform; it evolves ammonia when heated with soda-lime, but gives only a slight brown coloration when treated with strong sulphuric aeid.

Both S. hispidus and S. Kombe have hairy seeds with a slender thread-like appendage, terminating in a feathery tuft of long silky hairs, the seeds of the former being coated with short ap- pressed brown hairs, and those of the latter with white hairs ; but in the species used at Delagoa Bay and ealled “umtsuli” the thread-like appendage of the seed is abseut. Aeeording to infor- mation furnished by Messrs T. Christy & Company of London, and obtained from a correspondent on the Zanzibar coast, the natives pound the seeds into an oily mass, which assumes a red colour, portions of this mass being smeared on the arrow immedi- ately behind the barb.

See Jcones Plantarum, No. 4, 1870; Pelikan, Arch. Gen. de Afédicine, July 1865, p. 115; Van Hasselt, Arch. Neert. des Se., [2], vii., 1872, p.161; Arch. de Physiol., No, 5, 1872, p. 526; Rapport sur UInaye, Paris, 1877, 8vo.

STROUD, a market-town of Gloucestershire, is situated on the Swindon and Gloucester branch of the Great Western Railway, on a branch of the Midland Railway, and on the Thames and Severn Junction Canal, 10 miles south of Gloucester and 30 north-east of Bristol. It is picturesquely situated on an eminence environed by higher hills, but is built in a somewhat straggling and irregular fashion, Among the principal buildings are the town-hall, built in the reign of Elizabeth, the Lansdown hall (1879), the Badbrook hall (1869), with reading-room and large room for concerts, the subscription rooms (1834), and the hospital, erected in 1875 at a cost of £8754, to replace the dispensary erected in 1823. The town is the principal

seat of the west of England cloth manufacture, and possesses very extensive mills. There are also silk mills, scarlet-dye works, breweries, logwood-crushing mills,

1 See Proc. Roy. Soc. Edin., 1869-1870, p. 99; reprinted in

Jour. Anat, and Physiol., vol. vii. pp. 140~155, * Pharm, Jowr., [8], xi. pp. 884, 835,

There is little doubt, however, that

in the service of Prussia.

malady, he wou her complete confidence also, and became equally the favourite of both. When therefore in 1770 he was appointed master of requests, he virtually took the government of the kingdom into his own hands, and on the 20th September the council of state was superseded, Though acting as an absolutist, his sympathies were democratic, and he used his position to promote the general benefit of the people and to curb the influence of the nobility. The extent of his reforms, and the sudden- ness with which they were introduced, had all the practical effect of a revolution. They included the enfranchisement of the peasants, complete religious toleration, the abolition of commercial restrictions, the reorganization of the army, and the introduction of examinations for public offices, His reforms were received with consternation, and a con- spiracy was entered into to effect his overthrow. The queen dowager persuaded Christian VII. that Struensee was carrying on an intrigue with the queen, and had entered into a plot to assassinate him, in order that he might rule as regent. He and his friend Count Brandt were consequently arrested on 20th February 1772. The attempt to prove that he had been unfaithful in his duty as minister to the king failed, but he did not deny the liaison with the queen, and he and Count Brandt were both beheaded and quartered on the 28th April (sce DENMARK, Vol. vii. p. 87).

See Leben und Begebenheiten der Grafen Struensee und Brandl, 1772; Memoirs of an Unfortunate Queen, London, 1776; Hast, Struensee og hans Ministerium, Copenhagen, 1824; J enssen-Tusch, Die Verschwirung gegen die Kinigin Karoline Mathilde und die Grafen Struensee und Brandt, nach

bisher ungedriickten Original. acten, Leipsie, 1864; Wraxall, Life and Times of Queen Caroline, 1864; K. Wittich, Strwensce, Leipsie, 1879.

STRUVE, Frieprich Guore Winnetm (1793-1864), astronomer, was born at' Altona on April 15, 1793. In 1808 he entered the university of Dorpat, where he first studied philology, but soon turned his attention t0 astronomy. In 1813 he was appointed observer in the new university observatory and a few years later professor of astronomy. He remained in Dorpat, occupied with researches on double stars and in geodetic work, till 1839, when he removed to Pulkova, near St Petersburg, as director of the new Central Observatory. Here he con tinued his activity until he was obliged to retire (in 1861) owing to failing health. He died at St Petersburg on

November 23, 1864.

5 Carl Gustav Struensee von Carlsbach, elder brother of Johann Friedrich, born at Halle 18th August 1735, attained high eminence He was ennobled in 1789, became ee of finance and president of the excise department in 1791, and died a

Berlin 17th Oetober 1804.

which he carricd on for many years.

and more extensive ones of Struve.

Novus Stcllarum Duplicium).

tions, 1876). burg, 1852, fol.).

in which he had been engaged during the greater part of his life.

He had commenced them with a survey of Livonia (1816-19), which was followed by the measurement of an arc of meridian of more provinces of Russia (Beschreibung der

than 34° in the Baltic Breitengradmessung in den Ostseeprovinzen Russlands, 2 vols. 4to, Dorpat, 1831).

de 25° 20′ entre le Danube et la Mer Glaeiale, 2 vols, and 1 vol. plates, St Petersburg, 1857-60, 4to).

STRY, or Strys, a town of Galicia, Austria, is pleasantly situated on a tributary of the Dniester, about 40 miles to

the south of Lemberg. In 1880 it contained 12,625

inhabitants, chiefly engaged in tanning and the manu- In 1886, however, the town was almost wholly destroyed by fire, and its population was

facture of matches.

‘greatly reduced by the wholesale migration and deaths from privation consequent upon this calamity. STRYCHNINE. See Poisons, vol. Nox Vomica, vol. xvii. p 687. STRYPEH, Joun (1643-1737), historian and biographer,

Stepney, Church, Spitalfields. 1 merchant and silk throwster. The son was born Ist ‘November 1643. He was educated at St Paul’s School, and on 5th July 1662 entered Jesus College, Cambridge. Thence he proceeded to Catherine Hall, where he gradu- ted B.A. in 1665 and M.A. in 1669. On the 14th July of the latter year he was preferred to the curacy of l) heydon-Buis, Essex, and a few months afterwards was vhosen curate and lecturer of Low Leyton in the same ounty. On account of the smallness of the salary, the patron allowed the people to choose their own minister, }he vacancy in the vicarage remaining unfilled during the jife of Strype. He was never instituted or inducted, but n 1674 he was licensed by the bishop of London to preach and expound the word of God, and to perform the ‘Jull office of priest and curate during the vacancy of the ricarage. In his later years he obtained from Archbishop ‘fenison the sinecure of Tarring, Sussex, and he dis- vharged the duties of lecturer at Hackney till 1724. ‘Vhen he became infirm he took up his residence with Mr arris, an apothecary at Hackney, who had married his aughter, and died there 11th December 17 37, at the /avanced age of ninety-four.

_ At an early period of his life Strype obtained access to the papers \€ Sir Michael Hicks, secretary to Lord Burghley, from which he ‘rade extensive

trauscripts; he also carried on an extensive cor- spondence with Archbishop Wake and Bishops Burnet, Atter- Jory, and Nicholson. The materials thus obtained formed the “sis of his historical and biographical works, which relate chiefly », the period of the Reformation. The greater portion of his | iginal materials have been preserved, and are included in the {J

ak aS Ty

Struve’s name is best known by his obscrvations of double stars, These bodics had first been regularly measured by W. Herschel, who discovered that many of them formed systems of two stars revolving round their common centre of gravity. After him J. Herschel (and for some time South) had observed them, but their labours were eclipsed by the systematic With the 94-inch refractor at Dorpat he discovered a great number of double stars, and published in 1827 a list of all the known objects of this kind (Catalogus His micrometric measurements of | 2714 double stars were made from 1824 to 1837, and are contained

in his principal work Stellarwm Duplicium ct Multiplicium Mensure:

Mierometrice (St Petersburg, 1837, fol.; a convenient suminary of

the results is given in vol. i. of the Dunecht Observatory Publica- The places of the objects were at the same time) determined with the Dorpat meridian circle (Stellarwn Fizarum

Lmprimis Duplicium et Multiplicium Positiones Mediz, St Peters- At Pulkova he determined anew the constant of aberration, but was chiefly occupied in working out the results of former ycars’ work and in the completion of the geodetic operations

This work was afterwards extended by Struve and General Tenner into a measurement of a meridional arc from the north coast of Norway to Ismail on the Danube (Are du Méridien

xix. p. 279, and

was the son of John Strype or Van Stryp, a native of Brabant, who to escape religious persecution went to England, and settled near London, in a locality after- wards known as Strype's Yard, formerly in the parish of but subsequently annexed to that of Christ Here he carried on the business of

Lansdowne manuscripts in the British Museum. His works can scarcely be entitled original compositions, his labour having con- sisted chiefly in the arrangement of his materials, but on this very account they are of considerable value as convenicnt books of reference, easier of access and almost as trustworthy as the original documents. Besides a number of single sermons published at various periods, hc was the author of an edition of Lightfoot's Works, vol. ii., 1684; Memorials of Archbishop Cranmer, 1694; Life of Sir Thomas Smith, 1698 ; Life and Actions of John Aylmer, Bishop of London, 1701; Life of Sir John Cheke, with his Treatise on Superstition, 1705; Annals of the cformation in England, 4 vols., vol. i. 1709 (reprinted 1725), vol. ii. 1725, vol. iii. 1728, VOlPivielyel; Oded, 1725, 4 vols.; 3d ed. 1736-88, 4 vols.; Life and Actions of Edmund Grindal, Archbishop of Canterbury, 1710, of Matthew Parker, Archbishop of Canterbury, 1711, and of John Whitgift, Archbishop of Canterbury, 1818; An Accurate Edition of Stow's Survey of London, 1720, 2 vols. fol., the standard edition of Stow and of great value, although its interference with the original text is a method of editing which can scarcely be reckoned fair to the original author; and Evclestastical Memorvals, 1721, 3 vols.; 1738, 8 vols.; new ed. 1816. His Historical and Biographical Works were published in 10 vols., with a general index, 1820-40.

STUART, Stewart, or Stevart, the surname of a family who became heirs to the Scottish and ultimately to the English crown. Their descent is traced to a Norman baron Alan, whose eldest son William became progenitor of the earls of Arundel, and whose two younger sons Walter and Simon came to Scotland, Walter being appointed high steward of David I., who conferred on him various lands in Renfrewshire, including Paisley, where he founded the abbey in 1160. Walter, his grand- son, third steward, was appointed by Alexander IL justiciary of Scotland, and, dying in 1246, left four sons and three daughters. The third son Walter obtained by marriage the earldom of

Menteith, which ultimately came by marriage to Robert, duke of Albany, third son of Robert II. Alexander, fourth steward, the eldest son of Walter, third steward, inherited by his marriage with Jean, granddaughter of Somerled, the islands of Bute and Arran, and on 2d October 1263 defeated Haco at Largs. He had two sons, James and John. The latter, who commanded the men of Bute at the battle of Falkirk in 1298, had seven sons:— (1) Sir Alexander, whose grandson became in 1389 earl of Angus, the title afterwards passing in the female line to the Douglases, and in 1761 to the duke of Hamilton ; (2) Sir Alan of Dreghorn, ancestor of the earls and dukes of Lennox, from whom Lord Darnley, husband of Queen Mary, and also Arabella Stuart, were descended (3) Sir Walter, who obtained the barony of Garlies, Wigtownshire, from his uncle John Randolph, earl of Moray, and was the ancestor of the earls of Galloway, younger branches of the family being the Stewarts of Tonderghie, Wigtownshire, and also those of Physgill and Glenturk in the same county; (4) Sir James, who fell at Dupplin in 1332, ancestor of the lords of Lorn, on whose descendants were conferred at different periods the earldoms of Athole, Buchan, and Traquair, and who were also the progenitors of the Stewarts of Appin, Argyllshire, and of Grandtully, Perthshire; (5) Sir John, killed at Halidon Hill in 1333; (6) Sir Hugh, who fought under Edward Bruce in Ireland; and (7) Sir Robert of Dal- dowie, ancestor of the Stewarts of Allanton and of Coltness. James Stewart, the eldest son of Alexander, fourth steward, succeeded his father in 1283, and, after distin- guishing himself in the wars of Wallace and of Bruce, died in 1309. His son Walter, sixth steward, who had joint command with Douglas of the left wing at the battle of Bannockburn, married Marjory, daughter of Robert the Bruce, and during the latter's absence in Ireland was entrusted with the government of the kingdom. He died

in 1326, leaving an only son, who as Robert II. ascended

the throne of Scotland in 1370 (see vol. xxi. p- 490).

Sir Alexander Stewart, earl of Buchan, fourth son of

Robert II., who earned by his ferocity the title of the ‘‘ Wolf of Badenoch,” inherited by his wife the earldom of Ross, but died without legitimate issue, although from his illegitimate offspring were descended the Stewarts of Belladrum, of Athole, of Garth, of Urrard, and of St Fort. On the death of the “Wolf of Badenoch” the earldom of Buchan passed to his brother Robert, duke of Albany, also earl of Fife and earl of Menteith, but these earldoms were forfeited on the execution of his son Murdoch in 1425, the earldom of Buchan again, however, coming to the house of Stewart in the person of James, second son of Sir James Stewart, the black knight of Lorn, by Johanna, widow of King James I. From Murdoch, duke of Albany, were descended the Stewarts of Ardvoirlich and other families of the name in Perthshire, and also the Stuarts of Inch- breck and Laithers, Aberdeenshire. From a natural son of Robert II. were descended the Steuarts of Dalguise, Perthshire, and from a natural son of Robert III. the Shaw Stewarts of Blackhall and Greenock. The direct male line of the royal family terminated with the death of James V. in 1542, whose daughter Mary was the first to adopt the spelling “Stuart.” Mary was succeeded in her lifetime in 1567 by her only son James VI., who through his father Lord Darnley was also head of the second branch, there being no surviving male issue of the family from progenitors later than Robert II. In James V. sen of James [V. by Margaret, daughter of Henry VIL, the claims of the English junior branch became merged in the Scottish line, and on the death of Queen Elizabeth of England, last surviving offshoot of Henry VIIL, James VI. of Scotland, lineally the nearest heir, was proclaimed king of England, in accordance with a declaration of Elizabeth that no minor person should ascend the throne, but her cousin the king of Scots. The accession of J ames was, however, contrary to the will of Henry VIII., which favoured the Suffolk branch, whose succession would probably have marvellously altered the complexion of both Scottish and English history. As it was, the only result of that will was a tragedy initiated by Elizabeth, but con- summated by James, so as to clothe his memory with deep disgrace. In the Scottish line the nearest heir after James VL, both to the Scottish and English crowns, was Arabella Stuart, only child of Charles, earl of Lennox, younger brother of Lord Darnley,—Lady Margaret Douglas, the mother of Darnley and his brother, having been the daughter of Archibald, sixth earl of Angus by Margaret, queen dowager of James IV. James VI. (I. of England) was thus nearest heir of the junior English branch by a double descent, Arabella

Stuart being next heir by a single descent. On account of the descent from Henry VIL., the jealousy of Elizabeth had already caused her to imprison Arabella's mother (Elizabeth, daughter of Sir William Cavendish) on learning that she had presumed to marry Lennox. The daughter's marriage she was determined by every possible means to prevent. She objected when King James proposed to marry her to Lord Esme Stuart, whom he had created duke of Lennox, but when the appalling news reached her that Arabella had actually found a lover in William Seymour, grandson of Catherine Grey, heiress of the Suffolk branch, she was so deeply alarmed and indignant that she immediately ordered her imprisonment. This happened immediately before Elizabeth's death, after which she obtained her release, Soon after the accession of James a conspiracy, of which she was altogether ignorant, was entered into to advance her to the throne, but this caused no alteration in her treatment by J anies, who allowed her a maintenance of £800 a year. In February 1610 it was discovered that she was engaged to Seymour, and, although she then promised never to marry him without the king's consent, the marriage took place

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secretly in July following. In consequence of this her husband was sent to the Tower, and she was placed in private confinement. Though separated, both succeeded in escaping simultaneously on 3d June 1611; but, less fortunate than her husband, who got safe to the Con- tinent, she was captured at the Straits of Dover, and shut up in the Tower. Her hopeless captivity deprived her of her reason before her sorrows were ended by death, 27th September 1615.

By the usurpation of Cromwell the Stuarts were excluded from the throne from the defeat of Charles I. at Naseby in 1645 until the restoration of his son Charles II. in 1661. Carlyle refers to the opinion of genealogists that Cromwell "was indubitably either the ninth or the tenth or some other fractional part of half a cousin of Charles Stuart," but this has been completely exploded by Walter Rye, in the Genealogist ("The Steward Gene- alogy and Cromwell's Royal Descent," new ser., vol. ii. pp. 34-42), On the death of Charles II. without issue in 1685, his brother James, duke of York, ascended the throne as James IIL., but he so alienated the sympathies

of the nation by his unconstitutional efforts to further the Catholic religion that an invitation was sent to the prince of Orange to come “to the rescue of the laws and religion of England.” Next to the son of James If., still aa infant under his father’s control, Mary, princess of Orange, eldest daughter of James II., had the strongest claim to the crown ; but neither were the claims of the prince, even apart from his marriage, very remote, since he was the son of Mary, eldest daughter of Charles L The marriage had strengthened the claims of both, and they were pro- claimed joint sovereigns of England on 12th February 1689, Scotland following the example of England on the 11th April. They had no issue, and the Act of Settlement passed in 1701, excluding Catholics from the throne, secured the succession to Anne, second daughter of James II., and on her death without issue to the Protestant House of Hanover, descended from the princess Elizabeth, daughter of James I., wife of Frederick, count palatine of the Rhine. On the death of Anne in 1714, George, elector of Hanover, eldest son of Sophia, electress of Hanover (only surviving child of the princess Elizabeth), and Ernest, youngest son of George, duke of Brunswick, consequently became sovereign of Great Britain and Ireland, and, notwithstanding somewhat formidable at- tempts in behalf of the elder Stuart line in 1715 and 1745, the Hanoverian succession has remained uninter- rupted, and has ultimately won universal assent. The female line of James II. ended with the death of his daughter, Queen Anne. James, called James ITI. by the Jacobites and the Old Pretender by the Hanoverians, had two sons,—Charles Edward, the Young Pretender, who died without legitimate issue in 1780, and Henry, titular duke of York, commonly called Cardinal York, at whose death in 1807 the male line of James IT. came to an end. He was also the last lineal male representative of any of the crowned heads of the race, so far as either England or Scotland was concerned, and excepting of course the Hanoverian line. In the female Stuart line there are, however, still nearer heirs to the throne than those of the Hanoverian line, viz., the descendants of Henrietta, duchess of Orleans, daughter of Charles I., represented now only in Maria Theresa, married to Prince Louis Leopold of Bavaria, and their nine children. The male representation of the family, being extinct in the royal lines, is claimed by the earls of Galloway and also by the Stewarts of Castlemilk, but the claims of both are more than doubtful.

See Sir George Mackenzie’s Defence of the Royal Line of Scotland,

1685, and Antiquity of the Royal Line of Scotland, 1686 ; Craw- furd’s Genealogical History of the Royal and Ilustrious Fumily of

STU AR T

the Stuarts, 1710; Duncan Stewart's Genealogical Account of the Surname of Stewart, 1739; Andrew Stuart's Genealogical History of the Stuarts, 1798; Stothert's House of Stuart, privately printed, 1855; An Abstract of the Evidence to prove that Sir William Stewart of Jedworth, the Paternal Ancestor of the Present Earl of Galloway, was the Second Son of Sir Alexander Stewart of Darnley, 1801 ; Townend's Descendants of the Stuarts, 1858; Bailey, The Succession to the English Crown, 1879. (UY, 3pm)

STUART, Giipert (1755-1828), a distinguishtd Amer- ican portrait-painter, was born in Narragansett, Rhode Island, U.S., December 3, 1755. His father, a native of Perth, Scotland, and the son of a Presbyterian minister, had set up a snuff-mill in Narragansett, in company with another Scotsman, Dr Thomas Moffatt, and was known as "the snuff-grinder." The father removed early to New- port, where his son had the advantage of good instruc- tion. He began to draw early, but none of his sketches have been preserved. His first known pictures are of two Spanish dogs, and two portraits, the latter painted when he was thirteen years old, and now in the Redwood Library, Newport. In 1770-71 he received some instruc- tion from a Scottish artist named Cosmo Alexander, who took him to Scotland with him ; but, this patron dying soon after his arrival, Stuart, after struggling for a while at the university of Glasgow, had to work his way home in a collier. In the spring of 1775 he sailed again for England, and became the pupil and assistant of Benjamin West, with whom he painted until 1785, when he set upa studio of his own. One of his best pictures of this period is a full-length portrait of W. Grant of Congalton skating in St James's Park, now at Moor Court, Stroud, in the possession of Lord Charles Pelham Clinton. Two fine half-lengths by Stuart are in the National Gallery—his preceptor Benjamin West and the engraver Woolett. Stuart married in London and remained there, with the exception of a short visit to Dublin in 1788, until 1792, when he returned to America. Early in 1795 Stuart painted his first head of Washington. This portrait exhibits the right side of the face, and, although the least familiar, is undoubtedly the truest of the three portraits of Washington from his hand. The second was a full-length for the marquis of

Lansdowne, and the third a vignette head now belonging to the Atheneum in Boston, U.S. These last two show the left side of the face, and, although they are the readily recognized "' Stuart's Washington," are unsatisfactory as portraits and inferior as works of art. There are sixty-one replicas of these three pictures, and they have been engraved more than two hundred times. In the catalogue of Stuart's works are recorded seven hundred and fifty-four portraits. Stuart remained in Philadelphia, where he painted many of the prominent men of the country, until 1803, when he removed to Washington; two years later he went to Boston, where he died July 27, 1828.

Stuart's pictures have been little injured by time, which is doubt- less owing to his use of pure colours and to his manner of employ- ing them. His practice was to lay all the tints in their places separately and distinctly alongside of each other before any blend- ing was used, and then they were united by means of a large soft brush and without corrupting their freshness. It is this method that gives the firmness and solidity to his flesh work. A marked feature of Stuart's work is the total absence of all lines, his work being painted in with the brush from the beginning. It is this process that gives to his modelling its strength and rotundity. Stuart was pre-eminent as a colourist, and his place, judged by the highest canons in art, is unquestionably among the few recognized masters of portraiture.

STUART, Joan M'Dovatt (1818-1866), a South-Aus- tralian explorer, was born in England in 1818 and arrived in the colony about 1839. He accompanied Captain Sturt's 1844-45 expedition as draughtsman, and between 1858 and 1862 he made six expeditions into the interior, the last of which brought him on July 24 to the shores of the Indian

| rent free for seven years.

Ocean at Port Darwin, the first to have crossed the island continent from south to north. It was this transcon- tinental expedition which led to the territorial rights, and, in defiance of geographical position, the name of South Australia being extended over so much of central and north Australia. Stuart was rewarded with £3000 and a grant of 1000 square miles of

grazing country in the interior His name is perpetuated by Central Mount Stuart. He died in England June 5, 1866.

STUHLWEISSENBURG (Hung. Székes-Fehérvdr; Lat. Alba Regia), the capital of the county of Fehér, and in former times also of Hungary, is situated in 47° 11'N. lat. and 18° 25' E. long., in a fertile plain. It is the see of one of the oldest bishoprics in the country, and has a number of religious charities, convents, and nunneries, a seminary, a gymnasium, and a real school. It was the coronation and burial place of the Hungarian kings from the 10th to the 16th century, but has sunk into comparative insigni- ficance. A few yearsago some very remarkable excava- tions were made here. The town is now chiefly agri- cultural ; its fairs, especially for horses, are famous. The population (1885) numbers 27,000.

STURGEON. Sturgeons (Acipenser) are a small group of fishes, of which some twenty different species are known, from European, Asiatic, and North American rivers. The distinguishing characters of this group, as well as its position in the system, have been sufficiently indicated in the article IcuruyoLoey (vol. xii. p. 687). They pass a great part of the year in the sea, but periodically ascend large rivers, some in spring to deposit their spawn, others later in the season for some purpose unknown ; only a few of the species are exclusively confined to fresh water. None occur in the tropics or in the southern hemisphere.

Sturgeons are found in the greatest abundance in the rivers of southern Russia, more than ten thousand fish being sometimes caught at a single fishing-station in the fortnight during which the up-stream migration lasts. They occur in less abundance in the fresh waters of North America, where their capture is not confined to the rivers, the majority being caught in shallow portions of the shores of the great lakes. In Russia the fisheries are of immense value; yet but little is known of the sturgeon's habits, life, and early stages of development or growth. Early in summer the fish migrate into the rivers or towards the shores of freshwater lakes in large shoals for breeding purposes. The ova are very small, and so numerous that one female has been calculated to produce about three millions in one season. The ova of some species have been observed to hatch within a very few days after exclusion. Probably the growth of the young is very rapid, but we

have no knowledge as to the length of time for which the fry remain in fresh water before their first migration to the sea. After they have attained maturity their growth appears to be much slower, although continuing for many years. Frederick the Great attempted to introduce the sterlet into Prussia, and placed a number of this fish in the Gorland Lake in Pomerania about 1780; some of these were found to be still alive in 1866, and therefore had reached an age of nearly ninety years. Prof. Von Baer also states, as the result of direct observations made in Russia, that the hausen (Acipenser huso) attains to an age of from 200 to 300 years. Sturgeons ranging from 8 to 11 feet in length are by no means scarce, and some species grow to a much larger size.

Sturgeons are ground-feeders. With their projecting wedge-shaped snout they stir up the soft bottom, and by means of their sensitive barbels detect shells, crustaceans, and small fishes, on which they feed. Destitute of teeth, they are unable to seize larger prey.

In countries like England, where few sturgeons are

caught, the fish is consumed fresh, the flesh being firmer than that of ordinary fishes, well-flavoured, though some- what oily. The sturgeon is included as a royal fish in an Act of King Edward IL., which assigns to the sovereign all wrecks and whales, although it probably but rarely graces the royal table of the present period, or even that of the lord mayor of London, who can claim all sturgeons caught in the Thames above London Bridge. Where sturgeons are regularly caught in large quantities, as on the rivers of southern Russia and on the great lakes of North America, their flesh is dried, smoked, or salted. The ovaries, which are of large size,

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are prepared for caviare ; for this purpose they are beaten

with switches, and then pressed through sieves, leaving the membranous and fibrous tissues in the sieve, whilst the

eggs are collected ina tub. The quantity of salt added to |

them before they are finally packed varies with the season, _ Searcely any being used at the beginning of winter. Fin- ally, one of the best sorts of isinglass is manufactured from the air-bladder. After it has been carefully removed from the body, it is washed in hot water, and cut open in its whole length, to separate the inner membrane, which has a soft consistency, and contains 70 per cent. of glutin.

The twenty species of sturgeons (Acipenser) are nearly equally divided between the Old and New Worlds. The more important are the following : —

(1) The Common Sturgeon of Europe (Acipenser sturto) occurs on all the coasts of Europe, but is absent in the Black Sea. Almost all the British specimens of sturgeon belong to this species; it erosses the Atlantic and is not rareon the eoasts of North Ameriea, It reaches a large size (a length of 12 feet), but is always caught singly or in pairs, so that it cannot be regarded as a fish of com- mercial importance. The form of its snout varies with age (as in the other species), being much more blunt and abbreviated in old than in young examples. There are 11-13 bony shields along the back and 29-31 along the side of the body.

(2) Acipenser giildenstddtid is one of the most valuable species of the rivers of Russia, where it is known under the name “ Ossétr” ; it is said to inhabit the Siberian rivers also, and to range east- wards as far as Lake Baikal. It attains to the same large size as the common sturgeon, and is so abundant in the rivers of the Black and Caspian Seas that more than one-fourth of the caviare and isinglass manufactured in Russia is derived from this species, __(8) Acipenser stellatus, the “ Seuruga” of the Russians, occurs likewise in great abundance in the rivers of the Black Sea and of the Sea of Azoff. Ithasa remarkably long and pointed snout, like the sterlet, but simple barbels without fringes. Though growing only to about half the size of the preceding species, it is of no less value, its flesh being more highly esteemed, and its caviare and isinglass fetching a higher price. In 1850 it was reported that more than a million of this sturgeon are caught annually.

(4) The sturgeon of the great lakes of North America, Acipenser rubicundus, with which, in the opinion of American ichthyologists, the sea-going sturgeon of the rivers of eastern North Amcriea, Acipenser maculosus, is identical, has of late years been made the object of a large and profitable industry at various places on Lakes Michigan and Erie; the flesh is smoked after being cut into strips and after a slight pickling in brine; the thin portions and offal are

year, averaging fifty pounds each. The sturgeons of the lakes are unable to migrate to the sea, whilst those below the Falls of N jiagara are great wanderers; and it is quite possible that a specimen of this species said to have been obtained from the Firth of Tay was really captured on the coast of Scotland.

(5) Acipenser huso, the ‘“‘Hausen” of Germany, is recognized by the absence of osseous scutes on the snout and by its flattened, tape-like barbels. It is one of the largest species, reaching the enormous length of 24 feet and a weight of 2000 pounds. It inhabits the Caspian and Black Seas and the Sea of Azoff, whence in former years large shoals of the fish entered the large rivers of Russia and the Danube. But its numbers have been much thinned, and specimens of 1200 pounds in weight have now becoine

scarce. Its flesh, caviare, and air-bladder are of less value than. those of the smaller kinds.

(6) The Sterlet (Acipenser ruthenus) is one of the smaller species, which likewise inhabits both the Black and Caspian Seas, and ascends rivers to a greater distance from the sea than any of the other sturgeons; thus, for instance, it is not uncominon in the Danube at Vienna, but specimens have been caught as high up as Ratisbon and Ulm. Itis more abundant in the rivers of Russia, where it is held in high esteem on account of its excellent flesh, contributing also to the best kinds of caviare and isinglass. As

“early as last century attempts were My made to introduce this valuable fish

4Y into Prussia and Sweden, but without success. The sterlet is distinguished from the other European species by its long and narrow snout and fringed barbels. It rarely exceeds a length of three feet.

Sturgeons with the snout prolonged in an extraordinary manner, so as to form a long spade-like or conical process (Spatularia, Polyodon, Psephwrus), occur in the Mississippi and the great rivers of China and Central Asia. None of them have been made objects of trade, but special interest is attached to them froma geographical as well as paleontological point of view, the two genera last named being represented as far back as the Lias by an allied fossil genus, Chondrosteys, and all affording a striking proof of the close affinity of the North-American and North-Asiatie faunas of the recent period.

STURM, Jacques CHaries FRANCOIS (1803-1855), the discoverer of the algebraic theorem which bears his name, was born in Geneva in 1803. Originally tutor to the son of Madame de Stael, he subsequently resolved, in conjunction with his school-fellow Colladon, to try his fortune in the French metropolis. Sturm soon made the acquaintance of the foremost mathematicians in the capital, and obtained employment on the Bulletin Universel. On the discovery of his important. theorem regarding the determimation of the number of real roots of & numerical equation which are included between given limits, on 23d May 1829, he rapidly rose to fortune and public honours. He was chosen a member of the French Academy in 1836, became “repetiteur” in 1838, and in 1840 professor in the Polytechnic School, and finally succeeded Poisson in the chair of mechanics in the Faculty of Science at Paris. He presented numerous memoirs to the Academy, of which his admirers have said, with some pardonable exaggeration, that an impartial posterity will place them by the side of the finest memoirs of Lagrange. Sturm died at Paris on the 18th December 1855.

STURT, Cartes (d. 1869), a distinguished South- Australian explorer, was born in England, and at an early age entered the army, in which he reached the rank of captain. Having landed in Australia with his regiment (the 39th), he became interested in the geographical pro- blems which at that time were exciting general attention. A first expedition (1828) led to the discovery of

the Darling river; and a second, from which the explorer returned almost blind, made known the existence of Lake Alexandrina. For some time Captain Sturt was surveyor- general of South Australia, and he afterwards filled the post of colonial secretary. The first session of the South-Australian legislature (1851) voted him a pension of £600. From his third journey (1844-5), in which terrible hardships had to be endured, he returned quite blind, and he never altogether recovered his sight. He died at Cheltenham, England, June 16, 1869.

STUTTGART, the capital of Wiirtemberg, lies in the smal] valley of the Nesenbach, just above its confluence with the Neckar, near the centre of the kingdom and

The Sterlet,

about 115 miles west-by-north of Munich. It is charm- ingly situated among vine-clad and wooded hills, and stands at a height of nearly 900 feet above the sea. The town is intersected from p—-— ar

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south-west to north-east} {4 \//MAGSOR by the long and handsome }& #88 SIS K6nigs-Strasse, dividing it Be

into an upper and lower half. In all its main feat- ures it is essentially a modern town, and few of its principal buildings are = older than the present cen- FY tury. Many ofits modern ° edifices are, however, of considerable architectural importance, and the recent revival of the Renaissance style is perhaps nowhere better illustrated than at Stuttgart. The lower or south-eastern half contains both the small group of k streets belonging to old E& Stuttgart and also the most important part of the new town. A large proportion of the most prominent buildings are clustered round the spacious Schloss-Platz, on or near which are the following edifices :—the new palace, an imposing structure of the 18th century, finished in 1806; the old palace, a building of the 16th century, with a picturesque arcaded court ; the

Konigsbau, a huge modern building, with a fine col- onnade, containing ball and concert rooms, shops, «ec. ;

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Plan of Stuttgart.

1, Palace. 5. Town-house. 8. Hospital Church.

2, Old Palace. 6. Theatre, 9, Orphanage. 3. Prinzessen Palais, 7. Crown – Prince’s 10. Museum of Art. 4. Collegiate Church, Palace.

the so-called Akademie, formerly (1775-94) the seat of the Carls-Schule, where Schiller received part of his edu- cation, and now occupied by the king’s private library and by guard-rooms; the new courts of justice; the palaces of the crown prince and of Prince William ; the Stiftskirche, or collegiate church, a fine specimen of 15th- century Gothic; the extensive royal stables ; the new post- office ; the theatre ; and the central railway station, one of the handsomest structures of the kind in Germany. In the centre of the Schloss-Platz is the lofty jubilee column

capital.

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erected in memory of King William I. ; in the court-yard of the old palace is a bronze equestrian statue of Count Eberhard with the Beard; and adjacent is a fine statue, designed by Thorwaldsen, of Schiller, who was a native of Wiirtemberg. Among the other principal buildings are the polytechnic and

architectural schools, the Late Gothic Leonhardskirche and Spitalkirche, the fine modern Gothic church of St John, the new Roman Catholic church, the neat little English church, the synagogue, and several handsome villas and mansions, chiefly in the resuscitated Renaissance style.

The art collections of Stuttgart are numerous and valuable. The museum of art comprises a picture gallery, an almost unique collection of casts of Thorwaldsen's works, and a cabinet of engravings. The royal library contains about 350,000 printed volumes, including what is said to be the largest collection of Bibles in the world, and also 4000 MSS., many of great rarity. To these may be added the industrial museum, the cabinet of coins, the museum of natural history, the fine collection of majolica in the new palace, and the museum of antiquities. The city also contains numerous excellent educational establish- ments, though the state university is not here but at Tiibingen, and its conservatorium of music has long been renowned. Stuttgart is the centre of the publishing trade of South Germany, and has a busy industry in everything connected with the production of books. In various other industrial departments it also takes a high place, its manufactures including machinery, textile fabrics, pianos and other musical instruments, artists' colours, chemicals, sugar, and chocolate. Its trade is considerable. The population of Stuttgart in 1885 was 125,510, showing an increase of 7 per cent. since 1880. Four-fifths of these are Protestants. The town proper contains about 110,000 in- habitants, while the above total is made up by adding the populations of the suburban villages of Berg, Gablenberg, and Heslach. Stuttgart is the headquarters of the 13th corps of the German army, and contains a comparatively large garrison, for which accommodation is provided in three extensive barracks within the town and on the outskirts.

To the north-east of the new palace lies the beautiful palace park, embellished with statuary and artificial sheets of water, and extending nearly all the way to Cannstatt, a distance of over two miles. Cannstatt, a town with (1880) 16,205 inhabitants, is not officially incorporated with Stutt- gart, but may be looked on as practically forming part of it. Its beautiful situation on the Neckar, its tepid saline and chalybeate springs, and its educational advantages attract numerous visitors. In the environs of

Stuttgart and Cannstatt lie Rosenstein, the Solitude, Hohenheim, the Wilhelma, and other royal chateaus.

Stuttgart seems to have originated in a stud (‘‘Stuten Garten ”) of the early counts of Wiirtemberg, and the first mention of it occurs in a document of 1229. Its importance is of comparatively modern growth, and in early Wiirtemberg history we find it over- shadowed by Cannstatt, the central situation of which, on the Neckar, seemed to mark it out as the natural capital of the country. After the destruction of the castle of Wiirtemberg Count Eberhard, however, transferred his residence to Stuttgart (1320), and in 1482 it became the recognized capital of all the Wiirtemberg territories. Even as capital its growth was slow, and it enjoys little prominence in history. At the beginning of the present century it did not contain 20,000 inhabitants, and its real advance begins with the reign of King William I. (1816-1864), who exerted himself in every way to improve and beautify his In 1849 Stuttgart was the place of meeting of the so-called ‘*Rump Parliament” (Rumpfparlament). Among its eminent natives are Hegel (b. 1770), the philosopher, and Hauff (b. 1802), the poet and story-teller.

STYRAX. See Srorax.

STYRIA (Germ. Steiermark or Steyermark), a duchy and crownland in the Cis-Leithan part of the Austrian empire, is bounded on the north by Upper and Lower

Austria, on the E. by Hungary, on the S. by Croatia and Carniola, and on the W. by Carinthia and Salzburg. Its area is 8630 square miles. Almost the entire district is mountainous, being occupied by various chains and rami- fications of the eastern Alps; and, though Northern (or Upper) and Southern (or Lower) Styria are distinguished, the latter is low only in a relative sense. The North Limestone Alps touch Styria to the north of the Enns, beginning with the huge Dachstein (9830 feet), which rises on the north-west border of the duchy. To the south of the Enns the central chain of the Alps traverses Styria from south-west to north-east in two huge ranges, separated by the valleys of the Mur and the Miirz, and con- veniently grouped under the name of Styrian Alps. The more northerly of these two branches, forming a

prolonga- tion of the Tauern ridge, is the loftier, and culminates in the Hochgolling (9392 feet), the highest summit in Styria. The lower branch to the south is broken by the valley of the Mur, which turns abruptly to the right at its con- fluence with the Miirz, and still farther to the north-east is crossed by the Semmering Pass. To the south of the Drave the duchy is traversed by the Karawanken Mountains (highest peak, the Stou, 7346 feet), forming a continuation of the Carnie Alps. The mountains decrease in height from west to east, and the south-east part of Styria may be described as hilly rather than mountainous, There is nowhere level ground enough to form a plain in the proper acceptation of the term, but some of the valleys contain a good deal of fertile land. The rivers of Styria all drain into the Danube; the Save and the Traun are the most important of those not already mentioned. There are numerous small mountain lakes. The climate, of course, varies with the configuration of the surface, and there is a mean annual difference of about 7° Fahr. between the temperature of the north-west and the south-cast.

In spite of the irregular nature of the surface, but little of the soil can be called unproductive. About 21:40 per cent. is under tillage, 12°75 in meadow, and 16°75 in pasture, while nearly a half of the total area is covered with fine forests. The chief crops are oats, maize, rye, wheat, buckwheat, potatoes, and flax. Wine is produced in the valleys of Lower Styria, where large quantities of chestnuts are also grown. In the mountaius dairy-farming is successfully carried on in the Alpine fashion, and good horses are rearcd in the valley of the Enns. Sheep are comparatively few, but there are large numbers of goats and swine, while poultry-rearing and bee-keeping are very general in the Slavonic districts to the south. Some fairly successful attempts have also been made to breed silkworms, Trout and other fish are abundant in the rivers and mountain lakes and chamois are hunted among the higher Alps,

The great wealth of Styria, however, lies underground. Its ex- tensive and important iron mines yield nearly one-third of the iron ore raised in the Austrian empire, and its other mineral resources include brown coal, pit-coal, copper, zinc, lead, graphite, a little gold and silver, nickel, alum, cobalt, salt, dyer’s earth, potter’s clay, marble, and good mill and building stones. The best known of

its numcrous mineral springs are the thermal springs of Tiiffer, the alkaline springs of Rohitsch, and the brine springs of Aussee.

out of the country in large quantities,

above-named manufactures, and in brown coal, cattle, wine, and fruit. rivers (Drave, Save, Mur), the traffic of the duchy is facilitated by 600 miles of railway.

The population of Styria in 1880 was 1,213,597, equivalent to 140 per square mile, a proportion which, while not high in itself, 1s considerably above the rate in the other mountainous regions of

. Nearly the whole of these profess the Roman Catholic faith, the Protestants numbering only 8000 and the Jews about (Two-thirds of the inhabitants are Germans ; the remainder, chiefly found in the south parts of the duchy, in the valleys of the Drave and Save, are Slavs (Slovenes), About 65 per cent. are supported by agricultural pursuits, including forestry. The educa- tion of the crownland centres in the university of Gratz, which is

attended by about 1200 students. The capital and seat, of the ad- ministration is Gratz (100,000 inhabitants), which is also the head- quarters of the third corps of the Austrian army ; the only other town of any size is Marburg (17,600). The provincial estates con- sist of 63 members, including the two Roman Catholic bishops, the rector of the university, 12 representatives of the large landowners, 23 of the peasants, 19 of the towns, and 6 of the chambers of com- merce. Styria sends 23 members to the imperial parliament.

In the Roman period Styria, which even thus early was famed for its iron and steel, was inhabited by the Celtic Taurisci, and divided geographically between Noricum and Pannonia. Subse- quently it was successively occupied or traversed by Visigoths, Huns, Ostrogoths, Langobardi, Franks, and Avars. Towards the end of the 6th century the last-named began to give way to the Slavs (Wends), who ultimately madc themselves masters of the entire district. Styria was included in the con quests of Charlemagne, and

was henceforth comprised in the German marks erected against the Avar and the Slav. At first the identity of Styria is lost in the great duchy of Carinthia, corresponding more or less closcly

to the Upper Carinthian mark. This duchy, however, afterwards

fell to pieces, and a distinct mark of Styria was recognized, taking its name trom the margrave Ottocar of Steier (1056). A century or so later it was created a duchy. In 1192 the duchy of Styria came by inheritance to the honse of Austria, and from that time it shared the fortunes of Upper and Lower Austria, passing like them to the Hapsburgs in 1282. The Protestant Reformation met an early and general welcome in Styria, but the dukes took the most stringent ineasures to stamp it out, offering their subjects recantation or expatriation as the only alternatives. At least 30,000 Protestants preferred exile, and it was not till about 100 years ago that religious liberty was recognized. The modern history of Styria has been similar to that of the other Austrian crownlands, and calls for no special remark,

STYX, a river which the Greeks fabled to flow in the world of the dead. Homer speaks of it as a river of Hades by which the gods swore their most solemn oaths, and he couples it with the Cocytus and the Pyriphlege- thon, the river of wailing and the river of burning fire. Hesiod says that Styx was a daughter of Ocean, and that, when Zeus summoned the gods to Olympus to help him to fight the Titans, Styx was the first to come and her children with her; hence as a reward Zeus ordained that the most solemn oath of the gods should be by her and that her children (Emulation, Victory, Power, and Force) should always live with him. In another passage he says that Styx (whom, somewhat contradictorily, he describes as abhorred by the immortal gods) dwells far off from the gods in a beautiful house overarched with rocks and supported by tall silver pillars, which may be meant as a description of a stalactitic cave. Again Hesiod tells us that if any god, after pouring a libation of the water of Styx, forswore him- self, he had to lie in a trance for a year without speaking or breathing, and that for nine years afterwards he was ex- cluded from the society of the gods. In historical times the Styx was identified with a lofty waterfall near Nonacris in Arcadia. Pausanias describes the cliff over which the water falls as the highest he had ever seen, and indeed the fall is the highest in Greece. The

scenery is wild and deso- late. The water descends in two slender cascades, which, after winding among the rocks, unite and fall into the river Akrata (the ancient Crathis). The ancients regarded the water as poisonous, and thought that it possessed the power of breaking or dissolving vessels of every material, with the exception of the hoof of a horse or ass, or (according to others) of horn. The Arcadians used to swear by it on im- portant occasions. The people in the neighbourhood still hold that the water is unwholesome, and that no vessel will hold it. They call it the Black Water or the Terrible Water.

Considering the prominence given by the ancients to an oath by the water of Styx, and comparing the effect supposed to follow from breaking that oath with the destructive power supposed to be possessed by the water, we are tempted to conjecture that drinking the water was originally a necessary part of the oath,—that in faet in the stories of the Styx we have traditions of an ancient poison ordeal such as is commonly employed amongst barbarous peoples as a means of eliciting the truth (see ORDEAL).

See Leake, Travels in the Morea, iii. p. 156 sq; M. G. Clark, Peloponnesus, p. 802 sq.; Curtius, Peloponnesos, i. p. 195 sq.; Wordsworth, Greece, p. 384,

SUA—SUA

SUAKIN, or Suwakim, more correctly SawAxrn, the chief port of the Soudan on the Red Sea and the starting- place of caravans for Kassala and Berber, occupies a small island, placed in a deep bay in 19° 5’N. lat. The custom- house and Egyptian Government offices present a good frontage to the sea, and the principal houses are stately white structures, three stories high, not unlike those of Jiddah, With these, however, are intermingled shapeless huts, each with its courtyard walled in with mats. There are also the usual Greek drinking-shops, with their dirty loungers in coats and fez-caps, and a short street of coffee- houses and shops. The mosques are not remarkable. Passing through the bazaar and turning to the right past the tomb of Sheikh ‘Ali, one comes to an open space at the head of the recent causeway which unites the island to the mainland town of Al-Kaff (Al-Keif). The main street of Al-Kaff is (or was before the recent war) the busy centre of life and movement, while the side streets are oceupied by smithis,

forging lance-heads and knives ; leather workers, who drive a brisk trade in the amulets—passages of the Koran sewn up in leather cases—which the natives wear on their arms or round their necks ; and hairdressers, greasing and powdering with the dust of a red wood the bushy locks of the Hadendoa dandies. Beyond the town is a suburb of straw huts with their simple furniture of a bedstead, a few dishes, and a rubbing stone for the millet which with milk forms the chief food of the natives. Here too are the booths of the silversmiths, who make bracelets, anklets, ear and nose rings, for the women. The Hadendoa, a tall stalwart race, picturesquely draped in huge wrappers, to which the women add a petticoat, are most numerous on the mainland. The population of the island is mixed, with a large infusion of Arab blood. ‘The export trade of Suakin before the revolt of the Soudan yielded a customs revenue of £60,000 a year, the chief articles besides the ivory, which was a Government monopoly, being gum, cotton, sesame, senna, and hides. The total yearly trade was estimated at a million sterling.

The environs of Suakin, though not so absolutely desert as the opposite Arabian coast, are less wooded than some points (e.9., Sheikh Barghtit) whieh lie as conveniently for the inland trade. The island is without water and the harbour indifferent ; yet the settlement is ancient. Here as at Massowah traders were presum- ably attracted by the advantages of an island site which protected them from the nomads. The country inland from all this coast belonged in the Middle Ages to the Boja (Bejah), a rnde pastoral raee who appear to be identical with the Blemmyes of classical writers and of whom Hadendoa, Bisharin, and Ababdah are the modern representatives. ‘The trading places seem to have been always in the hands of foreigners since Ptolemais Theron was established by Ptolemy Philadelphus for intercourse with the ele- phant hunters. After Islam many Arabs settled on the coast and mixed with the heathen Boja, whose rule of kinship and succession in the female line helped to give the children of mixed marriages a leading position (Makriai, Khitat, i. 194 sq., translated in Burek- hardt’s Travels in Nubia, App. iii.). Thus in 13380 Ibn Batita found a son of the emir of Mecca reigning in Suakin over the Boja, who were his mother’s kin. Makrizi says that the chief inhabitants were nominal Moslems and were called Hadarib. The emir of the Hadarib was still sovereign of the mainland at the time of Burck- hardt’s visit (1814), though the island had an aga appointed by the Turkish pasha of Jiddah. The place was settled by the

Turks under Seliin the Great, but Turkish (or Egyptian) control over the mainland was not effective till the Egyptian conquest of the Soudan. Till the suppression of the slave trade, Suakin was an important slave port; of late years slaves have been secretly run across the Red Sea from less frequented points on the eoast. But legitimate commierce was rapidly growing before the revolt of the Soudan, and the port was visited by English, Egyptian, and Italian steamers.

SUARDI, Bartotommeo, usually known as BRAMAN- TINO from his master Bramante, was a distinguished painter and architect of the Milanese school. He was specially famed for his knowledge of perspective, and Lomazzo (Tratt. d. Pitt., iii. 1) praises him highly for the deceptive realism of his painting. The dates of his birth and death are unknown, but he was probably quite young when,

about 1495, he visited Rome in company with his master Bramante ; there he is said to have been employed as a painter by the pope, and he evidently spent much time in studying the remains of classical buildings in Rome, A number of measured drawings by his hand are still pre- served in the Brera library at Milan. Vasari mentions that he had seen a book of drawings by Bramantino of the early Lombardic churches of Northern Italy, such as S. Ambrogio at Milan and S. Pictro in Ciel d’Oro at Pavia,— a remarkable thing at a time when these noble structures were usually despised as being barbarous in style. The greater part of Bramantino’s frescos are now lost, partly because he was specially employed to paint the external facades of houses and public buildings, such as the mint at Milan. One, however, still exists over the doorway of 8. Sepolcro, a highly foreshortened figure of Christ, with the Madonna and Saints. He also painted some angels

Which still exist in the church of S. Eustorgio, also in

Milan. In 1513 he received eighty gold crowns for a Piet’ and Saints painted in the sacristy for the Cistercian monks of Chiaravalle, near Milan. In 1525 he was ap- pointed architect and painter to Francesco II. of Milan, and he was employed as military engineer to reconstruct the walls of the city, which was then threatened by the army of Charles V. The church of §.

Satiro in Milan is usually attributed to Bramantino, but it appears to have been mainly designed by Bramante. Bramantino died between 1530 and 1536. He left an able pupil called Agostino di Milano, who worked chiefly as an architect. SUAREZ, Francisco (1548-1617), Spanish theologian and philosopher, was born at Granada on the 5th of January 1548. After completing his studies at the university of Salamanca, he entered the Society of Jesus in 1564. The accounts of his early years represent him as backward in his development, and it was not without difficulty that he obtained admission to the order. Under the direction of Father Rodriguez, however, he threw off his mental slough and discovered powers of mind of the highest order. He is said to have habitually devoted seventeen hours a day to study, and wonders are reported of his prodigious memory. He was soon appointed to teach philosophy at Segovia, and he afterwards taught theology at Valladolid, at Alcala, at Salamanca, and at Rome successively. After taking his doctorate at Evora, he was named by Philip IL. principal professor of theology in the university of Coimbra. Suarez may be considered almost the last eminent representative of scholasticism, and his works in twenty-three folio volumes treat, after the scholastic method and with scholastic comprehensive- ness, all the main subjects of medizeval philosophy and theology. In philosophical doctrine he adhered to a moderate Thomism. On the question of universals he endeavoured to steer a middle course between the panthe- istically inclined realism of Duns Scotus and the extreme nominalism of William of Occam. The only veritable and real unity in the world of existences is the individual ; to assert that the universal exists separately ex parte rei would be to reduce individuals to mere accidents of one indivisible form. Suarez maintains that, though the humanity of Socrates does not differ from that of Plato, yet they do not constitute realiter one and the same humanity ; there are as many “formal unities” (in this case, humanities) as there are individuals, and these individuals do not constitute a factual, but only an essen- tial or ideal unity (“‘ita ut plura individua, quae dicuntur esse ejusdem nature, non sint unum quid vera entitate que sit in rebus, sed solum fundamentaliter vel per intel- lectum”). The formal unity, however, is not an arbitrary creation of the mind, but exists “‘in natura rei ante omnem operationem intellectus.” In theology, Suarez attached

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himself to the doctrine of Molina, the celebrated Jesuit professor of Evora. Molina tried to reconcile the doctrine of predestination with the freedom of the human will by saying that the predestination is consequent upon God's foreknowledge of the free determination of man's will, which is therefore in no way affected by the fact of such predestination. God gives to all men grace sufficient for their salvation, but some co-operate freely with this grace, while others resist it. Suarez endeavoured to reconcile this view with the more orthodox doctrines of the efficacy of grace and special election, maintaining that, though all share in an absolutely sufficient grace, there is granted to the elect a grace which is so adapted to their peculiar dis- positions and circumstances that they infallibly, though at the same time quite freely, yield themselves to its influ- ence, This mediatizing system was known by the name of ''congruism." Suarez is probably more important, however, as a philosophical jurist than as a theologian or metaphysician. In his extensive work 7ractatus de Legibus ac Deo Legislatore (reprinted, London, 1679) he is to some extent the precursor of Grotius and Pufendorf. Though his method is throughout scholastic, he covers the same ground, and Grotius speaks of him in terms of high respect. The fundamental position of the work is that all legislative as well as all paternal power is derived from God, and that the authority of every law resolves itself into His. Suarez conclusively refutes the patriarchal theory of government and the divine right of kings 'founded upon it,~—doctrines popular at that time in Eng- land and to some extent on the Continent, Adam, he remarks, possessed only a domestic or patriarchal, not a political authority. Power by its very nature belongs to no one man but to a multitude of men ; and the reason is obvious, since all men are born equal. It has been pointed out that this accords well with the J esuit policy of depreciating the royal while exalting the papal preroga- tive. But Suarez is much more moderate on this point than a writer like Mariana, approximating to the modern view of the rights of ruler and ruled, [n 1613, at the instigation of Pope Paul V., Suarez wrote a treatise dedi- cated to the Christian princes of Europe, entitled Defensio Catholice Fidei contra Anglicanx Sectx Errores. This was directed against the oath of allegiance which James I. exacted from his subjects. James caused it to be burned by the common hangman, and forbade its perusal under the severest penalties, complaining bitterly at the same tune to Philip IIT. that he should harbour in his dominions a declared enemy of the throne and majesty of kings. In France extracts from

the treatise were condemned to the flames by the parlement of Paris on similar grounds, Suarez died after a few days' illness on 25th September 1617 at Lisbon, whither he had gone to be present at an ecclesiastical conference,

The collected works of Suarez have been printed at Mainz and Lyons (1630) and at Venice (1740), also more recently at Besancon (1856-62) and in the colleetion of the Abbé Migne. His life has been written by Desehamps (Vita Fr, Suaresti, Perpignan, 1671). The chief modern authorities are K. Werner's Franz Suarez u. die Scholastik der letzten Jahrhunderte (Ratisbon, 1861) and the third volume of Stéckl's Geschichte der Philosophie des Mittelalters,

SUBIACO, a town of Italy, in the province of Rome, 25 miles east of Tivoli and 42 from the capital, is pictur- esquely situated on the right bank of the Teverone. It has iron-works and paper-mills, and in 1881 the population of the town was 6503 (commune, 7017), having decreased from 7452 in 1868,

Subiaeo, the Subdlaquewm of the Romans, was so called from its position under the artificial lakes constructed in connexion with one of the villas of the emperor Nero. In all probability there was no town in aneient times, and the modern town of Subiaco appears to have grown up subsequent to the establishment of the Bene- dictine monasteries in this neighbourhood. Of these the most

remarkable are Santa Scolastica,! which was built by the abbot Honoratus, and by the 11th century ranked as a regular princi- pality; and Sacro Speco, which has gathered its curious cluster of buildings round the cave in which St Benedict himself found an asylum (see vol. iii. p. 557). The points of most interest in the town, which still bears on the whole a elearly medieval impress, arc associated with Pope Pius VI. It was Pius who restored and ex- tended the great castle, erected in 1068 by Abbot John V., and long used as a summer residence by the popes; and it was he who built the costly ehurch of Sant' Andrea. His visit to the town in 1789 is commemorated by a triumphal arch. The first book printed in Italy was the Subiaco Lactantius of 1465.

SUBLEYRAS, Prerre (1699-1749), French painter, who passed nearly his whole life at Rome, was born at Uzés (Gard) in 1699. He left France for Italy in 1728, having carried off the great prize. He there painted for the canons of Asti Christ's Visit to the House of Simon the Pharisee (Louvre, engraved by Subleyras himself), a large work, which made his reputation and procured his admission into the Academy of St Luke. Cardinal Valenti Gonzaga next obtained for him the order for Saint Basil and the Emperor Valens (small study in Louvre), which was executed in mosaic for St Peter's. Benedict XIV. and all the princes of Rome sat to him, and the pope him- self commanded two great paintings—the Marriage of St Catherine and the Ecstasy of St Camilla—which he placed in his private apartments. For various religious corpora- tions at Milan, Perugia, and other places, and for various great persons many important altar-pieces were also exe- cuted ; but Subleyras shows greater individuality in his curious genre pictures, which he produced in considerable number (Louvre). It is in his illustrations of La Fontaine and Boccaccio that his true relation to the modern era comes out ; and his drawings from nature are often admir- able for their grave sobriety of treatment (see one of a man draped in a heavy cloak in the British Museum). Exhausted by overwork, Subleyras tried a change to Naples, but returned to Rome at the end of a few months to die (28th May 1749). His wife, the celebrated minja- ture painter, Maria Felice Tibaldi, was sister to the wife of Trémolliére,

SUCCESSION DUTY is a sum paid to the state by a person benefited by the succession to certain kinds of pro- perty. Legacies were first taxed in 1780. It was not until 1853 that a tax was levied upon succession to real property, or succession under any instrument other than a will by which property is enjoyed in succession to a deceased person. The duty is paid on succession to both real and personal property, in fact, in almost all cases which do not fall within the Legacy Duty Acts. The Succession Duty Act, 1853 (16 and 17 Vict. c. 51), defines succession as "every past or future disposition of property by reason whereof any person has or shall become benefi- cially entitled to any property, or the income thereof, upon the death of any person dying after the time appointed for the commencement of this Act, either immediately or after any interval, either certainly or contingently, and either originally or by way of substitutive limitation, and every devolution by law of any beneficial interest in pro- perty, or the

income thereof, upon the death of any person dying after the time appointed for the commencement of this Act to any other person in possession or expectancy." There are certain exemptions, the most important being successions of a husband or wife, successions where the whole value is under £100, individual successions under the value of £20, and legacies and shares of personal – estate chargeable under the Legacy Duty Acts. The duties levied vary from 1 to 10 per cent., according to the degree of consanguinity between the predecessor and the Successor. Leasehold property and personalty directed to be converted into real estate are liable to succession and

1 For the Santa Scolastica library, see LIBRARIES, vol. xiv. p. 530.

not to legacy duty. Special provision is made for the collection of the duty in the case of joint tenants, in the case where the successor is also the predecessor, and in other dispositions of a special nature. The duty is a first charge on property ; but, if the property be parted with be- fore the succession duty be paid, the liability of the suc- cessor appears to be transferred to the alienee. A bona fide purchaser is protected by a receipt for duty, notwithstand- ing any suppression or mis-statement in the account on the footing of which the duty was assessed, or any insuffi- ciency of such assessment. It is usual in requisitions on title before conveyance to demand for the protection of the purchaser the production of receipts for succession duty. Recent legislation has made some amendments in the law. By 43 Vict. c. 14, s. 11, succession duty may be commuted in certain cases by the Commissioners of Inland Revenue. 44 Vict. c. 12, s. 36, relieves from payment of succession duty on personal estate not exceeding £300 by payment of a sum of thirty shillings on the affidavit or in- ventory. Section 41 exempts from payment of the 1 per cent. duty in respect of property for which stamp duty has been paid on the affidavit or inventory. Up to 1885 certain property vested in bodies corporate and unincor- porate escaped liability to succession duty. 48 and 49 Vict. c. 51, s, 11, now imposes on such bodies (with con- siderable exceptions) a duty at the rate of 5 per cent. on the annual value, income, or profits of the succession. All the Acts which have been cited extend to the United Kingdom.

In the United States succession duty is regulated by tit. xxxv. ch. 10 of the Revised Statutes. The duty varies from 1 to 6 per cent., according to the degree of consanguinity.

SUCHET, Louis Gasriez, Duc p'ALBurera (1770- 1826), marshal of France, one of the most brilliant of Napoleon's generals, was the son of a silk manufacturer at Lyons, where he was born on 2d March 1770. He origin- ally intended to follow his father's business ; but the Revolu- tion of 1789 altered the bent of his ambition, and, having in 1792 served as volunteer in the cavalry of the national guard at Lyons, he manifested military abilities which secured hig rapid promotion. As chef de bataillon he was present at the siege of Toulon in 1793, where he took General O'Hara prisoner. During the Italian campaign of 1796 he dis- tinguished himself in most of the important contests and was severely wounded at Cerea on 11th October. In October 1797 he was appointed to the command of a demi- brigade, and in the following year hig services in Switzer- land were recognized by his promotion to the rank of general of brigade. He then went to Egypt, but soon afterwards was recalled, and in August made chief of the staff to Brune, to whom he rendered invaluable assistance in restoring the efficiency and discipline of the army in Italy. In July 1799 he was made general of division to Joubert in Italy, and, after being continued in the same office by his successors, was in 1800 named by Masséna his second in command. Soon afterwards he had an opportunity of manifesting those qualities which entitle him to rank among the most daring and clever tacticians of his time; his dexterous resistance to the superior forces of the Austrians with the left of Masséna, when the right and centre were shut up in Genoa, not only prevented the invasion of France from this direc- tion but powerfully contributed to the success of Napoleon's strategy of crossing the Alps, which culminated in the battle of Marengo on 14th June. He took a prominent part in all the subsequent events of the Italian campaign till the peace of Lunéville, 9th February 1801. In the campaigns of 1805 and 1806 he greatly increased his re- putation, more especially at Austerlitz, Saalfeld, Jena, Pultusk, and Ostrolenka. He obtained the title of count on 19th March 1808, and, after taking part in the siege

of Saragossa, was named generalissimo of the army of Aragon and governor of the province, which, by wise ad- ministration no less than by his brilliant valour, he in two years brought into complete submission. the army of Blake at Maria on 14th June 1809, and on 22d April 1810 inflicted a severe defeat on O'Donnell. being made marshal of France, 8th J uly 1811, he in 1812 achieved the conquest of Valencia, for which he was re- warded with the title of Duc d'Albufera. By Louis XVIIL he was on 4th June made a peer of France, but, having assisted Napoleon during the "hundred days," deprived of his peerage on 24th J uly 1815. He died near Marseilles on 3d January 1826. Suchet was the author of Mémoires sur ses Campagnes en Espagne, 2 vols., 1829-34.

He annihilated

After

he was

See C.-H. Barault-Roullon, Le Maréchal Suchet, Paris, 1854;

T. Choumara, Considérations militaires sur les mémotres du Maréchal Suchet, Paris, 1840.

SU-CHOW. There are in China three cities of this

name which deserve mention. (1) Su-chow, formerly one of the largest cities in the world, and still in 1880 credited

with a population of 500,000, in the province of Kiang-su, on the great Imperial Canal, 55 miles west-north-west of Shanghai. The site is practically a cluster of islands to the east of Lake Tai-hu, and streams and canals give com- munication with most parts of the province. The walls are about 10 miles in circumference and there are four large suburbs. Su-chow is a great commercial and manufactur- ing centre, the silk manufacture being represented by a greater variety of goods than are produced anywhere else in the empire; and the publication of cheap editions of the Chinese classics is carried to great perfection. 'There is a Chinese proverb to the effect that to be perfectly happy a man ought to be born in Su-chow, live in

Canton, and die in Lian-chow. The great nine-storied pagoda of the northern temple is one of the finest in the country. In 1860 Su-chow was captured by the Taipings, and, when in 1865 it was recovered by the valour and enterprise of General Gordon, the city, which had formerly been famous for its large and handsome buildings, was almost reduced to a heap of ruins. Of the original splendour of the place some idea may be gathered from the beautiful native plan on a slab of marble preserved since 1247 in the temple of Confucius and reproduced in Yule's Marco Polo, vol. i. Su-chow was founded in 484 by Ho-lu-Wang, whose grave is covered by the artificial "Hill of the Tiger" in the vicinity of the town. 'The literary and poetic designation of Su-chow is Ku-su, from the great tower of Ku-su-tai, built by Ho-lu-Wang. (2) Su-chow, formerly Tsiu-tsuan- tsiun, a free city in the province of Kan-suh, in 39° 48' 3" N. lat. (according to Sosnofskii), just within the extreme north-west angle of the Great Wall, near the gate of jade. It is the great centre of the rhubarb trade, and used to be the residence, alternately with Lian-chow-fu, of the governor of the province. Completely destroyed in the Dungan insurrection (1865-72), it was recovered by the Chinese in 1873 and has been rebuilt. (3) Su-chow, a commercial town situated in the province of Sze-chuen at the junction of the Min river with the Yang-tse-kiang, in 28° 46' 50" N. lat.

SUCKER. See Lump-sucker.

SUCKLING, Sir Joun (1609-1642), one of the most admired poets and men of fashion at the court of Charles L., and an active spirit in politics as well as in fashionable gaieties, belonged to a Norfolk family. His father was a high official under James I. and a comptroller of the household under Charles I.; finance seems to have been his strong point, and he managed his own affairs so well as to accumulate a considerable fortune, of which the poet was left master at the age of eighteen. His earliest bio- graphers fixed his birth in 1613, and founded on this a

reputation for extraordinary precocity in school learning. Mr Alfred Suckling, who edited his works in 1836, cor- rected this error, ascertaining

that he was born at Whitton in Middlesex and baptized on 10th February 1609. He was sent to Trinity College, Cambridge, in 1623, at what was then the usual age, and thereafter travelled on the Continent, as was also the custom for youths of his birth. Returning to London, he did not long remain inactive at court, but sought experience as a soldier, volunteering into the force raised by the marquis of Hamilton for the support of Gustavus Adolphus in the Palatinate. He reached Germany in July 1631 and was back at Whitehall in May 1632; but during this time he saw a good deal of hard service, being present at the battle of Leipsic and the sieges of Crossen, Guben, Glogau, and Magdeburg. Reappearing at court, he at once became a prominent figure. 'He had the peculiar happiness of making everything that he did become him." He was ready of wit, handsome of person, wealthy and generous, a leader in all pastimes, the best bowler and the best card-player at court. His happy skill in verse was only

one of the distinctions of a man who excelled in every-

thing ; but, as it happened, both the king and the queen had literary tastes, and he aimed at distinction in poetry with the ardent thoroughness which seems to have been part of his character. He became eminent at court just at the time when masques, after being the rage for a few years, had reached the height of their splendour and were beginning to pall; and it occurred to him to apply to the ordinary drama the improved scenery which the taste for masques had developed. We can trace in his plays both the taste for spectacular effect and the admiration for the wit of Shakespeare which he shared with his royal master. Aglaura was the first of them, and is said to have been the first play produced with elaborate stage scenery. It was produced first at Christmas in 1637 with a tragic ending, then reproduced at the following Easter with ingenious changes in the fifth act which made it end happily. With all its clever play on words and images, and its natural felicity of diction, it is not an interesting drama to read; the characters have no body or vitality. But it is full of incident, as if the dramatist were revelling in the newly discovered power of shifting the scenes, and making the most of his advantage in having the co-opera- tion of Inigo Jones. His comedy the Goblins is much happier, and there the frequent changes of scene are used with great skill to maintain the liveliness of the action. Suckling produced another tragedy in 1639, Brennorald ; it has more body

than its predecessor, but shows no mas. tery of passion or tragic character. He began still another tragedy, the Sad One, but was abruptly stopped in his literary career by the beginning of a tragedy in real life, the quarrel between Charles and his subjects. Suckling took a prominent part for a time on the Royalist. side. When war was levied on the Scottish Covenanters in 1639 Suckling raised a troop of a hundred horse at his own expense and accompanied them on the bloodless expedi- tion to the Border. He was elected member for Bramber to the Long Parliament which met in November 1640 bit in May of the following year he got into trouble in con- nexion with a plot for the escape of Strafford from the Tower and a project for calling in French aid, was charged with high treason, and fled beyond sea. The circumstances of his short life in exile are obscure, He continued to attract attention, and many pamphlets about him were

circulated, one in particular describing how he eloped with a lady to Spain and fell into the clutches of the Inquisition. The tradition is that he committed suicide in Paris some time before the end of 1642. Suckling's

reputation as a poet rests not upon his plays but upon

his minor pieces, They have wit and fancy and at times exquisite felicity of diction. The happiest as a whole is the Ballad upon a Wedding. « Prithee, why so pale, fond lover?" is an occasional song in Aglaura.

A collection of Suckling's poems was first published in 1646 with the title Fragmenta Aurea. The so-called Selections published by Mr Alfred Suckling in 1836 is really a full edition of his poems, letters, and_plays, which was re-edited, with slight additions, by Mr W. C. Hazlitt in 1874.

SUCRE, the capital of Bolivia, formerly known as Chuquisaca, but renamed in honour of General Sucre, the first president of the republic. Lying in 19° 2'45" §. lat. and 65° 17' W. long., at a height of 9183 feet above the sea, in a valley which drains southwards to the Pilecomayo (see PuaTE River), it enjoys an agreeable climate and has its markets well supplied with fruits and vegetables. The city is the seat of the archbishopric of La Plata and Char- cas, founded in 1609, and contains a magnificent

cathedral and several imposing churches and convents, Fora long time the university and colleges of Chuquisaca were among the most frequented in South America, and they are still of some note. The inhabitants, who are mainly of Indian origin, are variously stated to number 24,000 (Ondarza) and 12,000 (Almanac de Gotha).

The Spanish city of Chuquisaca was founded in 1539 on the site of a Peruvian town, whose original name survived the Spanish designation of Ciudad la Plata. It became in 1609 the seat of the supreme court of justice for the South American colonies—‘‘ Real Audiencia de la Plata y Charcas’’—Charcas being the name of a native tribe often given to the Chuquisaca district, and even to the city (Maria de las Charcas).

SUDAN. See Soupan.

SUDBURY, an ancient borough and market town of England, chiefly in Suffolk, but partly in Essex, is situated on the river Stour, forming the boundary between the two counties, and on a branch of the Great Eastern Railway, 19 miles south of Bury St Edmunds and 58 north-east of London. It is well built and well paved and contains a number of good houses. It is chiefly interesting from its three parish churches of All Saints, St Peter’s, and St Gregory’s. All Saints, dating from 1150 and consisting of chancel, nave, aisles, and tower, is chiefly Perpendicu- lar,—the chancel, however, being Decorated. It possesses a fine oaken pulpit of 1490. The church was restored in 1882. St Peter’s is Perpendicular, with a unique coved nave roof. St Gregory’s, once collegiate, in the Perpen- dicular style, was partly built by Simon Tybald, archbishop of Canterbury, who was beheaded by Wat Tyler’s mob. He established also a college for secular priests, of which a gateway still remains. The grammar-school was founded by William Wood in 1491. The principal modern build- ings are the town-hall, the corn exchange, the literary and mechanics’ institute, and St Leonard’s hospital. The town owed its early importance to the introduction of woollen inanufactures by the Flemings at the instance of Edward III, but this was afterwards replaced by silk crape, jacquard satin, &c.; the manufacture has now greatly de- clined, Cocoa-nut matting is an important manufacture, and there are also flour-mills, malt-kilns, lime-works, and brick and tile yards. A declining trade is carried on by the river, which is navigable up to the

town. The area of the municipal borough is 1459 acres, and includes, besides the parishes of All Saints, St Gregory, and St Peter, Balling- don cum Brundon in Essex and St Bartholomew. The population in 1871 was 6908, and 6584 in 1881.

Sudbury is supposed to have been in early times the chief town in Suffolk, and to have received its name in contradistinction to Norwich in Norfolk. By the Conqueror it was given to Richard de Clare, and from the earls of that name it obtained important privileges. It isa borough by prescription, but obtained its first charter from Mary in 1554. It obtained others from Cromwell and James II., and its governing charter is that of Charles IJ. From the reign of Elizabeth it sent one member to parliament until it was disfranchised in 1844,

SU D—SUE

SUDRAS. See BrauManism,vol. iv. p.203sq¢.,and Casts.

SUE, JosepH Marie (1804-1859), generally known as EuGckne Sug, French novelist, ranked by some as the chief practitioner of the melodramatic style in fiction, was born at Paris on 10th December 1804. Unlike most volumin- ous writers of light literature, Sue was a man of fortune. He was the son of a surgeon in Napoleon's army, and is said to have had the empress Josephine for godmother. But in later life he became something very different from a Bonapartist, and his residence in Savoy for the last years of his life was due to his having been banished from France after the coup @état. Until his father's death in 1828 Sue pursued the same profession and was present as a surgeon both in the campaign undertaken by France in 1823 for the re-establishment of royal power in Spain and at the battle of Navarino (1828). His naval experiences supplied much of the materials of his first novels, Kernock le Pirate, Attar-Gull, La Salamandre, La Coucaratcha, and others, which were composed at the height of the romantic movement of 1830, and displayed its Byronic enthusiasm, its fancy for outlandish subjects and names, and (in a very full measure) its extravagance. Then he took to more serious work, writing a naval history of France of no merit. His next venture was the historical or quasi- historical novel, in which style he composed Jean Cavalier (1840), besides other stories of adventure. "About this time he was strongly affected by the

socialist ideas of the day, and his attempt to display these in fiction produced (with others) his most famous and perhaps best works,— Les Mystéres de Paris (1842) and Le Juif Errant (1844-45). These were among the most popular specimens of the roman-feuilleton, then at the height of its popularity. The political and philosophical or pseudo-philosophical ‘purpose ” continuing to gain more and more ground on the novelist’s art, he followed these up with divers singular and not very edifying books, such as Les Sept Péchés Capitaux, Les Mystéeres du Peuple, and several others, all on a very large scale, though the number of volumes— ten, twelve, and sometimes even sixteen—gives rather an exaggerated idea of their length. Some of his books, especially the Wandering Jew and the Mysteries of Paris, were dramatized by himself, usually in collaboration with others. His popularity was immense, and, despite gross faults both of art and of morality (the latter somewhat exaggerated in general estimation, at least when the work of his successors is compared), he deserved that popularity in part. By an accident, which is noteworthy in the case of other pairs of novelists (notably in those of Thackeray and Dickens, and earlier of Fielding and Richardson), his period of greatest success and popularity coincided with that of another writer, and he has been even recently, and by not despicable authorities, compared with and exalted above Alexandre Dumas. This is entirely unjust, for Sue has neither Dumas’s wide range of subject, nor his genial humanity of tone, nor his interest of character, nor, above all, his faculty of conducting the story by means of lively dialogue ; he has, however, a command of terror which Dumas seldom or never attained, and which, melodramatic as he is, sometimes comes within measurable distance of the sublime, while his “‘ purpose ” gives him a certain energy not easily to be found elsewhere in novel-writing. From the purely literary point of view his style is undistinguished, not to say bad, and his construction loose and prolix. After the revolution of 1848 he sat for Paris (the Seine) in the assembly from April 1850 until his exile as above-mentioned. This exile rather stimulated than checked his literary production. The works of his last days, however (the chief of which is perhaps Le Diable Médecin), are on the whole much inferior to those of his middle period. Sue died at, Annecy (Savoy) on 3d August 1859.

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SUETONIUS. Caius Suetonius Tranquillus was one of the many second-rate authors and men of letters who lived in the early period of the Roman empire. He was the contemporary of Tacitus and the younger Pliny, and. his literary work seems to have been chiefly done in the reigns of Trajan and Hadrian. His father was an officer in the army and military tribune in the XIIIth legion, and he himself began life as an advocate. To us he is known as the biographer of the twelve Cyxsars, from Caius Julius down to Domitian. These lives are valu- able as covering a good deal of ground where we are without the guidance of Tacitus. As Suetonius was the emperor Hadrian's private secretary, he must have had access to many important documents. It would seem from occasional references which he makes to himself in the course of the work that he was a youngish man in the reign of Domitian, and so would have had opportuni- ties of conversing with men who had lived in the days of Tiberius, Caligula, Claudius, Nero, and had been present at the scenes of civil war and anarchy which followed the reign of the last-named. The most interesting fact about Suetonius is that he was a friend and correspondent of the younger Pliny, and the fact certainly tells in his favour. Several of Pliny's letters are addressed to him, and they all imply esteem and intimate friendship. Sometimes we find Pliny putting in a good word for him, as, for instance, on one occasion doing his best to help him in buying a small property at a fair price, not very far from Rome, with a house of moderate size and land enough to amuse but not to engross a man of scholarly tastes (i. 24). In another letter (v. 10) he playfully rallies him on his dilatoriness in publishing his works. Pliny does not men- tion the subject of these works. Again he recommends him to the favourable notice of the emperor Trajan, "'as a most upright, honourable, and learned man, whom persons often remember in their wills because of his merits," and he begs that he may be made legally capable of inheriting these bequests, for which under a special enactment Suetonius was, as a childless married man, disqualified. Trajan granted Pliny's request (x. 94,95). Hadrian's bio- grapher, Spartianus, tells us that Suetonius had his private secretaryship taken from him because he and some others of the imperial officials were not sufficiently observant of court etiquette towards the emperor's wife during his absence in Britain.

The Lives of the Cxsars has always been a popular work, at least with scholars, and has been frequently edited, as well as translated into most

modern languages, the latest English translation being that of Thomson in 1796. The lives of the first six Caesars are much fuller than those of the last six ; this shows that he was an industrious compiler rather than an original historian. He gives us no picture of the society of the time, no hints as to the general character and tendencies of the period. It is the emperor, the emperor only, who is always before us, and yet after all the por- trait is but a sorry performance, drawn without any real historical judgment or insight. It is the personal anecdotes he tells us, several of which are very amusing, that give his lives their chief interest; but he panders rather too much to a taste for scandal and gossip. A good many of his scandalous stories about the emperors may be and probably are fictions, but at any rate they reflect the gossip of the time. Still we owe him thanks for having thrown some light on an important period, parts of which are very obscure.

Suetonius is said to have been a voluminous writer, and among his works Suidas mentions treatises on the Roman Year, Cicero's Republic, The Kings, The Pedigree of Illustrious Romans, and Rome, tts Institutions and Customs, with several others,—works, it would seem, of learned research. Under his name have come down to us Lives of Terence, Juvenal, Horace, Persius, Lucan, and his friend the younger Pliny; but the genuineness of these is highly ques- tionable, and that of the last is hardly worth considering. Thcre is also a work entitled De illustribus grammaticis,—a ‘‘ grammaticus ” being what we should call ‘‘a professor of language and literature.”

SUEUR, Evstacue Lz (1617-1655), one of the founders of the French academy of painting, was born 19th Novem-

ber 1617 at Paris, where he passed his whole life, and where he died on 30th April 1655. His early death and retired habits have combined to give an air of romance to his simple history, which has been decorated with as many fables as that of Claude. We are told that, per- secuted by Lebrun, who was jealous of his ability, he became the intimate friend and correspondent of Poussin, and it is added that, broken-hearted at the death of his wife, Le Sueur retired to the monastery of the Chartreux and died in the arms of the prior. All this, however, is pure fiction. The facts of Le

Sueur’s life are these. He was the son of Cathelin Le Sueur, a turner and sculptor in wood, who placed his son with Vouet, in whose studio he rapidly distinguished himself. Admitted at an early age into the guild of master-painters, he left them to take. part in establishing the academy of painting and sculpture, and was one of the first twelve professors of that body. Some paintings, illustrative of the Hypnerotomachia Polyphili, which were reproduced in tapestry, brought him into notice, and his reputation was further enhanced by a series of decorations (Louvre) in the mansion of Lambert de Thor- igny, which he left uncompleted, for their execution was frequently interrupted by other commissions, Amongst these were several pictures for the apartments of the king and queen in the Louvre, which are now missing, although they were entered in Bailly’s inventory (1710); but several works produced for minor patrons have come down to us. In the gallery of the Louvre are the Angel and Hagar, from the mansion of De Tonnay Charente ; Tobias and Tobit, from the Fieubet collection ; several pictures executed for the church of Saint Gervais; the Martyrdom of St Lawrence, from SaintGermain de l’Auxerrois; two very fine works from the destroyed abbey of Marmoutiers ; St Paul preaching at Ephesus,—one of Le Sueur’s most complete and thorough performances, painted for the goldsmiths’ corporation in

1649 ; and his famous series of the Life of St Bruno, exe-

cuted in the cloister of the Chartreux. These last have more personal character than anything else which Le Sueur produced, and much of their original beauty survives in spite of injuries and restorations and removal from the wall to canvas. The Louvre also possesses many fine drawings (reproduced by Braun), of which Le Sueur left an incredible quantity, chiefly executed in black and white chalk. His pupils, who aided him much in his work, were his wife’s brother, Th. Goussé, and three brothers of his own, as well as Claude Lefebvre and Patel the landscape painter. Most of his works have been engraved, chiefly by Picart, B. Audran, Seb, Leclerc, Drevet, Chauveau, Poilly, and Desplaces. Le Sueur’s work lent itself readily to the engraver’s art, for he was a charming draughtsman; he had a truly delicate perception of varied shades of grave and elevated sentiment, and possessed the power to render them. His graceful facility in composition was always restrained by a very fine taste, but his works often fail to please

completely, because, producing so much, he had too frequent recourse to conventional types, and partly because he rarely saw colour except with the cold and clayey quality proper to the school of Vouet ; yet his St Paul at Ephesus and one or two other works show that he was not naturally deficient in this sense, and whenever we get direct reference to nature—as in the monks of the St Bruno series—we recognize his admirable power to read and render physiognomy of varied and serious type.

See Guillet de St Georges, Mém. inéd.; C. Blane, Histotre des Peintres; Vitet, Catalogue des Tableauz du Lowvre; D'Argenville, Vies des Peintres,

SUEZ (Suwets), the port of Egypt on the Red Sea and southern terminus of the Suez Canal (see below), situated at the head of the Gulf of Suez in 29° 58' 37" N. lat. and 32° 31/18″ & long. (see vol. iv. pl. XXXVI).

across the head of the gulf

SUE—SUE

The new harbours and quays are about 2 miles south of the town, with which they are connected by an em- bankment and railway, crossing a shallow which is dry at low water ; is on the north of the town near the English hospital and the storehouses of the Peninsular and Oriental Com- pany. The site is naturally an absolute desert, and till

the terminal lock of the freshwater canal

the water of the Nile was introduced by the freshwater canal in 1863 the water-supply of Suez was brought from the 'wells of Moses" on the Arabian coast, or else carried on camels, an hour's

journey, from the fortified brackish well of Bir Suweis.

Thus, in spite of its favourable position for commerce, Suez before the canal was but a small place. While the canal was in progress the population rose from 5000 to 15,000, but has since declined, The canal, in fact, carries traffic past Suez rather than to it ; and with its mean bazaar and mosques and mongrel population the town makes an unfavourable impression on the

visitor, save for the imposing view over the gulf, with the Sinai Mountains on its eastern and Mount ‘Ataka on its western shore,

A canal from the Nile to the Red Sea, the indispensable con- dition for the existence of a prosperous trading station at Suez, appears to have existed in very early times, Classical writers say that it was first planned by Sesostris (Rameses II.), and again undertaken by Darius I., but first completed by the Ptolemies (Arist., Meteor,, i. 14; Strabo, xiv. 25), The town at its terminus was Arsinoe or Cleopatris. The work was renewed by Trajan under the name Augustus amnis, but the trade from the East with Egypt still went mainly overland from Myus Hormus or from Bereniee on the Red Sea, below the Gulf of Suez, to Coptus in Upper Egypt. Instead of Arsinoe later writers name the port of Clysma, which the Arabs corrupted into Kolzum, calling the Red Sea the Sea of Kolzum. On the Moslem conquest of Egypt the canal was restored, and is said to have remained open more than a century, till the time of Mansiir, According to Mas‘idt (Mori, iv. 98), Hartin al- Rashid projected a canal across the isthmus of Suez, but was per- suaded that it would be dangerous to lay open the coasts of Arabia to the Greek navy. Kolzum retained some trade long after the closing of the canal, but in the 13th century it lay in ruins, and the neighbouring Suez, which had taken its place, was, as Yakut tells us, little better than aruin. From Mokaddasi, p. 196, it may be inferred that the name of Suez originally denoted Bir Suweis. Throughout the Middle Ages, as in Roman times, the main route from Cairo to the Red Sea was up the Nile to Kus, and then through the desert to Aidhdb. With the Ottoman conquest Suez became more important as a naval and trading station. Ships were built there from the 16th century onwards, and in the 18th century an annual fleet of nearly twenty vessels (Niebuhr) sailed from it to Jiddah, the port of correspondence with India. When the French occupied the town in 1798, and Bonaparte was full of his canal project, Suez was much decayed, and the conflicts which followed on its occupation in 1800 by an English fleet laid a great part of the town inruins. The overland mail route from England to India by

way of Suez was opened in 1837, The regular Peninsular and Oriental –

steamer service began a few years later, and in 1857 a railway was opened from Cairo through the desert. This line is now abandoned in favour of the

railway which follows the canal from Suez to Ismailia, and then ascends the Wady Tumeilat to Zakazitk, whence branches diverge to Cairo and Alexandria.

Sunz Cana. The great engineering features have been already treated of under CANAL (vol. iv. pp. 789-792), The opening of the canal to a great extent revolutionized the main lines of inter- national traffic. More especially it has restored to the Mediter- ranean countries a share in the commerce of the world such as they have not possessed since the beginning of the modern period. In doing so it has naturally caused the decay of certain stations (such as St Helena) on the ocean highways previously in vogue. In the case of sailing vessels, however, the winds at the Red Sea entrance of the canal are so frequently contrary that much of the advantage of the shortness of route is lost, and these vessels con- sequently still take the old-fashioned détours, Traffic, too, in the canal has so greatly increased that in 1886 a vessel was considered fortunate that got through in forty-eight hours. In 1882 ship- owners having expressed dissatisfaction with the condition of the service, schemes for rival canals were started,—one for a fresh-water canal from Alexandria to Cairo and thenee to Suez by way of Tel- el-Kebir, another for a canal from Alexandria to Mansurah and Ismailia, and then parallel to the original canal to Suez, and a

third for the construction of a second Suez canal, to be finished in .

1888. These proposals all fell to the ground ; but at length, in

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SU F—S UF

1886, it was determined to widen the existing canal so as to accom- modate the increased traffic, and the works are now in progress. Originally constructed by French capital, the Suez Canal has passed more and more into the financial ownership as well as under the political protection of England. In 1875 the British Government purchased 176,602 shares from the khedive of Egypt at the price of £3,976,582, or, including commission

and expeuses, £4,076,622, and exchequer bonds were issued to the value of £4,000,000. By opening up a passage by which the faunal forms of the Red Sea and of the Mediterranean may respectively advance uorth and south into regions from which they have hitherto been excluded, the canal has produced some curious results, which have been lately investigated by Dr Conrad Keller of Zurich (‘‘ Fauna im Suez-Kanal u. Diffusion de Mediter. u. Eryth. Thierwelt,” in Newe Denkschriften d. alig. schweizer Ges. f. Naturwiss., Zurich, 1883). Deep-sea forms are, of course, prevented passing by the shallowness of the canal; and the sandy nature of the soil, the large lakes, the currents, the disturbing influence exerted by the continual movement of vessels, and the excessive saltness of the water all tend to limit and retard the progress of even those forms most adapted to make their way through such a channel. The salinity of the water is much greater than that of the Mediterranean or the Red Sea. This is due mainly to two causes, —the rapid evaporation to which the water in the canal is subjected and the gradual melting of the deposits of salt (the result of previous evaporation in distant ages) in some of the depressions through which the canal is carried. In the Bitter Lakes, for example, it was found in 1872 that on an average each cubic métre of water contained 156°42 1b of salt, or about three times as much as ordinary sea water.

oe following figures are in continuation of the table in vol. iv. p. 792.

No. of Gries No. of Gross

Year.) Vessels Receipts. |/Year.| Vessels Receipts. entering. Tonnage. ‘ entering. Tonnage. . 1875| 1494 | 2,940,708 | £1,204,387 || 1881] 2727 | 5,794,401 | £2,050,974 1876| 1457 | 3,072,107| 1,229,157 |}1882| 3198 | 7,122,125) 2,421,835 1877| 1663 | 3,418,949| 1,339,617 ||1883| 3307 | 8,051,307] 2,633,912 1878| 15938 | 3,291,535] 1,272,435 || 1884] 3284 | 8,319,967) 2,495,124 1879| 1477 | 3,236,942] 1,214,444 || 1885| 3624 | 8,985,411| 2,488,297 1880] 2026 | 4,344,519 1,629,577 || 1886} 3100 | 8,183,313 2,309,218

In 1883 10 francs 50 cents were charged per ton (net tonnage), and pilotage dues amounted to 70 cents per ton on an average ; on 1st July 1884 pilotage dues were abolished ; and in 1885 the transit dues were reduced to 9 francs 50 cents per ton.

SUFFOLK, the most easterly county in England, is bounded E. by the North Sea, N. by Norfolk, W. by Cam- bridge, and 8. by Essex, the boundaries being chiefly the sea and rivers; it has somewhat the shape of a half moon. Its greatest length north to south from Yarmouth to Land- guard Point is about 50 miles, and its average length about 30; its greatest breadth from east to west is about 55 miles. The total area of the county is 944,060 acres, or 1475 square miles.

The principal geological formations are the Chalk and the Tertiaries, but they are frequently overlaid by drift. The surface is for the most part flat or slightly undulat- ing. In the extreme north-west round Mildenhall it joins the fen country. The fen land is bordered by a low range of chalk hills extending from Haverhill by Newmarket and Bury St Edmunds to Thetford. The Chalk extends eastwards, but towards the south passes under the London clay and crag, which adjoins the mouths of the principal rivers and extends from Sudbury by Ipswich to Aldeburgh. The easterly slopes of the Chalk are also overlaid by beds of clay, as well as by post-Glacial gravels, in which flint

implements and other indications of the presence of pre- historic man have been found. The most interesting deposits are, however, those of the crag of the late Miocene and Pliocene periods, resting on the London clay, or, where it overlaps, on the Chalk. At the base of the crag resting on the London clay is the famous Suffolk bone bed. The coast-line has a length of about 52 miles, and is comparatively regular, with only slight convexities towards the sea, the bays being generally shallow and the headlands rounded and only slightly prominent. The estuaries of the Deben, Orwell, and Stour are, however, of some length. The shore is generally low and marshy, with occasional clay and sand cliffs. The rivers flowing northwards are the Lark in the north-west corner, which passes in a north-westerly direction to the Great Ouse in Norfolk ; the Little Ouse or Brandon, also a tributary of the Great Ouse, flowing by Thetford and Brandon and forming part of the northern boundary of the county ; and the Waveney, which rises in Norfolk and forms the boundary between that county and Suffolk, from Palgrave till it falls into the mouth of the Yare at Yarmouth. The Waveney is

navigable from Bungay, and by means of Lake Lothing also communicates with Lowestoft. The rivers flowing in a south-easterly direction to the North Sea are the Blyth ; the Alde or Ore, which has a course for a long distance parallel to the seashore, and has its port at Orford ; the Deben, from Debenham, flowing past Wood- bridge, up to which it is navigable ; the Orwell or Gipping, which is navigable to Stowmarket, whence it flows past Needham Market and Ipswich; and the Stour, which forms nearly the whole southern boundary of the county, receiving the Brett, which flows past Lavenham and Had- leigh ; it is navigable from Sudbury and has an important port at Harwich. The county has no valuable minerals. Cement is dug for Roman cement; and lime and whiting are obtained in various districts.

Agriculture.—Suffolk is one of the most fertile counties in Eng- land. In the 18th century it was famed for its dairy products. The high prices of corn during the wars of the French Revolution led to the extensive breaking up of its pastures, and it is now one of the principal corn-growing counties in England. There is con- siderable variety of soils, and consequently in modes of farming, in different parts of the county. Along the sea-coast a sandy loam or thin sandy soil prevails, covered in some places with heath, on which large quantities of sheep are fed, and interspersed with tracts, more or less marshy, on which cattle are grazed. The best land adjoins the rivers, and consists of a rich sandy loam, with patches of lighter and easier soil. In the south-west and the centre is much fine corn land, having mostly a clay subsoil, but not so tenacious as the clay in Essex. In climate Suffolk is one of the driest of the English counties, the rainfall being only half that of the counties in the west. Towards the north-west the soil is generally poor, consisting partly of sand on chalk and partly of peat and open heath.

According to the agricultural returns for 1886, 780,448 acres or nearly five-sixths of the total area were under cultivation, 363,641 being under corn crops, 120,256 under green crops, 94,893 clover and rotation grasses, 174,970 permanent pasture, 19 flax, 57 hops, and 26,612 fallow. Wheat and barley are the most important of the corn crops, having an area of 118,873 and 151,630 respect- ively. Of green crops only 2452 were under potatoes, while 55,434 were under turnips and swedes, 36,211 under mangold, 852 under carrots, 4100 under cabbage, and 21,207 under vetches,—figures

which indicate that much attention is paid to the winter feeding of cattle. Horses in 1886 numbered 42,617, of which 32,262 were uscd solely for purposes of agriculture. The breed known as Suffolk punches is one of the most valued for agricultural purposes in Eng- land (see AGRICULTURE, Vol. i. p. 385). Cattle numbered 70,695, of which 23,652 were cows and heifers in milk or in calf, and 17,322 other cattle two years old and above. ‘The breed native to the county is a polled variety, on the improvement of which great pains have been bestowed in recent years. The old Suffolk cows, famous for their great milking qualities, were of various colours, yellow predominating. The improved are all red. Much milk is now sent to London, Yarmouth, &c. Many cattle, mostly imported from. Ireland, are grazed in the winter. The sheep are nearly all of the black-faced improved Suffolk breed, a cross between the old Norfolk horned sheep and Southdowns. Sheep numbered 433,986, of which 230,954 were one year old and above. Suffolk is famous

for pigs. The breed most common is small and very compact, and black in colour. Pigs numbered 121,866 in 1886, , : a

The following table gives classifications of holdings in 1875 and 1885:—

period mention may be made of those at Fornham St Geneveve and those between Aldeburgh and Snape. Many of the medieval castles were built on ancient mounds. The district submitted to

the Iceni joined the Trinobantes under Boadicea, the resistance 50 acres | From 50 to From 100 to From 300 to|/From 500 to} Above made was ultimately fruitless, A Roman road from London crossed

and under.} 100 acres. | 300 acres. | 500 acres. 1000 acres. | 1000 acres.

No.| Area.| No.| Area. | No.} Area. | No.| Area. No.| Area. | No.| Area. 1875 |5667/66,251/1436 101,644/2043‘336,383] 387 137,894] 169 110,169} 12 14,744 1885 {5607 64,899/1278 94,994 1872/330,133 409 154,590) 174 115,089} 17 22,314

Thus in 1875 there were in all 9714 holdings with 767,085 acres, and in 1885 9857 with 782,019 acres, According to the latest landowners Return (1878) Suffolk was divided among 19,276 pro- prietors, holding 920,268 acres, at a valued rental of £1,784,827, or an average all over of about £1, 18s, 93d. per acre. Of the owners 12,511 or nearly three-fourths possessed less than one acre each. The following possessed over 10,000 acres each :—Lord Rendlesham, 19,869 ; George Tomline, 18,473; marquis of Bristol, 16,954 ; the maharajah Dhuleep H. H. Singh, 14,615 ; Lord Hunt- ingfield, 11,713; earl of Stradbroke, 11,697; Sir Richard Wallace, 11,223 ; Lord Henniker, 10,910,

Communication.—The river navigation affords means of com- munication with different ports, and supplies facilities for a con- siderable amount of traffic. The county is intersected in all directions by branches of the Great Eastern Railway, which touch at almost every town of importance.

Manufactures and Trade.—The county is essentially agricultural, and the most important manufactures relate to this branch of in- dustry. They include that of agricultural implements, especially at Ipswich, Bury St Edmunds, and Stowmarket, and that of artj- ficial manures at Ipswich and Stowmarket, for which coprolites are dug. Malting is extensively carried on throughout the county. There is a gun-cotton manufactory at Stowmarket, and gun flints are still made at Brandon, At diffcrent towns a variety of small miscellaneous manufactures are carried on, including silk, cotton, linen, woollen, and horsehair and cocoa-nut matting. The principal ports are Yarmouth (situated chiefly in Norfolk), Lowestoft, South- wold, Aldeburgh, Woodbridge, and Ipswich. Yarmouth is one of the most important fishing stations on the east coast of England ; within the county Lowestoft is the chief fishing town. Herrings and mackerel are the fish most abundant on the coasts,

Administration and Population. —Su ffolk comprises 21 hundreds; the boroughs of Beccles (pop. 5721), which has several large malt- ings; Bury St Edmunds (16,111), the chief town in West Suffolk; Eye (2296), an ancient market town ; Ipswich (50,546), the largest town and principal port of the county ; Aldeburgh (2106), the birth- place of Crabbe ; Southwold (2107), a fishing town and bathing resort ; the largest part (5855) of

Sudbury (6584), a market and manufacturing town ; and smail portions of the boroughs of Thet- ford and Great Yarmouth, which are situated chiefly in Norfolk. The other principal towns are Hadleigh (3237), with a considerable trade in corn and malt ; Haverhill (3685) (partly in Essex), of great antiquity, and possessing important silk manufactures ; Lowestoft (16,755), a port and fishing station; Stowmarket (4052); and Woodbridge (4544), with some coasting trade. Suffolk is divided into geldable portions, in which the sovereign has the chief rights, and liberties. The liberties are those of St Etheldreda, St Ed- mund, and the dukedom of Norfolk. The court of quarter ses- sions is at Ipswich for the eastern division and by adjournment at Bury St Edmunds for the western. There are nineteen petty and sessional divisions. The hundreds of Hartismere and Stow and the borough of Eye are for petty sessional purposes included in

terminations of the place names are Anglian. The remains of old castles are comparatively unimportant, the principal being the entrenchments and part of the walls of Bungay, the ancient strong- hold of the Bigods ; the picturesque ruins of Mettingham, built by

by a deep moat, with the turret walls and the drawbridge still existing ; the splendid ruin of Framlingham, with high and massive walls, originally founded in the 6th century, but restored in the 12th; the outlines of the extensive fortress of Clare Castle, anciently

folk to the cause of the Parliament. James duke of York twice defeated the Dutch off the coast, —viz., Van Tromp off Lowestoft on 3d June 1665 and De Ruyter in Southwold Bay on 28th May 1672. Of monastic remains the most important are those of the

into a college of secular canons in the reign of Henry VL, and still retaining much of its ancient architecture, and now used as a

of Butley; and the remains of the Grey Friars monastery at Dun-

: peculiarity of the church architecture is the use of flint for purposes of ornamentation, often of a very elaborate kind, especi- ally on the porches and parapets of the towers. Another charac- teristic is the round towers, which are confined to East Anglia, but are considerably more numerous in

Norfolk than in Suffolk, the principal being those of Little Saxham and Herringfleet, both good examples of Norman. It is questionable whether there are any

well represented, but by far the greater proportion of the churches are Perpendicular, special features being the open roofs and wood- work and the fine fonts,

See Blome's Description of Suffolk, 1673; Kirby's Description, 1748, 2d ed. 1829 ; Suckling's History of Suffolk, 1846-48 ; Hervey's Visitation of Suffolk in 1561, ed., with additions, by Dr J. J. Howard, 1866; and Browne's History of Congre- gationalisn and Memorial of Churches in Suffolk, 1877. (T. F, Ii.)

SUFISM. See MoHAMMEDANISM, vol. xvi. p. 594; Mys- TICISM, vol. xvii. p. 130; and SUNNITES, p. 659 sg. infra. Sudbury have commissions of the peace and separate courts of SUGAR. F ormerly chemists called everything a "sugar"

quarter sessions; and Eye and Southwold have commissions of i j 1 the peace. For parliamentary purposes the county was until 1885 which had a pine ta: ane Se et lis oe

divided into East and West Suffolk, but it now constitutes five known as "sugar of lead" in Seo and familiar chem- divisions, each returning one member, viz., North or Lowestoft | ical parlance; but the term in its scientific sense soon division, North-east or Eye, North-west or Stowmarket, South or | came to be restricted to the sweet principles in vegetable

Sudbury, and South-east or Woodbridge. Bury St Edmunds re- i iwi — —

: * ae mal juices. nly one of these—cane sugar—was turns one member and Ipswich two; Eye, which formerly returned ae on — <4 = at ait 1619, when Fabrisio Bar- one member, was merged in the North-east division of the county ie z

in 1885, The county contains 517 civil parishes with parts of 7 | toletti isolated the sugar of milk and proved its individu- others. It is mostly in the diocese of Norwich. From 214,404 in | ality. In regard to all other “sugars” besides these two

3 the knowledge of chemists was in the highest degree 108 ee ils an ale ABE of hon | gtemetge of chemise was in the ghes dag to an acre was 0-38 and of acres to a person 2°65, 18th century, when Marggraf made the important discovery ae Hi A thie Vie district which now includes Nor- that the sugars of the juices of beet, carrots, and certain

t Anglia, hat portion, of Cambridge, and afterwards formed | other fleshy roots are identical with one another and with West, practically the character of a peninsula. It was inhabited | the sugar of the cane. Lowitz subsequently showed that by the Iceni, who had their capital at Icklingham, in the north- west | the granular part of honey 18 something different from of Suffolk. Of the numerous barrows and tumuli belonging to this | cane sugar ; this was confirmed by Proust, who found also

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that Lowitz’s honey sugar is identical with a crystallizable sugar present largely in the juice of the grape. Proust’s investigations extended to other sweet vegetable juices also. All those investigated by him owed their sweetness to Species. one or more of only three species,—(1) cane sugar, (2) grape sugar, (3) (amorphous) fruit sugar. Proust’s results obtain substantially to this day ; a number of new sugars strictly similar to these three have been discovered since, but none are at all widely diffused throughout the organic kingdom. Quanti: The quantitative elementary composition of cane sugar tative was determined early in the 19th century by Gay-Lussac .. ae and Thénard, who may be said to have virtually estab- mu” lished. our preseut formula, C,,H,,0,,. Under Fermenta- TION (vol. ix. p. 93) it has been explained how Gay-Lussac (in 1811) came to mis-correct his numbers so as to bring them into accordance with what we now express by CgH,,05=3C.H,,Oy.. Dumas and Boullay, some years later, found that cane sugar is what Gay-Lussac and Thé- nard’s analysis makes it out to be, while the “corrected ” numbers happen to be correct for grape sugar. Dumas and Boullay’s research completed the foundations of our present science of

the subject. ‘‘Sugar” is now a collect- ive term for two chemical genera named saccharoses (all Ci2H220,,) and glucoses (all C,H,,0,). All sugars are colourless non-volatile solids, soluble in water and also (though less largely) in aqueous alcohol; from either solvent they can in general be obtained in the form of crystals. The aqueous solution exhibits a sweet taste, which, however, is only very feebly developed in certain species. Action All sugars and their solutions have the power of turning the a polar- plane of polarization of light. In a given solution of a given kind zation of of sugar the angle a through which the plane is turned is governed ight. by the equation a= +[a]lp, where J stands for the length of solu- tion traversed (the customary unit of length being the centimetre) and p for the number of grams of dry sugar present in a volume of solution equal to that of (say) 100 grams (3°52 oz.) of water, where, however, ‘‘ gram” must be taken as merely a convenient word for “unit of weight”; -t[a], z.¢., the special value of a for 7=1 and p=1, is called the specific rotatory power of the sugar operated upon. The sign = indicates that the plane of polarization is turned either to the right or to the left according to the nature of the species. For a given species and a given temperature [a] has a constant value. Supposing its value to have been determined by standard experiments and / to be known (or to be kept constant throughout and taken as unit of length), the determination of a for a given solution suffices for the calculation of p. This method is largely used industrially for the assaying of cane sugar.

Sugars, though neutral to litmus and inert towards such substances as carbonates on the one hand and aqueous acids (qua acids) on the other, combine with strong bases, such as caustic potash, baryta, and lime, into saccharates, and, when brought into contact with the strongest nitric acid (or a mixture of the same with oil of vitriol) or (at the proper temperature) with acetic anhydride, unite with these into nitrates and acetates respectively, with elimination of water. These nitrates, &c., are related to the respective sugar exactly as (to take an analogous case) nitrate of methyl, CH,(NO,), is to methyl-alcohol, CH;(OH); only in the case of a sugar a plural of NO,’s is capable of entering into every one molecule and turning out so many HO’s ; hence sugars are said to be polyvalent alcohols, Of the several points of difference between saccharoses and glucoses the most important is that, while the latter remain unchanged when boiled with highly dilute sulphuric or hydrochloric (or certain other kinds of) acid, the former take up water

and every molecule breaks up into two molecules of glucose, which in general are of different kinds. Cane sugar, for instance, yields dextrose and levu- lose (so called from the direction in which they turn the plane of polarized light), thus—

Crp 901; + H,0 = CgH),0¢ + CoH 1.0,

Cane Sugar Dextrose Levulose. Cane sugar turns the plane of polarized light to the right; the mixed glucose produced is levo-rotatory; hence the process is spoken of technically as involving the inversion of cane sugar, and the mixed product is called invert sugar. The term “inversion,” however, has come somchow to be used for all decompositions which fall under the above equation ; occasionally it is used even in a wider sense, to include any decomposition of a carbo-hydrate (e.g., starch) into two less complex carbo-hydrates.

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All sugars are liable to fermentative changes ; a special Ferment- character of the three principal vegetable sugars is that, ative when brought into contact as solutions with yeast (living ©2@™8°- cells of saccharomyces), under suitable conditions, they suffer vinous fermentation, 7.¢., break up substantially into carbonic acid and alcohol. Dextrose and levulose break up directly, —C,H,,0O,=2C,H,O+2C0,. Cane sugar first, under the influence of a soluble ferment in the yeast, gets inverted, and the invert sugar then ferments, the dex- trose disappearing at a greater rate than the levulose.

It is remarkable that no sugar has ever been produced Artificial artificially even in the sense of being built up from other produe- native organic substances of less chemical complexity.

It is easy to produce dextrose from starch, or levulose from inulin, or both from cane sugar, by inversion ; but none of these processes is reversible by known methods. Yet the problem of producing cane sugar artificially may in a sense be said to have found a virtual solution at the hands of a German-American chemist, Fahlberg.! Fahlberg, by subjecting toluene, C,H,CH; (one of the components of coal-tar naphtha), to a series of operations has produced

from it a body, C,H, sO NH, which he called saccharine,

because he found it to be about 230 times as sweet as cane sugar. This saccharine is a white crystallized solid, only slightly soluble in cold water, but sufficiently so to admit of its incorporation with jellies, puddings, bever- ages, &c. A mixture of one part of it with 1000 parts of ordinary grape sugar (as produced industrially from starch) is as sweet as the best cane sugar. The substance, though an antiseptic, is said to be perfectly innocuous.

Glucoses.

Of these a pretty large number are now known, but only levu- Glucoses. lose and dextrose nced be noticed here. Both are largely present in all kinds of sweet fruit juices and in honey. In most of these materials they are accompanied by a small proportion of cane sugar, which forcibly suggests that the glucose in fruit juices is really inverted cane sugar. But, in opposition to this surmise, the proportion of cane sugar in oranges increases during the process of ripening, and the sourest of all fruits—the lemon—contains four parts of cane for every ten of invert sugar; besides, the juices of grapes and sweet cherries contain no cane sugar whatever. Accord- ing to Stammer, the young leaves of the sugar cane contain abun- dance of invert sugar, which gradually disappears and gives way to cane sugar as the leaves develop and ultimately dry up. In the living body of man dextrose is constantly being produced from the glycogen of the liver, to be taken up by the blood and oxi- dized into carbonic acid and water. In certain diseases, however (sec NUTRITION, vol. xvii. p. 681), the sugar survives and passes into the urine; as much as one pound avoirdupois may be dis- charged by a diabetic patient in twenty-four hours. A numerous class of vegetable substances, known as glucosides, contain glucose of some kind in the sense that, when decomposed by boiling dilute sulphuric acid or by the action of certain ferments, they split up into glucose and some product—not a sugar—which is characteristic of the respective specics. For examples, see Frr- MENTATION, vol. ix. p. 96.

Dextrose is being produccd industrially from starch by inversion Dextrose. (see below), and sold as grape sugar. Such grape sugar, however, is very impure. For the preparation of pure dextrose rich diabctic urine, honey, and

cane sugar are convenient materials. The method recommended by Soxhlet is to dissolve 160 grams (5°64 oz.) of powdered cane sugar in a mixture of 500 c.c. of alcohol of 85 per cent. by weight and 20 c.c. of fuming hydrochloric acid at 45° C. and to allow the solution tostand. After about a week dextrose begins to crystallize out, and, if the mixture is being frequently agitated, the deposit of crystals increases gradually. A small crop of crystals thus obtained suffices for inducing crystallization in a large supply of fresh liquor. Dextrose crystallizes from its highly concentrated aqueous solution—somewhat tardily—in minute soft crystals, united into warts or cauliflower-like masses, which contain 1H,O of crystal water beside CsH,.0, The crystals lose their water at 100°C. From absolute alcohol it crystallizes as CgH,,.0<. It dissolves in 1:2 parts of cold and far less of boiling water. 100 parts of alcohol of 0°837 specific gravity dissolve 1:94 parts at 17°°5 C. and 21°7 parts on boiling. In a given volume of aqueous solu-

1 See Amer. Chem. Jour., i. p. 170, ii. p. 181, and i. p. 425; short notices in Jour. Soc. Chem. Ind., iv. p. 608, and February 1886.

ion 5 parts of dextrose produce the same degree of sweetness as 3 og cane sugar. Deane fuses at 146° C. and at 170 passes into glucosan, CgH,,O;, an almost tasteless solid, which when boiled with dilute sulphuric acid is reconverted into dextrose. Ifa solu- tion of dextrose in absolute alcohol is saturated with hydrochloric acid gas at 0° C., di-glucose, Cj,H.0,;, is produced, which, however, is only isomcric with cane sugar (Gautier). ;

Levu- Levulose.—The liquid part of crystalline honey consists chiefly

lose, of levulose ; but its purification is difficult. From Invert sugar it can be extracted, according to Dubrunfaut, by cautious addition of slaked lime at a low temperature. The levulose separates out as a difficultly soluble lime compound, which is Separated from the mother-liquor containing the dextrose by pressure and by judicious washing with cold water. The levnlosate of lime is de- composed by the exact equivalent of oxalic acid solution; then the oxalate of lime is filtered off, and the filtrate evaporated on a water- bath. The levulose ultimately remains as a thick syrup, which

formerly was supposed not to be susceptible of crystallization ; but Jungfleisch and Lefranc have succeeded lately in obtaining crystals from it by means of alcohol. Levulose is very largely soluble in water, and fully as sweet as cane sugar. It fuses at 95° C.; at 170 it passes into levulosan, CgH,,05, analogous to glucosan.

Reac- The following reactions, though studied chiefly with dextrose,

tions. apply also to levulose, and, substantially at least, to glucoses gener- ally. Ifa solution of glucose is mixed with excess of caustic potash or soda, a solution of alkaline glucosate is formed, which, howevcr, has little stability. If the solution is heated, the glucosate is decomposed with formation of dark-coloured (soluble) alkali salts of acid products, which, whateycr they may be, are not reconvertible into glucose. Cane sugar, in these circumstances, remains sub- stantially unchanged, and can be regenerated by elimination of the alkali. Ifa solution of glucose is mixed with (not too much) sul- phate of copper, and an excess of caustic potash or soda be then added, no precipitate of cupric hydrate is formed, but an intensely blue solution, which, on standing in the cold gradually, and on heating promptly, deposits a red precipitate of cuprous oxide, Cu,0, the glucose being oxidized at the expense of the dissolved CuO into soluble alkali salts of little known acids. B means of this (Trommer's) test the least trace of glucose in a solution can be dis- covered. Cane sugar, in the circumstances, yields cuprous oxide only on long-continued boiling. Fehling has brought this test into the following more convenient form, which, besides, admits of quantitative application : 34°65 grams (1-22 oz.) of sulphate of copper, CuSO, +5H;0, and 173 grams (6 oz.) of Rochelle salt (double tartrate of potash and soda) are dissolved in a solution of 70 grams (2°46 02.) of solid caustic soda, and the intensely blue solution produced is diluted to1000c.c. Every c.c. of Fehling solution oxidizes about 5

an aggregate of minute crystals, If fused sugar is kept at a few degrees above its fusing-point for some time, it passes into an alloy,

innocent colouring agent for sauces, liqueurs, &. A pure solution of cane sugar is said to remain unchanged on boiling (it being understood, of course, that local overheating be carefully avoided); but continued contact with even so feeble an acid as carbonic induces at least partial inversion.

The statement of the unchangeability of sugar solution on boiling seems hardly credible, because a syrup boiling at all considerably above 100° GC, contains plenty of mole- cules at temperatures above 160° C., which are bound to suffer irreversible conversion into dextrose and levulosan (or levulose), and even, if hot enough, caramelization. In ordinary practice, at any rate, sugar solutions on boiling do behave as indicated by this theory. Cane sugar, as already stated, unites with alkalis, alkaline earths, and other of the more strongly basic metallic oxides into saccharates. A soluble saccharate of lime, which is readily decomposible by carbonic acid and even by filtration through bone charcoal, plays a great part in the manufacture of sugar. The fol- lowing strontium salt must be named, because it at least promised Some years ago to occupy a similar position industrially. Accord- % to Scheibler, if strontia hydrate, SrOH,0 + 8H,0, is added to a boiling 15 per cent. solution of cane sugar, then as soon as 2SrO is added for every Cy,H5.0,, the salt C)5H5.0,, + 28r0 separates out as a sandy powder, and after addition of 2:5 times SrO al- most all the sugar is precipitated. The precipitate is easily washed and decomposed by water and carbonic acid, with formation of insoluble carbonate of strontia (from which the hydrate can be reproduced) and a solution of cane sugar. The ultimate molasses produced in sugar making or refining, though they refuse to deposit crystals under any conditions, contain some 30 to 40 per cent. of real cane sugar ; Scheibler’s process applies to them,—to put the industrial bearings of the discovery in the proper light,—and it has led to quite a serics of patents for the production of strontia ; but, as far as we know, it has failed to take root in the sugar industry.

Milk Sugar occurs in the milk of mammals, and it is doubtful Milk whether it occurs anywhere else, although Bouchardat once proved sugar, its presence in a sample marked as sugar obtained from Sapota Achras (the sapodilla of the West Indies), It is made industrially in Switzerland as a bye-product in the making of cheese. It passes into the whey, from which it is extracted by evaporation to a small volume, decolorization with animal charcoal, and crystallization. From the commercial product the pure substance can be obtained by repeated recrystallization from water, and ultimately by pre- cipitation from the aqueous solution by alcohol. Milk sugar as it crystallizes from water under the ordinary conditions forms

hydrated crystals of the composition C,sH.0,,+H,O; under certain conditions anhydrous crystals separate out. The hydrated

the glucose, The cuprous oxide precipitate is allowed to settle, is then collected on a filter, and weighed directly or indirectly. From its weight the weight of the glucose is calculated,—a standard experi- ment with a known weight of the respective kind of pure glucose furnishing the factor. —A less exact but more expeditious method

Saccharoses.

Cane Of these only cane sugar, milk sugar, and maltose can be noticed

Sugar. here. The highest qualities of commercial cane sugar are chemi- cally pure. Pure cane sugar crystallizes from its supersaturated syrup in colourless, transparent monoclinic prisms (exemplified in colourless candy sugar). The crystals are barely, if at all, hygro- scopic ; they are rather hard, and when broken up in the dark give off a peculiar kind of bluish light. Sp. gr. 1598 at 4°C. The aqueous solution, saturated at ¢° C., contains p per cent. of dry ee ee 40° 50°

p=65‘0 65°6 67°0 69°8 75°8 82°7,

From 50° upwards the solubility increases at such a rate that a given quantum of water dissolves any quantity of sugar if the mix- ture is constantly kept boiling. Accordingly a sugar syrup when boiled down deposits nothing, but passes gradually into the condi- tion of fused sugar when the boiling – point merges into the fusing. point of sugar, which lies at 160-161° C. Even a cold-saturated solution of sugar has the consistence ofa syrup. Absolute alcohol hardly dissolves Sugar at all ; aqueous alcohol dissolves it the more largely the greater its proportion of water. Fused sugar freezes into a transparent glass, which is colourless if pure, but in practice gener- ally exhibits a yellowish hue, and, if really anhydrous, remains

syrupy. Milk sugar is hardly soluble in alcohol. The ordinary crystals, as the formula shows, have the composition of a glucose ; indeed milk sugar solution behaves to caustic alkalis and to Fehling solution as if it were a glucose. But the hydrated crystals lose their water at 130°, with formation

of a residue reconvertible into the original substance by the mere action of water ; besides, milk sugar is susceptible of inversion into dextrose and a specific galactose. The optical behaviour of a milk sugar solution varies

vinous fermentation ; but certain Spaltpilze induce a fermentation involving the formation of alcohol and of lactic acid. This process is utilized by the Kirghiz in the production of their native drink, ‘‘koumiss,” made from mare’s milk (see MrLx, vol. xvi. p- 305). Milk sugar is used in medicine as a diluent for dry medicines. Homeeopathists use it by preference. A solution of milk sugar in certain proportions of water and cow’s milk is used occasionally as a substitute for mother’s milk. Maltose does not occur in nature; it is largely produced along Maltose,

with dextrin when starch paste is acted upon by dilute sulphuric

listory.

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acid or the ferment called “diastase,” which is supposed to be the active agent in malt. For its preparation 2 kilograms (4°40 Ib) of potato starch are made into a paste with 9 litres (15°84 pints) of water over a water-bath ; after allowing it to cool down to 60° or 65° C., an infusion of from 120 to 140 grams (4:23 to 5 oz.) of malt made at 40° C. is added. The mixture is kept at from 60° to 65° for an hour; it is then boiled and filtered, The filtrate is evaporated to a syrup, which is exhausted twice with alcohol of 85 per cent. by weight and then once with absolute alcohol. The dextrin (mostly) remains ; the maltose passes into solution. The alcoholic extracts are evaporated to a syrupy con- sistence and allowed to stand. The absolute alcohol extract soon yields a crop of impure crystals of maltose, which are used to induce crystallization in the other two syrups. In regard to the somewhat tedious methods of purification we refer to the handbooks of chemistry. Maltose crystallizes (from alcohol on spontaneous evaporation) in fine needles of the composition C,,H,.0,,+H,0. The H,O goes offat 100° C. Maltose is less soluble in alcohol than dextrose, to which it is otherwise very similar. To caustic alkalis and Fehling solution it behaves exactly as dextrose does. Like it, it suffers vinous fermentation under the influence of yeast. When boiled with dilute sulphuric acid it breaks up into (so to say)

dex- trose and dextrose. Maltose plays an important part in the brewing of alcoholic malt liquors. (W. D.) History.

The original habitat of the sugar-cane is not known, but it seems to have been first cultivated in the country extending from Cochin China to Bengal (De Candolle). Sugar reached the West from India, and at a comparatively late date. Strabo (xv. i. 20) has an inaccurate notice from Nearchus of the Indian honey-bearing reed, and various classical writers of the first century of our era notice the sweet sap of the Indian reed, or even the granulated salt-like product which was imported from India, or from Arabia and Opone (these being entrepéts of Indian trade),! under the name of sac- charum or odxxape (from Sanskr., sarkara, ‘‘ gravel,” “sugar’’), and used in medicine. The art of boiling sugar was known in Gangetic India, from which it was carried to China in the first half of the 7th century ; but sugar-refining cannot have then been known, for the Chinese learned the use of ashes for this purpose only in the Mongol period, from Egyptian visitors.2_ The cultiva- tion of the cane in the West spread from Khiuzistan in Persia. At eae in this region ‘‘ sugar was prepared with art” about the time of the Arab conquest,? and manufacture on a large scale was carried on at Shuster, Suis, and Askar-Mokram throughout the Middle Ages.4 It has been plausibly conjectured that the art of sugar-refining, which the farther East learned from the Arabs, was developed by the famous physicians of this region, in whose phar- macopceia sugar had an important place. Under the Arabs the growth and manufacture of the cane spread far and wide, from India to Sis in Morocco (Edrisi, ed. Dozy, p. 62), and were also introduced into Sicily and Andalusia.

In the age of discovery the Spaniards became in their turn the great disseminators of the sugar cultivation: the cane was planted by them in Madeira in 1420; it was carried to San Domingo in 1494 ; and it spread over the occupied portions of the West Indies and South America early in the 16th century. Within the first twenty years of the 16th century the sugar trade of San Domingo expanded with great rapidity, and it was from the dues levied on the imports brought thence to Spain that Charles V. obtained funds for his palace-building at Madrid and Toledo. In the Middle Ages Venice was the great Huropean centre of the sugar trade, and towards the end of the 15th century a Venetian citizen received a reward of 100,000

crowns for the invention of the art of making loaf-sugar. One of the earliest references to sugar in Great Britain is that of 100,000 tb of sugar being shipped to London in 1319 by Tomasso Loredano, merchant of Venice, to be exchanged for wool. In the same year there appears in the accounts of the chamberlain of Scotland a payment at the rate of 1s. 94d. per pound for sugar. Throughout Europe it continued to be a costly luxury and article of medicine only, till the increasing use of tea and coffee in the 18th century brought it into the list of principal food staples. The increase in the consumption is exemplified by the fact that, while

1 Lucan, iii. 237; Seneca, Epist., 84; Pliny, H.N., xii. 8 (who supposes that sugar was produced in Arabia as well as in India); Peripl. Mar. Eryth., § 14; Dioscorides, ii. 104. The view, often repeated, that the saccharum of the ancients is the hydrate of silica, sometimes found in bamboos and known in Arabian medicine as tabdshir, is refuted by Yule, Anglo-Indian Glossary, p. 654 ; see also Not. et Extr. des MSS. de la Bibl. Nat., xxv. 267 sq.

2 Marco Polo, ed. Yule, ii. 208, 212. In the Middle Ages the best sugar came from Egypt (Kazwini, i, 262), and in India coarse sugar is still called Chinese and fine sugar Cairene or Egyptian.

® So the Armenian Geography ascribed to Moses oF CHORENE (q.v. for the date of the work); St Martin, Afém. sur l Arménie, ii. 372.

4 Istakhri, p. 91; Yakut, ii. 497. Tha‘dlibi, a writer of the llth century, says that Askar-Mokram had no equal for the quality and quantity of its sugar, ‘notwithstanding the great production of ‘Irak, Jorjan, and India.” It used to pay 50,000 pounds of sugar to the sultan in annual tribute (Lataif, p. 107). The names of sugar in modern Huropean languages are derived through the Arabic from the Persian shakar.

in 1700 the amount used in Great Britain was 10,000 tons, in 1800 it had risen to 150,000 tons, and in 1885 the total quantity used was almost 1,100,000 tons. » le In 1747 Andreas Sigismund Margeraf, director of the physical classes in the Academy of Sciences, Berlin, discovered the existence of common sugar in beetroot and in numerous other fleshy roots

which grow in temperate regions. But no practical use was made of the discovery during his lifetime. The first to establish a beet-sugar factory was his pupil and successor, Franz Carl Achard, at Cunern (near Breslau) in Silesia in 1801. The processes used were at first very imperfect, but the extraordinary increase in the price of sugar on the Continent caused by the Napoleonic policy gave an impetus to the industry, and beetroot factories were established at many centres both in Germany and in France. In Germany the enterprise came to an end almost entirely with the downfall of Napoleon I.; but in France, where at first more scientific and economical methods of working were introduced, the manufacturers were able to keep the industry alive. It was not, however, till after 1830 that it secured a firm footing ; but from 1840 onwards it advanced with giant strides. Now it is an industry of national importance, especially in Germany, control- ling in the meantime the market against the cane-sugar trade. While cane sugar was practically without a rival, the cultivation was in general highly profitable, but it was conducted under tropical skies, largely by slave labour and entirely removed from scientific supervision. The staple produced at the plantations was raw sugar, which was sent to Europe to be refined. It was not till the pressure of the competition with beet sugar began to make itself felt that planters realized the necessity for improving their methods of working. It has now been found possible to apply many of the processes and appliances devised in connexion with the production of beet sugar to the extraction of its older rival.

Manufacture.

CANE SUGAR MANUFACTURE. —The sugar-cane (Saccharum officin- Manu- arum) is a species of grass, the stalks or canes of which reach a facture.

height of from 8 to 15 feet, and attain a diameter of 14 to 2 inches. The stalks are divided into prominent joints or internodes, the long sheathing alternate leaves springing from each joint. As the canes approach maturity they throw up a long smooth hollow joint termed the arrow, whence springs the flower head, consisting of beautiful feather-like loose panicles. The points are filled with a loose spongy fibrous mass, saturated with a juice which is at first watery but afterwards becomes sweet and glutinous. As the

joints ripen, the leaves wither and fall away and the stem becomes externally smooth, shining, and hard, containing much silica. The varieties of sugar-cane in cultivation are very numerous, and are distinguished from each other by external colour, length of internodes (84 to 10 inches), height to which they grow, richness in juice, and many other characters. The four principal classes cultivated in the West Indies are the Creole or country cane, the Tahiti cane, the Batavian cane, and the Chinese cane. An average sample of Tahiti cane at maturity contains—water, 71°04 per cent.; sugar, 18°00 ; ligneous tissue and pectin, 9°56 ; albumen, colouring matter, aud insoluble salts, 1°20; silica, 0°20. The sugar-cane requires a rich, well-drained, but moist soil. It is propagated by slips taken from the upper part of the canes, which are planted at intervals about 5 feet apart or in close-set rows 6 feet apart. In the West Indies the planting takes place between June and October, and in the case of the Creole variety the canes are ready for cutting down by the beginning of January in the second following year. When mature the canes are cut down close to the ground, the remaining leaves and upper shoot removed, and the stalks immediately taken to the mill for crushing. The stocks left are liberally manured with crushed. remains and ashes of former crops, combined with nitrogenous manures, and are covered over; they then send up a crop of new stems, termed rattoons. The system of rattooning can be continued for several years, but the canes so treated go on declining in size and in yield of sugar. The yield of canes, of course, varies within wide limits; but 20 tons per acre may be regarded as a good average crop. : Cane-Crushing.—The juice is extracted by pressing the canes in a sugar-mill between three, or sometimes five, heavy close-set rollers of iron, placed horizontally in a powerful framework or cheeks. In a three-roller mill they consist of a cane, top, and megass roller respectively. The top roller is set above and between the other two, and under its periphery isa fixed metal plate called the trash turner, which guides the cane coming from between the cane and top rollers into the bite between top and megass rollers. Generally the cane roller is screwed up to within half an inch of the top roller, while the free space between top and megass rollers is considerably less. The mill is set in motion by steam power, and the canes are fed by hand on a travelling band or carrier into the rollers. If a thick feed is placed at one side and little at the other, one portion passes through imperfectly crushed, while the other severely strains the mill

and may either stop the machinery or cause a breakdown by some portion giving way. The yield of

Purifica- tion of cane juice.

Boiling down,

Sugar beet,

juice obtained with an ordinary mill varies from 60 to 65 per cent. One of the most useful devices for improving the machinery is the substitution of an hydraulic attachment, which can be applied to the headstocks of any of the rollers, in place of the rigid and im- movable screws and wedges of the ordinary mill. This secures a uniform pressure with the most irregular feed and much greater pressure than is possible with rigid rollers, resulting in a greatly increased yield of juice (67 to 70 per cent.) and a megass or refuse proportionately drier and therefore more available for fuel for steam-raising. The juice from the mill is led into a trough, whence it is carried by pipes to the clarifiers. But even the most perfect system of mechanical pressure leaves a large percentage of sugar in the refuse cane, and to remedy this the diffusion method (see below), which has been attended with remarkable success in the beet in. dustry, has been also applied to the extraction of cane juice. At Aska (Madras) in India it has been found possible by that process to obtain as much as 87% of the 90 per cent. of juice present in canes, Considerable difficulty was at first found’ in slicing the silicious stalks for diffusion ; but this process seems to promise a much more exhaustive extraction of the juice than can be secured by mechanical means. The juice is a turbid frothy liquid of a yellowish green colour, with a specific gravity of from 1-070 to about 1°100. The variety of cane cultivated, its age, and especially the nature of the season in which it has grown as regards rain, all have an important influence on the yield of sugar. ‘The expressed juice contains from 15 to 18 per cent. of solids, showing on a good average—sugar, 14°55 per cent.; glucose, 1°65; non-saccharine solids, ‘917 ; ash, ‘283. The juice got from sugar-cane is much richer in

sugar and less contaminated with non-saccharine solids than that yielded by beet; and its pleasant taste and aromatic odour contrast markedly with the acrid taste and unpleasant smell of beet juice.

Purification of the Juice.—In the hot climates where sugar-canes grow a process of fermentation is almost immediately set up in the impure juices from the canes, causing the formation of invert sugar and later products of fermentation, and thereby a serious loss of sugar. It is therefore essential that with the least possible delay the mannfacturing processes should be proceeded with. The juice is first filtered through a set of sieves to remove the mechanical impurities it carries from the mill. Then it is run into the clarifiers, a series of iron vessels capable of holding six or eight hundred gallons of juice, and in these it is heated up to about 130° Fahr., and milk of lime is added in quantity sufficient to neutralize the acid constituents it contains. The heat is then raised to just under the boiling-point, when gradually a thick scum rises and forms on the surface, and when the defecation thereby effected is complete the clear liquid below is drawn off, Various other sub- stances besides lime are employed for the defecation of juice, one of which, the bisulphite of lime in the so-called Icery process, has attained considerable favour. The bisulphite is added in excess ; the acids of the juice decompose a certain proportion of it, liberat- ing sulphurous acid, which by its influence promotes the coagula- tion of the albuminous principles aud at the same time promotes the bleaching of the liquid. In another process the green juice is first treated with sulphurous acid, which (with the natural acid constituents) is subsequently neutralized by lime. Recently also phosphoric acid has come into favour as a defecating agent.

Boiling Down.—From the clarifier the juice passes on to the battery, a range of three to five pans or “coppers,” heated by direct fire, in which it is concentrated down to the crystallizing point. The juice, gradually increasing in density, is passed from the one into the other till it teaches the last of the series, the striking teach, in which it is concentrated to the granulating point. The skimmings from these pans are collected Tum. From the striking teach the concentrated juice is removed to shallow coolers, in which the crystals form. A few days later it is transferred to hogsheads in the curing-house, and the molasses crystallized raw sugar into tanks. The sugar so

obtained is the muscovado of the sugar-refiners, and both Clayed sugar consists of raw sugar from which a portion of the anette

pan, Fryer’s concreter, and similar devices for the efficient

: ae evapora- tion of juice 2

by exposing it to the action of heat in thin films over

BEET Sucar Manvuracturr.—The sugar beet is a cultivated lety of Beta maritima (natural order Chenopodiacez), other varieties of which, nnder the name of mangold or mangel wurzel, are grown as feeding-roots for cattle. The plants are cultivated like turnips, and the roots attain their maturity in about five months

on inland sugar is there calculated on the roots.

juice is expressed. After having

SUGAR

after sowing,

being gathered during September and October. The efforts of growers have been largely directed to the development of

roots yielding juice rich in sugar; and especially in Germany these

efforts have been stimulated by the circumstance that excise duty The duty is based on the assumption that from 124 parts of beet 1 part of grain sugar is obtained ; but in actual practice 1 part of raw sugar is now yielded by 9°27 parts of root. Moreover, when the sugar is exported a drawback is paid for that on which no duty was actually levied, and hence indirectly comes the so-called bounty on German sugar. In 1836 for 1 part of sugar 18 parts of beet were used, in 1850 18°8 parts, in 1860 127 parts, and now (1887) about 9:25 parts only are required. In France till recently the inland duty was calculated on the raw sugar; hence the French grower devoted himself to the production of roots of a large size yielding great weight per acre, and had no motive to aim at rich juice and econo- mical production. Many

processes, therefore, have come into use in German factories which are not available under the French methods of working. But since 1884 the French manufacturers have had the power to elect whether duty shall be levied on the roots they use or on the raw sugar they make, and a large propor- tion have already chosen the former. The nature of the seasons exercises much influence on the composition of sugar beet, especially on its richness in sugar, which may range from 10 to 20 per cent. The following represents the limits of average composition :— Water ++, § 84°5 to 79°0 Sugar and other soluble bodies } solids OUTS to 17-0 Cellulose and other solids 40 4-0 The non-saccharine solids in the juice are very complex, embrac- ing albumen, amido-acids, and other nitrogenous bodies, beetroot gum, soluble pectose compounds, fat, colouring matter, with the phosphates, Ape oxalates, and citrates of potash, soda, lime, and iron, and silica. The relation and relative proportion of these to the sugar present are of the utmost importance.

Two distinct ways of obtaining the juice from bect are now Extr: principally employed,—pressure and diffusion. The mechanical tion | methods of pressure are principally used in France ; the process of juice. diffusion is all but universal in Germany. Formerly a modified diffusion process—maceration—was in use ; but it has now been generally abandoned, as has also a meaus of separating the juice by centrifugal action. For the mechanical processes the roots have first to be reduced to a condition of fine ulp. For this purpose Meth the roots, thoroughly trimmed and waste, are fed into a pala, of pre machine, in which a large drum or cylinder, armed with close-set sure. rows of saw-toothed blades, is revolved with great rapidity, so that the fleshy roots on coming against them are rasped down to a fine uniform pulp. The operation is assisted by pouring small quanti- ties of water or of watery juice on the revolving drum, which thins the pulp somewhat, and aids the free flow of the juice in the sub- sequent operation. The expression of the juice is effected either by the hydraulic press or by continuous roller presses. From the hydraulic press the juice flows freely at first ; but in order to obtain the largest possible yield it is necessary to moisten the first press- cake and submit it to a second ressure, whereby a thin watery

Bion pressed twice, the cake that is left should amount to not more than 17 per cent, of the original roots ; hence, allowing 4 per cent. for ligneous tissue, &., only about 13 per cent. of watcr, sugar, and soluble salts, &c., remain in the refuse. For the system of continuous pressure presses analogous to the mills employed for cane-crushing are used. Many modifications of the roller press have been introduced, and, although the best express from 3 to 5 per cent. less juice than the hydraulic press, they have several advantages under the system formerly common in France, which bound the maker to return press-cake containing a certain proportion of sugar for use as a feeding-stuff on the farm. In certain forms of press the lower rollers are per- forated to allow the escape of the expressed juice; in some the rollers are covered with india-rubber, so that they give an elastic Squeeze on an extended surface ; and in others the pulp is carried in an endless cloth through a series of rollers, being all the while subjected to gradually increasing pressure, _

The diffusion process for obtaining beet juice depends on the Diffusi action of dialysis, in which two liquids of different degrees of con- process centration separated by a membrane tend to transfuse through the membrane till equilibrium of solution is attained. In the beet the cell-walls are membranes enclosing a solution of sugar. Supposing these cells to be brought into contact with pure water, then by theory, if the cells contain 12 per cent. of juice, transfusion will go on till an equal weight of water contains 6 per cent. of sugar, while by the passage of water into the cell the juice there is reduced to the same density, Taking the 6 per cent. watery solution and with it treating fresh roots containing again 12 per cent., a 9 per cent. solution will be attained, which on being brought a third time in contact with fresh roots would be raised to a density of 105, Thus theoretically seven-eighths of the whole sugar would be obtained at the third operation, and it is on this theory that the diffusion process is based. In working the process a range of

Purifica- Ifthe juice obtained by any process were a pure solution of sugar | grainy mass of crystals floating in a fluid syrup. After being Separa- jon of the manufacturing operations would be few and simple. But beet | allowed to cool, the mass is fed into the drum or basket of a cen- tion of eet juice is at best a very mixed solution, containing much gum, acid | trifugal machine,

which by its rapid rotation separates the fiuid crystals uice. bodies, nitrogenous matter, and various salts. These adhere to the | molasses from the crystals, driving the liquid portion through the from

saccharine solution with the utmost obstinacy ; they attack the | meshed wall of the basket. For further cleaning of the crystals molasses.

sugar itself and change crystalline into invert sugar, communicat- from adherent syrup a small quantity of either water or pure syrup

ing to it a dirty brown colour and a disagreeable acrid taste and | is added to the drum, and is likewise forced through the sugar

smell. To separate as far as possible the non-saccharine con- | crystals by centrifugal action. Steam also is employed for cleaning

stituents and to remove the colour from the juice are troublesome | the crystals whilst in the centrifugal machine. ‘The syrup from

tasks. The preliminary purification embraces two sets of opera- | the first supply of sugar is returned to the vacuum pan, again

tions, —first the treatment of the juice with lime and carbonic acid, | boiled, and treated as above for a second supply of less pure sugar;

secondly, filtration through animal charcoal. Under the old | similarly a third supply is yielded by the drainings of the second.

method of working the juice is first boiled in a ene pan with | The molasses from the third supply is a highly impure mixture of

milk of lime to the extent of from 4 to 1 per cent. of lime to the ; crystallizable and invert sugar, potash, and other salts, smelling

weight of juice operated on. The boiling serves to coagulate | and tasting powerfully of its beet origin. Many methods have

the albuminoids, while the lime forms with certain of the other | been tried to recover the large amount of sugar contained in this

impurities an insoluble precipitate, and in part combines with the | molasses. That most extensively employed is the osmose process

sugar to form a soluble saceharate of lime. The insoluble lime | originated by Dubrunfaut, in which, by the application of a dialyser,

combination and the coagulum rise as a scum over the surface of | it is found that the salts pass through the membrane more rapidly

the juice, and the latter, now comparatively clear, is drawn off by | than does sugar. The elution process of Scheibler, which depends

a siphon pipe, to be treated in another vessel with carbonic acid. j| on the formation of a saccharate of lime, and the more recent

The acid breaks up the saccharate of lime and forms insoluble | strontia process of the same chemist, in which a strontiate of lime

earbonate of lime, whieh in precipitating carries down further | is formed, are also much employed. Another means of utilizing

impurities with it. After settlement the clear juice is drawn off | the molasses consists in fermenting and distilling from it an im-

and the precipitated slime pressed in a filter press, whereby it | pure spirit for industrial purposes. J ; ;

gives up tre juice it contains. As now commonly eonducted these Sugar-Refining.— Sugar -refiners deal indifferently with raw cane Refining.

operations—treating with lime and carbonic acid—are combined, | and beetroot sugars which come into the market, and by precisely

according to the method devised by Jelinek. The juice to be | the same series of operations. The sugar is first melted in charges

purified is heated and treated with as much as 5 per cent. of lime, | of 5 or 6 tons in blow-ups,—cast-iron tanks fitted with mechanical

while carbonic acid is simultaneously injected into the mass. The | stirrers and steam-pipes for heating the water. The solution called

juice meantime is raised to a temperature just under boiling-point. | Jiqguor is brought to a certain degree of gravity, from 25 to 33

The addition of such a large amount of lime effects the precipitation | Baumé, and formerly it was the practice to treat it, especially when

of a great proportion of the non-saccharine constituents of the juice. | low qualities of sugar were operated on, with blood albumen. The

The whole mass of turbid liquid formed by this treatment is forced | hot liquor is next passed through twilled cotton bags encased in a

into a filter press, and there the lime compounds and impurities are | meshing of hemp, through which the solution is mechanically

separated with great rapidity from the saccharine juice. Numerous | strained. From 50 to 200 of these filters are suspended in close

other methods of purification have been proposed, and to some | chambers, in which they are kept hot, from the bottom of a per-

extent have met with favourable reception ; but of these we can | forated iron tank, each perforation having under it a bag. These

only mention that of Dubrunfaut and De Massy, in which baryta | bags have from time to time to be taken off for cleaning out and

is substituted for lime, thereby producing an insoluble barium | washing. From the bag filter the liquor is passed for decolorizing

saccharate, and the analogous process of Scheibler, in which strontia | through beds of animal charcoal enclosed in cisterns to a depth

is employed in the same sense, producing likewise insoluble strontia | of from 30 to 50 fect, the sugar being received into tanks for con-

saccharate. The juice, which still contains much saline and other | centration in the vacuum pan. — In that apparatus it is boiled to

non-saccharine matter, is next filtered through animal charcoal ; grain," and the treatment is varied according to the et the

this largely removes colouring matter and carries away a further | finished sugar to be made. To make loaves small crystals only

proportion of the salts. Charcoal filtering is an expensive process; | are formed in the pan, and the granular eclipse He see.

being, moreover, a feature of the subsequent refining, many | jacketed open pans and raised to a temperature s about. ie

attempts have been made to dispense with it, and the success of | Fahr., which liquefies the grains. The hot 80 Wa is then cast

the Jelinek method in producing a comparatively pure and colour- | into conical moulds, the form of the loaf, in aes t ie a as u

less juice has given rise to hopes that it may at this stage be yet | cools crystallizes into a solid mass, still surrounded and mixed wit

dispensed with. a syrup containing coloured and other impurities. After ieee rystal- The next operation consists in concentrating the comparatively | settling and crystallization, a plug aD the bottom of t me zation. pure but thin and watery juice,—a work formerly done in open | is opened and the syrup allowed to drain away. ‘To whiten the

> UGA R

ten or twelve diffusers are employed, eight being in operation while the others are being emptied, cleaned, and refilled. These diffusers consist of large close upright cylinders capable of holding each two or three tons of sliced roots. They are provided with manholes above, perforated false bottoins, and pipes communicating with each other, so that the fluid contents of any one can be forced by pressure into any other. In working, pure water from an elevated tank is run into No. 1 cylinder, which contains the slices almost exhausted of their soluble contents ; it percolates the mass, and by pressure passes into No. 2, where it acts on slices some- what richer in juice. So it goes through the series, acquiring density in its progress and meeting in each successive eylinder slices increasingly rich in juice. Before entering the last cylinder the watery juice is heated, and under the combined influence of heat and pressure the juice within the eylinder becomes riehly eharged with sugar. No. 1 cylinder when exhausted is discon- nected ; No. 2 then becomes No. 1, and a newly charged cylinder is joined on at the other

extremity ; and so the operation goes on continuously. The juice ultimately obtained is diluted with about 50 per cent. of water; but it is of a comparatively pure saccharine quality, with less gummy, nitrogenous, and fibrous impurities than accompany the juice yielded by mechanical means.

pans by direct firing, but now carried out in closed vessels, in which the vacuum pan principle of boiling is brought into play. The apparatus consists of a series of three closed vessels, hence called a ‘triple effect,” although in some cases a two-vessel apparatus or double effect is employed. These pans are provided internally with a series of closed pipes for steam-heating, the steam from the boiler of the first passing by a pipe into the worm of the second, and similarly the steam from the second into the worm of the third when a third pan is employed. The steam which rises in the third pan is drawn off by a condenser and vacuum pump, and, as the vaeuum so created acts through the whole series, the juice 1s evaporated and concentrated at a comparatively low temperature

by the agency of the steam supplied to the first pan. The juice increases in gravity as it is drawn from the one pan to the other, till by the time it 1s run off from the third eylinder it has attained a concentration representing a gravity of about 25 Baumé. ‘This concentrated juiee is while in a heated condition filtered through fresh charcoal, from which it comes ready for boiling down to orystallization. To bring the dense juice to the crystallizing point it is necessary to conduct the evaporation at the lowest possible temperature. High temperature increases the uncrystallizable at the expense of the crystallizable portion, and burns some proportion into caramel, which darkens the liquid and the resulting sugar erystals. Boiling down at low temperature is effected by the use of the vacuum pan, a closed globular vessel in which by the aid of a condenser and air-pump a vacuum is maintained over the boiling Juice and the boiling-point is lowered in proportion to the decrease of air pressure. In vacuum pan boiling the thiek juice may simply be eoneentrated to that degree of density from which, on cooling, the crystals will form, or the crystals may be allowed to separate from the mother-liquor in the pan while the boiling proceeds; these crystals, forming nuelei, increase in size from the concentra- tion of fresh charges of

juice added from time to time. By this method the boiled-down juice as it leaves the pan consists of a

loaves they are treated with successive doses of saturated syrup, ending with a syrup of pure colourless sugar. These doses aro poured on the upper side of the cone, and, percolating down through the porous mass, carry with them the impure green syrup which still may adhere to the crystals. The liquor which obstinately remains in the interstices is driven out by suction or centrifugal action ; the loaf is rounded off, papered, and placed in a stove for drying. The syrup which drains from the loaves is sold as golden syrup. When refined crystals are to be made the contents of the vacuum pan are passed into the centrifugal machine; the syrup is then driven off by rotation, and the erystals purified either by adding pure syrup to the revolving basket or by blowing steam through it.

There are numerous modified and subsidiary processes connected with refining, as well as with all branches of the sugar industry, regarding which it is not possible here to enter into detail. The industry is essentially progressive and subject to many changes. Sorghum Sorcuum Sucar.—The stem of the Guinea corn or sorghum

United Kingdom is the only open market for sugar, which is con- sequently sold there at an unprecedentedly low price. The follow- ing table shows the relative proportions of the beet and the cane sugar trade and the principal sources of the supply for 1880-85 :—

sugar, (Sorghum piel cag) ee pie pee ne eee 1880-81. | 1881-82. | 1889-83, | 1883-84, | 1894-85, of sugar, and the possibility of cu Ivating it as a ri i Met eine and betes has attracted much attention in America. ome Be ie vo , ae ; i The sorghum is hardier than the sugar-cane ; it comes to maturity Austria-Hungary. 498,082 411,015 473.002 | 4 46,000 “558,000 in a season ; and it retains its maximum sugar content a consider- Buattechenc ct. eee 333 614 | 398,269 | 493,194 | 474,000 308,000 able time, giving opportunity for leisurely harvesting. The sugar Busia and Poland.) 250,000 | 308,779 284,991 | 308,000 | 387,000 is obtained by the same method as cane sugar. The cultivation of Hollaea sce 68,626 73,136 82,720 | 107,000 88,000

sorghum sugar has roe found ae ee a va a countries …..... 30,000 |__30,000 |__35,000 |__ 40,000 50,000 the total yield from that source in id not excee ‘ ‘ | s ___ 88000 | 50,000. Maple Mata S6ei sap of the ioe or ee joa a a cae a 1,774,545 *1860,974 | 2,147,081 | 2,361,000 2,546,000 sitgar. harinum, a large tree growing in the United States and Cana a, ; . ° eae a Tosa sarily of ees enn also occasionally finds its way See rs ees pg pee oe yO into commerce. The sap is collected in spring, just before the | | tTriniaad eee 43,600 53,400 54°000 59°800 es foliage develops, and is procured by making a notch or boring a Barbados…..... 45,000 53,000 52,000 56,000 60,700 hole in the stem of the tree about 3 feet from the ground, A tree ae eae ge ao te rea 18,000 may yield 3 gallons of juice a day and continue flowing for six Martinique …..... | 48°00 | a7’s0p 46,800} 49400 | 8’g00 weeks; but on an aoe on about 4 p “ uae are oo Guadeloupe …..... ae 157000 1522000 152:300 41,200 from each tree, 4 to 6 gallons o sap giving of sugar. € sap emerara …..... ‘ 5 ‘ ‘ 96,000 is purified and coneeStiaied in a simple manner, the whole work a. ae ne iietee lee 130409 138000 being carried on by farmers, who themselves use much of the pro- ava …...., 210,500 | 973000 283°600 | 811°400 Ee ied duct for domestic and culinary purposes. ig el ee of poe India Bie ue que 60,000 951000 e United States ranges from 30,000,000 to 0,000,000 ib, prin- TazZIS …..0… ao , ’ ‘ f i ieee obtained in OnE, New York, Ohio, and Beaaay Caaniter oe Tloilo be ol ecg eae oe ces In Canada also a considerable quantity of maple sugar is collected | | Peru… 7717”: :.{ 40,000 | 40,000 31,000 25,000 35,000 for domestic use. Bey tie sac cancers 32,000 29,000 21,000 30,000 40,000 Palm PaLM Ee tee ae on Eye the pie fie ae Total….| 1,979,900 | 2,044,000 | 2,056,000 | 2,210,400 “2,260,100. sugar. jaggery or khaur is obtained from the sap o Several palms, the Se Se ee eee wad date (Phenix sylvestris), the Palmyra Pee jlabelliformis), Beet and Cane..| 3,754,445 | 8,904,974 | 4,203,031 4,571,400 | 4,806,100 the cocoa-nut (Cocos nucifera), the gomuti (Arenga neha ania) | Thien nates values of beet and of a low quality of raw cane su ar and others. The principal source is Phentz sylvestris, which is for 1879-86 are shown in the followin g table :— § cultivated in a portion of the Ganges valley to the north of Cal- : cutta. The trees are ready to yicld sap when five years old; at Average Pricaieabh Year eight years they are mature, and continue to give an annual supply : till they reach thirty years. The collection of the sap (toddy) 1879. | 1880. | 1881. | 1889, begins about the end of October and continues, during the cool season, till the middle of*

*February. The sap is drawn off from Unclayed Manila (taal)| * 4-|s. ds. d}s dls. a. the upper growing portion of the stem, and a together an average on spot tree will run in a season 350 tb of toddy, from which about 35 tb of raw sugar—jaggery—is made by simple and rude processes. Jaggery production is entirely in native hands, and the greater ; part of the amount made is consumed locally; it only occasionally Average Prico of the Fourteen Years 1872 to 1885. | Price, August 1886, reaches the European market. Unelayed Manila (taal) ..... 14s.113d. percwt.| 8s. 8d. per ewt. Starch Starcy Sucar.—This, known in commerce as glucose or grape | | German beet; basis 88 per cent. f.o.b. 21s. 6id. | ie. " Sugar.* — sugar, an abundant constituent of sweet fruits, &c. (see p. 628 above), (J. PA.) is artificially elaborated on an extensive scale from starch. The SUGAR-BIRD, the Enelish name commonly given in industry is most largely developed in Germany, where potato starch di T lai 8 h : b & is the raw material, and in the United States, Indian corn starch | the West India Islands to the various mem ers of the being there cmployed. The starch is acted on by a weak solution | genus Certhiola (generally regarded as belonging to the of sulphuric acid, whereby soluble starch is formed, which ulti- Family Corebide 1) from their habit of frequenting the mately results in a mixture of glucose and dextrose in varying curing-houses where sugar is kept apparently attracted proportions, constituting the starch sugar of commerce. The highs by te ? fi Th IMle bird operations embrace the boiling of the starch with water containing | thither by t © Swarms or ilies, ese iTtule birds on ac- the requisite proportion of acid, the neutralization of the acid with count of their pretty plumage and their familiarity are lime, and the formation of a precipitate of sulphate of lime, which | ugually favourites, They often come into dwelling-houses, is separated by filtration in a filter press. The filtered liquid is, where they preserve great coolness, h opping gravely from when necessary, deprived of colour by passing it through a bed of : ee s p A full lon animal charcoal, and then it is concentrated to a density of from | One piece or Iurniture to another and carefully exploring 40 to 45 Baumé in a vacuum pan. If the resulting syrup contains | the surrounding objects with intent to find a spider or little dextrin it will on cooling slowly solidify into a granular con- | insect, In their figure and motions they remind a northern cretionary mass ; but if much dextrin is present it remains in the naturalist of a Nuthatch, while their coloration— black condition of a syrup. Starch sugar is very largely used by brewers 7 if

d hi : lls. to li Tit i and distillers, and by liqueur makers, confectioners, and others | Yetlow, Olive, grey, and white—reca § to him a Jitmouse. for making fruit and other syrups. Burnt to caramel, it is algo They generally keep in pairs and build a domed but un- employed to colour beverages and food substances. As an adul- tidy nest, laying therein three eggs, white blotched. with terant it is largely employed in the honey trade and for mixing rusty-red. Apart from all this the genus presents some with the more valuable cane sugar. In 1885 there were about ¢ ee Mr Sel Cot. B. Bn Wh fifty factories in Germany engaged in starch sugar making, in points of great interest. s clater (fas 0 a which 10,000 tons of hard sugar, 20,000 tons of syrup, and 1250 | Xl. pp. 36-47) recognizes 18 “species,” therein following tons of “colour” were made. Mr Ridgway (Proc. U.S. Nat. Ifuseum, 1885, pp. 25-30), Compaen: of which 8 are continental with a Joint range extending Com. At the present time, judging by the amount sent to the market, | from southern Mexico to Peru, Bolivia, and south-eastern merce,

cane aud beet sugars since vast quantities India, China, and other Eastern countrie

account, there cannot be a doubt that th

cane far exceeds that of beet sugar.

than forty years,

not have been so

of protection established in the produ

are produced in about equal amount ; but, of cane sugar are grown and consumed in s of which we get no e annual production of

Still, as a growth of not more 2 the dimensions to w attained are certainly remarkable.

hich the beet sugar trade has

But these dimensions would

ad it not been for the system cing countries and of bounties

xporting their produce, The

Brazil, while the remaining 15 are peculiar to certain of

1 Known in French as Gutt-guits, a name used for them also by some English writers, The Guitguit of Hernandez (Rer. Medic. N. Hisp. Thesaurus, p. 56), a name said by him to be of native origin, can hardly be determined, though thought by Montbeillard (ist. Nat. Oiseaux, v. p. 529) to be what is now known as Cereba cerulea, but that of later writers is C, eyanea, ‘he name is probably onomato- poetic, and very likely analogous to the ‘“Quit ” applied in Jamaica to several small birds.

the Antilles, and several of them to one island only. Thus C. cabott is limited, so far as is known, to Cozumel (off Yucatan),! C. tricolor to Old Providence, C. flaveola (the type of the genus) to Jamaica, and so on, while islands that are in sight of one another are often inhabited by different “species.” Further research is required; but even now the genus furnishes an excellent example of the effects of iso- lation in breaking up an original form, while there is com- paratively little differentiation among the individuals which inhabit a large and continuous area. The non-appearance of this genus in Cuba is very remarkable. (A. WN.)

SUGDEN, Epwarp BurtensHaw. See St Leonarps, Lorp.

SUHL, a manufacturing town in an isolated portion of Prussian Saxony, is picturesquely situated on the Lauter, on the southern slope of the Thuringian Forest, 64 miles to the north-east of Meiningen and 29 miles to the south- west of Erfurt. The armourers of Suhl are mentioned as early as the 9th century, but they enjoyed their highest vogue from 1550 to 1634. The knights of south Germany especially prized the swords and armour of this town, and many of the weapons used in the medieval campaigns against the Turks and in the Seven Years’ War are said to have been manufactured

at Suhl. Its old popular name of the “armoury of Germany” is more appropriate, how- ever, to its past than to its present position, for, already seriously crippled by the ravages of the Thirty Years’ War and by frequent conflagrations, it has suffered considerably in more modern times from the competition of other towns, especially since the introduction of the needle-gun. It still contains, however, large factories for firearms (military and sporting) and side arms, besides iron-works, machine- works, potteries, and tanneries. The once considerable manufacture of fustian has declined. A brine spring (Soolquelle) at the foot of the neighbouring Domberg is said to have given name to the town. The population in 1880 was 9937 and 10,605 in 1885. Suhl, made a town in 1527, belonged to the early principality of Henne- berg, and formed part of the possessions of the kingdom of Saxony assigned to Prussia by the congress of Vienna.

SUICIDE. The phenomenon of suicide has at all times attracted a large amount of attention from moralists and social investigators. Though of very small dimensions, even in the countries where it is most prevalent, its exist- ence is rightly looked upon as a sign of the presence of maladies in the body politic which, whether remediable or not, deserve careful examination. To those who look at human affairs from a theological standpoint, suicide neces- sarily assumes a graver aspect, being regarded, not as a minute and rather obscure disease of the social organism, but as an appalling sign of the tendency of man to resist the will of God. Compare Frno pz Sz. As a great number of persons are, either directly or indirectly, under the influence of the theological bias, and as the act of suicide is in itself of a striking character to the imagina- tion, the importance of the phenomenon from a sociological point of view has been to some extent exaggerated, especi- ally in those countries of the Continent where suicides are most numerous. Moreover, the matter has during the last twenty years become of direct interest to the Govern- ments of those countries where the whole able-bodied male population are more or less under the control of a military organization ; for, rightly or wrongly, a portion of the recent considerable increase in the suicide rate of Prussia, Saxony, Austria, and France is attributed to dislike of

military service. It may be observed in passing that the SSS) eee eee ee

1 In the article Brrps (iii. p. 749) attention was drawn to what was then believed to be a fact—namely, that the form found in this island was identical with that which inhabits the Bahamas; but now the two forms are regarded as distinct.

suicide rate among soldiers is high in all countries, Great Britain not excepted, as was shown by Mr W. H. Millar in the Journal of the Statistical Society, vol. xxxvii., 1874, and more recently by Dr Ogle in the same Journal, vol. xlix. (March), 1886. As enlistment is voluntary in the United Kingdom, the alleged dislike to conscription can- not be the sole cause of the high rate prevailing in some of the Continental states. Before referring to the more general characteristics of suicide, it will be well to furnish some idea of its magnitude in relation to the category of social phenomena to which it belongs, namely, death. The following tables are constructed for this purpose. The first (I.) gives the absolute number of cases of suicide as officially stated in a number of countries for a series of

I, Statement of the Number of Cases of Swieide in the Principal Coun- tries of Europe during the undermentioned Periods and Years.

at ie | TS al et BI oT eae as

Periods.| 3 | 2 | 3 |eu3| @ | 2| 8 8 1S pe aS

b/s |e |P8s| Ble] 2/3 [24] 5 % 5

Pa =

n|Aa/A IA ale lae |s 45

1836-40 | 214] 113| 272} 967 | 1471 | 183] 2574 .. | .. | 264] 528

1841-45 | 212|138| 806] .. | 1642 |1235] 2951/1890| :: | 247) 340] 595

1846-50 | 229] 150| 341) .. | 1696 [1263] 3446] .. | 185] 218] 373|177

1851-55 | 253 | 154| 402] 1025 | 2075 | 166] 3639] 150| 196] 275| 496| 666 1856-60 | 211| 145] 446] 1310 | 2152 | 213] 4002|170| 144] 339] 509|1799] -. 1861-65 | 301 | 141 |1431] 1343 | 2247 | 221/14700] 189 |1175|1384| 601 | 1051 | 1718 1866 |309|121| 443] 1329 | 2485 | 215] 5119|189| 244] 410] 704|1265| 588 1867 | 371|131| 469] 1316 | 3625 | 365] 5011) 198] 270) 471| 752|1407| 753 1868 |366|130| 498] 1508 | 8658 | 376| 5547| 212| 283| 441| s00|1566| 784 1869 |356|131) 462] 1588 | 3544 | 257| 5114| 221| 251| 430| 710|1375| 633 1870 |369|148| 486] 1554 | 8270 | 838] 4157|195| 247| 459] 657|1510| 788 1866-70 | 354 | 133| 472] 1459 | 3816 | 310| 4989] 203| 259] 449] 725 739 1871 |821|128) 505] 1495 | 8135 | 367| 4490| 244| 238) 419] 6538/2040] 836 1872 |309|132) 464] 1514 | 8457 | 356| 5275|219| 258| 405] 687|2194| 890 1873 |337|126) 439] 1518 | 8345 | 877| 5525|216| 804] 447| 723|2463| 975 1874 |394| 99] 439] 1592 | 3490 | 874] 5617| 244| 289) 450) 723 | 2617 | 1015 1875 |376|144| 394] 1601 | 8432 | 336] 5472|226| 334| 459| 745 | 2741] 922 1871-75 | 347|126| 448] 1544 | 3368 | 362] 5256|231| 294] 436) 706) 2411] 923 1876 |409|142| 507| 1770 | 4448 | 439] 5804| 269] 343] 522) 981 | 3376 | 1024 1877 | 430/130] 530| 1699 | 4563 | 470| 5878| 291| 824] 650) 1114 | 8598 | 1139 1878 |411|132| 544] 1764 | 4992 | 490] 6434] 817 | 425] 674| 1126 | 3486 | 1158 1879 | 438/141] 505| 2035 | 4881 | 553] 6496| 309| 380] 750| 1121 | 3469 | 1295 1880 | 384|124| 496] 1979 | 5034 | 591] 6638|338] 871] 682| 1171 | 3649 | 1261 1876-80 | 414 | 134| 516] 1849 | 4784 | 509] 6250] 305] 369] 656| 1103 | 3516 | 1161 1881 | 384/123] 495] 1955 | 5159 | 550| 6741] 306] 348] 695] 1248 | 3504] 1313 iss2 | 482/136] 505] 1965 | 5312 | 595] 7213/2838] .. | 724| 1128 | 3530] 1389 1883 | 470| 134] 513] 1962 | 5337 | 599] 7267| 341 .. | 1205 | 3595 | 1456 1884 |431| .. | .. | 2043 | 5013 a . [8783] ..

1881-84 | 442 1981 | 5205 | .. 3603

II. Statement of the Estimated Population of the undermentioned Countries in the Years 1868, 1876, and 1882; the Number of Deaths from Suicide and other Causes in the same Years in the same Countries ; and the Proportions borne by the Deaths to the

Population in each ease.” A.—1868.

Number of Estimated yt nw Population Inhabitants Countries. in the Le ee Middle of ; the Year. Total. DASE ee ee ee | __ Ce ae ee eee 20,026,554 |

1986 | 569,566 | 571,552 28,401 ae 17453,9393| 212 | 39,677 | 39,889 | 146 27,984 BA ALION close owtelsie 4,750,0004 158,559 | 159,0005 33,377 Bolginm…..s1..0.. 4,961,644 107,180 | 107,556 21,625 WenmMarls .cesgaccens 1,748,000 33,318 | 33,816 19,015 POORGS occas cess ie 38,829,617 916,491 | 922,088 23,955 DAW cco lscstececne 25,434,376 776,440 | 777,224 | 31 180,569 Genii… cows 247,069,379 655,070 | 658,728 | 152 |27,248 RALONN S Weancnecie 2,453,555 71,918 | 72,718 29,315 Ryfedeii.c occ. ccs0es 4,173,080 87,441 | 87,807 20,912 United Kingdom— England and Wales| 21,948,718 | 1508 | 479,114 | 480,622 | 69 (21,781/21,800 Triad severe dwvera-ss 5,465,914 87 86,098 86,185 | 16 |15,784)15,800 Beotland . oc. is ae 8,275,350 128 | 69,293 69,416 | 387 /21,163)21,200 158,090,121 |16,886 |4,050,165 4,066, 551 104 |25,636|25,740

rr ee rrr nnn nn a PURE URDU ARI

1 Uncertain data. 2 Still-births are excluded.

8 Adding natural increase of 1868 to population of 1867 (Kolb).

4 Estimate, deducting natural increase of 1869-1870 from figure in census of 1871. 5 159,186 including still-births.

630

years. Table II. (A, B, C) refers to three separate years and shows the number of cases of suicide relatively to all the deaths and to the population for certain countries, The totals for the countries in question are also given. Table I. is obtained from Morselli (Table I.) with the addi- tion of figures that have been published since his work appeared.’ Table III. gives the figures relating to three States of the American Union which have published statis- tics on the subject.

a

II. B.—1876. Number of Estimated Deaths Deathe per Population De eee Countries. k 2 ae ‘ Inhabitants. Liddle o cs) a8 Of aa aS) AS the Wear | S| ee | come ie ee Total.| ot a} Ss aAlPS PAUCIVES Goreme ecw 21,319,544 |

2438 631,925 | 634,363 | 114 29,686]29,800 Page terccess) hin 1,507,179 269 | 40,054 | 40,328 | 178 |26,582/96,760 BaVAri oceans 5,022,390 | 522 | 158,674 | 154,196 | 104 |30,596130,700 Belpiume..00). 000. 5,836,185 | 439 | 116,348 | 116,787 | 2 /21,818]21.900 Denmark ……..... 1,893,100 | 506 | 36,859 | 37,365 | 267 |19,433)19,700 INEIAED Go onvoonson 36,905,788 | 5804 | 828,270 | 834,074 | 157 |22,443109 600 Italy ,200888o0000000 27,625,825 | 1024 795,396 | 796,420 | 37 28,763/28,800 Prugeiam … 70a. 25,921,687 | 3917 | 656,469 | 660,386 | 151 |25,349125,500 Saxony) ..... 26.1. 2,800,0003, 981 | 77,140 | 78,121 | 350 |27,550/97,900 Siveden …....060<< 4,429,713 409 | 85,925 | 86,334 | 92 19,508)19,600 United Kingdom— England and Wales 24,370,267 | 1770 | 508,545 510,315 | 78 |20,827|20,900 Ireland' ..)..0.4. 5,277,544 | 111 | 92,218 | 99.394 | 20117,279117,300 Scotland,..... 3,552,183 | 131 | 73,998 | 74,129 | 37 |20,863/20,900 165,961,405 18,321/4,096, 816 4,115,137; 110 |24,690/24,800 II. C.—1882. Number of Estimated Deaths Deaths per i 1,000,000 Population Inhabitant Countries, in the DEE ILATIUS Middle of 3 AEs 5 oO the Year. es 2 2 Total. a | oS JAWSINOEY 5 aan Ban Gou on 22,316,567 | 3530 683,421 | 686,951 | 158 30,642 oo loners svs80'782 | a4 |1er'eoe | 1earaae (2 eapaee Belgium …2.0001.1.] 5/656,197 | 505 113,708 | 114298 203095 Denmark ……..... 2,008,100 | 513 | 38,295 | 38/738 19,045 BAT CEG oe sti cncer 37,769,000 | 7213 831,326 | 838,539 22,009 MCN Sicedivive svc esse 28,596,512 | 1389 785,937 | 787,326 27,451 PRUSSIBN feelin Ne 27,796,189 | 5812 | 694,979 | 700,291 25,009 NAXKODY) ae qese. ces ce 3,040,000 | 1128 | 85,106 86,234 27,999 co. vedgig."| 979125 | 482) 78,924 | 79,406 17,295 England and Wales 96,413,861 | 1965 514,689 | 516,654 19,526 Urelend) .. cs. . cee 5,097,853 | 105 | 88,395 | 88,500 17,379 Scotland……..... 3,785,400 | 167 | 72,822 72,989 19,256 174,043,732 23,406 4,178,609 4, 202,015/ 134 |21,986 | |

III. Statement of the Number of Deaths by Suicide in the under- mentioned States of the American Union in the Years named, with their Proportion to the Population.

Massachusetts. Rhode Island, Connecticut. ais! 1,006,600 1,000,000 1,000,000 tl 2 i d > Total. | Inhabit. | Total | 7200000) Total, Inhabit- ants.4 ants.4 ants.4 1870 91 62 Pate 124

1871 122 82 19 84 1872 117 76 18 77 1878 117 74 8 33

1874 115 71 18 (Oo 1875 159 96 26 101 ne on 1876 119 ie 18 69 49 83

1877 163 98 22 83 52 84 1878 126 76 21 78 55 83

1879 16] 94 13 48 58 95 1880 ioe 75 10 36 48 77

1881 165 88 23 82 69 109 1882 162 88 31 109 65 101

1883 167 89 25 On

1884 184 96 85

1 The figures for Austria up to 1871, although collected by the official registrar, are far from trustworthy. Since 1873 more reliable data have been obtained by the Sanitary service. The registrar's figures for 1871 and 1872 have been corrected by Dr N ecumann-Spallart ; those for the succeeding years are the figures of the sanitary service. A comparison of the returns from the two official sources shows that the figures of the latter authority are (except in two cases) 30 per cent. greater than the corresponding figures furnished by the former. , 2 Ist December 1875. 3 2,760,586 in 1875.

4 Population caleulated from average annual increase since 1880,

SU LGD &

The first feature which appears prominently in connexion with these tables is, as already observed, the small absolute amount of suicide officially reported. There is, however, a general consensus of opinion among those who have made a special study of this branch of vital statistics, to the effect that the number of suicides which actually occur is rather greater than is shown by the official returns. This opinion is based on the known natural repugnance on the part of those concerned to make a declaration that any person found dead committed suicide if his death can be accounted for in any other way. Continental statisticians think that this tendency to " give the benefit of the doubt " in cases of apparent suicide in the manner least likely to give pain to the relatives and friends of the deceased is more strongly

operative in England than in other countries, —an opinion which may be fairly considered doubtful when we bear in mind the remarkable difference between the two sets of official figures for Austria. It is not, however, maintained that the number of suicides is much understated, even in England, at any rate of late years. It may be observed that the information on the subject in any country cannot be much relied upon for years previous to 1850, at the earliest, and previous to 1860 for the United Kingdom. Perhaps an exception may be made in favour of the figures for Norway and Sweden. Differences in the mode of de- termining cases of supposed suicide in different countries make it necessary to be very careful in preparing "international" statistics of suicide. The remarks made by Dr Ogle in the paper already referred to are worth careful attention. He says: "I have been tempted to compare the English figures with those of foreign countries. I have, however, rigidly abstained from doing so. Those who have read the laborious treatise of Morselli on suicide, and have noted how heterogeneous in form and how unequal in numerical efficiency were the materials from different coun- tries with which he was forced to be content, will, I think, agree with me that it is at present more essential that statisticians should look to the accuracy and sufficiency of the returns of their own several countries than that they should indulge in premature comparison." The tables given above are not conceived in a spirit contrary to these judicious observations, but are merely intended to supply indications of the general nature of the phenomenon as met with in different countries. Those who wish to inquire more fully into the matter will find all the available information in the works of Morselli and Legoyt.

It is quite admissible, subject to the above reservations, to point out briefly, and if possible to explain, the leading features brought into relief by the tables. It will be seen that from 1868 to 1876 suicide increased in all countries for which returns were available in both years, not merely in number, but relatively (except Denmark, Prussia, and Scotland) to the population, and the figures for the years subsequent to 1876 do not show any linprovement in this respect. It will also be observed that the figures for the United Kingdom and Italy are low, those for Austria, Bavaria, Belgium, and Sweden moderate, those for Prussia, Baden, and France high, and those for Saxony and Den- mark very high. Attempts have been made to account for these differences by considerations derived from (1) race, (2) climate,

(3) density of population, and other circum- stances ; but it cannot be said that any satisfactory result has been obtained from these investigations, owing no doubt to the fact that the phenomenon is too minute to furnish numbers large enough for the proper application of the statistical method. Investigations into certain other points have been more successful, such as the relative pro- portions of the two sexes as regards number of suicides, the relation of the number of suicides to the age scale (see PoPpuLATION) of the population, and also the distribution

of the cases of suicide over the months of the year. Most valuable inquiries have also been made into the distribu- tion of suicides with regard to occupation, with results which appear to show that suicide is more prevalent among the educated than among the illiterate classes. For the suicidal tendency in insanity, see vol. xiii. pp. 105-6.

Scx.—It will have been observed that, apart from fluctuations in particular years, the various countries maintain fairly constant re- lations to one another as regards number of suicides. The series of numbers in Table I. is fairly regular, in each country usually in- creasing as the population increases, but in several cases faster. The proportion of female to male suicides is also fairly constant, so far as experience has hitherto gone. Broadly speaking, female suicides are never less than 15 per cent. and never more than 30 of the average annual number of suicides in any country. In England the proportion is high, having during the period 1863-76 averaged 26 per cent. In France the rate is nearly as high, though it appears to have been decreasing of late. In Prussia and most German states the rate is under 20 per cent. For further details reference may be made to Morselli, and for England and Wales to Dr Ogle’s paper already inentioned.

Age.—The influence of age on suicide shows considerable regu- larity in each country from year to year, and a certain degree of similarity in its effects is perceptible in all countries. Morselli gives a number of tables and diagrams, a study of which indicates a variety of interesting features. The observations already made as to the minuteness of the whole phenomenon in relation to the social organism must be particularly borne in mind in drawing conclusions from investigations which involve the breaking up of

numbers already small into parts. Itis true that, by adding to- gether the corresponding figures for a scries of years, fairly large numbers may be obtained, even for those parts of the age scale which, in any single year, yield only one or two cases of suicide, or even occasionallynone. But this mode of obtaining an enlarged image of the age scale of suicide must be cmployed with caution, since there may have been changes in the tendency to suicide, in the age scale, and in the occupations of the people during the period. Dr Ogle has prepared a table (IV.) which gives as correct a repre- sentation of the effect of age on suicide in England and Wales as it is possible to furnish. The age scale of suicide in question is also fairly representative of the corresponding age scales of other countries, though in each country slight variations from the typical scale are apparent at different parts of it.

IV. Average Annual Suicides in England and Wales at successive Age Periods per million Lives, 1858-83 (Ogle).

Rates per Million.

Rates per Million.

ee = Persons. | Males. | Females. Persons. | Males. | Females.

10 4 4 3 55 251 396 119

15 28 26 30 65 248 894 T1313}

20 47 62 34 75 183 806 85 25 69 99 42 85 116 226 46

85 116 175 62 ———

45 184 271 103 All ages} 72 104 4]

It will be seen that, taking both sexes together, the suicide rate rises steadily and rapidly after the tenth year has been passed, attaining its maximum in the period fifty-five to sixty-five years, after which it remains almost stationary for another ten years, When it sinks rapidly. Although no figures are given for any period previous to the tenth year, Dr Ogle mentions that

there were actually four cases of suicide of children between the ages of five and ten during the twenty-six years observed. Child suicide is apparently of more frequent occurrence on the Continent than in the British Isles. It is important to notice that the age scale of suicide for women is materially different from that for men. If represented by a diagram its curve makes a smaller angle with the base line than the corresponding curve of male suicide. As might be expected from the fact that females become fully developed, both in mind and body, at an earlier period of life than males, the suicide rate for women is relatively very high during the years fifteen to twenty, being in England and several other countries actually higher than that for men. Comparison between different countries in this respect is difficult, but the figures given by Morselli (Table xxvi. in his work) show that during the period in question the number of female suicides increases with great rapidity in all countries. Regarding the suicide of young persons of both sexes, Dr Ogle observes that it is higher than is generally supposed. ‘‘Few,” he says, ‘‘ would imagine that one out of every 119 young men who reach the age of 20 dies ultimately by his own hand; yet such is the case.” According to Dr Ogle’s figures, 1 out of every — who reach the age of 15 ultimately dies by her own

and.

Influence of Occupation.—The difficulty of investigating the mode in which the suicide rate is affected by differences of occupation is

considerable. Dr Ogle has with great labour worked out the figures for males for the six years 1878-83 in England and Wales. He obtained about 9000 cases of the suicide of persons with known occupations ; these he compared with the statement of occupations obtained from the census of 1881, taking account of the very con- siderable variety in the average age of the persons in each occupa- tion. This precaution was necessary in an attempt to ascertain whether the persons engaged in any particular occupation were more liable to suicide than those in other occupations, for the effect due to the occupation would in some cases be entirely obliterated by the effect due to age. The general result of his labours! was that the rate for soldiers is enormously in excess of that for any other occupation. It is

followed at a considerable distance by inn- keepers and other persons having constant access to alcohol,—a fact which certainly suggests that an excessive use of spirits is one of the principal causes of suicide. But another reason for the high rate among soldiers is certainly the fact that they have a ready and effective means of destruction constantly at hand. In like manner the high rate of suicide among medical men, chemists, and druggists may be attributed in part to their familiarity with poisons. Hardly any other general inferences can be drawn without entering on matters of conjecture, except that, excluding the case of clergy- men, the rate of those occupations which involve no serious bodily labour is higher than that observed in persons who work chiefly with their hands. It is impossible to make any satisfactory com- parison in this respect between England and Wales and other coun- tries, as the divisions of occupations in different countries are not on the same plan. It would be very advantageous if some approach to a common list of occupations could be adopted by all states ; but there is little prospect of that being realized for some time to come. It is, however, satisfactorily established that in all countries the uate rate is higher for the educated than for the uneducated classes. .

Season. —May and June are in most countries the months in which most suicides occur; but in some countries, such as Bavaria and Saxony, the maximum isin July. The difference between the warm and cold portions of the year is more marked in female suicides than in male suicides, especially in Italy. This is probably due to the fact that women show a tendency to adopt drowning as a mode of killing themselves, and that there is more shrinking from a plunge into water in cold than in warm weather. The fact that the maximum number of suicides occurs in the hot season, during which, according to Morselli and other Continental statis- ticians, insanity is more frequent than in the cool portions of the year, has been alleged as a reason for the high suicide rate in May, June, and July.

Modes of Suicide.—The favourite mode of suicide in England is among men hanging and among women drowning,—about one- third of the suicides of each sex being effected in these modes respectively (Morselli, Table xlv.). In Italy, however, the most common mode is by gunshot among men, and after that by drown- ing, hanging being less usual. A very large number of Italian women drown themselves, the proportion being in some

years over 50 per cent. of the total. In Prussia considerably over one-half the male suicides hang themselves, and women also make use of the rope more than in England. The use of poison is more common among English women than among those of Italy and Prussia.. Dr Ogle observes that women take less care than men to select painless poisons, nearly 50 per cent. of female suicides by poison in England during the years 1863-82 being effected by means of strychnia, vermin killer, carbolic acid, and oxalic acid, while 60 per cent. of the men employed prussic acid, laudanum, and other comparatively painless poisons. Dr Ogle, Morselli, and other writers have investigated the connexion between the choice of means and the age of suicide. Dr Ogle has also compiled a valuable table relating to method of male suicide in relation to occupation.

The whole subject has been treated exhaustively by Morselli in his Ji lSuicidio, Saggto di Statistica Morale Comparata, Milan, 1879 (Eng. trans., Suicide: Essay on Comparative Moral Statistics, London, 1881). Reference may also be made to A. Legoyt's Le Suicide Ancien et Moderne, Paris, 1881. This volume contains much interesting historical matter, but is inferior as a statistical work to that of Morselli. It contains, however, a useful bibliography of works on suicide.

Oficial Information.—Accurate information regarding suicide has for many years been given for all the countries of which mention has been made above in the publications of their respective Governments. For other countries the available statistics are meagre, accurate figures having in many cases only recently been obtained from Finland, Switzerland, Holland, Hungary, Croatia, Spain, and three or four of the States of the American Union. There are no figures for the whole United States, and none of value for any other countries. Such statistics as are in existence for these countries will be found in Confronti Internationali per gli Anni 1865-83 (Rome, 1884), published by the Italian General Statistical Department. (W. HO.)

SUIDAS, the author of a Greek lexicon. His personal life is totally unknown and even his date is uncertain. He must have lived before Eustathius (12th century), who quotes him repeatedly. Under the heading "Adam" the author of the lexicon gives a brief chronology of the

1 See Stat. Jour., March 1886, p. 112.

world, ending with the death of the emperor John Zimisces, Under “Constantinople” are mentioned the emperors Basil and Constantine, who succeeded John Zimisces in 975. It would thus appear that Suidas lived in the latter part of the 10th century. The passages in which Michael Psellus (who lived at the end of the 11th century) are referred to are thought by Kiister to be later interpola- tions; one of them is wanting in the Paris MSS. The lexicon of Suidas is arranged alphabetically, with some slight deviations from the strict alphabetical order. I¢ partakes of the nature of a dictionary and encyclopedia, containing not only definitions of words but also short articles on historical, biographical, geographical, and anti-quarian subjects. It includes numerous quotations from ancient writers ; the scholiast on Aristophanes in particu- lar is much used. Although the work is uncritical and the value of the articles very unequal, it contains a great deal of important information on ancient history and life. It deals with Scriptural as well as pagan subjects, from which we infer that the writer was a Christian. Prefixed to the work is a notice stating “the present book is by Suidas, but its arrangement is the work of twelve learned men,” and then follow their names,

The first edition of Suidas was that by Demetrius Chalcondylas (Milan, 1499), the next by Aldus (Venice, 1514). The chief later editions are those by L. Kiister (Cambridge, 1705), by T. Gaisford (Oxford, 1834), and by G. Bernhardy (Halle, 1834-1853). There is a cheap and convenient edition by Im. Bekker (Berlin, 1854).

SULLA (138-78 3.c.). The life of Lucius Corneljus Sulla makes one of the most important chapters in Roman history. Both as a general and as a politician he stands in the foremost rank of the remarkable figures of all time. It was by his ability and his force of character that Sulla, who had neither great wealth nor noble ancestry 1 to back him up, pushed himself to the front in early manhood, distinguishing himself in the J ugurthine War in 107 and 106, and being able with a good show of reason to claim the credit of having terminated that troublesome war by capturing Jugurtha himself. In these African campaigns Sulla showed that he knew how to win the

hearts and confidence of his soldiers, and through his whole subsequent career the secret of his brilliant successes seems to have been the enthusiastic devotion of his troops, whom he continued to hold well in hand, while he let them indulge themselves in plundering and in all manner of licence. “ Rome’s soldiers from Sulla’s time,” says Sallust (Cat., 11), “began to drink, to make love, to have a taste for works of art, to rob temples, and to confound things sacred and profane.” From the year 104 to 101 he served again under Marius in the war with the Cimbri and Teutones and fought in the last great battle near Verona, which annihilated the barbarian host. -Marius, it is said, was jealous of him, and any friendly feeling there may have hitherto been between the two now finally ceased. Sulla on his return to Rome lived quietly for some years and took no part in politics. What with his genuine love of letters and his love of gay company he was never at a loss for amusement, and he must always have been a particular favourite with fashionable Society at Rome. In 93 he was elected pretor after a lavish squandering of money, and he delighted the populace with an exhibition of a hundred lions from Africa, from the realm of King Bocchus. Next year (92) he went to the East with special authority from the senate to put pressure on the famous Mithradates of Pontus, and make him give back Cappadocia to its petty prince Ariobarzanes, one of Rome’s dependants in Asia, whom he had driven out. Sulla with a small army Soon won a victory over the general of Mithradates, and Rome’s client-king was restored. An embassy from

u ile belonged to quite a minor branch of the Cornelian gens,

the Parthians now came to solicit the honour of alliance with Rome, and Sulla was the first Roman who held diplomatic intercourse with that remote people. In the year 91, which brought with it the imminent prospect of revolution and of sweeping political change, with the enfranchisement of the Italian peoples, Sulla returned to Rome, and it was generally felt that he was the man to head the conservative and aristocratic party. Who was to have the command in the Mithradatic War and be en- trusted with the settlement of the East was the question of the day, and the choice lay plainly between Marius and Sulla. The rivalry between the two men and their

partisans was as bitter as it could possibly be. Marius was old, but he had by no means lost his prestige with the popular party.

Meanwhile Mithradates and the East were forgotten in the crisis of the Social or Italic War, which broke out in 91 and threatened Rome's very existence. The services of both Marius and Sulla were needed, and were given; but Sulla was the more successful, or, at any rate, the more fortunate. Of the Italian peoples Rome's old foes the Sam- nites were the most formidable ; these Sulla thoroughly vanquished, and took their chief town, Bovianum. But his victories were, after all, followed by the concession of the franchise to the Italian towns and communities generally, though an arrangement which made them vote in separate tribes greatly diminished their political power and became a further source of irritation. It was clear that Rome was on the eve of yet further troubles and revolutionary changes. Her armies, now recruited from the very scum of the population, had not the loyal and honourable spirit of former days, and cared only for licence and plunder. On every side it seemed that public life was demoralized and politics degraded. In 88 Sulla was consul; the revolt of Italy was at an end 3 and again the question came to the front—who was to go to the East and encounter the warlike king of Pontus, against whom war had been declared. The tribune Publius Sulpicius Rufus moved that Marius should have the command ; there was fearful rioting and bloodshed at Rome at the prompting of the popular leaders, Sulla narrowly escaping to his legions in Campania, whence he marched on Rome, being the first Roman who entered the city at the head of a Roman army. Marius now had to fly; and he and his party were crushed for the time.

Sulla, leaving things quiet at Rome, quitted Italy in 87 for the East, taking Greece on his way, and for the next four years he was winning victory after victory against the armies of Mithradates and accumulating boundless plunder. Athens, the headquarters of the Mithradatic cause, was taken and sacked in 86, and Sulla possessed himself of a library which contained Aristotle's works, In the same year at Chewroneia, the scene of Philip of Macedon's memor- able victory more than two and a half centuries before, and in the year following, at the neighbouring Orchomenus, he scattered like chaff, with hardly any loss to himself, imimense hosts of the enemy. Crossing the Hellespont in 84 into Asia, he was joined by the troops of

Fimbria, who soon deserted their general, a man sent out by the Marian party, now again in the ascendant at Rome. The same year peace was concluded with Mithradates on condition that he should resign all his recent conquests, give up all claim to meddle with Rome's Asiatic dependencies, and pay a considerable indemnity. In fact the king was to be put back to the position he held before the war 3 but, as he raised cavils and Sulla's soldiers wanted better terms and more spoil, he had in the end to content him- self with being on the same footing as the other princes of Asia,—simply a vassal of Rome.

Sulla returned to Italy in 83, landing at Brundusium,

having previously informed the senate in an official de- spatch of the result of his canipaigns in Greece and Asia, and announced his presence on Italian ground. He com- plained, too, of the ill-treatment to which his friends and partisans had been subjected during his absence. The revolutionary party, specially represented by Cinna, Carbo, and the younger Marius, had massacred them wholesale, confiscated his property, and declared him a public enemy. They felt they must resist him to the death, and with numerous bodies of troops scattered throughout Italy, and the support of the newly enfranchised Italians, to whom it was understood that Sulla was bitterly hostile, they counted confidently on success, but on Sulla's advance at the head of his 40,000 veterans many of them lost heart and deserted their leaders, while for the most part the Italians themselves, whom he confirmed in the possession of their new privileges, were won over to his side. Only the Samnites, who were as yet without the Roman fran- chise, remained his enemies, and it seemed as if the old war between Rome and Samnium had to be fought once again. Several Roman nobles, among them Cneius Pom- peius (Pompey the Great), Metellus Pius, Marcus Crassus, Marcus Lucullus, joined Sulla, and in the following year (82) he won a decisive victory over the younger Marius near Preeneste (Palestrina), and then marched straight upon Rome, where again, just before his defeat of Marius, there had been a great massacre of his adherents, in which the famous and learned jurist Mucius Scevola perished. Rome was at the same time in extreme peril from the advance of a Samnite army, and was barely saved by

Sulla, who, after a bloody and very hard-fought battle, routed the enemy before the walls of Rome. With the death of the younger Marius, who killed himself after the surrender of Preeneste to one of Sulla's officers, the civil war was at an end and Sulla was master of Rome and of the Roman world. Then came, with the object of breaking the neck of the Marian or popular party, the memorable "'proscription," when for the first time in Roman history a list of men declared to be outlaws. and public enemies was exhibited in the forum, and a reign of terror— a succession of wholesale murders and confiscations through- out Rome and Italy—made the name of Sulla for ever infamous. The title of "dictator" was revived after a long period and conferred upon him ; Sulla was in fact emperor of Rome, with absolute power over the life and fortunes of every Roman citizen. There were of course among them some really honest well-meaning men who looked up to him as the "saviour of society." After celebrating a splendid triumph for the Mithradatic War, and assum- ing the surname of "Felix" ("Epaphroditus," " Venus's favourite," he styled himself in addressing Greeks), he carried in 80 and 79 his great political reforms (see Rome, vol. xx. pp. 761-762). Of these the main object was to invest the senate, the thinned ranks of which he had recruited with a number of his own creatures, with full control over the state, over every magistrate and every province, and the mainstay of his political system was to be the military colonies which he had established with grants of land throughout every part of Italy, to the injury and ruin of the old Italian freeholders and farmers, who from this time dwindled away, leaving whole districts waste and desolate. Sulla's work had none of the elements of permanence ; it was a mere stop-gap purchased at the cost of infinite misery and demoralization.

In 79 Sulla resigned his dictatorship and retired to Puteoli, where he died in the following year, probably from the bursting of a blood-vessel, though there is a story that he fell a victim to a particularly loathsome disease similar to that which cut off one of the Herods (Acts xii. 23). The half lion, half fox, as his enemies

called him, the "Don Juan of politics," to quote Momm- sen's happy phrase, the man who carried out a policy of "blood and iron" with a grim humour,

amused himself in his last days with actors and actresses, with dabbling in poetry, and completing the Memoirs of his strange and eventful life.

_For Sulla and his times, there is his Life by Plutarch, who had his Memoirs for one of his authorities, and there are very numerous references to him in Cicero's writings. The best and fullest modern account of him is that of Mommsen (vol. iii., bk. iv. ch. 8, 9). (W. J. B.)

SULLY, Maximiniran pu Biruunr, DuKe or (1560- 1641), French statesman, was born at the chateau of Rosny near Mantes on 13th December 1560. He derived his early appellation and the title of baron from the place of his birth, and was known as Rosny during the greater part of his life. Some one of his numerous enemies pretended that he did not really belong to the illustrious family represented four centuries earlier by the trouvére and warrior Quenes de Béthune, but that his race was derived from Scottish Bethunes of no mark. There is, however, no reason for giv- ing any credit to this story. Sully was a second son; his elder brother died when but just of age, and even before this his father (if his own account may be trusted) treated Maxi- milian (so he himself spelt his name, and not Maximilien) as an eldest son. He was only eleven years old when his father, who was a Protestant, was presented to Henry of Navarre, and from that time he was more or less inseparably attached to the future king of France. He had a narrow escape on St Bartholomew's Day, but he did escape, and when little more than sixteen began to take an active part in the Civil Wars. He distinguished himself not a little, especially in the character of engineer. In 1583 he married Anne de Courtenay, who, however, died in 1589, and in the intervals of war he lived the life of a country gentle- man at Rosny. At the battle of Ivry, 1590, he had the good luck, though seriously wounded, to capture Mayenne's standard. As soon as Henry's power was established, Sully, who, though by no means always a complaisant or obliging servant, had been uniformly faithful, received his reward in the shape of numerous places, estates, and dignities. In 1601 he was made grand-master of the ordnance and in 1606 duke of Sully. He was also practi- cally the king's minister of finance during the greater part of his reign. After the assassination of his master he makes no further figure in history, though he survived for many years, saw the rise of a far greater minister than himself,

and did not die till (less than a year before Riche- lieu himself died) the 22d of December 1641, at Villebon near Chartres.

He had married a second time, and anecdote is not compliment- ary to his second wife, while his daughter, who married the great duke of Rohan, also had a not unblemished reputation. Sully, however, who, though deprived of (and indeed resigning) all con- trol of public affairs after Henry's death, retained great wealth, lived in what was almost a caricature of the stately fashions of the time, and busied himself in the composition of memoirs which are among the most curious in form, and not the least interesting in contents, of the kind. He instructed his secretaries to draw the book up in the form of an elaborate address to himself: "you then did this" ; '' you said as follows"; "as you have been good enough to inform us, the affair went on this wise"; and so forth. And he not only had the book executed in this extraordinary fashion but had it read out to him. Its title is as odd as other things about it and runs thus: Mémoires des Sages et Royales Giconomies d'Estat, domestiques, politiques, et militaires de Henry le Grand, UExemplaire des Roys, le Prince des Vertus, des Armes, et des Loix, et le Pare en cffet de ses Peuples Francois. Et des servitudes utiles, obéissances convenables, et administrations loyales de Maximilian de Béthune, l'un des plus confidans, familiers, et utiles soldats et servi- teurs du grand Mars des Frangots. Dedieés a la France, d tous les bons soldats, et tous peuples Frangois. Two folio volumes were splendidly printed, nominally at Amsterdam, but really under Sully's own eye at his chateau, in 1634; the other two did not appear till twenty years after his death. As his wealth, his im-

perious and grumbling temper, the favour which he had enjoyed

and his subsequent loss of it, joined to attract odium, his character

and his book were rather roughly handled in his lifetime. Mar-

bault, secretary to Du Plessis-Mornay, Sully's chief rival, wrote a

very caustic criticism of the AZemoirs, from which, though it re- mained in MS. till the 19th century, Tallemant des Réaux, the

insatiable scandal-monger, compiled a not unamusing but distinctly

calumnious article on Sully. Most of the stories it contains may be unhesitatingly disbelieved. At the same time Sully was by no means the ideally wise and good minister that he has not unfre- quently been represented as being. He was as faithful asa dog, and as surly. He grasped wealth and place to an extent not quite compatible with the idea of pure devotion to his king or his country, and his jealousy of all other ministers and all other favourites was extravagant and unceasing. Still there is no doubt that he was an excellent man of business, that, if not exactly what would be now called an incorruptible minister, he made no gains not sanctioned by the customs of the time, that he was inexorable in interfering with peculation and malversation on the part of others, that he

opposed the ruinous personal expenditure which was the bane of

almost all European monarchies in his day, and that he did much both as a man of war and as a man of peace to make France strong, united, and happy. His literary power, moreover, was far from small. diverting for a time, grows not a little wearisome, they have phrases and passages of great vivacity, which it is reasonable to attribute to Sully himself rather than to his spokesmen, and they show much

grasp of administrative business. The arrangement of the Memoirs so shocked the 18th century that in 1745

the abbé de I’Yicluse re-edited or rather rewrote them in the ordinary form of

narrative. This text has of course no interest ; the proper version with the commentary of Marbault may be found in the collection of Michaud and Poujoulat (vols. xvi. and xvii.).

SULMONA, or Sotmona, a city of Italy, in the province of Aquila (Abruzzo Ulteriore), now reached by a branch line from the railway between Pescara

and Aquila, lies, at a height of 1575 feet above the sea, at the junction of the Vella with the Gizio (a tributary of the Pescara), which supplies water-power to its paper-mills, fulling-mills, copper- works, &c. Besides its cathedral (S. Panfilo), rebuilt by Bishop Walther of Ocre (Frederick II.'s grand chancellor) in 1119, and several times remodelled in the 15th and 16th centuries, Sulmona, has in Santa Maria della Tomba a good example of pure Gothic, and in Corpus Domini a striking instance of the vagaries of Gothic in its decay. The com- munal buildings are half Gothic, half Renaissance. A Statue of Ovid, the most celebrated native of the city (which also gave birth to Innocent VIT.), stands in front of the cancellaria. In the vicinity of the town is Monte Morrone, where Celestine V. lived as a hermit and founded & monastery of "Celestines," which remained till 187 0, when it was transformed into a penitentiary. The popu- lation of Sulmona was 12,594 in 1861 and 14,171 in 1881 (commune, 17,601).

Sulmo, a city of the Peligni, is first mentioned during the Second Punic War (211 B.c.). It became a Roman colony probably in the reign of Augustus, and as a municipium it continued to flourish throughout the empire. Charles V. erected it into a principality, which he bestowed on Charles Lannoy of ' Pavia" celebrity. It

ultimately passed to the Corno and Borghese families. The bishopric is known as that of Valva and Sulmona.

SULPHUR.) The sulphur minerals, which are very numerous and varied, arrange themselves under three heads,—(1) metallic sulphates, of which hydrated sulphate of lime, CaSO,. 2H,O, gypsum, is the most abundant ; (2) metallic sulphides, a numerous family, including the majority of metallic ores, of which, however, only iron pyrites serves as a source for sulphur ; (3) elementary sulphur. In the organic world we meet with sulphur everywhere, this element forming an essential (though quantitatively subordinate) component of the albumenoids, a class of compounds contained in all vegetable and animal structures. Of organic materials rich in sulphur we may name animal hair (containing about 4 per cent.) and the essential oils of the onion, garlic, and mustard.

1 This chemical element has already been treated in its scientific aspects under CHEMISTRY (vol. v. p. 498 sq.).

of practical applications,

Although the fantastic form of his Memoirs, after being

é The present article is Intended to supplement what js there given, in the direction chiefly

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Elementary Sulphur.

This occurs as a mineral chiefly in the Upper Miocene deposits and in the Flétz, associated in general with gypsum, massive limestone, and marl. Commercially im- portant deposits are found in Sicily (provinces of Caltanis- setta, Girgenti, Catania), Italy (Latera and Scrofano, pro- vince of Rome), Spain (Teruel and Arcos), France (dept. Vaucluse), Transylvania, Poland (Swoszowice near Cracow), and Germany (Liineburg, in Hanover). The exhalations of volcanoes include, as a rule, sulphurous acid, SO,, and sulphuretted hydrogen, HS, which two gases, if moist, readily decompose each other into water and sulphur,—a circumstance which accounts for the constant occurrence of sulphur in all volcanic districts. Mt Purace in Colombia wears a cap of sulphur (derived from its own crater) which accumulates at the rate of about 2 feet per annum,— its superficial area amounting to 1435 square yards, The solfatara at Bahara Saphinque on the Red Sea is said to yield 600 tons of sulphur annually. The molten sulphur discharged from the crater of the Alaghez in the Armenian highlands forms solid excrescences, which the natives dis- lodge from their inaccessible positions by means of rifle- shots. A sulphur deposit near the Borax Lake in California is estimated to contain 20,000 tons.

Sicily, where in 1884 the annual production had almost reached 400,000 tons. The mode of mining there adopted is by a network of horizontal galleries (tunnels) driven through the deposit; the solid squares thus marked off are hewn out, a central pillar being left to support the roof. The total excavation is generally 100 feet high and from 25 to 50 wide ; not unfrequently the whole collapses, Down to a comparatively recent date all the work used to be done by hand, boys of eight to ten years of age being employed to carry the ore to the shaft and thence to the surface ; only where

a mine has reached a depth of 325 feet or more is water-power, if available, resorted to, Since 1868, however, the ore at Grotta Calda at least has been raised by properly constructed shafts with the help of steam-power, and this system is spreading.

The Sicilian ores are customarily classified as follows :— Per 100 parts of ore Per 100 parts of ore

Sulphur present, Sulphur recovered. Riehest ores …, 380-40 – Rich ores…..... 25-80 15-20 Ordinary …..... 20-25 10-15

The poor yield of actual sulphur is explained by the rather primi- tive method used for its extraction. A semicircular or semi- elliptical pit (calcarone) about 33 fect in diameter and 8 decp is dug into the slope of a hill, and the sides are coated with a wall of stone. The sole consists of two halves slanting against each other, the line of intersection forming a descending gutter which runs to the outlet. This outlet having been closed by small stones and sulphate of lime cement, the pit is filled with sulphur ore, which is heaped up considerably beyond the edge of the pit and covered with a layer of burnt-out ore. In building up the heap a number of narrow vertical passages are left to afford a draught for the fire. The ore is kindled from above and the fire so regulated (by making or unmaking air-holes in the covering) that, by the heat produced by the combustion of the least sufficient quantity of sulphur, the rest is liquefied. The molten sulphur accumulates on the sole, whence it is from time to time run out into a square

| stone receptacle, from which it is ladled into damp poplar-wood

moulds and so brought into the shape of truncated cones weighing 110 to 130 fb each. These cakes are sent out into commerce. A calcarone with a capacity of 28,256 cubic feet burns for about two months, and yields about 200 tons of sulphur. The immense volumes of sulphurous acid evolved give rise to many complaints ; all the minor pits suspend work during the summer to avoid de- struction of the crops. A calcarone that is to be used all the year round must be at least 220 yards from any inhabited place and 110 from any field under cultivation.

The yield of sulphur, as seen from the table given above, is miser- ably small, but the searcity of fuel in Sicily almost prohibits the introduction of any more rational method. As sulphur fuses at 114° C., high-pressure steam at once suggests itself as a suitable medium of heating. In the sulphur-works of Latera, in the pro- vince of Rome, the following apparatus (constructed by Gritti) is

Most of the sulphur Sici or brimstone of commerce comes from the rich fields of sulpl

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being used with success. A vertical truncated perforated cone of thick sheet-iron serves for the reception of the ore. This cone is enclosed in a similar cone of iron, which terminates in a detachable deep iron basin below, and is Tae with a tightly fitting lid. All the joints in this outer shell are steam-tight. The inner cone having been charged and the lid secured, steam of sufficient pressure to ensure a temperature of from 125° to 135° C. is blown into the apparatus, which soon causes the sulphur to melt and collect in the basin below. After from 30 to 50 minutes, reckoning from the time when the above temperature is reached, the operation is completed. The steam is then turned off and the sulphur made to run from the basin into a receptacle beside the apparatus, to be cast into sticks or cakes. The iron basin is then detached, and by turning aside an iron damper which held the ore in its place the exhausted ore is made to drop into a pit. Hach charge of ore amounts to about from 254 to 264 cwts., containing about 385 Ib of sulphur. Of this some 360 Ib are recovered as saleable sulphur, at the ex- pense of about 286 Ib of oak-wood as fucl.

R. E. Bollmann in 1867 proposed to extract the sulphur by means of bisulphide of carbon. The process, after having been tried at Bagnoli near Naples and given up as hopeless, was intro- duced in 1873 in Swoszowice near Cracow under the guidance of Winkler and has proved a success. The apparatus is constructed so that the bisulphide used in the process of

extraction is recovered by distillation ; the loss of bisulphide amounts only to one-half per cent., sometimes to less, and the sulphur produced is very pure. But by far the greater part of the purer qualities of commercial sulphur is produced from Sicilian calcarone sulphur by distillation, which removes the 8 per cent. or so of earthy impurities contained in it. The following apparatus (invented originally by Michel of Marseilles and improved subsequently by others) enables the manu- facturer to produce either of two forms of ‘‘ refined” sulphur which commerce demands. It consists of a stone-built chamber of about 2825 cubic feet capacity, which communicates directly with two slightly slanting tubular retorts of iron, each of which holds about 660 tb of sulphur. The retorts are charged with molten sulphur from an upper reservoir, which is kept at the requisite temperature by means of the lost heat of the retort fires. The chamber has a safety valve at the top of its vault, which is so balanced that the least surplus pressure from within sends it up. The first puff of sulphur vapour which enters the chamber takes fire and converts the air of the chamber into a mixture of nitrogen and sulphurous acid. The next following instalments of vapour, getting diffused throughout a large mass of relatively cold gas, condense into a kind of ‘‘snow,” known in commerce and valued as ‘‘flowers of sulphur” (flores sulphuris). By conducting the distillation slowly, so that the temperature within the chamber remains at a suflicicntly low degree, it is possible to obtain the whole of the product in the form of ‘‘flowers.” If compact (‘‘roll’”’) sulphur is wanted the distilla- tion is made to go on at the quickest admissible rate. The tempera- ture of the interior of the chamber soon rises to nore than the fusing-point of sulphur (114°C.), and the distillate accumulates at the bottom as a liquid, which is tapped off from time to time to be east into the customary form of rods of about 14 inches diameter.

In some places sulphur is extracted from iron pyrites by one of two methods. The pyrites is subjected to dry distillation from out of iron or fire-clay tubular retorts at a bright red heat. One- third of the sulphur is volatilized—3FeS, = Fe,S,-+S,—and obtained as a distillate. The second method is analogous to the calcarone method of liquation: the ore is placed in a lime-kiln-like furnace over a mass of kindled fuel to start a partial combustion of the mineral, and the process is so regulated that, by the heat generated, the unburut part is decomposed with elimination of sulphur, which collects in the molten state on an inverted roof-shaped sole below the

furnace and is thence conducted into a cistern. Such pyrites sulphur is usually contaminated with arsenic, and consequently is of less value than Sicilian sulphur, which is characteristically free from this impurity.

The substance known as ‘‘milk of sulphur” (lac sulphuris) is very finely divided sulphur produced by the following, or some analogous, chemical process, One part of quicklime is slaked by means of 6 parts of water, and the paste produced diluted with 24 parts of water; 2°3 parts of flowers of sulphur are added ; and the whole is boiled for about an hour or longer, when the sulphur

dissolves, — 38CaO + 12S = 2CaS, + CaS,0,.

The mixed solution of pentasulphide and thiosulphate of calcium thus produced is clarified, diluted more largely in a tub, and then mixed with enough of pure dilute hydrochloric acid to produce a feebly alkaline mixture; this shows that only the bulk of the pentasulphide is decomposed, —CaS, + 2HCl=CaCl, + H.S + (48 of precipitated sulphur). The addition of more acid would produce an additional supply of sulphur (by the action of the H,S,0; on the dissolved H,S); but this thiosulphate sulphur is yellow and compact, while the CaS, part has the desired qualities, forming an extremely fine, almost white, powder. The precipitate is washed, collected, and dried at a very moderate heat. It is used as a

medicine. If sulphuric acid is used instead of hydrochloric acid the preparation is apt to be contaminated with hydrated sulphate of lime. In the United Kingdom, indeed, precipitated sulphate of lime used to be added intentionally to produce what the public had got accustomed to ; but this practice has been rightly stopped by the authorities.

During the year 1875 the production of sulphur in Europe is

stated to have beeu as follows :-— Tons. Italy CON ECO SMM LaIEE DNC ono 4 AAGOTEAA UGH eCIKDAdaAnGodo Ab 360,000 PS IQANILN eter ese wcalatatsid oa GRRE ose 4,000

oe 3,7.

: . : 50

German empire (including 5000 tons of regenerated! sulphur) 14,500

450

HE Ota es aanueeite 382,700

By far the greater part of all the sulphur produced in Sicily and elsewhere is used for the manufacture of sulphuric acid. Subjoined is an enumeration of some other applications. (1) The manufacture of gunpowder (see vol. xi. p. 820). (2) The taking of casts. (8) The making of cements: (a) a mixture of molten sulphur and ferric oxide is used to cement the isolating bells to telegraph posts ; (0) a mixture of iron filings (100), flowers of sulphur (3 to 20), and sal-ammoniac (3 to 5) made into paste with water is used to cement iron bars (fences, &c.) into stone sockets ; (c) a mixture of molten sulphur with powdered quartz or glass has been recommended as an acid-proof material for sulphuric acid chambers ; (d) a mixture produced by the incorporation of powdered quartz and colouring matters, such as vermilion, &c., with molten sulphur is employed for ornamental articles. (4) The vulcanization of india-rubber (see vol. xii. p. 840 sg.). (5) Dusting vine-plants with flowers of sul- phur is said to keep off the fungus Ocdiwm Tuckeri, which has caused such devastation in the vineyards in France and elsewhere.

Sulphur Compounds.

Sulphuretted hydrogen, H,S (see CHEMISTRY, vol. v. p. 499 sq.), is used largely as such, or as sulphide of ammonium, (NH,),S =2NH,+H,S, for the detection, discrimination, and separation of metals. To give an example: the least quantity of lead dissolved in water as (say) nitrate can be detected by the addition of sulphur- etted hydrogen, which brings down the lead as a black precipitate of sulphide of lead,—Pb(NOg),-+H,S=PbS+2HNO,. The presence of a moderate quantity of mineral acid in the original solution does not interfere with the test. What we said of solution of salts of lead holds substantially of those of the following groups of metals. The formule and

the colours of the sulphides are given in brackets. A. Lead (black, PbS), silver (black, AgS), mercury as mercurous or mercuric salt (black, HgS+Hg or HgS respectively), copper (greenish black, CuS), bismuth (brown, Bi,S,), cadmium (yellow, CdS). B. Arsenic (yellow, As,S,), antimony (orange-red, Sb,S,), tin as stannic salt (yellow, SnS,). The sulphides A are insoluble ; the sulphides B are soluble in sulphide of ammonium solution, and the latter, from this solution, can be reprecipitated by acidification with dilute sulphuric or hydrochloric acid. The brown SnS pre- cipitated from stannous salts is insoluble in the (colourless) solution of (NH,),S, but soluble in the ycllow solution of the polysulphide (NH,).S,, as SnS,.. C. The following metals are not precipitated from their salt solutions if these are acidified sufficiently by added mineral acid; but they are precipitated from their neutral or alkaline solutions by sulphide of ammonium :—iron (black, FeS), nickel (black, NiS), cobalt (black, CoS), manganese (flesh-coloured, MnS), zine (white, ZnS). Aluminium and chromium, given as salts of their oxides, R.O,, are precipitated by sulphide of ammonium as hydrated oxides (Al,0O,.2H,O, colourless; Cr,0;.%H,O0, green or violet). The reagent acts on these as ammonia, NH;, the H,S being liberated, and behaves in a similar way to acid solutions of certain salts, ¢.g., the phosphates, of the following group D, these salts, ¢.g., CagP,0g, being precipitated as such. The ordinary salts of group D (barium, strontium, calcium, magnesium), and the salts of the alkali metals E (potassium, sodium, &c.) generally, give no precipitate with either sulphuretted hydrogen or sulphide of am- monium. It is easy to translate what we have stated into a method for the separation of groups A, B, C (D and E), from one another.

Of the three chlorides treated of in CHEMISTRY (vol. v. p. 501) only the lowest, S,Cl,, is of industrial importance. It is prepared by passing perfectly dry chlorine gas over heated sulphur contained in a retort, the retort being connected with a condenser constructed so that the uncondensed vapours are led away into the chimney. The two elements unite readily, and chloride of sulphur, 8,Cl,, distils over, contaminated, however, by more or less of surplus chlorine present as higher chlorides. To remove (or decompose) these the crude product is subjected to fractional distillation ; the thermometer rises rapidly and soon becomes constant (at about 136° under 758 mm. pressure). What afterwards distils over, at the constant boiling-point, is collected as pure S,Cl,,—a yellowish red liquid of 1°68 sp. gr. at

16°77 C. and 1°7055 at 0° (Kopp), which emits fumes of hydrochloric acid in moist air. Its smell is charac-

1 See Soprum, ‘‘ Le Blanc process for making soda-ash,” p. 243 above.

Produc- tion and

uses,

Sulphur-

etted hydro- gen.

Chlor-

ides.

teristic and unpleasant. Chloride of sulphur is decomposed by water, alcohol, ether (see CHEMISTRY) ; and benzol and bisulphide of carbon mix with it in all proportions without decomposition. A mixture of 100 parts of bisulphide of carbon and some 2°5 of chloride of sulphur is used for the vulcanization of (chiefly sheet) india-rubber. The mixture is readily imbibed by the rubber, which when allowed to dry (at from 22° to 25°C.) gives up the bisulphide of carbon and the chlorine of the reagent, the latter as HCl, but retains its sulphur in a state of chemical combination. Sulphur-
The gas SO, (see CHEMISTRY, vol. v. p. 501), produced extempore ous acid. by the combustion of sulphur, is used for the bleaching of silk, wool, straw, and wicker work, also for the disinfection of rooms and of wine-casks (to prevent acetous fermentation). A solution of the gas in water is manufactured industrially, for use chiefly in the manufacture of sugar. It is added to the beetroot or cane juice to prevent its fermentation while awaiting concentration, A solution of ‘‘bisulphite of lime” (produced by saturating milk of lime with sulphurous acid gas) is much used as an antiseptic generally. Liquefied sulphur dioxide has found an application as a frigorific for the manufacture of ice. The apparatus used is so constructed that the volatilized sulphur dioxide is all caught and recondensed.

Sulphurons acid when required as such or for the making of sulphites is always produced, even industrially, from oil of vitriol, by reduction with either sulphur or charcoal. In the heat the reactions are 280,+S=880, and 280; + C=CO, +280, respectively, and either can be (and is) executed practically in cast- iron vessels. The presence of carbonic acid in the gas produced by the charcoal process does not interfere with the preparation of sulphites. Thiosul- The soda salt Na,S,0,+5H,O, known commercially as hypo- phates. sulphite of soda, is used industrially for chiefly two purposes, namely, (1) as a solvent for chloride of silver in photography (se PxHotTocRraruy),—AgCl + Na,S,0,= NaCl + AgNaS,0;,—and (2) as an ‘“‘antichlor” in paper-making, to destroy the remnants of chlo- rine in bleached paper pulp. To understand its action we need only know that chlorine and water in such cases act like oxygen,— Cl,+ H,O=2HC1+0; every 4xO thus produced converts one 8,0, of Na,OS,0, into 280, of sulphuric acid. For the preparation of this salt a great many methods have been invented. The simplest to explain is the treatment of a solution of normal sulphite of sodium with sulphur,—SO,Na, +8 = S.0,Nay. Instead of ad ing free sulphur, Liebig prepares a solution of polysulphide of sodium (by dissolving sulphur in caustic-soda ley) and adds it to the sulphite, The surplus sulphur combines with the sulphite ; besides, the poly- sulphide contains thiosulphate from the first. Another method is to pass sulphurous acid through a solution of sulphide of sodium. Here, by first intention, if we may say so, sulphite of sodium and H,S are produced ; but the H,S and the excess of SO, give water and sulphur, and two-thirds of this sulphur unite with the sulphite first formed into thiosulphate. The crude sulphide of calcium, which is produced so largely in the Le Blanc process (see Sopium, supra, p. 243), when exposed to the air gets oxidized, with forma- tion of calcium thiosulphate, which can be extracted by means of water and converted into sodium salt by double decomposition with carbonate or sulphate of soda. Pure thiosulphate of soda forms large transparent monoclinic prisms, which lose no water on exposure to ordinary air in the cold. At about 48°C. they fuse into a liquid, which may remain liquid on cooling, but solidifies sud- denly when a fragment of the solid salt is dropped in. 100 parts of water dissolve at 16° 25° 35° 45° C, 65 75 89 109 parts of the salt (Mulder). The solution is not subject to oxidation in the air.

have so far been unqualified failures industrially. In regard to the Char chamber process we may add a few notes to what has been said proc under CHEMISTRY (vol. y. p. 508 sg.). As stated in that article, of pr nitrous acid, N03, when brought into contact with sufficiently duct: strong vitriol unites with it, giving rise to bodies similar to chamber ae N,0,+H,0 +280,= 280,98 or, what comes practically to the same,

N,0;+80,(out of the vitriol) =80,8 02. In the presence of sufficient water this union does not take place, because the water causes the product to break up as shown by the equation if read from right to left. These facts explain why a stronger acid than one containing some 60 per cent. or so of real H,SO, cannot be produced directly in the chamber. This incon- venience has led, in the hands of Gay -Lussac, to an important improvement on the original process. He inserts between the chamber outlet and the chimney a tower made of acid-proof stone and filled with pieces of coke, over which concentrated oil of vitriol is made to trickle down while the chamber gases ascend through the tower on their way to the chimney. The vitriol absorbs all or most of the NO., which would otherwise be lost, But the practical reliberation of the N,O, was beset with very great difficulties, which have been fully overcome only by a more recent invention of Glover's. He places between the kiln and the entrance side of the chamber a tower similar in construction to Gay-Lussac's, which the kiln gases have to traverse before they get into the latter, Through the tower he runs at the same time a stream of nitrated (Gay-Lussac) acid and one of ordinary chamber acid. The latter acts on the nitrated acid as water ; at least it virtually sets free the combined nitrous acid, so that it is reduced by the sulphurous acid coming from the kiln to nitric oxide, which travels into the chamber with the rest of the gases to do duty there in the well-known manner, As the kiln gases are very hot, a considcrable quantity of the watcr which goes through a Glover tower (as chamber acid) is volatilized and thus made to supply part of the steam necessary for the process. The Glover tower, besides fulfilling its primary object, serves to concen- trate part of the chamber acid and to supply part of the neces- sary steam without expense for fuel. The expenditure of nitrate of soda, which before the introduction of the two towers used to amount to from 8 to 13 parts per 100 of sulphur burned, has been reduced to from 3°5 to 65. The actual loss of nitrous acid of course is the less, cxteris paribus, the larger the chamber, and (for a given chamber) the greater the care with

which the process is conducted. But even under the most skilful management more nitrous acid is lost than can be accounted for by the unavoidable imperfections in the apparatus and in the mode of working them. From the in- vestigations of Weber and of Frémy it appears that, in the presence of relatively much water more especially, part of the nitrous acid suffers reduction, not to nitric, but to nitrous oxide, NO, which, being unsusceptible of direct oxidation, is lost for the process.

For a great many purposes (¢.g., the manufacture of “ superphos- Produc: phate” from bones or mineral phosphate of lime) the 60 to 64 per tion of cent. acid which comes out of the chamber can be used as it is ; strong but it is not strong enough for all purposes. In the production of acid. stronger (from chamber) acid the first step always is to run the acid into long, very shallow lead pans and to simply boil it down in these, either by the application of heat from below, in which case the bottoms of the pans must be protected by making them rest on plates of iron, or by enclosing the pans in a vault and causing the hot gases of a furnace fire to strike along the surface of the acid.

The result in either case is that, while more and more water goes away as steam, the residual acid of course gets stronger and stronger.

Sul- The anhydride SO, is used largely in the manufacture of tar | But with the strength the boiling-point rises, and, as necessary phuric colours. Oil of vitriol is decomposed by dropping it on a mass of consequences, the extent to which the acid attacks the lead (with acid. platinum scrap kept at a bright red heat within a fireclay retort, | formation of sulphate and sulphurous acid) and the danger of melt-

—S0,H,=H,0 +S0, +40, ; and, after removing the water—the bulk by partial condensation and the rest by means of vitriol—the sulphur dioxide and the oxygen are made to recombine by passing them over platinized asbestos at a dull red heat. The fumes of SO, formed are condensed in a dry receiver by application of cold from without (Winkler’s process).

The fact that finely divided platinum, ‘in virtue of its power of condensing oxygen, induces the union of SO, and 40, into SO, has been known for a long time ; but all attempts to utilize the reaction

ing down the pans by local overheating become greater and greater. When the acid has come up to about from 78 to 80 per cent. (corresponding to a specific gravity of 1-7 after cooling), it is not safe to push the concentration any further, quite apart from the fact that an acid of 80 per cent. when boiled down emits a very appreciable proportion of acid along with the volatilized water. An acid of 1-7 indeed is amply strong enough for a variety of applications, such as, for instance, the conversion of salt into sul- phate. If a stronger acid is wanted the concentration must be continued in glass or platinum retorts,

The vitriol maker's glass retort, as a rule, consists of two detach- Vitriol able parts, namely, a pear-shaped body about 34 feet high and maker's nearly 2 feet in diameter, and a glass alembic whose wider end fits glass the mouth of the pear, while its narrower outlet end points down- retort. wards and terminates within a slightly slanting lead-pipe, which conveys the distillate to a leaden tank. The retort rests on a layer of sand contained in a closely fitting iron basin, and the lateral space between the two is filled completely with sand. The iron basin is suspended within a furnace in such a way that only it, and not any part of the retort, is touched directly by the flame.

As a rule, some twelve retorts stand side by side, each in its own

presence of the unavoidably large mass of nitrogen, and soon loses its efficacy altogether owing to the accumulation on it of particles of incombustible matter from the kiln gases. Oxide of chromium,

sandbath, and are heated by the same fire. As the temperature of the boiling liquid and of the vapour rises at the end to beyond

300° C., a sudden draught of cold air might cause rupture of a

retort ; the apparatus is therefore placed in a special room accessible only through double doors, and the inner door is not permitted to be opened before the outer has been shut. The acid, as it is boil- ing down, gets stronger and stronger, because, although the vapour is very strongly acid

from the first, its percentage p’ of real H,SO, at any given stage is less than the value p, which obtains in the boiling liquid as it is at the time. p’ at a given barometric pres- sure is a fixed function of p only, and increases as p increases ; the difference p~p’ accordingly gets less and less. It becomes nil, not when the acid has become pure H,SO,, but when it has come up to the composition 12S0,+13H,O (Marignac). This particular hydrate only boils without change of composition; even pure H,SO, when distilled, by giving up more than 180, for 1H,O, becomes reduced to that hydrate 1280,+138HO, which then boils without further change of composition. A stronger acid than “ Marignac,” as we may call it, cannot be produced by the concentration of weaker acid, and even its production (from 1°7 acid) involves a very con- siderable loss of acid as distillate. Hence practically the process is stopped when the acid in the retorts has come up to some 96 per cent. of H,SO,, which is ascertained by the specific gravity of the last runnings being at a certain value. As soon as this point is reached the retorts are allowed to cool till the contents can be withdrawn with safety by means of lead siphons into glass carboys. This, however, means a considerable loss of time and fuel ; besides, the process of distilling from out of glass vessels is not free from danger, and for these reasons it is preferred in many establishments to con- centrate the pan acid in large platinum stills, although these are extremely expensive. The great advantage of the platinum still is that it admits of continuous working ; while pan acid (containing say 1 tb of water per VV ib of full strength—96 per cent. or so —acid) runs in, and a far weaker acid (containing for the same period of time 1 th of water and n tb of full strength acid) is distilling over, the balance V— 1 ib of finished acid is being withdrawn by means ofa platinum siphon. The outer limb of the siphon in its middle portion divides into a system of four narrower tubes and is cooled down by means of a cold-water jacket surrounding it, so that the acid can be run directly into carboys.

atinum The platinuin retort in its latest form has a large undulating

etort.

sulphate f alumi- ium,

sulphate if

opper.

bottom made of strong metal, on which a rapidly converging low body joins, made of thinner mctal because it is not so directly ex- posed to the flame. Along with this still a flat platinum pan is used with an undulating bottom similar to that of the still for the preliminary concentration of the acid. As platinum is not liable to fuse or be attacked by any strength of boiling acid, a aaa 4 ea pan does as much work as a far larger one made of lead.

Sulphates.

Several of these are treated of under the heads of the respective bases. Thus, for the sulphates of ammonia, see NITROGEN, vol. xvii. p. 515 sg.; for Porasstum and Soprvm, see these articles ; for calcium, see Lime (vol. xiv. p. 648) and Gypsum (vol. xi. p. 351) ; for barium, see BARYTES (vol. iii. p. 406) ; for magnesium, see Epsom Sars (vol. viii. p. 496) and Maenusrum (vol. xv. p. 217); and for iron, see COPPERAS (vol. vi. p. 352).

Sulphate of aluminium, Al,(SO,);+18H,O, the active ingredient of ALUM (vol. i. p. 648), is now being produced industrially in a state of perfect freedom from iron, and is more and morc taking the place of alum. Paper-makers, at least, no longer use anything else for the production of alumina soap, which in machine-made paper serves as the principal ingredient of the size. The crude salt is easily produced by treatment of relatively pure bauxite (native hydrated alumina) or china clay with chamber acid at a suitable temperature. The resulting mass is dissolved in water, the undis-solved matter (silica, &c.) allowed to settle, the clear liquor drawn off, and from it an apology for what is wanted is obtained by evapo- ration to a small volume and allowing to crystallize. But the salt thus obtained is always contaminated with a variety of foreign sulphates, including sulphate of iron, and this last-named impurity, for the majority of applications, cannot be suffered to remain. One of the best methods for its removal, if not the best, is that dis- covered by Semper and Fahlberg: the solution, which must contain all its iron as ferric salt and contain somewhat less than the normal proportion of sulphuric acid, is digested with hydrated binoxide of lead. In the course of about a week all the iron is completely precipitated.

The better qualities of sulphate of alumina nowadays have at most only a few thousandths per cent. ofiron. :

Sulphate of copper (blue vitriol) is made technically in chiefly two ways. One method is to heat metallic copper to redness in air until it is almost completely oxidized, and to dissolve the oxide by means of dilute sulphuric acid. The Cu,O present behaves like a mixture of metal and CuO. Another process starts from the sub- sulphide Cu,S (produced metallurgically as " mat," or erhaps ex- pressly from its elements), and converts this into su plate and

oxide by careful roasting. The product is dissolved in dilute sul- phuric acid. Large quantities of blue vitriol are produced incident- ally in the "parting" of auriferous silver (see Goxp, vol. x. p. 749) by means of oil of vitriol. Sulphate of copper crystallizes from its aqueous solution in large transparent blue crystals of the triclinic system ; their composition is CuSO,5H,O. 'The crystals are stable in the air. At 100°C. they lose 4H,O, the last H,O requiring a temperature of 200° C. for its expulsion. The anhydrous salt is dirty white ; it readily reunites with water, and consequently is available as a dehydrating agent, for instance, for the preparation of absolute alcohol from spirit of wine. 100 parts of water dissolve at 0° 10° 20° 50° 100°C.

31°6 37°0 42:3 65°8 2033 parts of crystallized salt (Poggiale). The salt is insoluble in alcohol. Blue vitriol is used largely in electrotyping and for many other purposes.

Subjoined are two general tests for sulphur. compounds when brought in contact at a red heat with a mixture of nitre and carbonate of soda (or some other equivalent alkaline oxidizing mixture) are changed so that the sulphur assumes the form of alkaline sulphate, which can be extracted by means of water. From the (filtered) solution the SO, is precipitated by addition of chloride of barium as BaSO,,—a white powdery precipi- tate characteristically insoluble in water and in dilute acids. (2) Any non-volatile sulphur compound, when heated on charcoal in a reducing flame with carbonate of soda, yields sulphide of sodium ("hepar''), which, when

moistened with water on a silver coin, produces a black stain of metallic sulphide. (Compare SELENIUM, vol. xxi. pp. 631-632.) (W. D.)

SULPICIUS SEVERUS. See Srverus.

SULTANPUR, or SuurTanpoor, a district of British India, in the Rdi Bareli (Roy Bareilly) division of Oudh, under the jurisdiction of the lieutenant-governor of the North-Western Provinces, lying between 26° 39’ and 27° 58’ N. lat. and 81° 36’ and 82° 44’ E. long. With an area of 1707 square miles, it is bounded on the N. by Faizdbad, on the E. by Jaunpur, on the 8. by Partabgarh, and on the W. by Rai Bareli. The surface of the district is generally level, being broken only by ravines in the neighbourhood of the rivers by which its drainage is effected. The central portion of the district is highly cultivated, while in the south are widespread arid plains and swampy jhils and marshes. The principal river is the Gumti, which passes through the centre of Sult4npur and affords a valuable highway for commerce. Minor streams are the Kandu, Pili, Tengha, and Nandhia, the last two being of some im- portance, as their channels are deep, though narrow, and form the outlet for the superfluous water of the extensive series of jhils. There are no forests in the district, the only tree-covered tracts being stunted dak jungles used for fuel. Wild animals are very few, chiefly wolves, nylghau, and wild hog. There are some good roads in the district, chief of which is the imperial high road from Faizabad to Allahabad, which intersects it from north to south. The Oudh and Rohilkhand Railway traverses the district for a few miles in the extreme east. The climate is considered mild, temperate, and healthy; the average annual rainfall

is about 46 inches.

The population, according to the census of 1881, was 957,912 (males 475,125, females 482,787), of whom 856,329 were Hindus and 101,524 Mohammedans. The only town with a population exceeding 5000 is Sultdnpur, the administrative headquarters of the district, which is situated on the right bank of the Gumti, and in 1881 contained 9374 inhabitants. Of the total area 571,795 acres were returned as cultivated in 1884-85 and 368,911 as cultivable ; the total area under crops in the same year was 672,058 acres, wheat and rice being the principal products. The trade of the district deals principally with grain, cotton, molasses, and native cloth, and

its manufactures — which, however, are unimportant — comprise coarse cotton cloth, brass vessels and other metal work, sugar, and indigo. The only incident worthy of note in the history of the district since the British annexation of Oudh is the revolt of the native troops stationed at Sult4npur during the mutiny. The troops rose in rebellion on 9th June 1857, and, after firing on and murdering two of their officers, sacked the station. Upon the restoration of order Sultanpur cantonment was strengthened by a detachment of British troops; but in 1861 it was entirely aban- doned as a military station.

SULU ISLANDS. See Pomiprines, vol. xviii. p. 752. SUMACH. See Luatuer, vol. xiv. p. 382.

(1) All sulphur Analysis.

Plate IX,

- of Holland, of which country the island is in large measure

clay schists, combined with hornblende talc and other schists, and traversed by veins of quartz. Granite also plays a considerable part, though it does not come so much to the surface. Carboniferous rocks (marls, sandstones, limestones, &c.) are in some places well developed. Between the Carboniferous period and the Tertiary there is a great blank all through the island. Augite-andesite of late Eocene origin has greatly modified the surface of the country, and constitutes, deter alia, the main part of the Barisan range.? The Tertiary formation is strongly developed in four different divisions. They are usually considered to be Eocene ; but. this determination rests on badly preserved fossils. The oldest or breccia division consists of débris of carboniferous limestone, syenites, and granites, sometimes in the form of breccia proper, some- times in that of sandstones or marl clays. The fish remains found in the marls have led some paleontologists to assign a greater antiquity than that of Eocene to these strata, while others, again, consider them to be Miocene. Above this division (apparently absent in south Sumatra) comes the second of sandstones, clay rocks, coal-beds, and coal. The coal appears to be the

result of a vegetation which grew in situ. Above the coal is sandstone, sometimes 1000 feet thick. The third division consists of marly sandstones of evidently marine origin; it is well developed in west Sumatra, but is absent from the south of the island. The fourth division is a limestone, rich in remains of corals, molluses, echinids, and ‘especially in Orbetoides ; it is well developed both in the west and in the south. Miocene deposits are more abundant in the south than in the west. At Lubu Lintang in the Benkulen residency the Ebuma fossils are characteristic.4

Minerals.—Sumatra possesses various kinds of mineral wealth. Gold occurs in the central regions ; gold mines have long been worked in Menangkabau and the interior of Padang, and gold-washing is carried on in several of the streams. Tin, which forms the staple of the neigh- bouring island of Bangka or BANoA (9.v.), is found more especially in Siak and the “division” of the L., Kotas. Copper mines are worked in the Padang Highlands (most largely in the district of Lake Sinkarah) and at Muki in Achin. Iron is not unfrequent, and magnetic iron is ob- tained at the “Iron Mountain” near Fort van der Capellen (Tanah Datar). Coal seams exist in the Malabuh valley (Achin),® in the Sinamu valley, and on both sides of the Ombilin (Umbilin) river; the Ombilin field was brought Into notice more especially by Mr D. D. Veth of the 1877- 79 expedition. Lignite of good quality is found in several localities. Oil wells are worked at Langkat and other places ; and arsenic, saltpetre, alum, naphtha, and sulphur may be collected in the volcanic districts.

Administrative Divisions.—The process by which the Dutch have advanced to their present position in Sumatra has been a very gradual one, and even yet, though their supremacy is effective all round the coast, much of the interior remains practically unpossessed. The following are the more important political subdivisions of the country.

A. The Dutch government of the West Coast (area 46,212 square miles), extending along the shore of the Indian Ocean from Trumon, 2° 53’N. lat., to the Mandjuta, 2° 25’S. lat., comprises the residencies Padang, Tapanuli, and the Padang Highlands (Padangsche Bovenlanden),

SUMATRA, in Malay called Pulu Partcha or Indalas, is one vf the largest and most important islands of the East Indian Archipelago. It stretches from

north-west to south-east for a distance of 1047 miles,—Tandjong Batu, the northmost point, being situated in 5° 40’ N. lat. and the southmost in 5° 59’S. lat. The greatest breadth is about 230 miles. In area it is estimated that Sumatra, with its 170,744 square miles,! is thirteen times the size

a dependency. The northern half runs obliquely parallel to the Malay Peninsula, from which it is separated by the Strait of Malacca, and the southern end is separated by the narrow Sunda Strait from Java. Unlike Java, Sumatra has a series of considerable islands (Nias Islands, Mentawei Islands, &c.) arranged like outworks in front of the coast that faces the open Indian Ocean. The general physical features of the island are simple and striking : a range of lofty mountains extends throughout its whole length, their western slopes descending rapidly towards the ocean and their eastern looking out over a vast alluvial tract of unusual uniformity. This mountain range is known as Bukit Barisan or Chain Mountain, It varies in average height from 1500 to 6000 fect, and consists of three or four ridges separated by plateau-like valleys. Among its more remarkable summits are Ya Mura or Gold Mountain, near the north end (6879 feet); Seret Berapi or Merapi (5857 feet), in 0° 44’ N. lat, ; Pasaman or Mount Ophir (10,866); Merapi (9563) ; Indrapura, in 1° 36’S. lat. (11,800), which has the reputation of being the culminating point of the whole island ; Dempo (10,000); and Abong Abong (10,000). The summit of Indrapura was reached by the Central Sumatran Expedition of 1877-79. Towards the north end of the island the spurs of the main chain sometimes extend towards the neigh- bourhood of the east coast. Owing to this configuration of the island, the water-courses of the western side are comparatively short: only very few of them are large enough to be navigable. Those of the eastern slope, on the other hand—such as the Tamiang, the Simpang, the Asahan, the Kubu, the Siak, the Indragiri, the Jambi, the Kampas, the Palembang—are longer, and can not un- frequently carry vessels of considerable burden. In their lower courses they form enormous inosculating deltas. The mountainous regions contain numerous lakes, many of them evidently the craters of extinct volcanoes. When, as sometimes happens, two or three of these craters have merged into one, the lake attains a great size. Amongst the larger lakes may be mentioned the Tao Silalahi, with its offshoots Tao Muara and Tao Balige ; Manindji, to the west of Fort de Kock; Sinkarah, south-east of Fort de

Kock; Korintji, inland from Indrapura ; Ranau, inland from Tampah; and the lake of the X. Kotas, in the Padang Highlands.

Volcanoes.— Sumatra, still possesses several centres of volcanic eruption, and in 1883 its southern extremity shared with Java in the disasters of the Krakatoa outbreak. Indrapura sends up from time to time heavy columns of smoke. Merapi,? the most active of the volcanoes in the island, was in full eruption in the years 1807, 1822, 1834, 1845, 1863-64, and 1872. Mt Talang in the Padang High- lands, also has three craters, one of which is filled with molten sulphur. J unghuhn registered sixteen Sumatran volcanoes, and others have since been discovered.

_ Geology.—A large part of the Sumatran highlands con- sists of very old (probably Silurian or Devonian) slates and

3 For the geology see R. D. M. Verbeek, Die Tertidrformation von Sumatra und thren Thierresten ; ‘‘Topographische en Geologische Beschrijving van Zuid-Sumatra” in Jaarboek van het Mijnwesen in Ned. Indiz, 1881, pl. i.; and short papers in Geol. Mag., 1877, 1878, &c. See also the 2d part of Midden-Sumatra, by D. D. Veth, 1882.

4 Full details and a geological bibliography will be found in H. van Cappelle, Het Karakter van de Nederlandsch-Indische Tertiatre Fauna, Sneek, 1885.

5 See Indische Gids, 1880, paper and map.

1 The triangulation of Sumatra was commenced in June 1883 by the measurement of a base line 4857 metres (nearly 31 miles) long in the neighbourhood of Padang.

_ ? Foran account of changes in the principal crater see Verbeek’s paper In Natuurk. Tidschr. van Ned. Indié, 1885.

Ss UMATR #

The governor of the whole government has his residence at Padang. The residency of Padang is bounded south by Benkulen and north by Tapanuli.

It contains a large number of separate districts, mostly corresponding to natural divisions formed by mountain-spurs or river valleys. Among the rest are Indrapura, Tapan, Lunang, and Silaut, which form the regency of Indrapura, and are the remains of the ancient kingdom of that name. Administratively Padang is divided into Ayer Bangis and Rau, Priaman, Padang, Painan. The headquarters of Ayer Bangis and Rau is Talu, to the north of Mt Ophir. Ayer Bangis it- self is on the coast, and has a good roadstead on one of the islands that protect its bay. At Rau is the Dutch fort of Amerongen, and to the north-west the old fort of Balong or Sevenhoven. Padang is a town of some 2000 houses and 15,000 inhabitants, with a Chinese settlement and a European quarter. It is the chief market in Sumatra for gold. Indrapura lies about 8 miles up the river of its own name, and is now only an unimportant village of bamboo huts. The residency of Tapanuli is divided into Siboga (which includes the Nias Islands), Natal, Mandeling and Angkola, Padang Lawas. The town of Siboga has con- siderable commercial importance, the bay on which it stands being one of the finest in all Sumatra. Tapanuli, the ancient capital, and Sinkil, a commercial town, also deserve to be mentioned. In Natal (properly Natar) the leading places are Jambur, Sinkuang, and Natar. Padang Sidem- puan, the chief town of Mandeling and Angkola, lies to the south of Mt Lubu Raya. Fort Elout was formerly the military centre in Great Mandeling. The residency of the Padang Highlands lies east of Padang proper. The whole surface is mountainous, and the natural districts are very numerous. Agam, Batipuand the X. Kotas,! the L. Kotas, Tanah Datar, and the XIII. and IX. Kotas form the five administrative divisions. Bukit Tinggi, or, as it is usually called, Fort de Kock, is the capital of the residency ; other places of note are Bondjol, Padang Pandjang Payakombo, Fort van der Capellen, Pagar Rujung (the residence of the last prince of Menangkabau), Priyangan (the remains of another capital of Menangkabau), Sinkarah, and Solok. To the government of the West Coast belong the following islands :—Banyak Islands, a small limestone group, well wooded and sparsely peopled ; Nias Islands, with an area of 2523 square miles; Batu Islands (Pulu Pingi, Pulu Baai, Tanah Masa, Tanah Balla, &c.; area 630 square miles) ; Mentawei and Pageh or Nassau Islands (area 4200 square miles); Engano (area 360 square miles), annexed by Hol- land in 1863 and seldom visited. The Nias Islands are a very interesting group (see Dr Schreiber in Petermann’s Mittheil., 1881). There are no volcanoes, but earthquakes are very frequent. In the

north the villages are mainly perched on steep hills reached by ladders; in the south they are larger and occupy low-lying sites.

B, The residency of Benkulen or Bencoolen (i.e, Bang Kulon, “west coast”) lies along the west coast from the Mandjuta to the south end of Sumatra. It is divided into eight districts :—Mokko-Mokko; Lais or Sungei Lama ; the district (ommelanden) of Benkulen; the capital Ben- kulen ; Seluma; Mana and Pasumah Ulu Mana; Kauer ; and lastly Kru. Among the noteworthy places are Mokko- Mokko, with the old English fort Anna; Bantal; Lais (Laye), the former seat of the English resident ; and Ben- kulen, the capital, with 12,000 inhabitants, Fort Marl- borough, and a Chinese kampong (see BENCOOLEN).

C. The residency of the Lampong districts, separated from Palembang by the Masudji river, is partly mountain- ous (Lampong Peak 6800 feet), partly so flat as to be under

- “Kota” means settlement or township, and a great many of the

districts are named from the number of kotas they contain ; thus in Agam we have the VII. Kotas, the VIII. Kotas, &c.

water in the rainy season. It is divided into the districts of Telok Betong, Tulang Bawang, Seputih, Sekampong, Katimbang, and Semangka. The more important places are Telok Betong, chief town of the residency, Menggala (with a good trade), Gunung Sugi, Sukadana, Tandjong Karang, Beniawang.

_D. The residency of Palembang consists of the former kingdom of this name, various districts more or less de- pendent on that monarchy, and (since 1839) the kingdom of J ambi. With the exclusion of this last it is divided into the administrative districts of Palembang; Tebing Tinggi; Lematang Ulu, Lematang Tlir, and the Pasumah country ; Komering Ulu, Ogan Ulu, Inim, and the Ranau districts ; Musi Ilir; Ogan Ihr, Komering Ili, and Blidah; and Iliran and Banyu Asin. In the kingdom of Jambi the government is left in the hands of the native chief. The town of Palem- bang

is a large place of 50,000 inhabitants (2500 Chinese), with extensive barracks, hospitals, &., a mosque (1740), considered the finest in the Dutch Indies, and a traditional tomb of Alexander the Great. A good description of the town and its river approaches is given by Mr Forbes.

E. The kingdom of Indragiri (along with Kwanten and the districts of Reteh and Mandah) is administratively subject to the residency of Riouw.

F, The residency of the East Coast was formed in 1873 of the territory of Siak and its dependencies and the state of Kampar. It consists of five divisions,—the island Bengkalis, Siak proper, Labuan Batu, Asahan, Deli. The island has an area of 529 square miles and a population of 5000. Deli is the most important part of the residency, —having been since 1870 the seat of the Amsterdam Deli Company, engaged in growing tobacco, coffee, dc.

G. In 1878 the Achin (Atjeh) kingdom was turned into a Dutch government, but the greater part of the territory is still but little known. Compare Acui, vol. i. p. 95 sg.

Flora.—Though Sumatra is separated from Java by so narrow a strait, the botanist at once finds that he has broken new ground when he crosses to the northern island, and the farther he advances inward the more striking becomes the originality of the flora. The alang fields, which play a great part in Java, have cven a wider range in Sumatra, descending to within 700 or 800 feet of sea-level; where- ever a space in the forest is clearea this aggressive grass begins to take possession of the soil, and if once it be fully rooted the wood- land has great difficulty in re-establishing itself. Among the orders more strongly represented in Sumatra than in Java are the Dip- terocarpacer, Chrysobalanacex, sclerocarp Myrtacexe, Melastomaceex, Begonias, Nepenthes, Oxalidaccw, Myristicacer, Ternstrimiacee, Connaracce, Amyridacce, Cyrtandracer, Epacridacee, and Hrio- caulacesw. Many of the Sumatran forms which do not occur in Java are found in the Malay Peninsula. In the north the pine tree (Pinus Merkusit) has advanced almost to the equator, and in the south are a variety of species characteristic of the Australian region. The, distribution of species does not depend on elevation to the same extent as in Java, where the horizontal zones are clearly marked ; and there appears to be a tendency of all forms to grow at lower altitudes than in that island. A remarkable feature of the Sumatran

flora is the great variety of trees that vie with each other in stature and beauty, and as a timber-producing country the island ranks high even among the richly wooded lands of the archipelago.2 The process of reckless deforestation is, however, beginning to tell on certain districts,—the natives often destroying a whole tree for a plank or rafter. The principal cultivated plants, apart from sugar cane and coffee, are rice (in great variety of kinds), the cocoa-nut palm, the areng palm, the areca and the sago palms, maize (jagung), yams, and sweet potatoes; and among the fruit trees are the Indian tamarind, the blimbing, pomegranate, jambosa, guava, papaw, orange, and lemon. Even before the arrival of Europeans Sumatra was known for its pepper plantations ; and these still form the most conspicuous feature of the south of the island. For the foreign market coffee is the most important of all the crops,—the Padang districts being the chief seat of its cultiva- tion. The average value of the coffee brought to market in Padang in the three years 1880-82 was £521,000. Benzoin was formerly obtained almost exclusively from Sumatra from the Styrax Benzoin.®

«The Central Sumatra Expedition alone collected specimens of about 400 kinds of timber.

3 See Miquel, flora Ind. Batave; Supp.1,“ Prodr. Flore Sumatrane,”

1860.

Fauna.—Snellemann confirms the statement of Wallace that no trace has been found of the orang-outan (Simia satyrus). The siamang (Hylobates syndactylus), an ape peculiar to the island, fills the woods with the cry “wwa uwa,” The ungko (Hylobates agilis) is not socommon. A fairly familiar form is the simpei (Semno- pithecus melalophus). No apes are found on the plateau of Alahan Pandjang and the slopes of the mountains above 1500 metres. The tjigah (Cercocebus cynomolgus) is the only ape found in central Sumatra ina tame state. The pig-tail ape (Macacus nemestrinus)— as Rafiles described it in his “ Descriptive Catalogue of a Zoological Collection made in Sumatra,” Zrans. Linn. Soc., 1820, vol. xiii. p. 243—is employed by the natives of Benkulen to ascend the cocoa-nut trees for the purpose of gathering the nuts. The Galeo- pithecus volans

(‘‘kubin,” “‘flying cat,” or “flying lemur”) is fairly common. Bats of from twenty to twenty-five species have been registered ; in central Sumatra they dwell in thousands in the limestone caves. The Pteropus edulis (‘‘kalong,” “ flying fox ”) is to be met with almost everywhere, especially in the durian trees. The tiger frequently makes his presence felt, but is seldom seen, and less frequently hunted; he prefers to prowl in what the Malays call tiger weather, that is, dark, starless, misty nights. The “clouded tiger” or rimau bulu (Felis macrocelis) is also known, as well as the Malay bear and wild dog. Paradoxurus musanga (‘‘coffee-rat” of the Europeans) is only too abundant ; Aretictis binturong appears to be rare. The Sumatran hare (Lepus netschert), discovered in 1880, adds a second species to the Lepus nigricollis, the only hare previously known in the East Indian Archipelago. The Manis javanicus is the only representative of the Edentaia. The Pachydermata are strongly characteristic of the Sumatran fauna: not only are the rhinoceros (Rh. sumatranus), the Sus vittatus, and the Tapirus indicus common, but the elephant (alto- gether absent from Java) is represented by a peculiar species. The Sumatran rhinoceros differs from the Javanese in having two horns, like the African variety. Its range does not extend more than 8500 feet above sea-level, and that of the elephant not above 4900 feet. The wild Bos sundaicus does not appear to exist in the island. The Antilope swmatrensis (kambing-utan) has been driven to the loneliest parts of the uplands. Cervus equinus is widely distributed, Cervus muntjac less so.}

Inhabitants.—The bulk of the Sumatran population is Malayan ; but to what extent the Malay has absorbed pre-Malayan blood is still open to investigation. ‘Ihe Kubus, a race or tribe still found in an emphatically savage state in the interior, have been by some regarded as the remains of an aboriginal stock ; but Mr J. G. Garson, reporting on Kubu skulls and skeletons submitted to him by Mr Forbes, comes to the conclusion that they are decidedly Malay, though the frizzle in the hair might indicate a certain mixture of Negrito blood (Journ. Anthrop. Inst., 1884). They speak the Malay dialect of the district to which they belong.

One of the most interesting of all the savage or semi-savage peoples is the Battaks or Batahs. About these a great deal has been written since Junghuhn published his Die Battaldnder in 1847. It is not known whether they were settled in Sumatra before the Hindu period. Their language contains words of Sans- krit origin and others most readily referred to Javanese, Malay, Menangkabau, Macassar, Sundanese, Niasese, and Tagal influence, At the present time they occupy the country to the south-east of Achin, in the centre of which lies the great Toba Lake; but it is evident that they formerly possessed, or at least were present in, various other districts both north and south. The process of ab- sorption into the Achin and Malay population which is now rapidly going on seems to have been long at work. In many points the Battaks are quite different from the Malay type. The average stature of the men is about 5 feet 4 inches, of the women 4 feet 8 mches. In general build they are rather thickset, with broad shoulders and fairly muscular limbs. The colour of the skin ranges from dark brown to a yellowish tint, the darkness apparently quite independent of climatic influences or distinction of race. The skull is rather oval than round. In marked contrast to the Malay type are the large black long-shaped eyes, beneath heavy black or dark brown eyebrows. The cheek bones are somewhat prominent, but less so than among the Malays. J. B. Neumann? reckons the inhabitants of the whole river basin of which he treats at 50,000. The Battak language, especially the Toba dialect, has been studied by Van der Tuuk (Bataksch Wi oordenboek), On the borders of Palembang and Benkulen live the Redjangers, a peculiar tribe who still employ a distinctive written character, which they cut with a kris on bamboo or lontar. The same character is employed by the Pasumahs, who bear traces of

Javanese elements or influence. Full details as to the various forms are given by Van Hasselt, Volksbe- eae —_— 4

1 For the birds see Forbes's Naturalist's Wanderings. On this, as on other branches of natural history, elaborate treatises appear in Midden-Sumatra.

Het Pane en Bila Stroomgebied," in Tijdsch. Ned. Aardrijksk. Gen., 1886.

3 Mr. C. A. van Ophuijsen has published (in Bijd. tot Land-, Taal-, en Volken-

Kunde, 1886) an interesting collection of Battak poetry. He describes a curi-

ous leaf language used by Battak lovers, in which the name of some leaf or plant is substituted for the word with which it has greatest phonetic similarity.

schr, en Taal van Mid.-Sumatra (1877-79 expedition), The original stock of the Achinese appears, according to K. H. F. van Langen (Tijdschr. voor Ind. Taal-, Land-, en Vi olken – Kunde,sBatavia, XXvili.), to have consisted of the Mantirs, who seem to have been driven inland by the Battaks and the Cheties (Tjeties) or Hindus. The Achinese language is at present spoken in four main dialects, of which the purest or most cultured is that of the XXV. and XXVI. Mukims. It shows, besides the Mantir element, Malay, Battak, Hindu, and Arabic influence. The inhabitants of the Nias Islands have a special tongue, which has been studied by Herr Sundermann.

The physical conditions of large tracts render it certain that as a whole the island cannot be thickly peopled. In 1881 the Govern. ment Almanac gave the population of the Dutch possessions as 2,142,873 (2894 Europeans, 2,098,984 natives, 11,289 Chinese, 1929 " Arabs," and 27,777 Orientals of other stock). To this consider- able additions must be made, as the kingdom of Achin (356,000 at least), as well as Indragiri and Kwanten (about 30,000). Perhaps a fair estimate for the whole is somewhat under 8,500,000. The Nias Islands would add 230,000 to the total. The most populous region is the government of the West Coast.

History.—As far as is known, Sumatran civilization and culture are of Hindu origin; and it is not improbable that the island was the first of all the archipelago to receive the Indian immi- grants who played so important a part in the history of the region. Certain inscriptions discovered in the Padang Highlands seem to certify the existence in the 7th century of a powerful Hindu king- dom in Tanah Datar, not far from the site of the later capital of Menangkabau. In these inscriptions Sumatra is called the “ first Java,” The traces of Hindn influence still to be found in the island are extremely numerous, though far from being so import- ant as those of Java. There are ruins of Hindu temples at Butar in Deli, near Pertibi, on the Panbi river at J ambi, in the interior of Palembang above Lahat, and in numerous other localities. One of the principal Hindu ruins is at Muara Takus on the Kampar river.4 The buildings (including a stupa 40 feet high) may possibly date from the 11th century. At Pagar Rujung are sree. stones with inscriptions in Sanskrit and Menangkabau Malay. Sanskrit words occur in the various languages spoken in the island; and the Ficus religiosa, the sacred tree of the Hindu, is also the sacred tree of the Battaks. At a later period the Hindu influence in Sumatra was strengthened by an influx of Hindus from Java, who settled in Palembang, Jambi, and Indragiri, but their attachment to Sivaism prevented them from coalescing with their Buddhist brethren in the north. In the 13th century Mohammedanism be- gan to make itself felt, and in course of time took a firm hold upon some of the most important states. In Menangkabau, for instance, the Arabic alphabet digniated the Kawi (ancient Javanese) character previously employed. Native chronicles derive the Menangkabau princes from Alexander the Great; and the Achinese dynasty boasts its origin from a missionary of Islam. The town of Samudera was at that period the seat of an important principality in the north of the island, whose current name is probably a corruption of this word.® Mr Wenniker in 1881 found a village called Samudra near Pasei (Passir), which possibly indicates the site.

Subjoined are a few leading events in the recent history of Sumatra. The island, or rather the portions possessed by the Dutch, were British from 1811 to 1816. 1821. Second expedition against Palembang ; Palembang captured 23d June. 1822. Men- angkabau recognized Dutch authority. 1825. Benkulen taken over from the English in May. 1837. Cultivation of coffee extended in West Coast region by Governor A. v. Michiels. 1840. Extension

of the West Coast government to Sinkil. 1851. Revolt suppressed in Palembang; expedition to the Lampong districts. 1853. Cholera rages in the island; Raja Tiang Alam, ringleader of the revolt in Palembang, surrenders. 1858. Expedition against Jambi; sultan dethroned and treaty made with his successor. 1860. Redjang added to Palembang residency. 1868, Expedition against Nias. 1865. Expedition against Asahan and Serdang (East Coast). 1872. Agreement with the British Government in regard to Sumatra. 1873. War in Achin commenced. 1874. Capture of the kraton of Achin. 1876, Capture of the VI., IV., and IX. Mukims (Achin); expedition against Kota Jutan (East Coast); emancipation of slaves on West Coast. 1878. Benkulen made a residency ; civil adminis- tration of Achin and dependencies entrusted to a governor.

The literature dealing with Sumatra is very extensive. Of the older worke the best known is Marsden's History of Sumatra, 1811. A full list of other authorities will be found in Veth's Aardrijkskundig Woordenboek van Nederl. Indié, 1869.. Among recent works by far the most important is Midden-Su- matra; Reizen en Onderzoekingen der Sumatra Eapeditie, 1877-1879 (1882), edited by Prof. P. J. Veth. See also Brau de Saint-Pol Lias, lle de Sumatra, 1884; Bastian, Indonesien; Buijs, Twee Jaren op Sumatra's Westkust; M. Fauque, "Rapport sur un Voyage 4 Sumatra," in Archives des Missions Scient., 3d ser.

vol. xii. ; Kielstra, Beschrijving van der Atjeh Oorlog, 1885-86, and 'Sumatras West-Kust van 1819-1825," in Bijd. tot Land-, &c., -Kunde, 1887. (H. A. W.)

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4 See descriptions of it in Tijdschr. van Ind. Taal-, Land-, en Volken-Kunde. 1860 and 1879, and Verhandel. Batav. Gen. van Kunst en Wetensch., 1881.

5 All the facts relating to this derivation are given in Yule and Burnell, Glossary of Anglo-Indian Words, s.v. "Sumatra."

SUMBAL, or Sumpvt, also called Musx Root, a drug recently introduced into European medical practice. It consists of the root of Ferula Sumbul, Hook., a tall Um- belliferous plant found in the north of Bokhara, its range apparently extending beyond the Amur. It was first brought to Russia in 1835 as a substitute for musk Bei was subsequently recommended as a remedy for cholera, and in 1867 was introduced into the British pharmacopeeia. The root as found in commerce consists of transverse sec- tions an inch or more in thickness and from 1 to 3 or more inches in diameter. It has a dark thin papery bark, a spongy texture, and the cut surface is marbled with white and blackish or pale brown ; it has a musky odour and a bitter aromatic taste. Sumbal is used in medicine as an antispasmodic and stimulating tonic, especially in nervous diseases. It owes its medicinal properties to a balsamic resin and an essential oil, Of the former it contains about 9 per cent. and of the latter one-third per cent. The resin is soluble in ether and has a musky smell, which is not fully developed until after contact with water ; by dry dis- tillation it yields umbelliferone, C)H,O., a crystalline sub- stance soluble in water, ether, and chloroform, and produc- ing in an alkaline solution a brilliant blue fluorescence, which is destroyed by the addition of an acid in excess.

Under the name of East Indian sumbal, the root of Dorema ammoniacum, Don., has occasionally been offered in English com- merce, It is of a browner hue, has the taste of ammoniacum, and gives a much darker tincture than the genuine drug; it is thus casily detected. The name “sumbal” (a word of Arabic origin, signifying a spike or ear) is applied to several fragrant roots in the East, the principal being Nardostachys Jatamansi, D.C. (see SPIKE- NARD). West African sumbal is the root of a species of Cyperus.

SUMBAWA (properly Sampawa or Samawa), an island of the East Indian Archipelago, one of the Sunda group, lies between 8° 6’ and 9° 3’§. lat. and 116° 47’ and 119° 12’ E. long., to the east of Lombok, from which it is sepa- rated by the narrow Allas strait. Its area is estimated at 5186 square miles. The population was computed to number about 150,000 in 1887, The deep Bay of Salee or Sumbawa on the north divides the island into two penin- sulas, and the isthmus is further reduced by the narrower Bay of Tjempi (Chempi) entering from the south. The eastern peninsula is deeply

indented by the Bay of Bima. The whole surface of Sumbawa is mountainous: G. Ny- enges, in the western peninsula, is 5560 feet high, and G. Tambora, in the eastern, which is said to have lost a third of its elevation in the eruption of 1815, is still 8697 feet high. There are no navigable streams. The climate and productions are not unlike those of Java, though the rains are heavier, the drought more severe, and the fertility less. Sulphur, arsenic, asphalt, and petroleum are the mineral products. Mohammedanism prevails throughout the island, except among certain mountain tribes.

Sumbawa is divided into four independent states, —Sumbawa proper, Dompo, Sangar, and Bima. Two other states on the northern cxtremity of the island were so devastated by the Tambora eruption of 1815 that their territory, after lying for long uninhabited, was in 1866 divided between Dompo and Sangar. Sumbawa proper occupics the westcrn peninsula, The residence of the sultan is Sumbawa, 2 milcs from the coast of the great bay, in 8° 32’S, lat. and 117° 20’ 33” E. long. It is surrounded with palisade and ditches. The inhabitants of this state employ sometimes the Malay and sometimes the Macassar character in writing. A considerable trade is carried on in the export of horses, buffaloes, goats, dinding (dried ficsh), skins, birds’ nests, wax, rice, katjang, sappanwood, &c. Sumbawa entered into treaty relations with the Dutch East India Company in 1674. Dompo is the western half of the eastern penin- sula. The capital of the state, Dompo, lies in the heart of the country, on a stream that falls into Tjempi Bay. Bada, the sultan’s residence, is farther west. Sangar occupies the north-western promontory of the island, and Bima the extreme east. Bima or Bodjo, the chief town of the latter state, lies on the east side of the Bay of Bima; it has a stone-walled palace and a mosque, as well as a Dutch fort. The population of Bima is curiously divided into twelve guilds or castes (dari). In the town isa Government Christian school dating from 1874.

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SUMMARY JURISDICTION. By a court of summary

jurisdiction is meant a court in which cases are heard and determined by a justice or justices of the peace, without the intervention of a jury. Such a court has duties to perform of two different kinds. It either hears and de- termines a case in a judicial capacity, or it acts rather in a ministerial

capacity where a prima facie case has been established, as by issuing a warrant of distress for non- payment of poor rate, or by committing an accused person for the decision of a higher court, generally assizes or quarter sessions, It is to the court acting in the former capacity that the term “court of summary jurisdiction ” more strictly applies. ver since the first institution of Justices of the peace (see JUSTICE or THE Prace), the tendency of English legislation has been to enlarge their jurisdiction and to enable offences of a less heinous nature to be tried in their courts without a jury. This inroad upon the functions of the jury can only be made by legislation. ‘‘The common law is a stranger to it, unless in the case of contempts,” says Blackstone. At common law all offences must be proceeded against by indictment, and an indictment can only be tried before a jury. Even where an offence is created by statute and is unknown to the common law the procedure must be by indictment, unless the statute creating the offence or some other statute specially makes it summary. The history of the gradual growth of summary jurisdiction will be found in Stephen, Listory of the Criminal Law, vol. i. chap. iv. The summary jurisdiction exercised by justices is the only one of much practical importance. It is unnecessary to do more than mention in passing the two other kinds named by Blackstone, that of the commissioners of taxes for revenuc offences and that of the superior courts for ConrEMPT oF Courr (¢.v.). A very remarkable case of the latter is the power given to a judge by 12 Geo. I. c, 29, s. 4, to summarily sentence to seven years’ penal servitude a solicitor practising after conviction for perjury, forgery, or barratry.

The principal Acts now dealing with summary jurisdiction are the Summary Jurisdiction Act, 18481 (11 and 12 Vict. c. 43), one of what are called Jervis’s Acts, and the Summary Jurisdiction Act, 1879 (42 and 43 Vict. c. 49). The former consolidated the law up to that time of a large number of Acts, but only to a certain extent, for a considerable number of previous enactments dealing in a greater or less degree with this subject are still law, the earliest being 5 Hen. IV. c. 10. It also amended the law in several important particulars. The amendment was in the direction of greater simplicity of procedure, and related to both criminal and only quasi-criminal matters. The procedure under the Act is shortly this. In all cases where an information is laid or complaint made the justices are, on proof of a prima facie case, to issue a SUMMONS (q.v.). An information is laid in

criminal matters in which the decision of the justices, if adverse to the defendant, would be a conviction. A complaint is made where the decision of the justices in such an event would be an order for the payment of money or otherwise in what may be called only quasi-criminal matters, e.g., claims under the Employers and Workmen Act. If the summons is disobeyed, a warrant may (in criminal charges only) issue in the first instance at the discretion of a justice. The warraut is good only within the local jurisdiction of the justice issuing it; and, if it is required to be executed in another jurisdiction, 1t must be backed, z.e., endorsed, by a justice of that jurisdiction (unless in case of a fresh pursuit, when it is good for 7 miles beyond the bounds of the jurisdiction in which it was issued). Complaints need not be in writing ; informations usually are, though the Act does not make writing necessary. Where a warrant issues in the first instance, the information must be upon oath. In all cases not otherwise provided for, the information must be laid or com- plaint made within six calendar months from the time at which the matter of the information or complaint arose. The hearing is in open court, and parties may appear by counsel or solicitor. If both parties appear, the justices must hear and determine the case. If the defendant does not appear, the justices may hear and

1 This name of the Act of 1848 is an example of a title of an Act conferred retrospectively (see StaTUTE), The name was given to it by the Act of 1879. In the same way the name of the Scotch Summary Procedure Act, 1864, was changed to that of the Summary Jurisdic- tion Act, 1864, by the Summary Jurisdiction Act, 1881.

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determine in his absence, or may issue a warrant and adjourn the hearing until his apprehension. If the complainant does not appear, the justices may dismiss the complaint or adjourn the hearing. The punishment inflicted may be fine or imprisonment, or both. Imprisonment as a rule cannot exceed six mouths, The regular mode of proceeding where a conviction adjudges a pecuniary penalty, or an order requires payment of a sum of money, is by issue of a warrant of distress to be levied on the goods of the defendant, The court usually consists of two or more justices, but the lord mayor or an

alderman of the City of London, a metropolitan police magistrate, and a stipendiary magistrate have each the authority of two justices. The Act further makes provision for curing defects in form in the proceedings for the payment of costs, for removing difficulties as to the boundaries of jurisdiction, and for various other inatters. The schedule gives forms of proceedings, whicli are as far as possible to be followed. The Act of 1879 amended the Act of 1848 in several important particulars, chiefly in the direction of greater leniency and enlarged jurisdiction and power of appeal. A greater discretion in the infliction of punishment is conferred on the court. A scale of imprisonment in respect of non-payment ot a fine or default of distress is fixed at periods varying according the amount of the fine unpaid, but in no case exceeding t}roe months (except in certain revenue offences, where the limit ‘s six months), and without hard labour, unless hard labour is specially authorized by the Act on which the conviction is founded. Time may be given for payment of money, or it may be ordered to be paid by instalments, or security may be taken. Summary trial of children under twelve is allowed at the discretion of the court in case of any indictable offence other than homicide, unless objection is made by the parent or guardian. SURETY, RECOGNIZANCE), and the issue and execution of warrants of commitment and distress, The issue of such a warrant may be postponed if the court thinks fit. The wearing apparel and bedding of a person and his family, and the tools and implements of his trade to the value of £5, are exempt from distress. Imprisonment may in certain cases be ordered instead of distress. The right of appeal is much extended. An appeal now lies from every conviction or order adjudgin imprison- ment without the option of a fine where the accused aid not plead guilty. The appeal by the Act of 1884 must be in accordance with the procedure of the Act of 1879, or of any subsequent Act giving a right of appeal in the particular case. The appeal is to QUARTER SEssIons (¢.v.). A summons or warrant is not avoided by the death or cesser of office of the justice issuing it. Under the powers of the Act rules and forms were framed which came into effect on Ist January 1880. The Summary Jurisdiction (Process) Act, 1881 (44 and 45 Vict. c. 24, applying to Great Britain, but not to Ireland), gave additional facilities for serving and executing the process of an English court of summary jurisdiction in Scotland or of a Scotch court in England, on endorsement in the country where it is executed. The

Vict. c. 48), repealed by the Acts of 1848

those Acts as to which doubts had._ arisen. other enactments dealing less directly with the powers of courts of

Property, Acts conferring summary jurisdiction are the Army, Bastardy, Customs, Post Office, and Vagrant Acts. Customs decision

besides appeal, a writ of certiorari, mandamus, or habeas corpus, or

: The English summons and warrant are repre- sented in Scotland by the warrant of citation and the warrant of apprehension, Where no punishment is fixed for a statutory offence, the court cannot sentence to more than a fine of £5 or sixty days imprisonment, in addition to ordering caution to keep the

peace. The Act of 1881 adopts many of the provisions of the English Act of 1879. In addition, it confers the discretion as to punishment to a sheriff trying by jury in cases where the prosecu- tion might have been by complaint under the Acts. Appeals from courts of summary jurisdiction are now mainly regulated by 38 and 39 Vict. c. 62, and proceed on case stated by the inferior judge,

Ireland.—The principal Acts dealing with the subject are the Summary Jurisdiction and Petty Sessions Acts, 1851 (14 and 15 Vict. cc. 92, 98). These Acts are more extensive in their purview than the English Acts, as they form in a great degree a code of substantive law as well as of procedure. The exceptional political circumstances of Ireland have led to the appointment of resident magistrates under 6 and 7 Will. LY. c. 18, and to the conferring at different times on courts of summary jurisdiction of an authority, generally temporary, greater than that which they can exercise in Great Britain. Recent instances are the Peace Preservation Act, 1881, and the Prevention of Crime Act, 1882. The provisions of the English Act of 1879 as to children were extended to Ireland by 47 and 48 Vict. ¢. 19.

United States.—By Art. III. s. 2 of the constitution the trial uf all crimes, except in cases of impeachment, is to be by jury. By Art. V. of the amendments no person can be held to answer for a capital or otherwise infamous crime unless on a presentment or indictment of a grand jury. Considerable changes have been made by State legislation in the direction of enlarging the powers of courts of summary jurisdiction. J. Wt.)

SUMMONS (swmmonitio) is a legal form demanding the attendance of a pergon in parliament (see Prrrage, vol. xviii. p. 462) or before a court of justice. The term as it applies to courts of justice is used both in civil and in criminal procedure, but is not applied universally to all cases of demanding attendance. Thus in the Probate, Divorce, and Admiralty Division the summons is usually, following the civil law, called a “citation,” while a summons

_to a witness (at least in the superior courts) bears the name

of ‘‘subpeena,” taken from the initial words of the penal clause in its Latin form. Whatever be the name, the principle of law is invariable, that a court before proceeding to adjudicate should bring before itself by some formal legal process all persons interested in the decision or able to influence the decision by giving evidence as material witnesses, The oral summons, like the oral pleading, seems to have been earlier in time than the written form. In Roman law the oral in jus vocatio existed centuries before the written dibellus conventionis, The antiquity and im- portance of the summons as a legal form in England is shown by the presence of the “‘sompnour,” or summoner of the ecclesiastical court, as one of the characters in the Canterbury Tales, and by the comparative frequency of “Sumner” as a surname, In civil procedure a summons may be issued either in the High Court or in an inferior court, such as a county court. In the High Court all actions are commenced by writ of summons, In the High Court the summons (in this case not in the form of a writ) is also a convenient mode of determining interlocutory matters by a judge or some other officer of the court— such as a master in the Queen’s Bench Division or a chief clerk in the Chancery Division—without the necessity of bringing the case into court.

The tendency of recent legislation is towards the increased use of the summons as a mode of presenting a case for decision. For instance, under the Vendor and Purchaser Act, 1874, and the Con- veyancing Act, 1881, many important questions, even of title to real property, may be raised on summons. It thus approaches very nearly to PLEADING (g.v.); in fact, the definition of pleading in the Judicature Act, 1873, s, 100, includessummons. The Rules of the Supreme Court, 1883, introduced two new forms of summons,— (1) the general summons for directions, by which several matters nay be included in a single summons which before the rules must have been the subject of separate applications ; (2) the originating summons in the Chancery Division, by which proceedings may be commenced without writ for certain kinds of relief specified in the rules (see Ord. lv. r. 3). The originating summons to a great extent supersedes the action for administration of a trust or of the estate of a deceased person.! An ordinary summons must be serycd

1 A similar practice existed before 1883 under the powers given by 15 and 16 Vict. c. 86, but was very limited in its operation, as it

applied simply to the personal estate of a deceased person,

two, an originating summons seven, clear days before its return. A decision on a summons is generally subject to appeal. In the Chancery Division it is customary to adjourn into court the con- sideration of a summons of more than ordinary importance. The appendix to the Rules of 1883 contains forms of every kind of summons in the High Court. In the county courts an action is commenced by plaint and summons. Two kinds of summons are in use,—the ordinary and the default summons. The latter is an optional remedy of the plaintiff in actions for debts or liqui- dated demands exceeding £5, and in all actions for the price or hire of goods sold or let to the defendant to be used in the way of his calling. It may also issue by leave of the judge or registrar in other cases, with the single exception that no leave can be given in claims under £5 where the claim is not for the price or hire of goods sold or let as above, if the affidavit of debt discloses that the defendant is a servant or person engaged in manual labour. The advantage of a default summons is that judgment is entered for the plaintiff without

hearing unless the defendant gives notice of defence within a limited time. A default summons must as a rule be served personally on the defendant ; an ordinary summons necd not be served personally, but may in most cases be delivered to a person at the defendant's house or place of business. A summons is also issued to a witness in the county court. Forms of summons are given in the County Court Rules, 1886. These include certain special forms used in Admiralty and interpleader actions and in proceedings under the Charitable Trusts Acts, the Friendly Societics Act, 1875, and the Married Women's Property Act, 1882. In criminal law a summons is the mode of securing the attendance of the defendant before a court of summary jurisdiction, whether it be sought to obtain a conviction or an order against him. Forms of summons to a defendant, a witness, or a surety will be found in the schedule to the Summary Jurisdiction Act, 1848, and in the rules issued in accordance with the Summary Jurisdiction Act, 1879 (see the article SUMMARY JURISDICTION, supra). Forgery of a summons or use of any document falsely purporting to be a summons or professing to act under such a document is punishable as felony ner the County Courts Act, 1846, and the Forgery Act of 1861.

Scotland.—Summons is a term confined in strictness to the commencement of an action in the Court of Session. Formerly it was the mode of commencing an action in the sheriff court, but such an action is now commenced by PETITION (g.v.). In some Acts of Parliament, however—e.g., the Citation Amendment Acts—the term 'summons " is certainly used to denote part of the process of an in- ferior court. The summons is a writ in the sovereign's name, signed by a writcr to the signet, citing the defender to appear and answer the claim. The will of the summons calls upon the defender to pee on the proper induciz.

SUMNER, Cuarzss (1811-1874), American statesman, was born at Boston, Mass., on 6th January 1811. He graduated at Harvard in 1830, and studied law with Judge Story. His natural powers of mind were great, his habits of study intense, and his success immediate and con- spicuous. Everything seems to have been expected of nim, and he disappointed nobody. In 1834 he had been admitted to the bar, was editor of the American Jurist, and was reporting the decisions of Judge Story. For the next three years he was a lecturer in the Harvard law school. He then spent three years in Europe,

always, however, studying with an intensity that never relaxed. Returning, he began the practice of law, but gradually drifted into politics during the anti-slavery struggle. In 1851 the few “free-soilers” in the Massachusetts legis- lature offered to vote for Democrats for other officers in return for Democratic votes for Sumner as United States senator. Sumner was thus sent to the Senate, to which he was regularly re-elected for the rest of his life. He at once became a man of mark, though not of popularity, in

the Senate. His fine personal presence, his somewhat florid rhetoric, his wealth of citation from learned and foreign tongues, his wide foreign acquaintance, high cul- ture, and social standing, seem to have staggered his Southern colleagues. They could not look down upon him, and they hardly knew what else todo. A long series of speeches brought about an assault upon him, 22d May 1856, by Preston 8. Brooks, a representative from South Carolina, in retaliation for Sumner’s criticism of Brooks’s uncle, a senator from his State. Brooks found Sumner writing in the Senate chamber, and beat him so cruelly that he narrowly escaped death. He was absent from his place until 1859, and never fully recovered from the effects of the assault. When his party took control of the Senate in 1861 Sumner became one of its foremost members. Like Stevens (see STEVENS), he propounded a theory of the relations of the seceding States to the Union which never was endorsed, but had its influence on the outcome of reconstruction. In the American Union States are auto- nomous, but Territories are theoretically under the abso- lute government of Congress, though in practice Congress gives them as much self-government as is possible or prudent. A Territory becomes a State by admission through an Act of Congress. Sumner held that the national boundaries of the Union were so fixed that no State could escape from them by secession, that a State’s secession was merely an abandonment of its Statehood, so that it fell back into the condition of a Territory and came under the absolute government of Congress. This “State- suicide” theory was in due time condemned by the Supreme Court, which held that a State could not lose its State- hood; but Congress had really acted upon it already in several points of reconstruction. Sumner’s peculiar field was in the Senate committee on foreign relations, of which he was chairman from 1861 until 1871. It was

during this period, in 1869, that he urged the “indirect” items of the Alabama claims, sacrificing without hesitation the English popularity which had always been dear to him. Within a year or two he felt compelled to oppose the new administration of President Grant in several particulars. In the expectation of gratifying the president, the Repub- lican senators removed Sumner from his chairmanship ; and, like Seward, he passed his later years in general op- position to the party which he had helped to organize. In December 1872 he introduced a resolution that the names of victories over fellow-citizens should be removed from the regimental flags of the army. For this his State legislature censured him, but the censure was rescinded just before his death. He had been from the beginning of the Civil War the advocate of emancipation and of the grant of full status to the Negroes; and for the last few years of his life his energies were devoted to forwarding his Civil Rights Bill, intended to give the freedmen the same legal rights as the whites. He died at Washington on llth March 1874.

Sumner’s speeches were collected in 1850 under the title of Ora- tions and Speeches, to which was added, in 1856, Recent Speeches and Addresses. Wis Works, in twelve volumes, were issued in 1875. See also Lester’s Life of Sumner, 1874; Harsha’s Life of Sumner ; and Pierce’s Memorial and Letters of Sumner.

SUMPTUARY LAWS are those intended to limit or regulate the private expenditure of the citizens of a com- munity. They may be dictated by political, or economic, or moral considerations. They have existed both in ancient and in modern states. In Greece, it was amongst the Dorian races, whose temper was austere and rigid, that they most prevailed. All the inhabitants of Laconia were forbidden to attend drinking entertainments, nor could a Lacedzemonian possess a house or furniture which was the work of more elaborate implements than the axe and saw. Amongst the Spartans proper, simple and frugal habits of

life were secured rather by the institution of the pheiditia (public meals) than by special enactments. The possession of gold or silver was interdicted to the citizens of Sparta, and the use of iron money alone was permitted by the Lycurgean legislation. ‘‘ Even in the cities which had early departed

from the Doric customs," says K. O. Miiller, "there were frequent and strict prohibitions against ex-

pensiveness of female attire, prostitutes alone being wisely

In the Locrian code of Zaleucus citizens were

excepted." 1 The Solonian sump-

forbidden to drink undiluted wine.

tuary enactments were directed principally against the extravagance of female apparel and dowries of excessive amount ; costly banquets also were forbidden, and expen- The Pythagoreans in Magna Grecia not only protested against the luxury of their time

sive funeral solemnities.

but encouraged legislation with a view to restraining it. At Rome the system of sumptuary edicts and enactments

was largely developed, whilst the objects of such legisla- tion were concurrently sought to be attained through the The code of the Twelve

exercise of the censorial power. Tables contained provisions limiting the expenditure on funerals. The most important sumptuary laws of the Roman commonwealth were those which follow. (1) The Oppian law, 215 B.c., provided that no woman should possess more than half an ounce of gold, or wear a dress

of different colours, or ride in a carriage in the city or

within a mile of it except on occasions of public religious ceremonies. This law, which had been partly dictated by the financial necessities of the conflict with Hannibal, was repealed twenty years later, against the advice of Cato.

Livy (xxxiv. 1-8) gives an interesting account of the com- motion excited by the proposal of the repeal, and of the

exertions of the Roman women against the law, which almost amounted to a female émeute. (2) The Orchian

law, 187 B.c., limited the number of guests at entertain-

ments. An attempt being made to repeal this law, Cato

offered strong opposition and delivered a speech on the

subject, of which some fragments have been preserved. (3) The Fannian law, 161 B.c., limited the sums to be

spent on entertainments; it provided amongst other things that no fowl should be served but a single hen, and (4) The Didian law, 143 3.c., ex-

that not fattened. tended to the whole of Italy the provisions of the Fannian law, and made the guests as well as the givers of entertain- ments at which the law was violated liable to the penalties. After a considerable interval, Sulla anew directed legisla- tion against the luxury of the table and also limited the cost of funerals and of sepulchral monuments. We are told that he violated his own law as to funerals when bury- ing his wife Metella, and also his law on entertainments when seeking to forget his grief for her loss in extravagant drinking and feasting (Plut., Swll., 35). Julius Cesar, in the capacity of prafectus morvbus, after the African war re-enacted some of the sumptuary laws which had fallen into neglect ; Cicero implies (Ep. ad Att., xiii. 7) that in Czsar's absence his legislation of this kind was not at- tended to. Suetonius tells us that Cesar had officers stationed in the market-places to seize such provisions as were forbidden by law, and sent lictors and soldiers to feasts to remove all illegal eatables (Jul., 43). Augustus fixed anew the expense to be incurred in entertainments on ordinary and festal days. Tiberius also sought to check inordinate expense on banquets, and a decree of the senate was passed in his reign forbidding the use of gold vases except in sacred rites, and prohibiting the wearing of silk garments by men. But it appears from Tacitus (Ann., il, 5, where a speech is put into his mouth very much in the spirit of Horace's « Quid leges sine moribus Vane proficiunt ?"), that he looked more to the improvement of manners than to direct legislative action for the restriction

of luxury. Suetonius mentions some regulations made by Nero, and we hear of further legislation of this kind by Hadrian and later emperors. In the time of Tertullian the sumptuary laws appear to have been things of the past (Apol,.@ vi.)

In modern times the first important sumptuary legisla- tion was—in Italy that of Frederick II. ; in Aragon that of James I., in 1234; in France that of Philip IV.; in Eng- land that of Edward II. and Edward III. In 1294 Philip IV. made provisions as to the dress and the table expendi- ture of the several orders of men in his kingdom, the most remarkable of which may be seen in Guizot's Civilisation en France, leg. 15. Charles V. of France forbade the use of long-pointed shoes, a fashion against which popes and councils had protested in vain. Under later kings the use of gold and silver embroidery, silk stuffs, and fine linen wares was restricted,—at first moral and afterwards economic motives being put forward, the latter especially from the rise of the mercantile theory. In England we hear much from the writers of the 14th century of the extravagance of dress at that period. They remark both on the great splendour and expensiveness of the apparel of the higher orders and on the fantastic and deforming fashions adopted by persons of all ranks. The parliament held at West- minster in 1363 made laws (37 Edw. III. c. 8-1 4) to restrain this undue expenditure and to regulate the dress of the several classes of the people. These statutes were repealed in the following year, but similer ones were passed again in the same reign. They seem, however, to have had little effect, for in the reign of Richard II. the same excesses prevailed, apparently in a still greater degree. Another Statute was passed in the year 1463 (3 Edw. IV. c. 5) for the regulation of the dress of persons of all ranks, In this it was stated that "the commons of the realm, as well men as women, wear excessive and inordinate apparel to the great displeasure of God, the enriching of strange realms, and the destruction of this realm." An Act of 1444 had previously regulated the clothing, when it formed a part of the wages, of servants employed in husbandry; a bailiff or overseer was to have an allowance of 5s. a year for his clothing, a hind or principal servant 4s,, and an ordinary servant 3s, 4d., —sums equivalent respectively to 50s., 40s., and 33s. 4d. of our money (Henry). Already in the reign of Edward II. a proclamation had been issued

against the "'outrageous and excessive multitude of meats and dishes which the great men of the kingdom had used, and still used, in their castles," as well as "persons of inferior rank imitating their example, beyond what their stations required and their circumstances could afford a and the rule was laid down that the great men should have but two courses of flesh meat served up to their tables, and on fish days two courses of fish, each course consist- ing of but two kinds. In 1363, at the same time when costumes were regulated, it was enacted that the servants of gentlemen, merchants, and artificers should have only one meal of flesh or fish in the day, and that their other food should consist of milk, butter, and cheese. Similar Acts to those above mentioned were passed in Scotland also. In 1433 (temp. James I.), by an Act of a parliament which sat at Perth, the manner of living of all orders in Scotland was prescribed, and in particular the use of pies and baked meats, which had been only lately introduced into the country, was forbidden to all under the rank of baron. In 1457 (temp. James II.) an Act was passed against "sumptuous cleithing." A Scottish sumptuary law of 1621 was the last of the kind in Great Britain.

Ferguson and others have pointed out that ' 'luxury " is a term of relative import and that all luxuries do not deserve to be dis- couraged. Roscher has called attention to the fact that the nature of the prevalent luxury changes with the stage of social develop-

ment. He endeavours to show that there are three periods in the history of luxury,—one in which it is coarse and profuse ; a second in which it aims mainly at comfort and elegance ; and a third, proper to periods of decadence, in which it is perverted to vicious and unnatural ends. The second of these began, in modern times, with the emergence of the Western nations from the medieval period, and in the ancient communities at epochs of similar transi- tion. Roscher holds that the sumptuary legislation which regularly appears at the opening of this stage was then useful as promoting the reformation of habits. He remarks that the contemporary formation of strong Governments, disposed from the consciousness of their strength to interfere with the lives of their subjects, tended to encourage such

legislation, as did also the jealousy felt by the hitherto dominant ranks of the rising wealth of the citizen classes, who are apt to imitate the conduct of their superiors. It is certainly desirable that habits of wasteful expenditure and frequent and wanton changes of fashion should be discouraged. But such action belongs more properly to the spiritual than to the temporal power. In ancient, especially Roman, life, when there was a confusion of the two powers in the state system, sumptuary legislation was more natural than in the modern world, in which those powers have been in general really, though imperfectly, separated. How far regulation of this kind could, and might usefully, be carried out by a spiritual power under purely moral sanctions, and whether and to what extent social offices, private as well as public, should be discriminated by costume, are questions which need not be dis- cussed at present. Political economists are practically unanimous in their reprobation of the policy of legislative compulsion in these matters. In a well-known passage Adam Smith protests against the ‘‘impertinence and presumption of kings and ministers in pretending to watch over the economy of private people and to restrain their expense, being themselves always and without any exception the greatest spendthrifts in the society.” Yet he does not seem to have been averse to all attempts to influence through taxation the expenditure of the humbler classes. The modern taxes on carriages, coats of arms, hair-powder, playing-cards, &c., ought perhaps not to be regarded as resting on the principle of sumptuary laws, but only as means of proportioning taxation to the capacity of bearing the burden.

The loci classici on Roman sumptuary laws are Gellius, Noctes Attica, ii. 24, and Macrobius, Saturn., iii. 17. On the similar English legislation Henry’s History of Great Britain may usefully be consulted. One of the best extant treatments of the whole subject is that by Roscher, in his essay Ueber den

Luaus, republished in his Ansichten der Volkswirthschaft aus dem geschtchtlichen Standpunkte (3d ed., 1878). (J. K. I.)

SUMY, a district town of Little Russia, in the govern- ment of Kharkoff, situated 125 miles to the north-west of the chief town of the government, was founded in 1652 by Little Russian Cossacks. It is poorly built, chiefly of wood, but is an important centre for the trade of Great Russia with Little

Russia,—cattle and corn being sent to the north in exchange for various kinds of manufactured and grocery wares. It has a classical pro-gymnasium and atechnical school. Its inhabitants, who numbered 16,030 in 1884, are engaged in commerce, in various kinds of petty trades, and in agriculture.

SUN. In the article Astronomy (vol. ii. p. 768 sq.) the sun has been considered as a member of the solar system, and references are given to various discoveries which have been made from time to time relating to its physical and chemical constitution. In the present article we propose to consider the sun as a star, and to state as briefly as may be the views at present held regarding its structure, and subsequently to refer to the most recent observations dealing with the physics and chemistry of the various phenomena which are open to our study.

The sun as ordinarily visible to us, bounded by the photosphere, is only a small part of the real sun: from observations made during eclipses it is now known that outside the photosphere are—first, an envelope, namely the chromosphere, which is mainly composed of hydrogen, and outside this another envelope, called the corona, while there is evidence that outside these, and especially along the plane of the sun's equator, there is a considerable ex- tension of matter which may or may not be of the same nature as that of which the corona is composed.

These various parts of the solar economy have been examined by the spectroscope, and from this examination two widely divergent views have arisen.

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According to the first view, the true atmosphere of the Extent sun 1s limited by the chromosphere, and the constituents of sun's of that atmosphere consist essentially of the vapours of the #™°- chemical elements recognized on the earth. It will be seen **P2**

that on this view the corona and the equatorial extension observed occasionally are merely solar appendages. In the other view the atmosphere of the sun is extended to the confines of the corona, the temperature naturally increasing as we descend ; and it is held that towards the

photosphere the temperature is so high that the chemical elements are dissociated into finer forms of matter, so that descending vapours get more simple, ascending vapours get more complex, and it is only in the cooler regions of the atmosphere that vapours resembling those of our ter- restrial elements can exist, while near the confines of the corona these vapours give place to solid particles and masses. Broadly stated, these divergent views have arisen from the application of two distinct methods of inquiry. In one method, light coming from every portion of the sun, and reflected, let us say, by a cloud into the spectroscope, gives us a spectrum full of absorption lines, and these lines are practically constant from year to year. In the other method, each minute portion of the solar economy has been examined bit by bit, and thus we have the spectrum of the spots, the spectrum of the promi- nences, the spectrum of the chromosphere, the spectrum of the corona, All these spectra vary enormously, not only among themselves, but from year to year; and, when we consider merely the spots and prominences, we may say that they vary from spot to spot and from prominence to prominence.

It will be obvious that the true mean density of the sun cannot be the same on the two hypotheses to which we have referred. If the atmosphere is practically limited by the photosphere, it has been found that the density of the sun is 1-444, water being taken as unity. If we include the corona in the sun’s atmosphere, and assume that its height is half a million of miles above the photo- sphere, then the volume of the sun is ten times that bounded by the photosphere, and the density is reduced to a tenth of the value given above.

We next proceed to discuss the chemical results obtained by the first method of inquiry to which reference has been made. For these results we are of course dependent upon comparisons of the lines given by various incandescent vapours with the Fraunhofer lines seen in the ordinary spectrum of the sun. If by such means complete evidence is afforded of the existence of one of our chemical elements in the sun, it is obvious that no information is given as to its precise locality ; further, if the high temperatures used in our laboratories to produce a spectrum should break up the molecules of the vapours as known to the chemist into finer ones, and if the temperature of the sun were to do the same, there would still be a

considerable similarity between the solar and the terrestrial spectrum of any one substance.

The first (A) of the following tables gives the substances present in the sun’s atmosphere according to (1) Kirchhoff, and (2) Angstrém and Thalén.

TABLE A.

Kirchhoff.

Sodium, Iron, Calcium, Magnesium, Nickel, Barium, Copper, Zinc.

Sodium, Iron, Calcium, Magnesium, Nickel, Chromium, Cobalt, Hydrogen, Manganese, Titanium.

Angstrom and Thalén.

A subsequent method of inquiry, which was capable of tracing merely a small quantity, gave the additional sub- stances shown in Table B.

Mean density.

Chemica constitu- tion of atmo- sphere.

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(18) At and slightly after the minimum the lines are chiefly known lines of the various metals. (14) At and slightly after the maximum the lines are chiefly of

TABLE B. Elements whose Longest Lines coincide with Fraunhofer Lines.

Certainly | Aluminium, Strontium, Lead, Cadmium, Cerium, unknown origin. coincident. Uranium, Potassium, Vanadium, Palladium, _ (15) On the hypothesis under discussion the change indicates an Molybdenum. increased temperature in the spots at the sun-spot maximum, The general result is that in passing from minimum to Cha: Probabl Indium, Lithium,

Rubidium, Cesium, Bismuth c ‘ in s1 renal Tin, liver, Glaciumm Lathaedat eo aee maximum the lines most affected change from those of the ins

ordinary chemical elements to lines whose significance are spa

or Erbium. : : spec not known. The accompanying diagram represents graphic-

Spectra of spots.

When we come’to bring the chemical evidence together

which has been acquired by the examination of separate baat Se a eee, hale parts of the solar economy, we find, as has been already Fe.

hinted, that the apparent similarity in chemical structure

suggested by the foregoing tables entirely breaks down.

Not only is the chemical nature of each separate solar Ka phenomenon different from that of any other, but the 500 Substances

facts of observation are in all cases entirely new and

strange, so that very little light is obtained towards the

understanding of them from ordinary laboratory work. We will consider the chemistry of the chief solar features

in order. Chemistry of the Constituent Parts.

The spectrum of the spots differs from that of the ordinary surface of the sun chiefly by the widening of certain of the Fraunhofer lines in the spot spectrum,— some being excessively widened. The lines which are most widened change from spot to spot and from year to year. The most extensive sun-spot observations of this nature have been carried on in Kensington, and the conclusions derived from 700 observations on spots be- tween 1879 and 1885 are as follows :—

(1) The spot spectra are very unlike the ordinary spectrum of the sun: some Fraunhofer lines are omitted ; new lines appear; and the intensities of the old lines are changed.

(2) Only very few lines, comparatively speaking, of each chemical element, even of those which have many among the Fraunhofer lines, were seen to be most widened. It was asif ona piano only a few notes were played over and over again, always producing a different tune.

(8) An immense variation from spot to spot was observed be- tween the most widened lines seen in the first hundred observa-

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tions. Change of quality or density will not account for this Most widened lines, F —b region, in sun-spot spectra, variation. To investigate this point the individual observations

of lines seen in the spectrum of iron were plotted out on strips of paper, and an attempt made to arrange them in order, but without success, for, even when the observations were divided into six groups, about half of them were left outstanding.

(4) If we consider the lines of any one substance, there is as much inversion between them as between the lines of any two metals. By the term “inversion” is meant that of any three lines, A, B, C, we may get A and B without C, A and C without B, B and C without A.

(5) Very few lines are strongly affected at the same time in the same spot, although a great many lines of the same substance may be affected, besides the twelve recorded as most widened on cach day.

(6) Many of the lines seen in the spots are visible at low temper- atures (some in the oxy-hydrogen flame), and none are brightened or intensified when we pass from the temperature of the electric arc to that of the electric spark.

(7) Certain lines of a substance have indicated rest, while other adjacent lines seen in the spectrum of the same substance in the same field of view have shown change of wave-length.

(8) A large number of the lines seen in spots are common to two or more substances with the dispersion employed.

(9) The lines of iron, cobalt, chromium, manganese, titanium, calcium, and nickel seen in the spectra of spots are usually coinci- dent with lines in the spectra of other metals with the dispersion employed, whilst the lines of tungsten, copper, and zinc seen in Spots are not coincident with lines in other spectra.

(10) The lines of iron, manganese, zinc, and titanium most fre- quently seen in spots are different from those most frequently seen in flames, whilst in cobalt, chromium, and calcium the lines seen in spots are the same as those seen in flames.

(11) Towards the end of the first series of investigations there appeared among the most widened lines a few which are not re- presented, so far as is known, among the lines seen in the spectra of terrestrial elements. This change took place when there was a marked increase in the solar activity.

(12) The most widened lines in sun

L spots change with the sun- spot period.

ally the disappearance of the lines of iron, nickel, and titanium and the simultaneous appearance of unknown lines in the spot spectra in passing

from minimum to maximum. In the region of the spectrum for which the curves are drawn six lines were recorded in each observa- tion, and therefore 600 in each series of 100 observations. In the curves the vertical ordinates represent not merely the number of individual lines recorded but the number of occurrences of lines of each substance. The dotted curve shows the variation in the frequency of the iron lines; at the minimum in 1879 practically all the 600 lines observed were iron lines; towards the end of 1881 they had dwindled down to 30; and during the three following years they fell to 10. The dot and dash curve shows a similar variation in the nickel lines, and the double line curve that of the titanium lines during the same periods. The continuous curve shows the gradual increase in the number of occurrences of unknown lines in passing from the minimum in 1879 to the maximum in 1884,

The chromosphere when quite quiescent merely gives Chromo: us a spectrum of hydrogen together with a line in the sphere

yellow, which, from its proximity to D, and D,, is called D;. The chromosphere is disturbed in two ways,—first, by prominences, of which more hereafter, and second, by the formation gradually and peacefully of domes, which are of no great height but sometimes extend over large areas and last for weeks. These last-named phenomena have been termed “wellings up,” the idea being that they were produced by the gradual uprise of vapours from below ; but it is clear that the same phenomena might be

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produced by the very slow descent of matter from above. The spectrum of these higher portions of the chromo- sphere, whether produced from below or above, is more complicated than the ordinary one. The following table (C) ae the principal lines which have been recorded up to 1887 :—

1869. Hydrogen D, All lines.

1474 (53815°9) Unknown. Bieeo* Magnesium, 3 out of 7 (Thalén). B38 Nickel, oa. noe D, D Sodium, oa 8 eae } Barium, 2 ,, 26 Sree } Tron, PA ng

aK) (Angstrém).

5275

5233°6 5179°9 Unknown. 4921°3 5014‘8 bright

After 1869. £4471 ee Unknown. B—a 5019 Titanium, 1 out of 201 (Thalén). 7 } Caletum, 2 , 74

The first new line in this table is called in spectroscopic language 1474, because when this work was begun the only maps available were those made by Professor Kirch- hoff, and this particular line fell at 1474 on his scale. Since then these artificial scales have been discarded in favour of the natural one, which is given by the wave- lengths of light of different colours. In this the reference number of the same line is 5315-9, which represents the wave-length in ten-millionths of a millimétre of that particular quality of light. After this we observe three lines of magnesium, only 3 out of 7; next a line of nickel, one only, however, out of 34; then two lines of sodium, although we might naturally expect to get all the 8 lines ; then two lines of barium out of 26; andsoon. Almost all the other lines have origins which are absolutely un- known : that is to say, we never get them in our terrestrial laboratories, and never, therefore, are able to match the bright lines in the chromosphere of the sun with any chemical substance. In 1871 the sun was more active, and this activity resulted in the addition of new lines, all, however, absolutely unknown to us, except one, which represents a line in the spectrum of titanium ; but in that case we get one line out of 201 in exactly the same way as we get two only of iron out of 460. It is most important to note that practically none of the lines shown in table C are among those which are widened in spots.

The prominences are of two kinds—those which are relatively quiet and give almost exclusively the lines of hydrogen and those in which the motions are as a rule very violent. The spectrum of the latter class generally includes a large number of metallic lines; hence they are generally called metallic prominences. The first stage of metallic prominence is usually the appearance of three lines of the following wave-lengths—4943, 5031, 5315°9. As the prominence increases in magnitude and violence other lines are added, until at times the spectrum seems full of lines. The rate of uprush

of these prominences sometimes reaches 250 miles per second, or nearly a million

substance the number of lines seen usually in the promi- nences is very small.

_ The general conclusions which have been derived from a discussion of the prominence observations made by Profs. Tacchini and Rice, in connexion with the sun-spot observa- tions already mentioned, are as follows,

(1) The chromospheric and prominence spectrum of any one substance, except in the case of hydrogen, is unlike the ordinary spectrum of the substance. For instance, we get two lines of iron out of 460.

(2) There are inversions of lines in the same elements in the prominences, as there are inversions in the spots: in certain pro- Minences we see certain lines of a substance without others ; in certain other prominences we see the other lines without the first.

(3) Very few lines are strongly affected at once, as a rule, and a bia small proportion altogether,—smaller than in the case of spots.

(4) The prominences are less subject to sudden changes than spots, so far as lines of the same element are concerned.

(5) There is a change in the lines affected according to the sun’s spot period.

(6) The lines of a substance seen in the prominences are those which in our laboratories become considerably brightened when we change the are spectrum for the spark spectrum.

(7) None of the iron lines ordinarily visible in prominences are seen at the temperature of the oxy-hydrogen flame. Some of the oxy-hydrogen flame lines are seen in the spots, but none have ever been seen iu the prominences.

(8) A relatively large number of the lines ordinarily seen are of unknown origin.

(9) Many of the lines seen are not ordinarily seen amongst the Fraunhofer lines. Some are bright lines.

(10) As in the spots the H and K lines of calcium in the ultra- violet are always bright in the spot spectrum, the other lines of calcium and the other substances being darkened and widened, so it would appear that the lines H and K of calcium are always bright in the prominences in which the other lines are generally unaffected,

(11) Many of the lines are common to two or more elements with the dispersion which has bcen employed.

The spectrum of the inner corona indicates that it is Corona.

chiefly composed of hydrogen. All the hydrogen lines are seen in it, and up to acertain height the H and K lines of calcium, proving the presence either of calcium or of something that exists in calcium which we cannot get at in our temperature.

In the outer corona most of the hydrogen lines dis- appear ; but one, the green line F, remains for a consider- able height side by side with the 1474 line, indicating, as far as we can see where everything is so doubtful, that the constituents of the outer corona consist most probably of hydrogen in a cool form and the unknown stuff which gives the 1474 line. We also know that the outer corona contains particles which reflect the ordinary sunlight to us, because in 1871 Dr Janssen, and in 1878 Professor Barker and others, saw the dark Fraunhofer lines in the spectrum of the corona. We must imagine, therefore, that some part of that spectrum depends for its existence on solid particles which not only give a spectrum like that of the lime-light but have the faculty of reflecting to us the light of the underlying photosphere. It was also put beyond all question in the eclipse of 1882 in Egypt that this corona has another spectrum of its own. ‘There are bright bands in the spectrum, showing that with these additions it is not a truly continuous spectrum like that of the lime-light, and that its origin is therefore in all probability very complex.

Association and Distribution of Phenomena.

Observations of prominences, spots, and other pheno- Connex- mena which require continuous investigation have been ee, carefully made from day to day for several years, and!

miles an hour,— figures which convey an idea of the enormous energies involved. The lines seen in these pro- nena.

minences, although many are present in the spectra of the metallic elements, appear with greatly changed intensities : the lines seen brightest in the prominences are frequently dim lines in the terrestrial spectrum. Again it may be remarked that these are not the lines which are most widened in spots. In the case of the spectrum of any one

one conclusion arrived at is that when and where the (disturbed) spots are at the maximum the facule and metallic prominences are also at the maximum. When the maximum changes from north to south latitude in the spots it also changes from north to south in the metallic

Associa- tion of localized pheno- mena.

prominences and the facule. These observations, there- fore, establish not only an important connexion between spots, metallic prominences, and facule but also the fact of the wonderful localization of these phenomena upon the sun. The spots are never seen higher in latitude than

40° north or south, and they are invariably seen in smaller

quantity at the equator. Similarly, the facule and metal- lic prominences do not go much beyond 40° north or south, and their minima are also at the equator. But this does not hold good for prominences of the quiet sort and the veiled spots,—that is, spots without umbree or very highly developed penumbre. They extend from one pole of the sun to the other ; hence there must exist a great difference between metallic and quiet prominences and between dis- turbed and veiled spots.

Although the more important of these solar phenomena are limited to certain zones of the sun's surface, and al- though they vary very violently, they have a cycle or regular succession of changes, during which the particular zone of the sun on which they appear alters. When there is the smallest number of spots on the sun—that is to say, when there is a sun-spot mimimum—the spots that appear are seen in a high latitude, and the latitude decreases gradually until we arrive at the next minimum. Thus

there are two perfectly distinct spotted areas, one corre-

Period of solar quietude.

sponding to the end of the old period, the other to the beginning of the new period. At the maximum period of sun spots the latitude of the spot zone is about 15°. Activity in the solar atmosphere, therefore, appears to begin in a high latitude—say about 30° or 35°—and very soon reaches the maximum in about latitude 15°; then it gradually dies away until spots, metallic prominences, and facule—all of reduced intensity—cling pretty near to the solar equator, and at the same time we get a new wave of activity, beginning again in a high latitude. This asso- ciation of what may be called localized phenomena is quite in harmony with a similar association of phenomena which are more or less generally distributed over the whole sur- face of the sun.

Pores, which are in reality nothing but small sun spots, may occur in any part of the sun, and are always accom- panied by a slight waviness in the chromosphere. Veiled spots—spots which never attain full development—are also universally distributed over the sun's surface and are accompanied by small prominences (see below).

The main periodicity on the sun is that of about eleven years which elapses between two successive maxima or minima. When the sun is quietest, there are very few of the ordinary tree-like prominences visible, and there is an especial dearth of them near the poles and the equator. There are facule, but they do not present their usual bright appearance, and are confined to the regions between latitudes 20° N. and 20°S. On examining the chemical nature of the materials in the chromosphere at such a period by means of a spectroscope, we see only the four lines of hydrogen and the line D,, whose

chemical signifi- cance we do not know. Practically speaking, there are no spots visible and the disk appears to be perfectly pure, except the darkening towards the limb produced by absorption in the sun's atmosphere. As there are no spots, or only very small ones in high latitudes, it follows that there are no metallic prominences. The spectroscope searching right round the limb of the sun gathers no indications of violent action—no region giving many lines —nothing but the simple spectrum of hydrogen. Obser- vations and photographs of the corona taken at solar eclipses occurring at minimum spot periods indicate that at two different sun-spot minima the appearances pre- sented by the corona are very much alike. A drawing made during the eclipse of 1867, before the application of

photography to solar investigations, exhibits a similar appearance to an absolutely trustworthy photograph ob-

tained at the eclipse of 1878. At the minimum period the chief feature is a very great extension of the corona in the direction of the solar equator, and a wonderfully exquisite outcurving right and left at both poles. It is probable that the equatorial extension pictured in the above-mentioned photograph is, after all, only a part of a much more extended phenomenon, one going to almost incredible distances from the sun itself. At the eclipse of 1878 precaution was taken to shield the eye of the observer from the intense light of the inner corona, which is sometimes so bright as to be mistaken for the sun's limb, by erecting a screen which covered the moon anda. space 12' high around it. The observer, Professor New- comb, saw on both sides of the dark moon a tremendous extension of the sun's equator, far greater than that re- corded in the photographs taken at the same time. But the extended portions may have been so delicately illu- minated that they could not impress their image on the photographic plate during the time it was exposed, or that the light itself is poor in chemically active rays. The extension, as observed by the shielded eye, amounted to six or seven times the diameter of the dark moon. In a more favourable situation the same extension, but to a less extent, was observed without the aid of a screen. At a sun-spot minimum, therefore, there exists a great equa- torial extension of the corona east and west.

The time between the minimum and the maximum sun- Transi-

spot periods is three or four years, and chat from maxi- tion te

mum to minimum seven or eight years, so that the sun vail increases in activity much more rapidly than it afterwards period. decreases in passing to the next minimum. Starting, then, about half way between minimum and maximum, we find an increased activity in every direction. The quiet prominences, consisting of hydrogen, are more numerous, and the facule are brighter. If at this time we examine the spectrum of the chromosphere, we find hydrogen and D, are not the only constituents: we get other short lines, the chief being the three lines of mag- nesium 6, b,,6,. The spots are more numerous and are in a lower latitude, having moved from near 35° to about 25°. Metallic prominences now constantly accompany the spots; and the number of bright lines visible in their spectra gradually increases from month to month. These changes are accompanied by changes in the corona, which affect not only its form but also its spectrum. At the minimum spot period the corona gives an almost continu- ous spectrum, differing only in the presence of a few dark lines, and occasionally a few not very obvious bright lines, whence we conclude that at the minimum the corona is not entirely gaseous. In passing from the minimum to the maximum the spectrum is no longer continuous: bright lines begin to appear, emanating from the incandescent gaseous portions of the corona, and at the same time there is an increase in brilliancy. At this period there is no longer any remarkable equatorial extension, although here and there streamers of strange outlines occur. A drawing of the eclipse of 1858, a period between minimum and maximum, shows in middle latitudes, both north and south, four remarkable luminous cones standing with their bases on the chromosphere. The amount of light and structure in the corona has increased to such an extent that the beautiful double curves seen at the poles at the minimuni are now hidden in a strong radiance.

During the maximum period all the solar forces are Maxi- doing their utmost, and we see in prominences and spots, — and indeed in every outcome of action that we can refer ?™ to, indications of the most gigantic energies being at work, The ordinary prominences, instead of clinging to

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the equator, now occur most frequently at the poles. The facule are brighter and are more widely distributed, and the chromosphere is richer in lines. The spots at this period occupy broad zones with mean latitudes of about 18° N. and 18° S. There are no spots near the poles and

We will now review the several phenomena in turn, beginning with the most widely distributed. Besides the general darkening near the edge of the sun's disk, Effects of

the surface is seen to be strangely mottled near the poles, near down- the equator, and in fact universally. Moreover, small black specks, rush.

none near the equator; but large spots, indicating a state of violent agitation, surrounded by gigantic faculez, follow each other in these zones. Each of these indicators of solar activity is accompanied by a prominence. At this time also we note the greatest velocities of down-rush in the vapours which form the spots and of up-rush in those which form the prominences. These changes are accom- panied by corresponding changes in the corona; and, fortunately, we have photographic records for two periods of maximum,—1871 and 1882. In these the streamers, instead of being limited to the equator or to mid-latitudes, exist in all latitudes, so that they practically extend to every part of the sun. Their directions, which may be called lines of force, are very varied, some being straight and some curved ; but it is difficult to unravel the appear- ances, because what we see are only projections of the actual things, and this is especially the case when the sun's pole is tipped towards or away from the earth to the greatest extent. In the eclipse of 1882 the corona in- dicated a more equal distribution of action than that of 1871, but the general result was the same.

After the maximum period there is a gradual falling off of all the various energies, the mean latitudes of the spots decreasing until they reach 8° N. and 8° S.; then another series of spots breaks out about 35° N. and 35° S. lat., and the cycle begins anew.

General Theory. It has been very generally accepted for some time that

- gun-spots are depressions in the photosphere, produced by

downfalls of cool material. The following sketch shows how, if we accept this view and also the hypothesis that the chemical elements are dissociated in the lower parts of the solar atmosphere, many of the more important solar phenomena may be explained and correlated.

We know that small meteorites in our own cold atmo- sphere are heated to incandescence by friction, that is, by the conversion of their kinetic energy into heat, and it is therefore not difficult to imagine that enormous masses, falling with great velocities through the sun's highly heated atmosphere, would be competent to give rise to such dis- turbances as those with which we are familiar on the sun's surface. This cool material is produced by the condensa- tion, in the upper cool regions of the sun's atmosphere, of the hot ascending vapours produced at the lower levels, and this is probably the main source of supply of spot- producing material. The faculee and other disturbances of the general surface do not precede but follow the formation of a spot, so that a spot may be considered as the initial disturbance of the photosphere in the region where it is observed. Large spots almost invariably appear first as little dots, frequently in groups, and then suddenly grow large. The little dots, according to the view of spot forma- tion now under discussion, are formed by small masses which precede the main fall. The heat produced by friction with the atmosphere and the arrested motion causes up- rushes of heated vapours, which eventually cool and con- dense, and afterwards fall to the photosphere and produce fresh disturbances. Down-rushes of cool material must take place all over the sun's surface, and, although the most violent results of such falls are restricted to certain regions, minor disturbances are distributed over the whole surface. These generally distributed phenomena are well known to be merely different degrees of the same kind of energies that operate in producing the more restricted ones.

calied granulations or pores, are everywhere visible, and spectro- Scopic examination shows that every one of these is a true spot. The fine mottlings frequently indicate the existence of powerful currents in that they take definite directions, sometimes in straight lines, sometimes in lines suggesting cyclonic swirls. In addition to the pores spots of a smudgy kind,

called veiled spots, are some- times seen, and it is probable that in such cases the force of the down-rush is insufficient to depress the photosphere to an extent competent to give rise to the ordinary dark spots. Some spots appear as large pores, that is, they consist of nothing but umbra ; others appear as well-developed veiled spots, consisting almost en- tirely of penumbra. The obvious large spots consisting of umbra and penumbra follow next in order of intensity, and, as has been previously pointed out, their appearance is confined to definite spot zones. Minute observation, therefore, shows that the whole of the sun's surface is traversed by down-rushes of varying intensities, from almost infinitesimal dimensions to the most powcrful that we can conceive. Some of the ordinary spots do not appear to be in any violent state of agitation: the penumbra and umbra are well de- fined, and the ridge of facule round such a spot does not indicate any disturbance by either lateral or convexion currents. Other spots, however, indicate very violent commotion, the penumbra and umbra being tremendously contorted and mixed up. In this kind of spot the disturbance often affects enormous areas of the sun's surface ; one spot in 1851 was 140,000 miles across, and the commotions were so great that they could be detected by eye ob- servation with the telescope. It appears as if the material carried in the first instance below the level of the photosphere produces a disturbance in the interior regions, which exhibits itself at the surface by an increase in the quantity and brilliancy of the sur- rounding facule. As a spot dies away it is replaced by facule, and these remain long after the spot has closed up. It often happens that new spots break out in the places occupied by pre- vious spots. The spot-producing material in its descent is dis- sociated either before or when it reaches the photosphere, and the rapidity and energy of the dissociation depend upon the velocity with which it travels. Gravitation is of course the main factor operating in the production of adown-rush. The velocity produced by gravitation in matter falling from great heights above the photosphere must be very great, and in consequence the kinetic energy of the moving mass must also be great. The motion is impeded by friction with the gases in the sun's atmosphere, and some or perhaps all the kinetic energy becomes heat. The heat thus developed must produce sudden expansions, and the initial down-rush is surrounded by up-rushes along the lines of least resistance. The effects of such down-rushes vary in degree accord- ing to the quantity of matter falling and the height from which it falls.

Equally too there are observed different degrees of the effects of Effects of All over the sun’s surface are seen domes of facule, up-rush.

up-rushes. don either separate or in groups, and there is indication that they are hotter than the rest of the surface, for the bright lines of hydrogen are seen to surmount them. It is probably owing to this that the chromosphere exhibits a billowy outline when under con- ditions of little disturbance. The next condition of increased action exhibits itself in the growing complexity of the chemical nature and of the form of the chromosphere. Occasionally the whole level of the chromosphere over a large region seems to be quietly raised, and observation proves this to be due to the intrusion of other vapours. There is either a gradual evaporation from the photosphere or a gradual vaporization or expansion of slowly fall- ing material over large regions, raising the level of the sea of hydro- gen. The chromosphere then appears to contain different layers, and the lower we descend towards the photosphere the less we know about the substances that exist there. The next degree of disturb- ance is seen in what are called the quiet prominences, which very frequently occur in regions where the beginning of a disturbance has been previously indicated by the appearance of domes and metallic strata. As arule the quiet prominences are not very high—not higher than 40,000 miles—and many of them resemble trees. They are almost entirely composed of hydrogen, or at least of a substance which gives some of the lines observed in the spectrum of hydrogen. Such a prominence grows upwards from the photosphere, being first of a small height, then getting higher and often broader, and finally a kind of condensation cloud may form at the top. The upward velocity of the gases forming these prominences is seldom very great. When a prominence disappears it does not follow that the substances of which it was composed have also disappeared, and there is evidence to show that the apparent disappearance is duc to a reduction of temperature. Thc most intense degree of action of an up-rush is exhibited by the metallic prominences, which

contain other substances in addition to hydrogen. They are seen mounting upwards to enormous heights with almost incredible velocities, and their ascent is accompanied by Violent lateral motions. Such prominences have been seen with an upward velocity of 250 miles a second, and of a height as great as 400,000 iniles, mixed up-rushes and down-rushes, and it may turn out eventually that this is the case in all the metallic prominences.

There is also evidence that some prominences consist of

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crease of temperature and possibly of the height of the solar atmo- sphere, due to the increased falls, will eventually become such that the descending materials are dissociated before they reach the photosphere. The production of spots must therefore gradually diminish until they finally disappear and end the spot cycle. At the minimum period, therefore, pores and veiled spots, due to less powerful energies, are at a maximum.

Records of eclipses, occurring when the sun was quietest, show Eclipse

ee A ccording to the gravitation -dissociation theory of the | that the condensing and condensed materials brought to the equator observa. i relations formation of spots, we ought to find that the effects, in Ac pene yee sa ite ae eee a fone = tons, Bane oe q produced by down-rushes of associated | Phere of the sun and are there collected, possibly in the form of a mena, Various degrees, p A Pee Ois s more or less regular ring the section of which widens towards the * matter are related to the effects, in like degrees, produced | sun, the widest part being within the boundary of the sun’s atmo- by the corresponding up-rushes of dissociated materials. pS a “i ae we : ring pas ae stable conditions, : ee ere will be no fall of material, an erefore no prominences or Comparing, then, the facts already stated, we have : spots. But suppose a disturbance caused, as oe by collisions, Effects of Down-rush. Effects of Up-rush. which most likely occur where the particles brought by the polar currents meet the surface of the ring. These particles then fall 1. Pores. 1, Domes. from where the ring first meets the atmosphere on to the photo- 2. Veiled spots. 4 ee EN) sphere, and form the first spots. Eclipse records show that this 3. Qniet spots. 3. Quiet prominences, action takes place about 30° lat. According to this view, there

4. Disturbed spots. 4. Metallic prominences. are usually no spots above 80° lat., because there is no ring, and because the atmosphere is too low to give the height of fall neces- It is a fact that the pores and domes are very closely associated sary to produce spots. There are no spots at the equator for the over all parts of the sun, and that the domes are most prominent | reason that the condensed matter has to pass for perhaps millions in places previously occupied by spots. All large spots are seen | of miles through strata of increasing temperature, and do not there- to be accompanied by metallic prominences, when observed at the | fore reach the photosphere before being dissociated. Accordingly, edge of the sun. There is also a strict relationship between the | we ought to find that at and after the maximum the corona is intensity of action going on in a spot and the associated prominence, | brighter and more truly a gaseous body on account of the increased so much so that a very violent change in a spot on the disk some- temperature. This is in strict accordance with eclipse observations times causes the bright prominence lines to become visible in its extending over twenty years. According to this view of the solar spectrum. The ordinary metallic prominences, as already stated, economy, the sun ought to give out more heat at a maximum than may consist of both ascending and descending material ; this will | ata minimum period, when the number of falls is greatest ; on this be best understood by likening the whole phenomenon to a splash. point see the article Murzorouoey (vol. xvi. p- 167 sq.). Physics We have previously scen that spots and metallic prominences are ‘ ofa very intimately connected as regards their occurrence in zones, and The Sun’s Place among the Stars. sun-spot this intimacy is easy to explain by supposing things to happen in The relative nearness of the sun makes it convenient as cycle. the way here set forth. The height of the solar atmosphere is

greater over the equator than at the poles; particles condensed on the outside at the poles have therefore a relatively small velocity when they fall into the photosphere, and are able to produce only pores or veiled spots. Over the equator the particles attain a higher velocity in their fall, but they also have to pass through a much greater thickness of atmosphere and undergo so much dissociation that on reaching the photosphere they are incom- petent to produce spots. In mid-latitudes, therefore, the falls of condensed particles should be most effective in producing spots. In this way

the absence of spots at the poles and equator is ex- plained,—one of the best-known facts of solar physics. The falls

a type of those stars which on account of their great dis- tance are less accessible to minute observation. If the sun were at a greater distance, its spectrum would become much fainter and would not show so much detail, but its general character would not be altered: its dark lines would not become bright ones. In the atmospheres of the various members of the solar system, including the earth, there is a very considerable absorption of blue light. We know also that this condition applies to the sun.

The light we receive under present conditions we cal] Star ab-

of the condensed particles, or meteoric matter, into the sun increase S = & 4 white ; but, if its own atmosphere and ours were removed Sorption

the temperature of the atmosphere over the spots and prominences which they produce, so that other falls in the same region are not

of light,

effective in producing spots on account of the increased dissociation which they must undergo before reaching the photosphere. If the material condensed in those regions is to produce a spot, it must be removed to some place where it can reach the photosphere with- out being dissociated. Hence from the first appearance of spots after a stn-spot minimum there is a continual change of latitude. From minimum to minimum there is a regular decrease in the latitude of spots; hence it is clear that there must be currents from the poles towards the equator in the upper atmosphere of the sun, causing the removal of condensed materials to lower and relatively cooler latitudes. Assuming the existence of such currents, we ought to find that successive spots have a tendency to form along the same meridians, for the polar currents would carry the con- densed materials to lower latitudes in a nearly meridional direction. Examination of sun-spot records for 1878-79 shows that there is a marked tendency for spots to follow each other in meridians. The existence of such currents is further supported by the outcurving of tlie corona at the solar poles as observed in several eclipses. If these currents exist, there must also be compensating currents towards the

poles in the lower parts of the sun’s atmosphere, carrying incandescent vapours along with them. Small prominences often ive indication of motion towards the poles which such currents examination of sun-spot records also shows the proper motion of the spots is polewards. existence of these currents has not been definitely proved, there is strong evidence that there exists some circulation of this nature in the solar atmosphere. When once the falls have commenced, if this hypothesis is true, they should rapidly increase in intensity, for, as it is the falls which Increase the temperature of the lower atmosphere by the conversion

or became so changed as to no longer absorb blue light, the sun would appear blue. If, on the other hand, the blue absorption were enormously increased, so that it extended into the green, the sun would appear red, be- cause every other kind of light would be absorbed. If two kinds of absorption—one in the red, the other in the blue —-were going on together, as they sometimes do in our laboratories, the sun would then appear green. Although these changes are not of actual occurrence in the sun, we find each of these conditions represented among the stars. In the coloured stars, which may be red, green, or blue, we are simply dealing with this kind of absorption pheno- mena. This difference in the conditions of absorption in the stars, however, is by no means the most important one: the difference of temperature as indicated by the spectrum is of primary importance. As in our Jabora- tories the spectrum of a substance is changed by a varia- tion of temperature, and always in a regular way, so the nature of a star’s spectrum furnishes a clue to its probable state as regards heat. For example, we may submit carbon vapour to a low temperature, and we shall then obtain what is called a spectrum of flutings; on increasing the temperature, the flutings are replaced wholly or partially by lines, according to the amount of increase. From hundreds of observations of this kind, both on carbon and other substances, it may be safely inferred that a fluted spectruni indicates a lower temperature than a line spectrum. There are doubtless substances in the sun’s atmosphere which, although represented by lines in its

Solar ra- diation and spectra.

| Stellar | spectra.

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spectrum, can be submitted to low conditions of tempera- ture so as to give fluted spectra. There can be little doubt, therefore, that a cooling of the sun would be followed by a change in its spectrum, which would cease to be one of lines and become one of flutings. While the sun was acquiring its present intensely heated state, it must at some period of its history have been in a condition of temperature in which its spectrum would consist of flut- ings, and similarly it must give a fluted spectrum at some future period when it has further cooled.

The ordinary Fraunhofer spectrum gives the sum total of the line absorptions of all the various layers in the sun's atmosphere, but by exanlining individual layers just off the edge of the disk we can single out the absorption lines produced by the lower layers. Thus the absorption produced by the hottest layer, the chromosphere— hottest because nearest the photosphere—is indicated by its usually simple radiation spectrum when examined in this way. If the sun were made hotter, therefore, the gases which give the simple chromosphere spectrum would have a larger share in the absorp- tion, and the niain features of the Fraunhofer spectrum would be the few dark lines corresponding to these bright ones. This being so, a star which gives practically the same absorption spectrum as the chromosphere of the sun must be hotter than the average temperature of the sun's atmosphere,—as hot as the hottest part of it. The bright central part of the sun is not very much less than the whole volume, butit isso much hotter that it gives out thousands of times more light than the atmosphere. The cool vapours in the atmosphere give the dark Fraunhofer lines by their absorption, and even if they are hot enough to give bright lines when seen on the sun's edge they can only reduce the intensity of the dark lines. Here the diffcrence of area between the disk representing the cen- tral mass and that representing the sun's atmosphere is very small, and, the light from the central mass being so much more intense, we do not ordinarily see the evidences of radiation, but, in place of it, the absorption of the atmosphere. If, however, we suppose the central mass to be very small compared with its atmosphere, the total radiation of the atmosphere may be sufficiently powerful to overcome the intensity of the light from the smaller central part, so that the spectrum of such a star would contain bright lines from the exterior mixed up with the dark lines from the interior. The spectrum of a star, therefore, docs not always depend upon its total diameter, but upon the

relative diameters of the central mass and the outer atmosphere. It is a question of sectional areas.

Observations of the spectra of a large number of stars show that, although there is a great difference between individual spectra, they still admit of arrangement in family groups. While some stars give line absorption spectra, others give fluted spectra, and

supposed to be due to new combinations of the original substances, rendered possible by a reduction of temperature ; that is, new lines are formed at the expense of the old ones. The hydrogen lines are very prominent in class II., though not so intense as in class I. The stars of these two classes may be grouped together and called hydrogen stars. Stars belonging to class III. exhibit unmistakable evidence of carbon vapour. Sodium and ironare also often present. All the stars in this class, of which fifty-five are known, agree in having a reddish tint. They are usually faint, and seldom exceed the fourth magnitude. There is evidence of the existence of carbon vapour In the sun's atmosphere, depending upon one solitary fluting, and hence stars of this class probably represent what the sun would become if it were cooled. Class III. therefore represents a lower temperature than classes II. and I. Class IV., containing 475 known members, includes the stars giving fluted spectra with the darkest edges of the flutings towards the violet. The origin of the substances of which they are mainly composed is not at present known. All the principal bands are absolutely unchanging in position, although there is considerable variation in the inten- sities. The bands in the spectrum appear to result from the rhythmical vibrations of the same substance, probably a complex one. Besides this unknown substance, there are also metallic lines in many of the stars, the complete spectrum consisting of the banded spectrum superposed upon the line spectrum. 'The metallic lines are generally seen in the spectra of sodium, iron, magnesium, or calcium ; the hydrogen lines are very inconspicuous.

These considerations suggest the question of stellar evolution. Stellar Comets and nebule are now supposed to consist of clouds of stones evolu- or small meteorites, and the difference between their spectra may tion.

be due to a difference of temperature, that of the nebule being highest. Comets ordinarily give the spectrum of carbon, and, if we imagine such cometary matter to surround a central bright nucleus, we have the spectrum of a star of the third class. On the nebular hypothesis, starting with ordinary cometary materials, the small masses resulting from the first condensations gravitate towards each other, and their energy becomes heat by the retardation of their motion on coming in contact. As soon as the condensed mass is hot enough, it gives a fluted spectrum, like stars of the third class. As the energy of condensation increases, the temperature is raised and the spectrum passes from that of a third class star to that of a second class star, and then to that of a first class star. On the subsequent cooling of what is then a star the successive stages will be again passed through in inverse order. According to this view, we ought to find fewer hydrogen stars than carbon stars, because every star is a carbon star at two periods of its existence, but a hydrogen star only once. On this point, however, nothing definite can be stated, as the stars of classes I. and II. have, in con- sequence of their greater brightness, received more attention than carbon stars.

rh maecice buht nes, et anced In 1866 a star of the tenth magnitude in the constellation New and a el pee pen ea eeyreggsbeeony ciently arrange Corona suddenly flashed up into a star of nearly the first magni- variable

if tude ; its spectrum as a tenth magnitude star differed from its stars.

Example. Stars whose spectra consist of a few ee thick absorption lines. i a Lyre. Stars whose spectra consist of a large} Sun, Capella Class Il. ..... { doen of fine absorption lines. ; &e. a? ars with fluted spectra, the maxima * Class I1I…..... { oe the He athe 3 towards the red. t 152 Schj. © ars with fluted spectra, the maxima ence Class IV. ..... being towards the blue. 8 a Orionis. Stars whose spectra contain bright lines, Classi …... ie of hydrogen, (6) of unknown sub- } B Lyre. stances.

This classification probably represents the stars in order of tem- perature, class I. being the hottest.

Although different stars may contain lines of identical wave- lengths, the thickness of these lines is very liable to variation in passing from one star to another. The thickest lines in the solar spectrum are H and K in the ultra-

violet, both of equal thickness ; on passing to some of the stars, however, we find H broad with K thin, and in others H without K. This is similar to what occurs in our laboratories when we study the spectrum of calcium, the substance which gives the lines H and K: at the temperature of the electric arc the blue line of calcium is very intense, while H and K are scarcely visible; but on passing to a higher temperature, that of the induction spark, H and K appear. In those stars which give H without K, namely, those in class I., it is probable that there isa very high temperature competent to separate H and K, just as H and K were conjointly separated from the blue line. A further indication of high temperature in the stars belonging to class I. is that the few lines which do occur in their spectra are almost the exact counterparts of those which occur in the hottest layer of the sun, hydrogen lines being especially prominent. The passage from class I. to class II. is by no means sudden: there are stars with every gradation of broad and fine lines. It will readily be understood that the stars of class II. are probably not so hot as those belonging to class I., and the change in the spectrum is

spectrum as a first or second,—the latter containing bright lines of hydrogen. In about a month it again became a tenth magni- tude star and appeared as if nothing had happened toit. There can be little doubt that here there was a sudden increase of tem- perature, as evidenced by the spectrum becoming like that of the chromosphere of the sun. ‘Ten years afterwards a new star appeared in Cygnus; it had never been seen before, but appeared suddenly as a third or fourth magnitude star. In about a year it gradually dwindled down to the tenth magnitude, and its spectrum became that ofa nebula. This mass was ata stellar distance, but it cannot be considered to have been a large mass of incandescent material, for in that case it would have taken millions of years, instead of only one, to cool down to the tenth magnitude. A possible explanation of most of the new and variable stars is to be found in the meteorite theory: the innumerable components of one group of meteorites colliding with those of another group would be competent to give out light sufficient to make the whole appear asa star. Each meteorite gives only a little light, but the total must be very considerable. The new star in Corona, and similarly all new stars, may have becn the result of a collision of two groups of meteorites. They die out quickly because the com- ponents are small and far apart. The sudden

increase in the bril- liancy of the star in Cygnus would be produced by a collision of a meteor swarm with the star already existing. (Jon Neate)

SUN-BIRD, a name more or less in use for many years,! and now generally accepted as that of a group of

1 Certainly since 1826 (cf Stephens, Gen. Zoology, xiv. pt. 1, p. 229). Swainson (Nat. Hist. and Classif. Birds, i. p. 145) says they are ‘‘so called by the natives of Asia in allusion to their splendid and shining plumage,” but gives no hint as to the nation or language wherein the name originated. By the French they have been much longer known as ‘‘Souimangas,” from the Madagascar name of one of the species given in 1658 by Flacourt as Soumangha.

over 100 species of small birds, but when or by whom it was first applied is uncertain. Most of them are remark- able for their gaudy plumage, and, though those known to the older naturalists were for a long while referred to the genus Certhia (TREE-CREEPER, 9.2.) or some other group, they are now fully recognized as forming a valid Family Wee- tarinudx, from the name Nectarinia invented in 1811 by Iliger. They inhabit the Ethiopian, Indian, and ~~Aus~~ tralian Regions,! and, with some notable exceptions, the species mostly have but a limited range. They are con- sidered to have their nearest allies in the Meliphagide (of. Honry-rater, vol. xii. p. 139) and the members of the genus Zosterops; but their relations to the last require further investigation. Some of them are called “‘ Humming-birds” by Anglo-Indians and colonists, but with that group, which, as before indicated (Hum- MING-BIRD, vol. xii. p. 357), belongs to the Picariz, the Sun-birds, being true Passeres, have nothing to do. Though part of the plumage in many Sun-birds gleams with metallic lustre, they owe much of their beauty to feathers which are not lustrous, though yet almost as vivid,? and the most wonderful combination of the brightest colours—scarlet, purple, blue, green, and yellow—is often seen in one and the same bird. One group, however, is dull in hue, and but for the presence in some of its mem- bers of yellow or flame-coloured precostal tufts, which are very characteristic of the Family, might at first sight be thought not to belong here. Graceful in form and active in motion, Sun-birds flit from flower to flower, feeding

chiefly on small insects which are attracted by the nectar ; but this is always done while perched, and never on the wing as is the habit of Humming-birds. The extensible tongue, though practically serving the same end in both groups, is essentially different in its quasi-tubular structure, and there is also considerable difference between this organ in the Vectariniidz and the Meliphagide? The nests of the Sun-birds, domed with a penthouse porch, and pensile from the end of a bough or leaf, are very neatly built. The eggs are generally three in number, of a dull white covered with confluent specks of greenish grey.

The Wectariniide form the subject of a sumptuous Monograph by Capt. Shelley (4to, London, 1876-1880), in the coloured plates of which full justice is done to the varied beauties which these gloriously arrayed little beings display, while, almost every available source of information having been consulted and the results embodied, the text leaves little to be desired, and of course supersedes all that had before been published about them. This author divides the Family into three subfamilies :—Neodrepanine, consisting of a single genus and species peculiar to Mada- gascar; Nectariniing, containing 9 genera, one of which, Cinnyris, has more than half the number of species in the whole group; and Arachnotherine (sometimes known as “ Spider-hunters ”), with 2 genera including 11 species— all large in size and plain in hue. To these he also adds the genus Promerops,4 composed of 2 species of South- African birds, of very different appearance, and the affinity of which to the rest can as yet hardly be taken as proved, According to Mr Layard, the habits of the Cape Promerops, its mode of nidification, and the character of its eggs are very unlike those of the ordinary Wectariniidz. Tn the

- OF Gadow, Proc, XxViii, > Of. Gadow, Proc. Zool Societ i c. : Y, 1883, pp. 62-69, pl. xvi. hk According to Brisson (Ornithologie, il, p. 460), this name was the invention of Réaumur. It seems to have become Anglicized.

SU N— British Museum Catalogue of Birds (vol. ix. pp. 1-126, and 291) Dr Gadow has more recently treated of this Family,

reducing the number of both genera and species, though adding a new genus discovered since the publication of

pyga helias of ornithology, cised systematists and one ‘whose proper place can scarcely yet be said to have been determined to every- body’s satisfaction.

&c., de Surinam, ii. p. 192), but was vague and meagre. however, it was satisfactorily figured and

SUN

Capt. Shelley’s work. (A. N.) SUN-BITTERN, otherwise the CaurAtx,® the Eury- a bird that has long exer-

According to Pallas, who in 1781 gave (N. nérdl. Beytriige, ii. pp. 48-54, pl. 3) a good description and fair figure of it, calling it the “Surinamische Sonnenreyger,” Ardea helias, the first author to

notice this form was Fermin, whose account of it, under the name

of ‘‘Sonnenvogel,” was published at Amsterdam in 1759 (Deser., In 1772, described in Rozier’s Observations sur la Physique, &c. (v. pt. 1, p- 212, pl. 1), as the Petit

Paon des roseaux—by which name it was known in Cayenne.® A

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Fig. 1.—Sun-Bittern (Zurypyga helias).

(Fi. (H. N., Oiseaux, viii. pp. 169, 170, pl. xiv.), who, calling it “Le Caurale ou petit Paon des

few years later D’Aubenton figured it in his well-known series Znl., 782), and then in 1781 came Buffon

roses,” announced it as hitherto undescribed, and placed it among the Rails. In the same year appeared the above-cited paper by Pallas, who, notwithstanding his remote abode, was better informed as to its history than his great contemporary, whose ignorance, real or affected, of his fellow-countryman’s priority in the field is inexplicable ; and it must have been by inadvertence that, writing “roses” for ‘‘roseaux,” Buffon turned the colonial name from one that had a good meaning into nonsense. In 1783 Boddaert, equally ignorant of what Pallas had done, called it Scolopax solaris,’ and in referring it to that genus he was followed by Latham (Synopsis, ill. p. 156), by whom it was introduced to English readers as the “Caurale Snipe.” Thus within a dozen years this bird was referred to three perfectly distinct genera, and in those days genera meant much more than they do now. Not until 1811 was it recognized as forming a genus of its own. This was done by Illiger, whose appellation Zurypyga has been generally accepted.

The Sun- Bittern is about as big as a small Curlew, but with much shorter legs and a rather slender, slightly decurved bill, blunt at the tip. The wings are moderate, broad, and rounded, the tail rather long and broad. The head is black with a white stripe over and another under each eye, the chin and throat being also white. The rest of the plumage is not to be described in a limited space otherwise than generally, being variegated with black, brown, chest- nut, bay, buff, grey, and white—so mottled, speckled, and belted ee

> A name, says Buffon, intended to mean Réle a queue, that is, a tailed Rail.

§ This figure and description were repeated in the later issue of this work in 1777 (i. pp. 679-681, pl. 1).

7 Possibly he saw in the bird’s variegated plumage a resemblance to the Painted Snipes, Rhynchexa. His specific name shows that he must

have known how the Dutch in Surinam called it,

SUN—SUN

either in wave-like or zigzag forms as somewhat to resemble certain moths. The bay colour forms two conspicuous patches on each wing, and also an

antepenultimate bar on the tail, behind which is asubterminal band of black. The irides are red; the bill is greenish olive ; and the legs are pale yellow. As in the case of most South- American birds, very little is recorded of its habits in freedom, except that it frequents the muddy and wooded banks of rivers, feeding on small fishes and insects. In captivity it soon becomes tame, and has several times made its nest and reared its young (which, when hatched, are clothed with mottled down ; Proc. Zool. Society, 1866, p. 76, pl. ix. fig. 1) in the Zoological Gardens (London), where examples are generally to be seen and their plaint- ive piping heard. It ordinarily walks with slow and precise steps, keeping its body in a horizontal position, but at times, when ex- cited, it will go through a series of fantastic performances, spreading its broad wings and tail so as to display their beautiful markings. This species inhabits Guiana and the interior of Brazil; but in Colombia and Central America occurs a larger and somewhat differently coloured form which is known as Z. major.

For a long while it seemed as if Hurypyga had no near ally, but, on the colonization of New Caledonia by the French, an extremely curious bird was found inhabiting most parts of that island, to which it is peculiar. This the natives called the Kagu, and it is

O° pa EG I, Fic. 2.—Kagu (Rhinochetus jubatus).

the Rhinochetus jubatus of ornithology. Its original describers, MM. Jules Verreaux and Des Murs, regarded it first asa Heron and then asa Crane (Rev. ct Mag. de Zoologie, 1860, pp. 439-441, pl. 21; 1862, pp. 142-144); but, on Mr George Bennett sending two live examples to the Zoological Gardens, Mr Bartlett quickly de- tected in them an affinity to Hurypyga (Proc. Zool. Society, 1862, pp. 218, 219, pl. xxx.), and in due time anatomical investigation showed him to be right. The Kagu, however, would not strike the ordinary observer as having much outward resemblance to the Sun-Bittern, of which it has neither the figure nor posture. It is rather a long-legged bird, about as large as an ordinary Fowl, walk- ing quickly and then standing almost motionless, with bright red bill and legs, large cyes, a full pendent crest, and is generally of a light slate-colour, paler beneath, and obscurely barred on its longer wing-coverts and tail with a darker shade. It is only when it spreads its wings that these are

seen to be marked and spotted with white, rust-colour, and black, somewhat after the pattern of those of the Sun-Bittern. Like that bird too, the Kagu will, in moments of excitement, give up its ordinary placid behaviour and execute a variety of violent gesticulations, some of them even of a more extraordinary kind, for it will dance round, holding the tip of its tail or of one of its wings in a way that no other bird is known todo. Its habits in its own country were described at some length in 1863 by M. Jouan (Mém. Soc. Sc. Nat. Cherbourg, ix. pp. 97 and 235),and in 1870 by M. Marie (Actes Soc. Linn. Bordeaux, Xxvil. pp. 323-326), the last of whom predicts the speedy extinction of this interesting form, a fate foreboded also by the statement of Messrs Layard (Ibis, 1882, pp. 534, 535) that it has nearly disappeared from the neighbourhood of the more settled and inhabited parts. The internal and external structure of both these re- markable forms has been treated in much detail by Prof. Parker in the Zoological Proceedings (1864, pp. 70-72) and Transactions (vi. pp. 501-521, pls. 91, 92; x. pp. 307-310, pl. 54, figs. 7-9), as also by Dr Murie in the latter work

(vii. pp. 465-492, pls, 56, 57), and the result of their

researches shows that they, though separable as distinct Families, Zurypygide and Rhinochetidz, belong to Prof. Huxley's Geranomorphex, of which they must be deemed the relics of very ancient and generalized types. Their inter-relations to the Rallide (Ratu, vol. xx. p. 222), Psophiide (TRUMPETER, g.v.), and other groups there is not space here to consider, any more than there is to specu- late on the bearings of their geographical position. It is only to be remarked that the eggs of both Zurypyga and Rhinochetus have a very strong Ralline appearance— stronger even than the figures published (Proc. Zool. Society, 1868, pl. xii.) would indicate. (ALN, SUNDA ISLANDS, the collective name of the whole series of islands in the East Indian Archipelago which extend from the peninsula of Malacca to New Guinea. They are divided into the Great Sunda Islands— z.c., Sumatra, Java, Borneo, Celebes, Banca, and Billiton, with their adjacencies—and the Little Sunda Islands, of which the more important are Bali, Lombok, Sumbawa, Flores, Sandalwood Island, Adanara, Solor, Savu, Pantar, &e. Sunpa Srrair is the channel separating Sumatra from Java, and

uniting the Indian Ocean with the Java Sea. It is 15 miles broad between the southmost point of Sumatra and the town of Anjer in Java. Right in the middle is the low-lying well-wooded island of Dwars in den Weg, otherwise Middle Island or Sungian. In 1883 Sunda Strait was the scene of the most terrific results of the eruption of Krakatoa, a volcano on the west side of the strait. The greater part of the island of Krakatoa was destroyed and two new islands, Steers Island and Calmeyer Island, were thrown up.
SUNDARBANS. See Ganass, vol. x. p. 68. SUNDAY, or Tue Lorp's Day (7) Tot HAlov tpépa, dies Solis; 7 kvpiaxt ypépoa., dies dominica, dies dominicus'). According to all the four evangelists, the resurrection of our Lord took place on the first day of the week after His crucifixion (7) pia [trav] caBBdtrwv: Matt. xxviii. 1, Mark xvi. 2, Luke xxiv. 1, John xx. 1; zpéty caBBdrov: Mark xvi. 9), and the Fourth Gospel describes a second appear- ance to His disciples as having occurred eight days after- wards (John xx. 26). Apart from this central fact of the Christian faith, the Pentecostal outpouring of the Spirit, seven weeks later, described in Acts 1i., cannot have failed to give an additional sacredness to the day in the eyes of the earliest converts.2, Whether the primitive church in Jerusalem had any special mode of observing it in its daily meetings held in the temple (Acts ii. 46) we cannot tell ; but as there is no doubt that in these gatherings the re- currence of the Sabbath was marked by appropriate Jewish observances, so it is not improbable that the worship on the first day of the week had also some distinguishing feature. Afterwards, at all events, when Christianity had been car- ried to other places where from the nature of the case daily meetings for worship were impossible, the first day of the week was everywhere set apart for this purpose. Thus Acts xx. 7 shows that the disciples in Troas met weekly on the first day of the week for exhortation and the break- ing of bread; 1 Cor. xvi. 2 implies at least some observ- ance of the day; and the solemn commemorative character it had very early acquired is strikingly indicated by an incidental expression of the writer of the Apocalypse (1. 10), who for the first time gives it that name ("the Lord's day") by which it is almost invariably referred to by all writers of the century immediately succeeding apostolic

1 The Teutonic and Scandinavian nations adopt the former designa- tion (Sunday, Sonntag, Séndag, &c.), the Latin nations the latter (Dimanche, Domenica, Domingo, &c.).

2 From an expression in the Epistle of Barnabas (c. 15), it would almost seem as if the ascension also was believed by some to have taken place on a Sunday.

‘in respect of a feast day or a new moon or a Sabbath” (Col. ii. 16 ; cf. Rom. xiv. 5, Gal. iv. 10, 11), they usually explained the “Sabbath day” of the commandment as meaning the new era that had been introduced by the advent of Christ, and interpreted the rest enjoined as mean- ing cessation from sin. But, when a series of imperial decrees had enjoined with increasing stringency an ab- stinence from labour on Sunday, it was inevitable that the Christian conscience should be roused on the subject of the Sabbath rest also, and in many minds the tendency would be such as finds expression in the Apostolic Constitutions (viii. 33): “Let the slaves work five days; but on the Sabbath day and the Lord’s day let them have leisure to go to church for instruction in piety.” There is evidence of the same tendency in the opposite canon (29) of the council of Laodicea (363), which forbids Christians from Judaizing and resting on the Sabbath day, and actu- ally enjoins them to work on that day, preferring the Lord’s day and so far as possible resting as Christians. About this time accordingly we find traces of a disposi- tion in Christian thinkers to try to distinguish between a temporary and a permanent element in the Sabbath day precept ; thus Chrysostom (10th homily on Genesis) dis- cerns the fundamental principle of that precept to be that we should dedicate one whole day in the circle of the week and set it apart for exercise in spiritual things. The view that the Christian Lord’s day or Sunday is but the Chris- tian Sabbath deliberately transferred from the seventh to the first day of the week does not indeed find categorical expression till a much later period, Alcuin being apparently the first to allege of the Jewish Sabbath that “ejus ob- servationem mos Christianus ad diem dominicam compe- tentius transtulit” (compare Drcaxoaus, vol. vii, p le But the subjoined sketch will incidentally show how soon and to how large an extent this idea has influenced the course of civil legislation on the subject.

times.!_ Among the indications of the nature and univer- sality of its observance during this period may be men- tioned the precept in the

(recently discovered) Teaching of the Apostles (c. 14): ‘And on the Lord’s day of the Lord (kara Kupiakyv Kupiov) come together and break bread and give thanks after confessing your transgressions, that your sacrifice may be pure.” Ignatius (Ad Magn., c. 9) speaks of those whom he addresses as “no longer Sab- batizing, but living in the observance of the Lord’s day (kara kupiaxiy (Gvres), on which also our life sprang up again.” Eusebius (H/.Z., iv. 23) has preserved a letter of Dionysius of Corinth (175 a.p.) to Soter, bishop of Rome, in which he says: “To-day we have passed the Lord’s holy day, in which we have read your epistle” . and the same historian (Zf.Z., iv. 26) mentions that Melito of Sardis (170 a.p.) had written a treatise on the Lord’s day. Pliny’s letter to Trajan in which he speaks of the meetings of the Christians “on a stated day ” need only be alluded to. The first writer who mentions the name of Sunday as applicable to the Lord’s day is Justin Martyr ; this designation of the first day of the week, which is of heathen origin (see SaBparTu, vol. xxi. p. 126), had come into general use in the Roman world shortly before Justin wrote. The passage is too well known to need quotation (Apol. i., 67) in which he describes how “on the day called Sunday” town and country Christians alike gathered to- gether in one place for instruction and prayer and charitable offerings and the distribution of bread and wine ; they thus meet together on that day, he says, because it is the first day in which God made the world, and because Jesus Christ on the same day rose from the dead.

As long as the Jewish Christian element continued to have any prominence or influence in the church, a tendency more or less strong to observe Sabbath as well as Sunday would of course persist. Eusebius (H.Z., iii. 27) men- tions that the Ebionites continued to keep both days, and there is abundant evidence from Tertullian onwards that so far as public worship and abstention from fasting are concerned the practice was widely spread among the Gentile churches. Thus we learn from Socrates (H.Z., vi. c. 8) that in his time public worship was held in the churches of Constantinople on both days ; the Apostolic Canons (can. 66 [65]) sternly prohibit fasting on Sunday or Saturday (ex- cept Holy Saturday); and the injunction of the Apostolic Constitutions (v. 20; cp. ii. 59, vii. 23) is to “hold your solemn assemblies and. rejoice every Sabbath day (except- ing one), and every Lord’s day.” In the primitive church the social conditions were such as hardly to admit of the question being raised, in Gentile circles at any rate, as

to the manner in which either the Lord’s day or the Sabbath ought further to be kept after the duty of congregational worship (usually early in the morning or late in the even- ing) had been discharged ; but the whole matter was placed on an entirely new footing when the civil power, by the constitution of Constantine mentioned below, began to legislate as to the Sunday rest. The fourth command- ment, holding as it doesa conspicuous place in the decalogue, the precepts of which could not for the most part be re- garded as of merely transitory obligation, had never of Course escaped the attention of the fathers of the church ; but, remembering the liberty given in the Pauline writings

Law relating to Sunday.

The earliest recognition of the observance of Sunday as a legal duty is a constitution of Constantine in 321 A.D., enacting that all courts of justice, inhabitants of towns, and workshops were to be at rest on Sunday (venerabili die Solis), with an exception in favour of those engaged in agricultural labour. This was the first of a long series of imperial constitutions, most of which are incor- porated in the Code of Justinian, bk. iii. tit. 12 (De Feriis). The constitutions comprised in this title of the code begin with that of Constantine, and further provide that emancipation and manumis- sion were the only legal proceedings permissible on the Lord’s day (die dominieo), though contracts and compromises might be made between the parties where no intervention of the court was necessary. Pleasure was forbidden as well as business. No spectacle was to be exhibited in a theatre or circus. If the emperor’s birthday fell on a Sunday, its celebration was to be postponed. The seven days before and after Easter were to be kept as Sundays. In Cod. i. 4, 9, appears the humane regulation that prisoners were to be brought up for examination and interrogation on Sunday. On the other hand, Cod. iii. 12, 10, distinctly directs the torture of robbers and pirates, even on Easter Sunday, the divine pardon (says the law) being hoped for where the safety of society was thus assured. After the time of Justinian the observance of Sunday appears to have become stricter. In the West Charlemagne forbade labour of any kind. A century later in the Eastern empire No. liv. of the Leonine constitutions abolished the exemption of agricultural labour con- tained in the constitution of Constantine. It is worthy of notice that this exemption was specially

preserved in England by a con- stitution of Archbishop Meopham. The canon law followed the lines of Roman law. The decrees of ecclesiastical councils on the subject have been very numerous. Much of the law is contained in the Decretals of Gregory, bk. ii. tit. 9 (De Feriis), c. 1 of which (translated) runs thus: ‘‘ We decree that all Sundays be observed from vespers to vespers (a vespera ad vesperam), and that all unlaw-

Pe lu In the Epistle of Barnabas already referred to (c. 15) it is called

the eighth day”: “We keep the eighth day with joyfulness, the day also in which Jesus rose again from the dead.” Comp. Justin Martyr, nal. c. Tryph., c. 138.

2 The longer recension runs: * But let every one of you keep the Sabbath after a spiritual manner. . , . And after the observance of the Sabbath let every friend of Christ keep the Lord’s day as a festival, the resurrection day, the queen and chief of all the days.” The writer finds a reference to the Lord’s day in the titles to Pss. vi. and xii. ; which are ‘‘set to the eighth.”

3 See Ignat., Ad Magn., ut supra, and Ep. of Barnabas (c. 15): “Your present Sabbaths are not acceptable unto me, but that is which I have made when, giving rest to all things, I shall make a beginning of the eighth day.” So practically Tertullian (Resp. ad Jud.,c. 4) and Clement of Alexandria, According to Augustine also (De Sp. et Lit., 14), the observance of the Sabbath is to be taken in a spiritual sense.

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ful work be abstained from, so that in them trading or legal pro- ceedings be not carried on, or any one condemned to death or punishment, or any oaths be administered, except for peace or other necessary reason.” Works of necessity (especially in the case of perishable materials or where time was important, as in fishing) were allowed, on condition that a due proportion of the gain made by work so done was given to the church and the poor. The con- sent of parties was insufficient to give jurisdiction to a court of law to proceed on Sunday, though it was sufficient in the case of a day sanctified by the ecclesiastical authority for a temporary purpose, e.g., a thanksgiving for vintage or harvest.

In England legislation on the subject began early and continues down to the most modern times. As early as the 7th century the laws of Ina, king of the West Saxons, provided that, if a “theowman’’ worked on Sunday by his lord’s command, he was to be free and the lord to be fined 80s.; if a freeman worked without his lord’s command, the penalty was forfeiture of freedom or a fine of 60s.,and twice as much in the case ofa priest. The laws of Athel- stan forbade marketing, of Athelred folkmoots and hunting, on the Sunday. In almost all the pre-Conquest compilations there are admonitions to keep the day holy. The first allusion to Sunday in statute law proper is the Act of 28 Edw. III. c. 14 (now repealed), forbidding the sale of wool at the staple on Sunday. The mass of legislation from that date downwards may be divided, if not with strict accuracy, at least for purposes of convenience, into five classes, —ecclesiastical, constitutional, judicial, social, and commercial. The following sketch of the legislation can scarcely presume to be exhaustive, but it will probably be found not to omit any statute of importance. It should be noticed that the terms ‘‘ Sunday” and ‘‘Lord’s day” are used in statutes. The term ‘‘Sabbath”’ occurs only in ordinances of the Long Parliament. ‘‘Sabbath- breaking ” is sometimes used as a popular expression for a violation of the Acts for Sunday observance, but it is objected to by Black- stone as being legally incorrect. Good Friday and Christmas Day are as a rule in the same legal positionasSunday. In English law Sunday is reckoned from midnight to midnight, not as in canon law a vespera ad vesperam. The Acts mentioned below are still law unless repeal of any of them is specially mentioned.

Ecclesiastical.—Before the Reformation there appears to be little or no statutory recognition of Sunday, except as a day on which trade was interdicted or national sports directed to be held. ‘Thus the repealed Acts 12 Ric. Il. c. 6 and 11 Hen. IV. c. 4 enjoined the practice of archery on Sunday. The church itself by provincial constitutions and other means declared the sanctity of the day, and was strong enough to visit with its own censures those who failed to observe Sunday. With the Reformation, however, it became necessary to enforce the observance of Sunday by the state in face of the question mooted at the time as to the divine or merely human institution of the day as a holy day. Sunday observance was directed by injunctions of both Edward VI. and Elizabeth, as well as by Acts of Parliament in their reigns. 5 and 6 Edw. VI. c. 1(the second Act of

Uniformity) enacted that all inhabitants of the realm were to endeavour themselves to resort to their parish church or chapel accustomed, or upon reasonable let thereof to some usual place where common prayer is used every Sunday, upon pain of punishment by the censures of the church. This is still law except as to Dissenters (see 9 and 10 Vict. c. 59). The same principle was re-enacted in the Act of Uniformity of Elizabeth (1 Eliz. c. 2), with the addition of a temporal punishment, viz., a fine of twelve pene for each offence. This section of the Act is, however, no onger law, and it appears that the only penalty now incurred by non-attendance at church is the shadowy one of ecclesiastical censure. 5 and 6 Edw. VI. c. 3 directed the keeping of all Sundays as holy days, with an exception in favour of husbandmen, labourers, fishermen, and other persons in harvest or other time of necessity. At the end of the reign of Elizabeth canon 18 of the canons of 1603 (which are certainly binding upon the clergy, and probably upon the laity as far as they are not contrary to the law, statutes, and customs of the realm, or the royal prerogative) provided that ‘‘all manner of persons within the Church of England shall celebrate and keep the Lord’s day, commonly called Sunday, according to God’s holy will and pleasure and the orders of the Church of England prescribed in that behalf, that is, in hearing the word of God read and taught, in private and public prayers, in acknowledging their offences to God and amendment of the same, in reconciling themselves charitably to their neighbours where displeasure hath been, in oftentimes receiving the communion of the body and blood of Christ, in visiting the poor and sick, using all godly and sober conversation.” ‘The Long Parliament, as might be expected, occupied itself with the Sunday question. An ordinance of 1644, c. 51, directed the Lord’s day to be celebrated as holy, as being the Christian Sabbath. Ordinances of 1650, c. 9, and 1656, c. 15, contained various minute descriptions of crimes against the sanctity of the Lord’s day, including travelling and ‘‘ vainly and profanely walking.” The Act of Uniformity of Charles II. (18 and 14 Car. II. c. 4) enforced the reading on every Lord’s day of the morning and evening prayer according to the form in the Book of Common Prayer,—a duty which had been pre-

viously enjoined by canon 14. By the first of the Church Building Acts (58 Geo. III. c. 45, s. 65) the bishop may direct a third service, morning or evening, where necessary, in any church built under the Act. By 1 and 2 Vict. c. 106, s. 80, he may order the performance of two full services, each if he so direct to include a sermon. The Burial Laws Amendment Act, 1880, forbids any burial under the Act taking place on Sunday.

Constitutional.—Parliament has occasionally sat on Sunday in cases of great emergency, as on the demise of the crown. In one or two cases in recent years divisions in the House of Commons have taken place early on Sunday morning. The Ballot Act, 1872, enacts that in reckoning time for election proceedings Sundays are to be excluded. A similar provision is contained in the Municipal Corporations Act, 1882, as to proceedings under that Act.

Judicial.—As a general rule Sunday for the purpose of judicial proceedings is a dies non. Legal process cannot be served or exe- cuted on Sunday, except in cases of treason, felony, or breach of the peace (29 Car. II. c. 7, s. 6). Proceedings which do not need the intervention of the court are good, ¢.g., service of a citation or notice to quit or claim to vote. By 11 and 12 Vict. c. 42,5. 4, a Justice may issue a warrant of apprehension or a search warrant on Sunday. The Rules of the Supreme Court, 1883, provide that the offices of the Supreme Court shall be closed on Sundays, that Sunday is not to be reckoned in the computation of any limited time less than six days allowed for doing any act or taking any proceeding, and that, where the time for doing any act or taking any proceeding expires on Sunday, such act or proceeding is good if done or taken on the next day. By the County Court Rules, 1886, the only county court process which can be executed on Sunday is a warrant of arrest in an Admiralty action.

Social.—Under this head may be grouped the enactments having for their object the regulation of Sunday travelling and amusements. The earliest example of non-ecclesiastical interference with recrea- tion appears to be the Book of Sports issued by James I. in 1618. Royal authority was given to all but recusants to exercise themselves after evening service in dancing, archery, leaping, vaulting, May- games, Whitsun-ales, morris-dances, and setting up of Maypoles; but bear and bull baiting, interludes, and bowling

by the meaner sort were prohibited. In 1625 the first Act of the reign of Charles I. (1 Car. I. c. 1), following the lines of the Book of Sports, inhibited meetings, assemblies, or concourse of people out of their own parishes on the Lord's day for any sports and pastimes whatsoever, and any bear-baiting, bull-baiting, interludes, commou plays, or other unlawful exercises and pastimes used by any person or persons within their own parishes, under a penalty of 3s. 4d. for every offence. 'The Act, it will be noticed, impliedly allows sports other than the excepted ones as long as only parishioners take part in them. Au Act which has had more important consequences in recent years is 21 Geo. III. c. 49 (drawn by Dr Porteus, bishop of London). It enacts that any place opened or used for public entertainment and amusement or for public debate upon any part of the Lord's day called Sunday, to which persons are admitted by payment of money or by tickets sold for money, is to be deemed a disorderly house. The keeper is to forfeit £200 for every day on which it is opened or used as aforesaid on the Lord's day, the manager or master of the ceremonies £100, and every doorkeeper or servant £50. The advertising or publishing any advertisement of such an entertainment is made subject toa penalty of £50. It has been held that a meeting the object of which was not pecuniary gain (though there was a charge for admission), but an honest intention to introduce religious worship, though not according to any established or usual form, was not within the Act. On this principle forms of worship most directly opposed_to the prevailing feeling of the country, such as Mormonism or Mohammedanism, are protected. In 1875 actions were brought in the Courts of Quecn's Bench and Exchequer against the Brighton Aquarium Company, and penalties recovered under the Act. The penalties were remitted by the crown; but, as doubts were felt as to the power of the crown to remit in such a case, 38 and 39 Vict. c. 80 was passed to remove such doubts and to enable the sovereign to remit in whole or in part penalties recovered for offences agaiust the Act of Geo. III. The rules made by justices and the bye-laws made by local authorities for the government of theatres and places of public entertainment usually provide for closing on Sunday. The Sundaygopening of museums and art galleries is governed by local regulations; there is no general law on the subject, though attempts have been made in that direction. The House of Lords recently passed a resolution in favour of the principle. A public billiard table must not be used on Sunday (8 and 9 Vict. c. 109). The Game Act (land 2 Will. IV. c.

32, s. 3) makes it punishable with a fiue of £5 to kill game or use a dog or net for sporting purposes on Sunday. Provisions for the regulation of street traffic on Sundays during divine service in the metropolis and provincial towns may be made by the local authorities under the powers of the Metropolis Management Acts, the Town Police Clauses Act, and the Public Health Act. Hackney carriages may ply for hire in London (1 and 2 Will. IV. c. 22). Where a railway company

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runs trains on Sunday one cheap train each way is to be provided (7 and 8 Vict. c. 85, s. 10). Most of the railway companies' own Acts also provide for the running of Sunday traius. ; Commercial.—At common law a contract made on Sunday is not void, nor is Sunday trading or labour unlawful. At an early period, however, the legislature began to impose restrictions, at first by making Sunday trade impossible by closing the places of ordinary business, later by declaring certain kinds of trade and labour illegal, still later by attempting to prohibit all trade and labour. 28 Edw. III. c. 14 (referred to above) closed the wool market on Sunday. 27 Hen. VI. c. 5 (the earliest Sunday Act still in force) prohibited fairs and markets on Sunday (necessary victual only excepted),

unless on the four Sundays in harvest,—an exemption since repealed

by 13 and 14 Vict. c, 23. 4 Edw. IV. c. 7 (now repealed) restrained the shoemakers of London from carrying on their business on Sun-

day.

subsequent legislation they have become perpetual.

Sunday."

3 Car. I. c. 1 inflicted a penalty of 20s. on any carrier or drover travelling on the Lord's day, and a penalty of 6s. 8d. on any butcher killing or selling on that day. Both this and the previous Act of 1625 were originally passed only for a limited period, but by Next in order is the most comprehensive Act on the subject, 29 Car. IL. c. 7, "An Act for the better observance of the Lord's

day, commonly called After an exhortation to the observation of the Lord's day by exercises in the duties of piety and true religion, publicly and privately, the Act provides as follows :—No tradesman, artificer, workman, labourer, or other person whatsoever shall do or exercise any worldly labour, business, or work of their ordinary callings upon

SUN Day

Act of Charles IL, there are various Acts dealing with special trades ; of these the Licensing Acts and the Factory and Workshop Act are the most important. By the Licensing Act, 1874, premises licensed for the sale of intoxicating liquors by retail are to be open on Sunday only at certain hours, varying according as the premises are situate in the metropolitan district, a town or populous place, or elsewhere. An exception is made in favour of a person lodging in the house or a bona fide traveller, who may be served with re- freshment during prohibited hours, unless in a house with a six. day licence. Attempts have often been made, but hitherto with- out success, to induce the legislature to adopt the principle of com- plete Sunday closing in England as a whole, or in particular counties.1_ In the session of 1886 a Bill for Sunday closing in Durham was passed by the Commons, but rejected by the Lords, The advocates of Sunday closing in Ireland and Wales have been more successful. The Sale of Liquors on Sunday (Ireland) Act, 1878, prohibits the opening of licensed premises on Sunday, except in Dublin, Cork, Limerick, Waterford, and Belfast. In these towns such premises may be opened from 2 P.M. to 7 P.M. Exemptions are also made in favour of lodgers and travellers, of packet- boats and railway stations, The Sunday Closing (Wales) Act, 1881, contains no exceptions of towns, like the Irish Act, and the only exemption is the sale of intoxicating liquors at railway stations. The Factory and Workshop Act, 1878, forbids the employment of a child, young person, or woman on Sunday in a factory or workshop. But a young person or woman of the Jewish religion may be employed on Sunday by a Jewish manufacturer, provided that the factory or workshop be not open for traffic on Sunday. There are a few other

the Lord's day or any part thereof (works of necessity and charity only excepted) ; and every person being of the age of fourteen years or upwards offending in the premises shall for every such offence forfeit the sum of 5s.

; and no person or persons whatsoever shall publicly cry, show forth, or expose to sale any wares, merchandises, fruit, herbs, goods, or chattels whatsoever upon the Lord's day or any part thereof upon pain that every person so offending shall forfeit the same goods so cried, or showed forth, or exposed to sale (s. 1). No drover, horse-courser, waggoner, butcher, higgler, their or any of their servants, shall travel or come into his or their lodging upon the Lord's day or any part thereof, upon pain that each and every such offender shall forfeit 20s. for every such offence ; and no person or persons shall use, employ, or travel upon the Lord's day with any boat, wherry, lighter, or barge, except it be upon extraordinary occasion to be allowed by some justice of the peace, &c., upon pain that every person so offending shall forfeit and lose the sum of 5s, for every such offence. In default of distress or non-payment of forfeiture or penalty the offender may be set publicly in the stocks for two hours (s. 2). Nothing in the Act is to extend to the prohibiting of dressing of meat in families, or dressing or selling of meat in inns, cooks' shops, or victualling houses for such as cannot be otherwise provided, nor to the crying or selling of milk before nine in the morning or after four in the afternoon (s. 3). Prosecutions must be within ten days after the offence (s. 4). The hundred is not responsible for robbery of persons travelling upon the Lord's day (s. 5). Service of process on the Lord's day is void; see above (s. 6). This Act has frequently received judicial construction. The use of the word ''ordinary" in section 1 has led to the establishment by a series of decisions of the principle that work done out of the course of the ordinary calling of the person doing it is not within the Act. Thus the sale of a horse on Sunday by a horse-dealer would not be enforcible by him and he would be liable to the penalty, but these results would not follow in the case of a sale by

legislative provisions of less importance which may be noticed. Fishing for salmon on Sunday by any means other than a rod and line is an offence under the Salmon Fishery Act, 1861. By the same Act a free passage for the salmon through all cribs, &c., used for fishery is to be left during the whole of Sunday. Carrying on the business of a pawnbroker on Sunday is an offence within the Pawnbrokers Act, 1872. Distilling and rectifying spirits on Sunday is forbidden by the Spirits Act, 1880. The effect of Sunday upon bills of exchange is declared by the Bills of Exchange Act, 1882. A bill is not invalid by reason only of its bearing date on a Sunday (s. 13). Where the

last day of grace falls on a Sunday, the bill is payable on the preceding business day (s. 14). Sunday is a ‘‘non- business day” for the purposes of the Act (s. 92). This review of Sunday legislation pretty clearly shows that its tendency at present: is opposed to extending facilities to trade on Sunday, but that as to recreation the tendency is rather in the other direction.? Scotland.—The two earliest Acts dealing with Sunday are some-what out of harmony with the general legislation on the subject. 1457, c. 6, ordered the practice of archery on Sunday ; 1526, c. 3, allowed markets for the sale of flesh to be held on Sunday at Edin- burgh. Then came a long series of Acts forbidding the profanation of the day, especially by salmon-fishing, holding fairs and markets, and working in mills and salt-pans. 1579, c. 70, and 1661, c. 18, prohibited all work and trading on the Sabbath. The later legis- lation introduced an exception in favour of duties of necessity and mercy, in accordance with ch. 21 of the Confession of Faith, In more modern times the exigencies of travelling have led to a still further extension of the exception. The Sabbath Observance Acts were frequently confirmed, the last time in 1696. These Acts were held by the High Court of Justiciary in 1870 to be still subsisting, as far as they declare the keeping open shop on Sunday to be an offence by the law of Scotland (Bute’s Case, 1 Couper’s Reports, 495). The forms of certificate in the schedule to the Public Houses

a person not a horse-dealer. Certain acts were held to fall within

the cxception as to works of necessity and charity, eg., baking

provisions for customers, running stage-coaches, hiring farm- labourers. The legislature also intervened to obviate some of the inconveniences caused by the Act. By 10 and 11 Will. IIL c. 24 mackerel was allowed to be sold before and after service. By 11 and 12 Will. III. c. 21 forty watcrmen were allowed to ply on the Thames on Sunday. By 9 Anne c. 23 licensed coachmen or chair- men might be hired on Sunday. By 34 Geo. III. bakers were allowed to bake and sell bread at certain hours, These Acts are all repealed. Still law are 2 Geo. IIL. c. 15 s. 7, allowing fish carriages to travel on Sunday in London and Westminster ; 7 and 8 Geo. IV. ¢. 75, repealing section 2 of the Act of Charles II. as far as regards Thames boatmen ; and 6 and 7 Will. IV. c. 37, permitting bakers out of London to carry on their trade

up to 1.30 p.m. The penalty of the stocks denounced by sect. 2 is practically obsolete (see Stocks). The prosecution of offences under the Act of Charles II. 1S now subject to 34 and 35 Vict. c. 87 (an Act which was passed for a year, but has since been annually continued by the Expiring Laws Continuance Act of cach session), by which no prosecution or proceeding for penalties under that Act can be instituted except with the consent in writing of the chief officer of a police district or the consent of two justices or a stipendiary magistrate. This is surely a more reasonable means of providing against any hardship

caused by the Act than the ex post facto power of remission of

penalties incurred under 21 Geo. III.‘c. 49. Besides the general

Acts Amendment Act, 1862 (superseding those in the Forbes Mac- kenzie Act of 1853), provide for the closing on Sunday of public- houses and of premises licensed for the sale of excisable liquors, and of inns and hotels, except for the accommodation of lodgers and travellers. Scots law is stricter than English in the matter of Sunday fishing. By 55 Gco. III. c. 94 the setting or hauling of a herring-net on Sunday renders the net liable to forfeiture. By the Salmon Fisheries (Scotland) Act, 1862, fishing for salmon on Sunday, even with a rod and line, is an offence. As to contracts and legal process, the law is in general accordance with that of England. Contracts are not void, apart from statute, simply be- cause they are made on Sunday. Diligence cannot be executed, but a warrant of imprisonment or medttatio fugex is exercisable. It should be noticed that, contrary to the English custom, the term “Sabbath” was generally used in the legislation of the Scottish parliament.

United States—Some of the early colonial ordinances enforced the obligation of attendance at church, as in England. In most States there is legislation on the subject of Sunday, following, as a general rule, the lines of the English Act of Charles II. In

1 The Act 1 James I. c. 9 (now repealed) appears, however, to have pro- vided for closing ale-houses in most cases, except on usual working days.

2 See, in addition to the authorities cited, Lyndewode, Provincial Constitutions bk. ii. chap. iii; Ayliffe, Parergon, p. 470; Gibson, Codex, tit. x. chap. i.; Heylin, History of the Sabbath, part ii.; the article ‘Lord’s Day” (by Bishop Barry) in the Dictionary of Christian Antiquities ; and Hessey, Sunday, (Bampton Lectures, 1860); also Robert Cox’s works on the Sabbath.

Massachusetts travelling, except from necessity or charity, is punish- able with a fine of ten dollars. Provision is sometimes made, as in the Massachusetts laws, for the benefit of persons observing Saturday as the Sabbath, on condition that they disturb no other person. The number of Sunday trains is often limited by State legislation. In some of the New England States Sunday is from sunset to sunset. In most States, however, it is reckoned, as in England, from midnight to midnight. By the constitution of the United States, art. I. s. 7, Sundays are to be excluded from the ten days allowed the president to return a Bill. A similar provision is often contained in State constitutions as to the return of a Bill by the governor. The United States legislation on the subject of Sunday is not important. It directs that naval and military studies are not to be pursued, and that the day is not to be reckoned in bankruptcy proceedings. ~ : (J. Wt.)
SUNDERLAND, amunicipaland parliamentary borough, market town, and large seaport of Durham, England, is situated at the mouth of the river Wear and on the North- Eastern Railway, 12 miles south-east of Newcastle-on-Tyne and 77 north-north-west of York. The municipal borough includes, besides the township of Sunderland proper on the south bank of the river, the adjoining township of Bishopwearmouth, which embraces about three-fifths of the total inhabitants, and the township of Monkwearmouth, on the north bank of the river. Sunderland proper consists chiefly of the High Street and other streets near the docks. It is connected with Monkwearmouth by a cast-iron bridge, designed by Rowland Burdon, and consisting of one arch with a span of 236 feet and a height above low water of 100 feet. It was opened in 1796 and widened in 1858.

The only ecclesiastical building of antiquarian interest is

enix

~ Scale of Yards

o. 20 400 600 800

Plan of Sunderland.

St Peter’s church, Monkwearmouth, which still retains the tower with other portions of the ancient Saxon building attached to the monastery founded by Benedict Biscop in 674. The modern public buildings embrace the custom- house (1837), the Sunderland and North Durham Liberal club in the Ionic style (1839), the corporation offices, the workmen’s hall, the new general market, the Victoria hall (1871), the assembly hall, and two theatres. The chari- table and benevolent institutions are numerous, including Gibson’s almshouses (1725) for twelve poor persons, Bowe almshouses (1725), Trinity Church almshouses (1719, re- built in 1876) for eight aged poor, the marine almshouses (1820), the eye infirmary (1836), the sailors’ home (1856), the orphan asylum (1853), the infirmary and dispensary (erected in 1868 and extended in 1882), and the blind institute, for which a new building has recently been erected. For the literary society and subscription library, originally founded in 1793, a new building was erected in 1877. The people’s park at Bishopwearmouth, 17 acres in extent, contains a bronze statue of Sir Henry Havelock, who was born at Ford Hall in the neighbourhood. The park was lately increased by an addition of 10 acres, called

the Extension Park, in which there is a statue of Alder- man Candlish, and a free library, museum, art gallery, and winter garden. Roker, on the north side of Sunderland, 1s a favourite bathing-place. The population of the municipal borough (area, 3306 acres) in 1871 was 98,242, and in 1881 it was 116,542 (males 57,131, females 59,411). The population of the parliamentary borough

(area, 5130 acres) in the same years was 104,409 and 124,841 respectively.

_ Much of the prosperity of Sunderland is due to the coal and limestone in the neighbourhood of the river Wear, of which it is the port. Its export of coal began in the reign of Henry VII., the trade being principally with London and the western coasts of England, although large quantities were also shipped to Holland, France, and other parts of the Continent. The coal trade is still of great importance, and the Monkwearmouth colliery is one of the decpest coal-pits in the world,—381 fathoms. Sunderland vies with the Clyde for its iron shipbuilding. The number of iron ships built in 1885 was 31 with a tonnage of 30,520 for home and 2 with a tonnage of 1255 for foreigners ; of steel ships, 9 with a tonnage of 8099 for home and 3 with a tonnage of 3635 for foreigners. Along both banks of the Wear numerous extensive works of various kinds are situated, including anchor and chain cable works, glass and bottle works, roperies, forges, iron-works, chemical works, paper-mills, breweries, and lime-kilns. The modern prosperity of the town has been largely promoted by the enterprise of George Hudson, the ‘‘ railway king.” The conservation of the port is vested in the Wear commissioners, to whose care the South Dock was transferred by the Wear Navigation and Sunderland Dock Act of 1859. Under their auspices great extensions and im- provements have been made, and there are now three large deep- water docks, embracing a total area of 43 acres, viz., Hudson dock north (18), Hudson dock south (14), and Hendon dock (11). Monk- wearmouth dock, 6 acres in extent and the property of the railway company, is chiefly used for the export of coal. New piers over half a mile in length are now (1887) being erected. The average annual value of the imports of foreign and colonial merchandise for the five years ending 1886 was a little over £700,000, and of the exports of produce of the United Kingdom a little over £600,000. The coasting trade, in regard to which specific details are wanting, is, however, more important. The total number of British and foreign vessels, sailing and steam, that entered the port of Sunder- land with cargocs or in ballast from foreign countries, British possessions, and coastwise in 1876 was 9708 of 2,329,576 tons and in 1885 9451 of 2,764,174 tons. The numbers that cleared in the same years were respectively 9430 of 2,357,430 tons and 9419 of 2,824,218 tons.

The early history of the borough is associated with Monkwear- mouth, which existed long before the town on the other side of the river, and had its origin in a convent which was founded by St Bega in the 7th century and

converted into a monastery for Benedictines by Biscop in 674. Bede was born at Wearmouth in 673, and in his seventh year was placed under the charge of Biscop. The monastery was reconstituted as a cell of Durham in 1084. About the close of the 12th century the inhabitants of Sunderland received from Bishop Pudsey a charter of free customs and privi- leges similar to those of Newcastle-on-Tyne. In 1634 the town was incorporated under the title of ‘‘mayor, aldermen, and com- monalty,” with the privilege of holding a market and annual fairs. In the preamble of the charter it is stated to have been a borough from time immemorial under the name of New Monkwearmouth, and to have been in the enjoyment of various liberties and free customs conferred by the bishops of Durham. Under a special Act in 1851 the town council was constituted the urban sanitary authority. Extensive drainage works have been carried out, as well as important street improvements. Sunderland has returned two members to the House of Commons since 1832. A large number of Scotch families settled in the town in 1640 and gave a considerable impulse to its trade. During the Civil War the in- habitants embraced the cause of the Parliament, while the neigh- bouring Newcastle held out for the king for two years. The Scottish army under Leslie, earl of Leven, entered Sundcrland on 4th March 1644, and the king’s forces followed them ; but no en- gagement took place beyond desultory firing.

SUNDERLAND, Rozpert Spencer, SEconD EARL oF (1640-1702), was the eldest son of Henry, the first earl, and Lady Dorothy Sidney, eldest daughter of Robert, second earl of Leicester. He was born in 1640 and suc- ceeded his father (who was killed at Newbury) in the title on 20th September 1643. During the years 1671-73 he acted as ambassador at Madrid, Paris, and Cologne con- secutively, and in 1678 went to Paris as ambassador

extraordinary. It was during this period of his life that he atquired that suppleness of feeling and love of finesse which may be traced throughout his subsequent career. From February 1679 to January 1681, a period when the country was rent in twain by real or fancied dangers to the Protestant

faith, he held the post of secretary of state for the northern department ; but his conduct in office was not marked by discretion. He voted for the exclusion of the duke of York from the succession to the throne, and the ill-feeling which this action created in the mind of Charles IT. was augmented by the overtures which Sunder- land made to the prince of Orange, whilst differences of opinion on the subject of the Exclusion Bill brought about a fierce quarrel between Sunderland and Halifax, the head of the “trimmers.” Early in 1683, having been reconciled to the duke of York and having secured a warm friend in the duchess of Portsmouth, Sunderland regained his place as secretary for the northern department. When James IT. succeeded to the throne, Sunderland became secretary for the southern department, from March 1685 to 27th October 1688, for most of which period he held the addi- tional post of president of the council, and was a member of the high commission for ecclesiastical causes. He after- wards claimed that he had used his influence to mitigate the proceedings of this obnoxious body, but he went suffi- ciently far with his royal master to sign the warrant for the committal of the bishops and to appear as a witness against them. Though Lord Sunderland was in sympathy, if not in actual communion, with Roman Catholicism, he hesitated to commit himself entirely to the acts of the fierce devotees who surrounded James II., and through their opposition he was dismissed in disgrace and sought security in Holland. He had been too much engaged in the acts of James II. to find a place among the advisers of William and Mary.

The visit which William paid to Althorp in Northampton- shire, the country seat of Sunderland, in 1695 was the prelude of a reconciliation between the king and _ his ambitious subject and of Sunderland’s recall into public affairs. From April to December 1697 he discharged the duties of lord chamberlain of the household and for the greater part of that time he was also lord justice of England ; but he finally retired from active life in the close of 1697 through disgust at the check which William received in the retention of a standing army. The rest of his life was passed in strict seclusion at Althorp, and there he died on 28th September 1702.

Lord Sunderland possessed a keen intellect and was consumed by intense restlessness; but his character was wanting in steadfastness, and he yielded too easily to opposition. His adroitness in intrigue and his fascinating

manners were exceptional even in an age when such qualities formed part of every statesman’s education ; but the charac- teristics which ensured him success in the House of Lords and in the royal closet led to failure in his attempts to understand the feelings of the mass of his countrymen. Consistency of conduct was not among the objects which he aimed at, nor did he shrink from thwarting in secret a policy which he supported in public. A large share of the discredit attaching to the measures of James II. must be assigned to the earl of Sunderland.

SUNDERLAND, CuHaruzs SPENCER, THIRD EARL OF (1675-1722), was the second son of the second earl, but on the death of his elder brother at Paris, on 5th Septem- ber 1688, he became the heir to the peerage. He was born in 1675, and when twenty years old was sent to the House of Commons by the two constituencies of Hedon in Yorkshire and Tiverton in Devonshire. He chose the latter, and represented it until his succession to the earldom of Sunderland in 1702. Throughout this period of his life

his career was undistinguished ; his first start in the world of politics occurred in 1705, when he was sent to Vienna as envoy extraordinary, a mission which he discharged with signal ability. republican feeling and had rendered himself personally obnoxious to Anne, he was foisted by the all-powerful influ- ence of his father-in-law, the duke of Marlborough, into’ the ministry as secretary of state for the southern depart- ment,

Although Sunderland was tinged with

This office he held from 3d December 1706 to 14th June 1710, when he fell, as he rose, through his

connexion with the duke and duchess of Marlborough. The queen offered him a pension of £3000 a year, but he proudly refused the temptation, saying that, if he could not serve, he would not plunder, his country. After the accession of George I. he was lord lieutenant of Ireland (1714-15), lord keeper of the privy seal (1715-17), and secretary of state for the northern department (April 1717 to March 1718). At the latter date he was raised to the post of prime minister, holding with the office of first lord of the

treasury the position of lord president of the council. Sir Robert Walpole had been shelved, and he revenged himself on the new administration by resisting and defeat- ing the Bill which was designed to limit the numbers of the House of Lords,—a victory over Sunderland which led to a partial reconciliation between him and Townshend and Walpole, his rivals. affairs during the South Sea mania, and the bursting of the financial bubble led to his political ruin. Walpole's influence he was acquitted of personal corrup- tion, but he was forced to resign his place as first lord of the treasury on Ist April 1721. which characterized the father had descended to the son: he was ever plotting, and within a few months after Wal-

Lord Sunderland was at the head of

Through The passion for intrigue

pole had saved him from disgrace, if not from a worse fate, he was engaged in scheming against the friend who had saved him. But his plots were interrupted by his death, which occurred on 19th April 1722. Lord Sunderland's manners were repelling and his disposition was harsh, but he stands high among his compeers for disinterestedness. The love of books ranked among the ruling passions of his life, and he spent his leisure hours and his wealth in form- ing the great collection at Althorp.

SUN-FISH. This name is chieflyand properly applied to a marine fish (Orthagoriscus) which by its large size, grot- esque appearance, and numerous peculiarities of organiza- tion has attracted the attention equally of fishermen as of naturalists. Only two species are known,—the rough or short sun-fish (O. mola), which is found in all seas of the temperate and tropical zones; and the much smaller and scarcer smooth or oblong sun-fish (0. truncatus), of which only a small number of specimens have been obtained from the Atlantic and Indian Oceans. That this genus belongs to the order Plectognathi and is allied more especi- ally to the globe-fishes (Diodon and TYetrodon) has been indicated in the article IonrnHyonoey (vol. ix. pp. 663, 694), where also the principal anatomical peculiarities have been noticed, and where illustrations of the young have been given (see figs. 64, 65).

Sun-fishes have the appearance of tailless fish. This is due to the extreme shortening of the tail, which is sup- ported by only a few short vertebre and reduced to a broad fringe of the trunk. Directly in front of it rise dorsal and anal fins, high and broad, similar to each other in size and triangular in form. The head is completely merged in the trunk, the boundary between them being indicated only by a very small and narrow gill-opening and a comparatively small pectoral fin. ‘This fin can be of but little use in locomotion, and the horizontal and ver- tical movements of the fish, as well as the maintenance of its body in a vertical position, are evidently executed by

the powerful dorsal and anal fins. The small mouth, situ- ated in front of the head, is armed with an undivided dental plate above and below, similar to but weaker than the teeth of the globe-fish (Diodon).

Sun-fishes are truly pelagic, propagating their species in the open sea, and only occasionally approach the coast. During the stormy season they live probably at some depth, but in calm bright weather they rise and rest or play on the surface with their dorsal fin high above the water. This habit has given rise to the popular name “sun-fish,” a term also sometimes applied to the basking- shark (vol. xxi. p. 777), which in like manner enjoys the warmth of a sunny day. In some years the rough sun-fish is by no means scarce on the south coast of England and on ‘the Irish coasts, where it appears

principally in the summer months. The usual size is from 3 to 4 feet in length, but this species attains to 7 feet and more. One of the . largest specimens (see the accom-

panying figure) was caught near Portland (Dorsetshire) in 1846, and is now in the British Museum; its length is 7 feet 6 inches. The sun-fish has no economic value, and is rarely, if ever, eaten.

‘Sun-fish (Orthagoriscus mola).

Whilst the rough sun-fish has a granulated, rough, shagreen-like skin, the second species (O. truncatus) has the surface of the body smooth and polished, with its small dermal scutes arranged in a tesselated fashion. It is

oblong in shape, the body being much longer than it is deep. The sides are finely ornamented with transverse silvery, black-edged stripes running downwards to the lower part of the abdomen. It has not been found to exceed 2 feet in length, but is very scarce, only a few specimens having been captured on the coasts of Europe, at the Cape of Good Hope, and off Mauritius.

SUNFLOWER. In the modern vernacular this name is most commonly applied to various species of Helcanthus, especially to H. annuus; but, as this is a tropical American herb, and the word “sunflower” or something correspond- ing to it existed in English literature prior to its intro- duction, or at any rate prior to its general diffusion in gardens, it is obvious that some other flower than the Helz- anthus must have been intended. The marigold (Calendula officinalis) is considered by Dr Prior to have been the plant intended by Ovid (Met., iv. 269-70)—

“*, . . Illa suum, quamvis radice tenetur, 2 Vertitur ad solem ; mutataque servat amorem —

and likewise the solsxce of the Anglo-Saxon, a word equi- valent to solseguium (sun-following). But this movement with the sun is more imaginary than real, the better expla- nation being afforded by the resemblance to “the radiant beams of the sun,” as Gerard expresses it. The central disk of tubular hermaphrodite flowers, encompassed by

the spreading neuter florets of the ray, has, indeed, a marked resemblance to the sun as conventionally depicted. The florets are provided with two or three dry, sharply pointed scales, which serve as pappus, and the whole mass of florets is encircled by a close involucre of leafy bracts. There are numerous varieties of the common sunflower in cultivation, the so-called double form being one in which the ordinarily tubular florets in the centre become spreading and “ligulate” like those at the circum- ference. The seeds, or more strictly speaking the fruits, contain much oil, for which the plant is cultivated in southern Russia. The oil is used in the manufacture of

soap. The seeds are also valued for their agreeable flavour, and are much used as food for poultry, &c. The so-called “Jerusalem artichoke” (Helianthus tuberosus) belongs to the same genus. It is believed to be a native of Canada, or perhaps a modified form of H. doronicoides, The tubers are rich in inulin and sugar, and the plant deserves more attention at the hands of cultivators than it has yet received. The word “Jerusalem” is evidently a corruption, while “artichoke” applies to the flavour of the tuber, which is not unlike that of the artichoke.

SUNNITES anp SHIITES. Thereligion of Mohammed Geo- is at present professed by 150 to 200 million souls, spread graphical over great parts of Asia (including the Indian Archi- a pelago), Africa, and southern Europe,i —over Asia Minor, ~* Armenia, Syria, Palestine, Arabia, Mesopotamia, the Caucasus, Persia, all upper Asia (including Siberia), the steppes of southern Russia, Afghanistan, Beluchistan, Tibet, China, Japan, India, Egypt, the Soudan as far as the equatorial lakes, the whole north coast of Africa and thence deep into the interior, European Turkey, Bulgaria, Bosnia, and Herzegovina. In most of these regions Mos- lems live side by side with men of other confessions, even where Islam is the ruling creed; it is found unmixed.in Central Asia and some parts of Arabia.

Mohammedans fall into the two great divisions of Sunnites and Shiites (Shia), separated by such bitter hatred as belongs to two hostile religions, or such as some Catholic populations feel towards a Protestant.2 The Sunnites, who accept the orthodox tradition (Sunna) as well as the Koran as a source of theologico-juristic doctrines, predominate in Arabia, the Turkish empire, the north of Africa, Turkestan, Afghanistan, and the Mohammedan parts of India and the east of Asia; the Shiites, whose origin has been explained in MoHAMMEDANISM (vol. xvi. pp. 564, 568, 592), have their main seat in Persia, where their confession is the state religion, but are also scattered over the whole sphere of Islam, especially in India and the regions bordering on Persia, except among the nomad Tatars, who are all nominally Sunnite. Even in Turkey there are many native Shi‘ites, generally men of the upper classes, and often men in high office. The Shiites are less numerous and less important than the Sunnites, but on the whole may amount to 20 millions.

SUNNITES.

Orthodox Islam preserves unchanged the form of Sunnites. doctrine established in the 10th century by Abt ’l-Hasan al-Ash‘ari (see vol. xvi. p. 593, and also pp. 553 sq., 592,

584). The attacks of rationalism, aided by Greek philo- sophy, were repelled and vanquished by the weapons of scholastic dialectic borrowed from the enemy; on most points of dispute discussion was forbidden altogether,

1 Exact statistics are unattainable because we lack details as to the great advances which Islam has recently made and is still making in Central Africa.

2 Generally speaking the Sunnites are the more bitter party. The relation is least strained in India, where the Sunnites approach the Shf’ites in reverence for ‘Ali, Hasan, and Hosain, and share the feasts of these saints.

Ulema.

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and faith in what is written in Koran and tradition was enjoined without question as to how these things were true (bild kaifa). Freer allegorical views, however, were admitted on some specially perplexing points, such as the doctrine of the eternity of the Koran, the crude anthropo- morphisms of the sacred text, &c.; and, since Mo‘tazilite views had never taken deep root among the masses, while the caliphs required the help of the clergy, and from the time of Motawakkil (847 a.p.) became ever more closely bound to orthodox: views, the freethinking tendency was thoroughly put down, and to the present day no rational- izing movement has failed to be crushed in the bud. Philosophy still means no more than scholastic dialectic, and is the humble servant of orthodoxy, no man venturing on devious paths except in secret. In the years 1872-78 the Afghan Jamal al-Din, a professor in the Azhar mosque at Cairo, attempted to read Avicenna with his scholars, and to exercise them in things that went beyond theology, bringing, for example, a globe into the mosque to explain the form of the earth. But the other professors rose in arms, forbade him to enter the mosque, and in 1879

pro- cured his exile on the pretext that he entertained demo- cratic and revolutionary ideas. Thus the later movements of thought in Islam never touch on the great questions that exercised Mohammedanism in its first centuries, ¢.9., the being and attributes of God, the freedom of the will, sin, heaven and hell, &c. Religious earnestness, ceasing to touch the higher problems of speculative thought, has expressed itself in later times exclusively in protest against the extravagances of the dervishes, of the worship of saints, and so forth, and has thus given rise to movements ana- logous to Puritanism.

That even in early times the masses were never shaken in their attachment to the traditional faith, with all its crude and grotesque conceptions, is due to the zeal of the ulema, or clergy, for the protection of Islam from every alien influence. Mohammedanism has no priesthood stand- ing between God and the congregation, but Koran and Sunna are full of minute rules for the details of private and civil life, the knowledge of which is necessarily in the hands of a class of professed theologians. These are the ‘ulema (“knowers,” singular ‘dlim), theology being briefly named “the knowledge” (‘“idm). Their influence is still enormous and hardly has a parallel in the history of re- ligions. For it is not supported by temporal agencies like the spiritual authority of the Christian priesthood in the Middle Ages, but is a pure power of knowledge over the ignorant masses, who do nothing without consulting their spiritual advisers. When the vigorous Spanish sultan Mansur b. Abi ‘Amir proposed to confiscate a religious foundation and the assembled ulema refused to approve the act, and were threatened by his vizier, one of them replied, “All the evil you say of us applies to yourself ; you seek unjust gains and support your injustice by threats; you take bribes and practise ungodliness in the world. But we are guides on the path of righteousness, lights in the darkness, and bulwarks of Islam 3 we decide what is Just or unjust and declare the right ; through us the pre- cepts of religion are maintained. We know that the sultan will soon think better of the matter ; but, if he persists, every act of his government will be null, for every treaty of peace and war, every act of sale and purchase, is valid only through our testimony.” With this answer they left the assembly, and the sultan’s apology overtook them before they had passed the palace gate! The same consciousness of independent authority and strength still survives

among the ulema. Thus the sheikhu ‘L-Islam ‘Abbds{ (who was deposed by the professors of the Azhar in 1882) had in

ie ona oe Gesch. d. herrschenden Ideen d. Islams, Leipsic,

SUNNITES

[SUNNITEs,

the first period of his presidency a sharp conflict with

‘Abbas Pasha, viceroy of Egypt, who asked of him an unjust

legal opinion in matters of inheritance. When bribes and threats failed, the sheikh was thrown into chains and treated with great severity, but it was the pasha who finally yielded,

and “Abbasi was recalled to honours and rich rewards,

The way in which the ulema are recruited and formed into a hierarchy with a vigorous esprit de corps throws an instructive light on the whole subject before us. The brilliant days are past when the universities of Damascus, Baghdad, Nishapuir, Cairo, Kairow4n (Kairwan), Seville, Cordova, were thronged by thousands of students of theo- logy, when a professor had often hundreds or even, like Bokhari, thousands of hearers, and when vast estates in the hands of the clergy fed both masters and scholars, Of the great universities but one survives—the Azhar mosque at Cairo—where thousands of students still gather to follow a course of study which gives an accurate picture of the Mohammedan ideal of theological education.2

The students of theology generally begin their course in Theo. early youth, but not seldom in riper years. Almost all cei

come from the lowest orders, a few from the middle classes,

and none from the highest ranks of society,—a fact which in itself excludes all elements of freer and more refined

education. These sons of poor peasants, artisans, or trades- men are already disposed to narrow fanaticism, and gener- ally take up study as a means of livelihood rather than

from genuine religious interest. The scholar appears before

the president's secretary with his poor belongings tied up in a red handkerchief, and after a brief interrogatory is entered on the list of one of the four orthodox rites, — Shafi'ite, Hanafite, Malikite, and Hanbalite. If he is lucky

he gets a sleeping-place within the mosque, a chest to hold

his things, and a daily ration of bread. The less fortunate make shift to live outside as best they can, but are all day in the mosque, and are seldom deserted by Moslem charity. Having kissed the hands of the sheikh and teachers of his school, the pupil awaits the beginning of the lectures. For books a few compendiums suffice him, Professors and students gather every morning for the daily prayer ; then the professors take their seats at the foot of the pillars of the great court and the students crouch on mats at their feet. The beginner takes first a course in the grammar of classical Arabic, for he has hitherto learned. only to read, write, and count. The rules of grammar are read out in the memorial verses of the Ajriimiya, and the teacher adds an exposition, generally read from a printed commentary. The student's chief task is to know the rules by heart ; this accomplished, he is dismissed at the end of the year with a certificate ({jdza), entered in his text-book, which permits him to teach it to others. The second year is devoted to dogmatic (kalém and tawhid), taught in the same mechanical way. The dogmas of Islam are not copious, and the attributes of God are the chief subject taken up. They are demonstrated by scholastic dialectic, and at the end of his second year the student, receiving his certificate, deems himself a pillar of the faith. The study of law (jikh), which rests on Koran and tradition, is more difficult and complex, and begins, but is often not com- pleted, in the third year. The student had learned the Koran by heart at school and has often repeated it since, but only now is the sense of its words explained to him. Of the traditions of the Prophet he has learned something incidentally in other lectures; he is now regularly intro- duced to their vast and artificial system. From these two sources are derived all religious and

civil laws, for Islam is a political as well as a religious institution. The five main points of religious law, “the pillars of Islam,” have been

2 Of the 126 madrasa or colleges which once belonged to the uni- versity of Damascus but five remained in 1880,

enumerated in vol. xvi. p. 553 sq.; the civil law, on the development of which Roman law had some influence, is treated under heads similar to those of Western juris- prudence. It is here that the differences between the four schools (vol. xvi. p. 594 sg.) come most into notice: the Hanafite praxis is the least rigorous, then the Shafi‘ite ; the Hanbalites, whose system is the strictest, have practi- cally disappeared in the Malikites. The Hanafite rite is official in the Turkish empire, and is followed in all Govern- ment offices whenever a decision still depends on the sacred law, as well as by all Mohammedans of Turkish race. In Egypt and North Africa Shafi‘ites are more numerous than Malikites, while the opposite is the case in Arabia. In

the local schools are of the poorest kind, except in India (thanks to the British Government) and perhaps in Con- stantinople.* Bokhard was once a chief seat of learning, but is now so sunk in narrow fanaticism that its eighty madrasas with their 5000 students only turn out a bigoted and foolish clergy (Vambéry).? But for this very reason Bokhara is famed as a luminary of pure theology and spreads its influence over Turkestan, Siberia, China, Kash- mir, Afghanistan, and even over India. Minor schools attached to mosques are found in other places, but teach still less than the great schools already mentioned.

Except in India, where it is controlled by the Govern- Caliph-

ment, the organization of the priestly and judicial persons ate and trained in the schools is a compromise between what theo- *™poral logical principles dictate and what the state demands. -°.””

1878 the Azhar had 7691 students,—3723 ShAfi‘ites with 106 sheikhs, 2855 Malikites with 75 sheikhs, 1090

Hanafites with 49 sheikhs, 23 Hanbalites with 1 sheikh. reignty.

In this as in the previous studies a compendium is learned by heart, and explanations are given from commentaries and noted down by the students word for word. The professors are expressly forbidden to add anything of their own. Therecognized books of jurisprudence, sonie of which run to over twenty folio volumes, are vastly learned, and occasionally show sound sense, but excel mainly in useless hair-splitting and feats of scholastic gymnastics, for which the Arabian race has a natural gift.

Besides the three main disciplines the student takes up according to his tastes other subjects, such as rhetoric (ma‘dni wabaydn), logic (mantik), prosody (‘aréd), and the doctrine of the correct pronunciation of the Koran (kir@a watajwid). After three or four years, fortified with the certificates of his various professors, he seeks a place in a law-court or as a teacher, preacher, cadi, or mufti of a village or minor town, or else one of the innumerable posts of confidence for which the complicated ceremonial of Mohammedanism demands a theologian, and which are generally paid out of pious foundations. A place is not hard to find, for the powerful corporation of the ulema seeks to put its own members into all posts, and, though the remuneration is at first small, the young ‘Alim gradually accumulates the revenues of several offices. Gifts, too, fall in, and with his native avarice and economy he rises in wealth, position, and reputation for piety. The common- alty revere him and kiss his hand; the rich show him at least outward respect; and even the Government treats him as a person to whom consideration is due for his influence with the masses.

This sketch of his education is enough to explain the narrow-mindedness of the ‘Alim, He deems all non-theo- logical science to be vain or hurtful, has no notion of progress, and regards true science—z.c., theology—as having reached finality, so that a new supercommentary or a new students’ manual is the only thing that is perhaps still worth writing. How the mental faculties are blunted by scholasticism and mere memory work must be seen to be believed; such an education is enough to spoil the best head. All originality is crushed out and a blind and ludicrous dependence on written tradition—

even in things profane— takes its place. Acuteness degenerates into hair-splitting and clever plays on words after the manner of the rabbins. The Azhar students not seldom enter Government offices and even hold important administrative posts, but they never lose the stamp of their education—the narrow un- teachable spirit, incapable of progress, always lost in ex- ternal details, and never able to grasp principles and get behind forms to the substance of a matter. (WwW. S.-B.)

Yet it is but a small fraction of the ulema of the Mos- lem world that enjoy even such an education as the Azhar

1 In 1878 seventeen lecture-rooms of the Azhar had 3707 students, of whom only 64 came from Constantinople and the northern parts of

Neither Koran nor Sunna distinguishes between temporal and spiritual powers, and no such distinction was known as long as the caliphs acted in all things as successors of the prophets and heads of the community of the faithful. But, as the power of the ‘Abbasids declined (see vol. xvi. p. 585 sq.) and external authority fell in the provinces into the hands of the governors and in the capital into those of the amir al-omard, the distinction became more and more palpable, especially when the Buyids (Buwaihids), who were disposed to Shi’ite views, proclaimed themselves sultans, z.e., possessors of all real authority. The theo- logians tried to uphold the orthodox theory by declaring the sultanate to be subordinate to the imamate or sove- reignty of the caliphs, and dependent on the latter especi- ally in all religious matters; but their artificial theories have never modified facts. The various dynasties of sul- tans (Buyids, Ghaznevids, Seljuks, and finally the Mongols) never paid heed to the caliphs and at length abolished them; but the fall of the theocracy only increased the influence of the clergy, the expounders and practical administrators of that legislation of Koran and Sunna which had become part of the life of the Mohammedan world. The Mame- lukes in Egypt tried to make their own government appear more legitimate by nominally recognizing a continuation of the spiritual dignity of the caliphate in a surviving branch of the “Abbasid line which they protected, and in 923 a.n. (1517) the Ottoman Selim, who destroyed the Mameluke power, constrained the ‘Abbasid Mutawakkil III, who lived in Cairo, to make over to him his nominal caliphate. The Ottoman sultans still

bear the title of "'successors of the Prophet," and still find it useful in foreign relations, since there is or may be some advantage in the right of the caliph to nominate the chief cadi (kédé) of Egypt and in the fact that the spiritual head of Khiva calls himself only the nakib (vicegerent) of the sultan.t In India too the sultan owes something perhaps to his spiritual title. But among his own subjects he is compelled to defer to the ulema and has no considerable influence on the composi- tion of that body. He nominates the sheckhu 'l-Isldém (senior, 2.¢., president of Islam) or mufti of Constantinople (grand mufti), who is his representative in the imdmate and issues judgments in points of faith and law from which there is no appeal; but the nomination must fall on one of the mollahs,® who form the upper stratum of the hierarchy the Ottoman empire, 8 from North Arabia, 1 from the government of Baghdad, 12 from Kurdistan, and 7 from India with its thirty million Sunnites.

2 In Kazan also the standard of learning seems to have been raised by Russian and Western scholars.

3 The madrasa is here a college, generally attached to a mosque, with lands whose revenues provide the means of instruction and in part also food and residence for scholars and teachers.

4 Til] the Russians gained preponderating influence the khan of Khiva also acknowledged the sultan as his suzerain.

5 Mollah is the Perso-Turkish pronunciation of the Arabic maulé, literally '' patron," a term applied to heads of orders and other reli- gious dignitaries of various grades.

Judicial offices.

Modern changes.

of ulema. And, though the various places of religious dignity are conferred by the sultan, no one can hold office who has not been examined and certified by older ulema, so that the corporation is self-propagating, and

palace intrigues, though not without influence, can never break through its iron bonds. The deposition of “Abd al-Aziz is an example of the tremendous power that can be wielded by the ulema at the head of their thousands of pupils! when they choose to stir up the masses; nor would Mahmud II. in 1826 have ventured to enter on his struggle with the Janissaries unless he had had the hierarchy with him.

The student who has passed his examinations at Con- stantinople or Cairo may take up the purely religious office of zmdm (president in worship) or khatéb (preacher) at a mosque. These offices, however, are purely ministerial, are not necessarily limited to students, and give no place in the hierarchy and no particular consideration or social status. On the other hand, he may become a judge or cadi. Every place of any importance has at least one cadi, who is nominated by the Government,? but has no further dependence on it, and is answerable only to a member of the third class of the ulema, viz., the mufti or pronouncer of fetwas. A fetwa is a decision according to Koran and Sunna, but without reasons, on an abstract case of law which is brought before the mufti by appeal from the cadi’s judgment or by reference from the cadi himself. For ex- ample, a dispute between master and slave may be found by the cadi to turn on the general question, ‘“‘Has Zaid, the inaster of “Amr,? the absolute right to dispose of his slave’s earnings?” When this is put to the mufti, the answer will be simply ‘‘ Yes,” and from this decision there is no appeal, so that the mufti is supreme judge in his own district. The grand mufti of Constantinople is, as we have seen, nominated by the sultan, but his hold on the people makes him quite an independent power in the state; in Cairo he is not even nominated by the Government, but each school of law chooses its own sheikh, who is also mufti, and the Hanafite is head mufti because his school is official in the Turkish empire.

All this gives the judges great private and political in- fluence. But the former is tainted by venality, the plague- spot of the East, which, aggravated by the scantiness of Judicial salaries or in some cases by the judge having no salary at all, is almost universal among the administrators of justice. Their political influence, again, which arises from the fusion of private and political law in Koran and Sunna, is highly inconvenient to the state, and often be- comes intolerable now that relations with Western states are

multiplied. And even in such distant parts as Central Asia the law founded on the conditions of the Prophet's lifetime proves so unsuited to modern life that cases are often referred to civil authorities rather than to canonical jurists. Thus a customary law ('orf) has there sprung up side by side with the official sacred law (sharé'a), much to the displeasure of the mollahs. In Turkey, and lately above all in Egypt, it has been found necessary greatly to limit the sphere and influence of the canonical jurists and intro- duce institutions nearer to Western legal usage. We do not here speak of the paper constitutions (khatt-c-sherif) and the like, created to dupe Western diplomatists and amuse their authors, but of such things as consular and commercial courts, criminal codes, and so forth. The pre- sent sultan seems also to aim at diminishing the power of the ulema by such measures as frequent changes of the

? Called in Constantinople softa, Persian sékhta, with zeal or love to God.

? In Egypt before the time of Sa'{d Pasha (1854-638) the local judges were appointed by the chief cadi of Cairo, who is sent from Constanti-

mops. Since then they have been nominated by the Egyptian Govern- ment,

3 Zaid and 'Amr are the Caius and Sempronius of Arabian law.

"burned up," scil.,

SUNNIEERS

(SUNNITES.

sheikhu 'Lislam, though this policy is perhaps less likely to confirm his power than to rob it of its last supports. The official hierarchy, strong as it is, divides its power with the dervishes. A religion which subdues to itself a race with strongly marked individuality is always influ- enced in cultus and dogma by the previous views and tendencies of that race, to which it must in some measure accommodate itself. Mohammed himself made a concession to heathen traditions when he recognized the Kaaba and the black stone ; and the worship of saints, which is now spread throughout Islam and supported by obviously forged traditions, is an example of the

same thing. So too are the religious orders now found everywhere except in . some parts of Arabia. Mystical tendencies in Moham- medanism arose mainly on Persian soil (see vol. xvi. p. 594), and Von Kremer has shown that these Eastern tendencies

fell in with a disposition to asceticism and flight from the

world which had arisen among the Arabs before Islam under Christian influence.t

while the Arabs imitated the Christian anchorites; thus the two movements had an inner kinship and an outer form so nearly identical that they naturally coalesced, and that even the earliest organizations of orders of dervishes, whether in the East or the West, appeared to Moham- medan judgment to be of one type. Thus, though the name of Sifé (see vol. xvi. p. 594) is first applied to Abt Hashim, who died in Syria in 150 a.w. (767), we find it transferred without question to the mystical brother- hood which appears in Khordsdn under Abu Sa‘id about 200 a.m. (815/6). Yet these two schools of Suffs were never quite similar; on Sunnite soil Stifism could not openly impugn orthodox views, while in Persia it was saturated with Shiite heresy and the pantheism of the extreme devotees of ‘Alf (see vol. xvi. p. 593). Thus there have always been two kinds of Stfis, and, though the course of history and the wandering habits which various orders borrowed from Buddhism have tended to bring them closer to one another, we still find that of the thirty-six chief orders three claim an origin from the caliph Abt- bekr, whom the Sunnites honour, and the rest from ‘All, the idol of the Shi‘ites.> Mystic absorption in the being of God, with an increasing tendency to Pantheism and ascetic practices, are the main scope of all Sufism, which is not necessarily confined to members of orders ; indeed the secret practice of contemplation of the love of God and contempt of the world is sometimes viewed as specially meritorious. And so ultimately the word sift has come to denote all who have this religious direction, while those who follow the special rules of an order are known as dervishes (“‘ beggars,” in Arabic fukard, sing. fakir—names originally designating only the mendicant orders). In Persia at the present day a Sufi is much the same asa freethinker. Several of the chief dervish orders arose in the evil times before and after the invasion of the Mongols: thus “Abd al-Kadir al-Jilani

(d. 561 aw.; 1165/66) founded the Kadiriya order, Ahmad al-Rifa'{ (d. 578 A.H. ; 1182/3) the Rifé'iya, Jalalu 'l-din Rumi (see Ruf) the Mawlawifya, Abu 'l-Hasan al-Shdédhilf (d. 656 a.n.; 1258) the Shadhilfya, Ahmad al-Badawi (d. 675 az. ; 1276) the Ahmadiya or Badawiya, an order still very widely spread in Egypt. While civil distress drove men to flee from the world, the stupid fanaticism of Turkish rule has helped on the belief in miracles so often associated with mysticism and all those deceits that go with the spread of enthusiastic notions. Of later orders we may name the

4 Op. cit., p. 52 sq.

5 These claims to early origin are mere fables, like the claim of the Oweist order to spring from Oweis, one of the oldest traditionalists, and so forth.

Intercourse with India had Sufis ang given Persian mysticism the form of Buddhistic nionkery,

Nakshbendiya, now the most important in the khanates of Turkestan, whose founder died 719 a.n. (1319), the Sa'diya (736 a.H.; 1335), the Bektashtya (758 a.u.; 1357), the Khalwatiya (800 a.u.; 1397).2

The modern dervishes have sunk as low as the modern ulema. The idea of absorbed contemplation of the divine being, freed from all earthly conceptions, and of mortifica- tion of the flesh in order to become one with God is grossly caricatured in the insane howlings hu hu ("he, he") and self-torture with red-hot knives, &c., practised by the "howling" Rifd'iya and in the dizzy whirling of the "dancing" Mawlawiya. Very pestilent too is their tradi- tional reputation for holiness with the common people, while ecstatic piety easily passes into deceit where it is still generally believed that a saint (walt) can work miracles. The wandering dervishes especially, who move constantly from place to place, are noted for all sorts of juggling im- postures, by the aid of which, like the Yogis of India, they live at the cost of the people? But they are no longer trusted or held in muchesteem even by the populace, whereas the conventual orders are usually regarded as pious and inspired men. Sheikh Ahmad, the founder of the Badawtya, is the

national saint of Egypt, and his tomb at Tanta is a great place of pilgrimage. The ulema dislike these rivals, but can do little against their influence.

The bright side in the modern world of Islam is found among the lower classes. The ruling classes of Turkey are utterly corrupt, and for centuries their one art of administration has been to suck the provinces dry. Taxes are exorbitant and bad laws check the production of wealth, while what remains of the useful institutions and public works of old time daily decays. To this is added the recklessness born of a more or less clear consciousness that things cannot last as they are. The effendi of Constanti- nople has lost faith in his religion and the future of his race; as for a sense of honour, as we understand it, that does not exist in the East. In Egypt things have not been quite so bad since Mohammed ‘Alf destroyed the Mamelukes and founded a state with some pretensions to order and solidity ; selfish as he was, he saw that to main- tain the revenue it was necessary to stimulate production, and to this end, amid many mistakes, he took not a few useful steps. His successors were less wise and skilful, yet prosperity increased, and for the first time for centuries national feeling began to assert itself. But this movement fell into the hands of the ignorant and fanatical ‘Ordbti Pasha (1882) and led to the English occupation and the entire disorganization of the country, so that Cairo is now little better than Constantinople.

Yet with all this the poorer classes have not lost their vigour, and among them Islam has still a deep-rooted strength. The common Turk of Roumelia or Asia Minor is still a solid sober honest fellow and a brave soldier, always ready to make every sacrifice for his religion. In Egypt the morality of the people has suffered from the great foreign immigration, which has introduced many evil ele- ments as well as some good ; yet even here the great mass of both townsmen and peasants are loyal to the old faith and to the traditional sobriety and parsimony which the nature of the country itself prescribes. These qualities taken with the undoubted intelligence of the Arabian population give hope of a revival of prosperity on the Nile under more favourable political conditions. The people have a persuasion of the superiority of their religion, which,

1 The best account of the dervishes is still that in D’Ohsson, Tableau Général de Emp. Ottoman, vol. ii., Paris, 1790. A

2 These mendicants belong in part to orders like the Bektashiya and Rif’iya, whose other members live in convents (Khangah, Takiya) ; in part they are Kalanderiya (Calanders), 7.c., bound by the rule of Kalander, a disciple of Bektash, which enjoins constant wandering.

while it often makes necessary reforms difficult, prevents them from losing national individuality and self-reliance, and the belief in predestination gives a certain dignity and Self-possession under calamities, without excluding foresight and activity in daily duty. But whether all this is enough to secure the political revival of the Sunnite commonwealths is doubtful in face of the preponderating influence on all the coasts of the Levant of Western civiliza- tion, which as yet is almost entirely a disintegrating force and seems certain to prevent a redintegration of Islam in Turkey, and probably also in Egypt. The khanates, again, are sunk in incredible moral corruption cloaked by blind fanaticism, while most of the Bedouin tribes of Arabia have known little about Koran and religion for the last eight centuries.® Islam has certainly still a great future in Central Africa, but this can hardly lead to veritable reformation of its system. Still there are many evidences that the faith is not yet dead even in its old realms. We lay no stress on the existence of various sects opposed to the current Sunnite orthodoxy, such as the puritanical Wahhabites of Arabia and India, or the Druszs (¢.v.), Nosairfya, Isma‘iliya, and Metwalfya of Syria, who are tinged with Shiite views and belong only politically to the Sunnite section of Islam. But in India there are still living seeds of further development within Islam proper. Under English control the ulema are unable to maintain the same spiritual tyranny over men’s minds as elsewhere, and we find more mutual toleration between Sunna and Shi’a, an easy accommodation to local tradition,* and even an ability to leave the grooves of Al-Ash‘ar{’s scholasticism and approach the ideas of the old rationalistic Mo‘tazilites. Movements in this direction have come to light quite recently ; but their further growth need not here be specu- lated on.® SHfiTEs.

The extreme Shi’ite view that ‘Al{ is to be regarded as an incarnation of the Godhead (see vol. xvi. pp. 568, 592) maintained its predominance only in

times when and places where the opposition to the sovereignty of the Omayyads and ‘Abbasids was intense, or where pantheistic influences from India were at work. From the first there existed also a milder form of Shiite faith, which soon was at open war with the fanatical Ismé‘iliya and their disciples, the Fatimites and Assassins (vol. xvi. p. 593 sq.).®

It was through the moderate Shfites that the caliph Shi’ite

Ma’mun thought to reconcile his dynasty with the house of ‘Alf (vol. xvi. p. 584), and it was this party that became dominant in Persia in the 10th Christian century under the Buyids. When they conquered Baghdad the Buyids abstained from interfering with the Sunnite orthodoxy of the populations of the capital and Arabian ‘Irdk, but the Shiite faith was openly professed in their courts at Rai, Shird4z, and Kirmén. But in the next century the power of the Shiite dynasty crumbled and fell before the Ghaz-nevids and Seljiks, who as Turks were Sunnites, and repressed the opposing views. In the 13th century the Mohammedan East was overrun by the Mongols, who at first were indifferent to all religion, and gave the Persian Shfites perfect liberty; later on the great-grandson of Jenghis Khan, Mohammed Khodahbende Oeljitu (1303-16),

3 Sefer Nameh, ed. Schefer, Paris, 1881, pp. 30 sq., 233.

4 See Garcin de Tassy, ‘Sur les particularites de la rel. mus. dans l’Inde,” reprinted in L’Jslamisme, 3d ed., Paris, 1874, pp. 290 sq. 296 sg. The Wahhabites protest against this laxity.

5 See Syed Ameer ‘Ali, Personal Law of Mohammedans, London, 1880, preface.

6 When the Fatimite lords of Egypt tried to enter into relations with the moderate Shi’ite Buyids in Baghdad they were met with polite reserve, and subsequently public protests against them emanated from the ‘Alide circles of that city (Wiistenfeld, Geschichte der [ati- miden-Chalifen, Gottingen, 1881, pp. 197, 237).

The Ithna- ‘Ashartya.

Shi’ite tenets.

himself became a Shi‘ite ; nor was the progress of the sect checked by the fall of the dynasty and the conquests of Timtr (1387), who veiled his religious indifference by proclaiming himself an admirer of ‘Ali. Thus the mass of

the Persian population remained Shf‘ites, and the Timurides accommodated themselves to the religious feelings of their subjects. Timur’s son, Shah Rokh, even built and furnished forth the tomb of the imam Riz4 in Meshhed (Meshed). The troublous times that followed and the intervention in Persian affairs of the Sunnite Ak-Koyunlu (see vol. xviii. p. 632 sq.) must have been unfavourable toShf‘ite principles ; but they gained a final victory through the Safawi dynasty, whose founder, Shéh Isma‘{l (1499-1523), gave the Shitite doctrine, in the form in which it is held by the Ithn4-‘Ashartya, the position it still has as the state religion of Persia.

The Ithna-‘Ashartya, or “Twelvers,” a sect of the moder- ate Shiites, have their name from the respect they pay to ‘Alf and his eleven immediate heirs through Fatima, daughter of the Prophet. Like all Shi‘ites, they hold that ‘Alf was designated as his successor by Mohammed,! and unjustly thrust aside by the three actual caliphs, Abtbekr, ‘Omar, and‘Othmén. Still more do they hate the Omayyad enemies of “Ali and his house (see vol. xvi. p. 563). They and the “Abbasids were usurpers, the true caliphs de jure being the im4ms—(1) ‘Ali; (2) Hasan ; (3) Hosain, then his heirs in the direct line —(4) ‘AH IL; (5) Mohammed al-Bakir ; (6) Ja‘far al-Sadik; (7) Musd4 al-Kazim ; (8) ‘Alt TIT. al-Rid& (in modern pronunciation Riza); (9) Mohammed II. al-Jawéd; (10) ‘Al IV. al-Askart ; (11) Hasan II. al-Khamt; (12) Mohammed ITI. al-Mahdi, who lived in the second half of the 3d century of the Flight (9th century A.p.), and to whom his Shi‘ite partisans looked to free them from the ‘Abbasid yoke. These hopes failed and he himself disappeared, whence the belief grew that he was concealed in a cave at Samarra and would return at the end of days. Meantime the sovereignty belongs to the other descendants of ‘Ali, the Sayyids (lords). In fact the Safawis claimed descent from the’seventh imdém, and neither the Afghan Nadir Shah, who overthrew their power, nor the Kajars, who now

reign, are regarded as legitimate. The false position which the royal house stands in with the clergy is an important element in the weakness of the crumbling state of Persia.

All other points in which Shi’ites differ from Sunnites depend on their legitimistic opinions, or are accommoda- tions of the rites of Islam to the Persian nationality, or else are petty matters affecting ceremonial, The rejection of the whole Sunnite traditions goes with the repudiation of the caliphs under whose protection these were handed down.? An allegorical and mystical interpretation recon- ciles the words of the Koran with the inordinate respect paid to ‘Ali; the Sunnite doctrine of the uncreated Koran is denied. To the Mohammedan confession “There is no god but God and Mohammed is His ambassador” they add “and ‘Ali is the vicegerent of God” (wali, properly “‘confidant”). There are some modifications in detail as to the four main religious duties of Islam,—the pre- scriptions of ritual purity, in particular, being absurdly exaggerated and made the main duty of the faithful. The prayers are almost exactly the same, but to take part in public worship is not obligatory, as there is at present no legitimate im&4m whose authority can direct the prayer

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1 To make this credible divers passages of the Koran have been changed from the received readings, and ultimately a special stira was me out of Koran phrases. See N Gldeke, Gesch. des Qorans, p. 220 sq.

25 Bt the comparison of Shi’ites with Protestants is futile. Shi‘ites have their own tradition (hadis) referred to “Ali, which is grossly dis- torted,—indeed a tissue of lies.

SP UNNGQTES

jurisprudence, and finally some arithmetic

[suf‘rres

of the congregation. Pilgrimage to Mecca, to which the Sunnite indwellers of ‘Ir&k and Arabia oppose difficulties, though since the reign of ‘Abd al-

Mejid it is officially thrown open to all, may be performed by a hired substi- tute,’ or its place can be taken by a visit to the tombs of Shiite saints, eg., that of ‘Alf at N ejef, of Hosain at Ker- bela, of Riz& at Meshhed, or of the “unstained Fatima” at Kum (Fétima-i-ma’astim, daughter of Musa, the 7th imam). The Shi‘ites are much the most zealous of Moslems in the worship of saints (real or supposed descendants of ‘Alf) and in pilgrimages to their graves, and they have a characteristic eagerness to be buried in those holy places. The Persians have an hereditary love for pomps and festivi- ties, and so the Shiites have devised many religious feasts. Of these the great sacrificial feast (id+-Kurbdén ; Turkish Kurbén Bairdém) is also Sunnite ; the first ten days of the month Moharram are dedicated to the mourning for the death of Hosain at Kerbela (vol. xvi. p. 568), which is cele- brated by passion-plays (ta‘ztya; see vol. xviii. p. 660), while the universal joy of the Nauroz, or the New Year of the Old Persian calendar, receives a Mohammedan sanc- tion by the tradition that on this day the Prophet conferred the caliphate on ‘Ali.4

While they naturally reject the four Sunnite schools of Eeclesi- jurisprudence, the Shiites also derive all law from the eo

Koran, and their trained clergy (mollahs) are the only class that can give legitimate legal responses. The training of the mollah resembles that of the Sunnite ‘4lim. The course

at the madrasa embraces grammar, with some rhetoric and

prosody, logic, dogmatic, Koran exegesis, tradition, and and algebra. The best madrasa is at Kerbel4.5 But the best students of Kerbel4 are no match even for the Sunnite disciples of Bokhard.® The scholar discharged from his studies becomes first a simple mollah, 2.¢., local judge and notary.’ A small

place has one such judge, larger towns a college of judges under a head called the sheikhu’l-Islém. The place of the Judicial Sunnite muftis is filled by certain of the imdmjuma, 7.¢., ficers. presidents of the chief mosques in the leading towns, who

in respect of this function bear the title of ¢mém mujtehid. This is a dignity conferred by the tacit consent of people and clergy, and is held at one time only by a very few dis- tinguished men. At the beginning of the 19th century there were but five mujtehids in Persia; now (1887) they seem to be more numerous. In Persia the cadi (kdzt) is an inferior judge who acts for the sheikhu'l-IslAm in special cases, and a mufti is a solicitor acting under the judge to prepare cases for court.

Under the Safawis, when the clergy had great influence, they had at their head the sadru 'ssodir, who administered all pious foundations and was the highest judicial authority. But so great a power was found dangerous ; 'Abbas the Great (1586-1628) abstained from filling up a vacancy which occurred in it, and, though Shah Sefi (1628-1641) restored the office, he placed it in commission. Nadir Shéh abolished it in his attempt to get rid of the Shi'ite hierarchy (1736), and since then it has not been restored. Yet the im4m-jum'a of Ispdhan, the old Safawi capital, is tacitly regarded as representative of the invisible imam of the house of 'Al, who is the true head of the church. Various vain attempts have been made in the 15th century to subordinate the authority of the clergy to the Government, These attempts had the sympathy of the better classes,

3 This the Sunnites also allow under certain conditions,

4 Without this sanction the Nauroz was celebrated even at court under the "Abbasids. It is the only feast still celebrated by the poor

as well as the rich. > On Turkish soil ; but the Shi'ite foundations there are tolerated, 8 Polak, Persien, Leipsic, 1865, i. 290. 7 No contract, especially no contract of marriage, is valid unless made before a mollah. An ordinary inferior judge is called darigha.

for the venality and moral corruption of the mollahs and their disposition to the most vulgar fraud are proverbial. But, on the other hand, the clerical power and the right of asylum at Meshhed, Kum, and some other sanctuaries are the only protection of the masses against the arbitrary tyranny of the court and the officials. There is nowa sort of truce between

the Government and the clergy, though the former is always suspicious of the latter. Only the venality of the spiritual courts has led, as in Turkestan, to a limitation of their jurisdiction, and judicial decisions are given also by civil magistrates according to ‘orf or custom- ary law and, although their decisions are often arbitrary, they are commonly resorted to in cases affecting property, in which the spiritual judge would think it his duty to “eat up” the sum in dispute. The main prop of the mollahs against the Government are the scum of the population, the léfis or foul rowdies. In 1862, according to Vam- béry, the im4m-jum‘a of Isp4h4n had at his orders a thousand of these scoundrels.

The rivals of the clergy in popular influence are the dervishes, whose show of holiness cloaks an immorality and propensity to crime far exceeding what is found among their brethren in Egypt and Turkey. So it has been for centuries, ac appears in Olearius’s account of the Calanders of his time (1637). Supported by popular superstition, the Persian dervishes are much more pretentious than those of the West. At the great feasts especially they quarter themselves impudently in wealthy houses and deafen the indwellers with their unceasing cry of Ydé hakk (“O Truth!” the mystical equivalent of ““O God!”). The wise and modest dervish who in Sa‘di’s poems tells the greatest sultan the truth as to the hollowness of his royal state has degenerated into the half-mad and insolent hanger-on who thrusts himself into audience-chambers and claims the seat of honour beside the grandees. The mul- titude of these motley vagabonds, some harmless, others dangerous, is explained by the love for idleness, buffoonery, and story-telling, which is even more marked in Persia than in other parts of the East.

Religions The great practical difference between the Sunnite and – Shi’ite communities is that among the former it is only ei *Y with the upper classes, who are few in number, and with ‘ects, the worse sort of dervishes that obedience to the precepts of religion is a mere formal profession. Most of the ulema and the middle and lower classes are sincere Moslems. In Persia it is the other way ; the praise of religion is always on men’s lips, but the inner conviction is that it is all a mockery. The clergy laugh inwardly at their own func- tions; the educated classes either believe nothing at all or hold secretly to a Sufi pantheism. Sa‘di and Hafiz are much more to them than the Koran; and, while the Sunnite takes his sortes beblice from the

Koran, the Shfite uses a copy of the songs of Hafiz. With the common people it is not the proper precepts of Islam, but the Shiite tenets directed against Sunnites and Jews, that find hearty ad- herence. ‘The death-feast of Hasan and Hosain excites them far more than the great sacrificial feast; and “Alf, the national saint, is much more popular than Mohammed. Islam, as it was forced on Persia by “Omar, was the faith of foreign conquerors and oppressors ; and the people have revenged themselves by travestying it and veiling their old convictions under its outward forms. And so Islam has never had any considerable influence on conduct save that it has confirmed the natural turn of the Persians for lying and hypocrisy. As it was long necessary to profess ortho- doxy for fear of the Arabs, it came to be an established Shi‘ite doctrine that it is lawful to deny one’s faith in case of danger. This “caution” (taktya) or “concealment” (ketmdn) has become a second nature with the Persians. And with this it goes that no one shrinks from secret sins,

though outwardly professing the utmost devotion. The preparation of wine and spirits, for example, is confined to Jews and Armenian Christians, but private drunkenness is most common. Very conscientious or pious people, however—e.g., the dervishes—use rather opium or hashish and confound the narcotic intoxication with mystic ecstasy. Another mischievous thing is the permission of temporary marriages,—marriages for a few hours on a money pay- ment. This legitimized harlotry (mot‘a) is forbidden by the Sunna, but the Shi’ites allow it, and the mollahs adjust the contract and share the women’s profits.

With all this, modern observers are agreed that the middle and lower classes of Persia are not hopeless, and that their natural intelligence, though combined with lack of perseverance, would make it much easier for them than for the Turks to take a new start if they were freed from the wretched civil and ecclesiastical administration. There Shi’ite is still mental life and vigour among them, as appears— sects. though in an unfavourable aspect— among the sects, which, allowance being made for ‘‘ takfya,” play no inconsiderable part. The Akhbaris (traditionalists), who adopt a semi-

philosophical way of explaining away the plainest doctrines (such as the resurrection of the flesh) on the authority of false traditions of ‘Alf, are not so much a sect as a school of theology within the same pale as the orthodox Shi‘a or mujtehidis.: A real dissenting sect, however, is the Sheikhis, of whose doctrines we have but imperfect and discrepant accounts.2 Representatives of the old extreme Shiites, who held ‘Ali for a divine incarnation, are found all over Persia in the ‘Alf-Ilahi or ‘Alf-Allahi sect (‘‘ “Ali deifiers”).3

Finally, in the year 1848 there broke out a violent Babi reaction against the wretched condition of state and church move- at a moment when a new succession to the throne had (as is ™°™* wont) involved great part of the land in anarchy (comp. vol. xviii. p. 651). As early as 1837 a young enthusiast, ‘Alf (son of) Mohammed, imbued with pantheistic and communistic ideas,* had begun a peaceable but zealous propaganda. Consistently enough with ultra-Shf‘ite principles, he deemed himself inspired by the spirit of God, and claimed to be the Mahdi, the twelfth imd4m, issued from his obscurity to lead the world to salvation. He took the title of Bab al- din (“portal of the faith”), and his followers are known as Bdbis. Baéb was a man of profound sincerity and averse to violent measures; he avoided all open polemic against the Government, which in turn at first tolerated him in its jealousy of the clergy. In 1844 the too great zeal of his follower Mollah Hosain occasioned Bab’s im- prisonment ; but Hosain and his emissaries continued the propaganda and made many converts in all provinces. When the troubles of 1848 broke out Hosain raised open rebellion in Mazenderdn. ‘Terrible conflicts ensued, made only more bitter by the execution of Bab (18th July 1849). Apparently suppressed, the movement proved that it was not extinct in an attempt to assassinate the shah in 1852. A new proscription followed; but there is no doubt that Babism still lives in secrecy, and the universal sympathy

1 The orthodox are so called because they allow the authority of the mujtehid (supra, p. 664). See Gobineau, Les Religions, &c., duns LV Asie Centrale, Paris, 1866, p. 28 sq.

2 Gobineau (op. cit., p. 30) reckons them as orthodox; but see Polak, Persien, Leipsic, 1865, i. 348; comp. also Von Kremer, Gresch. d.

herrschenden Ideen des Islams, p. 206 sq. (after Kazem Beg).

3 See Polak, op. cit., p. 849; Malcolm, Hist. of Persia, ii, 382 ; Rehatsek, in Journ. R.S.A. (Bombay branch), 1880, p. 424. Langlés, in Chardin, Voyages, 1811, x. 241, says that at the beginning of the 19th century their chief seats were north of Kandahar and Kabul (Cabul), and at Kashan.

4 The fusion of these two tendencies is in Persia as old as Mazdak (vol. xviii, p. 611). Communistic risings constantly took place in various parts of Persia under the caliphs, and that of Babek endangered the empire for twenty years (till §37 a.D.). The communists were afterwards absorbed in the Ishmaelites (see vol. xvi. p. 593 sq.), whose power was extinguished by the Mongols (1256). _

felt for the martyr Bab among generously minded Persians

may still give it a future.}

Less dangerous than these bold communists are the Ishmaelites, direct descendants of the old Isma‘ilfya, whose nihilist doctrines are now diluted into a harmless doctrine of incarnation. They are pretty numerous in India, at Bombay,

Surat, and Burhampur, but hardly are found in Persia.2 Despite their mutual feuds, Sunnites and Shfites are at one in their hatred and contempt for the professors of other religions. Holding that faith and unbelief are matter of predestination, Islam is not given to forcible proselytizing, and on certain conditions Christians and Jews (and later on Zoroastrians also) have always been tolerated in the Mohammedan empire, except that ‘Omar, mainly on political grounds, expelled all non-Moslems from Arabia. But none the less

the adherents of other faiths are hated and despised as children of

hell and enemies of true religion. To reconcile the present decay of Islam and prosperity of the unbeliever with their feelings and convictions, Sunnites and Shi'ites alike take refuge in the doctrine of a restoration of Islam before the end of the world through the 'divinely guided" Mahdi. In view of the interest in the subject excited by recent events, some addition may here be made to the brief statement in the article Manpr.3 Originally, as has been shown in that article, the idea of a god-sent deliverer from the ile- gitimate caliphs was attached by the Shi'ites to actual pretenders of the house of 'Ali ; the Mongols, the figure of the Mahdi was projected into the far future, and ultimately his arrival was madc a sign of the end of the world. Among the Sunnites, on the other hand, who could not accept the Shi'ite pretenders, some of those who felt that the Omayyad sovereignty was not truly spiritual and worthy of Islam borrowed the Christian hope of the second coming of Christ, whom Islam acknowledges as a prophet and precursor of Mohammed, and whose return at the end of the world seemed to accord with some vague passages of the Koran; others looked, like the Shiites, for a deliverer from earthly tyranny, but did not tie themselves to the belief that he must spring from the house of 'Ali. When the theo- logians of 'Abbasid times began to systematize the religious tradi- tions they found some that spoke of a return of Jesus and others referring to a Mahdi. These they combined together, so that Sunnites now believe that, when unrighteousness is at its height upon earth and the victory of the enemies of Islam seems sure, the Mahdi will appear to destroy the unbelievers and establish God's kingdom on earth. Then the Antichrist (dajjdl) will work new mischief, but be destroyed by J esus, who appears as precursor of the last judgment. Sunnite theologians have not all been at one in expecting a Mahdi as well as Jesus, but this is the view gencrally current in recent times ; and Sunnites and Shi'ites are agreed that the Mahdi will destroy the external foes of Islam, 7.¢., all non- Mohammedan powers. Theologians have tried by artificial inter- pretation of Koran and Sunna to fix when and how the Mahdi is to appear, and have concluded that he must be looked for at the close of a century. Of this widespread belief Mohammed Ahmed, the Sudanese Mahdi, availed himself in coming forward in the year 1300 of the Flight (1882-83). Theological Opinion is so un- settled as to all the details of the Mahdi's work that, according to trustworthy information, his death has not scriously impaired the impression produced by his victories. In Mecca, for example, in 1885 it was

commonly held to be conceivable that the Sudanese fighting in his name might destroy England and the Western powers ; and it is possible that the belief in this latest Mahdi has still an important part to play in the Eastern question. (A. MU.) SUNSTROKE (Heatstroke . Thermic Fever), a term applied to the effects produced upon the central nervous system, and through it upon other organs of the body, by exposure to the sun or to over-heated air. Although most frequently observed in tropical regions, this disease occurs also in temperate climates during hot weather. A moist condition of the atmosphere, which interferes with cooling of the overheated body, greatly increases the liability to suffer from this ailment. Sunstroke has been chiefly observed and investigated as occurring among soldiers in India, where formerly, both In active service and in the routine of ordinary duty, cases of this disease constituted a considerable item of sickness

1 See on Bab and Babism, Mirza Kazem Beg, in Journ. Asiatique, ser. 6, vols. vii. viii. ; Gobineau, op. cit., where there is a translation of Bab's new Koran; Von Kremer, op. cit., p. 202 Sq.

? See Garcin de Tassy, L'Islamisme, 3d ed. (1874), p. 298, and Rehatsek, ut sup.

3 Compare especially Snouck Hurgronje, ‘‘ Der Mahdi,” in Revue Coloniale Internationale, 1885, an article based on wide reading and personal observations at Jeddah and Mecca.

SU N—

and mortality. military authorities to the personal health and comfort of

but later on, and especially since the days of

Insolation; Coup de Soleil;

8 U®s

The increased attention now paid by

the soldier, particularly as regards barrack accommodation

and dress, together with the care taken in adjusting the

time and mode of movement of troops, has done much to lessen the mortality from this cause. It would appear that, while any one exposed to the influence of strong solar

heat may suffer from the symptoms of sunstroke, there are

certain conditions which greatly predispose to it in the case of individuals. Causes calculated to depress the health, such as previous disease, particularly affections of the nervous system,—anxiety, worry, or overwork, irregu- larities in food, and in a marked degree intemperance— have a powerful predisposing influence, while personal un- cleanliness, which prevents among other things the healthy action of the skin, the wearing of tight garments, which impede the functions alike of heart and lungs, and living in overcrowded and insanitary dwellings have an equally hurtful tendency. .

While attacks of sunstroke are frequently precipitated by exposure, especially during fatigue, to the direct rays of the sun, in a large number of instances they come ~~on under other circumstances. Cases are of not unfrequent occurrence among soldiers in hot climates when there is overcrowding or bad ventilation in their barracks, and sometimes several will be attacked in the course of a single night. The same remark applies to similar conditions existing on shipboard. Further, persons whose occupa~~ tion exposes them to excessive heat, such as stokers, laundry workers, &c., are apt to suffer, particularly in hot seasons. In the tropics Europeans, especially those who have recently arrived, are more readily affected than natives. But natives are not exempt.

The symptoms of heatstroke, which obviously depend upon the disorganization of the normal heat-regulating mechanism, as well as of the functions of circulation and respiration (see PATHoLoey, vol. xviii, p. 394), vary in their intensity and likewise to some extent in their form. Three chief types of the disease are usually described.

(1) Heat Syncope.—tIn this form the symptoms are those of exhaustion, with a tendency towards fainting or its actual occurrence. A fully developed attack of this descrip- tion is usually preceded by sickness, giddiness, some amount of mental excitement followed by drowsiness, and then the passage into the syncopal condition, in which there are pallor and coldness of the skin, a weak, quick, and inter- mittent pulse, and gasping or sighing respiration. The pupils are often contracted. Death may quickly occur; but if timely treatment is available recovery may take place.

(2) Heat Apopleay or Asphyxia.—In this variety the attack, whether preceded or not by the premonitory symp- toms already mentioned, is usually sudden, and occurs in the form of an apoplectic seizure, with great vascular engorgement, as seen in the flushed face, congested eyes, quick full pulse, and stertorous breathing. There is usually insensibility, and convulsions are not unfrequent. Death is often very sudden. This form, however, is also amenable to treatment.

(3) Ardent Thermic Fever.—This variety is characterized chiefly by the excessive development of fever (hyper- pyrexia), the temperature of the body rising at such times to 108° to 110° Fahr. or more. Accompanying this are the other symptoms of high febrile disturbance, such as great thirst, quick full pulse, pains throughout the body, head- ache, nausea, and vomiting, together with respiratory em- barrassment. After the attack has lasted for a variable period, often one or two days, death may ensue from collapse or from the case assuming the apoplectic form already described. But here too treatment may be suc- cessful if it is promptly applied.

Besides these, other varieties depending on the pro- minence of certain symptoms are occasionally met with. The chief changes in the body after death from heatstroke are those of anzmia of the brain and congestion of the lungs, together with softness of the heart and of the muscular tissues generally. The blood is dark and fluid and the blood corpuscles are somewhat altered in shape. Attacks of sunstroke are apt to leave traces of their effects upon the constitution, especially upon the nervous system. A liability to severe headache, which in many cases would seem to depend upon a condition of chronic meningitis, epileptic fits, mental irritability, and

alterations in the disposition are among the more important. It is often observed that heat in any form is ever afterwards ill borne, while there also appears to be an abnormal suscep- tibility to the action of stimulants. The mortality from sunstroke is estimated at from 40 to 50 per cent.

Treatment.—In respect of this discase means should be adopted to prevent attacks in the case of those who must necessarily be exposed to the sun. These consist in the wearing of loose clothing, with the exception of the headdress, which ought to be worn close to the head, in due attention to the function of the skin, and in the avoidance of alcoholic and other excesses. Cold water may be drunk in small quantities at frequent intervals. Sleeping in the open air in very hot seasons is recommended. ‘The treatment of a patient suffering from an attack necessarily depends upon the form it has assumed. In all cases he should if possible be at once removed into a shaded or cool place. Where the symptoms are mostly those of syncope and there is a tendency to death from heart failure, rest in the recumbent position, the use of diffusible stimulants, such as ammonia or cther, &c., together with friction or warmth applied to the extremities, are the means to be adopted. Where, on the other hand, the symptoms are those of apoplexy or of hyperpyrexia, by far the most successful results are obtained by the use of cold (the cold affusion, rubbing the surface with ice, enemata of ice-cold water). The effect is a marked lowering of the temperature, while at the same time a stimulus is given to the respiratory function. Mustard or turpentine applied to the nape of the neck or chest is a useful adjuvant. Should the temperature be lowered in this way but unconsciousness still persist, removal of the hair and blistering the scalp are recommended. The sub- sequent treatment will depend upon the nature of the resulting symptoms, but change to a cool climate is often followed by marked benefit. (J. O. A.)

SUPERIOR, Lake. See Lake and St Lawrence.

SURABAYA. See Java, vol, xiii. p. 605 sg. The population in 1880 was 122,234.

SURAKARTA, or Soto. See Java, vol. xiii. pp. 601, 606 sg. Its population was 124,041 in 1880.

SURAT, a district of British India, in the Guzerat division of Bombay presidency, lying between 20° 15’ and 21° 28’ N. lat. and 72° 38′ and 73° 30’ E. long. It has an area of 1662 square miles, and is bounded on the N. by Broach district and the native state of Baroda; on the E. by the states of Rajpipla, the Gaikwdr Bansda, and Dhar- ampur; on the 8. by Thana district and the Portuguese territory of Daman ; and on the W. by the Arabian Sea. Jt has a coast-line of 80 miles, consisting of a barren stretch of sand drift and salt marsh; behind that is a rich highly cultivated plain, nearly 60 miles in breadth at the em- bouchure of the Tapti, but narrowing to only 15 miles in the southern part; and on the north-east are the wild hills and jungle of the Dangs. The only important rivers are the Tapti and the Kim, the former of which is ordinarily navigable for native craft of from 18 to 36 tons. The district contains a large number of tanks for irrigation ; and a canal is projected from the Tapti with head works at Kamldpur, 35 miles from Surat. The fauna of the dis- trict consists of a few tigers, stragglers from the jungles of Bansda and Dharampur, besides leopards, bears, wild boars, wolves, hyzenas, spotted deer, and antelopes. The climate of Surat varies with the distance from the sea. Near the coast, under the influence of the sea-breeze, an equable temperature prevails, but 8 to 11 miles inland the breeze ceases to blow. The coast also possesses a much

lighter rainfall than the interior, the annual average ranging from 30 inches in Olpad to 72 in Chikhli, while at Surat city the average is 46 inches. The Bombay, Baroda, and Central India Railway runs through the district from north to south. A magnificent iron-girder bridge crosses the Tapti at Surat city.

The census of 1881 returned the population of Surat at 614,198 (306,015 males, 308,183 females), of whom Hindus numbered 415,031, Mohammedans 55,547, Parsis 12,593, and aboriginals 118,664. There are only two towns in the district with a population exceed- ing 5000,—namely, Surat (g.v.) and Bulsar (13,229). The culti- vated area in 1884-85 was returned at 726,583 acres, and the area available for cultivation at 81,663. The total area of crops in 1884- 85 was 550,233 acres, including 66,096 twice cropped. Rice occu- pied 103,972 acres, wheat 38,617, and jodr

108,644; cotton is also largely cultivated, and its culture is greatly increasing. Grain, cotton, timber, oil, sugar and molasses, and piece goods are the chief articles of export. Almost the whole female population is engaged in spinning cotton thread, and the weaving of cotton cloth in hand looms is carried on in the chief towns; silk is also manu- factured in considerable quantities, as well as brocades and em- broidery. In 1884-85 the revenue of the district amounted to £378,061, of which the land-tax contributed £268,644. Surat was one of the earliest parts of India brought into close relations with European countries, and its history merges almost entirely into that of its capital, long the greatest maritime city of the peninsula. By an arrangement made in 1799 the English were placed in posses- sion of Surat city and the town of Rander; subsequent cessions under the treaties of Bassein (1802) and Poona (1817), together with the lapse of the Mandvi state in 1839, brought the district into its present shape. Since the introduction of British rule the district has remained comparatively tranquil ; and even during the period of the mutiny peace was not disturbed, owing in a great mea- sure to the steadfast loyalty of its leading Mohammedan families.

SURAT, capital and administrative headquarters of the above district, is situated in 21° 9’ 30” N. lat. and 72° 54’ 15” EK. long., on the southern bank of the Tapti, distant from the sea 14 miles by water and 10 by land. Its origin appears to be comparatively modern, tradition assigning the foundation of the town to the beginning of the 16th century. As early as 1514 it was described by the Portuguese traveller Barbosa as a “very important seaport.” During the reigns of Akbar, Jahangir, and Shéh Jahan it rose to be the chief commercial city of India. From 1573 to 1612 the Portuguese were undis- puted masters of the Surat seas and part of the seaboard. But shortly after 1612 the city of Surat became the seat of a presidency under the English East India Company, and the Dutch also had made it their principal factory in India. During the 18th century it probably ranked as the most populous city of India, its population being at one time estimated as high as 800,000; but with the transfer of its trade to Bombay the numbers rapidly fell off, until in 1847 its inhabitants numbered only 80,000. Thenceforward the city began to retrieve its position, and in 1881 its population numbered 107,154 (54,524 males and 52,630 females).

SURBITON, a suburb of Kingston in Surrey, England, is finely situated on the river Thames, 12 miles south-west of London by the London and South-Western Railway. It consists chiefly of villa residences embosomed in woods and gardens. Along the river an esplanade has been con- structed, forming a pleasant promenade. Surbiton is the headquarters of the Kingston Rowing Club and the Thames Sailing Club. The recreation ground, in connexion with which there is a reading-room and library, is much fre- quented for athletic meetings and bicycle races. In the town there is a cottage hospital. The population of the urban sanitary district (area, 1000 acres) in 1871 was 7642, and in 1881 it was 9406.

SURETY, in law, is the party liable under a contract of GUARANTEE (9.v.). In criminal practice sureties bound by REcoGNIZANCE (q.v.) are a means of obtaining compliance with the order of a court of justice, whether to keep the peace or otherwise.

SURFACE, CONGRUENCE, COMPLEX. In the article CurvE the subject was treated from an historical point of view for the purpose of showing how the leading ideas of the theory were successively arrived at. These leading ideas apply to surfaces, but the ideas peculiar to surfaces are scarcely of the like fundamental nature, being rather developments of the former set in their application to a more advanced portion of geometry; there is conse- quently less occasion for the historical mode of treatment. Curves in space were briefly considered in the same article, and they will not be discussed here; but it is proper to refer to them in connexion with the other notions of solid geometry. In plane geometry the elementary figures are the point and the line; and we then have the curve, which may be regarded as a singly infinite system of points, and also as a singly infinite system of lines. In solid geo- metry the elementary figures are the point, the line, and the plane; we have, moreover, first, that which under one aspect is the curve and under another aspect the develop- able (or torse), and which may be regarded asa singly in- finite system of points, of lines, or of planes; and secondly, the surface, which may be regarded as a doubly infinite system of points or of planes, and also as a special triply infinite system of lines. (The tangent lines of a surface are a special complex.) As distinct particular cases

of the first figure we have the plane curve and the cone, and as a particular case of the second figure the ruled surface, regulus, or singly infinite system of lines 5 we have, be- sides, the congruence or doubly infinite system of lines and the complex or triply infinite system of lines. And thus crowds of theories arise which have hardly any ana- logues in plane geometry; the relation of a curve to the various surfaces which can be drawn through it, and that of a surface to the various curves which can be drawn upon it, are different in kind from those which in plane geometry most nearly correspond to them,—the relation of a system of points to the different curves through them and that of a curve to the systems of points upon it. In particular, there is nothing in plane geometry to correspond to the theory of the curves of curvature of a surface. Again, to the single theorem of plane geometry, that a line is the shortest distance between two points, there correspond in solid geometry two extensive and difficult theories, —that of the geodesic lines on a surface and that of the minimal surface, or surface of minimum area, for a given boundary. And it would be easy to say more in illustration of the great extent and complexity of the subject.

Surfaces in General; Torses, dc.

1. A surface may be regarded as the locus of a doubly in- finite system of points, —that is, the locus of the system of points determined by a single equation UV = (*a, y, z, 1)”, =0, between the Cartesian coordinates (to fix the ideas, say rectangular coordinates) x, y, 2; or, if we please, by a single homogeneous relation U = (*Sx, y, 2, w)”, =0, between the quadriplanar coordinates 2, Y,2,w. The degree n of the equation is the order of the surface 3 and this defini- tion of the order agrees with the geometrical one, that the order of the surface is equal to the number of the inter- sections of the surface by an arbitrary line. Starting from the foregoing point definition of the surface, we might develop the notions of the tangent line and the tangent plane; but it will be more convenient to consider the sur- face ab initio from the more general point of view in its relation to the point, the line, and the plane.

2. Mention has been made of the plane curve and the cone; it 1s proper to recall that the order of a plane curve 1s equal to the number of its

intersections by an arbitrary line (in the plane of the curve), and that its class is equal to the number of tangents to the curve which pass through

an arbitrary point (in the plane of the curve). The cone is a figure correlative to the plane curve: corresponding: to the plane of the curve we have the vertex of the cone, to its tangents the generating lines of the cone, and to its. points the tangent planes of the cone. But from a differ- ent point of view we may consider the generating lines of the cone as corresponding to the points of the curve and its tangent planes as corresponding to the tangents of the curve. From this point of view we define the order of the cone as equal to the number of its intersections (generating lines) by an arbitrary plane through the vertex, and its. class as equal to the number of the tangent planes which pass through an arbitrary line through the vertex. And in the same way that a plane curve has singularities (singular points and singular tangents) so a cone has singularities. (singular generating lines and singular tangent planes).

3. Consider now a surface in connexion with an arbi- trary line. The line meets the surface in a certain number of points, and, as already mentioned, the order of the sur- face is equal to the number of these intersections. We have through the line a certain number of tangent planes of the surface, and the class of the surface is equal to the number of these tangent planes.

But, further, through the line imagine a plane; this. meets the surface in a curve the order of which is equal (as is at once seen) to the order of the surface. Again, on the line imagine a point; this is the vertex of a cone cir- cumscribing the surface, and the class of this cone is equal (as is at once seen) to the class of the surface. The tangent. lines of the surface which lie in the plane are nothing else than the tangents of the plane section, and thus form a. singly infinite series of lines; similarly, the tangent lines of the surface which pass through the point are nothing else than the generating lines of the circumscribed cone, and thus form a singly infinite series of lines. But, if we: consider those tangent lines of the surface which are at once in the plane and through the point, we see that they are finite in number; and we define the rank of a surface as equal to the number of tangent lines which lie in a given plane and pass through a given point in

that plane. It at once follows that the class of the plane section and the order of the circumscribed cone are each equal to the rank of the surface, and are thus equal to each other. It may be noticed that for a general surface (**{wx, y, z, wy", 0} Ge order without point singularities the rank is a, = n(n — 1), and the class is n', = n(n —1)?; this implies (what is in fact. the case) that the circumscribed cone has line singularities, for otherwise its class, that is the class of the surface, would be a(a — 1), which is not = n(n —1)**.

4. In the last preceding number the notions of the tangent line and the tangent plane have been assumed as known, but they require to be further explained in refer- ence to the original point definition of the surface. Speak- ing generally, we may say that the points of the surface consecutive to a given point on it lie in a plane which is the tangent plane at the given point, and conversely the given point is the point of contact of this tangent plane, and that any line through the point of contact and in the tangent plane is a tangent line touching the surface at the. point of contact. Hence we see at once that the tangent line is any line meeting the surface in two consecutive points, or—what is the same thing—a line meeting the surface in the point of contact counting as two intersec- tions and in »—2 other points. But, from the foregoing notion of the tangent plane as a plane containing the point of contact and the consecutive points of the surface, the passage to the true definition of the tangent plane is not equally obvious. A plane in general meets the surface. of the order » in a curve of that order without double points ; but the plane may be such that the curve has a

double point, and when this is so the plane is a tangent plane having the double point for its point of contact. The double point is either an acnode (isolated point), then the surface at the point in question is convex towards (that is, concave away from) the tangent plane; or else it is a crunode, and the surface at the point in question is then concavo-convex, that is, it has its two curvatures in opposite senses (see infra, No. 16). Observe that in either case any line whatever in the plane and through the point meets the surface in the points in which it meets the plane curve, namely, in the point of

contact, which gua double point counts as two intersections, and in 2 — 2 other points ; that is, we have the preceding definition of the tangent line.

5. The complete enumeration and discussion of the singularities of a surface is a question of extreme difficulty which has not yet been solved! A plane curve has point singularities and line singularities ; corresponding to these we have for the surface isolated point singularities and isolated plane singularities, but there are besides con- tinuous singularities applying to curves on or torses circum- scribed to the surface, and it is among these that we have the non-special singularities which play the most important part in the theory. Thus the plane curve represented by the general equation **({x, y, 2)"=0, of any given order , has the non-special line singularities of inflexions and double tangents ; corresponding to this the surface represented by the general equation (**{z, y, 2, w)" =0, of any given order , has, not the isolated plane sin- gularities, but the continuous singularities of the spinode curve or torse and the node-couple curve or torse. A plane may meet the surface in a curve having (1) a cusp (spinode) or (2) a pair of double points; in each case there is a singly infinite system of such singular tangent planes, and the locus of the points of contact is the curve, the envelope of the tangent planes the torse. The reciprocal singularities to these are the nodal curve and the cuspidal curve: the surface may intersect or touch itself along a curve in such wise that, cutting the surface by an arbitrary plane, the curve of intersection has at each intersection of the plane with the curve on the surface (1) a double point (node) or (2) acusp. Observe that these are singularities not occurring in the surface represented by the general equation (*%x, y, 2, w)"=0 of any order; observe further that in the case of both or either of these singularities the definition of the tangent plane must be modified. A tangent plane is a plane such that there is in the plane section a double point in addition to the nodes or cusps at the intersections with the singular lines on the surface.

6. As regards isolated singularities, it will be sufficient to mention the point singularity of the conical point (or enicnode) and the corresponding plane singularity of the conic of contact (or cnictrope). In the former case we have a point such that the consecutive points, instead of lying in a tangent plane, lie on a quadric cone, having the point for its vertex; in the latter case we have a plane touching the surface along a conic; that is, the complete

intersection of the surface by the plane is made up of the conic taken twice and of a residual curve of the order n — 4.

7. We may, in the general theory of surfaces, consider either a surface and its reciprocal surface, the recipro- cal surface being taken to be the surface enveloped by the polar planes (in regard to a given quadric surface) of the points of the original surface; or—what is better—we

1 Ina plane curve the only singularities which need to be considered are those that present themselves in Pliicker's equations, for every higher singularity whatever is equivalent to a certain number of nodes, cusps, inflexions, and double tangents. As regards a surface, no such reduction of the higher singularities has as yet been made.

may consider a given surface in reference to the reciprocal relations of its order, rank, class, and singularities. In either case we have a series of unaccented letters and a corresponding series of accented letters, and the relations between them are such that we may in any equation inter- change the accented and the unaccented letters; in some cases an unaccented letter may be equal to the correspond- ing accented letter. Thus, let , 2' be as before the order and the class of the surface, but, instead of immediately defining the rank, let a be used to denote the class of the plane section and a' the order of the circumscribed cone ; also let S, S' be numbers referring to the singularities. The form of the relations is a=a(=rank of surface) ; aw=n(n—-1)—S; n'=n(n-1-S; a=n'(n'-1)-S'; n=n'(n'—1)?— 8'. In these last equations §, S' are merely written down to denote proper corresponding com- binations of the several numbers referring to the singular- ities collectively denoted by S, S' respectively. The theory, as already mentioned, is a complex and difficult one, and it is not the intention to further develop it here.

8. A developable or torse corresponds to a curve in space in the same manner as a cone corresponds to a plane curve: although capable of representation by an equation U= (*ix, y, 2, w,)", =0, and so of coming under the foregoing point definition of a surface, it is an entirely distinct geo- metrical conception. We may indeed, gwa surface, regard it as a

surface characterized by the property that each of its tangent planes touches it, not at a single point, but along a line; this is equivalent to saying that it is the envelope, not of a doubly infinite series of planes, as is a proper surface, but of a singly infinite system of planes. But itis perhaps easier to regard it as the locus of a singly infinite system of lines, each line meeting the consecutive line, or, what is the same thing, the lines being tangent lines of a curvein space. The tangent plane is then the plane through two consecutive lines, or, what is the same thing, an oscu- lating plane of the curve, whence also the tangent plane intersects the surface in the generating line counting twice, and in a residual curve of the order »— 2. The curve is said to be the edge of regression of the developable, and it is a cuspidal curve thereof ; that is to say, any plane section of the developable has at each point of intersection with the edge of regression a cusp. A sheet of paper bent in any manner without crumpling gives a developable; but we cannot with a single sheet of paper properly exhibit the form in the neighbourhood of the edge of regression : we need two sheets connected along a plane curve, which, when the paper is bent, becomes the edge of regression and appears as a cuspidal curve on the surface.

It may be mentioned that the condition which must be satisfied in order that the equation U=0 shall represent a developable is H(U)=0; that is, the Hessian or functional determinant formed with the second differential coefficients of U must vanish in virtue of the equation U=0, or—what is the same thing—H(U) must contain U as a factor. If in Cartesian coordinates the equation is taken in the form 2—f(x, y)=0, then the condition is rt—s? =0 identically, where 7, s, ¢ denote as usual the second differential co- efficients of z in regard to x, y respectively.

9, A ruled surface or regulus is the locus of a singly infinite system of lines, where the consecutive lines do not intersect ; this is a true surface, for there is a doubly infinite series of tangent planes,—in fact any plane through any one of the lines is a tangent plane of the surface, touching it at a point on the line, and in such wise that, as the tangent plane turns about the line, the point of con- tact moves along the line. The complete intersection of the surface by the tangent plane is made up of the line counting once and of a residual curve of the order x —1. A quadric surface is a regulus in a twofold manner, for

there are on the surface two systems of lines each of which is aregulus. A cubic surface may be a regulus (see No. 11 infra).

Surfaces of the Orders 2, 8, and 4.

10. A surface of the second order or a quadric surface is a surface such that every line meets it in two points, or— what comes to the same thing—such that every plane section thereof is a conic or quadric curve. Such surfaces have been studied from every point of view. The only singular forms are when there is (1) a conical point (cnic- node), when the surface is a cone of the second order or quadricone ; (2) a conic of contact (cnictrope), when the surface is this conic; from a different point of view it is a surface aplatie or flattened surface. Excluding these de- generate forms, the surface is of the order, rank, and class each =2, and it has no singularities. Distinguishing the forms according to reality, we have the ellipsoid, the hyperboloid of two sheets, the hyperboloid of one sheet, the elliptic paraboloid, and the hyperbolic paraboloid (see GEOMETRY, ANALYTICAL). A particular case of the ellip- soid is the sphere ; in abstract geometry this is a quadric surface passing through a given quadric curve, the circle at infinity. The tangent plane of a quadric surface meets it in a quadric curve having a node, that is, in a pair of lines ; hence there are on the surface two singly infinite sets of lines. Two lines of the same set do not meet, but each line of the one set meets each line of the other set ; the surface is thus a regulus in a twofold manner. The lines are real for the hyperboloid of one sheet and for the hyperbolic paraboloid; for the other forms of surface they are imaginary.

11. We have next the surface of the third order or cubic surface, which has also been very completely studied. Such a surface may have isolated point singularities (cnic- nodes or points of higher singularity), or it may have a nodal line; we have thus 21+2,=23 cases, In the general case of a surface without any singularities, the order, rank, and class are=3, 6, 12 respectively. The surface has upon it 27 lines, lying by threes in 45 planes, which are triple tangent planes, Observe that the tangent plane is a plane meeting the surface in a curve having a node. For a surface of any given order there will be a certain number of planes each meeting the surface in a curve with 3 nodes, that is, triple tangent planes ; and, in the particular case

where n = 3, the cubic curve with 3 nodes is of course a set of 3 lines ; it is found that the number of triple tangent planes is, as just mentioned, = 45, This would give 135 lines, but through each line we have 5 such planes, and the number of lines is thus = 27. ‘The theory of the 27 lines is an extensive and interesting one ; in particular, it may be noticed that we can, in thirty-six ways, select a system of 6×6 lines, or “double sixer,” such that no 2 lines of the same set intersect each other, but that each line of the one set intersects each line of the other set.

A cubic surface having a nodal line is a ruled surface or regulus ; in fact any plane through the nodal line meets the surface in this line counting twice and in a residual line, and there is thus on the surface a singly infinite set of lines. There are two forms ; but the distinction between them need not be referred to here.

12. As regards quartic surfaces, only particular forms have been much studied. A quartic surface can have at most 16 conical points (cnicnodes) ; an instance of such a surface is Fresnel’s wave surface, which has 4 real cnienodes in one of the principal planes, 4 × 2 imaginary ones in the other two principal planes, and 4 imaginary ones at Infinity,—in all 16 cnicnodes ; the same surface has also 4

real + 12 imaginary planes each touching the surface along a circle (cnictropes),—in all 16 cnictropes. It was easy |

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by a mere homographic transformation to pass to the more general surface called the tetrahedroid; but this was itself only a particular form of the general surface with 16 cnicnodes and 16 cnictropes first. studied by Kummer. Quartic surfaces with a smaller number of cnicnodes have also been considered.

Another very important form is the quartic surface having a nodal conic; the nodal conic may be the circle at infinity, and we have then the so-called anallagmatic surface, otherwise the cyclide (which includes the particu- lar form called Dupin's cyclide). These correspond to the bicircular quartic curve of plane geometry. Other forms of quartic surface might be referred to.

Congruences and Complexes.

13. A congruence is a doubly infinite system of lines, A line depends on four parameters and can therefore be determined so as to satisfy four conditions; if only two conditions are imposed on the line we have a doubly infinite system of lines or a congruence. Jor instance, the lines meeting each of two given lines form a congruence, It is hardly necessary to remark that, imposing on the line one more condition, we have a ruled surface or regulus ; thus we can in an infinity of ways separate the congruence into a singly infinite system of reguli or of torses (see infra, No. 16).

Considering in connexion with the congruence two arbitrary lines, there will be in the congruence a deter- minate number of lines which meet each of these two lines; and the number of lines thus meeting the two lines is said to be the order-class of the congruence. If the two arbitrary lines are taken to intersect each other, the con- gruence lines which meet each of the two lines separate themselves into two sets,—those which lie in the plane of the two lines and those which pass through their intersec- tion, There will be in the former set a determinate number of congruence lines which is the order of the congruence, and in the latter set a determinate number of congruence lines which is the class of the congruence, In other words, the order of the congruence is equal to the number of congruence lines lying in an arbitrary plane, and its class to the number of congruence lines passing through an arbitrary point.

The following systems of lines form each of them a congruence :—(A) lines meeting each of two given curves ; (B) lines meeting a given curve twice; (C) lines meeting a given curve and touching a given surface ; (D) lines touch- ing each of two given surfaces ; (E) lines touching a given surface twice, or, say, the bitangents of a given surface.

The last case is the most general one; and conversely for a given congruence there will be in general a surface having the congruence lines for bitangents. This surface is said to be the focal surface of the congruence ; the general surface with 16 cnicnodes first presented itself in this manner as the focal surface of a congruence. But the focal surface may degenerate into the forms belonging to the other cases A, B, C, D.

14, A complex is a triply infinite system of lines, —for instance, the tangent lines of a surface. Considering an arbitrary point in connexion with the complex, the com- plex lines which pass through the point form a cone ; considering a plane in connexion with it, the complex lines which lie in the plane envelope a curve. It is easy to see that the class of the curve is equal to the order of the cone; in fact each of these numbers is equal to the number of complex lines which lie in an arbitrary plane and pass through an arbitrary point of that plane ; and we then say order of complex=order of curve ; rank of complex =class of curve=order of cone ; class of complex=class of cone. It is to be observed that, while

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for a congruence there is in general a surface having the congruence lines for bitangents, for a complex there is not in general any surface having the complex lines for tangents ; the tangent lines of a surface are thus only a special form of complex. The theory of complexes first presented itself in the researches of Malus on systems of rays of light in connexion with double refraction.

15. The analytical theory as well of congruences ag of complexes is most easily carried out by means of the six coordinates of a line; viz., there are coordinates (a, 8, ¢, J, 9, ») connected by the equation af + bg + ch =0, and there- fore such that the ratios a :6:¢:f:g:h constitute a system of four arbitrary parameters. We have thus a congruence of the order 2 represented

by a single homogeneous equa- tion of that order (*fa, 6, c, f, 9, 2)”=0 between the six coordinates ; two such relations determine a congruence. But we have inregard to congruences the same difficulty as that which presents itself in regard to curves in space : it is not every congruence which can be represented com- pletely and precisely by two such equations.

The linear equation (*fa, 0, ¢,f,g,k)=0 represents a congruence of the first order or linear congruence; such congruences are interesting both in geometry and in con- nexion with the theory of forces acting on a rigid body.

Curves of Curvature ; Asymptotic Lines.

16. The normals of a surface form a congruence. In any congruence the lines consecutive to a given congruence lire do not in general meet this line; but there is a deter- minate number of consecutive lines which do meet it; or, attending for the moment to only one of these, say the congruence line is met by a consecutive congruence line. In particular, each normal is met by a consecutive normal; this again is met by a consecutive normal, and soon. That is, we have a singly infinite system of normals each meeting the consecutive normal, and so forming a torse; starting from different normals successively, we obtain a singly infinite system of such torses. But each normal is in fact met by two consecutive normals, and, using in the construction first the one and then the other of these, we obtain two singly infinite systems of torses each intersecting the given surface at right angles. In other words, if in place of the normal we consider the point on the surface, we obtain on the surface two singly infinite systems of curves such that for any curve of either system the normals at consecutive points intersect each other ; moreover, for each normal the torses of the two systems intersect each other at right angles ; and therefore for each point of the surface the curves of the two systems intersect each other at right angles. The two systems of curves are said to be the curves of curvature of the surface.

The normal is met by the two consecutive normals in two points which are the centres of curvature for the point on the surface ; these lie either on the same side of the point or on opposite sides, and the surface has at the point

in question like curvatures or opposite curvatures in the two cases respectively (see supra, No. 4).

17. In immediate connexion with the curves of curvature we have the so-called asymptotic curves (Haupt-tangenten- linien). ‘The tangent plane at a point of the surface cuts the surface in a curve having at that point a node. Thus we have at the point of the surface two directions of passage to a consecutive point, or, say, two elements of arc ; and, passing along one of these to the consecutive point, and thence to a consecutive point, and so on, we obtain on the surface a curve. Starting successively from different points of the surface we thus obtain a singly infinite system of curves; or, using first one and then the other of the two directions, we obtain two singly infinite systems of curves, which are the curves above referred to. The two

curves at any point are equally inclined to the two curves of curvature at that point, or—what is the same thing— the supplementary angles formed by the two asymptotic lines are bisected by the two curves of curvature. In the case of a quadric surface the asymptotic curves are the two systems of lines on the surface. .

Geodesic Lines.

18. A geodesic line (or curve) is a shortest curve on a surface ; more accurately, the element of arc between two consecutive points of a geodesic line is a shortest are on the surface. We are thus led to the fundamental property that at each point of the curve the osculating plane of the curve passes through the normal of the surface $ an, other words, any two consecutive arcs PP’, PP’ arevan plano with the normal at P’. Starting from a given point P on the surface, we have a singly infinite system of geodesics proceeding along the surface in the direction of the several tangent lines at the point P ; and, if the direction PP’ is given, the property gives a construction by successive elements of arc for the required geodesic line.

Considering the geodesic lines which proceed from a given point P of the surface, any particular geodesic line is or is not again intersected by the consecutive generating line; if it is thus intersected, the generating line is a

shortest line on the surface up to, but not beyond, the point at which it is first intersected by the consecutive generating line; if it is not intersected, it continues a shortest line for the whole course.

In the analytical theory both of geodesic lines and of the curves of curvature, and in other parts of the theory of surfaces, it is very convenient to consider the rectangular coordinates x, y, 2 of a point of the surface as given functions of two independent parameters p,q; the form of these functions of course determines the surface, since by the elimination of p, gfrom the three equations we obtain the equation in the coordinates x, y,z. We have for the geodesic lines a differential equation of the second order between p and g; the general solution contains two arbi- trary constants, and is thus capable of representing the geodesic line which can be drawn from a given point in a given direction on the surface. In the case of a quadric surface the solution involves hyperelliptic integrals of the first kind, depending on the square root of a sextic function.

Curvilinear Coordinates.

19. The expressions of the coordinates x, y, z in terms of p, g may contain a parameter 7, and, if this is regarded as a given constant, these expressions will as before refer to a point on a given surface. But, if p, g, 7 are regarded as three independent parameters, x, y,2 will be the co- ordinates of a point in space, determined by means of the three parameters p, g,7; these parameters are said to be the curvilinear coordinates, or (in a generalized sense of the term) simply the coordinates of the point. We arrive otherwise at the notion by taking p, g,r each as a given function of x, y,2; say we have p=/,(2,y,2), g=o(x,4,2), r= f,(x,y,2), Which equations of course lead to expressions for p, g,7 each as a function of x,y,z. The first equation determines a singly infinite set of surfaces: for any given value of » we have a surface; and similarly the second and third equations determine each a singly infinite set of surfaces. If, to fix the ideas, f,, f,, f4 are taken to denote each a rational and integral function of x, y,z, then two surfaces of the same set will not intersect each other, and through a given point of space there will pass one surface of each set; that is, the point will be determined as a point of intersection of three surfaces belonging to the three sets respectively; moreover, the whole of space will be divided by the three sets

of surfaces into a triply infinite system of elements, each of them being a parallelepiped.

Orthotomic Surfaces; Parallel Surfaces.

90. The three sets of surfaces may be such that the three surfaces through any point of space whatever inter- sect each other at right angles; and they are in this case said to be orthotomic. The term curvilinear coordinates was almost appropriated by Lamé, to whom this theory is chiefly due, to the case in question: assuming that the equations p=/,(,y,2), g=fo(%2), T= S(2Y;2) refer to a system of orthotomic surfaces, we have in the restricted sense 7, g, 7 as the curvilinear coordinates of the point.

An interesting special case is that of confocal quadric surfaces. The general equation of a surface confocal with

ears Oe ae li i 7 ee Le the ellipsoi mrptantis Pane Ret ae 3 and, if in this equation we consider «,¥,z as given, we have for @ a cubic equation with three real roots p, q, 7, and thus we have through the point three real surfaces, one an ellipsoid, one a hyperboloid of one sheet, and one a hyperboloid of two sheets.

21. The theory is connected with that of curves of cur- vature by Dupin's theorem. Thus in any system of ortho- tomic surfaces each surface of any one of the three sets is intersected by the surfaces of the other two sets in its curves of curvature.

22. No one of the three sets of surfaces is altogether arbitrary: in the equation p=/,(«,y,2), p is not an arbi- trary function of «#,y,2, but it must satisfy a certain partial differential equation of the third order. Assuming that p has this value, we have q=/,(z,y,2) and r=/,(z,y, 2) determinate functions of x,y,z such that the three sets of surfaces form an orthotomic system.

23. Starting from a given surface, it has been seen (No. 16) that the normals along the curves of curvature form two systems of torses intersecting each

other, and also the given surface, at right angles. But there are, intersecting the two systems of torses at right angles, not only the given surface, but a singly infinite system of surfaces. If at each point of the given surface we measure off along the normal one and the same distance at pleasure, then the locus of the points thus obtained is a surface cutting all the normals of the given surface at right angles, or, in other words, having the same normals as the given surface; and it is therefore a parallel surface to the given surface. Hence the singly infinite system of parallel surfaces and the two singly infinite systems of torses form together a set of orthotomic surfaces. –

The Minimal Surface.

24, This is the surface of minimum area—more ac- curately, a surface such that, for any indefinitely small closed curve which can be drawn on it round any point, the area of the surface is less than it is for any other surface whatever through the closed curve. It at once follows that the surface at every point is concavo-con-

vex ; for, if at any point this was not the case, we could, by cutting the surface by a plane, describe round the point an indefinitely small closed plane curve, and the plane area within the closed curve would then be less than the area of the element of surface within the same curve. The condition leads to a partial differential equa- tion of the second order for the determination of the minimal surface: considering z as a function of a, Ys and writing as usual p, q, 7, s, ¢ for the first and second differential coefficients of zin regard to a, y respectively, the equation (as first shown by Lagrange) is (1 9*)r ~ 2pgs(1+p*)t=0, or, as this may also be written, d

vi 2 : dy Via ag Jitpr@ =). “Phe general integral contains of course arbitrary functions, and, if we imagine these so determined that the surface may pass through a given closed curve, and if, moreover, there is but one minimal surface passing through that curve, we have the solution of the problem of finding the surface of minimum area within the same curve. The surface continued be- yond the closed curve is a minimal surface, but it is not of necessity or in general a surface of minimum area for an arbitrary bounding

curve not wholly included within the given closed curve. It is hardly necessary to remark that the plane is a minimal surface, and that, if the given closed curve is a plane curve, the plane is the proper solution; that is, the plane area within the given closed curve is less than the area for any other surface through the same curve. The given closed curve is not of necessity a single curve: it may be, for instance, a skew polygon of four or more sides.

The partial differential equation was dealt with in a very remarkable manner by Riemann. From the second

qda — pdy VIi+p+¢ =a complete differential, or, putting this=d we introduce into the solution a variable 6 which combines with z in the forms z+i¢ (¢= V—TI as usual). The boundary conditions have to be satisfied by the determination of the conjugate variables », 7’ as functions of z+7¢, 2—7i¢ or, say, of 4, Z’ respectively, and by writing S, S’ to denote «+7y, a —vy respectively. Riemann obtains finally two ordinary differential equations of the first order in S, §’, n, 7’, Z, Z, and the results are completely worked out in some very interesting special cases.

The memoirs on various parts of the general subject are very numerous; references to many of them will be found in Salmon’s Treatise on the Analytic Geometry of Three Dimensions, 4th ed., Dublin, 1882 (the most comprehensive work on solid geometry) ; for the minimal surface (which is not considered there) see Memoirs Xvili. and xxvi. in Riemann’s Gesammelte mathematische Wi erke, Leipsic, 1876; the former—‘‘Ueber die Fliche vom kleinsten Inhalt bei gegebener Begrenzung,” as published in Gétt. Abhandl., vol. xiii. (1866-67)—contains an introduction by Hattendorff giving the history of the question. (A. CA.)

SURGEONS, CoLiece or. See Socretizs.

form given above it appears that we have

SURGERY

Part J.—History.

pe in all countries is as old as human needs, A

certain skill in the stanching of blood, the extraction of arrows, the binding up of wounds, the supporting of broken limbs by splints, and the like, together with an in- stinctive reliance on the healing power of the tissues, has been common to men everywhere. In both branches of the Aryan stock surgical practice (as well as medical) reached a high degree of perfection at a very early period. Itisa matter of controversy whether the Greeks got their medicine (or any of it) from the Hindus (through the medium of the Egyptian priesthood), or whether the Hindus owed

that high degree of medical and surgical knowledge and skill which is reflected in Charaka and Suéruta (commenta- tors of uncertain date on the Yajur-Veda; see SANSKRIT, vol. xxi. p. 294) to their contact with Western civilization after the campaigns of Alexander. The evidence in favour of the former view is ably stated by Wise in the Intro- duction to his History of Medicine among the Asiatics (London, 1868). The correspondence between the Suéruta and the Hippocratic Collection is closest in the sections relating to the ethics of medical practice ; the description, also, of lithotomy in the former agrees almost exactly with the account of the Alexandrian practice as given by Celsus. But there are certainly some dexterous operations described

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in Suéruta (such as the rhinoplastic) which were of native invention ; the elaborate and lofty ethical code appears to be of pure Brahmanical origin; and the very copious materia medica (which included arsenic, mercury, zinc, and many other substances of permanent value) does not contain a single article of foreign source. There is evi- dence also (in Arrian, Strabo, and other writers) that the East enjoyed a proverbial reputation for medical and sur- gical wisdom at the time of Alexander’s invasion. We may give the first place, then, to the Eastern branch of the Aryan race in a sketch of the rise of surgery, leaving as insoluble the question of the date of the Sanskrit com- pendiums or compilations which pass under the names of two representative persons, Charaka and Susruta (the dates assigned to these ranging as widely as 500 years on each side of the Christian era).

The Suésruta speaks throughout of a single class of practitioners who undertook both surgical and medical eases. Nor were there any fixed degrees or orders of

what noticeably in the ancient surgery of the Hindus 3 and the reason of their backwardness in that matter was doubt- less their want of familiarity with the course of the arteries and with the arterial circulation. Besides the operation already mentioned, the abdomen was opened by a short Incision below the umbilicus slightly to the left of the middle line, for the purpose of removing intestinal con- cretions or other obstruction (laparotomy). Only a small segment of the bowel was exposed at one time; the con- cretion when found was removed, the intestine stitched together again, anointed with ghee and honey, and returned into the cavity. Lithotomy was practised, without the staff. There was a plastic operation for the restoration of the nose, the skin being taken from the cheek adjoining, and the vascularity kept up by a bridge of tissue. The ophthalmic surgery included extraction of cataract. Ob- stetric operations were various, including cesarean section and crushing the foetus.

The medication and constitutional treatment in surgical Medical cases were in keeping with the general care and elaborate- treat- ness of their practice, and with the copiousness of their ™°

skill within the profession; even lithotomy, which at Alexandria was assigned to specialists, was to be under-

taken by any one, the leave of the rajah having been first obtained. The only distinction recognized between medicine and surgery was in the inferior order of barbers, nail-trimmers, ear-borers, tooth-drawers, and phlebotomists, who were outside the Brahmanical caste.

Susruta describes more than one hundred surgical instru- ments, made of steel. They should have good handles and firm joints, be well polished, and sharp enough to divide a hair ; they should be perfectly clean, and kept in

flannel in a wooden box. They included various shapes of scalpels, bistouries, lancets, scarifiers, saws, bone-nippers, scissors, trocars, and needles. There were also blunt hooks, loops, probes (including a caustic-holder), directors, sounds, scoops, and forceps (for polypi, &c.), as well as catheters, syringes, a rectal speculum, and bougies. There were fourteen varieties of bandage. The favourite form of splint was made of thin slips of bamboo bound together with string and cut to the length required. Wise says that he has frequently used ‘this admirable splint,” particularly for fractures of the thigh, humerus, radius, and ulna, and it has been subsequently adopted in the English army under the name of the “ patent rattan-cane splint.”

Fractures were diagnosed, among other signs, by cre- pitus. Dislocations were elaborately classified, and the differential diagnosis given; the treatment was by trac- tion and countertraction, cireumduction, and other dexter- ous manipulation. Wounds were divided into incised, punctured, lacerated, contused, &c. Cuts of the head and face were sewed. Skill in extracting foreign bodies was carried to a great height, the magnet being used for iron particles under certain specified circumstances. Inflam- mations were treated by the usual antiphlogistic regimen and appliances ; venesection was practised at several other points besides the bend of the elbow; leeches were more often resorted to than the lancet; cupping also was in general use. Poulticing, fomenting, and the like were done as at present. Amputation was done now and then, notwithstanding the want of a good control over the hemorrhage ; boiling oil was applied to the stump, with pressure by means of a cup-formed bandage, pitch being sometimes added. Tumours and enlarged lymphatic glands were cut out, and an arsenical salve applied to the raw surfaces to prevent recurrence. Abdominal dropsy and hydrocele were treated by tapping with a trocar; and varieties of hernia were understood, omental hernia being removed by operation on the scrotum. Aneurisms were known, but not treated; the use of the ligature on the continuity of an artery, as well as on the cut end of it ina flap, is the one thing that a modern surgeon will miss some-

materia medica. Ointments and other external applications had usually a basis of ghee (or clarified butter), and con- tained, among other things, such metals as arsenic, zinc, copper, mercury, and sulphate of iron. For every

emer- gency and every known form of disease there were ela- borate and minute directions in the gAstras, which were taught by the physician-priests to the young aspirants.

Book learning was considered of no use without experience Training and manual skill in operations; the different surgical of prac-

operations were shown to the student upon wax spread on a board, on gourds, cucumbers, and other soft fruits; tap- ping and puncturing were practised on a leathern bag filled with water or soft mud; scarifications and bleeding on the fresh hides of animals from which the hair had been removed ; puncturing and lancing upon the hollow stalks of water-lilies or the vessels of dead animals; bandaging was practised on flexible models of the human body; sutures on leather and cloth; the plastic operations on dead animals ; and the application of caustics and cauteries on living animals. A knowledge of anatomy was held to be necessary, but it does not appear that it was systematically acquired by dissection. Superstitions and theurgic ideas were diligently kept up so as to impress the vulgar. The whole body of teaching, itself the slow growth of much close observation and profound thinking during the vigor- ous period of Aryan progress, was given out in later times as a revelation from heaven, and as resting upon an absolute authority. Pathological principles were not wanting, but they were derived from a purely arbitrary or conventional physiology (wind, bile, and phlegm) ; and the whole elaborate fabric of rules and directions, great though its utility must have been for many generations, was without the quickening power of reason and freedom, and became inevitably stiff and decrepit.

The Chinese appear to have been far behind the Hindus Chinese,

in their knowledge of medicine and surgery, notwith- standing that China profited at the same time as Tibet by the missionary propagation of Buddhism. Surgery in particular had hardly developed among them beyond the merest rudiments, owing to their religious respect for dead bodies and their unwillingness to draw blood or otherwise interfere with the living structure. Their anatomy and physiology have been from the earliest times unusually fanciful, and their surgical practice has con- sisted almost entirely of external applications. Tumours and boils were treated by scarifications or incisions. The distinctive Chinese surgical invention is acupuncture, or the

insertion of fine needles, of hardened silver or gold, for an inch or more (with a twisting motion) into the XXII. — 85

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seats of pain or inflammation. Wise says that “the needle is allowed to remain in that part several minutes, or in some cases of neuralgia for days, with great advantage”; rheumatism and chronic gout were among the localized pains so treated. There are 367 points specified where needles may be inserted without injuring great vessels and vital organs. ;

Cupping-vessels made of cow-horn have been found in ancient Egyptian tombs. On monuments and the walls of temples are figures of patients bandaged, or under- going operation at the hands of surgeons. In museum collections of Egyptian antiquities there are lancets, forceps, knives, probes, scissors, &c. Ebers interprets a passage in the papyrus discovered by him as relating to the operation of cataract. Surgical instruments for the ear are figured, and artificial teeth have been found in mummies. Mummies have also been found with well-set fractures. Herodotus describes Egypt, notwithstanding its fine climate, as being full of medical practitioners, who were all “specialists.” The ophthalmic surgeons were celebrated, and practised at the court of Cyrus.

As in the case of the Sanskrit medical writings, the earliest Greek compendiums on surgery bear witness to a long organic growth of knowledge and skill through many generations. In the Homeric picture of society the surgery is that of the battlefield, and it is of the most meagre kind. Achilles is concerned about the restora- tion to health of Machaon for the reason that his skill in cutting out darts and applying salves to wounds was not the least valuable service that a hero could render to the Greek host. Machaon probably represents an amateur, whose taste had led him, as it did Melampus, to converse with centaurs and to glean some of their traditional wisdom. Between that primitive state of civilization and the date of the first Greek treatises there had been a long interval of gradual progress. The surgery of the Hippo- Hippo- cratic Collection (age of Pericles) bears every evidence of cratic finish and elaboration. The two treatises on fractures and mse” on dislocations respectively are hardly surpassed in some

ways by the writings of the present mechanical age. Of the four dislocations of the shoulder the displacement downwards into the axilla is given as the only one at all common. The two most usual dislocations of the femur were backwards on to the dorsum ilii and forwards on to the obturator region. Fractures of the spinous processes of the vertebree are described, and caution advised against trusting those who would magnify that injury into fracture of the spine itself. Tubercles (piuara) are given as one of the causes of spinal curvature, an anticipation of Pott's diagnosis. In all matters of treatment there was the same fertility of resource as in the Hindu practice ; the most noteworthy point is that shortening was by many regarded as inevitable after simple fracture of the femur. Fractures and dislocations were the most complete chapters of the Hippocratic surgery ; the whole doctrine and practical art of them had arisen (like sculpture) with no help from dissection, and obviously owed its ex- cellence to the opportunities of the palestra. The next most elaborate chapter is that on wounds and injuries of the head, which refers them to a minute subdivision, and includes the depressed fracture and the contrecoup. 'Tre- phining was the measure most commonly resorted to, even where there was no compression. Numerous forms of wounds and injuries of other parts are specified. Ruptures, piles, rectal polypi, fistula in ano, and prolapsus ani were among the other conditions treated. The amputation or excision of tumours does not appear to have been under- taken so freely asin Hindu surgical practice; nor was litho- tomy performed except by a specially expert person now and then. The diagnosis of empyema was known, and the

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treatment of it was by an incision in the intercostal space and evacuation of the pus. Among their instruments were forceps, probes, directors, syringes, rectal speculum, catheter, and various kinds of cautery.

Between the Hippocratic era and the founding of the Alex. | school of Alexandria (about 300 B.c.), there is nothing of 2ncrin surgical progress to dwell upon. The Alexandrian epoch Period, stands out prominently by reason of the enthusiastic | cultivation of human anatomy—there are allegations also of vivisection—at the hands of Herophilus and Erasistratus. The sum and substance of this movement appears to have been precision of diagnosis (not unattended with pedantic minuteness), boldness of operative procedure, subdivision of practice into a number of specialities, but hardly a single addition to the stock of physiological or pathological ideas, or even to the traditional wisdom of the Hippocratic time. “The surgeons of the Alexandrian school were all distinguished by the nicety and complexity of their dressings and bandagings, of which they invented a great variety.” Herophilus boldly used the knife even on internal organs such as the liver and spleen, which latter he regarded “as of little consequence in the animal economy.” He treated retention of urine by a particular kind of catheter, which long bore his name. Lithotomy was much practised by a few specialists, and one of them (Ammonius) is said to have used an instrument for breaking the stone in the bladder into several pieces when it was too large to remove whole. A sinister story of the time is that concerning Antiochus, son of Alexander, king of Syria, who was done to death by the lithotomists when he was ten years old, under the pretence that he had stone in the bladder, the instigator of the crime being his guardian and supplanter Diodotus.

The treatise of Celsus De re medica (reign of Augustus) reflects the state of surgery in the ancient world for a period of several centuries: it is the best record of the Alexandrian practice itself, and it may be taken to stand for the Roman practice of the period following. Great jealousy of Greek medicine and surgery was expressed by many of the Romans of the republic, notably by Cato the Elder (234- Cato 149 B.c.), who himself practised on his estate according to Major, the native traditions. His medical observations are given in De re rustica. In reducing dislocations he made use of the following incantation: ‘“ Huat hanat ista pista sista damiato damnaustra.” The first Greek surgeon who established himself in Rome is said to have been Archagathus, whose fondness for the knife and cautery at length led to his expulsion by the populace. It was in the person of Asclepiades, the contemporary and friend of Cicero, that the Hellenic

medical practice acquired a permanent footing in Rome. This eloquent and plausible Greek confined his practice mostly to medicine, but he is credited with practising the operation of tracheotomy. He is one of those whom Tertullian quotes as abandoning themselves to vivisections for the gratification of their curiosity : “Asclepiades capras suas querat sine corde balantes et muscas suas abigat sine capite volantes” (De anima, 15). The next figure in the surgical history is Celsus, who Celsus. devotes the 7th and 8th books of his De re medica exclu- sively to surgery. There is not much in these beyond the precepts of the Brahmanical sAstras and the maxims and rules of Greek surgery. Plastic operations for the restora- tion of the nose, lips, and ears are described at some length, as well as the treatment of hernia by taxis and operation ; in the latter it was recommended to apply the actual cautery to the canal after the hernia had been returned. The celebrated description of lithotomy is that of the operation as practised long before in India and at Alex- andria. The treatment of sinuses in various regions is

dwelt upon, and in the case of sinuses of the thoracic wall

resection of the rib is mentioned. Trephining has the same prominent place assigned to it as in the Greek surgery. The resources of contemporary surgery may be estimated by the fact that subcutaneous urethrotomy was practised when the urethra was blocked by a calculus. Amputation of an extremity is described in detail for the first time in surgical literature. Mention is made of a variety of ophthalmic operations, which were done by specialists after the Alexandrian fashion.

Galen’s practice of surgery was mostly in the early part of his career (born 131 a.p.), and there is little of special surgical interest in his writings, great as their importance is for anatomy, physiology, and the general doctrines of disease. Among the operations credited to him are resec- tion of a portion of the sternum for caries and ligature of the temporal artery. It may be assumed that surgical practice was in a flourishing condition all through the period of the empire from the accounts preserved by Oribasius of the great surgeons Antyllus, Leonides, Rufus, and Heliodorus. Antyllus (300) is claimed by Haser as one of the greatest of the world’s surgeons; he had an operation for

aneurism (tying the artery above and below the sac, and evacuating its contents), for cataract, for the cure of stammering; and he treated contractures by something like tenotomy. Rufusand Heliodorus are said to have practised torsion for the arrest of hemorrhage ; but in later periods both that and the ligature appear to have given way to the actual cautery. Hiaser speaks of the operation for scrotal hernia attributed to Heliodorus as “a brilliant example of the surgical skill during the empire.” The same surgeon treated stricture of the urethra by internal section. Both Leonides and Antyllus removed glandular swellings of the neck (strum); the latter ligatured vessels before cutting them, and gives directions for avoiding the carotid artery and jugular vein. The well-known operation of Antyllus for aneurism has been mentioned before. Flap- amputations were practised by Leonides and Heliodorus. But perhaps the most striking illustration of the advanced surgery of the period is the freedom with which bones were resected, including the long bones, the lower jaw, and the upper jaw.

Whatever progress or decadence surgery may have ex- perienced during the next three centuries is summed up in the authoritative treatise of Paulus of Aigina (650). Of his seven books the sixth is entirely devoted to operative surgery, and the fourth is largely occupied with surgical diseases. The importance of Paulus for surgical history during several centuries on each side of his own period will appear from the following remarks of Francis Adams in his translation and commentary (vol. ii. p. 247).

‘* This book (bk. vi.) contains the most complete system of opera- tive surgery which has come down to us from ancient times. .. . Haly Abbas in the 9th book of his Practica copies almost everything from Paulus. Albucasis [Abulcasis] gives more original matter on surgery than any other Arabian author, and yet, as will be seen from our commentary, he is indebted for whole chapters to Paulus. In the Continens of Rhases, that precious repository of ancient opinions on medical subjects, if there be any surgical information not to be found in our author it is mostly derived from Antyllus and Archigenes. As to the other authorities, although we will occasionally have to explain their opinions upon particular subjects, no one has treated of surgery in a systematical manner ; for even Avicenna, who treats so fully of everything else connected with medicine, is defective in his accounts of surgical operations ; and the descriptions which he does give

of them are almost all borrowed from our author. The accounts of fractures and dislocations given by Hippocrates and his commentator Galen may be pronounced almost complete ; but the information which they supply upon most other surgical subjects is scanty.”

It is obviously impossible in a brief space to convey any notion of the comprehensiveness of the surgery of Paulus ; his sixth book, with the peculiarly valuable commentary of Adams, brings the whole surgery of the ancient world to a

focus ; and it should be referred to at first hand. Paulus himself is credited with the principle of local depletion as against general, with the lateral operation for stone instead of the mesial and with understanding the merits of a free external incision and a limited internal, with the diagnosis of aneurism by anastomosis, with an operation for aneurism like that of Antyllus, with amputation of the cancerous

breast by crucial incision, and with the treatment of fractured patella.

The Arabians have hardly any greater merit in medicine Arabian.

than that of preserving intact the bequest of the ancient world. To surgery in particular their services are small, —first, because their religion proscribed the practice of anatomy, and secondly, because it was a characteristic of their race to accept with equanimity the sufferings that fell to them, and to decline the means of alleviation. The great names of the Arabian school, Avicenna and Averroes, are altogether unimportant for surgery. Their one distinctively surgical writer was Abulcasim (d. 1122), who is chiefly celebrated for his free use of the actual cautery and of caustics. He showed a good deal of char- acter in declining to operate on goitre, in resorting to tracheotomy but sparingly, in refusing to meddle with cancer, and in evacuating large abscesses by degrees.

For the five hundred years following the work of Paulus Medi- of Aigina there is nothing to record but the names of a few ®v4l.

practitioners at the court and of imitators or compilers. Meanwhile in western Europe (apart from the Saracen civilization) a medical school had gradually grown up at Salerno, which in the 10th century had already become famous. From it issued the Regimen Salernitanum, a work used by the laity for several centuries, and the Com- pendium Salernitanum, which circulated among the profes- sion. The serious decline of the school dates from the founding of a university at Naples in 1224. In its best period princes and nobles resorted to it for treatment from all parts of Europe. The hétel dieu of Lyons had been founded in 560, and that of Paris a century later. The school of Montpellier was founded in 1025, and became the rallying point of Arabian and Jewish learning. A good deal of the medical and surgical practice was in the hands of the religious orders, particularly of the Benedic- tines. The practice of surgery by the clergy was at length forbidden by the council of Tours (1163). The surgical writings of the time were mere reproductions of the classi- cal or Arabian authors: “unus non dicit nisi quod alter.” One of the first to go back to independent observation and reflexion was William of Saliceto, who belonged to the school of Bologna; his work (1275) advocates the use of the knife in many cases where the actual cautery was used by ancient prescription. A greater name in the his- tory of medieval surgery is that of his pupil Lanfranchi of Milan, who migrated (owing to political troubles) first to Lyons and then to Paris. He distinguished between arterial and venous hemorrhage, and is said to have used the ligature for the former. Contemporary with him in France was Henri de Mondeville of the school of Mont- pellier, whose teaching is best known through that of his more famous pupil Guy de Chauliac; the Chirurgze of the latter bears the date of 1363, and marks the advance in precision which the revival of anatomy by Mondino had made possible. Eighteen years before Lanfranchi came to Paris a college of surgeons was founded there (1279) by Pitard, who had accompanied St Louis to Palestine as his surgeon. The college was under the protection of St Cosmas and St Damianus, two practitioners of medicine who suffered martyrdom in the reign of Diocletian, and it became known as the Collége de St Céme. From the time that Lanfranchi joined it it attracted many pupils. It maintained its independent existence for-several centuries,

Para- celsus.

Paré,

Six- teenth century.

alongside the medical faculty of the university; the corpora- tion of surgeons in other capitals, such as those of London and Edinburgh, were modelled upon it.

The 14th and 15th centuries are almost entirely without interest for surgical history. The dead level of tradition is broken first by two men of originality and genius, Paracelsus and Paré, and by the revival of anatomy at the hands of Vesalius and Fallopius, professors at Padua. Apart from the mystical form in which much of his teaching was cast, Paracelsus has great merits as a reformer of surgical practice. “The high value of his surgical writings,” says Haser, “has been recognized at all times, even by his opponents.” It is not, however, as an innovator in opera- tive surgery but rather as a direct observer of natural processes that Paracelsus is distinguished. His description of “hospital gangrene,” for example, is perfectly true to nature; his numerous observations on syphilis are also sound and sensible ; and he was the first to point out the connexion between cretinism of the offspring and goitre of the parents. He gives most prominence to the healing of wounds. His special surgical treatises are Die kleine Chirurgie (1528) and Die grosse Wund-Areei (1536-37),— the latter being the best known of his works. Somewhat later in date, and of much greater concrete importance for surgery than Paracelsus, is Ambroise Paré (1517- 1590). He began life as apprentice to a barber-surgeon in Paris and as a pupil at the hétel dieu. His earliest opportunities were in military surgery during the campaign of Francis I. in Piedmont. Instead of treating gunshot wounds with hot oil, according to the practice of the day, he had the temerity to trust to a simple bandage; and from that beginning he proceeded to many other de- velopments of rational surgery. In 1545 he published at Paris La méthode de traicter les playes faictes par hacque- butes et aultres bastons & feu. The same year he began to attend the lectures of Sylvius, the Paris teacher of anatomy, to whom he became prosector ; and his next book was an

Anatomy (1550). His most memorable service was to get the use of the ligature for large arteries generally adopted, a method of controlling the hemorrhage which made am- putation on a large scale possible for the first time in history. Like Paracelsus, he writes simply and to the point in the language of the people, while he is free from the encumbrance of mystical theories, which detract not a little from the merits of his fellow-reformer in Germany. It is only in his book on monsters, written towards the end of his career, that he shows himself to have been by no means free from superstition. Paré was adored by the army and greatly esteemed by successive French kings ; but his innovations were opposed, as usual, by the faculty, and he had to justify the use of the ligature as well as he could by quotations from Galen and other ancients,

Surgery in the 16th century recovered much of the dexterity and resource that had distinguished it in the best periods of antiquity, while it underwent the develop- ments opened up to it by new forms of wounds inflicted by new weapons of warfare. The use of the staff and other instruments of the “apparatus major” was the chief Mmprovement in lithotomy. A “radical cure” of hernia by sutures superseded the old application of the actual cautery. The earlier modes of treating stricture of the urethra were tried ; plastic operations were once more done with something like the skill of Brahmanical and classical times ; and ophthalmic surgery was to some extent rescued from the hands of ignorant pretenders. It is noteworthy that even in the legitimate profession dexterous special operations were kept secret ; thus the use of the ‘“‘apparatus major” in lithotomy was handed down as a secret in the family of Laurence Colot, a contemporary of Paré’s,

The 17th century was distinguished rather for the rapid

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progress of anatomy and physiology, for the Baconian and Seven. Cartesian philosophies, and the keen interest taken in com. ‘teenth plete systems of medicine, than for a high standard of “™™ surgical practice. The teaching of Paré that gunshot wounds were merely contused and not poisoned, and that simple treatment was the best for them, was enforced anew

by Magati (1579-1647), Wiseman, and others. Trephining was freely resorted to, even for inveterate migraine; Philip William, prince of Orange, is said to have been trephined seventeen times. Flap-amputations, which had been prac- tised in the best period of Roman surgery by Leonides and Heliodorus, were reintroduced by Lowdham, an Oxford surgeon, in 1679, and probably used by Wiseman, who was

the first to practise the primary major amputations. Fabriz von Hilden (1560-1634) introduced a form of tourniquet, made by placing a piece of wood under the bandage en- circling the limb; out of that there grew the block- tourniquet of Morel, first used at the siege of Besancon in 1674; and this, again, was superseded by Jean Louis Petit's screw-tourniquet in 1718. Strangulated hernia, which was

for long avoided as a noli me tangere, became a subject of operation, Lithotomy by the lateral method came to great perfection in the hands of Jacques Beaulieu. To this century also belong the first indications (not to mention the Alexandrian practice of Ammonius) of crushing the stone in the bladder. The theory and practice of trans- fusion of blood occupied much attention, especially among the busy spirits of the Royal Society, such as Boyle, Lower, and others. The seat of cataract in the substance

of the lens was first made out by two French surgeons, Quarré and Lasnier. Perhaps the most important figure in

the surgical history of the century is Richard Wiseman, the Wise- father of English surgery. Wiseman took the Royalist side ™2- in the wars of the Commonwealth, and was surgeon to James J. and Charles I., and accompanied Charles IT. in

his exile in France and the Low Countries, After serving

for a time in the Spanish fleet, he joined the Royalist cause

in England and was taken prisoner at the battle of Worce- ster. At the Restoration he became serjeant-surgeon to Charles IT., and held the same office under James II. His Seven Chirurgical Treatises were first published in 1676, and went through several editions ; they relate to tumours, ulcers,

diseases of the anus, king’s evil (scrofula), wounds, fractures, luxations, and lues venerea. Wiseman was the first to advocate primary amputation (or operation before the onset of fever) in cases of gunshot wounds and other injuries of the limbs. He introduced also the practice of treating aneurisins by compression, gave an accurate account

of fungus articulorum, and improved the operative pro- cedure for hernia.

The 18th century marks the establishment of surgery Eight- on a broader basis than the skill of individual surgeons of centh the court and army, and on a more scientific basis than °2!™ the rule of thumb of the multitude of barber-surgeons and other inferior orders of practitioners. In Paris the Ool- Iége de St Come gave way to the Academy of Surgery in 1731, with Petit as director, to which was added at a later date the Ecole Pratique de Chirurgie, with Chopart and Desault among its first ‘—professors. The Academy of Surgery set up a very high standard from the first, and exer- cised great exclusiveness in its publications and its hono- rary membership. In London and Edinburgh the develop- ment of surgery proceeded on less academical lines, and with greater scope for individual effort. Private dissecting rooms and anatomical theatres were started, of which per- haps the most notable was Dr William Hunter’s school in Great Windmill Street, London, inasmuch as it was the first perch of his more famous brother John Hunter. In Edinburgh, Alexander Monro, first of the name, became professor of anatomy to the company of surgeons in 1719,

transferring his title and services to the university the year after ; as he was the first systematic teacher of medicine or surgery in Edinburgh, he is regarded as the founder of the famous medical school of that city. In both London and Edinburgh a company of barbers and surgeons had been in existence for many years before; but it was not until the association of these companies with the study of anatomy, comparative anatomy, physiology, and pathology that the surgical profession began to take rank with the older order of physicians. Hence the significance of the eulogy of a living surgeon on John Hunter : “ more than any other man he helped to make us gentlemen ” ({unterian Oration, 1877). The state of surgery in Germany may be inferred from the fact that the teaching of it at the new university of

Gottingen was for long in the hands of Haller, whose office was “professor of theoretical medicine.” In the Prussian army it fell to the regimental surgeon to shave the officers. At Berlin a medico-chirurgical college was founded by surgeon-general Holtzendorff in 1714, to which was joined in 1726 a school of clinical surgery at the Charité. Mili- tary surgery was the original purpose of the school, which still exists, side by side with the surgical cliniques of the faculty, as the Friedrich Wilhelm’s Institute. In Vienna, in like manner, a school for the training of army surgeons was founded in 1785,—Joseph’s Academy or the Joseph- inum. The first systematic teaching of surgery in the United States was by Dr Shippen at Philadelphia, where the medical college towards the end of the century was largely officered by pupils of the Edinburgh school. With- out attempting to enumerate the great names in surgery during the 18th century, it will be possible to introduce the more prominent of them in a brief sketch of the addi- tions to the ideas and resources of surgery in that period. A great part of the advance was in surgical pathology, including Petit’s observations on the formation of thrombi in severed vessels, Hunter’s account of the reparative pro- cess, Benjamin Bell’s classification of ulcers, the observa- tions of Duhamel and others on the formation of callus and on bone-repair in general, Pott’s distinction between spinal curvature from caries or abscess of the vertebree and kyphosis from other causes, observations by various surgeons on chronic disease of the hip, knee, and other joints, and Cheselden’s description of neuroma. Among the great improvements in surgical procedure we have Cheselden’s operation of lithotomy (six deaths in eighty cases), Hawkins’s cutting gorget for the same (1753), Hunter’s operation (1785) for popliteal aneurism by tying the femoral artery in the canal of the triceps where its walls were sound (“excited the greatest wonder,” Assalini), Petit’s, Desault’s, and Pott’s treatment of fractures, Gim- bernat’s (Barcelona) operation for strangulated femoral hernia, Pott’s bistoury for fistula, White’s (Manchester) and Park’s (Liverpool) excision of joints, Petit’s invention of the screw-tourniquet, the same surgeon’s operation for lacrymal fistula, Chopart’s partial amputation of the foot, Desault’s bandage for fractured clavicle, Bromfield’s artery-hook, and Cheselden’s operation of iridectomy. Other surgeons of great versatility and general merit were Sharp of London, Gooch of Norwich, Hey of Leeds, David and Le Cat of Rouen, Sabatier, La Faye, Ledran, Louis, Morand, and Percy of Paris, Bertrandi of Turin, Troja of Naples, Palleta of Milan,

Schmucker of the Prus- sian army, August Richter of Gittingen, Siebold of Wiirz- burg, Olof Acrel of Stockholm, and Callisen of Copen- hagen.

Two things have given surgical knowledge and skill in the 19th century a character of scientific or positive ’ cufnulativeness and a wide diffusion through all ranks of the profession. The one is the founding of museums of anatomy and surgical pathology by the Hunters, Dupuy-

tren, Cloquet, Blumenbach, Barclay, and a great number of more modern anatomists and surgeons ; the other is the method of clinical teaching, exemplified in its highest form of constant reference to principles by Lawrence and Syme. In surgical procedure the discovery of the an- zesthetic properties of ether, chloroform, methylene, &c., has been of incalculable service; while the conservative principle in operations upon diseased or injured parts and what may be called the hygienic idea (or, more narrowly, the antiseptic principle) in surgical dressings have been equally beneficial. The following are among the more important additions to the resources of the surgical art :— the thin thread ligature for arteries, introduced by Jones of Jersey (1805); the revival of torsion of arteries by Amussat (1829) ; the practice of drainage by Chassaignac (1859); aspiration by Pelletan and recent improvers; the plaster-of-Paris bandage or other immovable applica- tion for simple fractures, club-foot, é&c. (an old Eastern practice recommended in Europe about 1814 by the English consul at Bassorah); the re-breaking of badly set fractures ; galvano-caustics and écraseurs ; the general introduction of resection of joints (Fergusson, Syme, and others); tenotomy by Delpech and Stromeyer (1831); operation for squint by Dieffenbach (1842); successful ligature of the external iliac for aneurism of the femoral by Abernethy (1806) ; ligature of the subclavian in the third portion by Astley Cooper (1806), and in its first por- tion by Colles ; crushing of stone in the bladder by Gruit- huisen of Munich (1819) and Civiale of Paris (1826) ; cure of ovarian dropsy by removing the cyst (since greatly perfected); discovery of the ophthalmoscope, and many improvements in ophthalmic surgery by Von Griafe and others ; application of the laryngoscope in operations on the larynx by Czermak (1860) and

others ; together with additions to the resources of aural surgery and dentistry. The great names in the surgery of the first half of the century besides those mentioned are:—Scarpa of Italy (1747-1832); Boyer (1757-1833), Larrey (1766-1842),— to whom Napoleon left a legacy of a hundred thousand francs, with the eulogy: ‘‘C’est Vhomme le plus vertueux que jaie connu,”—Roux (1780-1854), Lisfrane (1790- 1847), Velpeau (1795-1868), Malgaigne (1806-1865), Nélaton (1807-1873),—all of the French school; of the British school, John Bell, Charles Bell, Allan Burns, Liston, Wardrop, Astley Cooper, Cline, Travers, Brodie, Stanley, and Guthrie; in the United States, Mott, Gross, and others; in Germany, Kern and Schuh of Vienna, Von Walther and Textor of Wiirzburg, Chelius, Hesselbach, and the two Langenbecks. In surgical pathology the discoveries and doctrines of the 19th century are greater in scientific value than those of any antecedent period; and it would be unprofitable to attempt any enumeration of them, or of their authors, in a brief space.

The authorities mostly used have been— Wise, History of Medicine among the Asiatics, 2 vols., London, 1868 ; Paulus Agineta, trans- lated with commentary on the knowledge of the Greeks, Romans, and Arabians, in medicine and surgery, by Francis Adams, 3 vols., London, 1844-47 ; Haser, Gesch. d. Medicin, 3d ed., vols. i. and ii., 1875-81. (C C.)

Parr III.—PRAcTICE oF SURGERY.

A great change has taken place in the practice of surgery since the publication (1860) of the article SuRcERy in vol. xx. of the 8th edition of the present work. This change is due in great part to the fact that the germ theory of disease has been accepted by the majority of surgical teachers and practitioners. Scientific men have demon- strated that the causation of many diseased conditions is closely connected with the presence in the diseased organ, tissue, or individual of livmg organisms, which have to a certain extent been classified, and are supposed to be forms

systems, with windows on both sides and cross ventilation in the wards, were adopted in order to give the patients as much fresh air as was attainable. Hospital buildings were spread over as large an area as possible ;

the blocks were restricted in height, and if practicable were never higher than two stories. The term “hospitalism ” was coined by Sir J. Y. Simpson, who collected statistics com- paring hospital and private practice, by which he en- deavoured to show that private patients were not so liable to those constitutional sequele.

678 [PRACTICE, of plant life. In one sense it is perhaps unfortunate that the article on surgery has to be written at the present time, because, while there are few who now hold that these or- ganisms are inert, there are some who do not grant that they are the cause of disease ; and there are many differ- ences of opinion as to the best methods of applying this scientific knowledge to practical use. In other words, although much of the surgical practice of the present day is founded on a scientific basis, the practical details are still matter of dispute.

Improve- It is impossible in the present sketch to go with any This was very much the condition of affairs when Lister Listers 1 ments in fulness into the details of the experimental research by | in 1860, from a study of the experimental researches of 8e™m a which the truth of the germ theory was proved; but some | Pasteur into the causes of putrefaction, stated that the “— i ment, allusion must be made to the salient points which have a | evils observed in open wounds were due to the admission trea.

into them of organisms which exist in the air, in water, on ment of — instruments, on sponges, and on the hands of the surgeon, Wounds, | These organisms, finding a suitable nidus for their growth and development in the discharges and surrounding tissues,

bearing on the work of the surgeon. It has long been known that subcutaneous injuries follow, as a rule, a very different course from open wounds; and the past history

of surgery gives evidence that surgeons not only were aware of this great difference but endeavoured, by the use of various dressings, empirically to prevent the evils which were matters of common observation during the healing of open wounds. Various means were also. adopted to pre- vent the entrance of air, e.g., in the opening of abscesses by the “valvular method ” of Abernethy, and by the sub- cutaneous division of tendons in the common

deformity termed “club-foot.” Balsams, turpentine, and various forms of spirit were the basis of many varieties of dress- ing. These different dressings were frequently cumber- some, difficult of application, and did not attain the object

aimed at, while at the same time they retained the dis-

charges, and gave rise to other evils which prevented rapid and painless healing. In the beginning of the 19th cen- tury these complicated dressings began to lose favour, and practical surgeons went to the opposite extreme and applied a simple dressing, the main object of which was to allow a free escape of discharge. Others applied no dressing at all, laying the stump of a limb after amputa- tion on a piece of dry lint, avoiding thereby any unneces- sary movement of the parts. Others left the wound open for some hours after an operation, preventing in this way any accumulation, and brought its edges and surfaces to- gether after all oozing of blood had ceased and after the effusion, the result of injury to the tissues by the instru- ments used in the operation, had to a great extent sub- sided. As a result of these various improvements many wounds healed in a thoroughly satisfactory manner. But in other cases inflammation often occurred, accompanied by pain and suppuration or the formation of pus, and various feverish conditions, due to and in some way con- nected with the unhealthy state of the wound, were ob- served. These constitutional sequele frequently proved fatal and the general impression of surgeons was either that the constitution of the patient rendered him liable to these conditions, or that some poison had entered into the wound, and, passing from it into the veins or lymphatic vessels that had been cut across, reached the general circu- lation, contaminating the blood and poisoning the patient. The close clinical association between suppuration (or the formation of pus) in wounds and many of those fatal cases encouraged the belief that the pus cells from the wound entered the circulation (whence the word “ pyzemia eu was also frequently observed that a septic condition of the wound was associated with the constitutional fever, and it was supposed that the septic matter passed into the blood (whence the term “ septicemia”). It was further observed that the crowding together of patients with open wounds mereased the liability to these constitutional disasters, and every endeavour was made

by surgeons to separate their patients and to improve the ventilation of the larger hospitals. In building hospitals the pavilion and other

germinate in them and alter their chemical constitution, forming various poisonous compounds, which, if absorbed

into the blood, give rise to pyemia and septicemia. Having accepted the germ theory of putrefaction, he ap- plied himself to discover the best way of preventing these organisms from reaching the wound from the moment that it was made until it was healed. He had to deal with a plant and he desired to interfere with its growth. This was possible in one of two ways,—either (1) by directly destroying or paralysing the plant itself before it entered the wound or after it had entered, or (2) by an interference with the soil in which it grew, for example, by facilitating the removal of the discharges and preventing their accumu- lation in the wound cavity, and by doing everything to prevent depression of the wounded tissues, because healthy tissues are the best of all germicides. Several substances were then known possessing properties antagonistic to sepsis or putrefaction, and hence called “ antiseptic.” Act- ing on a suggestion of Lemaire’s, Lister chose for his ex- periments carbolic acid, which he used at first in a crude and impure form. He had many practical difficulties to contend with,—the impurity of the substance, its irritating properties, the difficulty of finding the exact strength in which to use it: on the one hand, he feared to use it too strong, lest it should irritate the tissues to which it was applied and thus prevent healing; on the other hand, he feared to use it too weak, lest its true antiseptic qualities should be insufficient for the main object in view. It is unnecessary to dwell on the details of his tentative ex- periments. As dressings for wounds he used various chemical substances, which, being mixed with carbolic acid in certain proportions, were intended to give off a quantity of carbolic acid in the form of vapour, so that the wound might be constantly surrounded by an antiseptic vapour which would destroy any organisms approaching it and at the same time not interfere with its healing. At first, although he prevented pyzemia in a marked degree, he, to a certain extent, irritated his wounds and prevented rapid healing. He began his experiments in Glasgow and con- tinued them after his removal to the chair of clinical surgery in Edinburgh. After many disappointments, he gradually

perfected his method of performing operations and dressing wounds, which will be best understood by an illustration.

A patient is suffering, let us say, from a diseased con- Ampu- 4 dition of the foot necessitating amputation at the ankle a

joint. The part to be operated on is enveloped in a towel

which has been soaked with a 5 per cent. solution of car- bolic acid. The towel is applied two hours before the operation, with the object of destroying the (putrefactive) organisms present in the skin. The patient is placed on the operating table, and brought under the influence of

joint.

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chloroform ; the limb is elevated to empty it of blood, and a tourniquet is applied round the limb below the knee. The instruments to be used during the operation have been previously purified by lying for half an hour in a flat porce- lain dish containing carbolic acid (1 to 20). The sponges are lying in a similar carbolic lotion. Towels soaked in the same solution are laid over the table and blankets near the part operated upon. The hands of the operator, as well as those of his assistants, are thoroughly purified by washing them in the same lotion, free use being made of a nail brush for this purpose. The operation is performed under a cloud of carbolized watery vapour (1 in 30) from a steam-spray producer. ‘The visible bleeding points are first ligatured ; the tourniquet is removed ; and then any vessels that have escaped notice are ligatured. The wound is stitched, a drainage-tube made of red rubber being intro- duced at one corner to prevent accumulation of discharge ; a strip of protective (oiled silk coated with carbolized dextrin) is washed in carbolic lotion and applied over the wound. A double ply of carbolic gauze! is soaked in the lotion and placed over the protective, overlapping it freely. A dressing consisting of eight layers of dry gauze is placed over all, covering the stump and passing up the leg for about 6 inches. Over that a piece of thin Mackintosh cloth is placed, and the whole arrangement is fixed with a gauze bandage. The Mackintosh cloth prevents the car- bolic acid from escaping and at the same time causes the

discharge from the wound to spread through the gauze. The wound itself is protected by the protective from the vapour given off by the carbolic gauze, whilst the sur- rounding parts, being constantly exposed to its activity, are protected from the intrusion of septic contamination ; and these conditions are maintained until sound healing las taken place. Whenever the discharge reaches the edge of the Mackintosh the case requires to be dressed, and a new supply of gauze applied round the stump. The gauze that is used should be freshly made and kept in a tin box to prevent evaporation of the volatile carbolic acid. This precaution is most needful in warm weather. When- aver the wound is exposed the stump is enveloped in a vapour (1 in 30) of carbolic acid by means of the steam- spray producer. At first a syringe was used to keep the surface constantly wet with lotion, then a hand-spray, such as Richardson's ether-spray producer. More recently a steam-spray producer has been introduced into practice. These dressings are repeated at intervals until the wound is healed, the drainage-tube being gradually shortened and ultimately removed altogether.

In the case of an accidental wound to which the surgeon is called a short time after its occurrence, carbolic lotion (1 to 20) must be injected into the cavity of the wound to destroy any organisms which may have fallen into it. The dressings already described are then applied. In operating on a case in which putrefaction has occurred, every endeavour must be made to destroy the causes of putrefaction which are already present. The substance most frequently used for this purpose is chloride of zinc solution, 40 grains to 1 oz. of water. This powerful anti- septic was extensively used some years ago by Mr De Morgan, Middlesex Hospital, London. When the wound

1 The gauze dressing consists of thin gauze which has been soaked in a mixture of carbolic acid (1 part), resin (5 parts), and paraffin (7 parts). The object of the paraffin is to prevent the gauze sticking to the skin. The resin retains the carbolic acid and prevents evaporation at the ordinary temperature; at the temperature of the body, however, a certain quantity of the carbolic acid is constantly being given off, and in this way the part operated on is enveloped in a vapour of carbolic acid. This antiseptic vapour persists as long as there is any carbolic acid in the gauze. A gauze dressing is not reliable for more than a week ; by that time the carbolic acid in the gauze is dissipated and the dressing requires to be renewed.

has been thus purified from its septic condition, the after- treatment must follow strictly the plan already recom- mended for a recent wound to avoid secondary contamina- tion at subsequent dressings.

The object Lister had in view from the beginning of his Progress experiments was to place the open wound in a condition since

as regards the entrance of organisms as closely analogous as possible to a truly subcutaneous wound, such as a con- tusion or a simple fracture, in which the unbroken skin acts as a protection to the wounded tissues beneath. The introduction of this practice by Lister effected a complete change in operative surgery. Although the principle on which he founded it was at first denied by many, it is now very generally acknowledged to be correct. In Germany more especially his views were speedily accepted. In France and England their adoption was slower. In Scot- land, perhaps in consequence of the fact that many saw him at work and worked under him, acquiring perhaps some little part of his persevering enthusiasm, he soon had many believers. Since about 1875 surgeons have been trying to improve and simplify the method; chemists have been at pains to supply carbolic acid in a pure form and to discover new antiseptics, the great object being to get a non-irritating substance which shall at the same time be a powerful germicide. Jodoform, eucalyptus, salicylic acid, boracic acid, corrosive sublimate, have been and are being used, and the question as to their relative superiority is not yet settled. Carbolic acid has the disadvantage of irri- tating the tissues. This is partly counterbalanced by its anesthetic properties. Absorption of the carbolic acid has occasionally taken place, giving rise to symptoms of poison- ing. But this danger has been greatly lessened by the introduction of pure acid. Of the antiseptics named carbolic acid, eucalyptus, and iodoform are volatile ; the rest are non-volatile. At first Lister for some years irrigated a wound with carbolic lotion during the operation, and at the dressings when it was exposed. The introduction of the spray displaced the irrigation method. At the present time the irrigation method is again gaining favour. All these different procedures, however, as regards both the antiseptic used and the best method of its application in

oily and watery solutions and in dressings, are entirely subsidiary to the great principle involved—namely, that putrefaction in a wound is an evil which can be prevented, and that, if it is prevented, local irritation, in so far as it is due to putrefaction, is obviated and septicemia and pyzmia do not occur. Alongside of this great improve- ment the immense advantage of free drainage is now uni- versally acknowledged. Surgeons now understand the dangers which lie on every side, and this knowledge causes them to take greater care in the purification and in securing the greater cleanliness of wounds, and some hold that much of the good result follows from these precautions apart from the principle of the system.

Putrefaction has been clearly shown by Pasteur, Tyndall, and others to be due to the activity of certain lowly forms of organized matter. Scientific men have therefore had their attention more particularly directed to these lower forms of plant life. A careful study has been made of their life history, and several diseased conditions are now known to be due to the deposit and growth of organisins of a specific form in the blood and in the tissues. This is not the place to discuss points still sub judice; but there can be no doubt, e¢.g., that the Bacillus anthracis is the cause of splenic fever and of its local manifestation, malignant pustule, and that erysipelas is due to the presence of a micrococcus. There are many other diseases spoken of as zymotic or fermentative, upon which observers are now at work, and hardly a month passes without the publication of new observations (compare ScHIzoMycETEs). It can

certainly be said that the relation between those organisms

and various specific diseases is the question which at pre-

sent most occupies the attention both of pathologists and of practitioners of medicine and surgery. It is now known that there are many varieties of organisins (in Crookshank’s Bacteriology sixty are described), some of

which are hurtful to the human economy, though others are apparently harmless. Those of the former class give rise to an alteration in the tissue in which they grow ; and during their growth they alter its composition and cause it to break up into various compounds, some of which, when absorbed into the blood-stream, poison the individual. Some, on the other hand, are either in themselves innocuous or are killed when they enter the blood, which is a fluid tissue and acts as a germicide ; hence the tissues in a healthy condition are spoken of as " germicidal." rently grow only on dead tissue, or in tissue the vitality} of which has been lowered.

Ferment- The alteration in the tissue is strictly analogous to a

ations. fermentation—such, for example, as the change which takes place in a solution of grape sugar in which the yeast plant has been planted. The solution breaks up into alcohol and carbonic acid ; along with this change there is an increase in the quantity of the yeast. The most common fermenta- tion is the alteration termed " putrefactive" or "septic." The cause of this change is in all probability a special organism named Bacterium termo. It lives on any dead matter containing nitrogen when exposed to heat and moisture ; dryness and cold are antagonistic to its growth. Its results are so evident and of such common observation that the term "antiseptic" was used long before the primary cause of the condition was understood. Antiseptics origin- ally were substances which interfered with sepsis. The term has now, however, a wider meaning, and includes any substance opposed to fermentation. " Antifermentative " or "antitheric" would be a better term. An antitheric substance is one which interferes with fermentation by destroying or paralysing the organism which is the primary cause of the condition. The word "antiseptic," on the other hand, should be reserved to denote any substance which is opposed to putrefaction or sepsis, —one form of fermentation. Many of the most dangerous fermentations have nothing in common with putrefaction: the products which result are odourless; the appearances which arise bear no similarity to the changes which occur when putre- factive fermentation is present. Plant the Bacterium lactis in milk, and souring, or the lactic acid fermentation, takes place ; plant the Bacterium termo in milk, and putrefactive fermentation occurs. The fermentations of smallpox, vaccinia, syphilis, scarlet fever, typhoid, relapsing fever, typhus, erysipelas, and cholera may be taken as

examples of fermentations of the non-putrefactive class, Apparently in them the organism enters the blood-stream, there de- velops and forms its products, which, acting directly or in- directly on the heat-centre, give rise to a specific fever. This fever continues until the soil is worn out, and the organism, finding no longer a nidus for its development, dies out, and recovery takes place. Death of course results if the individual has not sufficient strength to withstand the attack. There isa general law regarding all living things which holds true of these lowly organisms as of the highest : remove its food and the organism dies, or at any rate ceases to develop. It may, however, lie quiescent, again appearing when a new nidus is provided for it. These considerations explain the reason why, after one attack, the individual is protected for a longer or shorter period. They also explain why many diseases are becoming through course of time less virulent than they once were: the soil

? John Hunter defines ‘ vitality ” as the power which resists putre- faction,

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Some appa-

~—those which are the result (1) of injury and (2) of disease.

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is becoming exhausted in relation to the special require- ments of the organism, and the organism is therefore incapable of flourishing as it formerly did. Plant the organism in a virgin soil—take, for example, as was un- wittingly done, the organism of measles to Fiji—and a disease which in Great Britain is comparatively harmless becomes a most deadly scourge, An attempt has been made to divide organisms into two Infeetiys|, great divisions—the infective and the non-infective. The and non, first class can grow in living tissue ; the second cannot. = % ; The first form their products in living matter ; the second jams can only grow in dead or lowly vitalized matter. The in- fective organism can migrate from the original point of en- trance by the vascular and lymphatic streams to distant parts of the body, and may there form secondary foci of infection. As regards the non-infective the manufactory of the poison is principally restricted to the near

neighbour- hood of the original point of entrance, generally a wound. It cannot migrate into the living tissues around if they remain healthy. Both kinds of organism form ptomaines (77dpa, a carcase), the products of the fermentation which result from the breaking up of the tissue or discharge in which the organisms grow. They may enter the blood-stream and poison the patient. Their entry into the blood must be differentiated from the entry of the organism itself into the stream. Clinically, the two conditions, although often met with in one individual, are in many cases distinctly separable. This physiological division of organisms into infective and non-infective is at present only tentative, and much work must be done before a strictly physiologi- cal classification can be attempted 3 at present the main line of inquiry must be principally morphological. Even in this direction a difficulty meets the observer, because organisms change their shape according to the media in which they are cultivated. In the present article only a general view of the present aspects of surgical practice can be given. Special stress will be laid upon the principles which guide the surgeon in his daily work. For full particulars with reference to any special points the reader is referred to Holmes's System of Surgery, Erichsen's Science and Art of Surgery, and Grogs's System of Surgery. Surgical affections may be divided into two great classes,

I, InsvRIEs,

Before proceeding to the consideration of the different injuries Shock, it will be necessary to say a few words about the general condition 7 termed shock or collapse, which supervenes after a severe injury. Care must be taken not to confound this state with faintness or | syncope from loss of blood. Undoubtedly in many cases both con- iB ditions are present. Syncope from loss of blood is considered below. Syncope from mental emotion differs from shock in degree only. In shock the patient is pale, and bathed in cold clammy perspiration ; his sensibility is blunted; his pulse is small and feeble ; he is unable to make any active exertion, but lies in bed indifferent to external circumstances, and can only be roused with difficulty ; he frequently complains of a feeling of cold; and he may have a distinct shivering or rigor. These symptoms may continue for some hours ; the first evidence of improvement is that he shifts his position in bed and complains of the pain of the injury which has caused the condition. The pulse becomes

stronger, and he then passes from the state of shock into the condition of reaction. If the improvement continues recovery will take place, but if it is only transient the patient will sink back again into a drowsy condition, which, if it persists, will end in death. In severe cases there may be no reaction ; the patient then gradually becomes weaker and weaker, his pulse feebler and feebler, till death ensues. Shock is due to an impression conveyed to the central nervous system by an afferent nerve of common or special sensation. This impression produces a change in the medulla oblongata, by which the nerve-centres are so affected that a partial paralysis or paresis of the voluntary and involuntary muscular fibres in the body takes place. In consequence of the change in the voluntary muscles the patient is unable to lift his arm or move his leg; the respiratory functions are performed wearily, and the

muscle of the heart contracts feebly ; the muscular fibres in the walls of the blood-vessels lose their tonicity and the blood-vessels dilate ; the blood collects in the large venous trunks, more cespeci-

The procedure for the treatment of an open wound is—(1) arrest Wound of hemorrhage 3 (2) removal of any foreign bodies in the wound ; treat- (3) careful apposition of its edges and surfaces, —the edges being best ment.

ally of the abdomen ; the vessels of the skin are emptied of blood, giving rise to the marked pallor. Two of the great causes that keep up the normal circulation of the blood through the body are in partial abeyance: the heart has not sufficient energy to contract, and there is not a sufficient quantity of blood passing into it from the blood-vessels. The heart beats feebly (1) because its nervous cnergy is lowered, and (2) because it has not a sufficient quantity of blood to act upon. An understanding of these facts gives the general indications for treatment,—(1) external stimulation over the heart by mustard poultices or turpentine stupes ; (2) elevation of the limbs, to cause the blood to gravitate towards the heart ; (3) manual pressure on the

abdominal cavity from below upwards, to encourage the flow of blood from the dilated abdominal veins into the heart. These different measures may be supplemented' by the administration of stimulants by the mouth, or, if the patient cannot swallow, by subcutaneous injection of a diffusible stimulant,

. such as ether or ammonia. In syncope or faintness from mental emotion the weakened heart cannot drive a sufficient quantity of blood to the brain ; the patient feels dizzy and faint and falls down insensible. The condition is a transitory one, and the recumbent posture, assisted if need be by elevation of the limbs, causes the blood to gravitate to the heart, which is thereby stimulated to contraction ; a sufficient quantity of blood is then driven onwards to the brain, and the insensibility passes off. If the patient is in the sitting posture when he feels faint, the head should be depressed between the knees, which will cause the blood to rush to the brain, and the faintness will pass off.

With few exceptions the soft parts are freely supplied with blood- vessels, and as a preliminary to a consideration of the different forms of injuries it will be well to say a few words about hemorrhage or bleeding. Ifa blood-vessel is torn or cut across, the blood within it escapes, either externally on to the clothes or floor, or, in the case of a subcutaneous injury, into the tissues, giving rise to eechymosis. Cessation of the bleeding may take place in conse- quence of an arrest of the hemorrhage either by nature's effort or by the adoption of artificial means by the surgeon. The loss of blood may be so great that the heart's propelling power is weakened, and in this way the natural arrest is assisted. But there is always a danger that with the arrest of the hemorrhage the heart's action may recover its power and the bleeding recommence. In arresting hemorrhage temporarily the chief thing is to press directly on the bleeding part. The pressure to be effectual need not be severe, but must be accurately applied. Ifthe bleeding point cannot be reached, the pressure should be applied to the main artery between the bleeding point and the heart. In small blood-vessels pressure will be sufficient to arrest hemorrhage permanently. In large vessels it is usual to pass a ligature round the vessel and tie it with a reef knot. Apply the ligature also, if possible, at the bleeding point, tying both ends of the cut vessel. If this cannot be done, the main artery of the limb must be exposed by dissection at the most accessible point between the wound and the heart,

and there liga- tured. Hemorrhage has been classified in three varieties—(1) primary, occurring at the time of the injury ; (2) reactionary, or within twelve hours of the accident, during the stage of reaction ; (3) secondary, occurring at a later period, and caused by unhealthy processes attacking the wound and giving rise to ulceration of the coats of the blood-vessels. In treating these different varieties the principles already laid down hold good. In cases of severe hemor- rhage the patient suffers from syncope owing to loss of blood. Syncope from loss of blood is to be treated on the same principles as those already laid down for shock. But in addition it may be necessary in cases of severe hemorrhage, in which much blood has been lost, to introduce into the circulation fluid which will give the heart something to act upon. Blood drawn directly from the arm of a healthy person, and introduced through an opening in the vein of the arm, has frequently been made use of. The tendency of the blood to coagulate when brought in contact with foreign matter has led to the adoption of ingenious instruments to avoid this danger. Some surgeons have used defibrinated blood, and others milk. The opinion is at present gaining ground that a nutrient fluid is unnecessary, and that all that is required is to introduce an aseptic neutral fluid at the temperature of the body which has no tendency to cause coagulation of the blood with which it mixes. A saline solution, composed of *75 per cent. of common salt in dis- tilled water, fulfils all thesc requirements; 4 to 6 oz. are generally sufficient. Recent experiments have becn made by which blood drawn from the arm of the giver is mixed with a solution of phos- phate of soda. This admixture prevents the blood from coagulat- ing, and it can be introduced into the blood-stream with safety.

In a recent contusion careful pressure should be applied, with cotton wadding fixed in position with a bandage. The aim is to prevent ecchymosis and to hasten the absorption of the effused blood after it has escaped into the tissues. Accurate pressure fulfils these cnds more perfectly than the commoner application of cold.

brought in contact by the use of horse-hair stitches, the surfaces by carefully applied pressure ; (4) free drainage of the wound to prevent accumulation either of blood or of serous effusion, which may be done—(a) by leaving the dependent corner open, or (b) by introducing a drainage-tube, a skein of

catgut, or a skein of horse- hair; (5) avoidance of putrefaction by the use of antiseptic pre- cautions ; (6) perfect rest of the part by appropriate means during the cure. These methods of treatment require to be modified for wounds in special situations and for those in which there is much contusion and laceration. In punctured wounds free drainage is of primary importance. wound at the time of its following dangers have to be combated—(1) an intense inflamma- tion in the wound itself and surrounding parts; (2) inflammation of the lymphatic vessels leading from it ; (3) inflammation of the lymphatic glands ; (4) blood-poisoning of the general circulation. One of the commonest poisons is that connected with wound putre- faction ; of others some are the result of diseased action in the lower animals, ¢.g., hydrophobia, whilst some are special diseases in man. These diseased conditions are at the present time being carefully studied, and the observations all tend to one conclusion, that they are due to specific organisms which have found entrance into the diseased animal or man, and, finding there a suitable nidus for their growth and development, have set up a specific disease. If the surgeon is accidentally wounded in operating on the living subject, or the pathologist in making a post-mortem examination, the poison may pass into the wound and give rise to one or more of the symptoms already indicated. There can be no doubt that these special poisons,! which are spoken of as pathogenic or infect- ive, are 1n some way associated with low forms of plant life, and that in this they resemble the poison of putrefaction. If the operator is in good health the poison will generally have little effect ; if he is in bad health the effect may be very severe. We do not yet know in what cases bad results are to be expected. The great point in every doubtful case is to purify the wound thoroughly with some powerful antiseptic, so as to destroy the poison at the point of inoculation. If the poison escapes the germicidal action of the antiseptic used and enters the system, the patient should be stimu- lated, as the poison exercises a depressing action. For hydrophobia no cure is at present known. Experiments are, however, now (1887) being made by Pasteur which will throw some light on this dreadful disease.

Burns are dangerous accidents in young children and in old people Burns.

when the arcas affected are large, and when they are situated over the cavities of the body. The patient may die of shock soon after the accident, of

deep-seated inflammations coming on duringthe stage of reaction, or of hectic, which in all probability is a form of chronic pymia associated with profuse discharge from the woundcd surface. To prevent death fron any of these causes stimulating treatment is necessary. It has long been known that it is important to keep the air from the wounded surface, and antiseptic dressings must be used to prevent the access of organisms to it. When the skin is destroyed to any great extent contraction is apt to take place, followed by deformity. Care must be taken during the process of cure to prevent this, by keeping the limb in an extended position during the treatment of burns on the flexor surface. To hasten cicatrization after a burn in which the skin has been destroyed grafts of epidermic tissue may be planted on the granulating surtace according to the method of Reverdin. These grafts, each the size of a pin's head, become fixed and from them cicatrization spreads over the surface. After cicatrization the tendency to contraction is not nearly so great. Epidermis grafting must not be confounded with skin grafting, in which the grafts are of the whole thickness of the skin.

A bone may be broken at the part where it is struck, or it may Fracture,

break in consequence of a strain applied to it. In the former case the fracture is generally transverse and in the latter more or less oblique in direction. The fully developed bone is broken fairly across ; the soft bones of young people may simply be bent—" green stick" or "willow" fracture. Fractures are either simple or com- pound. A simple fracture is analogous to the contusion or sub- cutancous laceration in the soft parts; a compound fracture is analogous to the open wound in the soft parts. 'The wound of the soft parts in the compound fracture may be caused either by the same force which has caused the fracture, as in the case of a cart whcel going over a limb, first wounding the soft parts and then fracturing the bone, or by the sharp point of the fractured bone coming through the skin. In either case there is a communication between the external air and the injured bone. As some years elapse before the epiphyseal extremities of the bone become united by osseous deposit to the shaft, external violence may cause a

1 For their classification, as yet very imperfect, consult Ziegler's Pathological Anatomy (trans. by Macalister, London, 1883-84).

When a special poison has entered the Poisoned infliction or at some subsequent date the wounds.

separation of the epiphysis from the shaft. This variety of frac- ture is termed a diastasis. When a bone is broken there is gener- ally distortion and preternatural mobility, inability to use the limb, and pain on pressure over the fractured part. In 1 fractures there is also crepitus,—the feeling elicited when two osseous. surfaces are rubbed together. When a bone is bent, or when a diastasis has occurred, tliere is no crepitus. It is also absent in impacted fractures, in which the broken extremities are driven into one another. In order to get firm osseous union in a case of fracture the great points to attend to are accurate ap- position of the fragments and -complete rest of the broken bone. Accurate apposition is termed “setting the fracture”; this is best done by the extension of the limb and coaptation of the broken surfaces. Complete rest is attained by the use of appropriate splints. Asa rule it is of great importance to command the joint above and below the seat of fracture. In cases of fracture near a joint, in which very commonly a splintering of the bone into the joint has taken place, more cspecially in those cases in which numerous tendons in their tendinous sheaths have been stretched, if the surgeon forgets that there may be effusion into the joint and the tendinous sheaths, and that this effusion may form fibrous tissuc leading to stiffness of the joint and stiffening of the tendons, the result, more especially in old people, will be a permanently stiff joint or permanently stiffened tendons. Care must be taken in

such instances by gentle passive movement during the process of

cure to keep the joint and tendons free from the fibrous formation. To take a common example,—in fracture of the radius close to the wrist joint, it is necessary to apply appropriate splints to keep the bone at rest, and to arrange them so that the patient can move his fingers and thumb to prevent stiffness, and the splints must be taken off occasionally in order to move the wrist joint gently. If, however, the splints extend to the points of the fingers and are kept on for some weeks without removal, the consequence is a

In the inajority of

injury. The tonicity of the muscular structures around a joint often prevents a dislocation, the patient being prepared for the violence to which his joint is subjected. The osseous strength of a joint will depend very much on the position of the limb at the time of the accident.

When a joint is sprained or contused there is effusion into it and into the structures around it. In such cases accuratcly applied pressure will prevent effusion, and along with gentle passive exer- cise and rubbing will prevent subsequent stiffness. When a joint is dislocated it is of importance to restore the bones to their normal position as soon as possible after the accident. Within the last few years, in several dislocations, the treatment by extension of the limb and forcible pressure of the bones back into their normal position has been given up, and a method of treatment at one time in use in the French schools has been revived by Dr Bigclow of Boston, Mass., who has pointed out that with less force and there- fore less injury a dislocated joint may be reduced by manipulation. The great principle at the root of this treatment is to manipulate the limb so as to cause the dislocated bone to pass back into its normal position by the same path by which it lcft it. In com- pound dislocations the same precautions must be attended to as in compound fractures,

II. Process oF REPAIR.

After an injury certain changes take place, which, if kept within bounds, terminate in repair, in other words, in a restoration of the injured part to a condition as nearly as possible normal. When the injury is severe the restoration may fall far short of the normal. The recovery may take place with very little pain or discomfort even in severe injuries. Frequently, however, as the result either of improper treatment on the part of the surgeon or of feebleness on the part of the person injured, local uneasiness and a general feverish condition arise, which interfere with the healing. When

these evil results follow, a local death of tissue in a greater or less degree is observed. Three forms of local death have been described Forms of —(1) suppuration or the formation of pus; (2) ulceration, or the local

formation of an ulcer; (3) mortification, or the formation of a death.

normal radius and a useless hand. Instances occasionally occur in which non-union results, either from want of formative power on the part of the individual or in consequence of improper treat- ment by the surgeon. For the treatment of this condition the

reader is referred to one of the systematic works mentioned above. For fractures of the cranium see below, p. 688.

slough. These three processes run imperceptibly into one another. They are not distinctly separable from one another, and they very

Treat- There is no form of injury in which the truth of the principles | frequently occur together. It isto be noted that the process of ment of first advocated by Lister has been more prominently brought | repair and the local death which interferes with a painless repair com- forward than in compound fractures. When such an accident | differ only in degree. Asa general rule, in the truly subcutaneous pound occurs from direct violence the soft parts are generally much | wound of tissue, be it the soft parts or bone, the changes that take fractures. crushed and the bone is frequently comminuted. When a bone is place ending in its repair are simple and uncomplicated ; it is in broken from indirect violence the fracture is frequently oblique | the open wounds of the soft parts and in compound fractures of and the sharp point of the bone projects through the skin. In | bone that complications arise. : | such a case the injury is, as a rule, not so severe. Formerly com- In order to understand this process, it will be best to take a Repair pound fractures were the dread of the surgeon: septic inflammation simple injury, such asa clean cut. As the result of the passage of of an occurring in the wound reached the open medullary cavity of the | even the sharpest knife through the tissues a microscopic laceration incised _ bone, and the open blood-vessels of the bone gave easy access to | along the line of the incision must occur. The skin, subcutaneous wound. the causes and products of the inflammation into the general blood- | fat, fascia,

and muscle are divided. These parts being vascular, Stream, giving rise to pyemia. It is not asserted, however, that bleeding takes place from the cut vessels. Let us suppose that the this accident always occurred. In a case of compound fracture the bleeding has ceased, and that the surfaces and edges of the wound wound should be at once covered with a towel thoroughly soaked | are not brought into contact. The retractile power of the tissues, in a five per cent. solution of pure carbolic acid. And, if some time | when they are divided, necessarily produces a trench-shaped gap. elapses before the arrival of a surgeon, more of the solution must | If the sides of this gap are watched a weeping of a straw-coloured be poured upon the towel, which should be kept thoroughly soaked. | fluid will be observed, which, when examined under the microscope, After the fracture is set it will probably be necessary to inject the | is seen to have corpuscles floating in it. The fluid is the liquor solution into the interstices of the wound, over which an efficient sanguinis of the blood, and the corpuscles are the blood corpuscles. antiseptic dressing must be applied. When the injury is so severe | In the blood as it circulates throughout the vessels in the body, that it is impossible to prescrve the limb, amputation is the only | the yellow or red blood corpuscles are greatly in excess of the resource. It is often a difficult thing to say when the surgeon | white. In this fluid the white blood corpuscles are very numerous. should amputate. The question will frequently be settled by a | Careful observation, with the aid of a sufficiently powerful micro-consideration of the general circumstances and surroundings of the | scope, will show the formation of fine fibrils of 2 solid substance, patient, and no definite rules can be laid down. Speaking in general | which gradually extend over the field; this fibrillation takes its terms, an artificial substitute may take the place of the lower limb, | start from the white blood corpuscles. The effusion has coagulated. but no artificial substitute can ever efficiently take the place of the | A soft solid—fibrin—is formed, which gradually contracts, and upper limb ; and therefore surgeons will run some risk in attempt- | a clear fluid escapes; this is the blood serum. ‘To return to the ing to save an upper limb which they will not do in treating an | wound, —in consequence of the injury the smaller blood – vessels injury of a lower limb. dilate, their walls are thinned, and a stasis or stoppage of the flow of Joint There are three principal types of joint injury—(1)sprain or strain, | blood within these vessels takes place. The stasis is caused by the injury. in

which the ligamentous and tendinous structures around the joint | injury to the vessel walls, rendering the blood corpuscles more ad-

are stretched and even lacerated ; (2) contusion, in which the cartilaginous surfaces of the opposing bones in the joint are driven forcibly together ; (3) dislocation, in which the articular surfaces are separated from one another ; in this last injury the ligamentous capsule of the joint must be torn to allow the accident to occur. Joint strength may be classificd anatomically under three heads— (1) ligamentous, due to the ligaments binding the bones together ; (2) osseous, due to the shape of the bones forming the joint ; (3) muscular, due to the muscles surrounding the joint. Ligamentous strength predisposes to sprains, osseous to contusions, and muscular to dislocations. A joint is frequently saved from injury in conse- quence of the relative weakness of a bone near it. The ankle joint 1s saved by the weakness of the fibula, the wrist joint by the weak- ness of the radius, the sterno-clavicular joint by the weakness of the clavicle; the fracture of the bone preserves the joint from

hesive. The circulation is going on in the vessels beyond the arca of stasis. The blood inastate of stasis acts as an obstruction, and con- sequently there is an increased pressure on the inner surface of the thin walls. Asa result the fluid part of the blood or liquor sanguinis and the corpuscular elements of the blood escape into the tissues and on to the surface of the wound. On this surface and in the tissue next the surface a clotting takes place, and fibrin is formed. The surface of the wound becomes glazed, and as the fibrin contracts the blood serum oozes out upon the wound surface and escapes. The glazed surface then becomes vascular ; new blood-vessels are formed in it; and through these a circulation is set up continuous with the circulation in the blood-vessels around. If the surfaces of the gap are now brought into gentle contact, the blood-vessels on the two surfaces will unite. At first the uniting tissue is very succu- lent and vascular, and further changes must occur before the uniting

medium is consolidated. This is effected by the formation of fibrous tissue in the deeper parts of the uniting medium and by the forma- tion of epithelial tissue in the more superficial parts where the skin is divided.

Along with these changes the uniting medium becomes less vascular, and a linear scar is the result.

This is the case of an incised wound in which the surfaces are not brought at once into coutact. If, however, this is done, the same changes take place, and in a small wound no untoward results need follow. But in a wound of some size there is danger in bring- ing the edgcs of the wound into contact. In consequence of the difference in the retractile power of the different tissues that are divided, it may be impossible to bring the deeper parts into accurate contact. The patient will complain of local pain, accompanied by a throbbing sensation, showing that an accumulation of serum has taken place. Ifa stitch is removed, the serum will escape and the local uneasiness disappear. If, however, no relief is given, the re- tained serum, pressing upon the surrounding tissues and acting as a foreign body, will cause effusion of more serum. The white blood corpuscles will pass from the vessels in large numbers, will dic, and practically a cemetery of white blood corpuscles will be formed ; if a stitch is then removed a creamy fluid escapes. This fiuid is termed “pus.” Once the tension is relieved, the local uneasiness disappears; but the wound cannot then heal by primary union. The walls of the cavity must again become glazed ; vascularization must take place; and, as the walls of the cavity gradually come together by contraction, fibrous tissue is formed. This is wnion by second intention.

The collection of white blood corpuscles floating in the effusion and eventually forming pus is termed an abscess. Pus may also form amongst the tissues after a blow or other injury. As the result of a blow a certain area of tissue becomes congested, and effusion takes place into the tissues outside the vessels ; the effusion coagulates and a hard brawny mass is formed. This mass softens towards the centre; and if nothing is done the softened area gradually increascs in size, the skin becomes thinned over it, the thinned skin loses its vitality, and a small slough is formed. When the slough gives way, the pus escapes. Such shortly is the history of an acute abscess under the skin, and the explanation generally given is that a local necrosis or death of tissue takes place at that part of the inflammatory swelling farthest from the normal circu- lation. When the dying process is very acute death of the tissue occurs 7% masse, as in the core of a boil or in the slough in a carbuncle. Sometimes, however, no such evident mass of

dead tissue is to be observed, and all that escapes when the skin gives way is the creamy pus. In the latter case the tissue has broken down in a molecular form ; in the former case it has broken down en masse. After the cscape of the core or slough along with a

can be little doubt that the growth of an ulcer, as well as the disintegrating process which precedes its formation, is closely associated with the multiplication of low forms of plant life in the decaying tissue. By destroying these organisms with some powerful antiseptic the destructive process may be checked. Since these organisms live on decaying matter, they are termed “sapro- phytic.” The healthy tissues are antagonistic to their growth, and any treatment which renders the tissues around the gap healthy will interfere with their further development. The entrance of those organisms into a wound made by the surgeon, if they find in it a suitable soil for their development, is undoubtedly also a fertile cause of suppuration in wounds. But it must be distinctly remem- bered that any means which are adopted to keep the injured tissues in a healthy condition interferes with the growth of these sapro- phytes as directly as if the surgeon used some antiseptic substance which destroyed them. What relation obtains between a local necrotic process, such as the formation of a boil with its central slough, situated necessarily in the first instance under the skin, or the equally necrotic process, the formation of pus in a subcutaneous abscess, and these low forms of plant life? There can be no doubt that by the injection into the tissues of a powerful irritant these necrotic changes can be induced without the intervention of organisms. Professor Ogston and Mr Watson Cheyne have also shown that micrococci are present in the great majority of acute subcutaneous necrotic inflammations, as they are commonly met with in the human body. Here the question at present rests. The opinion of the present writer is that in all probability they are the cause of the necrotic process. It is not asserted that they are the cause of the primary inflammation, which need not go on to necrosis ; but the probability is that they find in the inflamed area a nidus for their growth and development. It is not known how they cause it, whether by direct action

upon the tissues or by uritating products formed during their growth. The organisms described by Ogston and Cheyne have a life history and require conditions for their existence and development different from those demanded by the saprophytic organisms already described. To reach the subcutaneous area of inflammation they must pass by the blood-stream, and must be able to exist in the living blood. They are probably associated with the infective class of organisms. In some suppurations at the present moment, such as acute suppurative periostitis, the formation of pus under the periosteum connected with bone, a suppuration within the medullary cavity of a bone called osteomyelitis, and in acute ulcerative endocarditis, the organ- isms met with are undoubtedly infective. We do not know exactly how they enter the blood-stream, but we know that they can live in it, and that the occurrence of these diseased conditions is un- doubtedly a local effect closely connected with blood-poisoning.

A portion of the body may die in consequence either of an intense Mortifi- inflammation or of a cutting off of the blood-supply. Besides these cation or two distinct varieties there is a great intermediate group of cases in gangrene.

certain amount of pus, a cavity is left, the walls of which become lined with lymph. The lymph becomes vascular, and receives the name of granulation tissue. The cavity heals by second intention.

Pus may accumulate in a normal cavity, such as a joint or bursa. It may also be met with in the cranial, thoracic, and abdominal cavities. In all these situations, if the diagnosis is clear, the principle of treatment is free evacuation of the pus, and in joints and in the peritoneal and pleural sacs washing out the cavity at the time of opening, free drainage, and careful antiseptic treatment during the subsidence of the inflammatory process. The tension is relieved by letting out the pus. If the after-drainage of the cavity is thorough the formation of pus ceases, and the serous discharge from the inner side of the abscess wall gradually subsides ; and as the cavity contracts the discharge becomes less and less, until at last the drainage-tube can be removed and the external wound allowed to heal. The large collections of pus which form in connexion with disease of the vertebre in the cervical, dorsal, and lumbar regions are also now treated by free

evacuation of the pus, with careful antiseptic measures. In all cases care should be taken to make the opening as dependent as possible in order that the drain- age may be thoroughly efficient. If tension occurs after opening by the blocking of the tube, or by its imperfect position, or by its being too short, there will be a renewed formation of pus. When a considerable portion of tissue dies in consequence of an injury, the death taking place by gradual breaking down or dis- integration, the process is termed wlceration, and the result is an ulcer. As long as the original cause which formed the ulcer is at work, the gap in the tissues becomes larger and larger. Suppose that the ulcerative process is going on and the ulcer is spreading. The ulcer is then painful and the parts around are inflamed. Remove the cause by appropriate treatment and the necrotic process ceases, the shreds of tissue are cast off, the ulcer gradually cleans, the inflammation subsides, the pain disappears : the ulcer becomes a healing ulcer, The surface of the gap becomes glazed, and those changes take place in it which have already been described as occurring in an open wound, The gap gradually contracts 1m size. Round the edges cicatrization occurs, leaving a scar or cicatrix. Within the last few years the process of cicatrization has been hastened by planting on the granulation tissue small grafts of epidermic tissue in the manner already described (p. 681). There

which both causes may be at work. A comparatively slight injury affecting a portion of the body imperfectly supplied with blood may give rise to an inflammatory condition which in a healthy part would be easily checked, but which in consequence of imperfect nutrition may end in mortification. Whilst the pressure of a tight boot in an old person with atheromatous vessels can give rise to mortification, the same pressure in a healthy person would give rise only to an evanescent redness. Frost-bite is a localized death of a portion of the body which has been exposed to prolonged cold. It may attack the fingers or toes. The death may occur directly without any intermediate reactionary inflammation, or it may follow an excessive reaction. The rule of treatment in all cases of gangrene in which there is a tendency to death is to keep the part warm by layers of wadding, but to avoid all methods which hurry the returning circulation; because any such increase would be followed by excessive reaction, which in its turn in a part already weakened would be followed by secondary death, When the part is dead, envelop it in antiseptic wadding to prevent putrefaction ; wait until

the line of demarcation between the living tissues and the dead part is evident, and then, if the case permits, amputate at a higher level. In spreading gangrene in which sepsis is present, and in which no line of demarcation forms, the best chance for the patient—at best a poor one—is to amputate high up in sound tissnes. In these cases the blood is generally poisoned, and if the patient recovers from the primary shock of the operation a return of the decaying process may attack the stump, and carry him off.

III. DisEAsEs. 1. Diseases of Blood-vessels.

An aneurism, in so far as we have to deal with it at present, may Aneur- be defined as a sac communicating with the lumen of an artcry. ism.

The sac-wall may be formed of one or more of the arterial coats which have become dilated. The tissues around, being condensed and being more or less adherent to the sac-wall, strengthen and sup- portit. The dilatation of the arterial coats is generally due to a local weakness, the result of disease. The diseased condition is almost always a chronic form of inflammation, to which the name atheroma

Treat- ment of true aneur- ism.

is given. In some instances the local weakness may be due to an injury bruising or lacerating the vessel and injuring its internal coat, When an artery is wounded and when the wound in the skin and superficial structures heals, the blood may escape into the tissues. In this case it displaces the tissues and by its pressure causes them to condense and form the sac-wall. The coats of the vessels, more especially when they are diseased, may be torn from a severe strain, and the blood will then escape into the condensed tissues forming the sac-wall. When one or more of the vessel coats form the sac there results what is called a true aneurism ; in those in- stances in which the sac-wall is formed by the condensed tissues around we have a primary false aneurism ; when a true aneurism bursts and the blood escapes into the tissues around it, as sometimes occurs in deep-seated aneurisms, giving rise to secondary localized accumulation, the term secondary false

anewrism is used. In both varieties of false aneurism the swelling is more diffuse and the pulsation as a rule is less marked than in the true aneurism.

The blood in an aneurism is at first in a fluid state, and at each beat of the heart a certain amount passes into the sac, causing its ex- pansion. In all aneurisms there is a tendency to coagulation of the blood, and a blood-clot is deposited in a laminar form on the inner surface of the aneurismal sac. In some instances this laminar coagulation by constant additions gradually fills the aneurismal cavity. The pulsation in the sac then ceases ; contraction of the sac and its contents gradually takes placc; the aneurism is cured. On the other hand, if the blood within the sac remains fluid, the aneurism will gradually increase in size; the tissues over the aneurism and the sac-wall will become thinned, and at last give way ; and death occurs from hemorrhage.

In the treatment of true aneurism the great principle is to encour- age coagulation in the aneurismal sac. This can be done by lessening the force of the circulation generally or locally. The general force of the circulation can be lessened by low diet, rest in bed, avoid- ance of all causes of vascular excitement, and by the administration of large doses of iodide of potassium. The force of the circulation can be decreased locally and temporarily by the application of a ligature to the artery between the ancurism and the heart or by the application of pressure upon the main vessel at a convenient point between the aneurism and the heart. The general treatment is available in all cases. The local treatment by operation or by compression is only available in those instances in which the aneurism is so situated that the blood-vessel can be compressed or ligatured, as in aneurisms of the head and neck or of the extre- mities. In certain aneurisms in the lower part of the neck and upper part of the thorax, in which a ligature cannot be applied between the aneurism and the heart, the blood-flow through the aneurismal sac has been diminished by the application of a ligature to one or more of the main vessels on the distal side of the aneur- ism. The blood-supply to the parts beyond the aneurisin being thus cut off, the immediate effect is increased pressure on the aneur- ismal sac ; but, since the parts accommodate themselves to altered circumstances, as the collateral blood-vessels increase in size, be- coming the main vessels of supply to the parts beyond, the original channel becomes of secondary

importance, the result being a diminu- tion in the size of the main vessel and diminished blood in the sac, encouraging coagulation and contraction of the aneurismal sac. Practically the same effect has sometimes been obtained in a per- manent way, as in cases of rapidly increasing aneurism of the sub- clavian artery in the root of the neck by amputation of the upper extremity at the shoulder joint. And within the last few years, in popliteal aneurism, the same thing has been done temporarily by the application of an elastic bandage to the limb from the foot upwards to the popliteal space, emptying the blood-vessels below ee and in this way cutting off the blood-supply tempo- rarily. the thigh, care being taken not to make firm pressure with the bandage as it passes over the aneurism behind the knee joint, so that the sac may not be emptied of blood. If the sac were emptied, the object in view would be defeated, because there would be no blood in the sac to coagulate. The continuation of the bandage in the thigh above the anenrism is practically a compressing agent applicd to the artery on the proximal side of the aneurism. ‘The rationale of this treatment of popliteal aneurism, due to Dr Walter Reid of the British navy, may, if this explanation is correct, be said to owe its success to the fact that in it we combine the two great principles which check the blood-pressure locally, z.¢., a cutting off of the blood-supply beyond the aneurismal sac and compression on the main vessel on the proximal side. It is to be noted that all these different means of checking the blood-pressure within the anenrismal sac are temporary in their action. The temporary arrest by compression, the equally temporary arrest by the application of a ligature, in the latter case the collateral anastomosing circulation taking the place of that of the main trunk which has been ligatured, start the process of coagulation within the sac, and, the process being once started, complete consolidation gradually takes place. Although these methods of treatment are principally of value in true aneurism, they are also to a certain extent useful in secondary

false aneurism. have to deal with a wounded vessel in which the blood, instead of

practically a (chronic) bleeding point ; the principle of treatment is to open the sac, turn out the clots, and below the bleeding point.

the blood in the vein is liable to coagulation, forming a clot or of veins

jections into the rectum will relieve the condition.

The application of the elastic bandage is continued up-

[PRACTICE, In primary false aneurisms, on the other hand, we

being poured out externally, is poured into the tissues, and is

and ligature the artery above The veins are liable to inflammation (phlebitis). When this occurs Diseases

thrombus, which, if displaced from its original position, either makes its way as an embolus towards the heart and is there arrested, or passes through the cavities of the heart into the lungs, there sticking and giving rise to lung symptoms. If the thrombus is formed in the hemorrhoidal plexus, it passes as an embolus by the portal system into the liver. If it is formed in the left side of the heart, it may pass into the large vessels at the root of the neck and reach the brain, giving rise to symptoms of brain disease, The thrombus niay be formed apart from inflammation of the vein wall in consequence of diseased states of the blood, as in gout and rheumatism, or it may form in consequence of stagnation of the blood-current due to slowing of the circulation in various wasting diseases, When a thrombus forms, absolute rest in the recumbent posture is to be strictly enjoined; the great danger is embolism or the displacement of the clot from its original position. Hot fomentations in the early stages and belladonna ointment when the condition becomes sub-acute are the best local applications. The desire is to promote absorption of the clot. The veins in the lower extremity and in the hemorrhoidal and spermatic plexus are liable to dilatation. The condition is termed variz. The veins dilate with tortuosity ; the valves become incompetent ; and the condition is apt to spread. In the lower extremity the primary cause may be an injury or some obstruction at a higher point. General laxity of the tissues predisposes to the condition 3 occupa- tions which necessitate much standing and alternation of leat and cold also act as predisposing causes. The treatment consists in giving the dilated vessel support by means of an elastic bandage or stocking. When the condition is local and gives discomfort, the vessel may be ligatured at various points so

as to cause its oblitera- tion. This operation should not be undertaken rashly, and should only be performed if the case is an aggravated one, since it is by no means devoid of risk. In the hemorrhoidal plexus the disease is termed internal hemorrhoids or piles ; many operations are per- formed for this condition, but in the great majority of cases the careful use of purgatives and the administration of cold water in- The dilated veins often ulcerate and give rise to bleeding piles; here an opera- tion is often called for, because the persistent loss of even small quantities of blood is apt to result in chronic anemia. The en- largement of the spermatic plexus is termed varicocele, and almost always occurs on the left side. The use of a suspensory bandage and cold bathing should first be tried ; if the disease persists, it is often associated with mental depression, and an operation—ligature at several points of the dilated vessel—should be performed. The disease may be associated with atrophy of the testicle on the same side, and this liability aggravates the mental condition and en- courages the surgeon to operate. Inflammation of the lymphatic vessels in the lower limbs is often associated with inflammation of the veins in the female after delivery, giving rise to the various forms of white leg. Acute inflammation of the lymphatic vessels and glands is also associated with poisoned wounds, and has al- ready been alluded to in connexion with injuries. The use of hot fomentations and careful elastic pressure with rest are prescribed

for treatment. : 2. Diseases of Bone.

Attention has already been directed to one form of injury to a Bone bone, viz., fracture. A word may now be said about inflammation diseases of a bone and its results. As a typical instance we will take a long bone, consisting of a shaft and two extremities. The walls of the shaft consist of dense bone, the extremities of cancellated tissue. The shaft of the bone is hollow, and filled with medullary tissue. In the fully developed bone the extremities alone are tipped with cartilage ; in the extremities of the bones of a growing person there are also layers, termed the epiphyseal cartilages. The bone is surrounded by a fibrous membrane termed the periosteum. This membrane is richly supplied with blood-vessels, which ramify through it and pass, along with lymphatic vessels and nerves, from it-into the Haversian canals in the dense bone forming the shaft, The deeper layers of the periosteum consist of osteoblastic cells, which also line the Haversian

canals. In the undeveloped condition these cell elements take an active part in the growth of the bone as regards its breadth, the epiphyseal cartilages taking an active part in its growth as regards its length. The medullary tissue in the cavity of the bone is supplied by the nutrient artery ; the cancellated tissue forming the extremities receives its blood-supply partly from the nutrient artery and partly from vessels passing in- directly from the periosteum. When a bone is injured—as happens, for example, in a severe bruise—the blood-vesscls in the periosteum and in the Haversian canals become congested, effusion of liquor

sanguinis and migration of the white blood corpuscles take place, and a severe gnawing pain is felt at the seat of the bruise. The pain is severe because the effusion cannot escape. It collects under the periosteum and in the Haversian canals. The cell elements in these situations are irritated, and cell proliferation takes place. The periosteum becomes thickened, and if the tension continues suppuration may occur between the periosteum and the bone. The periosteum is raised from the bone ; the blood-vessels passing into the Haversian canals are obliterated or torn across; and the outer layers of the hard dense bone, their sources of nutriment being cut off, die. The extent of the necrosed tissue will depend upon the extent of the suppurating area; if the suppurating area includes the nutrient artery within its range, nutriment being then cut off from the medullary tissue from which in part the deeper layers of the shaft of tle bone are supplied with blood, death of the whole thickness of the shaft of the bone may occur. As already stated, the most acute forms of suppurative periostitis and suppurative osteomyelitis are infective diseases, the suppuration in them being due to the presence of a micrococcus. If after au injury the primary inflammation is relieved by fomentations, leeching, or incisions, suppuration may be prevented; or even if, after suppuration has occurred, free incisions are made to allow the pus to escape, the periosteum may assume its normal position, and the area of necrosis be limited or necrosis be prevented altogether. After a portion of the shaft of the bone dies, the necrosed area is gradually absorbed ; but, if the area is of considerable size, and more particularly if sepsis occurs, the dead part is gradually scparated from the living, and after a time it becomes loose, and as a rule has to be removed by

operation. If the inflammation, acute in the first in- stance, becomes sub-acute, or if it is sub-acute from the first, then, instead of suppuration, the effusion under the periosteum coagu- lates, whereupon lymph is formed, the proliferating osteoblastic cells in the lymph take up their normal function, and new bone is made. This mass of new bone is termed a node. In the Haversian canals the osteoblasts there forming bone will render the bone tissue more dense and ivory-like in consistence, to which the term sclerosis is applied. In some cases the osteoblastic cells in the Haversian canals, instead of forming bone, feed upon the original bony tissue which constitutes the walls of the canals. The Haversian canals becoming enlarged, the result is a lessening of the amount of inorganic matter in the arca affected, and a cancellation of the hard bone takes place. This condition is called rarefying ostitis. The rarefaction of the densc bone may persist, or the process may stop, the osteoblasts again forming bone and the rarefied area be- coming sclerosed. In the cancellated tissue in the extremities of the long bones, and in that which forms the mass of the short bones, such as the vertebr, the tarsa] and the carpal bones, the inorganic matter compared with the hard bone is relatively in smaller amount than the organic matter filling the cancelle. Here as a result of injury the thin lamelle of bone may be cut off from their blood-supply, and death take place. If the process is acute, an area of cancellated tissue will die, and be separated from the surrounding living tissue as in the hard bone. In consequence, however, of the quantity of organic matter, death may take place in a molecular form, more nearly allied to the process of ulceration in the soft parts. This condition is known as cartes. If the inflammatory process in cancellated tissue is sub-acute, instead of a molecular death, sclerosis of the cancellated tissue occurs. When the cancellated tissue is the seat of inflammation, in con- sequence of its close connexion and intimate anatomical relations with the articular cartilages, they in their turn become implicated, and we have then to deal with disease of the joint. In all cases in which incisions are made to relieve tension under the periosteum, or in which portions of bone are removed to relieve tension in the shaft or in the medullary cavity of a bone, or in which incisions are made to check the progress of inflammatory action in the can- cellated tissue, strict antiseptic precautions must be taken to pre- vent sepsis occurring in the wound.

3. Discases of Joints. A joint is a complicated organ, and its integrity depends upon a

| joint. healthy condition of the bones which form it, of the articular carti-

lages which cover the ends of the bones, and of the synovial mem- brane which supplies the synovial fluid that lubricates the joint. These different structures are closely associated anatomically and physiologically, and disease beginning in any one of them will assuredly, unless checked, gradually extend to the others. The cartilage covering the ends of the bones receives its blood-supply mainly from the bone, and is also to a certain extent supplied at its edges by the synovial membrane. The cartilage being in itself non-vascular, disease does not commence in it; the majority of joint diseases commence either in the synovial membrane or in the bone ; as a general rule they begin with some slight injury of the joint. These injuries consist of strains or twists (of the joint) on the one hand and jarring or contusion on the other. In the latter case the elastic cartilage lessens the force of the contusion.

When a joint is strained, the ligaments binding the bones to-

gether are stretched and the synovial membrane becomes inflamed. Sprain.

Consequently effusion takes place into the joint, which becomes swollen and painful on pressure. Any movement of it is painful

and all the muscles around it are rigid. Ina healthy person appro- priate treatment—rest, hot fomentations, and gentle elastic pres- sure—will cause the fluid within the joint to be gradually absorbed, after which the joint can be restored to its normal condition. When the inflammation becomes sub-acute the pain disappears, and unless the joint is kept quiet by appropriate splints the condition is very apt to become chronic; that is, the joint becomes swollen and the movements are restricted. This condition is most persistent, and prolonged rest, along with counter-irritation by blistering or

by the application of tincture of iodine, is necessary before the effusion subsides. The joint may remain weak for the rest of the patient's life. Fibrous adhesions may form and prevent free move- ment. A joint in such a condition is always liable on the slightest injury to have a return of the effusion in an acute or sub-acutc form. These are the chief consequences of a strain in a healthy person. In a weakly person the primary strain may entail a very different result. The synovial membrane may undergo gelatinous or pulpy degeneration, and, although it is improbable that this condition is associated with the tubercular diathesis in all cases, there can be no doubt that in very many the degeneration of the synovial membrane is tubercular in character. The tubercle bacil- lus has been found in the thickened membrane. A joint in this condition swells; the enlargement, although it may be due in part to effusion into the cavity of the joint, is mainly caused by the thicken- ing of the synovial membrane, which has a peculiar doughy semi- elastic feeling. The movements of the joint are restricted, though little pain is complained of. If it is an upper limb the patient will not use it, if a lower limb he will walk with a distinct limp. The disease is a chronic one, and the joint may remain in this con- dition for months. Rest, elastic pressure, and blistering may check the progress of the disease, but as a rule, sooner or later, and very often as the result of some slight injury, a change takes place. On the one hand, the effusion within the joint, instead of being serous, becomes sero-purulent and even purulent, owing to the formation of pus within it. If the joint is an important one, inflammatory fever is set up ; the joint becomes intensely painful on the slightest movement, and unless incisions are made to allow the pus to escape it passes gradually into a state of complete dis- organization. The cartilage softens and breaks down, so that gradually the cancellated bone underneath is exposed. A similar change takes place in the opposing cartilage. It is destroyed in its turn and the ligaments binding the bones together are softened and lose their elasticity, so that the joint can be moved in abnormal directions. A grating sensation can be felt when the cancellated bony surfaces are rubbed together. Along with these changes within the joint, foci of inflammation form in the soft tissues around it. These inflammatory areas suppurate; the abscesses burst into the joint; the skin over thein gives way; and com- munication is established betwcen the external air and the cavity of the joint. Through this channel the causes of putrefaction reach the cavity, and complete disorganization of the part

accom- panied by sepsis occurs. Should the joint be an important one, a condition termed hectic is set up. If the discharge is allowed to continue, a gradual wasting takes place, which sooner or later ends in the death of the individual, unless the surgeon either re- lieves the tension by free incisions, or excises the joint, or anputates the limb. After disorganization has occurred, if the inflammatory process ceases, anchylosis of the joint may result. But, if the joint is freely drained and kept at rest, the inflammation will subside, and the granulation tissue on the two opposing surfaces will unite and a fibrous formation take place. The process may stop there, or the fibrous tissue may be gradually transformed into bone. Osseous union has taken place between the bones forming the joint. In many cases this is what the surgeon aims at, and it is of great importance to keep it constantly in view and to place the joint in such a position that, if anchylosis does occur, the limb may be as useful as possible. This result is only attained after prolonged treatment, and, if the patient's strength is unequal to it, it will be necessary to excise the affected joint or to amputate the limb. Suppuration sometimes occurs within a joint without any previous pulpy degeneration of the synovial membraue, either as the result of a wound or from septic inflammation sccondary to pyemia, or in consequence of a very acute simple synovitis resulting from excessive tension within the joint. When the synovial membrane is affected with pulpy degeneration the vitality of the cartilage at its edges, where it joins the synovial membrane, may be interfered with: the thickened synovial membrane, by encroaching on the articular cartilage, gradually by pressure alters the nutrition of the cartilage so that it disintegrates and breaks down, and when it is destroyed disorganization of the joint ensues, as already described. Should the disease assume this form, if care is taken, and if the joint is kept quiet, suppuration within it need not necessarily take place. The inflammation may assume a sub-acute type and fibrous anchy- losis occur.

Con- tusion.

Anehy- losis.

Rela- tions of venereal diseases.

When a. joint hasbeen severely contused, separation of the cartilage from the bone occurs ; effusion then takes place between the carti- lage and the bone; the cartilage is cut off from its nutrient supply ; and, unless the joint is kept at complete rest, unless the effusion is absorbed, the cartilage will sooner or later become necrosed. The necrosed cartilage will give way; the bone beneath will be exposed ; and, if the irritation is kept up, effusion, at first serous but soon becoming purulent in consequence of the tension within the joint, will take place. Changes follow in the opposing carti- lage, which has been itself bruised by the primary jar, and perhaps even separated from the bone beneath. It will in its turn necrose, and the bone will be exposed, suppuration taking place within the joint. The synovial membrane will become diseased, the liga- ments softened, and the evil sequence of events already described will ensue. A joint affected in this way is easily recognized from one in which the synovial membrane is primarily affected by the absence of swelling and by the intense pain. In the early stages complete rest should be obtained by affixing a weight to the affected limb. This, by setting up between the opposed and in- jured cartilaginous surfaces a condition of negative pressure, will tend to check the disease. But if this plan of treatment does not soon cause a subsidence of the pain, actual cautery must at once be resorted to. Contusion in which the cancellated bone is injured at some distance from the cartilage is most commonly met with in young people, in whom the extremities of the bones are not fully developed. In them the epiphyseal cartilages are richly supplied with blood for the performance of their physiological function, the formation of bone, and a comparatively slight in- jury may cause inflammation to be set up in the bone immediately in contact with the epiphyseal cartilage. As in the synovial mem- brane when it is affected with pulpy degeneration, this disease may be occasionally non-tubercular in character ; but in the majority of cases, more especially when the primary injury is very slight, the disease assumes the tubercular type and tubercle is deposited. In such cases the symptoms are often very insidious ; the young patient complains of some slight uneasiness, or the first thing to be noticed is a limp in walking when a lower limb is affected. In the case of an upper limb the patient will avoid moving the affected joint. As there is no external swelling, the disease may be overlooked in its early stages ; but, if it is suspected, and if the affeeted limb is kept at rest, the inflammation will subside and recovery ensue. On the other hand, if the patient is allowed to

use the limb, even in an imperfect way, the tubercular area may extend and the articular cartilage become affected. The articular cartilage does not in that case receive its proper nourishment: it disintegrates, breaks down, and the disease attacks the joint. Into this last tubercular matter escapes and suppuration occurs, result- ing sooner or later in disorganization of the joint.

In recent years a uscful limb has often been saved by excision of the affected joint. In the early stages the disease may subside under appropriate local treatment, such as counter-irritation, rest, pressure, assisted by constitutional treatment, such as tonics, fresh air, and careful dieting. By these means an operation may be avoided, and in applying such treatment it must be remembered that, while the disease itself may subside, the joint as an organ may be irretrievably damaged : it may become anchylosed. If anchylosis oceurs in a flexed position of the hip or knee joints, the limb will be useless for progression ; and an operation will be necessary in order to straighten it. In the ankle joint, if anchylosis occurs with the foot in an extended position, the patient will not be able to put his heel to the gronnd, and an operation will be necessary to bring the foot at right angles to the leg. Do not interfere with an anchylosed joint in the lower limb if it is in good position. If the shoulder joint becomes anchylosed after disease, the sterno- clavicular and acromio-clavicular joints take up to a great extent the function of the anchylosed shonlder. In the elbow, in what- ever position the joint becomes anchiylosed, the arm loses much of its usefulness and excision of the joint is performed in order to get a movable elbow. In the wrist it may be necessary to operate for anchylosis ; but as a rule, if the fingers are mobile, the anchylosed wrist does not interfere to any great extent with the usefulness of the hand.

4. Venereal Diseases.

Three distinct affections are ineluded under this term—gonorrheea, chancroid, and syphilis. At one time these were regarded as dif- ferent forms of the same disease; and, though gonorrhea is now generally held to be quite distinct from the other two, there are not wanting eminent authorities, including Mr Jonathan Hutchin- son, who are inclined to look upon chancroid and syphilis as essen- tially one and the same disease. The present writer believes that gonorrhea, chancroid, and syphilis are three

distinct diseases, due to separate causes, which have nothing in common except their habitat. The cause in each case is a specific virus, probably a micro-organism. In the case of gonorrhea the virus attacks mucous membranes, especially that of the urethra ; in chancroid mucous membranes and the skin are affected ; in syphilis the

whole system comes under the influence of the poison. Gonorrhea

and chaucroid correspond to the process of septic intoxication, The organisms on implantation set up a local disturbance, and the products of this fermentative process pass into the system and give rise to constitutional effects ; but the organisms themselves do not pass into the system generally. In syphilis, on the other hand, there isa true infective process: the organisms pass into the general circulation and live and multiply wherever they find a suitable nidus. The joint affection commonly called “ gonorrheal rheu-matism,” which sometimes follows gonorrhcea, is in all probability an infective condition. If this is true, then in these rare cases gonorrheea is infective. The chancroid poison may pass into the lymphatics and canse inflammation of the lymphatic glands in the groin, giving rise to chancroidal bubo. These clinical facts are undoubtedly opposed to any generalization such as that laid down above, and itis right to note them; but the general comparison between gonorrhea and chancroid as non-infective and syphilis as distinctly infective in its character holds good in the great major- ity of cases. A further study of these quasi-infective varieties of gonorrheea and chancroid must undoubtedly throw light upon the physiological classification of pathogenic organisms. These three affections are generally acquired as the result of impure sexual intercourse ; but there are other methods of contagion, as, for example, when the accoucheur is poisoned whilst delivering a syphi- litic woman, the surgeon when operating on a syphilitic patient. .An individual may be attacked by any one or any two of the three, or by all of them at once, as the result of one and the same connexion ; but they do not show themselves at the same time ; in other words, they have different stages of incubation. In gonorrheea the disease appears very rapidly, so also in chancroid, the first symptoms com-

mencing as a rule three or four days after inoculation. It is very different, however, with syphilis. Here the period of incubation is one rather of weeks, the average length being twenty-eight days, though it may vary from one week to eight. The length of the period of incubation, therefore, is the great primary diagnostic in the case of syphilis. “i

Syphilis is an infective fever, and its life history may be best Syphilis, considered by comparing it with vaccinia. A child is vaccinated on the arm with vaccine lymph. For the first two or three days nothing is observed ; but on the fourth day redness appears, and by the eighth day a characteristic vaccine vesicle is formed, which bursts and frees a discharge, which dries and formsa scab. If on the eighth day the clear lymph in the vesicle is introduced at another point in the child’s skin, no characteristic local effect follows. The system is protected by the previous inoculation ; this protection will last for some years, and in certain cases for the rest of the patient’s life. We have here, then, exposure to a poison, its introduction locally, a period of incubation, a charac- teristic local appearance at the seat of inoculation, a change in the constitution of the individual, and protection from another attack for a variable period. So with syphilis. The syphilitic poison is introduced at the seat of an accidental abrasion either on the genital organs or on any part of the surface of the body. The poison lies quiescent for a variable period. The average period is four weeks. A characteristic cartilaginous hardness appears at the seat of inoculation. If this is irritated in any way, an ulceration takes place ; but ulceration is an accident, not an essential. From the primary seat the system generally is infected. The virns is multiplied locally and, passing along the lymphatic vessels, attacks the nearest chain of lymphatic glands. If the original sore is in the genital organs, the glands in the groin are first attacked ; if in the hand, the gland above the inner condyle of the humerus; if on the lip, the gland in front of the angle of the jaw. The affected glands are indurated and painless; they may become inflamed, just as the primary lesion may ulcerate; but the inflammation is an acci- dent, not an essential. From the primary glands the mischief will affect the whole glandular system. The body generally is so altered that various skin eruptions, often symmetrical, break out. Any irritation of the mucous membrane is followed by superficial ulcer- ations, and in the later stages of the disease skin eruptions, pustular and tubercular in type, appear, and in weakly people in severe

cases, or in cases that have not been properly treated by the surgeon, syphilitic deposits termed gummata are formed. These, if irritated, break down and give rise to deep-seated ulcerations. Gummata may attack the different organs in the body ; the muscles, liver, and brain are the favourite sites. Their presence interferes with the functions of the organs, and, if the organ affected is one functionally important in the economy, may canse death. The individual is as a general rule protected against a second attack, although there have been rare cases recorded in which individuals have been attacked a second time.

Syphilis is treated by many surgeons by giving careful attention Treat- to the general health, to diet and regimen and tonics, by placing ment of the patient in the most favourable hygienic circumstances, in the syphilis. belief that it runs a natural course and has a tendency to natural

cure. Special ae are treated as they arise. Other surgeons oses of mercury, in the form of grey powder,

administer small iodide of mercury, or corrosive sublimate. If the physiological

DISEASES.] oURGEH R Y effects of mercury are observed—tenderness of the gums and a metallic taste in the mouth—this treatment is desisted from and iodide of potassium is administered, mercury being given again when its physiological symptoms have disappeared. Oleate of mer- cury or mercurial ointment, or mercury with lanoline, is applied to the primary lesion and rubbed in over the enlarged glands. This is

the hypertrophied gland is only altered in size ; it retains its general

shape and functional activity. Occasionally the hypertrophic area

is localized, and to a great extent separable from the original gland

by @ more or less distinct capsule. In the mammary gland, for Various

example, a local hypertrophy may occur, the microscopic characters forms of Between this condition tumour,

continued for six months or a year. In the later stages of the com- plaint iodide of potassium is the main remedy used. There are therefore two distinct methods of treating syphilis,—the non-mer- curial and the mercurial. Both methods have been extensively tried by the present writer, and he believes that the mercurial is infinitely preferable to the non-mercurial method. Recent investigations point to the valuc of corrosive sublimate as a germicide, and in all probability the good results which follow saturation of the system with mercury are to be explained in this way. It is said by the non-mercurialists that the administration of mercury masks the symptoms. There can be no doubt that the symptoms often appear after the mercury is stopped, but in a modified form, and there is no evidence that the mercurial treatment prolongs the disease. Syphilis has a tendency to natural cure, like all the continued fevers, and along with the administration of mercury careful hygienic treat- ment must receive particular attention, and often in weakly un- healthy people a long sea voyage is of great value. Any means which causes a free action of the skin, as, for instance, by periodic visits to thermal baths, is of. great assistance in eliminating the »oison.

: Syphilis as commonly met with nowadays is not of so severe a type as it formerly was. One reason often given for this is that mercury was formerly always pushed until its full physiological effects were observed, and that the lowering of the patient’s con- stitution by this severe treatment aggravated the primary com- plaint. There may be some truth in this explanation; but the principal reason in all probability is that the syphilitic organism does not now find so suitable a nidus or soil for its growth and development as it once did. Syphilis in the United Kingdom at the present moment is in the stage of an epidemic in its decline. This may be looked on as a startling statement ; but it is true of syphilis as of all infective diseases. A time must come when the soil is practically worn out, when it becomes so poor that the organ- ism grows only in a stunted form, producing a mild disease, till in time it ceases to grow altogether. It is not asserted that it will necessarily die out, because after lying fallow for a time the soil may recover its power and the disease be revived in a more virulent form, analogous to the

luxuriant crop which follows after a period of fallow. Syphilis can be conveyed by the discharge from any syphilitic lesion occurring within two years after the commence- ment of the complaint. It cannot be conveyed by the normal secretions of the syphilitic person except in the case of the semen, which, impregnating the ovum in the female, causes the feetus to be syphilitic. Syphilization of the foetus is followed by syphiliza- tion of the mother. Thc blood of a syphilitic person is infectious for two years after the commencement of the attack. Pure vaccine lymph cannot convey syphilis ; if, however, it is mixed with blood it may convey it. No person who has had syphilis should marry until he has been entirely free from the complaint for two, or better still for three, years. Ifa person marries before this time pregnancy greatly increases the risk to the mother. If there is any suspicion of syphilis the mother should take mercury during the period of pregnancy. It is interesting to note how time has a modifying influence in a case of repeated pregnancies occurring in a syphilitic woman. At first there may be miscarriage in the early stage of pregnancy ; after a time abortions in the later stage; there may then be a still-born child; then one born alive but syphilitic ; then a child born apparently healthy but soon becoming syphilitic; and ultimately a healthy child is born and remains healthy, showing no evidence of syphilitic disease. The disease has worn itself out. The relation of apparently healthy pcople born of syphilitic parcnts to syphilis acquired during the course of their life may explain those remarkable cases of escape from syphilitic infection which constantly come under the observation of the surgeon.

5. Tumours. As the result of a local irritation an acute inflammatory swelling . May appear. If the irritant is of a severe type the result may be local death. An abscess may form ; and, after the pus has escaped or has been evacuated, and after the original cause of the irritation has subsided, the swelling may disappear and the parts be restored to a condition nearly allied to the normal. If the irritant, however, is slight and its action prolonged, a chronic inflammatory swelling of the part may result. Although in many cases with appropriate treatment the induration disappears, in other cases it persists during the life of the individual. The indurated mass in its microscopic characters closely resembles the original anatomical characteristics of the part affected. When, for example, an organ

like a gland is the seat of a chronic irritation a general incrcase in its size takes place. A hypertrophy or overgrowth has occurred, but as a rule

1 Compare PATHOLOGY, VOl. xviii. p. 367 sq.

of which resemble imperfect gland tissue. and an adenoid or glandular tumour of the mamma no distinct line of demarcation can be drawn, and the probability is that the ade- nomatous tumour of the mammna is caused by local irritation. It may be the immediate outcome of a misdirected or excessive functional activity. The great practical difference, however, between it and true hypertrophy is this, that it can only be removed by opera- tion. The adenomatous tumour closely resembles in some of its microscopic characters one of the varieties of epithelioma, of which an increase in the columnar epithelium lining the acini in the gland is the main characteristic. This tumour is not a simple tumour like the true adenoma ; it does not grow slowly ; it is not encap- sulated ; the cellular elements in it not only invade the surrounding tissues but tend to pass into the lymphatic vessels and reach the lymphatic glands in the arm-pit, where they grow and form second- ary tumours similar in microscopic characters to the original growth. From these secondary foci a further invasion may take place, and the cell elements may reach the blood-stream and be caught in the capillaries, forming there new growths, till the patient dies from the general implication of the whole system. This form of tumour has been termed a malignant adenoma. While it has originally the microscopic characters of a simple adenoma, if we look to its life history we have in it an excellent example of a inalignant tumour. Microscopically it is a stepping-stone between the simple and the malignant type of tumour ; clinically it is characteristically malig- nant. The mammary gland is composed of glandular tissue and fibrous tissue. A hyperplasia of the fibrous tissue may occur in consequence of an excessive irritation of the glandular tissue, or apparently a primary increase in the fibrous tissue may occur locally, giving rise to a simple fibrous tumour of the mamma, of which fully developed fibrous tissue is the microscopic characteristic. This overgrowth may become encapsulated and give rise to no symptoms except those referable to its gradual increase in size, and after the gland in which it lies has fulfilled its life history it may stop growing, degenerate, and decay. In the uterus, e¢.g., those fibrous tumours which occur after the time of child-

bearing is past, after the uterus has fulfilled its destiny, cease to give any further trouble and are only inconvenient in consequence of their size. Fibrous tissue in the early stages of its development is largely composed of cell elements, and there are tumours, ¢.g., in conncxion with the mamma, which have their prototype in the undeveloped or cellular stage of fibrous tissue. These tumours also are essentially malignant. They grow rapidly, and are richly supplied with thin-walled blood- vessels ; the elements of the tumour pass directly into the blood- stream, and reach the capillaries, where they are arrested and where secondary growths like the original growth in their anatomical characteristics are formed, causing the death of the patient.

In what has just been said it will be seen that therc is no distinct line of demarcation between the inflammatory swelling and the hypertrophy, between the hypertrophy and the tumour proper, between the simple and the malignant tumour. The local irrita- tion can be traced in the case of the inflammatory swelling and the hypertrophy, and it is highly probable that both the simple and the malignant tumour are also due to local irritation. It must, however, be acknowledged that it cannot always be traced. If the malignant tumour is not due to local irritation, but to a general dyscrasia or peculiarity of the patient, the surgeon has slight grounds for recommending its removal. If, however, he believes that all tumours are evidences of local irritation, he is fully justified in recommending thcir early and complete removal—in the case of the malignant tumours before they have time to spread by the lymphatic or blood-stream to distant parts, in the case of simple tumours before they have assumed characteristics of malignancy, as these tumours sometimes do. The mammary gland has been taken as an example of an organ in which tumours frequently occur. The reason for this frequency, if we believe in local irritation as a cause of tumour- growth, is not far to seck: from the time of puberty to the time when it terminates its functional activity this gland is in a constant state of vascular unrest and functional change. Both forms of tu- mour are met with in all the organs and tissues of the body. Simple tumours are generally composed of fully developed tissue, similar to the tissue in which they lie, the simple fatty tumour occurring in connexion with fatty tissue, the simple fibrous tumour in con- nexion with fibrous tissue, the osseous tumour in connexion with bone. The malignant tumour, on the other hand, is generally formed of undeveloped tissue which has not yet fulfilled its destiny, which is not only

misplaced in situation but in time. The carti- laginous tumour has its prototype in cartilage, for that which covers the ends of the long bones and enters into the formation of a joint is a fully developed tissue. The true prototype of the cartilaginous tumour is not, however, fully developed cartilage, but one or other of those forms of cartilage which. as regards their developmental

Range of

surgical opera- tions.

Conser- vative surgery.

position, are intermediate between fibrous tissue and bone, and there- fore the cartilaginous tumour has frequently a life history more closely allied to the malignant than to the simple type of tumour

formation. . ;

No attempt can here be made to classify the different forms of tumour. The surgeon at the bedside meets with tumours as living parasitic formations. He studies their life history; he observes their birth, their growth, their peculiarities, and their tendencies ; he naturally attempts to classify them from a study of their physio- logical or clinical aspects. The pathologist, on the other hand, examines the tumour after it is removed ; he studies it as it appears to the naked eye and under the microscope; and he attempts to classify tumours from an anatomical standpoint. Within recent years the pathologist’s classification, associated with a recognition of the developmental division of the human embryo into different layers, has become the favourite ; but it is hoped that, as science advances, the increase of clinical knowledge, assisted by microscopic and embryological research, will make a physiological classification a reality.

IV. OPERATIVE SURGERY.

Within recent years the main advance in surgery has been from the scientific side, due to increased precision in physiological knowledge and a careful study of the relation of organisms to various diseased conditions. And with this progress operative skill, in many directions previously unthought of, has kept pace. Cranial operative surgery has advanced as the motor areas on the surface of the brain have been localized with greater precision. The ex- perimental physiologist has done his part; the clinical observer is now doing his. Cranial surgery necessitates special notice. In the thoracic cavity also diseased con- ditions are now relieved by surgical operations. The greatest advance of all, however, is in connexion with the abdominal cavity. Under this head the work of the last thirty years requires special notice. The peritoneum was at one time considered a closed book to the operator; now all is changed, and abdominal surgery has become one of the most important branches of operative work. Joints in a state of inflammation are also now freely opened and tension is relieved. With the relief of tension the in- flammatory process subsides and the joint recovers. The excision of diseased joints has also become part of the everyday work of the surgeon. Cancerous affections—using the term in a clinical sense—of the tongue, rectum, and larynx are now treated by excision of these organs. But it is still a question in what cases the operation prolongs life, and what cases are specially suited for operation. While greater latitude has been given to surgical interfer- ence with the different cavities of the body, operations upon the limbs have been restricted in consequence of the ac- ceptance of Lister’s views with regard to wound treatment. Many limbs upon which formerly amputation was per- formed, as, for example, in the case of compound fractures, are now saved. ‘The term “conservative surgery,” which formerly had reference to the excision of a diseased joint instead of amputation of the affected limb, has now a wider meaning, and covers not only the different excisions which have taken the place of amputation but also those cases in which a limb is saved by careful antiseptic man- agement after severe injury. At one time, perhaps, in the early stages of antiseptic wound treatment the brilliancy of the results obtained by these means, and the immunity which resulted from the prevention of blood-poisoning, en- couraged surgeons to save a limb which, when the wound was healed, was not really useful. An upper limb saved, however inefficient, is better than any artificial substitute, and every

endeavour in the direction of conservation should be made. Conservation in the case of a lower limb, on the other hand, may be carried too far, Unless the saved linib can support the weight of the body, it is far better to per- form amputation, because a satisfactory artificial substitute can be found to take the place of the lower extremity. In performing amputation on a lower limb every endeavour

should be made to obtain a stump which will bear, in part at any rate, the weight of the patient's body. Since the Modern introduction of anzsthetics rapidity in performing an Surgical amputation is not essential. Flaps can be carefully made an time can be taken to shape them; and they can be so. arranged that the resulting cicatrix will not be opposite

the sawn extremity of the bone. flaps the surgeon is justified in sacrificing to some extent the length of the limb, if by so doing he can leave a mobile and painless stump on which an artificial limb cans be comfortably fitted. But this does not hold good to the same extent for an upper limb. The pressure on the éx tremity is not so great, and the longer the stump the more easily can an artificial substitute be fitted on. As a result also of Lister's teaching operative procedure for the cure of various deformities, such as knock-knee, rickets, and club-foot, in which the bones affected are freely attacked, has done much to relieve unsightly deformity and increase the usefulness of the individual. In all operations absorb- able catgut ligatures for the cut vessels have since about 1861 taken the place of silk, which had to come away by ul- ceration,—a destructive process antagonistic to rapid heal- ing. Greater care is taken to save blood byemptying the part to be operated on before beginning the operation. Greater care is also taken to tie all bleeding points, so as to prevent reactionary hemorrhage and the escape of blood between the surfaces of the wound, whereby healing is retarded. Free drainage by india-rubber and glass tubing, by absorb- able tubes made of decalcified bone, by skeins of catgut acting by capillarity—all the outcome of an understanding of the local irritation and constitutional fever caused by tension—have done more than anything else to enable the surgeon to attain his triple object,—painlessness, rapidity, and safety in the

healing of a wound. Lastly, the clear understanding of the term “antiseptic” in its fullest mean- ing, the knowledge of the power which the unirritated and healthy tissues have as germicidal agents, and the introduction of various antiseptic or rather antitheric sub- stances, some of which destroy, some of which paralyse, those lowly organisms whose power for evil in an un- healthy tissue or an injured part is so great, contribute towards the same great end. By these means operations are to a great extent relieved of their dangers, and by anzsthesia, which prevents pain and suffering, they are robbed of their terrors. (ae ca)

1. Cranial.

The necessity for setting apart a distinct section of this article to deal separately with the region of the head does not depend upon any specialization in the principles of treatment peculiar to that region. The general laws of surgical procedure hold good here as elsewhere throughout the body; but they have to be exemplified in relation to a region so separated from others in its architectural and functional peculiarities as to call for special record and delinea- tion. The surgeon has to deal with a most intricate series of con- siderations—anatomical, physiological, and psychic—in devising suitable treatment for abnormal conditions in this region ; the inter- relation of cranial tissues and organs, their capital importance in the physical economy, and the position of some of them as the sub- strata of mental activities render any surgical interference a matter of great delicacy and grave anxiety. So much is this the casc that it has been left for the most daring and the most modern surgeons to prove that this is a region to which ordinary surgical rules may properly apply ; and hence what must be here recorded is largely matter of quite recent history and to a large extent at ; variance with the doctrine of former epochs. The function of the Function cranium as a protective agent for the brain and the organs of of the special sense is strikingly shown by its architectural design. The cranium. proper discharge of this function is of paramount importance from the economic value of the cranial contents ; and the demands upon it are the more exacting from the extreme delicacy of physical structure and the unstable physiological equilibrium present in the brain. Clothed externally by the densely resisting textures of the scalp, further protected by a layer of heat-deflecting hair, the cranium itself consists of a firmly welded bony

casket of ovoid form, maintained in its balanced position upon the upright spinal

In order to obtain such |

CRANIAL. |

column by a series of ligamentous and muscular bands. There is thus protection against the sun's rays and a general mobility that provides for the avoidance of impending blows. But the cranium has chiefly to reccive and annul transmitted physical vibrations, the result either of blows upon the head or of those jars and oscillations, incidental to bodily movements, which would interfere greatly with the functions of the brain did they actually reach it. -The function of the cranium in this respect has been fully described by Hilton, who shows that special bony ridges

. are present in the skull which arrest vibrations and divert them

into channels where their action is no longer deleterious, Three series of such buttresses descend from the vault to the base of the skull, where they converge in the region of the sella turcica ata point termed by Felizet "'the centre of resistance," and where the terminations of the ridges come into immediate contact with the cartilage of the foramen lacerum medium or the lake of cerebro- spinal fluid which surrounds the anterior and posterior clinoid pro- cesses. The transmitted vibrations are thus annulled by transfer- ence to a liquid or a soft solid medium, and lose all further power. In addition to the special mechanism which mitigates the effect of considerable shocks and renders slight ones ordinarily imperceptible, there is a general elasticity of the skull which enables it to with-

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immediate risks to life are from shock and compression, the latter due to depressed bony fragments or effused blood. The treatment of shock has already been alluded to (p. 680 above); that of com-

pression consists in the early relief of pressure by trephining, with Question elevation of the depressed fragments and removal of the blood-clots, of tre- if the symptoms are advancing. These symptoms are increasing phining.

stupor, stertorous respiration (Cheyne-Stokes breathing), relaxation of sphincters,—the condition passing on to complete coma. In cases where pressure symptoms are not urgent (especially in young patients with elastic skulls) and in cases where no such symptoms are present, expectant treatment should be employed, —complete rest, local cooling applications, constantly applied, the exclusion of all stimuli to the special sense-organs or to the attention, and a careful watch for further symptoms. Should symptoms of compres- sion appear and advance, or should slight symptoms already present become aggravated, immediate operative interference for the relief of pressure as above indicated must be resorted to, and in operat- ing in this region it must be remembered that strict antiseptic pre- cautions are essential, for in no region of the body—not excluding even the peritoneal cavity—are the effects of septic infection more disastrous and at the same time so hopeless of remedy.

Having thus alluded to the

;] > physiology and surgery of the cranial Topo- envelope, it remains to consider the corresponding aspects of the graphical cranial contents. The older theory of Flourens and Hertwig, that areas of all parts of the brain are equally concerned in producin g its aggregate brain.

stand great violence without material injury and so enhances its protective power. This elasticity is not uniformly present, but is much more developed in the bell-like vault than in the region of

fects of ‘lence.

the base. The osseous texture also is much more brittle in the latter locality. When, therefore, such severe shocks are communi- cated to the skull as overcome its elasticity and its power of resist- ance, the fracture which ensues is found as a rule to involve the base much more seriously than the vault.

These physical qualities are of great importance as giving an index of the relative resisting powers of different parts of the skull, and as affording data that may assist in determining the position of a fracture from a study of the forces which caused it. Of such forces those that are closely circumscribed in their area of appli- cation produce strictly local effects, whilst diffuse blows produce their most marked effects at a distance from their point of applica- tion. The former fact needs no illustration ; the latter has been made the subject of numerous researches in relation to the usual course of cranial fractures. From the rcsults of these investigations three different etiological laws have been educed—(1) Saucerotte's law of contrecoup ; (2) Aran's law of radiation ; and, in special re- lation to fractures of the base of the skull, (3) Von Wahl's law of parallel cleavage. In its special sphere each of these laws probably holds true; but the sphere of each is a limited one and is dependent upon the local peculiarities of the skull already described. The theory of contrecoup is that a foree produces its maximum effect at the opposite pole of the skull to the point of its application. That this law can have no general bearing is shown by the numerous cases in which the fracture bears no such relation to the force which causes it. In relation to a limited area of the vault, however, it appears

activities, has been displaced by the more recent theory of the localization of function. This theory is supported by the results of recent physiological and pathological investigations, the former carried on for the most part by Hitzig, Fritsch, and Ferrier, the latter by Broca and Meynert. The practical outcome of these re- searches—viz., an adaptation to the human brain of results obtained in that of the higher mammals, controlled by pathological observa- tions on the human brain itself—is that the surface of the brain can be mapped out into a series of topographical areas, each of which occupies a definite relationship to some well-defined function— motor, sensory, or psychic—of the human economy. Of the areas connected with psychic activity little is at present known; they are generally believed to occupy the frontal lobes of the brain.

and around the horizontal limb of the fissure of Sylvius are arranged those concerned in general and special sensation. The results of these researches confirm the views of Hughlings-Jackson, who has conclusively demonstrated the cortical origin of those epileptiform seizures in which the

motor phenomena are limited to particular groups of muscles. At the same time these results open a new field of anatomical and surgical inquiry, with the object of defining what relation the cerebral convolutions bear to external cranial land- marks, and of showing that circumscribed cortical disease or injury is capable of detection and relief.

: : In Localiza- the parietal region grouped around the fissure of Rolando are the tion of cortical areas connected with motor functions in the extremities, function.

For practical purposes in the Relation present state of our knowledge of cerebral physiology, the first of con-

to hold true ; for isolated fractures of the base resulting from blows upon the vault are on record, but as these are the only fractures which this theory would explain, and as they are very rare, its range of action is very greatly curtailed. Aran's law of radiation is that,

part of the question limits itself to an cxact delineation of the volutions position of the fissures of Rolando and Sylvius in relation to well- to sur- known cranial landmarks. In regard to the position of the former face of several researches have been made, and its upper extremity has head.

starting from the point where the blow is reccived, a fissure traverses the walls of the skull in the direction of the base and spreads itself in that fossa of the base of the skull which corresponds to the part

of the vault that is struck. Thus a diffuse blow on the frontal

bone causes injury to the anterior fossa of the base, and blows upon the parietals or occipital bone cause similar injury to the middle or posterior fossa respectively. This law holds true of the great

been localized at a point 2 inches behind the coronal suture in the mesial line by Broca, Turner, and Féré. For the purpose of its exact determination in the living subject, where the line of the coronal suture cannot always be detected, measurements have been made and formule for its localization devised by Giacomini, Lucas- Championniére, Hare, and Reid (see the

literature cited below). The commencement of the fissure of Sylvius is situated 14 inches

behind the external angular process of the frontal bone.

As an outcome of these additions to our knowledge of accurate Trephin- facts, a new branch of surgical procedure is now firmly established ing for and already sufficiently supported by successful results, viz., trephin- cortical

majority of fractures of the skull and will assist in localizing the course ofa fracture when the part of the skull first struck can be recognized. But numerous cases of fractured base are on record in which no fissure can be traced leading from the point first struck ;

. and from a study of these Von Wahl has concluded that fractures

of the base, whether connected with fissured vault or isolated, are always parallel to the direction of the force which caused them. Thus blows upon the frontal and occipital regions cause longi- tudinal fissures of the base, in the temporal region oblique fissures, and in the mastoid region transverse fissures. An index of the probable direction of a fracture is thus obtained by observing the exact point of incidence of the blow which caused it, whether other evidences of localized injury to the cranial contents be forthcoming or not.

The diagnosis of the presence of a fracturc is often a matter of great difficulty, especially where the soft parts are still intact, and

. by their contused and swollen condition mask the true nature of

the case. Apart from obvious external signs of injury, the following symptoms should lead to the suspicion of a fracture :—bleeding from the mouth, nose, or ears ; local ecchymoses or lacerations, as that of the membrana tympani; circumscribed hemorrhages, as under the scalp or visceral conjunctiva ; interference with the func- tions of the brain or special sense-organs, as aphasia, motor spasms or paralyses, blindness,

deafness, an altered condition of the respira- tion or the pupils, slight unconsciousness or profound stupor. The

ing for the relief of cortical disease. occurred in the hands of Hughes Bennett and Godlee, Fraser and Chiene, and Victor Horsley. The last-named presented to the British Medical Association meeting in 1886 three patients rclieved by tkis operation from cortical lesions. As a result of wide ex- perience in operating upon apes and upon human beings, Mr Horsley accentuates the importance of employing the following precautions in operative interference :—(1) thorough cleansing and disinfection of the scalp; (2) the use of chloroform as an anesthetic, morphia having been previously given to reduce cerebral congestion and to obviate excessive hemorrhage during the operation ; (3) strict antiseptic precautions ; (4) a semilunar incision through the soft parts; (5) the use of large trephines; (6) Macewen's method of replacing the bone in small fragments carefully purified. The occurrence of hernia cerebri signifies a failure in the antiseptic pre- cautions, and a primary union of the integuments is a matter of the most extreme importance. In removing the tumour or scar- tissue the knife is preferable to the thermo-cautery.! (A. W. H.)

1 Literature of Cranial Surgery.—Perceval Pott, Injuries of the Head; Sir Astley Cooper, Lect. on Surgery (Tyrell), vol. i.; Sir B. Brodie, Med. Chir. Trans., vol.

Soa, 307

Encouraging cases have disease,

Peri- toneal wound treat- ment.

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2. Thoracic.

rulent collections in the pericardium and pleural sacs may be roe as ordinary abscesses f incision. In the case of the pleural cavity the pus may be evacuated through an opeuing made in the axillary line at the seventh costal interspace ; but it is quite possible to empty it thoroughly at the fifth.

A drainage-tube is inserted, protected by a broad flange, that it may not slip into the cavity, and strict asepsis should be secured. Should sepsis occur, the wound should be washed out, and a counter-opening made if neeessary. As the lung, however, frequently will not expand, and a large cavity is therefore left to heal by granulation, with little chance of it ever getting filled up, surgeons have excised portions of the ribs in order to bring about a collapse of the chest wall and thus ensure obliteration of the cavity. The second, third, fourth, fifth, and sixth ribs have been partially removed, together with a portion of the clavicle. It is better in young people to remove the periosteum also. Some surgeons cut away the thiekened pleura as well. The possibility of opening into the pleural sacs and peri- cardium for the removal of tumours has been demonstrated by Konig and Kiister, who have reported cases where growths in connexion with the sternum and ribs were successfully removed. Special care was taken that as little air as possible should gain access to the pleural eavities. Attcmpts have also been made to tap and wash out vomicz in the lung, but as yet operative interference in such instances is not fully established.

3. Abdominal.

Modern surgery has made its greatest advance and has achieved its most signal triumphs in connexion with operations performed in those cavities of the body which are lined by a synovial or serous membrane. The older surgeons did not dare to systematically attack the joints and the cranial, thoracic, and abdominal cavities ; but the surgeon of to-day performs the most daring operations here with confidence, and is rewarded with a success which at first sight appears almost marvellous. The timid extraperitoneal manipula- tions of former days made use of in the treatment of hernia and kidney disease and in the formation of artificial anus, have now given way to systematic intraperitoneal modes of treatment, where- by we aim at the radical cure of hernia and bring discase affecting any of the abdominal viscera directly under our control. We have to eonsider the conditions under which wound treatment of the peritoneum is placed, and in what respect this portion of the human framework reacts upon injuries as compared with the general be- haviour. It is generally acknowledged that rest in the surgical sense, the factor necessary for healthy wound closure, is obtained by a condition of asepsis and fixation. Moreover, it is generally

granted that tension as a condition of unrest is dangerous not so much in itself as in the character of the material that gives rise to tension ; hence the extravasated serum and blood ina case of simple fraeture give rise to comparatively little disturbance. The presence of ascites need not lead to fever. But oncc let sepsis gain entrance and the fermenting exudate is resented by the organism ; violent attempts to throw it off are made; and forms of blood-poisoning more or less severe and variable ensue. In a severe injury of the extremities, say a compound fracture, the effused serum and blood- clot are not readily removed by the damaged lymphatic system, and, when that does act, sepsis having already occurred, the ab- sorption of the putrid fluid docs much harm. Fortunatcly the open character of the wound may allow the fetid discharge to escape. In any case, the surgeon ensures a good result when he makes use of splints, drainage, and antiseptics. He brings about local fixation, removes the excessive exudation, and so relieves the lymphatics and prevents sepsis. In the case of a penetrating abdo- minal wound, where the healthy peritoneum is injured, we have some- what different conditions, mainly varying in degree. It must cver be borne in mind that here we open into a huge lymph-sac. The peritoneum consists of a sheet of vascular and lymphatic network, covered with epithelium and provided with stomata. It is casily injured, and then rapid effusion ensucs. Like most vascular struc- tures, however, it heals quickly with favourable surroundings, and, the source of irritation having been removed, it speedily returns to the normal. In comparison with the large absorbing surface the injured portion is but small, and the effusion thrown out at the seat of injury may readily enough be absorbed by the remainder of

xiv. ; Hilton, Lectures on the Cranium ; Felizet, Recherches anat. et exper. sur les Sract. du crane, 1873; Aran, Arch. Gén. de Meéd., 4th ser., vol. vi. p.180; Saucerotte, Mélanges de Chirurgie, part i. p. 233, Paris, 1801; Von Wahl, “ Fracturen der Schadelbasis,” in Volkmann’s Series, No. 228; Flourens, Les propriétés et les fone- tions du Systeme Nerveusx, Paris, 1824: Hitzig and Fritsch, in Reichertand Du Bois Reymond’s Archiv, 1870; Hitzig, “ Ueber den heutigen Stand der Frage von der Localisation,” in Volkmann’s Series, No. 112 ; Ferrier, Functions of the Brain, 1876, and West Riding Reports, vol. iii., 1873 ; Hughlings-Jackson, Lond. Hosp. Rep., 1864, and Clin. and Phys. Researches, 1873; Broca, Sur la topographie

crdnio- cerebrale, 1876; Turner, “ Relations of Convolutions to Skull and Scalp,” in Jour. Anat. and Phys., 1878 ; Giacomini, Topograsia della Scissura di Rolando, 1878; Lucas-Championniére, La trépanation guidée par les localisations céré- brales, 1878; Hare, Jour. Anat. and Phys., January 1884; Reid, Lancet, vol. ii., 1884, p. 539; Hughes Bennett and Godlee, Brit. Med. Journ., May 1885 ; Victor Horsley, Brit. Med. Journ., vol. ii., 1886, p. 670.

the healthy sac. So Jong as the rate of absorption equals that of effusion tension cannot exist. If, however, the nature of the fluid be of importance, it is evident that nowhere in the body is this more marked than in the case of the peritoneum, and here above all other parts niust we preserve strict asepsis. This may be gained in vari- ous ways. (1) By drainage, in which case the surgeon carefully draws off from the pouch of Douglas any excess of fluid thrown out as the result of injury, until such time as the peritoneum itself has recovered its full absorbing power and the excessive secretion has ceased. (2) Where by careful sponging the operator so far relieves the peritoneum and then, closing the wound to prevent entrance of further sepsis, leaves the rest to nature. For, if we do permit a moderate scptic inoculation, it is evident that the rapid change of fluid may prove inimical to the development of septic ferments and the contact of healthy tissue will finally render impossible the existence of organisms, The presence, however, of any accumula- tion of putrid cffusion is at once resented by the peritoneum and an attempt by local peritonitis may shut off the collection, or even previous to any local reaction septic absorption may prove fatal, or again severe general peritonitis may kill the patient. (8) From the above we at once see how applicable the antiseptic system must be to the abdomen, and the most signal success has crowned atten- tion to matters of detail in this respect. By means of antiseptics we can securely close the abdomen, resting assured that the peri- toneum is perfectly capable of earrying off effusions due to our interference. Where we dread that oozing may complicate matters, the drainage-tube can in addition be employed, but the necessity for its use becomes less marked as the operator acquires

experience. Abdominal surgery requires from beginning to end the utmost care, and it is well that specialists reached a high standard of success before the adoption of the antiseptic system, since various points have been formulated, all of which, however, are of minor import- ance compared with the one great end in view,—that of asepsis from first to last. The utmost care should be taken to ascertain the general bodily condition of the patient, to see that the kidneys are healthy, and to select an anesthetic suitable to the requirements of the case. The temperature of the room, the clothing during operation, rapid dexterous manipulation, and preventives against hemorrhage require the utmost attention. The patient should be prepared by having had low diet and gentle purgatives for a few days prior to surgical interference, so that rest of the intestinal tract may readily be assured. As a material for ligature fine silk Chinese twist, of various sizes, may be employed. It must be care- fully disinfected by boiling, and is readily preserved pure in a five per cent. solution of carbolic acid. The ends should always be cut short. It possesses certain advantages over catgut.

In reviewing the field of abdominal surgery we must study shortly the methods and results gained by ovariotomy, removal of the uterine appendages (ovaries, Battey; tubcs, Tait), hysterectomy, myotomy, removal of fibroid tumours of the uterus, intraperi- toneal operations on the kidney, liver, spleen, intestinal tract, including stomach, pylorus, duodenum, small and large intestine. Finally, attention should be given to the extraperitoneal operations for sarcoma and disease of the kidney and intestine, i

From 1701, the date when Houston of Carluke, Lanarkshire, Ovario- carried out his successful partial extirpation, progress was arrested tomy. for some time, although the Hunters (1780) indicated the practica- bility of the operation. In 1809 Ephraim M ‘Dowell of Kentucky, inspired by the lectures of John Bell, his teacher in Edinburgh, per- formed ovariotomy, and continuing to operate with success estab- lished the possibility of surgieal interference, and was followed in the United States by many others. The cases brought forward by Lizars of Edinburgh were not sufficiently encouraging ; the operation met with great opposition ; and it was not until Clay, Spencer Wells, Baker Brown, and Keith began work that the pro- cedure was placed on a firm basis and regarded as justifiable. Im- proved methods were introduced, and surgeons vied with one another in obtaining

good results, until by the introduction of the antiseptic system of treating wounds this operation, formerly regarded as one of the most grave and anxious in the domain of surgery, has come to be attended with a lower mortality than any other of a major character. We may now briefly outline the mode employed in operating. The room should be well heated, be free from draughts, have a good light, and above alla pure atmosphere. The patient is secured to a firm table and well protected with blankets. An- zsthesia having been obtained, the state of the bladder being known, and the urine drawn off if thought necessary, the surgeon purifies the integument with carbolic acid five per cent. solution, attending specially to the region of the umbilicus and pubes, which latter should be shaved. A large perforated waterproof sheet may be spread over and secured to the body, through which the more pro- minent part of the tumid abdomen protruding presents a localized field for manipulation ; this also protects adjoining parts and ob- viates unnecessary exposure. An incision 2 or 3 inches in length in the linea alba and midway between the umbilicus and the sym.- physis pubis carries the surgeon down to the interval between the recti; bleeding points arc seized with pressure forceps ; and by a

further use of the knife the subperitoneal fat is exposed, the peri- toneum divided, and its free edges seized with forceps. The operator next introduces his finger and with the scissors enlarges the wound downwards or upwards on the left side of the umbilicus if neces- sary. The entire hand is then introduced between the parietal peritoneum and the tumour and swept around so as to ascertain the condition of affairs, and even to separate gently slight adhesions. A few sponges are next packed round the exposed tumour surface, which serve to kecp the intestincs and omentum out of the way and to retain any tumour content which may escape during tapping. With a large trocar, aided perhaps by an exhausting jar, the con- tents are drawn off, and, as the tumour collapses, its folds may be caught by forceps and the whole sac gradually pulled outside the abdomen. The pedicle is clamped by strong forceps; the tumour is cut off; the stump of the pedicle is carefully ligatured, the clamping forecps removed, the peritoneum carefully sponged out, more especially the pouch of Douglas, the ligature cut short, and the pedicle dropped into the cavity of the abdomen. At this stage the

forceps and sponges are counted, a definite number being always employed, and, their tale being perfect, the surgeon pro- ceeds to close the wound. For this purpose his needle traverses the entire thickness of the parietes from peritoneum to skin; the stitches should be about one-third of an inch apart, and closer apposition is gained by secondary sutures, which go through the integument alone. A dressing is now applied, and for the next few days the patient gets little else than occasional spoonfuls of hot water and milk, unless brandy be necessary, until she passes wind, after which time the usual diet is gradually resumed. It is necessary that the most precise precautions be taken against septic infection. The sponges are steeped in a five per cent. solution of earbolic acid, then dipped in boiling water, and squeezed dry immediately before use. Should the contents of the cyst be too viscid to run through the trocar, the contents of the sac must be pulled out with the hand. Adhesions to various organs must be dealt with by careful separation and ligature. Rents in the peri- toneum should be stitched up with fine catgut, and some operators also stitch over the stump of the pedicle, or bury it in a bared portion of the adjacent broad ligament, so that it may not contract adhesions. While the great majority of surgeons are at one as regards the use of antiseptic precautions, they do not agree as to the use of the spray. Many dispense with it altogether. Some employ it in the room prior to the operation. A few surgeons also, without availing themselves of the antiseptic system, appear to obtain as good, if not better, results than their fellows. It may also be noted that the antiseptic in use by different operators varies, and that, while the pedicle is usually ligatured, Keith attaches great importance to the clamp and cautery introduced by Baker Brown. The drainage-tube is not now so frequently employed as formerly. The statistical results show an increasing success in the case of every surgeon. Spencer Wells tells us that in his first five years one patient in three died, in his second and third five years one in four, in his fourth five ycars one in five, in 1876-77 one in ten, since the introduction of antiseptics (complete Listerism), 1878-84, 10°9 per cent,—the last series showing a marked absence of septic fatality. Keith in 1884 reported a mortality of 9°11 ; for- merly, when using the spray, he once had a successful consecutive series of 80. Koeberle up to 1878 had performed 300 operations, of which 231 had a favourable result. Of 300 patients operated on by Schroeder up to 1882 258 recovered ; in the last hundred cases there were only 7 deaths. Other figures are—Knowsly Thornton, 493 cases, 40 deaths ; Tait, 405

cases, 38 deaths, and in 1885 (in- cluding parovarian cysts) 139 cases, no deaths ; Olshausen (1885), 293 cases, 27 deaths (in the last hundred only 4 deaths).

Removal of the uterine appendages, the ovaries and Fallopian pfuterine tubes, is performed for thrce distinct conditions—(1) for disease, when the tubes are the seat of inflammatory changes and dis- tended, or when the ovaries are the seat of cystic and cirrhotic changes ; (2) for fibroid tumours, in which case by operating we hasten the menopause and briug about involution ; (3) in cases where dysmenorrhea is wearing out and rendering useless the life of the patient, and where less severe treatment is ineffectual. Oophorectomy, by which we mean removal of the ovaries only, was introduced by Battey of Georgia in 1872. It is now replaced by the more extensive procedure of Lawson Tait, sapingo-oophor- ectomy. The operation is sometimes followed by loss of sexual feeling and has been said to unsex the patient, hence strong objec- tions have been urged against it. The patient and friends should clearly understand the object and results likely to be gained. Ac- cording to Angus Macdonald, ‘‘as soon as we are certain that the ovaries or tubes are distinctly diseased and are not likely to yield to our ordinary methods of treatment . . . we are bound to at least inform our patient of the possibility of relieving her by opera- tion. The operation presents greater difficulties and is associated with a higher mortality than ovariotomy.” The greatest care must be taken in making the initial incision for fear of wounding the bowel. The organs are not uncommonly deeply placed and have contracted adhesions. Every trace of ovarian tissue should be

removed along with the tubes and the ligatures must be carried close up to the uterus. The stitches should be placed closer, since a ene Ma hernia is greater.

In cases of fibroid tumour—myoma—the surgeon must be largel = guided by the condition of the patient and the new growth as A a whether removal of the uterine appendages is sufficient. If it is not and the patient is in such

danger that the next period threatens life, he had better proceed to hysterectomy or entire removal of the uterus and appendages. When we consider the circumstances under which this operation is performed, the weakly anemic state of the patient, the size of the tumour, and the rapidity with which procedure should be conducted, we must regard hysterectomy as one of the gravest in the domain of surgery. There is, moreover, a special danger which does not obtain in ovariotomy,—the risk of septic poisoning. Since we cut into the canal of the uterus, it is obvious that we open into a septic cavity, and it is impossible merely to ligature and drop the pedicle, since by doing so we should court failure. The surgeon, having made a way into the peritoneum,

‘seizes and ligatures adhesions, projects the: tumour through the

wound, clamps the pedicle (cervix uteri), removes the tumour and uterus, and closes the wound, leaving the clamped pedicle protrud- ing. It is advisable to scoop out the septic central canal of the pedicle and carefully to pare away surplus tissue, and as dressing to have a plentiful supply of some potent non-irritating antiseptic in contact with the stump. If we take care that the septic focus is removed without coming in contact with its surroundings, if we keep the stump aseptic and dry, there will be little fear of septic fluid trickling down the side of the pedicle and causing septus, peritonitis, or blood-poisoning. Attempts have been made, by care- ful disinfection of the stump, paring its centre, careful ligature, and stitching its raw surfaces together, to treat the pedicle by dropping it into the abdomen as in ovariotomy, but as yet with no marked success. The results of hysterectomy in the hands of Keith (33 cases, 8 deaths, in 1885) stand unrivalled. Similar principles guide the performance of cesarean section and Porro’s operation.

Affections of the liver and gall-bladder have also been treated Removal

by laparotomy. In the latter case an incision is made over the of gall-swelling, and the gall-bladder, having been exposed, may be removed bladder ; or explored, gall-stones cleared out, the walls stitched to the sides of the abdominal wound, and a drainage-tube inserted as occasion requires. The spleen has also been attacked. In removal of the spleen ; entire organ spccial care must be taken that none of the larger veins give way during

manipulation. Most careful ligation and sub- division of the pedicle is requisite. In recent years the surgery of the kidney has made gigantic strides. There are three modes of kidney ; reaching the organ, each of proportionate value according to the nature of the case. (1) From the lumbar region. In this way we may open abscesses, remove calculi, and even extirpate if the kidney be not enlarged. Increased room may be obtained by re- moving the twelfth rib. By this method we gain sufficient and dependent drainage and we need not open the peritoneum. (2) As in ordinary laparotomy, making an incision in the middle line. This admits of our examining both organs and to a large extent determining the condition of each. We get free access and cau more readily treat the pedicle of vessels and the ureter. We open into the peritoneal cavity and again divide the peritoneum ; but our incisions are readily closed and we no longer dread interfering with this huge lymph-sac. For tumours of the kidney this method is clearly indicated. (3) Langenbuch has proposed making an incision along the outer border of the rectus, which is said to present advantages in certain cases.

Since the advance of ovariotomy the possibility of removal of portions portions of the intestinal tract with a subsequent suture of the of intes- divided ends has been repeatedly demonstrated, and thus resections tinal for disease of the pylorus and bowel have been successfully performed. tract. In cases of gunshot wound, laparotomy, arrest of hemorrhage, careful cleansing of the peritoneum, and suture of the wounded gut is now the established practice. Bull of New York reports a recovery in a case where seven wounds in the gut were sutured. All laparo- tomies are founded on the type of ovariotomy ; success depends on the fact that two opposed serous surfaces rapidly unite, and this fact must ever be borne in mind when we tear or injure the bowel and its coverings, or unite them. Sepsis is the main disaster likely to attend our intcrference, but with the means at our disposal, washing out the peritoneum if necessary, we should be able to obviate this.

In regard to operations on the abdominal organs in which we do not interfere with the peritoneum it is sufficient to note that from the lumbar region we can reach the colon, where it is uncovered by serous membrane, the kidney, and retroperitoneal tumours.’ (F, M. C.)

4, Deformities.

(1) For club-foot, see vol. vi. p. 42. (2) During the last few years, in consequence of the safety with es SS

1 The literature of abdominal surgery is very extensive. The most complete lists will be found in Olshausen's "Die Krankheiten der Ovarien," in Die deutsche Chirurgie, 1886, and in Hart and Barbour's Manual of Gynecology.

a diminished growth. This effect may be obtained by applying a weight to the limb; and by mechanical means founded on this general law cases of knock-knee that are getting worse can be im- proved. At first there is an arrest in the abnormality, which is soon followed by improvement. The different methods that have been recommended for division of the bones are only necessary in those cases in which they have become permanently distorted.

(3) Lateral curvature of the spine is a deformity which occurs Spina] during the developing period of life before the bodies of the verte- curva. bre are fully ossified. In young people who are growing rapidly, ture. and whose muscular system is weak, any bad habit, as, for example, that of standing and throwing the weight of the body constantly

Knoek- which boues may be divided, other deformities, such as knock-knee knee, &e. or genu valgum and bow-leg or genu varum, have been remedied by operation. Drs Macewen of Glasgow, Ogston of Aberdeen, Sehede of Hamburg, and the sea writer have been working at this subject and have devised, more especially in knock-knee, various methods of remedying the deformity. Operations are only justifiable when the deformity has become chronic. During the advancing stage, when the deformity is getting worse, when the bones are still cartilaginous and plastic, the evil can be remedied by mechanical means, This statement may be best illustrated by a short consideration of the developnient of the lower limbs and

the changes which normally take place. At birth all children are more or less bandy-legged. The child lies on its nurse’s knee with the soles of the feet facing one another ; the tibis and femora are curved outwards; and, if the limbs are extended, although the ankles are in contact, there is a distinct space between the knee joints. During the first year of life a gradual change takes place. The knee joints approach one another ; the femora slope downwards and inwards towards the knee joints; the tibie become straight ; and the sole of the foot faces almost directly downwards. While these changes are occurring, the bones, which at first consist prinei- pally of cartilage, are gradually becoming ossified, and in a normal ehild by the time it begins to walk the lower limbs are prepared, both by their general direction and by the rigidity of the bones which form them, to support the weight of the body. If, how- ever, the child attempts either as the result of imitation or from encouragement to walk before the normal bandy condition has passed off, the result will necessarily be either an arrest in the development of the limbs or an increase of the bandy condition. If the child is weakly, either rachitic or suffering from any ailment which prevents the due ossification of the bones, or is improperly fed, the bandy condition may remain persistent. As a rule, how- ever, in children that are precocious as regards walking, if proper carc is taken the bandy condition will disappear without any spccial treatment. Ina healthy child who does not attempt to walk until the limbs are prepared to support the weight of the body, no further abnormal change takes place. But in a weakly child in whom the development already described has occurred, in whom the limbs as regards their general direction are prepared for the support of the body, but in whom the bones forming the limbs are not sufficiently ossified, as in the rachitic child, the shafts of the femora above the knee and the shafts of the tibise below the knee bend forwards; at the same time a change takes place at the knee joint,—the condition called knock-knee. In the normal limbs, the tibie being vertical and parallel, and the distance between the upper extremities of the femora being greater than that between their lower extremities, the femora necessarily slope inwards towards the middle line, and there is therefore in every properly developed person an angle at the knee joint. If at this stage the bones are sufficiently rigid to bear the weight of the patient, no further change takes place; but, if the limbs give way and are not sufficiently strong, the normal angle at the kuee joint increases and the internal lateral ligament of the knee joint becomes stretched,—the result

being knock- knee, The condition may be arrested in its earliest stage by an improve- ment in the general health of the child; but, if no such improve- ment takes place, and if the child is allowed to walk, then definite changes occur in the bones which form the knee joint. These changes are the direct outcome of a general law, namely, that diminished pressure results in increased growth, increased pressure in diminished growth. The best example of the former principle is the rapid growth that takes place in a child that is confined to bed during a prolonged illness. The distorted, stunted, shortened, and fashionable foot of the Chinese lady is an example of the latter. In the knee joint there is diminished pressure between the internal condyle of the femur and the inner condyle surface of the tibia ; there is increased pressure between the external condyle of the femur and the outer condyle surface of the tibia. The result is an increased growth of the internal and a diminished growth of the external condyles ; the knock-kneed condition is intensified, and will go on as long as the primary cause is at work, getting worse and worse, and will only cease when the bones become fully de- veloped. As long as the disease is getting worse, the application of a rigid splint to the outer side of the limb fixed at the foot and at the upper part of the thigh, and the arrangement of an elastic bandage so as to draw the limb towards the splint, the person being kept in the horizontal posture, will cause a diminution in the pres- sure on the external condyles followed by their increased growth, and by an increased pressure on the internal condyles followed by

on one leg, gives rise to a drooping of the pelvis on one side ; or, if, when writing at a desk, they are allowed to sit in a twisted position, a lateral curvature of the spine takes place. By constant indulgence in these bad habits the cartilaginous spinal column gets set in an abnormal direction. In the concavity of the curve there is increased pressure and necessarily diminished growth, in the con- vexity of the curve diminished pressure with increased growth, The patient’s friends will probably notice first the right scapula being pushed backwards by the underlying ribs, which from their close attachment to the dorsal vertebre participate in a rotatory movement occurring in the vertebre themselves, and, unless means are taken to alter the abnormal distribution of pressure, the con- dition will become worse and worse, until complete ossification checks the progress of the deformity. The commonest curvature is one in which there is a dorsal convexity

towards the right, with the right shoulder higher than the left. Compensatory curves in the opposite direction form in the lumbar and cervical regions. Along with the lateral curvation a rotation of the bodics of the vertebree towards the convexity of the curve takes placc; their spinous processes necessarily turn towards the concavity of the curve. Since the line of the spinous processes of the vertebrx can be easily traced through the skin, their deviation may mislead the superficial observer as to the true direction in which curvature has taken place. As the lateral curvation occurs the articular facets along the line of the concavity are pressed together, the line of these facets being posterior to the bodics of the vertebre and their intervening elastic intervertebral disks. The result of this is that the vertebral column as a whole cannot fly away towards the convexity. The anterior parts of the bodies, being farthest away from the fixed point, are least restrained from movement, and they pass away toa greater extent than the posterior parts. The result is a rotation of each vertebra in the direction indicated. To counteract this deformity in the earliest stages, the patient (generally a girl) should be en- couraged to walk about with a book on her head, to retain which in position she must necessarily keep perfectly ercct. Muscular exercises, to strengthen the muscles of the back, ought to be en- joined and superintended by the surgeon. During the intervals of rest she should lie upon her back on a firm board, and should care- fully avoid taking any exercise which gives rise to weariness of the muscles ; for, whenever the muscles become wearied, she will at- tempt to take up a position which throws the strain off them on to her ligamentous and bony structures. One of the best exercises is to lay the patient on her face, fix her feet, and encourage her to raise herself by using the muscles of the back. When the deformity becomes more marked the use of the trapeze should be prescribed. Hanging with her arms upon the trapeze, the weight of the lower limbs and pelvis will tend to straighten the spine as a whole, neces- sarily diminishing the increased pressure upon the cartilaginous bodies of the vertebrae towards the concavity, and increasing the pressure between the sides of the bodies towards the convexity. The tendency to rotation must be counteracted in another way. The pelvis being fixed, elastic bands attached to fixed points, one in front of the patient towards her left side, another behind her to- wards her right side, are to be grasped by her right and left hands respectively, the right arm passing in front of her body, the left arm behind it. When the patient stretehes both hands simul- taneously there will

be an untwisting of the spine in a direction opposite to the abnormal rotation. In this description, the com- mon curvature—namely, of the dorsal region towards the right — has been taken as a typical example to illustrate the treatment. When the dorsal curve is in the opposite direction, the untwisting of the curve must necessarily be in the opposite direction also. During the intervals of active treatment the patient must wear a rigid support, which in itself has no direct curative action, but will materally assist the treatment by preventing the good result obtained by the muscular excrcises from being nullified. (J. ©.)

SURINAM. See Gurana, Durcn, vol. xi. p. Zoe

SURRENDER is a mode of alienation of real estate. It is defined by Lord Coke to be “the yielding up of an estate for life or years to him that hath an immediate estate in reversion or remainder” (Coke upon Littleton,

337b). It is precisely the converse of release, which is a

conveyance by the reversioner or remainderman to the tenant of the particular estate. A surrender is the usual means of effecting the alienation of copyholds. The sur- render is made to the lord, who grants admittance to the

purchaser, an entry of the surrender and admittance being made upon the court rolls. Formerly a devise of copy- holds could only have been made by surrender to the use of the testator’s will, followed by admittance of the devisee. The Wills Act of 1837 now allows the devise of copyholds without surrender, though admittance of the devisee is still necessary. A surrender must since 8 and 9 Vict. c. 106 be by deed, except in the case of copyholds and of surrender by operation of law. Surrender of the latter kind generally takes place by merger, that is, the com- bination of the greater and less estate by descent or other means without the act of the party. It has been dealt with by recent legislation (see REMAINDER). In Scotch law surrender in the case of a lease is represented by renunciation. The nearest approach to surrender of a copyhold is resignation 7 remanentiam (to the lord) or resignation iz favorem (to a purchaser). These modes of

conveyance are now practically superseded by the simpler forms introduced by the Conveyancing Act, 1874.

SURREY, a metropolitan county of England, is bounded north by the Thames, which separates it from Berks and Middlesex, east by Kent, south by Sussex, and west by Hampshire. Owing to the fact that it includes a portion of London, it ranks fourth among the counties of England in point of population, but in point of size it is only the thirtieth, the total area being 485,129 acres, or 758 square miles.

The geological structure of Surrey is reflected in its varied and picturesque scenery, the charms of which are enhanced by the large proportion of ground still remaining uncultivated. The extent of common land is also very great, a circumstance which, from its proximity to London, must be considered as specially fortunate. The northern portion of the county, in the London basin, belongs to the Eocene formation: the lower ground is occupied chiefly by the London clay of the Lower Eocene group, stretching (with interruptions) from London to Farnham ; this is fringed on its southern edge by the plastic clays or Wool- wich beds of the same group, which also appear in isolated patches at Headley near Leatherhead; and the Thanet sands of the same group crop out under the London clay between Beddington, Banstead, and Leatherhead. The north-western portion of the county, covered chiefly by heath and Scotch fir, belongs to the Middle Eocene group, or Bagshot sands: the Fox Hills and the bleak Chobham Ridges are formed of the upper series of the group, which rests upon the middle beds occupying the greater part of Bagshot Heath and Bisley and Pirbright Commons, while eastwards the commons of Chobham, Woking, and Esher belong to the lower division of the group. To the south of the Eocene formations the smooth rounded outlines of the chalk hills extend through the centre of the county from Farnham to Westerham (Kent). From Farnham to Guild- ford they form a narrow ridge called the Hog’s Back, about half a mile in breadth with a high northern dip, the greatest clevation reached in this section being 505 feet. ast of Guildford the northern dip decreases, and the outcrop widens, throwing out picturesque summits, frequently partly wooded, and commanding widely variegated views, the highest elevation being Botley Hill near Titsey, 866 feet. The Upper Greensand or grey chalk mazl, locally known as firestone, crops out

underneath the Chalk along the southern escarpment of the Downs, and the Gault, a dark blue marl, rests beneath the Upper Greensand in the bottom of the long narrow valley which separates the chalk Downs from the well-marked Lower Greensand hills. Leith Hill of this formation reaches a height of 967 feet, and from its isolated position commands one of the finest views in the south of England, the next highest summits being Hindhead Hill (894 feet) and Holmbury Hill (857

feet). The southern part of the county belongs to the Wealden formation of freshwater origin: the lower strata or Hastings beds occupy a small portion at the south- eastern corner, but the greater part consists of a blue or brown shaly clay, amid which are deposited river shells, plants of tropical origin, and reptilian remains.

The whole of the county north of the Downs is in the basin of the Thames. Besides a number of smaller streams, its chief affluents from Surrey are the Wey at Weybridge, the Mole at East Moulsey, and the Wandle at Wandsworth. The Eden, a tributary of the Medway, takes its rise in the south-east corner of Surrey.

According to the agricultural returns for 1886, of the total area of the county 299,034 acres were under cultivation, 77,553 being under corn crops, 44,998 under grecn crops, 26,741 rotation grasses, 138,117 permanent pasturc, 2547 hops, and 9078 fallow. There are considerable varieties of soil, ranging from plastic clay to calcareous earth and bare rocky heath. The plastic clay is well adapted for wheat, the most largely grown of the corn crops, occupying 29,694 acres in 1886, while barley, oats, and pease, which grow well on the loamy soils in different parts of the county, occupied respectively 15,439, 24,705, and 4587 acres, beans occupying 1872 and rye 1256. Of green crops there were 64382 acres under potatoes, 15,975 under turnips and swedes, 9995 man- golds, 860 carrots, 2660 cabbage, kohl-rabi, and rape, and 9076 vetches and other green crops. A considerable proportion of the area uuder green crops is occupied by the market gardens on the alluvial soil along the banks of the Thames, especially in the vicinity of London. The total area of nursery grounds in 1886 was 1466, and of market gardens 2953 acres. In early times the market

gar- deners were Flemings, who introduced the culture of asparagus at Battersea and of carrots at Chertsey, for which this district is still famous. The avea under orchards in 1886 was 2144 acres. Rhodo- dendrons and azaleas are largely grown in the north-western district ofthe county. In the ncighbourhood of Mitcham various medicinal plants are extensively cultivated for the London herb-sellers and druggists, such as lavender, mint, camomile, anise, rosemary, liquorice, hyssop, &c. The calcareous soil in the neighbourhood of Farnham is well adapted for hops, but this crop in Surrcy is of minor importance. There is a considerable area under wood (42,974 acres in 1881). Oak, chestnut, walnut, ash, and elm are extensively planted ; alder and willow plantations are common ; and the Scotch fir propagates naturally from seed on the commons in the north-west of the county. The extent of pasture land is not great, with the exception of the Downs, which are chiefly occupied as sheep-runs. Dairy-farming is a more important industry than cattle-feeding, large quantities of milk being sent to London. The number of horses in 1886 was 9930, of which 3273 were unbroken horses and mares kept solely for breeding; of cattle 49,986, of which 24,869 were cows and heifers in milk or in calf and 8699 other cattle two years old and above; of sheep 87,658 ; and of pigs 25,172.

‘According to the latest (1873) landowners Return for England, Surrey was divided among 17,298 proprietors possessing 398,746 acres at an annual value of £2,285,814, in addition to which there were 40,037 acres of common lands. Of the proprietors 12,712, or nearly two-thirds, possessed less than one acre each, the total which they owned being 2861 acres. ‘The average annual rental per acre of the land all over was about £5, 14s. 9d. The following proprietors held over 5000 acres eagh :—earl of Lovelace, 9958; crown, 7496; earl of Onslow, 6563 ; Sir W. R. Clayton, 6505; G. W. G. Leveson- Gower, 6368. ;

Manufactures.—The more important manufactures are chiefly confined to London and its immediate neighbourhood (see Lonpoyn, vol. .xiv. p. 832). There are paper-mills at Wandsworth, and along the valley of the Wandle there are snuff, drug, and copper mills. Calico bleaching and printing are carried on to a small extent in the same valley, and there are also a few silk mills and tanneries. Ropes, snuff, and drugs are likewise manufactured

along the banks of the Mole. Woollen goods and hosiery are made at Godalming, and gunpowder is largely manufactured at Chilworth. —

Communication._In addition to the navigation by barges, steamers ply on the Thames as far as Hampton. The Basingstoke Canal from Basingstoke to the Wey at Weybridge crosses the north- west corner of the county, and the Surrey and Sussex Canal passes southwards from the Wey near Guildford to the Arun. Surrey is more completely supplied by railways than any other county in England, the London, Chatham, and Dover, the South-Eastern, the London, Brighton, and South Coast, and the London and South-Western Railways intersecting it by their main lines as wellas by various branches.

Administration and Population.—Surrey contains 14 hundreds ; the borough of Southwark (pop. 221,946), which has no municipal government, but for certain purposes is connected with the city of

London ; and the municipal boroughs of Godalming (2505), Guild- ford (10,858), Kingston-upon-Thames (20,648), and Reigate (18,662).

A considerable portion (22,472 acres, with a population in 1881 of

980, 522) is within the metropolitan district of London, in addition to which there are the following urban sanitary districts—Alder- shot (20,155), Croydon (78,953), Dorking (6328), East Moulsey (3289), Epsom (6916), Farnham (4488), Ham Common (1349), Hampton Wick (2164), New Malden (2538), Richmond (19,066), Surbiton (9406), Teddington (6599), and Wimbledon (15,950). The county has one court of quarter sessions, and is divided into twelve petty and special sessional divisions. The central criminal court has jurisdiction over certain parishes in this county. The borough of Guildford has a separate court of quarter sessions and commission of the peace ; the boroughs of Reigate and Kingston-upon-Thames have commissions of the peace; the borough of Southwark is in- cluded in the petty sessional division of Newington ; and the borough of Godalming, in which the mayor and ex-mayor are magis-

trates, forms part of the petty sessional division of Guildford, the

county justices having concurrent jurisdiction. The county con- tains 152 civil parishes, with parts of two others. It is shared among the dioceses of Canterbury, Rochester, and Winchester. Until 1885 the county for parliamentary purposes was divided into East, Mid, and West Surrey ; it is now rearranged in six divisions, viz., Kingston, Mid (Epsom), North-East (Wimbledon), North- West (Chertsey), South-East (Reigate), and South-West (Guildford). The portion of Surrey formerly included in the borough of Green-

wich was in 1885 included in the borough of Deptford (Kent) ; the borough of Guildford was disfranchised ; one member was given to Croydon; and instead of the two metropolitan boroughs of Lambeth and Southwark the following fifteen constituencies (each

returning one member) were created :— Battersea and Clapham,

constituting two divisions; Camberwell, embracing the divisions of Lambeth, embracing the divisions of Brixton, Kennington, Lambeth North, and Norwood 2

North Camberwell, Dulwich, and Peckham ;

Southwark, containing the divisions of Bermondsey, Rotherhithe, and Southwark West; Wandsworth; and divisions of Walworth and West Newington.

Since the beginning of the 19th century the population has in- creased nearly 600 per cent. From 268,233 in 1801 it had increased by 1821 to 399,417, by 1851 to 683,082, by 1871 to 1,091,635, and by 1881 to 1,436,899, of whom 683,228 were males and 753,671 The number of persons to an acre is 2°96 and of acres to

females. a person 0°34. Within the last decade the increase has been 35°1

per cent.,—much greater than the inercase in the general town

population of England and Wales, which was 19°63 per cent., the increase in the whole population being only 14°34. thirds (980,522) of the population belong to the metropolitan district of London, but the suburbs of London extend practically throughout the greater part of the county, its increase in popu- lation being chicfly due to the building of residences for those who have business or professional interests in London.

History and Antiquities. Notwithstanding its proximity to London, Surrey has been associated with few great events in English history. Roman remains have been discovered at Albury, Kingston, Titsey, Woodcote, and a few other places, but none are of much importance. On several of the hills there are remains of camps of either Roman or British origin. The Roman Stance Street from London to Chichester in Sussex passed by Kingston, Chessington, Leatherhead, Dorking (where its remains are specially well marked), Leith Hill, and Ockley. During the Saxon period Surrey was included in the dominions of the South Saxons and afterwards of Wessex. Its name Surrey or “south kingdom” has apparently reference to its position sonth of London or south of the Thaines. Kingston in Surrey was in 838 the seat of a witana- gemot convened by Egbert; and after the capture of Winchester by the Danes it was from 901 to 978 the place where the Anglo-Saxon kings were crowned. Surrey was an earldom of Godwine ; and after the conquest was bestowed on William de Warren, who had married Gundrada, supposed to have been a danghter of the Conqueror. From the time that the great charter was on 15th June 1215 signed by King John at Runnymede near Egham the historical annals of the county are a blank, until the period of the Civil War, when a skirmish took place, 7th June 1648, at Kingston.

_ The only ecclesiastical ruins worthy of special mention are the picturesque walls of Newark Priory, founded for Augustinians in the time of Richard Coeur de Lion ; and the Early English erypt and part of the refectory of Waverley Abbey, the earliest house of the Cistercians in England, founded in 1138 by William Gifford, bishop of Winehester. The Annales Waverlienses, published by Gale in his Seriptores and afterwards in the Record series of Chronicles, are supposed to have suggested to Sir Walter Scott the name of his first novel. The ehnrch architecture is of a very varied kind, and has no peculiarly special features. Among the more

interesting churches are Albury, the tower of which is of Saxon or very early Norman date ; Beddington, a fine example of the Perpendicular, and containing monuments of the Carew family ; Chaldon, remarkable for its fresco wall-paintings of the 12th century,

Newington, with the

Nearly two-

Mary, but died before he was out of his teens.

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discovered during restoration in 1870 ; Compton, which, though mentioned in Domesday, possesses little of its original arehitecture, but is worthy of notice for its two-storied chancel, and its carved wooden balustrade surmounting the pointed Transition Norman arch which separates the nave from the chancel ; St. Mary's, Guild- ford, containing examples of Norman, Early English, Decorated, and Perpendicular, but is of interest chiefly for the grotesque carv- ing on the corbels of the aisles and the coloured medallions on the roof of the north chapel ; Leigh, Perpendicular, possessing some very fine brasses of the 15th century ; Lingfield, Perpendicular, containing ancient tombs and brasses of the Cobhams; Ockham, chiefly Decorated, with a lofty embattled tower, containing the mau- soleum of Lord Chancellor King (d. 1734), with full-length statue of the chancellor by Rysbroeck ; Reigate, chiefly Perpendicular, but with Transition Norman pillars in the nave ; Stoke d'Abernon, Early English, with the earliest extant English brass, that of Sir John d'Abernon, 1277; and Woking, Decorated, with Early English chancel. Of old castles the only examples are Farnham, occupied as a palace by the bishops of Winchester, originally built by Henry of Blois, and restored by Henry III.; and Guildford, with a strong quadrangular Norman keep. Ancient domestic architect- ure is, however, well represented, the examples including Bedding- ton Hall, now a female orphan asylum ; the ancient mansion of the Carews, rebuilt in the reign of Queen Aune, but still retaining the hall of the Elizabethan building ; Crowhurst Place, built in the time of Henry VII., the ancient seat of the Gaynesfords, and fre- quently visited by Henry VIII.; portions of Croydon Palace, an ancient seat of the archbishops of

Canterbury ; the gate tower of Esher Place, built by William of Waynflete, bishop of Winchester, and repaired by Cardinal Wolsey ; Archbishop Abbot's hospital, Guildford, in the Tudor style; the fine old Elizabethan house of Losely near Guildford ; Cowley House, Chertsey, originally of the time of James I., inhabited by the poet Cowley from the Restora- tion till his death ; Smallfield Place, now a farmhouse, at one time the seat of Sir Edward Bysshe, garter king-at-arms ; and Sutton Place, dating from the time of Henry VIIL, possessing curious mouldings and ornaments in terra-cotta. Among the cminent persons specially connected with Surrey may be mentioned George Abbot, archbishop of Canterbury, the son of a cloth. worker in Guildford ; Arthur Onslow, born at Merrow in 1691, who became member for Guildford and speaker of the Honse of Commons 3; Sir William Temple, who had his residence at Moor Park, where he died in 1699; Sir Nicolas Carew, beheaded for conspiracy in 1539, and other members of the family, who had their ancestral seat at Beddington ; John Evelyn, the diarist, who was born at Wotton in 1620; Malthus, the political economist, who was born at the Rooke, near the same place, in 1766; William Cobbett, who was born near Farnham in 1762; Horne Tooke, who was born at Westminster, wrote his well-known book at Purley, and died at Wimbledon in 1812; the historian Gibbon, who was born at Putney in 1737, whieh was also the birthplace of Cromwell, the minister of Henry VIII.

See Topley's Geology of the Weald and Whitaker's Geology of London Basin, forming part of the Memoirs of Geological Survey of United Kingdom; Surrey Archzological Collections; Aubrey, Natural Hi istory and Antiquities of Surrey, 5 vols., 1718-19 ; Manning and Bray, Hist. and Antiq. of Surrey, 1809-14; Bray- ley, Topograph. Hist. of Surrey, 5 Vols., 1841-46 ; Lysons, Environs of London, 5 vols., 1800-11 ; Baxter, Domesday Book of Surrey, 1876. (T. F. H.)

SURREY, Henry Howarp, Ear oF (15162-1547), one of the leaders in the poetic movement under Henry VIII. that heralded the great outburst of the Elizabethan period. Of his personal life outside his poetry only the barest out- line is known, and till comparatively of late even that outline was not free from confusion. Three different men— the grandfather of the poet, his father, and the poet him- self—bore the title within a period of ten or eleven years ; and at one time the poet was confounded with his grand- father, and

supposed to have been present at the battle of Flodden (1513). He was not born till at least two years after that event. It was his grandfather who distinguished himself at Flodden under the title of the earl of Surrey, and was created duke of Norfolk as a reward for his services, surrendering the title of Surrey to his son, the poet's father, for his lifetime. Although the poet has always been most familiarly known as the earl of Surrey, he really held the title only by courtesy, succeeding to it on that footing in 1524, when his father became duke of Norfolk. In one of his poems he speaks of having passed "his childish years" at Windsor "with a king's son." This was Henry VIII.'s natural son, Henry Fitzroy, duke of Richmond, who was affianced to Surrey's sister, It is

sometimes said that the two were educated together at Windsor; but the sweet companionship to which the poem refers, when the two youths "hoved" in the large green courts "with eyes cast up into the maiden's tower," belongs to the last year of Fitzroy's short life. Whether or not Surrey was educated from literal childhood with a king's son, he was certainly educated with the care for literary culture which about that time became common in the households of English noblemen; and, as the fashion was, he was sent, after passing through Cambridge, to complete his education in Italy. The tradition that he made the tour of Europe as a knight-errant, upholding against all comers the superiority of his mistress Geraldine, has no extrinsic evidence in its favour. If Geraldine was, as is commonly supposed, Elizabeth Fitzgerald, a daughter of the earl of Kildare, she was but a child of seven or eight years when Surrey set out on his travels. The legend about his knight-errantry is probably only a sign of the extent to which his chivalrous personality and poetry fascinated the imagination of his own and the next generation. The eminence of the Howards at Henry's court was evidenced in many ways: in the festivities at the king's marriage with Anne of Cleves, Surrey was the leader of one of the sides at the tournament, and two years later his cousin, Catherine Howard, became the king's fifth wife. Surrey took an active part in the insignificant wars of Henry's later years, accompanied the expedition, led by his father, which ravaged the south of Scotland in 1542, and held a command in the French expedition of 1544. When the king's death was

known to be near, the duke of Norfolk was suspected of aiming at the throne, and Surrey's own haughty and ostentatious manners countenanced the sus- picion. A month before the king's death both were arrested and lodged in the Tower, and on 13th January 1547 Surrey was brought to trial for high treason. The main charge against him was that he had "falsely, mali- ciously, and treacherously set up and borne the arms of Edward the Confessor." His plea that the arms belonged to his ancestors was probably not accepted as an extenua-

tion of the offence. A common jury found him guilty, and he was executed on Tower Hill on 19th January.

_ His poems, which had been one of the occupations of his crowded life, first appeared in print in Tottel's Miscellany in 1557. On the title-page of this memorable publication Surrey's name stood first, but this was probably in deference to his rank ; Wyatt was the first in point of time of Henry's " courtly makers" (see WYAtTT). Surrey, indeed, expressly acknowledges Wyatt, who was several years his senior, as his master in poetry. Seeing, however, that their poems were first published in the same volume, many years after the death of both, their names can never be disassociated, and it must always be hard to say which was the leader in the various new and beautiful forms of verse which Tottel's Miscellany introduced into English poetry. Surrey's only unquestionable distinction asa metrician lies outside the Miscellany: his trans- lation of the second and fourth books of the 4/ncid into blank verse —the first attempt at blank verse in English—was published separately by Tottel in the same year. But his sonnets (in various schemes of verse), his elegy on the death of Wyatt (in elegiac staves shut in by a final couplet), his pastoral poem (a lover's complaint put into the mouth of a shepherd), and his lyrics in livelicr measures are all extremely interesting experiments, and served as models for more than one generation of courtly singers and sonneteers. In form as well as in substance Surrey and his compeers were largely indebted to Italian predecessors ; most of his poems are in fact translations or adaptations of Italian originals. The tone of the love sentiment was new in English poetry, very different in its earnestness, passion, and fantastic extravagance from the lightness, gaiety,

and humour of the Chauccrian school. In this respect Totéel's Miscellany helped to educate the English muse for the triumphs of the tragic drama. Surrey's own con- tributions are distinguished by their copious and impetuous eloquence and sweetness.

SURROGATE is a deputy of a bishop or an ecclesiastical judge, acting in the absence of his principal, and strictly bound by the authority of the latter. At present the chief duty of a surrogate is the granting of marriage licences. Quite recently judgments of the arches court of Canterbury have been delivered by a surrogate. The office is unknown in Scotland, but is of some importance in the United States. In the State of New York the surrogate's court is a court of record, with jurisdiction over the administration of the personal estate of a deceased person and certain other matters. In New Jersey the surrogate is an official of

the orphans' court, grants unopposed probates, &c.

SURVEYING

URVEYING is the art of determining the relative positions of prominent points and other objects on

the surface of the ground and making a graphical delinea- tion of the included area. The general principles on which it is conducted are in all instances the same: cer- tain measures are made on the ground and corresponding measures are protracted on paper, on a scale which is fixed at whatever fraction of the natural scale may be most appropriate in each instance. The method of operation varies with the magnitude and importance of the survey, which may embrace a vast empire or be restricted to a small plot of land. All surveys rest primarily on linear measures for direct determinations of distance ; but these are usually largely supplemented by angular measures, to enable distances to be deduced by the principles of geome- try which cannot be conveniently measured over the surface of the ground where it is hilly or broken. The nature of a survey depends on the proportion which the linear and the angular measures bear to each other ; it may be purely linear or even purely angular, but is generally a combina- tion of both methods. Thus in India there are numerous instances of large tracts having been surveyed by the purely

linear method, in the course of the revenue surveys which were initiated by the native Governments. The operations were conducted by men who had no knowledge of geometry or of any other measuring instrument than the rod or chain, and whose principal object was the determination of fairly

accurate areas ; their methods sufficed for this purpose and were accepted and perpetuated for many years by the Euro- pean officers to whom the revenue assessments became en- trusted after the subversion of the native rule. In India, too, there are extensive tracts of country which have been surveyed by the purely angular method, either because the ground did not permit of the chain being employed with advantage, as in the Himalayan mountains and hill tracts generally, or because the chain was considered politically objectionable, as in native states where it would have been regarded with suspicion.

Surveys of any great extent of country were formerly constructed on a basis of points whose positions were fixed astronomically, and in some countries this method of opera- tion is still of necessity adopted. But points whose relative positions have been fixed by a triangulation of moderate accuracy present a more satisfactory and reliable basis ; for astronomical observations are liable, not only to the well-known intrinsic errors which are caused by uncer- tainties in the catalogued places of the moon and stars, but to external errors arising from deflexions of the plumb line under the influence of local attractions, and these of themselves materially exceed the errors which would be generated in a fairly executed triangulation of a not ex- cessive length, say not exceeding 500 miles. The French Jesuits who made a survey of China for the emperor about 1730 appear to have been the first deliberately to discard

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outlines. over the southern peninsula.

the astronomical and adopt the trigonometrical basis. In India the change was made in 1800, when what is known as the Great Trigonometrical Survey was initiated by Major Lambton—with the support of Colonel

Wellesley, after- wards Duke of Wellington—as a means of connecting the several surveys of routes and districts which had already been made in various parts of the country, and as a basis for future topography. This necessitated the inception of the survey as an undertaking calculated to satisfy the re- quirements of geodesy as well as geography, because the latitudes and longitudes of the points of the triangulation had to be determined for future reference,—as in the case of the discarded astronomical stations, though in a different manner,—by processes of calculation combining the results of the triangulation with the elements of the earth's figure. The latter were not then known with much accuracy, for so far geodetic operations had been mainly carried on in Europe, and additional operations nearer the equator were much wanted ; the survey was conducted with a view to supply this want. Thusa high order of accuracy was aimed at from the very first. In course of time the operations were extended over the entire length and breadth of Hin- dustan and beyond, to the farthest limits of British sway ; they cover a larger area than any other national survey as yet completed, and are very elaborate and precise. Thus, as triangulation constitutes the most appropriate basis for survey operations generally, a short account will be given of (1) the methods of the Great Trigonometrical Survey of India. This will be followed by accounts of (2) traversing as a basis for survey, (3) levelling, (4) survey of interior detail, (5) representation of ground, (6) geographical recon- naissance, (7) nautical surveying, (8) mapping, (9) map printing, (10) instruments.

I. Great TRIGONOMETRICAL SuRvVEY oF INDIA.

1. General Outlines.—Primarily a network was thrown The triangles on the central meridian were measured with extra care and checked by base-lines at distances of about 2° apart in latitude in order to form a geodetic arc, with the addition of astronomi- cally determined latitudes at certain of the stations. The base-lines were measured with chains and the principal angles with a 3-foot theodolite, which, however, was badly damaged almost at the outset by an accident to the azimuthal circle. The signals were cairns of stones or poles. The chains were somewhat rude and their units of length

had not been determined originally, and could not be after- wards ascertained. The results were good of their kind and sufficient for

geographical purposes ; but the central

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meridional arc—the “great arc”—was eventually deemed inadequate for geodetic requirements. A superior instru- mental equipment was introduced, with an improved modus operand2, under the direction of Colonel Everest in 1832. The network system of triangulation was superseded by meridional and longitudinal chains taking the form of grid- irons, and resting on base-lines at the angles of the grid- irons, as represented in fig. 1. For convenience of reduc- tion and nomenclature the triangulation west of meridian 92° E. has been divided into five sections,—the lowest a trigon, the other four quadrilaterals distinguished by cardinal points which have reference to an observatory in Central India, the adopted origin of latitudes. In the north-east quadrilateral, which was first measured, the meridional chains are about one degree apart 3 this dis- tance was latterly much increased, and eventually certain chains—as on the Malabar coast and on meridian 84° in the south-east quadrilateral—were dispensed with, because good secondary triangulation for topography had been accomplished before they could be commenced.

2. Modern Base-Lines.—All these were measured with Base. the Colby apparatus of compensation bars and microscopes, lines.

The bars, 10 feet long, were set up horizontally on tripod stands ; the microscopes, 6 inches apart, were mounted in pairs revolving round a vertical axis and were set up on tribrachs fitted to the ends of the bars. Six bars and five central and two end pairs of microscopes—the latter with their vertical axes perforated for a look-down telescope— constituted a complete apparatus, measuring 63 feet be- tween the ground pins or registers. For explanation of compensation see Eartu, Ficvrz oF Tux, vol. vii. p. 599. Compound bars are necessarily more liable to accidental changes of length than simple bars; they were therefore tested from time to time by comparison with a standard simple bar; the microscopes were also tested by comparison with a standard 6-inch scale. At the very first base-line the compensated bars were found to be liable to sensible variations of length

with the diurnal variations of temper- ature ; these were supposed to be due, not to error in effecting the compensation, but to the different thermal conductivities of the brass and the iron components. It became necessary, therefore, to determine the mean daily length of the bars very precisely, for which reason they were systematically compared with the standard before and after, and sometimes at the middle of, the base-line measurement throughout the entire day for a space of three days, and

under conditions as nearly similar as possible to those

obtaining during the measurement. Eventually ther- mometers were applied experimentally to both components of a compound bar, when it was found that the diurnal variations in length were principally due to difference of position relatively to the sun, not to difference of con- ductivity,—the component nearest the sun acquiring heat most rapidly or parting with it most slowly, notwithstand- ing that both were in the same box, which was always kept under the cover of a tent and carefully sheltered from the sun's rays. Happily the systematic comparisons of the compound bars with the standard were found to give a sufficiently exact determination of the mean daily length. An elaborate investigation of theoretical probable errors at the Cape Comorin base showed that, for any base- line measured as usual without thermometers in the com- pound bars, the p.e. may be taken as + 1°5 millionth parts of the length, excluding unascertainable constant errors, and that on introducing thermometers into these bars the p.e. was diminished to + 0°55 millionths.

In all baseline measurements the weak point is the determination of the temperature of the bars when that of the atmosphere is rapidly rising or falling ; the thermo- meters acquire and lose heat more rapidly than the bar if

their bulbs are outside, and more slowly if inside the bar. Thus there is always more or less lagging, and its effects are only eliminated when the rises and falls are of equal amount and duration; but as a rule the rise generally predominates greatly during the usual hours of work, and whenever this happens lagging may cause more error in a base-line

measured with simple bars than all other sources of error combined. In India the probable average lagging of the standard-bar thermometer was estimated as not less than 0°°3 Fahr., corresponding to an error of — 2 millionths in the length of a base-line measured with iron bars. With compound bars lagging would be much the same for both components and its influence would consequently be elimi- nated. Thus the most perfect base-line apparatus would seem to be one of compensation bars with thermometers attached to each component; then the comparisons with the standard need only be taken at the times when the temperature is constant, and there is no lagging.

3. Factor of Expansion of Standard Bar.—This was first determined in 1832 by measuring the increment in length between temperatures of 76° and 212° Fahr.; in 1870 the increment between 52° and 96° was measured ; the results indicated an increase of expansion with tem- perature. They were therefore combined on the empirical assumption that the expansion is the sum of two terms,— the first « times the temperature, the second y times the square of the temperature ; # and y were then determined from the two equations of condition given by the two sets of measurements. The resulting value of the expansion at 62° was found to be 5 per cent. less than the previously derived value at the mean temperature of 144°, thus show- ing the importance of employing a factor varying with the mean temperature of each base-line; and this was done in the final reductions.

4, Plan of Triangulation.—This was broadly a system – of internal meridional and longitudinal chains with an ex- ternal border of oblique chains following the course of the frontier and the coast lines. The design of each chain was necessarily much influenced by the physical features of the country over which it was carried. The most difii- cult tracts were plains of great extent, devoid of any com- manding points of view, in some parts covered with dense forest and jungle, malarious and deadly, and almost unin- habited, in other parts covered with towns and villages and umbrageous trees,—the adjuncts and concomitants of a teeming population. In such tracts triangulation was impossible except by constructing lofty towers as stations of observation, raising them to a sufficient height to over- top at least the earth’s curvature, and then either increas- ing the height to surmount all obstacles to mutual vision, or clearing the lines, both of which

were laborious and expensive processes. Thus in hilly and open country the chains of triangles were generally made “double” through- out, z.e., formed of polygonal and quadrilateral figures, to give greater breadth and accuracy; but in tracts of forest and close country they were carried out as series of single triangles, to give a minimum of labour and expense. Symmetry was secured by restricting the angles between the limits of 30° and 90°. The average side length was 30 miles in hill country and 11 in the plains; the longest principal side was 62°7 miles, though in the secondary triangulation to the Himalayan peaks there were sides exceeding 200 miles. Long sides were at first considered desirable, on the principle that the fewer the links the greater the accuracy of a chain of triangles; but it was eventually found that good observations on long sides could only be obtained under exceptionally favourable atmospheric conditions, which were of rare occurrence. The sides were therefore shortened, whereby the observa- tions were much improved and accelerated. In plains the

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length was governed by the height to which towers could be conveniently raised to surmount the curvature, under the well-known condition, height in feet = 2 x square of the distance in miles; thus 24 feet of height was needed at each end of a side to overtop the curvature in 12 miles, and to this had to be added whatever was required to surmount obstacles on the ground. In Indian plains re- fraction is more frequently negative than positive during sunshine ; no reduction could therefore be made for it.

5. Selection of Sites for Stations.—This, a very simple Sites for matter in hills and open country, is often very difficult in stations.

plains and close country. In the early operations, when the great arc was being carried across the wide plains of the Gangetic valley, which are covered with villages and trees and other obstacles to distant vision, masts 35 feet high were carried about for the support of the small re- connoitring theodolites, with a sufficiency of poles and bamboos to form a scaffolding of the same height for the observer. Other masts 70 feet high, with arrangements for displaying blue lights by night at 90 feet, were erected at

the spots where station sites were wanted. But the cost of transport was great ; the rate of progress was slow; and the results were unsatisfactory. Eventually a method of touch rather than sight was adopted, feeling the ground to search for the obstacles to be avoided, rather than attempting to look over them; the “rays” were traced either by a minor triangulation, or by a traverse with theodolite and perambulator, or by a simple alignment of flags. The first method gives the direction of the new station most accurately ; the second searches the ground most closely ; the third is best suited for tracts of unin- habited forest in which there is no choice of either line or site, and the required station may be built at the inter- section of the two trial rays leading up to it. As a rule it has been found most economical and expeditious to raise the towers only to the height necessary for surmounting the curvature, and to remove the trees and other obstacles on the lines.

6. Structure of the Principal Stations.—Each has a cen- tral masonry pillar, circular and 3 to 4 feet in diameter, for the support of a large theodolite, and around it a plat- form 14 to 16 feet square for the observatory tent, observer, and signallers. The pillar is carefully isolated from the platform, and when solid carries the station mark—a dot surrounded by a circle—engraved on a stone at its surface, and on additional stones or the rock iz situ, in the normal of the upper mark ; but, if the height is considerable and there is a liability to deflexion, the pillar is constructed with a central vertical shaft to enable the theodolite to be plumbed over the ground-level mark, to which access 1s obtained through a passage in the basement. In early years this precaution against deflexion was neglected and the pillars were built solid throughout, whatever their height ; the surrounding platforms, being usually con- structed of sun-dried bricks or stones and earth, were liable to fall and press against the pillars, some of which thus became deflected during the rainy seasons that intervened between the periods during which operations were arrested or the commencement and close of the successive circuits of triangles. In some instances displacements of mark occurred of which the magnitudes were not ascertainable, but were estimated as equivalent to p.c.’s of about + 9 inches in the length and + 2-4 in the azimuth of the side between any two deflected towers; and, as these theoretical errors are identical with what may be expected at the end of a chain of 36 equilateral triangles in which all the angles have been measured with a p.e. = +05, the

old triangula- tion over solid towers had evidently suffered much more from the deflexions of the towers than from errors in the

measurements of the angles. XXII — 88

Principal stations.

Theo- dolites.

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7. Instruments for Measuring Principal Angles.—Large

theodolites were invariably employed. Repeating circles

were highly thought of by French geodesists at the time when the operations in India were being commenced ; but they were not used in the survey, and have now been gener- ally discarded. al,

The principal theodolites are somewhat similar to the astronomer's alt-azimuth instrument, but with larger azi- imuthal and smaller vertical circles, also with a greater base to give the firmness and stability which are required in measuring horizontal angles. The azimuthal circles have mostly diameters of either 36 or 24 inches, the ver- tical circles having a diameter of 18 inches. In all the theodolites the base is a tribrach resting on three levelling foot-screws, and the circles are read by microscopes ; but in different instruments the fixed and the rotatory parts of the body vary. In some the vertical axis is fixed on the tribrach and projects upwards ; in others it revolves in the tribrach and projects downwards. In the former the azimuthal circle is fixed to the tribrach, while the telescope pillars, the microscopes, the clamps, and the tangent screws are attached to a drum revolving round the vertical axis ; in the latter the microscopes, clamps, and tangent screws are fixed to the tribrach, while the telescope pillars and the azimuthal circle are attached to a plate fixed at the head of the rotatory vertical axis. The former system—called that of jlying microscopes—permits the vertical axis to be readily opened out and cleaned, and presents the same clamp and tangent screw for employment during a round of angles; the latter—the system of fixed microscopes—necessitates the

removal and replacement of all the microscopes, clamps, and tangent screws whenever the axis is cleaned, which is very troublesome, and it presents three sets of clamps and tangent screws for successive employment during a round of angles, which is a departure from true differentiality. The vertical axis is perforated for centring over the station mark with the aid of a “look-down telescope” instead of a plummet. The azimuthal circle is invariably read by an odd number of microscopes, either three or five, at equal intervals apart. The telescope rests with its pivots in Y’s at the head of two pillars of a sufficient height to enable it to be completely turned round in altitude. The vertical circle is fixed to the transit axis of the telescope, and is read by two microscopes 180° apart, at the extremities of arms projecting from one of the pillars. The stand is a well-braced tripod, carrying an iron ring on which the theo- dolite rests and may be turned round bodily whenever de- sired, as for shifting the position of the zero of the azimuthal circle relatively to the points under observation. The ring is 3 inches broad and of the same diameter as the circle of the foot-screws of the theodolite. In some instruments the foot-screws rest directly on the ring; but the instru- ment can be raised off the ring and turned round with the aid of an apparatus in the centre of the stand. In others they rest in grooves at the angles of an iron triangle which sits on the ring and can be shifted in position by hand ; thus with the stand well levelled in the first instance the circle may be set within 1’ of any required reading. ‘The centring over the station mark is performed by pushing screws placed either in the drum of the stand or at the angles of the triangle.

For travelling the theodolites were packed in two cases, the larger containing the body of the instrument, the smaller the telescope and the vertical circle; the stand constituted a third package. Each was carried on men’s shoulders as the safest method of transport ; the weights, of the heaviest 36-inch and of the lightest 24-inch instru- ments, as packed with ropes and bamboos, were, respect- ively, as follows :—body, 649 tb 3 telescope, 130; stand, 232 ; total, 1011 tb; and 300, 135, and 185, total 620 ib.

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8. Signals.—Caims of stones, poles, or other opaque Signal signals were primarily employed, the angles being measured by day only; eventually it was found that the atmosphere was often more favourable for observing by night than by day, and that distant points were raised well into view by refraction by night which might be invisible or only seen with difficulty by day. Lamps were then introduced of the simple form of a cup, 6 inches in diameter, filled with cotton seeds steeped in oil and resin, to burn under an inverted earthen jar, 30 inches in diameter, with an aper- ture in the side towards the observer. Subsequently this contrivance gave place to the Argand lamp with parabolic reflector ; the opaque day signals were discarded for helio- tropes reflecting the sun's rays to the observer. The in- troduction of luminous signals not only rendered the night as well as the day available for the observations but changed the character of the operations, enabling work to be done during the dry and healthy season of the year, when the atmosphere is generally hazy and dust-laden, instead of being restricted as formerly to the rainy and unhealthy seasons, when distant opaque objects are best seen. A higher degree of accuracy was also secured, for the lumi- nous signals were invariably displayed through diaphragms of appropriate aperture, truly centred over the station mark ; and, looking like stars, they could be observed with greater precision, whereas opaque signals are always dim in comparison and are liable to be seen excentrically when the light falls on one side.

A signalling party of three men was usually found sufii- cient to manipulate'a pair of heliotropes—one for single, two for double reflexion, according to the sun's position— and a lamp, throughout the night and day. Hieliotropers were also employed at the observing stations to flash in- structions to the signallers.

9. Measuring Horizontal Angles.—The theodolites were Measw- | invariably set up under tents for protection against sun, img hoi |

wind, and rain, and centred, levelled, and adjusted for the "i

runs of the microscopes. Then the signals were observed ° in regular rotation round the horizon, alternately from right to left and vice versa ; after the prescribed minimum number of rounds, either two or three, had been thus measured, the telescope was turned through 180°, both in altitude

and azimuth, changing the position of the face of the vertical circle relatively to the observer, and further rounds were measured; additional measures of single angles were taken if the prescribed observations were not sufficiently accordant. As the microscopes were invariably equidistant and their number was always odd, either three or five, the readings taken on the azimuthal circle during the telescope pointings to any object in the two positions of the vertical circle, “face right” and “face left,” were made on twice as many equidistant graduations as the number of microscopes. The theodolite was then shifted bodily in azimuth, by being turned on the ring on the head of the stand, which brought new graduations under the microscopes at the telescope pointings; then further rounds were measured in the new positions, face right and face left. This process was repeated as often as had been previously prescribed, the successive angular shifts of position being made by equal arcs bringing

equidistant graduations under the microscopes during

the successive telescope pointings to one and the same object. By these arrangements all periodic errors of graduation were eliminated, the numerous graduations that were read tended to cancel accidental errors of divi- sion, and the numerous rounds of measures to minimize the errors of observation arising from atmospheric and personal causes.

The following table (I.) gives details of the procedure at different times ; in the headings M stands for the number of microscopes

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the zero settings of the circle, N for the number of graduations brought under the microscopes, A=360°+N, the are between the graduations, R_ the prescribed number of rounds of measures, and P=Rx Z, the minimum number of telescope pointings to any station, excluding repetitions for discrepant observations :—

Period. | M Z N A R P 1830-45 5 8 ao 9° ol 3 | os 1845-55 io | 50 | 7127| 2 | 90

ee) io | SD | is] 38 | 30 1855-80 3 | 12 | 36 \10° o’| 3 | 36

Under this system of procedure the instrumental and ordinary errors are practically cancelled and any remaining error is most probably due to lateral refraction, more especially when the rays of light graze the surface of the ground. The three angles of every triangle were always measured.

10. Vertical Angles. Refraction.—The apparent alti- tude of a distant point is liable to considerable variations during the twenty-four hours, under the influence of changes in the density of the lower strata of the atmosphere. Ter- restrial refraction is very capricious, more particularly when the rays of light graze the surface of the ground, passing through a medium which is liable to extremes of rarefac- tion and condensation, under the alternate influence of the sun's heat radiated from the surface of the ground and of chilled atmospheric vapour. When the back and forward verticals at a pair of stations are equally refracted, their difference gives an exact measure of the difference of height. But the atmospheric conditions are not always identical at the same moment everywhere on long rays which graze the surface of the ground, and the ray between two recipro- cating stations is liable to be differently refracted at its extremities, each end being influenced in a greater degree by the conditions prevailing around it than by those at a distance ; thus instances are on record of a station A being invisible from another B, while B was visible from A.

When the great-are entered the plains of the Gangetic valley, simultaneous reciprocal verticals were at first adopted with the hope of eliminating refraction ; but it was soon found that they did not do so sufficiently to justify the expense of the additional instruments and observers. After- wards the back and forward verticals were observed as the stations were visited in succession, the back angles at as nearly as possible the same time of the day as the forward angles, and always during the so-called "time of minimum refraction," which ordinarily commences about an hour after apparent noon and lasts from two to three hours. The apparent zenith distance is always greatest then, but the refraction is a minimum only at stations which are well elevated above the surface of the ground; at stations on plains the refraction is liable to pass through zero and attain a considerable negative magnitude during the heat of the day, for the lower strata of the atmosphere are then less dense than the strata immediately above and the rays are refracted downwards. On plains the greatest positive

refractions are also obtained,—maximum values, both positive and negative, usually occurring, the former by night, the latter by day, when the sky is most free from clouds. The values actually met with were found to range from + 1:21 down to — 0:09 parts of the contained arc on plains ; the normal “coefficient of refraction ” for free rays between hill stations below 6000 feet was about ‘07, which diminished to ‘04 above 18,000 feet, broadly varying in- versely as the temperature and directly as the pressure, but much influenced also by local climatic conditions.

In measuring the vertical angles with the great theodo- lites, graduation errors were regarded as insignificant com- pared with errors arising from uncertain refraction ; thus no arrangement was made for effecting changes of zero in

over the azimuthal circle of the theodolite, Z for the number of

and

the circle settings. The observations were always taken in pairs, face right and left, to eliminate index errors, only a few daily, but some on as many days as possible, for the variations from day to day were found to be greater than the diurnal variations during the hours of minimum refraction.

ll, Results deduced from Observations of Horizontal Angles » Weaghts.—In the Ordnance and other surveys the bearings of the surrounding stations are deduced from the actual observations, but from the “included angles” in the Indian Survey. The observations of every angle are tabulated vertically in as many columns as the number of circle settings face left and face right, and the mean for each setting is taken. or several years the general mean Weights. of these was adopted as the final result; but subsequently a “concluded angle” was obtained by combining the single means with weights inversely proportional to g?+0?+n, —g being a value of the e.m.s.1 of graduation derived empirically from the differences between the general mean and the mean for each setting, o the e.m.s. of observa-

tion deduced from the differences between the individual

measures and their respective means, and » the number of

measures at each setting. Thus, putting w,, w,,... for the weights of the single means, w for the weight of the con- cluded angle, // for the general mean, C’ for the concluded angle, and d,, d,, . the single means, we have

.. for the differences between JZ and

aes Wy dy + Wolly + Wy + We + QU Nt AO neta ones sai eee eamtosauises acseancans (2).

C—WM vanishes when x is constant; it is inappreciable

when g is much larger than 0; it is significant only when the graduation errors are more minute than the errors of

observation; but it was always small, not exceeding 0’-14 with the system of two rounds of measures and 005 with the system of three rounds.

The weights of the concluded angles thus obtained were employed in the primary reductions of the angles of single triangles and polygons which were made to satisfy the geometrical conditions of each figure, because they were strictly relative for all angles measured with the same instrument and under similar circumstances and conditions, as was almost always the case for each single figure. But in the final reductions, when numerous chains of triangles composed of figures executed with different instruments and under different circumstances came to be adjusted simultaneously, it was necessary to modify the original weights, on such evidence of the precision of the angles as might be obtained from other and more reliable sources than the actual measures of the angles. This treatment will now be described.

12. Determination of Theoretical Absolute Errors of Theoreti- Observed Angles.—Values of theoretical error for groups calerrors of angles measured with the same instrument and under Die similar conditions may be obtained in three ways,—(i.) from the squares of the reciprocals of the

weight w deduced as above from the measures of such angle, (ii.) from the magni- tudes of the excess of the sum of the angles of each triangle above 180° + the spherical excess, and (iii.) from the magni- tudes of the corrections which it is necessary to apply to the angles of polygonal figures and networks to satisfy the several geometrical conditions (indicated in the next sec- tion). Let e, ¢, and ¢, be the values of the e.m.s. thus obtained ; then, putting for the number of angles grouped together, we have

a= Bd gaa eee of triangular os [w] n

also, putting W for the mean of the weights of the ¢ angles

1 The theoretical ‘‘ error of mean square” = 1°48 x ‘‘ probable error.”

Harmon- izing angles,

of a polygonal figure having m geometrical equations of condition, and # for the most probable value of the error

of any observed angle, we have

a : eas for a single figure,

le] fol for a group of figures,

the brackets [] in each case denoting the sum of all the quantities involved. e, usually gives the best value of the theoretical error, then ¢. As a rule the value by e, is too small; but to this there are notable exceptions, in which it was found to be much too great. The instrument with which the angles were measured in these instances gave very discrepant results at different settings of the circle ; but this was caused by large periodic errors of graduation which did not affect the “concluded angles,” because they were eliminated by the systematic changes of setting, so the results were really more precise than was apparent.

When weights were determined for the final simultaneous reduction of triangulations executed by different instru- ments, it became necessary to

find a factor p to be applied as a modulus to each group of angles measured with the same instrument and under similar conditions, to convert the as yet relative weights into absolute measures of preci- sion. p was made=e,+e, whenever data were available, if not to e,+¢,; then the absolute weight of an observed angle in any group was taken as wp? and the e.m.s. of the angle as 1+p./w. The average values of the e.m.s. thus determined for large groups of angles, measured with the 36-inch and the 24-inch theodolites, ranged from + 0’“24 to +0’°67, the smaller values being usually obtained at hill stations, where the atmospheric conditions were most favourable.

13. Harmoniang Angles of Trigonometrical Figures.— Every figure, whether a single triangle or a polygonal net- work, was made consistent by the application of corrections to the observed angles to satisfy its geometrical conditions. The three angles of every triangle having been observed, their sum had to be made=180°+the spherical excess ; in networks it was also necessary that the sum of the angles measured round the horizon at any station should be exactly = 360°, that the sum of the parts of an angle measured at different times should equal the whole, and that the ratio of any two sides should be identical, what- ever the route through which it was computed. These are called the triangular, central, toto-partial, and side condi- tions ; they present 2 geometrical equations, which contain ¢ unknown quantities, the errors of the observed angles, ¢ being always >n. When these equations are satisfied and the deduced values of errors are applied as corrections to the observed angles, the figure becomes consistent. Primarily the equations were treated by a method of suc- cessive approximations; but afterwards they were all solved simultaneously by the so-called method of minimum squares, which leads to the most probable of any system of corrections ; it is demonstrated under Eartu, Figure OF THE (vol. vii. p. 599). The following is a general out- line of the process :—

Let x be the most probable value of the error and w the recipro- cal of the weight of any observed angle X, and let a, b,...n be the coefficients of x in successive geometrical equations of condition whose absolute terms are Ca, 9+ +» €,3 then we have the following group of m equations containing ¢ unknown quantities to be satis- fied, the significant coefficients of x being 1 in the triangular, toto- partial, and central, and + cot X in the side equations :—

AX) + Aela +... + Ay, =lg Dydy + Doty +... + Dye, =e

Ma + Nala +... + My = Cp P The values of x will be the most probable when = | is a minimum,

a condition which introduces » indeterminate factors Ne ouls Re

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whose values are obtained by the solution of the following equa- tions :— [aau]r\,rq[0d.u)r\,...[bnu]r, =e, [an.w]rg+[bn.u]r,...[nnu]r, =e, the brackets indicating summations of ¢ terms as to left of (3). Then the value of any, the pth, x is

Up = Up {dpa t bys +... + Nphn} The minimum or [= is =[eA]

In the application to a single triangle we have Ly + Wy + Xy =e,

ASO+ (th + Ug + Uy) 5 y= UWA} A—y=Wyr 3 ag=Uphr.

In the application to a simple polygon, by changing symbols and putting X and Y for the exterior 18 5 for the vel eaten with errors x, y, and z and weight reciprocals w, v, and w, a for cot_X and 6 for cot Y, ¢ for any triangular error, ¢, and e, for the central and side errors, \, and A, for the factors for the central and side equations, and W for w+v+w, the equations for obtaining the

factors become ae wiau—bry], _ we [»- 57} -[A” pan [F

. — “The +] au + 0% — or bs =0,- “or |

and the general expressions for the errors of the angles are—

a w= tet(a W— aw bv)r\y- wr, })

y= FF le~ (BW + aw—bv)r,— dave} }

2= 7p {e- (au — bv)dy+ (w+v)re} J

14. Calculation of Sides of Triangles.—The angles Sides of having been made geometrically consistent inter se in each triangle,

figure, the side-lengths are computed from the base-line onwards by Legendre's theorem, each angle being dimin- ished by one-third of the spherical excess of the triangle to which it appertains. The theorem is applicable without sensible error to triangles of a much larger size than any that are ever measured.

15. Calculation of Latitudes and Longitudes of Stations Latitaie | and Azmuths of Sides.—A station of origin being chosen and _ of which the latitude and longitude are known astronomi- 08

cally, and also the azimuth of one of the surrounding stations, the differences of latitude and longitude and the

reverse azimuths are calculated in succession, for all the of side. —

stations of the triangulation, by Puissant's formule de Géodésie, Paris, 1842, 3d ed.).

Problem.— Assuming the earth to be spheroidal, let A and B be two stations on its surface, and let the latitude and longitude of A be known, also the azimuth of Bat A, and the distance between A and B at the mean sea-level ; we have to find the latitude and longitude of B and the azimuth of A at B.

The following symbols are employed :—a the major and 6 the

(Traité

2 pe 4 minor semi-axis ; ¢ the excentricity, = 12 = € p the radius of a curvature to the meridian in latitude), = a ; » the normal {1 -e'sin?\}? '

to the meridian in latitude A, = —__* ; {1 —e%sin?n}4 latitude and longitude of A; 4+A\ and Z+AZ the required lati- tude and longitude of B; A the azimuth of Bat A; B the azimuth of A at B; Ad=B-(r+A); c the

distance between A and B. Then, all azimuths being measured from the south, we have

and Z the given

- cos A cosec 1” = 1¢é sin?4 tan \ cosec 1” 2 pw a¢ # ~4 pw 1-2 ai © sintA cos A(1+38 tan?) cosec 1” 6 pv

(9),

cos?.4 sin 2X cosec 1”

| a= | |

c sin 4

1 ce? sin 2A tan X *; v2 cos A sik

1 c?(14 3 tan?) sin 2.4 cos.4 “6 v3 cos }

1 sin? 4 tan? X

3v3 cosx _

NE | (10),

cosec 1”

cosec 1”

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id, 2 Me PisG A cose 1”) any points for which both may be available: they indi- mai i: ea: cate the extent to which differences may be attributable AA” a. +73 14 2tan Ma t sina cosec 1” = errors in the adopted geodetic constants, as distinct B-(r+A)= We % +(11). | rom errors in the trigonometri i 2 e (8- tan \) a ge soniaee: gonometrical or the astronomical say 60 tan? 2) convo

1” 17. Final Reduction of Principal Triangulation. —The Redue- = J calculations described so far suffice to make the angles of tion of

Each A is the sum of four terms symbolized by 6), 45, 53, and 8, ; the calculations are so arranged as to produce these terms in the

order 5A, 6Z, and 64, each term entering as a factor in calculating the following term. The arrangement is shown below in equations in which the symbols P, Q,... Z represent the factors which depend ou the adopted geodetic constants, and vary with the latitude ; the logarithms of their numerical values are tabulated in the Awziliary Tables to Facilitate the Calculations of the Indian Survey.

—igogeped + i. ee ze aie aw also, for each portion of the triangulation— secondary as he 3 stot & pases. Gainke 2 A=480W (12), | Well as principal —as executed year by year. But on the Sd=-,4.Xtand oyb=+5..V.tand 54,4=45,L.2 completion of the several chains of triangles further reduc-

By this artifice the calculations are rendered less laborious and made susceptible of being readily performed by any persons who are acquainted with the use of logarithm tables.

16. Limits within which Geodetic Formule may be em-

odetic ployed without Sensible Error.—Each A is expressed as a rmule. series of ascending differentials in which all terms above

the third order are neglected ; for the side length c in no ease exceeded 70 miles, nor was the latitude ever higher than 36°, and for these extreme values the maximum magni- tudes of the fourth differential are only 0-002 in latitude and 0”:004 in longitude and azimuth.

Far greater error may arise from uncertainties regard- ing the elements of the earth’s figure, which was assumed to be spheroidal, with semi-axes a = 20,922,932 feet and b=20,853,375 feet. The changes in AA, AZ, and AA which would arise from errors da and db in a and 6 are indicated by the following formule :—

a dp dv dy 2de dv d.AX = — Ad. ac dy). a(S ~ aa) – 20,.— |

d d AAD = — AL. ~ by. — (Bgl + 5,1)

ahd=- dA 3,4{2-2(4_@ 1 2 tan’\ +—

r,s — (53.4 + 544)2—

How this was done will now be set forth. But first it must be noted that the triangulation might at the same time have been made consistent with any values of latitude, longitude, or azimuth which had been determined by astronomical observations at either of the trigonometrical stations. This, however, was undesirable, because such observations are liable to errors from deflexion of the plumb-line from the true normal under the influence of local attraction, and these errors are of a much greater magnitude than those that would be generated in triangu- lating between astronomical stations which are not a great distance apart. The trigonometrical elements could not be forced into accordance with the astronomical without altering the angles by amounts much larger than their probable errors, and the results would be useless for in- vestigations of the figure of the earth. The only inde- pendent facts of observation which could be legitimately combined with the angular adjustments were the base-lines,

= _ and all these were employed, while the several astronomical oe ‘000,000, 0478 {da — 2db — 3(da — db) sin? h} determinations—of latitude, differential longitude, and iy azimuth—-were held in reserve for future geodetic investi-

<= + 000,000, 0478 {da-+ (da — db) sin? d} (14).

2de ra

gations,

*000,0145 {da — db} As an illustration of the problem for treatment, suppose a com- Specific bination of three meridional and two longitudinal chains comprising illustra-

seventy-two single triangles, with a base-line at each corner, as shown tion

(ee The adopted values of the semi-axes were determined

by Colonel Everest in an investigation of the figure of the earth from such data as were available in 1826. Forty years afterwards an investigation was made by Captain (now Colonel) A. R. Clarke with additional data, which gave new values, both exceeding the former.! Accepting these as exact, the errors of the first values are da = — 3130 feet and db) = — 1746 feet, the former being 150, the latter 84 millionth parts of the semi-axis. The corresponding changes in arcs of 1° of latitude and longitude, expressed in seconds of are and in millionth parts () of arc-length, are as follows :—

In lat. 5° d. AA= — “069 or 19 wand d.AL= —“5400r150 4;

” 15° oF) =“15 29 31 290099 a9 — “554 ”? 154,, ; oe) 25° oe) = “195 33 54,, 2 ” me? ae 161,, ; cee, | 908 84, oss aT, a 2o ls,

These assumed errors in the geodetic latitudes and longi-

. tudes are of service when comparisons are made between

independent astronomical and geodetic determinations at

1 See Account of the Principal Triangulation of the Ordnance Sur- vey, 1858, and Comparisons of Standards of Length, 1866.

in the accompanying diagram (fig. 2); suppose the three angles of every triangle tohave been C B

measured and made con- AVAVAVAVAVAVAVAVANAY

sistent. Let A be the ori-

gin, with its latitude and

longitude given, and also

the length and azimuth of

the adjoining base-line.

With these data processes

of calculation are carried <

through the triangulation »,

to obtain the lengths and D LIEDLE PL EP. azimuths of the sides and : 4
the latitudes and longi- Fig. 2.

tudes of the stations, say in the following order :—from A through B to E, through F to E, through F to D, through F and E to C, and through F and D to C. Then there are two values of side, azimuth, latitude, and longitude at E,—one from the right- hand chains via B, the other from the left-hand chains via F; similarly there are two sets of values at C; and each of the base- lines at B, C, and D has a calculated as well as a measured value. Thus eleven absolute errors are presented for dispersion over the triangulation by the application of the most appropriate correction to each angle, and, as a preliminary to the determination of these corrections, equations must be constructed between each of the absolute errors and the unknown errors of the angles from which

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they originated. Forthis purpose assume X to be the angle opposite the flank side of any triangle, and Y and Z the angles opposite the sides of continuation ; also let x, y, and 2 be the most probable values of the errors of the angles which will satisfy the given equations of condition. Then each equation may be expressed in the form [ax+by+cz]=Z, the brackets indicating a summation for all the triangles involved. We have first to ascertain the values of the coefficients a, b, and ¢ of the unknown

quantities. They are readily found for the side equations on the circuits and between the base-lines, for x does not enter them, but only y and z, with coefficients which are the cotangents of Y and Z, so-that these equations are simply [cot Y.y—cot Z.zJ=#. But three out of four of the circuit equations are geodetic, corresponding to the closing errors in latitude, longitude, and azimuth, and in them the co- efficients are very complicated. They are obtained as follows. The first term of each of the three expressions for AA, AZ, and B is differentiated in terms of c and A, giving

Tar S anr{ 2 -aatand sin “}

a Aba AL { os dA cot Asin i” }

dB= a4+sa{F rad ot Aaa u”}

in which de and dA represent the errors in the length and azimuth of any side ¢ which have been generated __ 7 in the course of the triangulation up to it from the base-line and the azi- muth station at the origin. The errors in the latitude aud longitude of any station which are due to the triangula- 5 tion are d\,=[d.AA], and dZ,=[d. AZ}. Let station 1 be the origin, and let 2, 3,... be the succeeding stations taken along a predetermined line of traverse, which may either run from (3) 5 vertex to vertex of the successive tri- angles, zigzagging between the flanks of the chain, as in fig. 3 (1), or be 2 carried directly along one of the flanks, as in fig. 3(2). For the general sym- 1 bols of the differential equations sub- stitute AAn, ADn, AAn, Cn, An, and Bn, for the side between stations » and : n-+1 of the traverse ; and let dc, and Fig. 3. 6A, be the errors generated between the sides c,_ and Cn; then de _ 8c, dey 8, | Sey. dt, _ “| 6c], a Cee ee oe ‘ete set @A,=6A,; dA4,=dB,+54,3.. . dAn=ABp1+5An Performing the necessary ‘substitutions and summations, we get 6c, n 80, Sn a + 4, ae +44ne

for]

aks

(1)

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6.4,(1+ 44 cot A]sin1”) 3.4, +... (14 AAq cot An sin 13 Ay,

6c, 1 OC OCn

ae Jar +... + Ane

— {{[Ad tan 4]8.4, +”[AAtan AJA, +... +A), tan A,5Ap} sin 1”

5c,

Cy

Aa

OCn TAZ] a + { [AL cot 4]6.4,+ [AL cot A]Jo4,+... +ALZ, cot A,5A,}sin 1” Thus we have the following expression for any geodetic error—

6c 6c a ise tone + b5A, +. —+¢n04n=F, ...(16),

where » and ¢ represent the respective summations which are the coefficients of 6c and 6A in each instance but the first, in which 1 is added to the summation in forming the coefficient of 5.4.

The angular errors x, y, and z must now be introduced, in place of dc and 6A, into the general expression, which will then take different forms, according as the route adopted for the line of traverse was the zigzag or the direct. In the former, the number of stations on the traverse is ordinarily the same as the number of triangles, and, whether or no, a common numerical notation may be adopted for both the traverse stations and the collateral triangles ; thus the angular errors of every triangle enter the general expression in the form + px+ cot Yip’y —cot Z.p’z, in which y’=y sin 1”, and the upper sign of ¢ is taken if the tri- angle lies to the left, the lower if to the right, of the line of traverse. When the direct traverse is adopted, there are only half as many traverse stations as triangles, and therefore only half the number of

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#’sand ¢’s to determine ; but it becomes necessary to adopt different

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numberings for the stations and the triangles, and the form of the coefficients of the angular errors alternates in successive trian gles. Thus, if the yth triangle has no side on the line of the traverse but only an angle at the /th station, the form is

+ hy%pt+ cot Vpu’Yp— cot Zp.p’ pty If the gth triangle has a side between the [th and the (J+1)th sta- tions of the traverse, the form is

cot Xo(u’ — M4 at (P, +H, 41 00t Vo)yg- (G,4.4— Hw’, cot Zz)eqe

As each circuit has a right-hand and a left-hand branch, the errors of the angles are finally arranged so as to present equations of the general form

[ase + by + cz], —[aa+by+cz)=Z. ;

The eleven circuit and base-line equations of condition having been duly constructed, the next step is to find values of the angular errors which will satisfy these equations, and be the most probable of any system of values that will do so, and at the same time will not disturb the existing harmony of the angles in each of the seventy-two triangles. Harmony is maintained by introducing the equation of condition x+y+z=0 for every triangle. The most probable results are obtained by the method of minimum squares, which may be applied in two ways.

(i) A factor \ may be obtained for each of the eighty-three equa-

, ak i. Mae acd tions under the condition that [=+ – + =| is made a minimum, u,

v, and w being the reciprocals of the weights of the observed angles. This necessitates the simultaneous solution of eighty-three equations to obtain as many values of . The resulting values of the errors of the angles in any, the

pth, triangle, are Lp=UplapA] ; Yp=VUplopA] 3 %p=WylCpA]...0.000-(17).

(ii.) One of the unknown quantities in every triangle, as x, may be eliminated from each of the eleven circuit and base-line equa- tions by substituting its equivalent —(y+<) for it, a similar substi- tution being made in the minimum. Then the equations take the form [(~a)y+(c-a)z]=£, while the minimum becomes

Thus we have now to find only eleven values of \ by a simultaneous solution of as many equations, instead of eighty-three values from eighty-three equations ; but we arrive at more complex expressions for the angular errors as follows :—

ik ae {(tup + Wp)[(bp — Ap)A] ~ wl (Cp — ap)NT} a 2 of pay tot Mlle ~ MpIA1~ tyllbp ~)NI} |

The second method has invariably been adopted, originally be- Reduc- cause it was supposed that, the number of the factors X being re- tion duced from the total number of equations to that of the circuit and rincipal base-line equations, a great saving of labour would be effected. But triangu- subsequently it was ascertained that in this respect there is little lation. to choose between the two methods ; for, when « is not eliminated, and as many factors are introduced as there are equations, the factors for the triangular equations may be readily eliminated at the outset.) Then the really severe calculations will be restricted to the solution : of the equations containing the factors for the circuit and base-line equations, as in the second method.

In the preceding illustration it is assumed that the base-lines are errorless as compared with the triangulation. Strictly speaking, however, as base-lines are fallible quantities, presumably of differ- ent weight, their errors should be introduced as unknown quantities of which the most probable values are to be determined in a simul- taneous investigation of the errors of all the facts of observation, whether linear or angular. When they are connected together by so few triangles that their ratios may be deduced as accurately, . or nearly so, from the triangulation as from the measured lengths, this ought to be done; but, when the connecting triangles are so numerous that the

direct ratios are of much greater weight than the trigonometrical, the errors of the base-lines may be neglected. -” In the reduction of the Indian triangulation it was decided, after _ examining the relative magnitudes of the probable errors of the linear and the angular measures and ratios, to assume the base-lines to be errorless (see § 19, p. 704 below).

The chains of triangles being largely composed of polygons. or other networks, and not merely of single triangles, as has been assumed for simplicity in the illustration, the geometrical harmony to be maintained involved the introduction of a large number of “side,” ‘‘central,” and ‘‘toto-partial” equations of condition, as well as the triangular. Thus the problem for attack was the simul- taneous solution of a number of equations of condition =that of all the geometrical conditions of every figure+four times the number of circuits formed by the chains of triangles+the number of base- lines—1, the number of unknown quantities contained in the equations being that of the whole of the observed angles; the method of procedure, if rigorous, would be precisely similar to that

already indicated for ‘‘ harmonizing the angles of trigonometrical figures,” of which it is merely an expansion from single figures to great groups.

The rigorous treatment would, however, have involved the simultaneous solution of about 4000 equations between 9230 un- known quantities, which was quite impracticable. The triangula- tion was therefore divided into sections for separate reduction, of which the most important were the five between the meridians of 67° and 92° (see fig. 1, p. 696), consisting of four quadrilateral figures and a trigon, each comprising several chains of triangles and some base-lines. This arrangement had the advantage of enabling the final reductions to be taken in hand as soon as convenient after the completion of any section, instead of being postponed until all were completed. It was subject, however, to the condition that the sections containing the best chains of triangles were to be first reduced ; for, as all chains bordering contiguous sections would necessarily be ‘‘ fixed” as a part of the section first reduced, it was obviously desirable to run no risk of impairing the best chains by forcing them into adjustment with others of inferior quality. It happened that both the north-east and the south-west

quadrilaterals contained several of the older chains; their reduction was therefore made to follow that of the collateral sections containing the modern chains.

But the reduction. of each of these great sections was in itself a very formidable undertaking, necessitating some departure from a purely rigorous treatment. For the chains were largely composed of polygonal networks and not of single triangles only as assumed in the illustration, and therefore cognizance had to be taken of a number of ‘‘side” and other geometrical equations of condition, which entered irregularly and caused great entanglement. Equa- tions 17 and 18 of the illustration are of a simple form because they have a single geometrical condition to maintain, the triangular, which is not only expressed by the simple and symmetrical equation e+y+z=0, but—what is of much greater importance—recurs in a regular order of sequence that materially facilitates the general solution. Thus, though the calculations must in all cases be very numerous and laborious, rules can be formulated under which they ean be well controlled at every stage and eventually brought to a successful issue. The other geometrical conditions of networks are expressed by equations which are not merely of a more complex form but have no regular order of sequence, for the networks pre- sent a variety of forms; thus their introduction would cause much entanglement and complication, and greatly increase the labour of the calculations and the chances of failure. Wherever, therefore, any compound figure occurred, only so much of it as was required to form a chain of single triangles was employed. The figure having previously been made consistent, it was immaterial what part was employed, but the selection was usually made so as to introduce the fewest triangles. The triangulation for final simultaneous reduction was thus made to consist of chains of single triangles only ; but all the included angles were ‘‘ fixed” simultaneously. The excluded angles of compound figures were subsequently har- monized with the fixed angles, which was readily done for each figure per se.

This departure from rigorous accuracy was not of material im- portance, for the angles of the conrpound figures excluded from the simultaneous reduction had already, in the course of the several independent figural adjustments, been made to exert their full in- fluence on the included

angles. The figural adjustments had, how- ever, introduced new relations between the angles of different figures, causing their weights to increase cxteris paribus with the number of geometrical conditions satisfied in each instance. Thus, suppose w to be the average weight of the ¢ observed angles of any figure, and n the number of geometrical conditions presented for satisfaction ; then the average weight of the angles after adjustment may be

u Yp=F [(2bp — Gp —Cp)r]

IU >= 3 [(2¢p — Gp — by)d]

The most laborious part of the calculations was the construction and solution of the normal equations between the factors. On this subject a few hints are desirable, because the labour involved is liable to be materially influenced by the order of sequence adopted in the construction, The normal equations invariably take the form of (4), the coefficients on the diagonal containing summations of squares of the coefficients in the primary equations, while those above and below contain summations of products of the primary quantities, such that the coefficient of the pth in the gth equation is the same as that of the gth Xin the pth equation. In practice, as any Single angular error only enters a few of the primary equa- tions of condition, many of the coefficients vanish, both in the primary and in the normal equations ; and it is an object of great importance so to arrange the normal equations that most blanks shall occur above and fewest blanks between the significant values on each vertical line of coefficients ; in other words, the significant values above and below the diagonal should lie as closcly as possible to the diagonal, every value on which is always significant. This advantage is secured when the primary equations are arranged in groups in which each contains a number of angular errors in common and as many as possible of those entering the group on each side. Thus the arrangement must follow the natural succes- sion of the chains of triangles rather than the characteristics of the primary equations ; if, for example, all the side equations were grouped together, and all the latitude equations, and so on, great entanglement would arise in the solution of the normal equations, enormously increasing the labour and the chances of failure. The best arrangement was found to be to group the side and the

three geodetic equations of each circuit together in the order of sequence of the meridional chains of triangles, and then to introduce the side equations connecting base-lines between the groups with which they had most in common.

The following table (II.) gives the number of cquations of condi- tion and unknown quantities—the angular errors—in the five great sections of the triangulation, which were respectively included in the simultaneous general reductions and relegatcd to the subse- quent adjustments of each figure per se :—

Simultaneous. External Figural.

Equations. Equations. , ‘ aa |S a wa Section. is 3 F 2 g ye a 2 : : g Gos Olt es = oy et Be 5 a oD SASi ES | as | Ra] B {Side |\SP| FS | aa Bossi ewe | aA} ae] 8 | &

Cz”) 8 gis oe

1. N.W. Quad 23 550 | 1650 | 267 | 104 | 152 | 6 {| 761 | 110 2. S.E. Quad. 15 277 831 | 164 64 92 } 2) 476 68 3. N.E. Quad 49 ayy fl alyaiey | 1b 56 69 | 0 | 341 50 A LASO Uisters|sveieteis 303 909 | 192 79 | 101 | 2 | 547 77 5. S.W. Quad. ..| 24 172 516 83 32 52) 1 237 40

The magnitudes of the 2481 angular errors determined simultane- ously in the first two sections were very small, 2240 being under 0”-1, 205 between 0’ “1 and 0”°2, 33 between 0”°2 and 03, 2 between 0-3 and 0’°4, and 1 between 0”°4 and 0”°5. In the third section, which contained a number of old chains, executed with instruments inferior to the 2 and 8 foot theodolites, they were larger: 780 were under 0”‘1, 911 between 0”‘1 and 1:0, 27 between 1-0 and 2”°0, and 1 between 2’0 and 2’°1. Thus the corrections to the angles were generally very minute, rarely exceeding the theoretical probable errors of the angles, and therefore applicable without taking any liberties with the facts of observation.

taken as a

t—n

a hexagon, 2 for a quadrilateral, 2°5 for the network around the Sironj base-line, &c.

In framing the normal equations between the indeterminate

the factor thus being 1°5 for a triangle, 1°8 for 18. Theoretical Error of any Function of Angles of a Theoreti-

Geometrically corrected Triangulation.—The investigation = of such theoretical errors was no easy matter. When first}. 0″

: 36 ._ tions of essayed it was generally assumed by mathematicians 1M anoles,

factors \ for the final simultaneous reduction, it would have greatly added to the labour of the subsequent calculations if a separate weight had been given to each angle, as was done in the primary figural reductions ; this was obviously unnecessary, for theoretical requirements would now be amply satisfied by giving equal weights to all the angles of each independent figure. The mean weight that was finally adopted for the angles of each group was therefore taken as t OT

p being the modulus already indicated in section 12.

The second of the two processes for applying the method of miuimum squares having been adopted, the values of the errors y and z of the angles appertaining to any, the pth, triangle were finally expressed by the following equations, which are derived from (18) by substituting w for the reciprocal final mean weight as above determined :—

England that any attempt to exhibit the theoretical error by a purely algebraical process soon led to results of in- tolerable complexity, so that it was desirable to introduce numbers as soon as possible for every symbol except the absolute terms of the geometrical or primary equations of condition. But on continuing the algebraical process cer- tain relations were found to exist between the coefficients of the indeterminate factors in the normal equations of the minimum square method and the coefficients of the un- known quantities in the primary equations of condition, which

enormously simplified the process and led to a general algebraical expression of no great complexity ; it was also found that, the number of primary equations being n, the

labour of calculation by the formula was reduced to an nth of that involved by resorting at once to numbers.

Let F be any function whatever of the corrected angles (X,- 2), (X,— 2%,),... of a trigonometrical neue 3 let A= ax? a= ax,” 15 also let 2, t%,..., Symbols hitherto employed to represent the rela- tive reciprocal weights of the observed angles X,,X.,..., in future represent absolute measures of precision, the p.¢.” of the observed angles ; then the following formula expresses the p.e. of any func- tion of the corrected angles rigorously :—

62 ope 4at[fo.ul4,...[fn.u]4,} 6 yd Tlfe.uli[fo.u]Bat|fo.ul Bot… +[fr. ul Bp}

lala oP og 6 a

{[fa.u]No[fo.u] Ny +... +[fn.u] Nn} The symbols a, 6,...% have the same signification as in (8) to (6) of section 18. A, B,...Nare coefficients which must be de- termined in the process of solving the normal equations as follows :— Ag=A gen tAstot… +Anén Ao =Bi eat Brest. – + Bren

(20).

An=N lq + Nees + elete + Nnren where the coefficient represented by any two letters in one order is identical with that represented by the same letters in the reverse order; thus A,=V,. Hence to find the p.e. of any angle, as (X, —2), in a single triangle we have i 1 Fel, wel 4p= ee eer

all the other factors vanish, and

Uy Uy + Ug+ Ug To find the p.e. of the ratio R of either side to the base, — if

=sin (X,—- x)+sin (X, — 2%), then A= cot X, sin 1”, =P cot X, sin 1”, A=, and p.e2 of R

= Jie { U, cot?X, + U,cot?X,

p.e” of (X,-2%)=u, – =p.e” of X,—p.e.” of 2.

(uw, cot Xj — w,.cot X_)?

Uy + Ug + Ug =

When the function of the corrected angles is the ratio of the terminal to the initial side of an equilateral triangle or a regular quadrilateral or polygon (either of two sides being taken if the figure has an odd number of exterior sides), then, assuming all the angles to be of equal weight, we have the following values of the p.e.’s and the relative weights of the ratios :—

Figure. p.e. Weight. Figure. p.e. Weight. Triangle…... £824/u sin 1” 1-49 | Pentagon £1-21,/u sin 1” 0°68

Quadrilateral 1:00 “s 1:00 | Hexagon 1°29 AG 0°60 Trigon oe 1:05 >,» 0°90! Heptagon 1°41 ne 0°50 Tetragon … 115 ,, 0°75] Octagon ‘1°57 » Or41

In ordinary ground seven single triangles will span about as much as two hexagons and the weights of the terminal sides would be as twenty-one by the former to thirty by the latter. In a flat country two quadrilaterals would not span more than one hexagon, giving terminal side weights as five to six; but in hills a quadrilateral may span as much as any polygon and give a more exact side of con- tinuation. Thus in the Indian Survey polygons predominate in the plains and quadrilaterals in the hills.

The theoretical errors of the lengths and azimuths of the sides, and of the latitudes and longitudes of the stations, at the termini of the chains of triangles or at the circuit closings, might be calculated with the coefficients a, 6, and ce of x, y, and zin the circuit and base-line equations as the /’s, and the known p.e.’s of X, Y, and Z and the other data of the figural reductions. Such calculations are, however, much too laborious to be ordinarily under- taken. Thus the exactitude of a triangulation is very generally estimated merely on the evidence of the magni- tudes of the differences between the trigonometrical and the measured lengths of the base-lines ; for, though the

combined influence of angular precision and geometrical configuration is what really governs the precision of the results, it 1s not readily ascertainable, and is therefore generally ignored. But, when questions as to the intrinsic value of a triangulation arise, the theory of errors should

always be appealed to, and its intimations accepted rather than the evidence of base-line discrepancies, which if very small are certainly accidental, and if seemingly large may be no greater than what we should be prepared to expect. Good work has occasionally been redone unnecessarily, and inferior work upheld, because their merits were erroneously estimated. The following formule will be found useful in acquiring a fairly approximate knowledge of the magnitude of the errors which theory would lead us to expect, not only in side, but in latitude, longitude, and azimuth also, at the close of any chain of triangles. They indicate rigorously the p.e.’s at the terminal end of a chain of equilateral triangles of which all the angles have been measured and corrected and are of equal weight; the results may be made to serve for less symmetrical chains, including networks of varying weight, by the application of certain factors which can be estimated with fair pre- cision in each instance.

Let ¢ be the side length, ¢ the pe. of the angles, n the number of triangles, and R the ratio (here=1) of the terminal to the initial side, then

pe. of R=e sin URV2n p.e. of azimuth = eV} n

a = /2n3 + 302 +100

When the form of the triangles deviates much from the equi- angular, the pe. must be multiplied by a factor increasing up to 1°4 as the angles diminish from 60° to 30°, and a mean value of ¢ must be adopted. When the chain is double throughout, the p.e. must be diminished by a factor taking cognizance of the greater weight of compound figures than of single triangles. When the chain is composed of groups of angles measured with

different in- struments, a separate value of e must be employed for each group,

and the final result obtained fromV[p.c.2]. The pe. of R may be determined rigorously for any chain of single triangles, with angles of varying magnitudes and weights, by (22), with little labour of calculation.

19, Kelations between Theoretical Errors of Base-lines Theoreti and those of a Triangulation.—These relations have to be “4l@ investigated in order to ascertain whether the base-lines ina may be assumed to be errorless in the general reduction of ofa _ the triangulation ; being fallible quantities, their errors triange must be included among the unknown quantities to be in- !ation. vestigated simultaneously, if their respective p.e.’s differ sensibly, or if the p.e.’s of their ratios are not materially smaller than those of the corresponding trigonometrical ratios. By (23) the p.e. of the ratio of any two sides of an equilateral triangle is « sin 1”./2+3; but the pe. of the ratio of two base-lines of equal length and weight is » »/2, where 7 is the p.e. of either base-line ; thus weight of trigo- nometrical ratio: weight of base-line ratio: 3y?:«? sin? 1”, or as 3:1 when «= +0°3 and y= +1°5 millionth parts, which happens generally in the Indian triangulation. But the chains between base-lines were always composed of a large number of triangles, and the average weight of the base-line ratios was about eleven times greater by the direct linear measurements than by the triangulation, even when all the unascertainable constant or accidental errors —as from displacements of mark-stones—which might be latent in the latter were disregarded. Moreover, the base- lines were practically all of the same precision ; they were therefore treated as errorless, and the triangulation was made accordant with them.

If a base-line AD be divided at B and C into three equal sections connected together by equilateral triangles, and every angle has been measured with a p.e. =e, the p.e. of any trigonometrical ratio may be put =«.e sin 1”, x being a coefficient which has two values for each ratio,— the greater value when the triangulation has been carried along one flank of the line, the smaller when along both

p.e. of either coordinate=ec

1 For an investigation of these formule, see Appendix No. 3, vol. vii of Account of Operations of Great Trigonom. Survey, 1882.

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CD | which is expressed as follows for logarithmic computation— alien = yz Mian Zoos! PS 1:83 and 1:23; for AB? 2°94 and 1°99; for RO? 9-16 and Sp 1l-n+l Pa 1:46. The val where m=2 sin? = cosec 1”, n=2 sin?PS sin? —, and : e values for the last two ratios show that, when . 2 ’ 3? the length of a base-line is determined partly by measure- | /=cot Psin dP; 1, m, and n are tabulated.

ment and partly by triangulation, the p.e. is smallest if 21. Calculation of Height and fefraction.—Let A and B Height the central section rather than an end section is measured, | (fig. 4) be any two points the nor- é B and re-

flanks, as follows :—for ratio is k= 1:41 and 1; for

AD

fraction.

muth erva- Ss.

If, with linear and angular p.e’s as in the Indian operations, a single section is measured once only, and the lengths of the other sections are derived from it by trian- gulation, the p.e. of the entire length will be greater than that of the whole line once measured ; it will be less if the

section is measured oftener than once and the mean taken. °

20. Azimuth Observations in connexion with Principal Triangulation.—These were invariably determined by

the repetitions on each zero were more numerous; the azimuthal levels were read and corrections applied to the star observations for dislevelment. As already mentioned (§ 17), the triangulation was not adjusted, in the course

mals at which meet at C, cutting the sea-level at pand ¢; take Dg = Ap, then BD is the difference of height; draw the tangents Aa and Bb at A and B, then aAB is the depression 4 of B at A and bBA that of A at B; jom AD, then BD is deter- mined from the triangle ABD.

et | |

‘measuring the horizontal angle between a referring mark | The triangulation gives the dis- 2%

and a circumpolar star, shortly before and after elonga- | tance between A and B at the sea- i

tion, and usually at both elongations in order to eliminate level, whence pqg=c; thus, putting “8

the error of the star’s place. Systematic changes of “face” Ap, the height of A above the sea-

and of the zero settings of the azimuthal circle were made | level, = #, and pC =r,

as in the measurement of the principal angles (§ 9); but | 4 D=e(1+2- a) aS ; (26) Fic. 4 * Tt 22 << u

Putting D, and Dz, for the actual depressions at A and B, S for the angle at A, usually called the “subtended angle,” and h for BD—

° . . 2 TT Ba} reecerseccesteseceesscs of the final simultaneous reduction, to the astronomically Te 7 5 ne determined azimuths, because they are liable to be vitiated and h=AD ~~ Dye (28).

by local attractions; but the azimuths observed at about fifty stations around the primary azimuthal station, which was adopted as the origin of the geodetic calculations, were

The angle at C being =D,+ Dg, S may be expressed in terms of asingle vertical angle and C when observations

referred to that station, through the triangulation, for have been taken at only one of the two points. ¢, comparison with the primary azimuth. A table was pre- | the “contained arc,” = ce” cosec 1” in seconds. Putting pared of the differences (observed at the origin — computed apy

from a distance) between the primary and the geodetic azi- muths ; the differences were assumed to be mainly due to the local deflexions of the plumb-line and only partially to error in the triangulation, and each was multiplied by the factor = tangent of latitude of origin P= tangent of latitude of comparing station’

in order that the effect of the local attraction on the azi-

muth observed at the distant station—which varies with the latitude and is=the deflexion in the prime vertical x the tangent of the latitude—might be converted to what it would have been had the station been situated in the same latitude as the origin. Each deduction was given a weight, w, inversely proportional to the number of tri- angles connecting the station with the origin, and the most probable value of the error of the observed azimuth at the origin was taken as a (24) ;

the value of x thus obtained was — 1““1.

The formule employed in the reduction of the azimuth observations were as follows. In the spherical triangle PZS, in which P is the pole, 7 the zenith, and S the star, the co-latitude P7 and the polar distance PS are known, and, as the angle at S is a right’ angle at the elongation, the hour angle and the azimuth at that time are found from the equations

cosP=tanPS cotPZ, cosZ=cosPS sinP.

The interval, 6P, between the time of any observation and that of the elongation being known, the corresponding azi- muthal angle, 8Z, between the two positions of the star at the times of observation and elongation is given rigor- ously by the following expression—tan 67

N Qsin?Z5P

~~ cot PS sinPZ sinP 41+ tan*PS coséP + sec2PS cotP sindP

j (25),

D’,, and D’, for the observed vertical angles, and ¢,, $s for the amounts by which they are affected by refraction, Da=D’au+ $a and Dp= D’y+ $6; $a and ¢ may differ in amount (see § 10), but as they cannot be separately ascer- tained they are always assumed to be equal; the hypo- thesis is sufficiently exact for practical purposes when both verticals have been measured under similar atmospheric conditions. The refractions being taken equal, the ob- served verticals are substituted for the true in (27) to find S, and the difference of height is calculated by (28); the third term within the brackets of (26) is usually omitted. The mean value of the refraction is deduced from the formula Pee a (29).

An approximate value is thus obtained from the observa- tions between the pairs of reciprocating stations in each district, and the corresponding mean “ coefficient of refrac- tion,” 6+ C, is computed for the district, and is employed when heights have to be determined from observations at a single station only. When either of the vertical angles is an elevation — Z must be substituted for D in the above expressions.!

IL TRAVERSING, AS A BASIS FOR SURVEY.—RECTANGULAR SPHERICAL CoORDINATES.

Traversing is a combination of linear and angular Travers- measures in equal proportions : the surveyor proceeds from 1s-

point to point, measuring the lines between them and at 0 i er SS

1 In topographical and levelling operations it is sometimes convenient to apply small corrections to observations of the height for curvature and refraction simultaneously. Putting d@ for the distance, r for the earth’s radius, and x for the coefficient of refraction, and expressing the distance and radius in miles and the correction to height in feet, then correction for curvature=3d?; correction for refraction= — 4×0”; cor- 2—4k L

each point the angle between the back and forward lines ; he runs his lines as much as possible over level and open ground, avoiding obstacles by working round them. The system is well suited for laying down roads, boundary- lines, and circuitous features of the ground, and is very generally resorted to for filling in the interior details of surveys based on triangulation. It has been largely em- ployed in certain districts of British India, which had to be surveyed in a manner to satisfy fiscal as well as topo- graphical requirements ; for, the village being the adminis- trative unit of the district, the boundary of every village had to be laid down, and this necessitated the survey of an enormous number of circuits. Moreover, the traverse system was better adapted for the country than a network of triangulation, as the ground was generally very flat and covered with trees, villages, and other obstacles to distant vision, and was also devoid of hills and other commanding points of view. The principal triangulation had been carried across it, but by chains executed with great diffi- culty and expense, and therefore at wide intervals apart, with the intention that the intermediate spaces should be provided with points as a basis for the general topo- graphy in some other way. A system of traverses was obviously the best that could be adopted under the cir- cumstances, as it not only gave all the village boundaries but was practically easier to execute than a network of minor triangulation.

Procedure of the Indian Survey.—The traverses are executed in minor circuits following the periphery of each village and in major circuits comprising groups of several villages ; the former are done with 4” to 6” theodolites and a single chain, the latter with 7” to 10” theodolites and a pair of chains, which are compared frequently with a standard. The main circuits are connected with every station of the principal triangulation

within reach. The meridian of the origin is determined by astronomical observations ; the angle at the origin between the meridian and the next station is measured, and then at each of the successive stations the angle between the immediately preceding and following stations ; summing these together, the “inclinations” of the lines between the stations to the meridian of the origin are successively determined. The distances between the stations, multiplied by the cosines and sines of the inclinations, give the distance of each station from the one preceding it, resolved in the directions parallel and perpendicular respectively to the meridian of the origin ; and the algebraical sums of these quantities give the corresponding rectangular coordinates of the successive stations relatively to the origin and its meridian. The area included in any circuit is expressed by the formula

area=half algebraical sum of products (a +2) (y2—4) (80), %, y, being the coordinates of the first, and x, y, those of the second station, of every line of the traverse in suc- cession round the circuit.

Of geometrical tests there are two, both applicable at the close of a circuit: the first is angular, viz., the sum of all the interior angles of the described polygon should be equal to twice as many right angles as the figure has sides, less four ; the second is linear, viz., the algebraical sum of the x coordinates and that of the y coordinates should each be=0. The astronomical test is this: at any station of the traverse the azimuth of a referring mark may be determined by astronomical observations; the in- clination of the line between the station and the referring mark to the meridian of the origin is given by the traverse ; the two should differ by the convergency of the meridians of the station and the origin. In practice the angles of the traverse are usually adjusted to satisfy their special geometrical and astronomical tests in the first instance,

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[TRAVERSING,

and then the coordinates of the stations are calculated and adjusted by corrections applied to the longest, that the angles may be least disturbed, as no further corrections are given them.

Convergency of Meridians.—The exact value of the Conve. convergence, when the distance and azimuth of the second gency astronomical station from the first are known, is that of & me B-(x+A) of equation (11); but, as the first term is ‘ing sufficient for a traverse, we have

convergency = tan oe ‘ substituting x, the coordinate of the second station per- pendicular to the meridian of the origin, for ¢ sin A.

Adjustment of a System of Traverses to a Triangulation.— Adjust. The coordinates of the principal stations of a trigonometri- ment of cal survey are usually the spherical coordinates of latitude es and longitude ; those of a traverse survey are always rect- cull angular, plane for a small area but spherical for a large one. It is often necessary, therefore, for purposes of comparison and check at stations common to surveys of both descriptions, to convert either rectangular coordi- nates into latitudes and longitudes, or vice versa, in order that the errors of traverses may be dispersed by proportion over the coordinates of the traverse stations, if desired, or adjusted in the final mapping. The latter is generally all that is necessary, more particularly when the traverses are referred to successive trigonometrical stations as origins, as the operations are being extended, in order to prevent any large accumulation of error. Similar conversions are also frequently necessary in map projections. The method of effecting them will now be indicated.

Transformation of Latitude and Longitude Coordinates Tran into Rectangular Spherical Coordinates, and vice versa.—Let ation A and B be any two points, Aa the meridian |e coon of A, Bd the parallel of latitude of B; then Ab, Bb will be their differences in latitude and longitude; from B draw BP perpendi- cular to da; then AP, BP will be the rect- angular spherical coordinates of B relatively to A, Put BP=2,Al=y, theanc > =aamd the arc Bb, the difference of longitude, =; also let Ag, Az, and Xy be the latitudes of A, B, and the point P, py the radius of curvature of the meridian, and vy the normal termin- ating in the axis minor for the latitude A»; and let p, be the radius of curvature for the latitude 4(Ag+A,). Then, when the rectangular coordinates are given, we have, taking A as the origin, the latitude of which is known,

Ho: 5:

i tan A, cosec 1”; 2p p = :

x = cose 1” — N; w=— sec(A,+ 47) cosec 1” Po Yp

Np=Aat ¥Y eosecl’; y= cS 31). Ne ~~X And, when the latitude and longitude are given, we have! 7 (3)2 sin 2), sin 1” y=p{o—da+ sin 1” X= Wy COS (Ap + 4) sin 1” Graphic Method of Determining the Coordinates of an Un~~ Coordi visited Point observed from Several Stations.—When a hill ua peak or other prominent object has been observed from a ae . number of stations whose coordinates are already fixed, = the converging rays may be projected graphically, and from an examination of their several intersections the most probable position of the object may be obtained almost as accurately as by calculations by the method of least squares,

1 In the Indian Survey, tables are employed for these calculations which give the value of 1” of arc in feet on the meridian, and on each parallel of latitude, at intervals of 5’ apart ; also a corresponding table of arc-versines (Pb) of spheroidal arcs of parallel (Bb) 1° in length, from which the are-versines for shorter or longer arcs are obtained pro- portionally to the squares of the arcs; x is taken as the difference of longitude converted into linear measure.

which are very laborious and out of place for the deter- mination of a secondary point. The following is a de- scription of the application of this method to points on a plane surface in the calculations of the Ordnance Survey. Lets, %, .. . be stations whose rectangular coordinates, %y, Vo… perpendicular, and y,, Ya, ... parallel, to the meri- dian of the origin are given; let a,,a,,...be the bearings —here the direction-inclinations with the meridian of the origin—of any point P, as observed at the several stations; and let p be an approximate position of P, with coor- dinates %p, Yp, as determined by graphical projection on a district map or by rough calculation. Construct a diagram of the rays converging around p, by taking a point to represent p and drawing two lines through it at right angles to each other to indicate the directions of north, south, east, and west. Calculate accurately (yp — y,) tan a, and compare with (zp —,); the difference will show how far the direction of the ray from s, falls to the east

or west of p. Or calculate (wp —x,) cota, and compare with (Yp— ¥,) to find how far the direction falls to the north or south of p. Set off the distance on the corresponding axis of », and through the point thus fixed draw the direction a, with a com- N

mon protract- or, All the other rays around p may be drawn inw like manner ; they will in- tersect each other in a number of points, the centre of which may be adopted as the most prob- able position of P. The co- ordinates of P will then be readily obtained from those of p + the distances on the meridianand perpendicular. In the annexed diagram (fig. 6) P is supposed to have been observed from five sta- tions, giving as many intersecting rays, (1, 1), (2, 2),...5 there are ten points of intersection, the mean position of which gives the true position of P, the assumed position being p. The advantages claimed for the method are that, the bearings being independent, an erroneous bearing may be redrawn without disturbing those that are correct; similarly new bearings may be introduced without disturb- ing previous work, and observations from a large number of stations may be readily utilized, whereas, when calcula- tion is resorted to, observations in excess of the minimum number required are frequently rejected because of the labour of computing them.

Fig. 6.

Til. Leve.xie.

evelling. Levelling is the art of determining the relative heights of points on the surface of the ground as referred to a hypothetical surface which cuts the direction of gravity everywhere at right angles. When a line of instrumental levels is commenced at the sea-level, a series of heights is determined corresponding to what would be found by perpendicular measurements upwards from the surface of water communicating freely with the sea in underground channels; thus the line traced indicates a hypothetical prolongation of the surface of the sea inland, which is ‘everywhere conformable to the earth’s curvature.

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1 For fuller details and an application to spherical surfaces, see Account of the Graphic Method of the Ordnance Survey, by J. O'Farrell, London, 1886.

The trigonometrical determination of the relative heights of points at known distances apart, by the measurements of their mutual vertical angles,—as already described in section I.—is a method of levelling. But the method to which the term "levelling" is always applied is that of the direct determination of the differences of height from the readings of the lines at which graduated staves, held vertically over the points, are cut by the horizontal plane which passes through the eye of the observer. Each method has its own advantages. The former is less accu- rate, but best suited for the requirements of a general geographical survey, to obtain the heights of all the more prominent objects on the surface of the ground, whether accessible or not. The latter may be conducted with extreme precision, and is specially valuable for the deter- mination of the relative levels, however minute, of easily accessible points, however numerous, which succeed each other at short intervals apart; thus it is very generally undertaken part passu with geographical surveys, to furnish lines of level for ready reference as a check on the accuracy of the trigonometrical heights. In levelling with staves the measurements are always taken from the horizontal plane which passes through the eye of the observer; but the line of levels which it is the object of the operations to trace is a curved line, everywhere conforming to the normal curvature of the earth's surface, and deviating more and more from the plane of reference as the distance from the station of observation increases. Thus, either a correction for curvature (see footnote, page 705) must be applied to every staff reading, or the instrument must be set up at equal distances from the staves; the curvature correction, being the same for each staff, will then be eliminated from the difference of the readings, which will thus give the true difference of level of the points on which the staves are set up.

Levelling is an essentially simple operation ; but, as it has to be repeated very frequently in executing a long line of levels—say seven times on an average in every mile—it must be conducted with every precaution against

errors of various kinds, instrumental and personal, some accidental and tending to cancel each other, others systematic and cumulative. Instrumental errors arise when the visual axis of the telescope is not perpendicular to the axis of rotation, and when the focusing tube does not move truly parallel to the visual axis on a change of focus. The first error is eliminated, and the second avoided, by placing the instrument at equal dis- tances from the staves ; and, as this procedure has also the advan- tage of eliminating the corrections for both curvature and refraction, it should invariably be adopted. Errors of staff readings should be guarded against by having the staves graduated on both faces, but differently figured, so that the observer may not be biassed to repeat an error of the first reading in the second. The staves of the Indian survey have one face painted white with black divisions —feet, tenths, and hundredths—from 0 to 10, the other black with white divisions from 5°55 to 15°55. Deflexion from horizontality may either be measured and allowed for by taking the readings of the ends of the bubble of the spirit-level and applying corresponding cor- rections to the staff readings, or be eliminated by setting the bubble to the same position on its scale at the reading of the second staff as at that of the first, both being equidistant from the observer.

Certain errors are liable to recur in a constant order and to accumulate to a considerable magnitude, though they may be too minute to attract notice at any single station, as when the work is carried on under a uniformly sinking or rising refraction—from morning to midday or from midday to evening—or when the instru- ment takes some time to settle down on its bearings after being set up for observation. They may be eliminated (i.) by alternating the order of observation of the staves, taking the back staff first at one station and the forward first at the next; (ii) by working in a circuit, or returning over the same line back to the origin ; (iii.) by dividing a line into sections and reversing the direction of operation in alternate sections. Cumulative error, not eliminable by working in a circuit, may be caused when there is much northing or southing in the direction of the line, for then the sun’s light will often fall endwise on the bubble of the level, illuminating the outer edge of the rim at the nearer end and the inner edge at the further end, and so biassing the observer to take scale readings of edges which are not equidistant from the centre of the bubble ; this introduces a tendency to raise the south or depress the north

ends of lines of level in the northern hemisphere. On long lines, the employment of a second observer, working independently over the same ground as the first, station by station, is very desirable. The great lines are usually carried over the main roads of the country, a number of “bench marks” being fixed for future reference. In the Ordnance Survey of Great Britain lines have been carried across from coast to coast, in such a manner that the level of any common cross- ing point may be found by several independent lines. Of these points there are 166 in England, Scotland, and Wales; the dis- crepancies met with at them were adjusted simultaneously by the method of minimum squares.

Sea-Level.—The sea-level is the natural datum plane for levelling operations, more particularly in countries border- ing on the ocean. The earliest surveys of coasts were made for the use of navigators, and, as it was considered very important that the charts should everywhere show the minimum depth of water which a vessel would meet with, low water of spring-tides was adopted as the datum. But this does not answer the requirements of a land survey, because the tidal range between extreme high and low water differs greatly at different points on coast-lines. Thus the generally adopted datum plane for land surveys is the mean-sea level, which, if not absolutely uniform all the world over, is much more nearly so than low water. Tidal observations have been taken at nearly fifty points on the coasts of Great Britain, which were connected by levelling operations ; the local levels of mean sea were found to differ by larger magnitudes than could fairly be attributed to errors in the lines of level, having a range of 12 to 15 inches above or below the mean of all at points on the open coast, and more in tidal rivers! But the general mean of the coast stations for England and Wales was practically identical with that for Scotland. The observations, how- ever, were seldom of longer duration than a fortnight, which is insufficient for an exact determination of even the short period components of the tides, and ignores the annual and semi-annual components, which occasionally attain con- siderable magnitudes. The mean-sea levels at Port Said in the Mediterranean and at Suez in the Red

Sea have been found to be identical, and a similar identity is said to exist in the levels of the Atlantic and the Pacific Oceans on the opposite coasts of the isthmus of Panama. This is in favour of a uniform level all the world over 3 but, on the other hand, lines of level carried across the continent of Europe make the mean-sea level of the Mediterranean at Marseilles and Trieste from 2 to 5 feet below that of the North Sea and the Atlantic at Amsterdam and Brest,—a result which it is not easy to explain on mechanical prin- ciples. In India various tidal stations on the east and west coasts, at which the mean-sea level has been deter- mined from several years' observations, have been connected by lines of level run along the coasts and across the conti- nent ; the differences between the results were in all cases due with greater probability to error generated in levelling over lines of great length than to actual differences of sea- level in different localities.

may be some 560 feet higher at Kurrachee than at Cape Comorin; but, on the other hand, the Indian pendulum operations have shown that there isa deficiency of density under the Himalayas and an increase under the bed of the ocean, which may wholly compensate for the excess of the mountain masses and deficiency of the ocean, and leave the surface undisturbed. If any bumps and hollows exist, they cannot be measured instrumentally ; for the instru- mental levels will be affected by the local attractions pre- cisely as is the sea-level, and will thus invariably show level surfaces even should there be considerable deviations from the geometrical figure.

IV. Survey or IntER1or Devan.

(1) General Principles.—We have seen that the skeleton General framework of a survey may be either a triangulation or a Ptu- system of traverses; very generally it is a combination of "PE!

both. The method of filling in the details is necessarily influenced to some extent by the nature of the framework, but it depends mainly on the magnitude of the scale and the requisite degree of minutiz. In all instances

the principal triangles and circuit traverses have to be broken down into smaller ones, to furnish a sufficient number of fixed points and lines for the subsequent operations. The filling in may be performed wholly by linear measurements or wholly by direction intersections, but is most frequently effected by both linear and angular measures, the former taken with chains and tapes and offset poles, the latter with small theodolites, sextants, optical squares, or other reflecting instruments, magnetized needles, prismatic compasses, and plane tables. When the scale of a survey is large, the linear and angular measures are usually recorded on the spot in a field-book and afterwards plotted in office ; when small they are sometimes drawn on the spot on a plane table and the field-book is dispensed with.

(2) The Scale.—In every country the scale is generally Scale.

expressed by the ratio of some fraction or multiple of the smallest to the largest national units of length, but some- times by the fraction which indicates the ratio of the length of a line on the paper to that of the corresponding line on the ground. The latter form is obviously preferable, being international and independent of the various units of length adopted by different nations. See table of maps and scales under Map, vol. xv. p. 522. In the Ordnance Survey of Great Britain and Ireland both forms of expression are adopted, the smaller scales being 1 inch and 6 inches to a mile for provinces and counties, the larger zAjq for parishes and 4, for towns. In the Indian Survey the standard topographical scale is 1 inch to a mile, diminishing to 4 and } inch for geographical reconnaissance, and rising by multiples of 2 to higher scales, of which the greatest, for other than city surveys, is 32 inches, for cadastral purposes. In both surveys the double unit of the foot and the Gunter’s link (= 6,th of

ee er sea-level, however, may not coincide everywhere | g foot) is employed, the former invariably in the triangu- a with the geometrical figure which most closely represents lation, the latter very generally in the traversing and filling P

the earth’s surface, but may be raised or lowered, here and there, under the influence of local and abnormal at- tractions, presenting an equipotential surface—an ellipsoid

in, because of its convenience in calculations and measure- ments of area, a square chain of 100 Gunter’s links being exactly one-tenth of an acre.

or spheroid of revolution slightly deformed by bumps and hollows—which Bruns calls a “geoid.” Archdeacon Pratt has shown that, under the combined influence of the positive attraction of the Himalayan Mountains and the negative attraction of the Indian Ocean, the sea-level

(8) Ordnance Survey Methods.—All linear measures are made Ord- with the Gunter’s chain, all angular with small theodolites only ; nance neither magnetized nor reflecting instruments nor plane tables Survey are ever employed, except in hill sketching, when bearings are methods. taken with the prismatic compass. As a rule the filling in is done by triangle-chaining only ; traverses with theodolite and chain are occasionally resorted to, but only when it is necessary to work round woods and hill tracts across which right lines cannot be carried. ;

(a) Detail Surveying by Triangles—This is based on the points Detail of the minor triangulation. The sides are first chained perfectly survey- straight, all the points where the lines of interior detail cross the ing by sides being fixed ; the alignment is effected with a small theodolite, triangles; and marks are established at the crossing points and at any other

1 In tidal estuaries and rivers the mean-water level rises above the mean-sea level as the distance from the open coast-line increases ; for . instance, in the Hooghly river, passing Calcutta, there is a rise of 10 inches in 42 miles between Sagar (Saugor) Island at the mouth of the river and Diamond Harbour, and a further rise of 20 inches in 43 miles between Diamond Harbour and Kidderpur, F

DETAIL. |

points on the sides where they may be of use in the subsequent operations. The surveyor is given a diagram of the triangulation, but no side lengths, as the accuracy of his chaining is tested by comparison with the trigonometrical values. Then straight lines are carried across the intermediate detail between the points estab- lished on the sides; they constitute the principal ‘‘ cutting up or split lines”; their crossings of detail

are marked in turn and straight lines are run between them. The process is continued until a sufficient number of lines and marks have been established on the ground to enable all houses, roads, fences, streams, railways, canals, rivers, boundaries, and other detail to be conveniently measured up to and fixed. Perpendicular offsets are limited to eighty and twenty links for the respective scales of 6 inches to a mile and sys.

(b) Detail Surveying by Traverses.—When a considerable area has to be thus treated it is divided into a number of blocks of con- venient size, bounded by roads, rivers, or parish boundaries, and a ‘traverse on the meridian of the origin” 1s carried round the peri- phery of each block. Commencing at a trigonometrical station, the theodolite is set to circle reading 0° 0’ with the telescope point- ing to the north, and at every “forward” station of the traverse the circle is set to the same reading when the telescope is pointed at the ‘‘ back” station as was obtained at the back station when the telescope was pointing to the forward one. When the circuit is completed and the theodolite again put up at the origin and set on the last back station with the appropriate circle reading, the circle reading, with the telescope again pointed to the first forward station, will be the same as at first, ifno error has been committed. This system establishes a convenient check on the accuracy of the operations and enables the angles to be readily pro- tracted on a system of lines parallel to the meridian of the origin. Asa further check the traverse is connected with all contiguous trigonometrical stations by measured angles and distances. Tra- verses are frequently carried between the points already fixed on the sides of the minor triangles; the initial side is then adopted, instead of the meridian, as the axis of coordinates for the plotting, the tclescope being pointed with circle reading 0° 0’ to either of the trigonometrical stations at the extremities of the side.

(ce) Plotting and Examination.—The plotting is done from the field-books of the surveyors by a separate agency. Its accuracy is tested by examination on the ground, when all necessary addenda are made. The examiner—who should be both surveyor, plotter, and draftsman—mounts the plot on his sketching block, and verifies the accuracy of the detail by intersections and productions and occasional direct mcasurements, and generally endeavours to cause the details under examination to prove the accuracy of each other

rather than to obtain direct proof by remeasurement. He fixes conspicuous trees and delineates the woods, footpaths, rocks, preci- pices, steep slopes, embankments, &c., and supplies the requisite information regarding minor objects—whether pit, shaft, level, spring, well, conduit, weir, quarry, refuse heap, waste, orchard, stack- yard, railway, canal, manufacturing and mineral works, viaducts, bridges, tramways, plantations, &c.—to enable a draftsman to make a perfect representation according to the scale of the map. In exaniining a coast-line he delineates the foreshore and sketches the strike and dip of the stratified rocks. In tidal rivers he ascertains and marks the highest points to which the ordinary tides flow. The examiner on the 25°344 inch scale (=z;4yy) is required to give all necessary information regarding the parcels of ground of differ- ent character—whether arable, pasture, wood, moor, moss, sandy —defining the limits of each on a separate tracing if necessary. He has also to distinguish between turnpike, parish, and occupa- tion roads, to collect all names, and to furnish notes of military, baronial, and ecclesiastical antiquities to enable them to be ap- propriately represented in the final maps. The latter are sub- jected to a double examination,—first in the office, secondly on the ground ; they are then handed over to the officer in charge of the levelling to have the levels and contour lines inserted, and finally to the hill sketchers, whose duty it is to make an artistic representa- tion of the features of the ground.

(4) Indian Survey Methods—All filling in is invariably done by plane-tabling on a basis of points previously fixed ; the methods . differ simply in the extent to which linear measures are introduced to supplement the direction rays of the plane table. When the scale of the survey is small, direct measurements of distance are rarely made and the filling is usually done wholly by direction intersections, which fix all the principal points, and by eye-sketching ; but as the scale is increased linear measures with chains and offset poles are introduced to the extent that may be desirable. A sheet of drawing paper is mounted on cloth over the face of the plane table ; the points, previously fixed by triangulation or otherwise, are projected on it —the collateral meridians and parallels, or the rectangular coordinates, when these are more convenient for employment than the spherical, having first been drawn ; the plane table is then ready for use. Operations are commenced at a fixed point by aligning with the sight rule on another fixed point, which brings the meridian line of the table on that of

the station. The magnetic needle may now be placed on the table and a position assigned to it for future reference. Rays are drawn from the station point on the table to all conspicuous objects around with the aid of the sight rule. The table is then taken to other fixed points, and the process of ray-drawing is repeated at each ; thus a number of objects, some of which may become available as stations of observation, are fixed. Additional stations may be established by setting up the table on a ray, adjusting it on the back station—that from which the ray was drawn—and then ob- taining a cross intersection with the sight rule laid on some other fixed point, also by interpolating between three fixed points situated around the observer. The magnetic needle may not be relied on for correct orientation, but is of service in enabling the table to be set so nearly true at the outset that it has to be very slightly altered afterwards. The error in the setting is indicated by the rays from the surrounding fixed points intersecting in a small triangle instead of a point, and a slight change in azimuth suffices to reduce the triangle to a point, which will indicate the position of the station exactly. Azimuthal error being less apparent on short than on long lines, interpolation is best performed by rays drawn from near points, and checked by rays drawn to distant points, as the latter show most strongly the magnitude of any error of the primary magnetic setting. In this way, and by self-verificatory traverses “fon the back ray” between fixed points, plane-table stations are established over the ground at appropriate intervals, depending on the scale of the survey ; and from these stations all surrounding objects which the scale permits of being shown are laid down on the table, sometimes by rays only, sometimes by a single ray and a measured distance. The general configuration of the ground is delineated simultaneously.

Checking and Examination. —Various methods are followed. Checking For large scale work in plains it is customary to run arbitrary lines and

across it and make an independent survey of the belt of ground to a distance of a few chains on either side for comparison with the original survey ; the

smaller scale hill topography is checked by examination from commanding points, and also by traverses run across the finished work on the table.

V. REPRESENTATION OF GROUND.

The master lines of ground are the main ridges and water-partings of the hills, the watercourses, and the hori- zontal contour lines of the coasts; the subordinate lines are those which define the undulations and minor features falling between the low-lying plains and the crests of the hills. These lines must first be laid down on a horizontal projection to fix the dimensions of cach feature of the ground, after which the slopes must be indicated with sufficient relief and character to present a true picture of the corrugations of surface. In ancient maps the hills are represented as seen against the sky in profile by a spectator standing on the ground below at some distance off. This system of “natural representation,” as it was called, was serviceable in enabling persons looking at the hills from the quarter from which they had been sketched to identity them readily, for which reason such views of distant inland hills are still commonly given on the margins of marine charts of coast-lines for the assistance of navigators. But, when all other objects except the hills are shown in a map by their horizontal projections, hills represented in perspec- tive are false to their surroundings, and misleading to all who approach them from other directions than that of the adopted point of view, for the vertical projection of the profile is practically turned over and confused with the horizontal plane. Hence in course of time hills came to be drawn as if seen from a high bird’s-eye point of view, the position of which was shifted until at last the point of sight was supposed to be vertically over them ; thus the evils of the perspective system were diminished, whilst something of natural representation was still preserved. About the end of the 18th century the perspective and the bird’s-eye systems gave way to the true method of indicating the forms of hills, viz., by their horizontal projections, like all the other details of the ground, and by adding the requisite shading to bring every feature into proper relief.

examina- tion.

Main lines of ground.

Hill-Shading.—There are two rival methods of hill-shad- Hill- ing,—one by horizontal contours, the other by vertical shading.

hachures. A contour being the line of intersection of a hill

Scale of shade.

by a horizontal plane, contour lines indicate the markings which would be made by the successive risings of a flood to different levels above the sea; vertical hachures indicate the directions which the particles of a volume of water, equally disseminated over the top of a hill, would naturally take in running down the sides and slopes. The most perfect representation of ground is obtained when the shade lines, whether horizontal or vertical, are sufficiently close and well graduated in tone and intensity to imitate good mezzotint shading in Indian ink. A good effect may be and is frequently produced by assuming light to fall on the hills obliquely from a specific direction, illumi- nating them on one side and throwing the reverse slopes into shadow. But this has the disadvantage of giving similar slopes different intensities of shade according to their position with reference to the assumed direction of the light ; on the other hand, vertical lighting, which gives the same intensity to the same slope wherever situated, fails in relief and perspicacity. A commission of citizens appointed by the republican Government of France in 1803 to formulate rules on the subject of topography, con- demned the representation of hills in demi-perspective as absurd, but approved the system of oblique side-light ; it also condemned contours, except for engineering works, and recommended vertical hachures, under the idea that the slope lines of the fall of water represent a material effect of which the eye is witness every moment, and recalls the general cause, if not of the formation, at least of the figure and characteristics, of the mountains.

Scale of Shade.—For military purposes it is very desir- able that maps should be so drawn as to enable the angles of inclination of all slopes to be readily ascertained, with a view to determining what portions of the ground are suited for the manceuvres of each of the three arms,—infan- try, cavalry, and artillery. Thus military topographers of different nationalities have

proposed a variety of scales to regulate the thickness and distance apart of the shade lines, and generally the proportion of black to white, for different angles of slope, that the map may convey to the mind as accurate a knowledge of the slopes of the ground as of the horizontal outlines. All slopes, however, are not of equal practical importance, but only those which are of most common occurrence and most liable to be gone over by men and horses and wheeled vehicles, and their inclina- tion rarely exceeds 25° ; consequently it is of most import- ance to be able to distinguish variations of slope below that angle: it is occasionally desirable to know the sharper slopes up to 45° or 50°, but greater inclinations are com- paratively of rare occurrence and unimportant. Now in a true scale of shade the intensity increases with the in- clination from 0° to 90°; thus, putting black + white =1, the proportion of black to white for any inclination ¢ by a scale of cosines will be black = 1—cos 7, white=cos7. But that scale does not sufficiently accentuate the lower in- clinations, which are the most important, and have there- fore to be dealt with more emphatically; this has led to the introduction of a variety of conventional scales, each with the special characteristics which commended themselves to its author. Major Lehmann of the German army supposed light to be admitted in parallel vertical rays and gave the horizontal plane the fullest light, because the reflected coincides with the vertical ray; at an inclination of 45° the reflected ray is perfectly horizontal, and this slope was therefore least illumined. Disregarding all greater slopes, he placed 45° at the head of his scale and represented it by absolute black ; the scale was divided into nine equal parts of 5° each, from 0° to 45°, up to which the illumination varies inversely as the angle of inclination. General van Gorkum of the Netherlands army improved on Lehmann’s system : he adopted certain groups of contours

arranged according to the slope, making the vertical distances between the contours equal in each group but greater in the higher groups, and between the contours he drew vertical hachures the lengths of which showed by reference to a scale the angles of slope. His lowest group included all angles

up to 25°, the vertical distance between the contours being so regulated with reference to the scale of the map as to permit the draftsman to represent the slopes without inconveniently long hachures. For higher angles he doubled and trebled the vertical interval of his contours and the thickness of his hachures. Thus the relative altitudes of any required points might be deduced with comparative facility by noting the thickness and counting the number of the vertical hachures between them. In this respect the system satisfies the require- ments of a military map, but the effect is unpleasing and unsuggestive of hill forms. In 1828 a second French com- mission, having Laplace for its president, was appointed to report on topographical drawing. It reversed the decision of the first commission in favour of oblique side light, as being difficult to execute and inaccurate in giving different intensities to the same angles of slope facing differently ; and, after trying various scales of shade, it determined to increase the intensity in proportion to the sines of double the angles of inclination diminished by 4, which gives a more rapid increase of shade for the gentle than the steep slopes. In subsequent instructions of the “depdt de la guerre” the proportion of black to white is fixed at one and a half times the angle of slope. In England various scales of shade have been proposed, by Colonel Scott and Captain Webber of the Royal Engineers, and by the Council of Military Education. Colonel Scott’s scale is interesting as having been derived from the average of measurements taken from the best examples of hill sketch- ing in the Ordnance and other surveys, whereas all the others were deduced from a conventional application of geometrical principles. The following table (IIL) gives the several scales :-—

Table showing the Proportion of Black to White on any Unit of Area, in Horizontal Plan.

Angle 5 O 5 Council ? Seale of Major First ; Second | Colonel} Captain! of Mili- Slo, Cosines. | Lehmann. | French. | French. | Scott. | Webber. |tary Edu- ope: cation. Be | Wal B. | W.. | B. | W. | B. |W. | B. | We | BS | AW: BS ve

45° *293 |°707 |1°000 0-000 | 600 | °400 |°675 |-325 |-708 |-292 |“803}197/ .. | .. 85° *181}°819} °780, °220)-512 |-488]°425}°575] .. | .. | °724]°276|-640| -360 25° “094 |°906 | °560| °440/°380 |°620 |-375 |°625

|-339 |-661 |°550 1-450 | 457 | 543 20° 060 |-940| °450| °550}°350 |°650 |-300 |°700 |°255 |-745 |°455 }°545 |°333 | 667 5? 034 |°966 | °340| °660)-286 |-714 1-225 |-775 |°189 |-811 |°338 |°662 |-254 | °746 10° °015| °985| *230| °770)|°209 |-791 |°150 }°850 |°126 |-874 |-250 |-750 |-160 | °840 ia 007 (“993 | °155) °845/°155 {845 |°105 |-895 |°088 |-917 |*173|°827| .. | .. a °004/-996 | °120) °880}-110|°890 |-075 |-925 |-055 |-945 |°108 |°892 |-082} -918 4° *002|-998| °077| °923]-095 |-905 |-060 |-940 |-049 |-951|-065|-935| .. | .. ge 001 |°999| “066, °934|°073 |-927 |-045|-955 |°038 |-962 |-033 |-967 |°047 | -953 “001 |“999 044, *956}°050 |°950 |-030 }-970 | 025 975 |014 “986 |°025 | 975

Of late years the system of shading by lines has been Mezzo- abandoned for the English army, and a method of repre- tint senting slopes by mezzotint shading over a few governing hi contour lines, laid down by actual survey, has been intro- duced instead. The effect aimed at is a transparent shade, dark in proportion to the steepness of the ground represented ; its object is to give body and expression to the contours and to explain and develop minor features of the ground which may lie between them. This style of shading, being distinct from all line drawing, may be applied over the most crowded details without causing confusion, such as would be produced by hachure shad- ing. The contours are indicated by continuous red lines of constant thickness, strong enough to be everywhere visible through the shading, which is effected by applying lead with a soft pencil over the parts where it is wanted, and then rubbing it in firmly with a piece of chamois

leather folded into a small pad. No pencil marking is allowed ; lightening is done with india-rubber ; the shading is finally fixed with a wash of thin gum-water.

It is to be noted that the several scales of shade above given were devised for military maps to be drawn on a scale of not less than 4 inches to the mile and possibly much greater. The harshness and mannerism to which all line-shading by rule is liable are of less importance in maps of small areas represented on large scales than on maps of large areas on small scales. In the former the sacrifice of pictorial effect is more than compensated by the additional information regarding the slopes of the ground ;

the field sketches ; and in drawin tween light and shade and sateen light from a corner of the map to give a stronger relief, and to attract the eye to the highest points and enable it to distinguish readily the higher from the lower ground. His general aim is to produce a more pictorial and less mechanical study of the ground than is supplied by the field sketches. Many exquisite maps have been thus produced and afterwards engraved ; see sheets 32, 38, 38, 53, and 64 of Scotland, 38 and 48 of England, 75 of Wales, 93, 94,191, and 192 of Ireland. These sheets, however, though admirable specimens of engraving, fall short of the original drawings in tone and relief, for in them the hill-shading is necessarily shown by line-etching, and it does not produce such effective contrasts and gradations of light and shade as the original brush work.!

he increases the contrasts be-

Delineation by Instrumental Contouring.—A very precise Instru-

knowledge of the configuration of surface may be acquired mental contour:

in the latter any attempt to introduce so much informa- tion would tend to crowd the map objectionably, and con-

fuse the vertical with the horizontal details. The smaller the scale of a map of hill country the more necessary it is to abandon mechanical conventionalism, and to aim at achieving an artistic representation which will convey an immediate and accurate impression of the general character of the ground.

In India the topography has been mainly executed on scales of or less than 1 inch=1 mile and rarely exceeding 2 inches, and, as the range of altitude varies considerably in different parts of the country, from plains and undulations little above the sea-level to mountains rising to an altitude of 29,000 feet, scales of shade were long deemed wholly unsuitable for employment. The higher mountains had necessarily to be brought into

prontinence over the lower by giving them a darker shade than was due simply to their slopes, and similarly the elevated plateaus had to be more lightened and illuminated than the low-lying plains. But in course of time, as the number of hands employed in the operations increased more rapidly than the available supply of artistic draughtsmen, the in- troduction of a scale of shade became necessary, in order that the multitude of workers might be put more nearly on a par with the few. For men who have been accustomed to associate a certain depth of shade with a certain angle of slope will work together within narrower limits of error and divergence than if left entirely to their own unaided judgment and untutored proclivities. The field sketchers should therefore learn to work on a system which gives every hachure line a definite meaning, so that their sketches may be rightly interpreted and appropriately translated and ren- dered in the final representation of the ground, when it is the duty of the draughtsman to enhance the tone of the map as much as possible while maintaining its truthfulness.

Ordnance Survey System of Delineating Grownd.—As a rule the features of the ground are sketched in the field on the 6-inch scale, and afterwards reduced and published on the 1-inch scale. The Highlands of Scotland were sketched partly on the l1-inch and partly on the 2-inch scale; in Ireland the 1-inch scale only was used; and this scale is now being adopted for hill sketching in England and Wales. In the parts where the 6-inch scale was used. the ground was first contoured instrumentally ; a plan of the con- tours and of all surveyed outlines was supplied to the sketcher, who proceeded to insert the hill features with the aid of a prismatic compass, protractor, plotting scale, and a ‘“‘hill-sketcher’s scale,” graduated to show the horizontal intervals betwcen the contours which correspond to various angles of inclination from 0° to 45°. He was required to delineate slopes up to 45° by horizontal hachures, and slopes beyond 45° by vertical hachures. The thickness and number of the strokes, the relation to light and shade, and the character of the touch were left to the skill and experience of the sketcher. The introduction of scales of shade adapted to various inclinations and altitudes was frequently mooted, with a view to securing greater uniformity ; but no such scale was adopted, for it was found that, though at first different workmen produced different results, long practice and constant comparison, together with the aid derived from the instrumental

contours, effected all desirable uniformity. Thus in good sketches it was found that the maximum breadth of stroke used in the representation of very steep mountain slopes was 2; inch, and the minimum used in low and nearly flat country, sty inch, also that the average proportions of light to shade were 1 to 3 at the maximum and 25 to 1 at the minimum inclinations. In the field sketches the light is supposed to fall vertically, and all slopes of like altitude and inclination are similarly expressed. “he 6-inch sketches are reduced to the l-inch scale for publica- tion by an artist working with Indian ink and the camel-hair brush on an impression in outline of the l-inch map. He makes a careful study of the several sketches which he has to combine together, in order to determine which features should be retained and which omitted in the reduction, and he divides the ground into zones of different altitude to guide him in giving a strength of shade proportioned to the altitude rather than to the slope as in

by carrying true contour lines over the ground and pro-. jecting them on the map of the survey. But the contours

do not give a true representation of the ground, for they

seldom represent actual lines on the surface, as do the lines on the map which indicate roads, watercourses, walls, enclosures, &c.; they give, however, a conventional representation which is sufficient per se for the engineer and the expert, and they furnish guiding lines for all shading, whether by hachures or mezzotint, which may be subsequently executed to produce an artistic delinea-

tion of the features of the ground. In instrumental con- touring we have first to decide on the vertical intervals to be maintained between the contours. They depend on the scale of the survey and the nature of the ground. In the Ordnance Survey they are made as small as from 5 to 10 feet, when special plans on large scales are being pre- pared for engineering requirements ; but for the general maps they are 50 feet up to an elevation of 100 feet above the sea-level, and 100 beyond up to 900 feet, which eleva- tion, being the practical limit of cultivation, is the highest generally marked, though in the northern counties of Eng- land and in parts of Scotland additional contours have been executed at the altitudes of 1000, 1250, 1500, 1750, 2000, 2500, 3000, &c., feet. The intervals having been deter- mined on, instrumental

levelling is commenced at either the top or the bottom of those slopes which best define the general lay of the ground, or at some previously established bench mark of which the height above the sea is known. Points are marked out on the slopes with pickets at the prescribed vertical intervals, and then the contour lines of the horizontal planes passing in succession through each of these points are traced with a levelling instrument and staff and surveyed by traverse, the two processes being performed either simultaneously or consecutively as may be most convenient.

The instruments generally used in the Ordnance Survey are a 5-inch theodolite—employed as a levelling instrument—and a con- touring staff, 8 feet long, provided with a sliding vane which may be fixed at any required height ; the staff is shifted about until the vane is brought into the horizontal plane of the theodolite, when the bottom of the staff will be on the contour line. A serviceable contouring instrument of very simple construction is the water- level, which consists of a pair of transparent phials partially filled with water ; the phials are placed upside down at the ends of a hollow bar fixed on a rotatory vertical axis, aud have their mouths connected with piping of any available material, — brass, tin, or gutta-percha. The water in both phials is in free communication, and the water surfaces indicate the horizontal plane naturally, without any mechanical contrivance. The instrument is well suited for short sights not requiring a telescope, and may be readily mani- pulated by persons ignorant of the use of instruments of a higher class. Eye-refiecting levels, clinometers, orometers, and other light instruments, which may be held in the hand and do not require a fixed support, are frequently employed for interpolating minor between major contours. In military sketching on large scales hypothenusal inclinations and lengths are sometimes measured ; the bases and perpendiculars are deduced on the spot from a table

1 With certain exceptions, principally of a military nature, the hill features are now sketched on the 1-inch scale, on photographic reduc- tions of the 6-inch contoured sheets, faintly printed in orange colour, as a guide to the sketchers.

ing.

Geo- graphical reconnais- sance.

of gradients ; and then the contour lines, and the orthogonals also if required, are laid down.

VI. GEoGRAPHICAL RECONNAISSANCE.

When a traveller passes through an unknown or little known region the opportunity afforded him of acquiring some new geographical knowledge depends largely on the configuration and aspects of the ground, the condition of the atmosphere, the attitude of the inhabitants, and the time available. If hills are numerous and prominent and free from forest, and other conditions are favourable, a large area may be covered in a short time by reconnaissance from the stations of a chain of triangles carried along the line of route, fixing points in advance, some of which be- come stations of observation whence further points are fixed ; and thus the continuity of the operations is main- tained. But the ground may be flat and devoid of pro- minent points, the view circumscribed by forests and other obstacles, the atmosphere dense and unfavourable for distant vision, the inhabitants hostile, and the time short, and the traveller may be restricted to his line of route and unable to deviate from it; he must then endeavour to maintain a continuous traverse of the route, sketching in the ground in its immediate vicinity. Whenever breaks of continuity occur he must resort to astronomical observations to effect a connexion between the dissociated sections of his survey and to obtain an independent check on the general accuracy of the operations. He has therefore to be prepared to measure base-lines, to carry on a triangulation in some regions and a traverse in others, and to make any astro- nomical observations which may be wanted, and, if possible, to complete his mapping on the ground instead of post- poning it to be done elsewhere. He should supply himself with some instruments suited for rough and rapid work and with others for better work when time and opportunity permit, and he should be careful to arrange beforehand the general character of the proposed operations and the scales and projections to be adopted for the mapping ; he should also provide himself with blank sheets of paper duly graticulated to scale, for work in detail in the vicinity of the line of route and for general geography. For measures of base-lines and distances on the ground, chains, rolls of

crinoline wire, long Assam canes, and perambulators may be employed, also omnimeters and subtense theodolites, to measure the angle subtended by a pole of known length, whence the distance may be deduced. For measures of angles and bearings, either theodolites,! or sextants, or prismatic compasses may be used, according as more or less accuracy is required. For the general survey the plane table is a most valuable instrument: it enables bearings to be at once laid down on the paper without previous measurement, and much detail to be sketched in on the spot, instead of being plotted subsequently from a field-book ; then the only independent angular measurements which need be taken are those of the principal triangles and of very distant points beyond the range of the table. Rough and rapid route surveys may be made by pacing the dis- tances, taking the magnetic bearings, and combining with the results of astronomical observation. Many thousand

? In many respects a theodolite is more suitable than a sextant : (1) it measures horizontal angles directly, whereas the sextant measures oblique angles, which have to be reduced to the horizon ; (2) it mea- sures a round of several angles with much greater facility ; (3) it measures all vertical angles with equal facility, including the small elevations and depressions of distant peaks which cannot be readily seen by reflexion from mercury for measurement with a sextant ; (4) its telescopic power is usually far higher; (5) it may be so mani- pulated as to eliminate the effects, without ascertaining the magni- tudes, of the constant instrumental errors,—excentricity, index, and collimation ; and (6) when much accuracy is required the influence of graduation errors may be greatly reduced by systematic changes of the settings of the horizontal circle.

SURVEYING

judicious introduction of latitudes

[RECONNAIssancp,

miles of itinerary through regions in Central Asia have been surveyed by Asiatic employés of the Indian Govern. ment in this way ; the northings and southings were cop- trolled by latitude observations, and the factors thus ob. tained were applied to the eastings and westings, longitudes being

impracticable. The theodolite should be employed to fix points on very distant ranges, for it will give good results, even with short bases and very acute angles, pro- vided the objects actually observed are well identified in each instance. Observations should be taken from three stations, giving two triangles with a common side, which _ will at once show up any mistake, whether of identit , Circle reading, or calculation, Whenever a break of continuity occurs in the triangulation or the traversing, astronomical observations must be resorted to. Much may be done bya and azimuths, more par- ticularly where there is considerable northing and southing, for then differences of longitude may be obtained from the azimuths and differences of latitude. A prominent peak, visible from great distances all round, may be made to serve as a connecting link between regions which cannot be con- tinuously connected, by measuring its azimuth and distance from a base-line in each region; the addition of latitudes at the azimuth stations will much strengthen the work.

Collateral Astronomical Determinations. — Determine, tions of azimuth, latitude, time, and longitude may all be required for geographical reconnaissance,—the first two more particularly, as they can be obtained readily with much accuracy ; the fourth, being much the most trouble- some to get and the least reliable when got, is only re sorted to when it cannot be dispensed with. 4

The azimuth of an object may be determined without Admih | calculation by observing the angles between the object | and a star at equal altitudes on opposite sides of the meridian ; but it is generally found by observing the angle in one position of the star and applying thereto the azimuth of the star as obtained by calculation. In the spherical triangle PZS, in which P repre- ? sents the pole, 7 the zenith, and & the star, the angle PZS is the star’s azimuth, which can be computed when any three parts of the triangle are given. P§, the polar distance of the star, is given by the tables, and PZ, the co-latitude, 3 must be previously determined ; then, for the third part, we may have either (1) PSZ, a right 2 angle, by observing a circumpolar star at its Fig. 7. maximum elongation, or (2) the hour angle P for any star, by taking the time of the observation, or (3) the zenith distance 7S, by measurement simultaneously with the hori- zontal angle. Of these three methods the first is the most accurate, but it is not always convenient; the

second re- quires, in addition, special observations for time ; the third is generally the most convenient, for it may be performed between sunset and dark, when the stars are coming into view, but when there is still sufficient light to illuminate the wires of the telescope and the referring mark, and thus enable lamps to be dispensed with.

The latitude is most readily determined by measures of Latitude. | stars' zenith distances on the meridian, duly corrected for refraction ; then, the polar distance being known, the lati- tude is at once ascertained. 'The stars should be observed in pairs of nearly equal zenith distance, north and south, for this eliminates all constant instrumental errors, as of index, excentricity, and graduation, and also errors in the adopted refractions. When a single star is employed, circum-meridian observations of zenith distance may be taken and reduced to the meridian by calculation ; tables

for the pole star are given in the Nautical Almanac, which

enable an observation, taken at any known time in the 24

hours, to be reduced to the pole.

NAUTICAL.]

The time is usually best determined by measuring the zenith distances of stars situated not far from the prime vertical; then, the latitude and polar distance being known, the hour angle P of the spherical triangle is found by calculation. Time may also be determined by observing the transits of stars over the wires of the tele- scope of a theodolite set up in the meridian.

The longitude may be determined either absolutely, by purely astronomical methods, as by observations of the moon's motion, or differentially, with the aid of telegraph lines and travelling chronometers. Absolute longitude is the geographer's great difficulty ; for much time must be devoted to the observations, and much more to their re- duction, when undertaken with the object of fixing the relative positions of the stations of a survey. The obser- vations are of various kinds,—(1) lunar distances, 7.¢., the distance between the moon and the sun or one of the

meters and boiling-point thermometers; descriptions of them, and the formule employed in reducing the observa- tlons, are given under BARoMETER (vol. iii. pp. 381-387). Here it is only necessary to add that the date and hour of every barometric observation should be recorded, and the observations referred for reduction to those taken at the same time at one or more of the nearest standard meteoro- logical observatories ; otherwise corrections should be given to the barometer readings for the hour of the day and the month of the year, in order to reduce them as nearly as may be to the local mean altitude of the mercury. The index errors of aneroid barometers, being liable to varia- tions, should be determined from time to time by observa- tions at stations of known altitude, or by comparisons with boiling-point thermometers.

VIL. Navricat Surveyina.

stars given for this purpose in the Nautical Almanac; (2) lunar zenith distances, observed at points of the moon’s path where the conditions are favourable; (3) lunar

Nautical surveying has for its object the determination Nautical of the configuration of land which is covered and concealed S**vey- from view by water, more particularly along the foreshore ™®

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transits over the meridian, observed with transits of the moon-culminating stars given in the Nautical Almanac ; (4) lunar occultations of stars ; (5) eclipses of the sun and moon ; (6) eclipses of Jupiter's satellites. The first method requires the employment of a sextant or other reflecting instrument ; the second may be accomplished with either a reflecting instrument or a theodolite; the third with a theodolite ; for the last three a good astronomical telescope is wanted. The first, when carried out strictly, requires three observers,—one to measure the lunar distance, while the others are measuring the zenith distances of the moon and the star; but, as the last two are not wanted with great accuracy, the several observations may be taken in succession by one person, and the observed zenith distances afterwards adjusted to the time of the lunar distance.

The effects of errors of observation in these methods are as follows. In (1) an error in time produces the same error in the longitude, and an error of one second of arc in the distance pro- duces two seconds in time in the longitude. In (2) an error of one second in time produces at least thirty seconds of time error in the longitude, and one second of arc in the zenith distance at least two seconds of time in the longitude. In (3) to (6) an error of time pro- duces the same error in the longitude. The first method is pre- ferred by seamen and travellers, who are more expert in the use of the sextant than of the theodolite. The second method is pre- ferred by those who are more familiar with the theodolite, and who are equipped with one of good telescopic power. It gives very good results when the observations are made at the most favourable time, which occurs when the resultant of the moon's motion in right ascension and in declination lies in the direction of the observer's zenith; this time may be readily found by graphical projection on a chart of the heavens.

Differential longitude may be determined chronometri- cally, on land as at sea, by carrying about several well- rated chronometers and comparing their times with the local times deduced from observations of the sun and stars ; or electro-telegraphically, by interchanging signals between two stations connected by a telegraph wire, and ascertain- ing the local times at which the signals are transmitted from and received at each station.

Hypsometry.— Determinations of height form a very necessary part of geographical reconnaissance. Whenever triangulation is possible, vertical angles may be measured and the heights ascertained in regular succession. But in a traverse this is scarcely practicable ; breaks of continuity in the verticals are liable to be of frequent occurrence, and then recourse must be had to observations of the pressure and temperature of the atmosphere, or of the temperature of the vapour of boiling water, from either of which fairly correct heights may be deduced differentially under normal atmospheric conditions in settled weather. The instruments employed for this purpose are mercurial and aneroid baro-

of a coast-line, and wherever navigation is carried on in comparatively shallow waters and a knowledge of the depth of water is of great importance; it has likewise to lay down the positions of oceanic islands, shoals, and rocks, and generally to delineate whatever land exists immediately above or below the surface of the ocean. Its methods differ according as they are performed in or out of sight of land. When in the vicinity of land it is pre- ceded by a survey of the coast-line and a belt of the country beyond, which must be of sufficient breadth to furnish suitable points of reference for the survey opera- tions on the water, and may have to be extended inland to embrace those peaks of distant hill ranges which are prominent objects at sea for the guidance of mariners. This done, the nautical survey is carried on in boats, by taking soundings and determining the positions of the boats by observations to some of the points already fixed on land. The observations are necessarily made with sextants and magnetic compasses only. With the former the angles between conspicuous land-marks are measured, and, as the angle between any two points is half the magnitude of the angle between the same points at the centre of the circle which passes through them and through the boat, the measurement of two angles between three points enables two circles to be drawn on the chart, the intersection of which will generally indicate the position of the boat with sufficient accuracy. Occasionally, however, it happens that the positions of all three points on shore and the boat also lie actually, or very nearly, on the circumference of one and the same circle; then a bearing taken with the compass will fix the position of the boat on the circumference of the circle. Time is noted whenever soundings are taken, that due allowance may be made for the rise and fall of the tide. All the sounding

stations are not fixed by observations to points on shore, as just indicated, but only a certain proportion, and between them straight lines of sounding are run, with intervals measured either by a patent log, or by time, or by counting the strokes of the oars; whenever possible the lines of sounding are carried parallel to each other. Sounding is the most important part of a nautical surveyor's duty and that on which his character mainly depends. It is essentially the work of the sailor, for in carrying it out the accidents of wind and water—the direction and force of the wind, the rise and fall of the tide, and the velocity of currents—must be duly taken cognizance of and the work managed to suit wind and weather ; on the other hand, the work on land may be done by landsmen. Nautical surveying, out of sight of land, rests on astronomical determinations of latitude and time, chronometric longitudes, and dead reckoning by log. XXII, — 90

Gratieu- lation.

714

When triangulation is resorted to, base-lines are measured sometimes with a patent log, sometimes by sound, by noting the interval in time between the flash and the report of a gun. The great length of modern ironclads presents a base-line which is occasionally very convenient : points are taken at each end of the ship, as far apart as possible, from which two observers can see each other ; they are carefully marked, and the distances between them determined for future reference ; then angles between moderately distant objects and observers standing at these points, taken simul- taneously from each point, enable the required distances to be obtained. The magnetic variation is determined by observing the azimuth of the sun, when on or near the horizon, with a standard compass fixed amidship, care being taken beforehand to determine any deviation of the needle which may be due to the attraction of the surround- ing ironwork, by observing the bearing of a distant mark as the ship is swung round and her head laid on different points of the compass. See also NAvicATION (Practical), vol. xvii. p. 264.

VIII. Maprine.

Graticulation.—The sheets of paper on whicn the details of the survey of any large area of country are to be laid down must be furnished with a

system of conventional lines, drawn with a view to assimilate the margins of con- tiguous sheets and to form a graticulation within which the details may be accurately inserted. The graticule is sometimes rectangular, sometimes spherical, sometimes a combination of both, as when points of which the latitude and longitude coordinates are given have to be plotted within rectangular marginal lines. Spherical graticules are constructed in various ways, usually in accordance with some specific method of projection ; see GEOGRAPHY (Mathematical), vol. x. p. 197. The following convenient method is not referable to any demonstrated projection, but is generally employed on the Indian Survey. Suppose the intersection of two meridians by two parallels to form a small spherical quadrilateral, with sides of aliquot parts of a degree in latitude and in longitude; let m be the length of each of the meridional arcs, p, p' the lengths of the arcs on the upper and lower parallels, and let g be a diameter, then

g= Ni? +p. 7'; thus, m, p, and p' being given, g is calculated. With these data, which are tabulated for different arcs and scales, the corner points of a number of quadrilaterals are laid off in suc- cession on either side of an adopted meridian, and lines are drawn through the points to indicate the collateral meri- dians and the parallels of latitude. The latter are always curved, more or less sensibly ; the former are also curved, though in a much less degree, being concave to their initial meridian, and the more so the farther they are from it. When the area is small and the scale large, the meridians are practically straight lines, and the several sheets of a map, each projected on its own meridian, will fit together closely when carried on in any direction. But, when the area is large—exceeding 8 or 10 square degrees —and the scale small, the sheets will not fit together con- tinuously unless they are projected with reference to a single meridian for the whole map, to which the meridians on either side will be increasingly concave, or unless all the meridians are made straight lines, by slightly contract- ing each of the intermediate arcs of parallel to a length which is exactly proportioned to the lengths and relative distances of the upper and lower parallels of the map from it. There must be some distortion in either case: in the first, meridians which are actually straight lines are repre- sented as being curved; in the second, straight meridians are obtained, but the distances between them are exact

only on the upper and lower parallels, and are too small elsewhere, more particularly on the middle parallel, the length of which necessarily exceeds the mean length of the upper and lower parallels… But distortion is inevitable whenever a spherical surface is projected on a plane. |

When a map is constructed in rectangular sheets, some station is adopted as the origin and its meridian as the i principal axis, to which the corner points of the sheets are | to be referred ; the coordinates of these points are given such dimensions as are most suitable for the size and scale of the map, and are equivalent to the rectangular spherical coordinates of imaginary points on the curved surface of the earth, at corresponding distances from the origin and its meridian. These being given, the distances of the points from the origin in latitude and longitude may be computed, as already shown (p. 706) ; thus data become) available for projecting the graticulation of meridians and . parallels within the rectangular marginal lines of each : sheet, or for introducing the divisions of latitude and longi- ‘ tude on the marginal lines if preferred. Conversely, when the latitudes and longitudes are given, the rectangular spherical coordinates are computed and the marginal lines | projected around the graticulation. Filling in is then commenced: the principal stations are laid down by their | coordinates and the topographical details pencilled around them by copying or tracing the field sheets of the survey; . the names and the outlines are then inked in; the shad- | ing for delineating the features and general configuration of the ground is usually done last of all. The manner in which the details are inked in and rendered permanent depends on whether the map is to be reproduced by hand only—as when it is to be engraved or lithographed—or whether in its reproduction photography is to be employed and the action of light invoked, either in entire superses- sion of or in partial co-operation with the labour of the draftsman. Iu the former case the map is made as perfect a pictorial representation of the surface of the ground as possible, the hill features being represented artistically in mezzotint shading with a brush or in chalk drawing, anda variety of colours used to facilitate discrimination of differ- ences of topographical detail. In the latter no colours are used which

will not photograph well, nor flat shades of any colour, nor—as a rule—mezzotint shading, but only some substitute therefor in pen and ink. This last condition is essential for the commonly employed processes of photo-zincography and photo-lithography ; but endeavours have recently been made, with some degree of success, to re- produce mapping in middle tones by the processes of photo- collotype and photo-gravure.

Photography is much employed as an auxiliary in map- Photo- ping ; for when a map is to be published on various scales graphy the hand-drawn details of the largest scale edition may be oe 4 reduced by its means as accurately as by the familiar pantagraph, and of course very much more rapidly. Thus in the Ordnance Survey town maps on the scale of gig are reduced to the scale of +#,; for incorporation into the parish maps; the latter are reduced for insertion in the 6-inch maps, and they in turn for the l-inch map. By limiting the dimensions of each sheet for reduction to 3 feet by 2, and by a judicious use of stops to lenses, the re- ductions are made without any error in scale or any distor- tion that can be detected by the most rigid examination.

But photography reduces every part of the original alike, the printing of words and names as well as the topographt- eal details, and it reproduces all the minor and less import-

1 In Mr O'Farrell's pamphlet On the Construction and Use of the Six Sheets of Marginal Lines for Maps of every part of the World, published by the Ordnance Survey, tables are given of the lengths of meridional and longitudinal arcs, their versines and diagonals, for every ten minutes in latitude from the equator to 80° N. and 80°S.

ant as well as the more important features ; hence a reduc- tion is rarely suited for reproduction without intermediate modification, the printing being generally too small to be easily legible, and the mass of minor detail tending to con- fuse the principal sub-lines. The draftsman. is therefore called in and the procedure so arranged as to obtain the best results with the least labour. Either he may con- struct a new map by tracing from a silver print of the photograph whatever topographical details are required for it

and omitting the rest, or he may ink in such details at once with black ink on a blue print taken from a transfer of the photograph to stone or zinc, in both cases adding names and writing of appropriate sizes ; either result may be reproduced by photography, as the unblackened details of the blue print will disappéar in the process. This done, a transfer to stone or zinc may be made from the second photograph for the printing off. Prints from photographic reproductions to full scale exhibit all the blemishes of the hand drawing and somewhat exaggerate them, whereas prints from photo-reductions are freer from blemish, and often as clear and sharp as good hand lithographs. In employing a process of double photography, therefore, the first photo is usually made on a larger scale than that for publication ; the lines of the printing and topographical detail are correspondingly exaggerated by the draftsman ; and then the second photo is a reduction, which should be sharp, clear, and free from blemish.

IX. Marv PRINTING.

Various processes are employed for the reproduction of maps in large numbers for general issue ; some are purely manual, the map being redrawn by hand on copper, stone, or other substance pre- senting a suitable surface from which prints may be taken, or on paper specially prepared for transfer to such substance ; others are earried out with the aid of photography, whereby an exact copy of the original can be obtained either directly upon, or for subsequent transfer to, the surface to be printed from. The former include the processes of copper-plate engraving and lithography, which are the oldest, and still in some respects the best of all, but slow and ex- pensive ; the latter include the processes of photo-lithography, photo-zincography, photo-gravure, and photo-collotype. Engrav- ing on stone is much employed on the Continent for map work, being cheaper and quicker than engraving on copper. Electro- metallurgic processes are frequently employed in connexion with copper-plate engraving, either to protect and harden the surface of the plate with a facing of steel or to furnish duplicates to be printed from, instead of the plate itself being used ; sometimes the wear of the plate is prevented by transferring a print from it to a litho- graphie stone or a zinc plate, from which the printing is done in its stead. By the anastatic process an old print of a map may be transferred to a zine plate to be printed from.

Engraving may be performed on copper, wood, zinc, or stone ; see vol. villi. p. 435. As done on copper plate for mapping, it is a combination of ploughing with the burin and etching with an acid, the former being used for the names and topographical outlines, the latter for the features of the ground. The system adopted in the Ordnance Survey of Great Britain—where it las been largely em- ployed and carried to great perfection—is as follows. The 6-inch maps of the survey are engraved on copper plates measuring 36 by 24 inches within the marginal lines and weighing about 35 Ib; the l-inch maps are 18 by 12 for England and 24 by 18 for Scotland. The corners of the maps, the prescribed marginal subdivisions, and the trigonometrical points are first marked on the plate by a scoring machine, in which it is laid, and which is provided with a travelling catriage holding a steel pricker. The carriage is moved along a graduated scale and the pricker along another scale at right angles to the former, and all points of which the rectangular coordinates are known are laid off by vernier-read measurements from the two scales. The plate is then removed from the scoring machine, heated, aud given a thin coating of white wax, to form a surface on which the topographical details are plotted before the graving is com- menced. This surface is divided into a number of reetangles by fine lines joining marginal subdivisions, the distances between whieh are usually so regulated as to introduce sixteen of the survey sheets on the spy Scale into one sheet on the 6-inch scale. The reductions to this scale are made by photography, and the subsequent reduc- tions to the 1-inch scale either by the pantagraph or by photography. Tracings of the reductions in lamp-black, made to fit into the rect- angles, are transferred to the wax ground by rubbing with a steel burnisher, The plate is then ready to be placed in the hands of the

engravers, who complete first the outlines, then the printing and writing, and afterwards the ornament, each class of work being usually done by a different person. The figures of latitudes, longi- tudes, and altitudes, and various conventional symbols, are stamped with steel punches. Parks and sands are ruled with a dotting wheel, and buildings shaded in lines with a

ruling machine. When a plate of the 1-inch map is being engraved, all the printing is completed, and line-engraving with the exception of the contour lines, and then an electrotype duplicate of the plate is taken. The contour-lines are engraved on the duplicate, and the hills are etched on the original plate ; thus two editions of the map are obtained, one with contours but without hills, the other with hills but without contours, the topographical details and writing being the same in both. In etch- ing, the surface of the plate is thinly coated with an acid-resisting substance composed of asphalt, Burgundy pitch, and virgin wax, forming an etching ground, on which the outlines of the hill features are traeed, and then marked through with a needle which removes the ground where it passes, exposing the surface of the copper. Aquafortis is applied to bite in the finer lines and then poured off ; the parts which are bitten sufficiently are painted over with '"stop-ping varnish"; and acid is again applied. The processes of stopping out and biting in are alternately repeated until all the required tints from the lightest to the darkest are produced. In printing from a copper plate, a much more powerful press has to be used than in printing from stone or zinc, as the ink lies in the furrows that have been ploughed or bitten into the plate and not on its surface; the process of printing is also much slower. In engraving on stone or zinc, the surface is eoated with a preparation of gum and lamp-black, and on it the detail is traced with red chalk and afterwards cut in with very fine steel or diamond points so as just to lay bare the surface of the ground without penetrating to any depth, asin copper- plate engraving. A little oil having been rubbed over the surface, the gummy composition is washed away and printing-ink applied ; the printing is performed almost exactly in the same way as in ordinary lithography, except that the printing-ink is in the first in- stance spread over the stone or the zinc plate with a dabber instead of a roller.

Electrotyping is employed to conserve work engraved on copper, either by depositing a thin surface of steel over an engraved plate, which enables it to be printed from very much oftener without injury, or by produeing a duplicate to be employed in its stead in the printing. In the latter case, a double process is gone through : first, a cast or matrix is produced in relief by the deposition of copper on the surface of the original plate, and then an intaglio of the matrix—which is therefore a duplicate of the original—is formed by depositing copper on the surface of the matrix. For details of

these processes, see HLECTRO-METALLURGY, Vol. vili. p. 114. In the Ordnance Survey electrotyping was first employed to obtain duplicates on which to make the corrections and additions neces- sary to show the growth of railroads and towns since the time of the original survey. The alterations are effected more easily when obsolete details are scraped off the electrotype matrix than when they are scooped out of an intaglio ; the original plate is also preserved intact.1 Electrotyping is further serviceable in producing the two editions of the general map, one with contour lines, the other with hill-shading, already mentioned, as well as editions for geological and other details. It is also serviceable in effecting a combination of portions of several plates: matrices of the different portions are riveted together to form a single plate; then an intaglio of this plate is taken, on which any details lost at the junction of the matrices are made good by hand. The dimensions of a full-sized plate are 384 by 264 inches; the weight of a matrix is 18 Ib, and of the duplicate 38 ib.

There are two essentially distinct processes of lithography,—one in which the map is wholly drawn by hand on the stone, the other, a much quicker but coarser process, in which it is traced with greasy ink on specially prepared paper, which is then laid face downwards onthe stone. When lithographs are to be produced bya single print- ing, all hill features, as well as topographical outlines and names, are drawn with a pen or fine camel-hair brush in ink of one colour. Double printing is necessary when the hills are drawn in chalk, two stones being required, one for the chalk work, the other for the pen- and-ink work ; and in chromo-lithography a separate stone is re- quired for the work in each colour. For full details, see Lirno-GRAPHY, vol. xiv. p. 699. ;

Zincography has of late years largely taken the place of litho- graphy for printing from hand-drawn transfers, though not for hand-drawing on the surface of the zinc, as on stone and copper. Zinc plates are less costly and bulky than lithographic stones, and are much more conveniently handled: thus a plate measuring about 43 by 28} inches and 8, of an inch thick weighs 60 Ib, is easily carried by one man, and costs 16 shillings ; a lithographic stone of the same surface is 44 inches thick, weighs 450 Ib, requires four men

1 In the Freneh and Austrian surveys eorrections are made on fresh eopper deposited by electrieity over the faulty parts, whieh are scooped out.

Electro- typing.

Litho- graphy.

Zinco- graphy.

to lift it, and costs about £7. Prints from transfers to a zinc plate are as satisfactory as prints from transfers to stone, and there is no liability of the plate being fractured in the press, which not unfre- quently happens to the stone. The surface of the plate is repared by scraping it evenly all over with a razor blade in parallel lines, until all irregularities are removed ; the plate is then bent so as to present a slightly convex surface, which is ground with pumice- stone and water, and smoothed with a piece of steatite, and then given a grained surface with sand. It is flattened by being passed through a press, after which it is ready to receive the transfer. The subsequent procedure depends, as in lithography, on the circum- stance that greasy substances do not mix with water and are repelled by gummy substances. The greasy ink lines of the transfer are

readily absorbed by the surface of the plate ; then a preparation of

gum and decoction of gall nuts (to which a little phosphoric acid is added), applied to the entire surface of the plate, serves to etch the blank ground without affecting the lines of the transfer ; but it prevents the ink from spreading, and also fills up the pores of the blank parts of the plate with a gummy substance, which repels a greasy ink. Printing ink, therefore, applied as usual with a roller to the entire surface of the plate adheres to the inked lines only and can be readily washed off the blank spaces, and then a print taken will show the inked lines only. The tracing for transfer is drawn on paper thinly coated with starch to prevent the graphic writing-ink from soaking into it; the ink is a mixture of Paris black, Castile soap, white wax, tallow or sweet oil, and shellac, which being greasy is readily absorbed by the zinc. The tracing is laid face downwards on the plate and passed several

times under the pressure of the roller of the printing press. It is then wetted and peeled off, the ink remaining on the zinc. The surface of the plate is again washed with the etching liquid, which removes stains from the blank spaces and renders them more susceptible of being equably wetted with water, and also—after a few drops of turpen- tine have been added—removes the unabsorbed writing-ink and helps to fix the lines. The plate is then ready to be printed from. The printing-ink is cistron of lamp-black—with a little Prussian blue added—and linseed oil varnish of a thickness depending on the temperature and the subject. Small corrections on the plate can be made by removing the surface with a strong solution of hydrate of potash, and then preparing a new surface to be drawn on by applying dilute nitric acid and afterwards washing off the nitrate of zine.

Anastatic Anastatic printing produces facsimiles of any inked print by printing. transfer to a zine plate, the inked lines on it being absorbed in a

Photo- graphy.

greater or less degree by the plate. The print is laid face down- wards on blotting-paper, and brushed with a solution of nitric acid diluted with five times its bulk of water until thoroughly and evenly saturated ; it is then placed face downwards on a zinc plate with a well-grained surface, and passed under the roller of a power- ful copper-plate printing press. The grease of the ink, being set free by the acid, adheres to the surface of the plate; but, as the amount of ink absorbed is much less than in the case of an ordinary transfer, it is strengthened by working up with lithographic ink, oil, and gum water until the surface is sufficiently strong to bear etching with the usual preparation of gum, nut galls, and phosphoric acid. The plate is now ready to be printed from in the usual manner. If the original print is an old one, it must first have its ink softened by immersion in hot water containing half an ounce of caustic strontia for every pint of water, the time of immersion varying, with the condition of the print, from a few minutes to an hour. A print well worked up is often superior to the original. Photography having already been described in detail (see vol. Xviii. p. 821), its application to mapping and map-printing need only be noticed here. The action of light can be employed either by placing the map in contact with a sheet of sensitized paper and against a glass plate in a printing frame, when

the light will pass through the map and produce a picture of it on the paper, or by using a camera furnished with an object-glass, through which rays of light from the map are transmitted so as to produce a picture on a sensitized glass plate, which can afterwards be printed from. The best known of the processes in which the camera is not used is the “eyanotype”; the paper is sensitized with a mixture containing nearly equal proportions of solutions of ammonio-citrate of iron and the ferrid-cyanide of potassium ; the prints give white lines on a dark-blue ground, and are very inexpensive. There are other processes of printing with the salts of iron, uranium, &c., which sive an exact transcript of the original drawing with dark lines on a white ground. But they are only suitable for maps drawn in pen and ink not larger than the glass plate of the printing frame; being therefore only serviceable in special cases when few copies are wanted, they are little employed and may be regarded more as curiosities than as ordinary methods of map-printing. Photo- graphy is generally effected with the aid of a camera, and em- ployed to obtain a negative of a map on glass, from which prints may be taken either for use per se or for transfer to a flat surface of zinc, stone, or other suitable material to print from. The map is usually attached to a board suspended vertically in an adjust-

able frame, while the camera is placed on an adjustable stand set at right angles to the map frame on a tramway, along which it can be moved to any desired distance from the map. The camera is furnished with a ground-glass focusing screen, on which is encilled a rectangle whose dimensions are proportional to those of a corre- sponding rectangle on the map, in the ratio of the scale of the required photograph to that of the map. The map and the focusing screen are brought into parallelism at such a distance that the image of the rectangle on the map exactly coincides with the rect- angle on the focusing screen. A sensitized collodion plate is then substituted for the screen and a negative taken, which is afterwards “fixed” and ‘‘intensified” so as to produce the greatest trans. parence in the lines and an almost opaque density of the ground. Printing from a negative is usually performed by the action of light when only a few copies are wanted, and mechanically

when many are wanted ; the prints are taken directly from the negative in the one instance, and from a transfer of the negative to the surface of a stone or metal plate in the other. Of the processes of printing directly from the negative, silver printing, the oldest, is as yet unsurpassed for the delicacy of its results, but it is expensive and perishable; the prints are taken on paper coated with albumen containing an aitdlina chloride, such as common salt, floated on a bath of nitrate of silver, and allowed to dry in the dark. After exposure to light in a printing frame, the prints are washed, toned with a solution of gold, and then fixed in a bath of hyposul phate of soda, which dissolves all the remaining unaltered chloride of silver. At the Ordnance Survey office platinum printing is now (1887) largely used instead of silver printing for all purposes where only a few copies of a map are required. It is more expensive, but the prints are absolutely permanent and are produced more quickly than silver prints. Their rich velvety black colour and freedom from glaze render them peculiarly suitable. The paper is sensitized with a preparation of platinum and ferric oxalate. After exposure to light, the image is developed almost instantaneously by layin, the print on a hot solution of potassic oxalate ; it is then vai in successive baths of dilute acid to remove the soluble iron salts, and after that in a few changes of water. Various processes of “collo-chromate” printing are also most usefully employed in map- printing ; they depend on the reaction of the salts of chromium— particularly the alkaline bichromates—on gelatin, gum, albumen, or other colloid substances, which, in proportion to the amount of the action of light upon them, become more or less insoluble in and unabsorbent of water, and acquire the property of taking up greasy ink and not attracting plumbago or other fine dry pigment in powder. When the subject is in line the print is taken on paper that is usually coated with a mixture of gelatin and bichromate of potash, coloured with Indian ink or any other suitable pigment; after a few minutes’ exposure in the copying frame the paper is plunged into tepid water, which dissolves the unaltered gelatin in the blank parts of the print—they have been protected from the light under the dark parts of the negative—leaving a clear image in pigment on a white ground. When the subject is in half-tone, the gelatin film has to be detached from the paper that it may be developed by being washed on the unexposed side, a temporary support being employed to preserve the image from injury during the washing; the most delicate shades in the half-tones are thus perfectly preserved.

In the processes noticed above it is necessary to repeat the opera- Photo-
tion by exposure to light for every print produced; the rate of mechan-
printing will therefore be more or less dependent on the sensitiveness ical

| of the paper, the strength of the light, and the condition of the printing

atmosphere. In the processes about to be described these dis- advantages are obviated by transferring the photographic image to a surface of stone or metal, from which prints may be made mechani- cally in any numbers independently of light or weather. The photo-mechanical processes are broadly divisible into two classes,— one comprising photo-lithography, photo-zincography, and photo- typography, for the reproduction of subjects in line only; the other, photo-collotype and photo-gravure, for subjects in mezz0- tint or half-tone as well as line.

Photo-lithography and the analogous photo-zincography are the Photo-
processes which have hitherto beeu most extensively employed for i. map
printing. They are the simplest to carry out; they allow graphy the
photographs of several sections of a map which may be tooand large to be
reproduced as a whole to be combined ; and additions photo and corrections
may be readily made by hand on the stone or zinc _, plate. The prints for
transfer from the negatives are taken on paper graphy: coated with a
mixture of gelatin and potassium bichromate, as in the pigment printing
process, except that the greasy ink or colour- ing matter is not mixed with
the gelatin, but applied evenly over the surface of the prints after exposure
to the light. The inked print is immersed for a few minutes in tepid water to
soften the gelatin still remaining soluble in the parts not acted upon by light,
and is then laid on a sloping plate and washed with a soft sponge until all
the unaltered soluble gelatin and the ink overlying it are removed. The lines
on which the light has acted remain insoluble and retain the ink, forming a
clear image of the subject in a greasy

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. in the same way as a woodcut.

INSTRUMENTS, |

ink. When a map is photographed in several sections, as often happens, each section overlaps well all round to enable the transfers from the different negatives to be neatly joined together without showing lines of junction; if the whole is too large to be printed ona single sheet of paper, it is cut up into sections for printing separately. ‘ The object of photo-typography is to obtain by photographic agency a surface block which may -be set up with type and printed The image may be obtained ona zine plate by transfer in the same way as for photo-zincography, or it may be printed directly from a reversed negative. In the latter case the zinc plate is usually prepared with a thin coating of bitumen, a substance which has the property of becoming in- soluble under the influence of light, so that, when after exposure the plate is washed with turpentine or benzole, the image remains on the zinc, while the ground is washed away. In both cases the image is strengthened by careful inking and by the application of powdered resin, which the plate is heated sufficiently to melt. The image is then etched with nitric acid. The operations of inking, applying resin, and biting with acid are repeated several times, until the plate is bitten sufficiently deeply to give clear prints. In another process, which is perhaps preferable for fine work, a mould is obtained by electrotyping a relief in swollen gelatin, the surface of which has been metallized with plumbago or bronze owder. ‘These processes are largely used for producing small maps to illustrate books and newspapers, but not for maps of ordinary size. The three mechanical processes just noticed are only applicable to maps drawn in line, and to get good prints every line should be of the same blackness, though of different breadth. Attempts have been made to reproduce brush-shaded drawings, exhibiting con- tinuous gradations of shade, by photo-lithography and photo-zinco- graphy, but with very partial success, and only by breaking up and destroying the continuity of gradation. The following processes are specially suited for reproducing maps in half-tone. In photo-collotype, so-called from the printing surface being of

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requisite linear and angular measurements on the ground, the other for plotting the data thus acquired on paper, and for measuring from the map,

when completed, lengths and areas which it may not be convenient to calculate from the numerical data. As a rule different instruments are employed for the mensuration on the ground and for the plotting on paper; but to this rule there is a notable exception in the plane table, by means of which all bearings may be drawn directly on paper with a sight rule, without previous measurement of any kind, and thus a plot of the ground may be constructed without employing any other instrument.

Field Instruments.—These are of two classes,—linear, for deter- Field mining distances directly by actual measurement along the surface instru- of the ground, and angular, for determining the bearings of, or the ments.

angles between, any objects. Some instruments are automatic, as the needle, which points to the magnetic north, the plumb-line and the spirit-level, which indicate the direction of gravity, and hypsometers of various kinds, for measuring altitudes; others are entircly controlled by the manipulator. Some require to be rigidly supported on the ground, as measuring bars and theodolites ; others are adapted for flexible supports, as reflecting and magnetic instruments, which may be employed either on land or on the oscillating deck of a ship at sea. Some, as magnetic compasses, measure angles in the horizontal plane only ; others, as theodolites, in two planes,—one horizontal, the other vertical ; others, as refiect- ing instruments, in all planes; others, as levelling instruments, measure nothing, but simply indicate a plane of reference. And there are certain instruments by which angles are measured in the ordinary way, and direct distances are determined by micrometric measures of the small angles subtended at a distance by objects of known dimensions.

Linear instruments are of two classes,—one for exact measnre- Linear ment of base-lines the lengths of which are required to be known instru- with great precision, the other for ordinary and rough measure- ments.

lo} gelatin, a plate with a perfectly smooth surface, usually of thick mei glass, either is coated with a sensitive mixture of gelatin and bichromate of potash, upon which the photographic image is pro-

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duced by the action of light through a reversed negative, or is employed to support a gelatin film on which the image has been imprinted from an ordinary negative, and which is attached to the plate with suitable cement. The gelatin when properly moistened possesses the valuable property of receiving a greatcr or less amouut of ink in different parts of the image in exact proportion to the intensity of the action of the light on each part ; thus it is capable of reproducing the most delicate gradations of shade. The process is admirable for maps of small size, which only require a single plate, but is not suited for making a combination of sections to form a map of ordinary size; nor can additions or corrections be made on the gelatin film, which is, moreover, so tender that it does not readily permit of a large number of prints of uniform quality being taken, and is easily damaged.

The several methods of obtaining an incised image on a copper

grav. plate by means of photography are broadly divisible into the two

groups of electrotyping and etching processes ; one of each will be briefly noticed. (1) A positive pigment print, forming a relief in hardened gelatin, is developed on a silvered copper plate by the ordinary operations of the autotype or pigment printing process ; it is then blackleaded and copper is deposited on it to form an

ments. Among the former may be included the Colby apparatus of compensation bars and microscopes, described in sect. I., § 2 (p. 696 above), Bessel's apparatus, those of Struve and the United States Coast Survey, and Porro's (adopted by the Spaniards and the French in Algiers), which have already been described in EARTH (FIGURE OF THE), vol. vii. pp. 598, 600, and GEODESY, vol. x. pp. 168, 164. For less exact but still essentially accurate measures the instruments most commonly employed

are the brass or steel chain of 100 links, the graduated metallic tape, and the offset pole.

For reconnaissance and rough measurement, perambulators, with wheels of known periphery and dials to indicate the number of revolutions, are largely used in India. Crinoline wire has been employed with advantage in Australia ; it is so light that a length of 1000 feet or more may be easily carried, rolled on a drum, by one man, who pays it out as wauted; he is usually followed by another, who commences rolling it up at the opposite end when an entire length has been laid out on the ground. Air lines arc sometimes measured by stretching the wire over the tops of trees in valleys obstructed with forest, also the breadths of rivers by resting the wire on logs anchored at suitable intervals to support it above water.

Angle-measuring instruments are of two classes, direct and re- Angle-flecting. Both are provided with an aligner, usually a telescope, measur- which is pivoted over the centre of the graduated circle or sector : ing in onc the aligner is pointed in succession to any two objects the instru- angle between which is being measured ; in the other it is pointed ments.

electrotype intaglio, from which prints may be taken in the usual way, three to four weeks being required for the deposition of enough copper to produce a plate of sufficient thickness. (2) A negative pigment print is developed on a highly polished copper plate, upon which a very fine grain of powdered resin has been deposited and

fixed by heat. The intaglio is obtained directly on the plate by biting in with a solution of perchloride of iron, which penetrates the gelatin film with comparative easc in those parts representing the shades and lines of a map, where there is little or no gelatin, and thus bites the copper to a considerable depth, while in the parts representing the blank spaces and ground of the map, where the gelatin is thicker, it penctrates with more and more difficulty as the thickness of the gelatin increases, and in the highest blanks should leave the copper untouched. The operation of biting takes only a few minutes, and the gravure is remarkable for its delicacy of gradation and richness of effect; there is, however, some difficulty in etching to the proper depth so that the plate may stand much Printing without the loss of the finest tint. In both cases the copper plates have to be protected by a facing

of steel before they can be printed from. The processes have not yet been used to any great extent for maps with half-tones, but they are very promising. For maps in linc the first method gives excellent results, and 1s largely employed in the Austrian and Italian surveys.

X. INSTRUMENTS.

The instruments employed in survey operations are broadly divisible into two classes, one for making the

to one object, while an image of the second is thrown on the first by double reflexion from a pair of mirrors. Reflecting instruments are largely employed in nautical surveys, as they can be held by the hand and do not require a rigid support; but they are very rarely used in land surveys. A description of them will be found under SEXTANT (vol. xxi. pp. 724-725). They give the angle in the plane in which they are held; and, whenever this plane is sensibly oblique to the horizon, the angle must be reduced by calculation to the plane of the horizon before it can be employed in the work of aland survey. The other instruments give the required horizontal angles, whatever the altitudes of the objects observed.

The circles of angle-measuring instruments are usually divided into 360 equal parts called degrees, and subdivided into spaces ranging downwards from thirty to five minutes of arc, according as the diamcter of the circle is increased. Smaller arcs are measured by interpolation between the subdivisions, with the aid of a circle reader which moves with the aligner. All instruments except those of the simplest form are supplied with one or more circle readers and spirit-levels and a telescope ; these important adjuncts, which are common to so many instruments, will therefore be first described, and afterwards the more important instruments which are employed in connexion with survey operations.

Circle readers are of two kinds,—the vernier and the microscope.

Circle Both are held over the circle at the extremity of a radial arm | the inverted image transmitted by the object-glass or a combina. readers, pivoted over its centre. The vernier moves in contact with the | tion of four lenses for inverting the image and causing all objects surface of the circle,

while the microscope views it a short distance | to be viewed naturally. The former is usually employed for ob. off; the former is usually applied to circles whose diameters do | serving celestial objects, the latter for observing terrestrial. The not exceed 12 inches, the latter to those of larger diameter. Both | field of view being more or less extensive, a central point is estab. kinds of reader are applicable to linear scales as well as to graduated | lished in the tube, usually by the intersection of a pair of fine wires circles, the microscope being usually employed when most precision | or spider lines—one vertical, the other horizontal—in the plane of is desired. the image, and the telescope is directed by bringing this point on Vernier. The vernier is so called after its inventor, a Frenchman. Its | any specific object in the field. As the interval betveen the object- principle is very simple. The space between any convenient number, | glass and the image varies with the distance of the object, a tube n, of graduations on the circle is set off on the vernier and divided } is provided to slide within the telescope tube and carry the object- into (n+1) equal parts; then some one division of the vernier will | glass at one end, while the telescope tube carries the diaphragm always coincide with a graduation of the circle. On counting the | and eye-piece at the other end, or vice versa. The image and the divisions from the index onwards it is found that the coinciding | wires are brought into the same plane by a focusing screw, which division, say the mth, of the vernier is opposite the mth gradua- | acts on the inner through the onter tube. The wires are attached tion of the circle, counting from the last one passed by the index. | to the surface of an adjustable annular diaphragm, which is held This indicates that the distance of the index from the last gradua- Ba position by ~ pairs of antagonizing screws—one pair horizontal, | Beer ee E . eee cael ge the other vertical—with shoulders working against the exterior of 1s n+l ero eee ep ee, oe the tube in which the diaphragm is combed. so as to move it to variably taken as an odd number, such that the unit of (+1) may | the right or left and up or down, in order to bring the point of be some convenient aliquot part of the circle, as a minute for a | intersection of the wires into the visual axis of the telescope. In circle divided into degree spaces. practice the first adjustment is to set the eye-piece to distinct vision Micro- The micrometer microscope presents the combination of object | of the wires; the object-glass is then set truly to focus, which is meter and eye glasses met with in ordinary microscopes, with the addition | accomplished when no apparent parallax, or movement

of the image micro- of a wire-carrying diaphragm, movable by a screw, for micrometric | relatively to the wires, is seen on shifting the position of the eye, | Scope. measurements in the plane of the focus of the object-glass. The | for this would indicate that the image is either in front of or behind tube is conical at the object end and cylindrical at the eye end ; | the plane of the wires. The line Joining the point of intersection the box of the micrometer is mounted between these two parts at | of the wires with the centre of the object-glass is called the “line right angles with the visual axis. The tube is held at the extremity | of collimation,” and the diaphragm should be so fixed that this line of the arm of an alidade, in a collar in which it may be moved closer | may always be perpendicular to the axis on which the telescope to or away from the surface of the circle, or be turned round so as | revolves. to place the micrometer tangentially to the circle. The distance The surveying compass gives the magnetic bearing of any object, Survey. | between the micrometer and the object-glass is usually about four | and is the simplest of all instruments for measuring horizontal ing com times that between the object-glass and the face of the circle, and | angles. It consists of a magnetized needle, with an agate centre, pass, ~~thus a correspondingly magnified image of the spaces between the | poised on the point of an upright pivot in the centre of the bottom ! graduations is obtained in the plane of measurement. The object~~ | ofa circular box and carryinga concentric circular card or silver ring, glass is held in a small tube which can be screwed in or out of the | the circumference of which is graduated into 360°, and is sometimes if principal tube, to enable the length of the image to be adjusted to | further subdivided. The aligner is constituted by a pair of sight | an exact integral number of revolutions of the micrometer. The | vanes attached to the box at opposite extremities of a diameter, | box of the micrometer and the wire diaphragm are rectangular, the | one vane having a narrow slit for the eye to look through, the other latter sliding to the right or left within the former. Slow motion | with a wider opening bisected by a vertical wire to be set on the | is communicated to the diaphragm by the micrometer screw, which | observed object. There is no circle readcr, the prolongation of the passes into it through a collar in one side of the box, against which | wire on to the graduations being estimated by the eye ; and there the shoulder of the screw is pressed by an internal spiral spring | is no level, for the circle poises itself horizontally on the supporting acting against the sides of the diaphragm and the box. The screw

| pivot. is furnished with a circular head divided into a number of equal The prismatic compass is similar to the surveying compass, with Prisms- parts— usually 60, each equivalent to 1” for circular arcs, and 100 | the addition of a prism in the eye vane through which the wire oftie con: | for linear scales —and is rotated opposite an index arm fixed on the | the sight vane and the divisions of the circle are viewed apparently pass. box ; complete revolutions are marked by the teeth of a stationary | togethcr; the division with which the wire coincides when the comb, which is fixed above the wire of the diaphragm aud viewed | needle isat rest indicatcs the magnetic azimuth of any object bisected _ with it through the eye-piece. by the wire. The sight vane carries a mirror turning on a hinge, Spirit- The spirit-level consists of a glass tube not quite filled with | to enable objects to be seen by reflexion which may be too high to level. alcohol, a small quantity of air being left, which rises as a bubble | be seen on the wire ; the eye vane is furnished with a pair of dark to the highest part of the tube. In small and coarse levels the | glasses to be employed when the sun is being observed. diameter of the tube is largest in the middle and decreases uni- Magnetic instruments are useful for rapid reconnaissance and formly towards the ends, which are closed by the blow-pipe; in | rough survey, and for filling in the minor details of an exact survey, long and delicate levels the tube is cylindrical, but with a longi- | but they are not to be relied on to give bearings with errors less tudinal portion of the interior surface ground to the curvature of | than ten to fifteen minutes. In plotting, however, bearings are a circle of greater or less radius according as the level is designed | preferable to angles, for, by drawing a number of meridional lines to be more or less sensitive, and it is sometimes closed by circular | parallel to each other on the paper, each bearing may be plotted from glass stoppers cemented into the ends. When the tube is held | an independent meridian without any accumulation of error, such horizontally, with the curved surface of the intcrior uppermost, the | as arises when a number of angles are plotted in succession with middle part is occupied by the air bubble. Lines are ctched on the | the protractor adjusted on short lines. outer surface at equal distances from the central point, to enable The plane table is in its usual form simply a rectangular board Plave the tube to be set with the bubble exactly in the middle, or a scale | mounted horizontally on a stand, on which it may be turned round table. graduated throughout its entire length is provided, to enable any | and set in any required position ; it is

furnished with a flat sight deviation from centricality to be measured and the corresponding | rule, which usually carries a pair of sight vanes and has a bevelled dislevelment to be calculated and allowed for subsequently in the | edge, parallel to the line of sight, to serve asa ruler, also with a reduction of the observations, The glass tube is commonly fixed | magnetic needle. Occasionally the construction is more elaborate, in a metal tube, with plaster of Paris for protection ; but, as it is | and the board is surrounded by a marginal frame with graduations then liable, under changes of temperature, to torsion and strain, | radiating from the centre as the degrees of a circle, so that it may which may sensibly alter its curvature, it is preferable to place it | be used as an instrument for measuring horizontal angles, while the in a metallic cradle and rest it 6n cork bearings, with due provision | sight rule is furnished with a telescope, which takes the place of against sliding, the whole being covered with a glass cylinder if | the vanes and is mounted on an axle to measure vertical angles. need be for further protection. The metallic cradle or tube is | The size is made as great as is consistent with the limits of porta- attached to any instrument on which the level is to be mounted | bility in each instance, so that the sheet of paper to be drawn on by adjusting screws, for setting it correctly with reference to the | may beas large as possible. The standard plane table of the Indian axis of rotation with which it is associated. The value of a division | Survey measures 30 inches by 24, and is made of planks of well- of the scale, in seconds of arc, is usually called the ‘‘run,” and is | seasoned wood 1 inch thick, with transverse edge bars below to determined by attaching the level with its scale to a (generally) | prevent warping and buckling. It is set up on a stand, usually vertical circle, and taking both the circle and the bubble end read- | a braced tripod, to which it is clamped by a powerful hand screw Ings in different positions of the circle. As the length of the | passing through the head of the stand into a brass socket fixed bubble is much affected by changes of temperature, and the curva- | centrally under the table; the screw when relaxed serves as a ture of the tube may not be identical at all points, values of the pivot, round which the table may be turned in azimuth and set m run are commonly obtained under widely differing temperatures. any required position. The table is then firmly clamped so as Tele- The telescope consists of a tube, carrying an achromatic object- | to maintain a constant position during all the subsequent laying scope. glass and an eye-piece which holds either a pair of

lenses for viewing | off of bearings. The sight rule is 30 inches long, 2 wide, and one-

b- graduated circles of equal diameter, usually 6 to 8 inches.

third of an inch thick, of ebony, with a brass sight vane at each end, and a fiducial edge parallel to the line of sight; the vanes are about 5 inches high, which gives sufficient elevation and depression for general use. ‘The magnetic needle is about 6 inches long and is held in a rectangular brass box an inch broad, placed on the table whilst it is being set and afterwards removed. Heights may be determined on the spot with the aid of a clinometer, formed of a bar carrying a spirit-level and a pair of sights, one of which has a seale of tangents graduated to radius=the interval between the sights. For the method of employing the table see § 4, p. 709 above.

The theodolite, the most important of all instruments for the purposes of a survey, is a combination of two graduated circles placed at right angles to each other, for the measurement of hori- zontal and vertical angles, a telescope, which turns on axes mounted centrically to the circles, and an alidade for each circle, which carries two or more readers of tlie arcs through which the telescope ismoved. ‘The whole is supported by a pedestal resting on foot- screws, which are also employed to level the instrument. The size varies from a minimum with circles 3 inches in diameter to a maxi- mum with a 36-inch horizontal and an 18-inch vertical circle, the weight ranging from 4 Ib to 1000 Ib; the dimensions and magni- fying powers of the telescope increase with the diameter of the horizontal circle. The telescope may be connected rigidly with the alidade and move with it while the circle remains stationary, or with the circle and move with it while the alidade remains stationary. ‘The varieties of form as well as of size are numerous : in some the telescope may be completely turned round

in altitude as well as azimuth, and pointed to any object celestial or terrestrial ; in others the range of movement in altitude is restricted to about 25° above and 25° below the horizon, and a pair of sectors are substituted for the complete vertical circle; in some the telescope and vertical circle are placed between, in others outside of, the pillars which support their common axis; in some the pedestal is a simple tribrach resting on three foot-screws, in others it takes the objectionable form of a ball carrying the vertical axis and a socket holding the ball between two parallel plates, which are antagonized and set firm by two pairs of foot-screws, turning in sockets fixed to tle lower plate, while their heads are pressed against the upper plate, to fix itand bring the instrument into level at the same time. There are numerous other specialities of form which have been introduced to meet specific requirements ; but these cannot be noticed here.

The transit theodolite is an alt-azimuth instrument with ae

he telescope is mounted between a pair of conical arms which taper

much impaired by variations in the refractive condition of the lower strata of the atmosphere, more particularly on long lines, so that when heights have to be determined with much accuracy the theo- dolite must be discarded for a levelling instrument, to be set up repeatedly with staves at short distances. When truly adjusted the theodolite measures the horizontal angle between any two objects, however much they may differ in altitude, as the pole star and any terrestrial object ; but, as adjustments are not always made with accuracy nor permanently maintained, it is desirable always to take the observations in pairs, with the face of the vertical circle alternately to the right and left of the observer, for this eliminates collimation error from the horizontal angles and index error in the setting of the spirit-level from the vertical angles.

When a horizontal angle is measured several times for greater accuracy, one of two methods of procedure is adopted. (1) The angle is measured once or oftener in the usual way, the horizontal circle remaining clamped and the

telescope and alidade moving over it; then the position of the horizontal circle is shifted! as often as may be desired, and after each shifting the angle is again measured as formerly ; thus a separate numerical result is obtained for each operation. Or (2), the first object A having been observed and the telescope set on the second object B, the horizontal circle is unclamped and turned round until the telescope is brought back on A, when it is again clamped ; then the alidade is unclamped and the telescope again moved over the horizontal circle to be set on B. The operation is repeated as often as may be desired. The vernier readings are only.taken for the first telescope pointing to A and the last to B; their difference + 360° for every complete revolution of the circle, divided by the number of repetitions, gives the angle. This method is objectionable when a round of several angles has to be measured, but it enables the value of a single angle—more par- ticularly a small one, as between objects in the same field of the telescope—to be determined accurately with much greater rapidity than the first method.

An auxiliary telescope is sometimes fixed below the plate of the horizontal circle of a theodolite, to be pointed to a referring mark while the upper telescope is being moved about, and thus to serve as a check on the general stability of the instrument and on the per- manence of the initial setting of the circle during the measurement of a round of angles. When a theodolite is set up on a lofty scaffolding which is liable to be swayed by the wind, or on a stand which cannot be readily isolated from the observer, horizontal angles may be measured accurately by employing a second observer to keep the auxiliary telescope truly pointed to a referring mark while the observing telescope is being pointed.

outwards and end in cylindrical pivots, constituting what is called the transit axis of the instrument. The pivots rest on Y’s or in semicircular collars, on the heads of a pair of pillars, which are made of sufficient height to enable the telescope to revolve betwecn

The subtense transit theodolite differs from the ordinary transit Subtense theodolite merely in having a pair of wire-carrying micrometers transit mounted in the telescope tube, in order that the small angle sub- theodo- tended by a distant object of known dimensions, or by two objects lite.

them and be pointed to stars in the zenith. These pillars stand on a circular plate, which serves as the alidade of the horizontal circle and is usually constructed to revolve round a vertical axis fixed in the centre of the plate of the horizontal circle ; this axis passes downwards into a socket in the centre of a tribrach, which forms the pedestal of the instrument and rests on three mill- headed foot-screws by which the instrument is levelled. The vertical circle is mounted centrically on one of the cones of the transit axis, near the pivot end; its alidade, usually a rectangular plate carrying a pair of verniers, is fitted centrically over that axis, in contact with the circle but nearer the shoulder of the pivot, and, while the telescope and the circle revolve together, it is held station- ary by an adjustable arm the end of which is pinched between a pair of antagonizing screws mounted on the nearest pillar. The alidade of the horizontal circle carries two or three equidistant verniers, because any error in centring an alidade over a circle is eliminated in the mean of the readings whenever two or more verniers, placcd at equal distances apart round the circle, are read. A clamp, with a tangent screw for communicating slow motion, is attached to the nearest pillar, to act on the vertical circle aud the telescope ; another is attached to the plate of the horizontal circle, to act on the alidade of that circle and so also on the telescope for azimuthal motion; and a third to the pedestal, to act on the plate of the horizontal circle. The first two are employed in measuring the vertical and azimuthal

sufficiently near each other to be seen in the same field of the tele- scope, may be measured with greater facility and precision than on the graduated circles in the usual way. The micrometers are held in a rectangular box, one on the right hand, the other on the left, with the wires brought as closely as possible into the plane of the fixed wires in the ordinary diaphragm ; the box can be turned on the telescope tube through an angle of rather more than 90°, to enable the micrometer wires to be set parallel to either the hori- zontal or the vertical wire of the diaphragm, or to be placed at any desired angle of inclination. The subtense object usually employed in survey work is a pole of known length ; if held perpendicularly to the line of sight of the telescope, its direct distance may be determined from the angle measured by the micrometers with a sufficiently small percentage of error to make this method preferable to chaining over rough ground. The instrument has been advan- tageously employed in carrying traverses of considerable

length over ground which was impracticable for direct linear measurements. The micrometers are also serviceable in astronomical observations for time and longitude, for they give additional wires on which to observe the passage of a star, at distances from the fixed wire which may be varied with the speed of the star ; and for determining the longitude they permit numerous measures of the distance bet ween the edge of the moon and a star to be taken, immediately before and after occultation.

Eckhold's omnimeter is a theodolite furnished with a microscope Eck- of considerable magnitude facing a graduated linear scale ; the tube hold's of the microscope is rigidly attached to the telescope tube, either omni- at right augles or parallel to it, so that the two always move to- meter.

angles, the third in setting the zero-diameter of the horizontal circle In any specific direction, with a view to the repetition of the mea- surements of the azimuthal angles at different parts of the circle. For levelling the instrument, two levels are fixed at right angles

to each other on the plate of the alidade of the horizontal circle ; a third is attached to the telescope, or, preferably, to the alidade of the vertical circle; a fourth is mounted on the transit axis when levelling for astronomical observations. A magnetic compass or needle is added, and also a plummet for centring the instrument over the station mark. : Theodolites are designed to measure horizontal angles with greater accuracy than vertical, because it is on the former that the most important work of a survey depends, and they are measurable With greatest accuracy ; measures of vertical angles are liable to be

gether. The scale is fixed either parallel or perpendicular to the alidade plate of the horizontal circle ; thus, when the telescope is moved through vertical ares within the range of the scale, the tangents of the arcs are measured by the microscope on the scale. The latest and best form of the instrument is shown in fig. 8, which represents a transit theodolite converted into an omnimeter by the application of a microscope AB to the telescope at right

1 This is often done arbitrarily, but systematic shifts which bring equidis-

tant graduations of the circle under the verniers during all the telescope point- ings to any one object are always preferable (see sect. I., § 9, p. 698 above).

Prismatic reflexion theodo- lites.

720

angles to it, and of a scale C to the plate of the alidade of the hori- zontal circle in a plane parallel to that of the vertical circle. The Inicroscope _is furnished with a diagonal _eye- piece, through which the obser- ver looks down on the scale. The scale is divided

into 100 equal (—7/lmm parts, and is mov- S435 able in its bed- plate through the length of

one of these di- visious by one rotation of a mi- crometer screw, with a large head, D, the cir- cumference of which is divided into 100 equal parts, each divi- sible into fifths byavernier. The microscope has a fixed wire in a diaphragm at its eye end, 4, and, when the tele- scope is set on an object and the wire is seen between a pair of divisions on the scale, the scale is moved by the micrometer screw until the nearest division is brought under the wire; the scale reading corresponding to the horizontal position of the telescope being known, the difference between it and the reading when the telescope is pointing above or below the horizontal plane is the tangent of the arc of elevation or depression, to radius=the perpendicala from the axis of rotation of the tele- Us wv

scope to the scale.

both the distance and the height of any point * over which a staff of

known length has been «4 fe) set up vertically may be readily determined with fair accuracy. Let O (fig. : 9) be the position of the Hig. 9 transit axis of the telescope, OA the direction of the telescope when horizontal, and Oa the corresponding direction of the micro- scope at right angles to the scale amn; let M be a distant point over which the staff J£N has been set up vertically, and let m and ” be the graduations under the microscope when

the tele- scope is pointing to the bottom and top of the staff; then, since JfN and Oa are known, the horizontal distance 0.4 and the height AM are determined from the proportions

A: Oa } sae: mn,

uma

AM:am

It is essential that the focusing tube of the microscope should always move parallel to the visual axis when different divisions of the scale are being brought into focus, otherwise errors materially exceeding the quantities appreciable by the micrometer may be caused. The linear results thus obtained are satisfactory when the subtense staff is set up at a moderate distance; the instrument has often been used with advantage in localities where measur- ing chains could not be conveniently employed. As an angular instrument it is identical with the ordinary transit theodolite, as will be seen from the figure, which may be referred to as illus- trating the description of that instrument; the foot-screws are represented as resting on a plate such as is usually fixed on the head of a folding tripod stand, their lower extremities, as well as the grooves in which they are placed on the plate, being concealed from view by a capping upper plate, which is clamped over their shoulders to prevent the instrument from falling off the stand.

In any theodolite with a telescope of the ordinary form the height of the pillars must necessarily be somewhat greater than half the length of the telescope if stars in the zenith are to be observed or if the telescope is to be completely rotated on its transit axis; the higher the pillars the higher the centre of gravity, the less perfect the stability of the instrument when set up for observation, and the greater its weight and cumbersomeness for transport. In Germany and Russia theodolites and transit instruments are sometimes em-

ployed in which the eye end of the telescope tube is removed—a counterpoise to the object end being substituted in its place ; and a prism is inserted at the intersection of the visual axis with the transit axis, so that the rays of light from the object-glass may be reflected through one of the tubes of the transit axis to an eye-piece in the pivot of this tube. In this case the pillars need only be high enough for the counterpoise to pass freely over the plate of the horizontal circle ; but the observer has always to place himself at gs angles to the direction of the object he is observing,

he levelling instrument consists of a telescope which carries a Levely long spirit-level parallel to itself and is mounted on a horizontal instr. plate, which is fixed rigidly either on the head of a vertical axis ment, revolving within a socket in the centre of the pedestal or on that of a hollow cone revolving round a vertical axis which projects upwards from the pedestal. There are various forms of the instru. ment ; in the Y-level the telescope rests on a pair of Y's, in which it can be both rotated and fuitaed end for end; in the dumpy level the telescope is rigidly attached to its supports, and its tube is made shorter and of greater diameter, to carry an object-glass of shorter focal length and larger aperture. A magnetic compass is attached to the instrument to enable the bearings of the levelling staves to be taken whenever desired. Levelling staves are of a variety of patterns and are graduated in various ways, best on both faces and dissimilarly, for a check on accidental errors of reading, as indicated in sect. ITI.

Reflecting levels are portable instruments which may be held by Reftectin the hand for rough and rapid survey work. They are of two forma: levels, | in one an image of the eye of the observer, in the other an image of the bubble of a spirit-level, is seen by reflexion on a level with the observed object. The first consists of a square of common looking-glass, which is set in a frame suspended from a ring on the line of prolongation of one of the diagonals in such a manner as to swing freely but not turn round on its axis of suspension; the frame is weighted by a metal plate behind, to which it is so adjusted that, when suspended, the plane of the surface of the mirror will be vertical. A small portion of the glass at one end of the horizontal diagonal is either cut away or unsilvered. When the image of the observer's eye is seen on the diagonal, all objects bisected by the diagonal, whether viewed through the opening in the mirror or by reflexion, are on the level of

the eye. The second consists of a tube open at the object end and closed at the eye end bya disk which is perforated with a sight hole ; a mirror filling up half the section is fixed in the tube, facing the eye end at an angle of 45° with the axis; and an all-round transparent spirit-level is mounted over an opening above the mirror, and its bubble is seen | by reflexion in the axis of the tube. Abney's level is of the latter Abney': | construction, but with the spirit-level attached to the alidade of a level. graduated arc fixed to one side of the (rectangular) tube; thus vertical angles as well as levels may be determined with it.

The optical square is a reflecting instrument indicating a right Optical angle, and is of great use in laying off perpendiculars for the squat. measurement of offsets from a line of survey. It consists of two glass plates, one wholly the other partially silvered, which are fixed permanently in a shallow circular box at an angle of 45°, so that any two objects seen together through a sight hole in the box— one directly through the transparent portion, the other by reflexion in the mirror of the partially silvered glass plate—subtend an angle of 90° at the point where the observer is standing. :

Plotting and Plot-measuring Instruments.—These comprise linear Plotting scales, common compasses, and angular protractors for laying off instm ; distances and angles measured on the ground, proportional com- ments | passes and pantagraphs for reproducing a finished plot on some other scale, and opisometers and planimeters for measuring plotted lines and areas.

Scales are divided, either decimally or fractionally, into equal Scale. — parts, each of which is a portion of a fixed unit of length, as a foot or an inch ; some are subdivided more or less minutely through- out their entire length between a pair of parallel lines; others are subdivided at their extremities only. Diagonal scales are formed by eleven equidistant parallel lines, the outer ones of which are divided primarily and subdivided into tenths at their extremities.

The primary divisions are joined by cross lines perpendicular to the eleveu parallel lines; the end subdivisions are joined diagon- ally, the first on the lower line with the second on the upper, and

so on, each diagonal cutting every horizontal line in a point a tenth

of a subdivision beyond the cutting point on the parallel line below, as measured from any one of the perpendicular lines; and each of these tenths is further divisible into tenths by measurin from the perpendicular at intervals of tenths between the paralle lines ; thus great precision of measurement is obtained. —_

The Marquois scale and triangle consist of a scale divided i throughout into equal parts more or less minutely and a right- an and angled triangle of which the hypothenuse is three times the shortest a. nl | side. An arrow is drawn perpendicular to the hypothenuse to | serve as a pointer to the divisions of the scale. The third side has a bevelled edge for ruling. When the triangle is placed with its hypothenuse against the scale and is moved along it, all lines drawn

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along the bevelled edge are parallel to each other, their distances apet being one-third of the distances travelled by the arrow along

e scale.

Compasses usually take the form of a pair of legs movable about a joint, so that their extremities, which are of steel, finely pointed, may be set at any required distance apart ; the legs may be knee- jointed, and one is usually adapted to hold either a pencil, a ruling

n, or a steel pointer, as may be desired. A beam compass is em- ployed when long lengths are laid off; it consists of a light tubular metal bar, or a rectangular deal rod, fitted with a pair of boxes, which slide along it and

carry either pen, pencil, or pointer, and may be set and clamped at any desired distance apart.

Proportional compasses consist of two parts so exactly similar that when held in contact throughout they appear as one; each is pointed at both ends, flat and grooved through one-half its length, and tapering to a point in the other half. The two are coupled together by a pair of similar sliders, one for each groove, turning on a common axle which carries a disk at one end and a clamping screw at the other; by shifting the position of the sliders in the grooves the distances between the points at the opposite ends can be brought into any desired ee ie ge The settings for different proportions are effected by bringing a line on the slider opposite the lines of a fractional scale engraved on one side of the groove.

Protractors are of two forms circular (or semicircular) and rect- angular ; the circumferences of the former are divided into 360° or 180°; the latter are divided on three sides of their periphery by lines drawn from the centre of the fourth side to the degree points on the circumference of a semicircle of which that side is the diameter. The protractor being set with its centre on a given point and its zero line on a given line passing through the point, any angle with this line at the point can be readily laid off. Pro- tractors for plotting traverses are commonly annular, that they may be centred over the station of origin with the zero diameter on the initial meridian ; their bearings at any other station may be laid off without moving the protractor by drawing lines parallel to the same bearings at the origin. Rectangular protractors some- times have parallel lines engraved on their faces at equal distances,

‘ for setting over paper ruled with parallel lines at unequal distances,

and their backs engraved with scales of rhumbs, sines, secants, and tangents and common scales of equal parts.

The station pointer enables the position of any station at which angles between three fixed points have been measured to be plotted on paper. It consists of three arms: the centre arm carries a graduated circle fixed over an axis at one end; the other two are movable round this axis, and each carries a vernier for reading the circle. Hach arm has a straight edge

bevelled as aruler, aud the lines on the prolongations of these edges meet in the centre of the axis, where there is a small opening through which a point may be pricked on the paper. The arms having been set to the observed angles, the instrument is moved about until each edge is over one of the fixed points on the paper, when its centre will be exactly over the position of the station if none of the angles are very acute. The instrument is much used in nautical surveying, for laying down the — of a vessel at sea by angles measured to fixed objects on shore.

The triangular compass is serviceable in reproducing plans to full scale ; it is formed by jointing a third leg to the centre pin of the joint of an ordinary pair of compasses, so as to be movable in any direction.

The pantagraph is employed in reproducing a map on a different — generally a smaller—scale. It consists of two long arms, 4B and AC, jointed together at A, B and two short arms, FD and FE, joimted together at F and with the long arms at D and EF; FD 1s made exactly equal to AH and FE to AD, so that ADFE is a true parallelogram whatever the angle at 4. The instrument is supported parallel to the paper ong lvory castors, on which it moves Fic 10 freely. A tube is usually fixed — se vertically at c, near the extremity of the long arm AC, and similar tubes are mounted on plates which slide along the short arms BD and FD; they are intended to hold either the axle pin ona weighted fulcrum round which the instrument turns, or a steel pointer, or a pencil, interchangeably. When the centres of the tubes are exactly in a straight line, as on the dotted line Ofc, the small triangle b/D will always be similar to the large triangle dc4; and then, if the fulcrum is placed under b, the pencil at f, and the pointer at c, when the instrument is moved round the fulcrum aS a pivot, the pencil and the pointer will move parallel to each other through distances which will be respectively in the propor- tion of bf to bc; thus the pencil at f draws a reduced copy of the Map under the pointer at c; if the pencil and the pointer were Interchanged an enlarged copy would be drawn; if the fulcrum and pencil were interchanged, and the sliders set for f to bisect bc,

A

the map would be copied exactly. Lines are engraved on the arms BD and FD, to indicate the positions to which the sliders must be set for the ratios 4,

3,..., which are commonly required.

The square pantagraph of Adrian Gavard consists of two graduated Gavard's arms which are pivoted on a plain bar and connected by a graduated square bar sliding between them throughout their entire length, to be set panta- at any required distance from the plain bar; a sliding plate carrying graph.

a vertical tube, to hold either the axle of the fulcrum, the pencil, or the pointer, is mounted on one of the arms and ona prolongation of the plain bar beyond the other arm, and also on the graduated con- necting bar; and an additional arm is provided by means of which reductions below or enlargements above the scales given on the instrument can be readily effected.

_ The eidograph is designed to supersede the pantagraph, which Hido- is somewhat unsteady, having several supports and joints. It is graph. composed of three graduated bars, one of which is held over a ful- crum and carries the others, which are lighter, one at each extremity. The three bars are movable from end to end in box-sockets, each having an index and a vernier in contact with the graduated scale. The box-socket of the principal bar turns round the vertical axle of the fulcrum ; that of each side bar is attached to a vertical axle, which also carries a grooved wheel of large diameter and turns in a collar at either end of the principal bar. The two wheels are of exactly the same diameter and are connected by a steel band fitting tightly into the grooves, so that they always turn together through identical arcs ; thus the side bars over which they are respectively mounted, when once set parallel, turn with them and always remain parallel. A pointer is held at the end of one of the side bars and a pencil at the diagonally opposite end of the other. The bars may be readily set by their graduated scales to positions in which the distances of the pencil and the pointer from the fulcrum will always be in the ratio of the given and the required map scales.

The opisometer is intended to measure the lengths of roads, rivers, Opiso-

and other lines on a map. It consists simply of a milled wheel meter. mounted in a forked handle on a steel screw with a very fine thread. The

wheel, being turned up to one end of the screw, is put down on the map with the handle held vertically over the point at which the measurement is to commence, and is run over the road or line until the point is reached at which the measurement is to stop; it is then lifted off the paper, placed on the scale of the map, and run backwards to the initial end of the screw, over a length of the scale which corresponds to the length run over on the map.

The polar planimeter was invented by Professor Amsler of Polar Schaffhausen for the measurement of areas on maps and plans. It plani- consists essentially of two arms jointed together and a roller, car- meter. ried at right angles to one of the arms and moving in touch with the paper, which by its revolutions records the area of a figure whose perimeter is traced by a point on that arm, while the instrument is turned bodily on a ; point on the other arm , as a fixed centre. There are two forms of the & instrument: in one the position of the roller is fixed and the arms are jointed on a common pinion; in the other the roller and a pinion, to : ; which the holding arm is attached, are both carried by a slider, which is movable along the tracing arm and can be set at any required distance from the tracing point. The first form gives areas in a single unit of measure only, the second in various units. The annexed figure represents the first form, showing the joint 4, the tracing point P, the fixed point O, and the roller with its graduated dial and vernier, for indicating the lengths of line rolled over while the tracer 2 moves round the peri- meter of the area under measurement.

The following ex- planation of the theory of the instrument is due to Professor Green- hill. Let OA, AP be the two arms jointed at A, with the fixed point at Oand the tracer at P, and suppose the wheel to be fixed at # on the prolongation of the arm PA. Let OA=a, AP=b, AR=c, and the radius of the roller=r; Se ts ns and let the direction of Tie ’ Fig. 12,

a positive rotation of the roller, as marked by the graduations, be that of rotation on a right-handed screw on the axle of R which would give motion in the direction 42. Drop the perpendicular

OF from O on AR, and first suppose the joint 4 to be clamped. Then, if is in 4R produced, a rotation of the instrument about O with angular velocity w will give to Rthe component velocities OL.w in the direction ZR and J&.w in the direction perpendicular to IR, and will therefore compel the roller to turn with the angular

velocity a w; but, if Jis on the other side of R, the angular velocity

of the roller will be 2 a, Therefore, keeping 4 clamped, the

roller will turn through an angle = 6 or ~* 4, according as J is

or is not on the same side of R as A, when the instrument is rotated through an angle @ about 0; but, when J coincides with R, the roller will not turn, and then P describes a circle, called the % a circle," represented by the middle dotted circular line, of radius

(OR? + RP*)=/{a? ~ 2 + (b+¢)} =a/(a? +0 + 2be). Next unclamp the joint 4 and clamp the arm QA ; then the roller

will turn through an angle — <¢, while 4P turns through an angle ¢.

Now suppose P to travel round the finite circuit PP,P,P, by a combination of the preceding motions in the following order. (1) Clamp the joint, and move P to P, and 4 to A, on ares of circles

of centre O; then the roller will turn through an angle – 6,

6 being=AOA,=POP,. (2) Unclamp the joint and clamp the arm, and move the pointer from P, to P, on the arc of a circle of

centre 4); then the roller will turn through an angle= -< 4%, '

being=P,4,P, (8) Unclamp the arm and clamp the joint, and move the pointer from P, backwards to P3 and A, to A, on arcs of circles of centre O, through an angle 6; then the roller will turn

through an angle — 6, if OF, is the perpendicular from 0 on P,A.

SUSA, the Biblical SausHan, capital of Susiana or Elam and from the time of Darius I. the chief residence of the Achzemenian kings, was a very ancient city, which had been the centre of the old monarchy of Elam and undergone many vicissitudes before it fell into the hands of the Persians (see Exam). The site of the town, which has been fixed by the explorations of Loftus and Church- ill, lies in the plain, but within sight of the mountains, between the courses of the Kerkha (Choaspes) and the Dizful, one of the affluents of the Pasitigris. The Shapur, a small tributary of the Dizful, washes the eastern base of the ruin-mounds of Sts or Shish. Thus the whole district was fruitful and well watered, fit to support a great city ; the surrounding rivers with their canals gave protection and a waterway to the Persian Gulf; while the position of the town between the Semitic and Iranian lands of the empire was convenient for administrative purposes. It is not therefore ‘surprising that Susa became a vast and populous capital; Greek writers assign to it a circuit of 15 or 20 miles,—a statement which is fairly well borne out by the remains. These include three main mounds, of which one is identified with the strong citadel! and a second shows the relics of the great palace built by Darius I. and completed by Artaxerxes Mnemon. Susa was still a place of importance under the Sasanians, and after having been razed to the ground in consequence of a revolt seems to have been rebuilt by Shapur IT. under the name of Erdnshahr-Shapur (Noldeke, Gesch. d. Perser aus Labari, p. 58). The fortifications were destroyed at the time of the Moslem conquest (Mokaddasi, p. 307) ; but the site, which is now deserted, was inhabited in the Middle Ages, and a seat of sugar-manufacture.

In Daniel viii. 2 the river of Shushan is called Ulai, a name which is identical with Avrai of the Bundehesh and Euleus of classical writers. What is told of the Euleus makes it impossible

to identify it with the inconsiderable Shapir; but authorities differ as to whether it is another name for the Choaspes or rather denotes

1 The Greeks called the citadel the Mepvéviov (Strabo, xv. 8, 2), and supposed it to have been founded by the Ethiopian Memnon. It was strong enough to withstand Molon in his war with Antiochus the Great (Polyb., v. 48).

(4) Unclamp the joint and clamp the arm, and move the pointer from P, to P on the arc of a circle of centre 4, and consequently

through an angle ¢; the roller will turn through an angle ce r

which cancels the angle due to motion (2). Thus in completing the finite circuit PP,P,P, the roller will have turned through an

angle (RI- RL) 2=(4r~ Az) 2.

But the area PP,P,P;=area PP,Q,Q, = sector OPP, —sector 09Q,=4(OP? — OP,2)9, =4{04?+ AP?24AT. AP-(OA2 AP? +2AI,. AP) 6, =(AI- AJ) 08, =br times the angle turned through by the roller. The area PP,P,P; is therefore b times the travel of the circum- ference of the roller.

Any irregular area, supposed to be built up of infinitesimal ele- ments found in the same manner as PP,P,Ps, will be accurately measured by the roller when the point P completes a circuit of the perimeter, the arm AP being free to turn on the joint at 4 and the arm OA on a fixed point O. If, however, O is inside the area, the area of the zero circle must be added to the area deduced from the readings of the roller. When the roller is fixed permanently, this area is constant, and is usually engraved on the arm in units of the adopted length 6; when the roller is held on a slider which also carries the pinion of the arm OA, the length 6 may be so adjusted that the areas described will be expressed in any desired unit of measure.

Literature and Authorities consulted.—Accounts of the Operations of the Great Trigonometrical Survey of India; Manual of Survey for India; Col. A. R. Clarke, Geodesy; Methods and Processes of the Ordnance Survey; Col. Water- house, On the Application of Photography to Maps and Plans; and Professional Papers of the Royal Engineers. (J. T. W.)

the Dizful or the Pasitigris. Susa in the days of its greatness must have stretched nearly from river to river. There is a sane- tuary of the tomb of Daniel on the banks of the Shapur, and Arabic geographers relate that this

tomb was a frequented shrine before the Moslem conquest and that the Arabs turned the stream over the grave.

SUSA, a city of Italy, in the province of Turin, 33} miles west of Turin by the railway which passes by the Mont Cenis tunnel into France, is situated on the Dora Riparia (tributary of the Po) at 1625 feet above the sea, and is so protected from the northern winds by the Rocciamelone that it enjoys a milder winter climate than Turin itself. The city walls, 20 to 30 feet broad at the base, were about 50 feet in height, but in 1789 their ruinous condition caused them to be reduced by about half their elevation. Numerous remains of Roman buildings and works of art still show the importance of the ancient town; and the triumphal arch erected by Cottius in honour of Augustus still stands on the old Roman road between Italy and Gaul,—a noble structure, 45 feet high, 39 broad, and 23 deep. The inscription, now illegible, mentioned fourteen ‘‘civitates” subject to Cottius. Among the modern buildings of Susa the first place belongs to the church of San Giusto, founded in 1029 by Olderico Manfredi II. and the countess Berta, and in 1772 raised to be the cathedral. The population of the city was 3254 in 1871 and 3305 in 1881 (commune, 4418).

Segusio (also Secusio, Siosium, Seutinm, Seucia, &c.) was at a very early period the chief town of this Alpine region, and the Cottian Alps themselves preserve the name of the Segusian chief Cottius, who with the title of prefectus became a tributary and ally of Rome in the reign of Augustus, and left his state strong enough to maintain its independence till the reign of Nero. As a Roman municipium and military post Segusio continued to flourish. After the time of Charlemagne a marquisate of Susa was established ; and the town became in the 11th century the capital of the famous countess Adelaide, who was mistress of the whole of Piedmont. On his retreat from Legnano, Barbarossa set fire to Susa; but the town became more than ever important when Emanuel Philibert fortified it at great expense in the 16th century.

SUSA (Stsa), a city of Tunis, on the coast of the gulf of Hamdma, 33 miles south of Hamdma. It occupies the side of a hill sloping seawards, and is still, as far as the

town proper is concerned, surrounded with heavy white-

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SUS—SUS

washed Oriental-looking walls. The Kasr al-Ribdt, a square building flanked by seven bastions, was probably either a Roman or Byzantine fortress, and a Byzantine chapel is now transformed into the Kahwat al-Kubba or Café of the Dome. Since the French annexation the citadel, built on the highest point within the town, has been entirely restored and serves as the headquarters of the general commanding a division; and a camp of tile- roofed brick buildings has been erected in the neighbour- hood. The space within the walls is proving too limited for the growth of the population, and houses already extend along the shore to north and south for about a mile. Susa is the ancient seaport of Kairwan (45 miles inland), with which it is connected by a horse-tramway, and it has a rapidly increasing commerce. In 1864 the port was visited by about 195 vessels, in 1885 by 701, of which 532 were Italian. The exports in 1885 were valued at £1,371,510 (oil, to Genoa and Leghorn, £232,530 ;

grain, largely to Sicily, £397,760 ; sansa or olive refuse, to

France, £13,715; esparto, a comparatively recent article for this port, £17,935), and the imports (including build- ing-stone from Sicily and Malta, brick, lime, marble, and timber) amounted to £660,135. The population, which numbered 8000 in 1872 (2000 Jews, 1000 Christians), had increased to upwards of 10,000 in 1886.

Susa is the ancient HADRUMETUM (q.v.). In 1537 it was besieged by the marquis of Terra Nova, in the service of Charles V., and in 1539 was captured for the emperor by Andrea Doria. But as soon as the imperial forces were withdrawn it became again the seat of Turkish piracy. The town was attacked by the French and the

_. Knights of St John in 1770, and by the Venetians in 1764.

SUSANNA (“Lily”), the heroine of one of the apocryphal additions to the Greek text of the book of Daniel, the others being the Song of the Three Children and the story of Bel and the Dragon. In the English version the story of the virtuous Susanna—the false accusation brought against her by the elders and her deliverance by the judg- ment of Daniel—is put as a separate book. Jerome, in his Preface to Daniel, points out that it had been observed both by Jews and Christians that this story was certainly written by a Greek, and not translated from Hebrew, since Daniel makes a series of Greek puns on the names of trees.

SUSSEX, a maritime county in the south of England, lying between 50° 43’ and 51° 9’ N. lat. and 0° 49’ E. and 0° 58’ W. long. It is 76 miles from Lady Holt Park to Kent Ditch, and 28 miles from Tunbridge Wells to Beachy Head, and adjoins Kent on the N.E., Surrey on the N., Hampshire on the W., and the English Channel on the S. Its total area is 933,269 acres or 1458 square miles.

The range of chalk hills known as the South Downs divides the county into two districts—that of the coast and that of the Wealden—which are of unequal extent and possess very different characteristics. In the west- ern part of the county the South Downs are about 10 miles distant from the sea; they continue eastwards for about 45 miles, and terminate in the bold headland of Beachy Head. Their average height is about 500 feet, though some of the summits reach 700 (Ditchling Beacon, 813 feet ; Chanctonbury Ring, 783; Firle Beacon, 700; and the Devil’s Dyke, 697). The Forest Ridge extends through the northern part of the county from Petworth to Crowborough, reaching the coast in Fairlight Down. The principal summits are Crowborough Beacon (796 feet), Brightling Hill (647), and Fairlight Down (528). The county has suffered greatly from incursions of the sea. The site of the ancient cathedral of Selsey is now a mile out at sea. Between 1292 and 1340 upwards of 5500 acres were submerged. In the early part of the 14th cen- tury Pagham harbour was formed by a sudden irruption of the sea, devastating 2700 acres. Recently all this land has been reclaimed and again brought under cultivation.

There is considerable reason for believing that the whole coast-line of the county has been slightly raised in the last 800 years (possibly by earthquake shock), as the large estuaries at the river mouths no longer exist, and the archipelago round Pevensey (eye signifies “island ”) has only a slight elevation above the neighbouring marsh land.

The rivers are small and unimportant. The principal Rivers.

are the Rother, the Cuckmere, the Ouse, the Adur, the Arun, and the Lavant. The Rother rises in the Forest Ridge, in the parish of Rotherfield, and enters the sea near Rye, its course having been diverted by a great storm on 12th October 1250, before which date its exit was 12 miles to the east, beyond Dungeness. The Cuckmere also rises in the Forest Ridge, near Heathfield, and empties itself into the sea a little to the east of Seaford. The Ouse rises in St Leonards Forest, to the north-west of Lindfield, and, passing through Isfield and Lewes, enters the sea at New- haven, now the principal port in the county. The former outlet was at Seaford, but in the reign of Elizabeth the sea broke through the beach bank at some warehouses just below Bishopstone and formed what is now called the old harbour, which was in use until the Newhaven one was made a safer exit. The Adur has three sources, all in the neighbourhood of St Leonards Forest, and flows southwards, entering the sea at Southwick. The mouth of the river formerly shifted from year to year, ranging both east and west over a distance of 2 miles. The Arun rises in St Leonards Forest, in the parish of Slinfold, flows through Amberley and Arundel, and enters the sea at Littlehampton. The Lavant has its source in Charlton Forest and encircles Chichester on all sides except the north, entering the sea through creeks in the extreme south-west corner of the county.

The portion of the county to the north of the South Forests.

Downs is called the Weald ; it formerly formed part of the forest of Andredsweald (‘‘the wood or forest without habit- ations”), which was 120 miles in length and about 30 in breadth. The total area of forests in 1885 was 113,043 acres, being the greatest of any county in England. About 1660 the total was estimated at over 200,000 acres. The chief remains of the ancient forests are Tilgate, Ashdown, and St Leonards, but the names in many parts indicate their former wooded character, as Hurstpierpoint (hurst

meaning ‘‘wood”), Midhurst, Fernhurst, Billingshurst, Ashurst, and several others. The forests were interspersed with lagoons, and the rainfall being very great caused marshes and the large river estuaries; the rainfall, however, abated in consequence of the cutting down of the Wealden forests for fuel in the extensive ironworks that formerly existed in that district. The wood was exported in the reign of Edward VI.

The greater portion of the county is occupied by the Geology.

Chalk formation, of which the South Downs are almost entirely composed. Firestone is found in the west, and Steyning is built upon it. At the base of the Downs the Greensand crops up, but is of small extent. The Wealden formations occupy nearly all the inland district of the county, and in these was found the ironstone from which iron was extracted. Sussex was at one time the centre of the English iron manufacture ; before 1653 there were 42 iron-forges or mills (reduced to 18 before 1667) and 27 furnaces (reduced to 11 before 1664), which employed 50,000 men? and furnished the main supply of ordnance for the national defence. The last forge at Ashburnham was not extinguished until 1809. Between 1872 and 1876 boring was carried on at Netherfield, near Battle, with the object of discovering what beds were below the Wealden, and if possible of reaching the Paleozoic rocks, which at

1 Suss. Arch. Coll., xxxii. pp. 22-25.

Flora and fauna.

Climate.

Kentish Town, Harwich, Ostend, and Calais had been found at a depth of about 1000 feet below the sea-level. Some slight hope was entertained of the occurrence of Coal- measures, as in the Boulonnais the Carboniferous limestone, where last seen, dips south. The boring was continued to a depth of 1905 feet, the Oxford Clay being reached. The chief result was the discovery of the unusual thickness of the Kimmeridge Clay, which began at 275 feet from the surface and continued to a depth of about 1469 feet. The

most practical result was the finding of thick beds of gyp- sum (at about 160 feet), which were before unknown in the Weald and are now worked at Netherfield. From Beachy Head to Selsey Bill there lies, south of the Downs, a low and level tract belonging to the Tertiary period, of which there is no such record at any other place in England. The towns of Hove, Worthing, Littlehampton, Bognor, &c., are built on gravel, sand, and loam of the Post-Pliocene or Pleistocene series, and these superficial beds overlie the Eocene series in patches and contain a large fossil fauna. Remains of the mammoth occur in the mud deposit (or Lutraria clay) of this district, and the Chichester museum contains the greater portion of a fine skeleton of the Hlephas antiquus obtained off Selsey Bill. Of the British Quater- nary fossils forty-five are peculiar to Selsey, and twenty others probably find here their earliest place in British geological history. The Bracklesham beds occur at the bay of that name, and their main divisions extend from Wittering on the west to the Barn Rocks, east of Selsey Bill, a distance of 7 miles. They are full of fossil shells,

particularly nummulitic.!

An analysis of the flora of the county was placed before the British Association in 1872 by Mr W. B. Hemsley (&cport, 1872 p. 128), who stated the total number of indigenous plants to be 1000, to which 59 introduced species must be added. The most interest- ing features of the flora are the number of species to the county area, the species peculiar to certain formations, viz., the Chalk (56), maritime species (76), and the rare species, especially of the Atlantic and Scottish types. Amongst the rarer marsh plants are Isnardia palustris, Scirpus triqueter, S. carinatus, Pyrola media, Habeneria albida, Festuca sylvatica of the “Scottish” type of Watson ; this last is not found in adjoining countics. A prominent feature of the Wealden flora is the extent of heath land and the large size the heath attains. The fauna includes 29 species of Mammalia. The birds are very numerous, no less than 291 species having been recorded. There are about 76 species of general migratory visitors. Of the 216 species of marine fishes found round the British coasts 106 have been observed off Sussex, and there are also 19 freshwater fish.?

The county presents two distinct climates, that of the coast district being mild, equable, and dry, whilst that of the Wealden district is continental, extreme, and rainy. The coast rainfall is about 25 to 26 inches annually and that of the Weald about 33 inches ; this is due partly to the South Downs, which rise up in the path of the rain-clouds, and partly to the large extent of forest. In the wet years of 1852 and 1872 the rainfall at several Wealden stations exceeded 50 inches. At Crowborough Beacon the average yearly rainfall from 1871 to 1884 was 38°16 inches; at Brighton during the same period it was only 28°87. Temperature in the Weald at Uckfield has ranged from 98° Fahr. on 14th July to—4° on 20th January 1838. The mean daily range of temperature in the Weald is about half as much again as on the coast. The in- fluence of the sea in modifying the temperature of the coast district is specially noticeable in the autumn months, when the temperature is higher than in the Weald and other parts of England northwards, and fashion has (perhaps unconsciously) selected the period from September to November for the Brighton season. Sea-bathing, first introduced about the middle of the 18th century, together with the fresh pure air, has turned the stream of health-seekers from Bath and Tunbridge Wells and other watering-places into Sussex. The poor but populous fishing-town of Brighthelmston developed into the fashionable town of Brighton ; the new town of Worthing sprang up in Broadwater parish ; and the fishing village of East- bourne rose in importance. The Cinque Port town of Hastings afterwards developed its fashionable suburb St Leonards, and Sea- ford was also resorted to; in the western part of the county the hamlet of Bognor became a fashionable place. The opening of the

1 Address to Geological Section of British Association, 1882.

2 Good lists of fauna and flora of certain parts of the eastern divi- sion of the county have been published by the Hastings Literary and Philosophical Society and the Eastbourne Natural History Society.

railway from London to Brighton in 1840, soon followed by coast lines from east to west, occasioned a great inercase in the coast towns, and now almost the entire coast (except in its steep parts) presents a line of fashionable ‘‘health resorts” unequalled in an

English county; these indeed form the special distinguishing feature of Sussex amongst other counties.

Sussex is divided into the six rapes® of Hastings, Pevensey, Admin. | Lewes, Bramber, Arundel, and Chichester. The only rapes which ea oa exist for practical purposes are that of Hastings, which hasa separate – | coroner, and the last three, in which the liability to repair bridges falls as of common right upon the rape instead of the county division, The Act 19 Hen. VII. cap. 24 directed that for convenience the county court should be held at Lewes as well as at Chichester and this apparently gave rise to the division of Sussex into east and west parts, and separate quarter scssions are now held for these two divisions. The boroughs of Hastings, Rye, Brighton, and the city of Chichester have separate commissions of the peace and courts of quarter sessions. There are eighteen petty and special sessional divisions. At the time of the Domesday survey the county con. tained 65 hundreds, but the modern total is 68. Ofthe 7 municipal boroughs which the county contains Arundel, Chichester, Hastings, and Rye existed long before the passing of the Municipal Corpora- tions Act, 1835 ; Brighton was incorporated in 1854, Lewes in 1881, and Eastbourne in 1883. Winchelsea, Seaford, Pevensey, and Mid- hurst were unreformed corporations existing under old charters, the first being governed by a mayor and the last three by bailiffs, but all their privileges have lately been abolished. ‘‘ Sussex,” as Mr Freeman observes,‘ ‘‘is no shire, no department, but a component element of England, older than England.” The diocese of Chi- chester is nearly coextensive with the county and the old kingdom of Sussex. In the year 681 the county was converted to Christianity by St Wilfrid (afterwards archbishop of York), who founded the see of Selsey, but in 1075 the see was transferred from Selsey to Chichester. The diocese consists of two archdeaconries, Lewes and Chichester, and five deaneries. There are 322 civil parishes, with parts of seven others. |

Prior to the Reform Bill of 1832 Sussex returned twenty-eight Parla. members to the House of Commons, two for the county and two mentary eacli for the boroughs of Arundel, Bramber, Chichester, East Grin- repre stead, Hastings, Horsham, Lewes, Midhurst, New Shoreham (with sentation the rape of Bramber), Rye, Seaford, Steyning, and Winchelsea, —_ The borough of New Shoreham was in 1771 added to the rape of Bramber. In

1832 Bramber, East Grinstead, Seaford, Steyning, and Winchelsea were entirely disfranchised, the first-named being classed with the worst of the ‘‘rotten” boroughs ; Arundel, Hors- ham, Midhurst, and Rye were each deprived of one member; the county was divided into two parts (Hast and West), each returning two members ; and a new borough, Brighton, was created,,to which two members were allotted. Chichester and Lewes were each de- prived of one member in 1867, and Arundel was disfranchised in 1868. The Redistribution of Seats Act, 1885, disfranchised Chi- chester, Horsham, Midhurst, New Shoreham (with. the rape of Bramber), and Rye, and deprived Hastings of one member. It also divided the county into six (instead of two) divisions, viz., Lewes, Southern or Eastbourne, Eastern or Rye, South-western or Chiches- ter, Northern or East Grinstead, North-western or Horsham, each returning one member. Brighton still retains two members.

According to the latest owners of land fetwrn (1873), there were Land: 11 proprietors with more than 10,000 acres each ; 8 of 5000 to 10,000 ; OwneT 1015 of 100 and less than 5000 ; of 10 and less than 100 acres, 1677; of 1 and less than 10, 2347; and of less than an acre, 14,675,— i making a grand total of 19,733 landowners, having a gross esti- , mated rental of £2,418,522 ; there were in addition 23,788 acres of common or waste lands. The eleven principal landowners were— q Lord Leconfield, 30,221 acres; the duke of Norfolk, 19,217; the Par duke of Richmond, 17,117; the earl of Chichester, 16,232; the ’ marquis of Abergavenny, 15,364; Rev. John Goring, 14,139; the earl of Ashburnham, 14,051; the earl of Egmont, 14,021; Viscount Gage, 18,739; the Earl De la Warr, 11,185; and the duke of Devon- shire, 11,062. At the time of the Domesday survey there were 15 tenants in capite, 584 under-tenants, and 2497 bordarit (or cottagers), also 765 cotarii (or cottars). The custom of borough-English, by which land descends to the youngest son, prevailed to an extra- ordinary degree in Sussex, and no less than 140 manors have been catalogued in which it was found.’ Gavelkind tenure existed in | Rye, in the large manor of Brede, and in Coustard manor (in Brede | | parish). ° ° . ° * A icul- | :

The coast district has becn under cultivation from the time ofAgnA® | the Romans and is very fertile, being specially suitable for market ture. |

gardens and for growing fruit trees. ‘The fig gardens of West Tarring are celebrated. Marshall,® describing the Weald in 1788, a ee a ee

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3 Probably derived from the Icelandic hreppr, signifying land divided by a rope. It is first mentioned in the Domesday survey.

4 English Towns and Districts, p. 125.

5 Suss. Arch. Coll., vi. 164.

§ Rural Economy of the Southern Counties, &c.

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SUSSEX

says: ‘‘The townships of the Weald are in general very large, owing, as it would seem, to the fewness of sites fit for habitation. .. . Alarge portion of the vale lands remain in a state of common- age, particularly on the outskirts and towards the extremities of the district. . . . There is scarcely an acre of natural herbage or old

ass-land”; of the coast district he observes that there is strong circumstantial evidence that the lands were not only brought to their present form but cultivated before the laying out of town- ships. He also mentions that in the Isle of Selsey he observed some common field land, as well as about Chichester. The South Downs afford excellent pasture for sheep, Sussex being famed for a special breed of blackfaced sheep. The total number in 1886 was 518,665, —seventh in order amongst English counties. The total area of land and water in Sussex is 933,269 acres (1881), of which in 1886 there were 682,072 under crops, bare fallow, and grass, made up of 74,518 acres of wheat, 18,067 of barley, 66,509 of oats, 399 of rye, 6307 of beans, and 9493 of pease,—the total of corn erops being 175,298 acres. The green crops were 73,315 acres in extent, including 3405 of potatoes, 28,686 of

turnips and swedes, 12,152 of mangolds, 326 of carrots, 11,847 of cabbage, kohl-rabi, and rape, and 16,899 of vetches and other green crops. Clover, sain- foin, and grasses under rotation occupied 63,724 acres (47,851 for hay). Permanent pasture or grass amounted to 340,352 acres (117,956 for hay), included chiefly in the South Downs and used for sheep pasture, and the extensive pastures of Pevensey Marsh, used for fattening stock. The total area cultivated with hops was 10,391 acres, Sussex ranking next to Kent. In 1833 the total of hops was only 7701 acres. The number of horses in 1886 was 24,964, of which 20,473 were used solely for agricultural purposes. Cattle in the same year numbered 115,633, of which 40,693 were cows and heifers in niilk or in calf. The total of pigs was 41,064. Poultry in 1885 included 317,712 fowls, the fattening of which for the London markct forms an important industry in the north- eastern part of the county, the centre being at Heathfield.

The earliest statement as to the population of Sussex is made by Bede, who describes the county as containing in the year 681 land of 7000 families; allowing ten to a family (not an unreasonable estimate at that date), the total population would be 70,000. At the time of the Domesday survey (about 400 years later) the total number of tenants in capite, under-tenants, bordarii, cotarii, servi, villani, &c. (in fact all able-bodied males), was 10,410.41 Assuming each of these to represent a family of ten, the total population was then 104,100. In 1693 the county is stated? to have contained 21,537 houses. If seven were allowed to a house at that date, the total population would be 150,759. It is curious, therefore, to observe that in 1801 the population was only 159,311. The decline of the Sussex iron-works probably accounts for the small increase of population during several centuries, although after the massacre of St Bartholomew upwards of 1500 Huguenots landed at Rye, and in 1685 (after the revocation of the Edict of Nantes) many more refugees were added to the county. In 1881 the total population was 490,505, of whom 232,331 were male and 258,174 female. The principal towns were Brighton (population, 107,546; 128,440 in parliamentary borough), Hastings (42,258 ; 47,738 in parliament- ary borough), Chichester (8114), Lewes (10,815), and Rye (4667).

Bede records that St Wilfrid, when he visited the county in 681, taught the people the art of net-fishing. At the timc of the Domes- day survey the

fisheries were extensive, and no less than 285 saline (or salt-works) existed. The customs of the Brighton fishermen were reduced to writing in 1579. The census of 1851 returned 915 fishermen, but a parliamentary return in 1869 stated the number of men and boys to be 2236, and they manned 780 boats. The census of 1881 returned 1471 fishermen. The approximate value of the fish landed at Brighton yearly is about £20,000.

There are now no important industries ; the chief is the brick, tile, and pottery, the main centre of which is St John's Common. The census of 1881 returned 1485 brickmakers in the county. The London, Brighton, and South Coast Railway Company have exten- sive works at Brighton. There is a daily service of passenger steamers from Newhaven to Dieppe in France, and large quantities of fruit, vegetables, butter, and eggs are conveyed from France to London.

The earliest settlers in the county were the Celtic tribes whose memorials are found in the hill-forts of Mount Caburn, Hollingbury, White Hawk, Ditchling Beacon, Devil's Dyke, Chanctonbury Hill, Cissbury, &c., the latter being a great factory for flint implements. They gave the names to the rivers. Little is, however, known respecting them beyond the fact that they had a distinct coinage some two centuries before the Roman invasion,—a coarse imitation of the Greek stater of Philip II. of Macedon. These coins have been found in various parts of Sussex. At the time of Cxsar's landing (55 B.c.) the Belgic tribe of the Regni inhabited the county and had their capital at Regnum (Chichester). Sir G. B. Airy fixed on

Pevensey as the place of Czxsar's landings in 55 and 54 B.c.; this eee eS

1 Sir H. Ellis, General Introduction to Domesday Book. | a. 2 Account by John Houghton, F.R.S., of Acres and Houses in each County (King's

Pamphlets, Brit. Mus.).

is, however, much disputed, and opinion generally puts the landing near Deal. A few years after this Sussex appears to have formed part of the kingdom of Commius, a British chieftain, and upon his death seems to have

been allotted to his son Tincommius. These two are the only British rulers of the county whose coins have been found. Upon the conquest of Britain under Claudius the Romans found a ready tool in a king named Cogidubnus, who is mentioned by Tacitus, and who was created imperial legate, and may probably be identified with the king of that name mentioned in the cele- brated inscription on the temple of Neptune and Minerva found at Chichester. Sussex was reduced to submission prior to the reign of Vespasian, and Major-General Pitt-Rivers suggests that the hill-fort of Mount Caburn may have been one of the twenty oppida Suetonius states to have been reduced by that emperor. Roman settlements became numerous in the county and villas sprang up, the remains of which are still occasionally found, the chief being that at Bignor, near Stane Street, the Roman road connecting Chichester with London and still partly traceable. A fortress was erected at Anderida (Pevensey), and there was another town named Mutu- antonis, which is thought to be Lewes; but, having regard to the Antons in West Sussex, it may have been situated farther west than Lewes, perhaps at Littlehampton. Sussex was the first county invaded by the Saxons, who in 477 landed under Hlle at Keynor near Chichester. After fourteen years of struggle they reached the point where the South Downs abut on the sea at Beachy Head, and in 491, as the Saxon Chronicle grimly records, ‘‘ Aille and Cissa beset Andredes-ceaster (Anderida), and slew all that were therein, nor was there a Briton left there any more.” This resulted in the formation of a distinct kingdom of South Saxons, whence its name of Sussex. The subjugation of the county was very complete, for it is still one of the most thoroughly Saxon counties in England, and its inhabitants, speech, place-names, customs, &c., are almost entirely Saxon. The next important event in the history of the county was the landing of William of Normandy (28th September 1066), followed by the battle of Senlac* or Hastings (14th October 1066). The Conqueror erected on the battlefield a state abbey dedi- cated to St Martin, but it was not completed until after his death. The next chief event was the battle of Lewes between Henry ITI. and the barons under Simon de Montfort in 1264, which “ wiped out the stain—if stain it were—of Senlac.” The only other import- ant events have been the rebellion of Jack Cade in 1450, which received very substantial support in East Sussex, and the naval engagement fought off Beachy Head in 1690, in which the English and Dutch fleets combined were defeated by the

French. Charles II. in his flight after the battle of Worcester escaped in 1651 from Brighton in a fishing-boat.

The foremost place amongst the illustrious natives of Sussex must be assigned to Shelley the poet. Of statesmen we have Richard Cobden and John Selden, and of eminent ecclesiastics Archbishops Frewen, John Peckham, and William Juxon, also Arch- deacon Hare. Its poets include Thomas Otway, Thomas Sackville (afterwards earl of Dorset), and John Fletcher. Of antiquaries we find Sir William Burrell, John Elliot, Rev. Thomas W. Horsfield, Mark Antony Lower, Dr Mantell (geologist), and Dr Richard Russell (founder of modern Brighton).

Dialect.—A large number of Saxon words are still retained and pronounced in the old style ; thus gate becomes ge-at. The letter a is very broad in all words, as if followed by w, and in fact con- verts words of one syllable into words of two, as faiis (face), tadist (taste), &c. Again, a before double d becomes ar, as arder and larder for adder and ladder ; ot is like a long 7, as spile (spoil), intment (ointment) ; an ¢ is substituted for a in such words as rag, flag, &e. The French refugees in the 16th and 17th centuries in- troduced many words which are still in use. Thus a Sussex woman when unprepared to receive visitors says she is in dishabille (désha- billé, undress); if her child is unwell, it looks pekid (piqué), if fretful is a little peter-gricvous (petit-grief) ; she cooks with a broach (broche, a spit), and talks of coasts (coste, Old French) or ribs of meat, &c. There is an excellent Dictionary of the Sussex Dialect by the Rev. W. D. Parish.

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index to the first 25 vols.; Domesday Book in relation to the County of Sussex (1886). See also C. Fleet, Glimpses of our Sussex Ancestors, two series ; Swainson, Chichester Cathedral ; Col. Lane-Fox (now Pitt-Rivers), ‘‘ Examination into the Character and Probable Origin of the Hill Forts of Sussex,” in Archwologia, xli. 27, and ‘* Further Remarks,” &c., ib., p. 53; G. Slade Butler, Topographica Sussex- iana; M.A. Lower, The Churches of Sussex (illustrated by R. Nibbs) and The Worthies of Sussex; J. C. Egerton, Sussex Folk and Sussex Ways; Proceedings of the Brighton and Sussex Natural History Society; W.E. Baxter, The Domesday

Book for the County of Sussex, being that portion of a Return of Owners of Land in 1873 which refers to Sussex, Lewes, 1876; J.D. Perry, Historical and Descriptive

3 The hill of Senlac is now occupied by the abbey and town of Battle.

Account of the Coast of Sussex; Frederick Dixon, The Geology of Sussex; M. A. Lower, Chronicles of Pevensey; William Topley, Memoirs of the Geological Survey of England and Wales: Geology of the Weald, parts of the Counties of Kent, Surrey, Sussex, and Hants; J. G. Bishop, Brighton Pavilion and its Royal Associations ; Merrifield, A Sketch of the Natural History of Brighton and its Vicinity, 1864; H. D. Gordon, The History of Harting ; Basil Champneys, A Quiet Corner of Eng- land : Studies of Landscape and Architecture in Winchelsea, Rye, and the Romney

Marsh, 1874; M. A. Tierney, History and Antiquities of the Castle and Town of

Arundel ; Holloway, History of Rye; Horsfield, History and Antiquities of Lewes; W. D. Cooper, History of Winchelsea; M. A. Lower, Chronicles of Battle Abbey ; Howard, Hastings Past and Present, &c. (F. E. 8.)
SUTHERLAND, a northern maritime county of Scot- land, is bounded E. by Caithness, 8.E. by Moray Firth, S. and S.W. by Ross and a part of Cromarty, and N. and W. by the Atlantic and the North Sea. The area is 1,297,846 acres, or nearly 2028 square miles. The northern and western shores are broken and irregular, in some cases deeply indented, and in the

north-west, at Cape Wrath, near Durness, at Whiten Head, and farther south at the island of Handa there are ranges of wildly precipitous cliffs. Numerous islands stud the larger inlets on this coast; the only ones inhabited in 1881 were Oldney with four persons and Roan (in Kyle of Tongue) with forty-three ; Handa, which had eight inhabitants in 1871, had none in 1881. On the north coast the principal sea lochs are the Kyle of Tongue, Loch Erriboll, and the Kyle of Durness, and on the west coast Loch Inchard, Loch Laxford, the various branches of Eddrachillis Bay, and Loch Inver. The eastern shore is low and comparatively regular, the only inlets being Loch Fleet and Dornoch Firth. With the excep- tion of the narrow plain along the east coast, various stretches of low ground on the west coast, and the low grounds adjoining the rivers and inland lochs, the surface consists chiefly of a succession of irregular elevations of from 500 to over 3000 feet in height. Much of the western district adjoining the coast from Cape Wrath southwards is occupied by Archzan gneiss, forming a series of bare rounded knolls. Resting unconformably on the gneiss are deposits of grits and sandstones, generally regarded as of Cambrian age, rising into wild cliffs between Cape Wrath and the Kyle of Durness. These are succeeded unconformably by Silurian strata, specially developed in the neighbourhood of Durness and Erriboll; in the former region they form a basin occupied chiefly by the limestone series, containing a remarkable collection of fossils, and at Erriboll, from which the strata at Durness are separated by a great dis- location, they present a remarkable series of horizontal dis- placements. Towards the east the gneiss is intermixed with granite and syenite, which cap the summits of a few of the mountains. Outliers of Old Red Sandstone also occur in this eastern mountainous region, sometimes in masses of coarse conglomerate. The highest mountain summit in Sutherland is Benmore Assynt (3273 feet), the culminating peak of a fine range of Silurian quartzites and limestone rocks lying to the south-east of Loch Assynt, while to the south-west are the picturesque conical summit of Canisp (2779 feet) and the curious Suilven (2399 feet) with its forked top. The next highest and most picturesque series of mountain groups occurs in the north-eastern region, south of the Kyle of Tongue,—Ben Hope, a rounded mass with imposing precipices rising near Loch Hope to a height of 3040 feet, while to the eastward is the picturesque Ben Loyal or Laoghal (2504 feet), formed of granite, and south from it, near Loch Naver, the great bulk of Ben Klibreck (3154 feet). Numerous other summits

attain a height of over 2000 feet, but the greater proportion of the mountain- ous region consists of elevated moorlands, bleak and un- interesting, except when the heather assumes its purple tints in autumn. In the lower region along the shores of Moray Firth the Old Red Sandstone occurs resting uncon- formably on the crystalline series of rocks, and is in turn succeeded by an interesting series of Jurassic strata, which, faulted against the older formations, are exposed along the coast from Golspie to Helmsdale. In this series, at Brora,

some seams of coal have been worked, but the presence of iron pyrites greatly lessens its value.

building stone.

Year.) under.

Limestone is wrought in various districts, and there are a number of quarries for Small quantities of gold have been found in some places.

Sutherland has a much greater proportion of its area occupied by water than any other large county in Scotland, the parish of Assynt being completely honeycombed with lochs and tarns. Loch Assynt, the largest of these, 10 miles in length, and narrow and irregular in outline, is entitled to rank, from its picturesque creeks and the grandeur of the adjoining mountain scenery, as the most beautiful loch in Sutherland. Loch Shin, extending 17 miles throughout nearly the whole of Lairg parish, from south-east to north-west, is towards the centre overhung by mountain masses, but otherwise is without interest to any but the angler. It is succeeded northwards by a series of lochs,—Griam, Merkland, More, Stack, Garbadmore, Garbadbeg—extending through the centre of the parish of Eddrachillis. Lochs Merkland and Griam occur, like Loch Shin, in the course of the river Shin, a tributary of the Oykel, which last forms the southern boundary of the county with Ross and falls into Dornoch Firth; Lochs More and Stack are in the valley of the Laxford, running north-westward to Loch Laxford. The Dionard or Grudie flows northwards to the Kyle of Durness, and the Hope, after expanding into Loch Hope, about 10 miles in length, falls into Loch

Erriboll. The Borgie, which in its course forms Loch Loyal and falls into Torrisdale Bay; the Naver, which flows from the loch of that name through a fertile strath to the sea at Betty- hill of Farr; the Strathy; and the Halladale are the prin- cipal other rivers flowing northwards. Those entering Moray Firth are the Oykel; the Helmsdale, which reaches the sea at the town of that name; the Brora, which receives various tributaries before it expands into Loch Brora, 3 miles from its entrance into the sea at Brora; and the Fleet, flowing into Loch Fleet.

Agriculiure.—According to the agricultural returns of 1886 only 3110 acres out of 1,347,033 were in cultivation, less than a fortieth part of the whole area. The best land is that adjoining Moray Firth, where agriculture is in a very advanced condition. Along the river valleys there are, however, many fertile patches. At the beginning of the 19th century the crofters occupied almost every cultivable spot throughout the county ; between 1811 and 1820 they were ejected from their holdings to the number of 15,000, and, according to the statement of Hugh Miller, "*compressed into a wretched selvage of poverty and suffering that fringes the county on its eastern and western shores." The homes they left were, he says, "'improved into a desert"; but in the opinion of those who made the alteration these mountainous parts were as '"'much calculated for the maintenance of stock as they were unfit for the habitation of man." The crofters in Sutherland are now (1887) chiefly confined to the western seaboard, the number of crofts, all on the estates of the duke of Sutherland, amounting, according to the Report of the Crofters Commission, to 1238, and representing a population of 6190. The general agricultural condition of the county has been much improved by successive dukes of Sutherland, aided by the liberality of the Government in the advancement of money for the construction of roads and bridges ; and within recent years large reclamations have been made, in order to obtain 4 wider area for the growth of fodder and turnips. The following

table gives the number and acreage of various classes of holdings in 1875, 1880, and 1885 :—

50 acres and l50 to 100/100 to 800/300t0 500} 500 to | Above acres. acres, acres. | 1000 ac, | 1000 ac.

Total.

1875 |2505) 11,994 | 29 |2069) 42 |6939| 9 3576! 4 /2212) .. 1880 |2498) 12,539 | 34 |2541} 40 |6661| 15 |5730| 5 /2689] .. | .. ’ 1885 |2512) 13,232 | 44 |3259] 41 |7899] 14 |5224) 5 /2899] 2 |8050/2618} 40,063

In 1885 of the class of holdings not exceeding 50 acres in extent 68 were between 20 and 50 acres each, 661 between 5 and 20, 1764 between 2 and 5, and 19 between } and 1 acre.

Out of the 33,110 acres under tillage in 1886 there were 10,343 under corn crops, 5052 under green crops, 8861 rotation grasses,

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$602 permanent pasture, and 252 fallow. The principal corn crop is oats, which occupied 8392 acres, barley occupying 1845, rye 63, pease 24, and wheat only 19. Potatoes occupied 2014 acres and turnips and swedes 2981. Cattle, chiefly West Highland, short- horn, and crossbred, numbered in 1886 12,806, of which 5576 were cows and heifers in milk or in calf; horses, which include a large number of ponies, although Clydesdales are used on the large farnis, numbered 2665, of which 2015 were used solely for purposes of agriculture ; sheep, the rearing of which is the staple business of the county, the principal breed being Cheviots, nunibered 211,825, of which 158,961 were two years old and above; and pigs, 1037. According to the Report of the Crofters Commission, there were four deer forests within the county, all belonging to the duke of Sutherland, viz., Ben

Armin and Coir-na-fearn, 35,840 acres; Dunrobin, 12,180; Glencanisp, 34,490; and Reay, 64,600; in all 157,110 acres, or more than one-ninth of the total area. There is acomparatively small area under woods, —only 12,260 acres in 1881.

According to the latest (1873) owners and heritages Return the land was divided among 433 proprietors possessing 1,297,253 acres at an annual value of £71,494, or 1s. 1d. an acre all over. There were 348 proprietors who possessed each less than one acre, the total amount which they owned being only 59 acres. The bulk of the land is possessed by the duke of Sutherland, who owned 1,176,454 acres, the other proprietors possessing above 10,000 acres each being Sir Charles W. A. Ross, 55,000; E. C. Sutherland-Walker, 20,000; Sir James Matheson, 18,490 ; and the executors of Gordon M‘Leod, 11,000. The total valued rental of the county in 1674 was only £27,193 Scots or £2266 sterling, while in 1885-86 it was £103,979.

Communication.—The county is well supplied with roads con- sidering its mountainous character and its sparse population. Helmsdale affords the means of export for a considerable amount of farm produce. The Highland Railway enters the county at Inver- shin and after passing northwards to Lairg turns eastwards to the coast, which it skirts to Helmsdale, whence it turns north-westwards along the banks of the Helmsdale, bending afterwards eastwards at Forsinard into Caithness.

Industries. —Various textile manufactures at one time established in the county have been discontinued, the only important manu- facture now remaining being that of whisky at Clyne and Brora. Herring fishing prosecuted from Helmsdale is an important in- dustry, and the cod, ling, and other deep-sea fishings engage a large number of boats and men. ‘There. are valuable salmon fisheries in several of the rivers.

Administration and Population.—The county contains 13 entire parishes and part of the parish of Reay, the remainder being in Caithness. The county returns one member to parliament, and one isreturned for the Wick group of burghs. Dornoch, the only royal burgh, had but 497 inhabitants in 1881, while Golspie had 1548 and Helmsdale 794. The population has not varied greatly in numbers since the beginning of the 19th century. In 1801 the

numbers were 23,117, and in 1881 they were 23,370, a gradual decrease having taken place since 1851, when the numbers reached 25,793. In 1881 there were 11,219 males and 12,151 females. Sutherland is the most sparsely peopled county in Scotland, there being only 12 persons to the square mile, while the average for Scotland is 125. Sutherland forms a joint sheriffdom with Ross and Cromarty, and a sheriff-substitute resides at Dornoch. Small debt circuit courts are held at Helmsdale, Tongue, Melvich, and Scourie, and justice of peace courts at Dornoch, Golspie, Brora, and Helmsdale. .

History and Antiquities.—The ancient Celtic inhabitants were almost entirely expelled by the Scandinavian settlers who occupied the county after its conquest by the Norse jarl Thorfinn in 1034. The remains of Pictish towers are numerous, as are also stone circles. Of other antiquities mention may be made of the vitrified fort on Dun Creich and of the extensive remains of Dun Dornadilla in Durness parish. After the conquest of the district by the Scot- tish kings, Sutherland was conferred on Hugh Freskin (a descendant of Freskin of Moravia or Moray), whose son William in 1228 was created ear] of Sutherland by Alexander II. The nineteenth earl of Sutherland was created duke in 1833. The seat of the ancient episcopal sce of Sutherland and Caithness was at Dornoch, where a cathedral was erected by Gilbert of Moravia (1222-1245), of which the ancient tower, attached to the modern parish church, still remains.

See Sir Robert Gordon’s History of the Earldom of Sutherland, 1813; Hugh

Miller’s Sutherland as it is, 1843; and C. W. G. St John’s Tour in Sutherland- shire, 1849. JM 105 1BE))

SUTTEE, the name given by English writers to the rite of burning a widow on the funeral pyre of her husband a$ practised among certain Hindu castes, and especially among the Rajputs. The word saté (as it should rather be written) properly denotes the wife who so sacrifices herself, not the rite itself, and means “a good woman,” “a faithful

| wife.” The sacrifice was not actually forced on a wife, but

it was strongly recommended by public opinion as a means to her own happiness and that of her husband in the future state, and the alternative was a life of degraded and miser- able widowhood. The practice was current in India when the Macedonians first touched that country (Diod. Sic., xix. 33), and it lasted into the 19th century, having been toler- ated even by English rulers till 1829. (See Inp1a, vol. xii. p. 806.) The subject is illustrated by copious quota- tions from ancient and modern authorities in Yule's Anglo-Indian Glossary, p. 666 sg., and by comparison of similar rites among other nations in Tylor's Primitive Culture, ch. xi. It has its root in the primitive view of the future life, which regards the dead as having similar needs to the living. The wife is sent into the world of shades with her husband, just as arms, clothing, or treasure are buried in his tomb, or slaves are slain to attend their master in the underworld. The Indian custom is not, therefore, properly a part of Brahmanism ; but it was adopted by the ministers of that religion, who strained their sacred texts to find support for it.

SUTTON COLDFIELD, an ancient market town and municipal borough of Warwickshire, England, is situated on the London and North-Western Railway, 8 miles south of Lichfield and 7 north-east of Birmingham. The town has been greatly increased of late years by the erection of villas for persons having their business offices in Birming- ham, Walsall, and other towns. The church of the Holy Trinity—Early English and Late Perpendicular, restored in 1874 and enlarged in 1879—contains a fine Norman font and the tomb of Bishop Vesey. He obtained from Henry VIII. the grant of the park and manorial rights for the benefit of the town, the annual value (now about £2000) being expended in charities and education. On the pictur- esque park near the town, 2400 acres in extent, the in- habitants have the right of grazing horses and cattle at a small fee. A town-hall was erected in 1859; in it there is a good library. The corporation formerly consisted of a warden and 24 members; but in 1885 Sutton obtained a municipal charter, by which it is divided into six wards, with an alderman and three councillors for each ward. The population of the township in 1871 was 5936, and in 1881 it was 7737. .

Sutton was at one time a royal manor and an apanage of the earls of Warwick. It owes much of its prosperity to the gifts of John Vesey (Voysey), bishop of Exeter in the 16th century, who was a native of the place. In its

charter of incorporation, 20th Henry VIII., it is called the royal town of Sutton Coldfield.

SUTTON-IN-ASHFIELD, a town of Nottinghamshire, England, is situated on an eminence on the Nottingham and Worksop and the Erewash Valley Railways, 3 miles west-south-west of Mansfield. The church of St Mary Magdalene of the 12th century was restored in 1868. In the churchyard is a yew tree reputed to be 700 years old. There are a number of collieries and limeworks in the vicinity. Cotton hosiery and thread are the principal manufactures. The dukeof Portland is lord of the manor. The population of the urban sanitary district (area, 4855 acres) in 1871 was 7574, and in 1881 it was 8523.

SUWAEKI, a government of Russian Poland, occupies the north-east corner of the kingdom, extending to the north between East Prussia and the Russian governments of Kovno, Vilna, and Grodno. Its area is 4846 square miles. It covers the east of the low swelling, studded with lakes, which skirts the south coast of the Baltic (see PoLaND), its highest parts reaching 800 to 1000 feet above the sea. Its northern slopes descend to the valley of the lower Niemen, while in the south it falls away gently to the marshy tract of the Bebrz. The rivers flow there in deep gorges and valleys, diversifying the surface. Suwatki is watered by the Niemen, which forms its eastern and its northern boundary and is largely used as a channel of communication ; it has many affluents from both slopes

of the swelling. The Augustowo Canal connects the navi- gable Hancza, tributary of the Niemen, with a tributary of the Bebrz, which belongs to the basin of the Vistula, and an active traffic is carried on on this canal. The population was 606,573 in 1883, the increase being 3400 during the year. It hasa most varied composition, embracing Lithu- anians (the prevailing element), who number about four- tenths of the whole (Zhmuds, 31°5 per cent. ; Lithuanians proper, 10°3), Poles (28°4, of whom 5°3 are Mazurs), Jews (17°2), Germans (6°8, but they are rapidly increasing), and White Russians (4°6). In religion the Catholics are pre- dominant (449,476 in 1883); the Jews come next (98,743); there are also 38,610 Protestants, 13,275 Orthodox Greeks, and 6246 Raskolniks.

Tertiary and Chalk deposits are widely spread in Suwatki, and the entire surface is covered with Post-Tertiary deposits. The bottom moraine of the great ice-sheet of North Germany, containing scratched boulders and furrowed by depressions having a direction north-north-east to south-south-west,! covers immense tracts of the ridge of the lake-districts and its slopes, while limited spaces are covered with well-washed glacial sands and gravel. On the northern slopes of the coast-ridge, the boulder-clay being covered with lacustrine deposits, there are at many places layers of fertile soil; and in the southern parts of the province the boulder-clay is very stony, and sometimes covered with gravel. Still, nearly nine-tenths of the surface are considered suitable for cultivation. Agriculture is the chief occupation, and potatoes are extensively grown for export to Prussia, where they are used for the manufac- ture of spirits, which are smuggled into the province. The manu- factures are unimportant (600 workinen; annual produce valued at £124,000, one-half being due to distilleries), All manufactured wares are imported, mostly from Prussia; and all trade is in the hands of Jews. The educational institutions include two gymnasia for boys, one for girls, one seminary for teachers (at Weiwery), one Catholic seminary, and 196 lower grade schools, having altogether an aggregate of 13,198 scholars in 1884. Suwatki is divided into seven districts, the chief towns of which with their populations in 1882 were—SuWALKI (see below), Augustowo (11,100), Kalwarya (10,600), Mariampol (5610), Seiny (4035), Wilkowiszki (6700), and Wtadistawow (9300). Wierzbolowo (3550), an important custom-house, situated on the railway from St Petersburg to Berlin, also has municipal institutions.

SUWAEKI, capital of the above government, is situated at the source of the Hancza, tributary of the Niemen, 75 miles north-west of Grodno. In the 15th century it was but a small village, lost amidst forests, and peopled by Lithuanians. In the end of the 18th century it became the capital of the Augustowo government, but never had any importance, except as the seat of the local authorities. Since 1834 it has been the capital of the government of Suwatki. Its population was 18,640 in 1882.

SUWAROFF, or Suvororr, ALEXANDER VASILIEVICH (1729-1800), Russian general, was born at Moscow on 24th November 1729, the descendant of a Swede named Suvor who emigrated to Russia in 1622.

Suwaroff entered the army at an early age and first distinguished himself at the battle of Kunersdorf in 1759, where he acted as aide-de-camp to General Fermor. Throughout the Seven Years' War he was conspicuous for his bravery and military skill. He next took part in the battles between the Russians and Poles at the period of the first dismemberment of Poland. Being afterwards transferred to the banks of the Danube (1773), he there in the cam- paigns against the Turks laid the foundation of his repu- tation as a military commander. In 1775 he put an end to the formidable revolt of Pugatcheff, who was brought in chains to Moscow and there decapitated. In 1789 Suwaroff defeated the Turks at Fokshani (Moldavia), and again in the same year on the Rimnik. In 1790 he took by assault the town of Ismail, on which occasion he sent his well-known couplet to the empress. On the termina- tion of this war Suwaroff was summoned to another cam- paign against the Poles. After the defeat of Kosciusko by Fersen at Macieowice in Siedlce (1794) he marched on

1 Hedroits, in Proc. Russ. Geol. Committee, iii., 1884.

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Warsaw, and captured its suburb Praga, where 15,000 Poles were massacred. Upon this the city capitulated, and the Russian general was made field-marshal. He re. mained in Poland till 1795 and was received in triumph on his return to St Petersburg. In November 1796 the empress Catherine, his firm friend and admirer, died. On the accession of Paul, who always laboured to undo his mother's work, Suwaroff fell into disgrace and was banished to his country-seat at Kontchanskoe in the government of Novgorod. There he remained some time in retirement. He unsparingly criticized the new military tactics and dress introduced by the emperor, and some of his caustic verses reached the ears of Paul. His conduct was therefore watched and his correspondence with his wife, who had remained at Moscow—for his marriage relations had not been happy—was tampered with. On Sundays he tolled the bell for church and sang among the rustics in the village choir. On week days he worked among them ina smock frock. But in February 1799 he was summoned by the emperor to assist in the campaign with the Austrians against the French. Suwaroff took command of the com- bined forces at Verona. He attacked Moreau, the French

general, at Cassano, the ford of the Adda, and completely defeated him, taking about 3000 prisoners; he then made a triumphal entry into Milan. He next defeated Mac- donald on the Trebbia in a sanguinary engagement which lasted three days, from the 17th to the 19th of June (1799). Soon afterwards Joubert was defeated and slain at Novi (15th August). But the importance of these sue- cesses was neutralized by the constant squabbles between Suwaroff and the Austrian commanders. The Russian general now received orders to join Korsakoff in Switzer- land and to assist him in driving the French from that country. Heaccordingly crossed the Alps, suffering severe losses, but on his arrival learned that Korsakoff had been previously defeated by Masséna. It only remained for him to effect a retreat with the shattered remains of his army. He finally reached his winter quarters, between the rivers Iller and Lech, and thence directed his home- ward march to Russia. The emperor Paul, who soon after this time entirely changed his policy and made an alliance with Bonaparte, recalled Suwaroff in disgrace, and on his return refused to see him. The veteran retired to his country-seat, where he died on the 18th of May 1800. Lord Whitworth, the English ambassador, was the only person of distinction present at the funeral of this remark- able man. He lies buried in the church of the Annuncia- tion in the Alexandro-Nevskii monastery, the simple in- scription on his grave being, according to his own direction, “ Here lies Suwaroff.”

Among the Russians the memory of Suwaroff is cherished as that ofa great and successful general, but he hardly enjoys such a reputa- tion among foreigners, who generally look upon his victories as due rather to the huge masses of men under his control than to military genius. His tactics seem to have been somewhat Oriental. He formed no general plans for his campaigns, but trusted to celerity of movement and blows rapidly struck. He was terribly reckless of human life, neither sparing his own soldiers nor showing mercy to the conquered. And yet we find him the subject of exaggerated eulogy among English writers in the early part of the 19th century. He was a man of great simplicity of manners, and while on a*cam- paign lived as a common soldier, sleeping on straw and contenting himself with the humblest fare. But he had himself passed through all the gradations of military service, and had been for many years a private soldier; moreover, his education had been of the rudest kind. He affected the habits

of a humourist, and his gibes pro- cured him many enemies. He had all the natural contempt of a man of ability and action for ignorant favourites and ornamental carpet-knights. Droll stories, in keeping with the well-known eccentricity of his character, are told of his manner of life in camp-

SVEABORG, an important fortress of Finland, built by Count Ehrensvird in 1749 on seven small islands off the harbour of Hetstncrors (g.v.). It is the seat of a great naval harbour and arsenal.

SU W—S V E

SWA—SWA

SWABIA, Suara, or Suevia (Germ. Schwaben), is the name of an ancient duchy in the south-west part of Germany, afterwards transferred to one of the ten great circles into which the empire was divided in the reign of Maximilian J. (1493-1519). At present the official use of the name is confined to a province of Bavaria (capital, Augsburg), comprising a mere fragment of the former Swabia, but in common use it is still applied to the districts included in the old duchy. The duchy of Swabia was bounded on the N. by the Rhenish Palatinate, on the E. by the Lech (separating it from the duchy of Bavaria), on the S. by Switzerland, the Lake of Constance, and Vorarl- berg, and on the W. by the Rhine. It corresponds roughly to the modern Wiirtemberg, Baden, and Hohenzollern, with part of Bavaria. The circle of Swabia coincided more nearly than most with the duchy from which it was named, but was rather more extensive. It was bounded by Switzerland, France (after the cession of Alsace), and the circles of the Upper and Lower Rhine, Franconia, Bavaria, and Austria. Its area was about 13,500 square miles. The Swabian circle contained more independent states of the empire than any other, including the countship (after- wards duchy) of Wiirtemberg, the margraviate of Baden, the principalities of Hohenzollern and Liechtenstein, a whole series of smaller secular and ecclesiastical principalities, and upwards of thirty free imperial towns (Augsburg, Ulm, &c.).

Swabia is intersected from west to east by the Danube, and.

is one of the most mountainous (Black Forest, Swabian Jura) and picturesque parts of the German empire. It is also very fertile. The Swabians are a strong, big-framed, and good-humoured race, and, though in several popular legends the "'Schwab" plays the part of a 'wise man of Gotham," he is probably no denser than his neighbours. The use of the name of Swabia in connexion with the south-west part of Germany, previously called Alemannia (see ALEMANNI), begins with the 5th century of our era, when the Suevi poured into the country and amalgamated with the Alemanni. It was not, however, till the 8th century, when the dukedom of Alemannia was abolished and Rhetia and Alsace separated from it, that Swabia became the recognized name of the district, henceforth administered by nuncii camere, as representatives of the Frankish emperors. One of these nuncii, who usurped the ancient title of duke of Alemannia, was executed in 917, but two years later Henry I, yielded to the popular will in allowing Count Burkhard I. to style himself duke of Swabia. The dukedom thus founded, which lasted for more than three centuries, repeatedly changed hands, and was generally conferred by the emperors and kings of the Saxon aud Franconian lines on members of their own families. In 1079 it passed into the hands of Frederick I. of Hohenstaufen, the progenitor of a line of German monarchs, and under his successors Swabia had the reputation of being the most civilized and prosperous part of Germany. As, however, the Hohenstaufen line gradually lost strength in its hopeless struggle with the papacy, the Swabian nobles increased in powcr at the expense of the dukes, and several of them became '"'immediate." No duke of Swabia was appointed after the death of Conradin, the last of the Hohenstaufen, in 1268, and his place was henceforth filled in some degree by the count of Wiirtemberg as primus inter pares. For the next 250 years or so the history of Swabia consists of an endless series of feuds between the different members of the duchy, mingled with more or less abortive attempts of the German emperors and others to restore peace. The lesser nobles fought with the greater nobles, the towns banded themselves together against both, and alliances and counter-alliances were formed and dissolved with bewildering rapidity. The ''Schleglerkrieg" is the name given to a bloody contest between the counts of Wiirtemberg and the lesser noblesse in 1367. The most important of the various leagues formed by the towns was the ''Schwibischer Stidtebund" of 1376, the point of which was directed against Wiirtemberg. In 1488 the

Swabian estates,—nobles, prelates, and towns,—weary of constant dissension, joined in the Great Swabian Confederation, the object of which was to maintain peace throughout the country. This league possessed a carcfully drawn up constitu- tion and exercised executive and judicial functions throughout the whole of Swabia, maintaining a standing army to give force to its decrees. Though not successful in completely abolishing war Within Swabia, the confederation was by no means a failure. It Was, for instance, the general of the confederation that put an end to the calamitous Peasants' War of 1525. The Reformation found

ready acceptance in Swabia. Wiirtemberg, Ulm, and some of the other estates even joined in the Schmalkald League; but for this they afterwards had to pay large fines to the emperor, while the towns lost their democratic constitution, and with it most of their political importance. The outstanding feature of Swabian history for some time afterwards may be said to be the struggle for supre- macy between the Protestant Wiirtemberg and the Roman Catholic Austria. In 1512, when all Germany was divided into ten circles, one of them was named the Schwibischer Kreis, or Swabian Circle (see above). The circle received its complete organization in 1563, and retained it practically unchanged till the dissolution of the empire in 1806. Swabia suffered severely in the Thirty Years' War, and it was also one of the scenes of the struggles con- sequent on the French Revolution. But its modern history must be sought for under such headings as WiiRTEMBERG and BADEN.

SWAHILI (Wa-Swahili, 2.¢., "Coast People," from the Arabic sdhil, coast), a term now commonly applied to the inhabitants of Zanzibar and of the opposite mainland between the parallels of 2° and 9° S., who are subjects of the sultan of Zanzibar, and whose mother-tongue is the Ki-Swahili language. According to present local usage no person would be called a Swahili unless he verified these two conditions. The Swahili are essentially a mixed people, in whom the Bantu and Arab elements are mingled in the proportion of about three to one; and the same is true of their speech, which of all the Bantu dialects has been most affected by Arab and other influ- ences. The interest attaching to the Swahili people, who have figured so

largely in the history of African enterprise during the last half century, is thus of a social rather than of a strictly scientific character. The energy and intelligence derived from a large infusion of Semitic blood has enabled them to take a leading part in the develop- ment of trade and the industries, as shown in the wide diffusion of their language, which, like the Hindustani in India and the Guarani in South America, has become the principal medium of intercommunication throughout most of the continent south of the equator. During his journey from the Indian Ocean to the Atlantic Commander Cameron found that a knowledge of this language enabled him everywhere to dispense with the aid of an interpreter, as it was understood by one or more persons in all the tribes along the route. Owing to this circumstance the intelligent and enterprising natives of Zanzibar have been found indispensable assistants in every expedition pene- trating from the eastern seaboard to the interior since they began to be employed by Speke and Burton as porters and escorts. Missionary enterprise has been at work amongst the Swahili, who are all Mohammedans, but with poor results. The language, however, has been carefully studied, and is now better known than perhaps any other member of the Bantu family. There are several varieties, of which the chief are—the archaic Ki-Ngozi in the north about the river Tana, mostly free from foreign elements ; the Ki-Mvita of the Mombasa district, reduced to writing by Krapf; and the Maneno Unguya of Zanzi- bar, which is most affected by Arabic, Persian, Indian, and other foreign influences, but which, nevertheless, is now the literary standard; of it complete grammatical treatises have been published, and into it portions of the Bible have been translated by Bishop Steere.

SWALLOW (A.-S. Swalewe, Icel. Svala, Dutch Zwaluw, Germ. Schwalbe), the bird which of all others is recognized as the harbinger of summer in the northern hemisphere ; for, though some slight differences, varying according to the meridian, are constantly presented by the birds which have their home in Europe, in northern Asia, and in North America respectively, it is difficult to allow to them a specific value ; and consequently a zoologist of wide views,

1 The language was first reduced to writing by the Arabs, who still use the Arabic character. But the European missionaries have wisely replaced this

by the Roman system, which is far more suited for the transliteration of most African, and especially of the Bantu, tongues.

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while not overlooking this local variation, will regard the Swallow of all these tracts as forming a single species, the LFirundo rustica of Linneus.1 Returning, usually already paired, to its summer-haunts, after its winter-sojourn in southern lands, and generally reaching England about the first week in April, it at once repairs to its old quarters, nearly always around the abodes of men; and, about a month later, the site of the nest is chosen, resort being had in most cases to the very spot that has formerly served the same purpose—the old structure, if still remaining, being restored and refurnished. So trustful is the bird that it commonly establishes itself in any of men's works that will supply the necessary accommodation, and a shed, a barn, or any building with an open roof, a chimney? that affords a support for the nest, or even the room of an inhabited house—if chance should give free access thereto, —to say nothing of extraordinary positions, may be the place of its choice. Wheresoever placed, the nest is formed of small lumps of moist earth, which, carried to the spot in the bird's bill, are duly arranged and modelled, with the aid of short straws or slender sticks, into the required shape. Thisis generally that of a half-saucer, but it varies according to the exigencies of the site. The materials dry quickly into a hard crust, which is lined with soft feathers, and therein are laid from four to six white eggs, blotched and speckled with grey and orange-brown deepening into black. Two broods are usually reared in the season, and the young on leaving the nest soon make their way to some leafless bough, whence they try their powers of flight, at first accompanying their parents in short excursions on the wing, receiving from them the food themselves are as yet unable to capture, until able to shift for themselves. They collect in flocks, often of many hundreds, and finally leave the country about the end of August or early in September, to be followed, after a few weeks, by their progenitors. The Swallows of Europe doubtless pass into Africa far beyond the equator,? and those of Northern Asia, though many stop in India or Burmah, even further to the southward, occasionally reaching Australia,

while those of North America extend their winter-wanderings to southern Brazil; but, whithersoever they then resort, they during that season moult their feathers, and this fact affords one of the strongest arguments against the popular belief (which, curious to say, is still partly if not fully entertained by many who should know better) of their becoming torpid in winter, for a state of torpidity would suspend all animal action.4 The chestnut forehead and

throat, the shining steel-blue upper plumage, and the dusky-_

white—in some cases reddening so as almost to vie with the frontal and gular patches—of the lower parts are well known to every person of observation, as is the markedly forked tail, which is become proverbial of this bird.

1 Dr Stejneger (one of the chief leaders in the recent American movement, the results though not the intention of which would be the subversion of much of the nomenclature of birds hitherto thought in Europe to have been established on tolerably firm principles) would apply to the Swallow the generic term of Chelidon, generally accepted for the MARTIN (vol. xv. p. 581), and to the latter Hirundo. Herein he is technically incorrect, for one of the first principles of zoological nomenclature has always been that a generic term, to be valid, must be defined. In the absence of definition such a term: may be, by courtesy, occasionally accepted ; but this courtesy has never been, nor except in America is likely to be, extended to the misapplication here in question,

- Hence the common English name of ‘‘Chimney-Swallow.” In North America it is usually the ‘‘ Barn-Swallow.”

3 It must be noted that the Swallow has been observed in England in every month of the year; but its presence from the begiuning of December to the middle of March is an extremely rare occurrence.

4 See John Hunter’s Essays and Observations in Natural Mistory, edited by Sir R. Owen in 1861 (ii. p. 280). An excellent biblio- graphy of the Swallow-torpidity controversy, up to 1878, is given by Prof. Coues (Birds

of the Colorado Valley, pp. 378-390), who seems still to hanker after the ancient faith in ‘‘ hibernation.”

SWA—SWA

Taking the word Swallow in a more extended sense, it is used for all the members of the Family Hirundinidz,® excepting a few to which the name Martin (vol. xv. p. 581) has been applied, and this Family includes from 80 to 100 species, which have been placed in many different genera. The true Swallow has very many affines, some of which range almost as widely as itself docs, while others seeni to have curiously restricted limits, and much the same may be said of several of its more distant relatives, But altogether the Family forms one of the most circumscribed and therefore one of the most natural groups of Oscines, having no near allies; for, though in outward appearance and in some habits the Swallows bear a considerable resemblance to Swirrs (g.v.), the latter belong to a very different Order, and are not Passerine birds at all, as their structure, both internal and external, proves. It has been sometimes stated that the Hirundinidew have their nearest relations in the FiycaTcuers (vol. ix. p. 351); but the assertion is very questionable, and the supposition that they are allied to the Ampelidx (of. Waxwine), though possibly better founded, has not as yet been confirmed by auy anatomical investi- gation. An affinity to the Indian and Australian Avtamus (the species of which genus are often known as Wood-Swallows, or Swallow-Shrikes) has also been suggested; and it may turn out that this genus, with its neighbours, may be the direct and lesg modified descendants of a generalized type, whence the Hirundinide have diverged; but at present it would seem as if the suggestion originated only in the similarity of certain habits, such as swift flight and the capacity of uninterruptedly taking and swallowing insect-food on the wing,

Swallows are nearly cosmopolitan birds, inhabiting every considerable country except New Zealand, wherein only a stray example, presumably from Australia, occasion- ally occurs. (A. N.)

SWAMMERDAM, Joun (1637-1680), may be ranked almost with Leeuwenhoek as one of the most eminent Dutch naturalists of the 17th century. Born at Amster- dam in 1637, the son of an apothecary and naturalist, he was destined for the church ; but he insisted on passing over to

the profession of medicine, meanwhile passion- ately devoting himself to the study of insects. Having necessarily to interest himself in human anatomy, he devoted much attention to the preservation and better demonstration of the various structures, and he devised the method of studying the circulatory system by means of injections, so doing the greatest service to practical anatomy. The fame of his collection soon became Euro- pean ; thus the grand-duke of Tuscany offered him 12,000 florins for his collection, on condition of his coming to Florence to continue it. His General History of Insects and other kindred works lie at the foundation of modern entomology, and include many important discoveries. Thus he cleared up the subject of the metamorphosis of insects, and in this and other ways laid the beginnings of their natural classification, while his researches on the anatomy of mayflies and bees were also of fundamental importance. His devotion to science led to his neglect of practice ; his father greatly resented this, and stopped all supplies ; and thus Swaimmerdam experienced a period of considerable privation, which had the most unfortunate consequences to his health, both bodily and mental. In 1675 he published his History of the Ephemera, and in the same year his father died, leaving him an adequate fortune, but the niischief was irreparable. He became a hypochondriac and mystic, joined the followers of Antoinette Bourignon, and died at Amsterdam in 1680.

SWAN (A.-S. Swan and Swon, Icel. Svanr, Dutch Zwaan, Germ. Schwan), a large swimming-bird, well known from being kept in a half-domesticated condition through- out many parts of Europe, whence it has been carried to

5 An enormous amount of labour has been bestowed upon the Hirundinide by Mr Sharpe (Cat. B. Br. Musewm, x. pp. 85-210), only commensurate, perhaps, with that required for an understanding of the results at which he has arrived. Nothing can better shew the difficulty of unravelling the many puzzles which the Family offers than this; and it is to be hoped that in his finely-ilustrated Monograph which is now in course of publication he will succecd in clearing up some of them.

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other countries. In England it was far more abundant formerly than at present, the young, or Cygnets,! being highly esteemed for the table, and it was under especial enactments for its preservation, and regarded as a “ Bird Royal” that no subject could possess without licence from the crown, the granting of which licence was accompanied by the condition that every bird in a “game” (to use the old legal term) of Swans should bear a distinguishing mark of ownership (cygninota) on the bill. Originally this privilege was conferred on the larger freeholders only, but it was gradually extended, so that in the reign of Eliz- abeth upwards of 900 distinct Swan-marks, being those of private persons or corporations, were recognized by the royal Swanherd, whose jurisdiction extended over the whole kingdom. It is impossible here to enter into further details on this subject, interesting as it is from various points of view.? It is enough to remark that all the legal protection afforded to the Swan points out that it was not indigenous to the British Islands, and indeed it is stated (though ou uncertain authority) to have been introduced to England in the reign of Richard Coeur de Lion ; but it is now so perfectly naturalized that birds having the full power of flight remain in the country. ‘There is no evidence to shew that its numbers are ever increased by immigration from abroad, though it is known to breed as a wild bird not further from our shores than the extreme south of Sweden and possibly in Denmark, whence it may be traced, but with considerable vacuities, in a south- easterly direction to the valley of the Danube and the western part of Central Asia. In Europe, however, no definite limits can be assigned for its natural range, since birds more or less reclaimed and at liberty consort with those that are truly wild, and either induce them to settle in localities beyond its boundary, or of themselves occupy such localities, so that no difference is observable between them and their untamed brethren. From its breeding- grounds, whether they be in Turkestan, in south-eastern Europe, or Scania, the Swan migrates southward towards winter, and at that season may be found in north-western India (though rarely), in Egypt, and on the shores of the Mediterranean.

The Swan just spoken of is by some naturalists named the Mute or Tame Swan, to distinguish it from one to be presently mentioned, but it is the Swan simply of the English languago and literature. Scientifically it is usually known as Cygnus olor or C. mansuetus. It needs little description: its large size, its spotless white plumage, its red bill, surmounted by a black knob (technically the “ berry ”) larger in the male than in the female, its black legs and stately appearance on tho water are familiar, either from figures innumer- able or from direct observation, to almost every one. When left to itself its nest is a large mass of aquatic plants, often piled to the height of a couple of feet and possibly some six feet in diameter. In the midst of this is a hollow which contains the eggs, generally from five to nine in number, of a greyish-olive colour. The period

1 Here, as in so many other cases, we have what may be called the “table-name” of an animal derived from the Norman-French, while that which it bore when alive was of Teutonic origin.

- At the present time the Queen and the Companies of Dyers and Vintners still maintain their Swans on the Thames, and a yearly expedition is made in the month of August to take up the young birds —thence called “Swan-upping ” and corruptly “Swan-hopping ” —- and mark them. The largest Swannery in England, indeed the only one worthy of the name, is that belonging to Lord Ilchester, on the water called the Fleet, lying inside the Chesil Bank on the coast of Dorset, where from 700 to double that number of birds may be kept—a stock doubtless too great for the area, but very sniall when compared with tho numbers that used to be retained on various rivers in the country. The Swanpit at Norwich seems to be the only place now existing for fattening the Cygnets for the table—an expensive process, but one fully appreciated by those who have tasted the Tesults. The English Swan-laws and regulations have been concisely but admirably treated by the late Serjeant Manning (Penny Cyclopedia, xxiii. pp. 271, 272), and the subject of Swan-marks, elucidated by unpublished materials in the British Museum and other libraries, is one of which a compendious account, from an antiquarian and historical point of view, would be very desirable.

of incubation is between five and six weeks, and the young when hatched are clothed in sooty-grey down, which is succeeded by feathers of dark sooty-brown. This suit is gradually replaced by white, but the young birds are more than a twelvemonth old before they lose all trace of colouring and becomo wholly white.

It was, however, noticed by Plot (NW. H. Staffordshire, p. 228) 200 years and more ago that certain Swans on the Trent had white Cygnets ; and it was subsequently observed of such birds that both parents and progeny had legs of a paler colour, while the young had not the “blue bill” of ordinary Swans at the same age that has in some parts of the country given them a name, besides offering a few other minor differences. These being examined by Yarrell led him to announce (Proc. Zool. Society, 1838, p. 19) the birds presenting them as forming a distinct species, C. immutabtlis, to which the English name of “ Polish” Swan had already been attached by the London poulterers.3 There is no question so far as to the facts; the doubt exists as to their bearing in regard to the validity of the so-called “ species.” Though apparently wild birds, answering fairly to the description, occasionally occur in hard winters in Britain and some parts of the European Continent,4 their mother country has not yet been ascertained,—for the epithet “Polish” is but fanciful,—and most of the information respecting them is derived only from reclaimed examples, which are by no means common. Those examined by Yarrell are said to have been distinctly smaller than common Swans, but those recognized of late years are as distinctly larger. The matter requires much more investigation, and it may be remarked that occasionally Swans, so far as is known of the ordinary stock, will produce one or more Cygnets differing from the rest of the brood exactly in the characters which have been assigned to the so-called Polish Swans as specific—namely, their white plumage slightly tinged with buff, their pale legs, and flesh-coloured bill. It may be that here we have a case of far greater interest than the mere question of specific distinction,® in some degree analogous, but yet in an opposite direction, to that of the so-called Pavo nigripennis before mentioned (PEACOCK, vol. xviii. p. 448).

Thus much having been said of tho bird which is nowadays commonly called Swan, and of its allied form, we must turn to other species, and first to one that anciently must have becn the exclusive bearer in England of the name. This is the Whooper, Whistling, or Wild Swan § of modern usage, the Cygnus musicus or C. ferus of most authors, which was doubtless always a winter- visitant to this country, and, though nearly as bulky and quite as. purely white in its adult plumage, is at once recognizable from the species which has been half domesticated by its wholly different but equally graceful carriage, and its bill—which is black at the tip and lemon-yellow for a great part of its base. This entirely distinct species is a native of Iceland, eastern Lapland, and northern Russia, whence it wanders southward in autumn, and the musical tones it utters (contrasting with the silence that has caused its relative to be often called the Mute Swan) have been celebrated from the time of Homer to our own. Otherwise in a general way there is little difference between the habits of the two, and very closely allied to the Whooper is a much smaller species, with very well marked characteristics, known as Bewick's Swan, C. bewicki. This was first indicated as a variety of the last by Pallas, but its specific validity is now fully established. Apart from: size, it may be externally distinguished from the Whooper by the bill having only a small patch of yellow, which inclines to an orange rather than a lemon tint; while internally the difference of the vocal organs is well marked, and its cry, though melodious enough, is unlike. It has a more easterly home in the north than the Whooper, but in winter not unfrequently occurs in Britain. —

Both the species last mentioned have their representatives in North America, and in each case the trans-Atlantic bird is cousid- erably larger than that of the Old World. The first is the Trumpeter-Swan, C. buccinator, which has the bill wholly black, and the second the C. columbianus or americanus'—greatly resem-

i i eS ee 8 M. Gerbe, in his edition of Degland's Ornithologie Européenne (ii. p. 477), makes the amusing mistake of attributing this name to the ''fourrewrs'' (furriers) of London, and of reading it '' Cygne du péle" (polar, and not Polish, Swan) !

4 Chiefly in the north-west, but Lord Lilford has recorded (Jbis, 1860, p. 351) his having met with them in Corfu and Hpirus.

5 The most recent authorities on the Polish Swan are Stevenson, in separately-printed advance sheets (1874) of his Birds of Norfolk (vol. iii.), and Southwell (Trans. Norf. & Norw. Nat. Society, i. pp. 258-260), as well, of course, as Dresser (B. Europe, vi. pp. 429-433, pl. 419, figs. 1, 2).

6 In some districts it is called by wild-fowlers ‘‘ Elk,” which perhaps may be cognate with the Icelandic Al/t and the Old German Elbs or Elps (cf. Gesner, Ornithologia, pp. 358, 359), though by mo- dern Germans Elb-schwan seems to be used for the preceding species,

7 Examples of both these species have been recorded as occurring in Britain, and there can be little doubt that the first has made its way hither. Concerning the second more precise details are required.

bling Bewick’s Swan, but with the coloured patches on the bill of less extent and deepening almost into scarlet. South America produces two very distinct birds commonly regarded as Swans,— the Black-necked Swan and that which is called Cascaroba or Coscaroba. This last, which inhabits the southern extremity of the continent to Chili and the Argentine territory, and visits the Falkland Islands, is the smallest species known,—pure white in colour except the tip of its primaries, but having a red bill and red feet.1 The former, C. melanocorypha or nigricollis, if not dis- covered by earlier navigators, was observed by Narbrough 2d August 1670 in the Strait of Magellan, as announced in 1694 in the first edition of his Voyage (p. 52). It was subsequently found on the Falkland Islands during the French settlement there in 1764-65, as stated by Pernetty (Voyage, ed. 2, ii. pp. 26, 99), and was first technically described in 1782 by Molina (Saggio sulla Stor. Nat. del Chile, pp. 234, 344). Its range seems to be much the same as that of the Cascaroba, except that it comes further to the northward, to the coast of southern Brazil on the east, and perhaps into Bolivia on the west. It is a very handsome bird, of large size, with a bright red nasal knob, a black neck, and the rest of its plumage pure white. It has been introduced into Europe, and breeds freely in confinement.

A greater interest than attaches to the South-American birds last mentioned is that which invests the Black Swan of Australia. Considered for so many centuries to be an impossibility, the knowledge of its existence seems to have impressed (more perhaps than anything else) the popular mind with the notion of the extreme divergence—not to say the contrariety—of the organic products of that country. By a singular stroke of fortune we are able to name the precise day on which this unexpected discovery was made. The Dutch navigator Willem de Vlaming, visiting the west coast of Zuidland (Southland), sent two of his boats on the 6th of January 1697 to explore an estuary he had found. There their crews saw at first two and then more Black Swans, of whicli they caught four, taking two of them alive to Batavia; and Valentyn, who several years later recounted this voyage, gives in his work? a plate representing the ship, boats, and birds, at the mouth of what is now known from this circumstance as Swan River, the most important stream of the thriving colony of West Australia, which has adopted this very bird as its armorial symbol. Valentyn, however, was not the first to publish this interesting discovery. News of it soon reached Amsterdam, and the burgo- master of that city, Witsen by name, himself a fellow of the Royal Society, lost no time in communicating the chief facts ascertained, and among them the finding of the Black Swans, to Martin Lister, by whom they were laid before that society in October 1698, and printed in its Philosophical Transactions (xx. p. 361). Subsequent voyagers, Cook and others, found that the range of the species extended over the greater part of Australia, in many districts of which it wasabundant. It has since rapidly decreased in numbers, and will most likely soon ccase to exist as a wild bird, but its singular and ornamental appearance will probably preserve it as a modified captive in most civilized countries, and perhaps even now there are more Black Swans in a reclaimed condition in other lands than are at large in their mother-country. The species scarcely needs description: the sooty black of its gencral plumage is relieved by the snowy white of its flight-feathers and its coral-like bill banded with ivory.

The Cygnine admittedly form a well-defined group of the Family Anatidz, and there is now no doubt as to its limits, except in the case of the Cascaroba above mentioned. This bird would seem to be, as is so often found in members of the South-American fauna, a more generalized form, presenting several characteristics of the Anatine, while the rest, even its

Black-necked compatriot and the almost wholly Black Swan of Australia, have a higher morphological rank. Excluding from consideration the little-known C. davidi, of the five or six? species of the

1 Dr Stejneger (Proc. U. S. Nat. Museum, 1882, pp. 177-179) has been at much pains to shew that this is no Swan at all, but merely a large Anatine form. Further research may prove that his views are well founded, and that this, with another very imperfectly known species, C. davidi, described by Swinhoe (Proc. Zool. Society, 1870, p. 480) from a single specimen in the Museum of Peking, should be removed from the Sub-Family Cygnine. Of C. coscoroba Mr Gibson remarks (Jbis, 1880, pp. 36, 37) that its "'note is a loud trumpet-call," and that it swims with ''the neck curved and the wings raised after the true Swan model."

2 Commonly quoted as Oud en Nieuw Oost Indien (Amsterdam, 1726). The incidents of the voyage are related in Deel iii. Hoofdst. iv. (which has for its title Description of Banda) pp. 68-71.

3 The C. wunwini doubtfully described by Mr Hume (Jbis, 1871, pp. 412, 413) from India, though recognized by Dr Stejneger (ué supra), seems to be only the immature of the Mute Swan,

Northern hemisphere four present the curious character, somewhat analogous to that found in certain CRANEs (vol. vi. p. 546), of the penetration of the sternum by the trachea nearly to the posterior end of the keel, whence it returns forward and upward again to revert and enter the lungs ; but in the two larger of these species, when adult, the loop of the trachea between the walls of the keel takes a vertical direction, while in the two smaller the bend jg horizontal, thus affording an easy mode of recognizing the respective species of each.4 Fossil remains of more than one species of Swan have been found. The most remark- able is C. falconert, which was nearly a third larger than the Mute Swan, and was described from a Maltese cave by Prof. Parker in the Zoological Transactions (vi. pp. 119- 124, pl. 30). (A. N.) SWANSEA, a municipal and parliamentary borough and large seaport of Glamorganshire, South Wales, is finely situated in an angle between lofty hills, on the river Tawe,

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Plan of Swansea.

near its mouth in the beautiful Swansea Bay, a recess of the Bristol Channel, and on the Great Western, London and North-Western, Midland, and Rhondda and Swansea Bay railway lines, 45 miles west-north-west of Cardiff. Being for the most part of comparatively modern growth, the streets are laid out with great regularity. Swan- sea retains few traces of antiquity, and some of its more picturesque features have been destroyed to make room for the construction of docks. Of the old castle,

4 The correct scientific nomenclature of the Swans is a matter that offers many difficulties, but they are of a kind far too technical to have any interest for the general reader. Dr Stejneger, in his learned “Outlines of a Monograph” of the group (ut supra), has employed much research on the subject, with the result (which can only be deemed unhappy) of upsetting nearly all other views hitherto existing, and propounding some which few ornithologists outside of his adopted country are likely to accept, since the principles on which he has gone are not those commonly received, nor (it may perhaps be added) are based on common sense. In the text, as above written, care has been taken to use names which will cause little if any misunderstand: ing, and this probably is all that can be said in the present state 0 confusion.

originally founded in 1099 by Henry Beauchamp, earl of Warwick, to secure possession of his lands in the province of Gower, the principal remains are the keep, built by Bishop Gower of St David’s after the castle had been for some time in ruins, a range of arched dungeons lit by loop-holes, and the hall, now fitted up for use as a volunteer drill hall. There are fragments of a wall with a Gothic window of the hospital of St David, founded by Bishop Gower in 1331. The church of St Mary’s, founded by the same bishop, was rebuilt in 1739, with the exception of the tower and chancel. The modern public buildings include the guildhall, in the Italian style with Corinthian pillars and pilasters, erected in 1846, and comprehending the municipal offices, the crown and nisi prius courts, the council chamber, and the library of the Swansea and Neath Incorporated Law Society ; the royal institution of South Wales, established 1835, a building in the Ionic style, and embracing a library, a lecture hall, and a museum of geology, mineralogy, natural history, and antiquities ; the free public library, schools of art, and art gallery, a fine new building with about 30,000 volumes (including the library of the Rev. Rowland Williams, one of the authors of Essays and Reviews) and a large number of beautiful engravings ; the grammar school, founded by Hugh Gore, bishop of Waterford, in 1682; the market (1830); the cattle market (1864) ; the Albert hall for concerts (1864), with a smaller hall erected in 1881; the agricultural hall ; the working men’s club (1875); the Prince of Wales hall | (1882); and

two theatres. The benevolent institutions include the general hospital, founded in 1817, and rebuilt with the addition of two wings in 1878; the Cambrian institution for the deaf and dumb, founded in 1847, and several times extended; the Swansea and South Wales institute for the blind (1865); the nursing institution (1853); the provident dispensary (1876) ; the eye hospital (1878); the industrial home (1859) ; and the sailors' home (1864). Swansea is specially well supplied with parks and recreation grounds. They include Brynmill grounds be- tween Parkwern and Singleton (1872), 9 acres in extent, and containing a beautiful reservoir and ornamental lawns ; Cwmdonkin park, on the uplands, 13 acres, and command- ing fine views ; the new recreation ground, formed in 1883, Il acres, situated between Brynmill and the Oystermouth road ; Park Llewelyn, to the north of Swansea, 40 acres ; and the St Helen's Field, near the beach, about 20 acres, now being laid out. The population of the municipal borough (area 4363 acres) in 1871 was 51,702, and in 1881 it was 65,597. The population of the parliamentary borough in 1881 was 73,971. Its area then was 4777 acres, but in 1885, when Swansea received independent representation, the area was diminished, the population of this smaller area being 50,043 in 1881.

Swansea owes its prosperity to its situation in the neighbourhood of extensive collieries and to its possession of great natural advant- ages asa harbour. With some exaggeration it has been called the "metallurgical centre of the world," but the title miust at least be allowed in reference to copper, which is imported to be smelted from all parts of the world. The smelting of copper, which has been carricd on in the district from the time of Elizabeth, is the distinctive and most important industry of the town, the others including tinplate manufacture, lead smelting, spelter and zinc mannfacture, the extraction and manufacture of silver, nickel, and cobalt, iron smelting, Siemens steel manufacture, the manufacture of chemicals, of agricultural manure, and of patent fuel, and the construction of railway carriages and waggons. In Swansea Bay there are valuable oyster fisheries. The earliest harbour works on a large scale were those of the South Dock Company, begun in 1847 and opened in 1859. This dock, which has an area of about 13 acres, with a half-tide basin of 4 acres and a lock 300 feet long by 60 feet wide, is used principally for the export of coal. The north dock, completed in 1882, has an area of about 104 acres, in addition to several other smaller docks. Au important addition Was made by the complction of

the Prince of Wales Dock in October 1881, with an area of 23 acres ; and as yet this additional accommo-

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dation is more than sufficient for the trade of the port. In 1876 the number of sailing and stcam vessels that entered with cargoes and in ballast from foreign countries, British possessions, and coastwise was 7799, of 1,068,062 tons ; the number that cleared being 7549, of 1,041,078 tons. In 1885 the entrances were 7447, of 1,461,248 tons, the clearances 7051, of 1,366,117 tons. The total average value of the imports of foreign and colonial produce during the five years ending 1885 was about £2,400,000, but has been decreasing ; and the total average value of the exports of the produce of the United Kingdom was about £1,500,000, but has been steadily in- creasing, and has reached over £2,000,000. There is a large trade with France, Portugal, Spain, and the Mediterranean ports. There is also considerable trade with South Africa, and the trade is greater with South than with North America. The exports consist chiefly of the various manufactures of the town, espeeially tin plates, the direct trade in which between Swansea and American ports has within the last two ycars attained great importance ; and the im- ports include chiefly metallic ores, timber, and various kind of pro- visions. Shipbuilding and ship-repairing are carried on, but the industry is of minor importance.

Swansea owes its origin to the erection of the castle in 1099 by Henry Beauchamp, earl 6f Warwick, who introduced into it a gar- rison of English and Flemish colonists. The fortress was frequently assaulted in the 12th and 13th centuries, and in 1260 was burned down by Llewelyn ab Grwfydd, last prince of North Wales. During the insurrection of Owen Glendower against Henry IV. it was again destroyed. Swansca was created a borough by a charter of King John, which is said to be preserved among the records of the Tower of London. The earliest charter in possession of the corporation is that granted by Henry III. in 1234, conferring upon it freedom from toll pontage and othercnstoms. Its privileges were confirmed by Edward II. and Edward III. The town was during the Civil War alternately in the hands of both parties, but in 1647 the castle was dismantled by the Parliamentarians,

after which Oliver Cromwell was made lord of Swansea, of the signiory of Gower, and of the manor of Kelvey. The corporation now consists of a mayor, 6 aldermen, and 18 councillors, and the borough has a commission of the peace. From the reign of Henry VIII. it contri- buted along with other boroughs to return a member to parliament. In 1658 it received a charter from Cromwell permitting it to return a member for itself, but after the Restoration it resumed its character as contributory. In 1832 it became the head of a new district of boroughs, and in 1885 it received separate representation, while a portion of its area was also included in a district of boroughs to which it gives the name. In the reign of Edward IV. the castle came by marriage to the Somerset family, and it is held by the duke of Beaufort, whose title of Baron Herbert of Gower dates from 1506.

SWARTZ, Otor (1760-1818), a celebrated Swedish botanist, was born in 1760, He commenced his botanical studies in Upsala, under Linneus and Thunberg, and began early to make excursions. He made a voyage to America in 1783, visited England in 1788, returned to Sweden in 1789, and was made professor of natural history in Stockholm. He was the author of many systematic works, and largely extended our knowledge of both flowering plants and cryptogams. He died in 1818.

See Sachs, Geschichte d. Botanik.

SWATOW (also, less frequently, Swartow and SHAN- Tow), a port of China, in the province of Kwang-tung, opened to foreign trade in 1869. It is situated at the mouth of the main branch of the river Han, which 30 miles inland flows past the great city of Chow-chu or Tai-chu (Tie-chu), and the surrounding country is more populous and full of towns and villages than any other part of the province. English merchants settled on Double Island in the river as early as 1856 ; but the city, which is built on ground but recently recovered from the sea, was formerly a mere fishing village. The trade of the port has rapidly increased. In 1869 718 vessels of all nations entered or cleared (of 310,500 tons burden), in 1884 1387 vessels (1,282,936 tons)—the total value of the trade being respectively £4,800,000 and £5,519,772. The surrounding country is a great sugar-cane district produc- ing annually about 2,000,000 piculs (= 1334 tb) of sugar, and there is an extensive refinery in the town employing upwards of 600 workmen

and possessing a reservoir for 7,000,000 gallons of water. Next in value comes the manu- facture of bean-cake, which is also imported in large quanti-

ties from New-chwang, Chefoo, Shanghai, Amoy, and Hong- Kong (total import in 1874, 1,408,384 piculs; in 1884, 2,539,710). Among the leading exports are tea (since about 1872); grass-cloth, manufactured at Swatow from so-called Taiwan hemp (the fibre of the Baehmeriu nivea from Formosa) ; pine-apple cloth, manufactured in the villages

about Kieh-Yang (a town 22 miles distant); oranges, for

which the district is famous ; cheap fans ; and pewter, iron, and tin wares. Swatow is also a great emigration port. In 1870 about 22,000 Chinese embarked there for Singa- pore, Bangkok, and Saigon ; and the number of emigrants has since increased so that British vessels alone carry 50,000 to 53,000 per annum. Of the whole foreign trade of the port upwards of 83 per cent. is in British bottoms, the trade with Hong-Kong being of especial importance. The population of Swatow is upwards of 30,000. In 1874 the foreign residents numbered 147 (63 British), in- cluding Double Island.

About 1865 the whole Swatow district was still divided into a number of ‘‘independent townships, eaeh ruled by its own head- men,” and the population was deseribed in the offieial gazetteer as ‘generally rebellious and wicked in the highest degree.” Mr Forrest, British eonsular agent, relates that in that year he was witness to the preparations for a fight between the people living on the opposite sides of the estuary, which was only prevented by an English war-vessel. The Taipings swept over the eountry, and by their ravages and plundering did mueh to tame the independence of the elans. The punishment inflicted in 1869 by Commander Jones on the inhabitants of Otingpui (Ou-ting-pei), about 8 miles from Swatow, for the attack they had made on the boats of H. M.S. ‘‘ Coekehafer,” showed the Chinese authorities that sueh piratieal villages were not so strong as had been supposed. General Fang (a native of Chow-chu-fu) was sent to reduce the district to order, and he earried out his instruetions with remorseless rigour.

SWEAT. See Nurririoy, vol. xvii. p. 685.

SWEATING-SICKNESS. A remarkable form of dis- ease, not known in England before, attracted attention at the very beginning of the reign of Henry VII. It was known indeed a few days after the landing of Henry at Milford Haven on August 7, 1485, as there is clear evidence of its being spoken of before the battle of Bos- worth on August 22. Soon after the arrival of Henry in London on August 28 it broke out in the capital, and caused great mortality. Two lord mayors successively and six aldermen, beside numerous other persons, died in ‘one week, At the end of October, however, the epidemic in London suddenly ceased. In Oxford it had already begun at the end of August, and lasted with great mortality for six weeks. In the course of the autumn it attacked various places, and by the end of December had spread over all England. Then the epidemic disappeared as suddenly as it came. This alarming malady soon became known as the sweating-sickness. It was regarded as being quite distinct from the plague, the pestilential fever, or other epidemics previously known, not only by the special symptom which gave it its name, but also by its extremely rapid and fatal course and by other characters to be noted presently.

From 1485 nothing more was heard of it till 1507, when the second outbreak occurred, which was much less fatal than the first (it is said because the treatment was better understood) and attracted less notice. In 1517 was a third and much more severe epidemic. It began in London in July, and lasted till the middle of December. Many distinguished persons died, including Lord Clinton, Lord Grey of Wilton, Andrea Ammonio, the king’s secre- tary, and others, with an immense number of the common people. In Oxford and Cambridge it was also very fatal, as well as in other towns, where in some cases half the population are said to have perished. There is evidence of the disease having spread to Calais and Antwerp, but with these exceptions it was confined to England.

In 1528 the disease recurred for the fourth time, and

with great severity. It first showed itself in London at the end of May, and speedily spread over the whole of Eng- land, though not into Scotland or

Ireland. In London the mortality was very great; the court was broken up, and Henry VIII. left London, frequently changing his residence. When the epidemic ceased cannot be accurately stated, nor have we any precise estimate of the mortality, The most remarkable fact about this epidemic is that for the first and last time it spread over the Continent. On the 25th July 1528 (English style) or 1529 (Roman style), when it was beginning to decline in London, it suddenly appeared at Hamburg. The story went that the infection was brought by a ship returning from England, the sailors of which were suffering from the disease. However this may have been, the disease spread rapidly, so that in a few weeks more than a thousand persons died. In less than a week it had spread to Liibeck, and thus was the terrible sweating-sickness started on a destructive course, during which it caused fearful mortality throughout eastern Europe. France, Italy, and the southern countries were spared. It spread much in the same way as cholera, pass- ing, in one direction, from north to south, arriving at Switzerland in December, in another northwards to Den- mark, Sweden, and Norway, also eastwards to Lithuania, Poland, and Russia, and westwards to Flanders and Holland, unless indeed the epidemic, which declared itself simultaneously at Antwerp and Amsterdam on the morning of September 27, came from England direct. In each place which it affected it prevailed for a short time only, —generally not more than a fortnight. . By the end of the year it had entirely disappeared, except in eastern Switzer- land, where it lingered into the next year ; and the terrible “English sweat” has never appeared again, at least in the same form, on the Continent.

England was, bowever, destined to suffer from one more outbreak of the disease, which occurred in 155], and with regard to this we have the great advantage of an account by an eye-witness, John Kaye or Caius, the eminent physician. It first appeared at Shrewsbury on April 13, and, after spreading to other towns in Wales and in the midland counties, broke out in London, causing in one week the death of seven hundred and sixty-one persons. At the end of July it ceased in London, but it went through the east of England to the north, until the end of August, when it began to diminish. At the end of September it ceased altogether, without affecting Scotland or Ireland. Nor did it apparently widely affect the Con- tinent, though Caius mentions its occurrence at Calais, and Brasavolus (De Morbo Gallico) speaks of tho English sweating-sickness as raging in Flanders in the year

15d], in which he wrote, causing the death of several thousand persons, and lasting at least till September.

Symptoms.—The symptoms as described by Caius and others were as follows. The disease began very suddenly with a sense of apprehension, followed by cold shivers (sometimes very violent), giddiness, headache, and severe pains in the neck, shoulders, and limbs, with great prostration,—in short, the usual symptoms of an acute febrile attack. In some cases the stomach was affected, and there was vomiting, but according to Caius this happened only m those who were full of food. The breathing was deep and frequent, the voiee like a moan. After the cold stage, which might last from half an hour to three hours, followed the stage of heat and sweating. The characteristic sweat broke out suddenly, and, as it seemed to those unaccustomed to the disease, without any obvious cause. In some cases it was much more copious than in' others, these differences depending, aceording to Caius, mainly on age, clothing, food, and other external circumstances, and also on the season, sweating being more profuse in hot weather, With the sweat, or after that was poured out, came a sense of heat, and with this headache and delirium, rapid pulse, and intense thirst. Palpitation and pain in the heart were frequent symptoms. Seinen Se Pea tp hae dear! Were eee

1 Guggenbiihl, Der englische Schweiss in der Schweiz, Lichten- steig, 1888.

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ewWwEHATING-SICKNESS

eruption of any kind on the skin was generally observed; Caius makes ne allusion to such a symptom. In the later stages there was either general prostration and collapse, or an irresistible tendency to sleep, which was thought to be fatal if the patient were permitted to give way to it. The malady was remarkably rapid in its course, being sometimes fatal even in two or three hours, aud some patients died in less than that time. More commonly it was protracted to a period of twelve to twenty-four hours, beyond which it rarcly lasted. Those who survived for twenty-four hours werc considered safe.

The disease, unlike the plague, was not especially fatal to the peer, but rather, as Caius affirms, attacked the richer sort and these who were free livers according to the custom of England in those days. “They which had this sweat sore with peril or death were cither men of wealth, ease, or welfare, or of the peorer sort, such as were idle persons, good ale drinkers, and taverne haunters.”

Relapses were not uncommon; but the statements sometimes made abeut the disease attacking the same person several times seem to rest on a misunderstanding of the original authorities. What is meant is that they had several, even twelve, successive attacks of sweating. The disease was not thonght to be transmitted by contagion from one persen to another. Nevertheless, in its spread, it appears, like cholera, to have followed the main lines of human travel. and_traffic,—passing with Richmond’s army to Bos- werth, thence to London, and soon. It would be difficult other- wise to explain why Calais should have been affected and not the adjacent parts of France. Even the very circumstantial story of the disease having been brought to Hamburg by a ship from England seems by no means incredible, though it is doubted by some.

Causes. —Some attributed the disease to the English climate, its moisture and its fogs, a view which was thought to be supported by the occurrence of unusual rainfall and atmosphcric moisture in the ycars of the sweating-sickness. But it is plain that the English climate was much the same before and after, and can hardly be regarded even as a predisposing cause, certainly not as an explana- tien, Nor is there much evidence that the epidemic years were distinguished for their humidity.

In 1485, 1507, and 1517 the seasons were in no way remarkable. The year 1528 (1529 in Continental reckoning) was, however, cer- tainly notable fer excessive moisture. In England cight weeks continuous rain began in April, and the harvest was spoiled. In

Germany the copious rainfall, and the cold fogs which endured

through the summer, gave the impression that the air of England had been carried over to the Continent. In 1551 the outbreak of the sickness in Shrewsbury is described as having been preceded by dense and stinking

fogs, which arosc from the valley of the Severn and spread over other parts of England. The summer was everywhere very hot, and in England moistas well. In Amsterdam a similar fog announced the outbreak of the sickness in 1528. But we cannot attribute much importance to these circumstances, since im other epidemics they were wanting, and similar conditions have eften occurred without any pestilence resulting.

It was again attributed by some to the intemperate habits of the English people, and to the frightful want of cleanliness in their houses and surroundings which is noticed by Erasmus in a well- knewn passage, and about which Caius is equally explicit. But causes such as these cannot, any more than climate, account for the incidence in time of an epidemic, even if they do something tewards explaining its geographical range. Nor is there much evidence that the English were worse in these respects than most European nations, though the native country of Erasmus may have set_an early example of cleanliness.

Caius and some of the chroniclers make out that this special liability of Englishmen to the sweating-sickness followed them even into foreign parts, so that in Calais, Brabant, and Spain it affected the English only and not the natives. This is puzzling and improbable, except so far that the English abroad may have belenged to the same classes who mainly suffered at home. “But a careful examination of those statements shows that they referred either to Englishmen who had left England while the disease was taging there and carried the infection with them, or to merchants and others who were in direct communication with home. This disease, like others introduced into a foreign country, did not always take root there. But it did se sometimes, as, according to contem- perary evidence, was the casc in Flanders in 1551. The statement also made that foreigners in England were not affectcd likewise Tequires qualification, since we know sevcral instances of forcigners in London who dicd of it. On the whole, no great importance can be attached to this supposed special liability of the English physical censtitution.

Frem all this we must conclude that elimate, season, and manner of life were not adequate, either separately or collcctively, to pro- duce the disease, though each may have acted. semetimes as a pre- dispesing cause. The

sweating-sickness was in fact, to use modern language, a specific infective disease, in the same sensc as plague, typhus, scarlatina, or ague. The origin of such diseascs is not

explained by causes such as those above enumerated. We can only suppose that they come into being by laws similar to those which have determined the evolution of species of animals and plants. But when once their specific distinctness is established they ‘‘ breed truc” and always present the same characters.-

Probable Identity with Miliary Fever.—The important questien, however, arises—Did this specific disease exist before or has it existed after the sixty-six years of its recognized history? or is it identical with any other known disease called by another name? It is very unlikely that any epidemic of so striking a disease should have existed before without having been noticed, and there is certainly no record since of any outbreak precisely similar. The only disease of modern times which bears any resemblance to the sweating-sickness is that known as miliary fever (‘‘ Schweiss- friesel,” ‘‘suette miliaire,” or “the Picardy sweat”), a malady which has been repeatedly observed in France, Italy, and Southern Germany, but not in the United Kingdom. It is characterized by intense sweating, and occurs in limited epidemics, not lasting in cach place morc than a week or two (at least in an intense form). On the other hand, the attack lasts longer than the sweating-sickness did, is always accompanied by an eruption of vesicles, and is not usually fatal. It is therefore evidently not the same as the English diseasc, though allied to it. The first clearly described epidemic was in 1718 (though probably it existed beforc), and the last in 1861. Between these dates some one hundred and seventy-five epidemics have becn countcd in France alone. A single epidemic of a disease which had a striking resemblance to the sweating- sickness was observed in 1802 at Rottingen, a village in the district of Wiirzburg, Germany. Its access was sudden; it affected chiefly robust persons; it was accompanied by profuse perspiration, rheumatic pains, &e., without any constant eruption. If death resulted it was usually in twenty-four hours. The epidemic lasted some ten days, and then entirely vanished. It may be

considered as an extremely severe form of miliary fever. Finally, Hirsch has drawn attentien to certain cases of a choleraic affection, observed first by Dr Murray in India (1839-40), which has been described as a sweating-sickness. It has, however, more resemblance to miliary fever than to the English sweat. A similar form of disease has been described by some French physicians as ‘‘choléra cutané ou sudoral.” On a review of the whole evidence, it would appcar that the only disease which the sweating-sickness much resembled was the miliary fever, of which it may conceivably have been, like the Rottingen epidemic, a highly malignant form.

Where did it Originate?—Whether it really originated in England is a question difficult toanswer. Its appearance certainly coincided with the arrival of a foreign army, consisting, as we know, largely of foreign mercenaries, men of foul habits and irregular lives (whom the French king was thought to have done his country a service hy getting rid of), and crowded into small vessels. Among such men any infective disease which arose would, by want of cleanliness and overcrowding, be likely to be fostered into great intensity. It is in accordance with the history of many epidemics to suppose that an ordinary and not very fatal disease might under such circumstances assume a malignant form.! Now, supposing that the French soldiers brought with them their native ‘“‘ Picardy sweat,” a malady local and not severe in its French home, might not this have become developed into the formidable English swcat- ing-sickness? If so, its great destructiveness in England would also be in great measure explained by its affecting a new popula- tion. For we find that any exported epidemic disease is generally more fatal in a country which receives it for the first time, among a population which offers a virgin soil to the disease, than it was in the country where it was endemic, and where men were inured to the infection. The notable excmption of northern France from the true sweating-sickness would then have depended upon the population there being already inured to a milder form of the same disease. As to southern France and other countries of the south, they were evidently not adapted by climate to receive the infection. If this be true, we need hardly expect to see the sweating-sickness again. The sweat of Picardy may continue from time to time to produce its comparatively slight epidemics; but the conditions which launched the English sweat on its rapid career of destruc- tion are unlikely to occur a second time. The example of the Rottingen epidemic,

which on a small scale was scarcely less re- markable, may show, however, that such an event is not quite impossible.

Authorities.—For history see Bacon's Life of Henry VIT., and the chronicles of Grafton, Holinshed, Bakcr, Fabyan, &ce. The only English medical account is that of John Caius, who wrote in English A Boke or Counseill Against the Disease commonly called the Sweate, or Sweating Sicknesse (London, 1552), and in Latin De Ephemera Britannica (Louvain, 1556; reprinted London, 1721). The English tract is reprinted in Babington's translation of Hecker's Epidemics of the Middle Ages, Syd. Soc., 1844. This also contains Hecker's valuable treatise on the English sweat, published in German, 1834, and also printed in his Volkskrank- heiten des Mittelalters, cdited by Hirsch, Berlin, 1865. Griiner's Scriptores de Sudore Anglico, Jena, 1847, contains nearly all the original documents, including

the two treatises of Caius. See also Hirsch, Handbook of Geographical and ITistorical Pathology, trans]. by Creighton, New Syd. Soc., 1885. GME. P:)

1 This Is the case even with the Oriental plague itself. See PLAGun.

For map

see vol. XVii, Plate XX.

Moun- tain and river systems.

SWEDEN

Part [.—GEroGRAPHY AND STATISTICS.

WEDEN comprises the eastern and southern divisions of the Scandinavian peninsula, Its northern ex- tremity, Kuokimodka, is situated in 69° 3' 21" and the southern in 55° 20' 18" N. lat. The western extremity (on the Cattegat) lies in 11° 6' 29" and the eastern (on the frontier of Finland) in 24° 10' E. long. 'The greatest length of the country from north to south is

986 miles and its greatest breadth 286 miles, and the area is 170,713 square miles. The length of the coast-line is 1603 miles, the length of the boundary line towards Norway 1019 miles, and that of the boundary line towards Finland 305 miles.

Sweden is divided into three chief parts,—the south- ern being called Gotaland, the middle part Svealand or Sweden proper, and the northern Norrland. The north and north-west parts of Norrland are called Lapland.

The frontier towards Norway, from 69° to 63° N. lat., is formed by a continuous mountain range called Kolen (the keel). The snow peaks of Sulitelma (6178 feet), east of Saltenfjord, on the frontier between Sweden and Norway, were long supposed to mark the highest elevation of this mountain chain, but the geodetical survey now in progress in western Lapland has already shown that there are at least two peaks whose height exceeds that of Sulitelma, viz., Kefnekaise (7008 feet) and Sarjektjikko (6988 feet).

In this mountain range (K6len), rise a great number of rivers and streams, which flow in a south-easterly direction to the Gulf of Bothnia. The immense quantity of fresh water that is thus carried into the gulf makes its water scarcely more salt than that of a lake (0°25 to 0°40 per cent. of salt). Between the upper courses of the rivers the watersheds consist of mountain ridges, which gradually diminish in height. The intermediate valleys are for the most part filled with the water of the rivers, and thus form a number of lakes at a considerable elevation above the sea-level. Issuing from these lakes, the rivers form great cataracts, and afterwards flow through the level plain that forms the coast-region of the Gulf of Bothnia fora distance of many miles from the shore.

The boundary between Sweden and Finland is formed by (1) Muonio Elf, and afterwards by (2) Tornea EI, into which it flows ; Tornea Elf rises in Torne& Trask, at an elevation of 1132 feet above the sea. Then come, in order along the coast, the following rivers:—(3) Kalix Elf, which in its upper course forms the lakes of Paitas Jaur and Kalas Jarvi;! (4) Stora Lulea& Elf (242 miles), which forms Stora Luleé Jaur (1214 feet) and receives on the right (5) Lilla Lule& Elf, which forms the lakes of Saggat Trask and Skalka Jaur (984 feet) ; (6) Pite& Elf, with the lake of Tjaggelvas

; (7) Skelleftea Elf, forming a number of great lakes, such as Hornafvan (1391 feet), Uddjaur (13875 feet), Storafvan (1371 feet); (8) Umea Elf (261 miles), with a great number of lakes, of which the largest is Stor-Uman, receives on the left a tributary of almost equal size, viz., (9) Vindel Elf; (10) Angerman Elf (211 miles), which receives the water of a whole system of streams and lakes, the largest of the latter being Stréms Vattudal, in the south of Lapland ; (11) Indals Elf, which receives the Ammera, with its tributaries and the numerous emissary lakes, as Hotagen (1017 feet), Kallsjon and Storsjon ("Storsa Lake " on the map) (958 feet, area 173 sq. miles). Close to the railway from Trondhjem to Ostersund, between

: The word for "lake," which is s/é or trask in Swedish, is jaur in Lapponian, and jarvi in Finnish, '* River" is e]f in Swedish.

Kallsjon and Storsjén, rises the peak of Areskutan (4652 feet), which is ascended every year by a great number of tourists, and in the vicinity many sanatoria are situated, Farther south flow three large rivers :—(12) Ljungan (193 miles), with Holmsjén (656 feet); (13) Ijusnan (249 miles); and (14) Dal Elf (286 miles), which passes through Sadrnasjén (1450 feet) and Siljan (541 feet, 110 sq. miles), and receives on the right (15) West Dal Elf. The last. named four rivers rise in a mountainous region with many high summits, which are the eastern outposts of the high range of Dovrefjeld, which traverses Norway from west to – east, between the parallels of 67° and 63° N. lat. Among these summits, situated on the frontier or in Sweden, are to be observed the Syltoppar (5865 feet), Son Fjell (4190 feet), Helags Fjell (5900 feet), and Stidjan (3860 feet) on the north shore of Sarnasjén.

In Norway, not far from the sources of Dal EIf, lies the lake of Famundsjé, which gives rise to (16) Klar Elf which flows southwards to Lake Vener, the largest lake in Sweden (144 feet, area 2150 square miles). The outlet of Vener is (17) Géta Elf, which falls into the Cattegat, near Gothenburg. The watershed between Dal Elf and Klar Elf is a wooded range of hills without high peaks, sloping to the south-east. The south-eastern part of Svealand comprises the water systems of the large lakes of Hjelmar (75 feet, area 185 square miles) and Malar (area 449 square miles). Lake Malar discharges into the Baltic at Stockholm by two outlets—(18) Norrstrém and Séder-str6m. They are, however, almost to be regarded as channels or sounds,

rather than as streams, the difference of level between Lake Malar and the Baltic being so small that occasionally, when the water is low in Malar and high in the Baltic, the current sets from the latter into the former. Lake Malar may thus be considered a fjord of the Baltic. Still its waters are kept fresh by the great number of small streams that discharge into it, the most important of these being (19) Fyris Elf, which passes Upsala.

The boundary between Svealand and Gétaland con- sists of wooded heights. Between Lake Vetter and the northern shore of Braviken Bay stretches the forest of Kolmorden, and between the northern extremity of Lake Vetter and Lake Vener lies that of Tiveden. Lake Vetter (290 feet, area 733 square miles) discharges itself into Braviken by (20) Motala Strém, the falls of which are utilized for the mills in the town of Norrképing, near the mouth of the river.

The central part of Gétaland consists of an extensive tableland or plateau, of which the highest part, at an elevation of 1237 feet, lies somewhat to the south of Vetter. On the north this plateau. descends rather ab- ruptly towards the fertile plains of Ostergétland (drained by Motala Strém) and Skaraborg lan, between Vetter and Vener. Near the south-eastern shore of Vetter, a little to the north of Jénképing, lies Mount Omberg (863 feet), and near the southern shore of Vener, close by Lidképing, lies Kinnekulle (915 feet), both hills re markable for their beauty. The great plateau descends less abruptly towards east, south, and west. A great number of lesser streams flow down its slopes. The prin- cipal are—(21) Emman, which falls into Calmar Sound; (22) Lyckeby&n, (23) Mérrums&n, and (24) Helgaan, which flow in a southerly direction ; and (25) Lagan, (26) Nissan, (27) Atran, and (28) Viskan, which fall into the Cattegat. On this great plateau and its slopes lie also many lakes. In the northern part, east of Vetter, lies Sommen (479 feet), and farther north Boren, Roxen, and Glan. Between

SW E

Vetter and Vener lies Unden (384 feet). On the summit of the plateau lies Ekelsjo (11832 feet), and on its southern slope Helgasjé (535 feet), Bolmen (466 feet), Méckeln (446 feet), and Asnen.

The southmost part of Sweden, Skane, consists for the | most part of a low fertile country. Only in the northern part, Christianstad lan, occur two low stretches of hills, | called Linderédsisen and Séderasen.

‘ Waterfalls—The largest waterfalls are—(1) Njuom- melsaska (Harspranget), in Stora Lule Elf, with a breadth of 60-70 feet, consisting of two cataracts of 103 feet at the upper end and a fall of 150 feet more in the course of 14 miles,—the largest waterfall in Europe ; (2) Adna- -Muorki-Kortje (“the great fall of the lake”), on the same | river as the former, higher up, between the two lakes | Jantajaur and Kaskajaur, has a fall of 130 feet, of which 100 feet are one perpendicular cataract ; (3) Tannforsen, 12 miles west of Areskutan in J emtland, between Tannsjin | and Noren, has a breadth of 160 and a perpendicular fall) of 84 feet ; (4) Trollhattan, in Géta Elf, consists of three successive falls having a total height of 100 feet. | It will be seen that, with the exception of the north- | west part along the Norwegian frontier, Sweden is not a mountainous country. On the other hand, fertile plains are not frequent. The most extensive are the north-west shore of the Gulf of Bothnia, where, however, the severe climate precludes any successful agriculture, the water districts of Lake Malar and Lake Hjelmar, the rich agri- } cultural district of Ostergétland between Vetter and the Baltic, Vestergétland, or the whole country between the two great lakes as far as Gothenburg, and, as has been just mentioned, the southmost part, or Skane, which comprises Christianstad and Malméhus lin. The greatest part of the country consists of low hills of granite or gneiss, clothed _with forests of pine and fir. The valleys are generally in great part filled with water, and the shores of their lakes or wide rivers are covered with forests of deciduous trees, chiefly birch, or consist of arable soil. With the exception of Finland there is no country so full of lakes as Sweden. Nearly one-twelfth of the whole surface of the country, or about 13,900 square miles, is covered with water.

Coast.—The coast of Sweden is not broken by so many or so deep fjords as that of Norway. The most considerable indentation is the above-mentioned Br&viken Bay. On the other hand, the Swedish coast is, perhaps in a. still greater degree than the Norwegian, fringed by innumer- able little islets. Except on the coast round Skane, in the south, the mainland does not come

into direct contact with the sea, girdled as it is by a belt of islands, holms, and skerries, more or less thickly set, which forms the

PHYSICAL FEATURES. |

ol |so-called “skirgird” fence of skerries or outer coast. SKar= 4

| Between this wall of islets and the mainland, therefore, extends a connected series of sounds of the greatest importance for coastal navigation, since they admit of ithe employment of vessels of less size and strength. ‘This skirgird forms, besides, a most valuable natural defence ; for, while some sounds are deep, navigation in the vicinity of the coasts is, as a rule, practically impos- sible without the help of pilots. _ The broadest part of this skdrgird is that off Stockholm,)which stretches many miles out into the Baltic. It con- ‘sists of a few large and well-peopled islands, surrounded | by many hundreds of islets, for the most part uninhabited. |The outer islands are bare grey rocks of gneiss, but the

“inner ones are mostly covered with fir and birch trees.

The entrance to Stockholm through this archipelago is of ‘its kind one of the most curious and picturesque in the World. The largest of these islands are Ljuster6, Vermdo, Tngaré, Vinds, Runmar6, Orné, and Uté (with rich iron Mines), As mentioned above, Lake Malar is to be con-

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sidered as a fjord of the Baltic. The skargard also extends into Malar, which is filled with islands. The most remarkable is Bjérk6, where the old town of Birka was situated. The archzological researches on this spot have been of the greatest importance for our knowledge of life in Sweden in the times of the vikings. The part of the skargird next in breadth is that off Carlskrona, where the islands of Sturké, Tjurké, Aspé, and Hasslé are situated.

The Cattegat skirgard, which extends from the fjord of Svinesund at the southern extremity of the Norwegian frontier as far as Halmstad, has a different aspect from that of the Baltic. In the Cattegat all the islands, as well as the rocks of the mainland, are almost bare of vegetation. Trees are

quite absent in most places, and generally the grey rocks are not even covered with grass or moss. They look as if they were polished by the sea. Between these bare rocks there is, however, in many places even on the larger islands arable soil of great fertility. In the northern part of the skirgard near Strémstad lie the larger islands of Sandé, Od6, Tjerns, Résé, &c. Farther seawards lie the Koster Islands and the Vader Islands with their lighthouses. A little more to the south, in the vicinity of Lysekil, are three narrow fjords—A byfjord, Gullmarfjord, and Koljefjord. Off the first-named lies Malmé,! remarkable for its quarry, wliere the fine granite of which the island consists is wrought. Next come, in succession, Korné, Skaftd, Flaté, Herman, and Lyré, the last two situated off the two largest islands on this coast, Oroust and Tjérn. All the islands now enumerated are surrounded by innumerable islets and rocks. South of Tjérn there are no considerable islands except Marstrand (with a small town and much-frequented sea-bathing quarters), Kod, and Klofveré, all situated immediately to the south of Tjérn. On the coast of Hal- land we find only Siré, off the fjord of Kungsbacka, and the Vaderé of Halland, off Torekow, between Laholm Bay and Skelder Bay, the only islands on the whole coast that are covered with a rich vegetation of trees. On the extreme point of the cape, between the latter fjord and the Sound, lies the isolated Mount Kullen with its light- house. In the Sound off Landskrona lies the islet of Hven, where Tycho Brahe had his observatory, Uranien- borg, in the end of the 16th century (1576-1597).

.. In the Baltic lie the two great islands of Gotland and Large

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Oland, of which the former is itself a county and a islands.

bishopric. These islands are quite different from the Swedish mainland. They are formed of Silurian limestone. On the western coast of Gotland the limestone rocks descend precipitously into the sea, and the island forms a comparatively smooth plateau, which slopes gradually to the east. The limestone soil is very fertile, and trees and plants thrive on it that do not otherwise grow in the climate of Sweden, such as walnuts, ivy, &c. The case is the same in Oland. This island somewhat resembles a house-top. A sterile limestone plain (Alvaren) stretches the whole length of the island

from north to south, and from this the country slopes both towards Calmar Sound on the west and téwards the Baltic on the east. The slopes, especially the western, are very fertile.

Sea-Led. —The seas that surround Sweden are remark- Depths

ably shallow. Round the south part of Norway runs Of sur-

a depression in the sea-bed, called the Norwegian Channel ‘°™=4ing

(see NorweEcIANn SrA). It stretches along the west and ~~” south coasts of Norway southward and eastward almost to Christiania Fjord and the Cattegat. The deepest part of this channel, upwards of 400 fathoms, extends through the Skagerack between Arendal in Norway and the Scaw. In the Cattegat the depth diminishes abruptly, and

1 Not to be confounded with the town of Malmé in Skane.

Climate.

Tempe- rature.

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between Gothenburg and the Scaw the greatest depth is between 33 and 55 fathoms. The greatest part of the southern half of the Cattegat has a depth of less than 30 fathoms. The depth of the Sound generally is even less than 12 fathoms, The whole southern part of the Baltic between Sweden and Germany is very shallow. West of Bornholm the depth nowhere reaches 30 fathoms. ast of Bornholm the sea is somewhat deeper, and a small area of a depth of 50 to 60 fathoms is found a little east of that island. The whole of that part of the Baltic which lies between Sweden and Russia is. divided into two separate basins by a submarine bank. From the southern extremity of Gotland (Hoburg) there extends a nearly uninterrupted bank to the south-west as far as the Prus- sian coast. The depth on this bank nowhere reaches 30 fathoms. The shallowest parts are Hoburg Bank south of Gotland, Mittel

Bank south-east of Oland, and Stolpe Bank off the Prussian coast. Between Faro off the north coast of Gotland and the Gottska Sandé there extends a similar bank, which continues with a somewhat greater depth of about 30 fathoms as far north as Stockholm. The deepest part of the Baltic between these banks is situated in the north part between Landsort and the Gottska Sandé, the maximum depth being about 160 fathoms. Alands Haf, the channel between the Swedish coast and the Aland Islands, is tolerably deep (100 to 160 fathoms).

~The Gulf of Bothnia is divided into two basins by the channel of Qvarken; the southern is the deeper (about 50 fathoms), and the depth increases towards the north- west, where, over a small area off the island of Ulf6 near the Swedish coast, it reaches 160 fathoms. The channel of Qvarken is very shallow (8 to 16 fathoms). The basin on the north side is also shallow. Only over a small area off Bjuré Cape does the depth exceed 160 fathoms.

Climate.—Sweden is situated between two countries of very dif- ferent climatological conditions. On the west there is the maritime climate of the Norwegian coast, and on the east the continental climate of Russia. It may be said that Sweden alternates between the two. Cold winters alternate with mild ones, and warm and dry summers with cool and rainy ones. But different parts of Sweden have also in this respect a greatly differing climate, of which we readily see the reason if we only recollect the character and the general features of the configuration of the country. Lapland and the western part of the country along the Norwegian frontier have a pronounced continental climate, and so has the high plateau to the south of Lake Vetter. On the other hand, the climate is more maritime the more we approach the coasts of the Baltic, and on the coast of the Cattegat and in Skane the maritime climate distinctly predominates.

The following table gives the mean annual temperatures (Fahr.)

at twenty-eight meteorological stations in Sweden, together with the means for January and July:—

Station. Annual. | Jan. | July. Station. Annual. | Jan. | July o 2 e es o ° e

MEG. secaeeessten 44°9 S153.) GIT || Orebro…5,...<.| ALG 25°8 | 62°6 Carlshamn….| 44°4 81°1 | 61:7 || Stockholm….. 41-4 26°1 | 61:4 Calmar'.....2.. 44°2 30°2 | 62-1 || Carlstad 41°6 24-9 | 62-9 Halmstad…....) 44°8 30°5 | 62°7 || Vesteras. 410 24:7 | 62°6 Vexid 42°3 2775 | G12 40°4 24°5 | 61°5 Visby 43°4 30°7 | 60°3 38°7 20°8 | 61°2 Gothenburg…| 44°4 29°8 | 62:1 }) 40:0 24°5 | 61:0 Vestervik …...,} 42°8 28°1 | 61:4 371 20°0 | 58-9 Jénkbping ….| 42°7 28°6 | 61:0 35°0 15°3 | 56-4 Venersborg….| 42'3 27°5 | 611 34°4 15°8 | 58°8 PKS, 2.000002 41°5 26°0 | 60:3 31°7 9:5 | 57-7 Linkoping…...| 48°4 27°8 | 63°9 33°8 11:2 | 60°6 Nyk6ping …... 43°5 26°6 | 61:4 || Haparanda….; 31°9 10°1 | 594 Askersund …,| 41°0 25°1 | 61:2 || Jockmock….. 29°1 31 | 58:0

From these figures it appears that, as mentioned above, the climate is most continental in the northern and interior parts of the country, especially at the two stations of Lapland, Stenselo and Jockmock, while it is more maritime on the coasts. For this reason the isotherms for January on the Scandinavian peninsula are linguiform. The warm sea off Norway causes the peculiarity that the western parts of Lapland, although situated at the greatest elevation above the sea, have not so cold winters as the interior parts round the great lakes. Still farther to the east the temper- ature increases again towards the coast of the Gulf of Bothnia.

SWEDEN

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Thus, for example, the isotherm of 10° F. enters Lapland from the north-east atabout 68° N. lat., runs towards the south-west over the great lakes as far as about 644°, south of Lake Stor-Uman, makes there an abrupt bend towards the cast, and runs in a north-easter] direction to Haparanda at the northern extremity of the Gulf of Bothnia. The isotherm of 23°F. runs from the grcat lake of Mjésen in Norway, north of Christiania, to the southern shore of Lake Siljan, or almost straight east, curves there to the north-east, and reaches the shore of the Gulf of Bothnia alittle north of the mouth of Ljusnan. Finally, the isotherm of ,30° runs from Gothenbur, towards the south-east to the lake of Asnen, curves towards the north-east, and passes Calmar and the northern parts of the islands Oland and Gotland. On the summit. of tho plateau south of Vetter the mean temperature is of course

lower than both north and south of the plateau. In July the temperature is almost constant all over the country. With the exception of the interior of Lapland the mean temperature varies generally between 59° and 62°. The warmest point is Linköping on the plain of Ostergétland, between Lake Vetter and the Baltic. The most temperate and most agree- able climate of the whole country is that of the Cattegat coast round Halmstad.

A good indication of the climate, especially that of the winter, is Equi- the time during which the freshwater lakes remain frozen. We glacial haveseen thatnearly lines. one-twelfth of the whole surface off Sweden is covered with water, and in Finland the number of the lakes is still greater. In both countries the times of freezing and breaking up of a great many lakes have been observed for many years, From these data we} can calculate the length of the ice periods. If these} » periods are entered }.\\“ on a diagram, we] can draw out the lines of equal ice periods, or the equi- glacial lines. The accompanying map shows these lines }, for Sweden and Fin- land. From it we see that the glacial period in the south- ern part of the country is 90 days, while in the north- ern part of Lapland it has a duration of no less than 230 of the 365 days of the year. The western lakes of Lapland, though the higher : in situation, have a : ‘ ecehek Bhorkes Map of Equal Ice wits ice period than the eastern. The ice period is considerably length- ened on the great plateau south of Lake Vetter. ais |

We have said above that in certain years the climate of Sweden Vari “t is more maritime, in others more continental. Thus, for instance, tions 0! the annual mean temperature of Upsala has varied during the temper — last 30 years between 43°°2 (1859) and 35°°0 (1867). The meant ture temperature of particular months varies of course in a still higher

degree, especially during the winter; thus the mean temperature of January 1873 was 34°°3, but of January 1875 only 12°°2.

The difference between the means of the warmest month and the coldest is the so-called yearly range of temperature. In Sweden July is generally the warmest and February the coldest month. The difference between the January and July temperatures, how- ever, as given in the foregoing table, will show the yearly ee approximately. It will be seen that this increases

towards he north. For the same latitude, it is greater in the interior of the country than on the coasts. F

As is easily understood, the periodic daily range of temperatur is least during the darkest part of the year, during aye pea January, especially in the north part of the country roum The polar line, and still farther north, where it is almost nil. The mean range for the whole country is in December only 2.

‘ Sweden.

_ 8306, and in September 1461.

CLIMATE AND GEOLOGY. |

maximum occurs in June or July at all stations except those of western Sweden, where it occurs as early as May. The mean of June is 13°.

The uon-periodic daily range of temperature, or the difference between the monthly means of daily maximum and minimum of temperature, is as usual considerably greater than the periodic. The difference is almost constant for all stations, especially during the warmer part of the year. We have, for the whole country—

Non-periodic. Periodic. Difference. 3°°0 7°°0 Ta 2) 4°°8 13°°0 671 os 5°°4

The mean direction of the winds shows little variation during different seasons. During the summer it is west or west-south- west in the south of Sweden, changes to south-west in the middle part of the country, and due south along the coast of the Gulf of Bothnia. In winter north-north-east winds become comparatively frequent in the north part of the country. This is explained by the difference in barometric pressure in summer and in winter. In July the mean height of the barometer indicates a gradual fall along the coast of the Baltic, from 29-828 inches in Calmar to 29°675 in Haparanda. In January, on the other hand, there is a gradual fall from 29°853 in Calmar to 29°718 in Herndésand, but thereafter a gradual rise to 29°834 in Haparanda. Unfortunately the isobarometric lines for Sweden have not yet been calculated with duc precision.

The rainfall is greatest on the coast of the Cattegat. The annual amount is greatest at Gothenburg, where it is 32°56 inches. At Halmstad it is 28°26, and at Venersborg, where Gota Elf issues from Lake Vener, it is 80°33. These are the rainiest stations of Generally speaking, the amount of rain diminishes afterwards as well towards north and north-west as towards south- east. The least rain falls on the one hand in northern Lapland, where the annual amount is only 15°52 inches, and on the other hand in the south-eastern corner of Sweden, where (at Calmar) we have the lowest known rainfall for the whole country (12°75 inches). Between these two tracts there runs a belt of greater pre- cipitation from Gothenburg towards the north-east to Upsala, where the annual amount is 23°28. Even along this belt the amount of

_ Tainfall diminishes towards the north-cast, but at every point the amount is greater than to the north-west and south-east of it.

The greatest amount of rain falls in July and August and the least in February and March. Thus, for instance, there fall in Upsala during August 2°86 inches and during March 0°99 inches. As the temperature varies, so does the rainfall for different years.

tr- The number of thunderstorms is small in Sweden compared m with the countries of the south. Their number diminishes as |

does the precipitation from south-west towards north and east. From 1871 to 1880 the mean annual number of thunderstorms at each station was 9°5 in Gotaland, 8°4 in Svealand, and only 6°3 in Norrland. In the south their number diminishes rapidly from west to east, from 11 on the coast of the Cattegat to 8°3 on the coast of the Baltic, and only 6°6 on the isle of Gotland. The thunderstorms have a distinctly marked annual and daily period. They occur almost always during the warmest time of the year and of the day. During the above-mentioned ten years the least number occurred during the month of February, only 3, whereas there occurred in May 1194, in June 3724, in July 4419, in August As regards the daily period, the least number, 147, occurred between 1 and 2 A.M., and the greatest, 1704, between 3and 4p.m. In Gotaland and Svealand most of the thunderstorms come with a south-westerly wind, in Norrland with a southerly ; for the whole country, the least number come with a northerly wind.

If the number of thunderstorms is small in Sweden, the same is ina still higher degree to be said of their intensity. Hail, which on the Continent causes such immense damage to the growing crops, is rare in Sweden, and often quite harmless. In the south of Germany about 2 per cent. of the crops are annually destroyed by hail. At Magdeburg the damage is 0°9 per cent., at Berlin 0°6 to 0°7 per cent., but in Swoden only 0°06 per cent. (H. H. H.)

Geology.—The fundamental rocks of Sweden belong to the Azoic or Pre-Cambrian formation, and consist of crystalline rocks. Three great divisions of this formation may be distinguished, —the grey gneiss, the red iron gneiss, and the granulite.

The grey gneiss rules in the northern and western parts of the country, from West Norrland down to the province of Calmar. The rock has a prevalent grey colour, and contains as characteristic Minerals garnet and in some parts graphite. ’ ;

The red iron gneiss prevails in western Sweden in the provinces of Vermland, Skaraborg, Elfsborg, and down to the province of

Christianstad. The formation is very uniform in its character, the gneiss having a red colour and containing small granules of magnetite, but, neverthcless, not a single iron-mine belongs to this region. The red gneiss contains in many places beds or masses of hyperite.

The granulite, also called eurite and hilleflinta, is the most important of the Pre-Cambrian formation, as it contains all the metalliferous deposits of Sweden. It prevails in the middle part of the country, in the provinces of Vermland, Kopparberg, Vestmanland, and Upsala. It occurs also in some parts of the pro- vinces of Ostergotland, Calmar, and Kronoberg. The main rock in this region consists of hilleflinta, a kind of very compact and fine-grained mixture of feldspar, quartz, and mica, often graduating to mica schists, quartzite, and gneiss. With these rocks are often associated limestones, dolomites, and marbles containing serpentine (Kolmarden). The

metalliferous deposits have generally the form of beds or layers between the strata of granulite aud limestones. They are often highly contorted and dislocated.

The iron-mines occur imbedded in more or less fine-grained gneiss or granulite (Gellivaara, Grangesberg, Norberg, Striberg), or separated from the granulite by masses of augitic and amphibolous minerals (grénskarn), as in Persberg and Nordmark. Sometimes they are surrounded by hilleflinta and limestone, as at Dannemora, Laugban, Pajsberg, and then carry manganiferous minerals. Argentiferous galena occurs at Sala in limestone, surrounded by granulite, and at Guldsmedshytta (province of Orebro) in dark hilleflinta. Copper pyrites occurs at Falun in mica-schists, surrounded by halleflinta. Zine blende occurs in large masses at Ammeberg, near the northern end of Lake Vetter. The cobalt ore consists of cobalt-glance (Tunaberg in the province of Sodcrmanland) and of linneite (at Gladhammar, near Vestervik). The nickel ore of Sweden is magnetic pyrites, containing only a very small percentage of nickel. The magnetic pyrites occurs generally imbedded in diorite and greenstoues. In the evidently most recent division of the granulite occurs clay-slate (at Grythytta in the province of Orebro).

Large masses of granite are found in many parts of Sweden, and form extensive massiffs as in the provinces of Kronoberg, Orebro, Goteborg, Stockholm, &c. Sometimes the granite gradu- ates into gneiss ; sometimes (as north of Stockholm) it encloses large angular pieces of gneiss. In many parts of Sweden occur greenstones, as hyperite, gabbro (anorthite-gabbro at Radmanso in the province of Stockholm), and diorite, the last often forming beds between the strata of the gnciss.

The Cambrian formation occurs generally associated with the Lower Silurian, and consists of many divisions. The oldest is a sandstone, in which are found traces of worms, impressions of Medusz, and shells of Lingula. The upper divisions consist of bituminous limestones, clay-slates, alum-slate, and contain numer- ous species of trilobites of the genera Paradoxides, Conocoryphe, Agnostus, Sphxrophthalmus, Peltura, &c. In Oland and north of Siljan are found beds with Odolus.

The Lower Silurian consists of the following divisions :—(1) beds with Ceratopyge ; (2) schists with Graptolites ; (3) large beds of red and grey limestone (200 feet in thickness) containing Megalaspis and Orthoceratites. This limestone is largely used as building material ; (4) slates with Trinucleus ; (5) slates with Brachiopods ; (6) slates with Graptolites. The Cambrian and Lower Silurian strata occur scattered in several places from Vesterbotten down to Jemtland (around Storsjén), and in the provinces of Skaraborg, Elfsborg, Orebro, Ostergotland, and Christianstad. The whole of the island of Oland consists of these strata. The strata are in most places very little disturbed, and form horizontal or slightly inclined layers. They are, south of Lake Vener, capped by thick beds of eruptive diabase (called ¢rapp). North of Lake Siljan (province of Kopparberg) occur Lower Silurian but not Cambrian strata, which have been very much dislocated. The Upper Silurian has in Sweden almost the same character as the Wenlock and Ludlow formation of England. The island of Gotland consists entirely of this formation, which occurs also in some parts of the province of Christianstad. In the western part of the province of Kopparberg are extensive deposits of sandstone, separated by beds of diabase, and seemingly of the same age,—the Middle Silurian,—but no fossils have been found in them. In the vicinity of this sandstone region are large beds and massiffs of porphyries. There are still two sets of stratified, not fossiliferous, deposits, viz., in the province of Elfsborg (formation of Dalsland) and around Lake Vetter (formation of Visingsd). The Dalsland formation, which attains the thickness of 6000 to 7000 feet, consists of conglomerates, chlorite schists, quartzites, and mica schists. The Visingsé formation, 800 to 1000 feet in thickness, consists of sand- stones, clay-slatc, &c. In the western and northern alpine part of Sweden, near the boundaries of Norway, the Silurian strata are covered by crystalline rocks, mica schists, quartzites, &c., of an enormous, thickness. These rocks form the mass of the high mountain of Areskutan, &c.

The Triassic formation (Rhetic division) occurs in the northern

part of the province of Malméhus. This formation consists partly of sandstones with impressious of plants (cycads, ferns, &c.), and partly of

clay-beds with coal.

The Cretaceous formation occurs in the provinces of Malmoéhus and Christianstad. Also some spots of this formation are found in the province of Blekinge. The Cretaceous beds of Sweden belong to the most recent division of the Cretaceous formation (chalk and dan- ien). In many parts it has all the characteristics of a coast-deposit.

The most recent deposits of Sweden date from the Glacial and Post-Glacial periods. At the beginning of the Glacial period the height of Scandinavia above the level of the sea was greater than at present, Sweden being then connected with Denmark and Germany and also across the middle of the Baltic with Russia. On tlie west the North Sea and Cattegat were also dry land. On the elevated parts of this large continent glaciers were formed, which, proceeding downwards to the lower levels, gave origin to large streams and rivers, the abundant deposits of which formed the diluvial sand and the diluvial clay. In most parts of Sweden these deposits were swept away when the ice advanced, but in SkAne they often form still, as in northern Germany, very thick beds. At its maxi- mum the inland ice not only covered Scandinavia but also passed over the present boundaries of Russia and Germany. When the climate became less severe the ice slowly receded, leaving its mor- aines, called in Sweden krosstenslera and krosstensgrus. Swedish geologists distinguish between bottengrus (bottom-gravel, bottom moraine) and ordinary krossgrus (terminal and side moraine). The former geuerally consists of a hard and compact mass of rounded, scratched, and sometimes polished stones firmly imbedded in a powder of crushed rock. The latter is less compact and con- tains angular boulders, often of a considerable size, but no powder. Of later origin than the krosstensgrus is the rudlstensgrus (gravel of rolled stones), which often forms narrow ranges of hills, many miles in length, called dsar, running generally, independent of the relief of the country, in a north-and-south direction or towards the south-east. They are of the same uature as the kames and eskers in Ireland and Scotland, and consist of rolled pebbles and sand. It is very probable that these asar were formed on the bottoms of rivers which cut their way in the inland ice. During the disap- pearance of the great inland icc large masses of mud and sand were carried by the rivers and deposited in the sea. These deposits, known as glacial sand and glacial

clay, cover most parts of Sweden south of the provinces of Kopparberg and Vermland, the more ele- vated portions of the provinces of Elfsborg and Kronoberg excepted. In the glacial clay shells of Yoldia arctica have been met with in many places (¢.g., near Stockholm). At this epoch the North Sea and the Baltic were connected along the line of Vener, Vetter, Hjelmar, and Malar. On the other side the White Sea was con- nected by Lakes Onega and Ladoga with the Gulf of Finland and the Baltic. In the depths of the Baltic and of Lakes Vener and Vetter there actually exist animals which belong to the arctic fauna and are remnants of the ancient ice-sea. The glacial clay consists generally of their darker and lighter coloured layers, which give it a striped appearance, for which reason it has often been called hvarfuig lera (striped clay). The glacial clay of the Silurian regions is generally rich in lime and is thus a marl of great fertility. The deposits of glacial sand and clay are found in the southern part of Sweden at a height ranging from 70 to 150 feet above the level of the sea, but in the interior of the country at a height of 400 feet above the sea.

On the eoasts of the ancient ice-sea, in which the glacial clay was deposited, there were heaped up masses of shells which belong to species still extant around Spitzbergen and Greenland. Most renowned among these shell-deposits are the Kapellbackarne near Uddevalla. With the melting of the great ice-sheet the climate became milder, and the southern part of Sweden was covered with shrubs and plants now found only in the northern and alpine parts of the country (Salix polaris, Dryas octopetala, Betula nana, &c.). The sea fauna also gradually changed, the arctic species migrating northward and being succeeded by the species existing on the coasts of Sweden. The Post-Glacial period now began. Sands (mosand) and clays (ékerlera and fucuslera) continued to be deposited on the lower parts of the country. They are generally of insignificant thickness. In the shallow lakes and enclosed bays of the sea there began to be formed and still is in course of formation a deposit known by the name gyttja, characterized by the diatomaceous shells it contains. Sometimes the gyttja consists mainly of diatoms, and is then called bergmjél. The gyttja of the lakes is generally covered over by peat of a later date. In many of the lakes of Sweden there is still in progress the formation of an iron-ore, called sjémalm, ferric hydroxide, deposited in forms resembling peas, coins, &c., and used for the manufacture of iron.! @: ECS) ne Se UL

1 The geology of Sweden has been worked out principally by Hisinger, Forselles, Erdmann, Térnebohm, and others. A systematic geological survey of Sweden was set on foot by the Government in 1858. The geology of the fossiliferous strata of Sweden has been elaborated chiefly by Nilsson, Angelin, Linnarsson, Lind-

strém, Nathorst, and others, and that of the Glacial and Post-Glacial periods by Sefstrém, Von Post, Torell, and others.

SWEDEN

Flora.—Of the whole area of Sweden about 132,000 square miles Flor,

[PHYSICAL FEATURKS,

are covered with wild vegetation. This may be broadly divided into five different sorts, viz., the forest, bush, marsh, heath, and prairie vegetations, of which the first-mentioned covers by far the largest area, or upwards of 40 per cent. of the whole surface of Sweden. In the northern part of the country the fir (Pinus sylvestris) and the pine (Pinus Abies) are the predominating trees; south of Dal Elf the oak (Quereus peduneulata), and in the southern and south-western provinces the beech (Fagus sylvatica) are, together with the fir and pine, the forest-forming trees, Besides these, there are two species of birch (Betula verrucosa and B. odorata), which form considerable forests. The bush vegetation derives its character from various species of Salix, Rubus, and Liosa, from Prunus spinosa and several other species. The marsh vegetation is composed of some low bushes, of Cyperaces, Graminez, and a small number of dicotyledonous and large-flowered monocotyledonous plants. The heath vegetation consists princi- pally of social Hricacex, especially heather (Calluna vulgaris), and the prairie vegetation of a considerable variety of plants.

The Swedish phanerogamic flora is angiospermous, with about thrice as many dicotyledonous as monocotyledonous plants. The gymnosperms are only about 0°25 per cent. of the species of the flora. Its largest families are (in the order of number of species) —Composite, Graminew, Cyperacex, Cructferex, Paptlionacesr, Ttosaceze, Personate#, Ranuneulaeew, Umbellifere, Alsinaces, Labiate, and Orchidex, the first-named being

represented by 160, the last-named by 38 species. The number of families repre- sented amounts to 99. The largest genus of the flora is Carez, with 88 species. More than 250 genera are represented by only one species each. The whole number of phanerogamic species now known in Sweden is 1475. Of thesc oulya very small number can be supposed to have originated in the country; the greatest number have immigrated from the south or east after the Glacial period, or have been introduced in one way or another by man. Among the immigrated species about 400 are more or less generally spread over the polar countries of the present period, or are to be found in southern countries as alpine plants. The great mass of these Glacial plants, the earliest inhabitants of the country, are confined to the northern part of Sweden ; a smaller number are also to be found, or are only to be found, in the south and in particular localities; a larger number—about 70 species—are abundantly distributed over the whole country.

The Glacial plants were followed and superseded partly by sub- arctic or subglacial species. Of these the Swedish flora has about 300, of which 50 are abundantly spread over the country, and 80 are pretty generally and abundantly distributed. The principal mass of the remaining species of the flora have immigrated in the same period as the oak, and have spread over the country south of Dal Elf, or also to the provinces immediately to the north of this river ; some are outlying steppe-plants ; some have entered with the beech, the last immigrated forest-tree of Sweden; and a small number of species, now limited to the west of the country, have possibly entered during a period before that of the beech, when the climate was warmer and moister than at present. (F. K.)

Fauna.—After the close of the Glacial period a twofold immigra- Fauna

tion of animals occurred,—from the south-west through Denmark, and from the north-east through Finland. Of the existing fauna, many species are widely spread. Especially in the north we find boreal circumpolar forms (wild reindeer, glutton, arctic fox, ptarimigan, several birds of prey, Grallz, and aquatie birds). Others, such as the bear, the wolf, the fox, the magpie, &c., are to be found only in the Old World, but are represented in America by forms resembling them so much as to be regarded by many as only local varieties. Many of the commonest species, ¢.g., the squirrel, the

woodpeckers, the crow, most of the singing-birds, &c., though wanting in the New World, are distributed over Europe and parts of northern Asia. ;

Besides thesc we find also specially eastern, southern, and western forms, which have immigrated from widely separated regions, Thus, the northern hare, Lepus timidus, properly an inhabitant of Russia and Siberia, but also to be found in the mountainous tracts of central Europe, is common in most parts of Sweden, while the European hare, Lepus ewropxus, which is spread over central and western Europe, and is also to be found in Denmark, is wanting. Most of the field-mice, and many birds which have an exclusively eastern range, have immigrated from Siberia. Among mamuinals, which nearly all belong to Europe, may be mentioned the roe-deer and the red-deer, the dormouse and the hedgehog; the last-named is common iu central and southern Sweden. The elk is considered to have immigrated from the south.

Not very long ago the bear, lynx, and wolf were common in all the forests of northern and central Sweden, but their number has rapidly decreased during the last fifty years. The bear is now confined to the wildest mountain and forest regions of Norrland aud Kopparberg lin. The wolf was formerly common throughout the country, and between 500 and 600 were killed annually fifty

years ago. Now the number is only 30 to 40, and it is to be found almost exclusively in the mountain regions of Norrland. The lynx is also being exterminated; it is still found in the greater part of northern and central Sweden, at least as far south as Lake Vener. Ou the other hand, foxes have of late increased, at least in certain parts of the country, and are common everywhcre. The glutton also is by no means rare in the mountain regions of Lapland. The destruction of cattle caused by beasts of prey, espceially in the north, is not inconsiderable, the loss being estimated at about 2500 reindcer and from 9000 to 10,000 sheep and goats annually.

Not without influence on the number of the smaller beasts of prey are the singular migrations of the mountain LemMine (q.v.), which has its home on the higher mountains above the tree- limit, whenee in certain years it migrates in countless numbers to the lower forest regions and lowlands, doing great damage to the vegetation wherever it goes. After the last migration in 1883 the number of the foxes was found to have increased in the regions through which the lemmings had passed.

Of eatable game the clk holds the first place. It has increased in numbers and range of late years, and is pretty common in the forest tracts of central Sweden. The roe-deer, which has its proper hoine in the southmost parts of Sweden, has also increased of late, and has been seen as far north as Orebro lin and Vestmanland. Hares occur in great abundance. Seals are found round the coast; they are hunted chiefly in the Baltic and the Gulf of Bothnia. Besides the larger beasts of prey, martens, weasels, otters, and squirrels are hunted for the sake of their skins, but not to any great extent. The beaver is now probably extinct. Some of the mammals (the bat, hedgehog, dormouse, badger, bear) hibernate ; most of the other animals are in winter covered with a thicker coat of hair, and some change their colour to white or grey.

The wood-grouse is the most valued winged game. Its favourite haunt is the great lone forests. Although it has been obliged to retreat before advancing cultivation, it is still pretty common in suitable places. More numerous and almost as much liked is the black grouse, which has somewhat the same distribution as the wood-grousc, but is less particular in the choice of its abode. In the forests of central and especially of northern Sweden the hazel-grouse is numerous in many places, and on the mountains above the tree-limit the ptarmigan is common everywhere. In the birch and willow regions we find the willow-ptarmigan, which above the snow-line is superseded by the common ptarmigan. In winter a great deal of game is exported from Norrland to the southern provinces. The partridge, probably introduced about 1500, with difficulty endures the rude climate of Sweden, and great numbers often perish in winter for want of food. Still it is distributed all over southern and central Sweden as far north as Jemtland, and of late its numbers have increased. The number of woodcock and snipe is, like that of Grallw in general, decreasing. Numerous sea-fowl are found on all the coasts. Some are killed and eaten, but as a rule they are not much relished.

Their eggs are collected for food by the inhabitants of the seaboard. The eider-duck is common on both coasts. Among the birds of prey the hawk is the most destructive and the most hunted. The gyrfalcon and the golden eagle are found in Norrland and Lapland, and the sea-eagle throughout the country, especially on the coasts. Some kinds of falcons and owls are very common, the latter especially in north- ern Sweden. In the interior the most characteristic birds are swallows, sparrows, the birds of the crow family, and the singing- birds, among which the lark, the chaffinch, the thrushes, and the many specics of Sylvia are most noticeable. The northern nightin-gale is rare in southern Sweden. The cuckoo is heard everywhere, especially in the forest regions. The mute swan is found in great numbers in a few places in southern and central Sweden. The whooper swan frequents the marshes and lakes of Lapland. The white stork is found in Skane and Halland, and herons are found in great numbers here and there in Skane and Blekinge. Cranes are distributed all over the country. Characteristic of the wild forest traets of Lapland is the Siberian jay. Upwards of 250 speeies of birds may be eonsidered as belonging to the Swedish fauna, most of them birds of passage, scarcely 40 remaining over winter in their Suinmer resorts. In spring and autumn Sweden is visited by great ts of the birds of passage of the extreme north, especially geeso and snipe.

The reptiles and amphibians are few (3 snakes, 3 lizards, 11 batrachiaus).

The Swedish rivers and lakes are generally well stocked with fish. The objects of capture are chiefly salmon, eel, pike, different Species of perch, burbot, and several species of the Salmonidez and Cyprinide. The annual income from the fisheries in the lakes and rivers amounts to upwards of £135,800, of which the salmon fisheries alone yield £42,000. Of still greater importanee, of course, are the sea-fisheries. In the end of last century the herring fishery in the “skargard” of the west coast was the most important in Europe, and it is estimated that in one year 1500 millions of herrings were taken. Somewhat later, however, the great shoals disappeared for a long time. In 1877 a new era began in the his-

tory of the west-coast fisheries, the take that year being 1,230,000 cubic feet. Since then the herring has returned every year in greater or smaller numbers. ‘here are also captured on the same coast flat-fishes and cod-fish, mackerel, and sprats. The annual produce of the sea-fishery of the south and west coasts is valued at about £111,000. A smaller variety of the herring is found in great abundanee on the east coast. In the Sound it is still 11 inehes in length, in the Baltic only 6 or 8 inches. This variety is called ‘‘stromming,” and is the objeet of an important fishery, annually bringing in more than £175,000. About 140 kinds of fishes are constantly found in Sweden or along its coasts. Of these nearly 100 belong exelusively to the sea, and upwards of 10 are to be found both in salt and fresh water. The remainder arc properly freshwater fishes, but many are found in the brackish water of the Baltic coasts. Here we find perch, pike, &c., by the side of purely saltwater fishes, as the “‘stromming,” the flat-fish, &e.

The species of Scandinavian insects number at least 15,000. Notorious among these are the Lapland gnats. The “skirgard” of the west coast has a rich fauna of lower marine animals, partly forms of boreal and arctie descent, partly immigrants from the south, The Royal Academy of Science has here a zoological station, Kristineberg, for the purpose of scientifically examining the marine fauna.

Compared with the fauna of the west coast, that of the Baltic is extremely poor. It consists partly of European boreal forms, whieh have immigrated from the west, partly of freshwater forms, which have been able to live in the brackish water. But other types also occur, whieh, though sparingly represented, are of the greatest interest to the naturalist,—namely, certain dwarfed forms,—two or three species of fishes, some erustaeeans and other lower marine animals, belonging to a purely arctic fauna, which have immigrated when the Baltic during a part of the Glacial period eommunieated with the White Sea. They are wanting on the south and west coasts of Sweden, but are found in the Arctic Ocean. Some of them, the four-horned cottus and some erustaccans, are found in Lake Vetter and some other lakes of central Sweden, whither they had come when these lakes formed part of the arctie sea; they have since been shut in and have survived both the climate and the altered composition of the water. The arctic “vikare” seal (Phoca feetida), which is common in the north part of

the Baltic but is not found on the west coast, and which is also found in Lake Ladoga, Lake Onega, and some lakes of Finland, is also eonsidered as a survival of the fauna of the Glacial period. On the west eoast lobster and oyster fisheries are carried on, the former being very productive. The common mussel is abundant, but in Sweden is only used as bait for fish. The crayfish iscommon in many places in central and southern Sweden. Pearls are sometimes found in the freshwater mussel Margaritana margaritifera, whieh is met with all over the conntry. (A. WI.)

Extent and Population. —Sweden takes rank among the larger Area and It contains 170,712°60 English square miles, popula- of which area 3,517°29 square miles are occupied by the large lakes tion.

countries of Europe.

Vener, Vetter, Malar, and Hjelmar, leaving 167,195°31 square miles, distributed among the counties as shown in the following table, which gives the areas and the estimated population in 1885 of the different administrative divisions (the capital Stockholm and the twenty-four “lan” or counties) into which the kingdom is divided :—

Lin. Square Miles. Population. Sime) Ida) ben (UN) b canpnongssdanensceaoose 12°65 215,688 Stockholms Gyumalll)svaseasee ces 3,008 °45 148,841 (US Hilblna nanson pbeenecnnoposenaonboasocaddace BUS 116,406 Sodemnanland@s.se-cesosccer eee 2,630°64 150,032 OPrcnsot land 5. cc.00- a saeseeate ass 4,272°88 267,842 UGIT AO) OV se semqonnecacseenonsovooducascace 4,440°51 197,392 IKON OCR nesnene sonacnesoGooseneneasooase 3,841°51 166,881 (aMMMATAS Sneeacacnens, cecteaeee sessions cere 4,439 06 240,507 (Goblandl ess acco-s:ccascosnessascesasece ey 52,570 Pies. ks acviees teed eaten 1,164:09 140,071 hristiamstad!) so. .tc-ce or eee eee een 2,506 °97 226,787 iralniolhSeesssc.cnce Soecawosennceaeases 1,847 °02 358,178 Jeepers Aetna tions cakercomenmees 1,899°45 136,978 Goteborg (Gothenburg)..... 1,952°51 281,001 IDIUES DORE oo dpocssacadeene cabsbouuodoasconos 4,948°15 282,335 Slcamalbonowesccmeacassteseascessctee Peete 3,283 °13 253,467 RVferamllaniel emer tarrcassennese cece cosesere seers 7,345°73 259,958 OES 2), Ree ee er eeen 3,502°88 182,513 Vestmanland

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Vital statistics.

Race,

Agricul- ture.

Mines.

Forests.

Manu- factures.

Com- merce,

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The population has long been steadily increasing. In 1750 it amounted to 1,763,368, in 1800 to 2,347,308, and in 1850 to 3,482,541. The census of December 31, 1880, returned the num- ber as 4,565,668 (2,215,243 males, 2,350,425 females), and at the end of 1885 the population was estimated at 4,682,769 (2,273,861 males, 2,408,908 females).

It will be seen that Sweden is sparsely peopled (the average for the whole country being only 28 inhabitants to the square mile), and that the population is very unevenly distributed,—Malmohus lin, which lies farthest south, counting 198 persons to the square mile, whereas Norrbotten, farthest to the north, and by far the largest county, has only 2°4.

The urban population as late as 1884 amounted to only 777,857 (the rural amounting to 3,866,591). The towns are in general small. Except Stockholm (215,688 inhabitants in 1885), only five towns—Gothenburg

(91,033), Malmé (44,532), Norrképing (28,503), Gefle (20,758), and Upsala (20,202)—had in 1885 more than 20,000 inhabitants.

The average number of marriages per 1000 inhabitants was for each of the years 1751-60 9°09; this proportion has gradually diminished since, having been 7°60 in 1851-60 and 6°81 in 1871- 80. The yearly average of living children born from 1871-80 was 133,730, and the yearly average of deaths 80,140. The yearly average of deaths to 100 inhabitants for 1751-1815 was 2-71; this number has since been almost constantly decreasing, the average for 1851-60 being 2°17, and for 1871-80 1:82. Immigra- tion and emigration till comparatively recent times had little in- fluence on the numbers of population, but the latter years of tho decennial period 1860-70 caused a change in this respect. The number of emigrants, which as late as 1867 amounted to little more than 9000, increased during 1868 to 27,000 and during 1869 to 39,000. During the years that followed there was a consider- able decrease, but towards 1880 the number of emigrants again rapidly increased, and in 1882 this amounted to upwards of 50,000. The figure for 1884 was 23,560. Immigration, on the contrary, continucs to be insignificant. The annual average of immigrants for 1875-84 was 3333.

The inhabitants of Sweden belong almost exclusively to the Scandinavian race. The principal exceptions are the Finns (in 1880 about 17,000), who chiefly inhabit the north-eastern part of the county of Norrbotten, the Lapps (in 1880 about 6400), spread over an area of about 44,000 square miles in Lapland and Jeintland, and the Jews (in 1880 about 3000).

Agriculture.—Agriculture is the principal industry in Sweden. The number of persons gaining their livelihood by this occupation aud those immediately depending on it was 2,342,000 in 1880, and the value of the harvest in 1884 was estimated at about £25,500,000 sterling, of which the grain-harvest made £14,800, 000. From 1840 to 1880 the export of grain (including meal, &.) ex- ceeded the import; but this has not been the case since 1881, while, on the other hand, the export of dairy produce has mean- while increased.

Mines.—Sweden is rich in minerals, especially iron-ores, and the Swedish iron is celebrated for its good quality. In 1884 526 iron-mines were worked, the joint produce of which amounted to 922,310 tons. The manufacture of

cast-iron amounted to 416,958 tons, that of bar-iron to 267,534 tons, of steel to 66,329 tons, and of hardware to 43,226 tons. The copper during the same year amounted to 650 tons, and the silver to rather more than 4000 ib. Pit-coal has been found only in Malmohus lan, and even there in small quantity compared to the consumption of the country. The produce of the coal-mines was in 1884 not more than 7,277,000 cubic fcet, whereas the import of coal amounted to 52,650,000 cubic feet.

Forcsts.—A great part of Sweden is, as was above mentioned, covered with forests. Most of these are the property of private persons or joint-stock companies, but the Government also possesses large forests, the value of which was in 1884 estimated at about £2,400,000. The forest produce ranks among the principal articles of export from Sweden.

Manufactures.—It was not till 1854 that Sweden completely broke with the pre-existing protectionist system and adopted the principles of free trade. Since 1860 there has been no prohibition, and iniport duty is in general low. The value of the manufactures, which as late as 1850 was estimated at only £2,000,000, was for 1883 computed at more than £10,600,000.

Commerce.—The united value of the exports and imports of Sweden was estimated for 1850 at little more than £4,000, 000, whereas in 1884 it was something over £31,000,000 (imports about £18,000,000, exports about £13,000,000). The principal articles of export were—timber and wooden wares, £5,747,000; metals and hardware goods, £2, 667,000; grain (including meal, &.), £1,307,000 ; aniinal food, £1,081,000; live animals, £652,000; paper and stationery, £584,000. The principal articles of import during the same year were—cotton and woollen manufactured goods, £3,012,000 ; colonial products (coffee, sugar, &c.), £2,309,000 ; grain and meal, £2,258,000; minerals (principally coal), £1,479,000;

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metals and hardware goods, £1,308,000; cotton, wool, &c,

£1,125,000 ; animal food, £1,036,000 ; ships, carriages, machines, instruments, &c., £807,000; hair, hides, bones, horns, and other animal substances, £784,000 ; tallow, oils, tar, gums, and similar substances, £782,000. The aggregate burden of vessels entering from and clearing to foreign ports was 858,827 tons in 1850, 5,388, 085 tons in 1884. The estimated value of the exports to the United Kingdom during 1884 was £6,229,000, to Denmark £1,848, 000, to France £1,073,000, to Germany £1,008,000, and to Norway £604,000; while the imports from Great Britain and Ireland reached £4,952,000, from Germany £4,947,000, from Denmark £2,932,000, from Russia and Finland £1,881,000, and from Norway £1, 225,000.

failways, Posts, and Telegraphs.—The length of the railways in Railways,

Sweden is very great in proportion to the population. In 1884 the total length was 4194 miles, of which 1487 miles belonged to the Government and 2657 to 76 private companies. system is remarkably well organized. offices was 1965, through which 46,533,627 inland letters, Post- cards, post-office orders, newspaper and book packets, &c,, were for- warded, and 5,507,770 to and 6,511,248 from foreign countries,

The telegraph system is also in a very flourishing condition. The Téle- total length of the telegraph wircs in 1884 was 12,969 miles, and graphs,

the number of messages forwarded was 1,178,959.

Fdweation.—With regard to education Sweden occupies a very Educa- Primary education is compulsory for all the tion.

prominent place. children of the country, and this principle is so strictly applied that in 1884 out of 733,329 children of school-age only 15,148 were not under tuition. To supply this primary instruction there are 9925 national schools of different kinds, with 5216 male teachers and 6832 female teachers (1884). For higher educational purposes there are’96 public schools (1885), of three grades, with 14,617 pupils, and two universities (Upsala with 1821 and Lund with 897 students). In Stockholm there is, besides, a medieal faeulty, the Royal Caroline Medico-Chirurgical Institution. A free university is in course of formation, for which large sums

have been given by private persons. There are a jarge number of Government schools for the military and naval services, for the technical scienees, for metallurgy, agriculture, nautical science, and for the blind and the deaf and dumb. All instruction at the national schools, the public schools, and the universities is free.

eligion.—Christianity was introduced into Sweden about the Religion,

ninth century, and was generally professed by the twelfth. The country adopted the doctrines of the Reformation during the reign of Gustavus Vasa. The national church, established by the resolu- tion passed at Upsala in 1598 (Upsala méte), is Lutheran. The country is divided into 12 bishopries (s¢ift). The bishop of Upsala is archbishop of Sweden. In 1880 the number of dissenters was 21,234, of whom 14,627 were Baptists, 2993 Jews, 1591 Methodists, and 810 Roman Catholics.

Army and Navy.—The land defences consist partly of a stand- Amy.

ing army, partly of a militia. The former is for the most part founded on the so-called ‘‘indelningsverk,” an institution dating from the time of Sweden’s greatness, which makes the soldier a settled farmer. This force comprises about 40,000 men. The militia comprises (since 1885) all males between twenty-one and thirty-two years of age. The time of drill for the militia is only forty-two days, extending over two years.

The navy, with a permanent personnel (also for the most part Navy.

founded on the “indelningsverk”) of rather more than 7000 men, consists principally of coasting vessels, both ironclad and wnarmoured.

Constitution.—Sweden is a limited monarchy. _ Its con- stitution, like that of England, rests on an_ historical development of several centuries. From the earliest times the people governed themselves through elected trustees, made laws and levied taxes, while the king was little more than their leader in war. By and by the power of the king was extended, and alongside of it there arose a class of great men, who certainly lessened the legal rights of the lower orders, but who never succeeded in completely subduing them. Through Engelbrecht the burghers and yeomen regained their influence on

the development of the state, and their deputies were summoned to the riksdag (1435). Gustavus Vasa and his son Charles IX. stripped the nobility of the high authority they had exercised during the latter part of the medieval period, and which had been dangerous both to the power of the king and to the people, and so saved the work of Engelbrecht. The right of the lower classes to be members of the riksdag was confirmed by the first " Riksdagsordning " ("law for regulating the riksdag or parliament") of Sweden (1617),

The postal Post. In 1884 the number of post Office,

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'- cannot be said to have gained despotic power.

CONSTITUTION. |

which for the first time legally regulated the system of four houses formerly adopted. In the 16th century the nobility, having been endowed with extensive domains by the crown, again won an ascendency that was very dangerous to the lower classes, but it was crushed when Charles XI., by the diminution of their property (1680), for ever put an end to the supremacy of the nobility and the council in the state. By this act the power of the king was greatly strengthened, so much so as to endanger even the most essential rights of the riksdag,—those of giving laws and levying taxes. But after the death of Charles XII. the despotic system was abolished, and all power was lodged in the hands of the riksdag by the constitutions of 1719 and 1720. During the following period, which is called "the time of liberty," it was the riksdag that had the function of appointing and dismissing the councillors of state, and by this means was able to dominate the administration so

completely as to make the power of the king of little more significance than an empty word. Different political parties defeated each other, and sold their services to foreign states without any regard to the interests of their own country. This state of affairs, which might eventually have proved exceedingly disastrous, was altered by a revolution effected by Gustavus III. (1772), which restored to the king his former power. In the new constitution, however, neither the authority of the king nor that of the people was clearly limited, and this soon led to collisions by which the king succeeded in considerably increasing his ascendency (1789), though he Gustavus IV., however, abused his great authority, so that he was dethroned by a revolution. New constitutional laws were now made, in which, guided by the experience of former times, an effort was made clearly to define the respective powers of the king and the representatives of the people, to prevent encroachment from either side. The effort was crowned with success, and the new constitution of June 6, 1809, is still in great measure in force. The old division, however, into four houses has been abolished, and the influence of the representatives of the people has been in- creased by the new Riksdagsordning of 1866. The other constitutional laws are the "Successionsordning" ("law of succession") of 1810 and the " Tryckfrihetsordning " ("law regulating the liberty of the press") of 1812.

The executive power is vested in the king alone. The legislative power he shares with the riksdag, both par- ties having the rights of initiative and veto. The king has, besides, a legislative power, not precisely defined, in certain economic matters. The right of levying taxes belongs to the riksdag alone; but the king may in cer- tain cases (as, for example, through his right of lowering the custom duties) exercise a certain influence. He can declare war and make peace, and has the supreme com- mand of the army.

The king is irresponsible, but all his resolutions must be taken in the presence of responsible councillors ("'statsrad"). These, who form the council of state, are ten in number, of whom seven are also the heads of departments of the administration (justice, foreign affairs, army, navy, internal affairs, finance, and ecclesiastical affairs, including both church and schools). For the advice they give the coun- cillors of state are responsible to the riksdag, which re- vises the record of their proceedings through an annually appointed board, which has power also to indict the coun- cillors

before a special tribunal, the “riksratt,” formed for the occasion, of which certain high functionaries have to be members. One of the councillors of state is, as prime minister, the head of the administration.

The riksdag meets every year on January 15, and consists of two houses. The members of the first house,

| They receive no payment.

one for every 30,000 inhabitants (143 in 1887), are elected by the “landsting” in the counties, or by the municipal councils of the larger towns, for a period of nine years. Any Swede is eligible who is at least thirty-five years of age, who possesses, and for three years before the election has possessed, real pro- perty to the value of 80,000 crowns, or who, during the same period, has paid taxes on an annual income of 4000 crowns. ‘The members of the second house (one or two for every district of judicature in the country, according as the population exceeds or falls short of 40,000, and one for every 10,000 inhabitants in the towns) receive a salary of 1200 crowns, and are elected for a period of three years by electors, or directly, according to the resolution of the electoral district. Ifa member retires during that period, his successor is elected for the remainder of the three years, and thus the house is wholly renewed at regular intervals, which is not the case with the first house. The franchise is possessed by every one who owns landed property to the value of 1000 crowns, or who has farmed for at least five years lands worth 6000 crowns, or pays taxes on an annual income of 800 crowns. All electors are eligible. The number of electors is about 6°5 per cent. of the population. The towns elect their representatives separately. Both houses have in theory equal power. Before bills are discussed they are prepared by boards, whose members are elected by half of each house. When the houses differ on budget questions, the matter is settled by a common vote of both houses, which arrangement gives the second house a certain advantage from the greater number of its members, By revisers elected annually the riksdag controls the finances of the kingdom, and by an official (‘justitieombudsman”) elected in the same way

the administration of justice is controlled ; he can indict any functionary of the state who has abused his power. The bank of the kingdom is superintended by trustees elected by the riksdag, and in the same way the public debt is administered through an office (“‘ Riksgiildskontoret”), the leader of which is appointed by the riksdag. Administration, Law, and Justice. —The administration consists partly of a centralized civil service, arranged under different departments, partly of local authorities. Each of the twenty-four counties has a governor (“landshofding”) who presides over the local offices (the ‘“‘ landskansli,” the “Jandskontor”), and is assisted by subordinate local officers (‘“ kronofogdar,” “ haradsskrifvare,” “ lansmiin ”). There is, moreover, in each county a representation (the “landsting”), elected by the people, that deliberates on the affairs of the county and has a right to levy taxes. Each county is divided into parishes, which, like the towns, have a very strong communal self-government. The law of Sweden dates from 1736, but it has of course under- gone a great many alterations and additions, the most important being the new penal law of 1864. Justice is administered by tribunals of three instances :—(1) the ‘“‘haradsratter” in the country, consisting of a judge and seven to twelve assessors elected by the people, who, if they are unanimously of an opinion different from that of the judge, can outvote him, and the “ radhusratter ” boards of magistrates) in the towns ; (2) three “ hofratter” ter courts) in Stockholm, Jénképing, and Christian- stad ; and (3) the royal supreme court, which passes sen- tence in the name of the king, and two members of which are present in the council of state when law questions are to be settled; this tribunal has, moreover, to give its opinion upon all proposed changes of the law.

of 1815, according to which each country is free and inde- pendent, though both are governed by the same king. The connexions of both countries with foreign states are regulated by the Swedish minister for foreign affairs, but when the king has to settle matters concerning foreign states which also are of importance to Norway a Norwegian councillor of state has to be present. Both countries have the same ambassadors and consuls abroad, and share the expenses of their support, Sweden bearing the larger part of this outlay.

In war the two countries are bound to assist each other. Thus the union is what is called a “unio realis.” (J. F. N.)

Part IJ.—HisTory.

From the earliest times of which we have any authentic information there were in Sweden two more or less dis- tinct peoples,—the Gota or Goths in the south, and the Svea or Swedes in the north. They spoke similar lan- guages, were of the same Teutonic stock, and had like customs, institutions, and religious beliefs ; but these facts did not prevent them from regarding one another with jealousy and dislike. The most powerful king among these peoples was the king at Upsala. There were other chiefs or kings, called in later times smaa-kongar, but they recognized the superiority of the Upsala king, whose peculiar position was due to the fact that there was at Upsala a great temple of Wodan, which was held in equal reverence by the Swedes and the Goths. Upsala was in the territory of the Swedes, and we can account for the feeling of the Goths with regard to it only by supposing that they were an offshoot from the Swedes, and that the worship of Wodan was in some special way associated with Upsala before the separation took place. Of the two peoples, the Goths seem to have been most active and open to new ideas. They spread along the southern coasts of Sweden and among the islands of the Baltic, and there can be little doubt that the Goths in Germany and Russia, who played so great a part in the disruption of the Roman empire, sprang from the Swedish Goths.

Slavery was not unknown in ancient Sweden, but it did not form an important element in social life. The vast majority of the people were free. They were divided into two classes, jarls and bondar, corresponding to the Anglo- Saxon eorls and ceorls. The bondar were the landed freemen, while the jarls were of noble blood. In some remote age the land may have been held in common by village communities, but in historic times there has always been in Sweden private property in land as well as in movables,—the jarls having wider lands than the bondar, and some bondar being better off than other members of their class. The kings were treated with much respect, for they belonged to families which were believed to be descended from the gods; but their power was far from being absolute. When a king died, his authority did not necessarily pass to one of his sons; the freemen

chose as his successor the member of the royal family who seemed to them best fitted for the duties of the office. The king's power was limited not only by the fact that he was elected but by the rights of the freemen in all matters concerning life and land. At regular times moots were held for legal, legislative, and political purposes; and without the sanction of the Great Thing, as the tribal assembly was called, no law was valid and no judgment good,

Besides the Great Thing, of which all freemen were members, there were local things, each attended by the freemen of the district to which it belonged. The chief function of these local assemblies was to settle disputes between freemen, their decisions being given in accord-

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ance with rules based on ancient customs. Very often their judgments could not be enforced; and here, as in other Teutonic lands, the impotence of the local popular courts was one of the causes which led to the growth of the king's authority. He was bound to go round his

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land in regular progress, doing and enforcing justice

among his subjects; and in course of time men felt more and more strongly that the best way of obtaining redress for serious grievances was to appeal directly to him.

As far back as we can go in Swedish history we find that the principal aim of the Upsala kings was to get rid of the smaa-kongar, and to put royal officers in their place. These officers ruled in the king's name in association with the local things, but their tendency, especially

in times of great civil commotion, was to make themselves:

as independent as possible. The king himself was always attended by some of the leading magnates, who formed a sort of council of state, and with their aid he prepared the plans which were afterwards submitted to the

Great Thing. Although the Great Thing never ceased to be in theory an assembly of the nation, it gradually lost its primitive character, the political rights of the common freemen being usurped by the nobles, who sought also to hamper the exercise of the royal authority.

According to the Ynglinga Saga, in which bits of old Swedish legends are preserved, the first Upsala kings were Ynglingar, sprung from Yngve Frey, the grandson of Wodan. We are told that the last representative of this dynasty was Ingjald Illrede, that he slew six of the smaa-kongar, and that he afterwards killed himself when he heard that the son of one of the murdered chiefs was advancing against him. It is said that the Ynglingar were succeeded by the Skioldungar, who claimed to be descended from Skiold, Wodan's son ; and the traditional account is that this line began with Ivar Widfadme, and that he not only became king at Upsala but conquered Denmark, a part of Saxony, and the fifth part of Eng- land. Another of the Skioldungar, Eric Edmundsson, is said to have been an even greater king than the founder of the dynasty. During this legendary period, kings in Sweden were often at war with kings in Norway and Denmark, and Swedish adventurers undertook many war- like enterprises against the Finns and the Wends. While Danes and Norwegians were founding states in the British Islands and France, the Swedes were accomplishing like results on the eastern sliores of the Baltic.

At this early period Sweden did not take in all the territory which now belongs to it. Scania, one of the most fruitful and prosperous districts of modern Sweden, had been from time immemorial an independent and comparatively powerful Gothic state. In the 9th century it was annexed to Denmark by King Guthrun; and, although in later times it was often a subject of bitter dispute between Denmark and Sweden, its connexion with the former country was not finally severed until the 17th century. Lund, the principal town in Scania, was for many generations the see of the primate of the Damish church.

The scattered notices of Adam of Bremen, Saxo, and certain saints' lives, with a few allusions elsewhere, are our direct written sources for this early period. They may be eked out by study of the laws and of local nomenclature. Later the rich runic remains of Sweden give us some fuller

help. After the end of the 10th century the evidence gradually becomes clearer and more trustworthy. There was then at Upsala a powerful king called Eric the Victory-Blest. He defeated a band of vikings m a great battle at Fyrisval, and, according to Adam of Bremen, had for some time complete control over

Denmark. He was succeeded in 993 by his son Olaf Olaf.

993-1306. | SW E

(993-1024), who was called the Lap-King because he was a child when his reign began. Olaf was baptized about the year 1000, and was the first Christian king of the Swedes. In the 9th century St Ansgar had laboured for some time as a missionary in Sweden, but without much success. | Even Olaf, who was supported in his efforts by Siegfred, the devoted English missionary from whom he had received instruction in Christian doctrine, found that it was | impossible to convert the majority of his subjects. He _ was allowed to build churches in West Gothland, but in | the rest of his dominions the people clung obstinately to paganism. During his reign there was war between | Sweden and Norway, and Olaf seems to have been in favour of carrying on the struggle with vigour. His people, however, desired peace, and it is related that at the Great Thing at Upsala they threatened to take his life if he did not give Olaf, the Norwegian king, his _ daughter in marriage. He consented to do as they ‘ wished, but broke his promise; and he would probably | have been set aside had it not been for the mutual jealousy of the Swedes and the Goths.

The Lap-King was succeeded, one after the other, by his sons Anund and Edmund the Elder ; and under their rule the church lost much of the ground which it had gained through the efforts of Olaf. After Edmund the Elder’s death the Goths resolved that Stenkil, the Christian jarl of West Gothland, should be made king. This decision was resisted by the Swedes, but the result of the civil war which broke out was that Stenkil was able to maintain his claim. He reigned from 1056 to 1066, and effectually protected the church without attempting to do violence to the convictions of the pagan population. His reign was followed by a period of much confusion, during which _ the Goths and the Swedes treated each other as enemies,— the latter upholding paganism, the former contending for Christianity. Under

Inge the Elder, who reigned from 1080 to 1112, the temple at Upsala was burned, and from this time there could be no doubt as to the ultimate triumph of the church, which was served with heroic courage by many zealous foreign missionaries. So much progress was made that Swerker Karlsson, who reigned from about 1135 to 1155, begged the pope to give the Swedish people bishops and a primate. Nicholas Break- spear, the English cardinal who was afterwards raised to the papacy as Adrian IV., was sent to make the necessary arrangements. He found that the Swedes and the Goths could not agree as to a place for the see of a primate ; but at a synod which met at Linköping in 1152 it was decided that the Swedish clergy should accept the law of celibacy, and that Sweden should pay a yearly tax to the pope. For a long time many pagan ideas and customs survived, but Sweden was now, at least nominally, a Christian country. When Swerker was murdered in 1155 the Goths wished valj- to make his son king, but the Swedes chose Eric Edwards- son, and he reigned until 1160. Eric was so good a king that after his death he was canonized by the popular Voice, as was then the way in the North. Upsala was made by him a primate's see, and he began the series of efforts which led to the annexation of Finland to Sweden. | Finnish pirates had often desolated the Swedish coasts,

and it had become absolutely necessary that their country ' should be subdued. Eric not only overcame the Finns, | but did what he could to compel them to accept Chris- tianity.

For about a century after Eric's death the Goths and the Swedes were almost constantly at war with one another, each people choosing its own king. The Goths preferred the descendants of Swerker, while the Swedes were loyal to the descendants of Eric, who were known as

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the yeomen-kings, because Eric had originally belonged to the class of bondar or yeomen. The Danish kings often aided one or other of the contending parties, and as a rule they seem to have done far more harm than good by their interference. To some extent the church main- tained among the people a sense of national unity, but it was not powerful enough to give much protection to the poorer members of the community against the

despotism of local magnates. In the end, when the church itself became rich, the higher clergy were quite as tyrannical as the secular nobles.

John Swerkerson, the last king of the Swerker dynasty, died in 1222; Eric the Halt, the last of the yeomen-kings, in 1250. In the latter year the crown was given to

Waldemar, whose mother was a sister of King Eric the Walde- Halt. Waldemar belonged to the Folkungar family, which ™4-

had acquired great estates and risen to a position of high importance in the state. Under this dynasty the Goths and the Swedes gradually ceased to be jealous of one another, and became a thoroughly united people. From this time civil troubles in Sweden sprang, not from the antagonism of rival peoples, but chiefly from the increas- ing power of the great landowners, who strove incessantly to limit the rights of the free peasantry, and were often strong enough to defy the crown.

At the time of the death of Eric the Halt, Birger Brosa, Waldemar's father, was in Finland, where he conquered Tavastland and strengthened the hold of the Swedish crown over those tribes which had been already subdued. On his return to Sweden he was indignant to find that he had not himself been elected to the throne. He accepted what had been done, however, and devoted his energies to the promotion of his son's interests. Until his death Birger was the real ruler of Sweden, and the nation had never been governed by a man of stronger will or more upright character. If he did not actually found Stock- holm, it was he who made it the strongest fortress in the country,—a service for which the Swedish people had good reason to be grateful to him, for it enabled them to put an end to the depredations of Finnish pirates. After the death of Birger great evils were brought upon the country by the folly and incompetence of Waldemar, who was at last driven from tle throne and imprisoned by his brother

Magnus, who succeeded him. Magnus (1279-1290) was Magnus.

a lover of pomp and splendour, and formed a more brilliant court than the Swedes had ever seen. He granted immunity from taxation to those landowners who should give the crown ross-djenst or horse-service, that is,

serve the king in war at the head of a body of horse- men. His intention in adopting this plan was to secure for the crown a powerful body of loyal and attached supporters, but, as the measure added to the wealth, dignity, and influence of the nobles, its ultimate effect was to weaken the royal authority. Although he increased the importance of the aristocracy, Magnus was not unmindful of the interests of the common freemen. He is known as Ladu-laas or Barn-Lock, because he issued a law requir- ing persons of noble birth to pay for the straw and corn with which, when travelling, they might be supplied by peasants. Magnus was also a munificent benefactor of the clergy. He endowed a large number of churches and built five monasteries.

Magnus was succeeded by his son Birger (1290-1319). Birger.

Birger was only nine years old when his father died, and for a long time the power of the crown was wielded by his guardian, Torkel Knutsson, a wise and vigorous statesman. Knutsson drew up a code of laws which was accepted by the Great Thing in 1295; and in Finland he not only put down rebellion but annexed Savolax and Carelia. In 1306, misled by his brothers Eric and Waldemar, Birger XXII. — 94

Magnus.

Albert.

Mar- garet.

caused this faithful and able counsellor to be beheaded, and the result was civil war, in which the weak king found it hard to make way against his restless and ambitious brothers. At last he got them into his power by treachery, and threw them into a dungeon of the castle of Nyképing, where they died of starvation. Soon afterwards Birger himself died, despised and hated by his subjects. He was succeeded by his nephew Magnus, his brother Eric’s son, a child of about three years of age. Magnus’s guardian, Mats Ketilmundsson, was a man of strong and noble char- acter, and as long as his supremacy lasted the Swedish people were more prosperous than they

had ever been before. Taking advantage of the troubled condition of Denmark, he joined Scania and the neighbouring districts of Halland and Blekinge to the Swedish kingdom ; and had his prudent system of government been maintained these provinces might have been kept, for the inhabitants seem to have preferred Swedish to Danish rule. But, when he died in 1336, the king fell under the influence of un- worthy favourites. Scania, Halland, and Blekinge were restored to Denmark, and Sweden was soon in a state of the greatest confusion. In 1363 a number of nobles who had given Magnus much trouble, and whom he had expelled from the country, went to his sister's son Albert, count of Mecklenburg, and offered him the crown. The offer was accepted, and afterwards Albert was formally elected by the Great Thing. Magnus resisted, but was defeated and made prisoner in a battle at Enkoping in 1365. In 1371 he was released, and the rest of his days he spent in Norway, where he was not unpopular. From his mother he had inherited the Norwegian crown, but before the misfortunes of his later years it had been transferred to his son Haco.

The nobles and the hierarchy of Sweden were now so powerful that only a king of the highest political genius could have hoped to control them. Albert of Mecklenburg proved to be utterly unfit for the task he had undertaken. He tried to protect himself by giving many of the great offices of state to Germans, but he was warned that he would be dethroned if he continued to show so much favour to foreigners. In 1371 he accepted as his chief counsellor a great Swedish noble called Bo Jonsson, to whom about a third of the kingdom is said to have belonged. Bo Jonsson gave much more heed to his own interests than to those of his country, and did hardly anything to mitigate the hardships inflicted on the common people at this tinie by the turbulence of the well- off classes. After Bo Jonsson's death Albert attempted to regain some of the authority which he had been forced to delegate to his powerful minister ; but the nobles refused to obey him, and invited Margaret of Denmark and Norway to take his place.

Margaret, one of the most remarkable figures in Scandinavian history, was the daughter of Waldemar IV. of Denmark, and at an early age she had become the wife of Haco of Norway, son of the Swedish king whom Albert had supplanted. The offspring of this marriage was an only son, Olaf, who succeeded his grandfather in Denmark in 1375 and his father in Norway in

1380. Both countries were ruled firmly and wisely by Margaret in her son's name; and after his death in 1387 the Danes and the Norwegians begged her to retain supreme power. To this request she assented; and, when the Swedish nobles asked her to undertake the government of Sweden also, she at once expressed her willingness to attack Albert, who had irritated her by claiming the Danish crown. An army was soon despatched to Sweden, and in 1389 Albert was defeated and taken prisoner at Falképing. Stockholm, which was held by German mercenaries, refused to admit the conqueror, and for several years it was besieged

without success by Danish troops. At last the difficulty had to be settled by negotiation. In 1395 it was arranged that Albert should be set at liberty on condition that within three years he should pay a ransom of 60,000 marks. If at the end of that period the money was not paid, he was either to give up Stockholm or to return to captivity. The result was that in 1398 Stockholm was | surrendered by the Hanseatic League, which had become security for the fulfilment of Albert's engagement.

Meanwhile Margaret had persuaded the Danes, the Norwegians, and the Swedes to accept her grandnephew Eric of Pomerania as her successor, and in 1397 he was crowned at Calmar. Margaret was eager that the union of the Scandinavian countries under a single sovereign : should be made permanent, and delegates from the ' councils of state of the three kingdoms met at Calmar to discuss her proposals. On the 20th of July 1397 these delegates concluded what was called the uniou of Calmar. Sweden, Norway, and Denmark, while retaining their local laws and customs, were in all future time to be ruled by one king. When a king died he was to be succeeded by his eldest son; but if he were childless his Successor was to be freely elected. In foreign affairs Scandinavia was always to act as a united country, Margaret had excellent intentions in devising this bold schenie, but the time was not ripe for so vast a change, It was inevitable that when popular movenients were no longer held in check by her strong will, formidable difficulties shouid spring from the jealousies of the three nationalities.

Even after Hric's coronation Margaret remained the real Erie XII, sovereign, and she was powerful enough to make the union something more

than a mere name. But even during her lifetime the Swedish people showed that they resented the idea of being taxed for objects in which they were only indirectly interested, and when she died (in 1412) it soon became evident that Eric would be unable to retain their allegiance. In 1386 Margaret had formally recognized the claim of Gerhard VI., count of Holstein, to be feudal lord of the duchy of Schleswig. Gerhard died in 1404, leaving three young sons. Margaret and Eric then tried to recover the rights of the Danish crown in the duchy ; and in 1413, soon after Margaret's death, Eric caused Schleswig to be declared a forfeited fief. The result was a war which lasted about twenty years. The Swedes had to bear heavy burdens to enable Eric to carry on the conflict, and he made no attempt to allay their discontent.

He seldom visited their country, and his officers often treated them with reckless cruelty. In the province of Dalecarlia the royal bailiff acted so tyrannically that i 1434 the people rebelled. They were led by a brave and patriotic miner, Engelbrecht Engelbrechtsson, and under his influence the movement spread rapidly among the peasantry of other districts. The Swedish council of state, alarmed by the enthusiasm he had excited, agreed in 1436 to declare the king deposed. The nobles were more afraid of the peasants than of Eric, and soon placed him on the throne again; but he never fully recovered his authority. He was obliged to make Charles Knutsson his viceroy in Sweden; and Knutsson was as anxious 8 Engelbrechtsson that Swedish independence should be restored, The two patriotic leaders became jealous of one another, and Engelbrechtsson was murdered by a member of Knutsson's party. But the popular agitation lost none of its original force, and in 1439 Eric was dethroned by all his kingdoms. He fled to the island of Gotland, where he lived for some years by piracy; and afterwards he was compelled to seek for refuge in Pomerania.

Christopher of Bavaria, Eric's nephew, was elected to ics

the Danish throue, and he was soon acknowledged also in "P

- Dantzic. j became king of Sweden, but he was unable to assert

many foreign scholars.

Norway and Sweden. He was a man of good intentions, but was not strong enough to overcome the prejudice created against him by the fact of his being a foreigner. When he died in 1448 the Danes chose Christian, count of Oldenburg, as his successor, and the Norwegians by and by followed their example. Had the decision in

| Sweden rested only with the nobles and the clergy,

Christian would at once have received the Swedish crown,

| for under the nominal rule of a foreign king these classes

were able to tyrannize as they pleased over their poorer neighbours. But the Swedish people generally so strongly

‘ disliked the union, and stood so urgently in need of the _ protection of a native sovereign, that Charles Knutsson ; was made king. He mounted the throne as Charles VIII.

The aristocracy, both spiritual and temporal, detested him ; and in 1457 he found in Archbishop Jéns Bengtsson so formidable an enemy that he had to make his escape to Christian I. of Denmark and Norway then

supremacy over the country as a whole, and in 1464 Charles VIII. again secured the throne. In the following year Charles was displaced a second time, but soon after- wards he was recalled, and he retained the crown until his death in 1470.

Charles was succeeded, not as king but as regent, by

’@ his nephew Sten Sture, under whose firm rule Sweden ~ became prosperous and contented. Sten Sture was a far-

seeing statesman, and sided resolutely with the peasants against the nobles. He took great pains also to promote the intellectual culture of the people. The university of Upsala was founded by him, and he introduced into Sweden the art of printing, and invited to the country He was not able

wholly to destroy the union, for in 1496 he was defeated by King Hans of Denmark and Norway, who afterwards received the Swedish crown. Nevertheless Sten Sture remained the real master of Sweden, and after the defeat of the Danes by the Ditmarshers in 1500 his power was almost absolute. He died in 1503, when his authority passed to his nephew Svante Nilsson Sture, whom King Hans and the Swedish clergy and nobles in vain attempted to put down. Svante Nilsson Sture was succeeded by his son, Sten Sture the younger, in 1512, and for some time this brave and patriotic regent vigorously held his own both against his enemies at home and against Christian IL, king of Denmark and Norway. In 1520, however, he was mortally wounded in a battle with the Danes at

tit Bosesund, after which Christian II. became king of

Sweden. This sovereign had some enlightened ideas, but he was a man of ferocious passions, and he had no sooner restored the union than he made the maintenance of it impossible by an act of almost unparalleled cruelty. Under the pretence of upholding the honour of the church he ordered at Stockholm the execution of ninety persons accused of having taken part in the deposition of his friend and supporter Archbishop Gustavus Trolle, who had been the late regent’s bitterest enemy. Most of the condemned men were nobles, and Christian hoped that by killing them he would secure the allegiance of the peasantry. The whole Swedish nation, however, was

{shocked by so horrible a massacre, and resolved to shake off for ever the hated Danish yoke.

The movement for national independence was headed by

)Gustavus Ericsson, known afterwards as Gustavus Vasa.

his young noble had been one of a group of Swedish hostages whom Christian II. had sent to Denmark, treat- ing them as if they had been prisoners of war. In 1519 he escaped from prison, and after a short stay in Ltibeck

‘found his way to Dalecarlia, where he went about in

disguise among the peasantry, urging them to combine

against the common enemy. At first they were afraid to act with him, but their hesitation vanished when they heard of the blood-bath in Stockholm, —a crime by which Gustavus himself was more than ever embittered against the Danes, for his father was one of Christian IL.'s victims. A force raised by Archbishop Trolle having been defeated, Gustavus led his troops beyond the limits of Dalecarlia and took Vesteris and Upsala, and laid siege to Stockholm and Calmar. 'These fortresses were bravely defended, but in 1523, with the help of a fleet sent to him by Liibeck, he succeeded in capturing them.

In 1521 he had been declared regent, and in 1523, before Gustavus the conquest of Stockholm and Calmar, he summoned at Vasa.

Strengnés a diet which elected him to the throne. Soon afterwards he made himself master of Finland, and he annexed Scania, Halland, and Blekinge. The union had now been brought to an end, and from this time Sweden was always ruled by her own kings. Denmark and Norway, however, remained subject to one crown until the beginning of the 19th century ;

Gustavus Vasa was by far the greatest sovereign who had up to this time ruled the Swedish people. Before he was made king the doctrines of Luther had been pro- claimed in Sweden by the brothers Olaus and Laurentius Petri; and Gustavus, who listened attentively to their teaching, became one of the most enthusiastic adherents of the Reformation. He acted cautiously, however, and resolutely opposed violent agitators. The majority of the Swedes cordially accepted the new doctrines, and at a diet held at Westerés in 1527 Gustavus received authority to reorganize the church. This he did thoroughly, making it clear from the beginning that Protestant pastors would never be permitted to wield the power which the Roman priesthood had so often abused. The greater part of the vast estates which had belonged to the Roman clergy he confiscated and applied to the uses of the state. In his secular policy he was as bold and successful as in his dealings with the church. For centuries the independence and arrogance of the great nobles had been the curse of the Swedish people. Gustavus missed no opportunity

of limiting their influence. He compelled them to bear their fair share of the public burdens, and secured for himself faithful allies by obtaining for burghers and the peasantry, who had lost almost all their political influence, a recognized place in the diet, which was now summoned more frequently and regularly than it had been for several generations. Gustavus did everything he could to encour- age industry. For six years he fought with Liibeck in order to ‘break the supremacy of the Hanseatic League, and he concluded treaties of commerce with England and the Netherlands. So many changes were effected in Sweden in his time that several conspiracies were formed against him, but lie had little difficulty in overcoming his enemies, for he had the confidence and affection of the great mass of his subjects. In 1544 it was decided by the diet that the Swedish throne should cease to be elective, and that it should be hereditary in the family of Gustavus.

When Gustavus died in 1560, his eldest son Eric he- Eric XIV.

came king. Eric was foolish enough to go to war with Frederick II. of Denmark for no better reason than that the latter, like Eric himself, claimed the right to put three crowns in his coat-of-arms. This war, which lasted seven years, caused much suffering to both nations. The Danes were generally beaten at sea, but under the leader- ship of the stout soldier Daniel Rantzau they gained important victories on land. Intellectually Eric was one of the most cultivated of Swedish kings, but in action he was so headstrong and wayward that most people believed him to be insane. He wasted the treasure amassed by

John ITE.

Sigis- mund.

Charles aX,

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his father, and under the influence of passion and suspicion caused the death of many powerful and loyal subjects. In 1568 his brothers John and Charles rebelled against him. His favourite, Géran Persson, who was accused of

having constantly misled him, was seized and executed, and Eric himself was obliged to surrender. He was deprived of the crown and kept in close confinement until 1577, when he was murdered.

John mounted the throne as John ITI. (1568-1592). In 1570 the war between Sweden and Denmark was brought to an end by the peace of Stettin. Sweden obtained some advantages by this treaty, but she had to resign to Denmark her claims to the island of Gotland, and to Scania, Halland, and Blekinge. Through the influence of his first wife Catherine, sister of King Sigis- mund II. of Poland, John had become a Catholic ; and as king he laboured to restore as far as possible the old religious forms. His efforts were bitterly resented by the Protestants, while at Rome he was condemned for not acting with sufficient decision in the interest of his church. He was succeeded by his son Sigismund, who had been elected king of Poland in 1587. In the interval between John's death and Sigismund's arrival in Sweden supreme power was exercised by Duke Charles, Sigismund's uncle. Charles, the ablest of all the sons of Gustavus Vasa, resolved to take advantage of the opportunity to place the ecclesiastical system of the country on a satisfactory basis. Accordingly a great assembly was summoned at Upsala in 1593, and by this assembly it was decreed that the Augsburg confession of faith should be accepted as the authoritative statement of the theological doctrines of the Swedish church. The decision was of vast importance, and the Swedes have ever since looked back upon it as one that marked an era in their national history.

Before his coronation in 1594 Sigismund undertook to protect the rights of his Protestant subjects; but, being an ardent Catholic, he soon began to work for the triumph of his own creed. On his return to Poland the discontent he had excited in Sweden found free expression, and he was obliged to place the administration of affairs in the hands of his uncle, Duke Charles. In the time of King John a dispute about frontiers had led to war between Sweden and Russia, and this war was still going on when Charles undertook his new duties. In 1595 he concluded peace, securing for Sweden the provinces of Esthonia and Narva, but yielding to Russia some districts on the borders of Finland. These districts were held by Klas Fleming, an enthusiastic adherent of King Sigismund, and he declined to give them up, nor were they surrendered until the death of this general in 1597.

Meanwhile Charles had found that some members of the council of state were bent on thwarting all his schemes, and from them he appealed to the diet. The diet heartily supported him, and appointed him governor-general of Sweden; where- upon he set to work in earnest to put down Catholic intriguers, and to promote the interests of the peasantry in opposition to those of the great nobles. In 1598 Sigis- mund advanced against him with a Polish army, and was defeated at Staingebro, near Linkoping. The war went on for some time, but Sigismund himself returned to Poland. In 1600 the diet demanded that he should reside in Sweden or send his son to be educated as a Pro- testant. No answer being returned to these demands, Sigismund was dethroned, and his heirs were deprived of the right of succession. Duke Charles was then made king, and reigned as Charles IX. Sigismund continued to regard himself as the lawful sovereign, and as the same pretension was made by his descendants, a very bitter feeling sprang up between Sweden and Poland,—a feeling which led to many wars during the next sixty years.

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Charles IX. (1600-1611) carried on with splendid vigour the work which had been begun by. his father Gustavus Vasa. Under his rule Sweden became a thoroughly Protestant country, and for the first time associated herself to some extent with the general Pio. testant movement in other lands. Charles watched with especial interest the action of religious parties in Germany, and carefully maintained good relations with the leading German Protestant princes. At home one of his principal

-aims was to force the aristocracy to be subservient to the

crown, and he succeeded as no Swedish king had done before him. For burghers and the peasantry he secured in the diet a more important and more clearly defined | place than had formerly belonged to them, and he devised many sagacious measures for the material welfare of his people. He devoted much attention to the development of mining industries, and by the founding of convenient seaports he gave a great impetus to trade. In foreign relations he was not less masterful than in his manage- ment of domestic affairs. In 1609 he sent an army into Russia to oppose the false Demetrius, whose pretensions to the Russian throne were supported by Poland. The

Swedish generals, after having achieved some success, were obliged to retreat in consequence of a mutiny among their troops ; but Charles despatched a fresh force, which did its work so well that the Russians came to terms, and even promised to accept his younger son, Charles Philip, as czar. In the last year of his life Charles was engaged in a war with Christian IV. of Denmark, who invaded Sweden because Charles claimed to be king of the Norwegian Laplanders and sought to exclude the Danes from the extensive trade with Riga. Calmar, notwithstanding the strenuous exertions of Charles, was captured by the Danes, and from this circumstance the struggle came to be known as the Calmar War. | Charles IX. was succeeded by his son Gustavus Gusta Adolphus (1611-1632), the most illustrious of the kings 4‘ of Sweden. He was only seventeen years of age when he became king, but he had already given evidence of high intellectual and moral qualities. One of lis first public acts was to appoint as chancellor the youngest of his counsellors, Axel Oxenstjerna, a great statesman whose name is intimately associated with all the most prominent events of his reign. By mingled gentleness and firmness Gustavus won almost immediately the goodwill of his subjects, and before he was many years on the throne he became the object of their most enthusiastic devotion. He showed unfailing respect for the rights of the diet, improved its organization, and summoned it regularly one a year. Industry and trade flourished under his wise rule, and he did much to develop the educational system of Sweden by giving splendid endowments to the university of Upsala and by founding the university of Dorpat and many schools and colleges. He introduced into the army a rigid system of discipline, yet he was adored by his soldiers, who had perfect faith in his military genius and were touched by his care for their welfare and by the cheerfulness with which, when necessary, he shared their hardships. ; The war with Denmark which had been begun in his father’s time he was obliged to continue, but he did s0 very unwillingly, and as soon as possible (in 1613) he signed a treaty of peace, by which, in return for the pay- ment of a million thalers, Sweden received back all the territory that had been conquered by the Danes. Having no further cause of anxiety in this direction, he prosecuted with renewed vigour the war with the Russians, who ha not kept their promise to recognize Prince Charles Philip as czar. The Swedish general, Count de la Gardie, ha gained many advantages in the struggle, and when

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1568-1660. | SW B

Gustavus himself took part in it the Swedes were so successful that in 1617 the czar Michael was glad to conclude the peace of Stolbova, giving up Kexholm, Carelia, and Ingermanland, and confirming Sweden in the possession of Esthonia and Livonia. The next task of Gustavus was to subdue Sigismund of Poland, who had formally renewed his claim to the crown of Sweden after Charles IX.'s death, and had proved himself one of the most troublesome of the young Swedish king's enemies. In 1621 Gustavus took the field against him, and achieved a series of brilliant successes, which were interrupted only when, in 1629, Austria sent to the aid of Poland a force of 10,000 men under Arnheim.

Meanwhile the Thirty Years' War, begun in 1618, had been raging in Germany. Christian IV. of Denmark, who had intervened on behalf of the Protestants, had been forced to lay down his arms; and it seemed in the highest degree probable that the Catholic reaction, headed by the fanatical emperor Ferdinand II., was about to be com- pletely

triumphant. Gustavus, like his father and grand- father, was an enthusiastic Protestant, and he had watched with grief and dismay the misfortunes of those who were struggling for the right of free judgment in religion. At last he resolved to give them the support they so urgently needed, and, in order that he might without unnecessary delay act upon his decision, he arranged with Poland in 1629 that there should be an armistice for six years. He then began to make preparations for his great enterprise, and in 1630 he embarked for Germany with an army of 15,000 men. In undertaking this splendid task he was not influenced only by religious motives. He wished to punish the Austrians for having helped the Poles; he hoped to find an opportunity of adding to Swedish territory ; and there are reasons for supposing that he dreamed of snatching the imperial crown from the Haps- burg dynasty and placing it on his own head. But all the evidence we possess goes to show that these objects were subordinate. His principal aim was to save Protestantism in Germany from extinction.

He had many unexpected difficulties to contend with, for he was distrusted by most of the German Protestant princes. Very soon, however, his tact and courage enabled him to overcome every obstacle, and at Breitenfeld he gained a decisive victory over the imperial general Tilly. After this great success the confidence of the German Protestants revived, and Gustavus was everywhere received as their deliverer. Tilly tried to prevent him from crossing the Lech, but was again defeated; and the Swedish king took possession of Munich, having already held court at Frankfort. For some time the destinies of the empire appeared to be at his disposal, but all the hopes excited by his heroic career were suddenly cut short by his death in the battle of Liitzen in 1632.

Gustavus was succeeded by his daughter Christina, whom, before his departure for Germany, he had presented to the diet as heiress to the crown. During her minority Sweden was governed by five nobles whom the diet appointed to be her guardians, the foremost place being given to Axel Oxenstjerna. They continued the foreign policy of Gustavus, maintaining in Germany a powerful army, which, although no longer uniformly successful, gained many victories over the imperial forces. —

Christina, carefully educated in accordance with instructions left by her father, became one of the most cultivated women of the 17th century ; and at an early age she astonished her guardians by the vigour of her understanding. In 1644, on her eighteenth birthday, she assumed supreme power, and for some time she fulfilled all the expectations which had been formed as to her reign. In 1645 she brought to an end a war with Denmark which had been begun two

years before. The Danes had been repeatedly defeated, and by the treaty of Brémsebro they resigned to Sweden Jemtland and Harjeaadalen along with the islands of Gotland and Oesel, and gave up Halland for a period of twenty-five years. Contrary to the advice of Oxenstjerna, Christina pressed for the conclusion of peace in Germany, and, when her object was attained, the Swedes had no reason to be dissatisfied with the result. By the peace of Westphalia, concluded in 1648, Sweden obtained the duchies of Bremen, Verden, and Western Pomerania, a part of Eastern Pomerania, and Wismar. Moreover, Sweden was recognized as a state of the empire.

The Swedish people were anxious that Christina should marry, but she declined to sacrifice her independence. In 1649, however, she persuaded the diet to accept as her successor the best of her suitors, her cousin Charles Gustavus of Pfalz-Zweibriicken, the son of the only sister of Gustavus Adolphus. In the following year she was crowned with great pomp. About tlis time her character seemed to undergo a remarkable change. She became wayward and restless, neglected her tried counsellors, and followed the advice of self-seeking favourites. So much discontent was aroused by her extravagance and fickleness that she at last announced her determination to abdicate, and she abandoned her purpose only in deference to Oxenstjerna's entreaties. She now devoted herself to her duties with renewed ardour, and made her court famous by inviting to it Descartes, Grotius, Salmasius, and other scholars and

philosophers. But she had soon to encounter fresh difficulties. During the Thirty Years' War the influence of the nobles had been greatly increased, partly in consequence of their position in the army, partly through the wealth they acquired in Germany. They made as usual so bad a use of their power that an agitation which seemed likely to have most serious conse- quences sprang up against them among the peasants, the burghers, and the clergy. Unable to bring order out of the prevailing confusion, and longing for repose, Christina finally resolved to resign the crown; and in 1654 she formally laid the royal insignia before the diet in order

that they might be transferred to Charles Gustavus, who Charles

forthwith became king as Charles X. Christina imme- X. diately left the country, and did not return to it for many years. She ultimately made some attempts to recover the crown, as well as to be elected queen of Poland, but her efforts were not successful. She joined the Roman Church, and there was much talk at all the courts in Europe about the eccentricities of her character and about her passionate love of art and learning.

Charles X. (1654-1660) devoted his energies chiefly to war, in which he was brilliantly successful. He began his military career by attacking Poland, whose king claimed to be the true heir to the Swedish crown. Ina great battle at Warsaw Charles destroyed the Polish army, and Poland would probably soon have been absolutely at his mercy but for the intervention of Russia, which sought to weaken him by invading Esthonia and Livonia. While the war with Poland and Russia was in progress, Charles became involved in a strnggle with Denmark, and he conducted it so vigorously and skilfully that the Danes, by the peace of Roeskilde, signed in 1658, gave up Scania, Halland, Blekinge, and various other territories. War with Denmark was several times renewed, and at the time of his death Charles was engaged in making extensive preparations for a fresh onslaught.

He was succeeded by his son Charles XI, a child of Charles During the minority of Charles XI. XI.

four years of age. the government was carried on by his mother Hedwig Eleonore and by the chancellor De la Gardie and four other ministers. In 1660 they concluded with Poland the

peace of Oliva, whereby Sweden received the whole of Livonia as far as the Diina. Soon afterwards peace was also concluded with Denmark and Russia, the former receiving back Drontheim and Bornholm, which had been taken by Charles X. Sweden, however, kept Scania, Halland, and Blekinge, which were now finally severed from the Danish monarchy. In 1672 Charles XI. him- self assumed the direction of affairs. For some time hé seemed to take little interest in public business, and in 1674 he was rash enough to send an army into Germany to aid Louis XIV. in his war with the United Provinces and their allies, The Swedes were defeated at Fehrbellin by the elector of Brandenburg, who at once followed up his victory by taking possession of Pomerania. Christian V. of Denmark, thinking he had now a good opportunity of recovering Scania, joined the enemies of France and Sweden, and at sea the Danes gained several great victories over the Swedes. disasters, began to show the real vigour of his character. He placed himself at the head of his army, and in several battles so decisively defeated the Danes that they were driven from Scania, the greater part of which they had occupied.

sustained no other losses. At this time the finances of Sweden were in utter

confusion, and the revenue was not nearly large enough to

cover the necessary expenditure. So many of the crown

lands had from time to time been given away to nobles

that the administration could not be carried on without a system of crushing taxation.

that these lands should be taken back. Charles XI.

became convinced that there was no other way out of his

difficulties, and in 1680, with the sanction of the diet, he

ordered that the fourth part of all the crown lands which

had been given away during the previous thirty years

should be restored. This, however, was only the begin-

ning of the so-called process of reduction, which was soon extended and carried out with ruthless severity. By this measure some of the foremost families in Sweden were

ruined, and the crown was made almost independent of

the diet, for it recovered no fewer than ten counties, seventy baronies, and many smaller estates. Charles became virtually an absolute sovereign, and on the whole he made an excellent use of his power. For more than a century Sweden had been almost constantly engaged in war. She now enjoyed a period of repose, and profited greatly by the king's vigorous administration. He built fortresses, reorganized the army and navy, and carried on many important public works in the interests of commerce. He also founded the university of Lund, and made larger provision for popular education, frequently impressing upon the clergy the duty of attending to the intellectual needs of their parishioners. His comparatively early death was lamented by the great majority of the people, who were grateful for the steady determination with which he applied himself to the duties of his office.

Charles XI. was succeeded by his son Charles XII. (1697-1718), the most brilliant although not the greatest figure in Swedish history. He was a youth of fifteen when his father died, and he was so enthusiastically devoted to sport and all kinds of physical exercise that he seemed to be utterly destitute of "political ambition. Accordingly Augustus II. of Poland and Saxony, Peter I. of Russia, and Frederick

IV. of Denmark, thinking the time had come for the recovery of the possessions taken from their predecessors by Sweden, formed an alliance against him, and they appear to have had no doubt that he would be easily overcome. Charles XII., however, was

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Charles XI., aroused by these

When peace was made in 1679, Sweden had to give up to Brandenburg a part of Pomerania, but she

The common people, unable to bear the burdens imposed upon them, had often insisted

sister Hedvig Sophia.

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in reality a man of extraordinary vigour and daring, and he soon convinced his enemies that they would find in him a formidable opponent. In 1700 he began what is known as the Northern War by suddenly advancing against Copenhagen, which he was about to besiege when Frederick, alarmed by the overwhelming numbers of the enemy, accepted Charles's terms, and signed the peace of Travendahl. Charles at once crossed the Baltic to attack Augustus II. and Peter I., the former of whom was besieging Riga, while the latter threatened Narva. At Narva the Swedish king gained a splendid victory, and afterwards he defeated the Saxons, driving them away from Riga. If he had now concluded peace, he might have been for many years by far the greatest potentate in northern Europe. But he was resolved to humiliate Augustus IT., and this he did most effectually. Defeated at Klissoff, Augustus was held to have forfeited the throne of Poland, and at Charles's suggestion Stanislaus Leczinski was elected king. Charles followed Augustus into Saxony, and in 1706 forced him to conclude the treaty of Altranstiidt. Meanwhile Peter I. had been taking possession of Swedish territory on the Baltic, and on a portion of it had begun to build St Petersburg, instead of attacking him directly, Charles resolved

to thwart him by seizing Moscow, and this decision proved fatal to his great designs. Worn out by a long and dreary march, during which many soldiers died of hunger and disease, his dispirited army was defeated at Poltava (1709); and Charles, ignorant of the real condition of the enemy's forces, fled across the Russian frontier into Turkey. He remained five years in the Turkish dominions, trying to induce the sultan to become his ally. But, although war did break out between Russia and Turkey, the Turks had little confidence in Charles, for it was supposed that he wished to become king of Poland, and the sultan suspected that if this scheme were effected he might become a dangerous enemy of the Ottoman empire. Convinced at last that nothing was to be gained from Turkey, Charles made his escape, and in fourteen days rode from Adrian- ople to Stralsund. In his absence the war had been continued by Peter I., who had soon been joined again by Augustus II. and Frederick IV.; and ultimately the alliance was strengthened by the accession of the king of Prussia and the elector of Hanover, each of whom was eager to possess those Swedish territories which were in the neighbourhood of his own dominions. In Stralsund, which was besieged by an army of Danes, Saxons, Prussians, and Russians, Charles displayed astonishing valour and military skill, but about a year after his arrival the town was obliged to surrender. He then went to Lund, adopted vigorous measures for the defence of the Swedish coasts, and attacked Norway. By the advice of his friend Baron Gértz he entered into negotiations with Peter I., who was not unwilling to come to terms. Had Charles lived, it is possible that the tide of misfortune might have turned, but he was shot dead while engaged in besieging Frederikshall. His intention was to conquer Norway after having made peace with Russia, and from Norway to cross to Great Britain, where he hoped to punish the elector of Hanover by placing the Pretender on the English throne.

All the conditions of political life in Sweden were now changed. The Swedish people were surrounded by a crowd of enemies whom they could not hope to overcome, and in the confusion caused by the Northern War the nobles had recovered their anciént power. As Charles XII. had no children, it was doubtful whether the crown should

pass to his younger sister Ulrica Eleonore or to Charles Frederick of Holstein-Gottorp, the son of his elder The nobles decided in favour of

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ye. ing to place all real power in their hands.

‘ many sacrifices. | Verden to Hanover ; in 1720 Stettin and Western Pomer- ania as far as the Peene were resigned to Prussia; and in

) and a part of Viborg lan.

1660-1790.]

Ulrica Eleonore, who secured their support by undertak- In 1720 her authority was transferred to her husband, Prince Frederick

gdevk of Hesse, who reigned as Frederick I. until his death in

1751. He reigned, however, only in name, for the diet, which now practically meant the nobles, usurped every important prerogative of the crown. There were two parties, known as the Hats and the Caps, who assailed one another with much vehemence; but on one point they were agreed, and that was that the Swedish people should in future be ruled, not by a king, or bya king

acting in conjunction with the diet, but by the aristocracy.

Meanwhile Sweden had been shorn of most of the foreign territory for which in past times she had made so In 1719 she had given up Bremen and

1721 Russia obtained Livonia, Esthonia, Ingermanland, In 1741, against the wish of King Frederick, the Hats plunged into a war with Russia ;

_ and the consequence was that in 1743 Sweden had to

conclude the degrading peace of Abo, by which she lost Eastern Finland. She had even to beg Russia to aid her against Denmark, and she was obliged to recognize Adol- phus Frederick of Holstein-Gottorp, a relative of the ezarina Elizabeth, as heir to the throne.

From the reign of Charles IX. until that of Charles XII. Sweden had been one of the greatest powers in Europe. She had conducted many wars successfully ; she had secured a vast territory beyond her proper limits; in the crisis of the struggle between Catholicism and Pro- testantism she had lent powerful support to those who were fighting for spiritual freedom. In the management

_ of international relations during this period no great

| decision was arrived at by any European state without

reference to her wishes, and there seemed to be solid

reasons for the belief that her power would be enduring.

Yet she suddenly sank from her high position to that of a

third-rate state, which exercised little or no influence on

the affairs of the rest of the world. This striking change was immediately due to the calamities brought upon his country by Charles XII., but sooner or later it would have come even if he had never lived. The circumstances of Europe were in his time very different from those with which Gustavus Adolphus had to. deal. Russia had emerged as a united and growing state; Prussia had begun to display some of the qualities which were ulti- mately to make her supreme in Germany; and Hanover had been made important by the accession of the house of Brunswick to the throne of Great Britain. Sweden could not have permanently maintained her conquests against

_ these new political forces. Charles XII., by his bold but

headstrong policy, only hastened a process which was in

_ any case inevitable.

} Under Adolphus Frederick (1751-1771) Sweden took part in the Seven Years' War, siding with the enemies of Frederick the Great. But she was now so feeble, and her

Statesmen were so incompetent, that her intervention led to no serious results. The Hats, who were responsible for the humiliation brought upon Sweden by this exhibi-

| tion of her weakness, had to make way for the Caps; but

neither party had the power or the will to arouse the

'nation from the lethargy into which it had fallen. Gus- tavus III., Adolphus Frederick's son (1771-1792), was a man of a very different temper from his indolent father. He had great energy of character, a thorough comprehen-

sion of some of the conditions of political progress, and a frank and persuasive manner. In early youth he seems

| to have convinced himself that it would be impossible for

Sweden to become a prosperous country unless the royal

authority were restored, and when at the age of twenty- five he succeeded his father he secretly resolved to make the crown supreme.

He carried out his plans with remarkable ability and caution. Under the pretence that he wished to introduce a new system of military manceuvres, he collected around him about two hundred officers, most of whom were young men, and they were gradually induced to pledge themselves to support him. Agents were despatched to win over the regiments in the provinces, and Gustavus was careful to make a good

impression on the burgher class and on the peasantry. When all was ready, the commandant of Christianstad, on the 12th of August 1772, .as previously arranged, formally renounced his allegiance to the diet, and one of the king's brothers went to the town with the regiments in the neighbourhood and pretended to besiege it. Suspicions were aroused at Stockholm, and at a meeting of the council of state Gustavus was bitterly reproached by some of the members. He then boldly proclaimed his purpose. The members of the council of state were arrested, and the king received the homage of the leading authorities in the military, naval, and civil services. The diet was forthwith summoned, and at its first sitting Gustavus spoke of the lamentable condition of the kingdom, and of the need for more efficient methods of government. He had no wish, he said, to establish an absolute monarchy, but it was necessary that the supremacy of the aristocracy should be destroyed, and that the country should re-establish the system which existed in the time of Gustavus Adolphus, when the crown and the diet had each its separate func- tions and worked cordially together. A new constitution, which had been drawn up, placing executive power wholly in the king's hands, was afterwards read, and at once accepted.

Delivered from the trammels which had hampered his immediate predecessors, Gustavus worked hard for the welfare of his subjects. Agriculture, industry, and trade revived ; the army and navy were improved; and the educated classes began to show greater interest in art, literature, and science. Unfortunately the king took the court of France as the model for his own court, and the country resented the incessant demands for money which were rendered necessary by his personal extravagance. In 1788 he declared war with Russia, hoping to recover Livonia and the part of Finland which Russia had con- quered ; and the discontent he had aroused found expres- sion in the army, the leaders of which declined to fight, protesting that the war ought not to have been begun without the sanction of the diet. At the same time Den- mark was persuaded by the czarina Catherine to attack Sweden. Gustavus seemed to be on the verge of ruin, but he was saved by his own courage and sagacity. Hastening back from Finland, he was able to rescue Gothenburg from the Danes with a force raised in Dale- carlia,

and soon afterwards, through the intervention of England and Prussia, Denmark was induced to withdraw from the struggle. The majority of the diet, seeing the dangers to which the nation was exposed, rallied around the king, and, notwithstanding the opposition of the nobles, recognized the right of the crown to declare war. Impressed by the firm and rapid action of Gustavus, the army returned to its allegiance, and the conflict with Russia was begun in earnest. In 1789 the Swedes were very unsuccessful, but in the following year they gained several victories both at sea and on land. Gustavus saw, however, that it would be impossible for him to wrest from Russia any of her territories, and in 1790 peace was concluded on the understanding that both states should occupy the position they held before the war.

Gustavus

IV.

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Gustavus was greatly excited by the French Revolution, and sought to form an alliance with Russia, Prussia, and Austria for the restoration of Louis XVI. But the diet refused to support his wild schemes. Several nobles, desiring to avenge the supposed wrongs of their order, entered into a conspiracy against him, and in 1792 he was mortally wounded by an assassin who acted as their agent.

Gustavus IV. (1792-1809) was not quite fourteen years old when his father was murdered, and during his minority the government was carried on by his uncle the duke of Sédermanland. Gustavus began to exercise royal authority in 1796. His reign was remarkable chiefly for the obstinacy with which he clung to his own ideas, no matter how far they might conflict with the obvious interests of his country. He had a bitter detestation of Bonaparte, and in 1803 went to Carlsruhe in the hope that he might induce the emperor and some of the German princes to act with him in support of the Bourbons. His enmity led to an open rupture with France, and even after the peace of Tilsit, when

Russia and Prussia offered to mediate between hin and the French emperor, he refused to come to terms. The consequence was that he lost Stralsund and the island of Riigen. He displayed so much friendship for England that Russia and Denmark, acting under the influence of France, declared war against him; and the whole of Finland was soon held by Russian troops. Gustavus attacked Norway, but his army was driven back by the Danes and Norwegians. He still declined to make peace, and he even alienated England when she attempted to influence him by moderate counsels. The Swedish people were so enraged by the consequences of his policy that in 1809 he was dethroned, and the claims of his descendants to the crown were also repudi- ated. He was succeeded by the duke of Sédermanland, who reigned as Charles XIIT.

Charles XIII. (1809-1818) concluded peace with Russia, Denmark, and France, ceding to Russia by the treaty of Frederikshamm (1809) the whole of Finland. The loss of this territory, which had been so long associ- ated with the Swedish monarchy, was bitterly deplored by the Swedes, but it was universally admitted that under the circumstances the sacrifice was unavoidable. Charles assented to important changes in the constitution, which were intended to bring to an end the struggle between the crown and the aristocracy and to provide some security for the maintenance of popular rights. The king was still to be at the head of the executive, but it was arranged that legislative functions and control over taxation should belong to the diet, which was to consist of four orders— nobles, clergymen, burghers, and peasants.

As Charles XIII. was childless, the diet elected as his successor Prince Christian Augustus of Holstein-Sonder- burg-Augustenburg. In 1810, soon after his arrival in Stockholm, this prince suddenly died ; and Sweden aston- ished Europe by asking Marshal Bernadotte to become lieir to the throne. Bernadotte, who took the name of Charles John, was a man of great vigour and resource, and soon made himself the real ruler of Sweden. Napoleon treated Sweden as almost a conquered country, and com- pelled her to declare war with England. Bernadotte, associating himself heartily with his adopted land, resolved to secure its independence, and entered into an alliance with Russia. In 1813 he started with an army of 20,000 Swedes to co-operate with the powers

which were striving finally to crush the French emperor. The proceedings of the Swedish crown prince were watched with some suspicion by the allies, as he was evidently unwilling to strike a decisive blow at France; but after the battle of Leipsic he displayed much activity. He blockaded Hamburg, and by the peace of Kiel, concluded in January 1814, he

forced Denmark to give up Norway. He then entered France, but soon returned, and devoted his energies to the conquest of Norway, which was very unwilling to be united with Sweden. Between the months of July and November 1814 the country was completely subdued, and Charles XIIT. was proclaimed king. The union of Sweden and Norway, which has ever since been maintained, was recognized by the congress of Vienna; and it was placed on a sound basis by the frank adoption of the principle that, while the two countries should be subject to the same crown and act together in matters of common interest, each should have complete control over its internal affairs. The new relation of their country to Norway gave much satisfaction to the Swedes, whom it consoled in some measure for the loss of Finland. It also made it easy for them to transfer to Prussia in 1815 what remained of their Pomeranian territories.

In 1818 Bernadotte mounted the throne as Charles Charl XIV., and he reigned until he died in 1844. Great XIV.

material improvements were effected during his reign, He caused new roads and canals to be constructed; he encouraged the cultivation of districts which had formerly been barren; and he founded good industrial and naval schools. He was not, however, much liked by his subjects. He never mastered the Swedish language, and he was so jealous of any interference with his authority that he sternly punished the expression of opinions which he dis- liked. To the majority of educated Swedes the constitu- tion seemed to be ill-adapted to the wants of the nation, and there was a general demand for a political

system which should make the Government more directly respon- sible to the people. In 1840 a scheme of reform was submitted to the diet by a committee which had been appointed for the purpose, but the negotiations and dis- cussions to which it gave rise led to no definite result.

Charles XIV. was succeeded by his son Oscar I. (1844- Oscar.

1859). Oscar had always expressed sympathy with liberal opinions, and it was anticipated that the constitutional question would be settled during his reign without much difficulty. These expectations were disappointed. The diet met soon after his accession, and was asked to accept the scheme which had been drawn up in 1840. The measure received the cordial approval of the burghers and peasants, but was rejected by the nobles and the clergy. In 1846 a committee was appointed to prepare a new set of proposals, and late in the following year the discussion of its plans began. While the debates on the subject were proceeding some excitement was produced by the revolutionary movement of 1848, and a new ministry, pledged to the cause of reform, came into office. The scheme devised by this ministry was accepted by the committee to which it was referred, but the provisions of the existing constitution rendered it necessary that the final settlement should depend upon the vote of the next diet. When the diet met in 1850 it was found that the

difficulties in the way were for the time insuperable. –

The proposals of the Government were approved by 4 majority of the burghers, but they were opposed by the nobles, the clergy, and the peasantry. The solution of the problem had, therefore, to be indefinitely postponed. Although the constitution was not reformed, much was done in other ways during the reign of Oscar I. to pro- mote the national welfare. The criminal law was brought into accordance with modern ideas, and the law of inhertt- ance was made the same for both sexes and for all classes of the community. Increased freedom was secured or industry and trade; the methods of administration were improved ; and the state took great pains to provide the country with

an efficient railway system. The result of the wise legislation of this period was that a new spirit of

the conflict. ‘ Russian acts of aggression on his northern frontiers, the _ king of Sweden and Norway concluded a treaty with _ England and France, pledging himself not to cede terri- | tory to Russia, and receiving from the Western powers a

national representatives.

) brother Oscar II., who still reigns (1887).

‘ in other collections.

| by Riihs in the 19th.

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enterprise was displayed by the commercial classes, and that in material prosperity the people made sure and rapid progress.

In 1848, when the difficulty about Schleswig-Holstein led to war between Denmark and Germany, the Swedes sympathized cordially with the Danes, of whom they had for a long time ceased to be in the slightest degree jealous. Swedish troops were landed in Fiinen, and through the influence of the Swedish Government an armistice was concluded at Malmo. The excitement in favour of Den- mark soon died out, and when the war was resumed in 1849 Sweden resolutely declined to take part in it. The outbreak of the Crimean War greatly alarmed the Swedes, who feared that they might in some way be dragged into In 1855, having some reason to complain of

LITERATURE. |

promise of help in the event of his being attacked. . The

demands based on this treaty were readily granted by

Russia in the peace of Paris in 1856. Charles XV. (1859-1872) mounted the throne after

’. his father’s death. Nearly two years before his accession

_he had been made regent in consequence of Oscar I.’s ill- health. Charles was a man of considerable intellectual ability and of decidedly popular sympathies, and during his reign the Swedish people became enthusiastically loyal to his dynasty. In 1860 two estates of the realm—the peasants and the burghers—presented petitions, begging him to submit to the diet a scheme for the reform of the constitution. This request he willingly granted. The main provisions of the plan offered in his name were that the diet should consist of two chambers,—the first chamber

» to be elected for a term of nine years by the provincial

assemblies and by the municipal corporations of towns not represented in those assemblies, the second chamber to be elected for a term of three years by all natives of Sweden possessing a specified property qualification. The execu-

» tive power was to belong to the king, who was to act

under the advice of a council of state responsible to the This plan, which was received with general satisfaction, was finally adopted by the diet in 1866, and is still in force.

Early in the reign of Charles XV. there were serious disputes between Sweden and Norway, and the union of the two countries could scarcely have been maintained but for the tact and good sense of the king. He also exercised a steadying influence in 1863, when his people expressed passionate sympathy with the Poles in their insurrection against Russia, and with the Danes in their war with Prussia and Austria.

Charles XV. died in 1872, and was succeeded by his Under him Sweden has maintained good relations with all foreign

_ powers, and political disputes in the diet have never been

serious enough to interrupt the material progress of the nation.

_ Many documents relating to Swedish history have been published in Scriptores Rerum Suecicarum Medii divi, edited by Fant, Geijer, and Schroder, in Scriptores Suecict Medii Avi, edited by Rietz, and Among the older histories of Sweden may be named those by Dalin and Lagerbring in the 18th century and More important works on the subject are

those by Geijer, Carlson, Fryxell, and Strinnholm. (J. SI.)

Part III. —LITERATURE. Swedish literature, as distinguished from compositions

in the common norrexna tunga of old Scandinavia, cannot ’ be said to exist earlier than the 13th century. Nor until

the period of the Reformation was its development in

any degree rapid or copious. The oldest form in which Swedish! exists as a written language is the series of manuscripts known as Landskapslagarne, or “The Com- mon Laws.” These are supposed to be the relics of a still earlier age, and it is hardly believed that we even possess the first that was put down in writing. The most important and the most ancient of these codes is the “Elder West Géta Law,” reduced to its present form by

| the law-man Eskil about 1230. Another of great interest

is Magnus Eriksson’s “‘ General Common Law,” which was written in 1347. These ancient codes have been collected and edited by Prof. Schlyter. The chief ornament of medizval Swedish literature is Um Styrilse Kununga ok Héfdinga (“On the Conduct of Kings and Princes”), first printed, by command of Gustavus IL. Adolphus, in

1634. The writer is not known; it has been conjecturally dated 1325. It isa handbook of moral and political teaching, expressed in terse and vigorous language. St Bridget, or Birgitta (13027-1373), an historical figure of extraordinary interest, has left her name attached to several important religious works, in particular to a collection of Uppen-

_ barelser (“‘ Revelations”), in which her visions and ecstatic

meditations are recorded, and a version, the first into Swedish, of the five books of Moses. This latter was undertaken, at her desire, by her father-confessor Mattias (d. 1350), a priest at Ianképing. The translation of the Bible was continued a century later by a monk named Johaunes Budde (d. 1484),

In verse the earliest Swedish productions were probably the folk-songs. The age of these, however, has been commonly exaggerated. It is doubtful whether any still exist which are as old, in their present form, as the 13th century. The bulk are now attributed to the 15th, and many are doubtless much later still. The last, such as “Axel och Valborg,” ‘ Liten Karin,” “Kampen Grim- borg,” and “Habor och Signild,” deal with the adven- tures of romantic medieval romance. Almost the only positive clue we hold to the date of these poems is the fact that one of the most characteristic of them, ‘ Engel- brekt,” was written by Tomas, bishop of Strengniés, who died in 1443. Tomas, who left other poetical pieces, is usually called the first Swedish poet. There are three rhyming chronicles in medieval Swedish, all anonymous. The earliest, Hrikskrinikan, is attributed to 1320; Karls- kronkan is at least 120 years later; and the third, Sturekrénikorna, was probably written about 1500. All three have been edited by G, E. Klemming. The col- lection of rhymed romances which bears the name of Queen Euphemia’s Songs must have been written before the death of that lady in 1312. They are believed to date from 1303. They are versions of three medizval stories taken from French and German sources, and they deal respectively with King Arthur and the Table Round, with Duke Frederick of Normandy, and with Flores and Blancheflor. They possess very slight poetic merit in their Swedish form. A little later the romance of King Alexander was translated by, or at the command of,

Bo Jonsson Grip; this is more meritorious. A brilliant and pathetic relic of the close of the medival period exists in the Love Letters addressed in 1498 by Ingrid Persdotter, a nun of Vadstena, to the young knight Axel Nilsson. The first book printed in the Swedish language appeared in 1495.

The 16th century added but little to Swedish literature, and that little is mostly connected with the newly founded university of Upsala. The Renaissance scarcely made itself felt in Scandinavia, and even the Reformation failed to waken the genius of the country. Psalms and didactic

1 For the Swedish language, see SCANDINAVIAN LANGUAGES, Vol. xxi.

spiritual poems were the main products of Swedish letters in the 16th century. Two writers, the brothers Petri, take an easy prominence in so barren a period. Olaus Petri (1497-1552) and Laurentius Petri (1499-1573) were Carmelite monks who proceeded in 1516 to Witten- berg to study theology under Luther, and who came back to Sweden as the apostles of the new faith. Olaus, who is one of the noblest figures in Swedish annals, was of the executive rather than the meditative class.) He found time, however, to write a Chronicle, which is the earliest prose history of Sweden, a mystery-play, Tobie Comedia, which is the first Swedish drama, and three psalm-books, the best known being published in 1530 under the title of Vagre Gudhelige Vijsor (“ Certain Divine Songs”). lLaurentius Petri, who was archbishop of all Sweden, edited or superintended the translation of the Bible published at Upsala in 1540. He also wrote many psalms. lLaurentius Andree, who died in 1552, had previously prepared a translation of the New Testament, which appeared in 1526. He was a polemical writer of prominence on the side of the Reformers. Finally, Petrus Niger (Peder Svart), bishop of Vesteras (d. 1562), wrote a chronicle of the life of Gustavus I. up to 1533, in excel- lent prose. The same writer left unpublished a history of

the bishops of Westeras his predecessors. The latter half of the 16th century is a blank in Swedish literature. With the accession of Charles IX. and the consequent development of Swedish greatness, literature began to assert itself in more vigorous forms. The long life of the royal librarian, Johannes Bureus (1568-1652), formed a link between the age of the Petri and that of Stjernhjelm. Bureus studied all the sciences then known to mankind, and confounded them all in a sort of Rabbinical cultus of his own invention, a universal philosophy in a multi- tude of unreadable volumes, But he was a patient anti- quarian, and advanced the knowledge of ancient Scandi- navian mythology and language very considerably. He awakened curiosity and roused a public sympathy with letters ; nor was it without significance that two of the greatest Swedes of the century, Gustavus Adolphus and the poet Stjernhjelm, were his pupils. The reign of Charles IX. saw the rise of secular drama in Sweden. The first comedy was the Zisbe of Magnus Olai Astero- pherus (d. 1647), a coarse but witty piece on the story of Pyramus and Thisbe, acted by the schoolboys of the college of Arboga in 1610. This play is the Ralph Roister Doister of Swedish literature. A greater dramatist was Johannes Messenius (1579-1636), who, having been discovered plotting against the Government during the absence of Gustavus in Russia, was condemned to im- prisonment for life—that is, for twenty years. Before this disaster he had been professor in Upsala, where his first historical comedy Disa was performed in 1611 and the tragedy of Stgnil/in 1612. The design of Messenius was to write the history of his country in fifty plays; he completed and produced six. These dramas are not particularly well arranged, but they form a little body of theatrical literature of singular interest and value. Mes- senius was a genuine poet; the lyrics he introduces have something of the charm of the old ballads. He wrote abundantly in prison; his magnum opus was a history of Sweden in Latin, but he has also left, in Swedish, two important rhyme-chronicles, Messenius was imitated by a little crowd of playwrights. Nikolaus Catonius (d. 1655) wrote a fine tragedy on the Trojan War, Troijen- borgh, in which he excelled Messenius as a dramatist. Andreas Prytz, who died in 1655 as bishop of Linköping, produced several religious chronicle plays from Swedish history. Jacobus Rondeletius (d. 1662) wrote a curious "Christian tragi- comedy" of Judas Redivivus. 'These

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plays were all acted by schoolboys and university youths, and when they went out of fashion among these classes the drama in Sweden almost entirely ceased to exist, Two historians of the reign of Charles IX., Erik Géransson Tegel (d. 1636) and Agidius Girs (d. 1639), deserve

mention.

[LITERATURE,

The reign of Gustavus Adolphus was adorned by one Stjern. great writer, the most considerable in all the early history hjelm

of Sweden. The title of "'the Father of Swedish Poetry" has been universally awarded to Géran Lilja, better known by his adopted name of Georg Stjernhjelm (1598-1672), This extraordinary man was born at Wika in Dalecarlia on the 7th of August 1598. He took his degree at Greifswald, and spent some years in travelling over every quarter of Europe. On his return he attracted the notice of Gustavus Adolphus, who gave him a responsible post at Dorpat in 1630, and raised him next year to the nobility. After the king's death Christina attached him, as a kind of poet-laureate, to her court in Stockholm, His property lay in Livonia, and when the Russians plundered that province in 1656 the poet was reduced to extreme poverty for two or three years. He died at Brunkeborg in Stockholm on the 22d of April 1672, Stjernhjelm was a man of almost universal attainment, but it is mainly in verse that he has left his stamp upon the literature of his country. He found the language rough and halting, and he moulded it into perfect smoothness and elasticity. His master Bureeus had written a few Swedish hexameters by way of experiment. Stjern- hjelm took the form and made it national. His greatest poem, L/ercules, is a didactic allegory in hexameters, written in very musical verse, and with an almost Oriental splendour of phrase and imagery. In its faults as well as its beauties the style of Stjernhjelm reminds us of that of his great Dutch contemporary Vondel. He was certainly influenced by a writer a few months older than himself, the German poet Martin Opitz. The Hercules, which deals with the familiar story of the dispute for the hero between Duty and Pleasure, was first printed, at Upsala, in 1658, but was finished some years earlier. Bréllops- Besvirs Ihugkommelse, a sort of serio-comic epithalamium in the same measure, is another very brilliant work of Stjernhjelm. His masques, Zhen fagne Cupido ('Cupid Caught") (1649), Preds-aft (" The Birth of Peace") (1649), and Parnassus Triumphans (1651), were written for the entertainment of the queen, and have a charming lyrical lightness. He can scarcely, however, be said to have been successful in his attempt, in the first two of these, to introduce unrhymed song-measures. Stjernhjelm was an

active philologist, and left a great number of works on language, of which only a few have ever been printed. He wrote letter A of the earliest Swedish dictionary, published in 1643, and a work on mathematics entitled Archimedes Reformatus. No brighter intellectual figure arose in Sweden till the beginning of the 19th century.

The claim of Stjernhjelm to be the first Swedish Sie may be contested by a younger man, but a slightly earlier”

writer, Gustaf Rosenhane (1619-1684), who was @ reformer on quite other lines. If Stjernhjelm studied Opitz, Rosenhane took the French poets of the Renais- sance for his models, and in 1650 wrote a cycle of one hundred sonnets, the earliest in the language; these were published under the title Venerid in 1680. Rosenhane printed in 1658 a “Complaint of the Swedish Lam guage” in thirteen hundred rattling rhyming lines, and in 1682 a collection of eighty songs. He was 4 metrist of the artistic order, skilful, learned, and unim- passioned. His zeal for the improvement of the litera ture of his country was beyond question. Most of the young poets followed Stjernhjelm rather than Rose

| various occasions by Lucidor the Unfortunate.

+ edition of only 100 copies. _ forgotten, and the name of Wexionius had dropped out of

_ and reprinted its contents in 1863. ‘ considered only the followers of Stjernhjelm; we have _ now to speak of an important writer who followed in the

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hane. As personal friends and pupils of the former, the brothers Columbus deserve special attention. Each wrote copiously in verse, but Johan (1640-1684) almost entirely in Latin, while Samuel (1642-1678), especially in his Odx Suethice, showed himself an apt and fervid imitator of the Swedish hexameters of Stjernhjelm. Of a rhyming family of Hjarne, it is enough to mention one member, Urban Hjarne

(1641-1724), who introduced the new form of classical tragedy from France, in a species of

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transition from the masques of Stjernhjelm to the later regular rhymed dramas. _ Lars Johansson (1642-1674), who called himself " Luci-

His best play was a Rosimunda.

dor the Unfortunate," has been the subject of a whole tissue of romance, most of which is fabulous. It is true, however, that he was stabbed, like Marlowe, in a mid- night brawl at a tavern. His poems were posthumously collected as Flowers of Helicon, Plucked and Distributed on Stripped of the myth which had attracted so much attention to his name, Lucidor proves to be an occasional rhymster of a very low order. Haquin Spegel (1645-1714), the famous archbishop of Upsala, wrote a long didactic epic in alex- andrines, G'od's Labour and Rest, with an introductory ode to the Deity in rhymed hexameters.° He was also a good writer of hymns. Another ecclesiastic, the bishop of Skara, Jesper Svedberg (1653-1735), wrote sacred verses, but is better remembered as the father of Sweden- borg. Peter Lagerléf (d. 1699) cultivated a pastoral vein in his Llisandra and Lucillis ; he was professor of poetry, that is to say, of the art of writing Latin verses, at Upsala. Olof Wexionius (1656-1690 ?) published his Sinne-Afvel, a collection of graceful miscellaneous pieces, in 1684, in an Its existence was presently

the history of literature, when Hanselli recovered a copy We have hitherto

footsteps of Rosenhane. Gunno Eurelius, afterwards en-

mi nobled with the name of Dahlstjerna (1661-1709), early

showed an interest in the poetry of Italy. In 1690 he translated Guarini's Pastor Fido, and iu or just after 1697

_ published, in a folio volume without a date, his Kunga- _ Skald, the first original poem in ottava rima produced in

Swedish. This is a bombastic and vainglorious epic in

_ honour of Charles XI., whom Eurelius adored ; it is not, however, without great merits, richness of language, flow-

ing metre, and the breadth of a genuine poetic enthusiasm.

He published a little collection of lamentable sonnets when his great master died. Eurelius struck the lyre _ several times in honour of Charles XII, but these poems | have all perished. He was a true patriot, and grief at _ the defeat of Poltava is said to have cost him his life.

Johan Runius (1679-1713), called the “Prince of Poets,”

| published a collection entitled Dudaim, in which there is

nothing to praise, and with him the generation of the 17th century closes. Talent had been shown by certain individuals, but no healthy school of Swedish poetry had

| been founded, and the latest imitators of Stjernhjelm had | lost every vestige of taste and independence.

In prose the 17th century produced but little of import-

ance in Sweden. Gustavus Adolphus (1594-1632) was

| the most polished writer of its earlier half, and his ‘ speeches take an important place in the development of _ the language. bet. was Olof Rudbeck (1630-1702), the famous author of | Atland er Manhem.

The most original mind of the next age

He spent nearly all his life in Upsala, building anatomical laboratories, conducting

| musical concerts, laying out botanical gardens, arranging

medical lecture rooms—in a word, expending ceaseless

energy on the practical improvement of the university. He was a genius in all the known branches of learning ; at twenty-three his physiological discoveries had made him famous throughout Europe. His Adland (or Atlan- tka) appeared in four folio volumes, in Latin and Swedish, in 1679-98 ; it was an attempt to summon all the authority of the past, all the sages of Greece and the bards of Iceland, to prove the inherent and indisputable greatness of the Swedish nation, in which the fabulous Atlantis had been at last discovered. It was the literary expression of the majesty of Charles XI., and of his autocratical dreams for the destiny of Sweden. From another point of view it is a monstrous hoard or cairn of rough-hewn antiquarian learning, now often praised, sometimes quoted from, and never read. Olof Verelius (1618— 1682) had led the way for Rudbeck, by his translations of Icelandic sagas, a work which was carried on with greater intelligence by Johan Peringskjéld (1654-1720), the editor of the Heimskringla. The French philosopher Descartes, who died at Christina's court at Stockholm in 1650, found his chief, though posthumous, disciple in Anders Rydelius (1671-1738), bishop of Lund, who was the master of Dalin, and thus connects us with the next epoch. Charles XIL, under whose special patronage Rydelius wrote, was himself a metaphysician and physio- logist of merit.

A much more brilliant period followed the death of Charles XIJ. The influence of France and England took the place of that of Germany and Italy. The taste of Louis XIV., tempered by the study of Addison and Pope, gave its tone to the academical court of Queen Ulrica Eleonore, and Sweden became completely a slave to the periwigs of literature, to the unities and graces of classical France. Nevertheless this was a period of great intel- lectual stimulus and activity, and Swedish literature took a solid shape for the first time. This Augustan period in Sweden closed somewhat abruptly about 1765. Two writers in verse connect it with the school of the preced- ing century. Jacob Frese (1691-1729), whose poems were published in 1726, was an elegiacal writer of

much grace, who foreshadowed the idyllic manner of Creutz, Samuel von Triewald (1688-1743) played a very imper- fect Dryden to Dalin's Pope. He was the first Swedish satirist, and introduced Boileau to his countrymen. His Satire upon our Stupid Poets may still be read with entertainment. (1708-1763) takes a higher place than any writer since Stjernhjelm. He was inspired by the study of his great English contemporaries. His Swedish Argus (1733-34) was modelled on Addison's Spectator, his Thoughts about Critics (1736) on Pope's Essay on Criticism, his Tale of a Horse on Swift's Tale of a Tub. Dalin's style, whether in prose or verse, was of a finished elegance. His great epic, Swedish Freedom (1742), was written in alexandrines of far greater smoothness and vigour than had previously been attempted. When in 1737 the new Royal Swedish theatre was opened, Dalin led the way to a new school of dramatists with his Brynhilda, a regular tragedy in the style of Crébillon pére. In his comedy of The Envious Man, he introduced the manner of Moliére, or more pro- perly that of Holberg. His songs, his satires, his occa- sional pieces, without displaying any real originality, show Dalin's tact and skill as a workman with the pen. He stole from England and France, but with the plagiarism of a man of genius; and his multifarious labours raised Sweden to a level with the other literary countries of Europe. They formed a basis upon which more national and more scrupulous writers could build their various structures. A foreign critic, especially an English one, will never be able to give Dalin so much credit as the

Both in verse and prose Olof von Dalin Dalin.

Fru Norden- flycht.

Creutz.

Gyllen- borg.

Swedes do; but he was certainly an unsurpassable master | genius in the whole century ; but he wrote almost entirely

of pastiche.

The only poet of importance who contested the laurels of Dalin was a woman. Hedvig Charlotta Nordenflyclit (1718-1763) was the centre of a society which ventured to rival that which Queen Ulrica Eleonore created and Dalin adorned. Both groups were classical in taste, both worshipped the new lights in England and France. Fru Nordentlycht wrote with facility and grace ; her collection of lyrics, Zhe Sorrowing Turtledove (1743), in spite of its affectation, enjoyed and merited a great success ;_ it was the expression of a deep and genuine sorrow—the death of her husband after a very brief and happy married life. It was in 1744 that she settled in Stockholm and opened her famous literary salon. She was called "The Swedish Sappho," and scandal has been needlessly busy in giving point to the allusion. It was to Fru Nordenflycht's credit that she discovered and encouraged the talent of two very distinguished poets younger than herself, Creutz and Gyllenborg. Gustaf Filip Creutz (1729-1785) was a Finlander who achieved an extraordinary success with his idyllic poems, and in particular with the beautiful pastoral of Atzs och Camilla, long the most popular of all Swedish poems. In 1763, the year of the death of Dalin and of Fru Nordenflycht, Creutz ceased to write, having been appointed minister to Spain; he gave up poetry for poli- tics. Gustaf Frederik Gyllenborg (1731-1808) was a less accomplished poet, less delicate and touching, more rhetorical and artificial. His epic Taget éfver Bilt ("The Expedition across the Belt") (1785) is an imitation, in twelve books, of Voltaire's Henriade, and deals with the prowess of Charles X. It is impossible to read it. He wrote fables, allegories, and satires. He outlived his chief contemporaries so long that the new generation addressed him as "Father Gyllenborg." Anders Odel (1718-1773) wrote in 1739 the famous 'Song of Malcolm Sinclair," the Stnclairsvisa. The writers of verse in this period were exceedingly numerous, but it cannot be need- ful, in a sketch of this kind, to preserve the minor names.

In prose, as was to be expected, the first half of the 18th century was rich in Sweden as elsewhere. The first Swedish novelist was Jakob Henrik Mork (1714-1763). His romances have some likeness to those of Richardson ; they are moral, long-winded, and slow in evolution, but written in an exquisite style, and with much knowledge of human nature. Adalrik och Géthilda, which went on appearing from 1742 to 1745, is the best known; it was followed, between 1749 and 1758, by Thecla. Jakob Wallenberg (1746-1778) described a voyage he took to the East Indies and China under the very odd title of Min Son pa Galejan (" My Son at the Galleys"), a work full of humour and originality. We have already indicated that Dalin's activity in prose was scarcely less abundant or less meritorious than that in verse. He wrote an important history of Sweden down to Charles IX. His contemporary Johan Ihre (1707-1780), a professor at Upsala, edited the Codex Argenteus of Ulfilas, and produced the first com- plete Swedish dictionary. In doing this he was assisted by the labours of two other grammarians, Sven Hof (d. 1786) and Abraham Sahlstedt (d. 1776). Karl Gustaf Tessin (1695-1770) wrote on politics and on esthetics. Anders Johan von Hépken (1712-1789), the friend of Ulrica Eleonore, was a master of rhetorical compliment in addresses and funeral orations. In spite of all the encouragement of the court, drama did not flourish in Sweden. Among the tragedians of the age we may men- tion Dalin, Gyllenborg, and Erik Wrangel (d. 1765). In comedy Reinhold Gustaf Modée (d. 1752) wrote three good plays in rivalry of Holberg. In science Linnzeus, or Karl von Linné (1707-1778), was the name of greatest

in Latin. The two great Swedish chemists, Torbern Olof Bergman (1735-1784) and Karl Vilhelm Scheele (1749— 1786), flourished at this time. In pathology a great name was left by Nils Rosén von Rosenstein (1706-17 73), in navigation by Admiral Fredrik Henrik af Chapman (d. 1808), in philology by Karl Aurivillius (d. 1786). But these and other distinguished savants whose names might be enumerated scarcely belong to the history of Swedish literature. The same may be said about that marvellous and many-sided genius, Emanuel Swedenborg (1688-1772), who, though the son of a Swedish poet, preferred to prophesy to the world in Latin (see SwEDENBORG),

What is called the Gustavian period is supposed to commence with the reign of Gustavus III. in 1771 and to close with the abdication of Gustavus IV. in 1809, This period of less than forty years was particularly rich in literary talent, and the taste of the people in literary matters widened to a remarkable extent. Journalism began to develop; the Swedish Academy was founded; the drama first learned to flourish in Stockholm; and literature began to take a characteristically national shape. This fruitful period naturally divides itself into two divisions, equivalent to the reigns of the two kings, The royal personages of Sweden have commonly been pro- tectors of literature; they have strangely often been able men of letters themselves. Gustavus III. (1746-1792), the founder of the Swedish Academy and of the Swedish theatre, was himself a playwright of no mean ability. One of his prose dramas, Siri Brahe och Johan Gyllen- stjerna, held the stage for many years. In 1773 the king opened the national theatre in Stockholm, and on that occasion an opera of Thetis och Pelée was performed, written by himself. In 1786 Gustavus created the Swedish Academy, on the lines of the French Academy, but with eighteen members instead of forty. The first list of immortals, which included the survivors of a previous age and such young celebrities as Kellgren and Leopold, embraced all that was most brilliant in the best society of Stockholm ; the king himself presided, and won the first prize for an oration. The principal writers of the reign of Gustavus IIT. bear the name of the Academical school. But we must first consider a writer of genius who had nothing academical in his composition.

Karl Mikael Bellman (1740-1795), the most original Bellman.

and one of the most able of all Swedish writers, was an improvisatore of the first order (see Bettman). The riot of his dithyrambic hymns sounded a strange note of nature amid the conventional music of the Gustavians. Of the academical poets Johan Gabriel Oxenstjerna (1750-1818), the nephew of Gyllenborg, was a descriptive idyllist of grace. He translated Paradise Lost. A writer

of far more power and versatility was Johan Henrik Kellgren.

Kellgren (1751-1795), the leader of taste in his time (see KELLGREN). He was the first writer of the end of the

century in Sweden, and the second undoubtedly was Karl Leopolt.

Gustaf af Leopold (1756-1829), “the blind seer Tiresias- Leopold,” who lived on to represent the old school in the midst of romantic times. Leopold was not equal to Kellgren in general poetical ability, but he is great in didactic and satiric writing. He wrote a satire, the Enebomiad, against a certain luckless Per Enebom, and a classic tragedy of Virginia. He is little read now. Gudmund Géran Adlerbeth (1751-1818) was a translator, and the author of a successful tragic opera, Cora och Alonzo (1782). Anna Maria Lenngren (1754-1817) was a very popular sentimental writer of graceful verse, chiefly between 1792 and 1798. She was less French and more national than most of her contemporaries; she 18 @ Swedish Mrs Hemans.

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Two writers of the academic period, besides Bellman, and a generation later than he, kept apart, and served to lead up to the romantic revival. Bengt Lidner (1759- 1793), a melancholy and professedly elegiacal writer, had analogies with such German sentimentalists as Novalis. | He led a strange wandering life, and died, still young, in j extreme poverty. His poems appeared in 1788. Tomas | Thorild (1759-1808) was a much stronger nature, and led the revolt against prevailing taste with far more vigour. But he is an irregular and inartistic versifier, and it is mainly as a prose writer, and especially as a very original and courageous critic, that he is now mainly remembered. He settled in Germany, and died as a pro- fessor in Greifswald. Karl August Ehrensvaérd (1745- 1800) may be mentioned here as a critic whose aims somewhat resembled those of Thorild. The creation of the Academy led to a great production of esthetic and philosophical writing. Among critics of taste may be mentioned Nils von Rosenstein

(1752-1824) ; the rhetor- ical bishop of Linköping, Magnus Lehnberg (1758-1808) ; and Count Georg Adlersparre (1760-1809). Kellgren and Leopold were both of them important prose writers.

The excellent lyrical poet Frans Mikael Franzén (1772- 1847) (see Franzen), and a belated academician Johan David Valerius (1776-1852), fill up the space between _ the Gustavian period and the domination of romantic mé ideas from Germany. It was Lorenzo Hammarskéld

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Md: (1785-1827) who in 1803 introduced the views of Tieck

/and Schelling by founding the society in Upsala called " Vitterhetens Vanner" (see HAMMARSKOLD). This passed away, but was succeeded in 1807 by the famous " Aurora – forbundet," founded by two youths of genius, Per Daniel – Amadeus Atterbom (1790-1855) and Vilhelm Frederik Palmblad (1788-1852). These young men had at first _ to endure bitter opposition and ridicule from the academic writers then in power, but they supported this with Polyfem and Fosforos (1810-1813). They were named _ "Fosforisterna " (Phosphorists) from the latter. The principal members of the school were the three writers | last named (see ATTERBoM) and Karl Frederik Dahlgren _ (1791-1844), a humorist who owed much to the example of Bellman. Fru Julia Nyberg (1785-1854), under the title of Euphrosyne, was their tenth Muse, and wrote agreeable lyrics. Among the Phosphorists Atterbom was the man of most genius. On the side of the Academy they were vigorously attacked by Per Adam Wallmark (1777-1858). One of them, Atterbom, eventually forced the doors of the Academy itself.

_ In 1811 certain young men in Stockholm founded a society for the elevation of society by means of the study ie of Scandinavian antiquity. This was the Gothic Society, iwhich began to issue the magazine called Jduna as its organ. Of its patriotic editors the most prominent was

jes Erik Gustaf Geijer (1783-1847), but he was presently

joined by a young man slightly older than himself, Esaias)Tegnér (1782-1846), afterwards bishop of Vexid, the "greatest of Swedish writers (see GEIJER and TEGNER). . Even more enthusiastic than either in pushing to its last extreme the worship of ancient myths and manners was | Per Henrik Ling (1776-1839), now better remembered as the father of gymnastic science than asa poet. The | Gothic Society eventually included certain younger men | than these—Arvid August Afzelius (1785-1871), the first editor of the Swedish folk-songs; Gustaf Vilhelm } Gumeelins (1789-1877), who has been somewhat pre- 'tentiously styled "The Swedish Walter Scott," author of the historical novel of Zord Bonde; Baron Bernhard von | Beskow (1796-1868), lyrist and dramatist; and Karl _ August Nicander (1799-1839), a poet who approached

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the Phosphorists in manner. The two great lights of the Gothic school are Geijer, mainly in prose, and Tegnér, in

his splendid and copious verse. Johan Olof Wallin Wallin. (1779-1839) may be mentioned in the same category, although he is really distinct from all the schools. He

was archbishop of Upsala, and in 1819 he published the national hymn-book of Sweden, now officially used in all churches ; of the hymns in this collection, one hundred

and twenty-six are written by Wallin himself.

From 1810 to 1840 was the blossoming-time in Swedish poetry, and there were several writers of distin- guished merit who could not be included in either of the groups enumerated above. Second only to Tegnér in genius, the brief life and mysterious death of Erik Johan Stag- Stagnelius (1793-1823) have given a romantic interest to nelius. all that is connected with his name. His first publica- tion was the epic of Vladimir the Great (1817); to this succeeded the romantic poem Blanda. His singular dramas, The Bacchantes (1822), Sigurd Ring, which was posthumous, and Zhe Martyrs (1821), are esteemed by

many critics to be his most original productions. His mystical lyrics, entitled Liljor 1 Saron ("Lilies in Sharon"), and his sonnets, which are the best in Swedish, may be recommended as among the most delicate products of the Scandinavian mind. Stagnelius has been compared, and not improperly, to Shelley. Erik Sjéberg, who called Sjoberg. himself " Vitalis" (1794-1828), was another gifted writer whose career was short and wretched. A volume of his poems appeared in 1820; they are few in number and all brief. His work divides itself into two classes—the one profoundly melancholy, the other witty or boisterous. Two humorous poets of the same period who deserve mention are Johan Anders Wadman (1777-1837), an improvisatore of the same class as Bellman, and Kristian Erik Fahlcrantz (1790-1866), bishop of Vesteras, whose humorous polemical poem of Noah's Ark (1825) is a masterpiece.

Among the poets who have been mentioned above, the majority distinguished themselves also in prose. But the period was not one in which Swedish prose shone with any special lustre. The first prosaist of the time was,

without question, the novelist Karl Jonas Ludvig Alm- Almqvist.

qvist (1793-1866), around whose extraordinary personal character and career a mythical romance has already collected (see ALMQvist). He was encyclopedic in his range, although his stories preserve most charm ; on what- ever subject he wrote his style was always exquisite. Frederik Cederborgh (1784-1835) revived the comic novel in his Uno von Trasenberg and Ottar Tralling. The historical novels of Gumelius have already been alluded to. Swedish history supplied themes for the romances of Count Per Georg Sparre (1790-1871) and of Gustaf Henrik Mellin (1803-1876). But all these writers sink Fredrika before the sustained popularity of the Finnish poetess Bremer. Fredrika Bremer (1801-1865), whose stories have reached farther into the distant provinces of the world of letters than the writings of any other Swede except Tegnér (see Bremer). She was preceded by Sofia Zelow, afterwards Baroness von Knorring (1797-1848), who wrote a long series of aristocratic novels.

At the beginning of the romantic period a high position was taken as an independent thinker by Benjamin Hoijer (1767-1812), who owed much at the outset to Kant and Fichte. Geijer also distinguished himself in philosophical writing, but the most original of Swedish philosophers has been Kristofer Jakob Boström (1797-1866), a peri- patetic talker, who wrote little, but whose system has been reduced to literature by K. Claéson (1827-1859), Professor Axel Nybleus (b. 1821), and other disciples. A polemical writer of great talent was Magnus Jakob

Runeberg.

Crusenstolpe (1795-1865), of whose work it has been said that "it is not history and it is not fiction, but something brilliant between the one and the other." As an historian of Swedish literature Per Wieselgren (1800-1877) has com- posed a valuable work, and he has made other valuable contributions to history and bibliography. In history we meet again with the great name of Geijer, with that of Jonas Hallenberg (1748-1834), and with that of Anders Magnus Strinnholm (1786-1862), whose labours in the field of Swedish history were extremely valuable. Geijer and Strinnholm prepared the way for the most popular and perhaps the greatest of all Swedish historians, Anders Fryxell (1795-1881), whose famous Berdttelser ur Svenska fMistorien appeared in parts during a space of nearly sixty years, an extraordinary example of persistent and uninter- rupted work. As a legal historian the first place is easily maintained by Karl Johan Schlyter (b. 1795). Hans Jirta (1774-1847) was a statesman who wrote with vigour on economical subjects. In science it is only possible to mention the celebrated names of Jons Jakob Berzelius (1779-1848) the chemist, Elias Fries (1794— 1878) the botanist, Karl Adolf Agardh (1785-1859) the physiologist, and Sven Nilsson (1787-1883) the paleontologist.

In the generation which has just passed away, the first poet of Sweden, without a rival, was Johan Ludvig Runeberg (1804-1877), who divides with Tegnér the highest honour in Swedish literature (see RUNEBERG). The other leading verse-writers were Karl Vilhelm Bottiger (1807-1878), the son-in-law and biographer of Tegnér ; Johan

Borjesson (1790-1866), the last of the Phosphorists, author of various romantic dramas; Vilhelm August von Braun (1813-1860), a humorous lyrist; “Talis Qualis,” whose real name was Karl Vilhelm August Strandberg (1818-1877) ; and August Teodor Blanche (1811-1868), the pepular dramatist. But Runeberg is the only great

SWEDENBORG, or SvEDBERG, EMANUEL (1688-1772), was born at Stockholm January 29, 1688. Jesper Svedberg, subsequently professor of theology at Upsala and bishop of Skara, was a pious, learned, and a brave man, who did not escape the charge of heterodoxy, and believed himself to be in constant intercourse with angels. Emanuel shared as a child his father’s piety, and his parents thought that “angels spoke through him.” His education embraced the Latin, Greek, and Hebrew languages, and, above all, mathematics with the natural sciences, but seems to have been curiously defective in theology. Endowed with unusual intellectual powers and an iron constitution, he acquired vast stores of learning in all those branches. Having completed his university course at Upsala, in 1710 he commenced the customary European tour, visiting England, Holland, France, and Germany, studying especially natural philosophy, though alternating it with the composition of Latin verses, little of the poet as there was in his nature. In 1715 he returned to Upsala, and devoted himself to natural science and various engineering works. From 1716 to 1718 he published a scientific periodical, called Daedalus Hyper- boreus, a record of mechanical and mathematical inven- tions and discoveries. In 1716 he was introduced to Charles XII., who appointed him assessor in the Swedish college of mines. Two years later he distinguished him- self at the king’s siege of Frederikshall by the invention of machines for the transport of boats and galleys over- land from Stromstadt to Iddefjord, a distance of 14 English miles. The same year he published various matheniatical and mechanical works. At the death of

His father, Dr –

poetic name of this period. In prose there was not even a Runeberg. Novel-writing was sustained at no ver high level by Karl Anton

Wetterbergh (b. 1804), who called himself "Onkel Adam," by Emilie Carlén (b. 1807), whose autobiography has lately appeared, by Oskar Patrick Sturzen-Becker, "Orvar Odd," (1811-1869), by August Blanche, and by Marie Sofia Schwartz (b. 1819), Lars Johan Hierta (1801-1872) was the leading journalist, Johan Henrik Thomander, bishop of Lund (1798-1865), the greatest orator, Matthias Alexander Castrén (1813- 1852) a prominent man of science, and Karl Gustaf af Forsell (1783-1848) the principal statistician of this not very brilliant period. Elias Lénnrot (1802-1884) is distinguished as the Finnish professor who discovered and edited the Xalevala. It is impossible to give an exhaustive list of names in so short a sketch as this.

Swedish literature is not in a very lively condition at the present time. The most popular living poet is the Finn, Zakris Topelius (b. 1818). Of a higher artistic merit are the finished lyrics of Count Karl Snoilsky (b. 1841). King Oscar II. (b. 1829) is a genuine poet of the second order, as his father Charles XV. was of the third. Karl David af Wirsén (b. 1842) is an active writer on the conservative side. The best living author of Sweden is undoubtedly Viktor Rydberg (b. 1829), who has written masterly novels and historical works. The latest infiu- ences from Denmark and France are beginning to be represented by Strindberg the novelist, and by Fru A. Ch. Edgren, the most successful Swedish dramatist of the moment. The revival of literature which has been so marked in the other two Scandinavian countries has not yet spread into Sweden.

Authorities.—P. Hanselli, Samlade Vitterhetsarbeten fran Stjern-hjelm till Dalin; B. E. Malmstrom, Grunddragen af Svenska Vitterhetens Historia; P. Wieselgren, Sveriges Skina Literatur; Warburg, Svensk Litteraturhistoria 1 Sammandrag. (E. W. G.)

Charles XII. Queen Ulrica elevated him and his family to the rank of nobility, by which his name was changed from Svedberg to Swedenborg. The next years were devoted to the duties and studies connected with his office, which involved the visitation of the Swedish, Saxon, Bohemian, and Austrian mines. In 1724 he was offered the chair of mathematics in the university of Upsala, which he declined.

Gradually his inquiring and philosophical mind led him to wider studies than those of his profession. As early as 1721 he was seeking to lay the foundation of a scientific explanation of the universe, when he published his Prodromus Principiorum Rerum Naturalium and had already written his Principa in its first form. Thirteen years later, in 1734, appeared 1 three volumes Opera Philosophica et Mineralia, the first volume of which (his Principia) contained his view of the first principles of the universe, a curious mechanical and geometrical theory of the origin of things. The same year followed Prodromus Philosophiz ratiocinantis de Infinito e Causa Finali Creationis, which treats of the relation of the finite to the infinite and of the soul to the body, seek- ing to establish a nexus in each case as a means of over- coming the difficulty of their relation. From this time he applied himself to the problem of discovering the nature of soul and spirit by means of anatomical studies. He travelled in Germany, France, and Italy in quest of the most eminent teachers and the best books dealing with the human frame, and published, as the results of his inquires among other works, his Gconomia Regnt Animals (Lon- don, 1740-41) and Regnum Animale (‘The Hague, 1744-49, London, 1745). But a profound change was coming Over

him, which was to make of the scientific inquirer the super- naturalist prophet. Neither by geometrical, nor physical, nor metaphysical .principles had he succeeded in reaching and grasping the infinite and the spiritual, or in elucidat- ing their relation to man and man’s organism, though he | had caught glimpses of facts and methods which he

/ Late in life he wrote to Oetinger that ““‘he was introduced | by the Lord first into the natural sciences, and thus pre- | pared, and, indeed, from the year 1710 to 1744, when heaven was opened to him.” This latter great event is described by him as ““‘the opening of his spiritual sight,” “the manifestation of the Lord to him in person,” “his introduction into the spiritual world.” Before his illu- mination he had been instructed by dreams, and enjoyed extraordinary visions, and heard mysterious conversations. According to his own account, the Lord filled him with His spirit to teach the doctrines of the New

Church by the word from Himself ; He commissioned him to do this work, opened the sight of his spirit, and so let him into the spiritual world, permitting him to see the heavens and the hells, and to converse with angels and spirits for years ; but he never received anything relating to the doctrines of the church from any angel but from the Lord alone while he _was reading the word (7'rue Christian Religion, No. 779). He elsewhere speaks of his office as principally an opening of the spiritual sense of the word. His friend Robsahm reports, from Swedenborg's own account to him, the cir- cumstances of the first extraordinary revelation of the Lord, when He appeared to him and said, "I am God the Lord, the Creator and Redeemer of the world. I have chosen thee to unfold the spiritual sense of the Holy Scripture. _ Iwill Myself dictate to thee what thou shalt write." From that time he gave up all worldly learning, and laboured solely to expound spiritual things. But it was some time before he became quite at home in the spiritual world. Inthe year 1747 he resigned his post of assessor of the college of mines that he might devote himself to his higher vocation, requesting only to be allowed to receive as a pen- sion the half of his salary. He took up afresh his study of Hebrew, and began his voluminous works on the interpreta- tion of the Scriptures. The principal of these is the Arcana Celestia in eight quarto volumes, which he printed in Lon- don between 1749 and 1756, professing to have derived the whole of it by direct illumination from the Almighty Himself, and not from any spirit or angel. His later work De Coelo et de Inferno (London, 1758) consists of extracts and portions of the Arcana. His MS. work Apocalypsis Explicata, expounding the doctrines of the New Church, was prepared in 1757-59. In 1763 appeared his Sapientia Angelica de Divino Amore et de Divina Sapientia, containing _ the most philosophical brief account of the principles of the | New Church. The long list of his subsequent writings will be found in the works mentioned below. His life from 1747 | Was spent alternately in Sweden, Holland, and London, in | the composition of his works and their publication, till his death, which took place in London, March 29, 1772. He was a man who won the respect, confidence, and love of all who came into contact with him. Though people might disbelieve in his visions, they feared to ridicule them in his presence. His _ manner of life was simple in the extreme ; his diet consisted chiefly of bread and

milk and large quantities of coffee. He paid no | attention to the distinction of day and night, and sometimes lay for days together in a trance, while his servants were often dis- turbed at night by hearing what he called his conflicts with evil) spirits. But his intercourse with spirits was often perfectly calm, in broad daylight, and with all his faculties awake. Three extra- ordinary instances are produced by his friends and followers in _ proof of his seership and admission into the unscen world. But | there exists no account at first hand of the exact facts, and Sweden- _borg's own reference to one of these instances admits of another

| explanation than the supernatural one. The philosopher Kant was Struck by them in 1768, but in 1765, after further inquiries, con-

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| thought only required confirmation and development. |

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cluded that two of them had 'uo other foundation than common report (gemeine Sage)." See Kehrbach's edition of Kant's Trawme eines Geistersehers (Leipsic, 1880).

_ Swedenborg's theosophic system is most briefly and comprehen- sively presented in his Divine Love and Divine Wisdom. 'The point of view from which God must be regarded is that of His being the Divine Man. His esse is infinite love ; His manifestation, form, or body is infinite wisdom. Divine love is the self-subsisting life of the universe. From God emanates a divine sphere, which appears in the spiritual world as a sun, and from this spiritual sun again proceeds the sun of the uatural world. The spiritual sun is the source of love and intelligence, or life, and the natural sun the source of nature, or the receptacles of life; the first is alive, the second dead. The two worlds of nature and spirit are perfectly distinct, but they are intimately related by analogous substances, laws, and forces. Each has its atmospheres, waters, and earths, but in the one they are natural and in the other spiritual. In God there ave three infinite and uncreated ' degrees" of

being, and in man aud all things corresponding three degrees, finite and created. They are love, wisdom, use; or end, cause, and effect. The final ends of all things are in the Divine Mind, the causes of all things in the spiritual world, and their effects in the natural world. By a love of each degree man comes into conjunction with them and the worlds of nature, spirit, and God. 'he end of creation is that man may have this conjunction and become the image of his Creator and creation. In man are two receptacles for God,—the will for divine love and the understanding for divine wisdom, —that love and wisdom flowing into both so that they become human. Before the fall this influx was free and unhindered, and the conjunction of man with God and the creation complete, but from that time the connexion was interrupted and God had to interpose by successive dispensations. At last the power and influence of the spirits of darkness, with whom man associates himself by his sin, became so great that the existence of the human race was threatened, and Jehovah was necessitated to descend into nature to restore the connexion between Himself and man. He could not come in His unveiled Divinity, for the "hells" would have then perished, whom he did not seek to destroy but only to subjugate. Another purpose of Jehovah's incarnation was the manifestation of His divine love more fully than ever before. Swedenborg wholly rejects the orthodox doctrine of atonement; and the unity of God, as opposed to his idea of the trinity of the church, is an essential feature of his teaching. Another distinc- tive feature is that Jehovah did not go back to heaven without leaving behind Him a visible representative of Himself in the word of the Scripture. This word is an eternal incarnation, with its threefold sense—natural, spiritual, celestial. And Swedenborg is the divinely commissioned expounder of this threefold sense of the word, and so the founder of the New Church, the paraclcte of the last dispensation. That he might perceive and understand the spiritual and the celestial senses of the word he enjoyed immediate revelation from the Lord, was admitted into the angelic world, and had committed to him the key of " correspondences" with which to unlock the divine treasures of wisdom. Swedenborg claimed also to have learnt by his admission into the spiritual world the true states of men in the next life, the scenery and occupations of heaven and hell, the true doctrine of Providence, the origin of evil, the sanctity and perpetuity of marriage, and to have been

a witness of the "last judgment," or the second coming of the Lord, which took place in the year 1757. It was then that the New Church, or the New Jerusalem, was inaugurated, and Swedenborg claimed to be the divinely appointed prophet and teacher of its doctrines, and maintained that his revelations excel all that preceded them.

Swedenborgianism.—Swedenborgianism, as professed by Swedenborg's followers, is based on the belief of Swedenborg's claims to have witnessed the last judgment, or the second advent of the Lord, with the inauguration of the New Church through the new system of doctrine promulgated by him and derived from the Scriptures, into the true sense of which he was the first to be introduced. The doctrines of the New Church are those of the internal sense of the word as revealed to Swedenborg, who received them into his understanding and published them through the press and not as a preacher. They are briefly—(1) that the Lord Jesus Christ is the only God, that in Him there is the Trinity of Father, Son, and Holy Ghost, the Father being His infinite divine nature or soul, the Son His glorified human nature or divine body, and the Holy Spirit the life proceeding from His divine humanity for the salvation of man ; (2) that the Father in His eternal humanity descended as the Lord Jesus Christ to the earth, assuming fallen human nature, that in it he might conquer hell and deliver mankind from its influence ; (8) that the Sacred Scriptures are the true word of God, accommodated to the understanding of angels and men, and constituting the perpetual medium between heaven and the church, the law of correspondence having been revealed by the Lord to Swedenborg as the key for their interpretation ; (4) that man is not saved by faith alone but by a life according to the word, the summary of whieh is the decalogue ; (5) that heaven is made up of those who

keep God's commandments and love Him and His kingdom, and hell of those who love themselves and the world; (6) that the spiritual world—heaven and hell—holds the same relation to the natural world and its inhabitants as the soul to the body, being in and around the natural world and its life, and that after the death of the body the spirit

continues to live in the spiritual world it had previously though unconsciously inhabited. Swedenborgians now constitute a widely spread and considerable society, with a regularly constituted ecclesiastical organization and a zealous missionary activity. Soon after Swedenborg's death students of his works in England and Sweden began to translate them from the Latin and to spread his views. First in time and activity amongst these early Swedenborgians was the Rev. John Clowes, rector of St John's, Manchester, who translated the whole of several treatises. The first public meeting of Swedenborgians, from which dates the foundation of the society, was held in London December 5, 1783, and was attended by five persons. The separation of the society from the "old church" as a religious body, with its distinct creed, worship, and ecclesiastical organization, took place May 7, 1787, and its first place of worship was in Great Eastcheap, London. The first general conference of the New Church was held April 17, 1789, in this chapel, when a series of resolutions concern- ing the creed, the sacraments, and ecclesiastical order of the society were adopted. At the same time churches began to be formed in various towns in England and in America. Towards the end of the century Swedenborg's doctrines obtained a considerable degree of acceptance on the Continent, scparate socicties having arisen here and there. Meantime the Manchester Printing Society, under Mr Clowes, printed and distributed Swedenborg's works in large numbers. In 1810 a London Printing Society was formed, which has been very active in the same way to the present time. In 1817 a convention of the American New Church was held in Philadelphia, which gave proof of the growth of the body in the United States. The same year the tenth general conference of the English section of the church was attended by twenty-seven delegates and ministers of various socicties, and in 1821 there were upwards of fifty-two of these in Great Britain. At the general conference in 1885 it was reported that there were sixty-five societies or churches in Great Britain connected with the con- ference, having 5700 registered members, the net increase of the year being 119. The names of thirty-two ordained ministers appear in the report; the investments of the society amount to £60,453; and there arc a dozen educational and missionary institu- tions in connexion with it. Some of the New Church day schools are amongst the largest aud most efficient in the kingdom.

From the same report it appears that the New Church has societies or institutions in most British colonies as well as in the principal countries of Europe. The report of the General Convention of the New Jerusalem in the United States, 1885, gives the names of 116 societies in America, with nearly the same number of ordinary ministers. In Italy, Sweden, and Prussia there is a Swedenborg mission sustained by help from England and America. In South Germany there exist congregations of the New Church, and the librarian of the university of Tiibingen, Dr Immanuel Tafel, was exceedingly active until his death (1863) in the publication and translation of Swedenborg's works, and in the vindication of the doctrines ofthe New Church. In Austria, Norway, and Switzerland also there are congregations. But, in addition to full converts to Swedenborgianism, a considerable number of prominent theologians and other thinkers have been attracted by Swedenborg's works and parts of his system. While the extravagant anthropomorphism, the mechanical materialism, the theological narrowness, the wild allegorizing, the entire absence of historical knowledge, and the astounding prophetic claims of the man and his system,—in a word, the Gnosticism of Swedenborg and his followers, —must be offensive to philosophical minds, they can discover in his writings and the drift of his thought fine ethical views, profound glances of insight into the depths of the universe, —God, nature, man, and his destiny. The names of Octinger, Herder, Goerres, Coleridge, Emerson, J. D. Morell may be given as proof of this. Such thinkers were attracted by one or more of the dominant and pervading principles or tenden- cies of his extraordinary mind. For he felt, if he did not adequately expound, the harmony of the universe, the fundamental unity of being and thought, of knowledge and will, of the divine and the human ; and his wild system of allegory, with his equally wild communications with the unseen world, failed to conceal a deep moral and intellectual revolt against the most irrational forms of traditional orthodoxy, while his deep spiritual nature spurned the shallow intellectualism of the rationalists of the 18th century.

Literature.—A rich collection of materials for a life of Swedenborg is Docu- ments concerning the Life and Character of Swedenborg, Collected, Translated, and Annotated, by Dr. R. L. Tafel, in 3 vols.,

Swedenborg Society, 1875-77. Of English lives the principal are— Emanuel Swedenborg, a Biography, by J. J.G. Wilkinson, London, 1849; Swedenborg, a Biography and an Exposition, by E. Paxton Hood, London, 1854; Swedenborg, his Life and Writings, by William White, 1856, rewritten in 1867 and in 1868; Emanuel Swedenborg, the Spiritual Columbus, a Sketch, by U. 8. E,, 2d ed., London, 1877. A useful handbook of Swedenborg's theology, consisting of extracts in English from his numerous works, is the Compendium of the Theological Writings of Emanuel Swedenborg, by

the Rey. Samuel Warren, London, 1885. Brief summaries of hig system and writings are given in all the above biographies and in Edmund Swift's Manual of the Doctrines of the New Church, London, 1885. Important critiques from independent points of view are " Emanuel Swedenborg," in the Prospective Review, May 1850; "The Mystic,' in Emerson's Representative Men, 1850+ Kant's 7dume eines Geistersehers, 1766 (the best cdition by Kehrbach, Leipsic, 1880) ; Herder's "' Emanuel Swedenborg," in his Adrastea (Werke zur Phil. und Gesch., vol. xii. pp. 110-125) ; Gocrres's Emanuel Swedenborg, seine Visionen und sein Verhdltniss zur Kirche, 1827; Dorner's Gesch. d. Prot. Theol., Munich, 1867 pp. 662-67. For the history of Swedenborgianism, see Rise and Progress of the New Jerusalem Church in England, America, and other Parts, by Robert Hindmarsh edited by E. Madeley, London, 1861, The chief apologetic work is Noble's Appeal, 10th ed. 1881, London. See also National Review, April 1858, (J. FS) —

SWEET POTATO. See Poraro.

SWIFT, a bird so called from the extreme speed of its flight, which apparently exceeds that of any other British species, the Hirundo apus of Linnwus and Cypselus apus or murarius of modern ornithologists, who have at last learned that it has only an outward resemblance but no near affinity to the SwaLLow (ante, p. 729) or its allies, Well known as a summer-visitor throughout the greater part of Europe, it is one of the latest to return from Africa, and its stay in the country of its birth is

of the shortest, for it generally disappears from England very early in August, though occasionally to be seen for even two months later.

The Swift commonly chooses its nesting-place in holes under the eaves of buildings, but a crevice in the face of a quarry, or even a hollow tree, will serve it with the accommodation it requires. This indeed is not much, since every natural function, except sleep, oviposition, and incubation, is performed on the wing, and the easy evolutions of this bird in the air, where it remains for hours together, are the admiration of all who witness them. Though considerably larger than a Swallow, it can be recognized at a distance less by its size than by its peculiar shape. The head scarcely projects from the anterior outline of the pointed wings, which form an almost continuous curve, at right angles to which extend the body and tail, resembling the handle of the crescentic cutting-knife used in several trades, while the wings represent the blade. The mode of flight of the two birds is also unlike, that of the Swift being much more steady, and, rapid as it is, ordinarily free from jerks. The whole plumage, except a greyish-white patch under the chin, is a sooty black, but glossy above. Though its actual breeding-places are by no means numerous, its extraordinary speed and discursive habits make the Swift widely distributed; and throughout England scarcely a summer's day passes without its being seen in most places.

Among other peculiarities the Swifts, as long ago described (probably from John Hunter's notes) by Home (Phil. Trans., 1817, pp. 332 et segg., pl. xvi.), are remarkable for the development of their salivary glands, the secretions of which serve in most species to glue together the materials of which the nests are composed, and in the species of the genus Collocalia form almost the whole substance of the structure. These are the "edible" nests 80 eagerly sought by Chinese epicures as an ingredient for soup, and their composition, though announced many ycars since by Home (ut supra), whose statement was confirmed by Bernstein (Act. Soe, Sc. Indo-Néerlandice, iii. Art. 5, and Journ. fiir Ornithologie, 1859, pp. 111-119), has of late been needlessly doubted in favour of the popular belief that they were made of some kind of sea-weed, Alga, or other vegetable matter collected by the birds.? It may be

hoped that the examination and analysis made by Mr J. R. Green (Jour nal of Physiology, vi. pp. 40-45) have settled that question for all time. These remarkable nests consist essentially of mucus, secreted by the salivary glands above mentioned, which dries and looks like isinglass. Their marketable value depends on their colour and purity, for they are often intermixed with feathers and other foreign substances. The Swifts that construct these "edible" nests form a genus Collocalia, of which the number of species is uncertain; but they inhabit chiefly the islands of the Indian Ocean from Be north of Madagascar eastward, as well as many of the tropica. Ne ee ee

1 This species, A. caudacuta, has been generally, but Mr Hume says (Stray Feathers, ix. p. 230) wrongly, identified with the Hirundo oe of Pallas. So many authors have recently ascribed the foundation : the genus Chetura to Stephens in the year 1825 that it may not be amiss to state that its origin dates only from 1826, the same year ad which Boie established the commensurate genus Acanthyllis.

2 Hence one species has been called Collocalia fuctphaga.

islands of the Pacific so far as the Marquesas,—one species occur- ring in the hill-country of India. They brecd in caves, to which they resort in great numbers, and occupy them jointly and yet alternately with Bats —the mammals being the lodgers by day and the birds by night.?

The genus Cypselus, as noted by Willughby, with its American ally Panyptia, exhibits a form of pedal struc- ture not otherwise observed among birds. Not only is the hind-toe constantly directed forwards, but the other three toes depart from the rule which ordinarily governs the number of phalanges in the Bird's foot,—a rule which applies to even so ancient a form as Archexopteryx (see Birps, vol. iii. p. 728),—and in the two Cypseline genera just named the series of digital phalanges is 2, 3, 3, 8, instead of 2, 3, 4, 5, which generally obtains in the Class Aves. Other Swifts, however, do not depart from the normal arrangement, and the exception, remarkable as it is, must not be taken as of more value than is needed for the recognition of two sections or subgenera admitted by Mr Sclater in his monographical essay on the Family (Proc. Zool. Society, 1865, pp. 593-617). There seem to be about half a

dozen good genera of Cypselidx, and from fifty to sixty species. Their geographical distribution is much the same as that of the Hirundinidex (cf. SwaLLow, ‘ ut supra) ; but it should be always and most clearly borne in mind that, though so like Swallows in many respects, the Swifts have scarcely any part of their structure which ‘ isnot formed on a different plan ; and, instead of any near affinity existing between the two groups, it can scarcely be doubted by any unprejudiced investigator that the Cypselide not only differ far more from the Hirundinide ‘ than the latter do from any other Family of Passeres, but that they belong to what in the present state of ornitho- logy must be deemed a distinct Order of Birds—that which in the present series of articles has been called ‘Picariz. That the relations of the Cypselidex to the | Trochilide (cf. Hommine-Birp, vol, xii. pp. 357 sq.) are close, as has been asserted by L’Herminie and Nitzsch, Dr Burmeister and Prof. Huxley, is denied by Dr Shufeldt (Proc. Zool. Society, 1885, pp. 886-914), but the views of ‘the last have since been controverted by Mr F. Lucas (Auk, 1886, pp. 444-451). (A. N.)

SWIFT, Jonatuan (1667-1745), dean of St Patrick’s, the greatest satirist of his own or perhaps of any age, was born in Hoey’s Court, Dublin, November 30, 1667. Like Pope’s, his family was of Yorkshire origin ; in the time of Charles I. the representative of one branch had obtained “a peerage, which expired with him. The first of his own immediate ancestors known to us was a clergyman, rector of St Andrew’s, Canterbury, from 1569 to 1592, whose son succeeded him in that living, and whose grandson was the Rev. Thomas Swift, vicar of Goodrich in Herefordshire, ‘renowned for his eccentricity, his mechanical ingenuity, and, above all, his stubborn devotion to Charles I. and the ‘persecutions he underwent in consequence. Plundered _ thirty-six times, and ultimately ejected from his living, he Bdied in 1658, leaving his thirteen children a small and | greatly impoverished landed estate and the questionable

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advantage of a substantial claim on the gratitude of the ‘restored sovereign. More fortunate than most ruined / cavaliers, his eldest son

Godwin soon obtained the attorney- generalship of the palatinate of Tipperary. This piece of /good fortune naturally attracted other members of the family across the channel,—among them Jonathan, one of He youngest of nine brothers, but already husband of | Abigail Ericke of Leicester, a lady of ancient descent and "Means more limited than his own. A student of law, but

') | MrH. Pryer has given one of the latest accounts of some of these ') caves in North Borneo (Proc. Zool. Society, 1885, pp. 582-588), which may be read to advantage.

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never called to the bar, Jonathan appears to have subsisted for some years on windfalls and casual employments. At length (1665) he became steward of the King's Inns (an- swering to the Inns of Court in England), an office of small emolument. Two years afterwards he died suddenly, leaving an infant daughter and a widow pregnant with the future dean of St Patrick's. So embarrassed had his circum- stances been that, although considerable debts were owing to the estate, Mrs Swift was for the moment unable to pay the expense of his interment. Thus Swift's first experience of life was that of a dependant on the charity of his uncles, more particularly of Godwin ; and the inevitable bitterness of the situation was aggravated by the grudging manner in which the Tipperary official seemed to dole out his parsimonious help. In fact, the apparently prosperous relative was the victim of unfortunate speculations, and chose rather to be reproached with avarice than with im- prudence. A virulent resentment became ingrained into the youth's whole nature, and, though ultimately acquainted with the real state of the case, he never mentioned his uncle with kindness or respect. Other relatives did more to merit his regard. Yet he took no pride in his Irish connexions or nativity, and a singular adventure in his infancy seems to have afforded him a pretext for insinuat- ing that he was really born in England. When he was but two years old his nurse, a native of Whitehaven, was recalled to that town by an illness in her family. So attached had she become to her charge as

to clandes- tinely carry him away with her. Mrs Swift was induced to consent to his remaining with her for a time, and the child spent three years in Cumberland. By his return his education had made considerable progress, and in the next year he was sent to the grammar school at Kilkenny. There can be no question as to the author of Gulliver having been a remarkable child, but unfortunately only one anecdote of his school-days has been preserved. It is the story, graphically narrated by himself, of his having once invested the whole of his pocket-money in the purchase of an old horse condemned to the knacker's yard, his momentary triumph over his school-fellows, and his mortification on discovering the uselessness of his acqui- sition,—an anecdote highly characteristic of his daring pride and ambition, and from which, instead of the moral he professed to discover, he might have derived an augury of the majestic failure of his life.

In April 1682 Swift matriculated at Trinity College, Dublin, where he failed to distinguish himself. " By the ill-treatment of his nearest relations," he says, mean- ing especially his uncle Godwin, "he was so discouraged and sunk in his spirits that he too much neglected his academic studies, for some part of which he had no great relish by nature ; so that when the time came for taking his degree as bachelor of arts he was stopped of his degree for dulness and insufficiency, and at last hardly admitted in a manner little to his credit, which is called in that college speciali gratia, February 15, 1685." The college roll, nevertheless, shows that the only subject in which Swift absolutely failed was natural philosophy, including mathematics, in which the future author of the Voyage to Laputa was hardly likely to excel, nor is it surprising that a student of fitful and unruly temperament should have performed his obligatory theme negligenter. His examination in Greek and Latin was satisfactory, and the extent of desultory information evinced by his writings seems to prove that he had always been an industrious reader. His mortification made him reckless, and he repeatedly underwent academic censure during the next three years, though it is not certain whether some of the records supposed to apply to him do not in fact relate

to his cousin Thomas. XXIT. — 96

Swift and Temple.

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In 1688 Swift quitted the university, and, after a brief residence with his mother at Leicester, entered the family of Sir William Temple at Moor Park, near Farnham, as he declares for the advantage of Temple's conversation, but at least partly as an amanuensis. A distant relationship between his mother and Lady Temple appears to have

recommended him to this post, which he found trying to

Early writings and settle- ment in Treland.

his pride and independence. Temple was, as Swift ad- mitted, "a man of sense and virtue," but his temper was exclusive, his manners formal, and he had retired from public affairs from self-regard and over-fastidiousness. If he solaced his voluntary ostracism by a comparison with the elegant retirement and lettered ease of Cicero, it did not therefore occur to him to compare his obscure Irish secretary with the Roman orator's amanuensis Tiro, who had, at least, invented shorthand. We, who know that in the patron's place the dependant would have governed the nation, need not be surprised at finding, full twenty years afterwards, the iron of servitude still rankling in the latter's haughty soul. He withdrew from Temple's service on a pretext of ill health from May 1690 to August 1691, but returned, and undoubtedly made himself useful to his employer, who on one occasion rendered him the medium of a confidential communication to King William, who had consulted Temple on the bill for triennial parliaments, then sanctioned by both branches of the legislature. Swift did his best to enforce Temple's arguments in favour of the measure, and was in after life wont to refer to the failure of his rhetoric as the most useful lesson his vanity had ever received. Struck, it would seem, rather by the physical than the mental endowments of the robust young Irishman, William offered him a troop of horse, a proposal which appears to have been subsequently commuted into a promise of church preferment. Swift had already (July 1692) proceeded to the degree of M.A. at Oxford, and the execution of his design to embrace the

ecclesiastical pro- fession was hastened by a quarrel with Temple, occasioned by the latter's reluctance to contract any definite engage- ment to provide for him. Throwing up his employment, he passed (May 1694) over into Ireland, but found his views impeded by the refusal of all the bishops to ordain him without some certificate of the regularity of his deport- ment while in Temple's family. Five months passed ere he could bring himself to solicit this favour from his old patron, which he ultimately did in a letter submissive in appearance, but charged to the full with smothered rage and intense humiliation. Forgiveness was easy to one in Temple's place and of Temple's disposition, and he not only despatched the requisite testimonials, but added a recommendation which obtained for Swift the living of Kilroot, in the diocese of Down and Connor (January 1695). His residence here was not fated to be of long duration. Temple, who knew his value and had not parted with him willingly, soon let him understand that a return was open to him, and Swift, whose resentment was cooled by time, and soothed by the acknowledgment of his value to his patron, readily complied (May 1696). He continued to reside with Sir William till the latter's death in J anuary 1699. No further disagreement troubled their intimacy, and Temple bequeathed Swift the charge of editing his writings, a laborious but not an unprofitable commission. Macaulay has justly indicated the familiarity with public affairs acquired by Swift at Moor Park as one main cause of his subsequent distinction as a politician, and here too he laid the foundation of his literary renown. He is reported to have read regularly for eight hours every day ; and we have his own authority for his having, as early as 1691, "written and burned, and written again, more on all manner of subjects than perhaps any man in England." The only relics of these early days, however, belong to a

species of composition in which he was little qualified to excel, He has, indeed, a name among the poets of Eng. land, but the merit of his verse is usually in the ratio of its approach to the sermo pedestris. Mistaking the nature of his powers, he must needs begin with Pindarics, and the result may be imagined. Yet his own simple account of his feelings while endeavouring composition proves that the mood was right though the

channel was wrong, and that there was error as well as truth in his kinsman Dryden's severe and unforgiven remark, "Cousin Swift, you will never be a poet." Swift's first prose composi- tion betrayed his resentment. In the Battle of the Books (1697), a satirical contribution to the controversy on the comparative merits of the ancients and the moderns raised by Perrault, but with especial reference to the question of the genuineness of the letters of Phalaris, on which his patron Temple had taken the wrong side, Swift for the first and last time committed a plagiarism, and sought to conceal it by an untruth. It is undoubtedly adapted, though certainly improved from, De Callitres's Histoire Poétique de la Guerre nouvellement déclareé entre les An- cuens et les Modernes. Here also his sarcasm for the first and last time recoiled upon himself. The satire against Dryden and Bentley wants, indeed, nothing but truth to be excellent; but the pictures of the former in his monstrous helmet and the latter in his patchwork mail yield in ludicrousness to the idea of the author of the Pindarie Odes presuming to ridicule the author of Absalom and Achito- phel, and the inglorious student of Trinity College, Dublin, challenging the first philologist of the age on a question of classical scholarship. It is, however, to his credit that his learning was greater than that of the other writers on his side and his pretensions less. Swift's next literary labour was his edition of Temple's posthumous works, already mentioned. They appeared with a dedication to King William, which was to have made the editor a prebendary. A petition to this effect miscarried, as he always believed, through the negligence or ill-will of the nobleman who undertook to present it. Be this as it may, he had become too important to be overlooked, and soon obtained the post of secretary and chaplain to Earl Berkeley, one of the lords justices of Ireland. The better half of this appointment, however, escaped him on his arrival in that country, his secretaryship being transferred to a Mr Bushe, who, when Lord Berkeley had at length an opportunity of recompensing Swift's disappointment by the gift of the deanery of Derry, successfully exerted his influence in favour of another clergyman, who is asserted to have gained his interest by the judicious outlay of a thousand pounds. With bitter indignation Swift threw up his chaplaincy, but was ultimately reconciled to his patron by the presentation to the rectory of Agher, in Meath, with the united vicarages of Laracor and Rathbeggan. For the

first time in his life he might now call himself his own master, and had an opportunity of exhibiting, free from suspicion of external constraint, that stern regard to duty which was not the least prominent feature of his character. In an age of general laxity—in a priest of an alien church, whose most energetic servants commonly succumbed to the mortifying conviction of their uselessness and the detesta- tion they excited among the people for whom they laboured, the parishioners of Laracor found a clergyman whom they might have heard three times a week. The energy, however, which probably gained the respect, certainly failed to influence the convictions, of his Catholic flock. We have his own authority for reckoning his average congregation at "half a score"; and on one occasion his clerk Roger was his only auditor. In fact, his exertions! the pulpit were more meritorious than his achievements ; he entirely lacked the fire, the self-oblivion, the expansive

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geniality of the orator. He himself characterized his discourses as " pamphlets," and, if meant to imply their arid and argumentative character, the criticism is just. The author of the Tale of a Tub, which he had had by | him since 1696 or 1698, must have felt conscious of powers capable of far more effective exercise ; and his resolution to exchange divinity for politics must appear fully justified on a comparison of these inconclusive essays with another performance of the same period. The Discourse on the Dissensions in Athens and Rome (September 1700), written in the Whig interest, "without humour and without satire," and intended as a dissuasive from the pending im- peachment of Somers and three other noblemen, received the honour, extraordinary for the maiden publication of a young politician, of being generally attributed to Somers himself or to Burnet, the latter of whom found a public disavowal necessary. Three years and a half later | appeared a more remarkable work. Clearness, cogency, masculine simplicity of diction, are conspicuous in the pamphlet, but true creative power told the Tale of a Tub. "Good God! what a genius I had when I

wrote that book !” was his own exclamation in his latter years. It is, indeed, if not the most amusing of Swift’s satirical works, the most strikingly original, and the one in which the compass of his powers is most fully displayed. In his kindred productions he relies mainly upon a single element of the humorous,—logical sequence and unrufiled gravity bridling in an otherwise frantic absurdity, and investing In the Zale of a Tub he lashes out in all directions. The humour, if less cogent and cumulative, is richer and more varied; the invention too, is more daringly original and more completely out of the ; reach of ordinary faculties. The supernatural coats and the quintessential loaf may be paralleled but cannot be surpassed ; and the book is throughout a mine of sugges- tiveness, as, for example, in the anticipation of Carlyle’s clothes philosophy within the compass of a few lines. At the same time it wants unity and coherence, it attains no conclusion, and the author abuses his digressive method + of composition and his convenient fiction of hiatuses in the original manuscript. The charges it occasioned of profanity and irreverence were natural, but groundless. There is nothing in the book inconsistent with Swift’s professed and real character as a sturdy Church of Eng- land parson, who accepted the doctrines of his church as an essential constituent of the social order around him, battled for them with the fidelity of a soldier defending his colours, and held it no part of his duty to understand, interpret, or assimilate them.

I Before the publication of the Tale of a Tub, Swift had _, taken a step destined to exercise a most important influence ou his life, by inviting two ladies to Laracor. Esther Johnson, a dependant of Sir William Temple’s (born in | March 1681), whose acquaintance he had made in the » latter’s family, and whom he has immortalized as “Stella,” } came over with her chaperon, Mrs Dingley, and was soon permanently domiciled in his neighbourhood. The melan- _ choly tale of Swift’s attachment will be more conveniently narrated in another place, and is only alluded to here for | the sake of chronology. Meanwhile the sphere of his | intimacies was rapidly widening. He had been in England for three years together, 1701 to 1704, and counted Pope, Steele, and Addison among his friends. The success of _ his pamphlet gained him ready access to all Whig circles ;

1 The name “ Stella” is simply a translation of Esther. Swift may have learned that Esther means “star” from the Hlementa Linguz Persice of John Greaves or from some Persian scholar; but he is more likely to have seen the etymology in the form given from Jewish

sources in Buxtorf’s Lexicon, where the interpretation takes the more

suggestive form ‘Stella Veneris.”

but already his confidence in that party was shaken, and he was beginning to meditate that change of sides which has drawn down upon him so much but such unjustifiable obloquy. The true state of the case may easily be collected from his next publications—Zhe Sentiments of a Church of Lingland Man, and On the Reasonableness of a Test (1708). The vital differences among the friends of the Hanover succession were not political, but ecclesiastical. From this point of view, Swift’s sympathies were entirely with the Tories. Asa minister of the church he felt his duty and his interest equally concerned in the support of her cause ; nor could he fail to discover the inevitable tendency of Whig doctrines, whatever caresses individual Whigs might bestow on individual clergymen, to abase the Establish- ment as a corporation. He sincerely believed that the ultimate purpose of freethinkers was to escape from moral restraints, and he had an unreasoning antipathy to Scotch Presbyterians and English Dissenters. One of his pamphlets, written about this time, contains his recipe for the promotion of religion, and is of itself a sufficient testimony to the extreme materialism of his views. Censorships and penalties are among the means he recommends. His pen was exerted to better purpose in the most consummate example of his irony, the Argu- ment against Abolishing Christianity. About this time, too (November 1707), he produced his best poem, Baucis and Philemon, which, as he frankly tells us, owes very much to the corrections of Addison.

From February 1708 to April 1709 Swift was in Swift London, urging upon the Godolphin administration the joins the

claims of the Irish clergy to the first-fruits and tenths (Queen Anne’s bounty”), already granted to their

brethren in England. His having been selected for such terial a commission shows that he was not yet regarded as a Writer.

deserter from the Whigs, although the ill-success of his representations probably helped to make him one. By November 1710 he was again domiciled in London, and writing his Journal to Stella, that unique exemplar of a giant's playfulness, "' which was written for one person's private pleasure and has had indestructible attractiveness for every one since." In the first pages of this marvel- lously minute record of a busy life we find him depicting the decline of Whig credit and complaining of the cold reception accorded him by Godolphin, whose penetration had doubtless detected the precariousness of his allegiance. Within a few weeks he had become the lampooner of the fallen treasurer, the bosom friend of Oxford and Boling- broke, and the writer of the Hxaminer, a journal estab- lished as the exponent of Tory views (November 1710). He was now a power in the state, the intimate friend and recognized equal of the first writers of the day, the asso- ciate of ministers on a footing of perfect cordiality and faniliarity. "We were determined to have you," said Bolingbroke to him afterwards; " you were the only one we were afraid of." He gained his point respecting the Trish endowments; and, by his own account, his credit procured the fortune of more than forty deserving or un- deserving clients. The envious but graphic description of his demeanour conveyed to us by Bishop Kennet attests the real dignity of his position no less than the airs he thought fit to assume in consequence. The cheerful, almost jovial, tone of his letters to Stella evinces his full contentment, nor was he one to be moved to gratitude for small mercies. He had it, in fact, fully in his own power to determine his relations with the ministry, and he would be satisfied with nothing short of familiar and ostentatious equality. His advent marks a new era in English political life, the age of public opinion, created indeed by the circumstances of the time, but powerfully fostered and accelerated by him. By a strange but not unfrequent

irony of fate the most imperious and despotic spirit of his day laboured to enthrone a power which, had he himself been in authority, he would have utterly detested and despised. For a brief time he seemed to resume the whole power of the English press in his own pen and to guide public opinion as he would. His services to his party as writer of the Hxaminer, which he quitted in July 1711, were even surpassed by those which he rendered as the

author of telling pamphlets, among which The Conduct of

the Allies and Remarks on the Barrier Treaty (November and December 1711) hold the first rank. In truth, how- ever, he was lifted by the wave he seemed to command. Surfeited with glory, the nation wanted a convenient ex- cuse for relinquishing a burdensome war, which the great military genius of the age was suspected of prolonging to fill his pockets. The Whigs had been long in office. The High Church party had derived great strength from the Sacheverell trial. Swift did not bring about the revolution with which, notwithstanding, he associated his name. There seems no reason to suppose that he was consulted respecting the great Tory strokes of the crea- tion of the twelve new peers and the dismissal of Marl- borough (December 1711), but they would hardly have been ventured upon if Zhe Conduct of the Allies and the Examiners had not prepared the way. A scarcely less important service was rendered to the ministry by his Letter to the October Club, artfully composed to soothe the impatience of Harley's extreme followers. He had every claim to the highest preferment that ministers could give him, but his own pride and prejudice in high places stood in his way.

Swift Generous men like Oxford and Bolingbroke cannot have made — _ been unwilling to reward so serviceable a friend, especially oe, when their own interest lay in keeping him in England.

Patrick's; Notwithstanding, therefore, some dubious expressions in fallof Swift's letters, natural to the deferred hope, we need not the Tory doubt their having actually used their best efforts to obtain ministry. for him the vacant see of Hereford. Swift, however, had formidable antagonists in the archbishop of York, whom he had scandalized, and

the duchess of Somerset, whom he had satirized. Anne was particularly amenable to the influence of priestly and female favourites, and it must be considered a proof of the strong interest made for Swift that she was eventually persuaded to appoint him to the deanery of St Patrick's, Dublin, vacant by the removal of Bishop Sterne to Dromore. It is to his honour that he never speaks of the queen with resentment or bitterness. In June 1713 he set out to take possession of his dignity, and encountered a very cold reception from the Dublin public. The dissensions between the chiefs of his party speedily recalled him to England. He found affairs in a desperate condition. The queen's demise was evidently at hand, and the same instinctive good sense which had ranged the uation on the side of the Tories, when Tories alone could terminate a fatiguing war, rendered it Whig when Tories manifestly could not be trusted to maintain the Protestant succession. In any event the occupants of office could merely have had the choice of risking their heads in an attempt to exclude the elector of Hanover, or of waiting patiently till he should come and eject them from their posts; yet they might have remained formidable could they have remained united. To the indignation with which he regarded Oxford's refusal to advance him in the peerage the active St John added an old disgust at the treasurer's pedantic and dilatory formalism, as well as his evident propensity, while leaving his colleague the fatigues, to engross for himself the chief credit of the administra- tion. Their schemes of policy diverged as widely as their characters: Bolingbroke's brain teemed with the wildest plans, which Oxford might have more effectually dis-

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countenanced had he been prepared with anything in their place. Swift's endeavours after an accommodation were as fruitless as unremitting. His mortification was little likely to temper the habitual virulence of his pen, which rarely produced anything more acrimonious than the attacks he at this period directed against Burnet and his former friend Steele. One of his pamphlets against the latter (The Public Spirit of the Whigs) was near involving him in a prosecution, some invectives against the Scots having proved so exasperating to the peers of that nation that they repaired in a body to the queen to

demand the punishment of the author, of whose identity there could be no doubt, although, like all Swift's writings, except the Proposal for the Extension of Religion, the pamphlet had been published anonymously. The immediate withdrawal of the offensive passage, and a sham prosecution instituted against the printer, extricated Swift from his danger,

Meanwhile the crisis had arrived, and the discord of Oxford and Bolingbroke had become patent to all the nation. Foreseeing, as is probable, the inrpending fall of the former, Swift retired to Upper Letcombe, in Berkshire, and there spent some weeks in the strictest seclusion, This leisure was occupied in the composition of his remarkable pamphlet, Free Thoughts on the State of Public Affairs, which indicates his complete conversion to the bold policy of Bolingbroke. The utter exclusion of Whigs as well as Dissenters from office, the remodelling of the army, the imposition of the most rigid restraints on the heir to the throne,—such were the measures which, by recommending, Swift tacitly admitted to be necessary to the triumph of his party. If he were serious, it can only be said that the desperation of his circumstances had momentarily troubled the lucidity of his understanding; if the pamphlet were merely intended as a feeler after public opinion, it is surprising that he did not perceive how irretrievably he was ruining his friends in the eyes of all moderate men. Bolingbroke's daring spirit, however, recoiled from no f extreme, and, fortunately for Swift, he added so much of his own to the latter's MS. that the author was obliged to recall a production which might not improbably have cost him his liberty and his deanery. This incident but just anticipated the revolution which, after Bolingbroke had enjoyed a three days' triumph over Oxford, drove him | into exile and prostrated his party, but enabled Swift to ' perform the noblest action of his life. Almost the first acts of Bolingbroke's ephemeral premiership were to order him a thousand pounds from the exchequer and despatch him the most flattering invitations. The same post brought a letter from Oxford, soliciting Swift's company in his retirement ; and, to the latter's immortal honour, he hesitated not an instant in preferring the solace of his friend to the offers of St John. When, a few days afterwards, Oxford was in prison and in danger of his life, Swift begged to

share his captivity ; and it was only on the offer being declined that he finally directed his steps towards Ireland, where he was very ill received. The draft on the exchequer was intercepted by the queen's death.

These four busy years of Swift's London life had not aa been entirely engrossed by politics. :

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First as the associate shipsand of Steele, with whom he quarrelled, and of Addison, whose prised. esteem for him survived all differences, afterwards as the Janeows intimate comrade of Pope and Arbuthnot, the friend of witué Congreve and Atterbury, Parnell and Gay, he entered deeply into the literary life of the period. He was trea- surer and a leading member of the Brothers, a society

of wits and statesmen which recalls the days of Horace

and Mecenas. He promoted the subscription for Popes Homer, contributed some numbers to the Tatler, Spectator,

and Intelligencer, and joined with Pope and Arbuthnot m

establishing the Scriblerus Club, writing Martinus Scrib- lerus, his share in which can have been but small, as well as John Bull, where the chapter recommending the educa- tion of all blue-eyed children in depravity for the public good must surely be his. His fugitive productions during this period are very numerous, and mostly distinguished not only by pungent wit but by overflowing animal spirits. | The most celebrated are the cruel but irresistibly ludicrous satires on the astrologer Partridge, a man in fact respect- able for his sincere belief in his art, and no mean writer. | Many of his best poems belong to this period. A more laboured work, his Memorial to Harley, proposing the

chiefly remarkable as a proof of the deference paid to French taste by the most original English writer of his day. His History of the Last Four Years of Queen Anne is ‘ not on a level with his other political writings. To sum | up the incidents of this eventful period of his life, it was | during it that he lost his mother, always loved and dutifully | honoured, by death ; his sister had been estranged from him some years before by an imprudent marriage, which, though making her a liberal allowance, he never forgave. i The change from London to Dublin can seldom be an sh agreeable one. To Swift it meant for the time the fall from unique authority to absolute insignificance. All share in the administration of even Irish affairs was de- nied him ; every politician shunned him; and his society hardly included a single author or wit. Ata later period he talked of “dying of rage, like a poisoned rat in a hole”; for some time, however, he was buoyed up by feeble hopes of a restoration to England. So late as 1726 _ he was in England making overtures to Walpole, but he had no claim on ministerial goodwill, and as an opponent _he had by that time done his worst. By an especial cruelty of fate, what should have been the comfort became the bane of his existence. We have already mentioned his invitation of Esther Johnson and Mrs Dingley to Ireland. Both before and after his elevation to the deanery of St Patrick’s these ladies continued to reside near him, and superintended his household during his absence in London. He had frustrated a match proposed for Stella, and, with “his evident delight in the society of the dark-haired, bright- eyed, witty beauty, a model, if we may take his word, of all that woman should be, it seemed unaccountable that he did not secure it to himself by the expedient of matrimony. A constitutional infirmity has been suggested as the reason, _and the conjecture derives support from several peculiarities in his writings. But, whatever the cause, his conduct proved none the less the fatal embitterment of his life and ‘Stella’s and yet another’s. He had always been unlucky | in his relations with the fair sex. In 1694 he had idealized }as “Varina” a Miss Waring, who then discouraged his ‘attentions, but two years later made him advances in her turn. Swift’s mind had also changed, and he could find | no better way out of the difficulty than an insulting letter affecting to accept her proposal on terms which he knew ‘taust put it out of the question. Varina was avenged by) Vanessa, who pursued Swift to far other purpose. Esther Vanhomrigh, the orphan daughter of

a commissioner of _ Irish trade, had become known to Swift at the height of | his political influence. He lodged close to her mother, and Was a frequent guest at her table. Vanessa insensibly became his pupil, and he insensibly became the object of her impassioned affection. Her letters reveal a spirit full /of ardour and enthusiasm, and warped by that perverse bent which leads so many women to prefer a tyrant to & companion. Swift, on the other hand, was devoid of) passion. Of friendship, even of tender regard, he was fully capable, but not of love. 'The spiritual realm, _ whether in divine or eartlily things, was a region closed to

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regulation of the English language by an academy, is"

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him, where he never set foot. Asa friend he must have greatly preferred Stella to Vanessa ; and from this point of view his loyalty to the original object of his choice, we may be sure, never faltered. But Vanessa assailed him on a very weak side. The strongest of all his instincts was the thirst for imperious domination. Vanessa hugged the fetters to which Stella merely submitted. Flattered to excess by her surrender, yet conscious of his binding obligations and his real preference, he could neither discard the one beauty nor desert the other. It is humiliating to human strength and consoling to human weakness to find the Titan behaving like the least resolute of mortals, seek- ing refuge in temporizing, in evasion, in fortuitous circum- stance. He no doubt trusted that his removal to Dublin would bring relief, but here again his evil star interposed. Vanessa's mother died (1714), and she followed hin, Unable to marry Stella without destroying Vanessa, or to openly welcome Vanessa without destroying Stella, he was thus involved in the most miserable embarrassment ; still, for a time he continued to temporize. At length, unable to bear any more Stella's mute reproach and his own consciousness of wrong, he gave a reluctant consent to a private marriage, which, as at least the weight of testimony seems to prove, though there is no documentary evidence, was accordingly performed. This was in 1716. At the same time he insisted on their

union being kept a strict secret, justifying a demand really dictated by tenderness for Vanessa, and perhaps by the unavowable reason to which allusion has been made, on the most futile and frivolous pretexts. Never more than a nominal wife, the unfortunate Stella commonly passed for his mistress till the day of her death, bearing her doom with uncom- plaining resignation, and consoled in some degree by unquestionable proofs of the permanence of his love, if his feeling for her deserves the name. Meanwhile his efforts were directed to soothe Miss Vanhomrigh, to whom he addressed Cadenus [Decanus| and Vanessa, the history of their attachment and the best example of his serious poetry, and for whom he sought to provide honourably in marriage, without either succeeding in his immediate aim or in thereby opening her eyes to the hopelessness of her passion. In 1717, probably at his instance, she retired from Dublin to Marley Abbey, her seat at Celbridge. For three years she and Swift remained apart, but in 1720, on what occasion is uncertain, he began to pay her regular visits. Sir Walter Scott found the Abbey garden still full of laurels, several of which she was accustomed to plant whenever she expected Swift, and the table at which they had been used to sit wasstill shown. Dut the catastrophe of her tragedy was at hand. Worn out with his evasions, she at last (1723) took the desperate step of writing to Stella, or according to another account to Swift himself, demanding to know the nature of the connexion with him, and this terminated the melancholy history as with a clap of thunder. Stella replied by the avowal of her marriage, sent her rival's letter to Swift, and retired to a friend's house. Swift rode down to Marley Abbey with a terrible countenance, petrified Vanessa by his frown, and departed without a word, flinging down a _ packet which only contained her own letter to Stella. Vanessa died within a few weeks. She left the poem and corre- spondence for publication. The former appeared imme- diately, the latter was suppressed until it was published by Sir Walter Scott.

Five years afterwards Stella followed Vanessa to 'the grave. The grief which the gradual decay of her health evidently occasioned Swift is sufficient proof of the sin- cerity of his attachment, as he understood it. It is a just remark of Thackeray's that he everywhere half-consciously recognizes her as his better angel, and dwells on her wit

and her tenderness with a fondness he never exhibits for any other topic. Yet he could never overcome his repug- nance to acknowledge their union till she lay on her death- bed, when he was heard by Mrs Whiteway (his cousin, a lady of fortune and talent, who, though not residing with him, superintended his household during his latter years) to say, “ Well my dear, if you wish it, it shall be owned.” She answered, “It is too late.” On January 28, 1728, she died, and her wretched lover sat down the same night to record her virtues in language of unsurpassed simplicity, but to us who know the story more significant for what it conceals than for what it tells. A lock of her hair is preserved, with the inscription in Swift’s handwriting, most affecting in its apparent cynicism, “Only a woman’s hair!” ‘Only a woman’s hair,” comments Thackeray ; “only love, only fidelity, purity, innocence, beauty, only the tenderest heart in the world stricken and wounded, and passed away out of reach of pangs of hope deferred, love insulted, and pitiless desertion; only’ that lock of hair left, and memory, and remorse, for the guilty, lonely wretch, shuddering over the grave of his victim.” The more unanswerable this tremendous indictment appears upon the evidence the greater the probability that the evidence is incomplete. Tout comprendre c’est tout par- donner. The hypothesis to which we have referred must for ever remain an hypothesis, but better than any other it not only excuses but explains.

‘Between the death of Vanessa and the death of Stella, as though withheld by an evil fate until he could no longer enjoy them, came the greatest political and the greatest literary triumph of Swift’s life. He had fled to Ireland a broken man, to all appearance politically extinct; a few years were to raise him once more to the summit of popu- larity, though power was for ever denied him. With his fierce hatred of what he recognized as injustice, it was impossible that he should not feel exasperated at the gross misgovernment of Ireland for the supposed benefit of England, the systematic exclusion of Irishmen from places of honour and profit, the spoliation of the country by absentee landlords,

the deliberate discouragement of Irish trade and manufactures. An Irish patriot in the strict sense of the term he was not; he looked upon the indi- genous population as conquered savages; but his pride and sense of equity alike revolted against the stay-at- home Englishmen's contemptuous treatment of their own garrison, and he delighted in finding a point in which the triumphant faction was still vulnerable. His Proposal for the Universal Use of Irish Manufactures, published anony- mously in 1720, urging the Irish to disuse English goods, became the subject of a prosecution, which at length had to be dropped. A greater opportunity was at hand. One of the chief wants of Ireland in that day, and for many a day afterwards, was that of small currency adapted to the daily transactions of life. Questions of coinage occupy a large part of the correspondence of the primate, Arch- bishop Boulter, whose anxiety to deal rightly with the matter is evidently very real and conscientious. There is no reason to think that the English ministry wished otherwise ; but secret influences were at work, and a patent for supplying Ireland with a coinage of copper halfpence was accorded to William Wood on such terms that the profit accruing from the difference between the intrinsic and the nominal value of the coins, about 40 per cent., was mainly divided between him and the duchess of Kendal, the king's mistress, by whose influence he had obtained the privilege. Swift now had his opportunity, and the famous letters signed M. B. Drapier (1724) soon set Ireland in a flame. Every effort was used to dis- cover, or rather to obtain legal evidence against, the author, whom, Walpole was assured, it would then have

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taken ten thousand men to apprehend. None could be procured ; the public passion swept everything before jt: the patent was cancelled; Wood was compensated by a pension ; Swift was raised to a height of popularity which he retained for the rest of his life; and the only real sufferers were the Irish people, who lost a convenience go badly needed that they might well have afforded to con- nive at Wood's illicit profits. Perhaps, however, it was worth while to teach the English ministry that not every- thing could be done in Ireland. Swift's pamphlets, written in a style more level with the popular intelligence than even his own

ordinary manner, are models alike to the controversialist who aids a good cause and to him who jg burdened with a bad one. The former may profit by the study of his marvellous lucidity and vehemence, the latter by his sublime audacity in exaggeration and the sophistry with which he involves the innocent halfpence in the obloquy of the nefarious patentee.

The noise of the Drapier's letters had hardly died AWAY Oulline's when Swift acquired a more durable glory by the publica- Travels,

tion of Gulliver's Travels in 1726. The work had been at least partly written by 1722, and the keenness of the satire on courts and statesmen suggests that it was planned while Swift's disappointments as a public man were still rankling and recent. It is Swift's peculiar good fortune that his book can dispense with the interpretation of which it is nevertheless susceptible, and may be equally enjoyed whether its inner meaning is apprehended or not. It is so true, so entirely based upon the facts of human nature, that the question what particular class of persons sup- plied the author with his examples of folly or misdoing, however interesting to the commentator, may be neglected by the reader. It is also fortunate for him that in three parts out of the four he should have entirely missed "the chief end I propose to myself, to vex the world rather than divert it." The world, which perhaps ought to have been vexed, chose rather to be diverted ; and the great satirist literally strains his powers ut puerts placeat. Few books have added so much to the innocent mirth of man- kind as the first two parts of Gulliver; the misanthropy is quite overpowered by the fun. The third part, equally masterly in composition, is less felicitous in invention; and in the fourth Swift has indeed carried out his design of vexing the world at his own cost. Human nature indignantly rejects her portrait in the Yahoo asa gross libel, and the protest is fully warranted. An intelligence from a superior sphere, bound on a voyage to the earth, might actually have obtained a fair idea of average humanity bya preliminary call at Lilliput or Brobdingnag, but not from a visit to the Yahoos. While Gulliver 1s infinitely the most famous and popular of Swift's works, it exhibits no greater powers of mind than many others. The secret of success, here as elsewhere, is the writers marvellous imperturbability in

paradox, his teeming imag- ination, and his rigid logic. Grant his premises, and all the rest follows; his world may be turned topsy-turvy, but the relative situation of its contents is unchanged. The pains he took to be correct are evinced by the care with which, as Prof. De Morgan has shown, he caleu- lated the proportions of Lilliput and Brobdingnag 10 ordinary humanity on the basis of 1 to 12 and 12 tof respectively, and his copying the description of the storm word for word from Sturmy's Compleat Mariner. By such accuracy and consistency he has given the wildest fiction imaginable an air of veracity rivalling Defoe.

Swift's grave humour and power of enforcing momentous

Modest Proposal for Preventing the Children of Poor People 4 in Ireland from Being a Burden to their Parents, by fatten- ing and eating them (1729), a parallel to the Argument

Swift's : : : * hig latter truth by ludicrous exaggeration were next displayed in his .

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ion (written in 1731, published in 1738), a surprising ssemblage of the vulgarities and trivialities current in

verses, not seldom indecent and commonly trivial, with the exception of his remarkable lines on his own death and the

coins should be struck as well as circulated in Ireland. His exertions in repressing robbery and mendicancy were "strenuous and successful. His popularity remained as reat as ever, and, when he was menaced by the bully Bettesworth, Dublin rose as one man to defend him. He zoverned his cathedral with great strictness and conscien- jlousness, and for years after Stella's death continued to old a miniature court at the deanery. But his failings »f mind were exacerbated by his bodily infirmities; he srew.more and more whimsical and capricious, morbidly suspicious and morbidly parsimonious; old friends were ystranged or removed by death, and. new friends did not ome forward in their place. For many years, neverthe- Jess, he maintained a correspondence with

Pope and Boling- broke, and with Arbuthnot and Gay until their deaths, vith such warmth as to prove that an ill opinion of man- ‘kind had not made him a misanthrope, and that human iffection and sympathy were still very necessary to him. The letters become scarcer and scarcer with the decay of ais faculties; at last, in 1740, comes one to his best Jublin friend, Mrs Whiteway, of heart-rending pathos :—

| “I have been very miserable all night, and to-day extremely eaf and fullof pain. Iam so stupid and confounded that I cannot xpress the mortification I am under both of body and mind. All) can say is that I am not in torture; but I daily and hourly xpect it. Pray let me know how your health is and your family: | hardly understand one word I write. Iam sure my days will be ery few; few and miserable they must be. I am, for those few Jays, yours entirely,—Jonathan Swift.

) “If I do not blunder, it is Saturday, July 26, 1740.

“Tf I live till Monday I shall hope to see you, perhaps for the ast time.”

) In March 1742 it was necessary to appoint guardians ‘f Swift’s person and estate. In September of the same fear his physical malady reached a crisis, from which he merged a helpless wreck, with faculties paralysed rather jaan destroyed. “He never talked nonsense or said a ‘olish thing.” The particulars of his case have been vestigated by Dr Bucknill and Sir William Wilde, who lave proved that he suffered from nothing that could be alled mental derangement until the “labyrinthine vert- 0” from which he had suffered all his life, and which le erroneously attributed to a surfeit of fruit, produced jaralysis, “a symptom of which was the not uncommon me of aphasia, or the automatic utterance of words Mgoverned by intention. As a consequence of that jaralysis, but not before, the brain, already weakened by

emile decay, at length gave way, and Swift sank into he dementia which preceded his death” (Craik, Life of

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Swift). The scene closed on October 19, 1745. With what he himself described as a satiric touch, his fortune was bequeathed to found a hospital for idiots and lunatics. He was interred in his cathedral, in the same coffin as Stella, with the epitaph, written by himself, “Hic depositum est corpus Jonathan Swift, S.T.P., hujus ecclesie cathedralis decani; ubi seva indignatio ulterius cor lacerare nequit. Abi viator, et imitare, si poteris, strenuum pro virili libertatis vindicem.”

The stress which Swift thus laid upon his character as Personal

an assertor of liberty has hardly been ratified by posterity, which has comparatively neglected the patriot for the genius and the wit. Not unreasonably ; for if half his patriotism sprang from an instinctive hatred of oppres- sion, the other half was disappointed egotism. He utterly lacked the ideal aspiration which the patriot should possess: his hatred of villainy was far more intense than his love of virtue. The same cramping realism clings to him everywhere beyond the domain of politics,—in his religion, in his fancies, in his affections. At the same time, it is the secret of his wonderful concentration of power : he realizes everything with such intensity that he cannot fail to be impressive. Except in his unsuccessful essay in history, he never, after the mistake of his first Pindaric attempts, strays beyond his sphere, never attempts what he is not qualified to do, and never fails to do it. His writings have not one literary fault except their occa- sional looseness of grammar and their frequent indecency. Within certain limits, his imagination and invention are as active as those of the most creative poets. As a master of humour, irony, and invective he has no superior; his reasoning powers are no less remarkable within their range, but he never gets beyond the range of an advocate. Few men of so much mental force have had so little genius for speculation, and he is constantly dominated by fierce in- stincts which he mistakes for reasons. As aman the lead- ing note of his character is the same,—strength without elevation. His master passion is imperious pride,—the lust of despotic dominion. He would have his superiority acknowledged,

and cared little for the rest. Place and profit were comparatively indifferent to him ; he declares that he never received a farthing for any of his works except Gulliver's Travels, and that only by Pope's manage- ment ; and he had so little regard for literary fame that he put his name to only one of his writings. Contemptuous of the opinion of his fellows, he hid his virtues, paraded his faults, affected some failings from which he was really exempt, and, since his munificent charity could not be con- cealed from the recipients, laboured to spoil it by gratuitous surliness. Judged by some passages of his life he would appear a heartless egotist, and yet he was capable of the sincerest friendship and could never dispense with human sympathy. Thus an object of pity as well as awe, he is the most tragic figure in our literature,—the only man of his age who could be conceived as affording a groundwork for one of the creations of Shakespeare. "To think of him," says Thackeray, "is like thinking of the ruin of a great empire." Nothing finer or truer could be said.

Swift's correspondence is the best authority for his life. Of his contemporaries, we are mainly indebted to his panegyrist Delany and his detractor Lord Orrery. Hawkesworth compiled the parti- culars of his life, and published what was the standard edition of his works till the appearance of Sir Walter Scott's in 1814. This edition is not likely to be superseded, but might with great ad- vantage be reissued with amendments and additions. The biogra- phy prefixed is based on Hawkesworth, but is far more copiously and elegantly written. At the same time the author's views are frequently conventional, his judgments superficial, and his good nature has made him too indulgent to his hero. The late John Forster subjected all available records of Swift's life to the most diligent scrutiny, and in 1875 published the first volume, coming down to 1711, of a biography intended to have been completed

in three volumes. Invaluable in many respects, it exhibited the process as well as the result of biography, and hence threatened to be too long. Mr H. Craik, succeeding to the post vacated by Forster's death,

judiciously reduced the scale, and produced in one volume (1882) a work which will long rank as the standard one on the subject. Remarkable monographs on Swift have been produced by Leslie Stephen in the "Men of Letters" series, Dr Johnson in the Lives of the Poets, Thackeray in the English Humourists. Mr Stephen is anxiously impartial; Johnson's acute- ness is perverted by his antipathy; Thackeray, as is natural in a novelist, has dwelt disproportionately on the romantic side of Swift's history, and his pity for Stella and Vanessa forms too large an element in his general judgment. But he has, better than any one else, apprehended the fearfully tragic element in Swift's character and fortunes. Swift's early life has been carefully investigated by Dr Barrett of Trinity College, and the final epoch of his life by Monck Mason and Sir William Wilde. His greatness is exaggerated and his failings are extenuated in two brilliant articles in the Quarterly Review, vols. cli. and clvi. Minor points in his life and writings have received much elucidation from numerous inquirers, especially the late Mr Charles Dilke and Colonel F. Grant. Mr Stanley Lane Poole has edited selections from his works and cor- respondenee, with excellent notes and prefaces, and has prepared a valuable bibliography. (R. G.)

SWIMMING anp DIVING. In the case of man the power of swimming is acquired, not natural. As com- pared with the lower animals, to most of which it comes perfectly easily, he is at a disadvantage in its acquisition, owing not to his greater relative weight so much as to the position of his centre of gravity, along with the fact that in the case of quadrupeds the motions which serve to sup- port and propel them in the water are very similar to those of locomotion on land. No race of mankind, however, can be mentioned to which the art is unknown, and in many barbarous countries it is more widely diffused and carried to greater perfection than amongst the civilized nations of the world.

For learning to swim, a quiet sandy beach is the best place, as sea water is more buoyant than fresh. All arti- ficial aids, such as corks, air belts, cork jackets, inflated bladders, and the like, may be avoided ; they raise some parts of the body too high above and so sink others too far below the natural plane of flotation, whereas the first fundamental rule is that the mouth only should be above water, and the legs close to the

surface. Belts, &c., are also apt to become misplaced and so cause trouble and annoyance as well as danger. It is best for beginners to take some instruction from a practical teacher, though many have become adepts by merely watching good per- formers. Confidence in the floating power of the body is the first thing to be acquired. The easiest way of floating is to lie on the back (which should be slightly hollowed), the arnis being stretched out beyond the head but not lifted

out of the water; this attitude not only facilitates respira- |

tion but counterbalances the weight of the lower limbs. The knees may be bent outward, the toes also pointing side- ways, the hips rigid, so assisting to keep the legs up as close as possible to the top of the water. By easy breathing one

lungs kept charged, the body will assert its buoyancy.

To further enable him to realize that water is capable of supporting the human body, the learner may adopt the following plan. Walk down the steps of a bath, or along a shelving beach on a calm day, into about 3 feet of water ; turn and face the shallow place, and, having taken a breath, stoop down and try to pick an egg or some similar object (a handful of sand will suffice) from the bottom. Repeat this several times leisurely, going farther out at each venture, till the water reaches up to but not higher than the middle of the chest. It will soon be found that the object is not so easy of recovery, and the beginner learns that but little exertion is required to keep the body afloat. When this experience has been gained the novice should commence with the Breast Stroke, which is nowadays some-

times unjustly set aside as the “old stroke.” It is neat natural, and graceful enough, though necessarily the slowest. from the great resistance of the chest to the water and the fact that part of the arm stroke is negatived by its own movement. Like walking in pedestrianism, however, it forms the groundwork of every other branch of the art, and cannot safely be overlooked. The stroke is com. menced by placing the hands with the backs upward, and the wrists bent so that the fingers will point to the front, the insides of the wrist-joints

between arm and thumbs touching the breast not lower than 4 inches under water. Begin the stroke by pushing the arms gently forward to their full extent, keeping the palms flat and the fingers closed. Now turn the palms of both hands outward, and make a strong stroke to the right and left by each arm through an angle of 90°; in this part of the stroke the two arms describe a semicircle, of which the head may be termed the centre. It must be most distinctly borne in mind that all depression of the hands will tend to raise the body perpendicularly, whereas the only true position in swimining is the horizontal, which propels it forward. To complete the arm movement, bend the elbows back- ward and inward, until they come close to (but not neces sarily touching) the sides of the body. Carry the hands in a straight line edgeways to the position from which they started in front of the chest. Simultaneously with the stretching of the hands from the front of the body the feet are struck out to the utmost width in a way cleft for them by the toes. As the arms are being brought round in the semicircular motion the lower limbs are stiffened and brought firmly together by grasping the water, so to speak, with the whole of the leg, more especially between the knees, ankles, and soles and toes of the feet. Whilst thus imparting forward motion to the swimmer, they finish in a straight line behind the body. Then, when the arms are bent, and the hands are being brought to the front of the body, the knees are turned outward, heels kept together, toes also turned out, and the feet are carried up to the body and in this position are once more ready for repeating the movements as de- scribed. Beginners must be careful not to make the arm movements quicker than those of the legs, and it must be distinctly remembered that the latter are the great pro- pellers. Unison of the movements as mentioned, and regularity in each part of the stroke, are indispensable to perfection. All hurry and excitement must be carefully avoided, and every complete stroke and kick gone about with mechanical precision and neatness. The only part requiring strong muscular exertion being the closing of the legs after they have been spread wide apart,—the one strong propelling element,—every effort is to be made to ensure correctness and power in its performance. The arm movements should be easy and graceful, all jerkiness

or suddenness of motion being carefully avoided. will soon be convinced that, properly balanced and with |

Breathing should be unrestrained and natural, without gasping, sputtering, or short or sudden heavings. A safe rule is to have a full breath at every stroke, its division being regulated as follows. Blow slowly outward when the first part of the arm movement is being performed, 4.@ stretched out in front ; inspire as the hands are going out- ward and round. Then, as the lungs are fully charged, no effort is necessary to suspend respiration while the hands are carried in to the front of the body again. This regu- larity of breathing is essential to pleasure, comfort, and gracefulness of action. The nostrils and air-passages should always be thoroughly cleared, the mouth cleansed, and the throat gargled before entering the water.

Swimming on the Back is a pleasant and useful branch of the art; the chief requisite for its acquirement 1s COM fidence. The tyro should begin practice in water reaching

Swim

up to about the upper part of the chest, turn his back shoreward, take a long breath, and lie gently backward in the water, keeping the hands on the waist with the elbows extended outward, the chest being expanded, and the breath held. As one lies well back the feet will be lifted off the ground ; they should then be spread outward as far apart as possible, in the same position as when they are opened up in breast swimming. The body and legs are thus lying extended at full length like the letter Y, the legs forming the branches or fork. Now comes the pro- pelling part of the movement. As in the front stroke, the muscles are set, and the legs are by one strong motion brought firmly and closely together. While this is being done the toes, by a slight movement of the ankle, are turned upward, and so, as the movement is finished, the great toes, inner ankles, and inside of the whole leg meet. This motion, strongly but not jerkily executed, sends the body forward, and, when the impetus obtained is nearly— not quite—expended, the legs are bent, so that the feet are drawn close up to the trunk, with the knees outward and heels together. The stroke is renewed by spreading apart, closing

again, and soon. The breath is exhaled when spreading and closing the legs, and inhaled as the feet are drawn up to the body. If greater speed is wanted, the hands can be used as sculls by carrying them . outward from the body, but at the same time level with it, | facing downward. When the arms are sufficiently ‘ extended to be in a line across from hand to hand, the ” wrists are turned to allow of the palms of the hands fac- ing toward the feet, thumbs upward. Elbows, wrists, and hands are now firmly braced, and a strong pull towards the legs is made. This is the progressive motion, and should _ be performed just as the legs are being closed. _ Another style is to bend the elbows downward, so as to Jie of the hands being carried upward along the sides of

the body, thumbs inward, and palms facing the bottom of the water. When the hands have been carried up to the armpits they are spread apart to the full extent of the arms, and the propelling part is performed as in the other ‘method by pulling strongly toward the legs.

_ _Astill more powerful stroke, and one used at competi- tions, is accomplished by carrying the hands up to the ‘armpits, as described in last method; then, turning the wrist so as to allow of the palms of the hands facing up- ward, point the fingers in the direction of progress, stretch both arms as far as possible in a line with the body and beyond the head, and turn the wrists half round, until the lands are back to back, thumbs upward. The propelling action is now performed by sweeping both hands outward and round until they touch the legs and the arms are once more straight along the sides of the body. There is a double kick in this style, and the action is as follows. When the hands are being carried up to the shoulder one kick is delivered ; then as the arms are being carried beyond the head the nether limbs are drawn up in position for another kick, which is delivered as the arms are sweeping down on the stroke. This is no mere ornamental stroke, out combines in its practice grace with power, and enables the swimmer to move through the water at great speed. Another racing back stroke is performed by lifting aands and arms out of the water at the finish of the pull downward, carrying them in the air, stretching them at ‘ull length forward beyond the head, and then dipping shem into the water,

executing the positive part of the stroke as in the last-described method. In this stroke 3 is only a single kick to each pull of the arms, the

egs being drawn up as the arms are swung up in the ir and closed as the arms are pulled through the water. Ml hile this movement is much practised by some experts, ‘tis neither so graceful nor so speedy as the other, and

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there is much splashing, while steering is, in the case of a close race, likely to become rather erratic. Both are at the present time the fastest known methods of swimming on the back, and, with moderately good turning and push- ing in a swimming bath, 100 yards should be covered in about 74 seconds, probably less.

Of treading as a branch of swimming something should be known by every one. It is the only department of the art that is at all natural; and, if treading were resorted to in cases of accidental immersion, tliree-fourths of the resulting deaths would be prevented. The essential condition, of course, is that the hands be kept under water. When one falls into water the legs sink and the body assumes a perpendicular position, the water splashes over the face, and, once the eyes become filled or the mouth covered, the inclination of any one unable to swim is to throw the hands up and make an effort as if to creep along on the surface. These efforts only increase the danger of the position. On becoming submerged one should keep per- fectly inactive for a brief time; the head will soon rise above the surface, and at this moment one ought to beat downward with both hands alternately, never allowing them to splash or disturb the surface, the head being leaned back so as to keep only the face and nostrils clear. The back of the head and ears may be covered, but this does not matter. The motions of the hands, exactly similar to those of a dog’s forepaws when swimming and walking, are to be continued, the feet at the same time striking down—not hurriedly, nor with sudden jerky movement, but easily and gracefully, the ankles moving as if working treadles, so that the soles of

the feet act as sustaining and, it may be, propelling surfaces. The movements of hands and feet may be altered by beating downward with both hands at once, or both feet at once, but in cases of accident the former action is to be recommended. Swimmers, when treading at competitions or for display, either fold their arms across their chest or hold hands and arms above the surface. In artistic swimming trials, as much as possible of the body should be shown above the surface, and bob- bing up and down ought to be avoided. Treading is of much importance even to a good swimmer, as it allows him to divest himself of upper clothing, and enables him to lay hold of anything, such as a rope or line that does not quite reach the surface; it is also the most comfortable position in which one can partake of refreshment in case of a long swim, and is useful for purposes of conversation.

The Side Stroke may be said to hold in swimming a position somewhat similar to that of running in pedes- trianism ; as it becomes better known, the advantages of this style of aquatic progression are becoming more and more appreciated. The practice of it, however, ought not to be begun until complete proficiency has been attained in the primary stroke. Its main recommendations are apparent almost ata glance. A good average side move- ment will carry the swimmer a stroke in two seconds, each stroke covering a distance of fully six feet. The method is said by some to have been introduced by George Pewters about the year 1850. The body is turned on either side, but preferably with the right side downward, as thereby the legs act more freely and naturally and the heart has no weight on it to impede its action. The head is more immersed and thereby reduced in weight, being supported by the water and not by any muscular exertion of the neck or shoulder, and the lower extremities are less immersed than in the breast stroke. If one is lying on the right side, the right arm is thrown boldly out in front, with the palm of the hand downward and on a level with the lower side of the head. When pushed out to the utmost it is kept rigid, brought downward through the water in one strong

novement, without any bending of either wrist or elbow, XXII. — 97

and this, the positive action, is finished when the hand has reached the legs, and comes between these limbs at full stretch. It is then carried up along the body to the chin, and the stroke renewed. The left hand is formed into a scoop, turned outward by the wrist at right angles to the forearm. The left arm, with the elbow bent, is then directed outward, and makes a straight pulling (not circular nor swinging) stroke to the left hip. When one arm is performing the negative the other is at the positive part of the stroke. The action of the legs should be long and vigorous, and they should never cross each other, but should work in unison with the arms and shoulders. The left knee is brought up in front of the body, with the foot in front of and at right angles to the body. Put the foot in a line with the front of the leg, and bring it round to meet the other in a line with the body. Meanwhile stretch the right or lower leg as far away as possible from the body toward the back and then bring it down to meet the other by a powerful plain stroke. The legs are then returned upward to the body, the heels touching, the knees apart, the toes of the left foot forward and of the right foot downward. To learn this graceful and useful side stroke some persons need long and steady practice ; others acquire it comparatively quickly. The swimmer steers with his left or right hand and arm as the direction de- mands. The head and neck must be held in one position, not raised nor turned at any part of the stroke. SBear- ings should be taken from what can be seen in the line of vision away from and in front of the body, and only very seldom indeed should the head be turned to look in ad- vance. Breath is inhaled as the under hand is pulling downward, and exhalation should take place while the mouth is immersed, which is when the uppermost hand is performing the stroke along the body.

The coincident movement of arms and legs may be thus described. As the legs are bent up to the body the upper or left hand has been stretched in front and the right or lower arm has just finished the pull. As the top arm pulls downward the legs are opened wide and almost in the same motion swung round and closed. It will be apparent that the legs are returned upward with knees bent as the downward pull is being performed with the lower arm. No effort is to be made to sink the head, neither is it to be held up in any way. The turn of the body by the power of the strokes will be quite enough to allow of the lips being

sufficiently clear of the water for the purpose of inspiration. There should be no sudden pull at any part whatever of this complete stroke.

The Overhand Stroke, when properly practised and acquired, is the most useful and easy of all styles of swimming. Beginners, however, should beware of acquir- ing it before they are thorough adepts with the side stroke, otherwise they lose all power of speed and good appear- ance. Harry Gurr is sometimes said to have been the inventor of this stroke in 1863, but Harry Gardener, in August of the year previous, when he won the 500 yards championship in Mancliester, used the overhand or over- arm stroke. The only movements of the side stroke which differ from those of the overhand are tliose of the left or upper arm and hand. By carrying this arm in the air a lengthened reach is obtained above the surface. As in the side stroke, the head lies as far as possible into the water, the body, legs, and feet in a straight line level with and close to the surface. The left arm is carried forward and stretched as far as possible out of the water in a line with the face and in advance of the head. The arm and hand re-enter the water, and are pulled through it with the strongest propelling stroke. The limb out of water should be carried through the air quietly, gracefully, and evenly till dipped for the stroke, not swung uselessly

round from the shoulder in a half circle. The left arm and hand being in the air, the head lies deeper in the water than in the side stroke, and it is reduced in weight, The legs work simultaneously with the left arm ; that is, they are drawn up as this arm reaches in front, and are at their nearest wide stretch by the time it is in position for the pull; they are then pulled strongly together as the upper arm is performing its strong movement. At no time when the upper arm is being carried forward above the water should the hand be higher than a very few (say about three) inches above the surface. The elbow alone is elevated, and is the highest part of the arm. In fact, the hand is so close to the surface that, on being lifted upward after the delivery of the stroke, the wrist has to be bent; otherwise the fingers would actually touch the water. Once, however, the hand comes opposite the eyes it is straightened in a line with the fore-arm and in this position carried to the dipping point.

Breathing is regu- lated in precisely the same way as when swimming by

means of the side stroke.

Touching and Turning.—The methods of ‘touch and turn” were brought into vogue by the now numerous swimming races in baths. Whether the baths be long or short, from 10 to 15 feet in the push-off is gained at each end of every length by all com- petitors. Assuming that the swimmer is using the side or over- hand stroke and going on the right sidc, the method to be adopted is as follows. When within 3 feet of the end wall of the bath the left or upper hand quits its propelling movement, and reaches in front of the head till it touches the wall just above water-mark, The palm of the hand is then placed horizontally on the wall, the fingers to the right, which is the direction to which one is turning ; the little finger is uppermost and thumb undermost. The knees are bent, and the body, now close to the wall, is turned to the right on its own axis by the left hand, after which the feet press against the wall under the hand. As in diving and plunging, the body, arms, and hands are in a straight line, and the head between the biceps, all under water. The thighs are doubled up under the loins, the calves of the legs touching the back of the thighs, and the soles of the feet pressing hard against the wall. A strong push-off is made by the feet and legs, and the swimmer resumes his ordinary stroke and course for a new length.

Ocean Swimming.—Persons having from any cause to swim in the heavy rolling breakcrs of mid ocean should use the side stroke when available. No attempt should be made to breast or mount the waves. By taking their direction a side-stroke swimmer 1s

carried an unexpectedly long distance. The large dangerous rollers —

come almost in regular succession after an interval of small waves. The swimmer soon notices them, fills his lungs, swims into them, ducking the head, and quickly emerges when the wave has passed. Then a fresh supply of breath is inhaled.

Plunging.—In this the performer enters the water in somewhat the same manner as when diving (see below), but ata flat angle, and from the moment of doing so makes no active muscular movement whatever of any part of the body under water. Plunging came into vogue as the most graceful and practical method of starting I swimming races. From 8 to 5 fcet above the water-level makes the best springing point, whethcr from bank, board, or rock. The knees should be kept together and slightly bent, with the weight on the balls of the feet and the lungs fully charged. The spring forward at the signal to start is given with all muscular power available. A swing of the arms from behind is taken, and, as the feet quit their support, the arms are swung forward so as to rise Up to and straight beyond the head. The body is shot into mid-air as far as possible, and, before touching the water, the head falls between the arms till the chin just touches the chest and the ear grazes the inside of the biceps. The body now glides gracefully and almost noiselessly into the water, with the chest slightly- hollowed, the shoulders contracted, and the arms rigidly braced out straight. The hands are now laid flat and the thumbs locked, while the hips and ankles are kept in one rigid straight linc, with the soles of the feet turncd upward and level with the surface, the toes pointing straight behind. The forward motion from the spring co as long as the body will float and the air in the lungs can be held, when the feet, followed by the arms, begin to sink, and the plunger ends his performance by mercly raising his head. Adepts in this branch have saved" themselves from a sinking vessel by 4 long plunge from the ship's side, and so by one effort have got clear out of the vortex that is caused by her settling down and sinking.

Diving.—The rule in diving, as distinguished from plunging, 1s most explicit. In diving alone are the limbs allowed to ma " muscular movements under water. When properly performed} is a most graceful feat to the eye, and a good swimmer 18, 85 # Tune

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known by the way in which he enters the water. The height of the end of the board from the surface of the water may be from 3 to 20 feet. If

the water is taken properly a clean dive or header is made, but some swimmers are careless and will flop into the water with the body contracted like a ball, instead of straightened out like anarrow. ‘The descent of good divers into the water varies from 3 to 4 feet, of clumsy performers from 7 to 8 feet. The dive may be a standing or running one. The feet and legs are kept together, with the chest inflated, the arms slightly swung to and fro twice or so, and the body and legs bent towards the water. The lungs are charged, and the dive is made immediately before the arms and hands are raised forward into the air above the bent head. The feet are used with all the power possible in springing off. When in mid air the diver straightens himself out from finger tips to toes. The shoot downwards is made by declining the arms so as to enclose the head, the chest is momentarily contracted, and the water is gracefully and noiselessly entered fingers first. The instant the body is covered, throw up the head and arms so as to reach the surface. The eyes instinctively close as they enter the water ; if it were otherwise, the force with which the surface is struck might cause injury, especially in the case of high diving. _ As soon as the water is entered the eyes should be opened, as | swimming under water with them closed may be attended with danger. The best method for novices is to begin from a board 8 feet high ; and, as confidence and a good style are acquired, the height may be raised 1 or 14 feet at a time. Running headers are accomplished by running 10 or 12 paces before springing off, and the diver endeavours to clear as long a distance as possible before entering the water. Muscles and weight have nothing whatever to do with perfection in diving. Slim youths and heavy middle- aged men and women have alike excelled in this branch of aquatics. The important requisites are courage and strength of nerve, com- bined with experimental knowledge of the behaviour of the body while in air and water. Do not enter the water feet first. This ig only done by those who have not the courage to dive in the proper ; Manner, and it sometimes causes harm to the respiratory organs, while one may lose balance and so come on to the water quite flat and be seriously injured in the stomach, ribs, or spine.

Object Diving.—Some divers move over the bottom in straight lines, and others search on no planatall. The best way is to strike to the right

or left on the circumference of the circle surrounding » the objects and work spirally inwards to the centre of the circle.

If the face be kept close to the bottom and the eyes brought well into use success will reward one's efforts, and no object ought to be missed. For object diving the drawers should have a pocket casily accessible to one hand, in order to receive the objects raised. These are collected by swimming on the breast as quickly as pos- sible. All movements under water ought to be gone about with the utmost alacrity, but at the same time without undue haste or flurry, otherwise the heart's action will be increased, the breath will suffer, and the stay under water will be shortened.

Plate Swimming.—This is a most interesting and enjoyable branch of the art. From a very early period we find references to mechanical appliances as aids to progression and support in the water, these helps generally taking the form of large flat surfaces made of wood, tin, leather, waterproof fabrics, or other similar materials. Sometimes they were flat, in other instances slightly coucave. Some were made banded like the covers of a book, or hinged, others opened and closed with umbrella-like action, while quite a large number were made web-like, to resemble a duck's foot; nearly all were more or less collapsible. From what can be gleaned of the style of these articles it is evident that the inventors cannot have been familiar with the principles of swimming, or aquatic

propulsive action, and so, while a number of the contrivances were undoubtedly the outcome of much thought and ingenuity, they /could not be regarded as in any way improving on the ordinary or primitive swimming movements; and, while greater surface than } is offered by hands and feet was always given, with the evident / intention of reducing "slip," much resistance took place at the neutral or negative part of the stroke. The one good effect in most of these inventions was thus more than nullified by this "drag," ' which, besides being objectionable in itself, had the additional dis- / advantage of bringing into requisition muscles of legs and arms) the development of which was antagonistic to perfection of swim- /™ming. In 1876 Mr R. H.

Wallace-Dunlop, C.B., announced that | he had invented swimming plates which afforded increased speed | without causing undue straining of the muscles; and these claims have been justified by subsequent experience. The arrangements for a lateral movement of the heels in the footboards or plates, f i

with freedom of the ankles, showed at once that Mr Dunlop had fully studied the details of the art of swimming, with the effect of greatly reducing "slip" in the positive and altogether doing away with "drag" in the negative parts of the leg stroke. Slow swimmers, by the use of the new appliances, move quickly and easily through the water, whilst moderately fast swimmers have their speed increased to an almost wonderful extent. To swim 100 yards in 70 seconds without artificial aid is regarded as a good per-

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formance: there are not halfa dozen living swimmers who can reduce this time by so much as five seconds. Yet about ten years ago a London swimmer, uot by any means the fastest, with the assist- ance of the plates covered the distance of 100 yards in 60 seconds. It will thus be apparent that the invention marks an important advance in the art of swimming. These plates are made of wood —mahogany or American bass,—and are in shape somewhat like an artist's palette, with this difference, that the bay or indenta- tion of the edge runs in to where the thumb-hole would be. The straps are made of leather, and all buckles and metal should be of bronzed or lacquered brass ; the woodwork ought to be kept well polished or varnished. The hand plates are at the

thickest part g of an inch thick, but those for the feet must be much stronger, as the whole weight of the body is upon them while one is standing at or walking to the water'sedge. In learning to use them, let the swimmer begin by lying flat on the water, straightening the arms out about 24 inches apart. Spread the feet and legs well outward ; then so place the feet that the plates shall be vertical, and thus offer the soles as resisting surfaces to the water; close the legs in such a way that the flat parts will meet when the legs come together. The return of the feet to the body is the same as in natural or unaided swimming, #.¢., by bringing them heels first so that the plates are carried up edge ways. Next, turn the ankles so as to allow of the soles facing outward, this being in plate swimming the point from which the positive or propelling part of the stroke actually starts. Now press outward and round until the plates meet as before, and repeat. Practise slowly and steadily until sure that in the recovery there is no drag, and that when spreading apart and closing the resisting surfaces are squared so as to reduce slip to its minimum. The hands are moved as in ordinary swimming, with this difference, that they are all the time lying flat; on their return to the body after the propelling move- ment no motion of wrist is to be made, great care being taken to keep the hand plates perfectly parallel with the surface of the water, as the slightest deviation from this rule, at any one part of the arm stroke, will sink or raise the head and chest, and so alter the natural and correct plane of the whole body. As the plates are lighter than the water the feet will tend to come close to the surface, if not indeed sometimes above it, causing splashing unless care be taken to avoid this. Floating in any position is easy and comfortable with plates on, and diving, sculling, and back swimming are all facilitated. The length of stroke in plate-swimming is nearly double that of ordinary water movements. The recommendations of the invention, especially in sea and long- distance swims, may be summed up in four words—safety, power, endurance, speed.

Long Immersions.—It is on record that on October 6, 1835, Samuel Brock, a Yarmouth fisherman, after being capsized, remained in the water for 74 hours before he was picked up. As a long- distance swimmer in ocean and tidal waters no one has ever approached

Matthew Webb (1848-83), of the British mercantile marine service. His first great feat was plunging (April 23, 1873) off the Cunard 8.8. " Russia" into a heavy sea in the unsuccessful endeavour to save a young sailor who had fallen overboard, when he passed 37 minutes in the sea before the lifeboat relieved him. He received the silver medal from the Royal Humane Society of London, the Stanhope gold medal, and a £100 purse subscribed by the passengers of the "Russia." In June 1874 he swam from Dover to the north-east Varne buoy (94 sea miles). . On July 3, 1875, he went from Blackwall Pier to Gravesend Town Pier on an ebb tide (184 miles) in 4 h. 52 m. 44 s., and on July 19, 1875, from Dover to Ramsgate (15 sea miles) in 87 h. An unsuccessful attempt to swim from Dover to Calais (174 sea miles) in the narrowest part of Dover Straits took place on August 12, 1875. He afterwards successfully accomplished the feat on August 24-25, 1875, after 21 h. 44 m. 55 s. immersion, the distance swum having been as nearly as possible 394 statute miles. A foolhardy attempt to swim the whirlpool rapids of Niagara cost Webb his life on July 24, 1883. On September 15, 1875, F. Cavil swam on the ebb of a strong spring tide from Putney to Blackwall (13 miles 3 furlongs) in 3 hr. 50 m. Miss Agnes Beckwith, of London, on the 17th July 1878, swam 20 miles in the Thames, without any assistance whatever, in 6 hours 25 minutes. Horace Davenport, of London, for years amateur champion of Great Britain, on 2d September 1884, swam from Southsea, Portsmouth, to Ryde, Isle of Wight, and back again in 5h. 25 m. a

Remarkable and Best Swimming Records.—The great majority of these have been achieved in England, but accurate statistics cannot be said to be plentiful. The following are some of the authenti-

cally recorded results.

Best Records in Open and Still Water :—100 yards, 1 m. 53 s.; 220 yards, 2 m. 544s.; 300 yards, 4m. 578 ; 500 yards, 7 m, 58s.; half-mile, 14m. 17} s.; 1000 yards, 15 m, 51} s.; 1 mile, 28 m. 193 s.; 3 miles, 1 h. 53 m. 30s. F

Bath Swimming.—Of the innumerable enclosed swimming baths in Great Britain not many are exactly similar in measurement as regards

length and breadth. The shorter the bath the faster becomes the time test of speed by the aid of each turn, The Lambeth bath, where the greatest number of champion- ship and other celebrated bath races in the kingdom have been decided, is 40 yardslong. The following are the best Lambeth records:—40 yards, 233s; 80

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yards, 52} s.; 100 yards, 1 m. 73 s.; 120 yards, 1 m. 28! s.; 160 yards, 2 m. 2 s.; 200 yards, 2 m. 413 s.; 220 yards, 2 m. 59} s.; 400 yards, 5 m. 443 s.; } mile, 6m. 214 s.; 500 yards, 7 m. 194 s.; 600 yards, 8 m. 46} s.; 800 yards, 11 m. 464 s.; ¢ mile (21 turns), 13 m. 3 s.; 1000 yards, 14 m. 56} s.; 1200 yards, 18 m. 55 s.;_# mile, 20 m. 3 s.; 1400 yards, 21 m. 173 s.; 1 mile (43 turns), 27 m. 3}:s. The records of other baths include :— 500 yards, 6 m. 55 s. (Oldham Baths); 100 yards, 1 m. 43 s. (Blackburn Baths); 1 mile, 26 m. 21 s. (Westminster Aquarium) (80 turns).

Longest Time under Water, in Glass Tank.—4 m. 29} s.

Longest Dives.—109 yards 2 feet 6 inches, and 113 yards 1 foot.

Longest Plunges.—\Krom a springboard 5 feet above the level surface of the water, 73 feet 1 inch; from a fixed board, 3 feet 6 inches above the water level, 76 feet 3 inches.

For baths and bathing, see BATHS, vol. iii. p. 434. For drowning and rescuing life, see DRownine, vol. vii. p. 475. There are two societies with headquarters in London which consist of delegates from nearly all the swimming clubs in the metropolis. These have framed rules and regulations for the conduct of clubs, races, and other performances included under "swimming." The Professional Swimming Association was successfully floated by Mr Robert Watson on July 6, 1881. The Amateur Swimming Association was reinaugurated in 1886 by the amalgamation of the Swimming Association of Great Britain and the Amateur Swimming Union. There are annual competitions for the amateur champion- ships at 500 yards, } mile, 1 mile in still water, and 5} milesinthe Thames. There are also the Associated Swimming Clubs

of Glasgow and the Associated Clubs of Dundee, each similar in its objects and composition to the Amateur Swimming Association.

The literature of the subject of swimming is considerable, and the following works may be mentioned. Thevenot, The Art of Swinming, transl. from the French, London, 1789; Swimming, two letters by Benjamin Franklin, Bungay, 1791; Walker's Manly Sports, art. "Swimming," London, 1836; G. H. Cliss, Gymnastics and Swimming, London, 1840; W. H. Leveral, Swimming and Swimmers, London, 1861; S. W. Higgenson, "' Swimming," in The American and Continental Monthly, May 1870; " Piscator,' How to Swim, London, 1si2e Charles Steedman, Manual of Swimming, London, 1873; Leahy, Swimming in the Eton Style, Nottingham, 1875; J. Bell Pettigrew, Animal Locomotion, London, 1874; W. Wilson, Swimming, Diving, and How to Save Life, Glasgow, 1876; Torkington, Swimming Drill, London, 1876; R. H. W. Dunlop, Plate Swimming, London, 1877; Menstery, New Manual of Swimming, New York, 1878; W. Wilson, The Swimming Instructor, 1883; J. H. Walsh, art. " Swiin- ming," British Rural Sports, London, 1886, (H. F. W.—W. WL.)

SWINDON. The towns of Old and New Swindon, in Wiltshire, England, are situated on several railway lines, about 77 miles west of London and 30 east-north-east of Bath. The old town is built on an eminence commanding fine views of the surrounding country. It received a charter for a fair from Charles I, and has weekly markets for corn and cattle. The church was erected in 1851, from the designs of Sir Gilbert Scott. There is a town- hall and a corn exchange. Swindon New Town, to the north from Old Swindon, has grown up since the construc- tion of the Great Western Railway, which has its principal works there. There isa market-house for meat, fish, and vegetables. Connected with the Great Western Railway mechanics' institution there is a library of about 14,000 volumes. The combined areas of Old and New Swindon, which form separate urban sanitary districts, amount to 2524 acres, with a population in 1881 of 22,374. Old Swindon (area 1214 acres) had a population in 1871 of 4092 and in 1881 of 4696, and New Swindon (area 1310 acres) a population in 1881 of 17,678.

SWINE. The oldest known even-toed or Artiodactyle Ungulates (see Mammatta, vol. xv. p. 429) were neither Oxen, Antelopes, Deer, Camels, nor Pigs, but presented a generalized type, which by modification in various direc- tions has given rise to all these very diverse forms. They were mostly of small size, and had invariably the full number of teeth of the typical mammalian heterodont dentition, viz., 44, of which the incisors were 2 on each side, the canines }, the premolars 4, and the true molars 3. The molars were short and square, crowned with blunt, rounded cusps, and the canines were not remarkably developed. All the feet terminated in four toes, the two middle ones (the third and fourth of the complete typical mammalian extremity) of nearly equal size, the outer ones (second and fifth) smaller, and also equal. The five-toed ancestor of these forms has not yet been discovered. They had no special weapons, as horns or antlers, on their foreheads. Such was the condition of all the hitherto dis- covered animals of this division at the commencement of the Tertiary period. Very early a change took place in the characters of the molar teeth in certain members of the group: the rounded tubercles became sharp ridges curved in a crescentic form, and better adapted for a purely herbivorous diet, especially for cutting and bruising the comparatively dry and hard blades of grass which grow

in open plains. The animals thus separated from the rest —the Selenodont (crescent-toothed) Artiodactyles—haye undergone various further modifications of teeth, teet, and other parts, and constitute the diverse forms of ruminat. ing animals mentioned above. Those whose molar teeth retained more of the primitive tuberculated (bunodont) form, were the ancestors of the present family of Swine, some of which, looking upon their organization as a whole, have undergone less change since the Focene period than almost any other mammals.

Remains of very generalized swine-like animals have been abundantly found in Eocene and early Miocene formations both in America and Europe. In the former continent they never (as far as present evidence indicates) underwent any great diversity of modification, but gradu-

ally dwindled away and almost died out, being only repre- sented in the actual fauna by the two closely-allied species of peccary, among the smallest and most insignificant mem- bers of the group, which have existed almost unchanged since the Miocene age at least, if the evidence of teeth alone can be trusted. In the Old World, on the other hand, the swine have played a more important part in recent times, having become widely distributed, and throw- ing off some curiously specialized forms. At the present time, though not very numerous in species, they range through the greater part of the Old World except within or near the Arctic Circle, although, in common with all the other members of the great Ungulate order, they were completely absent from the whole of the Australian region until introduced by man in very recent times.

The existing swine-like animals may be divided natu. rally into three families:—I. Hippopotamide ; II. Suide, or true Pigs ; III. Dicotylidex, or Peccaries.

I, Famity HIpporpotaMIps#.

Muzzle very broad and rounded. Feet short and broad, with four subequal toes, with short rounded hoofs, all reach- ing the ground in walking. Incisors not rooted but con- tinuously growing; those of the upper jaw curved and directed downwards ,; those of the lower straight and pro- cumbent. Canines very large, curved, continuously growing; upper ones directed downwards. Premolars +; molars %. Stomach complex. No cecum.

This appears to be an exclusively Old-World form,—no animals belonging to it, either recent or fossil, having been found in America. The family has been divided into three genera, according to the number of the incisor teeth. (1) Hexaprotodon, incisors 3, a type which comes nearest to the generalized or ancestral form of the group, is now extinct, being only known from the early Pliocene formations of the Sub-Himalayan range. (2) Hippopotamus proper, incisors , contains the one well-known species 1. amphibius, now confined to the rivers and lakes of Africa, but formerly (in the Pliocene period) abundantly distrib- uted, under various minor modifications, in Europe, as far

north as England. Remains of an allied form have been found in the island of Madagascar, where it is now extinct. (3) Choeropsis, incisors reduced to 7, contains one very small and still little known species, from rivers of Liberia, West Africa, C. liberiensis. See H1ippopoTAMUs.

II. Famity Suiw2z.

An elongatea mobile snout, with an expanded, truncated, nearly naked, flat, oval terminal surface in which the nostrils are placed. Feet narrow ,; four completely developed toes m each. LHoofs of the two middle toes with theur contiguous surfaces flattened. The outer (second and fifth) digits not reaching to the ground in the ordinary walking postin Teeth variable in number, owing to the suppression m some forms of an upper incisor and one or more premolars.

Incisors rooted. Upper canines curving more or less outwards or upwards. Stomach simple, except for a more or less de- veloped pouch near the cardiac orifice. A cecum. Colon spirally coiled. Confined to the Old World. Sus.—Dentition: 73, c+, p+, m2; total 44, Upper incisors diminishing rapidly in size from the first to the third. Lower incisors long, narrow, closely approximated, and almost horizontal in posi- tion, their apices inclining towards the middle line; the second slightly larger than the first, the third much smaller.

Fia. 1.—Dentition of Boar (Sus scrofa).

Canines strongly developed and with persistent roots and | partial enamel covering, those of the upper jaw not having

the usual downward direction, but curving strongly out- _ wards,upwards, and finally inwards, while those of the lower _ Jaw are directed upwards and outwards with a gentle back- _ ward curve, their hinder edges working and wearing against

‘) the front edges of the upper canines! They appear ex- of the upper lip

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ternally to the mouth as tusks, the form _ being modified to allow of their protrusion, but are much less developed in the females than in the males. The teeth of the molar series gradually increase in size and complexity from first to last, and are arranged in con- tiguous series, except that the first lower premolar is separated by an interval from the second. First and Second upper premolars with compressed crowns and two roots. The third and fourth have an inner lobe developed on the crown, and an additional pair of roots. The first and second true molars have quadrate crowns, with four principal obtuse conical cusps, around which numerous accessory cusps are clustered. The crown of the third molar is nearly as long (antero-posteriorly) as those of the first and second together, having, in addition to the four _ principal lobes, / of numerous clustered conical cusps, and supported by several additional roots. The lower molar teeth resemble | generally those of the upper jaw, but are narrower. Milk dentition: 73, c4, m2; total 28,— the first permanent premolar having no predecessor in this series. The third incisor, in both upper and lower jaw, is large, developed before the others, and has much the size, form, and direction of the canine. Vertebre: C 7, D 13-14, L 6, S 4, C 20-24. The hairy covering of the body varies ‘ much under different conditions of climate, but when best | developed, as in the European wild boar, consists of long stiff bristles, mostly abundant on the back and sides, and

of a close softer curling under-coat. ee

‘ If from any accidental circumstances these teeth are not con- | stantly worn down by friction, they grow into a complete circle, the ‘ Point penetrating the bone of the jaw close to the root of the tooth.) The natives of the Fiji Islands avail themselves of this circumstance to | produce one of their most valued ornaments—a circular boar’s tusk :

the upper canines being extracted, the lower ones are allowed to grow) to the desired form.

a large posterior talon or heel, composed |

SWINE

This genus occurs at present under three principal modifications or subgenera.

A. Sus proper comprises a number of animals found in a wild state throughout the greater part of Europe (except where exterminated by human agency), the north of Africa, southern continental Asia, and the great islands of the Malayan archipelago, Formosa, and J apan. The following among others have been admitted by zoologists as distinct species :—Sus scrofa, the wild boar of Europe, Asia Minor, and North Africa, once common throughout the British Isles ; S. sennaarensis, North-East Africa; S. cristatus, Hin- dustan; S. vittatus, Java, Borneo, Amboyna, Batchian; S. barbatus, Borneo; S. papuensis, New Guinea; 8. timorensis, Timor and Rotti; S. andamanensis, Andaman Islands > &, celebensis, Celebes; S. tatvanus, Formosa ; S. leucomystax, Japan; S. verrucosus, Java, Borneo, Ceram. This list will give some idea of the geographical distribution of wild pigs, but it must be borne in mind that through the whole of this region, and in fact now throughout the greater part of the habitable world, pigs are kept by man in a domesticated state, and it is still an open question whether some of the wild pigs of the islands named above may not be local races derived originally from imported domestic specimens. In New Zealand a wild or rather "feral" race is already established, the origin of which is of course quite recent, as it is well ascertained that no animal of the kind ever lived upon the island until after its settlement by Europeans. Whether the various breeds of domestic pigs have been derived from one or several sources is still unknown. As in so many similar cases there is no historic evidence upon the subject, and the researches of naturalists, as Nathusius, Rutimeyer, Rolleston, and others, who have endeavoured to settle the question on anatomical evidence, have not led to satisfactory con- clusions. It is, however, tolerably certain that all the species or forms of wild pigs enumerated above and all the domestic races are closely allied, and it is probable (though of this there has been no opportunity of proof)

—— —= —— Fig. 2.—Wild Boar and Young.

will breed freely together. It is a curious circumstance that the young of all the wild kinds of pigs (as far as is known at present) present a uniform coloration, being dark brown with longitudinal stripes of a paler colour, a character which completely disappears after the first few months. On the other hand, this peculiar marking is rarely seen in domestic pigs in any part of the world, although it has been occasionally observed. It is stated by Darwin that the pigs which have run wild in Jamaica

and the semiferal pigs of New Granada have resumed this aboriginal character, and produce longitudinally striped young; these must of course be the descendants of do- mestic animals introduced from Europe since the Spanish conquest, as before that time there were no true pigs in the New World. Another character by which the Euro- pean domestic pig differs from any of the wild species is the concave outline of the frontal region of the skull, a form still retained by the feral pigs in New Zealand.!

B. The diminutive pig of Nepal, the Terai, and Bhutan, Sus salvanius, has been separated from the rest by Hodgson under the generic name of Porcula, but all the alleged distinctive characters prove on more careful investigation to have little real value. Owing to its retired habits, and power of concealment under bushes and long grass in the depths of the great Saul Forest, which is its principal home, very little has been known of this curious little animal, scarcely larger than a hare. The recent acquisition of living specimens in the London Zoological Gardens has, however, afforded opportunities for careful anatomical observation.?

C. Two well-marked species of African swine have been with more reason separated under the name of Potamocherus. The dentition differs from that of true Sus, inasmuch as the anterior premolars have a tendency to disappear; sometimes in adult specimens the first upper premolar is retained, but it is usually absent, as well as the first and often the second lower premolars. The molar teeth are also less complex ; the last especially has a much less developed heel. There are

also characteristic cranial differences. The two species are very distinct in outward appearance and coloration. One is P. africanus, the South African River-Hog, or Bosch-Vark, of a grey colour, and the other P. poreus or penicillatus, the West African Red River-Hog, remarkable for its vivid colouring and long pencilled ears. It should be noted that the young of both these species, as well as of the pigmy S. salvanius, present the striped character of true Sus, a strong indication of close affinities, whereas in all the following forms this is absent.

Babirussa.—Dentition: «2, c+, p 2, m3; total 34. The total number of teeth is therefore considerably reduced, the outer upper incisor and the two anterior premolars of both jaws being absent. The molars, especially the last, are smaller and simpler than in Sus, but the great peculiarity of this genus is the extraordinary development of the canines of the male. These teeth are ever-growing, long, slender, and curved, and entirely without enamel covering. Those of the upper jaw are directed upwards from their base, so that they never enter the mouth, but pierce the skin of the face, resembling horns rather than teeth, and curve backwards, downwards, and finally often forwards again, almost or quite touching the skin of the forehead. There is but one species, B. alfurus, found only in the islands of Celebes and Buru. Its external surface is almost entirely devoid of hair. With regard to the curiously modified dentition, Wallace (Malay Archipelago, i. p. 435) makes the following observations. "It is difficult to understand what can be the use of these horn-like teeth. Some of the old writers supposed that they served as hooks by which the creature could rest its head on a branch.

1 The breeding of pigs has of late years been practised with more care and skill than formerly, especially in the United States, where the "hog product " ranks with wheat and cotton as one of the leading agricultural exports. Several volumes have been published of the pedigrees of two breeds—the Berkshire and the Poland-China. The official estimate of the number of swine in the United States in 1886 is 46,000,000, and about the same number is assigned unofficially to Europe, where Servia takes the lead in proportion to population and Norway stands lowest. :

® See Garson, Proc. Zool. Soc. Lond., 1883, p, 413.

SWINE

But the way in which they usually diverge just over and in front of the eye has suggested the more probable idea, that they serve to guard these organs from thorns and spines while hunting for fallen fruits among the tangled thickets of rattans and other spiny plants. Even this, however, is not satisfactory, for the female, who must seek her food in the same way, does not possess them,

Fic. 3.—Head of Babirussa,

I should be inclined to believe rather that these tusks were once useful, and were then worn down as fast as they grew, but that changed conditions of life have rendered them unnecessary, and they now develop into a monstrous form, just as the incisors of the beaver and rabbit will go on growing if the opposite teeth do not wear them away. In old animals they reach an enormous size, and are generally broken off as if by fighting.”

Phacocherus.—The Wart-Hogs, so called from the large —

cutaneous lobes projecting from each side of the face, have the teeth still more remarkably modified than in Babirussa. The milk dentition, and even the early con- dition of the permanent dentition, is formed on the same general type as that of Sus, except that certain of the typical teeth are absent, the formula being 74, ci, p8, m3, total 34; but as age advances all the teeth have a tendency to disappear, except the canines and the posterior molars, but these, which in some cases are the only teeth left in the jaws, attain an extraordinary development. The upper canines especially are of great size, and curve outwards, forwards, and upwards. Their enamel covering is confined to the apex, and soon wears away. The lower canines are much more slender, but follow the same curve ; except on the posterior surface, their crowns are covered with enamel. Unlike those of the babirussa, the canines of the wart-hog are large in both sexes. The third molar tooth of both jaws is of great size, and pre- sents a structure at first sight unlike that of any other

mammal, being composed of numerous (22-25) parallel cylinders or columns, each with pulp cavity, dentine, and enamel covering, and packed together with cement. Care- ful examination will, however, show that a similar modi- fication to that which has transformed the comparatively simple molar tooth of the mastodon into the extremely complex grinder of the Indian elephant has served to change the tooth of the common pig into that of Phaco- cheerus. The tubercles which cluster over the surface of the crown of the common pig are elongated and drawn out into the columns of the wart-hog, as the low trans verse ridges of the mastodon's tooth become the leaf-like plates of the elephant's.

Two species of this genus are distinguished :—P. africanus, Ailian's Wart-Hog, widely distributed over the continent ; and P. ethiogicus, Pallas's Wart-Hog, confined to south-eastern Africa. In the latter species the dentition

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reaches its most complete reduction, as in adult specimens the upper incisors are absent and the lower ones worn down to the roots.

IIT. Famiry Dicotyiipz.

Snout as in Suide. Dentition: i 2,c4, p 8,m8; total

38. Incisors rooted ; upper canines directed downwards, with sharp cutting hinder edges. Toes, four on the fore feet and three on the hind feet (the fifth wanting). Stomach complex. A cecum. Conjined to the New World.

There is one genus, Dicotyles, with two species, D. tagagu, the Collared Peccary, and D. labiatus, the White- Lipped Peccary. See Peccary. (Ww. H. F.)

SWINEMUNDE, a Baltic port and bathing-place on the island of Usedom in Pomerania, Prussia, is situated at the mouth of the Swine, 35 miles to the north-west of Stettin. Its broad unpaved streets and one-

story houses built in the Dutch style give it an almost rustic appearance, although its industries, beyond some fishing, are entirely connected with its shipping. The entrance to the harbour, one of the best on the Prussian Baltic coast, is protected by two long breakwaters, and is strongly fortified. Swinemiinde lighthouse, 216 feet high, the loftiest in Germany, rises beside the new docks on the island of Wollin, on the other side of the narrow Swine. Ships drawing not more than 16 feet can proceed to Stettin, but those of heavier burden discharge or lighten at Swinemtinde, which thus stands in the relation of a fore-port to the larger city, with which it is connected by railway. Exclusive of merely passing ships, 615 vessels with a burden of 189,491 tons entered and 607 vessels

with a burden of 179,336 tons cleared the port in 1880. In 1882 it possessed a fleet of 39 vessels with a burden of 5218 tons. The population in 1880 was 8478.

The Swine, the central and shortest passage between the Stettiner

| Haff and the Baltic Sea, was formerly flanked by the fishing villages of West and East Swine. Towards the beginning of last century it was made navigable for large ships, and Swinemiinde, which was founded on the site of West Swine in 1748, was fortified and raised to the dignity of a town by Frederick the Great in 1765. _ In 1775 it had 1000 inhabitants, in 1816 3191. – SWINTON, a town in the West Riding of Yorkshire, is situated at the junction of the Dearne and Dove navigation with the river Don navigation, and of the South Yorkshire and Midland railway lines, 9 miles north-east of Sheffield and 8 south-west of Doncaster. In the church of St Margaret (rebuilt in 1817) two beautiful Norman arches of the old church are preserved. There are collieries, quarries, and brickfields in the neighbourhood. A large number of persons are employed in the South Yorkshire Railway establishment for the repairing of engines and waggons. There are also flint and glass-bottle | works, iron-works (for stoves, grates, fenders, and kitchen ‘ ranges), and earthenware manufactures. The town was formerly renowned for its Rockingham ware, but the manufacture has been discontinued for some years. A free warren was granted to

Swinton by Henry IT. King John, on his march from York to Boston, slept at Swinton old hall. The population of the urban sanitary district (area 1700 acres) in 1871 was 5150, and in 1881 it was 7612.

SWINTON, a large village of Lancashire, is situated on | Several railway lines, 5 miles north-west of Manchester and 6 south-east of Bolton. The Swinton industrial schools, | Opened in February 1846, are a fine range of buildings of _ brick with stone facings, surrounded with grounds extend- ing to 20 acres. The church of St Peter, a fine building _ of stone with a lofty western tower, was erected from the designs of Sir Gilbert Scott in 1869. The manufacture of cotton and coal mining are the chief industries. _ Anciently a large part of Swinton was possessed by the Knights Hospitallers of St John of Jerusalem. Swinton

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and Pendlebury form an urban sanitary district (area 2166 acres) under the government of a local board of twelve members ; its population, estimated at 14,052 for LS71, amounted in 1881 to 18,107.

SWITHUN, Sz, bishop of Winchester from 852 to 862. The name of St Swithun, patron saint of Winchester cathedral from the 10th to the 16th century, is scarcely to be found in any contemporary document. His death is entered in the Anglo-Saxon Chronicle under the year 861 ; and his signature is appended to several charters in Kemble's Codex Diplomaticus. Of these charters three belong to 833, 838, and some year between 860 and 862. In the first the saint signs as "Swithunus presbyter regis Egberti," in the second as " Swithunus diaconus," and in the third as "Swithunus episcopus." Hence if the second charter be genuine the first must be spurious, and is so marked in Kemble.

More than a hundred years later, when Dunstan and Ethelwold of Wiuchester were inaugurating their church reform and sup- planting the secular canons of the degenerate English founda- tions by monks, St Swithun was adopted as patron of the restored church at Winchester, formerly dedicated to St Peter and St Paul. His body was taken up from its almost forgotten grave outside the old monastery and transplanted to Ethelwold's new basilica on 15th July 971. Numerous

miracles preceded and followed this transla- tion. “We have seen,” saysone contemporary writer, “the precincts of the monastery so thronged with crowds of ailing folk that a traveller could scarcely make his way to the shrine ; and yet, after some days, so numerous were the cures that even within the church itself there were scarcely five sick people to be seen.” Another writer, likewise a contemporary, claims to the saint’s credit two hundred cures in the short space of ten days.

The revival of St Swithun’s fame gave rise to a mass of legendary literature, from which it can only be deduced that towards the end of the 10th century very little was known concerning his career. The so-called Vit# Swithuni of Lantfred and Wulstan, written about this time, hardly contain the very smallest kernel of bio- graphical fact; and all that has in later years passed for authentic detail of St Swithun’s life is extracted from a biography, ascribed with much probability to Gotzelin, a monk who came over to Eng- land with Hermann, bishop of Salisbury from 1058 to 1078. From this writer, who has perhaps preserved some fragments of genuine tradition, we learn that St Swithun was born in the reign of Egbert, and was ordained priest by Helmstan, bishop of Winchester (838-c. 852). His fame reached the king’s ears, who appointed him tutor of his son Adulphus (Ethelwulf) and numbered him amongst his chief friends. Under Ethelwulf he was appointed bishop of Winchester, to which see he was consecrated by Archbishop Ceolnoth. In his new office he was remarkable for his piety and his zeal in building new churches or restoring old ones. At hisrequest Ethelwulf gave the tenth of his royal lands to the church. His humility was such that he made his diocesan journeys on foot ; and when he gave a banquet he invited the poor and not the rich. He built near the eastern gate of his cathedral city a bridge whose stone arches were so strongly constructed that in Gotzelin’s time they seemed a work “non leviter ruiturus.” He died 2d July 862, and gave orders that he was not to be buried within the church but outside in “a vile and unworthy place.”

William of Malmesbury adds that, as Bishop Alhstan of Sherborne was Ethelwulf’s minister for temporal, so St Swithun was for spiritual matters. The same chronicler uses a remarkable phrase in recording

the bishop's prayer that his burial might be "ubi et pedibus preetereuntium et stillicidiis ex alto rorantibus esset obnoxius." This expression has been taken as indicating that the well-known weather myth coutained in the doggrel lines—

St Swithin's day if thou dost rain

For forty days it will remain;

St Swithin's day if thou be fair

For forty days 'twill rain na mair— had already, in the 12th century, crystallized round the name of St Swithun ; but it is doubtful if the passage lends itself by any straining to this interpretation. Mr Raine has suggested that the legend is derived from the tremeudons downpour of rain that occurred, according to the Durham chroniclers, on St Swithun's day, 13815 (Hist. Dunelm., pp. xiii. 96-7). Another theory, more plausible, but historically worthless, traces it to a heavy shower by which, on the day of his translation, the saint marked his displeasure towards those who were removing his remains. This story, however, cannot be traced farther back than some two or three centurics at the outside, and is at variance with the 10th- century writers, who are all agreed that the translation took place in accordance with the saint's desire as expressed by vision. More probable is Mr Earle's suggestion that in the legend as now current

General configu- ration.

Area,

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we have the survival of some pagan or possibly prehistoric day of augury, which has sheltered itself and preserved its vitality under the protection of an ccclesiastical saint. This view is supported by the fact adduced in Notes and Queries (1st ser., xii. p. 187) that in France St Médard (June 8) and St Gervase and St Protais (June 19) are accredited with an influence on the weather almost identical with that

attributed to St Swithun in England. Mr Parker pro- fesses to detect a shower of rain as the symbol of St Swithun in the clog almanacs (of Queen Elizabcth's time), but Mr Earle doubts the resemblance. Of other stories connected with St Swithun the two most famous are those of the Winchester egg- woman and Queen Emma's ordeal. The former is be found in Gotzelin's life (c. 1100), the latter in Rudborne's Historia Major

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(15th century),—a work which is also responsible for the not improbable legend that this prelate accompanied Alfred on his visit to Rome in 856.

The so-called lives of St Swithun written by Wulstan, Lantfred, and perhaps others towards the end of the 10th century may be found in Bollandus's Actq Sanctorum (July), i, 821-827 ; Mabillon's Acta SS. O. B., vi. 70, &c., vii. 628, &c.; and Earle's Life and Times of St Swithun, 59, &c. See also William of Malmesbury, Gest. Reg., i. 150, and De Gest. Pont., 160, 167, 179; Florence of Worcester, i, 168; Rudborne ap. Wharton's Anglia Sacra, i. 287; Hardy's Cat, of MSS., i. 513-17; Brand's Popular Antiquities; Chambers's Book of Days, Ethelwulf's Tithe Charters, nearly all of which refer to St Swithun in the body of the text, may be studied in Haddon and Stubbs's Councils, iii. 636-45; a com- parison of the charter on page 642 with Gotzelin's life (ap. Earle, 69) and William of Malmesbury (Gest. Reg., 150; De Gest. Pont., 160) seems to show that these charters, even if forgeries, date back at least to the 11th century, as well as the story of his being Ethelwulf's " altor et ductor."

SWITZERLAND

Part I.—GEoGRAPHY AND STATISTICS.

8 the Swiss Confederation consists of a number of small districts, differing from each other in many points, but gathered round a common centre, originally for common defence against a common foe, it is not surprising that its political boundaries do not coincide with

those of nature. So we find that Ticino is south of the main chain of the Alps, a large part of the Grisons is east of the Rhine and of the ranges separating it from Tyrol, while Schaffhausen is north of the Rhine, and Porrentruy is in the French plain far down the western slope of the Jura. Putting aside these exceptional cases (all of them outside the original limits of the Confederation), the physical geography of Switzerland may be thus roughly summed up :—

(1) To the south there is the main chain of the Alps, which is joined at Mont Dolent (12,566 feet) by the lower ranges running east from the east end of the Lake of Geneva, and which continues to be the boundary up to the Stelvio Pass.

(2) To the north of this main chain of the Alps there is another great range, only slightly inferior in height and extent, which starts from the hills known as the Mont Jorat above Lausanne, rises in the great peaks of the Bernese Oberland and in the Tédi, trends to the north near Chur, and, after rising once more to form the Santis, dies away on the south shore of the Lake of Constance.

(3) The main chain of the Alps and this great north outlicr are parallel to each other fron1 Mont Dolent to near Chur; joined for a short space near the Pizzo Rotondo (west of the St Gotthard), they again part near the Oberalp Pass (east of the St Gotthard). Between these two great ranges flow two of the mightiest European rivers, the Rhine towards the east and the Rhone towards the west, their head waters being separated only by the tangled mountain mass betwecn the Pizzo Rotondo and the Oberalp Pass.

(4) To the north of the great north outlier of the main chain of the Alps there aro what may be called the plains of Switzerland, really the huge undulating valley of the Aar (and its affluents), to which must be added the Thur valley between the Aar basin and the Lake of Constance.

Thus, omitting the special cases named above, we may roughly describe Switzerland as consisting of two great trenches traversed by two great rivers, and enclosed by two huge mountain masses, together with the enormous valley of the Aar and the smaller one of the Thur, both these

shut in by the great north outlier of the main chain of the Alps, the Rhine, and the Jura,—two deeply cut trenches, and two wide and undulating valleys.

The main chain of the Alps rises in Swiss territory to the height of 15,217 feet in Monte Rosa, and its north outlier to 14,026 feet in the Finsteraarhorn. The mean level of the Aar valley has been estimated at 1378 feet, its lowest point being the low-water mark of the Rhine at Basel (914 feet); the lowest level within the Confedera- tion, however, is on the Lago Maggiore (646 feet).

According to the most recent calculations, the total area of the Confederation is 15,964°2 square miles, of which 71:7 per cent., or 11,443°3 square miles, are classed as "productive," 3032 square miles being covered by forests, and 132°3 square miles by vines. Of the other 28°3 per cent., or 4520°9 square miles (classed as " unproductive "),

709-9 are occupied by glaciers, 520°3 by lakes, 90 by beds of rivers and streams, and 62°4 by towns, villages, and buildings. Of the whole area the three great cantons of the Grisons, Bern, and Valais take up 7439-9 square miles, or nearly one-half, while, if to them be added Vand, Ticino, and St Gall, the extent is raised to 10,552 square miles, or about two-thirds of the entire Confederation.

The total area of Switzerland (15,964°2 square miles) is Rivers

distributed over four great river basins (draining to three different seas) in the following proportions :—Rhine 11,166; Rhone, 2717 ; Po, 1358; and Inn, 721.

The Rhine basin is by far the largest in Switzerland, and drains of course to the North Sea. The Rhine itself is formed of two branches,—Vorder Rhine (valley of Dissentis) aud Hinter Rhine (from the Splugen and St Bernardino),—which unite at Reichenau, near Chur. The joint stream receives several mountain torrents, expands into the Lake of Constance, and then turns west, receiv- ing the Thur, and opposite Waldshut the great stream of the Aar, finally leaving Swiss territory at Basel, where it turns north. Its main affluent is the Aar, the basin of

which covers no less than 6794 square miles. This stream rises in the glaciers of the Ber- nese Oberland, expands into the Lakes of Brienz and of Thun, receives from the left the Kander, the Saane, and the Zihl, and from the right the Emme, as well as (near Brugg, that great meeting-place of the waters) the Reuss flowing through the Lake of Lucerne and the united stream of the Linth and the Limmat flowing through the Lakes of Wallenstadt and Zurich. It is interesting historically to note the fact that the thirteen cantons which till 1798 formed the Confederation are all comprised in the Rhine basin, the ten oldest (i.¢., all before 1500) being within that of the Aar, and that it was only after 1798 that certain Romansch-, Freneh-, and Italian-speaking "allies " and subject lands—with their respective river basins—were tacked on. The Rhone rises in the glacier of the same name and flows west, receiving the mountain torrents of the Visp, the Lonza, and the Dranse, besides others, expands into the Lake of Geneva, and a little way from Geneva quits Swiss terrl- tory on its way to the Mediterranean. The main stream flowing from Switzerland to the Po basin is the Ticino (from the St Gotthard), which widens into the Lago Maggiore; another stream expands into the Lake of Lugano; and others run into the Lake of Como,—all finally joining the Po in the Lombard plains, thus draining to the Adriatic. The Ramm, flowing through the Munster- thal, joins the Adige and so drains into the Adriatic. The Znm basi is composed of the upper part of the river (above Martinsbruck) and drains into the Danube and so into the Black Sea. _

Most of the great Swiss rivers, being in their origin mere moun- tain torrents, tend to overflow their banks, and hence much 1s required and has been done to prevent this by embanking them, and regaining arable land from them. So the Rhine (between Ragatz and the Lake of Constance), the Rhone, the Aar, the Reuss; and in particular we may mention the great work on the Linth (1807 to 1822) carried out by J. Konrad Escher, who earned by his success the surname of " Von der Linth," and on the Zihl near the Lakes of Neuchatel and Bienne, while the diversion of a Kander from its junction with the Aar at Uetendorf to a channe by which it flows into the Lake of Thun was effected as early 2s 1714}

There are very many lakes in Switzerland. The (Geneva and Constance) balance each other at the south-west an north-east corners of the Confederation. The following list Sai details regarding the fiftecn over 4 square miles in extent. It wi : be noticed that of these twelve are in the Rhine basin (eleven 0

ally a series of e of all the im-

1 The hydrographic bureau of Switzerland publishes annu graphic tables representing the seasonal changes in the volum portant rivers,

two largest Lakes.

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them being in that of the Aar), two in the Po basin, one in the Rhone basin, and noue at all] in the Inn basin. It has been esti. mated that in the Rhine basin there are no fewer than nineteen large and thirty-seven smal] lakes. Of the smaller Swiss lakes we may mention the Dauben See, and the Oeschinen See, as well as the Marjelen See close to the Gross Aletsch glacier, There are of course an infinite number of Alpine tarns.

ea in | Mean HWeight| . Name of Lake. River Basin. suene of Surface or Miles, |_ above Sea Feet, Level in Feet. Geneva™..... Rhone. 223 1230°3 984°3 Constance*..! Rhine. 208°1 | 13805°8 905-5 Neuchatel …| Aar, Rhine. OPE on) lee 7a 472°4 Maggiore* ...| Ticino, Po. S257 646°3 1230°3 Jmecerne …... Reuss, Aar, Rhine. | 438°7| 1433-7 2 858 UTC. 0. ss Limmat, Aar, Rhine.) 33-8! 1341-9 469°1 Lugano”..... Po. 19-4; 889°] 902-2 sR… .. Aar, Rhine. WSs) USS yes) 711°9 Bienne ., Aar, Rhine. 162} 1423-9 2559 ZUg…....| Reuss, Aar, Rhine. | 14:8] 1368-1 1321-4 IBIENZ..... Aar, Rhine. 11°5| 1851 856°4 Ghat… ..... Aar, Rhine. NOESY) 1427-2 Spal i allenstadt. { ae Hucmat, \) s-9| 1304-4 | «. 500 Sempach….. | Aar, Rhine. yf! W654 |?..... Hallwyl…... Aar, Rhine. 4 1483 ?1522°8

The lakes marked * are only partly in Swiss territory. tet «=. There area great number of waterfalls in Switzerland, the loftiest % being

that of the Staubbach (1001 feet), in the valley of Lauter- brunnen, or "Olear Springs" (Bernese Oberland). In the Ober- land, too, we find the Handeek (200-220 feet), near the source of the Aar, while the Reichenbach descends in seven falls and the Giessbach in thirteen. The falls of the Rhine at Schaffhausen contain an enormous mass of water, though they are only 82 feet in height. In southern Switzerland the Pissevache fall (200 feet), in the Rhone valley, is the best known. . DrA. Heim! reckons up 471 glaeiers in Switzerland and 462 in Austria, his figures for France and Italy being untrustworthy and incomplete; but Switzerland has 188 glaciers of the first rank (i.¢., over 43 miles long) as against 71 in Austria, though Austria _ has 891 of the seeond rank (i. ¢., between 43 and 3 miles long) as against 333 in Switzerland. The distribution of the Swiss glaciers deserves notice, for in eleven eantons (that is, half of those in the Confederation) there are no glaciers at all, while in five others (Unterwalden, Vaud, St Gall, Sehwyz, and Appenzell) they only cover about 13 square miles out of 709-9 square miles of ice and snow in the Confederation, according to the official survey. Valais heads the list with 375-1 square miles, then come the Grisons (138°6), Bern (111°3), Uri (44°3), Glarus (13°9), and Ticino (18'1). The longest glacier in the Alps is the Gross Aletsch in the Bernese Oberland, 15 miles long; it has a basin of 49°8 square miles and a maximum breadth of 1968 yards. In point of length the Unteraar glacier comes next (10°4 miles), followed by the Gorner and Viescher glaciers (each 9-4 miles), The lowest point to which a Swiss glacier is known to have descended is 3225 feet, attained by the Lower Grindelwald glacier in 1818. Dr Heim has ascertained that the maximum annual snowfall in the Alps takes place in the lower snow regions, a eonclusion which the present writer ean confirm from personal experience gained on the ascent of several of the highest Oberland peaks in J anuary 1874 and 1879. Dr Heim states that in the central Alps of Switzerland the limit of | perpetual snow varies from 9259 to 9023 feet, See GLACIER. In Switzerland, where the height above sea-level varies from 646 _ feet (Lago Maggiore) to 15,217 feet (Monte Rosa), we naturally find | very many elimates, from the regions of olives, vines, oaks and beeches, pines and firs, to those of high mountain pastures, thododendrons, and of eternal snow (see ALPS). AS regards the duration of the seasons, there is a eorresponding variety. It

has been reckoned that, while in Italian Switzerland winter lasts only three months, at Glarus it lasts four, in the Engadine six, ou the St Gotthard eight, on the Great St Bernard nine, and on the St Théodule always. A painstaking writer has calculated that, if Switzerland were flattened out into a plain, and reduced to the) level of the sea, it would be eomprised between the isotherms | 51°°8 and 55°°4 F. As a matter of fact the mean temperature | varies no less than 344°, for at Bellinzona it is 544° F., at Geneva | 497°, at Basel 493°, at Chur 483°, at Interlaken 48°, while on the Great St Bernard it sinks to 30°, and on the St Théodule to 20°. The Alps form the boundary between the region where the rain- fall is greatest in summer and that where it is greatest in autumn, the winter and spring rainfall varying but slightly. These are | the percentages of the annual rainfall in Switzerland at different scasons :—

1 Tn his epoch-making work, [Jandbuch der Gletscherkunde, Stuttgart, 1885.

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thine Basin: winter, 18; spring, 25; summer, 38; autumn, 24. Rhone Basin: „ 21; „ 6; 39 26; ” 27. Ticino Basin: „ 12; 4, 26; ee Ais a6 35.

It has been shown by careful observations that the rain (or show) fall is greatest as we approach the Alps, whether from the north or south, the flanks of the great ranges and the valleys opening out towards the plains receiving mueh more rain than the high Alpine valleys enclosed on all sides by lofty ridges. Thus the annual rainfall is 85 inches at Basel but 64% at Beatenberg (above Inter- laken) and 69 at Schwyz, rising to 88 on the Grimsel and 102 on the St Bernardino, and falling again at Lugano to 63. Dr Heim ealculates that the percentage of snow in the total annual rainfall in Switzerland varies from 63 on the Great St Bernard to 6 at Geneva, the mean fall of 34 being at Platta in the Grisons. Thunderstorms generally vary in frequency with the amount of rainfall, being most common near the great ranges, and often very local. The floods eaused by excessive rainfall are sometimes very destructive, as in 1839, 1852, and 1868, while the same cause leads to

landslips, of which the most remarkable have been those on the Rossberg above Goldau (1806), at Evionnaz (1835), and at Elm (1881).

As regards the larger eyclones or storms of Europe, a south wind in the Alps indicates that the barometrical minimum is in the English Channel, a west wind that it is in the North Sea, a north wind that it isin the Eastern Alps, and an east wind that the depression is in the Mediterranean, about Corsica. When the baro- metrical minimum shifts from the Atlantie over Scandinavia to Russia, a south-west wind in the Alps is followed by west and then north winds. The "fohn" is the most remarkable of the local winds in Switzerland,—a strong south-west or south wind, very hot and very dry. It was formerly supposed to eome from the Sahara, but is now held to be a south-west or south wind which, saturated with moisture, crosses the Alps, precipitating a copious rainfall in its eourse; commencing its descent in the northern valleys with a high temperature for these great heights, it neces-

| sarily increases in temperature and dryness as it passes into the

high pressure of lower levels. Dr Hann coneludes from observa- tion that, assuming the air to cool at the rate of 1° O. in every 100 metres of ascent, and the ridge erossed by the féhn to be 2000 metres in height, the heat lost on the ascent is only 0°5 C., so that when the fohn reaches the north side it will have a heat, not of 10°, but of 20°. The fohn occurs most frequently in spring. Other local winds in the Alps are those whieh blow up a valley in the morning and down it in the evening, due to the heating of the air in the valleys by the sun during the day and its cooling by terrestrial radiation at night. The eloud streamers from great Alpine peaks are due to the condensing of the moisture in a layer of air, and, as the moisture is carried away by the wind, so the streamer is dissolved.

For all these reasons Switzerland has many varieties of climate; and, while, owing to the distribution of the rainfall, the Ticino and Aar valleys are very fertile, the two great trenches between the main chain and its north outlier, though warm, are less pro- ductive, as the water comes from the rivers and not from the skies.

Asphalt is the only raw mineral produet the export of which Mineral exeeeds the import; and it is obtained only in the canton of products,

Neuchatel, where the output of the Val de Travers deposit in 1883 reached 28,000 tons. Though iron ores are known (aecording to Weber and Brosi's map) to exist in 13 localities, gold in 3, silver in 22, copper in 29, lead in 27, nickel and cobalt in 2, tin in 1, sulphur in 3, Switzerland is practically dependent for all its metals on foreign supply. While 35,161 tons of iron were obtained in 1870 (mostly from mines in the Jura), only 19,045 were obtained in 1881. True coal is wholly absent; lignites, however, occur both in the Tertiary and the Quaternary formations, the most important workings being those of Kipfnaeh, Utznach, Mérschwyl, Diirnten, Lutry, Conversion, and Oron. In 1870 the output was 33,364 tons, in 1881 only 6184. Anthracite occurs in Valais. Peat is eommon in many parts. Salt (42,000 tons) is proeured from wells in Aargau, Basel, and Vaud. The first salt-deposit was discovered in 1886 at Rothenhaus (Basel canton), that of Rheinfelden in 1844, of Ryburg in 1845, and of Kaiseraugst in 1865. The wells at Bex have been worked since 1554.2

Game is not abundant in any part of Switzerland; and rigorous Game,

game laws and other devices have been adopted in order to increase the number of wild animals. In 1875 a law was passed in aceord- ance with which a eommission marked out certain reservations or 'districts franes pour la chasse au gibier de montagne"; and in 1881 their limits were revised for another term of five years, in- eluding an area of 5268 square kilometres in 1885. There were then within this area 8487 chamois and about 106 roebuck. The chamois were most abundant in the Grisons, Bern, Glarus, and Freiburg. In the Alpine regions the marmot and Alpine hare are still common, and their numbers have incrcased under the pro- tective system. Grouse, partridge, wild duek, and snipe are the

2 See Stockalper, Rapport sur le groupe 16 Produtis Bruts Exp. Nat. 8. & Zurich, 1883, and Hermann Streng, " Rohprodukte u. deren Fundorte in der Schweiz," in Zeitsch. f. schweiz. Statistik, 1884.

XXIT. — 98

Fisheries.

Census returns.

Density of popu- lation.

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chief game birds. A close time protects birds not considered game, and the federal council in 1885 appointed a commission to

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one-third of the expense of the construction of fish-ladders, Tp

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1882 a Swiss fisheries society was founded. Conventions in regard draw up a catalogue of all birds found in Switzerland, and to | to the fisheries have been signed with Italy, France, and Germany, establish stations for collecting facts of ornithological interest. Great importance attaches to the domestic animals of Switzer. (See

Attention has recently been directed to the diminution of the | land. In 1876 there were 284,478 owners of live-stock, in 1886 oi supply of freshwater fish, due in part to over-fishing and in part | 289,610. The following are the numbers for those two years: to pollution of the streams. It is estimated that the fish-bcaring | horses, 100,935 and 98,333; cattle, 1,035,930, 1,211,713; sheep waters in the whole country cover an aggregate area of 1581 square 367,549, 341,632; goats, 396,055, 415,916; pigs, 334,515, 394 451. kilometres (1348 belonging to lakes and 233 to rivers and streams), | mules, 3145, 2741 ; asses, 2113, 2042; and beelives, 177,895, the cantons with the greatest areas being Vaud (448 square kilo- | 207,180. See Z. J. schw. Statistik, 1886. ; metres), Bern (161), Thurgau (139), and Neuchatel (98). Close The following table gives a variety of details regarding the Table of seasons,

and in certain places close years, have been established, twenty-two Swiss cantons, arranged in the order of their extent, a. and numerous fish-hatcheries are also in operation (57 in 1885), the | In the first column the languages principally spoken in the different A species treated being mainly salmon, lake trout, river trout, gray- | cantons are indicated by letters, as described in the appended foot. ling (ombre), red trout or Réthel, the Swiss Coregonus, American | note, and the percentages of population speaking them in 1880 are Coregonus (C. albus), Salmo fontinalis, and the ‘“‘mader.” No fewer given. In every case the official language is that of the Inajority, | than 5,709,482 fish were introduced into the lakes and rivers in | with the exccption of Freiburg, where it is German. The same 1885. By a law of 1884 the federal council is allowed to defray | column also shows the various executive and legislative authorities, ee eae

ate Date of Area in Population. Density, Deputies Canton. * ies. Toco Lee —- Gane road Cantonal Capital. ae sion. | Constitution. Bees 1850, 1880, Mile. Rath Capitals.

Grisons (Graubiinden) ..G 46, R 40, 114..K; L/ 1803 | 1880 2754°0 | 89,840 | 94,991 35 5 Chin… 8,889

Berm (Berne)... .....06+. By IY US asconones 9 Int USES | SG 2659°5 | 457,921 | 532,164} 205 | 97 Bern «| 44,087

Valais (Wallis)..... 67, 222.4… D; L| 1815 | 1875 2026°8| 81,527|160,216| 500; 5 (| Sion…....0m 4,871

Vaud (Waadt)..... 1 GO) (CG Oscasacecanr B; M| 1803 | 1861 (’72) | 1244-3 | 199,453 | 288,730] 194] 12 Lausanne…... 30,179

Ticino (Tessin)..... 99°0. .C; Nj) 1803 | 1830 (83) | 1088-0 | 117,397 | 130,777 | 122 Hl Bellinzona…..| 2,486

St Gall (Sankt Gallen)..G99°1….ccccccccs. A; L| 1803 | 1861 (’75)| 779-5 | 169,508 | 210,491] 281} 10 | St Gall…....| 21,438

AMIN CH eae mer cites: acts cs CeO SE Serer .A;O]} 1351 | 1869 665°9 | 250,184 317,576] 500] 16 ZUTICh 2 eee 75,956

Freiburg (Fribourg)..... PCS) Grell .. cca. sc D; L| 1481 | 1857 644°4| 99,805 | 115,400] 181 6 Freiburg. 2am 11,546

Lucerne (Luzern)..... (GF OSS SNnee aera A; 1332 | 1875 (82); 579-4 | 182,789 | 184,806 | 234 7 Lucerne.,...../ 17,850

Aargau (Argovie).....: (B) ORG) Ssenaeeearcar A; Ij 1803 | 1852 (’77)} 542-0 | 199,720 | 198,645! 3641! 10 ASH... eee 5,944

Wire. otearite ovenee ek Ge 715 UO caneue A, E; P| 1291 | 1850-51 | 415°4} 14,500, 23,694 57 1 Altort |p eee 2,90)

Thurgau (Thurgovie)....G 99°5 …….00.. A; L} 1803 | 1869 381°4 | 88,819, 99,552] 295 5 Frauenfeld 5,811

ISIGIDIAaoane cone eucncdoun Bee CO Oe a aaceneeeante AVAO)| 2918 AS 76—740 3850°7 | 44,159} 51,285; 151 3 Sehwyz…..... 6,543

Neuchatel (Neuenburg) .F 75, G 24…..... B; M; 1815 | 1858 (’80)| 311°8| 70,679 | 103,732] 348 5 Neucliatel….. 15,612

Soleure (Solothurn) ..... GAO Sakae sea ase A; QO] 1481 | 1875 305°9 | 69,613 | 80,424] 272 4 Soletre. 5 7,668

ObwaldhaGiG9:3).o..=—. AR 1867 ‘ 1 Samen ….0e 4,039

Unterwalden {xiiwald 1G 99-0 0 Ase | ise7 2904 | 2h) A) ee 1 | Stanza 2910

Glinas oe ee © 908. ecceieescs H; P| 1352 | 1842:(780)| 266°8| 30,197) 349913 | 194] 9 | Glarus… 5,530

Basel (Basle, | Urban …G 96°3 …..... ANS Ib; | § 1875 13°8 2 3 Basel… 61,399

Wale)... Rural ….G 995.00. As Q 1501 1863 162°7 77,385 | 124,372 | 769 } 3 | Liestal….. .. 4679

Omter- 2… Ga99nG. Bees. A; Pi 1876 93°4 3 Appenzell….. 4,302

Appenzell Inner …....6.99°9 ….....E; P 1513)) 1879 68°5 54,869) 64,709) 661) 5 | aiitem 0mm 11,082

Schaffhausen ….... (C409 ARE eens A; L| 1501 | 1876 113°6 | 35,278} 38,348] 335 2 Schaffhausen.) 11,795

Geneva (Genf, Ginevra).F 85, G11….....B; Mj 1815 | 1847 ?79)| 107°8| 63,932/ 101,595 | 1013 5 Geneva…..... 68, 320

Vs eee Cee ee A; O| 1852 | 1873 (81); 923] 17,456} 22,994] 259! 1 | Zug… 4,924 * Languages.—G, German; F, French; I, Italian; R, Romansch. Executive Authority.—A, Regierungsrath; B, Conseil d'état; C, Consiglio di stato; D,

Staatsrath; E, Standeskoinmission; H, Rath u. Standeskommission; K, Kleiner Rath u. Standeskommission. conseil; N, Gran consiglio; O, Kantonsrath; P, Landsgemeinde; Q, Landrath. For details regarding the Stande Rath, of 44 members, and the National Rath, of see p. 795; and for information regarding the referendum in the cantons, see p. 796.

145 (made up as shown in column 8 above),

The first federal census of which the results were published was neither quite synchronous (April 1836 to February 1838) nor quite systematic. That of 1850 took account only of the population with right of residence (population domiciliée), and not of the population actually present at the date of the ceusus. In 1860 the census was declared decennial. The following are the numbers returned :— March, 18-28, 1850, 2,892,740 ; December, 10, 1860, 2,507,170; December 1, 1870, 2,669,147; December 1, 1880, 2,846,102.

As regards density of population, Switzerland, with 198°5 persons to the square mile, stands considerably above Scotland (125) and a long way below England and Wales (446). The Alpine region is the sparsest generally, though certain districts, like Appenzell Ausser-Rhoden, are very densely peopled; the Jura region has a much higher ratio; and the densest region of all is the Swiss plateau. If we draw an irregular line from the east end of the Lake of Geneva by Thun, Lucerne, and the south of the Lake of Zurich to Rheineck, we shall have nearly all the more densely populated portions of the country to the north, the only notable exception being what might be called the Swiss peninsula of Lugano. A large proportion of the country to the south has only from 1 to 19 inhabitants to the square kilometre. The districts where the density rises above 250 to the square kilometre are that to the south-east and south-west of Geneva, the vicinity of Lausanne, the districts of Chaux de Fonds, Neuchatel, Biel, Bern, Soleure, Basel, a large tract along both sides of the Lake of Zurich, and the district between St Gall and Rheineck. The districts in which an increase of population had taken place between 1870 and 1880 are curiously distributed. An increase of 30 per cent. or over occurs only in the environs of Basel and in two large areas of which the chief centres are Altdorf and Airolo. Decrease was prevalent throughout a large part of the better populated regions of the north, while a certain increase had taken place throughout much of the south-western area.

Legislative Authority.—L, Grosser Rath; M, Grand

In 1880 there were 960°8 males to every 1000 females, a nt smaller preponderance of females than in England and Wales, statistics For every 1000 above the age of 50 there are 176 unmarried females to 154 unmarried males. The disproportion of the sexes in the country at large is mainly due to emigration ; but in certain cantons it is partly due to exeess of women in the immigrants from neighbouring countries. In Uri, Schwyz, and Valais only is there an excess of males. In every 1000 of the population there were, in 1860, 296 under 15 years of age, 620 between 15. and 60 years, and 84 upwards of 60; the corresponding figures in 18/0 being 315, 595, and 90; and for 1880, 319, 593, and 88.

The pro- : portion of married persons to the total number of the adults (474

per cent.) is less than in most other countries, though this pro portion has been gradually raised both before and sinee 1880 by certain legislative changes, including the new marriage law im 1874. At the same time the average fertility of the marriages has decreased. arly marriages on the part of the males are slightly more frequent than in England. Divorce and separation are fre- quent. Thus in 1876-80 they formed nearly 5 per cent. of the marriages, while in Belgium and the Netherlands they do not reach 1 per cent. As regards the inarriage relations of the different creeds, the five years 1877-81 showed that (excluding the eanton

of Geneva, where the creed is not registered) there were only

0°7 separations per 1000 existing marriages where both husbanil

aud wife were Catholics, 2°8 where both were Protestants, 32 where the husband was a Catholic and the wife a Protestant,

and 4°5 where the husband was a Protestant and the wile 4 Catholic.

The percentage of illegitimate births during the years 1871-// was 5°7, 5°2, 5°1, 4°8, 4°4, 50, and 4°9 respectively, a rate almost identical with that of England and Wales. Infant mortality has been decreasing. While 20°32 per cent. of the quick-born children of 1876 died in their first year, only 17°3 died in 1885.

The following table shows the annual number of births, &c. :—-

Marriages.| Per 1000. Births. | Per 1000.) Deaths. | Per 1000,

1871-75 | 21,732 85, 832 31°6 | 64,479 Paes | 1876-80 91,197 82°5 64,671 23°1 1881-84 85,612 29‘6 61,082 21°1 1885 83,579 | 28°6 | 61,548 | 21-0

At the census of 1880 there were in Switzerland 211,035 foreigners (112,311 males and 98,724 females), or one foreigner to every 13 or 14

of the population. The origin of this alien element was very various :— from Alsace-Lorraine, 2607 males, 2732 females é Germany, 43,923, 45,991 ; Austria-Hungary, 8389, 4929; Italy, 27,821, 13,709 ; Spain and Portugal, 175, 93; France, 26,264, 27,389; Holland and Belgium, 445, 493; Great Britain, 1027, 1785 ; Russia, 599, 685; Servia, Roumania, and Greece, 119, 35; Denmark, Norway, and Sweden, 194, 188; America, 5638, 548.

Between 1868 and 1877 the average number of emigrants from

Hon. | Switzerland was 3516 per annum ; between 1878 and 1882 it was 6 7196. In 1883, 1884, and 1885 the figures were respectively i 13,502 (12,758 of them native-born Swiss), 9608, and 7583. By

far the greater proportion of the emigrants found their way to America, and mainly to the United States, though some of the South American republics (as Chili) attract a considerable number. Iu the five years 1876-80 3172 persons on an average left for North America annually, 99 for Central America, 594 for South America, and 107 for Australia, while Asia and Africa together did not count more than 167.

The population is to a very great extent rural. Only three cities (Zurich, Geneva, and Basel) have a population exceeding 50,000, and at the census of 1880 only 59 other towns had each more than 4000 inhabitants. Of these Bern (see table above), Lausanue, Chaux de Fonds (22,456), St Gall, Lucerne, Neuchatel, Winterthur (13,595), Schaffhausen, Biel (11,628), Freiburg, Herisau (11,082), ; and Locle (10,464) exceeded 10,000. mA religious census was taken in 1850, 1860, 1870, and 1880; in the first case only three categories were recognized —Catholic, Protestant, and Jew; in 1860 and 1870 four—Catholic, Protestant, Christians of other denominations, and non-Christian. After much discussion the federal council, which had proposed to drop the religious census in 1880, was prevailed upon by thearguments of ten cantous to adopt a similar classification in 1880. The figures in 1870 were—1,566,347 Protestants, 1,084,369 Catholics, 11,435 members of other sects, and 6996 Jews; in 1880 the Protestants ‘numbered 1,667,109, the Catholics 1,160,782, the Jews 7378, and

miscellaneous 10,838. The Jews are most strougly represented in the cantons of Bern (1316 in 1880), Basel (1053), Aargau (1284), Zurich (806), Neuchatel (689), and Geneva (662).

_ It has been estimated that, of the whole area of Switzerland, 1,642,471 acres are under arable cultivation and 1,917,632 acres in forest, while 2,866,113 acres are altogether unproductive. Agricul- tural statistics have never been systematically registered by the federal authoritics, and only a few of the cantons have devoted seri- ous attention to the matter. Herr C. Miihlemann (Z. f. schweiz.) Stot., 1886) gives the following estimate of the area cropped and

the annual value (in thousands of francs) of the produce :—

Acres. | Value. Value.

153,308 | 36,054 || Other fodder plants 15,532 2,666

S -| 193,993 | 43,846 || Pease and beans… 9,574 1,060

y 86,089 | 18,805 || Rape…....cccceceee 1,966 486

c 33,610 5,057 || Hemp and flax….. 12,463 6,101

PRES tee ccce coe tssesscese 122,645 | 20,468 || Chicory….....1 6 18 BOtALOeS….....045 264,938 | 79,859 || Tobacco….....000008 1,730 704

)} 8cet and turnips.. 43,850 | 13,254 || Vegetables…..... 41,545 4,842 Carrots 16,056 3,148 |; Meadows, good…..| 529,122 | 153,512 | Mixed fodder 333,612 | 86,677 5 medium} 609,865 | 82,928 Glover…..... -| 217,897 | 66,048 – poor…...| 578,940 | 28,115 Lucerne «| 27,744 7,449 || Pasturesand“alps”/ 1,962,693 | 189,001 Esparcet 89,324 | 19,340 || Vineyards…..... 79,020 | 62,359

| The value of the fruit produce is given as 127,418,391 francs (apples, 71,316,992; pears, 38,656,150). }, The name “allmend” is given to land still held in common, * whether arable, meadow, pasture, or forest. The

main part of the allmends” now existing consists of pasture and forest land. The pasture lands, “alps,” or high mountain pastures comprise “‘voralpen,” used in the spring, “nittelalpen,” or cow-pastures, }and “‘hochalpen” (sometimes 9000 feet above the sea), for sheep i and goats. ‘They are most numerous in Neuchatel, Bern, and The capital value of the whole is estimated at 200,000,000 vfrancs or more. Of the 3032 miles of forest land 127°3 belong to the state, 2007-1 to “communes ” or private associations, and 897 ‘o private persons. The federal Government has done much to “reafforest tracts, both by itself and by stimulating cantonal effort, and generally to promote the science of forestry. The silk industry of Switzerland was already established at

Zurich and Basel in the latter half of the 13th century; but after In- a period of prosperity it died out. It was again introduced by dustries. the Protestants expelled from Locarno in 1555. Crape, velvet, and taffetas were the favourite products of the first stage; ribbon- Weaving came later with another band of Locarno refugees and the French Huguenots. In 1872 116 firms were engaged in the silk trade, in 1881134. Between those dates the employees had increased from 39,940 to 49,816 (65,000 in 1883), and the wages from 15,382,186 to 19,815,453 francs. In 1881 2,153,100 kilos of raw silk and 1,067,700 of silk-waste were imported ; and the export of silk goods, ribbons, and ferret silk was 1,152,300, 1,965,400, and 819,000 kilos respectively. Cotton begun to be manufactured in Switzerland in the 15th century, aud power-loom weaving was introduced in 1830. The industry has owed a good deal to the abundant water-power of the country. In 1881 there were about 28,000 cotton looms; and cotton-spinning employed about 60,000 spindles. The workers numbered 88,046 in 1883. Bleach- ing and cloth-dressing have attained a great development in the neighbourhood of St. Gall, both in the cantons of St Gall and Appenzell. Printworks are especially numerous in Glarus. Aargau is the chief seat of the woollen manufacture, having 4 millions of the total production valued at 114

million francs. Linen, the first of the Swiss textile fabrics to find its way to a foreign iarkct, is no longer manufactured on a large scale. Embroidered goods are the great specialty of the export trade of eastern Switzerland, — the cantons of St Gall, Appenzell, Thurgau, and part of Zurich. In flat-stitch machine embroidery 15,256 workers were employed in 1872, and 27,801 in 1880 (48 and 47 per 1000 inhabitants). In the different departments of hand embroidery 33,359 persous were employed in 1881. The St Gall market is also supplied by a large number of workers in Vorarlberg. The value of the embroidered goods exported from the consular district of St Gall for America alone increased from 19 to nearly 30 million francs between 1879 and 1882. Straw-plaiting is an important industry in Aargau (centre at Wohlen), Ticino, and Freiburg. In 1867-68, when the trade was at its best, the total export was worth 104 million francs, Watch and clock making is a specially Swiss industry, giving employment to 44,000 workers in 1883. In Geneva alone 296 establishments were at work in 1882 in some department or other of the manufacture. The valley of Joux (Vaud and Saint Croix), Chaux de Fonds, Locle, Les Brenets, Les Ponts, Fleuvier (Neu- chatel), Bienne, Porrentrny, Saint Imicr (Bern), Granges (Soleure), Waldenberg (Basel), and Schaffhausen are all important seats of the craft. The condensed-milk industry of Switzerland is also well known. The exports in 1875 amounted to 4,261,800 kilos, and in 1883 to 12,086,900. A similar article is Nestlé's infants' food from Vevey. Swiss cheese (Emmenthal and Gruyére) has a widespread reputation ; the export increased from 5,093,100 kilos in 1851 to 25,959,400 in 1883. The production of beer in Switzerland was 6,160,000: gallons in 1867 and 20,240,000 in 1882; in the latter year 289,564 gallons were exported. The dis- tilleries (1006) produce about 990,000 gallons of pure alcohol annually. Allusion can only be made here to the great chemical] industries of the country, its potteries, paper-mills, engineering works, gun-factories, &c. a

Wood-carving was one of the most ancient, as it is now one of the best known, of the minor arts of Switzerland. The great seat of the modern industry is the Bernese Oberland, where the peasants during the long evenings of winter for centuries devoted themselves to producing artistic articles in wood. It was regularly organized. by Christian

Fischer in Brienz (1825), and is now mainly in the hands of a company, founded in 1881, which associates capitalists and workmen in the profits. In 1870 1189 men and 56 women were employed throughout Switzerland in this department ; in 1880 the numbers were 1202 and 105.4

Owing to the original abundance of timber it was almost the only Wooden material employed in the building of houses. There are practically houses. three styles: the so-called block-house, in which the logs are laid one upon the other; the post-built house, in which upright posts and a strong framework are filled in with planks ; and the " riegel- haus," in which a framework of wood is filled in with brick or stones. In the cantous of Zurich, Thurgau, and Schaffhausen the riegelhaus (the usual form in southern Germany) has—chiefly owing to the increased cost of timber—displaced the two other styles, which alone were in use there till the beginning of the 17th century." :

In Gsell-Fels's Bader u. klimatische Kurorte der Schweiz (1880), Health 505 health stations are mentioned. In Aargan we have the hot stations, springs of Baden and Schinznach (sulphur), the salt baths of Rheinfelden and Mumpf, the mineral waters of Wildegg and Birmensdorf. In Appenzell there are a number of places between

1 See Rahn, Gesch. der bildenden Kiinste in der Schweiz; Salvisberg, Die Holzschnitzeret des Berner Oberlandes; and Davinet, Bericht tiber Holzschnitzeret,

1884,

2 See Gladbach, Die Holz-Architectur der Schweiz 1885; Graffenried and Sttirler, Architecture Suisse ; Hochstitter, Schweizer Architektur ; Varin, L'Arch. pittoresque en Suisse; and Gladbach, Der Schweizer Holzstyl,

Com- meree.

Eduea- tion.

2000 and 3000 feet above the sea famous as whey-cure stations (Heiden, Gais, Appenzell, &c.), and various chalybeate springs (Weissbad, Gonteni, Heinrichsbad). Basel eontains salt baths at Schweizerhalle, Bienenberg, and Schauenburg. Bern is particularly rich in baths and sanatoriums (Lenk, Weissenburg, Heustrich, Gurnigel, Engistein, Blumenstein). Schwarzseebad is the chief mineral spring in Freiburg ; Pfaffers-Ragatz in St Gall is world- famous. The Stachelberger Schwefelbad in Glarus is much fre- quented. The Grisons have almost a superfluity of mineral waters, some of which (St Moritz, Fideris) are exported in large quantities. Weissenstein in Soleure is one of the oldest sanatoriums in Switzer- land. Lavey and Bex in Vaud are respectively famous for their sulphur and salt baths. In Valais, Saxon and Leukerbad are famous. 'The importance of altitude in the attractiveness of a health resort is shown in a table by Guyer, 280 of the hotels for foreign visitors being upwards of 3900 feet above the sea. Dr F. Stopel (Industrie u. Handelspolitik der Schweiz, 1876) reckoned the total receipts from foreign visitors at 120,000,000 francs.

The position taken by Switzerland in the trade and commerce of the world is remarkable when the various natural obstacles are considered —such as absence of raw material for her industries, eostly and difficult means of transport, and restrictive customs established by neighbouring eountries. The following table shows the value in thousands of francs of the imports and exports for 1885 (the first year for which we have official returns) :—

Imports.| Exports. |Imports. /Exports. Germany…seceeeee 249,262 | 157,620 |! Russia… 21,318 | 9,481 France…. ~~.| 179,195 | 189,670 || United Stutes…....., 17,842 | 77,723 | Npalliyenn~~00.: " 96,3872! 13,076 |

England is the great market for silver watches; Germany for gold watches and musical boxes; France for weaving machinery ; Russia for mills; Italy for miscellaneous machinery; France for asphalt; France for butter; France, Italy, Germany, and the United States for cheese; Germany for silk; Germany for cattle; Franee for sheep and goats. Cotton manufactures find their way to France, Italy, Austria, Britain,

Germany, Spain, India, &c.; leather to the United States and the Argentine Republic. The customs increascd from 3,953,192 francs in 1850 to 21,342,403 in

1884.

By article 27 of the federal constitution of 1874, primary instruc- tion, while left in the charge of the several cantons, is required to be sufficient, obligatory, gratuitous, unsectarian, and under public control of the state. The primary school age is up to twelve years, as far as this general law is concerned, but in some cantons this is raised to fourteen, fifteen, or sixteen years of age. The first school year also varies from five to seven in different cantons. Great variety indeed exists in the whole school organization of the scveral eantons ; while the chief authority as regards the primary sehools is in some cases vested in an educational department or educational council, or both, in others it is entrusted to an educational director with or without a council. Considering the difficulties caused in many regions by a sparse population and a rugged eountry, primary instruction is well carried out. Funds are provided by the state, the commune, and often by the private individual. Even in remote districts the school buildings are generally good. Bern has been especially active in building newschools. In 1882 218,191 boys and 215,889 girls attended the primary schools. Of these 311,271 had German as their mother tongue, 97,113 French, 19,864 Italian, and 5832 Romansch. 'The total number of male teachers was 5840, and of female teachers 2525; the average pay in money per male teacher was 1303 francs, for female teachers 822 francs. The primary school property was valued at 137,534,597 franes (86,647,507 in 1871). The expense was 14,781,610 francs (8,708,174 in 1871). The communes contributed 8,349,697 francs and the state 2,825,722. The expense per scholar was 34°1. For the school children who are too poor to obtain proper food and elothing both public and private assistanee is freely rendered. Besides the ordinary public primary schools, there are a considerable number of secondary schools (attended in 1882 by 11,155 boys and 8976 girls), preparatory (or intermediate) schools (9556, 2133), infant schools (10,864, 11,242), schools for adults (12,758, 1110), and private schools (6057, 4834). In 1882 there were in all

272,039 males and 244,896 females in receipt of edueation, Among the preparatory schools are the “colleges”’ or “ gymnasiums” and the industrial schools, one of which exists in almost all the cantonal capitals as well as at Winterthur, Burgdorf, Porrentruy, Einsiedeln, Murten, and Brieg. In Grisons and Neuch4tel normal schools for the education ‘of teachers are attached to the cantonal schools. Separate establishments for this purpose exist in the cantons of Zurich, Bern, Lucerne, Schwyz, Freiburg, Soleure, St Gall, Aargau, Thurgau, Tessin, Vaud, and Valais. Among the more specialized institutions of the preparatory or middle class are the Technitium

at Winterthur, the veterinary colleges at Zurich and Bern, the agvieultural schools at Oberstrass and Riitli, and the schoo] of dentistry at Geneva. In the four universities of Basel, Bern, Zurich, and Geneva, each with faculties of law, theology, medicine and arts (philosophy), the average number of matriculated students per session of six months was, between 1876 (the first year of the Geneva university) and 1881, in theology 118, in law 188, in medieine 469, and in arts 288,—a total of 1058, to which must be added 334 non-matrieulated. Basel has a preponderance in theology, Bern in law, Zurieh in arts. The great federal polytechnicum at Zuriely (opened in 1855) comprises schools of architecture, eivil and industria] engineering, industrial chemistry, forestry, and agriculture.

The public libraries of Switzerland are briefly described in yol, xiv. p. 528, as they existed in 1868 (cf. p. 548); for the learned societies, see SOCIETIES.

The total revenue of the Confederation, which was only 22,049,353 Finance francs in 1869, had increased to 44,308,000 on an average in 1879- | 1883, and reached 48,392,000 in 1885 ; the expenditure, which was 21,744,459 at the first date, had correspondingly increased to 43,312,510 in 1879-18838, and 46,278,685 in 1885.

In Switzerland there is no standing army, but every male citizen Amy between twenty-four and forty-four years of age is bound to military |

service and drill. The federal forces consist of the Auszug, Elite, or regular army (men from twenty to thirty-two years old), and the | landwehr (men thirty-two to forty-four years). The whole army : was reorganized in 1874, when extensive functions were assigned to the military physician in eonnexion with the reeruiting and calling out of the soldiers. In the ten years 1875-84 there was one new recruit for 111 of the population (foreigners excepted); 49 per cent. of the total were declared fit for service, 19 per cent. 1e- : manded, and 32 per cent. declared unfit. In the long run, about | 61°1 percent. of the young men of the country passed the standard,

In 1886 the regulars numbered 117,179 and the landwehr 84,046.2

Railway construction, which began in 1844, proceeded in earnest Railways, after the new legislation of 1852, and by the close of 1862 718 miles had been construeted ; by 1872 the ordinary lines reached a total of 1459 miles, with 5 miles of special lines; for 1882 the corre- sponding figures were 2667 and 81. The annual railway profits increased from 105,599,970 francs in 1870-74 to 179,151,112 in 1880-84. Tramways began to be laid down in 1862, and rope railways in 1877. The railways are mostly in the northern plateau and connect with the systems of Northern Europe. The only Swiss line which crosses to the south of the Alps is the St Gotthard (see Raitways). The proposed Simplon. railway has already been carried up the Rhone valley as far as Brieg. The mountainous eharacter of the country and the speeial exigencies of its traflie , have suecessfully stimulated to some striking efforts of railway engineering. Thus the Rigi railway rises from the Lake of Lueerne to a height of 5739 feet, with a maximum gradient of 250 per thousand ; that of the Rorschach-Heiden line is 50 per thousand. _ | Switzerland is famous for its well-made and well-kept carriage- Roads roads. Some of those that traverse the mountain-passes have been constructed at great expense. One of the most remarkable is the mule-path down an almost perpendicular rock from the Gemmi Pass to Leukerbad, made in 1737-40.

Bern has been the seat of the international Postal Union since Post 1874 (see Post-OFFicz, vol. xix. p. 584). The federalization of office the

national post-office dates from 1848,—the different cantons having previously conducted their postal business according to very different methods. It is to be noted that this department charges itself with the conveyance of passengers as well as mails,—these numbering 831,839 in 1880 and 754,365 in 1885. For other details see the table given in vol. xix. p. 585. ,

The length of telegraph lines increased from 1920 kilometres in Tele- 1852 to 6874 in 1884 (wires from 1920 to 16,618 kilometres), and graphs the number of despatches from 2876 in 1852 to 1,127,311 in 1884, the total reeeipts for the latter year being 2,555,687 francs. —

In Switzerland there are thirty-three legalized banks of issue ; Banks. their average circulation of notes in 1885 was to the value of 123,431,000 francs. There are 325 savings banks proper (deposits 246,359,735 francs in 1882) and 162 other institutions which receive deposits (267,298,548 francs in 1882). Most of these are in the liands of companies or private merchants. :

Besides the older but valuable works of Faber (1756), Fasi (1765-68), Fiissli (1770-72), Normann (1795-98), Durand (1795-96), Meister (1796), sec Hzst. geogr. Statistische Gemdlde der Schweiz (a scries of monographs, published by Huber and Co. of St. Gall and Bern); Mottinger, Staatshaushalt der schweiz. Eidgen-, 1847; Franscini, Stat. della Svizzera, Lugano, 1827 and 1847-49; Wirth, Allge meine Beschretbung der Schweiz; Legoyt and Vogt, La Suisse; Prof. Bglis most convenient Zaschenbuch (1878, &c.) and Schweizerkunde ; Berlepsch, Sc kunde, 1875; and Furrer's comprehensive Volkswirthshaft-Lexicon. A statistica bureau was founded in 1860, a statistical society in 1864. Dr Kummer gives 4 history of Swiss statistics in Zeitschrift fiir schwetz. Stat. 1885, and lis succcssor,

Herr Milliet, to whom we are indebted for much of the above informati: is engaged on a statistical handbook. (W. A. B. C.—H. A. W:

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Libraries,

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1 See especially C. Grob, Statistik tiber der Unterrichtswesen in der se 7 parts, 1883, and Dr H. Wettstein, Bericht iéber Gruppe 30, Unterrichisie (Zurich Exhibition), 1884,

2 Details may be found in the Almanach de Gotha, 1887.

3]

in mind.

) by little wins its independence of the empire, practically

| former masters, and that the Romansch-speaking Leagues of Rheetia (Graubiinden) pass from the status of an ally to

is universally acknowledged. History alone can supply us

Forest districts) there gradually gather other German dis-

HISTORY. |

Part II.—Hisrory.

The Swiss Confederation is made up of twenty-two small states, differing from each other in nearly every point,— religious, political, social, industrial, physical, and linguis- tic; yet it forms a nation the patriotism of whose members

with the key to this puzzle; but Swiss history, while thus essential if we would thoroughly grasp the nature of the Confederation, is very intricate and very local. A firm hold on a few guiding principles is therefore most desirable, and of these there are three which we must always bear (1) The first to be mentioned is the connexion of Swiss history with that of the empire. Swiss history is

| largely the history of the drawing together of bits of each _of the imperial kingdoms (Germany, Italy, and Burgundy)

for common defence against a common foe—the Hapsburgs; and, when this family have secured to themselves the per- manent possession of the empire, the Swiss League little

in 1499, formally in 1648. Originally a member of the empire, the Confederation becomes first an ally, then merely afriend. (2) The second is the German origin and nature of the Confederation. Rounda German nucleus (the three

tricts; the Confederation is exclusively German ; and it is not till 1803 and 1815 that its French- and Italian-speak- ing ‘“‘subjects” are raised to political equality with their

that of a ember of the Confederation. Even now, though

_ by the constitution three languages (German, French, and ~ Italian) are recognized as official, the overwhelming majo-

) 1848 and 1874.

ty three Forest districts, the Confederation is enlarged ‘with the original three members, but not necessarily with looking after common interests, in maintaining any real

‘union; the diet was merely an assembly of ambassadors with powers very strictly limited by their instructions, and

shaking off dependence on the Hapsburgs—up to 1394

‘up to 1499 (1648); IV. the period of religious divisions

(“homines vallis Uranie ”), the free community of the valley

rity of the population of the Confederation is German-speak-

ing (2,030,792 out of 2,846,102 in 1880), and the capital was fixed at Bern by a law of 1848, having previously shifted between various German-speaking towns, while in

jolden days the diet always met in some German-speaking

place. (3) Swiss history is a study in federalism. Based on the defensive alliances of 1291 and 1315 made between

by the admission of other districts and towns, all leagued

each other. Hence great difficulties are encountered in

there was no central executive authority. The Confeder- ation is a Staatenbund, or permanent alliance of several small states. After the break-up of the old system in

11798 we see the idea of a Bundesstaat, or an organized

state with a central legislative, executive, and judiciary,

work its way to the front, an idea which is gradually real- jized in the constitutions of 1848 and 1874. ‘constitutional history of the Confederation is summed up

The whole

in this transition to a federal state, which, while a single

state in its relations with all foreign powers, in home ‘ matters carefully maintains the more or less absolute inde- pendence of its several members.

Swiss history falls naturally into five great divisions : I. the origins of the Confederation—up to 12911; II. the

(1474) ; III. the shaking off dependence on the empire—

and French influence—up to 1814; V. the construction of an independent state as embodied in the constitutions of

I. On August 1, 1291, the men of the valley of Uri

1 For the legendary origin, see TELL.

evi rezikb A ND

of Schwyz (“ universitas vallis de Switz”), and the associa- Early tion of the men of the lower valley or Nidwald (“ communi- history

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tas hominum intramontanorum vallis inferioris”) formed an Everlasting League for the purpose of self-defence against all who should attack or trouble them, a league which is expressly stated to be a confirmation of a former one (“antiquam confederationis formam juramento.vallatam presentibus innovando”). This League was the foundation of the Swiss Confederation.

What were these districts? and why at this particular moment was it necessary for them to form a defensive league? The legal and political conditions of all differed. (2) In 853 Louis the German granted (énter alia) all his lands (and the rights annexed to them) situated in the “pagellus Uroniz” to the convent of Sts Felix and Regula in Zurich (the present Fraumiinster), of which his daughter Hildegard was the first abbess, and gave to this district the privilege of exemption from all jurisdiction save that of the king (Retchsfretheit). The abbey thus became . possessed of the greater part of the valley of the Reuss be- tween the present Devil’s Bridge and the Lake of Lucerne, for the upper valley of Urseren belonged at that time to the abbey of Dissentis in the Rhine valley, and did not become permanently allied with Uri till 1410. The privileged position of the abbey tenants gradually led the other men of the valley to “commend” themselves to the abbey, whether they were tenants of other lords, or free men as in the Schichenthal. The meeting of all the inhabitants of the valley, for purposes connected with the customary cultivation of the soil according to fixed rules and methods, served to prepare them for the enjoyment of full political liberty in later days. The important post of “protector” (advocatus or vogt) of the abbey was given to one family after another by the emperor as a sign of trust ; but, when, on the extinction of the house of Zaringen in 1218, the office was granted to the Hapsburgs, the

protests of the abbey tenants, who feared the rapidly rising power of that family, and perhaps also the desire of the emperor to obtain command of the St Gotthard pass (of which the first authentic mention occurs about 1236, when of course it could only be traversed on foot), led to the recall of the grant in 1231, the valley being thus restored to its original privileged position, and depending immediately on the emperor. (b) In Schwyz we must dis- tinguish between the districts west and east of Steinen. In the former the land was in the hands of many nobles, amongst whom were the Hapsburgs; in the latter there was, at the foot of the Mythen, a free community of men governing themselves, and cultivating their land in common; both, however, were politically subject to the emperor's delegates, the counts of the Ziirichgau, who after 1173 were the ever-advancing Hapsburgs. But in 1240 the free community of Schwyz obtained from the emperor Frederick II. a charter which removed them from the jurisdiction of the counts, placing them in immediate dependence on the emperor, like the abbey men of Uri. In a few years, however, the Hapsburgs contrived to dispense with this charter in practice. (¢) In Unter- walden things were very different. The upper valley (Obwald or Sarnen, so called because of its position with regard to the Kernwald) formed part of the Aargau, the lower (Nidwald or Stanz) part of the Ziirichgau, while in both the soil was owned by many ecclesiastical and lay lords, among them being the Hapsburgs and the Alsatian abbey of Murbach. Hence in this district there were no privileged tenants, no free community, no centre of unity, and this explains why Obwald and Nidwald won their way upward so much more slowly than their neighbours in Uriand Schwyz. Thus the early history and legal position of these three districts was very far from being the same.

In Uri the Hapsburgs, save for a brief space, had abso-| in Schwyz in 1281, in Nidwald uot till this very docu-

lutely no rights ; while in Schwyz, Obwald, and Nidwald | ment of 1291 ; yet, despite the great differences in their

they were also, as counts of the Ziirichgau and of the | political status, they all joined in concluding this League,

Aargau, the representatives of the emperor. and confirmed it by their separate seals, thereby laying The The Hapsburgs had been steadily rising for many years | claim on behalf of their union to an independent exist. League from the position of an unimportant family in the Aargau | ence. Besides promises of aid and assistance in the case CF T201. souilianiol a powerful clan of large landed proprietors in | of attack, they agree to punish great criminals by their

Swabia and Alsace, and had attained a certain political | own authority, but advise that, in minor cages and in all

importance as counts of the Ziirichgau and Aargau. In one | civil cases, each man should recognize the "judex" to

or both qualities the cadet or Lauffenburg line, to which | whom he owes suit, engaging that the confederates will,

the family estates in the Forest districts round the Lake of | in case of need, enforce the decisions of the "judex." At

Lucerne had fallen on the division of the inheritance in | the same time they unanimously refuse to recognize any

1232, seem to have exercised their legal rights in a harsh | " judex" who has bought his charge or is a stranger to

manner. In 1240 the free men of Schwyz obtained pro- | the valleys. All disputes between the parties to the

tection from the emperor ; in 1244 the Hapsburgs built the treaty are, as far as possible, to be settled by a reference to

castle of New Hapsburg on a promontory jutting out into | arbiters, a principle which remained in force for over six :

the lake not far from Lucerne, with the object of enforcing | hundred years. “Judex” is a genera) term for any local

their real or pretended rights. It is therefore not a matter | official, especially the chief of the community, whether

for surprise that, when, after the excommunication and de- | named by the lord or by the community ; and, as earlier in

position of Frederick II. by Innocent IV. at the council of | the same year Rudolph had promised the men of Schwyz

Lyons in 1245, the head of the cadet line of Hapsburg | not to force upon them a “judex” belonging to the class

sided with the pope, the men of the Forest districts should | of serfs, we may conjecture from this very decided protest

rally round the emperor. Schwyz joined Sarnen, Nidwald | that the chief source of disagreement was in the matter

helped Lucerne ; the castle of New Hapsburg was reduced | of the jurisdictions of the lord and the free community,

to its present ruined state; and in 1248 the men of | and that some recent event in Schwyz led it to insist on

Schwyz, Sarnen, and Lucerne were threatened by the | the insertion of this provision. It is stipulated also that

pope with excommunication if they persisted in uphold- every man shall be bound to obey his own lord “ conyeni-

ing the emperor and defying their hereditary lords the | enter,” or so far ag is fitting and right.

counts of Hapsburg. The rapid decline of Frederick’s II. In the struggle for the empire, which extended over Morgaten

cause soon enabled the Hapsburgs to regain their author- | the years following the conclusion of the League of 1291, we and the

ity in these districts. Yet these obscure risings have a | find that the Confederates support without exception the a

double historical interest, for they are the foundation in anti-Hapsburg candidate. On October 16, 1291, Uri and *”

fact (so far as they have any) of the legendary stories Schwyz ally themselves with Zurich, and join the general

of Hapsburg oppression told of and by a later age, and rising in Swabia against Albert, the new head of the house

these fleeting alliances are doubtless what is represented | of Hapsburg. It soon failed, but hopes revived when in

by the “antiqua confederatio” of 1291, Schwyz already | 1292 Adolf of Nassau was chosen emperor. In 1297 he

taking the lead, while Uri, secure in its privileged posi- | confirmed to the free men of Schwyz their charter of 1240,

tion, contented itself with giving a moral support to its and, strangely enough, confirmed the same charter to Uni,

neighbours. After this temporary check the power of | instead of their own of 1231. It is in his reign that we

the Hapsburgs continued to increase rapidly. In 1273 | have the first recorded meeting of the “landsgemeinde” (or

the head of the cadet line sold all his lands and rights in assembly) of Schwyz (1294), that of Uri being heard of as

the Forest districts to the head of the elder or Alsatian early as 1275. But in 1298 Albert of Hapsburg himself

line, Rudolph, who a few months later was elected to the | was elected to the empire. His rule was strict and severe,

imperial throne, in virtue of which he acquired for his though not oppressive. He did not indeed confirm the

family in 1282 the duchy of Austria, which now for the | charters of Uri or of Schwyz, but he did not attack the

first time became connected with the Hapsburgs. Rudolph | ancient rights of the former, and in the latter he exercised

recognized the privileges of Uri but not those of Schwyz; | his rights as a landowner and did not abuse his political

and, as he now united in his own person the characters of rights as emperor or as count. In Unterwalden we find

emperor, count of the Ziirichgau and of the Aargau, and | that in 1304 the two valleys were joined together under a

landowner in the Forest districts (a name occurring first | common administrator, a great step forwards to permanent

in 1289), such a union of offices might be expected to result | union. The stories of Albert's tyrannical actions in the

in a confusion of rights. On April 16, 1291, Rudolph | Forest districts are not heard of till two centuries later,

bought from the abbey of Murbach in Alsace (of which he | though no doubt the union of offices in his person was @

was "'advocate") all its rights over the town of Lucerne | permanent source of alarm to the Confederation. It was

and the abbey estates in Unterwalden. It thus seemed | in his time too that the "terrier " (or list of manors and

probable that the other Forest districts would be shut off estates, with enumeration of all quit rents, dues, &c., pay-

from their natural means of communication with the outer | able by the tenants to their lords) of all the Hapsburg

world by way of the lake. Rudolph's death, on July 15 possessions in Upper Germany was begun, and it was on

of the same year, cleared the way, and a fortnight later | the point of being extended to Schwyz and Unterwalden

(August 1) the Everlasting League was made between | when Albert was murdered (1308) and the election of

the men of Uri, Schwyz, and Nidwald (the words "et } Henry of Luxemburg roused the free men to resist the

vallis superioris," 7z.e., Obwald, were inserted later on the | officials charged with the survey. Despite his promise to

original seal of Nidwald) for the purpose of self-defence | restore to the Hapsburgs all rights enjoyed by them under

against a common foe. We do not know the names of the | his three predecessors (or maintain them in possession),

delegates of each valley who concluded the treaty, nor the Henry confirmed, on June 3, 1309, to Uri and Schwy2

place where it was made, nor have we any account of the | their charters of 1297, and, for some unknown reason,

deliberations of which it was the result. The common seal confirmed to Unterwalden all the liberties granted by his

—that great outward sign of the right of a corporate body | predecessor, though as a matter of fact none had been

to act in its own name without needing to ask the permis- | granted. This charter, and the nomination of one

sion of auy external authority—appears first in Uriin 1243, | imperial bailiff to administer the three districts, had the

1232-1352.]

effect of placing them all (despite historical differences) in an identical political position, and that the most

A few days later the Confederates made a fresh treaty of alliance with Zurich; and in 1310 the emperor placed certain other inhabitants of Schwyz on the same privileged footing as the free community. The apsburgs were put off with promises ; and, though their request (1311) for an inquiry into their precise rights in Alsace and in the Forest districts was granted, no steps were taken to carry out this investigation. Thus in Henry's time the struggle was between the empire and the Hapsburgs as to the recognition of the rights of the latter, not between the Hapsburgs and those dependent on them as landlords or counts.

On Henry's death in 1313 the electors hesitated long setween Frederick the Handsome of Hapsburg and Louis f Bavaria. The men of Schwyz seized this opportunity 'or making a wanton attack on the great abbey of insiedeln, with which they had a long-standing quarrel is to rights of pasture. The abbot caused them to e excommunicated, and Frederick (the choice of the minority of the electors), who was the hereditary "advo- vate" of the abbey, placed them under the ban of the mpire. Louis, to whom they appealed, removed the)oan; on which Frederick issued a decree by which he estored to his family all their rights and possessions in he three valleys and Urseren, and charged his brother _4zeopold with the execution of this order. The Con- 'ederates hastily concluded alliances with Glarus, Urseren, \rt, and Interlaken to protect themselves from attack on }very side. Leopold collected a brilliant army at the Austrian town of Zug in order to attack Schwyz, while » body of troops was to take Unterwalden in the rear oy way of the Briinig pass. On November 15, 1315, 'ueopold, with from 15,000 to 20,000 men, moved forward |jlong the shore of the Lake of Egeri, intending to assail jhe village of Schwyz by climbing the steep hillside above he sonthern end of the lake, through the narrow pass of orgarten between the mountain and the lake. At the jammit of the pass waited the valiant band of the Con- 'pderates, from 1300 to 1500 strong. The march up the "Hgged and slippery slope threw the Austrian army into jisarray, which became a rout and mad flight when huge joulders and trunks of trees were hurled from above by "heir foes, who charged down on them, and drove them pito the lake. No fewer than 1500 Austrians fell ; their Wrilliant cavalry had completely failed before the onset of ye lightly armed Swiss footmen. Leopold fled in hot aste to Winterthur, and the attack by the Briinig was riven back by the men of Unterwalden. On December | 1315, representatives of the victorious highlanders met " Brunnen, on the Lake of Lucerne, not far from Schwyz, nd renewed the Everlasting League of 1291. In their in lines the two documents are very similar, the later king chiefly an expansion of the earlier. That of 1315 } in German (in contrast to the 1291 League, which is 1 Latin), and has one or two striking clauses largely hdebted to a decree issued by Zurich on July 24, 1291. sone of the three districts or their dependents is to cognize a new lord without the consent and counsel of he rest (this is probably meant to provide for an inter-

Pgnum in or disputed election to the empire, possibly for Ne chance of the election of a Hapsburg); strict obedience 4 all lawful matters is to be rendered to the rightful lord fh each case, unless he attacks or wrongs any of the Con- Rderates, in which case they are to be free from all Hligations; no negotiations, so long as the "Lander" ave no lord, are to be entered on with outside powers, ave by common agreement of all. Louis solemnly recog-

nized and confirmed the new League in 1316, and in 1318 a truce was concluded between the Confederates and the Hapsburgs, who treat with them on equal terms. The lands and rights annexed belonging to the Hapsburgs in the Forest districts are fully recognized as they existed in

the days of Henry of Luxemburg, and freedom of com- merce is granted. But there is not one word about the political rights of the Hapsburgs as counts of the Ziirich- gau and Aargau. This distinction gives the key to the whole history of the relations between the Confederates and Hapsburgs; the rights of the latter as landowners are fully allowed, and till 1801 they possessed estates within the Confederation ; it is their political rights which are always contested by the Swiss, who desire to rule themselves, free from the meddling of any external power.

As early as 1320 we find the name "Swiss" (derived The from Schwyz, which had always been the leader in the Leg"

struggle) applied to the Confederation as a whole, though it was not till after Sempach (1386) that it came into popu- lar use, and it did not form the official name of the Con- federation till 1803. This is in itself a proof of the great renown which the League won by its victory at Morgarten. Another is that as years go by we find other members admitted to the privileges of the original alliance of the three Forest districts. First to join the League (1 332) was the neighbouring town of

Lucerne, which had grown up round the monastery of St Leodegar (whence the place took its name), perhaps a colony, certainly a cell of the great house of Murbach in Alsace, under the rule of which the town remained till its sale in 1291 to the Hapsburgs. This act of Lucerne was opposed by the house of Austria, but, despite the decision of certain chosen arbitrators in favour of the Hapsburg claims, the town clung to the League with which it was connected by its natural position, and thus brought a new element into the pastoral associa- tion of the Forest districts, which now surrounded the entire Lake of Lucerne. Next, in 1351, came the ancient city of Zurich, which in 1218, on the extinction of the house of Zaringen, had become a free imperial city in which the abbess of the Fraumiinster (the lady of Uri) had great influence, though from 1240 the citizens elected the council which she had previously named. In 1336 there had been a great civic revolution, headed by Rudolph Brun, which had raised the members of the craft guilds to a position in the municipal government of equal power with that of the patricians, who, however, did not cease intrigu- ing to regain their lost privileges, so that Brun, after long hesitation, decided to throw in the lot of the city with the League rather than with Austria. In this way the League now advanced from the hilly country to the plains, though the terms of the treaty with Zurich did not bind it so closely to the Confederates as in the other cases (the right of making alliances apart from the League being reserved, though the League was to rank before these), and hence rendered it possible for Zurich now and again to incline towards Austria in a fashion which did great hurt to its allies. In 1352 the League was enlarged by the admission of Glarus and Zug. Glarus belonged to the monastery of Sackingen on the Rhine (founded by the Irish monk Fridolin), of which the Hapsburgs were ‘ advocates,” claiming therefore many rights over the valley, which refused to admit them, and joyfully received the Con- federates who came to its aid; but it was placed on a lower footing than the other members of the League, being bound to obey their orders. Three weeks later the town and district of Zug, attacked by the League and abandoned by their Hapsburg masters, joined the Confederation, forming a transition link between the civic and rural members of the League. The immediate occasion of the union of these two districts was the war begun by the

Austrian duke against Zurich, which was ended by the Brandenburg peace of 1352, by which Glarus and Zug were to be restored to the Hapsburgs, who also regained their rights over Lucerne; Zug was won for good by a bold stroke of the men of Schwyz in 1864, but it was not till the day of Nafels (1388) that Glarus recovered its lost freedom. These temporary losses and the treaty made by Brun of Zurich with Austria in 1356 were, how- ever, far outweighed by the entrance into the League in 1353 of the famous town of Bern, which, founded in 1191 by Berthold V. of Ziringen, and endowed with great privileges, had become a free imperial city in 1218 on the extinction of the Zaringen dynasty. Founded for the purpose of bridling the turbulent feudal nobles around, many of whom had become citizens, Bern beat them back at Dornbiihl (1298), and made a treaty with the Forest districts as early as 1323. In 1339, at the bloody fight of Laupen, she had broken the power of the nobles for ever, and in 1352 had been forced by a treaty with Austria to take part in the war against Zurich, but soon after the conclusion of peace entered the League as the ally of the three Forest districts, being thus only indirectly joined to Lucerne and Zurich. The special importance of the accession of Bern was that the League now began to spread to the west, and was thus brought into con- nexion for the first time with the French-speaking land of Savoy. The League thus numbered eight members, the fruits of Morgarten, and no further members were admitted till 1481, after the Burgundian war. But, in order to thoroughly understand the nature of the League, it must be remembered that, while each of the five new members was allied with the original nucleus,—the three Forest districts,—these five were not directly allied to one another : Lucerne was allied with Zurich and Zug ; Zurich with Lucerne, Zug, and Glarus ; Glarus with Zurich ; Zug with Lucerne and Zurich; Bern with no one except the three original members. The circumstances under which each entered the League can alone explain the very intri- cate relations at this time of its eight members.

After a short interval of peace the quarrels with Austria broke out afresh ; all the members of the League, save the three Forest districts and Glarus, joined the great union of the South German cities; but their attention was soon called to events nearer home. Lucerne fretted much under the Austrian rule, received many Austrian subjects among her citizens, and refused to pay custom duties to the Austrian bailiff at Rothenburg, on the ground that she had the right of free traffic. An attack on the custom-house at Rothenburg, and the gift of the privileges of burghership to the discontented inhabitants of the little town of Sempach a short way off, so irritated Leopold III. (who then held all the possessions of his house out- side Austria) that, unmindful of the defeat of his uncle at Morgarten in 1315, he collected a great army, with the intention of crushing his rebellious town. Lucerne mean- while had summoned the other members of the League to her aid, and, though Leopold's feint of attacking Zurich caused the troops of the League to march at first in that direction, they discovered their mistake in time to turn back and check his advance on Lucerne. From 1500 to 1600 men of Uri, Schwyz, Unterwalden, and Lucerne opposed the 6000 which made up the Austrian army. The decisive fight took place on July 9, 1386, near Sempach, on a bit of sloping meadow-land, cut up by streams and hedges, which forced the Austrian kniglits to dismount. The great heat of the day, which rendered it impossible to fight in armour, and the furious attacks of the Con- federates, finally broke the Austrian line after more than one repulse and turned the day (see WINKELRIED). Leopold, with a large number of his followers, was slain,

and the Hapsburg power within the borders of the Con. federation finally broken. Glarus at once rose in arms against Austria, but it was not till the expiration of the truce made after Sempach that Leopold's brother, Albert of Austria, brought an army against Glarus, and was signally defeated at Nafels (not far from Glarus) on April 9, 1388, by a

handful of Glarus and Schwyz men, the troops of the other Confederates arriving too late. |

In 1389 a peace for seven years was made, the Comfed- Freedom erates being secured in all their conquests; an attempt from the made in 1393 by Austria by means of Schéno, the Pilltial chief magistrate of Zurich and leader of the patrician …

: 5 ; To p- party, to stir upa fresh attack failed owing to a rising burgs, of the burghers, who sympathized with the Confederates, and on July 16, 1394, the peace was prolonged for twenty years (and again in 1412 for fifty years), various stipula- tions being made by which the hundred years' struggle of the League to throw off all political dependence on the Hapsburgs was finally crowned with success. Glarus was freed on payment of 200 pounds annually (in 1389-1395 it bought up all the rights of Siackingen); Zug too was released from Austrian rule. Schwyz was given the town of Einsiedeln (the "advocatia" of the great abbey following in 1397); Lucerne got the Entlibuch, Sempach, and Rothenburg, the last-named being mortgaged only; Bern and Solothurn were confirmed in their conquests. Above all, the Confederation as a whole was relieved from the overlordship of the Hapsburgs, to whom, however, all their rights and dues as landed proprietors were expressly reserved,—Bern, Zurich, and Solothurn guaranteeing the maintenance of these rights and dues, with power in case | of need to call on the other Confederates to support them by arms. Thus the distinction always made by the Con- federates between the Hapsburgs as rulers and as land- owners was once more upheld ; and, though that powerful family entertained hopes of recovering its former rights, so that technically the treaties of 1389, 1394, and 1412 were but truces, it finally and for ever renounced all its feudal rights and privileges within the Confederation by ; the " Everlasting Compact" of 1474.

It is probable that Bern did not take any active share in the Senipach war because she was bound by the treaty of peace made with the Austrians in 1368 ; and Solothurn, allied with Bern, was doubtless a party to the treaty of 1394 (though not yet in the League), because of its

suf- ferings in 1382 at the hands of the Kyburg line of the Hapsburgs, whose possessions (Thun, Burgdorf, &e.) in 1384 fell into the hands of the two allies.

We may mention here the foray (known as the English or Gugler war) made in 1374-75 by Enguerrand de Coucy (husband of Isabella, daughter of Edward II. of England) and his freebooters (many of them Englishmen and Welshmen), called " Gugler" from their pointed steel caps, with the object of obtaining possession of certain towns in the Aargau (including Sempach), which he claimed as the dowry of his mother Catherine, daughter of the Leopold who was defeated at Morgarten. He was put to rout in the Entlibuch by the men of Bern, Fret burg, Schwyz, and Unterwalden in December 1375. This victory, which gave rise to the first great Swiss war song, was commemorated with great rejoicings as lately as 1875. –

II. The great victory at Sempach not merely vastly a Ee increased the fame of the Everlasting League but also mall, St enabled it to extend both its influence and its territory. Gall, and The 15th century is the period when both the League and Valais its several members took the aggressive, and the expan sion of their power and lands cannot be better seen than by comparing the state of things at the beginning and at the end of this century. The pastoral highlands – Appenzell (Abbatis Cella) and the town of St Gall he

1352-1428. |

long been trying to throw off the rights exercised over them by the great abbey of St Gall, founded in the 7th century by the Irish monk of that name. The Appen- zellers in particular had offered a stubborn resistance, and the abbot's troops had been beaten back by them in 1403 on the heights of Végelinseck, and again in 1405 in the great fight on the pass of the Stoss! (which led up into the highlands), in which the abbot was backed by the duke of Austria. Schwyz had given them some help, and in 1411 Appenzell was placed under the protection of the League (save Bern), with which in the next year the city of St Gall made a similar treaty to last ten years. So too in 1416-17 several of the "tithings" of the Upper Wallis or Valais (z.c., the upper stretch of the

Rhone valley), which in 1388 had beaten the bishop and the nobles in a great fight at Visp, became closely associated with Lucerne, Uri, and Unterwalden. It required aid in its final struggle against the great louse of Raron, the count- bishop of Sitten (or Sion), and the house of Savoy, which held Lower Wallis,—the Forest districts, on the other hand, wishing to secure themselves against Raron and Savoy in their attempt to permanently conquer the Val @Ossola on the south side of the Simplon pass. Bern, however, supported its burgher, the lord of Raron; but, by a peace made in 1420, the powers of the bishop and the lord of Raron were greatly diminished; the latter house soon after sold all its lands and rights, and migrated to the district of Toggenburg. Such were the first links which bound these lands with the League ; but they did not become full members for a long time—Appenzell in 1513, St Gall in 1803, Wallis in 1815. Space will not allow us to enumerate all the small con- _ quests made in the first half of the 15th century by every member of the League ; suflice it to say that each increased _ and rounded off its territory, but did not give the conquered lands any political rights, governing them as "subject lands," often very harshly. The same phenomenon of jlands which had won their own freedom playing the part of tyrant over other lands which joined them more or less |by their voluntary action is seen on a larger scale in the case of the conquest of the Aargau, and in the first attempts to secure a footing south of the Alps.

In 1412 the treaty of 1394 between the League and the | Hapsburgs had been renewed for fifty years; but when in 1415 Duke Frederick of Austria helped Pope John XXII. 'to escape from Constance, where the great council was then sitting, and the emperor Sigismund placed the duke under the ban of the empire, summoning all members of the empire to arm against him, the League hesitated, because of their treaty of 1412, till the emperor declared 'that all the rights and lands of Austria in the League were [forfeited, and that their compact did not release them from their obligations to the empire. In the name, therefore, 'of the emperor, and by his special command, the different members of the League overran the extensive Hapsburg Possessions in the Aargau. 'The chief share fell to Bern, 'but certain districts (known as the Freie Aemter) were joined together and governed as bailiwicks

held in common |by all the members of the League (save Uri, busied in tlie ‘south, and Bern, who had already secured the lion’s share of the spoil for herself). This is the first case in which the League as a whole took up the position of rulers over districts which, though guaranteed in the enjoyment of ‘their old rights, were nevertheless politically unfree. yn encouragement and a reward, Sigismund had granted

allie —

” The tales of the heroic defence of Uli Rottach of Appenzell, and o£ the appearance of a company of Appenzell women disguised as varriors which turned the battle, are told in connexion with this fight, sut do not appear till the 17th and 18th centuries, being thus quite |

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in advance to the League the right of criminal jurisdiction (“haute justice ” or “ Blutbann ”’), which points to the fact that they were soon to become independent of the empire, as they were of Austria. But all through the 15th century it must be carefully borne in mind that the members of the League were constantly recognized as and acknowledged themselves to be members of the empire.

As the natural policy of Bern was to scek to enlarge its borders at the expense of Austria, and later of Savoy,

Anhistorical, so far as our genuine evidence goes.

so we find that Uri, shut off by physical causes from extension in other directions, as steadily turned its eyes towards the south. In 1410 the valley of Urseren was finally joined to Uri; though communications

were diffi- cult, and carried on only by means of the “stiebende Briicke,” a wooden bridge suspended by chains over the Reuss, along the side of a great rocky buttress (pierced in

1707 by the tunnel known as the Urnerloch), yet this

enlargement of the territory of Uri gave it complete com- mand over the St Gotthard pass, long commercially import- ant, and now to serve for purposes of war and conquest. Already in 1403 Uri and Obwald had taken advantage of a quarrel with the duke of Milan as to custom dues at the market of Varese to occupy the long narrow valley on the south of the pass called the Val Leventina; in 1410 the men of the same two lands, exasperated by the insults of the local lords, called on the other members of the League, and all jointly (except Bern) occupied the Val d’Ossola, on the south side of the Simplon pass. But in 1414 they lost this to Savoy, and, with the object of getting it back, obtained in 1416-17 the alliance of the men of Upper Wallis, then fighting for freedom, and thus regained the valley, despite the exertions of the great Milanese general Carmagnola. In 1419 Uri and Obwald bought from its lord the town and district of Bellinzona. This rapid advance, however, did not approve itself to the duke of Milan, and Carmagnola reoccupied both valleys ; the Con- federates were not at one with regard to these southern conquests ; a small body pressed on in front of the rest, but was cut to pieces at Arbedo near Bellinzona in 1422. A bold attempt in 1425 by a Schwyzer, Peter Rissi by name, to recover the Val d’Ossola caused the Confederates to send a force to rescue these adventurers ; but the duke of Milan intrigued with the divided Confederates, and finally in 1426, by a payment of a large sum of money and the grant of certain commercial privileges, the Val Leventina, the Val d’Ossola, and Bellinzona were restored to him. Thus the first attempt of Uri to acquire a footing south of the Alps had failed, but the wish to recover its lost conquests still continued, and a later attempt was more successful, leading to the inclusion in the Confederation of what has been called “Italian Switzerland.”

First Italian

con-

quests.

The original contrasts between the social condition of The first the different members of the League became more marked “vil war.

when the period of conquest began, and led to quarrels and ill-feeling in the matter of the Aargau and the Italian conquests which a few years later ripened into a civil war, brought about by the dispute as to the succession to the lands of Frederick, count of Toggenburg, the last male representative of his house. Count Frederick’s prede- cessors had greatly extended their domains, so that they took in not only the Toggenburg or upper valley of the Thur, but Uznach, Sargans, the Rhine valley between Feldkirch and Sargans, the Prittigau, and the Davos valley. He himself, the last great feudal lord on the left bank of the Rhine, had managed to secure his vast posses- sions by making treaties with several members of the League, particularly Zurich (1402) and Schwyz (1417),— from 1428 inclining more and more to Schwyz (then ruled by Ital Reding), being disgusted with the arrogant

| behaviour of Stiissi, the burgomaster of Zurich. His

death (April 30, 1436) was the signal for the breaking out of strife. The Prittigau and Davos valley formed the League of the Ten Jurisdictions in Rhetia (see below), while Frederick’s widow sided with Zurich against Schwyz for different portions of the great inheritance which had been promised them. After being twice defeated, Zurich was forced in 1440 to buy peace by certain cessions (the Upper March) to Schwyz, the general feeling of the Con- federates being opposed to Zurich, several of them going so far as to send men and arms to Schwyz. Zurich, how- ever, was bitterly disappointed at these defeats, and had recourse to that policy which she had adopted in 1356 and 1393—an alliance with Austria (concluded in 1442), which now held the imperial throne in the person of Frederick III. Though technically within her rights ac- cording to the terms on which she had joined the League in

1351, this act of Zurich caused the greatest irritation in the Confederation, and civil war at once broke out, especially when the Hapsburg emperor had been solemnly received and acknowledged in Zurich. In 1443 the Zurich troops were completely defeated at St Jakob on the Sihl, close under the walls of the city, Stiissi himself being slain. Next year the city itself was long besieged. Frederick, unable to get help elsewhere, procured from Charles VII. of France the despatch of a body of Armagnac free lances (the Ecorcheurs), who came, 30,000 strong, under the dauphin Louis, plundering and harrying the land, till, at the very gates of the free imperial city of Basel (which had made a twenty years' alliance with Bern), by the leper house of St Jakob on the Birs (August 26, 1444), the desperate resistance of a small body of Confederates (1200 to 1500) till cut to pieces, checked the advance of the freebooters, who sustained such tremendous losses that, though the victors, they hastily made peace, and returned whence they had come. Several small en- gagements ensued, Zurich long declining to make peace because the Confederates required, as the result of a solemn arbitration, the abandonment of the Austrian alliance. At length it was concluded in 1450, the Confederates restoring almost all the lands they had won from Zurich. Thus ended the third attempt of Austria to conquer the League by means of Zurich, which used its position as an imperial free city greatly to the harm of the League, and was the . cause of the first civil war which distracted the League. These fresh proofs of the valour of the Confederates, and of the growing importance of the League, did not fail to produce important results. In 1452 the " Confederates of the Old League of Upper Germany" (as they styled themselves) made their first treaty of alliance with France, a connexion which was destined to exercise so much influ- ence on their history. Round the League there began to gather a new class of allies (known as " Zugewandte Orte," or associated districts), more closely joined to it, or to certain members of it, than by a mere treaty of friendship, yet not being admitted to the rank of a full member of the League. Of these associates three, the

abbot (1451) and town of St Gall (1454), and the town |

of Bienne (Biel), through its alliance (1352) with Bern, were given seats and votes in the diet, being called “soci”; while others, known as “ confcederati,” were not so closely bound to the League, such as Wallis (1416-17), Schaff- hausen (1454), Miihlhausen (1466), Rothweil (1463).! Ap- penzell, too, in 1452, rose from the rank of a “‘ protected district” into the class of associates, outside which were certain places “ protected” by several members of the League, such as Gersau (1359), the abbeys of Engelberg (c. 1421) and Einsiedeln (1397-1434), and the town of

1 To the class of ‘ confcederati” belonged in later times Neuchatel

(1495-98), the Leagues of Rhetia (1497-98), Geneva (1519-86), and the bishop of Basel (1579).

Rapperschwyl (1458). The relation of the “associates” to the League may be compared with the ancient practice of “commendation”: they were bound to obey orders in the matter of declaring war, making alliances, &e.

In 1489 Sigismund succeeded his father Frederick in the Hapsburg lands in Alsace, the Thurgau, and Tyrol, and, being much irritated by the constant encroachments of the Confederates, in particular by the loss of Rapper. schwyl (1458), declared war against them, but fared very badly. In 1460 the Confederates overran the Thurgau, and occupied Sargans. Winterthur was only saved by an heroic defence. Hence in 1461 Sigismund had to give up his claims on those lands and renew the peace for fifteen years, while in 1467 he sold Winterthur to Zurich. Thus the whole line of the Rhine was lost to the Haps- burgs, who retained (till 1802) in the territories of the Confederates the Frickthal only. The Thurgovian baili-

wicks were governed in common as “subject” lands by all the Confederates except Bern. The touchiness of the now rapidly

advancing League was shown by the eager- ness with which in 1468 its members took up arms against certain small feudal nobles who were carrying on a harassing guerilla warfare with their allies Schaffhausen and Mihlhausen. They laid siege to Waldshut, and to buy them off Sigismund in August 1468 engaged to pay 10,000 gulden as damages by June 24, 1469; in default of payment the Confederates were to keep for ever the Black Forest, Waldshut, and certain other Black Forest towns on the Rhine. A short time before (1467) the League had made treaties of friendship with Philip the Good, duke of Burgundy, and with the duke of Milan. All was now prepared for the intricate series of intrigues which led up to the Burgundian War,—a great epoch in the history of the League, as it created a common national feel- ing, enormously raised its military reputation, and brought about the close connexion with certain parts of Savoy which finally (1803-15) were admitted into the League.

had promised to pay. In this strait he turned to Charles the Bold (properly the Rash), duke of Burgundy, who was then beginning his wonderful career, and aiming at restoring the kingdom of Burgundy. For this purpose Charles wished to marry his daughter and _ heiress to Maximilian, son of the emperor, and first cousin of Sigis- mund, in order that the emperor might be induced to give him the Burgundian crown. Hence he was ready to meet Sigisniund's advances. On May 9, 1469, Charles promised to give Sigismund 50,000 florins, receiving as security for repayment Alsace, the Breisgau, the Sundgau, the Black Forest, and the four Forest towns on the Rhine (Rheinfelden, Sackingen, Lauffenburg, and Waldshut); im addition, Charles took Sigismund under his protection, specially against the Swiss, and agreed to give him aid im a war if he was attacked by them. It was not unnatural for Sigismund to think of attacking the League, but Charles's engagement to him is quite inconsistent with the friendly agreement made between Burgundy and the League as late as 1467. The emperor then on his side annulled Sigismund's treaty of 1468 with the Swiss, and placed them under the ban of the empire. Charles com- mitted the mortgaged lands to Peter von Hagenbach, who proceeded to try to establish his master's power there by such harsh and severe measures as to cause all the people to murmur, then rise against him.

The Swiss in these circumstances began to look towards Louis XI. of France, who had confirmed the treaty of friendship made with them by his father in 1452. Sigis- mund had applied to him early in 1469 to help hum 10 his many troubles, and to give him aid against the Swiss | but Louis had point-blank refused. Anxious to secure

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Sigismund did not know where to obtain the sum he i gundian ar.

| Steps.

_ Bern to Charles. 'suspicious of this movement to the west, by which Bern alone could profit, though the League as a whole might 'lose ; then, too, Uri had in 1440 finally won the Val Lev-

1436-1476.]

their neutrality in case of his war with Charles, he made

| a treaty with them on August 13, 147 0, to this effect. All

the evidence goes to show that Sigismund was not a tool in the hands of Louis, and that Louis, at least at that time, had no definite intention of involving Charles and the Swiss in a war, but wished only to secure his own flank.

Sigismund in the next few years tried hard to get from Charles the promised aid against the Swiss (the money was paid punctually enough by Charles on his behalf), who put him off with various excuses. Charles on his side, in 1471-72, tried to make an alliance with the Swiss, his efforts being supported by a party in Bern headed by Adrian von Bubenberg. Probably Charles wished to use both Sigismund and the Swiss to further his own interests, but his shifty policy had the effect of alienating both from him. Sigismund, disgusted with Charles, now inclined towards Louis, whose ally he for- mally became in the summer of 1473,—a change which was the real cause of the emperor's flight from Treves in November 1473, when he had come there

expressly to crown Charles. The Confederates on their side were greatly moved by the oppression of their friends and allies in Alsace by Hagenbach, and tried in vain (January 1474) to obtain some redress from his master. Charles's too astute policy had thus lost him both Sigismund and the Swiss. They now looked upon Louis, who, thoroughly

_ aware of Charles's ambition, and fearing that his disap- ' pointment at Treves would soon lead to open war, aimed at a master stroke—no less than the reconciliation of

Sigismund and the Swiss. This on the face of it seemed

impracticable, but common need and Louis's dexterous _ management brought it to pass, so that on March 30, _ 1474, the Everlasting Compact was signed at Constance, _ by which Sigismund finally renounced all Austrian claims on the lands of the Confederates, and guaranteed them in | quiet enjoyment of them ; they, on the other hand, agreed to support him if Charles did not give up the mortgaged ' lands when the money was paid down.

The next day the Swiss joined the league of the Alsatian and Rhine

i cities, as also did Sigismund. Charles was called on to receive the money contributed by the Alsatian cities, and

to restore his lands to Sigismund. He, however, took no Within a week the oppressive bailiff Hagenbach was captured, and a month later (May 9, 1474) he was put to death, Bern alone of the Confederates being represented. On October 9 the emperor, acting of course at the instance of Sigismund, ordered them to declare war against Charles, which took place on October 25, Bern acting in the name of the Confederates, and

) alleging that they made war solely by order of the emperor) and not as principals. his alliance with the Confederates, promising money and jpensions, the latter to be increased if he did not send ' men. directs Swiss policy, though all the Confederates are not) quite agreed. She

was specially exposed to attack from Charles and Charles's ally (since 1468) Savoy, and her' | best chance of extending her territory lay towards the west and south. A forward policy was thus distinctly _the best for Bern, and this was the line supported by the | French party under Nicholas von Diesbach, Von Bubenberg

Next day Louis formally ratified

Throughout these negotiations and later, Bern

Opposing it, though not with any idea of handing over The Forest districts, however, were very

entina, and she and her neighbours favoured a southerly policy—a policy which was crowned with success after

_ the gallant victory won at Giornico in 1478 by a handful

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of men from Zurich, Lucerne, Uri, and Schwyz over 12,000 Milanese troops, though the main body of the Confederates was already on its way home. Thus Uri gained for the first time a permanent footing south of the Alps, not long before Bern had won its first conquests from Savoy.

The war in the west was begun by Bern and her allies (Freiburg, Solothurn, &c.) by marauding expeditions across the Jura, in which Héricourt (November 1474) and Bla- mont (August 1475) were taken, both towns being held of Charles by the "sires" de Neuchatel, a cadet line of the counts of Monthéliard. It is said that in the former expedition the white cross was borne (for the first time) as the ensign of the Confederates, but not in the other. Meanwhile Yolande, the duchess of Savoy, had, through fear of her brother Louis XI. and hatred of Bern, finally joined Charles and Milan (January 1475), the immediate result of which was the capture, by the Bernese and friends (on the way

back from a foray on Pontarlier in the Free County of Burgundy or Franche Comté) of several places in Vaud, notably Granson and Kchallens, both held of Savoy by a member of the house of Challon, princes of Orange (April 1475), as well as Orbe and Jougne, held by the same, but under Burgundy. In the summer Bern seized on the Savoyard district of Aigle. Soon after (October-November 1475) the same energetic policy won for her the Savoyard towns of Morat, Avenches, Estavayer, and Yverdun; while (September) the Upper Wallis, which had conquered all Lower or Savoyard Wallis, entered into alliance with Bern for the purpose of opposing Savoy by preventing the arrival of Milanese troops. Alarmed at their success, the emperor and Louis deserted (June-September) the Confederates, who thus, by the influence of Louis and Bernese ambition, saw themselves led on and then abandoned to the wrath of Charles, and very likely to lose their new conquests. They had entered on the war as "' helpers" of the emperors, and now became principals in the war against Charles, who raised the siege of Neuss, made an alliance with Edward IV. of England, received the surrender of Lorraine, and hastened across the Jura (February 1476) to the aid of his ally Yolande. On February 21 Charles laid siege to Granson, and after a week's siege the garrison of Bernese and Freiburgers had to surrender, and, by way of retalia- tion for the massacre of the garrison of Estavayer in 1475, of the 412 men two only were spared in order to act as executioners of their comrades. This hideous news met a large body of the Confederates gathered together in great haste to relieve the garrison, and going to their rendezvous at Neuchatel, where both the count and town had become allies of Bern in 1406. An advance body of Bernese, Freiburgers, and Schwyzers, in order to avoid the castle of Vauxmarcus (seized by Charles), by the Lake of Neuchatel, on the direct road from Neuchatel to Gran- son, climbed over a wooded spur to the north, and attacked (March 2) the Burgundian outposts. Charles drew back his force in order to bring down the Swiss to the more level ground where his cavalry could act, but his rear misinterpreted the order, and when the main Swiss force appeared over the spur the Burgundian army was seized with a panic and fled in disorder. The Swiss had gained a glorious victory, and regained their conquest of Granson, besides capturing very rich spoil in Charles's camp, parts of which are

preserved to the present day in various Swiss armouries. Such was the famous battle of Granson. Charles at once retired to Lausanne, and set about reorganizing his army. He resolved to advance on Bern by way of Morat (or Murten), which was occupied by a Bernese garrison under Von Bubenberg, and laid siege to it on June 9. The Confederates had now put away all jealousy of Bern, and collected a large army. The decisive battle took place on the afternoon of June

Internal disputes in the

League.

788

22, after the arrival of the Zurich contingent under Hans Waldmann. English archers were in Charles's army, while with the Swiss was René, the dispossessed duke of Lorraine. After facing each other many hours in the driving rain, a body of Swiss, by outflanking Charles's van, stormed his palisaded camp, and the Burgundians were soon hopelessly beaten, the losses on both sides (a contrast to Granson) being exceedingly heavy. Vaud was reoccupied by the Swiss, Savoy having overrun it on Charles's advance ; but Louis now stepped in and procured the restoration of Vaud to Savoy, save Granson, Morat, Orbe, ahd Echallens, which were to be held by the Bernese jointly with the Freiburgers, Aigle by Bern alone,—Savoy at the same time renouncing all its claims over Freiburg. Thus French-speaking districts first became permanently connected with the Confederation, hitherto purely German, and the war had been one for the maintenance of recent conquests, rather than a purely defensive one against an encroaching neighbour desirous of crushing Swiss freedom. Charles tried in vain to raise a third army ; René recovered Lorraine, and on J anuary 5, 1477, under the walls of Nancy, Charles's wide-reaching plans were ended by his defeat and death, many Swiss being with René's troops. The wish of the Bernese to overrun Franche Comté was opposed by the older members of the Confederation, and finally, in 1479, Louis, by very large payments, secured the abandonment of all claims on that province, which was annexed to the French crown. These glorious victories really laid the foundation of Swiss nationality ; but soon after

them the long-standing jealousy between the civic and rural elements in the Con- federation nearly broke it up. This had always hindered common action save in case of certain pressing questions. In 1370, by the “ Parsons’ ordinance ” (Pfaffenbrief), agreed on by all the Confederates except Bern and Glarus, all residents, whether clerics or laymen, in the Confederation who were bound by oath to the duke of Austria were to swear faith to the Confederation, and this oath was to rank before any other; no appeal was to lie to any court spiritual or lay (except in matrimonial and purely spiritual questions) outside the limits of the Confederation, and many regulations were laid down as to the suppression of private wars and keeping of the peace on the high roads. Further, in 1393, the “ Sempach ordinance” was accepted by all the Confederates and Solothurn; this was an attempt to enforce police re- gulations and to lay down “articles of war” for the organization and discipline of the army of the Confede- rates, minute regulations being made against plundering, ——women, monasteries, and churches being in particular protected and secured. But save these two documents common action was limited to the meeting of two envoys from each member of the Confederation and one from each of the “socii” in the diet, the powers of which were greatly limited by the instructions brought by each envoy, thus entailing frequent reference to his Government, and included foreign relations, war and peace, and common arrangements as to police, pestilence, customs duties, coin- age, &c. The decisions of the majority did not bind the minority save in the case of the affairs of the bailiwicks ruled in common. Thus everything depended on common agreement and goodwill. But disputes as to the division of the lands conquered in the Burgundian war, and the proposal to admit into the League the towns of Freiburg and Solothurn, which had rendered such good help in the war, caused the two parties to form separate unions, for by the latter proposal the number of towns would have been made the same as that of the “ Lander,” which these did not at all approve. Suspended a moment by the campaign in the Val Leventina, these quarrels broke out

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after the victory of Giornico ; and at the diet of Stanz (December 1481), when it seemed probable that the fail. ure of all attempts to come to an understanding would result in the disruption of the League, the mediation of Nicholas von der Fliie (or Bruder Klaus), a holy hermit of Sachseln in Obwald, though he did not appear at the diet in person, succeeded in bringing both sides to reason, and the third great ordinance of the League—the "compact of Stanz "—was agreed on. By this the promise of mutual] aid and assistance was renewed, especially when one mem- ber attacked another, and stress was laid on the duty of the several Governments to maintain the peace, and not to help the subjects of any other member in case of a rising. The treasure and movables captured in the war

| Were to be equally divided amongst the combatants, the

territories and towns amongst the members of the League, As a practical proof of the reconciliation, on the same day the towns of Freiburg and Solothurn were received as full members of the Confederation, united with all the other members, though on less favourable terms than usual, for they were forbidden to make alliances, save with the con- sent of all or of the greater part of the other members, Both towns had long been allied with Bern, whose influence was greatly increased by their admission. Frei- burg, founded in 1178 by Berthold IV. of Zaringen, had on the extinction of that great dynasty (1218) be- come a free imperial city, but had bowed successively to Kyburg (1249), Austria, the sons of Rudolph (1277), and Savoy (1452); when Savoy gave up its claims in 1477 Freiburg once more became a free imperial city. She had become allied with Bern as early as 1243. The ancient Roman city of Solothurn (or Soleure) had been associated with Bern from 1351, but had in vain sought admission into the League in 1411. Both the new mem- bers had done much for Bern in the Burgundian war, and it was for their good service that she now procured them this splendid reward, in hopes perhaps of aid on other important and critical occasions.

The compact of Stanz strengthened the bonds which joined the members of the Confederation ; and the same centralizing tendency is

well seen in the attempt (1483- 89) of Hans Waldmann, the burgomaster of Zurich, to assert the rule of his city over the neighbouring country districts, to place all power in the hands of the guilds (whereas by Brun's constitution the patricians had an equal share), to suppress all minor jurisdictions, and to raise a uniform tax. But this idea of concentrating all powers in the hands of the Government aroused great resistance, and led to his overthrow and execution. Peter Kistler succeeded (1470) better at Bern in a reform on the same lines, but not of such a sweeping character.

The early history of each member of the Confederation, Practica

and of the Confederation itself, shows that they always .,

empire.

professed to belong to the empire, trying to become im- mediately dependent on the emperor in order to prevent the oppression of middle lords, and to enjoy practical liberty. The empire itself had now become very much of a shadow; cities and princes were gradually asserting their own independence, sometimes breaking away from it altogether. Now, by the time of the Burgundian war the Confederation stood in a position analogous to that of a powerful free imperial city. As long as the emperor's

' nominal rights were not enforced, all went well; but, when

Maximilian, in his attempt to reorganize the empire, erected in 1495 at Worms an imperial chamber which had Juris- diction in all disputes between members of the empire, the Confederates were very unwilling to obey it, partly because they could maintain peace at home by their own authority, and partly because it interfered with their practical independence. Again, their refusal to join the

fies

1476-1521. |

“Swabian League,” formed in 1488 by the lords and

cities of South Germany to keep the public peace, gave further offence, as well as their fresh alliances with France. Hence a struggle was inevitable, and the occa- sion by reason of which it broke out was the seizure by the Tyrolese authorities in 1499 of the Miinsterthal, which belonged to the “ Gotteshausbund,” one of the three leagues which had gradually arisen in Rhetia. These were the “ Gotteshausbund” in 1367 (taking in all the dependents of the cathedral church at Chur living in the Oberhalbstein and Engadine), the “Oberer or Grauer Bund” in 1395 and 1424 (taking in the abbey of Dissentis and many counts and lords in the Vorder Rhein valley, though its name is not derived, as often stated, from the “grey coats” of the first members, but from “ grawen ” or “grafen,” as so many counts formed part of it), and the “League of the Ten Jurisdictions” (Zehngerichtenbund), which arose in the Prattigau and Davos valley (1436) on the death of Count Frederick of Toggenburg, but which, owing to certain Austrian claims in it, was not quite so free as its neighbours. The first and third of these became allied in 1450, but the formal union of the three dates only from 1524, as documentary proof is want- ing of the alleged meeting at Vazerol in 1471, though practically before 1524 they had very much in common. In 1497 the Oberer Bund, in 1498 the Gotteshausbund, made a treaty of alliance with the Everlasting League or Swiss Confederation, the Ten Jurisdictions being un- able to do more than show sympathy, owing to Austrian influence, which was not bought up till 1649-52. Hence this attack on the Miinsterthal was an attack on an “associate” member of the Swiss Confederation, Maxi- milian being supported by the Swabian League ; but its real historical importance is the influence it had on the relations of the Swiss to the empire. The struggle lasted

several months, the chief fight being that “an der Calven ” or “auf der Malserheide” (May 22, 1499), in which Benedict Fontana, a leader of the Gotteshausbund men, performed many heroic deeds before his death. But, both sides being exhausted, peace was made at Basel on September 22, 1499. By this the matters in dispute were referred to arbitration, and the emperor annulled all the decisions of the imperial chamber against the Con- federation; but nothing was laid down as to

its future relations with the empire. No further real attempt, how- ever, was made to enforce the rights of the emperor, and the Confederation became a state allied with the empire, enjoying practical independence, though not formally freed till 1648. Thus, 208 years after the origin of the Con- federation, it had got rid of all Austrian claims (1394 and 1474), as well as all practical subjection to the emperor. But its further advance towards the position of an inde- pendent state was long checked by religious divisions within, and by the enormous influence of the French king on its foreign relations.

With the object of strengthening the northern border of the Confederation, two more full members were admitted in 1501—Basel and Schaffhausen—on the same terms as Freiburg and Solothurn. The city of Basel had originally been ruled by its bishop, but in the 14th century it became a free imperial city; before 1501 it had made no permanent alliance with the Confederation, though in con- tinual relations with it. Schaffhausen had grown up round the Benedictine monastery of All Saints, and became in the 13th century a free imperial city, but was pledged to Austria from 1330 to 1415, in which last year the emperor Sigismund declared all Duke Frederick's rights

forfeited in consequence of his abetting the flight of Pope

John XXII. It had become an "associate" of the Con- federation in 1454.

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A few years later, in 1513, Appenzell, which in 141] The and in 1452 an League

had become a "protected" district, "associate" member of the Confederation, was admitted

as the thirteenth full member; and this remained the members.

number till the fall of the old Confederation in 1798. Round the three original members had gathered first five others, united with the three, but not necessarily with each other; and then gradually there grew up an outer circle, consisting of five more, allied with all the eight old members, but tied down by certain stringent conditions. Constance, which seemed called by nature to enter the League, kept aloof, owing to a quarrel as to the criminal

jurisdiction in the Thurgau, which had been pledged to it

before the district was conquered by the Confederates. Neuchatel in 1495-98 became permanently allied with several members of the Confederation.

In the first years of the 16th century the influence of Conquests the Confederates south of the Alps was largely extended. ™ Italy.

The system of giving pensions, in order to secure the right of enlisting men within the Confederation, and of capitula- tions, by which the different members supplied troops, was originated by Louis XI. in 1474, and later followed by many other princes. Though a tribute to Swiss valour and courage, this practice had very evil results, of which the first fruits were seen in the Milanese (1500-1516). Both Charles VIII. (1484) and Louis XII. (1499 for ten years) renewed Louis XI.'s treaty. The French attempts to gain Milan were largely carried on by the help of Swiss mercenaries, some of whom were on the opposite side; and, as brotherly feeling was still too strong to make it possible for them to fight against one another, Ludovico Sforza's Swiss troops shamefully betrayed him to the French at Novara (1500). In 1500, too, the three Forest districts occupied Bellinzona at the request of its inhabitants, and in 1503 Louis XII. was forced to cede it to them. He, however, often held back the pay of his Swiss troops, and treated them as mere hirelings, so that when the ten years' treaty came to an end Matthew Schinner, bishop of Sitten (or Sion), induced them to join (1510) the pope, J ulius II., then engaged in forming the Holy League to expel the French from Italy. But when, after the battle of Ravenna, Louis XII. became all-powerful in Lombardy, 20,000 Swiss poured down into the Milanese and occupied it, Schmid, the burgomaster of

Zurich, naming Maximilian (Ludovico's son) duke of Milan, in return for which he ceded to the Confederates Locarno, Val Maggia, Mendrisio, and Lugano (1512), while the Rhetian leagues received Chiavenna, Bormio, and the Valtelline. (The former districts, with Bellinzona and the Val Leventina, were in 1803 made into the canton of Ticino, the latter were held by Rheetia till 1797.) In 1513 the Swiss completely defeated the French at Novara, and in 1514 Pace was sent by Henry VIII. of England to give pensions and get soldiers. Francis I. at once on his accession (1515) began to prepare to win back the Milanese, and, successfully evading the Swiss awaiting his descent from the Alps, beat them in a pitched battle at Marignano near Milan (September 13, 1515), which broke the Swiss power in North Italy, so that in 1516 a peace was made with France,—Wallis, the Rhzetian leagues, and St Gall being included on the side of the Confederates. Provisions were made for the neutrality of either party in case the other became involved in war, and large pensions were promised. This treaty was extended by another in 1521 (to which Zurich, then under Zwingli's influence, would not agree, holding aloof from the French alliance till 1614), by which the French king might, with the consent of the Confederation, enlist any number of men between 6000 and 16,000, paying them fit wages, and the pensions were raised to 3000 francs annually to each member of the Confederation. These two treaties were

the starting point and foundation of later French inter- ference with Swiss affairs, which became more and more oppressive, and was not finally thrown off till 1814.

IV. In 1499 the Swiss had practically renounced their allegiance to the emperor, the temporal chief of the world according to medieval theory; and in the 16th century a great number of them did the same by the world's spiritual chief, the pope. The scene of the revolt was Zurich, and the leader Ulrich Zwingli. But we cannot understand Zwingli's career unless we remember that he was almost more a political reformer than a religious one. In his former character his policy was

threefold. He bitterly opposed the French alliance and the pension and mercenary system, for he had seen its evils with his own eyes when serving as chaplain with the troops in the Milanese in 1512 and 1515. Hence in 1521 his influence kept Zurich back from joining in the treaty with Francis I. Then, too, at the time of the Peasant Revolt (1525), he did what he could to lighten the harsh rule of the city over the neighbouring rural districts, and succeeded in getting serfage abolished. Again he had it greatly at heart to secure for Zurich and Bern the chief power in the Confederation, because of their importance and size ; he wished to give them extra votes in the diet, and would have given them two-thirds of the "common bailiwicks " when these were divided. In his character as a religious reformer we must remember that he was a humanist, and deeply read in classical literature, which accounts for his turning the canonries of the Grossmiin- ster into professorships, reviving the old school of the Carolinum, and relying on the arm of the state to carry out religious changes. His theology sprang from a single ruling principle—the absolute and unlimited sovereignty of God. Hence his profound respect for the letter of the Bible led him to "legalism " and extreme Sabbatarianism. Hence his view of the incarnation bordered on Unitarianism, and sacraments were mere signs of that which is already given ; hence too sprang his denial of man's free will and his belief in absolute election and reprobation. Nay, God, being the absolute Author of all things, is the Author of evil, though He is not immoral, for He is above law, and what is morally wrong for man is not so for God. Zwingli began to preach the new views as early as 1516, long before and quite independently of Luther ; but it was only when at the end of 1518 he was called to Zurich as parish priest that he began to make any noise, and in fact it was even later (1522), when his admirers allowed themselves to eat fish in Lent, that disturbances arose, and the diet forbade all preaching which would disturb the public peace. But, after succeeding at two public disputations, his views rapidly gained ground at Zurich, which long, however, stood quite alone, the other Con- federates issuing an appeal to await the decision of the asked-for general council, and proposing to carry out by the arm of the state certain small reforms, while clinging to the old doctrines. Zwingli had to put down the extreme wing of the Reformers—the Anabaptists—by

force. Quarrels too arose as to allowing the new views in the "common bailiwicks." The disputation at Baden (1526) was in favour of the maintainers of the old faith ; but that at Bern (1528) resulted in securing for the new views the support of that great town, and so matters began to take another aspect. In 1528 Bern joined the union formed in 1527 in favour of religious freedom by Zurich and Constance (Christliches Burgrecht), and her example was followed by Schaffhausen, St Gall, Basel, and Mihlhausen. This attempt to virtually break up the League was met in February 1529 by the offensive and defensive alliance made with King Ferdinand of Hungary (brother of the emperor) by the three Forest districts,

with Lucerne and Zug, followed (April 1529) by the "Christliche Vereinigung," or union between these fiye members of the League. Zurich was greatly moved by this, and, as Zwingli held that for the honour of God war was as necessary as iconoclasm, war seemed imminent ; but Bern held back ; and the first peace of Kappel was concluded (June 1529), by which the Hungarian alliance was annulled and the principle of "religious parity" (or freedom) was admitted in the case of each member of the League and in the "common bailiwicks." This was at once a | victory and a check for Zwingli. He tried to make an alliance with the Protestants in Germany, but failed at the meeting at Marburg (October 1529) to come to an agreement with Luther on the subject of the eucharist, and the division between the Swiss and the German Reformations was stereotyped. Zwingli now developed his views as to the greater weight which Zurich and Bern ought to have in the League. Quarrels too went on in the "common bailiwicks," for the members of the League who clung to the old faith had a majority of votes in matters relating to these districts. Zurich tried to cut off supplies : of food from reaching the Catholic members (contrary to the wishes of Zwingli), and, on the death of the abbot of St Gall, disregarding the rights of Lucerne, Schwyz, and Glarus, who shared with her the office of protectors of the abbey, suppressed the monastery, giving the rule of the land and the people to her own officers. Bern in vain tried to moderate this aggressive policy, and the Catholic members of the League indignantly advanced towards Zurich. Near Kappel, on October 11, 1531, the Zurich vanguard under Gdéldli

was (perhaps owing to his treachery) surprised, and despite reinforcements the men of Zurich were beaten, among the slain being Zwingli himself. Another defeat completed the discomfiture of Zurich, and by the second peace of Kappel (November

1531) the principle of "parity" was recognized, not

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merely in the case of each member of the League and the "common bailiwicks," but also in that of each parish or "commune." Thus everywhere the rights of a minority |

were protected from the encroachments of the majority. The " Christliches Burgrecht" was abolished, and Zurich condemned to pay heavy damages. Bullinger succeeded Zwingli, but this treaty meant that neither side could now try to convert the other wholesale. The League was permanently split into two religious camps : the Catholics, who met at Lucerne, numbered, besides the five already mentioned, Freiburg, Solothurn, Appenzell (Inner Rhoden), and St Gall (with Wallis), thus commanding seventeen votes (out of twenty-nine) in the diet ; the Evangelicals were Zurich, Bern, Basel, Schaffhausen, Appenzell (Ausser Rhoden) (with Graubiinden), who met at Aarau; while Thurgau and Glarus were divided.

Bern had her eyes always fixed upon the Savoyard on lands to the south-west, in which she had got a footing my Pan. 1475, and now made zeal for religious reforms the excuse for resuming her advance policy. In 1526 William Farel, a preacher from Dauphiné, had been sent to reform Aigle, Morat, and Neuchatel. In 1532 he came to Geneva, an ancient city of which the rule had long been disputed by the prince-bishop, the burgesses, and the house of Savoy, the latter holding the neighbouring districts. She had become in 1519 the ally of Freiburg, in 1526 that of Bern also; and in 1530, by their influence, a peace was made between the contending parties. (In 1531 Bonivard, the prior of St Victor, for joining a rising in favour of political liberty, was imprisoned in the castle of Chillon, remaining there till 1536.) The religious changes introduced by Farel greatly displeased Freiburg,

which abandoned the alliance (1534), and in 1535 the a mation was firmly planted in the city. The duke ©

1499-1648.]

Savoy, however, took up arms against Bern (1536), who overran Gex, Vaud, and the independent bishopric of Lausanne, as well as the Chablais to the south of the lake. Geneva was only saved by the unwillingness of the citizens. and carried matters with a high hand. Shortly after this John Calvin, a refugee from Picardy, was, when passing through Geneva, detained by Farel to aid him, and, after an exile from 1538-1541, owing to opposition of the papal party, and of the burghers, who objected to Bernese rule, he set up his wonderful theocratic government in the city, pushing Zwingli's principles to their ultimate conclusions (see Servervs) (1553), and in 1555 expelling many who upheld municipal liberty, replacing them by French, English, Italians, and Spaniards as new burghers, whose names are still frequent in Geneva (e.g., Candolle, Mallet, Diodati). His theological views led to disputes with the Zurich Reformers, which were partly settled by the Consensus Tigurinus of 1549, and more completely by the Ifelvetic Confession of 1566, which formed the basis of union between the two parties.

By the time of Calvin's death (1564) the old faith had begun to take the offensive; the reforms made by the council of Trent urged on the Catholics to make an attempt to recover lost ground. Emmanuel Philibert, duke of Savoy, the hero of St Quentin (1557), and one of the greatest generals of the day, with the support of the Catholic members of the League, demanded the restoration of the districts seized by Bern in 1536, and on October 30, 1564, the treaty of Lausanne confirmed the decision of the other Confederates sitting as arbitrators (according to the old constitutional custom). By this treaty Gex, the Genevois, and the Chablais were to be given back, while Vevey, Chillon, Lausanne, Yverdun were to be kept by Bern, who engaged to maintain the old rights and liberties of Vaud, which in 1565 were further placed under the special protection of France. Thus Bern lost the lands south of the lake, in which St Francis of Sales, the exiled prince-bishop of Geneva,

at once proceeded to carry out the restoration of the old faith. In 1555 Bern and Freiburg, as creditors of the debt-laden count, divided the county of Gruyéres, thus getting fresh French-speaking subjects. In 1558 Geneva renewed her alliance with Bern, and in 1584 she made one with Zurich.

The decrees of the council of Trent had been accepted fully by the Catholic members of the League, so far as ™ relates to dogma, but not as regards discipline or the

‘ relations of church and state, the sovereign rights and jurisdiction of each state being always carefully reserved. The Counter Reformation, however, or reaction in favour of the old faith, was making rapid progress in the Con- federation, mainly through the indefatigable exertions of Charles Borromeo, from 1560 to 1584 archbishop of Milan (in which diocese the Italian bailiwicks were included), and nephew of Pius IV., supported at Lucerne by Ludwig Pfyffer, who, having been (1562-1570) the chief of the Swiss mercenaries in the French wars of religion, did so much till his death (1594) to further the religious reac- tion at home that he was popularly known as the “ Swiss king.” In 1574 the Jesuits, the great order of the reaction, were established at Lucerne; in 1579 a papal nuncio came to Lucerne; Charles Borromeo founded the “Collegium Helveticum” at Milan for the education of forty-two young Swiss, and the Catholic members of the League made an alliance with the bishop of Basel; in 1581 the Capuchins were introduced to influence the more ignorant classes. Most important of all was the Golden or Borromean League, concluded (October 5, 1586) between the seven Catholic members of the Confederation (Uri, Schwyz, Unterwalden, Lucerne, Zug, Freiburg, and Solo-

Bern thus ruled north and south of the lake, |

thurn) for the maintenance of the true faith in their territories, each engaging to punish backsliding members and to help each other if

attacked by external enemies, notwithstanding any other leagues, old or new. This league marks the final breaking up of the Confederation into two great parties, which greatly hindered its pro- gress, The Catholic members had a majority in the diet, and were therefore able to refuse admittance to Geneva, Strasburg, and Miihlhausen. Another result of these religious differences was the breaking up of Appenzell into two bits (1597), each sending one representative to the diet—“ Inner Rhoden” remaining Catholic, “ Ausser Rhoden” adopting the new views. We may compare with this the action of Zurich in 1555, when she received the Protestant exiles from Locarno and the Italian baili- wicks into her burghership, and Italian names are found there to this day (¢.g., Orelli, Muralt). The duke of Savoy made several vain attempts to get hold of Geneva, the last (in 1602) being known as the ‘ Escalade,”

In the Thirty Years’ War the Confederation remained neutral, being bound both to Austria (1474) and to France (1516), and neither religious party wishing to give the other an excuse for calling in foreign armies, But the troubles in Rheetia threatened entanglements. Austria wished to secure the Miinsterthal (belonging to the League of the Ten Jurisdictions), and Spain wanted the command of the passes leading from the Valtelline (conquered by the leagues of Rhetia in 1512), the object being to connect the Hapsburg lands of Tyrol and Milan. In the Valtelline the rule of the Three Leagues was very harsh, and Spanish intrigues easily brought about the massacre of 1620, by which the valley was won, the Catholic members of the Confederation stopping the troops of Zurich and Bern. In 1622 the Austrians conquered the Prattigau, over which they still had certain feudal rights. French troops regained the Valtelline in 1624, but it was lost once more in 1629 to the imperial troops, and it was not till 1635 that the French, under Rohan, finally succeeded in holding it. The French, however, wished to keep it per- manently ; hence new troubles arose, and in 1637 the natives, under George Jenatsch, with Spanish aid drove them out, the Spaniards themselves being forced to resign it in 1639. It was only in 1649-52 that the Austrian rights in the Prittigau were finally bought up by the League of the Ten Jurisdictions, which thus gained its freedom,

In consequence of Ferdinand IL's edict of restitution (1629), by which the status quo of 1552 was re-established —the high-water mark of the Counter Reformation—the abbot of St Gall tried to make some religious changes in his territories, but the protest of Zurich led to the Baden compromise of 1632, by which, in the case of disputes on religious matters arising in the 'common bailiwicks," the decision was to be, not by a majority, but by means of friendly discussion—a logical application of the doctrine of religious parity—or by arbitration.

But by far the most important event in Swiss history in this age is the formal freeing of the Confederation from the empire. Basel had been admitted a member of the League in 1501, two years after the Confederation had been practically freed from the jurisdiction of the impe- rial chamber, though the city was included in the new division of the empire into "circles" (1521), which did not take in the older members of the Confederation. Basel, however, refused to admit this jurisdiction; the question was taken up by France and Sweden at the congress of Miinster, and formed the subject of a special clause in the treaties of Westphalia, by which the city of Basel and the other " Helvetiorum cantones" were declared to be " in the possession of almost entire liberty and exemption from the empire, and nullatenus subject

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to the imperial tribunals." This was intended to mean exemption from all obligations to the empire (with which the Confederation was connected hereafter simply as a friend), and to be a definitive

settlement of the question. Thus by the events of 1499 and 1648 the Confederation had become an independent European state, which, by the treaty of 1516, stood as regards France in a relation of neutrality.

In 1668, in consequence of Louis XIV.'s temporary occupation of the Franche Comté, an old scheme for set- tling the number of men to be sent by each member of the Confederation to the joint army, and the appointment of a council of war in war time, that is, an attempt to create a common military organization, was accepted by the diet, which was to send two deputies to the council, armed with full political powers. This agreement, known as the Defensionale, is the only instance of joint and unanimous action in this miserable period of Swiss history, when re- ligious divisions crippled the energy of the Confederation.

Throughout the 17th and 18th centuries the Confedera- tion was practically a dependency of France. In 1614 Zurich for the first time joined in the treaty, which was renewed in 1663 with special provisions as regards the Protestant Swiss mercenaries in the king's pay and a promise of French neutrality in case of civil war in the League. The Swiss had to stand by while Louis XIV. won Alsace (1648), Franche Comté (1678), and Strasburg (1681). But, as Louis inclined more and more to an anti- Protestant policy, the Protestant members of the League favoured the Dutch military service ; and it was through their influence that in 1707 the "states " of the principality of Neuchatel, on the extinction of the Longueville line of these princes, decided in favour of the king of Prussia (representing the overlords—the house of Challon-Orange) as against the various French pretenders claiming from the Longueville dynasty by descent or by will. In 1715 the Catholic members of the League, in hopes of retrieving their defeat of 1712 (see below), agreed, while renewing the treaty and capitulations, to put France in the position of the guarantor of the League, with rights of interfering, in case of attack from within or from without, whether by counsel or arms. This last clause was simply the surrender of Swiss independence, and was strongly objected to by the Protestant members of the Confederation, so that in 1777 it was dropped, when all the Confederates made a fresh defensive alliance, wherein their sovereignty

and independence were expressly set forth. Thus France had succeeded to the position of the empire with regard to the Confederation, save that her claims were practically asserted and voluntarily admitted.

Between 1648 and 1798 the Confederation was dis- tracted by religious divisions, and feelings ran very high. A scheme to set up a central administration fell through in 1655, through jealousy of Bern and Zurich, the pro- posers. In 1656 a question as to certain religious refu- gees, who were driven from Schwyz and took refuge at Aurich, brought about the first Villmergen war, in which the Catholics were successful, and procured a clause in the treaty asserting very strongly the absolute sovereignty in religious as well as in political matters of each member of the League within its own territories. Later, the attempt of the abbct of St Gall to enforce his rights in the Toggenburg swelled into the second Villmergen war (1712), which turned out very ill for the defeated Catholics. Zurich and Bern were henceforth to hold in severalty Baden, Rapperschwyl, and part of the "common bailiwicks" of the Aargau, both towns being given a share in the government of the rest, and Bern in that of Thurgau and Rheinthal, from which as well as from that part of Aargau she had been carefully excluded in 1415 and 1460.

The only thing that prospered was the principle of « reli- gious parity," which was established by every treaty.

The diet had few powers; the Catholics had the majority there; the sovereign rights of each member of the League and the limited mandate of the envoys effectually checked all progress. Zurich, as the leader of the League, managed matters when the diet was not sitting, but could not en- force her orders. a collection of separate atoms, and it is really marvellous that it did not break up through its own weakness,

In these same two centuries, the chief feature in domestic Swiss politics is the growth of an aristocracy; the power of voting and the power of

ruling are placed in the hands of a small class. This is chiefly seen in Bern, Lucerne, Freiburg, and Solothurn, where there were not the primitive democracies of the Forest districts nor the government by guilds as at Zurich, Basel, and Schaff. hausen. It was effected by refusing to admit any new burghers, a practice which dates from the middle of the 16th century, and is connected (like the similar move ment in the smaller local units of the " communes" in the rural districts) with the question of poor relief after the suppression of the monasteries. Outsiders (Hintersissen or Niedgelassene) had no political rights, however long they might have resided, while the privileges of burgher- ship were strictly hereditary. Further, within the burghers, a small class succeeded in securing the monopoly of all public offices, which was kept up by the practice of co-opting, and was known as the " patriciate." So in Bern, out of 360 burgher families, 80 (in 1776 18 only) formed the ruling oligarchy ; and, though to foreigners the government seemed admirably managed, yet the last thing that could be said of it was that it was democratic. In 1749 Henzi made a fruitless attempt to overthrow this oligarchy, like Fatio at Geneva in 1707. The harsh character of Bernese rule (and the same holds good with reference to Uri and the Val Leventina) was shown in the great strictness with which Vaud was kept in hand: it was ruled as a conquered land by a benevolent despot, and we can feel no surprise that Davel in 1723 tried to free his native land, or that it was in Vaud that the principles of the French Revolution were most eagerly welcomed. Another result of this aristocratic tendency was the way in which the cities despised the neighbouring country districts, and managed gradually to deprive them of their equal political rights and to levy heavy taxes upon them. These and other grievances (the fall in the price of food after the close of the Thirty Years' War, the lowering of the value of the coin, &c.), combined with the presence of many soldiers discharged after the great war, led to the great Peasant Revolt (1653) in the territories of Bern, Solothurn, Lucerne, and Basel, interesting histori- cally as being the first popular rising since the cld days of the 13th and 14th centuries, and because reminiscences of legends connected with those times led to the appearance of the "three Tells," who greatly stirred up the people The rising was put down at the cost of much bloodshed, but the demands of the peasants were not granted. Yet during this period of

political powerlessness a Swiss literature first arises: Gessner and Tschudi in the 16th century are succeeded by Scheuchzer, Haller, Javater, Bodmer, De Saussure, Rousseau, J. von Miiller; the taste for Swiss travel is stimulated by the publication of Ebel's guide-book, based on the old Delicie; industry throve greatly. The residence of such brilliant foreign writers as Voltaire and Gibbon within or close to the territories of the Confederation helped on this remarkable intellectual revival. Political aspirations were not, however, wholly

crushed, and found their centre in the Helvetie Society, —

founded in 1762 by Balthasar and others.

The Confederation was little more than _

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1648-1803.]

| The Confederation and France had been closely con- uected for so long that the outbreak of the French Revolution could not fail to affect the Swiss,

~~/new ideas were spread in the western part of the Con~~

ederation, and risings directed or stirred up. In 1790 sower Wallis rose against the oppressive rule of the upper listricts ; in 1792 Porrentruy defied the prince-bishop of 3asel, despite the imperial troops he summoned, declared he "Rauracian " republic, and three months later became he French department of the Mont Terrible ; Geneva was nly saved (1792) from France by a force sent from 'urich and Bern ; and the massacre of the Swiss guard at he Tuileries on August 10, 1792, aroused intense indigna- ion. The rulers, however, unable to enter into the new

_[Meas, contented themselves with suppressing them by

oree, ¢.g., Zurich in the case of Stadfa (1795). St Gall ypanaged to free itself from its abbot (1795-97), but he Leagues of Rheetia so oppressed their subjects in the altelline that in 1797 Bonaparte (after conquering the filanese from the Austrians) joined them to the Cisalpine epublic. The diet was distracted by party struggles, and te fall of the old Confederation was not far distant. The amours of the vast treasures stored up at Bern, and the ~~esire of securing a bulwark against Austrian attack, "pecially turned the attention of the Directory towards ie Confederation ; and this was utilized by the heads of ae reform party in the Confederation,—Ochs, the burgo~~ naster of Basel, and La Harpe, who had left his home in aud through disgust at Bernese oppression, both now "fishing for aid from outside in order to free their land yom the rule of the oligarchy. Hence, when La Harpe, the head of twenty-two exiles from Vaud and Freiburg, uled (November 20, 1797) on the Directory to protect the liberties of Vaud, which France by the treaty of 1565 jas bound to guarantee, his appeal found a ready answer. 1798 French troops occupied Miihlhausen and Bienne Biel), as well as those parts of the lands of the prince- 'shop of Basel (St Imier and the Miinsterthal) as regards hich he had been since 1579 the ally of the Catholic embers of the Confederation. Another army entered Yaud (February 1798), when the "Lemanic republic" 'jas proclaimed, and the diet broke up in dismay without king any steps to avert the coming storm. Brune and 'is army occupied Freiburg and Solothurn, and, after ree fighting at Neueneck, entered (March 5) Bern, "Pserted by her allies, and distracted by quarrels within. ith Bern, the stronghold of the aristocratic party, fell the jd Confederation. The Revolution triumphed throughout he Confederation. Brune, on March 19, put forth a won-riul scheme by which the Confederation with its "'asso- jates" and "subjects" was to be split into three republics {the Tellgau (z.c. the Forest districts), the Rhodanic .e., Vaud, Wallis, the Bernese Oberland, and the Italian ailiwicks), and the Helvetic (i.e, the north and east prtions); but the Directory disapproved of this (March 23) nd on March 29 the Helvetic republic, one and indivis- dle, was proclaimed. This was accepted by ten out of he thirteen members of the old Confederation, as well as te constitution drafted by Ochs. By the new

scheme te territories of the Everlasting League were split up into Iventy-three (later nineteen, Rhetia only coming in in 499) administrative districts, called “cantons,” a name iw officially used in Switzerland for the first time, though ? may be found employed by foreigners in the French Featy of 1452, in Comines and Machiavelli, and in the eaties of Westphalia (1648). A central Government was %t up, with its seat at Lucerne, comprising a senate and Hgreat council, together forming the legislature, with an

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executive of five directors chosen by the legislature, and having four ministers as subordinates or “chief secretaries,” A supreme court of justice was set up; a status of Swiss citizenship was recognized ; and absolute freedom to settle In any canton was given, the political “communes” being now composed of all residents, and not merely of the burghers. For the first time an attempt was made to organize the Confederation as a single state, but the change was too sweeping to last, for it largely ignored the local patriotism which had done so much to create the Con- federation, though more recently it had made it politically powerless. The three Forest districts rose in rebellion against the invaders and the new constitutions which destroyed their ancient prerogatives; but the valiant | resistance of the Schwyzers, under Alois Reding, on the heights of Morgarten (April and May), and that of the Unterwaldners (September), were put down by French armies. The proceedings of the French, however, soon turned into disgust and hatred the joyful feelings with which they had been hailed as liberators. Geneva was annexed to France (1798) ; Gersau, after an independent existence of over 400 years, was made a mere district of Schwyz; immense fines were levied and the treasury at Bern pillaged; the land was treated as if it had been conquered. The new republic was compelled to make a very close offensive and defensive alliance with France, and its directors were practically nominated from Paris. In 1799 Zurich, the Forest cantons, and Rhetia became the scene of the

struggles of the Austrians (welcomed with joy) against the French and Russians. The manner too in which the reforms were carried out alienated many, and, soon after the Directory gave way to the Consulate in Paris (18 Brumaire or November 10, 1799), the Helvetic directory (January 1800) was replaced by an executive committee.

The scheme of the Helvetic republic had gone too far The in the direction of centralization ; but it was not easy to Act of

find the happy mean, and violent discussions went on between the "unitary" (headed by Ochs and La, Harpe) and "federalist" parties. Many drafts were put forward, and one actually submitted to but rejected by a popular vote (May 20, 1802). In July 1802 the French troops were withdrawn from Switzerland by Bonaparte, osten- sibly to comply with the treaty of Amiens, really to show the Swiss that their best hopes lay in appealing to him. The Helvetic Government was gradually driven back by armed force, and the federalists seemed getting the best of it, when (October 4) Bonaparte offered himself as mediator, and summoned many of the chief Swiss statesmen to Paris to discuss matters with him (the "'Consulta"—December 1802). He had long taken a very special interest in Swiss matters, and in 1802 had given to the Helvetic republic the Frickthal (ceded to France in 1801 by Austria), the last Austrian possession within the borders of the Confederation. On the other hand, he had made (November 1802) Wallis into an inde- pendent republic. In the discussions he pointed out that Swiss needs required a federal constitution and a neutral position guaranteed by France. Finally (February 19: 1803) he laid before the Consulta the Act of Mediation which he had elaborated, and which they had perforce to' accept—a document which formed a new departure in Swiss history, and the influence of which is visible in the present constitution. Throughout, "Switzerland" is used for the first time as the official name of the Confederation. The thirteen members of the old Confederation before 1798 are set up again, and to them are added six new cantons,—two (St Gall and Graubiinden or Grisons) having been formerly "associates," and the four others being made up of the XXII. — roo

The pact of 1815,

subject lands conquered at different times,—Aargau (1415), Thurgau (1460), Ticino or Tessin (1440, 1500, 1512), and Vaud (1536). In the diet, six cantons which had a population of more than 100,000 (viz., Bern, Zurich, Vaud, St Gall, Graubtinden, and Aargau) were given two votes, the others having but one apiece, and the deputies were to vote freely within limits, though not against their instructions. Meetings of the diet were to be held alternately at Freiburg, Bern, Solothurn, Basel, Zurich, and Lucerne,—the Government of each of these cantons becoming, by virtue of the presence of the diet, the executive of the Confederation, its chief magistrate being named the "landamman of Switzerland." The "lands- gemeinden," or popular assemblies, were restored in the democratic cantons, the cantonal governments in other cases being in the hands of a "great council" (legisla- tive) and the "small council" (executive),—a property qualification being required both for voters and candidates. No canton was to form any political alliances abroad or at home. The "communes" were given larger political rights, the burghers who owned and used the common lands becoming more and more private associations. There was no Swiss burghership, as in 1798, but perfect liberty of settlement in any canton. There were to be no privileged classes or subject lands. A very close alliance with France (on the basis of that of 1516) was concluded. The whole constitution and organization were far better suited for the Swiss than the more symmetrical system of the Helvetic republic; but, as it was guaranteed by Bonaparte, and his influence was predominant, the whole fabric was closely bound up with him, and fell with him. Excellent in itself, the constitution set forth in the Act of Mediation failed by reason of its setting.

For ten years Switzerland enjoyed peace and prosperity under the new constitution. Pestalozzi and Fellenberg worked out their educational theories; K. Escher of Zurich embanked the Linth, and was thence called "von der Linth"; the central Government prepared many schemes for the common welfare. On the other hand, the mediator

(who became emperor in 1804) lavishly expended his Swiss troops, the number of which could only be kept up by a regular blood tax, while the "Berlin decrees" raised the price of many articles. In 1806 the principality of Neuchatel was given to Marshal Berthier; Tessin was occupied by French troops from 1810 to 1813, and in 1810 Wallis was made into the department of the Sim- plon, so as to secure that pass. At home, the liberty of moving from one canton to another (though given by the constitution) was, by the diet in 1805, restricted by requiring ten years' residence, and then not granting political rights in the canton or a right of profiting by the communal property. As soon as Napoleon's power began to wane (1812-13), the position of Switzerland became endangered. Despite the personal wishes of the czar (a pupil of La Harpe's), the Austrians, supported by the reactionary party in Switzerland, and without any real resistance on the part of the diet, as well as the Russian troops, crossed the frontier on December 21, 1813, and a few days later the diet was induced to declare the abolition of the 1803 constitution, guaranteed, like Swiss neutrality, by Napoleon. Bern headed the party which wished to restore the old state of things, but Zurich and the majority stood out for the nineteen cantons. The powers exercised great pressure to bring about a meeting of deputies from all the nineteen cantons at Zurich (April 6, 1814, "the long diet"), but party strife was so bitter that many questions had to be referred to the congress sitting at Vienna. The congress decided (March 20, 1815) that Wallis, Neuchatel, and Geneva should be raised from the rank of "associates" to that of full members of the

confederation (thus making up the familiar twenty-two) and as compensation gave Bern the town of Bienne (Biel) and all (save a small bit which went to Basel) of the territories of the prince-bishop of Basel ("the Bernese Jura"); but the Valtelline was granted to Austria, and Miiblhausen was not freed from France.

The diet accepted this decision, and on August 7, 1815, the new constitution was sworn to by all the cantons save Nidwald, the consent

of which was only obtained by armed force, a delay for which she paid by seeing Engel- berg and the valley above (acquired by Nidwald in 1798) given to Obwald. By the new constitution the sove- reign rights of each canton were fully recognized, and 4 return made to the lines of the old constitution, though there were to be no subject lands, and_ political rights were not to be the exclusive privilege of any class of citizens. Each canton had one vote in the diet, where an absolute majority was to decide all matters save foreign affairs, when a majority of three-fourths was required. The management of current business, &c., shifted every two years between the Governments of Zurich, Bern, and Lucerne (the three '"Vororte"). The monasteries were guaranteed in their rights and privileges; and no canton was to make any alliance contrary to the rights of the Confederation or of any other canton. Provision was made for a federal army. Finally the congress, on November 20, 1815, placed Switzerland and parts of North Savoy (Chablais, Faucigny, and part of the Gene- vois) under the guarantee of the great powers, who engaged to maintain their neutrality, thus freeing Swit- zerland from her 300 years' subservience to France, and compensating in some degree for the reactionary nature of the new Swiss constitution when compared with that of 1803.

V. The cities at once secured for themselves in the Attempts cantonal great councils an overwhelming representation # tom.

over the neighbouring country districts, and the agreement of 1805 as to migration from one canton to another was renewed by twelve cantons. For some time there was little talk of reforms, but in 1819 the Helvetic Society definitely became a political society, and the foundation in 1824 of the Marksmen's Association enabled men from all cantons to meet together. A few cantons (notably Tessin) were beginning to make reforms, when the influence of the July revolution (1830) in Paris and the sweeping changes In Zurich led the diet to declare (December 27) that it would not interfere with any reforms of cantonal con- stitutions provided they were in agreement with the pact of 1815. Hence for the next few years great activity im this direction was displayed, and most of the cantons reformed themselves, save the most conservative (¢9., Uri, Glarus) and the advanced who needed no

changes (e.g., Geneva, Graubiinden). Provision was always made for revising these constitutions at fixed intervals, for the changes were not felt to be final, and seven cantons— Zurich, Bern, Lucerne, Solothurn, St Gall, Aargau, and Thurgau—joined together to guarantee their new free constitutions (Siebener Concordat of March 17, 1832). Soon after, the question of revising the federal pact was brought forward by a large majority of cantons in the diet (July 17), whereon, by the league of Sarnen (November 14), the three Forest cantons, with Neuchatel, the city of Basel, and Wallis, agreed to maintain the pact of 1815 and to protest against the separation of Basel in two halves (for in the reform struggle Schwyz and Basel had been split up, though the split was permanent only in the latter case). A draft constitution providing for a feder

administration distinct from the cantons could not secure a majority in its favour ; a reaction against reform set a and the diet was forced to sanction (1833) the division ©

Basel into the "city" and "country" divisions (each with half a vote in the diet), though fortunately in Schwyz the quarrel was healed. Religious quarrels further stirred up strife in connexion with Aargau, which was a canton where religious parity prevailed, later in others. In Zurich the extreme pretensions of the radicals and freethinkers (illustrated by offering a chair of theology in the university to Strauss because of his recent Lzfe of Jesus) brought about a great reaction in 1839, when Zurich was the " Vorort." 'In Aargau the parties were very evenly balanced, and, when in 1840, on occasion of the revision of the constitution, the radicals had a popular majority, the aggrieved clerics stirred up a revolt (1840), which was put down, but which gave their opponents (headed by A. Keller) the excuse for carrying a vote in the great council to suppress the eight monasteries in the canton. This was flatly opposed to the pact of 1815, which the diet by a small majority decided must be upheld, though after many discussions it determined (August 31, 1843) to accept the compromise by which four only were to

be suppressed, and declared that the matter was now settled. On this the seven Catholic cantons—Uri, Schwyz,

| Unterwalden, Lucerne, Zug, Freiburg, and Wallis—formed

“(September 7, 1843) a “Sonderbund” or separate league, ‘which (February 1844) issued a manifesto demanding ‘the reopening of the question and the restoration of ail ‘the monasteries. Like the radicals in former years the Catholics went too far and too fast, for in October 1844 the clerical party in Lucerne (in the majority since 1841, and favouring the reaction in Wallis) officially ‘invited in the Jesuits and gave them high posts, an act ‘which created all the more sensation because Lucerne was

ithe “ Vorort.” Twice (December 1844 and March 1845) ‘parties of Free Lances tried to capture the city. In December 1845 the Sonderbund turned itself into an ‘armed confederation, ready to appeal to war in defence ‘of the rights of each canton. The radicals carried Zurich ‘in 1845 and Bern in 1846, but a majority could not be ‘secured in the diet till Geneva (October 1846) and St Gall May 1847) were won by the same party. On July 20, 1847, the diet, by a small majority, declared that the ‘Sonderbund was contrary to the federal pact, which on August 16 it was resolved to revise, while on September 3 “it was decided to invite each canton to expel the Jesuits. Most of the great powers favoured the Sonderbund, but “England took the contrary view. On October 29 the Heputies of the unyielding cantons left the diet, which ordered on November 4 that its decree should be enforced by arms. ‘The war was short (November 11-29), mainly wing to the ability of Dufour, and the loss of life trifling. /One after another the rebellious cantons were forced to erences, and, as the Paris revolution of February 1848 pecupied all the attention of the great powers (who by the constitution of 1815 should have been consulted in the revision of the pact), the Swiss were enabled to settle their own affairs quietly. Schwyz and Zug abolished their “‘landsgemeinden,” and the seven were condemned to pay the costs of the war (ultimately defrayed by subscription), ‘which had been waged rather on religious than on strict oarticularist or states-rights grounds. The diet meanwhile lebated the

draft constitution drawn up by Kern of Thur- yau and Druey of Vaud, which in the summer of 1848 as accepted by fifteen and a half cantons, the minority onsisting of the three Forest cantons, Wallis, Zug, Tessin, md Appenzell (Inner Rhoden), and it was proclaimed on September 12. | The new constitution inclined rather to the Act of

ediation than to the system which prevailed before 1798. A status of "Swiss citizenship" was set up, closely joined © cantonal citizenship: a man settling in a canton not

being his birthplace got cantonal citizenship after two years, but was excluded from all local rights in the "commune" where he might reside. A federal or central Government was Set up, to which the cantons gave up a certain part of their sovereign rights, retaining the rest. The federal legislature (or assembly) was made up of two houses—the council of states (Stiinde Rath), composed of two deputies from each canton, whether small or great! (44 in all), and

| the national council (National Rath), made up of deputies

(now 145 in number) elected for three years, in the propor- tion of one for every 20,000 souls or fraction over 10,000, the electors being all Swiss citizens. The federal council or executive (Bundesrath) consisted of seven members elected by the federal assembly ; they are jointly respon- sible for all business, though for sake of convenience there are various departments, and their chairman is called the president of the Confederation. The federal judiciary (Bundesgericht) is made up of eleven members elected by the federal assembly for three years ; its jurisdiction is chiefly confined to civil cases, in which the Confederation is a party (if a canton, the federal council may refer the case to the federal tribunal), but takes in also great political crimes,—all constitutional questions, however, being reserved for the federal assembly. A federal university and a polytechnic school were to be founded ; the latter only has as yet been set up, and is fixed at Zurich.

All military capitulations were forbidden in the future. Every canton must treat Swiss citizens who belong to one of the Christian confessions like their own citizens, for the right of free settlement is given to all such, though they acquired no rights in the "commune." All Christians were guaranteed the exercise of their reli- gion, but the Jesuits and similar religious orders were not to be received in any canton. German, French, and Italian were recognized as national languages.

The constitution as a whole marked a great step forwards; though very many rights were still reserved to the cantons, yet there was a fully organized central government. Almost the first act of the federal assembly was to exercise the power given them of determining the home of the federal authorities, and on November 28, 1848, Bern was chosen, though Zurich still ranks as the first canton in the Confederation.

By this early settlement of disputes Switzerland was protected from the general revolutionary movement of 1848, and in later years her political history has been uneventful, though she has felt the weight of the great European crisis in industrial and social matters.

The position of Neuchatel, as a member of the Con- Events q, Since

A 1848.

federation (as regards its government only) and as

principality ruled by the king of Prussia, whose rights ha been expressly recognized by the congress of Vienna, was uncertain. She had not sent troops in 1847, and, though in 1848 there was a revolution there, the prince did not recognize the changes. Finally, a royalist conspiracy in September 1856 to undo the work of 1848 caused great excitement and anger in Switzerland, and it was only by the mediation of Napoleon III. and the other powers that the prince renounced (1857) all his rights, save his title, which his successor (the German emperor) has also dropped. Since that time Neuchatel has been an ordinary member of the Confederation. In 1859-60 the cession of Savoy (part of it neutralized in 1815) to France aroused considerable indignation, and

in 1862 the long-standing question of frontiers in the Vallée de Dappes was finally arranged

1 The method of election and length of term of office were left to the cantonal Governments; at present (1887), in eleven cantons (or half cantons) the people, in fourtcen the "great council," elect; twelve elect for one year and twelve for three, Wallis holding to the mean of two years.

Revised consti- tution

of 1874.

with France. In 1871 many French refugees, especially Bourbaki's army, were most hospitably received and sheltered. The growth of the Old Catholics after the Vatican council (1870) caused many disturbances in western Switzerland, especially in the Bernese Jura. The attack was led by Bishop Lachat of Basel, whose see was suppressed by several cantons in 1873. The Old Catholics have been recognized by nine cantons and the see of Basel set up again, though Bern does not recognize it. The appointment by the pope of the abbé Mermillod as "apostolic vicar" of Geneva, which was separated from the diocese of Freiburg, led to Monseigneur Mermillod's banishment from Switzerland (1872), but in 1883 he was raised to the vacant see of Freiburg and allowed by the federal authorities to return, though Geneva still refuses to recognize him. Perhaps the latest event of importance to Switzerland was the opening of the St Gotthard tunnel, which was begun in 1871 and ended in 1880; by it the Forest cantons seem likely to regain the importance which was theirs in the early days of the Confederation.

From 1848 onwards the cantons continually revised their constitutions, always in a democratic sense, though after the Sonderbund War Schwyz and Zug abolished their "landsgemeinde." The chief point was the introduction of the referendum, by which laws made by the cantonal legislature may (facultative referendum) or must (obligatory

referendum) be submitted to the people for their approval, and this has obtained such general acceptance tliat Frei- burg alone does not possess the referendum in either of its two forms, Tessin having accepted it in its optional form in 1883. It was therefore only natural that attempts should be made to revise the federal constitution of 1848 in a democratic and centralizing sense, for it had been pro- vided that the federal assembly, on its own initiative or on the written request of 50,000 Swiss electors, could submit the question of revision to a popular vote. In 1866 the restriction of certain rights (mentioned above) to Christians only was swept away; but the attempt at final revision in 1872 was defeated by a small majority, owing to the efforts of the anti-centralizing party. Finally, however, another draft was better liked, and on April 19, 1874, the new constitution was accepted by the people—144 cantons against 74 (those of 1848 without Tessin, but with Frei-burg and Lucerne) and 340,199 votes as against 198,013. This constitution is that now in force, and is simply an improved edition of that of 1848. The federal tribunal (now of nine members only) was fixed (by federal law) at Lausanne, and its jurisdiction enlarged, especially in con- stitutional disputes between cantons and the federal autho- rities, though jurisdiction in administrative matters (e.., educational, religious, election, commercial) is given to the federal council, a division of functions which is very anomalous, and does not work well. A system of free elementary education was set up, and many regulations made on ecclesiastical matters. A man settling in another canton was, after a residence of three months only, given all cantonal and communal rights, save a share in the common property (an arrangement which as far as possible kept up the old principle that the "commune" is the true unit out of which cantons and the Confederation are built), and the membership of the "commune" carries with it cantonal and federal rights. The referendum was intro-duced in its "facultative" form; 7.e, all federal laws must be submitted to popular vote on the demand of 30,000 Swiss electors or of eight cantons. If the revision of the federal constitution is demanded by one of the two houses of the federal assembly or by 50,000 Swiss citizens, the question of revision must be submitted to a popular vote, as also the draft of the revised constitution,—these provisions, contained already in the constitution of 1848,

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forming a species of “obligatory referendum.” Tt was sup. posed that this plan would lead to radical aud sweeping changes ; but as a matter of fact there have been (187 4-86) about one hundred and seven federal laws and resolutions passed by the assembly, of which nineteen were by the referendum submnitted to popular vote, thirteen being re- jected, while six only were accepted,—the rest becoming law as no referendum was demanded. ‘There has been a very stcady opposition to all schemes aiming at increased centralization. By the constitutions of 1848 and 1874 Switzerland has ceased to be a mere union of independent states joined by a treaty, and has become a single state with a well-organized central Government, to which have been given certain of the rights of the independent cantons, but increased centralization would destroy the whole character of the Confederation, in which the can- tons are not administrative divisions but living political communities. Swiss history teaches us, all the way through, that Swiss liberty has been won by a close union of many small states, and we cannot doubt that it will be best preserved by the same means, and not by obliterating all local peculiarities, nowhere so striking and nowhere so historically important as in Switzerland.

Chronological Table of Chief Events. 1291. First League of the Three | 1513. The Thirteen complete.

Lands. 1516. Alliance with France. 1315. Morgarten. 1531. Kappel. 1353. The Eight Orte complete. | 1586. Golden League. 1386. Sempach. 1648. Formal Freedom from the 1388. Nifels. Empire. :

1394. Hapsburgs give up rights.| 1798. The Helvetic Republie.

1444. St Jakob an der Birs, 1803. Act of Mediation—19

1474. Everlasting Compact. Cantons.

1476. Granson and Morat. 1815. Federal Pact—22 Cantons.

1481. Compact of Stanz. 1847. Sonderbund War.

1499. Practical Freedom from | 1848. Federal Constitution. the Empire. 1874. Revised Constitution.

General Authorities—For the early history, the works of luber, Rillict, and Von Wyss (see TELL) may be consulted; for general politieal history those of Daguet, Dandliker (large and small versions), Henne am Rhyn, Oeehsili, Strickler, Vulliemin ; and, for constitutional history, those of Blumer, Bluntsehli, Dubs, Meyer, and Orelli. Of those named, the works of Rilliet, Dandliker (the small version), Strickler, Dubs, and Orelli are best suited for foreign readers. Books on local history and on special periods abound, and many very valuable essays are hidden in the publieations of the numerous cantonal historical societies. Of modern English works relating to Switzerland the most notc- worthy are G. Grote, Seven Letters concerning the Politics of Switzerland [the Sonderbund War of 1847] (originally published 1847, reprinted 1876), and E. A. Freeman, ‘ Review of Kirk’s ‘Charles the Bold,’” in Historical Essays, first series, 1872, pp. 335-870, and Historical Geography of Europe, 1881. The great iistorisch-Geographischer Atlas der Schweiz, by Vogelin, Meyer von Knonau, and Von Wyss (Zurich, 1870), is almost indispensable to any serious student of Swiss history. Gerster’s small maps are appended to Oechsli’s history, and also pub- lished separately. (W. A. B.C.)

Part ITJ.—LIvrErRature.

It can hardly be said of Switzerland that she possesses a truly national literature. She has a literature in French and a literature in German, but these literatures are not the expression of a common intellectual life, for the German and French cantons have always been to some extent dominated by different ideas and sympathies. Political union has been only in part associated with the deeper union which relates to purely ideal interests. Even the difference between the French and the German literatures of Switzerland does not give a complete con- ception of the diversity of thought and sentiment which exists in the

country. Switzerland has also produced Italian writers and writers who use the Romansch dialect of the Grisons. The Romansch and Italian branches of her literature are not, however, sufficiently important to deserve more than passing notice.

During the struggles against the Hapsburgs the mem- bers of the Confederation were too seriously occupied 1 defending their political rights and in adding to oo territory to be very eager for the satisfaction of intellectua needs. They produced some vigorous war songs; but 1m other respects they were content with such literature 4

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of political independence.

might happen to reach them from neighbouring countries, At the time of the Reformation there was much intel- lectual activity in Switzerland, but it related chiefly to the controversy of the Protestants with the Church of Rome ; and Zwingli, Bullinger, and the other Reformers of the German cantons were not, like Luther, wise enough to write important treatises in the language of the people. They wrote chiefly in Latin, reserving the use of German fcr sermons and hymns. One good writer of this period

, whose interest was not confined to theology was Francois) Bonnivard, who, although a native of Savoy, had, as prior of the monastery of St Victor, been associated with

Geneva before the Reformation. He was one of the most resolute of those who opposed the ambition of Charles IIL, duke of Savoy; and it is he whose sufferings in the service of his adopted country have been immortalized by Byron in “ The Prisoner of Chillon.” After his release from imprisonment he became a Protestant, and wrote in French several important books, the chief of which is his Chron- aques de

Genéve. This work is written in a bright and animated style, and is especially valuable for its account of events with which the author himself was connected. Another vigorous writer of the 16th century was Aigidius Tschudi, who remained loyal to the Roman Church. He devoted himself with enthusiasm to the study of history. The only result' of his labours given to the world in his

lifetime was Die uralt wahrhaftig alpisch Rhitia, but several other works have since been published, the most

important being his Chronicon Helveticum and his Haupt- _ schlussel zu verschiedenen Alterthiimern.

After the Reformation a respect for learning was main- tained by the university of Basel, the Carolinum of Zurich, and various other educational institutions in the leading

"| towns of the Confederation ; but for a long time Switzer- _ land took little part in the literary movement of Europe.

Theology was still generally thought to be the only subject worthy of study by serious minds, and theologians

') continued to write their books in Latin (as, for example, | C. Gessner of Zurich).

In this respect their example was followed by men of science. In the few instances in which scholars belonging to German cantons wished to appeal to

') readers who were not specialists, they wrote in French, for) Switzerland was so intimately associated in politics with

France that the French language was spoken by the edu- jcated classes in all parts of the country. French litera- | ture was the only modern literature of which they had any

real knowledge.

Early in the 18th century there were many signs of an

Jintellectual awakening both in the German and in the

French districts. The literary activity manifested in the German cantons was indirectly connected with the fact that they had been gradually acquiring a stronger sense They had been alienated fron France by the arrogance of the French Government, and had been forced to consider whether it might not be possible for Switzerland to defend her own interests with- out foreign patronage. Here and there scholars began to jinterest themselves in Swiss history, and to take pride 'in the achievements of the forefathers of the republic ; and, in proportion as patriotic sentiment increased, ' thoughtful men became less inclined to take all their ideas 'from the country to which alone they had hitherto looked for intellectual guidance. They studied with greater earnestness the literatures of Greece and Rome, and some 'of them turned to English literature, with which they had jnot up to this time had the slightest acquaintance. These influences gave a powerful impetus to the best aspirations of the German population of Switzerland, and it was not in literature only that important results were achieved. Members of the family of Bernoulli at the university of

Basel had already been doing great work in mathematics; and now the fame of Switzerland as a country favourable to the development of science was extended by many investigators, the best known of whom were Euler, Haller, Scheuchzer, and Muralt.

The writer who first gave expression to the most characteristic literary conceptions of his time in Switzer- land was J. J. Bodmer, a native of Zurich. He was a good classical scholar, and in youth had made himself familiar with some of the masterpieces of English, French, and Italian literature. In 1721, in association with his friend Breitinger, a learned Protestant clergyman in Zurich, he began to issue the Discurse der Maler, written in imitation of the style of the English essayists. In this

periodical the two friends criticized freely the works of some popular German versifiers, and they wrote with so much force and confidence that they soon exercised con- siderable influence not only in Switzerland but in Germany. When the value of their work was beginning to be recognized, a high place was taken among German men of letters by Gottsched, a professor at Leipsic. He was an ardent admirer of the classic drama of France, and gathered around him a number of enthusiastic disciples, known as the Saxon school. For some time he was on friendly terms with the Swiss critics, with whom he agreed in condemning the wild extravagance of Lohenstein and his imitators. But when Bodmer and Breitinger went on to praise English literature, and to call attention especially to the splendid qualities of Milton, Gottsched denounced their opinions as utterly false and misleading. The result was that a bitter controversy broke out between the Saxon and Swiss schools, Bodmer and Breitinger presenting an elaborate statement of critical doctrine, the former in Vom Wunderbaren in der Poesie (1740), the latter in Kritische Dichtkunst (1740). The controversy was followed with great interest by many readers, and, although it was by and by almost forgotten, it helped to prepare the way for the outburst of German literature begun by Klopstock, Wieland, and Lessing. The theories of all the combatants were to some extent crude and even grotesque, but Bodmer and Breitinger did excellent service by the vigour with which they protested against the notion that poetry is merely the work of the understanding acting in subjection to rigid rules, and by their enthusiastic appre- ciation of great English writers. Bodmer also opened fresh sources of inspiration by editing a part of the W2belungen- lied and some poems of the Minnesinger,—undertakings in which he anticipated the labours of the Romantic school. He wrote an epic, the Woachide, and several dramas, but his work as a poet is feeble and unimportant in compari- son with his achievements as an editor and critic.

Bodmer

and reit- inger.

A. von Haller, who made his fame chiefly as a man of Haller.

science (see vol. xi. p. 396), ranked in literature also among the foremost men of his day. His poems are too directly didactic to give much pleasure to modern readers, but in some of them—especially Dze Alpen—there are passages of striking force and beauty. Haller knew the Alps not merely from books but by having visited them, and to him belongs the credit of having revealed that they appeal powerfully to the imagination, and of having asso- ciated them with great thoughts and aspirations. He wrote several prose romances, but outside of Switzerland these works, which had many readers at the time of their publication, are now practically forgotten.

A Swiss writer of the 18th century who, as a poet, became more famous even than Haller was Solomon Gessner. At Berlin and Hamburg he came under the influence of Ramler and Hagedorn, and after his return to his native town Zurich, where he lived as an artist, he published 'a series of idyllic poems which excited universal

Gessner.

Salis- Seewis.

Usteri.

Zimmer- mann.

Sulzer.

Hirzel.

Lavater.

Pesta- lozzi.

admiration. The most popular of his writings was his prose idyl, Der Tod Abel's (1758). This work was trans- lated into many languages, and was received with not less favour in Germany, France, and England than in Switzer- land. There is not much serious thought in Gessner's

works, and his sentiment sometimes degenerates into senti- mentalism, but a permanent place is secured for him in literature by his simple, lucid style and by the delicate grace of his sketches of idealscenery. These qualities were warmly appreciated by Lessing and afterwards by Goethe.

Of the German Swiss poets who were born after Gessner had become famous the best were J. G. Salis-Seewis and J. M. Usteri. Salis-Seewis was acquainted with Goethe, Schiller, Herder, and Wieland, but he was not so much influenced by them as by a greatly inferior poet, Matthison, whose ideas and methods closely resembled his own. There is little variety of sentiment in the poems of Salis- Seewis, but their uniformity of tone is prevented from being tiresome by his perfect sincerity and by the vividness of his diction. Usteri wrote at least one song—" Freut euch des Lebens "—which became popular among Germans of all classes, but his most important writings were some clever stories in the German dialect of Zurich.

Philosophy, in the strict sense of the term, was not profoundly studied in the German cantons in the 18th century, but philosophical problems, especially those relat- ing to ethics, were discussed in a popular style by a good many more or less able writers. Of these writers one of the most renowned was J. G. Zimmermann. His chief writings are Ueber die Einsamkeit (1755) and Vom Nation- alstolze (1758). These works present a strange combina- tion of cynicism and sentimentalism, but they profoundly impressed Zimmermann's contemporaries, and were trans- lated into most European languages. J. G. Sulzer spent the greater part of his life in Berlin, where he was held in much esteem at the time when Lessing was beginning to make a name as a critic and dramatist. His principal work is his Allgemeine Theorie der schinen Kiinste, in which he tried to present a complete exposition of the laws of art, starting with the philosophical principles of Wolf, and combining them with critical doctrines derived from English and French writers. His style is somewhat cold and formal, and to later generations his governing thoughts have seemed meagre and unfruitful. H. K. Hirzel wrote Das Bild eines wahren Patrioten (1767) and various other works, in which he displayed a considerable power of expounding and

illustrating great moral principles. He is remembered chiefly, however, by a charming descrip- tion which he wrote of a day spent by Klopstock and him- self with some friends on the Lake of Zurich,—a day celebrated by Klopstock in one of the finest of his early odes. J. K. Lavater made some reputation as a poet, but he owed his fame chiefly to his Physiognomische Fragmente (1775-78), in which he sought to develop the idea that the face presents a perfect indication of character, and that physiognomy may therefore be treated as a science. His notions are arbitrary and rather mystical, but he expressed them with so much vigour and enthusiasm that he found many admirers and disciples. J. H. Pestalozzi was a less pretentious but infinitely more useful writer than Lavater. Early in life, mainly through the influence of Rousseau, he became impressed by the necessity of a radical change in the methods of popular education ; and with splendid self- sacrifice he devoted his energies to the task of realizing his ideas and of inspiring others with a sense of their import- ance. His writings—of which Lienhard und Gertrud is the best—are not distinguished by any remarkable literary qualities, but his theories made his name famous all over the civilized world, and children in every good school may still be said to profit indirectly by his labours.

SWITZERLAND

(LITERATURE,

In the 18th century the German cantons produced many writers on historical subjects. tinguished of them was I. Iselin, who, in his Geschichte der Menschheit (1768), offered suggestions akin to those which were afterwards set forth with wider knowledge and deeper insight by Herder. J. H. Tschudi and J. J. Tschudi, The

descendants of Aigidius Tschudi, also did much good work Tschutis,

as historians. Greater than any of these—the foremost

historical writer of Switzerland—-was J. von Miiller, whose Miiller,

writings marked an era in German literature. His master- piece is his Geschichte der schweizerischen Eidgenossenschaft (1780). Miiller had not an adequate appreciation of the laws of evidence in historical inquiry, but he was inde- fatigable in research, and no German historian of his time had so great a power of bringing out the significance of facts by his method of grouping them. His style, although sometimes obscure and rhetorical, was often made warm and glowing by his eager love of freedom and justice. The literary movement of the French districts in the 18th century had little direct relation with that of the German cantons. It sprang chiefly from the influence of French refugees, who flocked in great numbers to western Switzerland after the revocation of the edict of Nantes, The most energetic of the French writers of Switzerland in

the first half of the 18th century was Bonrguet, the son of Bourguet,

a refugee. He travelled in Italy and Holland, and on his return to Geneva founded the Bibliothéque Italique, which appeared from 1729 to 1734. In carrying on this periodical, which extended to eighteen volumes, Bourguet was aided by a good many Swiss writers—among others by Abraham Ruchat and Loys de Bochat of Lausanne. Bourguet's colleagues also contributed articles to French periodicals of a similar kind in Holland, three of which— the Bibliothéque Universelle et Historique, the Bibliotheque Choisie, and the Brbliothéque Ancienne et Moderne—were conducted by Jean le Clerc, a native of Geneva. In 1732 Gourguet started at Neuchatel the Mercure Suisse, which went on until 1784 and did much to stimulate the interest of its readers in science, literature, history, and archeology. The indefatigable editor and his colleagues did not con- fine themselves to journalistic work. One of his books— Trauté des Pétrifactions—was an important contribution to geology ; and Loys de Bochat wrote a careful book entitled Mémoires Critiques sur [Histoire Ancienne de la Suasse. Ruchat was the author of [/istotre de la Reformation de la Suesse and of Délices de la Suisse. de Crousaz, a friend of Bourguet, display no remark- able qualities, but two of them, his Hxamen of Pope's Fissay on Man and his Commentaire on the same poem, have some interest for English readers. An English translation of the Hxamen by Mrs

Elizabeth Carter was published in 1739, and led to the intervention of War- burton, who considered it necessary to prove that the Lssay was not in any way hostile to religion.

During the second half of the 18th century all Europe Rouse

was reading the works of a Swiss writer, by far the most illustrious man of letters whom Switzerland has produced —J. J. Rousseau. He moved civilized mankind by many a doctrine which no one now holds to be true, but he owed his astonishing influence not so much to his fallacies as to his passionate zeal for the rights of the poor, to his enthusiasm for the free development of individual character, and to the power with which he reflected in his writings the beauty and the splendour of the external world. Of his own happiness he made shipwreck ; but, if we judge his work simply by the practical results which sprang from it, he was perhaps the greatest literary force of modern times. His family was of French origin, but 1t had been so long settled at Geneva that it had become thoroughly Swiss, and to this fact were due some of the

One of the most dis. Iselin,

The writings of J. P, Crousaz.

_most striking characteristics of his genius. Free and republican Switzerland was the only Continental country whose institutions were favourable to the growth of the ideas with which Rousseau shook to its centre the political and social system of the 18th century.

Of the other French writers of Switzerland in this age | the most eminent was perhaps H. B. de Saussure, who, in his Voyages dans les Alpes (1776-79), presented in a lucid

d and attractive style the results of much careful observa- ‘i tion. He was one of the founders of geology, and made im- i portant contributions to several other sciences. Another than distinguished scientific writer of this time was Charles

Bonnet, the author of several valuable works on natural history and psychology. His general conception of the order of the world he developed systematically in his Contemplation de la Nature (1764). Much good work

‘le De was also done by the brothers De Luc, one of whom, Jean- des.) André de Luc, gave in Lettres sur Quelques Parties de la ij Suisse (1787) a very vivid picture of the physical, social, and political peculiarities of a portion of Switzerland.

5 Some clever books were written by Madame de

Charriére, a native of Utrecht, who settled with her hus- band in the principality of Neuchatel in 1771. Much interest was excited by her lively Lettres Lcrites de _ Lausanne and by her Lettres. Neuchdteloises, and both in Switzerland and in France there were many admirers of her Mart Sentimental and of the corresponding work Lettres de Mistress Henley. Samuel Constant, the father _ of Benjamin Constant, wrote Camille and some other ‘romances in the form of letters; and Contes Morauz, in | the style of Marmontel, were written by J. Senebier, who did better work as an investigator in physics and physio- logy. .

In the second half of the 18th century there were in) French Switzerland many ardent students of history. ~ One of the ablest of them was P. H. Mallet, who took as his special subject the antiquities of northern Europe, but ‘|wrote also works on the general history of Denmark, ; Brunswick, and Hesse. Déranger was the author of a im- || Lestoire de Genéve; and Lamberty, who had served as secretary of several legations in Holland and Germany, brought together in his J/ émozres many interesting details about events of which he had personal knowledge. A + good history of Switzerland to the 17th century was written \by De Watteville, and Philibert dealt with the same

Allemagne, in which he brought the story down to 1468. }G. E. von Haller wrote several excellent historical works, jthe most important of which was his Bibliothek der | Schweizergeschichte. From the latter part of the 18th century onwards French Switzerland has produced

many influential writers, but they have been so intimately connected with France that ‘their works properly belong to French literature. Necker, who played so great a part in France before the Revolu- \tion, was one of the greatest writers of his age on politics jand finance ; and his daughter Madame de Stael, whom, although she was born in Paris, Switzerland may also claim, stands in the front rank of women who have devoted them- selves to literature. Her most brilliant work, Corinne, was \perhaps of less real importance than De [Allemagne, from ‘which Frenchmen obtained for the first time authentic 1 |/information as to the intellectual development of Germany. oné| Benjamin Constant wrote a work on the source, forms, and “. | history of religion ; he was also the author of Adolphe, a “romance, and adapted Schiller’s Wallenstein for the French ” ‘stage. But his principal work is the collection of his Discours Pronencés & la Chambre des Députés, in which he eloquently defends, from many points of view, the prin- ondiciples of constitutional government. De Sismondi dis-

played astonishing energy as a writer on history, literature, and political economy, and it is still necessary for students

| of the subjects on which he wrote to consult his works,

His Icstoire des Francais, although planned on too vast a scale, is a wonderful monument of industry, learning, and literary skill, and not less valuable in their own way are

his [Histoire dela Renaissance de la Liberté en Italie and

his De la Littérature du Midi de Europe. A. Vinet, an Vinet. eminent Protestant theologian, produced a great impression

by his Descours sur Quelques Sujets Religieux and various other theological works, which are full of vigorous thought expressed in a clear, direct, and manly style. Among Swiss novelists R. Tépffer, author of L’Z/ erttage, Traversée, Tépfter. and many other works, takes a distinguished place. His early writings attracted the attention of

Goethe, who read them with pleasure ; and Sainte-Beuve, in praising Tépffer's methods, gave utterance to the general opinion of educated Frenchmen. The three brothers André, Antoine Elisée, and The Joel Cherbuliez, and their sisters Adrienne and Madame Cher- Tourte-Cherbuliez, were all well-known writers ; and Victor bie. Cherbuliez, the son of André, is one of the brightest and

most fertile novelists of the present day in France. He commands respect also as a writer on politics.

In the later literature of the German cantons there are not so many famous names as in the later literature of the French cantons. Of a group of writers who connected the influences of the 18th century with those of the 19th, J. Atertini. B. Albertini was the most original; but he appealed to a comparatively small class. He was a bishop in the church of the Moravian Brethren, and his poems give powerful expression to the deeply religious sentiment of his sect.

A romance by J. C. Appenzeller—Gertrud von Wart Appen- (1813)—was so popular that it was translated into French, eller. Dutch, and English ; but it has not maintained the high

place which was for some time attributed to it. J. R. Wyss. Wyss edited the Alpenrosen from 1811 for about twenty years, and for this periodical he wrote many poems, taking

his subjects chiefly from Swiss history and legends. He completed and published a story begun by his father, Der Schweizerische Robinson, translations of which have been widely circulated in France, Spain, England, and America.

He also wrote '"Rufst du, mein Vaterland," the great national song of Switzerland. A.E. Frohlich was a good Fréllich. writer of fables, and J. A. Henne made a considerable Henne. reputation, not only as a poet but as the writer of a work entitled Manethos, die Origines unserer Geschichte und Chronologie, in which he sought to prove the European origin of the Aryan race. T. Meyer-Merian, author of the Meyer- well-known song, "Ich ging so ganz alleine," was also a Merian. vigorous

dramatist. Dramatic and lyrical poems of some power were written by T. Bornhauser, but they were too Bom- plainly intended to serve a political party to have per- hauser. manent significance. A more poetical writer was B. Reber. Reber, whose Bilder aus den Burgunder-Kriegen present

a series of glowing pictures from one of the most splendid periods of Swiss history.

All these writers were surpassed by Albert Bitzius, Bitzius. known as Jeremias Gotthelf from the title of his first book. He was the vicar of Liitzelfliith, and for many years found ample scope for his energies in quiet works of benevolence. Der Bauersptegel, oder Lebensgeschichte des Jeremias Gotthelf, published in 1836, when he was nearly forty years of age, at once made his name famous, and it was followed by Uli der Knecht, Uli der Péchter, Leiden und Freuden eines Schulmeisters, and other powerful tales.

The charm of his writings springs from the fact that they are an accurate representation of the thoughts, feelings, and habits of the people among whom he laboured. Bitzius was a man of an ardent and impulsive temper, but a close observer, capable of penetrating far below the

Keller.

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surface of life, and endowed with a remarkable faculty of reproducing his impressions in striking imaginative pictures. His style is often rough and careless, but his artistic defects are never serious enough to interrupt the free development of his fresh and vivid conceptions. Another German writer of Switzerland whose name is well known beyond the limits of his own country is Gottfried Keller. He established his reputation by his

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romance Der Griine Heinrich (1854), and afterwards he published Die Leute von Seldwyla, a series of tales of village life, and Sieben Legenden. He is also the author of some volumes of poems.

See E. H. Gaullieur, Htudes sur U Histoire Littéraire de la Suisse Francaise (1856); J. C. Morikofer, Die schweizerische Literatur des achizehnien Jahrhunderts (1861); and R. Weber, Die poetisehe

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SWORD. Origins and Early Forms.—The sword 1s a hand-weapon of metal, distinct from all missile weapons on the one hand, and on the other hand from staffi-weapons, —the pike, bill, halberd, and the like, —in which the metal head or blade occupies only a fraction of the effective length. The handle of a sword provides a grip for the hand that wields it, or sometimes for two hands; it may add protection, and in most patterns does so to a greater or less extent. But it is altogether subordinate to the blade. For want of a metal-headed lance or axe, which indeed were of later invention, a sharpened pole or a thin- edged paddle will serve the turn. A sword-handle without a blade is naught ; and no true sword-blade can be made save of metal capable of taking an edge. There are so- called swords of wood and even stone to be found in collections of savage weapons. But these are really flattened clubs; and the present writer agrees with Gen. Pitt-Rivers in not believing that such modifications of the club have had any appreciable influence on the form or use of true swords. On this last point, however, the opinions of competent archzeologists are so much divided that it must be regarded as fairly open. We will only remark that the occurrence in objects of human handiwork of a form, or even a series of forms, intermediate between two types is not conclusive evidence that those forms are historical links between the different types, or that there is any historical connexion at all. In the absence of dates fixed by external

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evidence this kind of comparison will seldom take us be-

yond plausible conjecture. A traveller who had never seen velocipedes might naturally suppose, on a first inspection, that the tricycle was a modification of the old four-wheeled velocipede, and the bicycle a still later invention; he would perhaps regard the two-wheeled " Otto" as the historical link between tricycles and bicycles. But we know that n fact the order of development has been quite different.

It is more difficult as a matter of verbal definition to distinguish the sword from smaller hand-weapons. Thus an ordinary sword is four or five times as long as an ordinary dagger: but there are long daggers and short swords ; neither will the form of blade or handle afford any certain test. The real difference lies in the intended use of the weapon ; we associate the sword with open combat, the dagger with a secret attack or the sudden defence opposed to it. One might say that a weapon too large to be concealed about the person cannot be called a dagger. Again, there are large knives, such as those used by the Afridis and Afghans, which can be distinguished from swords only by the greater breadth of the blade as com pared with its length. – Again, there are special types of arms, of which the yataghan is a good example, which their usual forms do not look much like swords, but m others that occur must be classed as varieties of the sword, unless we keep them separate by a more or less artificial theory, referring the type as a whole to a different origin.

Of the actual origin of swords we have no direct evidence. Neither does the English word nor, so far as

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we are aware, any of the equivalent words in other languages, Aryan or otherwise, throw any light on -the matter. We only know that swords are found from the earliest times of which we have any record among all people who have acquired any skill in metal-work. There are two very ancient types, which we may call the straight- edged and the leaf-shaped. Assyrian monuments represent a straight and narrow sword, apparently better fitted for thrusting than cutting. Bronze swords of this form have actually been found in Etruscan tombs, and by Dr Schlie- mann at Mycenz, side by side with leaf-shaped specimens. We have also from Mycenze some very curious and elab- orately wrought blades, so broad and short that they must be called ornamental daggers rather than swords. The leaf-shaped blade is common everywhere among the remains of men in the " Bronze Period" of civilization, and

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Fic, 1.—1-5, Greek swords of the classical type (Gerhard's Griechische Vasen- bilder), 6-15, Roman swords from Lindenschmit, Zracht und Bewaffnung des rémischen Heeres wihrend der Kaiserzett, Brunswick, 1882. 6, So-called "sword of Tiberius" from Mainz (Brit. Mus.); 7,

Bonn (private collection), length 765 mm.; 8, legionary (monument at Wiesbaden); 9, cavalry (monu- ment at Mainz); 10, cavalry (monument at Worms); 12, 13, sword handles

(Kiel and Mainz); 11, 14, 15, from Trajan's column, this was the shape used by the Greeks in historical times, and is the shape familiar to us in Greek works of art. It is impossible, however, to say whether the Homeric heroes wore the leaf-shaped sword, as we see it, for example, on the Mausoleum sculptures, or a narrow straight-edged blade of the Assyrian-Mycenean pattern. In any case, the sword holds a quite inferior position with Greek warriors of all times. We have not the means of pronouncing which pattern is the older. To a modern eye the Assyrian or Mycenzean sword looks fitter for thrusting than cutting. The leaf-shaped sword, so far as we know from works of art, was used with a downright cutting blow, regardless of the consequent exposure of the swordsman's body; this, however, matters little when defence is left to a shield or armour, or both. The use of the sword as a weapon of combined offence and defence—swordsmanship as we now

understand it—is quite modern. If the sword was de- veloped from a spearhead or dagger, one would expect it to have been a thrusting weapon before it was a cutting one. But when we come to historical times we find that the effective use of the point isa mark of advanced skill and superior civilization. The Romans paid special atten- tion to it, and Tacitus tells us how Agricola's legionaries made short work of the clumsy and pointless arms of the Britons when battle was fairly joined.1 The tradition was preserved at least as late as the time of Vegetius, who, as a technical writer, gives details of the Roman soldier's sword exercise. Asiatics to this day treat the sword merely as a cutting weapon, and most Asiatic swords are incapable of being handled in any other way.

Historical T'ypes.—The normal types of swords which we meet with in historical times, and from which all forms now in use among civilized nations are derived, may be broadly classified as straight-edged or curved. In the straight-edged type, in itself a very ancient one, either

thrusting or cutting qualities may predominate, and the blade may be double-edged or single-edged. The double- edged form was prevalent in Europe down to the 17th century. The single-edged blade, or backsword as it was called in England, is well exemplified in the Scottish weapons commonly but improperly known as claymores, and is now exclusively employed for military weapons. But these, with few exceptions, have been more or less influenced by the curved Oriental sabre. Among early double-edged swords the Roman pattern stands out as a workmanlike and formidable weapon for close fight ; the point was used by preference. In the Middle Ages the Roman tradition disappeared, and a new start was made from the clumsy barbarian arm which the Romans had despised. Gradually the broad and all but pointless blade was lightened and tapered, and the thrust, although its real power was unknown, was more or less practised. St Louis anticipated Napoleon in calling on his men ta use the point ; and the heroes of dismounted combats in the Morte Darthur are described as " foining " at one another. In the first half of the 16th century a well-proportioned and well-mounted cut-and-thrust sword was in general use, and great artistic ingenuity was expended, for those who could afford it, on the mounting and adornment. The growth and variations of the different parts of the hilt, curiously resembling those of a living species, would alone be matter enough for an archeological study. One peculiar form, that of the Scottish basket-hilt, derived from the Venetian pattern known as schiavone, has persisted to our own day without material change.

Quite different from the European models is the crescent- shaped Asiatic sabre, commonly called scimitar. We are not acquainted with any distinct evidence as to the origin of this in time or place. The fame of the Damascus manufacture of sword-blades is of great antiquity, as is also that of Khordsdn, still the centre of the best Eastern work of this kind. Whoever first made these blades had conceived a very definite idea,—that of gain- ing a maximum of cutting power regardless of loss in other qualities,—and executed it in a manner not to be improved upon. The action of the curved edge in deliver- ing a blow is to present an oblique and therefore highly acute-angled section of the blade to the object struck, so that in effect the cut is given with a finer edge than

could safely be put on the blade in its direct transverse section. In a well-made sabre the setting of the blade with regard to the handle ("leading forward ") is likewise ordered with a view to this result. And the cutting power of a weapon so shaped and mounted is undoubtedly very great. But

1 Agric., 36: "Britannorum gladii sine mucrone complexum ar- morum et in aperto pugnam non tolerabant."

the use of the point is abandoned, and the capacities of defensive use (to which Orientals pay little or no atten- tion) much diminished. These drawbacks have caused the scimitar type, after being in fashion for European light cavalry during the period of Napoleon's wars and somewhat longer, to be discarded in our own time. But, as long as Easterns adhere to their rigid grasp of a small handle and sweeping cut delivered from the shoulder, the Persian scimitar or Indian talwdr will remain the natural weapon of the Eastern horseman. Indian and Persian swords are often richly adorned; but their appropriate beauty is in the texture of the steel itself, the "damascen- ing" or "watering" which distinguishes a superior from a a "

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Fic, 2.—Oriental swords (reproduced by permission from Egerton's Jilustrated Handbook of Indian Arms, published by the India Office, 1880). 1, 2, Decorated Persian arms; 3, gauntlet sword ; 4, common type of talwdr (North-West Pro-

vinces); 5, yataghan type; 6, Persian talwdr; 8, kukri (Nepal); 7, 9, 10,

Mahratta, showing transition to gauntlet sword.

common specimen. This process, long obscure to Euro- peans, has in recent times been explained (see below). There are special Asiatic

varieties of curved blades of which the origin is more or less uncertain. Among these the most remarkable is perhaps the yataghan, a weapon pretty much coextensive with the Mohammedan world, though it is reported to be not common in Persia. It has been imported from Africa, through a French imitation, as the model of the sword-bayonets which have been common for about a generation in European armies; probably the French authorities caught at it to satisfy the sentiment, which lingered in Continental armies long after it had dis- appeared in England, that even the infantry soldier after the invention of the bayonet must have some kind of

sword. A compact and formidable hand-weapon has thus been turned into a clumsy and top-heavy pike. If we try to make a bayonet that will cut cabbages, we may or may not get a useful chopper, but we shall certainly get a very bad bayonet. The double curve of the yataghan is gy}. stantially identical with that of the Goorkha knife (kukri), though the latter is so much broader as to be more like a woodman's than a soldier's instrument. It is doubt. ful, however, whether there is any historical connexion, Similar needs are often capable of giving rise to similar inventions without imitation or communication. There are yet other varieties, belonging to widely spread families of weapons, which have acquired a strong individuality, Such are the swords of Japan, which are the highly per. fected working out of a general Indo-Chinese type; they are powerful weapons and often beautifully made, but a European swordsman would find them ill-balanced and clumsy, and the Japanese style of sword-play certainly has nothing to teach us.

Other sorts of weapons, again, are so peculiar in form or historical derivation, or both, as to refuse to be referred to any of the normal divisions. The long straight gauntlet- hilted sword (pafé) found both among the Mahratias in the south of India, and among the Sikhs and Rajputs in the north, is an elongated form of the broad-bladed dagger

with a cross-bar handle (katdr), as is shown by a transi:

tional form, much resembling in shape and size of blade the medizval English anlace, and furnished with a guard for the back of the hand. This last-mentioned pattern seems, however, to be limited to a

comparatively small region. When once the combination of a long blade with the gauntlet hilt was arrived at, any straight blade might be so mounted ; and many appear on examination to be of European workmanship—German, Spanish, or Italian. There are various other Oriental arms, notably in the Malay group, as to which it is not easy to say whether they are properly swords or not. The Malay " parang latok" is a kind of elongated chopper sharpened by being bevelled off to an edge on one side, and thus capable of cutting only in one direction. The anlace incidentally mentioned above seems to be merely an overgrown dagger ; the name occurs only in English and Welsh; in which language first, or whence the name or thing came, is unknown (see Philol. Soc. Dict., s.v.).

Modern European Developments.—In the course of the 16th century the straight two-edged sword of all work was lengthened, narrowed, and more finely pointed, till it became the Italian and Spanish rapier, a weapon still fur nished with cutting edges, but used chiefly for thrusting. We cannot say how far this transition was influenced by the estoc, a medieval thrusting weapon carried by horsemen rather as an auxiliary lance than as a sword. The Roman preference of the point was rediscovered under new conditions, and fencing became an art. Its progress was from pedantic complication to lucidity and simpherty, and the fashion of the weapon was simplified also. Early in the 18th century, the use of the edge having been finally abandoned in rapier-play, the two-edged blade was supplanted by the bayonet-shaped French duelling sword, on which no improvement has since been made except giving it a still simpler guard. The name of rapier 18 often but wrongly given to this by English writers. About the same time, or a little earlier, the primacy of the art passed from Italy to France, and there it still remains. It would take us too far to consider the history of fencing here; Mr Egerton Castle's work will be found 4 eo worthy guide, and almost indispensable for those who wis really to understand the passages relating to sword-play 1 our Elizabethan literature, of which the fencing scene 1 Hamlet is the most famous and obvious example.

Meanwhile a stouter and broader pattern, with sundry minor varieties, continued in use for military purposes, and gradually the single-edged form or broadsword prevailed. The well-known name of Ferara, peculiarly associated with Scottish blades, appears to have originally belonged toa Venetian maker, or family of makers, towards the end of the 16th century. The Spanish blades made at Toledo had by that time acquired a renown which still continues. Somewhat later Oriental example, imported probably by way of Hungary, induced the curvature found in most recent military sabres, which, however, is now kept within

“ia. 3.—Typical European swords, 16th-18th centuries. Reproduced by per- mission from Mr Egerton Castle’s Schools and Masters of Fence. 1, Early 16th cent.; 2, German, c. 1550; 3, Italian rapier, third quarter 16th cent.; | 4, Spanish rapier, late 16th cent.; 5, Italian, same period; 6, English, same | period ; 7, English musketeer’s sword, early 17th cent.; 8, Spanish broad- sword, early 17th cent.; 9, Venetian, c. 1550; 10, Italian, late 16th cent.; 11,) English, time of Commonwealth ; 12, French rapier, c. 1650; 13, German flam- | berg, early 17th cent.; 14, 15, small-swords, 1700-1750.

juch bounds as not to interfere with the effective use of the point. An eccentric specialized variety—we may call a “sport”—of the sabre is the narrow and flexible ‘schliger ” with which German students fight their duels Hor the most part not arising out of any quarrel, but set rials of skill), under highly conventional rules almost identical with those of the old English “ backswording” wactised within living memory, in which, however, the words were represented by sticks. These “schlager” fuels cause much effusion of blood, but not often serious

There are plenty of modern books on sabre-play, but comparatively little attention has been given to its scien- tific treatment. It is said that the Italian school is better than the French, and the modern German

and Austrian the best of all. Some of the English cavalry regiments have good traditions, enriched of late years by the application of a knowledge of fencing derived from eminent French masters.

The Manufacture of Swords.—Mechanical invention has not been able to supersede or equal hand-work in the production of good sword-blades. The swordsmith's craft is still, no less than it was in the Middle Ages, essentially a handicraft, and it requires a high order of skill. His rough material is a bar of cast and hammered steel tapering from the centre to the ends; when this is cut in two, each half is made into a sword. The "tang" which fits into the handle is not part of the blade, but a piece of wrought iron welded on to its base. From this first stage to the finishing of the point it is all hammer-and-anvil work. Special tools ~~are used to form grooves in the blade according to the regulation or other pattern desired, but the shape and weight of the blade are fixed wholly by the skilled hand and eye of the smith. Measuring tools are at hand, but are little used. Great care is necessary to avoid overheating the metal, which would produce a brittle crystal~~ line grain, and to keep the surface free from oxide, which would be injurious if hammered in. In tempering the blade the workman judges of the proper heat by the colour. Water is preferred to oil by the best makers, notwithstanding that tempering in oil is much easier. With oil there is not the same risk of the blade coming out distorted and having to be forged straight again (a risk, how- ever, which the expert swordsmith can generally avoid); but the steel is only surface-hardened, and the blade therefore remains liable to bend. Machinery comes into play only for grinding and polishing, and to some extent in the manufacture of hilts and appurtenances. The finished blade is proved by being caused to strike a violent blow on a solid block with the two sides flat, with the edge, and lastly with the back; after this the blade is bent flatwise in both directions by hand, and finally the point is driven through a steel plate about an eighth of an inch thick. In spite of all the care that can be used both in choice of material and in workmanship, about 40 per cent. of the blades thus tried fail to stand the proof, and are rejected. The process we have briefly described is that of making a really good sword; of course plenty of cheaper and commoner weapons are in the market, but they are hardly fit to trust a man's life to. It is an

interesting fact that the peculiar skill of the swordsmith is in England so far hereditary that it can be traced back in the same families for several genera- tions.

The best Eastern blades are justly celebrated, but they are not better than the best European ones; in fact, European swords are often met with in Asiatic hands, remounted in Eastern fashion. The "damascening" or " watering" of choice Persian and Indian arms is not a secret of workmanship, but is due to the peculiar manner of making the Indian steel itself, in which a crystallizing process is set up; when metal of this texture is forged out, the result is a more or less regular wavy pattern running through it. No difference is made by this in the practical qualities of the blade.

The following list of works is intended to guide the reader, if desired, to fuller acquaintance with the literature and authorities of the subject, and will, it is hoped, be found useful for that purpose, but it does not profess to be in itself sufficient even as a selection. 2

Archxology and General History.—R. F. Burton, The Book of the Sword (only one vol. published), London, 1884; Colonel Lane Fox (now Major-Gen. Pitt- Rivers), Catalogue of Anthropological Collection, South Kensington Museum, London, 1874; 'Primitive Warfare," in Journal of the Royal United Service Institution, 1867, 1868, 1869. For special regions and periods, see Hon. Wilbraham Egerton, Jllustrated Handbook of Indian Arms, published by the India Office, London, 1880; Lindenschmit, 7racht und Bewaffnung des rdémischen Heeres wahrend der Kaiserzeit, Brunswick, 1882; Drummond and Anderson, Anctent Scottish Weapons, Edinburgh and London, 1881. The more general treatises and handbooks on arms and armour, such as Grose, Meyrick, Hewitt, Lacombe, Demmin, may be consulted with advantage, but are not always to be trusted in details, 'The Forms and History of the Sword," in Proceedings of the Royal Institution, 1883, by the present writer, gives further references and citations on various points. ;

Swordsmanship.—Egerton Castle, Schools and Masters of Fence from the Middle Ages to the Eighteenth Century, London, 1885 (including a

critical bibliography) ; Vigeant, Bibliographie de ’ Escrime Ancienne et Moderne, Paris, 1882; Gomard (assumed name of Possellier), Théorie de [Escrime, Paris, 1845 (historical intro- duction); Grisier, Les Armes et le Duel, Paris, 1847 (preface by A. Dumas); Chapman, Foil Practice, London, 1861; Notes and Observations on the Art of Fencing, 1864; J. M. Waite, Lessons in Sabre, &c., London, [1881]. The French official Manuel d’Escrime (approved 1877) gives a very clear and concise summary of the modern school. Cordelois’s Legons d’Armes (Paris, 1872, 2d ed.) and Camille Prévost’s Théorie Pratique de [Escrime (Paris, 1886) are the latest and best treatises on the small-sword. There is forthcoming in England, in the ¢‘ Badminton Series,” a work on Fencing by W. H. Pollock and F. Craufurd Grove, to which is added Bibliotheca Artis Dimicatoriz, a Complete and General Biblio- graphy of the Art of Fence, by Egerton Castle.

Technology.—Wilkinson, Engines of War, London, 1841; Latham, “ The Shape of Sword-Blades,” Journal of the Royal U.S. Institution, 1862; Marey, Mémoire sur les Armes Blanches, Strasburg, 1841, transl. by Lieut.-Col. Maxwell, London,

1860. (F. PO.)

SWORD-FISH. Sword-fishes are a small family of | tate to attack whales and other large cetaceans, and, by .

spiny-rayed fishes (Xiphiidx), the principal characteristic of which consists in the prolongation of the upper jaw into a long pointed sword-like weapon. The “sword” is formed by the coalescence of the intermaxillary and maxillary bones, which possess an extremely hard texture ; it has the shape of a much elongate cone, more or less flattened throughout its whole length; the end is sharply pointed. It is smooth above and on the upper part of the sides, and rough below owing to the presence of innumer- able rudimentary teeth, which have no function.

The general form of the body is well proportioned, somewhat elongate, and such as is always found in fishes with great power of Ye swimming, as, for in- stance, in the mackerel and tunny, and the tail

: : : Sword-Fish terminates in a powerful bi- (Histiophorus pul-

lobed caudal fin. A long fin chellyis). occupies nearly the whole length of the back, whilst the anal fin is generally interrupted in the middle, and conse- quently appears to be double. The skin is very firm, partly naked, partly with small lanceolate scales deeply imbedded in the skin. The teeth of the lower jaw are, like those of the upper, merely rudimentary structures, which render the surface of the bone rough without possessing any special function.

Sword-fishes have been divided into three generic groups :—

a. Histiophorus, with a high dorsal fin which can be spread out like a sail, and with ventral fins which are reduced to a pair of long styliform appendages.

b. Tetraptwrus, with a dorsal fin of which the anterior rays only are elongate, the remainder of the fin being low or partly obsolete, and with styliform ventral fins as in the preceding genus.

e. Xiphias, with the dorsal fin shaped as in Letrapturus, but without ventral fins.

Sword-fishes are truly pelagic fishes, which either singly or in pairs or in smaller or larger companies roam over the oceans of the tropical and subtropical zones of both hemi- spheres. Some species wander regularly or stray far into the temperate seas. Some of the tropical forms are the largest of Acanthopterygian fishes, and not exceeded in size by any other Teleostean ; such species attain to a length of from 12 to 15 feet, and swords have been preserved more than 3 feet long and with a diameter of at least 3 inches at the base. The Histiophori, which inhabit chiefly the Indo-Pacific Ocean, but occur also in the Atlantic, seem to possess in their high dorsal fin an additional aid for loco- motion. During the rapid movements of the fish this fin is folded downwards on

the back, as it would impede the velocity of progress by the resistance it offers to the water 4 but, when the fish is swimming in a leisurely way, it is frequently seen with the fin erected and projecting out of the water, and when quietly floating on the surface it can sail by the aid of the fin before the wind, like a boat.

The food of the sword-fishes is the same as that of tunnies, and consists of smaller fish, and probably also in great measure of pelagic cuttle-fishes. It has been ascer- tained by actual observation that sword-fishes procure their food by dashing into a school of fishes, piercing and kill-ing a number of them with their swords ; and this kind of weapon would seem to be also particularly serviceable in killing large cuttle-fish, like the saw of saw-fishes, which is used for the same purpose. But the swords of the large species of Histiophorus and Tetrapturus are, besides, most formidable weapons of aggression. These fishes never hesi-

repeatedly stabbing them, generally retire from the combat, victorious. That they combine in these attacks with the. thresher-shark is an often-repeated story which has its. foundation in the imagination of the observer, and which is fully disproved by the fact that the dentition of the thresher-shark is much too weak to make an impression on the skin of any cetacean. The cause which excites sword- fishes to such attacks is unknown ; but they follow the in. stinct so blindly that they not rarely assail boats and ships. in a similar manner, evidently mistaking them for ceta- ceans. They easily pierce the light canoes of the natives of the Pacific islands and the heavier boats of the pro- fessional sword-fish fishermen, often dangerously wounding the persons sitting in them. Attacks by sword-fishes on ocean-going ships are so common as to be included among sea-risks: they are known to have driven their weapon through copper-sheathing, oak-plank, and timber to depth of nearly 10 inches, part of the sword projecting

Into the inside of the ship; and the force required to pro-

duce such an effect has been described by Prof. Owen in a court of law as equal to “the accumulated force of fifteen double-handed hammers,” and the velocity as “ equal to that of a swivel-shot,” and ‘as dangerous in its effects as a heavy artillery projectile.” Among the specimens of planking pierced by sword-fishes which are preserved in the British Museum there is one less than a foot square which encloses the broken ends of three swords, as if the fishes had had the object of concentrating their attack on the same vulnerable point of their supposed enemy. The part of the sword which penetrates a ship’s side is almost always broken off and remains in the wood, as the fish is unable to execute sufficiently powerful backward move- ments to free itself by extracting the sword.

In the Mediterranean and on the Atlantic coasts of the United States the capture of sword-fishes forms a regular — branch of the fishing-industry. The object of the fishery in the Mediterranean is the common European sword-fish (Xiphias gladius), the average weight of which is about one cwt., and which is abundant off the Sicilian coasts and on the opposite coast of Calabria. Two methods are em- ployed,—that by harpoons, chiefly used for larger fish, and that by peculiarly constructed nets called palamitare. This fishery is very productive: a company of fishermen fre quently capture from twenty to fifty fish in a single day, and the average annual catch in Sicily and Calabria is reported to be 140,000 kilogrammes (138 tons). The products of the fishery are consumed principally in a fresh state, but a portion is preserved in salt or oil. The flesh of the sword-fish is much preferred to that of the tunny, and always commands a high price. This species is occa- sionally captured on the British coast. ;

On the coast of the United States a different species, Histiophorus gladius, occurs ; it is a larger fish than the Mediterranean sword-fish, attaining to a length of from 7 to 12 feet, and an average weight of 300 or 400 b. It is captured only by the use of the harpoon. From forty to fifty vessels, schooners of some 50 tons, are annually engaged in this fishery, with an aggregate catch amounting annually to about 3400

sword-fishes, of a value of $45,000. The flesh of this species is inferior in flavour to that of the Mediterranean species, and is principally consumed after having been preserved in salt or brine.

Useful and detailed information on the sword-fish fishery can – obtained from A. T. Tozzetti, "La Pesca nei Mari d'Italia € & Pesca all' Estero esercitata da Italiani," in Catalogo —ee Internazionale di Pesca in Berlino, 1880; also from La ia " Pesce-Spada nello Stretto di Messina (Messina, 1880), and G. Brown Goode, "Materials for a History of the Sword-fish, ¢ Report of the Commissioner of Fish and Fisherves, ee é.) ' Washington, 1883. (A. GG.

Ss Y B—S Y D

SYBARIS, a city of Magna Grecia, on the Gulf of Tarentum, between the rivers Crathis (Crati) and Sybaris (Coscile), which now meet 3 miles from the sea, but anciently had independent mouths, was the oldest Greek colony in this region. It was an Achzan colony founded by Isus of Helice (720 3.c.), but had among its settlers many Treezenians, who were ultimately expelled. Placed in a very fertile, though now most unhealthy, region, and fol- lowing a liberal policy in the admission of citizens from all quarters, the city became great and opulent, with a vast subject territory and divers daughter colonies even on the Tyrrhenian Sea (Posidonia, Laus, Scidrus). For magnifi- cence and luxury the Sybarites were proverbial throughout Greece, and in the 6th century probably no Hellenic city could compare with its wealth and splendour. At length contests between the democrats and oligarchs, in which many of the latter were expelled and took refuge at Crotona, led to a war with that city, and the Crotoniats with very inferior forces were completely victorious. They razed Sybaris to the ground and turned the waters of Crathis to flow over its ruins (510 zB.c.). Explorations undertaken by the Italian Government in 1879 have failed to lead to a precise knowledge of the site.

See Academy, vol. xvii. p. 73 (24th January 1880); Lenormant, La Grande-Grece (1881), i. 825 sg.; and THURII. .

SYCAMORE. See Fic, vol. ix. p. 154, and Martz, vol, xv. p. 524.

SYDENHAM, a suburb of London, in the county of Kent, is finely situated chiefly on elevated ground about 7 miles south of Charing Cross, London, There is rail- way communication by the London, Brighton, and South Coast, the Mid Kent branch of the South-Eastern, and the London, Chatham, and Dover lines. Formerly Sydenham was a small hamlet of Lewisham, which rose into favour from its sylvan beauty, its pleasant situation, and its medicinal waters. These springs were discovered in 1640 on Sydenham common. The quality of the water re- sembled that of Epsom, and was regarded as efficacious in scorbutic and paralytic affections. After the construc- tion of a railway the suburb grew into high repute as a residence, especially for the wealthier commercial and pro- fessional classes. The construction of the Crystal Palace (see Lonpon, vol. xiv. p. 836) in 1854 greatly aided the prosperity of Sydenham, although the building is not within its boundaries. There is a public lecture hall and literary institute at Sydenham Hill, and a school of art, science, and literature in connexion with the Crystal Palace. The charitable institutions include a home and infirmary for sick children and the South London dispen- sary for women. The population of the township (area, 1623 acres) was 19,065 in 1871, and 26,076 in 1881.

SYDENHAM, Tuomas (1624-1689), "the English Hippocrates," was born at Winford Eagle in Dorset in 1624, where his father was a gentleman of property and good pedigree. At the age of eighteen he was entered at Magdalen Hall, Oxford ; after two years his college studies appear to have been interrupted, and he served for a time as an officer in the army of the Parliament. He completed his Oxford course in 1648, graduating as bachelor of medi- cine, and about the same time he was elected a fellow of All Souls College. It was not until nearly thirty years later (1676) that he graduated as M.D., not at Oxford, but at Pembroke Hall, Cambridge, where his eldest son was then an undergraduate. His interest in medicine seems to have been aroused at an early age. Nothing is known of Sydenham's life between 1648 and 1663; but it is probable that he spent part of the time at Oxford. It is said also (on the authority of one Desault, in a work published at Bordeaux in 1733) that he studied at Mont- pellier, although it is not so stated by himself in his

dedicatory letter to Dr Mapletoft, among the other auto- biographical facts there given. In 1663 he passed the examinations of the College of Physicians for their licence to practise in Westminster and 6 miles round; but it is probable that he had been settled in London for some time before that. This minimum qualification to practise was the single bond between Sydenham and the College of Physicians throughout the whole of his career. He seems to have been distrusted by the heads of the faculty because he was an innovator and something of a plain-dealer. In his letter to Mapletoft he refers to a class of detractors "qui vitio statim vertunt si quis novi aliquid, ab illis non prius dictum vel etiam inauditum, in medium proferat"; and in a letter to Robert Boyle, written the year before his death (and the only authentic specimen of his English composition that remains), he says, "I have the happiness of curing my patients, at least of having it said concerning me that few miscarry under me; but [I] cannot brag of my correspondency with some other of my faculty. . . . Though yet, in taking fire at my attempts to reduce practice to a greater easiness, plainness, and in the meantime letting the mountebank at Charing Cross pass unrailed at, they contradict themselves, and would make the world believe I may prove more considerable than they would have me." Sydenham attracted to him in warm friendship some of the most discriminating men of his time, such as John Locke and Robert Boyle. His first book, Methodus Curandi Febres, was published in 1666 ; a second edition, with an additional chapter on the plague, in 1668; and a third edition, much enlarged and bearing the better-known title of Obdservationes Medicx, in 1676. His next publication was in 1680 in the form of two Epistolx Responsoriz, the one, "On Epidemics," addressed to Brady, regius professor of physic at Cambridge, and the other, "On the Lues Venerea," to Paman, public orator at Cambridge and Gresham professor in London. In 1682 he issued another Dissertatio Hpistolaris, on the treatment: of confluent smallpox and on hysteria, addressed to Dr Cole of Worcester. The Tractatus de Podagra et Hydrope came out in 1683, and the Schedula Momitoria de Nove Febris Ingressu in 1686. His last completed work, Pro- cessus Integri, is an outline sketch of pathology and prac- tice ; twenty copies of it were printed in 1692, and,

being a compendium, it has been more often republished both at home and abroad than any other of his writings separately. A fragment on pulmonary consumption was found among his papers. His collected writings occupy about 600 pages 8vo in the original Latin.

Hardly anything is known of Sydenham's personal history in London. He died in an acute paroxysm of gout in December 1689. He was buried in the church of St James's, Piccadilly, where a mural slab was put up by the College of Physicians in 1810.

Although Sydenham was a highly successful practitioner and saw more than one new edition of his various tractates called for, besides foreign reprints, in his lifetime, his fame as the father of English medicine, or the English Hippocrates, was decidedly posthumous. For a long time he was held in vague esteem for the success of his cooling (or rather expectant) treatment of smallpox, for his laudanum (the first form of a tincture of opium), and for his. advocacy of the use of Peruvian bark in quartan agues. There were, however, those among his contemporaries who understood something of Sydenham's importance in larger matters than details of treatment and pharmacy, chief among them being the talented Morton. But the attitude of the academical medicine of the day is doubtless shown forth in Lister's use of the term "sectaries" for Sydenham and his admirers, at a time (1694) when the leader had been dead five years. If there were any doubt that the opposition to him was quite other than political, it would be set at rest by the testimony of Dr Andrew Brown,! who went from Scotland to inquire into Sydenham's practice, and has incidentally revealed

1 See Dr John Brown's Horw Subsecive, art. '*Dr Andrew Brown and Sydenham."

what was commonly thought of it at the time, in his Vindicatory Schedule concerning the New Cure of Fevers. In the series of Harveian orations at the College of Physicians, Sydenham is first mentioned in the oration of Arbuthnot (1727), who styles him "emulus Hippocratis." Boerhaave, the Leyden professor, was wont to speak of him in his class

(which had always some pupils from England and Scotland) as " Anglie lumen, artis Phebum, veram Hippocratici viri speciem."" Haller also marked one of the epochs in his scheme of medical progress with the name of Syden- ham. He is indeed famous because he inaugurated a new method and a better ethics of practice, the worth and diffusive influence of which did not become obvious (except to those who were on the same line with himself, such as Morton) until a good many years after- wards. It remains to consider briefly what his innovations were. First and foremost he did the best he could for his patients, and made as little as possible of the mysteries and traditional dogmas of the craft. All the stories told of him are characteristic. Called to a gentleman who had been subjected to the lowering treatment, and finding him in a pitiful state of hysterical upset, he " conceived that this was occasioned partly by his long illness, partly by the previous evacuations, and partly by emptiness. I therefore ordered him a roast chicken and a pint of canary." A gentleman of fortune who was a victim to hypochondria was at length told by Sydenham that he could do no more for him, but that there was living at Inverness a certain Dr Robertson who had great skill in cases like his; the patient journeyed to Inverness full of hope, and, finding no doctor of the name there, came back to London full of rage, but cured withal of his complaint. Of a piece with this is his famous advice to Blackmore. When Blackmore first engaged in the study of physic he inquired of Dr Sydenham what authors he should read, and was directed by that physician to Don Quixote, "which," said he, "is a very good book; I read it still." There were cases, he tells us, in his practice where "I have consulted my patient's safety and my own reputation most effectu- ally by doing nothing at all." It was in the treatment of small- pox that his startling innovations in that direction made most stir. It would be a mistake, however, to suppose that Sydenham wrote no long prescriptions, after the fashion of the time, or was entirely free from theoretical bias. Doctrines of disease he had, as every practitioner must have ; but he was too much alive to the multi- plicity of new facts and to the infinite variety of individual con- stitutions to aim at symmetry in his theoretical views or at con- sistency between his practice and his doctrines; and his treatment was what he found to answer best, whether it were secundum artem or not. His fundamental idea was to take diseases as they pre- sented themselves in

nature and to draw up a complete picture ("krankheitsbild" of the Germans) of the objective characters of each, Most forms of ill-health, he insisted, had a definite type, comparable to the types of animal and vegetable species. The con- formity of type in the symptoms and course of a malady was duc to the uniformity of the cause. The causes that he dwelt upon were the "'evident and conjunct causes," or, in other words, the morbid phenomena; the remote causes he thought it vain to seek after. Acute diseases, such as fevers and inflammations, he regarded as a wholesome conservative effort or reaction of the organism to meet the blow of some injurious influence operating from without ; in this he followed the Hippocratic teaching closely as well as the Hippocratic practice of watching and aiding the natural crises. Chronic diseases, on the other hand, were a depraved state of the humours, mostly due to errors of diet and general manner of life, for which we ourselves were directly accountable. Hence his famous dictum: "acwtos dico, qui ut plurimum Deum habent authorem, sicut chronici ipsos nos." Sydenham's nosological method is essentially the modern one,.except that it wanted the morbid anatomy part, which was first introduced into the "natural history of disease" by Morgagni nearly a century later. In both departments of nosology, the acute and the chronic, Sydenham contributed largely to the natural history by his own accurate ob- servation and philosophical comparison of case with case and type with type. The Observationes Medic# and the first Epistola Respon- soria contain evidence of a close study of the various fevers, fluxes, and other acute maladies of London over a series of years, their differences from year to year and from season to season, together with references to the prevailing weather,—the whole body of ob- servations being used to illustrate the doctrine of the " epidemic constitution " of the year or season, which he considered to depend often npon inscrutable telluric causes. The type of the acute disease varied, he found, according to the year and season, and the right treatment could not be adopted until the type was known. There had been nothing quite like this in medical literature since the Hippocratic treatise, Iepi dépwv, bddrwv, rérwv ; and there are probably some germs of truth in it still undeveloped, although the modern science of epidemiology has introduced a whole new set of considerations. Among other things Sydenham is credited with the first diagnosis of scarlatina and with the

modern definition of chorea (in Sched. Monit.). After smallpox, the diseases to which he refers most are hysteria and gout, his description of the latter

(from the symptoms in his own person) being one of the classical pieces of medical writing. While Sydenham's "natural history" method has doubtless been the chief ground of his great post- humous fame, there can be no question that another reason for the admiration of posterity was that which is indicated by R. @ Latham, when he says, "I believe that the moral element of a liberal and candid spirit went hand in hand with the intellectual qualifications of observation, analysis, and comparison."

The most critical biography is that by Dr R. G. Latham prefixed to his translation of Sydenham's Works (2 vols., London, 1848, Syd. Soc.). Dr John Brown's " Locke and Sydenham," in Hore Subsecive, Edinburgh, 1858, is more of the nature of eulogy. Many collected editions of his works have been pub- lished, as well as three English translations. Dr W. A. Grcenhill's Latin text (London, 1844, Syd. Soc.) is a model of editing and indexing. There have heen foreign monographs on Sydenham by Goeden (Berlin, 1827), Rovers (Dort, 1838), F. Jahn (Hisenach, 1840), and Hvasser (Upsala, 1846). 'The most; inter. esting summary of doctrine and practice by the author himself is the introduc. tion to the 3d ed. of Observationes Medic (1676). (C. C

SYDNEY, the capital of New South Wales, and the oldest city in Australia, is situated on the east coast of that island-continent in 33° 51' 41" §. lat. and 151° 19' 23"°25 (10h. 4m, 49°55s.) E. long. It lies on the southern shore of the magnificent harbour of Port Jackson, which in 1770 was named, though not discovered, by Captain Cook. He anchored and landed in Botany Bay, about 6 miles to the south, and on afterwards coasting to the north noted what looked like an inlet, to which he gave the name of Port Jackson, after Sir George Jackson, one of the secretaries to the admiralty. It may seem strange that so careful an observer as Cook should have passed close to one of the finest harbours in the world without recog- nizing its capacity; but the cliffs

which guard the entrance are 300 feet in height, and no view of the landlocked basin can be seen from the masthead. Middle Head, which is posted right opposite the entrance, closes it in, and it is necessary to enter, turn to the south, and then to the west before the best part of the harbour discloses itself. This topographical peculiarity gives to the port its great shelter. When in 1788 Captain Phillip arrived at Botany Bay with the first convict fleet, he found its shallow waters and flat shores unsuited for the purposes of a settlement. Strangely enough he was also deterred by the want of water; yet it is on that very shore that the pumping-engine is situated by which Sydney has been supplied for many years. Going northwards, he turned in to examine Port Jackson mlet. Thither the fleet was instantly removed ; and Sydney was founded, and Australian colonization started, on 26th January 1788. Captain Phillip's choice of a site was de- termined by the existence of fresh water in a small stream running into Sydney Cove.

Fic. 1.—Harbour and environs of Sydney.

The port is flanked on both sides by a number of pro- montories—its characteristic feature—so that in addition to a broad central channel with deep water there 1s both on the north and the south side a series of sheltered bays with good anchorage. The entrance is a mile wide, with a minimum depth of 15 fathoms. Some little distance inside is a rock awash, known as the Sow and Figs, between which and the nearest headlands on either side is an inner bar, with 20 feet of water at low tide ; through this bar on the southern side a ship channel has been dredged giving 27 feet of water at neap tide. On the southern side there occur in succession Watson's Bay, Rose

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Bay, Double Bay, Rushcutter's Bay, Woolloomooloo Bay, Farm Cove, Sydney Cove, Darling Harbour, Johnstone's Bay, Blackwattle Bay, Iron Cove, Five Dock Bay, Hen and Chickens Bay, besides smaller inlets. On the north- ern side, beginning again at the Heads, there are North Harbour, Middle Harbour (with many subsidiary inlets), Chowder Bay, Sirius Cove, Mossman's Bay, Shell Cove, Neutral Bay, Careening Cove, Lavender Bay, Berry's Bay, Balls Head Bay, Lane Cove, Tarban Creek, and other small bays. All these promontories and coves give a, length of water frontage which is estimated at not less than 110 miles. Besides these, Botany Bay, though shal-

low and exposed and destitute of promontories, has a coast- Into it debouches George's river,

line of about 18 miles.

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which is navigable to. Liverpool, a distance of 14 miles from the mouth, and in which are several capacious bays.

The metropolitan area of Sydney really consists of a peninsula about 13 miles in length, lying between Parra- matta and George's rivers. The sea frontage of this area, from the South Head of Port Jackson to the North Head of Botany Bay, is 12 miles in length, and consists alter- nately of bold cliffs and beautiful beaches. Two of the latter—Bondi and Coogee—are connected with the city by tramways, and are favourite places of holiday resort. Sydney occupies, therefore, a position enjoying singular natural advantages.

The city proper, as subsequently determined, takes in the water frontage from the head of Rushcutter's Bay on

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For: CJ Denison

jthe east to the head of Blackwattle Bay on the west, giving a shore-line of 8 miles, of which 18 are the frontage jof the Domain and Botanic Gardens. The remainder is joccupied for commercial purposes, and is held partly by jthe Government and partly by private owners. There jare three large public wharfs—one, known as Circular |Quay, embracing the greater part of Sydney Cove, seven- eighths of a mile in length, the second at the head of Darling Harbour, a quarter of a mile in extent, and the third at the head of Woolloomooloo Bay. The rest is occupied by private wharfs, the principal of which are on the east shore of Darling Harbour. A project is on foot for the resumption of the whole by the Government, and ithe making of a uniform quay, with a railway and a new jstreet. The area of the city is 2670 acres, of which no part is more than a mile and a quarter distant from the water, whilst the average distance is three-quarters of a mile. The surface contour is undulating, the maximum

Fic. 2.—Map of Sydney

elevation being 230 feet and the average 120. The soil is sandstone, covered more or less with shaly clay. Of the city area about 800 acres are devoted to public use. The largest reserve is Moore Park, lying to the south-east of the city, nearly 500 acres in extent—originally a waste of sandhills. On it are the rifle range, the Agricultural Society's showground, and the principal cricket ground. The Inner and Outer Domains on the shore of the harbour contain about 130 acres. The former contains Government House, with its private garden and paddocks; the Outer Domain is a public park. The beautiful botanic gardens occupy the shore-line of Farm Cove, commanding the man-of-war anchorage. Hyde Park, the original race-course of the city, is about 49 acres in extent. At the north entrance isa statue of Prince Albert, and on its most elevated part is one of Captain Cook. Prince Alfred Park, on the southern boundary of the city, originally called Cleveland Paddocks, occupies nearly

18 acres, and in it is the original exhibition building, now much used for concerts and festive gatherings. Belmore Park occupies 10 acres,

and Cook and Phillip Parks each about the same area. The Fort Phillip reserve is a sort of acropolis, two of its rocky sides being escarped. Here, at an elevation of 146 feet, stands the astronomical ob- servatory. Grose Farm, on the south-west of the city, was the site of one of the earliest attempts at Government farming. It is an undulating and elevated piece of land, and is divided amongst the university and the affiliated colleges of St Paul, St John, and St Andrew, the Prince Alfred Hospital, and Victoria Park.

The city started from the banks of the Tank stream at the head of Sydney Cove, and the chief business part is still in the limited area lying between Darling Harbour and the Domain and Hyde Park. The streets are irregular in width, some of them narrow and close together, while those leadiug down to Darling Harbour have a steep incline. Sydney has consequently more the look of an Old- World city than any other in Australia, and in its lack of spacious promenades and open squares and places, and in its poor oppor- tunity for displaying its public buildings, it contrasts unfavour- ably with the more symmetrically planned sister cities of Australia. On the other hand, it has a charm which is all its own, as the glimpses of the harbour and the shipping obtainable from so many points give a delightful variety to the street vistas. The principal business street is George Street, 2 miles long, flanked with hand- some commercial buildings. In this street are the post-office, the town-hall, the cathedral, and the main railway station. Only second in importance is Pitt Street, which runs nearly parallel with it as far as the railway station.

The public and private buildings of Old Sydney are of a primi- tive order of architecture, but they are rapidly disappearing as the city 1s being rebuilt. With the exception of Government House, the university and affiliated colleges, and the registrar-general's office, all the non-ecclesiastical public buildings are in a classical style. Of the modern public buildings the museum, the post-office, the offices for the colonial secrctary, the minister for public works, and the minister for lands, and the custom-house are the finest. The town-hall is a fine building, but a little too florid; the great hall, when finished, will be the largest in Australia. The Anglican cathedral in George Street is small. A Roman

Catholic cathedral, on the east side of Hyde Park, replaces an earlier one that was burnt down, and will, when completed, be the finest ecclesiastical edifice in the city. The mint (an adaptation of an old hospital) is an imperial establishment, the cost of which is defrayed by the colonists. The annual value of the coinage from local gold is about £500,000, and this coinage has imperial currency. All the large public buildings are constructed of Sydncy sandstone, which is abundant in quantity, though variable in quality. The best comes from the quarries in Pyrmont.

The length of streets, lanes, and public ways is about 100 miles. These are mostly macadamized, but wood paving has lately come much into favour. The saleyards for cattle and sheep (area 40 acres) are 7 miles off, at Homebush. The gross city revenue from all sources is about £376,000. For municipal purposes the city is divided into eight wards, each returning three aldermen, and for parliamentary purposes into three electorates—east, west, and south—each returning four members. In 1881 the city popula- tion was 105,000. It was in 1886 officially estimated at 125,000. The population of the suburbs was officially estimated in 1884 at 150,000, making a total metropolitan population of 275,000. Com- munication with the suburbs! is maintained to a large extent by steam tramways, entirely in the hands of the Government. The whole district between Sydney and Parramatta is practically sub- urban for 2 miles on each side of the railway. The fashionable suburbs lie to the east of Sydney, the business extension of the city being more to the westward. The southern side is largely devoted to manufacturing operations, and population is rapidly extending in the direction of Botany Bay. The north shore of the harbour is outside the city limits, aud the communication is by steam ferries. The north shore has deep water close in shore, but little level ground, the land rising rapidly to an elevation of 300 feet. Up this ascent the Government has constructed a cable tramway, and from the railway between Newcastle and Sydney, which crosses the Parra- matta river 2 miles below the head of the navigation, there is to be a branch line of railway to the north shore, opposite the city.

Water was at first obtained from the so-called Tank stream ;

1 Paddington forms practically an eastern suburb of Sydney, with which there is constant omnibus communication. Victoria barracks are situated within its boundaries. Paddington is inhabited chiefly by the better classes, and possesses a number of public and private schools. A municipal constitution was granted it in April 1860. The population of the borough in 1881 was 9608.

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afterwards recourse was had toa lagoon on the southern Slope of the dividing ridge between Port Jackson and Botany Bay, from which an artificial tunnel, known as Busby's Bore, brought the water into the city at the level of Hyde Park. Whena further supply was wanted the same watercourse was utilized, the works being constructed at the point where it flowed into Botany Bay. A scheme is now (1886) in course of execution to bring water from the Upper Nepean, at a point 63 miles from Sydney. 'Two streams running in deep sandstone gorges are connected by a tunnel, and their united waters are brought in an open conduit. From the nature of the ground no large reservoir is possible near its source – but about 15 miles from Sydney, at Prospect, near Parramatta, a dam thrown across a valley makes a storage reservoir that will hold a year's supply. From that point the water is taken by open canal and piping to the existing reservoir in Crown Street, the limited area at a higher level being supplied by puinping. The delivery into the city will be over 150,000,000 gallons daily, and the cost of the whole works will exceed £1,500,000.

The old system of sewerage having several outfalls along the city front proved so objectionable that a new system has been de. signed, and is in course of execution, whereby the harbour will be preserved from all pollution. A great drain is carried from the city to the ocean at a projecting headland north of Bondi Bay known as Ben Buckler, where the sewage will go at once into deep water with a southerly current. The mouth of the sewer, though exposed to the beat of the ocean im very heavy weather, is 6 feet above high-water mark, and from that point it rises with a uniform inclination of 1 in 109, and in a nearly straight line, for a distance of 4 miles 25 chains. This main sewer, which

throughout is one continuous monolith in concrete, passes in tunnels under the rocky ridges, and on concrete arches across the intervening flats. It diminishes in size from 84 by 7} feet to 5 feet 1 inch by 4 feet 1 inch, and at the upper end it bifurcates to accommodate two separate districts. It is of an oblate, oviform section, as nearly circular as is consistent with a minimum velocity of 2} feeta second. It drains an area of 4282 acres, and is calculated to discharge all the sewage when this area is populated as thickly as London, to. gether with half an inch of rain per day. The bulk of the storm water is to pass off by surface drains. The sewage of the zone of land along the foreshore is to be lifted into the main sewer. From the southern slope of Sydney another large sewer runs southwards, and, crossing the mouth of Cook's River by a siphon, discharges its contents upon a sandy peninsula well suited for the purpose of a sewage farm.

The jurisdiction of the port of Sydney is in the hands of a marine board, of which three members are elected by the shipping interest, and three others and the president are nominated by the Govern- ment. They have the control of the pilot service, which is en- tirely a Government department. A new lighthouse has recently been erected on the South Head cliff, fitted with a powerful electric light, which is visible 27 miles off. The quarantine ground on North Head is isolated from the adjacent watering-place of Manly Beach by a fence and a broad belt of unoccupied land. Ships in quarantine anchor in a sheltered position off the beach, where a hospital ship is also stationed.

Port Jackson being the chief naval depot of Australasia and the headquarters of the admiral's station, the fortifications of the har- bour have engaged the attention of successive Governments. The inner line of defence constructed by Sir William Denison has been superseded by more elaborate works. On the north side of the harbour Middle Head, George's Head, and Bradlcy's Head have powerful guns which cross fire with those on the South Head, com- pletely commanding the entrance to the channel. There is alsoa very effective torpedo service. Garden Island, off the mouth of Woolloomooloo Bay, has been handed over to the imperial Govern- ment as a naval depét ; the man-of-war anchorage is close under its lee, and the colonial Government has

constructed all necessary wharfs and store-houscs. There is a Government dock at Cockatoo Island capable of accommodating the largest vessels, with a machine- shop close by. Adjoining this a new dock is being hewn out of the sandstone 600 feet in length and 108 feet wide; the depth of water over the sill at spring tide is to be 32 feet, and at neap tide 29 feet 6 inches, and the width at the entrance 84 feet. Mort's Dock and Engineering Company have a large dock at Waterview Bay capable of taking in all the ordinary mail steamers, Thereis also a patent slip, which can take up vessels of 1000 tons, anda second is in course of construction for vessels of 1500 tons. The graving- dock is 410 feet long. Besides this, there are other smaller patent slips, and a floating dock for the accommodation of smaller craft.

Sydney is in the centre of a great coal-basin, the eastern part of which is supposed to be under the sea; whether a workable seam exists under the city itself, and, if so, at what depth, is at present undetermined, borings of 2000 feet having as yet failed to strike the coal. The seams crop out at Lake Macquarie, north of Sydney, and dip to the south; they also rise to the surface at the south of Sydney, where they dip to the north. Twenty-four miles south of Sydney the seam has been found at a depth of 850 feet, and at

about the same distance to the north at a depth of 600 feet. Coal is also brought into the city by railway from the Blue Mountains and from the Mittagong district, but it is inferior in quality to that mined on the coast.

The abundance and cheapness of coal, as well as the natural and commercial advantages of Sydney, have been favourable to certain lines of manufacturing industry, notwithstanding the high price of labour. In addition to the industries connected with shipping, those connected with the pastoral industry have also been devel- oped, such as tanning, glue-making, meat-preserving, &c. The large railway works have, under the patronage of the Government, led to the manufacture of locomotives, and nearly all the rolling stock is made in the colonies. Ommnibuses, cabs, carriages, buggies, drays, and carts are made in

every variety and of excellent quality, as is also harness. Bootmaking is an extensive business ; there are also manufactories of tobacco, sugar, kcrosene, spirits, beer, tweed, paper, furniture, glass, pottery, and stoves, as well as a great variety of minor industries.

Public schools abound, with merely nominal fees. There is a high school for boys and girls. The grammar-school, with an attendance of 400 boys, receives from Government £1500 a year, with the free use of the buildings. To the handsome university buildings a medical school is now being added. The great hall is the finest Gothic building in Australasia. The university is a teaching as well as examining institution, degrecs being given in the four faculties of arts, medicine, law, and science. 'The univer- sity, which is governed by a senate elected by the graduates, has a Government endowment of £12,000 a year, and has been enriched by several donations and bequests (amounting to £250,000, of which about £180,000 by Mr Challis). 'To it are attached three denomi- national affiliated colleges, one belonging to the Anglican Church, one to the Roman Catholic, and one to the Presbyterian ; to cach the Government contributed the land, £10,000 towards the build- ing fund, and an annual stipend of £500 a year for the principal. Technical education is conducted nnder the auspices of a board supported entirely at the cost of the Government. The pupils already number more than a thousand, and the attendance at the elasses is steadily increasing. 'There is a good school of arts, with 400 members, and a good circulating library. The public free library is supported by the Government, and to it is attached a lending branch. The Royal Society has a roll of 500 members, meets periodically for the reading and discussion of scientific papers, publishes its transactions, and has a small library. The Linnean Society is also well supported, and a Geographical Society has lately been started. The museum, in College Street, is managed by trustces and supported wholly at the cost of the Government. There is a small museum attached to the university, to which Mr Macleay has bequeathed his collection, which is especially rich in natural history. ;

Sydney has many charitable institutions. It has three hospitals, the newest and largest, which is close to the university, having been built

after the best European models. There are three large lunatic asylums in the suburbs ; the latest is on the pavilion prin- eiple. The benevolent asylum, which is mainly supported by the Government, gives a large amount of outdoor assistance, takes in all waifs and strays, and acts as a lying-in hospital. Old men are provided for in an institution at Liverpool. At Randwick is an asylum for destitute children, which receives a large amount of Government support ; and there are two orphan asylums at Parra- matta; but the state children are now being boarded out, under the auspices of a Government board. There are two soup-kitchens and refuges, supported by private contributions, and also a charity organization society. There isa home visiting and relief society, intended principally for those who have known better. days, and a prisoners' aid society, besides numerous friendly societies. All the churches are well represented, and to each is attached one or more charitable agencies.

The climate of Sydney is mild and moderately equable. It resembles closely the climate of Toulon. The mean temperature is 62°°6 Fahr. and the extreme range of the shade thermometer is from 106° to 36° Fahr. The sea-breeze which prevails during the summer comes from the north-east, and, while it tempers the heat, makes the air moist and induces languor. In winter the prevail- ing wind is from the west, and the air is dry and bracing. The annual rainfall is 50 inches. The hot north-west wind of summer sometimes sends the humidity down below 30°, and once it has been as low as 16°. In the cool westerly winds of winter it seldom falls to 55°, and never below 45°. Thc average humidity for the year is 74°, The mean tide is 8 feet 3 inches. (A. GA.)

SYENE (Aswin). See Eeyrr, vol. vii. p. 783.

SYENITE. See Granite, vol. xi. p. 49.

SYLBURG, Frrepricn (1536-1596), an eminent Greek scholar, and one of the greatest figures in the annals of German philology, was the son of a farmer, and was born at Wetter near Marburg in 1536. Wetter had then an ex-

cellent school, taught by J. Foenilius and Justus Vulteius, and Sylburg also got help in his studies from the preacher J. Pincier, whose daughter he subsequently married. His studies were continued at Marburg and Jena, and then at Geneva (1559) and at Paris. Here his teacher was Henry Estienne (Stephens), to whose great Greek Thesaurus Sylburg afterwards made important contributions. Re- turning to Germany, he was for a time a schoolmaster at Neuhaus near Worms, and then head of a new gymnasium at Lich, where he edited a useful edition of Nicolas Cleynart's Greek Grammar (Frankfort, 1580), which was thrice reprinted during his lifetime. But the period of his important literary labours began when (having pre- viously, in 1581, declined a call to the Greek chair at Marburg) he resigned his post at Lich and moved to Frankfort to act as corrector and editor of Greek texts for the enterprising publisher J. Wechel. To his Frankfort period belong the editions of Pausanias (1583), Herodotus (1584), Dionysius of Halicarnassus (2 vols., 1586—one of his best pieces of work), Aristotle (5 vols., 1587—dedi- cated to the landgraves of Hesse, from one of whom, Louis IV., he received a pension), the Greek and Latin sources for the history of the Roman emperors (3 vols., 1589-90), and the Ilept ovvrdé£ews of Apollonius. In 1591 he was attracted to Heidelberg by the treasures of the library, not yet scattered by the Thirty Years' War. Here he became librarian to the elector palatine, and was un- tiring in collecting further MS. treasures. At the same time the series of editions, which Wechel had begun to find too costly, was continued by the Heidelberg publisher Hieronymus Commelinus. At Heidelberg were printed Clement of Alexandria (1592), Justin Martyr (1593), the Etymologicum Magnum (1594), the Scriptores de Le Rustica (1595), the Greek gnomic poets (1596), Xenophon (1596), Nonnus (1596), and other works. All Sylburg's editions show great critical power and indefatigable industry. Indeed he wore himself out with work, and died on 16th February 1596, "nimiis vigiliis ac typographicis laboribus consumptus," as his tombstone in the churchyard of St Peter's in Heidelberg has it. There is a careful notice of his life by K. W. Justi in Strieder's Hessische Gelehrten-Geschichte, xviii. 481 sq.

SYLHET, a British district of India, in the province of Assam, lying between 25° 12’ and 23° 59’ N. lat. and 91° and 92° 38’ E. long., with an area of 5381 square miles. It is bounded on the N. by the Khasi and Jaintia Hills district, on the E. by Cachar, on the 8. by the state of Hill Tipperah and the district of Tipperah, and on the W. by the district of Maimansinh. Sylhet consists of the lower valley of the Surma or Barak river, and for the most part isa uniform level, broken only by scattered clusters of sandy hillocks called tilds, and intersected by a network of rivers and drainage channels. In the south eight low ranges of hills, spurs of the Tipperah Mountains, run out into the plain, the highest range being about 1500 feet above sea-level. There is also a small detached group in the centre of the district called the Ita Hills. Entering the district from Cachar, the Surma bifurcates into two branches: the main branch flows beneath the hills border- ing the north-east part, while the minor branch, the Kusidra, flows in a south-westerly direction across the district ; they again unite on the south-western boundary and fall into the Meghna under the name of Dhaleswari. Both branches are navigable by large boats and support a busy traffic. The wild animals of the district comprise elephants, tigers, buffaloes, bison, and several varieties of deer. The climate of Sylhet is extremely damp and the rainfall is heavy, reaching an annual average of over 150 inches; the rainy season generally lasts from April to October.

In 1881 the population was returned at 1,969,009, of whom 999,785 were males and 969,224 females. Hindus numbered 949,353, Mohammedans 1,015,531, and hill tribes 3708. The only places with a population exceeding 5000 are Sylhet town (14,407) and Kashba Baniachang,:a large village (24,061). Sylhet town, the administrative headquarters of the district, is situated on the right or north bank of the Surma, and besides the usual public offices contains a handsome church and the mosque of Shah Jalal (a fakir whose miraculous powers contributed greatly to the Mussulman conquest of the country), which attracts pilgrims from great dis- tances. Out of the total area 3080

square niles were returned as under cultivation in 1882-83 and 654 as cultivable. The staple crop is rice, which yields three harvests during the year. There are immense forest tracts in the south-eastern parts of Sylhet. The chief industries are the weaving by Manipuri women of cotton cloths called Manipuri khesh, also handkerchiefs and mosquito curtains tastefully embroidered with silk. The manufacture of mats, ivory and shell carving, and other ornamental work are also pursued with much skill and elegance.

Sylhet with the rest of Bengal passed into the hands of the British in 1765. Previous to 1874 Sylhet formed an integral part of Bengal, being included in the Dacca division ; but in September of that year it was annexed, together with the adjoining district of Cachar, to the chief-commissionership of Assam.

SYLT (probably from the Old Frisian Silendi, z.¢., "sea- land") is the largest German island in the North Sea, being 40 square miles in area and nearly 23 miles long. Tt is, however, very narrow, generally about half a mile in width, except in the middle, where it sends out a peninsula 7 miles across. It belongs to the province of Schleswig-Holstein, and lies from 7 to 12 miles from the Schleswig coast. Its long and slender outline is highly suggestive of its former position as part of a continuous line of coast, now in great part swept away. The invasion of the sea has made considerable progress even within a comparatively recent period, and several hamlets were swallowed up in the 13th and 14th centuries. The process of gradual waste is still going on, though it is now obviated to some extent by the exertions of the Prussian Government, and counterbalanced by deposits of mud on the landward side. The central peninsula contains some "marshland" and moorland pasture, on which a few thousand sheep are grazed, but the rest of the island consists merely of dunes or sand-hills, which at places attain a height of from 100 to 150 feet. The inhabitants, about 3000 in number, are of Frisian origin, though a few in the extreme north of the island speak Danish. Their occupations are fishing, oyster-dredging, seamanship, and wild-duck catching ; the women make large quantities of woollen jackets. The chief places are Keitum (850 inhabitants), Westerland, which is annually visited by about 1500 sea-bathers, and

Morsum. Some very interesting pagan tombs have been found on the island.

SYLVESTER. See SILvEsTER.

SYMBOL. See Creeps.

SYME, James (1799-1870), surgeon, was born at Edin- burgh on 7th November 1799. His father was a writer to the signet and a landowner in Fife and Kinross, who lost most of his fortune in attempting to develop the mineral resources of his property. James was sent to the High School at the age of nine, and remained there until he was fifteen, when he entered the university. For two years he frequented the arts classes (including botany), and in 1817 began the medical curriculum, devoting him- self with particular keenness to chemistry. His chemical experiments led him to the discovery that 'a valuable substance is obtainable from coal tar which has the property of dissolving india-rubber," and could be used for waterproofing silk and other textile fabrics,—an idea which was patented a few months afterwards by Macintosh of Glasgow. In the session of 1818-19 Syme became assistant and demonstrator in the dissecting room of Liston, who had started as an extra-mural teacher of anatomy in competition with his old master Barclay; in those

years he held also resident appointments in the infirmary and the fever hospital, and spent some time in Paris prea ing dissection and operative surgery. In 1823 Liston handed over to him the whole charge of his anatomy classes, retaining his interest in the school asa pecuniary venture ; the arrangement did not work smoothly, and 9 feud with Liston arose, which did not terminate unti] twenty years later, when the latter was settled in London, Syme's next venture was the Brown Square school of medicine, which he started in 1824-25 in conjunction with Dr Macintosh, Dr Fletcher, and others; the partner. ship was again inharmonious, and soon came to an end, Announcing his intention to practise surgery only, Syme started a surgical hospital of his own, Minto House hos. pital, which he carried on from May 1829 to

September 1833, with great success as a surgical charity and school of clinical instruction. It was here that he first put into practice his method of clinical teaching, which consisted in having the patients to be operated or prelected upon brought from the ward into a lecture-room or theatre where the students were seated conveniently for seeing and taking notes. His private practice had become very considerable, his position having been assured ever since his amputation at the hip joint in 1823, the first of the kind in Scotland. In 1833 he succeeded Russel as professor of clinical surgery in the university. Syme's accession to the clinical chair was marked by two import- ant changes in the conditions of it: the first was that the professor should have the care of surgical patients in the infirmary in right of his professorship, and the second, that attendance on his course should be obligatory on all candidates for the medical degree. When Liston removed to London in 1835 Syme became the leading consulting surgeon in Scotland. On Liston's death in 1847 Syme was offered his vacant chair of clinical surgery at University College, London, and accepted it. He began prac- tice in London in February 1848; but early in May the same year difficulties with two of his colleagues at Gower Street and a desire to "escape from animosity and conten- tion" led him to throw up his appointment. He returned to Edinburgh in July, and was re-instated in his old chair, which the crown authority had meanwhile found a difficulty in appointing to. The judgment of his friends was that "che was always right in the matter, but often wrong i the manner, of his quarrels." In 1849 he broached the subject of medical reform in a letter to the lord advocate; in 1854 and 1857 he addressed open letters on the same subject to Lord Palmerston; and in 1858 a Medical Act was passed which largely followed the lines laid down by himself. As a member of the General Medical Council called into existence by the Act, he made considerable stir in 1868 by an uncompromising statement of doctrines on medical education, which were thought by many to be reactionary ; they were, however, merely an attempt 10 recommend the methods that had been characteristic of Edinburgh teaching since Cullen's time,— namely, a col stant reference of facts to principles, the subordination (but not the sacrifice) of technical details to generalities, and the preference of large professorial classes and the "magnetism of numbers" to the tutorial system, which he identified with "cramming."

In April 1869 he hada paralytic seizure, and at once resigned his chair ; he never recovered his powers, and died on 26th June 1870.

Syme's surgical writings are numerous, although the terseness of his style and directness of his method save them fron Bi bulky. In 1831 he published A 7'reatise on the Excision of Disease Joints (the celebrated ankle-joint amputation is known by his na His Principles of Surgery (often reprinted) came out a few mont F later ; Diseases of the Rectum in 1838 ; Stricture of the Urethra an Fistula in Perineo in 1849; and Excision of the Scapula i 1864, In 1848 he collected into a volume, under the title of Contributions

to the Pathology and Practice of Surgery, thirty-one original memoirs

ublished in periodicals from time to time ; and in 1861 he issued another volume of Observations in Clinical Surgery. Syme's charac- ter is not inaptly summed up in the dedication to him by his old pupil, Dr John Brown, of the series of essays Locke and Sydenham : "Verax, capax, perspicax, sagax, efficax, tenax."

See Memorials of the Life of James Syme, by R. Paterson, M.D., with portraits, Edinburgh, 1874.

SYMEON or Duruam was the author of two works of great importance in English history, especially in that of northern England, viz., the Historia Dunelmensis Ecclesve and the Historia Regum. Very little is known of his life. There is no record of the date of his birth or death. He was at Jarrow about 1080, before the monastic community moved thence to Durham (1083). He probably did not become a professed monk till some time after that event. In 1104 he was present at the opening of the coffin and the examination of the remains of St Cuthbert. Between 1104 and 1108 he composed his History of the Church of Durham, bringing it down to the death of William of St Oarilef (1096). Many years later he compiled his Hestoria Regum, which is a chronicle of Northumbrian affairs from the date at which Bede stops (731). He was also probably the author of a letter De

Archiepiscopis Hboraci, but not of the treatise De Miraculis et T'ranslationibus sometimes attributed to him. Selden, in his introduction to Twysden's Decem Scriptores, attributes the Historia Dunelmensis Ke- clesiz to Turgot, prior of that church; but Mr Arnold, in the preface to his edition of Symeon's works, successfully disproves Selden's assertions. This work is original and of great value; the Historia Regum, on the other hand, is a compilation from various sources, brought down by Symeon to 1121 or 1129. Both works were continued by other hands.

See Twysden, Decem Seriptores, and prefaces to Symeon's works, by Mr Hodgson Hinde (Surtees Society edition, 1868) and by Mr T. Arnold (Rolls Series edition, 1882-85).

SYMEON, surnamed Mztarurastes, Byzantine hagio- grapher, according to Leo Allatius (De Symeonum Scriptis, Paris, 1664), lived during the first half of the 10th century under Leo the Philosopher and his successor at Constanti- nople, where he successively held the positions of secretary, grand logothete, and master of the palace. This view, subse- quently adopted by Cave, Fabricius, and others, was after- wards disputed, but not convincingly, by Oudin (Comm. de Scriptt. Eccles. Antiq., vol. ii., 1722), who identified Meta- phrastes with another Symeon who also held the offices of logothete and master of the palace under John Comnenus, and published a still extant Hpitome Canonum in 1160. Symeon's Metaphrases, as his legends are called (whence his name Metaphrastes), occur in MS. in many European libraries ; many of them are also to be found in the Acta Sanctorum and similar collections ; but others remain un- printed. Allatius and Cave recognize only 122 of the hundreds of lives assigned to him as genuine. The titles of other writings of Symeon, with references to further authorities, will be found in the article "' Metaphrastes," by Gass, in Herzog-Plitt's Hncykl., vol. ix.

SYMMACHUS, pope from 498 to 514, had Anastasius II. for his predecessor and was himself followed by Hormisdas. He was a native of Sardinia, apparently a convert from paganism, and was in deacon's orders at the time of his election. The choice was not unanimous,

another candidate, Laurentius, having the support of a strong Byzantine party; and both competitors were con- secrated by their friends, the one in the Lateran church and the other in that of St Mary, on 22d November 498. A decision was not long afterwards obtained in favour of Symmachus from Theodoric, to whom the dispute had been referred ; but peace was not established until 505 or 506, when the Gothic king ordered the Laurentian party to surrender the churches of which they had taken posses-

sion. An important incident in the protracted controversy was the decision of the " palmary synod" (see vol. xix. p. 492). The remainder of the pontificate of Symmachus was uneventful; history speaks of various churches in Rome as having been built or beautified by him.

SYMMACHUS, Quintus AvRELIvs, consul in 391, and one of the most brilliant representatives in public life and in literature of the old pagan party at Rome, was educated in Gaul, and, having discharged the functions of preetor and queestor, rose to higher offices, and in 373 was proconsul of Africa. His public dignities, which included that of pontiff, his great wealth and high character, added to his reputation for eloquence, marked him out as the champion of the pagan senate against the measures which the Christian emperors directed against the old state re- ligion of Rome. In 382 he was banished from Rome by Gratian for his protest against the removal of the statue and altar of Victory from the senate-house, and in 384, when he was prefect of the city, he addressed to Valentinian a letter praying for the restoration of these symbols. This is the most interesting of his literary remains, and called forth two replies from St Ambrose, as well as a poetical refutation from Prudentius. After this Symmachus was involved in the rebellion of Maximus, but obtained his pardon from Theodosius, and appears to have continued in public life up to his death.

Ofthe writings of Symmachus we possess (1) ten books of Epistles, published after his death by his sou. The model followed by the writer is Pliny the Younger, and from a reference in the Saturnalia of Macrobius (bk. v., i. § 7), in which Symmachus is introduced as one of

the interlocutors, it appears that his contemporaries deemed him second to none of the ancients in the “rich and florid” style. The first edition of the Zpistles by Bart. Cynischus (s. . ef a., but pub- lished under Pope Julius II.) is very incomplete, and the collection was only gradually completed by subsequent editors. (2) Frag- ments of nine Complimentary Orations from a palimpsest, of which part is at Milan and part in the Vatican, were discovered by Mai, who published the Milan fragments in 1815, the Roman ones in his Scriptorum Veterum Nova Colicctio, vol. i. (1825), and the whole in 1846. The work was not well done, and many corrections are given in a new collation by O. Seeck (Commentationes in Honorem Th. Mommseni, Berlin, 1877, p. 595 sg.), which has been followed by an edition of the works of Symmachus in the Monumenta Ger- manize Historica, Berlin, 1883.

SYMPHONY. See Musto, vol. xvii. p. 95.

SYNAGOGUE (cvvaywyy), literally “assemblage,” is the term employed to denote either a congregation of Jews, i.e., a local circle accustomed to meet together for worship and religious instruction, or the building in which the con- gregation met. In the first sense the word is a translation of nDID, keneseth, in the second of NDIIN N’A, béth hakkeneseth. The germ of the synagogue, that is, of religious assemblages dissociated from the ancient ritual of the altar, may be found in the circle of the prophets and their disciples (see especially Isa. viii. 16 sq.) ; but the synagogue as an insti- tution characteristic of Judaism arose after the work of Ezra, and is closely connected with the development of that legal Judaism to which his reformation gave definite shape. From the time of Ezra downwards it was the busi- ness of every Jew to know the law; the school (béth ham- midrash) trained scholars, but the synagogue, where the law was read every Sabbath (Acts xv. 21), was the means of popular instruction. Such synagogues existed in all parts of Judea in the time of Psalm lxxiv. 8 (probably a psalm of the Persian period); in Acts xv. 21 it appears that they had existed for many generations “in every city.” This held good not only for Palestine but for the Disper- sion ; in post-Talmudic times the rule was that a synagogue must be built wherever there were ten Jews. And, though the name “synagogue” varies with mpocevyy (“place of

prayer”), it appears that everywhere the assemblage was primarily one for instruction in the law: the synagogue, as Philo puts it, wasa S.dacxadeiov. A formed institution

of this sort required some organization: the general order of the service was directed by one or more “rulers of the synagogue” (dpxiruvdywyot, Luke xiii. 14; Acts xiii. 15), who called on fit persons to read, pray, and preach ; alms were collected by two or more “collectors” (gabbdé sedakd) ; and a “minister” (hazzdn, brnpérns, Luke iv. 20) had charge of the sacred books (preserved in an “ark”) and of other ministerial functions, including the teaching of children to read, The discipline of the congregation was enforced by excommunication (héem) or temporary exclusion (niddity), and also by the minor punishment of scourging (Matt. x.17), inflicted by the hazedn. The disciplinary power was in the lands of a senate of elders (rpeaBdrepor, yepovoia), the chief members of which were dpyovres. The principal service of the synagogue was held on Sabbath morning, and included, according to the Mishnah, the recitation of the shema‘ (Deut. vi. 4-9, xi. 13-21; Numb. xv. 37-41), prayer, lessons from the law and prophets with Aramaic transla- tion, a sermon (derdshah) based on the lesson (Acts xiii. 15), and finally a blessing pronounced by the priest or invoked by a layman. On Sabbath afternoon and on Monday and Thursday there was a service without a lesson from the prophets; there were also services for all feast- days. Synagogues were built by preference beside water for the convenience of the ceremonial ablutions (comp. Acts xvi. 13); and remains of very ancient buildings of this class exist in several parts of Galilee ; they generally lie north and south, and seem to have had three doors to the south, and sometimes to have been divided by columns into a nave and two aisles.

Jewish tradition has a great deal to say about a body called “the great synagogue,” which is supposed to have been the supreme religious authority from the cessation of prophecy to the time of the high priest Simeon the Just, and is even said (by modern writers since Elias Levita) to have fixed the Old Testament canon (cp. vol. v. p. 3 sg.). But Kuenen

in his essay ‘Over de Mannen der Groote Synagoge” (Verslagen of the Amsterdam Academy, 1876) has shown that these traditions are fiction, and that the name keneseth haggdéla originally denoted, not a standing authority, but the great convoca- tion of Neh. viii.-x.

Compare in general Schtirer, Geschiehte des jiidischen Volkes, § 27, where the older literature is catalogued. For the usages of the synagogue in more recent timcs, see Buxtorf, Synagoge Judaica, Basel, 1641.

SYNEDRIUM (cvvédpiov), a Greek word which means “assembly” and is especially used of judicial or representa- tive assemblies, is the name by which (or by its Hebrew transcription, }/11N3D, sanhedrin, sanhedrim) that Jewish body is known which in its origin was the municipal coun- cil of Jerusalem, but acquired extended functions and no small authority and influence over the Jews at large (see vol. xiii. p. 424 sg.). In the Mishnah it is called “the san- hedrin,” “the great sanhedrin,” “the sanhedrin of seventy- one [members],” and “the great court of justice” (béth din haggadél). The oldest testimony to the existence and constitution of the synedrium of Jerusalem is probably to be found in 2 Chron. xix. 8; for the priests, Levites, and hereditary heads of houses there spoken of as sitting at Jerusalem as a court of appeal from the local judicatories does not correspond with anything mentioned in the old history, and it is the practice of the Chronicler to refer the institutions of his own time to an origin in ancient Israel. And just such an aristocratic council is what seems to be meant by the gerusia or senate of “elders” repeatedly mentioned in the history of the Jews, both under the Greeks from the time of Antiochus the Great (Jos., Ant., xii. 3, 3) and under the Hasmonean high priests and princes, The high priest as the head of the state was

doubtless also the head of the senate, which, according to Eastern usage, exercised both judicial and administrative oy political functions (comp. 1 Mac. xii. 6, xiv. 20). The exact measure of its authority must

have varied from time to time, at first with the measure of autonomy left to the nation by its foreign lords and afterwards with the more or less autocratic power claimed by the native sovereigns.

As has been shown in vol. xiii. p. 424 sq., the original aristocratic constitution of the senate began to be modified under the later Hasmoneans by the inevitable introduction of representatives of the rising party of the Pharisees, and this new element gained strength under Herod the Great, the bitter enemy of the priestly aristocracy.! Finally under the Roman procurators the synedrium was left under the presidency of the chief priest as the highest native tribunal, though without the power of life and death (John xviii, 31). The aristocratic element now again preponderated, as appears from Josephus and from the New Testament, in which "chief priests" and "rulers" are synonymous expressions. But with these there sat also "scribes" or trained legal doctors of the Pharisees and other notables, who are simply called "elders" (Mark xv. 1). The Jewish tradition which regards the synedrium as entirely composed of rabbins sitting under the presidency and vice-presidency of a pair of chief doctors, the nds and ab béth din,? is quite false as regards the true synedrium. It was after the fall of the state that a merely rabbinical béh din sat at Jabneh and afterwards at Tiberias, and gave legal re sponses to those who chose to admit a judicature not recognized by the civil power. Gradually this illegal court usurped such authority that it even ventured to pronounce capital sentences,—acting, however, with so much secrecy as to allow the Roman authorities to close their eyes to its proceedings (Origen, Hp. ad Afr. § 14). That this was possible will appear less surprising if we remember that in like manner the synedrium of Jerusalem was able to extend an authority not sanctioned by Roman law over Jews beyond Judea, e.g., in Damascus (Acts ix. 2; xxii. 5).

The council-chamber (SovAj) where the synedrium usually sat was between the Xystus and the temple, probably on the temple- hill, but hardly, as the Mishnah states, within the inner court. The meeting in the palace of the high priest which condemned our Lord was exceptional. The proceedings also on this occasion were highly

irregular, if measured by the rules of procedure which, according to Jewish tradition, were laid down to secure order and a fair trial for the accused.

Of the older literature of the subject it is enough to cite Selden, De Synedriis. The most important critical discussion is that of Kuenen in the Verslagen, &.,

of the Amsterdam Academy, 1866, p. 131 sg. A good summary is given by Schiirer, Geschichte des jruidischen Volkes, 2d ed., § 28, iii.

SYNESIUS, bishop of Ptolemais in the Libyan Penta- polis from 410 to ¢. 414, was born of wealthy parents, who claimed descent from Spartan kings, at Cyrene about 375. While still a youth (393) he went with his brother Euoptius to Alexandria, where he became an enthusiastic Neoplatonist and disciple of Hypatia (q.v.). Returning to his native place some time before 397, he was in that year chosen to head an embassy from the cities of the Pentapolis to the imperial court to ask for remission of taxation and other relief. His stay in Constantinople, which lasted three years, was wearisome and otherwise disagreeable ; the leisure it forced upon him he devoted in part to literary composition (see his De Providentia). The oration he delivered when at last admitted to the presence of Arcadius is also extant (De Regno). Returning abruptly to Cyrene in 400, he spent the next ten years partly that city, when unavoidable business called him there, but chiefly on an estate in the interior of the province, where ee eee

1 The name synedrium first appears under Hyrcanus II. (Jos., Am xiv. 9, 4). re

2 The former word properly means the sovereign and the latter a president of the tribunal. The false traditional application 1s posi', Mishnic.

he was able to enjoy the literary leisure that was most congenial to him, varying his studies with gardening and hunting and the quiet pleasures

of domestic life. His marriage took place at Alexandria in 403 ; in the previous year he had visited Athens. In 409 or 410 Synesius, whose Christianity had until then been by no means very pronounced, was popularly chosen to be bishop of Ptole- mais, and, after long hesitation on personal and doctrinal grounds, he ultimately accepted the office thus thrust upon him, being consecrated by Theophilus at Alexandria. One personal difficulty at least was obviated by his being allowed to retain his wife, to whom he was niuch attached; but as regarded orthodoxy he expressly stipulated for personal freedom to dissent on the questions of the soul's creation, a literal resurrection, and the final destruction of the world, while at the same time he agreed to make some concession to popular views in his public teaching (ra peév otkot pirooopay, ta & eEw ptAowvOGv), His tenure of the bishopric, which was comparatively brief, was troubled not only by domestic bereavements but also by barbaric invasions of the country, and by conflicts with the prefect Andronicus, whom he excommunicated for interfering with the church's right of asylum. The date of his death is un- known, but he died probably not later than 414.

His extant works are—(1) a speech before Arcadius, De Regno ; (2) Dio, sive de swo ipsius Institute, in which he signifies his purpose | to devote himself to true philosophy ; (3) Encomium Calvitii, a

literary jew d'esprit, suggested by Dio Chrysostom's Praise of Hair ; (4) De Providentia, in two books ; (5) De Insomniis ; (6) 157 Enpis- tole ; (7) 12 Hymni; and several homilies and occasional speeches. The editio princeps is that of Turnebus (Paris, 1553); it was followed by that of Morell, with Latin translation by Petavius (1612, greatly enlarged and improved 1633; reprinted by Migne, 1859). The £pistole, which for the modern reader greatly exceed his other works in interest, have been edited by Demetriades (Vienna, 1792) and by Glukus (Venice, 1812), the Calvitit En- comiwm by Krabinger (Stuttgart, 1834), the De Providentia by Krabinger (Sulzbach, 1835), the De Regno by Krabinger (Munich,

| 1825), and the Hymns by Flach (Tiibingen, 1875). See Clausen, De Synesio Philosopho (Copenhagen, 1831); Volkmann, Synesius

von Cyrene (Berlin, 1869); and Miss Alice Gardner's monograph in "The Fathers for English Readers " (London, 1886).

SYNOD. See Councit and PRESBYTERIANISM. | SYPHILIS. See Paruonoey, vol. xviii. pp. 404, 405, and SURGERY, p. 686 above.

SYRA, or Syros, a Greek island in the middle of the Cyclades, which in the 19th century has become the com- mercial centre of the Archipelago, and is also the residence | of the nomarch of the Cyclades and the seat of the central | law courts. In ancient times this island was remarkably fertile, as is to be gathered not only from the Homeric description (Od. xv. 403), which might be of doubtful | application, but also from the remains of olive presses and '| peculiarities in the local nomenclature. The destruction of its forests has led to the loss of all its alluvial soil, and now it is for the most part a brown and barren rock,) covered at best with scanty aromatic scrub, pastured by | sheep and goats. The length of the island is about 10 | miles, the breadth 5, and the area is estimated at 424 square miles. The population is now estimated to number about | 33,700, of whom about 20,500 are in the chief town. | Commerce is the main occupation of the islanders, though they also build ships, have extensive tanneries, large steam ' flour-mills, a steam weaving and rope factory, and a hand- kerchief factory, and grow vegetables for export. Hermopolis, as the chief town is called, is built round the harbour | on the east side of the island. It is governed by an active munici- pality, whose revenue and expenditure have rapidly increased. Among the public buildings are a spacious town-hall in the central square, a club-house, an opera-house, and a Greek theatre. Old Syra, on a conical hill behind the port town, is an interesting place, with its old Roman Catholic church of St George's still crowning the summit, This was built by the Capuchins, who in the Middle } Ages chose Syra as the headquarters of a mission in the East. Louis XTII., hearing of the dangers to which the Syra priests were exposed, took the island under his especial protection, and since that

time the Roman Catholic bishops of Syra have been elected by the ope. About the beginning of the 19th century the inhabitants of Syra

numbered only about 1000; whenever a Turkish vessel ap- peared they made off to the interior and hid themselves. On the outbreak of the war of Greek independence refugees from Chios, after being scattered throughout Tenos, Spezia, Hydra, &c., and rejected by the people of Ceos, took up their residence at Syra under the protection of the French flag. Altogether about 40,000 had sought this asylum before the freedom of Greece was achieved. The chief city was called Hermopolis after the name of the ship which brought the earlier settlers. Most of the immigrants elected to stay, and, though they were long kept in alarm by pirates, they have continued steadily to prosper. In 1875 1568 sailing ships and 698 steamers (with a total of 740,731 tons) entered and 1588 sailing ships and 700 steamers (with a total of 756,807 tons) cleared this port; in 1883 3379 sailing and 1126 steam vessels (with a total of 1,056,201 tons) entered and 3276 sailing and 1120 steam vessels (with a total of 960,229 tons) cleared. Most of the sailing vessels were Greek and Turkish, and most of the steamers were Austrian, French, and Turkish.

SYRACUSE (2vpéxooat, Dupdxoveat, Zvpjxoveat; Lat. Topo- Syracusz ; It. Siracusa), the chief Greek city of ancient graphy.

Sicily and one of the earliest Greek settlements in the island (see Sicity, p. 15 above). The foundation legend takes several shapes (Thuc., vi. 3 ; Strabo, vi. 4, p. 269) ; but there is no reason to doubt that Syracuse was founded by Archias of Corinth as part of a joint enterprise together with Corcyra, and the received date 735 B.c. may pass as approximate.! The first settlement was on a small island, parted from the coast by a very narrow channel (for map, see pl. IT7.). It points southward, in front of a deep bay, which, with the opposite headland (Plemmyrium), it helps to shelter from the sea. This formed the Great Harbour; the Lesser Harbour of Laccius lay to the north of the island, between it and a peninsula of the mainland, with the open sea to the east and north. The peninsula consists of part of a hill which almost everywhere leaves some space between itself and the sea. To the west of the Great Harbour a marshy plain lies on each side of the river Anapus. On the south side of the river is a smaller hill. The coast of the island and of the peninsula is rocky. That of the harbour is for the most part flat,

except part of the west and south sides and the headland opposite the island. From the island the city spread over the whole peninsula, while a detached suburb (Polichne) arose on the outlying hill beyond Anapus. The marshy ground between the two was not fit for building. All these additions have been gradually forsaken, and the modern town is confined to the island.

The island was called Ortygia, a name connected with Island of the Delian legend of Artemis (see Holm, Gesch. Sic., i. Ortygia.

886), but often simply the Island (Liv., xxv. 24, 30). Though the lowest part of the city, its position and strength made it the citadel, and it is therefore often spoken of by Diodorus and Plutarch as if it had been a real acropolis. It is famous for the fountain of Arethusa, connected in Greek legend with the river Alpheus in Peloponnesus.?2 The sweet water perished when an earth- quake brought in the sea in 1170.3 At the time of the first settlement the island was held by Sicels ; some have thought that a Phcenician element lingered on under both Sicels and Greeks. It is certain (Herod., vii. 166) that Syracuse and Carthage stood in relations to one another which were not usual between Greek and barbarian cities. Tt has also been thought from some legendary hints that Polichne was the original Syracuse, and that the plural form (Svpdxoveat) arose from the union of Ortygia and Polichne. But the plural form is common enough in

other cases. The chief evidence for the belief is that the pe 1 See Plut., Amat. Narr., 2. é 2 See Pind., Wem., i. 1, and the scientific discussions in Strabo, vi. 2, p. 270; also Pausanias, v. 7, 2-4. 3 Hugo Falc., ed. Murat., vii. 362 ; il Buono, 117.

Lumia, Sicilia sotto Guglielmo

Earliest histori- eal period.

Gelon.

great temple of Olympian Zeus stood in Polichne and that (Plut., Wic., 14) the register of Syracusan citizens was kept there.

Till the beginning of the 5th century z.c. our notices of Syracusan history are quite fragmentary. Almost the only question is whether, as some stray notices (Athen., i. 56; see Miiller's Dorians, i. 161, Eng. tr.) might suggest, the primitive kingship was retained or renewed at Syracuse, as it certainly was in some other Greek colonies. A king Pollis is spoken of ; but nothing is known of his actions. It is far more certain that Syracuse went through the usual revolutions of a Greek city. The descendants of the original settlers kept the land in their own hands, and they gradually brought the Sicel inhabitants to a state not unlike villainage. Presently other settlers, perhaps not always Greek, gathered round the original Syracusan people; they formed a distinct body, 890s or plebs, personally free, but with an inferior political franchise or none at all. The old citizens thus gradually grew into an exclusive or aristocratic body, called yépopoe or land- owners. We hear incidentally of disputes, seditions, and changes, among others the banishment of a whole gens (Thuc., v. 5; Arist., Pol., v. 3, 5, 4, 1); but we have no dates or details till we have entered the 5th century B.c. In its external development Syracuse differed somewhat from other Sicilian cities. Although it lagged in early times behind both Gela and Acragas (Agrigentum), it very soon began to aim at a combination of land and sea power. Between 663 and 598 it founded the settlements of Acree, Casmenz, and Camarina, of which the first was unusually far inland. The three together secured for Syracuse a continuous dominion to the south-east coast. They were not strictly colonies but outposts; Camarina indeed was destroyed after a revolt against the ruling city (Thwe;~-v. 1). That the inland Sicel town of Henna was ever a Syracusan settlement there is no reason to believe. Of this early time some architectural monuments still remain, as the two temples in Ortygia, one of which is now the metropolitan church, and the small remains of the Olym- pieum or temple of Zeus in Polichne,—all of course in the ancient Doric style.

The second period of Syracusan history, which roughly begins with the 5th century, is far better ascertained. It is a period of change in every

way. The aristocratic com- monwealth becomes in turn a tyranny and a democracy ; and Syracuse becomes the greatest Greek city in Sicily, the mistress of other cities, the head of a great dominion,— for a moment, of the greatest dominion in Hellas. Strange to say, all this growth begins in subjection to the ruler of another city. Hippocrates, tyrant of Gela, held the chief power in eastern Sicily at the beginning of the 5th century B.C. (498-491), He threatened Syracuse as well as other cities, and it was delivered only by the joint intervention of Corinth and Corcyra, and by the cession of the vacant territory of Camarina. In 485 the Syracusan 8jpos or plebs joined with the Sicel serf population to drive out the gamorot, the ruling oligarchs. These last craved help of Gelon, the successor of Hippocrates, who took possession of Syracuse without opposition, and made it the seat of his power. Syracuse now grew by the depopulation of other cities conquered by Gelon. He gave citizenship both to mercenaries (Diod., xi. 73) and to settlers from old Greece (Paus., v. 27, 16,17; Pind., Olymp., vi.), so that Syracuse became a city of mingled race, in which the new citizens had the advantage. The town spread to the mainland : the new town of Achradina, with separate fortifications, arose on the eastern part of the adjoining peninsula (Diod., x1. 73), while Ortygia became the inner city, the stronghold of the ruler. Indeed in the form of unwalled suburbs the city seems to have spread even beyond Achradina (Diod.,

xi. 61, 68, 72). Gelon’s general rule was mild, and he won fame as the champion of Hellas by his great victory over the Carthaginians at Himera. He is said to have been greeted as king; but he does not seem to have taken the title in any formal way.

Gelon’s brother and successor Hiero (478-467) kept UP Gelon’s

the power of the city; he won himself a name by hig succes. encouragement of poets and philosophers; and his Pythian ®°. and Olympian victories made him the special subject of the songs of Pindar. He appeared also as a Hellenic champion in the defence of Cume, and he attempted to found a Syracusan colony on the island of fEnaria, now Ischia. But his internal government, unlike that of Gelon, was

suspicious, greedy, and cruel. After some family dis- putes the power passed to his brother Thrasybulus, who was driven out next year by a general rising (see Sictzy, p. 16). In this revolution Thrasybulus and his mercen. aries held the fortified quarters of Ortygia and Achradina; the revolted people held the unwalled suburbs, already, it is plain, thickly inhabited. Thrasybulus yielded to the common action of Siceliots and Sicels. Syracuse again became a free commonwealth, and, as the effect of the tyranny had been to break down old distinctions, it was now a democratic commonwealth. Renewed freedom was celebrated by a colossal statue of Zeus Eleutherius and by a yearly feast in his honour. But when the mercenaries and other new settlers were shut out from office! new struggles arose. The mercenaries again held Ortygia and Achradina. The people now walled in the suburb of Tyche to the west of Achradina (Diod., xi. 73). The mercenaries were at last got rid of in 461. Although we hear of attempts to seize the tyranny and of an institution called petalism, like the Athenian ostracism, designed to guard against such dangers, popular government was not seriously threatened for more than fifty years. The part of Syracuse in general Sicilian affairs has been traced in the article SICILY (g.v.); but one striking scene is wholly local, when the defeated Ducetius took refuge in the hostile city (451), and the common voice of the people bade "spare the suppliant." We have but one solitary notice of the great military and naval strength of Syracuse in 439 (Diod., xii. 30). Yet all that we read of Syracusan military and naval action during the former part of the Athenian siege shows how Syracuse had lagged behind the cities of old Greece, constantly practised as they were in warfare both by land and sea.

The Athenian siege(415-413) is of the deepest importance Athenian for the topography of Syracuse, and it throws some light on 58 the internal politics. Hermocrates, the best of counsellors for external affairs, is suspected, and seemingly with reason, of disloyalty to the democratic constitution. Yet he is, like Nicias and Phocion, the official man, head of a board of fifteen generals, which he persuades the people to cut down to three. Athenagoras, the demagogue or opposition speaker, has the best possible exposition of democratic principles put into his mouth by Thucydides (vi. 36-40). Through the whole siege? there was a

treasonable party within the city, which—for what motive we are not told— kept up a correspondence with the besiegers.

The speech of Athenagoras is that of a very clever demagogue ; it sums up very forcibly all that can be said against oligarchy, at it may have been perfectly sincere. But his views were overrul , and preparation was made in earnest for the city's defence. MW hen the Athenian fleet under Nicias and Lamachus was at Rhegium m Italy, the question for the commanders was whether they should seek to strengthen themselves by fresh alliances on the spot e strike the blow at once. Lamachus was for immediate action, ant

there can hardly be a doubt that Syracuse must have fallen be a sudden attack by so formidable an armament in the summer ©

1 Diod., xi. 72; ef. Arist., Pol., v. 3, 10, and Grote's note, v. a 2 The chief authorities for the siege are Thucydides (bks, vi. and vil.), Diodorus (bk. xiii.), and Plutarch, Life of Nicias.

| confidence.

| disorder.

415. The Syracusans were neither at unity among themselves nor by any means adequately prepared for effectual defence. Through- out the whole struggle it is perfectly clear that they owed their final deliverance to the most extraordinary good fortune. Athens | had the prize within her grasp, and she lost it wholly through the persistent dilatoriness and blundering of her general, the despond- ing, vacillating Nicias. It was at his advice that the summer and autumn of 415 were frittered away and the siege not begun till the spring of 414. By that time the Syracusans were both in better spirits and better prepared : their troops were better organized, and they had built a wall from the Great Harbour to Panagia so as to screen them from attack on the side of Epipole on the north- west. The effect of this was to bar the enemy's approach and push back his blockading lines, which had to be carried over an incon- veniently large extent of ground. The Syracusans had been at first thoroughly cowed ; but they were cowed no longer, and they even

plucked up courage to sally out and fight the enemy on the high ground of Epipole. They were beaten and driven back ; but at the suggestion of Hermocrates they carricd a counter-work up the slope of Epipole, which, if completed, would cut in two the Athenian lines and frustrate the blockade. At this point Nicias showed considerable military skill. The Syracusans' work was destroyed by a prompt and well-executed attack ; and a second counter-work carried across marshy ground some distance to the south of Epipole and near to the Great Harbour was also demolished after a sharp action, in which Lamachus fell. However, the blockade on the land side was now almost complete, and the Athenian fleet had at the same time entered the Great Harbour. The citizens began to think of surrender, and Nicias was so confident that he neglected to push his advantages. He left a gap in his lines at the point where Epipole slopes down to the sea, and he omitted to

| occupy an important position on its north-western ridge, known as Euryalus, a pass which commanded on this side the approach to

_ the city from the interior. The second act of the drama may be said to open with the irre-

' trievable blunder of Nicias in letting the Spartan Gylippus first) land in Sicily, and then march at the head of a small army, partly || levied on the spot, across the island, and enter Syracuse by way

of Epipole, through the Euryalus pass. Gylippus was felt to be

|) the representative of Sparta, and of the Peloponnesian Greeks

generally, and his arrival inspired the Syracusans with the fullest Just before his arrival a few ships from Corinth had made their way into the harbour with the news that a great fleet was already on its way to the relief of the city. The tables were | now completely turned, and we hear of nothing but defeat and disaster for the besiegers till their final overthrow. The military | skill of Gylippus enabled the Syracusan militia to mect the Athenian | troops on equal terms, to wrest from them their fortified position on Plemmyrium, and to reduce them to such a plight that, as Nicias said in his despatch to Athens towards the

close of 414, they were themselves besieged rather than besieging. In the spring of the following year Syracuse once again gave herself up

for lost, when seventy-three warships from Athcns, under Demo-

sthenes, entered the harbour with a large force of heavy infantry jand light troops. Demosthenes decided at once to make a grand jattack on Epipole, with a view to recovering the Athenian block- jading lines and driving the Syracusans back within the city walls. The assault was made by night, by the uncertain light of the moon,

Jand this circumstance turned what was very nearly a successful

surprise into a ruinous defeat. The affair seems to have been well } planned up to a certain point, and well executed ; but the Athenian | van, flushed with a first success, their ranks broken and disordered | by a pursuit of the enemy over rough ground, were repulsed with great loss by a body of heavy armed Beeotians, and driven back in The confusion spread to the troops behind them, and the action ended in a wild flight through the narrow roads and | passes of Epipole. The army was now thoroughly out of heart, }and Demosthenes was for at once breaking up the camp, embarking the troops, and sailing back to Athens. But Nicias could not | bring himself to face the Athenian people at home, nor could he i be prevailed on to retire promptly to some position on the coast, such as Catana or Thapsus, where the army would be at least able to maintain itself fora time. He dallied till the end of August, /many weeks after the defeat, and on the 27th of that month was jan eclipse of the moon, on the strength of which he insisted on a delay of almost another month. His fleet too lingered uselessly in |the harbour, till, after a frantic effort to break out and a desperate conflict, it was utterly defeated and half destroyed. The broken and demoralized army, its ranks thinned by fever and sickness, at last began its hopeless retreat in the face of the numerous Syra- cusan cavalry, and, after a few days of dreadful suffering, was forced to lay down its arms. The Syracusans sullied the glory of their triumph by huddling their prisoners into their stone-quarries,—a living death, dragged out, for some of them at least, to the space

of seventy days. Her great deliverance and victory naturally stirred up

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the energies of Syracuse at home and abroad. Syracusan ships under Hermocrates now play a not unimportant part in the warfare between Sparta and Athens on the coast of Asia. Under the influence of Diocles the consti- tution became a still more confirmed democracy, some at least of the magistracies being filled by lot, as at Athens (Diod., xiii. 31, 35; Arist., Pol., v. 3-6). Diocles appears also as the author of a code of laws of great strictness, which was held in such esteem that later lawgivers were deemed only its expounders. There seems no reason to suppose, with Holm, an earlier lawgiver Diocles distinct from the demagogue; but the story of his death by his own hand to punish a breach of his own law is, we may suspect, a repetition of the story of Charondas (Diod., xiii. 33 ; cf. xii. 19). Under these influences Hermocrates was banished in 409; he submitted to the sentence, notwith- standing the wishes of hisarmy. He went back to Sicily, warred with Carthage on his own account, and brought back the bones of the unburied Syracusans from Himera, but was still so dreaded that the people banished Diocles without restoring him. In 407 he was slain in an attempt to enter the city, and with him was wounded one who was presently to outstrip both rivals.

This was Dionysius, son of another Hermocrates, and an adherent of the aristocratic party, but soon afterwards a demagogue, though supported by some men of rank, among them the historian Philistus (Diod., xiii. 91, 92). By accusing the generals engaged at Gela in the war against Carthage, by obtaining the restoration of exiles, by a variety of tricks played at Gela itself, he secured his own election, first as one of the generals, then as sole general (or with a nominal colleague) with special powers. He next, by another trick, procured from a military

assembly at Leon- tini a vote of a bodyguard; he hired mercenaries and in 406-5 came back to Syracuse as tyrant of the city (Diod., xiii. 91-96). Dionysius kept his power till his death thirty- eight years later (367). But it was wellnigh overthrown before he had fully grasped it. His defeat before Gela (see Srcity, p. 18) was of course turned against him. His enemies in the army, chiefly the horsemen, reached Syracuse before him, plundered his house—he had not yet a fortress —and horribly maltreated his wife; but they took no politi- cal or military steps against himself. He came and took his vengeance, slaying and driving out his enemies, who established themselves at AZtna (Diod., xiii. 113). This revolution and the peace with the Carthaginians confirmed Dionysius in the possession of Syracuse, but of no great territory beyond, as Leontini was again a separate city. It left Syracuse the one great Hellenic city of Sicily, which, however enslaved at home, was at least inde- pendent of the barbarian. Dionysius was able, like Gelon, though with less success and less honour, to take up the part of the champion of Hellas.

Diocles and Hermo- crates.

Diony- sius the der.

During the long tyranny of Dionysius the city grew greatly in Quarters

size, population, and grandeur. gathered all Sicily into it. } munities, in both Sicily and southern Italy, were sacrificed to Syracuse ; there the greatness and glory of the Greek world in the West were concentrated. The mass of the population of Gela and Camarina in the disastrous year 405 had, at the prompting of Dionysius, taken refuge at Syracuse. Gela had in the previous year received the fugitive inhabitants of Acragas (Agrigentum), which had been sacked by the Carthaginians. Syracuse thus absorbed three of the chief Greek cities of Sicily. It received large accessions from some of the Greek cities of southern Italy, from Hipponium on its west and Caulonia on its east coast, both of which Dionysius captured in 389 Bc. There had also been an influx of free citizens from Rhegium. At the time of the Athenian siege Syracuse consisted of two quarters—the Island and the “outer city ” of Thucydides, generally known as Achradina, and bounded by the sea on

the north and east, with the adjoining suburb of Apollo Temenites farther inland at the foot of the southern slopes of Epipole. With the vast increase in its population, it now grew

Plato says (Zpist., vii.) that he of the In fact the free Greek cities and com- city.

Diony- sius the Younger.

Dion,

into a city of four quarters. The suburb Temenites was expanded into Neapolis (New Town), spreading over the adjoining slopes. A district stretching down to the sea, to the north-west of Achra- dina, was taken in, and subsequently enlarged into a separate fortified town. Tyche (T¥xy) was the name given to this quarter, according to Cicero ({n Verr., iv. 52, 53) from an old temple of Fortune somewhere within its limits,—a fact which seems to indi- cate that the spot must have been inhabited in very early times. But of this Thucydides says nothing, and his silence on a point which would have naturally entered into his description of the Athenian blockading operations is somewhat perplexing. This quarter was in Cicero's time the most populous part of the entire city ; it was practically secured by the new city walls, which were drawn inland in a triangular form so as to enclose the hill of Epipole, the apex of the triangle being the fortress of Euryalus, the remains of which are said to be the most perfect existing specimen of ancient fortification. Syracuse was now secure on the land side. 'The Island (Ortygia) had been provided with its own defences, converted in fact into a separate stronghold, with a fort to serve specially as a magazine of corn, and with a citadel or acropolis which stood apart, and might be held as a last refuge. Dionysius, to make himself perfectly safe, drove out a number of the old inhabitants and turned the place into barracks for his soldiers, he himself living in the citadel. For any unpopularity he may have thus incurred he seems to have made up by his great works for the defence of the city ; these were executed under the direction of the most skilful engineers, and are said to have found

employment for 60,000 men. The new lines covered an extent of 3% miles, and were constructed of huge well-cut blocks of stone from the neighbouring quarries. Each quarter of the city had its own distinct defences, and Syracuse was now the most splendid and the best fortified of all Greek cities. Its naval power, too, was vastly increased; the docks were enlarged; and 200 new warships were built. Besides the triremes, or vessels with three banks of oars, we hear of quadriremes and quinqueremes with four and five banks of oars,—larger and taller and more massive ships than had yet been used in Greek sea warfare. The fleet of Dionysius was the most powerful in the Mediterranean. It was doubtless fear and hatred of Carthage, from which city the Greeks of Sicily had suffered so much, that urged the Syracusans to acquiesce in the enormous expenditure which they must havc incurred under the rule of Dionysius. Much too was done for the beauty of the city as well as for its strength and defence. Several new temples were built, and gymnasia erected outside the walls near the banks of the Anapus (Diod., xv. 18).

"'Fastened by chains of adamant" was the boastful

phrase in which Dionysius described his empire; but under his son, the younger Dionysius, an easy, good- natured, unpractical man, a sort of cleverish dilettante, a reaction set in amongst the restless citizens of Syracuse, which, with its vast and mixed population, must have been full of elements of turbulence and faction. But the burdensome expenditure of the late reign would be enough to account for a good deal of discontent. A remarkable man now comes to the front,—Dion, the friend and disciple of Plato, and for a time the trusted political adviser of Dionysius, whom he endeavoured to impress with a conviction of the infinite superiority of free and popular government to any form of tyranny or despotism. Dion's idea seems to have been to make Dionysius some- thing like a constitutional sovereign, and with this view he brought him into contact with Plato. All went well for a time; but Dionysius had those about him who were opposed to any kind of liberal reform, and the result was the banishment of Dion from Syracuse as a dangerous innovator. Ten years afterwards, in 357, the exile entered Achradina a victor, welcomed by the citizens as a

deliverer both of themselves and of the Greeks of Sicily generally. As yet, however, this was the only part of the city gained. A siege and blockade, with confused fighting and alternate victory and defeat, and all the horrors of fire and slaughter, followed, till Dion made himself master of the mainland city. Ortygia, however, was still held by Dionysius; but, provisions failing, it also was soon surrendered. Dion's rule lasted only three years, for he perished in 354 by the hand of a Syracusan assassin. It was, in fact, after all his professions, little better than a military despotism. The tyrant's stronghold in the Island was left standing,

SYRACUSE

and Dion actually opposed a proposal for its destruction The man who won immense popularity by the proposal was murdered, and Dion seems to have been an accomplice in the crime.

Of what took place in Syracuse during the next ten years we know but little. The younger Dionysius came back and from his island fortress again oppressed the citizens ; the plight of the city, torn by faction and conflicts and plundered by foreign troops, was so utterly wretched that all Greek life seemed on the verge of extinction (Plato, Epist., viii.). Sicily, too, was again menaced by Carthage. Syracuse, in its extremity, asked help from the mother-city, Corinth ; and now appears on the scene one of the noblest figures in Greek history,

TIMOLEON (q.v.). To him Syracuse owed her deliverance Timo- from the younger Dionysius and from the rule of despots, leon.

and to him both Syracuse and the Sicilian Greeks owed a decisive triumph over Carthage and the safe possession of Sicily west of the river Halycus, the largest portion of the island. From 343 to 337 he was supreme at Syracuse, with the hearty goodwill of the citizens. The younger Dionysius had been allowed to retire to Corinth; his island fortress was destroyed and replaced by a court of justice. Syracuse rose again out of her desolation—grass, it is said, grew in her streets—and, with an influx of a multitude of new colonists from Greece and from towns of Sicily and Italy, once more became a prosperous city,

Timoleon, having accomplished his work, accepted the position of a private citizen, though, practically, to the end of his life he was the ruler of the Syracusan people, After his death (337) a splendid monument, with porticoes and gymnasia surrounding it, known as the Timoleonteum, was raised at the public cost to his honour.

In the interval of twenty years between the death of Agatho.

Timoleon and the rise of Agathocles to power another "le. revolution at Syracuse transferred the government to an oligarchy of 600 leading citizens. All we know is the bare fact. It was shortly after this revolution, in 317, that Agathocles with a body of mercenaries from Campania and a host of exiles from the Greek cities, backed up by the Carthaginian Hamilcar, who was in friendly relations with the Syracusan oligarchy, became tyrant or despot of the city, assuming subsequently, on the strength of his successes against Carthage, the title of king. Syracuse passed through another reign of terror; the new despot proclaimed himself the champion of popu- lar government, and had the senate and the heads of the oligarchical party massacred wholesale. This man of blood seems to have had popular manners, and to have known how to flatter and cajole, for a unanimous vote of the people gave him absolute control over the fortunes of Syracuse. His wars in Sicily and Africa left him time to do something for the relief of the poorer citizens at the expense of the rich, as well as to erect new fortifications and public buildings; and under his strong government Syracuse seems to have been at least quiet and orderly. After his death in 289 comes another miserable and obscure period of revolution and despotism, in which Greek life was dying out; and but for the brief intervention of Pyrrhus in 278 Syracuse, and indeed all Sicily, would have fallen a prey to the Carthaginians.

A better time began under Hiero II., who had fought Hiero II.

under Pyrrhus and who rose from the rank of general of the Syracusan army to be tyrant—king, as he came to be soon styled—about 270. During his reign of over filty years, ending probably in 216, Syracuse enjoyed tran- quillity, and seems to have grown greatly in wealth and population. Hiero's rule was kindly and enlightened, combining good

order with a fair share of liberty and self- government. His financial legislation was careful and con-

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SYRACUSE

siderate ; his laws! as to the customs and the corn tithes were accepted and maintained under the Roman govern- ment, and one of the many bad acts of the notorious Verres, according to Cicero, was to set them aside (Cic., J Verr., ii. 13; iii. 8). It was a time too for great public works,— works for defence at the entrance of the Lesser Harbour between the Island and Achradina, and temples and gym- nasia. Hiero through his long reign was the staunch friend and ally of Rome in her struggles with Carthage ; but his paternal despotism, under which Greek life and civilization at Syracuse had greatly flourished, was un- fortunately succeeded by the rule of a man who wholly reversed his policy.

Hieronymus, the grandson of Hiero, thought fit to ally himself with Carthage; he did not live, however, to see the mischief he had done, for he fell in a conspiracy which he had wantonly provoked by his arrogance and cruelty. There was a fierce popular outbreak and more bloodshed : the conspirators were put to death and Hiero’s family was murdered; whilst the Carthaginian faction, under the pretence of delivering the city from its tyrants, got the upper hand and drew the citizens into open defiance of Rome. Marcellus was then in command of the Roman army in Sicily, and he threatened the Syracusans with attack unless they would get rid of Epicydes and Hippo- erates, the heads of the anti-Roman faction. Epicydes did his best to stir up the citizens of Leontini against Rome and the Roman party at Syracuse. Marcellus there- fore struck his first blow at Leontini, which was quickly stormed ; and the tale of the horrors of the sack was at once carried to Syracuse and roused the anger of its population, who could not but sympathize with their near neigh- bours, Greeks like themselves. The general feeling was now against any negotiations with

the Roman general, and, put- ting themselves under Epicydes and Hippocrates, they closed their gates on him. Marcellus, after an unsucessful – attempt to negotiate, began the siege in regular form (214 B.c.) by both land and sea, establishing a camp on Polichne, where stood the old temple of Olympian Zeus; but he made his chief assault on the northern side and on the defences of Tyche, particularly at the Hexapylum, the entrance facing Megara and Leontini. His assault sea- wards was made mainly on Achradina, but the city was defended by a numerous soldiery and by what seem to have been still more formidable, the ingenious contrivances of Archimedes, whose engines dealt havoc among the Roman ships, and frustrated the attack on the fortifications on the northern slopes of Epipole (Liv., xxiv. 34). Marcellus had recourse to a blockade, but Carthaginian vessels from time to time contrived to throw in supplies. At length treachery began to work within. Information was given him in the spring of 212 (two years from the commence- ment of the siege) that the Syracusans were celebrating a great festival to Artemis; making use of this opportunity, he forced the Hexapylum entrance by night and established himself in Tyche and on the heights of Epipole. The strong fortress of Euryalus held out for a time, but, being now isolated, it soon had to surrender. The "outer" and the "inner city" of Thucydides still held out, whilst a Carthaginian fleet was moored off Achradina and Cartha- ginian troops were encamped on the spot. But a pesti- lence broke out in the autumn of 212, which swept them clean away, and thinned the Roman ranks. The ships sailed away to Carthage; on their way back to Syracuse with supplies they could not get beyond Cape Pachynus owing to adverse winds, and they were confronted by a Roman fleet. All hope for the city being now at an end, the Syracusans threw themselves on the mercy of Mar-

1 The laws of Hiero are often mentioned with approval in Cicero's Speeches against Verres.

cellus ; but Achradina and the Island still held out for a brief space under the Syracusan mercenaries, till one of their officers, a Spaniard,

betrayed the latter position to the enemy, and at the same time Achradina was carried and taken. Marcellus gave the city up to plunder (Liv., xxv. 31), and the art treasures? in which it was so rich—many of the choicest of them no doubt—were conveyed to Rome. From this time art seems to have become quite fashionable in certain Roman circles. Archimedes perished in the confusion of the sack, while he was calmly pursuing his studies (Liv., xxv. 31).

Syracuse was now simply one of the provincial cities of Under Rome's empire, and its history is henceforward merged in Rome.

that of Sicily. It retained much of its Greek character and many of its finest public buildings, even after the havoc wrought by Marcellus. Its importance and historic associations naturally marked it out as the residence of the Roman przetor or governor of Sicily. Cicero often speaks of it as a particularly splendid and beautiful city, as still in his own day the seat of art and culture® (Z'usc., v. 66; De Deor, Nat., iii. 81; De Rep., i. 21), and in his speeches against Verres (iv. 52, 53) he gives an elaborate description of its four quarters (Achradina, Neapolis, Tyche, the Island), or rather the four cities which com- posed it. It seems to have suffered in the civil wars at the hands of Sextus "Pompeius, the son of the triumvir, who fora short time was master of Sicily; to repair the mischief, new settlers were sent by Augustus in 21 B.c., and established in the Island and in the immediately ad- joining part of Achradina (Strabo, vi. 270, ed. Kramer). It is in these districts that the remains of Roman works— of amphitheatres and other public buildings—are mainly to be traced. We hear nothing of any importance about Syracuse during the period of theempire. It had its own senate and its own magistrates.t Caius Caligula restored its decayed walls and some of its famous temples (Sue- tonius, Caius, 21). Tacitus, in a passing mention of it (Ann., xiii. 49), says that permission was granted to the Syracusans under Nero to exceed the prescribed number of gladiators in their shows. Hence the city by that time must have been provided with an amphitheatre. In the 4th century it is named by the poet Ausonius in his Ordo Nobilium Urbium, chiefly, perhaps, on the strength of its historic memories.

Modern Syracuse is confined to the island of Ortygia, and is only Modern The island is irregularly oval town.

about 24 miles in circumference. in shape, and extends from north to south on the east side of the fine natural harbour, the Porto Grande (Magnus Portus). On the north it is connected with the mainland by a dyke or narrow isthmus, and between the southern extremity and the opposite peninsula of Massolivieri, the ancient Plemmyrium, there is a stretch of 1800 yards, forming the entrance to the harbour. The approach to the town from the mainland is defended by a dilapi- dated citadel of the time of Charles V., and the southern extremity is occupied by a castle named after George Maniaces, the last Byzantine general by whom it was held in the 11th century before it fell into the hands of the Saracens. The town is further de- fended by walls with bastions. The streets are in general narrow, and their chief feature consists in their numerous convents with wooden-latticed windows. Onc tolerably wide and handsome street crosses the island from east to west. Besides the fortifications, the principal objects of interest are the cathedral of Santa Maria delle Colonne (the ancient temple of Minerva), adjoining which is the archiepiscopal residence; the archzological museum, the finest works preserved in which are a statue of Venus in Parian marble and a colossal head of Zeus ; and the fountain of Arethusa, which still bubbles up as clear and abundant as ever on the west side of the island. Its waters, however, are no longer drinkable, an earth- quake in 1170 having allowed the sea water to become mingled with them. From the neighbourhood of this fountain a favourite promenade extends northwards along the shore of the Porto Grande. Syracuse has becn a place of little importance since the year 878,

when it was destroyed by the Saracens under Ibrahim ibn Ahmed.

2 Statues and pictures are particularized by Livy, xxv. 40.

3 The poets Theocritus and Moschus were Syracusans.

4 Local self-government, in fact, like most of the Greek cities.

Since that date the mainland portion of the city has never been rebuilt. Syracuse is the seat of an archbishop, and since 1865 has been the capital of a province, which takes its name from the town. The inhabitants manufacture drugs and other chemical articles, earthenware, &c., and carry on a considerable trade, principally in wine. In 1885 785 vessels of 21,818 tons entered the port and 778 vessels of 21,480 tons cleared. At Syracuse Admiral de Ruyter died in 1676 after his defeat by the French at Agosta. The popu-

lation in 1881 was 21,157. See Hare, Cities of Southern Italy and Sicily (London, 1883).

SYRACUSE, a.city of the United States, the county seat of Onondaga county, New York, 148 miles west of Albany, midway between that city and Buffalo. Syracuse is situated near the southern end of Onondaga Lake (5 miles long by 1 broad), whose waters flow northwards through Seneca and Oswego rivers into Lake Ontario at Oswego. The Erie Canal, flowing east and west, joins the Oswego Canal within the city. Syracuse contains several handsome public buildings,—the county court- house, the United States Government building, the city- hall, the State asylum for idiots, the Onondaga peni- tentiary, the county orphan asylum, the asylum of St Vincent de Paul, the high school (containing the central library of 15,000 volumes), a State armoury, &c. Syra- cuse is the seat of a (Methodist) university, founded in 1870 and consisting of a college of the liberal arts, a college of the fine arts, and a college of physicians and surgeons. The salt industry, to which Syracuse owed much of its early prosperity, is still the staple; the springs situated near the southern end of Lake Onondaga, which appears to be the remains of a once very extensive basin, have been under State control since 1797. Previous to the opening of the Michigan springs they were the largest in the United States, and they still yield on an average from 7,000,000 to 8,000,000 bushels of salt per annum. Rolling-mills, furnaces, steel-works, glass-works, breweries, and manufactories of barrels, agricultural machinery, and clothing are among the secondary industrial establishments. At the completion of the Erie Canal in 1825

Syracuse had only 300 inhabitants; by 1855 they were 25,107, and in 1860, 1870, and 1880 respectively they numbered 28,119, 43,051, and 51,792; in 1886 the number had risen to 81,000, including some adjacent villages recently annexed.

By some investigators it is believed that Lake Onondaga was De Soto's " silver-bottomed" lake. The great tribal fortress of the Onondagas on the east side of the lake near the spot now occupied by Liverpool was attacked without success by Champlain in 1615. The first house on the site of Syracuse was built in 1805. The

village, to which the name of Syracuse had been given in 1824, was incorporated in 1825, and the city in 1847.

SYR-DARIA (Gr. and Lat. Jawxartes; Arab. Shash or Sthun), a river flowing into the Sea of Aral, and having a length of 1500 miles and a drainage area of about 320,000 square miles. Incertitude as to its source prevailed until the recent occupation of Turkestan by the Russians. It has now been traced to the Naryn, which has its sources in the heart of the Tian-Shan complex, some 30 miles south of Lake Issik-kul, in the elevated valleys or syrts (12,000 feet) on the southern slope of the Terskei Ala-tau. Here under the name of Jaak-tash the river takes its rise amid mountain scenery of the wildest description, partly from the marshy mountain plateaus by which the ' Warm Lake" is also fed, and partly from the immense glaciers of the dark and barren Ak-shiriyak Mountains (Petroff and Sir-tash glaciers). After its union with another mountain stream, the Barskaun, it is called the Taragai, and flows west-south-west at from 11,000 to 10,000 feet above the sea, in'a barren longitudinal valley between the Terskei Ala-tau and the foothills of the lofty Kokshat-tau. On entering a wild narrow gorge driven from west to east through the south-west continuation of the Terskei Mountains (Samatyn-tau) it receives the name of Naryn. Through this gorge it descends by a series of rapids from

the heights of the mountain massif to a deep valley of the alpine region, its level at its issue from the gorge being reduced by fully 4000 feet :

Fort Narynsk, 20 miles below the junction of the Great and the Little Naryn, is only

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6800 feet above the sea. Here the river enters a broad valley—formerly the bottom of an alpine lake—and flows past the ruins of Fort Kurtka, for 90 miles westward, as a stream some 50 yards wide and from 3 to II feet deep. Its waters are utilized for irrigating Kirghiz com. fields, which contrast strangely with the barren aspect of the lofty treeless mountains. The Atpasha—a large mountain stream—joins the Naryn at the head of this valley and the Atabuga at its lower end, both from the left. Before reaching the lowlands, the Naryn crosses three ridges separating the valley of Kurtka from that of Ferghana, by a series of wild gorges and broad valleys (170 miles), representing the bottoms of old lakes; the Togus-torgau, 2000 feet lower than Kurtka, and the Ketmen-tube are both covered with Kirghiz corn-fields. Taking a wide sweep towards the north, the river enters Ferghana—also the bottom of an immense lake—where, after joining the Kara-Daria (Black river) near Namangan, it receives the name of Syr-Daria.2 The Kara-Daria isa mighty stream rising in the north-eastern spurs of the Atai Mountains. As it deflects the Naryn towards the west again, the natives consider it the chief branch of the Syr-Daria, but its volume is much smaller. At the con- fluence the Syr is 1440 feet above sea-level.

The waters of the Syr-Daria and its tributaries are im this part of its course largely absorbed by numberless canals for irrigation. It is to the Syr that Ferghana is indebted for its high, if somewhat exaggerated, repute in Central Asia as a rich garden and granary; cities like Khokand, Marghilan, and Namangan, and more than 800,000 inhabitants of the former khanate of Khokand, live by its waters. Notwithstanding this drain upon it, the Syr could be easily navigated, were it not for the Bigovat rapids at Irdjar, at the lower end of the valley, where the river finds its way to the Aral-Caspian deserts by piercing a depression of the Mogol-tau.

On issuing from this gorge the Syr enters the Aral de- pression, and flows for 850 miles in a north-westerly and northerly direction before reaching the Sea of Aral. On this section it is navigated by steamers. Between the Ird- jar rapids and Baitdyr-turgai (where it bends north) the Syt flows along the base of the mountain ridges which girdle the Tchotkat Mountains (see below) on the north-west, and receives from the longitudinal valleys of these alpine tracts a series of tributaries (the Angren, the Tchirtchik, the Keles), which in their lower courses fertilize the wide plains of loess extending from the right bank of the Syr. These plains and their rich supply of water have been the

I Reduced from Mushketof's "Geological Map of the Turkestan

Basin," in his Turkestan (Russian), 1886, vol. i. ; 2 Syr and daria both signify "river," in two different dialects.

cause of an oasis of Moslem civilization developing between the barren sands of the Aral depression and the mountain tracts of the Tian-Shan. The Angren rises beneath the highest parts of the Tchotkat range, and its valley is the granary of the region. The Tchirtchik has its origin in the Borotday Mountains at the junction of the Tchotkat and the Pskem rivers, and at the point where it issues from the mountains it sends off the famous canal Zakh- aryk; it flows past Tashkend along a valley 20 miles wide, and joins the Syr a few miles below its confluence with the Angren. The Keles comes from the Jity-su Mountains and also brings a

large volume of water for irrigation. But owing to wars and continual insecurity cities formerly important have now been abandoned ; and near T'chinaz, at the mouth of the Tchirtchik, are the ruins of a large town formerly fortified with high walls, and of aryks with manifold ramifications.

Some 50 miles below Tchinaz (770 feet above sea-level) the Syr bends northwards, but resumes its north-westerly course 150 miles farther down, following with remarkable persistency the borders of the loess which fringes the moun- tains. Its low banks, covered with rushes and rendered uninhabitable in summer by clouds of mosquitoes, are in- undated for 20 miles on both sides when the snows begin to melt. These inundations prevent the moving sands of the Kizil-kum desert from approaching the Syr; below Perovsk, however, the steppe gains the upper hand. Down to Perovsk the river rolls its muddy yellow waters, at the rate. of 3 to 5 miles an hour, in a channel 300 to 600 yards wide and 3 to 5 fathoms deep; at Perovsk its vertical section is 8220 square feet, and 312,500 cubic feet of water are discharged per second. The Arys and the Bugufi are the only tributaries worthy of notice on this part of its course; the other streams which descend from the Kara-tau fail to reach the river. The Kungrad Kirghiz rear numerous herds of cattle and sheep in the valley of the Arys, while lower down, as far as Julek, the Igintchis carry on agriculture. All: this applies, of course, only to the right bank; on the left the moistness is absorbed by the hot winds which cross the Kizil-kum sands towards the river. The dryness of the atmosphere makes its influence markedly felt on the Syr when it enters, below Julek, a region where the Kara-kum sands extend on its right. Ten miles below Perovsk the river traverses a marshy depression —the bottom of a lake not yet fully dried up—where it divides into two branches,—the Jaman- daria and the Kara-uzyak. The latter spreads out in marshes and ponds, from which it again issues to join the former at Karmaktchi, after a course of 80 miles. The main branch also, owing to its shallowness and sinu- osity, is very difficult to navigate, and this is increased by the rapidity of the current and the want of fuel. Between Kazalinsk and the Sea of Aral (158 feet) the navigation becomes somewhat easier, except for the last 10 miles, where the river divides into three shallow branches before entering the "Blue Sea." All three

have at their mouths sandy bars with only 3 feet of water, which are often forded by the Kirghiz.

Two former right-hand tributaries of the Syr—the Tchu and the Sary-su—which now disappear in the sands some 60 miles before reaching it, must be mentioned. The Tchu, which is 600 miles in length, rises in the Tian-Shan to the south-west of Lake Issik-kul, and is made up of many streams, of which the Kyz-art, the Juvan-aryk, and the Koshkar are the more important. On their union these form the Koshkar, which flows towards Lake Issik-kul, but a few miles before reaching that lake turns suddenly to the north-west, enters under the name of Tchu the narrow gorge of Buam, and, piercing the snow-clad Kunghei Ala-tau, emerges on its northern slope, having descended from 5500 feet to less than 2000 in a course of not more than 50 miles. In this part of its course it receives from the right the Kebin, whose high valley equals in size that of the upper Rhone. It then flows north-west-

wards through the valley of Pishpek, and, avoiding the Muyun-kum sands, describes a wide curve to the north before finally taking a western direction. Numberless streams flow towards it from the snow-clad Alexandrovsk Mountains, but they are for the most part lost in the sands before reaching it. The Tatas, 170 miles long, formerly an affluent of the Tchu, which rises in the highest parts of that range, pierces the Tcha-archa Mountains, and, flowing past Aulie-ata on the south border of the Muyun-kum, enters the salt lake Kara-kul 60 miles from the Tchu. The Tchu reaches the Saumal-kul group of lakes, 60 miles from the Syr, in the form of marshes with undefined channels. Another elongated group of lakes—the Uzun-kul—near the above and 50 miles from Perovsk, receives the Sary-su, which has a length of nearly 570 miles, and flows rapidly in a narrow channel along the west borders of the northern Famine Steppe (Bekpak-dala).

The delta of the Syr at present begins at Perovsk, whence it sends a branch to the south-west, the Yany-daria (Jany-daria or New river), which formerly reached the south-eastern corner of the Sea of Aral, very near the mouth of the Amu-daria. The Kirghiz affirm that a canal

dug for irrigation by the Karakalpaks gave origin to this river. It had, however, but a temporary existence. A dam erected by the Khokandese at Ak-metchet (Perovsk) caused its disappearance, and the Russians found but a dry bed in 1820. When the dam was removed the Yany-daria again reappeared, but it failed to reach the Sea of Aral; in 18538 it lost itself in Lake Kutchka-denghiz, after a course of 250 miles ; all traces of its bed were then lost in the sand. The Kirghiz legend can only be accepted, however, with very great caution ; the present writer is inclined to think that the canal of the Karakalpaks was merely intended to redirect the waters of the Syr into a channel which existed of old, but had been dried up.! Certain it is that five centuries ago, in the time of Timur, the Yany-daria brought the waters of the Syr to the Dau-kara Lakes, close by the present mouth of the Amu. 'The series of old beds in the Kizil-kum, which are still seen above Perovsk, shows that the Syr had a constant tendency to seek a channel to the south-west and that its present delta is but a vestige of what it was in past times. At a still more remote period this delta probably comprised all the space between the Kara-tau and the Nura-tau ; and in the series of elongated lakes at the base of the Nura-tau—the Tuz-kane and Bogdan-ata Lakes—we see an old branch of the delta of the Syr which probably joined the Zerafshan before reaching the Amu. The causes of this immense change are to be sought for simply in the rapid desiccation of the whole northern and central parts of Asia, due to the fact that we are now living in the later phase of the Lacustrine period, which has followed the Glacial period. The extremely rapid desiccation of the Sea of Aral is proved even by surveys a few decades old, and this process is but a trifle in com- parison with the changes which have taken place during the last five centuries: the extension of the Caspian Sea as far as the Sarakamysh lakes during the Post-Pliocene period and the extension of the Sea of Aral at least 100 miles to the east ofits present banks are both proved by the presence of Post-Pliocene marine deposits. (P. A. K.)-

SYR-DARIA, or Syr-DaRIINsK, a province of Russian Turkestan, in Asia, comprising wide tracts of land on both sides of the Syr-Daria river, from its entrance into the Sea of Aral up to Khojend, where it issues from the mountain region of the Tian-Shan. It is bounded on the

N. by the Russian provinces of Turgai and Akmolinsk, on the E. by Semiryetchensk and Ferghana (ex-khanate of Khokand), on the §. by the district of Zerafshan, Bokhara, and the Russian province of Amu-daria, and on the W. by the Sea of Aral. Its area (166,000 square miles), its population (more than one million inhabitants), and its cities (Tash-kend, Khojend, Jizak, &c.) make it the most important province of Russian Turkestan; and from its position between the mountain region of Central Asia and the great lake of the west Asian depression it is a region of deep interest for the geographer and geologist.

The south-eastern border of the province runs along the lofty Tchotkat Mountains. This chain, which separates the river Tchotkat from the Naryn, and runs for more than 200 miles from south-west to north-east, joining Alexan- drovsk Mountains on the east, raises its snow-clad peaks to an altitude of 14,000 feet. It diminishes in height towards the south, not exceeding 7000 feet in the barren Mogol-tau Mountains, but seems to be continued to the

south-west by the Baisun-tau. A series of shorter chains—

1 For the old beds of the Syr and the Amu, see Kaulbars's '* Lower Parts of the Amu," in Mem. Russ. Geogr. Soc., Phys. Geogr., ix. (1881).

the Tatas Ala-tau, the Bishelik, the Badam Mountains, the Kazyk-urt, and the Atym-tau—fringe the above on the north-west, and occupy the south-east corner of Syr-Dari- insk. The snowclad summits of the Tatas Ala-tau range from 14,000 to 15,000 feet, and immense glaciers occur about Manas Mountain. So far as our maps show, the range seems to run from west-south-west to east-north-east. The other chains just mentioned have a decidedly south-westerly direction, and are much lower, the outlying ranges having rather the character of broad plateaus, above 2000 feet in height, where the Kirghiz find excellent pasture grounds. Some of them, such as the Kazyk-urt, rise as isolated mountains from the steppe, and have therefore been called Ararats. The Kara-tau is quite separate from the preceding and runs at right angles to them—that is, from north-west to south-east. It belongs

therefore to another series of upheavals which prevails in western Asia and to which Richthofen has given the name of the “ Kara-tau series.” Its length is about 270 miles, and its average height about 5000 feet, rising at some points to 6000 and 7000 feet. It separates the Syr-Daria from the Tchu, and its gentle south-western slope contains the sources of a multitude of streams, which water the oasis around the town of Turke- stan. Another range, having the same direction, from north-west to south-east, touches the southern border of Syr-Daria, namely, the Nura-tau (or Nuratyn-tau), also called Turkestan Mountains, which lifts its icy peaks (15,000 to 16,000 feet in height) abruptly from the steppe. It separates Syr-Daria from Zerafshan, and the passes by which it is crossed reach an altitude of from 10,000 to 13,000 feet. Finally, a few islands of metamorphic or granitic rock, called Ararats by the natives, stand isolated in the steppes.

The mountainous tracts occupy, however, only a small part of Syr-Daria ; the rest of its wide surface is steppe. Three different areas must be distinguished,—the Kizil-kum, the Muyun-kum or Ak-kum, and the Kara-kum (“‘‘ black sands,” so called more from their desert character than from their colour). The Kizil-kum (red sands) is the most interesting. These sands occupy the wide stretch between the Amu and the Syr, and have a gradual ascent from 160 feet at the Sea of Aral to 1500 and 2000 feet in the south- cast. They are covered with numerous folds or elongated dunes (barkhans), partly shifting partly stationary, 30 to 60 feet high, and mostly parallel to each other, amidst which are immense spaces covered with clay, and saline clays appear here and there on the surface. The Kizil-kum varies much in its characteristics. Close by the Sea of Aral it is covered with shifting sands, the result of the disintegration of cretaceous sandstones ; and every storm raises clouds of hot sand which render communication excecdingly difficult. But even there a rich verdure covers the undulations in spring. Farther east the sands lose their shifting character, and the barkhans are covered with a kind of Carex, which serves as excellent food for sheep. The Holoxylon Anemodendron grows extensively on the elevated ridges and yields fuel and charcoal, which last is exported to Bokhara. In the west the surface is covered with remains of Aral-Caspian deposits. As the Tian-Shan is approached the steppe takes another character: a

thick covering of loess girdles the foothills and forms the fertile soil to which Turkestan is indebted for its rich fields and gardens.

The Kara-kum sands, situated to the north-east of the Sea of Aral, are manifestly a former bottom of the lake. They are covered with débris of Cardiwm edule, Mytilus, Dreissena polymorpha, Neritina litturata, Adaena vitrea, Hydrobia stagnalis, with remains of marine Algx (Zostera), and with fragments of Seirpus and Phragmites. The Kizil-kum is characterized by the presence of Lithoglyphus caspius, H. stagnalis, Anodonta podervsa, and the sponge Metehnikowia tubereulata. The evil reputation of the Kara-kum has been exaggerated to some extent ; the harsh things said of it apply only to the neighbourhood of the Sea of Aral. In the east the steppe has some vegetation and is readily visited by the Kirghiz. The barkhans do not shift, being covered with Cal- ligonum, Tamarix, Holoxylon Anemodendron, and some rushes ; shifting dunes 40 to 50 feet high occur, especially towards the Sea of Aral. The Muyun-kum or Ak-kum Steppe, between the Kara-tau Mountains and the Tchu, is quite uninhabited, except in the loess region at the northern base of the mountains.

Granites, granilites, syenites, porphyries, and various meta-

? Comp. J. Mushketoff's Turkestan, vol. i.

morphic slates constitute the bulk of the western Tian-Shan Mountains. They appear also in the Kara-tau and Nura-tau, and some- times in the form of isolated islands in the steppe. Silver and lead ores, as well as malachite and copper ore, are found in them, especially in the Mogol-tau, and turquoises about Khojend. The crystalline rocks, much metamorphosed, especially in the west, are overlain b

thick Devonian and Carboniferous deposits. Jurassic rocks (Rhetic) cover sinall areas on the slopes of the mountains. These last are all of fresh-water origin; hence it would seem that throughout the Jurassic and Triassic periods Turkestan was a continent intersected only by

lagoons of the Jurassic sea. The Jurassic deposits are most important on account of their coal-beds, which occur in the basing of the Badam and Sairam and in Ferghana. Chalk and Tertiary marine deposits are superimposed upon the above to the thickness of 2000 to 5000 feet, and are widely spread, although they have suffered greatly from denudation. The former belong to the Upper (Ferghana deposits, much resembling Senonian) and Middle Chalk, and contain phosphorite, gypsum, and naphtha (in the Amu-Daria basin). The Tertiary deposits, which contain gypsum and lignite, are represented by nummulitic sands around the Sea of Aral, and by Oligocene and Miocene (Sarmatic) deposits. In the Tian-Shan the red Tertiary conglomerates (Pliocene ?) attain a great develop- ment. Throughout the Chalk and earlier Tertiary periods the lowlands of Syr-Daria were under the sea. The character of the region during the Post-Pliocene period remains unsettled. To what extent the mountains of the western Tian-Shan were under ice during the Glacial period remains a subject of controversy among geologists ; many deposits, however, have been described, even in the outer parts of mountain tracts, which have a decidedly Glacial character.

The chief river of the province is the Syr-DARia (see above), with its tributaries. The frontier touches the eastern shore of the Sea of Aral, and numerous small lakes, mostly salt, are scattered over the sandy plains. A few lakes of alpine character occur in the valleys of the hilly tracts.

The climate of Syr-Daria varies greatly in its different parts. It is most severe in the high trecless syrts of the mountain region; and in the lowlands it is very hot and dry. As a whole, the western parts of the Tian-Shan receive but little precipitation, and are therefore very poor in forests. In the lowlands the heat of the dry summer is almost insupportable, the thermometer rising to 111° Fahr. in the shade; the winter is severe in the lower parts of the province, where the Syr remains frozen for three months. The average yearly temperature at Tashkend and Kazalinsk respectively is 54° and 44° (January, 28° and 8°; July, 80° and 76°).

The flora and fauna belong to two distinct regions,—to Turke- stan and to the Aral-Caspian depression (see TURKESTAN). The ter- races of loess mentioned above are alone available for culture, and accordingly less than 1 per cent. (0°8) of the total area of the pro- vince is under crops, the remainder being either quite barren (67 per cent. of the surface) or pasture land (42 per cent.). Although cultivation is possible only in a few oases, it is there carried to great perfection owing to a highly developed system of irrigation,— two crops being gathered every year. Wheat and barley come first, then pease, millet, and lentils, which are grown in the autumn. Rye and oats are grown only about Kazalinsk. Cotton is cultivated in the districts of Khojend, Kurama, and Turkestan. Gardening 1s greatly developed. Sericulture is also an important source © income, nearly 85 tons of silk being produced every year. Cattle- breeding is largely pursued, not only by the nomads but also by the settled population, and in 1881 it was estimated that Syr-Daria had 242,000 camels, 396,000 horses, 294,000 horned cattle, and 3,200,000 sheep. Fishing is pursued to some extent on the lower Syr. Timber and firewood are exceedingly dear ; timber is floate down from the mountains, but in small quantities; trees raised 10 gardens, dung, and some coal (the last in very limited quantity) are used for fuel. . ‘ f

The population of the province amounted to 1,109,500 in 1881, 2 whom 146,300 lived in towns, 326,600 were settled, and 621,60 were nomadic. It is comparatively dense in certain parts, ree 15 to 81 inhabitants per square mile in Kurama and Khojend, an still more in the valley of the Tchirtchik. Its ethnographical ge position is very mixed. The Russians barely number 8500, if the military be left out of account ; they live principally in towns an ‘ about Kazalinsk. Kirghiz (709,400 with the Kara-Kirghiz) 7 – Sarts (211,000) are the main elements of the population ; 50, is Tadjiks, 26,000 Uzbegs, 4500 Tatars, about 77,000 a (settled Kirghiz mixed with other elements), and a few be Persians, and Hindus must be added. The chief ocompal the Sarts, Uzbegs, Tadjiks, and Kuramints are agriculture @

SY R—S YR

gardening, while the Kirghiz chiefly lead a nomadic pastoral life. Manufactures are represented by a few distilleries; but a great variety of petty industries are practised in the towns and villages, Trade is carried on very largely.

Syr-Daria is divided into eight districts, the chief towns of which, with their populations in 1881, were—TassHKEND (q.v. (100,000), Aulie-ata (4450), Jizak (8700), Kazalinsk (2950), Khojend (28,000), Perovsk (8400), Tchemkent (8050), and Tchinaz (300). Turkestan or Agret (6700) and Ura-tube (11,000) also deserve mention. (EPARSRGs)

SYRIA. Etymologically, "Syria" is merely an abbre- viation of " Assyria," a name which covered the subject- lands of the Assyrian empire, the subject-peoples being also called "Syrians." Afterwards, in the Graeco-Roman period, the shorter word came to be restricted to the territory west of the Euphrates,—the designation "Syrians," how- ever, being given to the great mass of the Semitic popu- lations dwelling between the Tigris and the Mediterranean, who are more accurately called Aramzans (Gen. x. 22; comp. Semitic Lanovaces, vol, xxi. p. 645 sg.). The present article deals with Syria only in its geographical significance. For a map, see vol. xvi. pl. VIII.

Syria is the designation of the country which extends for about 380 miles (between 36° 5' and 31° N. lat.) along the eastern shore of the Mediterranean ; its eastern limit properly speaking is formed by the middle portion of the course of the Euphrates, but in point of fact it insensibly merges into the steppe country which naturally belongs more or less to Arabia. It is only the oases lying nearest the western border of the steppe (e.g., Aleppo, Palmyra) that can be reckoned as belonging to Syria.1 From time immemorial the land between Egypt and the Euphrates has been the battlefield for the empires of western Asia

jon the one hand and those of Egypt and Africa on the

other. It has also been the territory which the trading caravans of these empires have had to traverse; and by its position on the Mediterranean it has been the medium for transmitting the civilizing influences of the East to the West and again of the West to the East. Hence it is easy to

understand how the peoples of Syria should only in exceptional cases have played an independent part either in politics or in art and science; none the less on that account is their place in history one of the highest interest and importance.

The surface configuration of the country is a uniform one; the mountains for the most part stretch from north to south in parallel ridges, connecting the Cilician Taurus with the Red Sea range. The continuity is broken for short intervals at one or two points. Immediately con- nected with the Cilician Taurus in the north, and forming part of it, is the Alma Dagh (ancient Amanus). At its highest it does not rise much above 6000 feet, but it has an abrupt descent towards the sea, and terminates at its southern extremity in a bold headland, the Ras el-Khanzir. Here the Orontes reaches the sea through a depression in the chain, and the same outlet forms an important pass into the interior of the country. Frequently in ancient times it was only the territory to the south of the lower Orontes valley that was reckoned as constituting Syria. Farther south is the isolated Jebel Akra‘, about 6000 feet high (the Mons Casius of the ancients), which was held sacred by the Pheenicians; still farther to the south are the low Ansairi Hills, which derive their name from the people inhabiting them. Beyond those the Nahr el-Kebir (Eleu-

1 In the cuneiform inscriptions Syria is called Mat Hatti, “the land of the Cheta,” a designation transferred from the north Syrian people of that name (see below) to the region as a whole; Afldt Aharri, the “hinder” or “ western” land, denotes more properly the southern portion, but is also used for the whole. By the Arabs it is called Esh-Shém (more properly Esh-Sha’m), “the land on the left hand, as distinguished from Yemen, “the land on the right”; but the de- signation originally implied a wider region than the Syria defined above, including as it did a portion of Arabia.

therus) falls into the sea, and here north Syria may be held to terminate. To the south of this begins the Lebanon district (see LeBanon, vol. xiv. p. 393); an imaginary line drawn eastwards from a

point a little to the south of Tyre will represent the southern boundary of what may be designated as middle Syria. Occasionally Syria is spoken of in a narrow sense, as distinguished from Palestine; but there is no scientific ground for such a practice, for the mountains of PALESTINE (q.v.), the southern third of Syria, can be described as a southward continuation of the mountain masses already referred to, and cis-Jordanic as well as trans-Jordanic Palestine is simply a portion of Syria. Indeed the district as far as Sinai can be spoken of as a fourth division of the same country. A glance at a geological map reveals this very clearly. Cretaceous limestone constitutes the bulk of the hills and plateaus of Syria, and extends towards Sinai, where the zone of primitive rocks is reached. In the south of Palestine, nummulitic limestone and Nubian sandstone make their appearance from Sinai and northern Arabia. In addition to these, alluvial soils are principally met with. In middle Syria especially, eastwards from the upper course of the Jordan, great basaltic masses occur ; in the Hauran (comp. BasHan, vol. iii, p. 410) there are basalt peaks nearly 6000 feet in height. The basalt mountains are often much broken up so as to be quite inaccessible (Harra); but the basalt when decomposed forms the best of arable soils. It is only in isolated cases that the igneous formation ex- tends into western Syria. The tableland to the east of the principal mountain chains consists partly of good clay soil; the steppe (bddiyet esh-sham, also called hamdd), which has an average elevation of about 1800 feet, ex- tends towards the Euphrates with a gradual slope.

the mountains. The chief river of Syria in the narrower sense is the Orontes (Arabic E/-‘Asi), which rises in the Beka‘, the mountain valley between Libanus and Antilibanus, and follows a northerly course. At Antioch, where it is augmented by the stream whieh flows from the great lake of Ak Deniz, it turns westwards, falling into the sea near the ancient Seleucia, Not far from the source of the Orontes is that of the Litani (formerly Lita), which runs south- wards through the Beka‘, and afterwards westwards through a deep gorge of its own excavation, having its mouth a little to the north of Tyre; in its lower course it bears the name of El-Kasimiye. The principal river of south Syria is the Jorpan (q.v.). Like it, most of the other streams of Syria rising on the

eastern side of the water- shed terminate in inland lakes. Of these may be named the El-A‘waj and the Barada (Pharpar and Abana) of Damascus, which lose themselves in the lakes and marshes to the east of the city. In like manner the river of Aleppo falls into the lake El-Math. The ‘Afrina (Ufrenus of the ancients) falls into the Ak Deniz lake, and so into the Orontes; the Sadjtr is a tributary of the Kuphrates. Other lakes are the great salt lake to the south-east of Aleppo and the remarkable lake near Homs, in the neighbourhood of which the ruins of the old Hittite city of Kadesh have recently been discovered. The coastal streams have been enumerated under LEBANON and

PALESTINE (q.¥.).

Two distinct floral regions meet in Syria (comp. LEBANON). That Vegeta- of the coast is Mediterranean, and is charaeterized by a number of tion.

evergreen shrubs, with small leathery leaves, and of quickly flower- ing spring plants. On the coast of Pheenicia (comp. vol. xviii. p- 801) and southwards towards Egypt more southern forms of the same vegetation occur, as, for example, Ficus Sycomorus, and especially date-palms. This region is separated from the easterly one, that of the steppe flora, by the ridge of Lebanon and the mountains of Palestine. It is distinguished by the variety of its speeies, by the dry and thorny eharaeter of its shrubs, and by its marked poverty in trees. The Jordan valley has on account of its low level a sub-tropical character. As regards cultivated species, Syria is the home of the olive tree, which, like the vine, is found in all parts; but the white mulberry for silk is limited to a small district. Syria is throughout far from unfertile ; the district of the Hauran is one magnificent corn-field, while the orehard land about Damascus is renowned far and wide. In former times, how- ever, cultivation was carried on with much greater zeal, and the arrangements for irrigation—a necessity everywhere, especially on the side bordering on the steppe—were much more considerable and more carefully seen to. The numerous ruins on the lands at

The direction of the principal valleys is determined by that of Rivers.

Climate.

Ancient Syrians,

Rela- tions with ancient

Egypt.

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present under cultivation and still more on those to the east of them indicate that the limits of agriculture were once more exten- sive and the population much denser than at present. During the Roman period frontier fortresses on the edge of the steppe served to check the rapacity and barbarizing influence of the Bedouin hordes. ;

Syria presents great diversities of climate. The mountains, though sometimes not absolutely very high, arrest the west winds blowing from the Mediterranean, so that the atmospheric precipita- tion is much greater on the western than on the eastern slopes. Hence the springs on the eastern versant are fewer, and cultivation is therefore confined to isolated areas resembling oases. The rainfall drains off with great rapidity, the beds of the streams soon drying up again. Within historic times the climate, and with it the productivity of the country, cannot have greatly changed ; at most the precipitation may have been greater, the area under wood having been more extensive. Except for J erusalem, we have hardly any accurate meteorological observations ; there the mean annual temperature is about 63° Fahr.; in Beyrout it is about 68°. The rainfall in Jerusalem is 36-22 inches, in Beyrout 21°66. The heat at Damascus and Aleppo is great, the cooling winds being kept off by the mountains. Frost and snow are occasionally experienced among the mountains and on the inland plateaus, but never along the coast. Even the steppe exhibits great contrasts of temperature ; there the rainfall is slight and the air exceed- ingly exhilarating and healthy. The sky is continuously cloudless from the beginning of May till about the end of October ; during the summer months the nights as a rule are dewy, except in the desert. Rain is brought by the west wind ; the north-west wind, which blows often, moderates the heat. On the other

hand, an ozoneless east wind (sirocco) is occasionally experienced—especially during the second half of May and before the beginning of the rainy season—which parches up everything and has a prejudicial influence on both animal and vegetable life. On the whole the climate of Syria—if the Jordan valley and the moister districts are excepted —is not unhealthy, though intermittent fevers are not uncommon in some places.

Of the political relations of Syria in ancient times we know but little. Each town with its surrounding district seems to have con- stituted a small separate state; the conduct of affairs naturally devolved upon the noble families. At a very early period—as early probably as the 15th century z.c.—Syria became the meeting- place of Egyptian and Babylonian elements, resulting in a type of western Asiatic culture peculiar to itself, which through the com- merce of the Pheenicians was carried to the western lands of the Mediterranean basin. Industry especially attained a high state of development ; rich garments were embroidered and glass and the like were manufactured. The extant inventories of spoil carried off by the ancient conquerors include a variety of utensils and stuffs. The influence exercised at all times on Syrian art by the powerful neighbouring states is abundantly confirmed by all the recent finds. The Syrians were more original in what related to religion : every place, every tribe, had its "lord" (Ba'al) and its "lady" (Ba'alat) ; the latter is generally called 'Ashtar or 'Ashtaret. Besides the local Baal there were "the god of heaven" (El) and other deities ; human sacrifices as a means of propitiating the divine wrath were not uncommon. But in the Syrian mythology forcign influences frequently betray themselves. Over against its want of originality must be set the fact, not merely that Syrian culture spread ex- tensively towards the west, but that the Syrians (as is shown by recently discovered inscriptions) long before the Christian era exercised over the northern Arabs a perceptible influence, which afterwards, about the beginning of the 1st century, became much stronger through the kingdom of the Nabateans, The art of writing was derived by the Arabs from the Syrians.

Something about the ancient political and geographical relations of Syria can be gleaned from Egyptian sources, especially in con- nexion with the campaigns of Thothmes III. in western Asia. The Egyptians designated their Eastern neighbours collectively as ‘Amu. Syria up to and beyond the Euphrates is called more pre- cisely Sahi (or Zahi), and is regarded as consisting of the following parts :—(1) Rutenn, practically the same as Palestine (occasionally Palestine with Ccelesyria is called Upper Rutenu, as distinguished from Lower Rutenu extending to the Euphrates) ; (2) the land of the Cheta (sometimes reckoned as belenging to Rutenu), with Kadesh on the Orontes as its capital ; (3) Naharina, the land on both sides of the Euphrates (extending, strictly speaking, beyond the Syrian limits); (4) Kaftu, the coast land of the Pheenicians (Fenchu), along with Cyprus. The Canaanites in general are called Charu. From these lands the Egyptian kings often derived rich booty, so that in those days Syria must have been civilized and prosperous. Moreover, we possess enumerations of towns in the geographical lists of the temple of Karnak and in a hieratic papyrus dating about 200 years after Thothmes III. Some of these names can be readily identified, such as Aleppo, Kadesh, Sidon, and the like, as well as many in Palestine. These materials, however, do not enable us to form even a moderately clear conception of the

condition of the country at that time. It is certain that most of

the cities are of very great antiquity. It appears that the Cheta Cheta very probably were a non-Semitic people and that their power for ; a time extended far beyond the Syrian limits. Their inscriptions have not yet been deciphered with certainty. Within Syria their kingdom extended westwards from the middle course of the En. phrates to the neighbourhood of Hamath ; their capital appears to have been Carchemish. The most prevalent opinion identifies Carchemish with Jerabis on the Euphrates, an identification which

is favoured by the recent discovery of important “ Hittite” monn. ments at the place. Before then the so-called “ Hamath stones” were the most important inscriptions of the Cheta we possessed,

but numerous others, as well as various other remains, are now at

our command, and show that the influence of the powerful Cheta kingdom extended far into Asia Minor (compare HittitEs). The kingdom disappeared at an early date, but some of the minor Cheta states continued to subsist down to the 12th century B.C,

Next to the Cheta the Arameans were the people who held the Arame. most important towns of Syria, gradually advancing until at last ans, they occupied the whole country. Of the Aramean stocks named in Gen. x. 23, xxii. 21 sg., very little is known, but it is certain that Arameans at an early period had their abode close on the northern border of Palestine (in Maachah). A great part was played in the history of Isracl by the state of Aram Dammesek, t.é., the territory of the ancient city of Damascus (see vol. vi. p, 790) ; it was brought into subjection for a short time under David. The main object of the century-long dispute between the two king- doms was the possession of the land to the east of the Jordan (Hauran, and especially Gilead). Another Aramean state often mentioned in the Bible is that of Aram Zobah. That Zobah was situated within Syria is certain, though how far to the west or north of Damascus is not known ; in any case it was not far from Hamath. MHamath in the valley of the Orontes, at the mouth of the Beka‘ valley, was from an early period one of the most important places in Syria; according to the Bible, its original inhabitants were Canaanites. The district belonging to it, including amongst other — places Riblah (of importance on account of its situation), was not very extensive. In 733 B.c. Tiglath-Pileser Il. compassed the overthrow of the kingdom of Damascus ; he also took Arpad (Tell Arfad), an important place three hours to the north of Aleppo. Hamath was taken by Sargon in 720. Henceforward the petty states of Syria were at all times subject to one or other of the great world-empires, even if in some cases a certain degree of in- dependence was prescrved.

The foundation of numerous Greek cities shortly after Alexander’s Greek ; time was of great importance for Syria; ANTIOCH (g.v.), founded period, about 300 B.c. by Seleucus, became the capital of the Syrian kingdom of the Seleucide. Among other influential Greek towns were Apamea on the Orontes and Laodicea. The Seleucide had severe

struggles with the Ptolemies for the possession of the south- k ern part of Syria (comp. IsRaEL, vol. xiii. p. 420). §

After having been reckoned for a short time (from 83 to 69 B.¢.) Under among the dominions of Tigranes, king of Armenia, the country Roman was conquered for the Romans by Pompey (64-63 B.c.). It is sway. impossible here to follow in detail the numerous changes in the distribution of the territory and the gradual disappearance of particular dynasties which maintained a footing for some time longer in Chalcis, Abila, Emesa, and Palestine ; but it is of special interest to note that the kingdom of the Arab Nabateans (comp. vol. xvii. p. 160) was able to subsist for a considerable period towards the north as far as Damascus. In the year 40 B.c. Syria had to endure a sudden but brief invasion by the Parthians The country soon became one of the most important provinces of the Roman empire; its proconsulship was from the first regarded as the most desirable, and this eminence became still more marked afterwards. Antioch, adorned with many sumptuous buildings, as the chief town of the provinces of Asia, became in point of size the third city of the empire; its port was Seleucia, surnamed Pieria. The high degree of civilization then prevailing in the country is proved by its architectural remains dating from the carly Christian centuries; the investigations of De Vogué have shown that from the Ist to the 7th century there prevailed in north Syria and the Hauran a special style of architecture, —partly no doubt following Greco-Roman models, but also showing a great deal of originality in details. ‘ wi

The administrative divisions of Syria during the Roman period es varied greatly at different times; subjoined is an enumeration of divis them as they existed at the beginning of the 5th century. (1) Syria Euphratensis, which had for its capital Hierapolis (Syr. Mabég; Arab. Mambidj; Gr. BayBixn). The kingdom of Com- magene, beyond the limits of Syria, belonged to Syria Euphra- tensis ; its capital was Samosata, at the point where the Euphrates leaves the mountains, and it had other important towns on_ that river, such as Europus (the modern Barbalissus), (2) Syria L, or Ceelesyria, haying Antioch as its capital. The name Ccelesyria (4 Kowkh Zupla) originally, no doubt,

was applied to the valley between Libanus and Antilibanus, but was afterwards extended

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to the district stretching eastwards from the latter range. . (3) Syria II., or Syria Salutaris, with Apamea (Arab. Famtya, the modern Kal‘at el-Mudik) on the Orontes as capital. (4) Phenice Maritima; capital, Tyre. (5) Pheenice ad Libanum; capital, Emesa (Hims). To this division Damascus and Palmyra belonged ; occa- sionally they were reckoned to Coelesyria, the middle strip of coast being designated Syrophenicia. (6, 7, 8) Palestina I., II., and III. For these, which from the time of Vespasian had governors of their own, see vol. xvill. p. 177. (9) Arabia (capital, Bostra), which embraced all the region from the Hauran to the Arnon, and skirted the Jordan valley, stretching southwards to Petra. Through the kingdom of the Nabateans Roman influence pene- trated from Syria far into northern Arabia.

In 616 Syria was subjugated for a bricf period by the Persian Chosroes II. ; from 622 till 628 it was again Byzantine ; 636 and the immediately following years saw its conquest by the Moham- medans (see MOHAMMEDANISM, Vol. xviii. p. 562). Mo‘Awija, the first Ommayad caliph, chose Damascus for his residence ; but in 750 the capital of the empire was removed by the ‘Abbasids to Baghdad. Under the early caliphs the Arabs divided Syria into the following military districts (gonds). (1) Filistin (Palestine), consisting of Juda, Samaria, and a portion of the territory east of Jordan; its capital was Ramleh, Jerusalem ranking next. (2) Urdun (Jordan), of which the capital was Tabariye (Tiberias) ; roughly speaking, it consisted of the rest of Palestine as far as Tyre. (3) Damascus, a district which included Baalbec, Tripoli, and Beyrout, and also the Hauran. (4) Hims, including Hamath.

(5) Kinnasrin, corresponding to northern Syria; the capital at

first was Kinnasrin to the south of Haleb (Aleppo), by which it was afterwards superseded. (6) The sixth district was the military frontier (‘awdsim) bordering upon the Byzantine dominions in Asia Minor. The struggles of the Mohammedan dynasties for the possession of Syria cannot be gone into here ; suffice it to say that throughout their course the country still enjoyed a considerable

, degree of prosperity.

_ In the crusading period the kingdom of Jerusalem, whose rulers were never able to establish a foothold to the east of the Jordan, extended northwards to Beyrout; next it was the countship of | Tripoli on the coast; and beyond that in north Syria was the | principality of Antioch. Syria suffered severely from the Mongol Invasions (1260), and it never recovered its former prosperity. In 1516 the Ottomans took it from the Egyptian Mamelnkes. Under

\ the Turks its administrative divisions again varied at different

times ; out of the five pashalics of Aleppo, Tripoli, Damascus,

| Sidon (later ‘Akka), and Jerusalem two vilayets were subsequently

formed, having their capitals at Aleppo and Damascus. Quite recently south Palestine has been made a separate vilayet from | that of Damascus.

Rude stone monuments (circles and dolmeus) and other prehistoric remains show that Syria must have been inhabited from a very early period. Within historic times a great number of different nation- alities have fought and settled within its borders, the majority

) belonging to the Semitic stock. This last circumstance has ren-

dered possible a considerable degree of fidelity in the tradition of the oldest local names. After the Arameans had absorbed what remained of

the earlier population, they themselves were very powerfully influenced by Greco-Roman civilization, but as a people

| they still retained their Aramean speech. At present an Aramaic } dialect largely mixed with Arabic is spoken in three villages on

the eastern slope of Antilibanus (in Ma‘lila, Bakh‘a, and Jub‘adin), but this small survival is on the point of disappearing. Through- out the whole country elsewhere the language spoken is Arabic, | but with Aramaic elements, especially in the language of the pea- sants. Ethnographically the Aramaic element of the population admits of being distinguished from the Arabic type ; it is specially | strong in the mountain districts. The majority of the Christians J dwelling in Syria may be regarded as representatives of the } Aramean race. No traces of the earlier races, such as the Canaanites }or Phoenicians, can any longer be distinguished ; and every trace jof the presence of Greeks, Romans, and Franks has completely disappeared. ome | In the Arab immigration, two principal types are to be distin- | guished,—the pure Arab type of the nomad tribes (Bedouins) and | the type of the sedentary town Arabs and peasants, which shows an jintermixture of foreign and older elements. The two confront cach jother in sharp contrasts. Bedouin tribes are scattered throughout the whole country ; despising agriculture and the settled life, they are found with their camels, sheep, and goats on the borders of the territories appropriated by the peasants. Being more or less inde- pendent of the Government, especially in the district bordering on the steppe, they are able to exact black mail from their sedentary jbrethren. T’axed thus on both hands, the life of the peasant is economically far from an easy one ; hencc it should be the duty of Government to restrain the influence of the nomads and to force them as far as possible to form fixed settlements. In this respect the policy of the Turks during the 19th century to ensure the safety of the peasants and of travellers has been on the whole

back from Europe.

successful. In the districts bordering on the coast there are no large nomadic tribes, and on the higher plateaus of the cultivated land the power of the Bedouins is much reduced ; but south of Palestine and everywhere on the edge of the steppe they continue "Tauch as before. The most. powerful tribe of the Syrian desert is that of the 'Aneze, falling into numerous subdivisions, of which the Ruwala, Wuld 'Ali, Hesene, and Bischer may be mentioned. The tribe, estimated to number 300,000 in all, extends far into Arabia and reaches the Euphrates. The other Bedouin tribes of Syria have for the most part tolerably definite and circumscribed territories. East of the Jordan the best known are the 'Adwin on the Balka and the Bani Sakhr in Moab. The Bedouins to the south of the Dead Sea are called Ahl el-Kibli ("the people of the south") in contradistinction to those of the north (Ahl esh-Shema]). Finally, there occur sporadically in central and northern Syria nomadic Turkish tribes. Gipsy hordes are also met with in ¢con- siderable numbers.

_The religious as well as the ethnographical types are strongly divergent. The bulk of the population are Mohammedan ; the Bedouins have not much religion of any kind, but they profess Islam. Besides orthodox Moslems there are also Shi'ite sects, such as that of the Metawile (especially in northern Palestine), as well as a number of religious communities whose doctrine, combining philosophical and Christian with Mohammedan elements, is the outcome of the process of fermentation that characterized the first centuries of Islam. To this last class belong the Ishmaelites, Nosairians, and especially the Drusss (q.v.). In many cases it is obvious that the political antipathy of natives against the Arabs has found expression in the formation of such sects. The Nosairians, for instance, and no doubt the Druses also, were originally survivals of the Syrian population. The Jews are found exclusively in the larger centres of population ; in every case they have immigrated The Christians are an important element, con- stituting probably as much as a fifth of the whole population ; the majority of them belong to the Orthodox Greek Church, which has two patriarchs in Syria, at Antioch and Jerusalem. Catholics— United Greeks, United Syrians, and Maronites—are numerous. The mission of the American Presbyterian Church, which has had its centre in Beyrout for the last

sixty years, has done much for Syria, especially in the spread of popular education; numerous publications issue from its press, and its medical school has been extremely beneficial. The Catholic mission has done very good work in what relates to schools, institutes, and the diffusion of literature. The Christians constitute the educated portion of the Syrian people ; but the spirit of rivalry is producing stimulative effects on the Mohammedans, who have greatly fallen away from that zcal for knowledge which characterized the earlier centuries of their faith.

Accurate statistics of any kind for Syria cannot be had; even the area of the land under cultivation is unknown. The returns of population are, according to the Turkish official documents, only approximations. The total population may safely be put at less than 2,000,000 ; an official estimate in 1872-73 gave 1,365,680, of whom 976,322 were Mohammedans. Probably, however, this Was an under-estimate. Reclus (Nowv. Géogr. Univ., Paris, 1884) gives the area of Syria as 183,000 square kilométres (70,638 square miles) and the population as 1,450,000.

From the Egyptian and Assyrio-Babylonian monuments we learn that in ancient times one of the principal exports of Syria was timber; this has now entirely ceased. But it continues to export wheat, and with good roads the amount could be very largely in- ereased. Other articles of export are silk cocoons, wool, hides, sponges, and fruits (almonds, raisins, and the like); the amounts of cotton, tobacco, and wine sent out of the country are small. The only good harbours are those of Beyrout and Alexandretta (Scan- deroon). The caravan trade with the Kast has almost entirely ceased, and the great trade routes from Damascus northwards to Aleppo and eastwards through the wilderness arc quite abandoned. The traffic with Arabia has ceased to be important, being limited to the time of the going and returning of the great pilgrim caravan to Mecca, which continues to have its mustering-place at Damascus. The native industries in silk, cotton, and wool have been almost entirely destroyed by the import trade from Europe. The land is poor in minerals, including coal; water-power also is deficient, so that the introduction of European industries is attended with difficulties

even apart from the insecurity of affairs, which forbids such experiments as the improvement of agriculture by means of European capital. As regards the cultivation of the soil Syria remains stable; but the soil is becoming relatively poorer, the

value of the imports constantly gaining upon that of the exports. Literature.—Ritter, Erdkunde von Asien, vol. xvii., parts 1 and 2, Berlin, 1854-55 ; Burekhardt, Travels in Syria and the Holy Land, London, 1822; Lortet, La Syrie @aujourdhut, Paris, 1884; Baedeker, Palestine and Syria; Murray's Syria and Palestine; Porter, Five Years in Damascus, 2 vols., London, 1855 ; Burton and Drake, Unexplored Syria, 2 vols., London, 1872; A. v. Kremer, Mittelsyrien u. Damascus, Vienna, 1853. For the art history of Syria De Vogué's Syrie Centrale: architecture civile et religieuse du ler au 7me siécle (Paris, 1865- 77) may be consulted, and on its trade Zwiedineck v. Siidenhorst, Syrien u. seine Bedeutung fiir den Welthandel, Vienna, 1873. (A. SO.)

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Area and

popu-~ lation.

Com- merce and in- dustry.

Péshitta.

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SYRIAC LITERATURE

HE literature of Syria, as known to us at the present day, is, with the exception of translations from the Greek and some other languages, a Christian literature. The writings of the Syrian heathens, such as the so-called Sabians (see SABrans) of Harran, which were extant, at least in part, even in the 13th century,! seem to have now wholly disappeared. The beginnings of this literature are lost in the darkness of the earliest ages of Christianity. It was at its best from the 4th to the

8th century, and then gradually died away, though it kept up a flickering exist- ence till the 14th century or even later. We must own — and it is well to make the confession at the outset— that the literature of Syria is, on the whole, not an attract- ive one. As Renan said long ago,? the characteristic of the Syrians is a certain mediocrity. They shone neither in war, nor in the arts, nor in science. They altogether lacked the poetic fire of the older—we purposely emphasize the word— the older Hebrews and of the Arabs. But they were apt enough as pupils of the Greeks ; they assimilated and reproduced, adding little or nothing of their own. There was no Al-Farabi, no Ibn Sina, no Ibn Rushd, in the cloisters of Edessa, Ken-neshré, or Nisibis. Yet to the Syrians belongs the merit of having passed on the lore of ancient Greece to the Arabs, and therefore, as a matter of history, their literature must always possess a certain amount of interest in the eyes of the modern student. The Syrian Church never produced men who rose to the level of a Eusebius, a Gregory Nazianzen, a Basil, and a Chrysostom ; but we may still be thankful to the plodding diligence which has preserved for us in fairly good trans- lations many valuable works of Greek fathers which would otherwise have been lost. And even Syria's humble chroni- clers, such as John of Ephesus, Dionysius of Tell-Mahré, and Bar-Hebreeus, deserve their meed of praise, seeing that, without their guidance, we should have known far less than we now know about the history of two important branches of the Eastern Church, besides losing much in- teresting information as to the political events of the periods with which their annals are occupied.

As Syriac litcrature commences with the Bible, we first briefly enumerate the different versions of Holy Scripture.

The most important of these is the so-called Péshitta (mappakta peshitta), "the simple" or "plain version," the Syriac vulgate. This name is in use as early as the 9th or 10th century.3 As to the Old Testament, neither the exact time nor place of its transla- tion is known; indeed, from certain differences of style and manner in its several parts, we may rather suppose it to be the work of different hands, extending over a considerable period of time. It would seem, however, as a whole, to have been a product of the 2d century, and not

improbably a monument of the learning and zeal of the Christians of Edessa. Possibly Jewish converts, or even Jews, took a part in it, for some books (such as the Pentateuch and Job) are very literally rendered, whereas the coincidences with the LXX. (which are particularly numerous in the prophetical books) show the hand of Christian translators or revisers. That Jews should have had at any rate a consultative share in this work need not surprise us, when we remember that Syrian fathers, such as Aphraates, in the middle of the 4th century, and Jacob of Edessa, in the latter half of the 7th, had frequent recourse, like Jerome, to the scholars of the synagogue. 'To what extent subsequent revision may have been carried it is not easy to say; but it seems tolerably certain that alterations were made from time to time with a view to harmonizing the Syriac text with that of the LXX. Such an opportunity may, for instance, have been afforded on a consider- able scale by the adoption of Lucian's text of the LXX. at Antioch in the beginning of the 4th century (see SEPTUAGINT, Vol. xxi. p- 669). On all these points, however, we know nothing for

1 Bar-Hebreus, Chron. Syr., ed. Bruns and Kirsch, p. 176 ; Chwol-sohn, Ssabier und Ssabismus, i. 177.

2 De Philosophia Peripatetica apud Syros, 1852, p. 3.

3 See the passage of Moses bar Képha, who died in 903, cited by the

Abbé Martin in his Introduction a la Critique Textuelle du Nouveau Testament, p. 101, note.

certain, and may well repeat the words of Theodore of Mopsuestia in his commentary on Zephaniah i. 64: Aputvevra de Tara els pey Tiv Zipwy wap' brov 6% wore' obde yap &yvwaorar péxp. Tis THMEpov bars Tore ovros éorly.

The canonical books of the Old Testament according to the Canonical Péshitta are substantially those of the Hebrew Bible. In the books of Massoretic MSS. (see below), whether Nestorian or J acobite, the Old Tes. books of Chronicles, Ezra, and Nehemiah are passed over, and in tament the Nestorian the book of Esther also. But, on the other hand,it

must be noticed that all these books are cited by Aphraates, and that they all appear in the Codex Ambrosianus. Of the Chronicles there is a MS. of the 6th century in the British Museum, Add, 17104. Esther appears in a volume of equal age (Add. 14652) as one of the constituent parts of the " Book of Women," the others being Ruth, Susanna, Judith, and the history of Thecla, the dis. ciple of St Paul, which last is excluded from Biblical MSS. The oldest dated MS. of any portion of the Old Testament at present known to us is Add. 14425 in the British Museum (Gen., Exod., Num., Deut.), transcribed at Amid by a deacon named John in 464, The deutero-canonical books or apocrypha, translated by differ- Apo- ent hands from the Greek,® are nearly the same as in the LXX.6 erypha, The Codex Ambrosianus,' for example, contains Wisdom, the Epistle of Jeremiah, and two Epistles of Baruch ; the Song of the Three Children, Bel and the Dragon, and Susanna ; Judith, Siracides or Ecclesiasticus ; the Apocalypse of Baruch; the fourth book of Esdras ; and five books of the Maccabees, the fourth being the history of Samona and her sons, and the fifth Josephi de Bello Judaico lib. vi.8 To these must be added from other MSS. the first or third book of Esdras, the book of Tobit, and the prayer of Manasses,

Of the first book of the Maccabees two recensions are extant, as far as chap. xiv. 24. The book of Tobit presents the text of the LXX. as far as chap. vii. 11.9

The canonical books of the New Testament are the four Gospels, Canot- the Acts of the Apostles (to which are annexed the three catholic ical epistles, viz., James, 1 Peter, and 1 Johu), and the fourteen epistles books of of St Paul. The shorter apostolic epistles, viz., 2 and 3 John, 2 NewTes- Peter, and Jude, and the Apocalypse of St John, were rejected by tament. the early Syrian Church.!°

As to the Péshitta version of the Gospels (P), a variety of critical Tatian's questions arise when we consider it in connexion with two other Dia works, the Dia-tessarén of Tatian (T) and the Curetonian Gospels tessarin (Sc).11 Tatian, the friend of Justin Martyr, afterwards counted a and the heretic, composed out of the four Gospels a work which received Cureton- the title of Td dia reccdpw edaryyédov, in

Syriac more briefly ian Dia -tessarén, or Evangelion da-Méhallétz, “the Gospel of the Gospels. Mixed.” It is a subject of controversy whether Tatian wrote this work in Greek or in Syriac, and whether he compiled it from the Greek Gospels or from a previous Syriac version. According to Zahn™ and Baethgen,™ the author’s language was Syriac, his sources Greek. They hold that this was the only Gospel in use in the Syrian Church for nearly a century, but that about the year 250, under the influence of Western MSS. of the Greek

4 Mai, Patrum Nova Bibliotheca, vol. vii. 252.

5 Some scholars, such as P. de Lagarde and Bickell, think that Ecclesiasticus was translated from the lost Hebrew text.

8 See Ceriani, Monumenta Sacra et Profana, vol. i. fasce. 1, 2; vol. v. fascc. 1, 2; P. de Lagarde, Libri Vet. Test. Apocryphi Syriace.

7 Splendidly reproduced at Milan by the process of photo-lithography under the direction of the Rev. Dr A. M. Ceriani, 5 parts, 1876 foll.

8 See Das 6te Buch d. Bellum Judaicum iibersetat u. kritisch bearbeitel, by Dr H. Kottek, Berlin, 1886; only capp. 1 and 2.

° See the Syriac note on p. xii. of De Lagarde’s edition, 4

10 The principal editions of the Péshitta are contained in the Paris polyglott of Le Jay and the London polyglott of Walton, to which latter is attached the immortal Lexicon Heptaglotton of Edmund Castell. The Old Testament (without the apocrypha) was edited by 8. Lee in 1823 for the Bible Society, and is frequently bound up with the New Testament of 1826. The first edition of the New Testament was that of J. A. Widmanstad, with the help of Moses of Mardin (Vienna, 1556). Those of Tremellius (1569), Trost (1621), Gutbir (1664), and Leusden and Schaaf (1708, 1717) are well known. To the last named belongs Schaaf’s admirable Lexicon Syriacum Concordantiale. The American missionaries at Urimiyah have published both the Old and New Testaments in ancient and modern Syriac, the former in 1852, the latter in 1846. ‘ .

11 Remains of a very Antient Recension of the Four Gospels in Syriat, hitherto unknown in Europe, discovered, edited, and translated by W. Cureton, D.D., F.RS., 1858.

2 Forschungen zur Geschichte des neutestamentlichen Kanons, &¢., 1 Theil: Tatian's Diatessaron, pp. 98, 99. :

13 Tvangelienfragmente. Der griechische Text des Cureton schen Syrers wiederhergestellt, 1885,

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text (see Westcott and Hort, The New Testament in the Original Greek, Introd., §§ 118, 214), a version of "the Separate Gospels," Evangelion da-Mépharréshé, was introduced! The translator, ac- cording to Baethgen,? made use of T as far as he could; and of this text Sc is, in the opinion of these scholars, the solitary sur- vival in our days. The evidence for this view does not, however, appear to be conclusive. It seems that a Syriac version of the four Gospels, as well as of the other parts of the New Testament, must have existed in the 2d century, perhaps even before the version of the Old Testament. From this Tatian may have com- piled his Dia-tessarén, or he may have written that work in Greek and others may have done it into Syriac. Be that as it may, T certainly gained great popularity in the carly Syrian Church, and almost superseded the Separate Gospels. Aphraates quoted

Addai or Addeus (in its present shape a work of the latter half of the 4th century) transfers it to the apostolic times®; Rabbala, bishop of Edessa (411-435), promulgated an order that 'the priests and deacons should take care that in every church there should be a copy of the Separate Gospels (Evangelion da-Mépharréshé), and that it should be read''®; and Theodoret, bishop of Cyrrhus (423-457), swept up more than two hundred copies of it in the churches of his diocese, and introduced the four Gospels in their place: 7a ray rerrdpwr ebayyedicTay avTeoiyayor evayyéda."? The result of these and similar well meant efforts is that not a single copy of T has come down to our times.8 Both Aphraates and Ephraim, however, madc use of the Separate Gospels. The former seems to have employed a text which

Baethgen calls a slightly reviscd form of Sc (op. ctt., p. 95); we would rather speak of it as a revised form of the old Syriac Gospels of the 2d century. The latter made use of a more thorough Edessene revision, closely approaching in form to, if not identical with, P (Baethgen, p. 95; Zahn, p. 63). Our oldest MSS. of P are, however, more than a hundred years later than Ephraim's time. We eannot, therefore, expect very important textual results from the collation of even such MSS. as Add. 14470, 14453, 14459, ff. 1-66, and 17117, in _ the British Museum, all of which may be safely ascribed to the _ latter part of the 5th or the beginning of the 6th century. Early

in the 5th century Rabbala, bishop of Edessa, the friend and | correspondent of Cyril of Alexandria, occupied himself with " trans- _ lating the New Testament out of the Greek into the Syriac, because of its variations, exactly as it was."® This probably means, as _has been suggested by Nestle, that Rabbila undertook a revision _ of the Syriac text according to a Greek MS. or MSS. in his posses-

sion, that is to say, still further assimilated P of that day to a _ Greek (possibly, from his eonnexion with Cyril, Alexandrian) text.

We do not as yet know, however, whether this revision was merely | 4 private effort, or what influence, if any, it exercised on the history » of P; more likely it was a first step in the direction of the Philoxen-

jan version (see below). The result of these successive revisions | as regards Sc has been that it survives in but one mutilated codex,

and that written at comparatively so late a date as 450-470,1°—a) phenomenon which has its parallel in the case of the Itala codex c | of the Gospels, copied in the llth century. The greater part of this volume is in the British Museum (Add. 14451)"; but there are _ three leaves of it in the royal library at Berlin, forming the fly- | leaves of the MS, marked Orient. Quart. 528.12 Crowfoot's attempt

- **I Zahn, op. cit., pp. 104-106. 2 Op. cit., pp. 59, 60, 72 sq. 3 Wright's edition, p. owes 1.10, "as it is written at the head of the Gospel**

| of our Lifegiver, In the beginning was the Word.”

| 4 Nowextant only in the old Armenian version, translated by the Mechitarist » Aucher, and revised by G. Mésinger under the title of Evangelit Concordantis | | Lxpositio facta a S. Ephraemo, Venice, 1876.

| 5 Phillips’s edition, p. QX, 1. 17.

8S. Ephraemi Syri Rabulz epi Edessenit Balwi aliorumque opera selecta, ed. i J.J. Overbeek, Oxford, 1865, p. 220, 3. | 7 Alperixiis kaxouvOlas ércrouh, i. 20. | 8 Martin’s article “Le Acad recodpwy de Tatien” (from Revue des Ques- i tions Historiques, April 1883) contains much curious literary information, par-

ticularly regarding similar compilations of later date. See also Ciasca’s article | De Tatiani Diatessaron Arabica Versione,” in Cardinal Pitra’s Analecta Sacra Spicilegio Solesmenst parata, iv. 465. This Arabic Diatessaron begins with Mark)i. 1, John i. 1-5, Luke i. 5-80, Matthew i. 1-25a, Luke ii. 1-39. Ciasca’s copy is how (1887) in the hands of De Lagarde, who has published a few pages of it in Nachrichten von der konigl. Gesellschaft der Wissenschaften, 1886, No. 4, pp. 150-158. According to De Lagarde, the text is that of the ordinary Péshitta. | 9% Overbeek, op. cit., p. 172, 18-20. . | 10 The whole of the Abbé Martin’s elaborate argumentation (Introd. & la | Critique Teatuelle du N. T., pp. 163-236) is of no avail against this paleeographic ‘fact. No one who is conversant with Syriac MSS. can for a moment doubt that our codex of Sc was written within a few years of the time indicated above. The handwritings of Jacob of Edessa’s time (the latter half of the 7th century) are altogether different. Possessors of the abbé’s work should cancel pp. 234-236. The “‘Postscriptum,” as the author himself has explained, is only an elaborate joke. There is no MS. Add. 70125 in the British Museum, no catalogue of the Greek MSS. in twenty-five volumes, and of course no such photograph exists as he has described. As for the ‘special telegram from “ Réverend Crowfoot” through the “agence Fri-Frou-Fro and Co.,” dated 25th December 1882, it is enough to say that Mr Crowfoot died on 18th oh 1875. – :

See Wright, Catalogue, p. 73, No. exix.

‘) 12 See Rodiger in the Manutshertante of the Berlin Academy for July 1872, pP- 557; Wright, Fragments of the Curetonian Gospels (privately printed).

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it®; Ephraim wrote a commentary upon it*; the Doctrine of

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to retranslate Sc into Greek is a failure (Fragmenta Evangeliea, 1870-72); Baethgen’s work (Evangelienfragmente, &c.) will per- haps be found more satisfactory.

The scholars of the Monophysite branch of the Syrian Church Mono- were, however, by no means satisfied even with the revised text physite of P, and demanded a yet more aceurate reproduction of the Greek versions. text in use among them. Accordingly Aksénaya or Philoxenus, bishop of Mabbigh (485-519), undertook to satisfy this want, and Philo- with the assistance of his chorepiscopus, Polycarp, produced a literal xenus. translation of the whole Bible in the year 508.13 This seems at first to have met with considerable approval; Moses of Aggél, for example, who flourished from 550 to 570,” refers to the version of the New Testament and of the Psalms evidently as the standard work of the day. But it was in its turn superseded by two later revisions, and MSS. of it are now very rare. Portions of Isaiah survive in the British Museum, Add. 17106, ff. 74-87,16 and the text of the Gospels in the codex A. 2,18 of the Biblioteca An- geliea at Rome, of the 11th or 12th century,!” and perhaps also in the Beiriit (Beyrout) MS. deseribed by the Rev. Isaac H. Hall.8 At the beginning of the 7th century the work of retranslation and Tevision was again taken in hand by the Monophysites, the scene of their labours being the different convents in’ the neighbour- hood of Alexandria. ‘There, in the years 616-617,!% Paul, bishop Paul of of Tella dhé-Mauzélath or Constantina, undertook a version of the Tella. hexaplar text of the LXX. at the request of the patriarch Atha- nasius I.?° Of parts of this many MSS. are extant in

the British Museum and the Bibliothéque Nationale at Paris, and the Biblio-

‘ teca Ambrosiana at Milan possesses the second volume of a codex of

the entire work, which has been reproduced by photo-lithography under the direction of Ceriani.2 ‘This version not only exhibits the asterisks and obeli of Origen’s text of the LXX. , but the marginal notes contain many readings of the other Greek trans- lators, which have been largely utilized by Field in his noble work Origenis Hexaplorum que supersunt (2 vols., Oxford, 1875). At the same time and place the New Testament of Philoxenus was Thomas thoroughly revised by Thomas of Harkel or Heraclea,” bishop of of Har- Mabbogh,” who, being driven from his diocese, betook himself to kel. Alexandria and worked there in the convent of St Antony at the Enaton (or Nine-mile-village). This version comprises not only all the books contained in the Péshitta but also the four shorter epistles.” The lapse of another century brings us to the last attempt at a revision of the Old Testament in the Monophysite Church. Jacob, bishop of Edessa, undertook, when living iu retire- Jacob of ment in the convent of Tell- Adda or Teleda,”* in 704-705, to revise Edessa. the text of the Péshitta with the help of the Greek vorsions at his disposal,”” thus producing a curious eclectic or patehwork text. Of this work there are but five volumes extant in Europe, four of which came from the Nitrian Desert and form parts of a set whieh was written in the years 719-720. It would seem, therefore, never to have attained popularity.”8**

One other version remains to be noticed, namely, that used by

13 Assemani, Bibliotheca Orientalis, ii. 23. 14 B.0., ii. 82.

15 Idid., ii. 83; Guidi, Rendiconti della R. Accademia det Lincei, May and June 1886, p. 404.

16 Edited by Cerianiin Monumenta Sacra et Profana, vol. v. fase. 1, pp. 1-40.

17 See Bernstein, Das heilige Evangelium des Johannes, Leipsic, 1853, krit. Anmerkungen, pp. 3, 29; Martin, Introd. a la Crit. Text. du N.T., pp. 160-161.

18 Syriac Manuscripts, Gospels of a pre-Harklensian Version, Acts and Epistles of the Peshitto Version, written (probably) between 700 and 900 A.D., January 1884.

19 See Ceriani, Monumenta, vol. i. fasc. 1: Prolegomena in Edit. Vers. Syr. ex Textu LXX., p. iii. ; Martin, Introd., p. 139, note. 20 B.O., ii. 833-334.

21 Monumenta, vol. vii.: Codex Syro-hexaplaris Ambrosianus, 1874. The first volume of this codex was in the possession of Andreas Masius, but has dis- appeared since his death in 1573. Ht contained part of Deuteronomy, Joshua, Judges, (four books of) Kings, Chronicles, Ezra (and Nehemiah), Judith, and Tobit (complete?). See Middeldorpf, Codex Syriaco-hexaplaris, Berlin, 1835, who enumerates in his preface the labours of previous editors. Since his time the books of Judges and Ruth have been published by T. Skat Rérdam (Libri Judicum et Ruth secundwm Vers. Syriaco-hexaplarem, Copenhagen, 1859- 61), and Exodus, Numbers, Joshua, | and 2 Kings, by P. de Lagarde (Vet. Test. ab Origene recensiti Fragmenta apud Syros servata quingue, Gottingen, 1880, printed with Hebrew letters). Ceriani has commenced a critical edition in the Monu- menta, vol. i. fase. 1; vol. ii. fasec. 1-4; vol. v. fasec. 1, 2. ; ;

22 See B.0., ii. 90, 334; Bernstein, De Hharklensi N. T. Translatione Syriaca Commentatio, p. 4. fie

23 Or Manbij; according to others, of Germanicia or Mar‘ash. He must not be confounded with an older Thoimas of Germanicia, a Monophysite of the earlier part of the 6th century ; see B.O., ii. 92,326; Kleyn, Jacobus Baradaeiis, p. 43, note 1. 24 See Wright, Catal., p. 34, note.

25 It has been edited by White at Oxford-——the Gospels in 1778, the Acts and Apostolic epistles in 1799, the Pauline epistles in 1803 (the

cpistle to the Hebrews is defective, ending in the middle of chap. xi. 27). The text of the shorter epistles, 2 Peter, 2 and 3 John, and Jude, has been recently reprodueed by phototype from a manuscript dated 1471 — Williams Manuscript. The Syrian Antilegomena Epistles .. . edited by Isaac H. Hall, 1886. Consult also Transactions of the Royal Irish Academy, vol. xxvii. No. viii., ‘On a Syrian MS. belonging to the Colleetion of Archbishop Ussher,” by the Rev. J. Gwynn, D.D. There is a fine MS. of this version, dated 1170, in the university library, Cambridge, Add. MS. 1700. Its peculiar feature is that it has the two epistles of Clement inserted between the catholic epistles and those of St Paul.

26 Probably the modern Tell‘adi or Tell‘ade; see Socin, Paldst. u. Syrien, p. 480; Sachau, Reise in Syrien u. Mesopotamien, p. 459.

27 Wright, Catal., p. 38, col. 1.

28 See Ceriani, Le Edizioni ei Manoscritti delle Versiont Siriache del Vecchio Test., 1869, p. 27, and Monumenta, vol. ii. fase. 1, pp. xi., xii., vol. v. fase. 1, pp. 1-40; Martin, Introd., pp. 230-232, 296 sq.

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Malkite version.

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the Christian population of the Malkite (Greek) Church in Pales- tine, written in an Aramaic dialect more akin to the language of the Jewish Targims than to that of the Péshitta.1_ A lectionary containing large portions of the Gospels in this dialect was de- scribed by Assemani in the catalogue of the Vatican library,? studied by Adler,? and edited by Count Fr. Miniscalchi Erizzo under the title of Hvangeliarium Hierosolymitanum (2 vols., Verona, 1861-64). It was written in a

convent at a place called Abid,‘ not very far from Jerusalem, in the year 1030, and the scribe claims to have copied sundry other service-books for the use of his church (see Assemani, op. cit., p. 102). Fragments of other evangeliaria have been published by Land, from MSS. at London and St Petersburg, in his Anccd. Syr., iv. pp. 114-162, 213-222; of the Acts of the Apostles, p. 168; and of the Old Testament (translated from the Greek), pp. 103-110, 165-167, 222-223. According to the same authority (p. 231), the calendar in the Vatican MS, must have been drawn up about the middle of the 9th century. Few, if any, of the extant fragments appear to be of older date. Noldeke places the origin of the version in the 4th or 5th century, certainly not later than 600 (Joc. cit., jth Bey)

All the above revisions of the text of the Syriac Bible according to the Greek are, as we have seen, the work of Monophysites, with the single exception of the last, which proceeded from the Malkites. The Nestorian community obstinately adhered to the old Péshitta, and the solitary attempt made to introduce a revised text among them seems to have been an utter failure. Mar-abha I.,¢a convert from Zoroastrianism, who was catholicus from 536 to 552, went to Edessa, studied Greek there under a teacher named Thomas,’ and with his help translated the whole of the Old Testament into Syriac, and perhaps also the New. ‘This statement rests on the authority of the author of the Kitab al-Majdal (Mari ibn Sulaiman,® about the middle of the 12th century, supplemented and abridged by ‘Amr ibn Matta of Tirhan, who lived towards the middle of the 14th century), of ‘Abhd-isho’, bishop of Nisibis (died 1318), and of Bar-Hebreus (died 1286); and there appears to be no reason to doubt their word.!°

Before quitting the subject of the versions of Holy Scripture we

etic MSS. must devote a few words to the Massoretic MSS. of the Nestorians

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and Jacobites.14 In the year 1721 Assemani made mention in the Bibliotheca Orientatis (ii. 283), on the authority of Bar-Hebreus in the

Ausar Razé, of a “ versio Karkaphensis, hoc est Montana, qua videlicet incole montium utuntur.” About the meaning of these words scholars disputed, and some searched for MSS. of the alleged versiou, but in vain. At last, N. Wiseman (afterwards cardinal), guided by the light of another passage in the Bibliotheca Orientalis (ii. 499, 500, No. xxii.), recognized in Cod. Vat. cliii. a copy of what he believed to be the Karkaphensian version.!2 Later re- searches, more especially those of the Abbé Martin, have corrected these errors. The MSS. of the Karkaphensian tradition, of which there are ten in our European libraries, are now known to contain a philological and grammatical tradition of the pronunciation and punctuation of Holy Writ and sometimes of other writings. Syria was rich in schools and colleges; most of its towns possessed in- stitutions where instruction was given, more especially to students of theology, in the reading and exposition of the Greek and Syriac Scriptures and their commentators. Such were the great “ Persian school” of Edessa, which was destroyed, on account of its Nestorian tendencics, in 489; the school of Nisibis; of Mahézé near Seleucia ; of the monastery of Dér-K6ni or Dair-Kunna ; of the monastery of Ken-neshré or the Eagles’ Nest, on the left bank of the Euphrates, opposite Jerabis ; of the Daira ‘Ellaita, or monastery of St Gabriel and St Abraham, at Mosul; and many others.) Every such school or college had its teachers of reading and elocution, mahgéyané and makréyané (or makerydnz), who taught their pupils to pronounce, add the vowel-points, and interpunctuate correctly,16

1 See Noldeke, in 2.D.M.G., xxii. (1868), p. 448 sq.

2 MSS. Codd. Bibl. Apost. Vatic. Catalogus, ii. No. xix. p. 70 sq.

3 N. Test. Verss. Syriace Simplex, Philoxeniana, et Hierosolymitana, Copen- lagen, 1789; see also Martin, Introd., p. 237 sq.

4 See Noldeke, loc. cit., pp. 521, 527; Land, Anecd. Syr., iv. pp. 227-229.

5 The remaining literature in this dialect (all of it published by Land) con- sists of a few hymns (pp. 111-113), lives of saints (pp. 169, 170), and theological fragments (pp. 171-210). One fragment (p. 177) contains the title of a homily of John Chrysostom. 6 Properly Mar(i)-abha.

7 B.0., iii. 1, 86; compare ii. 411. 8 See p. 852, note 10.

9 See Hoffinann, Ausziige aus syrischen Akten persischer Martyrer, pp. 6, 7.

10 See B.O., ii. 411-419, iii. 1, 75; Bar-Hebreus, Chron. Eccles., ed. Abbeloos and Lamy, ii. 89; Martin, Introd., pp. 292-294.

11 See Martin, Tradition Karkaphienne ou la Massore chez les Syriens, Paris, 1870 (from Journ. Asiat.), and Introd., pp. 276-291.

12 In the Vatican Catalogue (vol. iii. 287, No. clii.) he translates the words akh mashléemanttha karképhaita by "juxta traditionem verticalen (!): hoc est, Montanorum in Pheenice et Mesopotamia degentium."

13 See his Hore Syriace, Rome, 1828, p. 78: II. Symbole Philologice ad Hist. Versionum Syriac. vet. federis. Particula prima; de versionibus generatim, deinde de Peschito, p. 147; III. Particula secunda ; recensionem Karkaphensem nunc primum describens, We necd not here indicate Wiseman's mistakes, but it is a pity to see them all reproduced even in the third edition of Scrivener's Plain Introduction, 1883.

14 See Hoffmann, Opuscula Nestoriana, 1880, p. v. sq.

15 See, for example, B.O., iii. 1, 341, col. 2 at the foot, and iii. 2, emxxiv. sq.

16 Hoffmann, Opuse. Nestor., p. vii. ; Martin, Introd., p. 289.

SYRIAC LITERS TU Be

[BIBLE VERSIONS,

before they were passed on to the higher classes of the eskolayé badhoké or malléphané, that is, the professors of exegesis and doctors of theology." The more difficult words and phrases of Scripture were gradually collected and written down so as to form " collect- anea,"

lukkaté dha-shémahé, or "fasciculi," kurrasé dha-shémahé, and the union of these composed a kethabha dha-kérayatha, or "book of readings," in which it was shown by means of vowel-points and other signs how each word was to be pronounced and accentuated,18 One such volume in the British Museum (Add. 12138, dated 899) represents the work of a Nestorian student in the convent of Mar Gabriel at Harrin!®; but the other MSS. extant in the different libraries of Europe?® are of Jacobite origin and have a common source, the scholastic tradition of the convent of Kark phétha, or "the Skull," at the village of Maghdal or Mijdal near Résh-'aing or Ras-'ain.1 Such are, for example, Cod. Vat., No. clii., now cliii., described by Assemani (Catal., iii. 287) and Wiseman (Hore Syr., p. 151); Cod. Paris, Ancien fonds 142, described by Zoten- berg (Catal., p. 30, No. 64) and Martin (Z'radition Karkaphienne, p- 36); Cod. Brit. Mus. Add. 7183, described by Rosen (Catal., p. 64, No. xlii.), and 12178, described by Wright (Catal., p. 108), From these and similar MSS., as well as from the words of Bar- Hebreus,"* it appears that the Karképhayé were the monks of the convent of Karkaphétha ; that they were Westerns or Occidentals, therefore Jacobites ; and that one of their chief authorities, if not the actual originator of the compilation, was Jacob bishop of Edessa. Accordingly, the marginal notes indicate various readings from Syriac MSS., from the LXX., and from the Harklensian version, as well as from different fathers and teachers.™ 'To the collection of words and phrases from the Péshitta version is added in several of these MSS. a similar, though shorter, collection from the Hark- lensian version and from the principal works of the Greek fathers which were read in translations in the schools,"4 followed by tracts on different points of orthography, grammar and punctuation. We have spoken above (p. 824) of the deutero-canonical books of Apo- the Old Testament. Other apocrypha may now be noticed morecryphal briefly ; ¢.g., Ps. cli. (in the hexaplar version of Paul of Tella) ; the works, Parva Genesis, or Liber Jubilzorum, a fragment of which has been edited by Ceriani (Ifonumenta, vol. ii. fase. 1, p- ix.); the Testament of Adam"; the History of Joseph and Asyath (Asenath), translated by Moses of Aggél*"; the History of Sanhérib, his Vizir Ahikar or Hikar, and his Disciple Nadhan.% Many similar books exist in Arabic, some of them probably translated from lost Syriac originals,

The names of Daniel and Ezra "the scribe" are prefixed to late apocalyptic works,2® and even to almanacs containing prognostica- tions of the weather, &c.3 The list of apocrypha of the New Testa- ment is also tolerably extensive. We may mention the Prot- evangelium Jacobi ; the Gospel of Thomas the Israelite, or of the Infancy of our Lord ; the Letters of Abgar and our Lord ; the Letters of Herod and Pilate ; prayers ascribed to St John the Baptist; the Transitus, Assumptio, or Kolunois Beatz Virginis, extant in four or five redactions !; Acts of the Apostles, such as St John, St Philip, St Matthew and St Andrew, St Paul and Thecla, and St Thomas®; the Doctrine of St Peter*; and the Apocalypse of St Paul.3 Others

17 Hoffmann, op. cif., pp. xx., xxi. What the whole curriculum of such a student should be, according to the mind of Bar-Hebrzus in the 13th century, inay be seen from the B.0., iii. 2, 937-938 (Nomocanon, translated by J. A. Assemani, in Mai, Seriptt. Vett. Nova Coll., x. cap. vii. § 9, pp. 54-56).

18 Hoffmann, op. cit., pp. vi., vii.

19 See Wright, Catal., p. 101. 20 Martin, Introd., p. 291. i

21 Hoffmann, in Z.D.M.G., xxxii. (1878), p. 745; and in Stade's Zeitschrift fir d. Alttest. Wissenschaft, 1881, p. 159. 22 Martin, op. cif., pp. 122, 129.

23 See Wiseman, op. cit., p. 178; Martin, op. cit., pp. 76, 77, 183; Rosen,

Catal., pp. 65, 66; Wright, Catal., p. 109. Among these occur q r and log. The investigations of Hoffmann (in Stade's Zeitschrift, 1881, p. 159) and Duval

(Journ. Asiat., 1884, p. 560) have made it certain that af designates not the

Péshitta, nor Jacob of Edessa, but one Tabhana (perhaps surnamed "the Beardless"), an eminent teacher at Résh-'aind. His colleague

Sabha was probably the fainous scribe Sabha, who wrote Brit. Mus. Add. 14428, 14430 (724), and 12135, ff. 1-43 (726).

24 Namely, (Pseudo-)Dionysius Areopagita, Gregory Nazianzen (2 vols.), the works of Basil, the epistles of Gregory and Basil, John Philoponus (the Atatrynris), and Severus of Antioch (Homiliz Cathedrales and certain synodical letters relating to the council of Antioch). A fuller list is given by Assemani, B.0., iii. 2, emxxxvii. 'sq.

25 See Phillips, A Letter of Mar Jacob, Bishop of Edessa, on Syriac Orthography, &c., 1869 (Appendix iii. pp. 85-96, issued separately in 1870); Martin, Jacobi epi Edessent Epistola ad Georgium epum Sarugensem de Orthographia Syriaca, &c., 1869.

26 Wright, Catal., p. 1242; see Renan, in the Journ. Asiat., November and Deceniber 1853, p. 427, and Wright, Contributions to the Apocryphal Literature of the New Testament, 1865, p. 61.

27 Wright, Catal., p. 1047; Land, Anecd. Syr., iii. 15-46. ; '

28 Wright, Catal., p. 1207, col. 1; Hoffmann, Ausziige aus syrischen a persischer Madrtyrer, 1880, p. 182; see for the Syriac text Brit. Mus. Orient. 2313, anda MS. in the collection of the S.P.C.K. (now presented by the Society to the university of Cainbridge). 29 Wright, Catal., pp. 9, 1065. _ dhe.

30 Wright, Catal., p. 352, col. 2; Brit. Mus. Orient. 2084, f. 1, Kéthabha dhe- Shtdha@eé dhe-zabhné dhé-Dhanv él nébhiya. 1

31 Most of these are published in Wright's'Contributions ; see also the es of Sacred Literature, 1865, vol. vi. 417, vol. vii. 129; and B. H. Cowper, Apocryphal Gospels, &c., 1867.

32 See Wright, Apocryphal Acts of the Apostles, 2 vols., 1871.

33 Cureton, Ancient Syriac Documents, pp. 35-41. i . .

34 Translated by Zingerle in Heidenheim's Vicrtcljahrsschrift, iv. p. 189 5%

of these apocrypha are extant in Arabic, but the Syriac originals have not yet been recovered. To these may be added such works as the Didascalia Apostolorum, edited (anonymously) by P. de Lagarde in 1854; extracts from the Constitutiones Apostolorum, ascribed to Clement, in the same editor's Religuizx Juris Eccles. Antig., pp. 2-32, 44-60 ; and the Doctrina Apostolorum, in Cureton's Ancient Syriac Documents, pp. 24-35, and in Reliquie Juris Eceles. Antiq. (under the title of Doctrina Addzi), pp. 32-44.

Into a description of the service-books of the Syrian Church in its different sects—Nestorians, Jacobites, Maronites, and Malkites —we cannot here enter.1 The bare enumeration of the various psalters, lectionaries, missals, &c., would far exceed our present limits. The oldest Syriac psalter in our European collections is not earlier than 600 (Brit. Mus. Add. 17110), and the series of lection- aries commences with the 9th century. Of anaphorz or liturgies it would be easy to specify some sixty.2_ The oldest of all is a fragment of the anaphora of Diodorus of Tarsus (in the British Museum, Add. 14699, ff 20, 21), of the 6th century, which has been edited and translated by Bickell.®

Besides the versions of Holy Writ and other works enumerated above, the literature of Syria comprises a vast amount of matter, interesting not merely to the Orientalist but also to the classical scholar, the theologian, and the historian. Some portions of this literature we must now endeavour to pass under review.

The long series of Syrian writers is headed by the name of Bar- Daisan or Bardesaines, "the last of the Gnostics."4 He was born at Edessa on 11th July 154,5 and seems to have been the son of heathen parents of rank. Of the manner of his conversion to Christianity, and how he came to deviate from orthodoxy, we are uninformed. Part of his life he spent at the court of Edessa; then he betook himself as a missionary to the rude mountaineers of Armenia, and finally settled down in the

fortress of Anium, where he prob- ably remained till his death in 222.6 He wrote, we are told, a History of Armenia, which Moses of Chorene used in a Greek trans- lation; Hypomnemata Indica, compiled from the oral information whicli he obtained from an Indian embassy passing through Edessa on its way to the Roman court; and polemical treatises against the polytheism of the heathens and the dualism of Marcion. He and his son Harmonius were poets, and their hymns were greatly admired and imitated. Even Ephraim could not help admitting their merits, whilst he reviled them." Of these works, however, only a few fragments have been preserved by later writers.® The famous dialogue Ilepi eiyapyévns or De Fato, which the voice of antiquity has unanimously ascribed to Bardesanes, was in reality composed by his disciple Philip, and doubtless presents us with an accurate account of his master's teaching. The Syriac title is Keéthabha dhé-Namosé dh' Athrawathé (The Book of the Laws of the Countries).°

Of Simeon bar Sabba'é ("the Dyers' Son "), bishop of Seleucia and Ctesiphon, and Millés, bishop of Susa, we know little beyond the fact of their martyrdom in the great persecution of the Chris- tians by Shabhor or Sapor II., which began in 339-340.2 Simeon is said by 'Abhd-ish6'" to have written "epistles,"?? which seem to be no longer extant. To him are also ascribed sundry hymns,¥ and a work entitled Kéthabha dh' Abhahatha (The Book of the Fathers), which, according to Sachau, treats of the heavenly and earthly hierarchy.44 The writings of Millés are stated by 'Abhd-

and by Perkins, Journal of the American Oriental Society, viii. p. 182 sg.; re- printed in the Journal of Sacred Literature, January 1865, p. 372 sq.

1 The reader is referred to the following works: J. A. Assemani, Codex Liturg. Feclesiee Universe, 13 vols., Rome, 1749-66 ; Renaudot, Liturgiarum Orient. Col- lectio, 2 vols., Paris, 1716; Etheridge, The Syrian Churches, their Early History, Liturgies, and Literature, London, 1846; Badger, The Nestorians and their Rituals, 2 vols., London, 1852; Howard, The Christians of St Thomas and their Liturgies, Oxford, 1864; Denzinger, Ritus Orientalium, Coptorum,

Syrorum, et Armenorum in administrandis sacramentis, 2 vols., Wiirzburg, 1863-64; J. Morinus, Comment. de Sacris Eccles. Ordinationibus, &c., Paris, 1655, Antwerp, 1695; Bickell, Conspectus Rei Syrorum Literaria, chaps. Vii.-x.

2 See a complete list in Bickell's Conspectus, pp. 65-68; comp. also Neale and Littledale's Liturgies of SS. Mark, James, &c., 2d ed., 1869, p. 146, and Appendix i.

3 See his Conspectus, pp. 63, 71-72. The Syriac text is given in Z7.D.M.G., xxvii. (1873), pp. 608-613.

4 See Merx, Bardesanes von Edessa, 1863; Hilgenfeld, Bardesanes, der letzte Gnostiker, 1864; Hahn, Bardesanes Gnosticus Syrorum primus Hymnologus, 1819.

5 So the Chronicon Edessenum, in Assemani, B.O., i. 389, and Bar-Hebreus, Chron. Eccles., i. 47; but Elias of Nisibis, as cited by Abbeloos in his notes on Bar-Hebreus, loc. cit., places his birth in 134.

6 Bar-Hebreeus, Chron. Eccles., i. 47.

7 E.g., Opera Syr., ii. 439 D, 553 F, last line.

8 Compare the hymn in the Syriac Acts of St Thomas (Wright, Apocryphal Acts, p. 274); Lipsius, Die Apocryphen-Apostelgeschichten und -Apostellegenden, i. 292 sq.

9 It was first edited by Cureton, with an English translation, in his Spici- legium Syriacum; see also T. & T. Clark's Ante-Nicene Christian Library, vol. xxii. p. 85 sg., and Merx, op. cit., p. 25 sq.

10 See S. E. Assemani, Acta Sanctorum Martyrum, i. 10 sq., 66 sq.

ll Or 'Ebédh-yéshi', bishop of Nisibis, whose bibliographical Catalogue has been edited by Abraham Ecchellensis, Rome, 1653, and by J. 8. Assemani in his B.O., iii. 1. There isan English translation of it by Badger, The Nestorians, ii. 361-379. ib FER wok, Ie BIE

13 Assemani, Acta Sanctorum Martyrum, i.5; Rosen, Catalogue, p. 14, col. 2, ans; Overbeck, S. Ephraemi, &c., Opera Selecta, p. 424.

isho‘ (Joc. cit.) to have been ‘epistles and discourses (mémré) on various subjects”; but of these time has also robbed us.

The name of Jacob (or St James) of Nisibis” is far more widely known. As bishop of that city he was present at the council of Nicwa. He lived to witness the outbreak of war between the Romans and the Persians, and is said to have delivered the city by his prayers from the latter power. He died in the same year (838).1® To him has been ascribed, on the authority of Gennadius of Marseilles!” and of the ancient Armenian version, a collection of homilies, the Syriac text of which has only been recovered and published within the last few years. George, bishop of the Arab tribes, writing to a friend in the year 714, is aware that the author was a certain “Persian sage,” hakkima Pharsayd, and discusses his date and position in the church, but does not think of identi- fying him with Jacob of Nisibis. Later writers are better informed, Bar-Hebreus knows the name of Pharhadh as the author 2 g ‘Abhd-isho‘ gives the older form of Aphrahat or ’Agpadrys”; and he is also cited by name by Elias of Nisibis (11th century) in his Chronicle.” The real author of the twenty-two alphabetical Homi- lics and the separate homily “On the Cluster ” is now, therefore, known to have been Aphraates, a Persian Christian, who took the name of Jacob, and was subsequently famous as “ the Persian sage,” He was probably bishop of the convent of Mar Matthew near Mosul, and composed his works, as he himself tells us, in the years 337, 344, and 345, during the great persecution under Sapor II.%

A junior contemporary of Aphraates was Ephraim,? commonly called Ephraem Syrus, “the prophet of the Syrians,” the most celebrated father of the Syrian Church and certainly one of its most voluminous and widely read writers. He was born of heathen parents at Nisibis, but became the pupil of the bishop Jacob, and finished his education at

Edessa. The incidents of his career are too well known to need recapitulation here. His death took place in June 373.% His works have been largely translated into Greek," Armenian, Coptic, Arabic, and Ethiopic.8 They consist of commentaries on the Scriptures, expository sermons, and a vast mass of metrical homilies and hymns on every variety of theologi- cal subject." Many of these last are composed in his favourite seven-syllable metre, in stanzas of different length; but he frequently used other metres and mixed strophic arrangements. Of Ephraim's commentaries on the Old Testament but little has reached us in the original Syriac.3!_ Most of what has been pub- lished in Zphraemi Opera Syr., vols. i. and ii., is derived from a large Catena Patrum, compiled by one Severus, a monk of Edessa, in 861.3? Of his commentary on the Dia-tessarén, preserved only in an early Armenian translation, we have spoken above (p. 825). In the same language there is extant a translation of his commentary on the Pauline epistles.#3 Vol. ii. of the Roman edition contains some exegetical discourses (pp. 316-395), the number of which has been largely increased by Overbeck (S. Ephraemi Syri, &c., Opera Selecta, pp. 74-104). In the same work will be found two of the discourses against early heresies addressed to Hypatius and Domnus (pp. 21-73; comp. Wright, Catal., p. 766, col. 2), two tracts on the love of the Most High (pp. 103-112), and the epistle to the

19 Kal Zuplns rédov elda cal dorea mdvra, NioiBw, Hidparny diaBds ; Lightfoot, S. Ignatius, i. 480.

16 This date is given by the Chronic. Edess. (B.0., i. 395), by Dionysius of Tell- Mahré (ibid., p. 17), by the so-called Liber Chaliphurum (in Land, Anecd. Syr., i. 4), by Elias of Nisibis (see Abbeloos's note in Bar-Hebreus, Chron. Eecles., ii. 31), and inferentially by Ephraim (Bickell, S. Ephraemi Syri Carmina Nisibena, p. 20). 17 In his De Viris Illustribus, written before 496.

18 Published by N. Antonelli (Rome, 1756) with a Latin translation, and re- printed in Gallandius, Bibl. Vet. Patrum, vol. v. The mistake has passed (no doubt through the Arabic) to the Ethiopic translation of

the fifth homily; see Zotenberg, Catal. des MSS. Ethiopiens de la Bibl. Nat., p. 248, col. 2, No. 17.

19 See De Lagarde, Anal. Syr., p. 108; The Homilies of Aphraates, ed. Wright, p.19; Ryssel, Hin Brief Georgs, Bischofs der Araber, 1883.

20 Chron. Eccles., ii.34. 21 B.O., iii. 1,85. 22 See Wright, Aphraates, p. 38.

23 Wright, Aphraates, pp. 440 and 507 ; comp. Sasse, Prolegomena in Aphr. Sap. Pers. Sermones Homileticos, 1878 ; J. Forget, De Vita et Scriptis Aphr., Sap. Persx, 1882; Bickell in Thalhofer, Bibliothek der Kirchenvdter, 102 and 103, where eight of the homilies are translated. 24 More correctly Aphrém.

25 See the Acta S. Ephraemi in the Roman ed. of his works by Peter Mobarak (Petrus Benedictus) and the Assemanis, pp. xxiii.-lxiii.; and comp. Bickell, Conspectus, p. 26, note 11. y : ;

**26 See the various authorities cited by Assemani, B.0., i. 54, note; Bickell, Carmina Nisibena, p. 9, note; Gabriel Cardahi, Liber Thesauri de Arte Poetica Syrorum, 1875, pp. 9-13. ; **

27 Even Photius speaks with respect of the rhetorical talent of Ephraim, so far as he could judge of it from these imperfect translations (ed, Bekker, p. 160). 28 See B.O., i. 149 sq. 29 Tbid., i. 63-149 ; iii. 1, 61. :

30 Compare, for instance, Bickell, Carm. Nisib., Introd., p. 31. The Syrian line consists of a certain fixed number of syllables, four, five, six, seven, eight, twelve, &c. In the older writers there is no intentional rime, which first appears, we believe, among the Westerns, in Antonius Rhetor (9th century). Real metres, like those of the Greeks and Arabs, coupled in the latter case with rime, were wholly unknown to the Syrians. Hebrew poetry barely rises, as regards outward form, beyond the level of Arabic rimed prose ; the Syrians, whilst destitute of rime, at least imposed upon themselves the restraint of a limited but fixed number of syllables.

31 Genesis and Exodus in Cod. Vat. cx., and five leaves of Genesis in Cod. Vat. exx. (see Assemani, Catal., iii. p. 125).

32 Cod. Vat. ciii., Brit. Mus. Add. 12144. Severus used for Genesis a com- mentary different from that in Cod. Vat. cx.; see Bickell, Conspectus, p.19; comp. Pohlmann, S. Ephraemi Syrt Commentariorum in s. scripturam textus in

14 Kurzes Verzeichniss der Sachau'schen Sammlung syrischer Handschriften, | codd. vatt. manuscriptus et in edit. Rom. impressus, 2 parts, 1862-64.

4

Berlin, 1885, p. x. and No. 108, 3.

33 See Bickell, Conspecius, p. 20.

Jacob of Nisibis.

Aphra-

ates.

Ephraim

Syrus.

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monks who dwelt in the mountains (pp. 113-131). Of metrical | (divine) chastisement, and on the invasion of the Huns,"! ip writings the same book contains (pp. 339-354) the hymns against | which he says: "The North is distressed and full of wars: and Julian the Apostate (pp. 1-20), and the conclusion of the hymns | if Thou be neglectful, O Lord, they will again lay me waste, If on Paradise (wanting in the Roman ed., vol. iii. 598).1 Other | the Huns, O Lord, conquer me, why do I seck refuge with the metrical homilies were published by Zingerle*; but far more im- martyrs? If their swords lay me waste, why do I lay hold on Thy

portant, as having a real historical interest, are the Carmina great Cross? If Thou givest up my cities unto them, where ig the Nisibena, or ‘Hymns relating to the City of Nisibis,” edited by | glory of Thy holy Church? A year is not yet at an end since they Bickell in 1866. Thcse poems, which deal in great part with the | came forth and laid us waste and took my children captive ; and history of Nisibis and its bishops and of adjacent cities (such as | lo, a second time they threaten our land that they will humble it” Anzit or Hanzit, Edessa, and Harran), were composed, according to | Now the invasion of the Huns took place in 395,18 and this poem Bickell (Introd., p. 6 sg.), bctween the years 350 and 370 or there- | must have been written in the following year (396). The few re- abouts.? A large quantity of hitherto unpublished matter is also maining writings of Cyrillona, composed in various metres, haye contained in Lamy, S. Ephraemi Syri Hymni et Sermones, vol. i. » | been edited by Bickell in the 7.D.If G., xxvii. p. 566 sq. and 1882, and vol. ii., 1886,—e.g., fifteen hymns on the Epiphany, a | translated by him in Thalhofer’s Bibliothek, 41, pp. 9-63, Bickel] discourse on our Lord, several metrical homilies (in particular for | is inclined to identify this Cyrilléna with another writer of the Passion week, the Resurrection, and New or Low Sunday), hymns | same period, ‘Abhsamya, a priest of Edessa, Ephraim’s sister’s ‘Ahh. on the Passover or unleavened bread (De Azymis) and on the Cruci- | son and a pupil of Zenobius ; but his reasons do not seem to us fixion, acts of Ephraim from the Paris MS. Ancien fonds 144, | sufficient. The Chron. Edess. (B.0., i. 401) states that ‘Abhsamyi commentaries on portions of the Old Testament, other metrical composed his hymns and discourses on the invasion of the Huns homilies, and hymns on the nativity, the Blessed Virgin Mary, | in 404; and Dionysius of Tell-Mahré (B.0., i. 169) speaks of him Lent, &. The so-called Testament of Ephraim‘ has been printed | in the year 397. Bar-Hebreus is less precise as to the date: after in the Opera Greca, ii. pp. 395-410 (with various readings at p. mentioning the death of Chrysostom (in 407), he adds that 433), and again by Overbeck (op. cit., pp. 187-156).5 about this time Theodore of Mopsuestia died (429) and ‘Abhsamya Ephraim’s Notwithstanding his vast fecundity and great popularity as a | flourished, who ‘composed many discourses in the (heptasyllabic) pupils. theological writer, Ephraim seems not to have had any pupils | metre of Mar Ephraim” on

the invasion of the Huns.! That worthy to take his place. In the Testament we find nientioned ‘Abhsamya may have taken the name of Cyrillona at his ordination with high commendation the names of Abhi, Abraham, Simeon, | is of course possible, but it seems strange that none of these three Mara of Aggél, and Zenobius of Gézirta,® to whom we may add | writers should have mentioned it, if such were the case. On Bar- Isaac’ and Jacob.? Two, on the other hand, are named with de- | Hebreus’s statement regarding the metre which he used in his cided reprobation as heretics, namely, Paulonas (IlavAwvas) or | discourses we do not insist ; he might easily make a mistake in Paulinus (IIavAivos) and Arwadh or Arwat.® Of these, Abha is | such a matter. cited by later writers and compilers as the author of a commentary During the latter part of the 4th century, too, there lived in Abbot on the Gospels, a discourse on Job, and an exposition of Ps. xlii. | the island of Cyprus the abbot Gregory, who appears to have been Gregory, 9.1° Paulonas or Paulinus is probably the same who is mentioned | sent thither from some monastery in Palestine as the spiritual by ‘Abhd-isho‘” as having written “madhrdshé or metrical homi- | head of the Syriac-speaking monks in the island.“ He cherished lies, discourses against inquirers, disputations against Marcion, friendly relations with Epiphanius, afterwards bishop of Salamis and a treatise concerning believers and the creed.” Zenobius, | or Constantia (367-403), and a monk named Theodore. ‘To these who was deacon of the church of Edessa, according to the same | are addressed several of his discourses and letters; others are authority,” composed treatises against Marcion and Pamphylius (2), general exhortations to the monks under his charge,” The dis- besides sundry epistles. He was also the teacher of Isaac of | courses seem to be only portions of a work on the monastic life, Antioch, of whom we shall speak shortly. which has not come down to us in a complete form, the “ book” Balaiand Better known than any of these disciples of Ephraim are two | mentioned by ‘Abhd-isha‘ in B. 0. , lii, 1,191. In the letters he Cyril- writers who belong to the close of this century and the beginning | addresses Epiphanius as an older man speaking with authority lona. of the next, Balai and Cyrillona. The date of Balaior Baleus, | to a younger; it is to be presumed, therefore, that they were chorepiscopus (as it seems) of the diocese of Aleppo, is fixed by his | written before Epiphanius

became bishop. being mentioned by Bar-Hebreus ™ after Ephraim, but before the With the 5th century commences the native historical literature Lives of time of the council of Ephesus (431). Acacius, bishop of Aleppo, | of Syria. Previous to this time there existed martyrologies and saints whom he celebrates in one of his poems, must therefore, as Bickell | lives of saints, martyrs, and other holy men, drawn up, in part at and says,“4be the same Acacius who had a share in converting Rabbala | least, to meet the requirements of the services of the church. Such martyrs. to Christianity,!° and died at an extreme old age (it is said 110 are, for example, the ancient martyrology in a manuscript of 411%; years) in 432. His favourite metre was the pentasyllabic, which | the Doctrine of Addai, in its present shape a product of the latter is known by his name, as the heptasyllabic by that of Ephraim, | half of the 4th century ; the Hypomnemata of Sharbél; and the and the twelve-syllable line by that of Jacob of Séragh. Some of Martyrdoms of Bar-samyd, Bishop of Edessa, and the Deacon Habbith, his poems have been edited by Overbeck in the often cited collection | which all belong to about the same period.* This sort of legendary S. Lphraemi Syri, &e., Opera Selecta, pp. 251-336, namely, a poem | writing was carried on to a much later date.*? The History of on the dedication of the newly built church in the town of Ken- | Béth Sélokh and its Martyrs, for instance, can hardly have been neshrin (Kinnesrin), five poems in praise of Acacius, the late composed before the 6th century, if so early”®; and the Acts of bishop of Aleppo, the first and eighth homilies on the history of | Afari must be still later.29 No larger collection of such documents Joseph, specimens of prayers, and a fragment on the death of had, however, been attempted before the time of Maratha, bishop Maratha Aaron.’® Cyrillona composed a poem “on the locusts, and on | of Maiperkat,®° a man of much weight and authority, who be ay = ; 5 ic | twice sent by the emperor Theodosius II. on embassies to the perkat. 1 : fact of in; acrosti : A 5 showtice Lice RS gra ae ihe eee eee i ae Persian monarch Yazdegerd I., and presided at the councils of

samya,

tism of Constantine (pp. 355-361) is certainly spurious (Bickell, Zoe. cit.). Seleucia or Ctesiphon, under the catholics Isaac and Yabh-alaha 2

5. P. Ephraemt Syrt Sermones duo, Brixen, 1869 (see B.O., i. 149, col. 1, No. 31); Monumenta Syriaca ex Romanis Codd. collecta, i. 4 (B.0., loc. cit., No. 30). 17 See Wright, Catal., p. 671, col. 1, No. Gh

Zingerle has rendered many of Ephraim's works into German, e.g., Die heilige 18 See Chron. Edess. in B.O., i. 400, No. xl.; Dionysius of Tell-Mahré, ibid., Muse der Syrer: Gestinge des h. Kirchenvaters Ephraem, 1833 ; Gesainge gegen die | note 1; and an anonymous continuer of Eusebius in Land's Anecd. Syr., i. 8, Gribler iber die Geheimmnisse Gottes,.1834; Festkrinze aus Libanons Garten, 1846; | 1.2. Joshua Stylites (ed. Wright, p. 10, 1. 1) specifies A. Gr. 707, which begam Des h. Kirchenvaters Ephraem ausgewdhlte Schriften, aus d. Griechischen und | with October 395. Syrischen uebersetzt, 6 vols., 2d ed., 1845-47 ; Die Reden des h. Ephraem gegen die 19 See also Wright, Catal., pp. 670-671 3 Overbeck, S. Ephraemi, &c., Opera Ketzer, 1850; Reden des h. Ephraem des Syrers tiber Selbstverldugnung und einsame | Selecta, pp. 379-381 : Bickell, Conspectus, p. 84; Cardahi, Liber Thes., pp. 27-29, Lebensweise, mit einem Briefe desselben an Einsiedler, 1871. Translations into | who places his death in 400. English have been attempted, though with less success, by Morris (Select Works 20 See his Conspectus, p. 21; Thalhofer, Bibl., 41, pp. 18, 16 (in the note). of S. Ephraem the Syrian, 1847)and Burgess (Select Metrical Hymns and Homilies 21 Bar-Hebreeus, Chron. Eceles., i. 133. of Ephraem Syrus, 1853; The Repentance of Nineveh, &c., 1853). 22 See B.O., i. 170-171. 23 Ibid., i. 172. 3 Comp. Bickell, Conspectus, p. 28, note 21. 4 See B.O., i. 141, No. 8. 24 Brit. Mus. Add. 12150, f. 252, edited by Wright in the Journal of Sacred 5 That it has been interpolated by a later hand is shown by the long and | Literature, 1865-66, viii. 45, 423: see the Acta Sanctorum, October, vol. xil. purposeless digression on Moses and Pharaoh (Op. Gr., ii. 405) and the story | 183-185. It can hardly be later than the middle of the 4th century. of Lamprotate at the end (ibid., p. 409), as also by the stanzas regarding the 25 Edited in part by Cureton, in his Ancient Syriac Documents, from MSS. of vine which Ephraim saw growing out of his mouth when he was an infant | the 5th and 6th centuries in the British Museum ; and in full by Phillips from (ibid., p. 408). 6 B.O., i. 88, 144. 7 Ibid., i. 165. a MS. of the 6th century at St Petersburg, 1876. See also Lettre d' Abgar ou 8 See Wright, Catal., p.

992, col. 2, No. 36. Histoire de la 2 abel des Edesséens, translated from te eee ee : a = o Lee Ss Venice, 1868 ; Lipsius, Die Edessenische Abgar-Sage, 1880; Matthes, Die Eesse- ° Also written of Ql | = Arntf and fies of= Uri. See Overbeck's text, nische "Agar Rage, 1883: Mosinger, Acta SS. dag en Edessenorum Sarbelii, &¢., p. 147, and the variants, p. xxx. The name seems to have been hopelessly | No. 1, 1874. corrupted by the scribes. 10 See Wright, Catal., pp. 831, col. 1, and 1002, col. 1. 26 See Cureton, Ane. Syr. Doc., and Lipsius, Die Edess. Abgar-Sage, p. 41 3%

LL B.O., iii. 1, 170. 12 Ibid., i. 168 ; iii. 1, 43. 27 See Hoffmann, Ausziige aus syr. Akten pers. Martyrer. :

18 In a passage cited by Assemani, B.0., i. 166. Cardahi (Liber Thes., pp. 28 See Mosinger, Monumenta Syr., ii. 683, and Hoffmann, op. cit., p.45. 4 25-27) places Balai's death in 460, but gives, as usual, no authority. This seems 29 See Abbeloos, Acta S. Maris, 1885, p. 47, where, as N dldeke has pointe too late. out, the writer confounds Ardashér, the first king of the Sasdnian dynasty,

14 Conspectus, p. 21; Thalhofer, Bibliothek der Kirchenvéter, 41, p. 68. with the last king of that line, Yazdegerd IIJ., who was overthrown by the

1 Overbeck, S. Ephraemi Syri, &c., Opera Selecta, p. 162, 1. 20. Arabs in the battle of Nihawand, a.H. 21 (642 a.D.). 'cated a 16 See also Wenig, Schola Syriaca, Chrestomathia, pp. 160-162; Bickell, Con- 30 Called by the Greeks Martyropolis, in Syriac Médhinath Sahdé, and by spectus, p. 46, note 5; Thalhofer, Bibliothek, 41, p. 67, and 44. the Arabs Maiyafarikin.

ai RR ae

resto About this time evil days came upon the Christian church in

&. schoo] by the order of the

| Mopsuestia. Hence Ibas in his letter to Mari speaks of him as

) Alexander of Hiera polis in 432, complains bitterly of his persecution |of the orthodox (7.e., the Nestorians). He died in August 435.2

5TH CENT.] ow it &C LhiTEeRartt & eB 829

respectively.' He is said, too, to have been a skilful physician.? To him 'Abhd-ishd' assigns the following works,3—'* A 'book of martyrdoms, anthems and hymns on the martyrs, and a translation of the canons of the council of Nicea, with a history of that council." The last named of these he undertook at the request of Isaac, catholicus of Seleucia, who died in 416.4 The canons which pass under his name are those of the council of Scleucia in 410.5 But his great work was the Book of Martyrs, containing accounts of those who suffered for the Christian faith under Sapor II., Yaz- degerd I., and Bahram V., to which he prefixed two discourses on the glory of the martyrs and on their torments. One of these narratives claims to have been recorded by an eye-witness, Isaiah, the son of Hadhbo (or Hadhabha), of Arzan CApfavyrv}), one of the Persian king's horsemen.® Portions of this work survive in the British Museum in MSS. of the 5th and 6th centuries, as well as in some of later date both there and in the Vatican. They have been edited by S. E. Assemani in the first volume of the Acta Sanctorum Martyrum, 1748.7 The commentary on the Gospels mentioned by Assemani is really by Maratha, the maphridn of Taghrith (Tekrit), who is also the author of the anaphora or liturgy.? Of him we shall have occasion to speak afterwards (see p. 838 infra). It is possible too that some of the above-mentioned Acts may belong not to the work of Maritha but to that of Aha, the successor of Isaac in the see of Seleucia, who likewise wrote a history of the Persian martyrs and a life of his teacher 'Abhda, the head of the school in the monastery of Dor-Koni or Dair-Kunna (where the apostle Mari was buried).9

Hibha (Grecized Ibas),*8 who in his you the translators of Theodore's works in the Persian school.24 This, with his letter to Mari the Persian 25 and other utterances, led to

of Ephesus (449),26 and Nonnus was substituted in hisroom. He was restored, however, at the end of tw don, and sat till October 457, when he was succeeded by Nonnus,"7 who in his turn was followed by Cyrus

in 471. Besides the writ- ings above-mentioned, ‘Abhd-isho’ attributes to-Ibas *8 “a comment- ary on Proverbs, sermons and metrical] homilies (madhrashé), and a disputation with a heretic ” ; but none of these appear to have come down to us.

_ During this stormy period the name of Acacius 1s mentioned as the author of certain epistles, his life, which is referred by Socrates (bk. vii is thus briefly recorded in ‘the Martyrologium Romanum Gregorit XIII. (Malines, 1859), 9th April: “Amide in Mesopotamia sancti

Acatii episcopi, qui pro redimendis captivis etiam ecclesix vasa

conflavit ac vendidit.” The said captives were Persian subjects,

.- 21) to the year 422,

, for his letters were thought worthy of a commentary by Mari, bishop of Béth

About the same time roge one of the stars of § Isaac, commonly called the Great, of Antioch.33

of Amid, but went as a young man to Edessa, where he enjoyed the teaching of Zenobius, the disciple of Ephraim.*! Thence he removed to Antioch, where he lived as pricst and abbot of one of the many convents in its immediate neighbourhood. In his younger days he would seem to have travelled farther than most of his countrymen, as it is stated that he visited Rome and other cities.25 With this agrees what is recorded by Dionysius of Tell-Mahré*6 as to his having composed poems on the secular games celebrated at Rome in 404, and on the capture of the city by Alaric in 410, which shows that he took a more than ordinary interest in the Western capital. Isaac died in or about 460, soon after the destruction of Antioch by the earthquake of 459, on which he wrote a poem. ” Isaac’s works are nearly as voluminous and varied as those of Ephraim, with which indeed thcy are often confounded in MSS. and in the Roman edition.38 They were gathered into one corpus by the Jacobite patriarch John bar Shishan or Susanna, who began in his old age to transcribe and annotate them, but

was hindered from completing his task by death (1073).39 Assemani has given a list of considerably more than a hundred metrical homilies from MSS. in the Vatican.? Of these part of one on the Crucifixion was edited by Overbeck,# and another on the love of learning by Zingerle.” But it has been left to Bickell to collect and translate all the extant writings of this Syrian father and to commence the pub- lication of them. Out of nearly 200 metrical homilies his first volume contains in 307 pages only fifteen, and his second brings

23 B.0., 1.199. 24 Ibéd., iii. 1, 85; Wright, Catal., pp. 107, col. 2, 644, col. 1.

25 See Labbe, Concil., ix. 51; Mansi, vii. 241.

26 The so-called Ayorpixh clvodos or latrocinium Ephesinum. Of the first session of this council a portion is extant in Syriac in Brit. Mus. Add. 12156, ff. 51b-61a (written before 562), containing the acta in the cases of Flavian of Antioch and Eusebius of Doryleum. Add. 14530 (dated 535) contains the second session, comprising the acta in the cases of Thas, his nephew Daniel of Harran, Trenezus of Tyre, Aquilinus of Byblus, Sophronius of Tella or Constantina, Theodoret of Cyrrhus, and Domnus of Antioch. These documents have been translated into German by Hoffmann, Verhandlungen der Kirchenversammlung zu Ephesus am xxii. August CDXLIx., &c., 1873 ; into French by Martin, Actes du Brigandage d’ Ephése, 1874 ; and into English (with the assistance of a German scholar) by the Rev. S. G. F. Perry, The Second Synod of Ephesus, 1881. See also Martin, Le Pseudo-Synode connu dans l Histoire sous le nom de Brigandage d’ Ephése, &c., 1875; and Perry, An Ancient Syriac Document purporting to be the record in tts chief features of the Second Synod of Ephesus, &e. » part i., 1867. Mr Perry printed a complete edition of the Syriac text at the Clarendon Press, Oxford, but no one seems to know what has become of the copies. The copies of the English translation were purchased at the sale of Mr Perry’s library by Mr Quaritch. 27 B.O., i. 257.

28 Ibid., iii. 1, 86. These are of course utterly ignored by Assemani in vol, i.

29 Ibid., iii. 1, 51. 30 Ibid., i. 195-196.

31 Beth Hardashér or Béth Hartashér, in Persian Weh-Ardashér or Beh-Ard- ashér, Arabicized Bahurasir, close by Seleucia, on the right bank of the Tigris. See Hoffmann, Verhandlungen der i a fe Ephesus, &c., p. 98, note 160. « B.0., tii. 1, 172.

33 Ibid., i. 207-234; Bickell, in Thalhofer's Bibliothek, No. 44, and Conspectus, pee,

B 34 That he is identical with Isaac, the disciple of Ephraim (as some have sup- posed), seems wholly unlikely. He may possibly have seen Ephraim in the flesh, but this is very doubtful, considering the date of his own death. Even Jacob of Edessa appears to have got into some confusion on this subject (see Wright, Catal., p. 603, col. 2). 35 Land, Anecd. Syr., iii. 84,

36 B.0., i. 208-209 ; see Dionysti Telmahharensis Chronici liber I., ed. Tullberg, 1850, p. 52, and Husebtt Canonum Epitome ex Dionysii Telm. Chronico petita, by C. Siegfried and H. Gelzer, 1884, p. 29. The difficulty was first cleared up by Scaliger, who in his Thesaurus Temporum, Animadv. No. MDLXIV., proposed

Syria. Paul of Samosata, Diodore of Tarsus, and Theodore of Mopsuestia had paved the way for Nestorius. The doctrines of these writers were warmly espoused by many of the Syrian theo- logians; and the warfare raged for many years in and around Edessa, till it ended in the total destruction of the great Persian emperor Zeno (488-489).!° Rabbiala, a native of Ken-neshrin (Kinnesrin), whose father was a heathen | priest but his mother a Christian, was converted to Christianity _ by Eusebius, bishop of Ken-neshrin, and Acacius, bishop of Aleppo. | He voluntarily gave up all his property, forsook his wife, and

became a monk in the convent of Abraham near his native city. On the death of Diogenes, bishop of Edessa, he was appointed his successor (411-412). His admiring biographer depicts him as a | model bishop, and he certainly appears to have been active and |_ energetic in

teaching and preaching and attending to the needs of | the poor. In the theological disputes of the day he seems at first | to have sided, if not with Nestorius, at least with those who were averse to cxtreme measures, such as John, patriarch of Antioch, and his partisans; but afterwards he joined the opposite party, and became a warm champion of the doctrines of Cyril, which he Supported at the council of Edessa (431). From this time onward) he was a staunch opponent of Nestorianism, and even resorted to such an extreme measure as burning the writings of Theodore of

‘the tyrant of Edessa,” and Andrew of Samosata, writing to

| Of the writings of Rabbala but little has come down to us. There is a sermon extant in manuscript, enjoining the bestowing of alms jon behalf of the souls of the dead and prohibiting all feasting on jthe occasion of their commemoration. Another sermon, preached jat Constantinople, is directed against the errors of Nestorius. 4 There are also extant canons and orders addressed to the monks and clergy of his diocese,!5 and a number of hymns, of which Over- beck has printed some specimens.!6 He also rendered into Syriac

ion of forty-six of his letters, written in Greek ‘to priests and mperors and nobles and monks ®;” but of these only a few remain, ‘¥-g., to Andrew of Samosata, condemning his treatise against the twelve anathemas of Cyril; to Cyril, regarding Theodore of Mop- suestia 2; and to Gemellinus of Perrhé, about certain monks and bther persons who misused the sacred elements as ordinary food.”2

1 See B.O., i. 174 sq.: Bar-Hebreeus, Chron. Eccles, i. 121, ii. 45, 49. 2 B.0., iii. 1, 73, and note 4. 3 Ibid., lee. cit. 4 Tbid., i. 195. 5 See Lamy, Conciliwm Seleucia: et Ctesiphonti habitum anno 410 3 comp. S. E. Assemani, Codd. MSS. Orient. Bibl. Palat. Medic., p. 94. CRB OP T15:) 7 See also B.O., i. 181-194. There is a German translation by Zingerle, Echte ficten der h. Mdrtyrer des Morgenlandes, 2 vols., 1836. 8 B.O., i. 179. ! 9 Ibid., ii. 401, iii. 1, 369 ; also Abbcloos, Acta S. Maris, pp. 72 sq., 88.

10 B.0., i. 353, 406. 1 See his biography in Overbeck, S. Ephraemi, &c., Opera Selecta, p. 159 sq., pecially pp. 170-181; translated by Bickell, in Thalhofer's Bibliothek, Nos. (02-104. 12 B.O., 1. 403. 13 Codd. MSS. Orient. Bibl. Palat. Medic., p. 107.

1+ See Overbeck, S. Ephraem, &., Opera Selecta, pp. 239-244: translated b onkhaptov. 37 B.O., i. 211. 38 See Bickell, Conspectus, p. 23, note. hickell, 15 TE pp. 210-221. ue 16 Thide ae 245-248, 362-378. y 39 B.O., i, 214-215, ii. 355 ; Bar-Hebraeus, Chron. Eccles., i. 447.

V7 See Wright, Catal., p. 719. 40 B.O., i. 214-234. 41 -S. Ephraemi Syri, &e., Opera Selecta, pp. 379-381. 18 Comp. the letter of Cyril to Rabbila, Overbeck, op. cit., pp. 228-229. 42 Monumenta Syriaca, i. 13-20; see also some extracts in Zingerle's Chrestom.

4 19 See Overbeck, op. cit., p. 200. 20 Ibid., p. 222. 21 Idid., p. 223, a fragment.

Syr., pp. 299 sq., 387 sq. Zingerle has translated large portions of the homilies *2 Ibid., pp. 230-238. The shorter fragment should follow the longer one.

on the Crucifixion into German in the Tiibinger Theolog. Quartalschrift, 187 Oh ls Further, Cardahi, Liber Thes., pp. 21-25.

Rabbiila was succeeded in the see of Edessa (485) by Ihibha or Ibas.

, bishop of Amid, Acacius 9 +The great event of of Amid.

yriac literature, Isaac of He was a native Antioch.

Dadha.

Simeon the Stylite.

Dadh- ish'.

Bar-

sauma of in defending and propagating their peculiar tenets.

Nisibis.

Narsai.

830

us in 858 pages only as far as No. 37.1 Some of these poems have a certain historical value, such as the second homily on fasting, probably written soon after 420,? the two homilies on the destruction of the town of Béth Hir by the Arabs (c. 457),8 and the two against persons who resort to soothsayers.4 Others possess some interest as bearing on the theological views of the author, who combats the errors of Nestorius and Eutyches.° One of the longest and most wearisome is a stupendous poem of 2137 verses on a parrot which proclaimed dys 6 Geds in the streets of Antioch.6 Another on repentance runs to the length of 1929 verses. In prose Isaac seems to have written very little ; at least Bickell" mentions only " various questions and answers, an ascetic narrative and ascetic rules."

Concerning Isaac's contemporary Dadha we know but little.§ He was a monk from the ncighbourhood of Amid, who was sent by the people of that city to Constantinople on account of the ravages of war and famine, to obtain remission of the taxes or some similar relief, and was well received by the emperor. He is said to have written about three hundred tracts on various topics connected with the Scriptures and on the saints, besides poems (madhrashé).

Here, too, we may record the name of Simeon the Stylite, who died in 459 or soon after.2_ The Monophysites contend that he held their theological views, and accordingly we find in a MS. of the 8th century a letter of his to the emperor Leo regarding Theodoret of Cyrrhus, who had come to him and tried to pervert him to the opinions of the Dyophysites,! and in another MS., of about the same age, three letters to the emperor Leo, to the abhot Jacob of Kaphra Réhimi, and to John I., patriarch of Antioch, all tending to prove that he rejected the council of Chalcedon." A third MS., of the 6th century, contains certain

“precepts and admonitions” addressed by him to the brethren.!* There is extant in very old MSS. a Life of Simeon, full of absurd stories, which has been edited by 8. E. Assemani in the deta Sanctorum Martyrum, vol. ii. 268 sq. At the end of it (p. 394) there is a letter by one Cosmas,” priest of the village of Panir, written in the name of his congregation to the Stylite, promising implicit obedience to all his precepts and orders, and requesting his prayers on their behalf; but there is nothing whatever to show that this Cosmas was the author of the Life or had any share in writing it.

About this time we find Dadh-ishd‘, the catholicus of Seleucia (421-456),16 composing his commentaries on the books of Daniel, Kings, and Bar-Sira or Ecclesiasticus.” But the chief seat of Nes- torian scholarship and literary activity was still the Persian school of Edessa, whcre Bar-sauma and other teachers were actively engaged Bar-sauma, if we inay believe the scurrilous Monophysite Simeon of Béth Arsham,}8 was originally the slave of one Mara of Béth Kardi,® and bore at Edessa the nickname of Sahé beth kénatya.2? He was at Edessa in 449, when his expulsion was called for by the rabble.4 In what year it actually took place we do not know, but we afterwards find him busy in the East under the catholicus Babhoyah or Babueus (from about 457 to 4838)? and his successor Acacius (from about 484 to 496), during which period he was bishop of Nisibis.2 Of his personal character and work this is not the place to attempt to form a judgment ; but the reader should beware of placing implicit trust in the statements of bitter and unscrupulous theological oppo- nents like Simeon of Béth Arsham, Bar-Hebreus, and Assemani. Bar-sauma does not appear to have written much, as ‘Abhd-ishd‘*4 mentions only parenetic and funeral sermons, hymns of the class called turgémé,*> metrical homilics (madhrashé), letters, and an anaphora or liturgy.

A fellow-worker with him both at Edessa and Nisibis was Narsai (or Narsé), of Ma‘allé‘tha or Ma‘althaya,?* whom Simeon of Béth Arsham calls “the Leper,’®” whereas his co-sectarians style him “the Harp of the Holy Spirit.” He was especially famous as a writer of hymns and other metrical compositions, his favourite metre being that of six

syllables.*8 He fled from Edessa to escape the wrath of the bishop Cyrus (471-498), probably in the year 489, and died

1 S. Isaaci Antiocheni, Doctoris Syrorum, Opera Omnia, ed. G. Bickell, part i., 1873; part ii., 1877. We hope soon to receive the remaining parts at his hands.

2 B.O., i. 227; Bickell,i. 280. 3 B.0., i. 225; Bickell, i. 207,227. 4 Bickell, ii. 205 sg. 5 See Bickell's translations in Thalhofer's Bibliothek, 44. 6 Bickell,i. 85. 7 Opera, i. p. viii. 8 See Land, Anecd. Syr., iii. 84. 9 See Bar-Hebreus, Chron. Ficeles., i. 142, 181, and note 2; B.O., i. 252,405. 10 Wright, Catal., p. 951, No. xxix. 11 Ibid., p. 986, No. 33, 12 Ibid., p. 1153, col. 1. 18 E.g., Cod. Vat. elx., tran- scribed 473; Brit. Mus. Add. 14484, of the 6th century. 14 B.0., i. 237.

15 Assemani is also mistaken in supposing that the Life was composed _at the request of Simeon, the son of Apollonius, and Bar-Hatar (?), the son of Udhan (Uranius?). These are merely the persons who paid for the writing of this portion of Cod. Vat. clx. 16 See Bar-Hebreus, Chron. Eccles., ii. 57, note 1.

17 B.O., iii. 1, 214. 18 Tbid., i. 351.

19 On the left bank of the Tigris, over against Jazirat Ibn 'Omar.

20 "The Swimmer, or Bather, among the Reeds," meaning " the wild boar." See Hoffmann, Verhandl. d. Kirchenversam. zu Ephesus, &c., p. 91, note 114.

21 Hoffmann, op. cit., p. 14; Bar-Hebreus, Chron. Eceles., ti. 55, note 1.

22 Bar-Hebreus, Chron. Eccles., ii. 57, note 1.

28 See B.O., iii. 1, 66, note 7, compared with i. 351, note 4, and ii. 407, note 2.

24 Ibid., iii. 1, 66. b 25 Sec Badger, The Nestorians, ii. 19.

26 Hoffmann, Ausziige, p. 208 ; Badger, The Nestorians, i. 174.

27 Perhaps in a spiritual sense only, though Assemani thinks otherwise ; see B.O., i. 352 and note 5, 354; iff. 1, 63. 28 B.O., iii. 1, 65, note 6.

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at Nisibis early in the next century.% Narsai's w merated by 'Abhd-ishd', consist of commentarie four books of the Pentateuch, J oshua, Judges, and Ecclesiastes Isaiah and the twelve minor prophets, J eremiah, Ezekiel, and Daniel, twelve volumes of metrical discourses (860 in number) 31 9 liturgy, expositions of the order of celebrating the Eucharist 'and of baptism, parenetic and funeral sermons, hymns of several sorts," and a book entitled On the Corruption of Morals.

Mari the Persian has been already mentioned as the correspondent M of Ibas. Besides the commentary on the epistles of Acacius above, p. 829), he wrote a commentary on the book of Daniel and a controversial treatise against the magi* of Nisibis. Acacius, catholi- cus of Seleucia (c. 484-496), composed discourses on fasting and on of Seley the faith, as also against the Monophysites, and translated into Per. oa sian for the king Kawadh a treatise on the faith by Elisha, bishop of Nisibis, the successor of Bar-sauma.®5 Assemani tries hard to cleanse Acacius from the stain of Nestorianism, but, as Abbeloos remarks, '"'vereor ne Athiopem dealbare voluerit ; nam omnia tun Jacobitarum tum Nestorianorum monumenta, que ipse recitat contrarium testantur." Mikha or Micah, another member of the Mikha band of exiled Edessenes,?" became bishop of Lashém.28 He wrote a commentary on the books of Kings, a discourse on his predecessor Sabhr-ish6', another on a person whose name is written Kntropos,® and a tract entitled The Five Reasons of the Mautzbne. © 'To these

orks, as enu- s8 on the first

writers may be added two others, —Yazidadh,*! who is also said to Yazidadh.

have belonged to the Edessene school and to have compiled ‘a book of collectanea (Zukkatz),” # and Ara, who wrote a treatise against the magi or Persian priesthood, and another against the

followers of Bardesines with the contemptuous title of Habhshosh-yatha or “ the Beetles.” 48 .

The Persian school at Edessa was, as we have already hinted, Trans- the chief seat of the study of Greek during the early days of the lations Syrian literature. Of the most ancient translators we know no- from thing; but the oldest MSS. are Edessene, viz., the famous MS. in the Greek. British Museum, Add. 12150, dated towards the end of 411, and the equally well known codex at St Petersburg, written in 462. The former contains the Recognitiones of Clement, the discourses of Titus of Bostra against the Manichees, the Theophania of Eusebius, and his history of the confessors in Palestine ; the latter, the Ecclesiasti- cal History of Eusebius. Now, as the text presented by these MSS, has evidently passed through the hands of several successive scribes, it secms to follow that these books were translated into Syriac in the lifetime of the authors themselves, or very soon after, for Euse- bius died in 840 and Titus in 871. Very likely the one or the other may have had a friend at the chief seat of Syriac learning who was willing to perform for him the same kind office that Rabbula under- took for Cyril.#* A little later on our information becomes fuller and more exact. Ma‘na,*a Persian by race,“ from the town of Beth Mani Hardashér, was resident at Edessa in the earlicr part of the 5th century, and is mentioned by Simeon of Beth Arshaim among the distinguished Nestorian scholars whom he holds up to ridicule.”

His nickname was Shathé ketma, “the Drinker of Ashes.” Ma’na devoted himself to the task of translating into Syriac the comment- aries of Theodore of Mopsuestia during the lifetime of that great theologian, who did not die till 429. He must, however, have with- drawn from Edessa at a comparatively early period, as he was bishop of Persis prior to 420, in which year (the last of his reign) Yazde- gerd I. made him catholicus of Seleucia, in succession to Yabh-alaha.” He had, it appears, translated a number of books from Syriac into

29 See Bar-Hebreeus, Chron. Eccles., ii. 773 B.0., ii. 407. 30 B.O., iii. 1, 65, 66.

31 Some of these are probably contained in the Berlin MSS. Sachau 174-176 (mémré dha-médhabbéraniithd, on the life of our Lord) and 219 (two poems on Joseph, and two others).

32 Two of them are often found in the Nestorian Psalter. See, for example, Brit. Mus. Add. 7156 (Rosen, Catal., p. 12, col. 2, No. 3a, c) and Add. 17219 (Wright, Catal., p. 134, col. 2, No. 3 a, c). ;

33 Méeghtishé, from magu, mag, the Persian priesthood, the head of whom in each district was the magupat, mogpet, or mobedh. See Noldeke, Geschichte der Perser und Araber zur Zeit der Sasaniden, p. 450. 34 B.O., iii. 1, 171. ee Ibid., iii. 1, 389. Elisha is called by some authorities Hosea ; ibid., ii. 407, iii. 1, 429. 36 Bar-Hebreeus, Chron. Eccles., ii. 74, note 2.

37 B.O., i. 352-3538. His enemies gave him the nickname of Dagon. *

38 Now Lasim,a short distance south-west of Daktk or Ta'iik, in Béth Garmal; see Hoffinann, Ausziige, p. 274.

39 Vocalized Kentropos or Kantropos; B.0., iii. 1,170, 1. 2.

40 Meaning probably the division of the Psalter into three kathismata (Bickell, Conspectus, p. 92); see B.O., iii. 1, 71, note 2.

41 For Yazed-dadh or Izad-dadh, like Yazed-panah, Yazed-bozedh; see Hofl- mann, Ausztige, p. 88, No. 796. 42 B.0., iii. 1, 226. '

43 Of Ara we seem to know absolutely nothing; his very florwit is uncertain, and he may have belonged to the previous century; B.0., iil. 1, 230. .

44 See above, p. 829, and compare Merx, " De Eusebianz Historie Eccles. Ver: sionibus, Syriaca et Armeniaca," in Atti del IV. Congresso Internazionale degli Orientalisti, Florence, 1880, i. 199 sq., especially

pp. 201-202. It may here be mentioned that the literature of Armenia is largely indebted in its earliest days to that of Syria, not only for the translation of Eusebius's Eccles. History, but for such works as the Doctrine of Addai and the Homilies of Aphraates, wrongly ascribed to Jacob of Nisibis. .

45 So the name is written by Mari bar Shélémdn, whom Assemani follows, B.O., iii. 1, 376, pronouncing it, however, Ma'né or Maanes. Elias of Nisibis also gives Ma'nd (Bar-Hebreeus, Chron. Eccles., ii. 58, note 2); but Bar-Hebreus himself (loc. cit.) has Maghna, which Abbeloos Latinizes Magnes.

46 His Persian name is unknown to us. 47 B.O., i. 352.

48 Bar-Hebreus, Chron. Eccles., ii. 55, 63. 49 B.0., ii, 401.

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John of Béth Garmai, afterwards bishop of Béth Sari (or Sérai 2)

and Abraham the Mede, disciples of Narsai; Mikha, afterwards bishop of Lashém in Béth Garmai; Paul bar Kakai (or Kaki), after-

wards bishop of Ladhan in al-Ahwaz ; ‘Abhshota (?) of Nineveh, and others,—who are expressly said to have “taken away with them”

(appek ‘amméhon) from Edessa, and disseminated throughout the

East, the writings of Theodore and Nestorius.5> Ibas himself was one of these translators in his younger days (see above, p. 829). About the same time with Ma‘na’s translations began the Aristo- telian studies of the Syrian Nestorians. To understand and trans-

late the writings of their favourite Greek theologians, Paul of

Samosata, Diodore of Tarsus, Theodore of Mopsuestia, and Nestorius himself, not to mention Theodoret § of Cyrrhus, required a consider- able knowledge of the Aristotelian logic. Probus (IIpéBos, in Syriac Prébhos, Prébha, or Prébhz), who trans- lated and commented on the Iept épunvelas,” and probably treated in a similar manner other parts of the Organon.® It is not easy to fix his date precisely. ‘Abhd-ishd‘® makes him contemporary with Ibas and another translator named Kimi. If the Berlin MS. Sachau 226 can be trusted, he was archdeacon and archiater at Antioch. Hoffmann 1° has assigned reasons for

supposing him not to be anterior to the Athenian expositor Syrianus (483-450 2).

Whilst the Nestorians were thus making rapid progress all over the East, another heresy was spreading in the West. Eutyches had found followers in Syria, among others Bar-sauma the archi- mandritc, a man famous for his piety and asceticism," who repre- sented the abbots of Syria at the second council of Ephesus," and was afterwards condemned by the council of Chalcedon.13 He died in 458.14 His life was written by his disciple Samuel, in much the same style as that of Simeon Stylites, and is extant in several MSS. in the British Museum.! ™ His memory has always been held in the greatest reverence by the Jacobites. The Armenians, accord- ing to Assemani,'* keep his commemoration on the 1st of February, the Syrians and Copts on the 8d. The decisions of the council of Chalcedon produced an immediate and irreparable breach in the Eastern Church ; and the struggle of the rival factions was carried on with desperate fury alike at Constantinople, Antioch, and Alex- andria. In Syria the persecution of the Monophysites was violent during the years 518-521, under the emperor Justin, and again in 535 and the following years, under Justinian, when they seemed in a fair way of being completely crushed by brute force.

The first name to be mentioned here, as belonging to both the 5th and 6th centuries, is that of Jacob of Sérigh, one of the most celebrated writers of the Syrian Church," 'the flute of the Holy Spirit and the harp of the believing church." There are no less than three biographies of him extant in Syriac,—the first, by his namesake Jacob of Edessa 18; the second, anonymous; the third, a lengthy metrieal panegyrie, said to have been written for his commemoration * by a disciple of his named George.*! This, how- ever, seems, from the whole tone of the composition, to be unlikely, and Bickcll is probably right in supposing the author to be George,

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1 Ibid., iii. 1, 876. 2 Bar-Hebreus, Chron. Eccles., ii. 68. 3 B.O., ii, 402 ; ii. 1, 877, 4 Ibid., i. 851-854. 5 B.O., i. 850; iii. 1, 226, note 8.

6 lis Eranistes (of which the fourth book is a demonstratio per syllogismos of the incarnation) appears as the name of an author in ‘Abhd-isho’s Catalogue (B.0., iii. 1, 41), under the form of Eranistatheos, or something similar.

7 See Hoffmann, De Hermeneuticis apud Syros Aristoteleis, 1869. MSS.,—Berlin, Alt. Best. 86, 9, 10; Brit. Mus. Add. 14660. The translation may possibly be even anterior to Probus.

8 Berlin, Sachau 226, 1, is described as * Isagoge des Porphyrius,von Probus, Presbyter, Archidiacon, und Archiater in Antiochien” ; and in the same M&.,

| No. 8, is “‘Erkliérung der Analytica von Probus,” with an “ Einleitung in d.

Erkl. d. Anal. von Probus,” No. 7. 9 B.O., iii. 1, 85.

10 Op. cit., pp. 144-145. The name of Fabri or Phubrius, which appears as a variation of Probus in Hottinger (B.0.), in Assemani (B.0., iii. 1, 85, note 5), in Renan (De Philosophia Peripatetica apud Syros, p. 14), and in other books on this :ubject, has nothing to do with that of Probus, but is an error for Kuwairi, Abii Ishak lbrahim, a Syro-Arabian Aristotelian who lived about the beginning of

| the 10th century. See the Fihrist, p. 262; Ibn Abi Osaibi‘ah, i. 234; Wiisten-

feld, Gesch. d. Arab. Aerate, p. 24, No. 62, “ Futheri oder Fubri.” ll All “‘hypocrisy” in the eyes of Assemani, B.O., ii. 2; “scelestissimus

pseudo-monachus,” p. 9.

| sammlung zu Ephesus, &c., p. 4, 1. 89.

12 Bar-Hebraus, Chron. Eccles., i. 161-165; Hoffmann, Verhandl. d. Kirchenver- 13 Bar-Hebreeus, loc. cit.,179. 14 Ibid., 181.

15 B.0., ii. 296, also p. exlviii. No. 8; Wright, Catal., p. 1123.

16 B.0., ii. 9; comp. Wright, Catal., p. 175, col. 2, No. 8, and p. 811, No. ecclxxxvii.

17 B.O., i. 288 sq.; Matagne, in Acta Sanctorum, October, vol. xii. 824, 927 ; Abbeloos, De Vita et Scriptis S. Jacobi Batnarum Sarugi in Mesopotamia epi, 1867; Bickell, Conspectus, p.25; Bickell in Thalhofer, Bibl. d. Kirchenvater, 58 ;

_ Martin, "Lettres de Jacques de Saroug aux Moines du Couvent de Mar Bassus,

et & Paul d'Edesse," in Z..D.M.G., xxx. (1876), p. 217. 18 B.O., i. 286, 299; Martin, in Z.D.M. G., XXX. p. 217, note 8. 19 Abbeloos, op. cit., p. 811. 20 See Wright, Catal., p. 811, No. ccclxxxix. The Armenians hold it on 25th

September, the Jacobites on 29th June, 29th J uly, and 29th October.

#1 Abbeloos, op. cit., p. 24; B.O., i. 286, 340.

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Persian (Pahlavi), and thus probably ingratiated himself with the However, he soon fell under the royal displeasure, was degraded from his office, and ordered to retire to Persis, where he resumed his former duties," and so incurred the anger of Yazdegerd's Ma'na's work, the exact extent of which is not known to us, was carried on and completed by other members of the Persian school,—such as Acacius the catholicus and Yazidadh :

Hence the labours of

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bishop of Sériigh, a contemporary of Jacob of Edessa.22 Jacob was born at Kurtam, "a village on the river Euphrates," probably in the district of Sérigh, in 451. His father was a priest, and, as his parents had been childless for many years, his birth was regarded as a reward

for their alms, prayers, and vows. Whether he was educated at Edessa or not, he soon acquired a great reputation for learning and eloquence. He appears to have led a life of quiet work and study, and to have devoted himself in particular to liter- ary composition. He became periodeutes of Haura in Sérigh, whence we find him writing to the Christians of Najran, and to the city of Edessa when threatened by the Persians.“ As perio- deutes he is mentioned in eulogistic terms by Joshua the Stylite 4 (503). In 519, when sixty-eight years old, he was made bishop of Batnan, the chief town of Sériigh, where he died on 29th Novem- ber 521. Jacob’s prose writings are not numerous. A liturgy is ascribed to him, and an order of baptism, the former of which has been translated by Renaudot,® the latter edited by J. A. Assemani.?” Further, he composed six festal homilies, one of which has been published by Zingerle,”* who has also translated the whole of them into German ™ ; a discourse showing that we should not neglect or despise our sins®°; another for the night of Wednesday in the third week of Lent#! ; and some short funeral sermons.2 To him we also owe a life of Mar Hannina (died in 500), addressed to one Philotheus.> Of his letters a considerable number have been pre- served, particularly in two MSS. in the British Museum, Add. 14587 and 17163, ff. 1-48.34 Of these Martin has edited and translated the three epistles to the monks of the convent of Mar Bassus at Harim,®> with a reply by the monks, and another letter to Paul, bishop of Edessa, from all of which it is evident that Jacob always was a Monophysite, and continued such to his death.2° The letter to Stephen bar Sadh-ailé is given, with an English ver- sion, by Frothingham*®’; and that to the Himyarite Christians of Najran has been edited and translated by Schroter in the Z.D.ILG., xxxi. (1877), p. 360 sg. It belongs to the year 519 or 520.38 Ac- cording to Bar-Hebreus,® he also wrote “a commentary on the six centuries of Evagrius, at the request of Mar George, bishop of the (Arab) tribes, who was his disciple.” As George, bishop of the Arab tribes, was a contemporary of Jacob of Edessa, this state- ment seems to rest on some misapprehension; at all events no such work now exists. The paucity of Jacob’s prose writings is more than compensated by a flood of metrical compositions, mostly in dodecasyllabic verse, or the four-syllable line thrice repeated. “ He had,” says Bar-Hebreus,* “seventy amanuenses to copy out his metrical homilies, which were

7604! in number, besides com- mentaries and letters and odes (madhrashé) and hymns (sughyatha).” Of these homilies more than the half have perished, but nearly 300 are still preserved in European collections.“ Very few of them have as yet been published, though many of them are by no means devoid of interest.“ Indeed Jacob is on the whole far more readable than Ephraim or Isaac of Antioch.

Very different from the gentle and studious bishop of Séragh Philo- was his contemporary and neighbour, the energetie and fiery Philo- xenus cf xenus of Mabbogh. Aksénaya or Philoxénus was a native of Tahal, Mab- somewhere in Béth Garmai, and studied at Edessa in the time of bogh. Ibas.** He was ordained bishop of Hierapolis or Mabbogh (Manbij) by Peter the Fuller, patriarch of Antioch, in 485, and devoted his

22 See Bickell in Thalhofer, Bidl., 58, p. 198. 23 Wright, Catal., p. 520, Nos. 15, 16. 24 Chronicle, ed. Wright, ch. liv. Joshua wrote in 507. 25 B.O., 1. 300-305. 26 Liturgg. Orientt. Collectio, li. 8356. 27 Cod. Liturg. Eccl. Univers., ii. 809, iii. 184. 28 Mon. Syr.,i.91. 29 Sechs Homilien des h. Jacob von Sarug, 1867. 30 Wright, Catal., p. 826, No. 16; comp. the Index, p. 1293, col. 1. 31 Ibid., p. 844, No. 32. 32 Tbid., p. 864, col. 2. 38 Jbid., p. 1118, No. 14; p. 1126, No. 16. 34 Ibid., Nos. delxxii., delxxiii., and comp. the Index, p. 1298, col.1. 35 Ibid., p. 602, col. 2.

36 See Martin, Z.D.M.G., xxx. (1876), pp. 217-219. F Peek

37 See his Stephen bar Sudaili the Syrian Mystic and the Book of Hierotheos, Leyden, 1886, p. 10 sq. ae Ye ; .

38 See Guidi, La Lettera di Simeone Vescovo di Béth- Arsdm sopra + Martiri Omeriti, 1881, p. 11. 39 Chron. Eccles., i. 191. 40 Loe. cit.

41 Jacob of Edessa says 763, of which that on the chariot of Ezekiel was the first, and that on Mary and Golgotha the last, which he left unfinished; see B.O., i. 299; Abbeloos, De Vita, &c., p. 312.

42 Comp. B.O., i. 305-389 ; Abbeloos, op. cit., pp. 106-113. ‘

43 Zingerle has given extracts in the Z.D.M.G., xii., xiii, xiv., xv., and xx., and in his Chrest. Syr., pp. 860-886. The homily on Simeon Stylites has been published by Assemani in the Acta S. Martyrum, ii, 280 sq.; that on virginity, fornication, &c., by Overbeck, S. Ephraemi Syri, &c., Opera Selecta, p. 885 sq. ; that on Alexander the Great (perhaps spurious) by Knés, Chrest. Syr., 1807, p. 66 sq. (there is a German translation by A. Weber, Des Mér Yakiib Gedicht tiber den glaubigen Kénig Alexsandris, 1852); on Habbibh and on Gurya and Shamina, Edessene martyrs, with a stghithaé on Edessa, by Cureton, Ancient Syriac Documents, pp. 86-98; on Sharbél by Mésinger, Mon. Syr., ii. 52, and on the chariot of Ezekiel, with an Arabic translation, ibid., p. 76; two on the Blessed Virgin Mary by Abbeloos, De Vita, &c., pp. 203-301; on Jacob at Bethel, on our Lord and Jacob, the church and Rachel, Leah and the synagogue, on the two birds (Lev. xiv. 4), on the two goats (Lev. xvi. 7), and on Moses' vail, (Exod. xxxiv. 38) by Zingerle, Mon. Syr., i. 21-90; on Tamar by J. Zingerle, 1871; on the palace which St Thomas built for the king of India in Heaven (perhaps spurious) by Sehrdoter, in 27.D.M.G., xxv. 821, xxviii. 584; on the fall of the idols by Martin, in 2.D.M.G., xxix. 107; on the baptism of Constantine (perhaps spurious) by Frothingham, in the Atti della Accademia dei Lincei for 1881-82 (Rome, 1882). Bickell has translated into German (in Thalhofer, Bibl., 58) the first homily on the Blessed Virgin Mary, that on Jacob at Bethel, on Moses' vail, and on Gurya and Shamiina. Some of Jacob's homilies are extant in Arabic, and even in Ethiopic. His prayer asa child see in Overbeck, op. cit., p. 382. 44 B.0., i. 853.

life to the advocacy of Monophysite doctrine. Twice he visited Constantinople in the service of his party, and suffered much (as was to be expected) at the hands of its enemies, for thus he writes in later years to the monks of the convent of Séniin near Edessa : "What I endured from Flavian and Macedonius, who were arch- bishops of Antioch and of the capital, and previously from Cal- endion, is known and spoken of everywhere. I keep silence both as to what was plotted against nie in the time of the Persian war among the nobles by the care of the aforesaid Flavian the heretic, and also as to what befell me in

Edessa, and in the district of the Apameans, and in that of the Antiochians, when I was in the con- vent of the blessed Mar Bassus, and again in Antioch itself; and when I went up on _two occasions to the capital, like things were done to me by the Nestorian heretics.”! He succeeded at last in getting rid of his cnemy Flavian in 512, and in the same year he presided at a synod in which his friend Severus was ordained patri- arch of Antioch.? His triumph, however, was but short-lived, for Justin, the successor of Anastasius, sentenced to banishment in 519 fifty-four bishops who refused to accept the decrees of the council of Chalcedon, among whom were Severus, Philoxenus, Peter of Apamea, John of Tella, Julian of Halicarnassus, and Mara of

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and illustrated with a commentary chiefly derived from that of Theodosius, 2!

At the same time with Jacob of Sériigh and Philoxenus the same neighbourhood, lived one of the earliest and best of the the Syrian historians, the Stylite monk Yéshii’ or Joshua. know nothing but that he originally belonged to the great convent of Zuknin near Amid, that at the beginning of the 6th century he was residing at Edessa, and that he dedicated his Chronicle of the Persian War ™ to an abbot named Sergius. His approving mention of Jacob* and Philoxenus™ shows that he was a Monophysite. Joshua’s Chroniele would have been entirely lost to us, had it not been for the thoughtfulness of a later writer, Dionysius of Tell. – Mahré (d. 845), who incorporated it with his account of the reign of Anastasius in the smaller redaction of his own History. Tt was first made known to us by Assemani (Bibl. Orient., i. 260-283), who gave a copious analysis with some extracts; and it is now generally acknowledged to be one of the best, if not actually the best, account of the great war between the Persian and Byzantine empires during the reigns of Kawadh and Anastasius (502-506),2 To the indefatigable Abbé Martin belongs the credit of publishing

and in Joshua

Of him we Stylite,

the editio princeps of the Syriac text.26 The work was written in the year 507, immediately after the conclusion of the war, .as is shown by the whole tone of the last chapter ; and it is much to be regretted that the author did not carry out his intention ofcon- tinuing it, or, if he did, that the continuation has perished,

The interest which Jacob of Sériigh took in every branch of Simeon literature was the means of bringing into notice a _hymn-writer of Kakaya, humble rank, the deacon Simeon Kukaya, a potter by trade, as his name denotes. This man lived in the village of Géshir," not far from the convent of Mar Bassus, and while he worked at his wheel composed hymns, which he wrote down on a tablet ora scroll, as might be convenient. Jacob heard of him from the monks, paid him a visit, admired his hymns, and took away some of them with him, at the same time urging the author to continue his labours.® A specimen of these Kukdyathé has been preserved in the shape of nine hymns on the nativity of our Lord, Brit. Mus. Add. 14520,

a MS. of the 8th or 9th century.

About the same time flourished Simeon, bishop of Béth Arsham,* Simeon commonly called Dardshé Pharsdya or 'the Persian Disputant," of Beth This keen Monophysite *! was one of the few representatives of his Arshim. creed in the Persian territory, and exhibited a wonderful activity, mental and bodily, on behalf of his co-religionists, traversing the

Amid. Philoxenus was exiled to Philippopolis in Thrace,? and afterwards to Gangra in Paphlagonia, where he was murdered about the year 523. The Jacobite Church commemorates him on 10th December, 18th February, and 1st April. Philoxenus, however, was something more than a man of action and of strife :, he was a scholar and an elegant writer. Even Assemani, who never misses an opportunity of reviling him,* is obliged to own (B.0., ii. 20) "'seripsit

Syriace, si quis alius, elegantissime, atque adeo inter optimos hujusce liugue scriptores a Jacobo Edesseno collocari meruit." Unfortunately scarcely any of his numerous works have as yet been printed. To him the Syriac Church owed its first revised translation of the Scriptures (see above, p. 825); and he also drew up an anaphora® and an order of baptism." Portions of his commentaries on the Gospels are contained in two MSS. in the British Muscum.® Besides sundry sermons, he composed thirteen hontilies on the Christian life and character, of which there are sevcral ancient copies in the British Museum. Of his controversial works the two most important arc a treatise On the Trinity and the Inearnation in three discourses,? and another, in ten discourses, showing "that one (Person) of the Trinity became incarnate and suffered"; but there are many smaller tracts against

the Nestorians and Dyophysites.! His letters are numerous and may be of some value for the ecclesiastical history of his time. Assemani enumerates and gives extracts from several of them,!2 but none of them have as yet been printed in full, with the exccption of that to Abi Nafir of Hérta (al-Hirah),!3 to the monks of Tell- 'Adda,!4 and to the priests Abraham and Orestes of Edessa regard- ing Stephen bar Sadh-ailé.%

Babylonian and Persian districts in all directions, and disputing with Manichecs, Daisanites, Eutychians, and Nestorians.22 After one of these disputations, at which the Nestorian catholicus Babhai (498-503) was present,*3 Simeon was made bishop, a dignity which he had declined on several previous occasions, He visited Herta (al-Hirah) more than once, and died during his third residence at Constantinople, whither he had come to see the empress Theodora.%

Stephen Contemporary with Jacob of Sériigh and Philoxenus of Mabbogh | Assemani states, on the authority of Dionysius of Tell-Mahre, that bar was the pantheist Stephen bar Sidh-ailé,16 with whom both of | he was bishop of Béth Arsham from 510 to 515, but the Syriac Stdh- these writers corresponded," and regarding whom the latter wrote | passage which he quotes merely gives the floruit of 510. If, how-ailé,' the above-mentioned letter to the priests Abraham and Orestes. | ever, the statements of John of Ephesus, who knew him personally,

This man was the author of the work entitled The Book of Hiero- theus, which he published under the name of Hierotheus, the teacher of St Dionysius of Athens,‘8 and exercised a strong infiuence on the whole pseudo-Dionysian literature.!9 Theodosius, patriarch of Antioch (887-896), wrote a commentary on the Hierotheus,? Bar-Hebreus too made copious extracts from it, which he arranged

1 [bid., ii. 15; comp. the mention of him at Edessa by Joshua the Stylite in 498, Chronicle, ed. Wright, chap. xxx. 2 Ibid., pp. 17, 18.

3 IIe was living there when he wrote to the monks of Séniin in 522; B.O., ii. 20.

4 “Scelestissimus hereticus” (B.0., ii. 11); “ flagitiosissimus homo ” (p. 12) ; “ecclesiam Dei tanquam ferus aper devastaverit” (p. 18).

5 B.0., ti. 23 sq.; Wright, Catal., Index, p. 1315.

6 Renaudot, ii. 310; B.0., ii. 24. 7 B.O., ii. 24,

8 Add. 17126, dated 511, and Add. 14534, probably of equal age,

§ The Vatican MS. (Assemani, Catal., iii. p. 217, No. Cxxxvii.) is dated 564; see B.O., ii. 25 sq.

10 B.0., ii. 27 sq. The Vatican MS. is dated 581; that in the British Muscum Add. 12164 is at least as old.

i See B.O., ii. 45, Nos. 15-17, and Wright, Catal., p. 1315.

12 B.O., ii. 30-46. Others may be found in Wright, Catal., p. 1315.

13 See Martin, Grammatica Chrestomathia et Glossarium Lingue Syriace, p.71.

14 Ign. Guidi, La Lettera di Filosseno ai Monaci di Tell ‘Addé (Teleda), Reale Accadeinia dei Lincei, anno cclxxxii., 1884-85, Rome, 1886. In the Ethiopic literature there is extant a book entitled Filékséyis, i.¢., Philoxenus, from the name of its author, “ Philoxenus the Syrian,

bishop of Manbag” (see, for ex- ample, Wright, Catal., p.177). It is a series of questions and answers on the Paradise of Palladius, like the Syriac work described in Wright, Catal., p. 1078.

15 See B.O., ii. 30; Frothincham, Stephen bar Sudaili, p. 28 sq.

16 So in a MS. of the 7th century (Brit. Mus. Add. 17163; see Wright, Catal.,

524), The MSS. of Bar-Hebreeus (Chron. Eccles., i. 221), have Cemars O, or a da710703. Asseinani writes ca chs (Sudaili).

****Hunt the deer” can of course be only anickname of the father. See Frothingham, op. cit., p. 56 sq. 17 B.O., i. 303, ii. 32 ; comp. Bar-Hebrzeus,**

Les Chron. Eccles., i. 221. 18 B.0., ii. 120, 290, 302; Frothingham, op. cit., p. 63 sq. The existence of

any good Greek text seems to be very doubtful, see Frothingham, p. 70.

HMB AOS, ii: 0,13 Frothingham, op. cit., pp. 2 and 81.

20 See MS. Brit. Mus. Add. 7189 (apparently the very copy used by Bar- Hebreeus); Rosen, Catal., p. 74 sq.; Frothingham, op. cit., p. 84.

be correct, he was probably made bishop before 503, the date of Babhai’s deccase. His death must have taken place before 548, in which year Theodora departed this life. Besides an anaphora,® we possess only two letters of Simeon, which are both of consider- able interest. The one is entitled On Bar-sauma and the Seet of the Nestorians*” ; it deals with the origin and spread of Nestorianism in the East, but from the bitterest and narrowest sectarian point of view.*° The other, which is much more valuable, is addressed to Simeon, abbot of Gabbila,®® and treats of the persecution of the Christians at Najran by Dha Nuwias, king of al-Yaman, in the year 523.49 It is dated 524, in which year the writer was himself at Hérta (al-Hirah),**

21 Brit. Mus. Or. 1017 (Wright, Catal., pp. 893-895) ; Bibl. Nation., Anc. fonds 138 (Zotenberg, Catal., pp. 175-176) ; Frothingham, op. cit., p. 87.

22 Hd. Wright, p. ix. 23 Ibid., chap. liv. 24 Ibid., chap. XXX.

25 See, for example, the use that has been made of it in De Saint-Martin's notes to Lebeau's Hist. du Bas-empire, vol. vii. Fr

26 Chronique de Josué le Stylite, 1876, in vol. vi. of the Abhandlungen fir d. Kunde d. Morgenlandes. Another edition was published by Wright, The Chronicle

of Joshua the Stylite, 1882. 7 sa he OF faadbany

28 Sce the narrative by Jacob of Edessa in Wright, Catal., p. 602; and comp. B.0., i. 121, ii. 322; Bar-Hebreeus, Chron. Eccles., i. 191.

29 Wright, Catal., p. 363. a

30 A village near Seleucia and Ctesiphon ; Bar-Hebraus, Chron. Eceles., ii, 85.

31 Assemani has tried to whitewash him, but with little success; B.0., i. 342 sq. If he had had before him the account of Simeon by John of Ephesus (Land, Anecd. Syr., ii. 76-88), he would probably have abandoned the attempt In dis- gust. See Guidi, La Lettera di Simeone Vescovo di Béth-Arsdm sopra 1 Martirt Omeriti, 1881, pp. 4-7. J 409

32 See Bar-Hebrzeus, Chron. Eceles., ii. 85, i. 189; comp. B.0., i. 341, i. 409, iii. 1, 403. 33 Land, Anecd. Syr., ii. 82, 1. 12. 34 Ibid., li. 87, last line.

35 B.O., iii. 1, 427. 36 Ibid., i. 345. 7 Ibid. ae

38 First printed in B.O.,i. 346 sq., from the Vatican MS. cxxxv. (Catal., iii. 21).

39 Al-Jabbil. Or is it Jabbul, on the east bank of the Tigris, between au Nu‘maniyah and Wasit? of

40 First printed in B.0., i. 364 sq., according to the text offered by Jonny Ephesus in his History. There is, however, a longer and better text in a Me.

6TH CENT. | (Kofpaos),! bishop of Tella or Constantina. his widowed mother, who put him twenty. He would not, however, be hindered from expelled by Justin in 521.

of the cruel persecutor Ephraim, patriarch of Antioch (529-544), His life was written by his disciple Elias (of Dara ?).2

elsewhere. have been published by Lamy.4 His creed or confession of faith, addressed to the convents in and around Tella, is found in Brit.

in Cod. Vat. clix. (Catal., iii. Smith, Catal., p. 463, No. 20). Another of the unfortunate Monophysite bishops whom Justin

of the name. He was banished, with his syncelli and with Isidore, bishop of Ken-neshrin (Kinnesrin), in the first instance to Petra, but was afterwards allowed to go to Alexandria,® where he died in about eight years.6 According to Assemani (Bibl. Orient,, ii. 52; comp. p. 169), Mara wrote a commentary on the Gospels. It would seem, however, from a passage of Zacharias Rhetor,’ that Mara

merely prefixed a short prologue in Greek to a copy of the Gospels

which he had procured at Alexandria,® and that this MS. contained

(as might be expected) the pericope on the woman taken in adultery (John viii, 2-11). That the Syriac translations of the prologue

and pericope were made by himself is nowhere stated.

E Yet another sufferer at the hands of Justin was John bar Aphtonya i. (Aphthonia, his mother’s name).9 He was abbot of the convent of St Thomas at Seleucia (apparently in Pieria, on the Orontes),

which was famous as a school for the study of Greek literature.

Being expelled thence, he removed with his whole brotherhood to

_ Ken-neshré (the Eagles' Nest) on the Euphrates, opposite Europus | (Jerabis), where he founded a new convent and school that more

than rivalled the parent establishment, for here Thomas of Hera-

_ clea, Jacob of Edessa, and others received their training in Greek

| letters.° His Life, written by a disciple, is extant in Brit. Mus.

i Add. 12174." According to Dionysius of Tell-Mahré, as quoted

| by Assemani (Joc. cit.), he died in 588. He wrote a commentary

} on the Song of Songs, some extracts from which are preserved in

| a Catena Patrwm in the British Museum (Add. 12168, f. 138a), a

| considerable number of hymns,!? and a biography of Severus of

| Antioch,' which must have been his last work, as he survived

Severus only about nine months.

| _ We now come to the man who was the real founder of the

| Jacobite Church in Asia, and from whom the Jacobites took their

name, Jacob bar Theophilus, surnamed " Burdé'ana"!4, because | his dress consisted of a barda'tha or coarse horse-cloth, which he never changed till it became quite ragged.!® What Assemani | could learn regarding him he has put together in the Bibi. Orient.,

) 11. 62-6916; since then our sources of information have been largely

| lucreased, especially by the publication of the Ecclesiastical History

) of John of Ephesus by Cureton and of the same writer's Lives in

Land's Anecd. Syr., i117 On a careful study of these is based Kleyn's excellent book Jacobus Baradziis, de Stichter der Syrische

Monophysictische Kerk, 1882. Jacob was the son of Theophilus

bar Ma'na, a priest of Tella or Constantina, and the child of his

old age. After receiving a good education, he was entered at the

f monastery of Pésilta (or the Quarry),!8 close by the village of Gum-'metha in Mount Izala (or Izla),!9 not far from Tella. About 527-

j of the Museo Borgiano and in Brit. Mus. Add. 14650, from which it has been _tcedited (with an excellent introduction, translation, and notes) by Guidi, La

Lettera di Simeone, &c., Reale Accademia dei Lincei, 1881. To this work the

_ Teader is referred for all the documents bearing on the subject,

'|_1 The name of the father is also given as Curcus and Cyriacus.

Barsus (B.0., ii. 54) is a misreading.

_ 2 There are two copies in the British Museum, edited by Kleyn, Het Leven van Johannes van Tella door Elias, 1882; see also the Life by John of Asia in Land, Anecd. Syr., ii, 169. 3 B.0., ii. 54.

| 4 Dissert. de Syrorum Fide et Disciplina in Ie Eucharistica, 1859, pp. 62-97.

5 See Land, Anecd. Syr., ii. 105. 6 Ibid., p. 108. 7 Ibid., iii. 250 sq.

) _ 8 Compare what is said of his fine library and of its ultimate deposition at

Amid, ibid., p. 245. 9 B.O., ii. 54.

| 10 See Bar-Hebraeus, Chron. Eccles. , i. 267, 289, and comp. pp. 258, 295, 321 ;

|| Hoffmann, Ausztige, p. 162, note 1260. ll Wright, Catal., p. 1124, No. 5.

42 See for example, Brit. Mus. Add. 17134 (Wright, Catal., p. 330).

13 Cited in Brit. Mus. Add. 14731 (Wright, Catal., p. 855). .

14 Usually corrupted into Baradseus ; the form Burdé‘aya seems to be incor- rect ; see Bar-Hebreus, Chron. Eccles., ii. 97. –

15 See Land, Anecd. Syr., ii. 375. 16 Comp. also ii. 326, 331.

W The life at p. 249 is of course by John of Asia; that at p. 364 can hardly be called his in its present form, though he may have collected most of the “Inaterials ; see Kleyn, op. cit., pp. 34, 105 sq. ‘ | 18 Land, op. cit., p. 365, ll. 6, 7. 19 Tbid., p. 372, 1. 2,

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To the same age and sect as Simeon belonged John bar Cursus He was a uative of Callinicus (ar-Rakkah), of good family, and was carefully educated by into the army at the age of quitting the service after a few years and becoming a monk. Subsequently, in 519, he was raised to the dignity of bishop of Tella, whence he was In 538 he visited Constantinople, and on his return to the East was seized by his enemies in the mountains of Sinjar, and dragged to Nisibis, Ras‘ain, and Antioch, where he died in 538, at the age of fifty-five, Having been for a year and six days a close prisoner in the convent of the Comes Manassé by order

The Jacobite Church commemorates him on the 6th of February. Canons by John of Tella are extant in several MSS, in the British Museum and The questions put to him by Sergius with his replies

Mus. Add. 14549 (Catal., p. 431), and an exposition of the Trisagion 314) and Bodl. Marsh. 101 (Payne

expelled from their sees (in 519) was Mara of Amid, the third bishop

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523 he and another monk of Tella, named Sergius, were sent to Constantinople in defence of their faith, and, being favourably recelved by the empress Theodora, they remained there fifteen years. Meantime the persecutions of the Monophysites, more especially that of 586-537 by Ephraim of Antioch, seemed to have crushed their party, despite all the efforts of the devoted John of Tella and John of Hephestus.2° This state of matters excited the religious zeal of al-Harith ibn J abalah, the Arab king of Ghassan, who came to Constantinople in 542-548, and urged Theodora to send two or three bishops to Syria. Accordingly two were conse- crated by Theodosius, the exiled patriarch of Alexandria, namely, Theodore as bishop of Bostra, with jurisdiction over the provinces of Palestine and Arabia, and Jacob as bishop of Edessa, with juris- diction over all Syria and Asia. From this time forward Jacob’s life was one of ceaseless toil and hardship. He visited in person and on foot almost every part of his vast diocese, consecrating deacons and priests, strengthening the weak, and bringing back those who had erred

from the true faith, But to restore the Monophysite Church bishops were necessary, and the consecration of a bishop required the presence of at least three others. Select- ing a priest named Conon from Cilicia and another named Eugenius from Isauria, he travelled with them to Constantinople and thence to Alexandria with letters of recommendation from the patriarch Theodosius. At Alexandria Conon was ordained bishop of Tarsus. in Cilicia and Eugenius bishop of Seleucia in Isauria, whilst Antoninus and Antonius were consecrated for dioceses in Syria.

On his return to Syria other bishops were appointed to sees there and in Asia, among the latter the historian John of Ephesus ; and so the work progressed, till at last Jacob's efforts were crowned by the enthroning of his old friend Sergius as patriarch of Antioch

(in 544). Sergius died in 547, and the see remained vacant for three years, after which, by the advice of Theodosius, Jacob and his bishops chose Paul, an abbot of Alexandria, to be their patriarch.

Of the subsequent internal strifes among the Monophysites thein- selves we cannot here speak. The aged Jacob set out once more

in the year 578 to visit Damian, patriarch of Alexandria, but died on the Egyptian frontier in the convent of Mar Romanus or of Casion. Here his remains rested in peace till 622, when they were stolen by the emissaries of Zaccheus, bishop of Tella, and buried

with much pomp in the monastery of Pésilta.2!_ His commemora-

tion takes place on 28th November, 21st March, and 31st July.

Jacob's life was too active and busy to admit of his writing much.

We may mention an anaphora," sundry letters,23 a creed or confes-

sion of faith, preserved in Arabic and a secondary Ethiopic trans-

lation,*4 and a homily for the feast of the annunciation, also extant

only in an Arabic translation.”

Conspicuous among the scholars of this age for his knowledge of Sergius Greek, and more especially of the Aristotelian philosophy, was of ; Sergius, priest and archiater of Ras‘ain. He was, however, if Ras’ain. Zacharias Rhetor may be trusted, a man of loose morals and ava- ricious.”° He journeyed in 535 from Ras‘ain to Antioch to lodge a complaint before the patriarch Ephraim against his bishop Asylus.”” Just at this time the exiled Severus of Antioch and Theodosius of Alexandria, as well as the Stylite monk Zé‘dra, were living with Anthimus of Constantinople under the protection of the empress Theodora. This alarmed Ephraim, who seems to have found a willing tool in Sergius. At any rate he sent him to Rome with letters to Agapetus, who travelled with him to Constantinople in the spring of 536, and procured the deposition and banishment of the Monophysites. Sergius died at Constantinople almost imme- diately afterwards, and Agapetus followed him in a few days, wherein John of Ephesus and Zacharias Rhetor clearly see the judgment of Heaven. As a man of letters Sergius was to the Monophysites what Probus was to the Nestorians: he was the first” to make them acquainted with the works of Aristotle by means of translations and commentaries, ‘Abhd-ish6‘, it is true, gives Sergius a place in his catalogue of Nestorian writers,” and states that he composed “expositions of logic” or “ dialectics” ; but he merely does so in the same way and on the same grounds that he registers the name of Jacob of Edessa as the author of “annals and a chronicle.”®! The books were too valuable for him to insist on the heresy of the writers. In the case of Sergius there was an additional reason. The man was well known in the East,®* many of his works being dedicated to his friend and**

21 scoethe emi: of this “‘translation” by Cyriacus, bishop of Mardé (Maridin), in Brit. Mus. Add. 12174 (Wright, Catal., p. 1131).

22 Translated by Renaudot, ii. 333. 23 Translated fom the Greek originals in Brit. Mus. Add. 14602 ; ‘atal., p. 701; Kleyn, op. cit., pp. 164-194. a : ; 24 ga the Arabic jee in Nigga op. cit., p. 121 sg.; the Ethiopic version has been edited by Cornill in 2.D.M.G., xxx. 417 sq. 25

Bodl. Hunt. 199 (Payne Smith, Catal., p. 448, No. 5). . 26 Land, Anecd. Syr., iii. 289, 11.13-15 ; comp. Bar-Hebreeus, Chron. Eccles., i. 207. 27 Bar-Hebreus (Chron. Eceles., i. 205) has Ascolius (see also B.O., ii. 323), but Asylus is correct; see Anecd. Syr., iii. 289, 1. 6, and Kleyn, Johannes van Tella, p. 59, L. penult. 28 Land, Anecd. Syr., ii. 19; iii. 290. 29 Bar-Hebreeus, Chron. Syr., 62 (trans., p. 59); see also the Hist. Dynast., 150 (trans., p. 94) and 264 (trans., p. 172). S00 BO: 1, 87. 31 Ibid., 229. 32 He may even be identical with the Sergius mentioned by Agathias as XXIT. — 105

see Wright,

834

pupil Theodore, afterwards Nestorian bishop of Mari or Merv (see p. 837 infra).1 What remains of Sergius's labours is mostly contained ina single MS. of the 7th century (Brit. Mus. Add. 14658).2 Of translations from the Greek we find in this volume the Isagoge of Porphyry, followed by the so-called Tabula Porphyrii,? the Categories of Aristotle,* the Ilept xécuou mpds 'AXéEavdpor,° and a treatise on the soul,—not the well-known Ilept yuyjjs, but a wholly different tractate in five short sections. It also contains

SYRIAC LITELEAIeT eS

[67H cENT.

the Manichees ; and of the Philalethes.° Probably by him are the older translation of the Homilix Cathedrales® and that of the eorre-spondence of Sergius Grammaticus and Severus regarding the doc-trine of the two natures in Christ,? possibly, too, the translation of the treatise against John Grammaticus of Cesarea™ and of some other works which are known to us only by a few scattered cita- tions.** Hence he is called by the Jacobites Méphashshtkana dha- khéthabhé, "the Translator of Books."

Sergius's own treatise on logic, addressed to Theodore, which is unfortunately imperfect; a tract on negation and affirmation ; a

treatise, likewise addressed to Theodore, On the Causes of the Universe, according to the views of Aristotle, showing how it is a circle ;

This seems the proper place to make mention of a most important Civil though anonymous work, the translation of the so-called Cig] Laws o Laws of the Emperors Constantine, Theodosius, and Leo, which lies the Em. at the root of all subsequent Christian Oriental legislation in ecelesi. perors,

a tract On Genus, Species, and Individuality; and a third tract addressed to Theodore, On the Action and Influence of the Moon, explanatory and illustrative of Galen's Ilep xpicluwy juepadv, bk. iil. ,® with a short appendix "On the Motion of the Sun." Here too we find part (sections 11, 12) of his version of the Ars Gram- matica of Dionysius Thrax, a larger portion (sections 11-20) Weng contained in Brit. Mus. Add. 14620 (Wright, Catal., p. 802). There is a scholion of Sergius on the term cxfya in Brit. Mus. Add. 14660 (see Wright, Catal., p. 1162). In his capacity of physician, Sergius translated part of the works of Galen. Brit. Mus. Add. 14661 contains books vi.~~viii. of the treatise De Simplicium Medicamentorum Temperamentis ac Facultatibus (Wright, Catal., p~~ 1187),® addressed to Theodore; and in Brit. Mus. Add. 17156 there are three leaves, two of which contain fragments of the Ars Medica, and one of the treatise De Alimentorum Facultatibus (Wright, Catal., p. 1188).9 As one of the clergy, he wasted his time in making a translation of the works which passed under the name of Dionysius the Areopagite.!° Brit. Mus. Add. 12151! con- tains this version with the introduction and notes of Phocas bar Sergius of Edessa,! a writer of the 8th century, as appears from his citing Athanasius II. and Jacob of Edessa. In Brit. Mus. Add. 2237013 we find Sergius's own introduction and the commentary of a later writer, Theodore bar Zaridi.4

astical, judicial, and private matters.2° The Syriac version, made from a Greek original, exists in two manuscripts," the older of which undeniably belongs to the earlier part of the 6th century. The work itself appears, according to the researches of Bruns (op. cit., pp. 318-319), to date from the time of the emperor Basiliseus (Brit, Mus. Add.

475-477), who was a favourer of the Monophysites; the Syriac translation is ascribed to a Monophysite monk of Mabbogh or Hierapolis (dbid., p. 155). The Paris MS. probably represents a Nestorian revision of the 9th or 10th century at (Baghdad) Bagh. dadh (zbid., p. 166). The oldest MS. of the secondary Arabic version is dated 1352 (ibid., p. 164), but it has been traced back to the time of the Nestorian lawyer Abu ’1-Faraj ‘Abdallah ibn at- Taiyib (who died 1043), whether made by him or not (

as a Nestorian is Ahi-dh’emmeh, metropolitan of Taghrith (‘Tekrit). dh’emmth,

He appears, on the contrary, to have becn the head of the Mono-

Paul of If Sergius was the Probus of the Monophysites, their Ma‘na was | physites in the Persian territory. According to Bar-Hebreus,” he Callini- Paul, bishop of Callinicus (ar-Rakkah), who, being expelled from | was appointed by Christopher, catholicus of the Armenians, to be cus. his see in 519, betook himself to Edessa and there devoted himself | bishop of Béth ‘Arbayé,® but was promoted by Jacob Burdé‘ana in

to the task of translating the works of Severus into Syriac. We know for certain!® that he edited versions of the correspondence of Severus and Julian of Halicarnassus on the corruptibility or incorruptibility of the body of Christ, with a discourse of Scverus against Julian!’; of the treatise against the Additions or Appendices of Julian, !8 and against the last apology of Julian 9; of that against

residing at the Persian court, where he translated into Greek a history of the kings of Persia ; see B.O., iii. 1,87, note 3; Renan, De Philesophia Peripatetica apud Syros, 1852, pp. 24-25. 1 B.0., iii. 1, 147 ; Renan, op. cit., p. 29.

2 Wright, Catal., p. 1154 sq.; comp. Renan, op. cit., p. 25 sq.; Journ. Asiat., 1852, 4th series, vol. xix. p. 319 sq.

3 There is a fragment of the Isagoge also in Brit. Mus. Add. 1618 (Wright, Catal., p. 738). ; ;

4 In the Vatican MS. elviii. (Catal., iii, 306, No. vi.) this translation is wrongly ascribed to Jacob of Edessa, who could hardly have been more than a boy at the tine when the MS. in the British Museum was transcribed. Besides, the ver- sion is not in his style. The Paris MS. Ancien fonds 161 naturally repeats this mistake (Zotenberg, Catal., p. 202). In Catal. Bibl. Palat. Medic., cod. cxeVi., it is likewise erroneously attributed to Honain ibn Ishak (comp. Renan, De Philos. Peripat. ap. Syros, p. 84, note 3). The Berlin MS. Alt. Best. 36 contains as No. 7 a treatise of Sergius on the Categories addressed to Philotheus.

5 Edited by Lagarde, Anal. Syr., p. 134 sq.; see V. Ryssel, Ueber den text- kritischen Werth d. Syr. Uebersetzungen griechischer Klassiker, part i. 1880, part ii. 1881. In parti. p. 4 Professor Ryssel speaks of this version as ‘ein Meister- werk der Uebersetzungskunst”; and in part ii. p.10 he says: “Die Ueber- setzung der Schrift wept xdcjov schliesst sich aufs engste an den Text des griechischen Originales an. Dass wir deshalb diese Uebersetzung als eine im besten Sinne wortgetreue bezeichnen kénnen, ziegt schon eine Vergleichung mit der lateinischen Bearbeitung des Apulejus von Madaura.” This opinion serves to rectify the judgement of Ibn Abi Osaibi‘ah (i. 204) that Sergius was only a mediocre translator, and that his work needed revision by the later Honain ibn Ishak. 6 See Sachau, Inedita Syr., pp. 101-126.

? This identification is due to Merx; see Dionysii Thracis Ars Grammatica, ed. Uhlig, p. xliv. sg. Merx has treated of an old, but independent, Armenian version in the same book, p. lvii. sq.

8 See Merx’s article in Z.D.M.G., xxxix. (1885), p. 237 sq.

9 See Sachau, Ined. Syr., pp. 88-94.

10 See Frothingham, Stephen bar Sudaili, p.3. 11 See Wright, Catal., p. 493.

12 B.0., i. 468. Assemani erroneously places him before Jacob of Edessa.

13 See Wright, Catal., p. 500.

14 There are also old MSS. of Sergius's version in the Vatican ; Catal., iii. Nos. evil. (p. 56), ecliv. (p. 542). Bar-Hebreeus states (Hist. Dynast., p. 158; transl., p. 99) that Sergius translated into Syriac the Syntagme of the Alexandrian priest and physician Aaron, and added to it two books ; but Steinschneider (Al-Farabi, p. 166, note 2) says that this is a mistake, and that the real author of the two additional books was the Arabic translator Masarjawaihi or Masarjis. The translator of the Geoponica, Al-Faldhah ar-Ramiyah (Leyden, cod. 414 Warn. ; Catal., iii. 211) and joint translator of the Meyddn ovvrakis of Ptolemy (Leyden, cod. 680 Warn.; Catal., iii. 80), by name Serjis or Serjiin (Sergius or Sergona) ibn ar-Riimi, seems to be a quite different person of later date.

1 B.O., ii. 46. He is to be distinguished from his namesake and contemporary, Paul, bishop of Edessa, who was banished to Euchaita in 522 (B.0., i. 409-411), restored to his see in 526 (ibid., p. 413), and died in the following year ; whereas Paul of Callinicus was working at Edessa in 528 (see p. 838 infra).

a foe part to a note at the end of Cod. Vat. cxl. (Catal., iii. 223; comp.

-O., loc. cit.).

< eae in 528; Cod. Vat. exl.; Brit. Mus. Add. 17200 (Wright, Catal.,

18 Cod. Vat. cxl.; Brit. Mus. Add. 12158 (Wright, Catal., p. 556), dated 588. 19 Brit. Mus. Add. 12158, CHEER, Coa);

559 to the see of Taghrith, where he ordained many priests and founded two monasteries. Among his numerous converts from heathenism was a youthful member of the royal family of Persia, whom he baptized by the name of George. This excited the anger of Khosrau I. Andsharwan, who ordered the bishop to be beheaded (2d August 575). Asa writer

Ahi-dh'emméh seems to have been more of a philosopher than a theologian.*! He wrote against the Persian priesthood and against the Greek philosophers, a book of definitions, a treatise on logic, on freewill in two discourses, on the soul and on man as the microcosm, and a treatise on the com- position of man as consisting of soul and body.2? He is also men- tioned by later authors as a writer on grammar.®

Somewhat before this time a monk of Edessa, whose name is un- Anony- known to us, tried his hand at the composition of a tripartite his- mous torical romance,#4—a history of Constantine and his three sons; an historical

account of Eusebius, bishop of Rome, and his sufferings at the hands romances.

of Julian the Apostate; and a history of Jovian or, as the Orientals usually call him, Jovinian, under Julian and during his own reign. The whole purports to be written by one Aploris or Aplolaris (Apol- linarius ?), an official at the court of Jovian, at the request of 'Abhdél, abbot of Sndriin (?) Mahéza, with a view to the conversion of the heathens. All three parts contain but a very small quantity of historical facts or dates, and deal in the grossest exaggerations and inventions. Yet the Syriac style is pure, and we gain from the book a good idea of the way in which the author's countrymen thought and spoke and acted. This romance has been published by Hoffmanu,® and Noldeke has given a full account of it, with an abridged translation, in Z.D.M.G., xxviii. p. 263 sg. He places the time of composition between 502 and 532. It is curious to find that this romance must have been known in an Arabic translation to the

20 There is a long extract from this work in Cod. Vat. exl. (Catal., ill, wee 4

21 Brit. Mus. Add. 14599, dated 569,; Cod. Vat. cxlii., dated 576; exliii., date 563; celvi.

22 Brit. Mus. Add. 17154. 23 Brit. Mus. Add. 17210-11, 12157. Fic

24 Compare, for example, Wright, Catal., p. 1323. The translation of Octoéchus is the work, not of Paul of Callinicus, but of an abbot Paul, who exe- cuted it in the island of Cyprus (see p. 838 infra). i

25 The passage quoted by Assemani (B.0., i. 409, note 2) seems, however, confound him with his namesake of Edessa. on

26 B.0., iii. 1, 267, note 6, 278, 338-339, 351 col. 2; comp. Bruns and Sachav, Syrisch-Rémisches Rechtsbuch, 1880, pp. 175-180. ; Zoten-

27 Brit. Mus. Add. 14528 (Wright, Catal., p. 177), and Paris, Suppl. 38 G ae 4 berg, Catal., p. 75, col. 1, No. 46). The text of the former was first pub ae 4 by Land (Anecd. Syr., i. 30-64), with a Latin translation. Both have ee e ou and translated, along with the Arabic and Armenian versions, with transia and a learned apparatus, by Bruns and Sachau, op. cit.

28 Wright, Catal., p. 1184. “

29 Chron. Eccles., ii. 99; comp. B.O., ii. 414, iil. 1, 192, note Es sii, 1,192

30 Ba-‘arbaya, the district between Nisibis and the Tigris. 31 B.O., in. 502).

32 Of this last part is extant in Brit. Mus. Add. 14620 (Wright, Catal. , p- i

33 See B.O., iii. 1, 256, note 2.

34 Contained in Brit. Mus. Add. 14641, ff. 1-131, a MS. of the 6th century.

35 Julianos der Abtriinnige, 1880.

6TH CENT. |

historian at-Tabari, who treats it as a genuine historical document.! From him it has passed to the Kamit of Ibn al-Athir, i, 283 sq., and the Akhbar al-Bashar of Abu ’1-Fida (Hist. Anteislamica, ed. Fleischer, p.

84). Ibn Wadih al-Ya‘kibi seems in his Annals? to have drawn from the same source, though independently of at- Tabari, and so also al-Mas‘iidi, Murij adh-Dhahab, ii. 323. Bar- Hebreus has also made some use of it in his Chronicon, ed. Bruns and Kirsch, pp. 68-69. No doubt, too, it is the work attributed by ‘Abhd-isho‘ to the grave ecclesiastical historian Socrates, who, as he says,’ wrote “a history of the emperors Constantine and Jovinian.”

Another, but much inferior, romance, of which Julian is the hero, is contained in Brit. Mus. Add. 7192, a manuscript of the 7th cen- tury. It has been edited by Hoffmann, op. cit., pp. 242-259, and translated by Noldeke, 7.D.1£.G., xxviii. 660-674. We shall not be far wrong in assigning it likewise to the 6th century, though it is probably rather later than that just noticed.

Of real historical value, on the contrary, is the anonymous nE@-Chronicon Edessenum, fortunately preserved to us in the Vatican | MS. clxiii.,4 and edited by Asscmani in B.O., i. 388-417. There is an English translation of it in the Journ. of Sacred Lit., 1864, vol. v. (new ser.), p. 28 sg. It begins with A.Gr. 180, but the entries are very sparse till we reach A.Gr. 513 (202 a.D.). The last of them refers to the year 540, about which time the little book must have been compiled. The author made use of the archives of Edessa and other documents now lost to us, as well as of the Chronicle of Joshua the Stylite (see above, p. 832). In religious matters he is not a violent partisan, nor given to the use of harsh words, a thing / to be noted in the age in which he lived. q¢ Another writer of first-rate importance as a historian is John, ij bishop of Asia or Ephesus, “the teacher of the heathen,” “the ‘hes. overseer of the heathen,” and “the idol-breaker,” as he loves to style himself.° He was a native of Amid, and must have been born early in the 6th century, according to Land about 505. He was ordained deacon in the convent of St John in 529, when he | must have been at least twenty years of age.’ In 534 the terrible | pestilence of the reign of Justinian broke out, and_at that time

John was in Palestine,’ having, doubtless, fled from Amid to avoid | the persecution of the Monophysites by Abraham bar Kili (?) of Tella,

bishop of Amid (from about 520 to 546), and Ephraim bar Appian of Amid, patriarch of Antioch (529-544), "a much worse persecutor than Paul or Enphrasius."® In 535 we find him at Constantinople, where in the following year, according to Bar- Hebreeus,!° he became bishop of the Monophysites in succession to the deposed Anthimus. Be this as it may, he was certainly re- | ceived with great favour by Justinian, whose friendship and con- fidence he enjoyed for thirty years, and "had the administration of the entire revenues of all the congregations of the believers (i.e., the Monophysites) in Constantinople and everywhere else.") Wishing to root out heathenism in Asia Minor, obviously for | political as well as religious reasons, the emperor appointed John } to be his missionary bishop.' In this task he had great success, | to which his faithful friend and fellow-labourer for thirty-five years, } Deuterius, largely contributed. He interested himself, too, in the missionary efforts of Julian, Theodore, and Longinus among the Nubians and Alodei.4 In 546 the emperor employed him in search- ing out and putting down the secret practice of idolatry in Constan- tinople and its neighbourhood. After the death of his patron the fortunes of John soon underwent a change. Bk. i. of the third part of his History commences with the perseeution under Justin in 571, in which he suffered imprisonment.!® His friend Deuterius, whom he had made bishop of Caria, was also persecuted, and died at Constantinople." From this time forward John's story is that of his party, and the evidently confused and disordered state of his History is fully explained and excused by his own words in bk. ii. | 50, where he tells us!8 "that most of these histories were written at the very time when the persecution was going on, and under the | difficulties caused by its pressure; and it was even necessary that

friends should remove the leaves on which these chapters were in- | scribed, and every other particle of writing, and conceal them in | various places, where they sometimes remained for two or three

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1 At-Tabari, Annales, i. 840 sq.; see Néldeke, in Z.D.M.G., xxviii. 291-292, and | Geschichte der Perser und Araber zur Zeit der Sasaniden, p. 59 sq.

2 Hd. Houtsma, i. 182-183. 3 BO. ii. 1, 41. 4 See Catal., iii. 329.

5 See Kecles. Hist., ed. Cureton, bk. ii. ch. 4 and bk. iii. ch. 36; Land, Anecd. Syr., li. 256, 1. 25. 6 B.O., ii. 88; Bar-Hebrieus, Chron. Eccles., i. 195.

7 B.O., ii., Dissert. de Monophysitis, p. exxv.; Land, Anecd. Syr., 174, ll. 8, 9.

8 B.O., ii. 85-86, E.H., ed. Cureton, bk. i. ch. xli.; comp. B.O., ii. 51.

10 Chron. Eccles., i. 195. ll £.H., ed. Cureton, bk. v. ch. 1.

12 Ibid., bk. ii. ch. 44; bk. iii. ch. 86, 87; comp. B.O., ii. 85.

13 #.H., ed. Cureton, bk. ii. ch. 44.

14 Ibid., bk. iv. ch. 6-8, 49-53 ; comp. Bar-Hebrzeus, Chron. Eccles., i. 229. How just his views were as a missionary may be seen from bk. iv. ch. 50, where he says "that it was not right that to an erring and heathen people, who asked to be converted to Christianity and to learn the fear of God, there should be sent by letter, before everything that was necessary for their edification, con- : ae and offence and the revilings of Christians against Christians."

EOe, ies. :

16 F.H., ed. Cureton, bk. i. ch. 17; bk. ii. ch. 4-7. Of unjust legal proceed- ings he complains in bk. ii. ch. 41, where he loses his mpoao7Tetov, &c.

7 #.H., ed. Cureton, bk. ii. ch. 44. 18 Payne Smith's translation, p. 163.

years. When therefore matters occurred which the writer wished to record, it was possible that he might have partly spoken of them before, but he had no papers or notes by which to read and know whether they had been described or not. If therefore he did not remember that he had recorded them, at some subsequent time he probably again proceeded to their detail ; and therefore occasionally the same subject is recorded in more chapters than one; nor after- wards did he ever find a fitting time for plainly and clearly arrang- ing them in an orderly narrative." Some of the chapters are actu- ally dated at various times from A.Gr. 886 (575 A.D.) to 896 (585). The time and place of his death are unknown, but he cannot have lived long after 585, being then about eighty years of age. His greatest literary work is his Ecclesiastical History in three parts, the first two of which, as he himself tells us,2 embraced, in six books each, the period from Julius Cesar to the seventh year of Justin II., whilst the third, also in six books, carried on the tale to the end of the author's life. The first part is entirely lost. Of the second we have copious excerpts in the Chronicle of Dionysius of Tell-Mahré*! and in two MSS. in the British Museum." The third has fortunately come down to us, though with considerable lacune, in Brit. Mus. Add. 14640 (of the 7th century).22 This book is worthy of all praise for the fulness and accuracy of its information and the evident striving of the author after impartiality. The Syriac style, however, is very awkward and involved, and abounds in Greek words and phrases. Of scarccly less value for the history of his own time is another work entitled Biographics of Eastern Saints, men and women, contained in Brit. Mus. Add. 14647, ff. 1-135.%4 These lives were gathered into one corpus about 569, as appears from the account of the combination of the monasteries of Amid during the persecution of 521, which was put on paper in 567,"° and from the history of the convent of St John, extending from its foundation in 389 to 568.26 To these lives Land has added three more, which are ascribed in MSS. to John, but do not seem to have been included in this collection. ""

The name of Zacharias Rhetor or Scholasticus, bishop of Mityléné Zachar- in Lesbos, must next be mentioned, for, though a Greek author, ias his work has entered into the Syriac literature as part of a compila- Rhetor.. tion by a Syrian monk. The Leclesiastical History of Zacharias seems to have terminated about the year 518, whereas his Syriac translator was writing as late as 569,% and even later. The MS. in the British Museum, Add. 17202,°° cannot be younger than the beginning of the 7th century, and is clearly the compilation of a Monophysite, who used Zacharias as his chief authority in books lli.-vi.; whereas books i., ii., and vii.~~xii. were gathered from differ~~ ent sources, such as Moses of Aggeél (about 550-570), Simeon of Béth Arsham (sce above, p. 832), Mara of Amid (see above, p. 833), the correspondence of Julian of Halicarnassus and Severus of Antioch (see above, p. 834), the history of John of Ephesus,?! &c. In a Syriac MS. in the Vatican (No. cxlv.)*? we find a series of extracts from this Syriac work.(f. 78 sg.) as a continuation of copious ex- cerpts from the Greek histories of Socrates and Theodoret. The last of these, on the public buildings, statues, and other decorations of the city of Rome, has been carefully re-edited and annotated by Guidi.**

We turn from the historians to the ascetic writers of this century, who seem to have been more prized by their countrymen, though far less valuable to us. And first we mention the author who is commonly called John Sabha * or "the Aged," placing him here on John the authority of Assemani (B.0., i. 483), for 'Abhd-isho' claims him Sabha. as a Nestorian (B.0., ili. 1, 103). His florwit is given as about

19 See Land, Joannes Bischof von Ephesos, der erste Syrische Kirchenhistortker, 1856. A very useful book.

20 E.H., ed. Cureton, bk. i. ch. 3. 21 B.0., ii. 100; comp. pp. 85-90.

22 Add. 14647 (dated 688), ff. 136-139; Add. 14650 (dated 875), ff. 189-206. Edited by Land, Anecd. Syr., ii. 289-829 and 385-391. See also a small frag- inent, ibid., 363, from Add. 12154, f. 201b.

23 Edited by Cureton, 1853. There is an English translation by R. Payne Smith, 1860, and a German one by Schonfelder, 1862.

24 Edited by Land, Anecd. Syr., ii. 1-288.

25 Anecd. Syr., ii. 212, 1.17; see also p. 191, last two lines.

26 Tbid., ii. 288, ll. 2, 3.

27 Ibid., ii. 343-862. That of Jacob Burdé‘ana (ibid., p. 364) is not his, at least in its present shape (see above, p.833). There is a slightly different redaction of it in the Bibl. Nation. at Paris, Anc. fonds 144 (Zotenberg, Catal., p. 187).

28 See Land, Joannes Bischof von Ephesos, p. 35 sg.,and Anecd. Syr., ili., Preface.

29 Land, Anecd. Syr., iii. pp. xi., xii., and p. 5, 1. 21 sq.

30 See Wright, Catal., p. 1046 sq. ‘

31 Not a few chapters in books vii.-x. seem to be derived, in part at any rate, from the sccond part of the Ecclesiastical History.

32 Catal., iii. 253; B.O., ii. 54 sq.; Mai, Scriptorum Veterum Nova Collectio, x. pp. xi.-xiv., 332-388. The MS., which Assemani calls ‘* pervetustus, Syriacis literis stronghylis exaratus” (p. 253), is not likely to be earlier than the middle of the 8th century, as it contains a work of the patriarch Elias, who sat from 708 to 728.

33 Il Testo Siriaco della Descrizione di Roma, &c., from the Bullettino della Commiissione Archeologica di Roma, fase. iv. anno 1884 (Rome, 1885). It is also extant in a shorter form in Brit. Mus. Add. 12154, f. 158a (see Wright, Catal., p. 984; Guidi, p. 235 sq.).

34 There is some uncertainty about his name.

{Dados on eisaQa, John of Dilaita, which, he says (p. 433), is a convent at Nineveh, on the opposite bank of the Tigris from Mosul. In vol.

iii. 1, 103 he prints CTS on elasQe, which he renders Joannes

In B.0., i. 484, Assemani gives

Isaac of Nineveh

836

550. His writings consist of short sermons or tracts, exclusively intended for the training and study of monks and ccenobites, and a number of letters. ‘Abhd-ishd‘ (Joc. cit.) says: “ he composed two volumes, besides mournful epistles, on the monastic life.” They were collected * by his brother, who has prefixed a brief apology, at the end of which the reader may find a eurious example of affected humility (B.0., i. 435)’ Two short specimens of the style of “the spiritual old man,” ash-Shaikh ar-rihani, are printed in Zingerle’s Monumenta Syr., 1. 102-104.

A little junior to John Sabha was the even more widely known Isaac of Nineveh, to whom the Nestorians also lay claim.4 His date is fixed, as Assemani points out, by the facts of his citing Jacob of Sériigh and corresponding with Simeon Stylites the younger or Thaumastorites, who died in 593. According to the Arabic biography, printed in B.O., i. 444, he was a monk of the convent of Mar Matthew at Mosul, and afterwards became bishop of that city, but soon resigned his office and retired to the desert of Skete in Egypt, where he composed his ascetic works. According to ‘Abhd-isho’ (B.0., iii. 1, 104), Isaac “wrote seven volumes on the guidance of the Spirit, and on the Divine mysteries and judgements and dispensation.” Many of his discourses and epistles have been catalogued by Assemani, B.O., i. 446-460. The MS. Vat. cxxiv. contains the first half of his writings (Catai., iii. 148), and similarly MSS. Brit. Mus. Add. 14632 and 14633.5 The Arabic translation is divided into four books ; the Ethiopic is naturally derived from the Arabic. A Greek version was made from the original Syriac by two monks of St Saba, near Jernsalem, named Patricius and Abraamius, on which see Assemani, B.O., i. 445, and Bickell, Con-spectus, p. 26. The only printed specimens of his discourses are two in Zingerle’s Monumenta Syr., 1. 97-101.

Abraham Another author of this class, but of less mark, is Abraham of

of Neph-

tar.

Moses of

Aggél.

Peter of Callini- cus.

Nephtar,® who flourished towards the end of the 6th century and in the early part of the 7th.? Him too the Nestorians claim as theirs.? ‘Abhd-isho‘ speaks of “various works” of his,? but onr libraries seem to contain only eight short discourses, the titles of which are given by Assemani, B.0O., i. 464.19 They have been trans- lated into Arabic, and there was also a Persian version of them by Job the monk (B.0., iii. 1, 481).

We record here the name of Moses of Aggél as being one of those who, after Rabbulad, undertook the translation of the writings of Cyril of Alexandria into Syriac. He made a version of the Gla- phyra, at the request of a monk named Paphnutius, from whose letter”! we learn that the treatise On Worship in Sptrit and in Truth had been already translated,!? whilst from the reply of Moses, as quoted in B.O., ii. 82-83, it is obvious that he was writing after the death of Philoxenus and the chorepiscopus Polycarp. Hence we may place him soon after the middle of the century, say from 550 to 570. Much later he cannot be, because his translation of the History of Moses and Asyath (see above, p. 826) has been ad- mitted into the Syriac compilation that passes under the name of Zacharias Rhetor (see above, p. 835).18

Peter of Callinicus (ar-Rakkah), Jacobite patriarch of Antioch, 578-591,!4 deserves mention on account of his huge controversial treatise against Damian, patriarch of Alexandria, manuscripts of parts of which, of the 7th and 8th centuries, are extant in the Vatican and the British Museum. Other writings of his arc an anaphora,’® a short treatise against the Tritheists,.” sundry letters,18 and a metrical homily on the Crucifixion of our Lord.49 In the

Daliathensis, i.e., from ad-Daliyah, al sJ], probably meaning Daliyat Malik ibn Tauk, on the right bank of the Euphrates below ar-Rakkah and Rahbat Malik ibn Tauk. In the Vatican Catalogue he calls him Daliathensis, writing,

however, in Syriac |Dadas 3. But how can obas3s mean "of ad-

Daliyah " (leas)? Following the analogy of waldo» wa pnd,

eT10 59009 —LasQe, and the like, it ought rather to mean "John of the Vine-Branches," or "John with the Varicose Veins," or (as in Arabic) 'John of the Buckets."

1 See Wright, Catal., p. 863, 7. version of it from a Vatican MS.

2 Fora list of them in Syriac and Arabic, see B.0. i. 435-444, and comp. Wright, Catal., pp. 582, 584, 860, 870 (No. 16). There is also an Ethiopié version,, Aragawt Manfastwi, made from the Arabic; see Zotenberg, Catal. des MSS. Ethiopiens de la Bibl. Nation., No. 115, p. 184. 3 B.O., i. 444,

4 Ibid., iti. 1, 104. 5 Wright, Catal., pp. 569, 576.

6 Also written Nethpar and N ephrath ; see Assemaui, Catal. Vat., iii. 138. But,

as we can find no trace of any such town as N' ephtar, the name of La Aaa nay have some other origin. 7 B.O., iii. 1, 191, note 1.

8 Compare Wright, Catal., p. 187, No. 154, 9 B.O., iii. 1, 191.

pe seem to be ten in Cod. Vat. ceccxix.; see Mai, Scriptt. Vett. Nova Coll., v. 65.

31 Cod. Vat. evii. (Catal., iii. 58); Guidi, Rendiconti della R. Accademia dei Lineei, May and June, 1886, p. 399 sq.

12 Brit. Mus. Add. 12166, ff. 155-258, bears date 553 (Wright, Catal., p. 491).

13 Of the Vatican MS. of the Glaphyra only five leaves remain (Catal., iii. 54), and the MS. in the British Museum, Add. 14555, is very imperfect (Wright, Catal., p. 483). As Guidi has shown, these two MSS. are merely the disjecta membra of one codex. 14 B.0., ii. 69, 332; Bar-Hebreus, Chron. Eccles., i. 250.

US 15h 10, EE comp. Bar-Hebreus, Chron. Eceles., i. 257. 16 B.O., ii. 77.

7 Brit. Mus. Add. 12155, f. 231b (Wright, Catal., p. 951).

38 Wright, Catal., p. 1314. 19 Brit. Mus. Add. 14591 (Wright, Catal., p. 671).

In the B.O., i. 484, Assemani gives an Arabic

SYRIAC LITLTRAtTUEe

–

[6TH cent,

dispute between him and Damian was involved his syncellus and

successor Julian, who defended Peter against an attack made upon

ee 4 Sergius the Armenian, bishop of Edessa, and his brother ohn.

Of the numerous Nestorian writers of tunately know but little more than can be learned from the cata. logue of ‘Abhd-isho‘. Their works have either been lost, or else very few of them have as yet reached our European libraries,

The successor of Narsai (above, p- 880) in the school of was his sister’s son Abraham,?! who must have fled from with his uncle.” His principal writings are commentaries on Joshua Judges, Kings, Ecclesiasticus, Isaiah, the twelve minor prophets, Daniel, and the Song of Songs.?8 :

To him succeeded as teacher John, also a disciple of Narsai,2

the 6th century we unfor.

miah, Ezekiel, and Proverbs ; also controversial treatises against the Magi or Persian priesthood, the Jews, and (Christian) heretics – a book of questions on the Old and New Testaments ; and various hymns. If the discourses on the plague at Nisibis ® and the death of Khosrau J. Anésharwan be really by him, he was alive as late as 579, in the spring of which year that monarch died.26

John was followed by Joseph Hiiziya,2'another disciple of Narsai,% J oseph him Bar-Hebrzus observes ® Hizaya,

and the first Syriac grammarian. Of that "he changed the Edessene (or Western) mode of reading into the Eastern mode which the Nestorians employ ; otherwise during the whole time of Narsai they used to read like us Westerns," He was the inventor of some of the Syriac signs of interpunction,?9 and wrote a treatise on grammar * and another on words that are spelled with the same letters but have different meanings.

Of Mar-abha%3 the Elder, catholicus from 536 to 552, we have Mar- already spoken above as a translator of the Scriptures (p. 826). He abhal.

was a convert from the Zoroastrian religion, and seems to have been a man of great talent and versatility, as he mastered both the Greek and Syriac languages. Receiving baptism at Herta (al-Hirah) from a teacher named Joseph, he went for the purposes of study to Nisibis, and afterwards to Edessa, where he and his teacher Thomas *4 trans- lated into Syriac the liturgy of Nestorius. They visited Constanti- nople together, and, escaping thence at some risk of their lives, be- took themselves to Nisibis, where Mar-abha became eminent as a teacher. On being chosen catholicus he opened a college at Seleucia and lectured there. Unluckily, he got into controversy, it is said, with the Persian monarch Khosrau I. Andsharwan (531-579), who banished him to Adharbaigan (Azerbijan) and destroyed the Nes- torian church beside his palace at Seleucia. Mar-abha, however, had the temerity to return to Seleucia, was thrown by the king into prison, and died there.3¢ His

dead body was carried by one of his disciples to Hérta, where it was buried and a monastery erected over the grave. He wrote" commentaries on Genesis, the Psalms, and Proverbs, and the epistles of St Paul to the Romans, Corinthians, Galatians, Ephesians, Philippians, and Hebrews 3 various homilies ; synodical epistles ®; and ecclesiastical canons. In these last he opposed the practice of marriage at least among the higher orders of the clergy, the bishops and catholics. What is meant by his "canones in totum Davidem" may be seen from such MSS. of the

20 B.O., ii. 8338 ; Bar-Hebreus, Chron. Eceles., i. 259.

21 B.0., iii. 1,71. Assemani would seem to have confounded him with a later Abraliam of Béth Rabban ; see his note, B.O., iii. 1, 681.

22 There seems to beno reason for ideritifying him with Abraham 'the Mede," whom Simeon of Béth Arsham nicknaines " the Heater of Baths" (B.0., i. 352).

23 The hymn appended to Nestorian copies of the Psalter probably pertains to this Abraham and not to the later Abraham of Béth Rabban (see, for ex- ample, Brit. Mus. Add. 7156, f. 157b); comp. Bickell, Conspectus, p. 37, and Hoffmann, Opuse. Nestor., xi., note 2.

24 B.O., iii. 1,72. Here again Assemani seems to have mixed up this John with a later John of Béth Rabban and with John Sabha of Bath Garmai ; see his additional notes in B.O., iii. 1, 631, 708.

25 During the time of the catholics Joseph and Ezekiel, from 552 to 578; see B.O., ii. 418, 433, note 2.

26 The hymn in the Nestorian MSS. of the Psalter (mentioned in note 23 above) is probably by this John and not by the later Jolin of Béth Rabban; comp. Hoffmann's note referred to above. 'The monastery of Rabban Zekha- isho' (or Isho'-zékha) in Dasen was not founded till about 590, and Zékha-isho himself did ue die till the thirteenth year of Khosrau IH. Parwéz, 603; see B.O., iii. 1, 472. ;

7 Ie., of al-Ahwaz or Khiizistan. He must not be confounded with Josepll Hazzaya, of whom we shall speak hereafter (see p. 838 infra). .

28 Bar-Hebreus, Chron. Eceles., ii. 78, says that Joseph Hiizaya was the im- mediate successor of Narsai; but the Nestorian writer cited by Asseinani (B.0., iii. 1, 64) is likely to be better informed. The passage quoted ibid., p. 82, points in the same direction ; comp. also B. 0., iii. 2, emxxvii.

29 Loc. cit.; comp. B.O., ii. 407. ’

30 See Wright, Catal., p.107, col. 2. Assemani (B.0., iii. 1, 64, col. 2) has mis-

translated the words EA3 dsm 2) ols?! caasstles 92, Comp. Hoflinann,

Opusc. Nestor., viii., xi. 31 Berlin, Royal Library, Sachau 226, 4.

32 Bar-Hebreus, Euvres grammaticales, ed. Martin, ii. 77.

33 Properly Mar(i)-abha, but we shall write Mar-abha. >

34 Probably the same who is mentioned among his disciples in B.O,, fi. 412, and some of whose writings are enumerated by ‘Abhd-Isho’ in B.O., iii. 1, 86-7.

35 So‘Abhd-ish6′ in B.0., iif.1,36; butin Brit. Mus. Add. 7181 the same remark is made as to the liturgy of Theodore of Mopsuestia (see Rosen, Catal., p. 59).

36 B.O., ii. 411-412, iii. 1, 75, notes J, 2; Bar-Hebrzus, Chron., Eccles., ti. 89-95.

37 B.O., iii. 1, 75. 38 Ibid., iii. 1, 76, note 4.

= Ibid., iii. 1, 81, and note I ; comp. Cod. Vat. ecevi. in Mai, Scriptt. Vett. Nova Coll., v. 21.

Nisibis Abraham Edessa of Nisibis,

: He Joh wrote commentaries on Exodus, Leviticus, and Numbers, Job, Jere- Ae,

a Se oe

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Psalter as Brit. Mus. Add. 71561

was secretly removed to his native place Kashkar. treatise on the monastic life, which was translated into Persian b his disciple Job the monk.®

mani has confounded him. under Abraham the nephew of Narsai.

His death did not take place till towards the end of the century.®

Mar-abha in place of David, whom he had deposed, about 540. He seems to have been much addicted to the study of the Aristo-

Sergius of Ras‘ain are dedicated to him.9 _ there is mentioned “a solution of the ten questions of Sergius.” He _ also composed a commentary on the Psalms and a metrical history of Mar Eugenius and his companions,” who came from Klysma and introduced asceticism into Mesopotamia about the beginning of the 4th century. What may have been the contents of the “liber varii argumenti” which he wrote at the request of Mar-abha himself it is hard to guess, in the default of any copy of it.

| Theodore’s brother Gabriel, bishop of Hormizdshér,!? is stated by ‘Abhd-ish6‘¥ to have written two controversial books against the ts. Manichees and the Chaldeans (astrologers), as also about 300 chap- ters on various passages of Scripture which needed elucidation and _ explanation.

| The successor of Mar-abha in the see of Seleucia was J oseph, in @ 552. He studied medicine in the West and practised in Nisibis, where he

lived in one of the convents. Having been introduced | by a Persian noble to the notice of Khosrau I., he cured that monarch | of an illness, and ingratiated himself with him so much that he _ favoured his appointment to the office of catholicus. Of his strange pranks and cruelties as archbishop some account, doubtless highly | coloured, may be read in B.O., iii. 1, 482-483, and Bar-Hebreeus,

Chron. Eccles., ii. 95-97. He was deposed after he had sat for three | years, but he lived twelve years longer, during which time no suc- | cessor was appointed. He promulgated twenty-three canons," and, according to Elias, bishop of Damascus (898)," after his deposition drew up a list of his predecessors in the dignity of catholicus,

| wherein he would seem to have paid special attention to those who | had shared the same fate with himself. At least Bar-Hebreus!6 (per- haps not a quite trustworthy witness in this case) gives currency to the charge of his having forged the consolatory epistles of Jacob | of Nisibis and Mar Ephraim to Papa of Seleucia on his deposition.

A little later in the century, under the sway of his successor | Ezekiel (a disciple of Mar-abha and the son-in-law of his predecessor

Paul), 567-580,!" there flourished Paul the Persian,!8 of Dérshar or | Dershahr,'® a courtier 'of Khosrau I. Andsharwin.2° He is said by Bar-Hebreeus *! to have been distinguished alike in ecclesiastical and philosophical lore, and to have aspired to the post of metropolitan

1 Rosen, Catal., p. 12.

2 Verzeichniss d. orient. Handschriften d. k. Hof: u. Staats-Bivi., &ce., p. 111.

| 3 Sec Bickell, Conspectus, p. 37, and comp. Brit. Mus. Add. 17219, f. 165b (beg., | Glory to Thee, Lord; how good Thou art !).

| + A village near Arbél or Irbil, in Hédhaiyabh.

5 B.0., iii. 1, 155, col. 1, 431 ; ili. 2, dccelxxiii.

§ Comp. B.0., iii. 1, 154, note 4, with Hoffmann, Ausziige, p. 172.

7 B.O., iti. 1, 93. 8 See Hoftinann, loc. cit.

} 9 See Brit. Mus. Add. 14658 (Wright, Catal., p. 1154); Renan, De Philosophia | Peripat. ap. Syros, p. 29. 10 B.0., iii. 1, 147.

ll See B.0., iii. 1, 147, note 4, and 633; iii. 2, decelxii.; Bar-Hebreus, Chron. Eecles., i. 85, with note 5; Hoffinann, Ausziige, p. 167. If the poem mentioned j by Asscmani (B.0., iii. 1, 147, note 4) really speaks of Abraham of Kashkar and) Still more of Babhai of Nisibis, it must be of later date, and Hoffmann is inclined to poe it to George Warda, a writer of the 13th century (sec Ausziige, p. 171, {note 1327).

}_ 12 A corruption of Hormizd-Ardashér, still further shortened by the Arabs

jinto Hormushir. It is identical with Sik al-Ahwiz, or simply al-Ahwa4z, on

{the river Karin. See Noldeke, Gesch. d. Perser u. Araber, p. 19, with note 5.

} 13 B.O., iii. 1, 147,

| 14 Ibid., iii.i.435. Elias bar Shinaya cites his “synod”; see Bar-Hebrus, Chron. Eccles., ii. 96, note 1.

| 15 In his Nomocanon, quoted by Assemani, B.O., iii. 1, 434.

16 Chron. Eccles., ii, 31.

17 See B.0., iii. 1, 435-489 ; Bar-Hebreeus, Chron. Eccles., ii. 97, 108.

18 B.O., iii. 1, 489; Renan, De Philos. Peripat. ap. Syros, pp. 16-22.

19 $4 y2), a place not known to the present writer.

20 See Noldeke, Gesch. d. Perser u. Araber, p. 160, note 3.

21 Chron. Eccles., ii. 97.

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and Munich, cod. Syr. 4 (Orient.

He wrote a Ay

He must, it would seem, be distinguished from another Abraham of Kashkar, who lived about the same time, and with whom Asse- This Abraham was a student at Nisibis Thence he went to Hérta (al-Hirah), where he converted some of the heathen inhabitants, visited Egypt and Mount Sinai, and finally settled down as a hermit in a cave on Mount Izla, near Nisibis, where a great number of followers soon gathered about him and a large monastery was built. He introduced stricter rules than heretofore among the ccenobites.?

Theodore, bishop of Mari or Merv, was appointed to this see by

telian dialectics, since several of the translations and treatises of Among his own works ”

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bishop of Persis, but, being disappointed, to have gone over to the

147).? Hymns of his are also extant.3 Zoroastrian religion. This may or ma : iti \ bra ; Under Mar-abha flourished Abraham of Kashkar (al-Wasit), dis- | tain that Paul sta more A ap eee ee Te oe Pan fam ie tinguished for his acquaintance with philosophy and for his ascetic speaks*?; “Scientia enim agit de rebus proximis et manifestis et ‘Kashir. virtues. He introduced certain reforms into the Persian monas- qu sciri possunt, fides autem de omnibus materiis que remote | teries, After living for some time in a cave at Hazzah,* he betook sunt, neque conspiciuntur neque certa ratione cognoscuntur. Hee himself to J erusalem and thence to Egypt. Returning to his old quidem cum dubio est, illa autem sine dubio. Omne dubium dis- | haunt, he led the life of a hermit for thirty years, travelling into | sensionem parit, dubii absentia

autem unanimitatem. Scientia | the far north as a missionary. He died at Hazzah, but his body | igitur potior est fide, et illam pre hae eligendum est." Bar-

Hebreus speaks of Paul's "admirable introduction to the dialectics (of Aristotle),"> by which he no doubt means the treatise on logic cxtant in a single MS. in the Brit. Mus. It has been edited, with a Latin translation and notes, by Land. _ About this same time Assemani" is said to have had the charge of t tricts of the Persian empire as far a specified "discourses on the fai

he Christians in the remoter dis- sIndia. Among his writings are hed "dis th and against the Manichees and Marcionites," as well as a book of "Greek questions," probably philosophical, bearing the strange title of Aleph Migin.2" All these have perished, but his name will go down to remote posterity as the translator into Syriac of the collection of Indian tales com- monly called Kalilah and Dimnah.*8 Of this work a single copy has come down to our time, preserved in an Oriental library. A transcript of it was first procured by Bickell," who, in conjunction with Benfey, edited the book (Leipsic, 187 6) ; and since then three additional copies of the same original have been got by Sachau.%? That Bodh made his Syriac translation from an Indian (Sanskrit) original, as "Abhd-ishO' asserts, is wholly unlikely ; he no doubt had before him a Pahlavi or Persian version. 1

_Just at this period the Nestorian Church ran a great risk of disruption from an internal schism. Hannana of Hédhaiyabh, the successor of Joseph Hizaya in the school of Nisibis, who had, it is said, a following of 800 pupils,3? had dared to assail the doc. trines and exegesis of Theodore of Mopsuestia and to follow in some points those of Chrysostom.?? He commenced his work at Nisibis, under the metropolitan Aha-dh'abhii(hi),®4 by publishing a revised edition of the statutes of the school.®* During the time of the catholicus Ezekiel (567-580) he brought forward his theological views, which were condemned at a synod held under the next catholicus, Isho'-yabh of Arzdn (581-595),87 and at another synod presided over by his successor, Sabhr-ishd' (596-604).38 On the death of this latter a**

struggle took place between the rival factions, the orthodox Nestorians putting forward as their candidate Gregory of Tell-Besmé,° bishop of Nisibis, whilst the others supported Gregory of Kashkar, a teacher in the school of Mahozé or Sélik (Seleucia).“° The influence of the Persian court decided the matter in favour of the latter, who was a persona grata in the eyes of the queen Shirin and her physician Gabriel of Shiggar (Sinjar),41 a keen Monophysite, who naturally availed himself of this oppor- tunity to harm the rival sect of Christians. Gregory was not, however, a partisan of Hannana, but an orthodox Nestorian, as appears from the account given of the synod over which he pre- sided, by which the Nicene creed was confirmed, the comment- aries of Theodore of Mopsuestia approved, and the memory and writings of Bar-sauma vindicated against his assailants. He died at the end of three years (607), and the archiepiscopal see remained vacant till after the murder of Khosrau II. Parwéz in 628, during which time of persecution Babhai the archimandrite distinguished himself as the leader and guide of the Nestorian Church. In the overthrow of Khosrau the oppressed Nestorians bore a part, more especially Shamta and Kurta, the sons of the noble Yazdin, who had been the director of the land-tax of the whole kingdom and had amassed an enormous fortune, which the king confiscated. To return to Hannana, his works, as enumerated by ‘Abhd-isho’,4 are—commentaries on Genesis, Job, Psalms, Proverbs, Ecclesiastes, the Song of Songs, the twelve minor prophets, the Gospel of St Mark, and the epistles of St Paul; expositions of the (Nicene) creed and the liturgy; on the occasions of the celebration of Palm

22 Tn the Preface to his Logic, as translated by Land (see note 25 below).

23 Chron. Eccles., ii. 97. 24 Add. 14660, f. 55b; see Wright, Catal., p. 1161.

25 Anecd. Syr., iv., Syr. text, pp. 1-32; transl., pp. 1-30; notes, pp. 99-113.

26 B.0., iii. 1, 219. Ka

27 Assemani, loc. cit., note 1, proposes to read Aleph Mellin, ‘the Thousand Words”; but Aleph Migin is more likely to be a corruption of some Greek word.

28 The Syriac title keeps the older forms Kalilagh and Damnagh.

29 Géttingen, university library, MS. Orient. 18d.

30 Berlin, Royal Library, Sachau 139, 149, 150.

31 See Keith-Falconer, Kalzlah and Dimnah, Introd., xlii. sq.

32 B.0., iii. 1, 81, note 2, 487. 33 Ibid., iii. 1, 84, note 3.

34 Who was probably, therefore, the immediate predecessor of Gregory (596).

35 B.0., iii. 1, 83, at tlle end of the first note. 36 Ibid., ii. 413 ; ili. 1, 435.

37 Ibid., ii. 415, iii. 1,108 ; Bar-Hebreus, Chron. Eccles., ii. 105, note 3.

38 B.O., ii. 4155 iii. 1, 82, 441.

33 Not aromatarius, as Assemani translates Besinayd.

40 B.O., ii. 416; ili. 1, 449. We need not believe the statements of Bar-Hebrzus, Chron. Eccles., ii. 107.

41 See B.O., ii. 404-406, 416, 472; Bar-Hebreus, Chron. Eccles., ii. 109 ; Noldeke Gesch. d. Perser u. Araber, p. 358, in the note ; Hoffmann, Ausziige, pp. 118-121

42 B.0., iii. 1, 452. 43 See B.O., iii. 1, 471.

44 See Hoffmann, Ausziige, pp. 115-121; Noldeke, Gesch. d. Perser u. Araber p. 383. To Yazdin is ascribed a hymn which appears in Nestorian Psalters, e.g., Wright, Catal., p.135; Zotenberg, Catal., p. 9. 4 B.O., iii. 1, 83-84.

places the periodeutes Bodh, who Bodh,

Hannana of Hé- dhaiyabh.

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Sunday, Golden Friday,! rogations,? and the invention of the cross ; a discourse on Palm Sunday ; and various other writings in which he attacked the teaching of Theodore of Mopsuestia, and which the church therefore placed on its index cxpurgatorius.3

Josephof The doctrines of Hannana found a warm champion in Joseph of

Hazzii.

Isho'- yabh I. of Arzon.

Méshiha- zékha,

Dadh- isho.

Bare 'idta.

Hazza (Arbél or Irbil),4 with whom Babhai the archimandrite entered into controversy.> He is said to have composed some 1900 tracts, of which 'Abhd-isho' mentions about a dozen as " profitable," whence we may conjecture that the rest were more or less deeply tinged with heresy. The chief of them are—on theory (or specula- tion) and practice ; the book of the treasurer, containing the solu- tion of abstruse questions ; on misfortunes and chastisements ; on the reasons of the principal feasts of the church; the book of the histories of the Paradise of the Orientals, containing many notices of ecclesiastical history ; an exposition of the vision of Ezekiel and of the vision of St Gregory; of the book of the merchant®; of (pseudo-)Dionysius (the Areopagite) ; and of the capita scientiz or heads of knowledge (of Evagrius) ; besides epistles on the exalted character of the monastic life. Joseph appears to have been made a bishop in his latter days, and to have taken the name

of ‘Abhd- ishd‘; at least a MS. in the India Office (No. 9) contains a traet on Zech. iv, 10 (f. 241b), and three series of questions addressed by a pupil to his teacher, by “ Mar ‘Abhd-ishd‘, who is Joseph Hazzaiya” (f. 298a).”

_ The successor of Ezekiel as catholicus of the Nestorians was Ish6é‘-yabh of Arzon, 581-595.8 He was a native of Beth ‘Arbayé, educated at Nisibis under Abraham (see above, p. 836), and subse- quently made bishop of Arzon (’‘Apfavyyij). He managed to in- gratiate himself with the Persian monarch Hormizd IV. (579-590), by whose influence he was raised to the archiepiscopate ; and he continued to stand in favour with his son and successor Khosrau I], Parwéz, as well as with the Greek cmperor Maurice. Doubtless both found the Christian archbishop a convenient ambassador and agent in public and private affairs, for Maurice had given his daughter Maria in marriage to Khosrau.9 He was also a friend of the Arab king of Herta (al-Hirah), Abi Kabis Nu‘man ibn al- Mundhir, who had becn converted to Christianity, with his sons, by Simeon, bishop of Hérta, Sabhr-isho’, bishop of Lashom, and the monk Isho’-zékha. Ona pastoral visit to this part of his diocese, the catholicus was taken ill, and died in the convent of Hind (the daughter of Nu‘man) at al-Hirah. Among his works are men- tioned” a treatise against Eunomius, one against a heretical (Mono- physite) bishop who had entered into argument with him, twenty- two questions regarding the sacraments of the church,!2 an apology, and synodical canons and epistles.

Méshiha-zékha, also called Ishd‘-zékha or Zékha-ishd’, was a monk of Mount Izla.44 When many of his brotherhood were ex- peed from their convent by Babhai the archimandrite,!* he betook himself to the district of Dasen,1° and founded there a monastery, which was henceforth known as Béth Rabban Zékha-isho’ or, for shortness’ sake, Béth Rabban simply.!7_ He was the author of an ecclesiastical history, which ‘Abdh-ish6′ praises as being “exact.”

Dadh-ishs‘ was the successor of Abraham of Kashkar as abbot of the great convent on Mount Izla,)8 apparently during the life- time of the latter, who lived toa great age (see above p- 837).19 He composed a

treatise on the monastic life and another entitled On Silence in Body and in Spirit, a discourse on the consecra- tion of the cell, besides funeral sermons and epistles. He also translated or edited a commentary on The Paradise of the Western Monks (probably meaning the Paradise of Palladius and J erome), and annotated the works of Isaiah of Scete.2

Hereabout too is the date of the monk Bar-‘idta,2! the founder of the convent which bears his name,” a contemporary of Babhai of Izli and Jacob of Béth ‘Abhé.2? He was tlre author of a monastic history, which is often quoted by Thomas of Margi,* and seems to — ee eee ees

1 The first Friday after Pentecost or Whitsunday, with reference to Acts iii. 6.

2 See B.O., ii. 413. 3 Ibid., iii. 1, 84, note 3.

4 Ibdid., iii. 1, 100; Hoffmann, Ausziige, p.117. Assemani confounds Joseph Hazzaya with the older Joseph Huzaya, and translates Hazzaya by “videns” instead of “ Hazzeus.”

5 £.g., his letters to Joseph of Hazza, B.O., iii. 1, 97, and the tract De Unione, ib., 95.

é According to Assemani, B.0., iii. 1, 102, note 4, of Isdiah of Seete, who, according to Palladius, was originally a merchant.

? See Hoffmann, Avusztige, p. 117, note 1057.

8 B.O., ii. 415, iii.1, 108 ; Bar-Hebreeus, Chron. Eccles., ii. 105, note3; Néldeke, Gesch. d. Perser u. Araber, p. 347, note 1.

9 Sec Noldeke, op. cit., p. 283, note 2, and comp. p. 287, note 2.

10 Bar-Hebreus (Chron. Eccles., ii. 105) tries to make out that Nu’man was a Monophysite, and that Isho’-yabh was trying to pervert him at the time of his death. But in such matters he is hardly a trustworthy witness.

1 B.O., iii. 1, 108.

12 See a specimen in Assemani's Catal. of the Vutican Library, iii. 280, No. cl., v.

13 Probably a defence of his doctrines addressed to the emperor Maurice; see B.0., iii. 1, 109, in the note.

14 B.O., iii. 1, 216, note 1, See above, p. 836, note 26.

15 Ibid., iii. 1, 88-89. 16 Hoffmann, Ausziige, p. 202 sq.

W B.O., iii. 1, 216 note 1, 255 in the note: Hoffmann, Ausztige, p. 206.

18 B.O., iii. 1, 98, note 1. 19 Hoffmann, Azusziige, p. 173.

20 B.0., iii. 1, 99. 21 Ibid., ii. 415, col. 2. Pronounce Bar-'itta.

22 B.0., iii. 2, decelxxix.; Hoffmann, Ausztige, p. 181.

3 Comp. Wright, Catal., p. 187, No. 152. 23 B.O., iii. 1, 453, 458, 471.

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have been a work of considerable value. He must be distinguished from a later Bar-'idta, of the convent of Sélibha, near the village of Héghla on the Tigris,25 with whom Assemani has confounded him.26

In the Bibl. Orient., iii. 1, 230, 'Abhd-isho' mentions an historian whose name is given by Assemani as Simeon Karkhaya, with the additional information that he was bishop of Karkha and flourished under the patriarch Timothy I. about 800. His name seems however, to have been wrongly read, and he appears to have lived at a much earlier date. At least Elias bar Shinaya speaks in his Chronicle" of one Simeon Barkaya 8 as the author of a chronicle (in at least two books), who wrote in the reign of the Persian kine Khosrau IJ. Parwéz, A. Gr. 902=591 a.p. 7

The name of Sabhr-ishd' the catholicus carries us over into the Sabhr. 7th century. He wasa native of Pérdz-abadh in Bath Garmai, ish!

became bishop of Lashom, and was raised to the archiepiscopate in 596 by the favour of Khosrau II. Parwéz. On the murder of his father-in-law Maurice (November 602), Khosrau resolved upon war, and took the field in 604, when he besieged and captured the fortress of Dara, the first great success in a fearful struggle of twenty-five years. Bar-Hebreus states that Sabhr-isho' accom. panied him and died during the siege 8°; but other authorities say, doubtless more correctly, that he died at Nisibis.2! He is said to have been the author of an ecclesiastical history, of whieh a frag- ment, relating to the emperor Maurice, was supposed to be extant in Cod. Vat. clxxxiii.; but Guidi has shown that this is incorrect, and that the said fragment is merely an extract from a legendary life of Sabhr-ish' by some later hand (7.D.I2.G., xl., pp- 559-561).

About the same time with Sabhr-isho', if Assemani be right,®? we Simeon may place Simeon of Béth Garmai, who translated into Syriac the of Béth This version seems unfortunately to be Garmai,

Chronicle of Eusebius. entirely lost.

With the 7th century begins the slow decay of the native litera- Period of ture of the Syrians, to which the frightful sufferings of the people Greco- during the great war with the Persians in its first quarter largely Persian

During all those years we meet with scarcely a War,

contributed.*4 name of any note in letters, more especially in western Syria. Paul of Tella and Thomas of Harkel were, it is true, labouring at the revised versions of the Old and New Testaments in Alexandria,® but even there they were scared by the Persian hosts, who took possession of the city in 615 or 616, shortly after the capture of Jerusalem by another army in 614.36 A third diligent worker under

the same adverse circuinstances was the abbot Paul, who fied from Abbot his convent in Syria to escape the Persian invasion, and took refuge Paul,

in the island of Cyprus. Here he occupied himself with rendering into Syriac the works of Gregory Nazianzen.3" Of this version, which was completed in two volumes in 624, there are several old MSS. in the British Museum.%8 This Paul was also the translator of the Octoéchus of Severus, of which there is a MS. in the British Museum, Add. 17134, dated 675.29 To this collection he him- self contributed a hymn on the holy chrism and a translation of the " Gloria in excelsis."

The name of Mariitha is the first that deserves mention here, Maratha more, however, on account of his ecclesiastical weight and position of Tagh- He was a native of Shurzak (2), a village rith.

than his literary merit. in the diocese of Béth Nuhadhré,*! was ordained priest in the con- vent of Nardus, lived for twenty years in the convent of Zakkai or Zaccheus at Callinicus (ar-Rakkah), and went thence to Edessa for purposes of study. On returning to the East, he resided in the convent of Mar Matthew at Mosul, where he occupied himself with remodelling its rules and orders. He sided with the Monophysite party at the Persian court, and, after the death of the physician Gabriel," found it advisable to retire to 'Akéla (al-Kifah).® He was elevated to the dignity of metropolitan bishop of Taghrith in 640, after the establishment of peace between the Greeks and

25 See Hoffmann, Ausziige, p. 181, note 1414. 26 B.O., iii. 1, 458. 27 See Rosen, Catal., p. 88, col. 1, 2.

°8 The difference in writing between Jao fo and Laces is not great. The pronunciation of the word Leses is not quite certain.

29 B.O., ii, 415, iii. 1, 441 sq.; Baethgen, Fragmente syr. u. arab. Historiker, pp. 36, 119. 30 Chron. Eccles., ii. 107.

31 Chron. Eccles., loc. cit., note 2; B.O., iii. 1, 441, col. 1.

32 Assemani, Catal., iii. 387. 33 B.0., iii. 1, 168, 633.

84 See the remarks of Néldeke in Gesch. d. Perser u. Araber, p. 299, note 4.

35 See above, p. 825. Thomas of Harkel also compiled a liturgy (B.0., ii. 92, col. 1), and is said to have translated from Greek into Syriac five other liturgies (idid., col. 2), viz., those of Gregory Nazianzen, Basil, Gregory Nyssen, Diony- sius the Areopagite, and John Chrysostom, 3

36 See Noldeke, Gesch. d. Perser u. Araber, pp. 291-292; Chronique de Michel le Grand, p. 222; Bar-Hebreus, Chron. Syr., p. 99.

37 See BO), ily ls ieee

38 See the fine series of MSS. deseribed in Wright's Catal., pp. 423-435. One of these is dated 790, another 845. Two other MSS. (ibid., pp. 436-438) seem to contain part of the older version of the Nestorians (B.0., iii. 1, 24, note 1).

39 Wright, Catal., p. 330 sg. The translator is wrongly described in the codex as "bishop of Edessa" (see above, p. 834, note 15). His convent was probably that of Ken-neshré, of which both John bar Aphtonya (see_above, p. 833) and John Psaltés or Calligraphus were abbots. Compare B.0., ii. 54.

40 B.O., ii, 416, 418.

41 See Hoffmann, Ausztige, pp. 208-216, but especially p. 215.

42 See above, p. 837.

43 Bar-Hebreus, Chron. Eceles., ii. 111; B.O., ii. 416.

So a SS SE GS © ES ce a

a a See

Yonq

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organizer of the Jacobite Church in the East, which

(Herat). Maratha died in 649.

to the clder Maritha of Maiperkat.?

of the water on the eve of the Epiphany, and sedris.4

Aristotle, his commentary on the Ilept épunvelas, and his letters to the priest Aitilaha of Mosul on certain terms in the Iept épunveias, and to the periodeutes Yaunan or Jonas on some points in the logic of Aristotle1® Of his astronomical and geographieal studies there are a few examples in Brit. Mus. Add. 14538, ff. 153-155, such as whether the heaven surrounds the earth in the form of a wheel or sphere, on the habitable and uninhabitable portions of the earth, on the measurement of the heaven and the earth and the space between them, and on the motions of the sun and moon.!? In the Royal Library at Berlin there is a short treatise of his on the astrolabe. 3 More or less theological in their nature are his letter to the priest and periodeutes Basil of Cyprus, on the 14th of Nisan, A. Gr. 976 (665 A.p.),14a treatise on the weeks of Daniel, and letters to Sergius, abbot of Shigear (Sinjar), on two discourses of Gregory Nazianzen.16 He is also said to have drawn up a liturgy.l"

John I., Jacobite patriarch of Antioch, was called from the con- vent of Eusébhona at Tell-'Adda to the archiepiscopal throne in 631, and died in December 648.18 Bar-Hebraus tells us that he

- translated the Gospels into Arabic at the command of the Arab

emir 'Amr ibn Sa'd. He is better known as the author of numer- ous sedras and other prayers, whence he is commonly called Yohan- nan dé-sedhrau(hi), or "John of the Sedris." He also drew up a liturgy. 19

During the second quarter of this century, from 633 to 636, the Muhammadan conquest of Syria took place. The petty Arab king-

7 ut doms of the Lakhmites (al-Hirah), the Tha‘labites and Kindites, f Sym.

and the Ghassinites, as well as the wandering tribes of Mesopotamia, were absorbed ; and the Persians were beaten back into their own country, quickly to be overrun in its turn. The year 638 witnessed the last-effort of the Greek empire to wrest Syria from the invaders ; the Muslim yoke was no longer to be shaken off. The effects of this conquest soon begin to make themselves manifest in the litera- ture of the country. The more the Arabic language comes into use, the more the Syriac wanes and wastes away; the more Muham- madan litcrature flourishes, the more purely Christian literature pines and dwindles ; so that from this time on it becomes necessary to compile grammars and dictionaries of the old Syriac tongue, and to note and record the correct reading and pronunciation of words in the Scriptures and other books, in order that the understand- ing of them may not be lost.

Among the small band of Monophysite scholars who made them- selves conspicuous during the latter half of the 7th century the most famous name is that of Jacob of Edessa.2° He was a native of “En-débha (the Wolf’s well), a village in the district of Gumyah (al-Jimah), in the province of Antioch. The date of his birth is not mentioned, but it may have been about 640 or a little earlier.2! He studied under Severus Sébdkht at the famous convent of Ken- neshreé, where he learned Greek and the accurate reading of the

1 The circumstances are given in detail by Bar-Hebreus (Chron. Eceles., ii. 119 sq.) and Assemani (B.0., ii. 419).

2 Sce Brit. Mus. Add. 14645, f. 198a (Wright, Catal., p. 1118).

3 See above, p. 829. From the commentary are taken the passages quoted in the Catena of Severus. See Assemani, Catal., iii. 11 (on Eixod., xv. 25), 24, and Wright, Catal., p. 910.

4 See Brit. Mus. Add. 14727, f. 140a; 17267, f. 17b; 17254, f. 164a ; 17128, f£.91b.

5 According to Bar-Hebreeus, Chron. Eccles.,i. 275; B.O., ii. 8834. Dionysius of Tell-Mahré gives 644.

6 On the Persian name Sébdkht see Noldeke, Gesch. des Artachsir 1 Papakén, in Beitrdge 2. Kunde d. indogerm. Sprachen, iv. 49, note 4; Gesch. d. Perser u. Araber, p. 396, note 1. 7 See Wright, Catal., p. 598, col. 1.

8 See B.O., ii. 885; Bar-Hebraus, Chron. Jogo. 16 Oise

9 Compare Renan, De Philos. Peripat. ap. Syros, pp. 29, 30.

10 See Brit. Mus. Add. 14660 and 17156 (Wright, Catal., pp. 1160-63), and the Catal. of the Royal Library of Berlin, Sachau 226, 6, 9.

ll Wright, Catal., p. 1008. 12 See Sachau, Ined. Syr., pp. 127-1384.

18 Alter Bestand 87, 2 (Kurzes Verzeichniss, p. 32). 14 Same MS., 3.

15 Wright, Catal., p. 988, col.2. 16 Ibid., p. 432, col.2. 17 B.O., ii. 468.

18 Bar-Hebreus, Chron. Eccles., 1.275; B.O., ii. 335. But Dionysius of Tell-

Mahré says 650; B.0., i. 425. 19 Berlin, Sachau 185, 6. vn | 20 Bar-Hebreeus, Chron. Eccles., i. 289; B.O., i. 468, ii. 335. Assemani tries) hard in vol. i. to prove that he was not 2 Monophysite (p. 470 sq.), but in vol. | ii. 337 he gives up the attempt in despair. Compare Lamy, Dissert. de Syrorum) Fide, &ec., p. 206 sq.

***1 The dates given in B.0., i. 469, seem to be utterly wrong.**

Persians,' and was the first real maphriin (maphréyaina) and so rapidly in- creased in numbers and influence that he was ealled upon to ordain bishops for such remote regions as Segestan (Sistan) and Harew His life was written by his suc- cessor Denha.* Maratha eompiled a liturgy and wrote a comment- ary on the Gospels, both of which are

sometimes wrongly assigned t.° He was also the author of short discourses on New (or Low) Sunday, and on the conseeration as well as of some hymns

Contemporary with M&riitha, under the patriarch Athanasius

. Gammala (died in 6315) and his successor John, flourished Severus Sebokht ® of Nisibis,' bishop of the convent of Ken-neshré, at this time one of the chief seats of Greek learning in western Syria. He devoted himself, as might be expected, to philosophical and mathe- matical as well as theological studies.® Of the first we have speci- mens in his treatise on the syllogisms in the Analytica Priora of

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Scriptures. Thence he went to Alexandria, but we are not told how long he remained there. After his return to Syria he was appointed bishop of Edessa in 679-680 22; but Bar-Hebreus says that he was ordained by the patriarch Athanasius II., 684-687, which seems more probable, as they werc intimate friends, If he was appointed in 684, the three or four years for which he held this office would terminate in 687-688, in which latter year Julian Romaya (or "' the Soldier") 23 was eleeted patriarch. Apparently Jacob was very strict in the enforcement of eanonieal rules, and thereby offended a portion of his elergy. He would seem to have appealed to the patriarch and his fellow- bishops, who were in favour of temporizing ; whcreupon Jacob burnt a copy of the rules before the gate of Julian's convent, at the same time crying aloud, "I burn with fire as superfluous and useless the canons which ye trample under foot and heed not." He then betook himself to the convent at Kaisiim, a town near Samosita, and Habbibh was appointed to Edessa in his stead. After a while the monks of Eusébhona invited Jacob to their convent, and there he taught for eleven years the Psalms and the reading of the Scriptures in Greek, the study of which language had fallen into desuetude. Owing to disputes with some of the brethren "who hated the Greeks," he left this house and went to the great convent at Tell- 'Adda, where he worked for nine years more at his revised version of the Old Testament.?4 On the death of Habbibh Jacob was re- called to Edessa, where he resided for four inonths, at the end of which time he returned

to Tell-‘Adda to fetch his library and. pupils, but died there on 5th June 708.25 In the literature of his country Jacob holds much the same place as Jerome among thie Latin fathers. He was, for his time, a man of great culture and wide reading, being familiar with Greek and with older Syriac writers. Of Hebrew he probably understood very little, but he was always ready, like Aphraates, to avail himself of the aid of Jewish scholars, whose opinion he often cites. He appears before us as at once theologian, historian, philosopher, and grammarian, as a translator of various Greek works, and as the indefatigable correspondent of many students who sought his advice and assist- ance from far and near. Asa theologian, Jacob wrote commentaries on the Old and New Testaments, which are cited by later authors, such as Dionysius bar Salibi2‘ and Bar-Hebreus, as well as in the large Catena of the monk Severus”, further, scholia on the whole Scriptures, of which specimens may be found in S. Ephraemi Opera. Syr.8 and in Phillips’s Scholéa on some Passages of the Old Testament (1864). His discourses on the six days of ereation are extant at Leyden and Lyons.° This was his latest work, bcing unfinished at the time of his death ; it was completed by his friend George, bishop of the Arab tribes. Like many other doctors of the Syrian Church, Jacob drew up an anaphora or liturgy,! and revised the liturgy of St James, the brother of our Lord.? He also composed orders of bap- tism,*° of the consecration of the water on the eve of the Epiphany,4 and of the solemnization of matrimony,® with which we may con- neet his translation of the order of baptism of Severus* and the tract upon the forbidden degrees of affinity.” The Book of Treasures ® contained expositions of the Eucharistic service, of the consecration of the water, and of the rite of baptism, probably identical with or similar to those which are found separately in MSS.®9 He likewise arranged the horologium or canonical hours of the ferial days,* and drew up a calendar of feasts and saints’ days for the whole year.* Of his numerous eanons,” those addressed to the priest Addai have been edited by Lamy, Dissert. de Syrorum Fide, iten JOn OS She and De Lagarde, Peliquie Juris Eccles. Antiquissime, p. 117 sq.”

22 According to the calculation of Dionysius of Tell-Mahre, 677; see B.O., i. 426.

23 So called because he had in his younger days served along with his father in the imperial army. _ _ 24 See above, p- 825. :

25 According to Dionysius of Tell-Mahré, B.O., i. 426, a.p. 710; but Elias bar Shinaya confirms the earlier date. See Baethgen, Fragmente syr. u. arab. His- toriker. – 40, 121. Ne

26 Sod Bibl. Med. Laurent. et Palat. Codd. Orientt. Catal., p. 85, No. xlviii. :

27 B.O., i. 487-488 ; Cod. Vat. cili. (Catal., iii. 7); Brit. Mus. Add. 12144 (Wright, Catal., p. 908). The former MS. contains a brief exposition of the Pentateuch, Job, Joshua, and Judges by Jacob, loc. cit., pp. 9-11. 28 B.O., i. 489-498.

29 See Brit. Mus. Add. 14488 and 17198, ff. 55a, 61a; eompare Cod. Vat. v.

tal., ii. pp. 12, 18). ;

& Tocien Cod. é (1) Gol. (see Catal. Codd. Orientt., v. 69, aud Land, Anecd. Syr., i. 2-4); Lyons, No. 2 (see Neubauer in Archives des Missions scientifiques et littéraires, 8 ser., vol. i. p. 568, Paris, 1873). The Paris MS. is merely a partial copy of the Leyden one (Zotenberg, Catal., p. 197). Itis cited in Brit. Mus. Add. 14781, f. 98b (Wright, Catal., p. 854, col. 2, at the foot), and in the Bod- leian Catal., p. 462, No. 5. Another Paris MS. (Zotenberg, Catal., p. 213) con- tains the punctuation and explanation of difficult words and phrases in this work. 31 B.0.,i1.476. Itis extant in many MSS.

32 Jbid.; Brit. Mus. Add. 14691, f. 2b, and elsewhere. Whether he was the translator of the anaphora of Ignatius, we are unable to affirm or deny.

33 B.O., i. 477. 34 Ibid., 486, col. 1.

35 E.g., Zotenberg, Catal., pp. 66, 67. 36 H.g., Rosen, Catal., p. 61, eol. 2.

37 Cod. Vat. xxxvii. (Catal., ii. 244). 38 B.O., 1.487.

39 E.g., the Eucharist, Berlin, Sachau 218, 4 (addressed to the Stylite George of Sérugh); Brit. Mus. Add. 14496, f. 1a (Wright, Catal., p. 224). The similar exposition edited by Assemani (B.0., i. 479) is addressed to the priest Thomas ; comp. Brit. Mus. Add. 17215, f. 22b._ The consecration of the water, Cod. Vat. ecev., in Mai, Scripit. Vett. Nova Coll., v. The order of baptism, Brit. Mus. 14496, f. 23a (a mere fragment). 40 Brit. Mus. Add. 14704 ; Paris, Anc. fonds 78.

41 See Catal. Vat., ii. 250-272 ; and comp. Berlin, Sachau 39, 4. 42 B.0., i. 477.

43 See also Kayser, Die Canones Jacob's von Edessa dibersetzt und erléutert, zum Theil auch zuerst im Grundtext verdffentlicht, 1886.

Under this hcad we may mention the Scholion de Diaconissis carumque Munere (Catal. Vat., ii. 8319) and the Scholion de Fori- bus Ecclesie dum Ordinationes aut alia Sacra celebrantur oecluden- dis (Cod. Vat. ccciv., in Mai, Seriptt. Vett. Nova Coll., v.). Jacob also composed homilies, of which a few survive in manuscript: for example—(1) that Christians are not to offer a lamb after the Jewish fashion, nor oxen and sheep, on behalf of the deceased, nor to use pure wine and unleavened bread in celebrating the Eucharist ; (2) against the use of unleavened bread; (3) against the Armenians as Dyophysites, and because they offend against these doctrines +; (4) against certain impious men and transgressors of the law of God, who trample under foot the canons of the church? To these may be added his metrical discourses on the Trinity and the incarnation of the word* and on the faith against the Nes- torians.¢ Whether the treatise De Causa omnium Causarum® really belongs to him can hardly be decided till it has been published. The remarks in the Bodleian Catalogue, p. 585, note, point to a writer of much later date. The loss of Jacob's Chronicle is greatly to be regretted ; only a few leaves, all more or less mutilated, remain to us in Brit. Mus. Add. 14685.6 The author's design was to continue the Chronicle of Eusebius on the same plan, from the twentieth year of the

reign of Constantine down to his own time. The introduction was divided into four sections, the first of which treated of the canon of Eusebius and the error of three years in his calculation ; the second of the dynasties contemporary with the Roman empire, but omitted by Eusebius ; the third explained what dynasties were coordinated by Jacob with the Roman empire ; and the fourth contained separate chronologies of each of these dynasties. Then followed the chronological canon, beginning with Olympiad celxxvi. The last monarchs mentioned in the mutilated MS. are Heraclius I. of Constantinople, Ardashér ITI. of Persia, and the caliph Aba Bakr. This work, which was finished by the anthor in 692," has been extensively used by subsequent Syrian historians, both Jacobite and Nestorian, such as Bar-Hebreus,® Elias bar Shinaya,® &c., and it is therefore admitted by 'Abhd-ishS' into his list of books (B.0., iii. 1, 229). As a translator of Greek works Jacob deserves notice, not so much on account of any Aristotelian labours of his,!° as because of his version of the Homiliz Cathedrales of Severus, a work of capital importance, which he finished in 701.0 He also revised and corrected, with the help of Greek MSS., the abbot Paul's version of the Octoéchus of Severus (sce above, p. 838).?2 'The statement of Bar-Hcbreus that Jacob translated the works of Gregory Nazianzen seems to be erroneous. He merely retouched, we believe, the version of the abbot Paul (see above, p. 838), to which he probably added notes, illustrative extracts from the writings of Severus, and Athanasius's redaction of the Zwaywyh Kal é&tynots toropisv appended to the homily In Sancta Lumina.4 He made the Syriac version of the history of the Rechabites as narrated by Zosimus, which he is said to have translated from Hebrew into Greek and thence into Syriac.8 Of philosophical writings of his we may specify the Enchiridion, a tract on philosophical terms.16 The metrical composition on the same subject contained in two Vatican MSS. may perhaps also be by him." As a grammarian Jacob occupies an important placc in Syriac literature. Nestorian scholars, such as Narsai and his pupils, more especially Joseph Hizaya (sce above, p. 836), had no doubt elaborated a system of accentuation and interpunction, which vies in minuteness with that of the Jews, and had probably begun to store up the results of their studies in Massoretic MSS. of the Bible, like those of which we have alrcady spoken (above, p. 826). But Jacob was the first to givea decided

impulse to these pursuits among the Western Syrians, and to induce the monks of Eusébhind and Tell-‘Adda to compile Massoretic MSS. like those of their brethren in the East, and to pay attention to minute accuracy in the matter of the diacritical points and the signs of interpunction. Hence we usually find appended to such MSS. of the Jacobite schools the epistle of Jacob to George,

1 See Bibl. Med. Laurent. et Palat. Codd. MSS. Orientt. Catal., pp. 107-108.

2 Wright, Catal., pp. 984, col. 2; 996, col. 2.

3 Catal. Vat., ii. 516. 4 Ibid., iii. 353.

5 See B.0., i. 461-468. Besides the MS. described by Assemani, there are two in the Bodleian Library, Hunt. 123 (Payne Smith, Catal., 585) and Bodl. Or. 732, and a third at Berlin, Sachau 180, with an excerpt in Sachau 203.

6 See Wright, Catal., p. 1062. :

7 See Elias bar Shinaya in Rosen, Catal., p. 88, col. 1. 8 B.0., ii. 313-314.

9 See, for example, the notes in Abbeloos, Bar-Hebrei Chron. Eccles., ii. 55, 103, 107,123; Bacthgen, Fragmente syr. u. arab. Historiker, extracted from Elias bar Shinaya, p. 3; and the anonymous epitomizer in Land, Anecd. Syr., i. 2-22, transl. pp. 103-121 (Brit. Mus. Add. 14643 ; Wright, Catal., p. 1040).

10 Even the translation of the Categories in Cod. Vat. elviii. (Catal., iii. 306 ; comp. Renan, De Philos. Peripat. ap. Syros, p. 34) is not by him, but by Sergius of Ras‘ain (see above, p. 834).

e ~ ae ee i: a ; Cod. Vat. cxli.; Brit. Mus. Add. 12159, dated 868 (Wright, abat., Pp. 534 sq.).

12 B.O., i. 487 ; Cod. Vat. xciv., written between 1010 and 1033; Brit. Mus. Add. 17134, dated 675 (Wright, Catal., p. 330 sq.).

13 B.0., ii. 307, col. 25 iie ll 2as cole.

14 See Wright, Catal., pp. 423-497. 15 Ibid., p. 1128. 16 Ibid., p. 984.

17 Cod. Vat. xxxvi. and xey. (Catal., ii. 243 and 516). In the latter there are three other poems ascribed to him, the first theological, the second with the title De Philosophis et Bonis Artibus, and the third entitled On the Mind. In

ie PRs. these poems are said to be by Jacob of Sértigh, which seems altogether unlikely.

bishop of Sériigh, on Syrian orthography,?8 and a tract by him on the pointing of verbal and nominal forms and on the signs of interpunction and accentuation, besides a tract of apparently earlier date on the same signs, with a list of their names, b Thomas the deacon.!9 Further, Jacob's acquaintance with the Greek language and Greek MSS. suggested to hima striking simpli. fication of the systcm of vowel-points which was now probably beginning to be introduced among the Easterns.2° He saw that all the vowel-sounds of the Syriac language, as spoken by the Edessenes, could be represented by meaus of the Greek vowel Ictters, a style of pointing which would be far clearer to the reader thana series of minute dots. Accordingly he, or his school, put 4 for &, 0 for ¢ (a), € for e, H for 7, oy for w; and this system has been adhcred to by the Western Syrians or Jacobites since his time.2 J, acob wished, however, to go a step farther, and sought to introduce a reform for which his countrymen were not prepared. The constant perusal of Greek MSS. had accustomed him to see the vowels placed on an equality with the consonants as an integral part of the alphabet ; and, considering how much this contributed to clearness of sense and facility of reading, he desired to see the like done in Syriac. For this purpose he himself designed a set of vowel-signs, to be written on a line with and

between the consonants ; and for the purpose of making this invention known to his countrymen he wrote a Syriac Grammar,® in which he used them largely in the paradigms. The innovation, however, found no favour, and the work was supposed to be utterly lost, until a few fragments (partly palimpsest) were simultancously discovered by the present writer and Dr Neubauer.*4 Finally, amid all his labours as priest and bishop, teacher and author, Jacob found time to correspond with a large number of persons in all parts of Syria ; and these epistles are often among his most interesting writings." One of his principal correspondents was John the Stylite of the convent of Litarba (Alrap8a plur., but also Alrapyov, Avrapyov ; al-Atharib, near Aleppo); others were Eustathius of Dara, Kyrisona of Dara, the priest Abraham, the deacon George, and the sculptor Thomas. To the priest Addai he wrote on the orders of baptism and the consecration of the water,2" to the deacon Bar- hadh- bé-shabba against the council of Chalcedon,® to the priest Paul of Antioch on the Syriac alphabet, in reply to a letter about the defects of the said alphabet as compared with the Greek,29 and to George, bishop of Scrigh, on Syriac orthography (see above).

After Jacob we may name his friend Athanasius of Balad, who Athana- also studied under Severus Sébokht at Ken-neshré, and devoted sius Il. himself to the translation of Greek works, philosophical and theo- of Balad. logical, in the convent of Mar Malchus in Tar 'A bhdin or at Nisibis, where he for a time officiated as priest. "He was advanced to the patriarchate in 684 and sat till 687 or 688.29 In the year 645 he translated the Jsagdgé of Porphyry, with an introduction, which seems to be chiefly derived from the preface of the Greek comment: ator Ammonius*!; and he also edited a version of an anonymous

18 See B.0., i. 477 (No. 6) and p. 478 (No. 8). ;

19 See, for exainple, Catal. Vat., iii. 290; Brit. Mus., Rosen, pp. 69, 70 (Wright, p- 110); Paris, Zotenberg, Catal., p. 30. The letter and tracts have heen pub- lished by Phillips, A Letter by Mar Jacob, Bishop of Edessa, on Syriae Orthography, &ce. (1869; the third Appendix, pp. 85-96, 1870), and Martin, Jacobi epi Edessent Epistola ad Georgium epum Sarugensem de Orthographia Syriaca (1869). On the possible

identity of Thomas the deacon with Thomas of Harkel, see Phillips, third Appendix, p. 90. .

20 In the year 899 we find the fully developed Nestorian system of vowel-points in use (Brit. Mus. Add. 12138, see the facsimile in Wright's Catal., pl. xiii.). We may therefore fairly place its beginnings as early as Jacob's time. !

21 The credit of inventing this vowel-system is usually given to Theophilus of Edessa, who died in 785-786 (B.0., i. 64, 521), though Wiseman brought for- ward to our mind convincing arguments in his Hore Syriac#, pp. 181-188, in favour of the claims of Jacob. We have now, however, a MS. of Jacob's own time in which these Greek vowels are distinctly appended to Syriac words. See Brit. Mus. Add. 17134, f. 83b, in Wright's Catal., p. 337, col. 2, and pl. vi. In this plate, the handwriting of which cannot well be placed later than about

700, we find in 1, 1 the vowel YS (ypsilon) in the word [Aso,2, and in 1. 23 the vowel & in " "

in lines 6, 17, 18, 21, 22, and31. Noone can doubt, we think, that these vowels were added a pr. manu, especially if le compares their forms, particularly the a, with those of the Greek letters on the margin of pl. v. :

22 See Bar-Hebreeus in his Kéthabha dhé-Semhé, as quoted by Martin, Jacques ad' Edesse et les Voyelles Syriennes (Journ. Asiat., 1869, vol. xiii. pp. 458-459), or pp- 194-195 of Martin's edition. Jacob had already before him flie example of the Mandaites, from hase alphabet his figure of &> for ¢ appears to be borrowed.

23 B.O., i. 475, 477.

24 See Brit. Mus. Add, 17217, ff. 37,88 ; 14665, f. 28; in Wright's Catal., ae 78. These were reprinted, with the Oxford fragments (Bod1, 159), by Wrig.

in Fragments of the Las o13 LiNsco 3 50 Z or Syriac Grammar of Jacob of Edessa (1871). ; oF a are bes > see Brit. Mus. Add. 12172, ff. 65a, 73a; 17168, f. 154a. 26 See all these in Brit. Mus. Add. 12172, ff. 65-135 (Wright, Caial., pp. 592-604). Three of these letters have been published, two by Wright in the Journal of Sacred Literature, new series, x. (1861), p. 480 sg., and one by Schroéter in Z.D.M.G., xxiv. (1870), pp. 261-300. 27 B.O., i. 486, oe 11 Pari Mus. Add. 14715, f. 170a; see also Add. 12144, ff. 47a, 52b. 28 Brit. Mus. Add. 14631, f. 14b. 29

B.O., i. 477, No. i 1 30 B.O., ii. 335 ; Bar-Hebreus, Chron. Eccles., i. 287, 293. Dionysius of Tel?- Mahré places his death as late as 704. nilos 31 Cod. Vat. clviii.; Paris, Anc. fouds 161. According to Renan, De P. ‘lah Peripat. ap. Syros, p. 30, note 4, the MSS. elxxxiii. and exevi. of the Bibl. Palat. Medic. contain this translation and not that of Honain.

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STH CENT.] eY RIietAOC LITE RATU RE Isagégé, which is found in Brit. Mus. Add. 14660.! At the request of Matthew, bishop of Aleppo, and Daniel, bishop of Edessa, he undertook in 669 a translation of select epistles of Severus of Antioch, and of these the sixth book survives in two MSS.2 He also busied himself with Gregory Nazianzen, as is evidenced by a scholion introductory to the homilies? and the version of the

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There is an abridgement of it in Brit. Mus. Add. 17125, f. 81 sq. The commentary on Ecclesiastes is known to us only from the extracts preserved in Severus’s Catena.”

Regarding George, bishop of Martyropolis,24 we can add little or George of nothing to the scanty information collected by Assemani.2> This Martyro- scholar has, however, made a mistake in placing him so early as polis.

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Zwaywyh kal eEyynows toropidv.4 The only other writings of his with which we are acquainted are an encyclical letter, prohibiting Christians from partaking of the sacrifices of their Muhammadan rulers,® and a couple of sedras.®

He lias, however, misread the name. In the MS., as Professor Guidi informs us, it stands LD OL papad csi Ole, not ql.

The former part of the name seems to be Iavoudpios ; the latter is apparently (as Guidi suggests) a corruption of Kayédiédaros. Whether the poems in Brit. Mus. Add. 18821 and 145478 belong to the trans- lation of Januarius Candidatus or not, we cannotat present determine.

‘Akélayé or Arabs of ‘Akola (al-Kifah), the Ti‘ayé (?), the Tanakh, the Tha‘labites, the Taghlibites, and in general the nomad Arabs of Mesopotamia. Of his works the most important is his translation of the Organon of Aristotle, of which there is a volume in the British Museum, Add.14659,comprising, in its imperfect condition, the Cate- gories, Tlept épunvetas, and the first book of the Analytics, divided into two parts, with introductions and commentaries.” Of this ver- sion a specimen has been edited by Hoffmann, De Hermeneuticis, &c., p. 22 sqg., besides small fragments at pp. 30, 38, 45, and 53. He also compiled a large collection of scholia on the homilies of Gregory Nazianzen, which exhibits a wide range of reading,!! and completed

the Hexaémeron of Jacob of Edessa (see above, p. 839). His other

writings are—a commentary, or more likely scholia, on the Scriptures, cited in the Catena of Severus and by Bar-Hebreus in his Awsar Razé®; a short commentary on the sacraments of the church, treat- ing of baptism, the holy Eucharist, and the consecration of the chrism 14; a homily in twelve-syllable metre on the holy chrism in two shapes!®; another homily on solitary monks, in heptasyllabic metre !6; and a treatise on the Calendar in twelve-syllable metre,” cited by Elias bar Shinaya.18 Like Jacob of Edessa, he carried on an extensive literary correspondence, of which some specimens have luckily been preserved in Brit. Mus. Add. 12154, ff. 222-291, dated from 714 to 718. Several of them are addressed to John the Stylite of Litarba, one of whose letters to Daniel, an Arab priest of the

“circa annum Christi 580.” About a century later would probably be nearer the mark. Two of his pupils were Constantine, bishop of Harran, who may have flourished during the latter part of the 7th century, and his successor Leo, who lived at the very end of it

anu Contemporary with him, and probably an alumnus of the same | and the beginning of the 8th. Constantine wrote several contro- ih Ca- school, was the translator of the poems of Gregory Nazianzen, in the | versial works against the Monophysites, viz.,—an exposition of the lidat#. year 655, whom Assemani calls Senorinus Chididatus of Amid.' | creeds of the councils of Niewa and Chalcedon, a treatise against

Severus (of Antioch), an "anagnésticon" concerning an alleged mutilation of the Trisagion,?" and a reply to a treatise of Simeon (II., Monophysite bishop of Harran).2° "Leo's only literary effort appears to have been a letter to the Jacobite patriarch Elias, whom we have next to notice.

Elias belonged originally to the Dyophysite party in the Syrian Patri- Church, but was converted to the Monophysite sect by the study arch

Neorg Another scholar of note at this time is George, bishop of the Arab | of the writings of Severus. He was a monk of the convent of Gubba Elias, lig of tribes, the pupil and friend of Athanasius II. and Jacob.9 He was | Barraya, and for eighteen years bishop of Apamea (or Famiyah) ne A¥O ordained, it would scem, in 687 or 688, two months after the death | before he was raised to the patriarchate of Antioch (in 709). He tibed of Athanasius, and is said to have died in the first year of Athanasius | died in 724.29 The only work of his known to us is an Apology | LIL, who was consecrated in April 724. His diocese comprised the | addressed to Leo, bishop of Harran, in answer to a letter from him

asking the reasons for Elias's change of creed.39 It was probably written during the time of his episcopate. In it, besides George of Martyropolis and Constantine of Harran, he cites John of Damascus, among whose Greek works is a tract against the Jacobites, addressed to the bishop Elias in defence of Peter, archbishop of Damascus.

_ Lazarus of Béth Kandasa is known to us only through his dis- Lazarus ciple George of Béth Neéké as the compiler of a commentary on the of Béth New Testament, of which there are two volumes in the British Kandasa.

Museum, the one (Add. 14682) containing the Gospels of St John and St Mark, the other (Add. 14683) the third and fourth parts of the Pauline epistles from Galatians to Hebrews.3!_ The commentary on the epistles is merely an abridgement of Chrysostom ; in that on the Gospels use is also made of Jacob of Sériigh, and occasionally of Theodore of Mopsuestia,® Cyril of Alexandria, and Ephraim. He also quotes a passage of nine lines from the Sibylline oracles (ed. Friedlieb, viii. 287-296). At the end of part third of the Pauline epistles there is in Add. 14683 a chronological section, terminating with the accession of the ‘Abbasi caliph al-Mahdi in 775, which probably fixes the date of the author.*8 Much later he cannot have lived, as Add. 14683 is a MS. of the 10th century, having been presentcd to the convent of St Mary Deipara in Skete by the patriarch Abraham (or Ephraim), who sat from 977 to 981. In Brit. Mus. Add. 18295 there is a scholion by Lazarus explaua- tory of a passage in (pseudo-)Dionysius Areopagita.*4

About this time too may have lived the chronicler Daniel bar Daniel Moses the Jacobite, who is cited as an authority by Elias bar bar Shinaya in the years 122, 127, and 131 of the Hijrah, 7.¢., from Moses, 740 to 749 A.p.°°

Theophilus bar Thomas of Edessa is stated by Bar-Hebreus *’ Theo- to have been by religious profession a Maronite. He was addicted philus to the study of astrology, and an anecdote is related by Bar- of Hebreeus of his correspondence with Hasanah, the concubine of Edessa,**

tribe of the Ti‘iyé, is appended, f. 291. The most important of them is one written to the priest and recluse Yéshii‘ of Innib (near ‘Aziz, north of Aleppo), part of which relates to Aphraates aud his works (sce above, p. 827).

Contemporary with these scholars was Daniel of Salah (a village north-east of Midyid in Tir-Abdin),?° who wrote commentaries on the Psalms and Ecclesiastes.2! The former was in three volumes, and was composed at the request of John, abbot of the convent of

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) Syros, pp. 32-33.

Kusebius at Kaphra dhé-Bhartha (Kafr al- Barah, near Apamea).””

1 See Wright, Catal., p. 1161, and comp. Renan, op. cit., p. 31.

2 Brit. Mus, Add. 12181 and 14600 (Wright, Catal., pp. 558-569).

3 Wright, Catal., p.441. 4 Ibid., p.425. 5 Zotenberg, Catal., p. 28, col. 2.

6 Wright, Catal., p. 218, col. 1; Zotenberg, Catal., p. 47, col. 1, No. 23, d.

7 Cod. Vat. xevi. (Catal., ii. 521); see B.O., ii. exlix., 502, col. 2; iii. 1, 23, note.

8 Wright, Catal., pp. 775, 483, col. 1.

9 B.O., i. 494; Bar-Hebreeus, Chron. Eccles., i. 298, 303; Hoffmann, De Her- meneuticis apud Syros Aristoteleis, pp. 148-151; Renan, De Philos. Peripat. ap. 10 See Wright, Catal., p. 1163.

1] Brit. Mus. Add.14725, ff.100-215. It was evidently written after the death of

} Athanasius II., as shown by the remark on f. 132a (Wright, Catal., p. 443, col. 1).

The commentary contained in Brit. Mus. Add. 17197, ff. 1-25 (Wright, Catal., p. 441) is perhaps that of Elias, bishop of Shiggar (Sinjar), who flourished about 750, and is expressly stated (B.0., ii. 339) to have compiled a commentary on

| the first volume of Gregory Nazianzen (as translated by Paul). He followed the

older exposition of Benjamin, bishop of Edessa. This Benjamin was the writer ofa letter on the Eucharistic service and baptism (Wright, Catal., p. 1004, col. 2).

12 See Land, Anecd. Syr., i. p. 4.

13 B.0., i. 494-495; comp. Wright, Catal., p. 909, col. 2.

14 Wright, Catal., p. 985.

15 B.0., i. 832; Catal. Vat., iii. 102, No. 188 ; Wright, Catal., p. 848, No. 78.

16 Bodleian Catal., p. 425, No. 88. W7 B.0,1. 495; Catal. Vat., ili. 532.

18 Rosen, Catal., p. 88, Nos. 82, 33 ; comp. also the "Table of the New Moons," in Catal. Vat., ii. 402.

19 It has been printed by De Lagarde, Anal. Syr., pp. 108-134, and partly re- printed by Wright, The Homilies of Aphraates, pp. 19-37. Ryssel has translated and annotated it in Ein Brief Georgs, Bischofs der Araber, an d. Presbyter Jesus, 1883. 20 See Hoffmann in Z.D.M.G., xxxli. 741. :

21 According to a note in Payne Smith's Catal., p. 62, he was bishop of Tella dhé-Mauzélath ; but at the time when he wrote his commentary on the Psalms he was certainly only a priest and abbot of a convent (see Wright, Catal., p. 605, col. 2). ;

22 MSS. part i., Pss. i.-l., Brit. Mus. Add. 17187; part ii., Pss. li.-¢c., Add. 14679, 14668 (only three leaves) (see Wright, Catal., pp. 605-606) ;

Cod. Vat. cly., Pss. i.-lxviii. (Catal. Vat., iii. 297); part iii, Pss. ci.-cl., in Arabic, Berlin, Sachau 55. It is frequently cited by Bar-Hebreus in the Ausar Razé in Seve- rus's Catena, and also by Antonius Rhetor (Wright, Catal., p. 831, col. 1).

the caliph al-Mahdi, which fixes the date of his death in 785. He was the author of a history, which Bar-Hebreus cites3° and com- mends. He also translated into Syriac "the two books of the poet Homer on the conquest of the city of Ilion."®® This evi- dently means a version of the entire Jliad and Odyssey, incredible as it may appear. De Lagarde was, we believe, the first to discover citations. of this work by Jacob, or Severus, bar Shakko, bishop of

23 Catal. Vat., iii. 17; Wright, Catal., p. 909. _ ec –

24 T.e., Maiperkat or Maiyafarikin, Assemani calls him bishop of Taghrith or Tekrit.

25 B.0.,1. 465; ii. 96. The epistles to Christopher against Probus and John Grammaticus of Alexandria, and to the monks of the convent of Mar Matthew, are also cited in Brit. Mus. Add. 17197 (Wright, Catal., p. 607). ;

26 Assemani places Constantine as early as 630 and Leo about 640 (B.0., i. 466-467). But in the Catal. Vat. they are more correctly described as "'uterque §. Johannis Damasceni equalis" (vol. iii. 255).

27 These three are mentioned by Assemani,. B.0., i. 466.

28 Wright, Catal., p. 607, col. 2. '

29 B.0., ii. 95, 337 ; Bar-Hebreus, Chron. Eccles., i. 297; Baethgen, Fragmente, pp. 46,123. Dionysius of Tell-Mahre wrongly places his death some years later, in 729.

30 Two MSS. of this work survive, but both imperfect, the one at Rome, Cod. Vat. exlv. (Catal., iii. 258), the other in the British Museum, Add. 17197 (Wright, Catal., p. 606). 31 See Wright, Catal., pp. 608-612.

32 Sachau, Theodori Mops. Fragmenta Syr., pp. 101 and 62. :

33 The words of George of Béth Néké, bukhana dhé-dhogma (Wright, Catal., p. 611, col. 2), probably refer to the liturgical disputes which arose among the Jacobites about this time (B. O. ii. 341) and attained considerable importance a little later (p. 343). See Bar-Hebreeus, Chron. Eccles., i. 331.

34 See Wright, Catal., p. 1184.

35 See Baethgen, Fragmente, p. 2; Bar-Hebreeus, Chron. Eccles., ii. 152, note 2.

36 B.O., i. 521; Cardahi, Liber Thesauri, p. 39.

37 Hist. Dynast., p. 228 (transl., p. 147). 38 Op. cit., p. 98 (transl., p. 63).

39 Op. cit., p, 228 (transl., p. 148). Also at p. 40 (transl., p. 26) Bar-Hebraus says that "the poet Homer bewailed her (fall) in two books, which Theophilus the astrologer of Edessa translated from Greek into Syriac."

XXII. — 106

George of Bé'el- than.

Cyriacus.

Babhai thearchi- mand- rite.

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Mar Matthew, who died in 1241.1 Cardahi (Liber Thesauri, p. 40) quotes the rendering of Iliad ii. 204, but without saying where he found it. Theophilus is often spoken of as the first to use the Greek vowels in pointing Syriac words, but we have seen above (p. 840, note 21) instances of their occurrence in MSS. older than his time. Perhaps, however, he may have finally settled some details of the system and assisted in bringing it into more general use.?

George of Bé‘elthan, a village near Hims, was educated at the convent of Ken-nceshré, and became the syncellus of Theodore, bishop of Samosata, who prophesied great things of him. On the death of Athanasius III. a synod was held at Mabbdgh, at the close of 758, when a large majority of those present raised George, who was only a deacon, to the see of Antioch.? At the instigation of the anti-patriarch David, the caliph al-Mansir scourged him and threw him into prison, where he remained for nine years, till he was set free by his son and successor al-Mahdi. He was taken ill during one of his diocesan journeys at Kalaudiyah (Claudia), in the far north of Mesopotamia, and died in the convent of Bar-sauma near Meliténe (Malatyah), in 790.4 During his long imprison- ment George is said to have composed many discourses and metrical homilies. He was also the author of a commentary on the Gospel of St Matthew, the unique but imperfect MS. of which has been described by Assemani in Catal. Vat., tii. 298.

Cyriacus, a man of Taghritan family ° and a monk of the convent of Bizona, otherwise called the convent of the Pillar, near Calli- nicus, was ordained patriarch of the Jacobites in 793, and died at Mosul in 817. The record of his troubled life may be read in Bar- Hebreus’s Chron. Eccles., i. 329 sq.; B.O., ii. 116, 341-344. In the year 798 he endcayoured to effect a union with the Julianists, whose patriarch was Gabriel, and a creed was drawn up and signed by them and suudry other bishops, which has bcen preserved in Brit. Mus. Add. 17145, f. 27b.6 Besides an anaphora’ and canons,® he wrote a homily on the parable of the vineyard? and a synodical epistle on the Trinity and the incarnation addressed to Mark, patriarch of Alexandria, which is extant only in Arabic.!°

The number of Nestorian writers during the 7th and 8th cen- turies is relatively much larger than that of Jacobite, and the loss of many of their writings is much to be regretted, especially those bearing on ecclesiastical and political history. Want of spaco compels us, however, to omit many names which we would other- wise gladly have noticed.

Our list begins with the name of Babhai the archimandrite,” called Babhai the Elder, to distinguish him from the later Babhai bar

Nésibhnayé. He was a native of the village of Béth ‘Ainatha or Ba-‘ainatha in Béth Zabhdai, and succeeded Mar Dadh-isho’ (see above, p. 838) as abbot of the great convent on Mount Izla. On the death of the catholicus Gregory of Kashkar in 607 (see above, p. 837) a time of persecution followed, during which the Nestorian Church was ruled by Babhai with a firm and skilful hand. The bishops of Nisibis, Hédhaiyabh, and Karkha dhé-Béth Sélékh (or Béth Garmai) entrusted him with the duties of inspector of con- vents, with the express object of rooting out all who held the doc- trines of the Mésalléyané,’ as well as the followers of Hannana of Hédhaiyabh and Joseph of Hazza.18 So well did he acquit himself in this post 4 that, after the murder of Khosrau II. in 628, when his successor Kawadh II. Shérdé permitted a synod to be held, he would have been unanimously elected to the dignity of catholicus, had he only given his consent, in default of which the choice fell upon Ishd’-yabh of Gédhala (628-644). As a writer Babhai would seem to have been very prolific, for no less than eighty-three or eighty-four works are set down to his account.» The principal of these, as enumerated by ‘Abhd-ish6‘, are—a commentary on the whole text of Scripture ; on the commemorations of the Blessed Virgin Mary and St Jolin, and other commemorations and feasts throughout the year; on the reasons of the celebration of Palm Sunday and of the festival of the holy cross1®; a discourse on the union (of the two natures in our Lord, against the Monophysites) ”” ; exposition of the Centwrics of Evagrius}8 ; exposition of the discourses of Mark the monk (on the spiritual law); rules for novices ; canons for monks ; (controversial) letters to Joseph Hazzaya ; history of Diodore of Tarsus and his followers; on Matthew the wanderer, Abraham of Nisibis, and Gabriel Katraya.2° -To these must be added an account of the life and martyrdom of his contemporary

1 E.g., Iliad, i. 225, 226; vi. 325; xvi. 745; Odyssey, xviii. 26; see The Academy for October 1, 1871, p. 467. 2 Compare B.O., i. 64.

3 The minority appointed as anti-patriarch John of Callinicus (ar-Rakkah), who held office for four years (B.0., ii. 340, col. 2) and was succeeded by David, bishop of Dara (ibid.).

4 B.0., ii. 340; Baethgen, Fragmente, pp. 57, 128; Bar-Hebreus, Chron. Eecles., i. 319 sq., ti. 175. 5 Bar-Hebreus, Chron. Eccles., i. 343.

6 See Bar-Hebreeus, Chron. Eceles., i. 335. 7 Wright, Catal., pp. 206, 210.

8 Wright, Catal., p. 222, col. 2; Zotenberg, Catal., p. 28, No. 54.

9 Brit. Mus. Add. 14727, f. 110a (Wright, Catal., p. 887). 10 B.0., ii. 117.

U See B.O., iii. 1, 88 sq., 472; Hoffmann, Ausziige, pp. 121, 161, 173.

12 See B.O., iii. 1, 101; Bar-Hebreus, Chron. Eccles., i. 573.

13 See above, pp. 837, 838. 14 See B.O., iii. 1, 88, 89, 473.

15 B.0., iii. 1, 94, and note 1. 16 See next paragraph.

17 See Catal. Vat., iii. 372. 18 Ibid., iii. 367 sq.

39 Brit. Mus. Add. 17270 (Wright, Catal., p. 482).

20 That is, of Katar, on the coast of al-Bahrein.

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George, a convert from Zoroastrianism, whose heathen name was Mihramgushnasp," and a few hymns, contained in Nestorian psalters.??

The successor of Babhai was, as we have just mentioned, Ish6*. Ishgt

yabh II. of Gédhala,*® who was elected in 628 and sat till 644,24 He studied at Nisibis, and was bishop of Balad at the time of his elevation to the patriarchate. daughter of Khosrau II., on an embassy to Heraclius, the em peror of Constantinople, whom he met at Aleppo, and to whom, we are told he restored the holy cross, which had been

carried off by the Persians when they captured Jerusalem in 614.2% Foreseeing the downfall of the enfeebled Persian monarchy, Ishé'~~yabh prudently made conditions on behalf of his flock with the Muhammadan ruler it is said through the intervention of a Christian chief at N ajran and of Yéshi' (or Ish6'), bishop of that place.2° The deed or ordi~~ nance containing the terms of agreement was renewed and confirmed by 'Omar ibn al-Khattab."" According to 'Abhd-ish6', the principal writings of Ishd'-yabh were a commentary on the Psalms and sundry epistles, histories, and homilies. A hymn of his occurs in the Nestorian psalter Brit. Mus. Add. 14675.%

Sahdona of Halaman, a village in Béth Nuhadhré," was educated Sahdoni at Nisibis, and became a monk under Mar Jacob, the founder of of Hala- the famous convent of Béth 'Abhé.3° Here he composed a treatise min,

in two volumes on the monastic life, besides a history of his master, and a funeral sermon on him.*! He became bishop of Mahozé dh'Aréwan in Beth Garmai,*and was one of the Nestorian clergy who accompanied Ish6'-yabh of Gédhala on his embassy to Heraclius, Whilst halting at Apamea, Isho'~~yabh, John the Nestorian bishop of Damascus, and Sahdona tried their hand at converting the monks of a neighbouring (Jacobite) convent, the result of which was that Sahdona himself was converted, and afterwards wrote several heterodox works. This incident caused much scandal in the East, as may be seen from the numerous letters which Ishé'~~ yabh of Hédhaiyabh, another member of the embassy, found it necessary to write upon the subject.*4

This Isho'-yabh was the son of a wealthy Persian Christian named Isho'- Bas-tuhmag, of Kuphlina in Hédhaiyabh or Adiabéné, who used yabhIIl. He was educated at the of Hé- school of Nisibis, became bishop of Mosul, and afterwards metro- dhaiyabh.

often to visit the convent of Béth 'Abhe.35

politan of Hazza (Arbél or Irbil) and Mosul. The chief event of his rule at Mosul seems to have been that he hindered the Jacobites from building a church in that city,°6 notwithstanding that they were

supported by all the weight and influence of the Taghritans.” Bar-Hebreus declares that he bribed right and left to effect this. He was one of those who accompanied Ishd‘-yabh of Gédhala on his embassy to Heraclius,®® and stole a very costly and beautiful casket, containing relics of the Apostles, from a church at Antioch, the which he conveyed (apparently quite openly and shamelessly) to the convent of Béth ‘Abhé.# On the death of Mar-emméh! (who sat 644-647) # he was elevated to the dignity of catholicus,‘? which he held till 657-658.4 In his desire to do something for the promotion of learning he wished to found a school in the convent of Beth ‘Abhé, where he had built a magnificent church, but the abbot Kam-isho‘ and the rest of the lazy brotherhood would have none of this, and preferred to quit the convent and withdraw to the neigh- bouring village of Herpa in Saphsapha.* Hereupon the catholicus gave up this part of lis plan and built his college in his father’s village of Kuphlana (or Kulpana).46 Soon afterwards he found himself involved in another and more serious dispute with Simeon,

21 Brit. Mus. Add. 7200, f.14; Hoffmann, Avsziige, pp. 91 sq., 173.

22 E.g., Brit. Mus. Add. 7156, 17219; see Bickell, Conspectus, pp. 37, 38.

23 Judal, near Mosul.

24 B.0., ii, 416-418, iii. 1, 105, 475; Bar-Hebreeus, Chron. Eccles., iii. 113 and note 1, 127 and note 3; Baethgen, Fragmente, pp. 13, 19, 108, 111.

25 This, however, scems to have been given back by Ardashér ITI. in 628-629, as the festival to celebrate its restoration took place at Jerusalem in 629; see Bar-Hebreus, Chron. Eccles., ii. 113; B.O., iii. 1, 96 note 3, 105-106; Néldeke, Gesch. d. Perser u. Araber, pp. 391-392.

26 B.0., ii. 418, iii. 1, 108, col.1; Bar-Hebrzeus, Chron. Eccles., ii. 115. Bar- Hebreus names Muhammad himself, but it was more likely Abii Bakr (632-639).

27 See B.O., iii. 1, 108, col. 1. 28 Wright, Catal., p. 130, col. 2.

29 Hoffmann, Ausziige, p. 215. 30 Ibid., p. 226. 31 B.0., iii. 1, 453, 462

32 See B.O., iii. 1, 116, col. 1, at the foot. Assemani pronounces the name Arytin, but Aréwan is more likely to be correct. See Hoffmann, Ausziige, p. 277.

33 We cannot see that Assemani has any ground for asserting that Sahdona was converted "ab erroribus Nestorianis ad Catholicam veritatem" (B.0., iii. 1, 107, col. 1; comp. col. 2, ll. 10-12, and p. 120, col. 2, Il. 11-13). : ,

34 B.0., iii. 1, 116-128. Bar-Hebreus (Chron. Eccles., ii. 113) spitefully im- proves the occasion by making out that the eatholicus Isho'-yabh of Gédhala himself was the pervert. =

35 B.0., iii. 1,472; Hoffmann, Ausziige, p. 226. 36 B.0., iii, 1, 114-116.

37 Taghrith was always strongly Jacobite, and the Nestorians had no churell there till 767 (see B.O., iii. 1, 111, note 4; Hoffmann, Avusztige, pp. 190-191 ; Bar-Hebreus, Chron. Eccles., ii, 155-157).

38 Chron. Eccles., ii. 127. 39 B.0., iii. 1, 106, col. 1. '

40 There is no reason to doubt the circumstantial recital of a Nestorian ae p B.O., iii. 1,106, col. 2, 475. Strange to say, Assemani does not improve this occasion ! 41 Properly Mar(i)-emméh (see B.O., ii. 389, col. 2, No. 29

42 According to others, 647-650; B.O., ii. 420, iii. 1, 113, 615.

43 In 647 or 648. 4

44 Or, according to the other reckoning, till 660, B.0., locc. citt. He pei the maphrian Denha, who died in 660 (Bar-Hebreeus, Chron. Eccles., ii. 129, 131).

45 See Hoffmann, Ausziige, pp. 223, 227. 46 B.0., iii, 1, 124-125.

He was sent in 630 by Boran, the dhala,

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B.O., iii. 1, 136.

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lengthy correspondence, regarding which see B.O., iii. 1, 127-136.

His works, as enumerated by ‘Abhd-isho‘’, are—Huppakh Hushshabhé or “‘Refutation of (Heretical) Opinions,”? written for John, metro-politan of Béth Lapat,* and other controversial tracts, consolatory and other discourses, various hymns,® and an exhortation to cer- He arranged the Hudhra$ or service-book for the Sundays of the whole year, for Lent, and for the fast of Nineveh,” and drew up offices of baptism,® absolution,? and consecration. 1® He also wrote a history of the monk Ishd‘-sabhran, a convert from

tain novices.

the religion of Zoroaster and a Christian martyr.” A large collec- tion of his lettcrs is extant in Cod. Vat. clvil. (Catal., iii. 299), a judicious selection from which would be worth printing.” ‘Anan-isho’!8 of Hédhaiyabh and his brother Isho‘-yabh were fellow-students at Nisibis with Ishé‘-yabh JII., and afterwards entered the great convent on Mount Izla. | Ishd’-yabh subsequently became bishop of Kardaliyabhadh*; but ‘Andn-isho’ was seized with a fit of wandcring, and visited Jerusalem, whence he went on to the desert of Skete in Egypt, and made himself thoroughly acquainted with the lives and habits of its monks, regarding whom he had read so much in the Paradise of Palladius. On his return he soon forsook the great convent, because of dissensions that had arisen in it, and betook himself with his brother to the convent of Béth ‘Abhé, where he devoted himself to study, and so distinguished himself that he was employed by Isho‘-yabh ITI. to assist in arrang- ing the Hudhra (see above). nan-Ishd‘ wrote a volume of philo- sophical divisions and definitions, with a copious commentary, dedicated to his brother, and compiled a work on the correct reading and pronunciation of difficult words in the writings of the fathers,® thus following in the footsteps of Joseph Hiizaya (see above, p. 836), and anticipating Jacob of Edessa and the monks of the convent of Karkaphétha (see above, p. 826). He was also the author of a treatise entitled Liber Canonum de Arquilitteris, 4.e., on the different pronunciation and signification of words that are spelt with the same letters. This has been published, with the

additions of Honain ibn Ishak of al-Hirah (died in 873) and another

compiler, by Hoffmann, Opuscula Nestoriana, pp. 2-497 His greatest work, howcver, was a new recension or redaction, in two volumes, of the Paradise of Palladius and Jerome, with additions collected by himself from other sources and from his own experience.¥8 This he compiled at the request of the patriarch Gcorge, and it became the standard work on the’subject in the Nestorian convents.19 John of Béth Garmai (Garmékaya), called John the Elder, was a disciple of Jacob of Béth ‘Abhé, and his successor as abbot of that convent. After a

few months, however, he secretly fled from Béth ‘Abhé and betook himself to a hill near Dakika” in Béth Garmai, where the monastery of Ezekiel?! was soon afterwards built, in which he ended his days.” His works, according to ‘Abhd- isho‘,?? are—a collection of heads of knowledge or maxims, rules for novices, a brief chronicle, histories of Abraham, abbot of the great convent on Mount Izla, of the monk Bar-‘idta,*4 and of Mar Khodhahwai, the founder of the convent of Béth Halé (near al- Hadithah, by Mosul), with a discourse and hymns on the last

named.

Sabhr-isho‘ Rustam was a native of a village called Hérem, in Hédhaiyabh, and entered the great convent on Mount 1zl4 under the abbot Narsai, the successor of Babhai. Here, at the request

| of the monks, he wrote a tract on the occasion of the celebration | of Golden Friday, and also a large volume of disputations against | heresies and other theological questions.

He migrated thence,

1 Or Reshalir (Yakut); see Noldeke, Gesch. d. Perser u. Araber, p.19, note 4.

2 Or Arabs of Katar, on the Persian Gulf, and the adjacent districts. See 3 B.0., iii. 1, 187, note 1. 4 B.0., iii. 1, 188, col.1; Néldeke, Gesch. d. Perser u. Araber, p.41, note 2;

} UWoffmann, Ausztige, p. 41, note 351.

5 The composition on the martyr George quoted by Cardahi (Liber Thes., pp. 124-125) is probably of much laterdate. At least we should not expect such arti-

} ficial riming in the 7th century.

6 B.O., iii. 1, 189, 144, col. 2. 7 See Badger, The Nestorians, ii. p. 22.

8 Brit. Mus. Add. 7181 (Rosen, Catal., p. 59). . ,

9 E.g.,of apostates and heretics, Catal. Vat., ii. 307,367; of public penitents, ibid., 291, Brit. Mus. Add. 7181 (Rosen, Catal., p. 59). ie

10 ff.g., the consecration of an altar with the chrism, Catal. Vat., ii. 302, 368 ; see also tbid., 294, where canons of his are given, and Cod. Vat. cexci., in Mai, Scriptt. Vett. Nova Coll., v.

ll Catal. Vat., iii. 328; B.O., iii. 1, 285, note 2, and p. 633.

12 B.O., iii. 1, 140-143.

13 Properly 'Ana-n(1)-isho'; see B.O., iii. 1,144-146 ; Hoffmann, Opuse. Nestor.,

iv.

1# The older name of Shenna dhé-Bhéth Remm4n, in Arabic Sinn Ba-rimma, or simply as-Sinn ; sce Hoffmann, Ausziige, pp. 189, 253. ae

15 B.O., iii. 1, 144, col. 2, near the foot. 16 Ibid., iii. 1, 144.

17 From a MS. in the India Office library, London. There is another copy in the collection of the 8.P.C.K., now at Cambridge.

18 See B.0., ii. 493; iii. 1, 49, 145 col. 2, 151 col. 1, middle.

19 The Illustrations of the Book of the Paradise in Brit. Mus. Add. 17263, 17264 (Wright, Catal., pp. 1078-80) and Orient. 2311 seems to be a different work. The author of it is said to have been a Katraya, "a native of Katar," which 'Anan-ishO' was not. 20 Hoffmann, Auszige, p. 273.

21 So called from its founder; see Hoffmann, op. cit., p. 274, note 2154.

22 B.0O., iii, 1, 203-204, 474. But he must have lived till after 661, for Mar Kho- dhahwai was still alive in that year (B.0., iii. 1,151, near the top).

23 B.O., iii. 1, 204. 24 Tbid., iii. 1, 467, col. 2, ch. 4. 25 Ibid., ili. 1, 454-455.

the metropolitan of Rév-Ardashér? in Persis and of the Katrayé,? who refused obedience to him as his diocesan; and this léd to a

perhaps along with Narsai, to Béth ‘Abhé, where, however, he resided only for a short time, being invited by the monks of Beth Kuka* to become their prior. Here he composed cight discourses on the dispensation of our Lord, the conversion of the various countries by the Apostles, and on continence and the monastic life. Further, at the request of Mar Kardagh, the syncellus of Isho’- yabh IIl., he wrote lives of Isho‘-Zékha (of the convent of Gassa), of Isho’-yabh ITI., of Abraham abbot of Beth ‘Abhé, who came thither from the convent of Zékha-isha’,”” of Kam-isho’ abbot of Béth ‘Abhé,*8 of Abraham of Nethpar, of rabban Tydbh (or Job) the Persian, and of the elder Sabhr-isho‘, the founder of the convent of Beth Kaka, to which may be added the lives of the brothers Joseph and Abraham.2® __

George, the pupil and successor of Ishé‘-yabh III., was a native of George of Kaphra in Béth Géwaya, a district of Béth Garmai.3! His parents Kaphra. were wealthy, and owned two farms in the neighbourhood of the convent of Beth ‘Abhé. ‘Being sent to take charge of these, he got acquainted with the monks and ultimately joined their body. When Isho‘-yabh was promoted to the patriarchate, he appointed George to be metropolitan of Hédhaiyabh in his stead 32; and, on the death of his friend, George succeeded to the patriarchate in 661, and sat till 680. As an author he is not of much account, having written merely a few homilies, with hymns and prayers for certain occasions, and published nineteen canons. His too in all probability is the “cpistola dogmatica ” contained in Cod. Vat. cceclvii., p. 360.34

Elias, bishop of Mari or Merv, was one of those who were present Elias of at the death of Ishd‘-yabh III. and elected George as his

successor.®> Merv. He compiled a Catena patrum (Malléphanutha ahé-Kadhmayé) on the four Gospels, and wrote commentaries on Genesis, Psalms, Pro- verbs, Ecclesiastes, the Song of Songs, Ecclesiasticus, Isaiah, the twelve minor Prophets, and the epistles of St Paul. His letters would probably be of some interest to us, and the loss of his ecclesi- astical history, to which ‘Abhd-isho‘ applies the epithet of “trast- worthy,” is to be regretted.%6 _ Of Daniel bar Maryam we can only say that he flourished under Daniel Isho‘-yabh III. of Hédhaiyabh, about 650.37 He wrote an ecclesi- bar astical history in four volumes, and an explanation of the calendar. Maryam. The history is cited by George of Arbél in the 10th century for the date of the destruction of Jerusalem.38

Gabriel, surnamed Taurétha, was a native of the province of Gabriel Siarzir or Shahraziir.99 He studied at Nisibis, and then entered Taurttha. the great convent on Mount Izla, where he took part in a contro- versy with the Monophysite monks of the convent of Kartamin (near Mardin) and against Sahdona. He afterwards migrated to Béth ‘Abhé, where he wrote a life of Mar Narsai the abbot, an account of the martyrs of Tir Béra’in or Tir Bérén (Adhurparwa, Mihrnarsai, and their sister Mahdokht, in the ninth year of Sapor II.), a homily for the washing of the feet, &c.49 He became abbot of Beth “Abhé under the catholicus Hénan-ishd’ I. (686-701).%

Heénan-isho* I., called the Elder or the Lame (héghira), was ap- Hénan- pointed catholicus in 686,“ in succession to John bar Marta,* the fol- isho’ I. lower of George. He was opposed by Isho‘-yabh of al- Basrah, whom he threw into prison, but afterwards released on his making his sub- mission. A more serious rival was John of Dasen, bishop of Nisibis, surnamed the Leper, who curried favour with the caliph ‘Abd al-

Malik ibn Marwan and procnred the deposition of Hénan-ishd’, whose place he occupied for nearly two years.44 Bar-Hebreus adds ® that John put him for some days into prison, and then sent him off to a convent among the mountains in charge of two of his dis- ciples, who threw the luckless catholicus down a precipice and left him there for

dead. Luckily he was found by some shepherds, who took good care of him, though he seems to have been lame ever after. On his recovery he withdrew to the convent of Yaunan (or Jonah) 4® near Mosul, where he stayed till the death of his rival. He continued to rule the Nestorian Church till 701,47 and was buried

26 On the Great Zab, in Hédhaiyabh ; see Hoffmann, Ausztige, p. 215, note 1715

27 B.0., iii. 1, 468, col. 1, at the top.

28 Who died in 652; see Baethgen, Fragmente, pp. 21, 112.

29 B.O., ii. 418, col. 2. 30 Ibid., iii. 1, 228, eol. 1, near the foot.

31 B.0., ii. 421, iii. 1, 149; Bar-Hebreeus, Chron. Eccles., ii. 131, 138 ; Hoffmann, Ausztige, p. 277.

32 He must be distinguished from two other Georges, Persians by race, also disciples of Isho‘-yabh, viz., George, bishop of Pérath dé-Maishan or al-Basrah, and George, bishop of Nisibis, the latter of whom is the author of a well-known hymn (see B.0., iii. 1, 456; Bickell, Conspectus, p. 38), often found in Nestorian psalters, e.g., Rosen, Catal., p.14, w; Wright, Catal., p. 131, col. 1; Munich Catal., Cod. Syr. 4, p. 112.

33 B.0., iii. 1, 153, 34 Mai, Scriptt. Vett. Nova Coll., v.

36 Tbid., iii. 1, 148. 37 Ibid., ii. 420 ; iii. 1, 231.

39 See Hoffmann, Ausziige, p. 438, notes 364, 365, p. 254 sq.

40 B.O., iii. 1, 456-458 ; Hoffinann, Ausztige, pp. 9-16, from Brit. Mus. Add. 12174 (Wright, Catal., p. 1133).

41 Bar-sauma was abbot at the beginning of Hénan-ish6”s patriarchate; see BO. iil. 1, 45%, cole 1.

42 Bar-Hebreeus, Chron. Eccles., ii. 185; Baethgen, Fragmente, pp. 32, 117; B.O., ii. 423,

43 He sat 680-682 ; B.O., ii. 422, ili.1, 615; Bar-Hebreeus, Chron. Eccles., ii. 133.

44 Baethgen, Fragmente, pp. 34, 35, 118, 119.

45 Chron. Eccles., ii. 185 sq.; B.O., ii. 423.

46 B.O., ii. 424, note 3. Bar-Hebreus calls it ‘the convent of John.”

47 According to Elias bar Shindya in Baethgen, Fragmente, pp. 38,120. Others say 699.

35 B.0., ii. 420. 38 Ibid., iii. 1, 521.

Alaha- zékha.

Mikha.

David of Beth Rabban.

Babhai bar Nesibh- naye.

Bar- Sahdé.

Abra- ham bar Dashan- dadh.

Mar- abha II.

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in the convent of Jonah. Besides composing homilies, sermons, and epistles, he was the author of a life of Sergius Déwadha? of Daraukarah or Daukarah, near Kashkar, who was a contemporary of his. He also wrote a treatise On the Twofold Use of the School or university, as a place of moral and religious training as well as of instruction in letters, and a commentary on the Analytics of Aristotle.?

Presumably to this century belong two ecelesiastical historians who are known to us only from the Chronicle of Elias bar Shinaya. Alaha-zékha

is quoted by him in regard to events that took place in 594-596 and 606.4 Perhaps he is identical with that Alaha- zékha to whom we find Ishé‘-yabh III. writing a letter whilst he was yet bishop, consequently in the earlier part of the century.® Mikha or Micah is cited by Elias as an authority for the years 594- 596 and 605.6

Passing over into the 8th century, we may mention David of Béth Rabban, that is, of the convent of Zékha-isho’, afterwards of Béth ‘Abhé, who was the author of a monastic history, called The Little Paradise, whieh is frequently cited by Thomas of Marga. Its first chapter contained anecdotes relative to George Neshraya, Nathanicl, and other monks of Béth ‘Abhé, who lived under Hénan-isho’ I., towards the end of the 7th century.’ David attained episcopal dignity, though we do not know the name of his see. He wrote also a geographical treatise Upon the Linvits of Climates or Countries, and the Variations of the Days and Nights.®

Babhai bar Nésibhnayé (so called because his parents were of Nisibis) flourished under the catholicus Sélibha-zékha (713-729), the successor of Hénan-isho’.2 He was a native of Gébhilta or Jabilta in Tirhan,’ and is described by Thomas of Marga as being a tall, powerful man, with a magnificent voice, gentle and modest, and learned withal. He devoted himself to the reformation of the musical services of the Nestorian Church, which had fallen into sad confusion, and founded many schools, more particularly in the dioceses of Hédhaiyabh and Marga, with the spccial object of pro- moting the study of church music. The most important of these were at Képhar-‘Uzzél” in Hédhaiyabh and Bashish in the district of Saphsapha in Marga.!* At the former he took up his residence, but used to visit and inspect the others once a year. In his latter years he returned to Gébhilta and died there. He wrote discourses and homilies of different kinds, numerous hymns for various occa- sions, histories (of holy men), and letters.}3

Bar-Sahdé of Karkha dhé-Bhéth Sélokh flourished, according to Assemani, under the catholicus Pethién (731-740).14 ‘Abhd-ishd‘ states that he wrote an ecclesiastical history } and a treatise against the Zoroastrian religion.

When Babhai the Nisibene was residing at Képhar-‘Uzzél (sce above), a woman from the village of Béth Saiyadhé brought to him her crippled son, whom she called “only half a man,” and begged him to bless him. “This is no half man,” was the gentle monk’s reply ; “this shall be a father of fathers and a chief of teachers ; his name and his teaching shall be famous throughout the whole East.”16 This was Abraham bar Dashandadh “the Lame,” whose works are enumerated by ‘Abhd-ish6‘ as follows 17”—a book of exhort- ation, discourses on repentance,’® letters, the book of the king’s way, a disputation with the Jews, and a commentary on the dis- courses of Mark the monk.” He was teacher at the school of Bashiish in Saphsapha, where the future catholicus Timothy I. received his early education, as well as his successor Ishd’ bar Non and Abia Nuh al-Anbari.?°

Mar-abha, the son of Bérikh-sebhyanéh, was a native of Kashkar,?! and became bishop of that town. From this see he was promoted

1 His Arab biographer and co-religionist adds that his grave was opened 650 years afterwards, and his body found undecayed and looking as if he slept.

2 Not Didha. The word means “‘liable to fits,” “epileptic,” “ crazy.”

3 B.O., iii. 1, 154.

4 See Bar-Hebreus, Chron. Eccles., ii. 106 note 3, 107 note 3.

5 B.O., iii. 1, 141, No. 35.

6 See Bar-Hebreus, Chron. Eccles., ii. 106 note 3, 107 note 2.

? B.O., iii. 1, 217 col. 2, 218 col. 1; see also pp. 49 note 1, 184 col. 1, 1. 1.

8 B.O., iii. 1, 255. The poems referred to by Assemani in note 1 are no doubt of much later date. The first of them is edited by Cardahiin his Liber Thesauri, pp. 41-46. Cardahi places David’s death “‘in the year 800.” Twenty-two very artificial poems “on the love of wisdom,”

ascribed to him, are printed in the Directoriwm Spirituale of John of Mosul, edited by the bishop Elias John Millos, 1868, pp. 172-214.

® According to Elias bar Shinaya, in Baethgen, Fragmente, pp. 42, 47, 122, 124. Assemani (B.0., ii. 480) gives 714-728.

10 Hoffmann, Ausztige, p. 188.

ll Ibid., p. 236 sq. 12 Tbhid., p. 223.

43 See B.O., iii.1,177-181. Of his hymns a few are still extant; see Bickell, Con- spectus, p. 38; Brit. Mus, Add. 7156 (Rosen, Catal., p. 14, v, xX, y, Z), Add. 14675 (Wright, Catal., p. 131, col. 1), 17219 (ibid., p. 136, col. 1); Paris, Suppl. 56 (Zoten- berg, Catal., p. 9, col. 1, t); Munich, Cod. Syr. 4 (Orient. 147).

i4 B.0., ii. 430; Baethgen, Fragmente, pp. 49, 125.

15 Cited by Elias bar Shinaya ; see Bar-Hebreus, Chron. Eccles., ii. 65, note 1.

16 B.O., iii. 1, 179. 7 bid., iii. 1, 194.

18 According to another reading on desire or cupidity.

19 See Brit. Mus. Add. 17270 (Wright, Catal., p. 482).

20 Assemani (B.0., iii. 1, 196, note 4) says that Timothy I. wasa pupil of Abra- ham bar Liphah, but Isho' bar Non and Aba Nuh are expressly stated to have been pupils of Abraham "the Lame," ibid., p. 165, note 4, and p. 212, note 2; see also p. 486, col. 1.

21 Others say of Daukarah, in the neighbourhood of Kashkar, B.0., ii. 431.

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in 741 to the dignity of catholicus.2 At first he had some diffi- eulties with the emir Yisuf ibn ‘Omar ath-Thakafi, but these were settled by a visit to al-Kifah, which gave him an opportunity of going also to al-Hirah, where he was received with great honour by the aged bishop John Azrak. He shortened his name to Abha

the better to distinguish himself from his predecessor Mar-abha 1. (see above, p. 836). In the sixth year of his patriarchate he got into a dispute with his clergy about the management of the school at Seleueia, and withdrew to Kashkar, but returned to Seleucia before his death, whieh took place in 751, at the age, it is said, of 110 years. According to Bar-Hebreus, “he was learned in ecclesi- astical works and in dialectics, and composed a commentary on Theologus (z.e., Gregory Nazianzen),”3 and all his time he was occu: pied in reading books.” ‘Abhd-ishd’ mentions him in two places

as Abhi of Kashkar™ in B.O., iii. 1, 154, and as Abha bar Barikh. sebhyanéh at p. 157. In the former place he ascribes to him expositions, letters, and a commentary on the whole Dialectics of Aristotle,” and in the latter, The Book of the Generals, or Military Governors, and other works.**

Simeon bar Tabbakhé (the Butcher) of Kashkar held the im- Simeon portant post of chief officer of the treasury under the caliph al- barTab-Mansur,” about the same time that his co-religionist George bar bakhé, Bokht-isho’ of Gundé-Shabhér or Béth Lapat,® in Khizistan, was court physician.*® The only work of his mentioned by ‘Abhd-isho’ is an ecclesiastical history, which from his position at Baghdadh doubtless contained much valuable information.

Sarén or Sirin,* bishop of Nisibis and afterwards of Halah or Siren,

Holwan in Beth Madhayé,) was raised to the patriarchate in 754, by the orders of Aban, the Muhammadan emir of al-Madain (Seleucia). The bishops appealed to the ealiph ‘Abdallah as- Saffah,? and not in vain. The election was cancelled, and Jacob, bishop of Gundé-Shabhér, was chosen in his place (who sat till 77 3). Their continued squabbles, however, so irritated al-Mansir that he gave orders to throw them both

into prison. Sirén made his escape in time, but Jacob was caught and spent the next nine years under strict ward, during which time "the second Judas," 'Ish ibn Shahlatha or Shahlafa,*? deacon and physician, trampled the rights of the bishops under foot. On his release, he sent Siren as bishop to al-Basrah, at the request of some of the Christian citizens, but others would not receive him, and their quarrels once more attracted the caliph's attention. Sirén, warned by 'Isa, again made his escape, but was captured by the emir of al-Madain and died in prison.*4 The epithet of Aléphashshtkand, given to him by 'Abhd-isho',® implies that he was either a commentator on Serip- ture or a translator of Greek works into Syriac. He composed a treatise against herctics, but the remainder of 'Abhd-isho's text is not clear in Assemani's edition. %4

Cyprian, bishop of Nisibis, was appointed to that see in 741.57 Cyprian The great event of his life was the building of the first Nestorian of Nis: church in the Jacobite city of Taghrith, just outside of the walls, bis. on the banks of the Tigris, The idea originated with Sélibha- zékha, bishop of Tirhan, but would never have been realized, had 4 not Cyprian allowed the Jacobites to resume possession of the church of Mar Domitius at Nisibis. The building of the church i at Taghrith was commenced in 767.°8 Cyprian also erected a magni- P ficent church at Nistbis, on which he expended the sum of 56,000 dinars, in 758-759.%9 After this time it so happened that the patri- archs of the three Christian sects, Theodoret the Malkite, George p the Jacobite, and Jacob the Nestorian, were all in prison at once at Baghdadh. 'Isa the physician, thinking to improve the occa- sion to his own advantage, wrote to Cyprian that the caliph al-

Mansir coveted some of the golden and silver vessels of the church of Nisibis, hinting at the same time in pretty plain language that a handsome present to himself might be of some avail at this junc- ture. Cyprian had the courage to go straight to Baghdadh with the letter and show it to the caliph, who disgraced 'Isa and contfis- cated his property, releasing the three patriarchs at the same time." Cyprian died in 767. According to 'Abhd-isho', he wrote a com-

22 Baethgen, Fragmente, pp. 50, 125; Bar-Hebreus, Chron. Eccles., ii. 153; B.O., ii. 431, iii, 1, 157. %3 See B.O., iii. 1, 157, col. 2.

24 Whom Assemani takes for Abraham of Kashkar (see above, p. 837); for what reason we cannot see.

25 See B.O., iii. 1, 157, col. 2.

26 Perhaps a chronicle of the Muhammadan governors of al-'Irak.

27 B.O., iti. 1, 206, col. 1, 11. 4, 5.

28 Noldeke, Gesch. d. Perser u. Araber, p. 41, note 2.

29 B.0., iii. 1, 205, col. 2, note 4; Baethgen, Fragmente, pp. 59, 60, 129; Bar- Hebreus, Hist. Dynast., 221; Wiistenfeld, Gesch. d. arab. Aerzte, No. 26.

30 On the name see Noldeke, Gesch. d. Perser wu. Araber, p. 488, note 4.

31 See Hoffmann, Avsziige, p. 120.

32 He died in June of this same year.

33 See Bar-Hebraus, Hist. Dynast., p. 221; Wiistenfeld, Gesch. d. arab. Aerate, No. 26.

34 B.0., ii. 431; iii. 1, 168, 205-206.

35 Ibid., iii. 1, 168, 36 Tbid., iii. 1, 169. x

37 Baethgen, Fragmente, pp. 50, 125; Bar-Hebreus, Chron. Eccles., ii. 154, notel.

38 Bar-Hebreus, Chron. Eccles., ii. 155-157.

39 Baethgen, Fragmente, pp. 57, 128.

40 Bar-Hebreeus, Hist. Dynast., p. 224.

41 Bar-Hebreus, Chron. Eccles., ii, 161-163 ; B.O., iii, 1, 111-112.

42 Baethgen, Fragmente, pp. 60, 129.

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mentary on the theological discourses of Gregory Nazianzen and various forms of ordination,}

y Timothy I. was a native of Hazzi in Hédhaiyabh, and had been a pupil of Abrahain bar Dashandadh (see above, p. 844) at the school of Bashish in Saphsapha. He became bishop of Béth Baghésh,? and stood well with the Muhammadan governor of Mosul, Abia Misa ibn Mus‘ab, and his Christian secretary Abii Nah al-Anbari? On the death of Hénan-isho’ II. in 779,* several persons presented themselves as candidates for the dignity of catholicus. Timothy got rid of Ishd‘-yabh, abbot of Béth ‘Abhé, by pointing out to him that he was an old man, unfit to withstand his youuger rivals, and by promising, if he himself were successful, to make him metropolitan of Hédhaiyabh, which he afterwards did. Meantime Thomas of Kashkar and other bishops held a synod at the convent of Mar Pethidn in Baghdadh, and elected the monk George, who had the support of ‘Isa the court physician ; but this formidable

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1,195, the text of ‘Abhd-isha‘, as edited by Assemani, speaks of a

writer named Ishd'~~dénah, bishop of Kasra. Other MSS., however, Tsho'~~ read Basra (al-Basrah), which is confirmed by Elias bar Shinaya d&nah,

in Baethgen's Fragmente, p. 2. The variation Dénah-isho' in Bar-Hebreus (Chron. Eccles., i. 384) is of no consequence, and even there the MSS. differ. Besides the usual homilies of sorts and some metrical discourses, he wrote an introduction to logic, a work entitled The Book of Chastity, in which he collected lives and anecdotes of holy men aud founders of monasteries, and an ecclesi- astical history in three volumes.!® This valuable work is known to us only by a few citations in Bar-Hebreus and Elias bar Shinaya. Those in Bar Shinaya"" range from 624 to 714, but the extract in Bar-Hebreus!® brings us down to 793.

Reverting now to the Jacobite Church, we shall find that the number of its literary men in the 9th century is not large, though some of them are of real importance as theologians and historians.

Dionysius Tell-Mahraya was, as his surname implies, a native of Diony- Tell-Mahré, a village situated between ar-Rakkah and Hisn Mas- sius of lamah, near the river Balikh.!®9 He was a student in the convent Tell-

opponent died suddenly. Having by a mean trick obtained the support of the archdeacon Béroé and the heads of the various colleges, Timothy managed at last to get himself appointed catholi-

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rule than heretofore.”

| Wright, Catal., p. 425, Nos. 22-25.

} col. 1).

cus, about cight months after the death of his predecessor. He still, however, encountered strong opposition. Ephraim metro- politan of Gundé-Shabhér, Solomon bishop of al-Hadithah, Joseph metropolitan of Mari or Merv, Sergius bishop of Ma‘alléthaya, and others held a synod at the convent of Béth Halé, in which they made Rustam, bishop of Hénditha,° metropolitan of Hédhai- yabh in place of Isho‘-yabh,® and exconimunicated Timothy, who retorted with the same weapon and deposed Joseph of Mery. Joseph brought the matter before the caliph al-Mahdi, but, failing to gain any redress, in an evil hour for himself became a Muham- madan.’ Once more Ephraim summoned his bishops to Baghdadh and excommunicated Timothy for the second time, with no other result than a counter-excommunication and some disgraceful riot-

ing, which led to the interference of ‘Isi and the restoration of

peace. Timothy was duly installed in May 780.9 He made the bishops of Persia subject to the see of Seleucia, and appointed over them one Simeon as metropolitan with orders to enforce a stricter In his days Christianity spread among the Turks, and the khakan himself is said to have become a convert. Timothy’s disgraceful response to the caliph ar-Rashid in the matter of the divorce of Zubaidah may be seen in B.O., iii. 1,161. He is said to have died in 204 A.H. =819-820 A.D., or 205 = 820-821 ; but, if he really was catholicus for forty-three years, his death cannot have taken place till 823.% ‘Abhd-isho‘’ informs us that Timothy wrote synodical epistles, a volume on questions of ccclesiastical law, another on questions of various sorts, a third containing disputations with a heretic, viz., the Jacobite patriarch George, about 200 letters in two volumes, a disputation with the caliph al-Mahdi or his successor al- Hadi (on matters of religion), and an astronomical work on the stars.* Bar-Hebreeus adds hymns for the

dominical feasts of the whole year and a commentary on Theologus (Gregory Nazianzen).14

In this century too we may place the two following historical writers, whose names and works are unfortunately known to us only through the mention made of them by a later annalist. (1) An anonymous author, the abbot of the great convent (of Abra- ham on Mount Izla), cited by Elias bar Shinaya in his Chronicle under the years 740-741. (2) An ecclesiastical historian called Pethion, identified by Baethgen (Fragmente, p. 2, No. 6) with the catholicus of that name. This is, however, impossible, because the catholicus died in 740, whereas the Zeclesiastical History of Pethion is cited by Elias bar Shinaya under the years 765 and 768.

We conclude our enumeration of the Nestorian writers of this cen- tury with the name of another historian. In the Bibl. Orient., ili.

1 B.0., iii. 1, 111-113. By the “ theology ” of Gregory Nazianzen are probably meant the discourses bearing the title Theologica Prima, &c.; see, for example, 2 Hoffmann, Ausziige, p. 227 sq.

3 Also a pupil of Abraham bar Dashandadh (B.0., iii. 1, 212 note 2, 159, He is mentioned in commendatory terms by Timothy in his encyclical letters of 790 and 805 (B.0O., iii. 1, 82 col. 1, 164 col. 1; ‘Abhd-ish6’, Collectio Canonum Synodicorum, ix. 6, in Mai, Scriptt. Vett. Nova Coll., x. pp. 167 col. 1, 829 col. 1). He was the author of a refutation of the Kor’an, a disputation

against heretics, and other useful works (B.0., iii. 1, 212), among which may be

mentioned a life of the missionary John of Dailam (B.0., iii. 1, 183, col. 2).

4 Or, according to others, 777.

5 Hoffmann, Ausztige, p. 216 sq. OG IROL. bb dl AU

7 We need not believe all the evil that Bar-IHebreus tells us of this unhappy man, Chron. Eccles., ii. 171 sq.

8 See the whole miserable story told in full in B.0., ii. 483, iii. 1, 158-160 ; Bar-Hebreeus, Chron. Eecles., ii. 165-169.

9 Baethgen, Fragmente, pp. 64, 131.

10 Bar-Hebreeus, Chron. Eccles., ii. 169; B.0., ii. 433.

ll B.O., iii. 1,160. Compare Chwolson's interesting memoir "'Syrische Grab- inschriften aus Semirjetschie" (west of the Chinese province of Kuldja, more eorrectly Kulja), in Mém. de I' Acad. Imp. des Sc. de St, Pétersb., Tth ser., vol. xxxiv., No. 4. The oldest of these tombstones is dated A. Gr. 1169=858 a.D., and marked "'the grave of Mengki-tenesh the believer" (p. 7); but most of them belong to the 13th and 14th centuries. z

12 See B.O., ii. 434; iii. 1, 160. 13 B.0., iii. 1, 162-163. ' :

14 Chron, Eccles., ii. 179. He is probably the author of the hymn in Brit. Mus, Add. 7156 (Rosen, Catal., p. 18, col. 1, 1) and Paris, Suppl. 56 (Zotenberg, Catal., p. 9, col. 1, i). if

15 See Baethgen, Fragmente, p. 2, No.3; Bar-Hebrzus, Chron. Eccles. , ii. 152 note 2, 154 note 1 (Abbeloos writes " the abbots of the great convent").

of Ken-neshré," aud on its destruction by fire 1 and the consequent Mahré.

dispersion of the monks, he went to the convent of Mar Jacob at Kaisiim, in the district of Samosata.22 He devoted himself entirely to historical studics,* which he seems to have carried on in peace and quiet till 818. The patriarch Cyriacus (see above, p. 842) had got entangled in a controversy with the monks of Cyrrhus and Gubba Barraya about the words lakma sh?maiyana ("the heavenly bread"), &c., in the Eucharistic service, which ended in the mal- contents setting

up as anti-patriarch Abraham, a monk of the convent of Kartamin. After the death of Cyriacus in 817, a synod was held in June 818 at Callinicus (ar-Rakkah), in which, after con- siderable discussion, Theodore, bishop of Kaistim, proposed the election of Dionysius, which was approved by most of those present, including Basil I., maphrian of Taghrith.24 The poor monk was accordingly fetched to Callinicus, received deacon's orders on Friday in the convent of Estiina or the Pillar, priest's orders on Saturday in the convent of Mar Zakkai or Zaccheus, and was raised to the patriarchate in the cathedral on Sunday the first of Abh, 818, the officiating bishop being Theodosius of Callinicus. Abraham and his partisans, seeing their hopes disappointed, main- tained their hostile attitude, which led afterwards to the usual scandalous scenes before the Muslim authorities. Immediately after his installation, Dionysius commenced a visitation of his vast diocese, going first northwards to Cyrrhus, thence to Antioch, Kirkésion (Kirkisiya), the district of the Khabhir, Nisibis, Dara and Képhar-ttitha, and so back to Callinicus, where he enjoyed the protection of 'Abdalla ibn Tahir against his rival Abraham. He did not on this occasion visit Mosul and Taghrith, because the maphrian Basil thought the times unfavourable." In 825 'Abd- allah ibn Tahir was sent to Egypt to put down the rebellion of 'Obaidallah ibn as-Sari, where he remained as governor till 827.2" His brother Muhammad ibn Tahir was by no means so well disposed towards the Christians, and destroyed all that they had been allowed to build in Edessa.8 Wherefore the patriarch went down into Egypt to beg the emir 'Abdallah to write to his brother and bid him moderate his zeal against the church, which he accordingly did.2® On his return from Egypt the patriarch had troubles with Philoxenus, bishop of Nisibis, who espoused the cause of the anti- patriarch Abraham® ; and he then went to Baghdadh in 829 to confer with the caliph al-Ma'min as to an edict that he had issued on the occasion of dissensions between the Palestinian and Babylonian Jews regarding the appointment of an exiliarch.! During his stay in the capital disputes took place among the Christians, which ended in a reference to the caliph and in the deposition of the bishop Lazarus bar Saibhétha.*? From Baghdadh Dionysius pro- ceeded to Taghrith and Mosul, and nominated Daniel as maphrian in place of the deceased Basil. In 830 al-Ma'mtin made an attack on the Greek territory, and

the patriarch tried to see him on his return at Kaisim, but the caliph had hurried on to Damascus, whither Dionysius followed him and accompanied him to Egypt on a mission to the Bashmuric Copts, who were then in rebellion. Any efforts of his and of the Egyptian patriarch were, however, of no avail, and the unfortunate rebels suffered the last horrors of war

16 B.0., iii. 1, 195. 17 Baethgen, Fragmenie, p. 2.

18 Chron. Eccles., i. 333; B.O., iii. 1, 195, note 4 (where 695 is a mistake for 798). See also Bar-Hebreeus, Chron. Eccles., ii. 42 note 2, 114 note 1, 122 note 1, 127 note 8, 138 notes 1, 2, 140 note 1.

19 See Hoffmann in Z.D.M.G., xxxii. (1878), p. 742, note 2.

20 Bar-Hebreeus, Chron. Eccles., i. 347-349.

21 B.0., ii. 345, col. 1, where the rebuilding of it by Dionysius is mentioned ; Bar-Hebreeus, Chron. Eccles., i. 355, at the top.

22 Bar-Hebreeus, Chron. Eccles., i. 347-349. A previous residence at the con- vent of Zuknin near Ainid (B.0., ii. 98, col. 2) is uncertain, as the words daira dhilan probably mean no more than " the convent of us Jacobites."

23 Bar-Hebreus, Chron. Eccles., i. 347, last line. 24 Tbid., i. 847.

25 Ibid., i. 355-357; B.O., ii. 345. Abraham died in 837, and was succeeded by his brother Simeon as anti-patriarch.

26 Bar-Hebreeus, Chron. Eccles., i. 353.

27 Wiistenfeld, Die Statthalter von Aegypten, lte Abth., p. 32 sq.; De Sacy Relation de VEgypte par Abd-allatif, pp. 501-508 and 552-557.

28 Bar-Hebreeus, Chron. Eccles., i. 359. 29 Ibid., i. 369.

30 [bid., i. 363. 31 Tbid., i. 365. 82 Tbid., i. 365-371.

at the hands of al-Ma’miin and his general Afshin.! On this discourses,!8 and of various encomia, thanksgivings, consolato journey Dionysius saw and examined the obelisks of Heliopolis, | epistles,!9 and prayers,” in many of which he makes use not merely

the pyramids, and the Nilometer.? In 835 he revisited Taghrith to | of metre but also of rime.2!

settle some disputes between the Taghritans and the monks of Mar Lazarus bar Sabhétha, called as bishop Philoxenus and Basjl.2 Lazary Matthew at Mosul, and to ordain Thomas as maphrian in place of | ruled the see of Baghdadh in the earlier part of the 9th century, bar ‘ the deceased Daniel. In the same year he went once more to | As mentioned above, he was deposed by Dionysius in 829. He Sabneins Baghdadh to salute al-Ma’min’s successor al-Mu’tasim, and met | compiled an anaphora or liturgy,” and wrote an exposition of the ‘ there the son of the king of Nubia, who had come on the same | office of baptism. The latter may be only part of a larger work errand.* The latter years of Dionysius were embittered by the | ou the offices of the church, from which Bar-Hebreus may have oppressions and afflictions which the Christians had to endure at | derived the information regarding the musical services quoted by

the hands of the Muhammadans. He died on 22d August 845, and | Assemani, B. Oke wh AGE.

was buried in the convent of Ken-neshré.> He left behind him Contemporary with these was John, bishop of Dara, to whom John of one great work, his Annals, covering the whole period of the world’s | Dionysius dedicated the larger recension of his history (see above), Dari history from the creation down to his own time. Of this there | He compiled a liturgy,® and was the author of the following were two recensions, a longer and a shorter. The longer redaction | works—a commentary on the two books of Pseudo- Dionysius

was dedicated to John, bishop of Dari, and came down at all Areopagita De Hierarchia Celesti et Ecclesiastica,® four books on events to the year 837, or perhaps a little later.6 Assemani has | the priesthood," four books on the resurrection of the dead," and published an extract from it, which he was fortunate enough to | a treatise on the soul.29

find in Cod. Vat. cxliv., f. 89, in the B.O., ii. 72-77.7 It would Nonnus was an archdeacon of the Jacobite Church at Nisibis Nonnus seem to have been written, after the manner of John of Asia, in a during the first half of this century, the Nestorian bishop Cyprian of Nisibis, series of chapters dealing with particular topics. The shorter re- | having allowed the Monophysites to resume possession of the church daction is extant in a single imperfect MS., Cod. Vat. clxii.,8 and | of St Domitius in 767 (see above, p. 844). He is mentioned by Bar-

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is dedicated to George, ehorepiscopus of Amid, Euthalius the abbot (of Zuknin ?), Lazarus the periodeutes, the monk Anastasius, and the rest of the brotherhood. It is arranged by successive years, and ended with the year of the Greeks 1087=776 a.p.2 The author has adopted a division into four parts. Part first extends from the creation to the reign of Constantine. Here the chief authority is the Chronicorum Canonum Liber of Eusebius, supplemented by some extracts from other Greek sources, such as Eusebius's Ecclesiastical History and the Chronographia of Julius Africanus.

Hebreus as bringing charges against the bishop Philoxenus, who had sided with the anti-patriarch Abraham, and was therefore deposed by a synod held at Ras'ain in 827 or 828.29 We know also that he was in prison at Nisibis when he wrote his work against Thomas bishop of Marga and metropolitan of Béth Garmai, who flourished under the Nestorian catholics Abraham (887-850) and Theodosius (852-858). Besides this controversial treatise in four discourses, Nonnus was the writer of sundry letters of a similar eharacter.31

With these Dionysius has incorporated matter derived from sundry Romanus the physician, a monk of the convent of Kartamin, Roma- other works, ¢.g., the Chronicle of Edessa (see above, p. 835), the | was elected patriarch at Amid in 887, and took the name of Theo- nus the Méarrath Gazz or 'Cave of Treasures," !° Pseudo-Callisthenes's | dosius.*? He died in 896. He was the author of a medical syn- physi- Life of Alexander the Great, the story of the seven sleepers," and | tagma (kunndsha) of some repute.3 He wrote a commentary on cian or Josephus's Jewish War (see above, p. 823).!2 The second part of Pseudo ~~Hierotheus, On the Hidden Mysteries of the House of God, Theo~~ Dionysius's Chronicle reaches from Constantine to Theodosius II., | and dedicated it to Lazarus, bishop of Cyrrhus.? The work is dosius,

Theo-

dosius of Edessa, also a student of Greek at Ken-neshré.

and here he principally followed the Ecclesiastical History of Socrates (compare Cod. Vat. cxlv.). The third part extends from Theodosius II. to Justin II. Here Dionysius acknowledges himself chiefly in- debted to lis countryman John of Asia (see above, p. 835), but has also incorporated the short Chronicle of Joshua the Stylite (see above, p. 832) and the epistle of Simeon of Béth Arsham on the Himyarite Christians (see above, p. 832). The fourth part, coming down to 158 A.H.=774-775 A.D., is his own compilation, partly from such written documents as he could find, partly from the oral statements of aged men, and partly from his own observation. Assemani has given an account of the whole work, with an abridgement or excerpt of the fourth part, in the Bibl. Orient., ii. 98-116 ; but the labours of Dionysius of Tell-Mahré will never be appreciated as they deserve till the appearance of the edition which is now being prepared by Guidi.

Under Dionysius flourished his brother Theodosius, bishop of Bar-Hebreeus

Edessa. makes mention of him as accompanying Dionysius to Egypt in

Antonius

825-826 to complain to ‘Abdallah ibn Tahir of the wrongs of the Christians.% At an earlier period (802-803), when only a priest, he translated the homily of Gregory Nazianzen ou the miracles of the prophet Elijah, and Bar-Hebreus says that he also rendered into Syriac the poems of the same author.”

A friend of his was Antonius, a monk of Taghrith, surnamed “ the

the Rhe- Rhetorician.”!6 He was the author of a treatise on rhetoric in torician, seven chapters,” of a work on the good providence of God in four

eee 1 Bar-Hebreus, Chron. Eccles., i. 873; Weil, Gesch. d. Khalifen, ii. 246;

Wiistenfeld, Die Statthalter von Aegypten, 1te Abth., pp. 40-48.

2 Bar-Hebreus, Chron. Eccles., i. 377-381. 3 Ibid., 381.

4 Tbid., 381. 5 Ibid., 385. 6 Tbid., 383-385. 7 See Catal. Vat., iii. 253.

8 See Catal. Vat., iii. 828. Assemani’s account of this MS. is not so clear as could have been wished. In the Catal. Vat., iii. 329, he says that it is “unus ex iis codicibus, quos Moses Nisibenus ccenobiarcha e Mesopotamia in Scetense 8. Mariz Syrorum monasterium intulit” (viz., in 932); but there is now no note whatever in the MS. to show that this was the ease.

9 B.0., ii.99. At present the MS. ends in the year 775, a few leaves being wanting at the end.

10 Translated into German by Bezold, Die Schatzhdhle (1883). The Syriac text is not yet published.

ll Guidi, Testi Orientali ineditt sopra i Sette Dormienti di Efeso (Reale Accad. dei Lincei), 1885 ; see in particular p. 34, note 3.

12 The Syriac text of this first part was edited by Tullberg, Dionysti Telma- harensis Chronici liber primus, 1850 (compare Land, Joannes

Bischof von Ephesos, pp. 39-41). The Husebian extracts have been translated and compared with the Greek original (so far as possible), the Latin version of Jerome, and the Armenian version, by Siegfried and Gelzer, Eusebii Canonwm Epitome ex Dionysti Telmaharensis Chronico petita (1884). On this work see Gutschmid, Untersuchungen tiber d. syrische Epitome der Eusebischen Canoncs (1886). The editors have not always correctly rendered the text of their " blatero Sytius"; see a flagrant example on p. 79, last paragraph.

13 Bar-Hebreus, Chron. Eccles., i. 3613 B.O., ii. 345.

M4 Cod. Vat. xevi., Catal. Vat., ii. 521; B.O., ii. ip. exlix No. 17.

15 Bar-Hebreeus, Chron. Eccles., i. 363; B.O., ii. 345. To this version perhaps belong the poems contained in Brit. Mus. Add. 14547 (Wright, Catal., p. 488) and 18821 (ibid., p. 775). 16 Bar-Hebreus, Chron. Eccles., i. 363; B.O., ii. el. and 345.

17 Brit. Mus. Add. 17208 (Wright, Catal., p. 614).

divided into five books, the first and second of which he finished at Amid, before going down to the Fast, and the third at Samosita, He also compiled a collection of 112 Pythagorean maxims and proverbs, with brief explanations in Syriac and Arabic, addressed to one George.*® A synodical epistle of his is extant in Arabic, written to the Egyptian patriarch Michael III.,?" and a Lenten homily in Arabic.38

Moses bar Képha was the son of Simeon Képha (or Peter) and Moses his wife Maryam. The father was from the village of Mashhad bar al-Kohail, on the Tigris opposite al-Hadithah,®9 the mother a Kepha.

native of Balad, in which town their son was born somewhere about 818. He was taught from his early youth by Rabban Cyriacus, abbot of the convent of Mar Sergius on the Tira Sahya, or Dry Mountain, near Balad, and there assumed the monastic garb. He was elected bishop of Beth Remm4n (Barimma),° Beth Kiyonaya,# and Mosul, about 863, and took the name of Severus. He was also for ten years periodentes or visitor of the diocese of Taghrith. He died A. Gr, 1214=903 a.p.,# "aged

about ninety years, of which he had been bishop for forty," and was buried in the convent of Mar Sergius. His works are numerous. He wrote commentaries on the whole Old and New Testaments, which are often cited by Bar-Hebreus in the Ausar Razé. Of these that on the book of

18 Brit. Mus. Add, 14726 (Wright, Catal., p. 617),

19 Brit. Mus. Add. 17208. 20 Brit. Mus. Add. 14726.

21 See a specimen in Rédiger's Chrestom. Syr., 2d ed., pp. 110-111.

22 See Wright, Catal., p. 496, col. 2. 23 See. Renaudot, ii. 399.

%4 Cod. Vat. exlvii., Catal., iii. 276. 25 B.0., ii. 123.

26 B.O., ii, 120-121 ; Cod. Vat. e. (Catal., ii. 539), eeclxiii. (Mai, Scriptt.Vett. Nova Coll., v.); Bodl, Or. 264 (Payne Smith, Catal., pp. 487-492). There is an extract in Cod. Vat. ecccxi. p. 1 (Mai, op. cit.),

27 B.0., ii, 121; Cod. Vat. c. (Catal., ii. 542), ecclxiii. (Mai, op. cit.); Bodl. Or. 264 (P. Smith, pp. 492-496). Extracts from bks. ii. and iv. in Zingerle, Monwm. Syr., i. 105-110; from bk. iv. in Overbeck, S. Ephraemi, &c., Opp. Sel., pp» 409- 413 ; see Bar-Hebreus, Chron. Eccles., ii. 394, note 1, No. 13.

28 B.O., ii. 119; Cod. Vat. c. (Catal., ii. 581), ecclxii. (Mai, op. cit.).

29 B.0., ii. 219, note 1. From it there are extracts in Cod. Vat. exlvii. (Catal., iii. 276). 30 Bar-Hebreeus, Chron. Eccles., i. 363; B.O., ii. 346, col. 1.

31 These writings are all contained in Brit. Mus. Add. 14594 (Wright, Catal., pp. 618-620). 32 Bar-Hebreus, Chron. Eccles., i. 891; ii. 213. ; '

33 Ibid., i. 391. Assemani suggests that it may be the work contained in Cod. Vat. excii. (Catal., iii. 409). Compare Frothingham, Stephen bar Sudaili the Syrian Mystic and the Book of Hierotheos, 1886, p. 84 sq.

34 A forgery of Stephen bar Stidh-ailé ; see above, p. 832. .

35 Brit. Mus. Add. 7189 (Rosen, Catal., p. 74). This is the very copy which was procured with some difficulty for the use of Gregory Bar-Hebreus (Wright, Catal., p. 1205). :

36 Paris, Ancien fonds 118, 157 (Zotenberg, Catal., p. 147 col. 1, 166 col. 1); Bod]. Marsh. 201, f. 58 (Payne Smith, Catal., p..507); B.O., ii. 125. It is admir- ably edited by Zotenberg in the Journ. Asiat., 1876, pp. 426-476.

37 B.O., ii. 124. 38 Brit. Mus. Add. 7206, f. 73 (Rosen, Catal., p. 103).

39 See Hoffmann, Ausziige, p. 190. 40 Tbid., p. 190. :

41 B.O., ii. 218, note 1, col. 2; Hoffmann, Ausziige, p. 30, note 243. In Wright's Catal., p.620, col. 2, the name is written Béth Kiyona ; in B.0., ii.127, Bee 42 In Wright's Catal., p. 621, col. 1, he is called bishop of Béth Remman an Béth 'Arbaye (Ba-'arbaya). + d 43 As correctly given in B.O., ii. 218; Bar-Hebreus, Chron. Eccles., ii. 217 @0

by MS. C. also in i. 395). 44 B.O., ii. 180, note 3; 218, col. 2.

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Genesis survives, though imperfect, in Brit. Mus. 17274,) and there are extracts from them in Paris, Ancien fonds 35 (Zotenberg, Catal., 9.156), and Bodl. Marsh.101 (P. Smith, Catal., p. 462). The Gospels and Pauline epistles (imperfect) are contained in Brit, Mus. Add. 17274 (Wright, Catal., p. 620), the latter only in Bodl Or. 703 (P. Smith, Catal., p. 410) and Bodl. Marsh. 86 (ibid., p. 418). His treatise on the Hexaémeron in five books? is preserved to us in the Paris MS. Anc. fonds 120 (Zotenberg, Catal., p. 197), and there are extracts from it in two other MSS. (7bid., pp. 157, 159). The work De Paradiso, in three parts, dedicated to his friend Ignatius of

grammar. WHonain also wrote a treatise On Synonyms, whether they be “voces equilitterz ” (as rghiz and raggiz) or not (as ‘aketha and karyutha). Extracts from this work have been preserved to us by a later compiler, who made use also of the canons of ‘Anan- isho’ of Hédhaiyabh™ (see above, p. 848). In Cod. Vat. cexvii (Catal., iii. 504) there are excerpts from a medical treatise of Honain, but no title is given. Honain, his son Ishak, and his nephew Hobaish ibn al-Hasan al-A‘sam (‘ Stiff-wrist ”) were among the earliest and ablest of those Christians, chiefly Nestorians, who, during the 9th and 10th centuries, making Baghdadh their head-

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4 haozo (P)3isk le tk dy ; ion of | Quarters, supplied Muhammadan scholars with nearly everything

‘ ¢ (: } is oe bchtinas ’ age Sie eps wiser | that they knew of Greek science, whether medicine, mathematics,

a me aa me ney on the soul® survives in Cod. or philosophy. As a rule, they translated the Greek first into at. cxlvii. (Catal., iii. 273-274) ; it consists of 40 chapters, with a = ar he raw :

| supplementary chapter to show that the dead are profited by wee. Syriac and afterwards into Arabic; but their Syriac versions have

unfortunately, as it would appear, perished, without exception.” An elder contemporary of Honain was Gabriel bar Bokht-isho’, Gabriel in Arabic Jabra’il ibn Bakhtishi‘ (or rather Bokhtishi’),a member bar

ings made on their behalf. That on predestination and freewill, in four discourses, is extant in Brit. Mus, Add. 14731 (Wright, Catal.,

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853). The Disputations against Heresies, spoken of by Moses's biographer in B.O., ii. 218, col. 2, is probably identical with the work On Sects mentioned by Assemani at p- 131, No. 7. The Festal Homities for the whole year® is extant in several MSS., ¢.9., Brit. Mus. Add. 21210 (Wright, Catal., p. 877) and 17188 (cbdid., p- 621), Paris, Anc. fonds 35 and 123 (Zotenberg, Catal., pp. 156, 159).7_ Besides these we have four funeral sermons,® an ad- monitory discourse to the children of the holy orthodox church,?® and a discourse showing why the Messiah is called by various epithets and names.!° Moses also wrote expositions of the sacra- nients of the church, such as on the holy chrism, in 50 chapters, Cod. Vat. cxlvii. (Catal., iii. 274) and Paris, Anc. fonds 128 (Zoten- berg, Catal., p. 159),4 with which is connected the discourse on the consecration of the chrism in Brit. Mus. Add. 21210 (Wright, Catal., p. 879); on baptism, addressed to his friend Ignatius, in 24 chapters, Cod. Vat. cxlvii. (Catal., iii. 276), in connexion with which we may take the discourse on the mysteries of baptism in Brit. Mus.

(p. 844). He was in practice at Baghdadh in 791, and attended on Ja'far ibn Yahya al-Barmaki, became court physician to ar- Rashid, and maintained this position, with various vicissitudes, till his death in 828.78 'Abhd-ishd' says that he was the author of a Syriac lexicon,"" which is our reason for giving him a place here, but no such work is mentioned by the other authorities to whom we have referred. 28

Of Isho' Mariizdya, in Arabic 'Isa al-Marwazi, from the city of Isho* Mari or Merv, little is known to us beyond the fact that he com- Mari- piled a Syriac lexicon, which was one of the two principal authori- zaya.

ties made use of by Bar ‘Ali. That he should be identical with the physician al-Marwazi, who lived about 567,2° seems wholly un- likely. We might rather venture to identify him with Abi Yahya al-Marwazi, who was an eminent Syrian physician at Baghdadh,

of a family of renowned physicians, beginning with George bar Bokht-Bokht-isho’ of Gundé-Shabhor, whom we have mentioned above sho”.

wrote in Syriac upon logic and other subjects, and was one of the teachers of Matta ibn Yaunan or Yiinus (who died in 940)! In any case, ‘Isa al-Marwazi secms to have flourished during the latter part of the 9th century, and therefore to have been a contemporary of Bar ‘Ali. _

Ish6’, or ‘Isa, bar ‘Ali is stated in Cod. Vat. ccxvii. (Catal., iii. Bar ‘Ali, 504, No. xv.) to have been a pupil of Honain. His father ‘Ali and his uncle ‘Isa, the sons of Da’iid or David, were appointed by the catholicus Sabhr-ishé‘ II. (882-836) to the charge of the college founded by him in the convent of Mar Pethion at Baghdadh.* Bar ‘Ali’s lexicon is dedicated to a deacon named Abraham, who made certain additions to it after the death of the author. *4

Isho‘ bar Non was a native of the village of Béth-Gabbaré near Ishd’ bar Mosul. He was a pupil of Abraham bar Dashandadh (see above, p- Non.

Add. 21210 (Wright, Joc. cit.) and on baptism in Cod. Vat. xevi. (Catal., ii. 522) 1; exposition of the liturgy, Brit. Mus. Add. 21210 (Wright, Catal., p. 879) and Berlin, Sachau 62 (2); further, exposi- tions of the mysteries in the various ordinations, Cod. Vat. li. (Catal., ii.820)}3; on the ordination of bishops, priests, and deacons, Brit. Mus. Add. 21210 (Wright, Catal., p. 879}; on the tonsure of monks, Cod. Vat. li. (Catal., ii. 322).° He also compiled two anaphore,’® one of which has been translated by Renaudot, ii. 391. Lastly, Moses bar Képha was the author of a commentary on the dialectics of Aristotle, mentioned by Bar-Hebreus in Chron. Ficcles., ii. 215, and of a commentary on the works of Gregory Nazianzen, and an ecclesiastical history, mentioned by his bio- grapher in B.0., ii. 218, col.2. The loss of this last book is to be

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regretted.

The contemporary Nestorian writers of mark are hardly more numerous,

In this century the foundations of Syriac lexicography were laid by the famous physician Abii Zaid Honain ibn Ishak al-‘Ibadi of Hérta (al-Hirah).” He applied himself to medicine at Baghdadh, under Yahya, or Yuhanna, ibn Masawaihi (Mastiyah or Mesue) ; but an ill-feeling soon sprang up between teacher and pupil, and Honain took his departure for the Grecian territory, where he spent a couple of years in acquainting himself with the Greek language and its scientific literature. He afterwards became physician to the caliph al-Mutawakkil. His downfall and excommunication

fear of God (which he wrote as a deacon of the church), a Syriac grammar, and a compendious Syriac lexicon. The lexicon has no doubt been in great part absorbed into the later works of Bar ‘Ali and Bar Bahlil.” The grammar seems to have been entitled Ke- thabha dht-Nukzé, or the ‘* Book of (Diacritical) Points.” It is cited by Bar-Hebreus in the Ausar Raz2™ and by Elias of Tirhan in his a a rece ini ee ee Ny oS OLD hae Pe Als

1 Wright, Catal., p. 620. 2 B.O., ii. 128, No. 1. 3 Ibid., ii. 218, col. 2.

4 Ibid., ii. 128, No. 2, 5 Ibid., ii. 131, No. 6. 6 Ibid., ii. 131, No. 9.

7 See also Cod. Vat. clix. (Catal., iii. 316-317); on the Ascension, Cod. Vat. exlvii. (Catal., iii. 276). 8 Brit. Mus. Add. 17188 (Wright, Catal., p. 622).

9 Brit. Mus. Add. 21210 (Wright, Catal., p. 879).

10 Brit. Mus. Add. 17188 (Wright, Catal., p. 622).

ll The Paris MS. Ancien fonds 35 contains another redaction in 36 chapters (Zotenberg, Catal., p. 157).

12 See also Cod. Vat. eccexi., in Mai, Seriptt. Vett. Nova Coll., v.

18 See also Cod. Vat. ecciv., in Mai, op. cit. 14 B.0., ii. 131, No. 8.

15 Compare Cod. Vat. eccv., in Mai, op. cit. 16 B.0., ii. 130, No. 4.

V7 Al-‘{badi was the nisbah of an Arab Christian of al-Hirah. See Ibn Khal- likan, ed. Wiistenfeld, No. 87. Latin writers generally call him Joannitius.

18 See the Fihrist, pp. ¢ 91° and 140; Ibn Abi Usaibi‘ah, ed. Miiller, i. 184; Ibn Khallikan, ed. Wiistenfeld, No. 208; al-Mas‘adi, Murij adh-Dhahab, ix. 173 5q.; Bar-Hebreeus, Chron. Syr., p.170(transl., p. 173; B.O., ii. 270, note 3); Chron. Hceles., ii. 197-199 (B.0., ii. 488); Hist. Dynast., p. 263 sq. (transl., p. 171 sg.); Wenrich, De Auctt. Gr. Versionibus, Index, B. Xxxi.; Wiistenfeld, Gesch. d. arab. Aerzte, No. 69. S B.O., iii. 1, 165.

20 See Gesenius, De Bar Alio et Bar Bahlulo Commentatio, 1834, Pete

***1 See Hoffmann, Z.D.M.G., xxxii., 1878, p. 741.**

844) at the same time with Abii Nuh al-Anbari (see above, p. 845, note 3)and Timothy, his predecessor in the dignity of catholicus (see above, p. 845). He retired first to the convent of Mar Abraham on Mount Izla, where he devoted himself to study and to refuting the views and writings of his schoolfellow and subsequent diocesan Timothy, whom he spitefully called Zalém-otheos (“‘the wronger of God”) instead of Timotheos. In consequence of a dispute with the monks he left Mount Izla and went for some months to Bagh- dadh, where he stayed at the house of George Masawaihi (Mastiyah or Mesue) and taught his son Yahya.2° He then returned to Mosul, where he took up his residence in

the convent of Mar Elias, and lived there for thirty years, till the death of Timothy.*° Through

| were meanly brought about by a fellow-Christian of the same pro- | the influence of Gabriel bar Bokht-isho' (see above) and his son- (fession, Isra'il_ ibn at-Taiftri, and Honain died soon after, 260 in-law Michael bar Masawaihi (Mastiyah or Mesue), the physician | A.H, =873 A.p.'8 Honain composed most of his original works in | of the caliph al-Ma'miin, he was appointed catholicus A.Gr. 1135 1 Arabic, and likewise many of his translations from the Greek. 22 Edit. Baethgen, p. 32; see Hoffmann, Opuse. Nestor., p. xvii.

1 'Abhd-ish6′ mentions but three books of his,?® viz., a book on the 23 Hoffinann, Opusc. Nest., pp. 2-49; see B.O., ii. 308, col. 2, and Cod. Berlin,

Sachau 72, No. 14. There is also a MS. in the collection of the 8.P.C.K.

24 Cod. Vat. excii. (Catal., iii. 409), Syntagma Medicum Syr. et Arab., is not likely to be his, but requires closer examination.

25 This is a large subject, into which we cannot here enter, the more so as it pertains rather to a history of Arabic than of Syriac literature. We would refer the reader to Wiistenfeld, Geschichte d. arab. Aerzte u. Naturforscher, 1840 ; Flugel, Dissert. de Arabicis Scriptorum Gracorum Interpretibus, 1841 ; Wenrich, De Auctorum Grecorum Versionibus et Commentariis, 1842; Renan, De Philoso- phia Peripatetica apud Syros, 1852, sect. viii. p. 51; Al-Farabi (Alpharabius) des Arab. Philosophen Leben u. Schriften, by M. Steinschneider, 1869; A. Miiller, Die Griechischen Philosophen in der arabischen Ueberlieferung, 1873. Of Muham- madan authorities two of the most important are the Fihrist of Abu '1-Faraj Muhammad ibn Ishak al-Warrak al-Baghdadhi, commonly called Ibn Abi Ya'kiib an-Nadim (died early in the 11th century), and the 'Uyun al-Anba fi Tabakat al-Atibbaé of Muwaffak ad-Din Abii 'l-Abbas Ahmad ibn al-Kasim as-Sa'di al-Khazraji, generally known by the name of Ibn Abi Usaibi'ah (died in 1269). The former work has been edited by Fliigel, J. Rodiger, and A. Miiller, 1871-72, the latter by A. Miiller, 1884.

26 See Ibn Abi Usaibi‘ah, ed. Miiller, i.127; Wiistenfeld, Gesch. d. arab. Aerzte, No. 28; Bar-Hebreeus, Chron. Syr., pp. 139-140, 170 (B.0., ii. 271, note, col. 1), and Hist. Dynast., 235, 264. 27 B.O., iii. 1, 258,

28 Compare Gesenius, De BA et BB, p. 7.

29 See Gesenius, op. cit., p. 8; B.O., iii. 1, 258,

30 B.O., iii. 1, 437, 438, note 2.

31 See the Fihrist, p. 263; Ibn Abi Usaibi‘ah, ed. Miiller, i. 234-235,

82 B.O., iii. 1, 257; Gesenius, op. cit., cap. ii. 33 Gesenius, op. cit., p. 14.

34 Ibid., p. 21; see Hoffmann, Syrisch-arabische Glossen, 1874, and Payne Smith, Thes. Syr., passim. 35 See B.O., iii. 1, 501 sq.

36 So Assemani, B.0., ii. 435. Bar-Hebreus (Chron. Eccles., ii. 181) says that he resided for thirty-eight years in the convent of Sa‘id near Mosul.

Denha,

Thomas of Marga.

Tsho’- dadh of Merv.

Kendi.

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= 823-824 a.p.1_ He sat for only four years, and was buried, like his predecessor, in the convent of Kélil-ishd‘ at Baghdadh. Of his ill-feeling towards Timothy I. we have already made mention ; how he kept it up after Timothy’s death, and what troubles he got into in consequence, may be read in the pages of Assemani (B.0., iii. 1, 165). Bar-Hebreus has preserved some account of a disputa- tion between him and a Monophysite priest named Papa.2 ‘A bhd- isho* gives the following list of his works *—a treatise on theology, questions on the whole text of

Scripture, in two volumes, a collec- tion of ecclesiastical canons and decisions,‘ consolatory discourses, epistles, a treatise on the division of the services, turgamé or “interpretations,” ° and a tract on the efficacy of hymns and anthems. Of the questions on Scripture there is a copy in the col- lection of the S.P.C.K., and of the consolatory discourses a mutilated MS. in the British Museum, Add. 17217 (Wright, Catal., p. 613).§ The replies to the questions of Macarius the monk seem to belong to the treatise on the division of the services (purrash teshméshatha), if one may judge by the first and only one quoted.”

A disciple of Ishd‘ bar Non was Denha, or, as he is otherwise called in some MSS. of ‘Abhd-ishd”s Catalogue, Thibha (or rather Hibhi, Ibas). Assemani places him under the catholicus Pcthidn (dicd in 740), but we prefer to follow the authority of John bar Zo’bi in his Grammar.® Denha was the author of sermons and tracts on points of ecclesiastical law, and of commentaries on the Psalms, on the works of Gregory Nazianzen (as contained in two vols. in the translation of the abbot Paul), and on the dialectics of Aristotle.

In 217 A.H.=832 A.p., the same year in which Sabhr-isho’ II. succeeded to the patriarchate,’ a young man named Thomas, the son of one Jacob of Béth Sherwanayé, in the district of Salakh,” entered the convent of Béth ‘Abhé, which seems at this time to have fallen off sadly in respect of the learning of its inmates.2 A few ycars afterwards (222 a.u.=837 a.D.) we find him acting as secretary to the patriarch Abraham (also a monk of Béth ‘Abhé, who sat from 837 to 850).18 By him he was promoted to be bishop of Marga, and afterwards metropolitan of Béth Garmai, in which capacity he was present at the ordination of his own brother Theo- dosius (bishop of al-Anbar, afterwards mctropolitan of Gundé- Shabhor) as catholicus in 852.14 Thomas of Marga (as he is com- monly called), having been very fond from his youth of the legends and histories of holy men, more especially of those connected with his own convent of Béth ‘Abhé, undertook to commit them to writing at the urgent request of the monk ‘Abhd-ishs‘, to whom he dedicates the Monastic History. Assemani has given a. toler- ably full analysis of this work, with a few extracts, in the BuO, iii. 1, 464-501, throughout which volume it is one of his chief authorities, The

publication of it ina complete form is much to be desired. The MSS. available in Europe are—Cod. Vat. clxv. (Catal., iii. 331), of which Codd. Vatt. ecclxxxi.-ii. are a copy (Mai, Scriptt. Vett. Nova Ooll., v.); Paris, No. 286 in Zotenberg's Catal., p. 216 (also copied from Vat. clxv.); Brit. Mus. Orient. 2316 (ff. 182, 17th century, imperfect) ; Berlin, Sachau 179 (copied in 1882). Thomas also wrote a poem in twelve-syllable metre on the life and deeds of Maran-'amméh, metropolitan of Hédhaiyabh, which he introduced into his History, bk. iii. ch. 10 ; see B.O., iii. 1, 485.

Isho'-dadh of Mari or Merv, bishop of Hédhatta or al-Hadithah, was a competitor with Theodosius for the patriarchate in 852.1 According to 'Abhd-ish6', his principal work was a commentary on the New Testament, of which there are MSS. in Berlin, Sachau 311, and in the collection of the S.P.C.K. It extended, however, to the Old Testament as well, for in Cod. Vat. eccclvii. we find the portions relating to Genesis and Exodus.16

In the B.0., iii. 1, 218, 'Abhd-ishd' names a certain Kendi as the author of a lengthy disputation on the faith.17 Assemani places this "Candius" or "Ebn Canda" under the catholicus John IV., apparently on the authority of 'Amr ibn Matta. We sus- pect, however, that the person meant is 'Abd al-Masith (Ya'kib) ibn Ishak al-Kindi, the author of a well known apology for the Christian religion, which has been published by the Society for Promoting Christian Knowledge.!8 The work dates from the time of the caliph

1 Bar-Hebreeus (loc. cit.) says 205 A.H.=820-821 a.p. 3 see above, p. 845.

2 Chron. Eccles., ii. 183-187.

3 B.0., iii. 1, 165-166. 'Amr ibn Matta says that he wrote a commentary on Theologus, i.e., Gregory Nazianzen, B.O., iii. 1, 262, note 1.

4 Compare B.0., iii. 1, 279. 5 See Badger, The Nestorians, ii. 19.

_ § The pious Monophysites of St Mary Deipara cut up this volume for bind- ing, &c., as they did some other Nestorian books of value in their library.

_../ Cod. Vat. Ixxxviii. 5 (Catal., ii. 483); cl. 9(Catal., iii. 281); clxxxvii. 5 (Catal., ill. 405). Assemani supposes that the next article inclxxxvii. does not belong to Theodore of Mopsuestia, but is taken from Isho' bar Non's questions on Scripture.

8 B.O., iti. 1, 175. 9 Wright, Catal., p. 1176, col. 1.

10 B.O., ii. 435; iii. 1, 505 sq.

1 Ibdid., iii. 1,479; Hoffmann, Ausztige, pp. 244-245.

12 B.O., lil. 1,488 ; comp. the ordinance of Sabhr-ishd', pp. 505-506.

18 B.0., iii. 1, 204 col. 1, 488 col. 2, 490 col. 2.

14 Ibid., iii. 1, 210, 510 col. 2. 15 Ibid., iii. 1, 210-212.

16 Mai, Scriptt. Vett. Nova Coll., v. The name of the author is there given as Tesciuaad, doubtless a misprint for dad. We are therefore surprised to find Martin writing " Ichou-had évéque d'Hadeth," Introd. & la Critique Textuelle du Nouveau Test., p. 99. 17 The correct reading is dhé-hdimanitha.

18 The Apology of El-Kindi, 1885. An English translation appeared in 1882, The Apology of Al-Kindy, &e., by Sir W. Muir.

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al-Ma'miin (813-833), and therefore synchronizes with the disputa- tions of Theodore Abi Korrah, bishop of Harran.! Being written in

Arabic, it hardly belongs to this place, but is mentioned to avoid misapprehension.

Theodore bar Khoni is stated to have been promoted by his uncle Theo. John IV. to the bishopric of Lashdm in 893.29 He was the author dore bar of scholia (on the Scriptures), an ecclesiastical history, and some Khon; minor works. s

To about this period probably belongs another historian, the loss Ahrén, of whose work we have to regret. This is a writer named Ahron or Aaron, who is mentioned by Elias bar Shiniya under 273 a.u.= 886-887 A.D.72

In the 10th century the tale of Jacobite authors dwindles away Jacobite to almost nothing. Most of the dignitaries of the church composed authors their synodical epistles and other official writings in Arabic, and of 10th the same may be said of the men of science, such as Abii ‘Ali ‘Isa century, ibn Ishak ibn Zur‘ah (943-1008) and Abi Zakariya Yahya ibn ‘Adi, who died in 974 at the age of eighty-one. About the middle of the century we may venture to place the deacon Simeon, Simeon, whose Chronicle is cited by Elias bar Shinaya under 6 A.H.=627- the dea. 628 A.D. and 310=922-923.% The 11th century is somewhat more con, prolific.

A Persian Christian named Gisd,* leaving his native city of

Ushnikh or Ushnii in Adharbaigan, settled, after several removals, in the district of Gubds or Giibas,”4 one of the seven dioceses of the province of Meliténe (Malatiah), and built there a humble church, in which he deposited sundry relics of St Sergius and St Bacchus, and cells for himself and his three companions. This happened in 958.2° As the place grew in importance, other monks gradually resorted to it, and among them “ Mar(i) Yohannan dé- John of Maron,” or John (the son) of Mardn,?6 a man of learning in both Maron, sacred and profane literature, who had studied under Mar Mékim at Edessa. Gisa, the founder of the convent, died at the end of twelve years, and was succeeded as abbot by his disciple Elias, who beautified the church. Meantime its fame increased as a seat of learning undcr the direction of

John of Mirdn, and many scribes found employment there. The patriarch John VII., da-strighta, '*He of the Mat" (his only article of furniture)," was one of its visitors. Elias, on his retirement, nominated John of Marén as his successor, who, aided by the munificence of Emmanucl, a monk of Harran and a disciple of the maphridn Cyriacus,"8 rebuilt the church on a larger and finer scale, whilst a constant supply of fresh water was provided at the cost of a Taghritan merchant named Maratha. This was in 1001. About this time Elias bar Gaghai, a monk of Taghrith, founded a monastery near Meliténe, but died before it was finished. His work was taken up by one Eutychus or Kulaib, who persuaded John of Maron to join him. Here again his teaching attracted numbers of pupils. At last, after the lapse of twelve years, when there were 120 priests in the convent, he suddenly withdrew by night from the scene of his labours and retired to the monastery of Mar Aaron near Edessa, where he died at the end of four years, about 1017. His commentary on the book of Wisdom is cited by Bar-Hebreus in the Ausar Razé.™

Mark bar Kiki was archdeacon of the Taghritan church at Mosul, Mark bar and was raised to the dignity of maplirian by the name of lgnatius Kiki. in 991,°° After holding this office for twenty-five years, he became a Muhammadan in 1016,! but recanted before his death, which took place at an advanced age* in great poverty. Hecomposed a poem on his own fall, misery, and subsequent repentance, of which Bar-Hebreeus has preserved a few lines. *?

According to Assemani, B.0., ii. 317 and cl., Bar-Hebreus men- Joseph tions in his Chronicle that a monk named Joseph wrote three dis- of Mel courses on the cruel murder of Peter the deacon by the Turks at tine. Meliténe in 1058. The anecdote may be found in the edition of Bruns and Kirsch, p. 252 (transl., p. 258), but the discourses would seem rather to have dealt with the retribution that overtook the re- tiring Turks at the hands of the Armenians and the wintry weather. =

Yéshi' bar Shiishan (or Susanna), syncellus of Theodore or John i, IX., was chosen patriarch by the eastern bishops, under the name bar of John X., in opposition to Hayé or Athanasius VI., on whom the shal.

choice of their western brethren had fallen in 1058.4 He soon abdicated, however, retired to a convent, and devoted himself to study.

19 See Zotenberg, Catal., No. 204, 1 and 8, and No. 205.

20 B.O., ii. 440; ili. 1, 198. 21 See Baethgen, Fragmente, p. 3.

22 Ibid., p. 2; Bar-Hebreeus, Chron. Eccles., ii. 126, note 1.

23 Others write Gaiyasa.

24 Bar-Hebreus, Chron. Eccles., i. 401 sq.; B.O., ii. 288, 350. h

25 B.0., ii. 260. Gibds was on the right bank of the Euphrates, between the plain of Meliténe and Claudia. . 2

26 Abbeloos, in a note on Bar-Hebreeus, Chron. Eccles.,i. 404, raises the question what connexion there may be between this historical personage and the some- what shadowy ‘“ Joannes Maro,” to whom Assemani has devoted a large space B.O., i. 496-520. 27 B.O., ii. 132, 351. 28 Ibid., ii. 442.

29 B.O., ii. 283 ; see also p. cl.

30 Bar-Hebreus, Chron. Kccles., ii. 257 ; B.O., ii. 443.

31 See Baethgen, Fragmente, pp. 105, 153; B.O., iii. 289, note 1.

32 According to Cardahi, Liber Thesauri, p. 140, in 1030 or 1040.

33 Chron. Eccles., ii. 289 ; B.O., ii. 448, and also p. cl.

34 Bar-Hebreus, Chrou. Eccles., i. 437 sq.; B.O., ii. 141 (where there are errors, see Add., p. 475), 354.

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alg Arabic Abu ’l-Hasan ‘Isa ibn al-Bahlal, the fullest and most valu-

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On the death of Athanasius he was reelected patriarch in 1064, and sat till 1073.1 He carried on a controversy with the patriarch of Alexandria, Christodilus, regarding the mixing of salt and oil with the Eucharistic bread according to the Syrian practice.2 He com- piled an anaphora, issued a collection of twenty-four canons,? and wrote many epistles,* chiefly controversial. Such are the letters in Arabic to Christodilus on the oil and salt® and the letter to the catholicus of the Armenians.6 The tract on the oil and salt is ex- tant in Paris, Anc. fonds 54 (Zotenberg, Catai., p. 71), and there is an extract from it in Suppl. 32 (Zotenberg, Catal., p. 54). Bar- Shiishan also wrote four poems on the sack of Meliténe by the Turks in 1058,’ and collected and arranged the works of Ephraim and Isaac of Antioch, which he had begun to write out with his own hand when he was interrupted by death.®

r _Sa‘id bar Sabini lived during the latter part of the 11th century.

He was versed in Greek as well as Syriac, and well known as a literary man, ® especially as a writer of hymns.!° The patriarch Athanasius VII. Abu ‘l-Faraj bar Khamniaré (1091-1129) raised him to the office of bishop of Meliténe (Malatiah) in October 1094. His consecration took place at Kankérath, near Amid, by the name of John, and he set out for Malatiah, which he entered on the very day that the gates were closed to keep out the Turks, who laid siege to it under Kilij Arslan (Da’id ibn Sulaiman), sultan of Iconium. He was murdered during the course of the siege, in July 1095, by the Greek commandant Gabriel.)

The Nestorian writers of these two centuries are both more numer- ous and more important than the Jacobite.

We may place at the head of our list the name of Hénan-isho' bar | Sardshwai, who must have lived quite early in the 10th century, as he is cited by Elias of Anbar, who wrote about 922.2 He was bishop of Herta (al-Hirah), and published questions on the text of Scrip- _ ture and a vocabulary with glosses or explanations, !° which is con- stantly cited by his successor in this department of scholarship, Bar Bahlal.'# :

With Bar Sardéshwai we naturally connect Ishd' bar Bahlil, in

able of Syriac lexicographers. His date is fixed by that of the elec- || tion of the catholicus 'Abhd-isha'L., in which he bore a part, in 963.!° | 'Abhd-isho' in his Catalogue, B.O., iii. 1, 261, mentions an author i@ Abhziidh, a teacher in some school or college (eskalaya), who com- } posed a treatise containing demonstrations on various topics, alpha-) betically arranged and dedicated to his friend Kurta.1° In note 5 Assemani makes the very circumstantial statement, but without | Siving his authority, that Abhzidh was head of the college founded | at Baghdadh about 832 by Sabhr-isho' II. ,!" under Sergius (860-872). | But, if this writer be identical, as seems probable, with the Baziidh who was the author of a Book of Definitions described at some length by Hoffmann, De Hermeneuticis apud Syros Aristoteleis, pp. 151-153, we must place him nearly a century later, because he cites the "scholia" of Theodore bar Khouni, who was appointed bishop jof Lashom in 893.18 The whole matter is, however, very obscure, jand Hoffmann has subsequently (Opuse. Nestor., p. xxii.) sought to jidentify Baziidh, who was also called Michael (ibid., p. Xxi.), with the Michael who is mentioned as a commentator on the Scriptures by 'Abhd-isha', B.O., iii. 1, 147, and whom Assemani supposed to be the same as Michael bishop of al-Ahwaz (died in 852 or 854).19 All then that appears to be certain is that the Persian Baziidh also bore the Christian name of Michael, and that, besides the alphabetically arranged demonstrations and the Book of Definitions, he composed 2 tract on man as the microcosm. *?

Elias, bishop of Pérdz-Shabhor or al-Anbar, flourished about 922, as appears from his disputes with the catholicus Abraham (905-937),2! and his account of the miserable bishop Theodore of Béth Garmai, \who, after his deposition by John bar Héghiré (900-905) and subsequent absolution by Abralam, became a Muhammadan.22 He was

1 Bar-Hebreeus, Chron. Eccles., i. 445; B.O., it. 148 (where there are again many errors, see Add., p. 475), 355. 2 B.O., ii. 144, 356. 3 Bar-Hebreeus, Chron. Eccles, i. 446; B. Omainspo: 4 Bar-Hebreeus, Chron. Eccles., i. 4473 B.O., ii. 355. 5 B.0., ii. 508, col. 2. § Ibid., ii. 211, 383; Berlin, Sachau 60, 1.

Bar-Hebreeus, Chron. Syr., p. 252 (transl., p. 258); B.O., ii. 317.

Bar-Hebrasus, Chron. Eccles., i. 447 5 B.O., ii. 855.

Bar-Hebrzus, Chron. Eccles., i. 463: B.O., ii. 211-212.

}| 10 See one of these, an acrostic canon, used in the service of the assumption jf the monastic garb, in Cod. Vat. li. (Catal., ii. 321, No. 31), Brit. Mus. 17232

Wright, Catal., p. 372, No. 22), Paris, Suppl. 38 (Zotenberg, Catal., p. 74, No. 84), Bodl. Hunt. 444 (P. Smith, Catal., p. 248, No. 9).

U Bar-Iebreeus, Chron. Syr., pp. 278-279 (transl., pp. 284-285).

12 B.0., iii. 1, 260, col. 2, at foot.

13 Hashhatha are XpHoes and \é£ers 5 see Hoffmann, Opuse. Nestor., p. xiii.

14 B.O., iii. 1,261; see Payne Smith, Thes. Syr., passim.

15 Bar-Hebreeus, Chron. Eccles., iii. 251; B.O., ii. 442, iii. 1, 200 col.2 ; Gesenius, De BA et BB, p. 26; see Payne Smith, Thes. Syr., passim. An edition of his Lexicon, by M. R, Duval, is now (1887) being printcd in Paris at the expense pf the French Government.

16 B.0., iii. 1, 261. W7 Tbid., ii. 435. 18 See above, p. 848.

19 B.0., iii. 1, 210, note 2, col. 2. Michael's Book of Questions is quoted by Solomon of al-Basrah in The Bee, ed. Budge, p. 135.

20 Hoffmann, op. cit., p. xxi.

"1 B.0., iii. 1, 258, note 3; Baethgen, Fragmente, pp. 84, 141.

22 B.O., iii. 1, 234, col. 1, at foot.

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the author of a collection of metrical discourses in three volumes, "? an apology, epistles, and homilies.

_ George, metropolitan of Mosul and Arbél, was promoted to this George dignity by the catholicus Emmanuel about 945, and died after 987. of Mosul He contested the patriarchate three times but in vain, Viz..—in 961, and when Isra'él was elected,™ in 963, when 'Abdh-ishd' I. was the Arbél. successful candidate," and in 987, when the choice of the synod fell on Mari bar Tobi." His chief work was an exposition of the ecclesiastical offices for the whole year, in seven sections, of which Assemani has given a full analysis in B.O., iii. 1, 518-540. Some specimens of his twrgamé or hymns may be found in Codd. Vatt. xe.

a ia (Catal., ii. 487, No. 27, and 490, No. 24), and Berlin, Sachau

5

The date of Emmanuel bar Shahharé" is fixed by his presence at Emma- the consecration of "Abhd-ishd' I. in 963.89 He was teacher in the nuel bar school of Mar Gabriel in the convent called the Daira 'ElIaita at Shah- Mosul. Cardahi places his death in 980.3! Besides some minor haré. expository treatises, he wrote a huge work on the

Hexaémeron or six days of creation.*2 The Vatican MS.%8 contains twenty-eight discourses, of which the second is wanting, and a twenty-ninth is added On Baptism. It is dated 1707. The MS. in the Brit,

Mus., Orient. 1300, dated 1685, also contains twenty-eight dis- courses, of which the second is wanting. Some of them are in seven-syllable, others in twelve-syllable metre. Cardahi has pub- lished a specimen in his Liber Thesauri, pp. 68-71. Emmanuel's brother, 'Abhd-isho' bar Shahharé, is mentioned by Assemani, B.0., ii, 540, and by Cardahi. _The latter has printed part of one of his poems, on Michael of Amid, a companion of Mar Eugenius, in Liber Thesauri, pp. 186-137. It is taken from Cod. Vat. elxxxiv. (Catal, iii. 395). But there the author is called Bar Shi'arah, a3 /S03D, and is said to have been a inonk of the convent of Michael (at Mosul).

Somewhere about the end of this century we may venture to Andreas place a writer named Andrew, to whom 'Abhd-isho' has given a or place in his Catalogue, and whom Assemani has chosen to identify Andrew. with the well known Andrew, bishop of Samosata, the opponent of Cyril of Alexandria. The words of 'Abhd-isho', if we understand

them rightly, mean that this Andrew wrote turgamé (or hymns of a particular kind) and a work on puhhadm stydmé, the placing of the diacritical and vowel points and marks of interpunction.3" He was therefore an inoffensive grammarian.

Elias, the first Nestorian catholicus of the name, was a native of Elias Iss

Karkha dhé-Gheddan, was trained in Baghdadh and al-Madain, Nestor- and became bishop of Tirhan, whence he was advanced to the ian cath- primacy in 1028, and sat till 1049.°® According to 'Abhd-isho', he olicus. compiled canons and ecclesiastical decisions, and composed gram- matical tracts.® According to Mari ibn Sulaiman,! he was the author of a work on the principles of religion in twenty-two chapters, which may be identical with the second of the above, and of a form of consecration of the altar (kuddas al-madhbah). His Grammar**

was composed in his younger days, before he became bishop. It has been edited and translated from a MS. at Berlin® by Baethgen.“ A tract of his on the diacritical points and marks of interpunction is cited and used by John bar Zo’bi.*

Abi Sa‘id ‘Abhd-isho’ bar Bahriz was abbot of the convent of ‘Abhd-Elias or Sa‘id at Mosul, and a candidate for the patriarchate when isho’ bar Elias I. was elected in 1028. He was subsequently promoted to Bahriz. be metropolitan of Athdr or Mosul.“ He collected ecclesiastical canons and decisions, wrote on the law of inheritance,” aud an exposition of the offices of the church.**

Assemani has assigned the same date to Daniel (the son) of Daniel of Tabhanitha, bishop of Tahal in Béth Garmai, but without any Tahal. sufficient reason.48 If he be really identical with the Daniel to

23 B.0., iii. 1, 258-260; Cod. Vat. clxxxiii. (Catal., iii. 383); Berlin, Sachau 132; collection of the 8.P.C.K. ; Cardahi, Liber Thesauri, pp. 72-76.

24 In Cod. Vat. xci. (Catal., ii. 491, No. 35) there is a homily ascribed to Elias of Anbar, but the Syriac text has Paul. 25 B.O., ti. 442.

26 Ibid., ii. 442; iii. 1, 200, col. 2. 27 Tbid., ii. 448.

28 See also Codd. Vatt. cxlviii., exlix., and cliii., in Catal., iii. 277 sq. In Cod.

Vat. cl. (Catal., iii, 280) there are questions regarding various services, baptism, and communion at Easter.

29 See B.O., iti. 1, 540. In Arabic ash-Shahhar or, according to another read- ing, ash-Sha“ar (see end of this paragraph). 30 B.0., iii, 1, 200, col. 2.

31 Liber Thesauri, p. 71. 32 B.O., iti. 1,277. 33 No. elxxxii., Catal., iii. 380.

34 There are two MSS. in Berlin, Sachau 169-170 and 309-310 (see Sachau, Reise, pp. 364-365), and one in the collection of the S.P.C.K.

35 In the MS. Brit. Mus. it is said that this is only the fourth volume of the

Henaémeron, (SOQ Pane (Aopgico {LeSo2d {Asar2 :

36 B.0., iii. 1, 202.

37 See Hoffmann, Opusc. Nestor., pp. vii., viii.

rendered the words, librum de ratione punctandi.

38 In Arabic Karkh Juddan, in Béth Garmai; see Hoffmann, Ausziige, pp.

254, 275. 39 B.O., ili. 262-263; Bar-Hebreus, Chron. Eccles., ii. 285-287.

40 B.0., iii. 1, 265. 4 Tbid., p. 263, col. 1.

42 Alter Bestand 36, 15, in Kurzes Verzeichniss, &c., p. 31.

43 Syrische Grammatik des Mar Elias von Tirhan, 1880.

44 See B.0., iii, 1, 265, note 7; Catal. Vat., iii. 411 (under No. ii.); Wright,

Catal., p. 1176, col. 2. 45 B.O., iii, 1, 268-264,

46 B.O., iti. 1, 279. 47 Ibid., p. 267, col. 2, lin. penult.

48 That he follows ‘Abhd-ishd’ bar Bahriz in the Catalogue of tAbhd-ishdt is

And so Abraham Ecchellensis

no evidence whatever as to his date; and the work mentioned in Je Obaane ils 174, notes 3 and 4, is not by Bar Bahriz, but by George of

Mosul and Arbel (see Cod. Vat. cliii.).

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Elias bar Shinaya.

850 SPYRIAC LIPTRSary Se [107TH cent.

whom George, metropolitan of Mosul and Arbél, dedicated his ex- position of the offices of the church, he must have lived about the middle of the previous century. He wrote funeral sermons, metri- cal homilies, answers to Scriptural questions and enigmas, and other stuff of the same sort. More important probably were his "Book of Flowers," Kéthabha dhé-Habbabhé, which may have been a poetical florilegium ; his Solution of the Questions in the Fifth Volume of Isaac of Nineveh's Works ; and his commentary on the Heads of Knowledge or maxims (of Evagrius).1

Conspicuous among the writers of this century is Elias bar Shinaya, who was born in 975,? adopted the monastic life in the convent of Michael at Mosul under the abbot John the Lame,? and was ordained priest by Nathaniel, -bishop of Shenna (as-Sinn), who afterwards became catholicus under the name of John V. (1001-12).4 Elias was subsequently in the convent of Simeon on the Tigris opposite Shenna, and was made bishop of Béth Nuhadhré in 1002.5 At the end of 1008 he was advanced to the dignity of metropolitan of Nisibis. With the next patrjarch, John VI. bar Nazl (1012-20), previously bishop of Hérta, he was on good terms; but he set his face against Isho'-yabh bar Ezekiel (1020-25).8 Under Elias I. (1028-49) all seems to have been quiet again. That our author survived this patriarch is clear from his own words in B. O., iii. 1, 268, col. 2, Il. 19, 20.9 His greatest work is the Annals or Chroniele, of which unfortunately only one imperfect copy exists. Baethgen has published extracts from it under the title of Frag- mente syr. u. arab, Historiker, 1884, which have enabled scholars to recognize its real importance."! The exact date of the Annals, and probably of the writing of the unique copy, is fixed by the statement of the author, f. 15b, that John, bishop of Hérta, was ordained catholicus on Wednesday, 19th of the latter Teshrin, A. Gr. 1824 (19th November

1012 a.p.), and that he still ruled the Nestorian Church "down to this year in which this work was composed, namely, A. Gr. 1330" (1018-19).2 After the Annals we may mention Elias's Syriac grammar, one of the best of the Nestorian writings on the subject,' and his Arabic-Syriac vocabu- lary, Kitab at-Tarjuman fi ta'lim lughat as-Surydn or 'the Inter- preter, to teach the Syriac Language." It has been edited by De Lagarde in his Pretermissorum Libri Duo, 1879, and was the store-house from which Thomas a Novaria derived his Thesaurus Arabico-Syro-Latinus, 1686. Elias was also a composer of hymns, some of which occur in the Nestorian service-books,4 and of metrical homilies, apparently of an artificial character.15 He edited four volumes of decisions in ecclesiastical law, which are often citcd by 'Abhd-isho' of Nisibis in his Collectio Canonwm Synodicorum' , indeed the third section, "On the Division of Inheritances," is en- tirely borrowed from the work of Elias." Of his epistles that to the bishops and people of Baghdadh on the illegal ordination of Isho'-yabh bar Ezekiel is preserved in Cod. Vat. cxxix. (Catal., iii. 191).1% Six of his Arabic dissertations have been described by Assemani in the B.O., iii. 1, 270-272. The most important of them appears to be No. 5, a disputation, in seven sessions or chapters, with the vizir Abu 'l-Kasim al-Husain ibn 'Ali al-Maghribi, pre- ceded by a letter to the secretary Abu '1-'Ala Sa'id ibn Sahl. These meetings took place in 1026, and the work was committed to writing in 1027, after the death of the vizir at Maiyifarikin in October, and published with the approbation of the celebrated commentator, philosopher, and lawyer Abu '1-Faraj 'Abdallah ibn at-Taiyib,!9 who was secretary to the patriarch Elias I. The anonymous work de- scribed in full by Assemani (B.0., iii. 1, 303-306) under the title of Kitabu *l-Burhan 'ala sahthi (or rather fi tashthi) 'l-tman, 'The Demonstration of the Truth of the Faith," is also by him."

Here we may pause in our enumeration to cast an eye upon some

1 B.O., iii. 1, 174. 2 Rosen, Catal., p. 89, col. 2.

3 B.0., iii. 1, 266 note 3, 271 col. 1.

- **Baethgen, Fragmente, pp. 101, 151 ; 104, 153; compare Bar-Hebreeus, Chron. Eccles., ii. 261, 281; B.O., ii. 444.**

5 Baethgen, Fragmente, pp. 101, 152. 6 Ibid., pp. 108, 152.

7 Ibid., pp. 104, 153; Bar-Hebreeus, Chron. Eccles., ii. 283 ; B.O., ti. 446.

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® Consequently the statement in B.0., ii. 447, is inaccurate. Cardahi (Liber Thesauri, p. 84) names 1056.

10 Brit. Mus. Add. 7197 (Rosen, Catal., pp. 86-90; Wright, Catal., p. 1206).

jl Baethgen has overlooked Wright's Catal., p. 1206, and the plate in the Oriental Series of the Palwographical Society, No. lxxvi. The Syriac text was evidently written by an amanuensis, whereas the older Arabic text was prob- ably written by Elias himself.

12 There are some extracts from the Annals in Berlin, Sachau 108, 2.

13 There are MSS. in the Brit. Mus. Add. 25876, Or. 2314 (frag.); Vat. Cod. exciv. (Catal., iii. 410), Codd. eccex. eccel. (Mai, Scriptt. Vett. Nova Coll., v.); Palat. Medic. ceclxi. (Catal., p. 419); Berlin, Sachau 5, 2, also 216, 1, and 306, 1; and in the collection of the S.P.C.K. Part of the work (sections 1-4) has been edited by Dr. R. Gottheil, Leipsic, 1886.

__ 4 E.g., Cod. Vat. xc. (Catal., ii. 487), Nos. 13, 15,17, 18; Cod. Vat. xci. (Catal., il. 491), Nos. 12, 14, 16, 17; Berlin, Sachau 64, 10.

15 See Cod. Vat, clxxxiv. (Catal., iii. 390), a poem on the love of learning, in which the letter Alaph does not oceur. If is printed by Cardahi in the Liber Thesauri, pp. 83-84. 16 Mai, Scriptt. Vett. Nova Coll., x.

17 B.O., iii. 1, 267-269 ; Mai, op. cit., v. pp. 54, 220. 18 B.O., iii. 1, 272-273.

19 He died in 1043; see B.O., iii. 1, 544; Wiistenfeld, Gesch. d. arab. Aercte, No. 132; Ibn Abi Osaibi‘ah, ed. Miller, i. 239; Bar-Hebreeus, Hist. Dynast., p. 355 (transl., p. 233); Chron. Syr., p. 239 (iransl., p. 244); Chron. Eccles., ii. 283.

***0 See the German translation by L. Horst, Des Metropoliten Elias von Nisibis Buch vom Beweis der Wahrheit d. Glaubens, Colmar, 1886.**

anonymous translations, which we are inclined to ascribe to t

and a centuries, ng which are interesting as showing be ee ay. opular literature of the Syrians was, compared with i

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We have already spoken of the older translation of Kalilagh w8. ray, Damnagh, made by the periodeutes Bodh in the 6th century of our e : era (see above, p. 837). About the middle of thie 8th century there a appeared an independent Arabic translation from the Pahlavi b sai ‘Abdallah ibn al-Mukaffa’, which, under the name of Kalilah wa-Dimnah, has been the parent of secondary versions in the Syriac Persian, Greek, Hebrew, and Spanish languages.21 The Syriac version was discovered by the present writer in a unique MS. in the library of Trinity College, Dublin, and published by him in 1884. It is evidently the work of a Christian priest, living ata time when the condition of the Syrian Church was one of great degradation, and the power of the caliphate on the wane, so that the state of society was that of complete disorder and licentious. ness,” a description which would very well apply to the 10th or 11th century. Indeed we could not place it much later, because part of the unique MS. goes back to the 13th century, and even its text is very corrupt, showing that it had passed through the hands of several generations of scribes. “The chief value of this later Syriac version is that it sheds light on the original text of the Arabic K. w. D. The Arabic text which the Syriac translator had before him must have been a better one than De Sacy’s, because numbers of Guidi’s

extracts,% which are not found at all in De Sacy's text, appear in their proper places in the later Syriac,"

To about the same period, judging by the similarity of style and Sindban, language, we would assign the Syriac version of the book of Sindi- badh. This work was translated, probably in the latter half of the 8th century, from Pahlavi into Arabic by Misa, a Muham- madan Persian. It is, as Néldeke has shown,2* the smaller of the two recensions known to the Arabs, the larger, entitled Aslam (2) and Sindibadh, being the work of al-Asbagh ibn 'Abd al-'Aziz as- Sijistani. The smaller Sindibadh was in its turn done into Syriac, and thence into Greek by Michael Andreopiilus for Gabriel, prince of Meliténe (1086-1100), as discovered by Comparetti,?' under the name of Zuvrizas (Sindipas), just as Kalilah wa-Dimnah was trans- lated by Symeon (the son of) Seth for the emperor Alexius Com- nenus, who ascended the throne in 1081. The Syriac version, which bears the title of the Story of Sindban and the Philosophers who were with him, has been edited by Baethgen, with a German translation and notes, from the unique MS. in the Royal Library at Berlin.*8

A third product of the same age we believe to be the Syriac trans- Life of lation of Pseudo-Callisthenes's Life of Alexander the Great, made Alexan- from an Arabic version of a Greek original. Of this, however, we der the shall le better able to judge when the Syriac text lies before us in Great. print.

Lastly we would place somewhere between the 9th and 11th cen- Asop''s turies the Syriac translation of Esop's (Aisop's) Fables, which has Fables. been edited under a somewhat Jewish garb by Landsberger,®" who imagined himself to have found the Syriac original of the fables of Syntipas (Sindipas), whereas Geiger 3! clearly showed that we have here to do with a Syriac rendering of one of the forms of the fables of Esop. In fact, as Geiger pointed out, DIDID" is only a clerical error for DISIDNI. In Syriac MSS. of this collection the title is written MADAMA, 'of Josephus." In some close relation to these stands the story of Josephus and king Nebuchadnezzar in the Berlin MS. Alt. Bestand 57, ff. 16-57, with which are inter- woven a number of

Esopic fables. They have been edited (with ae exception of two) by Rédiger in his Chrestom. Syr., 2d ed., pp.

97-100.

Resuming our enumeration of Syrian writers, we find that in the 12th century the number of them, whether Jacobite or Nestorian, is small, but two of the former sect are men of real mark. oat

Abu Ghalib bar Sibini, the younger brother of Sa‘id bar Sabiini Abi (see above, p. 849), was almost as unfortunate as his brother. He Ghalib was raised to the episcopate of Edessa after his brother’s death by bar__ Athanasius VII., but speedily deposed on account of a quarrel, Sabuni although many of the Edessenes, among them the governor Bald-

tions,

21 See Keith-Falconer, Kalilah and Dimuah or the Fables of Bidpat, 1835, Introduction. : }

22 Wright, The Book of Kalilah and Dimnah, translated from Arabic into Syriac.

23 See Wright’s Preface, p. xi. sq.

24 See Guidi, Studit sul Testo Arabo del Libro di Kalila e Dimna, 1873.

25 Keith-Falconer, op. cit., p. 1x. 26 Z.D.M.G., xxxiii. (1879), pp. 521-522.

°7 Ricerche intorno al Libro di Sindibdd, 1869, p. 28 sq. ; The Folk-lore Society, Vol, ixe ly peor sa: ‘shed

28 Alt. Bestand 57, ff. 60-87. A small specimen had already been publishe by Rodiger, Chrestom. Syr., 2d ed., pp. 100-101. ich

29 An edition of it is in preparation by Mr E. A. W. Budge, of the a Museum, from five MSS. Sce Rédiger, Chrestom. Syr., 2d cd., pp. 112-

120, an Perkins in the Journal of the American Oriental Society, iv. p. 359 sq.

30 DIDIDT NOM, Die Fabeln des Sophos, Syrisches Original der Griechischen Fabeln des Syntipas, 1859. Compare his earlier dissertation, Fabule aliquo Arameex, 1846. 31 Z.D.M.G., xiv. (1860), p. 586 sq. | BS

32 B.0., iii. 1, 7, with note 2. So, for example, MS. Trin. Coll. Dublin, B. % 32 (Wright, Kalilah and Dimnah, pp. ix., x.).

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win, brother of Godfrey of Bouillon, took his part. He died of a fall from his horse, shortly after the death of the patriarch in 1129.1 Though a good scholar and linguist, he does not appear to have written anything that has come down to our times. Assemani, it is true, ascribes to him three poems in twelve-syllable metre on the capture of Edessa by Zengi ibn Ak-sunkur ; but, as this took place in 1144,? the writer must have been his successor, Basil bar Shumna

(1143-69).

John,* bishop of Harran and Mardé or Mardin, had charge of the Jacobite churches in the East, his diocese including Tell-Besmé, Képhar-titha, Dara, Nisibis, Ras‘ain, and the Khabhora or Khabir. He was originally a monk of Edessa, was appointed bishop by Athanasius VII. in 1125, and was killed by a fall from his horse in 1165, at the age of seventy-eight.> He devotgd himself chiefly to the restoration of the decayed churches and’ monasteries of his diocese, as may be seen from the autobiographical fragment in B.O., ii. 217 sq. From the same document, pp. 224-225, it appears that he was fond of MSS., which he collected, repaired, and bound, and that he wrote with his own hand four small copies of the Gospels in gold and silver. He enjoyed a well earned reputation as a land- surveyor and practical engineer. Bar-Hebreeus notes his great liberality in redeeming the captive Edessenes who had been carried off by Zengi’s troops.’ The fall of Edessa (1144), however, was an event that got him into a great deal of trouble. He was

ill-advised enough to write a treatise on the Providence of God, in which he maintained that chastisements of that kind were not sent upon men by God, and that, if the troops of the Franks (Crusaders) had been there, Edessa would not have been taken by Zengi. Such rank heresy of course brought down upon him the whole bench of bishops. He was attacked by the priest Salibha of Karigarah (?),° by John bishop of Kaisiim,® John bar Andreas bishop of Mabbogh," and Dionysius bar Salibi.! He was also the compiler of ananaphora." – The star of this century among the Jacobites is undeniably Jacob

bar Salibi of Meliténe (Malatiah). He was created bishop of Mar'ash, under the name of Dionysius, by Athanasius VIII. _(Yéshi' bar Ketrah, 1138-66), in 1145, and the diocese of Mabbogh

was also placed under his charge.!¥ Michael I. (1166-99) transferred him to Amid, where he died in 1171.14 The list of his works, as quoted by Assemani from a Syriac MS., is very considerable, and he has dealt with them at great length.® We may mention the following. (1) Commentary on the Old Testament, of which only one complete MS. exists in Europe." The order of the books is— the Pentateuch, Job, Joshua, Judges, Samuel and Kings, Psalms, Proverbs, Ecclesiastes, the Song of Songs, Isaiah, Jeremiah and Lamentations, Ezekiel, Daniel, the twelve minor Prophets, and Ecclesiasticus. Each book has a material or literal and a spiritual or mystical commentary. Several of the books have two com- melutaries, one on the Péshitta, the other on the Hexaplar text ; Jeremiah has actually three, one on the Hexaplar, and two, 2 shorter and a longer, on the Péshitta. (2) Commentary on the New Testament, from which Assemani has given many extracts. The order of the books is—the four Gospels, the Revelation of St John, the Acts of the Apostles, the seven apostolic epistles, and the fourteen epistles of St Paul.1® (3) A compendium of theology, of which we do not seem to have any MS. in Europe ; see B.0O., ii. 163, col. 1, ll. 13-15, and p. 170. (4) A copious treatise against heresies, dealing with the Muhammadans, the Jews, the Nestorians, the Dyophysites or supporters of the council of Chalcedon, and the Armenians." (5) A treatise on the Providence of God, against

1 Sce B.O., ii. 212, 358-359 ; Bar-Ifebraeus, Chron. Eccles., i. 467-479.

2 B.O., ii. eli. (comp. p. 317).

3 See Bar-Hebreeus, Chron. Syr., p. 328 (transl., p. 335); Chron. Eccles., i.

497, 547.

4 His baptismal name was probably Jacob; see B.O., ii. 230, col. 1, at the foot.

5 B.O., ii. 216, 226; Bar-Hebreeus, Chron. Eccles., i. 531.

6 B.O., ii. 226; Bar-Hebreeus, Chron. Eccles., i. 525-527.

7 Chron. Eccles., i. 501. 8 Died in 1164, B.0., ii. 362.

9 B.O., ti. 364; Bar-Hebreeus, Chron. Eecles., i. 501, 554, 559. Died in 1171.

10 Afterwards of Tur-"Abhdin ; Bar-Hebreus, Chron. Eccles.,i.515. He com- posed both in Armenian and Syriac, B.0., ii. 360 coll. 1, 2, 362 col.1; Bar- Hebrzus, Chron. Eccles., i487. Died in 1156 ; B.0., ii. 362; Bar-Hebraeus, Chron. Eceles., i. 517; see Brit. Mus. Orient. 1017 (Wright, Catal., pp. 897-898). _

11 B.O., ii. 207 ; Bar-Hebrzeus, Chron. Eccles., i. 503. 12 B.0., ii. 230.

13 B.0., ii. 362; Bar-Hebraeus, Chron. Eccles., i. 513-515.

14 B.O., ii. 363, 365 ; Bar-Hebreeus, Chron. Hccles., i. 559.

15 B.0., ii. 210; comp. Catal. Bibl. Laur. e Palat. Medic., p. 79.

16 B.0., ii. 157-208. :

17 At Paris, Suppl. 92, in Zotenberg's Catal., No. 66. There are fragments in Ane. fonds 8 (Zotenberg, Catal., No. 9); see also Cod. Vat.

xcvi. 29, 42, 43 (Psalms), 80 (on the Prophets). 18 B.O., ii. 157-170.

19 The Gospels are in Brit. Mus. Add. 7184; Cod.Vat. clv. 19-24, clvi., eclxxv.- ix.; Paris, Anc. fonds 33, 34 (Zotenberg, Catal., Nos. 67-68); Bodl. Or. 703, 2. St Matthew, Bodl. Hunt. 247. Revelation, &c., Brit. Mus. Add. 7185; Bodl. Or. 560. Dudley Loftus was the first to make use of these commentaries in his two works, The Exposition of Dionysius Syrus, written above 900 years since, on the Evangelist St Mark, translated by D.L. (Dublin, 1672), and A Clear and Learned Explication of the History of our Blessed Saviour J.C.,... by Dionysius Syrus, ... translated by D. L. (Dublin, 1695); see Payne Smith, Catal., p. 411, notes dandf. Loftus's manuscript translations are in the Bodleian Library, Fell 6 and 7.

20 B.O., ii. 170, 211. The section against the Muhammadans is contained in Cod. Vat. xevi. 19, and that against the Nestorians in Paris, Anc. fonds 125 (Zotenberg, Catal., No. 209, 2). There is an extract from the latter in Bodl.

John, bishop of Mardiu,! apparently no longer extant. (6) Exposi- tions of the Eucharistic service," of the Nicene creed," of the con- secration of the chrism,"4 of the services of consecration," and of the Jacobite confession of faith. (7) Canons on confession and absolution.*" (8) Two anaphore or liturgies.*8 (9) Various prayers, procmia, and sedras.® (10) Homilies, ¢.g.,encomium on the patriarch Michael the Elder, on the Passion of our Lord,®! and on withhold- ing the sacrament from those who abstain from communicating for a period of more than forty days.92 (11) A commentary on the six Centurtes of Evagrius.*? (12) Two poems on the fall of Edessa (1144),34 three on the fall of Mar'ash (1156),®> and two on another incident (1159).36 Among the works mentioned in the list in B.O., ii. 210- 211, we cannot find any traces of the Commentarius in Scripta Doctorwm, the Compendium Historiarum Patrum et Sanctorum et Martyrum, and the Compendium Canonum Apostolicorum, nor of the commentaries on the books of

Dialectics, ibid., col. 1. Of the epistles two are extant in Arabic, Berlin, Sachau 61,1, 2. From a treatise On the Structure of Man there are two short extracts in Bodl. Marsh. 361, f. 39. Dionysius appears also to have revised the Jacobite order of baptism,*" and to have drawn up a volume of services for the days of the week.*8

Michael the Elder,®? the son of Elias, a priest of Meliténe, of the Michael

family of Kindasi,* was abbot of the convent of Bar-sauma, near I. Meliténe, which we find him supplying with water, with the help of John, bishop of Mardin, in 1163.42 He was elected patriarch in 1166, and held office till 1199.48 He revised the Jacobite pontifical and ritual, arranging its contents under forty-six heads, as exhibited in Cod. Vat. li.,4* drew up an anaphora,® wrote a tract setting forth the Jacobite confession of faith,* a treatise against a Coptic schis- matic, Mark the son of Konbar, on the question of confession, and a poem on a case of persecution in 1159. He also revised in 1185 the life of Abhhai, bishop of Nicwa, having found most copies of it in a very disordered state.® His most important work was a Chronicle, from the creation to 1196 A.p., which was trans- lated, with other works of his, into Armenian, and apparently exists in that language alonc.5° Some extracts from it were published by Dulaurier in the Journal Asiatique for 1848, p. 281 sq., and 1849, p. 315 sg., and the whole has been edited in a French trans- lation by V. Langlois, Chronique de Michel le Grand, 1868. Accord- ing to him the translator of the first part of the work was the: vartabed David, and it was finished by the priest Isaac, who com- pleted his task in 1248, continuing it down to his own day. A third person engaged in translating the works of Michael into Armenian was the vartabed Vartan.! Appended to the Chronicle is an extract from a treatise of his "On the Sacerdotal Order and its Origin," or 'On the Origin of Sacerdotal Institutions," with a con- tinuation by Isaac and Vartan, which is followed in the MSS. by the Jacobite "confession of faith." *% Michael appears also. to

Or. 467 (P. Smith, Catal., p. 561). From itis extracted the list of the Jacobite' patriarchs in B.0., ii. 323, note 1. 21 B.0., ii. 207; see above.

22 B.O., ii. 176-208 ; Cod. Vat. cii., eeclxi. ; Brit. Mus. Or. 2307 (partly Arabic) ; Paris, Anc. fonds 35, 69, 125. 23 Cod. Vat. clix. 4; Bodl. Marsh. 101.

24 Cod. Vat. clix.30(in Arabic). 25 B.0.,ii.171; comp. Cod. Vat. clv.10,clix.31.

26 Bodl. Marsh. 101, f.31. 27 B.O., ii. 171. 28 Ibid., ii. 175. 29 Ibid., ii. 175.

30 Ibid., ii. 170. Read, with slightalterations, on theinstallation of a bishop or patriarch. Cod. Vat. li. 26, ccciv. ; Paris, Suppl. 23.

31 Cod. Palat. Medic. xl. (Catal., p. 78).

32 Cod. Palat. Medic. lxii. (Catal., p. 107). 83 Berlin, Alt. Bestand 387, 1.

34 B.0., ii. 317; Bar-Ilebreus, Chron. Syr., 328 (transl., p. 335).

35 B.0., ii. 317; Bar-Hebreeus, Chron. Syr., 346-347.

36 B.O., ii. 451-452 ; Bar-Hebreeus, Chron. Eceles., ii. 351.

37 Brit. Mus. Arund. Or. 11 (Rosen, Caial., p. 62, col. 2).

38 Cod. Vat. eccexxv., in Mai, Scriptt. Vett. Nova Coll., v.

39 So called to distinguish him from his nephew Micliael the Younger, Yéshi‘ Sephéthana or “Big-lips,’ who became patriarch at Meliténe (1199-1215), in opposition to Athanasius IX., Salibha Kéraha (the Bald), at Mardin (1199-1207), and John XIV., Yéshii‘ the scribe (1208-20).

40 Bar-Hebrzeus, Chron. Eccles., 1. 537. om

41 Assemani expressly says “at Shenna” (read 1 14 3), B.0., ii. 154, but the list

of patriarchs at p. 323 does not give the word lass, though he repeats it in the translation (No. 100). In the Dissert. de Monophysitis, p. xcviii., he makes Michael belong to the convent near Meliténe, and merely mentions another convent of Bar-sauma at "Sena " (see also the Index, p. 532). Langlois, in the preface tothe Chronique de Michel le Grand, p. 3, thinks ofa convent near Mardin, such as that restored by John, bishop of Mardin (B.0., ii. 222, 1. 19). We believe, however, that the convent near Melitene is meant, as John of Mardin had acquired a certain reputation in what Abbeloos calls the "ars gromatica" (Bar-Hebrzus, Chron. Eccles., i. 526, note 1), wherefore it is said that Michael sent for him (shaddar bathréh), and that John "returned to his diocese because the winter was at hand, meaning to come back in April" (p. 527).

42 Bar-Hebreus, Chron. Eccles., i. 525.

43 B.O., ii. 368-369 ; Bar-Hebreeus, Chron. Eccles., i. 535-605.

44 Assemani's Catal., ii. 314 sq.; B.O., ii. 155.

45 Cod. Vat. xxv. 8; Paris, Anc. fonds 68 (Zotenberg, Catal., p. 49); Leyden, Cod. 1572 (Catal., v.73). 46 Bar-Hebrzeus, Chron. Eccles.,i.549; Langlois, p. 331.

47 Bar-Hebreeus, Chron. Eccles., i. 573-575; B.O., ii. 155, No. iii.

48 Bar-Hebreus, Chron. Eccles., ii. 351.

49 See Brit. Mus. Add. 12174, No. 8 (Wright, Catal., p. 1124); Cod. Vat. xxxvii. 12 (Catal., ii. 247); B.O., ii. 505, col. 2. But the account of the death of the empcror Constantius, and the lives of Jacob of Sérigh and of Mar Aha, appear to be wrongly ascribed to him in Catal. Vat., ii. 248-249.

50 The present writer has been recently informed that a copy of the original Syriac exists in the library of the convent of az-Za'farin near Mardin.

51 Langlois, Préface, p. 10, and note 2. 52 Langlois, p. 363 sq.

53 Langlois, Préface, p. 8, at the top; Bar-Hebreus, Chron. Eccles., i. 606, note

6.

7

[12TH cunt.

852 S¥Y¥RIACSAITERA TTR

have written an ecclesiastical history, which is entirely lost to us. At least Bar-Hebreeus! speaks of his recording certain matters in his " Ekklésiastiké,"' which do not appear in the Chronicle.

Theo- A thorn in the side of Michael was his disciple Theodore bar

dore bar Wahbén. He first appears on the stage in 1170,? when the emperor

Wahbon. Manuel sent Theorianus to the Armenian catholicus and the Jacobite patriarch with letters. Michael declined an interview, but sent John of Kaistim to see Theoriants at Kal'at ar-Riim, and on his coming a second time to the same place selected Theodore bar

He is the same as Joseph bar Malkén, bishop of Mardin whose metrical tract on the points, entitled Méesidhta dhé- Nukzé, or "the Net of the Points," is found in MSS., along with the grammatical writings of Elias bar Shinaya and John bar Zo'bi,16 This tract ms peu have been composed before 1190. imeon Shankélabhadhi or Shankélawi, of Shankélabhadh or – Sj kélawah," near Irbil, must have been a contemporary of Bar Malka oa and perhaps somewhat senior to him. He was the teacher of John iwi

Elias ITE.

Isho’- Ishd’-yabh bar Malkon was ordained bishop of Nisibis in 1190 | nessed a faint revival of Syriac literature before its extinction.

yabh by the catholicus Yabh-alaha II. (1190-1222), was present at the David bar Paul is cited by Bar-Hebreus in the Ausar Razé,® and David bar consecration of his successor Sabhr-ishd’ IV. (1222-25), and died may therefore be supposed to have lived early in the 13th century. bar Paul. Malkon. under Sabhr-ishd‘ V. (1226-56), his follower at Nisibis being Makki- | He was evidently a man of considerable culture, and a versifier,

Wahbon as his representative.? Ten years afterwards, in 1180, when Michael was at Antioch, Ibn Wahbon was made anti-patriarch at Amid by certain malcontent bishops, under the name of John.4 Michael, however, at once took energetic measures,® got hold of the anti-patriarch, formally deposed him, and shut him up in the convent of Bar-sauma, whence he was afterwards allowed to make his escape by some of the monks. He fled to Damascus, where he tried in vain to bring his case before Salah ad-din, and thence to Jerusalem, after the fall of which city in 1187 he joined Gregorius Degha, the Armenian catholicus, at Kal‘at ar-Rim and went with him to Cilicia, where the king, Leo, made him patriarch of the Jacobites in his territories. He died in 1193. According to Bar- Hebreus, Theodore bar Wahbdn was a good scholar, and could speak and write three foreign languages, Greek, Armenian, and Avabic.@ He compiled an anaphora,’ wrote an exposition of the Eucharistic service, and a statement of his case against Michael in Arabic.®

Of Nestorian writers there are scarcely any worth naming in this century, for the historian and controversialist Maré bar Shélémon, otherwise Mari ibn Sulaiman, wrote in Arabic!©; and Elias III.,! Abi Halim ibn al-Hadithi, of Maiperkat, metropolitan of Nisibis and catholicus from 1175 to 1190, chiefly used the same language in his homilies and letters. He is best remembered for having compiled and arranged the prayers in one of the service books, which is still called by his name, “the Abi Halim.” 28

kha, who was afterwards catholicus (1257-65).14 He wrote on questions of grammar, besides homilies, letters, and hymns, in which, however, he chiefly, if not exclusively,employed the Arabic language.!>

1 Chron. Eccles., i. 589.

2 Ibid., i. 549, 551, where 1172 is an error, as remarked by Abbeloos in note 1. John of Kaisim, who was present on the oceasion, died in 1171 (p. 559).

3 The disputations held on these occasions were of course utterly fruitless. See Leunclavius, Legatio Imp. Cxesaris Manuelis Comneni Aug. ad Armenios, sive Theoriant cum Catholico disputatio, &c., 1578, and in Galanus, Concilia- tionts Ecclesie Armenz cum Romana… parsi., 1690, p. 242 sq.3 Disp. Theoriani secunda, in Mai, Scriptt. Vett. Nova Coll., vi. pp. xxiii, and 314 sq., and in Migne, Patrol. Gr., cxxxiii.114 sq.; also Bar-Hebrxus, Chron. Eccles., i. 549-557 ; Langlois, Chronique, pp. 329-381; comp. Abbeloos's notes on Bar-Hebreus, pp. 550-552, and B.0., ii. 864-365. 4 Bar-Hebreus, Chron. Eccles., i. 575 sq.; B.O., ii. 218.

5 Bar-Hebreeus, Chron. Eccles., i. 579 ; B.O., ii. 214. 6 Chron. Eccles, , i. 581.

? See Renaudot, ii. 409; B.O., ii. 216; Payne Smith, Catal., p. 241, note c.

8 B.O., ii, 216. 9 Bar-Hebreus, Chron. Eccles,, i. 581, at the foot.

10 He flourished in the first half of this century (B.0., iii. 1, 554-555, 582). His work is extant in the Vatican Library in 2 vols., eviii. and cix. (Mai, Scriptt. Vett. Nova Coll., iv. 219-223), with the title Kitab al-Majdal or "the Tower," wrongly ascribed to 'Amr ibn Matta of Tirhan. The first voluine, transcribed in 1401, is theological aud dogmatical ; it comprises the first four sections. The second volume is theological and historical. The series of patriarchs ended with cal 'Abhd-ish6* bar Mukl of Mosul (1188-47), but is continued down to Yabh-alaha bar Kayoma of Mosul (1190), '"'qui nunc sedem tenet," i.e, in 1214, when

this volume was written. His epitomizer ‘Amr ibn Matta of Tirhan lived in the first half of the 14th century (B.0., iii. 1, 580, 586). To him is ascribed Cod. Vat. cx., which ‘“‘autographus esse videtur” (Mai, Scriptt. Vett. Nova Coll., iv. 224-227). It consists of five parts, of which the first is wanting in this MS., which has therefore no title. The series of catholics in pt. v., fundam. 2, is continued down to Yabh-alaha (1281-1317). In pt. v., fundam. 3, sect. 6, we find the confession of faith of Michael, bishop of Amid and Maiyafarikin (B.0., iii. 1, 557), translated into Arabic by the priest Saliba ibn Yohanna, whom G. E. Khayyath, archbishop of ‘Am€dia, asserts to be the real author of the whole work (see his Syri Orientales sew Chaldei Nestoriani et Romanorum Pontificum Primatus, 1870, and comp. Hoffmann, Ausziige, p. 6). Cod. Vat. delxxxvii. (Mai, op. cit., v. 594) contains part of the same work as Cod. Vat. ex. (though the Catalogue calls it the Majdal, and ascribes it to Mari), viz., pt. v., fundam. 1 and 2 (“‘usque ad Ebediesum Barsaume successorem, qui @biit die 25 novem- bris an. Christi 1147. Continuat eandem historiam Amrus Matthei filius, a Jesuiabo baladensi, Ebediesu successore, usque ad Iaballahum III. Timothci secundi successorem, qui obiit die 31 ianuarii an. Christi 1222” !). Cod. Vat. dclxxxviii. is also said to contain “Historia Patriarcharum Chaldseorum sive Nestorianorum,” from Addai and Mari down to Yabh-alaha bar Kayoma, by ‘Amribn Matta. “ Hee autem historia longe fusior est atque emendatior illa, quam Mares f. Salomonis conscripsit, de qua in precedente codice”! And to add to the perplexity, Sachau describes his Cod. 12 (Arab.) as “Theil einer

of of grossen Kirchengeschichte der Nestorianer. gyal peal Biicher der Geheim-

nisse. Alte Papierhandschrift (14 Jh.). Es ist das Jose!! WT von ‘Amr

b. Matta aus Tirhan.” Possibly the MS. in the collection of the S.P.C.K. may give some light.

ll B.O., ii. 450, iii. 1, 287 ; Bar-Hebreus, Chron. Eccles., ti. 367-369.

12 B.O., iii. 1, 290.

13 Badger, The Nestorians, ii. 23: “The Aboo Haleem contains a collection of collects appointed to be read at the conclusion of the Nocturns of all the Sundays throughout the ycar, of the festivals, and the three days of the Baootha a’ Ninwéyé, before the commencement of the Matins.” See B. O., iii. 1, 291-295,

14 B.O., iii. 1, 295, note 1. 15 Ibid., iii. 1, 295-306.

bar Zo‘bi, for whom he wrote a Chronikon or chronological treatise in the form of questions and answers, explanatory of the various eras, the calendar, &. There is a MS. in the British Museum Add. 25875,18 and several at Berlin.” He was also the author of a moral poem in eniginatical language, of which ‘Abhd-isho’ thought it worth his while to write an explanation for his disciple Abraham.”° To him is likewise ascribed “the questions of Simon Képha concerning the Eucharist and Baptism,” which he appears to have introduced to the notice of his pupil John bar Z6’bi.2

John bar Zo’bi flourished about the end of the 12th and the be- John

nning of the 1 He was a monk of Béth Kika (or bar Kuké) in Hédhaiyabh, and numbered among his pupils Jacob bar Zo’bi.

ginning of the 13th century.

Shakko, or Severus, bishop of Mar Matthew (see below). He wrote metrical homilies, partly in seven-syllable, partly in twelve-syllable verse, on the chief points of the Nestorian faith. One of these is mentioned by Assemani, B.O., iii. 1, 309, note 1% ; another, on the four problems of philosophy, is in Berlin, Sachau 72,15. Bar Zo’bi is, however, better known as a grammarian.™ The larger of his two grammars is based_on the works of previous writers, such as Severus Sebokht and Denha, commentators on Aristotle, and the grammarians Elias I., the catholicus, and Elias bar Shinaya, bishop of Nisibis.” The smaller grammar is an epitome in verse, accom- panied by a metrical tract on the four chief marks of interpunction.*? He secmsalsoto have continued the treatise of Honain De Synonymis,8 so that he may

perhaps be Hoffmann's "analecta anonymus, " *9 As the lamp flares up before it expires, so the 13th century wit-

We have from his pen a poem on the letters of the Syriac alphabet,*! a note on the mutable letters,®? and a brief enumeration of the categories of Aristotle,*5 a moral poem in twelve-syllable verse, another on repentance in an Arabic translation,® and specimens of a third in Cardahi's Liber Thesauri, p. 138. Theological are a dialogue between a Malkite and a Jacobite on the hymn Trisagion * and a tract in Arabic on matters in dispute between the Jacobites and Malkites. 3"

Jacob bar Shakk6 (Shakkaké ?),38 or 'Isa, bar Mark, of Bartellai or Jacob Bartulla, near Mosul, was a monk of the famous convent of Maror Sev- Matthew, of which he afterwards became bishop by the name of erus bar Severus.°? He was trained in grammar by John bar Zo'bi (see above) Shakko.

in the convent of Béth Kaka (or Kiké) in Hédhaiyabh,* and in dialectics and philosophy by Kamal ad-Din Masa ibn Yinns at Mosul." He composed one of his works, the Book of Treasures,

16 H.g., Cod. Vat. exciv. (copied from a MS, written in 1246), and Brit. Mus Add. 25876, f. 276b (mote the colophon, f. 290b, Wright, Catal., p. 1178); see B.0., iii. 1, 308, col. 1, No. viii., and the Abbé Martin, De la Meétrique chez les

Syriens, 1879, p. 70 (at p. 68, 1. 14, read farDogar ; " the bishop of Nisibis"),

17 See Hoffinann, Ausziige, p. 231, and note 1847.

18 Wright, Catal., p. 1067. 19 Sachau 108, 1, 121, and 153, 1,3. f

20 Cod. Vat. clxxxvii. (Catal., iii, 404); MS. Ind. Off. No. 9, "Tracts in Syriac, f. 204. It has been published by Cardahi, Liber Theswuri, p. 89. Cardahi calls the author as-Sankalabari, blindly copying Assemani's Sancalabarensis, and places his death in 780 (see B.0., iii. 1, 295, note 5,

p. 226, note 7; and Catal. Vat., iii. 405). 21 B.O., iii. 1, 562. 22 Bar-Hebreus, Chron. Eccles., ii. 409.

23 Brit. Mus. Or. 2305 ; and apparently Berlin, Sachau 8.

24 It has been translated by Badger, The Nestorians, ii. 151-153.

25 B.O., iii. 1, 3807. :

26 Part of this work, namely, the portion that deals with the marks of inter- punction, has been edited and translated by Martin, Traité sur l Accentuation chez les Syriens Orientaua, 1877. on

27 MSS. of these grammars,—Cod. Vat. exciv., ecccl.; Brit. Mus. Add. 25876 ; Or. 2314; Berlin, Alt. Best. 36,16, and Sachau 216, 2, and 306, 2. a

28. Berlin, Sachau 72, 14. 29 Opusc. Nestor., p. iv. 30 B.0., ii. 248.

31 Cod. Vat. cexvii. (Catal., iii. 505); Paris, Anc. fonds 118 (Zotenberg, Catal., p- 166), 157 (ibid., p. 147).

32 Paris, Anc. fonds 164 (Zotenberg, Catal., p. 213). a

33 Berlin, Alt. Best. 36, 13. 34 Cod. Vat. xevi. (Catal., ii. 522).

35 Cod. Vat. lviii. (Catal., ii. 351). ; A

36 Cod. Vat. exlvi. (Catal., iii. 268), ecviii. (Catal., iii. 498); Paris, Anc. fonds 134 A (Zotenberg, Catal., p. 154), with an Arabic translation.

87 Bodl. Hunt. 199 (P. Smith, Catal., p. 449), Poc. 79 (ib., p. 459).

38 Written C234 and OD.

39 Bar-Hebreeus, Chron. Eccles., ii. 409(a contemporary). In Cod. Vat. ececxl. (Mai, Scriptt. Vett. Nova Coll., v.) he bears the name of Jacob bar Talia, a nee tion of Bartellaya. In MS. Berlin, Alt. Best. 38, 1 (if the Catal. be yee Be is called “ metropolitan of the convent of St Matthew

near Arbela," co ea Mar Matthew at Mosul with Béth Kaka, where he was trained, i a8) others have identified him with Jacob, bishop of Maiperkat (Médhinath Sande). With Taghrith he never had anything ° do.

40 Hoffmann, Ausziige, p. 215, note 1715. re

41 Born 1156, died Tope ; Bar-Hebreus, Chron. Eccles., ii. 411 ; i Gesch. d. arab. Aerzte, No. 229; Ibn Khallikan, ed. Wiistenfeld, No. 757; Ibn Osaibi'ah, ed. Miiller, i. 306.

in 1231 and died in 1241,1 on his way to visit the aged patriarch Ignatius II. (maphrian 1215-22, patriarch 1222-53). He possessed a great many books, which were all conveyed to the démosion? of the ruler of Mosul. His works are as follows. (1) The Book of Treasures, a theological treatise in four parts, viz., part i., of the three-one God; part ii., of the incarnation of the Son of God; part iii., of the Divine Providence; part iv., of the creation of the universe, the angels, the different kinds of life, the soul of man, the resurrection, and the last judgement.? (2) The Dialogues, in two books. Book i., dial. 1, on grammar, followed by a discourse on the same in twelve-syllable metre ; dial. 2, on rhetoric ; dial. 3, on the art of poetry or metres ; dial. 4, on the eloquence and copiousness of the Syriac language. Book ii., dial. 1, on logic and the syl- logism ; dial. 2, on philosophy, its kinds, divisions, and subdivisions, in five sections, viz., (a) on the definitions of philosophy, its divi- sions, &c.; (6) on the philosophic life and conduct ; (¢) on physics or physiology ; (@) on the four disciplines,—arithmetic, music, geo- metry, and mathematics; (ec) on metaphysics and theology.4 Of his letters two are extant, in verse, addressed to Fakhr ad-Daulah Mark bar Thomas and his brother Taj ad-Daulah Aba Tahir Sa'id.® He also wrote a confession of faith regarding the Trinity and the incarnation, which he himself cites in the Book of Treasures, part il., chap. 14, and an exposition of the services and prayers of the church, which is referred to in the same work, part. ii., chap. 31 (on the addition of the words "wlio was crucified for us" to the Trisagion).€ Under the name of Jacob of Maiperkat we have an adinonition

addressed to persons seeking ordination as priests, which is found in many scrvice books.'

Aaron bar Ma'dani (or Ma'dani?) had been recently appointed bishop of Mardin, under the name of John, when he was promoted

M1. by the patriarch Ignatius II. to the dignity of maphrian in 1232.8

His bodily presence seems to have been somewhat insignificant, and he was no orator, for which reasons he was unpopular.? In 1237 he went to Baghdadh, where in the following year he composed his panegyric on the holy Mar Aaron, and ingratiated himself with the three brothers Shams ad-Daulah, Fakhr ad-Daulah, and Taj ad- Daulah, the sons of the archiater Thomas, who were in high favour at the court of al-Mustansir billah. He learned to speak and write Arabic thoroughly.!® In 1244 he was recalled to Mosul and received with every mark of respect.1! On the death of Ignatius in 1252, Dionysius (Aaron 'Angir) was created patriarch," but a rival faction setup John bar Ma'dani!* ; and so the two ruled in a divided church till Dionysius was murdered in the convent of Bar-sauma near Meliténe in 1261," after which time his rival sat alone till 1263. John bar Ma'dani compiled an anaphora! and wrote a great many poems, of which Bodl. Hunt. 1 contains no less than 60.17 Some of the more important of these are the poem on the soul, entitled "the Bird" (Parah#tha), on the high origin of the soul and its degradation by sin,!® on the excellent path of the perfect," and on the capture of Edessa and other places by the Seljak sultan 'Ala'u'd-din Kaikobadh in 1235.7! Of his homilies Cod. Vat. xcvii. contains eighteen for various feasts in Arabic." These writers are, however, all cast into the shade by the impos- .ing figure of Bar-Hebreus, as we are accustomed to call him, one of the most lcarned and versatile men that Syria ever produced. Abu '1-Faraj Gregory *+ was the child of a physician at Meliténe (Malatiah) named Aaron, a convert from Judaism or of Jewish descent, whence his son got the name of Bar 'Ebhraya or Ibn al-

1 Assemani (B.0., ii. 455) is mistaken ; see also pp. 237 and 477. ;

2 According to Abbeloos, Bar-Hebreus, Chron. Eccles., ii. 412, ‘in erarium publicum principis Mossulz assumptifuerunt.”’ We suspect that the Christian bishop’s library went to light the fires of the public bath.

3 Cod. Vat. clix. (Catal., iii. 307); Brit. Mus. Add. 7193 (Rosen, Catal., p. 84) ; and in the collection of the S.P.C.K. An extract in Cod. Vat. ceccxi. (Mai, Scriptt. Vett. Nova Coll., v.); see B.O., ii. 287-240.

4 Brit. Mus. Add. 21454 (Wright, Catal., p. 1165); Godttingen, Cod. Orient. 18c ; Bodl. Marsh. 528 (apparently imperfect, P. Smith, Catal., p. 642). Ex- cerpts in Berlin, Alt. Best. 38,1. Book i., dial. 8, has been edited by Martin, “De la Métrique chez les Syriens,” in Abhandlungen fiir d. Kunde d. Morgen- landes, Bd. vii., No. 2, 1879.

5 Brit. Mus. Add. 7193 (Rosen, Cafal., p. 84); see Bar-Hebreus, Chron. ae ii. 407, where the third brother Shams ad-Daulah is also mentioned.

B.O., ti. 240.

7 E.g., Cod. Vat. li. 9 (Catal., i. 818); ecciv. (Mai, Scriptt. Vett. Nova Coll., v.); Paris, Suppl. 22, 23, 38, 94 (the last in Arabic), see Zotenberg, Catal., pp. 68, 72, 76; comp. B.0., ii. 241. 8 B.O., ii. 454. 9 Bar-Hebraus, Chron. Eccles., ii. 407.

10 Tbid., ii. 411. ll Ibid., ii. 418. 12 Ibid., i. 697, 701; B.O., ii. 376.

13 Bar-Hebreus, Chron. Eccles., i. 707; B.O., ii. 877. ;

14 Bar-Hebreeus, Chron. Eccles., i. 787. 15 [bid., i. 748.

16 See Renaudot, ii. 512.

I” See Payne Smith, Catal., pp. 379-382, and MS. Berlin, Sachau 207, 3.

18 Bodl. Hunt. 1; Poc. 298 (P. Smith, Catal., p. 641); Cod. Vat. ceiv. (Catal., iii. 489); Berlin, Sachau 61, 8. 19 Bodl. Hunt. 1; Cod. Vat. celv.

20 Bodl. Hunt. 1; Poe. 298; Vat. cciv. Edited in part by Cardahi in the Liber Thesauri, pp. 66-68.

21 Hunt. 1. Palat. Medic. lxii. contains two poems on the love of God and the love of wisdom (Catal., p. 108). A

22 Catal., ii. 528. There is one, also in Arabic, on repentance and death in Cod. Vat. ccxx. (Catal., iii. 508). ¥ .

23 B.O., ii. 244 sq. See Gibbon's eulogy of him, Decline and Fall of the Roman Empire, ed. Smith, 1855, vol. vi. p. 55. : et. p

24 His baptismal name was John, as appears from the inscription on his tombstone ; Badger, The Nestorians, i. 97. Gregory he probably adopted when he becaine a bishop.

'Tbri, "the son of the Hebrew." He was born in 1226, and de- voted' himself from his boyhood to the acquisition of Greek and Arabic. A little later he applied himself also to theology and philosophy, besides practising medicine under his father and other distinguished physicians. His lot was cast, however, in evil days. In 1248 many of the inhabitants of Malatiah fled to Aleppo before the advancing hordes of Hulagii and his Tatars, and his father would have been among the fugitives, had it not been for a lucky accident.*° In the following year his father had actually to attend as physician upon one of the l'atar generals, whom he accompanied to Khartabirt, and on his return retired almost immediately from Malatiah to the safer city of Antioch." Here Bar-Hebreus com- pleted his studies and commenced his monastic life.28 Thence he went to Tripolis, where he and Salibha bar Jacob Wagih, of Edessa, were studying medicine and rhetoric with a Nestorian teacher named Jacob, when they were summoned before the patriarch Ignatius II., on 14th September 1246, and ordained bishops, the former of Giibds (Guibas) near Malatiah, the latter of 'Akko.29 Bar- Hebreeus was then just twenty years of age. In the following year

he was transferred to Lakabhin, another diocese adjacent to Mala- tiah,° by the patriarch Ignatius.! After the death of Ignatius, Bar-Hebreus took the part of Dionysius (Aaron ‘Angir) against John bar Ma‘dani, and was transferred by him in 1253 to Aleppo,” but quickly deposed by his old friend Salibha (who sided with John bar Ma‘dani)**; nor did he recover tiis see till 1258.34 The next patriarch, Ignatius 1II. (Yéshi’), abbot of Gévikith near Mopsu- estia,®° advanced him to the dignity of maphrian in 1264.26 Hence- forth his life was an active and busy one, and it seems almost marvellous that he should have studicd and written so much, while in no way neglectful of the vast diocese committed to his charge. The story is told by himself in simple language in his Ecclesiastical History,” with a continuation by his surviving brother Bar-sauma Safi, giving a nearly complete list of his works.°8 He died at Mardghah in Adhurbaigin on 30th July 1286, and the greatest respect was shown to his memory by Greeks, Armenians, and Nestorians alike, the shops being closed and no business trans- acted.® His body was conveyed to the convent of Mar Matthew at Mosul, where his grave was seen by Badger in October 1843.41 Bar-Hebreus cultivated nearly every branch of science that was in vogue in his time, his object being on the one hand to reinvigo- rate and keep alive the Syriac language and literature, and on the other to make available to his co-religionists the learning of the Muhammadans in a suitable form. Hence his treatment of the Aristotelian philosophy, following in the footsteps of Ibn Sina (Avicenna) and other Arabian writers. The Kéthabha dht-Bhé- bhatha, or “ Book of the Pupils of the Eyes,” is a compendium of the art of logic or dialectics, comprising an introduction on the utility of logic and seven chapters in which the author deals suc- cessively with the Jsagégé of Porphyry, the Categories, De Inter- pretatione, Analytiea Priora, Topica, Analytica Posteriora, and De Sophistieis Elenchis.® In connexion with it we take the Kzthabha dha-Stwadh Sophia or “ Book of the Speech of Wisdom,” a com- pendium of dialectics, physics, and metaphysics or theology.‘ The large encyclopedia entitled Héwath Hekhmétha, “ Butyrum Sapientiz,” or less correctly Hekhmath Hekhmatha, “Sapientia Sapientiarum,” comprises the whole Aristotelian discipline. The first volume contains the Logie, viz., the Isagdgé, Categories, De Interpret., Anal. Pri. and Poster., Dialectica, De Sophist. Elenehis,

Rhetorie, and Art of Poetry. The second comprises the Physies, viz., De Auseult. Physiea, De Cxlo ec Mundo, De Meteoris, De Genera- tione et Corruptione, De Fossilibus, De Plantis, De Animalibus, and De Anima. The third, in its first section, treats of the Metaphysies, viz., of the origin and writers of philosophy, and of theology ; in its second section, of ethics, economics, and politics. An abridge-

25 B.0., ii. 263. a

26 Ibid., ii. 244; Bar-Hebreeus, Hist. Dynast., p. 481 (transl., p. 815); Chron. Syr., p. 503 (transl., p. 521).

27 B.0., ii. 245; Bar-Hebreeus, Hist. Dynast., pp. 486-487 (transl., pp. 318-319); Chron. Syr., 504-505 (transl., p. 522).

28 See the poem No. 29 in Cod. Vat. clxxiv. (Catal., iii. 356).

29 Bar-Hebreeus, Chron. Eccles., i. 667 ; B.O., li. 245, 374. From ‘Akko Salibha was transferred to Aleppo, under the name of Basil (B.0., ii. 375), and promoted in December 1252 by the patriarch John bar Ma‘dani to be maphrian, under the name of Ignatius (B.0., ii. 377, 455). He died in 1258.

30 B.O., ii. 260. 31 Tbid., ii. 246; Bar-llebreus, Chron. Eccles., i. 685.

32 B.0., ii. 246; Bar-Hebreeus, Chron. Eccles., i. 721. 33 Tbid., i. 721.

34 Ibid., i. 727. 35 He sat from 1264 to 1282.

36 B.O., ii. 246; Bar-Hebreeus, Chron. Eccles., i. 749, ii. 433.

37 Ibid., ii. 431-467; B.O., ii. 248-263.

38 Bar-Hebreus, Chron. Eccles., ii. 467-485; B.O., ii. 264-274. Two brothers died before him, Michael and Muwaffak. See the poems Nos. 166 and 170 in Cod. Vat. elxxiv. (Catal., iii. 358).

39 B.0., ii. 266; Chron. Eccles., ii. 473. 40 B.O., ii. 460.

41 The Nestorians, i.97. For ‘£1536” read 1537, and for “ August” July.

42 Compare Renan, De Philos. Peripat. apud Syros (1852), p. 65 sq.

43 Brit. Mus. Or. 1017; Paris, Anc. fonds 138; Berlin, Alt. Best. 38,2, 39; Sachau 140, 2, and 198,8; Cambridge, collection of the 8.P.C.K.

44 Brit. Mus. Or. 1017; Paris, Anc. fonds 138 (Syr. and Arab.); Berlin, Alt. Best. 38,4; Sachau 91 (Syr. and Arab.), also 140, 1, and 198, 9; Cambridge, coll. of the 8.P.C.K.

45 Palat. Medic. clxxxvi.-vii., clxxvi.-ix. (=clxxxvi.; see Renan, De Philos. Peripat. apud Syros, p. 66); Bodl. Hunt. 1 (imperf.); compare also Palat, Medic. clxxxiii.-iv. and xii. (p. 109).

ment of this large work is the Tég¢rath Tégératha or “ Mercatura Mercaturarun,” which goes over the same ground in briefer terms.! To this class too belongs a poem “On the Soul, according to the views of the Peripatetics,” which is described as “ mémra shinaya,” 2.€., according to Assemani, riming in the letter sk.2 Bar-Hebreeus also translated into Syriac Ibn Sina’s Kitab al-isharat wa ’t-tan- bihat,? under the title of Kéthabha dhé-Remzé wa-Méiranwatha,4 and another work of the same class, entitled Zubdat al-Asrar or “the Cream of Secrets,” by his elder contemporary, Athir ad-din Mufaddal ibn ‘Omar al-Abhari (died in 1262).° Nor did he neglect the study of mathematics and astronomy. In 1268 we find him lecturing on Euclid in the new convent at Maraghah, and again in 1272, at the same place, on the Megisté (“H meyddn ovvraékis) of Ptolemy. He drew up a zi, z.¢., a set of astronomical tables or astronomical almanac, for the use of tiros?; but his principal work in this branch of science is the Sullaka Haundnaya or ‘ Ascent of the Mind,” a complete treatise on astronomy and cosmography, which he composed in 1279.8 His medical writings are more numerous, for Bar-Hebreus was famous asa physician 2 and had been in attendance as such on the Tatar “king of kings” in 1263, He made, for example, a translation and an abridgement of Dios- corides’s treatise Ilept tys larpixfs (De Medicamentis Simplicibus), under the title

of Kéthabha dhé-Dhioskoridhis,4 and wrote a com- mentary on the Aphorisms of Hippocrates in Arabic,!? and on the Questiones Medice of Honain ibn Ishak in Syriac.12 He also pub- lished the Quastiones in an abridged Syriac translation.4 Further, he is said to have written commentaries in Arabic on Galen's treatises De Elementis (Hep! rév cab' Inmoxpdrny crorxelwv) and De Tempera- mentis (Ilepi xpacéwv).! ° He made an abridged version in Arabic of al-Ghafiki's 1° " Book of Simples" (al-adwiyah al-mufradah)," and left an unfinished Syriac translation of the Canon (al-Kanun fi 't- Tibb) of Ibn Sina.1® A large medical treatise of his own composi- tion in Syriac is mentioned, but no special title is given. Asa grammarian Bar-Hebreus deserved well of his country, and his writings. on this subject are now well known and appreciated by Orientalists. By making use of the work of previous grammarians, especially Jacob of Edessa, he has succeeded in giving a very full sketch of the language according to the Oriental system, with many valuable observations as to dialectic differences, &. The larecr grammar bears the title of Kethabha dhé-Semhé, "the Book of Lights" or "Rays."?° It has been published, according to the Paris MS. Ancien fonds 166, by the Abbé Martin.2! The smaller metrical grammar, Kéthabha dhé-Ghrammatiki," was edited so long ago as 1843 by Professor Bertheau of Gottingen, according to the MS. Orient. 18 in the library of that university, but without the fifth section De Vocibus Aiquivocis. Martin has republished it in his Guvres Grammaticales d' Abou 'l Farad), vol. ii., including the fifth section, according to the Paris MS. Ancien fonds 167.2 A third, still smaller grammar, Keéthabha dha-Bhélésusitha or "the Book of the Spark," was left unfinished by the author. As a theologian, Bar-Hebreus's most useful work undeniably is the 4usar Razé or "Storehouse of Secrets," the Horrewm Mysteriorum as it is commonly

called.* This is a critical and doctrinal commentary on the text of

the Scriptures of the Old and New Testaments, based on the Péshitta, but taking note of the various readings of the Hebrew text, the LXX. and other Greek versions, the later Syriac translations, and even the Armenian and Coptic, besides noting differences of reading be- tween

the Nestoriansand Jacobites. The doctrinal portion is drawn from the Greek fathers and previous Syrian theologians, of course

of the Monophysite school. The Afénarath Kudhshé, or " Lamp of**

1 Palat. Medic. ec.; Berlin, Sachau 211: Cambridge, coll. of the S.P.C.K.

2 B.O., ii. 268, in the note, col. 2, No. 28.

3 Theoremata et Exercitationes, a course of logic, physics, and inetaphysics ; see Wistenfeld, Geschichte d. arab. Aerzte, p. 73, No. 61; B.O., ii. 270, note 2.

4 Cod. Vat. exci.; Palat. Medic. clxxxy. (Arab. and Syr.); Paris, Ane. fonds 163. 5 See Hist. Dynast., p. 485 (trausl., p. 318).

6 B.0., ii. 253; Chron. Eccles., ii. 443.

? B.O., ii. 307 ; but the calendar there indicated is of later date.

8 Bodl. Hunt. 540; Paris, Anc. fonds 162. On the date see Payne Smith, Catal., p. 584. 9 Wiistenfeld, Gesch. d. arab. Aerzte, No. 240.

10 Chron. Eecles.,i.747. 11 B.O., ii. 268, in the note, col. 1, No. 13, and p. 270.

12 Tbid., ii. 268, col. 1, No. 15, and p. 270.

13 Apparently unfinished, for Bar-saumais careful to add "as faras Thiriakt," B.0., it. 272, No. 28; see also p. 268, in the note, col. 2, No. 25.

14 B.0., ii. 270, No. 16.

15 Wenrich, De Auctorwm Gree. Verss. et Commentt. Syriacis, &., 1842, pp. 242- 243, 270; Wiistenfeld, Gesch. d. arab. Aerzte, No. 240.

16 Wiistenfeld, op. cit., No. 176; Ibn Abi Usaibi'ah, ed. Miiller, ii. 52.

17 B.0., ii. 270, No. 143 268, note, col. 1, No. 14.

18 Ibid., ii. 272, No. 24; 268, note, col. 2, No. 22.

19 Ibid., ii. 272, No. 26. 20 Ibid., ii. 307.

2 Guvres Grammaticales d' Abow 'l Faradj, dit Bar Hebreus, vol. i., 1872. The chapter on the signs of interpunction, &c., was edited by Dr Phillips in 1869, in A Letter by Mar Jacob, Bishop of Edessa, on Syriac Orthography. MSS. of this work are—Cod. Vat. cecexvi., eccexxii.; Bodl. Hunt. 1, Pocock 298; Paris, Ane. fonds 166; Brit. Mus. Add. 7201; Palat. Medic. exxii.; Géttingen, Or. 18b; Berlin, Alt. Best. 43, Sachau 307, 308; Cainbridge, coll. of the §.P.C.K.

22 B.O., ii. 308.

23 Of this work there are many MSS. in Europe, differing from one another in the quantity of the scholia and the retention or omission of section 5.

24 B.O., ii. 272, No. 27. 25 Tbid., ii. 277.

26 Portions of this work have been edited at various times, but a complete edition is still unachieved. Larsow made a very sinall beginning in 1858. See the list in Nestle's Brevis Lingua Syr. Grammatica, 1881, pp. 31-32. MSS. of

[13TH cEnr,-

the Sanctuary," isa treatise on the "bases" or first principles on which the church is established.2" It deals in twelve " bases" with the following subjects :—(1) of knowledge in general, (2) of the nature of the universe, (3) of theology, (4) of the incarnation, (5) of the knowledge of.celestial substances, 7. e., the angels, (6) of the earthly priesthood, (7) of the evil spirits, (8) of the rational soul

(9) of free will and liberty, fate and destiny, (10) of the resurrec- tion, (11) of the end of the world and the last judgement, (12) of paradise. The Kéthabha dhé-Zalgé, or "Book of Rays," is a com. pendium of theology, going over nearly the same_ground as the previous work, in

ten sections.% The Kethabha ah' lthikon, or Liber Tav 7OKey, was composed at Maraghah in 1279. It has been fully analysed by Assemani in the B.O., ii. 303 sq. Part i. treats of the exercises of the body and mind, such as prayer, manual work, study, vigils, fasting, &c.; part ii., of the regimen of the body ; part it, of the purifying of the soul from evil passions ; part iv., of the adorning of the soul with virtues.29 The Kethabha dh3- Yi aund, or

" Book of the Dove," is a similar work specially intended for the use

of ascetics living in solitude as hermits. It is also divided into four parts, viz., (1) of the training of the body, ¢.g., in alienation from the world, repentance, poverty, humility, patience, fraternal love,

&c. ; (2) of the training of the soul, ¢.g., in quiet, religious exercises, prayer, watching, fasting, &c. ; (3) of the spiritual rest of the per-

fect; and (4) an autobiographical sketch of his own spiritual life,3 Bar-Hebreus also spent part of his time in excerpting, arrang- ing, and commenting upon the Book of Hierotheus concerning the hidden Mysteries of the House of God.*1 In the commentary he chiefly follows that of Theodosius, patriarch of Antioch (see above, p._846).°? He compiled an anaphora,% published a confession of faith or creed,*4 and approved the order of baptism of Severus, as translated by Jacob of Edessa.5 More valuable than these is his Kethabha dhé-Huddayé, "the Book of Directions" or "N on1ocanon," which is for the Jacobite Church what the Kunnasha adhé- Kanone of 'Abhd-ish6″ is for the Nestorian, both in ecclesiastical and secular matters.° To us Europeans the historical writings of Bar-Hebreus surpass in interest and value everything else that he has written. He planned and executed a Universal History in three parts.®? Part i. contains the political History of the World from the creation down to his own times.*® Part ii. is the history of the church from Aaron downwards, the treatment being exceedingly brief till we reach the post-apostolic period, when it becomes a history of the patriarchs of the church of Antioch, and finally, after the age of Severus, of the patriarchs of the Monophysite branch of that church down to the year 1285. The meagre continuation by a later hand reaches to 1495. Part iii. offers us the history of the

Eastern division of the Syrian Church from St Thomas the apostle onwards. From the time of Maratha (629) it becomes the history of the Mono- physite maphrians of Taghrith, though a record is always carefully kept of the catholic patriarchs of the Nestorians. It closes with the year 1286, but there is a continuation by Bar-Hebrzus's brother Bar-sauma to 1288, and thence by another writer to 1496.29 In the last years of his life, at the request of some Muslim friends in Mara-

this work—Cod. Vat. clxx., eelxxxii.; Palat. Medic. xxvi.; Bodl. Hunt. 1; Brit. Mus. Add. 7186, 21580, 23596; Berlin, Alt. Best. 11, Sachau 134; Gottingen, Orient. 18a ; Cambridge, coll. of the S.P.C.K.

27 B.0., ii. 284. MSS.—Cod. Vat. elxviii.; Paris, Anc. fonds 121 ; Cambridge, coll. of the 8S.P.C.K. This work has been translated into Arabic—Paris, Anc. fonds 128; Brit. Mus. 18296 ; Bodl. Hunt. 48; Berlin, Sachau 81; Cambridge, coll. of the 8.P.C.K. Mr R. J. H. Gottheil has recently lithographed, 'for private circulation only," a small portion of this work, viz., basis ii., ch. iii. sect. 3, paragr. b, on plants (26 pp. of text, 8 pp. of reface); the title is A list of Plants and their Properties from the Mendrath Kudh¥é of Gregorius bar 'Eberdyd edited by Richard J. H. Gotthetl, B.A.

°8 B.O., ii. 297. MSS.—Cod. Vat. elxix.; Bodl. Or. 467, Hunt. 521; Paris, Anc. fonds 129, Suppl. 59; Brit. Mus. Or. 1017; Berlin, Sachau 85; Cambridge, coll. of the 8.P.C.K.

29 MSS. —Cod. Vat. elxxi.; Bodl. Marsh. 681, Hunt. 490; Brit. Mus. Add. 7194, 7195 ; Paris, Auc. fonds 122, Suppl. 75. There are two Arabic translations of this work ; see Zotenberg, Catal., p. 201, No. 247. :

30 Bodl. Hunt. 1; Cambridge, coll. of the S.P.C.K. There is an Arabic translation, Paris, Anc. fonds 126, 145 (ff. 292-299).

31 Probably a production of Stephen bar Siidh-ailé ; see Brit. Mus, Add. 7189, where we have the commentary of Theodosius, patriarch of Antioch, and com- pare Frothingham, Stephen bar Sudaili, p. 87 sq. See also above, p. 432,

32 Brit. Mus. Or. 1017. Other MSS.—Paris, Anc. fonds 138; Berlin, Sachau 206. The work seems to have been translated into Arabic (see Zotenberg, Catal., p. 176). 33 B.0., ii. 275. 34 Ibid., ii. 276; Cod. Vat. clxxill.

35 See Cod. Vat. lii.; Paris, Anc. fonds 97; Medic. Palat. xliv.

36 B.0., ii. 299. Rendered into Latin by J. A. Assemani in Mai, Scriptt. Vett. Nova Coll.,x. MSS.—Cod. Vat. exxxii., ecelvi.-vii., ecclviii.-ix.; Bodl. Hunt. 1; Paris, Anc. fonds 140; Berlin, Alt. Best. 40; Palat. Medic. lxi. It has been translated into Arabic. 37 B.0., ii. 311.

38 This has been edited under the title of Bar-Hebreei Chronicon Syriacum by Bruns and Kirsch, with a Latin translation, in two volumes, 1789. Both text and translation are equally bad, and the work deserves a new edition.

39 Parts ii. and iii., which supplied Assemani with the greatest part of the materials for the second volume of his Bibl. Orientalis, have been edited by Abbeloos and Lamy in three volumes, viz., part ii. in two volumes, 1872-74, and part iii. in one volume, 1877, accompanied by a Latin translation and notes. It might be advantageously reprinted, if revised by a competent hand. MSS. of the entire history are—Cod. Vat. elxvi., ceelxxxiii.-viii.; Bodl. Hunt. 1; Palat. Medic. exviii. Part i. is contained in Cod. Vat. clxvii. and Bodl. Hunt. 52; partsii. and iii. in Brit. Mus. Add. 7198 and Cambridge Dd. 3, 8, 1, as also in the coll. of the S.P.C.K. Whether the Berliri MS., Sachau 210, contains the entire work or only a part of it we do not know; it is simply described as “Chronik des Bar Hebreus.” There are excerpts in Cod. Vat. elxxiii.

ghah, he undertook to make a recension in Arabic of the political history, which he all but finished within the space of one month before his last illness came on,!_ This edition is enriched with many references to Muhammadan writers and literature which are wanting in the Syriac. It is entitled al-Mukhtasar fi ’d-Duwal, or “Com- pendious History of the Dynasties.”2 Asa poet Bar-Hebreus is admired by his

countrymen, and even Renan has thought the poem on the theme Bona Lex sed Melior Philosophia to be worthy of publi- cation.* Some of the poems were badly edited and translated by Von Lengerke in 1886-38 according to the Paris MS. Ancien fonds 130 ; others have been published by the Maronite priest Augustinus

Scebabi (phish at Rome, 1877. The Carmen de Divina Sapi-

entia was brought out so long ago as 1638 by Gabriel Sionita, and has been republished at Rome in 1880 by Yohanna Notayn

Jou O73 Ge 2 Darauni (/ 3 3¢ > all wi Loy).4 In his youth Bar-Hebreus wrote

a book on the interpretation of dreams, pushshak helmé®; and in his later years he made a collection of entertaining and humorous stories in Syriac, entitled Kethabha dhé-Thunnayé Méghahhekhané, with an

we O- Arabic counterpart under the title of Daft al-Hamm (wall @);

“the Driving away of Care.”® The contents of the TunndyZ are, however, inore varied than the title seems to promise, as may be seen from Assemani’s enumeration of the chapters, B.O., ii. 306.7 Contemporary with Bar-Hebraus, though somewhat younger, we may place Daniel bar Khattab, to whom Assemani has devoted two . articles in the B.0., ii., at pp. 244 and 468. Among the poems of Bar-Hebreus we find verses addressed to this Daniel by the Nestorian Khamis bar Kardahé with his reply and another by Bar-Hebreus.® He composed abridgements in Arabic of several of Bar-Hebreus’s works, ¢.g., the Nomocanon,® Ethies, Ausar Razé, Ménarath Kudh- shé, Kéthabha dhé-Bhabhatha, and the larger grammar.!° An inde- pendent work of his, also in Arabic, treats of The Bases, or First Principles, of the Faith and Consolation of the Hearts of Believers.Y. With Daniel bar Khattab we may close our list of Jacobite writers in the literature of Syria. The Nestorians kept the lamp burning for a little, though not much longer, as we shall presently see. Shélémon, or Solomon, of Khilat or Akhlat, on the shores of Lake Van, was present as metropolitan of Pérath d&-Maishin or al-Basrali at the consecration of the catholicus Sabhr-isho’

in 1222.12 Besides some prayers and short discourses (mémroné), he wrote a treatise on the figure of the heavens and the earth,!3 and compiled a volume of analecta, partly theological, partly historical, which he entitled Kethabha dhé-Dhebboritha or "the Bee." It is dedicated to his friend Narsai, bishop of Khéni-Shabhér or Béth Wazik, called by the Arabs al-Bawéazig or al-Bawazij, on the lesser Zab. Of this work an analysis has been given by Assemani in the B.0., ili. 1, 309-824, and there is a German translation of it by Schén- felder, 1866. It has been recently edited by Mr E. A. W. Budge, of the British Museum, with an English translation, Oxford, 1886. This was an age of song with the Nestorians, in which lived some of their favourite writers of hymns. (1) One of the most conspicu- ous of these is George Warda (the Rose) of Arbél or Irbil, whose poems have entered so largely into the use of the Nestorian Church that one of their service books is to this day called the Warda.'6 His date may be gathered from certain of his hymns, which speak of the calamities of the years 1535-88=1224-27 a.p.17 (2) About the same time flourished Mas'id of the family Béth Kashsha (in Arabic Ibn al-Kass), who was physician (hakim) to the caliph al- Musta'sim (1242-58), and outlived his patron.18 One of his poems

1 B.O., ii. 264.

2 Hdited by Pocock, with a Latin translation, in 1663. MSS.—Cod. Vat. elxvii.; Brit. Mus. Add. 6944, 6952, 1, 23304-5; Bod]. Pocock 54,162; Palat. Medic. exvii.

3 De Philos. Peripat. ap. Syros, p. 67.

4 B.0., ti. 308. MSS.—Cod. Vat. clxxiv.; Bod]. Hunt. 1, Marsh. 201; Paris, Anc. fonds 118, 130, 157; Palat. Medic. lxii. (Catal., p. 110); sce also Cod. Vat. eccexxli.; Bodl. Poc. 298; Berlin, Alt. Best. 41, 2, 3, and Sachau 61, 4-6.

5 B.0., ii. 271, No. 20. 6 Ibid., ii. 268, note, col. 2, No. 31; p. 272, note 1.

7 See a few short specimens in Kirsch and Bernstein's Chrest. Syr., pp. 1-4, and in an article by L. Morales in the Z.D.M.G., xl. p. 410 sq. MSS.

—Cod. Vat. elxxiii.; Ind. Off. No. 9, ‘Tracts in Syriac,” ff. 351-413. The Daf* al-Hamm is contained in Paris, Auc. fonds 160. The catalogue of Bar- Hebreeus’s works in B.0., ii. 268, note, adds one Arabic book to this long list (col. 1, No. 19, at the foot) of which we know nothing but the title there given in Syriac, Kethabha dhé-Henyin Yuthrané, ‘On the Pleasure of Gain.”

8 Payne Smith, Catal., p. 377; Catal. Vat., iii. 358.

9 B.O., ii. 463 5 Cod. Vat. Arab. dcxxxvi. (Mai, Scriptt. Vett. Nova Coll., iv. 573).

10 B.O., ii. 464,

ll Ibid., ii. 244; Cod. Vat. Arab. lxxiv. (Mai, op. cit., iv. 153).

12 B.0., ii. 453, No. 75; Bar-Hebrzeus, Chron. Eccles., ii, 371.

13 B.0., iii. 1, 310. 14 See Hoffmann, Ausztige, pp. 189 and 296. =

15 MSS.—Cod. Vat. clxxvi., clxxvi.; Brit. Mus. Add. 25875; RAS. Add. 76; Munich, Cod. Syr. 7 (with an Arabic translation). Bod]. Pocock 79 and Paris, Anc. fonds 113, contain only an Arabic translation, different from that in the Munich MS. , ae

16 Badger, The Nestorians, ii.25. A few specimens are given by Cardahi in the Liber Thesauri, p. 51. Badger has translated one, op. cit., pp: 51-57.

W? Catal. Vat., iii. 391, at the top. Important MSS. of Warda’s hymns are Cod. Vat. elxxxiv.; Berlin, Alt. Best. 24, Sachau 188; Cambridge, coll. of the S.P.C.K,.

18 B.O., iii. 1,561; Bar-Hebrieus, Hist. Dynast., pp. 522-523 (transl., pp. 341-342).

for the feast of the Epiphany occurs in Cod. Vat. clxxxiv. (Catal. iii. p. 389).19 (8) Khamis bar Kardahé of Arbél was a younger

contemporary of Bar-Hebrzus, as appears from his correspondence Khamis.

with Daniel bar Khattab (see above). He too has bequeathed his

name to one of the Nestorian service books, which is still called Gabriel the Khamis.®° (4) Gabriel Kamsa (the Locust) was a monk of Béth-Kamsa.

Kuka. He became metropolitan of Mosul, and was present at the consecration of Yabh-alaha III. in 1281." There is a long poem of his in Cod. Vat. clxxx. (Catal., iii. 376), treating of the creation, the incarnation, the life of our Saviour, the preachin g of the apostles, and the praises of the fathers of the church, and concluding with

an encomium on Sabhr-isho', the founder of Beth-Kaka. (5) John John of of Mosul was a monk of the convent of St Michael near that city.2? Mosul.

His work entitled Kethabha dht-Shappir Dubbaré was published at Rome in 1868 by E. J. Millos, archbishop of "'Akra, as a school- book, under the title of Directorium Spirituale. 'It is, of course, impossible to say to what extent the original has been tampered with in such an edition, but there is a MS. in the Brit. Mus. Or. 2450.28 The composition of the work is placed by Millos in 1245, and the death of the author by Cardahi (Lib. Thes., p. 120) in 1270.

'Abhd-isho' bar Bérikha holds nearly the same position in regard 'Abhd- to the Nestorian Church that Bar-Hebreus does in relation to the ish3′ bar Jacobite, though far inferior in talent and learning to "the Son of Bérikhia.

the Hebrew." He flourished under Yabh-alaha III., being firstly bishop of Shiggar (Sinjar) and Béth-'Arbayé about 1285,24 and after- wards, before 1291, metropolitan of Nisibis and Armenia. He died in 1318.°6

He has left us a list of his own publications at the end of the Catalogus Librorum, in the B.O., iii. 1, 325 sq. Several of these seem to be lost,—at least they do not appcar in the cata- logues of our collections,—such as the commentary on the Old and New Testaments," the Kéthabha Katholikos on the marvellous dis- pensation or life of our Lord on earth,* the Kethabha Skolastikos against all the heresies,?® the book of the mysteries of the Greek philosophers,®° the twelve discourses comprising all the sciences,3! and the ecclesiastical decisions and canons,? as also an Arabic work with the title Shah-marwarid or "the King-pearl."33 The Mar- ganitha or " Pearl" is a theological work in five sections, treating of God, the creation, the Christian dispensation, the sacraments of the church, and the things that prefigure the world to come. There is a careful analysis of its contents in B.0., iii. 1, 352-360. It has been edited, with a Latin translation, in Mai, Seriptt. Vett. Nova Coll., x., and done into English by Badger, The Nestorians, ii, 380 sg. The date of composition is 1298.34 'Abhd-ishd' himsclf translated this work into Arabic in 1312, as we learn from 'Amr ibn Matta in the Majdal, where large portions of it are quoted.35 The Collection of Synodical Canons or Nomocanon is also fully analysed by Assemani, £.0., iii. 1, 882-851. It has been edited, with a Latin translation, in Mai, Seriptt. Vett. Nova Coll., x.*8 As a poet 'Abhd-isho' does not shine according to our ideas, although his countrymen admire his verses greatly. Not only is he obscure in vocabulary and style, but he has adopted and even exaggerated all the worst faults of Arabic writers of rimed prose and scribblers of verse." His principal cffort in poetry is the Paradise of Eden, a collection of fifty poems on theological subjects, which has been analysed by Assemani, B.O., ili. 1, 325-332. This volume was pub- lished by the author in 1291, and in 1316 he found that it was necessary to add an explanatory commentary.? Another collection of twenty-two poems, which may be regarded as parts of one com- position, treating of the love of wisdom and knowledge, is found in Cod. Vat. clxxiv. (Catal., iii. 359) and Bodl. Marsh. 201 (P. Smith, Catal., p. 510); and a third, including the above and a selection from the Paradise, is contained in Bodl. Marsh., 361.*% Of his minor works, enumerated in the B.0O., iii. 1, 861, the con- solatory discourses, the letters, and the commentary on the epistle of Aristotle to Alexander concerning the great art (alchemy) seem

19 See Cardahi, Liber Thesauri, pp. 125-128.

20 Badger, The Nestorians, ii. 24; see one of his poems translated, pp. 38-49. Cardahi gives some specimens in Liber Thesauri, pp. 59-62. Important MSS. of his poems are—Cod. Vat. elxxxy.-vi.-viii. ; Brit. Mus. Add. 18716, f. 44a, and Orient. 2304; Berlin, Sachau 178; see also Cod. Vat. Ixxxix. and Brit. Mus. Or.

24 B.0., i. 539. 25 Tbid., i. 538; ifi. 1, 327, col. 2. 26 Tbid., i. 539; iii. 1, 3 notes 2, 3,325 note 1. 27 Ibid., fii. 1, 395. 28 Id., ibid. 29 Id., p. 360. 30 Id., ibid. 31 Id., ibid. 32 Id., ibid.

Cambridge, coll. of the 8.P.C.K.

35 BO. iii. 1, 360, note 4; see Cod. Vat. Ixv., eccvii., and Cod. Vat. Arab. ex. (Mai, Scriptt. Vett. Nova Coll., iv.); compare B.O., iii. 1, 589.

36 MSS.—Cod. Vat. exxviii., cxxix., ceclv.

37 See Payne Smith's minute descriptions in his Catal., p. 523 sq.

38 MSS.—Cod. Vat. eexlv., ecelxxix.; Paris, Anc. fonds 166; Berlin, Alt. Best. 41,1, Sachau 1, 21, 80 ; Brit. Mus.Oricut. 2302-3 ; Cambridge, coll. of the S.P.C.K.

39 B.0., iii., 1, 327, col. 2. :

40 Payne Smith, Catal., p. 523; see also p. 531, Nos. 30, 31. In Paris, Ane. fonds 104, there is a poem explanatory of the ecclesiastical calendar (Zotenberg, Catal., p. 128).

to be lost. The tuwrgdmé arc collected in a MS. at Berlin, Alter ~~Bestand 41, 4. His commentary on an enigmatical poem of Simeon Shankélawi we have already mentioned (see above, p. 852). To us his most useful work decidedly is the Catalogue of Books, which forms the basis of vol. iii. part 1 of Assemani's Bibi. Orient. There is an older edition of it by Abraham Ecchellensis, Rome, 1653. It has been translated into English~~

~~by Badger.! The Catalogue con~~ sists of four parts, viz., (1) the Scripturcs of the Old Testament, with sundry apocrypha, B.0., iii. 1,5; (2) the Scriptures of the New Testament, p. 8; (8) the Greek fathcrs who were translated into Syriac, p. 18; (4) the Syriac fathers, chiefly, of course, of the Nestorian Church, pp. 65-362. It is to be regretted that 'Abhd- ish6' contented himself merely with enumerating the titles of

1 The Nestorians, ii. 361. Badger ascribes the work to the year 1298, probably on the authority of his MS.

SYZRAN, a district town of Russia, in the government of Simbirsk, lies 90 miles to the south of Simbirsk, a few miles from the Volga. It originated in a fort, erected in 1683, to protect the district from Tatars and Circassians. Most of its inhabitants (24,500 in 1882) are engaged in gardening and tillage. In the large villages of the sur- rounding district, one of the richest in Simbirsk, various petty trades are carried on. Syzrafi has long been in repute for its tanneries and manufactures of leather (£20,000 annually). Several flour-mills and other manu- factures have recently sprung up. The town is connected by rail with Penza and Morshansk in the west, and with Orenburg in the east, and much grain is exported; timber is brought from the upper Volga, and manufactured wares from Nijni-Novgorod. In 1882 the goods shipped from Syzraii and Batraki (a port on the Volga) were valued at £153,540. In the same year the grain and other wares sent by rail exceeded one million cwts. Syzrafi is a badly built town, most of the houses being of wood.

SZABADKA (German, Maria-Theresiopel), a royal free town of Hungary, in the county of Bacs, on Lake Palics, in 46° 8' N. lat. and 19° 42' E. long. It is the centre of an immense agricultural district and has little claim to special distinction. There are a chamber of advocates, an upper gymnasium, a state training institute for governesses, and an industrial and commercial school. The population (61,367 in 1880) was about 63,500 in 1885, mostly Hun- garians, but partly Bunyevaczs (a branch of Servians).

SZARVAS, a town of Hungary, on the Kérdés, in the county of Békés, is a place noted for the wealth of its peasantry and the excellence of its

breed of horses. The population was 22,504 in 1880, and about 24,000 in 1885, chiefly Slovaks, but all speaking Hungarian.

SZATMAR-NEMETI, a royal free town of Hungary, in the county of Szatmér, is situated on the river Szamos and the Hungarian North-Eastern Railway, in 47° 49’ N. lat. and 22° 51’ E. long. It is the seat of a Roman Catholic bishop and has a seminary, a male and female normal school, and several Government offices. The town has a considerable trade in wine and wood. The population num- bered 19,708 in 1880, and about 22,000 in 1885. They are mostly Magyars, and by religion Romanists, Pro- testants, and Greeks in almost equal proportions.

SZEGEDIN, a royal free city of Hungary, second only to Budapest, is situated on both banks of the Theiss at the influx of the Maros, in 46° 16’ N. lat. and 20° 10’ E. long., in the county of Csongrad. It is a great centre of the commerce and agriculture of the Alféld, has a Roman

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books, and never thought it worth his while to give the date of the writers, nor even to arrange his notices in any kind of chrono- logical order.? : After ‘Abhd-isho‘ there are hardly any names among the Nes- torians worthy of a place in the literary history of the Syrian nation. We may make an exception in favour of the catholicns

Timothy I1., who was elected in sueccssion to Yabh-alaha III. in Tim

1318, having previously been metropolitan of Mosul and Ipbil If. under the name of Joseph. He wrote a work on the sacraments of the church, of which Assemani has given an analysis in BO, iii. 1, 572-580.4 His death took place in 1328. (W. W*.)

2 MSS.—Cod. Vat. clxxvi.; RAS, Add. 76 (imperfect); Rome, Bibl. Vitt. Eman. A. 1194, MSS. Sessor. 162; Cambridge, coll. of theS, P.C.K, SF 15 (Oh, tate JL. BYR A Waterers

Catholic gymnasium, a state real school, and a library with about 80,000 volumes. There are a Franciscan, a Piarist, and a Minorite convent, and a large hospital, as well as various Government offices, a superior law court, and a chamber of advocates. The inner town consists of fine broad streets and large squares adorned with many palatial edifices, but the suburbs, inhabited by the peas- antry, are little superior to ordinary Hungarian villages. The river is spanned by a railway bridge of stone anda fine suspension bridge. Szegedin possesses factories of soap, soda, matches, candles, leather, and spirits, steam and saw mills, and salt and tobacco magazines, It is the chief seat of the manufacture of paprika (a kind of pepsicum) and of a pastry tarhonya, both largely exported to all parts of the world. During the summer the ship- ping trade is very brisk, especially in corn and timber. Szegedin is an important station on the Alféld-Fiume and the Austrian-Hungarian State Railways, and is a terminus of the Arad-Csandd Railway. The inhabitants in 1880 numbered 73,675, and in 1885 76,600 (estimated), en- tirely Magyars.

Since the 15th century Szegedin has bcen one of the most promi- nent cities in Hungary. From 1526 till 1686 it was in possession of the Turks, who fortified it. It is also notorious for its many witchcraft trials. In 1848 it sent strong detachments to the national Hungarian army. In July 1849 the seat of the Govern- ment was transferred hither for a short time. In March 1879 the town was almost completely destroyed by an inundation. In the reconstruction the site of the old fortress was laid out as a public gardcn.

SZENTES, a market town of Hungary, in the county of Csongrad, on the left bank of the Theiss, 30 miles north of Szegedin. It has a county-hall (1885) and a promenade. The inhabitants are chiefly employed in agriculture, in breeding geese, and in fishing. The population (28,712 in 1880) numbered about 30,000 in 1885, all Magyars.

SZIGET (Mérmaros-Sziget), chief town of the county of Marmaros in the north-east of Hungary, is the centre of a salt-mining district, with mining and forestry head departments. The town lies in a valley which abounds in picturesque scenery and is rich in mineral springs. It has a

county-hall, Protestant and Catholic gymnasia, a convent, a nunnery, and a training-school for teachers. The popu- lation (10,852 in 1880) was about 11,200 in 1885.

SZOLNOK, the capital of the county of Jdsz-Nagy- Kun-Szolnok, Hungary, is situated on the Theiss and the Zagyva, and is the junction of four railways. It carries on a brisk trade in tobacco, salt, and especially in wood. In 1880 the population (Magyars), chiefly Roman Catho- lics, numbered 18,247, and in 1885 about 19,000.

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ENCYCLOPAHDIA BRITANNICA

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ENCYCLOPADIA BRITANNICA

A

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE

NINTH EDITION

VOLUME XXIII

EDINBURGH: ADAM AND CHARLES BLACK

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ENCYCLOPAIDIA BRITANNICA.

1:

T’ is the twentieth symbol in our alphabet. It has varied

but little in form since the earliest days when it ap- peared in Greece and Italy, though some of the Italic alphabets exhibit variants: e.g.,in Umbrian and Etruscan inscriptions we find the horizontal stroke sometimes on one side only, and slanting ; sometimes the form is nearly that of our ordinary small ¢ without the ornamental turn at the bottom. In value it has been in all languages a surd or voiceless dental, corresponding to d, which is voiced. But the term “dental” includes some varieties of position, of which the most definite are—(1) where the point of the tongue touches the teeth (true “dental”), asin French ; (2 where the tongue touches the gum behind the teeth, and not the teeth at all, as in English ; (3) where the point of the tongue is slightly bent back against the palate, produc- ing the sound much heard in south India (often called “cerebral”). T’ when followed by ¢ or y is liable to pass into the s-sound; this happened in the local dialects of Italy before the Christian era ; at Rome the transition was later. This changed sound passed on into the Romance lan- guages, eg. in French “nation,” pronounced “nasion,” whence in England it was sounded first as “nasiun” and now as “‘nashun.” Similarly in English ¢ followed by u undergoes a change of sound; this is due, however, to the old sound of %, viz., long French w, or Old English y. This long yy developed into the 7 sound heard in “ use,” “cure,” &e.; then the new 7 affected the preceding ¢, and the result is ¢sh, as in “nature” (natshure) ; similarly din “verdure ” is sounded as dzk (verdzhure).

English employs the digraph th to denote two sounds, differing as voiceless and voiced sounds—the initial sounds of “thin” and “then” respectively. It would be a great convenience if dh could be used for the voiced sound, so that “then” should be written “dhen.” But it would be even better if the single symbols could be employed to denote these single sounds, as was to some extent the case in the earlier days of our language: in Anglo-Saxon we have the two symbols aud p. The first is only ad crossed ; the second was a rune and wascalled “thorn.” These, however, were not consistently employed one for the voiceless and one for the voiced sound ; also ¢h is

actually found in the oldest texts, and later on it occurs together with 8 and p. It is probable that the voiceless sound was originally the

only one in Teutonic. It was eventually differentiated into two sounds; but, as is usually the case, writing remained more archaic than speech. In modern English and Ice- landic, and probably in the parent Teutonic also, initial th is voiceless, except in English in a small number of pronouns and particles in common use, as “thou,” “ this,” “that,” “then,” “than,” “though,” “thus”; and it is regu- larly voiceless when final. The nature of the two sounds is this : the tongue is pressed against the back of the teeth (sometimes, especially when used by foreigners, against the bottom of the upper teeth) and either the breath for th or the voice for dh is forced through the interstices of the teeth. This pair of sounds is found in modern Greek, where th ap- pears as 9 and dh as 6. In Spanish and in Danish under certain circumstances the sound denoted by d is dh.

TABARI and Earty Aras Hisrortans. Arabian historians differ from all others in the unique form of their compositions. Each event is related in the words of eye-witnesses or contemporaries transmitted to the final narrator through a chain of intermediate reporters (rdwis), each of whom passed on the original report to his successor. Often the same account is given in two or more slightly divergent forms, which have come down through different chains of reporters. Often, too, one event or one important detail is told in several ways on the basis of several con- temporary statements transmitted to the final narrator through distinct lines of tradition. The writer therefore exercises no independent criticism except as regards the choice of authorities ; for he rejects accounts of which the first author or one of the intermediate links seems to him unworthy of credit, and sometimes he states which of several accounts seems to him the best. Modern judgment does not always confirm this choice; some authorities much esteemed by Moslems are by European scholars deemed untrustworthy, and vice versa. Fortunately the various historians did not always give preference to the same account of a transaction, and so one supplies what another omits.

A second type of Arabian historiography is that in which an author combines the different traditions about one occurrence into one continuous

narrative, but prefixes a statement as to the lines of authorities used and states which of them he mainly follows. In this case the writer

recurs to the first method, already described, only when the different traditions are greatly at variance with one another. In yet a third type of history the old method is entirely forsaken and we have a continuous narrative only occasionally imterrupted by citation of the authority for some particular point. But the principle still is that what has been well said once need not be told again in other words. The writer therefore keeps as close as he can to the letter of his sources, so that quite a late writer often reproduces the very words of the first narrator.

From very early times the Arabs had great delight in verses and tales, and the development of their language was certainly much influenced by this fact. In ancient times story-tellers and singers found their subjects in the doughty deeds of the tribe on its forays, in the merits of horse or camel, in hunting adveatures and love complaints, and some- times in contests with foreign powers and in the impression produced by the wealth and might of the sovereigns of Persia and Constantinople. The appearance of the Prophet with the great changes that ensued, the conquests that made the Arabs—till then a despised race—lords of half the civilized world, supplied a vast store of new matter for relations which men were never weary of hearing and recounting. They wished to know everything about the apostle of God, whose influence on his own time was so enormous, who had accomplished all that seemed impossible and had inspired the Arabs with a courage and confidence that made them stronger than the legions of Byzantium and Ctesiphon. Every one who had known or seen him was questioned and was eager to answer. Moreover, the word of God in the Koran left many practical points undecided, and therefore it was of the highest importance to know exactly how the Prophet had spoken and acted in various circumstances. Where could this be better learned than at Medina, where he had lived so long and where the majority of lis companions continued to live? So at Medina a school was gradually formed, where the chief part of the traditions about Mohammed and his first successors took a form more

or less fixed. Soon divers fathers of Islam began to assist memory by making notes, and their disciples sought to take written jottings of what they had heard from them, which they could carry with them when they returned to their homes. Thus by the close of the Ist century many dictata were already in circu- lation. For example, Hasan of Basra (d. 110 a.u.; 728 A.D.) had a great mass of such notes, and he was accused of some- times passing off as oral tradition things he had really drawn from books ; for oral tradition was still the one recognized authority, and it is related of more than one old scholar, and even of Hasan of Basra himself, that he directed his books to be burned at his death. The books were mere helps, and what they knew these scholars had handed on by word of mouth. Long after this date, when all scholars drew mainly from books, the old forms were still kept up. Tabari, for example, when he cites a book expresses himself as if he had heard what he quotes from the master with whom he read the passage or from whose copy he tran- scribed it. He even expresses himself in this wise: ‘Omar b. Shabba has related to me in his book on the history of Basra.”

Mistorians before Tabari.

Naturally, then, no independent book of the Ist century from the Flight has come down tous. But in the 2d cen- tury real books began to be composed. The materials were supplied in the first place by oral tradition, in the second by the dictata of older scholars, and finally by various kinds of documents, such as treaties, letters, collec- tions of poetry, and genealogical lists. Genealogical studies had become necessary through “Omar’s system of assigning state pensions to certain classes of persons according to

their kinship with the Prophet, or their deserts during his lifetime. This subject received much attention even in the Ist century, but books about it were first written in the 2d, the most famous being those of Ibn al-Kalbi (d. 146 4.4.), of his son Hisham? (d. 204), and of Al-Sharki ibn al-Kotami. Genealogy, which often called for elucidations, led on to history. Belddhort’s excellent Ansdb al-Ashraf (Genealogies of the Nobles) is a history of the Arabs on a genealogical plan.

The oldest extant history is the biography of the Prophet by Ibn Ishak (d. 150). This work is generally trustworthy. Mohammed’s life before he

appeared as a prophet and the story of his ancestors are indeed mixed -with many fables illustrated by spurious verses. But in Ibn Ishak's day these fables were generally accepted as history—for many of them had been first related by contemporaries of Mohammed— and no one certainly thought it blameworthy to put pious verses in the mouth of the Prophet's forefathers, though, according to the /hrist (p. 92), Ibn Ishak was duved by others with regard to the poems he quotes.

The Life of the Prophet by Ibn 'Okba (d. 141), based on the statements of two very trustworthy men, "Orwa ibn az-Zobair (d. 94) and Az-Zohri (d.124), seems to be quite lost, Sprenger having vainly made every effort to find a copy. It was still much read in Syria in the 14th century. But we fortunately possess the Book of the Campaigns of the Prophet by Al-Wakidi (d. 207) and the important Book of Classes of his disciple Ibn Sa'd.2 Wakidi had much more copious materials than Ibn Ishak, but gives way much more to a popular and sometimes romancing style of treatment. Nevertheless he sometimes helps us to re- cognize in Ibn Ishak's narrative modifications of the genuine tradition made for a purpose, and the additional details he supplies set various events before us in a clearer light. Apart from this his chief merits lie im his studies on the subject of the traditional authorities, the results of which are given by Ibn Sa'd, and in his chronology, which is often excellent. A special study of the traditions about the conquest of Syria made by De Goeje in 1864 led to the conclusion that Wakidi's chronology is sound as regards the main events, and that later historians have gone astray by forsaking his guidance. This result has been confirmed by certain contemporary notices found by Néldeke in 1874 in a Syriac MS. of the British Museum. And that Ibn Ishak agrees with Wakidi in certain main dates is import- ant evidence for the trustworthiness of the former also. For the chronology before the year 10 of the Flight Wakidi did his best, but here, the material being defective, many of his conclusions are precarious. Yet, though we have good ground for doubts, we are seldom able to construct a better chronology. Wakidi had already a great library at his disposal. He is said to have had 600 chests of books, chiefly dectata written by or for himself, but in part real books by Abt Mikhnaf (d. 130), Ibn Ishak (whom he uses but does not name), 'Awana (d. 147), and other authors. Abu Mikhnaf left a great number of monographs on the chief events from the death of the Prophet to the caliphate of Walid II. These

were much used by later writers, and we have many extracts from them, but none of the works themselves, except a sort of romance based on his account of the death of Hosain, of which Wiistenfeld has given a

1 Of Hisham b. al-Kalbi's book there are copies in the British Museum and in the Escorial.

2 Ibn Ishak's original work seems to be still extant in the Kopriilii library at Constantinople; the edition of it by Ibn Hisham has been edited by Wiistenfeld (Gottingen, 1858-60) and translated into German by Weil (Stuttgart, 1864).

8 'Wakidi has been edited from an imperfect MS. by Kremer (Cal- cutta, 1856). A condensed translation by Wellhausen appeared in 1882. The great book of Ibn Sa'd is unpublished, but there are some useful papers on it by Loth.

translation. With regard to the history of 'Irak in par- ticular he was deemed to have the best lights, and for this subject he is Tabart's chief source, just as Madain{, a younger contemporary of Wakidt, is followed by preference in all that relates to Khorasan. Madaint's History of the Caliphs is the best if not the oldest published before Tabart ; but this book has quite disappeared and is known only by the excerpts given by later writers, particularly Beladhori and Tabari. From these we judge that he had great narrative power with much clear and exact learning, and must be placed high as a critical historian. His plan was

to record the various traditions about an event, choosing

them with critical skill; sometimes, however, he fused the several traditions into a continuous narrative. A just estimate of the relative value of the historians can only be reached by careful comparison in detail. This has been essayed by Briinnow in his study on the Kharijites (Ley- den, 1884), in which the narrative of Mobarrad in the Kamil is compared with the excerpts of Madaint given by Beladhorf and those of Abt Mikhnaf given by

Tabart. The conclusion reached is that Abi Mikhnaf and Madéini are both well informed and impartial.

Among the contemporaries of Wakidi and Madaint were Ibn Khidash (d. 223), the historian of the family Mohallab, whose work was one of Mobarrad's sources for the History of the Khdriites ; Haitham ibn 'Adi (d. 207), whose works, though now lost, are often cited; and Saif ibn 'Omar at-Tamim{, whose book on the revolt of the tribes under Abu- bekr and on the Mohammedan conquests was much used by Tabari. Saif, however, seems to have been little es- teemed ; Beladhor{ very seldom cites him, and nothing can be found in Arabic literature about his life and those of his authorities. He is barely mentioned in the J%hrist, the writer plainly having nothing to tell of him, and blundering in the one thing he does say by representing his disciple Sho'aib as his master. Hajji Khalifa knows nothing but his name. His narratives are detailed and

often tinged with romance, and he is certainly much in-

ferior to Wakid{ in accuracy. Besides these are to be mentioned Abu 'Obaida (d. 209), who was celebrated as a philologist and wrote several historical monographs that

are often cited, and Azraki, whose excellent History of

Mecca was published after his death by his grandson (d. 244). With these writers we pass into the 3d century of Islam. But we have still an important point to notice in the 2d century; for in it learned Persians began to take part in the creation of Arabic historical literature. Ibn Mokaffa' translated the great Book of Persian Kings, and others followed his example. Tabari and his contem- poraries, senior and junior, such as Ibn Kotaiba, Ya'kubi, Dinawarf, preserve to us a good part of the information about Persian history made known through such transla- tions.1 But even more important than the knowledge conveyed by these works was their influence on literary style and composition. Half a century later began versions from the Greek either direct or through the Syriac. The pieces translated were mostly philosophical; but the Arabs also learned something, however superficially, of ancient history.

The 3d century was far more productive than the 2d. Abu “Obaida was presently succeeded by Ibn al-A‘rAbi (d. 231), who in like manner was chiefly famous as a philologist, and who wrote about ancient poems and battles. Much that he wrote is quoted in Tabrizi’s commentary on the //amdsa, which is still richer in extracts from the historical elucidations of early poems given by Ar-Riyashf (d. 257). Of special fame as a genealogist was Ibn Habib

1 For details see the introduction to Néldeke’s excellent translation

of Tabari’s History of the Persians and Arabs in the Sasanian Period, Leyden, 1879.

(d. 245), of whom we have a booklet on Arabian tribal names published by Wiistenfeld (1850). Azraki again was followed by Fakihi, who wrote a History of Mecca in 272,2 and “Omar b. Shabba (d. 262), who composed an excellent history of Basra, known to us only by excerpts. Of the works of Zobair b. Bakkar (d. 256), one of Tabart’s teachers, a learned historian and genealogist much consulted by later writers, there is a fragment in the Képriilii library at Con- stantinople, and another in Géttingen, part of which has been made known by Wiistenfeld (Die Familie Al-Zobair, Gottingen, 1878). Ya’kubi or Ibn Waédih wrote a short general history of much value, published by Houtsma (Ley- den, 1883). About India he knows more than his prede- cessors and more than his successors down to Bérunt. Ibn Khordadbeh’s historical works are lost. Ibn ‘Abdalhakam (d. 257) wrote of the conquest of Egypt and the West. Extracts from this book are given by De Slane in his Histoire des Berbéres, and others by Karle and Jones, from which we gather that it was a medley of true tradition and romance, and must be reckoned, with the book of his slightly senior contemporary, the Spaniard Ibn Habtb, to the class of historical romances (see below, p. 5). A high place must be assigned to the historian Ibn Kotaiba (d. 276), who, as Rosen has well shown, wrote a series of books with a view to raising the scholarship of the large class of hétibs or official scribes. To this series belong his very useful Handbook of History (ed. Wistenfeld, Géttingen, 1850) and his ‘Oydin al-Akhbdr, though the latter book according to the arrangement falls rather under the class of Mitterzx humaniores. Much more eminent is Belddhort (d. 279), whose book on the Arab conquest (ed.

De Goeje, Leyden, 1865-66) merits the special praise given to it by Mas‘udi, Of his great Ansdb al-Ashrdf a large part exists at Paris in the valuable collection of M. Schefer and another part was published by Ahlwardt in 1884. A contemporary, Ibn abi Tahir Taifur (d. 280), wrote on the ‘Abbasid caliphs and was drawn on by Tabarf. The sixth part of his work is in the British Museum. Of the universal history of Dinawari (d. 282), entitled The Long Narratives, an edition by Girgas is now (1887) in the press.

Tabari.

All these histories are more or less thrown into the shade by the great work of Tabari, whose fame has never faded from his own day to ours, and who well deserves to have this article on early Arabic histories placed under his name. Abt Ja‘far Mohammed b. Jarir at-Tabari (so his full name runs) is described as a tall lean figure, with large eyes, brown complexion, and hair which remained black till his death. His learning was astounding and few could speak so well. Born 224 a.H. (838-9 a.p.) at Amol in Tabaristan, he came to Baghdad as a young man and heard there the most famous teachers of the age. He travelled through Syria and Egypt (where he was in 263), and finally settled down in Baghdad, where he remained till his death in 310 (922 a.p.), always active and surrounded by pupils. He is said to have written forty pages daily for forty years. This no doubt is an exaggeration, but certainly he must have been a man of most persistent industry. His two chief works are a great Commentary on the Koran and his Annals. There is an anecdote to the effect that each originally filled 30,000 leaves, but that his pupils found them too extensive to be written to his dictation, and that he then resolved to condense them to a tenth of their original size, exclaiming, “God help us! Ambition is extinct.” One cannot say how far tliis story is true, but it is probable enough that his materials, at least for the Annals, were many times greater than the book itself.

? Published in excerpt by Wiistenfeld along with Azraki, Leipsic,

1857-59.

Where the same topic comes up in the Annals and in the Commentary we often find different traditions quoted, or the same tradition derived through different channels, and this shows the copious variety of his sources. Various parts of the Annals give the impression of being condensed. The Commentary was published before the Annals, and is better composed. It is the head corner-stone of Koran exegesis, as the Annals are of historiography. It came into general use mainly through the abridgment of Baghawi in the beginning of the 6th century of the Flight, being itself too large to be much read. The great book exists complete in the viceregal library at Cairo, and ought to be pub- lished at once.}

The Annals are a general history from the creation to 302 A.H., and are in the course of publicationat Leyden. They will fill some 7000 to 7500 pages, one and a half printed pages corresponding roughly to one leaf of Tabari's original MS. Tabarf added a supplement about his authorities, an abridgment of which is to follow the Leyden edition. It contains biographical notices of traditionalists, contempo- raries of Mohammed, and their successors to the second half of the 2d century.2_ Other works by Tabar{ will be spoken of in detail in the preface to the Leyden edition.

The success of the Annals and Commentary was due above all to the author's personality. The respect paid to him by his contemporaries appears in various anecdotes preserved in lus biography. His pupils had an unbounded admiration for his extraordinary knowledge, and what he said seemed to them the best that could be said. In truth, both his great works were the best of their kind, especially the Commentary, which, in the judgment of ail impartial critics, has not been equalled, before or since, in complete- ness, learning, and independent judgment. A contempo- rary says that "it would be worth a journey to China to procure the book." So general was this view that the opinion of 'Tabarf was quoted as a legal authority.

The inferiority of the Annals as a literary composition may be due partly to the author's years, partly to the in- equality of his sources, sometimes superabundant, some- times defective, partly perhaps to the somewhat hasty condensation of his original draft. Nevertheless the value of the book is very great: the author's selection of tradi- tions is usually happy, and the episodes of most import- ance are treated with most fulness of detail, so that

it deserves the high reputation it has enjoyed from the first. This reputation rose steadily; there were twenty copies (one of them written by Tabari's own hand) in the library of the Fatimite caliph 'Aziz (latter half of the 4th cen- tury), whereas, when Saladin became lord of Egypt, the princely library contained 1200 copies (Makrizi, i. 408 sq.). Only princes and rich men could own a_ book which in the time of 'Az{z cost one hundred dinars. We know that it had a place in most great libraries in other countries, for we find that it was used in all lands. Thus the fact that no complete copy can now be found any- where, and that the Leyden edition rests on odd volumes lying in various places, gives a striking image of what the East has suffered from barbarism.

The Annals soon came to be dealt with in various ways. They were published in shorter form with the omission of the names of authorities and of most of the poems cited ; some passages quoted by later writers are not found even in the Leyden edition. On the other hand, some interpola- tions took place, one in the author's lifetime and perhaps by his own hand. Then many supplements were written, e.g., by Ferghan{ (not extant) and by Hamadhant (partly preserved in Paris). 'Arib of Cordova made an abridg-

- See the excellent article by Loth in Z.D.IL@., xxxv. 588 sq.
- The MS. containing this abridgment is deseribed by Loth in 4.0,.M.G., xxxii, 581 sg. It is now in the British Museum.

ment, adding the history of the West and continuing the story to about 365.3 Ibn Mashkawaih wrote a history from the creation to 369 a.H., with the purpose of draw- ing the lessons of the story, following Tabart closely, as far as his book is known, and seldom recurring to other sources before the reign of Moktadir ; what follows is his own composition, and shows him to be a writer of talent.+ In 352 an abridgment of the Annals was translated into Persian by Bal'am{, who, however, interwove many fables.® Ibn al-Athir (d. 630) abridged the whole work, usually with judgment, but sometimes too hastily. Though he sometimes glided lightly over difficulties, his work is of service in fixing the text of Tabarf. He also furnished a continuation to the year 620. Later writers took Tabari as their main authority, but fortunately sometimes con- sulted other sources, and so add to our knowledge,— especially Ibn al-Jauzi (d. 597), who adds many

important details. These later historians had valuable help from the biographies of famous men and special histories of countries and cities, dynasties and princes, on which much labour was spent from the 4th century onwards.

Historians after Tabart.

The ehief historians after Tabarf may be briefly mentioned in chronologieal order. Razi (d. 825) wrote a History of Spain; Euty- ehius (d, 828) wrote Annals (published by Poeock, Oxford, 1656), whieh are very important beeause he gives the Christian tradition ; Ibn ‘Abd Rabbihi (d. 328) has very valuable historical passages in his famous miscellany called Al-‘Ikd al-Farid (8 vols., Cairo, 1298 A.H.); Sult (d. 835) wrote on the ‘Abbasid caliphs, their viziers and eourt poets; Mas‘tdt (see Mas‘tpy) composed various historieal and geographical works (d. 345). Of Tabari’s pet leet Hamza Is- pahani we have the Annals (published by Gottwaldt, St. Petersburg, 1844); Abu ‘l-Fara} al: Ispahani (d. 856) in his Book of Songs (Kitab al- Aghdnt, 20 vols., Cairo, 1285) gave the lives of poets whose songs were sung ; Ibn al-Kutiya (d. 367) wrote a History of Spain; Ibn Zulak (d. 887) a History of Egypt; ‘Otbi wrote the History of Mah- mud of Ghaznu (d. 421), at whose court he lived (printed on the margin of the Egyptian edition of Ibn al-Athir); Tha‘labi (d. 427) wrote a well-known History of the Old Prophets; Abi No‘aim al- Ispahant (d. 480) wrote a History of Ispahan, chicfly of the scholars of that eity; Tha‘alibi (d. 429 or 480) wrote, inter alia, a well- known History of the Pocts of his Time, now (1887) in course of publication at Damaseus. Bertini (d. 440) takes a high place aniong historians by his Chronology of Ancient Nations (ed. Sachau, Leipsie, 1878; Eng. trans., London, 1879) and his contributions to the history of India and Khwarizm; Koda’t (d. 454) wrote a De- scription of Egypt aud also various historical pieees, of which some are extant; Ibn Sa‘id of Cordova (d. 462) wrote a View of the History of the Varions Nations. Baghdad and its learned men found an exeellent historian in Al-Khatib al-Baghdadi (d. 468), and Spain in Ibn Haydn (d. 469), and half a century later in Ibn Khakan (d. 529) and Ibn Bassam (d. 542). Sam ‘ani (d. 562) wrote an exeellent book on genealogies; Ibn ‘Asdkir (d. 571) a History of Damaseus and her Scholars, which is of great value, and exists in whole or in part in several libraries. The Biographical Dictionary of the Spaniard

Ibu Pasenal (d. 578) and that of Dabbi, a some- what Junior contemporary, are edited in Codera's Bibliotheca Arab. Hisp, (1883-1885); Saladin found his historian in the famous 'Imad addin (d. 597). Ibn al-Jauzi, who died in the same year, has been already mentioned. Abdalwithid's Zistory of the Almo- hades, written in 621, was published by Dozy (2d ed., 1881). The geographer Yakut (d. 626) wrote also some historieal works, now lost, Abdallatif (d. 629) is known by his writings about Egypt (trans. De Saey, 1810); Ibn al-Athir (d. 680) wrote, in addition to the Chronicle already mentioned, a Biographical Diettonary of Con- temporartes of the Prophet. Kifti (d. 646) is espeeially known by his History of Arabic Philologists. Sibt ibn al-Jauzt (d. 654), grand- sou of the Ibn al-Jauzi already mentioned, wrote a great Chronicle, of which mueh the larger part still exists, Codera has edited (Madrid, 1886) Ibn al-'Abbar's (d. 658) Biographical Lemicon, al-

ready known by Dozy's exeerpts from it. Ibn al-'Adim (d. 660) is

? Of this work the Gotha library has a portion containing 290-820 A.H., of whieh the part about the West has been printed by Dozy in the Bayan, and the rest is to be published at Leyden.

4 A fragment (198-251 a.H.) is printed in De Goeje, Fragm. Hist. Ar., vol. ii., Leyden, 1871. Schefer possesses an exeellent MS. of the years 249-315 ; Oxford has another fragment, 345-360 a.H.; the seeond part is in the Eseorial.

® The first part was rendered into French by Dubeux in 1836. We have now an excellent Freneh translation by Zotenberg, 1874.

famed for his History of Aleppo, and Abi Shama (d. 665) wrote a well-known History of Saladin and Nureddin, taking a great deal from 'Imad addin, A. Miiller has recently published (1885) Ibn abi Osaibia's (d. 668) History of Physicians. The History of Ibn al-'Amid (d. 675), better known as ELMACIN (q.v.), was printed by Erpenius in 1625. Ibn Sa'id al-Maghribi (d. 673 or 685) is famous for his histories, but still more for his geographical writings. 'The noted theologian Nawawi (q.v.; d. 676) wrote a

Biographical Dictionary of the Worthies of the First Ages of Islam. Pre-cminent as a biographer is Ibn Khallikan (d. 681), whose much-used work was partly edited by De Slane and completely by Wiistenfeld (1835- 40), and translated into English by the former scholar (4 vols.,

1843-71),

Abu Panay, better known as Bar-Hebreus (d. 685), wrote besides his Syriac Chronicle an Arabic History of Dynasties (ed. Pocock, Oxford, 1663). Ibn‘Adhart’s History of Africa and Spain has been published by Dozy (2 vols., Leyden, 1848-51), and the Kartds of Ibn abi Zar’ by Tornberg (1848). Arab writers is Abulfeda (d. 732), whose Annales Muslemicx were published with a Latin version by Reiske (Copenhagen, 5 vols. 4to,

1789-94),

published by Fleischer (1831). Not less famous is the great

Encyclopxdia of his contemporary Nowairi (d. 732), but only some Ibn Sayyid an-Nas (d. 784) wrote a

extracts arc as yet in print. full biography of the Prophet ; Mizzi (d. 742) an extensive work on the men from whom traditions have been derived. We still possess, nearly complete, the great Chronicle of Dhahabt (d. 748), a very learned biographer and historian. the geographical and historical Masdlik al-Absdr of Ibn Fadlalléh (d. 749) is much to be desired. It is known at present by extracts given by Quatremére and Amari. Ibn al-Wardt (d. 749 or 750),

best known by his Cosmography, wrote a Chronicle which has been

Safadi (d. 764) got a great name as a bio-

printed in Egypt. grapher,

Shdfi’ite School. Of Ibn Kathir’s History the greatest part is ex-

tant. For the history of Spain and the Maghrib the writings of

Tbn al-Khatib (d. 776) are of acknowledged value. Another history, of which we possess the greater part, is the large work of Ibn al- Forat (d. 807).

Slane (1868). of the History of the Berbers, and there is a poor Egyptian edition of the whole work. grapher Firtizabddi (d. 817) only a Life of the Prophet remains.

Maxnizi (d. 845) is spoken of in a separate article; Ibn Hajar

(d, 852) is best_ known by his Biographical Dictionary of Contem- poraries of the Prophet, now in course of publication in the Biblio- theea Indica. Timur (Leeuwarden, 1767). ‘Aint (d. 855) wrote a General History, stillextant. Abu ’l-Mahdsin (d. 874) wrote at length on the history of Egypt; the first two parts have been published by Juynboll. Fliigel Jurists. Ibn Shihna (d. 890) wrote a History of Aleppo. Of Sa- khawi we possess a bibliographical work on the historians. The polymath Soyiti (d. 911) contributed a History of the Caliphs and many biographical pieces. Samhidt’s History of Medina is known through the excerpts of Wiistenfeld (1861). Ibn Iyds (d. 930) wrote a History of Egypt, and Diyarbekri (d. 966) a Life of Mo- hammed. To these names must be added MAKKARI (q.v.) and Hajji Khalifa, the famous Turkish bibliographer (d. 1068), who, besides his Bibliographical Lexicon and his well-known geography, the Jihdn-nwma, wrote histories, mostly in Turkish. He made use of European sources, and with him Arabic historiography may be said to cease, though he had some unimportant successors.

A word must be said of the historical romances, the beginnings of which go back to the first centuries of Islam. The interest in all that concerned Mohammed and in the allusions of the Koran to old prophets and races led many professional narrators to choose these subjects in place of the doughty deeds of the Bedouins. The increasing veneration paid to the Prophet and love for the marvellous soon gave rise to fables about his childhood, his visit to heaven, &c., which have found their way even into sober his- tories, just as many Jewish legends told by the converted Jew Ka”b al-Ahbar and by Wahb ibn Monabbih, and many fables about the old princes of Yemen told by ‘Abid, are taken as genuine history (see, however, Mas‘tidi, iv. 88 sq.). A fresh field for romantic legend was found in the history of the

victories of Islam, the exploits of the first heroes of the faith, the fortunes of ‘Ali and his house. Even under the first Omayyads there were in the mosques of most great cities preachers who edified the people by stories about Islam and its victories, and there is ample evidence that these men did not stick to actual fact. Sho’ba said of them ‘they get from us a handbreadth of tradition and make it an ell.” Then, too, history was often expressly forged for party ends,

One of the best known of

The History of the Time before Mohammed has been

A complete edition of

Yati’l (d. 768) wrote a Chronicle of Islam and Lives of Saints. Sobki (d. 771) published Lives of the Theologians of the

Far superior to all these, however, is the famous Ibn Khaldtin (d. 808), who proves himself a great thinker in the Prolegomena to his Universal History. Of the Prolegomena there are an edition by Quatremére (1858) and a French version by De The latter scholar also published text and version

Of the historical works of the famous lexico-

Ibn ‘Arabshah (d. 854) is known by his History of

as published Ibn Kotlubogha’s Biographies of the Hanafite

The ‘people swallowed all this, and so a romantic tradition sprang up side by side with the historical, and had a literature of its own,

the beginnings of which must be placed as early as the second century of the Flight. The oldest samples still extant are the

fables about the conquest of Spain ascribed to Ibn Habib (d. 288),

and those about the conquest of Egypt and the’ West by Ibn

‘Abdalhakam (d. 257). In these truth and falsehood are mingled,

as Dozy has shown in his Recherehes. But most of the extant literature of this kind is, in its present form, much more recent; e.g., the Story of the Death of Hosain by the Pseudo-Abi Mikhnaf (translated by Wiistenfeld) ; the Conquest of Syria by Abu Isma‘i] al-Bagri (edited by Nassau Lees, Calcutta, 1854, and discussed by De Goeje, 1864) ; the Psendo- Wakidi (sce Hamaker, De Expug- natione Memphidis ct Alexandriz, Leyden, 1885) ; the Pseudo-Ibn Kotaiba (see Dozy, Recherches) ; the book ascribed to A‘sam Kiufi,

&e. Further inquiry into the origin of these works is called for, but some of them were plainly directed to stir up fresh zeal against the Christians. In the 6th century some of these books had gained so much authority that they were used as sources, and thus mally un- truths crept into accepted history. (M. J. DEG.)

TABERNACLE, the portable sanctuary of Israel in the wilderness wanderings. Critical analysis of the PENTA- TEUCH (.v.) teaches us to draw a sharp line between the old notices of the tabernacle contained in the pre-Deutero- nomic history book (JE) and the account given by the post-exilic priestly narrator. The latter throws back into the time of Moses the whole scheme of worship and ritual of which the second temple was the centre, and, as this scheme necessarily implies the existence of an elaborate sanctuary on the pattern of the temple, he describes a tabernacle of extraordinary splendour pitched in the middle of the camp, with an outer and inner chamber and a court- yard, and all the apparatus of sacrificial and atoning ritual, just as in the temple, only constructed of boards, posts, and curtains so that it could be taken down and moved from place to place. The whole description is ideal, as appears not only from the details but from the fact that the old history knows nothing of such a structure. The Chronicler indeed, who had before him the Pentateuch in its present shape, assumes that after the Israclites entered Canaan the tabernacle continued to be the one legitimate place of sacrifice until it was superseded by Solomon’s temple, and represents it ag standing at Gibeon in the days of David and his son (1 Chron. xxi. 29 sg.; 2 Chron. i, 3). But the book of Kings knows Gibeon only as “the greatest high place” (1 Kings iii. 4).1

Again, the tabernacle of the Priestly Code is pre-emi- nently the sanctuary of the ark, bearing the name mishkan haedith, “the tabernacle of the testimony,” ¢.¢., the habit- ation in which lay “the ark of the testimony ” or chest containing the stones on which the decalogue was inscribed. But between Joshua’s days and the building of the temple the ark migrated from one tent or habitation to another (2 Sam. vii. 6; 1 Chron. xvii. 5), and at Shiloh it was housed not ina tent but ina temple (1 Sam. iii. 3, 15), And, while in the Priestly Code the tabernacle is the only legitimate sanctuary and its priests are the only legitimate priests, the whole history shows that no such restriction was even thought of till after the time of the prophet Isaiah.

With all this it agrees that the oldest parts of the Penta- teuch speak indeed of a tabernacle, but one of a quite different kind. The tabernacle of the Elohist (for of the two narratives—Elohistic and Jahvistic—which are com- bined in the so-called Jehovistic history only the former seems to mention it) isa tent which Moses pitched outside the camp (Exod. xxxiii. 7 sq.), and where Jehovah was wont to reveal Himself to him in the pillar of cloud, which descended for the purpose and stood at the door (Num. xi. 25; xii.5; xiv. 10); it is therefore called dhel mo‘éd, “the

1 Two passages in the old history, which comprises the books of Judges, Samuel, and Kings, speak of the tabernacle (dhel ma‘éd); but external and internal evidence show them to be interpolated (1 Sam. il, 22; 1 Kings viii. 4).

tent of tryst.” No description of it is given, nor is its origin spoken of, but something of the old narrative has obviously been lost before Exod. xxxiii. 7, and here what is lacking was probably explained. It appears, however, that it was very different from the tabernacle described by the priestly narrator. It was not in the centre of the camp but stood some distance outside it,! and it was not the seat of an elaborate organization of priests and guarded by a host of Levites, but had a single minister and custo- dian, viz., Joshua, who was not a Levite at all but Moses’ attendant (Exod. xxxiii. 11).

The existence of such a simple tent sanctuary presents none of the difficulties that beset the priestly narrative. Portable shrines were familiar to Semitic antiquity, and tents as sanctuaries were known to the Israelites in much later times at the high places and in connexion with irre- gular worships (Ezek. xvi. 16, “thou didst take of thy garments and madest for thyself sewn high places,” 2.e., shrines of curtains sewn together; 2 Kings xxiii. 7, where for “hangings for the grove” read “tents for the Ashera”; comp. Hos. ix. 6 and Syriac prakk, Assyrian parakku, a small chapel or shrine, from ‘the same root as Hebrew paroketh, the vail of the Holy of Holies). Such idolatrous tabernacles were probably relics of the usages of the nomadic Semites, and it is only natural that Israel in its wanderings should have had the like. And it is note- worthy that the portable chapels of the heathen Semites were mainly used for divination (comp. Journ. of Philol., Xili. 283 sq.), just as the Mosaic tabernacle is described by the Elohist not as a place of sacrifice (such as the tabernacle of the Priestly Code is) but as a place. of oracle.

The heathen shrines of this sort contained portable idols or baetylia (see Selden, De Dits Syrits, i. 6); but what the Mosaic tabernacle contained is not expressly told. The ordinary and seemingly the easiest assumption is that the ark stood in it, and Deut. x. 1 sg., which must be drawn from the lost part of the older narrative already alluded to, certainly places the construction of the ark, to contain the tables of stone, just before the time when the taber- nacle is first mentioned by the Elohist. But neither in Deuteronomy nor before it are the ark and the tabernacle ever mentioned together, and of the two old narrators it is not clear that the Jahvist ever mentions the tabernacle or the Elohist the ark. The relation between the two calls for further investigation, especially as the ark retains its importance after the occupation of Canaan, while the “tent of tryst” is not mentioned after the time of Moses, who, according to the Elohist (Exod. xii.), enjoyed at it a privilege of direct access to the Deity not accorded to later prophets.

TABERNACLES, Feast or. The original character of this Hebrew feast, celebrated at the close of the agri- cultural year as a thanksgiving for the produce of the seasons, but especially for the vintage and olive harvest, has been explained in PenrargvcH, vol. xviii. p. 511. As such it is described in the old law of Exod. xxiii. 16, under the name of “the feast of ingathering,

at the end of the year” (which, in the old Hebrew calendar, ran from autumn to autumn), “when thou hast gathered in thy labours out of the field” (comp. Exod. xxxiv. 22). The same feast is spoken of in Deut. xvi. 13 as “the feast of booths” (E.V. “tabernacles,” whence the current name of the feast), when “thou hast gathered in thy corn and wine” from the corn-floor and the wine-press. No ex- planation is here given of the name “feast of booths”; but after the exile it was understood that during this feast the people assembled at Jerusalem were to live in

1 In old Israel the sanctuary, after the people had settled down in cities, usually stood outside the town, and this was the case even with the temple at Jerusalem when it was first built.

booths constructed of branches of trees (Lev. xxiii. 39 sq.; Neh. viii. 14 sg.). The passage in Nehemiah, describing the celebration of the feast in 444 B.c., serves as a com- mentary on the post-exilic law in Leviticus, and from it we learn that the use of booths on that occasion had no foundation in traditional usage, but was based directly on the law, which then for the first time became generally known.? According to the law in question, the booths were to be a memorial of the wilderness wandering (Lev. xxi. 43), but of this there is no hint in Deuteronomy ; and, while it is quite in the style of the later law to attach a new historical reference to an old name like ‘feast of booths,” it is certain from Exodus that the feast had originally agricultural and not historical significance. As such it is exactly parallel to the vintage feasts of other ancient nations, e.g., to the Athenian Oschophoria. And, in particular, it is noteworthy that in Judges ix. 27 we find a vintage feast at Shechem among the Canaanites, from whom the Israelites first learned the ways of agri- cultural life, and from whom so much of the popular religion was copied. To acts of worship nominally ad- dressed to Jehovah, but really to the Canaanite Baalim, Hosea expressly reckons rites celebrated “on all corn- floors” (ix. 1), expressing thanks for divine gifts of corn, wine, and oil (ii. 8 sz.), and in their context these allusions leave no doubt that the prophet refers, in part at least, to autumn feasts, in which Jehovah worship was mingled with Canaanite elements (comp. Wellhausen, Prol. zur Gesch, Isr., cap. 3, ii; Eng, trans., p. 92 sq.). These feasts were local in character, but in northern Israel there was a great autumn feast at the royal sanctuary at Bethel (1 Kings xii. 33), as even in

the days of Solomon there was such a feast at Jerusalem (1 Kings viii. 2). In the nature of things the local feasts were the older, and it was the fame of great shrines that gradually tended to draw worshippers from a distance to temples like those of Jerusalem and Bethel. Finally, the Deuteronomic law of the one sanctuary and the course of events which made that law the practical rule of the remnant of Israel put an end to all local religious feasts, but at the same time obscured the old significance of the festal cycle, and made room for the historical interpretation of the celebrations, now concentrated at the temple, which prevailed among the later Jews (comp. Passover and PsnTEcost). In their later form all the yearly feasts have exact times and rules. In Deuteronomy the autunin feast is not yet tied toa day—it could hardly be so while it was still essentially a harvest thanksgiving—but in the priestly legislation it is fixed to commence on the fifteenth day of the seventh month (Ley. xxiii. 34). In Deuteronomy the feast lasts seven days; Lev. xxiii. 36 adds an eighth, and this day ultimately became the most important (John vii. 37).

If we accept the conclusion that the autumn festival was origin- ally a vintage feast celebrated in local sanctuaries, the name ‘“feast of booths” admits of a natural explanation. The Canaan- ite feast at Shechem and the Hebrew feast at Shiloh (Judges xxi. 21) were partly celebrated abroad in the vineyards, and Hosea also knows such feasts on the open corn-floors. That it was usual to go forth and live in booths during the vintage may be concluded from Isa.i.8; the same practice still prevails at Hebron (Robinson, Bibl. Res., ii. 81). If it was these booths erected among the vine- yards that originally gave their name to the feast, we can under- stand how the book of Nehemiah recognizes the crection of booths within the city of Jerusalem as an innovation. No doubt at all feasts where there was a great concourse of visitors many would be compelled to live in tents ; this secms to have been the case even in old Israel (Hos. xii. 9). But that is quite a different thing from the latcr observance, in which booths or bowers had to be made and used even by those who had houses of their own.

- The expression that the Israelites had not done so since the days of Joshua means that there was no recollection of their having ever done so; for of course it is assumed that Joshua carried out every direction of the law.

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TABLES i

TABLES, Maruematican. In any table the results tabulated are termed the “tabular results” or “respond- ents,” and the corresponding numbers by which the table is entered are termed the “arguments.” A table is said to be of single or double entry according as there are one or two arguments. For example, a table of logarithms is a table of single entry, the numbers being the arguments and the logarithms the tabular results ; an ordinary multiplication table is a table of double entry, giving xy as tabular result for x and y as arguments. The intrinsic value of a table

jelue of may be estimated by the actual amount of time saved by

consulting it ; for example, a table of square roots to ten decimals is more valuable than a table of squares, as the extraction of the root would occupy more time than the multiplication of the number by itself. The value of a table does not depend upon the difficulty of calculating it; for, once made, it is made for ever, and as far as the user is concerned the amount of labour devoted to its original construction is immaterial. In some tables the labour re- quired in the construction is the same as if all the tabular results had been calculated separately; but in the majority of instances a table can be formed by expeditious methods which are inapplicable to the calculation of an individual result. This is the case with tables of a continuous quan- tity, which may frequently be constructed by differences. The most striking instance perhaps is afforded by a factor table or a table of primes; for, if it is required to deter- mine whether a given number is prime or not, the only available method (in the absence of tables) is to divide it by every prime less than its square root or until one is found that divides it without remainder. But to forma table of prime numbers the process is theoretically simple and rapid, for we have only to range all the numbers in a line and strike out every second beginning from two, every third beginning from three, and so on, those that remain being primes. Even when the tabular results are con- structed separately, the method of differences or other methods connecting together different tabular results may afford valuable verifications. By having recourse to tables not only does the computer save time and labour but he also obtains the certainty of accuracy; in fact, even

when the tabular results are so easy to calculate that no time or mental effort would be saved by the use of a table, the certainty of accuracy might make it advantageous to employ it.

The invention of logarithms in 1614, followed immedi- ately by the calculation of logarithmic tables, revolutionized all the methods of calculation ; and the original work per- formed by Briggs and Vlacq in calculating logarithms 260 years ago has in effect formed a portion of every arith- metical operation that has since been carried out by means of logarithms. And not only has an incredible amount of labour been saved! but a vast number of calculations and researches have been rendered practicable which otherwise would have been quite beyond human reach. The mathematical process that underlies the tabular method of obtaining a result may be indirect and complicated ; for example, the logarithmic method would be quite unsuitable for the multiplication of two numbers if the logarithms had to be calculated specially for the purpose and were not already tabulated for use. The arrangement of a table on the page and all typographical details—such as the shape of the figures, their spacing, the thickness and placing of the rules, the colour and quality of the paper,

v¢.—are of the highest importance, as the computer has

1 Referring to factor tables, Lambert wrote (Supplementa Tabularum, 1798, p. xv.): “ Universalis finis talium tabularum est ut semel pro Semper computetur quod sepius de novo computandum foret, et ut

pro omni casu computetur quod in futurum pro quovis casu compu- tatum desiderabitur.” This applies to all tables.

- 1,020,000.

to spend hours with his eyes fixed upon the book ; and the efforts of eye and brain required in finding the right numbers amidst a mass of figures on a page and in taking them out accurately, when the computer is tired as well as when he is fresh, are far more trying than the mechanical action of simple reading. Moreover, the trouble required by the computer to learn the use of a table need scarcely be considered; the important matter is the time and labour saved by it after he has learned its use. Tables are, aS a rule,

intended for professional and not amateur use ; and it is of little moment whether the user who is unfamiliar with a table has to spend ten seconds or a minute in obtaining an isolated result, provided it can be used rapidly and without risk of error by a skilled computer.

In the following descriptions of tables an attempt is made to give an account of all those that a computer of the present day is likely to use in carrying out arithmet- ical calculations. Tables of merely bibliographical or historical interest are not regarded as coming within the scope of this article, although for special reasons such tables are briefly noticed in some cases. ‘Tables relating to ordinary arithmetical operations are first described, and afterwards an account is given of the most useful and least technical of the more strictly mathematical tables, such as factorials, gamma functions, integrals, Bessel’s functions, &e, It is difficult to classify the tables de- scribed in a perfectly satisfactory manner without prolixity, as many collections contain valuable sets belonging to a variety of classes. Nearly all modern tables are stereo- typed, and in giving their titles the accompanying date is either that of the original stereotyping or of the turage in question. In tables that have passed through many editions the date given is that of the edition described. A much fuller account of general tables published previously to 1872, by the present writer, is contained in the British Association Report for 1873, pp. 1-175; and to this the reader is referred.

Lables of Divisors (Factor Tables) and Tables of Primes.—The Divisors existing factor tables extend to 9,000,000. In 1811 Chernac pub- and lished at Deventer his Cribrum Arithmeticum, which gives all the primes. prime divisors of every number not divisible by 2, 3, or 5 up to In 1814-17 Burckhardt published at Paris his Tables des Diviseurs, giving the least divisor of every number not divisible by 2, 8, or 5 up to 8,036,000. The second million was issued in 1814, the third in 1816, and the first in 1817. The corresponding tables for the seventh (in 1862), eighth (1868), and ninth (1865) mil- lions were calculated by Dase and issued at Hamburg. Dase died suddenly during the progress of the work, and it was completed by Rosenberg. Dase’s calculation was performed at the instigation of Gauss, and he began at 6,000,000 because the Berlin Academy Was in possession of a manuscript presented by Crelle extending Burckhardt’s tables from 3,000,000 to 6,000,000. This manuscript, not having been published by

1877, was found on examination to be so inaccurate that the publication was not desirable, and accordingly the three intervening millions were calculated and published by James Glaisher, the Factor Table for the Fourth Million appearing at London in 1879, and those for the fifth and sixth millions in 1880 and 1883 respectively (all three mil- lions stereotyped). The tenth million, though calculated by Dase and Rosenberg, has not been published. It is in the possession of the Berlin Academy, having been presented in 1878. The nine quarto volumes (Z'adles des Diviseurs, Paris, 1814-17; Factor Tables, London, 1879-83 ; Factoren-Tafeln, Hamburg, 1862-65) thus form one uniform table, giving the least divisor of every number not divisible by 2, 8, or 5, from unity to nine millions. The arrange- ment of the results on the page, which is due to Burckhardt, is admirable for its clearness and condensation, the least factors for 9000 numbers being given on each page. The tabular portion of each million occupies 112 pages. The first three millions were issued separately, and also bound in one volume, but the other six millions are all separate. Burckhardt began with the second million instead of the first, as Chernac's factor table for the first million was already in existence. Burckhardt's first million does not supersede Chernac's, as the latter gives all the prime divisors of numbers not divisible by 2, 3, or 5 up to 1,020,000. It occupics 1020 pages, and Burckhardt found it very accurate; he detected only thirty-eight errors, of which nine were due to the author, the remaining twenty-nine having been caused by the slipping of type

in the printing. The errata thus discovered are given in the first million. Burckhardt gives but a very brief account of the method by which he constructed his table ; and the introduction to Dase's millions merely consists of Ganss's letter suggesting their eon- struction. The Introduction to the Fourth Million (pp. 52) con- tains a full aceount of the method of construction and a history of factor tables, with a bibliography of writings on the subject. The Introduction (pp. 103) to the Sixth ALillion contains an enumeration of primes and a great number of tables relating to the distribution of primes in the whole nine millions, portions of which had

been published in the Cambridge Philosophical Proceedings and elsewhere. The factor tables which have been described greatly exeeed in both extent and accuracy any others of the same kind, the largest of which only reaches 408,000. This is the limit of Felkel's Tafel aller einfachen Faeteren (Vienna, 1776), a remark- able and extremely rare book," nearly all the copies having been de- stroyed. Vega (Zabulx, 1797) gave a table showing all the divisors of numbers not divisible by 2, 3, or 5 up to 102,000, followed by a list of primes from 102,000 to 400,313. In the earlier editions of this work there are several errors in the list, but these are no doubt corrected in Hiilsse's edition (1840). These are the largest and most convenient tables after those of Chernac. Salomon (1827) gives a factor table to 102,011, Kohler (Handbueh, 1848) all divisors up to 21,524, and Houél (Tables de Logarithmes, 1871) least divisors up to 10,841. Barlow (Tables, 1814) gives the complete resolution of every number up to 10,000 into its factors; for example, corre- sponding to 4932 we have given 2?.37.137. This table is unique so far as we know. The work also contains a list of primes up to

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(Vannes, 1832), which extends to 40,000. In Merpaut's work the quarter-square is termed the "arithmone." Ludolf, who published in 1690 a table of squares to 100,000 (see next paragraph), explains in his introduction how his table may be used to effect multiplications by means of the above formula; but the earliest book on quarter- squares is Voisin, Tables des Aultiplications, ow logarithmes des nombres entiers depuis 1 jusqu'a 20,000 (Paris, 1817). By a log- arithm Voison means a quarter-square, 7@.e., he calls a a root and ja? its logarithm. On the subject of quarter-squares, &c., see the paper (already referred to) in Phil. Mag., November 1878,

Squares, Cubes, &c.—The most convenient table for general use, Squares, as well as the most extensive, is Barlow's Tables (Useful Knowledge cubes, &e.

Society, London, from the stereotyped plates of 1840), which gives squares, cubes, square roots, cube roots, and reciprocals to 10,000. The largest table of squares and cubes is Kulik, Zafeln der Quadrat- und Kubik-Zahlen (Leipsic, 1848), which gives botli as far as 100,000. ‘Two early tables also give squares as far as 100,000, viz., Maginus, Zabula Tetragonica (Venice, 1592), and Ludolf, Tetragonometria Tabularia (Amsterdain, 1690). Hutton, Tables of Products and Powers of Numbers (London, 1781), gives squares up to 25,400, cubes to 10,000, and the first ten powers of the first hundred numbers. Barlow, Alathematieal Tables (original edition, London, 1814), gives the first ten powers of the first hundred numbers. The first nine or ten powers are given in Vega, Tabulx (1797), and in Hiilsse’s edition of the same (1840), in Kohler, Handbuch (1848), and in other collections. Faa de Bruno, Caleul des Erreurs (Paris, 1869), and Miiller, Vierstellige Logarithmen (1844), give squares for use in connexion with the method of least squares. Small tables

100,103, Both these tables are omitted in the stereotyped reprint | occur frequently in books intended for engineers and practical men. of 1840. In Kees’s Cyclopxdia (1819), article ‘‘ Prime Numbers,” | Draeh (Messenger of Math., vol. vii., 1878, p. 87) has given to 33 there is a list of primes to 217,219 arranged in decades. ‘The | places the cube roots (and the cube roots of the squares) of primes Fourth Mitlion (1879) contains a list of primes up to 30,341. Qn | up to 127. Small tables of powers of 2, 3, 5, 7 occur in various the first page of the Second Million Burckhardt gives the first nine | collections. In Vega’s Tabulew (1797, and the subsequent editions,

multiples of the primes to 1423; and a smaller table of the same kind, extending only to 313, occurs in Lambert’s Supplementa. Multiplication Tables—A multiplication table is usually of double entry, the two arguments being the two factors; when so arranged it is frequently called a Pythagorean table. The largest

including Hiilsse’s) the powers of 2, 3, 5 as far as the 45th, 36th, and 27th respectively are given ; they also occur in Kohler’s Hand- buch (1848). The first 25 powers of 2,3, 5, 7 are given in Salomon, Logarithmische Tafeln

(1827). Shanks, Rectification of the Cirele (1853), gives powers of 2 up, to 2721,

Triangular Numbers.—E. de Joncourt, De Natura et Preelaro Tri- Usu Simplicissime Speciei Numerorum Trigonalium (The Hague, angular 1762), contains a table of triangular numbers up to 20,000: viz., numbers. 4n(1 +1) is given for all numbers from ~=1 to 20,000. The table occupies 224 a

Reeiprocals.—Barlow's Tables give reciprocals up to 10,000 to 9 or Reci-

10 places ; and they have been carried to ten times this extent by procals.

and most useful work is Crelle's Rechentafeln (stereotyped, Bremiker's edition, 1864), which gives in one volume all the products up to 1000 × 1000, so arranged that all the multiples of any one number appear on the same page. 'The original edition was published in 1820 and consisted of two thick octavo volumes. The second (stereotyped) edition is a convenient folio volume of 450 pages. Only one other multiplication table of the same extent has appeared,

viz., Herwart von Hohenburg's Zabulx Arithmetice Mpocbapat- pécews Universales? (Munich, 1610), on which see Napier, vol. xvii. p- 183. The invention of logarithms four years later afforded another ineans of performing multiplications, and Von Hohenburg's work never became generally known. 'The three following tables are for the multiplication of a number bya single digit. (1) Crelle, Erleichterungs-Tafel fiir jeden, der zu reehnen hat (Berlin, 1836), a work extending to 1000 pages, gives the product of a number of seven figures by a single digit, by means of a double operation

Oakes, Zable of the Reeiprocals of Numbers from 1 to 100,000 (London, 1865). This gives seven figures of the reciprocal, and is arranged like a table of seven-figure logarithms, differences being added at the side of the page. The reciproeal of a number of five figures is therefore taken out at once, and two more figures may be interpolated for as in logarithms. Picarte, Za Division réduite a une Addition (Paris, 1861), gives to ten significant figures the reciprocals of the numbers from 10,000 to 100,000,

and also the first nine multiples of these reciprocals. Small tables of reciprocals

are not common.

Tables for the Expression of Vulgar Fractions as Decimals.—Tables Vulgar of this kind have been given by Wucherer, Goodwyn, and Gauss. fractions Wucherer, Beytrige zum allgemeinern Gebrauch der Deeimalbriiche as

of entry. Hach page is divided into two tables: for example, | to multiply 93882477 by 7 we turn to page 825, and enter the right- hand table at“line 77, column 7, where we find 77339 ; we then enter the left-hand table on the same page at line 93, column 7,

Quarter- squares,

and find 656, so that the product required is 65677339. (2) Bretsehneider, Produktentafel (Hamburg aud Gotha, 1841), is some- what similar to Crelle’s table, but sinaller, the number of figures in the multiplicand being five instead of seven. (3) In Laundy, 4 Table of Products (London, 1865), the produet of any five-figure number by a single digit is given by a double arrangement. The extent of the table is the same as that of Bretschneider’s, as also is the principle, but the arrangement is different, Laundy’s table occupying only 10 pages and Bretschneider’s 99 pages. Among earlier works may be notieed Gruson, Grosses Kinmatleins von Eins bis Hunderttausend (Berlin, 1799),—a table of products up to 9×10,000. The author’s intention was to extend it to 100,000, but we believe only the first part was published. In this book there is no condensation or double arrangement; the pages are very large, each containing 125 lines. Quarter-Squares.—Multiplication may be performed by means of a table of single entry in the manner indicated by the formula— ab=}(a+b)?-4(a —b), Thus with a table of quarter-squares we can multiply together any two numbers by subtracting the quarter-square of their difference from the quarter-square of theirsum. The largest table of quarter- squares is Laundy, Zable of Quarter-Squares of all Numbers up to 100,000 (London, 1856). Smaller works are Centnerschwer, MVeu- erfundene Multiplieations- und Quadrat-Tafeln (Berlin, 1825), which extends to 20,000, and Merpaut, Tables Arithmonomiques 1 For information about it, see a paper on “ Factor

Tables," in Cumb. Phil. Proe., vol. iii. (1878) pp. 99-138, or the Introduction to the Fourth Million.

2 See a paper "On Multiplication by a Table of Single Entry," in Phil. Mag., November 1878, for a notice of this book.

(Carlsruhe, 1796), gives the decimal fractions (to 5 places) for all decimals,

vulgar fractions whose numerator and denominator are each less than 50 and prime to one another, arranged according to denomi- nators. The most extensive and elaborate tables that have been published are contained in Henry Goodwyn's First Centenary of Tables of all Decimal Quotients (London, 1816), 4A Tabular Series of Decimal Quotients (1823), and A Table of the Cireles arising from the Division of a Unit or any other Whole Number by all the Integers from Z to 1024 (1823). The Tabular Series (1823), running to 153 pages, gives to 8 places the decimal corresponding to every vulgar fraction less than 7°°, whose numerator and denominator do not surpass 1000. The arguments are not arranged according to their numerators or denominators, but according to their magnitude, so that the tabular results exhibit a steady increase from '001 (=z59) to 09989909 (=,9°;). The author intended the table to include all fractions whose numerator and denominator were each less than 1000, but no more was ever published. The Zable of Cireles (1823) gives all the periods of the circulating decimals that can arise from the division of any integer by another integer less than 1024. Thus for 13 we find 076928 and '153846, which are the only periods in which the fraction 3 can circulate. The table occupies 107

pages, some of the periods being of eourse very long (¢.g., for 1021 the period contains 1020 figures). The First Centenary (1816) gives the complete periods of the reciprocals of the numbers from 1 to 100. Goodwyn's tables are very scarce, but as they are nearly unique of their kind they deserve special notice. A second edition of the First Centenary was issued in 1818 with the addition of some of the Tabular Series, the numerator not exceeding 50 and the denomi-

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nator not exceeding 100. A posthumous table of Gauss's, entitled '*Tafel zur Verwandlung gemeiner Briiche mit Nennern aus dem ersten Tausend in Decimalbriiche," occurs in vol. il, pp. 412-434 of his Gesummelte Werke (Gottingen, 1863), and resembles Goodwyn's Table of Circles. On this subject see a paper ''On Circulating Decimals, with special reference to Henry Goodwyn's Table of Circles and Tabular Series of Decimal Quotients," in Camb. Phil. Proc., vol. iii. (1878), pp. 185-206, where is also given a table of the periods of fractions corresponding to denominators prime to 10 from 1 to 1024 obtained by counting from Goodwyn's table. Sec also the section on '' Circulating Decimals," p. 13 below.

complete canon giving all the six ratios of the sides of a right-angled triangle is due to Rheticus (1551), who also introduced the semi- quadrantal arrangement. Rheticus's canon was calculated for every ten minutes to 7 places, and Vieta extended it to every minute (1579). In 1554 Reinhold published a table of tangents to every minute, The first complete canon published in England was by Blunedvile (1594), although a table of sines had appcared four years earlier. Regiomontanus called his table of tangents (or rather cotangents) tabula fecunda on account of its great usc; and till the introduction of the word "tangent" by Finck (Geometriv Rotundi Libri XIV., Basel, 1583) a table of tangents was called a tabula fecunda or canon facundus. Besides '' tangent," Finck also introduced the word ''secant," the table of secants having pre- viously been called tabula benefica by Maurolycus (1558) and tabula Sacundissima by Vieta.

By far the greatest computer of pure trigonometrical tables is George Joachim Rheticus, whose work has never been superseded. IIis celebrated ten-decimal canon, the Opus Palatinum, was pub- lished by Valentine Otho at Neustadt in 1596, and in 1613 his fiftcen-decimal table of sines by Pitiscus at Frankfort under the title Thesawrus Mathematicus. The Opus Palatinwm contains a complete ten-decimal trigonometrical canon for every ten seconds of the quadrant, semiquadrantally arranged, with differences for all the tabular results throughout. Sines, cosines, and sccants are given on the left-hand pages in columns headed respectively ''Perpendiculum," "Basis," "Hypotenusa," and on the right-hand appear tangents, cosecants, and cotangents in columns headed respectively '' Perpendiculum," '' Hypotenusa," '' Basis." At his death Rheticus left the canon nearly

complete, and the trigonometry was finished and the whole edited by Valentine Otho; it was named in honour of the elector palatine Frederick IV., who bore the ex- pense of publication. The Thesaurus of 1613 gives natural sincs

labours undertaken by Rheticus; his tables not only remain to this day the ultimate authorities but formed the data whereby Vlacq calculated his logarithmic canon. Pitiscus says that for twelve years Rheticus constantly had computers at work.

A history of trigonometrical tables by Hutton was prefixed to all the early editions of his Tables of Logarithms, and forms Tract xix. of his Mathematical Tracts, vol. i. pp. 278-306, 1812. A good deal of bibliographical information about the Opus Palatinwm and earlier trigonometrical tables is given in De Morgan's articlo '*Tables" in the English Cyclopedia. The invention of logarithms the year after the publication of Rheticus's volume by Pitiscus

xagesi- Sexagesimal and Scaccntenary Tables.—Originally all caleulations | changed all the methods of calculation ; and it is worthy of noto pl ap land were sexagesimal ; and the relics of the system still exist in the | that Napier's original table of 1614 was a logarithmic canon of sines ice cen- division of the degree into 60 minutes and the minute into 60 | and not a table of the logarithms of numbers. The logarithniic gary. ary. seconds. To facilitate interpolation, therefore, in trigonometrical | canon at once superseded the natural canon ; and since Pitiscus's and other tables the following large sexagesimal tables werc con- | time no really extensive table of pure trigonometrical functions has structed. John Bernoulli, 4 Seaxcentenary Table (London, 1779), | appeared. In recent years the employment of the arithmometer gives at once the fourth term of any proportion of which the first | of Thomas de Colmar has revived the use of tables of natural term is 600" and each of the other two is less than 600'; the | trigonometrical functions, it being found convenient for some table is of double entry, and may be more fully described as giving | purposes to employ an arithmometer and a natural canon instcad ay of a logarithmic canon. Junge's Tafel der wirklichen Linge der the value of <75 correct to

tenths of a second, x and y each con- | ginas und Cosinus (Leipsic, 1864) was published with this object. taining a number of seconds less than 600. Michael Taylor, A Scxa- | It gives natural sines and cosines for every ten seconds of the gesimal Table (London, 1780), exhibits at sight the fourth term of | quadrant ‘to 6 places. F. M. Clouth, 7 ables pour le Calcul des any proportion where the first term is 60 minutes, the second any | Coordonnées Goniométriques (Mainz, n.d.), gives natural sines and number of minutes less than 60, and the third any number of | ©osines(to 6 places) and their first nine multiples (to 4 places) for minutes and seconds under 60 minutes ; there is also another table | every centesimal minute of the quadrant. Tables of natural func- in which the third term is any absolute number under 1000. Not | tions occur in many collections, the natural and logarithmic values much use seems to have been made of these tables, both of which | being sometimes givcn on opposite pages, sometimes side by sido were published by the Commissioners of Longitude. Small tables | on the same page. : ; ' . for the conversion of sexagesimals into centesimals and vice versa The following works contain tables of trigonometrical functions ; are given in a few collections, such as Hiilsse’s edition of Vega. other than sines, cosines, and tangents. Pasquich, Tabule Log- igon) figono- Trigonometrical Tables (Natwral).—Peter Apian published in1533 | arithmico- Trigonometrice (Leipsic, 1817), contains a table of sin? , jetric} @btrical. a table of sines with the radius divided decimally. The first | cos*x, tan?x, cot?x from a=1° to 45° at intervals of 1’ to 5 places.

Andrew, Astronomical and Nautical Tables (London, 1805), con- tains a table of ‘‘squares of natural semichords,” 7.¢., of sin? 4 from x=0° to 120° at intervals of 10” to 7 places. This table has recently been greatly extended by Major-General Hannyngton in his Haversincs, Natural and Logarithinic, used in computing Lunar Distances for the Nautical Almanac (London, 1876). The namo “haversine,” now frequently used in works upon navigation, is an abbreviation of “half versed sine”; viz., the haversine of z is equal to 4(1-cos), that is, to sin’4a, The table gives logarithmic haversines for every 15” from 0° to 180°, and natural haversines for every 10” from 0° to 180°, to 7 places, except near the beginning, where the logarithms are given to only 5 or 6 places. The work itself occupies 327 folio pages, and was suggested by Andrew’s, a copy of which by chance fell into Hannyngton’s hands. Han- ee recomputed the whole of it by a partly

mechanical method, a combination of two arithmometers being employed. A table of haversines is useful for the solution of spherical triangles when two sides and the included angle are given, and in many other problems in spherical trigonometry. Andrew's original table seems to have attracted very little notice. Hannyngton's was printed, on the recommendation of the superintendent of the Nautical Almanac office, at the public cost. Before the cal- culation of Hannyngton's table Farley's Natural Versed Sines (London, 1856) was used in the Nautical Almanac office in com- puting lunar distances. This fine table contains natural versed sines from 0° to 125° at intervals of 10" to 7 places, with proportional parts, and log versed sines- from 0° to 185° at intervals of 15" to 7 places. The arguments are also given in time. The manuscript was used in the office for twenty-five years before it was printed. Traverse tables, which occur in most collections of navigation tables, contain multiples of sines and cosines.

Common or Briggian Logarithms of Numbers and Trigono- Common

for every ten seconds throughout the quadrant, to 15 places, semi-quadrantally arranged, with first, second, and third differences, Natural sines are also given for every second from 0° to 1° and from

metrical Rattos.—For an account of the invention and history of or Brig- logarithms, see LoGARITHMS (vol. xiv. p. 773) and Narimr. 'The gian log- following are the fundamental works which contain the results of arithms.

89° to 90°, to 15 places, with first and second differences. The rescue of the manuscript of this work by Pitiscus forms a striking episode in the history of mathematical tables. The alterations and cinendations in the earlier part of the corrected edition of the Opus Palatinum were made by Pitiscus, who had his suspicions that Rheticus had himself calculated a ten-second table of sines to 15 decimal places; but it could not be found. Eventually the lost canon was discovered amongst the papers of Rheticus, which had passed from Otho to James Christmann on the death of the former. Amongst these Pitiscus found (1) the ten-second table of sines to 15 placcs, with first, second, and third differences (printed in the Thesaurus); (2) sines for every second of the first and last degrees of the quadrant, also to 15 places, with first and second differences ; (3) the commencement of a canon of tangents

and secants, to the saine number of decimal places, for every ten seconds, with first and second differences ; (4) a complete minute canon of sines, tangents, and secants, also to 15 decimal places. These tables taken in

connexion with the Opus Palatinwm givo an idea of the enormous | Thesawrus Logarithmorum Completus.

the original calculations of logarithms of numbers and trigono- metrical ratios :—Briggs, Arithmetica Logarithmica (London, 1624), logarithms of numbers from 1 to 20,000 and from 90,000 to 100,000 to 14 places, with interscript differences ; Vlacq, Arithmctica Log- arithmica (Gouda, 1628, also an English edition, London, 1631, the tables being the same), ten-figure logarithms of numbers from 1 to 100,000, with differences, also log sines, tangents, and secants for every minute of the quadrant to 10 places, with interscript differences ; Vlacq, Trigonometria Artificialis (Gouda, 1633), log sines and tangents to every ten seconds of the quadrant to 10 places, with differences, and ten-figure logarithms of numbers up to 20,000, with differences; Briggs, Trigonometria Britannica (London, 1633), natural sines to 15 places, tangents and secants to 10 places, log sines to 14 places, and tangents to 10 places, at intervals of a hundredth of a degree from 0° to 45°, with interscript differences for all the functions. In 1794 Vega re-printed at Leipsic Vlacq’s two works in a single folio volume, The arrangement of the

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table of logarithms of numbers is more eompendious than in Vlaeq, being similar to that of an ordinary seven-figure table, but it is not so convenient, as inistakes in taking out the differenees are more lable to oceur. The trigonometrical canon gives log sines, cosines, tangents, and eotangents, from 0° to 2° at intervals of one seeond, to 10 places, without differences, and for the rest of the quadrant at intervals of ten seeonds. The trigonometrical eanon is not wholly reprinted from the Trigonometria LOGARITHMS, p. 776 ; eomp. also Monthly Notices of Roy. Ast. Soe. for May 1872, June 1872, Mareh 1873, and 1874, suppl. number). Vega seems not to have bestowed on the trigonometrieal canon anything like the eare

that he devoted to the logarithms of numbers, as Gauss} estimates the total of last-figure errors at from 31,983 to 47,746, most of them only amounting to a unit, but some to as mueh as 38or 4, As these errors in the Trigonometria Artificialis still remain uncorreeted, it eannot be said that a reliable ten-plaee logarithmie trigonometrical eanon exists. The ealeulator who has oeeasion to perform work requiring ten-figure logarithms of numbers should use Vlaeq's Arithmetica Logarithmica of 1628, after earefully correeting the errors pointed out by Vega and Lefort. After Vlaeq, Vega's Thesaurus is the next best table ; and Pineto's Tables de Logarithmes Vulgaires & Dix Décimales, con struites @apres un nouveau mode (St Petersburg, 1871), though a traet of only 80 pages, may be usefully employed when Vlacq and Vega are unprocurable. Pineto's work consists of three tables: the first, or auxiliary table, eontains a series of factors by which the numbers whose logarithms are required are to be multiplied to bring them within the range of table 2 ; it also gives the loga- rithms of the reeiproeals of these faetors to 12 places. 'lable 1 merely gives logarithms to 1000 to 10 plaees. Table 2 gives logarithms from 1,000,000 to 1,011,000, with proportional parts to hundredths. The mode of using these tables is as follows. If the logarithm eannot be taken out direetly from table 2, a factor Mis found from the auxiliary table by which the number must be multiplied to bring it within the rauge of table 2. Then the logarithm ean be taken out, and, to neutralize the effeet of the multiplieation, so far as the

result is eoneerned, log (= must be added ; this quantity is there-

fore given in an adjoining eolumn to Mf in the auxiliary table. A similar procedure gives the number answering to any logarithm, another faetor (approximately the reciprocal of MZ) being given, so that in both eases multiplication is used. The laborious part of the work is the multiplication by Af; but this is somewhat com- pensated for by the ease with which, by means of the proportional parts, the logarithm is taken out. The factors are 300 in number, and are chosen so as to minimize the labour, only 25 of the 300 consisting of three figures all different and not involving 0 or 1. The prineiple of multiplying by a factor whieh is subsequently caneelled by subtraeting its logarithm is used also in a traet, eon- taining only ten pages, published by MM. Namur and Mansion at Brussels in 1877 under the title Tables de Logarithmes a 12 décimales jusqu'a 434 milliards. Here a table is

given of logarithms of numbers near to 434,294, and other numbers are brought within the range of the table by multiplication by one or two factors. The logarithms of the numbers uear to 434,294 are seleeted for tabulation because their differences commence with the figures 100 ...and the presence of the zeros in the difference renders the inter- polation easy.

If seven-figure logarithms do not give sufficiently accurate results, it is usual to have reeourse to ten-figure tables ; with one exception, there exist no tables giving 8 or 9 figures. The exception is John Newton's Trigonometria Britannica (London, 1658), whieh gives logarithms of numbers to 100,000 to 8 places, and also log sines and tangents for every eentesimal minute (7.c., the nine-thousandth part of a right angle), and also log sines and tangents for the first three degrees of the quadrant to 5 places, the interval being the one-thonsandth part of a degree. This table is also unique in that it gives the logarithms of the differences instead of the actual differenees. The arrangement of the page now universal in seven- figure tables—with the fifth figures running horizontally along the top line of the page—is due to John Newton.

As a rule seven-figure logarithms of numbers are not published separately, most tables of logarithms eontaining both the logarithms of numbers and a trigonometrieal eanon. Babbage's and Sang's logarithms are exceptional and give logarithms of numbers only. Babbage, Table of the Logarithms of the Natural Numbers from 1 to 108,000 (London, stereotyped in 1827; there are several tirages

1 See his ''Kinige Bemerkungen zu Vega's Thesaurus Logarithmorum," in Astronomische Nachrichten for 1851 (reprinted in his Werke, vol. iii. pp. 257-264); also Monthly Notices Roy. Ast. Soc. for May 1873.

of later dates), is the best for ordinary use. Great pains were taken to get the maximuin of elearness. The ehange of figure in the middle of the bloek of numbers is marked by a change of type in the fourth figure, whieh (with the sole exeeption of the asterisk) is the best method that has been used. Copies of the book were printed on paper of different eolours—yellow, brown, green, &e.—as it was eonsidered that blaek on a white ground was a

fatiguing eombination for the eye. The tables were also issued with title-pages and introductions in other languages. The book is not very easy to proeure now. In 1871 Mr Sang published A New Table of Seven-place Logarithms of all Numbers from 20000 to 200000 (London). In an ordinary table extending from 10,000 to 100,000 the differenees near the beginning are so numerous that the proportional parts are either very erowded or some of them omitted; by making the table extend from 20,000 to 200,000 instead of from 10,000 to 100,000 the differences are halved in magnitude, while there are only one-fourth as many in a page. There is also greater aeeuracy. A further peculiarity of this table is that multiples of the differences, instead of proportional parts, are given at the side of the page. Typographieally the table is exeeptional, as there are no rules, the numbers being separated from the logarithms by reversed eommas. This work was to a great extent the result of an original ealeulation ; see Ldinburgh Transactions, vol. xxvi. (1871). Mr Sang proposed to publish a ninc-figure table from 1 to 1,000,000, but the requisite support was not obtained. Various papers of Mr Sang's relating to his logarithmie caleulations will be found in the Zdinburgh Proceedings subsequent to 1872. In this connexion referenee should be made to Abraham Sharp's table of logarithms of numbers from 1 to 100 and of primes from 100 to 1100 to 61 places, also of numbers from 999,990 to 1,000,010 to 63 places. These first appcared in Geometry Improv'd . . . by A. 8. Philomath (London, 1717). They have been republished in Sherwin's, Callet's, and the earlier editions of Hutton's tables. Parkhurst, Astronomical Tables (New York, 1871), gives logarithms of numbers from 1 to 109 to 102 places.? In many seven-figure tables of logarithms of numbers the values of Sand Tare given at the top of the page, with V, the variation of each, for the purpose of dedueing log sines and tangents. Sand 7'

denote log — and log fle respeetively, the arguments being

the number of seconds denoted by ccrtain numbers (sometimes only the first, sometimes every tenth) in the number eolumn on each page. 'Thus, in Callet's tables, on the page on whieh the first ber is 67200, S = log 6/20″ ta 6720 while th number is »S = log arag— 6799 2 While the V's are the variations of each for 10'. To find, for example, log 1°52′12″7, or log sin 6782"7, we have S=4°6854980 and log 6732°7 = 3°8281893, whenee, by

addition, we obtain 8°5136878 ; but V for 10” is — 2°29, whenee the variation for 127 is — 8, and the log sine required is 8°5136870. Tables of S and 7 are fre- quently ealled, after their inventor, ‘‘Delambre’s tables.” Some seven-figure tables extend to 100,000, and others to 108,000, the last 8000 logarithms, to 8 plaees, being given to ensure greater accuracy, as near the beginning of the numbers the differences are large and the interpolations more laborious and less exact than in the rest of the table. The eight-figure logarithms, however, at the end of a seven-figure table are liable to oeeasion error; for the eomputer who is aeeustomed to three leading figures, common to the bloek of figures, may fail to notice that in this part of the table there are four, and so a figure (the fourth) is sometimes omitted in taking out the logarithm. In the ordinary method of arranging a seven-figure table the change in the fourth figure, when it oceurs in the course of the line, is a souree of frequent error unless it is very elearly indicated. In the earlier tables the ehange was not marked at all, and the computer had to decide for himself, each time he took out a logarithm, whether the third figure had to be inereased. In some tables the line is broken where the change oceurs; but the dislocation of the figures and the eorresponding irregularity in the lines are very awkward. Babbage printed the fourth figure in small type after a change. The best method seems to be that of prefixing an asterisk to the fourth figure of each logarithm after the change, as is done in Sehrén’s and many other modern tables, This is beautifully elear and the asterisk at onee eatehes the eye. Shortrede and Sang replaee 0 after a ehange by a nokta (resembling a diamond ina pack of eards). This is very elear in the ease of the 0’s, but leaves unmarked the eases in which the fourth figure is 1 or 2. Babbage printed a subseript point under the last figure of each logarithm that had been inereased. Schrén used a bar subseript, which, — ee 2 Legendre (Traité des Fonctions Elliptiques, vol. ii., 1826) gives a table of natural sines to 15 places, and of log sines to 14 places, for every 15” of the quadrant, and also a table of logarithms of uneven numbers from 1163 to 1501, and of primes from 1501 to 10,000 to 19 plaees. The latter, which was extraeted from the Tables du Cadastre, is a continuation of a table in Gardiner’s Tables of Logarithms (London, 1742; reprinted at Avignon, 1770), whieh gives

logarithins of all nuinbers to 1000, and of uneven numbers from 1000 to 1143. Legendre’s tables also appeared in his Ezercices de Caleul Intégral,

vol. iii. (1816).

and 7 = log

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being more obtrusive, is not so satisfactory. In some tables the increase of the last figure is only marked’ when the figure is in- creased to a 5, and then a Roman five (v) is used in place of the Arabic figure. Hereditary errors in logarithmic tables are con- sidered in two papers “On the Progress to Accuracy of Logarithmic Tables” and ‘On Logarithmic Tables,” in Monthly Notices of Loy. Ast. Soc. for 1873. See also the Monthly Notices for 1874, p. 248 ; and a paper by Gernerth, Ztsch. f. d. dsterr. Gymn., Heft vi. p. 407. Passing now to the logarithmic trigonometrical canon, the first great advance after the publication of the Trigonometria A rtifietalis in 1633 was made by Michael Taylor, Tables of Logarithms (London, 1792), which gives log sines and tangents to every second of the quadrant to 7 places. This table contains about 450 pages with an average number of 7750 figures to the page, so that there are altogether nearly three millions and a half of figures. The change in the leading figures, when it oceurs in a column, is not marked at all; and the table must be used with very great caution. In fact it is advisable to go through the whole of it, and fill in with ink the first 0 after the change, as well as make some mark that will catch the eye at the head of every column containing a change. The table was calculated by interpolation from the Trigonometria Artificialis to 10 places and then reduced to 7, so that the last figure should always be correct. Partly on account of the absence of a mark to denote the change of figure in the eolumn and partly on account of the size of the table and a somewhat inconvenient arrangement, the work seems never to have come into very general use. Computers have always preferred Bagay’s Nouvelles Tables Astronomiques et Hydrographiques (Paris, 1829), which also contains a complete logarithmic canon to every second. The change in the column is very clearly marked by a large black nucleus, surrounded by a circle, printed instead of zero. Bagay’s work has now become very rare. ‘The only other canon to every second that has been eed is contained in Shortrede’s Logarithmie Tables (Edin- urgh). This work was originally issued in 1844

in one volume, but being dissatistied with it Shortrede issued a new cdition in

1849 in two volumes. The first volume contains logarithms of

numbers, antilogarithms, &c., and the second the trigonometrical canon to every second, The volumes are sold separately, and may be regarded as independent works; they are not even described on their title-pages as vol. i. and vol. ii. The trigonometrical canon is very complete in every respect, the arguments being given in time as well as in are, full proportional parts being added, &c. The change of figure in the eolumn is denoted by a nokta, printed instead of 0 where the change oceurs.

Of tables in which the quadrant is divided centesimally, the principal are Hobert and Ideler, Nowvelles Tables Trigonometriques (Berlin, 1799), and Borda and Delambre, Tables Trigonométriques Déeimates (Paris, 1801). The former give, among other tables, natural and log sines, cosines, tangents, and cotangents, to 7 places, the arguments proceeding to 8° at intervals of 10” and thence to 50° at intervals of 1’ (centesimal), and also natural sines and tangents for the first hundred ten-thousandths of a right angle to 10 places. The latter gives log sines, cosines, tangents, cotangents, secants, and coseeants from 0° to 3° at intervals of 10” (with full proportional parts for every second), and thence to 50° at intervals of 1 (centesi- mal) to7 places, There is also a table of log sines, cosines, tangents, and cotangents from 0’ to 10’ at intervals of 10” and from 0° to 50° at intervals of 10’ (centesimal) to 11 places. Hobert and Ideler give a natural as well as a logarithmic canon; but Borda and Delambre give only the latter. Borda and Delambre give seven- figure logarithms of numbers to 10,000, the line being broken when a change of figure takes place in it.

In Briggs’s Trigonometria Britannica of 1633 the degree is divided centesimally, and but for the appearance in the same year of Vlacq’s Trigonometria Artificialis, in which the degree is divided sexagesimally, this reform might have been effected. It is clear that the most suitable time for effecting such a change was when the natural canon was replaced by the logarithmic canon, and Briggs took advantage of this opportunity. He left the degree unaltered, but divided it centesimally instead of sexagesimally, thus ensuring the advantages of decimal division (a saving of work in

interpolations, multiplications, &c.) with the minimum of change. The French mathematicians at the end of the 18th century divided the right angle centesimally, completely changing the whole system, with no appreciable advantages over Briggs's system. In fact the centesimal degree is as arbitrary a unit as the nonagesimal, and it is only the non-centesimial subdivision of the degree that gives rise to inconvenience. Briggs's example was followed by Roe, Oughtred, and other 17th-century writers ; but the centesimal divi- sion of the degree seems to have entirely passed out of use, till it was recently revived by Bremiker in his Logarithmisch ~~trigono~~ metrische Tafeln mit finf Decimalstellen (Berlin, 1872). This little book of 158 pages gives a five-figure canon to every hundredth of a degree with proportional parts, besides logarithms of numbers, addition and subtraction logarithms, &c.

Collections of Tables.—For a computer who requires in one volume logarithms of numbers and a ten-second logarithmic canon,

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perhaps the two best books are Schrén, Seven- Figure Logarithms Collec- (London, 1865, stereotyped, an English edition of the German work tions,

published at Brunswick), and Bruhns, 4 New Manual of Logarithms to Seven Places of Deeimals (Leipsic, 1870). Both give logarithnis of numbers and a complete ten-sccond canon to 7 places ; Bruhns also gives log sines, cosines, tangents, and cotangents to every second up to 6° with proportional parts. Schrén contains an inter- polation table, of 75 pages, giving the first 100 multiples of all numbers from 40 to 420. The logarithms of numbers extend to 108,000 in Schron and to 100,000 in Bruhns, Almost equally convenient is Bremiker's edition of Vega's Logarithmic Tables (Berlin, stereotyped ; the English edition was translated from the fortieth edition of Dr Bremiker's by W. L. F. Fischer). This book gives a canon to every ten seconds, and for the first five degrees to every second, with logarithms of numbers to 100,000. All theso works give the proportional parts for all the differences in the logarithms of numbers. In Babbage's, Callet's, and many other tables only every other table of proportional parts is given near the

beginning for want of space. Schron, Bruhns, and most modern tables published in Germany have title- pages and introductions in different languages. Dupuis, Tables de Logarithmes a& sept Décimales (stereotyped, third tirage, 1868, Paris), is also very convenient, containing a ten-seeond canon, besides logarithms of numbers to 100,000, hyperbolie logarithms of numbers to 1000, to 7 places, &c. In this work negative characteristics are printed throughout in the tables of circular functions, the minus sign being placed above the figure ; these are preferable to the ordinary char- acteristics that are increased by 10. This is the only work we know in which negative characteristies are used. The edges of the pages containing the circular functions are red, the rest being grey. Dupuis also edited Callet's logarithms in 1862, with which this work must not be confounded. Salomon, Logarithmische Tafeln (Vienna, 1827), contains a ten-second canon (the intervals being one second for the first two degrees), logarithms of numbers to 108,000, squares, cubes, square roots, and cuhe roots to 1000, a factor table to 02 Oil ten-place Briggian and hyperbolic logarithms of numbers to 1000 and of primes to 10,333, and many other useful tables. The work, which is scarce, is a well-printed small quarto volume.

Of collections of general tables the most useful and accessible are Hutton, Callet, Vega, and Kéhler. Hutton's well-known Mathe- matical Tables (London) was first issued in 1785, but considerable additions were made in the fifth edition (1811). The tables contain seven-figure logarithms to 108,000, and to 1200 to 20 places, some antilogarithms to 20 places, hyperbolic logarithms from 1 to 10 at intervals of '01 and to 1200 at intervals of unity to 7 places, logistic logarithms, log sines and tangents to every second of the first two degrees, and natural and log sines, tangents, secants, and versed sines for every minute of the quadrant to 7 places. The natural functions occupy the left-hand pages and the logarithmic the right-hand. The first six editions, published in Hutton's lifetime (d. 1823), contain Abraham Sharp's 61-figure logarithms of numbers. Olinthus Gregory, who brought out the 1830 and suceeeding editions, omitted these tables and Hutton's introduction, which contains a history of logarithms, the methods of constructing them, &e. Callet's Tables Portatives de Logarithmes (stereotyped, Paris) seems to have been first issued in 1783, and has since passed. through a great many editions. In that of 1853 the contents are seven-figure logarithms to 108,000, Briggian and hyperbolic loga- rithms to

48 places of numbers to 100 and of primes to 1097, log sines and tangents for minutes (centesimal) throughout the quad- rant to 7 places, natural and log sines to 15 places for every ten minutes (centesimal) of the quadrant, log sines and tangents for every second of the first five degrees (sexagesimal) and for every ten seconds of the quadrant (sexagesimal) to 7 places, besides logistic logarithms, the first hundred multiples of the modulus to 24 places and the first ten to 70 places, and other tables. This is onc of the most complete and practically useful collections of logarithms that have been published, and it is peculiar in giving a centesimally divided canon. The size of the page in the editions published in the 19th century is larger than that of the carlier editions, the type having been reset. Vega's Tabule Logarithmo-trigonometrice was first published in 1797 in two volumes. The first contains seven- figure logarithms to 101,000, log sines, &c., for every tenth of a second to 1', for every second to 1° 30', for every 10" to 6° 3', and thence at intervals of a minute, also natural sines and tangents to every minnte, all to 7 places. The second volume gives simple divisors of all numbers up to 102,000, a list of primes from 102,000 to 400,318, hyperbolic logarithms of numbers to 1000 and of primes to 10,000, to 8 places, e* and log,,e* to x=10 at intervals of ~~01 to 7 figures and 7 places respectively, the first nine powers of the numbers from 1 to 100, squares and cubes to 1000, logistic loga~~ rithms, binomial theorem coefficients, &c. Vega also published Manuale Logarithmico-trigonometricum (Leipsic, 1800), the tables in which are identical with a portion of those contained in the first volume of the Zabulz. The Tabule went through many editions, a stereotyped issue being brought out by J. A. Hiilsse (Sammlung mathematischer Tafeln, Leipsic) in one volume in 1840. The

contents are nearly the same as those of the original work, the ehief difference being that a large table of Gaussian logarithmis is added. Vega differs from Hutton and Callet in giving so many useful non- logarithmic tables, and his collection is in many respects eomple- mentary to theirs. Sehulze, Neue wad erweiterte Sammlung log- arithmischer, trigonometrischer, und anderer Tafeln (Berlin, 1778, 2 vols.), is a valuable collection, and contains seven-figure loga- rithms to 101,000, log sines and

tangents to 2° at intervals of a second, and natural sines, tangents, and secants to 7 places, log sines and tangents and Napierian log sines and tangents to 8 places, all for every ten seconds to 4° and thenee for every minute to 45°, besides squares, cubes, square roots, and cube roots to 1000, ‘binomial theorem coefficients, powers of ¢, and other small tables. Wolfram’s hyperbolic logarithms of numbers below 10,000 to 48 places first appeared in this work. Lambert, Supplementa Tabu- larum Logarithmicarum et Trigonometricarum (Lisbon, 1798), con-

are Gaussian logarithms, least divisors of numbers to 10,841, anti-logarithins, &c. The work contains 118 pages of tables. The same author’s Reeweil de Formutes et de Tables Numériques (Paris, 1868) contains 19 tables, occupying 62 pages, most of them giving results to 4 places ; they relate to very varied subjects, —antilogarithms,

; C c ieee See ec Gaussian logarithms, logarithms of eee elliptic integrals, squares

for use in the method of least squares, &c. Bremiker, Tafel vier- stelliger Logarithmen (Berlin, 1874), gives four-figure logarithins of numbers to 2009, log sines, cosines, tangents, and eotangents to 8° for every hundredth of a degree, and thence to 45° for every tenth of a degree, to 4 places. There are also Gaussian logarithms, squares from 0°000 to 13,500, antilogarithms, &c. The book eontains 60 pages. Willich, Popular Tables (London, 1853), is a useful book for an amateur; it gives Briggian and hyperbolic logarithms to 1200 to 7 places, squares, &c., to 348, &c.

tains a number of useful and curious non-logarithmic tables ; it bears a general resemblanee to the second volume of Vega, but contains numerous other small tables of a more strictly mathe-

Hyperbolie or Napierian Logarithms.—The logarithms invented Napierian by Napier and explained by him in the Descriptio (1614) were not loga- the same as those now called natural or hyperbolic (viz., to base rithms.

matical character. A very useful collection of non-logarithmic tables is printed in Barlow's New Mathematical Tables (London, 1814). It gives squares, cubes, square roots, and cube roots (to 7 places), reciprocals to 9 or 10 places, and resolutions into their prime faetors of all numbers from 1 to 10,000, the first ten powers of numbers to 100, fourth and fifth powers of numbers from 100 to 1000, prime numbers from 1 to 100,103, eight-plaee hyperbolic logarithms to 10,000, tables for the solution of the irreducible case in eubie equations, &c. In the stereotyped reprint of 1840 only the squares, cubes, square roots, cube roots, and reeiproeals are retained. The first volume of Shortrede's tables, in addition to the trigonometrical canon to every second, contains antilogarithms and Gaussian logarithms. Hassler, Tabule Logarithnuicw et Trigono- metrics (New York, 1830, stereotyped), gives seven-figure logarithms to 100,000, log sines and tangents for every seeond to 1°, and log sines, cosines, tangents, and cotangents from 1° to 3° at intervals of 10" and thence to 45° at intervals of 30'. Every effort has been made to reduce the size of the tables without loss of distinetness, the page being only about 8 by 5 inehes. Copies of the work were wulllehed with the introduction and title-page in different lan- guages. Stanley, Tables of Logarithms (New Haven, U.S., 1860), gives seven-figure logarithms to 100,000, and log sines, eosines, tangents, cotangents, secants, and cosecants at intervals of ten seconds to 15° and thence at intervals of a minute to 45° to 7 places, besides natural sines and cosines, antilogarithms, and other tables. This collection owed its origin to the fact that Hassler's tables were found to be inconvenient owing to the smallness of the type. Luvini, Tables of Logarithms (London, 1866, stereotyped, printed at Turin), gives seven-figure logarithms to 20,040, Briggian and hyperbolic logarithms of primes to 1200 to 20 places, log sines and tangents for each second to 9', at intervals of 10' to 2°, of 80" to 9°, of 1' to 45° to 7 eens. besides square and cube roots up to 625. The book, which is intended for schools, engineers, &c., has a peeuliar arrange- ment of the logarithms and proportional parts on the pages. Chambers's Mathematical Tables (Edinburgh), containing loga- rithms of numbers to 100,000, and a canon to every minute of log sines, tangents, and secants and of natural sines to 7 places, besides proportional logarithms and other small tables, is cheap and suitable

e), and very frequently also Napierian, logarithms. Napierian logarithms, strietly so ealled, have entirely passed out of use and are of purely historic

interest ; it is therefore sufficient to refer to LocariTHMs and Naprer, where a full aecount is given. Apart from the inventor's own publieations, the only Napierian tables of importanee are contained in Ursinus's Trigonometria (Cologue, 1624-25) and Schulze's Sammlung (Berlin, 1778), the former being the largest that has been constructed. Logarithms to the base e¢, where e denotes 2°71828, were first published by Speidell, Mew Logarithmes (1619).

The most copious table of hyperbolic logarithms is Dase, Tafel Hyper- der natirlichen Logarithmen (Vienna, 1850), which extends from 1 bolic to 1000 at intervals of unity and from 1000 to 10,500 at intervals loga- of -1 to 7 places, with differences and ES ea parts, arranged rithms,

as in an ordinary seven-figure table. By adding log 10 to the results the range is from 10,000 to 105,000 at intervals of unity. The table formed part of the Annals of the Vienna Observatory for 1851, but separate copies were printed. The most elaborate table of hyperbolic logarithms is due to Wolfram, who ealeulated to 48 places the logarithms of all numbers up to 2200, and of all primes (also of a great many eomposite numbers) between this limit and 10,009. Wolfram's results first appeared in Schulze's Samm- lung (1778). Six logarithms which Wolfrain had been prevented from computing by a serious illness were supplied in the Berliner Jahrbuch, 1788, p. 191. The complete table was reproduced in Vega's Thesaurus (1794), when several errors were corrected. Tables of hyperbolic logarithms are contained in the following colleetions:—Callet, all numbers to 100 and primes to 1097 to 48 places ; Borda and Delambre (1801), all numbers up to 1200 to 11 places ; Salomon (1827), all numbers to 1000 and primes to 10,333 to 10 places; Vega, Tabulx (ineluding Hiilsse's edition, 1840), and Kohler (1848), all numbers to 1000 and primes to 10,000 to 8 places ; Barlow (1814), all numbers to 10,000 ; Hutton and Willieh (1853), all numbers to 1200 to 7 places; Dupuis (1868), all numbers to 1000 to 7 places. Hutton also gives hyperbolie logarithms from 1 to 10 at intervals of '01 to 7 places. Rees's Cyclopedia (1819), art. ''Hyperbolic Logarithms," eontains a table of hyperbolic loga- rithms of all numbers up to 10,000 to 8 places.

Tables to convert Briggian into Hyperbolic Logarithms, and vice Conver- versa.—Such tables merely consist of the first hundred (sometimes sion of only the first ten) multiples of the modulus ~~43429 44819… and Briggian its reciprocal 2‘30258 50929 … to 5, 6, 8,10, or more places. They and are generally to be found in collections of logarithmic tables, but hyper~~ rarely execed a page in extent, and are very casy to construct. bolic Sehron and Bruhns both give the first hundred multiples of the loga- modulus and its reciprocal to 10 places, and Bremiker (in his edition rithms.

for schools, though not to be compared as regards matter or typo- graphy to the best tables deseribed above. Of six-figure tables

remiker’s Logarithmorum VI. Decimalium Nova Tabula Bero- linensis (Berlin, 1852) is probably one of the best. It gives logarithms of numbers to 100,000, with proportional parts, and log sines and tangents for every second to 5°, and beyond this point for every ten seconds, with proportional parts. Hantsehl, Logarithmisch -trigonometrisches Handbuch (Vienna, 1827), gives

five-figure logarithms to 10,000, log sines and tangents for every ten seconds to 6 places, natural sines, tangents, seeants, and versed sines for every minute to 7 places, logarithms of primes to 15,391, hyperbolic logarithms of numbers to 11,278 to 8 places, least divisors of numbers to 18,277, binomial thcorem coefficients, &e. Farley’s Six-Figure Logarithms (London, stereotyped, 1840) gives six-figure logarithms to 10,000 and log sines and tangents for every minutc to 6 plaees. Of five-figure tables the most convenient is Tables of Logarithms (Useful Knowledge Society, London, from the stercotyped plates of 1839), which were prepared by De Morgan, though they have no name on the title-page. They contain five-figure logarithms to 10,000, log sines and tangents to every minute to 5 plaees, besides a few smaller tables. Lalande’s Yables de Logarithmes is a five-figure table with nearly the same eontents as De Morgan’s, first published in 1805. It has since passed through many editions, and, after being extended from 5 to 7 places, passed through several more. Galbraith and Haughton, Manual of Mathe- matical Tables (London, 1860), give five-figure logarithms to 10,000 and log sines and tangents for every minute, also a small table of Gaussian logarithms. Houél, Tables de Logarithines &

Cing Déei- males (Paris, 1871), is a very convenient collection of five-figure tables ; besides logarithms of numbers and cireular funetions, there

of Vega and in his six-figure tables) and Dupuis to 7 places. Degen, Tabularwm Enneas (Copenhagen, 1824), gives the first hundred multiples of the modulus to 30 places.

Antilogarithms.—In the ordinary tables of logarithms the Anti- natural numbers are integers, while the logarithms are ineommen- loga- surable. In an antilogarithmic canon the logarithms are exaet rithms.

quantities, such as ‘00001, -00002, &c., and the corresponding numbers are ineommensurable. The largest and earliest work of this kind is Dodson’s Antilogarithmie Canon (London, 1742), whieh gives numbers to 11 places corresponding to logarithms from 0 to 1 at intervals of ‘00001, arranged like a seven-figure logarithmic table, with interseript differenees and proportional parts at the bottom of the page. This work was the only antilogarithmic canon for more than a century, till in 1844 Shortrede published the first edition of his tables; in 1849 he published the second edition, and in the same year Filipowski’s tables appeared. Both these works eontain seven-figure antilogarithms: Shortrede gives numbers to logaritlims from 0 to 1 at intervals of ‘00001, with differences and multiples at the top of the page, and Filipowski, 4 Table of Anti- logarithms (Loudon, 1849), contains a table of the same cxtent, the proportional parts being given to hundredths.

Addition and Subtraction, or Gaussian, Logarithms,—The object

loga- rithms.

Gaussian of such tables is to give log (w£8) by only

PA ib tw S

one entry when log a are given (see LOGARITHMS, vol. xiy. Pp: 777). Let C=log (1+2).

Leaving out the specimen table in Leonelli’s Théorie des Logarithmes Additionnels et (Bordeaux, 1803), the principal tables are in Zach’s Monatliche Correspondenz (1812),

tA

and log 4 4=log x,

to 5 at intervals of ‘1; the table is not conveniently arranged, Peter Gray, Tables and Formule (London,

1870)

to 6 places, with proportional parts to hundredths, and log (1-2)

Lafeln der Additions. und Subtractions – Logarithmen (Leipsic,

1849), ;

00001, all to 7 places, with proportional parts, reprinted from Hiilsse’s: edition of Vega (1849); the 1840 edition

seven-figure logarithmie table. was reprinted in Pasquich, Tabule (Leipsic,

de la Landc’s Tafeln (Leipsie, 1832), ate Handbuch and Galbraith and Haughton, Manual (London, Lables de Logarithmes (1871), also gives a smal] of Gaussian logarithms, the addition and subtraction logarithms being separated as in Zech. Modified Gaussian given by J. H. T. Miiller, Vierstellige Logartthmen (Gotha, 1844),

viz.,a four-place table of B and ~ log 1-2 froin 4=0 to ‘03

thence to ‘23 at intervals of 001, to 2 at intervals of ‘01, and to 4 at intervals of Logarithmic Tables (vol. i, 1849), viz., a five-place table of B (1+) from 4=5 to 8 at intervals of +1, ‘3 at intervals of ‘001, to 8 at intervals Filipowski’s Antilogarithms (1849) contains Gaussian logarithms arranged ina new way, The (@+1) as tabular result for log 2 as intervals of ‘001 to 5 places. Weiden- bach, Tafel wm den Logarithmen (Copenhagen, 1829), gives

from *382 to

3°6 at intervals of ‘01, Logistic and Proportional Logarithms.—In most collections of tables of logarithms

and seconds; and Callet and Hutton to x= 5280”, log 10,800 — log x) form part of nearly al} collections of tables relating to navigation, Bagay, i but such are not often’to tables. The same remark applies to tables rithms for every minute to 24 , which give to 4 of log 1440-log a, The object of a proportional or logistic table, or a table of log a —log x, is to facilitate the tions in which the third term is a Interpolation Tables. —AN tables of regarded as interpolation tables, theile (Berlin, 1848), gives numbers from 70 to 699, polation table gi from 40 to 410, ficients, which are required when second and higher orders of differ- ences are used, are described below. Woolhouse, On Lnterpolation, Summation, Numerical Tables (London, 1865), contains nine pages of interpolation tables. The book con- sists of papers extracted from vols. xi, and xii. of the Assurance

Dual Logarithms. —This term is used by Mr Oliver Byrne in his Dual Arithmetic, Y oung Dual Arithmetician, Tables of Dual Logarithms, &c. (London, 1863-67). A dual number of the ascend- ing branch is a continued product of powers of 11, 1-01, 1001, &c.,

13

taken in order, the powers only being expressed denotes (11)%(1-01)(1-001 ¥(1-0001)8 the numbers following the \ being called dual digits. A dual number which has all but the last digit zeros is called a dual logarithm ; logarithms in which logarithms. A dual number of the descending branch is a con- tinucd product of powers of ‘9, ‘99, &e.: for instance, (°9)3(~~99)? ig The Tables, which occupy 112 pages, give dual numbers and logarithms, both of the ascending and descend~~ ing branches, and the corresponding natural numbers. The author claimed that his tables were smperior to those of common logarithms, Constants. —In nearly all tables of logarithms there is a page de- Con- logarithms, stants,

such as 7, 3, Tw, f/m, A specially good collection is printed in

Templeton’s Millwrights and Engineer’s Pocket Companion (cor- rected by §, Maynard, London, 1871), which gives 58 constants involving 7 and ‘their logarithms, generally to 80 places, and 13 others that may be properly called mathematical. “A good list of constants involving z is given in Salomon (1827). Paucker in Grumert’s Arehiv (vol. i. p. 9) has a nuniber of con- stants involving x given toa great many places, and Gauss’s memoir

on the leiniscate function (IVerke, vol. ili.) has ae? é &e., calculated to about 50 places, out to 707 places (Shanks, Proc. Roy. Soc, , Vol. xxi. p. 319) and to 263 places (Adains, Proe, Roy. Soe., vol. xxvii.

places (see Adams, Proc, Loy. Soc.,

Lables for the Solution of the Irreducible Case in Cubic Equations.— trreduci- Lambert, Supplementa (1798), at intervals of ‘001 to 7 places, and Barlow (1814) gives a? —x from equations, %=1 to 1-1549 at intervals of ‘0001 to 8 places.

Binomial Theorem Coefficients. —The values of Binoniial 2e(% — 1) x2 —- 1)(e2-2) we—1)... (%—5) theorem es ene ae coef

from #=°01 tow=1at intervals of ‘01 to 7 places, are serviceable for cients. use in interpolation by second and higher orders of differences, The table quoted above occurs in Schulze (1778), Barlow (1814), Vega (1797 and Succeeding editions), Hantsch] (1827), and Kohler (1848), Rouse, Doctrine of Chanees (London, no date), gives on a folding sheet (@+6)” for »=1, Pe 5 PAD) Lambert, Supplementa (1798), has the coefficients of the first 16 terms in (1+)? and (1-2), their accnrate values being given as decimals, Vega (1797) Oo 1

has a page of tables giving ae . and similar

2.4° 2.4.6’ °° 9, 37°° quantities to 10 places, with their logarithms to 7 places, and a page of this kind occurs in other collections, Kohler (1848) gives the values of 40 such quantities, a(a +1)

Figurate Nuwmbers.—Lambert, Supplementa, gives Uy Tg ae Figurate x(-+1)...(+11) , numbers, See sae, from 2=1 to 380.

Trigonometrical Quadratic Surds,—The surd values of the sines Trigono-

of every third degree of the quadrant are given in some tables of metrical

logarithms; ¢, g-, in Hutton's (ike, ad) 1855), we find quadratic

Ee ant + V8) 4/48 + A$ 9/154 84/5) — 89d}; and oun

the numerical values of the surds 4/(5 + 4/5), J/ (22), &e., are given

to 10 places. extended to 20 places by Peter

Gray, (1877), p. 105. Circulating Decimals.— Goodwyn's tables have (;

Several others have been published giving the num- ing deci-

primes up to 2,548 and for 22 primes exceeding that limit. Desmarest, Théorte all primes up to 10,000. Reuschle, Mathematische Abhandlung, enthaltend neue zahlentheoretisehe Tabclien (1856), contains a simi. lar table to 15,000. This Shanks extended to 60,000; the portion from 1 to 80,000 is printed in the Proe, Loy. Soe., vol. xxii. p. 200, and the remainder is preserved in the archives of the society (Zd., Xxili, p. 260 and xxiy. p. 892). The number of digits in the

decimal period of Z is the same as the exponent to which 10 be-

longs for modulus p, so that, whenever the period has p—1 digits, 10 is a primitive root of p, Tables of primes having a given number, 2, of digits in their periods, 7.¢., tables of the resolutions of 10" — 1 into factors and, as far as known, into prime factors, have been given by Loof (in Grunert's Archiv, vol. xvi. p. 54; reprinted in Nouv. Annales, vol. xiy. p. 115) and_by Shanks (Proc. Roy. Soc., vol. xxii. p. 881). The former extends to »=60 and the latter to 2=100, but there are gaps in both. Reuschle's tract also contains resolutions of 10"~ 1. For further references on circulating deci- mals, see Proc. Camb. Phil. Soc. , Vol. iii. p. 185 (1878), ; Pythagorean Triangles, — Right-angled triangles in which the

Pytha- gorean triangles.

Pythagorean triangles, as, for example, the triangles 3, 4, 5 and 5, 12, 18. Schulze, Sammlung (1778), contains a table of such triangles subject to the condition tan bw>gs (w being one of the acute angles). About 100 triangles are given, but some occur twice. Large tables of right-angled rational triangles were given by Bretschneider, in Grunert's Archiv, vol. i. p. 96 (1841), and by Sang, Edinburgh Transactions, vol. xxiii. p. 727 (1864). In these the triangles are arranged according to hypothenuses and extend to 1201, 1200, 49, and 1105, 1078, 264 respectively. Whitworth, in a paper read before the Lit. and Phil. Society of Liverpool in 1875, carried his list as far as 2465, 2337, 784. See also Rath, 'Die rationalen Dreiecke," in Grunert's Archiv, vol. lvi. p. 188 (1874). Sang's paper also contains a table of triangles having an angle equal to 120° and their sides integers.

Powers of +.—Paucker, in Grunert's Archiv, vol. i. p. 10, gives a-1and 1? to 140 places, and 72, oh, x, 3 to about 50 places ; and in Maynard's list of constants (see " Constants," above) 7 is given to 31 places. The first twelve powers of 7 and r~! to 22 or more places were printed by Glaisher, Proc. Lond, Math. Soc., vol. viii. p. 140, and the first hundred multiples of and 3} to 12 places by Kulik, Tafel der Quadrat-und Kubik-Zahlen (Leipsic, 1848).

The Serics 1? +2-" + 8-" + &e.—Let Sn, Sn Fn denote respectively the sums of the series 1-"+2-"3-" &c., 1-213 "— BOa¢ "43"45-"4 &e, Legendre (Traité des Fonctions Elliptiques, vol. ii. p. 432) has computed S, to 16 places from n=1 to 35, and Glaisher (Proc. Lond. Math. Soc., vol. iv. p. 48) has deduced s, and o» for the same arguments and to the same number of places. The latter has also given Sp, Sn, On for n=2, 4, 6,... 12 to 22 or more places (Proc. Lond. Math. Soc., vol. viii. p. 140), and the values of Sa, Where D,»=2-"+3-"5-" &e. (prime numbers only in- volved), forn=2, 4, 6,... 86 to 15 places (Compte Rendu de ' Assoc. Francaise for 1878, p. 172).

Tables of e* and e~*, or Hyperbolic Antilogarithms.—The largest tables are the following. Gudermann, Theorie der potenzial- oder cyklisch-hyperbolischen Functionen (Berlin, 1833), which consists of papers reprinted from vols. viii, and ix. of Crelle's Jowrnal, and gives logy) sinh x, logy, cosh «, and log,, tanh x from «=2 to 5 at intervals of 001 to 9 places

and from x=5 to 12 at intervals of ‘01 to 10 places. Since sinh = (ct — e-#) and cosh x=4$(ce*+e~*), the values of et and e-* are deducible at once by addition and sub- traction. Newman, in Camb. Phil. Trans., vol. xiii, pp. 145-241, gives values of e~* from #=0 to 15349 at intervals of 001 to 12 places, from #=15°350 to 17°298 at intervals of °002, and froin 7=17°300 to 27°635 at intervals of °005, to 14 places. Glaisher, in Camb. Phil. Trans., vol. xiii. pp. 248-272, gives four tables of ¢*, e-%, logy) €%, logy e~*, their ranges vie from «=‘001 to ‘1 at in- tervals of 001, from ‘01 to 2 at intervals of ‘01, from ‘1 to 10 at intervals of **1, from 1 to 500 at intervals of unity. Vega, Tabulz (1797 and later edd.), has logy, ¢** to 7 places and e* to 7 figures from z=-01 to 10 at intervals of 01. Kéhler’s Handbuch contains a small table of ¢. In Schulze’s Sammlung (1778) e* is given for z=1, 2, 3,...24 to 28 or 29 figures and for «=25, 30, and 60 to 32 or 33 figures ; this table is printed in Glaisher’s paper (Joc. cit.). In Salomon’s Tafeln (1827) the valucs of ¢”, e”, CO. A toreren, where n has the values 1, 2,...9, are given to 12 places. Bret- schneider, in Grunert’s Archiv, tii. p. 38, worked out ¢ and e~* and also sin « and cos x for =1, 2,...10 to 20 places.

Factorials.—The values of logy, (n!), where 2! denotes 1.2.8…%, from n=1 to 1200 to 18 places, are given by Degen, Tabularum Enneas (Copenhagen, 1824), and reprinted, to 6 places, at the end of De Morgan’s article “ Probabilitics” in the Encyclopedia Metro- politana. Shortrede, Tables (1849, vol. i.), gives log (n!) to »=1000 to 5 places, and for the arguments ending in 0 to 8 places. Degen also gives the complements of the logarithms. The first 20 figures

are computed

Powers of 7.

Series

1-“+

Qo”) &c.

Hyper- bolic antilog- arithms.

Facto- rials.

of the values of 7x! and the values of logiy ae

by Glaisher as far as n=71 in the Phil. Trans. for 1870 (p. 370), and the values of = to 28 significant figures as far as n=50 in

Camb. Phil. Trans., vol. xiii. p. 246.

Bernoul- Bernoullian Numbers.—The first fifteen Bernoullian numbers

lian num- were given by Euler, Jnst. Calc. Diff., partii. ch. v. Sixteen more

bers. were calculated by Rothe, and the first thirty-one were published by Ohm in Crelle's Journal, vol. xx. p. 11. Prof. J. C. Adaims has calculated the next thirty-one, and a table of the first sixty- two was published by him in the Brit. Assoc. Report for 1877 and in Crellc's Journal, vol. lxxxv. p. 269. The first nine figures of the values of the first 250 Bernoullian numbers, and their Briggian logarithms to 10 places, have been printed by Glaisher, Camb. Phil. Trans., vol. xii. p. 384.

Tables of Tables of log tan (4r+4¢).—Gudermann, Theorie der potenzial-

log tan oder cyklisch-hyperbolischen Functionen (Berlin, 1833), gives (in 100

(47 +46). pages) log tan(im +4) for every centesimal minute of the quadrant to 7 places. Another table contains the values of this function, also at intervals of a minute, from 88° to 100° (centesimal) to 11

sides and hypothenuse are all rational integers are frequently termed »

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places. Legendre, J'ratté des Fonctions Elliptiques (vol. 11. p. 256), gives the same function for every half degree (sexagesimal) of the quadrant to 12 places.

The Gamma Function. —Legendre’s great table appeared in vol. Gamnia

i of his Exercices de Calcul Intégral (1816), p. 85, and in vol. ii. function. of his Lraité des Fonctions Elliptiques (1826), p. 489. Logi In) is given from x=1 to 2 at intervals of ‘001 to 12 places, with differ- ences to the third order. This table is reprinted in full in Sehlo- milch, Analytische Studien (1848), p. 183; an abridgment in which the arguments differ by °01 occurs in De Morgan, Diff. and Int. Caic., p. 587. The last figures of the values omitted are also sup- plied, so that the full table can be reproduced. A seven-place abridgment (without differences) is published in Bertrand, Caleul Intégral (1870), p. 285, and a six-figure abridgment in Williamson, Integral Calculus (1884), p. 169. In vol. i. of his Zzerciccs (1811), Legendre had previously published a seven-place table of logy) I(«), without differences.

Tables connected with Elliptic Functions.—Legendre calculated Elliptic elaborate tables of the clliptic integrals in vol. ii. of Zraité dcs functions: Fonctions Elliptiques (1826). Denoting the modular angle by 4, the amplitude by ¢, and the incomplete integral of the second kind by Fy (¢) the tables are—(1) logy) # and log, K from =0° to 90° at intervals of 01 to 12 or 14 places, with differences to the third order ; (2) H,(¢) and F(¢), the modular angle being 45° from ¢=0° to 90° at intervals of 0°°5 to 12 places, with differences to the fifth order ; (3) E, (45°) and F' (45°) from =0° to 90° at intervals of 1°, with differences to the sixth order, also # and K for the same argu-

ments, all to 12 places; (4) (4) and F(¢) for every degree of both the amplitude and the argument to 9 or 10 places. The first

three tables had been published previously in vol. iii. of the Luxer- cices de Caleul Intégral (1816). Tables involving q.—Verhulst, Traité des Fonetions Elliptiques Tables

(Brussels, 1841), contains a table of log, logyo (= for argument ae

at intervals of 01 to 12 or 14 places. Jacobi, in Crelle’s Journal, vol. xxvi. p. 98, gives logy 4 from 6=0° to 90° at intervals of 0°71 to 5 places. Meissel, Sammlung mathematischer Tafeln, i. (Iser- lohn, 1860), consists of a table

of logy) ¢ at intervals of 1′ from 9=0° to 90° to 8 places. Glaisher, in Month. Not. Roy. Ast. Soc., vol. XXXVii. p. 372 (1877), gives logy) ¢ to 10 places and g to 9 places for every degree. In Bertrand, Calewl Intégral (1870), a table of logy ¢ from @=0° to 90° at intervals of 5’ to 5 places is accompanied by

tables of logy “i = and ttenloen” and by abridgments of

Legendre’s tables of the elliptic integrals, Schlomilch, Vorleswngen der héheren Analysis (Brunswick, 1879), p. 448, gives a small table of logy) g for every degree to 5 places.

Legendrian Coefficients. —The values of P”(x) for n=1, 2, 38,...7 Legen-

from z—0 to 1 at intervals of ‘01 are given by Glaisher, in Brit. drian co- Assoc. Icp. for 1879, pp. 54-57. The functions tabulated are P(x) =2, efficients. P*(a)=4(8a? ~~1), P(x) = (5x? — 80), P*(a) =} (8524 —~~ 302? 3), P(a) = 4 (68a —70x> 15x), P%x) = 71; (281×8 — 31524 +1052? — 5), P1(c¢) =qg(42927 — 69325 + 315a2-—35x). The functions occur in connexion with the theory of interpolation, the attraction of spheroids, and other physical theories.

Besscl’s. Functions.—Bessel’s original table appeared at the end Bessel’s of his memoir ‘‘Untersuchung des planetarischen Theils der func- Storungen, welche aus der Bewegung der Sonne entstehen’’ (in tions. ‘Abh. d. Berl. Akad., 1824; reprinted in vol. i. of his Abhand- lungen,p. 84). It gives Jz) and J;(x) from x=0 to 3°2 at intervals of ‘01. More extensive tables were calculated by Hansen in “ Erinit- telung der absoluten Storungen in Ellipsen von beliebiger Excen- tricitat und Neigung”’ (in Schriften der Sternwarte Sceberg, part 1.,

Gotha, 1843). They include an extension of Bessel’s original table to x=20, besides smaller tables of J,,(x) for certain values of 1 as far as n=28, all to 7 places. Hansen’s table was reproduced by Schlomilch, in Zeitschr. fiir Math., vol. ii. p. 158, and by Lommel, Studien tiber die Bessel’schen Functionen (Leipsic, 1868), p. WAT Hansen’s notation is slightly different from Bessel’s; the change amounts to halving each argument. Schlomilch gives the table in Hansen’s form ; Lommel expresses it in Bessel’s.

Sine, Cosine, Exponential, and Logarithm Integrals. —The func- Sine, &c.,

% gin 2 cos # z gn integrals. ade, —— dx, — dx, x ee wee

ae 0 i mo which are denoted by the functional signs Siz, Ciz, Hix,

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tions so named are the integrals

lizrespectively. Soldner, Théorie et Tables dune Nouvelle Fonction Transcendantc (Munich, 1809), gave the values of liz from ~=0 to 1 at intervals of ‘1 to 7 places, and thence at various intervals to 1220 to 5 or morc places. This table is reprinted in De Morgan’s Diff. and Int. Cale., p. 662. Bretschneider, in Grunert’s Archiv, vol, iii. p. 83, calculated Ei (+2), Sia, Ciz for v=1, 2… .l0itonae places, and subsequently (in Schlomilch’s Zeitschrift, vol. vi.) worked out the valucs of the same functions from «=0 to 1 at intervals of ‘01 and from 1 to 7°5 at intervals of ‘1 to 10 places. Two tracts by L. Stenberg, Zabule Logarithms Integralis (Malm6, part i. 1861

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and part ii. 1867), give the values of li 10* from w= —15 to 3°5 at intervals of 01 to 18 places. Glaisher, in Phil. Zrans., 1870, p. 367, gives Ki(+2), Siz, Cia from x=0 tol at intervals of ‘01 to 18 places, from #=1 to 5 at intervals of *1 and thence to 15 at intervals of unity, and for 2=20 to 11 places, besides seven-place tables of Siz and Ciz and tables of their maximum and minimum valucs, See also Bellavitis, ‘“Tavole Numeriche Logaritmo-Integrale” (a paper in Memoirs of the Venetian Institute, 1874). Bessel calculated the valucs of li 1000, li 10,000, 11 100,000, 1i 200,000, ... li 600,000, and li 1,000,000 (see Abhandlungen, vol. ii. p. 339). In Glaisher, factor Table for the Sixth Million (1883), § iii., the values of li x are given from #=0 to 9,000,000 at intervals of 50,000 to the hearest integer.

Values of fi “e~ Pdax and &® [“o-dx,—These functions are em- 0 0 cee ployed in researches connected with refractions, theory of errors, * L x= oe Cee ie) conduction of heat, &c. Let Wh QO alie, evox Oe c~ “da be denoted

by Erfa and Erfe x respectively, standing for “error function” and “error function complement,” so that Erfz+Erfe a=44/a (Phil. Mag., Dec. 1871; it has since been found convenient to transpose as above the definitions of Erf and Erfe). The tables of the

functions, and of the functions multiplied by ¢*”, are as follows. Kramp, Analyse des Réfractions (Strasburg, 1798), has Erfe x from = to 8 at intervals of ‘01 to 8 or more placcs, also log.) (Erfe 2)

and log,,(e”””“Erfe a) for the same values to 7 places. Bessel, Punda-

menta Astronomiz (Konigsberg, 1818), has log,.(e”“Erfe x) from x=0 to 1 at intervals of ‘01 to 7 places, likewise for argunient log,, x, the arguments increasing from 0 to 1 at intervals of ‘01. Legendre, Lraité des Fonetions Kiliptiques (1826), vol. ii. p. 520, contains

T(4,e~”), that is, 2 Erfe x from w=0 to ‘5 at intervals of ‘01 to 10 places. Encke, Berliner Ast. Jahrbuch for 1834, priuts = Erf x from x= 0 to 2 at intervals of ‘01 to 7 places and i Erf (px) from

*=0 to 3°4 at intervals of ‘01 and thence to 5 at intervals of *1 to 5 places, p being 4769360. Glaisher, in Phil. Mag., December 1871, has calculated Erfe x from x=8 to 4°5 at intervals of ‘01 to ii, Mey or 14 places. Encke’s tables and two of Kramp’s were reprinted in the Encyclopedia Metropolitana, art. “ Probabilities,”

Lables of Integrals, not Nwmerical.— Meyer Hirsch, Integral- tafeln (1810 ; Eng. trans., 1823), and Minding, Jntegraliafeln (Berlin, 1849), give values of indefinite integrals and formule of reduction : both are uscful and valuable works. De Haan, Nouvelles Tables a Intégrales Définics (Leyden, 1867), is a quarto volume of 727 pages containing evaluations of definite integrals, arranged in 485 tables, The first edition appeared in vol. iv. of the Transactions of the Anisterdam Academy of Sciences. This, though not so full and accurate as the second edition, gives references to the original memoirs in which the different intcgrals are considered.

Lables relating to the Theory of Nwmbers.—These are of so tech- nical a character and so numerous that a full account cannot be attempted here. The

reader is referred to Cayley's paper in the Grit. Assoc. Rep. for 1875, where a full description with references is given. Three tables may, however, be briefly noticed on account of their importance and because they form separate volumes: (1) Degen, Canon Pellianus (Copenhagen, 1817), relates to the inde- terminate equation y*-axz?=1 for valucs of a from 1 to 1000. It in fact gives the expression for ,/a as a continued fraction ; (2) Jacobi, Canon Arithmeticus (Berlin, 1839), is a quarto work contain- ing 240 pages of tables, where we find for each prime up to 1000 the numbcrs corresponding to given indices and the indices corre- sponding to given numbers, a certain primitive root (10 is taken whenever it is a primitive root) of the prime being selected as base ; (3) Reuschle, Tafeln complexer Primzahlen, welehc aus Wurzeln der Hinheit gebildet sind (Berlin, 1875), includes an enormous mass of results relating to the higher complex theories. A table of x(n), where x(7) denotes the sum of the complex numbers which have 7 for their norm for primes up to n= 13,000 (cf. Quart. Journ., vol. xx. p. 152), has been published since the date of Cayley's report. Some tables that belong to the theory of numbers have been described above under "Factor Tables" (p. 7).

Bibliography.—Full_ bibliographical and historical information relating to tables is collected in Brit. Assoc. Rep. for 1873, p. 6. The principal works are: —Heilbronner, Historia Matheseos (Leipsic, 1742), the arithmetical portion being at the end; Scheibel, Kinleitung zur mathematischen Biioherkenntniss (Breslau, 1771-84); Kistner, Geschichte der Mathemattl; (Gottingen, 1796-1800), vol. dies Murhard, Bibliotheca Mathematica (Leipsic, 1797-1804), vol. ii.; Rogg, Bibliotheca Mathematica (Tiibingen, 1830), and continuation from 1830 to 1854 by Sohnke (Leipsie and London, 1854); Lalande, Bibliographie Astronomique (Paris, 1803), a separate index on p. 960. A great deal of accurate information upon early tables is given by Delambre, Histoire de I' Astronomie Moderne (Paris, 1821), vol. i.; and Nos. xix. and xx. of Hutton's Mathematical Tracts (1812). For a complete list of logarithmic tables of all kinds from 1614 to 1862, see De Haan, *TYets over Logarithmentafels," in Verslagen en Mcdedeelingen der Koning. Akad. van Wetenschappen (Amsterdam, 1862), pt. xiv.

j De Morgan’s article « Tables,” Which appeared first in the Penny Cyclopedia,

and afterwards with additions

| in the English Cyclopedia, gives not only a good deal of bibliographical informa- | tion but also an account of tables relating to life assurance and annuities,

astronomical tables, commercial tables, &c. (J. W. L. G.)

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TABOO (also written Tasu and Tarv) is the name given to a system of religious prohibitions which attained its fullest development in Polynesia (from Hawaii to New Zealand ; see vol. xix. p. 426), but of which under different names traces may be discovered in most parts of the world.

The word “taboo” is common to the different dialects Meaning.

of Polynesia, and is perhaps derived from ta, “to mark,” and pu, an adverb of intensity. The compound word “taboo” (tapu) would thus originally mean “marked thoroughly.” Its ordinary sense is “sacred.” It does not, however, imply any moral quality, but only ‘‘a connexion with the gods or a separation from ordinary purposes and exclusive appropriation to persons or things considered sacred ; sometimes it means devoted as by a vow.” Chiefs who trace their lineage to the gods are called arti tabu, “chiefs sacred,” and a temple is called a wahi tabu, ‘place sacred.” The converse of taboo is noa (in Tonga gnofooa), which means “general” or “common.” Thus the rule which forbade women to eat with men, as well as, except on special occasions, to eat any fruits or animals offered in sacrifice to the gods, was called ai tabu, “ eating sacred” ; while the present relaxation of the rule is called ai nod, eating generally, or having food in common. Although it was employed for civil as well as religious purposes, the taboo was essentially a religious observance. In Hawaii it could be imposed only by priests; but elsewhere in Polynesia kings and chiefs, and even to a ccrtain extent ordinary individuals, exercised the same power. The strictness with which the taboo was observed depended largely on the influence of the person

who imposed it: if he was a great chief it would not be broken ; but a powerful man often set at nought the taboo of an inferior,

A taboo might be general or particular, permanent or General

temporary. A general taboo applied, e.g., to a whole class and par- of animals ; a particular taboo was confined to one or more Lael individuals of the class. Idols, temples, the persons and , names of kings and of members of the royal family, the persons of chiefs and priests, and the property (canoes, houses, clothes, &c.) of all these classes of persons were always taboo or sacred. By a somewhat arbitrary exten- sion of this principle a chief could render taboo to (tem in favour of) himself anything which took his fancy by merely calling it by the name of a part of his person. Thus, if he said “That axe is my backbone,” or “is my head,” the axe was his ; if he roared out “That canoe! my skull shall be the baler to bale it out,” the canoe was his likewise. The names of chiefs and still more of kings were taboo, and could not be uttered. If the name of a king of Tahiti was @ common word or even resentbled a common word, that word dropped out of use and a new name was sub- stituted for it. Thus in course of time most of the common words in the language underwent considerable modifications or were entirely changed.

Certain foods were permanently taboo to (i.e., in favour Dura- of or for the use of) gods and men, but were forbidden to tion. women. ‘Thus in Hawaii the flesh of hogs, fowls, turtle, and several kinds of fish, cocoa-nuts, and nearly everything offered in sacrifice were reserved for gods and men, and could not, except in special cases, be consumed by women.

In the Marquesas Islands human flesh was tabooed from women. Sometimes certain fruits, animals, and fish were taboo for months together from both men and women. In the Marquesas houses were tabooed against water : nothin g was washed in them; no drop of water might be spilled in them. If an island or a district was tabooed, no canoe or person might approach it while the taboo lasted; if a path was tabooed, no one might walk on it. Seasons generally kept taboo were the approach of a great religious ceremony, the time of preparation for war, and the sickness of chiefs. The time during which they lasted varied from

Penalty for vio- lation.

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years to months or days. In Hawaii there was a tradition of one that lasted thirty years, during which men might not trim their beards, &c. A common period was forty days. A taboo was either common or strict. During a common taboo the men were only required to abstain from their ordinary occupations and to attend morning and evening prayers. But during a strict taboo every fire and light on the island or in the district was extinguished ; no canoe was launched ; no person bathed; no one, except those who had to attend at the temple, was allowed to be seen out of doors; no dog might bark, no pig grunt, no cock crow. Hence at these seasons they tied up the mouths of dogs and pigs, and put fowls under a calabash or bandaged their eyes. ‘The taboo was imposed either by proclamation or by fixing certain marks (a pole with a bunch of bamboo leaves, a white cloth, &c.) on the places or things tabooed.

The penalty for the violation of a taboo was either religious or eivil. The religious penalty inflicted by the offended atuas or spirits generally took the form of a disease: the offender swelled up and died, the notion being that the atwa or his emissary (often an infant spirit) had entered into him and devoured his vitals. Cases are on record in which persons who had unwittingly broken a taboo aetually died of terror ou discovering their fatal error. Chiefs and priests, however, could in the case of involuntary trans- gressions perform certain mystical ceremonies which prevented this penalty from taking effeet. The civil penalty for breaking a taboo varied in severity. In Hawaii there were police officers appointed by the king to see that the taboo was observed, and every breach of it was punished with death, unless the offender had powerful friends in the persons of priests or chiefs. Elsewhere the punishment was milder ; in Fiji (which, however, is Melanesian) death was rarely inflicted, but the delinquent was robbed and his gardens despoiled. In New Zealand this judicial robbery was reduced toa system. No sooner was it known that a man had broken a taboo than all his friends and acquaintances swarmed down on him and carried off whatever they could lay hands on. Under this system (known as muru)

property eirculated with great rapidity. If, eg., a ehild fell into the fire, the father was robbed of nearly all- he possessed.

Besides the permanent and the artificially created taboos there

naturally were others whieh arose spontaneously as a result of circumstances.

taboo,

Thus all persons dangerously ill were taboo and were removed from their houses to sheds in the bush; if they remained in the house and died there the house was tabooed and deserted. Mothers after childbirth were taboo, and so were their new-born children. Women before marriage were now, and could have as many lovers as they chose; but after marriage they were strictly tabooed to their husbands and from every one else. One of the strictest taboos was incurred by all persons who handled the body or bones of a dead person or assisted at his funeral. In Tonga a common person who touched a dead chief was tabooed for ten lunar months ; a chief who touched a dead chief was tabooed for from three to five months aecording to the rank of the deceased. Burial grounds were taboo ; and in New Zealand a eanoe whieh had earried a corpse was never afterwards used, but was drawn on shore and painted red. Red was the taboo colour in New Zealand ; in Hawaii, Tahiti, Tonga, and Samoa it was white. In the Marquesas a man who had slain an enemy was taboo for ten days: he might have no inter- course with his wife and might not meddle with fire ; he had to get some one clse to cook for him. A woman engaged in the prepara- tion of cocoa-nut oil was taboo for five days or more, during which she might have no intercourse with men. A tabooed person might not eat his food with his hands, but was fed by another person ; if he could get no one to feed him, he had to go down on his knees and pick up his food with his mouth, holding his hands behind him. A chief who was permanently taboo never ate in his own house but always in the open air, being fed by one of his wives, or taking his food with the help of a fern stalk so as not to touch his head with his hands ; food left by him was kept for him in a sacred place; any other person eating of it was supposed to die immediately. A man of any standing could not earry provisions on his back ; if he did so they became taboo and were useless to any one but himself. For the taboo was

communicated as it were by infection to whatever a tabooed person or thing touched. This rule applied in its fullest force to the king and queen of Tahiti. The ground they trod on became sacred ; if they entered a house, it became taboo to them and had to be abandoned to them by its owner. Hence special houses were

1 The origin of this eustom may perhaps be discerned in a eustom of the Dieri tribe, South Australia. Among them, if a ehild meets with an aceident, all its relations immediately get their heads broken with stieks or boomerangs till the blood flows down their faces, this surgieal operation being supposed to ease the child's pain (Native Tribes of S. Australia, p. 280).

set apart for them on their travels, and, except in their hereditary districts, they were always carried on men's shoulders to prevent them touching the ground. Elsewhere, as in New Zealand, this rule was not carried out so strietly. But even in New Zealand the spots on which great chiefs rested during a journey became taboo and were surrounded with a fence of basket-work. The head and hair, especially of a chief, were particularly taboo or sacred; to touch a man's head was a gross insult. Ifa chief touched his own head with his fingers he had immediately to apply them to his nose and snuff up the sanctity which they had abstracted from his head. The cutting of a chief's hair was a solemn ceremony ; the severed locks were collected and buried in a sacred place or hung up on a tree. If a drop of a chief's blood fell upon anything, that thing became taboo to him, 7.¢., was his property. If he breathed on a fire, it became saered and could not be used for cooking. In his house no fire could under any cireumstances be used for cooking ; no woman could enter his house before a certain service had been gone through. Whatever a new-born child touched became taboo to (z.¢., in favour of) the child. The law which separated tabooed persons and things from contact with food was especially strict. Hence a tabooed or sacred person ought not to leave his comb or blanket or anything which had touched his head or back (for the back was also particularly taboo) in a place where food had been cooked ; and in drinking he was careful not to touch the vessel with his hands or lips (otherwise the vessel beeame taboo and could not be used by any one else), but to have the liquid shot down his throat from a distance by a second person.

There were various ceremonies by which a taboo could be removed. Remoy In Tonga a person who had become taboo by touehing a chief or of tabo anything belonging to him could not feed himself till he had got rid of the taboo by touching the soles of a superior chief's feet with his hands and then rinsing his hands in water, or (if water was scarce) rubbing them with the juice of the plantain or banana. But, if a man found that he had already (unknowingly) eaten with tabooed hands, he sat down before a chief, took up the foot of the latter, and pressed it against his stomach to counteract the effect of the food inside. In New Zealand a taboo could be taken off by a child or grandchild. The tabooed person touched the child and took drink or food from its hands ; the man was then free, but the child was tabooed for the rest of the day. A Maori chief who be- came taboo by touching the sacred head of his child was disinfected, so to speak, as follows. On the following day (the ceremony could not be performed sooner) he rubbed his hands over with potato or fern root which had been cooked over a saered fire; this food was then carried to the head of the family in the female line, who ate it, whereupon the hands became noa. The taboo was removed from a new-born child in a somewhat similar manner. The father took the child in his arms and touched its head, back, &c., with some fern root which had been roasted over a sacred fire; next morning a similar ceremony was performed on the child by its eldest relative in the female line; the child was then noa, «e., free from taboo. Another inode of removing the taboo was to pass a consecrated piece of wood over the right shoulder, round the loins, and back again over the left shoulder, after which the stick was broken in two and either buried, or burned, or cast into the sea.

Besides the taboos already described there were others which Private any one could impose. In New Zealand, if a man wished to pre- taboos serve his house, crop, garden, or anything clse, he made it taboo; similarly he could appropriate a forest tree or a piece of drift timber, &c., by tying a mark to it or giving it a chop with his axe. In Samoa for a similar purpose a inan would set up a representation of, ¢.g., a sea pike or a shark, believing that any one who meddled with property thus protected would be killed by a sea pike or shark the next time he bathed. Somewhat similar to this was what may be called the village taboo. In the autumn the kwmera (sweet potato) fields belonging to the village were taboo till the crop was gathered, so that no stranger could approach them; and all persons engaged in getting in the

erop were taboo, and eould therefore for the time engage in no other oeeupation. Similar taboos were laid on woods during the hunting season and on rivers during the fishing season.

On looking over the various taboos mentioned above a: we are tempted to divide them into two general classes, — fieatiat taboos of privilege and taboos of disability. Thus the taboo of chiefs, priests, and temples might be described as a privilege, while the taboo imposed on the sick and on persons who had come in contact with the dead might be regarded as a disability ; and we might say acccordingly that the former rendered persons and things sacred or holy, while the latter rendered them unclean or accursed. But that no such distinction ought to be drawn is clear from the fact that the rules to be observed in the one case and in the other were identical. On the other hand, it is true that the opposition of sacred and accursed, clean and

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unclean, which plays so important a part in the later history of religion, did in fact arise by differentiation from the single root idea of taboo, which includes and reconciles them both and by reference to which alone their history and mutual relation are intelligible.

The original character of the taboo must be looked for not in its civil but in its religious element. It was not the creation of a legislator but the gradual outgrowth of animistic beliefs, to which the ambition and avarice of chiefs and priests afterwards gave an artificial extension. But in serving the cause of avarice and am bition it subserved the progress of civilization, by fostering conceptions of the rights of property and the sanctity of the marriage tie,— conceptions which in time grew strong enough to stand by themselves and to fling away the crutch of superstition which in earlier days had been their sole support. For we shall scarcely err in believing that even in advanced societies the moral sentiments, in so far as they are merely sentiments and are not based on an induction from experience, derive much of their force from an original system of taboo. Thus on the taboo were grafted the golden fruits of law and morality, while the parent stem

dwindled slowly into the sour crabs and empty husks of popular superstition on which the swine of modern society are still content to feed.

It remains to indicate briefly some facts which point to a wide diffusion under various names of customs similar to the taboo, As might have been expected, the taboo is

‘found, though in a less marked form, among the Micro-

nesians, Malays, and Dyaks, all of whom are ethnologically connected with the Polynesians. In Micronesia both the name and the institution occur: the inhabitants of certain islands are forbidden to eat certain animals and the fruits of certain trees; temples and great chiefs are tabooed from the people ; any one who fishes must previously for twenty-four hours abstain from women;} in conversing with women men are not allowed to use certain words, &c. Again, the Malays have the custom, though apparently not the name. In Timor and the neighbouring islands the word for taboo is pamali (or pomali); and during the long festival which celebrates a successful head-hunt the man who has secured the most heads is pamali; he must not sleep with his wife nor eat from his own hand, but is fed by women. Pamali is a Javanese word, and had originally in Java and Sumatra the same meaning that it now bears in Timor. In Celebes a mother after child- birth was pamali. Amongst the Dyaks of Borneo the pamali (called by the Land Dyaks porikh) is regularly practised at the planting of rice, harvest home, when the cry of the gazelle is heard behind, in times of sickness, after a death, &c. At the harvest home it is observed by the whole tribe, no one being allowed to enter or leave the village. The house where a death has taken place is pamali for twelve days, during which no one may enter it and nothing may be taken out of it. A tabooed Dyak may not bathe, meddle with fire, follow his ordinary occu- pation, or leave his house. Certain families are forbidden to eat the flesh of particular animals, as cattle, goats, and snakes. The taboo is often indicated by a bundle of spears ora rattan. The Motu of New Guinea also have the taboo: a man is tabooed after handling a corpse. He then keeps apart from his wife; his food is cooked for him by his sister; and he may not touch it with his hands. After three days he bathes and is free.2 But the Motu appear to be Malayo-Polynesians, not Melanesians proper.

‘the Fraser Lake tribes in North America.‘

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ished in Fiji. It is observed in New Caledonia in cases of death, to preserve a crop, &e. According to the Rev. R. H. Codrington, there is this distinction between the Mel- anesian and the Polynesian taboo, that for the former there is no supernatural sanction : the man who breaks a taboo simply pays compensation to the person on whose tabooed property he has transgressed. But Mr R. Parkinson states that in New Britain (now New Pomerania) a person who violates a taboo-mark set on a plantation, tree, &c., is supposed to be “attacked by sickness and misfortune.” To go through the similar customs observed by savages all over the world would be endless; we may, however, note that a regular system of taboo is said to exist among some of the wild tribes of the Naga Hills in India, and that the rules not to touch food with the hands or the head with the hands are observed by tabooed women among one of In fact some of the most characteristic features of taboo—the prohibi- tion to eat certain foods and the disabilities entailed by childbirth and by contact with the dead, together with a variety of ceremonies for removing these disabilities— have been found more or less amongst all primitive races. It is more interesting to mark the traces of such customs among civilized peoples, e.g., Jews, Greeks, and Romans.

Amongst the Jews—(1) the vow of the Nazarite (Num. Amongst vi, 1-21) presents the closest resemblance to the Polynesian the Jews.

taboo. The meaning of the word Nazarite is “one separated or consecrated,” and this, as we saw (p. 15), is precisely the meaning of taboo, It is the head of the Nazarite that is especially consecrated (v. 7, “his separation unto God is upon his head”; v. 9, “defile the head of his separation” ; v. 11, “shall hallow his head”), and so it. was in the taboo. The Nazarite might not partake of certain meats and drinks, nor shave his head, nor touch a dead body,—all rules of taboo, If a person died suddenly beside him, this was said to ‘defile the head of his separation,” and the same effect, expressed in the same language, would apply to a tabooed Polynesian in similar circumstances. Again, the mode of terminating the vow of the Nazarite corresponds with the mode of breaking a taboo. He shaved his head at the door of the sanctuary and the priest placed food in his hands, either of

which acts would have been a flagrant violation of a Polynesian taboo. (2) Some of the rules for the observance of the Sabbath are identical with rules of strict taboo ; such are the prohibitions to do any work, to kindle a fire in the house, to cook food, and to go out of doors (Exod. xxxv. 2, 3; xvi. 23, 29). The Essenes strictly observed the rules to cook no food and light no fire on the Sabbath (Josephus, Bell. Jud, ii. 8,9). (8) Any one who touched a dead body was “unclean” for seven days; what he touched became unclean, and could communicate its uncleanness to any other person who touched it. At the end of seven days the unclean person washed his clothes, bathed himself, and was clean (Num, xix. 11, 14, 19, 22), In Polynesia, as we have seen, any one who touched a dead body was taboo; what he touched became taboo, and could communicate the infection to any one who touched it; and one of the ceremonies for getting rid of the taboo was washing. (4) A Jewish mother after childbirth was unclean (Lev. xii.); a Polynesian mother was taboo. (5) A great many animals were unclean, and could infect with their uncleanness whatever they touched; earthen vessels touched by certain of them were broken. Certain animals were taboo in Polynesia, and utensils which had contracted

a taint of taboo were in some cases broken.

Amongst the Greeks a survival, or at least a reminiscence, Amongst of a system of taboo is perhaps to be found in certain the applications of the epithets “sacred” and “divine ” in Gteeks.

However, in Melanesia also we find the taboo. It flour-

1 For other examples of taboos (especially injunctions to continence) among various peoples in connexion with fishing, hunting, and trading, see Turner, Samoa, p. 849; Aymonier, Notes sur les Laos, pe 2 se, 25, 26, 118, 141; W. Powell, Wanderings in a Wild Country, p. 207; Report of International Expedition to Point Barrow, Alaska, p. 39, Washington, 1885. * Journ. Anthrop. Inst., viii. p. 370.

a a ee, a 3 Journ, Anthrop. Inst., xi. p. 71; Dalton, Descriptive Ethnology of Bengal, p. 48. 4 Journ. ee vil. p. 206, Pe 6 == &

Homer, Thus a king or a chief is sacred (iepi ts TyAe- padxoro, Od., ii, 409, xviii. 405, ke. ; iepov pevos ’AXAKuvdo10, Od., vii. 167, vill. 2, &c.) or divine (dios “Odvaceds, dc. ; ’Odveajos Getoro, Il. ii. 335, &e. ; Oetwv Bacrdjov, Od., iv. 691); his chariot is sacred (J/., xvii. 464), and his house is divine (Od., iv. 43). An army is sacred (Od., xxiv. 81), and so are sentinels on duty (//., x. 56; xxiv. 681). This resembles the war-taboo of the Polynesians; on a warlike expedition all Maori warriors are taboo, and the permanent petsonal taboo of the chiefs is increased twofold: they are ‘“‘tabooed an inch thick.” The Jews also seem to have had a war-taboo, for when out on the war-path they ab- stained from women (1 Sam. xxi. 4, 5), —a rule strictly observed by Maori warriors on a dangerous expedition. The Dards, who with the kindred Siah Posh K4firs on the southern slopes of the Hindu Kush—tribes which probably of all Aryan peoples retain a social state most nearly ap- proximating to that of the primitive Aryans—abstain from sexual intercourse during the whole of the fighting season, from May to September ; and “victory to the chastest” is said to be a maxim of all the fighting tribes from the Hindu Kush to Albania! The same rule of continence in war is observed by some Indian tribes of North America.? In Homer a fish is sacred (J/., xvi. 407), and Plato points out that during a campaign the Homeric warriors never ate fish (/tep., 404 B). Even in time of peace the men of Homer’s day only ate fish when reduced to the verge of starvation (Od., iv. 363 sq.; xii. 329 sg.). The Siah Posh Kafirs refuse to eat fish, although their rivers abound in it.* The Hindus of Vedic times appear not to have eaten fish It is probable, therefore, that among the early Aryans, as among primitive peoples in various parts of the world, the eating of fish was tabooed. Again, the threshing-floor, the winnowing-fan, and meal are all sacred (//., v. 499; H. Merc., 21, 63; J/., xi. 631). Similarly in New Zealand a taboo was commonly laid on places where farming operations were going on; and among the Basutos, before the corn on the threshing-floor can be touched, a religious ceremony has to be performed, and all “defiled” persons are carefully kept from seeing it.® Although the Homeric folk ate swine, the epithet “divine ” commonly applied to a swineherd in Homer may point to a time wheh pigs were sacred or tabooed. In Crete pigs were certainly sacred and not eaten (Atheneus, 376a), and apparently at Pessinus also (Pausanias, vii. 17, 10). Amongst the Jews andSyrians, of course, pigs were tabooed ; and it was a moot question with the Greeks whether the Jews abhorred or worshipped pigs (Plut., Qucest. Conv., iv. 5).

The pigs kept in the great temple at Hierapolis were neither sacrificed nor eaten ; some people thought that they were sacred, others that they were unclean, évayéas (Lucian, De Dea Syria, 54). Here we have an exact taboo, the ideas of sacredness and uncleanness being indistinguish- able. Similarly by the Ojibways the dog is regarded as “unclean and yet as in some respects holy.”® The diver- gence of the two conceptions is illustrated by the history of the cow among different branches of the Aryan race: the Hindus regard this animal as sacred; the Shin caste among the Dards hold it in abhorrence.? The general word for taboo in Greek is dyos, which occurs in the sense both of “sacredness” and of “ pollution”; and the same is true of the adjective dyss and of the rare adjective

1 Reclus, Nouv. Géog. Univ., viii. p. 126.

2 Schoolcraft, Indian Tribes, iv. p. 63; Adair, Hist. of American Indians, p. 163. Cp. Morse, Report on Indian Affairs, p. 180 sq., and Bancroft, Native Races of the Paetfie States, i. p. 189.

3 Elphinstone, Kingdom of Caubul, ii. 379, ed. 1839 ; Journ. Ethnol. Soe., i. p. 192. 4 Zimmer, Altindisehes Leben, p. 271.

® Casalis, The Basutos, p. 251 sq.

§ Kohl, Aiteht-Gami, p. 88, Eng. trans.

7 F. Drew, The Jummoo and Kashmir Territories, p. 428; Biddulph, Tribes of the ITindoo Koosh, p. 51.

dvayns, “tabooed” (Bekker’s Anecdota Graca, 212, 32; Harpocration, s.v. avayets). Usually, however, the Greeks discriminated the two senses, dyvés being devoted to the sense of “sacred” and evayys to that of “unclean” or “accursed.” ‘*To taboo” is ayifew ; ‘to observe a taboo” is dyvevew ; and the state or season of taboo is dyveia or éyioreia, The rules of the Greek dyveta correspond closely to those of the Polynesian taboo, consisting in “ purifications, washings, and sprinklings, and in abstain- ing from mourning for the dead, child-bed, and all pollu- tions, and in refraining from certain foods,” &c.§

Amongst the Romans, who preserved more traces of Amongst primitive barbarism than the Greeks, the flamen dialis the

was hedged in by a perfect network of taboos. He was not allowed to ride or even touch a horse, nor to look at an army under arms, nor to wear a ring which was not broken, nor to have a knot on any part of his garments ; no fire, except a sacred fire, could be taken out of his house; he might not touch or even name a goat, a dog, raw meat, beans, and ivy ; he might not walk under a vine; the feet of his bed had to be daubed with mud ; his hair could be cut only by a freeman, and his hair and nails when cut had to be buried under a lucky tree ; he might not touch a corpse, &. His wife, the flaminica, was also subject to taboos: at certain festivals she might not comb her hair ; if she heard thunder, she was taboo (feriata) till she had offered an expiatory sacrifice. The similarity of some of these rules to the Polynesian taboo is obvious. The Roman feriz were periods of taboo ; no work might be done during them except works of necessity: e.g., an ox might be pulled out of a pit or a tottering roof supported. Any person who mentioned Salus, Semonia, Seia, Segetia, or Tutilina was tabooed (ferias observabat).? The Latin sacer is exactly “taboo”; for it means either “sacred” or “ accursed.” Literature.—On the Polynesian taboo, see Cook, Voyages, vol. v. p. 427 sq., vol. vii. p. 146 sq. (ed. 1809); G. F. Angas, Savage Seenes in Australia and New Zealand, passim ; W. Yate, New Zealand, p. 84 sq. ; Ellis, Polynesian Researehes, 2d ed., vol. iv. p. 385 sq.; Langsdorff, Reise wm die Welt, i. p. 114 sqg.; Mariner, Tonga Islands, i. p. 141 note, ii. pp. 82, 220sg.; Turner, Nineteen Years in Polynesia, p. 294 sq. ; Id., Samoa, p. 185 sq.; Klemm, Cultwr- gesehiehte, iv. p. 872 sq. ; Waitz-Gerland, Anthropologie der Natwr- Volker, vi. pp. 343-363 ; Shortland, Z’raditions and Superstitions of the New Zealanders, p. 101 sq.; Id., Maori Religion and Mythology, p. 25 sq.; Old New Zealand, by a Pakeha Maori, chapters vii.-xii. ; Polack, Manners and Customs of the New Zealanders, i. p. 275 sq. ; Diefenbach, Travels in New Zealand, ii. p. 100 sqg.; R. Taylor, Mew Zealand, p. 163 sg. On the taboo in Micronesia, see Waitz-Gerland, op. eit., Vv. pt. ii. p. 147 sq. ; among the Dyaks and Malays, see Id., vi. p. 354 sq.; Low, Sarawak, pp. 260-262 ; Bock, Head-Hunters of Borneo, pp. 214-280 ; Spencer St John, Life in the Forests of the

-Far East, i. p. 184 sg.; A. R. Wallace, The Malay Archipelago, p.

196 ; in Melanesia, Williams, Fiji and the Fijians, i. p. 284 sq. (ed. 1860); J. E. Erskine, The Western Pacifie, p. 254; Vinccendon- Dumoulin and Desgraz, Jles Marquwises, p. 259 sq.; Journ. Anthrop. TMBty, Xs pp. 279, 290; Ch. Lemire, Nouvelle Calédonie, Paris, 1884, p. 117; R. Parkinson, Im Bismarek-Archipel, Leipsic, 1887, p. 144, (J. G. FR.) TABRIZ, TAvRIS, or TAVRIZ, a town of Persia, capital of the province of Adarbaijén (Azerbijan, ancient Atropatene), is situated in 38° 4’ N. lat. and 46° 18’ E. long., more than 4000 feet above the sea, at the eastern end of a wide valley, through which runs a river whose waters irrigate the gardens that encircle the town. In 1812 the walls had a circumference of 34 miles. Overlooking the valley on the north-east and east are bold bare rocks, while to the south rises the more regular peak of Sahand. The town possesses few buildings of note, and of the extensive ruins but few merit attention. Mounsey in 1866 mentioned the blue mosque ; the ark or citadel, containing the palace of the heir-apparent,—a large frowning building near the centre of the town; the Great Maidan, an open square;

8 Diogenes Laertius, viii. 1, 88; cp. Plut., Quest. Oonv., v. 10. 9 Macrobius, Sat., i. 16, 8.

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and the bazaars. The mosque, which he ascribes to Shah Abbas, is that of the Turcoman Jahan Shah (1410-1468). Abbas Mirza converted the citadel intoan arsenal. Among the ruins of old Tauris the sepulchre of the Mogul sultan, Ghazan Khan, is no longer to be distinguished, except as part of a huge tumulus. It is situated about 2 miles south-west from the modern town, but far within the original boundaries. The “spacious arches of stone and other vestiges of departed majesty” with which Porter found it surrounded in 1818 were possibly remains of the college (madrasa) and monastery (2éwiya) where Ibn Batuta found shelter during his visit to the locality. In spite of the cholera visitation of 1822 and other occasional ravages of sickness, and the severe cold of winter, the climate of Tabriz is proverbially healthy. Its orchards and fruit gardens have a high reputation, and its running streams make amends for ill-paved and narrow streets and sorely defective municipal arrangements. General Schindler estimated the population in 1886 at about 170,000,—a number agreeing with the latest

local census. The same authority states that the city contains 8 tombs of imdmzddehs, 318 mosques, 100 public baths, 166 cara- vanserais, 3922 shops, 28 guard-houses, and 5 Christian (Armenian) churches ; but this account must comprise in some of its items more buildings than are actually in use. There are said to be nearly 3000 Armenians in the place. Tabriz is a city of extensive commerce, a great emporium for the trade of Persia on the west, and the special mart between Turkey, Russia, and Persia. It possesses an international telegraph station, and the line passes hence to Tiflis and Europe on one side and to Teheran on the other. Subsidiary lines have been constructed to near Astara on the Caspian (186 miles long) and to Saujbulak on the Kurdish frontier (125 miles long). Eastwick in 1860 estimated the value of the exports to Turkey at about £600,000 and to Russia at about £400,000, exclusive of smuggling. The chief imports were British, and some Swiss—coloured eotton goods, grey calicoes, and broadcloth,—with miscellaneous goods from Germany. In 1881 there was a marked improvement in the trade of Tabriz, mainly in increased imports from Constantinople. In 1885 the imports amounted to £721,730 and the exports to £306,687. The principal items of the former were cottons (from England), woollen cloth (from Austria and Germany), sugar (from France), and tea (from Holland); of the latter dried fruits (to Russia) and silk (to France, Austria, and Switzerland), There are lead mines near Tabriz, and cobalt and copper are obtainable from the Sahand. There is perhaps no city in Persia on which so much has been recorded by native and foreign writers as Tabriz. Among the former Ibn Batuta, the Arab, and Hamd Ullah, the Persian, are notable. Of the latter may be mentioned Chardin, Porter, Ouseley, Tancoigne, Morier, Du Pre, Malcolm, Lady Sheil, Eastwick, Moun- sey, Schindler, and Madame Dieulafoy (in Towr dw Monde, 1888). The naine Tabriz has been a subject of much comment and con- jecture, but there is no doubt that it is taken from the ancient name of Tauris. The history of Tabriz is a long and painful record of sieges and conflicts, of earthquakes and destruction by natural causes. Of late years it has recovered to some extent its former high position, and is in many respects a worthy rival to the capital. TACITUS. The famous Roman historian Tacitus, who ranks beyond dispute in the highest place among men of letters of all ages, lived in the latter half of the first and in the early part of the 2d century of our era, through the reigns of the emperors Nero, Galba, Otho, Vitellius, Vespasian, Titus, Domitian, Nerva, Trajan. All we know of his personal

history is from allusions to himself in his own works, and from eleven letters addressed to him by his very intimate friend the younger Pliny. The exact year of his birth is a matter of inference, but it may be approximately fixed near the close of the reign of Claudius, from 52 to 54 a.p. Pliny indeed speaks of Tacitus and himself as being “much of an age”! (prope- modum xquales), though himself born in 61 or 62, but he must have been some years junior to his friend, who began, he tells us,? his official life with a questorship under Vespasian in 78 or 79, at which time he must have

1 Pliny, Epp., vi. 20. 2THistm 1. 1.

been twenty-five years of age at least. Of his family and birthplace we know nothing certain ; we can infer nothing from his name Cornelius, which was then very widely extended ; but the fact of his early promotion seems to point to respectable antecedents, and it may be that his father was one Cornelius Tacitus, who had been a pro- curator in one of the divisions of Gaul, to whom allusion is made by the elder Pliny in his Natural History (vii. 76). But it is all matter of pure conjecture, as it also is whether his “przenomen” was Publius or Caius. He has come down to us simply as Cornelius Tacitus. The most interesting facts about him to us are that he was an eminent pleader at the Roman bar, that he was an eye- witness of the “reign of terror” during the last three years of Domitian, and that he was the son-in-law of the great and good Julius Agricola, the humane and enlightened governor of Britain. This honourable connexion, which testifies to his high moral character, may very possibly have accelerated his promotion, which he says * was begun by Vespasian, augmented by Titus, and still further ad- vanced by Domitian, under whom we find him presiding as praetor at the celebration of the secular games in 88, and a member of one of the old priestly colleges, to which good family was an almost indispensable passport. Next year, it seems, he left Rome, and was absent till 93 on some provincial business, and it is possible that in these four years he may have made the acquaintance of Germany and its peoples. His father-in-law died the year of his return to Rome. In the concluding passage of his Lzfe of Agricola he tells us plainly that he witnessed the judicial murders of many of Rome’s best citizens from 93 to 96, and that

being himself a senator he felt almost a guilty complicity in them. ‘Our hands,” he says, “dragged Helvidius to prison ; we were steeped in Senecio’s innocent blood.” # With the emperor Nerva’s accession his life be- came bright and prosperous, and so it continued through the reign of Nerva’s successor, Trajan, he himself, in the opening passage of his Agricola, describing this as. a “singularly blessed time” (beatissimum seculum) ; but the hideous reign of terror had stamped itself ineffaceably on his soul, and when he sat down to write his History he could see little but the darkest side of imperialism. To his friend the younger Pliny we are indebted for all we know (and this is but trifling) about his later hfe. He was advanced to the consulship in 97, in succession to a highly distinguished man, Virginius Rufus, on whom he delivered in the senate a funeral eulogy. ‘“‘The good fortune of Virginius,” says Pliny,® “was crowned by having the most eloquent of panegyrists.” In 99 he was associated with Pliny in the prosecution of a great political offender, Marius Priscus, under whom the provincials of Africa had suffered grievous wrongs. The prosecution was successful, and we have Pliny’s testimony ® that Tacitus spoke with his characteristic dignity. Both received a special vote of thanks from the senate for their conduct of the case. Of his remaining years we know nothing, and we may presume that he devoted them exclusively to literary work. It would seem that he lived to the close of Trajan’s reign, as he seems’ to hint at that emperor’s ex- tension of the empire by his successful Eastern campaigns from 115 to 117. Whether he outlived Trajan is matter of conjecture. It is worth noticing that the emperor Tacitus in the 3d century claimed descent from him, and directed that ten copies of his works should be made every year and deposited in the public libraries. He also had a tomb built to his memory, which was destroyed by order of Pope Pius V. in the latter part of the 16th cen- tury. Tacitus, as we gather from one of Pliny’s letters,®

3 Hist., i, 1. 4 Agricola, 45.

5 Hpp., ii. 1. 6 Hpp., ii. 11. 7 Ann, ii. 61; iv. 4

8 Epp., ix. 28.

had a great reputation during his lifetime. On one occasion a Roman knight, who sat by his side in the circus at the celebration of some games, asked him, “Are you from Italy or from the provinces?” His answer was, “You know me from your reading.” To which the knight replied, ‘‘ Are you then Tacitus or Pliny?”

Pliny, as we see clearly from several passages in his letters, had the highest opinion of his friend’s ability and worth. He consults him about a school which he thinks of establishing at Comum (Como), his birthplace, and asks him to look out for suitable teachers and professors. And he pays! him the high compliment, “I know that your fistories will be immortal, and this makes me the more anxious that my name should appear in them.”

The following is a list of Tacitus’s remaining works, arranged in their probable chronological order, which may be approximately inferred from internal evidence :—(1) the Dialogue on Orators, about 76 or 77; (2) the Life of Agricola, 97 or 98; (3) the Germany, 98, published probably in 99; (4) the Histories (Historiz), completed probably by 115 or 116, the last years of Trajan’s reign (he must have been at work on them for many years) ; (5) the Annals, his latest work probably, written in part perhaps along with the Histories, and completed subse- quently to Trajan’s reign, which he may very well have outlived.

The Dialogue on Orators discusses, in the form of a conversation which Tacitus professes to have heard (as a young man) between some eminent men at the Roman bar, the causes of the decay of eloquence under the empire. There are some interesting remarks in it on the change for the worse that had taken place in the edueation of Roman lads,

The Life of Agricola, short as it is, has always been considered an admirable specimen of biography. The great man with all his grace and dignity is brought vividly before us, and the sketch we have of the history of our island under the Romans gives a special interest to this little work.

The Germany, the full title of which is ‘‘Concerning the geography, the manners and customs, and the tribes of Germany,” describes with many suggestive hints the general character of the German peoples, and dwells particularly on their fierce and inde- pendent spirit, which the author

evidently felt to be a standing menace to the empire. The geography is its weak point; this was no doubt gathered from vague hearsay.

The Histories, as originally composed in twelve books, brought the history of the empire from Galba in 69 down to the close of Domitian's reign in 97. The first four books, and a small fragment of the fifth, giving us a very minute account of the eventful year of revolution, 69, and the brief reigns of Galba, Otho, and Vitellius, are all that remain to us. In the fragment of the fifth book we have a curious and interesting account of the Jewish nation, of their character, customs, and religion, from a cultivated Roman's point of view, which we see at once was a strongly prejudiced one.

The Annals—a title for whieh there is no aneient authority, and which there is no reason for supposing Tacitus gave distinctively to the work—record the history of the emperors of the Julian line from Tiberius to Nero, comprising thus a period from 14 A.D. to 68. Of these, nine books have come down to us entire; of books v., xi., and xvi. we have but fragments, and the whole of the reign of Caius (Caligula), the first six years of Claudius, and the last three years of Nero are wanting. Out of a period of fifty-four years we thus have the history of forty years.

An attempt has been made recently to prove that the Annals are a forgery by Poggio Bracciolini, an Italian scholar of the 15th ecntury, but their genuineness is confirmed by their agreement 2 in various minute details with coins and inscriptions discovered since that period. Another important fact has been brought to light. Ruodolphus, a monk of a monastery at Fulda in Hesse- Cassel, writing in the 9th century, says that Cornelius Tacitus speaks of the river known to moderns as the Weser as the Visurgis. In the Annals as they have come down to us we find the Visurgis mentioned five times in the first two books, whence we may con- clude that a manuscript of them was in existence in the 9th century. Add to this the testimony of Jerome that Tacitus wrote in thirty books the lives of the Cesars, and the evidence of style, and there cannot be much doubt that in the Annals we have a genuine work of Tacitus.

1 Epp., vii. 33. 2 See Introduction to vol. i. of Furneaux's edition of the Annals of Tacitus, Clarendon Press Series, 1884.

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Much of the history of the period described by him, especially of the earlier Caesars, must have been obscure and locked up with the emperor's private papers and memoranda. As we should ex- pect, there was a vast amouut of floating gossip, which an historian would have to sift and utilize as best he might. Tacitus, as a man of good social position, no doubt had access to the best information, and must have talked matters over with the most eminent men of the day. There were several writers and chron- iclers, whom he occasionally cites but not very often; there were memoirs of distinguished pcrsons,—those, for example of the younger Agrippina, of Thrasea, and Helvidius. There were several collections of letters, like those of the younger Pliny; a number, too, of funeral orations; and the ''acta senatus" and the ''acta populi" or "acta diurna," the first a record of proceedings in the senate, the latter a kind of gazette or journal. Thus there were the materials for history in considerable abundance, and Tacitus was certainly a man who knew how to turn them to good account. He has given us a striking, and on the whole doubtless a true, picture of the empire in the 1st century. He wrote, it may be admitted, with a political bias and a decided turn for satire, but he assuredly wrote with a high aim, and we may accept his own account of it: ''I regard? it as history's highest function to rescue inerit from oblivion, and to hold up as a terror to base words and actions the reprobation of posterity." Amid great evils he recognized the existence of truly noble virtues even in his own degenerate age. Still for the most part he writes as a man who felt deeply that the world was altogether 'out of joint"; the empire was in itself in his view a huge blunder, and answerable more or less directly for all the diseases of society, for all the demoralization and corruption of the great world of Rome, though as to the provinces he admits that they were better off in many ways under the emperors than they had been in the last days of the republic. But his political sympathies were certainly with the old aristocratic and senatorian régime, with the Rome of the Scipios and the Fabii; for him the greatness of his country lay in the past, and, though he felt her to be still great, her glory was, he thought, deeidedly on the wane. He was, in fact, a political idealist, and could hardly help speaking disparagingly of his own day. In his Germany he dwells on the contrast between barbarian freedom and simplieity on the one hand and the servility and degeneracy of Roman life on the other. Yet he had a strong

and sincere patriotism, which invariably made him minimize a Roman defeat and the number of Roman slain. There seems to have been a strange tinge, too, of superstition about him, and he could not divest himself of some belief * in astrology and revelations of the future through omens and portents, though he held these were often misunderstood and misinterpreted by charlatans and im- postors. On the whole he appears to have inclined to the philo- sophical theory of ‘‘necessitarianism,” that every man’s future is fixed from his birth; but we must not fasten on him any particular theory of the world or of the universe. Sometimes he speaks as a be- liever in a divine overruling Providence, and we may say confidently that with the Epicurean doetrine he had no sort of sympathy.

His style, whatever judgment may be passed on it, is certainly that of a man of genius, and cannot fail to make a deep impression on the studious reader. Tacitean brevity has become proverbial, and with this are closely allied an occasional obscurity and a rhetor- ical affectation which his warmest admirers must admit. He has been compared to Carlyle, and there are certainly resemblances between the two both in style and tone of thought. Both affect singularity of expression ; both incline to an nnhopeful and cynical view of the world. Tacitus was probably never a popular author ; to be understood and appreciated he must be read again and again, or the point of some of his acutest remarks will be quite missed. He has been several times translated, but it has always been felt that he presents very great, if not insuperable, difficulties to the translator.

Murphy’s translation (a paraphrase we should call it) is perhaps one of the best known ; it was published early in the present century. On this was based the so-called Oxford translation, published by Bohn in a revised cdition. The latest translation is that by Messrs Church and Brodribb. There is on the whole a good French translation by Louandre. The editions of Tacitus are very num. erous. Among more recent editions, the best and most useful are Orelli’s (1859); Ritter’s (1864); Nipperdey’s (1879); Furncaux’s (Annals, i.-vi.), vol. i., Clarendon Press, 1884 e (W. J. B.)

TACITUS, M. Crauprius, Roman emperor from Sep- tember 25, 275, to April 276, was a native of Interamna (Terni) in Umbria, and was born about the year 200. In the course of his long life he discharged the duties of

various civil offices, including that of consul in 273, with universal respect. Six months after the assassination of Aurelian he was chosen by the senate to succeed him, and the choice was cordially ratified by the army. During his

brief reign he set on foot some domestic reforms, and

3 Ann., ili. 65. EFM iijios Wily Pall, DP

sought to revive the authority of the senate, but, after a victory over the Alani near the Palus Meotis, he succumbed to the hardships and fatigues of his new duties at Tyana in Cappadocia. Tacitus, besides being a man of immense wealth (which he bequeathed to the state), had considerable literary culture, and was proud to claim descent from the historian, whose works he caused to be transcribed at the public expense and placed in the public libraries.

TACTICS. See War.

TADMOR. See PALMyRa.

TAFILELT, a large oasis in Morocco (see vol. xvi. p. 832). The principal place is Abuam.

TAGANROG, a seaport of southern Russia, on the northern shore of the Sea of Azoff, in the government of Ekaterinoslaff, and nearly 200 miles south-east of its chief town. It is built, principally of wood, on a low cape, and, with its extensive store-houses, exchange, and wholesale shops, has the aspect of an important commercial city. It is well provided with educational institutions for children, and has a library anda theatre. The imperial palace, where Alexander I. died in 1825, and the Greek monastery (under the patriarch of Jerusalem) are worthy of notice. The advantageous situation of Taganrog was well known as early as the 13th century, when Pisan merchants founded there a colony, Portus Pisanus, which, however, was des- tined soon to disappear during the great migrations of the Mongols and Turks. An attempt to obtain possession of the promontory was made by

Peter I., but it was not definitely annexed by the Russians until seventy years afterwards (1769). Its commercial importance dates from the second half of the present century ; in 1870 its popu- lation had risen to 38,000, and after it had been brought into railway connexion with Kharkoff and Voronezh, and thus with the fertile provinces of south and south-east Russia, the increase was still more rapid, the number reaching 63,025 in 1882,—Greeks, Jews, Armenians, and West-Europeans being important elements. Notwith- standing the disadvantages of its open roadstead, the foreign trade of Taganrog rapidly expanded, the annual value of the exports having recently reached £2,500,000. The chief article of export being corn, the trade of the city, depending on the crops in south Russia, is subject to great fluctuations. Linseed and other oil-bearing grains are also important articles of commerce, as well as tallow and butter. The imports, which consist chiefly of fruits (dried and fresh), wine, oil, and coffee, are much smaller than the exports; and of the 989 ships (499,500 tons) that entered the port in 1885 no fewer than 775 (446,500 tons) were in ballast. The coasting trade, chiefly with Rostoff, was represented in the same year by 1321 vessels (224,000 tons) entering and 1343 vessels clearing.

The roadstead of Taganrog is very shallow, and exposed to winds which cause great variations in the height of the water ; it is, more- over, rapidly silting up. At the quay the depth of water is only 8 to 9 feet, and large ships have to lie 5 to 18 miles from the town.

Taganrog, with the surrounding territory of 137,000 acres, having a population of nearly 30,000, living in a dozen villages, constitutes a separate township, and, though reckoned to the Rostoff district of Ekaterinoslaff, has a separate governor and administration.

TAGLIACOZZI, Gasparo (1546-1599), a surgeon of wide repute, was born at Bologna in 1546, and studied at that university under Cardan, taking his degree in philo- sophy and medicine at the age of twenty-four. He was appointed professor of surgery and afterwards of anatomy, and achieved notoriety at least, and the fame of a wonder- worker. He died at Bologna on November 7, 1599.

His principal work is entitled De Curtorum Chirurgia per Insitionem Libri Duo (Venice, 1597, fol.); it was reprinted in the following year under the

title of Chirurgia Nova de Narium, Aurium, Labiorumque Defectu per Insitionem Cutis ex Humero, arte hactenus omnibus ignota, sarciendo (Frankfort, 1598, 8vo).

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The latter title sufficiently indicates the art which he professed of repairing nose, ears, and lips by a species of ingrafting of skin from the arm, that member being kept in apposition with the part to be repaired until such time as the semi-detached graft had formed its new vascular conuexions. His Latinized name of Taliacotius is well known to the readers of Butler (Hudibras, i. 1), whose hum- orous representation of-the nature of the Taliacotian art is, how- ever, in some important particulars inaccurate.

TAGLIONI, Marie (1809-1884), a ballet dancer, was the daughter of Filippo Taglioni, an Italian master of the ballet, and was born at Stockholm 23d April 1809. She was trained by her father, who in his discipline is said to have been pitilessly severe. It was to his care and her own special talent for dancing that she owed her success, for she possessed no remarkable personal attractions. Her first appearance was at Vienna, 10th June 1822, in a ballet of which her father was the author, La Léception dune jeune nymphe c la cour de Terpsichore. Her success was immediate, and was repeated in the chief towns of Germany. On 23d July 1827 she made her debut at the Opera House, Paris, in the Ballet de Stcilien, and aroused a furore of enthusiasm. Her style was entirely new, and may be termed ideal as opposed to the realistic and volup- tuous ballet previously in vogue. Among her more remark- able performances were the dancing of the Tyrolienne in Guillaume Tell and of the pas de fascination in Meyerbeer’s Robert le Diable. At this period the ballet was a much more important feature in opera than it is now, and in fact with her retirement in 1845 the era of grand ballets may be said to have closed. In 1832 she married Comte Gilbert de Voisins, by whom she had two children. Losing her savings in speculation, she afterwards supported her- self in London as a teacher of deportment, especially in connexion with the ceremony of presentation at court. During the last two years of her life she stayed with her son at Marseilles, where she died in April 1884. Taglioni is frequently mentioned in the novels of Balzac; and Thackeray, in Zhe Newcomes, says that the

young men of that epoch “ will never see anything so graceful as Taglioni in La Sylphide.”

TAGUS (Span. Z’ajo, Portug. Z’ejo), the longest river of the Iberian Peninsula. Its length is 566 miles, of which 192 are on or within the frontier of Portugal, and the area of its basin, according to Strelbitsky, is 31,864 square miles. The basin is comparatively narrow, and the Tagus, like the other rivers of the Iberian tableland, generally flows in a rather confined valley, often at the bottom of a rocky gorge at a considerable depth below the general level of the adjacent country. The source of the river is at the height of 5225 feet above sea-level, on the western slope of the Muela de San Juan, in the south-west of the province of Teruel. Thence it flows at first north- westwards, but, after receiving the Rio Gallo on the right, it flows west, and then south-west or west-south-west, which is its general direction for the rest of its course. The rocky gorges which occur in its course (the principal being where the river is overhung on the right bank by the ancient city of Toledo, and again at the Puente del Arzobispo, near the frontier of Estremadura) all belong to the Spanish section of the river, and in this section the stream is frequently encumbered by sandy shallows or broken by rocky rapids, and is not navigable except for short distances. The Portuguese section has a quieter current, and Villavelha, the highest point to which boats can ascend, lies within the Portuguese frontier. Regular river-navigation begins only at Abrantes, a few miles below which the Tagus is greatly widened by receiving on its right bank the impetuous Zezere from the Serra da Estrelha. Passing Santarem, the highest point to which the tide ascends, and the limit of navigation for large sailing vessels and steamers, the river divides below Salvaterra into two

See vol, Sais. Plate re

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arms, called the Tejo Novo (the only one practicable for ships) and the Mar de Pedro, and these arms enclose a deltaic formation, a low tract of marshy alluvium known as the Lezirias, traversed by several natural canals or minor branches of the river. Both these arms enter the upper end of the fine Bay of Lisbon (114 miles long by about 7 broad), and the Tagus leaves this bay in the form of a channel 45 miles long by 2 wide (see vol. xiv. p. 692),

communicating with the ocean, but having unfortunately a bar at its mouth. On the north side of this channel stands the city of Lisbon. Only slight traces are still to be found of the gold for which the sands of the Tagus were anciently celebrated.

The narrower part of the Tagus basin lying to the south, the tributaries on the left bank are almost all mere brooks, most of which dry up in summer. The principal exception is the Rio Zatas or Sorraya, which, rising in the Serra d'Ossa, flows westwards across the plateau of Alemtejo, and joins the Mar de Pedro. The principal tributaries on the right bank, besides the Zezere, are the Jarama, descending from the tableland of New Castile a little below Aranjuez, the Alberche and the Tietar, which collect their head waters from opposite sides of the Sierra de Gredos, and the Alagon, from the rough and broken country between the Sierras de Gredos and Gata.

TAHITI ARCHIPELAGO. The eastern Polynesian island-group generally known as the Society Islands (Isles de la Société, or Tuiti) lies between 16° and 18° S. lat. and 148° and 155° W. long., and stretches for nearly 200 miles in a north-west and south-east direction; the total area does not exceed 650 square miles, of which 600 fall to Tahiti alone. To the east and north-east a channel of only 140 miles in breadth, but over 2000 fathoms in depth, separates this group from the great chain of the Low Islands, beyond which the ocean extends unbroken to America. 'To the west as far as F'iji— the main islands of which group lie between the same degrees of latitude as those of Tahiti— there are 1500 miles of open water. About 300 miles south- west lies Cook's Archipelago, and at the same distance south are the Austral Islands. To the north, excepting a few coral banks, there is open sea to Hawaii, a distance of 2600 miles.

Tahiti occupies a central position in the Pacific. Sydney lies about 3400 miles to the west and San Francisco about as far to the north-north-east. Honolulu, Noumea, and Auckland are each somewhere about 2400 miles away ; Panama is at a distance of 4600 miles.

The archipelago consists of eleven islands, which are divided into two clusters—the Leeward and the Wind- ward Islands—by a clear channel of 60 miles in breadth. The Leeward Islands, to which alone the name of Society Islands was given by Cook, are Tubai or Motuw-iti, a small

uninhabited lagoon island, the most northern of the whole archipelago ; Maupiti or Mau-rua—‘“ Double Mountain,” the most western; Bora-bora (Bola-Bola of the older navigators), or Faéarui; Tahaa; Raiatea or Ulietea (Boen- shea’s Princessa), the largest island of this cluster, and Huahine, which approach each other very closely, and are encircled by one reef. To the Windward Islands, the Georgian Islands of the early missionaries, belong Maiaiti or Tapamanu (Wallis’s Sir Charles Saunders Island and Boenshea’s Pelada); Morea or Eimeo (Wallis’s Duke of York Island and Boenshea’s San Domingo); Tahiti—Cook’s Otaheiti (probably Quiros’s Sagittaria; Wallis’s King

George’s Island, Bougainville’s Nouvelle Cythére, and Boenshea’s Isla d’Amat), the most southern and by far.

the largest of all the islands; Tetuara or Tetiaroa—“ The Distant Sea” (? Quiros’s Fugitiva; Bougainville’s Umaitia

and Boenshea’s ‘Tres Hermanos); and Matia or Maitea |

(? Quiros’s La Dezana, Wallis’s Osnaburg Island, Bougain-

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ville’s Boudoir and Pic de la Boudeuse, and Boenshea’s San Cristoval), which is by a degree the most eastern of the archipelago. Bellinghausen, Scilly, and Lord Howe (Mopia) are three insignificant clusters of coral islets to the north- west and west, and, like Tubai aud Tetuara, are atolls. The length of the Tetuara reef ring is about six miles ; it bears ten palm-covered islets, of which several are in habited, and has one narrow boat-passage leading into the lagoon. With the exception just named, the islands, which agree very closely in geological structure, are mountainous, and present perhaps the most wonderful example of volcanic rocks to be found on the globe. They are formed of trachyte, dolerite, and basalt. There are raised coral beds high up the mountains, and lava occurs in a variety of forms, even in solid flows; but all active volcanic agency has so long ceased that the craters have been almost entirely obliterated by denudation. Hot springs

are unknown, and earthquakes are slight and rare. Nevertheless, under some of these flows remains of plants and insects of species now living in the islands have been found,—a proof that the formation as well as the denudation of the country is, geologically speaking, recent. In profile the islands are rugged. A high mountain, usually with very steep peaks, forms the centre, if not the whole island ; on all sides steep ridges descend to the sea, or, as is oftener the case, to a considerable belt of flat land. These mountains, excepting some stony crags and cliffs, are clothed with dense forest, the soil being exceptionally fertile. All voyagers agree that for varied beauty of form and colour the Society Islands are unsurpassed in the Pacific. Innumerable rills, fed by the fleeting clouds which circle round the high lands, gather in lovely streams, and, after heavy rains, torrents precipitate themselves in grand cascades from the mountain cliffs—a feature so striking as to have attracted the attention of all voyagers, from Wallis downwards. Round most of the islands there is a luxuriant coral growth ; but, as the reefs lie at no great distance, and follow the line of the coast, the inter- island channels are safer than those of the neighbouring Tuamotus, which exhibit the atoll formation in perhaps its fullest development, and in consequence have been justly called the “Low” or ‘ Dangerous Archipelago.” Maitea, which rises from the sea as an exceedingly abrupt cone, and Tapamanu appear to be the only islands which have not their fringing and more or less completely encircling barrier-reefs.1 The coasts are fairly indented, and, protected by these reefs, which often support a chain of green islets, afford many good harbours and _ safe anchorages. In this respect the Society Islands have the advantage of most of the Polynesian groups.

The island of Tahiti, in shape not unlike the figure 8, has a total length of 35 miles, a coast-line of 120, and a super- ficial area of 600 square miles. It is divided into two distinct portions by a short isthmus (Isthmus de Taravao) less than a mile in width, and nowhere more than 50 feet above sea-level. The southern, the peninsula of Tairabu, or Tahiti-iti (Little Tahiti), alone as large as Raiatea (after Tahiti the most important island of the group), measures 12 miles in length by 6 miles in breadth ; while the northern, the circular main island of Porionuu, or Tahiti-uni (Great Tahiti), has a length of 23 miles and a width of 20. The whole island is mountainous. A little to the north-west of the centre of Great Tahiti the Society Islands attain their

greatest altitude. There the double- peaked Orohena rises to 7340 feet, and Aorai, its rival, is only a few hundred feet lower. Little Tahiti cannot boast of such mountains, but its tower-like peaks are very striking. The flat land of the Tahitian coast, extending to a width of several miles—with its chain of villages, its

1 Darwin, Structure of Coral Reefs, London, 1842.

fertile gardens, and its belt of palms, sometimes intersected by stream-fed valleys which open on the sea-shore—forms a most pleasing foreground to the grand amphitheatre-like mountain ranges. A good road surrounds the entire island, which is divided into eighteen districts, each under a chief and a municipal council of which he is president. A railroad is in contemplation. By the last census the population of the entire island was 9194, one-eighth being French and foreigners. The majority of the natives pro- fess the Protestant religion.

The extreme north of the island is formed by Point Venus, to the east of which lies the Bay of Matavai, and some miles still farther cast Papeete, the European town and the seat of govern- ment. The beautiful harbour, of fair size and depth, is entered by two passages in the reef, Papeete to the north, 7 fathoms in depth, and Taunoa to the east, the wider and more convenient, though shallower. The town, in 1881, had a population of 3224, half of whom were French or French half-castes, but at least a dozen different nations were represented by the 800 whites. The little city is decidedly French in character. ‘‘Papecte is the emporium of trade for the products of the South Sca Islands east of 160° E. long. Small schooners of from 20 to 50 tons burden bring the yroduce of the various groups to Tahiti, whence they are shipped direct for Europe, either by Cape Horn or the Cape of Good Hope, according to the season of the year. These schooners, of which about twenty fly the Tahitian flag, take back portions of the cargoes of vessels arriving from Europe for sale or barter amongst the islands. The chief exports are cocoa-nuts, mother-of-pearl, cotton, and some sugar, mainly to England and Germany, very little to France; and oranges, trepang (for China), and edible fungus to California.”* Many whalers formerly visited Papeete harbour, but for some years there has been a steady

diminution in their number. In 1845 forty-eight called there, in 1860 five, and none in 1874. Commerce has also in other respects decreased. Three sugar-mills with distilleries attached, two cotton manu- factories, and a manufactory of cocoa-nut fibre were at work in 1886, Oranges and vanilla are profitably grown. The timber of the country is hardly used, great quantities of Californian pine being imported. Oxen and hogs are reared. The artificial culture of the pearl oyster is beginning to be discussed, but the pearls of the Society Islands are not to be compared in number or quality to those of the Tuamotus. A good deal of trading in fruit, fibre, shell, &c., is carried on with the natives, but still mainly by barter. The competition of the Chinese immigrants, of whom in 1886 there were already 400 on Tahiti and Eimeo, is beginning to be keenly felt. Theimportation of “labour,” chiefly for the plantations, from other Polynesian islands was placed under Government control in 1862. The Tahitians themselves prefer handicrafts to agricultural work, and many are employed as artisans by European masters, who find them as handy and industrious as their own countrymen, but for domestic service they show no aptitude. Papeete is in direct sailing communication with San Francisco, and with Sydney by a Government steamer which calls every five months; also with France by Bordeaux steamers which touch on their way to Noumea.

Climate.—The seasons are not well defined. Damp is excessive ; there is little variation in the weather, which, though hot, is never- theless not depressing, and the climate for the tropics must be considered remarkably healthy. The rainfall is largest between December and April, but there is so much at other times of the year also that these months hardly deserve the name of the rainy season. During this period north-west winds are frequent, con- tinuing at times for weeks, and there are thunderstorms and hurricanes, though they are not nearly so destructive as in some of the neighbouring islands. During the eight drier and cooler months south-east winds (corresponding with the trades) prevail, but there are southerly winds which bring rain, and even westerly breezes are not unfrequent. The mean temperature for the year is 77° F.; maximum 84°, minimum 69°. The average rainfall from December to March (4 months) is 29 inches; from April to November (8 months), 19 inches. The above observations apply to the coast only.

Fauna.—Neither the zoology nor the botany of the archipelago has been thoroughly investigated. Mammalians, as in other Poly- nesian islands, are restricted to a few species of bats (mostly of the genus Pteropus), rats, and mice, none of them peculiar. Of domestic animals, the pig and the dog—the former a small breed which quickly disappeared before the stronger European strains— were plentiful even in Wallis's days. The ornithology is very poor as compared with that of the Western Pacific; and, in marked

1 The best chart of Tahiti is that published by the French Government in 1876, and corrected down to 1881. Morea is given on the same sheet.

2 Wallace, Australasia, London, 1884.

3 For fuller statistics, see Notices Colontales, Paris, 1886, vol. ii.

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contrast to the isolated Hawaiian archipelago, the Society Islands possess no peculiar genera and but few peculiar species. They claim, however, a thrush, several small parrots of great beauty, doves, pigeons, rails, and a sandpiper. Of this sandpiper, 7'ringa leucoptera, which, with many of the birds here mentioned, was dis- covered as far back as Cook's stay in the islands, only one specimen (now in the Leyden museum) is known to exist; and of the rest, their range being often limited to one portion of a small island, several species are (through the increase in the number of cats, &c.) threatened with extermination. A jungle-fowl (var. of Gallus bankiva) is found in the mountains, but as domesticated fowls were abundant, even when Tahiti was first discovered by Europeans, these wild birds are doubtless the offspring of tame birds, probably imported with the pigs and dogs by Malay vessels. There are no peculiar reptiles, and batrachians are entirely wanting. The lagoons swarm with fish of many species. Insects are poor in species, though some of them are indigenous. Crustaceans and molluscs, on the other hand, are well represented ; worms, echino- derms, and corals comparatively poorly. A noteworthy feature of Tahitian conchology is the number of peculiar species belonging to the genus Partula, almost every valley being the habitat of a dis- tinct form.+

Flora.—This, though luxuriant, is not very rich. Like the zoology, it is much poorer than that of the more western groups of the Pacific. Metrosideros, Melastoma, and Acacia are the only links which this typically Polynesian region has retained to join it to Australia. Four genera are peculiar, of which three are claimed by the Com- posite and Lobeliacex, orders characteristic of Hawaii. It is rich in trees, shrubs, and hardwood plants, poor in the smaller under- growth. Orchids, including some beautiful species, and ferns are abundant ; but, here as in Polynesia generally, Rubiacew is the order best represented. Remarkable are the banana thickets, which, chiefly on Tahiti, grow at an altitude of from 3000 to 5000 feet. Along the shore—in some places almost to the extinction of all native growth—many exotics have established themselves; and a great variety of fruit-bearing and other useful trees have been successfully introduced into most of the islands.®

Inhabitants. —The Tahitians are a typical Polynesian race, closely connected physically with the Marquesans and Rarotongans, but widely divided from them in many of their customs. The dialects, also, of the three groups are different, the Tahitian being perhaps the softest in all Oceania. The women rank with the most beauti- ful of the Pacific, though the accounts given of them by early voyagers are much exaggerated; and for general symmetry of form the people are unsurpassed by any race in the world. Even now in its decadence, after generations of drunkenness and European disease and vice, grafted on inborn indolence and licentiousness, many tall and robust people (6 feet and even upwards in height) are to be found. The women, asa rule, are small in proportion to the men. Men and women of good birth can generally be dis- tinguished by their height and fairness, and often, even in early age, by their enormous corpulence. The skin varies from a very light olive to a full dark brown. The wavy or curly hair and the expressive eyes.are black, or nearly so; the mouth is large, but well-shaped and set with beautiful teeth ; the nose broad (formerly flattened in infancy by artificial means); and the chin well developed. Solong as the native costume was retained, the tiputa, an oblong piece of bark cloth with a hole in its centre for the head, and the parw, a plain piece of cloth round the loins, were worn alike by men and women of the higher classes. Men of all ranks wore, with or without these, the maro, or T bandage. The women concealed their breasts except in the company of their superiors, when etiquette demanded that inferiors of both sexes should uncover the upper

part of the body. The chiefs wore short feather cloaks, not unlike those of the Hawaiians, and beautiful semicircular breastplates, dexterously interwoven with the black plumage of the frigate bird, with crimson feathers, and with sharks' tecth ; also most elaborate special dresses as a sign of mourning. The priests had strange cylindrical hats, made of wicker-work and over a yard in height. Circumcision, and in both sexes tattooing, were generally practised, and much significance was attached to some of the marks. The houses (vare) were long, low, and open at the sides. Household utensils were few—plain round wooden dishes, sometimes on legs, cocoa-nut shells, baskets, &. Low stools and head-rests were used. Pottery being unknown, all food was baked in the '' native oven" or roasted over the fire. Their chief musical instruments were the nose-flute (vivo)—often used as the accompani- ment of song—and the drum (pyahu). Of the latter, those kept in the marai were huge elaborately carved hollow cylinders of wood, the upper end of which was covered with sharks' skin. Conch- shells (6%) were also used. Tahitian stone adzes, which are greatly inferior in finish to those of the Hervey Islands, are, like the adzes of eastern Polynesia in general, distinguished from those of western Polynesia by their triangular section and adaptation to a socket.

4 Finsch and Hartlaub, Fauna Central-Polynesiens, Halle, 1867. 5 De Castillo, IiZustrationes Flore Insularum Maris Pacifict, Paris, 1886.

24 2 i ee 7 Slings were perhaps the favourite weapons of the Tahitians; they | ous; but with these traits are blended deceit, irritability, and had also plain spears expanding into a wide blade, and clubs. The cruelty, which formerly reaehed an unexampled degree of savage bow and arrow seem only to have been used in certain ceremonial brutality. Their notions of morality were never, aceording to our games (tea). Their canoes (vaa), from 20 to 70 feet in length, were | ideas, very precise; and their customs, such as the tayo, or exehange double or single, and provided with sai] and outriggcrs. They | of name with the rights which it carried over the wife of the giver were not well finished, but the high curved sterns, rising sometimes | of the name and all her female relations, seemed to the earlier to a height of 20 feet, of those destined to carry the images of | European obscrver strangely revolting. It would appear, however, their gods, were earved with strange figures and hung with feathers,! | that with the introduction of the viees of civilization

such limita- Cannibalism is unknown in the Society Islands, though some cere- | tions as their primitive morality recognized have disappeared and monies whieh were performed in connexion with human sacrifices | all self-respect has been lost. Especially characteristic were the may possibly be survivals of this practicc. The staple food of the | elaborate costume-dances (hetvas) performed by women. Besides islanders consisted of the bread-fruit, the taro-root, the yam, the | dancing, the singing of songs (pehe), and the recitation of historical sweet potato, and in some districts the wild plantain (fei); but | and mythieal ballads (wbus), the natives had also a variety of sports they also ate much fish (the turtle was considered saered food), as | and games, During the periodical seasons of rejoicing wrestling well as pigs and dogs, though of the latter, as pets, the women were | (maona), boxing (moto), and spear-throwing (vero patia) matches, so fond as to suckle the puppies sometimes even to the exclusion of | with foot and canoe-races, were held; also sham fights and naval their own children. Popot was a favourite dish made of bananas | reviews. They had several games in which a ball was used,—onc, and cocoa-nut. Kava (ava), which was prepared in the usual Poly- | apaz, not unlike our bandy, while another, twiraa (played chiefly nesian manner, was drunk, but in moderate quantities and only by | by women), was a kind of football; but surf-swimming (Saahee) the chicfs, was perhaps the most favourite sport with both sexes. Kites were Tahitians were good fishermen and bold seamen. They steered | known. Cock-fighting (faatitoraamoa) was much practised. by the stars, of which they distinguished many constellations. Discovery and Exploration. —Therc is little doubt that the main The land was carefully tended and the fields well irrigated. Three | island and some other members of the group were visited by the great classes were recognized :—(1) the hwiari, of divine origin, | Spaniard Pedro Fernandez de Quiros in February 1607. They were which included only the suzerain (artrai), who bore a semi-sacred | rediscovered in June 1767 by Wallis in the “ Dolphin,” who took as well as a political character, and the reigning ehiefs of distriets; | nominal possession of Tahiti for George III. and named it after him. (2) the bue-raatira, proprietors and cultivators of inherited land, | In the following year Bougainville visited Tahiti, claimed it as who also built canves, made arms, &c.; to these two classes also French, and ealled it La Nouvelle Cythére. With Tetuara (called belonged the priests (tahora), who were medicine-men as well ; | by him Umaitia) and Eimeo it makes up the Archipel de Bourbon

of (3) the manahune, fishers, artisans, &c., and slaves (¢it7). As wars | his most inaceurate chart. Almost all we know of the early state and infantieide depopulated the island this class gradually acquired | of the islands is, however, due to Captain Cook's visits in 1769, land and with it certain privileges. Rank is hereditary and de- | 1778, 1774,and1777. The name of Soeiety Islands was given to the termined by primogeniture, not necessarily in the male line. The | Leeward group on his first voyage in honour of the Royal Society. firstborn of an arirai reeeived at birth the title of otw; the father, | In 1774 Tahiti was also visited by two Spanish vessels, which left who was the first to pay homage to his own child, then abdieated, | two priests, who remained for ten months on the island. The and henceforth took up the position of regent. It is easy to see | Spaniards named it Isla d'Amat. The islands were again visited that, while this custom tended to keep honours within a family, | in 1788 by the "Lady Penrhyn." Bligh in the ''Bounty" spent it may have encouraged the practice of infanticide, which was | five months on the island in the same year, and it was revisited by common in all grades of society when Tahiti was first visited by | that ship after the famous mutiny. At this time the leading chief Europeans. The age at whieh the otu's authority became real | was Pomare, whose family had been pre-eminent in the island for varied according to his own abilities and the will of his subjects. | more thana century. Aided by sixteen of the " Bounty " mutineers, Though arbitrary, the power of the arirai was limited by the | and armed with guns procured from Bligh and a Swedish vessel, power of his vassals, the district chiefs (raatiras), who ruled | Pomare greatly strengthened his power and brought to a successful absolutely over their respective districts, and who might be of as | elose a long struggle with Eimeo. In 1791 the "Pandora" earried good blood as the arirai himself. The arirai had a councillor, | off fourteen of the " Bounty " mutineers, and from this time forward but was alone responsible for any act. The bi-insular form of | visits were frequent. Tahiti promoted the independence of the chiefs, and war was rarely Missions.—The attempt of the Spaniards in 1774 was followed declared or an army or fleet despatched without the raatiras being | by the settlement of twenty-five persons bronght in 1797 by the first summoned tocouncil. Withont their favour nothing could be | missionary ship ' Duff." Though befriended by Pomare I. (who accomplished, for their power over their own people was absolute. | lived till 1805), they had many difficulties, especially from the The form of government was thus strictly

feudal in character, but | constant wars, and at length they fled with Pomare I. to Eimeo it gradually centralized into a monarchy, which, in the person of | and ultimately to New South Wales, returning in 1812 when Pomare IJ., the English missionaries greatly helped to regulate | Pomare renonnced heathenism, In 1815 he regained his power in and strengthen. The arirai sent his commands by a messenger | Tahiti. For a time the missionaries made good progress, —a print- (vea) whose credentials were a tuft of eocoa-nut film. This tuft ing press was established (1817), and coffee, cotton, and sugar were was returned intact as a sign of assent or torn in token of refusal, | planted (1819); but soon there came a serious relapse into heathen After the chief the wife ranked first, and then his brother. The practices and immorality. Pomare II. died of drink in 1824. arirai was carried on the shoulders of his subjects, and chiefs were | His successor Pomare II{. died in 1827, and was succeeded by his not allowed to feed themselves. Women always ate apart. Their | half-sister Aimata, the unfortunate ‘Queen Pomare.” In 1828 a places of worship (marat)—national, local, or private—were square | new fanatical sect, the ‘‘ Mamaia,” arose, which gave much trouble tree-surrounded enclosures. They each had a single entrance, and | to the missions and whose influence is still felt. The leader pro- contained several small courts, within whieh were houses for the | claimed that he was Jesus Christ, and promised to his followers a images and attendant priests. A pyramidal stone structure, on | scnsual paradise, which were the aetual altars, stood at the further end of the square. French Annexation.—In 1836 the Freuch Catholic missionaries The marais were also used as plaees of sepulture of chiefs, whose | in Mangareva attempted to open a mission in Tahiti. Queen embalmed bodies, after being exposed for a time, were buried in a Pomare, advised by the English missionary and consul Pritchard, crouehing position. Their skulls, however, were kept inthe houses | refused her consent, and removed by force two priests who had of their nearest relations. Inthe great marai at Atahura the stone | landed surreptitiously and to whom mauy of the opposition party structure was 270 feet long, 94 fect wide, and 50 feet high, and its | in the state had rallied. In 1838 a Freneh frigate appeared, under summit was reached by a flight of steps, built of hewn coral and | the command of M. Du Petit-Thouars, and extorted from Pomare basalt. Sacrificial offerings, including human sacrifices, formed a | the right of settlement for Frenchmen of every profession. Other prominent part of Tahitian worship. An eye of the victim

was | aets of interference followed, and at length, in 1842, Admiral du offered to the arirai, and placed within his mouth by the officiating | Petit-Thouars procured the signature of a document placing the priest. Every household possessed its own guardian spirits (dz), | islands under French protection, the authority of the queen and but there were several superior divinities, of which, at the begin- | chiefs being expressly reserved. In 1843 Petit-Thouars reappeared, ning of this century, Oro was the niost venerated. The images, | and, alleging that the treaty of 1842 had not been duly carried out, which are less remarkable than those of Hawaii, were rough repre- | deposed the queen and took possession of the islands, His high- sentations of the human form carved in wood. Some were covered | handed action was not countenanced by the Freneh Government, from head to foot with small human figures cut in relief; others but, while it professed not to sanetion the annexation, it did not were mere sticks clothed with feathers. The areot, a lieentious | retrace the steps taken. Two years were spent in reducing the association of strolling players, men and women, whieh numbered | party in the islands opposed to French rule ; an attempt to conquer among its ranks the highest ehiefs, and practised infanticide, was | the western islands failed ; and at length, by agreement with Eng- a special feature of Tahitian soeiety. land, France promised to return to the plan of a protectorate and The Tahitians arc light-hearted, frivolous, courtcous, and gener- | leave the western islands to their rightful owners. The London missionaries were replaced by French Protestants, but neither they nor the priests have been very successful, possibly because French is a compulsory subject in the Government schools. In 1880

1 The museum of the London Missionary Socicty and the British Museum con- tain important collections of Tahitian images, dresses, weapons, &c.

Tahiti, including Fimeo, was proclaimed a French colony. It is the residence of the governor-general of the French dependencies

in the Pacific. ‘

Literature.—The following list includes the books which secm most to de- serye mention: Hawkesworth’s Voyages, especially Wallis’s Voyage,

H.M.S. “Dolphin,” in vol. i., London, 1773 ; Cook’s Three Voyages, with Forster s account of the sccond voyage ; Freycinet, Voyage de la Coquille, and Lesson’s account of the same voyage, Paris, 1839; Bennett, Whaling Voyage. London, 1840. For manners and customs of the natives, see Cook, Duff, Ellis. For modern statistics, sec Desgraz, La Tahiti, Paris, 1845; Notices Colontales, Paris, 1886, vol. ii. For the early history of the islands, see Ellis, Polynesian Researches, London, 1829 ; Vineendon-Dumoulin and Desgraz, [les Taiti, Paris, 1544. For mission history, sce Voyage of the Dugf, London, 1799,; Ellis ; Williams, Afisstonary Enterprise in the South Sea Islands, London, 1839, For the French occupation, see Moerenhout, Voyage aux Ties du Grand Océan, Paris, 1887 ; Vineendon-Dumoulin and Desgraz; Pritchard, Polynesian Reminiscences, London, 1866. (A. Vv. H.)

TAIWAN. See Formosa.

TAJAK, Tasik, or TAUSIK, a term originally occurring in the Pahlavi writings, and explained to mean, first, the Arabs in general, then their descendants born in Persia and else- where out of Arabia, and, lastly, the Persians in general and their descendants born in Turkestan and elsewhere out of Persia. Tajak has thus come to be the collective name of all communities of Iranian stock and Persian speech, wherever found in Central Asia. These are co-extensive with the former eastward and northward limits of the Persian empire; but, since the ascendency of the Tarki races, they have become the subject element in Turkestan, Afghanistan, Bokhara, Khiva, Kashgaria, while still politi- cally dominant in Badakhshan, Wakhdn, Darwaz, Kost, and Karatéghin. In most of these places the Tajaks, with the kindred Galchas, seem to form the bulk of the popula- tion, the distinction being that Tajak is applied rather to the settled and more civilized lowlanders of modern Persian speech, Galcha to the ruder highlanders of Ferghana, Kohistén, Wakhan, &c., who speak either archaic forms of Persian or dialects intermediate between the Iranian and Sanskritic (Indian) branches of the Aryan linguistic family. The Tajaks are thus a settled Iranian people, agriculturists in the country, traders and artisans in the towns, and are essentially ‘“Parsivan,” that is, men of Persian speech, —this term, however, being more specially applied to those of Afghanistan, But, although mainly of Iranian stock, with light complexion and regular features, the Tajaks claim Arab descent, regarding the district

about Baghdad as their primeval home, and considering themselves the descendants of the Arabs who overran Central Asia in the first century of the Flight. At the same time, “it is evident that the inhabitants of the greater part of this region (Central Asia) must from an early period have come in contact with the successive waves of Turkish (Tfirki) and even Mongol population which broke over them; accordingly we find that, although the type is essentially Iranian, it has under- gone a certain: modification, . . . face, though obviously Persian, is more oblong than that of the Turk, more or less heavy cheeks, thick nose, large mouth, wide forehead, .. . middle height, powerful frame, and broad shoulders, . . dark hair, but among the Galchas a few fair people are found” (Capt. J. M. Trotter, Bokhdra, p. 169). The term Tajak must also be distinguished from Sate, the latter simply meaning “trader” or “shopkeeper,” and being applied indiscriminately to the settled as opposed to the nomad element, and especially to the urban populations, of whatever race, in Central Asia.1 The Tajaks are known as Tats on the west side of the Caspian (Baku, Lenkoran, &c.).

TAKA. See Nusta,

TALAVERA pr LA Retna, a town of Spain, in the

1 “Quand un Usbeg est devenu complétement sédentaire .. . il devient Surte ; le mot Sarte n’est done pas une appellation ethnique” (Charles de Ujfalvy in Bul. Soc. Géogr., June 1878). But the Tajaks, being always settled, were the first to be known as Sartes; whence the still prevalent erroneous impression that the word had a racial mean- ing, implying an Iranian as opposed to a Tiirki element. Neverthe- less there is a certain local etiquette observed in the use of the two words Tajak and Sarte, embodied in the popular saying: ‘* When a

stranger presents himself and eats your bread, call him a Tajak; when he is gone you may call him a Sarte.”

province of Toledo, is situated on the right bank of the Tagus, and on the railway from Madrid to Caceres, some 40 miles below Toledo and 64 miles south-east from Madrid. It was formerly surrounded by a triple

circumivallation, portions of which still remain. It has no buildings of special interest, and its commerce and manufactures are inconsiderable. The population within the municipal limits in 1877 was 10,029.

Talavera is the birthplace (1536) of Mariana the historian. Well- ington overcame a superior French force here on July 27-28, 1809.

TALBOT, Famity or. Apart from its achievements, this is one of the few families in the English aristocracy which traces alike its descent and its surname from the Norman conquerors of England ; and it may really be said that there has hardly been a time during the last eight hundred years in which the Talbots have not been of con- siderable account in public life. Yet in some periods they appear rather as a potential influence, while at certain marked epochs they stand out among the most prominent actors in English history. The name of Richard Talbot

‘occurs in Domesday Book as the holder of nine hides of

land in Bedfordshire under Walter Giffard, earl of Buck- ingham. There is no evidence that he came over to Eng- land with the Conqueror himself; and, as he did not hold of the king in capitte, it is clear that he was not a leader. His son Geoffrey Talbot took part with the empress Maud against King Stephen. But apparently it was another son Hugh who continued the line ; of whom it is recorded that he held the castle of Plessi against Henry I. for Hugh de Gournay, and afterwards became a monk at Beaubec in Normandy. His son Richard obtained from Henry IT. the lordship of Linton in Herefordshire, and from Richard I. the custody of Ludlow castle; and his descendants for some generations appear to have been wardens of various castles on the borders of Wales. Under Edward II. a Gilbert Talbot was head of the house, and invaded Scot- land in the king’s company, but afterwards took part with Thomas of Lancaster against the king. He, however, was pardoned, and obtained from Edward III. a confirmation of the grant of the manor of Linton and other lands to himself and his heirs.

His son Richard, who had married a daughter of John Comyn of Badenoch, laid claim to certain lands in Scot- land in her right, and, when restrained from entering that country by land (Edward IIL. having then made an alliance with King David), he joined in a successful expedition which

invaded it by sea in the interests of Edward Baliol. Three years later he was taken prisoner in Scotland, and redeemed for 2000 marks, after which the king made him governor of Berwick. He took part also in Edward's wars against France, as did likewise his son Gilbert, who succeeded him. At this time the family possessed lands in the counties of Oxford, Gloucester, Hereford, and Kent, and a little later in Berkshire, Wilts, Salop, and Essex. Another Gilbert Talbot, grandson of the last, claimed to carry the great spurs at the coronation of Henry V., and had a commission to receive the submission of Owen Glendower and his adherents. He also distinguished himself in the invasion of Normandy. He was twice married, his second wife being a Portuguese lady, but he left no male issue, and was succeeded by his brother John, the special hero of the family.

Hitherto the head of the house had borne the name of Lord Talbot ; but this John, after obtaining by marriage the title of Lord Furnivall, was for his distinguished actions created earl of Shrewsbury. He made his name so terrible in France that for several generations afterwards French mothers used to threaten refractory children that the Talbots would come if they were not quiet (Brown's Venetian Calendar, ii. 75). He rescued Maine from the

French and took Pontoise; but his own capture by the Maid of Orleans was what probably discouraged the English most of all in their disasters beyond sea. He was exchanged for an eminent French prisoner and a heavy ransom besides. He served also several times as lieutenant of Ireland, and in 1446 was created earl of Wexford and of Waterford, in addition to the title of Shrewsbury, which had been conferred upon him in 1442. He died in 1453, in an unsuccessful expedition for the recovery of Guienne, which had lately submitted to the French. His son J ohn, Viscount Lisle, was slain along with him in the same fatal battle.

But, besides his martial exploits which live in history, this John claims some attention for his family alliances. His first wife Maud, a

granddaughter of Thomas, Lord Furnivall, brought him the castle of Sheffield as part of her inheritance, and he was accordingly summoned to

parliament in the days of Henry IV. as John Talbot of |

Hallamshire, otherwise Lord F urnivall, more than thirty years before he was made earl of Shrewsbury. The property remained in the hands of his descendants, and became a favourite residence of the family during the whole of the Tudor era; and, but for the death in 1616 of Gilbert, seventh earl of Shrewsbury, without male issue, it has been remarked by Hunter that Sheftield might have remained much longer a centre of feudal magnificence rather than of commerce and manufactures. The second wife of John, earl of Shrewsbury, was Margaret, the eldest of three daughters of Richard Beauchamp, earl of War- wick, by Ais second wife, a daughter of Thomas, Lord Berkeley. By her he obtained a third part of the Berkeley property ; and, though she did not become the mother of a line of earls, her eldest son, Jolin Talbot, was created Viscount Lisle, and it was he who fell along with his father at the disastrous battle of Chatillon in Gascony. His son Thomas, who inherited the title of Viscount Lisle, was also slain at the early age of twenty-two in a feudal contest with Lord Berkeley, arising out of a dispute as to the possession of Berkeley castle, at Nibley Green, near Wotton-under-Edge, March 20, 1470 ; and the title was afterwards conferred on Edward Grey, the husband of one of his two sisters.

John, the second earl of Shrewsbury, was the first earl's son by his first wife. He had been knighted at Leicester in 1426 along with the infant king Henry VI., had served in the wars of France, and been made chancellor of Ireland during his father's lifetime, when he was only Lord Talbot. Afterwards he was made lord high treasurer of England, and in 1459 was rewarded for his services to the house of Lancaster with a grant of 100 marks a year out of the lordship of Wakefield, forfeited by Richard, duke of York. But next year he and his brother Christopher were slain at the battle of Northampton, fighting in the cause of Henry VI. His son John succeeded him, and then his grandson George, who fought for Henry VII. at Stoke, and whom King Henry VIII sent as his lieutenant against the rebels in that most formidable insurrection, the Pilgrimage of Grace. But perhaps the thing which most refounds to his credit is the humanity with which (as

related by Cavendish) he received the fallen Cardinal Wolsey into his house at Sheffield when he was on his way up to London as a state prisoner, and endeavoured to remove those gloomy anticipations of his fate which in fact brought on his last illness.

Francis, the fifth earl, took a leading part in the invasions of Scotland under Henry VIII. and Edward VI, and was one of the two peers who alone opposed the bill for abolishing the pope's jurisdiction under Elizabeth, His son George, who succeeded, was the earl to whom the custody of Mary Stuart was committed, his delicate and

| onerous task being rendered all the more difficult for him

by the intrigues of his bold, ambitious second wife, Bess of Hardwick, the builder of Chatsworth, who had married three husbands before her union with him. Two sons of this last earl succeeded one another, and the title then devolved, for want of male issue, on the lineal descendants of Sir Gilbert Talbot of Grafton in Worcestershire, third son of John, the second earl. This Sir Gilbert had fought for Henry VII. at Bosworth, where he wag severely wounded, was knighted on the field, and was throughout one of the first Tudor's most trusted councillors, He fought also at Stoke against the insurgents with Lambert Simnel, was made a knight banneret, governor of Calais, and lord chamberlain.

The ninth earl, George, descended from this Gilbert, is not distinguished by any prominent actions. He died unmarried, and his brother, who followed next, was succeeded by his grandson Francis, chiefly memorable for his unhappy fate. His second wife, a daughter of the earl of Cardigan, was seduced by the duke of Buckingham, whom the outraged husband challenged to a duel. The countess, it is said, was present at the scene, and held Buckingham's horse in the disguise of a page, saw her husband killed, and then clasped her lover in her arms, receiving blood-stains upon her dress from the enibrace. Charles, the twelfth earl, son of this unfortunate nobleman, was raised by William III. to the dignity of a duke for his important diplomatic services. His position in those slippery times was altogether exceptional. Abandoning the religion of his ancestors he became

a Protestant, was one of the seven who signed the invitation to William of Orange to come over, and was continually consulted by him on state affairs after he became king. Yet, being apparently of a very sensitive disposition, he seems to have at times repented what he had done, and even corresponded with James at St Germain ; yet again, in times of danger, he was as ready as ever to stake his life and fortunes jn the service of his country to preserve the new settlement. It was apparently his extreme sensitiveness that caused him to be spoken of as “the king of hearts.” In 1694 he was created marquis of Alton and duke of Shrewsbury, but as he left no son these titles died along with him, and the earldom of Shrewsbury devolved on his cousin Gilbert, a Roman Catholic priest.

From this time the direct line of Sir Gilbert Talbot of Grafton began to fail. A nephew three times succeeded to an uncle, and then the title devolved upon a cousin, who died unmarried in 1856. On the death of this cousin the descent of the title was for a short time in dispute, and the lands were claimed for the infant son of the duke of Norfolk under the will of the last carl ; but the courts decided that, under a private Act obtained by the duke of Shrewsbury in the sixth year of George I., the title and estates must go together, and the true successor to the earldom was found in Earl Talbot, the head of another line of the descendants of Sir Gilbert Talbot of Grafton, sprung from a second marriage of Sir Gilbert’s son, Sir John Talbot of Albrighton. The head of this family in the beginning of the last century was a divine of some mark, who died bishop of Durham in 1730. His son Charles, who filled the office of lord chancellor, was created Baron Talbot of Hensol in Glamorganshire in 1733; and his son again was advanced to the dignity of Earl Talbot in 1761, to which was added that of Baron Dynevor in 1780. Then succeeded a nephew, who was also created Viscount Ingestre, and assumed by royal licence the surname of Chetwynd before Talbot, from his mother.

The Earl Talbot who successfully claimed the Shrews- bury title (as the eighteenth earl) was the present earl’s

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grandfather, and all the titles just mentioned have been united in his line ever since. (J. GA.

TALBOT, Witt1am Henry Fox (1800-1877), a dis- coverer in photography, was the only child of William Davenport Talbot, of Laycock Abbey, Wilts, and of Lady Elizabeth Fox Strangways, daughter of the second earl of Ilchester. He was born in February 1800, and educated at Harrow and at Trinity College, Cambridge, where he gained the Porson prize in 1820, and graduated as twelfth wrangler in 1821. From 1822 to 1872 he frequently communicated papers to the Royal Society, many of them on mathematical subjects. At an early period he had begun his optical researches, which were to have such important results in connexion with photography. To the Edinburgh Journal of Science in 1826 he contributed a paper on "Some Experiments on Coloured Flame ee to the Quarterly Journal of Science in 1827 a paper on 'Monochromatic Light"; and to the Philosophical Maga- zine a number of papers on chemical subjects, including one on "Chemical Changes of Colour." Before Daguerre exhibited in 1839 pictures taken by the sun, Talbot had obtained similar success, and as soon as Daguerre's dis- coveries were whispered communicated the results of his experiments to the Royal Society (see PHoTocrapny, vol. xviii, p. 824). In 1841 he made known his discovery of the calotype process, but after the discovery of the collodion process by Scott Archer, with whom he had a lawsuit in reference to his patent rights, he relinquished this field of inquiry. For his discoveries, the narrative of which is detailed in his Pencil of Nature (1844), he received in 1842 the medal of the Royal Society. While engaged in his scientific researches he devoted a consider- able portion of his time to archeology, and this field of inquiry latterly occupied his chief attention. Besides reading papers on these subjects before the Royal Society of Literature and the Society of Biblical Archeology, he published Hermes, or Classical and Antiquarian Researches (1838-39), and Illustrations of the Antiquity of the Book of Genesis (1839). With Sir Henry Rawlinson and Dr Hincks he shares the honour of having been one of the first decipherers of the cuneiform inscriptions of Nineveh, He was also the author of English Etymologies (1846). He died at Laycock Abbey, 17th September 1877.

TALC. See Grotocy, vol. x. p. 228, and MINERALOGY, vol. xvi. p. 414.

TALCA, a town of Chili, capital of the province of Talca, is situated on the Claro, a tributary of the Maule, nearly due south of Santiago, with which it is connected by rail. The town has a lyceum and some woollen manu-

factures (especially of “‘ ponchos”). In 1875 the population numbered 17,496, and in 1885 about 19,000.

TALENT. See Numismatics, vol. xvii. p. 631.

TALES are, in the usual acceptance of the word, ficti- tious narratives, long or short, ancient or modern. In this article ‘‘tale” is used in a stricter sense, as equivalent to the German “Volks-mirchen” or the French ‘conte populaire.” Thus understood, popular tales mean the stories handed down by oral tradition from an unknown antiquity, among savage and civilized peoples. So understood, popular tales are a subject in mythology, and indeed in the general study of the development of man, of which the full interest and importance is scarcely yet recognized. Popular tales won their way into literature, it is true, at a very distant period. The Homeric epics, especially the Odyssey, contain adventures which are manifestly parts of the general human stock of popular narrative. Other examples are found in the Aegveda, and in the myths which were handled by the Greek dramatists. Collections of popular tales, more or less subjected to conscious literary treatment, are found in Sanskrit, as in the work of

| and Finnish, Esthonian, and Magyar stories.

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Somadeva, whose Kathé Sarit Sdgara, or ‘‘Ocean of the Streams of Story,” has been translated by Mr Tawney (Calcutta, 1880). The THousanp anpD ONE Nicuts (¢.2.) are full of popular tales, and popular tales are the staple of the medieval Gesta Romanorum, and of the collections of Straparola and other Italian conteurs. In all these and similar gatherings the story, long circulated from mouth to mouth among the people, is handled with conscious art, and little but the general outline of plot and character of incident can be regarded as original. In the Histoires ou Contes du Temps Passé of Perrault (Elzevir, Amsterdam, 1697; the Parisian edition is of the same date) we have one of the earliest gatherings of tales which were taken down in their nursery shape as they were told by nurses to children. This at least seems probable, though M. Alfred Maury thinks Perrault drew from literary sources. Perrault attributed the composition to his son, P. Darmau- cour, at that time a child, and this pretext enabled him to give his stories in a

simple and almost popular guise. In the dedication signed by the boy, Perrault offers remarks which really do throw a certain light on the origin and characteristics of "'marchen." He says, "Ils renferment tous une morale trés sensée et donnent une image de ce qui se passe dans les moindres familles, ot la louable impatience d'instruire les enfans fait imaginer des histoires dépourvies de raison pour s'accomoder & ces mémes enfants, qui n'en ont pas encore." It seems that popular tales in many cases probably owe their origin to the desire of enforcing a moral or practical lesson. It appears that their irrational and "infantile" character—'" dépourvies de raison" —is derived from their origin, if not actually among children, at least among childlike peoples, who have not arrived at "raison," that is, at the scientific and modern conception of the world and of the nature of man.

The success of Perrault's popular tales brought the genre into literary fashion, and the Comtesse d'Aulnoy in- vented, or in some cases adapted, ''contes," which still retain a great popularity. But the precise and scientific collec- tion of tales from the lips of the people is not much earlier than our century. The chief impulse to the study was given by the brothers Grimm. The first edition of their Kinder- und Haus-Mérchen was published in 1812. The English reader will find a very considerable bibliography of popular tales, as known to the Grimms, in Mrs Alfred Hunt's translation, Grimm's Household Tales, with Notes (London, 1884). 'How unique was our collection when it first appeared," they exclaim, and now merely to enumerate the books of such traditions would occupy much space. In addition to the mirchen of Indo-European peoples, the Grimms became acquainted with some Malay stories, some narratives of Bechuanas, Negroes, American Indians, Thus the Grimmy' knowledge of non-European marchen was extremely slight. It enabled them, however, to observe the increase of refinement 'in proportion as gentler and more humane manners develop themselves," the monstrosities of Finnish and Red-Indian fancy gradually fading in the narratives of Germans and Italians. The Grimms notice that the evolution of popular narrative resembles the evolution of the art of sculpture, from the South-Sea idol to the frieze of the Parthenon, "from the strongly marked, thin, even ugly, but highly expressive forms of its earliest stages to those which possess external beauty of mould." Since the Grimms' time our knowledge of the popular tales of non- European races has been greatly enriched. We possess

numbers of North-American, Brazilian, Zulu, Swahili, Eskimo, Samoan, Maori, Kaffir, Malagasy, Bushman, and even Australian marclien, and can study them in compar- ison with the stories of Hesse, of the West Highlands of Scotland, of Scandinavia.

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While the popular romances of races of all colours must be examined together, another element in this subject is not less important. It had probably been often observed before, but the fact was brought out most vividly by Von Hahn (@riechische und albanesische Mérchen, Leipsic, 1864), that the popular tales of European races turn on the same incidents, and display the same succession of situations, the same characters, and the same plots, as are familiar in the ancient epic literature of Greece, India, Germany, and Scandinavia. The epics are either fully-developed mirchen evolved by the literary genius of poets and saga-men, or the mirchen are degenerate and broken-down memories of the epics and sagas, or perhaps there may be examples of both processes. The second view,—namely, that the popular tales are, so to speak, the scattered grains of gold of which the epic is the original “pocket” or “placer,”-—the belief that the mirchen are the detritus of the saga,—was for a long time prevalent. But a variety of arguments enforce the opposite conclusion, namely, that the mirchen are essentially earlier in char- acter than the epic, which is the final form to which they have been wrought by the genius of Homer or of some other remote yet cultivated poet. If this view be accepted, the evolution of mirchen and of certain myths has passed through the following stages :—

(1) The popular tale, as current among the unculti- vated peoples, such as Iroquois, Zulus, Bushmen, Samoans, Eskimo, and Samoyedes. ‘his tale will reflect the mental condition of rude peoples, and will be full of monstrous and miraculous events, with an absence of reason proper, as Perrault says, “a ceux qui n’en ont pas encore.” At the same time the tale will very probably enforce some moral or practical lesson, and may even appear to have been invented with this very purpose, for man is everywhere impressed with the importance of conduct.

(2) The same tale—or rather a series of incidents and a plot essentially the same—as it is discovered surviving in the oral traditions of the illiterate peasantry of European races. Among them the monstrous element, the ferocity of manners observed in the first stage, will be somewhat modified, but will be found most notable among the Slavonic tribes. Nowhere, even in German and Scottish miirchen, is it extinct, cannibalism and cruel torture being favourite incidents,

(3) The same plot and incidents as they exist in the heroic epics and poetry of the cultivated races, such as the Homeric books, the Greek tragedies, the Cyclic poets, the Kalewala of the Finns, certain hymns of the Rigveda, certain legends of the Brahmanas, the story of the Volsungs,—in these a local and almost historical character is given by the introduction of names of known places, and the adventures are attributed to national heroes,—Odys- seus, idipus, Sigurd, Wainamoinen, J ason, Pururavas, and others, The whole tone and manners are nobler and more refined in proportion as the literary workmanship is more elaborate.

This theory of the origin of popular tales in the fancy of peoples in the savage condition (see MytTHoLoey), of their survival as miarchen among the peasantry of Indo- European and other civilized races, and of their transfigu- ration ito epics, could only be worked out after the discovery that savage and civilized popular tales are full of close resemblances. These resemblances, when only known to exist among Indo-European peoples, were explained as part of a common Aryan inheritance, and as the result of a malady of language. This system, when applied to myths in general, has already been examined (see Myrxo- Locy). According to another view, marchen everywhere resemble each other because they all arose in India, and have thence been borrowed and transmitted. For this

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theory consult Benfey’s Panchatantra and M. Cosquin’s Contes de Lorraine (Paris, 1886). In opposition to the Aryan theory, and the theory of borrowing from India, the system which is here advocated regards popular tales as kaleidoscopic arrangements of comparatively few situa- tions and

incidents, which again are naturally devised by Among these incidents may be men- tioned, first, kinship and intermarriage between man and the lower animals and even inorganic phenomena. Thus

| 4 girl is wooed by a frog, pumpkin, goat, or bear, or

elephant, in Zulu, Scotch, Walachian, Eskimo, Ojibway, and German marchen. This incident is based on the lack of a sense of difference between man and the things in the world which is prevalent among savages (see MyTHoLoey). Other incidents familiar in our nursery tales (such as ‘‘Cinderella” and “Puss in Boots”) turn on the early belief in metamorphosis, in magic, in friendly or protecting animals (totems or beast manitous). Others depend on the early prevalence of cannibalism (compare Grimn, 47, “The Juniper Tree”), This recurs in the mad song of Gretchen in Faust, concerning which a distinguished student writes, “This ghost of a ballad or rhyme is my earliest remembrance, as crooned by an old East-Lothian nurse.” (Compare Chambers’s Popular Rhymes of Scot- land, 1870, p. 49.) The same legend occurs among the Bechuanas, and is published by Casalis. Yet another incident springs from the taboo on certain actions between husband and wife, producing the story of Cupid and Psyche (see Lang’s Custom and Myth, 1884, p. 64). Once more, the custom which makes the youngest child the heir is illus- trated in the marchen of the success, despite the jealousy of the elders, of Cinderella, of the Zulu prince (Callaway’s Tales from the Amazulu, pp. 64, 65), and in countless other marchen. In other cases, as in the world-wide marchen corresponding to the Jason epic, we seem in presence of an early romantic invention,—how diffused it is difficult to imagine. Moral lessons, again, are inculcated by the numerous tales which turn on the duty of kind- ness, or on the impossibility of evading fate as announced in prophecy. In opposition to the philological explanation of the story of Cidipus as a nature-myth, this theory of a collection of incidents illustrative of moral lessons is admirably set forth in Prof. Cauparetti’s Edipo e la Mitologia Comparata (Pisa, 1867).

On a general view, then, the stuff of popular tales is a certain number of incidents and a certain set of combina- tions of these incidents. Their strange and irrational character is due to their remote origin in the fancy of men in the savage condition; and their wide distribution is caused, partly

perhaps by oral transmission from people to people, but more by the tendency of the early imagination to run everywhere in the same grooves. The narratives, in the ages of heroic poetry, are elevated into epic song, and in the Middle Ages they were even embodied in legends of the saints. This view is maintained at greater length, and with numerous illustrations, in the introduction to Mrs Hunt's translation of Grimm's Kinder- und Haus-Marchen, and in Custom and Myth, already referred to.

A complete bibliography of the literature of popular tales would fill many pages. The reader who is curious about savage popular tales may turn to Theal's Kafir Folk Lore (2d ed., London, 1886); Callaway's Nursery Tales of the Amazulu (London, 1868) ; Schooleraft's Algie Researches; Gill's M yths and Tales of the South Pacifie; Petitot's Traditions Indiennes (1886) ; Shortland's Maori Keligion and Mythology (London, 1882); The South African Folk Lore Reeord; the Folk Lore Reeord (London, 1879-85, Malagasy stories); Rink's Tales and Traditions of the Eskimo; Bleek's Hottentot Tales and Fables (London, 1864); Castrén's Samoyedisehe Mérehen ; and Leland's Algonquin Legends (London, 1884). For European tales, the bibliography in the translation of Grimm already referred to may be used, and the Maisonneuve collection, Les Littératures populaires may be recommended. The names of

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Liebrecht, Kohler, Dasent, Ralston, Nigra, Pitré, Cosquin, Afanasief, Gaidoz, Sébillot, may serve as clues through the enchanted forest of the nursery tales of Europe. (221L,)

TALFOURD, Sim Tuomas Noon (1795-1854), was at once eminent as a lawyer, as a writer, and as a member of a brilliant and polished society. He had the faculty of winning friendships ; so sympathetic indeed was his nature that he unconsciously biassed many of the most acute among his acquaintances towards an estimate of his genius as an author—more cspecially as a dramatist—hardly cominensurate with what more impartial criticism has decided to be his just meed of praise. But, though even his most excellent work in literature has now ceased to be generally cared for, his poetry must always be inter- esting to the literary student.

The son of a brewer in good circumstances, Talfourd was born on January 26, 1795, at Doxey, near Stafford (some accounts mention Reading). education, first at an institution near Hendon, and later at the Reading grammar-school under Dr Valpy. Here, it is said, he acquired his taste for dramatic poetry, pre- sumably under the guidance of Dr Valpy. At the age of eighteen the lad was sent to London to study law under Mr Chitty, the special pleader. Early in 1821 he joined the Oxford circuit, having been called to the bar at the Middle Temple in February of that year. When, fourteen years later, lie was created a serjeant-at-law, and when again he in 1849 succeeded Mr Justice Coltman as judge of the Court of Common Pleas, he attained these distinctions more perhaps for the zeal and laborious care which he invariably displayed in his conduct of the cases confided to him than on account of any brilliance of forensic talent or of any marked intellectual subtlety. A parliamentary life had always had an attraction for him, and at the general election in 1835 he was returned for Reading. This seat he retained for close upon six years, and he was again returned in 1847. In the House of Commons he ‘was no mere ornamental member. Those efforts of his which have most interest for us of later date were made on behalf of the rights of authors, for whose benefit he introduced the International Copyright Bill; his speech on this subject was considered the most telling made in the House during that session. The bill met with strong opposition, but Talfourd had the satisfaction of seeing it ultimately pass into law in 1842, albeit in a greatly modified form.

At the period of his elevation to the bench he was created a knight, and thenceforward his life was, in the intervals of his professional labours, devoted to scholarly and literary pursuits. From his school days he had enter- tained dreams of attaining eminence as a writer ; and to the last he remained a diligent student of literature, ancient and modern. During his early years in London Talfourd found himself forced to depend—in great measure, at least —upon his literary exertions. He was at this period on the staff of the London Magazine, and was an occasional contributor to the Hdinburgh and Quarterly reviews, the New Monthly Magazine, and other periodicals ; while, on joining the western circuit, he acted as law reporter to The Times. His legal writings on matters germane to lit- erature are excellent expositions, animated by a lucid and sufficiently telling, if not highly polished, style. Among the best of these are his article “On the

Principle of Advocacy in the Practice of the Bar” (in the Law Magazine, January 1846); his Proposed New Law of Copyright of the LTighest Importance to Authors (1838) ; Three Speeches de- liwered in the House of Commons in Favour of an Extension of Copyright (1840); and his famous Speech for the De- fendant in the Prosecution, the Queen v. Moxon, for the Publication of Shelley’s Poetical Works (1841).

But Talfourd cannot be said to have gained any position

He received his early |

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among men of letters until the production of his tragedy Zon, which was privately printed in 1835, and produced in the following year at Covent Garden theatre. The tragedy was also well received in America, and it met with the honour of reproduction at Sadler’s Wells in December 1861. This dramatic poem, its author’s masterpiece, turns upon the voluntary sacrifice of Ion, king of Argos, in re- sponse to the Delphic oracle, which had declared that only with the extinction of the reigning family could the pre- vailing pestilence incurred by the deeds of that family be removed. Asa poem Jon has many high qualities. The blank verse, if lacking the highest excellence, is smooth and musical, and the lines are frequently informed with the spirit of genuine poetry ; the character of the high-souled son of the Argive king is finely developed, and the reader is affected throughout by that same sense of the relentless working and potency of destiny which so markedly distin- guishes the writings of the Greek dramatists.

Two years later, at the Haymarket theatre, The Athenian Captive was acted with moderate success. In 1839 Glen- coe, or the Fate of the Macdonalds, was privately printed, and in 1840 it was produced at the Haymarket ; but this home drama is indubitably much inferior to his two classic plays. The Castilian (1853) did not excite a tenth part of the interest called forth by Jon. Before this he had pro- duced various prose writings other than those already re- ferred to,—among them his ‘History of Greek Litera- ture,” in the Encyclopedia Metropolitana.

Besides the honour of knighthood and his various legal distinctions, Talfourd held the honorary degree of D.C.L. from the university of Oxford. He died in court during the performance of his judicial duties, at Stafford, on March 13, 1854.

In addition to the writings above-mentioned, Talfourd was the author of The Letters of Charles Lamb, with a Sketch of his Life (1837); Recollections of a First Visit to the Alps (1841); Vacation Rambles and Thoughts, comprising recollections of three Conti- nental tours in the vacations of 1841, 1842, and 1848 (2 vols., 1844); and Final Memorials of Charles Lamb (1849-50).

TALISMAN. See AMULET.

TALLAGE, or Tatiiace (from the French taller, 2.e., a part cut out of the whole), appears to have signified at first a tax in general, but became afterwards confined in England to a special form of tax, the assessment upon cities, boroughs, and royal demesnes—in effect, a land tax. Like ScuracE (q.v.), tallage was superseded by the subsidy sys- tem in the 14th century. The last occasion on which it was levied appears to be the year 1332. The famous statute of 25 Edw. I. (in some editions of the statutes 34 Edw. I.) De Tallagio non Concedendo, though it is printed among the statutes of the realm, and was cited as a statute in the preamble to the Petition of Right in 1627, and by the judges in John Hampden's case in 1637, is probably an imperfect and unauthoritative abstract of the Conjfirmatzo Cartarum. The first section enacts that no tallage or aid shall be imposed or levied by the king and his heirs with- out the will and assent of the archbishops, bishops, and other prelates, the earls, barons, knights, burgesses, and other freemen in the kingdom. Tallagiwm facere was the technical term for rendering accounts in the exchequer, the

accounts being originally kept by means of ¢alles or notched sticks. The tellers (a corruption of talliers) of the exchequer were at one time important financial officers. The system of keeping the national accounts by tallies was abolished by 23 Geo. III. c. 82, the office of teller by 57 Geo. ITT. c. 84.

TALLEYRAND DE PERIGORD, Cuartes Maurice (1754-1838), created by Napoleon a prince of the empire under the title of the Prince de Bénévent, was born at

Paris on 2d February 1754. His father, who was of a _ younger branch of the princely family of Chalais, was an

officer in the army of Louis XV., and his mother, also of noble family, was a member of the royal household at Ver- sailles. An accident in infancy rendered Talleyrand lame for life, and changed his whole career. His upbringing was, in accordance with the fashionable heartlessness of the day, entirely left to strangers; and while a boy he was, in con- sequence of his lameness, formally deprived by a conseil de Famille of his rights of primogeniture,—his younger brother, the Comte d'Archambaud, taking his place; and he was destined for the church. He keenly felt the blow, but was powerless to avert it; and he used his enforced profession only as a stepping-stone to his ambition, always despising it, and coolly and defiantly forsaking it when he found it an embarrassment.

When he was removed from the country he was sent to the Collége d'Harcourt, where he speedily distinguished himself; and in 1770, when sixteen years of age, he became an inmate of the Séminaire de St Sulpice, his education being completed by a course in the Sorbonne. Much as Talleyrand despised the church as a career, he never ceased highly to appreciate theology as a training, and he publicly testified to its value to the statesman and specially to the diplomatist. While achieving distinction as a student, he carefully cultivated such society as might promote his advancement; and it was in the circle of Madame du Barry that his cynicism and wit, reported by her to the king, gained him the position of abbé. To his arts of manner were added, not only his advantages of birth and scholarship, but a penetrating judgment of men and affairs, a subtle audacity, and a boundlessly selfish ambition. As early as 1780 we find this abbé malgré lui to have reached the important position of " agent-general " of the French clergy. His ability and his flagrant immorality alike rendered him a marked man, and the latter did not prevent his appointment, in accordance with his father's dying request to the king, as bishop of Autun in January 1789. The

clergy of his own diocese immediately elected him a member of the states-general ; and he delivered before his constituents one of the most remarkable speeches which the crisis produced, containing a sagacious and statesmanlike programme of the reforms which the condition of France demanded, He thus entered the assembly as one of its leaders.

The states-general had hardly met ere Talleyrand's influ- ence was called into play. He successfully urged the clergy to yield to the demand of the commons that the three estates should meet together; and the nobles could thereafter only follow the example thus set. On the question of the extent of the assem bly's authority he again sided with the popular leaders, As a financier of great foresight and power he soon became justly celebrated ; and his position in the assembly may be estimated by his appointment as one of a committee of eight to frame the project of a constitution. All his previous successes were, however, eclipsed by the daring with which he attacked the rights and privileges of his own order. He had seconded the proposals that the clergy should give up their tithes and plate for the benefit of the nation, and on 10th October 1789 he himself proposed a scheme whereby the landed property of the church should be confiscated by the state. On 2d November, after violent debates, his project was carried, and the old clergy thereafter ranked him as anenemy. But his general popularity so much increased that he was charged by the national assembly to prepare a written memoir in defence of its labours; and the mani- festo, read on February 10, 1790, was received with great approval throughout the country. On the 16th he was elected president of the assembly for the usual brief term.

On various subjects he was now looked up to as an! avow. All,

authority,—on education, on electoral and ecclesiastical

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reform, on banking, and on general finance, a diplomatist had not yet begun.

On July 14, 1790, Talleyrand, at the head of 300 clergy, assisted at the féte in the Champ de Mars in commemora- tion of the fall of the Bastille, and

publicly blessed the great standard of France. By this tinie, however, the dispute as to the civil constitution of the clergy had broken out, the decision of the assembly being resisted by the king, backed by the pope. When in November the king yielded, Talleyrand boldly took the required oath, only two bishops following his example. New bishops were elected by the assembly, and these he, in open defiance of the church, consecrated. In the end of April 1791 he was suspended from his functions and excommunicated by the pope. Without a moment's hesitation Talleyrand aband- oned his profession, which he never afterwards resumed, He had been false to its vows, and had scandalized it by his shameless life. It was only in the preceding February that he had, in declining nomination for the archbishopric of Paris, felt, indiscreetly enough and contrary to his usual practice, the necessity of writing to the Moniteur a hypo- critical confession of his gambling propensities, stating his gains at 30,000 francs. Although in 1801 the excom- munication was recalled, it was nearly half a century after his first act of defiance ere he became personally reconciled to the church, and then only when he was at the point of death.

On purely political lines, however, Talleyrand's career became more and more celebrated. In the beginning of the same month of April 1791, his friend Mirabeau having just died, he was appointed to succeed him as a director of the department of Paris, a position which still further increased his influence in the circles of the metropolis. On the flight of the king in June, Talleyrand leaned at first and cautiously towards the duke of Orleans, but finally declared for a constitutional monarchy with Louis XVI. still on the throne. Ere the constitutional assembly brought its existence to a close on 14th September, he unfolded before it his Imagnificent scheme of national education, which, in the words of Sir Henry Bulwer, "having at one extremity the communal school and at the other the Institute, exists with but slight alterations at this very day." The assembly had voted that none of its members should be members of the new legislative body, so that Talleyrand was free ; besides, events were hurrying on with strange and critical rapidity ; and Talleyrand left France for England, reaching London in the end of January 1792. With this visit his diplomatic career may be said to have begun,

He was not formally accredited, but had in his pocket an introduction to Lord Grenville by Delessart the foreign minister ; the king himself was aware of his mission, the ostensible object of which was to conciliate England. Talleyrand for his part shared the ulterior views of Narbonne, the minister of war, that it would be for the advantage of his country to divert its energies, which were morbidly directed to its internal troubles, into another channel, and to precipitate an Austrian war. Although received well in London society, he found the want of official credentials a fatal obstacle to his diplomatic nego- tiations, and he returned to Paris, whence he was almost immediately again despatched to the English court under much more favourable conditions, He was nominally only attendant with De Chauvelin, the minister plenipotentiary, but he was really the head of the embassy, and he carried with him a letter of Louis XVI. to George III. At this time, indeed, TaHeyrand's relations with Louis were very close,—far closer than he afterwards cared or dared to however, was of no avail. The startling course of the Revolution made the English look askance

His career as

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upon his mission, and he returned baffled to Paris, where he arrived shortly before the coup @état of the 10th of August. But this place, where his wariest manceuvres were outdone by the rapidity of the popular movements, and where at any turn of affairs he might lose his head, was not to his liking; and by the middle of September he is for the third time in London. It is characteristic of the man—of the dexterity as well as audacity of his intrigue—that he who had but shortly before carried with him a letter of favour from Louis XVI. was, now that royalty was abolished, the bearer of a specific passport— "going to London by our orders"—under the hand of Dantou. Equally characteristic is the express falsehood with which he opens his negotiations: he writes at once to Lord Grenville, "I have at this time absolutely no kind of mission in England"—he was selling his library and seeking repose. His courtesies were not returned ; and, although he succeeded in making friends in certain high quarters, he was, in the end of January 17 94, under the provisions of the Alien Act, ordered to leave

England. Fortified with an introduction by Lord Lansdowne to Washington, he sailed for the United States.

A decree of the convention had issued against Talley- rand during his stay in England. He was an émigré. But as the excesses of the period drew to a close the proscription was recalled on the appeal of Chénier, who founded on Talleyrand's relations with Danton and his mission to England in the service of the Revolution! On July 25, 1795, he arrived at Hamburg, whence he passed to Berlin, and, after a short stay there, to Paris. He was received with enthusiasm in the circles of fashion and intrigue. He would have been eagerly welcomed by any of the political parties as a strength; but the Directory was in power, and he supported it. Within the Directory he supported Barras, as against his compeers. He was thus a moderate constitutionalist and in the way of advancement.

During his absence from France he had been elected a member of the Institute. He was now elected its secre- tary. In this capacity he read before it two memoirs—one on the "commercial relations of the United States with England," and the other ''on the advantages of withdraw- ing from new colonies in present circumstances." These memoirs exhibit Talleyrand at the very maturity of his powers, and are sufficient to establish his position as one of the most far-seeing and thoughtful statesmen that France ever possessed. The first paper shows how, in spite of the War of Independence, the force of language, race, and interest must in his view bind England and the States together as natural allies; and it contains that remarkable passage (which once read is never forgotten) in which the civilization of America is described as exhibited in space as well as in time,—as the traveller moves west- ward from State to State he appears to go backward from age to age. The papers, which were read in April and July of 1797, made his claim to state recognition irre- sistible, and towards the end of the latter month he was appointed to the post of foreign niinister.

He had been carefully scanning the political situation, and he accurately foresaw that the Directory, which represented no one set of opinions, but only a vain com- pound of all, could not stand against unity of policy backed by force, and in the meantime could be manipu- lated. Thus with a brutal swiftness its personnel becomes changed. Barras with his sluggish

moderation remains ; but, behind and through him, it is the dexterous purpose of Talleyrand that is at work. This is the first character- istic of his administration. Its second is the ability which he displays in his communications with the diplomatic service, in view of the rupture with England. Its third is

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the shamelessly corrupt manner in which he approaches the American ambassadors on the subject of the seizure of certain ships, on the conclusion of a commercial treaty between England and the States, putting himself in his public and powerful position at their service,—if the bribe were suitably large. And its fourth is that he is hardly in the chair of office until he has shrewdly selected Bonaparte as the object of his assiduous flatteries, writing to him in semi-confidence, and laying the basis of their future intimacy. But his first term of office was short: the American ambassadors spurned his offer and let his conduct be publicly known, with the result that for this and other reasons he resigned his post. Public opinion was outraged. His official corruption, however, was not ended, for Talleyrand turned everything into gold; in his later diplomacy also he could always be bought ; and this public immorality was but too faithfully reflected in his private life, in which gambling was his passion and a source of his vast wealth.

Out of office, but still pulling the strings of the Directory, he awaited the arrival of Napoleon in Paris, and it was his hand which was most powerful in shaping the events of the 18th and 19th Brumaire—9th and 10th November 1799. He reconciled Sieyés to Bonaparte ; a majority of the Directory—Sieyés, Ducos, and at last at his persuasion even Barras—resigned ; the Directory collapsed, and the consulate was established (see NApotEon and Sixyvus). Napoleon was the first and Talleyrand the second man in France. |

He was now an absolutist, the whole drift of his influence being in the direction of consolidating, under whatever title, the power of Bonaparte. For many years henceforward Talleyrand’s career is part of the general history of France. He is soon again foreign minister ; and he is acknowledged to have been the ablest diplomatist of an age when diplomacy was a greater power than it has ever been before or since. To him

falls a full share of responsibility for the kidnapping and murder of the Duc d'Enghien in March 1804 (see Savary). He had assisted at the councils when the atrocity was planned, and he wrote to the grand-duke justifying the seizure of the prince while on Baden territory. His hand in the matter was of course concealed. But, when one advised him to tender his resignation, he demurely remarked, "If, as you say, Bonaparte has been guilty of a crime, that is no reason why I should be guilty ofa folly." In other and more agreeable directions he had prostrated himself before Napoleon's purposes, approving among other things of the policy of the Concordat (15th July 1801), and securing thereby the recall of his excommunication. To the pope's grateful brief, which gave him liberty "'to administer all civil affairs," he coolly gave a wide interpretation, and he shortly thereafter married. He of course supported and defended first the consulship for life and then the crown- ing of the emperor. .

By and by, however, a change comes over his political attitude, and it is not long ere Napoleon detects it. This change we date, with Sainte-Beuve, from the end of January 1809. Before the peace of Tilsit, July 8, 1807, from Jena onwards, he had personally accompanied the great conqueror ; after it they stood apart, for the states- man saw in those brilliant but ceaseless conquests the prelude to the ruin of his master and his country. He was now prince of Benevento, and he withdrew from the ministry, receiving at his own desire the title of vice-grand- elector of the empire. Yet he had not disapproved of the Spanish war; the young princes had even been entrusted to his surveillance at his country house at Valengay. But anything might have happened to the emperor in Spain, and Talleyrand had evidently been calculating the chances

of the future. So at the date stated the explosion occurs, Napoleon pouring upon Talleyrand all the fury of his invective, reproaching him with the affair of the Duc d'Enghien, and clamouring to know where his enormous wealth had come from,—how much he had gained at play or on the stock exchange, and what was the sum of his bribes by foreign powers. Over and over again such scenes are repeated, the burden of the fierce reproaches being always the same; but Talleyrand stands impassive as a statue, remarking once, but not till he is out of the room, and is limping away, 'What a pity that such a great man has been so badly brought up !" or sending in, at another time, a resignation, which of course is not ac- cepted. The reproaches of the emperor were only too well founded, his minister having reaped a vast harvest from the smaller powers at the formation of the Rhenish Con- federation ; it is indeed recorded that Talleyrand oncc put a figure upon his gains in this department of corruption— the figure being no less than sixty million francs.

It is undoubtedly to his credit, however, that he steadily resisted a warlike policy, and that he was particularly opposed to the Russian invasion. He was occasionally employed in diplomatic negotiations, and was even again offered the post of foreign minister if he would give up that of vice-grand-elector. This offer, which would have placed him at the mercy of Napoleon, he declined, and the breach between the two widened. Before the events of 1814 his hotel had become the centre of anti-Napoleonic intrigue ; as the crisis approached he communicated with the allies; when it was at hand he favoured a regency, and appeared anxious that Marie Louise should remain in Paris ; and when this was abandoned he carefully arranged a feigned departure himself, but that his carriage should be turned back at the city gates; he did return ; and the emperor Alexander was his guest at the Hotel Talleyrand ! ! The revolution was his work; and his nominee Louis XVHT ascended the throne. For a third time, and again under a new master, he was appointed foreign minister. It would be difficult to overestimate the splendid services which he now rendered to France. In Paris, on 23d April, the treaty was concluded under which the soldiers of the allies were to leave French soil ; and Talleyrand success- fully urged that the territory of France should be the enlarged territory of 1792, and also that the great art treasures of which so many European cities had been despoiled should remain in

Paris. A final treaty of peace between Europe and France was concluded on 30th May, and in September the congress of Vienna assembled. It was the scene of Talleyrand's greatest triumphs. He succeeded single-handed in breaking up the confederation of the allies, and in reintroducing the voice of France into the deliberations of the European powers. Further, on January 3, 1815, a secret treaty was concluded between Austria, France, and England.

When Napoleon escaped from Elba and advanced towards Paris, Louis XVIII. retired to Ghent. Although the congress of Vienna was thus broken up, Talleyrand made no haste to follow him thither. He was puzzled, and remained so during the Hundred Days. He despised Louis, and an early approach to Bonaparte was out of the question. He therefore coolly betook himself to Carlsbad, remarking, when an explanation was asked for, that the first duty of a diplomatist after a congress was to attend to his liver! Waterloo of course decided him. He ap- peared at Ghent, and was but coldly received. The foreign powers, however, intervened, conscious after Vienna of Talleyrand's value ; and, among others, Wellington insisted that the great diplomatist must be taken into the councils

of Louis,—with the result that he became prime minister.

at the second restoration. But his position was one of

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extreme difficulty. The king disliked him; there were scenes bordering on violence in the royal presence; the Russian emperor intimated his hostility to him ; he shared the odium of having a man like Fouché for a colleague ; Chateaubriand and his party hated and beset him. For- tunately an excuse of a broad and national kind soon pre- sented itself. He objected to the conditions which the

_allies were imposing upon France, refused to sign the

treaty, and on 24th September resigned office.

He retired into private life, in which he remained for fifteen years. He only spoke in the House of Peers three times during this period,—twice (1821 and 1822) in favour of the liberty of the press, and once (1823) to protest against the Spanish war. But in 1830, when Charles X.'s reign was evidently imperilled, he again is at the centre of intrigue ; and it is actually at his private but urgent suggestion that Louis Philippe heads the revolution,

| taking, to begin with, the title of lieutenant-general of the | kingdom. Declining the post of foreign minister, he

proceeded to London as ambassador, conducting himself and serving his country with his usual consummate skill. He returned crowned with success after the formation of the Quadruple Alliance. In November 1834 he resigned, and quitted public life for ever.

He emerged from his retirement on March 3, 1838, to pronounce before the Institute the éloge of Reinhard, and in so doing to treat of diplomacy in general, and to suggest an indirect but adroit apology for his own career. He was received with unbounded enthusiasm by the élite of French literature and society—Cousin even exclaiming that the éloge was worthy of Voltaire. His last illness, which had by this time shown itself, soon prostrated him. He was visited on his death-bed by crowds of celebrities, including the king. He died on May 17, 1838, at the great age of eighty-four. He is buried at Valengay.

According to his desire, his memoirs under his own hand will not appear till 1890.

There is a considerable body of anonymous and untrustworthy literature both in French and English on the subject of this sketch.

For the earlier part of Talleyrand's career, see the general literature of the Revolution; for the Napoleonic, the general histories, includ-

| ing especially the Memoirs of the Duc de Rovigo ; for the third and

last, also the general histories, and especially the Correspondence between Talleyrand and Lowis XVIII., edited by Pullain (1880;

transl. into English, 1881), and the Memoirs of Guizot. Refer- ences abound to the private life of Talleyrand, and on it see also the Histoire Politique et Vie Intime, by G. Touchard-Lafosse (1848),

and the Souvenirs Intimes sur M. de Talleyrand, by Amedée Pichot (1870). The student must be on his guard in perusing most of this last-mentioned literature. For many years the His- toire Politique et Privée, by G. Michaud (1853), stood practically uncorrected, although evidently a studied and bitter attack. The view taken by Louis Blanc in his Dix Ans (translated into English in 1845) is also quite distorted, and if one wishes to see a complete misreading of Talleyrand's career it can be found in Blanc's tenth chapter of his fifth book. Sir Henry Lytton Bulwer rendered great service by his life of Talleyrand, published in his Historieal Char-

acters; and the worth and accuracy of Bulwer's biography, which was speedily translated into French, has been amply acknowledged by Sainte-Beuve in his valuable treatise (lectures) on Talleyrand, published in 1870. Reference should also be made to Mignet, Bastide, and the Mémoires Politiques of Lamartine.

Caution will have to be exercised in reading Talleyrand's auto- biography, which will not appear till 1890. The testimony of con- temporaries will not be available to check it, and Talleyrand is proved to have presided at the destruction of much documentary evidence implicating himself, ¢.g., at the moment when the Russian emperor was living at his house. (DSa)

TALLIEN, Jean Lampert (1769-1820), the chief leader of the party that overthrew Robespierre, was the son of the maitre dhétel of the Marquis de Bercy, and was born in Paris in 1769. The marquis, perceiving the boy's ability, had him well educated, and got him a place as a lawyer's clerk. Being much excited by the first events of the Revolution, he gave up his desk to enter a

printer's office, and by 1791 he was overseer of the printing

Hepartment of the Monitewr. While thus employed he honceived the idea of the journal-affche, and from January o May 1791 he placarded a large printed sheet on all the walls of Paris twice a week under the title of the Am

les Citoyens. This enterprise of his, of which the expenses vere defrayed by the Jacobin Club, made him well known ito the revolutionary leaders; and he made himself still more conspicuous in organizing the great “Féte de la Liberté” on April 15, 1792, in honour of the released soldiers of Chateau-Vieux, with Collot d’Herbois. On \July 8, 1792, he was the spokesman of a deputation of the section of the Place Royale which demanded from the legislative assembly the reinstatement of Pétion and Manuel, and he was one of the most active popular leaders in the attack upon the Tuileries on 10th August, on which jday he was appointed secretary or clerk to the revolution- ary commune of Paris. In this capacity he exhibited an almost feverish activity ; he perpetually appeared at the bar of the assembly on behalf of the commune; he announced the massacres of September in the prisons in terms of praise and apology ; and he sent off the famous circular of 3d September to the provinces, recommending them to do likewise. At the close of the month he resigned his post on being elected, in spite of his youth, a deputy to the Convention by the department of Seine- et-Oise, and he commenced his legislative career by defend- ing the conduct of the commune during the massacres. He took his seat upon the Mountain, and showed himself one of the most vigorous Jacobins, particularly in his defence .of Marat; he voted for the execution of the king, and was ‘elected a member of the Committee of General Security on ‘January 21,1793. After a short mission in the western provinces he returned to Paris, and took an active part in the coups @état of 3lst May and 2d June, which resulted in the overthrow of the Girondins. For the next few ‘months he remained comparatively quiet, but on Septem- ber 23, 1793, he was sent with Ysabeau on his famous mission to Bordeaux. This was the very month in which the Terror was organized under the superintendence of the Committees of Public Safety and General Security, and Bordeaux was one of the cities selected to feel its full weight. Tallien showed himself one of the most vigorous jof the proconsuls sent over France to establish the Terror jin the provinces ; though with but few adherents, he soon awed the great city into quiet, and kept the guillotine constantly employed. It was at this moment that the romance of Tallien’s life commenced. Among his prisoners was Theresa, Comtesse de Fontenay, the daughter of the great Spanish banker Cabarrus, the most beautiful and fascinating woman of her time, and Tallien not only spared her life but fell deeply in love with her. She quickly abated the fierceness of his revolutionary ardour, and from the lives she

saved by her entreaties she received the name of “Our Lady of Pity.” This mildness, however, displeased the members of the committees; Tallien was recalled to Paris ; and Madame de Fontenay was impmsoned |there. Danton and his friends had but just fallen, and the members of the committees were half afraid to strike jagain at the moderates, so Tallien was spared for the time, and was even elected president of the Convention on March 24, 1794. But the Terror could not be maintained at the jsame pitch: Robespierre began to see that he must strike at many of his own colleagues in the committees if he was ‘to carry out his theories, and Tallien was one of the men ‘ ondemned with them. They determined to strike first, sand on the great day of Thermidor it was Tallien who, jurged on by the danger in which his beloved lay, opened ithe attack upon Robespierre. The movement was suc- essful; Robespierre and his friends were guillotined ; and the young Tallien, as the leading Thermidorian, was

elected to the Committee of Public Safety. Now came the great months of his career: he showed himself a vigorous Thermidorian ; he was instrumental in suppress- ing the Revolutionary Tribunal and the Jacobin Club ; he attacked Carrier and Lebon, the proconsuls of Nantes and Arras; and he fought bravely against the insurgents of Prairial. In all these months he was supported by his Theresa, whom he married on December 26, 1794, and who became the leader of the social life of Paris. His last political achievement was in July 1795, when he was present with Hoche at the destruction of the army of the émigrés at Quiberon, and ordered the executions which followed. After the close of the Convention Tallien’s political import- ance came to an end, for, though he sat in the Council of Five Hundred, the moderates attacked him as terrorist, and the extreme party as a renegade. Madame Tallien also got tired of him, and became the mistress of the rich banker Ouvrard. Bonaparte, however, who is said to have been introduced by him to Barras, took him to Egypt in his great expedition of June 1798, and after the capture of Cairo he edited the official journal there, the Décade Egyptienne. But Menou sent him away from Egypt, and on his passage he was captured by an English cruiser and taken

to London, where he had a good reception among the Whigs and was well received by Fox. On returning to France in 1802 he got a divorce from his unfaithful spouse (who eventually married the Prince de Chimay), and was left for some time without employment. At last, through Fouché and Talleyrand, he got the appointment of consul at Alicante, and remained there until he lost the sight of one eye from yellow fever. On returning to Paris he lived on his half-pay until 1815, when he received the especial favour of not being exiled like the other regicides. His latter days were spent in the direst poverty; he had to sell his books to get bread. He died at Paris on Nov- ember 16, 1820.

TALLIS (Tattys, Tatys, or Ta.isrus), THomas (c. 1515-1585), justly styled "the father of English cathe- dral music," was born, as nearly as can be ascertained, about the year 1515. The history of his youth is involved in some obscurity ; there seems, however, but little doubt that, after singing as a chorister at old Saint Paul's under Thomas Mulliner, he obtained a place among the children of the chapel royal. His next appointment was that of organist at Waltham abbey, where, on the dissolution of the monastery in 1540, he received, in compensation for the loss of his preferment, 20s. for wages and 20s. for reward. An interesting relic of this period of his career is preserved in the library of the British Museum, in the form of a volume of MS. treatises on music, once belong- ing to the abbey, on the-last page of which appears his autograph, "Thomas Tallys," with the final letter pro- longed into an elaborate flourish—the only specimen of his handwriting now known to exist.

Not long after his dismissal from Waltham, Tallis was appointed a gentleman of the chapel royal; and thence- forward he laboured so zealously for the advancement of his art that his genius has left an indelible impression upon the English school, which owes more to him than to any other composer of the 16th century, and in the history of which his name plays a very important part indeed.

One of the earliest compositions by Tallis to which an approximate date can be assigned is the well-known Service in the Dorian Mode, consisting of the Venite, Te Deum, Benedictus, Kyrie, Nicene Creed, Sanctus, Gloria in Excelsis, Magnificat, and Nunc Dimittis, for four voices, together with the

Preces, Responses, Paternoster, and Litany, for five, all published for the first time, in the Rev. John Barnard's first Book of Selected Church Music, in 1641, and reprinted, with the exception of the Vemte

and Paternoster, in Boyce's Cathedral Music in 1760.1 That this work was composed for the purpose of supply- ing a pressing need, after the publication of the second prayer-book of King Edward VI. in 1552 there can be no reasonable doubt; and its perfect adaptation to its intended purpose is sufficiently proved by the fact that, for more than three hundred years, its claim to occupy the first and highest place among compositions of its class has been undisputed. Written in the style. known among Italian composers as lo stile famigliare, i.e., in simple counterpoint of the first species, nota contra notam, with no attempt at ingenious points of imitation, or learned complications of any kind—it adapts itself with equal dignity and clearness to the expression of the verbal text it is intended to illustrate, bringing out the sense of the words so plainly that the listener cannot fail to interpret them aright, while its pure rich harmonies tend far more surely to the excitement of devotional feeling than the marvellous combinations by means of which too many of Tallis's contemporaries sought to astonish their hearers, while forgetting all the loftier attributes of their art. In this noble quality of self-restraint the Zitany and Responses bear a close analogy to the Zmproperia and other similar works of Palestrina, wherein, addressing himself to the heart rather than to the ear, the princeps musicx produces the most thrilling effects by means which, to the super- ficial critic, appear almost puerile in their simplicity, while those who are able to look beneath the surface discern in them depths of learning such as none but a very highly cultivated musician can appreciate. Of this profound learning Tallis possessed an inexhaustible store ; and the rich resources it opened to his genius not only placed his compositions on a level with those produced by the best of his Italian and Flemish contemporaries, but enabled him to raise the English school itself to a height which it had never previously attained, and which, nevertheless, it continued to maintain undiminished until the death of its last representative, Orlando Gibbons, in 1625. Though this

school is generally said to have been founded by Dr Tye, there can be no doubt that Tallis was its greatest master, and that it was indebted to him alone for the infusion of new life and vigour which prevented it from degenerating, as some of the earlier Flemish schools had done, into a mere vehicle for the display of fruitless erudition, ‘Tallis’s ingenuity far surpassed that of his most erudite contemporaries ; but he never paraded it at the expense either of intrinsic beauty or truthfulness of expression. Like every other great musician of the period, he produced occasionally works confessedly intended for no more exalted purpose than the exhibition of his stupendous skill, one of the most remarkable character- istics of which was the apparent ease with which it disposed of difficulties that, to composers of ordinary ability, would have proved insurmountable. In his canon, Miserere nostri, the intricacy of the contrapuntal devices seems little short of miraculous; yet, so smooth and flowing is the effect produced by their dizzy involutions, that no one unacquainted with the secret of their con- struction would suspect the presence of any unusual element in the composition. In his motet, Spem in alium non habui, written for forty voices disposed in eight five-part choirs, each singer is intrusted with a part, agreeable and interesting in itself, yet never for a moment interfering with any one of the thirty-nine equally interest- ing parts with which it is associated. These towrs de force, however, though approachable only by the greatest contrapuntists living in an age in which counterpoint

1 Boyce’s unaccountable omission of the very beautiful Venite is a

inisfortune which cannot be too deeply deplored, since it has led to its consignment to almost hopeless oblivion.

was cultivated with a success that has never since been equalled, serve to illustrate one phase only of Tallis’s many-sided genius, which shines with equal brightness in the eight psalm-tunes (one in each of the first eight modes) and unpretending little Venz Creator, printed in 1567 at the end of Archbishop Parker’s /irst Quinquagene of Metrical Psalms, and many other compositions of like simplicity.

In 1575 Tallis and his pupil William Byrd—as great a contrapuntist as himself, though by no means his equal in depth of expression—obtained from Queen Elizabeth royal letters patent granting them the exclusive right of printing music and ruling music-paper for twenty-one years ; and, in virtue of this privilege, they issued, in the same year, a joint work, entitled Cantiones que ab argu- mento Sacre vocantur, guingue et sex partium, containing sixteen motets by Tallis and eighteen by Byrd, all of the highest degree of excellence. Some of these motets, adapted to English words, are now sung as anthems in the Anglican cathedral service. But no such translations appear to have been made during Tallis's lifetime; and there is strong reason for believing that, though both he and Byrd outwardly conformed to the new religion, and composed music expressly for its use, they remained Catholics at heart to the end of their days.

Tallis's contributions to the Cantiones Sacre were the last of his compositions published during his lifetime. He did not, indeed, live to witness the expiration of the patent, though Byrd survived it and published two more books of Cantiones on his own account in 1589 and 1591, besides numerous other works. 'Tallis died November 23, 1585, and was buried in the parish church at Greenwich, where a quaint rhymed epitaph, preserved by Strype, and reprinted by Burney and Hawkins, recorded the fact that he served in the chapel royal during the reigns of Henry VIII, Edward VI., Mary, and Elizabeth. This was de- stroyed with the old church about 1710; and it was not until about twenty years ago that a copy was placed in the present building. Portraits, professedly authentic, of Tallis and Byrd were engraved by Vandergucht in 1730, for Nicolas Haym's projected History of Music, but never published. One copy only is known to exist.

Not very many works besides those already mentioned were printed during Tallis's lifetime; but a great number are still pre- served in MS. Unhappily, it is to be feared that many more were

destroyed, in the 17th century, during the spoliation of the cathedral libraries by the Puritans. (W. S. R.)

TALLOW is the solid oil or fat of ruminant animals, but commercially it is almost exclusively obtained from oxen and sheep. The fat is distributed throughout the entire animal structure; but it accumulates in large quantities

as “suet” in the body cavity, and it is from such suet that tallow is principally melted or rendered. The various methods by which tallow and other animal fats are separated and purified have been dealt with under OILs (see vol. xvii. p. 743). In commerce ox tallow and sheep tallow are generally distinguished from each other, although much nondescript animal fat is also found in the market. Ox tallow occurs at ordinary temperatures as a solid hard fat having a yellowish white colour ; when fresh and new it has scarcely any taste or smell; but it soon acquires a distinct odour and readily becomes rancid. The fat is insoluble in cold alcohol, but it dissolves in boiling spirit of 0°822 sp. gr. in chloroform, ether, and the essential oils. The hardness of tallow and its melting- point are to some extent affected by the food, age, state of health, &c., of the animal yielding it, the firmest ox tallow being obtained in certain provinces of Russia, where _ for a great part of the year the oxen are fed on hay. New tallow melts at from 42°-5 to 43° ©., old tallow at 43°5,

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and the melted fat remains liquid till its temperature falls to 33° or 34°C. Tallow consists of a mixture of two- thirds of the solid fats palmitin and stearin, with one-third of the liquid fat olein. A fluid oil known as tallow oil is obtained from solid tallow by the separation by pressure of the greater part of the olein. To facilitate the separation of the olein, tallow is first melted and just before resolidi- fying it is mixed with about 10 per cent. of benzene or petroleum spirit. The mixture is then allowed to solidify in flat cakes or slabs, which are placed in press bags and piled between iron plates in a hydraulic press. On the application of pressure the olein mixed with the solvent hydrocarbon flows freely out, leaving a hard dense cake of stearin and palmitin in the bags. The volatile solvents are subsequently driven off by blowing steam through the oil, which remains a turbid fatty fluid from the proportion of solid fats it carries over with it from the hydraulic press. ‘Tallow oil is a useful lubricant and a valuable material for fine soap making, but it is not now abundantly prepared. Mutton tallow differs in several respects from that obtained from oxen. It is whiter in colour and harder, and contains only about 30 per cent. of olein. Newly rendered it has little taste or smell, but on exposure it quickly acquires characteristic qualities and becomes rancid. Sweet mutton tallow melts at 46° and

solidifies at 36° C.; when old it does not melt under 49°, and be- comes solid on reaching 44° or 45°C. It is sparingly soluble in cold ether and in boiling spirit of 0°822 sp. gr. In early times tallow was a most important candle-making substance, and candles made from this material are still consumed in no inconsidcrable quantity, but the greater proportion of the supply is now absorbed by the soap trade; the artificial butter trade which has sprung up since 1872 also takes up large quantitics of sweet tallow. ‘Tallow is further used extcnsivcly as a lubricant and in leather dressing, &c. It is of course a product of all cattle and shecp-rearing countrics, and it forms an important article of export from the United States, the Argentine Republic, and the Australian colonies. Till within the last quarter of a century Russia supplied nearly all the tallow imported into the United Kingdom; but now the imports from that source are on the most

meagre scale, although Russian P. Y. C. (pale yellow candle) con- tinues to represent the finest commercial brand.

TALLOWS, Vucrrastz. See O1ts, vol. xvii. p. 746.

TALMA, Josepu Francois (1763-1826), French tragedian, was born at Paris 15th January 1763. After attending the Mazarin college, he accompanied his father, who was a dentist, to London, where he studied in the hospitals. While in London he took part in some amateur theatricals, and, his talents at once attracting notice, a pro- fessional engagement was offered him. To this, however, his father would not consent, and shortly afterwards he was sent to Paris, where for some years he was assistant to a dentist. His predilection for the drama could not be restrained, and on 21st November 1787 he made his début at the Comédie Francaise in Afahomet. His efforts from the first won appreciation, but for a considerable time he was restricted to secondary parts. It was in jeune premier parts that he first came prominently into notice, and he attained only gradually to his unrivalled position as the exponent of strong and concentrated passion. In 1791 he and other dissentients founded the Théatre Francais de la rue de Richelieu,—a name changed in 1792 to Théatre de la République, where he won his most striking successes. Talma was among the earliest advocates of realism in scenery and costume, being greatly aided in his reforms by his friend the painter David. He possessed in perfection the physical gifts fitting him to

excel in the highest tragic parts, an admirably proportioned figure, a striking counten- ance, and a voice of great beauty and power, which, after he had conquered a certain thickness of utterance, enabled hin to acquire a matchless elocution. At first somewhat stilted and monotonous in his manner, he gradually

emancipated himself from all artificial trammels, and became by perfection of art a model of simplicity. Talma enjoyed the intimacy of Napoleon, with whom he had an acquaintance before Napoleon attained greatness; and he was a friend of Chénier, Danton, Camille Desmoulins, and otlier revolutionists. He made his last appearance 11th June 1826. and died at Paris 19th October of that year.

Talina was the author of Mémoires de Le Kain, précédés de Réflexions sur cet Actewr ct sur ? Art Théétral, contributed to the Colkection des Mémoircs sur l Art Dramatique. It was published separately at Paris in 1856, under the title Aéflexions de Talma sur Le Kain ctU Art Théétral. See Mémoires de J. F. Talma, écrits par lui-méme, et reccwillis ct mis cn ordre sur lcs paptiers de sa famille, by Alex. Dumas (1856).

TALMUD signifies—(1) ‘‘study of and instruction in anything (whether by any one else or by oneself)” ;! (2) “learning acquired”;? (3) “style, system”:® as such it is synonymous with Mishnah in its fifth signification, vol. xvi. p. 503; (4) “theory,” in contradistinction to “ prac- tice,”*—- synonymous with MMzdrash in its fourth significa- tion, vol. xvi. p. 285 ; (5) such interpretation of the Mosaic law as is apparent on the surface thereof and does not necessitate any further disquisition ;° (6) Boroztho, or the non-canonical Mishnah ;® (7) Gemara, 2.¢., the oldest com- mentary on the canonical Mishnah ;” (8) the texts of Mish- nah and Gemara combined, —the meaning which is the one most commonly attached to the term Talmud. Although the word Talmud is not to be found in the Bible, there can be little doubt that it is a classical Hebrew term, as may be seen by the analogy of Tahdnin, “supplication,” Tan- ham, “consolation,” &c.

Recensions of the Talmud.—The Talmud exists in two recensions,—the Palestinian, commonly, but by mistake, called Talmud Yerushalmi (see

below), and the Babylonian, correctly called Talmud Babli. The Talmud Yerushalmi embodies the discussions on the MisHNAH (q.v.) of hundreds of doctors, living in Palestine, chiefly in Galilee from the end of the 2d till about the middle of the 5th century, whilst the Babylonian Talmud embodies chiefly the discussions on the same J/ishnah of hundreds of doctors living in various places in Babylonia, such as Neharde‘a,§

1 Compare Mishnah, Peah, i. 1, DOD 29 MN TWdMi (“ana the studying of the Law balances them all”) ; Adoth, iv. 18, VT °%N

TWD ON (“be circumspect as regards instruction’),

2 See Perek Rabbi Meir, 6, STNDONI 125 09219 Nd} (“whose heart is not arrogant on account of his learning”); ¢f. T. B., Pesahim, leaf 49a ; dp nanw19 moon (“his learning becomes forgotten by him”).

3 See T. B., Synhedrin, leaf 24a, baa Sw nqwbn (the mode of study prevalent in Babylonia”); comp. T. B., Pesahim, 34, 533 IWMI RNNYOY PAN ION RIWMT SPIN °3NT Dw ONwWED (“foolish Babylonians, who, because ye dwellin a land of darkness, say sayings that are obscure”), and T. B., Baba Mesi‘a, leaf 85a; Rabbi Zera fasted a hundred fasts on going up to Palestine, so that he

might forget the style of Babylonico-Talmudic study caxdsaa NDA or

mxdaa xtindn), that it should not trouble him any further. Rashi takes the quotation from Baba Mesi‘a to signify the concrete Babylonian Talmud, which, however, is impossible.

4 See T. B., Kiddushin, leaf 40b: “Is theory cab) greater or

practice (MWY) greater? . . . They all answered, Theory (71105) is greater because it leads to practice.” Z’almud, as will have been seen, is here given. as synonymous with Limmud.

> See T. B., Baba Kamma, leaf 1040, NINONP synbn wT say this is a plain [Mosaic] teaching”).

6 See T. B., Baba Bathra, leaf 1300, catchword wind 7, and Varixe Leetiones in loco. :

? See T. B., Baba Mesva, leaf 336, and compare Rashi in loco.

8 The rector of this academy was Shemuel, court physician of Shapur J., and astronomer. Whilst his friend and fellow-pupil Rap (q.v.; they both attended the lectures of the principal editor of the Mish- nah) excelled in the other parts of the Jewish law, Shemuel was pre- eminent in the civil law. On account of this he is repeatedly called in the Talmud both “Shapur’’ (like his master) and “ Aryokh” (lion, king, teacher), To him is due the legal principle that “the law of

Kaphri,t Mahuza,? Shekhansib,? but notably at the two great academies of Sura and Pumbaditha, from about 190 to nearly the end of the 6th century. The doctors of both recensions, although they primarily discuss the correctness of the text and meaning of the Al¢shnah, and what should be the right legal decision according to it, do not confine themselves to this. They introduce, as occasion serves, not merely the whole of the oral tradition handed down to their time, and the necessary references to, and interpreta- tions of, the various laws to be found in the Pentateuch and the other sacred writings, but exhibit also, though only in a fragmentary manner, an almost complete cycle of the profane sciences as current orally and known to them by books composed by Jews and Gentiles. The doctors of both these recensions were and are called Amoraim (ON WN), c.c., mere “discussers, speakers,”! because, unlike the Mishnic doctors, who were and are called Z’annaim (DS3/), z.¢., “learners, teachers,” they abstained from mak- ing new laws unless absolutely compelled by circumstances to do so.6 These Amoraim stand, on the whole, in the same relation to their Mishnic predecessors as counsel giving a legal opinion, or judges deciding legal cases, stand to the legislature which frames the laws. In these points the doctors of both recensions agree. There are, however, also points of considerable difference between the two Tal- muds. These are not merely geographical, and so neces- sarily linguistic,® but also material. Whilst the discussions in the Palestinian Talmud are simple, brief, and to the point, those in the Babylonian Talmud are subtle, long- winded, and, although

always logical, sometimes even far- fetched.” But there is another difference. The Palestinian Talmud, besides containing legal and religious discussions, is a storehouse of history, geography, and archzxology,

the civil government is the law,” ¢.e., that except in religious matters the Jew must submit to the laws of his country (‘T. B., Baba Bathra, 545), Shemuel and Rab (like Rabbi Yohanan and Resh Lakish, Abayye and Raba, and others), though intimate friends, nevertheless differ on nearly all imaginable points, so that when the Talmud wishes to give firmness to a certain decision or opinion, it uses the phrase : “Rab and Shemuel, &c., both agree.”

? The rector of this school was Rab Hisda, the father-in-law of Rasa (q.v.).

? The rector of this school was RaBa (q.v.).

> The rector of this school was Rab Mahman b, Yishak (T. B., Gittin, 318, Rashi, catchword NIN), husband of the learned and accomplished Yaltha, the daughter of the resh galutha (T. B., Hullin, leaf 1093), &c.

4 Amora may also mean an interpreter. The great teachers of the first five centuries had generally a man (or several men) at their side, who to the learning requisite to translate the master’s teaching given in Hebrew, and dilate on it in Aramaic, added a Stentor’s voice, and could by fascinating speech command the attention of the audience. The first Babylonian Amora, i.e. explainer of the Mishnah, who had an Amora, v.e., a popular teacher, was Rabbi Shila. The first who is known to have acted as Amora, z. €., popular teacher, to an Amora, @.é., an explainer of the Mishnah, was the famous RaB (g.v.). See T. Y., Berakhoth, iv. 1, 2, &c.; T.B., Berakhoth, leaf 276; and T. B., Yoma, leaf 20b (against Rapoport, ‘Hrekh Millin, s.v. ‘‘ Amora”’).

> This certainly was not unfrequently the case, but even then they did so only in the spirit of the Tannaim.

§ The Palestinian Amoraim, teaching people who understood Greek, had not to explain the Greek terms which frequently occur in the Mish- nah and other works kindred to it. The Babylonian Amoraim, how- ever, who in

common with their hearers were ignorant of Greek, had a somewhat irregular though certainly effective way (received by them traditionally) of explaining the Greek terms in the Mishnah, &c., by Aramaic etymology. We will give two instances only of this practice : —(1) ‘P*MIDN, which is evidently the Greek broOjKn, is explained

T. B., Baba Mesi‘a, leaf 66), 11D xdw pyr ay x7 xd, “thou shalt get no payment except from this,” —evidently = “NP NaN AX — “upon this thou shalt stand,” t.e., “if 1 do not pay, this shall serve as my security’; compare Rashi on Baba Kamma, 110, catchword PTD ; (2) 9PM is evidently the Greek S:a0huen, and is ex- plained as being a compound of (Dp) ops NOM NT, “this shall stand when I am no more,” we, “this is my last will and testa- ment.” From T. B., Baba Bathra, leaf 1356 (evidently a Babylonian Boroitho), we see that in T. B., Baba Mesi’a, leaf 19a, three words aan bp ye], 53) have fallen out. 7 Compare p. 35, footnote 3.

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whilst the Babylonian Talmud, taking into consideration that it is treble® the size of its fellow Talmud, coutains legs of these. On the other hand, it bestows more care upon the legal and religious points, and, being the later and the more studied of the two, it is also the more trustworthy.

System of the Talmud.—Most people imagine not only that the Talmuds area pathless wilderness, without so much as grammatical rules in their respective languages, but that the laws laid down in them rest on mere tradition. In reality their languages have strictly grammatical rules (see below under Azds, &c.), and their laws rest on a strictly logical system. The laws in both Talmuds are discussed and argued on philosophical rules, for which it is claimed that they have existed from time immemorial, and can be traced to the Pentateuch itself. These are—(1) the Seven Rules (ni yaw), put forth by Hillel (Z’osephto Synhedrin, vii., last §; Sephro, towards the end of the Introduction ; Aboth de-Rabbi Nathan, xxxvii.) but a great deal older than his time ; (2) the Thirteen Rules (nya mwy why), put forth by R. Yishma‘el (Introduction to Siphro), which can, how- ever, be traced im nce to the foregoing “Seven Rules”; both these are for the Halakhah; and (3) there are also the Thirty-two Rules (ny19 onwi pw>w), put forth by R. Eliezer b. R. Yose Haggalili (vol i. of most editions of the Babylonian

Talmud), which are for the Agadah. In addition, most of the points to which these rules apply are secured by early tradition. Itis quite true that by idiosyn- crasy digressions are very frequent both in Talmud and Midrash; but in the Halakhah the digression, however long, invariably ends in coming back to the original cause of the logical combination, whilst in the Agadah the digression either comes back to the place from which it started, or else will be found, ou exantination, to have been introduced for its own sake, and have served its own pur- pose. As the doctors of Talmud and Midrash are mostly introduced in dialogues, this is the only practical, if some- what uncommon, method.

Division of the Talmud.—The external division of both Talmuds is identical with the division, subdivision, and sub-subdivision of the Mishnah, although there is not always Gemara in the one when there is Gemara in the other.? This, however, need not be further discussed here, as all on this head is minutely specified in M1sHnan (q7.v.). Concerning the internal division into Halakhah and Agadah, it ought to be said that the former is more largely represented in the Babylonian Talmud, whilst the latter is more largely and more interestingly given in the Palestinian Talmud. Whole collections of Aidrashim now in our hands have constituted (if we may judge from the known to the unknown) part of the Palestinian Talmud, and seem to have chiefly belonged to those portions of it which have been gradually lost.

Purpose.—The Talmud, unlike the Aishnah, contains not only individual decisions, but everything that is necessary for arriving at legal and religious decisions of whatever description these may be, whilst, like the Mishnah, it is not itself a handbook of decisions. This is only in accordance with the nature and spirit of an oral law which delegates the decisions to the Talmudico-speculative capacities of the teachers of every age. Even several of the comparatively few instances in which the words… ’3 xn35m (“and the

8 Bibliographers generally fall into a mistake in describing the size of the Babylonian as twelve times that of the Palestinian Talmud. They forget that two-thirds of the size of the former is simply owing to the commentaries by which it is invariably accompanied.

® The only thing that ought to be mentioned here is, that to the Palestinian Talmud the Sheba‘ Massekhtoth Ketannoth Yerushalmiyyoth (Frankfort, 1851, 8vo) must be added, whilst Gemara Shekalim aud the Massekhtoth Ketannoth, which now form an integral part of the Babylonian Talmud, are (Aboth de-Rabbi Nathan excepted) unjusti- fiably attached to it. 10 See Rashi on Gen. xlvii, 2.

decision is according to so and so”) occur in the Babylonian | us believe that these mnemonic phrases are late inventions, Talmud are alater addition. They belong to the Halakhoth | but they have as yet failed to make good their assertions. Gedoloth,! and are consequently, at the earliest, of the 8th | See T. B., Shabbath 104a, ana I. B., ‘Erubin, 546, where century, but are probably of even much later date. these Simanim are positively mentioned early in the 4th Editors.—The editorship of the Palestinian Talmud is | century ; ¢f. Rashi in loco. ; generally, after Maimonides,” ascribed to Rabbi Yohanan | Value.—The value of the Talmuds may be estimated by (b. Napha). But this, if literally taken, is a gross mistake, | the fact that they contain the Mishnah in various recen- as that teacher (0b. 279) died more than a hundred years | sions and a large portion of the contents of Midrashic col- before the latest Amora (c. 450) mentioned in that Talmud. | lections, and in addition comprise a vast amount of Sopheric A similar error is made with respect to the editor or | literature not to be found in the canonical Mishnah and editors of the Babylonian Talmud, whose names are given | Agadiec matter not to be found in the known Midrashim, as Rab Asshi (see Ras) (0d. 427) and Rabina (0d. 550), | and have thousands of notices on secular knowledge of all and who lived still much earlier than the last teachers | kinds. Here, however, the reader ought to be again re- mentioned in that Talmud (Sth century). But it ought | minded that, whilst the Babylonian Talmud, the one of to be remembered that when the ancients speak of | much larger extent, contains a great deal more Judaxo- editors of books of such a mixed character as the Jfish- | religious matter, the Palestinian Talmud—of much smaller nah, the Zohar, both Talmuds, &c., they mean the person | extent—is of much greater value for the historian, the or persons who gave the first impulse to the collection or | geographer, the numismatist, and other students. redaction of such books. In this sense,

certainly, Rabbi Vicissitudes of the Talmud.—Whilst the Babylonian Yohanan was the editor of the Palestinian and Rab Asshi | Talmud commanded the attention of a hostile world, and and Rabina were the editors of the Babylonian Talmuds. | was proscribed, mutilated,® and condemned, and finally For, whilst the first of the latter pair went more than | delivered over to the flames* by popes and kings, the once through the discussion of the whole Mishnah by the | Palestinian Talmud_ suffered still more from one single Amoraim from 190 to his time (c. 427), the latter supple- | enemy—neglect.> Thousands of copies of the former mented the collection down to his own time (550). As | recension were destroyed in the course of time, but, this regards the Babylonian Talmud, the Amoraim were | Talmud being studied in all parts of the world, the few succeeded by a new order of men called Saboraim (;235 | copies surviving became the means of an endless supply. wD), ze, “opiners,” who ventured only occasionally to | Not so as regards the Palestinian Talmud, which found revise and authenticate the sayings of their predecessors. | no students, or but few, after the closing (c. 450) of the The last of these Saboraim were Rab ‘Ina (or Giza) and | Jewish academies in Palestine ; and we have even to thank tab Simona (c. 550-590). In any case neither the one | the enemies of traditional Judaisin, the Karaites, who used Talmud nor the other was written down, slight private | it in controversy with their Rabbanite opponents, for the notes excepted (o»inb nib), before the close of the 6th | preservation of some copies of it. By degrees the neglect of century, if then. The apparently insurmountable diffi- | the book became so great that whole chapters of treatises, culty of keeping such vast masses of literature in the head | whole treatises of orders, and almost two whole orders is removed when one takes into consideration that both | themselves, disappeared, and are lost to this day.® teacher and student had means of help to their memory Aids to the Study of the Talmuds.—(a) Lexicons.—The first rank fully corresponding to the vastness of the literature. In | is oceupied by lexicons for both Talmmuds and A/idrashin, and of the first place, they had the nwmbers already occurring in these that by R. Nathan b. Yehiel of Rome, compiled in the 11th the Mishnah (e.g., five must not separate the heave-offering ae ae centuries, claims the first place. All other lexicons, from ona : 5 : ias Levita, Philip Aquinas, Johannes Buxtorf, &c., down to on account of the benediction to be recited in: connexion Levy and Jastrow, are more or less based upon this grand work

with the act; Zerumoth i. 1), &e. Secondly, they had | called ‘Arukh.7 (b) Grammars.—A slight attempt at eompiling a names. Since to the sayings of the Talmud were generally | ‘ ‘ attached the names of those who uttered them, saying and name became in the memory of the student identical. If somebody who had heard a certain saying from somebody, who in his turn had heard it from somebody else, was mentioned in the Talmud, all other sayings, however unlike these in nature, if they had only the same link of tradition, were recited on the same occasion: e.g., in the Palestinian Talmud, Afegillah iv. 1, “says Rabbi Haggai, says Rabbi Shemuel b. Rab Yishak,” &c.; T. B., Berakhoth, leaf 3b, &e., “says Rabbi Zerika, says Rabbi Ammi, says Rabbi Yehoshua* b. Levi,” &e. Thirdly, other oral tradi- tons, Which went. by the order of the Pentateuch, received in the written Pentatench vast aids to memory. Fourthly, the Jlishnah (although itself not written down), by its divisions, subdivisions, and sub-subdivisions, became, in its turn, a mighty aid to memory. Fifthly, as regards the Babylonian Talmud, there are additional means of aiding memory in existence, for every now and then one meets with a Alnemosynon (Siman), which strings together the order of subjects (eg., T. B., Berakhoth, 32a, last line). Both in MSS. and printed editions these Simanim are given in brackets. Rapoport and his followers would have

3 Raymundus Martin (Ramon Martinez), backed up by his teacher Pablo Cristiani (see RAMBAN), was one of the first five (or rather six) mutilators (called censors) of the Talmud and kindred books. See Touron, Ilistoire des Hommes Illustres de ? Ordre de Saint Dominique, i, (Paris, 1748, 4to) p. 492; Jour. Philol., xvi. 134.

4 In the midsummer of 1244 twenty-four waggons full of Talmud copics were bummed in France (see Journal of Philology, xvi. 133). A certain Donin (afterwards called Nicolaus), a converted Jew, by his accusations against the Talmud, managed that Rabbi Yehiel of Paris had to dispute with him publicly about its contents. The disputation took place in the midsummer of 1240; and R. Yehiel came out of it so victorionsly that only after four years’ further machinations the Talmud was actually burned. The disputation is printed under the name of Disputatio cum Nicolao A. 1252 (!) habita cum Versione Latina in Wagenseil’s Tela Ignea Satane (Altdorf, 1681, 4to); a less incorrect Hebrew edition came out in 1878, 8vo, at Thorn.

This event of burning the Talmud called forth three, elegies—(1) by R, Binyamin b. Abraham De' Mansi, beginning obi NiAN, and the refrain of which was MIND AOSHI, NWA MWD ON (see MS. Add. 874, Camb. Univ. Lib., leaves 307a-308a); (2) by R. Meir of Rothenburg (see Ros), the beginning of which is WMA NNW Sey (in the Ashkenazic ritual for the 9th of Ab); and (3) by R. Abraham b. Yishak (see Zunz, Zur Gesch. u. Lit., pp. 463-4). 'This Abraham b. Yishak is the father of the famous En-bonet Abram Bederesi (not Bedarshi ; sce Schiller-Szinessy, Catal., i. correction 5), the author of the Behinath 'Olam.

5 See Schiller-Szinessy in the Academy, 1878, p. 171, and extract from Excursus iii. (to the Catalogue) on the Palestinian Talmud in Occasional Notices, &c., i., Cambridge, 1878, 8vo.

6 See the before-mentioned Occasional Notices.

7 Rabbenu Nathan b. Yehiel b. Abraham was, on his father's side an 'Anav (1]¥)—and not an 'Akko (133) as Rapoport, no doubt aiter' Ibn Yahya, writes it in Bikkure Iaittim, x. 7—1.e., of the family 'Anavim (Dei Mansi, Dei Mansueti, Dei Piatelli, Dei Pietosi, Dei

1 Eg., T. B., Berakhoth, leaf 36a, See Rashi and Tosaphoth, catchword snsbn ; bid., 366, and in other places.

seein his Introduction to the commentary on the Afishnah (commonly, but by mistake, called Introduction to the Seder Zer'aim) and in his Introduction to the Mishneh Terai,

38 i & it

grammar, and this only for the Babylonian Talmud, was made by the late learned S. D. Luzzatto. It exists in Italian Padua, 1865), German by Kriiger (Breslau, 1873), English by Goldammer (New York, 1876), and Hebrew by Lerner (St Petersburg, 1880). Of more value, however, is Noldeke's Mandaitie Grammar, although it stands in connexion with the Babylonian Talmud only in an indirect way. (e) Commentaries. Commentaries on the greater por- tion of the Babylonian Talmud are extant, by the famous Rabbenu Hananeel of Kairwan, the teacher of Rirx (g.v.), by RAsuHt (q.v.),

and by the descendants and disciples of this latter commentator, who composed the Zosaphoth. All these are included in the latest Talmud edition of Vilna. It is asserted by Rasap II, (q.v.) that the whole (B.) Talmud had been commented on in Arabic. As regards the commentaries on the Palestinian Talmud, it ought to be said that the Pene Mosheh, &e., by RB. Mosheh Margaliyyoth, and the Korban Ha‘edah, &c., by R. David Frankel (the teacher of Mendelssohn), make more than one commentary on the whole, and they are embodied in the Zhitomir edition (1860-67). (d) Method- ology.—Among the many Introductions to the Babylonian Talmud that of R. Shemuel Hannagid must now be considered the first, not only in time but also in value. There was indeed an earlier, aud perhaps a still more valuable one in existence (see SAADIA), but it is now unfortunately lost. As regards the Palestinian Talmud, the only one in existence is that by the late Z. Frankel (Breslau, 1870, 8vo). The author was a most learned man, but somewhat confused in his diction. (e) Translations. —Renderings of isolated treatises of the Babylonian Talmud exist in Latin, Ugolini, Thesaurus, xix., Zebahim and Menahoth, and SSG g Synhedrin;} in French, e.g., Berakhoth, by Chiarini (Leipsic, 1831,

Umani, Dei Umili), and, on his mother’s side, of the Tappuhim, i.e.,

De Pomis, to which the celebrated author of the Lexicon Semah David

belonged. Rabbenu Nathan’s father and grandfather, like Rabbenu Nathan himself and his brother’s descendants, were, no doubt, papal court Jews (and not linendrapers, as the latest editor of the ‘Arukh, by misreading and misinterpreting the somewhat hard verses of his author, contrives to show). This lucrative position furnished them with

ample means not only for their noble charities to congregational insti- &c.), but also with the leisure

tutions (a synagogue, religious bath,

necessary for the pursuit of Talmudic studies. Rabbenu Nathan was

resh kalloh (rector of the Jewish university), and unquestionably the greatest Talmudist, even as he was the poorest Hebrew poet, in As regards

his teachers we know four, three of whom he attended, whilst he studied and digested the works of the fourth so well that, though personally unknown to His first teacher was his own father; his second teacher, from whom Rabbenu Nathan no doubt obtained his thorough knowledge of Babylonian habits, was R. Masliah of Sicily, who had been a hearer of the greatest

Italy in the 11th and 12th centuries.

one another, they may be justly called master and disciple.

"‘ gaon" of Pumbaditha; his third teacher was R. Mosheh b. Ya‘akob b.

Mosheh b, Abbun of Narbonne (or Toulouse ; better known under the name of R. Mosheh Haddarshan); and the fourth was Rabbenu Han- He owed so much to this teacher that as soon as

aneel of Kairwan. the ‘Arukh had appeared most people took it for granted that Rabbenu

Hananeel had lived at Rome, and accordingly called him ‘‘a man of see MS. Brit. Mus. Add. 27,201, leaf 73b, and

Rome—Ish Romi"; Tosaphoth, passim, (That Rabbenu Gershom, Rabbenu Mosheh *D)5), and others were his teachers, as Rapoport, Joe. cit. » asserts, is a fic- tion.) Rabbenu Nathan, in his ‘Arukh, does not merely explain the foreign (i.¢., Aramaic, Persian, Greek, Latin, and Arabic) words occur- ring in the Targums, Talmuds, and Midrashim, but the subject-matter also, and thereby proves himself a doubly useful guide. In this, al- though he had been preceded by no less a personage than the Gaon Semah b. Paltoi (fl. 870), who also coniposed such an ‘Arukh, Rabbenu Nathan was virtually the first, as the Gaon’s work had been early lost. The assertion that the fourth of the four men captured by the Spanish admiral (see below, p. 39) was R. Nathan Habbabli, that he lived in Narbonne, and that he also composed a similar "Arukh, rests on a misunderstanding, as the quotation in the Yohasin clearly shows. The passages there given under R. Nathan Habbabli are taken verbatim from the ‘Arukh of our author (compare the article WIY, &c.). That Rome has been at times called in Jewish writings "

Babel,” and that cousequently Labbabli may mean ‘the Roman,” is clear from the writings of the New Testament, We will only add here a few words concerning the bibliography of the book. Of the ‘Arukh exist so far ten editions, the first of which came out undated, but before or about 1480. The seventh edition was enriched by the physician R. Binyamin Musaphia’s Musaph, .e., Additamenta (Musaphia was a Greek and Latin scholar), and the latest edition by Dr Kohut is now in progress. As regards the MSS. of this remarkable lexicon the best copies are to be found partly in the University Library, Cambridge (Add. 376, which has all the verses of the author and additamenta by R. Shemuel Tbn Yid3, and Add. 471-72), and partly at the Conrt Library, Vienna (Cod, evi. 1 and 2). The latter were carried off by Napoleon I. to Paris in 1809, but in 1815 were returned to Vienna,

? Various writers assert that there exist many books containing Latin translations of various treatises of the Babylonian Talmud.

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8vo); and in German, ¢.g., Berakhoth, by Rabe (Halle, 1777, 4to), regard being had also in both to the same treatise of the Palestinian recension, and again by Pinner (1842); Baba Mesi‘a, by Sammter (1876), both at Berlin and in folio; (Nuremberg, 1856, 8vo); Ta’‘anith, by Straschun (Halle, Megillah aud Rosh Hasshanah, by Rawicz (Frankfort-on-the-Main, 1884 and 1886). been translated into Spanish has yct to be proved. As regards the Palestinian Talmud, Ugolini’s 7hesawrus contains the treatises in Latin :— Pesahim (vol. xvii.); Shekalim, Yoma, Sukkah,

‘Abodah Zarah, by Ewald

1883) ;

The assertion that the whole of this Talmud has

following

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Losh Hasshanah, Ta’anith, Megillah, Hagigah, Besah, Mo’ed Katan (vol. xviii.); Ma’aseroth, Ma‘aser Sheni, Hallah, ‘Orlah, Bikkwrim (vol. xx.); Synhedrin, Kethuwboth (vol. xxx.),

Makkoth (vol. xxv.); Kiddushin, Sotah, M. Schwab (of the Bibliotheque Nationale, Paris) has undertaken a French translation of the entire Palestinian Talmud, which is now in progress ; from this Berakhoth has been translated into English (London, 1886, 4to).

Editions. —The editions of the Palestinian Talmud, in what was then called its entirety, are only four:—(a) Venice, 1523, without any commentary; (b) Cracow, 1609, with a short comimentary, the text apparently from a different MS. from that used for the editio

princeps; (c) Krotoschin, 1866, with a short commentary differing

from that of Cracow: these three editions are each comprised in one volume; (d) the fourth edition came out at Zhitomir, with commentaries by different men (see Commentaries above). All these editions are in folio. Of the editions of isolated treatises, which are not a few, we will only mention those of Berakhoth (Vienna, 1874) and Peah and Demai (Breslau, 1875, both in 4to), with a new com- mentary by Z. Frankel. The editions of the Babylonian Talmud are so numerous that they would require several entire sheets for enumeration. There is in existence an approximately good treatise on them (see Varix Lectiones, vols. i, and viii.). “We will only name three of the entire editions :—(1) the editio princeps, Venice, 1520-23,?—which, though disfigured by numerous misprints, was not mutilated by the censor; (2) the edition of Basel (1578-81), which omits ‘Abodah Zarah altogether, and hasa cheering (?) notice in Latin ;% (3) the latest edition, now printing at Vilna, with old commentaries hitherto unpublished. Of isolated treatises, which may be counted by more than hundreds, we will only mention one (the Portuguese of at least Berakhoth), the existence of which was asserted in the last century (Pahad Vishak, s.v. NNINNDI 812)4), then again called in question in our own times, but positively proved by the present writer from an early work composed at the time when but few editions of the Talmud existed. It is the Zera’ Abraham (Camb. MS. Ti. 6. 50, leaf 595). Materials for the critical edition of the Babylonian Talmud from an ancient MS. formerly in the monastery of Pfersee, but now in the Royal Library of

Munich, and other MSS, and early prints of isolated treatises in various public and private libraries of Europe, Asia, and Africa, have been collected and are being published by Rabbinovicz. Of this import- ant work fifteen volumes, containing the following treatises, have already come out:—the whole Seder Zera‘im (1867); Besah, Hagigah, Moed Katan (1869); Sukkah, Ta’anith (1870); Rosh Hasshanah, Yoma (1871); ‘Hrubin (1873); Pesahiim (1874); Shabbath (1875) ; Megillah, Shekalim (1877); Synhedrin (1878); ‘Abodah Zarah, Makkoth, Shebuioth, Horayoth, ‘Eduyyoth (1879); Baba Bathra (1881) ; Baba Kamma (1882); Baba Mesi’a (1888) ; Zebahim (1884); Menahoth (1886).4 All these were printed in 8vo and at Munich, except vol. ix., which came out at Mainz.

Influence of the Talmud.—It must be admitted by every critical student of history that the Talmud has not merely been the means of keeping alive the religious idea among the Jews, but has formed their strongest bond of union, When, after the fall of the city of Jerusalem and its temple, and the expatriation of the Jews from Palestine, a goodly portion of the Mosaic law lost its application, the Talmud became the spirit which put fresh life into the letter which

Upon examination these books turn out to contain either a transla- tion only of Mishnic treatises with or without excerpta from, and with or without scholia on, Gemara, or disputations which introduce small pieces of Gemara. The utmost they contain is a chapter or two translated from Gemara itself (as, for example, “ Edzard, Aboda Saray &c., Hamburg, 1705-10, 4to, which contains Gemara of the first two Perakim).

2 The paging of this has been followed in all subsequent editions.

3 Nunc ab omnibus iis que contra religionem Christianam facie- bant recognitum, et juxta mentem Sacri concilii Tridentini expurga- tum et approbatum, ut non modo citra impietatem verum etiam cum fructu a nostris legi possit.

4 The notes in the first fourteen volumes go under the namie of DDD, “31, whilst those of the fifteeuth volume have the title of DMN? 3933, in memory of the late Abraham Merzbacher, who not merely proved the Mecenas of this publication during his lifetime,

but left a considerable sum for its continuation and completion.

had become toa great extent dead. Moreover, by the Tal- mud, the interpretation of which was chiefly in the hands of the academies of Sura and Pumbaditha, the Jews of all the world found, if not a new Jerusalem, at least a new Yabneh (Jamnia), z.c., a place where the old learning was not merely continued, but made to shine with a yet greater splendour. This fact will be the more readily acknow- ledged and appreciated when one casts a glance at the miserable religious condition of the Karaites, the so-called Scriptural Jews.

Transference of Talmudic Learning from the Kast to the West.—There naturally came a time when Talmudic learn- ing, if it was to maintain its influence upon the Jews, could not be confined to one spot. We have seen under Rasut (q.v.) that the great emperor of the West (Charle- magne) had been the means, towards the close of the 8th century, of bringing learned Talmudists not only to Pro- vence but to the north of France and the south of Ger- many.! But when nearly two hundred years later the academies of Babylonia were threatened with extinction (because of their lacking, from various causes, the means of subsistence), so that they had to send out members of their body to supplicate the support of their richer brethren in other countries, it providentially happened that the four men whom they sent were taken by a Spanish corsair admiral and sold in four different slave-markets. Rabbi Shemaryah was sold at Alexandria, and was redeemed by the Jews, and great was their astonishment when they recog- nized in him a most able Talmudist. He became the head of the Cairo community, and one of the most successful Jewish Talmud teachers Egypt ever had. Rabbi Husshiel was taken to Kairwan, in Africa. There the Jews redeemed him; and when his great learning was found out he was named the spiritual head of the Jews in that place. From the school which he founded sprang not merely his own son, the famous Rabbenu Hananeel, but also the great Rabbenu Nissim, both teachers of Ripu (q.v.). Another learned cap- tive, R. Mosheh, was brought to the slave-market of Cor- dova, the rabbi of which town, a noble and rare example of unselfishness, modesty, and love of truth, placed the ragged stranger who had only been ransomed for charity’s sake a

day or so before at the head of the community instead of himself. The name of the fourth is unknown (see RaBan IL., and Yohasin, ed. Cracow, leaf 1255). Some assert that he was R. Nathan Habbabli, and that he became the teacher of the Jews in Narbonne, but this is a mere conjecture, the truth of which has yet to be proved (see page 37, footnote'). Be this, however, as it may, four great Talmudists, who had come direct from the Babylonian academies, became the means of bringing Babylonico-Tal- mudic learning to places the Jews of which had been de- pendent on the religious and literary crumbs that fell from the richly-laden tables of Sura and Pumbaditha. Some years afterwards the former academy was closed, and a short time afterwards the same fate befell that of Pumba- ditha, the sunset of which, if not the noonlight, in the persons of Rab Sherira Gaon and his son Rab Hai Gaon was even more glorious than that of the sister academy, the last "gaon" of which was Rab Shemuel b. Hophni, father-in-law of Rabbenu Hai. Meanwhile, however, Tal- mudic learning had not merely become naturalized, but eventually indigenous in various parts of Africa, and part of Europe (Spain, Italy, Provence, the south of Germany, and the north of France). Rabbenu Gershom b. Yehudah of Metz and his disciple Rabbenu Yishak of Troyes, Rabbenu Ya'akob b. Yakar of Worms, Rabbenu Eli'ezer Haggadol and his disciple and successor Rabbenu Yishak Segan Leviyyah, Rabbenu Yishak b. Yehudah of Mainz,

1 Italy, notably Sicily, was apparently the country which obtained her teachers direct from Trak.

Rabbenu Elyakim of Spires, Rabbenu Nathan b. Yehiel of Rome, and last but not least Rashi himself, and his sons-in-law and other disciples, represented Talmudic learn- ing in such perfection as had not been found' before as regards the Babylonian Talmud, even in the land of its birth and growth. It was the disciples' disciples of these men who studied aud taught in various towns of England within a hundred years (1150) after the Conquest. When, towards the end of the 13th century and the commence- ment of the 14th, the Jews were driven out of England (1290) and France (1306), and flocked chiefly to Italy, Greece, Germany, and Poland, the last- named country appropriated the lion's share of Talmudic learning, so that

till within our own century the rabbis of the chief communities in Hungary, Moravia, Bohemia, and other Austrian states, and in Germany, Holland, England, &c., had to be fetched from Poland. Talmudic learning, since Mendelssohn and his school arose, threatened to die out not merely among the Jews in Germany, but also among those of the other countries where the Jews spoke the German tongue in some form or other. Within the last twenty-five years, however, fresh impulse has been given to these studies, not merely among Jews but also among Christians. (s. M. 8.-8.)

TAM, commonly called Raspenvu TAM, more correctly Rapsenu THam (’=00 4322). By this title are known two eminent Rabbinic scholars, both named Ya‘akos, to whom this epithet was given in allusion to Genesis xxv. 27: “And Jacob was a perfect man” (Ish Tam, 07 8). They belonged to the north of France, lived in the 12th century, and were master and pupil.

1. RapBenu Ya‘akos B. MEIR B, SHEMUEL was, on his mother’s side, a grandson of Rasui (q.v.). He was his parents’ third son, younger brother of Ribam and RasHBAM (q.v.), older brother of Rabbenu Shelomoh of Rameru,? and brother-in-law of Rabbenu Shemuel b. Simhah of Vitry the younger ® (the reputed author of the Mahzor Vitry,* now apparently lost®). Rabbenu Tham had, like his grand- father Rashi, six teachers:—(1) his own father, (2) his brother Ribam, (3) his brother Rashbam, (4) Rabbenu Ya‘akob b. Shimshon,® (5) his grandfather Rashi,’ and (6) Rabbenu Yoseph Tob- Elem the younger.’ Rabbenu Tham had at least five children.® The names of three of his sons were Yoseph,!° Yishak,!! and Shelomoh.!? Rabbenu Tham was unquestionably among Jews the foremost man of his age. For not only was he the greatest Talmudist after his maternal grandfather’s death, but he also added reading wide and varied to a stupendous memory and a marvellous

2 See MS. Add. 27,200 in the Br. Mus., leaf 158d.

3 See Rashi’s Stddur, i. leaf 10.

4 See Schiller-Szinessy, Catalogue, ii. p. 88.

5 See art. Rasut (vol. xx. p. 284, note 10). :

6 This rabbi was a disciple of R. Shemuel Hallevi (see Schiller- Szinessy, Catal., ii. p. 65, note 1) and of Rashi, and was not only a great Talmudist, as were all the disciples of the last-named eminent teacher, but also a great mathematician and astronomer, though a terribly bad poet. His commentary on Adboth is in part printed, and is to be found, more or less perfect, in various libraries in Europe, although not recognized as his. It is ascribed variously to Rashi, to Rashbam, and others. There are copies of it in Cambridge (Add. 1213; Add. 1528), Oxford (Opp. 317), the British Museum (Add, 27201), the Beth Hammidrash of the Ashkenazim in London, &c. (The master of St John's, Cambridge, is preparing an edition of it.) A work on intercalation by Rabbenu Ya'akob b. Shimshon exists in MS. at the Bodleian (Opp. 317) under the name of Sepher Haelkoshi. From him, no doubt, Rabbenu Tham imbibed his love for science. On the fact that Rabbenu Ya'akob b. Shimshon was Rabbenu Tham's teacher (against Zunz), see Schiller-Szinessy, Catal., ii. p. 66, note.

7 Rabbenu Tham, dying an old man, must have been from fourteen to sixteen years of age when Rashi died.

8 See Sepher Hayyashar, § 620 (leaf 74a, col. 2).

9 See Camb. MS. Add. 667, 1, leaf 648, col. 1.

10 See Brit. Mus. MS. Add, 27200, leaf 1580.

11 See Sepher Hayyashar, § 604.

12 See Shibbole Halleket (ed. Buber), p. 10.

4()

power of combination, such as appeared only again in the last century in the persons of R. Yehonathan Eybenschiitz (ob. 1764) and R. Yehezkel Landau (ob. 1793). . Let us add that he was a lexicographer, grammarian, and Biblical commentator of no mean order; that he was a poet in Hebrew and Aramaic! inferior only to Ibn Gebirol (AVICEBRON, 9.v.), Mosheh Ibn 'Ezra, and Yehudah Hallevi (and by far greater in this art than the commentator Abraham Ibn "Ezra); that he was held in high esteem by

prince and nobles ;? and that he was a man of great wealth, with which he generously supported, not merely his own poorer hearers, but other itinerant scholars also.?

His works are the following :—

(1) Commentary on Job, and, no doubt, on other parts of the Bible (see Camb. Univ. Lib. MS. Dd. 8. 53, leaves 14, 4a, lla, 126). All these are apparently now lost. (2) Hakhra‘oth, %.e., lexical and grammatical decisions between Menahein Ibn Seruk and Dunash b, Labrat (see Sepher Teshuboth Dunash b. Labrat, Edinburgh, 1885, 8vo). That these ‘‘decisions” are really by Rabbenu Tham is proved by the before-named MS., leaves 10a and 16a, where the book is quoted by an author of the 13th eentury. (3) Sepher Hayyashar (Vienna, 1810, folio). Although this work, in its present form, is the compilation of one of Rabbenu Tham’s disciples, R. Yishak b. Durbal by name (also called Isaac of Russia; see Schiller-Szinessy, Catalogue, i. p. 164, and ii. p- 66), not only is the foundation Rabbenu Tham’s (see Preface), but the contents also are virtually his. Compare the Cambridge MS. Add. 667. il passim. (4) The greater part of the Tosaphoth in the Babylonian Talmud are indirectly also by Rabbenu Tham; and he is virtu- ally the first Tosaphist. It is true that his father, his brother RASHBAM (g.v.), and his unele Rabbenu Yehudah b. Nathan had written Z’osaphoth before him, and that this kind of literary acti- vity lasted to within the first quarter of the 14th eentury. Still, most and the best of the Zosaphoth now in our hands rest on Rabbenu Tham and his school. (5) Mahzor, %.@., & prayer-book, &c., for the whole year, with Rabbinie ordinances, &e. See Tosaphoth on T. B., Berakhoth, leaf 37a, catehword DDIDA, and Birekhoth Maharam of R. Meir b. Barukh of Rothenburg (Riva di Trento, 1558, 8vo), leaf 4a. (6) Poems. These are partly didactic and partly liturgical. Of the former kind a specimen will be found (“On the Accents,” communicated by Halberstam) in Kobak’s Yeshurun, v. p. 125 sq. The liturgical poems, again, are of two kinds : plurals, possessive pronouns, and such like (rhymed prose), and which perfectly resemble most of the productions of the Franco- Ashkenazic school (see, for example, the facsimile in Muller’s Cata- logue, Amsterdam, 1868, 8vo); (6) such as have metre and rhyme, and resemble the productions of the Sepharadic school, e.g., the one beginning **3’Y JA (and not 13; 102a).** (7) Various ordinances,

&c., are to be found in later writers (see MS, Add. 667, in Cambridge, passim, and Teshuboth Maharam, Prague, 1608, folio, § 1023, &c.). Rabbenu Tham died in ial s see Rashi’s Siddur, ii. (formerly Luzzatto’s, then Halberstam’s, and ct the property of the master of St John’s College, Cambridge), leaf 48a,

2. RABBENU Ya‘axos of Orleans, rabbi of London (2). He is often quoted in the Zosaphoth (both on the Penta- teuch and on the Babylonian Talmud). No independent works of his, however, are extant. He was killed at London in the tumult on the coronation day of Richard Cceur-de-Lion (September 3, 1189; Schiller-Szinessy, Catal., 1, pola, (S. M. 8.-S.)

TAMAQUA, a borough of Schuylkill county, Pennsy]- vania, United States, in a broken, hilly country, upon the

- See his Vesib Pithgam (in the Ashkenazie ritual; it is intro- duetory to the prophetie lesson for the second day of Pentecost). If we have the eorrcet reading of that poem there, Rabbenu Tham must have been a Levite; and if so, the Shemuel Hallevi mentioned by R. Yaakob b. Shimshon as his teacher, in the Cambridge MS, Add. 1213, leat 276, is very possibly: Rabbenu Tham’s paternal grandfather.

2 See epher Hayyashar, § 595 (leaf 67a, col. 1), and § 610 (1st) tm fine. To this high position it is no doubt to be aseribed that his life was saved by a knight during the second crusade, in which the whole congregation of Rameru was reduced to beggary, after many of its members had been ruthlessly slain.

- For example, the poverty-stricken Abraham Ibn ‘Ezra, to whom he not only gave money but kind words also, in good verses (Kerem Hemed, vii. p. 35).

- For other metrical poems by Rabbenu Tham, see Zunz, Literaturg. der Syn. Poesie (Berlin, 1865, 8vo), p. 266,

(a) such as have no metre and rhyme only by means of

; see MS. Add. 667, leaf

Little Schuylkill river, 98 miles nearly north of Phil. adelphia. It is in the midst of the anthracite coal region, and coal mining is one of its principal interests. It is an important railroad centre, upon the Philadelphia and Reading system, being the point of intersection of three main lines and the terminus of several minor branches, The borough had a population of 5960 in 1870 and of 5730 in 1880.

TAMARIND. This name is popularly applied to the pods of a Leguminous tree, which are hard externally, but within filled with an acid juicy pulp containing sugar and various acids, such as citric and tartaric, in combination with potash. The acid pulp is used asa laxative anda refrigerant, the pods being largely imported both from the East and the West Indies. The tree is now widely distri- buted in tropical countries, but it is generally considered that its native country is in eastern tropical Africa, from Abyssinia southward to the Zambesi. Sir Ferdinand von Mueller notes that it is truly wild in tropical Australia, The name (meaning in Arabic “Indian date”) shows that it entered medizeval commerce from India, where it is used, not only for its pulp, but for its seeds, which are astringent, its leaves, which furnish a yellow or a red dye, and its timber. The tree (Tamarindus indica, L.) attains a height of 70 to 80 feet, and bears elegant pinnate foliage and purplish or orange veined flowers arranged in terminal clusters. The flower-tube bears at its summit four sepals, but only three petals and three perfect stamens, with indications of six others. The stamens, with the stalked ovary, are curved away from the petals at their base, but are directed towards them at their apices. The anthers and the stigmas are thus brought into such a position as to obstruct the passage of an insect attracted by the brilliantly- coloured petal, the inference of course being that insects are necessary for the fertilization of the flower.

TAMARISK. The genus Tamarix gives its name to a small group of shrubs or low trees constituting the tamarisk family. The species of tamarisk and of the very closely allied genus Myricaria grow in salt deserts, by the sea-shore, or in other more or less sterile localities in south temperate, subtropical, and tropical regions of the eastern hemisphere. Their long slender branches bear very num- erous small appressed leaves, in which the

evaporating surface is reduced to a minimum. The flowers are minute and numerous, in long clusters at the ends of the branches or from the trunk. Each has 4~6 free sepals, and as many petals springing with the 4-12 stamens froma fleshy disk. In Z'amarix the stamens are free, while in MM; yricaria they are united into one parcel. The free ovary is one- celled, with basal placentas, and surmounted by 3-5 styles. The fruit is capsular, and contains numerous seeds, each usually with a long tuft of hairs at one end. The great value of these shrubs or trees lies in their ability to with- stand the effects of drought and a saline soil, in consequence of which they grow where little else can flourish. It is on this account that the common tamarisk, 7. gallwa, is planted on our sea-coasts, and affords shelter where none other could be provided. The light feathery appearance of the branches, and the pretty rose-coloured flowers, render it also an elegant and attractive shrub, very different in character from most others.

Some species produce galls, valued for their tannin, while the astringent bark of others has been valued for medicinal purposes. The ashes of the plant, when grown near the sea, are said to contain soda; but#when cultivated inland or on sweet soil, they are, it is alleged, free from soda.

For tamarisk manna, see Manna, vol. xv. p. 493.

TAMBOFF, one of the largest and most fertile govern- ments of central Russia, extends from north to south between the basins of the Oka and the Don, and has

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Vladimir and Nijni-Novgorod on the N., Penza and Sara- toff on the E., the Don Cossacks and Voronezh on the S., Tula and Ryazaii on the W. It consists of an undulating plain intersected by deep ravines and broad valleys, rang- ing between 450 and 800 feet above sea-level. Chalk and Jurassic deposits, thickly covered by boulder-clay and loess, are widely spread over its surface, concealing the underlying Devonian and Carboniferous deposits. These last appear only in the deeper ravines, and seams of coal have been noticed at several places. Iron ore (in the north-west), limestone, clay, and gypsum are obtained for building and manufacturing purposes; traces of naphtha have been discovered at

Tamboff. The mineral waters of Lipetsk, similar to those of Franzensbad in their alkaline elements, and chalybeate like those of Pyrmont and Spa, are well known in Russia. Tamboff is watered by the tributaries of the Oka and the Don. The Oka itself only touches the north-west corner of the government, but its tributaries, the Moksha and the Tsna, are important channels of traffic. The Don also only touches Tamboff, and of its affluents only the Voronezh and the Khoper and its tributary the Vorona are at all navigable. As a whole, it is only in the north that Tamboff is well watered ; in its southern part, which is exposed to the influence of the dry south-eastern winds, the want of moisture is much felt, especially in the district of Borisoglyebsk, which belongs to the dry steppes of the lower Volga.

The climate is continental, and, although the average tempera- ture at Tamboff is 42° F., the winter is comparatively eold (Janu- ary, 18°; July, 68°). The rivers remain frozen for four months and a half. Forests oeeupy less than one-sixth of the total area, and oecur chiefly in the west; in the south-east wood is searee, and straw is resorted to for fuel. The soil is fertile throughout; in the north, indeed, it is clayey and sometimes sandy, but the rest of the government is covered with a sheet, 2 to 3 feet in thiekness, of the most fertile tchernozem, of sueh riehness, indeed, that in Borisoglyebsk eorn-fields whieh have not been manured for eighty years still yield good erops.

Tamboff is one of the densely peopled provinees of Russia. Its population in 1883 reaehed 2,519,660, and in several districts (Kozloff, Lebedyafi, Lipetsk) there are from 110 to 130 inhabitants per square mile. Itis Great Russian in the eentral portion, but has a notable admixture of MonpviINIANs (g.v.) and Meseheriaks in the west and north-west, as also of Tartars: the Mordvinians (who are rapidly becoming Russified) constitute 4 per eent. of the aggregate population of Tamboff; the Tartars number about 20,000, and the Meseheriaks about 4000. Noneonformity is widely spread, although the official figures diselose only 14,300 Raskolniks. Not-withstanding a high birth-rate (45 in the thousand), the annual inerease of population is but slow (0°5 per cent. annually).

The prevailing oeeupation is agriculture, and in 1883 only 168,200 persons had their residenee in towns, whieh are mostly themselves nothing but large

villagesof agriculturists living together, with a few merchants. More than two-thirds of the area is arable, and of this proportion 53 per cent. belongs to peasant communities, 36 per eent. to private individuals, and 11 per cent. to the erown. The erops of the years 1888 to 1885 yielded on the average 8,885, 000 quarters of grain (half being rye, and one-third oats). Corn is exported toa considerable extent from the south, although it is deficient in the north. Hemp and linseed are also eultivated for exportation. The eultivation of tobacco is yearly increasing: 5220 acres were under this crop in 1885, and yielded nearly 50,000 ewts. In the same year 15,950 aeres were under beetroot, and yielded 1,660,000 ewts. Cattle-breeding, though less extensively earried on than formerly, is still important (656,300 horses, 399,500 horned eattle,, and 1,326,600 sheep in 1883). Exeellent breeds of horses are met with, not only on the larger estates, but also in the hands of the wealthier peasants, those of the Bityug river being most esteemed. Manufactures are represented chiefly by distilleries, tallow-melting works, sugar-works, and a few woollen- cloth mills. The petty trades are not very extensively carried on in the villages. Commerce is very brisk, owing to the large amounts of corn exported, —Kozloff, Morshansk, Tamboff, and Borisoglyebsk being the ehief eentres for this traffie, and Lebedyafi for the trade in horses and eattle. Tamboff is rather backward edueationally : in 1883 there were only 629 sehools, attended by 34,739 boys and 5680 girls. The government is divided into twelve districts, the ehief towns of whieh, with their populations in 1884, are Tamboff (34,000 inhabitants), Borisoglyebsk (18,000), Elatma (7560), Kir- sanoff (7770), Kozloff (27,900), Lebedyai (6250), Lipetsk (15,860),

Morshansk (21,200), Shatsk (7260), Spassk (5010), Temnikoff (13,700), and Usmafi (8110 in 1880). A distinetive feature of Tam- boff is its very large villages of erown-peasants, a dozen of which have from 5000 to 7000 inhabitants each. Several of them—like Raskazovo (a great eentre of Noneonformity), Atabukhi, Sasovo, Izberdei, and Arkhangelskoye—are important eommercial centres.

The region now included in the north of the government was settled by Russians during the earliest centuries of the prineipality of Moseow, but

until the end of the 17th eentury the fertile tracts to the south remained too inseeure for settlers. In the following eentury a few immigrants began to eome in from the steppe, and landowners who had received large grants of land as gifts of the ezars began to bring their serfs from central Russia. The popula- tion has very rapidly inereased within the present eentury.

TAMBOFT, capital of the above government, 300 miles distant from Moscow, is situated on the Tsna river, and on the railway from Kozloff to Saratoff. It is almost entirely built of wood, with broad unpaved streets, lined with low houses surrounded by gardens. It has a small public library, a theatre, and the few educational institu- tions which are usual in the chief towns of Russian pro- vinces. Its manufactures are insignificant ; and its trade, in local grain and in cattle purchased in the south and sent to Moscow, is far less important than that of Morshansk or Kozloff. The population in 1884 was 34,000.

TAMERLANE. See Trvcr.

TAMILS. The word Zamil (properly Jamil) has been identified with Dravida, the Sanskrit generic appellation for the South Indian peoples and their languages; and the various stages through which the word has passed — Dramida, Dramila, Damila—have been finally discussed by Bishop Caldwell in his Comparative Grammar of the Dravidian Languages (2d ed., 1875, p. 10 sq.), and the derivation has recently been endorsed by Col. Yule and Dr Burnell in their Glossary (p. 2516). The identification was first suggested by Dr Graul (Reise nach Ostindien, vol. iii, 1854, p. 349), and then adverted to by Dr G. U. Pope (Zamil Handbook, 1859, Introduction) and Dr Gundert (Malayalma Dictionary, 1872, s.v.). It should, however, be mentioned that the former prefers now to take the word Tamil to be a corruption of ¢enmoli, southern speech, in contradistinction to vadugu, the northern, 7.e., Telugu language. As in the case of the Kafir, Turkish, Tagala, and other typical languages, the term Tamulic or Tamulian has occasionally been employed as the designation of the whole class of Dravidian peoples and languages, of which it is only the most prominent member. The present article deals with Tamil in its restricted sense only.

The Tamils, taken as the type and representatives of the Dravidian race, do not now, owing to early intermixture with the Aryan immigrants, materially

differ in physical character from the other curly-haired indigenous population of India. They were at one time, on the ground of the general structure of their language, classed with the Mongoloid (Turanian, Scythian) and even the Australian races, but that classification is rejected by all the leading ethnologists. They form, in fact, with the other mem- bers of the group, a separate and distinct family, which is of the dolichocephalic class, and comes near the Ifdo- European or Aryan type; while there are scattered remnants of a still earlier population of India (Mundas, Kolarians), whose race characteristics, however, do not so essentially differ from those of the Dravidians as to con- stitute them a class by themselves. The Tamils proper are smaller and weaker-built than the Europeans, though more graceful in shape. Their physical appearance is described as follows :—a pointed and frequently hooked pyramidal nose, with conspicuous nares, more long than round ; a marked sinking in of the orbital line, producing a strongly defined orbital ridge; hair and eyes black; the latter, varying from small to middle-sized, have a peculiar sparkle and a look of calculation; mouth large, lips thick

marked development and breadth, and to the general contour an obtuse oval shape, somewhat bulging at the sides ; forehead well-formed, but receding, inclining to flattish, and seldom high; occiput somewhat projecting ; beard considerable, and often strong; colour of skin very dark, frequently approaching to black (Manual of the Administration of the Madras Presidency, Madras, 1885, vol. i, Introd., p. 36; see also Caldwell, Comparative Grammar of the Dravidian Languages, 1875, pp. 558-79). The Tamils have many estimable qualities, frugality, patience, endurance, politeness,—and they are credited with astounding memories ; their worst vices are said to be lying and lasciviousness. Of all the South-Indian tribes they are the least sedentary and the most enterprising. Wherever money is to be earned, there will Tamils be found, either as merchants or in the lower capacity of domestic servants and labourers. The tea and coffee districts of Ceylon are peopled by about 800,000; Tamils serve as coolies in the Mauritius and the West Indies. In Burmah, the Straits, and Siam the so-

called Klings are all Tamils (Graul, Reise nach Ostindien, Leipsic, 1855, vol. iveppe ts),

Language.—The area over which Tamil is spoken extends from a few miles north of the city of Madras to the extreme south of the eastern side of the peninsula,

throughout the country below the Ghats, from Pulicat to

Cape Comorin, and from the Ghats to the Bay of Bengal,

including also the southern portion of Travancore on the western side of the Ghats and the northern part of According to the census of 1881, the number

Ceylon. of Tamil-speaking people throughout the province was 12,413,517, inclusive of 21,992 Yerkalas, 3843 Kurumbas,

and 287 Irulas, three tribes speaking rude dialects of the To these should be added about 160,000 in But, as of all the Dravidian languages the Tamil shows the greatest tendency to spread, its area becomes ever larger, encroaching on that Tamil is a sister of Malay-

language. the French possessions.

of the contiguous languages. alma, Telugu, Canarese, Tulu, Kudagu, Toda, Kéta, Gond, Khond (Ku), Urdon, Rajmahal, Keikadi, and Brahui, the nine last-named being uncultivated tongues ; and, as it is the oldest, richest, and most highly organized of the Dravidian languages, it may be looked upon as typical of the family to which it belongs. The one nearest akin to it is Malayélma, which originally appears to have been simply a dialect of Tamil, but differs from it now both in pronunciation and in idiom, in the retention of Old-Tamil forms obsolete in the modern language, and in having discarded all personal terminations in the verb, the person being always indicated by the pronoun (F. W. Ellis, Dissertation on the Malayélma Language, p. 2; Gundert, Malayalma Dictionary, Introd. ; Caldwell, Comparative Gr., Introd., p. 23; Burnell, Specimens of South Indian Dialects, No. 2, p. 13). Also, the proportion of Sanskrit words in Malayalma is greater, while in Tamil it is less, than in any other Dravidian

tongue. This divergence between the two languages cannot be traced farther back than about the 10th century; for, as it appears from the Cochin and Travancore inscriptions, previous to that period both languages were still substantially identical; whereas in the Rdmacharitam, the oldest poem in Malayalma, composed probably in the 13th century, at any rate long before the arrival of the Portuguese and the introduction of the modern character, we see that language already formed. The modern Tamil characters originated "in a Brahmanical adaptation of the old Grantha letters corre- sponding to the so-called Vatteluttu," or round-hand, an

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alphabet once in vogue throughout the whole of the Pandyan kingdom, as well as in the South Malabar and Coimbatore districts, and still sparsely used for drawin

up conveyances and other legal instruments (F. W. Ellis, Dissertation, p. 3). It is also used by the Mappilas in Tellicherry. The origin of the Vatteluttu itself is still a controverted question. The late Dr Burnell, the greatest authority on the subject, has stated his reasons for tracing that character through the Pehlevi to a Semitic source (Elements of South Indian Palzography, 2a ed., 1878, pp. 47-52, and plates xvii. and xxxii.). In the 8th century the Vatteluttu existed side by side and together with the Grantha, an ancient alphabet still used through- out the Tamil country in writing Sanskrit. During the four or five centuries after the conquest of Madura by the Cholas in the 11th it was gradually superseded in the Tamil country by the modern Tamil, while in Malabar it continued in general use down to the end of the 17th century. But the earliest works of Tamil literature, such as the Tolkdppiyam and the Kuraj, were still written in it. The modern Tamil characters, which have but little changed for the last 500 years, differ from all the other modern Dravidian alphabets both in shape and in their phonetic value. Their angular form is said to be due to the widespread practice of writing with the style resting on the end of the left thumb-nail, while the other alpha- bets are written with the style resting on the left side of the thumb.

The Tamil alphabet is sufficiently well adapted for the expression of the twelve vowels of the language (a, d, 2, 4, u, a, e, é, 0, 6, ev, aw), —the

occasional sounds of 6 and , both short and long, being covered by the signs for e, 4 7, 4; but it is utterly inadequate for the proper expression of the consonants, inasmuch as the one character k has to do duty also for kh, 9, gh, and similarly each of the other surd consonants ch, {, t, p represents also the re- maining three letters of its respective class. The letter & has, besides, occasionally the sound of h, and ch that of s. Each of the five consonants &, ch, ¢, t, p has its own nasal. In addition to the four semivowels, the Tamil possesses a cerebral 7 and J, and has, in common witli the Malayalma, retained a liquid J, once peculiar to all the Dravidian languages, the sound of which is so difficult to fix graphically, and varies so much in different districts, that it has been rendered in a dozen different ways (Manwal of the Administration of the Madras Presidency, vol. ii. p. 20 sg.). Fr. Miiller is probably correct in approximating it to that of the Bohemian ?, There is, lastly, a peculiar 7, differing in function but not in pronunciation from the dental n. The three sibilants and # of Sanskrit have no place in the Tamil alphabet ; but ch often does duty as a sibilant in writing foreign words, and the four corresponding letters as well as j and ksh of the Grantha alphabet are now frequently called to aid. It is obvious that many of the Sanskrit words imported into Tamil at various periods (Caldwell, doc. cit., Introd., pp. 86 sq.) have, in consequence of the incongruity of the Sanskrit and Tamil notation of their respective phonetic systems, assumed disguises under which the original is scarcely recognizable: examples are wlagu (loka), wrwvam (rapa), arukken (arka), arputam (adbhutam), natchattiram (nakshatram), trudi (rishi), t¢rkam (dirgha), arasen (rajan). Besides the Sanskrit ingredients, which appear but sparsely in the old poetry, Tamil has borrowed from Hindustani, Arabic, and Persian a large number of revenue, political, and judicial terms, and more recently a good many English words have crept in, such as tiratti, treaty, patlar, butler, akt, act, kuléb, club, kavarnar, governor, pinnalkédu, penal code, stkku, sick, mejastirattu, magistrate. But, as compared with its literary sister languages, it has preserved its Dravidian character singularly free from foreign influence. Of Tamil words which have found a permanent home in English may be mentioned curry (kart), mulligatawny (milagu, pepper, and tanmir, cool water), cheroot (suruttw), pariah (pareiyan).

The laws of euphony (avoiding of hiatus, softening of initial consonants, contact of final with initial consonants) are far more complicated in Tamil

than in Sanskrit. But, while they were rigidly adhered to in the old poetical language (Sen-Tamil), there is a growing tendency to neglect them in the language of the present day (Kodun-Tamil). It is true the Tamil rules totally differ from the prevailing Sanskrit; still the probability is in favour of a Sanskrit influence, inasmuch as they appear to follow Sanskrit models. Thus, iru] ntkkindn becomes trunikkindn ; pon pattiram, porpattiram; vittil kandén, viittir kandén; vdlsirumet, vdtstrumet ; palan tandén, palanranddn. Nouns are divided into high-caste

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and frequently turgid; lower jaw not heavy, its lateral expansion greater than in the Aryan and less than in the Turanian type, giving to the middle part of the face a

TAMILS

or personal and low-caste or impersonal,—the former comprising words for rational beings, the latter all the rest. Only in high- caste nouns a distinction between masculine and feminine is observed in the singular; both have a common plural, which is indicated by change of a final x (feminine /) into r; but the neuter plural termination kal (gal) may be superadded in every case. Certain nouns change their base termination before receiving the case affixes, the latter being the same both for singular and plural. They are for the ace. ei, instr. al, social édu (odu, udan), dat. ku, loc, 2 (idattil, in), abl. tlirundu (ininru), gen. udeiya (adu). There is, besides, a general oblique affix in, which is not only fre- uently used for the genitive, but may be inserted before any of the above affixes, to some of which the emphatic particle € may also be superadded. In the old poetry there is a still greater variety of affixes, while there is an option of dispensing with all. Adjectives, when attributive, precede the noun and are unchange- able; when predicative they follow it and receive verbal affixes. The pronouns of the Ist person are sing. ndén (ydn), inflexional base en, plural ndm (ydm), infl. nam, including, ndéngal, infl. engal, excluding the person addressed; of the 2d person ni, infl. wn (nin, nun), plural nir (ntyir, ntvir), ningal, infl. wm, wngal (num). To cach of those forms, inclusive also of the reflexive pronouns tan, tam, tdngad, a place is assigned in the scale of honorific pro- nouns. As in the demonstrative pronouns the forms beginning with Z

indicate nearness, those with a distance, and (in the old poetry) those with «what is between the two, so the same forms beginning with ¢ (or yd, as in yar, dr, who?) express the interro- gative. The verb consists of three elements—the root (generally reducible to one syllable), the tense characteristic, and the personal affix. There are three original moods, the indicative, imperative, and infinitive (the 2d singular imperative is generally identical with the root), as well as three original tenses, the present, past, and future. The personal affixes are—sing. (1) -én; (2) -dy, honorific Ar; (3) masc. -dn, fem. -dJ, honor. -dr, neuter -adu ; plural (1) -6m (-dm, -ém); (2) -irkal ; (3) mase. fem. -drkaj, ueut. -ana, These affixes serve for all verbs and for each of the three tenses, except that, in the future, -adw and -ana are replaced by -wm (kkum). It is only in the formation of the tenses that verbs differ, intransitive verbs generally indicating the present by ~~kir~~ (~~kinr~~), the past by ~~d~~, ~~nd~~, or ~~in~~, and the future by ~~v~~ (~~b~~), and transitive verbs by the corresponding infixes, ~~kkir~~ (~~kkinr~~), ~~tt~~.(~~nd~~), and ~~pp~~ ; but there are numerous exceptions and seemingly anomalous forma- tions, Other tenses and moods are expressed with the aid of special affixes or auxiliary verbs. Causal verbs are formed by various infixes (~~ppi~~, ~~vi~~, ~~ttu~~), and the passive by the auxiliary padu, to fall, or by wm, to eat, with a noun. The following four peculjarities are characteristic of Tamil :—first, the tenseless negative form of the verb, expressed by the infix a, which is elided before dissimilar vowels; second, the predicative employment of two negative particles 2l/ei and aJla, the one denying the existence or presence, the other denying the quality or essence; third, the use of two sets of participles,—one, called adjective or relative participle, which supplies the place of a relative clause, the language possessing no relative pronouns, and an ordinary adverbial participle or gerund ; and, fourth, the practice of giving adjectives a verbal form by means of personal affixes, which form may again be treated as a noun by attaching to it the declensional terminations, thus : periya, great; periydm, we are great; periydmukku, to us who are great. The old poetry abounds in verbal forms now obsolete. Adjectives, adverbs, and abstract nouns are derived from verbs by certain affixes. All post-positions were originally either nouns or verbal forms. Oratio indirecta is unknown in Tamil, as it is in all the other Indian languages, the gerund enru being used, like iti in Sanskrit, to indicate quotation. The structure of sentences is an exact counterpart of the structure of words, inasmuch as that which qualifies always precedes that which is qualified. Thus the attributive

precedes the substantive, the substantive precedes the preposition, the adverb precedes the verb, the secondary clause the orimary one, and the verb closes the sentence. The sentence, ‘Having called the woman who had killed the child, he asked why she had committed such infanticide,” runs in Tamil as follows :— Kulandeiyei kkonrupottavalei aleippittu ‘ni €6n ippadi

The child her who had killed having caused to be called, ‘‘Thou why thus ppatta sisu-v-atti seyday énru kéttan. made child-murder didst? having said he asked.

Much as the similarity of the structure of the Tamil and its sister languages to that of the Ugro-Tartar class may have proved suggestive of the assumption of a family affinity between the two classes, such an affinity, if it exist, must be held to be at least very distant, inasmuch as the assumption receives but the faintest shade of support from an intercomparison of the radical and least variable portion of the respective languages.

Lvterature.—The early existence, in southern India, of peoples, localities, animals, and products the names of which, as mentioned in the Old Testament and in Greek and Roman writers, have been identified with correspond-

ing Dravidian terms goes far to prove the high antiquity, if not of the Tamil language, at least of some form of Dravidian speech (Caldwell, Joc. cit., Introd., pp. 81- 106; Madras District Manual, i., Introd., p. 134 s9.). But practically the earliest extant records of the Tamil language do not ascend higher than the middle of the 8th century of the Christian era, the grant in possession of the Israelites at Cochin being assigned by the late Dr Burnell to about 750 a.D., a period when Malayaélma did not exist yet as a separate language. There is every probability that about the same time a number of Tamil works sprung up, which are mentioned by a writer in the 11th century as representing the old literature (Burnell, Joc. cit., p. 127, note). The earlier of these may have been Saiva books ; the more prominent of the others were decidedly Jaina. Though traces of a north Indian influence are palpable in all of them that have come down to us (see, ¢g., F. W. Ellis’s notes to the Kura/), we can at the same time perceive, as we must certainly

appreciate, the desire of the authors to oppose the influence of Brahmanical writings, and create a literature that should rival Sanskrit books and appeal to the sentiments of the people at large. But the refinement of the poetical language, as adapted to the genius of Tamil, has been carried to greater excess than in Sanskrit ; and this artificial character of the so-called High-Tamil is evident from a comparison with the old inscriptions, which are a reflex of the language of the people, and clearly show that Tamil has not undergone any essential change these 800 years (Burnell, Joc. cit., p. 142). The rules of High- Tamil appear to have been fixed at a very early date. The Tolkadppiyam, the oldest extant Tamil grammar, is assigned by Dr Burnell (On the Aindra School of Sanskrit Gram- marians, pp. 8, 55) to the 8th century (best edition by C. Y. TAmodaram Pillei, Madras, 1885). The Véirasdliyam, another grammar, is of the 11th century. Both have been superseded by the Wanndl, of the 15th century, which has exercised the skill of numerous commentators, and con- tinues to be the leading native authority (English editions in Pope's Third Tamil Grammar, and an abridgment by Lazarus, 1884). The period of the prevalence of the Jainas in the Pandya kingdom, from the 9th or 10th to the 13th century, is justly termed the Augustan age of Tamil literature. To its earlier days is assigned the Ndladiydr, an ethical poem on the three objects of exist- ence, which is supposed to have preceded the Aural of Tiruvalluvan, the finest poetical production in the whole range of Tamil composition. Tradition, in keeping with the spirit of antagonism to Brahmanical influence, says that its author was a pariah priest. It consists of 1330 stanzas on virtue, wealth, and pleasure. It has often been edited, translated, and commented upon ; see the introduc- tion to the excellent edition, just published, by the Rev. Dr Pope, in which also a comprehensive account of the pecul- iarities of High-Tamil will be found. To the Avvei, or Matron, a reputed sister of Tiruvalluvan, but probably of a later date, two shorter moral poems, called Attesdd: and Konreivéyndan, are ascribed, which are still read in all Tamil schools. Chintdmani, an epic of upwards of 3000 stanzas, which celebrates the exploits of a King Jivakan, also belongs to that early Jain period, and so does the Divakaram, the oldest dictionary of classical Tamil. The former is one of the finest poems in the language ; but no more than the first and part of the third of its thirteen books have been edited and translated. Kamban's kdmdyanam (about 1100 a.p.) is the only other Tamil epic which comes up to the Chintdmani in poetical beauty. The most bril- liant of the poetical

productions which appeared in the period of the Saiva revival (13th and 14th centuries) are two collections of hymns addressed to Siva, the one called Tiruvasakam, by Manikka-Vasakan, and a later and larger

one called Tévdram, by Sambandhan and two other devotees, Sundaran and Appan. Both these collections have been printed, the former in one, the latter in five volumes. They are rivalled both in religious fervour and in poetical merit by a contemporaneous collection of Vaishnava hymns, the Naldyira-prabandham (also printed at Madras). The third section of it, called Tirwvdymolt, or "Words of the Sacred Mouth," has lately been published in Telugu characters, with ample commentaries, in ten quartos (Madras, 1875-76). After a period of literary torpor, which lasted nearly two centuries, King Vallabha Deva, better known by his assumed name Ativirarama Pandiyan (second half of the 16th century), endeavoured to revive the love of poetry by compositions of his own, the most celebrated of which are the Neidadam, a somewhat extra- vagant imitation of Sri Harsha's Sanskrit Naishadham, and the Verrivérket, a collection of sententious maxims. Though he had numerous followers, who made this revival the most prolific in the whole history of Tamil literature, none of the compositions of every kind, mainly translations and bombastic imitations of Sanskrit models, have attained to any fame. An exceptional place, however, is occupied by certain Tamil sectarians called stttar (t.e., siddhas or sages), whose mystical poems, especially those contained in the Swavdkyam, are said to be of singular beauty. 'Two poems of high merit, composed at the end of the 17th

century, also deserve favourable notice—the Nitinert-

vlakkam, an ethical treatise by Kuméragurupara Desikan, and the Prabhulingalilei, a translation from the Qanarese of a famous text-book of the Vira-Saiva sect. See the analysis in W. Taylor's Catalogue, vol. ii p. 837-47.

The modern period, which may be said to date from the beginning of the last century, is ushered in by two great poets, one native and the other foreign. Tayumanavan, a philosopher of the pantheistic school, composed

1453 stanzas (pddal) which have a high reputa- tion for sublimity both of sentiment and style; and the Italian Jesuit Joseph Beschi (d. 1742), under the name Viram4muni, elaborated, on the model of the Chintdmani, a religious epic Témbévant, which, though marred by blemishes of taste, is classed by native critics among the best productions of their literature. It treats of the history of St Joseph, and has been printed at Pondicherry in three volumes, with a full analysis. English influence has here, as in Bengal and elsewhere in India, greatly tended to create a healthier tone in literature both as to style and sentiment. As one of the best Tamil translations of English books in respect of diction and idiom may be mentioned the Bdlavydpa- rikaj, or 'Little Merchants," published by the Vernacular Text Society, Madras. P. Percival's collection of Tamil Proverbs (3d ed., 1875) should also be mentioned. The copper-plate grants, commonly called Sdsanams, and stone inscriptions in Tamil, many of which have been copied and translated (Archxological Survey of Southern India, vol. iv.; R. Sewell, Lists of the Antiquarian Remains in the Presidency of Madras, vols. i., ii.), are the only authentic historical records. (See also Sir Walter Elliot's contribution to the Jnter- national Numismata Orientalia, vol. iii. pt. 2.) As early as the time of the Chinese traveller Hwen Tsang, books were written in southern India on talipot leaves, and Albiruni mentions this custom as quite prevalent in his time (1031). It has not died out even at the present day, though paper imported from Portugal has, during the last three centuries, occasionally becn used. Madras is now the largest depository of Tamil palm-leaf MSS., which have been described in Wilson's Catalogue of the Mackenzie Collection (Calcutta, 1828, 2 vols.), W. Taylor's Catalogue (Madras, 1857, 3 vols.), and Condaswamy Iyer's Catalogue (vol. i., Madras, 1861). The art of printing, however, which was introduced in southern India at an early date, while it has tended to the preservation of many valuable productions of the ancient literature, has also been the means of perpetuating and circulating a deal of literary rubbish and lasciviousness which would much better have remained in the comparatively safe obscurity of manuscript. Dr Burnell has a note in his Elements of South Indian Paleography (2a ed., p. 44), from which it appears that in 1578 Tamil types were cut by Father Joao de Faria, and that a hundred years later a Tamil and Portuguese dictionary was published at Ambalakkadu. At present the number of Tamil books (inclusive of newspapers) printed annually far exceeds that of the other Dravidian vernaculars put together. The earliest

Tamil version of the New Testament was commenced by the Dutch in Ceylon in 1688; Fabricius's trans- lation appeared at Tranquebar in 1715.

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translations of the whole Bible have been printed, and some of them have passed through several editions. The German missionary B. Ziegenbalg was the first to make the study of Tamil possible in Europe by the publication of his Grammatica Damulica, which appeared at Halle in 1716. Some time later the Jesuit father Beschi devoted much time aud labour to the composition of grammars both of the vulgar and the poetical dialect. 'The former is treated in his Grammatica Latino-Tamutica, which was written in 1728, but was not printed till eleven years later (Tranquebar, 1739). It was twice reprinted, and two English translations have been published (1831, 1848). His Sen- Tamil Grammar, accessible since 1822 in an English translation by Dr Babington, was printed from his own MS. (Clavis humaniorum Litterarum sublimioris Tamulici idiomatis) at Tranquebar in 1878. This work is espe- cially valuable, as the greater portion of it consists of a learned and exhaustive treatise on Tamil prosody and rhetoric. (See, on his other works, Graul's Reise, vol. iv. p. 327.) There are also gram- mars by Anderson, Rhenius, Graul (in vol. ii. of his Bibliotheca Tamulica, Leipsic, 1855), Lazarus (Madras, 1878), Pope (4th edition in three parts, London, 1883-5), and Grammaire Francaise- Tamoule, by the Abbé Dupuis, Pondicherri, 18638. The last two are by far the best. The India Office library possesses a MS, dictionary and grammar "'par le Réy. Pére Dominique" (Pondi- cherri, 1843), and a copy of a MS. Tamil-Latin dictionary by the celebrated missionary Schwarz, in which 9000 words are explained. About the like number of words are given in the dictionary of Fabricius and Breithaupt (Madras, 1779 and 1809). Rottler's dictionary, the publication of which was commenced in 1834, is a far more ambitious work. But neither it nor Winslow's (1862) come up to the standard of Tamil scholarship; the Dictionnaire Tamoul-Francais, which appeared at Pondicherri in 2 vols. (1855- 62), is superior to both, just as the

Dictionarium Latino-Gallico- Tamulicum (ibid., 1846) excels the various English-Tamil diction. aries which have becn published at Madras.

Compare the following works of reference :—A, T. Mondiére and J. Vinson in Dictionnaire des Sciences Anthropologiques, s.v. '* Dravidiens "3/8. C. Chithys The Tamil Plutarch, Jaffna, 1859 ; J. Murdoch, Classified Catalogue of Tamil Printed Books, Madras, 1865; C. E. Gover, Folk-Songs of Southern India, Madras, 1871; Bishop Caldwell's Comparative Grammar of the Dravidian Languages, 2d ed., London, 1875; Graul's Retse nach Ostindien, vols. iv. and Vag the quarterly Lists of Books registered in the Madras presidency ; [Dr Maclean's] Manual of the Administration of the Madras Presidency, vols. i. and ii., Madras, 1885, folio; and F, Miiller, Grundriss der Sprachwissenschaft, Vienna, 1884, iii, i. 162-246. R. BD

TAMWORTH, a municipal borough and market-town of England, on the borders of Staffordshire and Warwick- shire, chiefly in the former, is situated at the junction of the Tame with the Anker, and on branches of the London and North-Western and Midland Railway lines, 7 miles south-east of Lichfield, 20 north-west of Coventry, and 110 north-west of London. The castle, situated on a height above the Anker near its junction with the Tame, is now chiefly of the Jacobean period, but is enclosed by massive ancient walls. It was long the residence of the Saxon kings, and, after being bestowed on the Marmions by William the Conqueror, remained for many years an im- portant fortress. Through the female line of the Mar- mions it has descended to the Marquis Townshend. Formerly the town was surrounded by a ditch called the King's Dyke, of which some trace still remains. The church of St Editha, originally founded in the 8th century, was rebuilt, after being burned by the Danes, by Edgar, who made it collegiate, but the present building in the Decorated style was erected after a fire in the 14th century. Since 1870 it has been undergoing restoration at a cost of £10,000. The free grammar school, refounded by Edward VI., was rebuilt in 1677, and again in 1867-68 at a cost of £3000. The other public buildings are the swimming bath and boys' institute (1885), the town-hall (1701), and the arcade, formerly used as a covered market, but recently obtained by the Salvation Army. The charities include Guy's almshouses, endowed in 1678 by Thomas Guy, founder of Guy's Hospital, London, and the cottage hospital with twenty-one beds. Waterworks have recently been erected at a

cost of over £25,000. On the “moors” burgesses have rights for cattle. Coal, fireclay, and blue and red brick clay are dug in the neighbourhood ; and there are also market gardens. The town possesses a clothing factory, paper-mills, and manufactories of smal] The population of the municipal borough (area

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200 acres) in 1871 was 4589, and in 1881 it was 4891,— that of the parliamentary borough (area 11,602 acres) in the same years being 11,493 and 14,101. Tamworth ceased to be a parliamentary borough in 1885.

Tamworth is situated near the old Roman Watling Street, and occupies the site of a fort which, from the beginning of the 8th eentury, was the chief royal residence in Mercia. The town, after being burnt by the Danes, was rebuilt and fortified by Ethelfleda, daughter of Alfred the Great. From the reign of Edward the Martyr to that of William Rufus it was a royal mint, and some of the coins struck at Tamworth are still in existence. The town was ineorporated in the 3d year of Elizabeth, from whom it obtained the grant of a fair and the confirmation of various privileges bestowed by Edward III. The Elizabethan charter was superscded by one conferred by Charles II., which continued to be the govern- ing eharter of the town till the passing of the Municipal Act. The town, with occasional intermissions, returned members to parlia- ment from the reign of Henry I. till 1885. Among its more dis- tinguished representatives have been Thomas Guy aud Sir Robert Peel.

TANAGER, a word adapted from the quasi-Latin Tan- agra of Linneeus, which again is an adaptation, perhaps with a classical allusion, of Tangara, used by Brisson and Buffon, and said by Marcgrave (Hist. Rer. Nat. Brasiliz, p. 214) to be the Brazilian name of certain birds found in that country. From them it has since been extended to

a great many others mostly belonging to the southern:

portion of the New World, now recognized by ornitholo- gists as forming a distinct Family of Oscznes, and usually considered to be allied to the Pringillide (cf. F1ncn, vol, ix. p. 191); but, as may be inferred from Prof.

Parker’s remarks in the Zoological Zransactions (x. pp. 252, 253, and 267), the Tanagride are a ‘‘feebler” form, and thereby bear out the opinion based on the examination of many types both of Birds and Mammals as to the lower morphological rank of the Neotropical Fauna as a whole (cf. Birps, vol. iii. p. 743). The Tanagers are a group in which Mr Sclater has for many years | interested himself, and his latest treatment of them is contained in the British Museum Catalogue (xi. pp. 49-307). Therein he admits the existence of 375 species, which he arranges in 59 genera, forming six Subfamilies, Procniatiny, Euphoniine, Tanagrine, Lamprotine, Phenicophiline, and Pitylinw. These are of very unequal extent, for, whilc the first of thein consists of but a single species, Procnias tersa,—the position of which may be for several | reasons still open to doubt,—the third includes more than 200. | Nearly all are birds of small size, the largest barely exceeding a | Song-Thrush. Most of them are remarkable for their gaudy i colouring, and this is especially the case in those forming the » genus called by Mr Sclater, as by most other authors, Calliste, a _ term inadmissible through preoccupation, to which the name of Tanagra of right scems to belong, while that which he names Lanagra should probably be known as Thraupis. The whole _ Family is almost confined to the Neotropical Region, and there | are several forms peculiar to the Antilles; but not a tenth of the species reach even southern Mexico, and not a dozen appear in the northern part of that country. Of the genus Pyranga, which has the most northern range of all, three if not four species are common summer iminigrants to some part or other of the United States, and two of them, P. rubra and P. xstiva,—there known respectively as the Scarlet Tanager and the Summer Redbird,—reach even the | Dominion of Canada, visiting as well, though accidentally, Bermuda. P. xstiva has a western representative, P. coopert, which by some authors is not recognized as a distinct species. The males of all these are clad in glowing red, P. rubra having, however, the wings and tail black. The remaining species, P. ludoviciana, the males of which are mostly yellow and black, with the head only red, does not appear eastward of the Missouri plains, and has not so northerly a range. Another species, P. hepatica, has just shewn itself within the limits of the United States. In all these the | females are plainly attired; but generally among the Tanagers, however bright may be their coloration, both sexcs are nearly alike | in plumage. Little has been recorded of the habits of the species of Central or South Ameriea, but those of the north have been as closely

observed as the rather retiring nature of the birds renders possible, and it is known that insects, espeelally in the larval _ condition, and berries afford the greater part of their food. They | have a pleasing song, and build a shallow nest, in which the eggs, _ generally 3 in number and of a greenish-blue marked with brown _ and purple, are laid.

On a whole the Tanagridx may perhaps be considered

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to hold the same relation to the Fringillidx as the Icteridz do to the Sturmdz and the Mniotiltide to the Sylviide or Turdidx, in each case the purely New-World Family being the “feebler” type. . (A. WN.) TANCRED (d. 1112), son of the marquis Odo the Good and Emma the.sister of Robert Guiscard, one of the most famous heroes of the first crusade. See Crusapzs, vol. vi. p. 624 sq. . ; TANCRED, the last Norman king of Sicily, reigned 1189-1194. See Sicizy, vol. xxii. p. 26. TANGANYIKA, a lake in East Central Africa, called Msaga (“tempestuous”) by the Wakawendi and Kimana by the Warungu. The meaning of the name Tanganyika is, according to Cameron, nothing more than “the mixing place.” It is the longest freshwater lake in the world, being about 75 miles longer than Lake Michigan. Although the Arabs had long known of the existence of the lake, the first Europeans who discovered it were Speke and Burton in 1858. It has since been visited by Living- stone, Cameron, Stanley, Thomson, and Hore, who have all added to our knowledge of it. Tanganyika, which is situated some 600 miles as the crow flies from the east coast of Africa, extends from 3° 16’S. lat. to 8° 48’ S. lat., and lies between 29° 10’ E. long. and 32° 30’ E. long. Its length is 420 iniles, and its breadth varies from 10 to 50 miles. Its area is 12,650 square miles, and its altitude may be taken as 2700 feet above sea-level (Cameron, 2710; Stanley, 2770; Hore, 2750; Popelin, 2665). It has a coast-line of 900 miles in extent. Its greatest depth has not yet been determined, but Hore states that a 168-fathom rope often failed to reach the bottom. Tanganyika may be described as an enormous crevasse. It is bordered on all sides by hills and mountains, some of which rise to from 5000 to 10,000 feet above its waters. The scenery is marked by exceptional grandeur, and is well calculated to impress the traveller. Burton says :— “Tt filled us with

admiration, with wonder, and delight. Beyond the short foreground of rugged and precipitous hill-fold, down which the footpath painfully zigzags, a narrow plot of emerald reen shelves gently towards a ribbon of glistening yellow sand, ere bordered by sedgy rushes, there clear and cleanly cut by the breaking wavelets. Farther in front stretches an expanse of the lightest, softest blue, from 30 to 35 miles in breadth, and sprinkled by the east wind with crescents of snowy foam. It is bounded on the other side by tall and broken walls of purple hill, flecked and capped with pearly mist, or standing sharply pencilled against the azure sky. 'To the south lie high bluff headlands and capes; and as the eye dilates it falls on little outlying islets, speckling a sea horizon. Villages, eultivated lands, the frequent canoes of the

fishermen, give a something of life, of variety, of movement to the scenery."

Tanganyika is fed by numerous rivers and streamlets which flow from the surrounding hills, the yearly rainfall being about 27 inches, but the rainy seasons vary extremely in different years, altering the surface area of the lake accordingly. Hore found that between March 1879 and August 1880 the waters had fallen 10 feet 44 inches, as marked by a water-gauge he had erected at Ujiji, and he also saw evident signs of the receding of the waters all round the shores of the lake—belts of dead timber and bleached rock. Some 120 rivers and streams flow into the lake ; the most important river is the Malagarasi, near Ujiji. Just below the rapids its width is 500 feet, and the average depth 5 feet. For many years Tanganyika was a riddle to African explorers,—Livingstone, Baker, and others believing that it belonged to the Nile system, and that it was connected with the Albert Nyanza. That this theory is incorrect was proved when Livingstone and Stanley explored the north end of the lake in November 1871, finding no outlet. It was Cameron, in March 1874, who first solved the riddle, and found that the outlet of Tanganyika was the river Lukuga, at about the centre of the western shore of the lake, 5° 52' 45" S. lat. In 1876

this outlet was visited by Stanley, who found that there was no apparent outflow, and doubt was thrown upon Cameron's observations, which, however, have been proved to be correct by Hore, who in 1880 found a

strong current setting unequivocally out of the lake. Not only so, but he obtained good views of the river, which gradually widens soon after the rapids near the lake are passed. He followed the river to 5° 50’S. lat., and, from an altitude of 1100 feet above the river, he saw it flowing far away to the westward. ‘The question is therefore settled that Lake Tanganyika belongs to the Congo system, but it is only an occasional tributary to that miglity river, its contribution depending upon the rainfall. ‘The lake is subject to fre- quent storms, especially from the $.8.E. and 8.W., lasting sometimes for two or three days, and leaving a heavy swell, which proves a great hindrance to navigation. Hore says —“T have never witnessed such wondrous cloud-scenery aud majestic effects of thunder and lightning as on Tan- ganyika.”

The shores and water of the lake abound in animal life,—crocodiles, the hippopotamus, otters, and many kinds of fish being found in its waters. Flocks of waterfowl abound in the river mouths: gulls, divers, herons, kingfishers, eagles, fish-hawks, and black ibis are very numerous. The shores are very fertile,—rice, manioc, kaffre corn, two kinds of ground nuts, maize, uleysi, pumpkins, sweet potatoes, sugar-cane, castor-oil tree, tamarind, cotton, tomato, and cueumber growing luxuriantly. The oil palm grows at Ujiji, Urundi, and at the south end of the lake, the borassus near the Malagarasi river, the screw palm in Uguha, and the raphra in sevcral localities. The tzetse fly is found on the shores of the lake from Ujiji round the southern end as far as Ubwari on the west coast. Amongst the useful timber trees may be noticed the gigantic inbule, the mininga, lignum vite, and ebony. The people inhabit- ing the eountries on the borders of the lake form ten distinct tribes, with separate national peculiarities and customs. They live in well-organized villages, in which considerable social order is main- tained. They have also learnt, to some extent at any rate, to utilize the products of their country: they work their own iron and copper ; salt is prepared for barter ; palin oil is collected ; and in some places there are large pottery works. Their fishing industry is extensive, and dried fish is exported; boatbuilding is carried on to a small extent; cotton cloth is manufactured at several places, and at others the famous grass or palm-fibre cloth; whilst the dairy farms of Uhha export packages of butter. There are sev- eral London Missionary Society stations on Lake Tanganyika, also one belonging to the Roman Catholics; and a station of the African International

Association is situated at Karema. Ujiji, an Arab town of some importance, stands on the eastern shore of the lake.

TANGIERS, or Tancrer (Zanja), a seaport of Morocco and capital of a pashalik, on the Strait of Gibraltar, about 14 miles to the east of Cape Spartel, stands on two eminences at the north-west extremity of a spacious bay. The town has a fine appearance from the sea, rising gradually in the form of an amphitheatre, and defended by walls and a castle. The streets, which are unpaved, are very narrow and crooked, and the houses, except those occupied by foreign ambassadors or consuls and a few others, are mean. The main thoroughfare is that which leads from the Bab-al-Marsa (Gate of the Port) to the Bab-al-Sok (Gate of the Market Place); the sok presents a lively spectacle, especially on Sundays and Thursdays. The manufactures of Tangiers are of little importance, consisting chiefly of coarse woollen cloth, mats, and pottery ; tanning is also carried on, but the leather, though much esteemed in Europe, is inferior to that made in other parts of Morocco. The harbour is a mere road- stead, but it is the best Morocco possesses, and affords good anchorage and shelter to the largest vessels, except during the prevalence of strong winds from the north-west or east. ‘Tangiers has a large trade with Gibraltar. The climate is temperate and healthy, but the inhabitants often suffer much in summer from deficiency of water-supply. Tangiers, which is the residence of all the foreign ministers and consuls to the court of Morocco, has a population estimated at about 20,000, of whom some 400 are Europeans.

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The Roman Tingis, which stood in the immediate vieinity of the site of Tangiers, boasted of great antiquity; under Augustus it became a free city, and Claudius made it a Roman colony and capital of Tingitana. It was held successively by Vandals, Byzan- tines, and Arabs, and fell into the hands of the Portuguese towards the end of the 15th century. In 1662 it was made part of the dowry of Catherine of Braganza on her marriage with Charles II, of England; the English defended it in 1680, but, on account of its expense, dismantled it in 1684 and abandoned it to the Moors, who fortified it anew. It was bombarded by a Spanish fleet in 1790

and by the French in 1844.

TANHAUSER, or TannuAuseEr, the subject of one of the most famous of old German legends, is represented as a knight who after many wanderings comes to the Venusberg. He enters the cave where the Lady Venus holds her court, and abandons himself to a life of sensual pleasure. By and by he is overcome by remorse, and, invoking the aid of the Virgin Mary, he obtains per. mission to return for a while to the outer world. He then goes as a pilgrim to Rome, and entreats Pope Urban to secure for him the forgiveness of his sins. The pope, who happens to have a rod in his hand, says it is as im- possible for him to be pardoned as for the rod to blossom, Tanhauser therefore departs in despair, and returns to the Lady Venus. In three days the rod begins to put forth

‘green leaves, and the pope sends messengers in all direc-

tions in search of the penitent; but he is never seen again, This legend was at one time known in every part of Germany, and as late as 1830 it survived in a popular song at Entlibuch, a version of which was given by Uhland in his Alte hoch- und niederdeutsche Volkslieder. It can be traced back to the 14th century, but in its original form seems to have belonged to the period of Teutonic paganism. According to some legends, the Venus- berg is the Hoselberg or Horselberg, a hill near Eisenach associated with the Teutonic goddess of the nether world, who was known by various nates, such as Hulda, Hilda, and Hel. To this goddess the name of Venus appears to have been transferred. Among the attendants of Hulda was the faithful Eckhart, and in the preface to the Heldenbuch he is said to sit before the Venusberg, and to warn passers-by of the dangers to which they may be exposed if they linger in the neighbourhood. The legend has been reproduced by several modern German poets, and forms the subject of one of Wagner’s operas.

In the 13th century, contemporary with Pope Urban IV., there was a German knight called Tanhaduser, who was well known as a minnesinger at the court of Frederick II., duke of Austria. After Duke Frederick’s death Tanhaiuser was received at the court of Otho IL, duke of Bavaria ; but, being of a restless disposition, and having wasted his fortune, he spent much time in wandering about Germany. He also went as a crusader to the Holy Land. His poems (printed in the second part of the Minnesinger,

edited by Von der Hagen) are fresh, lively, and graceful, but lack the ideal tone which marks the writings of the earlier minnesinger. He was much esteemed by the meistersinger, and it is possible that the story of his adventurous life may have been connected with the old legend about the Venusberg.

See Kornmann, Mons Veneris (1614), and Griisse, Die Sage vom

hitter Tanhéuser, and Der Tanhdéuser und Ewige Jude; also Zander, Die Tanhiuser Sage und der Minnesinger Tanhduser.

TANJORE, a district of British India, in the Madras presidency, lying between 9° 50’ and 11° 25’ N. lat. and between 78° 55’ and 79° 55’ E. long., with an area of 3654 square miles, It forms a portion of the Southern Carnatic, and is bounded on the N. by the river Coleroon, which separates it from Trichinopoly and South Arcot districts, on the E. and S.E. by the Bay of Bengal, on the S.W. by Madura district, and on the W. by Madura and Trichinopoly and Pudukotta state. Tanjore

is known as the garden of Southern India. It is well watered by an elaborate system of dams, cuts, and canals in connexion with the rivers Cauvery and Coleroon, and the soil is exceedingly productive. The delta of the Cauvery occupies the flat northern part, which is highly cultivated with rice, dotted over with groves of cocoa-nut trees, and densely populated. Tanjore is a land of temples, many of them being of very early date. The great temple of Tanjore city is said to be the finest in India; it is of the 11th century, and remains in excellent preservation to the present day. The district has a coast-line of 140 miles, but communication with shipping is unsafe, owing to a heavy surf which breaks incessantly on the shore. The rainfall, as elsewhere on the Coromandel coast, varies considerably from year to year; the mean annual fall, as observed at ten stations for four years, was 47:14 inches. Tanjore is amply provided with means of communication. [t is traversed by two branches of the South Indian Railway.

The census of 1881 returned the population of the district at 2,130,383 (males 1,026,528, females 1,103,855), of whom 1,939,421 were Hindus, 112,058 Mohammedans, and 78,258 Christians. Tanjore is the first district in which Protestant missions began, and now it is second only to Tinnevelly

in the number of its | Christian missions. These establishments were taken over in 1826 | by the Society for the Propagation of the Gospel, which subse- quently founded missions in several parts of the district. The total number of native Protestants belonging to the various societies in 1881 was 8255. Romau Catholic missions in Tanjore date from the first half of the 17th century, and the number of native Roman Catholics in 1881 was 67,745. Five towns have populations ex- ceeding 10,000, viz., Tanjore (see below), Negapatam 53,855, Com- baconum 50,098, Mayavaram 23,044, and Munnargudi 19,409.

Of the total area of the district, reckoned at 2,392,117 acres, 1,468,500 were returned in 1884-85 as cultivated, and 149,228 as available for cultivation, while forests covered 21,422 acres, Rice is the staple crop, and is raised almost entirely by artificial irriga- tion; green crops are common; plantain and betel-vine gardens abound in the delta, where sugar-cane and tobacco are also culti- vated. The chief manufactures are metal wares, silk cloths, carpets, and pith-work. Imports consist chiefly of cotton piece goods, twist and yarn, metals, timber, and betel nuts. Rice is by far the most important article of export alike by sea and land. The gross revenue in 1884-85 was £549,982, the land yielding £389,755.

The modern history of Tanjore commences with its occupation by the Mahrattas in 1678 under Venkaji, the brother of Sivajf the Great. The British first came into contact with Tanjore by their expedition in 1749 with a view to the restoration of a deposed raja. In this they failed, and a subsequent expedition was bought off. | The Mahrattas practically held Tanjore until 1799. In October of _ that year it was ceded to the East India Company in absolute | Sovereignty by Raja Sharabhoji, pupil of the missionary Schwartz, _ the company engaging to pay the raj4 of Tanjore one-fifth of the net revenue of the territory which was transferred to them, with a further sum of £35,000. Raji Sharabhoji retained only the capital | and a small tract of country around. He died in 1833, and was succeeded by his son Sivaji, on whose death in 1855 without an heir the house became extinct, the rights and privileges appertain- ug to it ceased, and Tanjore became British territory.

TANJORE, capital and administrative headquarters of the above district, is situated in 10° 47’ N. lat. and 79° 10° 24” E. long. As the last capital of the ancient Hindu dynasty of the Cholas, and in all ages one of the chief | political, literary, and religious centres of the south, the city is full of interesting associations. Its monuments of Indian art and early civilization are of the first importance. | Besides its great temple, the city is famed for its artistic | manufactures, including silk carpets, jewellery, repoussé work, copper wares, &c. It contained a population in | 1881 of 54,745 (26,272 males and 28,473 females). The South Indian Railway connects Tanjore with Negapatam, | 1ts seaport on the east, and Trichinopoly on the west.
TANNAHILL, Rozerr (1774-1810), one of the most popular of the successors of Burns in song-writing, was a | Weaver in Paisley, where he was born in 1774. He was apprenticed to his father’s trade at the age of twelve, in the year of the first publication of the poems of Burns, which quickened the poetic ambition of so many Scottish | youths in humble life. The young apprentice studied and

composed poetry as he drove the shuttle to and fro, with shelf and ink-bottle rigged up on his loom-post. Apart from his poetry, he had little variety in his life. He was shy and reserved, of small and delicate physique, and took little part in the vigorous social life of the town, beyond sitting and snioking at a club of local worthies, and occa- sionally writing humorous verses for their amusement. He had apparently but one love affair, the heroine of which was the original of “ Jessie, the Flower of Dunblane.” He bade her farewell in indignant rhymes after three years’ courtship. The steady routine of his trade was broken only by occasional excursions to Glasgow and the land of Burns, and a year’s trial of work at Bolton. He began in 1805 to contribute verses to Glasgow and Paisley period- icals, and published an edition of his poems by subscription in 1807. Three years later the life of the quiet, gentle, diffident, and despondent poet was brought by his own act to a tragicend. Tannahill’s claims to remembrance rest upon half a dozen songs, full of an exquisite feeling for nature, and so happily wedded to music that their wide popularity in Scotland is likely to be enduring. ‘

Loudon’s Bonnie Woods and Braes,” “ Jessie, the Flower of Dunblane,” and “Gloomy Winter’s Noo Awa” are the best of them.

Tannahill’s centenary was celebrated with great honour at Paisley in 1874; and, in an edition by Mr David Semple, published in 1876, there is an exhaustive and minutely learned account of all that has been prescrved concerning the poet, his ancestry, and the occasions of his various poems.

TANNIN, a generic name for a class of vegetable substances which, as the name indicates, are all available for tanning, meaning the conversion of animal hide into leather. Tannin is widely diffused throughout the vegetable kingdom. An enumeration of the principal materials which form the commercial sources of the substance will be found under LEatuER, vol. xiv. p. 381, and in various special articles referred to from that heading.

Our chemical knowledge on the subject is very limited ; and, as long as we know no better, each of the various tanning materials must be viewed as containing a “tannin” of its own kind! Only a few have as yet been obtained in a state approximating chemical purity. The following characters are common to them all :—

(1) All are colourless or little-coloured non-volatile solids, sol- uble in water and in alcohol; the solution has an astringent taste.

(2) They colour blue litmus paper fecbly red, yet all unite with the alkalies into soluble salts ; the solutions of these eagerly absorb oxygen from the air, with formation of dark-coloured products.

(8) They form insoluble salts with the oxides of lead, zinc, copper, producible by addition of solution of the tannin to one of the respective acetate.

(4) They form very dark-coloured (green or blue) compounds with ferric oxide, conveniently producible by addition of the tannin to ferric or ferroso-ferric acetate. Ordinary old-fashioned black (gall-nut) ink may be quoted as an illustration.

(5) Tannin solutions precipitate gelatine as an insoluble compound, generallyassumed to be chemicallysimilartothe substance of leather.

(6) Ifa piece of raw hide be placcd in a solution of any tannin, it imbibes the latter with formation of LEATHER (q..).

(7) Aqueous tannin-solutions, if mixed with dilute sulphuric acid, are readily oxidized by solution of permanganate of potash, which, being reduced to manganous salt, loses its intense violct colour.

Upon the last two propositions Lowenthal has based a convenient method for the assaying of tannin materials. A known weight of the substance to be analysed (say sumach) is extracted with water, and the extract diluted to a known volume. An aliquot part of the extract is then mixed with a certain proportion of a standard solution of indigo-carmin and of sulphuric acid, and, after large dilution with watcr, standard permanganate is dropped in from a burette (graduated glass tube) until the colour of the indigo is completely discharged. After deducting the volume of reagent which would have been taken up by the indigo alone, the rest is put down as corresponding to the ‘‘ permanganate reducers gene- rally.” Another measured volume of the extract is then poured over a sufficient weight of dry shavings of raw hide, after having been suitably diluted, and the whole is allowed to stand until the tannin has all passed into the hide. The liquid is then filtered,

1 Coffee beans and tea leaves contain peculiar tannins.

and a measured volume, corresponding to exactly the quantity of extract used for the assay, tested with permanganate. The volume of reagent used this time is deducted from that used in the assay as a correction. From the net permanganate the weight of pure gallotannic acid which it would oxidize is calculated on the basis of standard experiments, and from this weight the ‘‘ percentage of tannin” is deduced. The method is purely empirical, and the results are of no value unless obtained according to a rigorously prescribed mode of procedure. Of individual tannins that of the gall-nuts, known as gallotannic acid, is best known. For its pre- paration

(according to Pélouze) powdered gall-nuts are placed in an apparatus for extraction ‘‘by displacement,” and in it soaked in a mixture of 9 parts of ether and 1 part of water for twenty-four hours. The liquid is then allowed to drain off, aud the residue washed with aqueous cther. The liquid on standing separates into two layers,—a lower heavy layer, which contains the tannin, and an upper inore purely ethereal layer, which contains gallic acid and other impurities. The lower layer is drawn off, washed once or twice with ether, and then evaporated to dryness at a gentle heat; the tannin remains as a porous friable mass of a slightly greyish-yellow colour. This is the taunin of the pharmaceutist.

Such tannin is not by any meansan absolutely unitary substance. Its solution, if allowed to stand in the presence of a ferment which is naturally present in gall-nut extract, or more readily if boiled with sulphuric acid, yields a large proportion of gallic acid, which is easily obtained in pure crystals. According to Strecker, glucose is formed at the same time, whence he viewed tannin asa glucoside (see Sugar). But this is now recognized as a mistake, since Hugo Schiff showed that pure tannin is only digallic acid, C,,H,,0,= 2C,H,O0; (gallic acid) minus 1H,O. Pure tannin, according to Schiff, can be obtained by dehydrating pure gallic acid by means of chloride of acetyl. The tannin of the Chinese gall-nuts scems to be identical with gallotannic acid.

Quercitannic Acid.—The tannin of oak bark is certainly different from gallotannic acid, because it yields no gallic acid when boiled with dilute vitriol. Etti (Jahresb. uber die Fortschr. der Chemie for 1880, p. 898) prepares it by extracting the powdered bark with dilute alcohol at a gentle heat, adding ordinary ether to the alcoholic extract, and shaking out the tannin with acetic ether. The acetic ether extract is distilled to recover the solvent, the residue filtered, and the filtrate evaporated to dryness to obtain the pure (?) tanuin as a reddish-white powder of the composition C,,H,,0, At 130- 140° C. it loses water and forms phlobaphen, C34H 90.7, a brown solid insoluble in water but soluble in solution of the tannin. Quercitannic acid forms quite a series of such anhydrides : CoH 39017 5 CoH ogOrg; Cz4H 6015; CyyHog014 Some, if not all, of these are contained in aqueous oak-bark extract, and they play an important part in its application for

tanning, According to Etti, quercitannic acid is a tri-methyl substitution-product of digallic acid, C,,H,,0, minus 3H plus 38CH3=C,H)60,.

Besides these two tannins, those of coffee and cachou are the only ones which have been obtained in a relatively definite form.

TANNING. See LEAruer.

TANTALUM. A rare element closely allied to Nioprum. See vol. xvii. p. 513.

TANTALUS, a hero of ancient Greek myth and legend. He wasa son of Zeus and Pluto (“Wealth”), and became the father of Pelops, Proteus, and Niobe. He dwelt in splendour on Mount Sipylus near Smyrna, and was admitted to the table of the gods themselves. But he abused the divine favour by revealing to mankind the secrets he had learned in heaven, or by killing his son Pelops and serving him up to the gods at table. Another story was that he stole nectar and ambrosia from heaven and gave them to men. According to others, Pandareus stole a golden dog which guarded the temple of Zeus in Crete, and gave it to Tantalus to take care of. But, when Pandareus demanded the dog back, Tantalus denied that he had received it. Therefore Zeus turned Pandareus into a stone, and flung down Tantalus with Mount Sipylus on the top of him. The punishment of Tantalus in the lower world was famous. He stood up to his neck in water, which fied from him when he tried to drink of it and over his head hung fruits which the wind wafted away whenever he tried to grasp them. From this myth is derived the English word “tantalize.” Another story is that a rock hung over his head ready to fall and crush him. The tomb of Tantalus on Mount Sipylus was pointed out in antiquity, and has been in modern times identified by Texier with the great cairn beneath Old Magnesia ;

but Prof. W. M. Ramsay inclines to identify it with q remarkable rock-cut tomb beside Magnesia. The story of Tantalus contains a reminiscence of a semi-Greek kingdom which had its seat at Sipylus, the oldest and holiest city of Lydia, and one of the chief birthplaces of early Greek civilization. Of this ancient city the remains are still visible on the northern slope of Mount

Sipylus, and about 4 miles east of Magnesia. They consist of sepulchral mounds, rock-cut tombs, and a small acropolis perched on an almost inaccessible crag which juts out from the nearly perpendicular limestone wall of Mount Sipylus. There was a tradition in antiquity that the city of Tantalus had been swallowed up in a lake on the mountain ; but the legend may, as Prof. W. M. Ramsay thinks, have been suggested by the vast ravine which yawns beneath the acropolis.! This acropolis is too small ever to have been the seat of a great empire; rather, like Pessinus and other great religious centres of Asia Minor, it may have been “the seat of a priestly suzerainty maintained over the hiero-doulot [sacred slaves] of the surrounding district.” Connected as the city was on the one hand with the sea, and on the other with the capital of the ancient kingdom of Phrygia by means of the “royal road,” it was a natural meeting-place for Greek and Oriental culture. A com- parison of the art of Phrygia with the early art of Mycensz and Olympia has fully confirmed the legend which con- nects the family of Tantalus with the Peloponnesus.

See PELors, PHryaia, and a paper by Prof. W. M. Ramsay in Journal of Hellenic Studies, iii. p. 33 sq.

TAOISM. See Lio-rszr,

TAORMINA (Zawromenium), now an unimportant vil- lage of about 3000 inhabitants, is magnificently situated at the edge of a precipitous cliff 900 feet high on the east coast of Sicily, about 32 miles from Messina and the same from Catania. The original city was founded by a tribe of Siculi after the destruction of the neighbouring city of Naxos in 403 3.c. by Dionysius of Syracuse. It was built on the hill of Taurus, whence came the name Tavpopévoy (Diod., xiv. 58). In 358 3.c. the city was increased by the settlement of the exiled survivors from Naxos, which was only 3 miles distant ; and hence Pliny (//. W., iii. 8) speaks of Naxos as having been the original name of Tauromenium. Owing to its commanding site, the city has frequently been the scene of important struggles. When with the rest of Sicily it passed into the possession of the Romans, it shared with two other Sicilian cities the privileges of a "'civitas foederata." During the Servile War (134-132 3B.c.) Tauromenium was occupied by a body of rebel slaves, but was finally taken by the consul Rupilius, and the whole garrison slaughtered. In 36 Be. it was one of Sextus Pompey's chief strongholds in his war with Augustus, who after his victory established a Roman colony there. Under the empire it was a flourishing city, famed for its wine (Pliny, H. W., xiv. 6) and red mullets (Juv., v. 93). In 902 a.p. it was taken from the Byzan- tine emperor by the Saracens, who called the place Moezzia. In 1078 it was captured by the Normans. A large number of ancient remains bear witness to its former importance. Fine autonomous silver coins of c. 300 B.¢. exist, with ov. a laureated head of Apollo, and rev. a tripod, with the legend TAYPOMENITAN, and a magis- trate's initials AI. The theatre is, next to that at Aspendus (Painphylia), the best preserved in existence. It is Greek in plan, but the existing structure belongs mostly to the Roman period, and is specially remarkable for the preserva- tion of its lofty scena wall, and two large chambers which form entrance-porches to the cavea. It is excavated in an

' Legends of submerged cities and castles are common in different parts of Europe. It has been suggested that they are confused recol-

lections of the ancient villages built on piles in lakes (Wood-Martin, Lake Dwellings of Ireland, p. 28).

elevated peak of rock, and commands one of the most maynificent views in the world, with Mount Etna in the distance. Remains of five piscine and a large bath, popularly called a naumachia, still exist, together with remains of the ancient city wall and that of the arx.

Sce Serradifalco, Antichita di Sicilia, Palermo, 1834-42, vol. v. ; Hittorff and Zanth, Architecture Antique de la Sicile, Paris, 1870.

TAPACULO, the name! given in Chili to a bird of singular appearance,—the Pteroptochus albicollis of ornitho- logy,—and, throughout this series of articles (Brrps, vol. iii. p. 743 ; OrniTHOLOGY, vol. xviii. p. 40, et alibi), applied in an extended sense to its allied forms, which are now found to constitute a small Family, Pteroptochidez,

Tapaeulo. belonging to the Tracheophonous division of Passeres, and

therefore peculiar to South America. About 20 species, which are disposed by Mr Sclater (Jbis, 1874, pp. 189- 206) in 8 genera, are believed to belong to this group.

The species of the Family first made known _ is ~~Scytalopus magellanicus, originally described in 1783 by Latham (Synopsis, iv. p. 464) as a Warbler. Even in 1836 Gould not unnaturally took it for a Wren, when establishing the genus to which it is now referred ; but some ten years after Johannes Miiller found that Scytalopus, together with the true Tapaculo, which was first deseribed by Kittlitz in 1830, possessed anatomical characters that removed them far from any position previously assigned to them, and determined their true place as above given. In the meanwhile a kindred form, Hylactes, also first described in 1830, had been shewn by Eyton to have some very exceptional osteological features, and these were found to be also common to Pteroptochus and Scytalopus, In 1860 Prof. Cabanis recognized the Pteroptochide as a distinct Family, but made it also include Menura (cf. Lyre~~ BIRD, vol. xv. p. 115), and in 1874 Mr Sclater (wt supra) thought | that Atrichia (cf. ScruB-BIRD, vol. xxi. p. 554) might belong here. | It was Garrod in 1876 and 1877 who finally divested the Family of these aliens, but, until examples of some of the othcr genera have been anatomically examined, it may not be safe to say that they all belong to the Pteroptochidex.

The true Tapaculo (P. albicollis) has a general resem- blance in plumage to the females of some of the smaller Shrikes (Lantus), and to a cursory observer its skin might

1 Of Spanish origin, it is intended as a reproof to the bird for the

shameless way in which, by ereeting its tail, it exposes its hinder parts. | It has been sometimes misspelt ‘‘Tapacolo,” as by Mr Darwin, who gave (Journal of Researches, chap. xii.) a brief but entertaining aeeount of the habits of this bird and its relative, Wylactes megapodius, called hy the Chilenos ‘‘ El Turco.”

pass for that of one; but its shortened wings and powerful feet would on closer inspection at once reveal the difference. In life, however, its appearance must be wholly unlike, for it rarely flies, hops actively on the ground or among bushes, with its tail erect or turned towards its head, and continually utters various and strange notes,—some, says Mr Darwin, are “like the cooing of doves, others like the bubbling of water,and manydefy all similes.” The “Turco,” Hylactes megapodius, is larger, with greatly developed feet and claws, but is very similar in colour and habits. Two more species of Hylactes are known, and one other of Pteroptochus, all of which are peculiar to Chili or Patagonia. The species of Scytalopus are as small as Wrens, mostly of a dark colour, and inhabit parts of Brazi] and Colombia, one of them occurring so far northward as Bogota. (A. N.)

TAPESTRY. See TEXTILEs.

TAPE-WORMS, or Crxstopa, are a group of worms forming one of the three main divisions of the Platy- helminthes, the other two being the Turbellaria (see PLANARIANS and NEMERTINES) and J’rematoda (see TREMATODA). They have been defined as follows :—“ Flat worms without mouth or alimentary canal, which typically develop by alternation of generations, by budding from a generally pear-shaped nurse, with which they remain united for a lengthened period as a ribbon-like colony or ‘ strobila.’ The individual joints of the colony, ¢.e., the sexual animals or ‘ proglottides,’ increase in size and maturity as they are removed farther from

their origin by the intercalation of new buds, but are not distinguished in any special way. The nurse, however, known by the uname of the ‘ head’ (scolex) is provided with four or two suckers, and usually with curved claw-like hooks. The dorsal and ventral surfaces of the head are perfectly identical, so that the arrangement of the hooks presents a strikingly radiate appearance. By means of this apparatus the worms fasten themselves on the intestinal membrane of their hosts, which (except in the case of the otherwise peculiar Archigetes) all belong to the Vertebrata. The nurses develop from little round six-hooked embryos in a more or less complicated fashion as so-called ‘ bladder-worms.’ The latter inhabit very diverse, but usually parenchym- atous, organs of the higher and lower animals, and are thence passively transferred to the intestine of their subsequent host” (Leuckart, 1,? p. 270).

Historical Sketch.—Certain forms of Cestodes have been known from time immemorial. The hydatid cyst is alluded to by early medical writers, and Aristotle speaks of examining the tongue of pigs to ascertain the presence of bladder-worms. By this author and Hippocrates the Cestodes and other flat worms are spoken of as éApuOes mAatetat, in opposition to the otpoyyvAu or “round worms”; the word Z’enia (Gr. rawia) does not occur in Greek authors, but is first used by the Romans (Pliny, H. N., xi. 33). In the treatises of the Middle Ages the tape-worm figured as Lumbricus latus, only one species being recognized. Felix Plater (23) separated Bothrio-cephalus from the other human tape-worms, and Andry (24) gave it the name Zénia & épine, mistaking the nodular generative organs for vertebre. The appellation Bothriocephalus latus dates from Bremser, 1819 (25). Like other Hntozoa, the tape-worms and bladder-worms were supposed to arise by spontaneous generation; it was found, however, that animal forms strikingly like the Hntozoa sometimes lived freely. Pallas (19), seeing that the eggs of intestinal worms are expelled from the animals in which they live, and may remain for some time unaltered in water, suggested the hypothesis that the Hntozoa agree with other animals in originating from eggs which can be

2 These figures refer to the bibliography, pp. 55, 56. XXL — 7

carried from one animal to another. He also supposed that they reached the liver and other internal organs by means of the blood-stream. Other authorities endeavoured to explain the presence of Extozoa by supposing that they were transmitted from parents to children. Von Siebold (26) in 1838 discovered the six-hooked embryos of Tenia, and came to the conclusion that they could only pass into the fully-formed animal by a kind of metamorphosis. The subject was fully discussed by Eschricht (27), who endea- voured to prove that this phenomenon was of common occurrence among the L£ntozoa. Shortly afterwards ap- peared Steenstrup's famous work upon the alternation of generations (28), which furnished a ready explanation of the isolated facts till then observed regarding the Cestodes. The most important advances in modern times have been due to the introduction of helminthological experiment by Kiichenmeister, by means of which the demonstration has been furnished that certain bladder-worms are the larval stages of particular tape-worms. The first of these ex- periments took place in 1851, when Kiichenmeister fed a dog with bladder-worms from the rabbit, and a cat with specimens from the mouse, and succeeded in rearing tape- worms in their intestines (29). Similar investigations on different species have been made by Van Beneden, Leuckart, and others. Of systematic treatises the most important are those of Rudolphi (35), Diesing (20), and Van Beneden (13), while Von .Linstow, in addition to numerous scat- tered papers (80, 36), has given us an invaluable list of hosts with their respective parasites (21).

Anatomy.

In considering the anatomical peculiarities of the Cestoda it will be convenient to describe one particular species and afterwards to indicate the chief differences presented by other members of the group. For this purpose Txnia saginata, Goze (T. mediocanellata, Kuchenmeister), may be selected as a type, as it has been perhaps more studied than any other, and is one of the species most eommonly found in man; for further details, see Sommer (81).

Dimensions.—An average specimen of this tape-worm (fig. 1, A) will measure in a state of moderate contraction about 500 em., and consist of nearly 1400 segments; of those which immediately follow the head more

than 250 will be found within a length of 5 cm.; they gradually widen posteriorly, until the widest, which are situated about half-way down the chain, have a breadth of 14 mm. and a length of 6 mm.; whilst the terminal segments measure 5 mm: in breadth by 19 mm. in length.

The head (fig. 1, B) is spheroidal, 1:5 mm. in diameter, and bears on its lateral surface four equidistant suckers, which serve for the attachment of the whole worm. After death these are generally retracted, but during life they can be protruded and moved in all directions. They are a special development of the musculature of the body-wall, the radial fibres being the most conspicuons. The tape-worm now being described is abnormal, inasmuch as the front of its head is not provided with a circlet of hooks; these are well seen, however, in the other common human tape-worm (Tenia solium), which bears a double ring of them, situated around a button-shaped muscular pad (rostelZwm) which forms the apex of the head (fig. 1, C). By the varying contraction of the scparate parts of this organ the hooks may be moved in diffcrent direc- tions, and when the worm is attaching itself they are first extended directly forwards, and then brought back so as to force the rostellum into the tissues of the host. Each hook has a’ broad bifid base, to which the muscles are attached, supporting a long curved point. In Tenia saginata, to the consideration of which we now return, the rostellum is quite rudimentary, and has been described by earlier authors as a fifth sucker or even as a mouth ; it is interesting to note that during its incipient stages it bears a number of minute spines homologous with the hooks of other species. The head contains furthermore the anterior portions of the nervous and excretory systems. The latter of these consists of an annular vessel placcd immediately below the rostellum, from which four canals, corresponding to the four suckers, pass backwards: two of these gradually disappear, leaving two which pursue their course down the proglottides, in connexion with which they will be again alluded to, and open at the hinder extremity of the worm by a common pore. The nervous system of the Cestodes was long sought in vain: although some early investigators described a ganglion, they were unable to give any satisfactory proof of its existence, this having been first furnished by Schneider. It seems generally to consist of a central ganglion

lying within the head, from which two cords proceed backwards; these were regarded by Sommer and Landois as part of the ali- mentary system. Niemiec (6) has recently given a detailed account

of its structure in several different species, and its relations have

been discussed by Lang (7).

The proglottides arise by a species of budding in the narrow neck which immediately succeeds the head; they are separated from each other by grooves, which are at first so shallow and

indistinct that it is impossible to say with certainty where the segmentation really begins. The proglottides which have attained sexual maturity are situated some 30-40 em. from the head, and measure 1°5 mm. in length by 5 mm. in breadth. The segments, like the head, consist of a solid mass of tissue in which the various organs are imbedded. Like the Trematodes, the Cestodes were long thought to have no body-cavity or ccelom, and hence were called *‘parenchymatous” worms. Recently, however, a series of inter-cellular spaces has been described by Fraipont (8) as leading into the terminal excretory organs, and these spaces have been inter- preted both by himself and others as the homologue of a body- cavity, although this opinion has not been allowed to pass unchallenged (sce Pintner, 9). The surface of the body is covered by a thin clear homogeneous cuticle, which, according to some authorities, is perforated by fine closely-set pores. The hooks which have been described above, as well as the small spines and bristles found in certain species, are developments of this cuticle. This external covering cannot, according to Leuckart (1, p- 289), be regarded as homologous with the cuticle of other invertebrates, inasmuch as it is not a secretion from a special layer of subjacent cells, but is ‘‘ the structureless limiting membrane of the connective tissue substance, and is comparable with the so-called basement- membrane found in the other flat-worms . . . between the niuscular layer and the dermal epithelium.” It is to be observed, however, that this view has by no means found universal acceptance (see

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Steudener, 10), and it is a prior? improbable, since the Cestodes (and Trematodes) would thus form an exception to the general rule by which all animals are clad with an epithelium derived from the embryonic ectoderm. The subcuticular layer is described as con- sisting of long fusiform cells (probably modified connective-tissue cells) disposed perpendicularly to the cuticle. It seems possible that they are in direct connexion with the transverse muscles of the body. The matrix of the Cestode body consists of connective tissue, the cells eomposing which are seldom provided with a dis- tinct membrane, and sometimes can only be separately distingnished by their nuclei. The layer of muscles (see below) separates this wnatrix into a central and a cortical portion. Distributed in it, and especially in its cortical portion, are numerous calcareous corpuscles, which are generally spheroidal in form, varying up to 0°019 mm. in diameter and concentrically laminated; they contain a large amount (often 20 per cent.) of lime salts, diffused through an organic basis, from which' the salts can he removed with effervescence by the action of acids. These corpuscles have been variously inter- preted by the older authors as eggs, or as lymph or blood corpuscles, but the only theories which have been seriously maintained in modern times are—(1) that they are skeletal (Von Siebold); (2) that they are excretory (Claparede, Griesbach); or (3) that they form a reserve store of calcareous material to he used either in counter- acting the acid digestive juices of the host or for the production of ege-shells (Lenckart, 1, p. 288).

The muscular system consists of three sets of fibres—longitudinal, transverse, and sagittal. The first are the best developed, and run down the inner part of the cortical layer in the form of strong bands ; the second set lie immediately below them and pass across the body in the form of two flat inuscular plates, which converge towards each other as they approach the margins of the proglottis; the sagittal muscles run primitively straight from one flat surface of the body to the other, but their direetion is much modified after the growth of the genital organs, between the various parts of which they lie as isolated bundles; they are the weakest of all the sets. The muscular fibres are non-striated, and when they are fully de- veloped no nucleus ean be detected inthem. They taper towards the extremities, sometimes branching dichotomously, and, as above mentioned, a connexion has been asserted to be visible between them and the subcuticular cells.

The excretory system in the proglottides consists of two or four longitudinal canals which lie along their two narrow margins (fig. 1, D, ex.). The origin of these in the head has been already noted, and they pass continuously down the whole worm until they open into a vesicle at the posterior extremity of the terminal segment. In the hinder part of each proglottis they are connected by a trans- verse vessel (fig. 1, D, tr.), immediately above which a valve is formed by a duplicature of the wall, so that it is impossible to inject the excretory system from behind whilst fluid can be readily forced along it from before backwards. Fraipont has drawn a distinction between ascending and descendingeanals. Excretory openings have been described by various observers in the anterior portion of the worm, near the suckers (Wagener, 11; Fraipont, 8; Riehm, 12), and, although their preseuce is denied by Pintner (9), there seems sufficient evidence to show that they are more generally present than was formerly supposed. A ramifying network of smaller vessels connected with the main trunks just described is found in the more superficial parenchyma, and this in its turn gives off still finer capillaries which terminate in ciliated funnels. According to Fraipont these open into the intercellular lacune which are the representatives of the ccelom (see above), whilst Pintner maintains that the terminal funnels are completely closed, and are to be regarded as unicellular glands. ‘The subject, however, is one of extreme difficulty and demands further investigation. It is worthy of notice that each of the three systems of canals above described maintains its proper diameter throughout, and that no intermediate sizes can be found. The ‘‘plasmatic vascular system” described by Sommer and Landois, and regarded by them as part of the alimentary system, consists partly of some of these delicate canals and partly of the two cords of the nervous system. The main canals open posteriorly into a pulsatile vesicle, at the end of the last proglottis; when, however, some of these have been cast off the opening may be either by a shortened transverse vesicle, as Leuckart (1) maintains to be the case in the present species, or by separate openings, one for each canal.

The reproductive organs are serially repeated in the proglottides, each of which contains a complete set of male and female organs (fig. 1, D). The male organs may be discussed first. The testes (é.,¢.) are very numerous and scattered throughout the greater part of the proglottis; they are round vesicles (0°15 mm. in diameter) containing spermatozoa, and attached like

berries to the terminal ramifications of the vas deferens (v.d.); these gradually unite, form- ing larger and larger branches until they reach the main canal, which runs in a series of eoils transversely half way across the joint a little behind its middle, and ends in a eommon cloaca (cl.), whieh receives both the male and female organs, and is con- nected with the onter world by the porus genitalis. The outer por-

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tion of the vas has a thickened muscular wall. and this part of it is capable of extrusion and retraction, thus forming the male intro- mittent organ or “cirrus” (c.p.). The cuticle which lines all the distal portion of the vas deferens is here thin and delicate and armed with a scries of minute spines, which are directed backwards (Echeneibothrium), The cirrus in the present species is very short, but in other forms its length is sometimes considerable. The protrusion is effected by circular muscles placed around the end of the vas deferens, while the retraction is brought about by special longitudinal fibres, lying along the walls of the evaginable portion.

The female organs may be most conveniently studied by traeing them inwards from the cloaca. The vagina (v.) opens immediately posterior to the vas deferens, and like it is lined by a eontinuation of the external euticle. After passing about half way across the segment it bends backwards and terminates in a small cyst, the receptacnulum seminis (fig. 1, EK, 7.s.); this receives and stores up the male fertilizing elements, retaining them until the ova are ripe. From its posterior extremity there passes a thin-walled canal, wider than the vagina (7.), which serves to convey the spermatozoa to the ova, and hence is termed the “ fertilizing canal” (Befruchtungs- canal of German authors). It unites with the common oviduct, a tube formed by the union of the two oviducts (0.d.), and the two together pass backwards into a spherical glandular structure, called fron: its discoverer “ Melilis’s body” or the shell-gland (fig. 1, D and E, sh.g.). Within this apparatus it receives the dnct of the yolk-gland (y.g.), and then jasses directly forwards to open into the nterus. The ovaries (ov.) are two in number, situated one on each side of the middle line of the body; they are fan-shaped, and eonsist of a system of blind tubules situated on a branched efferent duct. The cells of the ovary (primitive eggs) have a sharp contour and a large nucleus; the yolk-gland

(y.g.) is very similar to the ovaries, behind and between which it is situated, but is distinguished by various histological details (it is called “ovary” by Moniez). The shell-gland, formerly regarded as the ovary, consists of closely compressed nucleated cells, and is provided with small thin duets opening into the narrow internal cavity of the organ. The uterus (wt.), in its early stage of development, is a long straight tube, lying almost in the longitudinal axis of the proglottis, and receiving posteriorly the oviduct after it emerges from the shell-gland (fig. 1, E, wé.). From what has been said it will appear that the ova on their way down the common oviduct are impregnated as they pass the end of the fertilizing canal, and then receive in succession, first their supply of food-yolk and their shell, during their sojourn in Mehlis’s body, after which they go forwards into the uterus, where they undergo the first stages of their development. The uterus assumes a very different shape as it becomes distended with eggs, which are far too numerous to be contained in a simple straight tube; small] protuberances arise from its walls, growing rapidly and bifurcating here and there, so as to produce the complicated branched appearance seen in fig, 1, F. As the uterus grows, the male, and later the female, genitalia degenerate and disappear, and in the proglottides which are ready to be liberated the only organ visible is the distended uterus. One of the most characteristic peculiarities in the sexual system just de- scribed is that there is no passage by which the ripe eggs can make their exit from the proglottis; these are therefore extruded only on its rupture; a very different state of things obtains in the genns Bothriocephalus (see below). Self-impregnation certainly occurs, and is probably the rule; it is obvious that the contrary case can only happen where two individuals lie side by side within the same host. Furthermore, the cirrus has been seen protruded into the vagina of the same joint, and the emission of sperm has been witnessed (Leuckart, 1; Van Beneden, 18, p. 601).

The eggs are ovoid or spherical, and consist of the germ-cell (nucleus and protoplasm) with an albuminous enveloping substance, which is again surrounded by a thin transparent skin. The shell frequently presents one or more appendages, probably the secretion of the shell-gland drawn out into threads. The structure of the ege has been best studied in Tania serrata (Van Beneden, 14), where it consists of a delicate shell containing a germ-cell, with a quantity of secondary yolk; the former divides into a ‘‘ granular”

cell, which segments no further, and an “embryonic” globe, which again divides into a number of cells, of which three are larger and constitute the ‘‘albuminogenous layer,” whilst the remainder are smaller and form the “embryonie mass,’”’ and secrete a delicate superficial cuticle, the cell-limits being indistinct. In the embry- onic mass from three to five flattened cells form a chitinogenous layer, and give origin to a superficial homogeneous coat, a shell of radially disposed chitinoid cylinders, and an internal faintly striated lining, whilst the remaining cells become the six-hooked einbryo or proscolex, a superficial layer to which the hooks belong, and a central mass of clearer cells. When the proscolex is mature the original egg-shell and the albuminogenous layer disappear, and only the chitinoid coats remain.

The proglottides are cast off by muscular action ; the fibres are not continuous between the successive segments, so that these are con- nected merely bysoft connective tissue, which readily gives way; the

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rupture takes place through the transverse vessel above described, and, as the hinder margin of the proglottis contracts forcibly when the next one has left it, the transverse vessel gives rise to the rounded vesicle which forms the termination of the excretory system.

Life-History and Development.

The six-hooked embryo (fig. 1, G) may be conveyed to the inter- mediate host in several ways, but the commonest is for it to be taken into the alimentary eanal along with food to which it may have adhered, or with water in which it was swimming ; the infection may take place either by means of free eggs or by whole proglot- tides. In the latter ease the soft tissnes are first digested by the gastric juice of the host, and in either case the egg-shell is dissol ved or rendered so brittle that the embryo readily escapes by the move- ments of its hooks. The proscolex, after spending a longer or shorter time free in the stomach or intestine, proceeds to perforate the wall of these organs by means of active burrowing motions. Although the embryo of a Tenia has only once been captured in its progress through the wall of the alimentary canal (Raum, 15, p. 28), there can be no doubt that this is the route by which it usually procceds, and that its next locality

is a blood-vessel, probably some small branch of the portal vein, in the blood of which it has been found by more than one observer. This would explain the frequency with which the next stage is found in the liver. There seems, however, reason to believe that many embryos penctrate the testinal wall completely and reach the body-cavity, in whieh they can wander freely. When the six-hooked embryo has reached its resting-place, which in addition to the liver may be lung, muscles, brain, connective tissue, or eye, it at once commences its further development, and in a few days becomes visible to the naked eye. Like any other foreign body, it causes a proliferation of cells, which in due time form a sheath of con- nective tissue, with a cellular lining, and smooth like a serous cavity within; this covering, however, is not found when the parasite is situated in the brain or the eye. The embryo now grows. in size, gencrally becoming somewhat elongated, and the hooks drop off. Sometimes they can be found lying detached in the connective-tissue sheath. The central cells enlarge and become elear, and in all the Tenie they liquefy, forming a quantity of fluid which fills the centre of the bladder-worm. At this stage the larve constitute the so-called ‘measles ” of beef (that of pork being due to Cysticercus cellulose, the immature stage of Tania solium) ; they are ovoid vesicles lying between the muscle fibres and varying in length from 4 to 8 mm. and being usually about 8 mm. in diameter (fig. 2, A). Ata point on one side of tlie bladder there appears a small thickening, the meniscus or rudiment of the future head ; this is soon followed by an invagination of the cuticle (fig. 2, B). When the rudimentary head thus formed is about 0°2 inm. in length (the bladder being 1°5 mm. in diameter) the forma- tiou of muscles in its walls commences. At four equidistant points near the bottom of the invagination the suckers are developed, and at the lowest part of the cavity the rostellum (and the double circlet of hooks in the armed species) is formed. Surrounding the head-rudiment on that surface which is towards the cavity of the bladder is a thin layer, kuown as the ‘‘receptacle.” This is best secn in Cysticercus ecllulose, in which there is also a very characteristic bend or kink in the pediele of invagination, which in most other bladder-worms remains straight (see fig. 2, C). The rudiments of the vascular system of the bladder have already appeared before the formation of the head, and now they extend into it as four longitudinal vessels, which become connected at the bottom of the invagination by a circular vessel. About this time, too, the cal- careous corpuscles above described make their

appearance. When the hooks and suckers are fully formed, the head undergocs a process of evagination, .so that what was previously a hollow cavity becomes a solid cylinder, and the hooks, which were below the suckers, eome to lie above them. Mature bladder-worms vary in size from Cysticercus fasciolaris, the size of a pea, to Cysteccreus tenutcollis, six inches or more in length.

The development into the adult tape-worm takes place only after the Cysticercus has been swallowed by the permanent or definitive host. The course of this metamorphosis has been followed experimentally, and it has been found that first the bladder and next the neck of the worm are dissolved by the gastric juice. The head only is left ; in the moist warmth of the intestine its suckers and rostellum exhibit very lively motions, which serve to bring about its attachment to the intestinal wall. It gradually increases in length, and the formation of segments speedily commences.

The life history of the Cestodes is generally summed up as con- sisting of three different forms:—(1) the proscolex, or six-hooked embryo, which gives rise to the bladder-worm ; (2) the scolex, which develops the chain or strobila by a process of budding ; and (8) the proglottis, or sexual animal, which produees eggs. Each of these three forms has certain claims to be regarded as a zoological “individual.” Van Beneden (18, Vers Int., p. 251) has laid great stress upon the correspondence between a Trematode and a ripe proglottis, and it has been since pointed out that a proglottis may

under favourable circumstances (that is, within the intestine) con- tinue to grow after being detached from the parent chain; it cannot _ be said, however, that the evidence upon which this rests is quite incontrovertible. Regarded from this point of view the life-history

Fig. 2.—Development of Twnia (from Leuekart). A, Cysticercus bovis in beef; nat. size. B, invaginated head of a Cysticercus before the formation of the suekers; X 25. C, invaginated head of Cysticercus cellulose, showing the bent neck and receptacle r; x 30. D, stages in the development of the

brood- cupsules in Echinococcus: a, the thickening of the parenchyma of the bladder; b, subsequent formation of a cavity in it; c, development of the sueker's ; d, a capsule with one head inverted into its eavity; e, a eapsule with two heads; x 90,

of the tape-worms furnishes an admirable instance of the alterna- tion of generations, The individuality of the proglottides, however, although maintained by authorities so eminent as Leuckart, is by no means universally accepted ; a distinction has been drawn be- tween their formation and true budding seen in other animal colonies, such as the Polyzoa; and Riehm, in a recent work (12), has pointed out that the casting-off of these sexual segments is in some respects eomparable to the detachment of the hectocotylized arm of a Cephalopod, and the formation of new joints to the de- velopment of an Oligochztous worm from a few segments; further- nore, eertain organs—for example, the nervous and excretory systems—are continuous throughout the whole chain, and an isolated proglottis is unable to maintain its existence for more than a very limited period. According to this view, alternation of generations only occurs in Cestodes in forms such as Cenwrus, where there is a proliferation of heads in the wall of the bladder.

The Cestode larve corresponding to the stage which has just been described present considerable variations both in form and struc- ture, and upon these classifications of the group have been based, and generic names have been given to the different forms; Von Lin- stow (36) has, however, pointed out the undesirableness of this, as they are all parts of the life-history of one genus, 7wnia. The most recent arrangement is that of Villot (16), whieh is as follows :—

I. The caudal bladder arises from the proscolex by simple growth and structural modification, without the formation of any new parts. A larger or smaller quantity of fluid is present, and also a connective-tissue sheath; the host is a vertebrate. Cysticercus (true bladder-worms), Piestocystis, Cenurus, Echinococcus.

II. The caudal bladder arises from the proscolex by budding, that is, by the formation of new parts; there is no connective-tissue sheath, and the host is an invertebrate. Cysticercoidei, Leuckart. (a) Caudal bladder formed by

endogenous budding; the head is surrounded, not only by the body of the worm and the caudal bladder, but also by the blastogen (proseolex). Polycercus (from the earthworm), Monocercus (from the black slug, Arion). (b) Caudal bladder formed by exogenous budding; the head is only surrounded by the body of the worm and the caudal bladder. Cercocystis (from Tenebrio), Staphylocystis, Urocystis, Cryptocystis. ;

Of these the most important are the first group, and regarding some of them a few words must be added. In the great majority of species only one tape-worm head is produced, and such bladder- worms constituted the genus Cysticereus of the older helmintho- logists. In eertain cases, however, notably in the worm which produces the “staggers” of sheep, numerous heads are formed in the wall of each bladder ; such larve formed the genus Cenurus, but apart from their polyccphalous condition there are no structural peculiarities calling for special notice. The third variety of bladder-

1 At the moment of going to press, Grassi (Zeitschr. J. Parasitenk., ii. 11) makes the important communication that ZJania murina (=T. nana) may develop without un intermediate host.

worm (Echinococcus) is characterized by the fact that the tape-worm heads are not directly developed in the wall of the bladder itself, but from “ brood capsules” which lie in numbers on the inner wall of the bladder.

Development of the Echinococcus.—The smallest bladder yet seen was reared by Leuckart in the pig, and consisted of a minute proto- plasmic mass surronnded by a structureless cuticle. This cuticle thickens by deposition of new layers as growth proceeds, and the lamination of the cuticle is one of the characteristic peculiarities of the Echinococcus, another being the absence of an excretory system. At certain points in the parenchyma lining the cyst small warts are noticed (fig. 2, D,a), which enlarge and become hollow ; then the cavity enlarges in a direction opposite to the point of origin, and at the extremity of this hollow suckers and hooks are formed as in the case of Cysticercus described above (3, c). No sooner has the devel- opment of the first of these reached a certain degree of completeness than others are formed in similar fashion. The first part of the invagination takes place, by which the future head comes to lie | within the

brood-capsule and the pedicle is no longer hollow but solid ©; the suckers and hooks are, however, still invaginated, and remain so for a considerable period. Seeing that the interior of the brood-capsule is lined with cuticle, it corresponds to the outside of the parent cyst, aud hence is probably the representative of a previous invagination. If this be so then the development of Echinococcus would be quite comparable with that of Cysticercus, the only difference being that, instead of the head being an inva- gination of the wall of the cyst itself, it is a secondary invagina- tion, the primary being the brood-capsule. This does not, however,) exhaust the peculiarities of the Zchinococcus; the form just de-) scribed, with a simple cyst and brood-capsules, is common in cattle, and hence goes by the name of Echinococcus veterinorum ; but cases are frequent, and are the most common in the human subject, in which the cyst contains daughter-vesicles, differing from those just described in being sterile—giving rise to no heads. These daughter-bladders may originate in three different ways : (1) from little granular heaps, which are seen between the different layers of the cuticle, and which are probably derived primarily from _ the parenchymal layer,—since new layers of cuticle are continually formed internally, these bladders gradually make their way out- wards, until they come to lie externally to the mother-vesicle (Echinococcus exogena, Kuhn; £. scoleciparicns, Kiichenmeister) ; | (2) from brood-capsules ; (3) from Zehinococcus-heads ; these last two modes of developinent give rise to vesicles, which are within the mother-vesicle, and produce a form which has been variously called | Echinococcus endogena, Kuhn, £. altricipariens, Kiichenmeister, and #. hydatidosus. A very remarkable form is Lchinococcus multilocularis, which consists of a number of very small vesicles embedded in a common soft stroma; it is found exclusively in man, and for long was regarded as a form of alveolar cancer. The mode of its development is unknown (for further information, see Virchow, 17). Compound bladders occur in man and the ox, | whilst other ruminants, swine, and monkeys usually harbour the simple or exogenous forms. ‘The organs most often affected are liver and lungs. The adult tape-worm (TZ. cchinococcus) is found ‘ in the intestine of the dog, jackal, and wolf, occurring in consider- _ able numbers between the villi. Its length (fig. 38, A) is at most 5 mm. and it consists of only three or four segments; the head has four suckers and a double circlet of hooks.

Pathological Effects.

The pathological effects of Cestodes fall naturally into two categories—(1) those due to the adult worm, and (2) those due to the larve or bladder worms.

(1) Those of the first group are in general slight, being confined to the abstraction of a certain amount of nutri- ment, and to a more or less acute feeling of irritation, | sometimes amounting even to colic-like pains, in the intestine. There have indeed been many authorities who _ have maintained that they were beneficial; Jérdens went so far as to describe them as the good angels and unfailing _ helpers of children, and Schimper records that the Abys- | sinians consider that they prevent constipation, and only | regard them as disadvantageous when they grow too long, | Notwithstanding all this, however, there are not a few cases on record in which anzmia and neurotic, or even | mental, diseases have been caused by the malnutrition | and irritation which they occasion.!

1 The method of treatment for the removal of these tape-worms from the human body consists in the administration, first of purgatives, and thereafter of one or other of the following anthelmintics:—tur- pentine, male fern (Lastrea Filix-mas), pomegranate, or kousso,—of

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(2) The effects of Cestode larve may again be divided into two subdivisions. (a) That due to the invasion and wandering of a large brood of six-hooked embryos has been most successfully studied in cases in which animals have been fed for experimental purposes with fragments of ripe tape-worms ; in such instances a train of symptoms has been observed to which the name “acute cestodic tuberculosis” has been given. It is characterized by loss of appetite, fatigue, ruffling of the hair, and fever ; on post-mortem examination it has been found that the lymphatic system is in a state of inflammation, while the niuscles present the appearance which has already been described. (b) The effects of formed bladder-worms may be summed up as dependent upon the pressure of the growing cyst and the consequent absorption of the sur- rounding tissues of the host, so that the importance of the results depends almost entirely upon the organ which is

affected. Bladder-worms in the brain are, of course, the most frequently fatal, especially when, as is not unfre- quently the case, they exert pressure upon the ganglia at its base. Ktichenmeister has collected a considerable number of occurrences of cystic worms in the brain ; among these sixteen were not accompanied by pathological symptoms during life; in six others these were slight; twenty-four were cases of epilepsy, six of crainp, forty-two of paralysis, and twenty-three of mental disturbances of varying intensity. Cysticerci in the brain vary greatly in size and form according to the precise situation which they occupy; in its ventricles they have been found as large as a pigeon's egg. In the meshes of the arachnoid the bladder sometimes grows into a remarkably branched structure, which has been called Cysticercus racemosus by Zenker (3). Another peculiar form from the same organ has been described by Koberlé (4); it is characterized by the great length of its head-process (2 cm.), which is coiled up into a regular spiral of sometimes three turns; it has received the name Cysticercus turbinatus, though its specific distinctness is doubtful. The occurrence of Cysticerct in the eye is of special interest, because of the opportunity it affords of observing, by means of the ophthalmoscope, the development of the worm in its natural environment. It seems generally to lie at first below the retina, and is visible as a bluish-white sharply defined body; subse- quently the retina is destroyed by the pressure, and the worm falls forward into the vitreous body; sometimes the head may be seen protruding first through the opening ; in the chambers of the eye the Cystecercus is almost always free, that is, without a capsule, and swimming in the fluid, so that its form and motions may be readily and accurately observed. A large number of cases of this affection have been recorded, principally by Von Graefe in Berlin (5), and in some the bladder has been successfully removed by operation.

The special symptoms of the Echinococcus vary, like those of other bladder-worms, with its situation and size: when it grows within cavities with more or less firm limits compression of adjoining vessels and glandular passages often results, producing cedema, varicose veins, congestion of various organs, or even dyspneea, if the parasite occur in the thorax. The liver is its most frequent seat, and next the Inng; but there is scarcely any organ of the body in which it has not been found, even the

bones being sometimes affected. Since the expanding cyst grows in the direction of least resistance, it has a tendency to pass

which the first two are the most reliable. Turpentine may be given in half-ounce doses along with eastor oil, or made up into an emulsion with yolk of egg; while the male fern is usually administered in the form of liquid extract (half a drachm to one drachm). Careful search should be made in the evacuations for the head or scolex, without the expulsion of which there is no certain evidence that the parasite has been removed from the body.

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towards the surface of organs, and sometimes a cure is effected spontaneously by its rupturing into the alimentary canal or into some other passage leading to the exterior. Cases in which the cyst opens into the blood-vessels are

Fig. 3,.—Various Forms of Tape-Worms. Leuckart). B, Archigetes sieboldi; fypus; xX 10 (from Van Beneden), (from Carus). ;

almost always suddenly fatal. occurs near the surface of the body, it may be evacuated by puncture and a cure effected with but little risk.

A, Tenia echinococcus; x 12 (from x_60(from Leuckart). (©, Echinobothrium D, Caryophyllzus mutabilis: x about 5

Systematic Arrangement of the Cestoda.

The following classification of the Cestodes, based mainly on that of Van Beneden, exhibits the present state of our knowledge of the group :—

Class Cestoda.

Family I. Amphilinide.—Body oval, flattened, with a sucker at the anterior extremity; testes vesicular, vas deferens opening posteriorly; ovary (germarium) single, yolk glands double, vagina opening near the vas deferens, uterus opening anteriorly; embryo ciliated in front and with ten

hooks. Examples: Amphilina, Wagener (see below), Amphiptyches, Wagener.

Family IL. Caryophyllxide.—Body unsegmented, flat, extended ; head expanded, bilobed, and without hooks ; a single set of sexual organs in the hinder portion ; development probably a simplified metamorphosis. Example: Caryophylleus mutabilis, from the intestine of Cyprinoid fishes (fig. 3, D).

Family III. Psewdophyllide.—Head provided with two sueking grooves ; proglottides not always well defined; a uterine aperture always present in addition to the openings of the vas deferens and vagina; embryo always (?) with a ciliated coat, and egg-shell with an operculum. Examples: Bothrio-cephalus (see below), Trizenophorus (= Tricuspidaria), Soleno- phorus, Schistocephalus, Ligula, Archigetes, and perhaps Duthiersia (see below).

Family 4V. Diphyllide.—Neek and two suckers armed with hooks. Example: Eehinobothrium, two species known from Selachians, one immature from a molluse (fig. 3, C).

Family V. Tetrarhynchide.—Head provided with four suckers and four protractile proboscides armed with hooks ; sexual openings marginal. Example: Letrarhynchus (see below), about forty species known, many only described from im- mature forms,

Family VI. Tetraphyllidw.—Head with four very mobile and distinet suckers, which are often armed with hooks or ehitinous rods ; body segmented, proglottides cast off when mature ; sexual openings marginal.

Subfamily i. Phyllobothrinz. —Suckers without hooks or spines. Examples: Echeneibothrium, Phyllobothrium, Anthoboth- rium, a few species of each, all from Elasmobranch fishes.

Subfamily ii. Phyllacanthine.—Suckers each with two to four hooks. Examples: Cailiobothrium, Onchobothrium, Acan- thobothrium, two or three species of each genus known from Selachians,

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Family VII. Teniad#.—Head furnished with four suckers and often with a single or double circlet of hooks >. proglottideg well-defined and cast off when mature; no uterine aperture, Example: Tenia (see below). 4

It seems advisable to add a few details regarding some of the forms alluded to in the above synopsis, :

Amphilina foliacea, described as a found in the body-cavity of the sturgeon. glands open into the sucker, and are surrounded by the museleg of that organ; the nervous system consists of two ganglia, wit} a commissure, and two lateral nerves ; those of Bothriocephalus, the female those of the Trematodes ; family is generally regarded as furnishing a connecting link be tween the Cestoda and Trematoda ; see Salensky (18) and Lang (7),

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Fic. 4.—Bothriocephalide. A, A segment of Bothriocephalus latus, showing the generative organs from the ventral surface ; ez., excretory vessels; ¢, cirrus; ¢.p., cirrus pouch ; v.d., vas deferens; v.0., vaginal opening; v, vagina; sh.g., shell-gland ; od., oviduct; ov., ovary ; y.g., yolk-gland ; y.@., itsduct; wf., uterus; u.o., uterine opening; the testes are not visible from this side; x 23 (from Sommer and Landois). B,C, marginal and lateral views of the anterior part of B. cordatus, showing the cephalic grooves; x 5 (from Leuckart), D, Ciliated embryo of B. latus ; x 60 (from Leuckart).

Bothriocephalus latus (82) is the most conspicuous example of the family Psewdophyllide, and is, moreover, noteworthy as being the largest tape-worm found in man; its length often reaches 8 to 9 metres, and its extreme breadth 10 to 12 mm. The head bears two grooves, which eorrespond in position with the flat sides of the body. There are two (more correctly three) genital openings, — which are situated, not on the margin but on the flat side of the body, on that surface which is usually called the ventral. The most anterior of these is the male aperture (fig. 4, A, ¢.), and im- mediately behind it is that of the vagina (v.0.), so close that on superficial examination the two often seem to coincide. This vaginal opening, like that of the Teniadw, serves for the intromission of the penis and for the fertilization of the ova, but not for the exit of the ripe eggs; this being provided for by a special aperture at the other end of the uterus from that at which the eggs enter it. This uterine opening (w.0.) is situated at a short distance behind the other two. The result of this arrangement is that the eggs call be evacuated without any injury to the proglottis, and consequently their discharge commences before its separation from the parent worn) and may continue for a long period. The uterus (ut.) itself, owing to its disposition in folded coils, when full of eggs, presents an irregular, round, lobular appearance, which has been compared to a flower or heraldic lily. The yolk-gland (y.g.) is widely dis-_ seminated in the lateral areas of the segments, and its ducts (y.d.) form a series of branching tubules, first described by Eschrieht (27) under the name ‘yellow ducts.” The excretory organs (ez.) differ from those of the Teniade in that the canals exhibit a retieu- late arrangement. The

embryo (fig. 4, D) as it leaves the egg is covered with a ciliated mantle, which corresponds to the firm egg- shell and associated membrane of the cystic tape-worms, and per- haps also to the ciliated envelope of certain Trematode larve (see TREMATODA). This eiliated organism swims freely about in the water, but after a time the six-hooked proscolex escapes from it. The next stage in its life-history is not yet known, but it has been recently shown by Braun of Dorpat (38) that at a subsequent stage it inhabits the pike and burbot, and develops into the sexual adult when transferred to the intestine of the human subject. The geographical distribution of Bothriocephalus is limited; it has been recorded with certainty in but few places outside Europe; while within that continent the coasts of the Baltic aud Switzerland are

the principal localities; it is widely distributed in Russia, and has been recorded from Poland, Denmark, Germany, as well as from France and Britain, though it is possible that the cases occurring in these latter countries have been due to importation, The genus Ligula has the segmentation obscure or indistinguish- able. About six species are known. One is found encapsuled in a monkey, one in the’common seal, others in reptiles and teleosteans. Archigetes sieboldi (fig. 3, B) occurs in the body-cavity of an Oligochetous worm (Tubifex rivulorum); it is about 3 mm. long, and consists of an oval body (scolex), to which is attached a cylin- drical tail (proscolex), bearing at the posterior extremity three

airs of hooks; both these parts are capable of motion. ‘The scolex Has eight longitudinal excretory canals, and a terminal vesicle; the ventrally situated genital aperture is the common exit of the vas deferens, the vagina, and a uterus separate from the latter, the development is direct, and it attains sexual maturity without a change of host. Duthiersia, Perrier (34), contains two species, both from the intestines of varanian lizards. The genus is characterized by the presence of two large compressed frilled suckers, separated by a septum and perforated at their bases. The proglottides have three genital apertures resembling those of Bothriocephalus.

Fie. 5,—Tetrarhynchus. A, General view of the worm; x 4. B, head showing the suckers, proboscides, and excretory canals; x 25, C, portion of a pro-

boscis showing the two forms of hooks; highly magnified. (Ali from Pintner.)

The genus Tetrarhynchus was, a few years ago, made the subject ‘of an elaborate memoir by Pintner (9), who investigated 7. longi- collis, V. Ben. The head, in which its most striking anatomical peculiarities are situated, really includes both the head and neck of previous authors (fig. 5, A); it is some 9°94 mmm. long, but only (0°75 mm. in diameter, and bears at its anterior end two obliquely placed oval disks (fig. 5, B), each of which is perforated towards the apex by two round holes through which the four proboscides pro- jtrude. Each of these disks, moreover, shows traces of a division into two, a fact which indicates that it is formed by the fusion of two suckers corresponding to those commonly found in tape-worms. The flattening in this genus seems to be in a direction at right angles to that in which it usually takes place. The proboscides, which are the most characteristic organs of the genus, are four in number, and protrude from or can be retracted into the anterior urface of the head. Each consists of three parts:—(1) the toothed portion is the most anterior; it is shaped like a long narrow glove- finger, like which it is invaginable; on its external surface it bears rows of hooks, closely set in diagonal lines (fig. 5, C); there jare two forms of these: those which are directed outwards are large triangular hooks, with apices pointing backwards, whilst those situated on that surface of the proboscis which is turned towards the other proboscides are fine, delicate, and curved; between the hooks are fine chitinous hairs; (2) the membranous sheath is firmly attached where the general surface of the body ‘passes over into the toothed portion around the orifice of the Anvagination ; it consists of a thick homogeneous transparent skin, apparently an excretion of cells lining the cavity of the pro- oscis; (3) the muscular portion is the most posterior of all, and is composed of six layers, remarkable as containing striped muscular) fibres ; throughout all these three portions of the proboscis there extends a retractor muscle. The action of these various structures [1s not thoroughly understood, but it is probable that the proboscis is)protruded by the action of the last-named muscular sheath, whilst it 1s retracted, after the relaxation of this, partly by the retractor muscle and partly by the pressure of the surrounding medium.

The family Teniad@# is usually described as containing only the

one geuus Tenia, but, owing to the number and variety of its species, of which more than 350 have been described, it has been subdivided into gronps, regarded by different authors as genera or subgenera, The subjoined arrangement is mainly that of Leuckart. It labours under the disadvantage that its chief divisions are based upon the bladder-worm or larval stage, which is only known in the case of comparatively few species.

I. Cystici (cystic tape-worms).—Head rarely unarmed; usually provided with a rostellum and with one or more rows of hooks ; proglottides longish oval when mature ; uterus with median stem and lateral branches; the larva has a caudal bladder containing fluid.

1. Cystotenia, Leuckart.—The head arises in the wall of the embryonic bladder.

a. Tenia saginata, Goze.—Without hooks (= 7. medio- canellata, Kiichenmeister,=genus Teniarhynchus, Weinland).

b. Tenia soliwm, Rudolphi.—Head with a double circlet of hooks.

ce. Tenia acanthotrias, Weinland.—Head with a triple circlet of hooks (=genus Acanthotrias, Weinland).

2. Echinococcifer, Weinland.—The heads arise in special brood-capsules. Tenia echinococeus, V. Siebold.

II. Cystoidet (ordinary tape-worms).—The larva has no distended

caudal bladder containing fluid.

1. Hymenolepis, Weinland.—Proboscis with a single row of smallhooks. Tenia nana, V. Siebold, 7. favopunctata, Weinland.

2. Dipylidiwm, Leuckart.—Head with several rows of hooks, each with a discoidal base; a right and left set of genital organs in each joint, the uterus,

however, being single and common to the two, Tenia cucwmerina, Rudolphi (= 7. edliptica, Batsch),

Haniann (2) has recently proposed a new genus, Ptychophysa, for Tenia lineata, Goze, which is defined by the following characters :—(1) the porus genitalis is on the surface and not on the inargin of the joints ; (2) the vaginal opening is anterior to that of the cirrus ; (8) at a certain period the uterus is convoluted ; (4) there is a peculiar shell-gland. In many of these characters the species shows a resemblance to the Bothriocephalide.

Occurrence in Man.—The Cestodes which in the adult state infest man, with their corresponding larve and temporary hosts, are as follows :—

Tenia saginata. Cysticercus bovis, Ox.

TZ’. solium. C. cellulose. Pig, man. T. nana. (?) 3

7. flavopunctata. (%) (?)

T. madagascartensts. (2) (?)

T. cucumerina. C.T cucumcring. Trichodectes canis.

Bothrioccphalus latus. Pike, burbot. B. cristatus, (?) B. cordatus. Fish (?)

Other species, however, inhabit the human body in their larval condition ; a list of them, with the corresponding adult forms and permanent hosts, is subjoined :—

Cysticercus cellulose. Teznia solium. Man.

C. acanthotrias. T. acanthotrias (incog.) —_(?)

C. tenwicollis. T. marginata. Dog, wolf. Echinococcus, T. echinococcus. Dog.

Phylogeny.—There can be no doubt that the Cestodes and Tre- matodes are intimately related and have sprung from a common ancestor ; there are so many structural peculiarities in which they agree (compare

TREMATODES), and they are connected by so many intermediate forms, that their affinity can admit of no doubt. According to Leuckart, the original ancestor of both was probably allied to the Planarians, while Huxley (22, pp. 218, 676) points out that it is at all events possible that they have no connexion with free forms but have always been anenterous, and in fact are nothing but “ gigantic morulz, so to speak, which have never passed through the gastrula stage.”

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TAPIOCA is a farinaceous food substance prepared from cassava starch, the product of the large tuberous roots of the cassava or manioc plant, Manihot utilissima (Jatropha manthot), native of Brazil (see Cassava, vol. v. p. 182, and comp. Arrowroot, vol. ii. p. 631, fig. 6). Cassava starch, being separated from the fibrous and nitro- genous constituents of the roots, is in a moist condition spread upon iron plates, and with constant stirring exposed to such heat as causes a partial rupture of the starch granules, which agglomerate into irregular pellets, becoming hard and translucent when cooled. In this partly torrefied condition the starch forms the tapioca of commerce, a light, pleasant, and digestible food, much used in puddings and as a thickener for soups. The French prepare an artificial tapioca from potato starch, mixed with various vegetable substances, for use in soups, é&c., which is found in the market under such names as tapioca Crecy, tapioca Julienne, &c., according to the dried vegetables with which the preparations are made.

TAPIR. The general characters of the animals of the perissodactyle or odd-toed section of the hoofed mainmals are described under Mammatia, vol. xv. p. 427. This once numerous group is at present represented by only three rather isolated families, the Horses, Rhinoceroses, and Tapirs. The last of these have retained much more of the original characters of the primitive Ungulates of the Eocene period than the others, and have indeed remained practically almost unchanged since the Miocene period, while almost all other mammalian forms which existed then have either become extinct or undergone extensive modification, The tapirs constitute the single genus, Tapirus, of the family Tapiride.

The dentition is ¢ §, ¢ 4, p $, m 3; total 42. Of the upper incisors, the first and second are nearly equal, with short, broad crowns, the third is large and conical, considerably larger than the true canine, which is separated from it by an interval. Lower incisors diminishing in size from the first to the third; the canine, which is in contact with the third incisor, large and conical, working against (and behind) the canine-like third upper incisor. In both jaws there is a long interspace between the canines and the commencement of the teeth of the molar series, which are all in contact. First upper premolar with a triangular crown, narrow in front owing to the absence of the anterior inner cusp. The other upper premolars and molars all formed on the same plan and of nearly the same size, with four roots and quadrate crowns, rather wider transversely than from before backwards, each having four cusps, connected by a pair of transverse ridges, anterior and posterior. The first lower premolar compressed in front; the others composed of a simple pair of transverse crests, with a small anterior and posterior cingular ridge.

Skull clevated and compressed. Orbit and temporal fossa widely continuous, there being no true post-orbital process from the frontal bone, Anterior narial apertures very large, and extending high on the face between the orbits; nasal bones short, elevated, triangular, and pointed in front. Vertebre: C7, D18, L5, S$ 6, C about 12.° Limbs short and stout. Fore feet with four toes, having distinct hoofs: the first is absent, the third the longest, the second and fourth nearly equal, the fifth the shortest and scarcely reaching the ground in the ordinary standing position. Hind feet with the typical perissodactyle arrangement of three toes, —the middle one being the largest, the two others nearly equal. Nose and upper lip elongated into a flexible, mobile snout or short proboscis, near the end of which the nostrils are situated. Eyes rather small. Ears of moderate size, ovate, erect. Tail very short. Skin thick and but scantily covered with hair.

The existing species of tapir may be grouped into two sections, the distinctive characters of which are only

recognizable in the skeleton. (A) With a great anterior |

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prolongation of the ossification of the nasal. septum (mesethmoid), extending in the adult far beyond the naga] bones, and supported and embraced at the base by ascend.

ing plates from the maxille (genus Elasmognathus, Gill), Two species, both from Central America, Tapirus baird; ‘ and 7. dowi. The former is found in Mexico, Honduras,

Nicaragua, Costa Rica, and Panama; the latter in ‘

American Tapir, from a living specimen in the London Zoological Gardens.

Guatemala, Nicaragua, and Costa Rica. (B) With ossifica- tion of the septum not extending farther forward than the nasal bones (Zapirus proper). Three species, 7’. indicus, the largest of the genus, from the Malay Peninsula (as far north as Tavoy and Mergui), Sumatra, and Borneo, distinguished by its peculiar coloration, the head, neck, fore and hind limbs being glossy black, and the intermediate part of the body white; 7. americanus (7’. terrestris, Linn.), the common tapir of the forests and lowlands of Brazil and Paraguay ; and 7’. roulini, the Pinchaque tapir of the high regions of the Andes. All the American species are of a nearly uniform dark brown or blackish colour when adult; but it is a curious circumstance that when young (and in this the Malay species conforms with the others) they are conspicuously marked with spots and longitudinal stripes of white or fawn colour ona darker ground.

The habits of all the kinds of tapirs appear to be very similar. They are solitary, nocturnal, shy, and inoffensive, chiefly frequenting the depths of shady forests and the neighbourhood of water, to which they frequently resort — for the purpose of bathing, and in which they often take refuge when pursued. They feed on various vegetable substances, as shoots of trees and bushes, buds, and leaves. They are hunted by the natives of the lands in which they live for the sake of their hides and flesh.

The singular fact of the existence of so closely allied animals as the Malayan and the American tapirs in such distant regions of the earth and in no intervening places is accounted for by what is known of the geological history of the race, for, if we may judge from the somewhat scanty remains

which have been preserved to our times, consisting chiefly of teeth, the tapirs must once have had a very wide distribution. the Eocene epoch, but in deposits of Miocene and Pliocene date remains undistinguishable generically and perhaps specifically from the modern tapirs (though named 7. priscus, T. arvernensis, &c.) have been found in France, Germany, and in the red crag of Suffolk. Tapirs appear,

There is no proof of their having lived in —

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owever, to have become extinct in Europe before the Pleistocene period, as none of their bones or teeth have een found in any of the caves or alluvial deposits in which hose of elephants, rhinoceroses, and hippopotamuses occur in abundance; but in other regions their distribution at his age was far wider than at present, as they are known o have extended eastward to China (7'. sinensis, Owen) and westwards over the greater part of the southern United States of America, from South Carolina to Cali- fornia. Lund also distinguished two species or varieties from the caves of Brazil. Thus we have no difficulty in tracing the common origin in the Miocene tapirs of Europe of the now widely separated American and Asiatic species. It is, moreover, interesting to observe how very slight an amount of variation has taken place in forms isolated during such an enormous period of time. (W. H. F.) TAR is a product of the destructive distillation of organic substances. It is a highly complex material, vary- ing in its composition according to the nature of the body from which it is distilled,—different products, more- over, being obtained according to the temperature at which the process of distillation is carried on. As commercial products there are two principal classes of tar in use—(1) wood tar, the product of the special distillation of several varieties of wood, and (2) coal tar, which is primarily a \bye-product of the distillation of coal for the manufacture of illuminating gas. These tars are intimately related to the bitumen, asphalt, mineral pitch, and petroleum ob- tained in very many localities throughout the world.

Wood Tar.—Wood tar, known also as Stockholin and as Archangel tar, is principally prepared in the great pine forests of central and northern Russia,

Finland, and Sweden. The material chiefly employed is the resinous stools and roots of the Scotch fir (Pinus sylvestris) and the Siberian larch (Larix sibirica), with other less common fir-tree roots. A large amount of tar is also prepared from the roots of the swamp pine (P. australis) in North and South Carolina, Georgia, and Alabama, in the United States. In the distillation of wood a series of products, including gas, tar, pyroligneous acid and wood spirit, and ‘charcoal may be obtained, and any of these may be the primary object of the operation. When tar is the sub- stance sought, the ancient and crude method of working is lyet largely adopted in the north of Europe. The wood to be treated is closely piled up into a huge conical stack or pile on an elevated platform, the sole of which is covered ‘with clay and tiles. The sole slopes inwards from every side to the centre, where an opening communicates with a vaulted cavity under the elevated platform. The pile of wood is closely covered over with layers of turf and earth jor sand to a depth of several inches, but leaving at first

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near the bottom numerous apertures for the admission of

air to promote ignition. The pile is ignited from below, and as the fire spreads through the heap the various apertures are closed up and a slow smouldering combus- tion goes on for some days till, by the sinking of the pile, ithe top of the stack falls in, and a bright flame springs ‘up at that point. About ten days after ignition tar first begins to flow, and it is at once collected into barrels. jAccording to the size of the pile, the distillation may continue several weeks, the tar secured amounting to about 17°5 per cent. of the wood operated on. In this “method several valuable products—the gas, the crude pyro- ‘igneous acid, and much charcoal—are lost or wasted; and

more economical process of treating the wood in closed | stills or retorts is now largely used in Russia, the gas evolved —

jserving as fuel under the retorts. The heavier tar pro- ducts of the distillation collect at the bottom of the retort, whence they are carried off by a pipe toa receiver; the volatile portion passes off at the upper part of the retort, |

and is separately condensed, the lightest portion passing through a worm condenser. From treatment in close retorts resinous roots yield from 16 to 20 per cent. of tar, with some oil of turpentine and pyroligneous acid.

Wood tar is a semi-fluid substance, of a dark ~~brown or black colour, with a strong pungent odour and a sharp taste. Owing to the presence of acetic (pyrolignéous) acid, which is a collateral product, it has an acid reaction ; it is soluble in that acid, as well as in alcohol and the fixed and essential oils, &c. 'Tar consists essentially of a mixture of homologous hydrocarbons, and by redistillation it can be fractionated into a series of bodies having fixed boiling points. Some varieties of tar have a granular appear~~ ance, from the presence of minute crystals of pyrocatechin, which dissolve and disappear on heating the substance. Pyrocatechin dissolves freely in water, and to it the tar water (liquor picts) of pharmacy probably owes its value.

Crude tar from retorts, when submitted to redistillation, gives off wood spirit (methyl-alcohol), and then acetic (pyroligneous) acid, and finally, on forcing the heat, pitch oil is driven off. The residuum left in the still hardens into a solid vitreous mass, which forms the black pitch of commerce. 'Tar and pitch are most largely used as pro- tective coatings for woodwork and other materials much exposed to water and the weather. Thus tar is of great value in connexion with shipbuilding and shipping gene- rally. A considerable quantity is used in manufacturing tarred ropes, and in the "smearing" of highland sheep to afford a protection against the weather. Pitch also is the basis of the Berlin black or Brunswick black used for coat- ing cast-iron goods and for "'' japanning " preparations.

Coal Tar.—The art of distilling coal for the production of tar was discovered and patented by the earl of Dun- donald in 1787, and till the general introduction of coal gas some amount of coal was yearly distilled in Scotland for the production of coal tar. The demand for the sub- stance was limited, it being principally used for coating iron castings and smith work, for making an inferior lamp black, and as a source of a solvent oil. With the extensive use of coal gas the necessity for tliis separate distillation ceased, and soon tar was produced in the manu- facture of gas in quantities that could not be disposed of. It was burned up for heating gas-retorts; it was

mixed with coal dust, sawdust, &c., for making patent fuel ; and it was distilled for producing a series of hydrocarbon oils, heavy tar, and pitch; but it was only after the dis- covery and introduction of ‘ tar-colours” that the sub- stance came for some time to be really valuable. Since that time its price has fluctuated greatly; and in the United Kingdom alone there are now distilled annually about 10,000,000 tons of coal for gas-making, producing 120,000,000 gallons of crude tar,—a quantity greatly in excess of the ordinary demand.

If wood be distilled slowly at low temperatures, the gases consist chiefly of carbonic oxide and carbonic acid, mixed with only very little of carburetted hydrogens, and consequently little luminous on combustion; the watery part of the tar includes relatively much of methyl-alcohol, acetone, and acetic acid; the oily part of the tar (tar proper) has a certain proximate composition characteristic of this mode of distillation. Our present knowledge in regard to this last-named point is very incomplete; of definitc species the following have been discovered :—

0 Phenol, CgH; OH (synonym carbolic acid).

2) Cresol, (CgH,.CII3)0H.

(8) Phlorol, (CgH4.OH)C2H;.

(4) Pyrocatechine, (CgH4)(OH)2, one of three isomcridcs.

(5) Guaiacol, Celis { OGHy methyl-ester of No. 4. (6) Homo-pyrocatechine, { CgHs(CH;) }(OH)2. (©) Creosol, { Cotis(CTs) } OGir methyl-ester of No. 6. Genuine creosote consists of (1), (2), (5), and (7). In addition, there are numberless bodies which still await scientific definition. If the distillation of wood is carried out at a very high tempera- ture,—if, for instance, the wood is placed in a relatively large retort

previously brought up to a bright red heat and kept at such temperature, or if the vapours produced at a relatively low tempera- ture are passed through intensely heated pipes before reaching the condenser (Pettenkofer's method for producing illuminating gas from wood),—the gas produced contains a considerable admixture of luminiferous hydrocarbons, the proportions of niethyl-aleohol, acetone, and acetic acid get less, and the tar proper assumes more of the character of coal-gas tar (see below). Similar observations we make in the case of coal. About 1862 Wigan cannel eoal used to be distilled industrially at low temperatures to produce **lioht oils." Schorlemmer examined these and found them to consist chiefly of " paraffins" (see PARAFFIN) from C;H,. upwards. A similar result is obtained with ordinary coal, although in its case the "'"benzols" are more largely represented. If we distil any kind of coal at high temperatures—i.c., in the way customary for illumin-

ating-gas making—the distillable part of the tar proper consists —

chietly of benzene, C;H,, and benzene-derivatives, z.é., benzols, C.H,+2CH,; phenols, C,H,O, and homologues, (CgH;.nCH,)OH ; amido-bodies, CsH;NH, (aniline), and homologues; condensed benzols, such as naphthalene, C,,H,=2C,H, ~ C,H,; anthracene, C,,H,)=3C,H, — C,H, ; chrysene, C,,H,.= 4C 5H, — CgHy>, &c. The paraffins then becomé an altogether subordinate feature.

A great and meritorious research of Berthclot's has thrown con- siderable light on the chemical mechanism of dry distillation. As found by him, even the most complex of the substances named are producible by the interaction upon one another of a few bodies of very simple constitution, or evenone or other of these by the mere action of a high temperature. Tio give a few examples. Marsh- gas, CH,, when passed through red-hot tubes, yields olefines, C.H,, CgH,, C,Hs, &c., with elimination of hydrogen, H,. The same CH,, if subjected to a spark-current (i.¢., local application of intense heat), yields acetylene and hydrogen, 2CH,=C,H,+3H,, and the acetylene produced passes partly into benzene, CsHg= 30H. Ethylene, C,H, when passed through a porcelain tube kept at a moderate red heat, yields benzene, C,H,, styrolene=pheny]l- ethylene, C,H;.C,H;, naphthalene, -C,,H,, and perhaps also its hydride, Cy Hj). Acetylene, gua potential benzene, and

ethylene yield styrolene and hydrogen, C;H,+C,H,=C,H;.C,H,+H,; and styrolene plus ethylene yields hydrogen and naphthalene, CoH.

Benzol at a high temperature loses hydrogen, and, so to say, doubles up into di-phenyl, C,H; and this latter, when heated with ethylene, yields anthracene, C,4Hy, and hydrogen, C,.H)) + C,H, = C,H} 2H,. Conversely, hydrogen may, so to say, turn out its equivalent of a hydrocarbon ; thus, for instance, chrysene, CigHy. 2H, yields di-phenyl, C,,Hjo, + benzene, C,H,

Pyrogenic reactions generally are reversible; thus, any of the following three equations is correct, whether we read it from the left to the right or from the right to the left :—

(1) CoHg (ethane), at a red heat becomes CoHy+Hy.

(2) Cy2H19+CeHe=CigHj2+2H2.

(8) C1 4H 0-+2H,=2CgH_e+CeH,. Hence no single pyrogenic reaction goes to the end ; if it does not, so to say, check its own progress, other secondary reactions set in and do so, the general result being that ultimately, but in general slowly, a state of dynamic equilibrium is attained in which a set of synthetic reactions on the one hand and a set of analytic reactions on the other compensate one another.

Industrial Working of Coal Tar.1—Coal tar, as it eomes from the gas-works, is used for a variety of purposes, such as—(1) for fuel, the tar being made into a spray by means of a steam-injector and the spray kindled; (2) for the preservation of building materials, porous stones, and bricks, &c.; (3) for making roofing- felt (in 1868, five-sixths of the 9000 tons of tar produced at the Berlin gas-works was thus utilized ; the case, however, is different now) ; (4) for making a low quality of lamp-black. At present, however, most of the tar produced, in centres of industry at least, is worked up by distillation. The tar as it comes from the gas- works is allowed to rest in a “ pond” until the tar-water (solution chiefly of ammonia and certain ammonia salts) has gone to the top. The tar proper is then pumped into a large wrought-iron still (of upright-cylinder form preferably) and therein subjected to distilla-tion over a naked fire. A necessary preliminary, however, is the removal of the unavoidable remnant of water, which is best effected by cautiously

heating the tar in the still so as to render it more fluid and enable the water to rise to the top and then letting the upper stratum run out by an overflow tap at the side. The dis- tillation is then started. It involves the formation of two sets of volatile products, namely—(1) combustible gases (including sulphur- etted hydrogen and bisulphide of carbon vapour), which must be led away to avoid nuisance and danger of fire, and (2) a very complex liquid or semi-liquid distillate. This latter is collected in successive fractions, generally in this manner :—(1) as ‘‘ first runniugs,’”’ what comes over at temperatures below 105° to 110° Cs; (2) as ‘‘light oils,” at temperatures between 110° and 210° Che GS as ‘‘carbolic oil,” at temperatures between 210° to 240° C.; (4) as ie

1 For wood tar, see Woop Spirit and VINEGAR,

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‘‘ereosote oil,” at temperatures between 240° to 270° anthracene oil, at temperatures above 270°.

In the earlier part of the “first runnings” and light-oil period the condenser must be kept cold ; towards the end it must be ke t warm to prevent choking by solidified naphthalene. In practice, the operator does not go entirely by the boiling point, but to q great extent by the specific gravity of the distillate, which, ip general, increases as the boiling point rises. As soon as a dro of the last runnings floats in water (exhibits the specific gravity 1), the ‘‘light oil” is supposed to be over. That the fractionation is not always and everywhere effected in the same way needs hard} be said. If the manufacture of carbolic acid is aimed at, it is best (according to Lunge) to select the fraction 170° to 230° C, for this purpose. Naphthalene boils as high as 217°, yet a deal goes into this earbolic-acid fraction. As soon as naphthalene begins to crystallize out largely (on cooling down a sample of distillate), the earbolic acid may be presumed to be over. What follows next is put aside as creosote oil, until, after the disappearance of the naphthalene, a new solid product, namely, anthracene, begins to show itself. With any tar that contains a remunerative proportion of anthracene, the anthracene oil is the most valuable of the pro- ducts, as the raw material for the making of artificial alizarins,

Supposing the anthracene to have been extracted as completely as practicable, the residue in the still consists of ‘hard pitch,” a viscid black fluid which on cooling freezes into a fragile solid, In former times more commonly than now “soft pitch ” used to be produced by leaving more or less of the anthracene oil and even creosote oil in the still. At the end of the anthracene stage of the distillation it is as well, if not necessary, to help the very high boiling vapour out of the still by means of superheated steam, and to keep the worm at 100° C. to prevent high te. At a German establishment a vacuum is used with great advantage.

We come now to explain briefly how the several fractions are worked up.

The pitch (which we assume to be “hard pitch”) must be run off hot through a tap at the bottom of the still and led into a low. roofed and well closed-in ‘‘ house,” because it would take fire in the open air. After it has cooled down sufficiently in the “ house,” the pitch is run into pitch-holes in front of the house and allowed to freeze there. The depth of pitch in a hole is about 12 inches, The solid pitch is hacked out with pickaxes and sent into commerce. A superior apparatus for the recovery of the pitch, which precludes all danger of conflagration and many inconveniences of the ordinary system, has been devised for the Paris gas-works by Regnault.? Lunge found, from many distillations, that tar from the midland counties yields about 55 per cent. of hard pitch.

Hard pitch is used chiefly for making the following. (1) Asphalt.—The pitch is fused up—perhaps in the still which pro- duced it—with the requisite proportion of creosote and anthracene oil, previously freed from their valuable components. Such asphalt is used for street-paving, ¢.¢., filling up the spaces between the paving-stones, and, in admixture with sand and generally more or less of natural asphalt, for the making of footpaths and floorings generally. In Germany it serves for the making of pipes for con- veying acid liquids in works and chemical laboratories, &c. End- less hemp-paper is soaked in liquefied asphalt and wound spirally around au iron core, previously smeared over with soft soap, in about 100 layers. The whole is then exposed to strong pressure while still hot, and is separated from the core after being allowed to cool. Such pipes stand almost any kind of acid, but they must not be used for hot liquids. (2) Varnishes.—The pitch

is dissolved in suitable tar oils,—creosote oil for a lower and light oil for a higher quality. (8) Coke.—In former times more frequently than now pitch was made into coke by transferring it to a special flat still and distilling as long as any volatile products came off, The coke which remains is a very pure and consequently valuable fuel. (4) Lamp Black (as a last resource, if no other mode of utilization is practicable).—The pitch is subjected to partial com- bustion on hot iron plates and the smoke conveyed into chambers to deposit its carbon. The yield is about 40 per cent.

Anthracene Oil.—The oil is allowed to stand cold for a week or so until the anthracene has crystallized out as completely as possible. The mother-liquor is then eliminated, the bulk by means of a filter-press, the rest, at a higher than the ordinary temperature, by hydraulic pressure. The crude product includes far more than half its weight of impurities—phenanthrene, paraftin, naphthalene, &c. T'o remove these as far as possible, the erude anthracene is ground up and treated with petroleum spirit (boiling at 70° to 100° C.) or coal tar naphtha (120° to 190°), in which real anthracene is relatively insoluble. The insoluble part is separated by filtering arrangements and _ presses (so constructed as to avoid danger of fire), and at last sublimed, more with the view of bring- ing it into a customary convenient form than with the object of effecting further purification. Such final anthracene may contain 50 to 65 per cent. of pure substance. The only reliable method for

2 It is described in Lunge's Treatise on the Distillation of Coal Tar, London, 1882, to which this article is largely indebted.

C.; (5)

jetermining its strength is to convert a known weight into anthra- uinone, C,H). by boiling it with a glacial acetic acid solution

of chromic acid, separating out the quinone by diluting with water, olleeting and weighing the product. One part of quinone corre-

sponds to 0°8558 of anthracene. — ee, ‘ ’

Creosote Oil is either used as it is for pickling timber, softening

f pitch, &c., or else redistilled to extraet from it what there is of

nthraeene oil and carbolic acid oil, which are worked up with the

ective principal quantitics.

ws seine this oil to have been collected (as it should ‘be if intended for the making of carbolic acid) between 170° and 930°, the process of extraction is, briefly, as follows. The oil is ‘mixed with a suitable proportion of caustic-soda ley (ascertained by an assay) in an iron vessel at 40° to 50°C. Charles Lowe recom: mends ley of 1°84 sp. gr., diluted with water to five times its volume. After settling, the aqueous layer is withdrawn into a lead-lined vessel, and the soda supersaturated by sulphuric acid. Crude carbolic acid rises to the top as an oil, and is withdrawn to ‘be sold as such or purified. See CARBOLIC ACID.

Naphthalene abounds in the oil left after extraction of the carbolic acid by caustic soda and in the more volatile fractions of the creosote oil. From these it separates out (not completely), on standing, in crystals. These are collected, best in a filter-press, and then subjected to hydraulic pressure to force out the rest of the mother-liquor. The crude naphthalene thus obtained contains an impurity which causes it to beeome red on standing in the air. To remove it, the crude product is mixed with 5 to 10 per cent. of vitriol of at least 1°7 sp. gr., at a moderate heat (addition of a little ‘ binoxide of manganese is an improvement, Lunge); it is then | washed, first with water, then with dilute alkali, and lastly again with water, to be ultimately distilled or sublimed. In the latter case it is obtained in the form of thin colourless plates of great beauty. It fuses at 80°C. and boils at 217° C. Naphthalene is used largely in the making of certain tar colours, such as Manchester yellow, C,,H,(NO,),, and the beautiful scarlets and crimsons made by the ‘‘farbwerke” in Hochst, Germany; these:latter are diazo- compounds derived from 8-naphthol, C,,H;(OH). Coal gas, if ‘impregnated at a suitable temperature with naphthalene vapour immediately before issuing from the burner, gains greatly in lumin- osity. This is the prineiple of the “albo-carbon” gas lamps.

First Runnings and Light Oil.—These may be said to include all the industrially valuable ‘‘benzols” (taking ‘“‘benzol” as a generic term for

benzol or benzene itself and its higher homologues, CsH,, CrHg, CgHi9, &e.). As the distiller in most cases does not aim at an actual separation of all the individual benzols from one) another, but at the production of certain benzol mixtures demanded by the trade, the mode of working may assume a great variety of forms; yet the first aim in all cases is the same, being the elimina- tion of all the non-benzol from the given oil or oils. For this purpose the light oil is, asa rule, subjected to a preliminary fraction- | ation over a naked fire to split it up into fractions fit to be worked | for (crude) benzol (C,H, and C;H,), for carbolic acid (C,H,O), and to be incorporated with the creosote oil respectively; the carbolic acid is extracted, and the creosote-oil part put aside, and thus one | or more mixtures of ‘‘ benzols” are obtained.

The first runnings contain the bulk of the benzene, C,H,, and a little of its higher homologues, associated, however, with bisulphide of carbon, low-boiling olefines, C,He,, traces of carbolic acid, &c. To remove these impurities as far as possible, the oil is thoroughly agitated with concentrated oil of vitriol (which takes up the impurities exeept the bisulphide of carbon), and the ‘‘ dirty” acid allowed to settle out. The acid is then withdrawn as neatly as possible, and the residual oil washed, first with water, then with dilute caustic soda, and, lastly, again with pure water. The washed oil then is subjected to a preliminary fractionation by distillation over a naked flame in the “ crude benzol still.”

The several mixed benzols obtained arc subjécted finally to a further fractionation in stills worked with steam, to be divided into mixed products known by specific names in commerce. But thesc | We cannot possibly eonsider here. We will rather give an idea of

the way in which the several chemical species (benzene, toluene, | &c.) are being isolated in a state of approximate purity to meet | the demands of the tar-colour industry. To do so even for one

named component by means of ordinary stills would require an | endless number of fractional distillations. The work is very materially shortened if, as proposed by Mansfield long ago, we combine the still with an inverted eondenser (still-head, dephlegma- | tor), inserted between the still and the worm, and keep that inter- | mediate condenser at a suitable constant

temperature, so that all the less volatile part of thc vapour is recondensed and sent baek _ to the still. An excellent apparatus of this kind was constructed and worked successfully by Coupier. His apparatus consists of three parts, viz.:—(1) a still heated by means of a coil of close | Steam pipes; (2) a columnar rectifier—* colonnen-apparat”’ as the

Germans call it,—which communicates with the still, and which | 1s divided into many compartments by horizontal septa so contrived that the vapour in passing from a compartment to the next higher

one must bubble through the liquid condensed there from preceding vapour, —an overflow pipe, trapped below by condensate, hindering accumulation of the liquid in any compartment beyond a certain level; (8) a constant temperature still-head, consisting of a succes- sion of communicating ring-shaped tubes, which arc immersed in a bath of water or molten paraffin kept at a prescribed constant temperature. Only the most volatile part of the vapour survives as such in the columnar rectifier, the degree of its volatility depending, of course, other things being equal, on the rate at which we distil. This most volatile part suffers partial condensation at the prescribed temperature in the still-head ; the condensed parts are sent back to compartments of the ‘‘column” by pipes bent into the shape of a J at the point where they join the “column,” so as to prevent vapour from entering them. The uncondensed vapour goes to the worm, and is condensed as usual.

To prepare benzene, the still-head is kept at 60° to 70° C. At first a mixture of low-boiling bodies and benzene goes over, which is rejected, but soon pure benzol follows and continues until almost all this component has distilled over. The benzol obtained boils between 80° and 82° C., and consequently is practically pure. In order now to extract the toluene, C,Hg, we raise the temperature of the still-head to 100°C. A small quantity of a mixture of benzene and toluene follows, which is rejected. Aftcrit comes a continuous distillation of almost pure toluene, boiling at 110° to 112°C. Ina similar manner (relatively) pure xylene, CgHyo, boiling point 137° to 140°,

and tri-methyl-benzene, C,H,,, boiling point 148° to 150°, can be extracted successively ; but the process becomes troublesome with anything above toluene on aceount of the high temperatures involved for still and still-head. Coupier’s apparatus is now super- seded by other constructions, but they all work on the same prin- ciple,—that of the Coffey still, as used for the rectifying of spirit of wine.

Pure benzene, toluene, and xylene are used largely for the manu- facture of tar-colours. The following (and other) mixtures are pro- duced directly from the light oil or first rannings :—

(1) 90 per cent. DenZOl……...0ccs.cccreses initial boiling point 82°C, (2) 50 per cent. DenZOl……...ccssseeceeee 59 “A 88

Ra) eegMLUHMEG len aeeces te ecteeeeseesccssetccssces i 0 100

4) Carburetting naphtha,.....sscseeeree a Hy 108

5) Solvent naphtha……...ssee0 Reese = + 110

6) Burning naphtha…….....c.esserersee “ “5 138

No. 4 serves for enriching coal-gas and adding to its luminiferous power, No. 5 for varnishes, No. 6 for feeding primitive lamps used in the open air, wherc smoke is no objection. __.

The following percentage table for the tar from the Berlin gas- works (given in Chemische Industrie for 1879) gives an idea of the quantitative composition of this most complex material :—

Benzol (including toluol, &.).....ecccesscsceeerreee 0°80 UL OHETIMGMZOIS: scssccessetesesers cscs ts 0°60 Crystallized carbolic acid……... 0:20 Cresol for disinfecting purposes.. 0°30 INGIBDGHAIENE access… scscrsosercsssoces 3°70

5°60 TOs be Oller averessercareseecdstaceisrecescerecrtsnesere 24°00 Anthracene (PUre).....-cssercssererscrerseccesereres 0°20 UEC

literemerapeee c:strenenateercsastrsasecserssorerssarssccsses 55:00 VA BEIRAN GMOS S rrcecescscestoaccecssscescscsecessadceascess 15°20

(J. PA.—W. D.)

TARAI, a British district in the Kumaun division of the lieutenant-governorship of the North-West Provinces and Oudh, India, lying between 28° 51’ and 29° 30’ N. lat. and 78° 46’ and 79° 47’ E. long. It contains an area of 988 square miles, and is bounded on the N. by the Khumaun Bhabar, on the E. by Nepal and Pilibhit sub- division of Bareilly district, on the 8. by the districts of Bareilly and Moraddbdd and the native state of Rampur, and on the W. by Bijnaur. The headquarters of the dis- trict are at Naini Tal. Tarai (‘moist land”) consists of a long narrow strip of country running for about 90 miles east and west along the foot of the Himalayas, with an average breadth of about 12 miles. At its northern edge, where the waterless forest tract of the Bhabar ends, a series of springs burst from the surface, and these, in- creasing and uniting in their progress, form the numerous streams that intersect the Tarai. The Deoha is the great river of the Tarai proper, and is navigable at Puilibhit. Elephants, tigers, bears, leopards, hyenas, and other wild animals are found in the district. The climate is normally bad, but improvement is gradually following the spread of sanitary measures.

According to the census of 1881 the population was 206,993 (118,815 males and 93,678 females). Hindus numbered 131,966 and Mohammedans 74,982. The only town with a population

exceeding 10,000 is Kasipur, with 14,667 inhabitants. The whole tendency of the population is to agricultural and not to urban life.

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The total arca under crop in 1884-85 was 254,288 acres, of which rice occupicd 92,186 acres, wheat 54,627, and other food grains 80,304 acres. There are no manufactures worthy of uote, and the chief trade is the export of grain. The gross revenue in 1884-85 amounted to £42,048, the land yielding £35,507. The Tarai came under British rule at the time (1802) when Rohilkhand was ceded to the East India Company. The Government

is said to have looked with indifference on this uninviting tract, but since 1831, when the revenue settlements were revised, this reproach has been less deserved. With an improved system of embankments and irrigation in 1851, the formation of the Tarai into a separate district In 1861, and its complete subjection to Kumaun in 1870, the moral and material history of this tract has greatly improved.

TARANTO. See Tarentum.

TARANTULA. The tarantula (Zycosa tarantula) be- longs to the mining section of the family Lycoside or Wolf Spiders. Its cephalothorax is dorsally of a brownish grey colour, whilst the abdomen is more distinctly brown, and marked with either two or three pairs of triangular black spots above the apex of the triangles pointing back- wards. One of the most striking specific characteristics of this spider is a large circular black spot which covers the anterior ventral half of the abdomen, the remainder of this surface presenting an ochreous hue. The largest species does not exceed # inch in length. The eight eyes are arranged in three transverse rows, the anterior containing four small eyes, while behind this two pairs of larger eyes are arranged in two rows, the eyes of the hindermost row having between them a wider interval than the first pair.

The tarantula is widely distributed in southern Europe, round the shores of the Mediterranean. It occurs through- out Spain and is found in southern France, and extends into Asia. In Italy it is said to be especially common in Apulia, round the town of Taranto, from which place the name of this spider is usually derived. A species has also been described from northern Africa. It is usually to be found in dry pieces of waste land exposed to the sun. It lives in an underground passage, which it digs for itself and lines with its web. These passages are round in section, and sometimes an inch in diameter, and may extend to a depth of a foot or more below the surface. The tube first descends vertically for some inches, then bends at an obtuse angle, becoming vertical again near its closed end. The tarantula takes up its position at the first bend, where it can command the entrance, on the look-out for prey. In some cases the tube is prolonged above the surface of the earth by the formation of a small funnel, built up of fragments of wood and earth, and lined like the walls of the tunnel by the web. The females show

considerable maternal care for their offspring, and some- times sit upon their egg sacs; and the species, although somewhat fierce and combative amongst themselves, are capable of being tamed.

TarantisM. The tarantula has given its name to one of those dancing manias which overspread Europe during the Middle Ages. The bite of the spider threw the sufferer into a depressed state of melancholy, accompanied by various nervous disorders. The con- dition was accompanied by 4n increased sensibility to the power of music. The excitement of the nervous system amounted in some cases almost to insanity. The symptoms of the patient seem to have varied a good deal with the character of the individual attacked: the most common were a lividity of the body, icy cold- ness, great depression, nausea, sexual excitement, and loss of sight and hearing. The only means of arousing the sufferer from the lethargy into which he sank was music. Under the influence of this he awoke as it were, and commenced moving rhythmically, then began to dance, and continued increasing the rapidity of the motion until he fell exhausted to the ground, By this means it was considered that the poison of the tarantula was distributed through the system and worked out through the skin. If the inusic ccased whilst the patient was dancing, he at once sank back into the state of lethargy from which he had been aroused, but when thoroughly cxhausted he generally awoke relieved and cured at least for a time. This dancing mania became contagious: one person caught it from another quite independently of the bite of the tarantula, and in this way whole districts became affected. One of the most veculiar characteristics was the attraction that

bright pieces of metal, or brilliant pieces of colour, exerei over the imagination of the dancers. This was particularly mark in the later history of the disease. Each sufferer apparently admi one particular hue, the sight of which seemed to cause him greatest rapture. Red was a very general favourite, though t colour threw St Vitus’s dancers into a frenzy of rage; green, yellow, and other colours also had numerous’ admirers. Other colours, on the contrary, they detested, and attempted to destroy articles of the obnoxious shade.

In marked contrast to the effect produced by hydrophobia, tarantism appeared to evoke in its victims an intense longing for the sea, into which at times they would precipitate themselves; at all times they secmed to prefer the vicinity of water, sometimes carrying globes of this fluid whilst dancing.

In its origin tarantism appears to have been contemporaneous with the St Vitus's dance of Germany. It first appeared towards

the end of the 14th century in Apulia; thence it spread gradually

throughout Italy, and reached its height during the 17th century, by which time the dancing manias of the North had already died out. It affected not only inhabitants of the country but foreigners visiting it; age appears to have had no saving influence: children

and old people alike commenced dancing at the sound of the " tarantella, but as a rule women were more susceptible than men, — From the 17th century onwards it has gradually declined, and is now practically unknown, the only relic of it being the graceful dance of southern Italy called the tarantella. The bite of the tarantula is painful but not dangerous, and the real cause of the phenomena described above must be sought in the temporary epidemic prevalence of an hysterical condition.

The Lycosa tarantula is figured in Ann. Se. Nat., 2d ser., iii. Zoologie, 1835,

TARARE, on the Turdine, a manufacturing town of France, and the second most populous in the department of Rhéne, is 25 miles north-west of Lyons. Within a circle drawn 25 or 30 miles from the town more than 60,000 workmen are employed, and the value of the textile fabrics produced exceeds £600,000 per annum, Tarlatans are made in Tarare on more than 3000 J acquard looms. The manufacture of Swiss cotton yarns and crochet embroideries was introduced at the end of last century ; in the beginning of the 19th figured stuffs, openworks, and zephyrs were first produced. The manufacture of silk plush for hats and machine-made velvets, which was set up a few years ago, now employs 2900 workmen and 500 girls, the latter being engaged in silk throwing and winding. There are, besides, four or five dyeing and printing establishments, and silk looms working for the Lyons

trade. An important commerce is carried on in corn, cattle, linen, hemp, thread, and leather. In 1886 the population was 11,848 (commune 12,980).

Till 1756, when Simonnet introduced the manufacture of muslins from Switzerland, Tarare lay unknown among the mountains, On the old castle to which the town owes its origin may be seen the arms of the family of Albon.

TARASCON, a town of France, in the department of Bouches-du-Rhéne, is situated on the left bank of the Rhone, opposite Beaucaire, with which it is connected by @ suspension and a railway bridge. It is on the Lyons and Marseilles Railway, 156 miles south of the former town. The church of St Martha, built in 1187-97 on the ruins of a' Roman temple, rebuilt in 1379-1449, has a Gothic spire, and many interesting pictures in the interior, which is of fairly pure Pointed architecture. Of the original building there remain a porch, and a side portal with capitols like those of St Trophimus at Arles. The former leads to the crypt, where are the tombs of St Martha and Louis IL, king of Provence. The castle, picturesquely situated on a rock, was begun by Count Louis II. in the 14th century and finished by King René of Anjou in the 15th. It contains a turret stair and a chapel entrance, which are charming examples of 15th- century architecture, and fine wooden ceilings. It is now used as a prison. The civil court of the arrondissement of Arles is situated at Tarascon, which also possesses a coml- mercial court, a hdétel de ville, and fine cavalry barracks. Hats, and the so-called Arles sausages, are made here. The population in 1886 was 6647 (commune 9314).

the fair of Beaucaire and the féte of La | (Me Ge: tetarin celebration of St Martha's deliverance of the town from a legendary monster of that name. King René presided in 1469, and grand exhibitions of costume and strange ceremonies take place during the two days of the festival. Tarascon ' was originally a settlement of the Massaliots, built on an island of the Rhone. The medieval eastle, where Pope Urban ll. lived in | 1096, was built on the ruins of a Roman castrum. The inhabitants of Tarascon preserved the municipal institutions granted them by 'the Romans, and of the absolute power claimed by the counts of 'Provence they only recognized the rights of sovereignty. Tarascon played a bloody part in the White Terror of 1815.

TARAXACUM is the name usually applied in medical practice to the common dandelion (Taraxacum officinale, Wiggers), The DANDELION (q.v.) is a plant of the northern hemisphere, extending to the Arctic regions, and is culti- vated in India. The preparations chiefly employed are the fluid extract, the preserved juice of the root, or succus, and the solid extract. The dried and roasted root, mixed with ground coffee, is often sold under the name of dandelion coffee for use as a beverage. The root is most bitter from March to July, but the milky juice it contains is less abundant in the summer than in the autumn. For this reason, the extract and succus are usually prepared during the months of September and October. After a frost a change takes place in the root, which loses its bitterness to a large extent. In the dried state the root will not keep well, being quickly attacked by insects. Externally it is brown and wrinkled, internally white, with a yellow centre and concentric paler rings. It is 2 inches to a foot long, and about } to 4 inch in diameter. The juice when first exuded is bitter and neutral, but on exposure to the air soon acquires an acid reaction and a brown tint, coagulat- ing and depositing a complex substance, to which the name of ‘“leontodonium” has been given, From this deposit a bitter principle, ‘“‘taraxacin,” and an acrid crystalline substance, ‘‘taraxacerin,” soluble in alcohol, have been obtained, but to which of these the medicinal properties are due ig not known. In autumn the root con- tains about 24 per cent. of inulin, but in summer barely 2 per cent. When the juice has fermented, mannite is found init. Taraxacum is chiefly employed as a stimulant | tonic in hepatic disorders. In some cases it acts as a – cholagogue and mild aperient, and in others as a diuretic. | The roots of other Composite plants are somctimes gathered _ by careless collectors for dandelion, especially that of Leontodon hispidus (L.). The root of this plant is tough when fresh, and

rarely exudes any milky juice. The flowers, moreover, have | feathery pappus, while in the dandelion it is simple.

TARBES, a town of France, chef-lieu of the depart- ment of Hautes-Pyrénées, is situated in one of the most

_ beautiful plains of France, on the left bank of the Adour, | streams from which are conducted through all parts of the town. The lines of railway

from Paris to Pierrefitte and from Toulouse to Bayonne cross here. Among the many gardens and open spaces for which Tarbes is distinguished is the Massey garden (35 acres), given to his native town by a Versailles official of that name, in which his statue faces the town museum, founded by the collector Achille Jubinal. The varied collections include Roman remains, | and specimens of the fauna and flora of the Pyrenees. _ The architecture of the cathedral is heavy and unpleasing, but the cupola of the transept (14th century), the modern

| glass in the 12th-century apse, and a rose window of the | Sth century, in the north transept, are worthy of notice. | The Carmelite church has an interesting steeple, and there _ are the ruins of a chapel and cloister, and Roman remains _ In the garden of the former episcopal palace, now occupied , by the prefecture. The municipal buildings, with the public library (22,000 volumes), the lyceum, the court of Justice, and the barracks (which are large and fine) may also be mentioned among the public buildings. The garrison and artillery establishments, the latter associated

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with an arsenal and large workshops, have considerable im- portance. Other industrial establishments are a foundry machine manufactory, felt and woollen factories, and wool and flax spinning mills. Paper, lace, knitted goods, car- riages, and leather are also made here, and marble from the Pyrenees is prepared for the market. There are important fairs and markets, particularly for horses, as Tarbes is a well-known centre for a special breed of light horses, its stud being the most important in the south of France. The population of the town was 24,882 in 1886.

Tarbes, a mere vicus in the time of Gregory of Tours, rose into importance after the destruction of the ancient Aquitanian town of Turba. The seat of the bishopric was transferred to it about the 9th century, when a castle was also built. Raymond I., towards the middle of the 10th century, rebuilt the town, fortified it, and made it the capital of the county of Bigorre. The

English held the town from 1360 to 1406. In 1569 Tarbes was burnt by Mont- gomery, and the inhabitants were driven out. This happencd a second time, but in August 1570 the peace of St Germain allowed the inhabitants to return to the grass-grown streets. Subsequently Tarbes was four times taken and re-taken, and a number of the inhabitants of Bigorre were forced to take refuge in Spain, but in 1594 the members of the League were finally expelled. The Eng- lish, under Wellington, gained a victory over the French near Tarbes in 1814. Théophile Gautier was born here in 1811.

TARENTUM, or Taras, now Taranto, a famous Greek city of southern Italy, situated on the north coast of the bay of the same name, at the entrance of the only secure port on the gulf. This port, now called the Mare Piccolo, is a bay 16 miles in circuit, landlocked by a low rocky peninsula. The entrance is so narrow that it is crossed by a bridge of seven arches ; it was already bridged in Strabo's time. The modern town, in the province of Lecce, which is the see of an archbishop and had in 1881 a population of 26,611, stands on the peninsula, which is now rather an island, the isthmus connecting it with the mainland having been cut through for defence by Ferdinand I. The ancient citadel occupied the same site, but the city in its best days was much larger, traces of the walls being visible about 2 miles from the gates of the modern town. 'The remains of antiquity are inconsiderable.

Tarentum was a Spartan colony founded about the close of the 8th century B.c. (Jerome gives the date 708) to relieve the parent state of a part of its population which did not possess, but claimed to enjoy, full civie rights. Legend represents these Parthent# (so they are called) as Spartans with a stain on their birth, but the accounts are neither clear nor consistent, and the facts that under- he them have not been cleared up, The Grecks were not the first scttlers on the peninsula: recent excavations have brought to light signs of a pre- Hellenic trading-place, and the name of Taras may be older than the colony. To the Greeks Taras was a mythical hero, son of Neptune, and he is sometimes confounded with the cecist of the colony, Phalanthus, Situated in a fertile district, especially famous for olives and sheep, with an admirable harbour, great fisheries, and prosperous anufactures of wool, purple, and pottery, Tarentum grew in power and wealth and extended its domain inland. Even a great defcat by the natives in 473 1.c., when more Grecks fell than in any battle known to Herodotus, did not break its

prosperity, though it led to a change of government from aris- tocracy to democracy. A feud with the Thurians for the district of the Siris was settled in 482 by the joint foundation of IJeraclea, which, however, was regarded as a Tarentine colony. In the 4th century Tarentum was the first eity of Great Greece, and its wealth and artistie culture at this time are amply attested by its rich and splendid coins; the gold pieces in particular (mainly later than 3860) are perhaps the most beautiful ever struck by Greeks (see NUMISMATICS, vol. xvii. p. 637). In the second half of the century Tarentum was in constant war with the Lucanians, and did not hold its ground without the aid of Spartan and Epirote condottiert. ‘Then followed war with Rome (281), the expedition of Pyrrhus, and at length, in 272, the surrender of the city by its Epirote garrison (sce the details in vol. xx. p. 748 sq.). Tarentum retained nominal liberty as an ally of Rome. In the Second Punic War it suffered severely, when it was taken by Hannibal (212), all but the citadel, and retaken and plundered by Fabius (209). After this it fell into great decay, but revived again after recciving a colony in 123 B.c. Jt remained a eonsiderable seaport, and its purple, second only to that of Tyre, was still valued, but in Strabo’s time it had shrunk nearly to the limits of the present town. After the fall of the Western empire it was held from time to time by

Goths, Lombards, and Saracens, but was not finally wrested from Byzantium till Robert Guiscard took it in 1063.

For special literature about Tarentum, see Busolt, Griech. Gesch., i. 206 sq. TARES, or Vercuzs. See Acricunturs, vol. i. p- 376. TARGUM (O78) in its concrete sense signifies the

paraphrastic translation of the Hebrew Scriptures, or parts thereof, into the Aramaic tongue. It has, however, three other meanings:—(1) a translation from any language into another; (2) an interpretation in any language;2 and (3) the Aramaic portions of certain books of the Bible (notably Daniel and Ezra).*

The word is not itself found in the Bible; but the participle methurgam (03902) occurs in Ezr. iv. 7. The noun Z’argum, a form similar to TauMup

(¢.v.), occurs for the first time in the Afishnah, both canonical* and non-canonical,°—the latter being apparently the older source.

Origin.—Although none of the Targums now in our hands are as old as the Sepruacint (¢.v.), the public use of Targums on Sabbaths, festivals, &c., is very ancient, and indeed their language was for several. hundreds of years the sole one understood by the majority of the Jews in Palestine and Babylonia. How the Hebrew people of Juda came so entirely to unlearn their own Hebrew tongue as to stand in need of an Aramaic translation of their Scriptures need not be dwelt on here (see vol. xi. p. 597 and vol. xxi. p. 648). But an important contrast between the Aramaic and Greek versions deserves particular notice. The use of the Septuagint by the Greek-speaking Jews of Alexandria, Asia Minor, and elsewhere caused those who adopted it to forget entirely their own Hebrew tongue. The Aramaic version (Targum), however, spring- ing from a religious necessity, was the cause of revival of the knowledge of Hebrew, which had been nigh forgotten. It is therefore easy to understand why the Jews in general have shown comparatively little attachment to the Septua- gint, whilst they ever ardently revered the Aramaic version, even after the institution of publicly reciting it had ceased. ¢ To this day pious Jews privately prepare themselves every Friday for the lessons of the coming Sabbath by reading the weekly portion twice in the sacred text and once in the Targum (O39 INN1 N7pN dw).

Former Use of the Targum in Public.—The following rules had to be observed in the reading of the Scriptures at the synagogal service :—

I. As regards the Law (Pentateuch). (1) The private person called to the Law (which chiefly contains halakhic matter) read one verse of it, which the official methurgeman or turgenian (trans- lator) immediately paraphrased ; (2) whilst the reader of the Law was not allowed to take his eye off the written scroll, the methurge- man was forbidden, not merely to read out of a written Targum, but even to look into the sacred text ;® (3) each of these had to wait till the other had quite finished the reading and translation respectively ; (4) one was not allowed to raise his voice in a louder

key than the other; (5) a certain number of passages, although allowed to be read, were not allowed to be translated; these were—

7 Hence I3WN DOIN (German translation), &c.

? When the word is used in either of these two senses the language into which the translation is made, or in which an interpretation is given, must be specified, or otherwise indicated, ég., 31° OVIN (Greek translation), DYIWN DIN (Septuagint), Dopy DIIN (Aquila translated), except when it is Aramaic, in which case the language may be named (as in Ezra iv. 7) or not (Tosephto, Shabbath, xiii. [xiv.] 2).

3 Compare Mishnah, Yadayim, iv. 5.

5 Siphere (see vol. xvi. Shophetim), Pisko 161.

° “Let not the Aramaic be lightly esteemed by thee,” says the Jerusalem Talmud, ‘seeing that the Holy One (blessed be He !) has giveu honour to it in the Pentateuch (Gen. xxxi. 47), in the Prophets (Jer. x. 11), and in the Hagiographa (Dan. ii. 4),” (Sotah, vii. 2). Instead of ‘‘ Arammi” (Aramaic) the AMidrash Rabbah on Genesis reads “ Parsi” (Persian); the reading here is “ Sursi” (Syriac).

7 See Misunau, vol. xvi. p. 503.

8 This was done to prevent its being thought that the Targum (the exponeut of the oral Law) was to be found in writing in ‘the Pentateuch (the exponent of the written Law).

4 See last note. p- 507) on Deuteronomy (Pericope

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(a) such as might reflect unfavourably on a father of a tribe, or on aneminent teacher(T. B., Afegill., 254, Tosaph., catchword TW YD) « (6) such as might encourage the ignorant to think that there was some truth in idolatry; (c) such as might offend decency (Mishnaj, Megillah, iv 10; Tosephto, ibid, 35, 37 ; T. Yer, age ip 10; and T. B., ibid., leaf 256); (d) such as were fixed by the Lord Himself to be read in Hebrew only (as the sacerdotal benediction, — Num. vi. 24-26); (6) the translator was neither allowed to give a literal translation nor to add anything that had no foundation in the Divine word; he had to give the spirit of the letter,10

II. As regards the Prophets. (1) The person called to read the Prophets (which chiefly contain agadic matter 1) might read three verses, of which the translator, who might be the reader himself,22 sought to render the meaning to the best of his ability 5 (2) the translator was allowed both to read out of a Targum volume and to look also into the book containing the prophetic text; (8) if reader and translator were two different persons they

observed the third rule given above for the case of reading the Law ; (4) here also certain passages were not allowed to be translated :—(a) such as reflected on great men of the Israelite nation; (b) such as offend decency ; (5) any one sufficiently intelligent might read, and of course paraphrase, the portion from the Prophets.

III. As regards the Hagiographa. The widest range of liberty must have been granted both to reciters and translators, as very scanty mention of any particular provision concerning it is to be found in the Talmuds. The Psalms and the book of Esther are classed together in so far as they may be read and paraphrased even by ten persons (T. B., Afeg., 216). For Job and Lamentations, see below.

Duration of this Practice.—The practice of publicly reciting the Targum continued somewhat later than the last of the geonim. Within the last 400 years of that period, however, the power of this ancient institution began to fluctuate, gradually declined, and finally almost —but not entirely ’—died out. The causes of this were twofold. One was, that after the Mohammedan conquests Arabic supplanted Aramaic as the vernacular, and the Targums thus became unintelligible to the mags (see Seder Rab ‘Amram, i., Warsaw, 1863, leaf 29a), even as was already the case in the Western world. ‘A second and more important cause, however, was the spread of Karaism, whose criticism of the Rabbinic contents of the Targums provoked the Rabbanites to pay more attention

to the etymology and grammar of the Hebrew text of the

® The Babylonian Talmud (AMegiliah, 256) says that the priestly benediction was not to be recited in Aramaic on account of the phrase “the Lorp shall lift up His countenance upon thee,” which would appear as if the Lord had been a respecter of persons. In Talmudic times they had apparently, in Babylonia, lost the real reason of the Mishnic prohibition, which is that this benedictiou is doubly, yea, trebly Divine, being framed in its every word by God Himself, and can thus only be recited in those very words (FA, thus; Num. vi 23). See Mishnah, Sotah, vii. 2; T. Yerushalmi, ibid., and Megillah, iv. 11, and, finally, Bemidbar Rabbah, cap. xi. in medio.

10 See Tosephto, Megillah, iv. in fine.

11 See Miprasi, vol. xvi. p. 285.

12 Thus Jesus (Luke iv. 16-27) no doubt read the Haphtarah (pro- phetic portion) himself, and paraphrased it himself. From this custom of reading and paraphrasing by one and the same person the sermon (17) sprang. The passage in question (Isa. lxi. 1, &c.) was read on the Sabbath before the New Year (day of memorial),

18 Long after the institution of publicly reciting the Targum on the Law had generally declined, it was yet retained in Germany and Italy on certain days of the three high festivals, viz., (a) the seventh day of Passover, (0) the first day of Pentecost, and © the last day attached to the festival of Tabernacles (i.¢., WIM NMNW). The passages so recited were—(a) parts of the lesson for the day—the soug of Moses and the children of Israel, with the introduction 3 (8) the Decalogue in Exodus ; (c) the last portion of Deuteronomy. In the first case the paraphrase was from the three Targums mixed, in the second from the Targum Yonathan with deviatious, in the last from the Targum Onkelos. (These pieces are interspersed with sundry bits of poetry; see Camb. MS. Add. 374, leaves 169a-1718, 199a-208a, 4230-4276.) Towards the end of the 14th century, as regards Passover and Pentecost, the custom fell into desuetude, but down to our own days some of the congregations of Italy continue the usage of reciting the Targum Onkelos in connexion with the narration of the death of Moses. ‘This custom, however, is now rapidly dying out. As regards the recitation of the Targum on the Prophets, a small remnant of the congregations folowing the rite of Rome (i.e., the so-called Italiant) continue it to this day on the festival of Passover. For the use of the Targum on Pentecost, see Responsa, by R. Meir of Rothenburg (RosH, ¢.2. footnote 3), No, 59.

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Bible. Thus the Targums, both in their periods of vigour and decay, exercised, directly and indirectly, a salutary influence. In each case the knowledge of Hebrew was ‘promoted ; and it advanced so much, that by 1000 a.p. the Jews of Irak, like those of the rest of the world then, and as in our own days, certainly knew the pure Hebrew better than the Aramaic

idiom. The same was the case in ‘other Arabic-speaking parts, as Spain, Africa, &c.,—Yemen then and still forming a solitary exception.!

Authorship and Age of the Various Targums.—The ‘Targums on the various books of the Bible are not merely by various authors, but also of various ages. They have only one thing in common,—all of them rest on oral traditions, which are hundreds of years older than the earliest form of the written Targums now in our hands. We enumerate them according to Biblical order, although that is not necessarily the chronological order in which they were either composed or committed to writing.

I. The Pentatewch.—(a) There is a complete Targum known as

Onkelos (DIPPIIN, DOPIN, DIOPI’, DI>*PIN). ‘The person and even the name of Onkelos have been for the last three hundred years a erux ertiticorum.

According to the Babylonian Talmud, Megil., 3a, “ Onkelos (son of Calonicus, Gitt., 560, or of Calonymus, ‘Ab. Zar., 11a), the pro- selyte, composed the Targum on the Pentateuch (111D§) out of the

mouth of R. Eliezer and R. Yehoshua’’,” who taught in the 1st and 9d centuries. In the Jerusalem Talmud, Jfcg., i. 9, the same thing is related on the same authorities, and almost in the same words, of the proselyte Aquila (Akylas) of Pontus, whose Greek version of the Bible was much used by Greek-speaking Jews down to the time of Justinian (Vov., cxlvi. cap. 1).2_ There are other parallels between what Zosephto and the Babylonian Talmud tell of Onkelos and what the Jerusalem Talmud and the Midrash tell of Aquila. Both throw their idolatrous inheritance into the Dead Sca (Tos., Demat, vi. 12; T. Y., Demai, vi. 10), and both have connexions with Roman emperors, Onkelos being sister’s son of Titus (@ittin, 566), and Aquila of Hadrian (Jfidr. Tunh., Mishpatin; sce, also, for Onkelos, ‘40. Z., 11a, and for Aquila’s connexion with Hadrian, T. Y., Hag.,ii.1; Shem. Rab., xxx.; Epiphanius, De Mens. et Pond., xiv. sq.). From these facts some (see N. Adler, Nethinah lagger, in the Vilna Pent., 1874, Introd.) still argue that Onkelos is but another name for Aquila, and that the Greek translator also wrote our Targum. This view was long ago refuted by R. ‘Azaryah de’ Rossi,? and is quite untenable. It is incredible that Aquila or any other

Greek could have had the mastery of Aramaic and of tradi- tional lore as well as of Hebrew which the Targum displays; and the phrase of T. Y.,‘Megil., i. 9, “an untutored person picked out for them Aramaic from the Greek,” is quite inapplicable to Onkelos, and ought to be taken as referring to the Peshito Syriac, which is admittedly dependent on the LXX. In a Jewish writing ‘‘for them ”—set absolutely—means “for the Christians.” The view now accepted by most critics is that the word Onkelos is a Babylonian corruption of Akylas, but that the name “Targum Onkelos ” originally meant no more than “Targum in the style of — i.¢., bearing to the freer Palestinian Targums a similar relation to that of Aquila’s version to the Septuagint.* Ou this view there never was a real person called Onkelos. But how Akylas (DODY; in Ber. Rab., i. middle, DIOP or PODN, ie. PON) could be corrupted into Onkelos has not been satisfactorily ex- plained ; and, besides the traditions about Onkelos which resemble what is known about Aquila, there are others, and these older than

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1 In Yemen the Targum is publicly recited to this day, and, strange to say, by boys of nine years of age or so in turn, See J. Saphir, Eben Sappir, i. (Lyck, 1866, 8vo) leaves 580, 61a. Saphir once told the present writer that a youth, eighteen years of age (ut supra, 61b), who carried his travelling-bag and served as his guide over the mountains, Said, 7.e., Seadyah, by name and a shoemaker by trade, could translate to him in Aramaic from memory any passage Saphir recited in Hebrew.

2 For the connexion of Aquila with R, Eliezer and R. Yehoshua’, see also Beresh. Rab., 1xx.; Bemidb. Rab., viii. end; Kohel. Rab., vii. 8.

3 Ze, ‘‘min Haadummim.” The Adummim are supposed to be one of the four noble families carricd to Rome by Titus.

4 The Jerusalem Talmud repeatedly cites Aquila’s renderings and never names Onkelos. But it does show acquaintance with renderings found in Onkelos (e.g., Megil., iv. 11; cf. Onk. on Exod. xxxii. 35). In the Midrash Rabbah, besides many eitations from Aquila, we find one of Onkelos by

name (in Bem. R., ix. in fine; Onk. on Deut. xxxii. 24) and various allusions (without name) to renderings found in him. He is also cited byname in the Palestinian Pireke de-R. Eliezer, xxxviii.

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either Gemara, which have no such resemblance, and assign to him an earlier date, associating him with R. Gamliel the elder, the teacher of St Paul (Tosephto, Shab., vii. [viii.] 18; Hag., iil. 2, 3; Kel. Bab. Bath., ii. 4; Mikv., vi. 3; Talmud B.,‘.4d. Zar., 11a; Mas. Semah., viii.init.). The Zohar (iii. leaf 73a of the small ed.) ascribes his being circuincised to Hillel (R. Gamliel’s grandfather) and Shammai. ‘These notices, it is true, do not speak of Onkelos as a targumist; and, indeed, the Targum being a representative piece of the oral law was certainly not written down, private notes (nvcgil- loth setharim) excepted, before the Mishnah, Toscphto, &c., 7.¢., till about the end of the 6th or the beginning of the 7thcentury. But in the opinion of the present writer this need not prevent us from recognizing Onkelos as a corrector and compiler of oral Targum in the Ist century. As regards the name, it may be suggested that Onkelos is a deliberate perversion of Evangelus, a Greek proper name which exactly translates the Jewish (and especially Babylon- ian-Jewish) name Mebasser. As the Christian writings are called Aven (iniquity, idolatry), and as the pre-Mishnie teacher R. Meir calls the gospel (evangelion) ongillayon (iniquity of the roll; T. B., Shab., leaf 116, Amst. ed. of 1645), or, by inversion, gilyon-aven (roll of iniquity), the name Evangelus, which suggested associations with the gospel, might be perverted into Onkclos quasi On-keles (iniquity of disgrace). And, while a Babylonian Jew coming to Palestine might find it convenient to translate his Hebrewname into Evangelus, this good Greek name was enough to suggest in after times that he was of heathen origin and so to facilitate the con- fusion with Aquila. The idiom of the Targum Onkelos, which is held to

be Palestinian with some Babylonian features, points to Babylonia as the country of its final redactor, if to Palestine as its source. It must be remembered that Hillel and other great fountains of Palestinian learning were of Babylonian origin.®

(g) Certain Targumic fragments on the Pentateuch go under the name of Targum Yerushalmi, or, rather, Palestinian Targum. These are the remains of a much larger Jerusalem Targum, once current in Palestine. But, the Palestinian rabbis not having approved of it, perhaps because it accorded in various of its interpretations and phrases with interpretations and phrases to

5 Bibliography of the Targum pridpayx.—(A) There are very fine MSS. of this Targum at Parma, Oxford, Cambridge (Dd. 11, 26, Add. 446, 1058), the British Museum, Kissingen (Rabbin Bamberger), &c. (B) A Massoreth on our Targum by an anonymous author, who must have lived in or before the 12th century, has been pub- lished—(1) by Luzzatto (Osar Nehinad, iv.); (2) by Adler (Vilna edition of the Pentateuch of 1874); and (8) by Berliner (with a German translation, &c., Leipsic, 1877, 8vo). (C) Leading editions: —(1) Bologna, 1482, editio prineeps, without vowel-points ; (2) the Complutensian polyglott; (8) the Bomberg Rabbinic Bible of 1517 ; (4) Sabbioneta, 1557, 16mo (reprinted, not without mistakes, at Berlin, 1884, imp. 8vo) ; and (5) Vilna edition of the Pentateuch of 1874, the Targum being pointed according to a Bodleian MS. (Canon. Orient, 91). (D) Translations :—(a) into Latin—(1) by Alphonsus Zamorensis (Polygl., 1517, &c.); (2) by P. Fagius (Strasburg, 1546, folio) ; (b) into English by Etheridge (Targums, London, 1862-65, 8vo), (E) Commentaries, all in Hebrew:—(1) Pathshegen, by an anonymous Provengal rabbi of the 12th century (see Mawzor), in the Vilna Pentateuch of 1874; (2) by R. Mordekhai b. Naphtali (Anisterdam, 1671-77, fol.) ; (3) Lehem Vesimlah (double commentary) by R. Bensiyyon Berkowitz (Vilna, 1846-56); (4) by Dr Nathan M. Adler (Vilna Pentateuch of 1874, ut supra). (F) Other litera- ture (also for the other Targums):—(a) in Hebrew—Jfeor ‘Enayim, by R. ‘Azaryah m. Haadummim (cheapest and best edition, Vilna, 1863; Mine Targumo, by R. Y. Berlin or Pick (Breslau, 1851, 4to) ; Oheb Ger, by S. D. Luzzatto (Vienna, 18380) ; ‘Oteh Or, by the before- named B. Berkowitz (Vilna, 1843) ; Zggereth Bikkoreth, by R. Z. H. Hayyuth (Chajes), ed. Briill, Presburg (1853, 8vo); Rapoport, ‘Hrekh Millin, (Prague, 1852, 4to) ;

Lowy, Bikkoreth Hattalmud, i. (Vienna, 1863, 8vo); (b) in Latin—Morinus, Hvercitationes, ti. viii. 6 (Paris, 1660); Winer, De Onkeloso (Leipsic, 1820, 4to); R. Anger, De Onkelo (Leipsic, 1845-46) ; (c) in German—Zunz, Gottesd. Vortrige (Berlin, 1832); Geiger, Urschrift (Breslau, 1857); Hamburger, Real-Ency- klopidie; Targum Onkelos, by Dr A. Berliner (Berlin, 1884, imp. 8vo). On this work, see Néldeke, in Zarncke's Centralbl., 1884, No. 39, and Lagarde in G@étt. Gel. Anzeig., November 1886 (No. 22) ; (d) in English: E. Deutsch, in his Literary Remains—to be used with caution. (G) Lexicons to this and other Targunis :—(1) as for the Talmuds and Midrashim, so also for the Targum, R. Nathan b. Yehiel's 'Arukh (see TaLMun, p. 37, note 7) stands first ; (2) next to it is Elias Levita's Methurgeman (Isny, 1541, fol.); (8) Buxtort's Lexicon Chaldaicum, Talmudicum, et Rabbinicum (cheap and new, though by no means best, edition, Leipsic, 1869-75); (4) Levy's Chald. Warterb. (1866-68) ; (5) Jastrow's Dictionary, i. (New York, 1886). (H) Grammars:—(1) Juda Jeitteles's Mfebo allashon (Prague, 18138, 4to); (2) Blicher's Marpe Leshon Arammi (Vienna, 1838) ; (3) Fiirst's Lehrgeb. d. Aram. Idiome (Leipsic, 1855) ; (4) Lerner's Dikduk Lashon Arammith (Warsaw, 1875) ; all in 8vo.

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be found in the Gospels,! it gradually lost its greater portion of its original matter, what it is.

regards its age, several of the 1'. Yonathan) were in the 2d with disapprobation. down before the Mishnah and other parts of the oral Law.?

(y) The Targum Yonathan, or T. of Jonathan, on the Pentateuch This Targum was no doubt undertaken, as Dr Bacher has shown (Z. D.M. G., xxviii. p. 69), to combine the finest This attempt could not have been made without both these Targums

before the compiler of the third Targum. The Targum Yonathan on the Pentateuch is a product, at the earliest, of the 7th century, to which conclusion internal evidence also The author is, of course, not the Yonathan b. 'Uzziel, principal of the eighty disciples of Hillel (T. B., Sukkah, 28a), who, aceording to 'T. Bab., Megill., 3a, composed a Targum on the

is also Palestinian.

parts of what early 7. Onkelos and 7’. Yerushalmé contained.

lying in writing points. 4

Prophets from the traditions of Haggai, Zechariah, and Malachi.®

Il. Targum Yonathan on the Prophets.—It has been known from carly quotations, as from Rasut (q. v.) and others, but notably from that, in addition to the complete cxtant Targum on the Prophets, there existed other Targuins or fragments of them. These are now kuown from the marginal additions to the Reuch. Tinian Codex of the Targum on the Prophets published by Lagarde As regards the complete Targum on the Prophets, no mistake can be greater than to believe that Rab Yoseph, a teacher of the 3d and 4th centuries, and head of the academy of Pumbaditha (see This mistake has its origin in the repeated phrase of the Babylonian Tal- mud, *}D1 37 D397 (“as Rab Yoseph targumizes”); but thena similar phrase exists with regard to Rab Shesheth, NWwY 37 DMN And in like manner the expres- sion }3937N1N73 (“as we targumize ”) is of frequent occurrence. In “fas we are in the habit of translating certain passages in Holy Writ according to a Targum As applied to Rab Yoseph and Rab Shesheth the phrase may certainly mean more and yet not imply that these teachers were in any way authors of the Targum on the Law, the Rab Yoseph and Rab Shesheth were uote in extenso the written word of the Law, which it was forbidden to recite orally, They therefore committed to memory the oral Targum, and so were, That Rab Yoscph was uot the author of the Targum on the Prophets will be clearly scen from the following Talmudic passage (B., Megillah, 3a; Mo’ed Katan, 28b):—‘‘ Were it not for the Targum of that verse [Zechar. xii. 11] I should not know the meaning of the prophet.” the Prophets ;8 and we see that Rab Yoseph must have had the Targum on the Prophets In the opinion of the present writer this Targum was composed by Yonathan ; and, not being on books of the Law, there was no reason why it should not have been there and then written

KIMHI (q.v.),

(Leipsic, 1872), and have been discussed by Bacher (wé sup.).

RABBAH), was the author of this Targum in whole or in part.

(“as Rab Shesheth § targumizes ”), this last instance the words mean

we have received.”

Prophets, or Hagiographa. both blind, and as such were not allowed to

of course, appealed to as Targumic authorities, &c.7

This verse is from the last but one of all

before hii.

eee ee 1 See T. Yer., Berakhoth, v. 8, and compare with 1t Luke vi. 36.

Compare Berliner, ut supra, pp. 85, 86.

2 Conipare last note.

3 Bibliography of the Targum Yerushalmi on the Pentateweh.—(A) There is a MS. of this Targum preserved in the Vatican library (eecexl.). (B) The first edition of thisTargum is in the so-called Christian Rabbinic Bible of 1517. It is to be found also in most polyglott and Rabbinic Bibles, ineluding the Polish editions (Warsaw, &c.). (C) Translations : —(a) Latin—(1) by Taylerus (London, 1649, 4to) ; (2) by Chevalier (in the Polyglott, London, 1653-57). (b) In English by Etheridge (Tar- gums, London, 1862-65, 8vo). (D) There are two commentaries on this Targum in Hebrew :—(1) by R. David b. Ya‘akob (Prague, 1609, 4to); (2) by R. Mordekhai b. Naphtali (Amsterdam, 1671-77, fol.).

4 See our Targum on Gen. xxi. 21, where Mohammed’s first wife (Khadidja) and their youngest daughter (Fatima) are mentioned by name,

> Bibliography.—(A) There certainly exists, somewhere in Italy, a MS. of this Targum, although the owner is at present unknown. (B) This Targum appeared for the first time in the Pentateuch edition of Venice (1590-91, 8vo). (C) Translations :—(a) Latin by Chevalier (London, 1658-57); (6) in English by Ktheridge (op. ezt.). (D) Com- mentaries:—(1) by R. David b.

Yalakob (Prague, 1609, 4to); (2) by R. Mordekhai b. Naphtali (Amst., 1671-77, fol.); (3) by an anony- mous author in the Warsaw edition.

8 In the editions before us (T. B., Sotah, 480) Yoseph stands on the margin instead of Shesheth ; but in the edition before R. ‘Azaryah m. Haadummim the reading was absolutely Shesheth ; see Meor ‘Enayim, eap. xly.

7 See Tosaphoth on B. Kam., leaf 3a, eatchword DIIND ID.

8 This is by no means an isolated phrase ; in T. B., Synhedrin, 946, a similar one occurs, referring to Isa. viii. 6.

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authority and the and is now in our hands It certainly never was part of the 7. Onkelos, nor was the T. Onkelos part of it, though the two are closely related. As pieces formerly found in it (now in and 3d centuries distinctly quoted 2 But like Onkelos it cannot have been written

down. Although the traditions it embodies came originally fro) Babylonia and returned to Babylonia, its language has yet a marked colouring of the Palestinian idiom than that of Onkelo; because it was not studied so much and therefore not so muc modified and interpolated. Some of the Agadoth occurring | this Targum are ascribed in the Talmud and Midrash to, k

men, but this is no conclusive argument against an early date, | can be shown that many laws and sayings supposed to be of ¢h 2d, 3d, and 4th centuries of the Christian era are actually of pre Christian times, and, indeed, ccrtain explanations, figures ; speech, &c., had been, so to say, floating in the air for centurie Certain passages in the Scptuagint contain Agadoth which » appear, seemingly for the first time, in the Talmudic literature The Prophets themselves knew Agadoth which only reappear j what are believed to be late Midrashim (comp., ¢.g., Isaiah xxi; 22 with T. B., Synh., 195; Isa. xxx. 26 with Targum on Jud v. 81, Ber, Rab., xii.; Ezek. xxii, 24, &e., with Ber. Rab., xxxiii) Ill. Targum on the Hagioyrapha.—No author’s name is attache to this Targum in whole or in part. The Psalms must have one” or two? Targums ; the book of Proverbs at least two ; book of Job at least three.!4_ There must have been two Targums o1 Canticles,!®

Ruth,!® Ecclesiastes,!? and Esthcr,!8 and probably thee on Lamentations,! the earliest of which was, ho doubt, simultane ously coming into existence with the earliest on the book of Job For Ezra-Nehemiah no Targum exists. Daniel only in part wante a Targum, and it is supposed to have had one ; °° and the book (or rather the book) of Chronicles have a by no means late one,*l although it is not by Rab Yoseph, of the 4th century.2?

- See, however, vol. xxi. p, 648. 10 Bibliography.—(A) There are MSS, of the Targum on the Prophets in the Bodleian (Opp. Add., 4to, 75 and 76, Uri 4 and Keunicott 5). (B) The earliest edition is in the Rabbinic Bible of 1517. (@ Translations :—(a) in Latin—(1) by Alphonsus Zamorensis (revised by Arias Montanus and afterwards by Clericus); (2) Jercmiah, by Ghislerus, 1623; (8) Minor Prophets, by Mereerus, 1559, Tremellius, 1567, and Figueiro, 1615; (4) Hosea, Joel, and Amos, by Quinquar- boreus, 1556; (5) Obadiah, by Bedwell, 1601, and Leusden, 1656; (6) in English—Isaiah, by Pauli (London, 1871, 8vo). (D) Besi the general literature mentioned under “ Onkelos” (in fine), we m mention Frankel, Zum Targum der Propheten (Breslan, 1872, 4to), whieh must be used with caution. ; 1 See T. B., Megillah, 21a, and also Rashi on T. B., Ta’anith, leat 18a. Zunz is greatly mistaken when he says (Gott. Vortr., p. 64) that the Targums on Psalms, Job, and Proverbs have one and the same linguistic character. The Targum on Proverbs is alinost pure Syriac,

12 See the Targun itself on Psalm Ixxvi. 11.

13 There, no doubt, existed another Targum on this book, older than that now in our hands; see Ber. Rabd,, xeiii.

MW See the extant Targum on Job xxiv. 19, and comp. note 19 infra.

5 See R. Nathan b. Yehiel’s ‘Arukh, sv. NOOD, A “ Yerushalmi Targum ” presupposes at least one other.

‘6 The Targum on the Five Megilloth has all one eharacter, and ig therefore wholly Yerushalni.

7 The Targum itself repeatedly quotes another Targum.

18 Sec Rashi on T. B., Megillah, leaf 130, eatchword D3}. We have still two Targums on Esther. It ought to be mentioned here that in the post-Talmudic Massekheth Sopherum, xiii. 6, an Aramaic translation of Esther iii. 1 is given with the introductory words; D3 4D 37 (‘Rab Yoseph targumized ”). This somewhat lengthy translation is found (the quotation from the Targum on Proverbs exeepted) almost verbatim in the Targum Sheni in Loe.

79 The book of Lamentations, and consequently a Targum thereon was no doubt used along with the book of Job and the Targunl thereon, by mourners. See Sehiller-Szinessy, Catalogue, i. p. 27.

20 See Munk, “ Notice sur Saadia ” (Cahen, La Bible: Isaie, Paris, 1838), p. 159. His ingenious remarks are seareely borne out by fact,

71 From a late name oeeurring in a book no conclusions must be drawn, as isolated words may be a mere interpolation. The internal charaeter of a work must deeide the age in which it was eonrposed,

2 Bibliography.—(A) There are MSS. of the Targum—(1) on the Psalms, in Parma (De-Rossi, 31, 32, 732) and Paris (110); (2) on Proverbs, in Parma (31, 32) and Paris (as before) ; (8) on Job, in Parma (81, 32) and Paris (as before) ; (4) on the Five Megilloth, in the Court Library of Vienna (xxix.), Parma (31, 82), the Bod- leian (Uri 1, 44), Cambridge (Add., 436); and (5) on Chronieles in the Vatican (Urb. i.), the Erfurt ministerial library, Cambridge (E 5, 9), and the Bodleian (Uri 35, 36). (B) The earliest editions of the Targum on the Hagiographa (except on Daniel, Ezra-Nehemiah, and Chronicles) are the Rabbinie Bibles, and on Chronicles those of 1680-83 by Beck and 1714 by Wilkins. (C) Translations :—(a) in Hebrew— the Targum Sheni—(1) Leshon Zahab (Const., 1782), and (2) Path- shegen hakkethab (Amst., 1770, repr. at Czernowitz, 1838),—all 8v0; (2) in Latin—(1) on the Psalms, by Aug. Justinianus, and again by Arias Montanus ; (2) on Proverbs, by Alphonsus Zamorensis; (3) om Job, by the same; (4) on Cantieles, by the same, and again by Schreckenfuchs (Basel, 1553, 8vo); (5) on Ruth, by Arias Montanus,

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State of Teat.—The Targum text is, taken as a whole, in a very corrupt state. The causcs of this corruption are many, but chiefly ‘the following :—(1) mistakes ordinarily made by scribes through ‘carelessness, or ignorance, or both; (2) the Targums had passed ‘from century to century and from country to country without ‘having been written down ; (3) when written down they were prob- me not provided with vowel-points at once ; (4) when provided with vowel-points most of them were first provided with Babylonian (or Assyrian), which afterwards were changed into Palestinian ones ; ‘this change was a fertile source of fresh mistakes ; (5) the loss of ‘the general knowledge of the Targumic idiom contingent on the ‘decline and final fall of the institution of publicly reciting the Targum was an additional source from which mistakes arose ; (6) conjectural cmendations contributed their quota to the corruption of the text ; (7) Buxtorf’s emendations founded on the diction of the Biblical Targum (as suggested in the Mcthurgeman) arc a gross : inasmuch as they lack the criticism of history; (8)

printers’ mistakes, increasing in every new edition, have all but ruined the text. The remedies for this corruption are :—(1) good Targum MSS. in private hands and public libraries, notably in Italy, Germany, and England ; (2) Targum MSS , according to the Babylonico-Assyrian system of punctuation, chiefly preserved in South Arabia, Russia, and England; (3) some early and com- paratively good printcd editions ; (4) the Aassoreth of the Targum. Value of the Targums.—The idea so long entertained, even by the learned, that these old versions were valuable chiefly as guides to the original readings of the sacred text must be given up. All of them contain more or less, whether visible at first sight or not, certain paraphrastic elements, which give no absolute security for the exact reading of the pristine Hebrew tcxt But besides their importance as linguistic monuments they have the highest value as historical records—(1) of the exegesis which obtained at the time of their composition, and (2) of the then current manners, thoughts, and aspirations both of the Jews and of the surrounding nations, ! i? _(8. M. 8.~~S.) TARIFA, a seaport of Spain, in the province of Cadiz, at the extreme south point of the Peninsula, 59 miles south~~ east from Cadiz and (by land) 21 miles west-south-west from Gibraltar. The town is nearly quadrangular, with narrow crooked streets, and is still surrounded by its old Moorish walls. On its east side, just within these, stands | the aleazar. The rocky island in front of the town, con- nected with the mainland by a

causeway, is strongly forti- \fied, and in some sense commands the Strait of Gibraltar. It has a lighthouse, 135 feet high, which has a range of 30 miles. The population within the municipal limits was 12,234 in 1877. Anchovy and tunny fishing is carried on, and there is some coasting trade. The manufactures (leather and earthenware) are unimportant. The oranges of Tarifa are famed for their sweetness. Tarifa is the Julia Joza of Strabo, between Gades and Belon,) which, according to that writer, was colonized by Romans and the ‘removed inhabitants of Zelis in Mauretania Tingitana. The Julia Transducta or Traducta of coins and of Ptolemy appears to be the same place. Its present name (Arabic Jaztrat Tarif) is derived from Tarif, the forerunner of Tarik (see vol. xvi. p. 578). , After a long siege it was taken from the Moors in 1292 by Sancho _IV. of Castile, who entrnsted it to the keeping of Alonzo Perez

Quinquarboreus (Paris, 1556, 4to), Mercerus (Paris, 1564-65 ; revised 1657); (6) on Lamentations, by Alph. Zam., by Quinquarboreus (Paris, 1549, 4to), by Ghislerus (Leyd., 1623, fol.), and again by jlaylerus (Lond. 1651, 4to); on Ecclesiastes, by Ar. Mont., by Schreckenfuchs (Basel, 1555, 8vo), and again by Costus (Leyden, 1554, 4to); (7) on Esther, by Ar, Mont. (1572, folio); (8) Chronicles by Beck from the Erfurt MS. (imperfect, Augsb., 1680-83), and by Wilkins from the Cambridge MS. (Amst. 1715); (c) in German— (1) on the Five Megilloth, by R. Ya‘akob b. Shemuel (Breisgau, 1584, 4to); (2) on the Targum Sheni, by David Ottensosser (Sulzbach, (1820, 8vo). (D) Commentaries:—(a) in Hebrew—(1) on the Targum ot the Five Megilloth, by R. Elyakim Rothenburg (Prague, 1618) ; | (2) on Esther alone, by R. Shemuel Makshan (Prague, 1601, 4to); (3) on thesame Targum, by R. David b. Yehudah Melammed (Cracow, 1644, 4to) ; on the Targum Sheni, by R. David b. Ya’akob (Prague, ce 4to); (6) in Spanish—on Canticles, by R. Mosheh Laniado (Venice, 1619, 4to).

) ‘R, Yehudah Ibn Koreish fully understood the value of the Targums, See his interesting epistle, addressed to the Jewish com- Muuity of Fez, published at Paris (1857, 8vo), under the name of Epistola de Studii Targum Utilitate. A translation of the intro- auctory part (by Wetzstein) is given in the LZ. B. OF iimcal, 29 eS by Dr Berliner, 7. O., p. 168 sq.). Ibn Koreish belonged to the 9th century, and not, as Berliner says, to the 10th or 11th; or was he a Karaite as Graetz (v. p. 293) half believes. ;

de Guzman ; the heroic defence by the latter, commemorated in the Romancero, earncd for him the name of Guzman ‘“‘el Bueno.” It was in the defence of Tarifa that Alfonso XI. gained the battle of Salado, a short distance to the westward, in 1340. The place was successfully defended against the French by Gough,in 1812. TARN, a department of southern France, formed in 1790 of the three dioceses of Albi, Castres, and Lavaur, all belonging to the province of Languedoc, lies between 42° 23’ and 44° 12’ N. lat. and 1° 32’ and 2° 56’ E. long. It is bounded N. and E. by Aveyron, S.E. by Hérault, S. by Aude, S.W. and W. by Haute-Garonne, N.W. by Tarn-et-Garonne. The slope of the department is from east to west, and its general character is moun- tainous or hilly; its three principal ranges, the Mountains of Lacaune (peak of Montalet, 4154 feet), the Sidobre, and the Montagne Noire, belonging to the Cevennes, lie on the south-east. The stony and wind-blown slopes of the first- named are used for pasturage. The highest point of the range and of the department is the Pic de Montalet (4154 feet) ; several other summits are not much short of this. The granite-strewn plateaus of the Sidobre, from 1600 to 2000 feet high, separate the valley of the Agofit from that of the Thoré. The Montagne Noire derives its name from the forests on its northern slope, and some of its peaks are from 3000 to 3500 feet high. The limestone and sandstone foot-hills are clothed with vines and fruit trees, and are broken by deep alluvial valleys of extra-ordinary fertility. With the exception of a small portion of the Montagne Noire, which drains into the Aude, the whole department belongs to the basin of the Garonne, —indeed, if the rivulet Giron be excepted, to that of the Tarn, which flows in a westerly direction past Albi, Gaillac, Lisle, and Rabastens, receiving on the left the Agofit at St Sulpice. Northern Tarn is drained by the Aveyron and its tributary the Viaur. The eastern portion of the department has the climate of Auvergne, the severest in France, but that of the plain is Girondin. At Albi the mean temperature is 55°, and the rainfall 29°5 inches.

The population of the department in 1886 was 358,757.

Of the total area of 2217 square miles, or 1,418,969 acres, there are 887,709 acres of arable land, 118,071 of meadows, 118,934 of vineyards, 186,594 under wood, and 52,408 of moorland. By last returns there were 11,360 horses, 3280 mules, 5430 asses, 20,550 bulls and oxen, 58,900 cows and heifers, 18,240 calves, 455,500 sheep (wool-clip in 1878 1209 tons), 87,700 pigs, 5350 goats, and 17,190 bee-hives. In 1878 37 tons 14 ewt. of silk cocoons were pro- duced. Oxen and sheep are fattened; ewes' milk cheese like that of Roquefort is made; and geese and turkeys are reared. The crops in 1881 were—wheat, 3,429,112 bushels; meslin, 53,118 ; rye, 1,371,040; barley, 37,730; buckwheat, 8448; maize and millet, 1,566,873; oats, 538,422; potatoes, 2,554,860; dry vegetables, 374,715; chestnuts, 268,125; beetroot, 196,625; 782 tons of hemp; 476 of flax; 9,676,476 gallons of wine (only half the quantity of the previous year, owing to the phylloxera). Both common and anal table wines are produced.

The mineral products include marble, porphyry, granite, lime, manganese, sulphate of baryta, alum, iron, lignite, and tourmaline. In 1881 335,430 tons of coal were taken from seven pits, and other mines are about to be opened. There are iron, alkaline, thermal, and carbonate of lime springs. The chief ccutre for the manu- facture of woollen stuffs (in 1875 287 mills, 6457 workmen, and 98,615 spindles) and for wool-spinning and weaving (4893 machine and hand looms) is at Mazamerrt (q.v.), but all sorts of woollen and cotton stufls are produced in other localities. Other industrial products are woollen hosiery, cotton, silk, and linen thread, morocco, hats, earthenware, glass, soap; and there are tanneries, distilleries, flour-mills, breweries, dye-works, sawiills, printing- works, and numerous limekilns, In 1881 929 tons of steel and 1947 tons of iron of various kinds were produced. The Tarn is navigable for 43 miles; there are 208 miles of national roads, 4274 of other roads, and 120 of railway. The department forms the diocese of Albi, and belongs to the 16th corps d'armée (Montpellier), and the court of appeal is at Toulouse. The chef-lieu is Albi. There are 4 arrondissements (Albi, Castres, Gaillac, Lavaur), 35 cantons, and 318 communes.

TARN-ET-GARONNE, a department of south-western France, was formed in 1808 of districts formerly belonging

i to Guienne and Gascony (Quercy, Lomagne, Armagnac, Bi

Rouergue, Agenais), with the addition of a small piece of Languedoc. From 1790 to 1808 it was divided between the departments of Lot, Haute-Garonne, Tarn, Aveyron, Gers, and Lot-et-Garonne. Lying between 43° 47’ and 44° 25’ N. lat. and 0° 55’ and 1° 58’ E. long., it is bounded on the N. by Lot, on the E. by Aveyron, on the S. by Tarn and Haute-Garonne, and on the W. by Gers and Lot-et-Garonne. The Garonne and its tributary the Tarn unite a few miles below Moissac, and separate the elevated lands to the north, which belong to the Cevennes and the central plateau, from those to the south, which are a continuation of the plateau of Lannemezan. The principal tributary of the Tarn on the right is the Aveyron, the affluents of which run through remarkably parallel valleys from north-east to south-west. The general slope of the department is from east to west; the highest point (1634 feet) is on the border of Aveyron, the lowest (164 feet) where the Garonne leaves it. The winter temperature is 37° F., that of spring and autumn 54° F., and that of summer 72° F. Rain falls seldom, but heavily, espe- cially in spring, the annual rainfall being 28-9 inches.

Of a total area of about 1436 square miles, or 919,265 acres, arable land occupies 552,708 acres, meadows and grass 45,078, vineyards 102,849, woods 115,429, moorland and pasturage 41,819. The returns in 1883 showed 2,167,000 bushels of wheat, 35,062 of meslin, 62,975 of rye, 77,000 of barley, 2,722,500 of oats, 759,000 of maize, 1,867,250 of potatoes, 35,468 tous of beetroot, 172 tons 8 cwt. of colza sced, 399 tons of hemp, 394 tons of flax, 250,788 tons of fodder, 12 tons 15 cwt. of silk cocoons, 20,048,380 gallons of wine. The live stock in 1881 included 14,336 horses, 1680 mules, 2120 asses, 89,295 cattle of various descriptions, 116,349 sheep, 1358 goats, 32,375 pigs ; 6847 beehives gave 25 tons 13 cwt. of honey and 8 tons 2 cwt. of wax. There are 57 quarries, employ- ing 426 workmen, where phosphates of lime, lithographic stone, freestone, potters’ clay, gypsum, and schist for slating are worked, as are also iron and copper. The manufacturing industry is repre- sentcd by flour-mills, various kinds of silk-mills (1817 workmen), and manufactories of

linen, wool, and paper. Much fruit is grown, and the principal exports are fresh fruit, wine, flour, phosphates, lithographic stone. ‘There are 83 miles of waterway, including 48 of canal, 156 miles of national roads, 3515 of other roads, 127 of rail- way lines, the centre of which is Montauban. Tarn-et-Garonne is oue of the least densely peopled departments of Francc: in 1886 there were 214,046 inhabitants, and their number is decreasing. Except some 10,000 Calvinists, all are Roman Catholics. The department forms the diocese of Montauban, and belongs to the jurisdiction of the Toulouse court of appeal and to the district of the 17th corps darmée (Toulouse). It has 3 arroudissements (Montauban, Moissac, and Castel-Sarrasin), 24 cantons, and 194 communes.

TARNOPOL, a market-town in Galicia, Austria, on the Sereth. It was formerly a fortress, and rendered valuable services to Polish kings, who, in their turn, conferred upon it important privileges. The town enjoys a brisk trade in grain and wine, and has some sugar factories. Its yearly horse fairs are famous throughout the country. The popu- lation in 1885 was 27,000, about half of them Jews.

TARPAULIN is a waterproof sheeting consisting of a stout canvas cloth impregnated and coated with tar. It is employed for covering hatchways and other openings into the holds of vessels, for making covers for railway and other waggons and farm ricks, and generally for protecting bulky goods and structures from weather and damp. Many waterproof compositions other than tar are used for similar purposes, the principal ingredients being solutions of india-rubber, gutta-percha, and various resinous bodies combined with pigments. See WATERPROOFING.

TARQUINII. See Errvurta, vol. viii. p. 634.

TARQUINIUS PRISCUS, Luctus, fifth legendary king of Rome, is represented as the son of a Greek refugee who removed from Tarquinii in Etruria to Rome, by the advice of his wife, the prophetess Tanaquil. Appointed guardian to the sons of Ancus Marcius, he succeeded in supplanting them on the throne on their father’s death. It was he who first established the Circus Maximus, built the great cloacz, and founded the triple temple on the

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Capitol,—the expense of these vast works being defrayed by plunder seized from the Latins and Sabines. Many of the ensigns both of war and of civil office are assigned to his reign, and he was the first to celebrate a Roman triumph, after the Etruscan fashion, in a robe of purple and gold, and borne on a chariot drawn by four horses, After a reign of thirty-eight years he was assassinated by the contrivance of the sons of Ancus Marcius, but Tanaquil had influence enough to secure the succession to Servius Tullius, his son-in-law. See vol. xx. p. 733, TARQUINIUS SUPERBUS, Lucius, son of the pre. ceding, and son-in-law of Servius Tullius, immediately succeeded the latter without any of the forms of election, and proceeded at once to repeal the recent reforms in the constitution, seeking to establish a pure despotisin in their place. Wars were waged with the Latins and Etruscans, but the lower classes were deprived of their arms, and employed in erecting monuments of regal magnificence, while the sovereign recruited his armies from his own retainers and from the forces of foreign allies. The com- pletion of the fortress temple on the Capitoline confirmed his authority over the city, and a fortunate marriage of his son to the daughter of Octavius Manilius of Tusculum secured him powerful assistance in the field. His reign was characterized by bloodshed and violence ; the outrage of his son Sextus upon Lucretia precipitated a revolt, which led to the expulsion of the entire family, after Tarquin had reigned twenty-five years. All efforts to force his way back to the throne were vain, and he died a lonely and childless old man at Cume. See vol. xx. p. 734. TARRAGONA, a maritime province in the north-east of Spain, with an area of 2451 square miles and a popu lation in 1877 of 330,105, was formerly part of the province of Catalonia. It is bounded on the S.E. by the Mediterranean, on the N.E. by Barcelona, on the N. by Lerida (the Sierra de Almenar), on the W. by Saragossa and Teruel, and on the S.W. by Castellon-de-la-Plana, The Ebro flows through the southern portion of the pro- vince, and the other chief streams are the Gaya and the Francoli. The district, although mountainous, is the rich- est in Catalonia. The hills are clothed with vineyards, which

produce excellent wines, and in the valleys are cultivated all kinds of grain, vegetables, rice, hemp, flax, and silk. Olive, orange, filbert, and almond trees reach great perfection, and the mountains yield rich pastures and timber trees of various kinds. Manufactures are well advanced, and comprise all textile fabrics, soap, leather, and spirits. There are also several potteries and coop- erages, and flour, paper, and oil mills. Silver, copper, lead, and barytes are plentiful, and quarries of marble and jasper are worked in the hills. The military government of the province is dependent on the captaincy-general of Catalonia. For administrative purposes the district is divided into eight partidos judiciales, containing 186 ayuntamientos, and returns three senators and eight . deputies to the cortes. Besides the capital, the towns in the province with more than 10,000 inhabitants are Reus (27,691), Tortosa (23,808), and Valls (13,256). TARRAGONA, the capital of the above province, 1s a flourishing seaport, the seat of an archbishopric, at the mouth of the Francoli, 63 miles by rail west-south- west of Barcelona, in 41° 10’ N. lat. and 0° 20’ E. long,, with a population of 23,046 in 1877. The picturesque but badly built older portion of the town stands on the steep slope of a hill 760 feet high, and is still surrounded by walls of Roman (in parts Cyclopean) origin. Below the walls a kroad street, the Rambla, divides the upper from the lower town, which hag been more regularly built in modern times along the low promontory which stretches out into the Mediterranean. The city is most beautifully situated, and

{ vains considerably in effect from its magnificent cathedral, one of the noblest examples of early Spanish art. It is 300 feet in length and 100 feet in breadth, and consisted priginally of a nave, aisles, transepts with an octagonal antern at the crossing, and an apsidal chancel. Several xterior chapels have been added in later times, and on he south-east stands a 14th-century steeple raised on a Romanesque tower. The east end was probably begun in 1131 on the ruins of an earlier church, but the main body ¢ the building dates from the end of the 12th century und the first half of the 13th, and is of transitional char- acter,—the exuberant richness of the sculptured capitals eing admirably kept in subordination by the Romanesque simplicity of the masses. Considerable changes were in- troduced at a later date; and the present west end of the ave cannot have been completed till late in the 14th century. On the north-east side is a cloister contemporary with the church, with which it communicates by a

very fine Boorway. The cloister contains much remarkable work, nd the tracery of the windows bears interesting marks of Moorish influence. Two other noteworthy churches in the lity are San Pablo and Santa Tecla la Vieja, both of the 12th century. The mole, begun in 1491, was chiefly constructed out of the Roman amphitheatre, of which a few ‘rows of seats can still be seen on the sea-shore. The ‘remains of a Roman aqueduct form a picturesque feature in the landscape. The Carcel de Pilatos is said to have been the palace of Augustus Czesar; it was partly destroyed by Suchet, and now serves as a prison. The museum con- tains a collection of the Roman antiquities which are con- tinually being discovered during excavations.

The trade is steadily increasing. During 1885 the vessels cleared ‘amounted to 377,250 tons (45,795 tons British, 47,181 French, ‘and 42,617 Swedish and Norwegian). The exports were valued ‘at £1,289,533 (wine £1,023,847), and the imports at £1,237,012. The exports were mostly to France, Great Britain, and the River Plate; the imports were chiefly from Germany, Russia, France, ‘and Sweden. There is communication by rail with Barcelona, ‘Valencia, and Lerida, and by steamer with other ports of Spain.

Tarraco was one of the earliest strongholds of the Romans in Spain, and became a colony (of Julius Cesar), the capital of His- pania Citcrior, and the richest town on the coast. To the Romans the Visigoths under Euric succeeded in 467, but on their expulsion ‘by the Moors in 710 the city was razed to the ground. It was long _ before the ruins were again inhabited, but by 1089, when the Moors were driven out by Raymond IV. of Barcelona, there must have {been a certain revival of prosperity, for the primacy, which had {18 removed to Vich, was in that ycar restored to Tarragona. In

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1118 a grant of the fief was made to the Norman Robert Burdet, ‘who converted the town into a frontier fortress against the Moors. In 1705 the city was taken and burned by the English, and a cen- tury later, after being partly fortified by them, it was captured and sacked by the French in 1811 under Suchet.

| TARSHISH. See Pranicta, vol. xviii. p. 806.

TARSUS, now Tarsts, an ancient city in the fertile plain of Cilicia, lay on both sides of the Cydnus, whose cool and swift waters were the pride of the city (Dio Chrys., vol. ii. p. 2, Reiske's ed. ; Vita Apollon., i. 7), and bore traffic to and from the port of Rhegma. In the time of Xenophon (Anab., i. 2. 23) Tarsus was already great and flourishing, and was the residence of the vassal king of Cilicia. Its civilization at this time seems to have been

, mainly Semitic, as was to be expected from the geograph- ical relations of Cilicia, which have generally associated | its history with that of Syria. We have coins of Tarsus | (nn) of the Persian period, bearing Aramaic inscriptions; 'and the deities of the town, known in later times as | Heracles, Perseus, Apollo, Athena (Dio Chr., ii, 22), seem _to have been akin to those of the Phcenicians and Syrians \ (see below). The Semitic influence was doubtless very ancient ; indeed, the Assyrians invaded Cilicia in the 9th | century B.c., at which date Tarsus is perhaps mentioned 'on the monuments under the name of Tarzi (Schrader, : Keilinschr. und Gesch., 1878, p. 240; the reading is not

certain). After Tarsus was Hellenized the citizens learned to boast that they were Argives sprung from the com- panions of Triptolemus (Strabo, xiv. 5. 12; Dio Chr., ii. 20), and the town became the seat of a famous school of philosophy which was frequented almost exclusively by natives, but sent forth teachers as far as Rome itself.1 More than one of these philosophers, notably Athenodorus the teacher of Augustus, and Nestor the teacher of Marcellus, held the chief magistracy of the city. Athenodorus and his predecessors were Stoics, but Nestor was an Academic (Strabo, xiv. 5. 14),? so that the Platonic philosophy is that with which Paul would probably have come in contact if he gave heed to the Greek wisdom of his native city. Presumably, however, he formed no higher opinion of the culture of Tarsus than did his con- temporary Apollonius of Tyana, whose testimony as to the character of the citizens (Vit. Ap., i. 7) is confirmed by Dio Chrysostom. 'Tarsus had made rapid material pro- gress since Cilicia became Roman (66 B.c.). It was the capital of a rich province, and had received freedom from Antony, and from Augustus the dignity of a metropolis and important

immunities for its commerce (Dio Chr., ii. 36). The inhabitants were vain, effeminate, and luxurious, more like Pheenicians than Greeks. Their sensuous Hastern religion in these golden days of affluence had more attrac- tion for them than the grave philosophy of the Porch ; and the legend supposed to be graven on the statue of Sardana- palus, at the neighbour city of Anchiale, “let us eat and drink, for to-morrow we die,” which Paul quotes in 1 Cor. xv. 32, might have been the motto of the mass of the townsmen.2 At Tarsus the emperor Tacitus died, and Julian was buried. The city was deserted and lay waste during the frontier wars of Greeks and Arabs in the first century of Islam; a Moslem general, who saw the ruins, estimated its former population at 100,000 (Beladhort, p. 169). It was rebuilt and settled as a military colony and frontier post by Harun al-Rashid in 787 a.D., and became a starting point of forays against the Christians. On such a campaign the caliph Ma’miin died, and was buried at Tarsus (833), having caught a fever, like Alexander the Great, by bathing in the cold Cilician waters. Tarsus was temporarily recovered to Christendom by Nicephorus Phocas, and again by the crusaders under Baldwin. Finally it remained in the hands of the Turks.

The Heracles of Tarsus was the Cilician god Sandan. Dio Chrysostom calls him the apynyds of the Tarsians (ii. 23), and he may be identified with the Baal of Tarsus named on the coins already spoken of. He was worshipped by the periodical erection of “a very fair pyre” (cbid.), a rite presumably analogous to that described in the De Dea Syria, ch. 49; and the remarkable ruin of Déniik-tash, a vast court with massive walls enclosing two lofty platforms of concrete, probably marks the site of his sanctuary (see Perrot and Chipiez, Hist. del’ Art, iv. 586 sq., and Langlois, Voyage dans la Cilicie, p. 265 sq.). A tradition making Sandan the founder of Tarsus is given by Ammianus (xiv. 8. 3); and, as the Greeks appear to have taken clements of the myth of Sandan (including the pyre) into their legend of Sardanapalus, this explains the current story that Sardanapalus founded Anchiale and Tarsus in one day (Arrian, ii. 5,2; Athen., xii. p. 529 sq.). On Sandan, see K. O. Miiller, in Rhein. Mus., 1829, and E. Meyer, in Z. D. M. G., 1877, p. 736 sg. Another account in Amniianus makes Perscus the founder of Tarsus, aud it appears from Dio Chir. that he was almost or quite as much honoured. The footprint of Pegasus was shown at Tarsus (Avienus, 1031 sg.; comp. Dio, ii. 24), and his tapods (wing?) was said to have fallen

there (Alex. Polyh. in Steph. Byz., s.v.). This worship reappears at Joppa. Apollo “ with the trident” had a sacred sword at Tarsus, which could be cleansed only by the water of the Cydnus (Plut., Def. Orac., 41), and is probably the same as the harpe shown on coins of Hadrian’s time; if so, he is presumably a differentiated form of Perseus.

1 To Strabo’s list must be added Zeno, the successor of Chrysippus.

2 Lucian, Macrob., 21, makes him a Stoic and teacher of Tiberius.

3 Atheneus, v. p. 215, tells of an Epicurean philosopher, Lysias, who, becoming priest of Heracles, became tyrant of the city, taxing the rich to provide largesses for the poor. The fact is probable, the date quite uncertain.

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The worship of Athena may be connected with the statement of Athenodorus (the famous philosopher of Tarsus) that the ancient name of the city was Parthenia (Fr. Hist. Gr., iii. 487); Abydenus in Eusb., Chron., p. 85, ed. Schéne) ascribes the foundation of her temple with its brazen columns and of the city itself to Sennacherib. Thus with the Baal of Tyre there was worshipped an unmarried goddess, as in so many shrines of Syria and Asia Minor. Dio Chr., il. 2, speaks also of Titans as lords of the city. The reference is to Japetus (Japhet ?), grandfather of Cydnus (Athenodorus, wé sup.).

TARTAGLIA, Nicco1 (c. 1500-1557), a self-taught mathematician, was born at Brescia about 1500. His father, Michele Fontana, was a postal messenger between Brescia and the neighbouring towns, who, dying in 1506, left two sons and a daughter to the care of their penniless mother. Niccold’s childhood was accordingly passed under the stress of dire poverty, and was marked by a cruel misfortune. During the sack of Brescia in 1512 he was, in the cathedral where he had vainly sought a refuge, horribly mutilated by some infuriated French soldiers. His skull was laid open in three places, his palate cloven, both jawbones fractured. Yet he recovered with no further assistance than his mother’s patient care. He, however, long continued to stammer in his speech, whence the nickname, adopted by himself, of “Tartaglia.” His education remains a mystery. Save

for the barest rudi- ments of reading and writing, he tells us that he had no master ; yet we find him at Verona in 1521 an esteemed teacher of mathematics. In 1534 he transferred his residence to Venice, and was there met by Antonio del Fiore with a challenge to one of the intellectual duels then customary. Del Fiore relied on his possession of an undivulged formula by Scipione del Ferro for the solution of a particular case of cubic equations. But Tartaglia had attained in 1530 similar result, which he now, in Feb- ruary 1535, greatly extended. His consequent triumph over his adversary gave him a high reputation, and his house became the resort of the learned of all grades and nations. The mystery in which he chose to shroud his method of dealing with cubic equations promised him a highly effective weapon in future contests, as well as leisure to perfect, before publishing, the coveted rules. But in 1539 Cardan enticed him to Milan, and there, by unremitting solicitations, procured from him the rude verses in which he had enshrined his discovery (see ALGEBRA, vol. i. p. 513). The Milanese physician's breach of his oath of secrecy gave rise toa bitter and lifelong quarrel, the most conspicuous incident in which was a public disputation at Milan, August 10, 1548, at which Cardan shrank from appearing. In 1548 Tartaglia ac- cepted a situation as professor of Euclid at Brescia, but returned to Venice at the end of eighteen months. He died at Venice December 13, 1557. Acrid and emulous in disposition, he incurred abundant enmities; yet his honesty, uprightness, and the morality of his life remain unimpeached. He was keen-witted, diligent, and ingenious, and by his discoveries in the solution of equations helped to initiate the rapid progress of modern mathematics.

Tartaglia's first printed work, entitled Nova Seientia (Venice, 1537), dealt with the theory and practice of gunnery, to which his attention had been drawn in 1581 by the question of a bombardier at Verona as to the elevation giving the greatest range. He easily found it to be 45° (true only im vaewo), but failed to demonstrate the correctness of his intuition. Indeed, he never shook off the erroncous ideas of his time regarding the paths of projectiles, further than to see that no part of them could be a straight line, He nevertheless inaugurated the scientific treatment of the subject, and his propositions reappeared in most ballistical treatises down to Blondel's in 1688. The publication of the Nova Seientia was determined by the menacing attitude of Soliman II. Unless in the interests of Christendom,

Tartaglia regarded it as a crime to promote arts of destruction. Inquiries rendered lawful by necessity were, however, resumed in his Quesiti et Invenzioni Diverse, a col- lection of the author's replies to questions addressed to him by persons of the most varied conditions, published in 1546, with a dedication to Henry VIII. of England. Problems in artillery

occupy two out of nine books; thesixth treats of fortification; the ninth gives several examples of the solution of equations of the third degree. His last years were full of activity. He published — in 1551 Regola Generale per sollevare ogni affondata Nave, intitolata

la Travagliata Invenzione (an allusion to his personal troubles at Brescia), setting forth a method for raising sunken ships, and describing the diving-bell, then little known in western urope. He pursued the subject in Ragionamenti sopra la Travagliata Invenzione (May 1551), adding a table of specific gravities. Of his largest work, entitled General T'rattato dt Numeri ¢ Misure, two parts appeared at Venice in 1556, the remaining four post- humously in 1560. This is a comprehensive mathematical treatise, including arithmetic, geometry, mensuration, and algebra as far as quadratic equations. He designed to embody the results of his original investigations in a separate form; but his Algebra Nova remained unwritten. He published the first Italian translation of Euclid (1543) and the earliest version from the Greek of some of the principal works of Archimedes (1543). These included the tract De Insidentibus Aquex, of which his Latin now holds the place of the lost Greek text. An Italian version of it is appended to his Ragionamenti. Tartaglia was the first Italian writer on forti-

fication, and claimed the invention of the gunner's quadrant.

Tartaglia''s own account of his early life is contained in his Quesit?, lib. vi. p. 74, See also Bittanti's Discorso di Niccold Tartaglia, Brescia, 1871; Buoncom- pagni, Intorno ad un Testamento inedito di N. Tartaglia, Milan, 1881; Libri, Hist. des Sciences Mathématiques, t. iii. p. 149; Montucla, Hist. des Math., vol. i. p. 567 ; Marie, Hist. des Sciences, t. ii. p. 242; Hankel, Zur Gesch. d. Math., 1874, p. 860; Rossi, Elogi di Bresciani Illustrt, p. 886. Tartaglia's writings on gunnery were translated into English

by Lucar in 1588, and into French by Rieffel in 1845. Thos. Salusbury published (London, 1564) an English version of ‘his Travagliata Invenzione, and a selection from his writings appeared at Venice in 1606 with the title Opere del Famosissimo Niccolo Tartagléa, 1 vol. 8vo.

TARTAN is a worsted cloth woven with alternate stripes or bands of coloured warp and weft, so as to form a chequered pattern in which the colours alternate in “sets” of definite width and sequence. The weaving of particoloured and striped cloth cannot be claimed as peculiar to any special race or country, for indeed such checks are the simplest ornamental form into which dyed yarns can be combined in the loom. But the term tartan is specially applied to the variegated cloth used for the principal portions of the distinctive costume of the High- landers of Scotland. For this costume, and the tartan of which it is composed, great antiquity is claimed, and it is asserted that the numerous clans into which the Highland population were divided had each from time to time a special tartan by which it was distinguished. After the rebellion of 1745 various Acts of Parliament were passed for disarming the Scottish Highlanders and for prohibiting the use of the Highland dress in Scotland, under severe penalties. These Acts remained nominally in force till 1782, when they were formally repealed, and since that time clan tartan has, with varying fluctuations of fashion, been a highly popular article of dress, by no means con- fined in its use to Scotland alone; and many new and imaginary “sets” have been invented by manufacturers, with the result of introducing confusion in the heraldry of tartans, and of throwing doubt on the reality of the distinctive “sets” which at one time undoubtedly were more or less recognized as the badge of various clans. The manufacture has long been carried on at Bannockburn, in the neighbourhood of Stirling, and it still continues to be a feature of the local industries there.

Undoubtedly the term tartan was known, and the material was woven, “‘of one or two colours for the poor and more varicd for the rich,” as early as the middle of the 15th eentury. In the accounts of John, bishop of Glasgow, treasurer to King James ITI. in 1471, there occurs, with other mention of the material, the following :—‘‘ Ane elne and ane halve of blue Tartane to lyne his gowne of cloth of Gold.” It is here obvious that the term is not restricted to particoloured chequered textures.!_ In 1538 accounts were

incurred for a Highland dress for King James V. on the occasion of a hunting excursion in the Highlands, in which there are charges for ‘‘ variant cullorit velvet,” for ‘‘ane schort Heland coit,” and for ‘‘Heland tartane to be hose to the kinge’s grace.” Bishop Lesley, in his De Origine, Moribus, et Rebus Gestis Scotorum, published in 1578, says of the ancient and still-used dress of the Highlanders and islanders, ‘fall, both noble and common people, wore mantles of one sort (except that the nobles preferred those of several colours).” George Buchanan, in his Rerum Scoticarum

? Neither so is it in the French tiretaine or in the Spanish tiritafta.

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Historia (1582), as translated by Monypenny (1612), says of the Highlanders, ‘‘they delight in marled clothes, specially that have any long stripes of sundry colours; they love chiefly purple and blue. Their predecessors used short mantles or plaids of divers colours sundry ways divided ; and amongst some the same custom) is observed to this day.” A hint of clan tartan distinctions is given by Martin in his Western Isles of Scotland (1703), which work also contains a minutc description of the dress of the High- landers and the manufacture of tartan. ‘‘ Every isle,” he observes, “ differs from each other in their fancy of making plaids, as to the stripes in breadth and colours. This humour is as different through the mainland of the Highlands, in so far that they who have seen those places is able at the first view of a man’s plaid to guess the

place of his residence.”

See W. and A. Smith, Tartans of the Clans of Scotland, 1850; J. Sobieski Stuart, Vestiarium Scoticum, 1842; R. R. M‘lan, Clans of the Scottish Highlands, 1845-46 ; J. Grant, Tartans of the Clans of Scotland, Edinburgh, 1885.

TARTARIC ACID, in its ordinary acceptation, refers to one acid, (C,H,O,)H,, which occurs in most acid fruit juices, in association generally with malic or citric, or both. Grape-juice owes its sourness almost entirely to acid tartrate of potash. While the juice ferments into wine, the greater part of the acid tartrate separates out, along with tartrate of lime, colouring

matter, and other impurities, as a hard crust adhering to the sides of the cask. Such impure acid tartrate of potash is known commercially as “argol.” It was known to the Greeks as zpvé, to the Romans as fx wm. The alchemists from the 11th century called it tartarus, which name has survived in familiar chemical parlance to this day. The true constitution of ¢artarus vint was discovered by Scheele in 1769. He was the first to isolate the acid from its acid potash salt by a method which is still used for its industrial extraction.

Manufacture.—Crude tartar (10 to 14 ewts.) is placed in a tank, and dissolved in sufficient water with the help of steam. The surplus acid is then neutralized by addi- tion of powdered chalk, and precipitated as lime salt :-—

2(CH 0.) KH = (C,H 09K, + (C,1,0,)H 5

normal salt, acid. (C,H,0,)H, + Ca CO,=(C,H,0,)Ca+ H,0 +C0,. The other half of the tartaric acid which remains dissolved as normal potash salt is then precipitated in the same form by addition of chloride of caleium :— (C,H,0,)K, + CaCl, = 2KCl + (C,H,0,)Ca. The tartrate of lime precipitate is collected, washed, and decomposed by an excess of sulphuric acid at 75° C.:— (C,H,0,)Ca H,80,—CaS0,(C,H,0,)Hy. The sulphate of lime is removed by decanting and filter- ing, and the acid solution evaporated in leaden pans to a sufficient degree to deposit crystals on standing in the cold. The crystals are purified by redissolving them in hot water, decolorizing the solution with animal charcoal, and causing the acid to crystallize a second time after addition of sulphuric acid, which promotes the formation of large crystals. The crystals contain a little sulphuric acid and a trace of lead ; if intended for internal use, they must be recrystallized from pure water.

Tartaric acid forms hard colourless transparent mono- clinic prisms of 1:764 spec. grav., easily soluble in cold and abundantly in hot water. It has a strong but agree- able sour taste. At 15° C. 100 parts of water dissolve 138 parts of the acid, 100 of alcohol (absolute) 20:4, and 100 of ether 0°39. It fuses at 135° ©. and passes into an amorphous modification known as meta-tartaric acid ; when heated more strongly it loses water, and passes into the forms of anhydrides. At high temperatures it is decomposed with formation of charcoal and volatile pro- ducts, which smell pretty much like

those formed from Sugar in the same circumstances. Most oxidizing agents produce formic from the aqueous acid. Boiling with oxide of silver and excess of caustic alkali produces oxalate.

Tartaric acid is used largely in calico printing as a discharge. In pharmacy and households it serves, con- Jointly with bicarbonate of soda or potash, for the extem-

poraneous preparation of effervescing drinks. The so- called German effervescing powders are a combination of weighed-out doses of tartaric acid and of bicarbonate of soda. In the so-called “seltzogénes” (glass apparatus in which carbonic acid is produced in one compartment, to be forced by its own pressure into a mass of water, wine, &c., in the other) the gas is similarly produced.

Lartrates.—The acid potash salt, (CsH,Og)HK, ‘cream of tartar,” is prepared from crude tartar (argol) by dissolving it in hot water, filtcring off what remains of tartrate of lime and other impurities, and allowing the filtrate to crystallize. The crystals are generally contaminated with a little of the lime-salt, for the removal of which the best method is to treat the powdered crystals with cold dilute hydrochloric acid and then wash them with cold water by displacement. The lime passes into the filtrate. Cream of tartar forms small colourless hard crystals which dissolve in about 200 parts of cold and in 15 parts of boiling water. In alcohol the salt is even less soluble than in water.

The normal (neutral) potash salt, (ChH,O,)K,+4H,0, is prepared by dissolving powdered cream of tartar in hot solution of carbonate of potash until a neutral or slightly alkaline solution is produced. The salt, being extremely soluble in water, does not. crystallize very readily. In former times the carbonate of potash required used to be made by igniting one half of the cream of tartar to be operated upon in a crucible. Hence the name of tartarus tartaris- atus, which is still familiar in pharmacy. The salt is used medi- cinally, and also for removing free acid from excessively sour wine by formation of relatively insoluble bitartrate (Liebig’s method).

Rochelle salt, (CsH,0,)KNa+4H,©, is prepared by not quite neutralizing hot solution of carbonate of soda with powdered cream of tartar. The (filtered) hot solution deposits on cooling magnificent crystals, readily soluble in water, though less so than the unmixed potash salt. Rochelle salt is used as a mild purgative. The so-called Seidlitz powders are effervescing powders with a con- siderable addition of Rochelle salt to the bicarbonate.

The normal tartratcs of lime, baryta, &c., are insoluble precipi- tates producible by double decompositions.

Tartar emetic, (C,H,0,)K(SbO)+4H,0, is produced by boiling 4 parts of oxide of antimony, Sb,O,, and 5 of powdered cream of tartar with 50 of water for about an hour. The filtered solution, on cooling, deposits crystals of the above composition soluble in 15 parts of cold and 2°8 of boiling hot water. ‘The crystals gene- rally exhibit the appearance of tetrahedra; yet they are rhombic prisms combined with pyramids. The process going on in the formation of the salt is easily understood if we remember that Sb,O, often acts on aqueous acids as if it were the monoxide, (SbO),0, of a radical (SbO) antimonyl. (SbO),0+H,0 is equi- valent to 2(SbO)OH, and

(C,H,0,)KH + OH(SbO) =H,0 + (C,H,0,)K(Sb0).

Tartar emetic has long had a standing in medicine. In doses of 1-3 grains it acts as a powerful emetic; very small doses (#5 to yy grain) induce perspiration. Large doses produce poisonous effects.

Analysis.—Tartaric acid is characterized chiefly by the relative insolubility of its acid potash salt. To produce it from a solution of a neutral tartrate, add acetic acid and acetate of potash, and stir vigorously; the salt gradually separates out as a crystalline precipitate. Neutral tartrate solutions, with chloride of calcium, give a precipitate of tartrate of lime, which is at first amorphous, and in this condition dissolves pretty readily in excess of reagent or tartrate, but in general re-separates in the crystalline form (the undissolved tartrate likewise becomes crystalline) on standing.

Anhydrides.—Tartaric acid, when kept at 185°, fuses and becomes meta-tartaric acid without change of weight, and on continued appli- cation of 140-150° C., ditartrylic acid, CgH,,)0,,=2C,H,O,~~—H.O; and at 180°~~

~~tartrelic acid, Cs;H,0j)=2C,H,O, — 2H,0, is produced. All these three acids form salts of their own, which, however, tend to become tartrates in the presence of water. At 180° real tartaric anhydride (like tartrelic, CsH,O;)=2C,H,O;) is produced, in addi~~ tion to tartrelic acid, as an infusible yellowish mass, insoluble in water and in ether. By continued contact with water it is con- verted finally into tartaric acid solution.

Lsomeric Modifications.—Among these racemic acid has long been known as an occasional bye-product in the manufacture of tartaric acid. It used to be believed that racemic acid is present ready formed in certain grape-juices, and thus comes to make its appear- ance occasionally; but it is well known now that the bulk of it at any rate is produced from what was originally tartaric acid, by the continued action of high temperatures and water. Racemic acid is almost identical with tartaric acid; the only purely chemical point of difference is that corresponding salts of the two acids often crystallize with different proportions of water. The two acids, however, are easily distinguished by their action on polarized light (see POLARITY, vol. xix. p. 314). A solution of tartaric acid turns the plane of polarization to the right ; racemie acid is, in this sense,

optically inactive. These long-known facts led Pasteur to the discovery of the true relations of the two acids. If the double racemate, (CyH,O0,)Na(NH,), is allowed to crystallize slowly, two kinds of crystals are’ produced, both bearing hemiedric faces, but differing from each other in the situation of these, exactly as the right hand differs from the left. Pasteur separated the two kinds of crystals, and found that one kind is identical with the ordinary (dextro-) tartrate of soda and ammonia, while the other contains a new kind of tartaric acid, which he called levo-tartaric acid because it turns the plane of polarization to the left. Equal weights of the two acids, when dissolved separately in water and mixed, unite, with perceptible evolution of heat, into optically neutral racemic acid. Racemic acid, then, is levo- and dextro-tartaric united (loosely) into one molecule. There are a number of optically inactive tartaric acids, not susceptible of decomposition in the sense in which racemic acid is. (W. D.) TARTARS (more correctly Tatars, but Tartars is the form generally current), a name

given to nearly three million inhabitants of the Russian empire, chiefly Moslem and of Turkish origin. The majority—in European Russia—are remnants of the Mongol invasion of the 13th century (see Moneots), while those who inhabit Siberia are survivals of the once much more numerous Turkish population of the Ural-Altaic region, mixed to some extent with Finnish and Samoyedic stems, as also with Mongols. The name is derived from that of the Ta-ta Mongols, who in the 5th century inhabited the north-eastern Gobi, and, after subjugation in the 9th century by the Tungus Kidafis, migrated southward, there founding the Mongolian empire under Jencuiz Kuan (q.v.). Under the leadership of his grandson (Batu) they moved west- wards, driving with them many stems of the Turkish Ural-Altaians towards the plains of Russia. The ethnographical features of the present Tartar inhabitants of European Russia, as well as their language, show that they contain no admixture (or very little) of Mongolian blood, but belong to the Turkish branch of the Ural-Altaic stock, necessitating the conclusion that only Batu, his warriors, and a limited number of his followers were Mongolians, while the great bulk of the 13th-century invaders were Turks, On the Volga they mingled with remnants of the old Bulgarian Turkish empire, and elsewhere with Finnish stems, as well as with remnants of the ancient Italian and Greek colonies in Crimea and Caucasians in Caucasus. The name of Tatars, or Tartars, given to the invaders, was afterwards extended so as to include different stems of the same Turkish branch in Siberia, and even the bulk of the then little known inhabitants of the high plateau of Asia and its north-western slopes, which was described under the general name of Tartary. This last name has almost disappeared from geographical literature, but the name Tartars, in the above limited sense, remains in full use. The present Tartar inhabitants of the Russian empire form three large groups,—those of European Russia and Poland, those of Caucasus, and those of Siberia. The discrimination of the separate stems included under the name is still far from completion. The following subdivisions, however, may be regarded as established. (1) The Kazafi Tartars, descendants of the Kiptchaks settled on the Volga in the 13th century, where they mingled with survivors of the Bulgar Turks and partly with Finnish stems. They number about halfa million in the government of Kazafi, about 100,000 in each of the governments of Ufa, Samara, and Simbirsk, and about 300,000 in Vyatka, Saratoff, Tamboff, Penza, Nijni-Novgorod, Perm, and Orenburg; some 15,000 belonging to the

same stem have migrated to Ryazafi, or have been settled as prisoners in the 16th and 17th centuries in Lithuania (Vilna, Grodno, and Podolia); and there are some 2000 in St Petersburg. In Poland they constitute 1 per cent. of the population of the district of Ptock. “The Kazai Tartars speak a pure Turkish dialect ; they are middle-sized, broad- shouldered, and strong, and mostly have black eyes, a straight nose, aud salient cheek bones. They are Mohammedans; polygamy is practised only by the wealthier classes and is a waning institution. Excellent agriculturists and gardeners, very laborious, and having a good reputation for honesty, they live on the best terms with their Russian peasant neighbours. It may be added that, according to M. Yuféroff (Etude éthn. sur les Bachkirs, 1881), those Bashkirs who live between the Kama, Ural, and Volga are not of Fiunish origin, but in virtue of their history, language, anthropological features,

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and customs must be regarded as Tartars. (2) The Astrakhan Tartars (about 10,000) are, with the Mongol Kalmucks, all that now re- mains of the once so powerful Astrakhan empire. They also are agriculturists and gardeners; while some 12,000 Kundrovsk Tartars still continue the nomadic life of their ancestors. (3) The Crimean Tartars, who occupied the Crimea in the 13th century, have pre- served the name of their leader, Nogai. During the 15th, 16th, and 17th centuries they constituted a rich empire, which prospered * until it fell under Turkish rule, when it had to suffer much from the wars fought between Turkey and Russia for the possession of the peninsula. The war of 1853 and the laws of 1860-63 and 1874 caused an exodus of the Crimean Tartars; they abandoned their admirably irrigated fields and gardens and moved to Turkey, so that now their number falls below 100,000. Those of the south coast, mixed with Greeks and Italians, are well known for their skill in gardening, their honesty, and their laborious habits, as well as for their fine features, presenting the Tartar type at its best, The mountain Tartars closely resemble those of Caucasus, while those of the steppes—the Nogais—are decidedly of a mixed origin from Turks and Mongolians.

The Tartars of Caucasus, who inhabit the upper Kubai, the steppes of the lower Kuma and the Kura, and the Araxes, number about 1,350,000. Of these (4) the Nogais on the Kuma show traces of an intimate mixture with Kalmucks. They are nomads, supporting themselves by cattle-breeding and fishing; few are agriculturists, (5) The Karatchais (18,500) in the upper valleys about Elburz live by agriculture. (6) The mountain Tartars (about 850,000), divided into many tribes and of an origin still undetermined, are scattered throughout the provinces of Baku, Erivan, Tiflis, Kutais, Dagh-estan, aud partly also of Batum. ‘They are certainly of a mixed origin, and present a variety of cthnological types, all the more go as all who are neither Armenians nor Russians, nor belong to any distinct Caucasian tribe, are often called Tartars. As a rule they are well built and little behind their Caucasian brethren. They are celebrated for their excellence as gardeners, agriculturists, cattlé- tenders, and artisans. Although most fervent Shiites, they are on very good terms both with their Sunnite and with their Russian neighbours. Polygamy is rare with them, and their women go to work unveiled.

The Siberian Tartars, mostly mixed with Finnish stcms, are the most difficult to classify. They occupy three distinct regions,—a strip running west to east from Tobolsk to ‘Fomsk, the Altai and its spurs, and South Yeniseisk. They originated in the agalo- merations of Turkish stems which in the region north of the Altai succeeded the Ugro-Samoyedic civilization (sec Siperia), and reached a relatively high degree of culture between the 4th and the 8th centuries, but were subdued and enslaved by the Mongols. In the meantime the following subdivisions of the Siberian Tartars may be accepted. (7) The Baraba Tartars, who take their name from one of their stems (Barama), number about 50,000 in the government of Tobolsk and about 5000 in Tomsk. After a strenuous resistance to Russian conquest, and much suffering at a later period from Kirghiz and Kalmuck raids, they now live by agri- culture, either in separate villages or along with Russians. (8) The Tcholym or Tchulym Tartars on the Tcholym and both the rivers Yus speak a Turkish language with many Mongolian and Yakut words, and are more like Mongols than Turks. In last century they paid a tribute for 2550 arbaletes, but they now are rapidly becoming fused with Russians. (9) The Abakan or Minu- sinsk Tartars occupied the steppes on the Abakau and Yus in the 17th century, after the withdrawal of the Kirghizes, and represent a

mixture with Koibals (whom Castrén considers as partly of Ostiak and partly Samoyedic origin) and Beltirs—also of Finnish origin. Their language is also mixed. They are known under the name of Sagais, who nuinbered 11,720 in 1864, and are the purer Turkish stem of the Minusinsk Tartars, Koibals, and Kyzyl or Red Tartars. Formerly Shamanists, they now are, nominally at least, adherents of the Greek Orthodox Church, and support themselves mostly by cattle-breeding. Agriculture is spreading but slowly among them; they still prefer to plunder the stores of bulbs of Liliwm Martagon, Peonia, and Erythronium Dens canis laid up by the steppe mouse (Afus socialis). The Soyotes, or Soyons, of the Sayan Mountains, who are Finns mixed with Turks, the Uryankhes of north-west Mongolia, who are of Turkish origin but follow Buddhism, and the Karagasses, also of Turkish origin but much like the Kirghizes, and reduced now to a few hundreds, are akin to the above. (10) The Tartars of the northern slopes of the Altai (nearly 20,000 in number) are of Finnish origin. They comprise some hundreds of Kumandintses, the Lebed Tartars, the Tchernevyie or Black- Forest Tartars, and the Shors (11,000), descendants of the Kuznetsk or Iron-Smith Tartars. They are chiefly hunters, passionately lov- ing their éazga, or wild forests, and have maintained their Shaman religion and tribal organization into suoks. They live partly also on cedar-nuts and honey collected in the forests. Their dress is that of their former rulers, the Kalmucks, and their language con- tains many Mongolian words. (11) The Altai Tartars, or “Altaians,” comprise—(a@) the Mountain Kalmucks (12,000), to whom this name

has been given by mistake, and who have nothing in common with the Kalmucks except their dress and mode of life, while they speak a Turkish dialect, and (0) the Teleutes, or Telenghites (5800), a remainder of a formerly numerous and warlike nation who have migrated from the mountains to the lowlands, where they now live along with Russian peasants.

Finally, there are a number of Tartars in Turkestan and Central Asia. Without including under this name the Sarts and the Kuramintses of Turkestan, still less the Kirghiz-Kazaks, it may be reckoned that there are

still nearly 30,000 survivors of the Uigurs in the valley of the 1li, about Kuldja, and in the Khami oasis.

As is evident from the above, although the name Tartars originated in an indiscriminate application of the word to the Turkish and Mongolian stems which invaded Europe six centuries ago, and its gradual extension to the Turkish stenis mixed with Mongolian or Finnish blood in Siberia, it still represents an aggre- gate of characters which warrant at least a provisional use of this genetic name, if those to whom it is given are properly subdivided. It embodies stems which, although widely distinct, still have some common ethnographical and philological features, besides being to some extent of like origin and history.

Yhe literature of the subject is very extensive, and bibliographical indexes may be found in the Geographical Dictionary of P. Semenoff, appended to the articles devoted respectively to the names given above, as also in the ycarly Indexes by M. Mezhoff. Besides the well-known works of Castrén, which are a very rich source of information on the subject, Schiefner (St Petersburg academy of science), Donner, Ahlqvist, and other explorers of the Ural-Altaians, as also those of the Russian historians Solovieff, Kostomaroff, Bestuzheff-Riumin, Schapoff, and Dlovaiskiy, the following containing valuable information may be mentioned :—the publications of the Russian Geographical Society and its branches ; the Russian Htnographicheskiy Sbornik ; the Jzvestia of the Moscow society of the amateurs of natural science; the works of the Russian ethnographical con- gresses; Kostroff's rescarches on the Siberian Tartars in the memoirs of the Siberian branch of the geogr. soc.; Radlotf's Reise durch wen Altai, Aus Sibirien; * Picturesque Russia ' (Jivopisnaya Rossiya) ; Semenoff's and Potanin's "'Supple- ments" to Ritter's Asien ; Harkavi's report to the congress at Kazafi ; Hartakhai's "Hist. of Crimean Tatars," in Vyestnik Evropy, 1866 and 1867; '' Katchinsk Tartars," in Jzvestia Ituss. Geogr. Soc., xx., 1884. (B.A. I)

TARTARUS, in the Jliad (viii. 13 sg., 481), is a dark underground prison with iron gates, as far below Hades as earth is below heaven, whither Cronus and the Titans were thrust down by Zeus (vol. xxi. p. 321), and to which the sovereign of Olympus threatens to consign other gods who may

disobey his behests. Later writers make Tartarus the place of punishment of the wicked after death : Aineas, in his visit to the abode of the shades, comes to a point where the road divides, the branch to the right leading to Elysium and that on the left to the prison-house of Tartarus, girt about by a triple wall, with the fiery Phlege- thon as a moat, and guarded by the fury Tisiphone (Z7., vi. 540 sq.). Tartarus is personified as the son of A‘ther and Ge, and father of the giants Typhoeus and Echidna.

TARTINI, Gruserre (1692-1770), violinist, composer, and inusical theorist, was born at Pirano, April 12, 1692, and in early life studied, with equal want of success, for the church, the law courts, and the profession of arms. His life as a young man was wild and irregular, and his temper extremely violent and impulsive. His unfitness for an ecclesiastical career was manifest ; and, after failing in jurisprudence, he crowned his improprieties by clan- destinely marrying the niece of Cardinal Cornaro, arch- bishop of Padua. Though the family of Tartini had been legally ennobled, the cardinal resented the marriage as a disgraceful mésalliance, and denounced it so violently that the unhappy bridegroom, thinking his life in danger, fled for safety to a monastery at Assisi, where, calmed by the soothing influence of the religious life, his character underwent a complete change. Docile and obedient, as he had before been passionate and headstrong, he studied the theory of music under Padre Boemo, the organist of the monastery, and, without any assistance whatever, taught himself to play the violin in so masterly a style that his performances in the church became the wonder of the neighbourhood. For more than two years his identity remained undiscovered, but one day the wind blew aside a curtain behind which he was playing, and one of his hearers recognized him and betrayed his retreat to the cardinal, who, hearing of his changed character, re- admitted him to favour and restored him to his wife.

Tartini next removed to Venice, where the fine violin-

playing of Veracini excited his admiration and prompted him to repair, by the aid of good instruction, the short- comings of his own self-taught method. After this he studied for some time at Ancona; and here, about 1714, he made the curious acoustical discovery on which his fame as a

theorist chiefly rests. He observed that, when two notes are sounded together on the violin with sufficient in- tensity, a third sound, distinct from both, is simultaneously produced. For the production of this “third sound,” as he called it, Tartini failed to account on strict mathematical principles. When the two primary notes form an im- pure consonance, the “third sound ” of Tartini (now known as a difference tone of the first order) is accompanied by beats due to the presence of different tones of higher orders, the existence of which, unknown of course to Tartini, has been established by Helmholtz. Tartini made his observations the basis of a theoretical system which he set forth in his 7rattato di Musica, secondo la vera scienzia dell’ Armonia (Padua, 1754) and Dei Principi dell’ Armonia Musicale (Padua, 1767). In 1721 he re- turned to Padua, where he was appointed solo violinist at the church of San Antonio. From 1723 to 1726 he acted as conductor of Count Kinsky’s private band, but after- wards returned to his old post at Padua, where he died on February 16, 1770.

Tartini’s compositions are very numerous, and faithfully illustrate his passionate and masterly style of execution, which surpassed in brilliancy and refined taste that of all his contemporaries. He frequently headed his pieces with an explanatory poetical motto, such as ‘* Ombra cara,” or ‘‘ Volgete il riso in pianto o mie pupille.” Concerning that known as Jd Trillo del Diavolo, or The Devil’s Sonata, he told a curious story to Lalande, in 1766. He drcamed that the devil had become his slave, and that he one day asked him if he could play the violin. The devil replied that he believed he could pick out a tune, and thereupon he played a sonata so exquisite that Tartini thought he had never heard any music to equal it. On awaking, he tried to note down the composition, but succeeded very imperfectly, though the resulting Devil’s Sonata is one of his best and most celebrated productions.

Besides the theoretical works we have mentioned, Tartini wrote a Trattato delle Appogiature, posthumously printed in French, and an unpublished work, Delle Ragioni e delle Proporzioni, the MS. of which has been lost.

TARUDANT. See Morocco, vol. xvi. p. 834.

TASHKEND, or TasHKEnt, one of the largest and most important cities of Central Asia, now the capital of Russian Turkestan, is situated in the valley

of the Tchir- tchik, some 50 miles above its junction with the Syr-Daria, in 41° 20’ N. lat. and 69° 18’ E.long. The city, formerly enclosed by walls which are now ruinous, is surrounded by rich gardens, and its houses are buried among the fruit and other trees which grow all along the number- less ramifications of the irrigation canals. The buildings, which are of stone and sun-dried bricks, are mostly low, on account of the earthquakes which frequently disturb the region. Like all old cities of Asia, Tashkend is sub- divided into sections (yurts), which are characterized by the special trades carried on in each. Asiatic Tashkend in 1871 had 78,130 inhabitants, mostly Sarts (75,176), with a few Uzbegs, Kirghizes, Jews, Russians, and Ger- mans. A depression in the south-east is occupied by Rus- sian Tashkend, dating from 1865, which has clean, broad streets lined with poplars, the low nice-looking houses being surrounded by gardens. In 1875 its population, exclusive of the military, was 4860, mostly Russians. It has a public library containing a rich collection of works on Central Asia, an observatory, a museum, two gymnasia, a seminary, and the buildings occupied by the administra- tion. A branch of the Russian Geographical Society has been opened at Tashkend, and its publications, as also those of the statistical committee and the Turkestan Gazette, contain most valuable information about Turkestan. Ac- cording to the most recent estimates, the population of

Tashkend, with its suburbs, is reckoned at 100,000. In consequence of the chequered history of the town (see TURKESTAN), few old buildings have been preserved, and only the madrasah Beklar Bek, with its fifty students, and the graves of Sheikh Zenedjin-baba and Zenghi-ata are worthy of mention. The former is four centuries old, and that of Zenghi-ata, a saint held in high veneration through- out Central Asia, yearly attracts thousands of pilgrinis.

A variety of petty trades are carried on in numerous small work- shops,—weaving and dyeing of cottons and the manufacture of small brass and iron wares, of harness, and especially of boots, being the chief. Most of the inhabitants are also engaged in raising corn, rice, oil-plants, cotton, wine, and lucerne, and in gardening. The trade of T’ashkend has lost its former

importance, but corn, cattle, silk, cotton, and fruits are still exported, and all kinds of manu- factured wares are imported from the countries to the south.

TASMAN, Ase, JanszEn (c. 1602-1659), a dis- tinguished Dutch navigator, born at Hoorn, North Hol- land, probably in 1602 or 1603. He is known to have made two important voyages of discovery in the Pacific and Southern Oceans; only of the second of them have we a full account. In June 1639 Tasman, along with Matthew Quast, was despatched by Van Diemen, governor- general of the Dutch East Indies, on a voyage to the Western Pacific, which was first directed to the Philippine Islands; part of the coast of Luzon was explored. Sailing east and north Tasman and Quast touched at several of the Bonin Islands, which they were probably the first to discover. Sailing still farther north, in quest of what were then known as the “islands of gold and silver,” they reached the latitude of 38° 40’ N., about 600 miles east of Japan, and continued east for other 300 miles on the parallel without discovering anything. On October 15 the navigators decided to return, and, after touching at Japan, anchored at Taiwan-fu, Formosa, November 21. After this, Tasman was engaged in operations in the Indian seas until 1642, when he set out on his first great expedition! Several Dutch navigators had already dis- covered various portions of the west coast of Australia, and the Dutch East India Company were anxious to obtain a more accurate and extended survey of that land. Sailing from Batavia on August 14, 1642, with two vessels, the ‘ Heemskirk” and “Zeehaan,” Tasman on November 24 sighted the land to which he gave the name of Van Diemen, in honour of the governor-general, but which is now named Tasmania. He doubled the land, which he evidently did not know was an island, and, run- ning up Storm Bay, anchored on December 1 in the bay to which he gave the name of Frederick Henry. There he set up a post on which he hoisted the Dutch flag. Quit- ting Van Diemen’s Land on December 5, Tasman steered eastwards with a vague idea of reaching the Solomon Islands, and on December 13 he discovered a “high mountainous country,” which he called ‘“Staatenland ” (New Zealand). Cruising along the west coast of the South Island, he anchored on the 18th in 40° 50’ S. lat., at the entrance of a “wide opening,” which he took to be a “fine bay,” but which was no doubt Cook’s Strait, He gave the name of Moordenaars (Massacre) Bay to the bay, at which he attempted to land, and where several of his men were killed by the natives. Leaving New Zealand, and pursuing an irregularly north direction,

but never coming in sight of Australia, he discovered, on January 21, 1643, two islands belonging to the Friendly group, to which he gave the names of Middelburg (Eova) and Amsterdam (Tongatabu). After discovering several other islands in the Friendly group and their neighbour- hood, Tasman steered north and west, reaching the neigh- bourhood of New Britain on March 22. On the 24th he

1 See Siebold's paper in Le Moniteur des Indes-Orientales et Occidentales, 1848-49, pt. i. p. 390.

passed Morghen Islands, and, sailing round New Ireland and along the north coast of New Guinea, he cleared the straits between New Guinea and Jilolo, arriving at Batavia on June 15, after a ten months' voyage.2 The materials for an account of Tasman's important second voyage in 1644 are extremely scanty; they consist of Tasman's own chart and some fragmentary notes by Burgomaster Witsen in his work (1705) on the migrations of the human race (translated in Dalrymple's collection). Further information as to authorities? will be found in Mr R. H. Major's Hakluyt Society volume on Early Voyages to Australia, where also will be found the "Instructions " given to Tasman for his voyage to New Guinea. He is instructed to obtain a thorough knowledge of Staten and Van Diemen's Land, and " whether New Guinea is a continent with the great Zuidland, or separated by channels and islands," and also "whether the new Van Diemen's Land is the same continent with these two great countries or with one of them." In this voyage Tasman had three vessels under his command. His discoveries were confined to the north and north-west coasts of Australia, and his chart gives the soundings for the whole of this line of coast. He discovered the Gulf of Carpentaria, and established the continuity of the north-west coast of the land designated generally "the great known south con- tinent," as far south as about the 22d degree. The fullest details as to maps of the voyage and other authorities will be found in Mr Major's Hakluyt Society volume referred to above. 'Tasman rightly ranks as one of the greatest navigators of the 17th century. He died at Batavia in October 1659.

For personal details, see paper on Tasman by Ch. M. Dozy in Bijdragen tot de Taal-, Land-, en Volkenkunde van Nederlundsch- Indié, 5th series, vol. ii. p. 808.

TASMANIA, formerly Van Dirmen's Lanp, is a com- Platel

pact island, forming a British colony, which lies to the south of Australia, in the Southern Ocean. It hasan area of 24,600 square miles (about three-fourths of the size of Ireland), and some fifty islets belong to it. Most of these lie between it and the southern shore of Victoria, in Bass's Strait. It is a land of mountain and flood, with picturesque scenery. The centre is a mass of hills, gene- rally covered with forest, with large lakes nearly 4000 feet above the sea; and this high land is continued to the west and north-west, while southward are other elevations. Ben Lomond in the east rises to a height of 5020 feet; in the north-west are Dry's Bluff (4257 feet) and Quam by (4000); while westward are Cradle (5069), Hugel (4700), French-man's Cap (4760), and Bischoff (2500). Wellington, near Hobart, is 4170 feet. Among the rivers flowing northward to Bass's Strait are the Tamar, Inglis, Cam, Emu, Blyth, Forth, Don, Mersey, Piper, and Ringarooma. The Mac- quarie, receiving the Elizabeth and Lake, falls into the South Esk, which unites with the North Esk to form the Tamar at Launceston. Westward, falling into the ocean, are the Hellyer, Arthur, and Pieman. The King and Gordon gain Macquarie Harbour; the Davey and Spring, Port Davey. The central and southern districts are drained by the Derwent from Lake St Clair,—its tributaries being the Nive, Dee, Clyde, Ouse, and Jordan. The Huon falls into D'Entrecasteaux Channel. 'The chief mountain lakes

- The best English translation of Tasman's Journal is in Bumey's Collection, vol. iii. The Dutch original was published at Amsterdam in 1860, edited by Jacob Swart, and contains the chart of the second voyage.

3 The subject is thoroughly discussed by P. H. Leupe in the Bijdragen van het kon. Inst. voor Taal-, Land-, en Volkenkunde v. d. Ind. Archipel, ser. i. pt. iv. pp. 128-140; in Bijd. voor Vader- landsche Geschiedenis en Oudheid Kunde, by KR. Fruin, new series, pt. vil. p. 254; and in the same writer's work De Reizen der Neder- | landers naar Niewwo Guinea (The Hague,

1875); also Col. A. Haga, | Nederlandsch Nieuw Guinea (The Hague, 1884),

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are the Great Lake (50 miles in circuit), Sorell, St Clair, Crescent, and Echo. The colony is divided into eighteen counties. The principal towns are Hobart, the capital, on the Derwent, with a population of 21,118 in 1881 (25,044 in 1886), and Launceston (12,752 in 1881; 19,379 in 1886), at the head of the Tamar. The rugged western half of the island has only a few small settlements, while the eastern country is increasing in population on account of the mines.

Climate.—This small colony has a far greater range of climate than can be experienced throughout the Australian continent. The eastern side is dry; the western is very wet. Tin and gold miners are partially arrested in their work during summer from want of water in the north-east. Dense forests and impracticable scrubs result in the west from deposition of a hundred or more inches of rain in the year, while other parts to the east occasionally suffer from drought. Tasmania does not escape the summer visit of an Australian hot wind. Hobart and Launceston, being near the sea, have greater equability of temperature, with rare frosts. The mean temperature of Hobart is 54°, of Waratah in the north-west 44°. Hobart averages 22 inches of rain, less than Melbourne, Sydney, and Brisbane. Inland, in the settled parts, cold is severe in winter, but only for a short period. The wooded north-west shore has no cold and no excessive heat, but plenty of showers. Up in the lake country the climate rather resembles the Highlands of Scotland. On the west and southern coasts the winds are usually strong, and often tempestuous.

Like New Zealand, Tasmania is very healthy. No miasma is retained in its forests. Rheumatism and colds may pre- vail, but little fever or dysentery occurs. Perhaps no part of the world can show relatively so many aged people. Children generally display the robustness of English village life. Asa retreat for Australians, Tasmania in the summer has strong claims. Cool and strengthening airs, magnifi- cent forest solitudes, and secluded fern-tree vales may be enjoyed along with all the comforts of modern civilization.

Geology.—The comparatively recent connexion of Tas- mania with Victoria is evidenced not less by rocks than by flora and fauna. The granitic islands of Bass's Strait are as SO many stepping-stones across, a depression having con- verted the loftier districts into islands. The want of simi- larity, however, between the tufted-haired Tasmanians and their Australian neighbours would indicate that the dis- ruption took place before the advent of the younger race on the northern side. While doubts exist as to the pres- ence of rocks older than the Silurian, a Paleozoic floor exists north, east, south, and west, though often thrown up into irregular ranges, sometimes over 5000 feet, by igneous irruptions, Convulsions have distinguished the history of the little island from one end to the other. Not only is granite in all its varieties very prevalent, but there is an immense amount of metamorphism in different directions. Then, at another period, not merely porphyries, but basalts and greenstones, were widespread in their ravages. They consumed or deranged beds of coal, and overflowed enor- mous tracts. Earthquakes were busy, and tremendous deluges denuded: great areas to depths of thousands of feet, leaving mountains of Primary rock, with peaked or plateau summits of basalt or greenstone. There are prismatic walls several hundreds of feet in height, and 4000 feet above the sea-level, as at Mount Wellington, looking down upon " ploughed fields" of greenstone blocks. Still, unlike Victoria, there are not the extinct craters to tell the tale of more modern lava flows. The lake district, up to over 4000 feet, is a tangled mass of granitic and metamorphic rocks. Quartz is so common a feature that the western storm-bound cliffs reflect a white light to passing ships; while mica, talcose, dolerite, and siliceous schists are

cominon over the island. Contorted slate and the tessel- ated pavement of Tasman's Peninsula are effects of that transmuting period. Granite is strong at eastern and northern points, at western localities, in the interior, and in the straits. Greenstone is exhibited southward in enor- mous fields, as well as in the western and lake districts, and alternates often with basalt. Silicified trees are seen standing upright in the floor of igneous rock. The Prim- ary rocks have more casts of former life than fossils in ordinary condition. The Hobart clay-slate abounds in Fenestella or lace coral, and trilobites occur in limestone. Slate is abundant on the north-west coast, the

South Hsk, and westward. New Red Sandstone near Hobart is marked by the presence of salt-beds. The Carboniferous forma- tions are not much exhibited on the western half of the island, but are prominent along the Mersey and other northern rivers. The southern fields are torn by igneous invaders. Anthracitic forms are conspicuous on Tasman's Peninsula. Inland, on the eastern side, the formations spread from near Hobart northward for scores of miles, and even to a thousand feet in thickness. The Fingal and Ben Lomond north-eastern districts are remarkably favoured with Carboniferous sandstones and crinoidal limestones, bearing excellent seams, and like strata are noticed in islands off the east coast. Carbonaceous non- coal-bearing beds by the Mersey are 500 feet thick. Tertiary rocks are not extensive, save in the breccia and coarse sandstone south of Launceston, over Norfolk plains, and along some river valleys. Alluvial gold deposits belong mainly to the Pliocene formations,—the ancient Primaries containing the auriferous quartz veins. Greenstone and basalt belong to various periods, the latter being specially apparent in the Tertiary epoch. Travertine, near Hobart and Richmond, is from freshwater action. The Pleistocene development was characterized by overwhelming denuding forces. Raised beaches are noticed along some of the larger rivers, and westerly moraines would imply a greater elevation of the country formerly. Caves and recent beds exhibit marsupial forms analogous to existing ones. Not far from Deloraine are limestone caves, with passages two miles in extent. The density and intricacy of the island scrubs have interfered with the investigation of its geology.

Minerals. —Tasmania has failed to take a very important position asa gold producer. Still, when the crushing of 1300 tons in one mine produced £11,528, adventurers may well be hopeful. From Beaconsfield mine, west of the Tamar, gold, was obtained to the value of £615,330 from July 1878 to January 1, 1887. In 1885 there were five districts under commissioners of mines. Westward, gold is found from Arthur river to Point Hibbs; north-westward, from Blyth river to Cape Grim. In the north-east are Scottsdale, Ringarooma, Mount Victoria, and Waterhouse fields; east, Fingal and St George river. Arsenic and silver are found with gold in the north-east; and iron, arsenic, copper, and lead with it at Beacons- field. For 1885 the gold export was 37,498 oz., worth £141,319. Silver occurs at Penguin, Mount Ramsey, and Waratah (Mount Bischoff), combined with lead. Copper is met

with at Mount Maurice, &c., but not in paying quantities. Bismuth at Mount Ramsey is rich, but the country is difficult to reach. Antimony, zinc, manganese, copper, plumbago, and galena are known west of the Tamar, where also asbestos in serpentine hillsis plentiful. Tin is well distributed in Tasmanian granite. Mount Bischoff, in the scrubby, rocky, damp west, has the richest lodes; other mines are in the north-cast and west. In ten years the product came to two and a half million pounds sterling. Bischoff district in 1885 gave 2871 tons of ore, much being found in huge blocks. Want of water in the north-east prevents mueh hydraulic working. An- thracite coal is pretty abundant at Port Arthur. Near Hobart are workings of poor quality. Around Ben Lomond are bituminous seams, but difficult of acccss. Fingal district has coal equal to that of Newcastle, with a seam of 14 feet, but carriage is difficult. Mersey river coal mines yielded 60,000 tons in the course of over a dozen years. Iron was worked near the Tainar, but did not pay, excess of chromium making it brittle; its steel was very malleable. All varieties of iron ores are known. Hobart freestone is largely exported to other colonies, Tasmanite or dysodile in the Mersey district is an inflammable resinous substance. During 1884 there

were raised 41,240 oz. of gold, 5461 tons of tin, and 5334 tons of coal. The total export of gold and tin during the five years 1880 to 1885 was of the value of £2,591,320,—being £642,230 more than for the ten years preceding. The export of tin averaged 79, 682 cwt.

Agriculture.—The island has not a large area fit for cultivation. A great part is very mountainous; and dense scrubs, with heavy forests, are impediments to the farmer. The west side is too wet, stormy, and sterile for settlement. Almost all the farms lie in the line between Hobart and Launceston and between Launceston and Circular Head. The climate being cooler and moister than in most parts of Australia, the productions are of an English character, hops, barley, and oats being freely raised. Cropping land for many suecessive years with wheat has lessened the produce of what was fertile country, as little manure had been used. In later times there has been a great improvement in agriculture. For some time Tasmanian growers did

well, supplying Australia and New Zealand with flour, potatoes, and fruit; but, as their customers became in their turn producers, the old markets failed in all but apples and stone fruit. Fresh and preserved fruit, with jams, together with excellent hops, continue to afford the islanders a good trade. In 1885-86 there were 417,777 acres in cultivation; in erop, 144,761; in grasses, 181,203. Wheat occupied 30,266 acres, barley 6838, oats 29,247, pease 7147, potatoes 11,073, hay 41,698, turnips 3680, and gardens and orchards 8198.

So large a part of the island is covered with thicket, rock, and marsh that it appears less pastoral than eastern Australia. total nuniber of sheep in 1886 amounted to 1,648,627, the horses to 28,610, and the eattle to 188,642. Of 16,778,000 acres only 4,403,888 have been sold or granted.

Flora.—This differs but little from Australia, with which it was formerly connected. Over a thousand species are represented. The euealypts are gums, stringy bark, box, peppermint, ironwood, &c. The celebrated blue gum (Luca- lyptus Globulus), so eagerly sought for pestilential places in southern Europe, Africa, and America, flourishes best in the southern dis- tricts of the island. For shipbuilding purposes the timber, which grows to a large size, is much prized. Acacias are abundant, and manna trees are very produetive. Sassafras (Atherosperma mos- chate) is a tall and handsome tree. Pines are numerous, The Huon pine (Daerydium cupressinwm), whose satin-like wood is so sought after, flourishes in Huon and Gordon river districts. The celery pine is a Phyllocladus, and the pencil cedar an Athrotaxis. The pepper tree is Tasmania fragrans. The Myrtacew are noble trees. The lakes cider tree is Eucalyptus resinifera, whose treacle- like sap was formerly made into a drink by bushmen. Xanthor- Toeas or grass.trees throw up a flowering spike. The charming red flowers of the Tasmanian tulip tree (Telopea) are seen from a great distance on the sides of mountains. ‘he so-called rice plant, with rice-like grains on a stalk, is the grass Richea. Of Boronia, Epac- ris, and Orchis there are numerous species. The Blandfordia, a Liliaceous plant, has a head of brilliant crimson flowers, The Casuarina, Exocarpus, Banksia, and tree fern resemble those of Australia. Tasmanian evergreen forests are very aromatie. At one time the island had an extensive timber trade with Sydney, Melbourne, and Adelaide, and it still exports £50,000 to £80,000 worth annually of planks, shingles, paling, &e.

Fawna,—Animal life in Tasmania is similar to that in Australia. The dingo or dog of the latter is wanting ; and the Tasmanian devil and tiger,or wolf, are peculiar to the island. The Marsupials inclnde the Macropus or kangaroo, Didelphys or opossum, Petaurus or flying phalanger, Perameles or bandicoot, Hypsiprymnus or kangaroo rat, Phascolomys or wombat ; while of Monotremata there are the Echidna or porcupine anteater and the duck-billed platypus. The marsupial tiger or Tasmanian wolf (Thylacinus cynocephalus), 5 feet long, is yellowish brown, with several stripes across the back, having short stiff hair and very short legs (see vol. xv. p. 380). Very few of these nocturnal carnivores are now alive to trouble flocks. The tiger cat of the eolonists, with weasel legs, white spots, and nocturnal habits, is a large species of the untameable native cats. The devil (Dasyurus or Sarcophilus ursinus) is black, with white bands on neck and haunches. The covering of this savage but cowardly little night-prowler is a sort of short hair, not fur. The tail is thick, and the bull-dog mouth is formidable. Among the birds of the island are the eagle, hawk, petrel, owl, finch, peewit, diamond bird, fire- tail, robin, emu-wren, crow, swallow, inagpie, blackcap, goatsucker, quail, ground dove, jay, parrot, lark, mountain thrush, cuckoo, wattlebird, whistling duck, honeybird, Cape Barren goose, penguin duck, waterhen, snipe, albatross, and laughing jackass. Snakes are pretty plentiful in scrubs; the lizards are harmless, Insects, though similar to Australian ones, are far less troublesome ; nlany are to be admired for their great beauty.

Fisheries.—I|n the early years of occupation the island was the resort of whalers from the United Kingdom, the United States, and France. Both sperm and black oil, with whalebone, were important articles of export till the retreat of the whales to other seas. Seal- ing was carried on successfully for many years in Bass’s Strait, until the seals were utterly destroyed. There has recently been a

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revival of whaling, the product of the island fishery for 1885 being £12,600. The bays contain some excellent fish, much esteemed in the neighbouring eolonies, particularly the trumpeter, found on the southern side of the island. Of nearly 200 sorts of fishes a third can be eonsidered good for food. The outer fisheries extend to 16 miles from shore, being from 20 to 80 fathoms deep. The species include the trumpeter (Latris, found up to 60 tb weight), the “salmon” of the old settlers (Arripis), the flathead (Platyeephalus), trevally (Neptonemus), garfish (Hemirhamphus), barracouta and kingfish (both Thyrsites). There are thirteen sorts of perch, and five of bream. The anchovy is migratory. English mackerel have been seen off the east coast; and some of the herrings are much like the English. Rock cod and bull-kelp cod are favourites. Mud oysters are nearly worked out; artificial oyster-beds are being formed. English trout (Salmo fario) are more certainly found than the true salmon (Salmo salar); the last are doubtful, though num- bers have been raised in hatcheries on the Derwent. Among fresh- water fish are a so-ealled freshwater herring (Prototroctes), various kinds of what the old settlers called trout (Galaxias), blackfish (Gadopsis), and fine perch.

Commerce.—Soon after the colony was founded there was a great trade in whale oil, as wellas in the oil and skins of seals) When this declined, merchants did well in the exportation of breadstuffs, fruits, and vegetables to the neighbouring and more reeently estab- lished colonies, not less than to New South Wales. Timber was also freely sent to places less favoured with forests or too busy with other employments, When the trade with England in oil fell off, the export in wool and then of metals succeeded. Tasmania has now an active commerce with Victoria, but has a competitor rather than a customer in New Zealand. The shipping during 1885 was 342,745 tons inward, 335,061 outward. The imports for that year came to £1,757,486; the exports to £1,318,698. Of the exports, £1,299,011 were of Tasmanian products and manu- factures, —including wool, £260,480; tin, £357,587; gold, £141,319; fruit, £105,363. The banks of the colony at the end of 1885 showed assets £3,754,226 and liabilities £8,814,631. he savings banks early in 1886 declared £455,774 to the eredit of depositors, Attempts have been recently made to draw Tasmania into closer commercial and fiscal relations with Victoria.

Manufactures.—Numerous industries are practised, though not to the extent of exportation, excepting from the working of 28 tanneries, 62 sawmills, 18 breweries, 7 manufactories of jam, and a rising wool factory.

Roads and Railways.—No colony, for its area, WaS ever so favoured with excellent roads as Tasmania has been. There are now about 5000 miles of good roads. The principal line of railway is that from Hobart to Launceston. Altogether, 260 miles of rail- way were open in 1887,

Post-Ofice.—I\n early years letters were carried by runners on foot across the island. In 1885 there were 246 post offices, and the telegraph had 1579 miles of wire. A submarine line connects Tasmania with Victoria.

Administration.—The governor is appointed by the British erown. The legislative council has eighteen members, and the assembly thirty-six. he revenue for 1885-86 was £571,396, the expenditure £585,766. The publie debt, eoutraeted for public works, aiounts to three and a third millions. The customs pro- vided £276,100. The official machinery is as extensive as for a eolony with seven or eight times the population.

Eduwcation.—At first the state made grants in aid to schools established by private persons and religious denominations, but ultimately, as in Victoria and New Zealand, education was made secular and eompulsory, religious teaching being out of school hours, or dependent on Sunday schools, which are to be found all over the island. There are 204 publie schools, maintained out of a fund of £32,793. In eight grammar and eollegiate schools a higher standard of instruction is reached. The degree of Associate of Arts is conferred on deserving scholars in the state schools ; and exhibitions (up to £200 a year for four years) enable pupils to study at the higher sehools or colonial or European universities, No state grant is now made for the support of any religious deno- mination.

Population.—The whites have entirely displaced the blacks. Outrages and cruelties led to conflicts; and now the last individual of the tribes has passed away. There are, however, some half- castes on islands in the Straits. The colonists in Tasmania are more concentrated than in other settlements. In 1818 there were 2320 men, 432 women, and only 489 children. At the eensus of 1881 the population numbered 115,705 (61,162 males, 54,548

females); in 1886 it was estimated at 133,791. The births in 1886 averaged 34°6 per thousand, the deaths 15°2,

History.—The Dutch navigator TasMAN (q.0.) sighted the island Noveinber 24, 1642, and named it Van Diemen's Land, after the Dutch governor of Java. He took possession at Frederick Henry Bay in the naine of the stadtholder of Holland, and then passed on to the discovery of New Zealand. The French Captain Marion in 1772 came to blows with the natives, Captain Cook was at

Adventure Bay, to the south, in 1777. His companion, Captain Furneaux, had entered the bay four years previously, assuring Cook that Van Diemen's Land was joined to New Holland. Admiral Bruni d'Entrecasteaux, with the naturalist La Billardiere, entered the Derwent, calling it North River, in 1792. Two years after, Captain Hayes named it Derwent. Mr Bass and Lieutenant Flinders passed through Bass's Strait, and first sailed round the island, in 1798. The high terms in which they spoke of Sullivan's cove, at the mouth of the Derwent, afterwards led to the settle- ment of Hobart there. The French discovery ships, "Géographe" and " Naturaliste," under Commodore Baudin, were off the coast in 1801-2. The island was settled from Sydney. A small party was sent to the Derwent, under Lieutenant Bowen, in 1803, and another to Port Dalrymple next year under Colonel Paterson, who was removed to Launceston in 1806. Captain Collins, who had been sent with a large number of convicts from England to form a penal colony in Port Phillip, thought proper to remove thence after three months, and establish himself at Hobart Town, February 1804. The carly days were trying, from want of supplies and of good government; and confliets arose with the natives, which led to the eclebrated Black War. In 1830 nearly all the settlers, with 4000 soldiers and armed constables, attempted to drive the aborigines into a peninsula, but caught only one lad. Mr George Robinson afterwards sueceeded in inducing the few hunted ones to surrender and be taken to Flinders Island. Deaths rapidly followed. The last nan died in 1862, the last female in 1872. Bushranging was common for years in this scrubby land. The colony was subject

to New South Wales till 1825, when independence was declared. ©

On free settlers being permitted to go to Van Diemen's Land, they endeavoured to get freedom of the press, trial by jury, and a popular form of rule. After long struggles, the liberties they sought for were gradually granted. A responsible government was the last boon received. Oppressed by the number of conviets thrown into the country, the free inhabitants petitioned again and again for the cessation of transportation, which was eventually allowed. Among the governors was Sir John Franklin, of polar celebrity. The first newspaper, Zhe Derwent Star, came out in 1810. Literature ad- vanced from that humble beginning. At first the Government entirely supported schools and churches, and for many years state aid was atforded to the Church of Englaud, Presbyterian, Wesleyan, and Roman Catholic churches, but this aid is now withdrawn. The island proving too small for a large population, numbers swarmed off to the neighbouring scttlements, and Port Vhillip, now Victoria, received its first inhabitants from Tasmania. Though not so prosperous as Victoria, the little island enjoys an amount of ease and comfort which few, if any, settlements elsewhere have been known to experience. (J. BO.)

TASSIE, James (1735-1799), gem-engraver and mod- eller, was born of humble parentage at Pollokshaws, near Glasgow, in 1735. During his earlier years he worked as a stone-mason, but, having visited Glasgow on a fair-holiday, and seen the collection of paintings brought together in that city by Robert and Andrew Foulis, the celebrated printers, he was seized with an irresistible desire to become an artist. He removed to Glasgow, attended the academy which had been established there by the brothers Foulis, and, applying himself to drawing with indomitable perseverance, seconded by great natural aptitude, he eventually became one of the most distin- guished pupils of the school. When his training was completed he visited Dublin in search of commissions, and there became acquainted with Dr Quin, who had been experimenting, as an amateur, in imitating antique engraved gems in coloured pastes. He engaged Tassie as an assistant, and together they perfected the discovery of a vitreous paste composition, styled "' enamel," a substance admirably adapted, by its hardness and beauty of texture, for the formation of gems and medallions. Dr Quin encouraged his assistant to try his fortune in London, and thither he repaired in 1766. At first he had a hard struggle to make his way, for he was modest and diffident in the extreme, and without influential introductions to amateurs and collectors. But he

worked on steadily with the greatest care and accuracy, scrupulously destroying all impressions of his gems which were in the slightest degree inferior or defective. Gradually the beauty and artistic character of his productions came to be known. He received a commission from the empress of Russia for a collection of about 15,000 examples ; all the richest

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cabinets in Europe were thrown open to him for purposes of study and reproduction; and his copies were frequently sold by fraudulent dealers as the original gems. He exhibited in the Royal Academy from 1769 to 1791. In 1775 he published the first catalogue of his works, a thin pamphlet detailing 2856 items. This was followed in 1791 by a large catalogue, in two volumes quarto, with illustrations etched by David Allan, and descriptive text in English and French by Rudolph Eric Raspe, F.S.A., enumerating nearly 16,000 pieces. Materials exist in MS., in the possession of a descendant of Tassie's, for a list of more than 3000 furtlier items.

In addition to his impressions from antique gems, Tassie executed many large profile medallion portraits of his contemporaries, and these form the most original and definitely artistic class of his works. They were modelled in wax from the life or from drawings done from the life, and—when this was impossible—from other authentic sources. They were then cast in white enamel paste, the whole medallion being sometimes executed in this material ; while in other cases the head only appears in cnamel, relieved against a background of ground-glass tinted of a subdued colour by paper placed behind. His first large enamel portrait was that of John Dolbon, son of Sir William Dolbon, Bart., modelled in 1793 or 1794; and the series possesses great historic interest, as well as artistic value, including as it does portraits of Adam Smith, Sir Henry Raeburn, Drs James Beattie, Blair, Black, and Cullen, and many other celebrated men of the latter half of the 18th century.

At the time of his death, in 1799, the collection of Tassie's works numbered about 20,000 pieces. (J. M. G.)

TASSIE, Wru.1am (1777-1860), gem-engraver and modeller, nephew of the above, was born in London on the 4th of December 1777. He succeeded to

the business of his uncle, to whose collection of casts and medallions he added largely. His portrait of Pitt, in particular, was very popular, and circulated widely. When the Shakespeare Gallery, formed by Alderman Boydell, was disposed of by lottery in 1805, William Tassie was the winner of the prize, and in the same year he sold the pictures by auction for a sum of over £6000. He died at Kensington on the 26th of October 1860, and bequeathed to the Board of Manufactures, Edinburgh, an extensive and valuable collection of casts and medallions by his uncle and himself, along with portraits of James Tassie and his wife by David Allan, and a series of water-colour studies by George Sanders from pictures of the Dutch and Flemish schools. (3. M. G.)

TASSO, Torquato (1544-1595), who ranks with Dante, Petrarch, and Ariosto among the first four poets of Italy, was the son of Bernardo Tasso, a nobleman of Bergamo, and his wife Porzia de' Rossi. Hc was born at Sorrento in 1544. His father had for many years been secretary in the service of the prince of Salerno, and his mother was closely connected with the most illustrious Neapolitan families. The prince of Salerno came into collision with the Spanish Government of Naples, was outlawed, and was deprived of his hereditary fiefs. In this disaster of his patron Tasso's father shared. He was proclaimed a rebel to the state, together with his son Torquato, and his patrimony was sequestered. These things happened during the boy's childhood. In 1552 he was living with his mother and his only sister Cornelia at Naples, pursuing his education under the Jesuits, who had recently opened a school there. The precocity of intellect and the religious fervour of the boy attracted general admiration. At the age of eight he was already famous. Soon after this date he joined his father, who then resided in great indigence, an exile and without occupation, in

Rome. News reached them in 1556 that Porzia Tasso had died suddenly and mysteriously at N aples. Her husband was firmly convinced that she had been poisoned by her brother with the object of getting control over her property. As it subsequently happened, Porzia's estate never descended to her son; and the daughter Cornelia married below her birth, at the instigation of her maternal relatives, Tasso's father was a poet by predilection and a

professional courtier of some distinction. In those days an Italian gentleman of modest fortunes had no congenial sphere of society or occupation outside the courts of petty ecclesi- astical and secular princes. When, therefore, an opening at the court of Urbino offered in 1557, Bernardo Tasso gladly accepted it. The young Torquato, a handsome and brilliant lad, became the companion in sports and studies of Francesco Maria della Rovere, heir to the dukedom of Urbino. The fate which condemned him for life to be a poet and a courtier like his father was sealed by this early entrance into princely palaces. At Urbino a society of cultivated men pursued the xsthetical and literary studies which were then in vogue. Bernardo Tasso read cantos of his Amadigi to the duchess and her ladies, or discussed the merits of Homer and Virgil, Trissino and Ariosto, with the duke's librarians and secretaries, Tor- quato grew up in an atmosphere of refined luxury and somewhat pedantic criticism, both of which gave a per- manent tone to his character. At Venice, whither his father went to superintend the printing of the Amadiyi, these influences continued. He found himself the pet and prodigy of a distinguished literary circle. But Bernardo had suffered in his own career so seriously from addiction to the Muses and a prince that he now determined on a lucrative profession for his son. Torquato was sent to study law at Padua. Instead of applying himself to law, the young man bestowed all his attention upon philosophy and poetry. Before the end of 1562 he had produced a narrative poem called Rinaldo, which was meant to com- bine the regularity of the Virgilian with the attractions of the romantic epic. In the attainment of this object, and in all the minor qualities of style and handling, ftinaldo showed such marked originality that its author was proclaimed the most promising poet of his time. The flattered father allowed it to be printed ; and, after a short period of study at Bologna, he consented to his son's entering the service of Cardinal Luigi d'Este. In 1565, then, Torquato for the first time set foot in that castle at Ferrara which was destined for him to be the scene of so many glories and such cruel sufferings. After the publica- tion of Rinaldo he had expressed his views upon the epic in some Discourses on the Art of Poetry, which committed him to a distinct theory and gained for him the additional celebrity of a philosophical critic. The age was nothing if not critical; but it may be esteemed a misfortune for the future author of the Gerusalemme that he should have started with pronounced opinions upon art. Essentially a poet of impulse and instinct, he was hampered in produc- tion by his own rules.

The five years between 1565 and 1570 seem to have been the happiest of Tasso's life, although his father's death in 1569 caused his affectionate nature profound pain. Young, handsome, accomplished in all the exercises of a well-bred gentleman, accustomed to the society of the great and learned, illustrious by his published works in verse and prose, he became the idol of the most. brilliant court in Italy. The princesses Lucrezia and Leonora d'Este, both unmarried, both his seniors by about ten years, took him under their protection. He was admitted: to their familiarity, and there is some reason to think that neither of them was indifferent to him personally. Of the celebrated story of his love for Leonora this is not the

place to speak. It is enough at present to observe that he owed much to the constant kindness of both sisters, In 1570 he travelled to Paris with the cardinal. Frank- ness of speech and a certain habitual want of tact caused a disagreement with his worldly patron. He left France next year, and took service under Duke Alfonso IT. of Ferrara. The most important events in Tasso's biography during the following four years are the publication of the Aminta in 1573 and the completion of the Gerusalemme LInberata in 1574. The Amuinta is a pastoral drama of very simple plot, but of exquisite lyrical charm. It ap- peared at the critical moment when modern music, under Palestrina's impulse, was becoming the main art of Italy. The honeyed melodies and sensuous melancholy of Aminta exactly suited and interpreted the spirit of its age. We may regard it as the most decisively important of Tasso's compositions, for its influence, in opera and cantata, was felt through two successive centuries. The Gerusalemme Laberata occupies a larger space in the history of Euro- pean literature, and is a more considerable work. Yet the commanding qualities of this epic poem, those which revealed Tasso's individuality, and which made it imme- diately pass into the rank of classics, beloved by the people no less than by persons of culture, are akin to the lyrical graces of Aminta. It was finished in Tasso's thirty-first year ; and when the MS. lay before him the best part of his life was over, his best work had been already accom- plished. Troubles immediately began to gather round him. Instead of having the courage to obey his own instinct, and to publish the Gerusalemme as he had con- ceived it, he yielded to the critical serupulosity which formed a secondary

feature of his character. The poem was sent in manuscript to several literary men of eminence, Tasso expressing his willingness to hear their strictures and to adopt their suggestions unless he could convert them to his own views. The result was that each of these candid friends, while expressing in general high admiration for the epic, took some exception to its plot, its title, its moral tone, its episodes, or its diction, in detail. One wished it to be more regularly classical ; another wanted more romance. One hinted that the Inquisition would not tolerate its supernatural machinery ; another demanded the excision of its most charming passages—the loves of Armida, Clorinda, and Erminia. Tasso had to defend himself against all these ineptitudes and pedantries, and to accommodate his practice to the theories he had rashly expressed. As in the Rinaldo, so also in the Jerusalem Delivered, he aimed at ennobling the Italian epic style by preserving strict unity of plot and heightening poetic diction. He chose Virgil for his model, took the first crusade for subject, infused the fervour of religion into his conception of the hero Godfrey. But his own natural bias was for romance. In spite of the péet's in- genuity and industry the stately main theme evinced less spontaneity of genius than the romantic episodes with which, as also in ftinaldo, he adorned it. Godfrey, a mixture of pious Aneas and Tridentine Catholicism, is not the real hero of the Gerusalemme. Fiery and passionate Rinaldo, Ruggiero, melancholy impulsive Tancredi, and the chivalrous Saracens with whom they clash in love and war, divide our interest and divert it from Goffredo. On Armida, beautiful witch, sent forth by the infernal senate to sow discord in the Christian camp, turns the action of the epic. She is converted to the true faith by her adora- tion for a crusading knight, and quits the scene witha phrase of the Virgin Mary on her lips. Brave Clorinda, donning armour like Marfisa, fightmg in duel with her devoted lover, and receiving baptism from his hands in her pathetic death; Erminia seeking refuge in the shep- herd's hut,—these lovely pagan women, so touching in

' cruel,—hard and unintelligent perhaps, but far from being

their sorrows, so romantic in their adventures, so tender in their emotions, rivet our attention, while we skip the battles, religious ceremonies,

conclaves, and stratagems of the campaign. The truth is that Tasso's great inven- tion as an artist was the poetry of sentiment. Sentiment, not sentimentality, gives value to what is immortal in the Gerusalemme. It was a new thing in the 16th century, something concordant with a growing feeling for woman and with the ascendant art of music. This sentiment, refined, noble, natural, steeped in melancholy, exquisitely graceful, pathetically touching, breathes throughout the episodes of the Gerusalemme, finds metrical expression in the languishing cadence of its mellifluous verse, and sustains the ideal life of those seductive heroines whose names were familiar as household words to all Europe in the 17th and 18th centuries.

Tasso's self-chosen critics were not men to admit what the public has since accepted as incontrovertible. They vaguely felt that a great and beautiful romantic poem was embedded ina dull and not very correct epic. In their uneasiness they suggested every course but the right one, which was to publish the Gerusalemme without further dispute. Tasso, already overworked by his precocious studies, by exciting court-life and exhausting literary industry, now grew almost mad with worry. His health began to fail him. He complained of headache, suffered from malarious fevers, and wished to leave Ferrara. The Gerusalemme was laid in manuscript upon a shelf. He opened negotiations with the court of Florence for an exchange of service. This irritated the duke of Ferrara. Alfonso hated nothing more than his courtiers leaving him fora rival duchy. He thought, moreover, that, if Tasso were allowed to go, the Medici would get the coveted dedication of that already famous epic. Therefore he bore with the poet's humours, and so contrived that the latter should have no excuse for quitting Ferrara. Meanwhile, through the years 1575, 1576, 1577, Tasso's health grew worse. Jealousy inspired the courtiers to calumniate and insult him. His irritable and suspicious temper, vain and sensitive to slights, rendered him only too easy a prey to their malevolence. He became the subject of delusions,—thought that his servants betrayed his confidence, fancied he had been denounced to the Inquisition, expected daily to be poisoned. In the autumn of 1576 he quarrelled with a Ferrarese gentleman, Maddalo, who had talked too freely about some love affair; in the summer of 1577 he drew his knife upon a servant in the presence of Lucrezia d'Este, duchess of Urbino. For this excess he was arrested; but the duke released him, and took him for

change of air to his country seat of Belriguardo. What happened there is not known. Some biographers have surmised that a com- promising liaison with Leonora d'Este came to light, and that Tasso agreed to feign madness in order to cover her honour. But of this there is no proof. It is only certain that from Belriguardo he returned to a Franciscan convent at Ferrara, for the express purpose of attending to his health. 'There the dread of being murdered by the duke took firm hold on his mind. He escaped at the end of July, disguised himself as a peasant, and went on foot to his sister at Sorrento.

The truth seems to be that Tasso, after the beginning of 1575, became the victim of a mental malady, which, with- out amounting to actual insanity, rendered him fantastical and insupportable, a misery to himself and a cause of anxiety to his patrons. There is no evidence whatsoever that this state of things was due to an overwhelming passion for Leonora. The duke, instead of acting like a tyrant, showed considerable forbearance. He was a rigid and not sympathetic man, as egotistical as a princeling of that age was wont to be. But to Tasso he was never

that monster of ferocity which has been painted. The subsequent history of his connexion with the poet, over which we may pass rapidly, will corroborate this view. While at Sorrento, Tasso hankered after Ferrara. The court-made man could not breathe freely outside its charmed circle. He wrote humbly requesting to be taken back. Alfonso consented, provided Tasso would agree to undergo a medical course of treatment for his melancholy. When he returned, which he did with alacrity under those conditions, he was well received by the ducal family. All might have gone well if his old maladies had not revived. Scene followed scene of irritability, moodiness, suspicion, wounded vanity, and violent outbursts. In the summer of 1578 he ran away again; travelled through Mantua, Padua, Venice, Urbino, Lombardy. In September he reached the gates of Turin on foot, and was courteously entertained by the duke of Savoy. Wherever he went, "wandering like the world's rejected guest," he met with the honour due to his illustrious name. Great folk opened their houses to him gladly, partly in compassion, partly in admiration of his genius. But he soon

wearied of their society, and wore their kindness out by his querulous peevishness. It seemed, moreover, that life was intoler- able to him outside Ferrara. Accordingly he once more opened negotiations with the duke; and in February 1579 he again set foot in the castle. Alfonso was about to contract his third marriage, this time with a princess of the house of Mantua. He had no children; and, unless he got an heir, there was a probability that his state would fall, as it did subsequently, to the Holy See. The nuptial festivals, on the eve of which Tasso arrived, were not therefore the occasion of great rejoicing to the elderly bridegroom. As a forlorn hope he had to wed a third wife ; but his heart was not engaged and his expectations were far from sanguine. ‘Tasso, preoccupied as always with his own sorrows and his own sense of dignity, made no allowance for the troubles of his master. Rooms below his rank, he thought, had been assigned him. The princesses did not want to see him. The duke was engaged. Without exercising common patience, or giving his old friends the benefit of a doubt, he broke into terms of open abuse, behaved like a lunatic, and was sent off without ceremony to the madhouse of St Anna. This happened in March 1579; and there he remained until July 1586. Duke Alfonso’s long-sufferance at last had given way. He firmly believed that Tasso was insane, and he felt that if he were so St Anna was the safest place for him. Tasso had put himself in the wrong by his intemperate conduct, but far more by that incomprehen- sible yearning after the Ferrarese court which made him return to it again and yet again. It would be pleasant to assume that an unconquerable love for Leonora led him back. Unfortunately, there is no proof of this. His relations to her sister Lucrezia were not less intimate and affectionate than to Leonora. ‘The lyrics he addressed to numerous ladies are not less respectful and less passionate than those which bear her name. Had he compromised her honour, the duke would certainly have had him murdered. Custom demanded this retaliation, and society approved of it. If therefore Tasso really cherished a secret lifelong devotion to Leonora, it remains buried in impenetrable mystery. He did certainly not behave like a loyal lover, for both when he returned to Ferrara in 1578 and in 1579 he showed no capacity for curbing his peevish humours in the hope of access to her society.

It was no doubt very irksome for a man of Tasso’s pleasure-loving, restless, and self-conscious spirit to be kept for more than seven years in

confinement. Yet we must weigh the facts of the case rather than the fancies which

have been induiged regarding them. After the first few months of his incarceration he obtained spacious apart- ments, received the visits of friends, went abroad attended by responsible persons of his acquaintance, and corre- sponded freely with whomsoever he chose to address. The letters written from St Anna to the princes and cities of Italy, to warm well-wishers, and to men of the highest reputation in the world of art and learning, form our most valuable source of information, not only on his then condition, but also on his temperament at large. It is singular that he spoke always respectfully, even affection- ately, of the duke. Some critics have attempted to make it appear that he was hypocritically kissing the hand which had chastised him, with the view of being released from prison. But no one who has impartially considered the whole tone and tenor of his epistles will adopt this opinion. What emerges clearly from them is that he laboured under a serious mental disease, and that he was conscious of it. He complains that his disorder at times amounted to frenzy, after which his memory was weakened and _ his intellectual faculties enfeebled. He saw visions and heard phantom voices. Puck-like spirits made away with his books and papers. The old dread of poison, the old terror of the Inquisition, returned with greater violence. His bodily condition grew gradually worse; and, though he does not seem to have suffered from acute attacks of illness, the intellectual and physical constitution of the man was out of gear. Meanwhile he occupied his uneasy leisure with copious compositions. The mass of his prose dialogues on philosophical and ethical themes, which is very considerable, we owe to the years of imprisonment in St Anna. Except for occasional odes or sonnets—some written at request and only rhetorically interesting, a few inspired by his keen sense of suffering and therefore poignant—he neglected poetry. But everything which fell from his pen during this period was carefully preserved by the Italians, who, while they regarded him as a lunatic, somewhat illogically scrambled for the very offscourings of his wit. Nor can it be said that society was wrong. Tasso had proved himself an impracticable human being ; but he remained aman of genius, the most interesting personality in Italy. Long ago his papers had

been sequestered. Now, in the year 1580, he heard that part of the Gerusalemme was being published without his per- mission and without his corrections. Next year the whole poem was given to the world, and in the following six months seven editions issued from the press. The prisoner of St Anna had no control over his editors; and from the masterpiece which placed him on the level of Petrarch and Ariosto he never derived one penny of pecuniary profit. A rival poet at the court of Ferrara undertook to revise and re-edit his lyrics in 1582. This was Battista Guarini ;

and Tasso, in his cell, had to allow odes and sonnets, |

poems of personal feeling, occasional pieces of compliment, to be collected and emended, without lifting a voice in the matter. A few years later, in 1585, two Florentine pedants of the Della Crusca academy declared war against the Gerusalemme. They loaded it with insults, which seem to those who read their pamphlets now mere parodies of criticism. Yet Tasso felt bound to reply ; and he did so with a moderation and urbanity which prove him to have been not only in full possession of his reasoning faculties, but a gentleman of noble manners also. Certainly the history of Tasso's incarceration at St Anna is one to make us pause and wonder. The man, like Hamlet, was distraught through ill-accommodation to his circumstances and his age; brain-sick he was undoubtedly; and this is the duke of Ferrara's justification for the treatment he endured. In the prison he bore himself pathetically, peevishly, but never ignobly. He showed a singular

indifference to the fate of his great poem, a rare magna- nimity in dealing with its detractors. His own personal distress, that terrible malaise of imperfect insanity, absorbed him. What remained over, untouched by the malady, unoppressed by his consciousness thereof, dis- played a sweet and gravely-toned humanity. The oddest thing about his life in prison is that he was always trying to place his two nephews, the sons of his sister Cornelia, in court-service. One of them he attached to the duke of Mantua, the other to the duke of Parma. After all his father's and his own lessons of life, he had not learned that the court was to be shunned like Circe by an honest man. In estimating Duke Alfonso's share of blame, this wilful idealization

of the court by Tasso must be taken into account. That man is not a tyrant's victim who moves heaven and earth to place his sister's sons with tyrants.

In 1586 Tasso left St Anna at the solicitation of Vincenzo Gonzaga, prince of Mantua. He followed his young deliverer to the city by the Mincio, basked awhile in liberty and courtly pleasures, enjoyed a splendid reception from his paternal town of Bergamo, and produced a meritorious tragedy called Zorrismondo. But only a few months had passed when he grew discontented. Vincenzo Gonzaga, succeeding to his father's dukedom of Mantua, had scanty leisure to bestow upon the poet. Tasso felt neglected. In the autumn of 1587 we find him journeying through Bologna and Loreto to Rome, and taking up his quarters there with an old friend, Scipione Gonzaga, now patriarch of Jerusalem. Next year he wandered off to Naples, where he wrote a dull poem on Monte Oliveto. In 1589 he returned to Rome, and took up his quarters again with the patriarch of Jerusalem. The servants found him insufferable, and turned him out of doors. He fell ill, and went to a hospital. The patriarch in 1590 again received him. But Tasso's restless spirit drove him forth to Florence. The Florentines said, "Actum est de eo." Rome once more, then Mantua, then Florence, then Rome, then Naples, then Rome, then Naples—such is the weary record of the years 1590-94. We have to study a verit- able Odyssey of malady, indigence, and misfortune. To Tasso everything came amiss. He had the palaces of princes, cardinals, patriarchs, nay popes, always open to him. Yet he could rest in none. To rest would have been so easy, had he possessed the temperament of Berni or of Horace. But he was out of joint with the world. No sensuous comforts, no tranquillity of living, soothed his vexed soul. Gradually, in spite of all veneration for the sacer vates, he made himself the laughing-stock and bore of Italy.

His health grew ever feebler and his genius dimmer. In 1592 he gave to the public a revised version of the Gerusalemme. It was called the Gerusalemme Conquistata. All that made the poem of his early manhood charming he rigidly erased. The versification was degraded; the heavier elements of the plot underwent a dull rhetorical development. During the same year a prosaic composition in Italian blank verse, called Le Sette Giornate, saw the light. Nobody reads it now. We only mention it as one of Tasso's dotages—a dreary amplification of the first chapter of Genesis.

It is singular that just in these years, when mental disorder, physical weakness, and decay of inspiration seemed dooming Tasso to oblivion, his old age was cheered with brighter rays of hope. Clement VIII. ascended the papal chair in 1592. He and his nephew, Cardinal Aldobrandini of St Giorgio, determined to befriend our poet. In 1594 they invited him to Rome. There he was to assume the crown of bays, as Petrarch had assumed it, on the Capitol, Lean and worn out with sickness, ready to

totter into the tomb, where rest might possibly be found, Tasso reached Rome in November. The ceremony of his coronation was deferred because Cardinal Aldobrandini had fallen ill. But the pope assigned hima pension ; and, under the pressure of pontifical remonstrance, Prince Avel- lino, who held Tasso's maternal estate, agreed to discharge a portion of his claims by payment of a yearly rent-charge. At no time since Tasso left St Anna had the heavens apparently so smiled upon him. Capitolian honours and money were now at his disposal. Yet this good fortune came too late. It seemed as though fate had decided that this man, in all his weakness of character and pathetic grace of genius, should win the stern fame of martyrdom. Both laurel wreath and wealth must be withdrawn from him. Before the crown was worn or the pensions paid he ascended to the convent of St Onofrio, on a stormy Ist day of April in 1595. Seeing a cardinal's coach toil up the steep Trasteverine Hill, those good monks came to the door to greet it. From the carriage stepped Tasso, the Odysseus of many wanderings and miseries, the singer of sweetest strains still vocal, and told the prior he was come to die with him.

In St Onofrio he died, on the 25th of April of that year 1595. He was just past fifty-one; and the last twenty years of his existence had been practically and artistically ineffectual. At the age of thirty-one the Gerusalemme, as we have it, was accomplished. The world too was already ringing with the music of Aminta. More than this Tasso had not to give to literature. But those succeeding years of derangement, exile, imprisonment, poverty, and hope deferred endear the man to us. Elegiac and querulous as he must always appear, we yet love Tasso better because he suffered

through nearly a quarter of a century of slow decline and unexplained misfortune.

Taken altogether, the best complete edition of Tasso's writings is that of Rosini (Pisa), in 33 vols. The prose works (in 2 vols., Florence, Le Monnier, 1875) and the letters (in 5 vols., same pub- lishers, 1853) have been admirably edited by Cesare Guasti. This edition of Tasso's Letters forms by far the most valuable source for his biography. No student can, however, omit to use the romantie memoir attributed to Tasso's friend Marchese Manso (printed in Rosini's edition of Tasso's works above cited), and the important Vita di Torquato Tasso by Serassi (Bergamo, 1790). To give any- thing like a complete account of more recent critical and bio- graphical Tasso literature is impossible within the limits of this article. (J. A. 8.)

TASSONI, ALEssanpro, Italian poet, was a native of Modena, where he was born in 1565, and where he died in 1635. From 1599 till 1608 ke was secretary to Cardinal Ascanio Colonna, and in this capacity saw some diplomatic service ; he was afterwards employed for some time in similar occupations by Charles Emmanuel, duke of Savoy. His best-known literary work is a burlesque epic entitled La Secchia Rapita, or "The Rape of the Bucket " (1622), the reference being to a raid of the Modenese upon the people of Bologna in 1325, when a bucket was carried off as a trophy. As in Butler's Hudibras, many of the personal and local allusions in this poem are now very obscure, and are apt to seem somewhat pointless to the general reader, but, in spite of Voltaire's contempt, it cannot be neglected by any systematic student of Italian literature (compare vol. xii. p. 512). Other characteristic works of Tassoni are his Pensieri Diversi (1612), in which he treats philosophical, literary, historical, and scientific questions with unusual freedom, and his Considerazioni sopra iu Petrarcha (1609), a piece of criticism showing great independence of traditional views.

TASTE is the sensation referred to the mouth when certain soluble substances are brought into contact with the mucous membrane of that cavity. The sense is located almost entirely in the tongue. Three distinct sensations are referable to the tongue—(1) taste, (2) touch, and (3)

temperature. The posterior part of its surface, where there is a A-shaped group of large papille, called circum- vallate papillz, supplied by the glosso-pharyngeal nerve, and the tip and margins of the tongue, covered with filiform (touch) papillae and fungiform papille, are the chief localities where taste is manifested, but it also exists in the glosso-palatine arch and the lateral part of the soft palate. ‘The middle of the tongue and the surface of the hard palate are devoid of taste. The terminal organs of taste consist of peculiar bodies named taste-bulbs or taste- goblets, discovered by Schwalbe and Lovénin 1867. They can be most easily demonstrated in the papille foliate, large oval prominences found on each side near the base of the tongue in the rabbit. Each papilla consists of a series of laminz or folds, in the sides of which the taste- bodies are readily displayed ina transverse section. Taste- bodies are also found on the lateral aspects of the circum-vallate papillee (see fig. 1), in the fungiform papillee, in the

Fic. 1.—Transverse section of a circumvallate papilla: W, the papilla; v, v, the wall in section ; R, R, the eircular slit or fossa; K, K, the taste-bulbs in posi- tion; N,N,the nerves. The figures arefrom Landois and Stirling’s Phystology.

papillze of the soft palate and uvula, the under surface of the epiglottis, the upper part of the posterior surface of the epiglottis, the inner sides of the arytenoid car- tilages, and even in the vocal cords.

The taste-bulbs are min- ute oval bodies, somewhat like an old-fashioned Flo- rence flask, about 5}, inch in length by 34, in breadth. Each consists of two sets of cells,—an outer set, nucle- ated, fusiform, bent like the staves of a barrel, and arranged side by side so as

Fig. 2.

Fie. 2.—Isolated taste-bulb: D, supporting

z or protective cells; K, under end; E free

to leave a small Opening at end, open, with the projecting apices of the taste-cells.

the apex (the mouth of the rie, 3.—d, Isolated protective cell; e, taste-

Fig. 3.

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barrel), called the gustatory pore; and an inner set, five to ten in number, lying in the centre, pointed at the end next the gustatory pore, and branched at the other extremity. The branched ends are continuous with non-medullated nerve fibres from the gustatory nerve. These taste-bodies are found in immense numbers: as many as 1760 have been counted on one circumvallate papilla in the ox. They are absent in rep- tiles and birds. F. E. Schultze states that they exist in the mouth of the tadpole, whilst the tongue of the frog is covered with epithelium resembling that of the gustatory bodies. Leydig has described organs having a similar structure in the skins of freshwater fishes and the tadpole: these may possibly be widely distributed taste-organs. The proofs that these are the terminal organs of taste rest on careful observations which have shown (1) that taste is only experienced when the sapid substance is allowed to come into contact with the taste-body, and that the sense

membrane where these are deficient ; (2) that they are most abundant where the sense is most acute; and (3) that section of the glosso-pharyngeal nerve which is known to be distributed to the areas of mucous membrane where taste is present is followed by degeneration of the taste- bodies. At the same time it cannot be asserted that they are absolutely essential to taste, as we can hardly suppose that those animals which have no special taste-bodies are devoid of the sense.

Taste is no doubt closely allied to smell; hence in invertebrates organs are found that may be referred to either of the senses (see Sent). Tastes have been vari- ously classified. One of the most useful classifications is into sweet, bitter, acid, and saline tastes. To excite the sensation, substances must be soluble in the fluid of the mouth. Insoluble substances, when brought into contact with the tongue, give rise to feelings of touch or of temperature, but excite no taste. The specific mode ‘of action of sapid substances is quite unknown. The extent of surface acted on increases the massiveness of the sensation, whilst the intensity is affected by the degree of concentration of the solution of the sapid substance. If solutions of various substances are gradually diluted with water until no taste is experienced, Valentine found that the sensations of taste disappeared in the following order— syrup, sugar, common salt, alocs, quinine, sulphuric acid ; and Camerer found that the taste of quinine still con- tinued although diluted with twenty times more water than common salt. Von Vintschgau found that the time required to excite taste after the sapid substance was placed on the tongue varied. Thus saline matters are tasted most rapidly (17 second), then sweet, acid, and bitter (‘258 second). This is probably due to the activity of diffusion of the substance. No relation between the chemical constitution of the substance and the nature of the taste excited by it has yet been discovered, and there are many curious examples of substances of very different chemical constitutions having similar tastes. For example, sugar, acetate of lead, and the vapour of chloroform have all a sweetish taste. A temperature of from 50° to 90° F. is the most favourable to the sense, water above or below this temperature either masking or temporarily paralysing it. Taste is often associated with smell, giving rise to a sensation of flavour, and we are frequently in the habit of confounding the one sensation with the other. Chloroform excites taste alone, whilst garlic, asafoetida, and vanilla excite only smell. This is illustrated by the familiar experiment of blindfolding a person and touch- ing the tongue successively with slices of an apple and of an onion. In these circumstances the one cannot be dis- tinguished from the other when the nose is firmly closed. No doubt also experience aids in detecting slight differ- ences of taste by suggesting to the mind what may be expected ; it is not easy, for instance, to distinguish the tastes of red and white wine when the eyes are blind- folded. Taste may be educated to a remarkable extent ; and careful observation—

along with the practice of avoid- ing all substances having a very pronounced taste or having an irritating effect—enables tea-tasters and winc- tasters to detect slight differences of taste, more especially when combined with odour so as to produce flavour, which would be quite inappreciable to an ordinary palate. As to the action of electrical currents on taste, observers have arrived at uncertain results. So long ago as 1752 Sulzer stated that a constant current caused, more especially at the moments of opening and of closing the current, a sen- sation of acidity at the anode (+ pole) and of alkalinity at the katode (— pole). This is in all probability due to electrolysis, the decomposition products exciting the taste-

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is absent or much weakened in those areas of mucous | bodies.

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Griinhagen found that rapidlyinterrupted currents fail to excite the sense ; Von Vintschgau, who has directed much attention to the sense of taste, says that when the tip of his tongue is traversed by a current there is only a tactile sensation. Again Hénigschmied, on the contrary, found that a current excited the metallic or acid taste at the anode placed on the tip of the tongue, whilst the alka. line taste of the katode was absent. The writer of this article has found that this is the experience of most persons examined by him.

Disease of the tongue causing unnatural dryness may

interfere with taste. Substances circulating in the blood may give rise to subjective sensations of taste. Thus santonine, morphia, and biliary products (as in jaundice) usually cause a bitter sensation, whilst the sufferer from diabetes is distressed by a persistent sweetish taste. The insane frequently have subjective tastes, which are real to the patient, and frequently cause much distress. Tn such cases, the sensation is excited by changes in the taste-centres of the brain. Increase in the sense of taste is called hypergeusia, diminution of it hypogeusia, and its ‘entire loss ageusia. Rare cases occur where there is a subjective taste not associated with insanity nor with the circulation of any known sweetish matters in the blood, possibly

caused by irritation of the gustatory nerves or by changes in the nerve centres.

As to the comparative anatomy of the tongue, see Owen's Com- parative Anatomy and Physiology of Vertebrates (London, 1868). For a full account of the physiology of taste, see Von Vintschgau's article " Geschmackssinn," in Hermann's Handbuch der Physiologie, vol. iii. part ii. (J. G. M.)

TATARS. See Tarrars.

TATE, Nanum (1652-17 15), poet-laureate, was born in 1652 in Dublin, and was educated at Trinity College there. He afterwards removed to London, and adopted literature as a profession, succeeding Shadwell as poet-laureate in 1692. He died within the precincts of the Mint, Southwark (whither he had taken refuge fron: his debtors), August 12, 1715.

His name is still remembered in connexion with the New Version of the Psalms of David, which, in conjunction with Nicholas Brapy (q.v.), he published in 1696 (see Hymns, vol. xii. p. 590). Tate was also the author of some ten dramatic pieces (see Biogr.

Dramatica, i. 703) and a great number of poems, including one entitled The Innocent Epicure, or The Art of Angling (1697).

TATIAN, one of the earliest Christian apologists, whose personality and work had an important influence on the history of the church during the period of the Antonines, He was by birth an Assyrian (according to Zahn of Sem- itic descent), but received a Greek education, and, after acquiring a very extensive knowledge of Greek literature, began to travel about the Roman empire as a wandering teacher or "sophist." But his inquiring disposition and his earnest spirit remained unsatisfied alike with the religions and the philosophies he encountered, while the – doings of men, their greed for amusement and pleasure, their vanity and treachery, disgusted him. In this tem- per, about 150 a.p., he reached Rome, where the Old Testa- ment fell into his hands, and at the same time he came into closer relations with the Christians ; their firm faith, chaste morals, fearless courage, and close fellowship deeply impressed him, and in the end the spectacle of their life and their monotheistic doctrine founded upon

prophetic revelation completely conquered him. Henceforward the whole unchristian world, with all its philosophy and culture, presented itself to him as mere darkness and the deception of demons, but the “ barbarian philosophy ” (for so he called Christianity) as the wisdom of God. He became a convert, and soon afterwards (152-153) wrote (most probably in Greece, where he stayed for some time)

his Oratio ad Grecos, which gained him great repute

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among the Christians, and is still extant. This discourse is distinguished from the other apologies of that century by the brusqueness with which its author repudiates the culture of the Greeks; his scorn, however, does not forget to avail itself of the resources of Greek philosophy and rhetoric. His polemic often reminds the reader of the Cynics and of such scoffers as Lucian ; his view of. things, however, is very different from that of the last-named writer, for with Tatian the “barbarian philosophy, ” on behalf of which he speaks, which teaches a monotheistic cosmology and inculcates rigid asceticism and renunciation of the world, is indisputably certain. In many details, and even in the general outline of his philosophy, Tatian the Christian continued without knowing it to be a Platon- izing philosopher ; but that he had undergone a radical change is shown by lis views of history and civilization, his faith in one living God, his conviction that truth is contained nowhere else than in the Christian Scriptures, his attitude of trust towards the Logos, made man in Jesus Christ, and finally by his earnest and world-forsaking expectation of judgment to come. The Oratio, which is polemical rather than apologetic in its character, has a special importance in the history of Christian dogma, inas- much as it gives an elaborated exposition of the doctrine of the Logos; it was also read by subsequent writers, as, for example, by Julius Africanus, for its chronological data. Tatian was the first apologist to undertake, on be- half of Christianity, a work of the class which afterwards developed into the numerous “ world-histories ” written from the Christian point of view. Tatian’s diction is often rough, harsh, and abrupt, his sentences involved and inelegant. He has the art, indeed, of expressing him- self with uncommon freedom and independence, and can put things also in a very graphic way, but at the

same time he is a careless stylist, or rather, as an apostate from the Greek view of things, he has tried to accentuate his

breach with classical traditions by elaborate carelessness,

and deliberate eccentricity.

Tatian soon returned from Greece to Rome, and came into close relations with the famous apologist Justin, whom he reverenced greatly. He himself established a school, to which the afterwards celebrated ecclesiastical writer Rhodon belonged for a time. So long as Justin lived (¢.¢., till 166) Tatian's doctrines excited no feelings of offence in the Christian community, although even in his Oratio there are germs of questionable and unorthodox views. These germs, however, he continued to develop until about 172; and, as about this very time the Roman church became severely opposed to everything Gnostic and heretical, a rupture was inevitable; the date of the breach is given by Eusebius (doubtless following Julius Africanus) as having been 172. But the teaching of

Tatian had really become open to challenge. He drew a ' distinction between the supreme God and the demiurge, considering the latter to be good in his nature indeed, but quite a subordinate being ; he accepted the doctrine of a variety of sons; he utterly rejected marriage and the use of animal food; he denied the blessedness of Adam ; he began to abandon the allegorical interpretation of the Scriptures and to see genuine difficulties and contradic- tions in them ; he sought to demonstrate from the epistles of Paul the indispensableness of the most rigid asceticism ; but indeed all his "heresies" (aud he has also been charged with docetism) have their explanation in this desire of his to establish a theoretical basis for his doctrine of the Christian duty of complete world-renunciation. He joined the " Encratites," a sect which indeed had existed before this time, but which received new life from his presence. Of his numerous writings belonging to this period nothing has survived the hostility which sought their repression

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save a few titles (BiBAtov zpoBAyparov, mept TOD Kara TOV cwrhpa Karapticuod, &c.) and one or two very iuteresting fragments in the works of Clement of Alexandria, Origen, and Jerome. Clement of Alexandria seems personally to have known Tatian, and even to have been his pupil for a time. Soon Tatian began also to be assailed in writing by the teachers of the church, and to be set aside as a very prodigy among heretics, and as a man who united the errors of Marcion with those of Valentine. Musanus, Rhodon, Treneus, the author of the Muratorian fragment (see below), Tertullian, Hippolytus, Clement of Alexandria, and Origen all took part in refuting him.

Towards the end of his life, or perhaps even between 152 and 172, Tatian went from Rome to Mesopotamia, and there—probably in Edessa—wrought a great deal. It is probable that he was in Rome about the year 172, but whether he died there or in his native country is not ascertained. It is very possible that in Syria, where ecclesiastical matters had not been developed so far as in – the West, the doctrines of Tatian met with toleration within the Christian communities, but neither of this can we be certain.) But this we do know, that a work of Tatian's not yet mentioned, the Diatessaron, held its ground in the Syrian churches and even in ecclesiastical use for two whole centuries.

The Diatessaron is a gospel very freely and boldly constructed by Tatian out of the four Gospels known to us. It cannot have been produced during his latter years, for all traces of dualism are absent. On the other hand, however, it exhibits ccrtain peculiar- ities of the theology of its compiler. Probably one would not be far wrong in assigning it to the first years of the reign of Marcus Aurelius. It was written by Tatian in Greek, not in Syriac as Zahn has tried to make out; this is shown—(1) by the title, it being known even among the Syrians as Diatessaron; (2) by a few Greek fragments which still survive; (8) by the Latin redaction which it received in the 6th century; (4) by its rejeetion in the Muratorian fragment—for that the word "m-tia-i," earelessly cor- rected by the transcriber, stood originally "tatiani" may be regarded ascertain." In estimating the work scholars were formerly entirely dependent on certain meagre notices in Eusebius, Theodoret, Ephraem Syrus, Epiphanius, and the later Syrians, but we have recently become possessed of large portions of it, and are now in a position to form for

ourselves an idea of its character and plan. In 1877 there was published? a Latin translation, by Aucher the Mechitarist, of Ephraem's gospel commentary, which had been pre- served in Armenian, and it then became apparent that Ephraem had taken the Diatessaron as his basis. This led to further research.® Recognizing with other scholars that other Syrian writers also, down to the middle of the 4th century, had used the Diatessaron (Theodoret tells us that 'in his diocese alone he caused more than 300 copies to be withdrawn from use), Zahn undertook the labo- rious task of restoring the work with the help of Ephraem's com- mentary and other sources.6 In details much of what Zahn has given as belonging to the text of the Diatessaron remains problem- atical,in particular he has not been sufficiently careful in his examination of the work of Aphraates,—but in all the main points his restoration has been successful. The rediscovery of such a work is in a variety of ways of the very highest importance for the early history of Christianity. (1) It is of interest for the history of the canon. It shows that in Tatian's time there was still no recognized New Testament canon, and that the texts of the Gospels were not regarded as inspired. He could not possibly have treated them with such freedom had they becn held to be otherwise. But the ecclesiastical use made of his work in Syria shows that Tatian intended it for the chureh, and, as we are informed further by Eusebius that Tatian also edited the Pauline epistles, we are entitled to conclude that, like Marcion, he wished to frame a special New Testament canon. (2) It is of importance for the Gospels as we now have them. We learn from the Diatessaron that about 160 A.D. our four Gospels had already taken a place of prominence in the church and that no others had done so; that in particular the Fourth Gospel had taken a fixed place alongside of the three

1 The author of the Acta Archelai treats him as a heretie.

2 See Zeitschr. f. d. luth. Theol., 1874 and 1875; Zettschr. 7. wiss. Theol., 1877; Zeitschr. f. Kirchengesch., iii. p. 400.

3 See Credner, Hinl., i. 437 sg.; Semiseh, Tatiant Diatessaron,

1856.

4 Kvangelit Concordantis Expositio facta a S. Ephraemo, Venice.

5 See Harnack, Ztschr. f. Kirchengesch., iv. p. 471 sq.

6 Zahn, Tatian’s Diatessaron, 1881.

synoptics, from the Diatessaron that the texts of our Gospels about the year 160 already ran essentially as we now read them, but that inten- tional changes were not wanting about the middle of the 2d century. Thus, forexample, Tatian in his Gospel according to Matthew found nothing about the ‘‘ church ” and about the building of the church upou Peter the rock. These sentences therefore are very probably of later interpolation. (4) It is of importance for the light it throws on Tatian’s Christianity. The Syriac translation of the Diatessaron still falls within the 2d century, but Zahn was mistaken in assum- ing it to presuppose a prior Syriac translation of the separate Gospels (the so-called Syrus Curetonianus); Baethgen! has shown the latter to be the later. It was only gradually that the ‘‘“evangelium der Getrennten” superseded the “evangelium der Gemischten,”? ‘

The best editions of the Oratio ad Grexcos are those of Worth (Oxford, 1700), Maranus (Paris, 1742), and Otto (Jena, 1851). See Daniel, Tatian der Apologet, 1837; Zahn, Tatian’s Diatessaron, Erlangen, 1881 (compare also his Zvang.- Comm. des Theophilus, Erlangen, 1883, p. 286 sg.); Harnack, Texte u. Unter- suchungen z. Gesch. d. altchr. Lit., i. 13 Id., Ztschr. f. Kirchengesch., iv. 471 $9.3 and Tatian’s Rede an die Griechen iibersetzt u. eingeleitet, Giessen, 1884; Hilgen- feld, Ketzergesch., Leipsic, 1884; Mller, art. ‘‘ Tatian,” in Herzog-Plitt’s Encyki., vol. xv.; and Donaldson, /ist. of Christ. Lit., iii. p. 3-62, (A. HA.)

TATIUS, Acuinies. See Romance, vol. xx. p. 635 sq.

TAULER, Joann (c. 1300-1361), was born about the year 1300 in Strasburg, where his father was a wealthy burgher. It is probable that he entered the Dominican convent in his native city about the year 1313, while Meister Eckhart was still professor of theology (1312- 1320) in the monastery school. From Strasburg he went to the Dominican college of Cologne, and

some believe that his superiors sent him a few years later to St James's College, Paris. After his theological education was finished he returned to Strasburg. In 1324 the pope placed under an interdict these parts of Germany, including Strasburg, which supported the excommunicated emperor Louis of Bavaria. It was one of the privileges of the Dominican and Franciscan orders to be allowed to perform religious services when the secular and all other regular clergy were silenced by an interdict. The Dominican order, however, had taken the side of Frederick, and in most places refused to say mass ; but in Strasburg they remained in the deserted city, kept their churches open, and admin- istered to the citizens the consolations of religion. It is supposed that this conduct of the Strasburg Dominicans was due to the influence of Tauler. In 1339 the heads of the order interfered, and commanded the monks to close their churches. The town council in return banished the Dominicans from the city. Tauler, with some of his brethren, found refuge in Basel, although that city, like Strasburg, sided with the emperor. During these years Basel was the headquarters of the "Friends of God" (Gottesfreunde, see Mysticism, vol. xvii. p- 133), and Tauler was brought into intimate relations with the members of that pious mystical fellowship. He returned to Strasburg probably in the year 1346. It is somewhat difficult to trace his later life. The Black Death came to Strasburg in 1348, and it is more than probable that, when the city was deserted by all who could leave it, Tauler remained at his post, encouraging by sermons and personal visitations his terror-stricken fellow-citizens. His corre- spondence with distinguished members of the Gottes- Jreunde, especially with Margaretha Ebner, and the fame of his preaching and other work in Strasburg, had made him known throughout a wide circle of pious people. He seems to have made preaching journeys, in the later years of his life, to Cologne and to other places in the Rhine- land. He died in the year 1361.

u vangelienfragmente: Der Griechische Text des Cureton' schen Syrers, Leipsic, 1885.

2 On the Diatessaron, its later history and various editions, see (besides Zahn, as cited above) the Codea Fuldensis, ed. Ranke, 1868 ; Schmeller, Ammonii Alex. qua et Tatiant dicitur Harmonia Evang., 1841; Sievers,

Tatian, Lat. and Ger., Paderborn, 1872; Martin, “De Tatiani Diatessaron Arabica Versione,” in Pitra’s Analecta Sacra, vol. iv. (1883), pp. 465, 487.

(3) As regards the text of the Gospels, we can conclude |

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It is somewhat difficult to form an estimate of the religious life and opinions of Tauler. For many years the clrief modern authority upon the subject was the late Prof. C. Schmidt of Strasburg, whose views had been introduced into England in Miss Winkworth’s book upon Tauler. According to Schinidt, Tauler’s religious life divides into two parts, before and after what may be called hig second conversion. In the first period Eckhart rules his religious life; in the second he is under the influence of the inystcrious ‘‘Friend of God in the Oberland,” whom Schmidt asserts to be Nicholas of Basel. Denifle doubts the historical character of this episode and the genuineness of the book, while Preger admits the fact of the conversion, but refuses to identify the mysterious stranger with Nicholas of Bascl.

It is still more difficult to determine the precise nature of the theological opinions of Tauler. Deuifle maintains that the only genuine remains of Tauler are the eighty well-known Sermons in- cluded in the earliest edition and four others in two manuscripts, all of which bear Tauler’s name; Preger seems inclined to admit in addition the Sermons in the account of Tauler’s conversion ; both critics exclude the famous Book of Spiritual Poverty. Schmidt, on the other hand, while admitting the authenticity of all the above-named sermons, calls the Book of Spiritual Poverty Tauler’s masterpiece.

If we take the Sermons by themselves, then Tauler’s teachers in theology were the Pseudo-Dionysius, Augustine, Gregory, Bernard, the two abbots of St Victor, Thomas Aquinas, and, above all, Theodoric of Freiburg and Meister Eckhart. His theology will represent the purest and highest type of German mysticism (see Mystictsm), and, by insisting upon personal relationship to God, freedom from the thraldon: of authority, and the worthlessness of mere good works without the renewal of the inward life, will re- present a tendency in theology which found full expression in the reformation of the 16th century. If, on the other hand, the Book of Spiritual

Poverty be included among the genuine writings of Tauler, then undoubtedly his views have more distinct connexion with that doctrine of the appropriation of the benefits of Christ's work of redemption by an imitatio Christ? finding expression in a life of evangelical poverty which is such a characteristic of the religious life of the century to which he belonged. The problem is a very difficult one, and it may be questioned whether we are yet in a position to solve it. Denifle is undoubtedly correct in his statement that we need critical texts of 14th-century mystical writers, and that very great uncertainty exists with reference to the authors of the individual mystical writings of that period. It may be added that it is very probable, when the organization and method of work among the ‘‘ Friends of God” are taken into con- sideration, that many mystical books of devotion were the work, not of one, but of several authors, and that the conditions of the problem concerning the authenticity of Tauler's writings are not unlike those which exist among the books and tracts ascribed to Wickliffe. This at all events nay be safely asserted, that Tauler's sermons are among the noblest in the German language. They are not so emotional as Suso's, nor so speculative as Eckhart's, but they are intensely practical, and touch on all sides the deeper pro- blems of the moral and spiritual life.

Tauler's Sermons were printed first at Leipsic in 1498, ana reprinted with additions from Eckhart and others at Basel (1521, 1522) and at Cologne (1548), There is a recent edition by Julius Hamberger, Frankfort, 1864. See Denifle, Das Buch von geistlicher Armuth, 1877; Carl Schmidt, Johann Tauler von Strass- burg, Hamburg, 1841; Miss Winkworth, Zauler's Life and Sermons; R. A. Vaughan, Hours with the Mystics, 3d ed., vol. i. pp. 214-807. The third volume of Preger's Gesch. der deutschen Mystik im Mittelalter, which will treat of Tauler, is in the press.

TAUNTON, a municipal borough and market-town of Somerset, England, is situated in the beautiful and fertile vale of Taunton Dene, on the river Tone, on the Taunton and Bridgwater Canal, and on several branches of the Great Western Railway, 45 miles south-south-west of Bristol, 31 north-east of Exeter, and 163 west-south-west of London. The river is crossed by a stone bridge of three arches. The town is well built, the three main streets being wide and regular, and meeting in a triangular space in the centre called the Parade, where there is a market cross. The castle, now occupied

by the museum of the Somerset Archeological and Natural History Society, is reputed to have been founded by Ine, king of the West- Saxons. The earliest portion of the present building was erected by Walter Giffard, bishop of Winchester, in the time of Henry L., but the whole building was repaired in 1496, and an embattled gateway erected by Bishop Langton. The church of St Mary Magdalene, a spacious building with double aisles both north and south of the nave, is chiefly Perpendicular, but has remains of Norman work in

the chancel arch, and of Early English in the north aisles and transepts. It possesses one of the finest of the characteristic towers of Somerset, but only a facsimile reproduction (erected 1857-62) of the old one. There are still some remains of the Augustinian priory founded by Bishop Giffard, and there are also two modern convents. Taunton is an important centre of education, the principal institutions being the grammar school (founded in 1522 by Richard Fox, bishop of Winchester), Huish's schools, the Independent college (1841), and the Wesleyan collegiate institution (1847). The other principal public buildings are the old market-house, the assembly rooms, the new market in the Ionic style, and the shire hall in the Eliza- bethan style, opened in 1858 at a cost of £28,000. The charitable institutions include the Taunton and Somerset hospital (opened in 1809 and extended in 1870 and 1873), the eye infirmary (1816), Gray's almshouses and chapel (1635), St Saviour's home for boys (1870), and the servants' training home (1882). The town possesses manufactories of silk, collars and cuffs, and gloves, iron and brass found- ries, coach-building works, and breweries. There is also a considerable agricultural trade. The population of the municipal and parliamentary borough (area 1249 acres) in 1881 was 16,614. The population of the same area in 1871 was 15,466.

Taunton has played a prominent part during the troubled periods of Eph history. Various Roman remains prove it to have been occupied by the Romans; but it first obtained historical notice when Ine, king of the West-Saxons, made it the border fortress of his kingdom. It takes the name Taunton, or Thoneton, from its situation on the Tone or Thone. The castle was razed by Ethelburg after expelling Edbricht, king of the South-Saxons.

About the time of William the Conqueror the town and castle were granted to the bishop of Winchester, and for many years the castle was the bishop's principal residence. In the reign of William it possessed a mint. In 1497 the town and castle were seized by the impostor Perkin Warbeck. Taunton was made the seat of the suffragan see of Taunton and Bridgwater in 15388, but, on the death of William Finch, the first bishop, in 1559, the Act had no further operation in reference to Taunton. Like the other towns of Somerset, Taunton was strongly Puritan in its sympathies. Situated at a point where the main roads of the county met, it was during the Civil War almost constantly in a state of siege by one or other of the rival parties. Having been garrisoned by the Parliamentary forces, it was captured by the Royalists in the summer of 1648, but on 8th July 1644 it was, after a long siege, taken by Blake, who held it with heroic pertinacity till relieved by Fairfax on the 11th May 1645, and again after it was invested by 10,000 troops under Goring till the siege was finally raised on the 3d July. Still constant to its Puritan traditions, Taunton welcomed Monmouth in 1685 with acclamation, and he was proclaimed king there on the 20th June, the maidens of the town presenting him with a standard. As a consequence, Taunton was made the chief example of the fearful vengeance of Jeffreys, who, at the assizes held in the castle, con- demned no fewer than 134 inhabitants of the town and neighbour- hood to death, and a much larger number to transportation. Taunton obtained a municipal charter from Charles I. in 1627, which was revoked in 1660. A second charter, granted by Charles II. in 1677, was permitted to lapse in 1792 owing to the corporation allowing a majority of their number to die without filling up the vacancies. From this time until it again received municipal government, 17th April 1877, it was under the care of two bailiffs appointed at the court leet of the lord of the manor. Formerly the town returned mo members to parliament, but in 1885 the number was reduced o one.

See Tonlmin's History of Taunton, edited by Savage, 1822; and several papers in the Proceedings of the Somerset Arehzologieal Society for 1872.

TAUNTON, a city of the United States, the county seat of Bristol county, Massachusetts, lies some 31 miles nearly south from Boston. The town proper, sometimes called Taunton Green, stands on the right bank of the Taunton river, at the head of navigation, about 17 miles above itsmouth.

The entire area enclosed within the cor- porate limits is 37 square miles. Taunton is traversed by the main line of the Old Colony Railway, which con- nects it with Boston and Fall River, Mass., and Pro- vidence, R.I. Owing to its situation and its connexions by rail and sea, Taunton has become a supply point for the

greater part or south-eastern Massachusetts. The popula- tion of the city was 18,629 in 1870, 21,213 in 1880, and 23,674 in 1885, showing an increase somewhat in excess of that of the State at large. Fully one-fourth of the popu- lation are of foreign birth, and the proportion is increasing. The State lunatic asylum is in Taunton. The leading industries are the manufacture of cotton goods, iron and steel products (particularly locomotives, machinery, nails and spikes), and silver-plated table ware. Taunton was incorporated as a town in 1639, and received a city charter in 1864.

TAURIDA, a government of southern Russia, includes the peninsula of Crimea (¢.v.) and a tract of mainland situated between the lower Dnieper and the coasts of the Black Sea and the Sea of Azoff, and is bounded by these two seas on the §., while it has on the N. the governments of Kherson and Ekaterinoslaff. The area is 24,540 square miles, of which 6990 square miles belong to the Crimea ; its continental part consists of a gently undulating steppe of black earth, with only a few patches of salt clay on the banks of the Sivash or Putrid Sea, and sands in the lower course of the Dnieper. It is watered by the Dnieper, which flows along the frontier for 180 miles, and by two small rivers, the Molotchnaya and Berda. Many small lakes and ponds occur in the north, especially among the Dnieper sands, as well as on the Kinburn peninsula, at the mouth of the Dnieper, where salt is made. There are no forests except the artificial plantations in the colonies of the Mennonites. The climate is continental, and resembles that of central Criniea and Kherson. The population in 1883 was 940,530 (247,780 in Crimea). The continental portion, although less mixed than that of the peninsula, consists of Russians (Great, Little, and White Russians), who constitute 83 per cent. of the population, Germans (11 per cent.), Bulgarians (5 per cent.), and Jews (1 per cent.).

Agriculture and cattle-breeding are the leading occupations. Wheat is the chief product, and by the Germans and Russian Non- conformists on the Molotchnaya agriculture is carried to a high degree of perfection. In 1882 there were within the government 356,270 horses, 485,800 cattle, and 3,985,800 sheep (2,891,700 merinos). Salt is made both on the mainland and in the Crimea, and the fisheries along the coast supply an export trade. Manu- factures are insignificant, but there is a brisk export trade in grain, salt, fish, wool, and tallow. The main centres of trade are the Kakhovka port on the Dnieper, Berdyansk on the Sea of Azoff, and the seaports of Eupatoria, Sebastopol, Sudak, and Theodosia. The government is divided into eight districts, the chief towns of which (with populations in 1881) are Simferopol (29,080), capital of the government, Eupatoria (18,420), and Theodosia (10,800) in Crimea, and Aleshki (8915), Berdyansk (18,180), Melitopol (18,310), Perekop (4280), and Yalta (3000) on the continent. Several villages, such as Bolshoy Tokmak (8000) and Andreevka (7300), have each a population of more than 5000.

TAUROMENIUM. See Taormina.

TAURUS. See Asta Mrvor, vol. ii. p. 704-5.

TAVERNIER, Jean Baptiste (1605-1689), the cele- brated traveller and pioneer of French trade with India, was born (1605) at Paris, where his father Gabriel and uncle Melchior, Protestants from Antwerp, pursued with reputation and success the profession of geographers and engravers. The conversations he heard in his father’s house inspired Jean Baptiste with an early desire to travel, and in his sixteenth year he had already visited England, the Low Countries, and Germany, and seen something of war with the imperialist Colonel Hans Brenner, whom he met at Nuremberg. Four anda half years in the household of Brenner’s uncle, the viceroy of Hungary (1624-29), and a briefer connexion in 1629 with the duke of Rethel and his father the duke of Nevers, prince of Mantua, gave him the habit of courts, which was invaluable to him in later years, and at the defence of Mantua in 1629, and in Ger- many in the following year with Colonel Walter Butler (afterwards notorious through the death of Wallenstein),

he gained some military experience. When he left Butler to view the diet of Ratisbon in 1630, he had seen Italy, Switzerland, Germany, Poland, and Hungary, as well as France, England, and the Low Countries, and spoke the principal languages of these regions. He was now eager to visit the East, and at Ratisbon he found the oppor- tunity to join two French fathers, M. de Chapes and M. de St Liebau, who had received a mission to the Levant. In their company he reached Constantinople early in 1631, and here he spent eleven months, and then proceeded by Tokat, Erzerum, and Erivan to Persia. His farthest point in this first journey was Ispahan ; he returned by Baghdad, Aleppo, Alexandretta, Malta, and Italy, and was again in Paris in 1633. Of the next five years of his life nothing is known with certainty, but it is probable that it was during this period that he became controller of the house- hold of the duke of Orleans. In September 1638 he began a second journey (1638-43) by Aleppo to Persia and thence to India as far as Agra and Golconda. His visit to the court of the Great Mogul and to the famous diamond mines was, of course, connected with the plans realized more fully in his later voyages, in which Tavernier travelled as a merchant of the highest rank, trading in costly jewels and other precious wares, and finding his chief customers among the greatest princes of the East. The second journey was followed up by four others. In his third journey (1643-49) he went as far as Java and returned by the Cape; but his relations with the Dutch proved not wholly satisfactory, and a long lawsuit on his return yielded but imperfect redress. In his last three journeys (1651-55, 1657-62, 1664-68) he did not proceed beyond India. The details of these voyages need not detain us here, and indeed are often obscure; but they completed an extraordinary knowledge of the routes of overland Eastern trade, and brought the now famous merchant into close and friendly communication with the greatest Oriental potentates. They also secured for him a large fortune and great reputation at home. He was presented to Louis XIV., “in whose service he had travelled sixty thousand leagues by land,” received letters of nobility (16th February 1669), and in the following year purchased the barony of Aubonne, near Geneva. In 1662 he had married Madeleine Goisse, daughter of a Parisian jeweller.

Thus settled in ease and affluence, Tavernier occupied himself, as it would seem at the desire of the king, in publishing the account of his journeys. He had neither the equipment nor the tastes of a scientific traveller, but in all

that referred to commerce his knowledge was vast and could not fail to be of much public service. He set to work therefore with the aid of Samuel Chappuzeau, a French Protestant littérateur, and produced a Nouwvelle Relation de VIntérieur du Sérail du Grand Seigneur (Ato, Paris, 1675), based on two visits to Constantinople in his first and sixth journeys. This was followed by Le Six Voyages de J. B. Tavernier (2 vols, 4to, Paris, 1676) and by a supplementary Recueil de Plusieurs Relations (4to, Paris, 1679), in which he was assisted by a certain La Chapelle. This last contains an account of Japan, gathered from merchants and others, and one of Tong- king, derived from the observations of his brother Daniel, who had shared his second voyage and settled at Batavia; it con- tained also a violent attack on the agents of the Dutch East India Company, at whose hands Tavernier had suffered more than one wrong. This attack was elaborately an- swered in Dutch by H. van Quellenburgh (Vindiciz Bata- vicx, Amst., 1684), but made more noise because Arnauld drew from it some material unfavourable to Protestantism for his Apologie pour les Catholiques (1681), and so brought on the traveller a ferocious onslaught in Jurieu's Esprit de

M. Arnauld (1684). Tavernier made no reply to Jurien; he was in fact engaged in weightier matters, for in 1684 he travelled to Berlin at the invitation of the Great Elector, who commissioned him to organize an Eastern trading com- pany,—a project never realized. The closing years of Ta- vernier's life are obscure ; the time was not favourable for a Protestant, and it has even been supposed that he passed some time in the Bastille. What is certain is that he left Paris for Switzerland in 1687, that in 1689 he passed through Copenhagen on his way to Persia through Mus- covy, and that in the same year he died at Moscow. It appears that he had still business relations in the East, and that the neglect of these by his nephew, to whom they were intrusted, had determined the indefatigable old man toa fresh journey.

Tavernier's travels, though often reprinted and translated, have two defects: the author uses other men's material without dis- tinguishing it from his own observations; and the narrative is much confused by his plan of often deserting the chronological order and giving instead notes from various

journeys about certain routes, The latter defect, it is true, while it embarrasses the biographer, ig hardly a blemish in view of the object of the writer, who sought mainly to furnish a guide to other merchants. A careful attempt to disentangle the thread of a life still in many parts obscure has been made by Charles Joret, Jean Baptiste Tavernier d'apres des Documents Nouveaux, 8vo, Paris, 1886, where the literature of the subject is fully given.

TAVIRA, a seaport of Portugal, in the province of Algarves, at the mouth of the Seca, 21 miles east-north-east of Faro. It is regularly built, and has an alcazar, used as an official residence, besides other public buildings. It has sardine and tunny fisheries, and carries on a consider- able coasting trade. Excellent fruit is grown in the neighbourhood. 'The population in 1878 was 11,459.

TAVISTOCK, a town of Devonshire, England, is finely situated in the valley of the Tavy, on the western border of Dartmoor, and on the South Devon Railway, 15 miles north of Plymouth, 14 south-east of Launceston, and 213 west-south-west of London. The town has been greatly improved since 1845, chiefly at the expense of the duke of Bedford, by the construction of a system of sewage and the erection of many new dwellings suitable for the work- ing classes. There are some remains (including a portion in the square, now used as a public library established in 1799) of the magnificent abbey of Sts Mary and Rumon, first founded in 961 by Orgar, earl of Devon. After de- struction by the Danes in 997 it was restored, and among its famous abbots were Lyfing, friend of Canute, and Aldred, who crowned Harold II. and William, and died archbishop of York. The abbey church was rebuilt in 1285, and the greater part of the abbey in 1457-58. The church of St Eustachius possesses a lofty tower supported on four open arches. Among the principal public buildings are the guild- hall (1848), the corn market (1838), the market buildings (1858), and the new hall for concerts and public entertain- ments. Near the town is Kelly College, opened in 1877, founded by Admiral Benedictus Marwood Kelly, with a preference for the founder's kin. Mines of copper, man- ganese, lead, silver, and tin are in the neighbourhood, and the town possesses a considerable trade in cattle and corn, as well as a brewery. The population of the township in 1881 was 6914. The parliamentary borough (area 11,450

acres), which had a population in 1871 of 7725 and in 1881 of 6879, was merged in the county in 1885.

The town owes its origin to the foundation of the abbey in 961. From Henry I. the abbots obtained the entire jurisdiction of the hundred of Tavistock, with a weekly market. A school for Saxon literature was established by the monks, which flourished till the Reformation. The Royalists were quartered at Tavistock after the defeat of the Parliamentarians on Bradock Down in 1648, and Charles I. visited it on his way to Cornwall. It returned members to parliament from the time of Edward I. till 1885, among its representatives having been John Pym, the great opposer of the policy of Charles I., and William, Lord Russell, beheaded in the

reign of Charles II. Among the famous natives of Tavistock are Sir John Glanville, judge under James I., William Brown, the author of Britannia's Pastorals, and Sir Francis Drake, of whom a colossal statue by Boehm was presented to the town by the duke of Bedford in 1883.

TAVOY, a British district in the Tenasserim division of Burmah, lying between 13° 15' and 15° 11' N. lat. and between 97° 48' and 98° 44' EB. long. It has an area of 7200 square miles, and is bounded on the N. by Amherst district, E. by the Yoma Mountains, 8. by Mergui district, and W. by the Bay of Bengal. The district is enclosed by mountains on three sides, viz., the main chain of the Yomas on the east, rising in places to 5000 feet, which, with its densely wooded spurs, forms an almost impassable barrier between British and Siamese territory ; the Nwahlabo in the centre, which takes its name from its loftiest peak (5000 feet); and a third range, under the name of Thinmaw, between the Nwahlabo and the sea- coast. The chief rivers are the Tenasserim and Tavoy, the former being formed by the junction of two streams which unite near Met-ta; for the greater part of its course it is dangerous to navigation. The Tavoy is navigable for vessels of any burden. It is interspersed with many islands, and with its numerous smaller tributaries affords easy and rapid communication over the country. The climate is on the whole pleasant. The rainfall averages about 190 inches a year.

The census of 1881 returned the population of Tavoy at 84,988 (males 41,785, females 43,203), of whom 82,187 were Buddhists, 828 were Mohammedans, and 1368 were Christians. The headquarters and capital is Tavoy town, which is situated on the left bank of the river of the same name, and contained a population of 13,372 in 1881. Of the total area, only 83,740 acres are (1885-86) culti- vated. Rice is the principal product ; the betel-nut is extensively grown for home consumption ; and the district is particularly rich in fruit trees. With its only port difficult of access, and with no means of internal communication, the trade of Tavoy district has always been small and almost entirely confined to Siam and the Straits Settlements. The principal imports are piece goods and other cotton manufactures, raw silk, tea, crockery, wines and spirits, metals, and provisions. The chief manufactures are salt and earthen pots. The gross revenue of the district in 1885-86 was £20,235, of which the land contributed £12,663. Tavoy was handed over to the British at the end of the first Burmese war in 1824. A revolt broke out in 1829, headed by Moung Da, the former governor, which was at once quelled, and since then the district has remained in undisturbed possession of the British.

TAWING. See LeaTHEr.

TAXATION. With regard to taxes in general Adam Smith lays down four maxims which have been briefly described as the maxims of equality, certainty, convenience, and economy. The treatment of the general principles of taxation by subsequent writers consists in the main of the development and criticism of these celebrated canons.

Equality of Taxation.—The subjoined passage from Adam Smith contains the germs of several distinct theories of what constitutes just or equal taxation :—

“The subjects of every state ought to contribute towards the support of its government as nearly as possible in proportion to their respective abilities, that is, in proportion to the revenue which they respectively enjoy under the protection of the state. The expense of government to the individuals of a great nation is like the expense of management to the joint tenants of a great estate, who are all obliged to contribute in proportion to their respective Interests in the estate. In the observation or neglect of this maxim consists

what is called the equality or inequality of taxation. Every tax, it must be observed once for all, which falls finally upon one only of the three sorts of revenue above-mentioned [viz., rent, wages, profits] is necessarily unequal in so far as it does not affect the other two. In the following examination of different taxes I shall seldom take much further notice of this sort of Inequality, but shall in most cases confine my observations to that Inequality which is occasioned by a particular tax falling unequally upon that particular sort of private revenue which is affected by it."

The first sentence implies (a) that every Government has

the right to exact contributions for its support from all its subjects.

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derived directly from the conception of sovereignty. It was the determination to insist on this principle which led to the retention of the 3d. per tb duty on tea, that "figment of a tax, that peppercorn rent," which lost the British their American colonies. The Americans opposed to this absolute doctrine the maxim that taxation ought to be coincident with representation,—that only those who shared in the powers should have the burdens of government. If the latter opinion is strictly construed it would follow that all taxes on articles of universal consumption are unjust except in a country where all who have the natural have also the legal capacity of voting. The doctrine of sove- reignty as the basis of taxation, pushed to its logical extreme, results in the maxim that a Government should impose such taxes as are "most easily assessed and collected, and are at the same time most conducive to the public interests" (M'Culloch). Just as a general looks to the efficiency of his army as a whole, and is prepared to sacrifice any portion if necessary, so, it may be said, the state should not regard the particular interests of individuals, but should rather consider the nation as an organism, or, to adopt older phraseology, a leviathan. So far as the political existence of a state is concerned, this view seems to meet with general acquiescence even in modern times, when patriotism is often classed amongst the doubtful virtues, but no ideal of a perfect state has yet met with such acceptance in any nation as to render popular a complete neglect of private interests.

Accordingly, a second basis of taxation (6) is found in the expansion of the term ‘‘abilities” used by Adam Smith, which leads to the position that taxes ought to be levied so as to involve equality of sacrifice on the part of the contributors. This is the ideal of taxation which was advocated by Mill and Fawcett. ‘Equality of taxation as a maxim of politics,” says the former, “‘ means equality of sacrifice. It means the apportioning the contribution of each person towards the expenses of government, so that he shall feel neither more nor less inconvenience from his share of the payment than every other person experi- ences from his.” It is admitted that this standard cannot be completely realized, but it is thought to furnish a proper foundation of remission in some cases and of pro- portional increase of taxation in others. It is generally on this ground that it is proposed to leave incomes below a certain amount untaxed,—a plan which, so far as direct taxes are concerned, has been adopted in the United Kingdom. It is clear, however, that any taxes on com- modities in general use must infringe this canon, whilst the distinction between “necessaries” and “luxuries,” as Adam Smith pointed out, is difficult to draw in com- munities advancing in civilization ; and certainly a con- siderable portion of the taxes on stimulants is, as a matter of fact, derived from persons whose incomes are below what is generally considered a reasonable minimum for the standard of comfort, and such persons would prob- ably consider enforced abstinence a greater sacrifice than the payment of a direct tax. It is also principally on the ground of equality of sacrifice that the proposal for graduated or progressive taxation rests. It is argued that a person with £10,000 a year can pay 10 per cent. (for example) as easily as a person with £1000 can pay 5 per cent. It is to be observed that the principle of equality of sacrifice regards the payment of taxes as duty imposed on the subjects of a state independently of the advantages they may derive individually from the expenditure of the amount levied.

A third basis of taxation, however, is found in the principle © that taxes ought to be considered as payment for valuable services rendered by the state to individuals,

According to this view, the right of taxation is ; and this seems to be the position Adam Smith had in view

in introducing the clause “under the protection of the state,” and in comparing the individuals of a great nation to the joint tenants of a great estate. It is easy to show, as Mill does, that, if protection is taken in its narrowest signification, as a matter of fact the poor need more protection than the rich, but the argument becomes more plausible, and more consonant with the general teaching of Mill, if stress is laid on the protection and assistance afforded by the state in the process of acquisition of indi- vidual fortunes—a view of taxation sometimes called the social dividend theory (cf. Walker, Helferich). It is really on this ground that Mill proposes that the “unearned increment” from land should be taken by the state, and, as has often been pointed out, “unearned increments ” are by no means confined to land. Without much exag- geration the state may be regarded as a partner in all industrial undertakings, and is therefore entitled to a share in the proceeds. In a somewhat similar manner, poor rates, education rates, &c., have been regarded as of the nature of insurance paid by the rich against the care- lessness of the poor. The principle under consideration has been generally applied in cases in which the service rendered by the state and the benefit accruing to indi- viduals are easily discovered and estimated, especially in connexion with local taxation.

The object of taxation is in general to provide the state with an adequate revenue, but in all cases the indirect effects are important, and sometimes provision of revenue is considered of secondary importance. Accordingly it has been maintained (d) that the state ought to use its powers of taxation for the promotion of various social ends. Adam Smith remarks that “it has for some time past been the policy of Great Britain to discourage the consumption of spirituous liquors, on account of their supposed tendency to ruin the health and corrupt the morals of the common people,” and in our own times the falling off in the revenue from alcoholic drinks often furnishes a subject for apparent congratulation in “budget” speeches. German writers with socialistic tendencies (¢.7., Wagner) have emphasized this social point of taxation; and Mill, although disapproving of graduated taxation of income, advocated the imposition of extremely heavy succession duties, with the object of promoting a better distribution of national wealth and compelling individuals to rely on themselves. Many

nations again have imposed duties on imports with the view of protecting and eucouraging home industries, and most of the import duties levied in England before the great reforms of Peel were of this nature. Accordingly, both theoretically and practically, the promotion of social or moral ends may be considered as a fourth basis of taxa- tion. It is worth noticing that in early times the fines received in the courts of justice were an important source of revenue.

Whatever basis of taxation be adopted, the elementary principle of justice noticed in the conclusion of A. Smith's first canon must be considered. If it is just to tax A, it is just to tax B under precisely similar circumstances. Thus stated, the principle seems almost formal, but for practical purposes small differences in circumstances may be neglected, and it is clear that in any great nation the taxpayers may be arranged in a limited number of groups, within each of which the constituent individuals may be regarded as similarly situated. A tax on rent, or wages, or profits would be obviously unequal if those in one place or employment were taxed while those in another were left free. The practical difficulty is to discover what cases may fairly be regarded as similar, especially if equality of sacrifice be taken as the ideal.

As a matter of fact, in every civilized community a complex system of taxation is adopted, the different parts

of which rest in different degrees upon the various prin- ciples just noticed. Some taxes are justified on the grounds of their convenience to the sovereign power, and others are increased or diminished in certain cases in accordance with the principle of equality of sacrifice : some are regarded as payments for services rendered by the state, others partake of the nature of sumptuary regulations or are approved on various social or moral grounds ; and sometimes the imposition of one productive tax involves, on the ground of simple equality, the adop- tion of similar taxes which are hardly worth collecting.

The remaining canons of Adam Smith are partly, like the Cer.

first, ethical in character partly purely economic. Of the tainty, second—the canon of certainty—Adami Smith remarks :— ~~"The time of payment, the~~

~~manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor and to every other person [on the ground of the otherwise arbitrary powers which are given to the tax~~ gatherer].... The certainty of what each individual ought to pay is in taxation a matter of so great importance that a very considerable degree of inequality, it appears, I believe, from the experience of all nations, is not near so great an evil as a very small degree of uncertainty." Perhaps the best example of the infringement of this canon is furnished by the taxes levied from the miserable pro- vincials by their Roman governors.

The third rule—the canon of convenience—which enjoins Con. that "every tax ought to be levied at the time or in the venience, manner to which it is most likely to be convenient for the contributor to pay it," may be justified, not merely on general grounds of good government, but also on the special economic ground of the increase in the productive- ness of taxes which satisfy the condition. It has been found possible to raise a considerable revenue by taxes on commodities, the payments of which by the consumers are made in insensible portions, when it would have been im- possible to collect the same amount by direct taxation at comparatively long intervals. Taxation is in this respect like bleeding.

The fourth rule—the canon of economy—states as its Economy, general principle that "every tax ought to be so contrived as both to take out and to keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state." Taxes may, accord- ing to Adam Smith, break this rule by requiring a large number of officials for their collection, by restraint of trade and production, by encouraging smuggling, and by causing unnecessary vexation; "and, though vexation is not, strictly speaking, expense, it is certainly equivalent to the expense at which every man would be willing to redeem himself from it." On smuggling Adam Smith elsewhere remarks that "to pretend to have any scruple about buying smuggled goods would in most countries be regarded as one of those pedantic pieces of hypocrisy which serve only to expose the person who affects to practise them to the suspicion of being a greater knave than his neighbours." It may be observed that in practical politics it is generally taken for granted that a tax which can be evaded will be evaded,

and indirect methods of taxation are to a great extent devices by which possibilities of evasion are restricted.

To these general rules of taxation explicitly given by Other Adam Smith, the following may be added, most of which general are implied in different passages of his treatment of taxa- Ze tion, but have been expounded and emphasized by subse- * quent writers. A convenient summary is given by Hel- ferich in Schénberg's andbuch der Politéschen Ockonomie (vol. ii, p. 138). (a) A given amount of revenue is, as & tule, both from the point of view of the Government and its subjects, more conveniently raised from a small number

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of very productive taxes than from a larger number with smaller returns per unit. This was one of the principal financial reforms advocated by Adain Smith with reference to the customs duties, and has been carried out in the United Kingdom by Sir Robert Peel and lis successors. The inextricable confusion of the customs duties levied before these reforms were effected can only be realized by those who study the details of the history of taxation. A similar process of simplification has been partially applied to the direct taxes, but in many cases (especially in local taxation) the rule is more honoured in the breach than in the observance. (6) A good system of taxation ought to provide for a self-acting increase in the revenue in propor- tion as the population and the consequent demands for governmental expenditure increase. It has been found by experience that an old tax causes less inconvenience than a new tax of smaller amount, a fact which is so striking in some cases as to have given rise to the saying that an old tax is no tax. (c) Those taxes are best which yield a steady and calculable return, instead of a return fiuctuat- ing in character and difficult to estimate. (d) Those taxes are best which in case of need can be most conveniently increased in amount. It is this characteristic of the inconie tax which renders it so popular with chancellors of the excliequer, and it was partly on this ground that Mr Gladstone substituted a tax on beer for the tax on malt. (e) Regard must always be paid to the real inci- dence of taxation, and care taken that the real burden of the tax falls on those aimed at by the legislature. No part of the theory or practice of taxation has given rise to so

much controversy as the incidence of particular taxes, a subject indeed of so much difficulty and importance as to occupy the greater portion of the treatment by systematic writers.

INCIDENCE oF ‘‘axaTion.—Taxes are generally divided into direct and indirect. A direct tax is defined by Mill as one “demanded from the very persons wlio it is in- tended or desired should pay it.” Others (e.g., M‘Culloch) define it as a tax taken directly from income or capital. In the former definition non-transferable taxes on expendi- ture would be included (e.g., a tax on livery servants), but not in the latter. Mill’s definition has been generally adopted (eg., by Wagner, in the German Handbuch, vol. il. p. 152); but in any case the most important direct taxes practically are those levied on income or capital directly, and the most important indirect the customs and excise duties. In examining the incidence of taxation the order of arrangement adopted by Adam Smith seems best. He discusses separately taxes on the three great species of income,—rent, profits, and wages (appending to the articles on the first two an examination of taxes upon the capital value of land, houses, and stock), and taxes intended to fall indifferently upon every species of revenue, viz., capitation taxes and taxes upon consumable commodities.

Taxes on Rent.—What is commonly known as rent consists in general of two parts, which may be termed economic reut and profit rent. Economic rent arises from the superiority of advantage of any source in the produc- tion of a certain amount of utility over the least productive source which the conditions of demand and supply (includ- ing transmission to market) render it possible to employ. Thus, in the production of food, some lands have an advantage in fertility or situation; again, in furnishing amenities of accommodation or facilities for business, some houses have from their situation a similar advantage ; and again, different processes in the arts and manufactures are Superior to others (giving rise to patents). In all these cases where the amount of the superior sources is limited (naturally or artificially), and recourse must be made to inferior sources of supply, economic rent is paid for the

superior advantage. Any tax imposed on this species of revenue falls on the owner. If levied in the first instance from the lessee, he will payso much less rent, and any new taxes imposed during the currency of leases ought, if intended to fall on the owner, to be taken directly from him. It may be assumed that every owner of a superior source has exacted the highest price obtainable for its use, so that he cannot transfer the tax to the tenant, nor through the tenant to the consumer. If, for example, a tax is imposed on tlie econonlic rent of agricultural land, the landlord cannot exact it from the tenant (for if the tenant could afford niore rent, why under competition was he not forced to do so before?) nor from the consumer of the produce, for the price is obviously determined inde- pendently of rent. Similarly a tax on the ground rent of houses, if it be assumed that the land is useless for other purposes, must fall on the owners; although a certain portion will be transferred to the occupier if the landlord could use it otherwise and escape the tax (cf. Mill, bk. v. ch. 111. §6). Taxes on economic rent of various kinds, so heavy as to absorb the whole amount, have been advocated by some theorists on grounds noticed under Adam Smith's first canon. It issaid they would impose no burden on the state as a whole, that they would not affect production or accumulation, and even that the substitution of the state for private owners—who are simply nati conswmere Jruges—would really increase the wealth and power of the nation by compelling these unproductive consumers to work, and by lightening the pressure of taxation on industry. It is, however, obvious that the confiscation of rent would, seeing that land has for generations been in the circle of exchangeable commodities, strike at the roots of the institution of private property. Apart from this general objection, there would in the case of agricultural land be great difficulty in separating economic from profit rent, and any exceptional tax on the latter would obviously tend to check agricultural improvements.

Taxes on Profits. —Profits, as commonly used, is a term Taxes on embracing three elements which, from an economic and Profits.

financial point of view, are quite distinct in character, viz., interest (pure and simple), insurance against risk, aud earnings of management. The interest on capital in any industrial area, lent on the same security, tends to equality. If, then, a tax is imposed on interest in every form, the incidence in the first place will be on the owners of cap- ital. But two indirect

consequences will follow. (1) As Adam Smith remarks, “the proprietor of stock is properly a citizen of the world, and is not necessarily attached to any particular country. He would be apt to abandon the country in which he was exposed to a vexatious inquisition in order to be assessed to a burdensome tax, and would remove his stock to some other country, where he could either carry on his business or enjoy his fortune more at his ease.” In this case the ultimate result would be that the country in which the tax was imposed would possess less capital, and thus would yield a higher rate of interest sufficient to counterbalance the burden of the tax. (2) The tax would tend to check the accumulation of capital within the country, so far as the interest received is a cause of accumulation, with the same ultimate result as in the former case. It must, however, be observed that the rate of interest is only one of the causes affecting the accumulation of capital.

A tax on some particular form of interest (security still being supposed perfect), for example on mortgages on land, would obviously fall on the borrowers. In the same way a tax on that part of the profit rent of houses which is interest on capital tends to fall on the occupier. In gene ral, however, the security is more or less imperfect, and the insurance against risk is allowed for in the rate of

interest charged on borrowed capital. Thus a tax which | first class (a) are the most direct of all taxes, in the sense took equal percentages from all species of interest would | that they cannot be transferred to other persons by the be in part a tax on insurance against risk, and the | beneficiaries. The principal difficulties connected with the tendency must be for such a tax to fall on the borrowers | “death duties,” as they are often called, arise in connexion of capital. Suppose at any time a perfect security yields | with the canon of equality of taxation. Opinion is stil] 3 per cent. and one with greater risk 6 per cent., then 3 | divided on the proportions which ought to be paid by per cent. represents the estimated value of the insurance | personal and real estate respectively, as well as on the against risk. A tax which reduces the net yield on the advisability of the taxes being made progressive according first to 2 per cent. would reduce the net yield on the | to the value of the property, and there are still greater latter to 4 per cent. In

order, then, for the insurance } difficulties in connexion with life interests in settled pro: against risk to remain the same, the rate yielded by the perty. Mull was strongly in favour of making the death latter must rise from 6 to 74 per cent. It follows, then, | duties very heavy and also graduated. “TI conceive,” he that a tax levied on all forms of interest (no allowance says (Pol. Econ., bk. v. ch. ii. § 3), “that inheritances and being made for risk) would tend to check investment in legacies exceeding a certain amount are highly proper proportion as risk was involved, aud would thus check | subjects for taxation, and that the revenue from these industrial enterprise. This result would follow even | should be made as great as it can be made without giving although the rate of interest on perfect security, owing to | rise to evasions by donation during life, or concealment the causes mentioned above, were raised in proportion to | of property, such as it would be impossible adequately to the tax. check. The principle of graduation, that is, of levying A tax on that part of profits known as earnings of | a larger percentage on a larger sum, though its applica- management would, if imposed generally, fall in the first | tion to general taxation would be in my opinion objec- instance on the entrepreneurs or employers of capital, and | tionable, seems to me both just and expedient as applied with similar indirect consequences to those just noticed | to legacy and inheritance duties.” The principal objec- in regard to interest. Capital would tend to flow abroad, | tions urged against such taxation are, that a stimulus and accumulation would be checked, since in general the | would be given to personal extravagance and a check employers of capital are also to a large extent the owners. | placed on accumulation, and that in consequence indirect So far as profits, in this sense, are of the nature of rent (a | production would be lessened, partly by want of capital view recently advocated as regards all profits by Prof. | and partly by the check placed on production on a Walker), a tax on profits would be analogous to a tax on large scale. As regards the want of capital, apart from rent. If the differences in the net advantages of different | the check placed on saving, there would be a tend- methods of employing capital are supposed to remain | ency to send it abroad. A heavy tax on large capitals constant (according to Prof. Marshall’s view of earnings of | at home will place a premium on investments abroad, management), a proportional tax on profits must be in| in which evasion would be easy. Perhaps, with the part transferred to the consumers of the articles produced, | present rate of accumulation, the

objection may be in the same way as a tax on interest with risk was shown | made light of, as it is by Mill; but the second, if to fall on the borrower. It will be seen from this general | less obvious, is more important. All our great staple survey that the incidence and effects of a tax on profits | manufactures are necessarily conducted on a large scale, (taking the term in its common acceptation without | and in many respects also large agricultural capitals are analysis) are extremely difficult to determine, and the | most productive. In manufactures, as a rule, the larger practical difficulty is still greater than the theoretical. | the scale of operations the more extended will be the For, as M‘Culloch and others have shown, profits are | division of labour in production, and the greater the always fluctuating and difficult to estimate. So great, | facilities for ready sale in foreign markets. Of all the for example, is this difficulty felt to be as regards farmers’ | causes which contribute to our commercial prosperity, profits that in the income tax it is assumed that such perhaps the most important is the large scale on which profits bear a certain proportion to the rent paid for land | our operations are conducted. We are able to employ on a purely empirical rule, which may happen to hit the | machinery where the foreigner, working on a_ smaller mark in a majority of cases, but is much more likely to be | scale, is obliged to use manual labour. There can be unequal and unjust in its operation. little doubt that graduated taxation, even on the modi- A tax on some particular form of profits (as distinct | fied form proposed by Mill, would tend to check produe- from a general tax on profits) will, it is generally said, fall | tion on a large scale. Indirectly it might artificially foster on the consumer of the article produced, on the ground of | joint-stock companies. (6) Taxes on the transference of the tendency of profits to equality. This view will be property from the living to the living cannot, as Adam noticed below under taxes on consumable commodities. Smith points out, be very easily taken directly, as such Taxeson ‘axes on Capital.—In early English history taxes | transactions for the most part actually are or might be capital. upon capital of a very simple kind played an important | secret. This has led to the invention of stamp and regis- part. A grant, for example, of certain fractional parts of | tration duties. The penalty of invalidity attaching to movables, commencing with the famous Saladin tithe (on unstamped documents of various kinds has proved a very both rent and movables) in 1188, and gradually settling | effective deterrent to evasion. A tax on sales will vary down toa fifteenth

for the counties and a tenth for the | in its incidence according to the nature of the commodity towns, prevailed for more than three centuries. In 1334 | and the degree of competition or monopoly (cf. H. Sidg- a fifteenth and tenth was fixed at a certain sum for each | wick's Principles of Pol. Econ., bk. it. ch. x.). The most township, and after this date a grant of one or more | important case is that of taxes on the transfer of land. "fifteenths and tenths" meant simply a grant according Theoretically it seems that, just as the farmer who takes to the scale then fixed (Dowell, vol. iii. p. 75). But in | land on rent offers more or less rent according to the our own times taxes on capital are levied principally when | burdens imposed on the land by rates, é&e., so the property changes hands, and may be divided, as they are purchaser of land will consider any expenses connected by Adam Smith, according as they are levied when. pro- | with its acquisition as part of the capital value, and thus perty passes (a) from the dead to the living, (b) from the | any taxes on transfer. will really fall on the sellers, If, living to the living. however, the taxes are imposed in such a way as to fall It is obvious, as regards incidence, that taxes of the | less heavily on land when sold in larger than in small

on

quantities, it is clear that the tendency will be for the differential portion of the tax at least to fall on the purchaser of a small amount ; and practically at present this feature is characteristic of the English system. A tax on the transfer of stocks and shares is generally held to fall on the seller, as in case of repeal he would obtain so much more; but in this case the same considerations apply as in the case of interest noticed above. A curious example of legal evasion is furnished by time-bargains ; and the imposition of the tax directly on the contracts of sale, instead of as at present on the actual transfer, has been strongly urged.

Taxes on Wages.—It is clear that the treatment of taxes on wages will depend on the general view taken of the determination of the rate of wages. Adam Smith appears to lay undue stress on the price of provisions, and to think that in most cases taxes on wages must fall on the employer of labour (bk. v. ch. ii. art. iii.). There seems, however, to be no sufficient reason why

a tax on labour should be transferred to the employer, except in the case where the wages are really at a minimum below which the supply of efficient labour could not be kept up. Even in this case, as Prof. Walker shows, there would probably be a degradation of labour before the rise in wages was effected. Certainly no practical statesman at the present time would venture to propose a direct tax on wages, under the idea that it would be transferred to the em- ployer. In Germany it was found necessary to abandon the system, owing to the hardship inflicted on the poor. At any rate, in all cases in which the rate of wages is above the “necessary” minimum, a tax on wages must fall on the labourer. A differential tax on some particular species of employment would, unless it partook of the nature of a monopoly, tend to fall on the consumer of the article produced or the person who enjoys the service rendered. In every case, speaking generally, the incidence of the tax will depend on the conditions of the demand and supply of the labour in question, and no further analysis canbe given without entering into the general principles governing wages. See Wacxs.

Capitation tames are chiefly of interest historically, as illustrated in England by the poll-taxes imposed at various times. The income tax as at present levied is in reality not a single uniform tax, as might at first sight appear, but a tax on the various species of rent, interest, profits, and wages. The anomalies which arise from practically taking income as uniform have often been pointed out and acknowledged, but the authority of Mr Gladstone may be

quoted in support of the view that the practical difficulties :

in the way of a readjustment more in accordance with theo- retical principles are insuperable. The objections noted above to a graduated property tax apply, mutatis mutandis, to a graduated income tax, which appears, however, to find increasing favour on the Continent. A full discussion of the anomalies of the income tax would involve a repetition of the analysis of the taxes on the various species of income.

Taxes on Commodities.—The general principles appli- cable in this case are that, where production takes place

,. under free competition, the tax will, owing to the tendency

of profits to equality, be transferred to the consumer, but that, when the article is practically monopolized, a tax must fallon the monopolist, on the assumption that he has already fixed such a price for the article as will, consider- ing the law of demand and the expenses of production, yield him a maximum revenue, The practical difficulties connected with the assumption of equality of profits have been well exposed by Cliffe Leslie (Financial Reform – Cobden Club Essays, 2d series, 1871-72).

_The incidence of export and import duties is peculiarly difficult to ascertain even theoretically. The prevailing

opinion that an import duty necessarily falls on the consumer of the import necessarily involves as its counter- part the position that an export duty must fall on the consumer of the export. If the latter view is upheld it is curious that export duties find such little favour with practical statesmen. It is clear, however, that the real inci- dence of export and import duties will depend partly on the conditions of production in various countries, partly on the variations in demand due to changes in price, partly on the indirect influence on the general balance of trade, and partly on the possibility of using substitutes for the article taxed (cf. H. Sidgwick's Principles of Pol. Econ., bk. ii. ch. v.; Cournot, Revue Sommaire des Doctrines Economiques, sects. 5 and 6). A fuller examination is not possible in the limits assigned to this article. In con- clusion, it may be pointed out that a thorough investigation of the general principles of taxation must presuppose the principles of political philosophy, whilst a full inquiry into the incidence of particular species of taxes must pre- suppose the principles of political economy. (J. 8. Nt.)

TAXIDERMY, the art of preserving the integument, together with the scales, feathers, or fur, of animals. Little is known of the beginnings of the practice of the "stuffing" or "setting up" of animals for ornament or for scientific purposes ; and it is highly probable, from what we gather from old works of travel or natural history, that the art is not more than some three hundred years old. It was practised in England towards the end of the 17th

century, as is proved by the Sloane collection, which in 1725 formed the nucleus of the collection of natural history now lodged in the galleries at South Kensington.

It was not until the middle of last century that any treatise devoted to the principles of the then little under- stood art was published in France, Réaumur's treatise (1749) being probably the first. This was followed at intervals by others in France and Germany, until the be- ginning of the present century, when the English began to move in the matter, and several works were published, notably those by E. Donovan,! W. Swainson,? Capt. Thomas Brown,® and others. These works, however, are now in- adequate ; and since the Great Exhibition of 1851, when the Germans and French taught British taxidermists the rudiments of scientific treatment of natural objects, several works have appeared upon the subject from the pens of American and English authors, such as J. H. Batty,' R. Ward,® and Montagu Browne.®

The first principle governing the art is that, after the specimen has been procured, in as fresh and clean a state as may be, it should have the skin stripped from the body in such a manner as not to disturb the scales if a fish or a reptile, the feathers if a bird, or the fur or hair if a mammal. To do this correctly requires a small stock of tools, as well as a great amount of patience and per- severance. The appliances comprise several sharp knives (some pointed and some obtuse), a pair of scissors, a pair of pliers, a pair of nippers or "cutting-pliers," some tow, wadding, needles and thread, also a "stuffing-iron," some crooked awls, a pair of fine long flat-nosed pliers, and a camel-hair brush. The preservative compound is often the original (Bécceur's) "'arsenical soap," made by cutting up and boiling 2 tb of white soap, to which 12 oz. of salt of tartar and 4 oz. of powdered lime (or whiting) are added

1 Instructions for Collecting and Preserving Various Subjects of Natural History, London, 1794.

2 The Naturalist's Guide for Collecting and Preserving Subjects of Natural History and Botany, London, 1822.

3 Taxidermists Manual, Glasgow, 18388.

4 Practical Taxidermy and Home Decoration, New York, 1880.

5 Sportsman's Handbook of Practical Collecting and Preserving, London, 1880.

8 Practical Taxidermy, London, 1879; 2d edition, 1884.

when dissolved; to this mixture, when nearly cold, 2 ib of powdered arsenic and 5 oz. of camphor (the latter pre- viously triturated in a mortar with spirits of wine) are added. The mixture is put away in small jars or pots for use. Like all arsenical preparations, this is exceedingly dangerous in the hands of unskilled persons, often causing shortness of breath, sores, brittleness of the nails, and other symptoms ; and, as arsenic is really no protection against the attacks of insects, an efficient substitute has been in- vented by Browne, composed of 1 tb of white curd soap and 3 bb of whiting boiled together, to which is added, whilst hot, 13 02. of chloride of lime, and, when cold, 1 oz. of tincture of musk. This mixture is perfectly safe to use when cold (although when hot the fumes should not be inhaled, owing to the chlorine given off), and is spoken of as doing its work efficiently. Solutions of corrosive sublimate, often recommended, are, even if efficient, dangerous in the extreme. Powders consisting of tannin, pepper, camphor, and burnt alum are sometimes used for " making skins," but they dry them too rapidly for the purposes of "mounting." Mammals are best preserved by a mixture of 1 ib of burnt alum to } b of saltpetre ; this, when intimately mixed, should be well rubbed into the skin. Fishes and reptiles, when not cast and modelled, are best preserved in rectified spirits of wine ; but this, when eco- nomy is desired, can be replaced by " Méller's solution " (bichromate of potash 2 oz., sulphate of soda 1 0z., dis-

tilled water 3 pints) or by a nearly saturated solution of

chloride of zinc. The cleaning of feathers and furs is performed by rubbing them lightly with wadding soaked in benzoline, afterwards dusting on plaster of Paris, which is beaten out, when dry, with a bunch of feathers,

The preparation and mounting of bird Specimens, the objects most usually selected by the amateur, are performed in the follow- ing manner. The specimen to be operated upon should have its nostrils and throat closed by plugs of cotton wool or tow; both wing-bones should be broken close to the body, and the bird laid upon a table on its back; and, as birds—especially white-breasted ones—should seldom, if ever, be opened on the breast, an incision should be made in the skin under the wing on the side most damaged, from which the thigh protrudes when pushed up slightly ; this is cut through at its junction with the body, when the knife is gently used to separate the skin from this, until the wing-bone is seen on the open side. This is then cut through by scissors, and by careful manipulation the skin is further freed from the back and breast until the neck can be cut off. The other side now remains to be dealt with; from this the wing is cut by travelling downwards, the remaining leg is cut away, and very careful skinning over the stomach and upon the lower back brings the operator to the tail, which is cut off, leaving a small portion of the bone (the coccyx) in the skin. The body now falls off, and nothing remains in the skin but the neck andhead. To skin these ott properly without unduly stretching the integument, is a task trying to the patience, but it can be accomplished by gradually working the skin away from the back of the head forward, taking care to avoid cutting the eyes or the eyelids, but, by cautious management, to cut the membranous skin over those parts, so that the eyes are easily extracted from the orbits without bursting. The skin should be freed down nearly to the beak, and then the back of the head, with neck attached, should be cut off, the brains extracted, all the flesh cleared from the skull and from the bones of the wings, legs, and tail, the skin painted with the preservative, and ultimately turned into its proper position. When ‘‘skins” only are to be made for the cabinet, it is sufficient to fill the head and neck with chopped tow, the body with a false one made of tow, lightly packed or loose according to the genius of the preparer, to sew up the skin of the stomach, and to place a band of paper lightly pinned around the body over the breast and wings, and allow it to remain in a warm position, free from dust, for several days or weeks, according to the size of the specimen. It should then be labelled with name, sex, locality, and date, and put away with insect powder around it,

When, however, the specimen is to be “ mounted,” the opera- tions should be carried up to the point of returning the skin, and then a false body of tightly wrapped tow is made upon a wire pointed at its upper end. This is inserted through the incision under the wing, the pointed end going up the neck and through the skull to the outside. When the imitation body rests within the skin, pointed wires are thrust through the soles of the feet, up

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the skin of the back of the legs, and are finally clenched in the body. Wires are also thrust into the butts of the wings, follow- ing the skin of the under surface, and also clenched through into the body. A stand or perch is provided, and the bird, being fixed upon this, is, after the eyes have been inserted, arranged in the most natural attitude which the skill of the taxidermist can ive it.

: Mammals are cut along the stomach from nearly the middle to the breast, and are skinned by working out the hind legs first, cutting them off under the skin at the junction of the femur with the tibia, and carefully stripping the skin off the lower back and front until the tail is reached, the flesh and bones of which are pulled out of the skin, leaving the operator free to follow on up the back and chest until the fore legs are reached, which are cut off in like manner. The neck and head are skinned out down to the inner edges of the lips and nose, great care being exercised not to cut the outer portions of the ears, the eyelids, the nose, or the lips, The flesh being cleared off, and the brain and eyes extracted, the skull should adhere to the skin by the inner edges of the lips. All the flesh should be trimmed from the bones of the legs. The head, being shaped, where the flesh was removed, by tow and clay, is returned into the skin. A long wire of sufficient strength ig tightly bound with tow, making a long, narrow body, through which wires are thrust by the skin of the soles of the feet. The leg wires and bones being wrapped with tow and clay into shape, the points of the wires are pushed through the tow body and clenched. They and the body are then bent into the desired posi- tion, and modelled up by the addition of more tow and clay, until the contours of the natural body are imitated, when the stomach is sewn up.

Reptiles, when small, have their skin removed by cutting away the attachment of the skull to the cervical vertebre, and by turn. ing the decapitated trunk out at the mouth by delicate manipula- tion. When large, they are cut along their median line, and treated in the same manner as mammals,

Fishes, after being covered on their best side with paper or muslin to protect the scales, are cut along the other side from the tail to the gills, and are skinned out by removing ‘‘cntlets,” as large as is possible without cracking the skin, which, indeed, should be kept damp during work. After being cured with a pre- servative, they are filled with sawdust or dry plaster of Paris, sewn up, turned over on a board, the fins pinned out, and the mouth adjusted, and, when perfectly dry, the plaster may be shaken out.

A new school of taxidermists, with new methods, whose aim is to combine knowledge of anatomy and modelling with taxidermic technique, are now coming to the front, and the next generation will discard all processes of “stuffing” in favour of modelling, Within the limits of an article like the present it is impossible to do more than glance at the intricate processes involved in this. In the case of mammals, after the skin has been completely removed, even to the toes, a copy is made of the body, posed as in life, and from this an accurate representation of form, including delineation of muscles, &c., is built up in light materials; the model is then covered with the skin, which is damped, and pinned in to follow every depression and prominence ; the study is then suffered to dry ; and, models having been made, in the case of large animals, of the mucous membrane of the jaws, palate, tongue, and lips, these are truthfully reproduced in a plastic material. The ordinary glass eyes are discarded, and hollow globes, specially made, are hand-painted from nature, and are fixed in the head so as to convey the exact expression which the pose of the body demands. Birds, if of any size, can be modelled in like manner, and fishes are treated by a nearly identical process, being finally coloured as in a “still life” painting,

To give a life-like representation, attention is also paid to artistic “mounting.” By this is meant the surrounding of specimens with appropriate accessories, and it is well exemplified by the new work shown in the natural history museum at South Kensington, where, for example,

birds are arranged as in a state of nature, feeding or flying to their young, sitting on their egos, swimming in miniature pools, or preening their feathers whilst perched lovingly side by side, and surrounded by exquisitely modelled

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foliage and flowers. This, with correct modelling of the specimens, which, except in rare instances, is not quite so striking in the new groups, indicates the future of the art, the hope of which lies in the better education of taxi- dermists as designers, artists, and modellers. (M. B.)

TAXILA. See Rawat Prnp1.

TAY, Tue, the longest river in Scotland, has its source on the northern side of Ben Lui, on the borders of Argyll- shire and Perthshire, being known in its earlier course as the Fillan, and, after forming Loch Dochart, as the Dochart, until entering Loch Tay, 25 miles from its source, at an elevation above sea-level of 553 feet. Its course through Perthshire is described in the article on that county. Its total length to the town of Perth is about 95 miles, and it drains a total area of about 2400 square miles, while its estuary extends for about other 25 miles. The navigation of the estuary is somewhat impeded by sandbanks. The only important port is Dundee, but vessels of 100 tons can pass up to Perth, the river being tidal to 2 miles above it. The salmon fisheries on the river and its estuary are among the most valuable in Scotland. A railway bridge over the Tay at Dundee, designed by Sir Thomas Bouch (see Bripaes, vol. iv. p. 340), was opened for traffic 31st May 1878, but was blown down during the crossing of a passenger train 28th December 1879. Some distance to the west a new bridge, designed by W.

H. Barlow, was commenced in 1882, and was opened for general traffic 20th June 1887.

TAYLOR, Bayarp (1825-1878), one of the most pro- lific among American authors, was born at Kennett Square in Chester county, Pennsylvania, on January 25, 1825. The son of a well-to-do farmer, he received his early in- struction in an academy at West Chester, and, later, at Unionville. At the age of seventeen he was apprenticed to a printer in West Chester.

less sights and delights, to many of which he afterwards gave expression in metrical form. From England, towards the end of 1852, he sailed for Calcutta, proceeding thence to China, where he joined the expedition of Commodore Perry to Japan. The results of these journeys (besides his poetical memorials, to which reference will be after- wards made) were A Journey to Central Africa, or Life and Landscapes from Egypt to the Negro Kingdoms of the Nile (1854); The Land of the Saracens, or Pictures of Palestine, Asia Minor, Sicily, and Spain (1854); and A Visit to India, China, and Japan in the Year 1858 (1855). On his return (1854) from these various journeyings he entered, with marked success, upon the career of a public lecturer, delivering addresses in every town of importance from Maine to Wisconsin. After two years' experience of this lucrative profession, he again started on his travels, on this occasion for northern Europe, his special object being the study of Swedish life, language, and literature. The most noteworthy result was the long narrative poem Lars, but his "Swedish Letters" to the Zrzbune were also re- published, under the title Morthern Travel (1857). In October 1857 he married Maria Hansen, the daughter of the well-known German astronomer. The ensuing winter was spent in Greece. In 1859 Taylor once more traversed the whole extent of the western American gold region, the primary cause of the journey lying in an invitation to lecture at San Francisco. About three years later he entered the diplomatic service as secretary of legation at St Petersburg, and the following year (1863) became chargé d'affaires at the Russian capital. In 1864 he returned to the United States and resumed his active literary labours, and it was at this period that Hannah Thurston, the first of his four novels, was published. This book had a moderate success, but neither in it nor in its successors did Bayard Taylor betray any special talent as a novelist : some of his characters are faithful studies from life, and he could

describe well the aspects of nature,—but a good deal more than this is necessary for the creation of noteworthy romances. In 1874 he went to Iceland, to take part in the centennial celebration which was held in that year. In June 1878 he was accredited United States minister at Berlin. Notwithstanding the resistless passion for travel which had always possessed him, Bayard Taylor was (when not actually en route) sedentary in his habits, especially in the later years of his life; and at Berlin he aggravated a constitutional liver affection by too sedulous devotion to literary studies and pursuits, in the intervals of leisure from his diplomatic duties. His death occurred on the 17th of December, only a few months after his arrival in Berlin. The main drawback to the widespread acceptance of Bayard Taylor's poetry as a whole is its perpetual diffuseness. His most ambitious productions—his Masgue of the Gods (1872), Prince Deukalion (1877), The Picture of St John (1865), Lars (1873), and The Prophet (1874)—are marred by a ceaseless effort to overstrain his power. avs is thie least likely of his longer poems to survive any length of time: it lacks the grandiose eloquence and impressive "adjuncts" of the Masque or Prince Deukalion, while in theme and treatment it is, at most, only sedately agreeable. The Poems of the Orient contains his most genuinely satisfactory poetic writings. But probably long after even the most familiar of the poems just mentioned have ceased to be popular, when even the Vicws Afoot and Eldorado no longer hold the attention of the numerous public interested in vividly narrated experiences of travel, Bayard Taylor will be remembered by his poetic and excellent translation of Faust. Taylor felt, in all truth, ''the torment and the ecstasy of verse"; but, as a critieal friend has written of him, '' his nature was so ardent, so full-blooded, that slight and common seusations intoxicated him, and he estimated their effect, and his power to transmit it to others, beyond the true value." He felt life as perhaps only the poetic temperament can experience the beauty of the world; single words thus became for him so charged with poetry that he overlooked the fact that to most people these were, simply in themselves, mero abstract terms—sunshine, sea, spring, morning, night, and so forth. Thus a stanza having absolutely nothing original or striking or even poetic in it would, because

born of him, seem to be poetry unadulterate : to his mind, each line, each word, was charged with delightful significance, therefore —so he felt-— would be so also to the sympathetic reader. He had, from the earliest period at which he began to compose, a distinct lyrical faculty : so keen indeed was his ear that he became too insistently haunted by the music of others, pre-eminently of Tennyson. But he had often a true and fine note of his own. His best short poems are ‘‘ The Metempsychosis of the Pine” and the well-known Bedouin love-song, the latter a stirring lyric that ought assuredly to endure. had himself in no inconsiderable degree what he wrote of as ‘‘ that pure poetic insight which is the vital spirit of criticism.’ The most valuable of these prose dissertations are the Studies in German Literature.

TAYLOR, Broox (1685-1731), a distinguished mathe- matician of Newton’s school, was the son of John Taylor, of Bifrons House, Kent, by Olivia, daughter of Sir Nicholas Tempest, Bart., of Durham, and was born at Edmonton in Middlesex, August 18, 1685. He entered St John’s College, Cambridge, as a fellow-commoner in 1701, and took degrees of LL.B. and LL.D. respectively in 1709 and 1714. Having studied mathematics with applause under Machin and Keill, he obtained in 1708 a remarkable solution of the problem of the “centre of oscillation,” which, however, remaining unpublished until May 1714 (Phil. Trans., vol. xxviii. p. 11), his claim to priority was unjustly disputed by John Bernoulli. Taylor’s Jfethodus Incrementorum Directa et Inversa (London, 1715) added a new branch to the higher mathematics, now designated the ‘calculus of finite differences.” Among other ingenious applications, he used it to determine the form of movement of a vibrating string, by him first successfully reduced to mechanical principles. The same work contained (p. 23) the celebrated formula known as “Taylor’s theorem.” It is of extensive use in almost every analytical inquiry ; but its full importance remained unrecognized until pointed out in 1772 (Berlin Memoirs) by Lagrange, who later termed it ‘le principal fondement du calcul différentiel.”

In his ‘essay on Linear Perspective (London, + 1715) Taylor set forth the true principles of the art with much originality, and in a more general form than any of his predecessors. The little work suffered, however, from the brevity and obscurity which affected most of his writings, and needed the

elucidation bestowed on it in the treatises of Joshua Kirby (1754) and Daniel Fournier (1761).

Taylor was elected a fellow of the Royal Society early in 1712, sat in the same year on the committee for adjudi- cating the claims of Newton and Leibnitz, and acted as secretary to the society January 13, 1714, to: October 21, 1718. During a visit to Paris in 1716 he made acquaintance with Bossuet and the Comte de Caylus, and knit a warm friendship with Bolingbroke, whom he visited at La Source in 1720. From 1715 his studies took a philosophical and religious bent. He corresponded, in that year, with the Comte de Montmort on the subject of Malebranche's tenets ; and unfinislied treatises, "On the Jewish Sacrifices" and "On the Lawfulness of Eating Blood," written on his return from Aix-la-Chapelle in 1719, were afterwards found among his papers. His marriage in 1721 with Miss Brydges of Wallington, Surrey, led to an estrangement from his father, a person of somewhat morose temper, which terminated in 1723 after the death of the lady in giving birth toa son. The ensuing two years were spent by him with his family at Bifrons, and in 1725 he married, with the paternal appro- bation, Sabetta, daughter of Mr Sawbridge of Olantigh, Kent, who, by a strange fatality, died also in childbed in 1730; in this case, however, the infant, a daughter, survived. Weighed down by repeated sorrows, Taylor's fragile health gave way; he fell into a decline, died December 29, 1731, at Somerset House, and was buried at St Ann's, Soho. By his father's death in 1729 he

In his critical essays Bayard Taylor }.

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had inherited the Bifrons estate. Socially as well as in- tellectually gifted, he possessed a handsome person and engaging manners, and was accomplished to an uncommon degree in music and painting. As a mathematician, he was the only Englishman after Newton and Cotes capable of holding his own with the Bernoullis; but a great part of the effect of his demonstrations was lost through his failure to express his ideas fully and clearly.

A posthumous work entitled Contemplatio Philosophica was printed for private circulation in 1793 by his grandson, Sir William Young, Bart., prefaced by a life of the author, and with an appendix containing letters addressed to him by Bolingbroke, Bossuet, &e. Several short papers by him were published in Phil. Trans., vols, xxvii. to xxxil., including accounts of some interesting experiments in magnetism and capillary attraction. He issued in 1719 an improved version of his work on perspective, with the title New Principles of Linear Perspective, revised by Colson in 1749, and printed again, with portrait and life of the author, in 1811. A French translation appeared in 1753 at Lyons. Taylor gave (Mc. thodus Incrementorum, p. 108) the first satisfactory investigation of astronomical refraction.

See Watt, Bibliotheca Britannica; Hutton, Phil. and Math. Dictionary ; Fétis, Biog. des Musiciens; Th. Thomson, Hist. of the R. Society, p. 802; Grant, Hist, Phys. Astronomy, p. 877; Marie, Hist. des Sciences, vii. p. 231,

TAYLOR, Str Henry (1800-1886), poet and colonial statesman, was born October 18, 1800, at Bishop-Mid- dleham, in the county of Durham. His ancestors had been small landowners for some generations, and both his studious father, who late in life emerged for a time froma recluse existence to make an efficient secretary to the Poor Law Commission, and his original warm-hearted mother were interesting persons. His mother died while he was yet an infant, and he was chiefly educated by his father, who, finding him less quick and deeming him less intel- ligent than his two elder brothers, allowed him to go to sea as a midshipman. Eight months summed up his naval career; it had taken much less to disgust him with it. After obtaining his discharge he was appointed to a clerkship in the storekeeper’s office, and had scarcely entered upon his duties ere he was attacked by typhus fever, which carried off both his brothers, then living with him in London. In three or four years more his office was abolished while he was on duty in the West Indies. On his return he found his father happily married to a lady whose interest and sympathy proved of priceless value to him. Through her he became acquainted with her cousin Isabella Fenwick, the neighbour and intimate friend of Wordsworth, who introduced him to Wordsworth and Southey. Under these influences he lost his early admira- tion for Byron, whose school, whatever its merits, he at least was in no way

calculated to adorn, and his intel- lectual powers developed rapidly. In October 1822 an article from his pen on Moore's Jrish Melodies appeared in the Quarterly Review. A year later he departed for London to seek his fortune as a man of letters, and met with such rapid success, though not precisely in this capacity, as has but rarely attended an unknown young man. He became editor of the London Magazine, to which he had already contributed, and in January 1824 obtained, through the influence of Sir Henry Holland, an appointment in the Colonial Office, insuring him, not only an ample salary, but considerable influence in this depart- ment of public affairs; The general standard of the office was probably at that time low; at all events Taylor was immediately entrusted with the preparation of confidential state papers, and his opinion soon exercised an important influence on the decisions of the secretary of state. He visited Wordsworth and Southey, travelled on the Con- tinent with the latter, and at the same time, mainly through his friend and official colleague, the Hon. Hyde Villiers, became intimate with a very different set, the younger followers of Bentham, without, however, adopting their opinions,—" young men," he afterwards reminded

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Stuart Mill, "who every one said would be ruined by their independence, but who ended by obtaining all their hearts' desires, except one who fell by the way." The reference is to Hyde Villiers, who died prematurely, and for whose sister, afterwards Lady Theresa Lewis, Taylor was an unsuccessful suitor. He actively promoted the emancipation of the slaves in 1833, and became an in- timate ally of Sir James Stephen, then counsel to the Colonial Office, afterwards under-secretary, by whom the Act of Emancipation was principally framed. His first drama, Isaac Comnenus, was published anonymously in 1827. Though highly praised by Southey, it made little impression on the public. Philip van Artevelde, the sub- ject of which had been recommended to him by Southey, was begun in 1828, published in 1834, and, aided by a laudatory criticism. from Lockhart's pen, achieved extra- ordinary success. Edwin the Fair (1842) was less warmly received. In the interim he had married (1839) the daughter of his former chief Lord Monteagle, and, in con- junction with Stephen, had taken a leading part in the abolition of negro apprenticeship in the West Indies. T'he Statesman, a

volume of essays suggested by his official position, had been published in 1836, and about the same time he had written in the Quarterly the friendly adver- tisements of Wordsworth and Southey, subsequently pub- lished under the somewhat misleading title of Votes from Books, In 1847 he was offered the under-secretaryship of state, which he declined. Notes from Life and The Eve of the Conquest appeared in this year, and Notes from Books in 1849, An experiment in romantic comedy, Zhe Virgin Widow, afterwards entitled A Sicilian Summer, was pub- lished in 1850. ‘The pleasantest play I had written,” says the author; ‘and I never could tell why people would not be pleased with it.” His last dramatic work was St Clement’s Eve, published in 1862. In 1869 he was made K.C.M.G. He retired from the Colonial Office in 1872, though continuing to be consulted by Government. His last days were spent at Bournemouth in the enjoyment of universal respect ; and the public, to whom he had hitherto been an almost impersonal existence, became familiarized with the extreme picturesqueness of his appearance in old age, as represented in the photographs of his friend Mrs Cameron. He died on March 27, 1886.

Sir Henry Taylor is pre-eminently the statesman among English poets. When he can speak poetically in this character he is impressive, almost great; when he deals with the more prosaic aspects of policy he is dignified and weighty, without being alto- gether a poet ; when his theme is entirely unrelated to the conduct of public affairs or private life he is usually little more than an accomplished man of letters. An exception must be made for the interesting character of Elena in Philip van Artevelde, and for Artevelde’s early love experience, which reproduces and trausfigures the writer’s own. The circumstance of Philip van Artevelde being to a great extent the vehicle of his own ideas and feelings explains its great superiority to his other works. It is subjective as well as objective, and to a certain extent lyrical in feeling, though not in form. Though more elaborate than any of his other dramas, it seems to smell less of the lamp. He has thoroughly identified himself with his hero, and the only fault to be found with this noble picture of a consummate leader and statesman is the absence of the shadow required for a tragic portrait. The blame allotted to Artevelde is felt to be merely conventional, and the delineation of uniform excellence becomes monotonous. The hero of Hdwin the Fair, Dunstan, the ecclesiastical statesman, the man of two worlds, is less sympathetic to the

author and less attractive to the reader. The character is nevertheless a fine psychological study, and the play is full of historical if not of dramatic interest. Isaac Comnenus is more Elizabethan in tone than his other dramas. Comnenus is like a preliminary sketch for Van Artevelde; and the picture of the Byzantine court and people is exceedingly lively. The idea of the revival of romantic comedy in The Virgin Widow is excellent, but the play lacks the humour which might have made it a success. The length of the speeches, even when not set speeches, is a drawback to all these dramas. Taylor's lyrical work is in general laboriously artificial. It is therefore extraordinary that he should have produced two songs (‘‘ Quoth tongue of neither

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maid nor wife" and "If I had the wings of a dove") which it would hardly be an exaggeration to call worthy of Shakespeare. His character as an essayist repeats his character as a dramatist. The essays published under the title of The Statesman occupy a peculiar place in literature. They have serious faults, especially the too obvious imitation of Bacon, but they nevertheless are original in their point of view, and their wisdom is the result of a different kind of observation from that which qualifies the bulk of essayists on human life. When writing as one of these Taylor is less removed from the commonplace, though many of his remarks are admirable. As a literary critic he seems unable to get beyond Wordsworth and the select circle of poets admired by the latter. His essays on Wordsworth did much to dispel the conventional prejudices of the day, but will not advance the study of the poet where his greatness is already recognized, His strictures on Byron and Shelley are narrow and nota little presumptuous. Presump- tion, indeed, the last fault to have been expected in so grave and measured a writer, is one of those of which he most freely accuses himself in the autobiography published a year before his death. It is not otherwise apparent in this highly interesting book, which, sinning a little by the egotisn1 pardonable in a poet and the garrulity natural toa veteran, is in the main a pleasing and faithful picture of an aspiring youth, an active maturity, and a happy and honoured old age. (R. G.)

TAYLOR, Isaac (1787-1865), a voluminous writer on philosophical and theological subjects, was born at Laven- ham, Suffolk, in 1787, and was trained by his father to be an artist, but early adopted literature as a profession. From 1824, the year of his marriage, he lived a busy but uneventful life at Ongar, in the parish of Stanford Rivers, Essex, where he died on June 28, 1865.

He early became a contributor to the Zeleetie Review, when it was conducted by Robert Hall and John Foster, and in 1822 he published a small volume entitled Elements of Thought. This was followed by a translation of Theophrastus with original etchings, a History of the Transmission of Ancient Books to Modern Times, Memoirs and Correspondence of Jane Taylor (his sister, who died in 1824), and a translation of Herodotus. None of these works attained very great popularity; but in 1829 he published anony- mously a work bearing upon the religious and political problems of the day, entitled The Natural History of Enthusiasm, which was eagerly read and speedily ran through eight or nine editions, The success of this publication encouraged him to produce, also anony- mously, The Natural History of Kanatieism, Spiritual Despotism, Saturday Evening, and The Physical Theory of Another Life, all of which commanded a large circulation. Among his subsequent works may be nientioned Ancient Christianity, a series of disserta- tions in reply to the “Tracts for the Times,” a volume entitled The Restoration of Belief, and a course of lectures on The Spirit of Hebrew Poetry.

TAYLOR, Jeremy (1613-1667), was a native of Cam- bridge, and was baptized on the 15th August 1613. His father, Nathaniel, though a barber, was a man of some education, respected by his townsmen, and lineally de- | scended from Dr Rowland Taylor, Cranmer’s chaplain, who suffered martyrdom under Mary. Jeremy, after passing through the grammar school, was entered at Caius College as a sizar in 1626, eighteen months after Milton had entered Christ’s, and while George Herbert was public orator and Edmund Waller and Thomas Fuller were undergraduates of the university. He was elected a fellow of his college in 1633, but the best evidence of his diligence as a student is the enormous learning of which he showed so easy a conimand in after years. Accepting the invitation of Risden, a fellow-student, to supply his place for a short time as lecturer in

St Paul's, he at once attracted attention by his remarkable eloquence as well as by his handsome face and youthful appearance. Arch- bishop Laud, ever on the outlook for men of capacity, sent for Taylor to preach before him at Lambeth, and, discern- ing that his genius was worth fostering, dismissed him from the overpressure of the metropolis to the quiet of a fellowship in All Souls, Oxford, and at the same time, by making him one of his own chaplains, showed his desire to keep him in permanent connexion with himself. At Oxford Chillingworth was then busy with his great work, the Religion of Protestants, and it is possible that by intercourse with him Taylor's mind may have been turned

towards the liberal movement of his age. After two years in Oxford, in March 1638 he was presented by Juxon, bishop of London, to the rectory of Uppingham, in Rut- landshire. In the autumn of the saine year he was appointed to preach in St Mary's on the anniversary of the Gunpowder Plot, and apparently used the occasion to clear himself of a suspicion, which, however, haunted him 'through life, of a secret leaning to the Romish com- munion. This suspicion seems to have arisen chiefly from his intimacy with Christopher Davenport, better known as Francis a Sancta Clara, a learned Franciscan friar who became chaplain to Queen Henrietta; but it may have been strengthened by his known connexion with Laud, as well as by his ascetic habits and ritualistic propensities. More serious consequences followed his attachment to the Royalist cause, when in 1642 the livings of the loyal clergy were sequestered by decree of parliament. The author of Lmscopacy Asserted against the Aerians and Acephali New and Old, ineffective as that work scems in the light of modern research, could scarcely hope to retain his parish. Along with Fuller, Chillingworth, and others, he found temporary refuge with the king at Oxford. His two little boys must have been cared for by friends, for his wife, Phoebe Langsdale, whom he had married the year after his settlement at Uppingham, had died with her third child in that disastrous year 1642.

During the next fifteen years Taylor's movements are not easily traced. Sometimes he appears with the king, from whom at his last interview he received, in token of his regard, his watch and some jewels which had orna-

mented the ebony case in which he kept his Bible. He is supposed to be the Dr Taylor who was taken prisoner with other Royalists while besieging Cardigan castle. In 1646 he is found in partnership with two other deprived clergymen, keeping a school at Newton Hall, in the parish of Llanvihangel. It was while resident here that he attracted the friendship of one of his kindest patrons, Richard Vanghan, earl of Carbery, whose hospitable mansion, Golden Grove, is immortalized in the title of Taylor's still popular manual of devotion, and whose countess had the greater distinction of being the original of the "Lady" in Milton's Comus. It was also while resident in Wales that Taylor married his second wife, Joanna Bridges, who was generally understood to be a natural daughter of Charles I., and who owned a good estate, though probably impoverished by Parliamentarian exactions, at Mandinam, in Carmarthenshire. From time to time he appears in London in the company of his friend Evelyn, at whose table he met such men as Boyle, Berkeley, and Wilkins. Thrice he was imprisoned : in 1653-4 for a well-intended but injudicious preface to his Golden Grove; again in Chepstow castle, from May to October 1655, on what charge does not appear; and a third time in the Tower in 1657-8, on account of the indiscretion of his publisher, Royston, who had adorned his "Collection of Offices" with a print representing Christ in the attitude of prayer. This unsettled life, with its interruptions, harassments, and privations, would seem rather to have stimulated than to have stinted the pro- ductiveness of his genius. In 1647 appeared his most important work, The Liberty of Prophesying, and in the following year the complete edition of his Apology for Authorized and Set Forms of Liturgy against the Pretence of the Spirit, as well as his Life of Christ, or the Great Euemplar, a book which at once won a popularity it still in large measure retains. Then followed in rapid succes- sion the Twenty-seven Sermons, 'for the summer half-year," and the Twenty-five "for the winter half-year," oly Living, Holy Dying, a controversial treatise on the Real Presence, the Golden Grove, and the Unum Necessarium, which by

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its Pelagianism gave great offence. During these years he was also busy with his Ductor Dubitantium (published in 1660), which he intended to be the standard manual of casuistry and ethics for the Christian people.

In 1658 settlement was at length reached through the kind offices of the earl of Carbery, who obtained for Taylor a lectureship in Lisburn. At first he declined a post in which the duty was to be shared with a Presby- terian, or, as he expressed it, “where a Presbyterian and myself shall be like Castor and Pollux, the one up and the other down,” and to which also a very meagre salary was attached. He was, however, induced to take it, and found, near his patron’s mansion on Lough Neagh, so congenial a retirement that even after he was raised to a bishopric he continued to make it his home. At the Restoration, instead of being recalled to England, as he probably expected and certainly desired, he was appointed to the see of Down and Connor, to which was shortly added the small and adjacent diocese of Dromore. He was also made a member of the Irish privy council and vice-chancellor of the university of Dublin. None of these honours were sinecures. Of the university he writes, “T found all things in a perfect disorder… . a heap of men and boys, but no body of a college, no one meinber, either fellow or scholar, having any legal title to his place, but thrust in by tyranny or chance.” Accordingly he set himself vigorously to the task of framing and enforcing regulations for the admission and conduct of members of the university, and also of establishing lectureships, His episcopal labours were still more arduous. There were, at the date of the Restoration, about seventy Presbyterian ministers in the north of Ireland, and most of these were from the west of Scotland, and were imbued with the dis- like of Episcopacy which distinguished the Covenanting party. No wonder that Taylor, writing to the duke of Ormonde shortly after his consecration, should have said, ‘I perceive myself thrown into a place of torment.” His letters perhaps somewhat exaggerate the danger in which he lived, but there is no doubt that his authority was resisted and his overtures rejected. His writings also were ransacked for matter of accusation against him, “a comunittee of Scotch spiders being appointed to see if they can gather or make poison out of them.” Here, then, was Taylor’s opportunity for exemplifying the wise toleration he had in other days inculeated. These Presbyterians had, like himself, suffered under Cromwell for their loyalty, and might have been expected to evoke his sympathy ; but the new bishop had nothing to offer them but the bare alternative—submission to episcopal ordination and juris- diction or deprivation. Consequently, in his first visita- tion, he declared thirty-six churches vacant ; and of these forcible possession was taken by his orders. At the same time many of the gentry

were won by his undoubted sincerity and devotedness as well as by his eloquence. With the Romanist element of the population he was less successful. Ignorant of the English language, and firmly attached to their ancestral forms of worship, they were yet compelled to attend a service they considered profane, conducted in a language they could not understand. As Heber says, “No part of the administration of Ireland by the English crown has been more extraordinary and more unfortunate than the system pursued for the introduction of the Reformed religion.” At the instance of the Irish bishops Taylor undertook his last great work, the Dis- suasive from Popery (in two parts, 1664 and 1667), but, as he himself seemed partly conscious, he might have more effectually gained his end by adopting the methods of Ussher and Bedell, and inducing his clergy to acquire the Irish tongue.

Nor were domestic sorrows awanting in these later years.

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In 1661 he buried, at Lisburn, Edward, the only surviv- ing son of his second marriage. His oldest son, an officer in the army, was killed in a duel; and his: second son, Charles, intended for the church, left Trinity College and became companion and secretary to the duke of Bucking- ham, at whose house he died. The day after his son’s funeral Taylor sickened, and, after a ten days’ illness, he died at Lisburn on the 13th August 1667, in the fifty-fifth year of his life and the seventh of his episcopate.

Taylor’s fame has been maintained by the popularity of his sermons and devotional writings rather than by his influence as a theologian or his importance as an ecclesiastic. His mind was neither scientific nor speculative, and he was attracted rather to questions of casuistry than to the deeper problems of pure theology. His wide rcading and capacious memory enabled him to carry in his mind the materials of a sound historical theology, but these materials were unsifted by criticism. His immense

learning served him rather as a storehouse of illustrations, or as an armoury out of which he could choose the fittest weapon for discomfiting an opponent, than as a quarry furnishing him with material for build- ing up a completely designed and enduring edifice of systematized truth, Indeed, he had very limited faith in the human mind as an instrument of truth. ‘‘ Theology,” he says, “is rather a divine life than a divine knowledge.” His great plea for toleration is based on the impossibility of erecting theology into a demonstrable science. ‘‘It is impossible all should be of one mind. And what is impossible to be done is not necessary it should be done,” Differences of opinion there must be; but “heresy is not an error of the understanding but an error of the will.” His aim in life was practical ; his interests werc in men rather than in ideas, and his sympathics were evoked rather by the experiences of individuals than by great movements. Of a decidedly poetic tempcrament, fervid and mobile in fecling, and of a prolific fancy, he had also the sense and wit that come of varied contact with men. All his gifts were made available for influencing other men by his easy command of a style rarely matched in dignity and colour. With all the majesty and stately elaboration and musical rhythm of Milton’s finest prose, Taylor’s style is relieved and brightened by an astonishing variety of felicitous illustrations, ranging from the most homely and terse to the most dignified and elaborate. His sermons especially abound in quotations and allusions, which have the air of spontaneously suggesting themsclves, but which must sometimes have baffled his hearers. This seeming pedantry is, however, atoned for by the clear practical aim of his sermons, the noble ideal he keeps before his hearers, and the skill with which he handles spiritual experience and urges incentives to virtue. But, through all his gorgeous eloquence and genial interest in human uature, there breaks from time to time some dead and laboured irrelevancy, the growth of his training in scholastic dialectics ; for ‘‘like some other writers of the 17th century he seems almost to have two minds, —one tender, sweet, luxuriant to excess, the other hard, subtle, formal, prone to definition and logomachy.”

The first collected edition of his works was published by Bishop Heber (with a life) in 1822, reissued after careful revision by Charles Page Eden, 1852-61. (M. D.)

TAYLOR, Joun (1580-1654), commonly called “The Water Poet,” was born at Gloucester in August 1580. Of his parentage and early boyhood very little is known, and that little is mainly to be gleaned from various scattered personal allusions in the numerous short writings of this prolific wit and rhymster. After fulfilling his apprentice- ship to a waterman, he seems to have served (1596) in the fleet under the earl of Essex, and to have been present at the naval attack upon Cadiz. On his return to England he took up the trade of Thames waterman, and for a time at any rate was a collector of the dues exacted by the lieutenant of the Tower on all wines destined for London. The title of “ Water Poet,” which he owes to his occupation On the river, isa misnomer. Taylor was no poet, though he could string rhymes together with facility ; his wit, which was vigorous and vulgar, found best expression in rollicking prose. He shows a broad sense of rough fun, occasionally of humour; but for the most part his comi- calities would now meet with scanty appreciation. He had a very good opinion of himself, his writings, and his Importance ; and it was he himself who set forth that he was the ‘“king’s water poet” and the ‘“queen’s water- man.” His literary performances can most easily and most

satisfactorily be studied in the handsome quarto, contain- ing all his productions, edited by Mr C. Hindley, and pub- lished in 1872. His “ works,” sixty-three in number, first appeared in one large volume—now a rarity sought after by collectors—in 1630. He delighted in eccentric freaks, calculated in narration to astound both the sober country- folk and the somewhat sceptical Londoners. Thus, with a companion as feather-brained as himself, he once started ona voyage from London to Queensborough in a paper boat, with two stockfish tied to two canes for oars ; before the journey’s end was reached the frail boat collapsed, as might have been expected, though a qualified success finally met Taylor’s efforts. The spirit of the bargee was in him, and he delighted in rough give-and-take; a rude lampoon was one of his favourite verbal weapons. Thus Thomas Coryat, the author of Crudities, having excited the literary waterman’s ridicule, was rewarded with a ludicrous dedication in the production entitled Taylor’s Travels in Germanic; again, the “water poet” indulged in abusive satire to his heart’s content in an “effusion” which he called A Kicksey-Winsey, or a Lerry Come-T’wang—a literary castigation which he inflicted upon those subscribers to a certain “ work” of his who omitted to substantiate their

promises, This production was entitled Zhe Penniless Pilgrimage, or the Moneyless Perambulation of John Taylor, and consisted of an account of its author's pedestrian tour from London to Edinburgh; and to this work some sixteen hundred persons are said to have promised their support. Another wagering ven- ture was a journey to Prague, where he is said to have been received and entertained by the queen of Bohemia in 1620. Two years later Taylor made "a very merry, wherry ferry voyage, or Yorke for my money," and in the ensu- ing year another water-journey, which he subsequently described in prose and verse as A New Discovery by Seca with a Wherry from London to Salisbury. At the out- break of the Civil War Taylor forsook the river and retired to Oxford, where he tempted fortune by keeping a public- house. His sympathies were wholly with the Royalists, —the Roysterists, as he called them once; and, when the town surrendered, the ‘‘ water poet" returned to London and kept a public-house under the sign of The Crown, in Phoenix Alley, Long Acre. He incurred some odium from his loyal observance of the king's death in the placement above his door of the sign of The Mourning Crown, and he was forced to take the latter down. With characteristic readiness he substituted for it his own portrait, with some

‘ doggerel lines underneath. It was here that in December

1654 he died, and in the neighbouring churchyard of St Martin's-in-the-Fields his remains were laid.

At the most, Taylor can only be called an amusing and vulgarly clever pamphleteer; he wrote nothing worthy of remembrance save by the historian of the period in which he lived, by the antiquary, and by the enthusiastic student of the many straggling little by- ways of literature.

TAYLOR, Tom (1817-1880), dramatist and art critic, was born at Sunderland in 1817. After attending school there, and studying for two sessions at Glasgow university, he in 1837 entered Trinity College, Cambridge, of which he became a fellow. Subsequently he held for two years the professorship of English literature at University Col- lege, London. He was called to the bar (Middle Temple) in November 1845, and went on the northern circuit until, in 1850, he became assistant secretary of the Board of Health. On the reconstruction of the board in 1854 he was

made secretary, and on its abolition his services were transferred to the Local Government Act Office, a depart- ment of the Home Office created by the Sanitary Act of 1866. In his very early years Tom Taylor showed a pre- dilection for the drama, and was in the habit of performing dramatic pieces along with a number of children in a loft

over a brewer's stable. His first dramatic composition was a rhymed fairy tale or extravaganza, written in conjunction with Albert Smith and Charles Kenny, and performed in 1846. From this time he wrote for the stage continuously till the close of his life, his dramatic compositions or adaptations numbering in all over 100, amongst the best known of which are Still Water Runs Deep, Victims, the Contested Election, the Overland Route, the Ticket of Leave Man, Anne Boleyn, and Joan of Arc. He may perhaps be regarded as the first dramatist of his time, so far as general appreciation goes; and, if his chief concern was the con- struction of a popular acting play, his dramas possess at the same time considerable literary excellence, while the characters are clearly and consistently drawn, and the dialogue is natural, yet nervous and pointed. In his blank

verse historical dramas, such as Anne Boleyn and Joan of

Arc, he was not so successful. Taylor was also a very frequent contributor to the light magazine literature of the day. In 1872 he withdrew from public life, and, on the death of Shirley Brooks in 1873, he became editor of Punch. He occasionally appeared with success in amateur theatricals, more especially in the character of Adam in As You Like Itand of Jasper in A Sheep in Wolf's Cloth- ing. He had some talent for painting, and for many years was art critic to the Z'%mes. He died at Lavender Sweep, Wandsworth, 12th July 1880.

Apart from the drama, his chicf contributions to literature are his biographies of painters, viz., Autobiography of B. R. Haydon (1853); Autobiography and Correspondence of C. R. Leslie, R.A, (1859); and Life and Times of Sir Joshua Reynolds (1865), which had been lcft in a very incomplete state by Mr Leslie. His Historical Dramas appearcd in one

volume in 1877. He also edited, with a memorial preface, Pen Sketehes from a Vanished Hand, seleeted from Papers of the late Mortimer Collins.

TAYLOR, Zacuary (1784-1850), president of the United States, was born in Orange county, Virginia, November 24, 1784. He entered the army as lieutenant in 1808, and rose to the rank of major in the war with Great Britain which followed. At the outbreak of the Mexican War he was in command of the American forces in Louisiana and Texas, and was directed to make the advance into the disputed territory which brought on the war. Beating the Mexicans in two battles, he followed them into Mexico, and there defeated Santa Anna in the crowning battle of his campaign, Buena Vista (1847). Dissatisfied with his treatment by the administration, he resigned and returned to the United States, where the Whig party nominated him and elected him president (1848). The struggle over the question of the admission of slavery to the territory taken from Mexico occupied his term of office, and he died at Washington, July 9, 1850.

TCHAD, Tsap, or Cuan, Lake. See AFRICA, vol. i. p. 255, and SouDAN.

TCHEREMISSES, or Cuerremisses. See FINLAND, vol. ix. p. 219, and Russta, vol. xxi. pp. 79-80.

TCHERKASY (Polish Czerkasy), a district town of Russia, in the government of Kieff, and 190 miles by rail to the south-east of Kieff, on the right bank of the Dnieper. It is poorly built, mostly of wood ; the population has rapidly increased lately, and has doubled since 1846, reaching 15,740 in 1883. There are now two gymnasiums for boys and girls, and several lower schools. The inhabitants (Little Russian) are mostly employed in agriculture and gardening. There is a brisk export trade in corn, refined sugar, tobacco, salt, and timber ; raw sugar and manufactured goods are imported, principally by Jewish merchants,

Tcherkasy, formerly Tcherkassk, was an important town of the Ukraine in the 15th century, and remained so, under Polish rule, until the revolt of Hmelnitski, when it became free, When West

Ukraine was taken again by Poland, most of its inhabitants migrated to the left bank of the Dnieper. It was annexed by Russia in 1795.

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TCHERNIGOFF, a government of Little Russia, on the left bank of the Dnieper, bounded by Moghileff and Smolensk on the N., Orel and Kursk on the E., Poltava on the S., and Kieff and Minsk on the W., has an area of 20,233 square miles. Its surface is an undulating plain, 650 to 750 feet high in the north, and from 370 to 600 feet in the south, deeply grooved by ravines and the valleys of the rivers. In the north, “ beyond the Desna,” about one-third of the area is under wood (which is rapidly disappearing), and marshes occur along the courses of the rivers ; while to the south of the Desna the soil is dry, sometimes sandy, and assumes the characters of a steppe- land as one proceeds southward. Chalk deposits prevail in the north, and Eocene inthe south. The government is watered by the Dnieper (which forms its western boundary for 178 miles) and its tributaries the Soj and the Desna, The latter, which flows through Tchernigoff for nearly 350 miles, is navigable, and timber is brought down its tribu- taries. Corn, linseed, timber, brandy, hemp, and sugar are shipped on the Dnieper, Soj, and Desna, and salt im- ported. The climate is much colder in the woody tracts of the north than in the south; the average yearly temperature at the town of Tchernigoff is 44°-4 (January, 23°; July, 68°°5).

The population, which is rapidly increasing, reached 1,996,250 in 1883. It is chiefly Little Russian (85°6 per cent.); Great Russians (6°1 per cent.), mostly Raskolniks, and White Russians (5°6 per cent.) inhabit the northern districts. Jews have spread rapidly since last century, and now number more than 45,000. There are, besides, some 20,000 Germans as well as Grecks at Nyczhin. Agri- culture is the principal occupation; in the north, however, many of the inhabitants are engaged in the timber trade and various domestic industries. Cattle-breeding is carried on in the central districts, and there were in 1883 572,200 horses, 515,800 cattle, and 948,000 sheep. Beet is extensively cultivated, and in 1884 2 million cwts. of beet-root were delivered to the thirteen sugar- works within the government. The culture of tobacco is also in- creasing, upwards of 500,000 ewts. being produced annually. Hemp is widely cultivated in the north, and the milder climate of the south cncourages gardening. Bee-keeping is extensively carricd on by

the Raskolniks. Tar, pitch, and a large variety of wooden manufactures are largely produced in the forest districts, as also are woven fabrics, felts, and leather wares. Limestone, grind- stones, china-clay, and building stone are quarried. Manufactures have begun to develop rapidly of late ; by 1881 their yearly produc- tion reached £1,340,000 (£860,000 from sugar-works and distil- leries). Trade is active, especially since the opening of the railway between Kieff and Kursk, which runs through Tchernigoff. The government is divided into fifteen districts, the chief towns (with populations in 1885) being Tchernigoff (19,000), Borzna (18,700), Glukhoff (16,450), Gorodnya (3550), Konotop (16,420), Kozelets (4430), Krolevets (9190), Mglin (10,880), Novgorod-Syeversk (8020), Novozybkoff (11,920), Nyezhin (43,020), Oster (8550), Sosnitsa (5650), Starodub (28,890 in 1880), and Surazh (38770). A number of unimportant towns (14 posads and 49 myestechkt) possess muni- cipal institutions.

TCHERNIGOFF, capital of the above government, stands on the right bank of the Desna, nearly half a mile from the river, 476 miles from Moscow. Far removed from the great channels of trade, its sole importance is as an administrative centre. Its houses are poorly built, and the streets are unpaved. The population (19,000 in 1885, one-third being Jews) is almost stationary. The ruins of its fortress, and the old cathedrals of Preo- brazhenie and Borisoglebsk, founded in the 11th and 12th centuries, bear witness to the former importance of the town. Numerous graves scattered about, and now partly explored, speak of the battles which caused its decay.

Tchernigoff is known to have existed before the introduction of Christianity into Russia. In 907 it is mentioned in the treaty of Oleg as next to Kieff, and in the 11th century it became the capital of the principality of Syeversk and an important commercial city. The Mongolian invasion put an end to its growth. Lithuania annexed it in the 14th century, but it was soon seized by Poland, which held it until the 17th century. The great rising in 1648 rendered it independent until 1654, when the Cossacks accepted the protectorate of the czars of Moscow. In 1686 it was definitely annexed to Russia.

TCHERNOMORSK, a government of Caucasia, Russia, consisting of a narrow strip of land between the main Caucasus chain and the Black Sea, formerly inhabited by the Adyghe mountaineers of Caucasus. This strip, pro- tected by the mountains from the cold winds of the north, is in respect of climate one of the most favoured parts of the Black Sea littoral. Owing to extensive emigrations of its inhabitants to Turkey since the Russian conquest of 1864, it is very thinly peopled, the population numbering

| but 25,980, mostly Russians, on an area of 2824 square

miles. The steep slopes of the Caucasus, whose summits range from 2000 to 10,000 feet, are furrowed by narrow gorges, and bear a luxuriant vegetation. The wild vine— a relic of former gardens—grows freely in the forests, which are almost impassable on account of the underwood and decaying trees. The moistness of the atmosphere contri-

| butes to the spread of the Caucasian fever, which is char-

acteristic of the littoral. Notwithstanding the proximity of the mountains to the sea, a road is now being con-

| structed along the coast,—for military reasons.

Agriculture is carried on, but only in the south, —gardening and the culture of the vine and tobacco being the chief occupations besides fishing and hunting. Some manufactures are rising up at

| Novorossiysk (3330 inhabitants) and Anapa (5350), the two prin-

cipal towns, which also have some foreign trade. The region is a separate province under a military governor residing at Novo- rossiysk, where a new harbour is being constructed.

TCHISTOPOL, a district town of Russia, in the govern-

| ment of Kazaii, 90 miles to the south-east of that town, on

the left bank of the Kama. Before 1781 it was a mere

) village (Tchistoye Pole), founded by runaway serfs ; at

present it is extending rapidly and becoming an industrial town, with flour-mills, distilleries, and a few cotton-mills, The merchants carry on a brisk trade in corn brought in from the fertile tracts of Ufa, and shipped down the Kama; manufactured wares are imported. The popula-

tion in 1883 was 18,200.

TCHITA, capital of Transbaikalia, Eastern Siberia, stands 585 miles east of Irkutsk, on the Tchita river, half a mile above its junction with the Ingoda. It was founded in 1851; and military considerations led to the selection of this very small village to be the capital of Transbaikalia.

Steamers on the Amur and Shilka do not penetrate so far |as the upper Ingoda; they usually stay at Sryetensk, 320 miles distant. }from Transbaikalia to the Amur region usually start

But the military supplies sent every year

from Tchita,—the forest-covered hills on the banks of the Ingoda supplying material for the construction of the barges (from 100 to 200 in number) on which these sup- plies are carried as soon as the melting of the snows in the ‘mountains temporarily raises the water in the river to a sufficient height. Tchita is built of wood, with unpaved Streets and wide open spaces. The dryness of the Buriat steppe close by prevents snow from accumulating to any depth, even when the cold is extreme; the merchandise

accordingly which is forwarded from Irkutsk to the Nertchinsk district is brought to Tchita on carts, and is there loaded on sledges for the continuation of the journey

down the frozen rivers. The population of Tchita in

| 1883 was 12,600. The inhabitants support themselves

by agriculture, by trade in furs, cattle, hides, and tallow, which are bought from the Buriats, and in all kind of | manufactured wares imported from

Russia and Western | Siberia.

| TEA. This important food auxiliary, now in daily use /a8 a beverage by probably one-half of the population of \the world, is prepared from the leaves of one or more plants belonging to the natural order Ternstrimiacee.

The order includes the well-known ornamental genus of

‘shrubs Camellia, to which indeed the tea-plants are so closely allied that by many systematic writers they are

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included in the same genus. The tea-plants have been cultivated in China for at least a thousand years.

As is commonly the case with plants which have been Botany.

long under cultivation, there is much doubt as to specific distinctions among the varieties of tea. Under the name of Thea sinensis, Linneeus originally described tea as a single species ; but with fuller knowledge of the Chinese plants he established two species, Thea Bohea and Thea viridis, and it was assumed that the former was the source of black teas, while Thea viridis was held to yield the green varieties. In 1843, however, Mr Robert Fortune found that, although the two varieties of the plant exist in different parts of China, black and green tea are made indifferently from the leaves of the same plant. The tea- plant is cultivated in China as an evergreen shrub, which grows to a height of from 3 to 5 feet. The stem is bushy, with numerous and very leafy branches; the leaves are alternate, large elliptical, obtusely serrated, veined, and placed on short channelled foot-stalks. The calyx is small, smooth, and divided into five obtuse sepals. The flowers are white, axillary, and slightly fragrant,—often

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Fia. 1.—Tea-Plant (Thea sinensis),

two or three together on separate pedicels. The corolla has from five to nine petals, cohering at the base. The filaments are short, numerous, and inserted at the base of the corolla; the anthers are large and yellow, the style trifid, and the capsules three-celled and three-seeded.

The wrzdis varieties are hardier, and possess larger and brighter green leaves than belong to the Bohea variety. No strictly wild tea-plants have been discovered in China, but an indigenous tea-tree (Zhea assamica) is found in Assam, which botanists now incline to regard as the parent species of all cultivated varieties. It differs in many respects from the Chinese plants. The indigenous Assam tea-plant is a tree attaining a height of from 15 to 20 feet, growing in the midst of dense moist jungle and in shady sheltered situations. Its leaves vary considerably in size, form, and venation, being usually smooth, thick, and leathery, lanceolate, ovate lanceolate, or oblong lanceo- late. They are variously dotted with pellucid cells containing essential oil, and the number of such cells shown by the leaf is held to be an indication of the quality of tea it will yield. The leaf of the Chinese plant never exceeds 4 inches in length, while that of the Assam tree reaches

XXIII. — 13

Range of growth,

Climate and soil,

98

9 inches and upwards. The Chinese plant is hardy, and capable of thriving under many different conditions of climate and situation; while the indigenous plant is tender and difficult of cultivation, requiring for its success a close, hot, moist, and equable climate. The characteristic venation of the leaf of the Chinese tea-plant is delineated in fig. 2. In minute structure the leaf presents highly characteristic appearances. The . under side of the young leaf is densely covered with fine one- celled thick-walled hairs, about 1 mm. in length and ‘015 mm. in thickness. These hairs entirely disappear with increasing age. The structure of the epidermis of the under

side of the leaf, with its contorted cells, is represented (x 160) in fig. 3. A further char- acteristic feature of the cellular structure of the tea-leaf is the abundance, especially in grown leaves, of large, branching, thick- walled, smooth cells (idioblasts), which, although they occur in other leaves, are not found in such as are likely to be confounded with or substituted for tea. The minute structure of the leaf in section is illustrated in fig. 4. The cultivated varieties of tea, being comparatively hardy, possess pyg. 9, an adaptability to climate excelled among food plants only by the wheat. The limits of actual tea cultivation extend from 39° N, lat. in Japan, through the tropics, to Java, Australia, Natal, and Brazil in the southern hemisphere. The tea-plant will even live in the open air in the south of England, and withstand some

—Tea-Leaf—full size.

Fie, 3.—Epidermis of Tea-Leaf (under side). x 160

amount of frost, when it receives sufficient summer heat to harden its wood. But comparatively few regions are suited for practical tea-growing. 2

A rich and exuberant growth of the plants is a first essential of successful tea cultivation. This is only obtain- able in warm, moist, and comparatively equable climates, where rains are frequent aud copious. Theclimate indeed which favours tropical profusion of jungle growth—still steaming heat—is that most favourable for the cultivation of tea, and such climate, unfortunately, is most prejudicial to the health of Europeans. It was formerly supposed that comparatively temperate latitudes and steep sloping ground afforded the most favourable situations for tea- planting, and much of the disaster which attended the early stages of the tea enterprise in India is traceable to this erroneous conception. Tea thrives best in light friable

| plant.

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soils of good depth, through which water percolates freely, the plant being specially impatient of marshy situations and stagnant water. Undulating well-watered tracts, where the rain escapes —

freely, yet without washing away the soil, are the most © valuable for tea gar- dens. Asa matter of fact, many of the Indian plantations are established on hill-sides, after the example of known districts in China, where hill slopes and odd corners are commonly occupied with tea-plants.

According to Chinese legend, the virtues of tea (cha, Histor, pronounced in the Amoy dialect ¢é, whence the English name) were discovered by the mythical emperor Chin- nung, 2737 B.c., to whom all agricultural and medicinal knowledge is traced. It is doubtfully referred to in the book of ancient poems edited by Confucius, all of which are previous in date to 550 B.c. A tradition exists in China that a knowledge of tea travelled eastward to and in China, having been introduced 543 a.p. by Bodhidharma, an ascetic who came from India on a missionary expedition, but that legend is also mixed with mythical and super- natural details. But it is quite certain, from the historical narrative of Lo Yu, who lived in the Tang dynasty (618-906 A.D.), that tea was already used as a beverage in the 6th century, and that during the 8th century its use had become so common that a tax was levied on its consump- tion in the 14th year of Tih Tsung (793). The use of tea in China in the middle of the 9th century is known from Arab sources (Reinaud, Relation des Voyages, 1845, p. 40). From China a knowledge of tea was carried into Japan, and there the cultivation was established about the begin- ning of the 13th century. Seed was brought from China — by the priest Miyoye, and planted first in the south island, Kiushiu, whence the cultivation spread northwards till it reached the high limit of 39° N. To the south tea cultiva- tion also spread into Tong-king and Cochin China, but the product in these regions is of inferior quality. Till well into the 19th century it may be said that China and Japan were the only two tea-producing countries, and that the product reached the Western markets only through the narrowest channels and under most oppressive restrictions.

In the year 1826 the Dutch succeeded in establishing tea gardens. in Java. At an early period the East India Company of Great Britain, as the principal trade interme- diary between China and Europe, became deeply interested in the question of tea cultivation in their Eastern posses- sions. In 1788 Sir Joseph Banks, at the request of the directors, drew up a memoir on the cultivation of economic plants in Bengal, in which he gave special prominence to tea, pointing out the regions most favourable for its

cultivation. About the year 1820 Mr David Scott, one of the Company's servants, sent to Calcutta from the district of Kuch Behar and Rangpur—the very district indicated by Sir Joseph Banks as favourable for tea growing—certain leaves, with a statement that they were said to belong to the wild tea-plant. The leaves were submitted to Dr Wallich, Government botanist at Calcutta, who pronounced them to belong to a species of Camellia, and no result followed on Mr Scott's communication. These very leaves ultimately came into the herbarium of the Linnean Society of London, and have authoritatively been pronounced to belong to the indigenous Assam tea- Dr Wallich's attribution of this and other specimens

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subsequently sent in to the genus Camellia, although scientifically defensible, unfortunately diverted attention from the significance of the discovery. It was not till 1834 that, overcome by the insistance of Captain Francis Jenkins, who maintained and proved that, called by the name Camellia or not, the leaves belonged to a tea-plant, Dr Wallich admitted "the fact of the genuine tea-plant being a native of our territories in Upper Assam as incontrovertibly proved." In the meantime a committee had been formed by Lord William Bentinck, the governor- general, for the introduction of tea culture into India, and an official had already been sent to the tea districts of China to procure seed and skilled Chinese workmen to conduct operations in the Himalayan regions. The discovery and reports of Captain Jenkins led to the investigation of the capacities of Assam as a tea-growing country by Lord William Bentinck's committee. Evidence of the abundant existence of the indigenous tea-tree was obtained ; and the directors of the East India Company resolved to institute an experimental establishment in Assam for cultivating and manufacturing tea, leaving the industry to be developed by private enterprise should its practicability be demonstrated. In 1836 there was sent to London 1 1b of tea made from indigenous leaves ; in 1837 5 ib of Assam tea was sent; in 1838 the quantity

sent was twelve small boxes, and ninety-five boxes reached London in 1839. In January 1840 the Assam Company was formed, and thenceforward the cultivation of tea in India was carried on as a private commercial undertaking. The tea districts of India include, in the order of their priority, Assam, Dehra Dun, Kumaun, Darjiling, Cachar, Kangra, Hazaribagh, Chittagong, Tarai, and the Nilgiris (Madras).

Attempts were repeatedly made to introduce tea culture in Ceylon, under both Dutch and British authority. No permanent success was attained till about 1876, when the disastrous effects of the coffee-leaf disease induced planters to give serious attention to tea. Since that period the tea industry has developed in Ceylon with marvellous rapidity, and it has every prospect of taking the first rank among Singalese productions. Tea-planting has also been suc- cessfully established in Natal. But beyond the regions above enumerated the industry has never taken root. It has been tried in the West Indies, the Southern States of America, Brazil, Australia, and the south of Europe; but cheap labour is a sine gua non of success, ‘Tea can be picked in China and the British East Indies for two or three pence a day of wages, and it is on such exceedingly moderate outlay that the margin of profit depends.

Tea is more or less cultivated for local consumption in all pro- vinecs of China except the extreme north, but the regions from which it is exported are embraced within the provinces in the south-cast—Kwang-tung, Fuh-keen, Keang-se, Che-keang, Keang- su, aud Gan-hwuy. Black-tea manufacture belongs to the more southerly portion of these regions, the green-tca country lying to the north. The methods employed in cultivating the plants and in making tea in China differ widely in various districts, and the teas retained for native use—especially the high-class fancy teas which are never seen abroad, and would probably not bear cx- portation—undergo special manipulation. The teas exported are of three principal classes—black tea, green tea, and brick tea.

In cultivation, the young plants are not ready for picking till they are three years old, by which time they should be well established, throwing out young shoots or “flushes” with vigour and profusion. It is these tender shoots, with leaf-buds and expand- ing leaves, which alone are gathered for tea mannfacture, and the younger thie leaf-bud the better is the quality of

the tea. Accord- ing to Chinese statements there are four gatherings of leaves in the year. The first is made early in April, when the young leaf-buds are just unfolding, and these, covered below with their fine silky hairs, are taken for making pekoe or young hyson. The sccond gathering takes place about the beginning of May, another in July, and the fourth in August and September. On each succeeding occasion the product is less fragrant and valuable, and the final

gathering is said to consist of large leaves of little value. These statements do not, however, accord with Indian experience.

_ The following brief outline of the Chinese tea-making processes is given by Mr Ball (Cultivation and Manufacture of Tea) :—

‘eThe leaves of black tca arc exposed to the sun and air on circular trays and treated as hay, during which an incipient saccharine fermentation is supposed to take place in conjunction with a volatile oil. Various modifications of flavour are thus produced by the management of this fermentation; a loss of tannin takes place by the conversion of part of the tannic acid into sugar. During this change the leaves become flaccid, and slightly tinged or spotted with red or brown colouring matter, and give out a peculiar odour, approximating to, or, as some think, identical with, the odour of tea. A certain change in this odour is carefully watched by the workmen, this being an indication that the roasting must not be delayed. It is not necessary to wait till the leaves are spotted with red. They are then roasted in an iron vessel, and afterwards rolled with the hands, to express their juices. The roasting and rolling are repeated so long as any juices ean be expressed from the leaves in the act of rolling. Finally, they are dried in sieves placed over a charcoal fire in drying tubes, during which the leaves are occasionally taken from the fire, and turned until completely dried. It is in this last stage of the proccss that the leaves turn plack, though this change of colour is mainly due to the process of manipulation previously to roasting, and not to the action of heat.”

Black tea.

“The leaves of green tea are roasted also in an iron vessel, but as soon as Green gathered, without any previous manipulation, all heating or fermentation of the teg,

leaves being studiously avoided; they are then rolled as black tea, and finally dried in the same vessel in which they have been roasted, by constantly stirring and moving them about. They are also fanned to hasten evaporation, and the drying and formation of the peculiar charactcristic colour of this tea, which it gradually acquires in this process, and which resembles the bloom on some fruits,”

The colour of genuine green tea is entirely due to the rapid drying of the fresh caves, which prevents the chlorophyll from under- going any alteration. The green tea sent out of China is, almost invariably faced or

glazed with artificial colouring matter, princi- pally with a powdered mixture of gypsum and Prussian blue.

The names distinguishing commercial qualities of tea are almost Com- entirely of Chinese origin. In general they indicate a gradation mercial of qualities from the fine and delicate product of the young leaf- varieties.

bud up to the hard and woody expanded and partly-grown leaf. The following list represents the ordinary series of qualitics, begin- ning with the finest :—

Biack Tea.—Flowery pekoe, orange pekoc, pekoe, pekoe souchong, souchong, congou, bohea.

Green Tea.—Gunpowder, skin, caper.

Of these names, pekoe is derived from pak-ho (white hairs), the pekoes showing the fine downy tips of the young buds ; souchong is from siaou- chung, little plant or sort; congou (kung-fu), labour ; bohea (ww-i), the mountains in Fuh-keen, the centre of the black-tea country ; and hyson (yii- tsien), before the rains, or tu-chwn, flour- ishing spring. Many other names occur in the trade denoting teas of special qualities or districts, such as oolong (black dragon) and twankay, from the district of that name in the province of Keang- su. Scented teas also form a special class of Chinese produce. In scenting the finished tea, either black or green is intimately inter- mixed with odoriferous flowers and left in a heap till the tea is fully impregnated with the odour, when the two substances are separated by sifting, and the tea so scented is immediately packed and ex- cluded from the air.

Brick tea is the special form in which tea is prepared for use throughout the vast tracts of Central Asia. It is made principally from broken leaves, stalks, and fragments of large leaves, com- pressed into blocks of various sizes. The bricks are of various degrees of compression, some being lightly squeczed into a loose mass and sewed up in cowhide bags, while others form compact resonant cakes, in which all trace of the original leaf structure is lost, with gilt characters impressed in their surface. Brick tea is much in demand over an area greater than the whole of Europe, and by many tribes

it is stewed with milk, salt, and butter or other fat and eaten as a vegetable. The Russian factors established in Hoo-pih prepare two sizes of brick tea, which they send off in great quantities through the Kalgan Gate of the Great Wall.

Under European supervision the cultivation and especially the manufacture of tea have in India undergone remarkable improve- ments. Indeed, the traditional and empirical teaching and processes of China proved a most serious stumblingblock to the progress of the tea industry under Western auspices. The tea-plants now cultivated in India are of three principal classes—the indigenous Assam, the Chinese, and a hybrid between the two. By much crossing and intermixture the gradations from one extreme to the other are almost imperceptible. The best qualities of black teas are made from indigenous and high-class hybrid plants, but these are comparatively tender and require a close humid climate. The hardiness of the Chinese plants is their most important character, for, favourably situated, the Assam plant gives a larger yield of delicate young leaf during the season than any other.

In favourable circumstances the tea-plant ‘‘flushes” or sends forth a fresh crop of tender young shoots from twenty to twenty- five times in the course of its growing and picking season of about nine months. The average annual yield per plant is very variable, but may be stated at abont one-fifth of a Ib of finished tea; and, as each acre of a garden holds 1500 to 1600 mature plants, the yield per acre may be from 300 to 350 ib per annum. The diagram (fig. 5) from Col. Money’s valuable practical treatise on the Culti-

imperial, hyson, young hyson, hyson

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Brick tea.

Tea in- dustry in India.

Picking.

extensively practised. The manufacture as carried on in the North. Western Provinces resolves itself into a rapid rolling and drying of the leaf. Without permitting the leaves to wither after gathering, they are, if frec from moisture, at once by exposure to a brisk heat sweated and softened for rolling. They are then without dela

rolled as in black-tea manufacture, next spread out in the sun till they take a blackish tinge, then again rolled, and this rolling and exposure may be repeated yet a third time. When the rolling is completed the tea is placed ina highly heated pan, in which it is stirred about briskly till the whole mass becomes too hot to be worked by hand. Then it is tightly packed in a strong canvas bag, in which it is beaten by a heavy flat stick to consolidate it, and in this condition left for a night. Next day it is fired off in a pan, beginning with a high heat, which is gradually reduced during the nine hours or thereby of the operation, an incessant stirrin

and tossing being kept up the whole time, During this firing off the green colour of the tea is developed; and Indian green tea never owes any of its colour to ‘‘ facing” with foreign substances,

The qualities of a sample of tea and its commercial value can

only with accuracy be determined by actual infusion and trial by of tea, a skilled tea-taster. Certain general and external appearances which indicate the class of a tca are obvious enough ; but, although . a pekoe may be readily distinguished from a souchong, the souchong of certain planters or districts may be more valuable than other pekoes, While it is impossible to define the conditions which determine the commercial value of an ordinary black tea, Col. Money lays down the following rules: the darker the liquor the stronger the tea, and the nearer the approach of the infused leaf to a uniform salmony brown the purer the flavour. Black tea of good quality should in infusion yield a clear bright brown liquor emitting a subdued fragrance, and in taste it should be mild, bland, and sweetish, with an agreeable astringency. Green tea yields a light-coloured liquor of high fragrance, but thin, sharp, and somewhat rasping in taste as compared with black tea.

The chemical components of tea leaves are essential oil, theine, Chemis.

tannin, boheic acid, incest, quercitannic acid, gallic acid, oxalic try. acid, gum, chlorophyll, resin, wax, albuminoids, colouring matters, cellulose, and mineral ash. Of these the first three—essential oil, theine, and tannin—are of importance in the infused beverage. The essential oil, on which the flavour of tea depends, is present to the extent of from 0°6 to 1 per cent. Theine (CsH,.N,O,) is an alkaloid identical with the caffeine obtained from coffee, and it is remarkable that the same substance is yielded by the maté or Paraguayan tea and the guarana of South America, and by the kola nut of Central Africa. The theobromine of cocoa is also closely allied to theine, and the characteristic components of the extract of meat similarly show certain points of contact with these stimulant bodies. To the tannin of tea infusions is due what is known as the strength of the tea. Prof. Dittmar has recently examined a number of China and Indian teas in regard to the pro- portions of theine and tannin in their infusions and to the depend- ence of these proportions on the time of infusion. The general result was that Chinese tea yields more theine and less tannin than Indian tea, and that in both cases 10 minutes' infusion extracts practically all the theine. Longer infusion adds only to the tannin that passes into the solution, and, as excess of tannin impedes diges- tion, prolonged infusion is hurtful and ought to be avoided.

The quantitative composition of ——_

vation and Manufacture of Tea illustrates the method in which a flush or shoot is picked, and the portions which go to make special classes of tea. The lines in the diagram show the points at which the shoot may be picked, and it is important that the lowest leaf taken should be so nipped off as to leave the bud in its axil uninjured on the branch, as from it the next flush will then develop. The three leaves at the growing point (a, b, c) yield pekoe, and the whole shoot down to and including f gives pekoe souchong. In the order of their age, the individual leaves manufacture into flowery pekoe, b orange pekoe, c pekoe, pekoe souchong, ¢ souchong, and fcongou. Were the flush further developed another

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Fia. 5.—Mode of Picking Tea.

leaf might be taken, which would be classed as bohea, but that is not a quality recognized by Indian growers. It is not, however, the practice to pick or treat leaves separately, the whole flush being manipulated together, and the tea is only separated into qualities by sifting after the manufacturing processes have been completed. Manu- The manufacture of black tea is found to be an essentially simple facture. matter. Many of the processes employed by the Chinese are quite Black superfluous, and several of the manual operations which bulk tea. largely in the Chinese manufacture, it is found, can with advantage be supplanted by mechanical agency. The whole object of the black-tea manufacturer is to ferment, roll, aud dry the leaf, and for that purpose the leaves undergo—(1) withering, (2) rolling, (3) fermenting, and (4) firing or dholing. Between the fermenting and the firing operations it is desirable to expose the leaves to the direct sunlight for an hour or thereby. This cannot always be done, as it is impossible to keep the Lessaatrbed leaves after they have attained their proper state; nevertheless the best result is always attained in bright weather, when it is possible to expose the fermented leaves to the sun.

The fresh leaves from the garden, as they are brought in to the factory, are withered by being spread evenly over square wicker- work trays—leaf challanies—thickly or thinly as the weather is hot or cool. Thus they are left exposed to the air till they become quite soft and flaccid, folding together when pressed in the hand into a clammy mass without crackling or rebound. In cloudy or rainy weather it becomes necessary to wither by machine, acting

on the leaves with artificially dried and heated air. Withering is | tea is of conrse subject to great a cor a preliminary to rolling, in which the flaccid and velvety leaves are | variation. The analyses i ‘ kneaded, twisted, and rolled back and forward over a table till the | der given in the accompanying | Volatile oil……..... 0-79 | 0-60 whole comes into a mashy condition by the exudation of juice. | table furnish a general idea of the ee seteeeens a on While in Chinese tea-making that juice is squeezed out of the leaves, | proportion of constituents. Me iiimeciegoent 9:22 | 3-64 in India it is most carefully lapped up and absorbed in the spongy A series of investigations

into | Gum…0777777”” 8°56 7:28 mass. In hand-rolling as much as can be worked between two | a large number of teas has been seanin. davemaerteeee 17°80 12-88 hands is operated on, and passed from man to man along the table | carried out by Mr G. W. Wigner aso ine Bae na till fully worked, when it is made up into a compressed ball and | (Pharm. Jour., 3d series, vi. 261, Colouring matter..| 23°60 | 19-12 so put aside for fermenting. This process is the distinguishing | 281, 402). In tea as imported | Albumen…..... 300 | 2°80 feature of black-tea making, and on its sufficient accomplishment | he found large proportions of | Woody fibre…..... lt | a depends much of the character and quality of the tea made. The | moisture which could be expelled 98-782 | 98-302

on exposure to a temperature of |__| “| 212°F. Inarange of thirty-five samples the average moisture was equal to 7°67 per cent., the lowest—in a Chinese young hyson— being 4°84, while in several congous it exceeded 10 per cent. The ash in sixty-seven specimens of ordinary and special Ania teas he found to average 5°78 per cent., the maximum being 7-02 and the minimum 5°17 ; and of that ash 54°50 per cent. was soluble in water. The proportion of extractive substances in twenty-four teas varied from 26°15 in a congou to 44°85 in Moyune young hyson. The total average nitrogen from sixty green teas, slightly faced, was 3°76, from sixty black teas 3°26, from six Assam teas 3°64, and from exhausted leaves 3°80 per cent.

So long as the Western world remained almost exclusively ~ i ion.

progress of the fermentation must be carefully watched, and at the point when by the colour it is known to be sufficiently advanced the tea is in favourable weather sunned by exposure, thinly spread out to the sunlight for about an hour. It is immediately there- after fired, either by the fumes of burning charcoal or by a current of dried and heated air from one of the numerous machines now in use. With this single firing the process is completed, and the tea so finished is sifted by machinery into commercial qualities according to the size of the leaf.

For the entire range of manufacturing operations numerous forms of machinery and mechanical devices have been adapted and intro- duced in Indian gardens, so that, apart from picking the leaves, tea-making has become practically a factory industry.

Green The manufacture of green tea is comparatively little prosecuted tea. in India. In Europe the demand has greatly fallen away, and, though the consumption is considerable in the United States, the supply is principally drawn from Japan, where its preparation is

1 The theine is certainly understated + more recent observers obtain from 1°8 to 3 per cent., and occasionally more,

2 The mineral salts (ash) partly included in these totals amounted to 5°56 and 5°24 respectively.

ee iar

dependent on China for its tea supply, adulteration was rampant and multiform in the trade. Especially aniong green and fancy teas there was scareely such a thing as an unsophisticated sample to be obtained. The Chinese were also expert in fabricating an artificial gunpowder—appropriately known as ‘‘lie tea,”—which consisted of the sweepings of tea warehouses artfully made up with a paste of rice water. Paddy husks and many kinds of leaves faced with China clay, soapstone, catechu, and black lead also found their way abundantly into tea. On the European side, exhausted leaves were again dried, impregnated with catechu and gum, and faced up to do duty as fresh tea, and the leaves of numerous plants —sloe-thorn, hawthorn, willow, beech, plane, Zpilobium angusti- foliwm, &c.—were freely worked upas tea. Adulterated teais now, however, comparatively rare, largely owing to the watchfulness of the eustoms authorities. Moreover, as it is nearly as cheap to make tea from the leaves of the tea-plant as from those of any other herb, there is not much incentive to substitute the false for the real.

At a very early period in the European history of tea the prob- able effects of its use on the health and morals of the population attracted jealous attention, and a great deal was written, mostly in a hostile sense, on the subject. In 1678 we find Mr Henry Savile writing to his uncle, Mr Secretary Coventry, in sharp reproof of certain friends of his ‘‘ who call for tea, instead of pipes and bottles after dinner,—a base unworthy Indian practice, which

municates to the system a diffused warm glow. Further, as used by Western communities, it is a medium of taking, in the form of sugar and cream, no inconsiderable amount of real nutriment. The other effects of tea are more a matter of general impression than of ascertained scientific reality. Its virtues have nowhere been better summarized than by the earliest Chinese writer on the sub- ject, the above-mentioned Lo Yu, who says, ‘It tempers the spirits and harmonizes the mind, dispels lassitude and relieves fatigue, awakens thought and prevents drowsiness, lightens or refreshes the body, and clears the perceptive faculties.” The gentle exhilaration which accompanies the moderate use of tea is not followed by the depression which succeeds the use of alcoholic stimuli. Experience has proved that it sustains the frame under severe muscular or mental exercise without causing subsequent exhaustion and collapse. Tea is frequently found to be beneficial to sufferers from nervous headache, and it counteracts to some exteut the effects of alcohol and of opiates, Taken in excess it produces cerebral excitement, sleeplessness, and general nervous irritability. The tannin con- tained in its infusions also interferes with the flow of the saliva, diminishes the digestive activity of the stomach, and impedes the action of the bowels. In this view the large quantity of strong tea used by the poor—and especially by the sedentary poor, —while serving to blunt the keen tooth of hunger, must work incalculable havoc with the digestive and nervous systems of the consumers.

I must ever admire your most Christian family for not admitting.” And he adds, with an audible sigh, “the truth is, all nations are growing so wicked as to have some of these filthy customs!” Sonie of the writers, however, although resolute for its banishment

It is a remarkable fact that no mention of tea is made by Marco Com- Polo, and that no knowledge of the substance appears to have merce reached Europe till after the establishment of intercourse between and sta- Portugal and China in 1517. The Portuguese, however, did little tisties.

from the caddy, were willing to give it a place in the medicine chest. “Among many other novelties,” says a medical writer in 1722, ‘‘ there is one which seems to be particularly the cause of the hypochondriac

disorders, and is generally known by the name of thea, or tea. It is a drug which of late years has very much insinuated itself, as well into our dict as regales and entertain- ments, though its occupation is not less destructive to the animal economy than opium, or some other drugs which we have at present learned to avoid.”! Dr Lettsom was the first medical writer who gave the public a reasonable and scientific account of the plant; but even he let the fear of its abuse run away with his judgment, asserting that “the first rise of this pernicious custom [that of drinking spirits to excess] is often owing to the weakness and debility of the system brought on by the daily habit of drinking tea; the trembling hand seeks a temporary relief in some cordial, in order to refresh and excite again the enfeebled system, whereby such persons almost necessarily fall into a habit of intemperanee.”? Jonas Hanway (Essay on Tea, 1756) was among its most vigorous assailants. ‘‘Men,”’ he says, ‘‘seem to have lost their stature and comeliness, and women their beauty What Shakespeare ascribes to the concealment of love is in this age more frequently oecasioned by the use of tea.” To these complaints echoes were not wauting, but after a while the tea-drinkers had it all their own way. In the meantime, however, tea was not without its apologists. To say nothing of our own familiar poets and essay- ists, its praises have been sung by Herrichen and by Francius in Greck verses, by Pechlin in Latin epigrams, by Pierre Petit in a Latin poem of five hundred lines, and by a German versifier, who celebrates, in a fashion of his own, its “‘ burial and happy resurrec- tion.”? Huet, bishop of Avranches, has also paid his graceful tribute* to a stimulant to which, probably, no scholar was ever more indebted, and which he continued to enjoy at the age of ninety. Dr Johnson draws his own portrait as ‘(a hardened and shameless tea-drinker, who for twenty years diluted his meals with only the infusion of this fascinating plant ; whose kettle had scareely time to cool ; who with tea amused the evening, with tea solaced the midnight, and with tea welcomed the morning.” 5 Authorities are not yet by any means agreed as to the exact physiological influence and value of tea. The very striking fact that theine is precisely the characteristic constituent of coffee, maté, guarana, and the kola nut, all substances eagerly sought after in different quarters of the globe, serves to show that the alkaloid satisfies some craving of the human system, although what its effect is has not yet been certainly determined. The quantity of theince consumed even by the most hardened tea-drinker is exceedingly ininute, and there are not wanting authorities who assert that it

is practically inert, an assertion surely contradicted by the general instinct of the race. What is indisputable about tea drinking is that it forms an agreeable means of imbibing the proportion of water necessary in human nutrition, which, being taken hot, com-

1 An Essay on the Nature, Use, and Abuse of Tea, 14, 15. 2 Lettsom, Natural History of the Tea-Tree, 78. 3 Der Thee Begriibniss und gliéckliche Wiederauferstehung [1680 ?}. 4 In the verses beginning— “I, puer, i, Theam confestim in pocula misce ;

Urget non solitus lumina nostra sopor;

Mens stupet ; obtuse languent in corpore vires ;

Languorem solvet vivida Thea novum.””—

‘ Hnetti Commentarius de rebus ad eum pertinentibus, 304,

> Literary Magazine, vol. il, No. 13 (1757),

towards the introduction of the herb into Europe, and it was not till the Dutch established themselves at Bantam early in the 17th century that these adventurers learned from the Chinese the habit of tea drinking and brought it to Europe.

The earliest mention of tea by an Englishman is probably that contained in a letter from Mr Wickham, an agent of the East India Company, written from Firando in Japan, on the 27th June 1615, to Mr Eaton, another officer of the eompany, resident at Macao, and asking for ‘‘a pot of the best sort of chaw.” How the com- mission was cxecuted docs not appear, but in Mr Eaton’s subsc- quent accounts of expenditure occurs this item—‘‘three silver porringers to drink chaw in.”

It was not till the middle of the century that the English began to use tea, and they also received their supplies from Java till in 1686 they were driven out of the island by the Dutch. At first the price of tea in England ranged from £6 to £10 per ib. In the Mercurius Politicus, No. 485, of September 1658, the following advertisement oceurs:—‘*That excellent and by all

Physitians approved China Drink called by the Chineans Zcha, by other nations Jay, alias Tee, is sold at the Sultaness Head, a cophee-house in Sweetings Rents, by the Royal Exchange, London.” Thomas Garway, the first English tea dealer, and founder of the well-known coffee-house, ‘‘Garraway’s,” in a curious broadsheet, 41 Exact De- scription of the Growth, Quality, and Virtues of the Leaf Tea, issued in 1659 or 1660, writes, ‘in respect of its scarceness and dearness, it hath been only used as a regalia in high treatments and enter- tainments, and presents made thereof to princes and grandees.” In that year he purchased a quantity of the rare and much-prized com- modity, and offered it to the public, in thc leaf, at fixed prices vary – ing from 15s. to 50s. the Ib, according to quality, and also in the infusion, ‘‘made according to the directions of the most knowing merchants and travellers into those eastern countries.” In 1660 an Act of the first parliament of the Restoration imposed a tax on “every gallon of chocolate, sherbet, and tea, made and sold, to be paid by the maker thereof, eightpence” (12 Car. II. c. 28).

Pepys’s often-quoted mention of the fact that on the 25th September 1660, “I did send for a cup of tee, a China drink, of which I never had drunk before,” proves the novelty of tea in England at that date. In 1664 we find that the East India Company presented the king with 2 Ib and 2 oz. of ‘‘thea,” which cost 40s. per ib, and two years afterwards with another parcel con- taining 22% ib, for which the directors paid 50s. per tb. Both parcels appear to have been purchased on the Continent. Not until 1677 is the Company recorded to have taken any steps for the importa- tion of tea. The order then given to their agents was for ‘teas of the best kind to the amount of 100 dollars.” But their instruc- tions were considerably exceeded, for the quantity imported in 1678 was 4713 ib, a quantity which seems to have glutted the market for several years. The annals of the Company record that, in February 1684, the directors wrote thus to Madras :-—“In regard thea is grown to be a commodity here, and we have oceasion to make presents therein to our great friends at court, we would have you to send us yearly five or six canisters of the very best and freshest thea.” Until the Revolution no duty was laid on tea other than that levied on the infusion as sold in the coffec-houses, By 1 William and Mary c. 6, a duty of 5s. per tb and 5 per cent. on the value was imposed. For several years the quantities im- ported

were very small, and consisted exclusively of the finer sorts. The first direct purchasc in China was made at Amoy, the teas

previously obtained by the Company’s factors having been purchased in Madras and Surat, whither it was brought by Chinese junks after the expulsion of the British from Java. During the closing years of the century the amount brought over seems to have been, on the average, about 20,000 tb a year. The instructions of 1700 directed the supercargoes to send home 300 tubs of the finer green teas and 80 tubs of bohea. In 1708 orders were given for “*75,000 Ib. Singlo (green), 10,000 tb imperial, and 20,000 Ib bohea.” The average price of tea at this period was 16s. per fb. During the 100 years from 1710 to 1810 the aggregate sale of tea by the East India Company amounted to 750,219,016 ib, worth £129, 804,595, of which 116,470,675 lb was re-exported, The duties during that century (excepting a period of eleven years, 1784-95, when they were only 12} per cent.) were excessive, amounting to about 200 per cent. on the value of common teas. The results of so enormous a tax were the creation of a gigantic smuggling trade, extensive adulteration of imported teas, and much fabrication of counterfeit tea within the country. Probably the duty-paid tea did not represent more than half what was consumed under the name of tea. The following table exhibits the principal facts con- nected with the trade during the period of the Company’s monopoly, which terminated on the 22d of April 1884, when the trade was thrown open to all, the prices quoted being those of good qualities

in the Company’s warehouse or in bond :—

i

THA

Home Con- Average Price per ib. Rates of Duty. suniption. tb.

1728 | [82/6 (duty included)]..... 4/ per tb, and £13, 18/7} %..... 1,493,626 TOW) cae w Aen 1/ per tb, and £43, 18/7} %..... 3,860,976 1782 | 5/ congou; 9/10 hyson….| 1/14 per Ib, and £55, 15/10 %....,| 6,202,257 1783

ie, a) od ce eee 4,741,522 1784 | 4/10 congou; 8/3 hyson,..| £12, 10/ per cent…....ccreeseveeeee 10,150,700 1785 | 4/3 congou; 6/9 hyson…. sae 14,800,932 W786 14/6 congou: 7/1 bysom…| —=«-—>sineiaie 15,851,747 1795 | 3/9 congou; 6/4 hyson….| £20 Per CONE. ..crssieresnsvravernesaense 21,342,845 1801 | 8/5 congou; 5/6 hyson….| £50 per cent,, £20 under 2/6….| 23,730,150 1821 | 3/ congou; 5/4 hyson…..| £100 and £96 per cent…....0. | 26,754,537 1833 | 2/6} congou; 4/2 hyson…) naan 31,829,620

The progressive increase in the consumption of tea in the United Kingdom during 50 years from 1836 till 1886 is instructively shown in the accompanying diagram constructed by Messrs J. C, Sillar and Co., of London. The dotted line represents the average monthly consumption in each year; the fluctuations in price of good sound congou are traced by the black line; and the years in which reduced customs duty came into operation are indicated along the base, From 1860 onwards the amount of Indian tea entered for home eonsumption is shown in monthly average by a black column. This column brings out the remarkable fact that the Indian tea consuined in the United Kingdom in a year now exceeds the total

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consumption of all kinds in 1860, and is more than double the whole quantity used fifty years ago.

The following table shows the growth of the British tea trade for five years ending 1885 :—

Total Imports,

Home Con- sumption,

160,225,911 165,069,339 170,828,431 175,090,875 182,443,215

Hong Kong.

India.

45,484,130 53,576,690 59,252,485 63,208, 309 63,794,025

China.

151,749,592 142,706,457 145,249,136 134,297,091 181,234,354

Ceylon.

171,676 507,081 2,005,510 2,210,983 4,242,944

10,445,758 10,820,915 10,863,695

9,411,477

209,801,622 210,663,133 222,262,431 218,877,759 212,148,820

8,353,829

The consumption of tea in the United Kingdom per head was in 1840 1:22 tb, which increased in 1850 to 1°86 Ib; in 1860 it reached 2°67 Ib, in 1870 3°81 Ib, in 1880 4:06 Tb, and now (1887) it is about 5 tb.

Next to the United Kingdom, the greatest tea-importing nation is the United States. Not- withstanding that tea has | Year ending

Tb entered for

from 1873 been duty free | 30th June. Consumption. Per Head. (duty 25 cents per fb in 1870

17°72 in 1871, and 15 in| 1870 | 40,812,189 | 1-06 1872), the habit of tea} 1871 46,972,788 1°19 drinking does not grow in| 1872 34,224,494 0°84 Ameriea as it is fonnd to 1873 106,423,570 2°55 do in the British Isles, as is 1875 64,708,079 1°47 shown by the aceompanying 1880 72,159,266 1°44 table. Of the 72,104,956 1b| 1881 81,949,796 | 1°59 of tea imported into the 1882 79,080,854 1°50 United States in the year 1883 70,771, 225 1:31 ended June 1885, 35,895,835 | 1884 65,774,234 1°18 tb was Chinese, 32,156,032 1885 69,820,172 1:22

Gane fom Jam, dol ———————— eee 3,540,148 Tb came from England. Nearly 6,000,000 Ib was re- exported, principally to Canada,

Ce ebel a] WMS eTReee TF L TUM TAA TT TA Lt | re a ba fT 7 BO ee hi

Bene N || Lt IT Tae Al ithe

Next to the English, the Dutch are the greatest consumers of tea outside of China; and the only other considerable tca-using nation is Russia. The following table gives the amount of tea imported in the year 1884 by the principal tca-drinking countries :—

TRATES aR oj liccres eee se 8 35,600,000 th = 48 Ib per head. Holland …... cece 3,900,000 ,, = “91 . Deminark,.....0%. auc 820,000 ,, = ‘04 iy New South Wales…. 8,487,981 ,, = 9°15 a Victoria. .....0.-c000 11,524,205 ,, = 11:99 _ South Australia…... 2,229,993 ,, = 7:00 55 Queensland…..... DTT 27 5 = re a, Cape of Good Hope… 1,295,042 ,, = 5:00 6

By this table the Australian colonists come out as the mosi inveterate tea-drinkers in the world. The quantity received by Holland in 1884 was 2,250,000 tb less than the imports of 1883, but the average of recent times has been 4,500,000 ib.

The quantity consumed in China has been estimated as high as 2000 millions of pounds annually, being at the rate of a little more than 5 tb per

head of the population ; and, considering the tea- drinking habits of the people, the estimate is by no means extrava- gant. In this light it may be safe to affirm that the amount of tea used yearly throughout the world reaches the gigantie total of 2500 millions of pounds.

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T.4 2

TEAK! may justly be called the most valuable of all known timbers. For use in tropical countries it has no equal, and for certain purposes it is preferable to other woods in temperate climates also. Its price is higher than that of any other timber, except mahogany.” Great efforts have been made to find substitutes, but no timber has been brought to market in sufficient quantities combining the many valuable qualities which teak possesses.

The first good figure and description of the tree was given by Rheede.? The younger Linnzus called it 7’ectona grandis. It is a large deciduous tree, of the natural order Verbenacex, with a tall straight stem, a spreadiug crown, the branchlets four-sided, with large quadrangular pith. Tt isa native of the two Indian peninsulas, and is also

Teak (Tectona grandis).

found in the Philippine Islands, Java, and other islands of the Malay Archipelago. In India proper its northern limit is 24° 40’ on the west side of the Aravalli Hills, and in the centre near Jhansi, in 25° 30’ N. lat. In Burmah it extends to the Mogoung district, in lat. 25° 10’. In Bengal or Assam it is not indigenous, but plantations have been formed in Assam as far as the 27th parallel. In the Punjab it is grown in gardens to the 32d.

Teak requires a tropical climate, and the most important forests are found in the moister districts of India, where during the summer months heavy rains are brought by the south-west monsoon, the winter months being rainless. In the interior of the Indian peninsula, where the mean annual rainfall is less than 30 inches, no teak is found, and it thrives best with a mean annual fall of more than 50

1 The Sanskrit name of teak is saka, and it is certain that in India teak has been known and used largely for considerably more than 2000 years. In Persia teak was used nearly 2000 years ago, and the town of Siraf on the Persian Gulf was entirely built of it. Saj is the name in Arabic and Persian; and in Hindi, Mahratti, and the other modern languages derived from Sanskrit the tree is called sag, sagwan. In the

_Dravidian languages the name is ¢eka, and the Portuguese, adopting this, called it teke, teca, whence the English name.

? The rate in the London market since 1860 has fluctuated between £10 and £15 per load of 50 cubic feet.

3 Hortus Malabaricus, vol. iv. tab. 27, 1683.

inches. The mean annual temperature which suits it best lies between 75° and 81° Fahr. Near the coast the tree is absent, and the most valuable forests are on low hills up to 3000 feet. It grows on a great variety of soils, but there is one indispensable condition—perfect drainage or a dry subsoil. On level ground, with deep alluvial soil, teak does not often form regularly shaped stems, probably because the subsoil drainage is imperfect.

During the dry season the tree is leafless; in hot localities the leaves fall in January, but in moist places the treeremains green till March. At the end of the dry season, when the first monsoon rains fall, the fresh foliage comes out. The leaves, which stand opposite, are from 1 to 2 feet in length and from 6 to 12 inches in breadth. On coppice shoots the leaves are much larger, and not rarely from 2 to 3 feet long. In shape they somewhat resemble those of the tobacco plant, but their substance is hard and the surface rough. The small white flowers are very numerous, on large erect cross-branched panicles, which terminate the branches. They appear during the rains, generally in July and August, and the seed ripens in January and February. On the east side of the Indian peninsula, the teak flowers during the rains in October and November. In Java the forests are leafless in September, while during March and April, after the rains have com- menced, they are clothed with foliage and the flowers open. During the rainy season the tree is readily recognized at a considerable distance by the whitish flower panicles, which overtop the green foliage, and during the dry season the feathery seed-bearing panicles distinguish it from all other trees. The small oily seeds are enclosed in a hard bony 1-4 celled nut, which is surrounded by a thick covering, consisting of a dense felt of matted hairs. The fruit is enclosed by the enlarged membranous calyx, in appearance like an irregularly plaited or crumpled bladder. The tree seeds freely every year, but its spread by means of self- sown seed is impeded by the forest fires of the dry season, which in India generally occur in March and April, after the seeds have ripened and have partly fallen. Of the seeds which escape, numbers are washed down the hills by the first heavy rains of the monsoon. These collect in the valleys, and it is here that groups of seedlings and young trees are frequently found. A portion of the seed remains on the tree; this falls gradually after the rains have commenced, and thus escapes the fires of the hot season. The germination of the seed is slow and uncer- tain; a large amount of moisture is needed to saturate the spongy covering ; many seeds do not germinate until the second or third year, and many do not come up at all.

The bark of the stem is about half an inch thick, grey or brownish grey, the sapwood white; the heartwood of the green tree has a pleasant and strong aromatic fragrance and a beautiful golden-yellow colour, which on seasoning soon darkens into brown, mottled with darker streaks. The timber

retains its aromatic fragrance to a great age. On a transverse section the wood is marked by large pores, which are more numerous and larger in the spring wood, or the inner belt of each annual ring, while they are less numerous and smaller in the autumn wood or outer belt. In this manner the growth of each successive year is marked in the wood, and the age of a tree may be determined by counting the annual rings.

The principal value of teak timber for use in warm countries is its extraordinary durability. In India and in Burmah beams of the wood in good preservation are often found in buildings several centuries old, and instances are known of teak beams having lasted more than a thousand years.* Being one of the few Indian timbers

4 In one of the oldest buildings among the ruins of the old city of Vijayanagar, on the banks of the Tungabhadra in southern India, the superstructure is supported by planks of teakwood 14 inches thick. These planks were examined in 1881; they were in a good state of

which are really durable, teak has always been used for buildings, particularly for temples, and in India it has been the chief timber employed for shipbuilding. When iron commenced to be exten- sively used for the last-named purpose, it was supposed that the demand for teak would decrease. This, however, has not been the case, for the wood is still very largely used for the backing of iron- clads and for decks of large vessels. It is also used for furniture, for door and window frames, for the construction of railway car- riages, and for many other purposes. White ants eat the sapwood, but rarely attack the heartwood of teak. It is not, however, proof against the borings of the teredo, from whose attacks the teak piles of the wharves in the Rangoon river have to be protected by a sheathing of metal.

Once seasoned, teak timber does not split, crack, shrink, or alter its shape. In these qualities it is superior to most timbers. In contact with iron, neither the iron nor the teak suffers, and in this respect it is far superior to oak. It is not very hard, is easily worked, and takes a beautiful polish. It has great elas- ticity and strength, and is not very heavy. The average weight of perfectly seasoned wood fluctuates between 38 and 46 tb per eubic foot.t Its

weight, therefore, is a little less than that of English oak. Green teak timber, however, is heavier than water, and unless thoroughly seasoned it cannot be floated. In Burmah, therefore, where the rivers are used to float the timber to the sea- ports, a peculiar mode of seasoning teak by girdling has been practised from time immemorial. Girdling consists in making a deep circular cut through bark aud sap into the heartwood, so as completely to sever communication between bark and sapwood above and below the cut. In teak, as in oak and other trees with well-marked heartwood, the circulation of the sap only takes place in the sapwood, and the girdled tree therefore dies after a few days if the operation has been effectually performed. But if even the smallest band of sapwood is left connecting the outer layers of wood above and below the girdle, the tree is not killed, and often recovers completely. The girdled tree is allowed to stand one or two years, and longer if a very large-sized tree. Being exposed to the wind and to the action of the sun, the timber of a girdled tree seasons more rapidly and more completely than that of a tree felled green. The teak produced in the presidencies of Madras and Bombay and in the Central Provinces is as a rule felled green, and even when dry it generally is a little heavier than the timber from Burmah.? For a long time to come, the rivers of Burmah and Siam will continue to afford the most couvenient and most economical routes for the transport of timber. Indeed the forests drained by the Salwin and its feeders are not likely ever to be worked otherwise than on the present plan, under which the logs are floated singly over the rapids and are caught and rafted lower down, at the kyodan or rope station, 70 miles above Maulmain.

As already mentioned, teakwood contains an aromatic oil, which gives it a peculiarly pleasant smell and an oily surface when fresh cut. To this oil may probably with justice be ascribed its great durability. In Burmah oil is extracted from the timber on a smal] scale, for medicinal purposes, by filling an earthen pot, which is placed inverted upon another, with chips of wood, and putting fire round it, upon which the oil runs down into the lower vessel.

According to the colour and texture of the wood, several varieties of teak are distinguished in India, Burmah, and Java; in the timber trade, however, these distinctions are of no importance. Teak as well as other trees, when

standing isolated, forms side branches far down the stem, and the,wood of such trees is more knotty and wavy, and generally heavier and darker-coloured than the timber of trees which have grown close together in a dense forest. Apart from the manner in which the tree had grown up in the forest, soil, elevation, and climate have a great influence upon the grain and the mechanical qualities of teak as of other timbers. Most of the larger logs brought to market have an irregular erack or hollow in the centre, which commences at the butt and often runs up a long way. There is little doubt that this is generally due to the action of the fires, which scoreh and often destroy the bark of young trees, Such external injuries are apt to induce decay in the wood. Moreover, most teak seedlings which come up naturally are cut down to the ground by the fires of the hot season ;

preservation and showed the peculiar structure of teak timber in a very marked manner. They had been in the building for 500 years (Indian Forester, vol. vii. p. 260). Tn the wall of a palace of the Persian kings near Baghdad, which was pillaged in the 7th century, two Americans found in 1811 pieces of Indian teak which were perfectly sound (Ouseley, Travels in Various Countries of the East, vol. ii. p. 280, note 67). In the old eave temples of Salsette and elsewhere in western India pieces of teak have been found in good preservation which must have been more than 2000 years old.

1 At 44°8 tb per cubic foot a load of 50 cubic feet weighs a ton (2240 Tb), hence in the Burmah ports a ton of teak timber is taken as equivalent to a load of 50 cubic feet,

2 Tt has been erroneously stated that the tree in Burmah is tapped for its oil before felling.

some are killed, but many sprout again during the rains, and this is generally repeated year after year, until a sapling is produced strong enough to outlive the fire. Such saplings have a very large pith, which dries up, eausing a hollow in the heart. Or a piece of the old shoot killed by the fire is enclosed by the new wood, and this also is apt to give rise to a hollow.

The leaves of the teak tree contain a red dye, which in Malabar was formerly uscd to dye silk and cotton. Natives of Burmah use the leaves as plates, to wrap up parcels, and for thatching,

In its youth the tree grows with extreme rapidity. ‘Two-year- old seedlings on good soil are 5 to 10 feet high, and instances of more rapid growth are not uncommon. In the plantations which have been made since 1856 in Burmah, the teak has on good soil attained an average height of 60 feet in 15 years, with a girth, breast high, of 19 inches. This is between 16° and 18° N. lat., with a mean annual temperature of 78° F. and a rainfall of 100 inches, In the Burmah plantations it is estimated that the tree will, under favourable circumstances, attain a diameter of 24 inches (girth 72 inches) at the age of 80. Timber of that size is market- able, but the timber of the natural forests which is at present brought to market in Burmah has grown uimch more slowly, the chief reason being the annual forest fires, which harden and im- poverish the soil. In the natural forests of Burmah and India teak timber with a diameter of 24 inches is never less than 100 and often more than 200 years old. In future, the timber growu in plantations and in forests under regular management may be ex- pected to grow much faster ; and there is no ground for anticipating that rapidly grown timber will be less valuable than that of slow growth, which is at present brought to market.

Like the other trees of the dry deciduous forest, teak does not attain any extraordinary size. The trees are not generally more than 100 to 150 feet high, even under the most favourable circumstances, and stems more than 100 feet to the first branch are not often found. Exceptionally tall trees were measured in 1861 in the Gwaythay forest in Pegu, east of the Sitang river, on gneiss. The stems had 106 to 114 fect to the first branch, with a girth, at 6 feet off the ground, from 7 to 16 feet. Larger girths, up to 25 feet, are not uncommon.

The teak tree does not usually form pure forests. It is asso- ciated with bamboos and a great variety of other trees, which have little market value, and, as a rule, thrives best in such company, Hence in the plantations established in Burmah, the object has been to raise forests of teak mixed with bamboos and other trees.

Most of the teak timber produced is consumed in India, The produce of the magnificent forests of Travancore, Cochin, the Madras presideney, Coorg, Mysore, Bombay, Berar, and the Central Provinces is all so consumed. Formerly there was a considerable export from the ports of the western coast, —Malabar, Kanara, Surat, and Broach,—but the country at present requires all the teak which its forests can produce; indeed the demand is in excess of the supply, and large quantities are imported from Burmah to Calcutta, Madras, Bombay, aud other Indian ports. Small quantities are still exported from the ports of the western coast to Arabia and the coast of Africa. The chief export is from Burmah, principally from Rangoon and Maulmain. Of the other teak-producing countries, Java exports a little ; there have also been exports from Saigon; and since 1882 Bankok has sent considerable quantities to Europe. But the Burmah coast is the chief source of supply at present. Rangoon has for a very long time been an important place for shipbuilding, teak being the chicf timber used: between 1786 and 1825 111 European vessels were built at Rangoon, aggregating 35,000 tons. At the same time timber was exported, and, when the place was taken by the British in 1852, teak was the chief article of export. Maulmain became British territory at the close of the first Burmese war in 1826. At that time the place was a large fishing village, and it was mainly through the export of teak timber and the shipbuilding trade that it attained its present importance. From 1829 to 1841 upwards of 50,000 loads of teak timber were exported, and, in addition, 68 vessels were built during that period, aggregating 15,680 tons, and estimated to have required for their construction 24,000 loads of teak timber. The forests from which Maulmain first derived its supplies are situated on the Attaran river, a feeder of the Salwin. In 1836, however, timber began to come down from more distant forests, and in 1841 one-fourth only of the supply was brought from the Attaran forests.

The increase in the export of timber from the Burmah ports was slow at first, but has gone on rapidly since Rangoon became a British port. Since that time the timber brought to the Burmah ports has come from the following sources:—(1) from the forests in the British coast provinces, Pegu and Tenasserim ; (2) from the forests in the former kingdom of Burmah, floated to Rangoon down the Sitang and Irrawaddy rivers ; (3) from the forests in the Shan states formerly tributary to Burmah, from the

Karenni country, and from Siam, which is all floated to Maulmain by the Salwin viver. Since 1856 the increase of the supply derived from these three sources has been large, as will be apparent from the following

averages for the eight years 1856-57 to 1863-64 and for the two years 1883-84 and 1884-85 :—

1856-7 to | 1883-4,

1863-4. 1884-5,

Loads Loads.

From the British coast provinces, Pegu and Tenasserim..| 22,675 44,228 From Burmah by Sitang and Irrawaddy rivers…....___.- 6,890 66,663 From Shan states, Karenni, and Siam, by Salwin river….] 55,491 163,751 PROTA IMEUISU Cotrteirsacscecescreccescrerdecrrsetseeccersecesecss 85,056 274,642

JSS MIAE ENE lon conn goqnbiog nc niconned ne cunpP ARP SHoAe cio t 000cn 76,763 | 153,192

Local consumption in Rangoon and Maulmain…. 8,293 121,450

Of the quantities exported, between 38,000 and 65,000 loads ! have gone beyond India during this period, the balance having been sent to Calcutta, Bombay, and other Indian ports. The quantities here stated do not include the timber consumed in Upper Burmah, nor that brought from the forests drained by the Menam and Mekhong rivers on the east side of the Indo-Chinese Peninsula, nor the teak produced in Java and the other islands of the Malay Archipelago, and in the extensive forests of the western peninsula of India. No data are yet available for a precise estimate ; but the total amount yielded by these forests, and consumed locally or exported, appears to be not less than 500,000 loads or tonsa year. In British India a large portion of the teak-producing tracts have since 1856 been placed under conservancy managenient, and similar measures will doubtless be

extended to the forests in Upper Burmah, now annexed to the British empire, as well as to the forests of the feudatory native states. In British India, the area of state forests demarcated in order to be permanently conserved? was in 1885 (in round figures) 33,000 square miles, and the teak-producing tracts included in this area may be estimated to cover about 12,000 square miles, or 7,680,000 acres. Large additions will be made to this area, especially in Upper Burmah. Of teak plantations, 12,000 acres have been formed in Burmah, 563 acres in Coorg, 34386 at Nilambur in Malabar, and about 2000 acres in other districts. There are good grounds for estimating the future yield of plantations at the rate of 50 cubic feet (one ton) per acre annually, The natural forests will, in their present impoverished condition, not furnish more than one cubic foot per aere annually, but, as protection against fire is gradually extend- ing, the proportion of teak is everywhere being increased by cultural operations in the forests, and the effect of these measures will eventually manifest itself by a considerable increase in the yield. In their present condition, the natural forests demarcated in India up to 1887 may be expected to yield 150,000 tons a year, while the produce of the plantations will eventually add 18,000 tons more. The teak forests in Java were surveyed in 1871, and their area was found to be 2280 square niiles, while the plantations in that island in 1880 amounted to 24,710 acres. These figures will serve to show that, if the system commenced in India and Java is maintained, there is no reason to apprehend a diminution of the teak supply. (D. BR.)

TEAL (Old English TELz), a word of uncertain origin, but doubtless cognate with the Dutch Zaling (formerly Talingh and Telingh), and this apparently with the Scandi- navian Atteling-And (Briinnich, Ornithol. Borealis, p. 18) and Atling, which it seems impossible not to connect with the Scottish Attedle or Atteal, to be found in many old records, though this last word (however it be spelt) is generally used in conjunction with Teal, as if to mean a different kind of bird; and commentators have shewn a marvellous ineptitude in surmising what that bird was.

The Teal is the Anas crecea of Linneus, and the smallest of the European Anatida, as well as one of the most abundant and highly esteemed for the table. It breeds in many parts of the British Islands, making its nest in places very like those chosen by the Wild Duck, A. boscas; but there is no

doubt that by far the greater number of those that are taken in decoys, or are shot, during the autumn and winter are of foreign origin. While the female pre- sents the usual inconspicuous mottled plumage of the same sex in most species of Anatinz, the male is one of the handsomest of his kind. His deep chestnut head and throat are diversified on either side by a line of buff, which, springing from the gape, runs upward to the eye, in front of which it forms a fork, one prong passing backward above and the other below, enclosing a dark glossy-green patch, and both losing themselves in the elongated feathers of the

1 Of the teak exported to foreign countries from India in 1883-84, 27,356 tons went to Great Britain, 8594 tons to Egypt, 2056 tons to Ceylon, 1984 tons to Japan, and 1823 tons to the Cape of Good Hope. The total quantity exported was 46,471 tons.

- Not including 16,000 square miles of second class reserves in the ‘ ‘ Po . was needed in consequence of the altered conditions of

Central Provinces.

hind-head and nape. The back and sides of the body appear to be grey, an effect produced by delicate transverse pencillings of black on a dull white ground. The outer lanceolate scapulars have one-half of their webs pure white, forming a conspicuous stripe along the side of the back. The breast is of a pale salmon or peach-blossom colour, each feather in front bearing a roundish dark spot, but these spots lessen in number and size lower down, and the warm tint passes into white on the belly. The tail-coverts above and below are velvety black, but those at the side are pale orange.

The Teal inhabits almost the whole of Europe and Asia,—from Iceland to Japan,—in winter visiting Northcrn Africa and India. It occasionally occurs on the western shores of the Atlantic; but its place in North America is taken by its representative, 4. carolinensis, the male of which is easily to be recognized by the absence of the upper buif line on the side of the head and of the white scapular stripe, while he presents a whitish crescentic bar on the sides of the lower neck just in front of the wings.

Species more or less allied to these two are found in most other parts of the world, and among such species are some (for instance, the A. gibberifrons of the Australian Region and the A. eatoni of Kerguelen Island) in which the male wears almost the same inconspicuous plumage as the female. But the determination of the birds which should be technically considered ‘ Teals,” and belong to the subgenus Wettiwm (generally misspelt Vettion), as distinguished from other groups of Anating, is a task not yet successfully attempted, and much confusion has been caused by associating with them such species as the GARGANEY (vol. x. p. 80) and its allies of the group Quer- quedula. Others again have not yet been discriminated from the WicEons (g.v.), the Pintail-Ducks, Dajila, or even from the typical form of Anas (cf. Ducx, vol. vii. p. 505), into each of which subgenera the Teals, Vettium, seem to pass without any great break. In ordinary talk “Teal” seems to stand for any Duck-like bird of small size, and in that sense the word is often applied to the members of the genus JVettopus, though systematists will have it that they are properly Geese. In the same loose sense the word is often applied to the two most beautiful of the Family Anatide, belonging to the genus Mz (commonly misspelt Acx)—the Carolina Duck of North America, 4. sponsa (not to be confounded with the above- named Anas carolinensis or Nettium carolinense), and the Mandarin-Duck of China, &. galericulata. Hardly less showy than these are the two species of the subgenus Hunetta,—the Faleated Duck, £. falcata, and the Baikal Teal, 2. formosa,—both from eastern Asia, but occasionally appearing in Europe. Some British authors have referred to the latter of these well-marked species certain Ducks that from time to time occur, but they are doubtless hybrids, though the secret of their parentage may be unknown ; and in this way a so-called Bimaculated Duck, Anas bimaculata, was for many years erroneously admitted as a good species to the British list, but of late this has been properly discarded. (A. N.)

TECHNICAL EDUCATION. The special education, the object of which is to train persons in the arts and sciences that underlie the practice of some trade or pro- fession, is technical education. Schools in which this training is provided are known as technical schools. In its widest sense, technical education embraces all kinds of instruction that have direct reference to the career a person is following or preparing to follow; but it is usual and convenient to restrict the term to the special training which helps to qualify

a person to engage in some branch of productive industry. This education may consist of the explanation of the processes concerned in production, or of instruction in art or science in its relation to in- dustry, but it may also include the acquisition of the manual skill which production necessitates. The term technical, as applied to education, arose from the necessity of finding a word to indicate the special training which

production during the present century. Whilst the changed conditions of production, consequent mainly on the appli- cation of steam power to machinery, demanded a special training for those who were to be engaged in produc- tive industry, the prevalent system of education was not adapted to the requirements of these persons, and schools were wanted in which the necessary instruction could be obtained. Other circumstances resulting mainly from the application of steam power to machinery have rendered technical education necessary. Production on a large scale led to a great extension of the principle of the division of labour, in consequence of which it was found economical to keep a man constantly engaged at the same kind of work, since the more he practised it the quicker and more skilful he became. Thus employed, the workman learned little or nothing of the process of the manufacture at which he assisted, or of other departments of the work than the particular one in which he was engaged, and his only opportunity of acquiring such knowledge was out- side the workshop or factory in a technical school. The economy effected by the division of labour led to the extension of the principle to other industries than those in which machinery is largely employed. There are many trades in which manual skill is as necessary now as ever, but even in these the methods of instruction prevailing under the system of apprenticeship are now almost obsolete.

In many industries, including trades in which machinery is not as yet extensively employed, production on a large scale has increased the demand for unskilled labour, numbers of hands being required to prepare the work to be finished by a few artisans. Rapidity of execution is attained by keeping a workman at the same work, which after a time he succeeds in

mechanically perform- ing, and continues to do until some machine is invented to take his place. In most trades, as formerly practised, the master employed a few apprentices who assisted him in his work, and who learnt from him to understand the details of their craft, so that, when the term of their appren- ticeship was over, they were competent to practise as journeymen. But now the master has neither time nor opportunity to instruct young lads, and the old relation of master and apprentice is changed into that of capitalist and workman. In consequence of these altered relations between employer and employed, there is an acknowledged want of properly trained workmen in a number of trades in which skilful hand work is still needed; and in these trades a demand has arisen for technical schools, or some other substitute for apprenticeship, as a means of suit- ably training workmen and foremen. The ever-increas- ing competition in production has led to the employment, in many trades, of children to do work of a mechanical kind requiring little skill; but, whilst thus employed, these young people have little opportunity of learning those parts of their trade in which skill and special knowledge are needed ; and when they are grown up, and seek higher wages, they are dismissed to make room for other children. Numbers of young men are thus thrown upon the labour market, competent to do nothing more than children's work, and to earn children's wages, and knowing no trade to which they can apply their hands. To remedy this, by creating some substitute for the old apprenticeship, is one of the objects of a system of technical education,

A complete system of technical education should provide necessary instruction for the different classes of persons engaged in productive industry. It is usual to divide these persons into three classes :—(1) workmen or journey- men ; (2) foremen or overseers ; (3) managers or masters.

The industries in which they are employed may be grouped under four heads :—(1) those involving the use of extensive machinery, such as iron and steel manufacture,

machine making, the textile industries, and some of the

chemical trades ; (2) those which mainly require the uge

of hand tools, as cabinet-making, brick-work, plumbing, and tailoring ; (3) those depending on artistic skill, as wood

and stone carving, metal-chasing, decorative work, and

industrial designing generally ; (4) agriculture in all its

branches. These industries will be referred to as manu- factures, handicrafts, art industries, and agriculture. The foregoing classification comprises groups which necessarily, to some extent, overlap one another. Every factory con- tains a carpenter's and smith's shop, and handicraftsmen — of group (2) are required in every manufacturing concern, Whilst the industries in which hand labour is exclusively employed are becoming fewer and fewer, there are many trades which, owing to the frequent invention of labour saving appliances, are passing gradually from the class of handicrafts to that of manufactures. In these trades, of which watch and clock making and boot and shoe making may be taken as examples, there is still a demand for goods largely if not entirely produced by hand work. In such trades, owing to the absence of facilities for instruction in the ordinary shops, there is a want of skilled hand labour which there is an increasing difficulty in satisfying, and to supply this want technical schools of different kinds have been established. Then, again, there are many branches of manufacturing industry which greatly depend for their success upon the designer's art, and it is necessary that the industrial designer should possess a knowledge of the pro- cesses of the manufacture in which his designs will be utilized, as well as of the properties and capabilities of the material to which they will be applied. Indeed, it is the possession of this knowledge which mainly distinguishes the industrial designer from the ordinary artist. To determine the best training for such designers is one of the problems of technical education. There are many trades, too, in which the handicraftsman and the designer should be united. This is the case in such industries as wood-engraving, metal-chasing, and silversmith's work, In these and other trades the true artisan is the artist and handicraftsman combined.

In order to reconcile some of the different views which are held as to the objects of technical education, it is necessary to keep in mind the broad distinction, above referred to, between the conditions of production on a large scale, as in those industries in which goods are manu- factured by the use of extensive labour-saving machinery, and in those trades in which hand work is chiefly em- ployed. Much of the diversity of opinion regarding the objects of technical education is due to the difference of standpoint from which the problem is regarded. The volume of the trade and commerce of Britain depends mainly on the progress of its manufacturing industries. It is these which chiefly affect the exports and imports. The aim of manufacturers is to produce cheaper and better goods than can be produced by other manufacturers at home or abroad ; and technical education is valuable to them, in so far as it enables them to do so. But the artisan engaged in hand industries looks to technical education for the means by which he may acquire a know- ledge of the principles of his trade, which the absence of the system of apprenticeship prevents him from acquiring in the shop. Hence the artisan and the manufacturer approach the consideration of the question from different sides. To the spinner or weaver who almost exclusively employs women to tend his machinery, or to the manu- facturing chemist whose workpeople are little more than labourers employed in carrying to and fro materials, knowing little or nothing of the scientific principles under- lying the complicated processes in which they are engaged, the technical education of the workpeople may seem to

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be a matter of little moment. What such manufacturers require are the services of a few skilled engineers, artistic designers, or scientific chemists. From the manufacturer’s point of view, therefore, technical instruction is not so much needed for the hands he employs in his work as for the heads that direct it. But in trades in which machi- nery plays a subsidiary part, technical teaching supplies the place of that instruction which, in former times, the master gave to his apprentice, and the workman looks to it to supply him with the knowledge of the principles ‘and practice of his trade, on the acquisition of which his individual success greatly depends. In the former class of industries, technical education is needed mainly for the training of managers ; in the latter, for the training of workmen. Hence has

arisen a double cry,—for the teaching of art and of the higher branches of science, with a view to their application to manufacturing industry, and for the teaching of trades, and of the scientific facts which help to explain the processes and methods con- nected with the practice of these trades. This double cry has led to the establishment of technical universities and of trade schools.

Owing to the conditions under which manufacturing industry is now carried on, it is difficult to select com- petent foremen from the rank and file of the workmen. The ordinary hands gain a very limited and circumscribed acquaintance with the details of the manufacture in which they are engaged, and have little opportunity of acquiring that general knowledge of various departments of work, and of the structure of the machinery in use, which is essential to the foreman or overseer. It is in evening technical classes that this supplementary instruction, which it is the workman's interest to acquire and the master's to encourage, can be obtained. The history of invention shows how frequently important improvements in machinery are made by the workman or minder in charge of it, and adds weight to the arguments already adduced for giving technical instruction to persons of all grades employed in manufacturing industry. To these advantages of technical education, as affecting the work- inen themselves as well as the progress of the industry in which they are engaged, must be added the general im- provement in the character of the work produced, resulting from the superior and better-trained intelligence of those who have had the benefit of such instruction.

In order that the different classes of persons who are to be engaged in productive industry may receive a fitting preparatory training, the programme of elementary and secondary as well as of the higher education must be organized with reference to their special requirements. If the demand for technical instruction is to be fully satisfied, a great part of our existing system of education must be reconstructed, and the training provided in our several schools must be made a more fitting preparation for indus- trial work than it is at present.

Schools in which the course of instruction is not special- ized with a view to any particular industry, but is so arranged as to form a general preparation

for manufac- turing or other trade pursuits, are often spoken of as professional, technical, or trade schools ; but such schools must be distinguished from apprenticeship schools, the object of which is to teach trades. Of the former class of schools there are excellent examples in the different countries of Kurope as well as in the United States, and some few have recently been established in the United Kingdom. Of the latter class the best examples are found in France and Austria. The study of these schools, and of the means of providing fitting education for the different classes of producers, may be simplified by a state- ment of the following propositions <——

1. The ordinary education of all persons who are likely to be engaged in productive industry should be determined by the general requirements of their future work. This proposition affects the curriculum of all schools in which different classes of producers are to be trained, ie., of primary, secondary, and higher schools, and involves the consideration of the extent to which, in such schools, modern languages, science, drawing, and manual instruc- tion should take the place of literary and classical studies.

2. Special schools or classes should be established (a) for instruction in art, and in those sciences which serve to explain the processes of productive industry, including agriculture, manufactures, and engineering, as well as in the application of art and science to these departments of industry; (0) for the teaching of, and in certain cases for practice in, various handicrafts or trades.

3. The special schools should be adapted to the require- ments of the different grades of workers, and to the different kinds of work in which they are or are likely to be engaged.

A survey of the technical schools in different countries shows how these different requirements are met. Owing to the complexity of the problem, a complete or an ideal system of technical education is nowhere to be found. Schools have been established to meet local and present wants, and the greatest variety exists in the attempts that have been made to establish schools in accordance with the foregoing propositions.

1. Workmen.—Many attempts have been made to provide a substitute for apprenticeship, but hitherto with no great success. Two classes of workpeople have to be considered—(1) those engaged in manufacturing industries, and (2) those engaged in handicraft industries. The education of all classes of workpeople begins in the publie elementary schools ; and, in view of the future occupa- tion of the ehildren, it may be taken for granted that primary instruetion should be practical, and should include drawing and elementary science, with some amount of manual training for boys, and with needlework, cookery, and domestic economy for girls. In nearly every country of Europe, and in the United States, primary instruction includes drawing, in addition to reading, writing, and reekoning. In England this is not yet the case, drawing being taught in very few schools outside of the jurisdiction of the London school board. In France, Belgium, Holland, and Sweden handicraft instruction is generally included in the cur- riculum of elementary schools. Rudimentary seience is also taught in nearly all the primary schools of Europe. Modelling is taught both to boys and girls in many Continental schools; and in Sweden ‘‘slojd,” or elementary woodwork, in which simple and useful articles are constructed with the fewest possible tools, is taught with considerable success to children of both sexes.

In Germany and Switzerland there exists an excellent system of evening continuation schools, known as Fortbildungs- or Ergdnez- ungs-Schulen, in which the instruction of the children who leave school before fourteen, and of those who leave at that age, is con- tinued. In most of these schools drawing is taught with special reference to local industries. Im England an attempt is being made to attract children to evening schools by means of recreative elasses. These classes are intended to eontinue the child’s general education, and to supplement it by some amount of practical teaching between the time that he leaves the elementary school and is prepared to take advantage of evening technical instruetion. The training of most workpeople, and of nearly all those who are engaged in manufacturing industry, consists of—(1) primary teach- ing in elementary schools ; (2) practice in the factory or shop ; (3) evening technical instruction.

In all the principal towns throughout Europe evening elasses have been established for teaching drawing, painting, and design- ing, and the

elements of scienee in their application to special industries. On the Continent these classes are mainly supported by the municipalities, by the chambers of eommerce, by industrial or trade societies, by county boards, and in some cases by the fees of the pupils. They reeeive little or no support from the state. They are well attended by workpeople of all grades, who are en- eouraged by their employers to profit by these opportunities of instruction. In England evening technical instruction is more systematically organized than in any other country. It is under the direction of the committee of the council of education known as the Science and Art Department, aud of the City and Guilds of London Institute for the advancement of technical education, an institute founded and supported by the corporation and by a large

number of the livery companies of London, The department encourages instruction in pure science and in art; the institute in the application of science, and to some extent of art also, to different trades.

Both the department and the institute make grants on behalf of properly registered teachers on the results of the examination of their pupils. The directory of the department contains a detailed syllabus of the twenty-five different subjects on the teaching of which grants are paid, and in the programme of the institute are found syllabuses of instruction in the technology of fifty different trade subjects. In the evening classes organized by the depart- ment, as well as in those in connexion with the institute, the workman or foreman engaged in any manufacturing industry has the opportunity, by payment of a very small fee, of studying art in all its branches, science theoretically and practically, and the technology of any particular industry. Provided his early education enables him to take advantage of this instruction, no better system has been suggested of enabling workmen, whilst earning wages at an early aye, to acquire manual skill by continuous practice, and at the same time to gaina knowledge of the principles of science connected with their work and explanatory of the pro- cesses of the manufacture in which they are engaged,

For those engaged in handicraft trades this evening instruction is equally valuable, and in many parts of Europe there exist evening trade schools in

which the workman is able to supplement the “ sectional” practice he acquires in the shop by more general practice in other branches of his trade. In Vienna, for example, and in other parts of Austria, there are found practical evening classes for carpenters, turners, joiners, metal-workers, and others ; and similar classes, some of which are subsidized by the City and Guilds Institute, have recently been established in England. Throughout Europe schools for weaving, with practical work at the loom and pattern designing, have existed for many years.

To provide a training more like the old system of apprenticeship, schools have been established in many parts of Europe which are known as professional, trade, or apprenticeship schools (écoles pro- Jessionelles, écoles des apprentis, Fachschulen). The object is to

train workmen ; and the pupils, after completing their course of

instruction in such a school, are supposed to have learnt a trade. The school is the substitute for the shop. In such a school the pupils have the advantage of being taught their trade systemati- cally and leisurely, and production is made subsidiary to instruc- tion. Under such an artificial system of production, the pupil is

less likely to acquire excellence of workmanship and smartness of

habit than in the mercantile shop, under the strain of severe com- petition. Moreover, the cost of maintenance of these schools renders it impossible to look to them as a general substitute for apprenticeship. By sending into the labour market, however, a few highly-trained workmen, who are absorbed in various works and exert a beneficial influence on other workmen, these schools serve a useful purpose. Schools of this kind have been tried with more or less success in different countries. In Paris there is the well-known Ecole Diderot for the training of mechanics, fitters, smiths, &c.; and similar schools have been established in other parts of France. A furniture-trade school of the same category

has recently been opened in Paris, and for many years a society of Christian Brethren have directed a large school in which several

different trades have been taught. In this establishment, situated in the Rue Vaugirard, all the secular and general instruction is given gratuitously by the brothers, and in the several shops attached to the school skilled workinen are employed, who in- struct the pupil apprentices, and utilize their labour. This system combines many of the advantages of shop work and school work, but it depends financially for its success upon the religious spirit which actuates its promoters and supporters. The Artane school, near Dublin, is conducted on somewhat similar principles, but is intended for a lower class of children. In Austria, particu- larly in the rural districts, there are numerous schools for the training of carpenters, joiners, turners, cabinetmakers, workers in stone and marble, in silver and other metals, &. Schools of the same class are found in Germany, Italy, and elsewhere. It is only in certain cases, however, that apprenticeship schools can be said to satisfactorily answer the purpose for which they have been established. Where a new industry, especially in rural districts, has to be created ; where decaying industries need to be revived ; Where machinery is superseding hand work, and, owing to the demands for ordinary hands, there is a dearth of skilled workmen ; where through the effects of competition and other causes the trade is carried on under conditions in which competent workmen cannot be properly trained in the ordinary shop, —in these cases, and in various art industries, an apprenticeship school may prove to be the best means of training workmen, and of advancing particular trades. Generally, an apprenticeship school should be looked upon as a temporary expedient, as a form of relief applied at the birth or during any temporary depression of a particular industry. The proper training school for workmen is the factory or shop.

2. Horemen.—The foreman must be familiar with the various

branches of work he is to overlook, and the training which the workman receives in the factory or shop affords him but scanty opportunities of obtaining this general knowledge. The foreman needs also a generally superior education. How then are foremen to be trained ? The problem is somewhat easier than that of train. ing workmen, because the number required is fewer. The variety of schools in Europe devoted to this purpose

is very great. There are three distinct ways in which foremen are being trained.

(a) The evening technical classes in Britain and on the Continent offer to ambitious workmen an opportunity of acquiring a know. ledge of other departments of the trade than those in which they are engaged, ‘as well as of the scientific principles underlying their work. ‘These classes serve the double purpose of improving the workpeople and of affording a means of discovering those who are best fitted to occupy higher posts.

(6) Special schools have been established for the training of fore- men. ‘There are many trade schools of this kind in which selected boys are received after leaving the elementary school. The best known are those at ChAlons, Aix, Nevers, Angers, and Lille in France. These schools are intended for the training of foremen in engineering trades. They are state institutions, in which practical mechanical work in the shops is supplemented by theoretical instruction. The first of these schools was founded in 1803. The course lasts three years, and the number of students in each school must not exceed three hundred. The students spend from six to seven hours a day in the workshop, and are trained as fitters, founders, smiths, and pattern-makers. As in all such schools, saleable goods are produced, but, as production is subordinated to instruction, the school does not bind itself to deliver work at a given date, and therefore does not compete with any manufacturing establishment. The students on leaving these schools are com- aie at once to undertake the duties of foremen, managers, or

raughtsmen, At Komotau, Steyr, Klagenfurt, Ferlach, and many other places schools have been established on somewhat similar principles. In Germany there are special schools for the training of foremen in the building trade, which are chiefly frequented in the winter, and numerous schools are found in all parts of the Continent for the training of weavers. At Winterthur in Switzer. land a school has been established the main purpose of which is the training of foremen. In Italy there are numerous technical institutes, the object of which is to train young men for inter- mediate posts in industrial works. In the United States the manual training schools, the number of which is rapidly increasing, have somewhat similar objects. In London, the

Finsbury technical college of the City and Guilds of London Institute has a day de- partment, the main purpose of which is the training of youths as foremen, works managers, &c.; but in this school, as well as in those last mentioned, the character of the instruction deviates considerably from that given in French schools, and aims rather at preparing youths to learn, than at teaching them, their trade.

(c) A third method adopted for the training of foremen is by en- couraging selected children of the ordinary elementary schools to continue their education in schools of a higher grade of a technical character. It is thought that, by developing to a higher degree the intelligence and skill of those children who show aptitude for scientific and practical work, they will be able, when they enter the shop, to learn their trade more quickly and more thoroughly, and to acquire that general knowledge of their work, and to exhibit those special aptitudes, which may qualify them for the position of foreman or manager. The education given in these schools, although having direct reference to the future career of the pupil, is disciplinary in character, and consists of the subjects of primary instruction further pursued,—of drawing, modelling, science, mathematics, and manual exercises. The curriculum is varied to some extent according to local requirements, the technology of the staple industries forming in many cases part of the instruction. Such schools, under varied forms, have been established in most Continental countries, some of the best examples of them being found in Paris, Lyous, Rheims, Rouen, and in other towns of France. The want of similar schools in Britain has been frequently pointed out. One of the oldest of these schools is the Ecole Martiniére at Lyons. The school was founded in 1820 by a bequest from Major-General Martin, who had fought against the English under Tippoo Sahib. In this school, in which the education is gratuitous, as in nearly all the higher elementary schools of France, instruction is given in drawing, modelling, chemistry, mechanics, and physics, in the working of wood and iron, and in German and English in addition to the subjects of an ordinary school education. Surveying is also taught to some of the pupils, and the instruction generally is of a very practical character. The students visit fac- tories under the guidance of the masters, and ou their return they write out full descriptions of their visits. The school hours are from seven till eleven in the morning and from one till seven in the afternoon. The boys from this school rapidly obtain places in

the commercial and industrial houses of Lyons, and many of them, after a time, succeed in obtaining high positions. A very similar school, on more modern lines, has been established at Rheims, and

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is accommodated in a building especially adapted to the purpose. In this school instruction is directed towards the staple industries of the district, namely, weaving, dyeing, and engineering. There are many other similar schools in France, the object of which is to give the children of artisans and small shopkeepers a higher practi- cal education in order to fit them to occupy the posts of foremen, overseers, and superior clerks in manufacturing and commercial firms. A large number of poor children showing talent are selected from the primary schools and receive scholarships ; and the objection sometimes urged against the establishment of higher elementary schools,—that the better classes only are able to benefit by them—is thus obviated. In Germany the real-schools in which Latin is not taught, known as Ohnelatein Realschulen, have very nearly the same objects as the higher elementary schools of France. ‘The instruction in these German schools is not yet so practical as in the schools of France. Drawing is always well taught, and the schools generally contain good chemical labora- tories, as well as collections of physical apparatus and museums. From the children of these schools the ranks of foremen are largely recruited. They receive no special trade instruction, but the general training is so arranged as to qualify them for higher posts in industrial works. The cost of this higher education seldom exceeds £3 per annum. In Bavaria it is two shillings a month.

In most of these schools, as well as in the chief intermediate com- mercial schools, the exit certificate exempts a lad from two of the three years’ compulsory military service, and this regulation, to which nothing corresponds in England, is an incentive to parents to allow their children to receive higher instruction, which operates very forcibly in largely increasing the number of well-educated youths in Germany. In these opportunities for higher education England is still very deficient, and the complaint is generally heard of the difficulties of obtaining competent foremen.

3. Masters.—The best special schools for the training of future masters, managers, engineers, manufacturers, and industrial chem- ists are in Germany, and are known as technical high schools or polytechnic schools. Schools of a similar character are found in other countries, and in England the facilities for higher technical education have within the last few years greatly improved.

In Germany the polytechnic or technische Hochschule is an

institution of university type in which the education has special reference to industrial purposes. In many respects the teaching coincides with that given in the universities. The chief distinction consists in the arrangement of courses of instruction in the several departments, in the admission of students having a non-classical preliminary training, and in the absence of certain faculties found in the university and the addition of others. It is not correct to say that the polytechnic is a professional school as distin- guished from the university ; for the faculties of law, medicine, and theology give to the university as distinctly a professional character as the faculty of engineering gives to the polytechnic. Nor can it be said that the scicntific shades at the universities are less practical than at the polytechnic. For, whilst workshops for instruction in the use of tools are found in very few of the polytechnic schools, the laboratories, for the practical study of chemistry and physics, are perhaps better fitted and under more eminent professors at some of the German universities than at the polytechnic schools. At the same time, engineers of every descrip- tion, architects, and builders, besides a great number of manufac- turing chemists, find in the polytechnic the scientific and technical training which the lawyer or physician, and in many cases the industrial chemist, seeks in the university. _ Insome of the large cities—in Berlin, Vienna, and Munich, for instance—the university and polytechnic coexist ; and in certain cases, in which a very special training is required to fit a youth for his carcer, the German student, after spending three or four years at a polytechnic school, passes on to another institution, such as a dyeing school, in which his studies are further special- ized with a view to his future work.

_ Taking the technical high school of Munich as a type of other similar institutions, we find the cost of the building and of the various collections it

contains to have amounted to nearly £200,000, and the annual cost of maintenance to be about £20,000. The institution consists of six schools :—(1) the general; (2) the civil engineering ; (3) the building; (4) the mechanical engineering ; (5) the industrial chemical ; and (6) the agricultural. A department for electrical technology is now being built. In other institutions there are architectural, pharmaccutical, and mining schools. The programme of the Munich school gives a list of about 180 different courses of instruction distributed over the scveral departments.

cal instruction is given are concentrated in the capital. There are a large number of provincial colleges where the education is some- what more practical, but where the mathematical and scientific teaching is not carried to so high a point (the Ecole Centrale at Lyons, the Ecole des Mineurs at St Etienne, and the Institut du Nord at Lille, &c.). The Ecole Centrale of Paris, in which the majority of French engineers who are not employed in the Govern- ment service are trained, is a rare instance of an institution for higher technical instruction which is self-supporting and inde- pendent of Government aid.

In Switzerland the federal polytechnic of Zurich is similar to the polytechnic schools of Germany and Austria. Italy has three superior technical institutes,—one at Milan, one at Turin, and one at Naples, in which technical education is given on the same lines as in German polytechnic schools. Holland has an excellent institution at Delft, which was opened in 1864; and in Russia the imperial technical school at Moscow is a high-class engineering school, in which the theoretical studies are supplemented, to a greater extent than in the German schools, by workshop practice.

In some of the German schools the fees charged vary according to the number of lectures and to the number of hours of practical work which the student takes per week. Thus at Munich the entrance fee for each student is 10s., and the lecture fee is 2s. 6d. for each hour’s lecture per week, including the use of materials. At Zurich the cost of a student in a chemical department, including laboratory practice, does not exceed £12 per annum,

and in other departments it does not exceed £4 per annum. At Delft the student pays about £16 per annum for a complete course.

In England there is a growing tendency to associate technical with university education. This is mainly owing to the fact that the colleges which have recently been established to give univer- sity education are poorly endowed, and have found it necessary to attract students by mecting the increasing demand for technical instruction. Most of the provincial colleges may indeed be regarded as technical schools with a literary side. In order that they may provide university education in addition to sound technical in- struction, it is necessary that they should be placed on a sound and satisfactory footing by means of state endowment. Of the more recently erected English colleges, the Owens College at Man- chester is the most important, combining the faculties of a German university with those of a polytechnic school. The Yorkshire College, Leeds, possesses a special school for the teaching of weay- ing and dyeing. Other somewhat similar institutions are found in Birmingham, Newcastle, Sheffield, Nottingham, Dundee, Cardiff, and elsewhere. The university of Edinburgh has a good school of chemistry, physics, and engineering, and the university of Glasgow has been long distinguished for the excellence of its physical laboratories. In University College and King's College, London, the metropolis possesses two institutions each of which may be likened to a university and a polytechnic combined. In the uni- versity of Cambridge there are mechanical workshops in connexion with the chair of engincering. The Royal School of Mines and the normal schools of science and art in South Kensington are the only technical institutions in England supported by state aid. The central institution in London has more in common with the German polytechnic school than any other institution in Britain. This school is designed for the technical teaching of engineers, architects, master builders, and industrial chemists. It was built at a cost of £100,000, and is maintained by an annual grant from the City and Guilds of London Institute of £10,000, in addition to the students' fees,

Such is a brief outline of the means provided for the technical education of masters in different parts of Europe. It will be seen from the foregoing statement that efforts are now being made to bring Britain more nearly on a level with other countries in the provision of those kinds of instruction

which are best adapted to the different classes of producers. But as yct only a beginning has been made, and in England technical students can be counted by hundreds, whilst those of Germany are numbered by thousands.

For further information the reader is referred to the Report of the royal commissioners on technical instruction, published in 1884, (P. M*.)

TEETH. See Mammatia, vol. xv. p. 349; DicEstive OrGANS, vol. vii. p. 232; Ivory; and Dentistry.

TEGEA, one of the chief cities of Arcadia, of which its territory occupied the south-eastern corner, being bounded on the S. by Laconia, on the E. by Cynuria and Argolis, on the N. by the territory of Mantinea, and on the W. by Menalia. Its legendary founder was Tegeates, son of Lycaon. Like many other cities of ancient Greece, Tegea was formed by the union of a population which had previously lived dispersed in villages. The people were divided into four tribes,—the Clareotis, Hippothcetis, Apolloniatis, and Athaneatis. Tegea offered a stubborn

resistance to the encroachments of Lacedzemon, and on more than one occasion defeated its ambitious neighbour. About 560 B.c., however, the Lacedsemonians found the bones of Orestes in Tegea and conveyed them to Sparta ; and henceforward Spartan valour, backed by this powerful fetich, proved too much for the merely carnal weapons of Tegea. At Platea (479 B.c.) 3000 Tegeans fought the good fight of freedom, and were the first to enter the breach which the Athenians had made in the Persian redoubt. Between the Persian and Peloponnesian Wars hostilities again broke out between Tegea and Sparta, in the course of which Tegea was twice defeated. However, in the Peloponnesian War (431-404), and afterwards in the Corinthian War (395-387), Tegea sided with Sparta. But after the battle of Leuctra (371), when the star of Sparta began to decline, Tegea concluded an alliance with the victorious Thebans, and fought on their side against Sparta at the great battle of Mantinea (362). In the Macedonian period Tegea joined the Attolian League, but Cleomenes, king of Sparta, having won it over to his side, the city was besieged and taken by Antigonus Doson, king of Macedonia, the ally of the Achzan League (222). In 218 the

city was retaken, except the acropolis, by the Lacedxmonians under Lycurgus. After the defeat of Machanidas, tyrant of Sparta, by Philopcemen in 207, Tegea passed into the hands of the Achzan League. In the time of Strabo it was the only town of any importance in Arcadia. In the 2d century it was visited by Pausanias, who has left a fairly full description of it (viii. 45-53),

Of its buildings much the most famous was the great temple of Athene Alea, which had often afforded sanctuary to fugitives from Sparta. The old temple was burued down in 394 B.c., and Pausanius speaks of the newer temple as by far the finest and largest in the Peloponnesus (that of Zeus at Olympia, however, occupied nearly double the area). The architect was Scopas; and, as the recent German excavations have proved, the temple was a Doric peripteros, with six columus at each end and fourtcen at each side. Of the columns which Pausanias mentions in addition to the Doric, the Corinthian may have stood in the pronaos and posticum, the [onic in ‘‘the interior of the temple” (for éxrds we should probably read éyrés in Pausanius, viii. 45,5). The ancient image of Athene Alea was carried off by Augustus, and placed at the entrance to his new forum at Rome. The statues of Ascu- lapius and Health, which in Pausanias’s time stood on the two sides of the image of the goddess at Tegea, were by Scopas. On the front pediment of the temple was sculptured the hunt of the Calydonian boar, on the back pediment the combat between Telephus and Achilles. Some fragments of these pedimental sculptures (comprising the head of the boar and two human heads, one helmeted) have been discovered ; and, as they are the only existing sculptures which can be referred with some certainty to the hand of Scopas himself, they are of the highest importance for the history of art. The site of the temple, at the modern village of Piali, was partially excavated under the auspices of the German archeological institute in 1879 and 1882. It appears that the foundations of the temple measured 49°90 metres (nearly 164 feet) by 21°30 (70 feet). As Tegea stood on a plain surrounded by mountains and liable to inundations, its site has been covered by an alluvial soil which has been favourable to the preservation of the ruins, and a thorough excavation might yield important results.

On the excavations, see Mittheilungen des deutschen archdologischen Institutes in Athen, 1879, p, 131 sq., 168 sq.; ibid., 1880, p. 52 sq.; dbid.,

1883, p. 274 sq. On the artistic value of the sculptures, see tbid., 1881, p. 393 sq.; Jour. Hell. Stud., 1886, p. 115 sq.

TEGNER, Esatas (1782-1846), the most celebrated of Swedish writers, was born November 13, 1782, at Kyrkerud in Wermland. His father was a pastor, and his grandparents on both sides were peasants. His father, whose name had been Esaias Lueasson, took the surname of Tegnerus—altered by his fifth son, the poet, to Tegnér —from the hamlet of Tegnaby in Smaland, where he was born. In 1799 Tegnér, hitherto educated in the country, entered the university of Lund, where he graduated in philosophy in 1802, and continued as tutor until 1810, when he was elected Greek lecturer. In 1812 he was named professor, and continued to work as a lecturer in Lund until 1824, when he was made bishop of Wexid. At

Wexioé he remained until his death, twenty-two years later, Tegnér's early poems have little merit. He was com. paratively slow in development. His first great success was a dithyrambic war-song for the army of 1808, which stirred every Swedish heart. In 1811 his patriotic poem Svea won the great prize of the Swedish Academy, and made him famous. In the same year was founded in Stockholm the Gothic League (Gétiska Jérbundet), a sort of club of young and patriotic men of letters, of whom Tegnér quickly became the chief. The club published a magazine, entitled Zduna, in which it printed a great deal of excellent poetry, and ventilated its views, particularly as regards the study of old Icelandic literature and history, Tegner, Geijer, Afzelius, and Nicander became the most famous members of the Gothic League. Of the very numerous poems written by Tegnér in the little room at Lund which is now shown to visitors as the Tegnér museum, the majority are short, and even occasional lyrics. His celebrated Song to the Sun dates from 1817. He completed three poems of a more ambitious character, on which his fame chiefly rests. Of these, two, the romance of Awel and the delicately-chiselled idyl of Matteards. barnen ("The First Communion," 1820), translated by Longfellow, take a secondary place in comparison with Tegnér's masterpiece, of world-wide fame. In 1820 he published in Zduna certain fragments of an epic or cycle of epical pieces, on which he was then working, Frithiofs- saga or the Story of Frithiof. In 1822 he published five

more cantos, and in 1825 the entire poem. Before it was completed it was famous throughout Europe ; the aged Goethe took up his pen to commend to his country- men this “alte, kraftige, gigantisch-barbarische Dichtart,” and desired Amalie von Imhoff to translate it into German. This romantic paraphrase of an ancient saga was composed in twenty-four cantos, all differing in verse form, modelled somewhat, it is only fair to say, on an earlier Danish masterpiece, the Helge of Oehlenschléiger. Frithiofssaga is the best known of all Swedish produc- tions ; it is said to have been translated nineteen times into English, eighteen times into German, and once at least into every European language. It is far from satisfy- ing the demands of nore recent antiquarian research, but it still is allowed to give the freshest existing impression, in imaginative form, of life in early Scandinavia. In later years Tegnér began, but left unfinished, two important epical poems, Gerda and Kronbruden. The period of the publication of Mrithiofssaga (1825) was the critical epoch of his career. It made him one of the most famous poets of Europe; it transferred him from his study in Lund to the bishop’s palace in Wexié ; it marked the first break- down of his health, which had hitherto been excellent ; and it witnessed a singular moral crisis in the inner history of the poet, about which much has been written, but of which little is known. Tegnér was at this time passionately in love with a certain beautiful Euphrosyne Palm, the wife of a town-councillor in Lund, and _ this unfortunate passion, while it inspired much of his finest poetry, turned the poet’s blood to gall. From this time forward the heartlessness of woman is one of Tegnér’s principal themes. It is a remarkable sign of the condi- tion of Sweden at that time that a man not in holy orders, and so little in possession of the religious temperament as Tegnér, should be offered and should accept a bishop’s crozier. He did not hesitate in accepting it: it was a great honour ; he was poor; and he was anxious to get away from Lund. No sooner, however, had he begun to study for his new duties than he began to regret the step he had taken. It was nevertheless too late to go back, and Tegnér made a respectable bishop as long as his health lasted. But he became moody and melancholy ; as early

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as 1836 he complained of fiery heats in his brain, and in 1840, during a visit to Stockholm, he suddenly became insane. He was sent to an asylum in

Schleswig, and early in 1841 he was cured, and able to return to Wexié. It was during his convalescence in Schleswig that he wrote Kronbruden. He wrote no more of importance; in 1843 he had a stroke of apoplexy, and on the 2d of November 1846 he died in Wexié. From 1819 he had been a member of the Swedish Academy, where he was succeeded by his biographer and best imitator Béttiger. In prose Tegnér wrote letters, which have been collected, and which are considered the best of their kind in the Swedish language. As a poet he will scarcely be preferred to Bellman or to Runeberg by Swedish verse amateurs, but he still exceeds these and all other writers in popularity.

See Bottiger, Teckning af Tegnérs Lefnad; Georg Brandes, Esaias Tegnér; Thomandcr, Tankar och Liéjen. (E. W. G.)

TEHERAN, or, more properly, TEHRAN (lat. 35° 40’ N., long. 51° 25’ E.), for about a century the recognized capital of Persia, has little to distinguish it, in general out- ward appearance, from other large cities of the country, though in quite recent years Parisian streets or boulevards, and even Western architecture for single houses, in the midst of mud-brick palaces or plain mud hovels, have been incongruously introduced. Formerly a kind of polygon some 4 iniles in circumference—with its mean “shahr panah” or wall, its clumsy and uneven ditch, and its six gates, two facing north, two south, one east, and one west, —Teheran has now been extended to an outer ditch and wall, thrown out on each side beyond the ancient limit. The bazaars are good, though hardly of the first class; the caravanserais deserve honourable mention; and the tele- graph and arsenal are respectable institutions. The streets are for the most part narrow and wretchedly paved. The “ Ark,” or citadel, contains the royal and better description of public buildings, and connecting its encircling wall with the city gates are four principal thoroughfares, of which the parallel avenues from the Nasiriya and Daulat entrances are the more notable. Between these two gates, in a parallelogram extending from one to the other and in-

cluding both, is the gas-lighted Tép Maidan, or “Place _ des Canons,” in the centre of which is a large reservoir. European professors are to be found in the king’s college, where some 250 students, more or less, are taught mathematics, engineering, military tactics, music, telegraphy, painting, together

with the Arabic, English, French, and Russian languages. Among the not very remarkable mosques—to some of which madrasahs, or colleges, are attached—may be specially mentioned the Masjid-i-Shah, or king's mosque, with its handsome enamelled front, and the Masjid-i-Madar-i-Shah, or mosque of the king's mother. Water is freely supplied to the town by means of the underground canals, or kandts, from the near mountain ranges. Public baths abound, but the Europeans use those of the Armenian and not of the Mohammedan community. The British legation stands in a handsome garden of great size, in which are placed the houses of the secretaries, which resemble English villas. In the summer Season the representatives of Western powers and other Europeans move out to the slope of the mountain range north of Teheran,—the British residents to Gulhak, a village about 7 miles from the city. A prominent feature in the landscape at Gulhak and the neighbouring summer quarters, as at Teheran itself, is Demavend, the noblest and most graceful of Persian mountains.

The present population of Teheran may be taken at 160,000 at most. According to a late authority (Bassett, 1887) the European inhabitants are reckoned at about 100 only; the Jews number some 2500; and there are 150 Gabrs or Parsis, a sorry remnant of the old fire-

worshippers. In 1872 there were said to be 1000 Arme- nians, mainly traders and artisans. In 1872 there were but four legations in Teheran—those of England, France, Russia, and Turkey. Since that year representatives have been added from Holland, Austria, Germany, and the United States. The French have summer quarters at Tejrish and the Russians at Zargandah, at no great dis- tance from the English Gulhak.

Morier supposes Teheran to be the Tahors of the Theodosian Tables, and recognizes it also in the account of the journcy of the Castilian ambassadors to Timur. Porter, too, relates that in 1637 the secretary of the Holstein ambassadors mentions Teheran as "one of the towns which enjoy the privilege of maintaining no soldiers." Again, in the 17th century, it was visited by Pietro della Valle and by Sir Thomas Herbert,—the latter spelling it "Tyroan." Most writers affirm that Teheran, though not of recent origin, can barely be held of repute till Agha Muhammad made it his residence in

about 1788, taking to himself the title of shah, as first of the Kajar kings, in 1796. Yet there is evidence that in the previous century it was a royal resort, if nothing more, in Herbert's state- ment that "the Toune is most beautified by a vast garden of the kings, succinct with a great towered mud-wall larger than the circnit of the city." Du Pré (who visited itin 1808) states that it had been pillaged and nearly destroyed by the Afghans,—evidently at their invasion of Persia in 1728. Since Agha Muhammad's time Teheran has been the usual seat of the Kajar dynasty, a circumstance to be attributed to the political advantages of its geographical position.

See, besides the authorities cited, Telegraphand Travel (1874) ; Dr Wills's Land of the Lion and Sun (1883) ; and Mr Bassett's Land of the Imdins (1887).

TEHUANTEPEC, an isthmus in Mexico, comprising the western extremities of the states of Vera Cruz and Oajaca, and limited eastwards by the states of Tabasco and Chiapas, thus lying between 16° and 18° N. lat. and 94° and 95° W. long. Between the Bay of Campeche on the north or Atlantic side and that of Tehuantepec on the south or Pacific side the distance in a bee line is only 125 miles. Here also the Sierra Madre falls rapidly from over 5000 feet in Chiapas to about 730 feet in the ridge skirting the Pacific coast, and leaving the rest of this district some- what level, with a rise from the Atlantic of not more than 60 feet in the mile except at the Chivela Pass, where for 8 miles the gradients are about 116 feet per mile.

This favourable condition of the relief, combined with a relatively healthy climate subject only to dangerous insect pests in summer, has naturally attracted attention to the Tehuantepec isthmus, as offering peculiar advantages for interoceanic communication either by a navigable canal, a railway, or a ship railway. A first conces- sion was made in 1841 by the Mexican Governinent to Don José de Garay, who had the land surveyed with a view toa canal, but who, after the war with the United States, surrendered his rights to Mr P. A. Hargous of New York. The company then organized to give effect to the Garay grant caused a fresh survey for a railway to be made in 1851, under the direction of the late Gencral J. G. Barnard. But nothing came of this or of another railway project in 1857,

when a third survey was executed, under the direction of Col. W. H. Sidell. Then the ‘‘Tehuantepec Railway Company,” formed in 1870 in New York, and reorganized in 1879, obtained a concession from the Mexican Government to construct the ‘‘Tehuantepec Railway”; but, after a few miles were made, the work was suspended, and in 1882 the Government contracted with private individuals for the completion of the line, which was to be 190 miles long, and to run from the mouth of the Goatzacoalcos (Coatzacoalcos) river on the Atlantic to the port of Salina Cruz on the Pacific. The work was carried to Minatitlan, a distance of 25 miles, in 1884, and was to have been completed in 1885; but since then operations appear to have been suspended for want of means. A Tehuantepec ship railway is also projected, as it is expected that most of the trade between the Atlantic and Pacific coasts of the United States will be attracted to this route, which shortens the distance between New York and San Francisco by 1477 miles, and between New Orleans and the same place by 2334 miles, as com- pared with that by the Panama railway and future canal.

Tehuantepec, the town which gives its name to the isthmus, bay, and neighbouring lagoon, stands on the river Tehuantepec, 15 miles above its mouth on the Pacific, where it develops a shallow and somewhat exposed harbour. Of the population, estimated at 14,000, a large number are civilized and industrious Indians en- gaged in cotton-weaving and on the salt-works. Indigo is grown in the district, and there are productive pearl-fishcries in the bay. Amongst the exports are cochineal and a purple dye extracted from a shellfish abounding on the coast.

Signal- ling gener- ally.

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TEIGNMOUTH, a seaport and market town of Eng- land, in Devonshire, consisting of the parishes of East and West Teignmouth, and situated on the English Channel, at the mouth of the Teign and on the Great Western Railway, 14 miles south of Exeter and 209 west-south- west of London. It is somewhat irregularly built, partly on a projecting peninsula and partly on the acclivities rising behind the river. The Teign is crossed by a bridge 1671 feet in length, built of wood and iron in 1824, St Michael’s church, in East Teignmouth, erected in 1829-23 in the Decorated style, was enlarged in

1875. The other buildings include St Scholastica's abbey (erected for Benedictine nuns in 1862), the East Devon and Teignmouth club-house, the mechanics' institute (1840), the temperance hall (1879), the sailors' home (1881), the baths (1883), and the public market (1883). There are two commodious

quays and a pier 600 feet in length. Fine pipe and potters' clay (from Kingsteignton) is shipped to Staffordshire. Coal and culm are imported, and there is also a trade with Newfoundland. Fishing is extensively carried on, The town, which is not incorporated, was formerly governed by portreeves. It now forms an urban sanitary district, which was extended on 29th September 1881. The popu- lation of the former area (1238 acres) in 1871 was 6751, and in 1881 it was 7120; that of the extended area (2347 acres) in 1881 was 8496.

Teignmouth is of very ancient origin. It received a grant of a market from Henry III. East Teignmouth was formerly called Teignmouth Regis, and West Teignmouth, Teignmouth Episcopi,— the manor having belonged to the see of Exeter until alienated by Bishop Vesey. Teignmouth was burned by French pirates in 1840, and was again devastated by the French on 26th June 1690.

TEINDS. See Trruzs.

TELEGRAPH

1 place iat (from rijAe and ypddw) signifies an

instrument to write at a distance. The term is specifically applied to apparatus for communicating in- telligence to a distance in unwritten signs addressed to the eye or ear, and has only recently had application to those wonderful combinations of inanimate matter which literally write at a distance the intelligence committed to them. The chief object of the present article is to ex- plain the principles and practice of the electric telegraph, and we shall allude to other telegraphic systems only to illustrate the general principles of signalling,

A word expressing an idea may, according to a pre- arranged plan of signalling, be communicated by voice, by trumpet calls, by gun fire, by gesture or dumb signs, by lamp signals, by flags, by semaphore, or by electric tele- graph. The simplest system of word-signalling hitherto practised is that of the nautical flag telegraph, in which each hoist represents a word by a combination of ‘four flags in four distinct positions (see Sianats, N AVAL). If m denote the number of flags, supposed all different, out of which the four to be sent up may be selected, the num- ber of different ideas which can be expressed by a single hoist is n(n —1)(n—2)(n— 3), since there are n varieties out of which the flag for each of the four positions may be.independently chosen. To commit to memory so great a number of combinations, which amount to 358,800 if n= 26, would be a vain effort; the operators on each side must therefore have constant recourse to a dictionary, or code, as it is called. For the sake of convenient reference each flag is called by the name of a letter of the alphabet, and all that the operator has to bear in mind is the letter by which each flag is designated. Sometimes the words to be expressed are spelled out by means of the flags as in ordinary language; but, as in most words there are more than four letters, as scarcely any two consecutive words are spelled with four or less than four letters, and as more than four flags at a time cannot be conveniently used, the system of alphabetic signalling frequently re- quires the use of two hoists for a word, and scarcely ever has the advantage of expressing two words by one hoist. It is therefore much more tedious than code signalling in the nautical telegraph.

In point of simplicity spoken words may be considered as almost on a par with the nautical telegraph, since each word is in reality spoken and heard almost as a single utterance. Next in order comes the system of spelling out words letter by letter, in which—instead of, as in the nautical telegraph, 358,800 single symbols to express the same number of ideas—26 distinct symbols are used to express by their combinations any number whatever of

distinct ideas. Next again to this may be ranked the system by which several distinct successive signals are used to express a letter, and letters thus communicated by compound signals are combined into words according to the ordinary method of language. It is to this last class that nearly all practical systems of electro-telegraphic signalling belong. But some of the

earliest and latest pro- posals for electric telegraphs are founded on the idea of making a single signal represent a single letter of the alphabet ; as instances we may name those early forms in which separate conductors were used for the different letters; a method suggested by Professor W. Thomson! in 1858 in which different strengths of current were to be employed to indicate the letters; and the various forms of printing telegraph now in use.

I. Hisrorican Skretcn or EARLy TELEGRAPHS,

Although the history of practical electric telegraphy Early does not include a period of more than half a century, the forms.

idea of using electricity for telegraphic purposes is much older. It was suggested again and again as each new dis- covery in electricity and magnetism seemed to render it more feasible. Thus the discovery of Stephen Gray and of Wheeler that the electrical influence of a charged Leyden jar may be conveyed to a distance by means of an insulated wire gave rise to various proposals, of which perhaps the earliest was that in an anonymous letter? to the Scots Magazine (vol. xv. p. 73, 1753), in which the use of as many insulated conductors as there are letters in the alpha- bet was suggested. Each wire was to be used for the trans- mission of one letter only, and the message was to be sent by charging the proper wires in succession and received by observing the movements of small pieces of paper marked with the letters of the alphabet and placed under the ends of the wires. A very interesting modification was also proposed in the same letter, viz., to attach to the end of each wire a small light ball which when charged would be attracted towards an adjacent bell and strike it. Some twenty years later Le Sage proposed a similar method, in which each conductor was to be attached to a pith ball electroscope. An important advance on this was proposed in 1797 by Lomond,’ who used only one line of wire and an alphabet of motions. Besides these we have in the same period the spark telegraph of Reiser, of Don Silva, and of Cavallo, the pith ball telegraph of Ronalds, and _ several

- See his Mathematical and Physical Papers, vol. ii. p. 105.

2 From correspondence found among Sir David Brewster's papers after his death it seems highly probable that the writer of this letter, which was signed ''C. M.", was Charles Morrison, a surgeon and 4

native of Greenock, but at that time resident in Renfrew. 3 See Arthur Young, Travels in France, p. 3.

others. Next came the discovery of Galvani and of Volta, and as a consequence a fresh set of proposals, in which voltaic electricity was to be used. The discovery by Nicholson and Carlisle of the decomposition of water and the subsequent researches of Davy on the decomposition of the solutions of salts by the voltaic current were turned to account in the water voltameter telegraph of Sémmering and the modification of it proposed by Schweigger, and in a similar method proposed by Coxe, in which a solution of salts was substituted for water. Then came the discovery by Romagnesi and by Oersted of the action of the galvanic current on a magnet. Thé application of this to tele- graphic purposes was suggested by Laplace and taken up by Ampére, and afterwards by Triboaillet and by Schilling, whose work forms the foundation of much of modern tele- | graphy. Faraday's discovery of the induced current pro- duced by passing a magnet through a helix of wire forming | part of a closed circuit was laid hold of in the telegraph of Gauss and Weber, and this application was at the request of Gauss taken up by Steinheil, who brought it to consider- | able perfection. Steinheil communicated to the Gottingen Academy of Sciences in September 1838 an account of his telegraph, which had been constructed about the middle of the preceding year. The currents were produced by a magneto-electric machine resembling that of Clarke. The receiving apparatus consisted of a multiplier, in the centre of which were pivoted one or two magnetic needles, which either indicated the message by the movement of an index or by striking two bells of different tone or recorded it by making ink dots on a ribbon of paper. Among other workers about this time we may mention Masson, Bréguet, Davy, Deval, Billon, Soudalot, and Vorsselman who pro- posed to use the physiological effects of electricity in work- ing an electric telegraph.!

Steinheil appears to have been anticipated in the matter _ of arecording telegraph by Morse of America, who in 1835 constructed a rude working model of an instrument ; this within a few years was so perfected that with some modi- fication in detail it has been largely used ever since (see below). In 1836 Cooke, to whom the idea appears to have | been suggested by Schilling's method, invented a telegraph in which an alphabet was worked out by the single and combined movement of three needles. Subsequently, in conjunction with Wheatstone, he introduced another form, in which five vertical index needles, each worked by a separ- ate multiplier, were made to point out the letters on a dial. Two needles were acted upon at the same time, and the letter at the point of intersection of the direction of the | mdexes was read. This telegraph required six wires, and was shortly afterwards displaced by the single-needle system, still to a large extent used on railway and other less im- portant circuits. The single-needle instrument is a vertical needle galvanoscope worked by a battery and reversing key, the motions to right and left of one end of the index corre- sponding to the dashes and dots of the Morse alphabet. To increase the speed of working, two single-needle instru- ments were sometimes used (double-needle telegraph). This system required two lines of wire, and, along with all multiple-wire systems, soon passed out of use. Similar _ Instruments to the single and double needle ones of Cooke | and Wheatstone were about the same time invented by the _ Rev. H. Highton and his brother Edward Highton, and '| were used for a considerable time on some of the railway lines in England. Another series of instruments, intro- duced by Cooke and Wheatstone in 1840, and generally known as '' Wheatstone's step-by-step letter-showing" or

1 The reader interested in the early history of the electric telegraph may consult Edward Highton, The Electric Telegraph, London, 1852; Moigno, Traité de Télégraphie Hlectrique, Paris, 1849; and Sabine, IMistory of the Electric Telegraph, London, 1869.

'' A BC instruments," were worked out with great ingenuity of detail by Wheatstone in Great Britain and by Bréguet and others in France. They are still largely used for pri- vate wires, but are being rapidly displaced by the

telephone.? Wheatstone also described and to some extent worked out an interesting modification of his step-by-step instrument, the object of which was to produce a letter-printing tele- graph. But it never came into use; some years later, however, an instrument embodying the same principle, although differing greatly in mechanical detail, was brought into use by Royal E. House of Vermont, U.S., and was very successfully worked on some of the American telegraph lines till 1860, after which it was gradually displaced by the Phelps combination telegraph. The House instrument is not now in use, but various modifications of it are still employed for private lines and for stock telegraphs, such as Calahan's and the universal stock telegraphs, Phelps's stock printer, Gray's automatic printer for private lines, Siemens's and Phelps's automatic type printers, dc. (see infra, pp. 120-121).

Tf. General DESCRIPTION oF ELECTRIC TELEGRAPHS FoR LAND AND SEA.

The first requisite for electro-telegraphic communica- Essential tion between two localities is an insulated conductor ex- appara-

tending from one tothe other. This, with proper apparatus for originating electric currents at one end and for dis- covering the effects produced by them at the other end, constitutes an electric telegraph. Faraday's term " elec- trode," literally a way for electricity to travel along, might be well applied to designate the insulated conductor along which the electric messenger is despatched. It is, how- ever, more commonly and familiarly called 'the wire" or "the line."

The apparatus for generating the electric action at one end is commonly called the transmitting apparatus or in- strument, or the sending apparatus or instrument, or some- times simply the transmitter or sender. The apparatus used at the other end of the line to render the effects of this action perceptible to any of the senses—eye, ear, or taste, all of which have been used in actual telegraphic signalling—is called the recewing apparatus or instrument.

In the aerial or overground system of land telegraphs Over- the main line consists generally of a "galvanized" iron ground

wire from one-sixth to a quarter of an inch in diameter, stretched through the air from pole to pole, at a sufficient height above the ground for security. The supports or in- sulators, as they are called, by which it is attached to the poles are of very different form and arrangement in different telegraphs, but consist essentially of a stem of glass, por- celain, coarse earthenware, or other non-conducting sub- stance, protected by an overhanging screen or roof. One end of the stem is firmly attached to the pole, and the other bears the wire. The best idea of a single telegraphic insulator may be got from a common umbrella, with its stem of insulating substance attached upright to the top of a pole and bearing the wire supported in a notch on the top outside. The umbrella may be either of the same substance as the stem—all glass or all glazed earthenware, for instance—or of a stronger material, such as iron, with an insulating stem fitted to it to support it below. Very good insulators may be made of continuous glass; but well-glazed porcelain is more generally used, or rather earthenware, which is cheaper, less brittle, and less hygro- scopic, and insulates well as long as the glazing is sufficient to prevent the porous substance within from absorbing moisture.

One of the best forms—vVarley's double cup insulator

2 For the different forms, see Prescott's Hlectricity and the Electric Telegraph, pp. 562-602. Sa —— 1s

heavy cores the copper is heavier. The different coatings of gutta percha and of the conductor are usually separated by a thin coating of Chatterton's compound (a mixture of gutta percha, resin, and Stockholin tar), in order to make them adhere firmly together, This practice has recently been departed from by Messrs Siemens Brothers, who have succeeded by an improved process of manufacture in getting perfect adhesion without the use of the compound. The core is served with a thick coating of wet jute, yarn, or hemp (2), forming a soft bed for the sheath, which consists of soft iron, or of homogeneous iron, wires of the best quality. The sheathing wires are usually covered with one or two servings of tarred canvas tape (¢), or of tarred hemp, laid on alternately with coatings of a mixture of asphaltum and tar. The weight of the iron sheath varies greatly according to the depth of

the water, the nature of the sea bottom, the prevalence of currents, and go on, Fig. 2 shows the intermediate type again sheathed with a heavy armour to resist wear in the shallow water near shore. In many cases a still heavier type is used for the first mile or two from shore, and several intermediate types are often introduced, tapering gradually to the thin deep- water type. Captain 8S. Trot and Mr F, A. Hamilton have proposed! to abandon the iron sheath and substitute a strong double serving of hemp, laid on in such a way as to prevent twisting when the cable is under tension. This suggestion, which is a revival with some modifications of an old idea, is, however, still in the experimental stage.

We will now describe very briefly a few of the most important processes in the manufacture and submergence of submarine cables,

In manufacturing a cable (fig. 5) the copper strand is passed Their through a vessel A containing melted Chatterton's compound, then mann.

through the cylinder C, in which a quantity of gutta percha, puri- facture, fied by repeated wash- ing in hot water, by mastica-

tion, and by filtering through wire-gauze filters, is kept warm by a steam- . jacket. As the wire is pulled

through, a coating of [, '+ ifg gutta percha, the thickness of

—is shown in fig. 1. It consists of two distinct cups (c, C), which are moulded and fired separately, and afterwards

cemented together. The double cup gives WU Y ANH) SAAS ING

great security against loss of insulation due to cracks extending through the in- sulator, and also gives a high surface in- sulation. An iron bolt (b) cemented into the centre of the inner cup is used for fixing the insulator to the pole or bracket. Under- In the underground system the main ground line generally consists of a copper wire, lines. or a thin strand of copper wires, covered with a continuous coating of gutta percha, india-rubber, or some equivalent insulat- ing substance, served with tarred tape and enclosed in earthenware, iron, or lead pipes laid below the surface of the ground. This

system is largely used for street and tunnel work, and to a considerable extent, especially in Germany, for ordinary lines, Fi. 1. — Varley's Each tube generally contains a number of peegete Me wires, which are either laid up intoa cable _ size. and covered with a serving of tarred tape or hemp before being drawn into the tube, or—as is more commonly the case in the United Kingdom—simply laid together in a parallel group and tied at intervals with binders, which are removed as the wires are drawn into the tube. On some long underground lines in Germany the insulated wires are laid up into a cable, served with jute or hemp, and sheathed with a continuous covering of iron wires, precisely similar to the submarine cables described below. The cable is laid in a deep trench and coated with bitumen. This form of cable is easily laid, and if properly manu- factured is likely to be very durable. Sub- Submarine Cables.—A submarine cable (figs, 2-4), as

marine usually manu- – x

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present, con- sists of a core a in the centre of which is a strand of cop- per wires vary- ing in weight for different cables between 70 and 400 ib to the mile. The stranded form was sug- gested by Prof. W. Thomson at a meeting of the Philo- sophical So- ciety of Glas- gow in 1854, because _its greater flexi- bility renders it less likely to damage the

ae ee Fics, 2-4.—Sections of three types of submarine cabl

: ics, 2-4.—Sections of three types of submarine cables velope during full size. Fig. 2.—Type of shore end. Fig. 8.—Inter- the manipula- mediate type. Fig. 4.—Deep sea type.

tion of the cable. The central conductor is covered with several continuous coatings of gutta percha, the total weight of which also varies between 70 and 400 Ib to the mile. With a light core the weight of the gutta percha generally exceeds that of the copper, while in some –

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Fig. 5. which is regulated by the die D, is pressed out of the cylinder by applying the requisite pressure to the piston P. The newly coated wire 1s passed through a long trough T, containing cold water, until it is sufficiently cold to allow it to be safely wound on a bob- bin B. This operation completed, the wire is wound from the bobbin B’ on to another, and at the same time carefully examined for air-holes or other flaws, all of which are eliminated. The coated wire is treated in the same way as the copper strand, — the die D, or another of the same size, being placed! at the back of the cylinder anda larger one substituted at the front. A second coating is then laid on, and after it passes through a similar pro- cess of examination a third coating is applied, and so on until the requisite number is completed. The finished core changes rapidly in its electric qualities at first, and is generally kept fora stated interval of time before being subjected to the specified tests. It is then placed in a tank of water and kept at a certain fixed temperature, usually 75° Fahr. , until it assumes approximately a constant electrical state. Its conductor and dielectric resistance and its electrostatic capacity are then measured. These tests are gencrally repeated at another temperature, say 50° Fahr., for the purpose of obtaining at the same time greater certainty of the soundness of the core and the rate of variation of the conduetor and dielectric resistances with temperature. Should these tests prove satisfactory the core is served with jute yarn, coiled in water- tight tanks, and surrounded with salt water. The insulation is again tested, and if no fault is discovered the served core is passed through the sheathing machine, and the iron sheath and the outer covering are laid on. As the cable is sheathed it is stored in large water-tight tanks and kept at a nearly uniform temperature by means of water.

The cable is now transferred to a cable ship, provided with water- Submer- tight tanks similar to those used in the factory for storing it. The sion. tanks are nearly cylindrical in form and have a truncated cone

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Fig. 2,

Fig. 8.

1 Journ. Soc. Telegr. Eng., vol. xii, p. 495.

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|

_ more readily lifted for repairs,

_ the bottom or be free from spans.

‘ portion between the surface of the water and the bottom of the sea

lies along a straight line, the component of the weight at right

‘ = to its length being supported by the frictional resistance to sin

rate o

|| where / stands for “ function.”

Surface of the sea, dc

THELEGRAPH

fixed in the centre, as shown at C, fig. 6. The cable is carefully

coiled into the tanks in horizontal flakes, each of which is begun at The different

the outside of the tank and coiled towards the centre.

coils are prevented from adhering by a coat- ing of whitewash, and the end of each nautical mile is carefully marked for future reference. After the

cable has been again subjected to the proper electrical tests and found to be in perfect condition, the hap is taken to the place where the shore end is to be landed. A sufficient length of cable to reach the shore or the cable-house is paid overboard and coiled on a raft or rafts, or on the deck of a steam-launch, in order to be connected with the shore. The end is taken into the testing room in the cable-house and the conductor connected with the testing instruments, and, should the electrical tests continue satis- factory, the ship is put on the proper course and steams slowly ahead, paying out the cable over her stern, The cable must not be over- strained in the process of submersion, and must be paid out at the proper rate to give the requisite slack. This involves the intro- duction of machinery for measuring and controlling the speed at which it leaves the ship and for measuring the pull on the cable. The essential parts of this apparatus are shown in fig. 6. The lower end¢ of the cable in the tank T is taken to the testing room, so that continuous tests for electrical condition can be made. The upper end is passed over a guiding quadrant Q to a set of wheels or fixed

uadrants 1, 2, 8,... then to the paying-out drum P, from it to the dynamometer D, and finally to the stern pulley, over which it passes into the sea. The wheels 1, 2, 3,... are so arranged that 2,4, 6,... can be raised or lowered so as to give the cable less or more bend as it passes between them, while 1, 3, 5,... are furnished with brakes. The whole system provides the mcans of giving sufficient back-pull to the cable to make it grip the drum P, round which it passes several times to prevent slipping. On the same shaft with P is fixed a brake-wheel furnished with a powerful brake B, by the proper manipulation of which the speed of paying out is regulated, the pull on the cable being at the same time observed by means of D. The shaft of P can be readily put in gear with a powerful engine for the purpose of hauling back the cable should it be found necessary to do so. The length paid out and the rate of paying out are obtained approximately from the number

_ of turns made by the drum P and its rate of turning. This is checked by the mile marks, the known position of the joints, &c.,

as they pass. The speed of the ship can be roughly estimated

from the speed of the engines; it is more accurately obtained

by one or other of the various forms of log, or it may be measured by paying out continuously a steel wire over a measuring wheel,

he average speed is obtained very accurately from solar and stellar observations for the position of the ship. The difference between the speed of the ship and the rate of paying out gives the amount ofslack. The amount of slack varies in different cascs between three

and ten per cent., but some is always allowed, so that the cable

may easily adapt itself to inequalities of the bottom and may be Bat the mere paying out of sufficient

cable will always lie closely along Whilst it is being paid out the

slack is not a guarantee that the

ing in the water. If, then, the speed of the ship be », the f paying out w, the angle of immersion 7, the depth of the water h, the weight per unit length of the cable w, the pull on the

| cable at the surface P, and A, B constants, we have—

A ‘ P=h{w- 2 f(u-o cos i}

WO CORO BSUS T). iiaccssocrarcreeasevians ig tae eatin (B), } The factors Af (u—v cos ¢) and Bf (v sin 2) give the frictional resistance to sinking, per unit length of the cable, in the direction of the length and transverse to the length respectively.! It is evident from equation (8) that the angle of immersion depends solely on the speed of the ship; henee in laying a cable on an irregular bottom it is of great ini-

portance that the speed should be sufficiently low. This may be

illustrated very simply as follows i—suppose @ a (fig. 7) to be the the bottom, and ce the straight line made by the cable; then, if a hill H, which is at any part steeper than the inclination of the cable, is passed over, the cable touches it at

some point ¢ before it touches the part immediately below ¢, and if 1 See Sir W. Thomson, Mathematical and Physical Papers, vol. ii. p. 165.

‘every possible case of practical operations.

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the friction between the cable and the ground is sufficient the cable will either break or be left in a long span ready to break at some future time. It is important to observe that the risk is in no way obviated by the increasing slack paid out, except in so far as the amount of sliding which the strength of the cable is able to produce at the points of contact with the ground may be thereby increased, The speed of the ship must therefore be so regulated that the angle of immersion is as great as the inclination of the steepest slope passed over. Under ordinary circumstances the angle of immersion @ varies between six and nine degrees, ?

Jo stern Pulley

Qualities of depends on three qualities of the main line—(1) its conducting quality, (2) its insulation, and (8) its electrostatic capacity.

1, The conducting quality of a wire or other elongated portion of Conduet- matter is measured by the quantity of electricity which it allows to ing

a Telegraph Line.—The efficiency of the telegraph

flow through it when a stated “electromotive force,” or * difference quality. of electric potentials,” is maintained between its two ends. It may be most naturally, and is in point of fact generally, expressed in terms of resistance to transmission, regarded as a quality inverse to that of conducting power, and expressed numerically by the reci- procal of the measure of the conducting power. An independent explanation and definition of the electrical resistance of a conductor may be given as follows :—the electrical resistance of a conductor is measured by the amount of electromotive force, or difference of potentials, which must be maintained between its ends to produce a stated strength of electric current through it.

2, The true measure of the insulation of a body is the resistance Insula- to conduction offered byits supports. The reciprocal of this, or the tion. conducting power of the supports, measures the defectiveness of the _- insulation. Since no substance yet known is absolutely a non- conductor of electricity, perfect insulation is impossible. If, however, the supports on which a telegraph wire rests present, on each part and on the whole, so great a resistance to electric conduc- tion as to allow only a small portion of the electricity sent in, in the actual working, at one end to escape by lateral conduction, instead of passing through the line and producing effect at the other end, the insulation is as good as need be for the mode of working adopted. With the good insulation attained in a submarine line, round every part of which the gutta percha is free from flaws, no telegraphic operation completed within a second of time can be sensibly influenced by lateral conduction. A charge communicated to a wire thus insulated under water, at the temperature of the sea- bottom, is so well held that, after thirty minutes, not so much as half of it is found to have escaped. From this, according to the familiar ‘‘ compound interest” problem, it appears that the loss must be at the rate of less than five per cent. per two minutes.

3. In 1849 Werner Siemens proved that ‘‘when a current is sent Eleetro- through a submerged cable a quantity of electricity is retained in static

charge along the whole surface, being distributed in proportion capacity.

to the tension of each point,”—that is to say, to the difference of potentials between the conductor at any point and the earth beside it. In 1854 Faraday showed the effect of this ‘‘electrostatic charge” on signals sent through great lengths of submerged wire, bringing to light many remarkable phenomena and pointing out the “inductive” embarrassment to be expected in working long sub- marine telegraphs, In letters? to Professor Stokes in November and December of the same year, Prof. W. Thomson gave the mathe- matical theory of these phenomena, with formule and diagrams of curves, containing the elements of synthetical investigation for Some of the results of this theory are given at the end of the present article. The con- ductor of a submarine cable has a very large electrostatic capacity in comparison with that of a land telegraph wire in consequence of the Tadnetiont as of a Leyden phial, which takes place across its gutta percha

coat, between it and its moist outer surface, which may be regarded as perfectly connected with the earth,—that is to say, at the same potential asthe earth. The mathematical expres- sions for the absolute electrostatic capacity C, per unit of length, in the two cases are as follows.

Let D=diameter of the inner conductor, supposed to be that of a Submar-

circular cross section, or of a circle inappreciably less than one cir- ine line. cmnscribed about the strand which constitutes a modern submarine SS See ee ee 2 For details of cable manufacture and laying consult Douglas's Telegraph Construction, London, 1877, and Captain V. Hoskier's Laying and Repairing of Electric Telegraph Cables, London, 1878. 3 Published in Proc. Roy. Soc, for 1855.

Air line.

Stand- ards of measure- ment.

Units.

conduetor; D'=outer diameter of the insulating coat; I=specific inductive capacity of the gutta percha or other substance consti- tuting the insulating coat. Then

I w=3 log, D'/D'

In the case of a single wire of cireular section, diameter D, un- disturbed by the presence of others, and supported at a constant height # above the earth by poles so far apart as not to influence its capacity sensibly— 1

C= Tog, 4h/D"

Example 1. Ina submarine cable in which D'= 1 centimetre ;

D=0-4 centimétre ; and [=3'2— Gael _ Santas $_{2\log.D'/D}$ 2× 3979

Example 2. In a land line in which D=0°6 centimétre and

h=600 eentimetres— 1 43431

C= og, 4h/D 7-204 166″ The eapaeity, therefore, is in this case less than one-twenty-ninth of that of the submarine eable of example 1 for the same length.

= 1°75.

Telegraph Testing. Standards of Measurement.—A brief consideration of the standards

according to which the electrical qualities referred to in the last

section are measured, and the measurements to be described in this section are made, will render the statements of those qualities and quantities more definite. A complete and universally comparable system of standards for physical measurements ean be obtained by adopting arbitrarily as fundamental units those of length, mass, and time, and expressing in terms of these in a properly defined manner the units of all the other quantities. The units now adopted all over the world for electrical measurements take the eentimétre as the unit of length, the gramme as the unit of mass, and the mean solar second as the unit of time. There are two systems in use, the electrostatic and the electromagnetic. In the former the mutual forees exerted by two bodies, each eharged with static electricity, are taken as the starting-point, and in the latter the mutual forees exerted between a current of electricity and a magnet. The units according to these two systems are definitely related ; but as we deal in the present article with the electromagnetic system we give the following brief account of it only. .

The dyne or unit force is that force which, acting on a gramme of matter, free to move, imparts to it a velocity of 1 centimetre per second. Unit quantity of magnetism or unit magnetic pole is that quantity of magnetism which, when placed at a distance of 1 centi- métre from an equal and similar quantity of magnetism or a magnetic pole, repels it with unit force. Unit magnetic field is a field which, when a unit quantity of magnetism or a unit magnetic pole is placed in it, is acted on by unit foree. Unit current is a eurrent which, when made to flow round a cirele of unit radius, produces a magnetic field of 2m units’ intensity at the centre of the eircle, or acts on a

unit quantity of magnetism placed at the centre of the cirele with 27 units of force. Unit quantity of electricity is the quantity conveyed by the unit current in one second, Unit difference of potential is the difference of potential between the ends of a conductor of unit length when it is placed with its length at right angles to the direction of force in a unit magnetie field and kept moving with a velocity of 1 centimétre per second in the direction at right angles to its own length and to the direction of the magnetic force. Unit electromotive force is produced in a closed eireuit if any unit of its length is held in the manner, and moved in the direction and with the velocity, deseribed in the last section. Unit resistance is the resistance which, when acted on by unit electromotive force, transmits unit current. Unit capacity is the eapacity of a body which requires unit quantity of electricity to raise its potential by unity. The units above specified are generally referred to as the absolute C.G.S. electromagnetic units of the differ- ent quantities. In practice their magnitudes were found ineon- venient, and certain multiples and submultiples of them have been adopted as the practical units of measurement: thus the ohm is equal to 10° C.G.S. units of resistance; the volt is equal to 108 C.G.S. units of electromotive foree ; the ampere is equal to 10-1 C.G.S. units of eurrent ; the coulomb is equal to 107! C.G.S. units of quantity ; the farad is the eapacity which is charged to a volt by a coulomb, and is equal to 10-* C.G.S. units of capacity ; the microfarad is the millionth part of the farad, and is equal to 10- ©.G.S. units of capacity.

We are here chiefly concerned with the units of electromotive force, resistanee, and capacity. No universally recognized standard of electromotive foree has yet been established, but the want has been to a great extent supplied by the potential galvanometers, electrostatic voltmeters, standard cells, and other instruments devised by Sir W. Thomson and others. The work of Lord Rayleigh, Dr. Fleming, and other experimenters on the Clark and Daniell standard eells has shown conclusively that an electromotive force

can be reproduced with certainty within one-tenth per cent. of accuracy by means of either of these eells. Specimens of the standard unit of resistanee,

or ohm, made of an alloy of platinum and silver, or of platinum and iridium, have been constructed, and can be relied on, if properly taken care of, to remain very nearly accurate from year to year. Similar specimens of the standard unit of capacity or microfarad which remain very nearly constant haye been suecessfully produced. For a fuller treatment of this subject and of the methods of determining the different units, see ELEc- TRICITY, vol. viii. p. 40 sq.?

Telegraph line testing consists mostly of comparisons of the te- sistanee of the conductor and the insulator with sets of standard resistances, and of comparisons of the inductive eapaeity of the line or cable with standard condensers of known capacity. When, as is sometimes the ease, the strength of the current flowing through the line or through a particular instrument is to be determined, it is measured by an electrodynamometer, or by a current galva- nometer, properly constructed for indieating eurrents in absolute — measure. In the absence of such an instrument it may be obtained

x a resistance which can be varied,

Ga galvanometer, K asingle lever by

key, K, a reversing key, and Ba Wheat. battery. Put the zine pole of the stone’s battery to the line and adjust bridge,

the resistance x until the gal- vanometer G shows no deflexion when K, is depressed. We then ; have, assuming no electromotive ids force in the line, 2=aa,/b. Next put the copper pole to the line and repeat the test, and suppose in this case 1=ax,/b ; if these two values of 7 nearly agree the true value may be taken as 2aa%/b(x, +2). The effeet of an electromotive force in the line itself is nearly eliminated by reversing the battery.

(2) Let the battery B (fig. 9) be connected through the keys K, By direct and K and the_galvanometer G with the line 2, which has its distant deflexio,

end to the earth as before; shunt the galvanometer by a shunt s until a convenient deflexion is obtained, and then take as quickly as possible a series of readings with zine and copper alternately to the line. Next substitute for 2 a set of resistance coils and vary the resistance until the

same series of readings is obtained. The resistance introduced for the reproduction of each reading indicates the apparent resistance of the line when that reading was taken. The readings will generally differ because of the existence of a vari- able electromotive force in the line. If, however, the difference is not very great, the harmonie mean of the arithmetie mean of the

1 For the development of this important part of electrical science, see Weber, ‘‘ Messungen galvanischer Leitungswiderstande nach einem absoluten Maasse, ” in Poggendorf’s Annalen, March 1851; Thomson, ‘‘ Mechanical Theory of Electrolysis,” ‘ Application of the Principle of Mechanical Effect to the Measure- ment of Hlectromotive Force, and of Galvanic Resistances in Absolute Units,” and “Transient Electric Currents,” in Phil. Mag., 1851 and 1852; Weber, Electrodynamische Maassbestimmungen, insbesondere Zuriickfiihrung der Strom-intensitatsmessungen auf mechanischen Maass, Leipsic, 1856 ; Thomson, ‘“ On the Electric Conductivity of Commercial Copper,” ‘‘Synthetical and Analytical Attempts” on the same subject, and ‘‘ Measurement of the Electrostatic Force between the Poles of a Daniell’s Battery, and Measurement of the Electrostati¢ Force required to produce a Spark in Air,” Proc. Roy. Soc., 1857 and 1860; reprint of Reports of Brit. Assoc. Committee on Electr. Stand., &c., edited by Prof. F. Jenkin ; Thomson, Electrical Units of Measurement, a lecture delivered at Institution of Civil Engineers, 1883 ; Reports of the International Conference for the Determination of the Electrical Units, held at Paris in 1882 and 1884; A. Gray, Absolute Measurements in Electricity and Magnetism, London, 1884.

2 See A. Gray, Absolute Measurements in Electricity and Magnetism, pp. 27, 74; also T. Gray, Phil. Mag., November 1886. The following quotation from the art. TreLrarara in the 8th ed. of the Ency. Brit. shows how comparatively recent is the introduction of anything like absolute measurement in telegraph testing :—‘‘The ordinary test for insulation consists in applying a galvanic battery, with one pole to earth and the other through a galvanometer coil, to the line of telegraph of which the remote end is kept insulated. If the insula- tion of the whole line were perfcct, the galvanometer needle would stand at zero; but, when looked for with a battery of suitable power and a galvanometer of suitable sensibility,

indications of a current are always found, unless it isa very short length of very perfectly insulated line that is tested. The absolute measure of the strength of this current divided by the absolute measure of the electromotive force of the battery gives an absolute measure for the insulation of the cable. No telegraphic testing ought in future to be accepted in any de- partment of telegraphic business which has not this definite character, although itis only within the last year that convenient instruments for working inabsolute measure have been introduced at all, and the whole system of absolute measure ment is still almost unknown to practical electricians." It was put in practice systematically for the first time in 1859, in experiments by Prof. F. J enkin.

3 For this theory, see ELECTRICITY, vol. Viil. p. 44.

give nearly the truc resistance. Since the deflexions are reproduced by substituting resistances for the line, the galvano- meter zero may be off the scale to one side, and hence the total deflexion, and therefore the sensi- bility, may be made very considerable. In this case the reversing key K is re- uired for keeping the de- | exion in the same direc- tion. With a perfectly insulated battery this can be accomplished by putting the galvanometer between the battery and the key K; but the arrangement shown is safer. The most suitable galvano- meter for these tests is a dead-beat mirror galvanometer with a long enough suspension to prevent error from the viscosity of the fibre. Such an instrument is much to be preferred to the astatic form, especially when variable earth-currents are present.

(8) a highiy sensitive modification of method (2) is obtained by the use of a differential galvanometer, one coil of which is joined in – eircuit with the standard resistances and the other coil with the line. The resistances are then adjusted to balance, or to give no permanent deflexion when the battery circuit is closed. Several balances with positive and negative currents must be taken and the results combined as indicated above.

(4) When an electrometer is employed for testing insulation, as described below, it may be used for the wire resistance also either by substituting it for the galvanometer in Wheatstone's bridge method (fig. 8, G) or by that shown in fig. 10. One pole of the battery B is joined to the K R L line through the reversing key K and the resistance R, the other pole being to the earth. The electrometer Z/ is then applied to the two ends of R and to the end of J and the earth alternately and the relative deflexion noted. The deflexions should be as ncarly as possible equal; that is, R should be as nearly as possible equal to 2, The form of re- yersing key shown at K, is convenient for this test, as it allows the comparisons to be made quickly ; and, as the readings can be always taken to the same side of zero, the whole length of the scale is available for each deflexion. The key consists of two ordinary front and back stop single lever keys fixed together by an insulat- ing piece 7 at such a distance apart that the contact stops a, b and ¢, @ are at the corners of a square. Suppose one pole of the battery put to the line and the resistance R adjusted until no change of deflexion is obtained by depressing K,; then R is equal to / if there is no earth disturbance. Then put the other pole of the battery to the line ; turn the levers of K through 90° round the pivot p ; and repeat the adjustment of R for a second determination of J. Repeat these measurements several times and combine the results in the manner described in method (2). If R is not made equal to 1, the resistances are in the ratio of the corresponding deflexions.

Measurement of Insulator Resistance.—(1) In the direct deflexion _ method the connexions are the same as those shown in fig. 9, except

- that the distant end of the line is insnlated. Very great care must be taken that the galvanometer and all the connexions between it and the end of the line are so well insulated that no sensible part of the observed deflexion is due to leakage through them. In

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resistances, when zinc and copper were respectively to the line, will

ce ;

jkion making the test, first earth the line for five minutes; then, with

od, the galvanometer short-circuited, apply the zinc pole of the battery

to the line; at the end of from thirty seconds to a minute, depend- ing on the length and capacity of the line, remove the short-circuit plug; and record the deflexion at the end of every ten or fifteen seconds during the whole time (usually from ten to twenty minutes) the test is continued, Again earth the line for an interval equal to that during which the battery was applied; then apply the copper pole of the battery and repeat the readings as before. Using the deflexions as ordinates and the corresponding times as abscissa, construct a smooth curve for both the zinc and the copper test. The galvanometer constant divided by the mean ordinate of these curves at any time gives the insulation at that time. To deter- mine the galvanometer constant, substitute a high resistance R, say one megohm, for the line, and shunt the galvanometer with a shunt 8. If the deflexion under these circumstances is d and G is the galvanomcter resistance, the constant is

c=Ra ets

.

_(2) The electrometer method is only applicable to lines of con- siderable inductive capacity, but is particularly well suited for – cable testing. The battery B (fig. 11) is connected through a re-

versing key K, to the ends of the resistance slide ab, one end of

which is put to earth. The slide generally consists either of 10 or 100 equal resistances, amounting in the aggregate to from 10,000 to 100,000 ohms. The cable can be connected by means

of the reversing key K to either pair of quadrants of the electrometer £7, the slider s being at the same time put to the other pair.

To determine the constant “= of the electrometer, con- “s nect the earth wire w with s the cable terminal and the slider with contact 1, and observe the defiexion ; this should be the same for both. directions of the current

through the slide; its value multiplied by 10, when the slide is made up of ten coils, gives the value in scale divisions of the full difference of potential between the ends of the slide. This number added to the zero reading of the electrometer is called the inferred zero. To find the insulation of the cable, remove the wire w, put in the short circuit plug py, move the slider to contact 10, and, the distant eng of the cable being insulated, apply by means of K, the zine pole of the battery to the cable and the copper pole to the earth. Allow sufficient time for the cable to charge—say one minute for a cable of 2000 knots—then remove the short-cir- cuit plug and take readings every fifteen or thirty seconds, The difference of these readings from zero gives the fall of potential of the cable due to discharge through the insulating coat. Next earth the cable at both ends for a time equal to the duration of the last test, and after reversing K put the copper pole of the battery to the cable and the zinc pole to the earth and take another series of readings. Subtract these readings from the inferred zero, and, using the differences as ordinates and the corresponding times as abscissee, draw two curves. ‘To find the insulation of the cable at any interval ¢ after the battery was applied, draw a tangent to the curve at the point corresponding to that time and produce it to cut the axis of the ordinates. Let D, be the ordinate to the point of intersection, and D the ordinate at the time ¢; then, if C be. the capacity of the cable in microfarads and I its insulation in megohms,

If the difference between the reading and the inferred zero at the times ¢ and t, be D and D,, the insulation is given by the equation __*4343(t, – 0) ~ Clog D/Dy’ when ¢,—¢ is reckoned in seconds. This latter is the formula com- monly used ; it gives the insulation at some time in the interval between the two observations ; the exact time depends on the rate of ‘‘absorption ” of the cable.

The advantages of the electrometer method of testing cables are the comparative steadiness of the needle during earth-current dis- turbances, its high sensibility for the detection of small intermittent faults, and the fact that simultaneous tests can be taken from both ends of the cable. In order to test from both ends simultaneously one or other of the following methods may be adopted. Call the ends of the cable A and B, and suppose the operator at A is to be- gin the test. The operator at B joins the copper pole to the earth and the zine pole to the line, and leaves the slider of his slide re-

sistance at the earth end of the slide. Then, at a time previously arranged, he watches until he sees the electrometer begin to indi- cate a charge in the cable, and moves the slider along the slide so as to keep the electrometer near zero, As soon as the electrometer ceases to indicate increase of charge he ceases to move the slider and begins to record the deflexions at regular intervals, the first reading being taken as zero. The other method is to lcave the slider permanently to earth and keep the electrometer so insensitive that the deflexion is always within the limits of the scale. Ob- serve the time at which the electrometer begins to be deflected, and from that time onward take readings every thirty seconds during the time of the test. The mean of the readings taken at both ends, reduced to the same sensibility, should be used for calculating the insulation. This method not only eliminates the effects of earth- current disturbance but also throws light on the nature and dis- tribution of such disturbances.

When an electrometer is not available and the line is too much Fall of disturbed for good tests to be obtained by the galvanometer method, potential the following procedure may be adopted. Join the battery and the method galvanometer in series with the cable as for the direct deflexion by gal- test. Short-circuit the galvanometer and charge the cable for one vano- minute. Insulate the cable for fifteen seconds; then break the meter. short circuit of the galvanometer; again apply the battery, and take the deflexion produced by the charge. Keep the battery on the cable for fifteen seconds, and during that time take if possible the direct deflexion reading two or three times. Again insulate for

Thom- son’s capacity test.

‘Gott’s test.

De Sauty’s test.

fifteen seconds and repeat the above readings; and continue the same cycle of operations for the whole time of the test. After earthing the cable for the proper interval repeat the above test with the other pole of the battery to the cable. To reduce the charge readings to absolute measure, find the deflexion

of the gal- vanometer needle due to the charge of a condenser of microfarads capacity by the testing battery ; let d be this deflexion. Then the deflexion that would be obtained by charging the whole cable would be Cd/n, and, if D be any one of the deflexions during the test, Dn/Cd is the fraction of the whole charge which has been lost in the fifteen seconds immediately preceding this charge ; thus ya 7348. 15 aie C22 vs C2d? — n? D

The method just described takes advantage in a somewhat imper- fect manner of both the direct deflexion and the electrometer test ; but the galvanometer shonld have such a long period that the whole of the charge can take Paes before the needle is sensibly moved from its zcro position, and that the vibration of the needle must not be damped to any great extent, —a condition which renders the instrument unsuitable for direct deflexion testing.

The points with regard to the cable which should be particularly attended to when testing for insulation are—the continuity of the insulation all through the test, that is, there should be no sign of a breakdown for ever so short a time; the rate of polarization with positive and negative current is always the same in a perfect cable, but is seldoin so when a fault exists ; the absolute insulation with both currents should also be the same if the cable is perfect, but is never so for any length of time when a fault exists. If the insula- tions show any sign of being defective great care must be taken not to apply a powerful battery to the cable, unless the object is to increase or ‘‘ break down” the fault. The resistance of a fault is generally diminished by applying the zine pole of the battery to the cable and increased by applying the copper pole; but if the fault is small it sometimes happens that both currents increase the resistance. Even a very powerful battery may in such a case fail to increase the fault.

Capacity Tests.—The arrangement of the connexions for Thom- son’s capacity test are shown in fig. 12. A well-insulated battery B is connected through a reversing key K, to the slide resistance ab, and by means of a key 6 K can be put to a standard condenser C and b to the cable, or the condenser and the cable can be con- nected together and then both -put to earth through the galvanometer G by closing

the key K,. Any point in the re- sistance ab can be put to earth by means of ee the slider s, Suppose Fig. 12, the middle point put to the earth, then C and L will be charged to equal potentials but of opposite sign. If the connexions to the slide are broken and C is joined to L, the resulting charge will be zero when the capacity C is equal to the capacity L, and when K, is closed no current will flow through G. Similarly, if as is to sb as L is to C the resulting charge is zero. Hence when, after joining C to L, no deflexion is shown on G when K, is closed—

G

A modification of this test has been suggested by Mr John Gott. The condenser C is joined in series with the cable and one end of the slide is put to earth. The galvanometer G is joined from the end of the cable to the slider s and the position of the latter, which gives no deflexion, is found by successive trials, the cable being discharged and recharged between the trials. A small con- denser in the galvanometer circuit is an advantage, as it allows several adjustments to be made without discharging the cable. The most suitable instrument, however, is an electrometer, as it allows the adjustment to be made at once.

_The eapacities of condensers may be compared by charging or discharging them through a galvanometer and comparing the deflexions, or, as in De Sauty's method, b substituting them for two sides of a Wheatstone's bridge. and nding the ratio of the resistances in the other two sides; then, with the galvanometer circuit closed, the battery circuit can be closed without producing any deflexion, The galvanometer circuit must join the condensers at the same points as the bridge resistances. 'These methods are quite unsuited for telegraph-line testing because of the resistance and the inductive retardation of the line.

Tests of a Submerged Cable.—During the submergence of a cable it is necessary to provide the means of knowing at every instant

TELEGRAPH

whether it continues in perfect electrical condition, so that should Testg of any fault develop it can be at once detected and further paying out sub. It is

also of great importance that mergeq the ship and shore should be in telegraphic communication with cable,

stopped until it is removed.

each other. The arrangements made for these purposes by different electricians vary considerably ; but the general principle will be gathered from fig. 13, which includes all that is absolutely necessary for the purpose. The Cabl

principal testing sta- = tion is always on board the ship, and from it all the testing operations both on board and on shore are regulated. Referring first to the arrangements on board, B is the testing battery, = K the testing key, and = ‘« G the testing galvano- = meter; B, is the sig- “=. nalling or ‘‘speaking” 8 ”

battery, K, the key, and G, the galvanometer ; R is a resistance box and E the earth-plate—the ship’s side in this case. The battery B is connected through the key K, the resistance R, and the galvano- meter G to the cable, as for direct deflexion testing. The shore end of the cable is at the same time connected to one set of plates of a highly insulated condenser C, and (although this may be omitted) to one pair of quadrants of an clectrometer Hl. The other pair of plates of the condenser are put to earth through the signalling key K,. It is convenient also to have a second condenser O, on shore, the capacity of which can be readily varied, so arranged that its capacity can be added to that of C, by depressing the key K, and again discharged through a galvanometcr G by releasing the key. The operations are then conducted as follows. The insulation is measured on board ship, alternately with positive and negative currents of from ten to fifteen minutes’ duration, by observing the deflexion on the galvanometer G; and the reading at the end of each minute, or oftener, is recorded in adiary. The continuity of the conductor is tested at short intervals—say every five minutes— by the observer on shore depressing the key K and thus adding the capacity of C to the cable. This gives a sudden deflexion on the galvanometer G on board, and at the same time shows that the conductor is continuous and that the observer on shore is attending to his duties. When the shore key K is released, the discharge through G is indicated by a throw deflexion, the amount of which is recorded in the diary and shows the

potential to which the shore end of the cable is kept charged. When the clectrometer ZU is used, a continuous test of the potential at the shore end is obtained, and the development of a fault in the cable is at once indicated. It is convenient for this purpose to dispense with the charge in the electrometer jar and needle and conuect the needle to the pair of quadrants which are joined to the cable. The deflexion is then proportional to the square of the potential and is always to one side of zero, so that the whole range of the scale is available for the de- flexion. The tests for wire-resistance and capacity are practically the same as those already described. They are in ordinary circum- stances of much less importance than the insulation tests. The wire-resistance test is of great value, however, for giving a close estimate of the temperature of the submerged cable, and hence for giving the means of comparing the tests of the submerged cable with those of the cable previous to submersion. In laying short lengths of cable the shore station may be dispensed with and capacity tests relied on for continuity. Commiunication between ship and shore is carried on by means of the keys K,, K,, the galvanometer G,, and the batteries B,, B,. The signalling key on board the ship adds or subtracts the electromotive force of the battery B, from the testing battery, and hence varies the potential of the cable. This is shown on shore by the partial charge or discharge of ©, passing through the galvanometer G, and is interpreted in accordance with

the single needle alphabet in the ordinary way. In a similar ~

manner the signalling key on shore varies the charge of C,, and so causes slight variations of the testing-current on board the ship, which are read on the galvanometer G, and interpreted in the same way. The testing is usually suspended during the signalling ; but if the message is long an undiatann reading is taken every few minutes according to pre-arrangement.

The galvanometers used at sca require to be constructed so that Marine the rolling of the ship does not deflect the needle, either on account galvan- of its inertia and the action of gravity, or of the relative changes in ometer.

the position of the ship’s magnetism. The best form of marine galvanometer consists of two short bobbins of fine silk-covered wire placed end to end, about an eighth of an inch apart, and having their axes in the same line, with a very light mirror, carrying ce- mented to its back one or more small

magnets suspended between the two bobbins in such a way that the centre of the mirror is in their common axis. The mirror and magnet system weighs from one-half to one grain. It is suspended as shown in fig. 14 by a

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single silk fibre f, which passes through the centre of inertia of the mirror and needle system m and is fixed at one end directly to the frame F and at the other end to a light spring s. The frame F is made thin enough to slide into the opening between the two bobbins, so that the mirror can be easily taken out for adjustment when necessary. So long as the suspending fibre passes through the centre of inertia of m it is clear that no motion of translation of F can produce rotation of the mirror. When the instrument requires to be highly sensitive, as for testing purposes, it is shielded from the action of the ship's and the earth's magnetism by enclosing it in a massive iron case. For signalling pur- poses the controlling magnet is arranged to produce at the needle a field so strong that the effect of variations of external mag- netism is inappreciable.

Testing for Faults.—Numerous methods have been proposed for the localization of faults in telegraph lines, some of a complex char- acter and adapted to the cases of faults of a kind which fortunately seldom, if ever, occur. We give here a brief outlinc of the tests for the cases of most common occurrence.

For the determination of the position of a complete rupture with the conductor insulated both the insulation and the capacity tests are theoretically applicable. The insulation of a line of uniform

Fic. 14.—Marine galvano- meter,

‘th con- type and material is inversely as its length ; hence if a piece is

broken off the insulation is increased. If I be the total insulation before rupture, J, the insulation of one section after rupture, and 7 the total length of the line, the length of the section is Ii/T,, Un- fortunately it is difficult to obtain the necessary accuracy in insula- tion testing on account of the great influence of earth-currents on the result ; but apart from this there is always some uncertainty, especially in cables, as to the insulation at the break. For cables a fairly reliable test can be obtained from the capacity even when the insulation at the fault is somewhat imperfect, if it be sufficient to hold the greater part of the charge for a few seconds, since the amount of loss in any short interval can be estimated by a separate test. ‘The capacity of a uniform cable is inversely as its length ; hence, if C be the total capacity of the perfect cable and ©, the capacity of one section, the length of that section is JC,/C. When— as is almost always the case—the cable is not quite uniform in electrical quality and in temperature, a table or a curve showing the wire resistance, the insulation, and the capacity up to any point from either end should be kept for reference.

It is not at all uncommon in cables for one side of a fracture to be partially insulated through the conductor not breaking exactly at the same point as the insulator. In this case, however, the other end will be in most cases almost perfectly earthed and the position of the fault can be very nearly determined by the wire- resistance test. When both ends are partially insulated it is very difficult to obtain a near approach to the position of the fault because of the uncertainty as to which side of the break offers the greatest resistance. A first approximation is obtained by finding the wire resistance from both ends and subtracting the total wire resistance of the cable from the sum of these. This gives the sum of the resistances at the fracture, and half of this, if it is not too great, subtracted from the resistance of either section gives an approxima- tion to the resistance of that section up to the break. If, however, the resistance at the fracture is comparable to the

total wire re- sistance of the cable, this method is useless. An approach to the solution of the difficulty can be obtained from capacity tests, the cable being discharged through different resistances at the testing end. But the procedure is very uncertain and difficult, and a full discussion of it would take more space than can be afforded here. The resistance at a fault can sometimes be greatly diminished by repeated application alternately of the positive and negative poles of a powerful battery to the cable, but this should never be resorted to if it can possibly be avoided. The direct deflexion method of taking wire resistance is most suitable for these tests. The resist- ance seems to diminish gradually after the battery is applied until it reaches a minimum value, after which it again increases. This maximum deflexion should be taken as indicating most nearly the true wire resistance up to the fracture,

When jthe fault is a partial earth without fracture, and both ends of the cable are available—as in factory testing, or when a second well-insulated cable can be used—the most satisfactory method is the loop test. In this the two sections of the cable form two sides of the Wheatstone's bridge ; one pole of the battery 18 put to the junction of the other two sides and the other pole to earth, —that is, practically to the fault. The ratio of the resist- ances in the bridge when balance is obtained gives the ratio of the tesistances of the two sections of the cable, or the ratio of the Tesistance of one section to the resistance of the other section plus the resistance of the second cable. 'The total resistance of the

'whic

1i9

cable being known, it is easy to determine the position of the fault. When the fault has a high resistance it is necessary to make a cor- rection for the want of perfect insulation in the sound part of the cable. When both ends of the cable are not available, measure the potential at the testing end and the resistance between that end and the earth, and simultaneously measure, by means of a slide re- sistance and zero galvanometer or by means of a quadrant electro- meter, the potential at the distant end. Then, if V be the potential at the testing end, v the potential at the distant end, and R the re- sistance measured, the true resistance of the fault is R(1- o/V). Another

simple, although less perfect method, may be mentioned. Measure the resistance between both ends and the earth and subtract from the sum the true wire resistance of the cable; the difference is twice the resistance of the fault. The imperfection of this method, and indeed of any which involves two observations not made simul- taneously, lies in the variable character of the resistance of a fault,

TIT. Moprern TELecRapus,

The code of signals introduced by Morse is still employed in the Morse United States and Canada, and the international code in vogue in system.

Europe differs only slightly from it. Currents in one direction only are used, and different combinations of from one to four long and short contacts form the letters, while the numerals are represented by groups of five signals, and punctuation and other special signs by groups of six and sometimes more. The instruments used for land telegraphs on this system are of two types, —“sounders,” which indicate by sound, and “recorders,” which record the signals,

(1) Recorders vary in details of construction, but all have the Morse same object, namely, to record the intervals during which the current recorders.

is applied to the line. In the earlier forms of instrument the record was made by embossing lines on a ribbon of paper by means of a sharp stile fixed to one end of a lever, which carried at the other end the armature of an electromagnet. This method of recording is still largely employed in America, and certainly has the advan- tage of simplicity. The form of instrument almost universally used in Europe makes the record in ink, and hence is sometimes called the “‘ink-writer.” This method has the advantage of dis- tinctness, and so is less trying to the eyes of the operators, The action of the instrument will be understood from the annexed sketch (fig. 15). Sup- pose s to be a strip of paper is being’pull- ad towards the left by means of two rollers 7, and 79 moved by a train of mechanism. Underneath the roller 7, a small wheel ¢ is kept turning by the same mechanism, and has its lower edge in contact with the surface of ink in the ink-well w. When a current is sent through ——————$—$—$ the magnet m, the armature a ig F1¢. 15.—Morse ink-writcr, one-fourth attracted and the lever 7 lifts the ae

ink-wheel 4 into contact with the paper, against the surface of which it rolls until the current is broken, thus making a mark the length of which depends on the speed of the mechanism and the time the current flows. As the speed of the mechanism is nearly constant, the relative lengths of the marks depend only on the duration of the current. In this way the letters of the alphabet, or any other understood signs, are indicated by groups of long and short marks, commonly called ‘‘ dashes” and * dots.”

(2) Operators who use the record- aa

learn to read the message by the click against its stop, and as this is a less reading, and leaves.the hands and eyes free to write, the sound is usu- ally preferred, Thus, when it is not necessary to keep a copy, a much simpler instrument may be employed and the message read by sound. The earliest successful form was Bright’s bell sounder, which consisted of two bells of distinct tone or pitch, one of which was sounded when the current was sent in one direction and the other when | it was reversed. This instru- ment was capable of giving very considerable speed, but it was more complicated than that now in use, which consists only of an electromagnet, with its armature lever arranged to stop

of the fatiguing method of

})

icc NT NN

Frc. 16.—Morse sounder, one-fourth full size.

y ing instrument soon Morse armature sounders.

rods M, M,, the one as much in front of the other as there is space between two successive holes in the perforated ribbon. To the other ends of A, B rods H, Hy, are loosely hinged, their ends passing loosely through holes in

the ends of the bar P, which is fixed to the divided disk D. By means of two collars K, K, and the wheel W, the disk D is made to oscillate in unison with the beam E.

The cranks C and C, are connected with the poles of the sending <_< R

Chemical tele- graphs. autographic telegraphs of Meyer, Lenoir, Sawyer, and others ; and + the autographic typo-telegraph of Bonelli. The oe of action | battery B. The operation is as follows. The paper ribbon R is of these instruments is this. Suppose two metallic cylinders, one | moved forward by its centre row of holes at the proper speed above at the sending and the other at Phe receiving station, to be kept | the upper ends of the rods M, M,; should there be no hole in the revolving synchronously, and suppose the axis of each to be | ribbon it pushes the crank A or B out of contact with the pins p, p threaded with a fine screw so that as it revolves rapidly it has a | and prevents a current passing to the line. Should, however, a slow side motion. Wrap round the cylinder at the sending station | row of holes, like group 1 above, be perforated, the rod M, will first a ribbon of tinfoil, or paper covered with a conducting coating, on | be allowed to pass through the paper and copper will be put to the which the message is written in varnish or some other insulating | line ; at the next half stroke of the beam, M will pass through, and substance. Suppose also a ribbon of paper which has been soaked | as the disk D reverses the battery zine will be put to the line. in iodide of potassium to be wrapped round the cylinder at the | Thus for a dot first a positive and then a negative current are sent receiving station. Cause a stile, as in the Bain telegraph, to press | to the line, the effect of the positive current continuing during the on each cylinder and set it in motion. It is evident that so long | time required for the paper to travel the space between two holes. as the stile at the sending end presses on the clean foil the stile | Again, suppose groups 3 and 4 to be punched. The first part will at the receiving end will continue to make a brown mark, but that | be, as before, copper to the line ; at the next half stroke of the beam when it passes over the varnish the mark will be interrupted. In | M will not pass through, as there is no hole in the paper; but this way, as the two cylinders revolve and move sideways, the series | at the third half stroke it passes through and zinc is put to the of interruptions made at the receiving end form an exact copy of | line. Thus for a dash the interval between the

positive and the the varnish marks at the sending end. These instruments are at | negative current is equal to the time the paper takes to travel over present but little used. twice the space between two successive holes. Hence for sending Auto- It has been found possible to make the Morse ink-writer so sensi- | both a dot and a dash reverse currents of short duration are sent matic _ tive that it can record signals sent over land lines of several hundred-| through the line, but the interval between the reversal is three tele- miles in length very much faster than they can be transmitted by | times as great for the dash as for the dot. In the receiving instru- graphs. hand, and this has led to the adoption of automatic methods of | ment the electromagnet is so constructed that the armature, if transmission. One was proposed by Bain as early as 1846, but it | pulled into any position by either current, remains in that position, did not come into nse. That now employed is, however, practically | whether the current continues to flow or not, until a reverse current a development of his idea. It consists in punching, by means of | is made to act on the magnet. For the dot the armature is de- “a puncher,” a series of holes in a strip of paper in such a way that, | flected by the first current, the ink-wheel being brought into con- when the strip is sent through another instrument, called the | tact with the paper and after a short interval pulled back by the ‘‘transmitter,” the holes cause the circuit to be closed at the | reverse current. In the case of the dash the ink-wheel is brought proper times and for the proper proportionate intervals for the | into contact with the paper by the first current as before and is message to be correctly printed by the receiving instrument or | pulled back by the reverse current after three times the interval. recorder. The most successful apparatus of this kind is that | The armature acts on an inking disk on the principle described devised by Wheatstone ; others have been introduced by Siemens | above, save only that the disk is supplied with ink from a groove and Halske, Garnier, Humaston, Siemens, and Little. in a second wheel, on which it rolls: the grooved wheel is kept Wheat- In Wheatstone’s automatic apparatus three levers are placed side | turning with one edge in contact with ink in an ink-well. By this stone’s by side, each acting on a set of small punches and on mechanism | method of transmission the battery is always to the line for the auto- for feeding the paper forward a step after each operation of the | same interval of time, and alternately with opposite poles, so that matic levers. The punches are arranged as shown in fig. 17, and the | the effect of electrostatic induction is reduced to a minimum. system. levers

are adjusted so Through the instrumentality of this method as many as 400 words

that the left-hand one moves @, 6, cand punches

per minute have lately been transmitted by Mr Preece between London and Newcastle, a distance of 278 miles.

a row of holes across the paper (group 1 in the figure), the middle one moves donly and punches a centre hole (2 in the figure), while the right-hand one moves a, },

The first considerable improvement on the House type-printer, Hughes's referred to above, was made by D. E. Hughes of Kentucky in 1855. type In the Hughes instrument (see fig. 19) two trains of clockwork printing mechanism, one at each end of the line, are kept moving synchron- tele- ously by powerful spring governors. Each instrument is provided graph.

The whole of

d, eand punches four holes (3 and 4 in the figure). this operation represents a dot and a dash or the letter "a." The side rows of holes only are used for transmitting the message, the centre row being required for feeding forward the paper in the transmitter. The perforation of the paper when done by hand is usually performed by means of small mallets, but at the central telegraph office in London the keys are only used for opening air-valves, the actual punching being done by pneumatic pressure. In this way several thicknesses of paper can be perforated at the same time, which is a great convenience for press work, since copies of the same message have often to be transmitted to several newspapers at the same time. The mode of using the paper ribbon for the transmission of the message is illustrated in fig. 18. An ebonite beam E is rocked up and down rapidly by a train of mechanism and moves the cranks A and B by means of two metal pins y, py. A and B are in metallic contact with each other through the springs s, s, and they carry two light vertical

with a key-board, resembling that of a small piano, the key levers of which communicate with a circular row, R, of vertical pins. A horizontal arm A

fixed to a vertical shaft in gear with the mechan- ism sweeps over these pins at the rate of from one to two turns per second. When a key is depressed, slightly raising one of the pins, the battery is put to the line for a short time at that part of the revolution by means of a sledge S carried by the horizontal arm. The current thus sent to the line may be made either to act directly on the printing instrument or to close a local circnit by means of a relay. For simplicity we will suppose direct action. The current then passes through the coils of a powerful electromagnet M, which relieves the printing mechanism. The electromagnet consists of two coils each containing a soft iron core of the same length as the coil. These cores rest on the ends of the two arms of a powerful horse-shoe permanent magnet, and thus become strongly polarized by induction. A soft iron armature is placed across the free ends of the soft iron cores and is pulled by a strong spring, the tension

of which is adjusted so as to be nearly equal to the magnetic attrac- tion. The current is sent in the proper direction to diminish the power of the magnet and allow the spring to preponderate. A very powerful action is thus obtained by means of a very small current, the actual work being done by motive-power in the instrument itself. After the letter is printed the mechanism short-circuits the

magnet and replaces the armature automatically. The printing The type-wheel W is carried round continu-

action is as follows.

‘** American combination printing telegraph,” because it embodied part of Hughes’s and part of House’s instruments. With this modified form somewhat greater speed was obtained, but it was found difficult to drive, requiring the use of steam or some such motive-power. In a subsequent modification introduced in 1875 an electromotor is applied to drive the printing mechanism. This allows a shorter train and stronger wheelwork to be used, secures more certain action, and involves less risk of derangement.

Hughes’s form was taken up by the French Government in 1860, and is still very largely in use in France.

Stock and private line telegraphs Stock constitute an important class of instru- tele- ments, of which Laws’s ‘‘gold indi- graphs.

=

TTL TL

Fia. 19.—Hughes’s type-printing instrument, one-tenth full size.

ously by the clockwork, to which it is attached through a friction sleeve which allows it to be stopped, and pushed backward or for- ward without stopping the mechanism. Another shaft carrying three cams is arranged so as to be locked into gear with the wheel- work when the armature leaves the poles of the magnet. The cams then come into action in rotation ; the first moves the adjustment lever, shown to the left of W in the figure, which pushes a wedge- shaped piece into the teeth of the yagi and adjusts it exactly to the proper position for printing ; the second cam presses the paper against the type ; the third moves forward the paper ; a fourth cam replaces the armature of the magnet and relieves the cam shaft, leaving the instrument ready to receive another letter. The whole of this operation occupies only a small fraction of a second. By means of the adjustment lever or ‘‘ corrector ” 7 every error in syn- chronism decidedly less than half the space from letter to letter is perfectly corrected each time an impression is made. Thus, during the time the receiving instrument at one station is in use, its type- wheel is kept in perfect agreement with the sending wheel at the other station ; and, if the electric action keeps time, a wrong letter cannot be printed unless the rate of the clockwork is at fault by some such amount as one or two per cent. If the two wheels are allowed to run a long time without the electric maintenance of agreement, they will be found more or less at variance, as the pieces of clockwork, however good, cannot be perfect. All that is necessary to bring them into agreement again is to strike several times the key corresponding to a prearranged adjustment signal— that corresponding to the dot type, forinstance. The receiver knows (according to the regulated system of working) that it is adjustment, not message, that is being sent; and he turns his type-wheel by hand till it prints

dots. He then signals back ‘O.K.” (‘All correct !”) and is ready to receive the message. If by any accident his type-wheel gets on a wrong letter in the course of a message, he disturbs the sender (who all the time sces the effect of his sending printed before his own eyes) by sending back a few currents on him ; he receives dots by way of acknowledgment, and resets his

cator,”’ introduced in 1866, may be taken as the forerunner. A brief description of Calahan’s stock telegraph, introduced in 1867, will give a general idea of the action of this class of instruments. The printing mechanism consists of two type- a wheels, on the edge of one of which are the letters of the alphabet and on the edge of the other the numerals from 1 to 9 and fractions by eighths up to unity. The type-wheels are placed side by side, but can be turned independently of each other. Beneath them a platen is carried on one end of a lever, whose other end is attached to the armature of an electro- magnet. Between the platen and the wheels a ribbon of paper broad enough to cover the edges of both wheels is passed. The instrument is worked by three lines of wire, one for driving each type-wheel and one for printing and feeding the paper forward. The movement of the type-wheel is accomplished by an escapement acted on by closing and opening the circuit of an electromagnet. For the convenience of the-sender the transmitting instrument is made in the form of two dials, each resembling the dial of an A B C instrument, round the edge of one of which letters are printed,and round the other thenumerals and fractions. Mechanism is provided for opening and closing the circuit, so that by turning a handle (fixed to an axis passing through the centre of the dial) until an index attached to it points to the letter which is to be printed, the type-wheel of the receiving instrument is in the proper position to print that letter, and this is accomplished by depressing a key and closing the third circuit. The printing magnet then raises the platen and presses the paper against the type. Suppose direct United States telegraph stock is to be reported and the price is 93. The operator turns the index on the letter dial to D and presses the printing key; he next turns the index to period and again presses the printing key ; he then turns in succession to U, to period, to S, to period, and prints these; then he turns the index on the figure dial to 9 and prints it, lastly to 3 and to period, and prints them, The quotation then reads on the paper ribbon D. U. S. 93.

Various modifications of this instrument have since been intro- duced. In one form, the ‘‘universal stock printer,” two lines of wire are required, and both type-wheels are driven by one wire, the printing magnet being made to change the action from one wheel to the other when the wheels are brought into a particular position. In another, ‘‘Phelps’s stock printer,” only one line of wire is required, a polarized armature being used for moving the type-wheels and an ordinary neutral armature for the printing. The rapid reversals which work the polarized armature do not last long enough to move the printing lever, but when a pause is made the printing mechanism is relieved and a letter printed. This instrument is similar in principle to the House apparatus and is capable of working at a considerable speed.?

Cowper’s writing telegraph is designed to record the message in Cowper’s written characters ; its arrangement is as follows :—Two lines of writing wire are connected, one with each of two small resistance slides, tele- which are placed in such a way that the sliders move in the same graph.

type-wheel to print correctly. This system of telegraphic printing has a great advantage over the step-by-step system in using con- tinuous instead of intermittent currents, and so avoiding the neces- sity for the rapidly acting clectrie escapement, which, however skil-

fully planned and executed, is always liable to failure when worked too rapidly. In Hughes’s instrument almost perfect accuracy and certainty have been attained ; and in actual practice it has proved to be decidedly superior to all previous type-printing telegraphs, not only in speed and accuracy, but in less liability to mechanical derangement from wear and tear and from accident. It involves many novel features: the receiving electromagnet is of peculiar construction and remarkable efficiency ; the transmitting apparatus has a contrivance to prevent unintentional repetitions of a letter through the operator holding his finger too long on a key ; the type-wheel has a lock for each station, to be opened by its own key, one of the letter keys of any of the instruments in the circuit. This instrument was for some years extensively used in the United States, until superseded by G. M. Phelps’s modification of it, known as the

plane but in directions at right angles to each other. A pen placed at the point of intersection of the lines of motion of the two sliders is connected

with them in such a way that, when it is moved, as in the act of writing, each slider takes up that component of the motion which is in the direction in which it is free to move. The sliders thus vary the resistance in the line circuits by an amount proportional to the motion of the pen, and when a battery is kept joined in the circuit the current varies in the same way. The current is passed through the coils of two electromagnets at the receiving end, each capable of giving motion to a pencil in one line, at right angles to the direction of motion of the other. When the pen at the sending end is moved as in the act of writing a message

1 For these and other type-printing instruments, see Prescott's Electricity and the Electric Telegraph.

the pencil at the receiving end moves in a corresponding manner on aeeount of the variations of the current, and in this way it writes the message on a slip of paper moving beneath its point. Methods of Working Telegraph Circuits.—(1) The arrangement on the open cireuit system for single-current working is shown in fig. 20, in whieh L, represents the line, G a simple form of galvanoseope, used simply to show ue wie that the currents are going to line when the message is being transmitted, K the transmitting key, B the battery, I the re- ceiving instrument, and E the earth- plate. The eomplete cireuit is from the plate E through the instrument I, the key K, and the galvano- scope G to the line L,, then through the eorresponding instru- ments to the earth-plate E at the other end, and baek through the earth to the plate E. The earth is always, exeept for some special reason, used as a return, beeause it offers little resist- anee and saves the expense and the risk of failure of the return wire. The earth-plate E ought to be buriéd in moist earth or in water. In towns the water and gas pipe systems form exeellent earth-plates. It will be observed that the circuit is not in this ease aetually open; the meaning of the expression "open eircuit" is 'no battery to line." Under normal eireumstances the instru- ments at both ends are ready to reeeive, both ends of the line being to earth through the receiving instruments. A signal is sent by depressing the key K, and so changing the contact from a to }, and thus putting the battery to line. On eireuits where

the traffie is small it is usual to make one wire serve several stations. The eonnexions at an intermediate or wayside station are shown at W. S is a switeh, eonsisting of three bloeks of brass fixed to an insulat- ing base. W may be made the terminal station of L, by inserting plug 3, and of L, by inserting plug 2, or the instruments may be eut out of cireuit by inserting plug 1.” In ordinary eircumstances the messages from all stations are sent through the whole line, and thus the operator at any station may transmit, if the line is free, by manipulating his key. The greatest inconvenience of this system arises from the varying strength and resistance of the batteries used at the different stations. As, however, delicate reeording instruments are seldom required on such eircuits little difficulty is experieneed. Positive (2) The connexions for positive and negative current or single- and nega- needle working on open cireuit are shown in fig. 21, in which all the tive letters have u L current, the same meanings as _ before. But N is a single needle instru- ment, and K is a reversing A The evers 1 and 2 press against oy the stops a when the line is free ; hence the line is to earth at both ends. But, if lever 1 is depressed, one pole of the battery is put to line; if 2 is depressed, the other pole is put to the line. In this way the needles of the reeeiving instrument may be made to turn to either left or right ; and, if we eall a motion to the left a dot and a motion to the right a dash, the Morse alphabet may be read from these motions. he connexions for wayside stations are illustrated at W, and will be readily understood from the descrip- tion given under single-eurrent working above.

(3) When the line eonsists in whole or in part of underground or submarine eable the capaeity eauses a very considerable diminu- tion in the speed of working. This is to some extent got over by putting the earth eon- nexion in the middle of the bat- tery and us- ing double the number of eells, as shown in fig. 22. The stop a of the key K is eonneeted

Open circuit, single- current system.

Double current.

Fig. 22,

through a switeh S with one pole of the battery B, and the stop d

in the usual way with the other pole. Suppose the arm ¢ of the switch S to be in contaet with 2; then when the key is mani-

pulated it sends alternately positive and negative currents into the line. If the positive is ealled the signalling current, the line will be charged positively each time a signal is sent ; but as soon as the signal is eompleted a negative charge is eommunieated to the line, thus hastening the diseharge and the return of the relay lever fo its insulated stop. This method of working has been already referred to in eonnexion with Wheatstone's automatie system.

The connexions for single-current working on this system are Closeq illustrated in fig. 23. It differs from the open cireuit in only requir- cireyit ing one battery (although, as L ad te system,

coc & °

in the figure, half of it is often plaeed at each end), in having the receiving instrument be- tween the line and the key, and in having the battery con-2 tinuously to the line. The o battery is kept to the line by the bar c, which short-cireuits the keys. When signals are to be sent from either station the operator turns the bar c out of contact with the stop 0, and then operates precisely as in open eir- euit sending. This system is more expensive than the open cireuit system, as the battery is always at work; but it offers some ad- vantages on eireuits where there are a number of intermediate stations, as the circuit is under a constant eleetromotive force and has the same resistanee no matter whieh station is sending or receiving. The arrangement at a wayside station is shown at W. When the circuit is long and contains a large number of stations,

the sending battery is sometimes divided among them in order to

ive greater uniformity of current along the line. When only one Pathan is used the current at the distant end may be considerably affected by the leakage to carth along the line.

In working long cireuits with ordinary instruments inconven- Relay iently high battery power is required in order to send sufficient working. current to produce the signals. In sueh eases it is usual to employ a loeal battery to produce the signals and to close the local battery circuit by means of a delicate circuit-closing apparatus ealled a relay, whieh is a very delicate electromagnetie key having its lever attached to the armature of the magnet. The arrangement ata station worked by relay is shown in fig, 24, where L is the line of

. t

wire, joined through sh —

&

the key K to one end_t of the coil of the relay magnet R, the other end of whieh is put to earth. When a current passes through R the armature A is attraeted and the loeal cireuit is elosed through the armature at 6. The local battery B, then sends a current through the instrument Iand records the signal. In the form of relay indicated in the figure the armature is held against the stop a by a spring S. In some eases—as, for example, in Siemens's polarized relay, shown in fig. 25—the armature a is put in contact through the pivot h with one pole N of a permanent magnet m, the other pole s of whieh is fixed to the yolk y of a horse-shoe eleetromag- net M. The armature is placed between the poles of the eleetromagnet, a little nearer one pole than the other, so that the magnetic attraetion holds the eon- @ taet lever against the insulated stop without the aid of a spring. This form of relay only answers to currents in one direction, but it is capable of giving great sensibility, and for some pur- poses—for instance, in some methods of quadruplex working—its directional eharaeter is an advantage.

Translation.—In a precisely similar manner a relay may be made Transla- to re-transmit automatically the message over another line, or, what tion. is the same thing, over a continuation of the same line when the whole length is too great for direct working. It is not usual in practice to employ the delieate receiving relay for re-transmitting the message, but it is made to work a coarser instrument, whieh takes the plaee of the sounder, or, it may be, the sounder itself, in the loeal cireuit. It is clear that one reeeiving relay may be

used to work a number of re-transmitting keys in the same local eircuit, and henee to distribute a message simultaneously over 4 number of braneh lines from a eentral station.

Duplex, Quadruplex, and Multiple Telegraphy.—Duplex tele- Duplex. graphy consists in the simultaneous transmission of two messages,

Fic. 25.—Siemens's polarized relay.

one in each direction, over the same wire. The solution of this problem was attempted by Gintl of Vienna in 1853 and in the following year by Frischen and by Siemens and Halske. Within a few years several methods had been proposed by different inventors, but none were at first very successful, not from any fault in the principle, but because the effect of electrostatic capacity of the line was left out of account in the early arrangements. The first to introduce a really good practical system of duplex telegraphy, in which this difficulty was sufficiently overcome for land line purposes, was J. B. Stearns of Boston (Mass.). In order that the line between two stations S, and S, may be worked on the duplex system it is essential that the receiving instrument at S, shall not be acted on by the currents sent into the line at S,, and similarly that the currents sent into the line at S, shall not act on the receiving instrument at S,, while at the same time these currents must act on the instruments at S, and S, respectively. The two methods most commonly employed arc the following. t

(1) In fig. 26 Bis the sending battery, B, a resistance equal to that of the battery, R a set of resistance coils, and C a condenser, _ Suppose the key at

station 8, to be de- (ei) pressed ; then a cur- ! rent flows into the line through cir- cuit 1, and to earth | through circuit 2. Now, if both these currents pass, as in- dicated in the fig- ure, round the elec- tromagnet of the receiving _instru- ment, but in opposite directions, and if their strengths are pro- perly adjusted, no effect will be produced on that instrument. At station S,, however, the current flows to earth, partly through cir- cuit 1 and partly through circuit 2, but in the same direction round the coils of the receiving instrument. Hence, if the current is strong enough, the receiving instrument

at S, will be set in action. Similarly the depression of the key at S, can be made to produce a signal at S, and yet have no effect on the instrument at S, The necessary and sufficient condition is that the currents in circuits 1 and 2 at the sending station shall at all times bear a certain fixed ratio to each other, depending on the coils of the receiving instrument at that station. If for simplicity we suppose the resist- ance of the line to be constant and not to be affected by the trans- mitting apparatus, and to be of zero electrostatic capacity, the fixed ratio may be obtained by adjusting R in the auxiliary circuit 2. In actual practice the line has capacity, and this is com- pensated for by supplying to R from the condenser C capacity equivalent to that of the line. C should be of such a form that the capacity in the circuit can be varied, and it must have the same inductive retardation as the line; that is to say, the capa- city must be distributed along the resistance R in a manner equi- valent to that in which the capacity of the line is distributed along its resistance. A rough approximation to this adjustment will answer the purpose for ordinary land line working, but for submarine cable work a very accurate adjustment is necessary. In order that the manipulation of the key may not affect the resist- ance of the line, the resistance between the point D and E should be as nearly as possible the same for all positions of the key. This implies that the keys shall not at any time break circuit, nor make contact on both the front and the back stops for more than an instant, for an instantaneous break of the circuit would affect the signals being received from the other station. The principle of the ‘‘continuity preserving key,” used for duplex working, will be understood from the figure. So long as the key is not depressed the line is kept to earth through the resistance B, ; when the key is pushed down it suddenly changes to the battery B, being at the transition in contact with both B and B, This produces very little disturbance, because the key is moving quickly at that part of its stroke, and the resistance of the line and receiving instru- ment is generally much higher than that of B,. This is called the “differential method.” The principle was first enunciated by Frischen ; but its present condition is the result of the labours of a large number of experimenters, among whom may be mentioned Siemens and Halske, Stark, Edlund, Gintl, Nystrom, Preece, Nedden, Farmer, Maron, Winter, Stearns, and Muirhead.

(2) The second method to which we may here refer is known as the “‘bridge method” from the similarity of the arrangement (see fig. 27) to that of the

Wheatstone bridge. Instead of sending the currents in the two branches of the divided circuit DP and DQ through the two coils of a differentially wound relay or receiving instrument, as in Frischen's method, two resistances a and 0 are inserted and the instruments are joined between P and Q. It is clear that if the difference of potential between P and Q is unaffected by closing the sending key K no change of current will take place in the instrument circuit. The relative potential of P and Q is not

affected by the manipulation of K if the resistance a is to that of b as the resistance of Lis to that of R; hence that is the arrange- ment used. The same remarks with regard to retardation and

capacity that were made when describing the differential method apply here also. Oue very great advantage in this method is that the instrument used between P and Q may be of any ordinary form.

Most important cables, such as those of the Eastern Telegraph Company and the various Atlantic cables, are worked duplex on Muirhead's plan. What may be called a mechanical method of duplexing a cable was described by Sir W. Thomson in a patent taken out by him in 1858. In this, as in the ordinary methods, a differentially wound receiving instrument was used, one coil being connected with the cable and the other with the earth; but it differed from other methods in requiring no ''artificial" or model cable. The compensation was to be obtained by working the slides of a resistance slide included in the circuit of the compensating coil, either by the sending key or by clockwork relieved by the key, so as to vary the resistance in that circuit according to any law which might be required to prevent the receiving instrument bein affected by the outgoing current. 'Four years later Varley pabantol his model cable, which was the first near approach to a successful solution of the duplex problem on the principle now adopted. It was not, however, a sufficiently perfect representation of a laid cable to serve for duplexing cables of more than a few hundred miles in length.!

By an interesting modification of the bridge method, which has been applied with excellent results by Dr Muirhead to submarine work,

condensers are substituted for a and 8, one being also placcd in the circuit between P and Q. In this case no current flows from the battery through the line or instruments, the whole action being inductive. As we have already stated, the distribution of the capacity along the resistance R must in submarine cable work be made to correspond very accurately with the distribution of the capacity along the resistance of the cable. This is accomplished by Dr Muirhead in the following manner. One side of a sheet of paraffined paper is covered with a sheet of conducting substance, say tinfoil, and over the other side narrow strips of the same sub- stance are arranged gridironwise to form a continuous circuit along the strip. The breadth and thickness of the strip and the thick- ness of the paraffined paper are adjusted so that the relative resist- ance and capacity of this arrangement are the same as those of the cable with which it is intended to be used. A large number of such sheets are prepared and placed together, one over the other, the end of the strip of the first sheet being connected with the beginning of the strip of the second, and so on to the last sheet, the whole representing the conductor of the cable. In the same way all the conducting sheets on the other side of the paper are connected together and form the earth-plate of this artificial cable, thus representing the sea. The leakage through the insulator of the cable is compensated for by connecting high resistances be- tween different points of the strip conductor and the earth coating. Faults or any other irregularity in the cable may be represented by putting resistances of the proper kind into the artificial line. This system of duplexing cables has proved remarkably successful.

Quadruplex telegraphy consists in the simultaneous transmission Quadru- The only new problem plex.

of two messages from each end of the line. introduced is the simultaneous transmission of two messages in the same direction ; this is sometimes called “diplex transmission.” The solution of this problem was attempted by Dr J. B. Stark of Vienna in 1855, and during the next ten years it was worked at by Bosscha, Kramer, Maron, Schaak, Schreder, Wartmann, and others. The first to attain success was Edison, and his method with some modifications is still used. One of the latest arrangements is shown in fig. 28, a brief description of which will indicate the general principle involved. K, and Ky are two transmitting keys the nature of which will be understood

from the illustration ; R, and R, are two differentially wound polarized relays, both of which are supposed to respond to positive currents and to be held against their back-stops by negative currents. When neither key 1s de- pressed a current, which for convenience we call—4, flows to the line ; this is sufficient to overcome the pull of the spring T in the relay R, (the receiving instruments are supposed to be at the other end of the line), and hence the levers of both relays are held against their back-stops. When K, is depressed a current — 1 is sent to the line, and, this being too weak to overcome the spring T, the lever

1 See De Sauty, Journ. Soc. Tel. Eng., vol. ii., 1873.

of R, moves into contact with the auxiliary lever 7 and closes the circuit of the sounder S;. When K, only is depressed a current +4 is sent to the line. This acts on both relays, but is powerful enough to overcome the pull of the spring T, and so to move the lever 2 and break the cir-

cuit of the siphon _re- sounder 8, be- corder and a fore it has time mirror galva- to act. Thus nometer, are K, acts on the shown; one

sounder 8, but not on the sounder 8,. When both keys are depressed a current +1 is sent into the line. This is sufficient to move the lever of R, into con- tact with 7 but not to overcome the pull of T,, and hence the circuit of sounder S, is closed ; it is also sufficient to move the lever of R, and close the circuit of S,. When therefore both keys are down the sounders §, and §, at the other end of the line are both set in action ; the first responds to K, and the second to K,. Thus all the conditions for re simultaneous transmission of two messages are provided for. It is not necessary to enter again into the ques- tion of continuity at the different positions of the keys. The figure illustrates how this diplex system may be duplexed, and hence how quadruplex working can be obtained. It is only necessary to wind the coils of the relay magnets differentially, when, by means of a precisely similar arrangement to that used for simple duplex, the instruments at the sending station are left unaffected by the out- going currents, but are

affected by the incoming currents. The method here indicated is on the differential principle; but it is scarcely necessary to say that the bridge method is equally a cable. A combination of the bridge and the differential methods has been used by Prescott and Smith, and possesses some advan- tages in certain cases. It is impossible in this article to go into the great variety of detail in arrangement and method with which it is possible to obtain good results.

The several methods that have been proposed for the transmission of a number of messages in one direction ou the same wire are reducible to two classes. In one the time which a revolving con- tact slider takes to make one revolution is divided into as many intervals as there are sets of sending and receiving instruments on the line, and by means of it the current is closed through the different sets of apparatus in succession. This implies the syn- chronous movement of the revolving sliders at the two ends of the linc. Ina sense this may be said to be simultaneous transmission : all the messages are being sent at the same time, but the progress of any one message is slower than it would be if it alone was occupy- ing the whole line in the ordinary way. The method possesses some

resistance S, three condensers C,, C2, C3, an artificial cable AC, the receiving instruments I and G, and one or more resistances R for adjusting the leakage current. The peculiar construction of AC has been already referred to. The conductor of the cable is practi-

cally insulated, as the condensers in the bridge have a very high resistance ; hence no appreciable current ever flows into or out of Cable

SSSI

the line. Two receiving 1n- struments, a

only is abso- lutely neces- = sary, Pub cbs is convenient to have the

Fig, 29. galvanometer ready, so that in case of accident to the recorder it

may be at once switched into circuit by the switch s. When one of the levers of K is depressed, the condenser C, and the cable, and the condenser C, and the artificial cable, are simultaneously charged in series; but, if the capacity of C, bears the same pro- portion to the Sa ays of the cable as the capacity of C, bears to the capacity of the artificial cable, and if the other adjustments are properly made, no charge will be communicated to C,. After a very short interval of time, the length of which depends on the inductive retardation of the cable, the condensers corresponding to C, and C, at the other end begin to be charged from the cable, and since the charge of C, passes through the receiving instrument I or G the signal is conn The charging of C, at the receiving end will take place, no matter what is the absolute potential of the condensers, consequently the incoming signals are not affected by those which are being transmitted from that end. In actual prac- tice the receiving instrument is so sensitive that the difference of potential between the two coatings of the condenser C, produced by the incoming signal is only a very small fraction of the potential of the battery B. When the key is relieved the condensers and cables at once begin to return to zero potential, and if the key is depressed and relieved several times in rapid succession the cable is divided into sections of varying potential, which travel rapidly towards the receiving end, and indicate their arrival there by pro- ducing corresponding fluctuations in the charge of the condenser Oy, All cables of any great length are worked by reverse currents, the single needle alphabet being used: that is to say, currents in one direction indicate dots and in the other direction dashes.

The following descriptions of the mirror galvanometer and the siphon recorder are, with some slight alteration, taken from a lecture delivered by Sir W. Thomson before the Institution of Engineers and Shipbuilders in Scotland.4

advantages when the line is capable of being worked at a higher speed than a single operator can attain, or when one of the stations can advantageously be used as a distributing station, for in that

(1) The instrument first used for receiving signals through a long Mirror submarine cable (the short-lived 1858 Atlantic cable) was the mirror

galvano- galvanometer,® which consisted of a small mirror with four light meter,

Con- nexions.

case one set of apparatus may be used as an automatic distributor. Multiple telegraphy on this plan was proposed by Thomson in 1858.” A very complete set of a paratus for the purpose was shown by Meyer at the Vienna exhibition of 1873.2, Delaunay’s multiple telegraph is the most recent development of the system, and has been lately adopted on some circuits in Great Britain.?

In the other class there are joined to the two ends of the line of wire a number of branch circuits, in each of which a set of trans- mitting and receiving apparatus isincluded. In the circuit, between the line and each of the sending keys, an electromagnetic vibrator is placed so as to open and close the circuit a great number of times during each signal. The vibrators in the key circuits at one end of the line have all different and, if possible, relatively incommen- surable periods. The receivers at the other end of the line consist of a corresponding set of electromagnetic vibrators, mounted on Tesonators and having exactly the same vibrational periods as those in the key circuits at the sending end. When any one of the keys 1s manipulated the currents sent into the line have such a pulsatory character that they only affect the receiver, which is capable of vibrating freely in unison with these pulsations. When a number of keys are manipulated at the same time the receivers analyse the resultant wave, each picking out its own component, thus separ- ating the different messages. The ‘harmonic telegraph” of Mr Hlisha Gray of America is a good example of this class.

Working of Submarine Cables.—The arrangement of the apparatus for working some of the most recent cables is shown in fig. 29. The cable is supposed to be worked duplex ; but, if 8, Cj, Cy, and AC are removed and the key connected directly with C3, the arrange- ment for simplex working is obtained. The apparatus consists of a sending battery B, a reversing transmitting key K, a slide of small

1 Tel. Jowrn., September 1886.

2 For a description, see Prescott's Electric Telegraph, . 862. 3 Preece, Journ. Soc. Tel. Eng., vol. xv. p. 231. aed i

magnets attached to its back (weighing-in all less than half a grain), suspended by means of a single silk fibre within the hollow of a bobbin of fine wire,—a suitable controlling magnet being placed adjacent to the apparatus. The action of the instrument is as follows. On the passage of a current of electricity through the fine wire coil the suspended magnets with the mirror attached tend to take up a position at right angles to the plane of the coil, and are deflected to one side or the other according as the current is in one direction or the other. Deflexions to one side are interpreted as dots and to the other side as dashes, and the messages are trans- mitted in accordance with the international Morse code of signals.

(2) The spark recorder in some respects foreshadowed the more Spark perfect instrument—the siphon recorder—which was introduced recorder.

some years later. Its action was as follows. To an indicator, suitably supported, a to-and-fro motion was given by the electro- magnetic actions due to the electric currents constituting the signals. The indicator was connected with a Ruhmkorff coil or other equivalent apparatus, designed to cause a continual succession of sparks to pass between the indicator and a metal plate situated beneath it and having a plane surface parallel to its line of motion. Over the surface of the plate and between it and the indicator there was passed, at a regularly uniform speed, in a direction per- pendicular to the line of motion of the indicator, a material capable of being acted on physically by the sparks, either through their chemical action, their heat, or their perforating force. The record of the signals given by this instrument was an undulating line of fine perforations or spots, and the character and succession of the undulations were used to interpret the signals desired to be sent.

(3) The latest form of receiving instrument for long submarine Siphon cables is the siphon recorder, for which Sir W. Thomson obtained recorder.

4 See his Mathematical and Physical Papers, vol. ii. p. 168. 5 For a description of the mirror galvanometer, see art. GALVANOMETER, Vol. xX. p. 50 sg.

(4) The automatic curb sender was designed by Sir W. Thomson Auto- for the purpose of diminishing the effect of inductive embarrass- matic ment in long cables. In ordinary hand-sending the end of the curb cable is put to one or the other pole of the battery and to earth sender,

his first patent in 1867. Within the three succeeding years great improvements were effected on it, and the instrument has since that date been exclusively employed in working most of the more

important submarine cables of the world,—indeed all except those on which the mirror galvanometer method is in use. In the siphon recorder (see fig. 30) the indicator consists of a light rectangular signal coil of fine wire, suspended be- tween the poles of two powerful elec- tromagnets M, M so as to be free to move about its longer axis, which is verti- eal, and so joined that the electric signal currents through the cable pass through _ it. A fine glass siphon tube is suspended ¥ with freedom to move in only onc degree, and is con- nected with the sig- nal-coil and moves with it. The short leg of the siphon tube dips into an in- sulated ink-bottle, so that the ink it contains becomes electrified, while the

long leg has its open end at a very small distance from a brass |

table, placed with its surface parallel to the plane in which the mouth of the leg moves, and over which a slip of paper may be passed at a uniform rate, as in the spark recorder. The ink is electrified by a small induction electrical machine E placed on the top of the instrument ; this causes it to fall in very minute drops from the open end of the siphon tube upon the brass table or the paper slip passing over it. When therefore the signal-coil moves in obedience to the electric signal currents passed through it, the motion communicated to the siphon is recorded on the moving slip of paper by a wavy line of ink-marks very close together. The interpretation of the signals is according to the Morse code,—the dot and dash being represented by

deflexions of the line of dots to one side or other of the centre line of the paper. A very much simpler form of siphon –

recorder has been de- frre vised and brought into use within the last few years. Instead of the electromagnets, two bundles of long bar- Si magnets of square sec- tion and made up of square bars of glass- hard steel are used. They are supported vertically on a cast- iron socket, and on the upper end of each is fitted a soft iron shoe, shaped to concentrate the lines of force and thus produce a strong Inagnetic field in the space within which the signal-coilissuspended. Instruments of this wii kind have been | Hl made to work lif f both with and = = Without electrifi- = ——— cation of the ink. 3. Without electrifi- cation the instrument (sec fig. 31) is very simple and compact, and capable of doing good work on cables 500 or 600 miles long. When constructed for electrification of the ink they are available for much greater lengths, but for cables such as the Atlantic the original form 1s still used. The strongest magnetic field hitherto obtained b permanent magnets (of glass-hard steel) is about 3000 C.G.S. Wit. the electromagnets used in the original form of siphon recorder a magnetic field of about or over 5000 C.G.S. is easily obtained. Fig. 32 shows a facsimile of part of a message received and recorded by @ siphon recorder, such as that of fig. 30, from one of the Eastern Telegraph Company's cables about 830 miles long.

iy

H f '| —

yy =

m!

Fie. 31.—Siphon recorder.

alternately, the relative time during which it is to battery and to earth depending to a great extent on the operator. By the auto-

2° A. & «#2, & © ff ¢ – * (€ 2 2 erp €c¢e FF 24

Rt e FF m@ d@it.@ te Pp Fia. 32,—Facsimile of siphon recorder message.

matic curb sender the cable is put to one or the other pole of the battery and then to the reverse pole for definite proportionate times during each signal. The cable is thus charged first positively and then negatively, or vice versa, for each signal. This method not only facilitates the discharge of the cable, and so accelerates the return of the index of the receiving instrument to zero, but provides the means of sending positive and negative currents into the cable at the proper times and for the proper intervals. The action. of the instrument is ae like that of Wheatstone's automatic transmitter, by a perforated slip of paper. The arrange- ment of the perforations and the method of using the paper sli

are, however, quite different, The paper is fed forward by a centra row of holes, which are therefore continuous. The dots and dashes of the message are represented by the side rows of holes; but the two currents required for a dot are produced wholly by one hole on one'side and those for a dash by one hole on the other side. The perforated slip is exactly similar to the message written by the siphon recorder, the side holes occupying the same relative positions as the loops to one side or other of the central line in the record. As the side holes reach a certain point in their passage through the instru: ment they allow the end of one or the other of two levers to fall; the other end of the lever lifts a light contact spring, forming one

mw, tb

-lever of a reversing key, and makes electrical connexion between

the battery and another set of Springs; which also form the levers of a reversing key. The spring is held up, by a flange on the edge of a revolving wheel passing under it, during the time required by the paper to advance through the distance between two central holes. During this interval the current is reversed at the proper time by a pair of adjustable cams fixed to the same spindle as the flanged wheel. This method of transmission has been found quite successful, though it has not becn brought into use, as hand- sending has hitherto proved sufficient for the work required.

Speed of Signalling.—The mathematical theory of the speed of Speed of telegraphic signalling was given in a paper on ‘‘ The Theory of the signal- Electric Telegraph" communicated by Sir W. Thomson! to the ling.

Royal Society in 1855. He shows that, if & be the wire resistance, e the capacity per unit length, and 7 the total length of the line, the current at the receiving end at any time ¢ after the application of the battery at the sending end is given by the equation C,=C {1 -2(e -—e4#+ 2 — 16 + &e,)}, where C is the maximum current which the battery is capable of t

maintaining through the line, and ¢ is equal to (?)@ when a is equal to kel log, ($)/r*._ The number # is quite arbitrary; it is chosen because it makes a nearly equal to the time required for the current to become sensible at one end of the line after the battery has been

i applied to the other end. The number 10’°, which is more con- venient for calculation and which does not differ greatly from 4, was subsequently adopted by Sir W. Thomson, and also by Professor Jenkin.” The equation may be written

i=€ 1 a§ (c —a%t[kel2 at 4×2t/hecl2 a Dri /kel2 ke.) t,

which shows plainly how the current is affected by the length, the resistance, and the capacity of the line.

It is evident from this equation that a finite time is required after the battery has been applied at the sending end for the current to become sensible at the receiving end, the interval being practi- cally equal to a, and also that for similar actions the intervals be- tween operations for one line must be to the corresponding intervals for another line directly as the values of a@ or of kel for the two lines. We see, therefore, that for lines of the same type, worked in the same manner, the speed of working will be inversely as the square of the length of the line, or, if the type varies, inversely as the product KQ, where K is the total resistance and Q the total capacity

1 See his Mathematical and Physical Papers, vol. ii. p. 61. 2 See Jenkin, Electricity and Magnetism, p. 331.

of the line. The interval a must not be confounded with the time required for each signal: it is a measure of the slowness of trans- mission ; but the

number of signals which can be received in a given time, on any one line, depends on the method of working and on the sensibility of the instruments employed. The ratios of the number of signals which can be sent over different lines in a stated time are the same as the ratios of the values of a for these lines. The value of a for the different Atlantic cables varies between a fifth and a quarter of a second, and, as the time required for the current to reach 90 per cent. of its maximum value is ten times , an instrument which requires as much as 90 per cent. of the full current to produce a signal and a fall to 50 per cent. between the signals could only receive about one signal every two seconds or between one and two words per minute. The instruments actually used attain to a speed of about twenty times this; but they are capable of showing distinctly a current of a ten-thousandth, or even less, of the maximum current. The value of for ordinary land lines is very small, probably not exceeding the five-thousandth part of a second for a circuit 500 miles in length. The current,

TELEMETER, or RancEFInDER. This is an instru- ment used in modern warfare to determine the distance or range to an enemy's position, in order that correct elevations may be given to guns or rifles directed against it. Telemeters have been made on three distinct princi- ples, and classified as acoustic, optical, and trigonometrical respectively.

Acoustic telemeters record the time which elapses between seeing the flash or smoke and hearing the report of a gun, rifle, or shell, the range being given in yards as 'the time in seconds x 364°6." The Boulengé telemeter is the best known of this class. It consists of a graduated glass tube filled with liquid and containing a small metal tra- veller, At the flash the instrument is brought to a vertical position, and the traveller starts from zero ; at the detona- tion it is turned to a horizontal position and the traveller stops. The objections to the acoustic telemeter are that the rate of transmission of sound in air is affected by wind and other local conditions and that the instrument cannot be used until firing has commenced.

Optical or perspective telemeters determine the distance to any point by observing the size of some object of known dimensions, as seen in a

graduated telescope. Porro's telemeter, Elliott's telescope, and Nordenfelt's macro- meter illustrate the principle. The chief defect of the system is that the objects most conveniently observed— men and horses—vary considerably in size, so that the assumption of a constant dimension may be productive of error.

Trigonometrical telemeters shorten the ordinary methods of surveying by adapting them to military purposes. They are of two kinds,—field rangefinders and rangefinders for coast batteries.

(1) Field rangefinders exist in great variety, and differ from one another both in the trigonometrical methods pur- sued and in the mechanical peculiarities exhibited. The following are the common solutions of what is technically called "the range-finding triangle,"—7.c., a triangle in which O (fig. 1) is the object the distance to which is required, AOB an acute angle, and AB the base,—O being visible both from A and B.

(i.) Where the base is a fixed length and the

angles are variable-—A fixed base is rarely

adopted except when the base forms part of

the instrument, the angles being observed by a B powerful telescopes. The range is usually read Fig. 1. in yards by the assistance of verniers, extreme perfection of mechanism being necessary. Many ingenious instru- ments of the kind have been devised, but none have as yet proved satisfactory. With a fixed base the accuracy diminishes as the range increases, (ii.) Where the base and the angles are variable.—The base angles are generally observed by instruments of the theodolite type, and the

therefore, rises almost to its full value for each signal when the time of contact is as small as the five-hundredth part of a second, or, on the Wheatstone instrument, when the speed is about 500 words per minute. There is, however, a very sensible increase in the effective resistance of the circuit, especially when iron wire is used, when signals are sent as rapidly

as 100 per second, so that higher battery power is required for fast than for slow rates of speed. The difficulty in working land lines at rates up to 300, or even more, words per minute is not to any serious extent electrical, but is in great measure due to material and magnetic inertia in the receiving instruments. Althongh land lines can be worked ata very high speed when the whole of the wire is insulated on poles, the rate is greatly diminished if a length of underground or of sub- marine cable is included in the circuit. In practice also the speed depends greatly on the position of the cable in the circuit ; for ex- ample, the actual speed from Dublin to London, according to Mr Preece, is about twice as great as that from London to Dublin. Mr Culley states that the greatest effect is produced when the cable is in the middle of the circuit. (T. GR.)

base is actually measured or found by means of a sub-base, The range is obtained by table or calculating scale. The Nolan rangefinder, which was the first telemeter used by the British artillery, was of this kind. (iii.) Where one base angle is a right angle, the other angles and base being variable.—The instrument used is generally double-reflect- ing of the sextant type,—the base being found as in (ii.). The most perfect example is the Watkin rangefinder, used

Fic. 2,—Watkin field rangefinder.

by the British horse and field ar- tillery. It (fig. 2) consists of an “Zéaedea horizon glass capable of assuming two positions, and an index glass set in a steel arm, which is worked by a movable collar on a graduated bar, and this again is moved by the turning of a graduated cylinder. O (fig. 3) being the o

object, the observer sets up a picket at A, and with the instrument at zero (the horizon glass being inclined 45° to the index glass) finds the right angle at the point C. A sub-base AB of 6 yards is then set off, and (with glasses set parallel and the sliding collar at 6) the ob- server reflects B upon A by turning the cy- linder, which is thus made to record the base AC in yards. This reading being set on the graduated bar by moving the sliding collar, the observer proceeds to A, and from there® reflects C upon O, which causes the range to be given in yards on the cylinder. In this operation the position of the sliding collar regulates the movement of the steel bar so that the number of turns of the cylinder is always a true measure of the range OC,

whatever the length of the base AC. (iv.) Where the angles are fixed and the base is a measure of the range.— The base points are determined by the use of prisms or of mirrors reflecting the particular angles adopted. The base is measured or found by a subsidiary triangle, and multi- plied by a constant to give the range. The Weldon range- finder, recently issued to the British infantry, is on this principle. It consists of three prisms, and is generally used as follows. (fig. 4) being the object and D a con- venient distant point, the observer makes with the first prism the right angle OAD. He then retires in the direc- tion DA till the second prism records the angle OBD=

TEHEL—TEL

88° 51’ 15”, when the range = 50 x AB. If it is inconvenient to measure AB, the observer can retire from B in the line OB until the third prism records the) angle OCA=74° 53’ 15”, when the range = 200 x BC. The prisms must be held in the plane of the objects and looked into at the same point. This rangefinder is very simple and portable, but is frequently inappli- cable on hilly or broken ground, and does not possess great accuracy. : A The merits of different field range- finders depend mainly upon the balance of advantages they offer with respect to accuracy, suitability to variety of ground, simplicity, portability, and durability, these conditions being of a more or less conflicting character. The fol- lowing are recognized principles:—(1) the naked eye cannot with certainty appreciate less than one minute dif- ference of angle, therefore telescopic power is necessary in proportion as the base is short compared with the range; (2) telescopes of high power cannot be steadied by hand alone; (3) the longer the base the more incon- venient are any restrictions as to its length or direction ; (4) it is a disadvantage to be compelled to traverse the line joining base points; (5) the longest base which it is convenient to measure by hand is that length of

sew OD

c Fia. 4.—Weldon range- finder,

measuring line which can be stretched tight in a high wind.

(2) Rangefinders. for Coast Batteries.—Rangefinding is less adapted to the requirements of coast defence than “position finding,”—a method which furnishes every gun with its proper training and elevation so that it can be fired without sighting the target. Rangefinders are, how- ever, sometimes employed. The most worthy of notice is the Watkin depression rangefinder used by the British artillery in coast batteries. The instrument resembles in principle the Watkin field rangefinder, the height above the sea-level being a vertical base. The range is found by observing the angle of depression to the object. This is done by a powerful cross-wire telescope, which forms part of the instrument. The fastest steamer can be continuously followed, and even the successive grazes of shot and shell can be observed. The instrument is levelled upon a tripod stand. When necessary, it finds its exact height in feet above the water-level in any state of tide by reference to a datum distance, and it records the range in yards auto- matically on a graduated cylinder. An interesting con- trivance combining telemeter and gun-sight, applicable to guns in permanent emplacements over non-tidal waters, has been tried in Italy. By means of a cam the hind-sight of the gun is always maintained in the position necessary to give the proper elevation in firing, so that it only remains to make the sights cover the target. (A. W. w.”)

TELEPHONE

ie is the art of reproducing sounds at a distance from their source. The term was first used by Philip Reis of Friedrichsdorf, in a lecture delivered before the Physical Society of Frankfort in 1861.1 But, although this lecture and Reis’s subsequent work received considerable notice, little progress was made until the sub- ject was taken up between 1874 and 1876 by Alexander Graham Bell, a native of Edinburgh, then resident in Boston, Mass. Bell, like Reis, employed electricity for the reproduction of sounds; but he attacked the problem in a totally different manner. This will be better understood if we consider shortly on what the chief characteristics of sound depend (compare Acoustics).

The sensation of sound is produced by rapid fluctuations in the pressure of the atmosphere on the tympanum of the

‘ear. If the fluctuations are irregular and non-periodic,

similar example is furnished by what has been variously Mechan- designated as the “string,” “toy,” “lovers,” and ‘ mechan- 7 tele- ical” telephone. Two disks of thin metal, or two stretched P?°*

membranes, each furnished with a mouthpiece, are con- nected together by a thin string or wire attached at each end to the centres of the membranes. A good example may be made with two cylindrical tin cups; the bottoms form the membranes and the cups the mouthpieces. When the connecting string is held taut and sounds, such as those of ordinary speech, are produced in front of one of the membranes, pulses corresponding to the fluctuations of the atmospheric pressure are transmitted along the string and communicated to the other membrane, which in its turn communicates them to the air, thus reproducing the sound. In both these examples all the three characteristics —pitch, relative intensity, and quality—of sound are reproduced.

Let us now return to the development of the application Page’s of electricity to telephony. In July 1837 Dr C. G. Page dis- of Salem, Mass., drew attention to the sound given out by °°’:

the sound is called a noise; if they are cyclic and follow a regular and sufficiently rapid periodic law, the sound is musical, In connexion with the present subject it is im-

portant to notice the three characteristics of a musical

sound, namely, pitch, loudness, and quality. The pitch of:

a musical sound depends on the number of cycles passed through by the fluctuations of the pressure per unit of time ; the loudness depends on the amount or the ampli- tude of the fluctuation in each cycle; the quality depends on the form or the nature of the fluctuation in each cycle. The necessary condition for a successful system of tele- phony is the ability to reproduce these characteristics.

I. History.

In 1831 Wheatstone by his “magic lyre” experiment showed? that, when the sounding-boards of two musical instruments are connected together by a

rod of pine wood, a tune played on one will be faithfully reproduced by the other. This only answers, however, for telephoning mu- sical sounds to short distances. Another and somewhat

eas Ueber Telephonie durch den galvanischen Strom," in Jahresber. d. physikalischen Vereins zu Frankfurt am Main, 1860-61, p. 57. See his Scientific Papers, p. 47.

an electromagnet at the instant when the electric circuit is closed or broken, and in October of the same year he dis- cussed, in a short article? entitled "Galvanic Music," the musical note produced by rapidly revolving the armature of an electromagnet in front of the poles. Experiments bearing on this subject were subsequently made by a great number of investigators. Page's discovery is of considerable im- portance in connexion with the theory of action of various forms of telephone, and was a very important feature in the early attempts by Reis to transmit music and speech. On

3 See Silliman's Journ., xxxii. p. 396 and xxxiii. p. 118.

4 Marrian, Phil. Mag., 3d ser., xxv. p. 382; Beatson, Arch. de ? Elect., v. p. 197 ; De la Rive, Treatise on Electricity, vol. i. p. 806, also Phil. Mag., 3d ser., vol. xxxv. p. 422, and Comp. Rend., xx. p. 1287, xxii. p. 482; Matteucci, Arch. de [Blect., v. 389; Guillemin, Comp. Rend., xxii. p. 264; Wertheim, Comp. Rend., xxii. pp. 336, 544, xxvi. p. 505, also Ann. de Chim. et de Phys., xxiii. p. 302, and Phil. Mag., 3d ser., xxviii. p. 544; Jannair, Comp. Rend., xxiii. p. 319; Joule, Phil. Mag., 3d ser., xxv. pp. 76, 225; Laborde, Comp. Rend., 1. p. 692; Poggendorff, Pogg. Ann., lxxxvii. p. 139, xcviii. p. 198; Du Moncel, Hap. de 0 Elect., vol. ii. p. 125, iii. p. 83; and Delesenne, Bibl. Univ., 1841, xvi. p. 406.

Bour- seul's sugges- tions.

Reis's tele- phone.

26th August 1854 there appeared in Z'Jllustration (Paris) an interesting article by Charles Bourseul on the electric transmission of speech.! The

writer recommended the use of a flexible plate at the source of sound, which would vibrate in response to the varying pressure of the air, and thus open and close an electric circuit, and of a similar plate at the receiving station, which would be acted on electromagnetically and thus give out as many pulsations as there are breaks in the current. These suggestions were to some extent an anticipation of the work of Reis ; but the conditions to be fulfilled before the sounds given out at the receiving station can be similar in pitch, quality, and relative intensity to those produced at the transmitting station are not stated, and do not seem to have been appreciated.

In Reis's lecture an apparatus was described which has given rise to much discussion as to priority in the invention of the telephone. The instrument was described in over fifty publications ?in various countries, and was well known to physicists previous to Bell's introduction of the electric telephone as a competitor with the electric telegraph. Reis caused a membrane to open and close an electric circuit at each vibration, thus transmitting as many electric pulses through the circuit as there were vibrations in the sound. 'These electric pulses were made to act on an electromagnet at the receiving station, which, in accord- ance with Page's discovery, gave out a sound of a pitch corresponding to the number of times it was magnetized or demagnetized per second. Reis's object was to re- produce at a distance not only music but also human speech; but that he did not wholly succeed is clear from the following extract from his lecture: '' Hitherto it has not been possible to reproduce human speech with sufficient distinctness. The consonants are for the most part repro- duced pretty distinctly, but not the vowels as yet in an equal degree." Considering the time at which he wrote, Reis seems to have understood very well the nature of the vibrations he had to reproduce, but he failed to compre- hend how they could be reproduced by electricity. His fundamental idea—the interruption of the current—was a, fatal mistake, which was not at the time properly under- stood. The suggestion of Bourseul and the experiments of Reis are founded on the idea that a succession of currents, corresponding in number to the successive undulations of the pressure on the membrane of the transmitting in- strument, could reproduce at the receiving station sounds of the same character as those produced at the sending station. Neither of them seemed to recognize anything as important except pitch and amplitude, and Reis thought the amplitude was to some extent obtained by the varying length of

contact in the transmitting instrument. This might possibly be to a small extent true; but, considering the small capacity of the circuits he used and the nature of his receiving instrument, it is hardly probable that dura- tion of contact sensibly influenced the result. The quality of the sounds was to some extent also reproduced ; but, judging from the results of recent telephone investigation, it is highly probable that this was due, not to the varying duration, but to the varying firmness of the contact. Since the effect of the degree of contact has, through the re-

searches of Bell, Berliner, Edison, Hughes, Elisha Gray,

and others, become generally understood, it has become easy to make instruments very similar to those of Reis ;

1 See also Didaskalia: Blatter fiir Geist, Gemiith, u. Publicitat, Frank- fort, No, 232, 28th September 1854; Du Moncel, Laposé des Appli- cations de I Electricité, Paris, vol. ii. p. 25, ed. 1854, vol. iii. p. 110, ed. 1856, and Comp. Rend., 26th November 1877.

2 The English reader may consult—Journ. Soc. Tel. Eng., March 1888 ; British Assoc. Rep., 1863 ; Civ. Eng. and Arch. Journ., vol. xxvi. p. 307; R. M. Ferguson, Zlectricity, London, 1866, p. 257; S. P, Thompson, Philip Reis, the Inventor of the Telephone, London, 1883.

and even his instruments, with slight modification, can be made to speak fairly well. The accidental transmission of words by Reis, the occasional recognition of the voice of a singer, and other instances of the transmission of quality were no doubt due to this element, the existence of or the necessity for which was never, so far as the present writer knows, hinted at by Reis.

The next worker at the telephone, and the one to whom Bell’s». the present great commercial importance of the instrument searches,

is due, was Bell. His aim was the production, by means of the undulations of pressure on a membrane caused by sound, of an electric current the

strength of which should at every instant vary directly as the pressure varied.? His first idea seems to have been to employ the vibrations of the current in an electric circuit, produced by moving the armature of an electromagnet included in the circuit nearer to or farther from the poles of the magnet. He proposed to make the armature partake of the vibrations of the atmosphere either by converting it into a suitable vibrator or by controlling its vibrations by a stretched membrane of parchment. In the early trials the armature had the form of a hinged lever of iron carrying a stud at one end, which pressed against the centre of a stretched membrane. The experiments with this form were not successful, and, with the view of making the moving parts as light as possible, he substituted for the comparatively heavy lever armature a small piece of clock spring, about the size of a sixpence, glued to the centre of the diaphragm. The magnet was mounted with its end carrying the coil op- posite, and very close to, the centre of the piece of clock spring. This answered sufficiently well to prove the feasibility of the plan, and subsequent experiments were directed to the discovery of the best form and arrange- ment of the parts. An increase in the size of the iron disk attached to the membrane augmented both the loud- ness and the distinctness of the sounds, and this finally led to the adoption of the thin iron disk now in use, which is supported round its edge, and acts as both membrane and armature. Again, the form of the opening or mouth- piece in front of the membrane exercised considerable influence on the efficiency of the instrument, and it was ultimately ascertained that a small central opening, with a thin air space extending across the face of the membrane, was best. It was also found that comparatively small magnets were sufficient, and that there was no particular virtue in the closed circuit and electromagnet, but that a small permanent magnet having one pole in contact with the end of the core of a short electromagnet, the coil of which was in circuit with the line, but which had no per- manent current flowing through it, answered the purpose quite as well. In fact the effect of keeping a permanent current flowing through the line and the coils of the electromagnet was to keep the core of the electro-magnet magnetized. This seems to have been almost simul taneously pointed out by Bell and others who were work- ing in conjunction with him and by Professor Dolbear. Many experiments were made for ascertaining the best length of wire to use in the coil of the transmitting and the receiving instrument; but this is

clearly a question dependent to a large extent on the nature of the line and the system of working adopted.

After Bell's success a large number of experimenters entered the field, and an almost endless variety of modi- fications have been described. But few possess any real merit, and almost none have any essentially new principle.

3 See A. G. Bell, "Telephone Researches," in Journ. Soc. Tel. Hng., 31st October 1877.

4 The extreme smallness of the magnets which might be successfully employed was first demonstrated by Professor Peirce of Brown Uni-

versity, Providence, R.I. 5 For a detailed description, in a collected form, of a large number

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A telephone transmitter and a receiver on a novel plan were patented in July 1877 by Edison, shortly after the introduction of Bell's instruments. The receiver was based on the change of friction produced by the passage of an electric current through the point of contact of certain substances in relative motion. In one form a drum, mounted on an axis and covered by a band of paper soaked in a solution of caustic potash, is turned under a spring the end of which is in contact through a platinum point with the paper. The spring is attached to the centre of a diaphragm in such a way that, when the drum is turned, the friction between the point of the spring and the paper deflects the diaphragm. The current from the line is made to pass through the spring and paper to the cylinder. Now it had been previously shown by Edison that, when a current is made to pass through an arrange- ment like that just described, the friction between the paper and the spring is greatly diminished. Hence, when the undulating telephonic currents are made to pass through the apparatus, the constant variation of the friction of the spring causes the deflexions of the diaphragm to vary in unison with the variation of the electric currents, and sounds are given out corresponding in pitch, and also to some extent in quality, with the sounds produced at the transmitting station. A cylinder of chalk was used in some of Edison's later

experiments with this receiver. The transmitter is illustrated (see fig. 10) and described (p. 182) below.

Experiments very similar to these of Edison were made by Elisha Gray of Boston, Mass., and described by him in papers communicated to the American Electrical Society in 1875 and 1878. In these experiments the electric current passed through the fingers of the operator's hand, which thus took the place of the spring in Edison's ap- paratus. The diaphragm was itself used as the rubbing surface, and it was either mounted and rotated or the fingers were moved over it. When the current passed, the friction was felt .to increase, and the effect of sending a rapidly undulating current through the arrangement was to produce a sound. The application of this apparatus to the transmission of music is described by Gray.?

In another form of telephone, brought prominently forward by Professor Dolbear,? the effects are produced by electrostatic instead of electromagnetic forces, as in the Bell telephone. Sir W. Thomson observed in 18633 that when a condenser is charged or discharged a sharp click is heard, and a similar observation was made by Cromwell F. Varley, who proposed to make use of it in a telegraphic receiving instrument.* In Dolbear's instrument one plate of a condenser is a flexible diaphragm, connected with the telephone line in such a way that the varying electric potential produced by the action of the transmitting tele- phone causes an increased or diminished charge in the condenser. This alteration of charge causes a correspond- ing change in the mutual attraction of the plates of the condenser ; hence the flexible plate is made to copy the vibrations of the diaphragm of the transmitter. It is Obvious that this apparatus may be used either as a transmitter or as a receiver, but that the effects must under ordinary circumstances be in either case extremely feeble.

In the Reis instruments the transmitter and receiver are separate parts, which are not interchangeable. The Bell telephone can be used either as a transmitter or as a of these modifications, see Du Moncel, "Le Téléphone," in Bibliothéque des Merveilles, Paris, 1882.

1 See George B. Prescott, The Speaking Telephone, London, 1879, pp. 151-205,

- Scientific American, 18th June 1881.

: Llectrostatics and Magnetism, p. 236.

See Tel. Journ., 1st August 1877, p. 178 ; also Adams, Journ. Soc. Tel, Eng., 1877, p. 476.

receiver. The Edison receiver and the Dolbear condenser were only intended to be used as receiving instruments.

It was very early recognized—and, indeed, is mentioned Liquid in the first patents of Bell, and in a caveat filed by Elisha ttans- Gray in the United States patent office only some two anaes hours after Bell's application for a patent—that sounds Be E and spoken words might be transmitted to a distance by Gray. causing the vibrations of a diaphragm to vary the re- sistance in the circuit. Both Bell and Gray proposed to do this by introducing a column of liquid into the circuit, the length or the resistance of which could be varied by causing the vibrations of the diaphragm to vary the depth of immersion of a light rod fixed to it and dipping into the liquid (see figs. 8, 9 below). This idea has been per- haps the most fruitful of any modification of telephonic apparatus introduced.

On 4th April 1877 Mr Emile Berliner filed a caveat in Ber-

the United States patent office, in which he stated that, liner's on the principle of the variation with pressure of the resist- "°°" ance at the contact of two conductors, he had made an ooo instrument which could be used as a telephone transmitter, mitter. and that, in consequence of the mutual forces between the two parts of the current on the two sides of the point of contact, the instrument was capable of acting as a receiver. The caveat was illustrated by a sketch showing a diaphragm with a metal patch in the centre, against which a metal knob was lightly pressed by an adjusting screw. This seems to have been the first transmitter in which it was proposed to use the resistance at the contact of two conductors.

Almost simultaneously with Berliner, Edison conceived Edison's the idea of using a variable resistance transmitter. He micro- proposed to introduce into the circuit a cell containing Seon carbon powder, the pressure on which could be varied by ;itter. the vibrations of a diaphragm. He sometimes held the carbon powder against the diaphragm in a small shallow cell (from a quarter to half an inch in diameter and about an eighth of an inch deep), and sometimes he used what he describes as a fluff', that is, a little brush of silk fibre with plumbago rubbed into it. In another form the plum- bago powder was worked into a button cemented together with syrup and other substances. In the specification of the patent applied for on 21st July 1877 he showed a sketch of an instrument which consisted of a diaphragm, with a small platinum patch in the centre for an electrode, against which a hard point, made of plumbago powder cemented together with india-rubber and vulcanized, was pressed by a long spring, the pressure of the carbon against the platinum disk being adjusted by a straining screw near the base of the spring. Subsequently he filed an application for a patent in which various forms of springs and weights assisted in maintaining the contacts and otherwise improved the instrument,

In the early part of 1878 Professor Hughes, while en- Hughes's gaged in experiments upon a Bell telephone in an electric micro- circuit, discovered that a peculiar noise was produced when- Phone. ever two hard electrodes, such as two wires, were drawn across each other, or were made to touch each other with a variable degree of firmness. Acting upon this discovery, he constructed an instrument which he called a microphone,® and which consisted essentially (see fig. 11) of two hard carbon electrodes placed in contact, with a current passing through the point of contact and a telephone included in the same circuit. One of the electrodes was attached to a sounding board capable of being vibrated by sound- waves, and the other was held either by springs or weights

> See Journal of the Telegraph, New York, April 1877 ; Philadelphia Times, 9th July 1877 ; and Scientific American, August 1877.

6 This terml was used by Wheatstone in 1827 for an acoustic ap- paratus intended to convert very feeble into audible sounds; see his

Scientific Papers, p. 32. XXIII. — 17

Blake trans- mitter.

Modifica- tions of Edison’s trans- mitter.

Radio- phone.

in delicate contact with it. When the sounding board was spoken to or subjected to sound-waves, the mechanical re- sistance of the loose electrode, due to its weight, or the spring, or both, served to vary the pressure at the contact, and this gave to the current a form corresponding to the sound-waves, and it was therefore capable of being used as a speaking-telephone transmitter.1 The best transmitters now in use are modifications of Hughes’s apparatus. A microphonic apparatus very similar to it is described in the specification of a German patent taken out by Robert Lutdge on 12th January 1878. In this patent the action of the microphone is also described.?

The next transmitter of note, introduced by Mr Francis Blake, U.S. (see fig. 13 below), although it does not, like the first microphones, embody anything intrinsically new, is one of the most perfect and convenient forms of micro- phone. It is at present almost universally used in the United States.

It appears to be pretty well established that carbon in one form or another is the best material for one or both of the contacts of a microphone transmitter. When both the contacts are of carbon and the surfaces have consider- able area, say from a quarter to half an inch in diameter, the sounds are loud, but have a tendency to harshness. When, as in the Blake transmitter, one of the contacts is a piece of polished gas carbon and the other a sinall sphere

of platinum about the twentieth of an inch in diameter, |

the articulation is clear, but less loud. For most purposes, however, the increased clearness more than compensates for the diminished loudness. Many transmitters in actual use—as, for instance, the “Gower,” largely employed in the United Kingdom—have a nuniber of contacts. Some of

these when properly adjusted are both loud and clear in their action. Although the Blake instrument is most in vogue in America, in the United Kingdom and on the Continent multiple contact microphones have found more favour. Carbon powder instruments have been to some extent used, and in one or two cases—as, for example, the Hunnings transmitter—with considerable success. The fault in most of them is the tendency of the powder to “pack,” which causes the instrument to rapidly lose sensi- bility. In the Hunnings transmitter this difficulty is to a large extent overcome by the use of a coarse granular powder in a somewhat large cell (about an inch in diameter and from one-eighth to one-fourth of an inch deep). The front face of the cell is a piece of platinum foil, which serves both as an electrode and asa diaphragm. The cell is placed either on edge or in an inclined position when in use, the action being precisely similar to that in other transmitters. In addition to its freedom from packing, the carbon, in consequence of the inclined position of the cell, is also less liable to fall away from the electrode and break the circuit. Some packing of the powder, however, does occur, and several modifications have been proposed by Blake and others for making the sound vibrations stir the powder and keep it loose. Good results appear to have been got by placing the cell mouth downwards, the carbon powder lying on the platinum foil, and by forming the upper electrode either of wire gauze or of a perforated plate completely immersed in the powder. The sound vibrations are con- veyed to the bottom of the cell by a bent tube communi- cating with a mouthpiece. Instruments of this class are very loud-speaking, and therefore very serviceable for long or disturbed circuits, The radiophone is an instrument proposed by A. G. Bell nai Bi

1 See Proc. Roy. Soc., vol. xxvii. p. 362 : ii : ; : . p. 862; Proc. Phys. Soc., vol. ii. p. 255; Phil. Mag., 5th ser., vol. vi. p. 44 ; Preece, Journ. Soc. Tel. Eing., vol. vii. p. 270. 2 Although this patent is dated pri y icati i prior to Hughes’s publications, it does not follow that the descriptions were filed before eo ;

and Sumner Tainter in 1880 for utilizing radiant energy, such as light or radiant heat, for the transmission of sound. The apparatus forms a telephone

transmitter of a particu- larly interesting kind. In the earlier papers describing it and the experiments which led to its invention it is called photophone, because at that time the effects were supposed to be wholly due to light. Afterwards, in order to avoid ambiguity, Bell changed the name to radiophone and sug- gested that, to distinguish between instruments depending on the different kinds of radiation, the names photophone, thermophone, &c., should be employed. He also proposed the name spectrophone for an application of this instrument to spectrum investigation.? The apparatus is founded on the discovery, made by Mr May while carrying out experi- nents on selenium for Mr Willoughby Smith, that when selenium is exposed to light its electrical resistance is very different from what it is in the dark. This discovery led to a great many interesting experiments by other investi- gators.4 In thinking over this discovery in 1878 Bell con- ceived the idea that, if a beam of light proceeding from one station could be made to fall on a selenium plate at another station, and if its intensity could be varied by the voice of a speaker, then by connecting a telephone and a battery in circuit with the selenium plate the words spoken at the distant station would be heard in the telephone. This was found to be the case. At first, to vary the intensity of the beam, it was passed through a small opening, the width of which could be varied by the vibrations of a diaphragm against which the speech was directed. But better results were afterwards obtained when the diaphragm formed a mirror from which the beam of light was reflected. The spreading of the beam, due to the vibrations of the mirror diaphragm, served to vary its intensity (see fig. 18 below).

Edison’s phonograph (see fig. 19 below) is an instrument Edison’s whose action somewhat resembles that of a telephone trans- phono- mitter and which has been much talked of in regard to its oraete

possible applications in telephony. It was invented shortly after the introduction of the telephone for the purpose of recording sounds, and was included in some of Edison’s telephone patents as a means of working a telephone trans- mitter, and thus telephoning sounds which had been pre- viously recorded on the phonograph sheets.

II. TELEPHONIC INSTRUMENTS.

One of the best-known forms of the Reis telephone is shown in fig. 1. The transmitter consists of a box A, provided with a mouth- piece M. In the top of the box a round hole is cut and across it a membrane S_ of hog's bladder is @/m™)\In\l stretched. A thin (((7 /A iil LB ASH strip of platinum & | Ye p fixed to the box at one side of the ~ : _ hole and extend- ing to the centre of the membrane, supports at that point one foot of a light metal tripod egf One of the feet, e or f, rests in a cup containing mercury, which is in metallic connexion with the terminal }, while

3 On this subject see A. G. Bell, Phil. Mag., 5th ser., vol. xi. p. 510, and Journ. Soc. Tel. Eng., vol. ix. p. 404 ; Mercadier, Phil. Mag., 5th ser., vol. xi. p. 78 ; Tyndall, Proc. Roy. Soc., vol. xxxi. p. 807 ; Routgen, Phil. Mag., 5th ser., vol. xi. p. 8308 ; Preece, Proc. Roy. Soc., vol. xxxi. p. 506; Rayleigh, Nature, vol. xxiii. p. 274, and Proc. Roy. Soc., 1877; Bidwell, Phil. Mag., 5th ser., vol. xi. p. 802; 8. P. Thomp- son, Phil. Mag., 5th ser., vol. vi. p. 276.

4 See W. Smith, Journ. Soc. Tel. Eng., vol. v. p. 183, and vol. vi. p. 423 ; M. L. Sale, Proc. Roy. Soc., vol. xxi. p. 283, and Phil. Mag., 4th ser., vol, xlvii. p. 216 ; Draper and Moss, Proc. Roy. Irish Acad., vol. i. p. 529; Rosse, Phil. Mag., 4th ser., vol. xlvii. p. 161; W. G. Adams, Proc. Roy. Soc., vol. xxiii. p. 585 and vol. xxiv. p. 163; W. G. Adams and B. E. Day, ibid., vol. xxv. p. 113 ; Werner Siemens, Monatsber. kin. Preuss. Akad. der Wissensch. zu Berlin, 1875, p. 280, and Phil. Mag., 4th ser., vol. i. p. 416; Sabine, Phil, Mag., 5th ser., vol. v. p. 401.

7 Ay

PACU eps

~~ Fig. 1.—Reis's telephone.

the end of the strip y is similarly in connexion with the terminal a. The receiver consists of an electromagnet made up of a magnetiz- ing coil H, with a stout knitting needle for a core. When in use these two instruments are joined in circuit with a battery B, so that under ordinary circumstances a

continuous current is flowing through the line. Suppose a sound is then produced in front of the mouthpiece M, the successive variations in the pressure of the air are communicated to the inside of the box, and cause the mem- brane to vibrate in unison with the sound. Reis's theory of the action of the instrument was that at each outward impulse of the membrane the point g would be thrown out of contact with the plate underneath it and would thus break the circuit. There would con- sequently result as many breaks in the circuit as there were vibra- tions in the sound, and, in conformity with Page's discovery, the electromagnetic receiver would give out a rapid succession of beats, which would together form a continuous sound of the same pitch as that to which the transmitter was subjected.

Fig. 2 shows the first telephone made by Bell for transmitting speech. It consisted of a wooden frame F, to one side of which a tube T was fixed; over the end AUN SHD instrument was joined in circuit with a battery and another simi- lar instrument placed at a dis- tance.

The next form tried is shown in fig. 8. It is very similar except in constructive details to the first ; the hinged armature, however, is omitted, its place being Soh taken by a small iron disk A r fixed to the centre of the @4__* _

diaphragm D. The electro- magnet H is, as before, placed so as to have the centre of // the soft iron core Yj C opposite to the ¢

tre of the di = ol centre of the disk, AWA

and the theory ac- cording to which it Fic. 3.—Bell's second telephone; one-fifth full size. was expected to act is the same. The results obtained with this instrument were much more satisfactory; indeed it was with one precisely like that shown in the figure that the remarkable results of the Philadelphia exhibition in 1876 were obtained. A perspec- tive and a sectional view of the receiving instrument used along with that shown in fig. o

3 are illustrated in figs. 4 and 5. It consisted of an iron cylindrical box B, through the axis of which a rod of soft iron C was passed to form the core

of an electromagnet, having the magnetizing helix H wound on the upper half of its length. Fig. 4. Fig. 5.

Across the top of the Fias. 4, 5.—Bell’s iron box receiver (1876). box a thin disk D of Fig. 4, perspective view ; fig. 5, sectional view. soft iron was fixed, the core C being just clear of the disk when the strongest current is flowing through the helix. In the per- Spective view the disk is removed, showing the end of the core.

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These instruments are interesting, not only because they may be considered the first really successful speaking telephones, but be- cause they are of the same form as those brought to Great Britain in 1876 by Sir W. Thomson, and exhibited before the British Asso- ciation at Glasgow in that year.

Fig. 6 shows one of the earliest forms brought into commercial use. On each pole of a somewhat large horse-shoe permanent magnet

Fic. 6.—Bell’s nultiple pole telephone (1877); one-fifth full size.

Ma short coil E with a soft iron core was fixed. This is one of the early forms of permanent magnet telephones, of which there were at that time several, including a hand telephone very similar to that shown in fig. 7, In another form, introduced about the end of 1877, the small magnetizing coils and soft iron cores were fixed on the side and opposite the poles of the horse-shoe magnet, and the diaphragm was placed with its plane parallel to that of the magnet. The diaphragm in these telephones was of thin sheet iron and a little over 4 inches in diameter.

The form of telephone now almost universally in use is shown in Bell’s fig. 7. It was introduced in December 1877 and consists of a com- hand pound permanent qq, magnet M, fitted into the centre of a tele- tube of vulcanite W phone. or “hard rubber” and carrying atone | endashort electro- magnet, the coil of which through its ® terminals ¢, ¢ is in- cluded in the cir- cuit when the instrument is in use. In front of the electromagnet, with its plane normal to the axis of the magnet, is fixed a thin soft iron disk about 13 inches in diameter, which has its cover cut toa convenient shape to form a

mouthpiece. This telephone acts well either as a transmitter or as a receiver; but for the former purpose it is now seldom used on account of the great advances which have been made in “microphone” transmitters.

It has been stated that Bell and Elisha Gray almost simultane- Bell’s ously suggested the use of a column of liquid to in the circuit. The form @m of instrument proposed by the former and said to have been exhibited at the Philadelphia exhibition is shown in fig. 8. It con- sists of a speaking tube or mouthpiece M, across the lower end of which a inembrane D is stretched. To the centre of the mem- brane a light rod R, made (of metal or of carbon, is _.. J fixed with its length at TEI right angles to the plane } of the membrane. Under ; the lower end of Ra small metallic vessel C is sup- ported on a threaded rod, working in a nut fixed to the sole F, sothat its height may be readily adjusted. Suppose C to be filled with Fie, 8.—Bell’s liquid transmitter. __ water or any other con- Fic. 9.—Hlisha Gray’s liquid transmitter. ducting liquid, and the rod R to be of metal. C is raised until the liquid just touches the point of the rod, when advantage is taken of the change of contact resistance with the greater or less immer- sion of R during the vibration of D. Good results were obtained with mercury as the liquid and with a rod of carbon.

The arrangement proposed by Elisha Gray is almost identical in E. Gray’s form with Bell’s. The only difference seems to be that Gray in- liquid tended the rod R (fig. 9) to reach near to the bottom of the vessel trans-

B or to the end of another rod, a prolongation of 6, projecting up mitter. from the bottom. The variation of the current was produced by the variation of the distance between the ends of the rod caused by the vibrations of the diaphragm. This plan was not tried until after the success of Bell’s experiments was known, and when it was

Fic. 7.—Bell’s hand telephone, present form,

Edison’s micro- phone trans- mitter.

Hughes’s micro- phone.

Blake trans- mitter.

tried the results did not prove encouraging. Indeed the variations of the resistance which can be produced in this way must be excess- ively small, unless the liquid has a very high specific resistance, the distance between the ends is very small, and the sides of the rods are prevented by an insulating covering from interfering with the results. Neither of these transmitters has any great merit as such, but they show that both Bell and Gray clearly recognized the principle on which successful transmission of the different forms of sound, including speech, could be accomplished.

The first successful microphone transmitter was Edison's. An early form of it (fig. 10) somewhat resembles Bell's hand tele- phone in ex- ternal form. A cell of insulating yy material has at its bottom a flat- Va headed platinum screw G; on the £ top of G is a layer of carbon powder C, on the

top of that a thin platinum disk D, and above 4 that, forming the cover of the cell, a disk of ivory B, held in

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position by a centre of this rubber tubing, the diaphragm hand telephone, is held in M. The varying pressure duced near it, causes corre- pressure on the carbon similar variations in its elec- when the instrument is in- cuit through which a cur- tions in the pressure on the €

ring E. Resting on the disk is a small piece of which is lightly pressed by A, and this, as in the position by themouthpiece on A, when a sound is pro- 4A sponding variations in the powder, and this produces trical resistance. Thus, cluded in an electric cir- rent is flowing, undula- 2 diaphragm produce corre-

Y the — :

- 10.—Fai- forms of the microphone are those introduced by guts uae Prof. Hughes. One of the commonest is shown Phone trans-jn fig. 11. It consists of two rectangular pieces of ™tter. wood, B and D, fixed to- gether with their planes at right angles to each other. D forms the base, and to B two

small blocks of carbon C, C are attached. Betwcen these a light rod A of the same matcrial is supported on in C, C. To the blocks are connected for the pur- the instrumcnt in an electric terial which Hughes found @ the carbon blocks and rod metallized by heating it to redness and plunging it while hot into mercury. If this microphone is joined in circuit with a telephone and a small battery, say one or two small Daniell cells, the vibration pro- a agent duced by a fly walking on Fig. 11.—Hughes's microphone. the base D can be distinctly heard in the telephone. The same apparatus will also act as a microphone transmitter, but the sounds are apt to be harsh. A better form for this purpose is shown in fig. 12. In this a light pencil of carbon M is pivoted at hand has one end resting on two blocks of £°° carbon ¢, ¢, the lower one being ; fixed to the base. : The pressure of M | on the carbon block i is regulated by a spring s. This ar- Fia. 12.—Microphone transmitter. rangement is en- closed in a box of thin wood, against which the sound is directed. It is capable of acting well as a transmitter, and especially in a modified form used by Hughes as a microphone receiver. The lower block ¢ is then attached to the centre of a vertical diaphragm and against it the sounds are directed. –

The Blake transmitter, which is perhaps most widely used of all, isasimple modification of the Hughes instrument last described. It consists (fig. 13) of a frame F, to which is attached a diaphragm D of thin sheet iron ; in front of this is a cover M, M provided with a suitable cavity for directing the sound-waves against the dia- phragm. The microphonic arrangement consists of a spring §, about the hundredth of an inch thick and the eighth of an inch broad, fixed at one end to a lever L, and carrying at its free ex- tremity a brass block W. In one side of W a small disk C of gas carbon is inserted, resting on the hemispherical end of a small platinum pin K, about the twentieth of an inch in diameter, held in position by a thin spring A. The pressure of the carbon on the platinum point can be adjusted by the screw N, which turns the lever about the flexible joint G. The electrical connexions of the instrument. as arranged for actual use are also illustrated in the figure. The current circuit goes through S, W, C, K, A, and the

sponding undulations in Perhaps the best known

4g} small cups formed

i] two electrodes e, ¢ Mig) pose of inserting | circuit. The ma- i most suitable for was wood charcoal

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primary circuit of the induction coil I to the battery B, and thence to S again. This forms a local circuit at the transmitting station. The line of circuit passes through the secondary of the induction

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Fic. 13.— Blake’s transmitter.

coil I to the line, from that to the telephone T at the receiving station, and then either to earth or back to the induction coil by a return line of wire. ;

Lelephonie Circuits.

The lines used for telephone purposes are, generally speaking, Tele. so far as erection, mode of insulation, and so on are concerned, much phone the same as those used for ordinary telegraphs. In towns where wires, a very large number of wires radiate from one centre or exchange, as it is called, where thick wires are unsightly, and where it is often necessary to provide for long spans, a comparatively thin wire of strong material is employed. For this reason various bronzes, such as silicon, aluminium, &c., have come to be extensively used for making wires for telephone lines. They are made from about the twentieth to the thirtieth of an inch in diameter, and are

found to wear well in the somewhat mixed atmosphere of a town; and owing to their lightness and considerable tensile strength it is comparatively easy to erect them and keep them in order. The main objection to them is the high electrical resistance they oppose to the current. The lines on a town exchange system are not, how- ever, as a rule, so long as to make this objection of great import- ance. But long lines, such as those extending between towns some miles apart, should be made of pure copper wire hard drawn. It has lately been found possible to draw copper so hard as to be almost equal to bronze in strength, and yet to retain about three times the electric conductivity of that substance. Copper and bronze wires possess great advantages for telephonic purposes over the iron wires employed in telegraph lines, in that they offer a much lower effective resistance to the rapidly undulating and intermittent currents pro- duced by telephonic transmitters. The electric resistance opposed by a wire to the passage of such a current is always greater than that opposed to a steady current, and this difference is much more marked when the wire is of magnetic material like iron. This in- creased resistance rises in proportion to the rapidity of the undula- tions of the current ; consequently high notes are more resisted than low notes. Besides this variable resistance, telephony has to contend with ‘‘self-induction” (see ELECTRICITY, vol. viii. p. 76 sq.) of the current on itself, and this is by no means unimportant, especially on long circuits.1 The marked difference between iron and copper for long circuits is plainly shown by the fact that Rysselberg and others have spoken clearly to a distance of over 1000 miles through a copper wire insulated on poles, whereas Preece – could not work a similar line of iron wire between London and Manchester.

The electrostatic capacity of the line (see TeLEGRapn, p. 115 Capacity. above) is also diminished by the use of thin wires of highly con- ducting material. They should all if possible be erected on poles at a considcrable height above the earth. It is not practicable to work an ordinary underground line through more than 20 miles, and cable telephony through distances of over 100 miles may in the present state of science be put down as an impossibility.

Another element of great importance in connexion with telephone 1 See papers by Prof. Hughes, Proc. Soc. Tel. Eng., vol. xv. p. 6, and Proc. Roy.

Soc., vol. xl. p. 468, with remarks on them by Prof. H. F. Weber, Tel. Journ., vol. xviii. p. 821 and vol. xix. p. 830; by Oliver Heaviside, Phil. Mag., vol. xxii. p. 118; by Rayleigh, Phil. Mag., vol. xxi. p. 381 and vol. xxii. p. 469.

See also Prof. Chrystal on the ‘‘ Differential Telephone,” in Trans. Roy. Soc. Edind., vol. xxxi. pp. 609-636.

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lines, which in most cases does not require to be attended to in ordinary telegraph circuits, is the induction from one line to an- other (see ELECTRICITY, Vol. viii. p. 76 sqg.). When two lines having, as in ordinary telegraphy, an earth connexion at each end run for any great distance, say a mile or more, parallel to each other on

the same supports, a conversation which is being carried on through

one of them can be overheard by means of the telephones on the This is due to the fact that, when a current is suddenly set up in one closed circuit, it induces an instantaneous current in any other closed circuit which is near to it. This induced current not only destroys the privacy of the circuit in question but also lowers its efficiency. The mischief is even greater when telegraph and telephone lines run along the same route supported on the same poles, because the strong intermittent currents sent through telegraph wires, and the irregular manner in which the intermit- tences follow each other, induce a series of such powerful secondary currents in the telephone lines that the noise heard in the tele- phone is often sufficient, when the line is a mile or two long, to drown all speech. In the case of parallel telephone lines the best, if not the only, cure is to use return wires, and arrange them so that the currents induced in the outgoing wire shall be neutralized by the corresponding current induced in the incoming wire. For mixed telegraph and telephone circuits various methods have been pro- posed ; but the most

generally approved plan is to have return wires. For circuits worked wholly on the return principle the main thing to be attended to is the symmetrical arrangement of the wires, so that the outgoing and incoming wires may be subjected to the same influence. This is nearly provided for by running them in such a way that they may be all supposed to lie on the surface of a cylinder in lines parallel to its axis, the two wires at the opposite ends of a diameter being always used for the same circuit. When more than four wires form the group complete compensation is not obtained in this way, because the current is always stronger near the transmitting end of the line than near the receiving end, on account of the very sensible effect of the capacity and the leakage of the line. It is therefore best to arrange the wires in groups of four —that is, in pairs of circuits—and run them so as to form spiral lines round an axial line equidistant from each of the four wires. Any pair of wires forming a circuit which runs parallel to other wires can be arranged so as to be very nearly free from induction by interchanging their position relatively to the other wires at short

be an ordinary telephone circuit worked through condensers. The telegraph apparatus consists of an ordinary receiver R, sending battery B, and key K, t together with a eon-

denser C, inserted be- tween the earth and the line terminal of the key, and two electromag- netic inductors E, KE’, When the key is de- retarded by the electro- denser C, which has to fact additional electro- sending end of the line. further retarded by the

pressed the current is

magnet E and the con- e be charged, giving in static capacity at the The current is still electromagnet E’;

Fig. 14, hence the condenser C, becomes charged so gradually that very little disturbance is noticeable in the telephone T. The condensers C,, C, prevent leakage from one line to the other, but have suffi- cient capacity to allow the telephone to act as if it were in a metallic circuit,

The Working of Telephone Circuits.

The method first employed for working a telephone line was extremely simple. A single line of wire, like an ordinary telegraph line, had a Bell telephone included in it at each end and the ends were put toearth. Words spoken to the telephone at one end could be heard by holding the telephone to the ear at the other. To obviate the inconvenience of placing the telephone to the mouth and the ear alternately, two telephones were commonly used at each end, joined either parallel to each other or in series. The con- trivance most generally adopted for calling attention is the call bell, rung either by a small magneto-electric machine or by a battery. The telephone was switched out of circuit when not in use and the bell put in its place, an ordinary key being used for putting the battery in circuit to make the signal. This arrangement is still employed, a hook being attached to the switch lever so that the mere hanging up of the telephone puts the bell in circuit. In some cases, when the bell is rung by a magneto machine, the coil of the machine is automatically cut out of circuit when it is not in action, but the turning of the handle moves a centrifugal arrangement by which it is thrown in.

Early methods,

At first it was usual to employ the same instrument both as trans- Working mitter and as receiver, and to join it in the direct circuit. But it with was soon found that the microphone transmitter could only be used micro- to advantage in this way when the total resistance of the circuit, phone,

distances along the line. Care must, however, be taken, when more than one group of four or when more than one pair are run, that the compensation produced by the twisted arrangement of one set, or of the interchanges of the wires in the different pairs, is not

spoiled by the twisting or interchanging of another set or pair.

elephone lines running parallel to telegraph lines should be formed into one or more groups, each being run on the twist plan so as to eliminate as completely as possible the effect of the telegraph signals ; the small residual effect of the telephone signals is of comparatively little importance in such

a case. A twisted cable of telephone wire may, when cach circuit is formed by diametrically opposite wires, be placed in the same tube with similar cables employed for telegraph purposes. The central wire of the cable may be used either asa telegraph line or as a telephone line having an earth return.

Another method is to use powerful telephone transmitters and

insensitive receivers ; that is to say, make the telephone currents so powerful that the telegraphic induced currents will be small in comparison, and use receivers so insensitive as to suit such currents. One of the main obstacles in the way of this method at present is the difficulty of getting strong telephonic currents, for even the best transmitters are not yet sufficiently powerful, and there is, besides, a decided tendency towards a loss of quality in the sound when the transmitter is made powerful. A third method is to render the telegraphic current comparatively harmless by taking away the suddenness of the intermittences. This is quite possible because the number of currents sent per second, even on fast working circuits, is not such as to produce a high musical note. If, then, the currents be made in some way to rise slowly to their full strength and fall again slowly to zero the diaphragm of the receiving instrument, instead of showing the sudden rise and sudden fall as at present, would move so slowly backwards and forwards that the ear would not be disturbed by the sound. Perhaps the simplest way to accom- plish this is to place an electromagnet in the circuit of the tele- graph line at the sending station, for the self-induction of the magnet coil prevents the current assuming its strength suddenly. But on telegraph circuits where speed is of great importance this method cannot be followed owing to the retardation of the telegraph signals and the consequent loss of speed thereby occasioned.

, An ingenious application of the method of compensation just indicated has been made by Rysselberg, who has used not only wires carried on the same poles as the telegraph but even the telegraph lines themselves for telephone purposes. The arrangement of his system is shown in fig. 14, where L and Ly represent two telegraph lines. Between these, at each end, are inserted two condensers C,, C, and a telephone T, together with transmitters, &c., so that, supposing the telegraph instruments removed, the two wires would

exclusive of the microphone, was small compared with the resistance of the microphone,—that is, on very short lines worked with low resistance telephones. The transmitter on long and high resistance lines worked better by joining indirectly in a local circuit, in the manner shown in fig. 13, the microphone, a battery, and the primary of an induction coil, and putting the line in circuit with the second- ary of the induction coil, which acted as the transmitter. The resistance of the microphone can thus be made a large fraction of the total resistance of the circuit in which it is placed ; hence, by using considerable currents, small variations in its resistance can be made to induce somewhat powerful currents in the line wire. The requisite energy is derived from the battery. If there are other resistances in the circuit it is, in some cases, better to join it as a shunt to the primary circuit of the induction coil. It may even prove advantageous to insert resistances in the circuit, increase the battery power, and join the microphone as here indicated, because in this way powerful currents can be obtained in the line without the harshness which is apt to be produced by the variations of a strong current passing through the microphone.

Translation from one line to another, or from one section to Transla another of the same line, is effected by putting the primary of an tion.

induction coil in the place of the receiving telephone, the secondary being in circuit with the second line or section. This plan is use- ful where the same message is to be sent to different pees at once (distributed), and is sometimes used for translating from a double wire to a single wire system. Probably a better plan is to work a microphone by the membrane of the receiving telephone, and re- transmit the message, taking new energy from a second battery.! When the induction coil arrangement is used for translating from a double to a single wire circuit, or vice versa, it is necessary to make the induction coil suit the circuits, so that either coil may be used as primary, according to the end from which the message is sent. Everything else being similar, the resistances of the coils should be in nearly the same ratio as the resistances of the lines in which they are placed.

In a large town it is neither practicable nor desirable to connect each subscriber directly with all the other subscribers, hence a system of ‘‘ exchanges” has been adopted. An exchange is a central station to which

wires are brought from the different subscribers, any two of whom can be put in telephonic communication with each other when the proper pairs of wires are joined together in the ex-

1 See Thomson and Houston, Tel. Journ., 15th August 1878.

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Ex- changes.

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change. The attendant there ascertains to whom it is that he wishes to speak, and by moving round the contact arm puts the : two subscribers' lines in contact. a

change. The arrangement is illustrated in fig. 15, where C represents an exchange from which wires radiate to the points a, be, d,..-. Suppose a wishes to speak tod; he communicates his wish to an attendant at C, who first c d

calls d, and then con- b

Sinclair's

nects 6 to 1, making the circuit continuous from a to d. The ar- rangements at the ex-* change for facilitating connexions vary con- siderably, but are simi- lar in principle to the switch boards used in telegraphy. Each of the ; wires is first brought to an indicator and then to a set of terminals arranged in an orderly.manner on a board, the number of the terminal for any one wire being the same as the number under the shutter of the indicator in that wire circuit. In many cases the terminals take the form of spring clips, which connect the line to earth, and under which a thin piece of metal, covered with insulat- ing material on one side and called a ''jack," can be readily inserted for connecting that circuit with any other. A piece of flexible wire cord, carrying a jack at each end, forms a ready and common

medium of connexion ; but in many cases the switch board is arranged with cross strips of metal so that by inserting a jack into the terminals of the two wires they can be both connected to the same strip of metal and therefore together. In large exchanges one switch board of moderate size is not sufficient, and so a number are fitted, being connected together by several conductors, in order that no interrup- tion may ensue in consequence of these being all occupied. A line on one board is connected with one on another board by joining the terminal of the first to one of the conductors connecting the two boards by a jack-cord, and then by another jack-cord connecting that conductor to the terminal of the other line. Thus different switch boards may be looked upon as separate exchanges, connected together by a number of trunk wires after the manner described below.

In a large system it is much more convenient and economical to have exchanges in the various districts, and connect these with a central exchange by a sufficient number of trunk lines. A sub- scriber in one district wishing to speak to a subscriber in another calls the exchange in his own district and is put in communication by the attendant stationed there with the central exchange. The attendant at.the central exchange puts the subscriber in communi- cation with the district he requires, and the attendant there calls the other subscriber and joins the two subscribers' lines together. In some cases neighbouring district exchanges have, besides a com- mon means of communication through the central exchange, an independent connexion. These arrangements are diagrammatically

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Fic. 15.—Telephone exchange.

Fra. 16.—Telephone district exchanges,

illustrated in fig. 16, where 1, 2, 3, 4, 5, 6 represent district ex- changes and C the central exchange ; districts 3 and 4 and 4 and 5 are supposed to have independent connexions,

An arrangement was proposed about two years ago by Mr D.

automatic Sinclair of the Glasgow telephone exchange for allowing small dis-

exchange.

trict exchanges to be worked by the attendants at the central ex- change.! The two exchanges are connected by a trunk line and from the district exchange wires are led to the different subscribers. These wires are in the normal state of matters connected with con- tact plates, over which an arm joined to the trunk wire can be made to travel. Suppose the central exchange wishes to speak to any one of the subscribers, the arm is made to travel round, by currents sent from the exchange through an electromagnetic step by step arrangement, until it comes in contact with the proper plate, after which the subscriber is called in the ordinary way. When one subscriber belonging to the district exchange wishes to speak to another in the same district, he rings the bell in the ordi- nary way, and this operation disconnects all other subscribers and puts him in connexion through the trunk line with the central ex-

1 See Proc. Phil. Soc. of Glasgow, vol. xvii. p. 39.

allows the shutter @ to fall down, exposing a plate p, on the front of which the number of the subscriber is printed. When the exchange is called, the shutter d is dropped, the attendant connects the line leading to the exchange table with the ter- niinal corresponding to the indicator, and finds who is wanted; then he calls that subscriber, makes the through connexion, and puts up the shutter. When the subscribers have finished, both call the exchange or, as it is commonly put, “‘ring off”; this drops both shutters and serves as the signal that they have finished speaking.

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Fig. 17.—Indicator or annunciator,

The principle of transmitting sound by the radiophone will be Radio- M represents a mirror, from which a phone.

understood from fig. 18. beam of light is reflected through the lens / to a second mirror m, and m forms a diaphragm against the back of which the sound vibrations sent through the tube ¢ are made to impinge. The beam of light, after being reflected from am, passes through the lower lens 2, and thence as a nearly parallel beam to the parabolic reflector R. photophonic receiver P, sup- posed in this case to be a spiral of selenium wire wound on the surface of a cylinder, Fra. 18,—Bell's radiophone, is placed at the focus of the reflector so that the beam of light from m is concentrated on it. In circuit with the receiver P a battery B and a telephone T are included and through the circuit a feeble electric current flows continuously. The photophonic receiver should be placed so as to receive as little light as possible from any other — source than the mirrorm. Words spoken through the tube t make the mirror m vibrate, so that the beam of light reflected from it becomes more or less spread. The lens7 is then unable to bring the beam into parallelism, and the intensity of the reflexions from R to P is varied, therefore also the current through the coil of the telephone, which in consequence gives out a sound. The amount of spreading of the beam bcing proportional to the intensity of the vibrations of m, and this again proportional to the intensity of the sounds, the sounds heard in the telephone are similar to those pro- duced at the end of ¢. Theoretically the receiver may be at any distance from the transmitter, but considerable difficulty arises if the distance is great.

One of the simplest forms of the phonograph is shown in fig, 19. Phono- It consists of a rigid spindle S screwed for about one-third of its graph.

length, and fitted to work smoothly but tightly in the frame J, f, Which is se- curely attached to a sole plate P. On the spindle a drum D is fixed, the axis of which coincides ac- curately with that of the spindle. On the surface of the drum a screw is cut of precisely the same pitch as that on the spindle.

Fic. 19.— Edison’s phonograph.

A fly-wheel W is fixed to one end of the spindle, and is provided with a handle H, by

which the spindle and drum can be conveniently turned. One of the bearings has either a screw thread cut along it, or is fitted with one or more studs which work easily, but without shake, in the screw thread. When the spindle is turned, it receives a trans- verse motion, and a point fixed relatively to the sole plate P and touching the drum traces out a spiral on its surface, exactly coin- ciding with the screw thread cut on it. A mouthpiece M, like that of a telephone transmitter, provided with a diaphragm of parch- ment or similar substance, is mounted on a lever, which is pivoted at h and provided with a set screw b.

mouthpiece. The vibrations of the diaphragm cause the needle

oint to make indentations more or less decp, according to the intensity of the sound, in the surface of the tinfoil. If the mouth- piece is then raised, the drum turned back to its original position, the

mouthpiece lowered so that the point rests on the groove which it previously made, and the drum again turned, the diaphragm, acted on by the needle point passing over the indentation, will give out the same words which were spoken to it. (T. GR.)

TELESCOPE

HE telescope is an optical instrument employed to view or discover distant objects.1 The fundamental optical principles involved in its construction have already been dealt with in the articles Ligut and Optics, and these should be first perused by the reader.

History.

The credit of the discovery of the telescope has been a fruitful subject of discussion. Thus, because Democritus announced that the milky way is composed of vast mul- titudes of stars, it has been maintained that he could only have been led to form such an opinion from actual examination of the heavens with a telescope. Other passages from the Greek and Latin authors have similarly been cited to prove that the telescope was known to the ancients. But, as has been remarked by Dr Robert Grant (Mstory of Physical Astronomy, p. 515), we are no more warranted in drawing so important a conclusion from casual remarks, however sagacious, than we should be justified in stating that Seneca was in possession of the discoveries of Newton because he predicted that comets would one day be found to revolve in periodic orbits. Molyneux, in his Dioptrica Nova, p. 256, declares his opinion that Roger Bacon (who died ec. 1294) "did per- fectly well understand all kinds of optic glasses, and knew likewise the method of combining them so as to compose some such instrument as our telescope." He cites a passage from Bacon's Opus Majus, p. 377 of Jebb's edition, 1733, translated as follows :—

"Greater things than these may be performed by refracted vision. For it is easy to understand by the canons above mentioned that the greatest objects may appear exceedingly small, and the contrary, also that the most remote objects may appear just at hand, and the converse ; for we can give such figures to transparent bodies, and dispose them in such order with respect to the eye and the objects, that the rays shall be refracted and bent towards any place we please, so that we shall see the object near at hand or at any dis- tance under any angle we please. And thus from an incredible distance we may read the smallest letters, and may number the smallest particles of dust and sand, by reason of the greatness of the angle under which we see them. . . . Thus also the sun, moon, and stars may be made to descend hither in appearance, and to be visible over the heads of our enemies, and many things

of the like sort, which persons unacquainted with such things would refuse to believe."

Molyneux also cites from Bacon's Epistola ad Parisiensem, "Of the Secrets of Art and Nature," chap. 5 :—

“Glasses or diaphanous bodies may be so formed that the most remote objects may appear just at hand, and the contrary, so that we may read the smallest letters at an incredible distance, and may number things, though never so small, and may make the stars also appear as near as we please.”

These passages certainly prove that Bacon had very nearly, if not perfectly, arrived at theoretical proof of the possibility of constructing a telescope and a microscope ; but his writings give no account of the trial of an actual telescope, nor any detailed results of the application of a telescope to an examination of the heavens. It has been pointed out by Dr Smith, in his Complete System of Optics, that Bacon imagines some effects of telescopes which cannot be performed by them, and his conclusion is that Bacon never actually looked through a telescope.

_ Giambattista della Porta, in his Magia Naturalis, printed in 1558, makes the following remarkable statement :— a

: In recent years the term “photographic telescope” has been applied to instruments employed to record the appearance of celestial objects by photography.

*“Tf you do but know how to jdin the two (viz., the concave and the convex glasses) rightly together, you will see both remote and near objects larger than they otherwise appear, and withal very distinct.”

Wolfius infers from this passage that its author was the first actual constructor of a telescope, and it appears not improbable that by happy accident Porta really did make some primitive form of telescope which excited the wonder of his friends. Here, however, his interest in the matter appears to have ceased, and he was unable either to ap- preciate the importance of his discovery or to describe the means by which the object was attained. Kepler, who exa- mined Porta’s account of his concave and convex lenses by desire of his patron the emperor Rudolph, declared that it was perfectly unintelligible. Poggendorff (Gesch. der Physik, p. 134) throws considerable doubt on the origin- ality of Porta’s statement.

Thomas Digges, in his Stratioticus, p. 359, published in 1579, states that his father, Leonard Digges, ‘‘among other curious practices had a method of

discovering by

perspective glasses set at due angles all objects pretty far distant that the sun shone upon, which lay in the country round about,”

and that this was by the help of a manuscript book of Roger Bacon of Oxford, who he conceived was the only man besides his father who knew it. There is also the following passage in the Pantometria (bk. i. chap. 21) of Leonard Digges? (originally published by his son Thomas in 1571, and again in 1591):—

‘Marvellous are the conclusions that may be performed by glasses concave and convex, of circular and parabolic forms, using’ for multiplication of beams sometime the aid of glasses transparent, which, by fraction, should unite or dissipate the images or figures presented by the reflection of other.”

He then describes the effects of magnification from a com- bination of lenses or mirrors, adding :—

‘But of these conclusions I minde not here to intreate, having

at large in a volume® by itselfe opened the miraculous effects of perspective glasses.” It is impossible to discredit the significance of these quotations, for the works in which they occur were pub- lished more than twenty years before the original date claimed for the discovery of the telescope in Holland.

That Roger Bacon had tolerably clear ideas as to the practical possibility of constructing telescopes, and that Leonard Digges had access to some unpublished MSS. of Bacon, and by their aid constructed some form of. tele- scope, seem to be obvious inferences from the preceding evidence. But it is quite certain that previous to 1600 the telescope was unknown, except possibly to individuals who failed to see its practical importance, and who confined its use to “curious practices” or to demonstrations of “natural magic.” The practical discovery of the instru- ment was certainly made in Holland about 1608, but the credit of the original invention has been claimed on behalf of three individuals, Hans Lippershey and Zacharias

Jansen, spectacle-makers in Middelburg, and James Metius of Alkmaar (brother of Adrian Metius the mathematician).

Descartes, in his treatise on Dioptrics (1637), attributes the dis- covery to Metius ‘‘about thirty years ago,” whilst Schyrelus de Rheita, a Capuchin friar, in his Oculus Enoch et Elie (Antwerp, 1645), gives the credit to Lippershey about 1609. Peter Borel, physician to the king of France, published at The Hague, in 1655, a work De Vero Telescopii Inventore. He was assisted in its pre-

paration by William Borel, Dutch envoy at the court of France, and the latter declares, as the result of patient investigation, that

2 He died about 1570. His son alludes to his untimely death in the preface to the Pantometria. 3 There is no further trace of this volume. ©

Leonard Digges,

The Dutch telescope of 1608.

Jansen.

Metius.

Lip- pershey.

Galileo.

Jansen and his father were the real inventors of the telescope in 1610, and that Lippershey only made a telescope after hints acci- dentally communicated to him of the details of Jansen’s invention. But the most trustworthy information on the subject is to be got from the researches of Van Swinden.! Briefly summarized, this evidence is as follows. In the library of the university of Leyden, amongst the MSS. of Huygens there is an original copy of a document (dated 17th October 1608) addressed to the states-general by Jacob Andrianzoon (the same individual who is called James Metius by Descartes), petitioning for the exclusive right of selling an

instrument of his invention by which distant objects appear larger and more distinct. He states that he had discovered the instrument by accident when engaged in making experiments, and had so far perfected it that distant objects were made as visible and distinct by his instrument as could be done with the one which had been lately offered to the states by a citizen and spectacle- maker of Middelburg. Among the Acts of the states-general pre- served in the Government archives at The Hague, Van Swinden found that on 2d October 1608 the assembly of the states took into consideration the petition of Hans Lippershey, spectacle-maker, a native of Wesel and an inhabitant of Middelburg, inventor of an instrument for seeing ata distance. On 4th October a committee was appointed to test the instrument, and on the 6th of the same month the assembly agreed to give Lippershey 900 florins for his instrument. Further, on the 15th December of the same year they examined an instrument invented by Lippershey at their request to see with both eyes, and gave him orders to execute two similar instruments at 900 florins each; but, as many other persons had knowledge of this new invention to see at a distance, they did not deem it expedient to grant him an exclusive privilege to sell such instruments. The dates of these documents dispose effectually of Borel's statement that Lippershey borrowed the ideas of Jansen in 1610. They also prove that, whilst Metius was in possession of a telescope, with which he may have experimented, about the time when Lippershey presented his application for patent rights, yet he makes no pretension that Lippershey borrowed the invention from him. The conclusion is that Lippershey was the first person who independently invented the telescope, and at the same time made the instrument known to the world. The common story is that Lippershey, happening one day, whilst holding a spectacle-lens in either hand, to direct them towards the steeple of a neighbouring church, was astonished, on looking through the nearer lens, to find that the weathercock appeared nearer and more distinct. He fitted the lenses in a tube, in order to adjust and preserve their relative distances, and thus constructed his first telescope. But doubt may be thrown on this traditional account owing to the further statement that the image of the weathercock so viewed was seen turned upside down. All the original Dutch telescopes were composed of a convex and a concave lens, and telescopes so cou- structed do not invert. The inverting telescope, composed of two convex lenses, was a later invention ; still it is not impossible that the original experiment was made with two convex lenses. Telescopes seem

to have been made in Holland in con- siderable numbers soon after the date of their invention, and rapidly found their way over Europe. Sirturus, in his De Telescopio (1618), states that “a Frenchman pro- ceeded to Milan in the month of May 1609 and offered a telescope for sale to Count di Fuentes”; and Lorenzi Pigorna writes,” under date 31st August 1609, that ‘‘Galileo had been appointed lecturer at Padua for life on account of a perspective like the one which was sent from Flan- ders to Cardinal Borghese.” Simon Marius, the German astronomer, appears to have made astronomical observa- tions in 1609 with a telescope which he procured from Holland, and Professor Rigaud of Oxford found from the MSS. of Harriot, the mathematician, that he had been making astronomical observations with a Dutch telescope as early as July 1609. Galileo, in his Vuncius Sidereus, states that, happening to be in Venice about the month of May 1609, he heard that a Belgian had invented a per- spective instrument by means of which distant objects appeared nearer and larger, and that he discovered its construction by considering the effects of refraction. In his Saggiatore Galileo states that he solved the problem of the construction of a telescope the first night after his return to Padua from Venice, and made his first telescope next day by fitting a convex lens in one extremity of a leaden tube and a concave lens in the other one. _A few

1 See Dr Moll of Utrecht, in Journ. Roy. Inst., vol. i., 1881. 2 Lettre d’ Uomini Illustri, p. 112, Venice, 1744.

days afterwards, having succeeded in making a better telescope than the first, he took it to Venice, where he communicated the details of his invention to the public, and presented the instrument itself to the doge Leonardo Donato, sitting in full council. The senate, in return, settled him for life in his lectureship at Padua and doubled his salary, which was previously 500 florins, and which then became treble that which any of his predecessors had enjoyed. Galileo may thus claim to have invented the telescope independently, but not till he had heard that others had done so. In fact the time was ripe; and, as often happens in similar circumstances, only a hint was necessary to complete the latent chain of thought. Galileo devoted all his time to improving and perfecting the telescope. Knowing the theory of his instrument, and possessed of much practical skill, coupled with unwearied patience, he conquered the difficulties of grinding and

polishing the lenses, and soon succeeded in producing telescopes of greatly increased power. His first telescope | magnified three diameters ; but he soon made instruments which magnified eight diameters, and finally one that magnified thirty-three diameters.? With this last in- strument he discovered in 1610 the satellites of Jupiter,

and soon afterwards the spots on the sun, the phases of Venus, and the hills and valleys on the moon. He demon- strated the rotation of the satellites of Jupiter round the planet, and gave rough predictions of their configurations, proved the rotation of the sun on its axis, established the general truth of the Copernican system as compared with

that of Ptolemy, and fairly routed the fanciful dogmas of

the philosophers. These brilliant achievements, together with the immense improvement of the instrument under

the hands of Galileo, overshadowed in a great degree the credit due to the original discoverer, and led to the uni- versal adoption of the name of the Galilean telescope for

the form of the instrument invented by Lippershey.

Kepler first explained the theory and some of the prac- Kepler. tical advantages of a telescope constructed of two convex lenses in his Catoptrics (1611). The first person who actually constructed a telescope of this form was Father Scheiner, who gives a description of it in his Rosa Ursina (1630). William Gascoigne was the first who practically Gas. appreciated the chief advantages of the form of telescope coigne. suggested by Kepler, viz., the visibility of the image of a distant object simultaneously with that of a small material object placed in the common focus of the two lenses. This led to his invention of the micrometer and his application of telescopic sights to astronomical instruments of pre- cision (see MicRoMETER, vol. xvi. p. 242). But it was not till about the middle of the 17th century that Kepler’s telescope came into general use, and then, not so much because of the advantages pointed out by Gascoigne, but because its field of view was much larger than in the Galilean telescope. The first powerful telescopes of this construction were made by Huygens, after much labour, Huy- in which

he was assisted by his brother. With one of these, 8% of 12-feet focal length, he discovered the brightest of Saturn's satellites (Titan) in 1655, and in 1659 he published his Systema Saturnium, in which was given for the first time a true explanation of Saturn's ring, founded on observations made with the same instrument. The sharpness of image in Kepler's telescope is very inferior to that of the Galilean in- strument, so that when a high magnifying power is required it becomes essential to increase the focal length. Cassini Cassiai. discovered Saturn's fifth satellite (Rhea) in 1672 with a telescope of 35 feet, and the third and fourth satellites in 1684 with telescopes made by Campani of 100 and 136 feet focal length. Huygens states that he and his brother

3 This last power could not be exceeded with advantage in this form of telescope till after the invention of the achromatic object-glass.

made object-glasses of 170 and 210 feet focal length, and he presented one of 123 feet to the Royal Society of Lon- don. Auzout and others are said to have made telescopes of from 300 to 600 feet focus, but it does not appear that they were ever able to use them in practical observations. Bradley, on 27th December 1722, actually measured the diameter of Venus with a telescope whose object-glass had a focal length of 2124 feet. In these very long tele- scopes no tube was employed, and they were consequently termed aerial telescopes. Huygens contrived some ingenious arrangements for directing such telescopes towards any object visible in the heavens,—the focal adjustment and centring of the eye-piece being preserved by a braced rod connecting the object-glass and eye-piece. Other con- trivances for the same purpose are described by La Hire (Mém. de? Acad., 1715) and by Hartsoeker (Miscel. Berol., vol. i. p. 261). Telescopes of such great length were natur- ally difficult to use, and must have taxed to the utmost the skill and patience of the observers. One cannot but pay a passing tribute of admiration to the men who, with such troublesome tools, achieved such results.

Until Newton's discovery of the different refrangibility of light of different colours, it was generally supposed that object-glasses of telescopes were subject to no other errors than those which arose from the spherical figure

of their surfaces, and the efforts of opticians were chiefly directed to the construction of lenses of other forms of curvature. James Gregory, in his Optica Promota (1663), discusses the forms of images of objects produced by lenses and mirrors, and shows that when the surfaces of the lenses or mirrors are portions of spheres the images are curves concave towards the objective, but if the curves of the surfaces are conic sections the spherical aberration is cor- rected. He was well aware of the failures of all attempts to perfect telescopes by employing lenses of various forms of curvature, and accordingly proposed the form of reflect- ing telescope which bears his name. But Gregory, accord- ing to his own confession, had no practical skill; he could find no optician capable of realizing his ideas, and after some fruitless attenipts was obliged to abandon all hope of bringing his telescope into practical use. Newton was the first to construct a reflecting telescope. When in 1666 he made his discovery of the different refrangibility of light of different colours, he soon perceived that the faults of the refracting telescope were due much more to this cause than to the spherical figure of the lenses. He over-hastily concluded from some rough experiments (Optics, bk. i. pt. ii, prop. 3) “that all refracting substances diverged the pris- matic colours in a constant proportion to their mean refrac- tion”; and he drew the natural conclusion “that refraction could not be produced without colour,” and therefore “ that

(Journal des Scavans, 1672). No further practical advance appears to have been made in the design or construction of

the instrument till the year 1723, when John Hadley (best Hadley,

known as the inventor of the sextant) presented to the Royal Society a reflecting telescope of the Newtonian con- struction, with a metallic speculum of 6-inches aperture and 62%-inches focal length, having eye-pieces magnifying up to 230 diameters. The instrument was examined by Pound and Bradley, the former of whom reported upon it in Phil. Trans., 1723, No. 378, p. 382. After remarking that Newton’s telescope “had lain neglected these fifty years,” they stated that Hadley had sufficiently shown “ that this noble invention does not consist in bare theory.” They compared its performance with that of the object-glass of 123-feet focal length

presented to the Royal Society by Huygens, and found that Hadley's reflector

‘‘will bear such a charge as to make it magnify the object as many times as the latter with its due charge, and that it represents objects as distinct, though not altogether so clear and bright. . . . Notwithstanding this difference in the brightness of the objects, we were able with this reflecting telescope to see whatever we have hitherto discovered with the Hugenian, particularly the transits of Jupiter's satellites and their shadows over his disk, the black list in Saturn's ring, and the edge of his shadow cast on his ring. We have also seen with it several times the five satellites of Saturn, in viewing of which this telescope had the advantage of the Hugenian at the time when we compared them ; for, being in summer, and the Hugenian telescope being managed without a tube, the twilight pre- vented us from seeing in this some of these small objects which at the same time we could discern with the reflecting telescope.” Bradley and. Molyneux, having been instructed by Hadley in his methods of polishing specula, succeeded in producing some telescopes of considerable power, one of which had a focal length of 8 feet; and, Molyneux having communicated these methods to Scarlet and Hearn, two London opticians, the manufacture of telescopes as a matter of business was commenced by them (Smith's Optics, bk. iii. ch. 1). But

it was reserved for James Short of Edinburgh to give James Born at Edin-
Short.

practical effect to Gregory's original idea. burgh in 1710 and originally educated for the church, Short attracted the attention of Maclaurin, professor of mathematics at the university, who permitted him about 1732 to make use of his rooms in the college buildings for experiments in the construction of telescopes. In Short's first telescopes the specula were of glass, as suggested by Gregory, but he afterwards used metallic specula only, and succeeded in giving to them true parabolic and elliptic figures. Short then adopted telescope-making as his pro- fession, which he practised first in Edinburgh and after- wards in London. All Short's telescopes were of the Gregorian form, and some of them retain even to the present day their

original high polish and sharp definition. Short died in London in 1768, having realized a consider- able fortune by the exercise of his profession.

no improvement could be expected from the refracting tele- scope” (T’reatise on Optics, p. 112). But, having ascertained by experiment that for all colours of light the angle of incidence is equal to the angle of reflexion, he turned his attention to the construction of reflecting telescopes. After

The historical sequence of events now brings us to the Achro- discovery of the achromatic telescope. The first person ™atic who succeeded in making achromatic refracting telescopes !°S°°P* seems to have been Chester Moor Hall, a gentleman of Chester Essex. He argued that the different humours of the M. Hall.

much experiment he selected an alloy of tin and copper as the most suitable material for his specula, and he devised means for grinding and polishing them. He did not attempt the formation of a parabolic figure on account of the probable mechanical difficulties, and he had besides satisfied himself that the chromatic and not the spherical aberration formed the chief faults of previous telescopes. Newton’s first telescope so far realized his expectations that he could see with its aid the satellites of Jupiter and the horns of Venus. Encouraged by this success, he made a second telescope of 64-inches focal length, with a magni- fying power of 38 diameters, which he presented to the Royal Society of London in December 1671. A third form of reflecting telescope was devised in 1672 by Cassegrain

human eye so refract rays of light as to produce an image on the retina which is free from colour, and he reason- ably argued that it might be possible to produce a like result by combining lenses composed of different refracting media! After devoting some time to the inquiry he found that by combining lenses formed of different kinds of glass the effect of the unequal refrangibility of light was corrected, and in 1733 he succeeded in constructing telescopes which exhibited objects free from colour, One of these instruments of only 20-inches focal length had an aperture of 25 inches. Hall was a man of independent

} The same argument was employed by Gregory more than fifty

years previously, but had been followed by no practical result. The lens of the human eye is not achromatic (see L1gur, vol. xiv. p. 601).

: XXIII. — 18

Euler.

Klingen- stierna.

means, and seems to have been careless of fame: at least he took no trouble to communicate his invention to the world. Ata trial in Westminster Hall about the patent rights granted to Dollond (Watkin v. Dollond),! Hall was admitted to be the first inventor of the achromatic tele- scope; but it was ruled by Lord Mansfield that ‘it was not the person who locked his invention in his scrutoire that ought to profit for such invention, but he who brought it forth for the benefit of mankind.”2 In 1747 Euler com- municated to the Berlin Academy of Sciences a memoir in which he endeavoured to prove the possibility of correct- ing both the chromatic and the spherical aberration of an object-glass. Like Gregory and Hall, he argued that, since the various humours of the human eye were so combined as to produce a perfect image, it should be possible by suitable combinations of lenses of different refracting media to construct a perfect object-glass. Adopting a hypo- thetical law of the dispersion of differently coloured rays of light, he proved analytically the possibility of constructing an achromatic object-glass composed of lenses of glass and water. But all his efforts to produce an actual object- glass of this construction were fruitless,—a failure which he attributed solely to the difficulty of procuring lenses worked precisely to the requisite curves (Mem. Acad. Berlin, 1753). Dollond admitted the accuracy of Euler’s analysis, but disputed his hypothesis on the grounds that it was purely a theoretical assumption, that the theory was opposed to the results of Newton’s experiments on the refrangibility of light, and that it was impossible to de- termine a physical law from analytical reasoning alone (Phil. Trans., 1753, p. 289). In 1754 Euler communicated to the Berlin Academy a further memoir, in which, starting from the hypothesis that light consists of vibrations excited in an elastic fluid by luminous bodies, and that the differ- ence of colour of light is due to the greater or

less fre- quency of these vibrations in a given time, he deduced his previous results. He did not doubt the accuracy of New- ton's experiments quoted by Dollond, because he asserted that the difference between the law deduced by Newton and that which he assumed would not be rendered sensible by such an experiment.? Dollond did not reply to this memoir, but soon afterwards he received an abstract of a memoir by Klingenstierna, the Swedish mathematician and astronomer, which led him to doubt the accuracy of the results deduced by Newton on the dispersion of refracted light. Klingenstierna showed from purely geometrical considerations, fully appreciated by Dollond, that the re- sults of Newton's experiments could not be brought into harmony with other universally accepted facts of refraction. _1 At a meeting of the Royal Astronomical Society held on 9th May 1886 a legal document, signed by Chester Moor Hall, was presented by Mr R. B. Prosser of the Patent Office to the society. On the same occasion Mr Ranyard made the following interesting

statement respecting Hall :—

‘‘Some years ago very little was known about Moor Hall. It was known that, about seven years after the patent for making achromatic object-glasses was granted to Dollond, his claim to the invention was disputed by other instru- ment-makers, amongst them by a Mr Champness, an instrument-maker of Cornhill, who began to infringe the patent, alleging that John Dollond was not the real inventor, and that such telescopes had been made twenty-tive years before the granting of his patent by Mr Moor Hall. John Dollond, to whom the Copley medal of the Royal Society had been given for his inven- tion, was then dead, and his son brought an action for infringing the patent against Champness. There is no report of the case, but the facts are referred to in the reports of subsequent cases. It appears that workmen who had been employed by Mr Moor Hall were examined, and proved that they had made achromatic object-glasses as early as 1733. Dollond's patent was not set aside, though the evidence with regard to the prior manufacture was accepted by Lord Mansfield, who tried the case, as having been satisfactorily proved. .. . Mr Hall was a bencher of the Inner Temple, and was alive at the time of the action. He was a man of some property, and is spoken of on his tombstone as an excellent lawyer and matt.ematician. He was not a fellow of the Royal Society, but must certainly

have known of the gift of the Copley medal to Dollond. It is very curious the conflicting evidence we have to reconcile, but I think the balance of evidence is in favour of there having been a prior in- vention of achromatic object-glasses before the date of Dollond's patent" (Astron. Register, May 1886; see also the Observatory for same date).

> Gentleman's Magazine, 1790, part ii. p. 890.

3 For a good account of this controversy, see Dr. H. Servus, Ge- schichte des Fernrohrs, p. 77 sq., Berlin, 1886 :

Like a practical man, Dollond at once put his doubts to the Dollong, test of experiment, confirmed the conclusions of Klingen- stierna, discovered ''a difference far beyond his hopes in the refractive qualities of different kinds of glass with respect

to their divergency of colours," and was thus rapidly led

to the construction of object-glasses in which first the chromatic and afterwards the spherical aberration were corrected (Phil. Trans., 1758, p. 733).

We have thus followed somewhat minutely the history of the gradual process by which Dollond arrived indepen- dently at his invention of the refracting telescope, because it has been asserted that he borrowed the idea from others. Montucla, in his Histoire des Mathématiques (pp. 448-449), gives the following footnote, communicated to him by Lalande :—

'*Ce fut Chestermonhall" (an obvious misprint for Chester Moor

Hall) ''qui, vers 1750, eut Vidée des lunettes achromatiques. I] s'adressoit 4 Ayscough,? qui faisoit travaillir Bass. Dollond ayant eu besoin de Bass pour un verre que demandoit le duc d'Yorck, Bass lui fit voir du crown-glass et du flint-glass. Hall donna une Iunette & Ayscough, qui la montra 4 plusieurs personnes; il en donna Ja construction a Bird, qui n'en tint pas compte. Dollond en profita. Dans le procés qu'il y eut entre Dollond et Watkin, au bane du roi, cela fut prouvé ; mais Dollond gagna, parce qu'il étoit le premier qui efit fait connoitre les lunettes achromatiques." It is

clearly established that Hall was the first inventor of the achromatic telescope ; but Dollond did not borrow the invention from Hall without acknowledgment in the manner suggested by Lalande. His discovery was beyond question an independent one. The whole history of his researches proves how fully he was aware of the conditions necessary for the attainment of achromatism in refracting telescopes, and he may be well excused if he so long placed implicit reliance on the accuracy of experiments made by so illustrious a philosopher as Newton. His writings suffi- ciently show that but for this confidence he would have arrived sooner at a discovery for which his mind was fully prepared. It is, besides, impossible to read Dollond's memoir (Phil. T'rans., 1758, p. 733) without being im- pressed with the fact that it is a truthful account, not only of the successive steps by which he independently arrived at his discovery, but also of the logical processes by which these steps were successively suggested to his mind,

The triple object-glass, consisting of a combination of two convex lenses of crown glass with a concave flint lens between them, was introduced in 1765 by Peter, son of John Dollond, and many excellent telescopes of this kind were made by him.

The limits of this article do not permita further detailed historical statement of the various steps by which the powers of the telescope were developed. Indeed, in its practical form the principle of the instrument has re- mained unchanged from the time of the Dollonds to the present day; and the history of its development may be summed up as consisting not in new optical discoveries but in utilizing new appliances for figuring and polishing, im- proved material for specula and lenses, more refined means of testing, and more perfect and convenient methods of mounting. About the year 1774 William Herschel, then W. Her a teacher of music in Bath, began to occupy his leisure he: hours with the construction of specula, and finally devoted himself entirely to their construction and use. In 1778 he had selected the chef d'ceuvre of some 400 specula which he made for the celebrated instrument of 7-feet focal length with which his early brilliant astronomical dis- coveries were made. In 1783 he completed his reflector of 18,5-inches aperture and 20-feet focus, and in 1789 his great reflector of 4-feet aperture

and 40-feet focal length. The fame of these instruments was rapidly spread by the brilliant discoveries which their maker’s genius and perse-

4 Ayscough was an optician in Ludgate Hill, London.

verance accomplished by their aid. The reflecting telescope became the only available tool of the astronomer when great light grasp was requisite, as the difficulty of procuring disks of glass (especially of flint glass) of suitable purity and homogeneity limited the dimensions of. the achro- matic telescope. It was in vain that the French Academy of Sciences offered prizes for perfect disks of optical flint glass. Some of the best chemists and most enterprising glass-manufacturers exerted their utmost efforts without succeeding in producing perfect disks of more than 34 inches in diameter. All the larger disks were crossed by striee, or were otherwise deficient in the necessary homo- geneity and purity.

inand, Pierre Louis Guinand, a humble watchmaker living

near Chaux de Fond in Neuchatel, Switzerland, was the first who succeeded in making marked progress in the manufacture of optical flint glass. After making pre- liminary experiments extending over seven years (1784- 90), and nothing daunted by their comparative want of success, he erected a furnace near Les Brenets, and devoted most of his slender earnings (then derived from making the bells, or rather gongs, of repeating watches) to the fulfilment of his ambition. His persistency, courage, and self-denial recall forcibly the story of Palissy. In 1805 he joined the optical establishment of Fraunhofer and Utz- schneider and remained with them about nine years. During this period extensive experiments were instituted with remarkable success. It is said that the disks for the Dorpat refractor (9°6 inches aperture, with which the observations of Wilhelm Struve were made) were manufac- tured during this period, though the complete instrument was not delivered till 1823. Fraunhofer had, however, profited so fully by the suggestions of Guinand, and had

‘ probably also so far improved on the original methods, that

he afterwards succeeded in producing still larger object- glasses. After Fraunhofer’s death in 1826 his successors Merz and Mahler carried out successfully the methods handed down to them by Guinand and Fraunhofer, and produced some large and excellent telescopes, which are hereafter mentioned. Meanwhile Guinand, having re- turned to his native country in 1814, resumed there the manufacture of disks of optical glass, discovered a method of removing striz by breaking and reuniting the portions by heat, when the glass was in a plastic state, and event- ually produced perfect disks up to 18 inches in diameter.

and to describe in detail special typical instruments, which, owing to the work accomplished by their aid or the practi- cal advances exemplified in their construction, appear most worthy of record or study.

Refracting Telescope.

In its simplest form the telescope consists of a convex object- Early lens capable of forming an image of a distant object and of an eye- forms.

lens, concave or convex, by which the image so formed is magnified. When the axis of the eye-lens coin- cides with that of the ob- ject-glass, and the focal point of the eye-lens is co- incident with the principal focus of the object-lens, parallel rays incident upon the object-glass will emerge from the eye-piece as parallel rays. These, falling in turn on the lens of the human eye, are converged by it and form an image on the retina.” Fig. 1 shows the course of the rays when the eye-lens is convex (or positive), fig. 2 when the eye- lens is eoncave (or negative) The former represents Kepler’s, the latter Lippershey’s or the Galilean telescope. The magnifying power obviously depends on the proportion of the focal length of the object-lens to that of the eye-lens, that is, magnifying power= F/e,

where F is the focal length of the object-lens and ¢ that of the eye-lens.

Fig. 2.

methods of determining the magnifying power of a telescope is to measure the diameter of the emergent pencil of rays, after the tele- scope has been adjusted to focus upon a star, and to divide the diameter of the object-glass by the diameter of the emergent pencil. If we desire to utilize all the parallel rays which fall upon an object- glass it is necessary that the full pencil of emerging rays should enter the observer's eye. Assuming with Sir William Herschel that the normal pupil of the eye distends to one-fifth of an inch in diameter when viewing faint objects, we obtain the rule that the minimum magnifying power which can be efficiently employed is five times the diameter of the object-glass Gavmacial in inches. The defects of the Galilean and Kepler telescopes are due to the ehromatic and spherical aberration of the simple lenses of which they are composed (see Oprics, vol. xvii. p. 802 sq.). The substitution of a positive or negative eye-piece for the simple convex or concave eye-lens, and of an achromatic object-glass for the simple object-lens, transforms these early forms into the modern achro- matic telescope. The Galilean telescope with a concave eye-lens instead of an eye-picce still survives as the modern opera-glass, on account of its shorter length, but the object-glass and eye-lens are achromatic combinations.

Also the diameter of the pencil of parallel rays emerging Magnify- from the eye-lens is to the diameter of the object-lens inversely as ing the magnifying power of the telescope. Hence one of the best power.

Most of these he disposed of to Lerebours and Secretan, opticians in Paris, by both of whom some fine object-glasses

The principles of an achromatic combination of prisms or lenses Achro- have been explained in Licut (vol. xiv. pp. 592, 595) and further matic developed in Optics (vol. xvii. p. 804 sqg.). As a lens may be re- object-

were made.! Guinand communicated his secrets to his sons before his death in 1823. About 1829 Bontemps entered into partnership with one of the sons, and another son carried on his father's manufacture in partnership with his mother. The latter firm was succeeded by Dauget of Soleure, whose exhibits of optical glass excited so-much attention at the London exhibition of 1851. About 1848 Bontemps joined the firm of Chance Brothers of Birming- ham, and thus carried the secret of Guinand's methods

to England. It is not a little remarkable that the only firms in the world by whom large disks of optical glass have been produced trace their success to information derived more or less directly from Guinand. MM. Feil of Paris, who are direct descendants of Guinand, and Messrs Chance Brothers of Birmingham are at the present time the only makers of optical glass in disks of larger diameter than 20 inches. INstTRUMENTS, &c.

We now proceed to give an account of the methods and principles of construction of the various kinds of telescopes,

1 See Wolf, Biographien, vol. ii. p. 301, and Clerke, History of Astronomy, pp. 146-147.

garded as built up of a series of thin slices of prisms, divided from glass.

each other by planes parallel to the axis of the lens, it will be seen that, if a prism perfectly achromatic for rays of two definite wave- lengths, and approximately achromatic for all rays, can be con- structed by combining two prisms of different kinds of glass, all that is required to produce an object-glass with similar small chromatic errors is to combine a convex lens of crown glass and a concave one of flint glass as in fig. 3, their surfaces being of such curvatures as to form aseries of imaginary prisms (such as we have supposed an object-glass to consist of) through any one of which all kinds of light falling on the 2 hig parallel to its axis will be refracted very nearly to a common focus ¥. Accordingly any pro-

2 In the case of short-sighted persons the image for very distant ob- jects (that is, for parallel rays) is formed in front of the retina ; there- fore, to enable such persons to see distinctly, the rays emerging from the eye-piece must be slightly divergent ; that is, they must enter the eye as if they proceeded from a comparatively near object. For normal eyes the natural adaptation is not to focus for quite parallel rays, but on objects at a moderate distance, and practically, therefore, most persons do adjust the focus of a telescope, for most distinct and easy vision, so that the rays emerge from the eye-piece very slightly diver- gent. Abnormally short-sighted persons require to push in the eye-lens nearer to the object-glass, and long-sighted persons to withdraw it from the adjustment employed by those of normal sight. It is usual, how- ever, in computations of the

magnifying power of telescopes, for the rays emerging from the eye-piece when adjusted for distinct vision to be parallel.

j i i iti i that the adjacent surfaces of the sup- d object-glass can be tested as regards its optical conditions by | is necessary to assume } : * esas a <9," 4.¢., calculating he point at which, after refrac- | posed infinitely numerous prisms form together some continuous tion through the two lenses, the ray so traced will cut their ‘ common axis. For the analytical solution of this problem it

curved surface, which practically is nearly spherical. But the | consider most desirable. Herschel advocates actual differences between the curves which may be required in | satisfying the terms depending on the second certain conditions for producing a perfect lens differ so slightly | power of the aberration, Kliigel that the refrac- from true spherical surfaces that it is impossible by any previously | tions of the rays should be as small as possible ; designed mechanical process to predict whether the resulting figure | or we may make it a condition that the second will be that of a sphere or some other curve very nearly that of a | and third surfaces shall have the same radius, so that the surfaces sphere. The mathematician, therefore, who discusses the subject | may be cemented together. The fourth condition is of course the is compelled to adopt spherical curves as the basis of his calcula- | desired focal length. But for all practical purposes it is sufficient tion, On this assumption we may then trace a ray rigidly through | to have placed the reader in a position to test the optical condi- any supposed object-glass as follows. Let A, B, A’, B’ be respectively | tions of any combinations that may be proposed, and to refer \ the points where the refracted ray produced would intersect the | him to the works mentioned in the subjoined note? ; for, in fact Practical optical axis after refraction at the first, second, third, and fourth the construction of object-glasses on paper is of far higher interest methods refracting surfaces respectively ; also let a be the first angle of in- | as a mathematical exercise than as a practical matter. By a slight of com- cidence, « and yw’ the refractive indexes for the crown and flint lens | departure from the spherical figure—a departure so minute that putation,

respectively for a ray of the wave-length whose course is to be traced, 7 and s the first and second radii for the crown lens, 7” and s’ the first and second radii for the flint lens, a, B, a’, B’, a’, and 0’ auxiliary angles, d the thickness of the crown lens, @’ the thickness of the flint lens, A the distance between the second and third surfaces.. Then for the intersect after refraction at the first surface

: i sina=— sina; bad . r.sina (A)=a-a; A ain (A) +73 for the intersect after refraction at the second surface

singe t2-4 sin (A);

sinB=yp.sinb;

rs , posi gs ae (B)=(A)+B-4; ee) s; for the intersect after refraction at the third surface

sin a’ = — (B-7’- aja),

: iby ve sin has sina’;

(ky (pe BA ‘=y_y/’, sina | (A’) ( )+a w;A a z sin (A’)’ for the interscct after refraction at the fourth surface sin b’= — (A’+s’-d’) sin‘4) ; sin 8 =p’ sin 0’; a , B’)=(A’ b’— A’: pas ee sin p’ (B’)=(A’)+8’— A’s B’s —s—a1 The computation is very much simplified when we consider the

angle of incidence to be very small—i.e., the point of incidence very near the optical axis, viz.,

a ; g oe p’s! ; Ep8-) ¢ > R 2-7°”™

By means of these formule we can compute B’ (the point where a ray, entering the first surface of the object-glass, will intersect the optical axis) for any angle of incidence=a, when for a ray of that wave-length the indexes of refraction are known for the glass of which the lenses are composed, if the radii of curvature of the lenses are also known. The most perfect object-glass would be one in which the value of B’ is the same for two rays of the two selected wave-lengths, through whatever portion of the

object-glass they may pass. This, however, is a condition which cannot be mathematically satisficd with spherical surfaces. It is of course possible to find values of the four unknown quantities 7, s, 7’, and s’ such that four conditions shall be satisfied. The ordinary approxi- mate method is to find such values of the radii that B’ is the same for rays of two different wave-lengths when the incident rays are near the axis, and for mean rays which enter near the margin of the lens ; _but of course this solution is indeterminate, and only becomes rigid when two radii are assumed. Thus, for any crown lens of any radii of curvature it is possible to find a flint lens to satisfy these conditions. The rigid solution becomes one of suc- cessive approximation to such four conditions as the computer may

there are no mechanical means sufficiently delicate to measure it with certainty—the optician may fail to realize true spherical surfaces, and thus on the one hand miss the fine definition which his calculation led him to expect, or on the other hand convert an object-glass which with spherical curves would have large spherical aberration into one perfectly corrected in this respect,

aving, therefore, for particular kinds of glass ascertained a good general form of object-glass, it becomes only necessary for the optician to perform an approximate calculation of the curva- tures requisite to produce correction of the chromatic aberration, and to trust to the process of final figuring for correction of the final spherical and chromatic aberration. It fortunately happens that in the rigid equations the terms which express the thick- ness and distance apart of the lenses involve only the focal distances of central rays, and have but a small influence on the ratios of the aberrations of the lenses; and, further, they affect

chiefly the focal length of the lens, and have a very small influence —

on the chromatic aberration. Thus in the preliminary computa- tion the optician may neglect the thickness of the lenses and emplo

the simple approximate formule given under Oprics, vol. xvii. p. 804—

ou. 1, a Bh «= ¥ re Pai 7 A ? Suc) P bu’ i ea where ‘ st and aay are the dispersive powers of the two kinds of

glass for the two rays which he desires to unite, f and /” the cor- responding focal lengths of the two lenses, and F the focal length of the combination. The focal lengths of the two lenses which secure the conditions of achromatism having been thus computed, the radii of curvature may be computed for either lens by the usual formula (see LiGutT, vol. xiv. p. 593) —

ee: 1)

an ld)(r 8 , In the last expression, where r and s correspond to the radii of curvature, the optician has an infinite range of choice. He will of course select such a proportion of 7 to s as experience or more elaborate calculation has shown to be favourable. In the form of object-glass recommended by Sir John Herschel, as fulfilling the most favourable conditions for correction of a spherical aberration for parallel as well as nearly parallel rays, the required curvatures for the exterior surfaces of the crown and the flint lens were found to vary very slightly for a considerable range of the ratio of the dispersive powers of the crown and the flint glass. —a # (the mean index of refraction) to be 1542 for crown glass an 1°585 for flint glass, Herschel proved that, if the radii in question are taken to be 6°72 for the crown lens and 14°20 for the flint lens (supposing the focal length of the desired combination to be 10), we have only to compute the radii of the second and third surfaces

1 Kuler, Dioptrica, St Petersburg, 1767-71; Clairaut, Mém. de l’Acad. Scien, .

1757 ; D’Alembert, Opusc., vol. iii.; Lagrange, Miscel. Taurin., iii. 2, p. 152, and Mem, Acad. Berl., 1778; Schmidt, Lehrbuch der analytischen Optik ; Santini, Teorica degli Strwmenti Ottict; Kltigel, in Gilbert’s Ann. d. Physik, xxxiv., 1810, pp. 265-275 and 276-291; Herschel, Phil. Trans, Roy. Soc., 1821, pp. 222-267; Littrow, Mem, R.A.S. (London), vol. iii. pp. 235-255; Robinson, Mechanical Philosophy, art. “Telescope,” vol. iii. pp. 403-514; Gauss, ‘‘ Ueber die achro- matischen Doppel-Objective,” in Lindenau’s Zeitschr., iv., 1817, pp. 345-351, and Gilbert’s Ann. d. Physik, lix. pp. 188-195; Gauss, in Louville’s Journal, 1856, i. pp. 9-43; Steinheil Astron. Nach., xl vili., 1851, col. 225-228, liii., 1860, col. 305-306, and 1861, col. 269-270; A. Steinheil, Ueber Berechnung optischer Con-

structionen ; Carl Steinheil, Repertoriwm, iii., 1867, pp. 430-440, and Miinchen Akad. Sitz., 1867, ii. pp. 284-297; Steinheil (Carl A. and H, A.), Géttingsche Nachrichten, 1865, pp. 131-143, 211-214.

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by means of the above simple formule and the measured dispersive and refractive power of the glass of the lenses. (The method of determining p, &c., is given under OpTics, vol. xvii. p. 800.) The

form generally adopted (see fig. 4) in the

best modern object-glasses is extremely

simple, viz., an equi-convex crown lens

and a flint lens whose first surface has the

same radius of curvature as the surfaccs =e % of the crown lens—this radius depending on the focal length which it is desired to give to the object-glass. Since in order to fulfil the conditions of achromatism the focal lengths of the two lenses have to be proportional to their dispersive powers (for the rays which it is desired to unite), and asin the two de- scriptions of glass in question the dispersion of flint glass for C to rays between F and G is very nearly twice that of crown glass, the posterior surface of the flint lens becomes nearly a plane. The final correction for achromatism is made, if necessary, by departing slightly from a plane in the curvature of the last surface of the flint lens, and the final correction for spherical aberration in the figuring of the surfaces. In a lecture delivered at the Royal In- — on 2d April 1886 Sir Howard Grubb, optician, of Dublin, sald :

“A truly spherical curve is the exception, not the rule. When I tell you that a sensible difference in correction for spherical aberration can be made by half an hour’s polishing, corresponding probably to a difference in the first place of decimals in radii of the curves, you will see that it is practically not necessary to enter upon any calculation for spherical aberration. We know

about what form gives an approximate correction; we adhere nearly to that, and the rest is done by figuring of the surface. To illustrate what I mean. I would be quite willing to undertake to alter the curves of the crown or flint lens of any of my objectives by a very large quantity, increasing one and decreasing the other so as to still satisfy the conditions of achromatism, but introducing theoretically a large amount of positive or negative spherical aberration, and yet to make out of the altered lens an object-glass perfectly corrected for spherical aberration. . . . I may remark that it is sometimes

ossible to make a better objective by deviating from the curves which give a rue correction for spherical aberration, and correcting that aberration by figuring, rather than by strictly adhering to the theoretical curves."

When an object-glass is designed for use as an ordinary telescope it is usual to select for the rays of different colour to be united those near C and those be- tween F and G, since rays of lower and higher re- frangibility produce a com- ° paratively faint impression , on the sense of sight. In such a telescope of any considerable aperture the image of a bright star at focus is surrounded by a halo of bluish or violet- coloured light,—a defect which is unavoidable in an , object-glass composed of a crown and flint lens on ac- count of the irrationality of their spectra (Licut, vol. xiv. p. 592), There seems to be no doubt that differ- ent eyes are differently im- pressed by rays of different wave-length. Thus two observers will often have different opinions as to the chromatic corrections of so the same object-glass: the observer whose eye is ab- normally sensitive to vio- let light will pronounce the + chromatic aberration over- $ corrected in an object-glass which another will consider perfect in this respect, and vice versa. Probably it is partly owing to this cause that the object-glasses of different makers show systematic differ- ences in their colour correction. An exceedingly sensitive method of testing this correction devised by Professor Stokes is given under Oprics, vol. xvii. p. 804. Another method, due to Professor Hark- ness and first carried out by Dr Vogel, is the following. Place behind the eye-picce a direct vision prism (¢f. Oprics, p. 801). The image of a star in the field will then be converted into a narrow spectrum, which, if there were no chromatic aberration, would when focused be represented by a faint coloured straight line, uniformly sharp and narrow. But in an ordinary object-glass only two points in the spectrum can be perfectly focused

simultaneously ; therefore all its other parts are spread out, forming a coloured band of variable breadth. If we focus on the brightest part of the spectrum, both

1 See Abney and Festing, Bakerian Lecture, Phil. Trans., 1886; also Photo- graphic News, May 1886, p. 332.

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its extreme ends become spread out into a more or less trumpet- shaped form, enabling the observer to note the range of the spec- trum over which precise definition can be expected. The amount of this extension will depend in some degree on the form of the object-glass, but much more (if the achromatism is fairly well corrected) on the irrationality of the spectra of the glass of which the lenses are composed. If we then focus, for example, on the C line, we shall have the band of light contracted at C and at another point (probably between F and G), widening to a slightly trumpet-shaped form below C, and markedly so above G. This second point of greatest contraction gives the wave-length of the ray which has the same focus asC. If the telescope has a focusing scale, we can also measure directly in this way the change of focus for rays of different colours. The chromatic aberration will be best corrected for the rays of minimum focus, and this minimum focus should for an ordinary telescope correspond with the brightest part of the spectrum, viz., with rays between D and E. A com-

parison of the chromatic correction of object-glasses by different makers is given by Dr Vogel (Monatsber. der Berliner Akad., April 1880), obtained in the manner just described. The tele- scopes compared are—

Observatory to YK No. of Aper- Maker. which Instru- perture of Focal tures in Focal ment belongs. Object-Glass. Length. BA m. m. Schroder …... Potsdam 0°298 5:4 18°1 V0] 0) 0 ee aoe ee Bs 0°207 3°16 15°3 Fraunhofer …. Berlin 0°243 4°331 17°8

Fig. 5, taken from the above-quoted paper, affords most interest- ing information as to the colour-correction of these three typical object-glasses. The curves of the diagram show the variation of the focal point for rays of different wave-lengths in the case of each object-glass. It will be seen that Fraunhofer has united the rays about C with those of wave-length 525 millionths millimétres, Grubb with those about wave-length 494, and Schréder about wave- length 463. The object-glasses of Grubb and Schréder are com-

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Spectrum of a white Star tor differeat adjustunent of tie focus hed Violet

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Fig. 5.

posed of modern glass, which is comparatively colourless, whilst Fraunhofer’s glass is decidedly green in colour. The minimum focus in Fraunhofer’s telescope is placed near D (rather at wave-length 585),

because the absorption of the blue and violet rays of the spectrum by the flint lens renders the brightest part of the spectrum less blue than in an objective composed of modern glass by Chance or Feil, which is nearly colourless. This circumstance enabled Fraunhofer to apply a very large over-correction for colour,—that is, to unite as perfectly as possible the red and central part of the spectrum, and to leave the outstanding violet rays to be in great part absorbed by the colour of the glass. The colour-corrections in the object-glasses of Grubb and Schroder are very different in character. In Grubb's object-glass the minimum focus is for rays of wave-length about 545, that of Schréder's is about wave-length 538, which appears to prove that Grubb's eye is more sensitive to

Photo- graphic object- glasses.

Triple object- glasses.

red and Schréder's to blue light. Also Grubb's object-glass unites the red rays very closely with the brightest part of the spectrum, and leaves the blue and violet rays outstanding. Schréder, on the other hand, leaves the red rays outstanding in order to unite the rays between D and F more closely. The conclusion is that to Grubb's eye the red rays would be obtrusively prominent in Schréder's telescope, and that he would pronounce the object-glass under-corrected ; whilst Schréder's eye would find the outstanding violet rays too prominent in Grubb's telescope, and pronounce it over-corrected. The absolute amount of light in the secondary spectrum in viewing the same object depends, ceteris paribus, upon the square of the aperture; therefore telescopes of large aperture have to be made of greater Lge eben focal length than those of small aperture, in order to diminish the secondary spectrum. Figs. a, B, y, 5 in the diagram give.the form of the spectrum of a star in Schroder's telescope for various adjustments of the focus ; figs. a' and y' give the corresponding forms for Fraunhofer's tele-scope. Fig. a represents the eye-piece focused for the brightest part of the spectrum ; fig. 8 when the red rays and those near Ha are simultaneously focused ; fig. y when the extréme red rays are In focus, the corresponding focus being a little below Hy ; fig. 6 when focused on Hy.

When a telescope is to be constructed for photographic purposes the aim should be to unite, as perfectly as possible, the rays near that portion of the spectrum which act most powerfully on the photographic plate to be employed. This latter point has been de- termined for the various photographic processes by Captain Abney.? The results are shown graphically in fig. 6 for the processes practi-

cally employed at present 7 in astronomical photo-

“| graphy. Visual spectrum.

AglI, acid or alkaline de- veloper.

Do., short exposure.

AgBr, acid or ferrous citro- oxalate developer.

Do., short exposure.

Orange, AgBr.

Do., short exposure.

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Green, AgBr.

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Do., short exposure.

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Agl ~~+ AgBr~~+ AgNO;; wet oo | . plate. 7 PUT |

Fig. 6.

To unite the rays near G or H the angle of the flint prism must be diminished ; that is, the focal length of the flint lens must be lengthened as compared with that of an object-glass of similar construction suited for eye observations; and the rays of greatest photographie action can be united more perfectly than the visible rays.

- If an object-glass is composed of three lenses of different kinds of glass it is theoretically possible to unite three instead of two points of the spectrum, besides improving the correction for spheri- cal aberration. The most important practical applications of such a system have been—(1) the triple object-glass of John Dollond ; (2) the application of a convex crown glass in front of an ordinary object-glass in order to alter its chromatic correction from that best suited for eye observations to that best suited for photographic observation. John Dollond's object-glass is generally described as a concave flint lens between two crown lenses. If the crown lenses are of similar glass, there is no gain as to the correction of the secondary spectrum ; it becomes only possible to correct the spheri- cal aberration more perfectly. Very few telescopes with triple object-glasses have been made since the days of John Dollond. But the great and detrimental obtrusiveness of the secondary spectrum in the large object-glasses of the present day can be diminished in no other way, unless very extreme focal lengths are adopted, or some new kinds of glass that can be produced in large disks are discovered, in which the irrationality of their spectra is less, and in which also there is the necessary difference in the

Agl+AgBr, ferrous oxalate developer.

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1 Proc. Roy. Soc., vol. xxxiii. pp. 164-186.

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"much shorter proportional focus than is usual or possible in double

relation between refractive index and dispersive power. The cost of a triple object-glass would of course be at least 50 per cent. greater than that of a double object-glass ; but, on the other hand, the extreme focal length necessary for large object-glasses might be considerably reduced. Thus the cost saved by a less heavy mount- ing and a smaller observatory and dome might counterbalance to some extent, if not entirely, the additional cost of the triple object- glass. Dr Schroder has constructed for the present writer an exquisite triple object-glass (three different kinds of glass) of 84-inches aperture and only 18-inches focal length. Its perform- ance with its highest eye-piece of 4-inch focus (power 72) is most admirable. It would probably be impossible to construct large telescopes approaching such short focal length, but there is no doubt that a large triple object-glass of 10 or 12 apertures focus would have an enormous advantage in colour correction, and prob- ably in spherical aberration, over a double object-glass of the same aperture and much greater focal length. One peculiarity of such a triple object-glass is that three points in the spectrum can have the same focus, and therefore the point of minimum focus may for the best chromatic adjustment not quite correspond with the focal point for the brightest part of the spectrum ; but, obviously, the rays of the whole visible spectrum may thus be brought to intersect the axis much more nearly at the same point. There will probably be a far wider adoption of the triple object-glass in the future, especially as the greater intrinsic brilliancy of the image in short-focus telescopes is a matter of high importance in the spectroscopic and photographic processes of modern astronomy. On the subject of triple object-glasses the reader is referred to an admirable paper by Professor C. 8. Hastings (Amer. Journal of Science and Arts for December 1879, p. 429), which exhibits the results to be got – from combinations of different existing kinds of glass.

The following table exhibits the excess of the focus for any ray over the true focus, the unit being zyq/ba0 of the focal length, in —I. the actual results of Dr Vogel’s observations on three existing object-glasses already quoted, but each reduced to comparison with its true or minimum focus; II. the theoretically best possible ~ results from a double object-glass consisting of Feil’s crown 1219 and Feil’s flint 1237, as computed by Hastings ; III. the theoretical results of four different triple object-glasses, capable of practical construction, of which details are given by Hastings.

Double Object-Glasses. Triple Object-Glasses.

IL. Til.

Hast- Hastings Hastings Hastings | Hastings

ings 1 2 3 4 A . ‘ 50 + 135 ae + 2 at – 8 Bi + 47 | + 64 | +106 + 66 +1 – 53 — 22 – 85 Cc} + 36 | + 41 | + 78 + 41 0 + 41 AO -++ 50 D O;|}+ 8; + 28 0 0 -+ 28 + 41 + 2 E| + 27 | + 29 0 + 13 ++ 25 – 10 – 67 – 10 F| + 64 56 | + 383 + 78 0 -14 — 60 – 4 G/ +171 | +226 | + 243 -+ 287 0 + 2 + 21 – 3

Prof. Hastings’s first condition in these computations is that the radius of curvature of none of the surfaces shall exceed one-fifteenth of the focal length. He also neglects the thickness and distance apart of the lenses, since these affect chiefly the focal length, but do not very materially affect the difference of the foci for different rays. The expression for the focal length F is then

e=’= 1(~~+=) The = v(~~+2) + (a — (+z)

where $= F vw’, uw’, w” are the indexes of refraction for the three

kinds of glass, and 7, 72, . . . 7 the radii of curvature for the six successive surfaces. Writing this in the form $= -NA+(W-B+(u”-1)0, we may call A, B, and C the curvature sums of the first, second, and third lenses respectively. The problem then is to find, for existing specimens of glass, values of A, B, and C no one of which shall exceed 30 when ¢=1, and which shall make ¢ independent of the wave-length of the light transmitted. The resulting values of A, B, and C for the first combination (marked ‘‘ Hastings 1”) are A C

5°47026 7°20827 — 835472; the curvatures are therefore very moderate and perfectly practicable. The constants for the glass of the first and second lenses have been determined by the author with great accuracy (see Amer. Jour., vol. xv. p. 273). The third glass is Fraunhofer’s flint 13 (Hastings 4 misprinted v in his table, in Amer. Jour., vol. xviii. p. 181), for which the constants are given in Schumacher’s Astron. Abhandlung fir 1823. If this glass can be reproduced in large disks, as no doubt it could be, we have the

meaus of making an object-glass very superior to any in existence and equally available for eye and photographic observation. Such an object-glass could be made of

object-glasses, not only because of the absence of secondary spectrum but also from the command afforded over the spherical aberration

Pree s CO P

by six surfaces. After satisfying the conditions of focal length, the first power of the spherical aberration, and two conditions of achromatism, we have still two available arbitrary conditions, which may be that r2=7r, and r,=7,. If these lead to convenient forms, as seems likely in the case in point, the whole may constitute a

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dispersive power was increased, as in the phosphatic glasses, the blue end of the spectrum, as compared with the red end, was not spread out more than in ordinary glass of like dispersive power (Report Brit. Assoc., 1875, p. 26). It is to be hoped, however, that makers of optical glass will not relax their efforts till astronomers

cemented lens; thus the loss of light at the interior surfaces may be eliminated, and the final perfecting of the spherical aberration be left to the figuring of the surfaces.

shall be able to obtain refracting telescopes in which the secondary spectrum is nearly if not quite eliminated. Abbe’s new optical glass * leads one to believe that this hope will soon be realized.

The addition of a convex crown lens in front of the ordinary A third object-glass, to diminish the colour-correction and change the or photo- minimum focus from that for rays between D and E to that for graphic rays near G, was first made by Rutherford of New York. In this lens.

In some recent large double object-glasses, especially those of Alvan Clark, it has been usual to leave a space between the crown and the flint lens

sufficient to afford access, through apertures in the cell, for cleaning the inner crown and flint surfaces, without

risk of disturbing the lenses and their centring.! If in fig. 3 we imagine the lenses to be considerably separated and through both lenses trace a ray entering the crown lens parallel to and at some distance from the axis, we shall find that the effect of the separa- tion is to diminish the power of the flint lens, and therefore to

way he altered his telescope from one suited for eye observations to one in the best chromatic adjustment for photographie work. The chromatic effect is the same as increasing the convexity of the crown lens, and by proper proportioning of the two radii of curvature it becomes possible also to conserve, aud even to further

perfect, the destruction of spherical aberration. The great object- glass of 36-inches aperture, now (1887) under construction for the Lick observatory by Messrs Clarke of Boston (Mass.), is to be pro- vided with an additional crown lens for this purpose.‘

The problem of making a perfectly achromatic object-glass has Blair’s been solved by Dr Blair (din. Trans., vol. iii. p. 58) by employ- achro- ing fluid media, and he actually constructed an object-glass con- matic sisting of a plano-convex lens and a meniscus lens, both of crown fluid ob- glass with their convexities turned towards each other, the space ject- between the lenses being filled with hydrochloric acid. Unfortu- glasses,

change the character of the chromatic aberration. Thus an object- glass over-corrected for colour can be improved in this respect by increasing the distance between the lenses. It has been suggested that a telescope can be made suitable for both eye observation and photographic purposes if means are provided for increasing the distance between the lenses without risk of deranging the centring when the telescope is to be employed for photography. But the great change that would be necessary in such a case cannot be brought about consistently with preservation of the perfection of the corrections for spherical aberration.?

Any account of the achromatic object-glass would be incomplete without reference to the labours of the Rev. W. Vernon Harcourt and Prof. Stokes. Experiments in the production of optical glass were instituted by the former in 1834; and specimens, exhibited at the meeting of the British Association at Cambridge in 1862, were placed in the hands of Prof. Stokes, who determined the opti- eal constants of the numerous specimens of glass which Harcourt produced, and indicated from these results the direction in which fresh experiments should be undertaken. It was discovered that titanic acid extends the blue end of the spectrum more than corre- sponds to the dispersive power of the glass, whilst boracic acid has the opposite effect (Report Brit. Assoc., 1871, p. 88). At a

meeting of the British Association at Belfast in 1874 a telescope-

was exhibited whose object-glass was constructed from Harcourt's glass by Sir Howard. Grubb of Dublin. The following is Prof. Stokes's complete and concise account of it.

'The original intention was to construct the objective of a phosphatic glass containing a suitable percentage of titanic acid, achromatized by a glass of terborate of lead. (The percentage of titanic acid Was so chosen that there should be no irrationality of dispersion between the titanic glass and the terborate.) As the curvature of the convex lens would be rather severe if the whole convex power were thrown into a single lens, it was intended to use two lenses of this glass, one in front and one behind, with the concave terborate of lead placed between them. It was found that, provided not more than about one-third of the convex power were thrown behind, the adjacent surfaces might be made to fit, consistently with the condition of destroying the spherical as well as the chromatic aberration, This would render it possible to cement the glasses, and thereby protect the terborate, which was rather liable to tarnish. At the time of Mr Harcourt's death two disks of the titanic glass had been prepared which it was hoped would be good enough for employment, as also two disks of terborate. These were placed in Mr Grubb's hands. On polishing, one of the titanic disks was found to be too badly striated to be employed ; the other was pretty fair. As it would have required arather severe curvature of the first surface and an unusual convexity of the last to throw the whole convex power into the first lens,

using a merc shell of glass to protect the terborate, Professor Stokes thought it more prudent to throw about one-sixth of the whole convex power into the third or crown glass lens, though at the sacrifice of an absolute destruction of secondary dis- persion, which by this change from the original design might be expected to be just barely perceptible. Of the terborate disks, the less striated happened to be slightly muddy, from some accident in the preparation ; but, as this signified less than the striz, Mr Grubb deemed it better to employ this disk. The tele- Scope exhibited to the meeting was of about 24-inches aperture and 28-inches focal length, and was provided with an object-glass of the ordinary kind, by which the other could be replaced, for contrasting the performance. When the telescope was turned on to a chimney seen against the sky or other suitable

nately such combinations are practically useless, not only on account of unavoidable leakage, but also because currents are set up in fluid lenses by changes of temperature, which correspond in effect with want of homogeneity in the flint lens in an ordinary object-glass,

Eye-Pieces.

The first substitute for the single lens of the Galilean and Kepler Eye-telescopes was the compound eye-piece invented by Rheita. Behind pieces.

the convex eye-lens of the Kepler telescope he applied a second short telescope, consisting of two convex lenses, their distance being the sum of their focal lengths. The principal effect was to erect the inverted image, and thus to constitute the simplest form of the day eye-piece, or common terrestrial telescope. The next improve- ment was the Huygenian eye-piece, which consists of two convex lenses (see fig. 7),—the “field-lens,” that, next the object-glass, having its focal length to that of the “eye-lens” as 8 to 1; the distance between them is twice the focal length of the latter, the combination being so placed as to form the visible image half-way between the two. This eye-piece is achromatic in the sense in which an eye-piece is said to be so: a colourless image seen through it does not appear bordered with coloured fringes, as is the case with a single lens or Rheita’s eye-piece. This is not because, as in the achromatic object-glass, all the central coloured rays are collected in one focus, which in the case of an eye-piece is a matter of compara- tively small consequence, but because it possesses

the same magnify- ing power for rays of all colours on an object of sensible angular diameter, so as not to form overlapping coloured pictures of it on the retina. This condition it is which furnishes the “equation of achromaticity” of an eye-piece. An expression for the magnifying power of a telescope provided with a certain eye-piece is formed in general terms which involve the focal length of its lenses, their dis- tances from each other, and their refractive indexes; and, this being made to vary by the variation of the last-mentioned elements only, the variation is equated to zero. The algebraic working, which even for a two-glass eye-piece is a little complex, is given in H. Lloyd’s Treatise on Light and Vision (London, 1881), and in an elaborate paper by Littrow in the fourth volume of the 7’rans. Roy. Astron. Soc. (p. 599). From the former we extract the following proposition: An eye-glass of two lenses of the same medium is achromatic when the interval between the lenses is an arithmetical

object, and half the object-glass covered by a screen with its edge parallel to the edges of the object, in the case of the ordinary objective vivid green and purple were seen about the two edges, whereas with the Harcourt objective there was barely any perceptible colour. It was not of course to be expected that the performance of the telescope should be good, on account of the diffi-

mean between their focal length,—a condition which the Huygenian Huy- construction evidently satisfies. The rationale of this is obvious, genian independently of algebraic analysis, by inspection of the course of eye-

the rays in fig. 7, where AC, BD are the lenses, PQ the image piece.

culty of preparing glass free from strie, but it was quite sufficient to show the possibility of destroying the secondary colour.”

An experiment to determine whether the substitution of titanic acid for a portion of the silica in ordinary crown glass would have an effect similar to that which had been observed in the phosphatic Series of glasses (viz., whilst somewhat raising the dispersive power, to produce a separation of the colours at the blue as compared with the red end of the spectrum, to an extent ordinarily belonging only to glass of much higher dispersive power) was carried out by Mr Hopkinson at the glass works of Messrs Chance of

Birmingham ; but it proved unfortunately in this combination that, whilst the

1 This arrangement also helps to equalize the temperatures of the lenses with each other and with the outer air.

2 Quite recently Prof. Stokes has suggested that to adapt a telescope to either photographic or telescopic purposes at pleasure the crown lens should be reversible as well as changeable as to distance with respect to the flint.

In this way doubtless the chromatic and spherical aberration could be pre-Served for the two kinds of work.

which would be formed by the object-glass alone, yg that really formed by the action of the field-glass. The object-glass being supposed achromatic, a ray of white light, as OC, going to form the image of a point Q, will be refracted by the field-glass at C towards the corresponding point q of the new image, but not asa

3 See Nature, vol. xxxiv. p. 622, 26th October 1886.

4 For recent literature on the secondary spectrum in double and triple object- glasses, &c., see W. Schmidt, Die Brechung des Lichtes in Glasern, insbesondere d. achromat. und aplanat. Objectivlinse, Leipsic, 1874; W. Harkness, ‘‘On the Colour Correction of Achromatic Telescopes,” in Amer. Jour. of Science and Aris, September 1879, pp. 189-196; C. 8. Hastings, “‘Triple Objectives with Complete Colour Correction,” 7b., December 1879, pp. .429-435; Perty, Ueber die Grenzen der sichtbaren Schopfung nach den jetzigen Leistungen der Mikroskope und Fernrohre, Berlin, 1874; H. C. Vogel, Ueber eine einfache Methode zur Bestim- mung der Brennpunkte und der Abweichungskreise eines Fernrohr-Objectivs fiir Strahlen von verschiedener Brechbarkeit ; C. A. Young, ‘‘The Colour-Correction of Certain Achromatic Object-Glasses,” in Amer. Jour. Sci., June 1880, pp. 454- 456 ; also a review of these papers by A. Safarik, Vierteljahrschrift der astrono- mischen Gesellschaft, 1882, pp. 13-39.

single white ray ; it will be separated into coloured rays, following different courses. The red ray Cr being less refracted will fall on a point 7 of the eye-glass more remote from its centre B than

Fia. 7.—Huygenian eye-piece.

the violet ray Cv, and (the prismaticity of the lens increasing from the centre outwards) will in proportion by the second trans- mission be more bent aside than the violet, and thus a compensa- tion is effected, and the two rays finally emerge parallel, their exact parallelism being secured by the proportion of their focal lengths. The Huygenian eye-piece possesses also other important advantages. The total deflexion of the light, to produce the mag- nifying power, is equally divided between the two glasses,—the most favourable condition for diminishing that distortion which is always perceived in looking obliquely through a lens; and the field of view is greatly enlarged in proportion to the size of the eye-lens, being such as would require, to produce the same magnifying power, a single lens of the much greater semi-diameter bd, found by draw- ing Qb parallel to yB and erecting bd. The inconvenience of this eye-piece (whence it is improperly termed a negative eye-piece) is that the image, being formed between its lenses, undergoes a cer- tain amount of distortion by the field-glass, owing to which equal linear portions of it do not correspond precisely to equal angular measures of the distant object. Equal parts ofa micrometer applied at the place of the image, so as to be seen at the same time through the eye-lens, will not correspond to precisely equal angular inter-

Common vals. The common astronomical or positive eye-piece, described

or posi-

by Ramsden (Phil. Trans., 1783), consists of two plano-convex

tive eye- lenses of equal lengths, having their convexities turned towards

piece.

piece.

each other and separated by two-thirds of the focal length of either, as in fig. 8. This combination is placed behind the image PQ

Fig. 8.—Common or positive eye-picce.

formed by the object-glass, at a distance AP equal to one-fourth of the focal length of A. The first or ee therefore, forms an enlarged image pq, at a distance one-third of that focal length which places it in the focus of the eye-glass. This eye-piece is not properly achromatic, but its spherical aberration is much less than in any of the other constructions, and it has the advantage of giving a flat field of view, requiring no change of focus to see the

Fia. 9.—Erecting or terrestrial eye-piece.

Erecting centre and borders of the field with equal distinctness. The erect- or terres- ing or terrestrial eye-piece was invented by Dollond. The principle trial eye- of its construction will be understood from fig. 9. It is conveni-

ent for telescopes of ordinary use, because it presents a non-in- verted image to the eye, although at some sacrifice of light and definition.

For an account of the theory of the chromatic and spherical aberration of cye-pieces by Sir George B. Airy, see Trans. Phil. Soc. Camb., vol. ii. p. 243 and vol. iii. p. 61. The author’s con- clusions are the following. (1) To secure the greatest distinctness with an eye-piece of the Huygenian type, the field-lens should be a meniscus of focal length 3, the radii of its surfaces 11:4, and its convexity towards the object-glass ; the eye-lens should be a double convex of focal length 1, the radii of its surfaces 1:6, and its more convex side towards the field-lens. The distance of the lenses should be 2. There should be a perforated diaphragm at distance 1 from the eye-lens. Ifa bright object appears yellow or a dark one blue at the edge farthest from the centre of the field, the lenses must be brought a little nearer together. (2) For an eye- piece of Ramsden’s type the two lenses should be plano-convex, of focal length 3, placed at distance 2, their convex surfaces being

Pa eee $e A-f-=2=~ ora iB, -istiiy fon,

turned towards each other. (8) For an erecting eye-piece of four ae lenses the first and fourth (reckoned from the object-glass towards. the eye) should be crossed lenses of focal length 8, the radii of their

surfaces 1:6, with their convex surfaces towards each other. The a

second lens should be a meniscus of focal length 4, the radii of its surfaces 25:11, and its convexity towards the eye. The third lens should be plano-convex, of focal length 4, its plane side towards the eye. The distance of the centre of the second lens from that of the first=4 ; that of the third from the second=6 ; and that of the fourth from the third=5°13. Ifa bright object appears yellow or a dark one blue at the edge farthest from the centre of the field, the third and fourth lenses must be together pushed inwards towards the second lens.

In many telescopes constructed specially for star observation only 5 the object-glass is over-corrected for colour and under-corrected for ; spherical aberration ; both these errors may sometimes be nearly eliminated by a properly constructed Huygenian eye-piece (see Microscopr, vol. xvi. pp. 266-267). But, when a telescope is to be used over a considerable range of field for micrometric measure- ments, it is obvious that the spherical aberration should be corrected by the object-glass alone. It is possible, however, to improve the appearance of objects somewhat in a telescope in which the chro- matic aberration is over-corrected by employing an eye-piece somewhat under-corrected for colour, and vice versa; but the only ~ satisfactory plan is to have both object-glass and eye-piece as free as possible from both chromatic and spherical aberration. In order to secure this, or a very large field of view, many forms of eye-piece have been devised. Achromatic combinations have been substi- tuted in some cases for the field-lens, in others for the eye-lens, in| others for both simple lenses of the Ramsden eye-piece. The best of these combinations which the present writer has tested and which practically fulfil all requirements of the astronomer are due to Dr Hugo Schroder, to whom he is indebted for information as H.S8chri- to their construction. Fig. 10 represents Schréder’s high power der’s

high

Fia. 10.—Schréder’s high power eye-piece.

eye-piece, which is admirably suited for micrometer work, not only because there are only two reflecting surfaces in the triple lens of which it is composed, but also because there is a comparatively large distance between the lens and the micrometer web when the latter is in focus. This condition is essential when it is desired to get the best bright illumination of the wires in a dark field (see MicRoMETER, vol. xvi. p. 248). The triple lens is composed of a dense fluid plano-convex lens between two lenses of soft crown glass. The radii of curvature are— —*

pres, (2aOEE SEU | st erm da

peeled —_ ag Sie \ dense flint glass,

cemented (r5s=° o plane

7g—80°026 convex

The corresponding foci for zones of different distance from the axis are— axis=100°00 ; zones 12°5 from axis, 99°81; 25 from axis, 99°32; 40 from axis, 93°35; 45 from axis, 100°15; 50 from axis, 101:85. Thus the aperture of the lens may be half its focal length J without any sensible defect. Fig. 11 represents 0. Schrv- Dr O. Schroder’s aplanatic eye-piece. The glass employed isder’s — Dauget’s crown (Cd) and flint (Fd,). The refractive power of crown aplanatic is 15126 for D, that of flint 16405 ; the dispersive power of both eye- kinds of glass is 0°588. piece.

\ soft crown glass.

Fic. 11.—Schréder’s aplanatic eye-piece.

The radii of curvature for a lens of 1 inch (27:07 mm.) focal length are—

mm. mm. —20-12 5=13°30 Te=7T3=10°94 cemented Te=T7= 7°00 cemented T4=0 Tg=—2 F,=focal point of combination= —9°05 mm. from vertex of 7; F,=position of observer’s eye= — 14°49 mm. from vertex of 7g.

The thicknesses and distances apart of the surfaces are—

’sse-

in

1.

elian,

’ each other.

TELESCOPE

Ist vertex to 2d = 0°70 mm. flint glass,

3d —yy_-+,, 4th= 3°50 ,, crown glass, Zs sy sop EU H LOO 5. BIT,

5th ,, ,, 6th= 0°61 ,, flint glass, 7th ,, ,, 8th= 2°45 ,, crown glass.

The distance between the plane surfaces is 22°57 mm. This form of eye-piece has been employed by Schonfeld in his southern “ Durch-musterung,” and Dr Schroder has made one for the present writer which gives a perfect field 44° in diameter on the telescope of 18 inches focal length and 33 inches aperture already referred to.

Reflecting Telescope.

The following are the various forms of reflecting telescopes.. The Gregorian holsnctipe is represented in fig. 12. AA and BB are

Fic. 12.—Gregorian telescope.

concave mirrors having a common axis and their concavities facing The focus of A for parallel rays is at F, that of B for parallel rays at f/—between Band F. Parallel rays falling on AA converge at F, where an image is formed; the rays are then re-

flected from B and converge at P, where a second and more enlarged —

image is formed. Gregory himself showed that, if the large mirror were a segment of a paraboloid of revolution whose focus is F, and the small mirror an ellipsoid of revolution whose foci are F and P respectively, the resulting image will be plane and undistorted. The image formed at P is viewed through the eye-piece at E, which may be of the Huygenian or Ramsden type. The focal adjustment is accomplished by the screw S, which acts on a slide carrying an arm to which the mirror B is attached. The practical difficulty of constructing Gregorian telescopes of good defining quality is very considerable, because if spherical mirrors are employed their aberrations tend to increase each other, and it is extremely difficult to give a true elliptic figure to the necessarily deep concavity of the small speculum. Short appears to have systematically con- quered this difficulty, and his Gregorian telescopes attained great eclebrity. The use of the Gregorian form is, however, practically abandoned in the present day. The magnifying power of the telescope iene tl of the large and the small mirror, ¢ the focal length of the eye-piece, and x the distance between the principal foci of the two mirrors (=F/in the diagram) when the instrument is in adjustment for viewing distant objects. The images are erect.

The Cassegrain telescope differs from the Gregorian only in the

where F and f are respectively the focal lengths

_ substitution of a convex hyperbolic mirror for a concave elliptical scope, mirror as the small speculum. This form has two distinct advan-

tages: (1) if spherical mirrors are employed their aberrations have a tendency to correct each other ; (2) the instrument is shorter than the Gregorian, cxteris paribus, by twice the focal length of the small mirror. Fewer telescopes have been made of this than perhaps of any other form of reflector ; but in comparatively recent years the Cassegrain has acquired importance from the fact of its adoption for the great Melbourne telescope. The magnifying power is com- puted by the same formula as in the case of the Gregorian telescope.

The Newtonian telescope is represented in fig. 18. AA is a con- cave mirror whose axis isaa. Parallel rays falling on AA converge on the plane a mirror BB, and are thence _re- flected at y right angles 2---+¥, to the axis, forming

an image inthe focus of the eye-piece EF. The surface ut of the large mirror should be a paraboloid of revolu- : tion, that of the small mirror a true optical plane. The magnifying power is=F/e. This form is employed in.the con- struction of most modern reflecting telescopes. A glass prism of total reflexion is sometimes substituted for the plane mirror.

The Herschelian or front view reflector is represented in fig. 14. AA 18 a concave parabolic mirror, whose axis ac is inclined to the axis of the tube ab so that the image of an object in the focus of

Fia. 13.—Newtonian telescope.

&

145

the mirror may be viewed by an eye-piece at E, the angle bac being equal to the angle caE. This form was adopted by the elder A

Herschel to avoid the loss of light from reflexion in the small mirror of the Newtonian telescope. It has several disadvantages. (1) The upper part of the observer's head must necessarily obstruct some of the rays which would otherwise fall on the large mirror; but when a telescope of very large aperture is employed the loss of light thus occasioned is comparatively insignificant. Moreover, disturbance of. the air in front of the telescope is created by heat from the observer's head and body, and this is fatal to the best definition. To avoid the latter drawback Sir John Herschel (Zncy. Brit., 8th ed., art. "Telescope," vol. xxi. p, 128) suggested the employment of a small right-angled prism of total reflexion placed close to the eye- lens of the eye-piece, to permit the observer to view the image by looking in a direction at right angles to the eye-piece, and thercfore at right angles to the tube. (2) In consequence of the tilting of the mirror aberration is created, and this increases rapidly with increased tilting. The construction is thus limited to telescopes in which the proportion of aperture to focal length is not too great. In Herschel's 40-feet telescope the proportion was 1 to 10, and the construction would hardly be applicable to modern telescopes, in which the proportion often rises to 1 to 5 or 6. Yet, when exceed- ingly faint objects have to be observed, this form of telescope has great advantages. Herschel found that some objects which he dis- covered with such an instrument could not even be seen when the same telescope was used in the Newtonian form. The front view telescope, however, has hardly been at all employed except by the Herschels. But at the same time none but the Herschels have swept the whole sky for the discovery of faint nebulz ; and probably no other astronomers have worked for so many hours on end for so many nights as they did, and they emphasize the easy position of the observer in using this form of instrument.

Construction of Object-Glasses.

The first point is the selection of glass disks of suitable quality. Testing The requisites are (1) general transparency and freedom from object- mechanical defects, such as specks, air-bubbles, &c.; (2) homogeneity; glasses.

(3) freedom from internal strain. The disk being roughly polished on the sides, faults of the first class are easily detected by inspection. In order to secure the maximum of light grasp for aperture it is desirable that the glass should be as colourless as possible; if the roughly polished disk is laid upon white paper the amount of dis- coloration can be readily estimated by comparing the colour of the sheet as seen directly with that seen through the glass. Fraun- hofer's glass was far from colourless, Dollond's more coloured still ; and we have shown that, for purposes when extreme light grasp is not an object, the less transparency of such glass to the blue rays of the spectrum affords advantages for a better correction of the chromatic aberration of rays in the brighter part of the spectrum. The amount of light excluded by specks, air-bubbles, or even scratches is quite insignificant ; but these blemishes create diffrac- tion phenomena and scattered light in the field, which are very injurious to the performance of the instrument, especially when faint objects are searched for in the neighbourhood of brighter ones. It is essential for a telescope lens that the glass should be perfectly homogeneous ; that is, the refractive index must be identical for every part of the disk. This can be tested with extreme delicacy by grinding the disk into the form of a lens and testing it by Toppler's method,! described under Oprics (vol. xvii. p. 805). If the disk is intended for a concave lens and is already so thin that it becomes undesirable to make it thinner at the edges by convert- ing it, in the first place, into a convex lens, it may be tested by placing one of its surfaces in contact with and at right angles to the axis of a crown lens of known perfection, and testing the com- bination by Toéppler's method.

outer shell has hardened before the inner portion—the finally solidified mass must be in a state of tension, like that of ''Rupert's drops." Unless cooled very gradually an optical disk would fly to pieces, but a very much smaller defect in the annealing process would be fatal for refined optical purposes. Changes of temperature would produce changes of curvature, and the lens would also change its form when successive portions of the

strained outer shell were removed in the process of grinding and polishing. Fortunately

1 Pogg. Annal., cxxxi., 1867.

model, = 19

If a glass disk is not properly Anneal- annealed—that is, if it has been too quickly cooled, so that the ing.

defects in annealing are very easily detected by mieaus of the polari- scope. The polished disk is placed in light reflected from a polar- izing surface, such as a sheet of glass blackened at the back, and examined with a Nicol's prism as an analyser. If the bright rings and black cross (see LicHT, vol. xiv. p. 618) are visible the disk is unfit for use; but, since few disks are so perfectly annealed as not to show a trace of the black cross, such as show it in no marked degree may be safelyemployed. Perfect annealing has now become the most difficult portion of the art of making optical glass, and large disks (more particularly of crown glass) are rejected by the optician more frequently for defects in annealing than for any other cause.

The disks having been selected, their refractive and dispersive powers determined, and the radii of curvature computed, it remains to convert the disks into lenses with surfaces of the required curva- ture, and to complete the object-glass. The work consists of five distinct operations—(1) rough grinding by a revolving tool supplied with sand and water ; (2) fine grinding with emery ; (8) polishing with oxide of iron, rouge, or putty powder, the grinder being faced with fine cloth, satin, paper, or—best of all—pitch ; (4) centring ; (5) figuring and testing. These processes are essentially of a tech- nical character, and can only be familiar to those who practise the art. The details would be out of place here, but are well described in a lecture delivered by Sir Howard Grubb at the Royal Institu-

' tion, 6th April 1886, and printed in Nature, 27th May 1886.

Con-

Construetion of Specula. The composition of metallic specula in the present day differs

struction very little from that used by Sir Isaac Newton. Many different

of specula,

alloys have been suggested, some including silver, nickel, zinc, or arsenic ; but that which has practically been found best is an alloy of four equivalents of copper to one of tin, or the following pro- portions by weight :—copper 252, tin 117°8. Such speculum metal is exceedingly hard and brittle, takes a fine white polish, and when protected from damp has little liability to tarnish. The process of casting and annealing, in the case of the specula of the great Melbourne telescope, was admirably described by Dr Robin- son in Phil. T'rans., 1869, vol. clix. p. 185. Shaping, polishing, and figuring of specula are accomplished by methods and tools pre- cisely similar to those employed in the construction of lenses. The reflecting surface is first ground to a spherical form, the parabolic figure being given in the final process by regulating the size of the pitch squares and the stroke of the polishing machine. The pro- cess of testing is identical with that of an object-glass.

Soon after Liebig's discovery of a process for depositing a film of pure metallic silver upon glass from a salt of silver in solution, Steinheil (Gaz. Univ. d@ Augsburg, 24th March 1856), and later, in- dependently, Foucault (Comptes Rendus, vol. xliv., February 1857), proposed to employ glass for the specula of telescopes, the reflect- ing surface of the glass speculum to be covered with silver by Liebig's process. These silver-on-glass specula are now the rivals of the achromatic telescope, and it is not probable that many tele- scopes with metal specula will be made in the future. The best speculum metal and the greatest care are no guarantec of freedom from tarnish, and, if such a mirror is much exposed, as it must be in the hands of an active observer, frequent repolishing will be necessary. This involves réfiguring, which is the most delicate and eostly process of all. Every time, therefore, that a speculum is repolished, the future quality of the instrument is at stake ; its focal length will probably be altered, and thus the value of the constants of the micrometer also have to be redetermined. Partly for these reasons the reflecting telescope with metallic mirror has never been a

favourite with the professional astronomer, and has found little employment out of England. In England, in the hands of the Herschels, Rosse, Lassell, and De la Rue it has done splendid service, but in all these cases the astronomer and the instrument-maker were one. The silver-on-glass mirror has the enormous advantage that it can be resilvered with little trouble, at small expense, and without danger of changing the figure. Its chief work has been done in the hands of Draper and Common, who were the engineers, if not the actual constructors, of their own instruments. Glass is lighter, stiffer, less costly, and easier to work than speculum metal. The silvered mirrors have also some ad- vantage in light grasp over those of speculum metal, though, aper- ture for aperture, the former are inferior to the modern object-glass. Comparisons of light grasp derived from small, fresh, carefully silvered surfaces are sometimes given which lead to illusory results, and from such experiments Foucault claimed superiority for the silvered speculum over the object-glass. But the present writer has found from experience and careful comparison that a silvered mirror of 12-inches aperture mounted as a Newtonian telescope (with a silvered plane for the small mirror), when the surfaces are in fair average condition, is equal in light grasp to a first-rate refractor of 10-inches aperture, or area for area as 2:3. This ratio will become more equal for larger sizes on account of the additional

thickness of larger object-glasses and the consequent additional ab- sorption of light in transmission.

Mounting of Teleseopes.

The proper mounting of a telescope is hardly of less importance Mount, than its optical perfection. Freedom from tremor, case and deli- ing of cacy of movement, facility of directing the instrument to any tele. desired point in the heavens, are the primary qualifications, Our scopes, limits forbid an historical account of the earlier endeavours to fulfil , these ends by means of motions in altitude and azimuth, nor can we do more than refer to mountings such as those employed by the Herschels, or those designed by Lord Rosse to overcome the en- gineering difficulties of mounting his huge telescope of 6 feet aper- ture. Both are abundantly illustrated in most

popular works on astronomy, and it seems sufficient to refer the reader to the original descriptions.

We pass, therefore, directly to the equatorial telescope, the instru- Equator. ment par excellence of the modern extra-meridian astronomer, and jal, relegate to the article TRANSIT CIRCLE (q.v.) a description of those mountings in which the telescope is simply a refined substitute for the sights or pinules of the old astronomers. The equatorial in its simplest form consists of an axis parallel to the earth's axis, called the "polar axis" ; a second axis, at right angles to this, called the " declination axis" ; and a telescope fixed at right angles to the latter. In fig. 15 AA is the polar axis; the telescope is attached to the end of the ¢ A declination axis ; the latter rotates in bearings attached vy, to the polar axis, and con- cealed by the telescope itself. The telescope is counter- poised by a weight attached to the op- posite end of the declination axis. The lower pivot of the polar axis rests on a cup bearing at C, the upper pivot upon a strong metal casting MM, attached to a stone pierS. A vertical plane passing through AA is therefore in the meridian, and, when the declination axis is horizontal, the telescope moves in the plane of the meridian by rotation on the declination axis only. Thus, if a graduated circle BB is attached to the declination axis, together with the necessary microscopes or verniers V, V for reading it (see TRaNsir CIRCLE), so arranged that when the telescope is turned on the declination axis till it is parallel to AA the vernier reads 0° or 90°, and when at right angles to AA 90° or 0°, then we can employ the readings of this circle to measure the polar distance or declination of any star seen in the telescope, and these readings will also be true (apart from the effects of atmospheric refraction) if we rotate the instrument through any angle on the axis AA. Thus one important attribute of an equatorially mounted telescope i is that, if it is directed to any fixed star, it will follow the diurnal motion of that star from rising to setting by rotation of the polar axis only. If we further attach to the polar axis a graduated

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Fia. 15.—Equatorial telescope.

circle DD, called the "hour circle," of which the microscope or

vernier R reads 0 when the declination axis is horizontal, we can obviously read off the hour angle from the meridian of any star to which the telescope may be directed at the instant of observation. If the local sidereal time of the observation is known, the right | ascension of the star becomes known by adding the observed hour angle to the sidereal time if the star is west of the meridian, or | subtracting it if east of the meridian. Since the equatorial is un-suitable for such observations when great accuracy is required (see Transit CrRcLE), the declination and hour circles of an equatorial are employed not for determination of the right ascensions and declinations of celestial objects, but for directing the telescope with ease and certainty to any object situated in a known position, and which may or may not be visible to the unaided eye, or to define approximately the position of an unknown object. Further, by causing the hour circle, and with it the polar axis, to rotate by clockwork or some other mechanical contrivance at the same angu-lar velocity as the earth on its axis, but in the opposite direction, the telescope will automatically follow a star from rising to setting,

Equatorial mountings may be divided into five types. (A) The Types of pivots or bearings of the polar axis are placed at its extremities. equator-The declination axis rests on bearings attached to opposite sides of ials.

the polar axis. The telescope is attached to one end of the declina-

tion axis, and counterpoised by a weight at the other end, as in fig.

15. (B) The polar axis is supported as in type A; the telescope

is placed between the bearings of the declination axis and 1s

mounted symmetrically with respect to the polar axis ; no counter-

poise is therefore requisite. (C) The declination axis is mounted

on the prolongation of the upper pivot of the polar axis; the tele-

scope is placed at one end of the declination axis and counter-

poised by a weight at the other end. (D) The declination axis

1 Herschel, Phil. Trans., 1795, vol. Ixxxv. p. 8347; Rosse, Phil. Trans., 1840, p. 503, and 1861, p. 681.

is mounted on a forked piece or other similar contrivance attached to a prolongation of the upper pivot of the polar axis ; the tele- scope is mounted between the pivots of the declination axis. (E) The eye-piece of the telescope is placed in the upper pivot of the polar axis; a portion or the whole of the axis of the teleseope tube coincides with the polar axis. Mountings of types A and B —that is, with a long polar axis supported at both ends—are often called the ‘‘ English mounting,” and types C and D, in which the declination axis is placed on the extension of the upper pivot of the polar axis, are called the ‘‘German mounting,” from the first employment of type C by Fraunhofer. A description of some of the best examples of each type will illustrate their relative advan- tages or peculiarities.

Fig. 15 may be taken as a practical example of the earlier equa- torials as made by Troughton in England and afterwards by Gambey for various Continental observatories. In the Phil. Trans. for 1824 (part 8, pp. 1-412)

will be found a description by Sir John Herschel and Sir James South of the equatorial telescope which they em- ployed in their measurements of double stars. The polar axis was similar in shape to that of fig. 15 and was composed of sheets of tinned iron. In Smyth's celebrated Bedford telescope the polar axis was of mahogany. Probably the best example of this type of mounting applied to a refractor is that made by the elder Cooke of York for Mr Fletcher of Tarnbank ; the polar axis is of cast iron and the mounting very satisfactory and convenient, but unfortunately no detailed description has been pub- lished. In recent years no noteworthy refractors 4 have been mounted on this plan; but type A has been chosen by Grubb for the great Mel- 4 bourne reflector, with marked ingenuity of adaptation to the peculiar requirements GF . of the case. Fig. 16 shows the whole instrument on asmall scale, andfig. 17 represents part of it on a larger scale, the upper part of the tube and polar axis being omitted. The g figures show the telescope directed % to the pole, the hour circle being ¥ set 6% from the meridian. The polar axis consists of a hollow cone © (fig. 17) of cast iron bolted to Shallots cast-iron cube H, to the lower side of which is attached a short steel axis carrying the driving sector EF and the hour circle R, and terminating in the lower pivot of the polar axis. This pivot ais terminated by a piece of chilled cast iron polished flat on its lower face, which face re- volves in contact with a piece of bell metal, flat on its wpper and partly spherical on its lower side, bearing in a correspondingly shaped annulus, formed to receive it in the cast-iron block which is attached to the pier. This arrangement enables the bell-metal cushion to take its own position when the direc- tion of the polar axis is slightly changed in pro- cess of adjustment. The pressure of the pivot on (Yo

- FSi SD -—. Fia. 16.—Melbourne reflector.

tion axis. The counterpoise U is attached to the other extremity. There is an elegant ar- rangement for diminishing the friction of the declination axis, which our limits do not per- mit us to describe, and the means for clamping and giving slow motion in declination do not require special notice. The reader is referred for a fuller description to Phil. Trans., 1869, pp. 127-161. The telescope is of the Cassegrain form, the mirror having a 4-fcet aperture and 304-feet foeal length.

The best existing examples of type B are Airy’s equatorial at Greenwich, the equatorial

fee eed

Fia. 18.—Greenwich equatorial,

its bearings, in the direction at right angles to the polar axis, is relieved by the sector A, which is forced up by the screw d acting through lamine of steel springs. The end pressure of a upon its

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Fic. 17.—Section of Melbourne reflector.

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bearings is relieved by a weight. The friction of the upper pivot is re- lieved by a sector pressed up against it by the action of two weights. In this way, although the moving part of the telescope weighs 18,170 Ib, it can be turned with a pressure of 124 ib, acting at a radius of 20 feet. The driving sector EF is 5 feet in radius ; its circular rim is accurately toothed to fit a square threaded endless screw E, which is turned by the driving clock. A toothed

wheel attached to H and acted on by a pinion connected with a hand-wheel affords an easy means of setting the instrument in hour angle, or moving the telescope quickly in right ascen- sion. The telescope is clamped by iron bands

7 to the strong cast-iron cradle, which is cast gywith and forms one extremity of the declina-

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i

“the whole of a night’s work; thus the observer, in order to direct the instrument on a parti- cular object, has only to set an index connected with the polar axis to the star’s right ascension

upon the hour circle, without the trouble of computing

the hour angle at the instant of observation. This convenient arrangement was first introduced by Airy.

The whole mounting is very massive, but very incon-

venient to use when a great many different objects

have to be examined on the same night; but on ac- count of its freedom from tremor and the excellence of its driving clock it should be very suitable for pro- longed study of a single object or for long photo-

graphic exposures. Quite recently Sir Howard Grubb New

has signed a contract to make a telescope of 28-inches aperture and Green- 28-feet foeal length,? which is to be substituted for the present tele- wich scope by Merz & Son of 12§-inches aperture and 18-feet focus. Fig. telescope. 19 is engraved from a photograph of the model of the original polar

axis. The model was prepared to illustrate the manner in which the

new telescope is to be mounted, and we are indebted for the picture

at Liverpool (also designed by Airy), and the pe equatorial recently erected at the Paris observatory.

he polar axis of the Greenwich equatorial consists of six iron tubes arranged so as to form two triangular braced beams connected by very strong elliptical wheels of cast iron, which carry the upper and lower pivots of the polar axis. These tubes are shown in sec- tion at the points T, fig. 18, which represents a section through

the declination axis in the plane of the equator when the tele- scope is directed to a star at the equator (for the general arrange- ment of the mounting, see fig. 19). The driving circle is 6 feet in diameter, and turns freely on the lower pivot of the polar axis, under the action of the driving clock. The hour circle is graduated on the driving circle, and may be set to show sidereal time during

1 See the detailed account in Greenwich Observations, 1868.

2 This object-glass will have the shortest proportional focal length of any yet constructed of aperture exceeding 16 inches. The following table gives the focal length in apertures of the largest existing refractors :—

Vienna telescope (Grubb) 27-inches aperture, focal length 15°5 apertures
Washington ,, (Clark) 26 7 – 150 , Pulkowa a (Clark) 30 vs ‘a 180 ss

Paris photo- graphic tele- scope.

Type C.

to the kindness of Mr Christie, astronomer royal. The object-glass will be actually outside the dome when the telescope is pointed near the zenith or near the horizon. The dew-cap, not shown in the model, will be always outside the dome, and it is not impossible

ZA Fic. 19.—Grubb’s telescope for Greenwich.

that this arrangement may be favourable to good definition, except in ease of high wind. When the telescope is not in use the dew- eap slides backwards on four rails parallel to the axis of the tele- scope, and the whole is housed in the position shown in fig. 19, The spectroscope is used at right angles to the telescope tube, a right-angled prism of total reflexion being interposed in the con- verging cone of rays near the focus. This prism can be turned 180° and an eye-piece inserted on the opposite side from the spectro- scope for observations near the zenith or horizon, otherwise the eye end would be too near the floor or northern pier.}

A figure of the new photographic telescope erected at the Paris observatory may be seen in Nature, 138th May 1886. The object- glass is by MM. Paul and Prosper Henry, the mounting by M. Gautier. Here Airy's braced tubes are replaced by hollow metal beams of triangular shape (as for the Liverpool equatorial), The hour circle has two toothed circles cut upon it, one acted upon by a screw attached to the pier and driven by the elock, the other by a second screw attached to the polar axis, which can be turned very slowly by a handle in the observer's hand. Thus a very slow movement can be given to the telescope in right ascension, inde- pendently of the clock. Slow motion in declination can be com- municated by a screw acting on a long arm, which can be clamped at pleasure to the polar axis by a convenient handle. An obloug metallic box, fitted with pivots, whose bearings are attached to the triangular beams, forms the tube for two parallel telescopes; these are separated throughout their length by a metallie diaphragm. The chromatic aberration of the object-glass of one of these tele- scopes is corrected for photographic rays, and the image formed by it is received on a highly sensitive photographic plate. The other telescope is corrected for visual rays and its image is formed on the plane of the spider lines of a filar micrometer. The peculiar form of the tube is eminently snited for rigid preservation of the relative parallelism of the axes of the two telescopes, so that, if a certain selected star is retained in bisection by two intersecting wires in the micrometer, by means of the driving clock, aided by small corrections given by the observer in right ascension and de- clination (required on account of irregularity in the clock move- ment, error in astronomical adjustment of the polar axis, or changes in the star's apparent place produced by refraction), the image of a star will continue on the same spot of the photographic plate during the whole time of exposure.

Exquisite photographs of star elusters, double stars, the moon, and planets have been obtained by MM. Henry, and they are the most eloquent testimony to the optical perfection of the object-glass and the efficiency of the mounting. They show also that we are entering npon a new era in practical astronomy, in which photography is destined to play a leading part. The Henry photographic object-glass is of 13°4-inches aperture and only 10 apertures in focal length. The “guiding telescope” is of 9}-inches aperture and nearly 12-feet focus. The photographic object-glass, notwithstanding its small proportional focal length, covers a field of 24° in diameter with perfect precision.

Many more telescopes have been made of type © than of any

_ 1 These inconvenient conditions are imposed by the dimensions of the exist- ing dome and may lead to accidents in practice.

other, and it is now almost exclusively employed for the mounting of modern refractors. Its essential features are (1) a comparatively ~ short polar axis and (2) a eross-head attached to the extension of

the upper pivot of the polar axis, to carry the bearings

of the de- elination axis. Fig. 20 shows the Dorpat Do

refractor, the chef dwuvre of Fraunhofer, and the refractor

first equa- A)\ torial of any importance that was pro- ‘ ‘\ clockwork. AA is the polar axis, B the

vided with _~“VY hour circle SE vernier V. C’ endless screw S, circle B. D is extremities the The wooden tele- cradle FF of cast flange on one end of clination circle EE, posite end, serves to declination to the arm G. \ \ lever which presses the \ \ in the figure) against the axis in order to relieve the

graduated on the face and read by the is the driving clock, which turns an that gears in the toothed edge of the the cross head supporting at its bearings of the declination axis, scope tube rests in a strong brass, which is

screwed to a the declination axis ; the de- which is attached to its op- elamp the instrument in H is a weight acting on a wheels & (one only seen |

upper pivot of the polar | friction of that pivot |

Fic. 20.—Dorpat refractor,

on its bearing. The counterpoise W balances the tube about the polar axis. M, M are counterpoise weights which act on levers m,m, whose fulcra are universal joints at » attached to the cradle. These weights serve to counterpoise the longer end of the tube and to check its flexure. QQ is the finder, a small telescope whose axis is parallel to the great telescope; having a low magnifying | power and a large field of view, it serves to direct the large telescope to any object seen in the sky, which otherwise would be difficult to find in the comparatively limited field of the large tele- scope, The stand TTT is of oak. The instrument is described in detail by Struve (Beschreibung des auf der Sternwarte zu Dorpat bejindlichen grossen Refractors von Fraunhofer, Dorpat, 1825, fol.) The instrument was an enormous advance upon all previous tele- scopes for micrometric research. In the hands of Struve results were obtained by it which in combined quality and quantity had never before been reached in micrometric research. Its success was such that the type of Fraunhofer's telescope became stereotyped for many years not only by his successors but throughout Germany. When twelve years afterwards Struve ordered the 15-inch refractor for the new observatory at Pulkowa, the only important change made by Fraunhofer's successors was, at Struve's suggestion, the substitution of a stone pier for the wooden stand in the original instrument.

Both the Dorpat and the Pulkowa refractor are defective in rigidity, especially in right ascension. The declination circle is most inconvenient of access, and slow motion in declination can only be effected when the instrument is clamped by a long and inconvenient handle, so that practically clamping in declination was notemployed. The slow motion in right ascension is defective, being accomplished in the Dorpat refractor by changing the rate

of the clock, aud in the Pulkowa refractor by a handle which when

- used affects very injuriously the rate of the clock for the time being. Struve's skill as an observer was such that he used to complete the bisection on the fixed wire of the micrometer by a pressure of the finger on the side of the tube,—a method of proved efficiency in such hands, but plainly indicative of the want of rigidity in the instrument and of the deficiency of the slow motions (see MIcRo- METER, vol. xvi. p. 245). The driving circle is also much too small, so that a very slight mechanical freedom of the screw in the teeth involves a large angular freedom of the telescope in right ascension, whilst its position at the lower end of a too weak polar axis tends to create instability in right ascension from torsion of that axis. Strange to say, the wooden tube has till very recently retained its place in German mountings.

About 1840 a great advance was made in the right direction by the Repsolds of Hamburg in the equatorial mounting of the Oxford heliometer. The driving circle was greatly increased in diameter, and placed at the upper end of the polar axis, and both the polar axis and the declination axis were made much stronger in propor-

tion to the mass of the instrument they were destined to yp,

carry. (A figure of this instrument is given in the Oxford Observations for 1850.) About 1850 Thomas Cooke of York began his career as a maker of equa- torial telescopes, and gave a new character to the German mounting. Fig. 21 represents a typical equatorial of his design. A strong cast-iron pillar is substituted for Fraunhofer's stand. On the semi-cylindrical top of the pillar rests the cast-iron box AA, which contains at its upper and lower extremities the y bearings of the polar axis. Its mode . JM of connexion with the pillar permits .f#/77—@— the inclination of the box to be changed for adjustment of the inclination of the polar axis, The strong cross-head C, sup- pe the bearings of the eclination axis, is of cast iron, bolted to a flange on é the upper pivot of the polar axis. Fraun- hofer's cradle and ie : wooden tube are OM abolished, and in 4G & Gi

their place is a ef Ulla = | cast-iron cylindri- % te eal tube D, flanged cy at both ends and also at the point where itis bolted to a corresponding flange

on the end of the declination axis, all three flanges being cast in one piece with the central tube; the rest of the tube consists of two slightly tapered brass cylinders bolted by strong flanges to the central tube f D. The handle F clamps the arm H to f the cross-head C at a pleasure, and slow mo- tion in declination is ‘a Mlislk communicated by the ===. an! handles at E and G. * Two circles at K and M are attached to the upper part of the polar axis. To one of these motion is communicated by the tangent screw at M (turned by the clock N) acting on teeth cut at the edge of the circle. The other is a graduated hour circle read by two opposite microscopes, one of which is seen at P. The endless cord hanging down and holding a sliding ring at Q is em- ployed to give slow motion in right ascension, in some instruments by moving the frame of the driving screw in the direction of the axis of the screw, in others by moving differential wheels which accelerate or retard the velocity of rotation of the driving screw without affecting the rate of the clock. The declination circle RR is attached to the farther end of the declination axis and is Inconvenient of access. Cooke’s stand is admirable for its symmetry and simplicity of design, its just apportioning of strength, and a general rigidity with suitability of means to ends.

It is not a little curious that the obvious improvement of trans- ferring the declination circle as well as the declination clamp to the telescope end of the declination axis was so long delayed ; we can ascribe the delay only to a desire to retain the declination circle as part of the counterpoise. We believe that the first important equatorials in which the declination axis was read from the eye end were the 15-inch by Grubb and the 6-inch by Cooke, made for the observatory of Lord Crawford (then Lord Lindsay) at Dun Echt (Aberdeenshire) about 1878. The plan is now almost universally adopted. Telescopes of such dimensions can be conveniently

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Fia. 21.—Cooke’s equatorial.

directed to any object by the circles without the observer being under the necessity to climb a special ladder. But when much larger instruments are required the hour circle becomes inaccessible from the floor, and means have to be devised for read- ing both circles from the eye end. This was first accomplished by Grubb in the great refractor

the cross-head simultaneously , with the hour circle attached to the upper end of the polar axis. Light to illuminate

the vernier and circle is U/, thrown from the lamp UY

of 27-inches aperture which he constructed eS

for the Vienna observatory, represented in A WY Great section in fig. 22. The observer’s eye is S C4 Vienna applied to the small telescope E, which Me, S tele- (by means of prisms numbered 1, 2, +, bj scope, 3, 4) views the vernier attached to 4% Lh

L upon prism 4 by Gf NE the prisms 6 and V LS XK

circle and always

i righ AS f 5. Prism 1 is in Ye the axis of the YY, Wg bi declination L4b gh oy

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Fic. 22.—Grubb’s 27-inch refractor (Vienna).

reflects rays along that axis, whatever the position of the telescope may be, whilst the prisms 2, 3, 4, 5, and 6 are attached to the cross- head and therefore preserve their relative positions to each other. Through the eye-piece of the bent! telescope E’ another hour circle attached to the lower end of the polar axis can be seen; thus an assistant is able to direct the telescope by a handle at H to any desired hour angle. A slight rotatory motion of the telescope E on its axis enables the vernier of the declination circle to be read through prism 1. The leading features of this fine instrument represent those of all Grubb’s large telescopes. The mode of re- lieving the friction of the declina- iii

tion axis is similar to that em- ployed in the Melbourne tele- scope and in the account of the Vienna telescope published by Grubb. The end fric- tion of the polar axis is relieved by a ring of conical rollers shown in section beside the principal figure. From this point

Fia. 23.—Dr Engelmann’s 8-inch refractor.

we must condense further description into critical remarks on a few typical modern instruments. (1) Telescopes of Moderate Size for Micrometric Research only.—

1 In the bent telescope refracting prisms are employed at the corners to change the direction of the rays.

Repsolds’ by the Repsolds of Hamburg. The declination circle for a micrometrie eye end with almost as little trouble as the ex- small reads from the eye end, and four handles for clamp- Y -changing of an eye-piece. The illumination of the circles and the equa- ing and slow motion in right ascension and declina- micrometer is by electric ineandescent lamps. The instrument torial. tion are situated near the observer’s hands. The may be adjusted to any latitude and is probably the most practical tube is of sheet steel, light, stiff, and free from and serviceable equatorial made. The subjoined description of the tremor. The eye end carries the micrometer new slow motion in declination is taken from Proc. &. Dubl. Soc., with an illuminating apparatus similar to that 1886, p. 107. previously described under MicroMETER, ‘The slow motion arrangements usually used in equatorials are of either of vol. xvi 246 sq… figs. 16, 17, 20, and 21 two

forms, viz., (a) an endless screw working into a sector or portion of a er Eliana Oe ga oie i toothed circle of long radius, or (6) a screw applying or pushing directly The lamp near the eye end illuminates against an arm, that arm being kept in contact with the screw by a spiral or the field or the wires at pleasure, as well some oes on of serind having * onarlantle mange a ete. The Ase tee iti i i Z ossesses the disadvantage that, however carefully made, it is impossible it is as the gre prs of the bic aae waite free from ‘loss’ or ‘back lash’; and consequently the position of the meter and the eC ination eircle ; telescope is not perfectly determinate in declination, which fault is incon- a separate lamp illuminates the venient when delicate measures are required. The second (0) has practically hour eircle. An excellent fea- – — Mia c D : eeps per’ – ture (see fig. 24) is the short teat Gite ncrow, Wal i bad = distance between the eye-piece the disadvantage that, what- and the declination ever ES of motion ia – | 4 quir e spring must be axis, so that the A capable of working through observer has to fol- @y thesame range; consequently low the eye cnd the spring will be much in a comparatively stronger in action at one end alll eirclac an of the range than the other, ee ee AS unless it be made very long other good point is — indeed, in which case its ac- the flattening of the cast-iron tion – —- pine ~~Di pleasant. To remedy these nee oe : 7 ne so that defects the author [Grubb] t e flange of the declination axis has devised the following, is attached as near to the axis of which possesses the advan~~ the telescope tube as is consistent rigs bj sation of Gere Z : s “ ig, 25 with free passage of the cone of attached to telescope, or vs rays from the object-glass. For cradle, on which is planted the block (b), forming the bearing of the screw. purposes of micrometric research ho = (n) is + ie toe ch er working o a hemp * me extremity of o eae s the clamp-arm 5 short stiff spring (8) is attached to this clamp-arm kag the sete Ann me bearing, not directly against any part of other arm, but against end of a second this instrument is the most ele- screw of same pitch as the main screw, the nut of which (00) is toothed on edge, gant, satisfactory, and useful that | and works into a wheel of equal size (pp) on main screw. The point of this we know, as was shown by the |; second screw, therefore, advances as much in one direction as the frame ABCD exceedin ‘| acourate. cbserha= is carried in other, according as the milled head is turned; and consequently x Bly ac re the point of the screw does not sensibly vary in its position with respect to tions of the minor planets Vic- the clamp-arm EFG. A short stiff spring can therefore be used, and the dis- toria and Sappho for

solar paral- advantage above mentioned disappears.” lax, by Galle’s method (see This form of slow motion could be applied with advantage to the PARALLAX, Vol. xviii. p. 249), right ascension also, and probably to the separation of the segments made by Dr Engelmann in 1882. of heliometers. The substitution of small incan- (3) Of large equatorials we name first the great refractor at Large descent electric lamps for the Fig. 24.—Dr Engelmann’s 8-inch Washington of 26-inches aperture and 32h-feet focal length.! The equa- oil lamps would be an improvement. refractor. mounting appears to be unworthy of the well-known excellence of torials, Grubb’s (2) Telescopes of Moderate Size for General Purposes.—The modern | the object-glass. To illuminate the micrometer an assistant is Wash- small equatorial should for general purposes be capable of carrying spectro- | required to hold a lamp in his hand. No convenient means are ington equa- —_ scopes of considerable weight, so that the strength of the axis and | provided for illuminating the declination axis; and in order to telescope, torial. _ the rigidity of the instrument generally have to be considerably | point the telescope in declination the following elaborate process

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Fig. 23 shows the mounting of the 8-inch refractor, of 9-feet foeal length, at the private observatory of Dr Engelmann, Leipsic. The object-glass is by Messrs Clark of Cambridge, Mass., the mounting

increased. Grubb has realized our ideas of what such an instru- ment should be in an equatorial of 6-inches aperture which he has recently made for the royal observatory at the Cape of Good Hope. The principal features are its great strength and rigidity, with special precautions to ensure preservation of the instrumental declination. The observations of Victoria and Sappho in 1882 revealed the great defieieney of most modern equatorials in this respect. That is to say, if a star near the meridian is first made to run along the measuring web of the micrometer, the clockwork then set in action, and the star brought back to the centre of the field by the slow-motion handle in right ascension, it will be found that the perfection of the biseetion is no longer preserved. Thus at most observatories the measures of difference of declination when the clockwork was employed were far inferior to those made with the telescope at rest. The reason seems to be that in most

equatorials the lower pivot is cylindrical, and enters an ordinary cylindrical bearing which cannot be a perfect fit. Also the cross- head, telescope, counterpoise, &c., generally together overbalance the polar axis about the upper bearing, so that the lower pivot presses upwards in its bearing, and its rotation, under the action of the clock or slow motion coupled with the friction of the sur- faces, gives rise to a small rolling freedom which creates the errors in question. In this telescope the lower pivot is of steel, made slightly conical, and carefully ground to fit a long conical bearing, in which it would work very tightly, or even jam, but for spring pressure brought to bear on its lower hardened flat end, which relieves the greater part of the thrust ; and the polar axis is aeeu- rately balaneed about its upper bearing by a weight at the lower end of the polar axis, so that the thrust is exactly in the axis of the cone. The upper pivot (4 inches in diameter) is also of steel, finished with the same care as that of a transit circle, so that the telescope rotates with the precision of a meridian instrument. Unusual rigidity has also been given to the declination clamping arms, and the new slow motion in declination is by far the best yet contrived ; it is a recent invention of Grubb's, and is de-

scribed below in his own words. The eye end, suitable for heavy spectroscopes, &c., is fitted to the butt end of the telescope by bayonet joints and tightening screws, so that it can be exchanged

has to be performed :—

'The instrument is brought into the meridian and set by the observer within a degree by means of coarse divisions painted on the edge of the declination circle. These divisions are rendered visible by lighting one or two of the gas burners of the dome, and viewed by the astronomer with an opera-glass. Then an assistant mounts by a ladder to a high platform and holds a gas lamp near the vernier, and the fine setting is accomplished by the observer seated in the observing chair, the declination clamp and slow-motion screw being convenient to his hand" (Washington Observations, 1874, Appendix I., p. 33). The polar and declination axes are of steel, only 7 inches in diameter at the thickest sons and the driving arc, which is far too small, is placed at the lower end of this slender axis. There must thus be considerable

liability to tremor in right ascension. However well the instrument may act in specially practised hands with an excellent Clark's micrometer (art. MIcROMETER, vol. xvi. p. 245), the instrument must be considered wanting in the rigidity and convenience which a modern equatorial should possess. In his official report on the instruments of European observatories New- comb defends the want of solidity and convenience of this instru- ment as compared with the Vienna telescope, because its smaller axes (notwithstanding Grubb's anti-friction arrangements) permit it to turn more easily and the mounting to be of far simpler deatgn But at the time of Newcomb's visit the Vienna teleseope had not been brought into work, and cannot have been in proper working order if the motion in declination was so stiff as he describes it, at least when the present writer tested the instrument in Dublin that motion was surprisingly easy.

_ The great Pulkowa refractor (fig. 26) erected in 1885 is of 30- Pulkowa inches aperture and 45-feet focal length. The object-glass is by refractor.

Clark, the mounting by the Repsolds. The tube is cylindrical, of riveted steel plate, graduated in thickness from the centre to its extremities, and bolted by very powerful flanges to a strong short cast-iron central tube, in which, as in Dr Engelmann's telescope (fig. 23), the attachment to the flange of the declination axis is placed as close as it can be to the axis of the tube without inter-

1 Described and figured in the Washington Observations, 1874, App. I.

fering with rays converging from the object-glass to any point in the field of view. A new feature in this instrument is the platform at the lower end of the polar axis, where an assistant can view the hour circle by one eye-piece and the declination circle by

another (looking up the perforated polar axis), and Ag, where he can also set the telescope to any hour angle PSV by one wheel, or to any declination by a second, with y the greatest ease. 'The observer at the eye end can also read off the hour and declination circles and communicate quick or slow motions to the telescope both in right ascension and declina- tion by

conveniently placed handles. The eye end presents an appearance too com- plicated to be figured here; it has a mi- crometer and its illumination for the position circle, a micrometer head, and a bright or dark field,! clamps in right ascension and declination and quick and slow motion in #*

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\ Ky Fia. 26.—Pulkowa refractor.

time and driven by a galvanic current from the sidereal clock, and counter weights which can be removed when a spectroscope or other heavy appliance is added. All these, although making up an ap- parently complicated apparatus, are conveniently arranged, and are all necessary for the quick and easy working of so large Yy an instrument. We have the authority of Otto Struve for stating that in practice they are all that can be desired. There is in this instrument a remarkably elegant method of relieving the friction of the polar axis. Let AA (fig. 27) be a section of the polar axis; it is then easy to adjust the weight P of the circles, &c., attached to its lower end so that the centre of gravity X of the whole moving parts of the instrument shall be in the vertical (VV) of a line passing through the apex of the hollowed flange py at q, which flange forms part of the polar axis. If now a wheel W is forced up against g with a pressure equal to

by employing a driving arc gets the telescope much closer to the polar axis with an increased radius for driving, and he makes the polar axis a very large hollow steel or cast-iron cylinder in which torsion is insensible. Both Grubb and the ,

Repsolds seem to think that for the tube of Sp the telescope all necessary rigidity can Au Cp be attained with cylindrical tubes of «4 Zid riveted steel, the thickness of the GJ 4 successive sheets of which dimin- é ish from the centre-piece out- Coa wards without making the extremities cone- shaped.

In these very large _tele-

scopes the

eis Fia. 28.—Grubb’s mounting for the Lick object-glass.

arrangements for giving access to the eye end and for following its diurnal motion have hitherto proved a source of difficulty. The travelling stages of the new Pulkowa telescope are the most man-

| ageable and practical that have yet been contrived, but even they

leave much to be desired. For energetic work the standing posi- tion is best, provided that the eye-piece is situated at the precise height above the stage which is most convenient for the observer, and that the altitude of the observed object is not greater than 60°. For altitudes above 60° a small chair with a back, the top of which is stuffed for the head to rest upon, is the best seat, provided that the observer’s eye can be kept at the height of the eye-piece. Accordingly Grubb has suggested the following plan for the observatory at Mount Hamilton, California, which is to cover the Lick telescope. The whole floor, 70 feet in dia- meter, is to be raised or lowered by water-power under control of the observer by means of electric keys, which act on a secondary piece of mechanism, that in turn works the valves and reversing gear of the water-engines. Other water-engines, similarly con- nected with keys at the observer’s hands, rotate the dome and per- form the quick motions in right ascension and declination. By this arrangement a large instrument can be worked with perfect facility and comfort. There is only one other plan, that of suspend- ing the observer’s chair to the eye end, so that his eye is near the centre of motion of the chair. This is quite practicable for a 36- inch telescope, and one observer, with the necessary guiding keys at hand, could easily work a telescope and dome of the largest dimensions as quickly and with more ease than he could one of 10 or 12 inches aperture. Probably a nervous astronomer would prefer a solid floor to work upon, as in Grubb’s proposal; in the latter case the quickest working can only be accomplished by two persons, one seated on the platform at the foot of the polar axis and doing the rough setting in right ascension and declination, the other meanwhile adjusting the height of the floor and the azimuth of the dome opening.

In very large equatorials there must be in existing methods con- Proposed siderable inconvenience from the extended width of the apparatus facilities at the eye end. Were we called upon to design a great refractor for using we should abolish all such apparatus and provide the observer large with a few conveniently placed small handles or keys for electrical tele- connexions, and we should perform all motions of the telescope scopes. whatsoever by electromotors. There is no form of energy so con- venient for the astronomer. It provides by incandescent lamps

the weight of the moving part of “m eement,

e whole weight ‘ of the pparrig = mg. a part would rest upon W in unstable equilibrium ; or if a pressure R, less than W, is employed, we have the end friction on the lower bearing removed to an extent=Rsin ¢, and the friction on the

bearings of the upper pivot removed to the extent of F cos o,— where ¢ is the latitude of the place. The wheel W is therefore Mounted on a guided rod, which is forced upwards by suitable levers and weights, and this relief of pressure is precisely propor- tional to the pressure on the respective bearings. The Repsolds find it unnecessary to relieve the friction of the Paclation axis. Fig. 28 shows the equatorial mounting which Grubb designed for the great object-glass of 36-inches aperture that Messrs Clark have completed for the Lick trustees, and which may be supposed to express Grubb’s latest ideas as to the mounting for a very large telescope. The Repsolds have a large driving circle at the upper end of the polar axis, thus avoiding torsion of the polar axis at the expense of greatly increased length of the cross-head. Grubb TC 1 There is also an elegant arrangement for printing on a ribbon of paper, by Pressure of the finger, the readings of the number of revolutions and fractions

of a revolution of the head at each observation, the ribbon being automatically moved forward for another record after each observation.

the most suitable light for his purpose, perfectly constant, giving off little heat, and unaffected by wind; and such a light can be placed where required without the aid of reflectors or any complicated apparatus, and its intensity can be regulated with ease and precision by changing the resistance of the

conductors. Moreover the electromotors can be as powerful or as delicate as we please, and can be placed in the most convenient or suitable posi- tions. The energy of a 5-horse-power steam-engine working for ten hours can be stored in accumulators of no inconvenient dimen- sions ready for use as required during a whole week or even a month, and can be brought into action in force equivalent to several horse- power to raise or lower the floor or turn the dome, or to perform slow motions requiring no greater energy than that exercised by the finger and thumb, or to illuminate a lamp of } or } candle- power. There would be no limit to the rigidity which could be given to such a telescope, as great ease of motion would not have Llane al ell i ah Pi ls Bn ocly tah

2 A woodeut showing these arrangements appeared in the Engineer, 9th July 1886.

Type D.

Lassell's mount- ing.

Com- mon's mount- ing.

to be considered, and we should abolish all complicated anti-friction apparatus for the declination axis, retaining it only for the polar axis to save wear in the teeth of the driving arc. Finally, instead of making the finder a short telescope attached to the eye end of the instrument, we should give it a focal length equal to that of the great object-glass, attaching the cell of its object-glass rigidly to the cell of the large object-glass and its eye end to the butt end of the main telescope, in order to secure the utmost rigidity in the relations of the axes of the two tele- 5

scopes. Such a finder would corre- spond in efficiency to that of the Henry photographic telescope, and would be available as a guid- ing telescope in photographic work, or for keeping a star exactly on the slit of a spectroscope.

The first important in- struments of type D were Mr Lassell's re- flectors, the largest of , which, and the last, 4 is represented in fig. & 29. The polar axis is sutlici- ently rigid, but (7x the long and / comparative-

ly slender

Fic. 29.—Lassell's reflector. forks which earry the pivots of the central cradle are elements of instability, especially when the instrument is directed to an object of considerable hour angle. There is practical confession of this instability in the cross-bracing which connects the two forks, and which must be removed if the telescope is pointed to an object between the zenith and the elevated pole.

The best ie, of type D is the reflecting telescope of 36-inehes aperture designed by Mr. A. A. Common, with which his exquisite photographs of nebule, &c., were made. The . principal preliminary conditions which he laid down as necessary were the following!:— (1) no tube properly so called, to avoid air-currents in the tube; (2) no mass of metal either below or at the side of the line joining the large and small mirrors, to avoid currents from possible difference of tempera- , ture between the mass of ~# metal and the surrounding ~@ — air; (8) an equatorial EN mounting capable of / direction to any part / i of the visible hea- vens and of con- tinued observation past the meridian without reversal ; (4) an _ efficient means of supporting the mirror without flexure; (5) driving elock ; circles to find or identify an object, and motions taken to eye end; (6) a D3 mounting which Fic. 30.—Common's reflecting telescope. will give the greatest amount of steadiness with the least amount of friction. Fig. 30 is a section of the instrument in the plane of the meridian. DD, is a cast-iron hollow eylinder, accu- rately bored out, attached to a strong base block. De is a cover bolted on the bottom of this eylinder, in the centre of which is a tapering steel pin D3, which enters a corresponding hole in the bottom of the polar axis E, and serves as the lower pivot of

1 Monthly Notices R.A.S., vol. xxxix. p. 384.

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the polar axis. The eylindrical part of the polar axis is accu- rately turned to a diameter one-eighth of an inch less than the outer cylinder, and the otherwise severe friction on the pin Dz is relieved by filling in the space betweeh D and E with mercury, so far as sufficient nearly to float the whole moving part of the telescope. The upper elbow-shaped part of the polar axis Ee is flanged and bolted to the lower part. In the section at right angles to that exhibited in fig. 30 this elbow-shaped part is T-shaped, and the eross of the T is bored to receive the declination axis; and, as the elbow puts the polar axis considerably out of balance, the T-shaped head is carried forward of the axial line about 14 inches, so that the whole weight of the telescope above just restores the balance. Two heavy weights X, X counterpoise the eye end F with the four braced tubes T, T which support it. B is the declination circle. It is impossible to describe this fine instrument adequately within our limits ; we mention as specially worthy of study the method of supporting the mirror and the eminently ingenious and practical form of the observatory, and refer the reader to Common’s illustrated account of the instrument in Mem, R.A.S., vol. xlvi. pp. 173-182.

There is also an admirable mounting of type D designed by Lord Rosse’s Rosse for his 3-foot reflector at Birr Castle, described by him in 8-foot Phil. Trans., vol. clxxi. p. 158, The instrument is planned on mount. the broad lines of Lassell’s telescope (fig. 29), but the badly planned ing, and weak fork of the latter is replaced by a thoroughly rigid bent fork made of boiler plate a quarter of an inch thick, firmly riveted to angle iron of 2} x 2} x8 inch scantling along each angle, the whole, as we have proved by trial, being exceedingly rigid. It would be an improvement to adopt Mr

Common’s plan of putting the declination axis a little out of the line of prolongation of the polar axis, and thus dispense with the counter-weight ; and we should prefer hollow steel tubes with push and pull bracing rather than the angle iron rods and bracing which form the tube.

In the Proceedings of the Royal Dublin Society (vol. ii. p. 862) Type E. Grubb describes a ‘‘siderostatic telescope,” which forms a good elementary example of type E. In fig. 31 TT is the tube of a tele- Grubb’s

v7, scope of 4-inches aperture, which is mounted to rotate sidero-

® about its axis, the latter forming the polar axis. MM static . is a plane mirror reflecting rays from a star S to the telescope, 65% object-glass, so that its image ean be viewed from the eye-piece at E, The star is retained in the field by the clock C. Stars of different declination can be viewed by rotating the mirror on its axis G, and in different hour angles. by rotating the tube upon its axis. The instrument in European atitudes cannot command a view of the heavens between the elevated pole and the zenith unless the distance OG is made i exceedingly great; even then only a limited range beyond the zenith is possible. The instrument is pri- | marily intended for solar spectro- scopy, and thus these draw- f backs do not apply. The H resulting ad- | , & vantage is” i / ¢ that the ob- “ “server may be in complete darkness and his observa- | tions are not interrupted by change of posi- tion. $f, = | In Comptes Loewy’s Fia. 81.—Grubb’s siderostatic telescope. Rendus for the equator- year 1883, vol. ialcoudé. xevi. pp. 735-741, M. Loewy gives an account of an instrument which he calls an “ equatorial coudé,” designed (1) to attain greater stability and so to measure larger angles than is generally possible with the ordinary equatorial ; (2) to enable a single astronomer to point the telescope and make observations in any part of the sky without ehanging his position; (3) to abolish the usual expensive dome, and to substitute a covered shed on wheels (which can be run back at pleasure), leaving the telescope in the open air, the observer alone being sheltered. These conditions are fulfilled in the manner shown in fig. 32. EP is the polar axis, rotating on bearings at E and P. The object-glass is at O, the eye-piece at E. There is a plane mirror at M, which reflects rays converging from the object-glass to the eye-piece at E. A second mirror N, placed at 45° to the optical axis of the object-glass, reflects rays

from a star at the pole ; but by rotating the box which contains this mirror on the axis of its supporting tube T a star of any declination ean be observed, and by eombining this motion with rotation of the polar axis the astronomer seated at E is able to view any object whatever in the visible heavens, except those situated between 102 and 12% hour

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wnt of By means of an azimuth compass, or, better, by the shadow of a

hae ial,

TELESCOPE

angle. An hour circle attached to EP and a declination circle

attached to the box containing the mirror N, both of which can be

read or set from E, complete the essentials of the instrument. Its mechanical details present no great difficulty, and

are most conveniently arranged. But we entertain _ *,gtave doubts as to the practical value of the > *, instrument, not on mechanical, but on optical ‘“. *s, grounds. _ light from two additional reflexions ; but

se at

other advantages, provided that ‘*., the mirrors could be made suffi- ciently perfect optical planes. A few years ago it was very difficult to obtain an op- tically perfect plane 6 inches in diameter, and having obtained it there remained the

in all positions it should be free from flexure. By making the mirrorsof silvered glass, one-fourth of their diameter in thickness, MM. Henry have not only succeeded in mounting them with all necessary rigidity free from flexure but have given them optically true plane sur- faces, notwithstanding their large diameters, viz., 11 and 15°7 inches. The present writer tested the equatorial coudé on double stars at the Paris observatory in 1884, and his last doubts as to the practical value of the instrument were dispelled. He has never seen more perfect optical definition in any of the many telescopes he has employed, and certainly never measured a celestial object in such favourable conditions of physical comfort. The easy position of the observer, the convenient position of the handles for quick and slow motion, and the absolute rigidity of the mounting leave little to be desired. In future instruments the object-glass will be placed outside the mirror N, so that both the silvered mirrors will be protected from exposure to the outer air, and probably will retain the brilliancy of their surfaces for a long period.

Fia. 32.—Loewy’s coudé equatorial.

Adjustment of the Equatorial.

Let us take the usual case, that of an equatorial of type C. (1) plumb line at apparent noon, lay down a meridian line on the upper surface of the stone pier, or other foundation, previously built for the instrument. (2) Employ this meridian line to set up the instrument and with it the polar axis approximately in the azimuth of the meridian, which can be tested by stretching a wire through the centres of the bearings of the polar axis, and dropping a plumb line from the extremities of the wire upon the meridian line. If this is carefully done when the azimuth adjustment is near the middle of its range all desirable accuracy in this preliminary de- sideratum will be secured. (3) Place the polar axis approximately at the altitude of the pole. This is very easily done for an instru- ment in which the polar axis is cylindrical or is encased in a box with an upper side parallel to that axis (as in Grubb’s or Cooke’s equatorials), Prepare a right-angled triangle of wood of which the acute angles represent the latitude and co-latitude of the place. Lay the hypothenuse of this triangle upon the line of the instru- ment parallel to the polar axis (or the wire of operation 2) with the angle equal to the co-latitude next to the elevated pole, and change the inclination of the

polar axis till a mason’s level placed on the side of the triangle opposite to the angle of the latitude shows the side in question to be horizontal. (4) Adjust the movable micro- meter web to coincidence with the axis of the position circle by bi- secting the image of a distant object and reading the number of revolutions or fractions of a revolution at two different readings of the position circle 180° apart. The mean of these two readings is the reading for coincidence with the axis of the position circle. Set the micrometer to this mean. (5) Adjust the polar axis more exactly to the required altitude as follows. Point the telescope to a well-known star not far from the equator and near the meridian, and turn the position circle so that the image of the star by the diurnal motion runs along the web. Read the declination circle. Now reverse the telescope to the other side of the polar axis and bisect the same star again, and again read the declination circle. The mean of the two readings is the star’s instrumental apparent declination ; the difference of the two readings is twice the index error. To eliminate this latter it is only necessary to shift the vernier of the declination circle by the screws provided for the purpose, without unclamping in declination, till the circle reads the star’s instrumental apparent declination. This being done, select another star near the meridian and compute its apparent declination (allowing for refraction). Set the telescope to this com- puted reading and clamp in declination ; then cause an assistant to

There must be a certain loss of

that could be tolerated for the sake of

further difficulty of mounting it so that

change the altitude of the polar axis (by the screw for the purpose) till the star is bisected by the micrometer wire. (6) Select any convenient known star about six hours from the meridian ; compute its apparent declination (allowing for refraction) ; and set the tele- scope to this reading in declination. Cause the assistant to turn the slow motion in azimuth till the image of the star is bisected by the micrometer web. (7) Repeat operation 5 and make final corrections if necessary. (8) Repeat operation 6 with stars both east and west of the meridian, and readjust azimuth if necessary. (9)

Turn the position circle of the micrometer 90°; place the declination axis nearly horizontal ; clamp the telescope in right ascension ; and ob- serve the time of transit of a known star across the web of the micrometer. Compute the true hour angle of the star from the known error of the micrometer and the star’s right ascension, and set the vernier so that the hour circle shall read the computed hour angle. By these meaus, with a previously prepared pro- gramme, the writer has frequently completely adjusted an equa- torial in less than an hour, so far as operations 4 to 9 were concerned.

There still remain two instrumental errors of the stand. (1) The line joining the optical centre of the lens with the axis of rotation of the position circle may not be at right angles to the declination axis. (2) The declination axis may not be at right angles to the polar axis. In modern equatorials it is usual to leave these adjustments to the maker, as to leave them to the astronomer would be incompatible with the greatest stability of the instrument. In a good instrument these errors will certainly be extremely small and have no influence on its efficiency for practical purposes. The methods for determining their amount are given in most works on practical astronomy.!

There remain two important optical adjustments which must be very carefully attended to, viz., the centring of the lenses of the object-glass relative to each other and the centring of the axis of the object-glass relative to that of the eye-piece. The former consists in placing the lenses of the object-glass so that the centres of curva- ture of their surfaces shall lie in one straight line, which line is the axis of the object-glass. This operation is so delicate and requires such special experience and skill that it should be left to the maker of the object-glass. An elegant method of testing this adjustment was given by Wollaston in Phil. Trans., 1822, p. 82. If the object- glass itself is perfectly centred, the test of the centring of its axis with that of the eye-piece is very easy : are the diffraction rings which surround the image of ; a bright star shown as in fig. 33, or is there flare, that is, are the rings extended on one side as in fig. 34? If the latter is the case, that side of the object-glass towards which the flare is directed is too far from the eye-piecc, and should be brought ; towards it by the appropriate screws or other means provided by the maker. Ina good object-glass perfectly centred, on a night of steady de- finition, a bright star in focus should appear as in fig. 33.

A useful apparatus for the adjustment of cen- «= tring is a small telescope (fig. 35) whose axis is in the centre of and at right angles to a flat piece of brass in the shape of an equilateral triangle fitted with screws at the three angles. To use this in- strument, place the points of the screws on the object-glass as in fig. 36, so that two angles of the triangle are in contact with the inner edge of the cell of the object-glass, and adjust the screw a so that the cross-wires in the common focus of the object- glass and eye-piece of the small telescope coincide with the image of the cross-wires of the micro- meter of the telescope which mark the axis of rotation of the position circle. Now, keeping the same angles of the brass triangle in con- tact with the cell, move the small centring telescope round the cir- cumference of the object-glass and note where there is the greatest de- parture from coincidence. Correct rygs, 35, 36.—Apparatus for adjust- this departure half by the screw @ ment of centring in a small telescope. of the small centring telescope and

half by the centring screws of the object-glass. The adjustment is perfect when the centring telescope can be moved round the whole periphery of the object-glass in the above manner whilst its cross-wires continue to bisect the cross-wires of the micrometer of

See 1 Chauvenet, Practical and Spherical Astronomy, vol. ii. pp. 379-390 ; Brunnow, Spherical Astronomy, p. 445 ; and Loomis, Practical Astronomy, pp. 28-32.

Fig. 33.

Fig. 34.

Driving clock.

the telescope. If after this adjustment has been perfected the dif- fraction rings are still not circular round the images of stars, the fault is in the

centring of the lenses of the object-glass with respect to each other, and the object-glass should be scent to the maker for rectification.

Driving Clock.

The means employed to cause an equatorial telescope to follow the diurnal motion of a star obviously must not resemble the intermittent motion of an ordinary clock. Numerous devices have been contrived for producing uniform mo- tion. But the limits of this article will only allow us to refer briefly to a few of those most commonly in use. Fig. 37 represents Fraun- hofer's governor. On its axis C is a pinion driven by a train of wheels, The axis carries an arm BB, at the ex- tremities of which, at- tached by springs f, /', are the weights D, D'. When these weights ac- quire a certain velocity of rotation the centri- fugal force is sufficient to cause the weights to fly out and rub against the inside of the cylinder AA, and their velocity is checked. Instead of a cylinder, the balls may rub against the inside of a hollow cone, and by raising or lowering the axis C the contact of the weights with the cone may be made to take place when the balls have slightly greater or less

Fic. 37.—Fraanhofer's governor.

velocity, and thus the rate of the clock is regulated. A much better arrangement is a modification of Watt's governor, employed by Grubb and Cooke. The governor balls g, g (fig. 38) repose on the points h, 2 of the arm KK till they reach their normal velocity, when they fly outwards and bring the point S (tipped with leather) into contact with the friction plate p. These clocks are simple in construction and act very well. Newcomb in the Washington equatorial has employed a long suspended conical pendulum ; when this pendulum in the least exceeds its normal velocity (that is, its

TELESPHORUS, bishop of Rome from about 128 till about 137, succeeded Sixtus J. and was followed by Hyginus. Eusebius in his History gives the date of the martyrdom of Telesphorus as the first year of Antoninus Pius (138) and in his Chronicle as the eighteenth year of Hadrian (135).

TELFORD, Tuomas (1757-1834), civil engineer, was the son of a shepherd in Eskdale, Dumfriesshire, and was born in the valley of the Megget, 9th August 1757. From early childhood he was employed as a herd,

occasionally attending the parish school of Westerkirk, where his quickness and diligence helped to make up for his lack of opportunity. On being apprenticed, at the age of fifteen, to a stone mason at Langholm, he found leisure not only to gain an acquaintance with Latin, French, and German, but to gratify his literary tastes by a wide variety of reading. In his early manhood he was much given to

normal departure from the vertical) it establishes an electrical con- tact which brings friction to bear, and thus reduces the power applied to the pendulum. There is occasional tendency to elliptical motion, and the clock is otherwise troublesome. In the Repsolds' _ driving clock of the 30-inch Pulkowa refractor the conical pendulum is reversed, being a hcavy weight at the top of a vertical steel rod, kept in conical rotation by a pin at its upper end, which entets a slot in a revolving arm. The rod is in fact a spring of such a form as to cause the revolutions to be nearly or perfectly isochronous whatever the angle of the cone of motion ; the clock is therefore, within limits, independent of the power applied to it or the force to be overcome.

Many forms of air-fans have been suggested; probably the best is the modification of Foucault's proposed by Hilger (see Monthly Notices R..A.S., vol. xlvi. p. 155), which is shown in fig. 39. E is the axis of rotation ; C and D are fans that are pulled towards the spindle EK by chronometer springs in the boxes A and B. The fans fly out symmetrically when the velocity exceeds 25 or 80 revolu- tions per second; the increased resistance of the air thus pro- duced checks the velocity of ro- tation. By means of the small weights W, W attached to arms on the fans Hilger states that it is possible to adjust this governor so that it shall even lose by an increase of the driving weight.

For the most refined work none of these governors can be said to be perfect; none would be even tolerable as a clock for astrono- mical time-keeping purposes. It is possible that the elaborate Greenwich driving clock may give better results, but its construc- tion is too complicated to be fre- quently repeated (see, for a de- scription of it, the Greenwich Observations for 1868). The only way in which nearly perfect uni- form motion can be realized is to control it in some way from a swinging pendulum. This is

done in Bond's spring governor! and by Grubb, the latter employing the arm of a remontoir train connected with a dead-beat escapement to bring friction to bear on a revolving plate connected with the axis of his governor (see fig. 88). The best existing driving clock is probably that at Lord Crawford's observatory at Dun Echt.2 An account of its performance is given by Dr Copeland in Viertel- jahrsschr. astron. Geselisch., 16 Jahrg., p. 305. In this clock gain of a hundredth of a second, or even less, introduces increased fric- tion on the revolving disk during the next second, or until the gain has been corrected. A still more perfect clock could probably be made on a similar plan by abolishing the clock weight and making the origin of power an electromotor, the current being cut off in a way similar to that in the Dun Echt clock if the clock of continuous motion gets in advance of the ordinary clock.

For information on clockwork of equatorials and telescope mount- ings generally, see Konkoly's Practische Anleitung zur Anstellung astron. Beobachtungen. (D. GI.)

Fic. 89.—Hilger's modification of Foucault's air-fan.

the writing of verse: a poem of some length on Eskdale appeared in 1784 in the Poetical Museum, published at Hawick ; under the signature of "Eskdale Tam" he con- tributed verses to Ruddiman's Weekly Magazine; and he addressed an epistle in rhyme to Burns, which was published in Currie's Life of the poet. But these poetical effusions were of comparatively little value. In 1780 Telford went to Edinburgh, where he was employed in the erection of houses in the "new" town, and occupied much of his spare time in learning architectural drawing. Two years later he proceeded to London, finding employ- ment in the erection of Somerset House. Having in 1784 superintended the erection of a house for the commissioner at Portsmouth dockyard, he next repaired the castle of

1 Konkoly, Practische Anleitung zur Anstellung astron. Beobacht-

ungen, Brunswick, 1888. ? Monthly Notices R.A.S., November 1873.

Sir W. Pulteney, member for Shrewsbury, who conceived such a high opinion of his talents that he got him made surveyor of public works for the county of Salop. His earliest bridge was that across the Severn at Montford, finished in 1792. In the following year he was appointed engineer of the Ellesmere Canal, which led to his being employed for the chief canals subsequently constructed in Great Britain, including the Caledonian (1804), the Glou- cester and Berkeley (1818), the Grand Trunk (1822), the Macclesfield (1824), and the Birmingham and Liverpool Junction (1825). He was consulted in 1806 by the king of Sweden, regarding the construction of the Gotha Canal between Lake Wener and the Baltic, and, his plans having been adopted, he visited the country in 1810 to superintend some of the more important excavations. In 1803 he had been appointed engineer for the construction of 920 miles of roads in the Highlands of Scotland, a great part through very difficult country. Of the numerous bridges built in this line of roads mention may be specially made of that across the Tay at Dunkeld. Subsequently he perfected the road communication between London and Scotland and the northern towns of England. An under- taking of equal magnitude and importance with that in the Highlands of Scotland was a system of roads through the more inaccessible parts of Wales, which involved the erection of the magnificent suspension bridge across the Menai Straits, begun in 1820, and the Conway bridge, be- gun in 1822. For the Austrian Government Telford built the Polish road from Warsaw to Brest. While the fame of Telford rests chiefly on his road and canal engineering, and the erection of the numerous bridges and aqueducts which this involved, he also did good work in harbour construction. In 1790 he was employed by the British Fishery Society to inspect the harbours on the north-east coast of Scotland ; and, besides constructing the important fishing harbour at Pulteneytown, Wick, he greatly improved those at the other principal fishing stations. His import- ant works of this kind were, however, his improvement of the harbours at Aberdeen and Dundee, and the construc- tion of the St Katherine’s docks at London. In 1828-30 he drained the north level of the eastern Fen district, an area of 48,000 acres. The erection of the Dean Bridge, Edinburgh, and of the Broomielaw Bridge, Glasgow, and the improvement (1833-34) of Dover harbour were the principal achievements of his later years. He died on 2d September 1834, and was buried in Westminster Abbey. Telford was never married. For twenty-one years he lived at the Salopian coffee house,

afterwards the Ship Hotel, Charing Cross. He was a fellow of the Royal Societies of London and of Edinburgh, and was annually elected president of the Institution

of Civil Engineers from its commencement. He received the

Swedish order of knighthood ‘‘ of Gustavus Vasa.” See Telford’s Memoirs, written by himself and edited by John Rickman (1888); also Smiles’s Lives of the Engineers.

TELL. The story of William Tell’s skill in shooting at and striking the apple which had been placed on the head of his little son by order of Gessler, the tyrannical Austrian bailiff of Uri, is so closely bound up with the legendary history of the origin of the Swiss Confederation that they must be considered together. Both appear first in the 15th century, probably as results of the war for the Toggenburg inheritance (1436-50); for the intense hatred of Austria, greatly increased by her support of the claims of Zurich, favoured the circulation of stories which assumed that Swiss freedom was of immemorial antiquity, while, as the war was largely a struggle between the civic and rural elements in the Confederation, the notion that the (rural) Schwyzers were of Scandinavian descent at once separated them from and raised them above the German inhabitants of the towns.

The Tell story is first found in a ballad the first nine stanzas of which (containing the story) were certainly

written before 1474. There is no mention made of the names of the bailiff or of his master, or of the hat placed ona pole. Tell is called “‘the first Confederate,” and his feat is treated as the real and only reason why the Con- federation was formed and the tyrants driven out of the land. It is probably to this ballad that Melchior Russ of Lucerne (who began his Chronicle in 1482) refers when, in his account (from Justinger) of the evil deeds of the bailiffs in the Forest districts, he excuses himself from giv- ing the story. He goes on to narrate how Tell, irritated by his treatment, stirred up his friends against the governor, who seized and bound him and was conveying him by boat to his castle on the Lake of Lucerne, when a storm

arose, and Tell, by reason of his great bodily strength, was, after being unbound, given charge of the rudder on his promise to bring the boat safely to land. He steers it towards a shelf of rock, called in Russ's time Tell's Platte, springs on shore, shoots the bailiff dead with his crossbow, and goes back to Uri, where he stirs up the great strife which ended in the battle of Morgarten. In these two accounts, which form the basis of the Uri version of the origin of the Confederation, it is Tell and Tell only who is the actor and the leader. We first hear of the cruelties of Austrian bailiffs in the Forest districts in the Bernese Chronicle of Conrad Justinger (1420). No names or details are given, and the dates are different in the two recensions of the Chronicle as "olden days before Bern was founded" (i.e, before 1191) and 1260. Several details, but only one name, are added in the De Nobilitate et Rusticitate Dialogus (cap. 33) of Felix Hemmerlin, a canon of Zurich, who wrote it after 1451 and before 1454; in this last year he was imprisoned by the Schwyzers, whom he had repeatedly insulted and attacked in his books. According to him, the men of Schwyz and of Unterwalden were the first to rise, those of Uri following suit much later. But neither Justinger nor Hemmerlin makes any allusion to Tell or his feat.

The Tell story and the "atrocities" story are first found combined ina MS. known as the White Book of Sarnen. They are contained in a short chronicle written between 1467 and 1476, probably about 1470, and based on oral tradition. Many details are given of the oppressions of the bailiffs: we hear of Gessler, of the meeting of Stou- pacher of Schwyz, Fiirst of Uri, and a man of Nidwald at the Riitlii—in fact, the usual version of the legend. To give an instance of tyranny in Uri, the author tells us the story of the refusal of 'der Thall" to do reverence to the hat placed on a pole, of his feat of skill, and of his shoot- ing the bailiff, Gessler, from behind a bush in the "hollow way" near Kiissnacht. Tell is represented as being one of those who swore at the Riitli to drive out the oppressors ; but the narrative of his doings is merely one incident in the general movement which began quite independently of him. The chronology is very confused, but the events are placed after Rudolph's election to the empire in 1273. This is the only account in which Tell is called "der Thall," which name he himself explains by saying, "If I were sharp (witzig) I should be called something else and not der Tall," 7.e., the simpleton or slow-witted man. The only other known instances of the Uri version of the legend relating to the origin of the

Confederation are the Latin hexameters of Glareanus (1515), in which Tell is compared to Brutus as “assertor patriz, vindex ultorque tyrannum,” and the Urnerspiel (composed in 1511-12), a play acted in Uri, in which Russ’s version is followed, though the bailiff, who is unnamed, but announces that he has been sent by Albert of Austria, is slain in the ‘hollow way.” Tell is the chief of the Riitli leaguers, and it is his deed which is the immediate occasion of the rising against the oppressors, which is dated in 1296. Mutius

(1540) is the latest writer who, in his description of the origin of the Confederation, does not mention Tell and his act. The two stories are now firmly bound together; the version contained in the White Book is the accepted one, though small additions in names and dates are often made.

The task of filling up gaps, smoothing away incon- sistencies, rounding off the tale, was accomplished by Giles TscHUDI (¢.v.), whose recension was adopted, with a few alterations, by Von Miiller in his History of the Confedera- tion (1780). In the final recension of Tschudi’s Chronicle (1734-36), which, however, differs in many particulars from the original draft still preserved at Zurich, we are told how Albert of Austria, with the view of depriving the Forest lands of their ancient freedom, sent bailiffs (among them Gessler) to Uri and Schwyz, who committed many tyrannical acts, so that finally on 8th November 1307, at the Riitli, Werner von Stauffacher of Schwyz, Walter Fiirst of Uri, Arnold von Melchthal in Unterwalden, each with ten companions, among whom was William Tell, re- solved on a rising to expel the oppressors, which was fixed for New Year’s day 1308. A few days later (November 18) the Tell incident takes place (described according to the White Book version), and on the appointed date the general rising. Tschudi thus finally settled the date, which had before varied from 1260 to 1334. He utterly distorts the real historical relations of the Three Lands, though he brings in many real historical names, their owners being made to perform historically impossible acts, and in- troduces many small additions and corrections into the story as he had received it In particular, while in his first draft he speaks of the bailiff as Gryssler—the usual name up to his time, except in the White Book and in Stumpft’s Chronicle of 1548—in his

final recension he calls him Gessler, knowing that this was a real name. Later writers added a few more particulars,—that Tell lived at Biirglen and fought at Morgarten (1598), that he was the son-in- law of Fiirst and had two sons (early 18th century), &c. Johannes von Miiller gave a vivid description of the oath at the Riitli by the three (Tell not being counted in), and threw Tschudi's version into a literary form, adding one or two names and adopting that of Hermann for Gessler, calling him of ' Bruneck." Schiller's play gave the tale a world-wide renown.

The story was, on the ground of want of evidence, regarded as suspicious by Guilliman in a private letter of 1607, and doubts were expressed by the brothers Iselin (1727 and 1754) and by Voltaire (1754); but it was not till 1760 that the legend was definitely attacked, on the ground of its similarity to the story of Tokko (see below), in an anonymous pamphlet by Freudenberger, a Bernese pastor. This caused great stir; it was publicly burnt by order of the Government of Uri, and many more or less forged proofs and documents were produced in favour of Tell. The researches of J. E. Kopp! first cleared up the real early history of the league, and overthrew the legends of the White Book and Tschudi. Since then many writers have worked in the same direction. Vischer (1867) has carefully traced out the successive steps 'in the growth of the legend, and Rochholz (1877) has worked out the real history of Gessler as shown in authentic documents. The general result has been to show that a mythological marks- man and an impossible bailiff bearing the name of a real family have been joined with confused and distorted re- Miniscences of the events of 1245-47, in which the names of many real persons have been inserted and many un-authenticated acts attributed to them.

The story of the skilful marksman who succeeds in striking some small object placed on the head ofa man or child is very widely

1 Documents for the History of the Federal Alliances, 1835 and 1851, and his History, part ii., 1847.

spread: we find it in Denmark (Tokko), Norway (two versions), Iceland, Holstein, on the Rhine, and in England (William of Cloudesley). How it came to be localized in Uri we do not know; possibly, through the story of the Scandinavian colonization of Schwyz, the tale was fitted to some real local hero.

The alleged proofs of the existence of a rcal William Tell in Uri in the 14th century break down hopelessly. (1) The entries in the parish registers are forged. (2) As to the Tell chapels—(a) that in the ‘‘hollow way” near Ktissnacht was not known to Melchior Russ and is first mentioned by Tschudi (1570). (b) That on Tell’s Platte is also first mentioned in Tschudi. The document which alleges that the chapcl was built by order of a “lands. gemeinde” held in 1388, at which 114 men were present who had been personally acquainted with Tell, was never heard of till 1759. The procession in boats to the place where the chapel stands may be very old, but is not connected with Tell till about 1582. (c) The chapel at Biirglen is known to have been founded in 1582. Other documents and statements in support of the Tell story have even less claim to credit. It has been pointed out above that with two exceptions the bailiff is always called Gryssler or Grissler, and it was Tschudi who popularized the name of Gessler, though Grissler occurs as late at 1765. Now Gessler is the name of a real family, the history of which from 1250 to 1518 has been worked out by Rochholz, who shows in detail that no member ever played the part attributed to the bailiff in the legend, or could have done so, and that the Gesslers could not have owned or dwelt at the castle of Kiissnacht ; nor could they have been called Von Bruneck.

In the Urnerspiel the name of the bailiff’s servant who guarded the hat on the pole is given as Heintz Vogely, and we know that Friedrich Voégeli was the name of one of the chief military officers of Peter von Hagenbach, who from 1469 to 1474 administered for Charles the Bold, duke of Burgundy, the lands (Alsace, &c.) pledged to him by Sigismund of Hapsburg. Now

Hagenbach is known to have committed many cruelties like those attributed to the bailiffs in the legend, and it has been plausibly conjectured that his case has really given rise to these stories, especially when we find that the Confederates had a hand in his capture and execution, that in a document of 1858 Hagenbachs and Gesslers appear side by side as witnesses, and that the Hagenbachs had frequent trans- actions with the Hapsburgs and their vassals.

Among the vast number of books and pamphlets on the Tell story, the two most to be recommended are W. Vischer, Die Sage von der Befreiung der Wald. stdtte, Leipsic, 1867, and E. L. Rochholz, Tell wnd Gessler, with a volume of documents 1250-1513, Heilbronn, 1877. Convenient summaries of the con- troversy will be found in any modern book on Swiss history, and more particu- larly in G. von Wyss, Ueber d. Gesch. d. drei Linder—Uri, Schwyz, u. Unterwalden —in den Jahren 1212-1315, Zurich, 1858; Alf Huber, Die Waldstdtte bis zur

festen Begriindung ihrer Eidgenossenschaft, mit einem Anhange tiber die geschicht- –

liche Stellung des Wilh. Tell, Innsbruck, 1861; Albert Rilliet, Les Origines. de la Confédération Suisse, Histoire et Légende, Geneva, 1869. W.

TELLER, Wityetm ABrauAM (1734-1804), was the son of the Leipsic clergyman, Romanus Teller, who edited the earlier volumes of the Englisches Bibelwerk (in 19 vols., 1749-70), an adaptation for German readers of the exe- getical works of Willet, Ainsworth, Patrick, Poole, Henry, and others. Teller was born at Leipsic on 9th January 1734, and studied philosophy and theology in the uni- versity there. Amongst the men whose influence mainly determined his theological position and line of work was J. A. Ernesti. His writings present rationalism in its course of development from Biblical supernaturalism to the borders of deistical naturalism. His first learned pro- duction was a Latin translation of Kennicott’s Dissertation on the State of the Printed Hebrew Text of the Old Testament (1756), which was followed the next year by an essay in which he expounded his own critical principles. In 1761 he was appointed pastor and professor of theology in the university of Helmstaédt. Here he pursued his ex- egetical, theological, and historical researches, the results of which

appeared in his Lehrbuch des christlichen Glaubens (1764). This work threw the entire theological world into commotion, as much by the novelty of its method as by the heterodoxy of its matter, and more by its omissions than by its positive teaching, though everywhere the author seeks to put theological doctrines in a decidedly

modern form. ‘In consequence of the storm of indignation —

the book provoked, Teller eagerly accepted an invitation from the Prussian cultus minister to the post of prebendary of KéIn on the Spree, with a seat in the Berlin consistory (1767). Here he found himself in the company of the rationalistic theologians of Prussia—Sack, Spalding, and

‘others—and became one of the leaders of the rationalistic party, and one of the chief contributors to Nicolai’s Allge- meine Deutsche Bibliothek. Teller was not long in making use of his freer position in Berlin. In 1772 appeared the most popular of his books, Worterbuch zum Neuen Testa- ment (6th ed., 1805). The object of this work is to recast the language and ideas of the New Testament and give them the form of 18th-century illuminism. Thus Heb. xiii, 8 signifies the permanence of Christ’s teaching, and, as the New Testament has no word for Christianity, “Christ” may mean sometimes His person and at others His doctrine or the Christian religion ; Col. i. 15 signifies the priority of Christ to all other Christians. By this lexicon Teller had put himself amongst the most advanced rationalists, and his opponents charged him with the design of overthrowing positive Christianity altogether. The edict of Wollner (1788), and Teller’s manly action as consistorialrath in de- fiance of it, led the Prussian Government to pass upon him the sentence of suspension for three months, with forfeiture of his stipend. He was not, however, to be moved by such means, and (1792) issued his work Die Religion der Vollkommeneren, an exposition of his theological position, in which he advocated at length the idea, subsequently often urged, of “the perfectibility of Christianity,”—that is, of the ultimate transformation of Christianity into a scheme of simple morality, with a complete rejection of all specifically Christian ideas and methods. This book represents the culminating point of German illuminism, and is separated by a long process of development from the author’s Lehrbuch.

Teller died on 9th December 1804. In addition to the above works he wrote Anleitung zur Religion tiberhaupt und zum Allgemeinen des Christenthums insbesondere (1792) ; and, besides his contributions to the Allgemeine Deutsche Bibliothek, he edited a popular and practically useful Magazin fiir Prediger (1792-1801).

See Gass, Geschichte der protestantischen Dogmatik, iv. pp. 206- 222; Tholuck, art. ‘‘ Teller,” in Herzog-Plitt’s Realencykl. ; Doring, Deutsche Kanzelredner des 18ten und 19ten Jahrh., p. 506 sq. ; Pusey, Causes of the Late Rationalistic Character of German Theology (1828), p. 150.

TELLEZ, Gasrre (c. 1570-1648), Spanish dramatist, better known as Trrso DE Mottna (his nom de plume), was born about the year 1570, and about 1613 entered the order of the Brothers of Charity at Toledo. In 1645 he became prior of the monastery of the order at Soria, where he died in 1648.

His dramatic works are said to have numbered nearly 300, but of these only a small proportion are now extant. A selection of the best of them was edited by Hartzenbusch in 1839-42 (Madrid, 12 vols.). See DRAMA, vol. vii. p. 421, and. SpanisH LITERATURE, vol. xxii. p. 359.

TELLICHERRI, a seaport town of India, in Malabar district of Madras, situated in 11° 44’ 53” N. lat. and 75° 31’ 38” E. long. It is a healthy and picturesque town, built upon a group of wooded hills running down to the sea, and is protected by a natural breakwater of rock, The town with its suburbs occupies about 5 square miles, and was at one time defended by a strong mud wall. The citadel or castle still stands to the north of the town. The East India Company established a factory here in 1683 for the pepper and cardamom trade. For two years (1780-82) the town withstood a siege by Hyder’s general Sard4r Khan, and in the subsequent wars with Mysore Tellicherri was the base of operations for the ascent of the Ghats from the west coast. In 1881 the population was 26,410.

TELLURIUM. See SELENIUM AND TELLURIUM.

TELPHERAGE. See Traction.

TEMESVAR, a royal free city and capital of the county of Temes, is the chief town of south-eastern Hungary. It lies on the navigable Béga Canal and the river Béga, in 45° 47’ N. lat. and 21° 14’ E. long. The inner town is

fortified and separated from the suburbs by a glacis, now partly converted into a park. Temesvar is the seat of the Roman Catholic bishop of Csandd and of a Greek bishop, as also of several Government departments of great im- portance, and of one of the fifteen army corps of the Austrian-Hungarian army. The majority of the inhabit- ants follow industrial and commercial pursuits, and carry on a brisk trade in grain, flour, spirits, fruits, flax, and hemp with the neighbouring districts and with Roumania and Servia, by means of the Arad-Temesvar and the Austrian-Hungarian State Railways, as well as by the Béga Canal and by road. The town possesses many charitable and educational establishments, and is a favourite place of residence on account of its neatness and cleanliness. It has been lighted by electricity since 1883. Among the build- ings specially worthy of notice are some fine old churches, a new theatre, and a synagogue in the Byzantine style. Temesvar played an important part in the Turkish wars and in that of 1848-49. The population was 37,500 in 1886.

TEMMINCK, Konrap Jacos (1778-1857), keeper of the Leyden museum of natural history, was especially distinguished as an ornithologist, and was the author of many magnificently illustrated systematic works. See ORNITHOLOGY, vol. xviii. p. 11 sq.

TEMPE. See THESSALY.

TEMPERA, or DisteMPER,! is a method of painting in which solid pigments are employed, mixed with a water medium 2 in which some kind of gum or gelatinous sub- stance is dissolved to prevent the colours from scaling off. Tempera is called in Italy “fresco a secco,” as distinguished from ‘fresco buono,” or true fresco, painted on freshly laid patches of stucco. The peculiarities of true fresco are described in vol. ix. p. 769 sg. The disadvantages of tempera painting are that it will not bear exposure to the weather ; the pigments merely lie on the surface and do not sink into the stucco, as is the case with true fresco pigments ; moreover, the medium

used, being soluble in water, will not stand the rain. Its advantages are that the painter can work at leisure, and can also transfer or sketch his whole design on the dry finished surface ; while in fresco work each portion of the design is hidden piece- meal as each new patch of stucco is applied (see RAPHAEL, vol, xx. p. 279). Another important point is that a far greater variety of pigments can be used in tempera paint- ing, as they are not subjected to the caustic action of wet lime. Lastly, tempera painting can be applied to any substance, such as dry plaster, wood, stone, terracotta, vellum, and paper.? Various media have been used for tempera work, such as the glutinous sap of the fig and other trees, various gums which are soluble in water, and size made by boiling down fish-bones, parchment, and animals' hoofs. In more recent times a mixture of egg and vinegar has been found to make a good medium, especially when it is desirable to apply the colours in considerable body or impasto. Painting in tempera is probably the oldest method of all, and was used in ancient Egypt very largely, as can be seen by an examination of the many existing examples on papyrus or wood and stone thinly coated with a skin of fine plaster (gesso). Other ancient examples have been found in Babylon and Nineveh, and for internal work it appears to have been much em- ployed by the Greeks. To some extent tempera was used by the Romans, though in most cases a combination of fresco and encaustic (hot wax) was employed for their mural decoration (see vol. xvii. p. 42).

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I For some account of tempera painting in classical and medieval times, see MURAL DECORATION, vol. xvii. pp. 39-47.

2 Hence it used to be called ‘‘ water-work”’; see Shakespeare, Hen. IV., part ii., act ii, se. 1.

3 Miniatures and illuminated letters in medieval MSS. were painted with very finely ground colours mixed with a tempera medium.

In medizval times, from the 6th century in the Byzantium of Justinian down to the 14th century, most painting, whether on walls or panels, was executed

in tempera, though in many cases it appears to have been the custom to put in the coloured ground in true fresco, and, when that was dry, paint on it the complete picture with a tempera medium. This was the method used in the Byzan- tine wall-paintings in the churches of Thessalonica, Mount Athos, and elsewhere. A similar practice existed in Eng- land and other northern countries,! as in the very complete series of paintings on the walls and vault of the chancel of Kempley church, Gloucestershire, dating from about 1100. Most commonly, however, in England as in France and Germany the whole painting was done in tempera, the finished surface of the plaster being first covered with a wash of old slaked lime or whitening. As a rule every inch of stone, whether carved, moulded, or plain, in the cathedrals and other churches of medizeval France, Eng- land, and other countries was covered with this thin coating of white, and then elaborately decorated with tempera painting. In those rare cases where want of money pre- vented the application of colour the stone-work of the in- terior received the coat of white, so that at any future time the colouring might be added, and also because the feeling of the Middle Ages evidently was that bare stone inside a building had an unfinished and uncomfortable look,? and was quite as unsuitable in a richly decorated and furnished cathedral as it would now be considered in a lady's drawing-room. The additional splendour gained by the use of minute patterns stamped in gesso, thinly laid over the surface of the stone, is described in MURAL DECORATION, vol. xvii. p. 47; see also fig. 17.

Tempera in Italy—For panel and canvas paintings tempera continued in use till nearly the end of the 15th century, when the Flemish method of oil painting gradu- ally took its place. In many cases with panel pictures of the latter part of the 15th century it is now difficult, if not impossible, to be sure whether they were painted in tempera or in oil, either because both methods were com- bined—the picture being begun in tempera and finished with oil glazings—or because an oil varnish has been laid over the tempera pictures, and so the pigments have ab- sorbed oil out of the varnish and have thus practically become associated with an oil medium. In some cases slight peculiarities of brush-work bear witness to one medium or the other; but these appearances are often de- ceptive, and any real certainty on the point is unattain- able. The round panel of the Madonna and St Joseph by Michelangelo may be mentioned as an example of these doubtful cases.

In the main the earlier tempera easel pictures were painted on wood,—pear, poplar, or walnut being commonly used ; but a few painters preferred in some cases to use canvas.? The National Gallery of London possesses a very beautiful example of this,—the Entombment, attributed to Van der Weyden (see ScHoors or PaintTING, vol. xxi. p. 438, fig. 29), which is most delicately and yet powerfully painted on linen without any priming. Usually both panels and canvas were prepared for tempera by being covered with a fine priming or coating of gesso (plaster). Some later painters used marble dust; others unfortu- nately used white lead, which has since blackened through the absorption of gases from the air.

1 A fine example of 14th-century tempera painting in Sweden is illustrated in vol. xvii. plate I.

- Nothing could be more opposed to the spirit of the Middle Ages than the modern rage for cutting off plaster and scraping old stone- work, under a mistaken notion of zsthetic honesty.

3 In order to ensure an even surface some painters prepared their

panels by covering them with linen or vellum, over which the gesso priming was laid.

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In the case of wall paintings, both tempera and fresco 4 were used together, —the proportion of fresco work being gradually increased. In the 13th and most of the 14th century little more than the groundwork of the picture was painted in fresco, though this varied according to the custom of each painter. In the 15th century increased technical skill and rapidity of execution allowed much more complete work to be done in fresco, till at last nothing but a few finishing touches were done in tempera. For this, exceptional certainty of touch and speed of execution were required, and some weaker painters never attained to a very complete mastery over the fresco process. The brilliant series of wall paintings by Pinturicchio in the cathedral library at Siena contain a very large proportion of tempera work, in spite of which they are still in a wonder- ful state of preservation. Raphael’s rapid advance in the mastery of fresco-work is clearly shown in

his paintings in the Vatican stanze, each one of which is carried to a further stage in true fresco than the preceding. Thus the earli- est painting of the series (the Disputa) is very largely executed in tempera, while some of the later ones are nearly completed in fresco, and show the most perfect skill in that difficult process. Michelangelo was specially re- markable for his great power in fresco, and carried his Sistine paintings to a very advanced stage before touching them with tempera. Sad to say, what tempera finishing touches he did apply have mostly been scraped off during the many cleanings and repairs that these works have undergone ; and the same misfortune has happened toa large number of other important pictures. Tempera was specially used for paintings on canvas which were in- tended to be hung like tapestry, as, for example, the fine 15th-century series at Rheims and Mantegna's Triumph of Julius Cesar at Hampton Court.5 It was also much used for large cartoons, such as Raphael's tapestry designs, now in the South Kensington Museum. After the first half of the 16th century the increasing use of oil painting, assisted by the artistic decadence of the age, caused the gradual disuse of both fresco and tempera.

A third process, often used during the earlier Middle Ages, was a sort of compromise between tempera and fresco, A finished stucco surface was prepared as for ordinary tempera, but before each day's painting the plaster was soaked with water, so that the pigments, laid on to the wet plaster, to some extent sank below the surface, though without penetrating as deeply as they would on newly mixed stucco. (J. H. M.)

TEMPERANCE SOCIETIES.® The modern temper- ance movement may be said to date from the publication at Philadelphia, in 1785, of Dr Benjamin Rush's essay on "The Effects of Ardent Spirits on the Human Body and Mind," which was republished in the Gentleman's Magazine of 1786, and had a wide circulation. The distinction which he draws between distilled and fermented liquors has, however, no foundation in fact, the difference being one of degree and not of kind. In 1808 Dr Lyman Beecher and Dr B. J. Clark, both readers of Rush, took action, and the result of the work of the latter was the formation of what is believed to be the first modern temperance society. It was formed in Greenfield, Saratoga county, New York, as an anti-spirits association, and still remains a teetotal society. This example was soon followed elsewhere, the early societies all

restricting their scope to advocacy of moderation in the use of distilled liquors, and placing no inhibition upon fermented drinks. One society had a

4 “Fresco” here means “ fresco buono,” or true fresco.

5 See vol. xvii. p. 38.

6 The manner and degree in which the law has in recent years regulated the sale of intoxicants is described under Liquor Laws (vol. xiv. p. 688).

byelaw requiring any member who became intoxicated to treat all the other members. The work made further progress when the American Temperance Society was founded in 1826. Three years later Prof. John Edgar of Belfast called attention to the need for similar work in Ireland; and John Dunlop nearly at the same time organized a temperance society in Glasgow. In 1830 the first English temperance society was founded at Brad- ford. The habitual use of fermented liquors in England was a prolific source of drunkenness, and the evil was greatly increased by the passing of the Beer Act in October 1830. Hence some of the reformers began to abstain from all forms of alcohol. This new departure found its leader in Joseph Livesey of Preston, a man of singular zeal and benevolence, who with six others signed a pledge of total abstinence on lst September 1832. The reformers were soon divided over the fierce “battle of the pledges.” Some were willing to pledge themselves to abstain, but not to refrain from providing alcoholic drink for their visitors. After the formation of the distinctive total abstinence organizations, the moderation societies died of inanition. It should be mentioned here that the Society of Bible Christians, founded at Salford in 1809, adopted the rule of abstinence from flesh meat and intoxicants, and that a number of the ‘‘radical reformers” were ab- stainers from a desire to diminish the public revenue, which they regarded as devoted to wrong purposes by the Government of the day. In Ireland Father Theobald Mathew became president of the Total Abstinence Society in Cork in 1838, and the “pledge” was taken from his hands by crowds; before he died in 1856 between three and four million persons are said to have received it from him in the course of his journeys. J. S. Buckingham secured the appointment of a committee of the House of Commons, which

sat in June 1834, to inquire into drunken- ness. The adjective “teetotal” was first used in Septem- ber 1833 by Richard Turner, a reformed drunkard, to express the thoroughgoing principle of total abstinence, but whether he coined the word, or whether it was merely a stuttering pronunciation of “total,” or an old dialect word has been disputed; Prof. Skeat (Ztym. Dict., s.v. ‘“Teetotal”) believes it is an emphasized form of “total,” formed on the principle of reduplication. The early teetotallers were earnest missionaries. In consequence of their efforts societies and leagues multiplied, periodicals were established, and, notwithstanding many failures and apparent retrogressions, the temperance movement pro- gressed. One of the chief forms of thrift amongst the artisan class was that of the friendly society, the meetings of which were usually held at the public-house, large sums being spent (sometimes by rule) on liquor. In 1835 the Independent Order of Rechabites was formed at Sal- ford, and has since had a prosperous career as a working- class insurance company on temperance principles. The Sons of Temperance and the Total Abstinent Sons of the Phoenix are similar organizations. The sickness and death-rate among members of these bodies is much below that of the ordinary friendly societies. The beneficial effect of abstinence upon health and longevity is shown by the experience of the United Kingdom Temperance Provident Institution, the example of which has led several large insurance companies to add a special section for teetotallers. The statistics of these offices show that the mortality of the ordinary insured is considerably heavier than that of the abstainers. A vehement con- troversy arose at an early period as to the use of sacra- mental Wine, and the nature of the wines mentioned in Scripture was discussed in innumerable pamphlets. The result has been that in a number of cases the wine now used for sacramental purposes is understood to be unfer-

mented. The cosmopolitan character of the movement was shown by the meeting of the World’s Temperance Convention at London in 1846. The Scotch United Presbyterian Abstinence Society, originated in 1845, was one of the first of the church societies ; and there are now few, if any, religious denominations either in England or America in which such organizations are wholly wanting, The Church of England Temperance Society has two

sections, one pledged to the temperate use of intoxicants and the other to total abstinence. This method of organ- izing has found imitators. The enactment of the Maine Liquor Law in America in 1851 (see vol. xv. p. 299) led to the formation, in 1853, of the United Kingdom Alliance, which has for its object the suppression of the liquor traffic by legislation, and with a view to this suggests that a power of local veto should be placed in the hands of the rate- payers. This proposal took parliamentary form in the Permissive Bill of Sir Wilfrid Lawson, which was ulti- mately withdrawn and replaced by a “local option” re- solution, which has been thrice affirmed by the House of Commons. Temperance hotels, temperance cafés, British workmen public-houses, cocoa houses, coffee palaces, tee- total clubs, have arisen in many places as social aids of the temperance movement. ;

In 1868 the Good Templar order was introduced into England from the United States, where it had come into existence several years earlier. In England it made rapid progress, until it was seriously checked by a dispute arising out of the Negro question; but the two sections have again reunited (1887). Good Templary is the free- masonry of temperance, with ritual, passwords, grips, é&c., closely modelled on those of the old secret societies. It has had a remarkable extension in Great Britain, the United States, the British colonies, and in Scandinavia, its aggregate membership now reaching over 623,000. One of its results has been the foundation of a temperance orphanage at Sunbury-on-Thames. Side by side with the general movement there has been a special movement against the use of alcohol as medicine, and the tendency of medical teaching now favours at least restriction of its use as a therapeutic agent. The London Temperance Hospital for the non-alcoholic treatment of disease was opened in October 1873. The importance of training the young was early recognized by the leaders of temperance reformation, and the labours of Dr R. B. Grindrod of Manchester and Mrs Carlile of Dublin led to the forma- tion of bands of hope, which are now found in connexion with many places of worship, The juvenile temples of the Good Templar order also work in the same direction. The Woman’s Christian Temperance Union, founded in the United States in 1874, is one of the latest forms of tem- perance activity. A branch was organized in Great Britain in 1876; and in 1883 the World’s Women’s Temperance Union came into existence.

The temperance movement has now branched out into a multi- tude of organizations in the United Kingdom, of which the Rail- way Temperance Union, the post-office temperance societies, and associations connected with the army and navy are types. The organizations of a more general character are the United Kingdom Alliance, which is very active in the dissemination of teetotal doctrines generally, the National Temperance League, the Scottish Temperance League, the British Temperance League, the Scottish Permissive Bill-Association, the Irish Temperance League, and the Trish Association for the Prevention of Intemperance. There are also large district and county societies. Next to these come the secret orders, of which the Rechabites, Sons of Temperance, Sons of the Pheenix are large benefit societies. The Independent Order of Good Templars is non-beneficiary, and seeks in its “lodges” to provide social attractions, and at the same time to train the mem- bers in temperance work; it is probably the largest voluntary association in the world. There are societies in connexion with the various religious bodies, of which the Church of England

Temperance Society, the Catholic League of the Cross, the Baptist Total Abstinence Society, are prominent instances.

Origin.

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The oldest organization in America is the Sons of Temperance (1842), now numbering about 80,000 members. The Independent Order of Good Templars (1851) is the largest, its membership approaching 100,000. Both these, as also the Royal Templars of Temperance (1877) and the Templars of Honour and Temperance (1845), are mutual benefit societies. The Woman’s Christian Temperance Union, the National Temperance Society and Pub- lication House (New York), and the National Prohibition Party are active in educational work. The Woman’s Christian Temper- ance Union is the outgrowth of “the Women’s Crusade” (1872), a remarkable uprising among the women of Ohio and Pennsylvania against the liquor traffic. The organization was effected in 1874, and has since spread throughout the United States, its member- ship now (1887) numbering 207,000. Its influence has been widely felt in legislatures and_in elections in which prohibitory laws have been voted upon. With the exception of the Church

Temperance Society of the Protestant Episcopal Church, which has the ‘double basis,” all the temperance societies of the United States are based on the doctrine of total abstinence ; and, with the additional exception of the Father Mathew Total Abstinence Societies of the Roman Catholic Church, they all advocate the principle of prohibition. Amendments embodying this idea have been inserted in the State constitutions (by popular vote) of Maine, Kansas, and Rhode Island. In Vermont and Iowa the legislature has enacted statutory prohibition, which is still in force. In other States local prohibition prevails to a large extent, chiefly in Georgia, Mississippi, Massachusetts, Tennessee, Kentucky, and

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C. L. Balfour, Mr John Habberton, Mr Edward Jenkins, Mrs S. C. Hall, Mrs Ellis, and many others. (7) Periopicats: the temperance periodicals issued in Great Britain now number about fifty.

TEMPLARS, Knicuts. Perhaps the most renowned of the three great military orders founded in the 12th century for the defence of the Latin kingdom of Jerusalem is that of the Knights Templars (pauperes commilatones Christi tem- plique Salomonict), though abolished long before its rivals. It differed from the Hospitallers and the Teutonic Knights in having been a military order from its very origin, inas- much as its earliest members banded themselves together for the express purpose of giving armed protection to the numerous pilgrims who, after the first crusade, flocked to Jerusalem and the other sacred sites in the Holy Land. Walter Map has preserved the legendary story of their first achievements, from which it would appear that their earliest efforts were confined to the immediate neighbourhood of Jerusalem; and the memory of their original aim may perhaps be traced from fifty to seventy years later, when they conducted Henry of Saxony from their own quarters on Mount Moriah to the banks of Jordan, or when on the fall of the Holy City (1187) they protected the vanguard of the Christians on its way from Jerusalem to Tripoli. The three orders were distinguished from each other by their garb. The Hospitallers wore black mantles with white crosses, the Templars white mantles with a red cross, the Teutonic Knights white mantles with a black cross.+

The Templars almost from their foundation had their quarters in the palace of the Latin kings, which had been the mosque of Mount Moriah. This palace was also known as Solomon’s temple, and it was from this templum Salo- monis that the Templars took their name.

About the year 1118 a Burgundian knight, Hugh de

1 William of Tyre, xii.c. 7, viii. 3, xviii. 3-6; James de Vitry, Hist. Hieros., 60-67.

before assuming the crown of Jerusalem in 1131.

Paganis, bound himself and eight comrades by a vow to the patriarch of Jerusalem to guard the public roads, to live as regular canons, and to fight for the King of Heaven in chastity, obedience, and self-denial. Baldwin II. granted them quarters on Mount Moriah and recommended their cause to St Bernard. Under his patronage the papal legate, Matthew, bishop of St Albano, presided at the council of Troyes in January 1128 for the purpose of drawing up or confirming the statutes of the new order. The seventy-two

statutes then drawn up met with the approval of Pope

Honorius II. and the patriarch of Jerusalem, and became the groundwork of du Temple." Long before St Bernard's death (1153) the new order was established in almost every kingdom of Latin Christendom. Henry I. granted them lands in Normandy. They seem to have been settled in Castile by 1129, in Rochelle by 1131, in Languedoc by 1136, at Rome by 1138, in Brittany by 1141, and_in Germany at perhaps a still earlier date. Alphonso I. of Aragon and Navarre, if we may trust the Spanish historians, be-queathed them the third of his kingdom (Mariana, x. c. 9). Raymond Berengar, count of Barcelona, and Alphonso's successor in Aragon, whose father had been admitted to the order, granted them the strong castle of Moncon (1143), and established a new chivalry in imitation of theirs. Louis VII. in the latter years of his reign gave them a piece of marsh land outside Paris, which in later times became known as the Temple, and was the headquarters of the order in Europe. Stephen of England granted them the manors of Cressing and Witham in Essex, and his wife Matilda that of Cowley, near Oxford. Eugenius III, Louis VIL., and 130 brethren were present at the Paris chapter (1147) when Bernard de Balliol granted the order 15 librates of land near Hitchin ; and the list of English benefactors under Stephen and Henry II. includes the noble names of Ferrers, Harcourt, Hastings, Lacy, Clare,

Vere, and Mowbray.

After the council of Troyes Hugh de Paganis came to England and induced a number of English knights to follow him to the Holy Land. Amongst these was Fulk, count of Anjou, who would thus seem to have been a Templar Hugh de Paganis died about the year 1136 and was succeeded by Robert de Craon, who is said to have been Anselm's nephew. Everard de

Barris, the third master, was con- spicuous in the second crusade. In the disastrous march from Laodicea to Attalia his troops alone kept up even the show of discipline ; and their success prompted Louis VIL. to regulate his whole army after the model of the Templar knights. In the French king's distress for money the Templars lent him large sums, ranging from 2000 silver marks to 30,000 solidi. When Conrad III. of Germany reached Jerusalem he was entertained at their palace (Haster 1148); and in the summer of the same year they took part in the unsuccessful siege of Damascus. The failure of this expedition was ascribed by a contemporary writer to their treachery,—a charge to which Conrad would not assent, This is the first note of the accusations which from this time were of constant recurrence.*

Henceforward for 140 years the history of the Templars is the history of the Crusapes (¢.v.). In 1149 the Templars were appointed to guard the fortress of Gaza, the last Christian stronghold on the way towards Kgypt. Four years later the new master, Bernard de Tremelal, and forty of his followers, bursting into Ascalon, were surrounded by the Saracens and cut off to a single man. William of Tyre has preserved the scandal of the day when he hints that they met a merited fate in their eager- ness to possess themselves of the city treasure. Next year

2 Hist. Pontific., ap. Pertz, xx. 535-536.

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the rumour went abroad that they had sold a noble half- converted Egyptian prince, who had fallen into their hands, to chains and certain death for 60,000 aurei. In 1166 Amalric, the Latin king of Jerusalem, hanged twelve Templars on a charge of betraying a fortress beyond the Jordan to an emir of Nur al-Din of Damascus. The military power of Nur al-Din (1145-1173) was a standing menace to the Christian settlements in the East. Edessa had fallen to the prowess of his father (1144-45); Damas- cus was conquered by the son (1153), who four years earlier had carried his depredations almost to the walls of Antioch, and in 1157 laid siege to the Christian town of Paneas near the sources of the Jordan. In the disastrous fight that followed for the safety of the fortress of the Hospitallers, Bertrand de Blanquefort, the master of the Templars, and Odo de St Amand, one of his successors, were taken prisoners. Bertrand was released later when Manuel was preparing to march against Nur al-Din. The Templars do not seem to have opposed Amalric's early expeditions against Egypt. It was Geoffrey Fulcher, the Templar correspondent of Louis VII., who brought back (1167) to Jerusalem the glowing accounts of the splendour of the caliph's court at Cairo with which Gibbon has en- livened his great work. Nor was the order less active at the northern limits of the Latin kingdom. Two English Templars, Gilbert de Lacy and Robert Mansel, ''qui Galen- sibus preerat," starting from Antioch, surprised Nur al- Din in the neighbourhood of Tripoli and put him bare- footed to flight. But jealousy or honour led the Templars to oppose Amalric's Egyptian expedition of 1168; and the wisdom of their advice became apparent when the renewed discord on the Nile led to the conquest of Egypt by Asad al-Din Shirkuith, and thus indirectly to the accession of Saladin, in 1169. In 1170 they beat Saladin back from their frontier fortress of Gaza; and seven years later they shared in Baldwin IV.'s great victory at Ascalon. Meanwhile Saladin had possessed himself of Emesa and Damascus (1174-75), and, as he was already lord of Egypt, his power hemmed in the Latin kingdom on every side. In July 1173 Amalric was succeeded by his son Baldwin IV., a boy of twelve. Raymond III., count of Tripoli, a

"man suspected of being in league with the Saracens, was

appointed regent, although in 1176 the masters of the Templars and the Hospitallers united in offering this office to the newly arrived Philip of

Flanders. The construction of the Templar fortress at Jacob's ford on the upper Jordan led to a fresh Saracen invasion and the disastrous battle of Paneas (1179), from which the young king and the Holy Cross escaped with difficulty, while Odo de St Amand, the grand-master, was carried away captive and never returned.

During Odo's mastership the Old Man of the Mountains sent to Amalric offering to accept the Christian faith if released from the tribute he had paid to the Templars since (according to the reckoning of M. Defrémery) somewhere about 1149. The Templars murdered the envoys on their return (c. 1172). Amalric demanded that the offenders should be given up for justice. Odo refused to yield the chief culprit, though he was well known, and invoked the protection of the pope. Amalric had to vindicate his right by force of arms at Sidon, and died while prepar- ing to take stronger measures. The connexion between the Templars and the Old Man was still vital eighty years later when the two grand-masters rebuked the insolence of the Assassin envoys in the presence of Louis IX. Ododе St Amand was succeeded by Arnold de Torroge, who died at Verona on his way to implore European succour for the Holy Land. The power of Saladin was now (1184) increasing daily ; Baldwin IV. was a leper, and his realm was a prey to rival factions. There were two claimants

for the guardianship of the state,—Raymond III. of Tripoli and Guy de Lusignan, who in 1180 had married Sibylla, sister of the young king. Baldwin inclined to the former,~~against the patriarch and Arnold de Torroge. There is something Homeric in the story of the fall of the Latin kingdom as related by the historians of the next century. A French knight, Gerard de Riderfort or Bide~~ ford, coming to the East in quest of fortune, attached himself to the service of Raymond of Tripoli, looking for the hand of some wealthy widow in reward. But on his claiming the hand of the lady of Botron he was met with arefusal, Angered at this, Gerard enrolled himself among the Templars, biding his time for revenge, and was elected grand-master on the death of Arnold. Baldwin IV. died (1185), leaving the throne to his young nephew Baldwin V., the son of Sibylla, under the guardianship of Raymond, whose office was not of long duration, as the little king died in

September 1186. This was Gerard's opportunity. The Templars carried the body of their dead :overeign to Jerusalem for burial; and then, unknown to the barons of the realm, Gerard and the patriarch crowned Sibylla and her husband Guy. The coronation of Guy was the triumph of Reginald of Chatillon, once prince of Antioch, and Saladin's deadliest foe. It was at the same time the overthrow of Raymond's ambition; and both Latin and Arabic writers are agreed that the Christian count and the Mohammedan sultan now entered into an alliance. To break this friendship and so save the kingdom, the two grand-masters were sent north to make terms with Raymond. But the rash valour of the Templars provoked a hopeless contest with 7000 Saracens. The grand-master of the Hospitallers was slain ; but Gerard made his escape with three knights to Nazareth (lst May 1187). In this emergency Raymond became reconciled with Guy; and Gerard placed the temple treasures of Henry II. at his king's disposal. Once more it was the Templars' rashness that led to the disastrous battle of Hittin (4th July). Gerard and the king fell into the hands of Saladin, but were released about a year later; Raymond of Tripoli made his escape through treachery or fortune; and 230 Templars fell in or after the battle, for the fight was scarcely over before Saladin ordered all the Templars and Hospitallers to be murdered in cold blood. One after another the Christian fortresses of Palestine fell into the hands of Saladin. Jerusalem surrendered on 2d-3d Octo- ber 1187, and the treasures of the temple coffers were used to purchase the redemption of the poorer Christians, part of whom the Templar warriors guarded on their sad march from the Holy City to Tripoli. Part of their wealth was expended by Conrad of Montferrat in the

Fall of Latin

kingdom.

Fall of Jern- salem.

defence of Tyre; but, when this prince refused to admit |

Guy to his city, both the Templars and the Hospitallers from the neighbouring parts flocked to the banner of their released king and accompanied him to the siege of Acre (22d August 1189). In his company they bore their part in the two years' siege and the terrible famine of 1190-

91; and their grand-master died in the great battle of 4th October 1189, refusing to survive the slaughter of his brethren. On the fall of Acre Philip Augustus established himself in the palace of the Templars, who are, however, stated to have sympathized with Richard. This king sold them the island of Cyprus for 100,000 besants ; but, unable to pay the purchase money, they transferred the debt and the principality to Guy of Lusignan. The English king consulted them before deciding on any great military move- ment ; and in June 1192 they advocated the bold plan of an advance on Egypt rather than on Jerusalem. In the disputes for the Latin kingdom of the East the Templars seem to have supported Guy, and, like Richard, were credited with having had a hand in the murder of Conrad XXIII. — 21

Siege of Acre.

John de Brienne.

Fifth crusade.

Seventh crusade.

of Montferrat (April 1192). It was in the disguise of a Templar and in a Templar galley that Richard left the Holy Land. When Acre was recovered, the Templars, like the Hospitallers, received their own quarters in the town, which from this time became the centre of the order. On the death of Henry of Champagne (1197) they vetoed the election of Raoul de Tabarie; after the death of his successor Amalric they refused to renew the truce with Saladin’s brother, Saif al-Din, and led an expedition against the Saracens before the arrival of the new king, John de Brienne, at whose coronation in 1210 William de Chartres, the grand-master, was present. Seven years later, with the aid of Walter de Avennis and of the Teutonic Knights, they commenced the building of their fortress of Castle Pilgrim, near Acre, on a rocky promontory washed by the Mediterranean on every side except the east. This wonderful structure, whose ruins are still to be seen, was fortified with a strong wall, founded on the substructure of a yet more extensive one running from sea to sea, and was flanked by lofty towers of huge squared stones. Within was a spring of pure water, besides fishponds, salt-mines,

woods, pastures, orchards, and all things fitted to furnish an abode in which the Templars might await the day of their restoration to Jerusalem.

It was from this castle that in May 1218 the fifth crusade started for the expedition against Egypt. The Templars were the heroes of the siege of Damietta, at which William de Chartres was slain. ‘First to attack and last to retreat,” they saved the Christian army from annihilation on 29th August 1219; and when the city surrendered (5th November) the only one of its twenty-eight towers that had begun to give way had been shaken by their engines. On the other hand, it was largely owing to their objections that John de Brienne refused the sultan’s offer to restore Jerusalem and Palestine.

From the very first the Templars seem to have been opposed to Frederick II., and when he landed at Acre (7th September 1228) they refused to march under the banners of an excommunicated man, and would only ac- company his host from Acre to Joppa in a separate body. They were accused of notifying Frederick’s intended _pil- grimage to the Jordan to the sultan, and they were certainly opposed to Frederick’s ten years’ peace with Al-Kamil, the sultan of Egypt, and refused to be present at his coronation in Jerusalem. Frederick was not slow to avenge himself: he left Jerusalem abruptly, publicly insulted the grand-master, demanded the surrender of their fortresses, and even laid siege to Castle Pilgrim. He left Acre on 3d May 1229, and on landing in Apulia gave orders to seize the estates of the order and chase all its members from the land.

Long before the expiration of Frederick’s peace Europe was preparing for a fresh crusade against the now divided realm of the Ayyubids. Theobald of Navarre and his crusaders reached Palestine about August 1239. The Templars shared in the great defeat near Jaffa, an engage- ment which their temerity had done much to provoke (13th November 1239). If the king ever accepted the overtures of Sdlih of Damascus, he was supporting the policy of Hermann of Perigord, the grand-master, who towards the summer of 1244 wrote a triumphant letter to England, telling how he had engaged this sultan and Nasir of Kerak to make an alliance against the sultan of Egypt and restore the whole of Palestine from the Jordan to the sea. Theobald, however, before leaving the Holy Land (27th September 1240), signed a ten

years' truce with Salih of Egypt. The Hospitallers seem to have been won over to his view, and when Richard of Cornwall arrived (11th October) he had to decide between the two rival orders and their opposing policies. After some hesi-

tation he concluded a treaty with the sultan of Egypt, much to the annoyance of the Templars, who openly mocked his efforts. On his departure the three orders came to open discord: the Templars laid siege to the Hospitallers in Acre and drove out the Teutonic Knights "in contumeliam imperatoris." They were successful on all sides. The negotiations with Damascus and Kerak were reopened, and in 1244 Hermann of Perigord wrote to the princes of Europe that after a "silence of fifty-six years the divine mysteries would once more be celebrated in the Holy City."

It was in this moment of danger that the sultan of Khari.

Babylon called in the barbarous Kharizmians, whom the mian in. Mongol invasions had driven from their native lands, Yson. These savages, entering from the north, flowed like a tide past the newly built and impregnable Templar fortress of Safed, swept down on Jerusalem, and annihilated the Christian army near Gaza on St Luke's day (18th October) 1244. From this blow the Latin kingdom of the East never recovered ; 600 knights took part in the battle; the whole army of the Templars, 300 in number, was present, but only 18 survived, and of 200 Hospitallers only 16. The masters of both orders were slain or taken prisoners. Despite the admirable valour of the Templars, their policy had proved the ruin of the land. Jerusalem was lost to Christendom for ever; and, though the Kharizmians melted away in the course of the next three years, they left the country so weak that all the acquisitions of Theobald and Richard fell an easy prey to the sultan of Babylon.

Recognizing the fact that the true way to Jerusalem Louis lay through Egypt, Louis IX. led his host to the banks 1X.'s of the Nile, being accompanied by the Templars. Their crusade, master, William de Sonnac, attempted in vain to restrain the rash advance of the count of Artois at the battle of Manstra (8th February 1250), which only three Templars survived. St Louis, when captured a few weeks later, \ owed his speedy release to the

generosity with which the order advanced his ransom-money. Shortly after his de- | parture from Acre (April 1254) they consented to an eleven years' truce with the sultans of Egypt and Damascus.

A new enemy was now threatening Mohammedan and Christian alike. For a time the Mongol advance may ¥ have been welcomed by the Christian cities, as one after . another the Mohammedan principalities of the north fell before the new invaders. But this new danger stimulated the energies of Egypt, which under the Mameluke Bey- Suc. bars (see vol. vii. p. 755) encroached year after year on the cesses of scanty remains of the Latin kingdom. The great Frankish — lords, fearing that all was lost, made haste to sell their lands to the Templars and Hospitallers before quitting Palestine for ever. In 1260 the former purchased Sidon and Beaufort ; next year the Hospitallers purchased Arsuf.

In 1267, by a skilful adaptation of the banners of both orders, Beybars nearly surprised Antioch. The Templar fortress of Safed surrendered with its garrison of 600 knights, all of whom preferred death to apostasy (June 1266). Beaufort fell in April 1268, Antioch six weeks

later ; and, though the two orders still made occasional brilliant dashes from their Acre stronghold, such as that

to Ascalon in 1264 and that with Prince Edward of Eng- ‘ land to destroy Kaktin in 1271, they became so enfeebled as to welcome the treaty which secured them the plain of Acre and a free road to Nazareth as the result of the English crusade of 1272.

But, though weak against external foes, the Templars were strong enough for internal warfare. In 1277 they espoused the quarrel of the bishop of Tripoli, formerly a member of the order, against his nephew Bohemond, prince of Antioch and Tripoli, and commenced a war which lasted three years. In 1276 their conduct drove Hugh IIL, king

of Cyprus and Jerusalem, from Acre to Tyre. In the ensuing year, when Mary of Antioch had sold her claim to the crown to Charles of Anjou, they welcomed this prince's lieutenant to Acre and succeeded for the moment in forcing the knights of that city to do homage to the new king. Thirteen years

later (26th April 1290) Tri- poli fell, and next year Acre, after a siege of six weeks, at the close of which (16th May) William de Beaujeu, the grand-master, was slain. The few surviving Templars jonment elected a new master, and, forcing their way to the sea-

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Pales- shore, sailed for Cyprus, which now became the head-

quarters of the order. A futile attempt against Alexandria in 1300 and an unsuccessful effort to form a new settlement at Tortosa about the same time (1300-2) are the closing acts of their long career in the western parts of Asia.

For more than a hundred years the Templars had been one of the wealthiest and most influential factors in Euro- pean politics. If we confine our attention to the East, we realize but a small part of their enormous power. Two Templars were appointed guardians of the disputed castles on the betrothal of Prince Henry of England and the French princess in 1161. Other Templars were almoners of Henry III. of England and of Philip IV. of France. One grand-master was godfather to a daughter of Louis IX. ; another, despite the prohibition of the order, is said to have been godfather to a child of Philip IV. They are reported to have reckoned a pope (Innocent III.) among their members and to have refused admission to a king and his nephew (Philip IV.). They were summoned to the great councils of the church, such as the Lateran of 1215 and the Lyons council of 1274. Frederick II.'s per- secution of their order was one of the main causes of his excommunication in 1239; and his last will enjoined the restoration of their estates. Their property was scattered over every country of Christendom, from Denmark to Spain, from Ireland to Cyprus. Before the middle of the 13th century Matthew Paris reckons their manors at 9000, Alberic of Trois-Fontaines at 7050, whereas the rival order of St John had barely half the latter number. Some fifty years earlier their income from Armenia alone was 20,000 besants. Both in Paris and in London their houses were used as strongholds for the royal treasure. In the London temple Hubert de Burgh and the Poitevin favourites of Henry III. stored their wealth; and the same building was used as a bank into which the debtors of the foreign usurers paid their dues. From the English Templars Henry III. borrowed the

purchase money of Oléron in 1235, from the French Templars Philip IV. exacted the dowry of his daughter Isabella on her marriage with Edward II. To Louis IX. they lent a great part of his ransom, and to Edward I. of England no less than 25,000 livres Tour- nois, of which they remitted four-fifths. James de Molai, the last grand-master, came to France in 1306 with 150,000 gold florins and ten horse-loads of silver. In the Spanish peninsula they occupied a peculiar position, and more than one king of Aragon is said to have been brought up under their discipline.

Such were the power and wealth of the Templars at the time when Philip IV. of France accused them of heresy and worse offences, had them arrested (13th October 1307), and forced them to confess by tortures of the most ex-cruciating kinds. Five years later (26th May 1312) the order was suppressed by decree of the council of Vienne and its goods transferred to the hospital of St John.

The order consisted of (1) knights, (2) chaplains, and (3) men-at- arms (armigert, clientes, and servientes). The knights were either bound for life or for a fixed period, and were the only members entitled to wear the white mantle. Married brethren were ad- mitted ; but no woman might enter the order. Each knight might

kcep three horses and one man-at-arms, who, like his master, might be bound for life or only for a time. Like Augustinian canons,

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they were to attend daily services ; but the soldier outwearied with his nightly duties might on certain conditions absent himself from matins with the master’s consent. Two regular meals were allowed for each day*; but to these might be added, at the master’s discre- tion, a light collation towards sunset. Meat might be eaten thrice a week ; and on other days there was to

be a choice of vegetable fare so as to suit the tenderest stomach. Brethren were to eat by couples, each keeping an eye on his fellow to see that he did not practise an unduc austerity. Wine was served at evcry mcal, and at those times silence was strictly enjoined that the words of Holy Writ might be heard with the closest attention. Special care was to be taken of aged and ailing members. Every brother owed the most absolute obedience to the master of the order, and was to go wherever his superior bade him without delay, “as if commanded by God.” All undue display in arms or harness was forbidden. Parti-coloured garments were forbidden; black or dusky- brown (burellus) was to be worn by all except the knights. All garments were to be made of wool; but from Easter to All Souls a linen shirt might be substituted for onc of wool. The hair was to be worn short, and a rough beard became one of the distinguishing marks of the order. Hunting and hawking were unlawful ; and the very allusion to the follies or secular achievements of earlier life was forbidden. A lion, however, being the type of the evil one, was legitimate prey. Strict watch was kept on the incomings and out- goings of every brother, except when he went out by night to visit the Sepulchre of our Lord. No letter, even from the nearest rela- tive, might be opened except in the master’s presence ; nor was any member to feel annoyance if he saw his relative’s gift transferred at the master’s bidding to some other brother. The brethren were to sleep in separate beds in shirts and breeches, with a light always burning in the dormitory. Those who lacked a mattress might place a piece of carpet on the floor ; but all luxury was discouraged. The order recognized two governing bodies, —the first, a meeting for ordinary business, to which only the wiser members were sumnioned ; the second, one for extraordinary affairs, such as the granting of lands or the reception of new members, on which occasions the master might summon the whole community. Even at these last assemblies the master seems to have decided on the final action (ce. 59). A term of probation was assigned to each candidate before admission ; and a special clause discouraged the reception of boys before they were of an age to bear arms, Lastly, the brethren of the Temple were exhorted to shun the kiss of every woman, whether maid or widow, mother, aunt, or sister.

The general spirit of the Templar statutes remained unaltered Adminis- to the end, though the increasing wealth of the order gave rise to tration. a number of additional rules. The grand-master was always head of the

society ; his instructions were binding on every member, and the very laws were at his discretion. But he could not declare war, alienate the society's estates, or even admit a member without the consent of his chapter. He was elected by thirteen brothers, chosen by a peculiar method of co-optation, and all, if possible, belonging to different nations: Next to him in dignity came the seneschal, on whom the duties of the absent master devolved. The marshal had charge of the steeds and accoutrements ; he also com- manded the knights and men-at-arms, the latter of whom seem in time of war to have been at the disposal of the turcopolier. The commander of the kingdom guarded the treasure-house, to which even the grand-master might not have a key; the commander of the city of Jerusalem had charge of the True Cross in time of war. There were twelve or perhaps more commanders or preceptors of the different provinces and kingdoms of Europe and Asia,—Jerusalem (kingdom and city), Acre, Tripoli, Antioch, France, England, Poitou, Aragon, Portugal, Apulia, and Hungary. No European preceptor could cross the sea without the grand-master's leave ; but all ought to be present at the election to this office. The privileges and duties of every member were strictly prescribed, from the number of horses he might ride and the amount of food he might eat to the colour of his clothes. The order seems to have owned a fleet, part of which, if not all, was under the authority of the commander of the kingdom. Besides the knights and men-at- arms, the society reckoned chaplains in its ranks ; and it was the habit of confession to these priests that seems to have stirred the wrath of the Dominicans and the Franciscans, who played a very conspicuous part in the overthrow of the order, especially in England, For grievous offences, such as desertion to the Saracens, heresy, or losing the gonfalon, a Templar might be expelled (perdre la maison); for minor offences, such as disobedience or lowering the banner in battle, he suffered a temporary degradation (perdre son abit). By a mutual agreement the Templars and Hospitallers, despite their long and deadly feud, were bound not to receive ejected members of the rival order ; and the Templar cut off in battle and defeat from all hope of rejoining his own ranks might rally to the cross of St John. As Acre was the headquarters of the order in the East, so Paris was its centre in the West (Matt. Paris, v. 478). Every member before admission must declare himself free of debt, sound of body, and affiliated to no other religious society ; he must also take a vow of obedience and chastity, at the same time re-

Suppres- ~ A scheme for the union of the three great military orders into | diocesan councils were only empowered to inquire into the conduct sion of one had received the sanction of Gregory X. and Louis IX., of | of individuals. ; ; , the order. Nicholas IV. and Boniface VIII. The recovery of the Holy Land The trial began on 11th April 1310. On 23d April Reginald de The was the dream of the last pope's highest ambition ; and when he | Pruino protested against the unfairness of the proceedings. On trial, died a prisoner in the hands of Philip IY. of France this king con- Tuesday, 12th May, fifty-four Templars were burnt by order of the tinued to advocate the plan for his own purposes. His gold or | archbishop of Sens, and a few days later four more. Next day the influence secured the election of Clement V. as pope (5th June 1305). | terror spread (19th May). Forty-six Templars withdrew their deze According to a slightly later tradition, before consenting to the | fence and the commissioners decided (30th May) to adjourn till new pope's appointment he exacted from him an oath to assist in | November. The second examination lasted from 18th December carrying out six propositions, one of which he would not disclose | 1310 to 5th June 1811. Meanwhile (c. April 1811) Clement and as yet. This sixth condition, if it ever existed, must have been Philip had come to terms. The pope condemned the Templars, the suppression of the Templars; and, whether false or true, | The council of Vienne met in October 1311. A discussion arose Villani's story emphasizes a popular and almost contemporary | as to whether the Templars should be heard in their own defence. opinion. It is known that Philip was urging Clement in this Clement, it is said, broke up the session to avoid compliance ; and direction before the latter's coronation at Lyons on 14th November | when seven Templars offered themselves as deputies for the defence 1305, and all through the two succeeding years. On 6th June | he had them cast into prison. Towards the beginning of March 1306 the pope summoned the grand-master from Cyprus to France. | Philip came to Vienne, and he was seated at the pope's right hand James de Molai obeyed the call, and, hearing of the charges against | when that pontiff delivered his sermon against the Templars (3d his order, demanded a prompt investigation. In this demand he | April 1312), whose ordcr had just been abolished, not at the general was supported by the leading Templars of the realm. Clement, | council, but in private consistory (22d March). On 2d May 1312 who disbelieved the accusations, fenced with the question. But, | he published the bull 4d

Providam, transferring the goods of the though only a very short time previously Philip had spoken of | society, cxcept for the kingdoms of Castile, Aragon, Portugal, and his special love for the order, and though it had sheltered him | Majorca, to the Knights of St John. The order was never formally from the fury of the Paris mob in 1306, he was now determined | pronounced guilty of the crimes laid to its charge; its abolition on its destruction. Its wealth would fill the royal coffers, and the | was distinctly, in the terms of Clement's bull Considerantes Dudum, rumours of the day afforded a ready engine for its overthrow. "non per modum definitive sententiz, cum eam super hoc secun- Accusa- For perhaps half a century there had been strange stories circulat- | dum inquisitiones et processus super his habitos non possemus tions, ing as to the secret rites practised by the order at its midnight | ferre de jure sed per viam provisionis et ordinationis apostolice " meetings. It was said that on his initiation each member had to | (6th May 1312). disavow his belief in God and Christ, to spit upon the crucifix, to The individual members of the order seem to have been left to submit to indecent ceremonies, and to swear never to reveal the | the judgment of provincial councils. They were divided into three secrets of the society or disobey the mandates of a grand-master, | classes,—(1) those who confessed at once ; (2) those who persisted who claimed full power of absolution. When the masswas celebrated | in denial of the charges ; (3) those who, having confessed at first, the consecrating words " Hoc est corpus" were omitted ; on Good | withdrew their confessions later on the plea that they had been Friday the holy cross was trampled under foot ; and the Christian | extracted by torture. The penalties for the three classes were _ duty of almsgiving had ceased to be observed. Even the vaunted | respectively (1) penitence, (2) perpetual imprisonment, (3) death by chastity of the order towards women had, it was said, been turned | fire. The cases of the grand-master, the visitor of France, and the into a sanction for more horrible offences. These evil practices | masters of Aquitaine and Normandy were reserved for the pope's were part of the secret statute law of an order which in its nightly | decision. Early in 1314 they were forced to make a public con- assem blies worshipped hideous four-footed figures,—a cat or a calf. | fession in Notre Dame, and had already been condemned to per- In England the very children at their play bade one another beware | petual imprisonment when the grand-master and the preceptor of of a Templar's kisses. Stranger stories yet were rife in this country | Normandy publicly

proclaimed their entire innocence. The king, and gravely reported before bishops and priests,—of children slain | without consulting the church, had them burnt "'in the little island" by their fathers because they chanced to witness the nightly orgies | of the Seine " between the Augustinians and the royal garden." of the society ; of one prior's being spirited away at every meeting The opinion that the monstrous charges brought against the Question of the general chapter; of the great preceptor's declaring that a | Templars were false and the confessions were only extracted by of their single hair of a Saracen's beard was worth more than the whole | torture is supported by the general results of the investigation (in guilt or body of a Christian man. In France they were said to roast their | almost every country outside France), as we have them collisasatt in inno- illegitimate children and smear their idols with the burning fat. Raynouard, Labbe, and Du Puy. In Castile, where the king flung cence. Suppres- For nearly two years Philip waited for Clement to fulfil his | them into prison, they were acquitted at the council of Salamanca. sion of bargain. A certain Templar from the prisons of Toulouse now | In Aragon, where they held out for a time in their fortresses against _ order in offered to put the king in possession of a secret that would be worth | the royal powcr, the council of Tarragona proclaimed in their favour France. a realm. Acting on the evidence of this informer, Philip issued | (4th November 1312). In Portugal the commissioners reported

nouncing his private property and dedicating his future life to the Holy Land. 'The order prided itself specially on the splendour of its religious services, the abundance of its alms, and its reckless valour for the Christian faith. At the time of its suppression it was calculated to number 15,000 members. Three MSS. of its ancient statutes, written in Old French, are still extant at Dijon, at Paris,and at Rome. Of these the first was transcribed about 1200, the last two from 1250 to 1300. They have been published by M. Maillard de Chambure (Paris, 1840).

orders (14th September 1307) for the arrest of all the Templars in France on the night of Friday, 18th October. He seems to have written to the neighbouring princes urging them to act in the same way. James de Molai

was seized with sixty of his brethren in Paris. On Saturday they were brought before the university of Paris to hear the enumeration of their crimes ; and on Sunday the Paris mob was gathered in the royal gardens, where preachers were inveighing against the iniquities of the order. The inquisitors began their work at once; and inhuman tortures forced the most horrible avowals from the lips of many. In Paris alone thirty-six Templars died under torture.! Of 140 Templars examined at Paris between 19th October and 24th November 1307, the experience of some of whom extended over nearly half a century, there is hardly one who did not admit the dishonouring of the crucifix at his reception. Very many confessed to other charges, even of the worst description. Clement V., although he suspended the inquisitors' powers on 27th October (Loiseleur, 159), before the end of the next month wrote to Edward II. to arrest all the English Templars, who were accord- ingly seized on 10th January 1808. About the same time they were arrested in Sicily (24th January) and in Cyprus (27th May). As Clement did not move fast enough, Philip went to Poitiers with 700 armed men, and the pope wasathis mercy. It was agreed that the prisoners, their lands, and their money should be nominally placed in the hands of Clement's commissioners. The power of 1 Michelet, Procés, i. 86; Gruelle, 35, &c.

the inquisitors was restored (5th July); and the property forfeited was to be devoted to the recovery of the Holy Land. Clement now gave orders for fresh diocesan inquiries into the guilt of the Templars. He had already heard the confessions of seventy-two at Poitiers (29th June to ist July). The grand-master and the three preceptors were re-examined at Chinon, and renewed their old confessions (20th August). Lastly, the bull Regnans in Colo sum-moned a great council at Vienne for lst October 1310, when the question of the guilt of the order might be'considered. The

that there were no grounds for accusation, At Mainz the council pronounced the order blamelcss, At Treves, at Messina, and at Bologna, in Romagna and in Cyprus, they were either acquitted or no cvidence was forthcoming against them. At the council of Ravenna the question as to whether torture should be used was answered in the negative except by two Dominicans; all

the Templars were absolved,—even those who had confessed through fear of torture being pronounced innocent (18th June 1310). Six Templars were examined at Florence, and their evidence is for its length the most remarkable of all that is still extant. Roughly speaking, they confess with the most elaborate detail to every charge,—even the most loathsome ; and the perusal of their evidence induces a constant suspicion that their answers were practically dictated to them in the process of the examination or invented by the witnesses themselves. In England, where perhaps torture was not used, out of eighty Templars examined only four confessed to the charge of denying Christ, and of these four two were apostate knights. But some English Templars would only guarantee the purity of their own country. That in England as elsewhere the charges were held to be not absolutely proved seems cvident from the form of confession to be used before absolution, in which the Templars acknowledge themselves to be defamed in the matter of certain articles that they cannot purge themselves. In England nearly all the worst evidence comes at second or third 2 See the evidence in full ap. Loiseleur, pp. 172-212.

hand or through the depositions of Franciscans and Dominicans. Yet it can hardly be doubted that the ‘‘spuitio super crucem ” did form a part of the initiation ceremony. Even the English Templars admitted that the statutes of the order were one and the same all the world over ; and there is uo setting aside the consist- ent evidence of almost every French Templar as to his guilt in this matter. Of the other charges the most revolting may have originated in the abuse and misinterpretation of a licence primarily intended for military emergencies. Such at least is the form it seems to take in the evidence of John Senand (ap. Mich., ii. p. 137). A debased mind might misinterpret this concession and translate it into coarser words, till (this part of the initiation ceremony being probably conducted in private, as, most certainly, was the spitting on the cross) there might be two formularies current in the order, of which the second was plainly immoral, whereas the first was perfectly harmless unless coupled with a sous-cntendre. _ So too with regard to the spwitio. One Templar says plainly that he took it for a joke,—pro trufa ; others regarded it as an imitation of St Peter’s denial ; a modern writer has suggested that the custom was intended asa symbol of

absolute obedience (ap. Mich., ii. 260). There is little doubt that most members looked upon the ceremony with disgust. Some salved their consciences by the excuse that they were denying Jesus and not Christ ; another when shown the crucifix denied his belief in the painted figure. Nearly all declared that they had spat near but not upon the cross, and denied Christ “non corde sed ore.” Men who could thus play with their own consciences at their initiation might well, when their lives were in peril, clothe a falsehood in the garb of truth by denying ‘‘ spuitio super crucem ” instead of confessing to ‘‘spuitio juxta crucem.”

The other charges stand upon a somewhat similar footing. The

ower of lay absolution might easily be developed out of the harm- ess words with which the master or preceptor dismissed his chapter. The cordule which Templars were accused of wearing in honour of their idol take a very different appearance as the ‘‘zones of chastity” or “belt of Nazareth” worn in accordance with St Ber- nard’s precept. With regard to the charge of idolatry the evidence is very conflicting. In France and at Florence a large proportion of the members confessed to indecent kissing (oscula inhonesta) at their initiation ; but hardly a single English Templar admitted the charge, and one French witness suggested an almost ludicrous ex- planation of the rumour. Here also a simple ceremony of respect or humiliation seems to have been expanded into one of shame- lessness ; but the evidence is too strong to admit of its being ex- plained away, at least in France.

Not a few witnesses confessed that they had been called upon to . declare Christ a false prophet, who suffered for His own sins and not for the race, and to believe only in a superior God of the heavens (Deum celi superiorem). One Florence witness admits that the idol was worshipped as God and Saviour. It was this head, ac- cording to one of the witnesses, that could make the order rich and cause the earth to bud and the trees to blossom. A Carcassonne Templar spoke of the idol (Raynouard, 241) asa friend of God, who converses with God when he wishes. On such evidence M. Loiseleur holds that the Templars were members of a secret religion, which combined the heretical teachings of the Bogomilians and the Luci- ferians. The former, ‘‘the friends of God,” believed in a Supreme Deity,

whose eldest son Satanael was the creator of our world after his revolt against his father, and whose younger son Jesus was made man to counteract the evil deeds of his brother. They did not venerate the cross, regarding it as the instrument of Christ's passion. The Luciferians, on the other hand, worshipped the eldest son, who had power over all the riches of this world. M. Loiseleur has shown some remarkable coincidences, verbal and otherwise, be- tween the creed of these two sccts and that of the Templars, who, according to him, borrowed from the former their belief in the Supreme Deity and from the latter their devotion to the God of this earth. It seems, however, doubtful whether he is justified in combining the several items of such scattered evidence into a com- ee doctrinal system. His argument might be turned against

imself ; for, if these heresies were so widely spread in medieval Europe, are they not for that reason those most likely to be ascribed to an unpopular order ?

On the whole it may perhaps be admitted that the charges of *'spuitio" and ''osculatio inhonesta"' were current, at least sporadi- cally, for fifty years before the suppression of the order. They may have become more general in the time of Thomas Beraud, the grand-master (who died 1273), according to the evidence of the pre- ceptor of Aquitainc. On the death of William de Beaujeu (1291) there were two rivals for the office of grand-master,—Hugh de Peraud, the visitor of France, and James de Molai. The latter in 1291, at a general chapter, had declared his intention of extirpating certain practices in the order of which he did not approve?; while, if we may trust the French witnesses, the most vigorous initiator according to the new method was Hugh de Peraud. This exactly fits in with the account? that the errors were introduced after

1 See Mich., ii. 6-11. 2 Mich., ii. 189,247. 3 Mich., ii. 132.

William de Beaujeu's death. In other words, it is probable that the party of Hugh de Peraud between 1290 and 1307 made a desperate effort to enforce the new ceremonies and the new doc- trines throughout France and England. The custom of ''spuitio," at all events, was very ancient, and Hugh

de Perand devoted his energies to the propagation of the ‘‘osculatio inhonesta.” This would explain the omission of all allusion to the latter ceremony when the English Templars were absolved; for they would not confess to a practice of which they were innocent. This theory likewise goes a long way towards interpreting both the confession and the denial of James de Molai and the general acquittal of the Templars in nearly all the councils outside France. (TAs A.)

TEMPLE. The temple is an institution common to Meaning,

religions of natural growth which have reached a certain stage, and in most languages bears a name expressing that it is the house or palace erected by men as a habitation for their god* (Greek, vads ; Hebrew, hékal, “palace,” or beth élohim, “house of God”; Latin, xdes sacrx). In this connexion the term ‘“‘house of God” has quite a different sense from that which we connect with it when we apply it to a Christian place of worship. A temple is not a meeting-place for worshippers; for many ancient temples were open only to priests, and as a general rule the altar, which was the true place of worship, stood not within the house but before the door. The temple is the dwelling-house of the deity to which it is consecrated, whose presence is marked by a statue or other sacred symbol; and in it his sacred treasures, the gifts and tribute of his worshippers, are kept, under the charge of his attendants or priests. Again, a temple implies a sanctu- ary; but a sanctuary or holy spot does not necessarily contain a temple. A piece of land may be reserved for the deity without a dwelling-house being erected to him upon it, and a sacred tree, stone, or altar, with the holy precinct surrounding it, may be recognized as a place where the worshipper can meet his god and present his offerings, although no temple is attached. Indeed the conception of a holy place, separated from profane use, is older than the beginnings of architecture; and natural objects of worship, such as trees and stones, which need no artificial protection or official keeper, are older than images enshrined under roofs and protected by walls and doors. All antique religion is essentially altar- worship (see Sacririce), and for ritual purposes the altar always continued to be the true centre of the sanctuary. But the altar is only a modification of the sacred stone (comp. Prizst, vol. xix. p. 726), and it has already been observed that, even in later times, the chief altar of a sanctuary stood outside the temple. In the oldest and most primitive forms of religion

the sacred stone is at once the place where gifts are offered and the material sign of the presence of the deity ; thus the temple with its image belongs to a later development, in which the significance of the sacred stone is divided between the altar outside the door and the idol, or its equivalent, within. But in many very ancient sanctuaries the place of a temple is taken by a natural or artificial grotto (e.g, the Phoenician Astarte grottoes, the grotto of Cynthus in Delos), or else the temple is built over a subterranean opening (as at Delphi); and, while this may be in part explained as connected with the cult of telluric deities, or the worship of the dead, it seems not unreasonable to think that in their origin cave temples may date back to the time when caves were commonly used as human habit- ations, that the altar in front of the temple had its proto- type in altars at the mouths of sacred caves, which were approached with holy fear and not entered by ordinary worshippers, and that thus some of the main features of the ancient temple were fixed from the first by the analogy

4 Templum properly denotes a spot inaugurated for the observation of auspices by the augurs. But at Rome most ades sacre were also templa, and so the terms came to be used as synonymous.

Solo- mon’s temple.

of more primitive sanctuaries. The influence of the cave temple seems at least to be undeniable in that widespread type of sanctuary in which, besides the court for the worshippers and an outer chamber, there was a dark and mysterious inner room, an adytum or Holy of Holies. This type is found in Egypt (see ARCHITECTURE, vol. ii. p. 388 and plate VII), among the Semites, as in the temple at Jerusalem and in ~~that of Hierapolis (De Dea Syr., § 31), and also among the Greeks and Romans. In Greece the adytum was not a universal feature, though large temples usually had an antechamber as well as the cella or proper chamber of the god. But, where an oracle was given, or mysteries were celebrated, an adytum was always found, and one of its names was péyapov, which seems to be a transcription of a Semitic word for a cave (meghara). Certain adyta in Greece were actually sub~~ terranean; and the association of oracles with caves is well known.

The architectural features and plan of temples in various parts of the world have been illustrated at length in the article ARCHITECTURE, and need. not detain us here, but some further notice of the successive temples at Jerusalem is called for by the unique interest of the subject, while a glance at the topographical problems connected with this holy site is necessary to supplement the article JERUSALEM,

1. The Temple of Solomon.—There were temples among the Hebrews before the time of Solomon, whether private, like that of Micah (Judges xvii. 5), or public, like that of Shiloh, where the ark was housed for a time (see TABER- NACLE). In this, as in other matters, the Israelites must have learned from the Canaanites, who had large temples in the time of the Judges. The “hold” (vault?) of the temple of El-Berith at Shechem was the place of refuge for a thousand men (Judges ix. 46 sq.), and at Gaza there was a vast temple with a roof supported on two middle pillars (Judges xvi. 29). Solomon’s enterprise was not therefore absolutely novel, and in point of size his temple can hardly have surpassed those just mentioned. But his subjects were much behind the Canaanites and Philistines in the constructive arts, and as Solomon had to call in the aid of Tyrian craftsmen it cannot be questioned that the design was derived from Tyrian architecture. The general plan, indeed, of the house or “ palace” (Azkal) of Jehovah, with an adytum (debir, E.V. “oracle”), an outer chamber, and an altar before the door, is, as we have seen, common to many countries, especially in temples which had an oracle, as was the case with Solomon’s temple, built to contain the ark. But all the distinctive features are Pheenician, or at least characteristic of the northern Semites, of whose art the Phcenicians were then the lead- ing exponents. For the general arrangements the temple of Hierapolis (Mabbog), described by Lucian, offers a complete parallel. Like that of Solomon, it faced the east, and had two celle and a pronaos. The interior was enriched with gold work. Before the door stood a brazen altar within a walled court. The walled court is a con- stant feature in the Phoenician and Syrian temples, known to us from their remains or from coins,! and the golden decorations, the portico, and the brazen altar appear in the ancient temple of Byblus and in other Phoenician shrines (C.I.8., Nos. 2, 143), The chief motives in the internal decoration of Solomon’s temple were the palm tree and the cherub. The former is one of the commonest Phoenician symbols, and the Phcenician

associations of the latter are clear from Ezek. xxviii. The cherub, in fact, is only a variety of the sphinx, and the way in which the palm and winged animal figures were combined in

1 See T. L. Donaldson, Architectura Numismatica (London, 1859) ; Renan, Mission de Phénicie ; Perrot and Chipiez, Hist. de ? Art, vol. iii.

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Pheenician decoration is shown in a fragment of alabaster preserved in the Louvre and here figured (fig. 1) after Perrot (op. cit., iii. 131). Two cherubs with outstretched wings stood in the adytum to form a baldachin over the ark. Baldachins over the image or symbol of the deity existed in other f temples of the[.A northern Semites | =/< (Donaldson, op.cit., | – & pp. 73, 76 sq., 99), F: Winks

and in many Phe- nician works of art |, (e.g., on the stele of |: ¢f

or symbolof adeity f . isovershadowed by |= the winged disk }.- (an Assyrian sym- | =: bol of godhead) ar-© ranged as a sort of canopy (Ménant, Glyptique Oriental, ii. 231, 238).

The adytum of the temple was a cube of 20 cubits each way ; the outer chamber was of the same breadth, but 40 cubits long and 30 high.2. The portico was of the breadth of the main building and 10 cubits deep. That the two chambers were separated by a solid wall and not by a mere wooden partition may be taken as certain if, with Stade, we understand 1 Kings vi. 31 to say that the doorway of the adytum was pentagonal, z.c., that instead of a hori- zontal lintel a rude arch of two blocks was introduced to distribute the pressure of the superincumbent wall. In this case it is not likely that the exterior walls of the adytum were carried up to a height of 30 cubits, so as to allow of a continuous roof… The reduction of the dimensions to English feet is approximately determined by the Siloam inscription, which gives a round number of 1200 cubits for a measured length of 1760 feet. The Hebrew cubit, therefore, was the short cubit of antiquity, and for practi- cal purposes may be taken as equal to the Greek cubit of 18 inches, used by Josephus for the measurements of Herod’s temple. Thus the roof-beams of the temple had a span of 30 feet, a length sufficient to make it probable that

the wooden pillars spoken of in 1 Kings x. 12 (comp. 2 Kings xviii. 16) were employed to support them. The roof of the temple at Gaza rested on pillars, as we have seen, and wooden pillars seem to have been used within the temple at Golgus (Cesnola, Cyprus, p. 139), which was smaller than that of Jerusalem. A peculiar feature in Solomon's temple was that all its sides except the front were surrounded by three stories (each 5 cubits high) of small chambers, 5 cubits wide on the ground floor, 6 on the first floor, and 7 on the second, the increasing breadth being evidently got by reducing the thickness of the walls by 1 cubit at each floor? Thus, allowing for the walls, the external measurements of the house cannot have been much less than 45 cubits by 90. The aspect of the fagade can only be conjecturally determined. Several Phoenician temples, known from coins, show on their fagade a high- pitched gable (Byblus, Tripolis), and that of Tripolis has also a flat-roofed wing on each side of the gable and portico, which would answer to the ends of the side chambers mn

2 The description of the temple in 1 Kings is often obscure and the text is not always sound. Cp. Stade's essay in Z. f. ATliche Wiss., 18838, p. 129 sq.

8 In such small chambers the winding stair (1 Kings vi. 8) can

hardly have been more than a vertical post with footholds nailed to it (Prof. J. H. Middleton).

Fig. 1.

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our temple. But perhaps the closest analogy to the frontispiece of Solomon's temple is the often-cited one of the temple at Paphos, of which a representation from a coin is an- nexed (fig. 2). Here the portico be- tween the side wings is flanked by /fim two slender towers, and in the end |iij of the nave above the door there im are square-topped windows. Solo- \ mon's temple had "windows of beams" (or "with horizontal lin- tels") "framed in," which, as Pro- fessor J. H. Middleton observes, is naturally explained on the analogy of the windows be- tween the beams in the wooden gables of Coptic churches. This is the obvious position of openings for light in

buildings the type of which was derived from wooden constructions, and we know that the oldest Phoenician temples were, at least in great part, of wood (Utica; Pliny, H.N., xvi. 79; comp. Jos., C. Ap., i. 17, 18, and Solomon's house of the forest of Lebanon). That Solomon's temple had towers cannot be proved, for the height of the porch is not given in Kings, and the 120 cubits of 2 Chron. iii. 4 is obviously an excessive figure, due to a mistake of the writer or of a copyist. But the fact that in Ezekiel's ideal temple the door-posts of the porch are 5 cubits broad makes the existence of slender turrets like those of Paphos on each side of the portal probable. Another feature of Solomon's temple is exactly reproduced at Paphos. On each side of the door the coin shows a fantastic pillar standing free. Solomon erected two such pillars of bronze, 18 cubits high (1 Kings vii. 15 sq.), with capitals of "lily work," 2.¢., adorned with lotus flowers, like the Phoenician capital from Cyprus figured by Perrot (op. cit., p. 116). Such twin pillars or twin stelz in stone are of constant occurrence in Phoenician sacred art, and are still familiar 'to us as the Pillars of Hercules. In Solomon's temple both the oracle and the outer cella had folding doors. In the second and third temples the inner door was replaced by a vail (pardkheth), and a vail also hung before the outer door (Mal. i.10; 1 Mac.i. 22, iv. 51; B.J., v. 5, § 4 sq.). The Chronicler (2 Chron. iii. 14) introduces a vail in the first temple. This feature also seems to be common to the temple with other Semitic shrines (comp. C.L.S., No. 86, naqp, Assyr. parakku, Syriac prakké, "shrines," and the Kaaba at Mecca).}

The temple had an inner court of its own (1 Kings vi. 36), but the outer or great court (1 Kings vii. 12) was the court of the palace as well as of the sanctuary. Details as to the position of the courts and buildings must be reserved till we speak of the site, but it may be noticed that Jer. xxxvi. 10 speaks of the 'higher court," to which the '' new gate" of the temple belonged. This new gate in the higher court can hardly be different from the "higher gate" built by Jotham (2 Kings xv. 35), or from the '"'higher gate" of Benjamin, which, in Jer. xx. 2, is not the city gate of that name, but a gate "in" (not "by" as E.V.) ''the house of the Lord." From its name this gate must have been on the north side or at the north-east angle of the temple area, so that the ground rose to the north or north-east. The upper court may be merely the upper part of the great court near the ''higher gate" leading to the palace (2 Chron. xxiii. 20), or may be the same as the "new court " of 2

Chron. xx. 5. But one cannot be sure that the Chronicler is not transferring to Jehoshaphat's time a new court of the second temple. We know, however, that the kings of Judah made from time to time considerable changes in and about the temple.

2. The Temple of Zerubbabel.—After the captivity an altar of stone took the place of the brazen altar, or rather perhaps of the altar of Ahaz (2 Kings xvi. 10 sq.). The altar was erected immediately after the return (Ezra iii.

Fig. 2.

1 Op. also the vail of Assyrian tissue given by Antiochus to the temple at Olympia (Pausan., 'v. 12, § 4), which Ganneau (Quarterly Statement, April 1878) boldly identifies with the vail of the temple that Antiochus Epiphanes carried off from Jerusalem (1 Mac., i. 22; Jos., Ant., xii, 5, § 4).

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2); but the rebuilding of the temple was long delayed, and the work was not completed till 520 B.c. (see Haccar). Jt was much inferior to the first temple in magnificence, though not perhaps in size (Haggai ii. 3). The proposed breadth of 60 cubits and height of 60 cubits spoken of in Ezra vi. 3 would indeed imply that it was larger than the first temple, but in view of the testimony of Haggai (loc. cit.) it seems unlikely that these dimensions were realized by Zerubbabel.

The first temple resembled other temples of antiquity in being built to contain a visible symbol of the presence of the deity, namely, the ark, which stood in the inner chamber. In the second temple the adytum was empty, but the idea that the Godhead was locally present in it still found expression in the continuance of the altar service, in the table of showbread (a sort of continual Jectisternium) that stood in the outer chamber, and above all in the annual ritual of the day of atonement, when the high priest entered the Holy of Holies to sprinkle the blood of' the expiatory sacrifice on behalf of the people. Not only in this point but in all others the ritual of the second temple was dominated by the idea of priestly mediation, and the stated sacrifices of the priests on behalf of the people, which replaced the old stated oblations of the kings, became the main feature of the altar service.

The first temple was primarily the royal chapel, and the kings did as they pleased init ; the second temple was the sanctuary of the priests, whose chief now became the temporal as well as the spiritual head of the people. In the time of Ezekiel not only laymen but uncircumcised foreigners entered the sanctuary and acted as servants in the sacred offices (Ezek. xliv. 7); in the second temple the laity were anxiously kept at a distance from the holy things, and even part of the court around the altar was fenced off by a barrier, which only the priests were allowed to cross (Joseph., Ané., xiii. 13, § 5). Being no longer hemmed in by the royal buildings, as the first temple had been (Ezek. xlili. 8), its precincts could be expanded to suit the necessities of the enormous host of ministers of various ranks demanded by the growing complexity of the ritual, which, in matters of music and the like, was immensely developed as time went on (comp. Psaxms). Herod's temple, with the dependent buildings, was a little city enclosed in its own fortifications, But long before his time the temple was a sort of priestly citadel, the fortress as well as the sanctuary of the hierocracy ; and the sacred offerings which flowed to Jerusalem from Jews in all parts of the world were lavishly expended on enlarg- ing and strengthening it (Jos., B.J., v.5,§1). The name of Simon II. (c. 200 B.c.) is associated in Ecclus. 1. 1 sq. with important works of fortification on the circuit of the temple. Twice ruined in the wars with the Seleucids, these bulwarks were twice rebuilt, by Judas and Jonathan Maccabeeus (1 Mac. vi. 7; Jos., Ant., xiii. 5,§ 11). The works were further strengthened by Simon (1 Mac. xiii. 52), and at the time of Pompey's siege (63 B.c.) constituted an almost impregnable fastness, strengthened on its weakest or northern side by great towers and a deep ditch (Ant., xiv. 4,§ 2). Twenty-six years later the temple was again be- sieged by Herod, who, attacking, like Pompey, from the north, had to force three lines of defence,—the city wall and the outer and inner temple (Anzt., xiv. 16, § 2).

Of the temple as it was in the Greek or the Hasmonean period we have two descriptions by Hellenistic Jews, Pseudo-Aristeus (comp. SEPTUAGINT) and Pseudo-Hecatzus (Jos., C. Ap.,i. 22). In such a matter we may suspect even notorious literary forgers of care- lessness and exaggeration rather than of absolute untruth. Pseudo- Aristeeus describes the temple as surrounded by a triple circuit of walls more than 70 cubits high, and as further protected by the adjoining Acra, which overlooked the place of

sacrifice. Comparing the account of Herod’s siege, we may perhaps take the third circuit to be the wall of the town, which is represented as lying below the

temple on the same hill, The upper city on the western hill is ignored, which seems to show that the account was written before the Hasmonean period (comp. JERUSALEM, vol. xiii. p. 641), as has been argued on other grounds in Seprvacinr. The Acra, which is often mentioned in the history of the Maccabee wars, seems to have been on the same site as the Baris or castle of the Hasmonean priest-princes, where they put on their priestly robes before doing sacrifice (Ant.,xv. 11, § 4). That the Baris was close to the temple appears both from this circumstance and from the fact that Antigonus was charged with setting fire to the porticoes of the temple during the siege by Herod (Ant., xiv. 16, § 2),—an accusation which would have had no plausibility unless the destruction of the porticoes had been useful to isolate the castle. Pseudo-Hecatzeus gives the temple precincts a length of 500 feet and a breadth of 100 ae The explanation of these numbers will appear in the sequel.

“3, The Temple of Herod.—In the eighteenth year of his reign (20-19 B.c.) Herod the Great began to rebuild the temple and its precincts from the foundation, doubling the old area (Ant., xv. 11; Bell. Jud., i. 21). The works included the reconstruction, on the old site, of the Baris, which now received the name of Antonia, and is generally reckoned by Josephus as forming part of the temple precincts. Apart from the Antonia, the temple area formed a quadrangular plateau supported by retaining walls of great height and strength, and surrounded by porticoes. Three of the porticoes were double walks, 30 cubits broad, with monolith pillars 25 cubits high, and cedar roofs; the fourth or southern portico (the Stoa Basilica) had four rows of Corinthian pillars and three walks, respectively 30, 45, and 30 cubits in breadth. The middle walk was twice the height of the aisles, and the latter were 50 feet high. As regards the size of this enclosure, we are told by Josephus that the Stoa Basilica was a stadium or 600 feet long (Ant., xv. 11, § 5); and in Ant., xx. 9, § 7, the same length is assigned to the

eastern colonnade, which was known as Solomon's Porch (comp. John x. 23; Acts iii. 11 and v. 12), because it, and it alone, rested on an ancient substructure held to be the work of Solomon. The whole circuit of the porticoes was therefore 4 stadia,! or with the Antonia 6 stadia (B.J., v. 5, § 2). The Antonia lay on the north side (Ant., xv. 11, § 4) and communicated by stairs with the north and west porticoes at the north-west angle of the enclosure. Fergusson and others suppose that it touched the temple only at this angle, thence stretching north and west. But in this case the Antonia, which, as we shall see below, lay just north of Wilson's arch, would have been built over the hollow of the Tyropcon valley, a supposition absurd in itself and inconsistent with B.J., v. 5, § 8, which says that it stood on a cliff. Again, the tower 70 cubits high that stood at the south-east angle of the Antonia overlooked the whole temple, just as we know from Pseudo-Aristeus that the old Acra overlooked the altar. But, if the south-east angle of the Antonia had been, as Fergusson supposes, at the north-west angle of the temple porticoes, the view from the tower would have been intercepted by the lofty porch in front of the Holy Place. The Antonia, therefore, had its south face along part of the north face of the temple enclosure, and to gain a circuit of 6 stadia for temple and Antonia together we must assign to the latter the length of a stadium from north to south. This is not too much, for Josephus describes it as a little town in itself (B.J., v. 5, § 8).

The Antonia, the porticoes, and the space immediately within them (the outer court, or, as modern writers call it, the court of the Gentiles) were not holy ground. But in

1 This measurement (Ant., xv. 11, § 3) has often been taken to refer to Solomon's temple. But this view is not demanded by the words of Josephus, and is inconsistent with the other measurements he gives and with B.J., v. 5, § 1, which states that the plateau was levelled up by Solomon only on the east. This from the lie of the contour lines makes a plateau 600 feet square impossible. The Mishnah makes the "mountain of the house" a square of 500 cubits, apparently borrowing from Ezekiel.

the middle of the enclosure there was a platform raised 15 cubits above the court of the Gentiles and fenced off by a barrier, with inscriptions, one of

which still exists (Palestine E. F. Quarterly Statement, 1871, p. 132), forbid- ding aliens to pass on pain of death. The platform was approached by steps on all sides but the west (BW, v. 1, § 5, and 5, § 2), and was surrounded by a wall, rising 25 cubits above the inner level, and pierced by four gates on the north side and as many on the south. On the west there was no gate, but on the east—that is, in front of the fane—there were two, one within the other; for the eastern end of the platform was walled off to form a separate court for the women, at a somewhat lower level. One of the northern and one of the southern gates belonged to the court of the women, but it was also entered directly from the east by a very splendid gate of Corinthian brass, much more costly than the others, though they were overlaid with silver and gold. An enormous gate, 40 cubits wide and 50 high (gate Nicanor), connected the women's court with the higher part of the platform, or court of the men of Israel. The beautiful gate of Acts ili. 2 is variously identified with the first or second of these eastern portals. The walls of the platform were lined within with chambers, in front of which ran a splendid colonnade ; and the gate- ways were connected with the colonnade by small lofty halls (exedrx), which from without had a tower-like aspect. It is doubtful whether all the gates had exedrx; but, on the other hand, there was such a hall also at the west end where no gate opened. In the court of the men—z.e., in the upper and western part of the platform just described—stood the fane or temple proper raised twelve steps above the court. For the ground plan of the Holy Place and the Holy of Holies the ancient dimensions of Solomon's temple were preserved, and the external size demanded by the scale of the surroundings was gained by increasing their height, placing a lofty second story above them, making their walls and those of the surrounding chambers (corresponding to the chambers in the first temple) enor- mously thick, and placing at the front or east end a porch 100 cubits wide and 100 cubits high. The open doorway of this porch was overlaid with gold, as was also the door of the fane and the wall round it. To the ornament of the entrance belonged also a golden vine with clusters of grapes as big asa man. In front of the fane beneath the steps was the great altar of stone, 50 (or, according to the Middoth, 32) cubits square and 15 high; it was as- cended by a flight of steps from the south. The part of the court round the fane and the altar was fenced off for the use of the priests, and other Israelites were admitted only when the sacrificial ritual required the presence of the sacrificer.

Besides the descriptions in Josephus, we have for Herod's temple a mass of details and measurements in the Mishnic treatise Middoth. Josephus was himself a priest, while the Mishnah was not written till a century after the destruction of the temple, though it uses traditions that go back to Levites who had served in the temple. The two sources differ in many measurements, and the Middoth appears to be possessed of detailed traditions only for the inner temple. The state of the evidence is not such as to allow a plan of the temple to be formed with architectural precision. The above account rests almost entirely on Josephus, who, apart from certain . exaggerations in detail, gives a satisfactory general account, such as could be written from memory without notes and drawings.

Herod's gigantic and costly structures were still in building, forty-six years after their commencement, when our Lord began His ministry (John ii. 20), and the works were not completed till the procuratorship of Albinus (62- 64 a.p.). In 66 the great revolt against Rome broke out, and in August 70 Jerusalem was taken by Titus and the temple perished in a great conflagration."

2 Qn 10 Ab; but Jewish tradition celebrates 9 Ab as the day of the destruction of the temple.

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4. Topography.—lt is not disputed that the site of the

saphy- temple lay within the great Haram platform (see JERU-

SALEM), now a Moslem holy place, and it is generally agreed also that the south-west corner of that platform is the south-west corner of Herod's outer plateau, parts of the southern and western retaining walls being confidently ascribed by experts to his age. But if Herod's temple (excluding the Antonia) was only 600 feet square it can have occupied but a small part of the Haram area, which measures about 1500 feet from north to south and 922 feet along the south wall. Moreover, the highest part of the hill, where the Dome of the Rock now stands, must have been outside and north of the

temple enclosure. But this affords no good reason to doubt the accuracy of Josephus's measurements in a matter in which his memory could hardly fail him, and where his tendency would be rather to exaggerate than to diminish. There is no evidence that the eastern wall of the Haram is as old as Herod, much less as old as Solomon ; for the supposed Phoenician letters found on stones belonging to it are not letters at all, and may be of any date.1_ Moreover, there are various evidences of later building about the east wall of the Haram ; the so-called Golden Gate is certainly a later construction, and Justinian's church rested on new substruc- tures to the south and east (Procopius, De Zd., v. 6), which implies an extension eastward of the old platform. And this is confirmed by the fact that in the neighbourhood of the south-east angle the platform does not rest on solid substructures such as Josephus speaks of, but on the vaults known as Solomon's stables. Again, though the temple of Solomon lay above the town, there is no evidence that it was on the very top of the hill; on the contrary, buildings of the dimensions given in 1 Kings might have been placed on the hill-top without the need for such great substructures as are spoken of in 1 Kings vii. 10; and we have seen in speaking of the courts of the first temple that the ground appears to have risen to the north, the upper court being on that side.?

If we accept the measurements of Josephus we have to break with medieval tradition, both Moslem and Christian, which associates the Sakhra or rock under the dome on the top of the hill with the sacred site of the Jews. So much weight has been laid on this circumstance by writers of eminence that it is necessary here to go into some particulars and show that earlier tradition goes quite the other way. It is a Talmudic legend that in the Holy of Holies the place of the lost ark was taken by a stone called the '' foundation stone.' Further this stone was identified with Jacob's stone at Bethel (comp. Rashi on Gen. xxviii. and Breithaupt's notes). Both Mohammedans and Christians transferred these legends to the Sakhra, which the former accordingly venerated as ''a gate of heaven" (Ibn 'Abd Rabbih, 'Zkd, iii. 369). Mohammedan sources enable us to trace back this identification to the Moslem Jew Wahb ibn Monabbih, who enriched Islam with so many Jewish fables and dicd a century aftcr Jernsalem was taken by the Arabs (Tabari, i. 571 sq. ; Ibn al-Fakih, p. 97 sg.). Eutychius, on the other hand, who is the first Christian writer to apply the Jewish legend to the Moslem Sakhra,

avers that the tradition was communicated to ‘Omar by the Christian patriarch Sophronius on the taking of Jerusalem, and guided the caliph in the choice of a site for his mosque. Kutychius wrote nearly three hundred years after this event ; and, though it is known from earlier authorities (Arculphus, Theophanes) that the first Moslem mosque was built on what was pointed out as the site of the temple, it is equally certain, and was known to Eutychius himself, that that mosque lay to the south of the Sakhra (Eutychius, ii. 289), which was not embraced in the precincts of the Moslem sanctuary till the reign of ‘Abd al-Malik, who built the dome, a§ an inscription with the date 691 still testifies (Ibid., p. 865). This is confirmed by the excellent Arabian historian Ibu Wadih (ii. 811). ‘Abd al-Malik’s motive was political, as both historians attest ; Mecca being in the hands of a rival, he resolved to set up

1 They are represented in the Recovery of Jerusalem (p. 143) and in the Adlas of plates of Jerusalem published by the Palestine Explora- tion Fund.

- That the temple was built on the threshing-floor of Ornan is naturally assumed by the Chronicler, who likes to minimize the number of old Hebrew sanctuaries ; but the old history knows nothing of a con- secration of the site before the ark was placed there.

another place of pilgrimage to supplant the Kaaba, and recommended it to the faithful as the point from which the Prophet made his miraculous ascent from Jerusalem to heaven (Ibn Wadih, wt Supra). There is nothing of the Jewish legend here ; that, as we have seen, was supplied by Wahb in the next generation, and on his fonnda- tion there grew up a mass of other fables for which it is enough to refer to Ibn al-Fakih, p. 98 sg. From all this it may be taken as certain that at the time of ‘Omar it was towards the south-west

~~angle of the Haram, on the site of the original mosque, that tradi~~

tion supposed the temple to have stood ; indeed Eutychius is guilty of self-contradiction when he first says that Sophronius indicated the Sakhra to ‘Omar as the site on which to build his mosque, and then adds that it was

not part of the Moslem sanctuary till a generation later. Finally, the extension of the Haram to the north so as to bring the Dome of the Rock into the centre of the sacred area was the work of ‘Abd al-Malik’s son Walid (Eutychius, ii. 373).

Thus far we have met with nothing but confirmation of Josephus’s measurements and the site they imply; but there are other topographical indications which supply confirmation more decisive. And first let us compare what is related of the outer gates of Herod’s temple with existing remains. On the north was the gate Tadi of the Mishnah, which Josephus mentions only incidentally. This, like the gate Shushan on the east, which he does not mention at all, must have been of minor importance ; the chief accesses were necessarily from the lower city to the south and the upper city to the west beyond the Tyropceon valley. The south wall, says Josephus, had gates in the middle (Ant. xv. 11, 5), The Mishnah names them the two gates of Huldah, which may mean “tunnel (weasel- hole) gates.” There is a double gate in the substructure of the south wall, 350 feet from the south-west angle, and from it a double tunnel leads up to the platform. This double gate exactly fits Josephus’s description. There is also a triple gate, 600 feet from the south-west angle, which those who suppose the wall to have been more than 600 feet long regard as the second Huldah gate. But this view does not give us two gates in the middle of the wall, especially as the old wall cannot have enclosed Solomon’s stables. In the west side the Mishnah places one gate (Kiponus), while Josephus recognizes four. But these accounts are at once reconciled if we accept Josephus’s measurements. For of his four gates the most southerly is necessarily the one which opened on a flight of steps descending and then reascending across the Tyropceon to the upper city opposite. Now at the south-west corner of the platform there are still remains of a great arch (Robinson’s arch), which must have belonged to a bridge connecting the upper city with the south portico of the temple. Thus one of the four gates is fixed. The second gate led to Herod’s palace (at the extreme north of the upper city) by means of an embankment crossing the Tyropceon (Ant., xv. 11, § 5). Comparing B. J, ii. 16, § 3, vi. 6, § 2, and v. 4, § 2, we see that the embankment also carried the city wall (the so-called first wall). Of this approach there are remains at Wilson’s arch, 600 feet north of Robinson’s arch*; thus, if Josephus’s measure- ments are correct, the two western

accesses were at the extreme ends of the western portico. Josephus's other two gates led to the suburbs outside the first wall, and therefore lay north of Wilson's arch, and were not gates of the temple enclosure proper but of the Antonia, which Josephus habitually reckons as part of the outer temple.* Of them the Mishnah would naturally take no account, and as naturally it would neglect the gate that led to the palace as being not a public entrance. But further,

3 The adjoining remains of ancient buildings unquestionably mark the site of the council hall where the Sanhedrim met, and which was close to the first wall and the temple but outside the latter (B. J., VartSe2; Wie Oh S13)

- One of the suburban gates may be Warren's gate, in the sub- structures of the Antonia wall, about 170 feet north of Wilson's arch. The other is sometimes identified with Barclay's gate between Wilson's arch and Robinson's arch. But this would not lead into the suburb.

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according to Josephus's account of the whole circumference of the temple with Antonia, the latter extended a stadium north of the north-west angle of the temple portico, 7.e., 600 feet north of Wilson's arch; and, if we measure off this distance ona plan of the rock contours and then draw a line at right angles to represent the north face of the Antonia, we find that this line runs across the narrowest part of the saddle from which the temple hill is assailable. The breadth of the Antonia from east to west cannot have been more than about 300 feet if, as is to be presumed, the gate Tadi was opposite the twin gates of Huldah ; but with this breadth it would entirely cover the dangerous saddle.

Every attempt to reconstruct the area and situation of the temple as it was before Herod must be more or less conjectural, and an analysis of the possibilities would take up so much space that it seems better simply to offer a plan which appears to satisfy the main conditions of the problem.

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A. Temple. B, B, B. Inner court. C,C,C. Great court. D, E. Porches of the king’s house. F. Palace of Solomon. G, Great tower of prison court. H. House of the forest of Lebanon. J. Water gate. K. North court. L, L, L. New space taken in by Herod. MNPQ. Herod’s enclosure. NP. Solomon’s portico. PQ. Stoa Basilica or royal portico. P. Triple gate. Q. Robinson’s arch. R. Double gate (Huldah gates). M. Wilson’s arch.

According to this plan the area of the temple enclosure was doubled by Herod, his additions being in the parts where the work of levelling up was heaviest, and where neither the convenience of worshippers nor reasons of defence called on earlier builders to extend the plateau. It is certain that the substructures of the south-west angle, raised to a dizzy height above the Tyropceon, are Herod’s (Ant., xv. 11, § 5), and Josephus also speaks of an extension to the north (B.J., v. 5,§ 1). But, on the other hand, the Baris already adjoined the temple, a condition which is satisfied by giving the older north court K (correspond- ing to the new court of Chronicles, and perhaps also to the upper court of the first temple) a length from east to west of 300 feet and a breadth from north to south of 150. The old east face of the plateau is, as Josephus says, 600 feet long, but this length was gained after the time of Nehemiah by taking in the site of the armoury or house

TEMPLE

of the forest of Lebanon (H) and the street in front of the water gate (J). For the proof that the water gate stood at a re-entrant angle between the retaining walls of the armoury and the palace and faced east as shown in the plan reference must be made to an article in the Journal of Philology (vol. xvi.). The rocky boss between these two walls was in Nehemiah’s time surrounded by an out- work, which to the north joined the wall of Ophel,—that is, of the swelling mass of hill which lies out to the north-; east of the palace. From the lower city (south of the Haram area) a stair near the wall led up to the plateau H (Neh. iii. 19; xii. 37). The armoury was 150 feet

long and 75 broad; the plan allows the same dimensions for the open space within the water gate. The great court CO, C, C is arranged in accordance with 1 Kings vii. 12, in such a way that it is at once the court of the palace and that of the temple, enclosing the inner court B. The dimensions of the inner court are not given in 1 Kings, but as the temple was twice the size of the tabernacle the court was probably also double the court of the tabernacle. This gives a length of 300 feet and a breadth of 150, as in the plan. The part of the court in front of the temple is 150 feet square, which agrees with the dimensions given in Ezek. xl. 23,27. The great court is a square of 300 feet. This gives room on the east face for two porches D and E leading to the palace and each 75 feet long. Both porches are described in 1 Kings vii. 6, 8, and the dimensions of one are given. It is also expressly stated that the porch was before (7.e., on the east side of) the pillars that deco- rated its front, and that it led into the inner court of the palace, so that the arrangement in the plan is fully justified. In the time of Jeremiah (xxxviii. 14) there were three entries from the palace to the temple; the third was prob- ably into the north court, the palace having been extended northwards. It is evident that before the time of Herod the palace had disappeared. It was on a lower level than the temple, and when it was cleared away the great sub- structures on the line PE stood out as the boundary of Solomon's building. North of E the substructures were less considerable, the rock at the north end of this porch being but 20 feet under the present level of the plateau. In Herod's time, as can be seen at Robinson's arch, the level of the plateau was the same as at present (2420 feet), but in older times there was a fall between the upper and lower court, and K was probably 10 feet above C, C, C. In that case D was on the natural level of the ground, while (unless the great court was on two levels) E stood on a retaining wall 10 feet high at the north end of the porch and nearly twice as lofty at the south end. The plan shows the temple thrown out on very lofty substruc- tures, so as to be practically inaccessible on all sides and overhang the Tyropeon in the most striking way.! The whole group of buildings formed a complete defence to the city of David on its northern or vulnerable side. It will be observed that in Herod's temple the Huldah gates at R led directly to the altar, the position of which seems never to have been changed, and also that the plan explains the statement of Hecatzeus that the temple was 150 feet broad. His length of 500 feet from east to west is 50 feet too much unless he includes some remains of the old palace. The Baris

is shown as standing on the south-west corner of the existing platform of the Dome of the Rock.

A word may be said in conclusion on the ancient line of wall to the west of the temple, which, as has been shown from Neh. iii. in the article JERUSALEM, ran along the eastern side of the Tyropeeon. A bridge connected the temple with the upper city in the time of the later Has-moneans, and, as the palace (on the site of Herod's palace)

1 It ought, however, to be observed that the contour lines in and near B, B, B are almost purely conjectural.

TERM Pbk Ee

and the Baris were the points which it was most important to connect, it no doubt corresponded to the northern bridge already spoken of, at Wilson's arch M. But at that date it must have led, not directly to the temple, but to a lower point on the slope south of the Baris. In Nehemiah's time there was no bridge, but the gate of Ephraim probably corresponded to the east end of the bridge near the south- west angle of the Baris. In that case the wall, as is natural, ran close under the western substructures of the temple and probably served as a buttress to them in the part of its course south of the gate of Ephraim, which in Neh. xii. 38 is called ''the broad wall." The throne of the Persian governor, beside the gate of Ephraim (see JERUSA-LEM, vol. xiii. p. 640), stood so close to the Baris that we may conclude that there was already a castle on its site, held for the great king. The position assigned to the gate of Ephraim, which, according to 2 Kings xiv. 13, was 600 feet from the corner gate, where the north wall of the city joined the west wall, suits the fact that a line drawn east and west 600 feet north of Wilson's arch coincides with the line of scarped rock marked on the plan. Here, therefore, the old north wall ran, with the great fosse filled up by Pompey. This wall figures also in Herod's siege, but seems to have been destroyed by him.

Literature.—The literature of the subject is immense. The re- sults of modern surveys and diggings are given in the Palestine Exploration Fund volume on Jerusalem (London, 1884) and in the accompanying Atlas. Of other books it may suffice to name De Vogué, Le Temple de Jérusalem (fol.,

Paris, 1864); Fergusson, Topography of Jerusalem (8vo, London, 1847); Id., The Temples of the Jews (4to, London, 1878) ; Thrupp, Antient Jerusalem (8vo, Cambridge, 1855) ; Lewin, The Siege of Jerusalem by Titus (8vo0, London, 1868); and Perrot and Chipiez, Histoire de l' Art (Paris, 1887). (W. B.S.)

TEMPLE, Str Witttam (1628-1699), English states- man, diplomatist, and author, was born in London in 1628. He came of an old English family, but of the younger branch of it, which had for some time been settled in Ireland. He was the eldest son of Sir John Temple, master of the rolls in that country. His mother was Mary Hammond, sister of a well-known Tory divine. Temple received a liberal education, calculated to produce that moderation of judgment for which he was afterwards re- markable. He was first a pupil of his uncle Dr Hammond, after which he went to the grammar-school at Bishop Stort- ford, and then to the Puritan college of Emmanuel at Cambridge, where he came under the influence of Cud- worth. At the commencement of the civil troubles his father embraced the popular cause and was deprived of his office. Coming to England, he sat in the Long Parlia- ment as member for Chichester, and was one of the recal- citrant members turned out by Colonel Pride. Before this event happened his son had left Cambridge, without taking a degree, and in 1647 started to travel abroad. In the Isle of Wight, while on his way to France, he fell in with Dorothy Osborne, and won her affections. Her father, Sir Peter Osborne, was governor of Guernsey and a Royalist. Her family were naturally opposed to the match, and threw difficulties in the way, which hindered its consummation for seven years. During this period Temple travelled in France, Spain, Holland, and other countries, gaining knowledge of the world and keeping up a constant correspondence with his betrothed. At length, apparently in 1654, the difficulties were surmounted and the marriage took place. In 1655 Temple and his wife went to Ireland. The next five years were spent in the house of Sir John Temple, who had made his peace with Cromwell, and had resumed his official position. His son took no part in politics, but lived the life of a student and a country gentleman.

The accession of Charles IT. rescued Temple, like many others, from obscurity. In 1660 he sat in the convention

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parliament at Dublin as member for Carlow, and he repre- sented the same county along with his father in the regular parliament that followed. After a short visit to England in 1661, as commissioner from the Irish parlia- ment, he finally removed thither in 1663. There he attached himself to Arlington, secretary of state, and two years later received his first employment abroad. It was in March 1665 that the disastrous war with the United Netherlands began. Charles II. was anxious to obtain allies, especially as Louis XIV. was taking up a hostile attitude. At this juncture the bishop of Miinster sent an envoy to England, offering to attack the Dutch if the English Government would supply the means. Temple was sent over to negotiate a treaty, and in this business gave evidence not only of the diplomatic skill but of the peculiar candour and frankness for which he was after- wards so distinguished. He was successful in making the treaty, but it was rendered ineffectual by the declaration of war by France, the threats of Louis, and the double- dealing of the prelate, who, after receiving a great part of the subsidy, made a separate peace with the Netherlands. Asa reward for his services Temple was created a baronet, and in October 1665 became the English representative at the viceregal court at Brussels. While the war con- tinued, Temple's duties consisted chiefly in cultivating good relations with Spain, which was a neutral in the quarrel between England and the Dutch, but was threat- ened by the claims of Louis XIV. on the Spanish Nether- lands. Louis's designs became apparent in the spring of 1667, when he marched an army into Flanders. This event was one of those which led to the peace of Breda, and to the subsequent negotiations, which are Temple's chief title to fame. The French conquests were made at the expense of Spain, but were almost equally dangerous to the United Netherlands, whose independence would have been forfeited had Louis succeeded in annexing Flanders. While the French were taking town after town, Temple made a journey into Holland and visited De Witt. The friendship established and the community of views dis- covered during this interview facilitated the subsequent negotiations. Temple had for some time pressed on his Government the necessity of stopping the French advance, and had pointed out the way to do so, but it was not till December 1667 that he received instructions to act as he had suggested. He at once set out for The Hague, and in January 1668 a treaty was made between England and the United

Netherlands, which, being joined shortly afterwards by Sweden, became known as the Triple Alli- ance. It was a defensive treaty, made against the en- croachments of France. Whether we regard the skill and celerity with which the negotiations were conducted or the results of the treaty, the transaction reflects great credit on Temple. The French king was checked in mid- eareer, and, without a blow being struck, was obliged to surrender almost all his conquests. Pepys records public opinion on the treaty by saying that it was “the only good public thing that hath been done since the king came into England.”

Unfortunately the policy thus indicated was but short- lived. In taking up a hostile attitude towards France Charles’s object had apparently been only to raise his price. Louis took the hint, increased his offers, and two years later the secret treaty of Dover reversed the policy of the Triple Alliance. Meanwhile Temple had developed the good understanding with the Dutch by contracting a com- mercial treaty with them (February 1668), and had acted as English plenipotentiary at Aix-la-Chapelle, where peace between France and Spain was made in May 1668. Shortly afterwards he was appointed ambassador at The Hague. Here he lived for two years on good terms both with De

Witt and with the young prince of Orange, afterwards William III. The treaty of Dover led to Temple’s recall ; but the plot was not yet ripe, and Temple nominally held his post for another year. He perceived, however, that his day was over and retired to his house at Sheen. In June 1671 he received his formal dismissal. The war with the Netherlands broke out next year, and was almost as discreditable to England as that of 1665. Want of success and the growing strength of the opposition in parliament forced Charles to make peace, and Temple was brought out of his retirement to carry through the change of front. After a negotiation of three days, carried on through the medium of the Spanish ambassador, the treaty of West- minster was made (February 1674). As a recognition of his services Temple was now offered the embassy to Spain. This he declined, as well as the offer of a far more import- ant post, that of secretary of state, but accepted instead a renewal of his embassy to The Hague, whither he went in July

1674. In the March following he was nominated ambassador to the congress at Nimeguen ; but, owing to the tortuousness of Charles's dealings, it was not till July 1676 that he entered that town. The negotiations dragged on for two years longer, for Charles was still receiving money from France, and English mediation was no more than a ruse. In the summer of 1677 Temple was sum- moned to England and received a second offer of the secretaryship of state, which he again declined. In the autumn of the same year he had the satisfaction of re- moving the last difficulties which hindered the marriage of William and Mary, an event which seemed to complete the work of 1668 and 1674. Louis still remaining obsti- nate in his demands, Temple was commissioned in July 1678 to make an alliance with the states, with the object of compelling France to come to terms. This treaty was instrumental in bringing about the general pacification which was concluded in January 1679.

This was Temple's last appearance in the field of diplomacy ; but his public life was not yet over. A third offer of the secretaryship was made to him ; but, unwilling as ever to mix himself up with faction and intrigue, he again declined. He did not, however, withdraw from politics; on the contrary, he was for a short time more prominent than ever. The state was passing through a grave crisis. Political passion was embittered by religious fanaticism. Parliament was agitated by the popish plot, and was pressing on the Exclusion Bill. The root of all the mischief lay in the irresponsibility of the cabinet to parliament and its complete subservience to the crown. To remedy this, Temple brought forward his plan fora reform of the privy council. This body was to consist of thirty members, half of whom were to be the chief officers of the crown, the other half being persons of importance, lords and commoners, chosen without reference to party. Special care was taken to select men of wealth, which Temple considered as the chief source of political influence. By the advice of this council the king promised to act. The parliament, it was supposed, would trust such a body, and would cease to dictate to the crown. The scheme was accepted by the king, but was a failure from the outset. Intended to combine the advantages of a parliament and a council, it created a board which was neither the one nor the other. The conduct of affairs fell at once into the hands of a junta of four, of whom Temple was at first one, and the king violated his promise by dissolving parlia- ment without asking the advice of the council. Temple

retired in disgust to his villa at Sheen, and appeared only occasionally at the council, where he soon ceased to exer- cise any influence. In 1680 he was nominated ambassador to Spain, but stayed in England in order to take his seat in parliament as member for the university of Cambridge.

He took no part in the debates on the great question of the day, and acting on the king's advice declined to sit in the parliament of 1681. Early in that year his name was struck off the list of the council, and henceforward he dis- appeared from public life. He continued to live at Sheen till 1686,when he handed over his estate there to his son, the only survivor of seven children, and retired to Moor Park in Surrey. When William III. came to the throne Temple was pressed to take office, but refused. His son became secretary at war, but committed suicide immediately after- wards. Sir William, though occasionally consulted by the king, took no further part in public affairs, but occupied himself in literature, gardening, and other pursuits. It should not be omitted that Swift lived with him as secre- tary during the last ten years (with one short interval) of his life. Temple died at Moor Park on 27th January 1699.

Temple's literary works are mostly political, and are of consider- able importance. Among them may be mentioned An Essay on the Present State and Settlement of Ireland (1668); The Empire, Sweden, &c., a survey of the different Governments of Europe and their relations to England (1671); Observations upon the United Provinces (1672); Essay upon the Original and Nature of Govern- ment (1672); Essay upon the Advancement of Trade in Ireland (1673). Some of these were published in the first part of his Al¢scel- lanea (1679). Inthe same year apparently his Poems were privately printed. In 1683 he began to write his Memoirs. The first part, extending from 1665 to 1671, he destroyed unpublished ; the second, from 1672 to 1679, was published without his authority in 1691; the third, from 1679 to 1681, was published by Swift in 1709. In 1692 he phe 2 the ~~second part of his Afiscellanea, containing among other subjects the essay Upon the Ancient and Modern Learning, which is remarkable only as having given rise to the famous controversy on the '' Letters of Phalaris." His Znéro~~ duction to the History of England, a short sketch of English history to 1087, was published in 1695. Several collections of his letters were published by Swift and others after his death.

His fame rests, however, far more on his diplomatic triumphs than on his literary work. His connexion with domestic affairs was slight and unsuccessful. He was debarred both by his virtues and his defects,—by his impartiality, his honesty, and his want of ambition,—from taking an active part in the disgraceful politics of his time. But in the foreign relations of his country he was intimately concerned for a period of fourteen years, and in all that is praiseworthy in them he had a principal hand. He cannot be called great, but he will be remembered as one of the ablest negotiators that England has produced, and as a public servant who, in an unprincipled age and in circumstances peculiarly open to corruption, preserved a blameless record.

See Life and Works of Sir William Temple, 2 vols. fol.,*1720; 2d ed., with Life by Lady Giffard, 1731; a more complete edition, including the Letters, was published in 4 vols. 8vo, 1814; Burnet, History of his own Time ; Courtenay, Memoirs of the Life, &c., of Sir William Temple, 2 vols., 1836; Macaulay, Essay on Sir William Temple. (G. W. P.)

TENANT. See LANDLORD AND TENANT.

TENASSERIM, a division of the province of British Burmah, lying between 9° 30’ and 19° 30’ N. lat. and 95° 50’ and 99° 30’ E. long. It has an area of 46,730 square miles and comprises the seven districts of Moulmein town, Amherst, Tavoy, Mergui, Shwagyin, Toungoo, and Salwin, which formed the tract south of Pegu conquered from Burmah in 1826, and were for many years generally known as the Tenasserim provinces. The southern ex- tremity of the division approaches the insular region of Malaysia, and it is fringed along its entire western coast by a number of islands, forming in the north the Moscos and in the south the Mergui Archipelago. The eastern frontier is formed by a mountain range 5000 feet high, which acts as a water-parting between the Tenasserim and the Siamese river systems.

The population of the division in 1881 was 825,741 (437,900 males and 387,841 females). By religion Hindus numbered 23,145, Mohammedans 24,786, Christians 28,315, Buddhists 698,304, and Nat worshippers 51,160. The cultived area in 1885-86 was returned at 729,251 acres. The gross

revenue in the same year was £184, 162, of which the land-tax yielded £107,631.

TENBY, a municipal and parliamentary borough and watering-place of Pembrokeshire, South Wales, is finely situated on a long and narrow promontory of limestone rock, washed on three sides by the sea, on the west side of

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Carmarthen Bay, and on a branch of the South Wales Railway, 10 miles east of Pembroke and 274 west of London (by rail). Its chief attractions as a watering-place are its picturesque appearance, its antiquarian remains, its equable and salubrious climate, and its wide stretch of firm sands. There are considerable remains of the old fortifica- tions of the town, dating originally from the Norman Con- quest, and repaired by Elizabeth, whose initials with the date 1588 are inscribed on a stone near the fine south-west gate, which with the south-west and north-west walls is in very good preservation. The remains of the castle on a lofty rock at the extremity of the promontory include the keep, a circular bastion overhanging the cliffs, and portions of the outer wall. Within the grounds, which are laid out in walks, there is a local museum; and on the summit of the hill is the Welsh memorial to the Prince Consort, a statue of Sicilian marble (1865). Opposite the castle, about 100 yards distant and accessible on foot at low water, is St Catherine’s Island, on which is a strong fort begun in 1868, forming one of the land defences of Pem- broke dockyard, The parish church of St Mary is a large and beautiful building, showing every variety of style from the Norman of the 12th to the Tudor of the late 16th century ; it has a massive tower with a spire rising to a height of 152 feet. In the north aisle are some medieval altar tombs and in the south aisle one of the early Tudor period. The fisheries of Tenby, for which the place was noted at a very early period, are still of importance. The trade of the port is inconsiderable. Steamers, however, ply to Bristol, Cardiff, Ilfracombe, and Weston-super- Mare. Inthe neighbourhood there are extensive limestone quarries. The population of the municipal and _parlia- mentary borough (area 640 acres) in 1871 was

3810, and in 1881 it was 4750. In summer it is augmented by more than a half.

Tenby has the same derivation as Denbigh in North Wales. Anciently it was called Dynbych-y-Pyscod, the “ precipice of fishes.” The importance of the town dates from the settlement of the Flemings in the reign of Henry I. In 1150 Cadell, eldest son of Rhys ab Gryffith, was slain by the people of Tenby, in revenge for which the castle was taken and the town devastated by his two brothers Meredith and Rhys. During the Wars of the Roses the fortifications were restored and strengthened by Jaspar, earl of Pembroke. They were again greatly strengthened by Elizabeth in apprehension of the landing of the Spaniards. At the beginning of the Civil War the town and castle were garrisoned for the king, but in 1644 it surrendered to the Parliamentarians after a siege of three days. Its privileges were extended by Humphrey, duke of Gloucester, who made the mayor an independent justice, and by Henry IV., Henry VI., Elizabeth, and Charles I. It is now governed by the Municipal Act, and the corporation are the sani- tary authority. Since the 27th of Henry VIII. it has formed part of the Pembroke district of boroughs for parliamentary repre- sentation.

TENCH, the Zinca tinca of naturalists, is one of the commonest and most widely spread freshwater fishes of Europe. It is generally distributed in all suitable local- ities throughout England, but is limited to a few lakes and ponds in the south of Scotland and in Ireland. As the tench is of comparatively uncommon occurrence in unen- closed waters, its place among the indigenous fishes of Great Britain has been denied, and it has been supposed to have been introduced from the Continent. In central Europe, however, where it is undoubtedly indigenous, it thrives best in enclosed, preserved waters, with a clayey or muddy bottom and with an abundant vegetation ; it avoids clear waters with stony ground, and is altogether absent from rapid streams. The tench belongs to the family of carps (Cyprinide), and is distinguished from the other members of that family by its very small scales, which are deeply embedded in a thick skin, whose surface 1s as slippery as that of an eel. All the fins have a rounded outline ; the short dorsal fin is without a spine, but the

males possess a very thick and flattened outer ray in the ventral fins. The mouth is rather narrow and provided at each corner with a very small barbel. Tench if kept in suitable waters are extremely prolific, and as they grow within a few years to a weight of 3 or 4 ib, and are then fit for the table, they may be profitably introduced

Tench (Tinca tinca).

into ponds which are already stocked with other fishes, such as carp and pike. They live on small animals or soft vegetable substances, which they root up from the ground. The albino variety especially, which is known as the “golden tench,” can be recommended for ornamental waters, as its bright orange colours render it visible for some distance below the surface of the water. This variety, which seems to have been originally bred in Silesia, is not less well- flavoured than the normally coloured tench, and grows to the same size, viz., to 6 and even 8 b.

TENDER. See PayMEnrT.

TENERIFFE. See Canary Istanps, vol. iv. p. 798.

TENIERS, Davin (1610-1690), the younger, a Flemish painter, almost ranking in celebrity with Rubens and Van Dyck, was born in Antwerp on 15th December 1610, His father, David Teniers the elder (1582-1649), whose style he followed with a vastly superior power of concep- tion, had been a pupil of Elsheimer in Rome and of Rubens in Antwerp. Besides these influences, we can also dis- tinctly trace that of Adrian Brouwer at the outset of his career. Although the young painter’s general system often reminds us of Rubens, several of his works also betray a vivid recollection of Brouwer in type as well as general arrangement. There is no evidence, however, that either Rubens or Brouwer interfered in any way with Teniers’s education, and Smith may be correct in supposing that the admiration which Brouwer’s pictures at one time ex- cited alone tempted the younger artist to imitate them. The only trace of personal relations having existed between Teniers and Rubens is the fact that the ward of the latter, Anne Breughel, the daughter of John (Velvet) Breughel, married Teniers in 1637. Admitted as a “master” in the guild of St Luke in 1632, Teniers had even before this made the public acquainted with his works.

The Berlin museum possesses a group of ladies and gentlemen dated 1630. No special signature positively distinguishes these first productions from those of his father, and we do not think it correct to admit with some writers that he first painted religious subjects. Dr Bode, in a most remarkable study of Brouwer and his works, expresses the opinion that Teniers's earliest pictures are those found under the signa- ture ''Tenier" (with the omission of the final s). Tenier is in reality a Flemish version of a thoroughly Walloon name, '"Taisnier," which the painter's grandfather, a mercer, brought with him when he came from Ath in 1558, and Bode's supposition is greatly strengthened by the circum- stance that not only David the elder but his brother Abraham and his four sons were all inscribed as ''Tenier." in the ledgers of the Antwerp guild of St Luke. Some really first-rate works—the Prodigal Son and a group of Topers in the Munich gallery, as well as a party of gentle- men and ladies at dinner, termed the Five Senses, in the

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Brussels museum—with the above signature are remark- able instances of the perfection attained by the artist when he may be supposed to have been scarcely twenty. His touch is of the rarest delicacy, his colour at once gay and harmonious. Both Waagen and Smith express the opinion that the works painted from 1645 to 1650 speak most highly of the master's abilities. We may venture to add that a considerable number of earlier productions would have been sufficient to immortalize his name. He was little over thirty when the Antwerp guild of St George enabled him to paint the marvellous picture which ulti- mately found its way to the Hermitage Gallery in St Peters- burg,—the Jubilee Meeting of the Civic Guards, in honour of their old commander, Godfrey Sneyders. Correct to the minutest detail, yet striking in effect, the scene, under the rays of a glorious sunshine, displays an astonishing amount of acquired knowledge and natural good taste. This paint- ing, one of forty among many of the master's earlier and later productions,! leads us to mention another work of the same year (1643), now in the National Gallery, London (No. 952), an equally beautiful repetition of which, dated 1646, belongs to the duke of Bedford. A hundred and fifty figures are resting after a pilgrimage to some holy shrine or some miraculous well. The hungry travellers are waiting for the meal which is being prepared for them in several huge caldrons. Truth in physiognomy,

distribution of groups, the beautiful effect of light and shade, command our warmest admiration. A work like this, says Waagen, stamps its author as the greatest among painters of his class. That, however, a subject of the kind should have been accepted as a “feast” (see the National Gallery Catalogue) may tend to prove how little, from the first, Teniers thought of dramatizing. Frankness in expression and freedom in attitude certainly guided his preference in the choice of a model, and we may even suppose him to have occasionally exaggerated both. He seems anxious to have it known that, far from indulging in the coarse amusements of the boors he is fond of painting, he himself lives in good style, looks like a gentleman, and behaves as such. He never seems tired of showing the turrets of his chateau of Perck, and in the midst of rustic merry-makings we often see his family and himself received cap in hand by the joyous peasants. We may also observe that he has a certain number of favourite models, the constant recur- rence of which is a special feature of his works. We even meet them in a series of life-size portrait-like figures in the Doria Pamphili Gallery in Rome,? as well as in a picture belonging to Mr H.R. Hughes, and the man here repre- sented as a fishmonger is unmistakably the painter’s brother, Abraham Teniers, judging from the portrait Edelinck has left us of this artist.

Teniers was chosen by the common council of Antwerp to preside over the guild of painters in 1644. The arch- duke Leopold William, who had assumed the government of the Spanish Netherlands, being a great lover of art, employed Teniers not only as a painter but as keeper of the collection of pictures he was then forming. With the rank and title of ‘‘ayuda de camara,” Teniers took up his abode in Brussels shortly after 1647. Immense sums were spent in the acquisition of paintings for the archduke. A number of valuable works of the Italian masters, now in the Belvedere in Vienna, came from Leopold’s gallery after having belonged to Charles I. and the duke of Buckingham. De Bie (1661) states that Teniers was some time in London, collecting pictures for the duke of Fuensaldafia, then acting as Leopold’s lieutenant in the Netherlands. Paintings in

1 The Hermitage Catalogue ascribes to Abraham Teniers the portrait of a bishop. This painting is, however, by David, and represents the celebrated bishop of Ghent, Anthony Triist, with his brother Francis, a Franciscan monk, 2 Under the name of Weeninx.

Madrid, Munich, Vienna, and Brussels have enabled art critics to form an opinion of what the imperial residence was at the time of Leopold, who is represented as con- ducted by Teniers and admiring some recent acquisition. No picture in the gallery is omitted, every one being in- scribed with a number and the name of its author, so that the ensemble of these paintings might serve as an illus. trated inventory of the collection.* Still more interesting is a canvas, now in the Munich gallery, where we see Teniers at work in a room of the palace, with an old peasant as a model and several gentlemen looking on. When Leopold returned to Vienna, Teniers's task ceased ; in fact, the pictures also travelled to Austria, and a Flemish priest, himself a first-rate flower painter, Van der Baren, became keeper of the archducal gallery. Teniers never- theless remained in high favour with the new governor- general, Don Juan, a natural son of Philip IV. The prince was his pupil, and De Bie tells us he took the likeness of the painter's son. Honoured as one of the greatest painters in Europe, Teniers seems to have made himself extremely miserable through his aristocratic leanings. Shortly after the death of his wife in 1656 he married Isabella de Fren, daughter of the secretary of the council of Brabant, and strove his utmost to prove his right to armorial bearings. In a petition to the king he reminded him that the honour of knighthood had been bestowed upon Rubens and Van Dyck. The king at last declared his readiness to grant the request, but on the express condition that Teniers should give up selling his pictures. The condition was not complied with; but it may perhaps account for the master's activity in favour of the foundation in Antwerp of an academy of fine arts to which artists alone should be admitted, whereas the venerable guild of St Luke made no difference between art and handicraft : carvers, gilders, bookbinders, stood on an even footing with painters and sculptors, however great their talent.4 There were great rejoicings in Antwerp when, on 26th January 1663, Teniers came from Brussels with the royal charter of the academy, the existence of which was due entirely to his personal initiative.

Teniers died in Brussels on 25th April 16905 A picture in the Munich gallery (No. 906), dated 1680, represents him as an alchemist, oppressed with a burden of age beyond his years. From this date we hear more of his doings as a picture-dealer than as a painter, which most probably gave birth

to the legend of his having given himself out as deceased in order to get higher prices for his works. David, his eldest son, a painter of talent and reputation, died in 1685. One of this third Teniers's pictures—St Dominic Kneeling before the Blessed Virgin, dated 1666—is still to be found in the church at Perck. As well as his father, he contributed many patterns to the celebrated Brussels tapestry looms. Cornelia, the painter's daughter, married John Erasmus Quellin, a well-known artist (1634-1715).

Smith's Catalogue Raisonné gives descriptions of over 700 paint- ings accepted as original productions of Teniers. Few artists ever worked with greater ease, and some of his smaller pictures—land- scapes with figures—have been termed ''afternoons," not from their subjects, but from the time spent in producing them. The museums in Madrid, St Petersburg, Vienna, Munich, Dresden, Paris, London, and Brussels have more than 200 pictures by Teniers. In the United Kingdom 150 may be found in private hands, and many other examples are to be met with in private collections throughout Europe. Although the spirit of many of these works

3 It was not until recently that the MS. inventory of this collection was discovered among the papers of the prince of Schwartzenberg in Vienna. It was published in 1883 by Adolf Berger. In 1658 Teniers published 243 etchings after the best Italian works of Leopold William's collection, which, with the portraits of the archduke and Teniers, were brought together as a volume in 1660, under the title Hl Teatro de Pinturas. 4 The separation was only obtained in 1778.

5 The date is often wrongly given as 1694 or 1695.

is as a whole marvellous, their conscientiousness must be regarded as questionable. Especially in the later productions we often detect a lack of earnestness and of the calm and concentrated study of nature which alone prevent expression from degenerating into grimace in situations like those generally depicted by Teniers. His education, and still more his real and assumed position in society, to agreat degree account for this. Brouwer knew more of taverns ; Ostade was more thoroughly at home in cottages and humble dwell- ings; Teniers throughout triumphs in broad daylight,

and, though many of his interiors may be justly termed masterpieces, they seldom equal his open-air scenes, where he has, without constraint, given full play to the bright resources of his luminous palette. In this respect, as in many others, he almost invariably suggests compari- sons with Watteau. Equally sparkling and equally joyous, both seem to live in an almost ideal world, where toil, disease, and poverty may exist, but to be soon forgotten, and where sunshine seems everlasting. But his subjects taken from the Gospels or sacred legend are absurd. An admirable picture in the Louvre shows Peter Denying his Master, next to a table where soldiers are smoking and having a game at cards. He likes going back to subjects illustrated two centuries before by Jerome Bosch—the Temptation of St Anthony, the Rich Man in Hell, incantations, and witches—for the simple purpose of assembling the most comic apparitions. His villagers drink, play bowls, dance, and sing ; Rey seldom quarrel or fight, and, if they do, seem to be shamming. His powers certainly declined with advancing age; the works of 1654 begin to look hasty. But this much may be said of Teniers, that no other painter shows a more enviable ability to render a conception to his own and other people's satisfaction. His works have a technical freshness, a straightforwardness in means and intent, which make the study of them most delightful; as Sir Joshua Reynolds says, they are worthy of the closest attention of any painter who desires to excel in the mechanical knowledge of his art.

As an etcher Teniers compares very unfavourably with Ostade, Cornelis, Bega, and Dusart. More than 500 plates were made from his pictures; and, ifit be true that Louis XIV. judged his "baboons" (magots) unworthy of a place in the royal collections, they found admirable engravers in France—Le Bas and his scholars—and passionate admirers. The duke of Bedford's admirable specimen was sold for 18,030 livres (£1860) in 1768. The Prodigal Son, now in the Louvre, fetched 30,000 livres (£8095) in 1776. Smith's highest estimates have long since been greatly exceeded. The Archers in St Petersburg he gives as worth £2000. The Belgian Government gave £5000 in 1867 for the Village Pastoral of 1652, which is now in the Brussels museum ; and a picture of the Prodigal Son, scarcely 16 by 28 inches, fetched £5280 in 1876.

Although Van Tilborgh, who was a scholar of Teniers in Brussels, followed his style with some success, and later painters often excelled in figure-painting on a small scale, Teniers cannot be said to have formed a school. Properly speaking, he is the last representative of the great Flemish traditions of the 17th century.

See T. Smith, A Catalogue Raisonné of the Works of the most Eminent Dutch, Flemish, and French Painters; John Vermoelen, Notice historique sur David Teniers et sa famille; L. Galesloot, Quelques renseignements sur la famille de P. P. Rubens et le décés de David Teniers and Un procés de David Teniers et la corporation des peintres & Bruaelles; Alph. Wauters, Histoire des environs de Bruaelles and Les tapisseries bruxelloises; F.T. Van der Brandern, Ge- schiedenis der Antwerpsche Schilderschool; Max Rooses, Geschichte der Maler- etined Antwerpens; W. Bode, Adriaen Browwer, ein Bild seins Lebens und seines

chaffens,

TENIMBER. See Trmor Lavr.

TENISON, THomas (1636-1715), archbishop of Canter- bury, was the son of Rev. John Tenison, rector of Mundsley, Norfolk, by Mary, daughter of Thomas Dowson of Cottenham, Cambridgeshire, where he was born on 29th September 1636. He was educated at the free school, Norwich, whence he entered Corpus Christi College, Cam- bridge, asa scholar on Archbishop Parker’s foundation. He graduated B.A. in 1657, M.A. in 1660, was chosen fellow in 1662, and became B.D. in 1667. For a short time he studied medicine, but in 1659 was privately ordained. In 1667 he was presented to the living of Holywell-cum- Needingworth, Huntingdonshire, by the earl of Manchester, to whose son he had been tutor, and in 1670 to that of St Peter’s Mancroft, Norwich. In 1680 he received the degree of D.D., and was presented by Charles II. to the important cure of St Martin’s-in-the-Fields. Tenison, ac- cording to Burnet, “endowed schools, set up a public library, and kept many curates to assist him in his inde- fatigable labours.” Being a strenuous opponent of the Church of Rome, and “ Whitehall lying within that parish, he stood as in the front of the battle all King James’s reign.”

In 1678, in a Discourse of Idolatry, he had endeavoured to fasten the practices of heathenish idolatry on the Church of Rome, and in a sermon which he published in 1681 on Discretion in Giving Alms was attacked by Andrew Pulton, head of the Jesuits in the Savoy. Tenison's reputation as an enemy of Catholicism led the duke of Monmouth to send for him before his execution in 1685, when Bishops Ken and Turner refused to administer the Eucharist ; but, although Tenison spoke to him in "a softer and less per- emptory manner " than the two bishops, he was, like them, not satisfied with the sufficiency of Monmouth's penitence. Under William, Tenison was in 1689 named a member of the ecclesiastical commission appointed to prepare matters towards a reconciliation of the Dissenters, the revision of the liturgy being specially entrusted to him. A sermon which he preached on the commission was published the same year. He appears to have been better satisfied with the religious sentiments of Nell Gwynn on the approach of death than with those of the duke of Monmouth, for in 1691 he preached her funeral sermon, in which he re- presented her as truly penitent,—a charitable judgment which did not meet with universal approval. The general liberality of Tenison's religious views commended him to the favour of William, and, after being made bishop of Lincoln in 1691, he was promoted to the primacy in December 1694. He attended Mary during her last ill- ness and preached her funeral sernion in Westminster Abbey. When William in 1695 went to take command of the army in the Netherlands, Tenison was appointed one of the seven lords justices to whom his authority was delegated. Along with Burnet he attended William on his deathbed, and it was from their hands that he received the Eucharist. He crowned Queen Anne, but during her reign was not in much favour at court. He was a commissioner for the Union in 1706. A strong supporter of the Hanoverian succession, he was one of the three officers of state to whom on the death of Anne was entrusted the duty of appointing a regent till the arrival of George I., whom he crowned on 31st October 1714. Tenison died at London on 14th December of the following year. Besides the sermons and tracts above mentioned, and various others on different points of the Popish con- troversy, Tenison was the author of The Creed of Mr Hobbes examined (1670) and Baconia, or Certain Genuine Remains of Lord Bacon (1679).

The Memotrs of the Life and Times of the Most Rev. Father in God, Dr Thomas Tenison, late Archbishop of Canterbury, appeared with- out date not long after his death. See also Burnet's History of his own Time and Macaulay's History of England.

TENNANT, Wiiiram (1784-1848), author of Anster Fair, was born in 1784 at Anstruther in Fifeshire, the birthplace of two other contemporary Scottish worthies, Thomas Chalmers and John Goodsir. He was lame from childhood, like his more famous contemporaries Byron and Scott, and this probably determined his father, who was a small merchant and farmer, to educate him for a scholarly career. But the paternal means failed before he had com- pleted his curriculum at St Andrews, and he was obliged to return home and act for some eight years of his early manhood as clerk to one of his brothers, a corn-factor. The corn-factor's clerk, however, under the impulse of a genius for language and a strong delight in literature, be- sides Greek and Latin and Hebrew, mastered, during his leisure, Italian and German, and not only read, but set himself to imitate, Ariosto and Wieland. And, strange to say, this poor youth, in a remote country town, anticipated the fashion of mock-heroic verse, which was set for England by "the ingenious brothers Whistlecraft," and which gave Byron the hint for his Don Juan. Anster Fair, a fantastic poem in offava rima, amazingly fluent, brimming over with

high spirits, rich almost to excess in diction and fanciful imagery, was written by Tennant in 1811, when his brother's business had failed and he did not know where to look for employment. Its publication in 1812 brought the poet into notice, and employment was found for him as school-master of the parish of Dunino, near St Andrews. From this he was promoted (1816) to the school of Lasswade, near Edinburgh; from that (1819) to a mastership in Dollar academy ; from that (1831), by Lord Jeffrey, who had written an admiring review of Anster Mair, to the professorship of Oriental languages in St Andrews. Ten- nant never fulfilled

the promise of his first poem, which reads as if it had been dashed off in a fit of careless and happy inspiration, and never flags in its humorous glee from the first stanza to the last. Zhe Thane of Fife (1822), in which he essayed the same vein, evidently cost him more pains, shows the same high reach of humorous imagination, and is indeed, as he claimed for it, “bold in its style and rare, fantastic, and sublime.” But the subject was more remote from general interest; the mock-epic machinery, with all his wealth of grotesque description, was too far-fetched for the popular taste; and the poem fell flat. A third poem, in the Scotch dialect, Papistry Stormed (1827), though full of the most spirited descrip- tion, was also in a vein of humour that found few sympa- thizers. He wrote also two historical dramas, Cardinal Beaton (1823) and John Baliol (1825). His last published work was a series of Hebrew Dramas (1845), founded on incidents in Bible history. He died near Dollar, on 15th February 1848.

A Memoir of Tennant by M. F. Conolly was published in 1861.

TENNENT, Sir James Emerson (1794-1869), English politician and traveller, the third son of William Emerson, a merchant of Belfast, was born there on 7th April 1794. He was educated at Trinity College, Dublin, of which he became LL.D. After travelling in Greece, where he made the acquaintance of Lord Byron, whose sentiments in re- gard to the Greek cause he fully shared, he studied for the bar and was called at Lincoln’s Inn in 1831. He published a Picture of Greece (1826), Letters from the digean (1829), and a History of Modern Greece (1830). On his marriage to the daughter and heiress of William Tennent, a wealthy merchant at Belfast, he adopted by royal licence the name of his wife in addition to his own. He entered parliament in 1832 as member for Belfast. In 1841 he became secretary to the India Board, and in 1845 he was knighted and appointed colonial secretary of Ceylon, where he remained till 1850. The result of his residence there appeared in Christianity in Ceylon (1850) and Ceylon, Physical, Historical, and Topographical (2 vols., 1859). On his return he became member for Lisburn, and under Lord Derby was secretary to the Poor Law Board from February to November 1852. From then till 1867 he was permanent secretary to the Board of Trade, and on his retirement he received a baronetcy from Lord Palmer- ston. In his early years his political views had a Radical tinge, and, although he subsequently joined the Tories,

his Conservatism was of a mild type. He withdrew from the Whigs along with Lord Stanley and Sir James Graham, and afterwards adhered to Peel. He died in London on 6th August 1869.

Besides the books above mentioned, he wrote Belgium in 1840 (1841) and Wine, its Duties and Taxation (1855), and was a con-

tributor to magazines and a frequent correspondent of Notes and Queries.

TENNESSEE, one of the United States of North America, the third added (June 1796) to the original thirteen, its predecessors having been Vermont (1791) and Kentucky (1792). Tennessee is bounded on the E. by the Unaka Mountains, which divide it from North Carolina,

Alabama, and Mississippi; on the W. by the Mississippi river, dividing it from Arkansas and Missouri; and on the N. by a line which erroneous surveys have caused to vary greatly from the intended boundary,—the line of lat. 36° 30’ N.—the variations all being measured to the north of that parallel. The actual boundary commences at the north-east corner of the State 7 miles north of 36° 30’, and continues at that distance as far as the frontier of Virginia and Kentucky, where it diminishes to 5 miles; thence to about its intersection with 86° 30’ W. it increases to 11 miles; thence a deflexion southwards to a point about 2 miles from the Cumberland reduces it to 10 miles; there it suddenly shoots north again to 12 miles, which distance is increased to 124 by the time it strikes the Tennessee ; on the other side of that river it becomes very nearly coincident with the normal 36° 30’; and to that line it adheres with very slight aberrations until it strikes the Mississippi. The eastern boundary has one deviation from the stipulated line: it runs along the culminating ridge of the Unakas till within 26 miles of the Georgia frontier, when it turns due south, giving to Tennessee a triangular piece of territory which should belong to North Carolina. The area of the State was 41,750 square miles in 1880, Its extreme length is 432 miles and its width 109.

Configuration and Geology.—Commencing at the eastern Geology,

frontier, the State of Tennessee is divided into several districts, having distinct characteristics and separated by well-marked natural boundaries, whose general direction from north-east to south-west corresponds with the trend of the main valleys (see the geological sketch map in- serted on pl. IT.).

1. The mountain region of East Tennessee is a long nar- row belt of very irregular surface, comprised between the Unaka Range and a disjointed chain of lower mountains, the principal of which are called the Chilhowee Range, and the whole of which may be considered as constituting the secondary mountain system of the State. The inter- vening space is occupied by broken masses forming hills, mountains, and valleys, some parallel to the principal ranges, some crossing the space at right angles to them. This region varies in width from 28 miles to about 7. All the rocks of this region and the next to it belong to what constitute in England the Silurian and Cambrian systems, the former being found in the western and the latter in the eastern part of the district. It has been contended that some metamorphic rocks near the crest of the mountains belong to the Archaic (Huronian and Laurentian) system ; but the preponderance of geological opinion now assigns them to the same formations as the neighbouring rocks, the difference in structure being due to metamorphic action. The lowest of these, called in Tennessee the Ocoee group, is believed to be coeval with the Potsdam group of the American system,—the Lower Silurian and perhaps the Upper Cambrian of the British Isles. It consists chiefly of slates and conglomerates, with the sandstones of the Chilhowee group above. Above these last are the Knox dolomite group, with its shales and limestone more separated from the other two groups and perhaps not exactly corresponding to any other recog- nized formations. The crystalline metamorphic rocks are mainly syenitic and micaceous gneiss, with micaceous, horn- blendic, and talcose schists. Occasional small dykes of diorite, greenstone, and basalt traverse these rocks, some- times interstratified, but oftener breaking through them.

2. The rocks of the first division are tilted at very high angles ; those of the second division, the eastern valley of the Tennessee, are fractured and distorted at nearly every conceivable angle, and, in consequence, it is the edges of the uplifted strata which here form the surface. The strata

on the §. by the line of lat. 35° N., dividing it from Georgia, | have been eaten away to form valleys, or left standing as

ridges, giving the whole tract a deeply channelled character, the ridges consisting of sandstone and dolomite and the valleys of friable schists. These all trend in the prevalent direction of the Appalachian upheaval, from north-east to south-west. The rivers take the same directions, except when they break through transverse fissures in the ridges, or work round their terminations where they give way to the outcropping of other rocks ; in these cases the current runs at right angles to their prevalent direction. All these formations belong to the Silurian period, the oldest cropping out to the eastward, the later members appearing to the westward. In some spots the Subcarboniferous rocks which once covered the entire valley have escaped the erosive action which swept the rest away. The whole district is a valley of denudation which has been excavated by the Tennessee and its tributaries,—some breaking through the Unaka barrier, and others descending from Virginia along the longitudinal valleys above described.

3. Rising in a steep elevation at from 800 to 1200 feet above the average level of the eastern valley of the Ten- nessee is the plateau popularly called the Cumberland Mountain. This mass, superincumbent on the Silurian system, consists of four very distinctly marked formations, —(i.) the Devonian black shale, (ii.) the Subcarboniferous silicious beds, (iii.) the Mountain Limestone, (iv.) the Coal- measures. These can easily be distinguished one above another on the face of the eastern escarpment ; but on the western side the first two extend in a wide plain far beyond the base of the plateau, constituting the fourth district. The Mountain Limestone is shaly at the bottom, and more solid at the top, where it abounds in silicious concretions. The Coal-measures consist of thick slabs of sandstone and conglomerate with the seams of coal interstratified between them. In its southern portion the plateau is divided longi- tudinally by the narrow valley of the Sequatchie river, which cuts deep into the subjacent Silurian beds. The portion east of this valley, known as Walden’s Ridge, has its strata much disturbed and tilted, conformably with the Silurian rocks below; the western portion, on the con- trary, has all its strata nearly horizontal. This formation, averaging about 40 miles in width, is divided by a stratum of conglomerate 80 feet thick into the upper and lower Coal-measures, the former of which are much the more productive, but cover a less area, large portions of it hav- ing been carried away by denudation. These coal-seams

are believed to average an aggregate thickness of 8 feet and to cover an area of 5000 square miles.

4, 5,6. The Subcarboniferous area, the central basin, and the western valley of the Tennessee can best be con- sidered together. They consist of the Subcarboniferous silicious beds, together with the basins formed by their erosion. On the western face of the Carboniferous belt the Mountain Limestone has been carried away with the harder rocks of the Coal-measures above it, but the under- lying silicious beds have resisted all erosive forces and are spread out over an extended area on both sides of the Mississippi. In Tennessee they form a margin round the central basin and are styled by local geologists the ‘ high- land rim.” They consist of two strata, a lower one dis- tinguished by the absence of lime and iron, and an upper one which contains both these materials in abundance. Both members consist mainly of a peculiar gravel, formed of silicious concretions embedded in a stiff retentive clay. The upper stratum has in addition considerable horizontal beds of limestone; it contains abundant fossils of a large coral, Lithostrotion canadense, by which it is easily recog- nized, is very fertile, and possesses inexhaustible beds of limonite. The lower stratum is destitute of both fossils and minerals and is of but little account for agriculture. Excavated from this formation is the central valley of

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Tennessee (No. 5), surrounded on all sides by an escarp- ment of about 200 feet in depth, by which descent is made from the “rim” into the valley. All the members of the Silurian period, except the three lowest, are represented in this valley, which has been formed by the erosive action of the rivers within its borders: its higher strata were carried off northwards by the Cumberland and its tribu- taries, westward by the Duck, and southward by the Elk, the last two being tributaries of the Tennessee. A channel of erosion along the lower portion of the Duck river con- nects this valley with another (No. 6) much narrower—the western valley of the Tennessee—where again the Silurian beds have been reached by the removal of the Subcarbon- iferous formations above them. Again, south of the main basin, the portion drained by the Elk is nearly separated from the rest by a number of

detached hills of the Subcar- boniferous formation, marking the watershed which divides the headwaters of the Elk from those of the Duck.

7, 8, 9, 10. A little west of the Tennessee river the Palzeozoic rocks disappear under the Cretaceous formations (No. 7), and these in their turn are covered successively by the Tertiary, Quaternary, and recent formations (Nos. 8, 9, and 10). The tract of ground covered by these four formations constitutes the Mississippi slope of western Tennessee, all of whose rivers run westward and discharge into the Mississippi. The dip of the strata is very slight, and the surface inclines with a very gentle slope.

In general terms, the territory embraced in Tennessee may be described as a great mountain chain on the east, from the foot of which extends a gently inclined plane, interrupted by an elevation, the Cumberland or Carboni- ferous plateau, and a depression, the central valley.

Ztivers.—The Cumberland and the Tennessee are the principal Rivers.

channels of inland navigation, while the Mississippi, washing the whole western frontier of the State, is its outlet to the Gulf of Mexico. The headwaters and embouchure of the Cumberland are in Kentucky, but much the greater part of its navigable stream is in Tennessee. From its confluence with the Ohio, at Smithland, Kentucky, to Nashville, a distance of 200 miles, it is generally navigable for eight months in the year, and during high water it is sometimes accessible to light-draft steamboats more than 300 miles further. The Tennessee rises in Virginia, crosses east Tennes- see in a south-western direction, and enters Alabama a little above Bridgeport ; in that State it assumes successively a westerly and a northerly direction, and then re-enters Tennessee and crosses the State northwards to its confluence with the Ohio at Paducah, Ken- tucky. Its navigable waters are divided by obstructions into three portions,—(1) from the mouth to Florence, Alabama, 300 miles, where navigation is arrested by the Muscle shoals; (2) thence through Alabama, about 100 miles, when the river breaks through the Cumberland Mountain; and (8) from Chattanooga to Kingston, about 100 miles further.

Agriculiwre.—In 1880 the number of farms was 165,650, embrac- Agricul- The ture.

ing 8,496,556 acres of improved land, valued at $206,749, 837.

principal productions are Indian corn, wheat, oats, cotton, tobacco, potatoes, pea-nuts, and hay, particulars of which for different years are shown in the following table :—

| SS ee Oe

Indian corn|52,089,926 bush.|41,343,614 bush.|62, 764,429 bush.|65,723,000 bush.

Wheat ….| 5,459,268 6,188,916 ,, | 7,331,353 ,, | 9,320,000 ,, ORtS ens os 2,267,814 4,513,315 ,, | 4,722,190 ,, | 7,680,000 Cotton 296,464 bales.| 181,842 bales.| 330,621 bales.} 313,807 bales. Tobacco ../43,448,097 th. {21,465,452 tb. [29,365,052 tb. [31,392,000 Ib. Potatoes ..| 3,786,677 bush.| 2,330,020 bush.| 3,724,382 bush.) 2,390,000 bush.

186,698 tons.

217,316 tons.

148,499 tons. 116,582 tons.

In 1884 1,250,000 bushels of pea-nuts were produced, as against

800,000 in 1883. In recent years considerable attention has been given to the cultivation of fruit and vegetables.

The live stock statistics in different years are shown in the table which follows next :—

Mules and

Cattle. ieee

Pigs.

Horses. Sheep.

126,345 102,983 173,498 187,208

290, 882 247,254 266,119 288,604

764,732 643,696 783,674 801,823

773,317 2,347,321 1,828,690 2,160,495 2,122,646

XXIII. — 23

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Minerals.—The chief minerals found in the State are coal, iron, copper, zinc, lead, and manganese. Of coal the output was 494,491 tons in 1880 and 1,100,000 tons in 1885 ; in the latter year there were also 268, 400 tons of coke. In 1880 there were produced 89,933 tons of iron ore (326,040 tons in 1885), 153,880 Ib of copper ingots, and. 792,621 cubic feet of marble and limestone. Of zinc 17,415 tons were produced in 1884. Besides the minerals already men- tioned, Tennessee yields millstone grit, hydraulic rock, barytes, fire-clay, gold, and petroleum.

Manufactures. —Since 1875 the manufacturing industries of the State have grown immensely. From 1880 to 1885 the number of establishments increased from 4326 to 4425, the capital invested from $20,092,845 to $40,768,650, and the value of the manufactured products from $37,074,886 to $75,216,211. In 1880 cotton was manufactured in the State to the value of $934,014 (in 1885 to $2,719,768), carriages and waggons $1,253,721, flour and grist- mill products $10,784,804, foundry and machine-shop products $1,191,531, iron and stcel $2,274,203, leather $2,051,087, lumber $4,015,310, and cotton-seed oil, cotton secd, and cake to the value of $1,235,000.

Population.—The population of the State, which in 1860 was 1,109,801 and in 1870 1,258,520, was in 1880 1,542,359 (males 769,277, females 773,082). Of this last total 403,151 were Negroes. In 1887 the total population was estimated to number about 1,800,000, giving a density of 43 inhabitants to the square mile, as against 36°9 in 1880. The growth of the principal cities is shown by the following table :—

Minerals.

Manu- factures.

Popula- tion.

1880. 9,693 5,377

. 1870.

1880. | 33,592 |

43,350 12,892

1870. .

8,682 4,119

Knoxville…... Jackson

40,226 25,865 6,093

Memphis …... Nashville …... Chattanooga ..

The considerable decline in the population of Memphis is ac- counted for by two epidemics of yellow fever in 1878 and 1879 (see Mempuis). Chattanooga is still increasing at a very rapid rate in consequence of the vast development of the mineral resources of east Tennessee. Knoxville is also growing from the same cause, but not so rapidly as Chattanooga.

Education.—Provision for common school education was made before the Civil War, but was limited to white children. A State bank was established for the purpose of regulating the currency, and a portion of its capital was reserved as a school fund ; its pro- fits were also to be used for school purposes. The fund on which interest is now paid is $2,512,500. A bill is now (1887) before the State legislature to increase the permanent State fund to $5,000,000. Besides this, the proceeds of a tax of 15 per cent. on property and a poll tax of $1 per annum are applied to the same purpose. Moreover, each county has the power of imposing a school tax on its people, and many

incorporate cities and towns add still further to it by special taxes within their limits. All children between six and twenty- one (cighteen until 1885) are entitled to free education in the public schools. In1875 the school population numbered 426,612, of whom there were 199,058 pupils enrolled. In 1886 the corresponding figures were 609,028 and 373,877, and in 1887 623,450 and 383,537. Besides the cominon schools numerous private schools exist. Higher education is provided for in several institutions, such as Vanderbilt university (Methodist) at Nashville, the university of the South (Episcopalian) at Sewanee or Cumberland Mountain, the south-western Presbyterian university at Clarksville, and others; the university of Tennessee at Knoxville is supported by State grants, and is not under the direction of any one denomination. Many smaller establishments entitled universities exist in various parts of the State.

Administration, &c.—The legislative and executive functions of government are carried on by a governor, a State senate, and a house of representatives, whose respective duties and prerogatives correspond almost cxactly to those of the president, senate, and representatives of the United States. Both the senators (33) and the representatives (99) are elected for two years. The president of the senate, who is elected by the senators, succeeds as governor in case of the death of the elected governor during his term of office. The governor has the power of veto on the Acts of the legislature. In case of its exercise, the Act is returned to the legislature, when, if it passes by a constitutional majority in both houses, it becomes Jaw in spite of the veto.

The judiciary administration is carried on by courts of four designations,—the county criminal courts, the circuit courts, the chancery courts, and the supreme court of the State. The county courts consist of the magistrates, who assemble at the county seat four times a year to transact county business. Thcy elect a chair- man out of their own body, who by virtue of such election becomes the financial agent of the county. In countics large enough to justify it, a county judge is elected, who exercises criminal juris-diction. There are fourteen circuit courts, cach having jurisdiction in several counties ; in these all common-law cases are adjudicated, except in those counties where thcre is a criminal judge. There

Educa- tion.

Adminis- tration.

TRuNeE Ss EE

are eleven chancery divisions, for each of which a chancellor is clected, who tries all cases in equity in his division. All these judges are elected for cight years. The judges of the supreme court, five in number, are elected by the people at large, but not more than two can be taken from any one of three divisions of the State, viz., the eastern, middle, and western. Their jurisdiction is purely appellate: they revise the decisions of the other courts, and their decisions are final, except where a question arises as to the inter- pretation of the United States constitution.

History.—At the time of its first settlement and occupatiou by History Europeans Tennessee was part of the territory granted to the colony i of North Carolina by Charles II. It was then, however, a hypo- thetical claim, the boundaries of which were chiefly determined by 36° 30’ and 85° N. lat. The castern boundary of North Carolina was the Atlantic Ocean; on the other side the western territory extended according to one thcory to the Mississippi, according to another theory to the Pacific Ocean. When the English settlers began to cross the Appalachian chain, they found the French estab- lished on the Mississippi and its tributaries,—the Ohio, the Ten- nessee, and the Cumberland. The Spanish claim of an indefinite extensiou of their possessions in Florida was also a constant menace to the advances of the earliest English colonists in the direction of South Carolina and Georgia. The most important effort of trans- montane colonization by the British prior to 1760 was the estab- lishment of Fort Loudon on the Little Tennessee river in 1756 or 1757. But in 1760 this post was captured by the Cherokees and its garrison massacred; and the same fate befell a number of colonists who had settled between Fort Chissel (on New River, Virginia) and Fort Loudon. Early in 1761 Colonel Grant com- pletely routed the Cherokces and compelled their French and Span- ish allies to withdraw to Louisiana and Georgia.

Hight years later the stream of emigration began to set westwards, mainly by two routes, of which one led through Cumberland Gap to the valley of

the Cumberland river, whilst the other followed the course of the Tennessee round the southern border of the Cumberland plateau into the western Tennessee valley.

When it was proposed to liquidate the debts incurred by both the States and the Federal Government for war expenses by the sale of public lands, an Act of Cession was passed in 1784 by the North Carolina legislature ceding their lands west of the mountains, includ- ing those of the Watauga settlers, to the Federal Government. But in the following year the North Carolina legislature repealed the Act of Cession, and the whole matter was thus indefinitely post- poned. The Watauga community now declared itself independent of North Carolina; that Statc had relinquished its sovereignty over them and the Federal Government had not accepted it. At this time the transmontane territory consisted of Washington, Sullivan, and Greene counties. It also embraced all the settlements on the Cumberland, comprising the existing counties of Davidson, Sumner, Montgomery, Robertson, and Williamson. Davidson county had been organized by the influence of James Robertson (one of the earliest arrivals from North Carolina, in 1769), who had moved to the site of the future city of Nashville. But Davidson county took no part in these proceedings. The State organized by the seceding counties in August 1784 was called the State of Franklin ; its con- stituent counties returned to their allegiance to North Carolina on 1st March 1788. A second Act of Cession was passed in 1790, by which the defunct State of Franklin became part of the territory of the United States south of the Ohio, including what now consti- tutes Kentucky and Tennessee. The northern portion became a State, under the name of Kentucky, in 1792, and the southern por- tion took rank as the State of Tennessee in 1796, being received into the Union the same year. The settlement of middle Tennessee was much retarded so long as the path of access to it from east Tennessee was through Cumberland Gap and down the Ohio. The broader route round the south of the Cumberland plateau by the Tennessee river was too unsafe for general use on account of the

powerful Indian tribes—the Creeks and the Cherokees. This obstacle was finally removed by General Jackson’s crushing defeat of the Creeks in

1814, and a large cession of their territory.

The position of Tennessee during the Civil War was the same as that of the other middle and southern States. While secession was in agitation, it refused to secede; but when actual hostilities commenced it joined the Southern confederacy. Even then, how- ever, west and middle Tennessee sympathized with the South, whilst eastern Tennessee sided with the North. Each division sent very large contingents to the army which it favoured. A large portion of the State was, during the later years of the war, in the occupation of the Northern army, and many great battles were fought on its soil, notably those of Fort Donelson, Murfreesborough (Stone River), Franklin, aud Nashville. Tennessee suffered more from the exhaustion attendant on the close of the war, and from the rigorous government which accompanied the period of recon- struction, than any other State except Virginia.

See Geology of Tennessee, Nashville, 1869; Elliott, ‘‘The Age of the Southern Appalachians,” in Amer. Jour. of Sc., April 1883; Bradley, ‘‘On the Silurian Age of the Southern Appalachians,” 7b., April 1875; Haywood, The Civil and Political History of the State of Tennessee from its earliest Settlement up to the Year 1796, Knoxville, 1823; Ramsay, Annals of Tennessee to the End of. the Eighteenth Century; Parton, Life of Andrew Jackson, New York, 1860; Kirke, The Rear Guard of the Revolution, New York, 1886; Reports of Tennessee Hist. Soc. and of Bureau of Agriculture, Mines, and. Immigration. (. F. W.)

TENNIS. This, the oldest, perhaps, of all existing ball-games, is at once the most difficult to learn, on account of the intricacy of its laws, and the most interesting when learnt, because of the great variety of its combinations and the difficulty of solving rapidly the problems which are constantly presented to the player. It derives an additional claim to attention from numberless historical associations. Of the origin of tennis it is not possible to speak with certainty; but it may be confidently assumed that it sprang from some very simple sport. It first appeared in Hurope in the Middle Ages, when we find it played in open courts, in the parks or ditches of the feudal castles of France and Italy. It was at first the pastime of kings and nobles, but afterwards became po- pular with all classes. The French seem

to have borrowed it from the Italians, and to have contributed some of its refinements ; and the English took it from the French. Though men- tioned in the Arthurian romances, the game was certainly not known in England in the time of Arthur. The name ¢ennis is supposed to be derived from the exclamation “Tenez!” employed by early French players in serving the ball. In Italy § the game is called “giuoco della palla”; in France, ‘‘jeu de paume,” which also means the tennis court ; in Germany it is called by the generic title of “Ballspiel”; in Spain, “juego al ble” or “jugar al ble.” It is clear from the French name that the ball was originally struck with the palm of the hand. This was afterwards protected by a glove, as is still the practice in the Basque country. Upon the glove strings and cross-strings were next stretched, to give a faster impulse; and the addition of a short handle made an easy transition to the racket. In the time of Henry VII. the hand still some- times met the racket, even in the royal court at Windsor.

One of the first improvements in the game consisted in the building of closed courts, first with walls, then with walls and roof. It is still played in the open air in some places in France, and “ pallone,” a rude and violent variety of the game, is yet seen in Italy. There are twenty-seven courts in England and one in Dublin.

As now played, tennis in France is virtually the same as in England, though there are a few differences of detail.

he court is rectangular (see the annexed plan). An inner wall runs round three sides, to the height of 7 feet, from

2, 2,

4,5, 6, mark chases.

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which a sloping roof, called the penthouse, reaches to the outer wall. The surrounding passage thus enclosed (not shown in plan) is 7 feet wide. Opposite to the long penthouse is the main wall, in which there is at one point a projection called the tambour, H, which deflects the ball across the court. In the inner wall, below the penthouse, there are several openings, the

one at the end, on the service side, being called the dedans, B, the others the galleries. At the further end of the court is the grille, a square opening adjacent to the main wall. Across the court, halfway between the two ends, is stretched a net n, 3 feet high in the middle and 5 feet at the sides. The game may be played by two, or by three, or by four players, one against one, one against two, or two against two. At the commencement the players toss or “spin” a racket, to decide which shall serve first, calling “ rough ” (for the knotted side) or “smooth.” The party which wins the “spin” has the choice of the service or the “ first stroke,” the latter term meaning the return of the service. The server then begins at the “dedans” end of the court, technically called the “service side,” pitches the ball in the air, and strikes it with his racket so that it shall drop on the side penthouse or on the wall above it, and then from the penthouse upon the floor on the other side of the net (called the “hazard side”), within the “service court” bounded by the “service line” # and the “ pass line” p. If he fail to do this, a “fault” is called, or a “pass” if the ball has gone beyond the pass line. If he serves a second fault, his adversary scores a point, called a “stroke.” A pass counts for nothing, but annuls a pre- vious fault. It now becomes the duty of the adversary,

called the “striker-out,” to return the ball by striking it with his racket in such a manner that it shall pass back over the net to the service side. The server must now strike it again and return it to the hazard side; and the player

SERVICE SIDE

SCALE OF FEET. o 10 20 30 40

J, net post ; g, g, gallery post; v, v, first galleries; y, y, second galleries; x, x, last galleries ; doors ; 0, 0, half-court line; 7, 7, openings under net for ventilation and warming: I, 2, 3,

who first returns the ball into the net or ‘out of court” (i.e., to the roof, or above the play line on the walls) loses the stroke, which is scored to his antagonist. But, if a player fail or refuse to strike the ball in the air (a “volley ”) or on its first bound and before it touches the floor a second time, then, except on the hazard side beyond the service line, a “‘chase” is made

or reckoned on the floor, according to the lines on or between which the ball has dropped the second time. This chase is a stroke in abeyance. When one has been made it is called by the marker, but does not affect the score until one of the players has scored 40, when they change sides, and the player who has allowed the chase to be made must then endeavour to win it, z.e., to place the second bound of the 1 In the Manchester Club this law (8) has been wisely abolished.

ball returned by him better, z.e., nearer to the end wall, than the point at which the chase was marked. As often as his adversary returns his stroke, he must again endea- vour to do this, until he succeeds or fails. If he succeed, he scores the stroke ; if not, it is scored to his adversary. If two chases have been made at any stage of the score, even at the beginning of a game, then the players must change sides and play for the chases, as above described. A player who succeeds in sending the ball into the grille, the dedans, or the last division of the gallery—called the “winning gallery ”—on the hazard side, scores at all times a stroke. The minutize of the game and the mode of

scoring cannot be more succinctly described than in the

annexed laws.! LAws.

Single-Handed Game.

1. The balls shall be not less than 2} in. and not more than 28 in. in diameter, and shall be not less than 24 oz. and not more than 2? oz. in weight.

Note.—There is no restriction as to the shape or size of the rackets.

2. (a) The choice of sides at the beginning of the first set is

determined by a spin. (6) In subsequent sets of a series, the players shall begin each set on the side on which they finished the set before it.

3. The ball served must be struck with the racket, and may be delivered from any part of the service side.

4. The ball served must touch the service penthouse before touching any other part of the court, except the rest of the side penthouse and the service wall ; and it must drop in the service court or on one of the lincs which bound it.

5. The service is good,

(a) if the ball served touch in its descent any part of the service penthouse so as to rise again from it, or

(0) if the ball served strike the service wall and afterwards touch in its descent any part of the service penthouse, even though it do not rise again from it, or

(c) if the ball served drop in the winning gallery.

6. A fault may not be returned.

7. A pass may not be returned ; but a ball served, which has not gone across the pass line on the penthouse, may be volleyed, although if untouched it might have dropped in the pass court. If a pass touch the striker-out, or if a service before it has dropped faa him when standing with both feet in the pass court, and not having atteinpted to strike the ball, it is still counted a pass.

8. A pass annuls a previous fault.

9. If the striker-out declare himself not ready for a service, and have made no attempt to return it, that service is counted for nothing, though it be a fault. It annuls a previous fault. The striker-out, having been asked if he is ready, and having declared himself ready, may not similarly refuse a second service.

10. The server continues to serve until two chases be mnade, or one chase when the score of either player is at forty or advantage (see law 25). The

players then change sides, the server becoming striker-out and the striker-out becoming server.

11. The return is good if the ball in play be struck with the racket so that it pass the net without touching a gallery post or anything fixed or lying in an opening on the side from which it is struck, and without going out of court.

12. The return is not good,

(a) if not in accordance with the terms of law 11, or

(d) if the ball be struck more than once, or be not definitely struck, or

(c) if the ball in play, having passed the net, come back and drop on the side from which it was struck, unless it should have touched a gallery post or anything fixed or lying in an opening on that side of the court which is opposite to the striker.

13. A ball which is no longer in play may not be returned.

14. The server wins a stroke (except as provided in law 9),

(a) ifa good service enter the winniug gallery or the grille, or

(0) if the striker-out fail to return a good service (except when it makes a chase ; see laws 17-19), or

(c) if the striker-out fail to return the ball in play (except when it makes a chase ; see laws 17-19), or

(d) if he himself return the ball in play so that it enter the ae gallery or grille, or fall on or beyond the service ine, or

(¢) if he serve or return the ball in play so that it drop or

fall upon a ball or other object which is on or beyond the service line, or

ee eee 1 Reprinted from the present writer’s Annals of Tennis, 1878, by the kind consent of the publisher Mr H. Cox.

(f) if he win a chase (see law 20), or

(g) if the striker-out lose a stroke (see law 16).

15. The striker-out wins a stroke (except as provided in law 9),

(a) if the server serve two consecutive faults (except as provided in law 31 (6)), or .

(b) if the server fail to return the ball in play (except when it makes a chase ; see laws 17-19), or

(c) if he himself return the ball in play so that it enter the dedans, or

(d) if he win a chase, or

(e) if the server lose a stroke (see law 16).

16. Either player loses a stroke,

(a) if he lose a chase (see law 21),

(b) if the ball in play (except as provided iu law 7) touch him or anything which he wears or carries, except his racket in the act of returning the ball, or

(c) if he touch or strike the ball in play with his racket more than once, or do not definitely strike it.

17. When a ball in play on either side of the net, not being that on which the striker is standing,

(a) falls on any part of the floor, except on or beyond the service line, or

(6) enters any gallery, cxcept the winning gallery, or

(c) touches a gallery post,

it is marked a chase

(a) at that line on the floor on which it fell, or

(8) better or worse than that line on the floor which is nearest to the point at which it fell, or

(y) at that gallery the post of which it touched,

except as provided in laws 18 and 19.

Note (a).—A ball in play which touches the net post and drops on the side opposite to the striker is marked a chase at the line on the side on which it drops.

Note (6).—A ball in play which enters a gallery is marked a chase at that gallery which it enters, notwithstanding that it may have touched an adjacent gallery post without touching the floor in the interim.

Note ©.—The gallery lines on the floor correspond and are equivalent to the galleries of which they bear the names.

18. When a ball in play

(a) drops or falls in the net, on the side opposite to the striker, or

(0) drops on the floor, on the side opposite to the striker, and, bounding over the net, falls on that side of it from which it was struck, whether it touch the net in its bound or not,

it is marked a chase at the line on the side opposite to the striker. 19. When a ball in play drops or falls upon a ball or other object which is on the floor (except when it is on or beyond the service line ; see law 14 (¢)), it is marked a chase at the point at which that ball or other object was when the ball in play dropped or fell upon it. 20. Either player wins a chase,

(a) if he serve or return the ball so that it enter a winning opening, or

(0) if he serve or return the ball so that it fall better than the chase for which he played, or enter a gallery or touch a gallery post better than the gallery or the gallery line at ‘which the chase was for which he played, or

(c) if he serve or return the ball so that it drop or fall upon a ball or other object which is at a point on the floor better than that at which, or at the gallery corresponding to which, the chase was for which he played, or

(d) if his antagonist fail to return the ball in play, except when it falls worse than the chase in question.

21. Either player loses a chase,

(a) if he fail to return the ball in play, except when it falls worse than the chasc in question, or

(2) if he return the ball in play so that it fall worse than the chase, or enter a gallery or touch a gallery post worse than the gallery or the gallery line at which the chase was for which he played, or

(c) if he return the ball in play so that it drop or fall upona ball or other object which is at a point on the floor worse than that at which the chase was for which he played.

22. When a ball in play

(a) falls at a point on the floor neither better nor worse than that at which, or at the gallery corresponding to which, the chase was for which the striker played, or

(>) enters that gallery or the gallery corresponding to that gallery line, or touches the post of that gallery, or falls on the gallery line corresponding to that gallery, at which the chase was for which the striker played, or

(c) drops or falls upon a ball or other object which is at a point on the floor neither better nor worse than that at which, or at the gallery corresponding to which, the chase was for which the striker played,

it is marked chase-off: it is not scored as a stroke won by either player ; the chase is annulled, and the striker has not to play for it again.

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TENNIS

23. As soon as two chases are marked, or one chase when the score of either player is at forty or advantage (see law 25), the layers change sides. The player who made the first chase now Bends it, while the other plays to win it; and so with the second chase, except when only one has been marked. ;

24, If by an error three chases have been marked, or two chases when the score of either player is at forty or advantage (see law 25), the last chase in each case is annulled. :

25. On either player winning his first stroke, the score is called fifteen for that player ; on either player winning his second stroke, the score is called thirty for that player; on either pee winning his third stroke, the score is called forty for that player; and the fourth stroke won by either player is scdred game for that player, except as below. ‘

If both players have won three strokes, the score is called deuce, and the next stroke won by either player is scored advantage for that player. If the same player win the following stroke, he wins the game; if he lose the following stroke, the score is again called deuce ; and so on, until either player win the two strokes immediately following the score of deuce, when the game is scored for that player.

26. The player who first wins six games wins a set, except as

below.

If both players win five games, the score is called games all, and the next game won by either player is scored advantage game for that player. Ifthe same player win the following game, he wins the set ; if he lose the following game, the score is again called games all; and so on, until either player win the two games immediately following the score of games all, when he wins the set.

Note.—Players often agree not to play advantage sets, but to decide the set

by one game after arriving at the score of games all.

27. Every chase is marked, and every stroke scored, by the marker, who is entitled to consult the dedans when he is in doubt. A player who is dissatisfied with the marker's decision is entitled to appeal to the dedans. A majority of the dedans confirms or reverses the marker's decision. An appeal must be made before a recommencement of play.

Note.—The dedans should not give a decision unasked on a question of marking a chase or stroke, but may, and should, correct inaccurate scoring of chases, strokes, games, or sets.

Three-Handed and Four-Handed Games, sometimes called Double Games.

28. The partners serve and strike-out in alternate games, unless it shall have been previously agreed to the contrary.

Note.—It is usually, but not always, agreed that the striker-out may leave to his partner such services as pass him.

The former laws apply to these as well as to single games, the advantages and disadvantages attaching to a single player under the former laws here attaching to a pair of players.

Odds.

29. (a) A bisque or a half-bisque may not be taken after the service has been delivered.

(b) The server may not take a bisque after a fault ; but the

_ striker-out may do so.

Note.—A bisque is a stroke which may be claimed by the recipient of odds at any time during a set, subject to the provisions of laws 29 and 30.

30, A player who wishes to take a bisque or a half- bisque, there being a chase or two chases isch, may take it either before or after changing sides; but he may not, after changing sides, go back to take it.

31. (a) When the odds of round services are given, the ball served by the giver of the odds must touch the grille pent- house after touching the service penthouse and before dropping in the service court or on one of the lines which bound it.

(>) Neither faults nor failure in complying with the above condition are counted against the giver of the odds; but the recipient of the odds may decline to return such services as do not touch both the penthouses ; if, however, he attempt and fail to return any such service, it is counted against him.

32. Half-court: the players having agreed into which half-court on each side of the net the giver of the odds shall play, the latter loses a stroke if the ball returned by him drop in either of the other half-courts.

But a ball returned by the giver of the odds which

(a) drops on the half-court line, or

(0) drops in his half-court and touches the dedans post

before falling, or

(c) drops in his half-court and falls in the dedans, even

though on the other side of the dedans post, or

_ (d) touches the dedans post before dropping,

1s counted for the giver of the odds.

5:9 “tei boasted against any wall by the giver of the odds whic

(e) drops in his half-court, or

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(f) drops on the half-court line, or (g) touches the dedans post before dropping, or (z) touches any penthouse, battery, or wall before drop- ping in

his half-court, dropping on the half-court line, or touching the dedans post, ‘ is also counted for the giver of the odds.

Note.—It is, of course, evident that the giver of these odds may make a chase, or win a chase or a stroke, with a ball which drops in his half-court, or on the half-court line, but falls in the other half-court.

33. When the odds of “touch no walls” or “touch no side walls” are given, a ball returned by the giver of the odds which on fall- ing makes a nick is counted for the striker.

Directions to the Marker. It is the duty of the marker to call the faults, and the passes ; to call the strokes, when won, or when he is asked to do so ; to call the games and sets at the end of each, or when asked to do so; to mark the chases, when made ; to call the chases when there are two in the order in which they were made, or the chase when there is one with the score at forty or advantage ; and then to direct the players to change sides ; to call the chase or chases again, in order as above, when the players have changed sides, and each chase as a player has to play for it ; not to call play or not play in doubtful cases before the conclusion of the rest, unless asked to do so; to decide all doubtful and disputed strokes, subject to an appeal to the dedans ; to warn the players of any balls lying on the floor in their way, or to their danger or disadvantage, and to remove all such balls ; to collect the balls into the ball-basket ; and to keep the ball-troughs constantly replenished in the dedans and last gallery, and the latter especially in three-handed and four-handed games, (J. MA*.) TENNIS, Lawn. Lawn-tennis is a modern adaptation of the first principle of tennis, in the simplest form, to a ball-game played on grass with rackets. The balls are of india-rubber, hollow, and covered with white cloth. The rackets are lighter and broader than those used at tennis. The court for the single-handed game, one player against one, is shown in fig. 1, that for the three or four-handed game in fig. 2, The dimensions of the courts, the size

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£ vl F. fen H F Fig. 1. Fia. 2.

Lawn-tennis courts. Fig. 1, for single game; fig. 2, for double game,

and weight of the balls, the mode of scoring, and other details are given in the laws of the game (see below). The only requisites for the game are the balls, rackets, net and posts, and a hard level surface of grass. It may be, and often is, played upon surfaces of wood, asphalt, cement, gravel, or other substance. The grass requires constant mowing, rolling, and in dry weather watering, to keep it

in order. In the winter months it should be sedulously weeded, sown where necessary, and swept and rolled when- ever the weather permits.

The choice of sides depends upon a toss or spin of a racket, as in tennis, The winner chooses the service or the preferable side, as he pleases. The server begins the game by striking the ball with his racket so that it passes (without touching) over the net, which is hung across the court from the posts A, A. The ball served must drop in the space which is diagonally opposite to him on the other side of the net,—a space bounded by the net, the side line, the half-court line, and the service line. His adversary, called the “striker-out,” must return the ball before it touches the ground a second time; and the server must similarly return it again ; and so on, until one or other player fails to return it over the net so that it shall drop on the ground anywhere on the side of the net furthest from him, and within or upon any of the lines which bound that space, technically called his adversary’s court, When one player thus fails, he loses a stroke, which the other is deemed to win, and it is added to the score of the latter. The score is kept as at tennis, but there are no chases.

Activity and condition have great value in lawn-tennis, though there is room for much skill in placing the ball in the corners with hard, low strokes, and in intercepting and returning the ball by the volley while in the air, before it reaches the ground. But in matches temper, endur-

ance, and quickness of movement count for very much.

Lawn-tennis, in one form or another, has been played for many centuries out-of-doors. The present variety of the game was first introduced, in a form which was soon shown .to be impracticable, about the year 1874. It was then taken up by the All England Club at Wimbledon, who in 1877 remodelled the size and shape of the court, and the laws, and altered the system of scoring to that which obtains in the parent game. Thereupon, with the consent of the M.C.C. at Lord's, who lent the authority of their name to the movement, the code of laws which now prevails, and has been occasionally amended only in a few details, was promulgated by the All England Club. The championship of the gamc, which is open to gentlemcn amateurs only, was instituted at Wimbledon by the A.E.C, in 1877, A lady's championship and a championship for pairs (gentlemen) have also been instituted, and are annually competed for on the grounds of the A.E.C. at Wimbledon. Lawn- tennis, in the short time which has elapsed since its introduction, has achieved immense popularity. Prize-meetings are held annu- ally at Bath, Cheltenham, Dublin, Edinburgh, Manchester, Liver- pool, and many other places in the United Kingdom; the game is also played with as great enthusiasm in the United States, Canada, Australia, and India. In all those countries prize-meetings are held and championships are instituted.

Laws.l

Single-Handed Game.

1. For the single-handed game the court is 27 feet in width and 78 feet in length. It is divided across the middle by a net, the ends of which are attached to the tops of two posts A and A (see fig. 1), which stand 3 feet outside the court on each side. The height of the net is 3 feet 6 inches at the posts and 8 feet at the centre. At each end of the court, parallel to the net, and at a dis- tance of 39 feet from it, are drawn the basc lines CD and EF, the extremities of which are connected by the side lines CHand DF, Half- way between the side lines, and parallel to them, is drawn the half-court line GH, dividing the space on each side of the net into two equal parts, called the right and left courts. On each side of the net, at a distance of 21 feet from it, and parallel to it, are drawn the service lines XX and YY.

2. The balls shall be not less than 24 inches nor more than 2,% inches in diameter, and not less than 13 oz. nor more than 2 oz. in weight.

3. In matches where umpires are appointed their decision shall be final; but where a referee is appointed an appeal shall lie to him from the decision of an umpire on a question of law.

4. The choice of sides and the right of serving during the first game shall be decided by toss, provided that, if the winner of the toss choose the right to serve, the other player shall have the choice of sides, and vice versa.

5. The players shall stand on opposite sides of the net. The player who first delivers the ball shall be called the server, the other the striker-out.

6. At the end of the first game the striker-out shall become server and the ees oma become striker-out ; and so on alternately in the subsequent games of the set.

7. The server shall stand with one foot beyond (i.e., further from the net than) the base line, and with the other foot upon the base line, and shall de-ee service from the right and left courts alternately, beginning from the right.

8. The bail served must drop within the service line, half-court line, and side line of the court which is diagonally opposite to that from which it was served, or upon any such line.

1 Printed by permission of the All England Lawn-Tennis Club.

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9. Itisa fault if the service be delivered from the wrong court, or if the server do not stand as directed in law 7, or if the ball served drop in the net or beyond the service line, or if it drop out of court or in the wrong court; it is not a fault if the server’s foot which is beyond the base line do not touch the ground at the moment at which the service is delivered.

10. A fault inay not be taken.

1l. After a fault, the server shall serve again from the same court from which he served that fault, unless it was a fault because served from the wrong court,

12. A fault may not be claimed after the next service has been delivered.

13. The service may not be volleyed, i.e., taken before it touches the ground.

14, The server shall not serve until the striker-out is ready. If the latter attempt to return the service, le shall be deemed to be ready.

15. A ball is in play from the moment at which it is delivered in serviee (unless a fault) until it has been volleyed by the striker-out in his first stroke, or has dropped in the net or out of court, or has touched either of the players or anything that he wears or carries, except his racket in the act of striking, or has beeu struck by either of the players with his racket more than onee consecutively, or has been volleyed before it has passed over the net, or has failed to pass over the net before its first bound (except as provided in law 17), or has touched the ground twice consecutively on either side of the net, though the second tinie may have been out of court.

16. It is a let if the ball served touch the net, provided the service be otherwise good, or if a service or fault be delivered when the striker-out is not ready, or if either player be prevented by an accident beyond his control from serving or returning the ball in play. In case of a let, the service or stroke counts for nothing, and the server shall serve again.

17. It isa good return although the ball touch the net, or, having passed outside either post, drop on or within any of the lines which bound the court into which it is returned.

18. The server wins a stroke if the striker-out volley the service, or fail to return the service or the ball in play (except in the case of a let), or return the service or ball in play so that it drop outside any of the lines which bound his opponent’s court, or otherwise lose a stroke, as provided by law 20.

19. The striker-out wins a stroke if the server serve two consecutive faults, or fail to return the ball in play (except in the case of a let), or return the ball in play so that it drop outside any of the lines which bound his opponent's court, or otherwise lose a stroke, as provided by law 20.

20. Hither player loses a stroke if the ball in play touch him or anything that he wears or carries, except his racket in the act of striking, or if he touch or strike the ball in play with his racket more than once consecutively, or if he touch the net or any of its supports while the ball is in play, or if he volley the ball before it has passed the net.

21, On either player winning his first stroke, the score is called 15 for that player; on either player winning his second stroke, the score is called 30 for that player; on either player winning his third stroke, the score is called 40 for that player ; and the fourth stroke won by either player is scored game for that player, except as below.

If both players have won three strokes, the score is called deuce; and the next stroke won by either player is scored advantage for that player. If the same player win the next stroke, he wins the game; if he lose the next stroke, the score is again called deuce ; and so on until either player win the two strokes immediately following the score of deuce, when the game is scored for that player. '

22. The player who first wins six games wins a set, except as below.

If both players win five games, the score is called games all; and the next game won by either player is scored advantage game for that player. If the same player win the next game, he wins the set; if he lose the next game, the score is again called games all; and so on until either player win the two games immediately following the score of games all, when he wins the set.

Note.—Players may agree not to play advantage sets, but to decide the set by one game after arriving at the score of games all.

23. The players shall change sides at the end of every set; but the umpire, on appeal from either party before the toss for choice, may direct the players to change sides at the end of every game if in his opinion either side

havea distinct advantage, owing to the sun, wind, or any other accidental cause ; but, if the appeal be inade after a match has been begun, the umpire may only direct the players to change sides at the end of every gaine of the odd and concluding set.

24. When a series of scts is played, the player who was server in the last game of one set shall be striker-out in the first game of the next.

Odds.

25. A bisque is one stroke, which may be claimed by the receiver of the odds at any time during a set, except as below. A bisque may not be taken after the service has been delivered. The server may not take a bisque after a fault; but the striker-out may do so.

26. One or more bisques may be given in augmentation or diminution of other odds.

27. Half-fifteen is one stroke given at the beginning of the second and every subsequent alternate game of a set.

28. Fifteen is one stroke given at the beginning of every gaine of a set.

29. Half-thirty is one stroke given at the beginning of the first game, two strokes at the beginning of the second game; and so on, alternately, in all the subsequent games of a set.

30. Thirty is two strokes given at the beginning of every game of a set.

31. Half-forty is two strokes given at the beginning of the first game, three strokes at the beginning of the second game; and so on, alternately, in all the subsequent games of a set.

32. Forty is three strokes given at the beginning of every game of a set.

33. Half-court: the players having agreed into which court the giver of the odds shall play, the latter loses a stroke if the ball, returned by him, drop out- side any of the lines which bound that court.

Three-Handed and Four-Handed Games.

34. The above laws shall apply to the three-handed and four-handed games, except as below. F ,

85. For the three-handed and four-handed games the court is 36 fect in width. Within the side lines, at a distance of 44 feet from them, and parallel to them, are drawn the service side lines IK and LM. The service lines are not drawn beyond the points I, L, K, and M, towards the side lines. In other respects, the court is similar to that which is described in law le

36. In the three-handed game the single player shall serve in every alternate

me. 4 eo. In the four-handed game, the pair who have the right to serve in the first game may decide which partner shall do so, and the opposing pair may decide similarly for the second game. The partner of the player who served in the first game shall serve in the third ; and the partner of the player who served in the second game shall serve in the fourth; and so on in the same order in all the subsequent games of a set.

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38. The players shall take the service alternately throughout each game. No player shall receive or return a service delivered to his partner. The order of service and of striking-out once arranged shall not be altered, nor shall the strikers-out change courts to receive the service, before the end of thc set.

39. The ball served must drop within the service line, half-court line, and service side line of the court which is diagonally opposite to that from which it was served, or upon any such line.

40. Itis a fault if the ball served do not drop as provided in law 39, or if it touch the server’s partner or anything that he wears or carries.

41, Ifa player serve out of his turn, the umpire, as soon as the mistake is discovered by himself or by one of the players, shall direct the player to serve who ought to have served; but all strokes scored and any fault served before such discovery shall be reckoned. Ifa game shall have been

completed before such discovery, then the service in the next alternate game shall be delivered by the partner of the player who served out of his turn; and so on in regular rotation. (J. MA*.)

TENT. A tent is a portable habitation or place of shelter consisting in its simplest form of a covering of some textile substance stretched over a framework of cords and poles, or of wooden rods, and fastened tightly to the ground by pegs. Throughout the greater part of the interior of Asia the pastoral tribes have of necessity ever been dwellers in tents,—the scantiness of water, the consequent frequent failure of herbage, and the violent extremes of seasons compelling a wandering life. Tents have also been used in all ages by armies in campaign. In ancient Assyrian sculptures discovered by Layard at Nineveh the forms of tent and tent-furnishings are similar to those which still prevail in the East, and it appears that then as now it was a custom to pitch tents within the walls of a city. The ordinary family tent of the Arab nomads of modern times is a comparatively spacious ridged structure, averaging from 20 to 25 feet in length, but sometimes reaching as much as 40 feet. Its covering consists of a thick felt of black goat hair (cp. Cant. i. 5), or sometimes of alternate stripes of black and white disposed horizontally. The ridge or roof is supported by nine poles (awamid) disposed in sets of three, the central set being loftier than those at each end, whereby a slope outward is formed which helps to carry off rain. The average height inside at the centre is 7 feet and at the sides 5 feet, and the cloths at the side are so attached that they can easily be removed, the shel- tered end being always kept open. Internally the tent is separated by a partition into two sections, that reserved for the women containing the cooking utensils and food. The jourt or tent of the Kirghiz of Central Asia is a very capacious and substantial structure, consisting of a wooden frame for sides, radiating ribs for roof, and a wooden door. _ The sides are made up of sections of laths, which expand and contract in lozenges, on the principle of lazy tongs, and to their upper extremities ribs are lashed at regular intervals. Over this framework a heavy covering of felt is thrown, which is either weighted down with stones or, when necessary, stitched together.

Tn Western countries tents are used chiefly in military encampments, by travellers and explorers, and for tem- porary ceremonial occasions and

public gatherings. The material of which they are composed is commonly a light linen canvas or navy duck; but for tents of small size stout cotton canvas is employed, being light, strong, elastic, and sufficiently waterproof. These tents vary in size from a low-pitched covering, under which a couple of men can With difficulty creep, up to spacious marquees, in which horticultural and agricultural shows are held, and which can accommodate thousands of persons.

The marquee is distinguished from the tent by being a ridged structure, devoted to show and social uses; but the humblest tent made—the tente d'abri or shelter tent of the French army— is also ridged in form. The tente d'abri affords sleeping accom- modation for six men, and consists of a rope stretched over three low poles and fixed into the ground. Four separate squares of canvas buttoned together are thrown over the rope and pegged to the ground on each side so as to form a low ridge. 'Two other Squares are used for covering the ends, being thrown over the slanting rope ends by which the poles are pegged to the ground. Each of the six men using the tent carries one of the squares

of canvas besides his quota of the poles, rope, and pegs. The Gipsies and travelling tinkers of England have an equally unpre-

tentious tent, which consists of a framework of hazel rods bent so as to form a series of low ridges, the ends being stuck into the ground, and over this frame blankets or other coverings are thrown and pegged down. The simplest, but at the same time the least convenient, of ordinary tents is the conical, consisting of a central pole with ropes and canvas radiating from it in an unbroken slope to the ground. This form, however, covers much ground in pro- portion to the accommodation it affords, as the space round the circumference is of little value. A tent, therefore, which has sides or a fall is a much more convenient structure. The counterpart of the conical is the pyramidal tent, the four equal sides sloping to the ground ; and this form with a fall or sides makes the square tent, which is both convenient in shape and firm in structure. Small tents are also made, modified from the Arab form, with a central pole and two lower lateral poles. In the umbrella tent the roof is supported by a set of ribs which radiate from the pole, precisely

as the ribs of an umbrella spread out from the stick. In the balloon expansion tent, invented in 1877 by Captain Newburgh Stewart, R.N., the use of tent polc, pegs, and ropes is entirely avoided, the canvas being supported by light ribs of elastic wood resting on the ground, and the structure is kept taut by hauling ropes descending from the apex and secured by a holdfast driven into the ground. When from the nature of the surface such fasten- ing cannot be obtained, a heavy weight of any kind hung to the hauling rope is sufficient to moor the tent, and except in stormy weather the weight may be hung high up, thus leaving the whole interior of the tent clear. As further provision against stress of weather there are four iron holdfasts at the sides, which may be skewered into the ground by long iron pins. Captain Stewart claims that his tent possesses much greater stability and capacity than the ordinary army tent, that it is much more easily and ex- sceniaas pitched and taken down, and that it is very much ighter. In the latter important respect he calculates that by the adoption of his pattern a regiment at present carrying eighty tents of the Indian service pattern would save no less than twenty tons of transport.

TEPLITZ, or Téprirz, one of the most frequented watering-places in the north of Bohemia, is picturesquely situated about 30 miles south of Dresden, in the plain of the Biela, which separates the Erzgebirge from the Bohemian Mittelgebirge. The main interest of the little town centres in the bathing season, which reaches its height in August; and the arrangements for the con- venience and amusement of visitors are very complete. There is a large curhaus, and numerous handsome bath- houses are situated both in Teplitz and in the immediately adjoining village of Schénau. The environs are laid out in pretty and shady gardens and promenades, the finest being in the park which surrounds the chateau of Prince Clary, the superior of the town. The other chief build- ings are the Roman Catholic and Protestant churches, the Jewish synagogue with a conspicuous dome, and the theatre. The saline-alkaline springs of Teplitz, ten to twelve in number, ranging in temperature from 90° to 117° Fahr., are classed among what are called “indifferent” waters. Used until lately almost exclusively for bathing, they are prescribed for gout, rheumatism, and some scro- fulous affections, and their reputed efficacy in alleviating the effects of gun-shot wounds had gained for Teplitz the sobriquet of “the warriors’ bath.” Military baths are maintained in the town by the Governments of Austria, Prussia, and

Saxony, and there are also bath-houses for the poor. ‘Teplitz is much visited for the after-cure, after Carlsbad and similar spas. The number of patients in 1883 was 6000 and the passing visitors were almost as numerous. The presence of a bed of lignite in the neighbourhood has encouraged the industrial development of Teplitz, which carries on manufactures of cotton and woollen goods, india-rubber, chemicals, hardware, &c. In 1880 the united population of Teplitz and Schénau was

16,750.

The thermal springs are fabled to have been discovered as early as 762, but the first authentic mention of the baths occurs in tho 16th century. The town is mentioned in the 12th century, the name being derived from a Slavonic word meaning “ warm bath.” Teplitz figures in the history of Wallenstein, and is also interest- ing as the spot where the monarchs of Austria, Russia, and Prussia first signed tho triple alliance against Napoleon in 1813. Itisa

curious fact that on the day of the earthquake at Lisbon (1st November 1775) the main spring at Teplitz ceased to flow for some minutes.

TERAMO, a town of Italy, capital of the province of Teramo (formerly Abruzzo Ulteriore I.) and an episcopal see, Stands on the left bank of the Tordino where it is joined by the Vezzola, 12 miles from the coast and 876 feet above sea-level. It is connected by a branch line with Giulianova on the railway from Ancona to Brindisi. The picturesque valley of the Tordino is here dominated by the peaks of the Gran Sasso d’Italia (9522 feet), The town is traversed by one straight wide street with large houses, but for the most part it consists of narrow dirty lanes; the modern suburbs are good. The cathedral (1317-55) has been greatly modernized ; the church of San Agostino is in the later Gothic style. The antiquities include remains of a gateway, a theatre, and baths, as well as numerous in- scriptions. There are manufactures of wool and silk, and of straw hats and pottery. The population of the town in 1881 was 8634, with its suburbs 13,988 (commune,

20,309).

Teramo is the ancient Jnteramna Pretutiana, capital of the

Pretutii. In the Middle Ages it was known as Aprutium (whence Abruzzo); the intermediate form of the present name was Teramne.

TERAPHIM (0°57), a Hebrew word found only in the plural, which the Authorized Version sometimes simply transcribes (Judges xvii. 5, xviii. 14 sg.; Hosea iil. 4), but elsewhere translates by “images” (Gen. xxxi. 19 and often elsewhere), “image” (1 Sam. xix. 13), “idols” (Zech. x. 2), “idolatry” (1 Sam. xv. 23). The etymology of the word is quite obscure (see Gesenius, Zhesawrus, p. 1519 sq.), but it appears that the teraphim were a kind of idols (Gen. xxxi. 30), with something of a human figure (1 Sam. xix. 13); and, though their use was condemned by the prophets (1 Sam. xv. 23; cp. 2 Kings xxiii. 24), they were long commonly used in popular worship, both domestic (1 Sam. xix. 13, in the house of David and Michal) and public (Judges xviii.). They are associated with the ephod, which in this connexion seems to mean a plated image, and Hosea speaks of ephod and teraphim as essential elements in the religious usages of northern Israel. Like the ephod, they were specially associated with divination, and in particular with the sacred lot (Zech. x. 2; Ezek. xxi. 21 [26]). From the last passage it appears that teraphim were used by the Babylonians as well as by the Hebrews. These statements and references cover all that is known about the teraphim ; the fables of the rabbins are collected in Buxtorf, Lex. Talmud., 2660 sq.

TERBURG, Grrarp (1608-1681), subject painter, was born in 1608, at Zwolle, in the province of Overyssel, Holland. His father, also an artist, sent him to study in Rome, where he adopted a style distinguished by great finish and accuracy. He practised for a time in Paris with much success, visited England, it is said, and then returned to Holland. In 1648 he was at Miinster during the meeting of the congress which ratified the treaty of peace between the Spaniards and the Dutch, and executed his celebrated little picture, painted upon copper, of the assembled plenipotentiaries,—a work which, along with the Guitar Lesson, now represents the master in the national collection in London. At this time Terburg was invited to visit Madrid, where he received employment and the honour of knighthood from Philip IV. It is said that, in consequence of an intrigue, he was obliged to return to Holland. He seems to have resided for a time in Haarlem ; but he

finally settled in Deventer, where he became a member of the town council, as which he appears in the portrait now in the gallery of The Hague. He died at Deventer in 1681.

Terburg is excellent as a portrait painter, but still greater asa painter of genre subjects. He depicts with admirable truth the

life of the wealthy and cultured classes of his time, and his work is free from any touch of the grossness which finds so large a place in Dutch art. His figures are well drawn and expressive in attitude; his colouring is clear and rich; but his best skill lies in his unequalled rendering of texture in draperies, which is seen to advantage in such pictures as the Letter in the Dutch royal col- lection, and in the Paternal Advice (known as the Satin Gown)— engraved by Wille—which exists in various repetitions at Berlin and Amsterdam, and in the Bridgewater Gallery. Terburg's works are rare; only about eighty have been catalogued.

TERCEIRA. See Azorzs, vol. iii. p. 171.

TEREDO, a genus of Lamellibranchiate Mollusca, of the order Jsomya, sub-order Stnupallia, family Pholadacea (see Moxiusca, vol. xvi. p. 685). The animals included in this genus are commonly known as " ship-worms," and are notorious for the destruction which they cause in ships' timbers, the woodwork of harbours, and piles or other wood immersed for a long period in the sea. They inhabit long cylindrical holes, which they excavate in the wood, and usually occur in great numbers, crowded | together so that often only a very thin film remains between the adjacent burrows. Each burrow is lined with a layer of calcareous substance secreted by the mollusc; this lining is not usually complete, but stops short a little distance from the inner end of the burrow, where the boring process continues to take place. In some burrows, how- ever, the lining is complete, either because the animal has reached its full size or because some cause prevents it continuing its tunnel ; in such cases the calcareous tube has a hemispherical termination. The burrows are usually driven in the direction of the grain of the wood, but not | invariably so. When a knot or nail or the tube of a

neighbour is reached, the course of the burrow is altered so as to bend round the obstruction. One burrow is never found to break into another.

The adult Zeredo, when removed from its burrow and calcareous tube, is from a few inches to 3 feet in length, according to the species to which it belongs, and is cylindrical and worm-like in appearance. The anterior end, which lies at the bottom of the burrow, is somewhat enlarged and bears a pair of shells or valves, which are not connected by the usual ligament, but are widely separated dorsally. The valves are triangular in shape and very concave on the side which is in contact with the animal. In front their edges are widely separated, and the mantle tube, which is elsewhere closed, has here a | slight median aperture, through which the short sucker-like | foot can be protruded. The next portion of the body | behind the shell-bearing part is naked, except for the shelly lining of the burrow, which is secreted by this part. Anteriorly this portion contains part of the body proper; posteriorly it forms a tube divided internally by) a horizontal partition into two chambers. In the lower | chamber are the elongated gill plates, which have the | typical lamellibranchiate structure. In the upper chamber anteriorly is the rectum. A thick muscular ring terminates ’ this region of the body, and bears two calcareous plates shaped like spades or battledores. The expanded parts of these plates are free and project backwards ; the handle is fixed in a deep socket or pit lined by epidermis. These calcareous plates are called pallets (Fr. palmules). Behind the pallets the tubular body bifurcates, forming two siphons similar to those of other Lamellibranchs ; the siphons can be contracted or expanded within wide limits of length. The principal organs of the body—stomach, heart, genera- tive organs, and nephridia—are situated in the anterior part of the body, forming a visceral mass, which extends some distance behind the valves. The heart is above the 1n- testine and not perforated by it. The two valves are connected by an anterior adductor muscle.

From its resemblance to Pholas, Teredo is placed by conchologists in the family Pholadidx, among the IJsomya ; but it is still unde-

cided which part of the body corresponds to the posterior adductor. According to Quatrefages, it is a muscular band passing transversely between the handles of the pallets. His discussion of this point is connected with another, namely, the nature of the long tubular portion of the body behind the valves. Deshayes limits the extent of the mantle to the part covered by the shell, and considers all the rest of the animal as formed by the siphons ; the branchix and part of the other viscera in this view are contained in the siphons. Quatrefages argues that the siphons commence at the point where their retractor muscles are inserted, namely, at the muscular ring corresponding to the pallets. This reasoning is plausible ; but it is difficult to accept the view that the retractor muscles of the siphons and the posterior adductor muscle are so closely connected as Quatrefages thinks ; in other Jsomya the retractors of the siphons and the posterior adductor are distinct and separate. Deshayes believes that the single adductor between the valves results from the fusion of the two muscles usually separate. Jeffreys believes that the posterior adductor is really present between the posterior parts of the valves; but the opinion of a conchologist on a question of morphology is not of very great weight. In other Jsomya the ati (parieto-splanchnic) ganglia are attached to the ventral surface of the posterior adductor. In Yeredo these ganglia are situated at the posterior end of the body proper, some distance behind the shells, and immediately bchind the generative organ. It is here probably that the rudiment of the posterior adductor, if it exists, is to be sought; or, if it does not exist, it is here that it originally was placed. ;

It is evident that the anatomy of Teredo has not yet been in- vestigated from the point of view of modern morphology; but as far as can be judged at present the body proper extends back some distance behind the shells, to the posterior limit of the visceral mass. ‘The part between this and the pallets is a tubular prolonga- tion of the mantle chamber containing the extended gill laminz, and beyond the pallets are the separate siphons. Besides the visccral ganglia a cerebral and a pedal pair are present. The stomach is provided with a large crystalline style. The function of the pallets is to form an operculum to the calcareous tube when the siphons are withdrawn into it. In some species the external or narrowcr end of the calcareous tube is provided with transverse lamine projecting into the lumen; and in some the

external aper- ture is divided by a horizontal partition into two, one for each siphon.

The Leredo, according to Quatrefages, is dicecious, though Gwyn Jeffreys believes it to be hermaphrodite. As in the case of the oyster, the ova are retained in the branchial chamber during the early stages of their development. The segmentation of the ovum is unequal, and leads to the formation of a gastrula by epibole. By the growth of a preoral lobe provided with a ring of cilia, and by the formation of a mouth and an anus, the trochosphere stage is reached. A pair of thin shells then appear on the sides of the larva, connected by a hinge on the dorsal median line, and the foot grows out between mouth and anus. By the time the larve ‘‘swarm,” or leave the branchial cavity of the parent to live for a time as free- swimming pelagic larve, the valves of the shell have grown s0 large as to cover the whole of the body when the velum is retracted; the foot is also long, cylindrical, and flexible, and can be protruded far pond the shell. The valves of the shell at this stage are hemi- spherical in shape, so that the whole larva when its organs are retracted is contained in a globular case.

Concerning the later changes of the larva and the method by which it bores into wood nothing or little is known from direct observation. Much has been written about the boring of this and other marine animals, but even yet the matter cannot be said to be satisfactorily elucidated. Osler, in a paper in Phil. Trans., 1826, argued that the Teredo bores by means of its shells, fixing itself by the surface of the foot, which it uscs as a sucker, and then rasping the wood with the rough front edges of the shell-valves. This view was founded on the similarity of the arrangement of the shells and muscles in Teredo to those occurring in Pholas, in which the method of boring described was actually observed. W. Thompson, in a paper in the Hdinb. New Phil. Jowrn., 1835, supported the view that the excavation is due to the action of a solvent secreted from the surface of the animal. Albany Hancock, again (Ann. and Mag. Nat. Hist., vol. xv.), thinks that the excavating power of Teredo is due to silicious particles embedded in the anterior portion of the integument, in front of the valves. But the actual existence of either Silicious particles or acid secretion has been denied by others, Jeffreys belicves that the foot is the organ by which the animal burrows. In the larger number of Lamellibranchs the foot is doubtless a

burrowing organ, and it is difficult to see how the limpet hollows out the rock to which it is attached if not by means of the surface of its foot. At the same time it is difficult to explain how the soft muscular foot can penetrate into hard wood.

he process is of course slow, and J effreys supposes that particles are detached one by one from the moistened surface to which the foot is applied. In any case the valves are coyered by an epidermis, which could scarcely be there if they were used in burrowing.

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Teredo grows and burrows at an extremely rapid rate : spawning takes place in the spring and suminer, and before the end of the year the animals are adult and their burrows of large size. Quatre- fages relates that at Guipuzcoa (N. Spain) a ferry-boat was sunk accidentally in the spring, and was raised four months afterwards, when its timbers were already rendered useless by 7. pedicellata. How long the animals live is not accurately known, but Quatre- fages found that they nearly all perished in the winter. This can- not be generally the case, as the size of the tubcs varies so greatly. In Holland their greatest ravages are made in July and August. Iron ships have nothing to fear from their attacks, and the copper sheathing now almost universally used protects wooden hulls. A great deal of loss is, however, caused by Zeredo in harbour works and shipping stages, and the embankments in Holland are con- tinually injured by it. The most efficient protection is afforded by large-headed nails driven in in close proximity. Soaking wood in creasote is not a certain safeguard ; Jeffreys found at Christiania in 1863 that a large number of harbour piles previously soaked in creasote had been completely destroyed by 7. navalis. Coal tar and the silicate of lime, used for coating stonework, have been sug- gested as protective coverings, but they do not seem to have been adequately tested.

Species of Zeredo occur in all scas. The animal was known to the ancients and is mentioned by Theophrastus, Pliny, and Ovid. In 1715 it is mentioned by Valisnieri, in 1720 by Deslandes. In 1733 great attention was drawn to it on account of the discovery that the wooden dykes of Holland were being rapidly destroyed by ship-worms, and that the country was in danger of inundation. Three treatises were published concerning the animal, by P.

Mas- suet, J. Rousset, and Godfrey Sellius. The work of the last-named, which was the best, described the anatomy of the creature and showed that its affinities were with bivalve molluscs. The truth of Sellius's view was not grasped by Linneus, who placed Zeredo together with Serpula in the genus Dentalium; but its proper position was re-established by Cuvier and Lamarck. Adanson, unaware of the work of Sellius, in 1757 believed himself to be the first to discover the molluscan affinities of Teredo. It will not be necessary to give here a definition of the genus taken from any systematist ; it will be sufficient to point out that the long cy- lindrical body with its two small anterior polygonal valves, the absence of a ligament and accessory valves, the muscular ring into which are inserted the calcareous pallets, and the continuous calcareous tube lining the hole bored by the animal are the diagnostic features.

Jeffreys, in his British Conehology, gives the following species as British : —Teredo norvegiea, Spengler; 7. navalis, Linn.; 7. pedi- eellata, Quatrefages; 7'. megotara, Hanley. T. norvegica occurs chiefly on the west coast of Great Britain. It was taken by Thompson at Portpatrick in Wigtownshire, and occurred in Jef- reys's time in abundance at Milford Haven. This species has been described by Gmelin and a number of British authors as 7. navalis, Linn. It is distinguished by having the base of the pallets simple, not forked, and the tube semi-concamerated at its narrower pos- terior end. The length does not usually exceed afoot. It is the T. navium of Sellius. 7. navalis has been identified from the figures of Sellius, to which Linnzus referred ; Sellius called it 7. marina. It occurs on all the western and southern coasts of Europe, from Christiania to the Black Sea, and is the species which causes so much damage to the Dutch embankments. The pallets of this species are small and forked, and the stalk is cylindrical. The tube is simple and not chambered at its narrow end. J. pedveellata was originally discovered by Quatrefages in the Bay of Los Pasages on the north coast of Spain; it has also been found in the Channel Islands, at Toulon, in Provence, and in Algeria, In I'. megotara the tube is simple and the pallets like those of 7. norvegiea ; it occurs at Shetland and Wick, and also on the western shore of the Atlantic, where its range extends from Massachusetts. to South Carolina. 7%. malleolus, Turton, and Z. bipinnata, Turton, belong to the West Indies, but are often drifted in floating timber to the coasts of Europe. Other occasional visitants to the British

shores are 7’. excavata, bipartita, spatha, fusticulus, cueullata, and Jimbriata. These were described by Gwyn Jeffreys in Ann. and Mag. Nat. Hist., 1860. T. jimbriata is stated to be a native of Vancouver’s Island. A kind of ship-worm, the Nauwsitora dunlopet of Perceval Wright, has been discovered in India, 70 miles from the sea, in a stream of perfectly fresh water, namely, the river Kumar, one of the branches of the Ganges. 7. corniformis, Lam., is found burrowing in the husks of cocoa-nuts and other woody fruits floating in the tropical seas ; its tubes are extremely crooked and contorted for want of space. Fossil wood and palm-fruits of Sheppey and Brabant are pierced in the same way.

Twenty-four fossil species have been recognized in the Lias and succeeding beds of Europe and the United States. The sub-genus Teredina, Lam., isa fossil of the Eocene of Great Britain and France.

Literatwre.—See, besides the works already mentioned, Godfrey Sellius,

Historia Naturalis Teredinis sew Xylophagi Marini, 1733; Adanson, Histoire Naturelle du Sénégal, Paris, 1757; Quatrefages, Annales des Sci. Nat., 1848-50 ;

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Forbes and Hanley, Brit. Mollusca, 1853; B. Hatschek, Entwicklung v. Teredo: Arbeiten aus dem Zool. Inst. Wien, 1880; Deshayes, Mollusques d’ Algérie ; Sir BE. Home, ‘ Anatomy of Teredo,” in Phil. Trans., vol. xcvi.; Frey and Leuckart, Beitrége zur Kenntniss wirbelloser Thiere, 1847 ; Woodward, Manual of Mollusca, London, 1851.

TEREK (Russ. Zerskaya oblast), a Russian government of Caucasia, situated to the north of the main Caucasus chain. It is bounded by Stavropol on the N., by the Caspian Sea and Daghestan on the E., by Tiflis and Kutais on the §., and by Tchernomorsk and Kuban on the W. Tt has an area of 23,548 square miles. From Mt Elburz to Kazbek the southern boundary coincides with the main

snow-covered range of the Caucasus and thus includes its ’ highest peaks ; further east it follows a sinuous line so as to embrace the secondary chains and their ramifications. Nearly one-third of the area is occupied by hilly tracts, the remainder being undulating and flat land belonging to the depression of the Terek ; one-half of this last, on the left bank of the river, is occupied by sandy deserts, salt clay steppes, and arid stretches unsuited for cultivation. Granites, syenites, diorites, and Palaeozoic schists consti- tute the nucleus of the Caucasus mountains ; Jurassic and Cretaceous formations rise to great heights in the secondary chains; and a series of Tertiary formations, covered by Quaternary deposits, cover a wide area in the prairies and steppes. A group of mineral springs occurs about Pyati-GORSK (g.v.).

The climate is continental. The mean annual temperatures are 49°6 Fahr. at Pyatigorsk (1850 feet above the sea; January 39°, July 70°) and 47°°7 at Vtadikavkaz (2230 ft.; January 23°, July 69°), but frosts a few degrees below zero are not uncommon. The mountain slopes receive an abundance of rain (37 in.), but the steppes suffer much from drought (rainfall between 10 and 20 in.). Nearly the whole of the government belongs to the drainage area of the Terek, but the north-west corner is watered by the upper tributaries of the Kuma. The Terek rises at the height of about 8000 feet in the glaciers of the Kazbek on the southern slope of the main chain of the Caucasus, which it pierces by the Darial gorge to the south of Vtadikavkaz after having received several dons or streams (Res, Guzel, Fiag, Ar). In 58 miles it descends nearly 6000 feet. A few miles above Vtadikavkaz it is 2068 feet above sea-level, at Mozdok 441 feet, and it is 29 feet below the Black Sea at Kizlyar. From Vtadikavkaz it pursues a north-easterly direction before taking its eastward course ; it seems most probable that at a recent epoch (Post-Pliocene) it joined the Kuma and perhaps the Manytch instead of flowing into the Caspian. In the lower part of its course it flows at a highcr level than that of the neighbouring plains, and is kept in its bed by dams. Inundations are frequent and cause great destruction. The delta begins at Dubovka (50 miles from the Caspian), and at this part the river frequently changes its bed. The Old Terek is no longer navigable, the chief current being directed northwards into the New ‘Terek. Several canals made by the Cossacks supply water for the irrigation of the neighbouring fields. Its chief tributaries are the Sunja on the right, and the Tcherekh, the Baksan,

and the Malka, in its upper course, on the left. The population of the government in 1884 was 615,660; of 606,500 inhabitants returned in 1888, 238,230 were Little and Great Russians, 1230 Georgians, 18,500 Armenians, 4300 Germans, 2570 Poles, 4780 Jews, 23,630 Ossets, 194,480 Tchetchens and Ingushis, 72,160 Kabardians, 9130 mountaineers of the Avarian stem, 25,860 Kumyks, 1770 Tatars, 6270 Nogais, 2470 Kalmutks, and 1620 Persians. Out of these 239,500 were reckoned as belonging to the Greek Orthodox Church, 336,460 were Mussul- mans, 17,730 Gregorian Armenians, and the remainder Protestants, Catholics, and Jews. Owing to the great fertility of the soil in the well-watered districts, agriculture is the chief occupation. In 1882 the crops, although below the average, yielded 967,000 quarters of corn, 268,000 bushels of potatoes, 6,750,000 gallons of wine, and tobacco to the value of £18,000. Cattle breeding is extensively carried on in the steppes, and there were in the same year 118,630 horses, 582,800 cattle, and 1,226,400 sheep ; murrains, however, are frequent, and cause great loss. Manufactures occupy only 3371 per- sons, and their yearly production hardly reaches £300,000 in value. Petty trades are rapidly spreading in the villages. Trade suffers from want of good roads. The railway from Russia to the Caucasus has not yet (1887) got beyond Vtadikavkaz. The military and other chief roads have an aggregate of only 1300 miles. The exports are limited to corn, wine, cattle, and some raw produce.

The government is divided into six districts, the chief towns of which, with their populations in 1883, were Vtadikavkaz (32,340), the capital, Georgievsk (4250), Groznyi (6280), Kizlyar (8780), Moz- dok (8380), and Pyatigorsk (11,120).

TERENCE. P. Terentius Afer (185 2-159 B.c.) holds a unique position among Roman writers. No writer in any literature has gained so great a reputation who has con- tented himself with so limited a function. He lays no claim to the position of an original artist painting from life or commenting on the results of his own observation. His art has no relation to his own time or to the country in which he lived. The chief source of interest in the fragmentary remains of Nevius, Ennius, Pacuvius, Accius, and Lucilius is their relation to the national and moral spirit of the age in which they were written. Plautus, though, like Terence, he takes the first

sketch of his plots, scenes, and characters from the Attic stage, is yet a true representative of his time, a genuine Italian, writing before the genius of Italy had learned the restraints of Greek art. The whole aim of Terence was to present a faithful copy of the life) manners, modes of thought and expression which had been drawn from reality a century before his time by the writers of the New Comedy of Athens. The nearest parallel to his literary position may be found in the aim which Virgil puts before himself in his Bucolics, He does not seek in that poem to draw Italian peasants from the life, but to bring back the shepherds of Theo- critus on Italian scenes. Yet the result obtained by Virgil is different. The charm of his pastorals is the Italian sentiment which pervades them. His shepherds are not the shepherds of Theocritus, nor are they in any sense true to life. The extraordinary result obtained by Terence is that, while he has left no trace in any of his comedies of one sketching from the life by which he was surrounded, there is perhaps no more truthful, natural, and delicate delineator of human nature, in its ordinary and more level moods, within the whole range of classical literature.- His permanent position in literature is due, no doubt, to the art and genius of Menander, whose crea- tions he has perpetuated, asa fine engraver may perpetuate the spirit of a great painter whose works have perished. But no mere copyist or verbal translator could have attained that result. Though without claims to creative originality, Terence must have had not only critical genius, to enable him fully to appreciate and identify himself with his originals, but artistic genius of a high and pure type. The importance of his position in Roman litera- ture consists in this, that he was the first writer who set before himself a high ideal of artistic perfection, and was the first to realize that perfection in style, form, and con- sistency of conception and execution. Living in the in- terval between Ennius and Lucilius, whose original force and genius survive only in rude and inartistic fragments, he produced six plays, which have not only reached our time in the form in which they were given to the world, but have been read in the most critical and exacting literary epochs, and still may be read without any feeling of the need of making allowance for the rudeness of a new and undeveloped art.

While his great gift to Roman literature is that he first made it artistic, that he imparted to “rude Latium” the sense of elegance, consistency, and moderation, his gift to the world is that through him it possesses a living

image of the Greek society in the 3d century B.c., presented in the purest Latin idiom. Yet Terence had no affinity by birth either with the Greek race or with the people of Latium. He was more distinctly a foreigner than any of the great classical writers of Rome. He lived at the meeting-point of three distinct civilizations,—the mature, or rather decaying, civilization of Greece, of which Athens was still the centre; that of Carthage, which was so soon to pass away and leave scarcely any vestige of itself; and the nascent civilization of Italy, in which all other modes were soon to be absorbed. Terence was by birth a Pheenician,

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TERENCE

and was thus perhaps a fitter medium of connexion between the genius of Greece and that of Italy than if he had been a pure Greek or a pure Italian ; just as in modern times the Jewish type of genius is sometimes found more detached from national peculiarities, and thus more capable of repro- ducing a cosmopolitan type of character than the genius of

men belonging to the other races of Europe.

Our knowledge of the life of Terence is derived chiefly from a fragment of the lost work of Suetonius, De Viris

Iliustribus, preserved in the commentary of Donatus. Confirmation of some of the statements contained in the Life is obtained from later writers and speakers, and also from the prologues to the different plays, which at the same time throw light on the literary and personal rela- tions of the poet. These prologues were among the original sources of Suetonius; but he quotes or refers to the works of various grammarians and antiquarians— Porcius Licinus, Volcatius Sedigitus, Santra, Nepos, Fene- stella, @. Cosconius—as his authorities. The first two lived within a generation or two of the death of Terence, and the first of them shows a distinct animus against him and his patrons. But, notwithstanding the abundance of authorities, there is uncertainty as to both the date of his birth and the place and manner of his death. The doubt as to the former arises from the discrepancy of the MSS. His last play, the Adelphi, was exhibited in 160

B.o. Shortly after its production he went to Greece, being then, according to the best MSS., in his twenty-fifth ("nondum quintum atque vicesimum egressus! annum"), according to inferior MSS., in his thirty-fifth year. This uncertainty is increased by a discrepancy between the authorities quoted by Suetonius. Cornelius Nepos is quoted for the statement that he was about the same age as Scipio (born 185 8.c.) and Leelius, while Fenestella, an antiquarian of the later Augustan period, represented him as older. As the authority of the MSS. coincides with that of the older record, the year 185 3B.c. may be taken as the most probable date of his birth. In the case of an author drawing originally from life, it might seem improbable that he should have written six comedies, so true in their apprehension and delineation of various phases of human nature, between the ages of nineteen and twenty-five. But the case of an imitative artist, reproduc- ing impressions derived from literature, is different ; and the circumstances of Terence's origin and early life may well have developed in him a precocity of talent. His acknowledged intimacy with Scipio and Lelius and the general belief that they assisted him in the composition of his plays are more in accordance with the statement that he was about their own age than that he was ten years older. Terence, accordingly, more even than Catullus, Tibullus, or Lucan, is to be ranked among those poets who are the "inheritors of unfulfilled renown." He is said to have been born at Carthage, brought to Rome as a slave, and carefully educated in the house of M. Teren- tius Lucanus, by whom he was soon emancipated.

1 Ritschl reads tngressus, which would make him a year younger.

and in one of his prologues he declares it to be his ambi- tion, while not offending the many, to please the " boni,"

Terence's earliest play was thé Andria, exhibited in 166 B.c., when the poet could have been only about the age of nineteen. A pretty, but probably apocryphal, story is told of his having read the play, before its exhibition, to Ceecilius (who, after the death of Plautus, ranked as the foremost comic poet), and of the generous admiration of it manifested by Cecilius. A similar instance of the

| recognition of rising genius by a poet whose own day was

past is found in the account given of the visit of Accius, on his journey to Asia, to the veteran Pacuvius. The next play exhibited by Terence was the Hecyra, first pro- duced in 165, but withdrawn in consequence of the bad reception which it met with, and afterwards reproduced in 160. The Heauton-timoroumenos appeared in 163, the Lunuchus and Phormio in 161, and the Adelphi in 160 at the funeral games of L. AZmilius Paulus,

After bringing out these plays Terence sailed for Greece,

either to escape from the suspicion of publishing the works

of others as his own, or from the desire to obtain a more intimate knowledge of that Greek life which had hitherto been known to him only in literature, and which it was his professed aim to reproduce in his comedies, The latter is the more probable motive, and we recognize in this the first instance of that impulse to visit the scenes familiar to them through literature which afterwards acted on many of the great writers of Rome. From this voyage to Greece Terence never returned. According to one account he was lost at sea, according to another he died at Stym- phalus in Arcadia, and according to a third at Leucadia, from grief at the loss by shipwreck of his baggage, con- taining a number of new plays which he had translated from Menander. The old grammarian quoted by Suetonius states that he was ruined in fortune through his intimacy with his noble friends. Another account speaks of him as having left behind him property consisting of gardens, to the extent of twenty acres, close to the Appian Way. It is further stated that his daughter was: so well pro- vided for that she married a Roman knight.

The tone of the prologues to Terence’s plays is for the most part apologetic, and indicates a great sensitiveness to criticism. He constantly speaks of the malevolence and de- traction of an older poet, whose name is said to have been Luscius Lavinius or Lanuvinus. The chief charge which his detractor brings against him is that of contaminatio, the combining in one play of scenes out of different Greek plays. Terence justifies his practice by that of the older poets, Neevius, Plautus, Ennius, whose careless freedom he follows in preference to the “obscura diligentia” of his detractor. He

recriminates upon his adversary as one who, by his literal adherence to his original, had turned good Greek plays into bad Latin ones. He justifies himself from the charge of plagiarizing from Plautus and Nevius. In another prologue he contrasts his own treat- ment of his subjects with the sensational extravagance of others. He meets the charge of receiving assistance in the composition of his plays by claiming, asa great honour, the favour which he enjoyed with those who were the favourites of the Roman people.

We learn from these prologues that the best Roman literature was ceasing to be popular, and had come to rely on the patronage of the great. A consequence of this change of circumstances was that comedy was no longer national in character and sentiment, but had become imi- tative and artistic. The life which Terence represents is that of a well-to-do-citizen class whose interests are com- monplace, but whose modes of thought and speech are refined, humane, and intelligent. His characters are finely delineated and discriminated rather than boldly conceived,

as they are in Plautus. Delicate irony and pointed epi- gram take the place of broad humour. Love, in the form of pathetic sentiment rather than of irregular passion, 1s the chief motive of his pieces. His great characteristics are humanity and urbanity, and to this may be attributed the attraction which he had for the two chief representa- tives of these qualities in Roman literature,—Cicero and Horace. It was through the comedies of Terence that the finer influences of the Epicurean philosophy—the friendli- ness, the tolerance, the consideration for the feelings of others, inferiors as well as equals, inculcated by that philosophy—entered into Roman life and literature. The dissolving influence of that school on the severer personal morality of the older Roman republic also entered into Roman life through the same medium. But it was a great gain to the strong but rude Roman character to learn, as it could from every line of Terence, lessons not only of courtesy and social amenity but of genuine sym-

pathy and consideration.

Terence’s pre-eminence in art was recognized by the critics of the Augustan age:

‘“‘Vincere Cecilius gravitate, Terentius arte.” The art of his comedies consists in the clearness and simplicity with which the situation is presented and developed, and in the consist- ency and moderation with which his various characters play their part. But his great attraction to both ancient and modern writers has been the purity and charm of his style, whether employed in narrative or dialogue. This charm he derived from his familiarity with the purest Latin idiom, as it was habitually used in the intimate intercourse of the best Roman families, and also with the purest Attic idiom, as it had been written and spoken a century before his own time. The fine Attic flavour is more perceptible in his Latin than in the Greek of his contemporaries. He makes no claim to the creative exuberance of Plautus, but he is entirely free from his extravagance and mannerisms. The superiority of his style over that of Lucilius, who wrote his satires a generation later, is almost immeasurable. The best judges and the greatest masters of style in the best period of Roman literature were his chief admirers in ancient times. Cicero frequently reproduces his expressions, applies passages in his plays to his own circumstances, and refers to his personages as typical representations of character.4 Julius Cesar characterizes him as “puri sermonis amator.” Horace, so depreciatory in general of the older literature, shows his apprecia- tion of Terence’by the frequent reproduction in his Sattres and in his Odes of his language and his philosophy of life. Quintilian applies to his writings the epithet “elegantissima,” and in that connexion refers to the belief that they were the work of Scipio Africanus. His works were studied and learned by heart by the great Latin writers of the Renaissance, such as Erasmus and Me- lanchthon ; and Casaubon, in his anxiety that his son should write a pure Latin style, inculcates on him the constant study of Terence. Montaigne applies to him the phrase of Horace : ‘‘Liquidus puroque simillimus amni.”

He speaks of “his fine expression, elegancy, and quaintness,” and adds, “he does so possess the soul with his graces that we forget those of his fable.”2 It is among the French, the great masters of the prose of refined conversation, that his merits have been most appreciatedin moderntimes. Sainte-Beuve, in his Nowveaux Lundis, devotes to him two papers of

delicate and admiring criticism. He quotes Fénelon and Addison, “deux esprits polis et doux, de la méme famille littéraire,” as expressing their admiration for the inimitable beauty and naturalness of one of his scenes. Fénelon is said to have preferred him even to Moliére. Sainte-Beuve calls Terence the bond of union between Roman urbanity and the Atticism of the Greeks, and adds that it was in the 17th century, when French literature was most truly Attic, that he was most appreci- ated. M. Joubert is quoted? as applying to him the words “Le miel attique est sur ses lévres ; on croirait aisément qu’il naquit sur le mont Hymette.”

The most famous edition of Terence is that of Bentley, published in 1726. More recent editions are those of Parry, in the Bibliotheca Classica, and of W.

Wagner. The text has been edited by A. Flickeisen in the Teubner series of.

classics. A number of editions of the separate plays have been published recently both in England and in Germany. Wie

TERESA, St. See THERESA, St.

TERLIZZI, a town of Italy, in the province of Bari, and 20 miles west from that town, stands in the midst of a fertile plain. It has a castle which at one time was

1 See Hp. ad Fam., i. 9, 19, and Phil., ii. 15. 2 Essays of Montaigne (trans. by Ch. Cotton), chap. lxvii. 3 By E. Negrette, in his Histoire de la Littérature Latine.

very strong and occasionally resorted to by the emperor Frederick II. and afterwards by the Aragonese sovereigns. The walls and towers of the town still remaim, but the fosse has been turned into boulevards. ‘Terlizzi has a considerable trade, chiefly in the wine and fruit of the district. The population of the town in 1881 was 20,442 (commune, 20,592).

TERM (from the Latin terminus) in English law is used in two senses, the idea common to both being that of a limited and certain period of time. E

(1) It denotes (or rather did denote) a fixed time during which the courts are open for legal proceedings. Terms in this sense affected only what used to be called the superior courts,—that is, the Queen's Bench, Common Pleas, and Exchequer. They were originally the leisure seasons of the year which were not occupied by great feasts or fasts of the church or by agriculture. Their origin is no doubt to be traced back to the legislation of the early Christian emperors, the principle being adopted in England through the influence of ecclesiastical judges, and still surviving in the universities and Inns of Court. Terms were regulated by many Acts of parliament, the effect of which was to confine to a comparatively short period the time during which the courts could sit 7m banco,—that is, for the decision of questions of law as distinguished from the decision of questions of fact. There were four terms, Hilary, Easter, Trinity, and Michaelmas, the average duration of each being about three weeks. All legislation on the subject previous to 1873 is now merely of historical interest, for by the Judicature Act of that year the division of the year into terms was abolished so far as related to the adminis- tration of justice.

(2) It denotes the time during which an interest in an estate for life or for years is enjoyed, also the interest it- self, because such an interest must determine at a definite time. If the interest be for life, it is an estate of freehold ; if for years, only a personal interest in real estate, and so personalty, even though the length of the term—for in- stance, 1000 years—may far exceed in duration any possible life estate. A term of years is of two kinds,—the first that created by an ordinary lease reserving a rent, as of a house or a building lease ; the second that created by a settlement or a will, usually without rent reserved, for the purpose of securing payment of money, such as portions to younger children, by the owner of the land. Both kinds have been considerably affected by recent legislation. or instance, the Conveyancing Act, 1881, enables a mortgagor or mort- gagee in possession to make certain leases. Before 1845 provision was always made in conveyances for keeping on foot a term to attend the inheritance, as it was called,—that is, for assigning the remainder of a term to trustees for the protection of the owner of the property against rent-charges or other incumbrances created subsequently to the term, although the term had been satisfied,—that is, the purpose for which the term had been created had been fulfilled. By 8 and 9 Vict. c. 112 the assignment of satisfied terms was

rendered unnecessary. The Conveyancing Acts, 1881 and 1882, give power to enlarge the unexpired residue of a long term in certain cases into the fee simple.

In Scotland terms are the days at which rent or interest is pay- able. They are either legal or conventional: the legal are Whit- sunday and Martinmas ; the conventional are fixed by agreement between the parties. A recent Act (44 and 45 Vict. c. 39) makes uniform the law as to removal terms in burghs. Terms as times of court sittings were defined by 6 Anne c. 53, which fixed four terms— Martinmas, Candlemas, Whitsuntide, and Lammas—for the now obsolete Court of Exchequer. By 19 and 20 Vict. c. 56, s. 26, the winter and summer sittings of the Court of Session are to be held to correspond with the Exchequer terms.

TERMINI, or Termini ImErEsE (Therma Himerenses), a town on the north coast of Sicily, at the mouth of a river of the same name, in the province of Palermo, and

23 miles east-south-east of that town. None of its modern buildings are of any special interest ; in the Piano de San Giovanni above the town the substructure of a Roman villa has been excavated, and there are also traces of an amphitheatre. Terntni is one of the busiest provincial towns of Sicily; the surrounding district being exceed- ingly fertile and the harbour good, there is a considerable export trade in grain, fruit, tartar, and other products. The macaroni of Termini is in high repute. The tunny and sardine fisheries are extensive, and there is a school of navigation. The warm saline springs (110° Fahr.), sung by Pindar, are still largely resorted to, there being a well-appointed bath establishment, founded by Ferdi- nand I. The population of the town in 1881 was 22,370, with its suburbs 22,733 (commune, 23,148).

For the ancient history of Termini see Himmra. ‘The castle of Termini, which Robert of Naples besieged in vain in 1338, was destroyed in 1860.

TERMITES. See Ant, vol. ii. p. 99.

TERMONDE. See DENDERMONDE.

TERN (Norsk Verne, Tenne, or Tende ; Swedish Térna; Dutch Stern'), the name now applied generally to a group of sea-birds, the Sterninx of modern ornithology, but, according to Selby, properly belonging, at least in the Farne Islands, to the species known by the book-name of Sand- wich Tern, all the others being those called Sea-Swallows —a name still most commonly given to the whole group throughout Britain from their long wings, forked tail, and marine habit. In Willughby's Ornithologia (1676), however, the word Tern is used for more than one species, and, though it does not appear in the older English dic- tionaries, it may well have been from early times as general

a name as it is now.

Setting aside those which are but occasional visitors to the British Islands, six species of Terns may be regarded as indigenous, though of them one has ceased from ordinarily breeding in the United Kingdom, while a second has become so rare and regularly appears in so few places that mention of them must for prudence sake be avoided. This last is the beautiful Roseate Tern, Sterna dougalli ; the other is the Black Tern, Hydrochelidon nigra, belonging to a genus in which the toes are only half-webbed, of small size and dark leaden-grey plumage. Itis without doubt the Sterna of Turner, and in former days was abundant in many parts of the fen country," to say nothing of other districts. Though nearly all its ancient abodes have been drained, and for its pera sterilized these many years past, not a spring comes but it shows itself in small companies in the eastern counties of England, evidently seeking a breeding- place. All around the coast the diminution in the numbers of the remaining species of Terns within the last 50 years is no less de- plorable than demonstrable.

The Sandwich Tern, S. sandvicensis or S. cantiaca—named from the place of its discovery, though it has long since ceased to inhabit that neighbourhood—is the largest of the British species, equalling in size the smaller Gulls and having a dark-coloured bill tipped with yellow, and dark legs. Through persecution it has been ex- terminated in all its southern haunts, and is become much scarcer in those to which it still resorts. It was, however, never so abundant as its smaller congeners, the so-called Common and the Arctic Tern, —two species that are so nearly alike as to be beyond

discrimina- tion on the wing by an ordinary observer, and even in the hand require a somewhat close examination.? The former of these has eee mNRNON 0

‘ “Starn” was used in Norfolk in the 19th century as a name for the bird commonly known as the Black Tern, thus confirming Turner, who, in 1544, describes what seems to have been the same species as “‘nostrati lingua sterna appellata.” In at least one instance the word has been confounded with one of the old forms of the modern STARLING (vol. xxii. p. 457). To Turner’s name, repeated by Gesner and other authors, we owe the introduction by Linneus of Sterna into scientific nomenclature. ‘‘Ikstern” is another Dutch form of the word.

It was known there as Carr-Swallow, Carr-Crow (corrupted into “Scarecrow ”), and Blue Dar (qu. = Daw ?).

3 Linneus’s diagnosis of his Sterna hirundo points to his having had an ‘‘ Arctic” Tern before him; but it is certain that he did not sus- pect that specific appellation (already used by other writers for the ‘Common ” Tern) to cover a second species. Some modern authorities disregard his name as being insufficiently definite, and much is to be said for this view of the case. Undoubtedly ‘‘hirundo” has now been used so indiscriminately for one species or the other as to cause con- fusion, which is perhaps best avoided by adopting the epithets of Nau-

the more southern range, and often affects inland situations, while the latter, though by no means limited to the Arctic circle, is widely distributed over the north and mostly resorts to the sea- coast. Yet there are localities where, as on the Farne Islands, both meet and breed, without occupying stations apart. The minute diagnosis of these two species cannot be briefly given. It must suffice here to state that the most certain difference, as it is the most easily recognizable, is to be found in the tarsus, which in the Arctic Tern is a quarter of an inch shorter than in its kinsman. The remaining native species is the Lesser Tern, S. minuta, one of the smallest of the genus and readily to be distinguished by its per- manently white forehead. All the species already mentioned, except the Black Tern, have much the same

general coloration— the adults in summer plumage wearing a black cap and having the upper parts of the body and wings of a more or less pale grey, while they are mostly lighter beneath. They generally breed In association, often in the closest proximity—their nests, contain- ing 3 eggs at most, being made on the shingle or among herbage. The young are hatched clothed in variegated down, and remain in the nest for some time. At this season the parents are almost regardless of human presence and expose themselves freely.

At least half-a-dozen other species have been recorded as occurring

in British waters, and among them the Caspian Tern, 8. caspia,.

which is one of the largest of the genus and of wide distribution, though not brecding nearer to the shores of England than on Sylt and its neighbouring islands, which still afford lodging for a few pairs. Another, the Gull-billed Tern, S. anglica, has also been not unfrequently shot in England. All these species are now re- cognized, though the contrary was once maintained, as inhabitants of North America, and many go much further.

An excellent synopsis of the Sub-family Sterninz has been given by Mr Howard Saunders in the Zoological Proceedings (1876, pp. 638-672). He recognizes 5 genera, —Hydrochelidon (with 3 species), Sterna (with 38), Venia, a very aberrant form consisting of but one species, the Inca Tern, peculiar to the western coast of South America, and G'ygis, composed of 2 species of purely white birds and restricted to the southern hemisphere; his fifth genus is Anous, to which belong the various species of Noppy (vol. xvil. p. 531). Often confounded with these last are the two species called in books Sooty Terns (8. fuliginosa and S. anexstheta), but by sailors " Egg-birds" or " Wide- awakes" from their cry. These crowd at certain seasons in innumerable multitude to certain islands within the tropics, where they breed, and the wonderful assemblage at present known as "' Wide-awake fair" on the island of Ascension has been more or less fully described from very ancient times. Dampier in his voyage to New Holland in 1699 particularly described and figured the Sooty Tern (Voyages, iii. p. 142), discriminating it from the Noddy, from which it had not before been distinguished. (A. N.)

TERNATE, a small island in the East Indian Archi- pelago, off the west coast of JiLozo (q.v.), in 0° 48’ N. lat. and 127° 19’ E. long. It is nearly circular in form, with an area of about 25 square miles, and consists almost entirely of a very remarkable volcano (5600 feet) formed of three superimposed cones. Frequent and de- structive eruptions have taken place. Cocoa-nuts, sago, tobacco, cotton, sulphur, and saltpetre are the chief pro- ductions of the island. The clove, which had been ex- tirpated by the early Dutch rulers to enhance its value by restricting its cultivation to the Banda Islands, Am- boyna, &c., is beginning again to be grown, as also is the nutmeg. The inhabitants are nearly all Mohammedan Malays. The town of Ternate, with a population of about 9000, is the seat of a native sultan and of a Dutch resident ; the harbour is commanded by a fort. The residency, which includes a part of the eastern coast of Celebes (see CELEBES), the greater part of Jilolo, and numerous smaller islands, has an area of 26,900 square miles and a population estimated at about 290,000.

mann (Isis, 1819, pp. 1847, 1848), who, acting on and confirming the discovery of Nitzsch (who first detected the specific difference), called the southern species S. fluviatilis and the northern S. macrura. Temminck’s name S. arctica applied to the latter a year later has been most generally used for it, notwithstanding,

TERNI, a town of Italy, in the province of Perugia, is situated in the fertile valley of the Nera, between two branches of that river, about 5 miles below the point where it is joined by the Velino. It has a station, three- quarters of a mile off, on the railway line between Rome and Ancona, 69 miles to the north of the former city and 19 south by west from Spoleto. Terni is an episcopal see, and the seat of a sub-prefecture and a chamber of commerce. Its public buildings include the cathedral (17th century), the church of 8. Francesco (partly dating from the 13th century), a gymnasium, and a theatre. Terni manufactures leather and cloth, and has some trade in wine and silk. For the traveller its chief interest lies in its antiquities (remains of an amphitheatre of the time of Tiberius, a temple, a theatre, baths, and numerous inscrip- tions) and in the proximity of the falls of Velino (Cascate delle Marmore). Alike in volume and in beauty these take a very high place

among European waterfalls; the cataract has a total descent of about 650 feet, in three leaps of 65, 330, and 190 feet respectively. They owe their origin to M’. Curius Dentatus, who in 272 8.c. first opened an artificial channel by which the greater part of the Lacus Velinus in the valley below Reate was drained. The population of the town in 1881 was 9415, with its suburbs 10,371 (commune, 15,853).

Terni is the ancient Jnteramna (‘‘inter amnes”), originally belonging to Umbria and founded, according to a local tradition, in the year 672 8.c. It early became a flourishing municipium, and it did not permanently suffer through being portioned out among his soldiers by Sulla. Its inhabitants had frequent litigations and disputes with their neighbours at Reate in connexion with the regulation of the Velinus, the waters of which are so strongly im- pregnated with carbonate of lime that by their deposits they tend to block up their own channel. The first interference with its natural course was that of M’. Curius Dentatus already referred to. In 54 8B.c. the people of Reate appealed to Cicero to plead their cause in an arbitration which had been appointed by the Roman senate to settle disputes about the river, and in connexion with this he made a personal inspection of Lake Velinus and its outlets. In the time of Tiberius there was a project for regulating the river and its outlets from the lake, against which the citizens of Inter- amna and Reate energetically and successfully protested (Tac., Ann., i. 79). Similar questions arose as the river formed fresh deposits during the Middle Ages and during the 15th and 16th cen- turies. A brancli of the Via Flaminia passed from Narnia to Forum Flaminii, and is given instead of the direct line in the Antonine and Jerusalem itineraries. The emperor Tacitus and his brother Florianus were probably natives of Interamna, which also has been claimed as the birthplace of Tacitus the historian, but with less reason. ‘Terni was the scene of the defeat of the Neapolitans by the French on 27th November 1798.

TERPANDER, a Lesbian poet and musician, settled in Sparta about the end of the Second Messenian War (668 B.c.). According to some accounts, he was invited thither by command of the Delphian oracle to compose the differences which had arisen between different classes in the state. His innovations in music were considered to have inaugurated a new era of musical art in Greece ; but we are very imperfectly informed as to their

nature. On the strength of a fragment (No. 5 in Bergk), which may or may not be genuine,—"'rejecting the four-toned song, we will sing to thee new hymns with the seven-voiced lyre,"— Strabo says that he increased the number of strings in the lyre from four to seven; others take the fragment to mean that he developed the citharcedic nomos (sung to the accom- paniment of the cithara or lyre) by making the divisions of the ode seven instead of four. We possess six short frag- ments of poetry in the Dorian dialect bearing the name of Terpander. They are from hymns to the gods Zeus, Apollo, Apollo and the Muses, the Dioscuri, &c., and are written in a slow spondaic movement or in dactyls. They present ~ no remarkable features and are probably spurious.

Bergk, Poetx Lyrici Greci, iii. (4th ed.) pp. 7-12, Leipsic, 1882.

TERRACINA, a town of Italy, in the province of Rome, and about 60 miles to the south-east of that city, at the

south-east extremity of the Pontine marshes, where the Monti Lepini (see Iraty, vol. xiii. p. 438, and Latium) descend into the sea. The ancient town (Volscian Ancur, Roman Yarracina) stood on the white hillside ("impositum saxis late candentibus Anxur"), along the foot of which, by the seashore, ran the Via Appia. The modern town stands mainly on the level ground. The most conspicuous building is the cathedral, which is believed to occupy the site of a temple of Jupiter Anxurus; it is enriched both externally and internally with beautiful old columns and Roman mosaics. Above the town, on the summit of the cliff, are the remains of a palace of Theodoric (c. 500), afterwards a medieval castle. The ancient harbour, con- structed by Antoninus Pius and once very important, is now silted up; a new mole affords shelter to coasting vessels. Fishing is carried on, and there is some trade in the produce of the district. The population of the town in 1881 was 6294 (commune, 8572).

Anxur finally became Roman in 400 B.c., and a colony was established there in 329. Its strategic position early gave it mili- tary importance ; and its pleasant situation and its mineral waters led many Romans to build villas and seek seaside quarters there.

TERRA-COTTA.! Strictly speaking this name is Mean. applicable to all objects made of baked clay, from the ing.

rudest brick to the finest piece of pottery, but it usually has a more limited meaning, to denote fictile objects which do not come under the head of pottery, such as statuettes and busts; and in its architectural use it specially implies the finer sorts of decorative clay-work, to the exclusion of common building bricks. In ancient times, especially among the Greeks and Romans, terra- cotta was employed for an immense variety of purposes, from the commonest objects of everyday use to the most elaborate and ambitious works of art, such as colossal statues and groups. Though the natural colour and sur- face of the burnt clay are generally very pleasing in tone and texture, it seems to have been universally the custom in classical times to cover the terra-cotta completely with a thin white coating, which formed an absorbent ground for the further application of colour. For internal work, except in rare instances, these colours were mixed with a tempera medium, and applied after the clay had been fired. They were therefore not true ceramic colours; and pigments of great variety and brilliance could be employed, as they had not to undergo the severe ordeal of the kiln. For external work, such as that shown in fig. 5, only earth pigments such as ochres and lime were used, and the colours were fired.

No branch of archeology has during the last dozen Greek

years or so developed so rapidly as that of Greek terra-

cotta figures; on this most fascinating subject an aston- oa

ishingly large mass of literature has been published in Germany and France.2. The discovery of this new world of Greek art began practically in 1873, with the first ex- cavations in the tombs of Tanagra, a Bceotian town on the high road from Athens to the north, which brought to light a number of very beautiful terra-cotta statuettes.’ Subsequent excavations at Corinth, Smyrna, Cyme, Taren- tum, the Cyrenaica, and many other places also yielded a vast number of terra-cotta figures of various dates and styles. By far the greater number belong to the second half of the 4th century B.c.; but examples of an earlier

1 An Italian word meaning literally ‘‘ baked earth.”

2 See list at the end of the present article.

8 See Bull. Com. Inst. Arch., 1874, p. 120. Many thousand tombs have been opened at Tanagra, partly cut in the rock and partly built of masonry. The statuettes were either arranged round the body or packed in large vases. The costume of the female figures is the same as that described by classical writers as being peculiar to the neigh- bouring city of Thebes. The finest of the Tanagra figures are from 8 to 9 inches high.

date are not wanting, not only of figures in the round, but also of reliefs, which appear to have been largely used for the decoration of the flat surfaces of walls and friezes. The earliest of all date from a quite prehistoric period, and are mostly small idol-like figures of the rudest possible form, having an almost shapeless trunk with stick-like projections for the limbs, and the breasts and eyes roughly indicated by round dots. They are usually decorated with coarse stripes or cheques in ochre colours. Examples of these have been found at Hissarlik (Troad), in Cyprus and other islands, and in the citadel of Tiryns in 1884-85 by Dr Schliemann and Dr Dérpfeld. Later but still very archaic figures, 2 or 3 inches high, have been exhumed in many parts of the AZgean Islands; some of these are stiff seated figures of deities,—links between Oriental and Hellenic art, like the statues of the Sacred Way at Bran- chides (south of Miletus). Comparatively few specimens

interest and naturalistic pathos bring us in closer contact with the life and personalities of the past than any more ambitious style of art could possibly do. Moreover, they prove more clearly even than the great plastic works in bronze and marble how deeply a feeling for beauty and a knowledge of art must have penetrated the whole mass of the people. Their immense number shows that they must have been far from costly, within the reach of every

one, and certainly not the production of any famous sculptors. Nevertheless, sketchy as they are in treatment and often faulty in detail, they are in pose, in motive, and in general effect works of the highest beauty, full of the most inimitable grace, and evidently the production of men in whom the best qualities of the sculptor were innate by a sort of natural ae:

birthright. Several small figures from

exist of the best period of Greek art—the 5th century.! A relief in the Louvre (about 18 by 12 inches) with a pierced background, dating from the first half of the 5th century, represents two female mourners at a sepulchral stele,—one standing and the other seated ; under the foot of the latter is inscribed AAEKTP, On the other side of the stele are two youths (the Dioscuri) standing by a horse. The whole design is simple, but very graceful, and the modelling is skilfully treated in very low relief. The colouring—blue, red, white, and dark brown—is well preserved. This relief was pressed in a mould, and was intended to be attached to a wall, probably that of a tomb, as a votive offering to the dead.?

In most cases the terra-cotta figures and reliefs occur in or close by tombs, but it is only in comparatively rare instances that the subjects represented have any reference todeath. Another large class have been found in the vicinity of temples, and are probably votive offerings, such as the small statuettes of horses from the acropolis of Athens, now in the Louvre. In other cases, as at Halicarnassus, great quantities of small figures were buried under a temple, probably to purify the site, as was done in Egypt under the later dynasties, when many hundred figures of bronze Were sometimes buried under one building. Owing to the fact that the statuettes found scattered in and round tombs have frequently their heads broken off, Pottier and Reinach have suggested that they were brought as offer- ings to the dead and their heads were broken off by the mourners at the side of the tomb. Rayet believes that this practice was a sort of survival of the custom of sacrificing female and boy slaves at the tombs of the dead. In many cases, however, the figures are intact, and it is probable that many of the tombs were broken Open and rifled long ago, which would explain the muti- lated and scattered condition of the figures. The tombs of Tanagra have yielded by far the richest finds of these figures, the specimens being

very remarkable for their beauty. These exquisite statuettes do not (in most cases) represent deities or heroic personages, but the homely every-day life of the Greeks, treated with great simplicity and evident realism: they are in plastic art what in painting would be called genre,? and in their strong human

1 A good example of a terra-cotta relief of the first part of the 5th century B.c. is figured in vol. ii, p. 852,

? Some very beautiful fragments of reliefs in terra-cotta are pre- served in the museums of the Louvre, of Copenhagen, and the Kir- cheriano in Rome. These represent on a small scale parts of Phidias's Panathenaic frieze, which have all the appearance of being works of the 5th century B.c., but may possibly be forgeries or Roman copies ; see Waldstein, Art of Pheidias, Cambridge, 1885.

3 In some the most homely sort of genre is represented,—a girl milking a cow, a cook or a barber at his work, &c. Even portrait figures occur, as, for example, a wonderfully lifelike group of a man

and his wife in the collection of Mr Ionides, recently lent to the South Kensington Museum.

Myrina (Mysia) have the artist's name in- scribed on them ; but signatures of this sort are rare.*

It is impossible to describe the many subjects treated. Only a few examples can bementioned. Among single figures the most frequent are those of girls stand- ing or seated in an immense variety of pose, and with plenti- ful drapery arranged in countless methods, showing the great taste with which a Greek lady could Fic. 1.—Statuette of a girl and infant Eros dispose the folds of from Tanagra. (St Petersburg.)

her ample pallium, whether it hung in graceful loops or was wound closely round the figure or formed a hood-like veil over the head. In some the lady holds a leaf-shaped

Fic, 2.—Aphrodite and cupids.

The pendant hung round the neck of Aphrodite is gilt.

(South Kensington Museum.)

fan, or is looking in a circular mirror, or holds a ball ready for the game. Many have a strange broad hat, probably of straw, which does not fit on the head, but must have

ee ee eee * See Gaz. des B.-Arts, xxxiii., 1886, p. 278.

Tech- nical methods.

Asia Minor statu- ettes.

the labours of Heracles. These also mostly date from the 4th century B.c., and the statuettes often appear to be copies from sculpture of the school of Praxiteles or Scopas. One instance is the fine nude figure of Eros as a youth leaning against a cippus, holding a bronze arrow in his hand, in the collection of M. de Branteghem, now in Rome.2 The whole of it was gilt, which was frequently the case with the Asia Minor statuettes, but rarely so in those of Tanagra.2 A very beautiful figure of a winged Victory in the same collection (from the Castellani sale) presents the same motive as the colossal Victory of Samothrace (in the Louvre) ; it supplies the missing right hand, which in the terra-cotta contains a bunch of roses. The drapery of this figure is blue, mottled, or shot with gold. Other figures, from their heights being arranged in even gradations, seem to be copies from some large pedi- mental sculpture. Unfortunately little is yet known of the various fabriques of these Asia Minor figures, as in most cases their provenance is very doubtful. The Lecuyer collection possessed some groups with several figures forming important compositions. One of these shows two female mourners at a tomb, and a warrior clad in full armour with his horse. The most remarkable group (see fig. 4) is that of a soul led by Hermes Psycho-

A)

been fastened by a pin to the hair or veil. One very beautiful motive is that of a girl playing with an infant Eros, who flies to her for shelter, and is received with welcome half tinged with dread. Fig. 1 shows a very lovely statuette of this kind, now in the Hermitage Palace. A favourite subject is taken from a game in which one girl carries her playmate on her back,—a motive which, though difficult to treat in sculpture, is managed very gracefully in terra-cotta. Other very lovely groups are Aphrodite suckling the baby Eros, or with more than one cupid hovering round her. A very beautiful example (see fig. 2) occurs in the South Kensington Museum (from the Castellani sale). It represents a half-nude figure of Aph- rodite reclining on a couch, with two cupids behind holding up a veil, which was coloured blue to form a background to the creamy white of Aphrodite's body.

The Tanagra and other figures are all formed of thin pieces of soft clay pressed into a mould, usually formed in two halves and then stuck together; and they are made hollow so as not to warp and crack in the firing, and have a hole at the back for the escape of moisture during that process. The head is solid and was formed in a separate mould, as were also any accessories, such as fans or mirrors, and arms if they extend away from the body. Replicas of the same figure are often varied by having different heads or accessories; three or four ex- amples have been found from the same mould. After the whole was put together it was usually touched up and finished with modelling tools. The colour was applied after baking; a coating of creamy white lime or chalk all over served as the flesh tint and also as a good ground for the other colours. The hair of the females is always of arich auburn red, such as the Venetians were so fond of painting in the 16th century; blue was touched on the eyes and crimson on the lips. Drapery, if not white, was usually rose-colour or blue, often with a fringe or bands of gold on the border. Necklaces, earrings, and other ornaments were generally gilt, the gold leaf being applied over a slightly raised surface of slip, as on the Greek vases. Similar examples have been found in tombs at Thebes, at Thespize, and round Athens. Some of the Attica figures are covered, not with the usual non-ceramic colours, but with a real white ena- mel, the vitrified surface of which is very often slightly decomposed ; further coloured decoration was in some cases added over this enamel.

A number of places in the west of Asia Minor have yielded large quantities of terra-cotta figures, very similar in size and technique to those of Tanagra, but belong- ing for the most part to quite a different school of sculpture. Un- like the Tanagra figures, which are rather pictorial in style and deal with genre subjects, those from Smyrna, Cyme, Myrina, and other places in Asia Minor are thoroughly sculpturesque in design, and are fre- quently miniature reproductions of f large statues or groups (see fig. 3). Many of them stand on moulded pedestals, while the Tanagra figures have only a thin slab of clay asa se am add = _. of base. The average size of _ both (Berlin ieanae) os classes is from 6 to 10 inches high. Very elaborate groups with three or four figures often occur. Dionysiac and Bacchanal subjects are fre- quently chosen, or scenes from sacred mythology, such as

Fia. 4.—A soul about to enter Charon's bark. (Prince Liechtenstein's collection, Vienna ; formerly in the Lecuyer collection.)

pompus to the bark of Charon, who is represented as a bent aged man. Hermes, a graceful nude figure, gently urges the shrinking soul—a draped female figure—to the boat, at the brink of the rush-grown Styx. The whole scene is imagined with much tender grace and real pathos, though not highly finished in its details. One of the most important terra-cotta figures yet discovered has recently been brought to England from Smyrna. It isa very beautiful copy of the Diadumenos of Polycletus, which in the details of its modelling reproduces some characteristics of the later school of Praxiteles. The fore- arms and the legs below the knee are lost ; but in breadth

1 Fine examples of all these existed in the collection of M. Lecuyer, which is now dispersed (see Lenormant, Coll. Lecuyer de terre-cuites, Paris, 1884, which is well illustrated with photographs).

2 In a few other examples objects of bronze are placed in the hands of the figures.

3 The lovely series of little figures of dancing cupids from Tanagra, some of which are in the Louvre and others in the South Kensington Museum, were wholly gilt, but the larger statuettes of Tanagra appear to have had gold applied only for special ornaments.

4 For many reasons both finders and dealers usually wish to keep secret where valuable finds are made. In most museums the labels simply repeat the dealer’s account (for want of better information), so that the statement of the provenance must usually be accepted with caution.

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Syrenaic statu- ‘tte

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THERRA-COTTA

of modelling and grandeur of style this little figure, which was only about 14 inches high when perfect, has the effect of a much larger statue, and it is a real master- piece of Greek plastic art.1 In the neighbourhood of Smyrna and Ephesus a large number of caricature figures have been exhumed, some of which are modelled with a wonderful feeling for humour.” These strange figures have attenuated limbs, large heads, flapping ears, and goggle eyes. Some play on musical instruments ; others represent actors; and one in the De Branteghem collec- tion is a caricature of a discobolus in almost the attitude of Myron’s celebrated statue.

A very different class of statuettes has recently come to light in the Cyrenaica, on the northern coast of Africa. Many of these are nude female dancers wearing an elaborate stephanos-like head-dress. They are realistic in modelling and very ungraceful in pose,—a striking con- trast to the exquisite taste of the Tanagra and most of the Asia Minor figures. Recent excavations in the tombs of Corinth have produced a large number of fine terra- cottas, ranging in date over a very long period. Another and artistically very perfect class of figures is being dug up from among the tombs of Tarentum. Some of these belong to the finest period of Greek art,

probably about 400 B.c., and others are even earlier. Many are not statuettes, but merely small busts of heroic style, and of the highest sculpturesque beauty. They are certainly not portraits, and do not appear to repre- sent deities. It.has been suggested that they are ideal- ized representations of ancestors, whose commemoration, in some places, formed an important cult; but their real meaning must for the present remain uncertain. Many thousand votive figures and reliefs in clay have been found within the temenz of the temples of the Chthonian deities at Tarentum and elsewhere. It seems to have been customary for the priests periodically to clear out of the temples the broken or too numerous offerings which were then buried within the enclosure ; whole series arranged chronologically in groups have been discovered buried in separate holes.

In addition to statuettes and reliefs, terra-cotta was used by the Greeks for various minor ornamental pur- poses. Delicately moulded necklaces and pendants for ears were stamped out in clay and then thickly covered with gold leaf; this produced a very rich effect at a small cost ; many fine examples are preserved in the Louvre. Children’s toys, such as miniature horses and chariots, and dolls with movable limbs of terra-cotta fastened with wooden pegs, occur in many tombs.

On a larger scale terra-cotta was adapted by the Greeks to important architectural ornamentation. Many fine examples have been found at Olympia and among the ruined temples of Selinus. In some cases the main cornices of the building were simply blocked out square in stone, and then covered with moulded plaques of terra- cotta, carefully formed to fit on and round the angles of the block. The large cymatium which forms the upper member of the cornice is curved upwards, so as to prevent the rain water from dripping all along the edge; and at intervals it is pierced by ornamental clay pipes, which project like a medieval gargoyle. In some examples from Selinus the cymatium is pierced with a beautiful Open pattern of lotus leaf (see fig. 5). The greatest care was taken in fitting these applied mouldings where each plaque joined the next, and especially in making them fit closely on to the stone blocks, in which rebates were cut to receive each plaque. The whole surface of

1 See Journ. of Hellenic Studies, vol. vi., 1886, p. 248.

? The British Museum possesses some fine caricatures of actors from Canino, very skilfully modelled and of a peculiar fabrique.

the terra-cotta is covered with elaborate painted orna- ments of great beauty, in ochre colours applied on a white ground, as in the case of the statuettes. These beautiful temple decorations are well illustrated by Dérpfeld and

Fia. 5.—Cornice enrichments of painted terra-cotta from Selinus. This section shows the careful way in which the terra-cotta is fitted on to the stone; the colours are red and brown ochre and cream-white.

others in Die Verwendung von Terra-cotten, Berlin, 1881. Though no complete examples of terra-cotta statuary now exist, it is certain that the Greeks produced it on a large seale and of the highest class of workmanship. Pliny (H._N., xxxv. 36) mentions that certain statues of Hercules Musagetes and the Nine Muses were “opera figlina,” executed by the painter Zeuxis. These were brought from Athens by M. Fulvius Nobilior, and placed in the temple of Hercules Musagetes, which adjoined the Porti- cus Octavie in the Campus Martius of Rome. Other and earlier examples of clay statues are mentioned by Pausanias.

Among the Etruscans the use of clay for important sculp- Etruscan,

ture was very frequent,—painted terra-cotta or bronze almost excluding marble and stone. An important ex- ample was the clay quadriga on the pediment of the temple of Capitoline Jupiter, which, according to one legend, was brought from Veii by Tarquinius Superbus. This existed till the destruction of the temple by fire in 83 B.c., and was considered one of the seven precious relics on which the safety of the Roman state depended. The great statue of Jupiter in the central cella of this triple temple was also of terra-cotta, and was said to be the work of an Etruscan sculptor from Fregenz. Vitruvius mentions “signa fictilia” as being specially Etruscan. Many other statues in the early temples of Rome were made of the same material. Among the existing specimens of Etruscan terra-cotta the chief are

large sarcophagi, with recumbent portrait effigies of the deceased on the top, the whole being of clay, decorated with painting. Fine examples exist in the Louvre and the British Museum; a good specimen from the latter collection is figured in vol. viii., plate VIII. The Museo Gregoriano in the Vatican possesses some very beautiful friezes of a later date—about the 4th century B.c.—when native Etruscan art had been replaced by that of Greece. These friezes are very rich and elaborate, with heads and scroll foliage in very salient relief. Some of them have at intervals cleverly moulded heads of satyrs, painted a brilliant crimson.

Another very elaborate application of terra-cotta is shown Magna- in the numerous large asci, covered with statuettes, which Grecian.

are found in the tombs of Canosa (Canusium), Cales, and

3 The use of this strongly glowing red is almost peculiar to Hellenic Italy ; the other colours used there were much the same as those of Greece itself. The same magnificent crimson often occurs on cenochoe, moulded into the form of satyrs' heads, which are found in the tombs

of Magna Grecia. XXIII. — 25

many parts of Magna Grecia. The statuettes are some- what similar in style and colourmg to the Tanagra figures, and date from about the same period (4th century B.c.), but are not equal to them as works of art; they are also usually crowded together in a somewhat awkward manner.! The British Museum is specially rich in these elaborate terra-cottas ; few of the colours used appear to be true ceramic pigments.

As in other branches of art, the Romans closely copied the Greeks in their wide application of terra-cotta for statues, reliefs, and architectural ornaments. A large num- ber of beautiful Graeco-Roman reliefs exist, many having designs evidently copied from earlier Greek sculpture. Berlin, the Louvre, the British Museum, and many places in Italy possess fine collections. Friezes with beautiful reliefs 12 to 18 inches deep often occur, little inferior in execution to the earlier Greek work. Many subjects of great

interest are represented: a very fine plaque in the Louvre has the scene of Orestes taking refuge at the sacred omphalos at Delphi, which is represented as a conical stone about 3 feet high, hung round with ornamental festoons made of gold.2 These terra-cottas belong to the early period of the empire; in the 2d century A.D. they became much coarser and less Greek in style, like all the sculpture of that time. A plaque in the Louvre, which represents a chariot-race in the circus, bears its maker's stamp, L.S.ER. At the end of the first and in the early part of the 2d century A.D. the use of terra-cotta for architectural adornment was carried to a high point of perfection in Rome. Many buildings of this period have + the most elaborate decora- | tion moulded in clay and fitted together with wonder- | ful neatness. Not only en- | riched cornices and friezes | were made of terra-cotta, but | even Corinthian columnswith | their elaborate acanthus capi- | tals. In all cases the whole | surface appears to have been | , covered with a thin coating Wp of "opus albarium" and then decorated with colours and even gold. The best existing «, examples in Rome are thew Amphitheatrum Castrense, | ~ many tombs on the Via La- | tina, and the barracks of the | VIIth cohort of the guards | (vigiles) in the Trastevere. | But few examples exist of | the large Roman terra-cotta | sculpture ; the best are some | seated female figures from ' tombs, small life-size, in the | Capitoline museum,—works | of great beauty and very skil- | fully fired without cracks or : warping. The British Mu-¥

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seum also contains fine speci- Fic. 6.—'Terra-cotta statue of the mens of terra-cotta sculpture Muse Urania, Ist century a.D.

on a large scale, especially a

the torso of a nude male figure (Hercules), some ter- minal figures of Bacchus, and a beautiful statue of Urania (see fig. 6).

1 A very large ascus from Canosa in the British Museum is deco- rated with no less than five statuettes of women and Victories, two large masks of Medusa, and six projecting figures of horses.

? Compare a similar representation of the omphalos on a Greek vase illustrated by Jahn, Vasenbilder, Hamburg, 1839.

| truth, combined

| masterpieces of

In the 14th and more especially in the 15th century Meq;. terra-cotta was adapted in various parts of Europe to the eval. most magnificent and elaborate architectural purposes. In Germany the mark of Brandenburg is specially rich in terra-cotta work.? The church of St Catherine in the town of Brandenburg is decorated in the most lavish way with delicate tracery and elaborate string-courses and cornices, – enriched with foliage, all modelled in clay; the town-hall is another instance of the same use of terra-cotta. At Tangermiinde, the church of St Stephen and other build- ings of the beginning of the 15th century are wonderful ex- amples of this method of decoration ; the north door of St Stephen's especially is a masterpiece of rich and effective moulding. In northern Italy this use of terra-cotta was carried to an equally high point of perfection. The Italy, western fagade of the cathedral of Monza is a work of the most wonderful richness and minute elaboration, wholly | executed in clay, in the latter part of the 14th century. The cathedral of Crema, the communal buildings of Piacenza, and S. Maria delle Grazie in Milan are striking examples of the extreme splendour of effect that can be obtained by terra-cotta work. The Certosa near Pavia has a most gorgeous specimen of the early part of the | 16th century ; the two cloisters are especially magnificent. i Pavia itself is very rich in terra-cotta decoration, especially the ducal palace and the churches of S. Francesco and §. |

Maria del Carmine. Some delicate work exists among the medieval buildings of Rome, dating from the 14th and 16th century, as, for example, the rich cornices on the south aisle of 8. Maria in Ara Cceli, c. 1300; the front of

S. Cosimato in Trastevere, built c. 1490; and a once very magnificent house, near the Via di Tordinone, which dates

from the 14th century. The most important application of terra-cotta in medizval Italy was to statuary—reliefs, busts, | and even groups of many life-sized figures—during the | 15th and 16th ae

centuries. Much 4

of the Florentine terra-cotta sculp- ture of the 15th century is among the niost beauti- ful plastic work the world has ever seen, espe- cially that by Jacopo della Quercia, Dona- tello, and the sculptors of the nextgeneration.® | For life, spirit, &

and realistic y HO HE

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with — sculptur- cig : tie esque breadth, F1¢ .—Portrait bust in terra-cotta: Florentine 4 onl work of the middle of the 15th century. (South

these pieces are Kensington Museum.)

invention and manipulation. The portrait busts are perfect models of iconic sculpture (see fig. 7). In some respects the use of burnt clay for sculpture has great advantages over that of marble: the soft clay is easily and rapidly moulded into form while the sculptor's thought is fresh in his mind, and thus terra-cottas often possess a spirit and vigour which can hardly be reproduced in the laboriously finished marble. These

3 See Adler, Mittelalterliche Backstein-Bauwerke, Berlin, 1862.

4 See Gruner, Terra-cotta Architecture of N. Italy, London, 1867.

5 The South Kensington Museum possesses a very fine collection of Florentine terra-cottas of the best period.

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qualities are specially remarkable in the best works of the Della Robbia family (see Roppra). In the 16th century a more realistic style was introduced, and this was heightened by the custom of painting the figures in oil colours. Many very clever groups of this class were produced by Ambrogio Foppa (Caradosso) for 8. Satiro at Milan and by Guido Mazzoni and Begarelli (1479-1565) for churches in Modena. These terra-cotta sculptures are unpleasing in colour and far too pictorial in style; but those of Begarelli were enthusiastically admired by Michelangelo. Much fine terra-cotta work was produced in France during the 16th century, partly under Italian influence,—many sculptors from northern and central Italy having settled in France, especially under the patronage of Francis I. In the same century a similar Italian influence prevailed largely throughout Spain, and very clever works were produced there, remarkable for their vivid realism and deceptive

tall pictorial style. In England the elaborate use of terra-cotta

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did not come into vogue till the early part of the 16th century, and then only in certain counties. Essex pos- sesses the finest examples, such as those of the manor Louse of Layer Marney, built in the reign of Henry VIII. The richly moulded windows and battlements of this house are very un-English in style, and it seems probable that all the terra-cotta decorations were made in Holland or Flanders. A richly decorated terra-cotta tomb with re-cumbent effigy exists in the church of Layer Marney ; and in the collegiate church of Wymondham in Norfolk there are very large and elaborate sedilia with lofty canopied niches, all of clay, which appear to be of the same date and fabrique as the Essex examples. Most of the terra- cotta sculpture in England, such as that by Torrigiano, of which fragments exist in Westminster Abbey, the colossal heads of the Czesars at Hampton Court, and the recumbent effigy in the Chapel of the Rolls,? were the work of Italian sculptors, mostly from Florence, who were invited to Eng- land in the reigns of Henry VII. and Henry VIII.

Of late years terra-cotta for architectural purposes has been employed for some very important buildings in London, such as the natural history museum at South Kensington, the Albert Hall, and the front of the other

museum in the Exhibition Road. The durability of well- fired clay, its dense texture, pleasant colour, and smooth surface make it specially suitable to an atmosphere laden with acids and soot as is that of London. The surface resists decomposition, and affords little hold to the minute particles of carbon. The great improvements which have been made in the manufacture of terra-cotta will probably lead to its more extensive use. The great difficulty is to retain the sharpness of impression given by the mould, and above all to avoid the uneven shrinkage and warping which is so liable to take place when it is fired in large pieces. Any want of truth in the lines of a long cornice becomes painfully apparent, and each moulded block of a door or window-jamb must fit accurately on to the next one, or else the line of moulding becomes broken and irregular. Terra- cotta is now made of many different colours, a rich red and a warm ochre or cream colour being the most pleasant to the eye. In order to avoid defects it is necessary that the clay should contain a large proportion of powdered silica, and that the whole mass should be thoroughly homo- geneous. ‘The method by which these ends are secured is much the same as that employed in the making of pottery (see vol. xix. p. 642 sg.).

The most important public collections are in the Louvre, the British Museum, the museums of Berlin and Athens, and a few fine

specimens exist in the South Kensington Museum. The splendid Sabouroff collection is now in the Hermitage Palace at St Peters-

: See Vasari, ed. Le Monnier, xii. 281. This interesting building is now threatened with destruction.

burg. Many museums in Italy—such as those at Florence, Perugia, Capua, Rome, and other places—contain many examples from Etruria and Magna Grecia. A large number of the finest of the Tanagra figures and the like are in private hands; some are illus- trated in the works mentioned in the following list ; that of Prince

Liechtenstein at Vienna is one of the finest.?

Literature.—Léon Heuzey, ‘‘Recherches sur les figurines de femmes voiléés,” in Mon. assoc. des études grecques, Paris, 1874; 1d., ‘‘Rech. sur un groupe de Praxitéle, . . . en terre cuite,” in Gaz. des B.-Aris, September 1875 ; Id., ‘* Rech. sur les terres cuitcs grecques,” in Mon. assoc. des étud. grec., 1876; Id., Les origines des terres cuttes, Paris, 1882; Id., Catalogue des figurines antiques du Louvre, Paris, 1882-83; Id., ‘*‘ Papposiléne et le dieu Bes,” in Bull. Cor. Hell., 1884, pp. 161-167 ; Froliner, Les terres cuites d’ Asie-Mimeure, Paris, 1879-81 ; Id., Cat. dela Coll. Lecuyer, Paris, 1883, and Cat. de la Coll. Barre, Paris, 1878 ; Kekulé, Griechische Thonfiguren aus Tanagra, Berlin, 1878; Id., Griechische Terracotien vom Berliner Musewm, Berlin, 1878; Id., Die antiken Terracotten von Pompeii, Stuttgart, 1880; Rayet, Monuments de l’art antique, Paris, 1884, vol. ii, pp. 74-90; Id., “Sur une plaque estampée,” in Bull. Cor. Hell., 1879, pp. 329-333; Id., Cat. de la Coll. Rayet, 1880; Id., “‘Les figurines de Tanagra (Louvre),” in Gaz. des B.- Arts, 1875; Id., ‘‘I’art gree au Trocadéro,” in Gaz. des B.-Arts, 1878 ; Furtwaengler, La Coll. Sabourof, Paris, 1882-85, splendidly illus- trated in colours; Martha, Cat. des figurines du musée d’ Athénes, 1880; Id., ‘* Figurines corinthiennes en terre cuite,” in Bull. Cor. Hell., 1879, pp. 29-42; Id., ‘Figurines de Tanagra,” ibid., 1880, pp. 71-75; Pottier, ‘Terres cuites Chypriotes,” ibid., 1879, pp. 86-94 ; Pottier and Reinach, ‘ Fouilles de Myrina,” ibid., various articles in vols. for 1882-83; Paul Girard, ‘‘ Nécropoles de la Gréce du Nord,” ibid., 1879, pp. 211-221; Max. Collignon, ‘‘Plaque estampée de Santorin,” ibid., 1881, pp. 436-438; Cesnola, Cyprus, London, 1877; Schlie- mann, Troy, Mycen#, and Tiryns; E. Curtius, Giebelgruppen aus Tanagra, Berlin, 1878; Delauney, ‘‘Terres cuites de Tanagra,” in Revue de France, May and June 1878. An account of the first discovery of the Tanagra figures is given by Otto Liiders in Bull. Inst. Cor. Arch., 1874, p.» 120; see also various articles in Gaz. Archéol., Archdol. Zeitung, and Mon. Inst. Arch. Rom. (especially vol. vi.). For the earlier known terra-cottas, see Panofka, Terracotten des k. Museums zu Berlin, 1842; Combe, Terra-cotias in the British Museum, London, 1810; and Gerhard, Monumenti figulini di Sicilia, Berlin, 1835. Other works have been already referred to. Clever but not quite satisfactory copies of the finest Tanagra and other figures are now made in Berlin and Vienna; they cost from twenty to thirty shillings each. (J. H. M.)

TERRANOVA, or TERRANUOVA, a seaport town of Sicily, on a hill at the mouth of the Terranova, in the pro- vince of Caltanisetta, and 414 miles east-south-east from Girgenti. It contains a castle and several large churches, but has little to interest the traveller. Though the har- bour is poor, there is a considerable trade in corn, wine, fruit, sulphur, and soda. Cloth is manufactured to a small extent. The population of the town in 1881 was 16,440, that of the commune 17,173. In and near Ter- ranova are the remains of the ancient GEL (q.v.). The modern town owes its origin to the emperor Frederick II.

TERRAPIN. See Torroisz.

TERRE HAUTE, a city of the United States, in Harri- son township, Vigo county (of which it is the county seat), in the western part of Indiana. It is situated in 39° 27’ N. lat. and 87° 54’ W. long., at a height of 492 feet above the sea, upon the east bank of the Wabash river, 186 miles nearly south of Chicago and 73 miles west-south-west of Indianapolis. The city stands upon level ground, about 60 feet above the ordinary surface of the river. It is regularly laid out, with wide streets, lined with shade trees ; its principal buildings are the State normal school and the Polytechnic Institute. Six great railroad lines pass through Terre Haute, connecting it directly with the cities of the Mississippi valley. This fact, together with its proximity to the coal-mines of Clay county, has greatly promoted its growth as a manufacturing centre. It had in 1880 a population of 26,042, as against 16,103 in 1870.

TERSTEEGEN, Grruarp (1697-1769), German reli- gious writer, was born at Mors in Rhenish Prussia on 25th November 1697. After being educated at the gymnasium of his native town, he pursued for some years the calling of a ribbon-maker. In 1728 he withdrew from all secular pursuits and gave himself entirely to religious work. His writings include a collection of hymns (Blumengdrtlein, 1729 ; last edition, Stuttgart, 1868), a volume of Gebete, and another of Briefe. He died at Miihlheim in Rhenish Prussia on 3d April 1769. See Hymns, vol. xii. p. 588.

TERTIARIES. See Franciscans, vol. ix. p. 700.

3 Very clever forgeries of terra-cotta are being manufactured, and in many cases real specimens have genuine heads which do not belong to them. ‘The colouring has frequently been touched up and falsified

while in the dealers’ hands. Hven the celebrated Campana collection contained many clever forgeries of terra-cotta reliefs.

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TERTULLIAN, whose full name was Quintus SEPTIM- 1us FLoRENS TERTULLIANUS, is the earliest and after Augustine the greatest of the ancient church writers of the West. Before him the whole Christian literature in the Latin language consisted of a translation of the Bible, the Octavius of Minucius Felix—an apologetic treatise written in the Ciceronian style for the higher circles of society, and with no evident effect for the church as a whole—and a list of the books recognized as canonical (the so-called Muratorian fragment). Whether Victor the Roman bishop and Apollonius the Roman senator ever really made an appearance as Latin authors is quite un- certain. Tertullian in fact created Christian Latin litera- ture; one might almost say that that literature sprang from him full-grown, alike in form and substance, as Athene from the head of Zeus. Cyprian polished the language that Tertullian had made, sifted the thoughts he had given out, rounded them off, and turned them into current coin, but he never ceased to be aware of his depend- ence on Tertullian, whom he designated as kar’ €£0×7v his master (Jer., De Vir. Zil., 53). Augustine, again, stood on the shoulders of Tertullian and Cyprian; and these three North Africans are the fathers of the Western churches.

Tertullian’s place in universal history is deterniined. by (1) his intellectual and spiritual endowments, (2) his moral force and evangelical fervour, (3) the course of his personal development, (4) the circumstances of the time in the midst of which he worked.

(1) Tertullian was a man of great originality and genius, characterized by the deepest pathos, the liveliest fancy, and the most penetrating keenness, and was endowed with ability to appropriate and make use of all the methods of observation and speculation, and with the readiest wit. His writings in tone and character are always alike “‘rich in thought and

destitute of form, passionate and _ hair- splitting, eloquent and pithy in expression, energetic and condensed to the point of obscurity.” His style has been characterized with justice as dark and resplendent like ebony. His eloquence was of the vehement order ; but it wins hearers and readers by the strength of its passion, the energy of its truth, the pregnancy and elegance of its expression, just as much as it repels them by its heat with- out light, its sophistical argumentations, and its elaborate hair-splittings. Though he is wanting in moderation and in luminous warmth, his tones are by no means always harsh ; and as an author he ever aspired with longing after humility and love and patience, though his whole life was lived in the atmosphere of conflict. Tertullian both as a as and as a writer had much in common with the apostle

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(2) In spite of all the contradictions in which he in- volved himself as a thinker and as a teacher, Tertullian was a compact ethical personality. What he was he was with his whole being. Once a Christian, he was deter- mined to be so with all his soul, and to shake himself free of all half measures and compromises with the world. It is not difficult to lay one’s finger upon very many obliquities, self-deceptions, and sophisms in Tertullian in matters of detail, for he struggled for years to reconcile things that were in themselves irreconcilable ; yet in each case the perversities and sophisms were rather the outcome of peculiarly difficult circumstances in which he stood. It is easy to convict him of having failed to control the glowing passion that wasin him. He is often outrageously unjust in the substance of what he says, and in manner harsh to cynicism, scornful to gruesomeness; but in no battle that he fought was he ever actuated by selfish interests. What he did was really done for the Gospel, as he understood it, with all the faculties of hissoul. But he understood the Gospel as being primarily an assured

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hope and a holy law, as fear of the Judge who can cast into hell and as an inflexible rule of faith and of discipline, Of the glorious liberty of the children of God he had nothing but a mere presentiment ; he looked for it only in the world beyond the grave, and under the power of the Gospel he counted as loss all the world could give. He well understood the meaning of

Christ’s saying that He came not into the world to bring peace, but a sword: in a period when a lax spirit of conformity to the world had seized the churches he maintained the “ vigor evangelicus ” not merely against the Gnostics but against opportunists and a worldly-wise clergy. Among all the fathers of the first three centuries Tertullian has given the most powerful expression to the terrible earnestness of the Gospel.

(3) The course of Tertullian’s personal development fitted him in an altogether remarkable degree to be a teacher of the church. Born at Carthage of good family —his father was a ‘“centurio consularis”—he received a first-rate education both in Latin and in Greek. He was able to speak and write Greek, and gives evidence of familiarity alike with its prose and with its poetry; and his excellent memory—though he himself complains about it—enabled him always to bring in at the right place an appropriate, often brilliant, quotation or some historical allusion. The old historians, from Herodotus to Tacitus, were familiar to him, and the accuracy of his historical knowledge is astonishing. He studied with earnest zeal the Greek philosophers; Plato in particular, and the writings of the Stoics, he had fully at command, and his treatise De Anima shows that he himself was able to in- vestigate and discuss philosophical problems. From the philosophers he had been led to the medical writers, whose treatises plainly had a place in his working library. But no portion of this rich store of miscellaneous knowledge has left its characteristic impress on his writings; this influence was reserved for his legal training. His father, whose military spirit reveals itself in the whole bearing of Tertullian, to whom Christianity was above everything a “militia,” had intended him for the law. He studied in Carthage, probably also in Rome, where, according to Eusebius, he enjoyed the reputation of being one of the most eminent jurists. This statement derives confirmation from the Digest, where references are made to two works, De Castrensi Peculio and Questionum Libri VIII, of a Roman jurist named Tertullian, who must have flourished about 180 a.p. In point of fact the quondam advocate never disappeared in the Christian presbyter. This was at once his strength and his weakness: his strength, for as a professional pleader he had learned how to deal with an ad- versary according to the rules of the art—to pull to pieces his theses, to reduce him ad absurdum, and to show the defects and contradictions of his statements,—and was specially qualified to expose the irregularities in the

pro- ceedings taken by the state against the Christians; but it was also his weakness, for it was responsible for his litigiousness, his often doubtful shifts and artifices, his sophisms and argumentationes ad hominem, his fallacies and surprises. At Rome in mature manhood Tertullian became a Christian, under what circumstances we do not know, and forthwith he bent himself with all his energy to the study of Scripture and of Christian literature. Not only was he master of the contents of the Bible: he also read carefully the works of Hermas, Justin, Tatian, Miltiades, Melito, Irenzeus, Proculus, Clement, as well as many Gnostic treatises, the writings of Marcion in particular. In apologetics his principal master was Justin, and in theology proper and in the controversy with the Gnostics, Treneus. As a thinker he was not original, and even as a theologian he has produced but few new schemes of doctrine, except his doctrine of sin. His special gift lay

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in the power to make what had been traditionally received impressive, to give to it its proper form, and to gain for it new currency. From Rome Tertullian visited Greece and perhaps also Asia Minor; at any rate we know that he had temporary relations with the churches there. He was consequently placed in a position in which he could check the doctrine and practice of the Roman Church. Thus equipped with knowledge and experience, he returned to Carthage and there laid the foundation of Latin Christian literature. At first, after his conversion, he wrote Greek, but by and by Latin almost exclusively. The elements of this Christian Latin language may be enumerated as follows :—(i.) it had its origin, not in the literary language of Rome as developed by Cicero, but in the language of the people as we find it in Plautus and Terence; (ii.) it has an African complexion; (iii.) it is strongly influenced by Greek, particularly through the Latin translation of the Septuagint and of the New Testament, besides being sprinkled with a large number of Greek words derived from the Scriptures or from the Greek liturgies; (iv.) it bears the stamp of the Gnostic style and contains also some military expressions ; (v.) it owes something to the original creative power of Tertullian. As for his theology, its leading factors were—(i.) the teachings of the apolo- gists; (ii.) the philosophy of the Stoics; (iii.) the rule of faith, interpreted in an anti-Gnostic sense, as he had received it from the Church of Rome; (iv.) the Soterio- logical theology

of Melito and Irenzeus ; (v.) the substance of the utterances of the Montanist prophets (in the closing decades of his life). This analysis does not disclose, nor indeed is it possible to discover, what was the determining element for Tertullian; in fact he was under the dominion of more than one ruling principle, and he felt himself bound by several mutually opposing authorities. It was his desire to unite the enthusiasm of primitive Christ- lanity with intelligent thought, the original demands of the Gospel with every letter of the Scriptures and with the practice of the Roman Church, the sayings of the Paraclete with the authority of the bishops, the law of the churches with the freedom of the inspired, the rigid dis- cipline of the Montanist with all the utterances of the New Testament and with the arrangements of a church seeking to set itself up within the world. At this task he toiled for years, involved in contradictions which it took all the finished skill of the jurist to conceal from him fora time. At last he felt compelled to break off from the church for which he had lived and fought; but the breach could not clear him from the contradictions in which he found himself entangled. Not only did the great chasm between the old Christianity, to which his soul clung, and the Christianity of the Scriptures as juristically and philosophically interpreted remain unbridged ; he also clung fast, in spite of his separation from the Catholic church, to his position that the church possesses the true doctrine, that the bishops per successionem are the reposi- tories of the grace of the teaching office, and so forth. The growing violence of his latest works is to be accounted for, not only by his burning indignation against the ever- advancing secularization of the Catholic church, but also by the incompatibility between the authorities which he recognized and yet was not able to reconcile. After having done battle with heathens, Jews, Marcionites, Gnostics, Monarchians, and the Catholics, he died an old man, carrying with him to the grave the last remains of primi- tive Christianity in the West, but at the same time in conflict with himself.

_ (4) What has just been said brings out very clearly how important in their bearing on Tertullian’s development were the circumstances of the age in which he laboured. His activity as a Christian falls between 190 and 220,

a period of very great moment in the history of the Catho- lic church ; for within it the struggle with Gnosticism was brought to a victorious close, the New Testament estab- lished a firm footing within the churches, the “apostolic” rules which thenceforward regulated all the affairs of the church were called into existence, and the ecclesiastical priesthood came to be developed. Within this period also falls that evangelical and legal reaction against the political and secular tendencies of the church which is known as Montanism. The same Tertullian who had fortified the Catholic church against Gnosticism was none the less anxious to protect it from becoming a political organiza- tion. Being unable to reconcile incompatibles, he broke with the church and became the most powerful representa- tive of Montanism in the West.

Although Tertullian’s extant works are both numerous and copious, our knowledge of his life is very vague. He cannot have been born much later than about 150. His activity as a jurist in Rome must fall within the period of Commodus; for there is no indication in his writings that he was in Rome in the time of Marcus Aurelius, and many passages seem to preclude the supposi- tion. The date of his conversion to Christianity is quite uncertain; there is much in favour of the years between 190 and 195. How long he remained in Rome after becoming a Christian, whether he had attained any office in the church before leaving Rome, what was the date of his visit to Greece, —on these points also we remain in ignorance. It is certain that he was settled in Carthage in the second half of 197, the date of his writing his Apologeticus and (shortly afterwards) his two books Ad Nationcs; we also know that he became a presbyter in Carthage and was married. His recognition of the Montanistic prophecy in Phrygia as a work of God took place in 202-203, at the time when a new persecution broke out. For the next five years it was his constant endeavour to secure the victory for Moutanism within the church ; but in this he became involved more and more deeply in controversy with the majority of the church in Carthage and especially with its clergy, which had the support of the clergy of Rome. As Jerome writes (De Vir, Iil., 53): ‘*Usque ad mediam etatem presbyter fuit ecclesie African, invidia postea et contumeliis clericorum Romane ecclesiz ad Montani dogma delapsus.” On his breach with the Catholic church, probably in 207-208, he became the head of a small Montanist community in Carthage. In this position he con- tinued to labour, to write, and to assail

the lax Catholics and their clergy until at least the time of Bishop Calixtus in the reign of Elagabalus. The year of his death is uncertain. Jerome (ut sip.) says: ‘‘Fertur vixisse usque ad decrepitam extatem.” That he returned at last to the bosom of the Catholic church is a mere legend, the motive of which is obvious; his adherents after his death continued to maintain themselves as a small community in Carthage. Although he had left the church, his earlier writings continued to be extensively read; and in the 4th century his works, along with those of Cyprian, were the principal reading of Western Christians, until they were superseded by those of Jerome, Ambrose, Augustine, and Gregory. Jerome has included him in his catalogue of Christian ‘‘viri illustres,” but only as a Catholic to whom reference should be made with caution.?

The works of Tertullian, on the chronology of which a great deal has been written, and which for the most part do not admit of being dated with perfect certainty, fall into three classes,—the apologetic, the polemical theological, and the ascetic. And in point of time also three periods can be readily distinguished, the years 202-203 and 207-208 constituting the divisions. Some of the things he wrote have unfortunately disappeared,—in particular the De Spectaculis, De Baptismo, and De Virginibus Velandis in Greek ; his works in Latin on the same subjects have survived.

I. Works dating from before 202-203.—To this class belong the Apologeticus (197) and the two books Ad Nationcs, De Specta- cults, De Idololatria, De Cultu Feminarum Libri If., De Testi- monto Animez (written soon after the Apologeticus), Ad Martyres (perhaps the earliest of all), De Baptismo Hereticorum (now lost), De Baptismo, De Penitentia, De Oratione (the last three written for catechumens), De Patientia, dd Uxorem Libri II., De Prescriptione Hezreticorum, and Adv, Marcionem (in its first form). The Apolo- geticus, which in the 3d century was translated into Greek, is the weightiest work in defence of Christianity of the first two centuries. Respecting its relation to the Octavius of Minucius Felix much has been written ; to the present writer it seems unquestionable that Tertullian’s work was the later. Of great moment also is the De Prescriptione Hereticorum, in which the jurist is more clearly heard than the Christian. The De Spectaculis and De Idololatria show that Tertullian was already in a certain sense a Montanist

1 Compare also the judgment of Hilary and of Vincent of Lerins, Commonit., 24.

before he formally went over to that crecd ; on the other hand, his De Penitentia proves that his earlicr views on church discipline were much more tolerant than his later. To learn something of his Christian temper we must read the De Oratione and the De Patientia. The De Baptismo is of special interest from the archeo- logical poiut of view.

Il. Works written between 202-208 and 207-208.—De Virginibus Velandis, De Corona Militis, De Fuga in Persccutione, De Exhorta- tione Castitatis, Scorpiace adv. Gnosticos (2), Adversus Hermogenem, De Censu Anime. adv. Hermogencm (lost), Adv. Valentinianos, Adv. Apellciacos (lost), De Paradiso (lost), De Fato (lost), De Anima, De Carne Christi, De Resurrectione Carnis, and De Spe Fidcliwm (lost), were all written after Tertullian had recognized the prophetic claims of the Montanists, but before he had left the church.

III. Works later than 207-208.—To this period belong the five books Adv. Mareionem, his main anti-Gnostic work (in the third form—the first of the five was written in 207-208), 4d Scapulam (a memorial to the governor, written soon after 211), Dc Pallio (possibly this ought to be classed among the carliest writings), Adv. Praxcan (his principal work against the Monarchians), and Adv. Judzxos. The latest extant works of Tertullian (all after 217) are his controversial writings against the laxity of the Catholics, full of the bitterest attacks, especially upon Calixtus, the bishop of Rome ; these are De Monogamia, De Jejunio, De Pudicitia, and De Ecstasi Libri VIF. (lost). The arguments against the geuuineness of some of the above writings do not sccm to the present writer to have weight. It is uncertain whether Tertullian was the author of the Acta Perpetuz et Felicitatis.

Literature.—A thoroughly adequate edition of the works of Tertullian and a full account of his fortunes as a writer are still desiderata ; the best edition at present is that of Oehler (8 vols., Leipsic, 1853). The editio princeps is by Beatus Rhenanus (Basel, 1521); others have appeared by Gelenius (1550), Pamelius (1579), De la Barre (1580), Rigaltius (1634), Semler (1770-71),

Oberthtir (1780), Leopold (1889 sg.),,and Migne (1844). The Vienna Academy is about to publish an edition by Reifferscheid. There are German translations by Besnard (1837) and Kellner (1882), and an English translation appears in Clark's Ante- Nicene Theological Library. Separate treatises of Tertullian have often been edited,—the Apologeticus by Havercainp (1718), Oehler (1849), and Kayser (1865) ; the Ad Nationes by Godofredus (1635) ; the De Spectaculis by Klussmann (1877) ; the De Testimonio Anime by Lindner (1862); the De Pallio by Salimasius (1856) ; other minor writings by Hurter, &c. The testimonies of the church fathers (the most important being those of Cyprian, Eusebius, Jerome, and Vincent of Lerins) are partly brought together in the editions.

The older studies on Tertullian by Le Nourry, Tillemont, Dupin, Allix, Cave, Ceillier, Mosheim, Centner, Semler, Noesselt, are to some extent reproduced in vol. iii. of Oehler's edition. Among the more inodern contributions to the subject may be mentioned those of Neander (Antignosticus: Geist des Tertul- lians, Berlin, 1825), Bohringer (Die Kirche Christi in Biographien, vol. iii., 2d ed., 1875), Mohler (Patrologie, vol. i., 1840, pp. 701-789), Kaye (Eccles. Hist. of the 2d and 3d Centuries, illustrated from the writings of Tertullian, 3d ed., 1845), Coenen (Comment. de Tertull., Utrecht, 1825), Hesselberg (Tertullian's Lehre, pt. i., Dorpat, 1848), Ebert (Gesch. d. Christl. Lit., 1874), Freppel (Tertullien, Paris, 1864), Hauck (Tertullian's Leben u. Schriften, 1877), Alzog (Patrologie, 3d ed., 1876); see also tlle manuals of ehureh history, history of dogma (¢.g., Harnack's Lehrb. d. Dogmengesch.; also Schwane's, Dorner's, and others), of Roman literature (Teuffel), of Christian philosophy (Ritter, Stéckl, Erdmann, Ueberweg). Compare also Deutinger, Geist d. Christl. Ueberlieferung, vol. i.

On the chronology and genuineness of the works attributed to Tertullian, see Mosheim, Semler, Noesselt (De Vera Altate et Doctrina Scriptorum Tertulliani, 1768; in Oeliler's ed., vol. iii.), Uhlhorn (Fundamenta Chronologiw Tertull., Gottingen, 1852), Bonwetsch (Die Schriften Tertullian's n. d. Zeit ihrer Abfass., Bonn, 1879), Kellner (" Zur Chron. Tert.'s," in Theol. Quartalschr., 1870-71), Groteineyer (Ueber Tertullian's Leben w. Schriften, Kempen, 1863-65), Harnack ('Zur Chronol. d. Schr. Tert.'s," in Ztschr. f. Kirchengesch., 1878), Noldechen ("Tert.'s

Geburtsjahr," in Ztschr. f. wiss. Theol., 1886). On Tertullian as a man, a citizen, and an author, see Ebert (as above), Engelhardt (' Tert.'s schriftstell. Character," in Zischr. f. d. hist. Theol., 1852), Ritter (in Braun and Achterfeld's Bonner Zeitschrift, Hft. 8), Hildebrand (in Jahn's Jahrb. z. Alterthumswissensch , 1843), Dieringer (Doctrina Tertulliant de Rep. et de Offic. et Jur. Civium Christian- orum, Bonn, 1850), Noldechen (''Tert. als Mensch u. als Biirger," in Hist. Zischr., 1885), Sehmidt (De Latinttate Tert., Erlangen, 1870-72), Klussmann (Curarum Tertull., pts. i., ii., Halle, 1881), Hauschild (Die Grundsdtze w. Mittel der Wortbildung bei Tert., Leipsic, 1881), and Langen (De Usu Tert. Preeposi- tionum, Miinster, 1869). On Tertullian as a jurist, see Blumenbach (De Presby- tero et Icto Tertulliano, Leipsic, 1735), Wiescnhavern (De Icto Tertulliano, Hildes- heim, 1743), Pagenstecher (De Jurispr. Tert., Harderwijk, 1768), Rudorff (Rém. Rechisgesch., i. p. 196 sq.). On Tertullian as an apologete, see Hefele ('Tert. als Apologet," in Beitr. zur Kirchengeschichte, vol. i.), Jeep (" Tert. als Apolo- get," in Jahrbb. f. deutsche Theol., 1864), Pelet (Essai sur l'apolog. de Tert., Strasburg, 1868), Condamin (De Tertulliano Vexate Religionis Patrono, Bar-le- Due, 1877), Werner (Gesch. d. apolog. u. polemisch. Lit., vols. i., ii., 1861-62). On his relations to the Greek apologists, see Harnack (Teate u. Unters. z. altchrist. Lit.~~Gesch., vol. i.); on those to Minucius Felix, Ebert (Tert.'s Verhdltniss zu M. Felix, Leipsic, 1868), and a number of other discussions by Hartel, Kiihn, &c. His relations to Clement of Alexandria have been investigated by Miinscher (in Henke's Magazin, vol. vi., 1796), Noldechen (Jahrbb. f. prot. Theol., 1886 ; Theol. Stud. wu. Krit., 1886); on his relations to Irenzeus, Hippo~~ lytus, Melito, and the Gnosties, see Harnack (Zur Quellenkritik der Gesch. d. Gnosticismus, Leipsic, 1873), Lipsius (Die Quellen der diltesten Ketzergesch., 1875), Harnack (De Apellis Gnosi Monarchica, Leipsic, 1874, and Texte u. Untersuch.., vol. i.), Hilgenfeld (Ketzergesch., 1884), and Hagemann (Die rém. Kirche, 1864). His relations to the Greek element in general are treated of by Caspari in vol. ili. of his Quellen zur Gesch. d. Taufsymbols (1875), and those to the New Testa- ment and primitive Christianity by Rénsch (Das N. T. Tert.'s, 1871), Volkmar (in Credner's Gesch. d. NTlichen Kanon, 1860), Westcott (Hist. of the Canon of the N. T., 5th ed., 1881), Charteris (Canonicity, 1880), Overbeck (Die Auffassung d. Stretts zwischen Petrus u. Paulus bei den Kirchenvdtern, Basel, 1877), Barth (Co Tert.'s Auffassung des Ap. Paulus,"

&c., in Jahrbb. f. prot. Theol., vol. viii.) and Noldechen (‘‘ Hin gefliigeltes Wort bei Tert.,” in Zéschr. f. wiss. Theol., 1885).

On Tertullian as a Montanist, see Gottwald (De Montanismo Tert., Breslau 1863) and the accounts of Montanism by Schwegler, Baur, Ritschl, Bonwetsch, De Soyres, Salmon, Harnack, and others; also Nodldechen (Die Krisis in Karthag. Schleierstreit,” in Zischr. f. kirchl. Wissensch. u. kirch. Leben, 1886).

TER—TES

On his relation to the creed and rule of faith consult Harnack (Pair. App. Opp., i., 2ded., ii, Appendix, and Leirb. d. Dogmengesch., vol. i.). His doctrine of the Eucharist has been discussed by Dieringer (in Der Katholik for 1864), Leim- bach (Beitr. 2. Abendmahislehre Tert.’s, Gotha, 1874), and in the standard works on the history of the doctrine generally. For his doctrine of the resurrection, see Oehninger (Lert. u. seine Auferstehungslehre, Augsburg, 1878); for his psycho- logy, see Der Katholik for May, August, and September 1865, Murton (Essai sur Vorigine de Vdme Wapres Tert., Strasburg, 1866), Burckhardt (Die Seelenlehre des Tert., Bautzen, 1857), Stock] (De Tert. Doctrina Psychol., Minster, 1863), and Hauschild (Tert.’s Psychologie, Frankfort-on-Main, 1880). On his doc- trine of the original state of man, see Wendt (Die Lehre von d. menschl. Voll- kommenheit, 1882) and Noéldechen (Zischr. f. wiss. Theol., 1885); and on lis doctrine of redemption, see Bordes (Exposé crit. des opin. de Tert. sur la redemp- tion, Strasburg, 1860). The treatise Adv. Praxean and his anti-Monarchian polemic are discussed by Lipsius VJahrbb. f. deutsch. Theol., 1868) and Hage- mann (as above), and in the church histories ; his conception of the sacra- ments by Leimbach (Theol. Stud. u. Krit., 1871). His ethical ideas are analysed by Miinscher (Henke’s Magazin, vol. vi., 1796) and Nielsen (Tert.’s Kthik, Copenhagen, 1879); the De Pallio by Kellner (Theol. Quartalschr., 1870), the De Patientia by Noldechen (Ztschr. f. kirchl. Wissensch. u. kirch. Leben, 1885), the Adv. Judzxos by Semler, Bonwetsch (as above), and Volkinar (in Credner’s Gesch. d. NTlichen Kanon), the spurious addition to the De Prescriptione by the authorities already cited for his relations to Gnosticism and by Lipsius (Zur Quellenkritik des Epiphanios, 1865). On the poem Adv. Marce., falsely

ascribed to Tertullian, see Hiickstadt's monograph (Leipsic, 1875), also the Zischr. f. wiss. Theol., 1876; on the poem De Sodoma et de Jona, see Miller (Rhein. Mus., xxii). The passages of archeological importance in Tertullian are discussed by Leimbach in Zéschr. f. die hist. Theol., 1871, and by Noldechen in Zischr. f. kirchl. Wissensch. u. kirchl. Leben, 1885; see also Morcellus (Africa Christiana, 3 vols., Brescia, 1816), Miinter (Primordia Ecclesie Africane, Copen- hagen, 1829), and Gorres ("' Das Christenthum u. der Staat z. Zeit des Kaisers Septiniius Severus," in Jahrbb. f. prot. Theol., 1878). Some editions of indi- vidual works of Tertullian, as well as philological investigations not mentioned in the foregoing list, will be found particularized in Mayor's Bibliographical Clue to Latin Literature, 1875. (A. HA.)

TERUDANT, or Tarupant. See Morocco, vol. xvi. p. 834.

TERUEL, a province of Spain, forming part of the ancient kingdom of Aragon, is bounded on the N. by Zaragoza, on the E. by Tarragona, on the S. by Castellon de la Plana and Valencia, on the 8.W. by Cuenca, and on the W. by Guadalajara, and has an area of 2363 square miles. It is intersected from east to west by the mountain chains of Albarracin and Gudar, from which several offsets diverge on either side. The loftiest summit is the Muela de San Juan (5280 feet), which is covered with snow for a great part of the year. These sierras give rise to several large rivers, the principal being the Tagus, the Guadalaviar, the Jiloca, and the Guadalope. Notwithstanding the fertile character of the plains and an abundance of mineral wealth, the trade of the province is unimportant, and civilization in a backward state, owing to the lack of means of trans- port, the want of enterprise, and imperfect communication with the outer world. The chief products are corn, wine, oil, cheese, fruits, timber, flax, hemp, silk, wool, and saffron, together with cattle, sheep, and swine ; while in the busier centres some slight manufacture of coarse cloth, paper, leather, soap, pottery, and esparto goods is carried on. The population of the province in 1877 was 249,000.

TERUEL, the capital and most important town of the above province, is situated on the left bank of the Guada- laviar, 142 miles east of Madrid, and on the high road from Calatayud to Valencia. It is an ancient walled city, fast falling into decay, with narrow gloomy streets and crumbling medieval

houses. Some of the numerous churches are worth seeing, with their paintings by the rarely known 17th-century artist Antonio Visquert, as is also the great aqueduct of 140 arches, raised 1555-60 by Pierre Bedel, a French architect. In the cloisters of San Pedro lie the remains of the celebrated “lovers of Teruel,” Juan de Marcilla and Isabella de Segura, whose pathetic story has formed the subject of numerous dramas and poems by Perez de Montalban, Yaque de Salas, Hartzen- busch, and others. The cathedral is Churrigueresque. Teruel was raised to the dignity of a sce in 1577, the bishop being suffragan of Zaragoza. The population of the city in 1877 was 9482.

TESCHEN (Polish C7eszyn), the chief town of a duchy in Austrian Silesia, is situated on the Olsa, a tributary of the Oder, 34 miles south-east of Troppau. It combines both Polish and German peculiarities in the style of its buildings, and contains five churches, the most interesting of which are the parish church, which formerly belonged

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to a Dominican monastery, and the Gnadenkirche, one of | IV. c. 7). This general repeal has been followed by the

the Protestant churches built in terms of the treaty of |

Altranstidt in 1706. The only relic of the ancient castle is a square tower, dating from the 12th century. The manufacturing industry of the town is slight, and, since the construction of the railway aa Oderberg, Teschen has lost much of the trade formerly commanded by its position near the borders of Silesia, Hungary, Moravia, and Galicia. A flax dressing and spinning

factory, a large brewery, and several furniture factories are the chief industrial establish- ments in the town. The population in 1880 was 13,004.

It was at Teschen that Maria Theresa and Joscph IJ. signed the peace which put an end to the war of Bavarian succession in 1779. The duchy of Teschen was formerly a more or less direct apanage of the Bohemian crown. For some timc it bore the name of Saxe- Teschen (Sachsen-Teschen), owing to the fact that Prince Albert of Saxony, who married an archduchess of Austria, received it as part of his wife's dowry. Prince Albert beqneathed it in 1822 to the emperor of Austria, who bestowed it on the archduke Albert.

TESSIN. See Ticrno.

TEST ACTS. The principle that none but persons pro- fessing the established religion were eligible for public em- ployment was adopted by the legislatures of both England and Scotland soon after the Reformation. In England the Acts of Supremacy and Uniformity and the severe penalties denounced against recusants, whether Roman Catholic or Nonconformist, were affirmations of this prin- ciple. The Act of 7 Jac. I. c. 2 provided that all such as were naturalized or restored in blood should receive the sacrament of the Lord's Supper. It was not, however, until the reign of Charles IT. that actual receiving of the communion of the Church of England was made a con- dition precedent to the holding of public offices. The earliest imposition of this test was by the Corporation Act of 1661 (13 Car. IT. st. 2, c. 1), enacting that, besides taking the oath of allegiance and supremacy and sub- scribing a declaration against the Solemn League and Covenant, all members of corporations were within one year after election to receive the sacrament of the Lord's Supper according to the rites of the Church of England. This Act was followed by the Test Act of 1672 (25 Car. II. c. 2). The immediate cause of the Test Act (the full title of which is "An Act for preventing dangers which may happen from popish recusants") was the king's declaration of indulgence, dispensing with laws inflicting disabilities on Nonconformists. This Act enforced upon all persons filling any office, civil or military, the obligation of taking the oaths of supremacy and allegiance and subscribing a declaration against transubstantiation, and also of receiving the sacrament within three months after admittance to office. The Act did not extend to peers; but in 1678 30 Car. II. st. 2 enacted

that all peers and members of the House of Commons should make a declaration against transubstantiation, invocation of saints, and the sacrifice of the mass,—a special exception being made in favour of the duke of York. The provisions of the Test Act were violated by both Charles II. and James II. on the ground of the dispensing power claimed by the Stuart kings. In a well-known case of Godden ». Hales (11 State Trials, 1166), an action for penalties under the Test Act brought against an officer in the army, the judges decided in favour of the dispensing power,—a power finally abolished by the Bill of Rights. After a considerable number of amend- ments and partial repeals by the legislature of the Acts of 1661, 1672, and 1678, and of Acts of indemnity to pro- tect persons under certain circumstances from penalties Incurred under the Test Act, the necessity of receiving the sacrament as a qualification for office was abolished by 9 Geo. IV. c. 17, and all Acts requiring the taking of oaths and declarations against transubstantiation, &c., were re- pealed by the Roman Catholic Relief Act of 1829 (10 Geo.

special repeal of the Corporation Act by the Promissory Oaths Act, 1871 (34 and 35 Vict. ¢. 48), of the Test Act by the Statute Law Revision Act, 1863, and of the Act of 1678 by 29 and 30 Vict. c. 19. Religious tests re- mained in the English universities until 1871. To bea member of the Church of England was a necessary con- dition precedent for holding most university or college offices by the Act of Uniformity of 1662, and such offices were not affected by the Toleration Act of 1688 and the Roman Catholic Relief Act of 1829. In 1871 the Uni- versity Tests Act abolished subscriptions to the articles of the Church of England, all declarations and oaths respect- ing religious belief, and all compulsory attendance at public worship in the universities of Oxford, Cambridge, and Durham. There is an exception confining to persons in holy orders of the Church of England degrees in divinity and positions restricted to persons in holy orders, such as the divinity and Hebrew professorships.

Scotland.—A religious test was imposed immediately after the Reformation. By 1567, c. 9, no one was to be appointed to a public office or to be a notary who did not profess the Reformed religion. The Scotch Test Act was 1681, c. 6, rescinded by 1690, c. 7. Re- nunciation of popery was to be made by persons employed in edu- cation (1700, c. 3). A motion to

add, after the 18th article of union, an exemption of Scotsmen from the sacramental test in the United Kingdom was negatived by the Scottish parliament. A similar fate awaited a proposal that while a sacramental test was in force in England all persons in public office in Scotland should subscribe their adhesion to the Presbyterian Church government. By 1707, c. 6, all professors, principals, regents, musters, or others bearing office in any university, college, or school in Scotland were to pro- fess and subscribe to the Confession of Faith. All persons were to be frec of any oath or test contrary to or inconsistent with the Protestant religion and Presbyterian Church government. The reception of the communion was never a part of the test in Scotland as in England and Ireland. The necessity for subscription to the Confession of Faith by persons holding a university office (other than that of principal or professor of theology) was removed by 16 and 17 Vict. c.89. The Act provides that in place of subscription every person appointed to a university office is to subscribe a declar- ation according to the form in the Act, promising not to teach any opinions Sppeed to the divine authority of Scripture or to the Confession of Faith, and to do nothing to the prejudice of the Church of Scotland or its doctrines and privileges.

Ireland.—An oath of allegiance was required by the Irish Act of Supremacy (2 Eliz. c. 1). The English Act of 3 Will. and M. ¢. 2 substituted other oaths and enforced in addition from peers, mem- bers of the House of Commons, bishops, barristers, attorneys, and others a declaration against transubstantiation, invocation of the Virgin Mary and the saints, and the sacrifice of the mass. By the Irish Act of 2 Anne c. 6 every person admitted to any office, civil or military, was to take and subscribe the oaths of allegiance, supremacy, and abjuration, to subscribe the declaration against transubstantiation, &c., aud to receive the Lord’s Supper according to the usage of the Church of Ireland. English legislation on the subject of oaths and declarations was adopted in Ireland by Yelver- ton’s Act, 21 and 22 Geo. III. c. 48, § 3 (Ir.). These provisions were all repealed by the Promissory Oaths Act, 1871. The Roman Catholic Relief Act of 1793 (33 Geo. ITI. c. 21, Ir.) excepted Trinity College, Dublin, from its provisions, and tests existed in Dublin university until 1873. They were abolished as far as regarded certain scientific professorships in 1867 by 30 Vict. c. 9, and

were finally abolished for the whole university by the University of Dublin Tests Act, 1873, except as to professors of and lecturers in divinity.

United States.—By art. 6 of the constitution, “no religious test shall ever be required as a qualification to any office or public trust under the United States.” A similar provision is generally included in the State constitutions.

TESTAMENT. See Wi.

TESTIMONY. See Evipence.

TETANUS (from Gr. retve, I stretch), a disorder of the nervous system, consisting in an increased reflex excita- bility of the spinal cord and manifesting itself by painful tonic spasm of the voluntary muscles throughout the body. The disease shows itself under various conditions. It occasionally occurs, particularly in tropical countries, with- out apparent cause, and has thus been known to affect numbers of persons simultaneously (idiopathic tetanus).

It is sometimes observed in new-born children (¢rismus neonatorum) and in parturient women (puerperal tetanus). But by far the greater number of cases occur in connexion with a wound or other injury, more especially in the ex- tremities, probably implicating some of the peripheral nerves. Certain forms of injury, as punctured, lacerated, and gunshot wounds, are more liable to be followed by tetanus than others. In many cases the liability bears no proportion to the extent of the wound. Exposure to cold after injury is an important exciting cause. The symptoms of tetanus in its most usual forms generally appear during the healing process of a wound, but occasionally they arise after cicatrization is completed. Sometimes they are pre- ceded by appearances of irritation in the wound or its neighbourhood, but this is exceptional. The earliest indi- cations of the disease usually show themselves, no matter where the wound is situated, by stiffness about the muscles of the jaw, causing difficulty in opening the mouth, which soon increases to lockjaw or trismus. ‘This is accompanied by spasm in neighbouring muscles, and the drawn features and exposed teeth give to the countenance the peculiar expression known as risus

sardonicus. The rigidity ex- tends to the muscles of the neck, back, chest, abdomen, and extremities, and the body frequently assumes a bent attitude, either backward (opisthotonos), forward (empros- thotonos), or laterally (plewrosthotonos). This general muscular rigidity, which at first is not constant but occa- sionally undergoes relaxation, is accompanied by frequently recurring convulsive seizures, which are readily excited by the slightest irritation, such as from a draught of cool air, a bright light, the closing of a door, &c. In such attacks there is great suffering and the expression of the face is indicative of agony ; and the function of respiration may be seriously involved and asphyxia threaten or actually take place. The temperature of the body sometimes rises to a high degree. The attack is usually acute and after a few days either passes off or, as is more frequent, ter- minates fatally, either by asphyxia from tonic spasm of the respiratory muscles or from exhaustion consequent on the violence of the symptoms together with the absence of sleep. Throughout the whole course of the disease the mind is clear. In idiopathic tetanus the symptoms are less severe, the course more chronic, and recoveries more common than in those which depend upon a wound or injury. The puerperal form, with symptoms which differ in no way from those described, is rare and occurs either after parturition or after abortion. Tetanus in new-born children, also a rare form, usually shows itself a day or two after birth by obvious difficulty in the acts of sucking and swallowing ; by the supervention of trismus, together with tonic contraction of the muscles of the limbs and body, sometimes accompanied by convulsive seizures; and by a peculiar low whining cry, seldom absent and very charac- teristic. Various opinions have been held as to the cause of this form of tetanus, some referring it to the wound produced by severance of the umbilical cord, others to pressure upon the bones of the head in parturition, &c. It has not yet been satisfactorily explained. Although sometimes recovered from, it is usually fatal.

The symptoms of poisoning by strychnine bear a strong resemblance to those of tetanus. They are, however, more acute and develop in connexion with something which has been taken ; further, the absence of a wound and the fact that the spasm affects the muscles of the extremities first, and not those of the jaws, as in tetanus, serve to establish the diagnosis. In HypropHopta (g.v.), which in certain of its symptoms resembles tetanus, the absence of trismus, the dread of water, and the violent spasms on attempting

to drink, together with the history of the case, readily enable a distinction to be made. Various other forms of

nervous disease accompanied by tetanic symptoms, such as cerebro-spinal meningitis, hysteria in some forms, &c., may be still more clearly distinguished from true tetanus.

The pathology of tetanus is referred to in the article Patuoxoey (vol. xviii. p. 391). No constant changes are observed in the body after death from tetanus. The most common are great dilatation of the blood-vessels of the spinal cord and sometimes evidence of inflammatory action, but these are probably the effects of the symptoms rather than their cause.

For the treatment of tetanus many remedies have been employed. Where a source of irritation in or about a wound can be made out, it ought to be dealt with by the surgeon. Of medicinal agents those which diminish the reflex excitability of the spinal cord and relax the spasm are to be recommended. But it is not safe to employ all substances which produce these effects. Thus tobacco and its active principle nicotine act powerfully in this way, but they are attended with danger from their poisonous proper- ties, and the same may be said of curari, conium, calabar bean, é&c., all of which have been used in tetanus. Opium carefully administered sometimes produces a markedly beneficial effect, as does also Indian hemp. Chloroform or ether inhalation greatly mitigates the severity of the spasm. Chloral hydrate and bromide of potassium or ammonium are among the most useful agents which can be employed, and they may be given separately or, still better, in combination. As adjuvants, the warm bath, the absence of all noise and excitement, and the maintenance of the strength by appropriate nutriment should not be neglected.

TETRARCH (rerpdépyxys), the ruler of a tetrarchy (retpapxia), that is, in the original sense of the word, of one quarter of a region. The title of tetrarch is familiar from the New Testament as borne by certain princes of the petty dynasties which the Romans allowed to exercise a dependent sovereignty within the province of Syria. In this application it has lost its original precise sense, and means only the ruler of part of a divided kingdom, or of a region too narrow to support a higher title. After the death of Herod the Great (4 B.c.) his realm was shared among his three sons: the chief part, including Judea, Samaria, and Idumea, fell to Archelaus (Matt. ii. 22), with the title of ethnarch ; Philip received the north-east of the realm, and was called tetrarch ; and Galilee was given to Herod Antipas, who bore the same title (Luke iii. 1). These three sovereignties were reunited under Herod Agrippa from 41 to 44 a.p. Another tetrarchy is men- tioned in Luke iii. 1, viz, that of Lysanias in the little district of Abilene, near Damascus, in the valley of the Barada. An inscription of this Lysanias is given in C. I. Gr., 4521.

See Renan, Mém del’ Acad., xxvi. 2 (1870), p. 49 sq.

TETUAN (Tettdwin), a town of Morocco, about 23 miles south-south-west from Ceuta and 44 south-east from Tangiers, is picturesquely situated about 9 miles inland on the steep slope of a hill, behind which rise the bold Rif Mountains. It is surrounded by walls flanked with towers, and has on the summit of the hill a castle which is the residence of the governor. The streets are narrow, unpaved, and dirty, and with few exceptions the houses are poor. Some of the numerous mosques, however, are handsome. The principal manufactures are gun-barrels, coarse woollen cloths, and woollen and silk sashes. The harbour of Tetuan, at the mouth of the Martil, allows only small vessels to cross the bar, and the roadstead is much exposed to the east. There is some export trade in cattle, grain, fruit, leather, and wool, principally to Gibraltar. The population of Tetuan is estimated at about 20,000 (5000 Jews).

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Tetuan is said to have been founded in 1492 by refugees from Granada. It was taken by storm on 4th February 1860 by the Spaniards under O’Donnell, but restored to Morocco when peace was concluded.

TEUTONES, or TrvToni, a powerful German tribe, first appearing in history along with the Crmsri (¢.v.). They are again mentioned at a later period by Pliny (Z/_W., xxxvii. 11) and others as inhabiting a district in the north- west of Germany to the north of the Elbe. The name of Teutones was never employed either by the Germans them- selves or by the Romans as a general name for the whole German nation.

TEUTONIC LANGUAGES. See Germany (vol. x. p. 514 sq.); also Enciish Lancuace, Gorus (vol. x. p. 852 sy.), SCANDINAVIAN LANGUAGES, F’RIsIANS, and HoLLAND

vol. xii. p. 84 sq.).

TEUTONIC ORDER, Tue, or TEuTonic KNIGHTS OF Sr Mary’s Hosprran at JERUSALEM (Deutscher Orden, Deutsche Ritter, Orden der Ritter des Hospitales St Marien zu Jerusalem), is one of the three great

military and re- ligious orders to which the crusades gave birth. Its name is derived from a German hospital founded at Jerusalem in 1128, which disappeared on the capture of the Holy City by the Saracens in 1187. The pity excited in the minds of some German merchants by the sufferings of the Christian soldiers at the siege of Acre in 1190 induced them to revive the work of this society under a somewhat different form ; and eight or nine years later the society, as thus resuscitated, was converted into a military order. Like the two other military orders, the Teutonic order adopted the Augustine rule of life ; and, in addition to the ordinary monastic vows, the members laid upon themselves the special obligations of tending sick and wounded pilgrims and of fighting the pagans. Frederick, duke of Swabia, took the young order under his protection, and it soon received charters from the pope and emperor, entitling it to the same privileges as the Templars and Knights of St John. Whatever was the case at first, the members of the order were ultimately required to be Germans of honourable birth. Priest brothers were intro- duced about 1220, and afterwards half-brothers, like the freres servants d'armes of the other orders, who did not require to be of noble birth, and might, to some extent, continue their ordinary secular occupations. The distin- guishing garb of the order consisted of a white mantle with a black cross.

Almost at once a rich stream of benefactions of all kinds began to flow into the coffers of the order, which gradu- ally acquired extensive territories in Palestine and also in Germany and other parts of Europe. Its first seat was at Acre, and the first grand-master was a Rhenish knight named Herman Walpot of Bassenheim. 'The order rose to great power and influence under Herman von SALza (g.v.), who held the office of grand-master from about 1210 to 1239, and enjoyed the fullest confidence of both em- peror and pope. He was also keen enough to see the hopelessness of the attempt to expel the Mohammedans from the Holy Land, and eagerly hailed the opportunity of trans- ferring the activity of the order to another sphere which was afforded by the invitation to undertake a crusade against the heathen Prussians. The successful progress of this crusade, the aggrandizement thereby accruing to the order, and its subsequent decline have already been nar- rated in the article Prussia (vol. xx. pp. 5-6). Soon after the beginning of the struggle, in 1237, the Teutonic order absorbed the order of the Brothers of the Sword, a union which brought Courland,

Semgallen, and Livonia to swell its territories. In 1291, when Acre, the last strong- hold of the Franks in Palestine, fell the order removed its headquarters to Venice; but, when its centre of gravity

became so obviously shifted to the extensive territories won from the Prussians, the seat of government was trans- ferred (1309) to MarienBure (g.v.) on the Vistula, where a splendid castle was erected for the grand-masters. The grand-mastership of Weinrich von Kniprode (1351-82) is the most prosperous period in the history of the order. Its territorial possessions far exceeded those attained by either of the rival orders, stretching from the Oder on the west to the Gulf of Finland on the east, and containing a population of two to three million souls. Its government at first was excellent, and for a time it may be said to have played the leading réle in the political history of northern Europe. Wherever the order spread, Christianity and German national life were introduced. Its revenues were very large, and its ranks were kept full by hosts of aspirants to a share in its pious and lucrative crusades.

So long as the order maintained its own high standard all went well with it. But its internal decay was syn- chronous with external events that would alone have been extremely perilous. The union of Poland and Lithuania in 1386 raised up a jealous neighbour, whose power it was wellnigh impossible in the long run to resist, while the nominal conversion of the latter to Christianity struck at the root of the order’s prosperity by depriving it of its mission. When there were no more heathens within reach to convert and despoil, the chief attraction to outsiders to join its ranks disappeared. After the conversion of Prussia into a secular duchy the Teutonic order still continued to exist as an ecclesiastical organization, possessing eleven bailiwicks in different parts of Europe, with a total area of 850 square miles and 88,000 inhabitants. The head- quarters were fixed at Mergentheim in Swabia. Its poli- tical importance was of course now a thing of the past, and the scattered position of the bailiwicks only emphasized its weakness. In 1801 the bailiwicks to the west of the Rhine were absorbed by France, and in 1809 the order was entirely suppressed by Napoleon, its lands going to the secular principalities within which they lay. In 1840 the order was

resuscitated in Austria, where it now exists as a semi-religious knighthood, presided over by a royal archduke. Of late it has been doing something towards justifying its existence and connecting itself with its past history by engaging in the ambulance service in time of war. The bailiwick of Utrecht, which survived the decree of Napoleon, also still exists, but the Dutch representatives of the order have become Protestants. The jewel of the order consists of a black and white cross, surmounted by a helmet with three feathers.

The complete organization of the Teutonic order included a grand-master (hochmeister), provincial masters (landmeister) for the greater provinces, and commanders (komtiiven) for the smaller dis- tricts and castles. The power of these officers was not, however, absolute. The grand-master co-operated with a chapter consisting of the provincial masters and five other important functionaries, while the provincial masters in turn ‘had to consult with the couneil formed by the knight commanders. The privileges enjoyed by the order in its palmy days were of the most extensive nature, and its relations to both church and state were often of a most exceptional nature.

See Voigt, Gesch. d. Deutschen Ritterordens (1857-59) ; Lohmeyer, Gesch. v. Ost- u. West-Preussen (vol. i., Gotha, 1881); and EH. Strehlke, Tabul# Ordinis Theu- tonici (Berlin, 1869).

TEWKESBURY, an ancient borough and market-town of Gloucestershire, England, is situated in a fine pastoral valley at the junction of the Severn and the Upper Avon, and on the Midland and Great Western Railways, 15 miles south of Worcester and 126 north-west of London. It has three principal streets, which are regularly built and well paved. The Severn is crossed by an iron bridge with a flattened arch of 170 feet span, erected by Telford in 1824. Of the great Benedictine abbey, one of the richest foundations in England, refounded and enlarged by Sir

Plate ITI. Bound- aries.

Robert Fitz-Hamon in the 12th century on the site of the ancient hermitage and Saxon monastery, there only remain the gate and part of the cloisters. The abbey church, consecrated in 1125, isa magnificent specimen of Early Norman. This elaborate cruciform building consists of nave and side aisles, with transepts united by a grand central tower richly ‘arcaded. The choir terminates in an apse and is surrounded by an ambulatory. One of the most remarkable features of the building is the unique western front, the central part of which is occupied by one vast arch extending from the ground to the roof. Origin- ally it was filled in with Norman windows, but these were removed in the 14th century, when the whole building underwent restoration in the Middle Decorated style, of which it is one of the finest existing examples. The nave was refilled by tracery windows, and stone groining was substituted for the carved wooden ceiling, a like transfor- mation taking place in the transepts. The old Norman columns in the choir still exist; but above them rises a grand superstructure of Decorated work. The elegant clerestory windows are of the 14th century, with stained glass of the same date. The ambulatory was rebuilt some distance farther out, and from it projected a beautiful series of chapels. The elaborate tombs include those of Sir Robert Fitz-Hamon, the De Spensers, Alan prior of Canterbury, Sir Guy de Brien, and the vault of George duke of Clarence (murdered in the Tower) and his wife Isabella. Edward, prince of Wales, slain after the battle of Tewkesbury (1471) by the Yorkists, is also buried in the church, which has undergone an extensive process of restoration under the direction of Sir Gilbert Scott. In the High Street there are several ancient timbered and gabled houses. Remains of an ancient wall have been discovered adjoining the town. The principal modern buildings are the town-hall, the philharmonic hall, and the corn exchange. There is a free grammar-school and a number of charities, including the dispensary, the rural hospital, and Queen Mary’s, Barnes’s, Richardson’s, and Russell’s almshouses. Formerly Tewkesbury had a woollen trade and an important mustard manufacture, but it is now chiefly dependent on its agricultural trade. The popula- tion of the municipal borough (area, 2619 acres) in 1871 was 5409, and in 1881 5100.

The town is supposed to derive its name from Theoc, a Saxon monk, who founded a hermitage here in the end of the 7th century, which was changed into a monastery by the duke of Mercia in 715, and rebuilt by Sir Robert Fitz-Hamon in 1102. On the death of Fitz-Hamon in 1147 the manor passed

to the De Clares, who became merged in the De Spensers, they in turn in the Beauchamps, and the Beauchamps in the Nevilles. At Tewkesbury took place, 4th May 1471, the battle between the Yorkists and Lancastrians which placed the crown on the head of Edward IV. During the Civil War the town was occupied by the Parliamentarians, who were driven out by the Royalists ; but it was surprised and captured by the former in 1644, after which it remained in their possession. Tewkesbury was first incorporated by Elizabeth in 1574, and when James I. sold the manor to the corporation in 1609 he granted it a new charter with extended privileges. This being lost during the Civil War, a new charter was granted by Charles II. Between 1692 and 1698 the town was without a corporation, but a new charter was granted by William III., which remained the govern- ing charter until the passing of the Municipal Act. Until 1867 Tewkesbury returned two members to the House of Commons ; from 1867 to 1885 it returned one; and in 1885 it became merged in the north or Tewkesbury division of Gloucestershire.

The Annales de Theokesberia (1066-1263) are published in Annales Monastici, edited by H. R. Luard, 1864.

TEXAS, the largest in area and the eleventh in popula- tion of the United States of America, is bounded by the Gulf of Mexico on the 8.E., by Louisiana and Arkansas on the E., by Arkansas and the Indian Territory on the N., the latter extending north of its northern prolonga- tion (the Panhandle), by New Mexico on the W. and N. of its western prolongation (the trans-Pecos region), and by Mexico on the 8.W. Its area in 1880 was 262,290 square

miles, or one-eleventh (nearly 9 per cent.) of the entire area of the United States. The extreme length is 740 miles, the breadth 825, and the coast line 400 miles. The boundaries, as recognized by the United States Govern- ment,! are—the Gulf of Mexico from the Rio Grande to the Sabine river, the Sabine river to 32° N. lat., thence the meridian of 94° 10’ to the Red river of Louisiana, thence following that river west to its intersection with the 100th meridian, thence north to lat. 36° 30’, thence west to 103° W. long., thence south to lat. 32°, thence west to its inter- section with the Rio

Grande, which river constitutes the south-western border of the State to the Gulf of Mexico.

The surface features are exceedingly varied, the prevailing ele- Physica] ments being steppes or treeless plains in the north-west, mountains featuyes west of the Pecos river, forests in the east, marshes adjacent to the and diyi. coast, low prairies in the south-east, and a combination of prairies sions,

and broken hills, interspersed with forest growth and thickets of tall shrubs (chaparral), in the centre. These regions are classified as follows (see map below). (1) The coast plain is the direct geo- graphical and geological continuation of the other States which border on the Gulf of Mexico. It includes all the country east of a line concentric with the coast, drawn from Texarkana in the north-east corner of the State to near Laredo on the Rio Grande. The general direction of its slope, in common with that of the rest of the State, is from north-west to south-east. Its altitude ranges up to 500 feet. The immediate coast strip is newly made marsh- land; west of this and north of the Colorado river are forests ; and to the south of it the country is mostly a plain. (2) The black prairie region suc- 10s 101 2 y

ceeds the coast plain on the west. Its west- ern border is sharply defined from the Red river to the Rio Grande, beginning at Denison, passing through or near the cities of Sherman, Dallas, Waco, Austin, and San Antonio, and then deflected west- ward to Eagle Pass. It is a gently undu- lating prairie,covered with a rich black soil, and varies in altitude “{_] from 300 to 700 feet. (3) The central region extends from the black prairie region on the east to the eastern escarpment of the great plains on the north-west and the trans-Pecos mountains on the south-west. This is the only region of Texas which is not the direct continuation of the physical features of some ad-

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Map showing geographical divisions.

within its bounds. In its north-eastern part are two long belts of stunted forest (the Cross Timbers), extending from the Red river to the Brazos, and separated by a prairie 50 miles in width. This is the most fertile portion of

the entire region. West of this sub-region and north of the Colorado is a broken, arid country (the Coal-measures), having a sandy, pebbly soil, covered with a scattered growth of vegetation. West of this, between the 100th meridian and the escarpment of the plains, is the gypsum country, consisting of the so-called “red beds” of the western United States, accompanied by massive deposits of gypsum and other salts. This country is much sculptured by erosion, and in places resembles the ‘“bad lands” of the upper Missouri country. There are also exten- sive intervals of prairie here. Near the centre, in the counties of San Saba, Mason, and Llano, is a rough, semi-mountainous area of older formations. The southern half of the central region is a broken country of white limestone formation, semi-tropical in climate, and covered with scraggy vegetation, its physical features graduat- ing into those of northern Mexico. The south-western part is a rolling plain, entirely destitute of streams. Throughout the region, at intervals of many milcs, low, truncated hills (duties) occur, representing the remains of limestone formations now being rapidly eroded. The region, as a whole, is poorly watered. It 1s best adapted for cattle and sheep raising, and is the chief locality of those industries in Texas. The altitude varies from 700 to 2500 feet. (4) The plains region is the portion of the State west of the 101st meridian and north of the thirty-second parallel, a naa, ae Dy Se

1 The State does not recognize the South Fork of the Red river as the northern boundary, but insists upon the North Fork ; it also claims the 100th meridian as laid down upon Mellish’s map (100 miles east of the true meridian) as the eastern border of the Panhandle.

joining political division. A great variety of conditions is embraced —

commonly known as the ‘‘Staked Plain” (Llano Estacado). It ig the direct southern continuation and termination of the great plains of the North American continent which extend along the eastern slope of the Rocky Mountains from British America to the Rio Pecos. The eastern edge is well marked by a steep escarpment, which, in consequence of destructive erosion, is constantly receding to the westward. The surface is smooth, and utterly devoid of forest growth or streams of water. But there are many small ponds or lakes, and in the southern part these are saline. The soil is

light, rich, and porous, and is covered with a good growth of rass. Until a few years ago this region was totally unpeopled, but many portions of it are now (1887) used for grazing purposes, water being seeured by means of wells or artificially constructed reservoirs. The altitude ranges from 2500 to 4000 feet. (5) The trans-Pecos or mountainous region west of the Pecos river is com- posed of numerous mountain peaks and ranges, with intervening valleys of many miles in width. It is poorly watercd, and the opulation outside the immediate Rio Grande valley is very sparse. he general level of the country is from 8000 to 5000 feet.

The rivers are separable into several sub-systems. The Rio Grande and the Arkansas, constituting the north and south limits of the Texas drainage system, with their respective tributaries, the Pecos and the Canadian, originate in a limited district of northern New Mexico and Colorado, and ultimately reach the sca at points a thousand miles apart. The Canadian and the Pecos have cut deep cafions through the Llano Estacado. The former continues eastward through Indian Territory, and the latter southward, join- ing the Rio Grande between 101° and 102° W. long. on the southern border of the State. The Rio Grande and the Pecos receive no tributaries of importance in Texas, but are constant in their flow. The next and most important group comprises the Red, the Brazos, and the Colorado, all of which originate along the eastern border of the Llano. They traverse similar regions, and have a general resemblance in character of sediment, irregularity of flow, velocity, and topography of drainage basins. Their brackish water is princi- pally derived from the sudden precipitation of rainfall along the gypsiferous escarpments of the Llano. Its volume is ordinarily small, the flow often ceasing entirely west of the black prairie region. There are periodic freshets, however, which suddenly swell the volume to cnormous proportions. These freshets, laden with the rich red loam of the plains, usually reach the lower in- habited sections of the State in periods of drought, and are termed ‘red rises.” Much of this sediment is deposited upon the flood plane of the lower valleys, and by this poe the most valuable sugar and cotton lands of the coast plain have been built up. Another important group consists of the Sabine, the Trinity, the San Marcos, the Guadalupe, and the Nueces, most of which have their origin near the western border of the black prairie region. These streams have a greater volume and are more constant in flow than any others, and are

usually without deep cafions or wide bottoms. Many of them, especially those south of Austin, have their origin from large springs situated along the foot of the escarp- ment line extending from Austin southwestward. Another sub- sidiary system of streams originates in the narrow Quaternary region along the coast, within the district of the greatest rainfall. These streams are tidal, and sometimes navigable towards their mouths, Most of them are locally known as bayous. In general, the rivers of Texas are not adapted for irrigation or navigation. Neither do they afford much available water power north of Austin.

The entire gcologic series, with a few exceptions, is represented in Texas. The earlier Paleozoic rocks, including the pre-Cambrian (Keweenawian; A in accompanying geological map), the Pots- dam (0c), and the Ordovician (0c), up to the Trenton, underlie the State, but are only exposed in two limited districts. The first of these is in the counties of Mason, Llano, Burnet, and San Saba in the central region ; the other is in the disturbed mountainous hen of the trans-Pecos region. The Cambrian was deposited horizontally upon the upturned Keweenawian, and the Ordovician appears to rest conformably upon the Cambrian (Potsdam); but there was a continental elevation of the whole region, probably commencing at the close of the Trenton epoch, which continued until the beginning of the Coal-measure epoch, for the Upper Silurian, Devonian, and sub-Carboniferous are absent, and the earlier rocks arc disturbed. These earlier Paleozoic sediments age no marked stratigraphical or paleontological differences tom the same formations throughout the continent, and thus show the widely distributed uniformity of conditions which then existed, At the commencement of the Carboniferous period, how- ever, that marked difference of faunal, lithological, and strati- graphical features began which distinguishes the synchronous deposits of the later formations of the western and eastern portions of the United States. The Texas region has been the transition ground, and hence all the geologic deposits, beginning with the Carboniferous, have two faces, dependent upon their geographical position east or west of 100° W. long., and representing the sedi- ments cither of interior continental basins or of the waters of the Atlantic during alternating periods of submergence and emergence.

The Carboniferous rocks, and most of the succeeding formations. are exposed in two widely separated portions of the State, with entirely different lithological and faunal aspects. The mutual re- lations of these series have never been traced. The first occurs in the central region between 97° and 100° W. long., north of the Colorado river, and consists of clays, sandstones, conglomerates, limestones, and coal seams of workable thickness. It is the south- western prolongation and termination of the Coal-measures of the

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QUATERNARY. MIOCENE (LOUP RIVER 2) __. CEN!

EASURES). ...K’ = © (ROCKY MOUNTAIN) . .K# “ORDOVICIAN AND CAMBRIAN. -..O0C PRE-CAMBRIAN. . . ~...--- A

Geological map of Texas.

eastern United States. These rocks, although in general similar to them, differ in some respects from those of the same formation further east, and also exhibit a few resemblances to the strictly marine Carboniferous of the

Rocky Mountain region (k?), To the other series belongs the trans-Pecos Carboniferous (x1). Although this is of the same geologic age as the eastern Coal-measures, it is a purely marine deposit of limestones and sandstones, and is barren of vegetable remains. It is exposed along the Guadalupe and other mountains of the trans-Pecos region, forming the most eastern outcrops of the non-coal-bearing Carboniferous of the west. The study of the areal distribution and relation of the strata intervening between the Carboniferous and the fully-identified Cretaceous in Texas has not been begun. The Permian, Triassic, and Jurassic, if they exist, have not been clearly diagnosed, although these names have been applied to the series of rocks west of the central Carboniferous region. The thickness of the sediments belonging to these undetermined strata is very great. They are mostly un- fossiliferous, and the presence of stratified gypsum and other salts indicates that they were laid down in an interior basin cut off from oceanic waters and were too highly concentrated for the existence of molluscan life. Certain of these deposits, known as “red beds” or “Jura-Trias”” (JT), extend beneath the Llano Estacado, across New Mexico, and into Arizona. The Cretaceous is by far the most conspicuous and extensive of the geologic formations of the State. It once covered the entire territory, but has been eroded away in many places west of the black prairie region, exposing the older formations, and is covered to the east of that region by more recent deposits. From the fact that the lowest member of the series is found resting directly upon the pre-Cambrian in Llano county, the Carboniferous in Lampasas and the counties northward, the Silurian in the trans-Pecos region, and the Jura-Trias beds in the plains region, it is evident that its beginning marked a period of conti- nental submergence, and that this submergence, from the great thickness of pelagic sediments in it, was long continued. The lowest member of the series, the oldest known of the American Cretaceous, is unknown elsewhere in the United States, and its peculiar features give individuality to the central region. This member (cN), which may be called the Texas group, is the equiva- lent of the Neocomian of Europe, and many of its fossils are common to Europe and America. It is not exposed east of the central region, except (probably) in the salines of Louisiana. There was a great elevation of this deep-sea formation at its close, as is attested by the shallow water sediments of later groups deposited unconformably upon it. The Middle (cc, cs’) and the Upper Cretaceous (cs? and cs!) are also well exposed. The black prairie region is

under- lain by the middle and upper groups of the marine Cretaceous characteristic of the other Gulf States and known as the Rotten Limestone (cs!) and Ripley (cs!) groups. The Cretaceous groups of the Rocky Mountain region extend into Texas, and are exposed in the trans-Pecos region and along the lower Rio Grande. The

Moun- tains.

Minerals.

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Tertiary formations, so far as recognized, are purely marine, and, like the marine Upper Cretaceous of the black prairie region, are the direct geographical continuation of the formations of the other Gulf States. They occupy the coast plain, in bands approximately concentric with the shore of the Gulf of Mexico, and represent the sediments of its receding waters. The alleged occurrence of the fresh-water Miocene, the Loup river group (M), upon the Llano Kistacado has not been demonstrated. Quaternary (q) and other recent alluvial deposits occur along the coast and the upper terraces of the three older river systems as far west as the eastern border of the central region. This is attested by the character of the de- posits, accompanied by well-authenticated remains of the elephant and mastodon. These Quaternary soils are mostly the redeposited detritus of the strata of the eastern escarpment of the Llano Estacado, which is carried down by the “red rises.” The surface features of the central region are the result of sub-aerial denudation. The black prairie is protected from this destructive erosive process by the tenacious character of its soil ; and the coast plain is covered by a luxuriant forest growth, and is constantly extending eastward by the recession of the shore line. The final emergence of the State began in Middle Cretaceous time, and was connected with the same movements that brought up the Rocky Mountain system. The strata of Texas, except the Paleozoic groups, are soft, and yield readily to disintegration. A few eruptive sheets are found in the trans-Pecos region and along the lower Rio Grande, being remnants of the eastern edge of the great eruptive area of the Rocky Moun- tain region. Granitic masses occur, as extrusions from the pre- Cambrian, in the central and trans-Pecos Paleozoic deposits.

The eastern ranges of the Rocky Mountain system are deflected towards the Gulf of Mexico after passing south of 33° N. lat., and take a south-easterly course through Texas into Mcxico, the trend of their axes being generally parallel to the direction of the Rio Grande and its principal tributaries. The only true mountains in Texas are situated west of the Pecos, with the exception of a few foot-hills (lomztas) which re-enter the State from Mexico near Eagle Pass and follow the river to an undetermined point below Laredo. The principal ranges are the Guadalupe, Limpia, Chinali, Los Chisos, Organ, and Franklin Mountains. They are composed of older rocks, in most places; the later formations have been washed away, except where protected by eruptive flows. The most eastern and northern of these mountains are usually the highest. Guadalupe Peak is 9000 fect ; Limpia Peak and the crest of the Chinalis, from 3500 to 8000 feet; Eagle Mountains, 7000; and the intervening valleys from 3500 to 5000 feet. The low buttes of the central region are miscalled mountains upon most maps. There are several well-defined escarpments extending for long distances, approximately north and south The step of the first of these, from Austin to Eagle Pass, is from 200 to 500 feet high, and is the result of an elevation at the close of the early Cretaceous period. Near the 100th meridian another escarpment occurs, and along the castern and southern borders of the Staked Plain still another. The western part of the coast plain has a few low hills. The rest of the State has no notable prominences.

The mincral resources of Texas have not been mapped or studied, and hence the State ranks last in mineral products. The trans- Pecos region is rich in silver and lead ores ; but the State owns thie mineral rights of nearly all the land, and has hitherto declined to open them to development. Only one mine is worked here. Silver and gold have also been discovered and mined in Llano and Mason counties, but without successful results. Gold occurs throughout the marine limestones of the lowest (Texas) group of the Cretaceous, but not in sufficient quantity for profitable extraction. Rich but not abundant copper ores occur in the drift of the gypsum country. Iron ore is found in the Tertiary of eastern Texas, and is profitably reduced in a few charcoal furnaces by the aid of convict labour. At present these are remote from coal and suitable means of trans- portation. Magnetic iron ore occurs in the pre-Cambrian rocks of Mason county, and recent analyses show it to be equal in quality to the best Swedish ores. It is in great abundance, but

remote from means of transportation and fuel. Ores of iron (sphzro-siderite) occur in the central Carboniferous formation, but their commercial value is unknown. The non-metals occur in great abundance in different portions of the State, including salt, gypsum, magnesium sulphate, natural cements, kaolin, and other clays. The unutilized beds of massive gypsum are, with the exception of those of the Sahara and the Andes, the purest and most extensive in the world. Salt is gathered from lacustral deposits or mined at El Paso, Colorado City, and along the lower Gulf coast for local use. The coals of the central Carboniferous area have been worked to some extent, but are generally of inferior quality, having from 50 to 70 per cent. of ash. Very recent discoveries of better quality have been reported. Tertiary fibrous lignite, of light specific gravity, is found in great abundance all along the junction of the coast plain and black prairie regions. It is worked to a small extent, but has no commercial value. The most important coal area is the semi-bituminous lignite belt of the trans-Pecos and lower Rio Grande regions, which is the direct geographical continuation of

the late Cretaceous coals of New Mexico and Colorado. It is worked at Eagle Pass and Santa Toma, near Laredo. The beauti- ful marbles and other ornamental stones of the State are untouched, with the exception of the Llano county granite.

The amount and regularity of the rainfall decreases inland, mean annual varying from 52°3 inches at Galveston to 18 at E Paso in the extreme west and 23 at Mobeetie in the extreme north, The subjoined table gives the mean temperature and rainfall of certain representative localities :—

Mean Precipitation in Inches,

Station.

Altitude

Summer Autumn.

Coast Plain.

Galveston Indianola Palestine

Black Prairie Region. Denison

San Antonio

Central Region. Fort Belknap…..... Chadburne .. Griffin

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», Makavet Plains Region. Fort Elliott », Concho Trans-Pecos Region. El Paso

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The coast plain and the black prairie regions have abundant rain- fall for agricultural purposes. It decreases, however, to the west, and varies greatly in different ycars, sometimes being ample; but in 1885-86 it did not average 10 inches. The precipitation is also very sudden, seldom lasting more than a few minutes at a time. Only 52 per cent. of the 20 inches of rainfall in the central region and west of it falls in the agricultural season, one-half being in summer and the remainder in autumn, so that it is equivalent to only 15 inches in regions where the rainfall occurs in more pro- ome seasons. This condition is, however, especially favourable or grazing. ‘There are few statistics of the plains region ; but the rainfall along its eastern escarpment is slightly greater and more regular than that of the central region. The tcmperature varies greatly throughout the State, both in extremes and means. Fort Ringgold on the lower Rio Grande is the hottest point in the United States, except Key West, Fla. Its mean temperature is 73°4° Fahr. ; that of El Paso is 63°, and of Mobeetie 54°6°. The prevalent winds are southerly and south-easterly, and blow constantly across the State, without which its summers would be unendurable. The Rio Grande valley is not subject to frosts. Snow seldom falls south of Galveston and Austin. In the Panhandle the winters are severe.

The arboreal flora of Louisiana and Arkansas extends into north- eastern Texas, conformable with the coast plain, where, immediately south of the Colorado river the great pine belt of the Atlantic and Gulf coasts terminates. The flora of the great plains region, principally consisting of nutritious grasses, enters the north-western portion of the State and extends south to the 32d parallel and east to the 101st meridian, The peculiar plants of the Rocky Moun- tain plateaus penetrate into the trans-Pccos region, while the north Mexican flora is found along the Rio Grande. The central region is a transition ground where these floras find representation generally in deteriorated and dwarfed species. In the coast plain occur the long and short leaf pine, with many species of oak and hickory. The black prairic region is destitute of trees, except scattered individuals of live oak and the mesquite bush (Prosopis glandulosa). The broad river valleys of this region, however, are well-timbered with pecan, cypress, cottonwood, and several species of oak, and have a vigorous growth of smaller shrubs. West of the black prairie region the dwarfed, stunted trees are of little value except for fuel. The river valleys have the same character of trees as further cast, but the rocky highlands are covered with scraggy bushes (chaparral) of oak, juniper, and cedar. The summits of the Guadalupe and Limpia ranges, in the trans-Pecos region, are clothed with forests of the yellow (Pinus ponderosa), flexible (P. flexilis), and nut pine (P. edulis), all of which attain great size. Many smaller trees grow on these mountains. The valleys and several of the ranges in the last-named region, however, are desti- tute of trees. The entire Rio Grande valley, from El Paso to Brownsville, grows many species of cactus and other prickly, corl- aceous shrubs. The grasses of the State are especially numerous In species, and are found most luxuriantly on the prairies of the lower

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coast, the central, and the plains regions. The lumber supply of the State comes entirely from the east Texas pine forests. The cedar, juniper, and

mesquite are only utilized for fuel and fencing.

The black bear (Ursus americanus), panther (felis concolor), and lynx (Felis rufa) are common to all parts of the State. The bison, wild horse, prongbuck (Anéilocapra americana), coyote (Canis latrans), grey wolf (C. lupus), eastern prairie dog (Cynomys ludovicianus), and the lesser Mammalia of the great Rocky Moun- tain plains constitute the fauna of the north-western part of the State, reaching into the western part of the central region. Their southern limit is approximately the 31st parallel. The highest ranges of the trans-Pecos region possess the unique avian and mammalian fauna of the Rocky Mountains, including the black- tailed or mule deer (Cariacus macrotis) and Roeky Mountain sheep, with a few Mexican species. The lower valleys have a mingling of the Mexican, Rocky Mountain, and great plain faunas. Along the valley of the Rio Grande, and extending northward in places, the subtropieal fauna is Mexican, including the peccary (Dicotyles torquatus), armadillo (Dasypus peba), jaguar (Felis onca), and ocelot (Felis pardalis). Among the birds are the scissor-tail (Milwulus forficatus), Mexican eagle (Polyborus cheriway), cha- parral cock (G@cococcyx viaticus), and numerous other unique forms, The fauna of the humid wooded coast plain is the south-western continuation and termination of that of the South Atlantic and Gulf States, with slight variations, and includes the Virginia deer (Cariacus lewcwrus), raccoon (Procyon lotor), opossum (Didelphys virginiana), alligator, &c. The black prairie region limits the last named fauna on the west, except in its wooded river bottoms. The central region possesses representatives of the great plains, Rocky Mountain, Mexican, and Louisiana faunas, but none of them cross it into other regions. It isa true transitional ground of most of the faunas of all temperate North Ameriea, east of the Pacific slope.

The total population in 1880 was 1,591,749 (837,840 males and 753,909 females), and in 1887 it was estimated to have risen to 2,415,000, giving 9°2 inhabitants to the square mile. Of the population in 1880 1,477,138 were natives of the United States and 114,616 foreign born. There were 393,884 Negroes, 186 Chinese, 992 Indians, and 48,000 civilized aborigines (Mexicans). Of the entire population 522,133 persons were engaged in oceupations as follows :—in agriculture (including stock-raising), 359,317 (68°8 per cent.); in law, medicine, and other professions,

97,651 (18°7 per cent.); in trade and transportation, 34,909 (6°7 per cent.); in manufacturing and mining, 30,346 (5°8 per cent.). At the same date there were 3153 prisoners, 2276 idiots, 1564 insane, 588 paupers, 1375 blind, and 771 deaf. 18°9 per cent. of the native whites, 24°7 of the foreigners, and 75°4 of the Negroes—or 29°7 per cent. of the entire population—were unable to read or write. The population of Texas has increased more rapidly than that of any State in the Union except Kansas. The following table shows the increase for the past few decades :—

Anglo- Mexican : Total Per g Biveri ae. Aborig'al oe ere ae Popula- |cent.in- | can Peece Ua Mescent (oe | Poets) | Buc. | ton! crease. 1950/ i a 212,592| .. 1860} 420,891} 182,921 403 ae ae, 604,215 | 184°2 1870) 564,700} 253,475 ais 879 62,411 25 818,579] 35°4 1880)1,197,237 | 393,484] 43,000 | 992 | 114,116] 136 /1,591,749| 94-4 1887 Be an sis c 200,000 | 300 |2,415,000} 9474

The population of the principal cities, according to the U.S. census of 1880 and trustworthy estimates in 1886, was as follows :—

1880. 1886. 1880. 1886.

Galveston …..... 22,248 | 30,000 |} Austin …..... 11,013 | 23,000 San Antonio …... 20,550 | 35,000 || Fort Worth…..... 6,663 | 25,000 DRS ofcie:e sis 0.0 10,358 | 32,000 || Waco …....0.. 7,295 | 20,000 FIGUSCOI.....00—.. 16,513 | 23,000 || Denison …..... 3,975 | 12,000

84 per cent. of the total population of the State is found east of the central region—the black prairie region (northern half) being the most densely populated, and the coast plain next. Between 1880 and 1887 there was a large flow of population into the trans-Pecos and plains regions, and during the last two years mentioned a deerease in the central region. The population consists princi- pally of white natives of the southern United States, except in the counties of Brazos, Fort Bend, Harrison, Marion, Moore, and Washington, where it is of Negro race ; in the counties of Fayette, Colorado, Guadalupe, Comal, and Gillespie, where it is German ; and along the Rio Grande, where it is Mexican.

Of the United States Texas now ranks first in the production of cotton and cattle, second in sugar, sheep, mules, and horses, eighth m rice and pigs. The eastern third of the State, containing 80 per cent. of the entire population, is agricultural ; the remainder 1s pastoral. The chief crops are cotton and Indian corn ; wheat is grown in the northern part of the black prairie and eastern part of the central regions, sugar in the lower bottom lands of the Brazos and the Colorado, rice on the coast. The chief vegetable products for 1880 were—cotton, 805,284 bales ; Indian corn, 29,065,172 bushels ;

wheat, 2,567,737 ; oats, 4,893,359 ; sweet potatoes, 1,460,079 ; Irish potatoes, 228,832 ; barley, 72,786; rye, 25,399; sugar, 4951 hogs- heads ; molasses, 810,605 gallons; hay, 59,699 tons ; tobacco, Doleree pounds; rice, 62,152 pounds; orchard products, to the value of $876,844. The total value of these products was $63,076, 311. Since 1882 the quantity of cotton produced annually has exeeeded 2,000,000 bales, of 500 pounds each. In 1880 there were 174,184 farms in the State, with an aggregate of 12,650,314 acres of im- proved land. The farms are usually of large size, and garden, orchard, aud dairy products are entirely secondary to plantation crops. The southern part of the coast plain and the rest of the State west of the black prairie region are peculiarly adapted to pastoral pursuits, which are entirely separated from agricultural, the cattle and sheep being allowed to roam at large, or enclosed in enormous pastures, where they subsist without other food or shelter than nature affords. In 1880 there were in the State— 4,084,605 cattle, 2,411,633 sheep, 1,950,371 pigs, 805,606 horses, and 132,447 mules and asses. ‘The sheep walks are more particu- larly confined to the southern half of the central region, including the lower Rio Grande valley.

The exports are cotton, wool, and hides, most of which are Com- The chief im- meree.

shipped from Galveston or sent overland by rail. ports are manufactured articles used in the State, also coal and railway material. Apart from a small retail trade along the border, there are no exports to the adjoining States, The principal seaport and commercial city is Galveston. The mileage in

railways has increased from 1048 in 1872 to 5974 in 1882, and to 7034 in 1886.

The founders of the State made liberal provision, by grants of Educa- land and revenue, for public education, but their intentions have tion.

not been carried out by subsequent legislation. Texas occupies the anomalous position of having the best school fund and the poorest school system in the United States. The public free school system proper consists of two normal schools for the preparation of teachers and numerous district schools, open for four months in the year. In most of the cities the State fund is supplemented by local taxation, and excellent schools are maintained. In 1886 there were 489,795 children within school age, and the cost of the maintenance of the whole system was $2,362,226. There are no schools for secondary cducation, except the high schools of a few cities. The State university is at Austin ; it is abundantly endowed with lands, but does not receive the full benefit of its revenues, There is also a State agricultural aud mechanical college, but technical training is made secondary.

The State government differs somewhat from those of the rest of Adminis- the Union, owing to the fact that it has had to adapt itself to the tration.

administration of the great public domain, by which most of the public institutions are supported and works of internal improvement accomplished, and because much of the attention of the Govern- ment has been necessarily diverted to the protection of its exten- sive frontier. The executive government consists of a governor, comptroller, treasurer, commissioner of the general land office, and superintendent of education, elected biennially, with an attorney- general and a sccretary of state, appointed by the governor. The Judiciary consists of two courts of final appeal, one for criminal, the other for civil business ; forty itinerant higher courts for the trial of penal offences and civil suits; courts for misdemeanours and minor civil cases in each county; and innumerable justices’ courts for first hearings. The legislature consists of 32 senators elected for four years, and 115 members of the house of representa- tives elected for two years. It is restricted by the constitution to biennial sessions of ninety days each. The State is divided into thirteen congressional and forty judicial election

districts. It is also divided into 232 counties, 75 of which have no population, or insufficient population to be organized. Each county is divided into four commissioners' preciucts and a varying number of school, election, and justiees' precincts. The State has always maintained a corps of troops, formerly for protection against Indians, but now for preserving order in the unorganized counties. It has institu- tions for the blind, deaf and dumb, and insane. The prison system is far superior to that of the other southern States, but still very imperfect. The bonded debt of the State on 1st January 1887 was $4,237,730, and its taxable wealth $600,000,000. The aggregate debt of all the counties and cities was $7,000,000. The homestead and exemption laws are unusually liberal to the debtor.

The upper Rio Grande valley was visited in 1580-83 by the History.

Spaniards, who established missions among the settled Indians near E] Paso and Santa Fé. The first white settlement was made by La Salle at Lavaca, on the coast, in 1685. The country was in- habited by Indians of various tribes, both savage and agricultural, most of whom are now extinct, except the so-called '' Mexican" population of the Rio Grande. From 1583 to 1794 many missions were established by Roman Catholic missionaries among the Indians, whe were completely alienated from their original language, reli- gion, domestic habits, and tribal relations. After the purchase of Louisiana from the French in 1803 Anglo-American adventurers began to cross into Texas from the United States. In 1821, when Mexico threw off the Spanish yoke, Texas and Coahuila constituted

Method of weav- ing.

a state of the republic. It was shortly after this that the first American colonists were permitted to enter the territory under Government patronage. Within ten years over 20,000 had settled between the Sabine and the Colorado. In 1830 the Mexican Government placed them under military rule, from which, with accompanying impositions, originated the war of Texan Independ- ence. The Anglo-Americans were assisted by volunteers from the United States, and the war was terminated by the defeat of the Mexicans under General Santa Anna at San Jacinto, 21st April 1836. From

1837 to 1845 Texas was an independent republic. It was admitted to the United States on 29th December 1845, in spite of the protests of Mexico, and a war with that country immediately ensued. The new State sold to the United States Government for $10,000,000 all the territory west and north of the present bound-. aries between the headwaters of the Rio Grande and the Arkansas. But it reserved the control and disposal of the public lands within its borders, which have proved a magnificent source of revenue, and also the right to divide into five states, should future growth and development justify it. By a small majority the State seceded from the Union in 1861. In 1868 a new constitution was adopted, and the State readmitted into the Union. In 1874 the Kiowa and Comanche Indians, who had prevented the settlement of the central

and plains regions from the earliest times, were subjugated.

See Hill, Geolog. Knowledge of Texas (1887)—Bull. 44, U. S. Geolog. Survey ; Geological Map of the United States, by C. H. Hitchcock ; Report on cotton production, Tenth U. 8. Census, by Dr. R. H. Loughridge ; forestry Reports, Tenth U. 8. Census; Mexican Boundary Survey, vol. i.; Proceedings of Boundary Commission, Austin, 1886; Trans. of Academy of Sciences, St Louis, vols. i. and ii, (Dr Shumard); Thrall, History of Texas ; Kendall, Santa Fé Expedition ; Spaight, Resources, &c., of Texas, Austin, 1882; Roemer, Kreidebildungen von Texas, 1852; Walcott, Cambrian Faunas of N. America—Bull 80, U. S. Geolog. Survey; Hill, ‘‘Topogr. and Geol. of Cross Timbers of Texas,” in Amer. Journ. Sci., April 1887; Cahe, Zoolog. Position of Texas ; Marcy, Exploration of Red River; Report of the U. 8. Mexican Boundary Survey ; Havard, Report on the flora of west and south Texas; and U. 8. explorations for a route for a Pacific Railway. @&. F.)

TEXTILES.! This word is applied to all fabrics which are woven ina loom, of whatever material they may be made, and whether the woven stuff be plain or figured. The simplest and earliest process of weaving was managed thus. The ground of the future stuff was formed by a number of parallel strings called the warp, having their upper ends attached to a horizontal beam and drawn taut by weights hung from their lower ends. In the early Greek loom each warp thread had a separate weight (see fig. 1). On the

number of the warp strings the fineness and width of the stuff depended. The strings of the weft were interlaced at right angles to those of the warp, and the combination of the two formed the woven stuff or web. The weft was so called from its being ‘‘ wafted ” in and out of the warp ; it is also often called the woof, though more correctly the woof is the same as the web or finished stuff. The threads of the weft were wound round a sort of bobbin on a pivot which was made to revolve inside a hollow boat-shaped piece of wood pointed at both ends so as to pass easily between the threads of the warp. This is called the shuttle. The thread passed out through a hole in the side of the shuttle, the inner pivot revolving as the thread was delivered between the strings of the warp. In order to make the weft interlace in the warp some of the upright strings were pulled forward out of the general plane in which the warp hung; this was done in the simplest way by a reed, which divided the threads into two sets called Jeaves and thus formed an opening called the shred, through which the shuttle could pass, as shown in fig. 1. Another way, applicable to more complicated ornamental weaving, was to have a series of threads attached to the warp at right angles, so that the weaver could pull any of the warp threads away from the rest, thus allowing the shuttle to pass in front of or behind any special warp strings. By a very simple mechanical contrivance these threads were worked by a foot treadle, thus leaving the weaver’s hands free to manage the shuttle.* In the

1 This article deals mainly with the history of the textile art ; for practical information as to modern processes, see WEAVING ; see also EMBROIDERY, Vol. viii. p. 160 sq.

2 These dividing sticks are called in French “batons 4 deux’’; in the simplest kind of weaving only one is required. The use of

treadles and “spring staves” is more applicable to the low loom, in which the warp is strained in a horizontal position.

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simplest sort of weaving first one and then the other half of the warp threads were pulled forward, and so a plain regularly interlaced stuff was woven. The next stage was to make a cloth with coloured stripes, by using success- ively two shuttles containing different-coloured threads. In a chequered cloth the warp was made of two-coloured threads stretched in successive bands, and the cross stripes of the weft were woven in by the two shuttles. To form a more complicated pattern the weft must not cross the warp alternately: the design is formed by either the warp or the weft predominating on the surface in certain places. Tn all cases each thread of the weft must be driven home to its place after each stroke of the shuttle. In the . earliest times this was done by beating the weft with a

wooden sword-shaped implement ® introduced between the strings of the warp; but later a heavy comb-shaped tool was used,* the teeth of which passed between the warp and drove home at one blow a longer length of the weft. An upright loom such as has been described is shown clearly in some of the wall paintings from Thebes, dating about 1600 B.c. and in other earlier ones from Beni-Hasan. A very similar loom is represented on a Greek vase of the 5th century B.c., with a picture of Penelope and the | never-finished piece of stuff (see fig. 1). In this interesting

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Fia. 1.—Penelope’s loom, from a Greek vase of the 5th century B.C. The standing figure is that of Telemachus.°

painting the upper band has simple geometrical ornaments, Looms: such as occur on archaic Greek vases; the next has figures of winged men and gryphons. This sort of loom is still used in Scandinavian countries for tapestry.6 Another form has the warp threads stretched, not upright, but horizontally,—an arrangement which is more convenient for working treadles. These two forms are called in French “la haute lisse” and “la basse lisse,”—the high and the low loom. The general principle is the same in both. Fig. 2 shows a simple form of the “basse lisse,” such as was used

throughout the Middle Ages, except in Tceland and in Scandinavia.’ The clay whorls, or pierced cones, decorated with simple painting, which have been found in countless numbers on the sites of Troy, Mycene, and other prehistoric cities, were probably used to strain the thread as it was being spun on the distaff.* Other

3 Lat. spatha. 4 Lat. pecten ; modern English batten or lay.

5 See Mon. Inst. Arch. Rom., vol. ix. pl. 42.

6 See the modern Faroese loom figured by Worsaae, Afbildninger fra det k. Museum for Nordiske Oldsager, Copenhagen, 1854, p. 128.

7 A fresco by Pinturicchio—911 in the National Gallery, London— has a careful representation of the medizval low loom ; the subject is the return of Ulysses to Penelope.

8 Dr Schliemann found 22,000 in the plains of Troy alone.

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heavier ones were employed to stretch the strings of the warp; this method must have been very inconvenient, as the whole warp could swing to and fro. A very obvious improvement, introduced in some countries at an early date, was to have a second beam, round which the lower ends of the warp could be wound. In Scandinavian gee countries the use of weights con- | tinued till modern times. In the fate- loom of the sagas these weights are heroes’ skulls, while the shuttle is a sword, – Some simple ori, form of weaving seems to have been practised by pre- historic man at af very early stage of development. Fig. R 3 shows an ex- ample of coarse fey flaxen stuff from §

the lake-dwellings ee ste wage . i d, #1G. 2.—Medizeval low-warp loom, from a cut – ti eager “ by Jost Amman; middle of the 16th century.

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Stone Age. Wool appears to have been the first sub- stance used, as no skill is required to prepare it for spin- ning. Weaving was speci- @ ally the duty of women, ®» and even in the Middle * Ages in Europe it was, in some countries, considered a specially feminine em- ployment. An early Chris- tian sarcophagus in the Lateran has a symbolical relief representing God condemning the future z world to labour,—tillage for the man and weaving for the woman :—He gives ears of corn to Adam and ™ Peto – a sheep to Eve. ae 2) ena age _ flaxen Hient The E tians were 8 un, Tom a iake- dwelling in *ption. famed be ths beauty of sinecataita

their woven stuffs, and almost incredible stories are related of the fineness of their linen, such as a pallium sent by King Amasis to the Spartans, which, Herodotus (iii. 47) says, was made of yarn containing no less than 360 threads ; the figures woven on this were partly of cotton and partly of gold thread. Herodotus also mentions a wonderful pallium sent by the same king to the shrine of Athene at Lindus. Few examples of the fine and richly ornamented sorts of Egyptian stuffs now exist, though we have immense quan- tities of the coarse linen in which mummies were wrapped. This, though coarse, is closely woven, and usually has in every inch many more threads to the warp than to the weft. A few fragments of Egyptian cloth of the XVIIIth Dynasty have been found with a border of coloured bands, the blue of which is indigo and the red extract of KERMzs

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‘ In the time of St Louis (18th century) in France some sorts of meting, such as ‘‘tapisserie Saracenois,” were done only by men.

Some existing specimens have in each inch 152 threads in the warp and 70 in the weft 3 in modern stuffs the proportion is the other way. A coarsely woven piece of Egyptian stuff in the British Museum has a border with a man swimming, supported by a float.

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(q.v.). In Egypt linen was specially employed for religious purposes, such as priestly and royal vestments, because it harbours dirt less than wool or cotton, which were also worn by the Egyptians, and it was used to bandage mummies, because it was thought not to engender worms. Though priests were allowed to wear outer garments of wool, they were obliged to put them off before entering a sacred place,

The Phoenicians were celebrated for their weaving, as Pheni- for their skill in other arts. ‘Their purple linen, dyed cian. with the murex, was specially valued; Tyre and Sidon were the chief places where this was made. Babylon, Carthage, Sardis, Miletus, and Alexandria were all famous seats of textile manufacture in the time of Herodotus,

Though no specimens of Assyrian textiles remain, some Assyrian.

notion of their richness of ornament and the styles of their patterns may be gained from the minute representa- tions of rich dresses worn by kings and other important personages in the sculptured wall-reliefs from Nineveh which are now in the British Museum. The stuffs worn by Asur-banipal are most elaborate in design, being covered with delicate geometrical patterns and diapers, with bor- ders of lotus and other flowers treated with great decora- tive skill, A large marble slab from the same palace is covered with an elaborate textile pattern in low relief, and is evidently a faithful copy of an Assyrian carpet. Still more magnificent stuffs are represented as being worn by Assyrian captives on the enamelled wall-tiles from Rameses II.’s palace (14th century B.c.) at Tel al-Yahudtya (see Porrsry, vol. xix. p. 603); the woven patterns are most minutely reproduced in their different colours, and the design, special to Assyria, of the sacred tree between two guardian beasts, is clearly represented, though on the most minute scale. .

Our knowledge of Greek textiles, in the almost com- Greek. plete absence of any existing specimens,‘ is chiefly de- rived from the descriptions of various classical authors. One indication of the patterns commonly used at an early period is given by the designs on much of the archaic Greek pottery, which clearly has ornament derived from textile sources. Vol. xix. p. 607, fig. 16, shows examples of these ; simple bands, chequers, and zigzags would natu- rally be the first steps towards more elaborate patterns. Again, recent excavations at Orchomenus and Tiryns have brought to light examples of ceiling and wall decoration the motives of which are obviously derived from textile patterns. A stone ceiling at Orchomenus has in relief a carpet-like pattern, and the painted wall-stucco of the Tiryns palace has many varieties of coarse but effective textile ornament. The poems of Homer are full of descrip- tions of woven stuffs of the most magnificent materials and design, used both for dresses ® and for tapestry hang- ings. In later times the most important examples of rich woven work of which we have any record were certain peploi made to cover or shade the statues of the deities

% A very magnificent royal dress, with woven patterns of deities, kings, animals, and the sacred tree, much resembling those on the metal bowls of Assyria, is figured by Layard, Monuments of Assyria, series i., pl. ix.

4 One remarkable example of tapestry from a tomb in the Crimea is supposed by Stephani to date from the 4th century B.c.; see Comp. Rend. Com. Arch., 1878-79, p. 40, pl. v.

° I1., iii, 125, viii. 288, ix. 200, x. 156, xiv. 178, xxii. 440; Od., li, 98, x. 220, xiv. 61, and many passages in books xviii, to xx, Homer describes (Od., xix. 225-235) a cloth of purple wool with a hunting scene in gold thread, woven by Penelope for Ulysses.

6 1., xvi..224, xxiv. 230, 6453; Od., iv. 124, 298, vii. 337. Many Greek vases, especially those with black figures and incised lines, have representations of rich woven dresses,—e.g., an amphora in the Vatican with Achilles and Ajax playing at a game like draughts, c. 460 B.C. A rather later vase in the British Museum has a fine figure of Demeter clad in a pallium covered with figures of chariots and winged men and horses,

at Athens, Olympia, Delphi, and other famous shrines.} Euripides (Jon, 1141-1162) gives a glowing description of a peplos which belonged to the temple of Apollo at Delphi, on which was depicted the firmament of heaven, with Apollo Helios in his chariot, surrounded by the chief stars and constellations. At Athens a new peplos, orna- mented with the battle of the gods and the giants, was woven for the gold and ivory statue of Athene in the Parthenon every fifth year, and was solemnly carried in procession at the greater Panathenza. Similarly at Olym- pia a new peplos was woven by sixteen women, and dis- played every fifth year at the Olympian games in honour of Hera. It appears probable that these magnificent peploi were not used as garments, which would have partly concealed the splendour of Phidias's gold and ivory statues, but were suspended over them like a medizval baldacchino. Very possibly, however, most of the elaborate work on them was embroidery done by the needle, and not loom or tex- tile work.

The Romans under the late republic and the empire possessed immense stores of the most magnificent textiles of every description, such as the splendid collection of tapestry which Rome inherited along with the other art treasures of Attalus II. of Pergamum (2d cent. B.c.). A very costly cloth of gold was called by the Romans "attalica," after Attalus. The C. Cestius who died about the middle of the lst century B.c., and who is buried in the existing pyramid in Rome, left orders in his will that his body was to be wrapped in certain attalica; but, as this was forbidden by a sumptuary law, his heirs sold the gold stuff and with the proceeds had two colossal bronze statues made, which were set outside the tomb. The feet of one of these have been found with an inscribed pedestal recording the above-mentioned facts. The size of the statue shows that the attalica must have been worth a very great sum. Examples of large prices given by Romans for woven stuffs are recorded by Pliny (H.W., viii. 48): Metellus Scipio bought some hangings from Babylon for 800,000 sesterces, and other similar stuffs were bought by Nero for four millions of sesterces (about £3360). Costly tapestry from Babylon is mentioned by Plautus (Sézch., IL., ii. 54), Silius Italicus (xiv. 658), and Martial (xiv. 150). Virgil (Geor., iii, 25) mentions woven

tapestries with figures of Britons being used at theatrical shows: “Purpurea intexti tollant aulea Britanni.” Other tapestries with scenes from the story of Theseus and Ariadne are mentioned by Catullus (Argon., xlvi. 267).2. On a very remarkable example of late Roman stuff found at Sitten (Sion) in Switzerland is woven a graceful figure of a nymph seated on a sea-monster, among scroll-work of foliated ornament, purely classical in design.* A large quantity of very remark- able woven stuffs has recently been found in tombs at Ekhmin (Panopolis) in Middle Egypt. More than 300 pieces have been bought for the South Kensington Museum. They are of various dates, apparently ranging from the 4th to the 6th or 7th century a.p. The earliest are of purely classical style: some have badly designed but very de- corative figures of pagan deities, with their names in Greek —e.g. Hermes and Apollo; others have figures driving chariots drawn by two centaurs, or marine gods, or long bands of animals—bears, lions, stags, ducks, and many others. These are used to decorate linen tunics or pieces of stuff about 2 feet square. The later examples appear to be Coptic vestments of various shapes, and are decor-

1 See De Ronchaud, Le Péplos d’Athéné, Paris, 1872, and La Tapisserie, Paris, 1885. The treasuries of most Greek temples appear to have contained large stores of rich woven stuffs.

2 See also Hor., Sat., ii, 6, 102-6; Ovid, Afetam., vi.; and Lucr., iv. 1026.

3 This fragment is illustrated by Miintz, La Tapisserie, Paris, 1882, p. 53.

ated with rude figures of St George and other Oriental saints, each with a nimbus. These ornaments are done by true tapestry weaving, the weft pattern being in brilliantly coloured wools on a flaxen warp. In some cases the colours, especially the magnificent reds and blues, are as bright as if they were new. Though in all cases the figure drawing is rude, the decorative value is very great.

From the 6th to the 13th century Byzantium became Byzan. the capital of all the industrial arts, and in none is its tine

influence more obvious than in that of weaving. There the arts of ancient Greece and of old Rome met and were fused with the artistic notions of ancient Egypt, Assyria, Persia, and Asia Minor, and this combination produced a fresh and very active art spirit, which for many centuries dominated the whole civilized world. As regards weaving, this new development was strengthened by the introduc- tion of silk into Europe in the reign of Justinian, and many specimens of early silk fabrics have lasted down to the present time, partly through their being safe against moths. The silken stuffs found in the tombs of Charle- magne and other kings, though perhaps not themselves as early as the 6th century, show one class of design used in Byzantium in the time of Justinian. Some of these com- bine the figure-subjects of ancient Rome with the stronger decorative beauty of the East. Chariot races in the circus, consuls and emperors enthroned in state, gladiatorial fights with lions, and other classical subjects occur, arranged in medallions or wreaths, set in close rows, so as to fill up the ground, Again, mixed with these classical scenes are designs of purely Assyrian origin, such as the sacred tree between two guardian beasts, closely resembling the designs of 2000 s.c. The manufacture of these rich fabrics was carried on, not only in Byzantium, but also in many towns of Greece proper, such as Athens, Thebes, and Corinth, all of og ye = which were spe- cially famed for their silk textiles. 52 During the same 773% time, the 6th to WZ, the 12th century, Baghdad, Damas- cus, Ispahan, and many other towns in Persia and Syria were producing #: woven stuffs of the richest materials anddesigns ; names of reigning caliphs 4 are sometimes “* mingled with Ar- 4%} abicsentences from the Koran and other sacred books, which are intro- duced freelyamong – the intricate pat- terns with the most richly decorative effect. By this means some existing speci- mens of the 8th to the 10th century can be dated. Fig. 4 shows a 16th-century example of the finest Persian damask in silk and gold,—a masterpiece of textile design.

Fig. 4.—Persian damask in silk and gold. (South Kensington Museum.)

According to the usual story, Roger of Sicily, who in Sicilian

1147 made a successful raid on the shores of Attica and took Athens, Thebes, and Corinth, carried off as prisoners a number of Greek weavers, whom he settled at Palermo and made the founders of the royal factory for

silk weav- ing. This story is doubtful, for the Saracenic inhabitants of Sicily had apparently been producing fine silken stufls

long before the 12th century. In part, however, the story may be true; certainly an impetus was given to the weaving industry of Palermo in the 12th century, and for about two centuries Sicily became the chief seat in Europe for the production of the finest woven stuffs. A large number of examples of these beautiful fabrics still exist, showing an immense variety of designs, all of which are imagined with the highest decorative skill,—perfect master- pieces of textile art, combining freedom of invention and grace of drawing with that slight amount of mechanical stiffness which is specially suited to the requirements of the loom. One of the earliest existing specimens, which shows the existence of the fabrique before the time of Roger I., is a piece of silk stuff in which the body of St Cuthbert at Durham was wrapped when his relics were translated in 1104; this was found at the opening of his grave in 1827, and is now preserved in Durham cathedral library. The figures woven on it show an interesting com- bination of Western and Oriental art. Birds and conven- tional ornaments of purely Eastern style are mingled with designs taken from late Roman mosaics,—the whole being blended with great skill into a highly decorative pattern! The Sicilian silks of the 12th to the 14th cen- tury were mostly used for ecclesiastical vestments, altar frontals, and the like; and the fact that examples have survived in almost all countries of Europe shows how im- portant and far-reaching a trade in them must once have been carried on. The favourite designs were the sun breaking through a cloud from whence rays of light are issuing, or conventionally treated ships, fountains, islands, castles, and an immense variety of birds and beasts, such as swans, mallards, eagles, lions, cheetahs, hounds, giraffes, antelopes, and others. Some specimens have siren-like female forms, with floating hair, casting nets, leaning down from palm trees, or issuing from shells. Others, rather later in style, have winged angel-like { figures. In many eases the Assyrian | sacred tree and its guardian beasts oc eur, and very fre- quently borders \S with sham Arabic letters are intro- duced,—a survival } of the time when § real sentences were pare woven into the fab- RX ries of Persia and WQS

Egypt, probably in tended as a visible sign that the stuff} was the genuine & product of Sara-} cenie looms. All

these are perfect tease S Ste a Otic masterpieces of tex- Fie, 5.—Sicilian silk stuff of the 13th century, tile art, and have in St Mary’s church, Dantzic.

b)

never since been rivalled either in beauty of design or in skilful use of gold and colours. Fig. 5 shows a character- istic example ; another copied from a painting is given under Murat Decoration, vol. xvii. p. 46, fig. 15.

In the 14th century the chief centre of fine silk weaving was transferred from Palermo to Lucca, Florence, Milan, Venice, and other towns in northern Italy, and a different class of design, less rich in fancy, but scarcely less beautiful In effect, came into vogue. The designs of these 14th and

1 See Raine, Sainé Cuthbert, Durham, 1828, plate iv. ; in his text the author is wholly wrong as to the provenance of these stuffs.

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15th century textiles were chiefly conventional adaptations of natural foliage and flowers, arranged with great beauty of line and wealth of de- Ry San) | /Zaee ¥

lines of leaf and ten- ; dril. An extremely ; rich design, largely § employed throughout $ the 15th century, was made from the arti- choke plant,? and was } especially used for the rich “cut” velvets of Genoa, Florence, and Venice, in which the &S pattern is formed in B relief by pile raised ¥ above pile, mixed with gold (see fig. 6 and vol. xvii. p. 46, fig. 14). At this time Venice contained a large number of Ori- ental craftsmen in all the industrial arts, silk and gold; 15th century,

and very beautiful stuffs were woven there with designs of mingled Oriental and Italian style,—probably the work of Mohammedan weavers (see fig. 7).

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Fic. 7.—Silk stuf of Oriental d Venice in the 15th century. (South Kensington Museum.)

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In all these Oriental, Sicilian, and early Italian stuffs Gold gold thread is used in a very lavish and effective way. It thread.

was made very skilfully, the richest effect being produced with little metal by thickly gilding fine vellum skins with gold leaf; the vellum was then cut into very thin strips

2 This is usually called the pine-apple pattern; but it was invented long before the discovery of America had introduced the pine-apple into Europe. ;

3 Italian and Flemish pictures of the 14th to the 16th century often give most valuable representations of rich textiles; see Vacher, Fifteenth Century Italian Ornament, London, 1886, a series of coloured plates of textiles taken from Italian pictures.

XXIII. — 27

Gold cloth.

English.

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and wound round a thread of silk or hemp so closely as to look like a solid gold wire. In and since the 15th cen- tury gold thread has been made by twisting a thin ribbon of gilt silver round a silken core. In this way much less gold is required, as the silver ribbon is gilded before being drawn out to its final thinness, and it is thus liable to tarnish, owing to the partial exposure of the silver surface. In classical times attalica and other gold stuffs were made of solid gold wire beaten out with the hammer.! Masses of this fine gold wire? have been found in the tombs of Egypt, Greece, and Etruria, the metal having lasted long after all the rest of the stuff had crumbled into dust. In 1544 the grave of the wife of Honorius was opened and 36 hb of gold thread taken out of it and melted.

Throughout the Middle Ages cloth of gold was largely employed for ecclesiastical and royal purposes. In some cases the whole of the visible surface was formed of gold thread, producing the utmost splendour of effect. Westminster Abbey still possesses a magnificent gold cope of the 15th century, in almost perfect brilliance of preservation. In the 13th and 14th centuries Cyprus and Lucca were specially famed for their gold stuffs, and the royal inventories of France and England show that the kings possessed stores of this to an immense value. The enormous sum of £11 a yard® is recorded to have been given for a “cloth of estate” in the private accounts of Henry VII. This was a cloth to hang over the royal throne, and must have been unusually wide, as other cloth of gold at the same time was bought for 38s. the yard. Various names were at different times given to textiles which were wholly or in part woven in gold, such as ciclatoun (a word of obscure origin), baudekin (from Bal- dak or Baghdad), nak, and tissue.4 Samite or examite (€€ pirot) was so called because the weft threads were only caught and looped at every sixth thread of the warp, lying loosely over the intermediate part. Medizeval samite was sometimes made of gold; if of silk it was a variety of satin, called satin of sex. Modern satin usually has its weft looped in less closely—satin of erght or ten.

Although throughout the Middle Ages the finer stuffs used in England were to a great extent the product of foreign looms, there was no lack of native textiles, many of which were of great beauty. In the use of the needle the women of England were especially skilful, and rich English embroideries were much exported, even into Italy, from the 12th to the 14th century,®

and were esteemed more highly than the productions of any other country. Two fine examples of early English silk and gold needle- work—a stole and maniple with the inscription Ae/fled Siert precepit : pro episcopo Fridestano —are preserved in the Durham library. Fridestan became bishop of Win- chester in 905. Other examples of native textiles have been found in the coffins of many ecclesiastics in England. Some interesting fragments are preserved in the chapter- house of Worcester cathedral ; the ground is of silk, and the pattern, of conventional scroll foliage, is a character- istic example of 13th-century design. Pictures in English MSS. show that the low loom was mainly used,—this being the most convenient for ordinary weaving.® England

1 The process of making wire by drawing it through conical aper- tures in a steel plate is said to have been first invented at Nuremberg in the 14th century.

- The Museo Gregoriano (Vatican) contains examples from Etruscan tombs. 3 Equal to quite £50 of modern money.

4 Hence thin paper laid between the folds of these rich stuffs to protect them was called tissue paper.

- The celebrated cope in Pienza cathedral, which once belonged to Pius H. (Piccolomini), is a magnificent example of English needle- work of the 15th century.

§ Among Chaucer’s pilgrims are included ‘‘ A webbe, a dyer, and a

tapisser,”’ the first a low-loom weaver, the last a weaver of tapestry on the high loom.

TEXTILES

was specially celebrated for its wool and woollen stnffs, and even at the present day English wool is used for the Gobelin tapestries ; in the 15th and 16th centuries it was largely imported into Flanders. In the 14th century Bath produced the finest woollen cloth, and that of Worcester was equally celebrated ; in the 15th century the produc- tion of woollen stuff was a great

source of wealth to Norwich and other towns in the eastern counties. A special sort of woollen yarn took its name from Worstead in Norfolk, where it was made ; it had a closer and harder twist than most woollen thread, and thus could be made up into cloth of special fineness, which was used for chasubles and other vestments, as is recorded in the in- ventories of York, Exeter, and other cathedrals.

Old English Names for Textiles.—A large number of uames for Old different sorts of textiles occur in old English writings, many of English them derived from the name of the place where the stuff was made names,

or exported. Buckram was a woven cloth of much richuess, highly prized, probably quite unlike what we now mean by the word. Damask or damas got its name from Damascus. Justian, from Fostat (Old Cairo), was a cheaper stuff made of linen and cotton mixed. Muslin, from Mosul, was a fine cotton stuff. Cloth of Tars (Tarsus) is often mentioned, usually meaning a purple cloth. Camoca or camak (Arab. kamkha, from Chinese kimkha, “ brocade”) was another richly decorated Oriental stuff. Cendal or sandal and syndonus were fine silk stuffs. Taffeta was made of silk or linen of very thin substance. Satin (from Low Lat. seta) was a glossy silk stuff made like samite. Velvet (from It. velluto, ‘‘shaggy’’) had a silk weft woven so as to form a raised pile, the ends of which were cut or shaved off to one even level; hence it is also called in Italy raso. Diaper, “jasper-like” (Ital. diaspro), was not only used to denote a regular geometrical pattern, but in some cases means also a special sort of linen or silk. Phrases such as “silk of brydges”’-(Bruges), “silk dornex,” from Dorneck in Flanders, and “sheets of raynes” (Rheims) often occur. A large nuinber of other similar names are to be met with in medieval writings.’

Space will not allow a description of the textile work in Other That of Italy and the East was medieval

each separate country. by far the most important throughout the Middle Ages.

Even Chinese textiles of gold and silk were imported into types,

the west of Europe, and were sometimes used for ecclesias- tical purposes. Medizeval vestments of Chinese stuff still exist, the shape and added borders of which show that they date from as early as the 14th century. These fabrics exactly resemble in design and workmanship some which are woven in China at the present day. A very interesting survival of the medieval style of weaving exists in Sweden and other Scandinavian countries. Articles of dress, counterpanes, table-covers, and the like are woven by the peasantry in a simple, highly decorative way, with

Fig. 8,—Indian hill loom, as still used, patterns which have altered little during the last three or four centuries. Though coarse in texture, many of these are of great artistic beauty; nothing bnt an occasional use

7 The most extraordinary spelling often occurs in lists of textiles in medieval documents, especially in the case of foreign names. Thus we find in the Bury Wills (printed by the Camden Society) “ fuschan in Appules,;” méaning Naples fustian; and many similar blunders.

of harsh colours shows any sign of decadence of style. Strong marks of Oriental influence are visible in these fine patterns, but the method of weaving is purcly native, —probably very like what the edicts of Louis IX. call “tapisserie nostrez.” Very beautiful fabrics are still pro- duced in India, old designs being followed, and woven in the simplest form of loom. Fig. 8 shows an example of a modern Indian loom used by the hill weavers. In such looms the richest materials, such as gold and silk, and the most elaborate patterns are woven, often by travelling weavers who can set up their whole apparatus in a very short time. CARPETS.

Carpet weaving was essentially an Oriental art, and was the natural product of a dry mudless country, where little furniture was used and the shoes were removed on entering a building. Till the 16th century carpets were almost unknown in France and England, except for royal personages and for the sanctuaries of cathedrals and im- portant churches. In the latter case they were usually laid in front of the high altar, and thus carried on to the floor the richness of colour which ornamented the walls and vault. Oriental carpets frequently occur in cathedral inventories among the other rich

treasures of foreign or native make which adorned the building. They were first employed in England for domiestic purposes by Queen Eleanor of Castile and her suite, in the latter part of the 13th century. In the palaces of Spain they were intro- duced much earlier, owing to the presence of the Moors in southern Spain. In many cases they were used for wall hangings, and the smaller ones to cover tables and other furniture, as is represented in many 15th-century Italian pictures. Though few examples of Oriental carpets exist earlier in date than the 15th century, yet the manufacture was carried on in the highest state of perfection centuries before. An example of the 14th century is preserved in a private collection at Vienna; it was originally made as a hanging for the Kaaba at Mecca! ‘These beautiful Oriental pile carpets are among the most perfect produc- tions of the weaver’s art, and till the 16th century were masterpieces of design and splendour of colour. Usually they were woven of wool or of camels’ or goats’ hair, with a separate warp and weft of flax; but many magnificent carpets were also made of silk mixed with gold thread. This extravagance of luxury produced an effect, at least as regards the use of silk, but little superior to that of fine wool or camel’s hair, as the special beauty of the silken gloss is seen on the sides, not on the ends of the silk thread. Pile carpets are woven in a very different way from ordinary textiles: short tufts of wool or silk are knotted on the warp so that the ends of the threads which form the pattern project, and these are cut down by shears to a uniform surface, thus forming a sort of textile mosaic. Each row is firmly fixed by a shoot of linen weft-thread thrown across the web, and then carefully beaten down with the batten.

Various classes of ornament occur in these magnificent Oriental carpets ; one variety has stiff geometrical patterns, the motives of which appear to be taken from mosaics or tiles. Another and still more beautiful sort, manufactured especially at Ispahan (see fig. 9), has elaborate flowing designs of flower forms, sometimes mixed with figures of cheetahs, lions, antelopes, and birds, in a few cases com- bined with human figures. Mr W. Morris, in his valuable lecture on textile fabrics (London, 1884), traces three stages of design, —first, a pure flowing style, closely resembling the early stucco mural reliefs of Cairo; secondly, a similar style blended with animal forms; and thirdly, a purely

1 See Karabacek, Die persische Nadelmalerei Susandschird and Vestr, Monatsch. f. d. Orient, 1884, p. 49, with cut.

floral style, flowing in its lines and very fantastic and ingenious in its patterns; this last he thinks belongs to

LT es | Lali My Diy fh 4 Fic. 9.—Persian pile carpet of the 15th century, woven of goats' hair and silk. (South Kensington Museum.) about the time of Shah Abbas, and lasted from about 1550 to 1650,—the culminating period of Oriental art.2 Since then there has been a distinct degradation of style, though in many cases older patterns have been worked from and very perfect work produced. At the present day the influ- ence of European taste is rapidly destroying this survival of the best class of design, and especially is introducing the most harsh and discordant colouring in place of the

glorious rich hues of the earlier Oriental weavers.

Though no existing specimens can be pointed out, it appears probable that the " tapisserie Saracenois " of Louis IX.'s edicts (1226-1270) refers to pile éarpets made by French weavers after the Oriental fashion.* The same edicts for the regulation of the textile industry mention two other classes of manufacture, "tapisserie & la haute lisse," ¢.e., what we call tapestry, and "tapisserie nostrez," "native stuff," probably resembling the coarse but effective patterned fabrics for aprons and dresses which are still woven by the peasantry near Rome, in the Abruzzi moun- tains, and elsewhere in Italy, and in Scandinavia.

TAPESTRY.

The making of tapestry (Gk. razys), like the weaving Tapestry.

of pile carpets, differs from ordinary fabric in that no visible weft is thrown completely across the loom, but the

2 A valuable help towards establishing the dates of carpet patterns is given by many medieval Italian pictures, in which Oriental carpets are often

represented with wonderful minuteness and appreciation.

8 Tapisserie in French means all sorts of patterned stuffs.

Flemish.

design is formed by short stitches knotted across the warp with a wooden needle called a broach. It is a sort of link between textile work and embroidery, from which it differs in having its stitches applied, not to a finished web, but to the stretched strings of a warp. It is made on a high loom, and the whole process, though requiring much skill, is mechanically of the simplest kind. It is very probable that many of the woven hangings used in ancient Egypt, Greece, and other countries were true tapestry ; but little is known on this point. ‘Tull after the 12th century, in northern Europe, embroidery seems to have served the place of tapestry, as, for example, in the wrongly named Bayeux tapestry (see vol. viii. p. 162); while in the south of Europe and in Oriental countries its place was supplied by the rich silken textiles and pile carpets mentioned above.

In the 14th century tapestry began to be largely made, especially in Flanders, where the craft of weaving became very important at an early time. The designs on the very few existing samples of 14th-century tapestry closely resem- ble those of contemporary wall painting. A characteristic early specimen in the Louvre has rows of medallions, each containing a scene from the life of St Martin, with two or three figures treated in a very simply decorative way. The spaces between the circles are filled up with a stiff geo- metrical ornament. To the end of the 14th century be- longs the magnificent tapestry in Angers cathedral, on which are represented scenes from the Apocalypse ; these were made at Arras, the chief seat of the tapestry manu- facture, both for quantity and quality. Hence the name arras (Italian arazzi) came to mean any sort of tapestry, wherever it was made. Another magnificent series of arras work is preserved in Rheims cathedral, with designs from the history of Clovis; these date from the middle of the 15th century. In the 14th century Flanders produced enormous quantities of woven stuffs. At that time twenty- seven streets were occupied by the weavers of Ghent; in 1382 there were 50,000 weavers in Louvain ; and at

Ypres there is said to have been a still larger number. From about 1450 to 1500 was the golden age for tapestry, especially in Bruges and Arras, where large quantities of the most magnificent historical pieces were woven from designs supplied by painters of the Van Eyck school. The Flemish tapestries of that time are perfect models of textile art, rich in colour, strong in decorative effect, graceful in drawing and composition, and arranged with consummate skill to suit the exigencies of the loom and the esthetic requirements of wall decoration. A very beautiful example of this class exists at Hampton Court, hung in the dark under the gallery in the great hall,—a striking contrast to the clever but artistically degraded tapestries of half a century later, which hang round the main walls of the hall. Other fine examples exist in the Cluny, Bern, and other museums, and especially in Madrid 2—in the royal collection and in that of the duke of Alva—and elsewhere in Spain. Though very rich and varied in effect, the tapestry of the best period usually is woven with not more than twenty different tints of wool,—half tints and grada- tions being got by hatching one colour into another. In the 16th century about sixty colours were principally em- ployed in the still fine but rapidly deteriorating tapestry

1 In tapestry the weft stitches are put in loosely and carefully pressed home, so that the warp strings are completely hidden.

- See Riafio, Tapestry of the Palace at Madrid, London, 1875 ; of all countries Spain is the richest in tapestry of the 15th and 16th centuries. The royal collection contains 2000 large pieces. Rich stores also belong to the principal cathedrals, such as Toledo, which on the feast of Corpus Christi is completely hung round with tapestry outside as well as inside. In the 17th century tapestry looms were worked in Spain under royal patronage. One of Velazquez’s finest pictures in the Madrid Gallery (Las Hilanderas) represents the visit

of some court ladies to a tapestry fabrique, in which women are work- ing the looms.

EA TULRES

of that period ; and in the laborious but artistically worth- less productions of the Gobelin factory more than 14,000 differently tinted wools are now

used.

In the 16th century the art began to decline ; very slight symptoms of decadence are visible in the beautiful tapestries with Petrarch's Zr:wmphs in the South Kensington Museum, —most gorgeous pieces of textile art, of the richest decora- tive effect. These were worked very soon after 1500 (see fig. 10). The influence of Raphael and his school succeeded

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Fia. 10.—Figure of Lucretia from the Triumph of Chastity, woven at Brussels about 1507. Her dress is an Italian velvet, similar in style to that shown in fig. 6. that of the 15th-century Flemish painters, and was utterly destructive of true art value in tapestry. Raphael's car- toons, fine as they are in composition, are designed without the least reference to textile requirements, and are merely large pictures, which the weavers had to copy as best they might. This new style, which reduced the art to a feeble copyism of painting, gave the death-blow to the produc- tion of really fine tapestry. Brussels became the chief place for the manufacture after the taking of Arras by Louis XJ. in 1477, and its weavers with wonderful skill imitated any sort of painting that was put before them. Cartoons were drawn by several of Raphael's pupils, such as Giulio Romano and Giovanni da Udine, and by Mabuse, Michiel Coxcie, Bernard van Orley, and other Italianized Flemish painters.

In 1539 Francis I. founded a factory for tapestry at French

Fontainebleau, and soon after other high looms were set up in Paris, examples from which still exist and show a rapid degradation of style. In 1603 a new factory was started in Paris under royal patronage, in the workshop of a family of dyers named Gobelin, after whom the new factory was named (see GoBELIN). The Gobelin looms were first worked by weavers from Flanders, who soon taught the

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-“paned_ losinge-wise.”

mysteries of the craft to a number of French workmen. Cartoons were supplied by Simon Vouet and other distin- guished French painters. In the reign of Louis XIV. a great impulse was given to the factory, and from 1667 the whole establishment became the property of the crown. Louis XIV.’s minister, Colbert, did much to encourage this and other industries. Charles Le Brun the painter was made director of the works, and a number of artists prepared the cartoons under his supervision. In the 18th century Coypel, Jouvenet, Boucher, Watteau, and many other popular painters made designs, often of great size and elaboration, for the Gobelin looms, but all in the very worst possible taste ; these include large series of sacred, inythological, and historical subjects, landscapes, sea-pieces, and even portraits, —the last being perhaps the most ridicu- lous misuse of the textile art that could possibly be in- vented. Other tapestry looms were worked in the 18th century at Aubusson, Felletin, and other places in France.

High-warp looms appear to have been worked in England in the 15th century, though by far the greater part of the rich stores of tapestry in this country came from Flanders. One very beautiful example of English work of this time exists in St Mary’s Hall at Coventry; it represents the marriage of Henry VI. Part of another series with the inarriage of Henry VII. is preserved in a house in Cornwall. In the latter part of the 15th and the first half of the 16th century cnormous sums were spent by the rich in England on Flemish tapestry. Cardinal Wolsey’s private accounts and inventories, which still exist,! give an astonishing picture of tle wealth which he lavished on the adornment of his palace at Hampton Court. In 1522 he bought 132 large pieces of Brussels tapestry, woven with Scriptural subjects, and mostly made to order, so as to fit exactly the various wall spaces. He also bought large quantities of costly Oriental carpets. In the inventories are enumerated “foot carpets,” “table carpets,” and “window carpets,” “hanging peces,” “borders with arms,” and ‘ window peces,” the last being strips of tapestry woven in narrow lengths to fit the sills and jambs of windows. Among the “wall peces,” in addition to the numerous sacred subjects, are mentioned mythological scenes, romances, historical

pieces, and “hangings of verdures,” the last being decor- ative work in which trees and foliage formed the main design, with accessory figures of hunting, hawking, and the like. The catalogue of Wolsey’s linen napery is no less sumptuous and abundant; he possessed an immense quantity of finest linen for sheets and ‘“ board-cloths” (table-cloths), mostly patterned with “damaske diaper” or This example of the wealth of textile work possessed by one rich prelate will give some notion of what England and other countries possessed in the 16th century.

In the reign of James I. tapestry looms were set up at Mortlake, and the industry was carried on during the fol- lowing reign under the direction of the painter Francis Crane. Charles I. introduced skilled weavers from Ouden- arde in Belgium, and the whole existing series of cartoons by Raphael were copied on the Mortlake looms.2 Most of the Mortlake tapestry has distinct marks, such as the shield of St George with F. C. (F. Crane). Some pieces are inscribed “ Car. Re. Reg. Mortl.” (Carolus rex regnans). Though closed during the Commonwealth, the Mortlake fabrique was again worked after the Restoration until the death of Crane in 1703. In the 18th century tapestry Was woven on a small scale in Soho and at Fulham, and within recent years a new royal fabrique has been estab- lished at Windsor, where very costly and skilful weaving in the pictorial Gobelin style is carried on. The only

1 See Law, Hampton Court Palace, London, 1885. * See RarHakL, vol. xx. p. 280.

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modern tapestry which has any of the merits of the best old productions is that made ona small scale by Mr William Morris at Merton Abbey (Surrey), where work of the high- est beauty has been produced. Unfortunately, however, the modern taste for feeble imitations of oil paintings has as yet shown little appreciation of this revival of the true textile art.

As in England, by far the greater part of the tapestry Italian.

used in Italy was a Flemish import. But in the 16th century, under the patronage of the dukes of Ferrara, tapestry looms were set up in Ferrara; these were, how- ever, worked by Flemish weavers, and closely resemble contemporary tapestry woven at Brussels. Other fabriques were established in Florence by the Medici princes, and continued to be worked till the end of the 17th century. Factories for tapestry existed also at Venice, Turin, and other northern cities, but the industry was purely an exotic, and never attained to any great importance. Since the pontificate of Clement XI., in 1702,° a papal factory for tapestry has existed in Rome, and is still carried on in the Vatican. The papal looms have produced a large number of most costly and elaborate copies of celebrated paintings, executed with wonderful skill, but utterly worthless as works of art.

The South Kensington Museum possesses the best and most Collec- The church tions.

illustrative collection of woven fabrics of various dates. of St Mary at Dantzic has a magnificent collection of early textiles, niostly used for vestinents ; these are well illustrated by Hinz, Die Schatzkammer der Maricn-Kirche zu Dantzig, 1870. Fine examples of early tapestry exist in the cathedrals of Rhcims, Bruges, Tournay, Augers, Beauvais, Aix, Sens, and in the church of St Rémy at Rheims. Other fine collections are preserved in the Louvre, the Cluny Museuin, at Chartres, Amiens, Dijon, Orleans, Auxerre, Naucy, Bern, Brussels, Munich, Berlin, Dresden, Vienna, and Nuremberg.4 In Italy the richest collections (mostly of later tae) are those of the Vatican, the Pitti, the Bargello, Palazzo del Té at Mantua, Turin (royal palace), Milan (royal palace), Como (cathedral), and the museum of Naples. The Spanish collections have been already mentioned. In England, besides the South Kensington Muscum, fine tapestries exist in the palaces of Windsor and Hampton Court. ‘Those formerly in the House of Lords were destroyed in the fire of 1834. St Mary’s Hall at Coventry contains the finest examples of the 15th century.

Literature.—By far the best work for its well-chosen coloured illustrations is that of Fischbach, Textile Fabrics, English ed., 1883 ; see alsoDupont-Auberville, Lornement des tissus, Paris, 1875-77 ; Michel, Recherches sur la fabrication des etoffes, Paris, 1852 (a very valuable work); Jubinal,

Anciennes tapisseries, Paris, 1858-59 ; De Ronchaud, Le péplos d’ Athené, Paris, 1872 ; Id., La tapisserie, Paris, 1885; Miintz, La tapisserie dans UV’antiquité, Paris, 1878; Lessing, Modeéles de tapis Orientauxz, Paris, 1879; Id., Ancient Oriental Carpets, London, 1879; Vin- cent Robinson, Oriental Carpets, London, 1882 (the illustrations are better than the text); Lady Alford, Needlework as Art, London, 1886 (deals partly with textiles). Though few works treat of the general history of textiles, a very large number exist about tapestry weaving. The chief are—Depping, Régle- ments sur les arts… au XIIIme siecle, Paris, 1837; De Montault, Tapisserie de la cath. d Angers, Paris, 1863; De Farcy on the same subject, 1875; Barraud, Tap. de la cath. de Beauvais, Beauvais, 1853; Rock, Textile Fabrics, S.K.M., London, 1870; Bock, Cat. des tissus, &c., au Musée German., Nuremberg, 1869 ; Kinkel, Rogier van der Weyden .. . et les tupisseries de Berne, Zurich, 1867; Givelet, Toiles brodées de Reims, Rheims, 1883; Louis Paris, Tap. de la ville de Reims, Rheims, 1843; Loriquet, Tap. de Notre Dame de Reims, Rheims, 1876 ; Pinchart, Tap. dans les Pays-Bas, and other works, Brussels, 1859-64 ; Dehaisnes, Tap, d’ Arras avant le XVme siécle, Paris, 1879; Proyart, Recherches sur les tap. @ Arras, Arras, 1863; Voisin, Tap. de la cath. de Tournay, Tournay, 1863; Van Drival, Tap. d’ Arras, Arras, 1864; Gorse, Tap. du chiiteau de Pau, Paris, 1881; De la Fons-Melicoq, Hautlisseurs des XIVme aw XVIme siecles, Paris, 1870 3 San- terre, Tap. de Beawvais, Clermont, 1842; Deville, Statuts, &c., relatifs a la corp. des tap. de 1258 & 1275, Paris, 1875; Darcel, Gaz. d. b.-arts, xiv. pp. 185, 278, and 414; Van de Graft, De Tapijt-Fabrieken de XVI. en XVII. Eeuw, Middelburg,

- 1869. On Italian tapestry, see De Montault, Tap. de haute lisse a Rome, Arras,

1879 ; Conti, L’arte degli arazzi in Firenze, Florence, 1875; Campori, L’arazzeria Estense, Modena, 1876; Braghirolli, Arazzi in Mantova, Mantua, 1879; Farabu- lini, arte degli arazzi, Rome, 1884; Gentili, art des tapis, Rome, 1878 ; and Mintz, Tap. Italiennes, Paris, 1880. On French and other late tapestry, sec Darcel and Guichard, Les tap. décoratives, Paris, 1881; Lacordaire, Hist. de tap- tsserie, Paris, 1855; Guillaumot, L’Origine .. . des Gobelins, Paris, 1860; Perathon, Tap. d’ Aubusson, de Felletin, et de Bellegarde, Paris, 1857; Roy-Pierrefitte, Les tap. de Felletin, Limoges,

1855; Durieux, Tap. de Cambrai, Cambrai, 1879; About and Bauer, Tap. apres les cartons de Raphuel, Paris, 1875; Houdoy, Tap. de la fabrication Lilloise, Lille, 1871; Vergnaud-Romagnesi, Tap. aw Musée d'Orléans, Orleans, 1859; De St Genois, Tap. @Oudenarde, Paris, 1864; Taleot, Fabric. des tissus, Paris, 1852; Guiffrey, Iist. de la tapisserie, Tours, 1886; Pine, Tapestry of the House of Lords, London, 1739; and De Champeaux, Tapestry, S.K.M. handbook, London, 1878; Ashenhurst, Treatise on Weaving, London, 1886. (J. H. M.)

TEZA, or TAzé. See Morocco, vol. xvi. p. 834.

3 An earlier fabrique was started in 1630 by Urban VIII., but it soon ceased to be worked. 4 The large collection in the Gobelin Museum was burnt in 1871.

THACKERAY, Witiiam Maxeprace (1811-1863), one of the greatest of English authors and novelists, son of Rich- mond Thackeray (Mrs Richmond Thackeray was born Miss

Becher), and grandson of W. R. Thackeray of Hadley, Mid- –

dlesex, was born at Calcutta on July 18, 1811. Both his father and grandfather had been Indian civil servants. His mother, who was only nineteen at the date of his birth, was left a widow in 1816, and afterwards married Major Henry Carmichael Smyth. Thackeray himself was sent home to England from India as a child, and went to Charterhouse, since his time removed to Godalming from its ancient site near Smithfield. Anthony Trollope, in his book on Thackeray in the English Men of Letters series, quotes a letter written to him about Thackeray's school-days by Mr G. S. Venables. '' He came to school young," Mr Venables wrote, "'a pretty, gentle, and rather timid boy." This accords with the fact that all through Thackeray's writings the student may find traces of the sensitiveness which often belongs to the creative mind, and which, in the boy who does not understand its meaning and its possible power is apt to assume the guise of a shy dispo- sition. To this very matter Mr Venables tersely refers in a later passage of the letter quoted by Trollope: " When I knew him better, in later

years, I thought I could recognize the sensitive nature which he had as a boy.” Another illustration is found in the statement, which will be re@ognized as exact by all readers of Thackeray, that ‘his change of retrospective feeling about his school-days was very characteristic. In his earlier books he always spoke of the Charterhouse as Slaughter House and Smith- field. As he became famous and prosperous his memory softened, and Slaughter House was changed into Grey Friars, where Colonel Newcome ended his life.” Even in the earlier references the bitterness which has often been so falsely read into Thackeray is not to be found. In “ Mr and Mrs Frank Berry” (Men’s Wives) there is a description of a Slaughter-House fight, following on an incident almost identical with that used in Vanity Fair for the fight between Dobbin and Cuff. In both cases the brutality of school life, as it then was, is very fully recognized and described, but not to the exclusion of the chivalry which goes along- side with it. In the first chapter of ‘““Mr and Mrs Frank Berry, ” Berry himself and Old Hawkins both have a touch of the heroic. In the story which forms part of Jen’s Wives the bully whom Berry gallantly challenges is beaten, and one hears no more of him. In Vanity Fair Cuff the swaggerer is beaten in a similar way, but regains his popularity by one well-timed stroke of magnanimity, and afterwards shows the truest kindness to his conqueror.

In February 1829 Thackeray went to Trinity College, Cambridge, and in that year contributed some engaging lines on Zimbuctoo, the subject for the prize poem, to a little university paper called The Snob, the title of which he afterwards utilized in the famous Snob Papers. The first stanza has become tolerably well known, but is worth quot- ing as an early instance of the direct comic force afterwards employed by the author in verse and prose burlesques :—

In Africa—a quarter of the world—

Men’s skins are black ; their hair is crisp and curied ; And somewhere there, unknown to public view,

A mighty city lies, called Timbuctoo.

One other passage at least in The Snob, in the form of a skit on a paragraph of fashionable intelligence, seems to bear traces of Thackeray’s handiwork.

At Cambridge James Spedding, Monckton Milnes (Lord Houghton), Edward Fitzgerald, W. H. Thompson (afterwards master of Trinity), and other distinguished persons were among his friends. In 1830 he left Cambridge without taking a degree, and went to Weimar and to Paris. His visit to Weimar bore fruit in the sketches of life at a small

German court which appear in /%tz-Boodle's Confessions and in Vanity Fair. In 1832 he came of age, and inherited asum which Trollope's book describes as amounting to about five hundred a year. The money was soon lost,—— some in an Indian bank, some in two newspapers which in Lovel the Widower are referred to under one name as The Museum, in connexion with which our friends Honeyman and Sherrick of Zhe Newcomes are briefly broughtin. His first regular literary employment after the loss of his patrimony was on Fraser's Magazine, in which in 1837-38 appeared Zhe History of Mr Samuel Titmarsh and the Great Hoggarty Diamond, a work filled with instances of the wit, humour, satire, pathos, which found a more ordered if not a fresher expression in his laterand longer works. For freshness, indeed, and for a fine perception which enables the author to perform among other feats that of keeping up throughout the story the curious simplicity of its supposed narrator's character, the Great Lloggarty Diamond can scarce be surpassed. The characters, from Lady Drum, Lady Fanny, Lady Janc, and Edmund Preston down to Brough, his daughter, Mrs Roundhand, Gus Hoskins, and, by no means least, Samuel Titmarsh's pious aunt with her store of ' Rosolio," are living; the book is crammed with honest fun; and, for pure pathos, the death of the child, and the meeting of the husband and wife over the empty cradle (a scene illustrated by the author himself with that suggestion of truth which no shortcoming in drawing could spoil), stands, if not alone in its own line, at least in the company of very few such scenes in English fiction. The Great Hoggarty Diamond, oddly enough, met with the fate that afterwards befell one of Lever's best stories which appeared in a periodical week by week,—it had to be cut short at the bidding of the editor. In the same year in which it appeared Thackeray married Isabella, daughter of Colonel Matthew Shawe. Of the daughters born of the marriage, one, Mrs Richmond Ritchie, has earned distinction as a novelist. Mrs Thackeray, to quote Trollope, ''

became ill and her mind failed her," and Thackeray thereupon '" became as it were a widower till the end of his days." In 1840 came out The Paris Sketch Book. Much of it had been written and published at an earlier date, and in the earlier writings there are some very curious divagations in criticism. The book contains also a striking story of card-sharping, afterwards worked up and put into Alta- mont's mouth in Pendennis, and a very powerful sketch of a gambler's death and obsequies, Three years before, in 1837, Thackeray had begun, in Fraser, the Yellowplush Papers, with their strange touches of humour, satire, tragedy (in one scene, the closing one of the history of Mr Deuceace), and their sublimation of fantastic bad spelling (M'Arony for macaroni is one of the typical touches of this) ; and this was followed by Catherine, a strong story, and too disagreeable perhaps for its purpose, founded closely on the actual career of a criminal named Catherine Hayes, and intended to counteract the then growing prac- tice of making ruffians and harlots prominent characters in fiction. There soon followed J%tz-Boodle's Confessions and Professions, including the series Men's Wives, already referred to; and, slightly before these, The Shabby Genteel Story, a work interrupted by Thackeray's domestic affliction and afterwards republished as an introduction to The Ad- ventures of Philip, which took up the course of the original story many years after the supposed date of its catastrophe. In 1843, and for some ten years onwards according to Trollope, Thackeray was writing for Punch, and the list of his contributions included among many others the cele- brated Snob Papers and the Ballads of Policeman X. In 1843 also came out the Jrish Sketch Book, and in 1844 the account of the journey Hrom Cornhill to Grand Cairo,

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in which was published the excellent poem of The White | In 1844 there began in Fraser the Memoirs of |

Squall. ey Lyndon, called in the magazine The Luck of Barry Lyndon, a Romance of the Last Century. Barry Lyndon has, with a very great difference in treatment, some resemblance to Smollett's Count /athom ;—the hero, that is to say, is or becomes a most intolerable scoundrel, who is magnificently unconscious of his own iniquity. The age and pressure of the time depicted are caught with amazing verisimilitude, and in the boyish career of Barry Lyndon there are fine touches of a wild chivalry, simplicity, and

generosity, which mingle naturally with the worse qualities | that, under the influence of abominable training, afterwards |

corrupt his whole mind and career. The man is so in- fatuated with and so blind to his own roguery, he has so much dash and daring, and is on occasions so infamously treated, that it is not easy to look upon him as an entirely detestable villain until, towards the end of his course, he becomes wholly lost in brutish debauchery and cruelty. His latter career is founded on that of Andrew Robinson Stoney Bowes, who married the widow of John, ninth earl of Strathmore. There is also no doubt a touch of Casanova in Barry Lyndon's character. Besides the con- tributions to /'unch specially referred to, there should be noticed Punch's Prize Novelists, containing some brilliant parodies of Edward Lytton Bulwer, Lever, Mr D'Israeli (in Codlingsby, perhaps the most perfect of the series), and others. Among minor but admirable works of the same period are found A Legend of the Rhine (a burlesque of the great Dumas's Othon l Archer), brought out in a periodical of George Cruikshank's, Cox's Diary (on which has been founded a well-known Dutch comedy, Janus Tulp), and the Fatal Boots. This is the most fitting moment for mentioning also Lebecca and Rowena, which towers, not only over Thackeray's other burlesques, excellent as they are, but over every other burlesque of the kind ever written. Its taste, its wit, its pathos, its humour, are unmatchable; and it contains some of the best songs of a particular kind ever written—songs worthy indeed to rank with

Peacock’s best. In 1846 was published, by Messrs Bradbury and Evans, the first of twenty-four numbers of Vanity Fair, the work which first placed Thackeray in his proper position before the public as a novelist and writer of the first rank. It was completed in 1848, when Thackeray was thirty-seven years old; and in the same year Abraham Hayward paid a tribute to the author’s powers in the Edinburgh Review. It is probable that on Vanity Fair has been largely based the foolish cry, now heard less and less frequently, about Thackeray’s cynicism, a cry which he himself, with his keen knowledge of men, foresaw and provided against, amply enough as one might have thought, at the end of the eighth chapter, in a passage which is perhaps the best commentary ever written on the author’s method. He has explained how he wishes to describe men and women as they actually are, good, bad, and indifferent, and to claim a privilege—

“Occasionally to step down from the platform, and talk about them: if they are good and kindly, to love and shake them by the hand; if they are silly, to laugh at them confidentially in the teader’s sleeve; if they are wicked and heartless, to abuse them in the Strongest terms politeness admits of. Otherwise you might fancy it was I who was sneering at the practice of devotion, which Miss Sharp finds so ridiculous; that it was I who laughed good- humouredly at the railing old Silenus of a baronet—whereas the laughter comes from one who has no reverence except for prosperity, and no eye for anything beyond success. Such people there are

living and flourishing in the world—Faithless, Hopeless, Charity- less: let us have at them, dear friends, with might and main.

Some there are, and very successful too, mere quacks and fools: | and it was to combat and expose such as those, no doubt, that |

laughter was made.”

As to another accusation which was brought against the book when it first came out, that the colours were laid on

too thick, in the sense that the villains were too villainous, the good people too goody-goody, the best and completest answer to that can be found by any one who chooses to read the work with care. Osborne is, and is meant to be, a poor enough creature, but he is an eminently human being, and one whose poorness of character is developed as he allows bad influences to tell upon his vanity and folly. The good in him is fully recognized, and comes out in the beautiful passage describing his farewell to Amelia on the eve of Waterloo, in which passage may be also found a sufficient enough answer to the statement that Amelia is absolutely insipid and uninteresting. So with the com- panion picture of Rawdon Crawley's farewell to Becky : who that reads it can resist sympathy, in spite of Rawdon's vices and shady shifts for a living, with his simple bravery and devotion to his wife? As for Becky, a character that has since been imitated a host of times, there is certainly not much to be said in her defence. We know of her, to be sure, that she thought she would have found it easy to be good if she had been rich, and we know also what happened when Rawdon, released without her knowledge from a spunging-house, surprised her alone with and singing to Lord Steyne in the house in May Fair. After a gross insult from Steyne, '' Rawdon Crawley, springing out, seized him by the neckcloth, until Steyne, almost strangled, writhed and bent under his arm. ' You lie, you dog,' said Rawdon ; ' you lie, you coward and villain !' And he struck the peer twice over the face with his open hand, and flung hin bleeding to the ground. It was all done before Rebecca could interpose. She stood there trembling before him. She admired her husband, strong, brave, and victorious." This admiration is, as Thackeray himself thought it, the capital touch in a scene which is as powerful as any Thackeray ever wrote—as powerful, indeed, as any in English fiction. Its full merit, it may be noted in passing, has been curiously accented by an imita- tion of it in M. Daudet's Fromont Jeune et Risler Atné. As to the extent of the miserable Becky's guilt in the Steyne matter, on that Thackeray leaves it practically open to the reader to form what conclusion he will. There is, it should be added, a distinct touch of good in Becky's conduct to Amelia at Ostend in the last chapter of the book, and those who think that too little punishment is meted out to the brilliant adventuress in the end may remember this to her credit. Itis supreme art in the treatment of her char- acter that makes the reader understand and feel her attrac- tiveness, though he knows her extraordinarily evil qualities ; and in this no writer subsequent to Thackeray who has tried to depict one of the

genus Becky Sharp has even faintly succeeded. Among the minor characters there is not one—and this is not always the case even with Thackeray's chief figures—who is incompletely or inconsistently de- picted ; and no one who wishes to fully understand and appreciate the book can afford to miss a word of it. Vanity Fair was followed by Pendennis, Esmond, and The Newcomes, which appeared respectively in 1850, 1852, and 1854. It might be more easy to pick holes critically in Pendennis than in Vanity Fair. Pendennis himself, after his boyish passion and university escapades, has dis- agreeable touches of flabbiness and worldliness ; and the important episode of his relations with Fanny Bolton, which Thackeray could never have treated otherwise than delicately, is so lightly and tersely handled that it is a little vague even to those who read between the lines; the final announcement that those relations have been innocent can scarcely be said to be led up to, and one can hardly see why it should have been so long delayed. This

_ does not of course affect the value of the book as a picture

of middle and upper class life of the time, the time when Vauxhall still existed, and the haunt for suppers and songs

which Thackeray in this book called the Back Kitchen, and it isa picture filled with striking figures. In some of these, notably in that of Foker, Thackeray went, it is Supposed, very close to actual life for his material, and in that particular case with a most agreeable result. As for

the two umbre of the marquis of Steyne, it is difficult to | believe that they were intended as caricatures from two |

well-known persons. hand forgot its cunning. Here, as in Vanity Fair, the heroism: has been found a little insipid; and there may be good ground for finding Laura Pendennis dull, though she has a spirit of her own. In later books she becomes, what Thackeray's people very seldom are, a tiresome as well as an uninviting person. Costigan is unique, and so is Major Pendennis, a type which, allowing for differences of period and manners, will exist as long as society does, and which has been seized and depicted

by Thackeray as by no other novelist. His two encounters, from both of which he comes out victorious, one with Costigan in the first, the other with Morgan in the second volume, are admirable touches of genius, In opposition to the worldliness of the major, with which Pendennis does not escape being tainted, we have Warrington, whose nobility of nature has come unscathed through a severe trial, and who, a thorough gentleman if a rough one, is really the guardian of Pen- dennis's career. There is, it should be noted, a character- istic and acknowledged confusion in the plot of Pendennis, which will not spoil any intelligent reader's pleasure. Probably most readers of The Newcomes (1854) to whom the book is inentioned think first of the grand, chivalrous, and simple figure of Colonel Newcome, who stands out in the relief of almost ideal beauty of character against the crowd of more or less imperfect and more or less base personages who move through the novel. At the same time, to say, as has been said, that this book "is full of satire from the first to the last page" is to convey an impression which is by no means just. There is plenty of kindliness in the treatment of the young men who, like Clive Newcome himself and Lord Kew, possess no very shining virtue beyond that of being honourable gentlemen ; in the character of J. J. Ridley there is much tenderness aud pathos ; and no one can help liking the Bohemian F. B., and looking tolerantly on his failings. It may be that both the fiendish temper of Mrs Mackenzie and the suffer-

ings she inflicts on the Colonel are too closely insisted on ; |

but it must be remernbered that this heightens the singular pathos of the closing scenes of tlie Colonel's life. It has seemed convenient to take The Newcomes after Pendennis, because Pendennis and his wife reappear in this book as in the Adventures of Philip; but Esmond (1852) was written and published before The Newcomes. To some students Lsmond seems and will seem Thackeray's capital work. It has not been rivalled, and only a few times approached by Mr Besant, as a romance reproducing with unfailing interest and accuracy the figures, manners, and phrases of a past time, and it is full of beautiful touches of character. But Beatrix, upon whom so much hinges, is an unpleasing character, although one understands fully why men were captivated by her insolent beauty and brilliancy ; and there is some truth in Thackeray's own saying, that 'Esmond was a prig." Apart from this,

the story is, like the illusion of a past time in the narrative, so complete in all its details, so harmoniously worked out, that there is little room for criticism. As to Esmond's marriage with the lady whom he has served and loved as a boy, that is a matter for individual judgment. Beatrix, it has been indicated above, is wonderfully drawn; and not the least wonderful thing about her is her reappearance as the jaded, battered, worldly, not altogether unkindly, Baroness in The Virginians. It was just what Beatrix

If they were, for once Thackeray's |

must have come to, and the degradation is handled with the lightest and finest touch.

In 1851 Thackeray had written The English Humourists of the Eighteenth Century, delivered as a series of lectures at Willis's Rooms in the same year, and re-delivered in the United States in 1852 and 1853, as was afterwards the series called The Your Georges. Both sets were written for the purposes of lecturing. In 1857 Thackeray stood unsuc- cessfully as a parliamentary candidate for Oxford against Mr Cardwell, and in the same year appeared the first num- ber of Zhe Virginians, a sequel to Hsmond. This is a most unequal work,—inferior, as sequels are apt to be, to Zsmond as an historical romance, less compact and coherent, prone to divagation and desultoriness, yet charming enough in its lifelikeness, in the wit and wisdom of its reflexions, and, as has been said, in its portrait of Beatrix grown old. The last number of Zhe Virginians came out in 1859, and in the same year Thackeray undertook the editorship of the Cornhill Magazine. This was a task which, as readers of his Roundabout paper "Thorns in the Cushion" will re- member, the kindliness and sensitiveness of his disposition made irksonre to him, and he resigned the editorship in April 1862, though he continued to write for the magazine until he died. In the Cornhill appeared from his pen Lovel the Widower, previously written, with different names for some of the personages, in dramatic form; Zhe Adventures of Philip; the Roundabout Papers; and the story, unhappily never finished, called Denis Duval. Lovel the Widower, changed from the dramatic to the narrative form, remains a piece of high comedy in which the characters are indicated rather than fully worked out, with a bold and practised touch. It contains

some references to Thackeray’s early and unfortunate newspaper speculations, and it was pro- vided by the author with illustrations which as in others of his books have a value which is entirely their own in furnishing, as it were, a far completer commentary on the letterpress than could have been given by any draughts- man, however perspicacious and finished, who approached the pictorial representation of the characters from the outside. To the general statement thus indicated an exception should be made in the case of Doyle’s illustra- tions to The Newcomes and to Rebecca and Rowena. On the other hand, not even Doyle could have matched the fun and spirit of Thackeray’s own illustrations to another burlesque story, one of his best, Zhe Rose and the Ring. The Roundabout Papers, a small storehouse of some of Thackeray’s best qualities as an essayist, came out in the Cornhill Magazine simultaneously with Lovel the Widower and with The Adventures of Philip. Among them is one differing in form from the rest, called The Notch on the Axe—a Story Ala Mode. It isan almost perfect specimen of the author’s genius for burlesque story-telling ; but it contains an odd instance, which a careful reader will not fail to discover, of the odd habit of inaccuracy of which Thackeray himself was conscious. Z’he Adventures of Philip is, as has been before said, in the nature of a sequel to or a completion of A Shabby Genteel Story. As with the other direct sequel, it is a work of great in- equality. It contains scenes of humour, pathos, satire, which rank with Thackeray’s best work ; some old friends from others of the novels make brief but pleasant reappear- ances in its pages; there are fine sketches of journalistic, artistic, and diplomatic life, and the scene from the last- named in Paris isinimitable. The Little Sister is altogether delightful; the Twysden family are terribly true and vastly diverting ; the minor characters, among whom old Ridley, J. J.’s father, should be mentioned, are wonder- fully hit off ; nor did Thackeray ever write a better scene than that of the quarrel between Bunch, Baynes, and M‘Whirter in the Paris pension. Philip himself is impos-

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sible; one cannot say that the character is ill-drawn—it is not drawn at all. It is an entirely different personage in different chapters ; and it has here and there a very un- pleasant touch which must have come of rapid writing. Yet so admirable are many parts of the book that it can- not be left out of the list of Thackeray's most considerable works. Denis Duval, which reached only three numbers, promised to be a first-rate work, more or less in the Hsmond manner. The author died while it was in progress, on the day before Christmas day 1863. He was buried in Kensal Green, and a bust by Marochetti was put up to his memory in Westminster Abbey.

Little has yet been said of Thackeray's performances in poetry. They formed a small but not the least significant part of his life's work. The grace and the apparent spou- taneity of his versification are beyond question. Some of the more serious efforts, such as The Chronicle of the Drum (1841), are full of power, and instinct with true poetic feeling. Both the half-humorous half-pathetic ballads and the wholly extravagant ones must be classed with the best work in that kind ; and the translations from Béranger are as good as verse translations can be. He had the true poetic instinct, and proved it by writing poetry which equalled his prose in grace and feeling.

It is not necessary to discuss the precise place which Thackeray will in future hold, in respect to his immediate contemporaries. What seems absolutely certain is that the force and variety of his genius and art will always hold for him a place as one of the greatest of English novelists and essayists, and, it should be added, as by no means the least of English critics. (w. H. P.)

THALBERG, Sicismonp (1812-1871), a celebrated pianist and composer for his instrument, was born at Geneva in 1812 (May 5 or January 7). In 1822 he was taken to Vienna, where, under the watchful care of Count Dietrichstein, his education was completed. There is some doubt as to the masters under whom he studied; but it is certain that he received instruction from Hummel, and perhaps also from Czerny, and that he took lessons in com- position from Sechter. He made his first appearance as a pianist at Prince Metternich's in 1826, and published his first composition—a Fantasia on Airs from " Euryanthe" —in 1828, but it was not until 1830 that

he was first fairly introduced to the public, with such brilliant success that from that time forward his only rival was Liszt. In 1834 he was appointed “kammervirtuos” to the emperor of Austria. He first appeared in Paris in 1837; and in 1838 he came to England, astonishing his hearers with the novel effects produced in his Variations on God Save the Queen, while he charmed them with his delicate touch and the purity of his expression. Thenceforward his career was a succession of triumphs. In order to disprove the popular idea that he could execute no music but his own, he played Beet- hoven’s Concerto in C minor (op. 37) at the London Wednesday Concerts, held in 1846-47 at Exeter Hall, with a keen intelligence which proved his power of inter- preting the works of the great masters to be at least on a level with his wonderful technique. Besides his pianoforte compositions, which are almost innumerable, Thalberg pro- duced two operas,—Cristina, which proved a complete failure, and Florinda, which fared but little better at Her Majesty’s Theatre in 1851. He played in London for the last time in 1863, and afterwards retired to his estate near Naples. He died at Naples, April 27, 1871.

THALES or Miterus (640-546 B.C.), son of Examyus and Cleobuline, is universally recognized as the founder of Greck geometry, astronomy, and philosophy. He is said by Herodotus and others to have been of Phcenician extraction, but the more common account (see Diogenes Laertius) is that he was a native Milesian of

noble birth. Zeller thinks that his ancestors belonged to the Cadmiean tribe in Boeotia, who were intermingled with the Ionians of Asia Minor, and thus reconciles the con- flicting statements. The nationality of Thales is certainly Greek and not Pheenician. The high estimation in which he was held by his contemporaries is shown by the place he occupied as chief of the seven “wise men” of Greece ‘ and in later times amongst the ancients his fame was quite remarkable. It is well known that this name (codds) was given on account of practical ability ; and in accordance with this we find that Thales had been occupied with civil affairs, and indeed several instances of his political sagacity have been handed down. Of these the most remarkable is the advice, praised by Herodotus, which he gave to his fellow-countrymen “

before Ionia was ruined,”—“ that the Ionians should constitute one general council in Teos, as the most central of the twelve cities, and that the remaining cities should nevertheless be governed as independent states” (Herod., i. 170). It is probable, however, that in the case of Thales the appellation “ wise man,” which was given to him and to the other six in the archonship of Damasius (586 B.c.),! was conferred on him not only on account of his political sagacity, but also for his scientific eminence (Plut., Solon, c. 3). To about the same time must be referred his celebrated prediction of the eclipse of the sun, which took place on May 28, 585 B.c. This event, which was of the highest importance, has given rise to much discussion. The account of it as given by Herodotus (i. 74) contains two statements :—(1) the fact that the eclipse did actually take place during a battle between the Medes and the Lydians, that it was a total eclipse (Herodotus calls ita “night battle”), that it caused a cessation of hostilities and led to a lasting peace between the contending nations; (2) that Thales had foretold the eclipse to the Ionians, and fixed the year in which it actually did take place. Various dates—ranging from 625 B.C. to 583 B.c. —have been assigned by different chrono- logists to this eclipse; but, since the investigations of Airy,’ Hind,? and Zech,* the date determined by them (May 28, 585 B.c.) has been generally accepted. This date agrees nearly with that given by Pliny (HW. W,, ii. 12). The second part of the statement of Herodotus—the reality of the prediction by Thales—has been frequently called in question, chiefly on the ground that, in order to predict a solar eclipse with any chance of success, one should have the command of certain astronomical facts which were not known until the 3d century B.c., and then merely approximately, and only employed with that object in the following century by Hipparchus. The question, however, is not whether Thales could predict the eclipse of the sun with any chance of success—much less whether he could state beforehand at what places the eclipse would be visible,.as some have erroneously supposed, and which of course would have been quite impossible for him to do, but simply whether he foretold that there would be a solar eclipse in that year, as stated by Herodotus. Now as to this there is quite a remarkable unanimity in the testi- mony of the ancients, and the evidence is of the strongest kind, ascending to Herodotus, and, according to the account of Diogenes Laertius, even to Xenophanes, who was an Ionian, and not much later than Thales. Further,

1 Bretschneider (Die Geom. vor Euklides, p. 40), without stating his authority, gives ‘‘ between 585 and 583 B.c.” as the date of the archonship of Damasius. In this he is followed by some other recent writers, who infer thence that the name ‘‘ wise” was conferred on Thales on account of the success of his prediction. The date 586 B.C., given above, which is taken from Clinton, is adopted by Zeller.

2 **On the Eclipses of Agathocles, Thales, and Xerxes,” Phil. Trans., vol. cxliii. p. 179 sq., 1853. 3 Atheneum, p. 919, 1852.

4 Astronomische Untersuchungen der wichtigeren Finsternisse, &c.,

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we know that in the 8th century B.c. there were obser- vatories in most of the large cities in the valley of the Euphrates, and that professional astronomers regularly took observations of the heavens, copies of which were sent to the king of Assyria; and from a cuneiform inscrip- tion found in the palace of Sennacherib at Nineveh, the text of which is given by George Smith,! we learn that at that time the epochs of eclipses of both sunand moon were predicted as possible—probably by means of the cycle of 223 lunations or Chaldean Saros—and that observations were made accordingly.

The wonderful fame of Thales amongst the ancients must have been in great part due to this achievement, which seems, moreover, to have been one of the chief causes that excited amongst the Hellenes the love of science which ever afterwards characterized them. Thales seems not to have left any writings behind him, though as to this there appears to be some doubt (see Diog, Laer., i. 23). Many anecdotes, amusing rather than instructive, are related of him, which have been handed down by Diogenes Laertius and other writers. From some of them it would appear that he was engaged in trade, which is indeed expressly stated by Plutarch (Solon, c. 2). It is probable that in the pursuit of commerce he was led to visit Egypt. Of the fact that Thales visited Egypt, and there became acquainted with geometry, there is abun- dant evidence. Hieronymus of Rhodes (ap. Diog.

Laer., i. 27) says, “he never had any teacher except during the time when he went to Egypt and associated with the priests.” 2.

But the characteristic feature of the work of Thales was that to the knowledge thus acquired he added the capital creation of the geometry of lines, which was essentially abstract in its character. The only geometry known to the Egyptian priests was that of surfaces, together with a sketch of that of solids, a geometry consisting of some simple quadratures and elementary cubatures, which they had obtained empirically. Thales, on the other hand, intro- duced abstract geometry, the object of which is to establish precise relations between the different parts of a figure, so that some of them could be found by means of others in a manner strictly rigorous. This was a phenomenon quite new in the world, and due, in fact, to the abstract spirit of the Greeks.

The following discoveries in geometry are attributed to Thales :— (1) the circle is bisected by its diametcr (Procl., op. cit., p. 157) ; (2) the angles at the base of an isosceles triangle are equal (Id., p. 250) ; (8) when two straight lines cut each other the vertically opposite angles are equal (Id., p. 299); (4) the angle in a semicircle is a right angle ;° (5) the theorem Euclid i. 26 is referred to Thales by Eudemus(Procl., op. cit., p. 352). Twoapplications of geometry to the solution of practical problems are also attributed to him :— (1) the determination of the distance of a ship at sea, for which he made use of the last theorem ; (2) the determination of the height of a pyramid by means of the length of its shadow: according to Hieronymus of Rhodes (Diog. Laert., i. 27) and Pliny (V. &, Xxxvi. 12), the shadow was measured at the hour of the day when a man’s shadow is the same length as himself. Plutarch, however, states the method in a form requiring the knowledge of Euclid vi. 4, but without the restriction as to the hour of the day (Sept. Sap. Conviv., 2). Further, we learn from Diogenes Laertius (i. 25) that he perfected the things relating to the scalene triangle and the theory of lines. Proclus, too, in his summary of the history of geometry before Euclid, which he probably derived from Eudemus of Rhodes, says that Thales, having visited Egypt, first brought

the knowledge of geometry into Greece, that he discovered many

1 Assyrian Discoveries, p. 409.

2 Cf. Pamphila and the spurious letter from Thales to Pherecydes, ap. Diog. Laer. ; Proclus, Jn primum Euclidis Elementorum Librum Commentarii, ed. Friedlein, p. 65; Pliny, H. W., xxxvi. 12; lam- blichus, Jn Vit. Pythag., 12; Plutarch, Sept. Sap. Conviv., 2, De Iside, 10, and Plac., i. 3, 1. ‘

3 This is unquestionably the meaning of the statement of Pamphila (temp. Nero), ap. Diog. Laert., i. 24, that he was the first person to describe a right-angled triangle in a circle,

things himself, and communicated the beginnings of many to his successors, some of which he attempted in a more abstract manner (xaQoAinér epov) and some in a more intuitional or sensible manner (aicOnrixwrepov) (op. cit., p. 65).

From these indications it is no doubt difficult to determine what Thales brought from Egypt and what was due to his own inven- tion. This difficulty has, however, been lessened since the transla- tion and publication of the papyrus Rhind by Eisenlohr ;* and it is now generally admitted that, in the distinction made in the last passage quoted above from Proclus, reference is made to the two forms of his work,—aic@ytikéTepoy pointing to what he derived from Egypt or arrived at in an Egyptian manner, while xa0oAtndrepoy indicates the discoveries which he made in accordance with the Greek spirit. To the former belong the theorems (1), (2), and (3), and to the latter especially the theorem (4), and also, probably, his solution of the two practical problems. We infer, then, [1] that Thales must have known the theorem that the sum of the three angles of a triangle are equal to two right angles. This inference is made from (4) taken along with (2). No doubt we are informed by Proclus, on the authority of Eudemus, that the theorem Euclid i. 32 was first proved in a general way by the Pytha- goreans (see PYTHAGORAS, vol. xx. p. 140); but, on the other hand, we learn from Geminus that the ancient geometers observed the equality to two right angles in each kind of triangle—in the equilateral first, then in the isosceles, and lastly in the scalene (Apoll., Conica, ed. Halleius, p. 9), and itis plain that the geometers older than the Pythagoreans can be no other than Thales and his school. The theorem, then, seems to have been arrived at by induc- tion, and may have been suggested by the contemplation of floors or walls

covered with tiles of the form of equilateral triangles, or squares, or hexagons. [2] We see also in the theorem (4) the first trace of the important conception of geometrical loci, which we, therefore, attribute to Thales. It is worth noticing that it was in this manner that this remarkable property of the circle, with which, in fact, abstract geometry was inaugurated, presented itself to the imagination of Dante :—

“ O se del mezzo cerchio far si puote Triangol si), ch’un retto non avesse.”—Par., c. xiii. 101. [8] Thales discovered the theorem that the sides of equiangular triangles are proportional. The knowledge of this theorem is dis- tinctly stiributed to Thales by Plutarch, and it was probably made use of also in his determination of the distance of a ship at sea.

Let us now consider the importance of the work of Thales. I. In ascientific point of view : (a) we see, in the first place, that by his two theorems he founded the geometry of lines, which has ever since remained the principal part of geometry ; (2) he may, in the second place, be fairly considered to have laid the founda- tion of algebra, for his first theorem establishes an equation in the true sense of the word, while the second institutes a proportion.® II. In a philosophic point of view: we see that in these two theorems of Thales the first type of a natural law, 7.e., the ex- pression of a fixed dependence bodreen different quantities, or, in another form, the disentanglement of constancy in the midst of variety—has decisively arisen.6 III. Lastly, in a practical point of view: Thales furnished the first example of an application of theoretical geometry to practice,” and laid the foundation of an important branch of the same—the measurement of heights and distances. For the further progress of geometry see PYTHAGORAS.

As to the astronomical knowledge of Thales we have the follow- ing notices :—(1) besides the prediction of the solar eclipse, Eu- demus attributes to him the discovery that the circuit of the sun between the solstices is not always uniform ;® (2) he called the last day of the month the thirtieth (Diog. Laert., i. 24); (8) he divided the year into 365 days (Id., i. 27); (4) he determined the dia- meter of the sun to be the 720th part of the zodiac ;° (5) he appears to have pointed out the constellation of the Lesser Bear to his countrymen, and instructed them to steer by it [as nearer the pole] instead of

the Great Bear (Callimachus ap. Diog. Laert., i. 23; of Aratus, Phenomena, v. 36 sq.). Other discoveries in astronomy are attributed to Thales, but on authorities which are not trust- worthy. He did not know, for cxample, that " the earth is spher- ical," as is erroneously stated by Plutarch (Placita, iii. 10); on the contrary, he conceived it to be a flat disk, and in this supposition he was followed by most of his successors in the Ionian schools, including Anaxagoras. The doctrine of the sphericity of the earth, 8 eee ee er

4 Ein mathematisches Handbuch der alten Aegypter, Leipsic, 1877.

5 Auguste Comte, Systéme de Politique Positive, iii. pp. 297, 300.

6 P, Laffitte, Les Grands Types de [Humanité, vol. ii. p. 292.

7 Ibid., p. 294.

8 Theonis Smyrnzi Platonici Liber de Astronomia, ed. Th. H, Mar- tin, p. 324, Paris, 1849. Cf. Diog. Laert., i. 24.

® This is the received interpretation of the passage in Diogenes Laertius, i. 24 (see Wolf, Gesch. der Astron., p. 169), where oeAnvatov is probably a scribe's error for (d:axod. Cf. Apuleius, Florida, iv. 18, who attributes to Thales, then old, the discovery: " quotiens sol mag- nitudine sua circulum quem permeat metiatur."

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for which the researches of Anaximander had prepared the way,? was in fact one of the great discoveries of Pythagoras, was taught by Parmenides, who was connected with the Pythagoreans, and remained for a long time the exclusive property of the Italian schools.? :

Whilst in virtue of his political sagacity and intellectual eminence Thales held a place in the traditional list of the wise men, on the strength of the disinterested love of knowledge which appeared in his physical speculations

he was accounted a “ philosopher” (¢:Ad- copos). His “philosophy” is usually summed up in the dogina “water is the principle, or the element, of things”; but, as the technical terms “ prineiple ” (apx4) and “element ” (oro:xetov) had not yet come into use, it may be conjectured that the phrase “ all things are water” (rdvra, #5wp éorf) more exactly represents his teaching. Writings which bore his name were extant in antiquity ; but, as Aristotle, when he speaks of Thales’s doctrine, always depends upon tradition, there can be little doubt that they were forgeries.

From Aristotle we learn (1) that Thales found in water the origin of things; (2) that he conceived the earth to float upon a sea of the elemental fluid ; (3) that he supposed all things to be full of gods; (4) that in virtue of the attraction exercised by the magnet he attributed to it a soul. Here our information ends. Aristotle’s suggestion that Thales was led to his fundamental dogma by observation of the part which moisture plays in the pro- duction and the maintenance of life, and Simplicius’s, that the impressibility and the binding power of water were perhaps also in his thoughts, are by admission purely conjectural. Simplicius’s further suggestion that Thales conceived the element to be modi- fied by thinning and thickening is plainly inconsistent with the statement of Theophrastus that the hypothesis in question was peculiar to Anaximenes. The assertion preserved by Stobeus that Thales recognized, together with the materia] clement ‘‘ water,” “mind,” which penetrates it and sets it in motion, is refuted by the precise testimony of Aristotle, who declares that the early physicists did not distinguish the moving cause from the material cause, and that before Hermotimus and Anaxagoras no one postulated a creative intelligence.

It would seem, then, that Thales sought amid the variety of things a single material cause ; that he found such a cause in one of the forms of matter most familiar to him, namely, water, and accordingly regarded earth and all that it contains as water vari- ously metamorphosed ; and that, asking himself no questions about the mauner of its transformation, he was content “to see in the forces of nature present deities ” (Zeller).

The doctrine of Thales was interpreted and developed in the course of three succeeding generations. First, Anaximander chose for what he called his

“principle” (épx4), not water, but a cor- poreal element intermediate between fire and air on the one hand and water and earth on the other. Next, Anaximenes, prefer- ring air, resolved its transformations into processes of thinning and thickening. Lastly, Heraclitus asserted the claims of fire, which he conceived to modify itself, not occasionally, but per- petually. Thus Thales recognized change, but was not careful to explain it; Anaximander attributed to change two directions ; Anaxinienes conceived the two sorts of change as rarefaction and condensation ; Heraclitus, perceiving that, if, as his predecessors had tacitly assumed, change was occasional, the interference of a moving cause was necessary, made change perpetual. Butall four agreed in tracing the variety of things to a single material cause, corporeal, endowed with qualities, and capable of self-transforma- tion. A new departure was taken by the Eleatic Parmenides (see vol. xviii. p. 315), who, expressly noting that, when Thales and his successors attributed to the supposed element changing qualities, they were untrue to the principle of monism, required that the superficial plurality of nature should be strictly distin- guished from its fundamental unity. Hence, whereas Thales and his successors had confounded the One, the element, and the Many, its modifications, the One and the Not-One or Many became with Parmenides matters for separate investigation. In this way two lines of inquiry originated. On the one hand Empedocles and Anaxagoras, abandoning the pursuit of the One, gave themselves to the scientific study of the Many; on the other Zeno, abandoning the pursuit of thc Many, gave himself to the dialectical study of the One. Both successions were doomed to failure; and the result was a scepticism from which the thought of Greece did not emerge until Plato, returning to Parmenides, declarcd the study of the Oue and the Many, jointly regarded, to be the true office of philo- sophy. Thus, meagre and futile as the doctrine of Thales was, all the Greek schools, with the solitary exception of that of Pythagoras, took their origin from it. Not in name only, but also in fact, Thales, the first of the Ionian physicists, was the founder of the philosophy of Greece.

¥ In likening the earth to a cylinder Anaximander recognized its circular figure in one direction.

See G. V. Schiaparelli, J Precursort di Copernico nell’ Antichita, p. 2, Milan, 1873.

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THALLIUM, one of the rarer elements of chemistry. Its discovery is one of the outcomes of Bunsen and Kirchhof’s method of spectrum analysis. When Crookes, in 1861, applied this method to the flue-dust produced in the roasting of a certain kind of pyrites he observed in its spectrum a green line foreign to all then known spectra, and concluded that his substance must contain a new element, to which he gave the name of thallium, from GadAés, a green twig. Crookes presumed that his thal- lium was something of the order of sulphur, selenium, or tellurium ; but Lamy, who anticipated him in isolating the new element, found it to be a metal. Our present knowledge of the chemistry of thallium is based chiefly upon the labours of Crookes.

The chemical character of thallium presents striking peculiarities. Dumas once called it the “ ornithorhynchus paradoxus of metals.” As an elementary substance, it is very similar in its mechanical and physical properties to lead ; like lead it forms an almost insoluble chloride and an insoluble iodide. But the hydroxide of thallium, in most of its properties, comes very close to those of the alkali metals ; it is strongly basilous, forms an insoluble chloroplatinate, and an alum strikingly similar to the

corresponding potassium compounds. Yet, unlike potas- sium or lead, it forms a feebly basic sesquioxide similar to manganic oxide, Mn,O..

Traces of thallium exist in many kinds of pyrites, as used for vitriolmaking. The only known mineral of which it forms an essential component is the “ crookesite” of Skrikerum, Smaland, Sweden, which, according to Norden- skidld, contains 33°3 of selenium, 45°8 of copper, 3°7 of silver, and 17:2 of thallium in 100 parts. Crookesite, however, is scarce. The best raw materials for the pre- paration of thallium are the flue-dusts produced indus- trially in the roasting of thalliferous pyrites and the “chamber muds” accumulating in vitriol-chambers wrought with such pyrites ; in both it is frequently associated with SELENIUM (q.v.). The flue-dust from the pyrites of Theux, near Spa (Belgium), according to Béttcher, contains 0°5 to 0°75 per cent. of thallium; that of the pyrites of Meggen, according to Carstanjen, as much as 3:5 per cent.; while that of the pyrites of Ruhrort yielded 1 per cent. of the pure chloride to Gunning.

For the extraction of the metal from chamber mud, the latter is boiled with water, which extracts the thallium as T],SO,. From the filtered solution the thallium is precipitated by addition of hydrochloric acid, as TICl, along, in general, with more or less of chloride of lead. The mixed chlorides are boiled down to dryness with oil of vitriol to convert them into sulphates, which are then separated by boiling watcr, which dissolves only the thallium salt. From the filtered solution the thallium is recovered, as such, by means of pure metallic zinc, or by electrolysis. The (approximately pure) metallic sponge obtained is washed, made compact by com- pression, fused in a porcelain crucible iu an atmosphere of hydro- gen, and cast into sticks. Methods for the final purification of the metal will easily be deduced from what follows.

The metal is bluish white; it is extremely soft but almost devoid of tenacity and elasticity. Its specific gravity is 11°86. It fuses at 290° C.; ata white heat it boils and cau be distilled in hydrogen gas. When heated in air it is readily oxidized, with forination of a reddish or violet vapour. When exposed to the air it readily draws a film of oxide; the tarnished metal when plunged into water reassumes its metallie lustre, the oxide film being quickly dissolved.

When kept in contact with water and air it is gradually converted into hydroxide, T1,OH,O or TIOH.

This hydrate, TIOH, most conveniently prepared by decomposing the solution of the sulphate with baryta water, crystallizes from its

solution in long yellow needles, TIOH or TIOH + H,0, which dissolve readily in water, forming an intensely alkaline solution, which acts asa caustic, like, for instance, potash-ley, and like it greedily absorbs carbonic acid from the atmosphere. But, unlike the alkalies, it readily loses its water at 100° C. and even at the ordinary tempera- ture, to pass into the state of anhydrous T1,0, which is black or black-violet. é

The chloride, TICI, is readily obtained from the solution of any thallous salt (¢.g., the sulphate), by addition of hydrochloric acid, as a white precipitate similar in appearance to chloride of silver, like which it turns violet in the light and fuses below redness into a (yellow) liquid which freezes into a horn-like flexible mass. The specific gravity of this ‘‘horn” thallium, as one might call it, is 7°02. One part of the precipitated chloride dissolves at 0° C. in 500 parts of water, and in 70 parts at 100° C. It is less soluble in dilute hydrochloric avid. Carbonate of soda solution dissolves it pretty freely.

The dodide, TII, is a yellow precipitate, which requires 16,000 parts of cold watcr and still more of solution of iodide of potassium for its solution.

The chloroplatinate, PtCl,Tl,, readily obtainable from thallous- salt solutions by addition of chloride of platinum (PtCl,H,), is a yellow precipitate soluble in no less than 15,600 parts of cold water.

The carbonate, T1,CO3, comes closer to the lithium compound than to any other ordinary carbonate. It forms resplendent monoclinic prisms, soluble at 18°C. in 19°1 and at 100° in 4°46 parts of water. A stable bicarbonate, TIHCOg, does exist.

The sulphate, T1,5O,, forms rhombic prisms isomorphous with K,SO,. It dissolves at 18° C. in 20°8 and at 101° in 5-2 parts of water. It unites with

vitriol into an acid salt, TIHSO,3H,0, and with sulphate of alumina into an ‘‘alum,” Al,(SO,),TI,SO, 24H,0.

Thallic salts are related to thallous pretty much as manganic are to manganous. The chloride, TICl,, is obtained as a solution by passing chlorine into a suspension of thallous chloride in water. The solution, when evaporated in vacwo, deposits colourless crystals, TICl,H,O. For the oxide, if chlorine be passed into a solution of thallous chloride in carbonate of soda a brown precipitate is produced, which, after drying, has the composition Tl,0, H,0. When heated with strong hydrochloric acid it evolves chlorine and yields TIC1; when heated with oil of vitriol it yields oxygen gas and thallous sulphate. Thallic sulphate, however, does exist,—in erystals, T1,(SO,)3+7H,O, soluble in dilute sulphuric acid, but decomposed by water, with precipitation of hydrated T1,0s.

Analysis. —All thallium compounds volatile or liable to dissocia- tion at the temperature of the flame of a Bunsen lamp impart to such flame an intense green colour, The spectrum consists of only one line, which, of course, has a definite position in the spectrum, and consequently is easily identified,—a most delicate test.

From solutions containing it as thallous salt the metal is easily precipitated as chloride, iodide, or chloroplatinate by the corre- sponding reagents (see supra). Sulphuretted hydrogen, in the presence of free mineral acid, gives no precipitate; sulphide of amnionium, from neutral solutions, precipitates T],S as a dark brown or black precipitate, insoluble in excess of reagent. Thallic salts are easily reduced to thallous by means of solution of sulphur- ous acid, and thus rendered amenable to the above reactions.

The atomic weight of thallium was determined very carefully by Crookes. He found it Tl=204°2,—O being 16. (W. D.)

THAMES, the most important river in Great Britain, has its source in several streams on the Gloucestershire border, the main one having its rise in the parish of Coates, 3 miles south-west of Cirencester. The upper part of the river, until the junction with the Thame near Dorchester, is generally called the Isis, a usage to which Camden per- haps gave currency, who derives the word Tamesis or Thames from the junction of the names of the

two rivers, the Thame and Isis. The total length of the river from Thames Head to London Bridge is 170 miles, and to Sheer- ness 228 miles. It drains an area of 6100 miles. It be- comes navigable 24 miles from its source, near Lechlade, its waters having been greatly augmented by the junction of the Colne, Leach, and Churn ; here also is the junction with the Thames and Severn Canal. The height of its source above sea-level is 370 feet, and that of the stream at Lechlade 250 feet, the average fall between Lechlade and London Bridge (146 miles) being 21 inches per mile. The course is remarkably equable throughout. Above Teddington, 19 miles from London Bridge, the tidal wave may be said to cease, and thence up to Lechlade naviga- tion is carried on by the aid of locks. A small steamer

plies as high as Oxford. While at Lechlade the daily flow of the ordinary summer level is about 100 million gallons, the flow at Teddington is about 380 million gallons. There are seven hours of ebb tide and five hours of flow tide, From the Nore to London Bridge, a distance of 40 miles, the tidal wave travels in two hours, and in other two hours it reaches Teddington. The width of the river at Ted- dington is 250 feet, and at London Bridge the width at high tide is 800 feet, the depth being 30 feet, while at low tide the width is 650 feet and the depth 12 feet. Large barges can ascend the river 150 miles above London Bridge, vessels of 200 tons as high as the bridge, and of 400 tons to the Pool, below which, at Irongate and St Katherine’s wharf, deep-sea steamer navigation commences, while vessels of any tonnage can come as high as Deptford.

The Thames leaves the Gloucestershire and Wiltshire border near Buscot, after which it separates successively Berks and Oxford, Berks and Bucks, Middlesex and Surrey, and, finally, at its estuary, Essex and Kent. Below Lechlade it has a winding course, passing near Farringdon and Bampton. After receiving the Windrush, it passes near the grounds of Blenheim, whence it receives from the left the Evenlode, and at Oxford it receives from the left the Cher- well. It then flows in a southerly direction to Abingdon, where it receives on the right the Ock from the valley of the White Horse, and has a junction with the Wilts and Berks Canal. Turning in

an easterly direction it is joined, about a mile after passing Dor- chester, by its principal aftluent the Thame. Thence, through an opening of the Chiltern Hills, it passes Bensington, and turns southwards by Wallingford and Reading, where it receives the Kennet from the right. It then bends northward to Henley, east-

‘ward to Great Marlow, and southward to Maidenhead, where it

reccives from the right the Loddon. Winding in a south-easterly direction it passes Eton, Windsor, Datchet, Staines, and Chertsey, receiving at Staines the Colne from the left. Flowing through the. grounds of Hampton Court it reaches Kingston and Teddington, where its bulk is increased by the tidal wave. From Richmond, where it receives the Mole, it begins to pass the villas and suburbs of London. At Gravesend, 27 miles below London, it has a width of half a mile, and at the Nore lighthouse, 50 miles below London Bridge, the estuary widens to nearly 10 miles. In the tidal reaches the principal affluents of the Thames are the Mole at Richmond, the Brent at Brentford, the Wandle at Wandsworth, the Lea at Blackwall, the Roding at Barking Creek, the Ingrebourne at Rain- ham, and the Medway at Sheerness. The land adjoining the river is greatly subject to floods, and from above London there were in ancient times wide stretches of marsh land covered by shallow lagoons. The embankments below London Bridge date possibly from the time of the Romans, but their origin is the subject of much dispute (see LoNDON, vol. xiv. p. 840). Between London Bridge and Chelsea the bed of the river has been altered artificially, and flooding is prevented by a marine wall (see Lonpon, vol. xiv. p. 823). The Thames occupies the bed of a much larger prehis- toric river, the gravels of which adjoin its banks at a considerable distance.

The scenery, though scarcely to be called picturesque, and ina certain sense monotonous, has a peculiar charm from the richness of its sylvan beauty and its pleasant alternation of hill and dale. The number of islands that occur in the course of the river add to its interest, and afford convenient seclusion for the erection of boat- houses and tents. The Thames vies with the Tyne as the principal river for boat-racing in England, and of course greatly surpasses the latter river as regards amateur boat-racing, the principal fixtures in which are the Oxford and Cambridge boat race and the

Henley regatta. The river affords about one half of the water supply of London, and is the principal outlet for its sewage. It is under the government of conscrvators, originally constituted in 1857, but

their duties have been extended by several subsequent Acts.

See The River Thames from Oxford to the Sea, 1859; Cassell's Royal River (richly illustrated), 1885 ; Huxley's Phystography, 1877; and Dickens's Dictionary of the Thames.

THANA, or TANNA, a district in Bombay presidency, India, with an area of 4243 square miles, lying between 18° 42' and 20° 20' N. lat. and 72° 45' and 73° 48' E. long. It extends along the coast for 105 miles, with a breadth of 50 miles, and is confined between the Sahyddri Ghats on the E. and the sea on the W., while on the N. it is bounded by the Portuguese territory of Daman and by Surat district, and on the S. by Koldba and Poona districts. The district is well watered and wooded, and, except in the north-east, is a low-lying rice tract broken by hills. The spurs of the Ghats form health resorts ; the two most

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conspicuous hills are Matheran and Tungar. Most of the hills were once fortified, but the forts built on them are now dilapidated and useless. The only rivers of any importance are the Vaitarna and the Ulhds, the former being navigable to a distance of about 20 miles from its mouth ; the latter is also navigable in parts for small craft. There are no lakes ; but the Vehdr and the Tulsi, formed artificially, supply Bombay city with water. The forests, lying chiefly in the northern half of the district, occupy 1664 square miles, or about 40 per cent. of the total area. The average annual rainfall exceeds 90 inches.

In 1881 the population of Thana was returned at 908,548 (males 468,236, females 440,312); Hindus numbered 806,805, Moham- medans 42,391, and Christians 39,545. The district has seven towns with populations exceeding 10,000, namely, Bandra (14,987), THANA (see below), Bhiwandi (13,837),

Kalyan (12,910), Bassein (10,357), Panvel(10,351), Uran (10,149). Thearea under cultivation in 1885-86 was 1,002, 448 acres, and 768,057 remained uncultivated. The total area of crops was 522,810 acres, including 5835 twice cropped. Rice is by far the most important product, and occupied 324,680 acres; it is also the chief article of export. Sugar-cane and plantains are cultivated largely, as well as mangoes and cocoa-nuts. In 1885-86 the gross revenue of the district was £245,182, the land yielding £130,409. The territory comj-rised in the district of Thana formed part of the dominions of the peshw4, and was

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annexed by the British in 1818 on the overthrow of Baji rao. Since then the operations to put down the Koli robbers, which extended over several years, have been the only cause of serious trouble, and lately, in 1874 and 1877, there were a number of gang robberies which were suppresscd, but not without difficulty.

THANA, chief town of the above district and a station on the Great Indian Peninsula Railway, lies 20 miles north- east of Bombay city, in 19° 11’ 30” N. lat. and 73° 1’ 30” E. long., and in 1881 had a population of 14,456 (males 7856, females 6600). It is a municipal town and a port, and contains a civil hospital and post-office.

THANE, or Taecn. See EnGuanp, vol. viii. p. 274; and Nosiuity, vol. xvii. p. 529.

THAPSACUS. See Mrsoporama, vol. xvi. p. 49.

THAR AND PARKAR, or Tour anp Parker, a dis- trict in the east of Sind, Bombay presidency, India, with an area of 12,729 square miles. It lies between 24° 13’ and 26° 15’ N. lat. and between 68° 51′ and 71° 8’ E. long., and is bounded on the N. by Khaipur state, on the E. by the states of Jaisalmir, Malani, and J odhpur, on the W. by Hyderabad district, and on the S. by the Runn of Cutch. The district is divided into two portions. The western part, called the “ Pat,” is watered by the Eastern Nara and the Mithrau canals, which constitute the sole water-system of the district, and the presence of water has created a quantity of jungle and marsh ; the other

part, called the “Thar,” is a desert tract of rolling sand-hills, running north-east and south-west, composed of a fine but slightly coherent sand. To the south-east of Thar is Parkar, where there are ranges of rocky hills, rising to 350 feet above the surrounding level, and open plains of stiff clay. The Parkar portion of the district contains the ruins of several old temples ; one of these is a Jain temple, which con- tained an idol of great sanctity and repute, known under the name of Gorcha. The climate is subject to consider- able extremes in temperature, being excessively hot in the summer and very cold in winter, the cold increasing as the sand-hills are approached.

The census of 1881 returned the population at 203,344 (males 112,400, females 90,944); Hindus numbered 43,755, Moham- medans 109,924, and Christians only 14. Umarkot, the birth- place of Akbar, is the chief town, with a population of 2828. The chief products of the district are rice, joar, bajri, cotton, and oil seeds. It is estimated that only 45 per cent. of the arable area 1s under cultivation. The exports are chiefly rice, wheat, oil-seeds, cattle, goats, and sheep; the imports consist of cotton, metals, dried fruits, piece goods, sugar, and tobacco. The manufactures are chiefly blankets, camel saddles, and coarse cotton cloth. The Imperial revenue in 1885-86 amounted to £44,313, of which the land supplied £32,927.

Very little is known of the early history of the district, The

Soda Rajputs, said to be descendants of Parmar Soda, are supposed to have come into this part of Sind about 1226, when they quickly displaced the rulers of the country, though, according to other authorities, they did not conquer the country from the Sumras, the dominant race, before the beginning of the 16th century. The local dynasty:of the Sodas succumbed to the Kalhoras about 1750, since which period the district has been subject more or less to Sind. The Talpur mirs succeeded the Kalhoras, and built a number of forts to overawe the people, who were lawless and addicted to robbery. On the British conquest of Sind in 1843 the greater part of the district was made over to Cutch; and in 1856 it was wholly incorporated in the province of Sind. In 1859 a rebellion broke out, which was quickly suppressed.

THARRAWADDY, a district in the Pegu division of Burmah, with an area of 2014 square miles. It lies between 17° 30’ and 18° 40’ N. lat. and between 95° 20’ and 96° 10’ E. long., and is bounded on the N. by Prome, on the E. by the Pegu Yoma range, on the S. by Hantha- waddy, and on the W. by Henzada. The Pegu Yoma range separates Tharrawaddy from Toungti district, and forms the water-parting between the rivers Irrawaddy and Sittang; there are also many small elevations. The Irrawaddy, which traverses the district for 46 miles, is the principal navigable river. Another important river is the Hlaing, which runs through the district from north to south, receiving from the east, through numerous channels, the drainage of the Pegu Yoma Mountains, which fertilizes the plain on its eastern bank. There are twenty-three teak forests and four fuel reserves in the district, covering an area of 817 square miles. Among the wild animals generally found in the mountains are the elephant, rhinoceros, bison, and various kinds of feathered game.

In 1881 the population was returned at 278,155 (males 143,413, females 134,742), of whom 1985 were Hindus, 1110 were Mohani- medans, 270,552 were Buddhists, whilst Christians and aborigines numbered 2363 and 2135 respectively. The area under cultivation in 1885-86 comprised 323,542 acres, and that available for cultiva- tion 186,002 acres; forests occupied 364,524 acres. The chief pro- ducts of the district are rice, sesamum, tobacco, sugar-cane, cotton, and fruits. The gross revenue of Tharrawaddy in 1885-86 was £85,254, of which the land yielded £51,523. The history of the district is identical with that of Hmnzapa (¢.0.). Tharrawaddy was formed in 1878 out of that portion of Henzada lying east of the Irrawaddy. Its headquarters are at Thoon-tshay, on the stream of the same name.

THASOS, an island in the north of the Agean Sea, off the coast of Thrace, 3} miles distant from the plain of the river Nestus (now the Kara-Su). The island was colonized at an early date by Phcenicians, attracted probably by its gold mines ; they founded a temple of Hercules, which still existed in the time of Herodotus. Thasus, son of Phcenix, is said to have been the leader of the Phcenicians, and to have given his name to the island. In 720 or 708 B.C. Thasos received a Greek colony from Paros. In a war which the Parian colonists waged with the Saians, a Thracian tribe, the poet Archilochus

threw away his shield. The Greeks extended their power to the mainland, where they owned gold mines which were even more valuable than those on the island. From these sources the Thasians drew great wealth, their annual revenues amounting to 200 or even 300 talents. Herodotus, who visited Thasos, says that the best mines on the island were those which had been opened by the Pheenicians on the east side of the island, facing Samothrace. After the capture of Miletus (494 B.c.) Histizus laid siege to Thasos. The attack failed, but, warned by the danger, the Thasians employed their revenues to build war ships and strengthen their fortifications. This excited the suspicions of the Persians, and Darius compelled them to surrender their ships and pull down their walls. After the defeat of Xerxes the Thasians joined the Greek confederacy ; but afterwards (in 467, 465, or 464, according to different calculations), on account of a difference about the mines and marts on the mainland, they revolted. The Athenians defeated

them by sea, and, after a siege that lasted more than two years, took the capital, Thasos, and compelled the Thasians to destroy their walls, surrender their ships, pay an indemnity and an annual contribution, and resign their possessions on the mainland. In 411 B.c., at the time of the oligarchical revolution at Athens, Thasos again revolted from Athens and received a Lacedeemonian governor ; but in 407 the partisans of Lacedeemon were expelled, and the Athenians under Thrasybulus were admitted. After the battle of ASgospotami (405 3.c.), Thasos again fell into the hands of the Lacedzmonians ; but the Athenians must have recovered it, for it formed one of the subjects of dispute between them and Philip of Macedonia. In the embroilment between Philip III. of Macedonia and the Romans, Thasos submitted to Philip, but received its freedom at the hands of the Romans after the battle of Cynoscephale (197 8.c.), and it was still a “ free ” state in the time of Pliny. Thasos, the capital, stood on the north side of the island, and had two harbours, one of which was closed. Archilochus described Thasos as “‘an ass’s backbone crowned with wild wood,” and the description still suits the mountainous island with its forests of fir. The highest mountain, Ipsario, is 3428 feet high. Besides its gold mines, the wine, nuts, and marble of Thasos were well known in antiquity. The mines

and marble quarries are no longer worked ; and the chief exports are now fir timber for shipbuilding, olive oil, honey, and wax. The imports consist of manufactured goods, beasts of burden, and corn, for the island is too mountainous to grow enough corn for the inhabitants.

In 1858 the population, distributed in ten villages, was estimated at 10,000. The people are Greek Christians, and do not differ in appearance from the inhabitants of the other Greek islands. The villages are mostly situated at some distance from the sca; for the island suffered from pirates up to a time within living memory. In the early part of this century sentinels stood on duty night and day, and at a signal of alarm the whole population, including the Turkish aga himself, used to hide in the woods. For a description of the island and its remains of antiquity, see A. Conze, Reise auf den Inseln des thrakischen Meeres, Hanover, 1860.

THAYETMYO, a district in the Irrawaddy division of Burmah, having an area of 2397 square miles, and lying between 18° 50’ and 19° 30’ N. lat. and between 94° 30’ and 95° 50’ E. long. It is bounded on the N. by the newly acquired territory of Burmah, on the E. by Tounga district, on the S. by Prome, and on the W. by Sandoway. On the west is the Arakan Yoma range, and on the east the Pegu Yoma; and the face of the country, where it does not rise into mountains, is everywhere broken by low ranges of hills, many of which are barren and destitute of all vegetation. The greater part of the district is wooded, and the Yomas east and west are covered with forests now mostly preserved. The chief river is the Irrawaddy, which traverses Thayetmyo from north to south. The country is well drained ; the drainage finds its way to the Irra- waddy by three main streams (the Pwon, Ma-httn, and Ma-de) on the west, and by two (the Kye-nee and Bhwot- lay) on the east. Several salt and hot springs occur in many localities of the district ; petroleum is also found, and extensive lime quarries exist a few miles south of Thayetmyo. The principal wild animals are leopards, wild cats, barking deer, elephants, rhinoceroses, tigers, black bears, and wild hogs. Silver pheasants and partridges are found in large numbers, especially in the mountains.

In 1881 the number of inhabitants in the district was 169,560 (males 87,308, females 82,252); Hindus numbered 2620, Moham- medans 1861,

Christians 2849, and Buddhists 148,629. The chief town is Thayetmyo, with a population (1881) of 16,097; itis situated in 19° 18’ 43” N. lat. and 95° 15’ 40” E. long., on the right bank of the Irrawaddy. Of the total area of 1,534,080 acres, only 108,167 were under cultivation in 1885-86 ; 547,631 were avail-

able for cultivation ; and forests occupied 256,256 acres. The chief products are rice, cotton, oil seeds, and tobacco ; cutch is also very

abundant, and the manufacture of the dye-stuff is carried on exten- sively. Coal has recently been found in the district, and earth oil- wells exist, but neither coal nor oil has yet been extracted in any quantity. The revenue of the district in 1885-86 was returned at £36,702, of which the land contributed £10,482. On the annexa- tion of Pegu by the British in 1852-53, Thayetmyo was formed into a subdivision of Prome district ; and in 1870 it was erected into a separate jurisdiction and placed under a deputy-commissioner.

THEATRE (6éazpov, ‘a place for seeing,” from Oedop.a). The invention of a building specially devised for dramatic representations was due to the Athenians (see Drama). At first representations at the Dionysiac festivals were held on temporary wooden platforms; an accident, however, which occurred in 500 B.c. induced the Athenians to begin the construction of a permanent building. This first theatre was not completed till 340 B.c., and during the interval a large number of theatres, designed on the same model, had been erected in many towns of Greece and Asia Minor, though in some cases, as at Sparta, they were used for assemblies of the people and dances rather than for dramatic performances. The great Dionysiac theatre at Athens was placed in the Lenzeum, an enclosure sacred to Dionysus, and its auditorium is scooped out of the rock at the base of the Acropolis on its south-east side. A similar position on the slope of a hill was always chosen by the Greeks, and it was not till the Ist century B.o. that theatres were built by the Romans on a level site. .

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in the south-east of Lycia, which, though late in date, is built after the old Greek model.! The seats for the cavity excavated in the hill-side, the spectators was | called the xotAov | slope is an encirc- Fig, 2.—Section showing the Seats A, —with B, ling passage (8ud- place for spectators' feet. level behind the top row of seats ran a colonnade, form- ing a covered passage with a gallery at the top. Rows these niches a series of large bronze jars (jxeta) were set: they were intended to catch and repeat the reverberation

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Fig. 1.—Plan of the Theatre at Myra.

Fig. 1 shows the plan of the existing theatre at Myra, audience are arranged in concentric tiers, rising like steps one above the other (see fig. 2); these mainly rest on a and the whole space occupied by (Lat.cavea). About half-way up the faa, precinctio). Flights of steps divide the seats into wedge-shaped blocks (kepxiSes, cunei). At the highest of niches were formed in the back wall of this, and also sometimes in the low wall encircling the duaZwpa; In of the voices from the stage. Vitruvius (iii, 5) gives

1 See Texier and Pullan, Asia Minor, London, 1865.

THEATRE

elaborate directions for the construction of these vases, which were to be tuned in a chromatic scale ;1 he mentions their use by the Greeks, but says he knows of no Roman theatre which possessed these vases, the real utility of which is very problematical. The segmental floor space in a Greek theatre was called the épyyotpa (orchestra), and was occupied by the chorus ; in the centre of this was the Overy, a platform slightly raised on steps, in the middle of which was an altar to Dionysus. The stage (xpockijviov, proscenium) was a narrow platform, raised 3 to 5 feet above the orchestra, with which it communicated by stairs, so that the chorus could move from one place to the other; the central part of the stage, where the principal actors usually stood, was the Aoyetov (pulpitum). The stage was also connected with a chamber under it (érocKyjmov) by a flight of stairs called yapwvioe xAipaxes, by which ghosts ascended. At the back of the stage was a lofty wall, which usually reached to the level of the colounade behind the highest row of seats; this was the oxyvy (scena), in which were three doors leading into the stage from the actors' dressing-rooms behind it.? This wall was usually decorated with three orders of columns and entablatures, forming an architectural fagade, which represented a palace or temple, before which the action of the play was supposed to take place. Other movable wooden scenery was in some cases added in front of the permanent scena ; or curtains with woven or embroidered figures were hung against it to form a background to the actors (aapa- meracpa Or aidaiar, aulea or siparium). More elaborate painted scenes were also used, but, according to Aristotle (Poet., iv. 16), not before the time of Sophocles. Various kinds of machinery were used, such as the pyxavy, to suspend in the air an actor who was playing the part of a god descending from heaven;* and the Apovrefov, an apparatus to imitate thunder by stones rolled in metal jars, probably in the ghost-chamber under the stage. Women were not excluded from the Greek tragic drama, but appear to have sat by themselves in the upper rows of seats (Atheneeus, xii. 534).° At least in late times the chief priestesses of Athens occupied marble thrones in the zpoeSpéa or front row.

The remains of the Dionysiac theatre at Athens, the prototype of all later theatres, were excavated in 1862, when the proscenium, orchestra, and lower rows of seats were found in a fair state of preservation. It must have held 30,000 people: the cavea reaches from the foot of the Acropolis hill to

close under the upper circuit wall. The rock-cut cavern, which was faced with the choragic monument to Thrasyllus (320 B.c.), seems to have opened behind the highest row of seats; the face of the rock is here scarped to a curve concentric with the lines of seats. The most interesting discovery was that of a row of 67 marble thrones in the front row, each inscribed with the name of one of the chief Athenian priests or with that of a secular official. The cavea was divided into 13 cunei F

1 The well-preserved theatre at Tauromenium, in Sicily, still has these niches, which are contrived in the dwarf wall on which the columns of the upper gallery stood.

- Earthenware vases, which are sometimes found under the floors of medizval church stalls, were probably placed there through a mistaken notion that this was carrying out Vitruvius's recommendation.

- The central door, used by the chief actor, was "the royal door." Hence the Roman proverbial phrase, "deus ex machina,"

This is shown by Jacobs, Verm, Schriften, iv. p. 272, and Passow in Zimmermann's Zeitschr. J. d. Alterth., 1837, No, 29.

§ These thrones are of various dates, ranging from the reign of Augustus or even earlier to that of Hadrian; see Papers of the American School of Classical Studies at Athens, vol. i, p. 123. Similar Greek theatre seats of earlier date still exist in the choirs of some churches in Rome, where they were once used for the episcopal or celebrant's throne. These were probably brought to Rome during the imperial period for use in the Roman theatres or amphitheatres. The finest example of pure Hellenic work is in 8. Pietro in Vincoli ' it is decorated with delicate honeysuckle scroll-work in relief,

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a low wall separated the auditorium from the orchestra. The front or "riser" of the stage is decorated with fine relicfs of deities on large marble slabs. These existing features are mostly restorations of the time of Hadrian, but

the reliefs themselves are of much earlier date. The floor of the orchestra is very late, formed of roughly laid slabs of stone, with a large central lozenge in marble, which may mark the limits of the thymele, and is apparently part of an earlier pavement.

The position of the Dionysiac theatre, with many of the chief temples of Athens in sight, and with its glorious view of Mount Hymettus, the blue waters of the Aigean Sea, and the islands of Salamis and A®gina, should not be forgotten in reading the dramas of the great tragedians, with their impassioned appeals to the glories of nature and their allusions to the protective presence of the divine patrons of Attica,

Outside Athens the largest Greek theatres were those at Megalopolis (Paus., viii. 32), Cnidus, Syracuse, Argos, and Epidaurus. By the end of the 4th century B.c. every important Hellenic city possessed its theatre, and new ones were built or old ones restored throughout the whole period of Roman domination. The most perfect existing example is that at Aspendus in Pamphylia,' a building of the 2d century of our era, in which the early Greek model has been closely followed. Aspendus is the only place where the whole scena with its three orders of columns is still standing, and every row of seats exists in almost perfect condition. In this theatre the whole interior appears to have been covered by an awning,® supported along the top of the scena by wooden poles set in rows of perforated corbels like those on the Colosseum in Rome. The earlier Greek theatres were probably unsheltered from the sun. Next to Aspendus, the theatre of Tauromenium, in Sicily (see Taormina), is the best preserved, at least as far as regards the scena and the upper gallery round the cavea. That at Myra, in Lycia (fig. 1), is also in good preservation.

The Roman Theatre.—In the main the theatres of the Romans were copied closely from those of the Greeks, but in the Greek theatre the orchestra occu- pied more than a semicircle, while the Romans made it ex- actly half a circle. The accompanying diagrams (see fig. 3) show the principle on which the plan of each was set out.® The Romans also introduced another important change, in many cases con- structing theatres on a level site, not scooped out of a hill- side as in the case of Hellenic theatres, This necessitated an elaborate arrange- ment of substruc- tures, with raking

vaults to carry the seats of the cavea, and also an additional visible facade with tiers of arches following the semicircle of the auditorium. The design universally adopted for this appears to have been tiers, usually three in number, of open arches, with intermediate

Fie. 3,—Diagram to show the Principle on which the Plans of the Greek aud Roman Theatre were set out,

” See Texier and Pullan, Asia Minor, London, 1865. 8 There was also a wooden pent-roof corbelled out over the stage. ® See Vitruvius, iii. 8 (Greek theatre) and iii, 2 to 7 (Roman).

engaged columns, each tier being of a different order, as is still to be seen in the remains of the theatre of Marcellus in Rome! The development of the use of the stone arch, and still more the use of concrete for forming vaults, enabled the Romans to erect their theatres on any site. Those in Rome were placed in the level plain of the Campus Martius.

During the Republican period the erection of permanent theatres with seats for the spectators was thought to savour of Greek luxury and to be unworthy of the stern simplicity of the Roman citizens. Thasin 154 B.c. Scipio Nasica induced the senate to demolish the first stone theatre which had been begun by C. Cassius Longinus (“tanquam inutile et nociturum publicis moribus,” Liv., Epit.. 48). Even in 55 3.c., when Pompey began the theatre of which remains still exist in Rome, he thought it wise to place a shrine to Venus Victrix at the top of the cavea, as a sort of excuse for having stone seats below it— the seats theoretically serving as steps to reach the temple. This theatre, which was completed in 52 B.c., is spoken of by Vitruvius as “the stone theatre” par excellence: it is said in the Regionary catalogues to have held 40,000 people. It was also used as an amphitheatre for the bloody shows in which the Romans took greater pleasure than in the purer intellectual enjoyment of the drama. At its inauguration 500 lions and 20 elephants were killed by gladiators. Near it two other theatres were erected, one begun by Julius Cxsar and finished by Augustus in 13 B.c.,

under the name of his nephew Marcellus,' and another built about the same date by Cornelius Balbus (Suet., Aug., 29; Pliny, H. W., xxxvi. 16). Scanty re- mains exist of this last theatre, but the ruins of the theatre of Marcellus are among the most imposing of the buildings of ancient Rome.

A long account is given by Pliny (7. W., xxxvi. 2 and 24) of a most. magnificent temporary theatre built by the eedile M. Aumilius Scaurus in 58 B.c. It is said to have held the incredible number of 80,000 people, and was a work of the most costly splendour. Still less credible is the account which Pliny gives (H. WV., xxxvi. 24) of two wooden theatres built by C. Curio in 50 3.c., which were made to revolve on pivots, so that the two together could form an amphitheatre in the afternoon, after having been used as two separate theatres in the morning.

In some cases the Romans built two theatres close together, one for the Greek and the other for the Latin drama, as is the case at Hadrian's magnificent villa near Tivoli. The two theatres at Pompeii are still well pre- served, and all Roman provincial towns of any importance seem to have possessed at least one theatre, designed with the semicircular orchestra after the Roman fashion (see fig. 3). The theatres built under the Roman rule in Hellenic cities seem, on the other hand, to have been usually constructed on the old Greek model, probably because they were designed by Greek architects. This is the case at Tauromenium, Aspendus, and Myra see (fig. 1). An important exception to this rule is the still well- preserved theatre of Herodes Atticus, at the south-west angle of the Athenian Acropolis, which has a semicircular orchestra. It was built in the reign of Hadrian by Herodes Atticus? a very wealthy Greek, who spent enormous sums in beautifying the city of Athens; he called it the Regillum, after his wife Regilla. Its cavea,

1 This design was also adopted for their amphitheatres, such as the colossea of Rome and Capua, the plan of which resembles the cavea of two theatres set together so as to enclose an oval space.

2 According to Livy (xl. 51), the theatre of Marcellus was built on the site of an earlier one erected by Aimilius Lepidus.

8 This theatre was not begun when Pausanias wrote his book Aética, and was complete when he wrote the Achaica (see Paus., vii. 20). It is illustrated in Mon. Inst., vi., plate 16.

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which is excavated in the rock, held about 6000 people; it was connected with the great Dionysiac theatre by a long and lofty porticus or stoa, of which considerable remains still exist, probably a late restoration of the stoa built by Eumenes II. of Pergamum. In the Roman theatre the “orchestra” was occupied, not by the chorus, but by senators and other persons of rank (Vitr., i. 6).4 The Romans used scenery and stage effects of more elaboration than was the custom in Greece. Vitruvius (iii. 7) mentions three sorts of movable scenery:—(1) for the tragic drama, fagades with columns represent- ing public buildings ; (2) for comic plays, private houses with practicable windows and balconies ;> and (3) for the satyric drama, rustic scenes, with mountains, caverns, and trees.

The Modern Theatre.—During the Middle Ages miracle plays with sacred scenes were the favourite kind of drama ; no special buildings were erected for these, as they were represented either in churches or in temporary booths. In the 16th century the revival of the secular drama, which, in the reign of Elizabeth, formed so im- portant a part of the literature of England, was carried on in tents, wooden sheds, or courtyards of inns, mostly by strolling actors of a very low class. It was not till towards the close of the century that a permanent building was constructed and licensed for dramatic representations, under the management of Shakespeare and Burbage.® In

4 The pit and stalls in a modern theatre occupy an analogous position,

5 These are shown on Greco-Roman vases of the latest type, with paintings of burlesque parodies of mythological stories.

6 The first building specially erected in London for dramatic purposes was built in 1576-77 by the actor James Burbage, who was originally a carpenter by trade. Jt was constructed of timber, and stood in Holywell Lane, Shoreditch, till 1598, when it was pulled down; it was known as “The

Theatre” par excellence. Of almost equally early date was the ‘‘Curtain” theatre, also in Shoreditch ; many explanations of its name have been given, but the real one uppears to be that it was so called from the plot of ground, known as ‘©The Curten,” on which it stood. It probably continued iu use till the general closing of theatres by order of the parliament in 1642.

The “Globe”? theatre, famous for its association with Shakespeare, was built by James Burbage, who used the materials of “‘ The Theatre, ie in the year 1598, Its site was in Southwark, in a district called “The Bankside,” near the old “Bear Gardens.” It was an octagonal structure of wood, with lath and plaster between the main framework. Tt was burnt in 1613, rebuilt, and finally pulled down and its site built over in 1644. Its name was derived from its sign of Atlas sup- porting the globe. Near it were two less important theatres, “The Rose,” opened in 1592 by Henslowe, and ‘‘The Swan,” opened in 1598 and probably owncd also by Henslowe ; like the Globe, it was an octagonal wood-and-plaster building.

The ‘‘ Blackfriars” theatre, another of the Burbages’ ventures, was built in 1596 (not 1576, as stated by Collier, Hist. of Dramatic Poetry and Annals of the Stage, new ed., 1879, vol. i. p. 287), near the old Dominican friary. ‘The ‘‘ Fortune” theatre was built by Edward Alleyn, the great rival of the Burbages, in 1599-1600, at a total cost, including the site, of £1320. It stood between Whitecross Street and Golding Lane. It existed as late as 1819, when a drawing of it was given by Wilkinson (Londina illustrata, 1819). The ‘*Red Bull” theatre was probably originally the galleried court of an inn, which was adapted for dramatic purposes towards the close of Elizabeth’s reign. Other early theatres were the “Hope” or “ Paris Garden” theatre, the ‘‘ Whitefriars ” and ‘‘ Salisbury Court ” theatres, and the “ Newington” theatre. A curious panoramic view of London, engraved by Visscher in 1616, shows the Globe, the Hope, and the Swan theatres.

The plan of the first English theatres appears to have had no con- nexion with those of classical times, as was the case in Italy: it was evidently produced in an almost accidental way by the early custom of erecting a temporary platform or stage in the middle of the open court- yard of au inn, in which the galleries all round the court formed boxes for the chief spectators, while the poorer part of the audience stood in the court on all

sides of the central stage. Something similar to this arrangement, unsuitable though it now seems, was reproduced even in buildings, such as the Globe, the Fortune, and the Swan, which were specially designed for the drama. In these and other early theatres there was a central platform for the stage, surrounded by seats except on one side, where there was 4 “oreen-room ~ oF

THEATRE

the 16th and 17th centuries a favourite kind of theatrical representation was in the form of “masques,” with pro- cessions of grotesquely attired actors and temporary scenic effects of great splendour and mechanical ingenuity. In the reigns of James J. and Charles I. Ben Jonson and the architect Inigo Jones worked together in the production of these ‘“ masques,” Jonson writing the words and Inigo Jones devising the scenic effects, the latter being very costly and complicated, with gorgeous buildings, land- scapes, and clouds or mountains, which opened to display mimic deities, thrown into relief by coloured lights, These masques were a form of opera, in which Ben Jonson’s words were set to music. Ben Jonson received no more for his libretto than Inigo Jones did for his scenic devices, and was not unnaturally annoyed at the secondary place which he was made to occupy: he therefore revenged himself by writing severe satires on Inigo Jones and the system which placed the literary and mechanical parts of the opera on the same footing. In an autograph MS. which still exists this satirical line occurs—“ Painting and carpentry are the soul of masque” (see Cunningham, Life of Inigo Jones, London, 1848).

In Italy, during the 16th century, the drama occupied a more important position, and several theatres were erected, professedly on the model of the classic theatre of Vitruvius. One of these, the Teatro Olimpico at Vicenza, still exists; it was designed by Palladio, but was not completed till 1584, four years after his death. It has an architectural scena, with various orders of columns, rows of statues in niches, and the three doors of the classic theatre, but the whole is painted with strong perspective effects which are very unclassical in spirit. Scamozzi, Palladio’s pupil, who completed the Teatro Olimpico, built another pseudo-classical theatre in 1588 at Sabbionetta for the duke Vespasiano Gonzaga, but this does not now exist.

In France the miracle play developed into the secular drama rather earlier than in England. In the reign of Louis XI., about 1467, the “Brothers of the Passion ” had a theatre which was partly religious and partly satirical. In the 16th century Catherine de’ Medici is said to have spent incredible sums on the dresses and scenery for the representation of the Italian ballet ; and in the middle of the 17th century the regular opera was introduced at Paris.

At the end of the 18th century the theatres of San Carlo at Naples, La Scala at Milan, and La Fenice at Venice were the finest in Europe; all these have been rebuilt in the present century, but have been eclipsed by the theatres of Paris, St Petersburg, and other capitals, both in size and architectural splendour.

“‘tireynge-howse.” The upper galleries or boxes coinpletely sur- rounded the stage, even the space over the green-room being occupied by boxes. This being the arrangement, it is easy to see why the octagonal plan was selected in most cases, though not in all,—the Fortune theatre, for example, was square. An interesting specifica- tion and contract for the building of the Fortune theatre is printed by Halliwell-Phillipps (op. cit. infra, p. 164). In all its details the Fortune is specified to be like the Globe, except that it is to be square in plan, and with timbers of heavier scantling. The walls are to be of wood and plaster, the roof tiled, with lead gutters, the stage of oak, with a “shadow” or cover over it, and the ‘‘tireynge-howse” to have glazed windows. Two sorts of boxes are mentioned, viz., _ Sentlemen’s roomes” and “ twoo-pennie roomes.” A woodcut show- ing this arrangement of the interior is given in a collection of plays edited by Kirkman in 1672.

_Much valuable information about the early theatres of London is given by Wilkinson, Londina Illustrata (1819), in which are engrav- Ings of some of them. See also Collier, Hist. of Dramatic Poetry, 1879; Halliwell-Phillipps, Life of Shakespeare, 1883; Malone, History of the Stage, 1790, republished by Boswell in 1821; the publications of the New Shakspere Society; the Ninth Report of the Historical MSS, Commission ; and a series of articles on early

ee et T. F. Ordish, in The Antiquary, vols. xi., xii.,

In the modern theatre the auditorium has changed comparatively little, except that the stalls have gradually encroached upon and almost absorbed the pit. The arrangement of the boxes, stalls, balcony, and gallery are too well known to need description. Few people, have, however, any notion of the immense size and extreme complication of the space and machinery behind the proscenium, of which the visible stage occupies but a very small proportion. The stage-floor slopes upwards away from the audience, so that it may appear deeper than it really is by diminishing the foreshortening.! Its extent behind the most distant plane of scenery is usually quite as great as that which the audience sees, In addition to this extension of the visible stage there are three other enormous spaces filled with the machinery to work the scenery.

(1) Of these the first consists of the ‘‘wings” (Fr. cowlisses), a series of chambers or platforms on each side of the stage, arranged many stories high, and reaching to more than double the height of the proscenium.

(2) The ‘‘ dock” or under-space (Fr. dessous), extending under the whole area of the stage floor, and about equal in height to the proscenium, is divided into three or four stories by suc- cessive floors, and contains long rows of immense windlasses (Fr. gril) for raising and lowering scenery, and also an elaborate arrangement of lifts by which actors can suddenly appear or vanish through the stage floor. Avery ingenious device called the “star trap,” invented by an English mechanician (Fr. trappe Anglaise), allows an actor to vanish through the floor without any opening in it being visible. This is done by making the trap door of thin boards (something like a venetian blind) fixed on to ficxible bands of steel; the weight of the actor makes these open in the middle and let him through, while the steel springs close the opening as soon as they are released. The whole movement is so rapid that the actor seems to sink through the solid floor.? In all mechanical appliances for theatrical purposes England is far ahead of other countries, many of which have adopted English methods.

(8) The third space, and the largest of all, is that above the proscenium—the ‘‘ flies” (Fr. dessus or cintre), extending over the whole of the stage, and reaching sometimes to nearly double the height of the proscenium. This also is divided into many floors, and contains rows of great windlasses, by

which scenery can be hoisted up out of sight, without folding or bending it. All these threc parts of the building are filled with a complicated but most orderly series of ropes, lifts, and machinery of every sort, of which it is impossible here to give a detailed description.

The old method of fixing scenery was to slide it in two halves from the wings in grooves formed in the stage floor: these are no longer used, as much more realistic cffects can be gained by sup- porting scenery from the top, or by building it up with supports of its own, so that, instead of a series of painted planes set parallel to the stage front, castles, cathedrals, or even whole streets are actually built upon the stage, “ors Por and give striking effects of real perspective.

A rapidly growing tendency now exists to increase the mechanical perfection of the theatre. The extended use of iron instead of wood for the stage floor and the various machines has been a great gain in space and rapidity of work- ing. It is now considered a great object to drop the curtain as seldom as possible, and even the Grand Opera House of Paris is now left far behind in the modern competition for mechanical perfection,’ though from an architectural point of view it is the most magnificent and costly of all existing build- ings of its kind. See fig. 4.

The latest improvement to ¢ prevent delay between the pre, 4 pian of the Grand Opera House in scenes has been: introduced in Paris : 200 feet to the inch. the Madison Square theatre A, Auditory. B,Stage. C, Grand Staircase. in New York city, which has D, Great Saloon. E, Royal Entrance, F,

Green-room. two stages, one above the other. During the performance of a scene the second stage floor is

1 This device was practised by the medieval architects in most European countries, who frequently made the floor of cathedrals and other large churches to slope upwards from west to east, sometimes as much as from two to three feet.

? Other varieties of this, such as the ‘‘ vampire trap,” allow an actor to vanish through an apparently solid wall.

3 In 1883 M. Reyer’s Sigurd was refused at the Paris Opera House mainly on account of the absence of the necessary mechanical appliances,

being prepared in the under-space, with all its scenery fixed, and when the curtain falls the first stage rises into the upper regions and the second floor goes up to take its place. These floors are accurately balanced by heavy counterpoise weights, so that the whole of these enormous masses are moved with comparatively little force.

On the whole, for magnificence of effect and mechanical ingenuity the great London pantomimes are unrivalled. Their transforma- tion-scenes are marvels of the mechanist’s skill, and are often devised with very high artistic talent. Unhappily much danger and suffering have often to be undergone by the women who act the part of fairies and the like, suspended high in the air by almost invisible supports, and by the young children who have to squeeze themselves into pasteboard shells representing insects or reptiles.

In addition to the above-mentioned parts of the theatre, which are reserved for the mechanical working of the performance, much space is occupied by the ‘‘green-room” for the actors, and rows of dressing-rooms. An immense deal of storage room is also required, and some of the Parisian theatres have large magazines te this purpose in the suburbs. In many cases also the atelier for the scene painters is far removed from the theatre, and thus far better space and lighting for the work can be provided. Fig. /f__¥)]

5 shows the plan of the Drury Lane | 4 theatre, in many respects the best ! arranged in London.

The painting of theatrical scenery | has frequently been the work of artists of very high talent, such as |P=3 Raphael in Rome, Watteau, Boucher, [and Servandoni in France, and Stan- } field in England. Paintings of very &, high artistic merit and wonderfully § decorative effect are now produced § for theatrical purposes, especially in [4)3 France, Germany, and England.!

pag In England especially great histor- § ical and antiquarian knowledge are 4? T brought to the aid of this branch of f § art. The landscapes in particular]] 4 are sometimes works of great beanty, [7 ¥ and very beautiful effects of lake * scenery with trees and mountains 4_ reflected in the water are got by set- ~~

ting great sheets of plate glass over yy¢.5,—Plan of Drury Lane Theatre:

the stage floor, slightly inclined, so 100 feet to the inch.

that a real reflexion is thrown by the A, Stage. B, Saloon between the landscape painted on the scene be- Chief Staircases, C, Entrance Hall. hind. Another ingenious device, used by Wagner at Baireuth and also in England for magical scenes, was to form a thin and semi- transparent curtain of vapour, which was sent up by a perforated steam-pipe concealed in a groove in the stage.

The various methods of lighting used are an important item in the production of striking effects. The old system of a row of ‘

The old way of producing lightning was to blow lycopodium or powdered resin with bellows through a flame, and this is still used in realistic effects of conflagrations. More effective lightning is now made by flashing the electric light behind a scene painted with clouds, in which a zigzag aperture has been cut out and filled with a transparent substance. ‘Thunder is made by shaking large sheets of iron, by rolling cannon balls above the ceiling of the auditorium, and by clapping together a series of planks strung together on two ropes. Wind is imitated by a machine with a cogged cylinder, which revolves against coarse cloth tightly stretched. The sound of rain is produced by shaking parched peas in a metal cylinder.

The orchestra is now usually arranged either below or above the proscenium, so that the musicians are not visible. The prompter is placed at one side, in the wings, so as to avoid the disfigure- ment of the hood-like box which formerly used to cut the front line of the stage into two halves. This is, however, less convenient for the actors.

Till the middle of the present century little trouble or expense was laid out on dresses and accessories. Certain conventional costumes, made of cheap stuff, were used for each part, with but little regard to historieal correctness. Armour and weapons were

1 Scene paintings are usually executed in distemper, frequently in an atelier formed in the roof of the theatre ; the artist partly works with his canvas laid upon the floor, or, where space allows, the painting is hung against a wall

and the artist works from a scaffold, with tiers of boarding arranged so that he can reach to any part of the great canvas.

made of pasteboard covered with metal foil, and stage jewellery was made of small cup-like pieces of tin formed with many facets, Now, however, no trouble or expense is spared to get the costumes and varions properties archzologically correct: real jewels and the richest stuffs are often used for the dresses, as well as real furni.- ture of the most costly sort for the furnishing of the scenic rooms, As much as £20,000 is sometimes spent before the play can be presented. All this splendour and realism is very hostile to the true interests of the drama ; magnificent scenery and costly accessories are expected by the audience, rather than good acting, In some scenes, such as the ballin the first act of Romeo and Juliet, as recently represented at the Lyceum, the words and acting of the chief performers were almost lost in the general bustle and splendour of the scene. Frequently, too, the noise of setting up some elaborate scene behind almost drowns the voices of the actors in front of the drop scene.

Another serious cause of the present low state of acting in England is the fact that a popular play sometimes runs for several hundred nights without a break, thus reducing the performers to the condition of machines. The modern system of expending large sums on dresses and decoration naturally prevents that frequent change of snbject which is so desirable, and which in France is provided for by the rules of the Théatre Frangais, where acting of a very high order of merit still survives.

The present system, aided by the enormous size to which London has unhappily grown, has completely changed the character of the audience. Instead of an andience largely composed of habitués, who by their constant attendance at the theatre had gained some knowledge of what acting ought to be, and were prepared to show their disgust at clap-trap or ranting, we have now practically a fresh and ignorant audience every night, who, by their applause of what is worst and their coldness to real refinement of acting, do much to lower the dramatic standard and demoralize the actors.

For further information the reader is referred to Donnet, Thédtres de Paris, 1821; Salomons, Construction des Thedtres, Paris, 1871; Garnier, Le Nouwvet Opéra de Paris, 1876-81 ; Coutant, Principaux Thedtres Modernes, Paris, 1870; Moynet, Z'Envers du Thédtre, Paris, 1874; Pougin, Dictionnaire du Thédire, Paris, 1885, (J. H. M

Law RELATING TO THEATRES.

The regulation of the theatre by legislation can be traced back to the time of the lower empire, in which it depended almost wholly upon constitutions of Theodosius and Valentinian, incor- porated in the Theodosian Code (tit. xv. 5, 6, 7), and a century later to a large extent adopted by Justinian. In the whole of this law there is an evident attempt at a compromise between the doc- trines of Christianity and the old Roman love of public spectacles ofall kinds. It deals less with theatrical representations proper than with gladiatorial contests and chariot races.?_ The Theodosian Code provided that the sacraments were not to be administered to actors save where death was imminent, and only on condition that the calling should be renounced in case of recovery. Daughters of actors were not to be forced to go on the stage, provided that they lived an honest life. An actress was to be allowed to quit the stage in order to become a nun. There were also numerous sumptuary regulations as to the dress of actors. None of the law which has been mentioned so far was adopted by Justinian, but what follows was incorporated in Cod. xi. 40 ('* De Spectaculis et Scenicis"), which consists entirely of extracts from the Theodosian Code of a very miscellaneous nature. Provision was made for the exhibition of public games and theatrical spectacles by magis- trates, practically confining them to exhibiting in their own cities. Statues of actors were not to be placed in the

public streets, but only in the proscenium of a theatre. A governor of a province was entitled to take the money raised for public games for the purpose of repairing the city walls, provided that he gave security for afterwards celebrating the games as usual. In Cod. iii. 12, 11 (“De Feriis”) is a constitution of Leo and Anthemius forbiddin dramatic representations on Sunday. The Digest (iii. 2) classe all who acted for hire (“omnes propter pecuniam in scenaim pro- deuntes”) as infamous persons, and as such debarred them from filling public offices. A mere contract to perform, not fulfilled, did not, however, carry infamy with it. By the 51st of the Movelle actresses could retire from the stage without incurring a penalty,

even if they had given sureties or taken an oath.

In England, as in other countries of western Europe, theatrical legislation was of comparatively recent introduction. Such legisla- tion was unnecessary as long as the theatre was under the control of the church and actors under its protection (see Drama). The earliest regulations were therefore, as might be expected, made by the church rather than by the state, The ecclesiastical ordinances were directed chiefly against the desecration of churches, though they sometimes extended to forbidding attendance of the faithful as spectators at plays of a harmless kind.* Sacraments and Christian

2 The word dudi seems sometimes to include, sometimes to exclude, dramatic performances. Its meaning in a particular instance depends on the context.

3 A large number of such ordinances will be found cited in Prynne, Hist

mastiz; Bossuet, Maximes et Reflexions sur la Comédie; Mariana, De Spectacultss Smith, Dicttonary of Christian Antiquities, arts. “‘ Actors” and ‘Theatre.

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burial were denied by the canon law to actors, whose gains, said St Thomas, were acquired ea turpi causa.1 The same law forbade plays to be acted by the clergy, even under the plea of custom, as in Christmas week, and

followed the Code of Justinian in enjoin- ing the clergy not to consort with actors or be present at plays (see the Decretals of Gregory, iii. 1, 12, and 15, ‘‘De Vita et Honestate Clericorum”). As lately as 1603 canon Ixxxviii. of the eanons of the Church of England enacted that churchwardens were not to suffer plays in churches, chapels, or churchyards.

The Reformation marks the period of transition from the ecclesi- astical to the non-ecclesiastical authority over the drama. Precau- tions began to be taken by the crown and the legislature against the acting of unauthorized plays, by unauthorized persons, and in unauthorized places, and the acting of plays objectionable to the Government on political or other grounds. The protection of the church being withdrawn, persons not enrolled in a fixed company or in possession of a licence from the crown or justices were lable to severe penalties as vagrants. The history of the legislation on this subject is very curious. An Act of the year 1572 (14 Eliz. e. 5) enacted that “all fencers, bearwards, common players of inter- ludes, and minstrels (not belonging to any baron of this realm, or to any other honourable person of greater degree),” wandering abroad without the licence of two justices at the least, were subject “to be grievously whipped and burned through the gristle of the right ear with a hot iron of the compass of an inch about.” This statute was superseded by 89 Eliz. e, 4, under which the punish- ment of the strolling ca is less severe, and there is no mention of justices. The jurisdiction of justices over the theatre disappears from legislation from that time until 1788. In 39 Eliz. c. 4 there is a remarkable exception in favour of persons licensed by Dutton of Dutton in Cheshire, in accordance with his claim to liberty and jurisdiction in Cheshire and Chester, established in favour of his ancestor by proceedings in guo warranto in 1499. The stricter wording ot this Act as to the licence seems to show that the licence had been abused, perhaps that in some cases privileges had been assumed without authority. In 14 Eliz. c. 5 the privileges of a player attached by service of a noble or licence from justices, in the later Act only by service of a noble, and this was to be attested under his hand and arms. The spirit of the Acts of Elizabeth frequently appears in later legislation, and the unauthorized player was a vagabond as lately as the Vagrant Act of 1744, which was law till 1824. He is not named in the Vagrant Act of 1824. The Theatre Act of 1737 narrowed the definition of a player of interludes, for

the purposes of punishment as a vagabond, to mean a person act- ing interludes, &c., in a place where he had no legal settlement.

Before the Restoration there were privileged places as well as privileged persons, ¢.g., the court, the universities, and the inns of court. With the Restoration privilege became practically con- fed to the theatres in the possession of those companies (or their representatives) established by the letters patent of Charles II. in 1662 (see DRAMA). In spite of the patents other and unprivileged theatres gradually arose. In 1735 Sir John Barnard introduced a bill “to restrain the number of playhouses for playing of interludes, and for the better regulation of common players.” On Walpole’s Wishing to add a clause giving parliamentary sanction to the juris- diction of the lord chamberlain, the mover withdrew the bill’ In 1737 Walpole introduced a bill of his own for the same purpose, there being then six theatres in London. The immediate cause of the bill is said to have been the production of a political extrava- ganza of Fielding’s, The Golden Rump. The bill passed, and the Act of 10 Geo. II. c. 28 regulated the theatre for more than a century. Its effect was to make it impossible to establish any theatre except in the city of Westminster, and in places where the king should in person reside, and during such residence only. The Act did not confine the prerogative within the city of Westminster, but as a matter of policy it was not exercised in favour of the non- privileged theatres, except those where the “legitimate drama” was not performed. The legitimate drama was thus confined to Covent Garden, Drury Lane, and the Haymarket from 1737 to 1843. In the provinces patent theatres were established at Bath by 8 Geo. III. ¢. 10, at Liverpool by 11 Geo. III. c. 16, and at Bristol by 18 Geo. III. ¢. 8, the Act of 1737 being in each case repealed pro tanto. The acting of plays at the universities was forbidden by 10 Geo. II. «. 19. Itis not a little remarkable that the universities, once possessing unusual dramatic privileges, should not only have lost those privileges, but have in addition become subject to special disabilities. The restrictions upon the drama were found very Inconvenient in the large towns, especially in those which did not ee patent theatres. In one direction the difficulty was met

y the lord chamberlain granting annual licences for performances of operas, pantomimes, and other spectacles not regarded as legiti- mate drama. In

another direction relief was given by the Act of 1788 (28 Geo. III. vc. 30), under which licences for occasional per- sis eaten easels sen

1 For this reason it appears to have been the custom in France for actors to be married under the name of musicians, See Hist. Parlémentaire de la Révolu- tion Francaise, vol. vi. p. 881. The difficulties attending the funeral of MoLiirE (@.2.) are well known,

| bill in the House of Lords was not unreasonable,

a |

formances might be granted in general or quarter sessions for a period of not more than sixty days. The rights of patent theatres were preserved by the prohibition to grant such a licence to any theatre within 8 miles of a patent theatre. During this period (1737-1843) there were several decisions of the courts which con- firmed the operation of the Act of 1787 as creating a monopoly. The exclusive rights of the patent theatres were also recognized in the Music Hall Act of 1752, and in private Acts dealing with Covent Garden and Drury Lane, and regulating the rights of parties, the application of charitable funds, &. (sce 16 Geo. III. ec. 13, 31; 50 Geo. III. e. cexiv; 52 Geo. III. c. xix; 1 Geo. IV. c. Ix.). The results of theatrical monopoly were beneficial neither to the public nor to the monopolists themselves. In 1832 a select committee of the House of Commons recommended the legal recognition of “stage-right” and the abolition of theatrical monopoly. The recommendations of the report as to stage-right were carried out immediately by Bulwer Lytton’s Act, 3 and 4 Will. IV. c. 15 (see Copyricut). But it was not till 1843 that the present Theatre Act, 6 and 7 Vict. c, 68, was passed, a previous bill on the same lines having been rejected by the House of Lords. The Act of 1843 inaugurated a more liberal policy, and there is now complete “free trade” in theatres, subject to the conditions imposed by the Act. The growth of theatres since that time has been enormous. In 1885 there were forty-six licensed under the Act in London, Liverpool coming next with ten. Nor does the extension scem to have been attended with the social dangers antici- pated by some of the witnesses before the committee of 1832.

The suppression of objectionable plays was the ground of many early statutes and proclamations. While the religious drama was dying out, the theatre was used as a vehicle for enforcing religious and political views not always as orthodox as those of a miracle play. Thus the Act of 34 and 35 Hen. VIII. c. 1 madeit criminal to play in an interlude contrary to the orthodox faith declared, or to be declared, by that monarch. Profanity in theatres seems to have been a crying evil of the time. The first business of the Government of Edward VI. was to pass an Act reciting that the most holy and blessed sacrament was named in plays by such vile

, and unseemly words as Christian ears did abhor to hear rehcarsed,

and inflicting fine and imprisonment upon any person advisedly contemning, despising, or reviling the said most blessed sacrament (1 Edw. VI. c.1). A proclamation of the same king in 1549 forbade the acting of interludes in English on account of their dealing with sacred subjects. In 1556 the council called attention to certain lewd persons in the livery of Sir F. Leke representing plays and interludes reflecting upon the queen and her consort and the formalities of the mass. The same queen forbade the recurrence of such a representation as the mask given by Sir Thomas Pope in honour of the princess Elizabeth at Hatfield, for she “ misliked these follies.” By the Act of Uniformity, 1 Eliz. c. 2, it was made an offence punishable by a fine of a hundred marks to speak any- thing in the derogation, depraving, or despising of the Book of Common Prayer in any interludes or plays. In 1605 “An Act to restrain the Abuses of Players” made it an offence punishable by a fine of £10 to jestingly or profanely speak or use certain sacred names in any stage play, interlude, show, may-game, or pageant (3 Jac. I. c. 21). In consequence of the appearance of players in the characters of the king of Spain and Gondomar, an ordinance of James I. forbade the representation on the stage of any living Christian king. The star chamber in 1614 fined Sir John Yorke for representing a Catholic drama in his house. The first Act of the reign of Charles I. forbade acting on Sunday (see SunDAY). Puritan opposition to the theatre culminated in the ordinance of the Long Parliament (sec vol. vii. p. 484). After the Restora- tion there are few royal proclamations or ordinances, the necessary jurisdiction being exercised almost entirely by parliament and the lord chamberlain. One of the few post-Restoration royal procla- mations is

that of February 25, 1665, restraining any but the com- pany of the Duke of York’s theatre from entcring at the attiring house of the theatre.

Preventive censorship of the drama by an officer of statc dates from the reign of Elizabeth, and is perhaps the only example of censorship of the press still existing in the United Kingdom (see Press Laws). Such a censorship is not unknown in other countries, and it seems to have existed even in republican Rome, if one may judge from Horace’s line, —

- Que neque in ede soncnt certantia judice Tarpa.” The master of the revels appears to have been the dramatic censor from 1545 to 1624, when he was superseded by the lord chamber- lain, In some cases the supervision was put into commission. Thus with Tilney, the master of the revels in 1581, were associated by order of the privy council a divine and astatesman. In other cases it was delegated, as to Daniel the poet by warrant in 1603. The proposal to give statutory authority to the jurisdiction of the lord chamberlain led, as has been already stated, tothe withdrawal of Sir John Barnard’s bill in 1735, and to considerable debate before the bill of 1737 became law. Lord Chesterfield’s objection to the “Tf the players,”

said he, “are to be punished, letit be by the laws of their country, and not by the will of an irresponsible despot.” The discretion reposed by the Acts of 1737 and 1843 in the lord chamberlain has been, according to the report of a select committee of the House of Commons in 1866, on the whole wisely exercised. On the other hand, there have been. instances where perhaps both he and his subordinate officer, the examiner of stage plays, have been some- what nice in their objections. Thus, during the illness of George Ill., King Lear was inhibited. George Colman, when examiner, showed an extraordinary antipathy to such words as “ heaven” or “angel.” The lord chamberlain’s powers are still occasionally ex- erted in the interests of public decency, less frequently for political reasons. Before 1866 the lord chamberlain appears to have taken into consideration the wants of the neighbourhood before granting a licence, but since that year such a course has been abandoned.

The existing law of theatres is mainly statutory. It will be convenient to treat it as it regards the building, the performance, and the licensing of the building and of the performance. A theatre may be defined with sufficient accuracy for the present purpose as a building in which a stage play is performed for hire. It will be seen from the following sketch of the law that there are a considerable number of different persons, corporate and unincorporate, with jurisdiction over theatres. A consolidation of the law seems urgently required, and the placing of jurisdiction in the hands of a central authority for the United Kingdom. The committee of 1866 recommended the transfer to the lord chamber- lain of the regulation of all places of amusement, and an appeal from him to the home secretary in certain cases, as also the exten- sion of his authority to preventive censorship in all public enter- tainments; but no legislation resulted. Several bills for the amendment of the law have been recently introduced, but hitherto without success in the face of more burning political questions.

Building. —A theatre (at any rate to make it such a building as can be licensed) must be a permanent building, not a mere tent or booth, unless when Teviiee by justices at a lawful fair by § 23 of the Act of 1843. It must, if in the metropolis, conform to the regulations as to structure contained in the Metropolitan Building Acts and the Metropolis Management Acts, especially the Act of 1878 (41 and 42 Vict. c. 32). This Act makes a certificate of structural fitness from the Board of Works necessary as a condition precedent for licence in the case of all theatres of a superficial area of not less than 500 square feet licensed after the passing of tho Act, gives power to the board in certain cases to call upon pro- prictors of existing theatres to remedy structural defects, and enables it to make regulations for protection from fire. Such regulations were issued by the board on May 2, 1879. As to theatres in provincial towns, the Towns Improvement Act, 1847, and the Public Health Act, 1875, confer certain limited powers over the building on municipal corporations and urban sanitary authorities. In many towns, however, the structural qualifications of buildings used as theatres depend upon local Acts and the by- laws made under the powers of such Acts. To a morc limited extent the rules made by justices may enforce certain structural requirements.

Performance.—To constitute a building where a performance takes place a theatre, the performance must be (a) of a stage play, and (6) for hire. (a) By § 23 of the Act of 1843 the word “stage- play” includes tragedy, comedy, farce, opera, burletta, interlude, melodrama, pantomime, or other entertainment of the stage, or any part thereof. The two tests of a stage play appear to be the exeitement of emotion and the representation of action. The ques- tion whether a performance is a stage play or not seems to be one of degree, and one rather of fact than of law. A ballet d’action would usually be a stage play, but it would be otherwise with a ballet divertissement. § 14 empowers the lord chamberlain to for- bid the acting of any stage play in Great Britain whenever he may be of opinion that it is fitting for the preservation of good manners, decorum, or the public peace to do so, § 15 imposes a penalty of £50 on any one acting or presenting a play or part of a play after such inhibition, and avoids the licence of the theatre where it appears. Regulations of police respecting the performance are contained in 2 and 3 Vict. c. 47, and in many local Acts. A per- formance may also be proceeded against as a nuisance at common law, if, for instance, it be contra bonos mores or draw together a great concourse of vehicles, or if so much noise be heard in the neighbourhood as to interfere with the ordinary occupations of life. Very curious instances of proceedings at common law are recorded. In 1700 the grand jury of Middlesex presented the two playhouses and also the bear-garden on Bankside (the “Paris garden” of Henry VIII, act v. sc. 3) as riotous and disorderly nuisances. In 1819 certain players were prosecuted and convicted before the court of great sessions of Wales for acting indecent open-air interludes at Berriew in Montgomeryshire. Performances on Sunday, Good Friday, and Christmas day are illegal (see SuNDAY). Regulations as to the sale of intoxicating liquors during the performance are made by the Licensing Acts and other public general Acts, as well as by local Acts and rules made by justices. It is frequently a con-

dition of the licence granted to provincial theatres that no excise- able liquors shall be sold or consumed on the premises. The Children’s Dangerous Performances Act, 1879 (42 and 48 Vict. ¢, 34), forbids under a penalty of £10 any public exhibition or per. formance whereby the life or

limbs of a child under the age of fourtecn shall be endangered. It also makes the employer of any such child indictable for assault where an accident causing actual bodily harm has happened to the child, and enables the court on conviction of the employer to order him to pay the child compensa- tion not exceeding £20. (6) The performance must be for hire, § 16 of the Act of 1843 makes a building one in which acting for hire takes place, not only where money is taken directly or in- directly, but also where the purchase of any article is a condition of admission, and where a play is performed in a place in which exciseable liquor is sold. In a recent case of Shelley v. Bethell (Law Reports, 12 Queen's Bench Division, 11) it was held that the proprietor of a private theatre was liable to penalties under the Act, though he lent the theatre gratuitously, because tickets of adinission were sold in aid of a charity.

Licensing of Building.—By § 2 of the Act of 1843 all theatres (other than patent theatres) must be licensed. By § 7 no licence is to be granted except to the actual and responsible manager, who is to be bound by himself and two sureties for due observance of rules and for securing payment of any penalties incurred. The metro- politan theatres other than the patent theatres (as far at least as they are included in the boroughs named in the Act of 1848) are licensed by the lord chamberlain. By § 4 his fee on grant of a license is not to exceed 10s. for each month for which the theatre is licensed. The lord chamberlain appears to have no power to make suitable rules for enforcing order and decency. He can, however, by § 8, suspend a licence or close a patent theatre where any riot or misbehaviour has taken place.

Provincial theatres fall under three different licensing authorities, The lord chamberlain licenses theatres in Windsor and Brighton, and theatres situated in the places where the queen occasionally resides, but only during the time of such occasional residence (§ 8). Theatres at Oxford and Cambridge, or within 14 miles thereof, are licensed by the justices having jurisdiction therein, but before any such licence can come into force the consent of the chancellor or vice-chancellor must be given. The rules made by the justices for the management of the theatre are subject to the approval of the chancellor or vice-chancellor, who may also impose such conditions upon the licence as he thinks fit. In case, of any breach of the rules or

conditions, he may annul the licence (§ 10). All other provincial theatres are licensed by four or more justices at a special session held within twenty-one days after application for a licence shall have been made to them (§ 5). The fee is not to exceed 5s. for each month for which the theatre is licensed (§ 6). The justices, like the lord chamberlain, appear to have no discretion as to grant- ing a licence. Their act is purely ministerial and confined to ascertaining that the applicant is the actual and responsible manager, and that he and his sureties are of sufficient substance to provide the requisite bonds. § 9 gives the justices authority to make at the special session suitable rules for enforcing order and decency at the theatres licensed by them, and of rescinding or altering such rules at a subsequent special session. It also givesa secretary of state power to rescind or alter such rules, and to make other rules. In case of riot or breach of the rules, the justices may order the theatre to be closed, and it thereupon becomes an unlicensed house. Penalties are imposed by the Act for keeping or acting in an unlicensed theatre, and for producing or acting in an unlicensed play.

Licensing Performanee.—A stage play must be duly licensed before performance. § 12 of the Act of 1843 prescribes that a copy of every new play and of every addition to an old play, and of every new prologue or epilogue or addition thereto (such copy to be signed by the master or manager), shall be sent to the lord cham- berlain, and, if the lord chamberlain does not forbid it within seven days, it may be represented. § 13 empowers the lord chamberlain to fix a scale of fees for examination; the fee is now two guineas for a play of three or more acts, onc guinea for a play of less than three acts. All plays represented previously to the Act are held to be licensed. A play once licensed is licensed once for all, unless the licence be revoked under § 14. The examination is the duty of a special officer of the lord chamberlain’s department, the examiner of stage plays.

Musie Halls.—Music was at no time the object of restrictions as severe as those imposed upon the drama. The present Music Hall Act (25 Geo. IL. c. 36) was passed in 1752, probably in consequence of the publication in 1750 of Fielding’s Inquiry into the Causes of the late Increase of Robbers. It is remarkable that two works of the same writer should from opposite causes have led to both theatre and music hall legislation Mt lasting importance. The Act was originally passed for a term of three years, but was made

perpetual by 28 Geo. II. c. 19. It applies only to music halls within 20 miles of London and Westminster. Every such music hall must be licensed at the Michaelmas quarter sessions, the licence to be signified under the

hands and seals of four or more justices. The licence may be granted for music or dancing or both. Public notice of the licence is to be given by affixing over the door the inscription “ Licensed pursuant to Act of Parliament of the twenty-fifth of King George the Second.” The penalty for keeping an unlicensed music hall is £100. Music halls beyond the radius of 20 miles from London and Westmiuster are usually governed by local legislation, which in most cases follows, mutatis mutandis, the lines of the Act of 1752. The music hall, like the theatre, must generally fulfil certain struc- tural requirements. In one important respect the law is more lenient to the music hall than to the theatre. A licence is neces- sary for a single performance of a stage play, but it is only habitual music or dancing that requires a music hall licence.

Scotland.—In Scotland the theatre has always exercised a smaller amount of influence than in England, and there has been little exclusively Scotch legislation on the subject. An Act of 1555, c. 40, discountenanced certain amusements of a semi-theatrical kind by enacting tliat no one was to be chosen Robert Hude (sic), Little Jolin, abbot of Unreason, or quecn of May. A proclamation of James VI. in 1574, and an Act of 1579, c. 12, followed the lines of English legislation by making persons using unlawful plays, such as jugglery or fast and loose, punishable as vagabonds. In 1574 the General Assembly claimed to license plays, and forbade represen- tations on Sunday. As in England, the licensing power seems then to have passed from the church to the crown, for in 1599 James VI. licensed a theatre at Edinburgh. The Act 1672, c. 21, exempted comedians while upon the stage from the sumptuary provisions of the Act respecting apparel. The chamberlain of Scotland, while such an office existed, appears to have exercised a certain police jurisdiction over theatres. The Theatre Act of 1843 extends to Scotland, as did also the previous Act of 1737.

Ireland.—Theatrical legislation, as far as it went, was based upon English models. Thus ridicule of the liturgy was forbidden by 2 Eliz. c. 2 ([r.);

common players of interlndes and wandering minstrels were deemed vagabonds, 10 and 11 Car. I. c. 4 (Ir.). In 1786 an Act was passed to enable the crown to grant letters patent for one or more theatres in Dublin city and county, 26 Geo. IIJ. c. 57 (Ir.). The preamble alleges that the establishing of a well-reculated theatre at the seat of government will be productive of public advantage and tend to improve the morals of the people. Exceptions from the restrictions of the Act were made in favour of entertainments for the benefit of the Dublin lying-in hospital and exhibitions of horsemanship or puppct-shows.

United States.—Public entertainments, dramatic or otherwise, are usually under the control of the municipal authorities. In some States, such as New York and Massachusetts, there is State legislation, requiring places of public entertainment to be licensed by the proper authority. In many States it is a condition of the licence that intoxicating liquors shall not be sold in such places. Other conditions, more or less usual, are that there shall be no Sunday or dangerous performances, that acrobats shall be properly protected, and that female waiters shall not be employed. Struc- tural qualifications are in some cases made necessary. Thus in 1885 the New York legislature passed an Act containing many minute provisions for eusuring the safety of theatres against fire. A characteristic piece of legislation is the New York Act of 1873, ce. 186, enacting that no citizen is to be excluded from a theatre by reason of race, colour, or previous condition of servitude. This Act of course merely carries out the important principle affirmed in art. xiv. of the amendments to the constitution of the United States. Seo PRIVILEGE.

The most recent if not the only work on the law relating to theatres is Geary's Law of Theatres and Music Halls, 1885. (J. Wt.)

THEBES. See Eeyrt, vol. vii. p. 776 sq.

THEBES (anciently 7Ba., Thebe, or in poetry some- times y8a, in modern Greek Phiva, or, according to the corrected pronunciation, Thivx), one of the most interest- ing towns in Greece, is situated on low hilly ground of gentle slope a little north of the range of Citheron, which divides Bceotia from Attica, and on the edge of the Beeotian plain, about 44 miles from Athens, whence it is now reached by two carriage-roads. It has about

3500 inhabitants, and is the seat of a bishop. The present town occupies the site of the ancient citadel, the Cadmea ; two fragments of ancient wall are visible on the north, and another, belonging either to the citadel or the outer wall, on the south. Two streams, rising a little south of the town, and separated by an average distance of about half a mile, flow on the two sides, and are lost in the plain. These are the ancient Ismenus on the east and Dirce (Atpxn) on the west, which gave to the town its name Ourérapos. The Dirce, now Platzidtissa, has several

and

springs. From the west side of the Cadmea another copious fountain (Paraporti) falls to the Diree. In a suburb to the east is another (Fountain of St Theodore), and north-west are two more. The Cadmea itself is supplied with water brought from an unknown source to the south by works supposed of prehistoric antiquity. It now enters the town by an aqueduct of twenty arches of Frankish construction. The ‘ waters” of Thebes are celebrated both by Pindar and by the Athenian poets, and the site is still, as described by Diczarchus (3d century B.c.), ‘all springs,” xa@vdpos taca. One, from which a pasha of Negroponte (Eubcea) is said to have supplied his table, is still called ‘‘the spring of the cadi.” Some of the marble basins, seats, &c., remain, and, with the frag- ments of wall above mentioned, are the only relics of the classic time. The most curious of later buildings is the church of St Luke, south-east of the Cadmea, believed to contain the tomb of the evangelist. From the abundance of water the place is favourable to gardens, and the neigh- bouring plain is extremely fertile. But the population is scanty, and the town at present of no importance.

In prehistoric times the Cadmea, with the enlarged city of Thebes into which it developed, was a power of the first rank, as is shown by its unrivalled legends. More parti- cularly the mythical wars with Argos (see below) point to a time when the “ Hellenes” of North Greece were still contending unequally against the ‘“ Acheans” of the Peloponnesus. In the legend as given by Aischylus these names are accurately preserved. At the beginning of continuous history (6th century B.c.) Thebes had long been possessed by immigrants from Thessaly, who knew the previous inhabitants as Cadmeans (Kadsetou).

The history of the town to the end of the 4th century is part of the general history of the nation (see GREECE). It had an aristocratic constitution, and claimed a contested sovereignty over the other towns of Beeotia. Down to 371 B.C. this status was not essentially changed. The battle of Coronea (394) showed the increasing military strength of the Thebans, and in 371 the genius of Epaminondas raised them by the victory of Leuctra for a brief period to the leading position in Hellas. Philip of Macedon spent part of his youth as a hostage at Thebes, and probably learnt there important lessons in war. By him and his successor the state was destroyed. In 338 the Thebans shared with the Athenians the defeat of Cheronea, and received a Macedonian garrison; the lion-monument erected by them on the field of battle, and still existing there, though in fragments, is a more impressive memorial of their greatness than anything now visible at the town itself. In 335, after the death of Philip, they revolted, and were punished by Alexander with a fearful ven- geance. It is said that 6000 Thebans were slain at the capture and 30,000 taken prisoners. The population was dispersed, and the town entirely razed (except, according to tradition, the house of the poet Pindar); and, though it was soon restored by the Macedonian Cassander (315), it never again played a leading part in history. In 86 B.c., having sided against the Romans in the Mithradatic war, it was plundered by Sulla, and fell into such decay that Strabo describes it as little better than a village. In the 2d century the traveller Pausanias, who gives a full account of it (ix. 5 sqg.), found only the citadel inhabited. In 395 a.p., however, it had some strength, for Alaric, on his way to the capture of Athens, did not think fit to attack it. In the later times of the Eastern empire (10th to 12th century) it again became wealthy and important, being specially celebrated for the manufacture of silk and cloth. In 1143 it was plundered by the Normans of Sicily (who transferred thither the chief artisans of the silk trade), and, after the capture of Constantinople by

the crusaders (1204), became with Athens a fief of the feudal empire. In 1311 it was again plundered by the Catalan Grand Company, a body of Spanish mercenaries, and appears to have had no return of prosperity.

Of more lasting effect than the politics of Thebes have been its legends. Bceotia, or rather the Cadmeis (Thucyd., i. 12), was a land of poetry from extremely ancient times, and the stories of Thebes are in Greek literature as important as those of Troy. The legends of the five chief groups will be found under the names indicated in the following division :—(1) the foundation of the Cadmea by Cadmus; (2) the foundation by Amphion,—to this belong originally the ‘‘seven-gated ” wall, the name of éwrdavdos ©7Bn, and the legends of Zethus, Antiope, and Dirce ; (3) war of the “Seven” (under Adrastus of Argos) ; war of the Epigoni, or ‘* descendants” of the Seven ; the story of (dipus; (4) legends of Bacchus,—at Thebes as elsewhere this religion was comparatively late, but became characteristic of the town ; (5) legends of Heracles lemeeanty found with thoso of Bacchus ; Thebes was reputed the

irthplace of both). From the epic poems, of which little but titles remain, these tales descended to the Attic tragedians ; upon them are founded:the Seven against Thebes of Mschylus, the Gidipus Tyrannus, Cidipus Coloneus, and Antigone of Sophocles, the Phoenissx, Supplices, and Bacchx of Euripides, &c., with innumer- able plays not extant. Apart from direct imitation of these works, the stories themselves, through Statius, Boccaccio, and others, have exercised a great influence on modern literature. In historical times the Thebans were not conspicuous for intellectual accom- plishments, but their reputation is sufficiently sustained by Pindar, perhaps the most distinctively Hellenic of all the national

oets.

N The most famous monument of ancient Thebes was the outer wall with its seven gates, which even as late as the 6th century B.C. was probably the largest of artificial Greek fortresses. The names of the gates vary, but four are constant,—the Preetides, Electra, Neiste or Neite, and Homoloides ; Pausanias gives the others as Ogygiee, Hypsistee, Crenes. There is evidence that the gate Electre was on the south, and near it was the tomb of the Thebans who fell at the capture by Alexander. The gates shown to Pausanias as Neistee and Preetides led respectively north-west and north-east. Two of the springs have been identified with some probability,—that of St Theodore with the CEdipodea, in which (Hdipus is said to have

purged himself from the pollution of homicide, and the Paraporti with the dragon-guarded fountain of Ares (see Capmus). Dicearchus, referring to the town of Cassander, gives two measurements for the circuit, equal to about 9 miles and 5$ miles, but even the smaller is impossible for the wall, and they probably refer to the territory proper of the town, or ‘yj @nBals. Beyond this the topography is wholly uncertain. From the interest of the site in history and still more in literature, as the scene of so many dramas, the temptation to fix details has been specially strong. Conjectural plans or descriptions, differing widely, are given by Leake, Forchhammer, Ulrichs, Bursian, and others (references below). All are based on the assumption that the description of Pausanias and the allusions of the Attic trage- dians may be read together and combined, and that the result will give the plan as it existed in the 5th and 4th centuries B.c. But to this two objections must be taken. (1) The account of Pausanias, even when clear in itself, is very uncertain evidence for anything earlier than the destruction by Alexander. It is said indeed that the restored town occupied the same area, but this is consistent with great disturbance of tradition ; and we have further to allow for inaccurate transmission through 450 years of decad- euce, and finally for the quality of Pausanias’s information, given apparently by casual guides to a traveller extremely uncritical. (2) It may be doubted whether the tragedians had accurate know- ledge of Theban topography, and they had certainly no reason for introducing it in their plays. Their plots are laid in a remote past ; and it is difficult to suppose them on the one hand s0 careful as to fit their scenes to the actual Thebes, and on the other hand so careless as to presume that it had suffered no great change between the times of Cadmus or of CAdipus and their own days. Indeed they did not make this mistake. The plays which contain most references to topography are the Scven against Thebes and the Phenisse. In the Seven the name of “Thebes” docs not occur at all (the title is a misnomer, probably not given by the author); the town is called by its ancient name ‘‘The Cadmea” (Kadpeta mAs), and the whole play assumes that tho “city of Cadmus” was much smaller than the Thebes contemporary with Zischylus can have been. In the Phwenisse the circuit of the walls is said to bo so small that a person within must necessarily know all that had taken place in a general attack (v. 1356). None of the con- ectural plans would approximately satisfy this, nor can it have een true for the time of Euripides. After this, it is not surprising to find

that the attempt to use the plays as evidence is involved in unauswered difficulties, a few of which are given below.

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In itself, however, and as relating to the ruins of the restored town merely, the description of Pausanias is curious and interesting. The principal buildings were at that time (2d century) the temple of Apollo Ismenius, which must have stood somewhere about the present church of St Luke, the theatre, near the gate Preetides, the Heracleum, with a gymnasium and race-course, and the temples of Artemis Eucleia, of Ammon, and of Fortune (Tdxn). Besides these Pausanias was shown all the gates, all the legendary sites, the house of Pindar (north-west beyond the Dirce), statues, &c., dedicated by him, several statues of immense antiquity, others attributed to the greatest artists, and in fact much more than itis easy to believe.

1. Apollo Ismenius and Apollo Spodius.—Sophocles (G. T., 21) mentions, as one of the Theban sanctuaries, “the oracular ashes of Ismenus,” “Iounvod uavtela owddos. Pausanias, who calls the river not Ismenus but Ismenius, describes (1) a temple of Ismenius or Apollo Ismenius (ix. 10, 2), and (2) an altar of Apollo Spodius, made of ashes and used in a peculiar manner as an oracle (ix. mL). We should suppose from Sophocles that both observations related to the same sanctuary; and Sophocles clearly identified the two, But in Pausanias they are in different places and have no connexion at all. Hither therefore the topography and ritual of the one period differed from those of the other, or, which is equally probable, the poet used Theban names without regard to accuracy.

2. Lhe Fountain of Ares.—Euripides, in the Supplices (v. 650 sq.), describes an army advancing on Thebes from the south as having its right at the Ismenian hill, its left at the fountain of Ares, and “the chariots below the monument of Amphion.” Pausanias also places the Ismenian hill on the right of the southern gate. But the fountain of Ares he places on the same side, a de- scription quite inconsistent with this and otherallusions. Ulrichs, while insisting on the agreement about the hill, merely observes on this that Pausanias is unintelligible. Of a still greater difficulty he says nothing. The tomb of Amphion is placed by Alschylus north of the town, and there or in that direction was shown to Pausanias. The topographers accordingly

suppose that the ‘‘chariots” of Euripides were in the plain to the north. But there is no suggestion in the passage that any part of the advancing army was separated from the rest, and the observer expressly says that he was at the place where the chariots fought and had a partieularly good view of this part of the battle (v. 684). Now he stood on the gate Electr, 7.e., as far as possible from the tomb of Amphion, as placed by Aischylus and Pausanias. It is impossible to make a consistent account of this, and it seems plain that Euripides took up the name “tomb of Amphion” at hazard, and ignored or forgot that the real tomb could not be brought into his picture.

3. The Altar of (Athena) Onca.—This was shown to Pausanias (ix. 12, 1), who was told that it marked the place where the lying down of a cow indicated to Cadmus the site destined for his city (er é€vradOa oixjom). “It is said,” he continues, “that in the acropolis there was formerly the house of Cadmus (Ké8yov oikta).” No other indication is given as to the place of the altar, and the natural inference is that it was shown in the Cadmea, But Aischylus (Septem, 501) places it outside the walls. Accordingly it is suggested that the oracular sign only indicated the neighbour- hood of the destined site, and that the altar shown to Pausanias was near that of Apollo Spodins, which is mentioned last before it, and may have been outside the wall. But this juxtaposition proves nothing about the place of Onca, for Pausanias himself shows that mention of Onca here is suggested by a reference to “oxen” in connexion with the altar of Spodius, which brought to his mind the ‘‘cow” of the other legend.

4. Lhe Tomb of Amphion and Zethus.—Apart from the con- fusion of Euripides already noticed, there is a difficulty about the mention of thismonument in Pausanias and Aischylus. Pausanias, after’describing several buildings near the gate Preetides, conclud- ing with some in the market-place, mentions next (without further indication of place) the tomb of Amphion and Zethus, and con- tinues thus,—‘‘the way from Thebes to Chalcis (north-east) is by this gate Proetides, &c.” Aischylus places the tomb of Amphion outside the wall opposite the north gate (Septem, 527), and the Preetides elsewhere. Ulrichs concludes that Pausanias “ evi- dently” went out by the north gate to view the monument and then returned to the Pretides. Of course this is possible, but it is useless to draw exact inferences from documents which require such an hypothesis. It is equally probable

that Pausanias identified the tomb with a monument called the Ampheion, which seems (Ulrichs, p. 17) to have been somewhere near the market-place. Indeed, there is no proof that they were not identical, for the’only evidence that the tomb was outside the wall (and therefore different from the Ampheion) is that of Hschylus and Euripides, whose imaginary cities were not much larger than the Cadmean hill, and must have excluded the Ampheion itself.

On the history, see references under GreEcr; on the topography and legends, Ulvichs, Reisen und Forschungen in Griechenland, ii. 1 sq.; Leake, Travels in

Northern Greece, ii. xiv.; Bursian, Geographie von Griechenland, i, 225 sg.; and the ‘Seven against Thebes,” ed. by A. W. Verrall, “Introduction.” (A. W. V.)

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THECLA, St, virgin, is commemorated by the Latin Church on September 23. The Bremary relates that she was born of illustrious parentage at Iconium, and came under the personal teaching of the apostle Paul. In her eighteenth year, having broken her engagement with Thamyris, to whom she had been betrothed, she was accused by her relations of being a Christian, and sentenced to be burned. Armed with the sign of the cross, she threw herself upon the pyre, but, the flames having been extinguished by a sudden rain, she came to Antioch, where she was exposed to the wild beasts, then fastened to bulls that she might be torn asunder, then thrown into a pit full of serpents, but from all these perils she was delivered by the grace of Christ. Her ardent faith and her holy life were the means of converting many. Returning once more to her native place, she withdrew into a mountain solitude, and became distin- guished by many virtues and miracles, dying at the age of ninety. She was buried at Seleucia.

The substance of the foregoing narrative, with many other curious incidents, occurs in the very ancient apocryphal book entitled the wepiddo: of Paul and Thecla (Acta Pauli et Theclz). Tertullian tclls us that this work was written by a presbyter in Asia, ‘‘out of love to Paul,” but that his conduct was not ap- proved, and led to his deposition. What caused special offence was its recognition of the right of women to preach and baptize. There is no doubt that the present differs very considerably from the original form of the Acta, but even now its Gnostic origin is betrayed in several features which it still retains—for example, the rejection of marriage. For the text, sce the Acta Apost. Apocr. of Tischendorf, who in the Prolegomena gives a large body of evidence for its great antiquity. A translation is given in the Ante-Nicene Christian Library.

THEFT is, in modern legal systems, universally treated as a crime, but the conception of theft as a crime is not one belonging to the earliest stage of law. To its latest period Roman law regarded theft (furtum) as a delict prima facie pursued by a civil remedy,—the acto furti for a penalty, the vindicatio or condictio for the stolen property itself or its value. In later times, no doubt, a criminal remedy to meet the graver crimes gradually grew up by the side of the civil, and in the time of Justinian the criminal remedy, where

it existed, took precedence of the civil (Cod., iii. 8, 4). But to the last criminal proceedings could only be taken in serious cases, ¢.g., against stealers of cattle (abigez) or the clothes of bathers (balnearti). The punishment was death, banishment, or labour in the mines or on public works. In the main the Roman law of theft coincides with the English law. The definition as given in the Institutes (iv. 1, 1) is “furtum est contrectatio rei fraudulosa, vel ipsius rei, vel etiam ejususus possessionisve,” to which the Digest (xlvii. 2, 1, 3) adds “lucri faciendi gratia.” The earliest English definition, that of Bracton (1506), runs thus: “furtum est secundum leges contrec- tatio rei alienze fraudulenta cum animo furandi invito illo domino cujus res illa fuerit.” Bractou omits the “lucri faciendi gratia” of the Roman definition, because in English law the motive is immaterial,! and the “usus ejus posses- sionisve,” because the definition includes an intent to de- prive the owner of his property permanently. The “animo furandi” and ‘“‘invito domino” of Bracton’s definition are expansions for the sake of greater clearness. They seem to have been implied in Roman law. J urtum is on the whole a more comprehensive term than theft. This difference no doubt arises from the tendency to extend the bounds of a delict and to limit the bounds of a crime. Thus it was furtum (but it would not be theft at English common law) to use a deposit of pledge contrary to the wishes of the owner, to retain goods found, or to steal a human being, such as a slave or filius familias (a special

1 Thus destruction of a letter by a servant, with a view of suppress-

ing inquiries into her character, makes the servant guilty of larceny in English law.

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form of furtum called plagium). The latter would be in English law an abduction under certain circumstances, but not a theft. On the other hand, one of two married persons could not commit furtwm as against the other, but theft may be so committed in England since recent legislation. Asa furtum was merely a delict, the obligatio ex delicto could be extinguished by agreement between the parties ; it will be seen that this cannot be done in England. In another direction English law is more con- siderate of the rights of third parties than was Roman. As will appear hereafter, the thief can give

a good title to stolen goods ; in Roman law he could not do so, except in the single case of a hereditas acquired by usucapio. The development of the law of furtum at Rome is historically interesting, for even in its latest period is found a relic of one of the most primitive theories of law adopted by courts of justice: ‘‘ They took as their guide the measure of vengeance likely to be exacted by an aggrieved person under the circumstances of the case” (Maine, Ancient Law, ch, x.). This explains the reason of the division of furtum into manifestum and nec manifestum. The mani- fest thief was one taken red-handed,—“ taken with the manner,” in the language of old English law. The Twelve Tables denounced the punishment of death against the manifest thief, for that would be the penalty demanded by the indignant owner in whose place the judge stood. The severity of this penalty was afterwards mitigated by the praetor, who substituted for it the payment of quad- ruple the value of the thing stolen. The same penalty

| was also given by the praetor in case of theft from a fire

or a wreck, or of prevention of search. No doubt the object of this large penalty was to induce injured persons to refrain from taking the law into their own hands. The Twelve Tables mulcted the non-manifest thief in double the value of the thing stolen. The actions for penalties were in addition to the action for the stolen goods them- selves or their value. The quadruple and double penalties still remain in the legislation of Justinian. The search for stolen goods, as it existed in the time of Gaius, was a survival of a period when the injured person was, as in the case of summons (i jus vocatio), his own executive officer. Such a search, by the Twelve Tables, might be conducted in the house of the supposed thief by the owner in person, naked except for a cincture, and carrying a platter in his hand, safeguards apparently against a violation of decency and against any possibility of his making a false charge by depositing some of his own property on his neighbour’s premises. This mode of search became obsolete before the time of Justinian. Robbery (bona w rapta) was violence added to furtum. By the actio w bonorum raptorum quadruple the value could be recovered if the action were brought within a year, only the value if brought after the expiration of a year. The quadruple value, it is to be noted, included the stolen thing itself, so that the penalty was in effect only a triple one. It was inclusive, and not cumulative, as in furtwm.

In England theft appears to have been very early regarded by legislators as a matter calling for special attention. The pre-Conquest compilations of laws are full of provisions on the subject. It is noticeable that the earlier ones appear to regard theft asa delict which may be compounded for by payment. Considerable distinctions of person are made, both in regard to the owner and the thief. Thus, by the laws of Ethelbert, if a freeman stole from the king he was to restore ninefold, if from a freeman or from a dwelling threefold. If a theow stole, he had only to make a twofold reparation. In the laws of Alfred ordinary theft was still only civil, but he who stole ina church was punished by the loss of his hand. The laws of Ina named as the penalty death or redemption accord-

ing to the wer-gild of the thief. By the same laws the thief might be slain if he fled or resisted. Gradually the severity of the punishment increased. By the laws of Athelstan death in a very cruel form was inflicted. Ata later date the Leges Henrict Primi placed a thief in the king's mercy, and his lands were forfeited. Putting out the eyes and other kinds of mutilation were sometimes the punishment. The principle of severity continued down to the present century, and until 1827 theft of certain kinds remained capital. Both before and after the Conquest local jurisdiction over thieves was a common franchise of lords of manors, attended with some of the advantages of modern summary jurisdiction. It might be exercised either over thieves who committed a theft or were appre- hended within the lordship (infangthef), or over those inhabitants of the lordship who were appreliended else- where (outfangthef). Hither or both franchises might be enjoyed by grant or prescription. As lately as 1 Ph. and M.c. 15 infangthef and outfangthef were confirmed to the lords marchers of Wales. An analogous franchise was theam, or the right of calling upon the holder of stolen goods to vouch to warranty, 7.e., to name from whom he received them. In the old law of theft there were to be found two interesting survivals of the primitive legal notions which were found in Roman law. Up to a com- paratively recent date a distinction analogous to that between furtum manifestum and nec manifestum was of importance in English criminal practice. The thief "taken with the manner" was by the Statute of West- minster the First not to be admitted to bail (see Letters of Junius, \xviii.). In modern procedure the

probable guilt or innocence of the accused is not so much to be considered in a question of bail as the probability of his appearance at the trial. The other matter worthy of notice is the old pursuit (secta) by hue and cry. In the pre-Conquest codes the owner was generally allowed to take the law into his own hand; as in early Roman law, and get back his goods by force if he could, no doubt with the assistance of his neighbours where possible. From this arose the later development of the hue and cry, as the recognized means of pursuing a thief. The Statutes of Westminster the First and of De officio coronatoris enacted that all men should be ready to pursue and arrest felons, and ten years later the Statute of Winchester (1285) enforced upon all the duty of keeping arms for the purpose of following the hue and cry. It also made the hundred liable for thefts with violence committed in it, an adoption no doubt in feudal law of the old pre-Conquest liability of the frith- borg. As justice became more settled, the hue and cry was regulated more and more by law, and lost much of its old natural simplicity. This led to its gradually becom- ing obsolete, though the Statutes of Westminster the First and De officio coronatoris are still nominally law as far as they relate to the hueandcry. The Statute of Winchester as to the liability of the hundred was repealed in 1827. The term theft in modern English law is sometimes used as a synonym of larceny, sometimes in a more com- prehensive sense. In the latter sense it is used by Mr Justice Stephen, who defines it as “the act of dealing from any motive whatever, unlawfully and without claim of right, with anything capable of being stolen, in any of the ways in which theft can be committed” (for which see § 296-300), “with the intention of permanently converting that thing to the use of any person other than the general or special owner thereof” (Digest of the Criminal Law, $295). In this broader sense the term applies to all cases of depriving another of his property, whether by removing or withholding it. Jt thus includes larceny, robbery, cheating, embezzlement, and breach of trust. Embezzle-

ment is a statutory crime created as a separate form of

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offence in the last century (see vol. viii. p. 159). The difference between larceny and embezzlement turns mainly on the fact of the master’s being in

actual or constructive possession of the stolen property (see Possession). Fraud- ulent breach of trust was not made a specific offence until 1857 (see Trust).

Larceny (a corruption of latrociniwm), or theft proper, was felony at common law. The common law of larceny has been affected by numerous statutes, the main object of legislation being to bring within the law of larceny offences which were not larcenies at common law, either because they were thefts of things of which there could be no larceny at common law, ¢.g., beasts fera nature, title deeds, or choses in action, or because the common law regarded them merely as delicts for which the remedy was by civil action, e.g., fraudulent breaches of trust. The earlicst Act in the statutes of the realm dealing with larceny appears to be the Carta Forestz of 1225, by which fine or imprisonment was inflicted for stealing the king's deer. The next Act appears to be the Statute of West- minster the First (1275), dealing again with stealing deer. From this it secms as though the beginning of legislation on the subject was for the purpose of protecting the chases and parks of the king and the nobility. An immense mass of the old Acts will be found named in the repealing Act of 1827, 7 and 8 Geo. IV. c. 27. An Act of the saine date, 7 and 8 Geo. IV. c. 29, removed the old dis- tinction between grand and petit larceny.1 The former was theft of goods above the value of twelve pence, in the house of the owner, not from the person, or by night, and was a capital crime. It was petit larceny where the value was twelve pence or under, the punishment being imprisonment or whipping. The gradual depreciation in the value of money afforded good ground for Sir Henry Spelman's sarcasm that, while overt hag else became dearer, the life of man became continually cheaper. The distine- tion between grand and petit larceny first appears in statute law in the Statute of Westminster the First, c. 15, but it was not created for the first time by that statute. It is found in some of the pre- Conquest codes, as that of Athelstan, and it is recognized in the Leges Henricit Primt. A distinction between simple and compound larceny is still found in the books. The latter is larceny accom- panied by circumstances of aggravation, as that it is in a dwelling- house or from the person. 'The law of larceny is now contained chiefly in the Larceny Act, 1861, 24 and 25 Vict. c. 96 (which extends to England and Ireland), a comprehensive enactment including larceny, embezzlement, fraud by bailees, agents, bankers, factors, and trustees,

sacrilege, burglary, housebreaking, robbery, obtaining money by threats or by false pretences, and receiving stolen goods, and prescribing procedure, both civil and criminal. There are still, however, some earlier Acts in force dealing with special cases of larceny, such as 88 Hen. VIII. c. 12, as to stealing the goods of the king, and the Game, Post-Office, and Merchant Shipping Acts. Later Acts provide for larceny by a partner of partnership property (31 and 32 Vict. c. 116), and by a husband or wife of the property of the other (45 and 46 Vict. c. 75). Pro- ceedings against persons subject to naval or military law depend upon the Naval Discipline Act, 1866, and the Army Act, 1881. There are several Acts, both before and after 1861, directing how the property is to be laid in indictments for stealing the goods of counties, friendly societies, trades unions, &c. The principal con- ditions which must exist in order to constitute larceny are these:— (1) there must be an actual taking into the possession of the thief, though the smallest removal is sufficient; (2) there must be an intent to deprive the owner of his property for an indefinite period, and to assume the entire dominion over it, an intent often described in Bracton's words as animus furandi; (8) this intent must exist at the time of taking; (4) the thing taken must be one capable of larceny either at common law or by statute. One or two cases falling under the law of larceny are of special interest. It was held more than once that a servant taking corn for the purpose of feeding his master's horses, but without any intention of applying it for his own benefit, was guilty of larceny. To remedy this hard- ship, 26 and 27 Vict. c. 108 was passed to declare such an act not to be felony. The case of appropriation of goods which have been found has led to some difficulty. It now seems to be the law that in order to constitute a larceny of lost goods there must be a felonious intent at the time of finding, that is, an intent to deprive the owner of them, coupled with reasonable means at the same time of knowing the owner. The mere retention of tle goods when the owner has become known to the finder does not make the retention criminal. Larceny of money may be committed when the money is paid by mistake, if the prisoner took it animo furandi. In two recent cases the question was argued before a very full Court for Crown Cases Reserved, and in each case there was a striking difference of opinion. In Reg. v. Middleton, Law Rep., 2 Crown

1 This provision was most unnecessarily repeated in the Larceny Act of 1861.

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Cases Reserved, 38, the prisoner, a depositor in a post-office savings bank, received by the mistake of the clerk a larger sum than he was entitled to. The jury found that he had the animus furandi at the time of taking the money, and that he knew it to be the money of the postmaster-general. The majority of the court held it to be larceny. In a case in 1885 (Reg. v. Ashwell, Law Rep., 16 Qucen's Bench Division, 190), where the prosecutor gave the prisoner a sovereign believing it to be a shilling, and the prisoner took it under that belief, but afterwards discovered its valuc and retained it, the court was equally divided as to whether the prisoner was guilty of larceny at common law, but held that he was not guilty of larceny as a bailee. The procedure in prosecutions for larceny has been considerably affected by recent legislation. The incon- veniences of the common-law rules of interpretation of indictments led to certain amendments of the law, now contained in the Larceny Act, for the purpose of avoiding the frequent failures of justice owing to the strictness with which indictments were construed. Three larcenies of property of the same person within six months may now be charged in one indictment. On an indictment for larceny the prisoner may be found guilty of embezzlement, and viee versa ; and if the prisoner be indicted for obtaining goods by false pretences, and the offence turn out to be larceny, he is not entitled to be acquitted of the misdemeanour. A count for receiv- ing may be joined witli the connt for stealing. In many cases it is unnecessary to allege or prove ownership of the property the sub- ject of the indictment. The Act also contains numerous provisions as to venue and the apprehension of offenders. In another direc- tion the powers of courts of SUMMARY JURISDICTION (9.v.) have been extended, in the case of charges of larceny, embezzlement, and receiving stolen goods, against children and young persons and against adults pleading guilty or waiving their right to trial by jury. The maximum punishment for larceny is fourteen years' penal servitude, but this can only be inflicted in certain exceptional cases, such as horse or cattle stealing and larceny by a servant or a person in the service of the crown or the police. The extreme vunishment for simple larceny after a previous conviction for felony is ten years' penal servitude. Whipping may be part of the sen- tence on boys under sixteen.

Lobbery is larceny accompanied by violence or threatened violence. Whether obtaining money by threats to accuse of crime was robbery at common law was open to some doubt. It is now a specific offence under the Larceny Act, punishable by penal servitude for life. Whipping may be added as part of the sentence for robbery by 26 and 27 Vict. c. 44.

Cheating is either a common-law or statutory offence. An indictment for cheating at common law is now of comparatively rare occurrence. The statutory crime of obtaining money by false pretences is the form in which the offence generally presents itself. Like embezzlement, this offence dates as a statutory crime from the last century. It now depends upon the Larceny Act. A false pretence is defined by Mr Justice Stephen as "a false representa- tion made either by words, by writing, or by conduct that some fact or facts existed" (Digest of the Criminal Law, § 330). The principal points to notice are that the false pretence must be of an existing fact (e.g., it was held not to be a false pretence to promise to pay for goods on delivery), and that property must have been actually obtained by the false pretence. 'The broad distinction between this offence and larceny is that in the former the owner intends to part with his property, in the latter he does not. By 22 aud 23 Vict. c. 17, no indictment for obtaining money by false pretences is to be presented or found by the grand jury unless the defendant has been committed for trial or the indictment is authorized in one of the ways mentioned in the Act. The maximum punishment for the common-law offence is fine or imprisonment at discretion, for the statutory five years' penal servitude.

Stolen Goods.—The owner of the goods stolen has an action against the thief for the goods or their value. How far he is entitled to pursue his civil right to the exclusion of criminal prosecution does not seem very clear upon the authorities. Onc of the latest statements of the law was that of Mr Justice Watkin Williams :—" It has been said that the true principle of the common law is that there is neither a merger of the civil right, nor is it a strict condition precedent to such right that there shall have been a prosecution of the felon, but that there is a duty imposed upon the injured person not to resort to the prosecution of his private suit to the neglect and exclusion of the vindication of the public law ; in my opinion this view is the correct one" (Midland Insur- ance Company v. Smith, Law Rep., 6

Queen’s Bench Division, 568). Dealing with stolen goods by persons other than the thief may affect the rights of such persons either criminally or civilly. Two varieties of crime arise from such dealings. (1) Recciving stolen goods knowing them to have been stolen, a misdemeanour at common law, is by the Larceny Act a felony punishable by penal servitude for fourteen years where the theft amounts to felony, a misdemeanour punishable by penal servitude for seven years where the theft is a mnisdemeanour, as in obtaining goods by false pretences. Recent possession of stolen property may, according to circumstances,

support the presumption that the prisoner is a thief or that he is a receiver. The Prevention of Crime Act, 1871, made important changes in the law of evidence in charges of receiving. It allows, under proper safeguards, evidence to be given in the course of the trial of the finding of other stolen property in the possession of the accused, and of a previous conviction for any offence involving fraud and dishonesty. (2) Compounding theft, or theftbote, that is, taking back stolen goods or receiving compensation on condition of not prosecuting, isa misdemeanour at common law. It necd not necessarily be committed by the owner of the goods. Under the Larceny Act it is a felony punishable by seven years’ penal servi- tude to corruptly take money or reward for helping to recover stolen goods without using all due diligence to bring the offender to trial. By the same Act, to advertise or print or publish any advertisement offering a reward for the return of stolen goods, and using any words purporting that no questions will be asked, &c., renders the offender liable to a penalty of £50. This penalty must, by 83 and 34 Vict. c. 65, be sued for within six months, and the assent of the attorney-general is necessary. Various Acts provide for the liabilities of pawnbrokers, publicans, miarine-store dealers, and others into whose possession stolen goods come. Search for stolen goods can only be undertaken by a police officer under the protection of a search warrant. The law as to stolen goods, as far as it affects the civil rights and liabilities of the owner and third parties, is shortly as follows. Asa gencral rule a purchaser takes goods subject to any infirmities of title. The property in money, bank-notes, and negotiable instruments passes by delivery, and a person taking any of these bona fide and for value is entitled to retain it as against a former owner

from whom it may have been stolen. In the case of other goods, a bona fide purchaser of stolen goods in markct overt (see SALE) obtains a good title (except as against the crown), provided that the thief has not been convicted. After conviction of the thief the property revests in the owner, and the court before which the thief was convicted may order restitu- tion, except in the cases specially mentioned in the Larceny Act, z.e., the bona fide discharge or transfer of a security for value with- out notice and the fraudulent dealing by a trustee, banker, &e., with goods and documents of title to goods entrusted to him. After conviction of the thief the goods must be recovered from the person in whose hands they are at the time of the conviction, for any sales and resales, if the first sale was in market overt, are good until conviction of the thief. If the goods were obtained by false pretences and not by larceny, the question then is whether the property in the goods has passed or not, and the answer to this question depends upon the nature of the false pretences employed. If the vendee obtains possession of goods with the intention by the vendor to transfer both the property and the possession, the property vests in the vendee until the vendor has done some act to dis- affirm the transaction. But if there was never any such inten- tion, —if, for instance, the vendor delivers the goods to A. B. under the belief that he is C. D.,—the property does not vest in the transferee, and the owner may recover the goods even from a bona Jide purchaser. }

Scotland.—There is a vast quantity of Acts of the Scottish parlia- ment dealing with theft. The general policy of the Acts was to make thefts what were not thefts at common law, eg., stealing fruit, dogs, hawks, or deer, and to extend the remedies, e.g., by giving the justiciar authority throughout the kingdom, by making the master in the case of theft by the servant liable to give the latter up to justice, or by allowing the use of firearms against thieves. The general result of legislation in England and Scotland has been to assimilate the law of theft in both kingdoms. As a rule, what would be theft in one would be theft in the other. There can be theft of children in Scots as in Roman law, under the name of plagiwm. The crime of stouthrief is robbery accom- panied by exceptional violence. The English receiving stolen goods and obtaining money under false pretences are represented by the reset and fraud of Scots law. Theftbote or redemptio furti appears in Icgislation as early as the assizes of King William, ec. 2. The offender was there subjected to the ordeal of water if convicted on the oath of three

witnesses, to be immediately hanged if the oath of three seniores were added. The offence was made punish- able by 1436, c. 1, 1515, c. 2, and appears still to be a crime. Blackmailing, under that name, was forbidden by 1567, c. 27. There is no consolidation Act for Scotland like the Larceny Act for England and Ireland, but various Acts are in force dealing with specific offences or with procedure. Thus 7 Anne c. 21, § 7, makes theft by landed men no longer treason, as it had previously been. 4 Geo. II. c. 32 deals with theft of lead, &c., fixed to houses, 21 Geo. II. c. 34 with the admissibility of an accomplice as witness in a charge of cattle stealing, 51 Geo. III. c. 41 with theft of linen, &c. The most important Act relating to procedure is 31 and 82 Vict. c. 95, § 12, by which a previous conviction for theft may be libelled and proved as aggravation of robbery, and a

1 For the Roman and English law, see, besides the authorities cited, Hunter,

Roman Law; Muirhead, Roman Law; 4 Stephen, Commentaries, pt. vi. chap. v.; 3 Stephen, Hist. of the Criminal Law, chap. xxviii.

previous conviction for robbery as aggravation of theft. Stolen goods are always taken subject to the inherent vitiwm reale of their acquisition, and the true owner may recover them from any one in whose possession they are. The protection given by markct overt is unknown in Scotland. Sce Macdonald, Criminal Law, p. 18. United Stotes—The law depends almost entirely upon State

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HE term theism has three significations. In its

legislation, and is in general accordance with that of England The only Acts of Congress bearing on the subject deal with theft in the army and navy, and with theft and receiving on the high seas or in any place under the exclusive jurisdiction of the United States. The doctrine of market overt is not acknowledged by any State. (J. Wt)

ISM

Meanings It is somewhat remarkable that the term theism by itself Theism of the widest acceptation its object is the Divine, whether | never occurs in its etymological and generic sense, never inarily roe regarded as personal or impersonal, as one being or as | means as a separate word what it means in the compounds a theism : ; : . – : : : . Valent to Tits a number of beings. In this sense theism is coexten- atheism, polytheism, pantheism, and monotheism. Ordin- mono, generic sive with religion and worship, includes all forms of | arily it is identified with monotheism, and consequently theism, sense, polytheism and of pantheism, as well as all varieties of opposed to polytheism and to pantheism, as well as to monotheism, and so may be said to denote the genus of | atheism. Whereas polytheism acknowledges a plurality which polytheism, pantheism, and monotheism are species. | of finite gods, theism as monotheism acknowledges only The conception of the Divine, in its utmost abstractness | one absolute infinite God. Whereas pantheism regards and generality, is, however, so vague that it may reason- | all finite things as merely aspects, modifications, or parts ably be doubted if the forms of theism, thus understood, | of one eternal self-existent being—all material objects and can be distributed into strictly logical and natural species, | all particular minds as necessarily derived from a single with definitions at once perfectly distinct in themselves | infinite substance,—and thus combines, in its conception and exactly accordant with phenomena. It may seem | of the Divine, monism and determinism, theism as mono- as if polytheism and monotheism must, by arithmetical | theism, while accepting monism, rejects determinism, and necessity, be exclusive of each other and exhaustive of | attributes to the Divine all that is essentially implied in theism; but this is not so. Pantheism may clearly | free personal existence and agency. Pantheism is, how- partake of the nature of both, and has been sometimes | ever, wonderfully protean, and rarely conforms to its extravagantly polytheistic, sometimes only doubtfully dis- | ideal; hence the systems called pantheistic are seldom tinguishable from fully developed monotheism. Probably | purely pantheistic, and are often more monotheistic than few, if any, polytheistic religions are purely polytheistic, | pantheistic. or, in other words, do not imply in some mode and Sometimes the term theism is employed in a still more Theism measure the unity as well as the plurality of the Divine. | special sense, namely, to

denote one of two kinds of and Christian ‘monotheism answers to a formal definition of | monotheism, the other kind being deism. Although deus “sm. monotheism only inasmuch as it holds to the unity of the | and theos are equivalent, deism has» come to be dis- Godhead, but contravenes it inasmuch as it holds that in | tinguished from theism. The former word first appeared the one Godhead there are three Divine persons, each | in the 16th century, when it was used to designate God. j antitrinitarian opinions. In the 17th century it came to Tts The complete negation of theism in its generie sense is | be applied to the view that the light of nature is the only negatives. atheism—the denial of the existence or of the knowability | light in which man can know God, no special revelation

of the Divine. It is only in modern times that the word atheism has acquired this meaning, only in recent times that it has come to be exclusively employed with this meaning. The Greeks meant by it simply disbelief in the Greek gods. The early Christians were called atheists because they refused to acknowledge the pagan deities. Protestants have been charged by Roman Catholics and Roman Catholics by Protestants with atheism. Through- out even the 18th century the word was used in an extremely loose manner, and often affixed to systems by which the existence and agency of God were unequivocally recognized. Atheism, in the sense now generally admitted to be alone appropriate, may be of three species,—namely, denial of the existence of the Divine, denial that the Divine has been shown to exist, and denial that it can be known that the Divine exists, The first species has been called dogmatic atheism, the second critical atheism ; and the third has been designated, and may conveniently be de- signated, religious agnosticism. Agnosticism per se should not be identified with atheism or with any of its forms. The term antitheism has been used by some theologians, e.g., Chalmers and Foster, as equivalent to dogmatic atheism ; but it may with much more practical advantage be employed to denote all systems of belief opposed to theism, either in the generic sense already indicated, or in the specific sense of monotheism. Understood in this latter mode, it is much more comprehensive than the term atheism. Polytheism and pantheism are alike antitheistic theories, although on different grounds ; while only those theories which deny that there is evidence for belief even in the existence of any god, any divine being, are atheistic.

having been given to the human race. Dr Samuel Clarke, in the Boyle Lectures preached in 1705, distributed deists into fourclasses. The first class "‘ pretend to believe the existence of an eternal, infinite, independent, intelli- gent being, and, to avoid the name of Epicurean atheists, teach also that this supreme being made the world ; though at the same time they agree with the Epicureans in this, that they fancy God does not at all concern Himself in the government of the world, nor has any regard to, or care of, what is done therein." The second class acknow- ledge not only that God made all things, but that He sustains and governs them, yet deny that He has any regard in His government to moral distinctions, these being merely the products of human will and law. The third class believe in the being, natural attributes, pro- vidence, and to some extent in the moral attributes and government of God, but deny the immortality of the soul and a future state of rewards and punishments. The fourth class acknowledge the being, natural and moral perfections, and providence of God, as also the immor- tality of the soul and a future state of rewards and punishments, yet profess to believe only what is discover- able by the light of nature, without believing any divine revelation (Clarke, On the Attributes, pp. 140-153, ed. 1823). This division is not an exact classification, nor does it rest on any precise definition of deism, but it, with substantial accuracy, discriminates and grades the varieties of English deism. Clarke did not contrast deism with theism, or even employ the latter word, His contem- porary, Lord Shaftesbury, on the other hand, generally used the term theism, yet only as synonymous with deism,

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and with a protest against either being opposed to revela- tion (Characteristics, vol. ii. p. 209, ed. 1727). Kant, in his Kritik der reinen Vernunft, explicitly distinguished and opposed deism and theism, but in a very peculiar manner. ‘The person who believes in a transcendental theology alone is termed a deist; he who acknowledges the possibility of a natural theology also, a theist. The former admits that we can cognize by pure reason alone

holding any view regarding the nature of primeval religion as established. The data which carry us farthest in our search for the historical origin of religion are undoubtedly the names expressive of the Divine which have been pre- served in the most ancient languages. They show us how men conceived of the Divinity long before the erection of the oldest monuments or the inscription of the oldest records. Language is much older than any of the state-

the existence of a supreme being, but at the same time maintains that our conception of this being is purely

ments in language. But language by no means carries us Evidence back to primitive man, or even to the historical origin of of lan-

transcendental, and that all that we can say of it is that it possesses all reality, without being able to define it more closely. The second asserts that reason is capable of presenting us, from the analogy of nature, with a more definite conception of this being, and that its operations, as the cause of all things, are the results of intelligence and free will. The former reyvards the supreme being as the cause of the world—whether by the necessity of his nature, or as a free agent, is left undetermined ; the latter considers this being as the author of the world" (Werke, ii, 491, edited by Rosenkranz, Meiklejohn's tr., 387-8). The account here given of deism seems neither self-con- sistent nor intelligible, and applies, equally well or equally ill, to every system—atheistic, agnostic, pantheistic, ideal- istic, or materialistic—which admits the existence but not the intelligence or personality of an Urwesen, eternal being, or first cause ; and the account of theism excludes all reference to revelation, and applies to every form of what has been regarded as deism. In recent theology deism has generally come to be regarded as, in common with theism, holding in opposition to atheism that there is a God, and in opposition to pantheisni that God is distinct from the world, but as differing from theism in maintain- ing that God is separate from the world, having endowed it with self-sustaining and self-acting powers, and then abandoned it to itself. This distinction is real, and perhaps the best attainable. At the same time many called deists must be adniitted not to have taught deism thus understood ; for example, most of the " English deists" did not deny that God was present and active in the laws of

nature, but merely denied that He worked otherwise than through natural laws. If by deism be meant belief in a personal God who acts only through natural laws, and by theism belief in a personal God who acts both through natural laws and by special interven- tions, this distinction also is real, and may be useful. The chief objection to it is that deism when so contrasted with theism does not denote, or even include, what theologians have generally agreed to call by the name.

The present article will treat specially of theism in the seuse of monotheism, but not to the exclusion of the relations between theism thus understood and theism in other acceptations,

Monotheism has been very generally assumed to have

me been the primitive religion. Lord Herbert, Cudworth,

and others have elaborately defended this opinion in the past, and it still finds learned advocates. On the other hand, the vast majority of recent anthropologists hold that religion originated in some rude phase of polytheism, and that monotheism has been everywhere preceded by poly- theism. Schelling, Max Miiller, and Hartmann have main- tained that the starting-point of religion was henotheism, an imperfect kind of monotheism, in which God was thought of as one, only because others had not yet presented thein- selves to the mind,—a monotheism of which polytheism was not the contradiction, but the natural development. Pantheism has also been frequently represented to be the earliest phase of religion. All these representations, how- ever, will be found on examination to be very conjectural. The present state of our knowledge does not warrant our

the idea of deity. The Egyptian word nutar and the &%8¢ i2-

names of the Egyptian gods found in the oldest Egyptian inscriptions prove that at a date long before the Egyptians wrote history, or are known to have worshipped animals or ancestors, they conceived of Divinity as power, and their deities as great cosmic forces ; but, as that word and these names cannot be shown to have belonged to man’s primitive speech, they cannot show what was man’s primitive religious belief, and do not disprove that

the forefathers of the people who first used them may have had some lower and ruder conception of the Divine than that which they convey. There are, according to Dr Legge, no words in the Chinese language known to be older than ti, (ven, shang-ti, and these words are good historical evidence that the Chinese conceived of the Divine, thousands of years before the Christian era, as a universal ruling power, comprehending the visible heavens, and an invisible, infinite, omnipresent force, manifested in the azure of the firmament, possessed so far of intellectual and moral qualities, and working towards ethical ends. There is no evidence that when the Chinese first used these words they worshipped fetiches, but neither is there evidence to the contrary, and even if there were it would not disprove that the ancestors of the Chinese had passed through an era of fetichism. All members of the Semitic family of languages have the word £7, or some modifica- tion of it, to denote deity, and hence we may conclude that the Semites had the word in this sense before they separated and became distinct peoples, but not that the idea of God originated when the word was first thus employed. All members of the Teutonic group of languages have the word God, or some slightly modified form thereof, and all members of the Slavic group of languages have the word Jog, or some modification thereof, to express the same conception : it does not follow that either Teutons or Slavs had no idea of deity until the former so applied the word God, and the latter so applied the word Bog. Both Teutons and Slavs are Aryans, and there is an older Aryan term for deity than either God or Bog. The Sanscrit deva, the Latin deus, and the northern ti, tivar, are forms of a word which must have been used by the Aryans to express their idea of the Divine when, in a prehistoric age, they lived together in their original home ; but we are not entitled to infer that even that prehistoric: Aryan term is the oldest word for deity. It may not be older than the primitive Semitic word or the primitive Turanian word, or the nutar of the Egyptians, or the ¢’en of the Chinese, or the earliest designations for the Divine in the earliest African and American languages. And there may have been Divine names older than any of these. The science of language has been able to recon- struct in part a prehistoric Aryan language, and may similarly be able to reconstruct a prehistoric Semitic language, a prehistoric Turanian, and perhaps a prehistoric Hamitic language. Should it proceed thus far it will probably perceive that all these prehistoric languages arose out of a still earlier prehistoric language in which also were words expressing ideas of

the Divine. There may be many strata of language buried too deep for human excavation in the abysses of unrecorded time. By no pos-

sibility, therefore, can the analysis of existing languages disclose to us the oldest name for deity or the historical origin of the idea of deity. Geology shows the vast antiquity of man, and nothing proves that he may not have been awed or comforted by thoughts of the Divine

ages before the invention of the oldest Aryan or Semitic'

words. It is merest conjecture to assign the formation of the conception of deity to the dawn of historic time. Between primitive speech, primitive religion, the primitive condition of man, and the little streak of light called human history there stretches an immeasurable expanse of darkness.

The belief in primitive monotheism is generally rested on the authority of the opening chapters of Genesis. It is, however, doubtful if the appeal to them be legitimate, because doubtful if their strict historicity can be proved to those who insist on judging them merely by critical and historical criteria, or even if it can be fairly inferred from the view that they form part of a revelation. Then, although these chapters plainly teach monotheism, and represent the God whose words and acts are recorded in the Bible as no mere national God but the only true God, they do not teach, what is alone in question, that there was a primitive monotheism, ~~—a monotheism revealed and known from the beginning. They give no warrant to the common assumption that God revealed monotheism to Adam, Noah, and others before the flood, and that the traces of monotheistic beliefs and tendencies in heathen~~ dom are derivable from the tradition of this primitive and antediluvian monotheism. The one true God is repre- sented in Genesis as making himself known by particular words and in particular ways to Adam, but is nowhere said to have taught him that He only was God. Adam knew, of course, only one God, as there was only one God to know; but that he knew there was only one God we are not told, nor are any grounds given us even for con- jecturing that he knew it. We are told that God created the heavens and earth, but not that Adam was told it, and we know too little about Adam to be able to conceive how he could have understood the

statement. We are informed that he knew God—the God who manifested himself to him in particular acts, but not what general idea he formed of God—whether henotheistic, pantheistic, or monotheistic, whether definitely exclusive of poly- theism or not, or in what measure anthropomorphic. It is not otherwise as regards what is reported of Noah. In fact, primitive monotheism is read into the records in Genesis only because they are read in an inaccurate and uncritical manner. If read aright, it would be seen that, while they speak much of how God acted towards man, they speak so extremely little as to what carly man knew of God that the appeal to them on behalf of the hypo- thesis of primitive monotheism must be futile, even on the traditional view of their authorship and historicity.

It is impossible to prove historically that monotheism ie was the primitive religion, Were, then, the oldest known E cy Rae historical forms of religion monotheistic? Many maintain gions not they were, but adequate evidence has never been adduced mono- for the opinion. The oldest known religion is probably theistic. the Egyptian, and for at least three thousand years its

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1 Among works in which the hypothesis of primitive monotheism is supported, the following may be mentioned :—Steuco, De Perenni Philosophia, 1540; Herbert, De Religione Gentilium, 1645; Gale, Court of the Gentiles, 1669-78; Cudworth, True Intellectual System, 1678 ; Bryant, Ancient Mythology, 1774-76 ; Crenzer, Symbolik u. Mythologie, 1819-21 ; De Bonald, Législation Primitive, 1819 ; Liiken, Lraditionen des Menschengeschlechts, 1856 ; Gladstone, ZZomer and the Homeric Age, 1860; Ebrard, A pologetik, pt. ii., 1875; Zockler, Lehre vom Urstand des Menschen, 1880 ; Cook, Origins of Religion

and Language, 1884 ; Rawlinson, Harly Prevalence of Monotheistic Beliefs (No. 11 of Present Day Tracts).

Evidence of book of Genesis.

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history can be traced by the aid of authentic records con- temporary with the facts to which they relate. origin, however, is not disclosed by Egyptian history, and was unknown to the Egyptians themselves. When it first appears in the light of history it has already a definite form, a character not rude and simple, but of considerable elevation and subtility, and is complex in contents, having certain great gods, but not so many as in later times, ancestor-worship, but not so developed as in later times, and animal worship, but very little of it as compared with later times. For the opinion that its lower elements were older than the higher there is not a particle of properly historical evidence,—not a trace in the inscriptions of mere propitiation of ancestors, or of belief in the absolute divinity of kings or animals; on the contrary, ancestors are always found propitiated through prayer to some of the great gods, kings worshipped as emanations and images of the sun-god, and the divine animals adored as divine symbols and incarnations. The greater gods mentioned on the oldest tombs and in the oldest writings are comparatively few, and their mere names—Osiris, Horus, Thoth, Seb, Nut, Anubis, Apheru, Ra, Isis, Neith, Apis—conclusively prove that they were not ancient kings or deceased ancestors, but chiefly powers of nature, and especially, although not exclusively, of the heavens ; yet from the earliest historical time they were regarded as not merely elemental, but as also ethical powers, working indeed visibly and physically in the aspects and agents of nature, yet in conformity to law and with intelligence and moral purpose. Wherever the powers of nature are thus worshipped as gods, the feeling that the separate powers are not all power, that the particular deities are not the whole of divinity, must be entertained and will find expression. The Egyptians had undoubtedly such a sense of the unity of the Divine from the dawn of their history, and they expressed it so strongly in various ways from a very early period that they have been pronounced mono- theists not merely by theologians attached to a traditional dogma but by most eminent Egyptologists—De Rougé, Mariette, Brugsch, and Renouf. As these scholars, how- ever, truthfully present the facts, they satisfactorily refute themselves. A religion with about a dozen great gods— distinct as regards their names, characteristics, histories, relationships, symbols, and worship—is not monotheisin in the ordinary or proper sense of the term. A religion in which the Divine is viewed as merely immanent in nature, and the deities deemed physical as well as moral, elemental as well as ethical powers, is rather pantheistic than

mono- theistic. Further, all assertions to the effect that the unity of the Divine is most emphatically expressed in the earliest historical stages of the religion are contrary to the evidence adduced even by those who make them. To quote Patah-Hotep as a proof of the monotheism of the Egyptian religion in its oldest historical phase is as

| uncritical as it would be to draw Homeric theology from

the dialogues of Plato. The Egyptian religion was a polytheism which implied monism; it was not mono- theism, which is exclusive of polytheism. Hence, not- withstanding frequent approximations to monotheism, the general result of the development of its monistic principles was pantheism, not monotheism.

description of it as “a purified and organized worship of spirits, with a predominant fetichist tendency,” has no historical warrant, but he fails completely to substantiate his own view, namely, that it was a strict and proper monotheism. The names T’ien and Ti afford no evidence that the early Chinese fathers regarded deity as truly and properly spiritual and personal. It is not in the most ancient Chinese writings that spirituality and personality

Egyptian Its religion

As to the ancient Chinese Chinese religion, Dr Legge easily shows that Prof. Tiele’s eligi

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are ascribed to T’ien, and such ascriptions are exceptional in Chinese writings of any date. The great development of ancestor worship in China has been largely due to the impersonal character of Tien. The arguments which . have been adduced in support of the hypothesis of a primitive Semitic monotheism are also insufficient. M. Renan’s belief in a monotheistic instinct peculiar to the Semitic race has been so often and so convincingly shown to be contradicted both by history and psychology that another refutation of it might well be regarded as a mere slaying of the slain. Divine names like El, Baal, Adon, and Melech, being the oldest terms

in the Semitic languages expressive of the Divinity, and having been retained through all the changes and perversions of Semitic reli- gion, have often been maintained to imply that primitive Semitic belief was monotheistic. But in reality Baal,

Melech, and Adon were not names originally, or indeed:

at any time, given to the one Supreme God, or exclusively to any particular god; on the contrary, they were titles applicable to many different gods. The oldest historical . form of Aryan religion—the form in which the Vedas present it—is designated by Max Miiller henotheism, in opposition to the organized anthropomorphic polytheism to which, he restricts the term polytheism, but henotheism thus understood includes polytheism in its wider and more ordinary acceptation, while it excludes monotheism pro- perly so called. The oldest known form of Aryan religion was indubitably polytheistic in the sense of being the worship of various nature-deities ; and everything approxi- mating to monotheism in India, Persia, Greece, and other Aryan-peopled lands was the product of later and more advanced thought. ‘The assertion that history everywhere or even anywhere shows religious belief to have com- menced with monotheism is not only unsupported by evidence, but contrary to evidence.!

While the oldest known religions of the world were thus not forms of monotheism, neither were they mere poly- theisms, wholly devoid of monistic and monotheistic germs and tendencies. The Chinese religion, indeed, can hardly be said to have been at any period a polytheism, the Chinese people no more regarding spirits and deceased ancestors as gods than Roman Catholics so regard angels and saints. They have throughout their whole known history explicitly and clearly acknowledged the unity of the Divine—the uniqueness of T’ien (Ti, Shang-Ti). Had they in like manner acknowledged the spirituality, per- sonality, transcendence of the Divine, their monotheism would have been indubitable. Then, even in those ancient religions, where a plurality of deities is apparent, a sense of the unity of the Divine is notwithstanding implied, and in the course of their development comes to expression in various ways. It could not be otherwise, for in these religions the divine powers (deities) are also powers of nature, and hence sprung from and participant in a mysterious common

nature, an ultimate and universal agency which is at once the source of physical and divine existences and forces. Neither nature-deities nor powers of nature are ever conceived of, or indeed can be conceived of, as entirely distinct and independent. ‘The lowest forms of polytheism, such as fetichism and animism, have no more marked characteristic than the indefiniteness of their

1 The view opposed in the above paragraph is that maintained in the following works (as well as those mentioned in the previous note), —De Rougé, Etudes sur le Rituel Funéraire, 1860; Renouf, Hibbert Lectures, 1879 ; Brugsch, Religion u. Mythologie d. alten Aegypter, 1884 ; Legge, Religion of the Chinese, 1880 ; Renan, Hist. des Langues Sémitiques, also Considérations sur le Caractere Gen. des Peuples Seimitiques, and Nouvelles Considerations ; Pesch, Der Gottesbegriff in den heidnischen Religionen des Alterthwms, 1886. Among the many replies to Renan, Max Miiller’s (“Semitic Monotheism,” in Chips, vol. i.) and Steinthal’s (in 7. V.S.IV., i.) specially merit to be mentioned.

idea of the Divine and the iniperfect individualization of their deities. In the highest forms of nature-worship, e.g., the Vedic, Egyptian, and Babylonian-Assyrian, the same trait is perceptible. This implicit monism of nature-worship may, through the action of various causes, come to explicit utterance in diverse modes, and has in fact done so, with the result that even in the oldest known poly- theisms are to be found remarkable approximations to monotheism. One form of approximation was henotheism. When worship is ardent and earnest the particular god worshipped is apt to have ascribed to him the attributes, as it were, of all the gods—an almost absolute and exclusive godhead. Max Miiller has shown how prominent a phenonienon henotheism is in the Vedas. Page Renouf has shown that it is very conspicuous also in the ancient inscriptions and hymns of Egypt. Horus, Ra, Osiris, Amun, Knum, were severally spoken of as if each were absolute God, invested not only with distinctive divine attributes but with all divine attributes. In the religious records of Babylon and Assyria mionotheistic approxima- tions of the same kind are likewise common. Now, in theniselves such monotheistic modes of expression may

truly be held to be the products of passing moods of mind, not reflexions of permanent conviction. But every mood of mind tends to perpetuate itself, and the enthusiasm of piety which utters itself in henotheistic praises and prayers may take abiding possession of the soul of a powerful ruler or even of the hearts of a whole class of society or of a whole people, and may seem to them to find the strongest possible confirmation in experience. We may illustrate from Assyrian religious history. Tiglath-Pileser showed a marked preference for the worship of Asshur, to him ‘king of all the gods,” ‘‘he who rules supreme over the gods.” Nebuchadnezzar, again, showed a great partiality for the god Merodach, and applied exclusively to him such magnificent titles as “the lord of all beings,” “the lord of the house of the gods,” “‘ the lord of lords,” ‘ the lord of the gods,” “ the king of heaven and earth.” Nabonidus, on the other hand, specially revered Sin, the moon-god, and represented him as “the great divinity,” “the king of gods upon gods,” “the chief and king of the gods of heaven and earth.”

heart of the devout may be directed exclusively to the | polytheisms which they built up in their youth have been

power of the powers, the God in the gods, God simply, the Divinity. The formation of names expressing Divinity in the abstract is an evidence of the existence of such a process, and names of the kind are to be found even among very rude peoples. But there are more obvious and con- clusive indications. In one of the most ancient of books, for example, and probably the oldest manuscript in the world, the maxims of Patah-Hotep, a wise Egyptian prince of the fifth dynasty, God simply (nutar) is often spoken of without a name or any mythological characteristic, and in a way which is in itself quite monotheistic. “If any one beareth himself proudly he will be humbled by God, who maketh his strength.” “If thou art a wise man, bring up thy son in the love of God.” ‘God loveth the obedient, and hateth the disobedient.” Sentences like these standing alone would be pronounced by every one monotheistic ; and even when standing alongside of refer- ences to “ gods” and “ powers ” they show that said gods and powers were not deemed by the Egyptian sage incon- sistent with oneness of power and

godhead or exhaustive of their fulness. In Babylonian-Assyrian religious history there are also distinct traces of the rise of the spirits of worshippers above particular deities, simply to deity. Sometimes they appear with special clearness in con- nexions which tell of awakened and afflicted conscience, of the pressure of a sense of sin and guilt forcing on the heart, as it were, a conviction of One with whom it has to deal, of its need of the forgiveness and favour, not of this god or of that, but of God. The following passage may be cited as an instance. ‘‘O my Lord, my sins are many, my trespasses are great, and the wrath of the gods has plagued me with disease, and with sickness and sorrow. I fainted, but no one stretched forth his hand! I groaned, but no one heard! O Lord, do not abandon Thy servant ; in the waters of the great stream do Thou take his hand ; the sins which he has committed do Thou turn to righteous- ness.” Many parallel passages might be drawn from Hindu, Greek, and other sources. Clearness of moral perception is decidedly favourable to monotheistic belief. The practical reason contributes as well as the speculative reason, and precisely in the measure of its healthiness and vigour, to the formation of a true idea of the Divine. It was due more to their moral earnestness and insight than to their intellectual superiority that the Persians came nearer to monotheism than any other people of heathen antiquity. Ahriman was entirely evil, and therefore only to be hated and combated; while Ahuramazd was abso- lutely divine, perfectly good, and therefore to be supremely worshipped and obeyed. This moral dualism approached more closely to true monotheism than the later speculative monism, which placed above both Ahuramazd and Ahriman Zervanakarene, boundless time, indeterminate being, an ethically indifferent destiny. Finally, reason in striving to understand and explain the world tends towards mono- theism. The mind cannot be expected to recognize the unity of God until it recognizes the unity of nature; when it sees nature to be a whole, a universe or cosmos, it cannot but form a conception of it which will be panthe- istic, if the unity of substance, law, and evolution be alone acknowledged, and monotheistic if a unity of causality, rational plan, and ethical purpose be also apprehended. In the measure in which reason advances either on the path of scientific investigation or of philosophical specu- lation, polytheisn1 must retreat and disappear ; in the measure in which it discerns unity, order, system, moral government, indications of spiritual character and design in the world, monotheism must rise and spread. Now, in the chief progressive heathen

nations reason, it can be proved, has gradually gained on imagination. Hence the

.of the Homeric gods,

undermined and broken down by them in their maturity.1

A monotheistic movement can be clearly traced in Mono. The popular religion of Greece, as it theistic appeared in the Homeric poems, was as distinctly poly- Movement

ancient Greece.

theistic and as little monotheistic as any known religion. Its gods were all finite, begotten, and thoroughly indi- vidualized beings. The need of unity was responded to only by the supremacy of Zeus, and Zeus was subject to destiny, surrounded by an aristocracy far from orderly or obedient, and participant in weakness, folly, and vice, To its eternal honour the Greek spirit, however, was not content with so inadequate a conception of the Divine, but laboured to amend, enlarge, and elevate it. The poets and dramatists of Greece purified and ennobled the popular myths, and, in particular, so idealized the character and agency of Zeus as to render them accordant with a true conception of the Godhead. The Zeus of Aschylus and of Sophocles was not only not the Zeus of Homer, but was a god belief in whom was inconsistent with belief in any The dramatists of Greece did not assail the popular conception of Divinity, but they sub- stituted for it one which implied that it was without warrant or excuse. They developed the germs of mono- theism in the Greek religion, while leaving untouched its polytheistic assumptions and affirmations. These, how- ever, were hot only persistently undermined, but often directly attacked by the philosophers, some of whom eventually reached a reasoned knowledge of the one absolute Mind. Xenophanes, Empedocles, and Anaxagoras were ainong the pre-Socratic philosophers who, on grounds of reason, rejected the polytheism and anthropomorphism of the current mythology, and advocated belief in one all- perfect divine nature. Socrates, although avoiding all attacks on the popular religion calculated to weaken the popular reverence for divine things, had real faith only in the one supreme Reason, the source and end of all things; and the best representatives of later Greek philosophy

were in this respect his followers. Plato attained by his dialectic a conception of God which will always deeply interest thoughtful men. God he deemed the highest object of knowledge and love, the source of all being, cognoscibility, truth, excellence, and beauty,—the One, the Good. The controversy as to whether his conception may be more correctly designated theistic or pantheistic will, perhaps, never be brought to a decisive conclusion, but in its general truth and grandeur it must be admitted far to transcend either the monotheism of the vulgar or any popular form of pantheism. Aristotle's character- istic cautiousness of judgment showed itself in the very meagreness of his theology. The representation which he gives of God hardly meets at all the demands of affection and of practical life, yet so far as it goes will be generally regarded as thoroughly reasonable. It is more unequivo- cally theistic than that of Plato. It sets forth God as without plurality and without parts; free from matter, contingency, change, and development; the eternal un- moved mover, whose essence is pure energy; absolute

1 The best literature relating to the subject of the preceding paragraph is indicated in the lists of books given in connexion with the relevant sections in Tiele's Outlines of the Iistory of Religion, and particularly in the French translation by M. Vernes. Hegel's Philosophy of Religion, Bunsen's God in Ilistory, Freeman Clarke's Ten Great Religions, the St Giles Lectures on the Faiths of the World, still more the series of Sacred Books of the East, and of ancient texts published under the title of Records of the Past, and the volumes of the Rev. de I' Ilist. des Religions, will be found useful to those wish- ing to make a survey of heathen thought regarding God so far as it approximated to the theistic idea. For the conceptions of the Divine entertained by non-civilized peoples, see especially Waitz's Anthro- pologie, aud Réville's Religions des Non-Civilisés, who both give extensive lists of literature.

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spirit, self-thinking reason, the voyows vonoews ; the one perfect being, whose life is completely blessed, and whose likeness is the goal towards which the whole universe tends. Stoicism was originally and predominantly a materialistic or hylozoic form of pantheism ; but some of its greatest

representatives conceived of God in a decid- edly theistic manner as the supreme moral reason. The beautiful hymn of Cleanthes to Zeus is full of the purest devotional feeling, springing from a clear sense of personal relationship to the one all-ruling personal Spirit. Greek philosophy proceeded throughout its whole course in entire independence of the popular polytheism, and was a con- tinuous demonstration of its futility ; and it largely con- tributed to that reasoned natural knowledge of God which must underlie all rational belief in revelation. It discerned in some measure all the chief arguments which have since been employed as theistic proofs. It failed, however, to conceive of God as truly creative, or of the universe as in its very substance the result of divine action ; it failed also to make evident, even to cultured minds, the superiority of monotheism to pantheism and scepticism ; and it failed especially to convert the common people to faith in one sole Deity.?

Israel presents us with the first example of a mono- theistic nation. The controversies as to how Israel ac- quired this pre-eminence can only be decided by critical and historical investigations into which we cannot here enter (see IsRAEL).

The science of Old Testament theology, giving due heed to the results of critical, historical, and exegetical research – regarding the documents with which it deals, has to trace by what means and through what stages Hebrew mono- theism was developed and established ; and to the treatises on this science our readers must be referred. The mono- theistic movement in Israel was one of continuous progress through incessant conflict until a result was reached of incalculable value to humanity. That result was a faith in God singularly comprehensive, sublime, and practical,— a faith which rested, not on speculation and reasoning, but on a conviction of God having directly revealed Himself to the spirits of men, and which, while ignoring meta- physical theorizing, ascribed to God all metaphysical as well as moral perfections ; a faith which, in spite of its simplicity, so apprehended the relationship of God to nature as neither to confound them like pantheism nor to separate them like deism, but to assert both the immanence and the transcendence of the divine ; a faith in a living and per- sonal God, the almighty and sole creator, preserver, and ruler of the world ; a faith, especially, in a God holy in all His ways and righteous in all His works,

who was directing and guiding human affairs to a destination worthy of His own character ; and, therefore, an essentially ethical, elevating, and hopeful faith. The existence of utterances in the Hebrew Scriptures which show that Hebrew faith was not always thus enlightened, and sometimes conceived of God as partial and cruel, is no reason for not acknow- ledging the general justice and grandeur of its representa- tion of the Supreme.

The God of the Old Testament is also the God of the New. Christ and the apostles accepted what Moses and the prophets had taught concerning God ; they assigned to

1 See Zeller, Die Entwickelung des Monotheismus bei den Griechen (in Vortrige, vol. i.); and Cocker, Christianity and Greek Philosophy, 1875; also, Meiners, Historia Doctrine de Vero Deo, 1780.

2 See the O. 7. Theologies of Oehler, Schultz, Kayser, Piepenbring, &c.; Ewald, Lehre der Bibel von Gott; Baudissen, Stud. z. Semit. Religionsgeschichte ; Kuenen, Hibbert Lecture; Duhm, Theologie d. Propheten ; W. Robertson Smith, Prophets of Israel, &c. As to the name " Jahveh," an instructive summary and examination of views is given by Prof, Driver in his article '"' Recent Theories on the Origin and Nature of the Tetragrammaton," in Studia Biblica, Oxford, 1885.

Him no other attributes than had already been assigned to Him. Like Moses and the prophets also they made no attempt formally to prove the existence or logically to define the nature of God, but spoke of Him either as from vision or inspiration. And yet their doctrine of God has original and peculiar features. Thus, first, the fatherhood of God was taught with incomparable distinctness and fulness by Jesus Christ,—a fatherhood not merely of natural creation or national election, but of spiritual relationship of love, sympathy, mercy, and grace for individual souls. Such fatherhood, if acknowledged at all, was only very rarely and vaguely acknowledged in heathendom, and, although not wholly absent from the Old Testament, is far from clearly and prominently there, and, indeed, is present chiefly by implication in passages which refer directly only to God's connexion with the people of Israel, as an elect and covenant people ; it is conspicuous and

central, however, in the conception of God introduced by Christianity. Secondly, Divine father- hood had its correlate in Divine sonship. God is repre- sented in the New Testament as revealing His fatherhood through His Son, Jesus Christ. In Old Testament repre- sentations of Israel, the Messiah, and Wisdom, and in the Logos doctrine of Judeo-Alexandrian philosophy, some approximations to this conception of the Divine may be traced, but they fell far short of it. According to the New Testament, God is not merely infinitely exalted above the world and definitely distinguished therefrom, nor merely immanent and everywhere operative in nature, but also incarnate in Christ ; and Christ is not merely " the Son of man," essentially sharing in humanity and truly representing it before God, but also " the Son of God," essentially sharing in Divinity, and giving the fullest disclosure of it to man. The foundation of the Christian faith as laid down in the New Testament is that Christ through His unique relation as Son to the Father perfectly declared and expressed the nature and will of God in relation to human salvation. Thirdly, God is exhibited in the New Testament as the Spirit, the Holy Ghost, who dwells in the spirits of men, to work in them the will of the Father, and to conform them to the image of the Son. Only when thus exhibited can the revelation of the Divine name be regarded from the New Testament point of view as other than manifestly incomplete. Even the manifesta- tion of God in Christ, being objective and single, must be supplemented by a manifestation which is subjective and multiple, before the one God, the one Christ, can find a place in the manifoldness of souls, the multitude of sep- arate hearts and lives. The manifestation of the Spirit is such a manifestation, and completes in principle the revelation of the Christian idea of God, the revelation of His threefold nature and name. This revelation completed God can be thought of as absolute spirit, absolute love, absolute good, and was, to some extent explicitly, and throughout implicitly, so represented in the New Testa- ment. It is precisely in virtue of the threefold represen- tation of God characteristic of the New Testament that Christianity is still held by so many of the world's pro- foundest thinkers as the absolute and perfect religion, the crown and consummation of religion,—speculatively con- sidered, an absolute revelation of God, and practically considered, a perfect salvation,—within which there may be infinite evolution and progress, but beyond which there can be no true light or real growth.?

The threefold representation of God in the New Testa- Doctrine ment was an entirely religious and practical representa- of the tion, inseparably connected with the historical facts of L2G

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3 The New Testament representation of God is treated of in the Vew Testament Theologies of Schmid, Reuss, Oostcrzee, and Weiss ; also in Wittichen, Die Idee Gottes, 1865.

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Christ's life and the spiritual experiences of the early | blending, however, of trinitarianism with theism the whole

Christians. It was not an ontological or even theological doctrine, and will be identified by no competent exegete with the dogma of the Divine Trinity set forth in the cecumenical creeds. The propositions constitutive of the dogma of the Trinity—the propositions in the symbols of Nice, Constantinople, and Toledo relative to the immanent distinctions and relations in the Godhead— were not drawn directly from the New Testament, and*could not be ex- pressed in New Testament terms. They were the pro- ducts of reason speculating on a revelation to faith—the New Testament representation of God as a father, a redeemer, and a sanctifier—with a view to conserve and vindicate, explain and comprehend it. They were only formed through centuries of effort, only elaborated by the aid of the conceptions and formulated in the terms of Greek and Roman metaphysics. The evolution of the doctrine of the Trinity was far the most important fact in the doctrinal history of the church during the first five centuries of its post-apostolic existence. To trace and describe it fully would be almost to exhibit the history of Christian thought during these centuries. It had neces- sarily an immense influence on the development of theism. The acceptance of the catholic doctrine of the Trinity implied the rejection of pantheism, of abstract monotheism, of all forms of monarchianism or unitarianism. It decided that theistic development was not to be on these lines or in these directions. At the same time the dogma itself was a seed for

new growths of theistic thought, and demanded a development consistent with its own nature. It is a doctrine, not as to the manifestations and revela- tions of Godhead, but as to their ground and explanation, the constitution of Godhead, a doctrine as to a trinity of essence, which accounts for the Trinity of the gospel dis- pensation. It affirms the unity of God, but requires us to conceive of His unity, not as an abstract or indeter- minate self-identity, not as “sterile, monotonous simpli- city,” but as a unity rich in distinctions and perfections,— the unity of an infinite fulness of life and love, the unity of a Godhead in which there are Father, Son, and Holy Spirit, a trinity of persons, a diversity of properties, a variety of offices, a multiplicity of operations, yet sameness of nature, equality of power and glory, oneness in purpose and affection, harmony of will and work. It finds its dogmatic expression as to what is ultimate in it in the formula—One substance in three persons, of which the first eternally generates the second, and the third eternally proceeds from the first and second. Now, manifestly, however much such a doctrine as this may have satisfied thought on a revelation as to the Godhead, it cannot have exhausted or completed it. If it answered certain ques- tions it raised others, and these more speculative and pro- found than those which had been answered. What is meant by affirming God to be “substance” or “in three persons”? What is meant by divine “generation” or “procession”? How are the substance and _ persons related % related? These and many kindred and connected ques- tions reason became bound to discuss by its adoption of the doctrine of the Trinity. This obligation could only be temporarily and partially evaded or concealed by represent- ing the doctrine as “‘a mystery ” to be accepted simply on authority or with blind faith. Data of the doctrine may have been given to faith, but the doctrine itself was the work of reason, and on no ground not plainly absurd could that work be held to have terminated in 589 a.p. As soon as an inspired record is left at all, as soon as any speculation is allowed on its contents, as soon as the pro- cess of forming doctrine is permitted to begin, all conceiv- able right to stop the movement anywhere is lost. By the

How are the persons distinguished and inter- .

character of the latter was, of necessity, profoundly changed. A trinitarian theism must be vastly different from a unitarian as regards practice. It must

be equally so as regards theory. It must be far more speculative. By its very nature it is bound to undertake speculative labours in which a simply unitarian theism will feel no call to engage.!

It was the general conviction of the early Christian Theism in writers that formal proofs of the Divine existence were Patristic In their view the idea of Ys.

neither necessary nor useful. God was native to the soul, the knowledge of God intuitive, the mind of man a mirror in which, if not rusted by sin, God could not fail to be reflected. The design argument, however, came early into use and was frequently employed. More speculative modes of reasoning were resorted to by Dionysius of Tarsus, Augustine, and Boetius.. The unity of God had to be incessantly affirmed against polytheists, Gnostics, and Manicheans. ‘The incomprehensibility of God and His cognoscibility were both maintained, although each was sometimes so emphasized as to seem to obscure the other. That the knowledge of God may be reached by the three ways of causality, negation, and eminence was implied by the pseudo-Dionysius, although only explicitly announced by Scotus. Neither any systematic treatment of the Divine attributes nor any elaborate discussion of single attributes was attempted. The hypothesis of eternal creation found a vigorous defender in Origen, but met with the same fate as the dualist hypothesis of un- created matter and the pantheistic hypothesis of emana- tion. Of all the patristic theologians Augustine was

~~undoubtedly the most philosophical apologist and ex~~

ponent of theism. He alone attempted to refute agnos- ticism, and to find a basis for the knowledge of God in a doctrine of cognition in general. On the large, difficult, and as yet far from adequately investigated subject, the influence of Platonic and Aristotelian, Stoic and Academic, Neopythagorean and Neoplatonic speculation on the for- mation of the Christian doctrina de Deo, it is, of course, impossible here to enter.?

Mohammed (570-632) founded a monotheistic religion which spread with amazing rapidity through Arabia, Syria, Persia, North Africa, and Spain, and gave, almost wherever it spread, a mighty impulse to the minds and wills of men. It was received as the gift of special inspiration and

revelation, although its creed contained little of moment on which reason would seem to be incompetent to decide. It had obvious merits, and must be admitted to have rendered real and important services to culture, religion, and humanity, but had also conspicuous faults, which have done much injury to individual, domestic, and national life. If the latest were always the best, it would be the most perfect of the three great theistic religions of the world; but it is, in fact, the least developed and most defective. Instead of evolving and extending, it marred and mutilated the theistic idea which it borrowed. In- stead of representing God as possessed of all spiritual fulness and perfections, it exhibited Him as devoid of the divinest spiritual attributes. It recognized His

| transcendent exaltation above His creatures, but not His

sympathetic presence with His creatures; apprehended vividly His almighty power, His eternity, His omnipres- ence and omniscience, but only vaguely and dimly His moral glory, His love and goodness, His righteousness

1 Baur, Ch. Lehre v. d. Dreieinigkeit, &c., 1841-48; Meier, Lehre v. a Trinitét in hist. Hntwickl., 1844.

2 Roesler, Philosophia Veteris Ecel. de Deo, 1782; and the histories of Christian doctrine by Hagenbach, Neander, Shedd, Bonifas, Sheldon, Harnack, &c.; Ganganf, Des h. Augustinus speculative Lehre von Gott, 1884.

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and holiness. The Allah of Mohammed was essentially despotic will, and so fell far below the Jahveh of Moses, essentially righteousness, and the Heavenly Father of Christ, essentially holy love. Mohammedanism is almost as contrary to Christianity as one form of theism can be to another. It

is as unitarian as Christianity is trini- tarian. Its cardinal tenet is as distinctly anti-trinitarian as anti-polytheistic. It has often been represented as hav- ing had the providential task assigned it of preparing the way for Christianity by destroying polytheism ; in reality, it has hitherto offered a far more stubborn resistance to Christianity than any polytheistic religion has done.}

The medizval world was so complex, so full of contrasts – and contradictions, that it cannot be “summed up in a formula.” Most general statements current regarding it will be found on examination only partially true. It is often described as the age in which external religious authority ruled, and all religious thought ran in narrow, strictly prescribed paths, whereas, in fact, the medizval theologians were far freer to speculate on almost all points of religious doctrine than Protestant divines have been. Because traditionalism abounded, it is forgotten that ration- alism also abounded; because scholasticism flourished, that mysticism was prevalent ; because theism was com- mon, that pantheism, speculative and practical, was not uncommon. The Middle Age was, however, par excellence, the age of theology. Theology never before or since so interested and dominated the human intellect. Nearly every eminent medizval thinker was a theologian. The chief streams of theistic belief and speculation which tra- versed the Middle Age were three,—the Christian, Jewish, and Mohammedan. The first was much the broadest and fullest. Few points of theistic doctrine were left un- handled by the Christian divines of the Middle Age. The conclusions came to on the chief points were various and divergent. As to the manner in which God is known, for instance, some laid stress on faith or authoritative revela- tion ; others on immediate consciousness, the direct: vision of the pure in heart, the illumination of the Spirit of God in the minds and hearts of the true children of God; others on reason and proof; and some attempted media- tion and synthesis. Anselm gave logical form to an a priori argument for the Divine existence based on the idea of God asa being than whom a greater cannot be con- ceived. His most ingenious attempt to demonstrate the absurdity of supposing the perfect, the infinite, to be a mere subjective fiction prepared the way for the multitude of attempts, identical or similar in aim, which have since been made. Thomas Aquinas was the best representative of those who held that the invisible God was only to be known through His visible works. He argued from motion toa mover, from effect to cause, from the contingent to the

necessary, from lower kinds of good to a supreme good, and from order and purpose in the world to a governing intelligence. Raymond of Sebonde added to the ontological and physico-teleological arguments a moral argument. William of Occam criticized keenly and un- favourably both the a priori and a posteriori proofs, and held that the existence of God was not a known truth but merely an article of faith. There was not less diversity of view as to how far God may be known. Erigena held that even God Himself could not comprehend His own nature, and Eckhart that the nature of God is neces- sarily unknowable, as being a nature without nature, Without predicates, without opposites, pure oneness. That Ian cannot know God's real nature, cannot know Him per essentiam, cannot have a quidditiva cognitio Dei, and that

1 See MoHAMMEDANISM, and authorities there mentioned ; also Kuenen, Hibbert Lectures, lect. 1, with authors and works there indicated,

the so-called attributes of God are only descriptive of the effects of His operations as they appear to the human mind, or even are merely symbols or metaphors, was maintained by many of the scholastic doctors. Aquinas, for example, with all his confidence as a dogmatic system- builder, so denied the cognoscibility of God. That the human mind may have a true, although it cannot have a perfect knowledge of God,—an apprehensive but not a comprehensive knowledge of Him,—was, however, in the Middle Age, as it has been ever since, the position most commonly taken up. The scholastic divines discussed a multitude of foolish questions regarding God, but that was not due to extravagant faith in the power of the human mind to know or comprehend God. Prof. Sheldon very justly says, 'on the whole, the scholastic theology, notwithstanding some strong negative statements, assumes in reality a minimum of acquaintanceship with the essen- tial nature of God." The negative statements are, for the most part, those of the mystics with respect to the beatific vision. Medieval discussions as to the nature of God turned chiefly on two points,—the relation of the Divine essence to the Divine attributes and of the one Divine substance to the three Divine persons. The conclusion come to by the vast majority of scholastic theo- logians on the first point was that the attributes were not really or

objectively in God, but merely human repre- sentations reflected, as it were, on the idea of God, because the mental constitution of man is what it is, and because God wished to be thought of in certain divers manners. To hold them objectively real in God, and therefore intrin- sically distinct either from the essence of God or from one another, was considered to be incompatible both with the incomprehensibility and with the absolute simplicity of the Divine nature. Duns Scotus, in maintaining that the attributes were formalitates realiter distincte, took up an exceptional position. On the other point the conclusion as generally reached was one seemingly quite inconsistent with the foregoing, namely, that the persons were objec- tively and eternally real and distinct. The discrepancy is especially apparent in those theologians (eg., Anselm, Abelard, Hugo and Richard of St Victor, Alexander of Hales, and Aquinas) who represented the persons of the Trinity as corresponding to distinctions among the very attributes which they in another reference denied to be distinct. The medizval schoolmen, with very few and doubtful exceptions, conjoined with their theism the doctrine of the Trinity as defined by the ancient church. Roscelin of Compiegne and Gilbert de la Porrée laid themselves open to the charge of tritheism ; and obviously nominalism, by allowing nothing but a nominal existence to the essence or general nature of which the individual is a Specimen, tended towards tritheism,—towards resolv- ing the Trinity into a triad of Divine individuals or self- subsistent beings, connected only by a common specific character. While the schoolmen accepted the doctrine of the Trinity on authority, they did not conceive them- selves precluded from endeavouring to illustrate it and to make it appear as consonant to reason as possible, They sought to show its consistency with the unity of God, and its general reasonableness by various speculative con- siderations, but especially by the aid of analogies drawn from the constitution of the mind and even from particular physical phenomena. They did not suppose that they were thereby demonstrating the doctrine of the Trinity : they fully recognized that doctrine to be the indication of a mystery, “dark with excess of light,” and the truth of which could only be directly apprehended in the beatific vision conferred by the highest and most special grace ; but they proceeded on the belief that, inasmuch as it was a central truth of revelation, the whole creation, and,

Moham- medan theism,

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above all, the nature and essence of man's spirit, must bear witness to it. At least one good result followed. Those who exercised their minds on the doctrine of the Trinity were necessarily led in some measure to form another idea of God than that of either an indeterminate unity or a confused synthesis of attributes,—to think of Him, with some clearness and steadiness, in an organic and harmonious manner, as absolute being, absolute life, absolute spirit, absolute intelligence, absolute love. Such thought as this distinctly appeared in Anselm, the St Victors, Aquinas, Bonaventura, Dante, &c. The omni- presence, omnipotence, and omniscience of God, and, generally, what are called His metaphysical and intellectual attributes, were discussed with excessive elaborateness and subtlety, while His moral attributes were left in the back- ground, or considered without sufficient earnestness or insight. The problems regarding the relationship of the Divine attributes to human agency, and, in particular, as to the compatibility of Divine prescience and predestina- tion with human freedom and responsibility, were even too laboriously and minutely debated between the medizval Augustinians and their opponents. What the disputants on both sides lacked was intellectual humility. They strode along "dim and perilous ways" as if they were in plain and safe paths, or as if their own faculties were superhuman. As to the general relation of God to the universe, few, if any, of the schoolmen can be charged with deism. While assigning to God a being and life transcending the universe, they also affirmed that He was everywhere in the universe, everywhere wholly present, everywhere essentially and actively present. Pantheism was prevalent all through the Middle Ages, but only two of its representatives, perhaps—Erigena and Eckhart,— showed much speculative capacity.!

Mohammedan theism drew chiefly from faith and fana- ticism the force which carried it onwards with such rapid- ity in its early career of conquest. At the same time it powerfully stimulated reason, as soon appeared in remark- able intellectual achievements, Of course, reason could not fail to reflect on the contents of the faith by which it had been awakened. The

result was the formation of many schools of religious opinion. So far as our subject is concerned, however, all medizeval Mohammedan thinkers may be ranked as philosophers, theologians, or mystics. The philosophers derived little of their doctrine from Mohammed, Even in what they taught regarding God they followed mainly Aristotle, and in some measure the Neoplatonists. They maintained the unity of God, but conceived of it in a way unknown to Mohammed, namely, as a unity allowing of the reality of no distinctions, quali- ties, or attributes in God. Then, although they affirmed the unity of God in the strictest abstract manner, they were not monists but dualists, inasmuch as they denied creation ex nihilo, and asserted the eternity of matter. The mode in which they supposed the multiplicity of finite

1 For the history of medieval theism may be consulted the histories of philosophy by Tennemann, Ritter, Erdmann, &c.; the special histories of medizeval philosophy by Stockl and Haureau, aud of later scholasticism by K. Werner; the histories of the Trinity and of Christian doctrine already mentioned; and a multitude of monographs, e.g., those of Christlieb, Huber, and Stéckl on Erigena; of Hasse, Remusat, Bouchitté on Anselm or his ontological argument; Delitzsch's Kritische Darstellung der Gotteslehre des Thomas Aquinas; Ritschl's ''Gesch. Studien z ch. Lehre von Gott," in Jahresb. f. deutsche Theol., x., referring chiefly to Aquinas and Scotus, &c. Medizval mysticism has found in Schmidt, Lasson, Preger, Jundt, admirable historians. On Eckhart there are good works by Martensen, Lasson, and others; see also a paper by Prof. Pearson in Mind, No. xli. On medieval predestinarianism consult chapter in Mozley's Treatise on the Augustinian Doctrine of Predestination. The keenest hostile criticism of medieval theism is that of Pasquale D'Ercole, 71 Teismo Filosofico Christiano, 1884. '

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| things to have been produced from God was by a series of emanations originating in Divine intelligence, not in Divine will. Their proofs of the Divine existence were, for the most part, founded on the principle of causality. The philosophers did not openly oppose the theism of the Koran, but they ignored it or set it aside, and represented it as only a useful popular faith, not a response to the demands of cultured reason. The " theologians,"

on the other hand, took their stand upon the Koran, sought to defend and develop into doctrine its representations of God, and to show the inconclusiveness and inconsistencies of the teaching of the philosophers regarding God. Even those of them, however, who exalted faith and revelation most—the orthodox Motakallemin or Asharites—by no means dispensed with philosophy and reason. It was chiefly on the metaphysical hypothesis of the atomic consti- tution of matter that they rested their proofs of the Divine existence. It was by subtle reasonings that they sought to establish the non-eternity of matter and the unity and immateriality of God. It was on speculative grounds that they contended God had eternally possessed all the attri- butes ascribed to Him in the Koran. Their predestina- tionism was as logically elaborated as that of the Augus- tinian scholastics. There flourished for a short period a school of liberal Mohammedan theologians, the Motazil- ites, who, while accepting the two fundamental doctrines of Islam—the unity of God and the divine mission of Mohammed, —refused to regard the Koran as an absolute religious authority, and sought to transform Mohammed- anism into a reasonable and ethical monotheism. They insisted on the rightful conformity of faith to reason, on human freedom, and on the righteousness as well as the unity of God. They endeavoured, in fact, to substitute for a God whose essence was absolute or arbitrary will a God whose essence was justice. This meant, however, not to develop or even reform, but to subvert and displace the Mohammedan idea of God, and the wonder is, not that they failed in so arduous a task, but that they had the courage to undertake it. Mohammedan mysticism (Sufism) was a reaction, chiefly of the Persian mind, against the narrowness and harshness of the monotheism of the Arabian prophet. Unlike philosophy, it was not a mere exotic, but an indigenous growth within the Mohammedan area, and hence orthodoxy has never been able to eradicate it. It has been the chief support of spiritual feeling and the chief source of poetry in Mohammedan lands. It still flourishes, has branches innumerable, and through its poets has shed seed widely even over Christendom. The mystics refuse to think of God as an arbitrary unlimited Will, separate and apart from everything; as one who reveals Himself clearly only through the words of a prophet ; as a being before whom man is mere dust and ashes, and who demands no higher service than fear, unquestioning faith, and outward obedience. In their view God is immanent in all things, expresses Himself’ through all things, and is the essence of every human soul. There

is not only no God but God, but no being, life, or spirit except the being, life, and spirit of God; and every man may be God's prophet, and more even than His prophet. For a man to know God is to see that God is immanent in himself, and that he is one with God, the universal life which breathes throughall things. Such knowledge or vision must glorify all nature, and must dilate and rejoice the heart of him who possesses it. Joy and ecstacy must characterize the worship of the Sufi. A religious scepticism based ou philosophical scepticism—disbelief in the existence of God grounded on disbelief in any truth not guaranteed by sense or mathematical demonstration— was not unknown among the Saracens, although no work in defence of it has come down to us, and perhaps none may have been written.

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In Algazel philosophical scepticism was combined with religious dogmatism and mysticism. He subjected the doctrines of the philosophers to a keen and hostile criticism, and maintained that reason was incompetent to reach the knowledge of God, yet cherished an ardent and exalted faith in God, based partly on the Koran and partly on mystic contemplation and devout experience.!

Jewish and Mohammedan religious thought were inti- mately connected in the Middle Age, and ran a nearly parallel course. The Rabbanites and the Karaites of Juda- ism corresponded to the orthodox and the Motazilites of Mohammedanism. In their theism there was no new feature or peculiar significance. Jewish theosophic mysti- cism found expression in the Kabbalah. The idea of God there presented was at once excessively abstract and excessively fanciful. It must be studied, however, in the original source or in special works. The Jewish philoso- phers differed little from the Arabian philosophers in their teaching regarding the evidences of the Divine existence, the nature and consequences of the Divine unity, and the

meaning of the Divine attributes. At the same time, they, with a few exceptions, affirmed the non-eternity of matter, and did not, like the Arabian Aristotelians, represent pro- vidence as merely general. They maintained strongly the transcendence of God and the impossibility of the human mind forming any positive conception of His essential being. They held that He was known as necessarily existent, but also as in Himself necessarily unknowable. Their view of the unity of God led them to an idea of God which may not unjustly be designated agnostic, and which prevented their regarding either nature or Scripture as a revelation of what God really is. Almost alone among eminent Jew- ish writers of the Middle Age, Jehuda Halevi contended that the representation of God given in the revelation to

In Christian Europe the human mind took a fresh start Renais- It revolted against the S4nce authorities to which it had long been submissive, and P°° ¢

at the epoch of the Renaissance.

exercised private judgment with a confidence uncorrected and unmoderated by experience. It turned with ardour to the free discussion of the greatest theme of thought, and probably at no period of history has there been more individual diversity of opinion on that theme. God and His relation to the universe were treated of from a multi- tude of points of view. Scepticism, naturalism, and pan- theism appeared in various forms ; all ancient systems of thought as to the Supreme Being found advocates; all modern theories as to the nature of the Divine were in some measure anticipated. Did our limits permit it would not be uninteresting to expound the speculations concern- ing Deity of several of the writers of the Renaissance,— and especially, perhaps, of these three—Nicolaus of Cusa, Giordano Bruno, and Thomas Campanella. The theo- sophie mysticism of the period was a preparation for the Reformation.®

The fusion of theology and philosophy was the distinc- tive feature of medieval Christendom; their separation has been a marked characteristic of modern Christendom. Even when both have been occupied with religious

inquiries and thoughts of God they have kept apart ; they have often co-operated, but seldom commingled. Theology has been on the whole cleric, and comparatively conserva- tive ; philosophy has been on the whole laic, and compara- tively progressive. But for theology holding fast to what had been handed down as truth regarding God there must have been little continuity or consistency in the development of religious convictions ; but for philosophy restlessly seek- ing ever more light there would have been little growth or increase of knowledge of the Divine.

The Reformers held that there was a knowledge of God The naturally planted in the human mind, and also derivable Reforma- from observation of the constitution and government of #™

Israel was self-evidencing, independent of the support of philosophy, and unattainable in any speculative way. The

function of reason was, in his view, not to sit in judgment

on what had been delivered regarding God to the Jews, but to repel the objections which philosophy had brought against it, and to show the inadequacy of the results reached by unaided human intelligence. Maimonides undertook to establish that reason and faith, science and revelation, were at one in what they affirmed regarding God, but in order to make out his thesis he sacrificed the literal sense of Scripture whenever it did not accord with the tenets of his philosophy, and substituted for the representation of God given through Moses and the prophets one very different in character. His idea of God is highly abstract and metaphysical, —the idea of a being so unlike every other being that no name or predicate whatever when applied to Him can bear its ordinary, or indeed any intelligible meaning. Existence, eternity, unity, ‘power, wisdom, justice, and other attributes, are not in Him whiat they are in any other being or even analogous in Him to what they are in any other being.?

1 Schahrastani’s Geschichte der religidsen u. philosophischen Secten bei den Arabern, Germ. trans. by Haarbriicker, 1850-51; Wiistenfeld, Die Akademie der Araber u. thre Lehrer, 1837; Schmolders, Essai sur les Ecoles Philosophiques chez les Arabes, 1842; Munk, AMélanges de Philosophie Juive et Arabe, 1859; Stemer, Die Mutaziliten oder Freidenker in Islam,

1865; Renan, Averroés et L’ Averroisme, 1852, &c, On Eastern mysticism, see Tholuck, Sujfismus s. Theosophia Persarum Pantheistica, 1821, and Bliithensammlung aus der morgen- lindischen Mystik, 1825; Cowell, “Persian Literature,” in Ouford Essays for 1855 ; Palmer, Oriental Mysticism, 1867; Redhouse, The Mesnevi of Jelalu-d-Din, 1881 sg.; Vaughan, in Hours with the Mystics, treats of the Oriental as well as Christian mystics. For Persian mysticism in its latest forms, sce De Gobineau, Religions et Philosophie dans 1 Asie Centrale, 1866. On Algazel, see Gosche, ‘Ueber Ghazzilis Leben u. Werke,” in Abhand. (philol. u. hist.) d. k. Akad. d. Wiss, z. Berlin, 1858.

. Munk, Esquisse Historique de la Philosophie chez les Juifs, 1849; Eisler, Vorlesungen tiber die jiidischen Philosophen des Mittelalters,

the world, but that this knowledge was so marred and corrupted by ignorance and sin as to require to be con firmed and supplemented by the far clearer and fuller light of the special revelation in the Scriptures. They were deeply sensible of the evils which had arisen from the over-speculation of the scholastic divines on the nature of God, and were under the impression that it would have been well if men had been content to accept the statements of Scripture on the subject with simple and unhesitating faith. Luther wished theology to begin at once with Jesus Christ. Melanchthon said, “There is no reason why we should devote ourselves much to these most lofty subjects, the doctrine of God, of the unity of God, of the Trinity of God”; and in the early editions of his Loci Communes he entered into no discussion of these themes. Zwingli in his De Vera et Falsa Religione and even Calvin in his Lnstitutio Religionis Christiane delineated the doctrina de Deo only in outline and general features. In the confessions of the churches of the Reformation nothing which the ancient church had cecumenically determined as regards that doctrine was rejected, and nothing new was added thereto. It soon becaine apparent, however, that the mind would by no means confine its thoughts of God within the limits which the Reformers believed to be alone legitimate and safe. The idea of God is so central in religion that it must affect and be affected by every change of thought on

1870, 1876; Joél, Beitrige z. Gesch. d. Philosophie, 1876. On the Kabbalah, see Franck and Ginsburg. Kaufmann, Geschichte der Attri- butenlehre in der jiidischen Religionsphilosophie der Muittelaiters, 1877; Friedlander, Guide of the Perplexed of Maimonides, 3 vols.,

1885.

3 M. Carriere's Philosophische Weltanschauung der Reformationszett, 1887; Punjer's Religionsphilosophie, i. 51-59, 69-75, 76-80; Bobha's Conoscenza di Dio, iii. 1-90.

Anti- trinitari- anism.

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any religious theme. The many and violent controversies | within Protestantism all reacted on the doctrine relative to Deity, causing it to be studied with intense energy, but in a manner and spirit very unfavourable, on the whole, to truth and piety. Every new dispute elicited more abstruse conclusions and more subtle definitions. In the disputa- tions of orthodox divines of the 17th and 18th centuries as to the nature, the attributes, the decrees, and the operations of God, we see scholasticism with all its peculiarities re- introduced and often exaggerated. Yet Protestant theism was in various respects an advance on that of the doctors of medieval scholasticism. The protest of the Reformers against the faults of the scholastic treatment regarding God did not lose its pertinency or value because their own followers fell into these very faults. If the subsequent history plainly showed that the doctrine could not have been so fixedly and exhaustively determined by the ancient church as the Reformers supposed, it also showed that the scholastic treatment of the doctrine had been justly condemned by them, and that speculation regarding God when not rooted in spiritual experience must necessarily be unfruitful. The scholasticism of Protestantism was in essential contradiction to the genius and aim of Protestan- tism. Then, in the Protestant doctrine of God more prominence was given than had previously been done to His manifestation in redemption, to the relation of His character towards sin, and, in particular, to the attribute of justice. The strong emphasis laid on the righteousness of God marked a distinct ethical advance. At the same time the idea of God in

the older Protestant theology was far from ethically complete. His fatherhood was strangely ignored or most defectively apprehended. Absolute sove- reignty had assigned to it the place which should have been given to holy love, and was often conceived of in an unethical manner. Further, whereas among medieval theologians it was the rule and not the exception, among Protestant divines it was the rare exception and not the rule, to affirm God to be unknowable. They asserted merely His incomprehensibility and man's limited know- ledge of His perfections. They did not in general, how- ever, abandon, at least explicitly, the premiss from which medizval theologians inferred the Divine incognoscibility, namely, that the absolute simplicity of the Divine essence ye incompatible with the existence of distinctions there- an

Difference of opinion as to the relation of reason to Scripture was in the Protestant world one of the chief causes of difference of belief as to God. Assaults on trinitarianism were contemporary with the Reformation, and they proceeded more on the conviction that the doctrine of the Trinity was unreasonable than that it was unscriptural. The founder of Socinianism, indeed, not only fully accepted the authority of Scripture, but went so far as to represent it as the source of all religious truth, even of the primary truths of natural religion ; yet, while he thus apparently and in theory attributed the knowledge of God more to Scripture and less to reason than did Luther or Calvin, really and in practice he did just the reverse, because he conceived quite otherwise of the con- nexion between Scripture and reason. While he held Scripture to be the source of religious truth, he also held reason to be so the organ of religious truth that nothing contrary to reason could be accepted on the authority of Scripture, and that only those declarations of Scripture could be deemed to be interpreted aright which were inter- preted in accordance with the axioms of reason. Luther, on the other hand, proclaimed aloud, Strangle reason like

B Gass, Gesch. d. prot. Dogm., i.; Heppe, Dogm. d. deutsch. Protes- tantismusim L6ten Johrh., i.; Frank, Gesch. d. prot. Theol., i.; Dorner, Hist. af Prot. Th.,ii.; and Muller, De Godsleer van Calvijn, 1883.

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a dangerous beast if it dare to question Scripture ; and Calvin, although he did not speak so harshly, demanded the unqualified submission of reason to the authority of Scripture. Antitrinitarianism has maintained its ground throughout the Protestant area, has assumed a variety of forms, and has exerted a powerful influence. It has been unable, it is often said, to do more than revive the doctrines which distracted the ancient church and were condemned by it as heresies. And this must be so far admitted. The doctrine of the Trinity comprehends only a few propositions, and every departure from it must involve a rejection of one or more of these, and must, consequently, belong to some one of a very few possible types or classes of belief. But essentially the statement is superficial and unjust. For the ways in which, and the grounds on which, both the affirmations of which the doctrine consists and the negations of these have been main- tained have not been the same. Alike the defences and the attacks have in the later era implied a deeper consciousness of the nature of the problems in dispute than those of earlier times. As of history in general, so of the history of the doctrine of God, it holds good that no present has been the mere reproduction of any past. was carried farther in English deism and its Continental developments. Deism sought to found religion on reason alone. It represents “nature” as the sole and sufficient revelation of God. There is no warrant for the view that the deists held nature to be independent of God, self- conservative and self-operative,—or, in other words, God to be withdrawn from nature, merely looking on and “seeing it go.” They believed that God acted through natural laws, and that it was doubtful if He ever acted otherwise than through these. Whatever was taught about God in Christianity and other positive religions beyond what reason could infer from nature ought, in their opinion, to be rejected as fiction and superstition, All their zeal was negative,—against ‘“ superstition.” What was positive in their own doctrine had but a feeble hold on them. God was little more to them than a logical inference from the general constitution of the world. They lacked perception of the presence of God, not only in the Bible, but in all human life and history.?

Modern philosophy, from its rise to the close of the 18th Modem

century, showed a double development, the one ideal and the other empirical, the Cartesian and the Baconian. The former was the more

essentially religious. Descartes en- deavoured to found philosophy on an indubitable refuta- tion of absolute scepticism. Such a refutation he believed himself to have effected when he had argued that thought, even in the form of doubt, necessarily implies the exist- ence of him who thinks; that the implication yields a universal criterion of certainty ; and that the presence of the idea of God in a man's mind, the consciousness of the mind's imperfection, and especially the character of the mind's concept of God as that of the most real being con- taining every perfection, demonstratively establish that God is and is what He is thought to be. God is and is true ; therefore man has not been made to err, and what- ever he clearly and distinctly sees as true must be true. In the opinion of Descartes, the idea of God is inherent in reason, is the seal of all certainty, and the corner-stone of all true philosophy. To the whole Cartesian school theology was the foundation of all science. To Spinoza,

2 Besides the works of Gass, Frank, and Dorner already mentioned, see the histories of deism by Leland, Lechler, and Sayous; of rationalism by Stiudlin, Tholuck, Hagenbach, and Hurst; Noack's Freidenker, 3 vols., 1858-55; Farrar's Crit. Hist. of Free Thought, 1863; Hunt's Rel. Thought in England, 8 vols., 1870-73; Leslie Stephen's Engl. Thought in the Eighteenth Cent., 2 vols., 1883; Cairns's Unbelief in the Eighteenth Cent., 1881; Beard's Hib, Lect., 1883; and the 2d vol. of Gillett's God in Human Thought, 1874.

The rationalistic process Deism.

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who most fully developed some of the distinctive principles of Descartes, it was identical with all science, for to him God was the only substance, and all things else were only His attributes or modes. Besides the pantheism of Spinoza, the occasionalism of Guelinx, Malebranche's vision of things in God, Leibnitz's pre-established harmony and optimism, and Wolf's rationalism were natural, if not necessary, outgrowths from the same root,—Cartesian theism. Perhaps, of all the many services to the cause of theism with which Cartesianism must be credited the greatest was that it constantly

gave prominence to the absolute perfection of God.!_ Baconian or empirical philo- sophy was content if, by the ways of causality and design, it could rise to an apprehension of a First Cause and Su- preme Intelligence. It tended of itself to a phenomenal- ism, sensationism, associationism, unfavourable to theism. It was, however, counteracted, restrained, and modified by Cartesianism and Platonism, and it naturally allied itself with positive science. The massive defence of theism erected by the Cambridge school of philosophy against atheisin, fatalism, and the denial of moral distinctions was avowedly built on a Platonic foundation. The popularity during the 18th century of the design argument, and what was called physico-theology, was largely due to the impres-

conviction that the eternal source of things must be immanent in their constitution, changes, and laws. The rapid growth of biology and tlie spread of the doctrine of evolution have not only tended in the same direction, but given a new and nobler conception of the teleology of the universe, and, consequently, of God as the supreme in- telligence. History—which the natural theologians of the 18th century so strangely ignored, which the solitary Italian thinker Vico alone recognized with clearness and comprehensiveness of vision to be necessarily the chief scene of the self-revelation of God—began with Lessing and Herder to be generally seen in its true religious light. The comparative or historical method of study has created two disciplines or sciences, comparative theology and Biblical theology,—which are both largely occupied with tracing the development of the idea of God. The ethical spirit of the age has so told on its religious teaching that to no generation save that to which the gospel was originally given has the Divine fatherhood been so distinctly set forth as to the present. Dogmatic theology, especially in Germany, has been earnestly active ; and its chief repre- sentatives have laboured so to amend and advance the doctrine concerning God that it may satisfy the new requirements which have arisen.

sion made on the general mind by the brilliant discoveries of the founders of modern astronomy, chemistry, and other physical sciences. Bishop

Berkeley showed how an em- pirical philosophy might be logically evolved into a theistic immaterialism, Hume how it might be logically dissolved

It is now necessary briefly to indicate the present state of thought Present on the chief points and problems of theism. state of

As to the origin, then, of our actual idea of God, that, it is seen, thought. can only be the whole religious history of man which precedes it, Origin of and the whole religious nature of mau which underlies that history. idea of lt is absurd to refer exclusively to any faculty, intuition, or feeling, God.

Nine- ‘teenth sentury.

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into an agnostic nihilism.

In the 16th, 17th, and 18th centuries mysticism had many representatives, several of whom, as, e.g., Weigel, Ottingen, Swedenborg, and especially Jacob Boehme, are entitled to a considerable place in any detailed history of theism. To the eyes of Boehme God revealed Himself from without and within in the most real and intimate manner. In the powers, antagonisms, and conjunctions of creation he saw the energies, struggles, and victories of the creative Spirit itself; in the constitution and opera- tions of physical and human nature, the essential constitu- tion and necessary processes of the Divine nature. His thoughts of God were in striking contrast to those of the deists and natural theologians of the 17th and 18th cen- turies, and strikingly anticipated those of a Schelling, Hegel, and Baader in the 19th century. Could Sweden- borg’s doctrine of correspondences be verified, our means of insight into the character of God would be largely extended.

The 19th century is sufficiently far advanced to allow us to see that a new epoch even in the history of theisin began near its commencement. The revolution in philo- sophy initiated by Kant has profoundly affected theistic thought. It has introduced that type of agnosticism which is what is most original and distinctive in the antitlieism of the present age, and at the same time stimu- lated reason to undertake bolder inquiries as to the Divine than those which Kant prohibited. The enlarged and deepened views of the

universe attained through the dis- coveries of recent physical science have rendered incredible the idea of a God remote from the world, irresistible the

1 Saisset, in the first part of his Modern Pantheism has some- what elaborate studies on (1) the theism of Descartes, (2) God in the system of Malebranche, (8) the pautheism of Spinoza, and (4) the theism of Leibnitz. Huber (1854) and Elvenich (1865) have written Special treatises on the Cartesian proofs of the Divine existence. Among the most thorough studies of Spinoza are those of Camerar, Pollock, and Martineau. Herder, Voigtlinder, and others have maintained that he was a theist, not a pantheist. On the Théodicée of Leibnitz there are three excellent papers by Prof. Torrey in the Andover Rev. for October, November, and December 1885. The best

general history of philosophy is Kuno Fischer's; the best history of Cartesianism F, Bouiltier's.

any revelation or instruction, any person or event, what can be traced in growth and formation through thousands of years, and can be shown by facts and documents to have been influenced by all the chief causes which have made history what it is. The history of the idea of God is the centre of all history, both explained by and explaining it; and our nineteenth-century idca of God is the result of the entire historico-psychological process which has produced the culture and religion of the 19th century. The idea of God is what it now is because God's whole guidance of man and man's whole searcli for God, the whole economy and evolution of things and the whole constitution and development of thought and feeling, have been what they have been from the beginning of history to the present time. Anthropology, comparative psycho- logy, the science of language, comparative theology, Biblical theo- logy, the history of philosophy, and the history of Christian doctrine, have all been engaged in attempting to discover the factors and stages of the vast and complex process which has resulted in the accepted idea of God; and, by their separate and conjunct endeavours, they have succeeded in casting great light on all parts of the process.

As to the absolute historical origin of theism—as to where, when, and how the theistic conception of the Divine first obtained recog- nition among men —a definitive answer has not yet been reached. But the labour expended on

the problem has not been wasted. It has made clearer the nature of the inquiry, rendered apparent the unsatisfactoriness of previous solutions, opened up glimpses of divers ways by which men have been led to belief in the unity of God, and accumulated means and materials for future and probably more successful work.

The question as to the psychological origin of theism cannot be wholly separated from that as to its historical origin. Unless theism can be shown to be the primitive form of religion, it cannot be held to have liad an entirely peculiar and distinct psychological origin, but must be viewed as simply a phase or development of religion. It cannot be said that there is as yet agreement as to the psychological origin, or as to the psychological constitution even, of religion. ‘The hypothesis of a simple impartation of the knowledge of God and spiritual things through primitive revelation, or through instruction and tradition which go back to the first appearance of man on earth, still retains a hold on certain conser- vative minds, but has received no confirmation from modern science and discovery, and is plainly of its very nature inadequate.

God being conceived to be what man would wish himself to be; Schleiermacher has argued that a feeling of absolute dependence, of pure and complete passiveness, is our evidence for the presence of an infinite energy, an infinite being; Mansel has represented the feeling of dependence and the conviction of moral obligation as the sources of the religious consciousness; Pfleiderer represents reli- gion as a response to the sense of conflict and contradiction between man’s feelings of dependence and of freedom; Rauwenhoff traces its origin to respect (Achtung), the root also of moral conduct and of family life; others have referred it to specific ethical feelings; and many have represented it to be essentially love. The number of these attempts and the diversity of these results are cxplained by the complexity of religious feeling. In religion all the feelings which raise man above the merely animal condition are involved. Man is not religious by any one feeling or by a few feelings, but by the whole constitution of his emotional nature. His heart, with all its wealth of feelings, has been made for God. Hence all the theories referred to have easily been shown to be

one-sided, and to have exaggerated the significance and influence in religion of particular emotional elements, but hence also they all contain more or less important portions of the truth, and have all contri- buted towards a knowledge of the full truth. Man is not only, however, disposed by all his chief sentiments for religion, but all these sentiments, when normally and healthfully developed, tend towards theism. It is only in a theistic form of religion that they can find true rest and satisfaction. One God can alone be the object of the highest devotional fear, can alone be regarded as ideally perfect, or as a being on whom the worshipper is absolutely dependent, can alone be loved with the whole heart and esteemed with undivided reverence, can alone be recognized as the sole author of the moral law, the alone good. The theories which trace the origin of religion to feeling have the merit of recognizing that religion is not an affair of mere intellect; that the Divine could not even be known by men if they had not feelings and affections as well as intellectual powers; that, if God be love, for example, He can only be known by love; that, if He have moral attributes, we must have moral feelings in order to be able to recognize them. On the other hand, in so far as those theories represent religion as reducible to mere feeling or as independent of intellect, they have the fault of overlooking that all the feelings included in religion presuppose apprehensions and judgments, and are valid only in so far as they have the warrant of intelligence. It is as much an error, however, to account for religion by any one intellectual principle as by any one emotional element. Religion has no one special seat, such as ‘‘ the central point of unity behind conscious- ness,” imagined by Schleiermacher; no ‘‘ special organ,” such as ‘*conscience ” was supposed to be by Schenkel; and no one special principle of cognition, such as the law of causality has been repre- sented to be by several philosophers and theologians, All the ultimate principles of cognition are involved in religion, and all lead, if consistently followed far enough, to theism. The whole head as well as the whole heart has been made for religion, and for the perfect form of religion. Max Miiller, in his Hibbert Lectures, traces the idea of God to a special faculty of religion—‘‘ a subjective faculty for the apprehension of the infinite,” ‘‘a mental faculty, which, independent of, nay, in spite of, sense and reason, enables man to apprehend the infinite under different names and under varying disguises.” This view will not bear, perhaps, a close scrutiny. The infinite, as an implicit condition of thought, is not more involved in

religious than in other thought. We cannot think anything as finite without implying the infinite. Space cannot be thought of except as extensively, nor time except as pro- tensively, infinite. As a condition of thought, the infinite is in- volved in religious knowledge only so far as it is involved in all knowledge. On the other hand, as an explicit object of thought, it is not present in the lower forms of religion at all, which exist only because the thought of infinity is not associated in the religious consciousness with that of Dcity, except where reflexion is some- what highly developed; and, even in the highest stages of religion, it is only apprehended as one aspect of Deity. Infinity is not God, but merely an attribute of the attributes of God, and not even an exclusively Divine attribute. The hypothesis that the idea of God is gained by intuition or vision is proved to be erroneous by the fact that the idea of God, and the process by which it is reached, are capable of being analysed, and therefore not simple, and like- wise by the variety and discordance of the ideas of God which have been actually formed. The apprehension of God seems to be only possible through a ‘process which involves all that is essential in the human constitution—will, affection, intelligence, conscience, reason, —and the ideas which they supply—cause, design, goodness, infinity, &c. These are so connected that they may all be embraced in a single act and coalesce in one grand issue. During the last thirty years there has been more psychological investigation as to the origin and nature of religion than during all previous history, and the whole tendency of it has been to set aside all solutions which represent man as religious only in virtue of particular senti- ments or principles, and to make manifest that the psychology of

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religion is that of the entire human nature ina special relationship. The best of the later investigations are much more thorough and comprehensive than any of earlier date.?

The agnosticism originated by Kant has been one of the distinc- Kantian tive and prominent phenomenain the history of religion and theism agnostj- during the 19th century. It sprang out of an earlier agnosticisin. cism, Hume and his predecessors admitted that the conditions of thought —otherwisc, the categories of experience or ideas of reason—were in appearance

necessary and objectively valid, but in reality only arbitrary and subjective, their seeming necessity and objectivity being illusory, and consequent on mere repetitions and accidental associations of sensations and feelings. Kant showed that they were not only scemingly but really necessary to thought, and irresolvable into the particular in experience. He denied, however, that we are entitled to consider them as of more than subjective applicability,—that what we necessarily think must necessarily be, or be as we think it. He affirmed all knowledge to be confined to experience, the phenomenal, the conditioned. It was quite in accordance with this view of the limits of knowledge that he should have denied that we can know God, even while he affirmed that we cannot but think of God. It was by no means in obvious harmony with it that he should have affirmed that we must, on moral grounds, retain a certain belief in God. Sir W. Hamilton and Dean Mansel followed Kant in holding that we can have no knowledge of God in Himself, as knowledge is only of the relative and phenomenal. They strove to show that the notions of the unconditioned, the infinite, the absolute, arc mere negations of thought, which destroy themselves by their mutual contradictions and by the absurdities which they involve. Yet both of these philosophers held that there is a revclation of God in Scripture and conscience, and that we are bound to believe it, not indeed as teaching us what God really is, but what He wishes us to believe concerning Him. Herbert Spencer, adopting Kant's theory of the limits of knowledge, and regarding as decisive Hamilton and Mansel's polemic against the philosophies of the Absolute, has concluded that the only truth underlying professed revelations, positive religions, and so-called theological sciences is the existence of an unknowable and unthinkable cause of all things. In the view of the Positivist the unknowable itself is a metaphysical fiction. The Kantian doctrine has had a still more extensive influence in Germany than in Britain, and German philosophers and theologians have displayed great ingenuity in thcir endeavours to combine with it some sort of recognition of God and of religion.

Fries, De Wette, and others have relegated religion to the sphere of faith, Schleiermacher and his followers to that of feeling, Ritsch] and his school to that of ethical wants, F. A. Lange to that of imagination, &c. Their common aim has been to find for piety towards God a special place which they can fence off from the rest of human nature, so as to beable to claim

for religion independence of reason, speculation, and science, a right to existence even although necessarily ignorant of the object of its faith, feeliug, moral sense, or phantasy.” ; :

The movement indicated has led to no direct conclusion which has obtained, or is likely to obtain, general assent. It has had, however, a very important indirect result. It has shown how interested in, and dependent on, a true criticism or science of cognition are thcism and theology. It has made increasingly manifest the immense significance to religion of the problem as to the powers and limits of thought which Kant stated and discussed with so much vigour and originality. Hence research into what ; the Germans call “die erkenntnisstheoretischen Grundsitze’’—the philosophical bases—of theism has been greatly stimulated and : advanced by the movement. This is an enormous gain, which I more than compensates for sundry incidental losses. Kant’s solu- tion of the problem which he placed in the foreground of philosophy } has not been found to be one in which the mind can rest. From | his agnosticism down to the very empiricism which it was his aim to refute descent is logically inevitable. The agnosticism of piety has in no form been able to discover a halting place,—a spot on

1 Among recent disquisitions as to the psychological origin of the religious consciousness and the conception of God may be specified—Pfleiderer’s in last ed. of his Religionsphilosophie; Biedermann’s in last ed. of his Dogmattk; W. Hermann’s in his Die Religion im Verhdltniss zum Welterkennen und zur Sittlich- keit, 1879; Kaftan’s in his Das Wesen der chr. Religion, 1881; Lipsius’s in his Philosophie und Religion, 1885; and Rauwenhoff’s in his ‘‘Ontstaan van den Godsdienst,” Theol. Tijdschr., May 1885.

2 Among works in which it is denicd that the real nature of God can be known arc—Kant’s Kr. d.r. V.; Fichte’s Kr. aller Offenbarung ; Schleicrmacher’s Reden, Dialekttk, and Glaubenslehre; Trendelenburg’s Log. Untersuchungen, ii. | §§ xx.-xxiv.; Hamilton’s Lect. on Met., and Discussions ; Manse?s Bampton Lect., and Philosophy of the Conditioned; H. Spencer’s First Principles: and the writings of Lange, Ritschl, and other Neo-Kantists. Among works in which the real cog- noscibility of God is affirmed are—Calderwood’s Ph, of the Infinite; C. Hodge’s Sys. Th., i.;

M‘Cosh’s Int. of the Mind, Phil. Series, &c.; H. B. Smith’s Jntr. to Ch. Th., and Futth and Philosophy; Maurice’s What is Revelation ?; Young’s Province of Reason; and Harris’s Phil. Bases of Theism. See also L. Robert, De la Certitude, &c., 1880; Ollé-Laprune, De la Certitude Morale, 1880; G. Derepas Les Théortes de I’ Inconnaissable, 1883 ; G. Matheson, in Can the Old Faith Live with the New?, 1885; R.T. Smith, Man’s Knowledge of Man and of God, 1886; ieee Die Erkennbarkett Gottes, 1876; and Bertling, Die Erkennbarkett Gottes,

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d _ Philo- | sophy of the Ab- solute.

THE iS ™

which to raise theism or any solid religious constrnction. In no form has it been able to prove its legitimaey, to maintain its self- consistency, or to defend itself successfully against the agnosticism of unbelief. It is, therefore, not surprising that it should have been very generally regarded as dangerous to theism in reality, even when friendly to it in intention. Yet there is mueh in the theory of cognition on which it proceeds which the theist can utilize. Indeed, no theory of cognition can afford a satisfactory basis to theism which does not largely adopt and assimilate that of Kant. He has conclusively shown that all onr knowledge is a synthesis of contingent impressions and necessary conditions; that without the latter there can be neither sense, understanding, nor reason; that they constitute intelligence, and are the light of mind; that they also pervade the whole world of experienee and illuminate it; that there is neither thing nor thought in the uni- verse which does not exhibit them in some of their aspects; that apart from them there can be no reality, no truth, no science. The agnostic corollaries appended to this theory by Kant and others, instead of being necessary consequences from it, are ineon- sistent with it. Kant and the agnostics say that we know only the eonditioned; but what they prove is that we know also the conditions of thought, and that these conditions are themselves unconditioned, otherwise they would not be necessary. They affirm that we can know only the phenomenal and relative, but what they establish is that it is as impossible to know only the relative and phenomenal as to know only the absolute and noumenal, and that in so far

as we know at all we know through ideas which are absolute and noumenal in the only intelligible, and in a very real and important, sensc. They maintain, what is very true, if not a truism, that the categories are only valid for experience, and they imply that.this is because experience limits and defines the cate- gories, whercas, according to their own theory, it is the categories which condition experienec and enter as constituents into all experience, so that to say that the categories are only valid for experience means very little, experience merely existing so far as the categories enable us to have it, and being valid so far as the categories are legitimately applied, although not farther, which leaves no more presumption against religious experience than against sensible experience. They have denied the objective validity of the categories or necessary conditions of thought. This denial is the distinctive feature of all modern agnosticism; and the theist who would vindicate the reality of his knowledge of God, the legi- timacy of his belief in God, the worth of his religious experience, inust refute the reasonings by which it has been supported; show that consciousness testifies against it, the subjectivity of any true category being unthinkable and inconceivable; and indicate how its admission must subvert not only the foundation of theology but of all other seienees, and resolve them all into castles in the air, or into such stnff as dreams are made of. In the accomplishment of this task as much guidanee and aid may be found, perhaps, in the theories of cognition of Ferrier and Rosmini as from those of any of the Germans; but Hegel and his followers, not a few of the Herbartists, Ulrici, Harms, and many other German thinkers, have contributed to show the falsity of the critical theory at this point. Amended here, it is a theory admirably fitted to be the corner-stone of a philosophical theism.

More may be attempted to be done in the region of the necessary and unconditioned. The conditions of thought, the categories of expcrience, the ideas of reason are all linked together, so that each has its own place and is part of a whole. And of what whole? The idea of God. All the metaphysical categories are included therein, for God is the Absolute Being ; all the physical categories, for He is Absoluto Force and Life; all the mental categories, for He is Absolute Spirit; all the moral categories, for He is the Absolutely Good. The idea of God is the richest, the most inclusive, the most comprehensive, of all ideas. It is the idea of ideas, for it takes up all

other ideas into itself and gives them unity, so that they constitute a system. The whole system issues into, and is rendered organic by, the idea of God, which, indeed, contains within itself all the ideas which are the conditions of human reason and the gronnds of known existence. All sciences, and even all phases and varieties of human experience, are only developments of some of the ideas included in this supreme and all-compreliensive idea, and the developments have in no instance exhausted the ideas. Hence in the idea of God must be the whole truth of the universe as well as of the mind. These sentences are an attempt to express in the briefest intelligible form what it was the aim of the so-called philosophy of the Absolute to prove to be not only true, but the truth. Tegel and Schelling, Krause and Baadcr, and their associates, all felt themselves to have the one mission in life of making manifest that God was thus the truth, the light of all knowledge, self-revcaling in all science, the sole object of all philosophy. The Absolute with which they occupied themselves so earnestly was no abstraction, no fiction, such as Hamilton and Mansel supposed it to be,—not the wholly indeter-minate, not that which is ont of all relation to everything or to anything, not the Unknowablc,—but the ground ofall relationship,

the foundation alike of existence and of thought, that which it is not only not impossible to know, but which it is impossible not to know, the knowledge of it being implied in all knowledge. Hegel expressed not only his own conviction, but the central and vital thought of the whole anti-agnostic movement whieh culminated in him when he wrote, ‘‘ The object of religion is, like that of philo- sophy, the eternal truth itself in its objective existence: it is God, and nothing but God, and the explanation of God. Philosophy is not a wisdom of the world, but a knowledge of the unworldly ; not a knowledge of outward matter, of empirical being and life, but knowledge of that which is eternal, of that which is God and which flows from His nature, as that must manifest and develop itself. Hence philosophy in explaining religion explains itself, and in explaining itself explains religion. Philosophy and religion thus coincide in that they have one and the same object.” The adherents of the philosophy of the Absolute must be admitted to have fallen, in their revulsion from agnosticism, into many extra- vagances of gnosticism ; but a theist who does not sympathize with

their main aim, and even aceepts most of the results as to which they are agreed, cannot be credited with having much philosophical insight into what a thorough and consistent theism unplies. A God who is not the Absolute as they understood the term, not the Unconditioned revealed in all that is conditioned, and the essential content of all knowledge at its highest, cannot be the God either of a profound philosophy or a fully-developed religion. The philosophy of tle Absolute was, on the whole, a great advance towards a philosophical theism.!

And yet it was largely pantheistic, and tended strongly towards pantheism. This was not surprising. Any philosophy which is in thorough earnest to show that God is the ground of all existence and the condition of all knowledge must find it difficult to retain a firm grasp of the personality and transcendence of the Divino and to set them forth with due prominence. Certainly some of the most influential representatives of the philosophy of the Absolute ignored or misrepresented them. The consequence was, however, that a band of thinkers soon appeared who were animated with the most zealous desire to do justice to these aspects of tho Absolute, and to-make evident the one-sidedness and inadequaey of every pantheistic conception of the Divine. This was the common aim of those who gathered around the younger Fichte, and whose literary organ was the Zeitschrift fiir Philosophie. Chalybius, K. Ph. Fischer, Sengler, Wceisse, Wirth, and Ulrici may be named as among the ablest aud most active. The Roman Catholic Giinther and his followers worked in mueh the same spirit. Lotze has effectively co-operated by his ingenious defence of the thesis that ‘‘ perfect personality is to be found only in God, while in all finite spirits there exists only a weak imitation of personality ; the finiteness of the finite is not a productive condi- tion of personality, but rather a limiting barricr to its perfect development.” This movement also, then, has tended to develop and contributed to enrich the theory of theism. Its special mis- sion has been to prove that theism is wider than pantheism, and can include all the truth in pantheism, while pantheism must necessarily exclude truth in theism essential to the vitality and vigour both of religion and of morality.?

The philosophy of the Absolute, judged of from a distinctly theistic point of view, was defective on another side. It regarded too exclusively the necessary and formal in thought, trusted almost entirely to its insight into

the significance of the categories and its powers of rational deduction. Hence the idca of the Divine which it attained, if vast and comprehensive, was also vague and abstraet, shadowy and unimpressive. Correction was needed on this side also, and it came through Schleiermacher and that large company of theologians, among whom Lipsius and Ritschl are at present the most prominent, who have dwelt on the importance of proceed- ing from immediate personal experience, from the direct testimony of pious feeling, from the practical needs of the moral life, &c. From these theologians may be learned that God is to be known, not through merce intellectual cognition, but through spiritual experience, and that no dicta as to the Divine not verifiable in experience, not efficacious to sustain piety and to promote virtue, to elevate and purify the heart, to invigorate the will, to ennoble

1 On the doctrine of God propounded by the philosophers of the Absolute may be consulted the histories of philosophy by Chalybaéus, Michelet, Erdmann, Ueberweg, K. Fischer, Harms, Zcller, &c., also Piinjer, ii. bks. 3 and 5; the chapters in Pfleidcrer on Schelling, Hegel, Neo-Schellingianism, and Neo- Hegelianism; Dorner's Hist. of Prot. Th., ii. 257, 395; Lichtemberger's Hist. des Idées Religieuses en Allemagne, &c., passim; Ehrenhaus's Hegel's Gottesbegrig, &c.; Franz on Schelling's Positive Philosophie; Opzoomer's Leer van God, bY Krause; K.Ph. Fischer's Characteristik der Theosophice Baaders ; &c.

2 See art. ''Theismus," by Ulrici, in Herzog's Real-Encyklopadie, xv. As representing this phase of theism the following works may be named :—C. H. Weisse's Idee der Gottheit, 1844, and Philosophische Dogmatik, 1855; Wirth's Speculative Idee Gottes, 1845; Sengler''s Idee Goties, 1845-47; J. H. Fichtc's Speculative Theologie, 1846-47 ; Hanne's dee der absoluten Persdnlichkett, 1867 ; Ulrici's Gott u. die Natur, 1875; and Lotze's Microcosmos, ii. ix. 4-5 (Eng. tr.). The school is well represented in America by Prof. Bowne. See his Studies in Theism, especially ch. 7-9. See also art. of Prof. J. S. Candlish on '' The Personality of God," in Princeton Rev., Sept. 1884, and of Gardiner on ' Lotze's Theistic Philosophy," in Presby. Rev., Oct. 1885.

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the character, to sanctify both individuals and communities, are likely to be true. Experience of the Divine can be the richest and surest experience only if it not merely implies all that is absolute and necessary in consciousness and existence, but is also confirmed and guaranteed by all that is relative and contingent therein. What are known as ‘‘ the proofs” for the Divine existence have from the time of Kant to the present been often represented as sophistical or useless. This view is, however, less prevalent than it was. During the last twenty years the proofs have been in mueh greater repute, and have had far more labour expended on them, than during the previous part of the century. Thcy have, of course, been considerably modified, in conformity with the general growth of thought and knowledge. For instance, they are no longer presented elaborately analysed into series or groups of syllogisms. It is recognized that the fetters which would assuredly arrest the progress of physical and mental science cannot be favourable to that of theology. It is recognized that the validity of the proofs must be entircly dependent on the truthfulness with which they indicate the modes in which God reveals Himself, the facts through which man apprehends the presence and attributes of God, and that, therefore, the more simply they are stated the better. Man knows God some- what as he knows the minds of his féllow-men—namely, inferen- tially, —yet through an experience at once so simple and so manifold that all attempts at a syllogistic representation of the process must necessarily do it injustice. The closeness and character of the con- nexion of the proofs have also come to be more clearly seen. They are perceived to constitute an organic whole of argument, each of which establishes its separate element, and thus contributes to the general result—confirmatory evidence that God is, and complemen- tary evidence as to what God is. The explanation of this doubtless is that the apprehension of God is itself an organic whole, a complex and harmonious process, involving all that is essential in the human mind, yet all the constituents of which are so connected that they may be embraced in a single act and coalesce into one grand issue. The cosmological argument concludes from the existence of the

mological world as temporal and contingent, conditioned and phenomenal,

argu- ment.

to the existence of God as its one eternal, unconditioned, self- existent cause. It is an argument which has been in no respect discredited by recent research and discussion, which is in substance accepted not only by theists but by panthcists, and which forms the basis even of the philosophy of Herbert Spencer. The principle on which it proceeds—the principle of causality—has only come to be more clearly seen to be ultimate, universal, and necessary. The hypothesis of an infinite series of causes and effects has not had its burden of irrationality in the least diminished. The progress of science has not tended to show that the world itself may be reason- ably regarded as eternal and self-existent ; in the view of theists it has only tended to render more probable the doctrine that all physical things must have their origin in a single non-physical cause. The necessity of determining aright the bearings of the new views reached or suggested by seience as to the ultimate constitution of matter, the conservation of energy, cosmic evolution, the age and duration of the present physical system, &c., has been the chief factor in the latest developments of the argument a contingentia mundi. The teleological argument, whieh concludes from the regularities and adjustments, preconformities and har- monies, in nature that its first cause must be an intelligence, has been both corrected and extended owing to recent advauccs of seience and especially of biological science. The theory of evolu- tion has not shaken the principle or lessened the force of the argument, while it has widened its scope and opened up vistas of grander design, but it has so changed its mode of presentation that already the Bridgewater Treatises and similar works are to some extent antiquated. Perhaps the most promising of the later applications of the argument is that which rests on the results obtained by a philosophical study of history, and which seeks to show that the goal of the evolution of life, so far as it has yet pro- ceeded, is the perfecting of human nature, and the eternal source of things a power which makes for truth and righteousness. The ethical argument—the proof from conscience and the moral order— held a very subordinate place in the estimation of writers on natural theology until Kant rested on it almost the whole weight of theism. It has ever since been prominent, and has been the argument most relied on to produce practical

conviction. Much importance is now rarely attached to those forms of the metaphysical argument which are deduetions from a particular conception, as, ¢.g., of a perfect being. Ignorance alone, however, can account for the assertion often met with that the argument is generally abandoned. It has only been transformed. It has passed from a stage in which it was presented in particular ontological forms into one in which it is set forth in a general epistemological form. As at present maintained it is to the effect that God is the idea of ideas, the ultimate in human thought, without whom all thought is confusion and self- contradiction. In this form, by what theologians and religious philosophers possessed of much speculative insight is it not held ??

ae pea ole Ee ee 1 See the present writer's 7heism, and the indications of the literature given in the notes.

THEISM

The changes adopted in the methods of theistic proof have all tended in one direction, namcly, to remove or correct extreme and exaggerated conceptions of the Divine transcendence and to produce a true appreciation of the Divine immanence,—to set aside deism and to enrich theism with what is good in pantheism. The general] movement of religious speculation within the theistic arca has been towards mediation between the extremes of pantheism and of deism, towards harmonious combination of the personal self-equality and the universal agency of the Divine. Positive science has power- fully co-operated with speculation in giving support and impulse to this movement. While the modern scientific view of the world does not result in pantheism, it affords it a partial and relative justification, and requires a theism which, while maintaining the personality of God, recognizes God to be in all things and all things to be of God, through God, and to God. It may be said that theism has always thus recognized the Divine immanence. The vague recognition of it, however, which precedes scientific insight and the conquest and absorption of pantheism is not to be identified with the realizing comprehension of it which is their result.?

As to the further treatment of the idea of God in recent or con- The idea temporary theology, the following may be mentioned as, perhaps, of God the chief distinetive features :—first, the general endeavour to in eon-

present the idea as a harmonious reflex of the Divine nature and tempo- life, instead of as a mere aggregate of attributes ; secondly, and rary consequently, the greater care shown in the classification and theology

correlation of the attributes, so as to refer them to their appropriate places in the one great organic thought; and, thirdly, the more truly cthical and spiritual representation given of the Divine character. To realize the nature and import of the first of these features it is only necessary to compare the cxpositions given of the idea of God in the works of such theologians as Nitzsch, Thomasius, Dorner, Philippi, Kahnis, and even more in those of the represen- tatives of German speculative theism, with such as are to be found in the treatises of Hill, Watson, Wardlaw, and Hodge, which, although published in the present century, express only the views of an earlier age. As to the second point, there has of late been a vast amount of thought expended in endeavouring so to classify and co-ordinate the attributes, and so to refer them to the various moments of the Divine existence and life, as that God may be able to be apprehended both in His unity and completeness, self-iden- tity and spiritual richness, as one whole harmonious and perfect personality. Of the work attempted in this direction our limits will not allow us to treat. In regard to the third feature, any one who will peruse an essay like Weber's Vom Zorne Gottes, or Ritschl's De Ira Dei, and compares the way in which the Biblical conception of the wrath of God is there presented with the mode of exhibiting it prevaleut for so many ages, is likely to be convinced that considerable progress has been made even in recent times in the study of the moral aspects of God's character. That the Divine glory must centre in moral perfection, in holy love, is a thought which is undoubtedly being realized by all theists with ever-increas- ing clearness and fulness.*

It follows from the above that theistic thought has been moving Advance in a direction which could not fail to suggest to those influenced by of trini- it that a rigidly unitarian conception of God must be inadequate, tarian and that the trinitarian conception might be the only one in which theism.

reason can rest as self-consistent. So long as the simplicity of the Divine nature was conceived of as an abstract self-identity, intelligence could not venture to attempt to pass from the unity to the trinity of the Godhead, or

hope for any glimpse of the pos- sibility of harmoniously combining them. But, this view of the simplieity of the Divine nature having been abandoned, and an idea of God attained which assigns to Hiin all the distinctions com- patible with, and demanded by, completencss and perfection of personality, the doctrine of the Trinity neccssarily entcred on a new stage of its history. The free movement of thought in this century, far from expelling it from its place in the mind of Christendom, has caused it to strike deeper root and grow with fresh vigour. Never since the Nicene age has theological speculation been so actively occupied with the constitution of the Godhead, and with the trinitarian representation thereof, as from the commencement of the present century. It is, of course, impossible here to describe any of the attempts which, during this period, have been made to show that the absolute Divine self-consciousness implies a trinitarian form of existence, and that intelligently to think the essential Trinity is to think thosc moments in the Divine existence without whieh personality and self-consciousness are unthinkable ; or that a worthy conception of Divine love demands a trinitarian mode of life; or that a world distinct from God presupposes that God as triune is in and for Himsclf a perfect and infinite world, so that

2 See the extremcly interesting papers by Peabody, Montgomery, Howison, andjHarris in the Journal of Speculative Philosophy for Oct. 1885, on the ques- tion, ‘‘Is Pantheism the Legitimate Outcome of Modern Science?” Also F. E. Abbot’s Scientific Theism, 1885; and J. Fiske’s Idea of God as affected by Modern Knowledge, 1885.

3 Bruch, Lehre von den Géttl. Eigenschaften, 1842; Moll, De Justo Attributorum Det Discrimine, 1855. Both are, however, already inadequate.

Position of uni- tarian theism.

Man’s interest in the

| idea of | God,

Growth

of the idea in

| specula-

tive thought,

Ya eis M

His attributes and activities already fully realized inthe trinitarian life can proceed outwards, not of necessity but of absolute freedom ; or that the whole universe is a manifestation of His triune nature, and all finite spiritual life a reflexion of the archetypal life, self- sustained and self-fulfilled therein. All the more thoughtful trinitarian divines of tle present endeavour to make it apparent that the doctrine of the Trinity is not one which has been merely imposed upon faith by external authority, but one which satisfies reason, gives expression to the self-evidencing substance of reve-lation, aud explains and supports religious experience. If it be thought that their success has not been great, it has to be remcem- bered that they have been labouring near the conimeneement of a movement, and so at a stage when all individual efforts can have only a very limited worth. Toone gencral conclusion they all seem to have come, namely, that the idea of God as substance is not the only idea with which we can connect, or in which we may find implied, tri-personality. The category of substance is, in some respects, one very inapplicable to God, as the philosophy of Spinoza has indirectly shown. If the theologians referred to be correct, the doctrine of the Trinity is not specially dependent upon it. In their view God canuot be thouglit of-consistently as, e.g., Absolute Life, Absolute Intclligence, or Absolute Love, unless He be thought of in a trinitarian manner.

While trinitarian theism has thus during the present century shown abundant vitality and vigour, it cannot be said to have gained any decided victory over unitarian theism. The latter has also within the same period spread more widely and shown more practical activity, more spiritual life, than inany formerage. The unitarianism represented by a Martineau is a manifest advance on that which was represented by a Priestley. Theism in its nnitarian form is the creed of very many of the most cultured and most religious minds of our time, alike in Europe and America. In this form it has also signally shown its power in contemporary India. Brahmoism is, perhaps, the most remarkable example of a unitarian theism which exhibits all the characteristics of a positive faith and a churchly organization. The

unitarian theism of the present age is distinguished by the great variety of its kinds or types. None of these, it must be added, are very definite or stable. Hence unitarian theism is often seen to approximate to, or become absorbed into, agnosticism or pantheism, cosmism or humanitari- anism. This may be due, however, less to its own character than to the character of the age. :

The mind of man has clearly not yet ceased to be intensely interested in thoughts of God. There are no grounds apparent for supposing that it will ever cease to seek after Him or to strive to enlarge its knowledge of His ways. And, if the idea of God be what has been suggested in the foregoing pages, the search for God cannot fail to meet with an ever-growing response. If the idea of God be the most comprehensive of ideas, inclusive of all the cate- gories of thought and implicative of their harmonious synthesis and perfect realization, all thought and experience must of its very nature tend to lead onwards to a fuller knowledge of God. For the knowledge of God, on this view, consists in no mere inference reached through a process of theological argumentation, but in an ever-growillg apprehension of an ever-advancing self-revelation of God; and all philosophy, science, experience, and history must necessarily work together to promote it.

All speculative thought, whether professedly metaphysical or professedly theological, is conversant with ideas included in the idea of God. It deals with what is necessary in and to thought ; and within that sphere, notwithstanding many aberrations, it has made slow but sure progress. The history of philosophical specu- lation is not only, like the whole history of man, essentially rational, but it is, in substance, the history of reason itself in its purest form,—not the record of an accidental succession of opinions, but of the progressive apprehension by reason of God’s revelation of Himself in its own constitution. ‘There is mueh in the history of speculative thought, jnst as in the outward life of man, that belongs to the accidental and irrational—errors, vagaries, paradoxes, whimsicalities, assuming in all ages the name and the guise of philosophy. But, just as the student of the constitutional history of England can trace, amidst all the complexity and contingency of outwarl and passing events, through successive times and dynasties, underneath the waywardness of individual passion and the

struggle for ascendency of classes and orders, the silent, steady development of that system of ordcred frecdom which we name the constitution of England, so, looking back on the course which human thought has travelled, we shall be at no loss to discern beneath the surface change of opinions, unaffected by the abnormal displays of individual folly and unreason, the traces of a continuous onward movement of mind.”? And this continuous onward move- ment is towards the clearer and wider apprehension of the whole system of ultimate truths which is comprehended in the idea of the Absolute Truth. The thoughts of men as to God are necessarily

1 Goblet d’Alviella, Contemporary Evolution of Religious Thought tn England, America, and India, 1885.

? Principal Caird, Progressiveness of the Sciences, pp. 27-28, Glasgow, 1875.

enlarged by increase of insight into the conditions of their own thinking. The disquisitions of merely professional theologians on the nature and attributes of God have done far less to elucidate the idea of God than the pliilosophical views of great speculative thinkers, and would have done less than they have actually accom- plished were it not for the guidance and suggestion found in these views.

The sciences co-operate with speculative philosophy and with one another in aiding thought to grow in the knowledge of God. The greatness, the power, the wisdom, the goodness, of the God of creation and providence must be increasingly apprchended in the measure that nature and its course, humanity and its history, are apprehended ; and that measure is given us in the stage of develop- ment attained by the sciences. ‘‘God’s glory in the heavens,” for example, is in some degree visible to the naked eye and uninstrueted intellect, but it becomes more perceptible and more impressive with every discovery of astronomy. Not otherwise is it as regards all the sciences. Eaeh of them has its distinctive and appropriate contribution to bring towards the completion of the revelation of God, and cannot withhold it.

But the idea of God is not one which can be rightly apprehended merely through intellect speculatively exercised or operating on the findings of science. Itrequires to be also apprehended through moral experience and the discipline of life. Neither individuals nor communities can know more of God as a moral being than their moral condition and character permit them to know. The appre- hension of God and the sense of moral distinctions and moral obli- gations condition each other and correspond to each other. History shows us that sincere and pious men may receive as a supernaturally revealed truth the declaration that God is love, and yet hold that His love is very limited, being real only to a favoured class, and that He has foreordained, for His mere good pleasure, millions of the human race to eternal misery. How was such inconsisteney possible? Largely because these men, notwithstanding their sincerity and piety, were lacking in that love to man through experience of which alone God's love can be truly apprehended. In like manner, it is not only the science of law which cannot advance more rapidly than the sense of justice, but also theology so far as it treats of the righteousness of God. Thus the knowledge of God is conditioned and influenced by the course of man's moral experience.

The same may be said of the distinctively religious experience. In it also there has been a continuous discovery and a continuous dis- closure of God. It is not long since the ethnic religions were very generally regarded as merely stages of human folly, so many monu- ments of aversion to God and of departure from the truth as to God. It was supposed that they were adequately described when they were called ''idolatrics" and ''superstitions." This view rested on a strangely unworthy conception both of human nature and of Divine providence, and is fast passing away. In its place has come the conviction that the history of religion has becn essen- tially a process of search for God on the part of man, and a proccss of self-revelation on the part of God to man, resulting in a eontinu- ous widening and deepening of human apprehension of the Divine. All, indeed, has not been progress in the history of religion either in the ethnic or Christian period ; much has been the reverse ; but all stages of religion testify that man has been seeking and finding God, and God making Himself known unto man.

But, while knowledge of God may reasonably be expected un- ceasingly to grow, in all the ways which have been indicated, from more to more, it is not to be supposed that doubt or denial of God's existence must, therefore, speedily disappear. Religious aguos- ticism cannot fail to remain long prevalent. The very wealth of contents in the idea of God inevitably exposes the idea to the assaults of agnosticism. All kinds of agnosticism merge into agnosticism as to God, from the very fact that all knowledge implies and may contribute to the knowledge of God. The more comprehensive an idea is from the more points can it be assailed, and the idea of God, being comprehensive of all ultimate ideas, may be assailed through them all, as, for example, through the idea of being, or of infinity, or of causality, or of personality, or of rectitude. 'Then, in another way, the unique fulness of the idea of God explains the prevalence of agnosticism in regard to it. The ideas are not precisely in God what they are in man or nature. God is being as man or nature is not; for He is independent and necessary being, and in that sense the one true Being. God is not limited by time and space as creatures are; for, whereas duration and extension merely are predicates of creatures, the corresponding attributes of God are eternity and immensity. God as first cause is a cause in a higher and more real sense than any seeond cause. So as to personality, intelligence, holiness, love. Just because the idea of God is thus elevated in all respects, there are many minds which fail or refuse to rise up to it, and which because of its very truth reject it as not true at all. They will not hear of that Absolute Truth which is simply the idea of God; but that they reject it is their misfortune, not any argument against the truth itself, (iis 185)

XXIII. — 22

Contribu- tious of seienee ;

of moral experi- enee ;

of re- ligious experi- enee,

Coming struggles with ag- nosticism.

THEMIS, the Greek mythological personification of custom. In Homer the word occurs both in the singular and in the plural (themistes), with the sense of “ custom,” ‘unwritten law.” But even in Homer Themis is also spoken of as a goddess who, at the command of Zeus, calls the gods to an assembly and summons or disperses the assemblies of men. But after all she is a thin abstraction, a faint shadow, by the side of the full-blooded gods of Olympus. Hesiod furnished her with a pedigree (making her the daughter of Sky and Earth), and married her to Zeus, by whom she became the mother of a brood of well- bred abstractions, —Legality, Justice, Peace, the Hours, and the Fates. Pindar, no doubt with a full sense of her abstract nature, speaks of her as the assessor of Zeus. In one passage (Prom., 209) Aischylus seems to regard her as identical with Earth, and “ Earth-Themis ” had a worship and priestess at Athens, where Athene also appears with the surname Themis. There was a tradition that the oracle at Delphi had first been in the hands of Earth, who transferred it afterwards to Themis, who in turn gave it up to Apollo. Themis had temples at Athens, Thebes, Tanagra, and Epidaurus. At Olympia she had an altar, and at Trcezen there was an altar of the Themides (plural of Themis). In modern writers Themis sometimes stands as a personification of law and justice,—an idea much more abstract and advanced than the original sense of ‘“ tradi- tional custom.”

THEMISTIUS, named ecidpadyjs, or “the well-lan- guaged,” was a rhetorician and philosopher of the latter half of the 4th century. Of Paphlagonian descent, he settled and taught at Constantinople. Thence he sas called to Rome, but, after a short stay in the West, returned to the Eastern capital, where he resided during the rest of his life. Though a pagan, he was admitted to the senate by Constantius in 355. He was prefect of Constantinople in 384 on the nomination of Theodosius. ‘Themistius’s paraphrases of Aristotle’s Posterior Analytics, Physics, and De Anima are deservedly esteemed; but weariness and disgust are the sentiments stirred by the servile orations in which he panegyrizes successive emperors, comparing first one and then another to Plato’s “true philosopher,” and, when all other compliments have been exhausted, to the “idea” itself. (See Reiske, quoted with approval by Dindorf in the preface to his edition: ‘‘ Fuit aulicus adu- lator et versipellis, vanus jactator philosophic sue, specie magis quam re culte, ineptus et ridiculus vexator et appli- cator Homeri et veteris

histori, tautologus et sophista ; in omnibus orationibus pene eadem, et ubique argutice longe petite.”) Themistius’s paraphrases of the De Celo and of book A of the Metaphysics have reached us only through Hebrew versions.

The first edition of Themistius’s works (Venice, 1534) included the paraphrases and eight of the orations. Ninetecn orations were known to Petavius, whosc editions appeared in 1613 and 1618. Harduin (Paris, 1684) gives thirty-three. Another oration was discovered by Angelo Mai, and published at Milan in 1816. The most recent editions are W. Dindorf’s of the orations (Leipsic, 1832) and L. Spengel’s of the paraphrases (Leipsic, 1866). The Latin translations of the Hebrew versions of the paraphrases of the De Calo and book A of the Metaphysics were published at Venice in 1574 and 1558 respectively. Sce Fabricius, Bibliotheca Greca, vi. 798 sq.

THEMISTOCLES was born in the latter part of the 6th century B.c., some time during the rule of the Pisistratids at Athens, the son of an Athenian father, Neocles, by a foreign woman from Thrace or Caria. A wayward, ambitious, aspiring boy, out of sympathy alike with ordinary boyish amusements and with the learning and culture of the age, he was told, it is said, by his schoolmaster “ that he would certainly be something great, whether good or bad.” The victory of Marathon in 490 stirred the young man’s soul, and he seems to have foreseen that it was but

the beginning of a yet greater conflict. He resolved from that time to make his country great, that he might be great and famous himself. As he was rising to political distine- tion, he had for his rival the Greek “ Cato,” the incorrupt- ible Aristides, a purer patriot, a better citizen, but a less sagacious and far-seeing statesman, The two men were in sharp antagonism as to what their country’s policy should be, and it ended in a vote of ostracism which sent Aristides into temporary banishment in 483. The main question between them probably was whether Athens should seek greatness by sea or by land (see vol. xi. p. 99), and the victory of the policy of Themistocles led on to the most brilliant era in Greek history, the maritime supremacy of Athens. Persia, he felt sure, was meditating a great revenge, and Athens must make herself a naval power to avert the blow. Already a small war with the Avginetan islanders, close to her own shores, had roused her

energies, and at the prompting of Themistocles she had built 200 ships and trained a number of seamen. In 480 the storm which Themistocles had clearly foreseen burst ; the great king, as he was called, was covering the land with his troops and the sea with his ships. Greece was divided and panic- stricken; Thessaly and all to the north of Bceotia had joined the enemy, and the despair of the remainder of the Greek world was echoed by the oracle of Delphi. There was, however, a word of hope in the memorable phrase of the ‘ wooden wall,”! which, it was generally felt, must point to the fleet, more, however, with a view to flight than tv resistance. Salamis, too, was named in the oracle, coupled with the epithet “divine,” which Themistocles cleverly argued portended disaster to the enemies of the Greeks rather than to the Greeks themselves. It was a great achievement when he finally prevailed on his fellow- citizens to quit their city and their homes—it seemed for ever—-and to trust themselves to their ships. There had been some sea-fights off the northern shores of Eubca; the Spartans had fallen at Thermopylx, and Xcrxes and his host were now laying waste Attica, not, however, before its inhabitants had conveyed their families to the adjacent island of Salamis, where also the Greek fleet had taken up its station, the Persian armada of 1200 vessels being in harbour at Phalerum. The Athenians from their ships saw the flames in which their city, its acropolis and its temples, were perishing, but their spirits rose with calamity, and with one heart, at the bidding of Themis- tocles, they called back all of their brethren who were in temporary banishment, Aristides among them. Nearly two- thirds of the entire fleet was theirs, but for the sake of unity among the allies, who would follow only the lead of Sparta, they acquiesced in its being under the command of a Spartan admiral. It was clear, however, that the fate of Greece now depended on the action of the Athenians and on the prudence and ability of Themistocles, by whom they were guided. The Greeks of the Peloponnese, more particularly the Corinthians, were for moving the ficet from Salamis to the isthmus, as the euemy’s land forces were already in possession of the neighbouring shores of Attica. Seeing the danger of yet further disunion, with the probable result of the breaking up and dispersion of the fleet, and having in vain protested against quitting their present station, Themistocles went straight to the Spartan admiral, Eurybiades, and induced him to call another council. There was much angry debating, till at last the Spartan felt he must yield to the threat of Themistocles that the Athenians would either fight at Salamis or

sail away as they were to Italy. But the Peloponnesian Greeks were still dissatisfied, and insisted that they ought to be at the isthmus for the defence of what yet remained

1 “The wooden wall shall alone remain unconquered to defend you and your children:” :

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of Greece ; a third council was held, and Themistocles felt that its decision would be against him, when, by a sudden

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happy thought, he contrived to have a secret message ~ conveyed to the commanders of the Persian fleet through |

his slave, an Ionian Greek from Asia, a man of intelligence

and education, and well acquainted with the Persian |

language. The communication came in the name of Themistocles, who professed that he wished well to the king, and that now was a good opportunity for attacking and crushing the Greeks, as they were divided among themselves and were bent on flight. The stratagem was successful, and the enemy’s great armada advanced along the coast of Attica that same night, and took up a posi- tion which effectually confined the Greek fleet within the narrow! strait between Salamis and the southern shore of Attica. The Greek captains, not knowing the state of the ease, were still wrangling through the night, when just before daybreak the banished Aristides came from AXgina with the news that the Persian fleet was close at hand and that retreat was impossible. ‘Let us still be rivals,” he said to Themistocles, ‘‘ but let our strife be which can best save our country.”

The great victory of Salamis (see vol. xi. p. 100) left Greece mistress of the sea, and was followed by the retreat of Xerxes. Themistocles, it is said, frightened the king back to Asia by another secret message, to the effect that the victorious Greeks were bent on following him up to the Hellespont

and burning his bridge of boats, but that he was doing his best to check their ardour, though in reality he had himself advised immediate pursuit of the enemy. We cannot but admire the man's sagacity and far- sightedness in thus laying the king under an obligation which he might some day turn to his own profit, though we cannot but feel that he had some of the worst as well as some of the most splendid characteristics of the Greek. After the victory Themistocles sailed with the Athenian

squadron through the Augean, and from some of the islanders | who had sided with the enemy he exacted heavy fines, out |

of which, it appears, he filled his own purse. When the Greeks met at the isthmus to decide according to custom the prizes of merit for the glorious day of Salamis, he re- ceived only the second prize, the first being awarded to the Spartan admiral, but by way of compensation he was soon afterwards heartily welcomed at Sparta, and loaded with honours so extraordinary as to imply that even the Spartans themselves recognized him as the first man in Greece. It was not long, however, before he gave them deadly offence. After the victories of Platwa and Mycale in 479 the Athen- ians went back to their desolate city and began to rebuild and fortify it. Jealous fears of the growing power of Athens were awakened, and the Spartans, as representatives of the Greeks generally, formally protested against the fortifica- tion of a Greek city outside the Peloponnese, on the ground that some future Persian invader might make it a base of operations. Themistocles saw the dangers of Spartan oppo- sition, and got the Athenians to commission him to arrange matters along with two other envoys, who, however, were purposely not allowed to arrive at Sparta at the same time as himself. He told the Spartan magistrates that before he could transact business with them he must wait for his colleagues ; meanwhile Athens was being fortified, every man, woman, and child putting a hand to the work, and as soon as Themistocles understood that it was sufficiently ad- vanced he declared openly that Athens would brook no sort of interference. The Spartans felt they had been tricked, but they could do nothing. And now Themistocles pro- ceeded to fortify Pirzeus, and to enlarge the harbour, thus providing Athens with an excellent naval dockyard, and holding out an inducement to foreigners to settle in the * Not more than a quarter of a mile wide in its narrowest part.

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| table.

city for the purposes of trade. Twenty war ships, too, were at his suggestion to be built every year, and nothing left undone to make Athens prosperous and powerful.

A few years afterwards (in 471 probably) we find his political career terminated by a vote of ostracism, due perhaps in part to Spartan influence at Athens, and also to an offensive boastfulness and ostentation which disgusted the sensitive Athenian democracy. He was even charged with corrupt practices and with receiving bribes from Persia. From Argos, whither he had retired as an exile, he was forced to flee by a threat of the Spartans, who alleged that they had proofs of his treasonable com- plicity in the schemes of their countryman Pausanias, and to take refuge in the island of Corcyra; but here again he was pursued by Spartan and Athenian commissioners, and driven to seek the protection of Admetus, king of the Molossians, the chief people of Epirus. In the court of this half-Greek half-barbarian prince he found a hospitable reception, and he was furnished with the means of crossing the Augean to Ephesus. Shortly after his arrival in Asia, the son of Xerxes, Artaxerxes, succeeded to the throne of Persia, and to him Themistocles contrived to make himself known as a fugitive from ungrateful Greece, which he had saved, and now ready and willing to advise and assist the king in avenging his father’s defeat. He was treated, it is said, with marked respect, and was liberally pensioned with the revenues of three wealthy towns—Magnesia, Myus, and Lampsacus. It was at the first of these, which was near the coast, and whence he might be supposed to have opportunities for watching the affairs of Greece, that he passed the last year of his life, dying a natural death at the age of 65. The year of his death is not accurately ascertainable ; opinions vary between 460 and 447.

Herodotus, Thucydides, and Plutarch are our chief original sources for the life of Themistocles. The subject is fully treated in the histories of Grote and Thirlwall. (W. J. B.)

THENARD, Louis Jacquus (1777-1857), was born on the 4th of May 1777, at Louptiére, near Nogent-sur-Seine, in Champagne. His father, though a poor man, sent him to the academy of Sens, where he received a liberal edu- cation. At the age of sixteen he went to Paris to study pharmacy. He attended the lectures of Fourcroy and Vauquelin, and saw that the only way to learn chemistry was to work at it. Vauquelin, himself a poor man, ad- mitted a few students to his laboratory on payment of a fee of 20 francsa month. But this fee was prohibitory to the peasant's son ; the utmost that his father could send him just kept him alive in Paris. Thénard went to Vau- quelin and asked to be allowed to do any menial work for him, if only he would let him assist in his laboratory. One of Vauquelin's sisters had slipped into the room and heard part of the conversation ; she said to her brother, '" He is a good lad; you should keep him ; he will help you in the laboratory, and look after our pot aw few; your dandy assistants always let it boil." Thénard was engaged on these terms. Long afterwards he said that he looked upon the chemistry of the pot au few and the process of sim- mering as of very great importance: they had been the turning-point of his life. Thénard assisted Vauquelin in the laboratory and at his lectures, and, when by starving for a day or two he accumulated sous enough to pay for a seat in the gallery, used to go to the theatre to improve his pronunciation and rub off his rustic accent.

By and by Vauquelin gave him an opportunity of testing his powers as a lecturer. Having to go for some days to the country, he asked Thénard to take his place. For the first two or three lectures his attention was fixed on his work, and his eyes did not wander from the lecture On the fifth day he ventured to look round the

| room, when to his consternation he saw Fourcroy and

Vauquelin among the audience. They were so satisfied with what they had heard that they obtained for Thénard in 1797 an appointment as teacher of chemistry in a school, and in 1798 the post of repétiteur at the Hcole Polytechnique.

In 1804 Vauquelin resigned the professorship of chemistry at the Collége de France, and successfully used his influence to have Thénard appointed. In 1810 he succeeded Fourcroy both as professor of chemistry at the Ecole Polytechnique and as member of the Academy. He was also appointed professor of chemistry in the faculty of the sciences. He was made a chevalier of the Legion of Honour in 1814, commander in 1837, and grand officer in 1842. In 1825 Charles X. gave him the title of baron ; from 1827 to 1830 he represented the department of Yonne in the chamber of deputies. In 1832 Louis Philippe made him a peer of France. As vice-president of the conseil supérieure de linstruction publique, he exercised a great influence on scientific education in France. He died 21st June 1857, and was buried at La Ferte, near Chalon-sur- Saéne. In 1861 a statue was.erected to him at Sens, and in 1865 the name of his native village was changed to La Louptiére-Thénard. Thénard was tall and strongly built, his hair was thick and black, his eyes bright, and his manner active and prompt. He married, in 1810, Mlle. Humblot, granddaughter of Conté. His wife and several of his children predeceased him. He was survived by his son Paul, who had assisted him in some of his later researches.

Thénard was above all things a teacher : as he himself said, the professor, the assistants, the laboratory, every- thing, must be sacrificed to the students. The history of his discovery of the peroxide of hydrogen well illustrates the predominance of the teacher in his character. He was lecturing on the formation of salts, and had told his students that a metal must be oxidized to a certain extent in order that it may combine with an acid to form a salt ; if the metal be combined with more than the proper quantity of oxygen, the excess of oxygen will be given off when the oxide is treated with an acid, and, as an illus- tration, he mentioned the action of acids on peroxide of barium. As he spoke his conscience smote him, for the experiment had not been made. Immediately after lecture he mixed peroxide of barium and nitric acid, keeping the temperature low by means of ice. He was surprised to see the peroxide dissolve without any evolution of gas. He left the mixture standing, and next day, before lecture, noticed small bubbles of gas rising from it. Pour- ing some of the liquid into a test-tube and warming it, he saw a large amount of gas escape, which he easily recog- nized as pure oxygen. At first he thought the acid had been oxidized, but he soon saw the true explanation of the phenomena, and discovered the peroxide of hydrogen. His lecture experiments were few, well-chosen, and accur- ately performed. If any failure occurred he would roundly scold his assistant, often apologizing for his vehemence when the short fit of anger was over. His. lecture room, seated for 1000, was almost always crowded by eager and attentive students and visitors.

Like most great teachers, Thénard published a text-book, and perhaps we may say that by his Traité de Chimie Elémentaire, Théorique et Pratique (4 vols., Paris, 1813-16; 6th ed., 5 vols., 1833-86) he did even more to further the progress of the science than by his numerous and important original discoveries. His first original paper (1799) was on the compounds of arsenic and antimony with oxygen and sulphur. Careful analyses led him to conclusions as to the composition of the metallic oxides contra- dictory of some of Berthollet’s theoretical views; he also showed (1802) that Berthollet’s “zoonic acid” was impure acetic acid. Berthollet, far from resenting these corrections from a younger man, took this opportunity of introducing himself, and invited Thénard to become a membcr of the “Société d’Arcueil,” to the proceedings of which Thénard contributed

important papers. Soon after his appointinent as repétiteur at the Ecole Polytechnique

Thénard made the acquaintance of Gay-Lussac, and formed with. him a lifelong friendship. Their joint work, and its relation to

the discoveries of Davy, have been fully recorded in the article Gay-

Lussac. Of his separate investigations perhaps the most important

is that on the compound ethers, begun in 1807. He showed that

each acid gives its own ether, and that the acid and alcohol can be

recovered by decomposing the ether by means of caustic alkali.

His discovery of peroxide of hydrogen (1818) has already been

described. His researches on scbacic acid (1802) and on bile (1807)

also deserve special notice. The blue substance known as Thénard's

blue (essentially aluminate of cobalt) was prepared by him in. response to a demand by Chaptal for a cheap blue, as bright as

ultramarine, and capable of standing the tempcrature of the porce-

lain furnace.

Thénard's researches were chiefly published in the Annales de Chimie et de Physique, in the Memotres de la Société d' Arcueil, and in the Comptes Kendus and the Afemotres of the Academy of Sciences. (A. C. B.)

THEOBALD, Lewis (1688-1744), will survive as the prime butt of the original Dunciad when as a playwright, a littérateur, a translator, and even as a Shakespearean commentator, he will be entirely forgotten. The son of an attorney, Theobald was born at Sittingbourne, in Kent, in 1688, and, after

a moderate education at Isleworth, studied for the profession of law,—a profession, however, which he never practised. He was a man with literary impulses, but without genius, even of a superficial kind; as a student, asa commentator, he might have led a happy and enviable life, had not the vanity of the literary idea led him into a false position. His Persian Princess (1711) and his Klectra (1714) gained no distinction. In 1726 The Double Falsehood had a certain vogue, partly from Theobald's pretence that the greater part of the play was by Shakespeare. In 1717 hecommenceda series of papers (not to 'The Censor," as has sometimes been stated, but under that title) which appeared in Mist's Weekly Journal ; these do not seem to have been highly thought of by his contemporaries, but they were successful in gaining for Theobald not a few enemies, among whom Dennis may be named. Seven or eight years later Theobald's cen- sorious tendencies had intensified rather than moderated, and in 1726 he ventured to attack the most eminent literary man of the day in his Shakespear Restored, or a Specimen of the many Errors as well committed as unamended by Mr Pope in his edition of this Poet. Two years later the censor was himself castigated severely, and, as the dedicatee of The Dunciad, he had long an unenviable notoriety ; as readers of the famous satire will remember, he occupied the place of chief victim until replaced by Colley Cibber in 1743. In the matter of Shakespeare editing, however, he had the advantage of his powerful rival. When in 1733 Theobald published his edition of Shakespeare in seven volumes, that of Pope had to go to the wall. Lewis Theobald wrote other dramas besides those already men- tioned, and translated plays from Sophocles and Aristo- phanes, besides a rendering of Plato's Phedo and a part translation of the Odyssey ; but for none of these things is he nowremembered. The student of English history might find it worth while to glance through Theobald's Life of Raleigh (1719). He died in 1744.

For plays, &c., see the Biographia Dramatica, vol. i.

THEOCRITUS, of Syracuse, the foremost Greek pas- toral poet, lived a life of which nothing is known except from allusions in his own works. The epigram appended to his poems makes him say, "'I ama Syracusan, a man of the people, a son of Praxagoras and Philinna." He must have been born early in the 3d century, among a Dorian people, whose Dorian speech survives in his rural idyls. These "little pictures" chiefly represent the life of

shepherds, neat-herds, and fishermen in the woods and on the shores of Sicily. They are doubtless inspired by the popular poetry of his time, and have much in common with the Romaic chants of the modern Greek shepherds. The first idyl is a song on Daphnis, the ideal

lover.

THE—THE

herdsman, sung by the shepherd Thyrsis to a goatherd. | The second is the magical chant which Simetha pours forth to the magic moon, in the hope of recovering her In the third a goatherd sings to his love, Amaryllis. The fourth is an interchange of rude banter between two country fellows; and the fifth is of the same kind. The scenes are in southern Italy. The sixth is a Sicilian singing match between two ideal herdsmen,—not contemporary rustics, but poets of nobler themes. The scene of the seventh is in Cos, where the poet introduces himself at a singing match. He may have been attached to the Asclepian medical school in Cos ; his friend Nicias was a physician. Sicily and rival minstrels occupy the ninth idyl. The tenth contains probably some real popular ditties, chanted by the reapers. The eleventh, addressed to Nicias, is a piece of artificial mythological genre, “The Cyclops in Love.” The twelfth is a lyric, almost of passionate affection. The thirteenth is another idyl on a mythical topic, the adventures of Hercules and Hylas. The fourteenth and fifteenth are sketches of military and urban life, the mercenary soldier in love, and the gathering at the Adonis feast in Alexandria. Theo- critus had wandered to the court of Ptolemy, and joined the literary society of his court. The sixteenth is a patriotic piece: the poet urges Hiero to assail the Carthaginians in Sicily. The seventeenth is a conven- tional hymn to Ptolemy Philadelphus on his marriage with his sister. The eighteenth is an epithalamium ; the nineteenth a tiny picture of Eros stung by a bee; the twentieth is the complaint of a herdsman rejected by a girl of the town; the twenty-first an idyl of fisher life: two poor old fishermen recount their dreams. The twenty-second idyl is a piece of heroic myth, the adven- tures of Castor and Polydeuces; and the twenty-fourth is a tiny epic on the infancy of Hercules. The twenty-third is an amorous complaint. The twenty-fifth describes the slaughter by Hercules of the Neniean lion. The twenty- sixth justifies, in the interests of

the ritual of Dionysus, the murder of the curious Pentheus. The twenty-seventh is the ‘“ Wooing of Daphnis,” or “ Oaristys,” an amorous discourse between a girl and a swain. The twenty-eighth is a graceful piece of vers de société, sent to a lady with the gift of an ivory distaff. The twenty-ninth is amorous; and there remain an imperfect and a spurious piece, and a set of twenty-three epigrams.

Ona general view, Theocritus’s surviving poems turn out to be—(1) rural idyls, the patterns of Virgil’s eclogues, and of all later pastoral poetry ; (2) minute epics, or cabinet pictures from mythology; (3) sketches of contemporary hfe in verse ; (4) courtly compositions ; and (5) expressions of personal kindliness and attachment. The first category and the third are those on which the fame of Theocritus depends. His verse has a wonderful Doric melody ; his shepherds are natural Southern people: it is not his fault that what he wrote truly of them has become a false commonplace in the pastoral poetry of the North.

Of Theocritus’s own life we only know what has been recorded, that he lived in Syracuse, Cos, and Alexandria, and that he was acquainted with Nicias, with Aratus, the astronomical writer, and with Philinus, head of a school or sect of physicians, The rest is silence or conjecture. Suidas says that, in addition to the surviving poems, the Pretidx, the Hopes, IIymns, the Heroines, Dirges, Elegies, and Lumbics were attributed to him.

The charm of Theocritus can only be tasted in his original Dorie, but the best English version is by Mr C. S. Calverley. M. Couat’s book on the Alexandrine school of poetry may be re- commended. J. Hauler, De Theoc. Vita et Carminibus (Freiburg, 1855), Hempel, Quest. Theoc. (Kiel, 1881), and Rannow, Studia

Theocritea (Berlin, 1886), nay also be found useful. The best Eng- lish edition of the poems is that of Bishop Wordsworth. (A. L.)

THEODOLITE. See Surveyine. 7 THEODORA, the wife of the emperor JustTInran (¢.2.),

was born probably in Constantinople, though according to

some in Cyprus, in the early years of the 6th century, and died in 547. We shall first give the usually received ac- count of her life and character, and then proceed to inquire how far this account deserves to be accepted. According to Procopius, our chief, but by no means a trustworthy

authority for her life, she was the daughter of Acacius, a

bear-feeder of the amphitheatre at Constantinople to the

Green Faction, and while still a child was sent on to the

stage to earn her living in the performances called mimes.

She had no gift for either music or dancing, but made her-

self notorious by the spirit and impudence of her acting in

the rough farces, as one may call them, which delighted the crowd of the capital. Becoming a noted courtesan, she accompanied a certain Hecebolus to Pentapolis (in North

Africa), of which he had been appointed governor, and,

having quarrelled with him, betook herself first to Alex-

andria, and then back to Constantinople through the cities

of Asia Minor. In Constantinople (where, according to a

late but apparently not quite groundless story, she now

endeavoured to support herself by spinning, and may there- fore have been trying to reform her life) she attracted the notice of Justinian, then patrician, and, as the all-powerful nephew of the emperor Justin, practically ruler of the em- pire. He desired to marry her, but could not overcome the opposition of his aunt, the empress Euphemia. After her death (usually assigned to the year 523) the emperor yielded, and, as a law, dating from the

time of Constantine, forbade the marriage of women who had followed the stage with senators, this law was repealed. Thereupon Justinian married Theodora, whom he had already caused to be raised to the patriciate. They were some time after (527) admitted by Justin to a share in the sovereignty; and, on his death four months later, Justinian and Theodora became sole rulers of the Roman world. He was then about forty-four years of age, and she some twenty years younger. Procopius relates in his unpublished history (‘Avéxdora) many repulsive tales regarding Theodora’s earlier life, but his evident hatred of her, though she had been more than ten years dead when the Anecdota were written, and the extravagances which the book contains, oblige us to regard him as a very doubt- ful witness. Some confirmation of the reported opposition of the imperial family to the marriage has been found in the story regarding the couduct of Justinian’s own mother

Vigilantia, which Nicholas Alemanni, the first editor of

the Axnecdota, in his notes to that book, quotes from a

certain “ Life of Justinian” by Theophilus, to which he

frequently refers, without saying where he found it.

Since the article JUSTINIAN (q.v.) was published, the pre-

sent writer has discovered in Rome what is believed to be

the only MS. of this so-called life of Justinian ; and his examination of its contents, which he has lately published, makes him think it worthless as an authority. See article

THEOPHILUS. | Theodora speedily acquired unbounded influence over

her husband. He consulted her in everything, and allowed

her to interfere directly, as and when she pleased, in the government of the empire. She had a right to interfere, for she was not merely his consort, but empress regnant, and as such entitled equally with himself to the exercise of all prerogatives. In the most terrible crisis of Justin- ian’s reign, the great

Nika insurrection of 532, her courage and firmness in refusing to fly when the rebels were attack- ing the palace saved her husband's crown, and no doubt strengthened her command over his mind. Officials took an oath of allegiance to her as well as to the emperor (Wov.,

viil.). She even corresponded with foreign ambassadors,

and instructed Belisarius how to deal with the popes. Pro-

copius describes her as acting with harshness, seizing on trivial pretexts persons who had offended her, stripping some of their property, throwing others into dungeons, where they were cruelly tortured or kept for years without the knowledge of their friends. The city was full of her spies, who reported to her everything said against herself or the administration. She surrounded herself with cere- monious pomp, and required all who approached to abase themselves in a manner new even to that half-Oriental court. She was an incessant and tyrannical match-maker, forcing men to accept wives and women to accept husbands at her caprice. She constituted herself the protectress of faithless wives against outraged husbands, yet professed great zeal for the moral reformation of the city, enforcing severely the laws against vice, and immuring in a " house of repentance" on the Asiatic side of the Bosphorus five hundred courtesans whom she had swept out of the streets of the capital. How much of all this is true we have no means of determining, for it rests on the sole word of Procopius. But there are slight indications in other writers that she had a reputation for severity.

In the religious strife which distracted the empire Theodora took part with the Monophysites, and her coterie usually contained several leading prelates and monks of that party. As Justinian was a warm upholder of the decrees of Chalcedon, this difference of the royal pair excited much remark and indeed much suspicion. Many saw in it a design to penetrate the secrets of both ecelesiastical factions, and so to rule more securely. In other matters also the wife spoke and acted very differently from the husband ; but their differences do not seem to have disturbed either his affection or his confidence. The maxim in Constantinople was that the empress was a stronger and a safer friend than the emperor ; for, while he abandoned his

favourites to her wrath, she stood by her protégés, and never failed to punish any one whose heedless tongue had assailed her character.

Theodora bore to Justinian no son, but one daughter,— at least it would seem that her grandson, who is twice men- tioned, was the offspring of a legitimate daughter, whose name, however, is not given. According to Procopius, she had before her marriage become the mother of a son, who when grown up returned from Arabia, revealed himself to her, and forthwith disappeared for ever; but this is a story to be received with distrust. That her behaviour as a wife was irreproachable may be gathered from the fact that Procopius mentions only one scandal affecting it, the case of Areobindus. Even he does not seem to believe this case, for, while referring to it as a mere rumour, the only proof he gives is that, suspecting Areobindus of some offence, she had torture applied to this supposed paramour. Her health was delicate, and, though she took all possible care of it, frequently quitting the capital for the seclusion of her villas on the Asiatic shore, she died comparatively young. Theodora was small in stature and rather pale, but with a graceful figure, beautiful features, and a piercing glance. There remains in the apse of the famous church of St Vitale at Ravenna a contemporaneous mosaic portrait of her, to which the artist, notwithstanding the stiffness of the material, has succeeded in giving some character.

The above account is in substance that which historians of the last two centuries and a half have accepted and repeated regarding this famousempress. But it must be admitted to be open to serious doubts. Everything relating to the early career of Theodora, the faults of her girlhood, the charges of cruelty and insoleuce in her government of the empire, rest on the sole authority of the Anecdota of Proco- pius,—a book whose credit is shaken by its bitterness and extra- vagance. If we reject it, little is left against her, except of course that action in ecclesiastical affairs which excited the wrath of Baro- nius, who had denounced her before the Anecdota were published.

In favour of the picture which Procopius gives of the empress it may be argued (1) that she eertaiuly did interfere constantly and

arbitrarily in the administration of publie affairs, and showed her- self therein the kind of person who would be crue] and unserupul- ous in her choice of means, and (2) that we gather from other writers an impression that she was harsh and tyrannical, as, for instance, from the references to her in the lives of the popes in the Liber Pontificalis (which used to pass under the name of Atastasius, the papal librarian). Her threat to the person whom she com- manded to bring Vigilius toher was ‘‘ nisi hoc feceris, per Viventem in secula excoriari te faciam.” Much of what we find in these lives is legendary, but they are some evidence of Theodora’s reputa- tion. Again (8) the statute (Cod., v. 4, 23) which repeals the older law so far as relates to seentex mutlieres is now generally attributed to Justin, and agrees with the statement of Procopius that an alteration of the law was nade to legalize her marriage. There is therefore reason for holding that she was an actress, and, consider- ing what the Byzantine stage was (as appears even by the statute in question), her hfe cannot have been irreproachable.

Against the evidence of Procopius, with such confirmations as have been indicated, there is to be set the silence of other writers, contemporaries like Agathias and Evagrius, as well as such later historians as Theophanes, none of whom repeat the charges as to Theodora’s life before her marriage. To this consideration no great weight need be attached. It is difficult to establish any view of the controversy without a long and minute examination of the authorities, and in particular of the Anecdota. But the most probable conclusions seem to be—(1) that the odious details which Procopius gives, and which Gibbon did not blush to copy, deserve no more weight than would be given nowadays to the malignant scandal of disappointed courtiers under a despotic government, where scandal is all the blacker because it is propagated in secret (see Procopius); (2) that apparently she was an actress and a courtesan, and not improbably conspicuous in both those charae- ters; and (3) that it is impossible to determine how far the specific charges of cruelty and oppression brought against her by Procopins deserve credence. We are not bound to accept them, for they are uncorroborated ; yet the accounts of Justinian’s government given in the Anecdota agree in too many respects with what we know aliunde to enable us to reject them altogether; and it must be admitted that there is a certain internal consistency in the whole picture which the Anecdota present of the empress. About the beauty, the intellectual gifts,

and the imperious will of Theodora there can be no doubt, for as to these all our authorities agree. She i evidently an extraordinary person, born to shine in any station of life.

Her fortunes have employed many pens. Among the latest serious works dealing with them may be mentioned M. Antonin Débidour's L'Impératrice Theodora: Etude Critique, Paris, 1885, which endeavours to vindicate her from the aspersions of Procopius; and among more imaginative writings are Sir Henry Pottinger's interesting romance Blue and Green (Loudon, Hurst and Blackett, 1879), M. Rhangabé's tragedy Ocodwpa (Leipsic, 1884), and M. Sardou's play Theodora, produced in Paris in 1884. See also Dr I. Dahn's Prokopios von Cisarea, 1865. (J. BR.)

THEODORE or Mopsvgstia, the most eminent repre- sentative of the so-called school of Antioch, the beginnings of which date from about the middle of the 3d century (see Luctan and Pav or Samosata). He was born at Antioch about the middle of the 4th century, and was a friend of Chrysostom ; in rhetoric the celebrated Libanius was his teacher. Soon, however, he attached himself to the school of the great exegete and asce' -, Diodorus, a presbyter in Antioch, and, with only a transitory period of vacillation, he ever afterwards remained faithful to the theology and ascetic discipline of this master. Under Diodorus he became a skilful exegete, and ultimately the pupil outstripped the master in Biblical learning. About 383 Theodore became a presbyter in Antioch, and began to write against Eunomius the Arian and against the christology of Apollinaris. Soon after 392 he became bishop of Mopsuestia in Cilicia (the modern Missis near Adana). As such he was held in great respect, and took part in several synods, with a reputation for orthodoxy that was never questioned. It was greatly to his advantage that in the Eastern Church the period between the years 390 and 428 was one of comparative repose. He was on friendly terms even with Cyril of Alexandria. He died in 428 or 429, towards the beginning of the Nestorian controversy.

Theodore was a very prolifie writer, but, before all, an exegete.

He wrote commentaries on almost every book of the Old and New Testaments, of which, however, only a small proportion Is now

extant, as ata later period he lost eredit in the ehurch. We still possess in Greck his commentary on the Minor Prophets, and in Latin translations commentaries on the minor Pauline epistles, besides very many fragments, especially of that on the epistle to the Romans. Theodore's importance as an exegete lies in two ehar- acteristics :—(1) in opposition to the allegorical method he insists on getting at the literal meaning, and adheres to it when found; (2) in his interpretation of the Scriptures he takes into account the historical circumstances in which they were produced, and substi- tutes the historical-typological for the pneumatico-christological interpretation of prophecy; in other words, he interprets all Old Testament passages historically in the first instance, and sees the fulfilment of Old Testament prophecy in the history of Christ and His church only in so far as the entire Old Testament is a " shadow of things to come." Following his master Diodorus, who had already written a treatise Tis Stapopa Oewpias kal adAAnyopias, Theodore also was the author of a special dissertation against the allegorists, 7.¢., against Origen and his followers, which, however, has unfortunately perished. The comparative freedom of Theodore's view of inspiration is also noteworthy. He discriminates between historical, prophetical, and didactie writings, and in accordance with this distinction assumes varying degrees of inspiration. Finally, he entertained very bold opinions about the canon and several of the books included in it. He esteemed very lightly the Solomonie writings and the book of Job; Canticles he explained as a nuptial poem of Solomon's; the book of Job appeared to him in many places hardly worthy of its subject, and he censures the writer sharply; Chronicles, Ezra, and Nehemiah he entirely rejected; he denied the accuracy of the titles of the Psalms, and referred the so-called Messianic element almost invariably to the kings of Israel ; he even criticized the eatholic epistles and rejected the epistle of James. His commentaries contain a great deal of learned matter, and his grammatico-historical observations are still to some extent useful. But, on the other hand, his learning must not be over- estimated. It falls behind that of Origen, Eusebius, and Jerome, notwithstanding the superiority of his method. It is specially noticeable that Theodore troubled himself little about textual criticism. He simply accepts the text of the LXX. as that of

revelation, and never manifests the slightest effort to control it by the original or by the Syriac.

But in addition to his commentaries Theodore also wrote extensive dogmatico-polemieal works, which were destined to operate long after his death disastrously for his fame. As a disciple of Diodorus, Theodore accepted the Nicenc teaching on the Neciine of the Trinity, but at the same time in christology took up a position very closcly approaching that of Paul of Samosata. The violence of his opposition to his fellow countryman, Apollinaris of Laodicea, perhaps the most acute and far-seeing theologian of the century, made it necessary for Theodore to formulate his christology with precision (in fifteen books on the Incarnation—all lost except a few fragments—and in special treatises against Apollinaris). He held the Logos to have assumed a complete manhood, which had to pass through the stages of ethical development just as in the case of any other human being. In this the Logos only supported tiie man Christ Jesus, but was not essentially connected with him; the Logos dwelt in him (évoixety), but any such thing as €ywors Puch did not and could not exist, because the finite is not " capax infiniti," and because any €ywo1s would have destroyed the reality of the human nature. The same sober and thoughtful way of looking at things, and the same tendency to give prominence to the moral element, which characterize the commentaries of Theodore appear also in his dogmatic. When, accordingly, the Nestorian eontroversy broke out, his works also were dragged into the discussion. At Ephesus, indeed, the memory of Theodore does not appear to have been attacked,' but soon afterwards the assault began. Marius Mercator, Rabulas of Edessa, Cyril, and other monophysites brought the eharge of heresy against his writings, and sought to counteract their influence. But it was not until more than a eentury afterwards that his fanatical adversaries succeeded—in spite of the strong opposition of the best theologians of the West—in obtaining from Justinian the eondemnation of his works in the controversy of the Tria Capitula, as it is called; this act of the emperor was con- firmed by the fifth cecumenical eouncil, and Theodore's name was accordingly deleted from the list of orthodox writers. From that day Theodore's works ceased to be read within the Byzantine Church, and hence have becn lost. The Syrians, on the other hand, have always held in high esteem the memory of the great teacher, and

have even carried back their liturgy to his name. The Nestorians possess, or possessed, a very large number of writings by him in Syriac translations. 2

Theodore took part also in the Pelagian controversy at the time When it raged in Palestine. In the treatise, only partially pre- Served,? Tpds rods Adyovtas Piwe: Kal ob yvdun mralew Tods

1 A confession, however, drawn up by him was spoken of; see Yahn, Bibdvioth. der Symbole, 20 ed., p. 229 5q.

ts Sce the catalogue in Assemani, Bibl. Or., iii. 1, p. 3 sq.

3 Sce Photius, Biblioth., c. 177; Mercator, p. 339 sq., ed. Baluz.

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&v@p@movs, he sharply controverts the doctrine of original sin and Jerome its advocate. In his view the theory of Augustine is “a new heresy,” “a malady”; he regarded it as a doctrine which necessarily led to dualism and Manicheism. The attitude thus taken by Theodore is not surprising; he more nearly takes up the ground of the old church doctrine as set forth in the apologists and in the great Greek fathers of the 3d and 4th centuries. The Pelagians driven from the East were received by him in Cilicia.

A brother of Theodore, Polychronius by name, bishop of Apamea, also achieved fame as an exegete, and expounded the theology of the sehool of Antioch.*

Literature.—Migne, Patrol.,ser. Gr., xvi. The Greek fragments of Theodore’s New Testament commentaries have been collected by Fritzsche (Theod. Mops. in NV. T. Comm., Turin, 1847). The commentaries on the Pauline epistles (Pitra, Spic. Solesm., i. 49 sq.) have been recognized by Jacobi (Zischr. f. christl. Wissensch., 1854) and Hort (Journ. Class. and Sacr. Philol., iv., 1859, p. 802 sq.), and edited by Jacobi (Halle University Programm, 1855-60). They have also been edited very admirably by Swete (Theod, Mops. in Epp. B. Pault Comm., i., ii., Cambridge, 1880-82), along with the Greek fragments and the fragments of the dogmatical writings , on this edition, see Schiirer, 7’heol. Lit. Zig., 1880-82, The commentary on the

Minor Prophets will be found in Mai's Nov, Patr. Biblioth., vii. 1854 (Wegnern, Berlin, 1834; Mai, Script. Vet. Nov. Coll., vi., 1832). Sce also Sachau, T'heod, Mops. Fragm. Syriaca, Leipsic, 1869, and Bathgen, '"' Der Psalmen- commentar des Theod. v. Mops. in Syr. Bearbeitung," in Zéschr. J. ATliche Wissensch., v.53 sq. Extracts from the writings of Theodore occur in the Catene of Marius Mercator, in the Acta of the third and fifth cecumenical councils, in Facundus, Liberatus. and Theodore's chief-adversary, Leontius Byzantinus.

The principal monograph on Theodore, apart from the cxcellent prolegomena of Swete, is that of Kihn (72. v. Mops. u. Junilius Afric. als Exegeten, Freiburg, 1880). On his importance for the history of dogma, sce the great works of Baur and Dorner. Upon the Antioch school in general, compare Miinscher, Comment. de Schola Antioch., Copenhagen, 1811; Hergenréther, Die antioch. Schule, 1866; and Kihn, Die Bedeutung der anttoch. Schule, Kichstadt, 1866. Literary and biographical details will be found in Dupin, Tillemont, Cave, Fabricius, Noris, Garnier, Schréckh, Alzog; see also Fritzsche, De Theod, Mops. Vita et Scriptis, 1836; Sieffert. Theod. Mops. Vet. Test. Sobrie Interpr. Vind., Ratisbon, 1827; Klener, Symbol, Lit. ad, Theod. M. pertin., Gottingen, 1836; Specht, Theod. v, Mops. u. Theodoret, Munich, 1871; Kihn in the 7b. Quartalschr., 1879; Nestle in Theol. Stud. aus Wurtemb., ii. 210 sg. ; and Batiffol, " Sur une Traduction Latine de Th. de Mops.," in Ann. de Philos. Chrét,, 1885. (A. HA.)

THEODORE, the name of two popes. Theodore I, pope from November 642 till May 649, succeeded John IV. He was the son of a bishop, and was born in Jeru- salem.

THEODORET, bishop of Cyrus, and an important writer in the domains of exegesis, dogmatic theology, church history, and ascetic theology, was born in Antioch, Syria, about 390. At an early age he entered the cloister ; and in 423 he became bishop of Cyrus, or Cyrrhus, a small city between Antioch and the Euphrates, where, except for a short period of exile, he spent all the rest of his life. The date of his death is uncertain, but it must have been at least six or seven years later than the council of Chal- cedon (451). Although thoroughly devoted to the ideals of monasticism, he discharged

his episcopal duties with remarkable zeal and fidelity. He was diligent in the cure of souls, labouring hard and successfully for the conversion of the numerous Gnostic communities and other heretical sects which still maintained a footing within the diocese. He himself claims to have brought more than a thousand Marcionites within the pale of the church, and to have destroyed many copies of the Diatessaron of Tatian, which were still in ecclesiastical use ; and he also exerted himself to improve the diocese, which was at once large and poor, by building bridges and aqueducts, beautifying the town, and similar works.

As an exegcte Theodoret belongs to the Antiochene school, of which Diodorus of Tarsus and Theodore of Mopsuestia were the heads. He was not actnally the personal disciple of either, but he adopted their methods, though without the consistency and boldness of the first-named. . His extant commentaries (those on Canticles, on the Prophets, on the book of Psalms, and on the Pauline epistles—the last the most valuable) are among the best performances of the fathers of the church. ‘They are brief, yet not wanting in that element of practical edification on which Chrysostom lays special weight as characteristic of the Antiochenes. In addition to these complete commentaries, we have fragments of some others

(of that on Isaiah, for example), principally met with in catene. There are also special elucidations of some difficult Scripture texts.

4 See Bardenheucr, Polychronius, Freiburg, 1879.

Theodoret’s chief importance is as a dogmatic theologian, it having fallen to his lot to take part in the great monophysite- Nestorian controversy and to be the most considerable opponent of the views of Cyril and Dioscurus of Alexandria. For more than twenty years he maintaincd the struggle against the Alcxandrian dogmatic and its formule (cordkos, Evwois Kad iwéoractv, mia iméaracis, évwors vouwh, and the like), and taught that in the person of Christ we must strictly distinguish two natures (hypo-stascs), whieh are united indced iu one person (prosopon), but are not amalgamated in essence. For these years his history coincides with that of the Eastern Church from 430 to 451, and for this very reason it is

impossible to sketch it even briefly here (sce Hefele, Cone.- gesch., vol. ii.). The issue was not unfavourable to Theodoret's causc, but melancholy enough for Theodoret himself: the council of Chalcedon condemned monophysitism indeed, but he unhappily yielded to pressure so far as also to take part in pronouneing "anathema upon Nestorius, and upon all who call not the Holy Virgin Mother of God, and who divide the one Son into two." As Theodoret had previously been a constant defender of Nestorius, it was impossible for him to concur in this sentence upon his unfortu- nate friend with a clear conscience, and in point of faet he did not ehange his own dogmatic position. It is distressing, therefore, to find him in his subsequent Epitome classing Nestorius as a heretic, aud speaking of him with the utmost hostility. Some of Theo- doret's dogmatic works are no longer extant: of his five books Tlept evarOpwmhaews, for example, directed against Cyril after the council of Ephesus, we now possess fragments merely. A good deal of what passes under his name has been wrongly attributed to him. Certainly genuine are the refutation (Avatpown) of Cyril's twelve avabenariouol of Nestorius, and the 'Epaviorns, or MoAdpuopdos (written about 446), consisting of three dialogues, entitled respect- ively "Atperros, Acvyxuros, and Aradfs, in which the monophys- itism of Cyril is opposed, and its Apollinarian character insisted on. Among the apologetico-dogmatic works of Theodoret must be reckoned his ten discourses Hep) mrpovolas.

Theodoret gives a valuable exposition of his own dogmatic in the fifth book of his Afperixfjs naxouv0tas émirous, already referred to.! This, the latest of his works in the domain of church his- tory (it was written after 451), is a source of great though not of primary importance for the history of the old heresies. In spite of the investigations of Volkmar and Hilgenfeld, we are still some- what in the dark as to the authorities he used. The chief un- eertainty is as to whether he knew Justin's Syntagma, and also as to whether he had access to the Philosophumena of Hippolytus in their complete form. Besides this work Theodoret has aie left us a church history in five books, from 324 to 429, which was pub- lished shortly before the council of Chalcedon. The style is better than that of Socrates and Sozomen, as Photius has remarked, but as a coutribution to history the work is inferior in importance. It is probable that its author was acquainted with the labours of Socrates; he appears also to have used those of Philostorgius the Arian, but

not those of Sozomen. Something indeed still remains to be cleared up as to the sources he employed; apart, however, from some documents he has preserved, relating to the Arian con- troversy, he does not contribute much that is not to be met with in Socrates. He made a thorough study of the writings of Athanasius for the work. As regards chronology he is not very trustworthy ; on the other hand, his moderation towards opponents, not except- ing Cyril, deserves recognition. The ‘EAAnviKkav Oepamevtixy Tradnuatwv (De Curandis Grecorum A ffectionibus)—written before 438—is of an historical and apologetic character, very largely indebted to Clement of Alexandria and Eusebius; it aims at showing the advantages of Christianity as compared with Hellenism, and deals with the assaults of pagan adversaries. The supcriority of the Christian faith both philosophically and ethically is set forth, the chief stress being laid on monachism, with which heathen philosophy has nothing to conipare. Much prominence is also given to the cult of saints and martyrs.

On this side of his character, however, Theodoret can best be studied in the thirty ascetic biographies of his :Adcos foropia. This collection, which has been widely read, is a pendant to the Historia Lausiaca of Palladius and the monkish tales of Sozomen. For the East it has had the same importance as the similar writings of Jerome, Sulpicius, Severus, and Cassiauus for the West. It shows that the “sobriety” of the Antiochene scholars can be predicated only of their exegesis; their style of piety was as exaggerated in its devotion to the ideals of monasticism as was that of their mono- physite opponents. Indecd, one of the oldest leaders of the school, Diodorus of Tarsus, was himself among the strictest ascetics.

Nearly 200 letters of Theodoret have come down to us, partly in a separate eollection, partly in the Acta of the councils, and partly in the Latin of Marius Mercator; they are of great value not only

- Roman Catholie writers vary greatly in their estimate of Theodoret’s ehristology and of his general orthodoxy. On the latest essay on this subjeet, by Bertram (Theodoreti, Episcopi Cyrensis, Doctrina Christo- logica, Hildesheim, 1883), see Theol. Lit.-Ztung., 1883, 568 sq.

for the biography of the writer but also for the history of his

diocese and of the church in general.

The edition of Sirmond (Paris, 1642) was afterwards completed by Garnier (1684), who has also written dissertations on the autlior's works. Schulze and Nésselt published a new edition (6 vols., Halle, 1769-74) bascd on that of their predecessors; a glossary was afterwards added by Bauer. The reprint will be found in vols, Ixxx.-lxxxiv. of Migne, and considerable portions occur in Mansi.

Besides the earlier labours of Tillemont, Ceillier, Oudin, Du Pin, and Vabricius and Harless, see Schréckh, Atrchengesch., vol. xviii.; Hefele, Conc.-gesch., vol. ii.; Richter, De Theodoreto Epp. Paul, Interprete, Leipsic, 1822; Binder, Etudes sur Théodoret, Geneva, 1844; St&udlin, Gesch. u. Lit. der Kirchengesch., Hanover, 1827; Kihn, Die Bedeutung der antioch. Schule, 1866; Diestel, Das A. 7. in der christl. Kirche, Jena, 1869; Specht, Theodor v. Mopsvestia u. Theodoret v. Cyrus, Munich, 1871; Roos, De Theodoreto Clementis et Husebit Compilatore, Halle, 1883; Jecp, Quellenuntersuch. z. d. griech. Kirchenhistorikern, Leipsic, 1884; and Moller, art. "Theodorct," in Herzog-Plitt's Realencykl., vol. xv. (A. HA.)

THEODORIC, king of the Ostrogoths (c. 454-526). Referring to the article Gorus for a general statement of the position of this, the greatest ruler that the Gothic nation produced, we add here some details of a more personal kind. Theodoric was born about the year 454, and was the son of Theudemir, one of three brothers who reigned over the East Gotlis, at that time settled in Pannonia. The day of his birth coincided with the arrival of the news of a victory of his uncle Walamir over the sons of Attila. The name of Theodoric's mother was Erelieva, and she is called the concubine of Theudemir. The Byzantine historians generally call him son of Walamir, apparently because the latter was the best known member of tle royal fraternity. At the age of seven he was sent as a hostage to the court of Constan- tinople, and there spent ten years of his life, which doubt- less exercised a most important influence on his after career. Shortly after his return to his father (about 471) he secretly, with a comitatus of 10,000 men, attacked the king of the Sarmatians, and wrested from him tlie import- ant city of Singidunum (Belgrade). In 473 Theudemir, now chief king of the

Ostrogoths, invaded Meesia and Macedonia, and obtained a permanent settlement for his people near Thessalonica. Theodoric took the chief part in this expedition, the result of which was to remove the Ostrogoths from the now barbarous Pannonia, and to settle them as "'foederati" in the heart of the empire. About 474 Theudemir died, and for the fourteen following years Theodoric was chiefly engaged in a series of profitless wars, or rather plundering expeditions, partly against the emperor Zeno, but partly against a rival Gothic chieftain, another Theodoric, son of Triarius.2 In 488 he set out at the head of his people to win Italy from Odoacer. There is no doubt that he had for this enterprise the sanction of the emperor, only too anxious to be rid of so troublesome a guest. But the precise nature of the rela- tion which was to unite the two powers in the event of Theodoric's success was, perhaps purposely, left vague. Theodoric's complete practical independence, combined with a great show of deference for the empire, reminds us somewhat of the relation of the old East India Company to the Mogul dynasty at Delhi, but the Ostrogoth was sometimes actually at war with his imperial friend. The invasion and conquest of Italy occupied more tlian four years (488-493). Theodoric, who marched round the head of the Venetian Gulf, had to fight a fierce battle with the Gepide, probably in the valley of the Save. At the Sontius (Isonzo) he found his passage barred by Odoacer, over whom he gained a complete victory (28th August 489). A yet more decisive victory followed on the 30th September at Verona. Odoacer fled to Ravenna, and it seemed as if the conquest of Italy was complete. It was delayed, however, for three years by the treachery of Tufa, an officer who had deserted from the service of Odoacer, and of Frederic the Rugian, one of the com- panions of Theodoric, as well as by the intervention of the Burgundians on behalf of Odoacer. A sally was made

2 In one of the intervals of friendship with the emperor in 483 Theodorie was made master of the household troops and in 484 eousul.

from Ravenna by the besieged king, who was defeated in a bloody battle in the Pine Wood. At length (26th February 493) the long and severe blockade of Ravenna was ended by a capitulation, the terms of which Theodoric

disgracefully violated by slaying Odoacer with his own hand (15th March 493). See Opoacrr.

The thirty-three years' reign of Theodoric was a time of unexampled happiness for Italy. Unbroken peace reigned within her borders (with the exception of a trifling raid made by Byzantine corsairs on the coast of Apulia in 508). The venality of the Roman officials and the turbul- ence of the Gothic nobles were sternly repressed. Marshes were drained, harbours formed, the burden of the taxes lightened, and the state of agriculture so much improved that Italy, from a corn-importing, became a corn-exporting country. Moreover Theodoric, though adhering to the Arian creed of his forefathers, was during the greater part of his reign so conspicuously impartial in religious matters that a legend which afterwards became current represented him as actually putting to death a catholic deacon who had turned Arian in order to win his favour. At the time of the contested papal election between Symmachus and Laurentius (496-502), Theodoric's mediation was welcomed by both contending parties. Unfortunately, at the very close of his reign (524), the emperor Justin's persecution of the Arians led him into a policy of repri- sals. He forced Pope John to undertake a mission to Constantinople to plead for toleration, and on his return threw him into prison, where he died. Above all, he sullied his fame by the execution of Boetius and Sym- machus (see Borrius). It should be observed, however, that the motive for these acts of violence was probably political rather than religious,—jealousy of intrigues with the imperial court rather than zeal on behalf of the Arian confession. Theodoric's death, which is said to have been hastened by remorse for the execution of Symmachus, occurred on 30th August 526. He was buried in the mausoleum which is still one of the marvels of RavENNA (q.v.), and his grandson Athalaric, a boy of ten years, suc- ceeded him, under the regency of his mother Amalasuntha.

Genealogy of Theodorve.

THEUDEMIR = Erelieva. d. 474.

A first wife=Tazoporic=Audefleda,

ora 454-526. sister of Clovis, concubine. king of the Franks. 7 | : Ostrogotho Thcudegotho, AMALASUNTHA = Eutharic, (or Arevagni), matried d. 534 a descendant married Sigismund, of the Amals. Alaric IT., king of the king of the Burgundians. | | West Goths. Pn ATHALAKIC, Witigis=MaTasurntuaA=Germanus, | Segeric, d. 534, nephew of pate, murdered Justinian, ing of the by his West Goths, father's es, put to death by d, 581. orders, 522. Piecnee G05) Amalafrida, a full sister of Theodoric, married Thrasamund, king of the

Vandals, and was mother, by an earlicr marriage, of Theodahad (d. 536).

_ Authorities.—The authorities for the life of Theodoric are very Imperfect. Jordanes, Procopius, and the curious fragment known as Anonynius Valesii (printed at the end of Ammianus Marcellinus) are the chief direct sources of narrative, but far the most important indirect source is the Variz (state-papers) of Cassiodorus, chief inmister of Theodoric. Malchus furnishes some interesting par- ticulars as to his early life, and it is possible to extract a little information from the turgid panegyric of Ennodius. Among German scholars Dahn (Kénige der Germanen, ii., iii., and iv.), Manso (Geschichte des Ostgothisehen Reichs in Italien), and Sartorius (Versuch iiber die Regierwng der Ostgothen, &c.) have done most to illustrate Theodoric's principles of government. The English reader may consult Gibbon's Decline and Fall, chap. xxxix., and Hodgkin's Jtaly and her Invaders, vol. iii., and Letters of Cassiodorus. (T. H.)

THEODOSIA, or Karra, a seaport and district town of Russia, situated on the east coast of Crimea, 69 miles to the east-north-east of Simpheropol. Its roadstead,

which has a width of 18 miles and is never frozen, is well protected from east and west winds, and partly also from the south, but its depth is small, ranging from 11 to 14 feet and reaching 35 feet only in the middle. The want of railway communication with the interior prevents it from gaining the commercial importance it might otherwise have possessed, so that its population was only 10,800 in 1881,—a low figure when compared with the 20,000 it had in 1672 and still more with the figure returned in last

century. Many remains of its former importance exist in the city and neighbourhood, the chief being a beauti- ful mosque—formerly a Genoese cathedral—synagogues several centuries old, old towers with inscriptions, baths, and a palace of Shah-Ghirei in the suburbs. Gardening is one of the leading industries ; fishing, a few manufactures, agriculture, and trade are also carried on. The foreign trade, which in 1830-40 reached an average of £90,000 for exports and £66,500 for imports, afterwards fell off, but it has experienced a revival in the course of the last 15 years, the exports of corn, linseed, and wool having reached £167,853 in 1884. The imports are insignificant.

Theodosia, a Milesian colony, was in Strabo's day a flourishing seat of trade (especially in grain), with a harbour capable of accom- modatiug a hundred ships; but before Arrian's time (¢. 125 A.D.) it appears to have been destroyed. More than a thousand years later (1263 to 1267) the Genocse established here their colony Kafa or Kefa, which grew rapidly up notwithstanding the rivalry of the Venetians. It was fortified, and became the see of a bishop, as well as the chief centre for the Genoese colonies on the Black-Sea coasts. It remained nearly independent until 1475, when it was taken by the Turks, but it continued to prosper under their rule, under the name of Kutchuk-Stambul, or Kryon-Stambul (Stambul of Crimea). 'The Russians took it in 1771, and annexed it in 1774. From that date it began to decay, and had only 3200 inhabitants in 1829, the emigration of the Crimean Tartars and the competition of Odessa being obstacles to its further growth.

THEODOSIUS I., emperor of Rome, surnamed the Great, was the son of Theodosius, Valentinian's great general, who in 368-69 drove back the Picts and Scots from the Roman territories in Britain, and, after other successes on the Continent, was at last despatched to sup- press the revolt of Firmus in Mauretania (372). Shortly after (376), the elder Theodosius, despite his great services, was put to death by order of Valens, probably through fear lest he should be the Theodosius or Theodore whom the prophetic tripod indicated as the future emperor.

The younger Theodosius was born about the year 346. He was a native of Spain, but the exact place of his birth is uncertain (Cauca in Galicia

according to Idatius and Zosimus, Italica according to Marcellinus). Pacatus and Claudian seem to claim for him at least a relationship to Trajan, of which, however, there is no satisfactory proof. He accompanied his father into Britain (368), and a little later distinguished himself by defeating the Sarmatians who had invaded Meesia (374). On _ his father's death he retired to his native place, where he lived quietly till after the great battle of Adrianople (August 9, 378), when Gratian summoned him to share the empire. Theodosius was made Augustus at Sirmium, January 19, 379, and was assigned all the Eastern provinces, including Illyricum. It was a time of great peril for the Roman state. The Huns had just made their appearance on the western shores of the Black Sea, and, after over- throwing the great nation of the Ostrogoths, had driven the more southern Visigoths to take shelter within the empire. Valens had consented to receive them (376) on condition that they should deliver up their arms and surrender their children as hostages to be distributed throughout the cities of the East. The latter half of the compact was enforced, but not the former ; and the barbarians, left with- out any sustenance, began to plunder the open country. After their great victory at Adrianople they reached the walls

of Constantinople, whence they were driven back by the valour of a band of Saracens. Meanwhile the Ostrogoths, the Taifali, the Huns, and the Alans had all crossed the Danube to share the spoils of the empire; and it was against this motley host that Theodosius had to contend. He appears to have gained some successes even before his elevation to the empire (Theodoret, v. 5, 6), and shortly after this retired to Thessalonica to organize his forces. He breathed courage into what remained of the Roman army, and summoned the very miners to his standard. But his chief reliance was placed in certain bodies of the Goths whom he had enrolled in his service. These, under their royal leader Modares, gained at least one decisive victory, probably in the course of 379. From the unchron- ological account of a later writer, Zosimus, to whom we owe almost all the details of Theodosius's early campaigns, we may infer that in the course of this year or the next Fritigern and his Visigoths were gradually driven across the

Danube, where they seem to have met with the Ostro- goths who had shared their fate. For a time the united nations turned their energy against the Western empire, till they forced Gratian to grant them leave to settle in Pannonia and Mesia. Before setting out on their new journey they perhaps combined their forces to attack Athanaric, who had retreated with his section of the Visigoths into the wilds beyond the Danube at the time of the Hunnish invasion. Unable to withstand their onset, Athanaric offered his services to Theodosius, and was received into Constantinople with every mark of favour, 11th January 381. Fifteen days later he died, and was honoured by the emperor with a splendid funeral, while his followers faithfully discharged the duty of guarding the Danube. In the two preceding years Thessaly and Macedonia had been swept by the barbarians. On one occasion the emperor himself barely escaped from their hands in a midnight attack which they had been induced to make by the sight of his blazing watchfires ; on another the united forces of the Ostrogoths and Visigoths crossed the Danube with the design of pillaging Greece. In his efforts against the invaders Theodosius was ably seconded by his colleague Gratian, who despatched his Frankish officers Baudo and Arbogastes to drive the enemy out of Macedonia and Thessaly (380), and, while Theodosius lay sick at Thes- salonica, made such terms with them as the latter emperor was glad to accept on his recovery. A little later, presumably towards the middle of 381, Promotus, Theodosius's lieutenant, inflicted a terrible defeat on a motley host that was attempting to cross the Danube. This was perhaps the decisive battle in the war ; and we read that on October 3, 382, all the remaining Goths in the empire submitted to Theodosius. Many of them appear to have entered the Roman army as "foederati"; and indeed, from the very commencement of his reign, Theodosius seems to have pur- sued a consistent policy of enrolling the Gothic warriors. At times they accepted his gifts while meditating treachery in their hearts; and Eunapius has preserved the story of how Fravitta, the leader of the faithful party, slew with his own hands his dishonest colleague Eriulf at a banquet in the emperor's own tent. Zosimus has charged Theodosius with burdening the provinces with excessive duties for the purpose of maintaining a host of useless barbarian officers, while the common soldiers were left unpaid. These barbarian troops, according to the same writer, often treated the Roman citizens with the utmost indignity, and on more than one occasion provoked a retaliation for which the emperor

refused to see any excuse. They were not, however, all quartered in one place, but received into the legions ; while others were sent to Egypt. On the whole, it may be said that his policy of attaching the invaders to himself was the salvation of the empire; it was they

Tek Ob Ost ws

who bore the brunt of the battle of the Frigidus; and the knowledge of the emperor’s good faith towards the Teutonic auxiliaries in his service must have contributed largely to the defection of Eugenius’s army on the same occasion.

In 383 Theodosius created his eldest son Arcadius Augustus. The same year saw the revolt of Maximus in Britain and the murder of Gratian (August 25, 383). For five years Theodosius consented to accept the usur- per as his colleague; but, when Maximus, flushed with success, attempted a few years later to make himself master of Italy, which, since the sudden death of Valen- tinian I. (17th November 375), had been governed under the name of his young son Valentinian II., Theodosius advanced against the invader and overthrew him near Aquileia (28th July 388). This victory was followed by the murder of Maximus and his son Victor, after whose death Theodosius conferred upon Valentinian IT. all that part of the empire which his father had held. Theodosius is said to have been induced to take this campaign by his love for Valentinian’s sister Galla, whom he now married. Meanwhile there had been fresh dangers from the Goths. In 386 another band of the Grcethingi or Ostrogoths, attempting to cross the Danube, was cut off by Promotus. The same general, in the course of the next two years, punished the barbarians who had deserted Theodosius at the beginning of the campaign against Maximus. Such signal services as these, though coupled with the fact that he had saved the emperor’s life, did not prevent Promotus from falling a victim to the intrigues of the favourite Rufinus, who is charged by Zosimus with compassing the death of other noble men. If we may trust the evidence of the last-mentioned historian, from the end of the year 388 Theodosius resigned himself to gluttony and volup- tuous living, from which he was only roused by the news that, in the Western empire, Arbogastes the Frank had slain the young emperor Valentinian and set up the grammarian Eugenius in his stead (15th May 392).

Into the curious history of the short-lived pagan revival in the Western empire there is no need to enter here. Zosimus assures us that the tears of Galla threw the whole court into confusion ; but there can be little doubt that to a religious, if not superstitious, mind like that of Theodosius it might well have seemed that he was fighting the battles of God, as he led his army of the cross against an enemy on whose standard shone the image of Hercules (Theodoret, v. 24). His host consisted partly of Romans and partly of barbarians. Timasius was leader of the former, but under him was ranged the more renowned Stilicho ; the latter were led by Gainas the Goth and Saul the Alan. The engagement was fought near the river Frigidus, some thirty-six miles distant from Aquileia. On the first day Theodosius's barbarians, engaging with those of the hostile army, were almost destroyed, and the victory seemed to be with Eugenius. After a night of prayer, towards cock-crow the emperor was cheered by a vision of St Philip and St John, who, mounted on white steeds, promised him success. With the morning he received and accepted the offer of service on behalf of the enemy's ambush, and once more advanced to the conflict. But even so, the issue of the day was doubtful till, if we may trust the concurrent testimony of all the great contem- porary church historians, a sudden gust of wind blew back the enemy's arrows on themselves. This was the turning- point of the battle: Eugenius was slain by the soldiers; and two days later Arbogastes committed suicide (Sep- tember 5-9, 394). From the north-eastern parts of Italy Theodosius passed to Rome, where he had his son Honorius proclaimed emperor under the guardianship of Stilicho. Thence he retired to Milan, where he died of dropsy (17th

January 395), leaving the empire to be divided between his two sons Honorius and Arcadius,—Honorius becoming emperor of Rome and the West, Arcadius of Constan- tinople and the East.

Important, however, as the reign of Theodosius was from the political point of view, it is perhaps still more important from the theological. According to Sozomen, his parents were both orthodox Christians, according to the creed sanctioned by the council of Nicea. It was not, however, till his illness at Thes- salonica that the emperor received baptism at the hands of Bishop

Ascholins, whereupon, says the same historian, he issued a decree (February 380) in favour of the faith of St Peter and Pope Damasus of Rome. This was to be the true catholic faith; the adherents of other creeds were to be reckoned as heretics and punished. The great council of Constantinople, consisting of 150 orthodox and 36 Macedonian bishops, met in the following year, confirmed the Nicene faith, ordered the affairs of the various sees, and declared the bishop of Constantinople to rank next to the bishop of Rome. The emperor cannot be acquitted of the intoler- ance which marks edicts such as that depriving apostatizing Christians of the right of bequest. It was not till 389 or 390 that he issued orders for the destruction of the great idol of Serapis at Alexandria. Other edicts of an earlier or later date forbade the unorthodox to hold assemblies in the towns, enjoined the surrender of all churches to the catholic bishops, and overthrew the heathen temples “throughout the whole world.” During the reign of Theo- dosius Gregory of Nazianzus was made bishop of Constantinople— an appointment which he did not long retain. In 383 Theodosius called a new council for the discussion of the true faith. The orthodox, the Arians, the Eunomians, and the Macedonians all sent champions to maintain their special tenets before the emperor, who finally decided in favour of the orthodox party. He seems to have suffered the Novatians to hold assemblies in the city. Perhaps the most remarkable incident in the life of Theodosins from a personal point of view is the incident of his submission to the reprimands of Ambrose, who dared to rebuke him and refuse to admit him to the Lord’s Supper till he had done public penance for suffering his Gothic auxiliaries to murder the townsmen of Thessa- lonica (390). Equally praiseworthy is the generous pardon that the emperor, after much intercession, granted to the seditious people of Antioch, who, out of anger at the growing imposts, had beaten down the imperial statues of their city (887). When the Christians in the eastern part of the empire destroyed a Jewish synagogue and a church belonging to the Valentinians, Theodosius gave orders for the offenders to make reparation. Such impartial conduct drew forth a remonstrance from Ambrose, who, where the interests of his creed was concerned, could forget the common principles of justice. In a sermon preached before Theodosius he introduced the Deity Him- self holding an argument against Theodosius on the subject of his remissness, and the imperial penitent yielded to the eloquent bishop. So pliant a disposition rendered him very dear to the saint, who availed

himself of his influence to counteract the efforts of Symmachus and the Roman senate for the restoration of the pagan rites at the altar of victory. “I loved the man,” says St Ambrose, “who, putting off his kingly robes, mourned publicly in the church a sin to which the guile of others had exposed him, —an emperor who thought it no shame to do an act of public penance that even private people would have blushed to perform.” The inspired vision of the saint saw the deceased emperor received into heaven by his old colleague Gratian; while Maximus and Eugenius down in hell were already experiencing how grievous a sin it is to take up arms against lawful princes (Ambrose, De Obitw Theod.).

Theodosius was twice married—(1) to Alia Flacilla, the mother of Arcadius (877-408) and Honorius (384-423); (2) to Galla (d. 394), the daughter of Valentinian I.

The chief authorities for the age of Theodosius are Ammianus Marcellinus, Zosimus, Eunapius, and the ecclesiastical historians (Socrates, Sozomen, Theo- doret). Much information may also be gleaned from the writings of St Ambrose, St Gregory of Nazianzus, Isidore of Seville, and the orators Pacatus, Libanius, Themistius. Of modern authorities Tillemont supplies an unrivalled collection of facts drily collected from all contemporary or nearly contemporary sources; he is specially useful for his synopses of the Theodosian laws. Clinton’s Fasté are the best guide for the chronology of the period. 1t is hardly necessary to mention the brilliant account given by Gibbon, or, in later years, from the stand- point of Italian history by Mr Hodgkin. (EAT A.)

THEODOSIUS II. (401-450) succeeded his father Ar- cadius as emperor of the East in 408. During his minority the empire was ruled by the pretorian prefect Anthemius and Pulcheria, who became her brother’s guardian in 414. Under his sister’s care the young emperor was brought up rather as a virtuoso than a prince. The chief events of Theodosius’s reign are the wars with Persia in 421 and 441, the council of Ephesus (434), and the inva- sion of the Huns under Attila (441-448). In 450 Theo- dosius was thrown from his horse while hunting, and re-

ceived injuries from which he died. He married Athenais, who on being baptized took the name of Eudocia. It was during his reign that the Codex Theodosianus, or collection of the constitutions of the Roman emperors, was formed. The idea took birth as early as 425, but was only put into execution between 435 and 438; in the latter year the Code was published.

THEODOSIUS III. was the last of three emperors whose short reigns filled the interval between the death of Justinian II. and the accession of Leo the Isaurian. The emperor Anastasius had sent a fleet to frustrate the in- tended expedition of the Saracens from Alexandria against Constantinople. On reaching Rhodes the troops rose against their leader, John the Deacon, slew him, and, start- ing for Constantinople, landed at Adramyttium, where they made a collector of the taxes emperor by the title of Theodosius III. The new emperor besieged Constan- tinople for six months before he took it; Anastasius resigned, and retired to a monastery, leaving his place to be filled by Theodosius III., who likewise resigned next year (717) in favour of Leo III. The closing years of Theodosius's life were spent in a monastery.

THEODOSIUS, of Tripolis, a Greek geometer and astronomer, three of whose works were contained in the collection of lesser writings named 'O puxpds dorpovo- povpevos (Sc. Tomes), or "O puxpds dotpdvopos.! Pappus of Alexandria, at the commencement of the sixth book of his Svvaywyy, speaks of this collection, the study of which is indispensable to any one who would master the science of astronomy (rov dotpovopovpevoy térov). These writings, which were highly esteemed in the school of Alexandria, were intermediate between the Elements of Euclid and the Almagest of Ptolemy, for the understanding of which, indeed, they formed an indispensable introduction. Of the life of Theodosius nothing is known. As to the time when he lived different opinions have been held, he being placed by some in the first century before and by others in the second century after the Christian era. The latter opinion is founded on an error of Suidas (s.v.), who on the one hand identifies the author of the three works referred to above with a sceptical philosopher of the same name who lived at the time of Trajan or later, and on the other hand distinguishes him from a native of Tripolis who wrote a poem on spring. It is now generally admitted that the subject of this article is the same as Theodosius the mathematician, who is mentioned by Strabo amongst the natives of Bithynia distinguished for their

learning, and whose sons were also mathematicians, the same, too, as the inventor of a universal sun-dial (horologium ampss wav xdipa) of that name who is praised by Vitruvius: (De Architectura, ix. 9). His date, therefore, could not have been later than the lst century B.c.; he may, however, have lived in the preceding cen- tury, inasmuch as the names mentioned by Strabo in the passage referred to above are, as far as we know, arranged chronologically, and Theodosius immediately follows Hip- parchus, who made astronomical observations between 161 and 126 p.c., and precedes Asclepiades the physician, who lived at Rome at the beginning of the lst century B.c.

The statement that he was “of Tripolis” is made, not on the authority of Suidas, as has been erroneously said, but because he is so described in the title of his principal work. It is probable, therefore, that he was a native of

1 This collection contained the following books :—“ Theodosii Tri- polite Sphericorum libri iii.; Euclidis Data, Optica, Cutoptrica, ac Phenomena; Theodosii Tripolite De Habitationibus et Noctibus ac Diebus libri ii.; Autolyci Pitanei De Sphera Mota, et libri ii. De Ortu atque Occasu Stellarum Inerrantium; Aristarchi Samii De Magnitudinibus ac Distantiis Solis ac Lung ; Hypsiclis Alexandrini

’“Avagopixds sive De Ascensionibus ; Menelai Sphwricorum libri iii.” — Fabricius, Bibliotheca Grea, ed. Harles, iv. p. 16.

The word theology

in the

Bithynia, and resided at Tripolis, where he wrote his work. Tripolis is generally taken to be the city of that name on the Phcenician coast, but it may have been a town of the same name in Lydia, on the Meander.

His chief work—Z@aipixa, in three books—trcats of the properties of the sphere and its sections, with the object of establishing the geometrical principles of spherical astronomy. This work, which is classical, is

distinguished for the order and clearness of the exposition as well as for the rigour of its proofs, and has ever since formed the basis on which the subject of spherical geometry has been treated. It does not contain any trace of spherical trigono- metry, which, on the other hand, was the special subject of the work having the same title, and included in the same collection, of Menelaus of Alexandria, who lived at the end of the 1st century.

Montucla suspected that a great part of the three books of Theodosius must have been known before his time, and that he merely did with respect to this branch of geometry what Euclid had done with the elements, namely, he collected and incorporated in his work the different propositions found before his time by astronomers and geometcrs. This conjecture of Montucla has been confirmed by A. Nokk (Ueber die Sphirik des Theodosius, Karls-ruhe, 1847), by Heiberg (Litterargeschichtliche Studien iiber Euklid, pp. 48 sq., Leipsic, 1882), and by Hultsch, from whose researches, and especially owing to the publication by the last of the cditio princeps of Autolycus, it is now quite certain that as early as the middle of the 4th century B.c. there existed a Greek text-book ou Sphcrics which, in its essential contents, scarcely deviated from the three books of Theodosius. He must therefore be regarded as mercly the editor, or at most the elaborator and expounder, of a doctrine which existed some centuries before him.

The Spherics of Theodosius was translated into Arabic at the beginning of the 10th eentury, and from the Arabie into Latin in the 12th century by Plato of Tivoli (Tiburtinus), This translation was published in 1518 at Venice, but was found so faulty by J. Voegelinus that he published a new Latin version, together with additions from the Arabian commentators, Vienna, 1529, 4to; other Latin translations were published by F. Maurolycus, Messina, 1558, fol.; by C. Clavius, Rome, 1586, 4to; and by Barrow under the title, Tueodosii Spherica, Methodo Nova Illustrata et Succincte Demonstrata, London, 1675, 4to. The Greek text was first published, and with it a Latin translation, by J. Pena, Paris, 1558, 4to; it has been edited since by Joseph Hunt, Oxford, 1707, and by E. Nizze, Berlin, 1852, bnt these two editions are founded on that of Pena. There is also a German translation by Nizze, Stralsund, 1826. His two editions are aecompanied with valuable notes and an appendix containing additions from Voegelinus and others.

The two other works of Theodosius whieh have eome down to us have not as yet been published in the original. The propositions, without demonstrations, in the work mepi nuepov kat vuxt@v (On Days and Nights), in two books, were given by Dasypodius, in Greek and Latin, in his Sphericze Doctrine Propositiones, Strasburg, 1572, 8yo, A Latin version of the complete work, with aneient scholia and figures, was given by Joseph Auria, Rome, 1591, 4to. Pappus has given a pretty full commentary on the first book of this work of Theodosius. His work mept oixnoewv (On Habitations) also was published by Auria, Rome, 1588, It gives an account of how, for every inhabitant of the earth from the equator to the pole, the starry firmament presents itself in the course of a year. The proposi- tions in it were also given by Dasypodius in his work mentioned above.

THEOGNIS or Mzcara was one of the early Greek elegiac poets ; he probably flourished about the middle of the 6th century B.c. We derive our knowledge of his life from the poems that bear his name. After the fall of Theagenes, who had made himself tyrant of Megara about 625, the usual struggles between oligarchy and democracy ensued. ‘Theognis was a violent partisan of the oligarch- ical faction in his native town, and wrote elegies in which he gave expression to the emotions roused in him by the varying phases of the struggle. He appears on one occasion to have lost his property (verse 345) and been driven into exile: perhaps it was then that he visited

PoE O

HE word theology comes from a heathen source— from the Greek classics. In the Republic of Plato

classics; 20d the Metaphysics of Aristotle it occurs, and in its

etymological meaning of “discourse or doctrine con- cerning Deity and Divine things”—Adyos rept rod Geod Kal wept trav Oev. Men who wrote about the gods and their doings, or who speculated about the Divine in the origination and operations of nature—men like Homer, Hesiod, Pherecydes, and Thales,—were called Geordyou. But there could, of course, be no theclogical science based on the popular religion of Greece. Theology was

only to be found among the Greeks in the form of philosophical speculation. Through St Augustine we know that Varro,

Sicily, Eubcea, and Sparta (783 sq.). In the end—if we may trust 1123 sqg. —he returned to Megara, and lived, at least for a time, in something like prosperity. The date. of his death is unknown. ‘The verses handed down to us under the name of Theognis amount in all to 1389. Not a few of them are ascribed on the evidence of the ancients to Tyrtzeus, Mimnernus, and Solon ; modern criticism has made it probable that two of the longer elegies are from the hand of Evenus (467-496 and 667-686); other fragments are demonstrably later than Theognis. It is now generally admitted that the Zheognidea were put together long after Theognis— possibly even as late as the 4th century B.c.—by some compiler who wished to provide a good collection of moral maxims for educational pur- poses. To separate the genuine fragments of Theognis from those which were ascribed to him by the reverence of a later age is a hopeless task.

The collection is divided into two books. The first, which is addressed to a youth called Cyrnus, or Polypexdes, opens with a spirited invocation of Apollo and Artemis, along with the Muses aud the Graces (vv. 1-18); then follows a passage which has been much discussed in connexion with the early history of writing, recommending Cyruus to set a seal upon the author’s verses, to prevent forgers from passing off spurious lines under his name (see Jcvons, Hist. of Greek Lit., p. 46). With verse 27 begins a series of counsels to Cyrnus. On the whole they are remarkable neither for loftiness of tone nor for poetic elevation. Cyruus is counselled to avoid “the bad” and frequent the society of “the good” men— the terms ‘‘good” and ‘‘bad” being used to denote aristocrats and democrats, just as kaAds Kaya0ds meant an oligarch in the later days of the Peloponnesian War. Sometimes the violence of party feeling leads Theognis beyond all bounds, as when he prays that he may “‘drink the black blood” of his opponents (849; cf. 837- 339 and 861). One striking feature in these elegies is the continual refrain about the evils of poverty. ‘To avoid poverty one should even throw oneself into the vasty decp, or from the beetling rocks ” (175-176; of. 266 sg., 351 sq., and 649 sg.). Elsewhere the poet reproaches Zeus

with allowing evil men to prosper, and attlicting the good (878 sqg.); he also complains that the punishment due to wicked men often falls upon their sons (781 sg.). A pleasing feature is the high value which is placed upon friendship: one is not to part with a friend lightly, or upon some slight occasion of displeasure (828 sqg.).” At the same time no one knows better than Theognis how quickly friends fail one in adversity (299-300). Life has on the whole few charms for our poet: ‘‘the best thing for man is not to be born or look upon the rays of the swift sun; once born it is best for him to pass as soon as possible the gates of death, and lie with a great barrow of earth above him” (425-429), The prevailingly sad tone of the elegies is occasionally broken by a convivial note. “It is shameful,” says the poet, ‘‘to be drunk when others are sober, or sober when others are drunk” (626-627); ‘‘among the uproarious I am very uproarious, but among the proper I am the properest of men ” (818-814). ‘The only elegy which possesses any considerable poetic merit in the first book is that in which Theognis predicts immortality for his young friend through the fame awaiting his own poems. The second book (1231-1389) consists of a number of amatory elegies addressed to some young friend of the author’s. In vigour and harmony of versification they are on the whole superior to the first book; but most if not all of them are probably spurious.

Bergk, Poetx Lyrici Greci, ii, 117-236, Leipsie, 1882, –

LOGY

“the most learned of the Romans,” distinguished three kinds of theology,—the first mythical or fabulous, the second physical or natural, and the third civil or popular. The mythical theology he censured as containing many things contrary to the dignity and nature of immortal beings; the natural theology he described as that which is true but beyond the capacity of the vulgar; the civil theology he considered to be that which it was good for the citizens to believe—the received religion of Rome. The general attitude of the Greek and Roman mind to religion was unfavourable to the cultivation of theology. Religion being dissociated in thought from truth could not give rise to science.

Pee Ob OG Y

The words theology and theologian do not occur in

fathers; Scripture, but it was inevitable that they should be trans-

planted into Christian soil. @edAoyos is found, as a V.R. in the inscription of the Apocalypse—the Revelation of John “the Divine,” “the theologian,” —and almost certainly refers to his maintaining the Divinity of the Logos— rjv rod Adyou Oedryra,—that the Adyos is Geds. In the 3d and Ath centuries a theologian usually meant one who distin- guished himself in defending the personality and Divinity of the Logos. It was on this ground that Athanasius and Gregory Nazianzen were honoured with the distinctive appellation of “theologians.” The term theology has not yet lost its early signification of ‘doctrine concerning God,” although a much wider meaning is more common. Theology in its ordinary general acceptation includes, as one of its divisions, theology understood as the treatment of the problems which directly refer to the being, attributes, and works of God. The Jztroductio ad Theologiam, and a later form of it, the Theologia Christiana, composed by Abelard in the 12th century, first gave currency to an acceptation of the word inclusive of all religious truth or belief. Among later scholastics the common designation for a general compendium of religious doctrine was Summa Theologix. Of such Summex among the most celebrated and characteristic are those of Alexander Hales, Albertus Magnus, and Thomas Aquinas. The medieval mystics deemed the essence of theology to be the immediate intuition of God, who, being once in contact with the soul, reveals to it the truth of all the principles of faith, and gives it at the same time spiritual peace and happiness. This view led toa use of the word which was prevalent among the Reformers and their imniediate successors,—a subjective application which identified it with what was characteristic of the mind of a true theologian, an enlight- ened and experienced homo renatus. In this sense it was a living practical acquaintance with the revelation of grace and truth made by God to man, a “habitus practicus,” a “sapientia eminens practica,” as it was called. With it, however, these earlier Protestant divines generally con- joined that objective application of the term which was current in later scholasticism, and this at length wholly displaced the subjective acceptation ; in other words, theology came to signify, not knowledge of a certain kind as inherent in the mind and operative in the life of the individual, but

knowledge in itself, a body of systematized truth, a science. Theology, thus understood, may be viewed, discussed, and applied in a variety of ways, so as to give rise to certain kinds or species of theology. In the 17th century the necessity for specialization of this sort began, from the operation of several causes, to be widely and strongly felt, and it became usual for divines to indicate by the titles of their theological systems the point of view and mode of treatment adopted. An adjec- tive added to the term ‘“‘theologia” served their purpose. Of adjectives thus employed in the 17th and early part of the 18th century, the following may be mentioned as either frequently used or of some intrinsic interest :—theoretica, practica, didactica, elenctica, polemica, irenica, pacifica, positiva, comparativa, dogmatica, theoretico-practica, didac- tico-elenctica, &c.

The extension given to the signification of the term theology was for a very lengthened period almost univer- sally restricted to the knowledge derivable from the Scrip- tures, the systematic exhibition of revealed truth, the science of Christian faith and life. It is still thus, per- haps, that the word is most commonly understood. Two things, however, have naturally suggested the employment of it in a wider manner. First, there was the rise and development of a theology not based on revelation,—the

The Greeks and Romans could not distinguish between nature and revelation, reason and faith, because ignorant of revelation and faith in their distinctive Christian sense. In the patristic and scholastic ages of the church, and for some time after the Reformation, men were not in general prepared to admit that there was a knowledge of God and of His attributes and of His relations to the world which might be the object of a science distinct from and inde- pendent of revelation. Yet the most learned and thought- ful even of the scholastic divines recognized in some measure that such was the case, and could hardly, indeed, do otherwise after they had become acquainted with the contributions which Greek, Jewish, and Arabian philo- sophers had made to the defence and elaboration of the doctrine concerning God. The separation of natural and revealed theology was virtually the work of the scholastics. The Theologia Naturalis sive Liber Creaturarum of the Spanish physician, Raymond de Sebonde, who taught theology in the

university of Toulouse during the earlier part of the 15th century, was, perhaps, the first work which, proceeding on the principle that God has given us two books, the book of nature and the book of Scripture, confined itself to the interpretation of the former, merely indicating the mutual relations of natural and revealed religion. A conviction of the truth of the distinction which he so clearly apprehended gradually spread ; more and more importance came to be attached to it. The deists proceeded on it, and tried to exalt natural theology at the expense of all theology professedly based on revela- tion, by representing the former as the truth of which the latter was the perversion. The wisest of their opponents, and thoughtful Christian writers in general—the adhe- rents of the moderate and rational theology of the 17th and 18th centuries—strove, on the other hand, to show that natural theology was presupposed by revelation and should carry the mind onwards to the acceptance of reve- lation. Thus natural theology came into reputation, not- withstanding the opposition of those who have denied its existence and contended that the reason of itself can teacla us absolutely nothing about God or our duties towards

Him. The recognition of natural theology contributed to Compa- awaken an interest in the various religions of the world, rative

and thus led to the second circumstance referred to, namely, the rise of what may be called comparative theo- logy, although it has hitherto been more generally designated the science of religions. It can be shown to have originated in the attempts made to prove that the principles of natural theology were to be found in all religions. In Bishop Steuco of Kisami's De Perenni Philosophia, published in 1540, and in Lord Herbert of Cherbury's De Religione Gentiliwm, published in 1663, we have two of the earliest and most characteristic attempts of the kind. From that time to the present the study of religions has proceeded at varying rates of progress, but without interruption. Important results have been ob- tained, and especially this result, the ascertainment, to the satisfaction of all competent judges, of a right method of investigation,—the establishment, as the true mode of study, of the coniparative method. As we have a right to speak of comparative anatomy and comparative philology, so have we a right to speak of comparative theology. The inference from the preceding remarks is obvious. If there be a natural theology and a comparative theology, it is a

mistake to identify theology per se with Christian theology. The word Christian is, in this case, a real and great restriction of the signification of the word theology, and Christian theology is not the only kind of theology. The proper procedure is to give to theology a general and comprehensive meaning, which can be limited and specialized,

rise and development of what is called natural theology. | when requisite, by adjectives like “natural” or “Christian.”

it

| | _ logy.

Is theo- logy the science of reli- gion or the doc- trine of God?

Objec- tions to the for- mer deti- nition met.

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What, then, is the general signification which we should give to the term? ‘There is room for difference of opinion, and especially as to whether God or religion should be regarded as the object of the science. Is theology the science which treats of God? or is it the science which treats of religion? ‘The latter view is now, perhaps, the more current. In addition to intrinsic reasons, the critical and sceptical spirit of the time is in its favour. Many speak of theology as a science of religion because they disbelieve that there is any knowledge of God to be at- tained. Dr Martineau, in his lecture on Jdeal Substitutes for God, protests against this tendency, and contends that the older view of theology, as the doctrine or rational apprehension of God, ought not to be abandoned, seeing that the new “science of religions,” ¢.¢., ‘the systematic knowledge of what men have believed and felt on things sacred to them,” can be no proper substitute for the old “theology.” We may admit, however, that the protest is essentially true,—that a knowledge of man’s religious opinions, emotions, and actions can never supply the place of a knowledge of God, that, when from religion its objec- tive basis, the reality and apprehensibility of God, is taken away, the study of it can have merely the psychological interest which belongs to mental disease and illusious,— and yet prefer the definition of theology as “the science of

religion” to its definition as “ the doctrine of God.” The latter seems much too narrow. Even Christian dogmatics is abont as much occupied with man as with God. The doctrines of sin and of the church, for example, are not doctrines regarding God. Then, although the new “science of religions” is not a substitute for the old “ theology,” it is still a science, or at least a very interest- ing and important branch of knowledge, which yet cannot be brought under the definition of theology approved by Dr. Martineau,—the definition immediately yielded by the etymology of the term. The science of religion is a very different thing from the “science of religions.” It is far more comprehensive. The “science of religions” is but one of the latest offshoots of the science of religion ; the old theology is its main trunk or stem. Theology, when viewed as the science of religion, has not to do merely with the religious consciousness and its states. It must aim at the complete comprehension of religion, and, unless religion be a delusion and disease, this can never be attained by treating religion merely as a subjective or psychological process to which there are no corresponding objective realities manifested either through nature or revelation. We have no right to assume that it is thus without a real and rational foundation in fact; on the contrary, we are bound to inquire whether it has external grounds and real objects or not, and, if it have them, what they are. We must endeavour to ascertain and expound its objective grounds as well-as its subjective contents. Thus the definition of theology as the science of religion in no way excludes what is implied in the definition of it as the science conversant about God and Divine things. It includes more than the latter definition, but does not exclude anything contained therein,

The definition of theology as the science of religion has been objected to by Dr Charles Hodge on two grounds :!— first, that the word religion is ambiguous, having both an objective sense and a subjective sense, and that its ety- mology is doubtful; and, second, that to define theology as the science of religion “makes theology entirely inde- pendent of the Bible. For, as moral philosophy is the analysis of our moral nature and the conclusions to which that analysis leads, so theology becomes the analysis of our religious consciousness together with the truths which that analysis evolves.” As to the first objection, the word

Systematic Theology, vol. i. pp. 20-21.

religion has, it is true, more significations than one, and consequently may be ambiguously used, but in point of fact it is not so used in the definition in question, in which religion is understood in its generic meaning, and as inclusive both of subjective and of objective religion. Theology has to treat of both, and if it treat of them aright it will not confound them. ‘“ The etymology of the word religion is doubtful.” Very true. But is no word to be employed in a definition if its etymology be doubtful? That would be an extremely hard law. In definition we have only to do with the actnal meaning of terms; we have nothing to do with their origin or history. As to the second objection, it has to be remarked that the definition does not make theology entirely independent of the Bible. It does not make Biblical theology in any degree independent of the Bible. It does not imply that the Bible is not the sole perfect standard by which truth and error, health and disease, are to be separated in the religious consciousness of individuals and the religious history of the race. It only implies that all religious phenomena whatever are to be studied by the theologian, just as moral philosophy cannot leave any moral pheno- niena unstudied. Moral philosophy, in treating of vice as well as of virtue, does not thereby equalize vice and virtue ; and no more does comparative theology, when it treats both of Christianity and heathendom, assume that the former has no superiority over the latter. It is merely a part of the task of moral philosophy to analyse the moral consciousness ; it is an equally essential part thereof to inquire into the foundation of rectitude, and to determine objective moral distinctions and relations, In like manner theology has much more to do than merely to analyse the religious consciousness ; it has also to treat of the grounds and objects of religion. If some reduce it to a mere analysis of the religious consciousness, and overlook or deny that there is an objective religious revelation in nature and Scripture as well as a religious susceptibility in the mind of man, this is no logical consequence of the statement that theology is the science of religion. There needs, perhaps, no other proof that the definition to which Dr Hodge objects is of some use than to consider for a moment his own definition. ‘Theology is the science concerned with the facts and the principles of the Bible.” Is theology, then, not concerned with the facts and prin- ciples of the physical world, the human mind, and history, so far as these are disclosures of God’s nature and

ways ? How can theology start from the Bible when it needs to be proved that there is a revelation from God in the Bible? And how can this be proved unless it is known from other sources than the Bible that there isa God? If there be such sources, theology must have to do with them; it can have no right to neglect anything by which God may be known or by which light may be thrown on the relations between God and man. It isa service to theology so to define it as to leave no room for asserting that it is only conversant with the Bible.

Theology, then, is the science of religion. What does this definition imply as to the relation of theology to religion? It iniplies, first, that theology presupposes and is preceded by religion. This is but anu instance of the general truth that experience must precede science, and that science must be founded on experience. The im plicit use of principles is always prior to their explicit development. Speech is a great deal older than gram- mar ; men reasoned long before Aristotle taught them how they reasoned ; and just as there must be speech before grammar, and reasoning before logic, so must there be religion before theology. Secondly, that theology is the science of religion implies that theology must not only succeed religion, but must evolve out of it a system of

Relation of theo-

logy to religion.

truths entitled to be called a science. Science is know- ledge in its completest, highest, and purest form. Theo- logy, therefore, by claiming to be the science of religion, professes to be the exhibition of religious facts and prin- ciples in their most general and precise shape, in their internal relationship to one another, in their organic unity and systematic independence. The principles of causality and of unity in the human mind impel it to seek law and order, explanation and connexion, as regards the pheno- mena of religion no less than any other species of pheno- mena; they impel it, in other words, to perfect its know- ledge of these phenomena, and can allow it no rest until it has attained to the system and science of them. Theology is the scientific system of them, and as such is a necessity to the thoughtful religious mind. It is no accident that in every age and nation thoughtful men have reflected on their religious convictions, and sought to

trace them to their grounds, and to harmonize and ‘systematize them, or that the Christian church has anxiously studied and debated for centuries problems concerning God, Christ, sin, salvation, &c.,—no accident, but the necessary conse- quence of those fixed laws of human nature by which man ever seeks, once that his intellect has been truly awakened, to define and complete his knowledge. Conscious that his religious experience, however vivid, involves much which requires to be cleared up; perceiving that the religious history of his race presents many apparently contradictory facts, many perplexing problems ; aware that the Bible is no more a system of theology than nature is a system of mechanics or chemistry,—man cannot, as a rational being, do otherwise than endeavour by the investigation of the whole phenomena of the case to verify, analyse, combine, and co-ordinate his notions as to spiritual things, so as to work them up into a comprehensive, consistent, firmly established, adequately certified, naturally organized whole, a scientific system.

But how may man hope to succeed in his efforts to arrive at a scientific understanding of his religious beliefs, feelings, and practices? How may‘he educe and elaborate from the phenomena of religion a system of theology entitled to be called science? Only, it is obvious, by following a truly scientific method. What then is a truly scientific method in theology? And what is implied in following it? To these questions a comprehensive, al- though necessarily brief, answer must now be given. scientific A right method in theology, as in all other sciences, is nethod such a use of reason on appropriate facts as will best attain ‘ truth. It implies, therefore, as an essential condition, a

right relation of reason to religious truth or fact, and to

the evidence for it. What the right relation is may, perhaps, be defined with substantial accuracy in the Adigious following propositions. (1) Religious truth, like all other

- truth, is “above reason” in the sense of being not created Above by but manifested to reason, but is not ‘‘ above reason”

veason, in any special sense which withdraws it from the cogniz- ance of reason. The truths of all science are the dis- . coveries but not the creations

of science, and they have been discovered because they existed, because they are the equivalents of a reality which is independent of science. In regard alike to mathematical, physical, mental, and religious truth, reason has only power to seek it, and to find or to miss it; it has no power to make it or right over it, but must accept it as something presented or given to it, and to which it is bound to do homage and yield submission. In this sense all truth is above reason and Tevealed to reason. In this sense reason stands to re-) ligious truth in the same relation as to physical truth, and to Christian truth in the same relation as to the truth In natural religion. Reason is simply the instrument or faculty of apprehending the truth manifested or revealed

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to it, and it can in no case apprehend truth without the aid of the appropriate manifestation or revelation. Unless Christ had lived and taught, reason could never have known His character and doctrine ; but no more could it have known Dante and his Divina Commedia, Shakespeare and his creations, Napoleon and his achievements, unless these men had appeared in the world and accomplished in

it their work. Without Christ the truth in Christ could not be known, but, Christ being given, that truth comes under the cognizance of reason, ceases to be in any special sense above reason, and affords to reason material for science. By truths above reason are sometimes meant truths which cannot be fully apprehended by reason. Such truths are, however, in no way peculiar to religion.

In all regions and directions reason finds that its range of vision is limited, and that its knowledge and science are bounded by nescience and mystery. Truths of special revelation are sometimes represented as above reason in the sense that reason can have no other evidence for them than that of testimony and external authority. But what truths of Scripture have thus been revealed to reveal no- thing, and are thus devoid of intrinsic light, of natural affinity to reason, of self-evidencing power? If there be any such, it must be admitted that they cannot in them- selves fall within the province of

science, although the testimony and assent to them may. Where reason stops science must end. (2) Reason in its investigation of Reason religion must be completely free, 2.¢., subject to no other must be laws than those which are inherent in its own constitution. ‘”°* In regard to most sciences there is no need to insist that the method of science is one in which reason is free, because all who occupy themselves with these sciences acknowledge it. But in regard to theology it is other- wise. All who call themselves theologians are by no means disposed to admit that reason, in its search for religious truth and in its efforts to construct theological science, must be absolutely free ; on the contrary, many of them hold that the church or the Bible, tradition or the common sense of humanity, must be allowed to have a co-ordinate or even superior jurisdiction. The proposition laid down implies that, if any view of this kind be true, theology is essentially different from science, and it is vain

to speak of scientific method in theology. It implies that

all claims to religious authority must be based on and con- formed to reason, and that all the deliverances of every professedly religious authority must be submitted without reserve or restriction to the reason of the theologian before

he can make a scientific use of them. This leads us to another proposition. (3) The only ascertainable limits of Reason reason in the investigation of religious truth, as of other a

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truth, are those which are inherent in its own constitution; 5. and in the search of religious truth, as of all other truth, jaws. reason ought to go as far as it can go without violation of the laws of its own constitution. Reason has its limits in

its own laws. It is the business of psychology and logic

to discover what these laws are. When they are known the powers of reason are known, because reason can never claim to be irrational. It is useless, however, to attempt

to mark off the external or objective boundaries of rational research, Human inquiry has, no doubt, external bound- aries beyond which it will never pass, but all apparent boundaries of this kind recede as they are approached. There is even absurdity, self-contradiction, in the very attempt to draw any line separating the knowable from the unknowable. To know it one must have already done what we affirm to be impossible,—known the un- knowable. We cannot draw a boundary unless we see over it. Reason cannot investigate too deeply any matter whatever, cannot possibly go too far, so long as it remains reason. Its own laws, the laws of evidence

Reason deals with evidence.

Sources of reli- gious truth.

and of inference, are the only discoverable expression of its lawgiver's "thus far." When it violates any of these laws it has gone too far, but only then, and then simply because it has ceased to be rational. As long as it con- forms to them the farther it goes the better. All this holds good not less in regard to religion than to any other object of investigation, and is an essential condition of the possibility of religious science. (4) In the study of religion, as in every other department of study, reason should admit nothing as true without sufficient evidence, while rejecting nothing sufficiently proved by evidence of any kind although it cannot be proved by evidence of another kind, or although it may be imperfectly under- stood or have unsolved difficulties connected with it. Theology is sometimes said to be a doctrine or science of belief or faith (a "Glaubenslehre"). Not a few, however, of those who say so regard belief or faith as essentially inclusive of reason, in the form of an immediate apprehen- sion of primary truth or self-evident fact ; in which case theology is only a Glaubenslehre in common with other sciences, and belief or faith is in no special mode or measure its foundation. But, whenever by belief or faith is meant mere belief or faith, a belief or faith independ- ent of and unconformed to reason, the apprehension and appreciation of truth,—to affirm that theology is based on such belief or faith is to represent it as so unlike every other science that it clearly cannot be a science at all. For all belief or faith we are bound to have real evidence, and enough of it. But we have no right to

reject any real evidence because there is not more or because there is not evidence of some other kind,—no right to neglect to follow any light there is because it may be dim, and much around it may be dark,—no more right to refuse to accept any well-established conclusion as to God and religion because there is great uncertainty as to the essence of religion, and because God in His absoluteness and infinity immeasurably transcends our highest thoughts, than we have to ignore or contest the conclusions of physical science because we cannot tell what matter is, and because we find that every hypothesis as to its nature brings with it many doubts and difficulties.

The foregoing conditions are perhaps the most general and fundamental of those to which reason must conform if it would originate and follow a scientific method in theology. The next question which demands an answer is, Whence are the data to be derived on which reason must operate in religious apprehension and _ theological investigation? What are the sources of religious truth ? Reason has not the truth in itself, but in order to possess it must find it. As the eye has not physical light within itself, but merely so corresponds to it as to apprehend it, not otherwise is it with reason and intellectual light. By sources of religious truth can only be meant the media through which God manifests Himself,—the ways by which He makes himself known ; and the physical world, finite minds, human history, Scripture, and the testemonium Spiritus Sanctt may all be maintained to be such sources. The atheist and the agnostic will not allow that there are any sources of religious truth ; the deist and the ration- alist will only admit the claims of general revelation, the exclusive Biblicist only of Scripture ; and the mystic will trust chiefly to special spiritual illumination; while the theologian of broader view will hold that all the ways indicated are sources, seeing that in and through them all knowledge and experience as to God and religion may be acquired, and must contend that in the study of theology none of them is to be ignored or excluded, underestimated or overestimated, but all are to be duly considered, and the information supplied by each to be taken in connexion with that supplied by the rest. The sources are distinct,

but not isolated. The light from each combines and harmonizes with the light from all the others. The revela- tion of God in nature is presupposed by that in Scripture, and Scripture contributes to unveil the spiritual signifi-

cance of nature. Without the light which the human mind supplies there can be no illumination from any other source, and yet all the light of the human mind is gained in connexion with the light from external sources. History gradually evolves the significance of nature, mind, and Scripture, yet cannot be understood if dissevered from the creation in which it is placed, from the mind of man in the principles and faculties of which it is rooted, or from Scripture as the record of the development of a plan of redemption which gives unity and meaning to the whole historical movement. However deep and full a source of religious truth the Bible may be, it is neither independent of other sources nor a substitute for them; on the con- trary, while casting light on them all it likewise receives light from them all. The living apprehension of spiritual realities presupposes a discernment which the Divine Spirit alone can give; yet that Spirit, according to the testimony of Scripture, speaks not of Himself, but only in conformity with what has already been uttered by the Father and the Son. It would obviously neither be consistent with the scope nor possible within the limits of an article like the present to determine the distinctive features, natural spheres, and various relationships of the media of revela- tion or sources of religious truth, but a sufficiently thorough investigation having this aim may safely be pronounced to be one of the chief desiderata of theological science.

The process of theological method itself has next to be Process considered. Its first step is the ascertainment of the of theo- relevant facts. But these are all the facts of nature and oe history, all the truths of Scripture, and all the phases of _ religion. The various departments of theology are based on and inclusive of various orders of these facts, and each order of facts must be ascertained and dealt with in appropriate special ways. Thus the relevant data of The facts natural theology are all the works of God in nature and of natw providence, all the phenomena and laws of matter, mind, He . and history,—and these can only be thoroughly ascertained “ by the special sciences. The surest and most adequate knowledge of them is knowledge in the form called scien- tific, and therefore in this form the theologian must seek to know them. The sciences which deal with nature, mind, and history hold the same position towards natural theo- logy which the disciplines that treat of the composition, genuineness, authenticity, text, development, &c., of the Scriptures do towards Biblical theology. They inform us, as it were, what is the true text and literal interpretation of the book of creation. Their

conclusions are the pre- misses, or at least the data, of the scientific natural theo- logian. All reasonings of his which disregard these data are ipso facto condemned. A conflict between the results of these sciences and the findings of natural theology is inconceivable. It would be a conflict between the data and conclusions of natural theology, and so equivalent for natural theology to self-contradiction. Then, the data of of Bibli- Biblical theology are all the words contained in the Bible, cal theo- viewed in their appropriate positions and historical con-°°8% nexions, and what these are and signify can only be ascertained by the processes of historical criticism and of hermeneutics. Biblical theology is the delineation of a section of the history of religious ideas,—that section of which the traces and records remain in the Bible. But the Bible comprehends many strata of writing, deposited at different times, and collocated and connected in various ways, and the history of its composition, the age and suc- cession of its parts, must be ascertained before we can exhibit the history of its contents, the course of the evolu-

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There must be, therefore, in theology need and scope for a great variety of applications of method.

It is easy, however, to exaggerate the importance of Practical acquaintance with the formal rules of method laid down investi- by logicians. The theory of method must be preceded by &tion

tion of its ideas. If the theories of recent critics as to the formation and relationship of the component portions of the Old Testament be true, the view taken of the develop- ment of Old Testament theology must be very different

from that formed on the supposition that the traditional essential,

theory is correct. And which theory is correct is a ques- tion of fact which can only be decided by dispassionate and thorough critico-historical investigation. So false rcadings must be distinguished from true, erroneous trans- lations from correct, and appropriate from inappropriate interpretations, which presupposes an adequate measure of linguistic,

grammatical, and exegetical knowledge and skill. The religion of the Bible, however, is but one of a multitude of religions which have left traces of them- selves in documents, monuments, rites, creeds, customs, institutions, individual lives, social changes, &c.; and there is a theological discipline—comparative theology—which undertakes to disclose the spirit, delineate the character, – trace the development, and exhibit the relations of all re- ligions with the utmost attainable exactitude. Obviously the mass of data which this science has to collect, sift, and interpret is enormous. They can only be brought to light and set in their natural relationships by the labours of hosts of specialists of all kinds. That hypotheses in this domain will for long arise and vanish with disappointing rapidity is only what is to be expected from its vast extent, the amount of its buried wealth, the gradual and fragmentary way in which its contents must be disinterred, the losses and changes which have occurred in the course of time, and the constant suggestion of fresh interpretations of ancient texts and new solutions of old problems which must come from unceasing discovery. Some theological disciplines, it must also be observed, presuppose others, and have consequently among their data the conclusions of those other disciplines. All doctrine, for example, founded on special revelation presupposes doctrine founded on general revelation ; all Christian theology must imply and incorporate natural theology. Christian dogmatics has to make use of the results of natural theology, Biblical theology, and comparative theology, and to raise them to a higher stage by a comprehensive synthesis which con- nects them with the person and work of Christ, as of Him in whom all spiritual truth is comprehended and all spiritual wants supplied. The conception of it prevalent until lately, as a system formed of generalizations and inferences from texts of Scripture, answers properly to no theological science, but much more nearly to Biblical theology than to Christian dogmatics,

When religious data have been ascertained, the materials of theological science have been obtained, but the scientific . edifice itself has still to be constructed. The general truths involved in particular disclosures have to be evolved ; the laws of the development of phenomena have to be discovered ; elements have to be reached by analysis and comprehensive views by synthesis ; laws and facts, funda-

practice—true theory by successful practice; and the ablest practitioners are always only to a small extent guided in their practice by conscious reference to the rules of method prescribed by logicians. In theology, as in all other depart- ments of science, a man can only become an investigator by investigating. And whether he will become, through the practice of investigation, a successful investigator or not will depend far more on his general intellectual char- acter, his ingenuity, originality, tact, and sensibility, his familiarity with the relevant facts and with the researches which are really bringing new truths in his department to light, his perseverance and diligence, than on his know- ledge of what the theorists on method have taught as to its nature and requirements. Yet, of course, such instruc- tion as logical theory can give is not to be despised, but to be received and acted on with all due appreciation.

When the data of the theologian are before him as particular facts, it is obvious that he must so enumerate and classify, so analyse and generalize, so correlate and combine them, as to elicit from them the principles which they imply, before either his procedure or results can be properly characterized as scientific. In other words, a method which starts from particulars must, in order to be scientific, be largely inductive. But in theology, as in all other departments of knowledge, the only induction which is of any value is more than any mere sunimation or combination of facts. This is not the place for a discussion of the nature of a true induction; but on any view it must hold good that to understand aright what induction in theology is we must know what is implied in all that is comprehended in it,—the ascertainment and collocation of facts, the discrimination of their charac- teristics, the classification of them, the analysis of what is complex, the synthesis of what is partial, the tracing of uniform relations, the inferential act, &c. Much which would not be without interest or use, or even some degree of novelty, might be said on all these points. Numerous as have been treatises on theology, there has not as yet appeared a single earnest attempt to expound the nature of method in theology ; even the many works professedly dealing not only with the encyclopedia but with the methodology have, in reality, quite ignored theological method proper. The present writer can only here note the desideratum ; to supply it would require a special and lengthened discussion. The so-called methods of induction— the methods of agreement, of difference, and of concomitant

variations—are as applicable in theology as in physical or mental science. They are not, properly speaking, processes of induction ; they are merely rules for testing inductions. Their value, of course, is not thereby lessened.

Method must be largely induc-

tive.

The theologian, not less than the physicist, must be on Number his guard against fancying that the validity or certainty of of data his inductions is to be estimated by the number of his °“7 instances. Many who have undertaken to prove the Divine a existence by the cosmological and teleological arguments nature have made the fatal mistake of supposing that all that was of the needed was an accumulation of what they deemed ex- ~~ amples or illustrations of Divine wisdom. They have XXII —- 34

mental and derivative principles, have to be exhibited in their natural organic connexion. This can only be done aright by right methods, and only by a variety of methods. No one-sided process can be appropriate or sufficient. The method must conform to the nature of the matter dealt with and to the end that has to be attained. Theo- logy includes a variety of sciences or disciplines, and these differ so greatly in character that they plainly cannot be studied aright if studied precisely in the same way. Some of them are more allied to criticism, others to history, and others again to philosophy. In some deduction can mani- festly have little place, while in others there is no obvious reason why it should not be largely uscd. There is no kind of science which, with its special processes, may not be called on to contribute to some department of theology.

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apprehend that the essential question at issue is not, What or how many appearances of order and of adaptation may be traced in the various provinces of nature? but, Do such appearances im any case warrant an inference to a super- natural intelligence and purpose? In like manner many dogmatic theologians have seemed to think that in order to establish a doctrine it was enough to cite a number of texts in its favour. Often their doctrines would be more easily believed if their texts were fewer. Often in

the Westminster Confession, for example, where the doctrine causes no difficulty, the texts cited in connexion therewith are quite inadmissible as proofs. Induction requires the strictest regard to relevancy. Whether the data for the proof of general truths in theology must be many or may be few will largely depend, as in physical and mental science, on the nature of the truths. When Newton had

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investigation and comprehensive and minute historical knowledge. Given, on the other hand, the Christian ideas of God and of man, and the fundamental relation between God and man cannot be otherwise conceived by enlightened reason and conscience than as one of salvation through faith and not by works. ‘True, as all physical nature obeys the law of gravitation, so all Scripture and spiritual experience testify to the power of the principle of faith; but then, also, as the decisive proof of the former lies in the thorough elucidation of any phenomenon which ex- emplifies it, not in the collection of numerous illustrative phenomena, so the decisive proof of the latter lies in an adequate analysis of any portion or form of the life of genuine faith, not in the accumulation of examples of faith drawn from the Scriptures or other records.

The two methods of induction to which reference has Histo-

just been made-—the historical and the thetical—are to Tical and be carefully distinguished but not absolutely separated, a and still less exhibited as antagonistic. Both have specific…

made out that the law of gravitation explained a single fact, applied to the moon, no person who fully compre-

hended his demonstration could seriously doubt either of tion

the certainty or of the universality of the law. It was a case of a vast intellectual conquest achieved by one decisive victory. What remained was merely to take possession of what had been won, and to explain certain apparent anomalies. On the other hand, when Mr Darwin published his Origin of Species, he had already accumu- lated, with amazing industry and

ingenuity, and through the uninterrupted investigations of many years, a multi- tude of observations and considerations in support of the general propositions therein enunciated as laws of bio- logical evolution. Of similar observations and considera- tions there has since been an enormous increase. Yet the so-called Darwinian laws are still under discussion. Why has their proof or disproof been so different a process from that of the establishment of the law of gravitation ? Largely because they are in themselves so different in nature. Laws of evolution can only be reached through the minute investigation of a far greater number of changes and appearances than laws of persistence. The discovery of truths of becoming may not be a more difficult but it is certainly a more delicate and complex process than the discovery of truths of being. Now this distinction not only emerges in theology but pervades it. In some de- partments of theology the laws to be discovered are laws of evolution, while in others they are laws of existence. Hence the method to be followed in the former must be predominantly chronological and genetic, in the latter predominantly analytic and synthetic. For example, in Biblical theology and comparative theology the inductive process must be of the kind appropriate in historical inves- tigation, whereas in natural theology and Christian dog- matics it must be of the kind appropriate in systematic investigations into which considerations of time, place, and circumstance do not enter. The faculties of mind and processes of method implied in the complete comprehension of religion as a concrete manifestation of spirit are those which are of prime moment in the historical disciplines of theology ; the faculties of mind and processes of method involved in the clear apprehension of the truths and laws of religion in its abstract or essential nature are those chiefly requisite in the theoretical disciplines of theology ; and, speaking generally, complete comprehension of the concrete presupposes a more minute and exhaustive ac- quaintance with particulars than does a clear apprehension of the abstract. To determine with scientific precision and thoroughness, for example, what were the stages of the development of doctrine in the Bible, or even to trace with such accuracy and completeness as the data supplied by the Bible and auxiliary sources permit the growth of single important ideas, as, eg., election, holiness, atone- ment, and kingdom of God, demands laborious critical

and appropriate functions ; neither is exclusively legiti- mate or can alone accomplish the work of science. The historical method by itself can only yield history. It has done all that can in any circumstances be reasonably expected from it, when it has enabled us accurately to realize the course of the history studied, or, in other words, when it has given us a correct reflexion of the history. If, not content therewith, we would further ascertain the nature and laws of the factors which formed the history we must supplement the historical with the thetical method. The historical method leads only to history, and in no form or province is history science. Science even of history, or of any department of history, cannot be reached simply by the historical method, but further requires recourse to the processes of positive science. Comparative theology, Biblical theology, and the history of Christian doctrines are most valuable theological dis- ciplines, but, inasmuch as their methods are purely histor- ical, their results are also purely historical, and they are not, rigidly speaking, sciences, but only sections of the history of religion, The tendency to substitute history for science, and the historical method for the scientific method, is prevalent in the present day in theology, as well as in ethics and jurisprudence, social philosophy and political economy. Obviously, however, it rests on ex- aggeration and illusion, and confounds things which ought to be distinguished. Neither history of the objects of a science, nor history of the ideas or doctrines of a science, is science, and the historical method of itself can only give us in connexion with science either or both of these forms of history. It is, therefore, inherently absurd to suppose that the historical method can be sufficient in such theological disciplines as natural theology and Christian dogmatics. In reality, it is not directly or immediately available in the study of these disciplines at all, and that just because it does not directly or immediately yield theory, doctrine, science. Only he who knows both the history of the objects and the history of the ideas of a science, and especially of a psychological, social, or religious science, can be expected to advance the science. In the sphere of religion, as in every other sphere, to confound history with science is to eliminate and destroy science ; but in no sphere is knowledge of history more a condition of the attainment of science, and historical research, properly conducted, more serviceable to scientific investigation, than in that -of religion. To the historical method we owe, not only the historical disciplines of theology, but also in a considerable measure the recent progress of its positive or

theoretical disciplines. It can never, however, be, as some fanatical disciples of the historical school would have us to suppose, the method of these last.

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The inductions of theology, even in its systematic or

oblems non-historical departments, often require to be very careful

and comprehensive in order to be conclusive. Theories or

- doctrines like the Christian dogmas of the Trinity, incar-

nation, and atonement were only arrived at through the labours and controversies of many generations of theolo- gians. It could not be otherwise. These dogmas, simple as they may seem to a superficial glance and untrained eye, are in reality very complex organisms of thought, only capable of being formed by a long process of evolution. They are theories inclusive of many theorems. They com- prehend a number of directly constitutive propositions and a still greater number of propositions subordinate and subsidiary to these. Every proposition which they involve should be the expression of real and relevant facts. As wholes they ought to combine a multitude of particulars of different kinds, and even of kinds the harmony of which is far from obvious and needs confirmation. Whoever intelligently accepts any one of these dogmas must, by necessary implication, reject a host of hypotheses regarding its subject, as either inadequate or positively erroneous. Inasmuch as they are not consistent with or are contrary to the dogma, he is logically bound to repudiate them, and yet he is only logically entitled to do so if his proof of the dogma have been

so comprehensive and complete as to include their separate and collective refutation. The establishment of the whole truth is only possible through the disproof of all the opposing errors. How the inductive method is applied in theology, however, will be better understood by the examination of a particular exemplifica- tion of it than by a general description ; and, perhaps, as regards at least form, a more careful or elaborate exempli- fication could hardly be pointed out than that exhibited in Dr Crawford's treatise on the atonement. An examination of it will show how very complex in reality may be a doctrine which is very simple inappearance, and how com- prehensive, therefore, must be the inductive procedure necessary to establish it and to warrant the rejection of the hypotheses which must seem to one who accepts it to err by excess or defect or to be absolutely false.

The inductions of theology, like those of other sciences, are seldom or never mere or pure inductions. They would be useless if they were. The examples of pure induction given in treatises on logic may serve their purpose, the illustration of the nature of ratiocination, but they are not reasonings of a kind which can increase positive know- ledge. The abstraction of induction from deduction may be needed to exhibit its distinctive formal character, but it is fatal to its practical efficiency. In all reasoning meant to increase our knowledge of objects, induction must receive from deduction some measure of assistance and guidance. This certainly holds true in theology. In regard to the doctrine of the Trinity, for example, the most difficult questions involved turn largely on the signi- fication and application of the terms employed in its ex- pression. These terms must be somehow defined, and definitions once introduced cannot fail to be used to some extent as principles of deduction. They are often largely so used by those who are quite unconscious of making any use of them, and who have no suspicion that the course and character of their reasonings are modified by them. Definitions often secretly introduce a great amount of hypothesis and deduction into reasonings imagined to be exclusively inductive. Further, principles of deduction are directly and explicitly introduced. The truth of the catholic doctrine, or indeed of any doctrine, of the atone- ment, for example, cannot be proved purely by induction. Tt is necessary to start with some assumption as to the authority of the Scriptures, or at least as to the authority of those whose teaching is contained in the Scriptures.

That assumption itself should, it is true, be proved by a process of apologetical and critical reasoning which is in the main inductive. It cannot, however, any more than the doctrine of atonement, be proved by a purely or ex- clusively inductive process, 7.e., without some co-operation or participation of deduction; and, once proved, it becomes a principle of which a deductive use is made. Every parti- cular statement of Scripture is read and interpreted in the light of it. So far as this is the case, deduction underlies all the inductions of doctrine based on the statements of Scripture. Of course, the dogmatic theologian, in so far as he founds on Scripture, is bound not to presuppose more than he is prepared to prove as a Christian apologist or Biblical critic and interpreter. The assumptions made in systematic theology ought to be the firmly ascertained results of its subsidiary sciences. And the less assumed the better, as the relevancy of the reasoning employed will be so much the more widely acknowledged. Every addi- tional assumption diminishes the number of persons who will grant the principles on which the argumentation pro- ceeds.. When, for instance, a doctrine like plenary inspira- tion is assumed as the basis of an argument for the atone- ment, the number of persons who can be benefited by the argument must be few. Those who will grant plenary inspiration are not likely to require to be convinced of the truth of the ordinary doctrine of the atonement ; they are almost certain to be already convinced. On the other hand, a man may have loose or vague views of inspiration, and yet it may be possible to satisfy him that the doctrine of the atonement is well founded. The proof of the

‘doctrine of the atonement may receive support and con-

firmation from the proof of the doctrine of plenary inspira- tion, but ought not to be made dependent on it.

Scientific method has not only to ascertain the facts and Systema- data of science, and to discover its laws, but also to dis- tization.

tribute and co-ordinate its contents. And this last is. like- wise an important function. Science is system. To exclude system from science is to suppress and destroy science. The spirit of system is in itself nothing more than the

spirit of order and unity. Without unity and order—that is, without system—there is no science ; instead of it there can be only confused ideas, isolated opinions. It is absurd to condemn either system or the spirit of system in theology or any other science. To systematize is an intellectual necessity; to systematize aright is a happy achievement and an immense boon; it is merely systematizing erroneously which is evil. Theology, by professing to be a science, pledges itself to systematize in a scientific manner. By claiming to be the science of religion it undertakes to exhibit the truths of religion in their proper relationship to one another, in their organic unity and essential interdependence. Thus to proceed is necessary to it, not only as a consequence, but also as a means of the development of its constituent dogmas, for no doctrine can be truly and fully evolved in isolation, but only in connexion with kindred doctrines and through the general growth of the science or system to which it belongs. Increase of insight into any one truth brings with it clearer views of all contiguous and related truths, and the collec- tive light thus gained illumines each particular to which it extends. To apprehend more distinctly the relations between either facts or theories is to understand better the facts or theories themselves. To comprehend any single doctrine aright we must study, not merely its special data, but those of allied doctrines, trace its connexions with those doctrines, and view both it and them as parts of an organic and harmonious whole. Hence the endeavour to systematize the contents of science should not merely follow the formation of its separate doctrines, but likewise accompany and participate in the process of their forma-

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tion. Wisely conducted systematization is entitled to be deemed an aid to discovery. It reveals where exploration is needed, and indicates the directions in which research will be successful. It is the highest form and

efiort of synthetic thought, and synthesis is a not less necessary and fruitful operation in scientific method than analysis. Unfortunately it cannot be denied that there has been a vast amount of erroneous systematizing in theology, and that it has done a vast amount of harm. Doubtless much of the aversion felt and expressed to system in theology is to be traced to the imperfect, artificial, false character of many theological systems. Instead of exhibiting religious truths in their real significance and interdependence, theo- logical systems have often disguised and disfigured, cramped and contorted these truths, or even ignored and rejected them. How, then, isa true and appropriate system to be distinguished from one which is false and imperfect? In various respects, which can here be merely mentioned. Thus, first, a true system is natural and not artificial. In equivalent terms, it is directly derived from the character of the matter of which it treats, and not arbitrarily ini- posed on that matter from without. Every system of thought, whether true or false, must, of course, be the product of intellect, but no true system is a mere inven- tion of intellect, a mere subjective creation interposed between the mind and things; it is, on the contrary, a representation of the real natures and relations of things. The human intellect can only construct a true system by finding in and among facts the connexions and harmonies which are actually there. But todo this may require more labour than is agreeable, or may contravene some cherished prejudice, or may not be recognized to be the sole legiti- mate procedure, and so it may devise, instead, a formula or scheme of thought suggested by some idea drawn from an extraneous source, force that scheme or formula upon things to which it is inappropriate, and so construct a sys- tem which is artificial and erroneous. Most sciences have suffered from artificial systematization of this kind, but probably none nearly so much as theology. Metaphysical philosophy has always sought to shape and modify religious and even distinctively Scriptural truths according to its own ideas, methods, and dogmas. Paul and John have often been merely the masks through which Plato and Aristotle have taught. Hegelian divines have passed all religious beliefs, all Scriptural doctrines, through the dia- lectic devised by their master, and, whatever those beliefs and doctrines may have been before subjection to the operation of that wonder-working machine, they have always come out ground into Hegelian notions. Juris- prudence exerted a similar influence, owing to its having been the only science which was studied with zeal and success in the Latin world when theology began

to be independently cultivated by the Latin Church. The Latin mind was so possessed by juristic or forensic ideas that the Latin fathers could not avoid looking at the gospel through them. This way of viewing it is still familiar. The so- called federal school of theology, long and widely influen- tial, exhibited the whole system of religious truth accord- ing to the analogy of a covenant,—a succession of cove- nants between God and man,—in other words, according to a conception which is essentially juristic and political, not intrinsically and properly religious. The making of a metaphor in this manner the basis of an entire system of theology is far from uncommon. ‘Thus, because sin may be likened to disease or to darkness or to death, and holi- ness to health or light or life, not a few would conceive of all religious truth according to these similitudes, and do violence to the reality when it does not easily adapt itself to the moulds which they have chosen for it. Dr Chalmers, for instance, distributed all systematic theology

into a study of the disease and a study of the remedy, and treated the doctrine of the Trinity merely as an appendix. At present, owing to the dominancy of physical science, there is a strong temptation to work upon spiritual facts with physical categories, and even to identify, 2.e., to con- found, the spiritual with the physical. Hence we hear of natural law, in the sense of mechanical or biological law, in the spiritual world.

Secondly, in a true system of theology the material and formal constituents of knowledge will be duly combined, but not in a false system. No true system of theology can be constructed simply by logical deduction from abstract conceptions, from a prior assumptions, from self-evident axioms. Mere reasoning from data so insufficient as these may be made plausible and imposing by being thrown into syllogistic, dialectic, or mathematical shapes, but it cannot be made truly profitable and productive. When the Wolfians had presented theology in the semblance of geometry, they had merely succeeded in dressing it in masquerade and binding it with fetters. Reason can only work effectively in theology when it is in possession of a large and close acquaintance with Divine things and acts harmoniously with the whole spiritual nature. On the other hand, without the application of logical reflexion to the truth implicitly contained in the sources of religious

knowledge, without the help of definition, induction, deduction, and all the processes involved in analysis, generalization, judgment, and reasoning, we never could reach a scientific system at all. Such a system is not simply an aggregation or accumulation of the data and con- stituents of religion, but the product of all the activities and forms of thought which give to the contents of re- ligious experience the order and organization which theo- logy, as science, demands.

Thirdly, a true system is one in which unity is the result of the conciliation of all relevant principles, even although they may be apparently antagonistic, while a false system is one which bases itself on some particular principle or idea to the exclusion of others, also legitimate. In a true system unity is produced by harmonizing differ- ences ; ina false system it is produced by ignoring differ- ences. A true system of theology is one which grows out of the struggle of opposing elements and recognizes the validity and significance of all religious truth. It is not, for example, so based on Divine sovereignty that injustice is done to human liberty, or so based on free will that God's agency is largely ignored, but it assigns to both Divine efficiency and human action their proper place, and does so, not merely by maintaining the truth of both, but also by exhibiting their relationship and harmony.

Fourthly, in a true system all the members are not merely included, connected, and classified,—they are also unified through reference to a centre. A true system must be a unity of members pervaded by a common life. In its remotest members must be traceable the pulsations of its heart. Only of late have theologians begun clearly to recognize that this characteristic of a true organic system must be taken into account in the formation of their science. Long after they were fully alive to the importance of treating of each head of doctrine or article of faith, each separate theological locus, they felt hardly any interest as to how the various doctrines, articles, or loci were to be connected. They were often content to take the order of arrangement from some external source, some creed, confession, or catechism. It was a step in advance when, although still arranging the dogmas merely in a series, they endeavoured to give each dogma its place, on the ground of its natural] and intrinsic relationship to

other dogmas. Theologians have, indeed, differed much as to what is the proper sertatim order. One, for example,

Specu- lative method in theo- logy,

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has begun with the nature and state of man, a second with the being and character of God, a third with the Divine authority of the Scriptures, and a fourth has followed the order of the Divine dispensations. Yet there need be no doubt that there is such an order, one in which every dogma is exactly where it ought to be. This order, it may also be safely affirmed, can only be one of advance from the simpler to the more complex. An order in which each dogma has before it only its natural antecedents, and after it only its natural consequents, must be one of con- tinuously increasing complexity. The spirit of order and of system cannot rest, however, in the series. It must classify as well as connect the doctrines. This also may be accomplished in various ways, and even when there is general agreement as to whiat are the natural groups, there may be considerable difference of opinion as to their delim- itation. But the most perfect distribution by classifica- tion, if unsupplemented, must be unsatisfactory. A still higher kind of unity has to be attained. It is that of the only unity which is truly organic. It is that of co- ordina- tion and correlation through a single central principle. An intellectual system, a system of science or doctrine, can only have this unity, and be in consequence a true system, when all its particular truths and various departments or divisions of truth are connected with one another and combined into a whole by reference to a common and central truth. tion of systematizing has now begun to be felt among theologians, and hence in several modern systems of Christian dogmatics the doctrines are not merely distri- buted into groups, but an attempt is also made to find a centre for the whole system in a single pervasive idea. Such a centre Rothe, for example, finds in the religious consciousness, a consciousness of sin and of grace; Kahnis in the doctrine of the Trinity; and Thomasius and H. B. Smith in Christ Himself, His person and work. So far as Christian theology is concerned, the last of these views is doubtless correct. Christian theology, like Christianity itself, must be Christocentric. All its doctrines either directly and immediately relate to Christ’s manifestation of God and

redemption of man, or are the antecedents and consequents of those which do. To Christ the entire system owes its distinctive character. For general theo- logy, on the other hand, the central and vital idea can be no other than that of religion itself. It must obviously be one derived from the domain of the science itself, and indeed from the essential nature of the object of the science. As it would be an error to seek the principles of biology elsewhere than in “life,” or of psychology else- where than in “mind,” so must it be to seek the principles of theology elsewhere than in “religion.” Theology is the science of religion, and in the true idea of religion should be found the central and constitutive principle of the general system of theology. That it can be found therein will appear as we proceed.

Must the work of method in theology end, however, even with the formation of a system which answers to the requirements just indicated? Is there no still higher procedure or application of theological method legitimate ? This is to ask if there be any place for a speculative method in theology, aud if speculative theology rest on any solid basis.

The history of theology might, perhaps, suffice of itself to show, on the one hand, that speculation has a large and legitimate place in the sphere of theology, and, on the other hand, that its place is one the limits of which are difficult to fix or keep within. Christian theology was initiated by Gnostic speculation, grandly reasonable in aiming at the exhibition of Christianity as the absolute truth and absolute religion, but otherwise wildly extra-

The necessity of conforming to this condi-

vagant. An Origen and an Augustine owed largely to speculativeness both their successes and their failures. The defects of scholasticism were due more to misdirection of the reflective understanding than of the speculative reason, and it was especially the speculative and the mystic divines of the Middle Age who opened up the way to modern thought and modern theology. Men like Nicholas of Cusa, Bruno, Telesio, and Campanella, looking from the heights of speculation, saw some aspects of religious truth which the Reformers, standing on lower if safer and less cloudy ground, overlooked. A Descartes and a Spinoza, into whatever errors they ay have

fallen, certainly did much, and in a directly speculative manner, to enlarge and advance the philosophy of religion. Kant supposed that, by his critical researches into the nature and limits of knowledge, he had made an end of speculative theology and done what would effectually deter reason from specu- lative adventures. It soon became apparent that his expectations had been doomed to disappointment, that in reality he had excited speculative reason to extraordinary activity and even audacity, and inaugurated an era of theology far more speculative than any which had preceded it. The great speculative movement in philosophy headed by Fichte, Schelling, Hegel, Baader, Krause, and others passed on immediately into the sphere of theology, its leaders themselves proceeding to apply their principles and methods to the explanation of the doctrines and phases of religion. Theologians by profession soon followed in their footsteps. Daub and Marheinecke constructed systems of Protestant dogmatics by means of Hegel's dialectic. Strauss, Baur, and their followers reached by the same method negative and antichristian results, bringing out the contradictions between the doctrines of the church and the speculative truths to which it was held that they should give place. Many theological systems of an almost exclusively speculative character have since appeared in Germany. Weisse's Philosophische Dogmatik and Rothe's Theologische Ethik are good typical instances. And, while not so predominant, the speculative use of reason is yet conspicuous in the treatises on Christian dogniatics of Dorner, Martensen, Schéberlein, Hofmann, Liebner, Biedermann, and others. In the department of philo- sophy of religion a speculative procedure is not less fre- quently followed, either as alone appropriate or as a necessary supplement to the genetic and historic method. Rosmini, Gioberti, and Mamiani inaugurated in Italy a speculative theology second only to that of Germany. Contemporary French theological literature can boast of at least one work displaying real speculative power,—the Philosophie de la LInberté of M. Secrétan. In America Hickok, Bushnell, and Mulford may be named as having shown confidence in the competency of speculative reason in the spiritual sphere. In Britain Principal Caird has argued in favour of a speculative procedure in theology with rare skill in his Jntroduction to the Philosophy of fteligion. On the whole, however, both in America and Britain, the speculative method has received little recogni- tion from theologians. But this, of course, may be held to be partly cause

and partly effect of the want of life and originality, of thoroughness and truthfulness, of ordinary American and British systematic theology.

Is there, then, room and need in theology for the speculative method? The answer must depend on what is meant by speculative method. There are kinds of so- called speculation which are plainly illegitimate and in- applicable. Thus, some have represented speculative theo- logy as part of a philosophy of which the whole system is deduced in a purely and strictly logical manner from an a priort principle, idea, or datum. On this view the specu- lative thinker somehow apprehends an absolute first of

thought or being, or both, and then from this primary and necessary datum evolves syllogistically or dialectically a whole philosophy, which includes a whole theology. Such speculation may be safely pronounced futile and delusive. It can never reasonably vindicate its choice of a starting- point, for the absolute first of existence and thought can only be that to which the worlds of fact and experience, of matter and of mind, refer us as their ultimate explana- tion. It ascribes an extravagant power to mere formal thinking. It is only consistent with exclusive idealism and exclusive rationalism, both justly discredited species of philosophy. It makes theology wholly dependent on a philosophy which must be false, since pure reason cannot, as it assumes, spin out of its own essence or out of any single datum the whole system of truth.

There is, however, a theology which claims to be at once

Theo- speculative and independent of philosophy. Such was the logical theology which Rothe sought to elaborate in his Theological Zee of wyhics. In the “Introduction” to that work he has fully

explained his method. It is, as there represented, the very same method with that of speculative philosophy, but it starts from a diffcrent point,—not from pure self-conscious- ness, but from the religious self-consciousness or God- con- sciousness. Its primary datum is, according to Rothe, as immediately

certain as that of speculative philosophy, the pious man being just as directly sure of God as the natural man is of his own self. Out of this datum it must evolve all its conclusions by an inward logical necessity, and construct an entire theological system of such a nature that every single thought implicitly supposes the whole. Speculative theology thus conceived of needs but a single fact, the datum from which it starts, and that fact must be a self-evident one, given immediately in and by con- sciousness ; all the rest is a succession of inferences de- ductively obtained. The facts of religion presented in nature, history, and Scripture not only need not but ought not to be taken into account by it, although at the close of its labours its success must be tested by the con- formity or nonconformity of its results with those facts.

“This system of a priori thought,” says Rothe, ‘‘to be success- ful as a speculation, must be an absolutely corresponding and constant image of the reality; but the speculative process itself takes no thought whether thcre be such a reality existing, or how the ideas which it constructs are related toit; but, without looking either to the right hand or to the left, it follows only the course of logical necessity, until it has accomplished the whole circle of its ideas, and constructs a complete system. Then first the specu- lative thinker looks out of himself, in order to compare the system of thought which he has indcpendently constructed with the objective reality, and to assure himself of his correctness by such a comparison; but in so doing he is slipping out of the region of speculative into that of reflective thinking. The necessity of such a verification, indeed, he acknowledges unconditionally, but he dis- tinguishes clearly between the speculation itself and that reflective critical process by which alone such a verification can be realized. With reference to the empirical reality around him, he acknowledges that his speculation is incorrect if his system of thought is not there reproduced, but he still persists that he has to complete his speculative labour without any direct reference to it. He concludes rather, from a clear want of correspondency, that he has speculated incorrectly, and can look for his error in nothing else than in his departure from a strict adherence to the laws of logic. Forthwith, then, he destroys his laboriously constructed system; but desire again proceed to construct another, he must proceed in the very samc manner as before, ¢.¢., by looking solely into his own thoughts, as though there were no world around him.”

Rothe, it will be observed, cannot be charged with hav- ing made theology dependent on philosophy. He repre- sented theological speculation and philosophical speculation as starting from different data, as running parallel to each other, and so as throughout distinct. But this was to avoid one extreme by falling into another. It was virtu- ally to deny the unity of thought, and to assume an in- credible dualism in the universe of speculation. A theo- logy absolutely separated from philosophy must be even

more unsatisfactory than one wholly dependent on it. Then, the method itself proceeds on assumptions unsup- ported by evidence, yct far from self-evident. It assumes, for instance, that a system of ideas generated @ priori will be a counterpart of reality, although it is neither incon- ceivable nor improbable that the characteristics of real existence may be incapable of being determined by the mere logic of necessary thought. Reason should not thus be credited with the extraordinary power of comprehend- ing reality without requiring to apprehend and study it. Another assumption is, that a complete and self-consistent system can only be reached by an exclusively a priore procedure, whereas it is far more likely that such a system will only be attained by a combination of different pro- ecsses. Again, the primary datum of theological specula- tion as understood by Rothe—the idea of God—is assumed to be immediately given and immediately certain. But the idea of God is not immediately given or immediately certain. ‘The piety which chooses to affirm so is a piety capricious in its affirmations ; the speculation which starts from such a foundation starts from an assumption easily shown by psychology and history to be eryoneous. Rothe went even farther astray. He represented not only the bare consciousness of God but the Christian, yea, the evangelical God-consciousness, as a simple and primary datum of consciousness. This was utterly arbitrary. It was to treat as an original apprehension what is indubit- ably an acquired experience. No a priori system—no properly deductive system—can be reasonably imagined to have such a starting-point. For these and other reasons, theological speculation of the kind advocated by Rothe may be rejected.

Still another species of theological speculation, however, The has been attempted and commended,—one which seems Schrijt- more modest, and claims to be more distinctively Christian. pe a It is the method advocated and exemplified in the Schrift- —_— beweis of Von Hofmann. He, instead of starting like Rothe with the religious consciousness, chose to start from a real concrete fact, what he calls the Christianity of the Christian,—a Christianity which he supposes to have acquired in the Christian a separate standing of its own, in virtue of which, and independently even of Scripture,

it is self-evident certain truth sustained and authenticated by the Spirit of God. From this fact or experience, expressed in its simplest and most general form, as a personal re- lationship or fellowship between God and man through Jesus Christ, Hofmann would deduce the whole theological system by a process of “ thinking within ” the central fact, so as logically to evolve from it its manifold wealth of contents, and would refrain on principle from looking out- wards, and taking into account the religious facts presented by history, experience, or Scripture. Now, in this system also, speculation is in excess. Such a speculative deduc- tion of facts from facts as is contended for is impossible.

Facts are not so involved in one another that they can be evolved from one another by mere thinking, and still less so that from one fact a whole system of facts can be thus evolved. From a single bone, indeed, of an animal which he has never seen or heard of a naturalist may in thought correctly construct the whole skeleton, but not by think- ing‘ within or from the one fact before him, but by making use of all the knowledge he has acquired of the structure of animals, of the relations of bones to bones. Dr Hofmann himself was quite unable to carry out the method he contended for. His so-called speculative argu ments are mere semblances of what they profess to be. Instead of the contents of his system being really “de- rived” from the simplest expression of the fact of Chris- tianity, new propositions are constantly borrowed from the known contents of Christianity, and added from without

PrHaoOnL OG Y 271 to the simplest expression, in order to help out the unfold- | cannot, indeed, begin with it or confine itself to it,—cannot and as a ing of the system. Further, in Hofmann’s system of | start with some single immediately certain religious fact, supple- speculation, as in that of Rothe, we are asked to start | and then by mere force of logic evolve therefrom a whole eee c : é cauansis . a8 induc- from an assumption which is not, and cannot be, justi- | theological system. Its data are all real facts of religion, sion.

Specu- lation neces-

fied—the assumption that Christianity in the Christian is independent of its objective grounds. Surely every ex- perience may reasonably be called upon

to produce evi- dence of its legitimacy and validity; and, if so called upon, how can it avoid referring to its grounds? It is only by an examination of the grounds of an experience that we can know whether it is an experience of reality or a form or effect of illusion. The fact from which we are told by Hofmann that we must deduce all other facts is only itself intelligible in the light of many of these facts, and even of the Christian system as a whole; it is a fact which has many conditions, and the right understanding of it requires its being viewed under its various conditions, not as ab- stracted from and independent of them.

In the forms indicated, then, speculation has failed to make good its claim to participate in the formation and development of theology. Does it follow that its claim is

and these it must deal with, in the first place, mainly by observation and induction. But observation and induction will not always alone lead toa satisfactory result. Obser- vation is confined to experience, which gives only the par- ticular. Induction, in so far as it effects a transition from the particular to the general, already involves the activity of speculative reason ; it makes discoveries only when guided by theory; it can never of itself reach ultimate truth ; and it is manifestly not its function to raise coherent comprehensive systems on their proper construc- tive principles. Then, the theologian who renounces speculation must deal most inefficiently with the chief ideas and doctrines of his science. Consider the greatest idea of all— the idea of God. Mere observation and in- duction do not yield the idea. Exclusively applied, they cannot take us beyond the contingent and conditioned, cannot take us beyond atheism and secularism. Waive,

a. a wholly unfounded? By no means. Speculation in the | however, this objection, and grant that the idea of God tematiz- forms described pretends to an independence of reality and | may be given, say, through revelation. What sort of idea ation; a, creative power for which there is no warrant in reason or | must it be in the mind of the theologian who refuses to

confirmation in fact. Hence the futility of such specula- tion is no disproof of the utility of a speculation which will fully recognize reality and directly endeavour to elucidate it. Speculation of this latter kind seems to be a necessary condition of true systematization and a neces- sary supplement to

induction and to all the special methods of particular sciences. In a true philosophy, for instance, science and speculation must necessarily be combined. So far from claiming independence of the sciences, a true philosophy will base itself upon them, and seek to rise above them by means of them. It is only thus that it can hope to reach the ultimate universal and real principle of knowledge and being, without which there can be no rest for reason or unity in the universe. But, having ascended by an analytic and inductive course to the unity of an all-comprehensive ultimate principle, philosophy must en- deavour to descend from it in a synthetic and deductive manner, so as to exhibit the whole organism of existence, or to determine how the many laws of science and the many facts of experience are connected with the absolute in being and causation, and through it with one another. It is conceivable that the descent should be accomplished in various ways, and Plato and Plotinus, Descartes and Spinoza, Fichte, Schelling, Hegel, Krause, Gioberti, and others have attempted it each in a way of his own; but two things are obvious, namely, that philosophy cannot consistently decline the task, and that any method it may adopt in trying to perform it must be one essentially speculative. An inductive and analytic method is clearly inapplicable, for the highest and last results of induction and analysis are just what are to be elucidated through being viewed in relation to the one supreme truth or fact. And among the data with which philosophy must thus synthetically or speculatively deal are those of religion. It requires to show how what theology teaches as to God's nature and operations comports with what itself affirms as to the absolute source and ground of existence, and this necessarily commits it to have recourse to a theologico- speculative use of reason. And to a very large use of it

speculate? Merely that of a complex of the attributes predicated of God in the Bible. Surely that is unworthy to be accounted an idea of God atall. The theologian who is in earnest with the idea of God, who would find order and light in the idea, who would think of Him as He is, Absolute Being, Harmonious Life, Infinite Personality, Perfect Spirit, Ultimate and only Complete Explanation of the Universe, must assuredly speculate, and speculate freely and largely, although he ought also to do so humbly and reverently. Even if he would maintain that we cannot have a knowledge of God as He is—that we must renounce the hope of a speculative knowledge

of Him, and be con- tent with a merely regulative knowledge,—he will find that he needs, as Kant, Hamilton, Mansel, and Spencer have practically so fully acknowledged, speculation, and much speculation, to support his thesis. The mind is not necessarily relieved from the duty of exercising specula- tive thought on the nature of God by receiving a special revelation regarding God. Christianity is a proof that such revelation may only increase obligation in this re- spect. It brought with it a wondrous idea of God, one of marvellous practical efficacy, but one also which forced Christian reason into paths of speculation, which could only be formulated after lengthened and severe speculative labour, and which no intellectually or spiritually quickened soul can accept otherwise than with speculative exertion. And this may show that speculation is as legitimate and applicable within the sphere of Christianity as within that of general theology. The comprehension of Christianity requires that we penetrate to its distinctive and central principle, and view all its contents in the light of that principle. It is only so that we can hope to accomplish either a true systematization or a true elucidation of its contents. The procedure by which this is effected cannot be one of mere formal logic, of pure deduction, or strict demonstration ; it must be one which implies a constant reference to facts and inductive results ; but still it must be one which is essentially synthetic and speculative.

Theology is a unity, a whole, but a very eomplex unity, a whole Relations

of many dissimilar parts. It may be spoken of in a broad and of the general way as a seience, but not less eorreetly as a department of theo- scienees. It includes many studies or diseiplines whieh may be logical eultivated in a seientifie spirit and aecording to seientifie methods, sciences. and these stndies or diseiplines, while closely eonnected, are also

elearly distinet. They are by no means mere divisions of a speeial

seienee. Natural theology and Christian dogmatics are as distinct

from eaeh other as physics is from ehemistry or anatomy from physiology. Comparative theology and Biblieal theology are as

if, for example, theism be true; since, in this case, the absolute principle of philosophy can be no other than God Himself, and its highest task no other than to show Him to be the essence of all existence, the light of all knowledge. In this case philosophy must inevitably become in the highest stage of its development a speculative theology.

Nor can positive theology dispense with speculation. It

distinct from each other as the study of the general history of mankind is from the study of the history of England.

Hence arise a number of problems. How are the theological sciences related to the non-thcological sciences and to one another? How are they located in the vast organism of science as a whole? and how are they connected with one another so as to form a smnaller organic whole in themselves? What principles have they in common, and what tasks are proper to each? Wherein do they agree and wherein do they differ in their methods of research? These are very important questions. There cannot be an earnest and scientific study of theology where they are overlooked. It is the special task of the theological discipline called “encyclopedia of theology” to discuss and answer them,—or, in other words, to determine the boundaries of theology, to exhibit and explain its inner organization, to indicate its component parts, and to trace their relations both to one another and to the theological system asa whole. This discipline is, therefore, the appropriate scientific approach and introduction to theology and to the various theological sciences.

It is of comparatively little importance whether or not it be itself called a theological science. Strictly speaking, perhaps, it is rather a section or prolongation of that division of general philosophy which treats of the relations of the sciences. One of the tasks of philosophy is to define and distribute, classify and co-ordinate, the sciences, so as to exhibit them as parts of an har- monious cosmos or members of a well-proportioned corpus. But philosophy, when in the pursuit of its merely general ends, cannot be

expected to go into details and to concern itself with all the subdivisions and ramifications of science. It will be content to trace main lines, to appreciate leading principles, processes, and results, and, in a word, to exhibit the organic unity and variety of science as a whole. It will leave the exact and exhaustive dis- tribution and survey of any particular kind or group of sciences to those who are extensively and minutely acquainted with that kind or group of sciences. The comprehensive philosophic survey of any order or department of studies is the encyclopedia thereof. Hence there is encyclopedia of mathematics, of physics, of philo- logy, and of jurisprudence, as well as of theology. Encyclopedia of philosophy, however, comprehends all the departmental encyclo- predias of science. And this for the simple reason that philosophy is inclusive and unitive of all science. As scientia scientiarum philosophy is, as Hegel has aptly said, “ wesentlich Encyclopidie. ” Hence theological encyclopedia—the encyclopedia of the sciences conversant with religion—may reasonably be held to be essentially a prolongation, a direct continuation, of philosophy.

Theological encyclopedia has had its course determined by the general movenient of theology. The various theological disciplines required to be evolved before they could be co-ordinated. The designation “theological encyclopedia” first occurs in its current technical sense in Mursinna’s Prime Linex Encyclopadix Theologicz (1764). It was only with the publication of Schleiermacher’s Kurze Darstellung des theologischen Studiwms in 1811 that the full scientific importance of the discipline was made evident. It has since been diligently cultivated in Germany, and is at length find- ing recognition in other countries.

There are, however, serious defccts even in the latest and best expositions of it. Two of these may be noted as being so serious that, owing to their prevalence, theological encyclopedia can hardly be said to have even yet entered a truly scientific stage. One is the virtual or express identification of theology with Christian theology. All the chief theological encyclopedists of Germany—Hagenbach, Lange, Rabiger, Rothe, Von Hofmann—follow Schleiermacher in this amazingly absurd procedure. Logically the Brahmanist, Buddhist, and Mohammedan might with equal justice identify all theology with theirown. The superiority of Christianity to other religions, the uniqueness of Christianity among religions, does not alter the

nature or lessen the magnitude of the error. Every ency- clopedia of theology which confounds the general with the special so completely as to identify theology with Christian theology for- feits its title to recognition as scientific ; and almost all, even of the latest and best theological encyclopedias, do so, The other fault referred to is that, even in the latest and best of theological ency- clopedias, the constituent sciences of theology are not so co- ordinated with reference to a centre as to render apparent their organic connexions. The German encyclopedists since Schleier- macher claim, indeed, that they so distribute the various disciplines of theology as to exhibit its natural organization. But the claim is not well founded. In reality, their schemes of distribution have no real unity. They are simply arrangements of the various theo- logical disciplines in a fourfold, threefold, or twofold manner, 7.¢., for cxample, as exegetical, historical, systematic, and practical, or as historical, systematic, and practical, or as didactic and practical. But this is merely external classification. It may be faultless of its kind, but it cannot of itself yield more than a superficial and mechanical arrangement of the theological sciences. Theology, to be scientifically surveyed and distributed, must be viewed as a unity, and all its parts must be shown to be included in it, and

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to have a definite place in it from its very nature and definition, as the science or philosophy of religion. Their relationship to one another must be determined by their relationship to the whole of which they are parts, to tliat science or rather philosophy which treats of religion as a whole. They can only be unified and co- ordinated in a truly organic manner by their due reference to religion, and consequently proper inclusion and location in the philosophy of religion. This necessity has as yct been only verbally acknowledged by: theological encyclopedists. !

There is an all-comprehensive science of religion,—one which Philo- It alone completely sophy of It is the one religion,

treats of religion in its unity and entirety. answers to the idea and definition of theology. general theological science, comprehends and dominates the special theological scicnces, so as to be the science of these sciences, and hence, in accordance with the true distinction between philosophy and

science, is properly called philosophy rather than science—the philosophy of religion. All philosophy is science, but all science is not philosophy. Philosophy, as distinguished from science, is general or universal as distinguished from particular or special science. This distinction is, of course, not an absolute one, but of degree—of more or less; every other distinction between them, however, is positively erroneous. The one general theological science is appropriately, therefore, termed philosophy. It is the philosophy of religion as there is a philosophy of nature and a philosophy of mind, cach inclusive of various sciences. Itis of the very nature of philosophy to be both before and after the sciences to which it relates, —to be at once their root and result, and at the same time their bond of union and source of life. And the general theology which may justly be identified with philosophy of reli- gion has undoubtedly held this relation to the special theological sciences. It preceded them, being the germ from which they evolved, the root from which they have sprung ; it has grown up along with them, permeating them as their common life ; and it also succeeds and transcends them, basing itself on them and per- fecting itsclf by means of then. It is the one generic science of the object with which it deals, and vast enough to comprehend a whole group of sciences, because its object—religion—is so rich, coinplex, and varied.

The primary task of a philosophy of religion is to ascertain and exhibit the nature of religion. Now, a general theory of religion is the natural introduction to all special religious studies and theo- logical sciences, and yet can itself only be brought to perfection through the advancement of these studies and sciences. For example, we can only adequately understand the nature of religion through study of the history of religion, and yet we cannot trace the history of religion at all unless we know generally what religion is. Again, in such works on Christian dogmatics as those of Schenkel, Kahnis, Biedermann, and Lipsius, we find a consider- able place assigned to an investigation into the general nature of religion. The investigation is manifestly not there strictly appro- priate ; its true position can only be in another and wider science. At the same time, it is undoubtedly a necessary antecedent to the investigations of Christian dogmatics, from the very fact that Christianity is a religion. On the other hand, Christianity is not only a religion, but a religion which claims to be the perfect or absolute religion ; and, clearly, if the claim be well founded,

the complete nature of religion can only be understood through that full knowledge of Christianity which Christian science may be expected to give.

From the very nature of religion the science or philosophy which treats of it as a whole must obviously be most comprehensive. Religion is a relation between a worshipping subject and a wor- shipped object. It implies both distinction and unity. Were there no distinction between the subject and the object there would be no religion, whether the self-identical unity were named God or man. Were there only distinction between them—were God and man absolutely separate from and indifferent to each other,— religion must be in this case also impossible. Religion thus supposes two factors, which are different yet related, so far distinct and so far akin; and our views of religion must depend on our views of these two factors. It involves still more. God does not

1 The best account of the history of theological encyclopedia is that given by Riabiger in his Theologik oder Encyclopidie der Theologie (1880), of which there is an English translation, with notes which considerably increase the value of the work, by the Rev. J. Macpherson (2 vols., 1884), The account in Zéckler's Handbuch der theol. Wissenschaften, i. 87-111 (1885), is also good. The fullest account of the history of attempts to classify the sciences is that of the present writer in Presby. Rev. for July 1885 and July 1886. The following may be specified as among the most useful of theological encyclopedias :—Schleicrinacher's Kurze Darstellung des theol. Studiums, Ist ed., 1810, 2d ed., 1830; Staudenmaier's Encyclopédie der theol. Wissenschaften, &c., 1834; Hagenbach's Encyclopddie u. Methodologie der theol. Wissenschaften, 10th ed., 1880; Crooks and Hurst's Encyclopedia and Methodology, on the Basis of Iagenbach, New York, 1884; Doede's Encyclopedie der Christelijke Theologie, 2d ed., 1883; Lange's Grundriss der theol. Encyclopddie, 1877; Von Hofmann's Encyclopadie der Theologie, 1879; Rothe's Theologische Encyclopédie, 1880; Drummond's Introduction to the Study of Theology; and Cave's Introduction to Theology, 1886. See also the article of Willibald Grimm, " Zur theol. Encyclopidie," in Zischr. f. wissensch. Theol., 1882, i.: and Gretillat's Exposé de Théologie Systématique, vol. i., ''Propédcutique,"

1885.

act on man by the direct manifestation of His absolute essence, nor does man know God by immediate vision. Take away the physical and moral worlds and the written word and the Incarnate Word of God—suppose, that is to say, both general and special revelation removed-———and au impassable chasm will separate man from God and all religion be destroyed. The revelation in nature and the reve- lation through particular inspiration and intervention, however, bridge over this chasm, and consequently religion is everywhere found existing in some form. But even revelation would be useless if man had not faculties to apprehend it and to avail him- self of it. The communion of man with God supposes powers of communion in man as well as in God. It can only be realized through religious faculties and processes which can be analysed and which have laws of exercise and evolution that can be traced. Further, religion has a history which shows how man has interpreted or misinterpreted the revelations made to him, what forms religion has assumed in various lands and ages, and how these forms—the religions of the world—have arisen and spread, developed and decayed, influenced one another and affected morality, eivilization, and general history. Thus religion, from its very nature or idea, requires us to treat—(1) of the object of religion (God), (2) of the subject in religion (man), and (3) of the media and process of religion, —or, in other words, (a) of the modes of Divine manifestation, (0) of the powers of human apprehension of the Divine, and © of religion itself asa kind of psychical life. All the special theological sciences deal with some of thesc themes, or some portion or portions of some of these themes, in certain aspects, but the philosophy or general science of religion deals with them all in their entirety and organic connectedness, the form appropriate to philosophy—to science which comprehends and thereby transcends special sciences.

For the philosophy of religion, as the highest discipline of theo- logy, the most uatural order to be followed in the treatment of its themes is probably that which has been indicated. It is the order which has been most commonly adopted in treatises that aimed at sys- tematic completeness. God, man, God’s manifestation of Himself to man, man’s experience of God, and the development of religions, —these are the topics, and such is,

in the main, the order of their discussion, usually found in philosophies of religion properly so ealled. This is, however, because the philosophy of meliict as a distinct discipline presupposes the results of the several special theological sciences. Theology ends as it begins, in unity ; but the unity in which it ends is very different from that in which it begins. It begins with the confused unity of common knowledge, the complex and undifferentiated germ of the theological sciences ;

either philosophy or theology. As a distinct department of philosophy, and the highest and most comprehensive theological science, it is of comparatively recent origin, and, indeed, younger than many a living individual ; but even in this latter sense the whole histories both of philosophy and of theology have been needed as the preparation and foundation for it. It could only appear in its alone adequate form when both philosophy and theology were highly developed, when both had freed theinselves from the yoke of all authority save that of truth and reason, when both had discovered their appropriate methods, when they could so combine as to do no violence to the proper nature of either—a kind of combination most difficult to accomplish. But this, as might easily be shown, was not before philosophy and theology became at once critical and speculative, or, in other words, before that great revolution of thought with which the names of Kant, Hegel, and Schleiermiacher are so gloriously associated. Only in the present century have philosophy and theology reached the stage in which they can unite and produce a philosophy of religion. And within the century many philosophies of religion have made their appear- ance, especially in Germany. Indeed, all the more eminent philo- sophers of Germany have fully recognized that a philosophy of religion is a most essential department of philosophy. That not a few of the so-called philosophies of religion produced have been very defective and erroncous is only what was to be expected. The worth of a man’s philosophy of religion cannot be greater than the worth of his philosophy and theology in general. It is impossible that the philosophy of religion of an Hegelian and a Neokantist can accord, very possible that both may be far remote from the truth. If empiricism, positivism, or materialism be true philosophy, or if authority be the foundation of religion and the standard of theo- logy, a philosophy of religion must be illegitimate and superfluous. When religion is assumed to consist merely of beliefs, emotions,

and actions which have no objective grounds, no real and rational

basis, its development can only be an object of history and of psychological analysis, and there can be no philosophy of religion, but simply a science of religions, which, seeing that it deals entirely with certain forms of mental disease and delusion, must be deemed merely a department of mental pathology. A philo- sophy essentially religious must combine with a theology essentially rational in order to yield what deserves to be called a philosophy of religion. If religion be the living apprehension and enjoyment of the truth which philosophy has for its mission to seek to coin- prehend, then, but only then, must a philosophy of religion be necessary alike to philosophy and religion.*

it ends with the unity of the clearest and deepest insight, in which We now pass to special theological disciplines which can at the Special

all distinctions are at once recognized and reconciled. This last is | utmost merely become sciences as distinguished from philosophy, theo-

the unity of that ultimate stage of theological knowledge which can | They all deal with religion, each of them treating of some particular logical alone claim to be philosophical as distinguished from scientific ; and | portion or aspect of it ; and the order and mode in which they do sciences: —

it can only be reached by those who have attained to an adequate mastery of all the sciences conversant with religion. The philo- sophical student of the whole must have studied scientifically its parts, know what is to be known about them, and make use of his knowledge in his own proper labours, The student of the parts ueeds to know only in a general way what religion is, and must follow in his studies an order of procedure determined by his lack or limitation of knowledge. The course by which the mind traverses the partial and special sciences of religion and rises to a philosophy of religion cannot be the same as that through which it unfolds a philosophy of religion itself, exhibits and confirms a religious theory of the universe, and harmonizes and elucidates all results of theo- logical research and all varieties of rcligious phenomena.

The philosophy of religion is itself, of course, special in relation to philosophy, of which it is only a department. And there may even be a special kind or form of the philosophy of religion, if that kind or form be general enough to include a natural group of theo- logical sciences aud to have regard to their collective effects. A special religion may be so significant, so important, and the subject of so many theological disciplines as to render indispensable the division alike of tle philosophy and of the sciences of religion into general and special. Christianity, as the most perfect form of religion, the fullest revelation of spiritual truth, the source and theme of a large group of scicnces, is such a religion. Hence there may be, and should be, not ouly a philosophy of religion but a philosophy of Christianity,—not only a generically religious but a specifically Christian theory of the universe. If the claims of Christianity be warranted, if in it religion and revelation were eonsummated, the philosophy of religion can only reach a satis- factory conclusion when it has passed into a philosophy of Christi- anity, or, in other words, attained such a comprehension of existence and life in relation to the person and work of Christ as is possible to the humanspirit. The philosophy of Christianity must obviously be connected with all Christian disciplincs in the same manner as

, the philosophy of religion is with all other theological disciplines. History The history of the philosophy of religion has, of course, been of philo- closcly eonjoined with the histories both of theology and of sophy of philosophy, and influenced by all the eauses which have affected religion, them. In the wide sense of religious reflexion it is as old as

so determines their relations to one another and the order of their succession. If we would rise, for example, through study of the parts or phases of religion in a sure and natural manner to a knowledge of it as a whole, we must necessarily begin with what of it is nearest and most accessible to us. But what is so is its

history. In its historical manifestation it is a phenomenon which Historical;

no one can refuse to acknowledge. The history itself, however, is not only a most extensive but a very complex phenomenon. It is external and internal, corporeal and spiritual, a history of outward events and actions, institutions and rites, and also of ideas, con- victions, and affections, What is external is

nearer and more accessible to us than what is internal, aud it is through the former that we must penetrate into the latter. They cannot be quite separated, for the external is only intelligible through the inter- nal, and the internal only attainable and verifiable through the external ; but they can be so far differentiated, and there is a history mainly of what is external in religion and another mainly of what is internal. The ordinary history of religion is mainly concerned with tracing the growth of religion in its most apparent form and institutional character. It may be divided into thrce great sections—the ethnic, Biblical, and ecclesiastical, —the history of the heathen religions, the history of the Jewish religion and of the risc of Christianity, and the history of the Christian church. acs

1 There is a laborious and impartial history of the philosophy of religion by Bernhard Piinjer, Geschichte der christlichen Religionsphilosophie, 2 vols., 1880- 83. Of this valuable work an English translation is soon to appear. Some ehapters of the history have been ably written by O. Pfleiderer in his Religions- philosophie auf geschichtlicher Grundlage, 1884, a first volume of a translation of which has been published. For a list of works ou the philosophy of religion the last edition of Hagenbach may be consulted. Here the following only can be mentioned :—Hegel, Philosophie der Religion, 2 vols., 1832; Krause, Die absolute Religionsphilosophie, 2 vols., 1835 ; Ohlert, Religionsphilosophie tn ihrer Ueberetin~ stimmung mit Vernunft, Geschichte, und Offenbarung, 1835 ; Billroth, Vorlesungen iiber Religionsphilosophie, 1837 ; Steffens, Christliche Religionsphilosophie, 2 vols., 1839; Taute, Religionsphilosophie, vom Standpunkte der Philosophie Herbaris, 2 parts, 1840-52 ; Rothe, Theologische Ethik, 3 vols., 1845 ; Weisse, Philosophische Dogmatik oder Philosophie des Christenthums, 3 vols., 1855-62; Apelt, Religions- philosophie, 1860; Stéekl, Lehrbuch der Religionsphilosophie, 2d ed., 1878 ; Lotze, Grundziige der Religionsphilosophie, 1882; Von Hartmann, Religion des Geistes, 1883; Teiehmiiller, Religionsphilosophie, 1886; Morell, Philosophy of Religion, 1849; Caird, Zntroduction to the Philosophy of Religion, 1876; Morris, Philosophy

and Christianity, 1883. MT, —-35

Psycho- logical ;

Apolo- getic ;

System- atic.

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Whether history in this form, even when studied in the most accurate and thorough manner, should be called science may be doubted, as it is simply occupied with the discovery and description of the particular and concrete. It is not usual so to designate it in any of its sections. The history of religious beliefs and ideas may be as purely and properly history as that of external institu- tions and transactions. It deals, however, not only with what is internal and spiritual but also with what is abstract and general, and hence it is at least more akin to science than is common history, and its sections are often called sciences. These sections are threc in number, and correspond to the sections of the ordi- nary history. They are known as comparative theology, Biblical theology, and the history of Christian doctrine. To the last of these, symbolics may fairly claim to be a necessary supplement. They are quite distinct from a conceivably attainable knowledge of the laws of religious history, such as might be with strict propriety designatcd science of religious history, a department of science of history. Of historical science in this last sensc there is as yet extremely little. ;

Religion is a spiritual process, and its history continuously implies the affections and opcrations of mind. The historical treatment of religion, therefore, necessarily leads to its psycholog- ical treatment. ‘The history alike of religious events and actions and of religious ideas and beliefs can only be explained through a knowledge of the religious powers and processes, t.¢., of the psychological factors and states which condition and determine its development. The psychological study of religion, although it has been greatly neglected, should reach over a very large depart- ment of theology. The department may be distributed into three disciplines—the general, comparative, and special psychology of religion. The first should treat of the general religious nature of man; the sccond should discover aud compare the psychical peculi- arities to be found in the various religions; and the third should exhibit elaborately the psychology of a particular religion, as, ¢9., Biblical and Christian psychology.

The historical and psychological sciences of religion deal with religion merely as an historical and psychological phenomenon. They do not imply its truth, and can be cultivated by those who regard it as a delusion equally with those who acknowledge it to be a certainty. It is the office of apologetics to determine whether or not it is true and how far it is true. If it end not in a negative result, in agnosticism or atheism, it must prove that God reveals himself to man, and that man apprehends God. _In other words, apologetics treats of the media of revelation—alike the objective and subjective, Divine and human media—and so is the science, on the one hand, of revelation, and, on the othcr hand, of religious certitude. It is divisible into general and special, or, in equivalent terms, into theological and Christian apologetics, —the former being the scientific exhibition of the grounds of natural religion, and the latter of the grounds of the Christian religion. They are some- times combined, inasmuch as both are needed in order to establish the truth of Christianity. In Germany it has become not uncom- mon to fuse them into one under the name of fundamcntal theology, described as the science which treats of the foundation of Chris- tianity. And, undoubtedly, it is not only expedient but even necessary to treat of both as introductory and preparatory to the construction of Christian science. But the distinction between them must not, therefore, be forgotten or ignored. Theological apologetics might be irresistible although Christian apologetics were futile. Theological apologetics derives its validity from its relation to natural theology, which has an absolute value of its own, wholly independent of any other science, of Christianity, or of anything else. The alliance of theological and of Christian apologetics is perfectly legitimate; the attempt to combine them into a single science, into a single homogeneous discipline, is decidedly the reverse.

The highest stage of theological science is the methodical educa- tion and exhibition of the truth involved in religion, either as con- tents of faith or elements of life. When conversant with the faith it is dogmatics, when with the life ethics; but, of course, here again distinction is not to be confounded with separation. True faith is living faith, and true life is the life of faith. Dogmatics and ethics are so intimately related that it is not surprising that they should have been long left undifferentiated, or that a few eminent theologians should still deny that they can be properly treated apart. Theology at this stage is commonly designated systematic, although the

term is not a good one, and others, little if any better perhaps, as didactic, theoretical, positive, thetic, &c., have been suggested as substitutes. Systematic theology, like historical, psychological, and apologetic theology, is divisible into general and special, the former including natural theology and theological ethics, and the latter Christian dogmatics and Christian ethics. The identification, so common in Britain, of systematic theology with Christian dogmatics is, of course, solely due to the survival among us of prescientific thought and language in theology. _ The historical and psychological sciences of religion may be con- joined under the designation of empirical, or phenomenological, or

historical (in the widest sense); the apologetic and systematic sciences under that of didactic, thetic, speculative, or systematic (in a loose sense). This twofold division of them is the one gene- rally adopted. And as it rests on an obvious and important dis- tinction it is fully entitled to acceptance, provided it be so received as not to hide or extrude the fourfold division founded on the real moments or stages of the process of theological investigation.

There are a considerable number of disciplines not included in : the divisions indicated, yet for which the theological encyclopadist is bound to find appropriate places. The best classification of these Exegeti- is into exegetical and practical. So-called exegetical theology, cal and however, is in all its departments simply instrumental and intro- practical ductory to historical theology; and practical theology is in all its theology, departments concerned with the use and application of religious knowledge, not with its acquisition and advancement. The former is not directly occupied with religion but with the records and documents from which its history must be ascertained; the latter is art and not science.

Considering theology, then, only as science directly engaged on

religion, the following are the sciences which belong to general theology:—(1) the history of religions; (2) comparative theology; (3) psychology of religion; (4) theological apologetics; (5) natural theology ; and (6) theological ethics. Those of Christian theology are—(1) Biblical history; (2) ecclesiastical history; (8) Biblical theology; (4) history of Christian doctrine; (5) symbolics; (6) Biblical and Christian psychology; (7) Christian

apologetics; (8) Christian dogmatics; and (9) Christian ethics. The remainder of this article will be devoted to a brief indication of the nature of such of the above studies as have not already been treated of in separate articles.

The history of religions and comparative theology differ from History of each other as sacred history and Biblical theology or ecclesiastical religions history and the history of Christian doctrines differ. That they and com- should rarely be distinguished proves only that the ethnic sacred parative ‘ books have not yet been so closely studied as the Bible, and that theology. the histories of the great ethnic religions are not yet so well known as the history of Christianity. As regards both the history of religions and comparative theology, see RELIGIONS.

The general psychology of religion should analyse the religious Psycho- nature of man and trace the laws of its development. It has to logy of ascertain the principles which guide reason in the scarch after God; religion. to determine what subjective religion is, what elements it involves, i and through what stages it may pass; and to show how the under- standing and imagination, the emotions and affections, the qualities and energies of will, operate in religion and influence its character. While general psychology of religion thus treats man as framed and fitted for religion, the comparative psychology of religion treats of the psychological composition and peculiarities of the various concrete and collective manifestations of religion. It is related to the general psychology of religion as comparative psychology to general psychology. It must concern itself with the religions of the rudest peoples. It has to explain what is psycho- logically distinctive of fetichism, animal worship, naturalistic religions like the Vedic, anthropomorphic polythcisms like those of Greece and Rome, and pantheisms like Brahmanism and Bud- dhism. For example, in each of these forms of religion imagination works differently, and the comparative psychology of religion should give a complete view of the operations of imagination in the formation of the religions of humanity. So as regards all the chief intellectual principles and all the chief sentiments.

The psychological study of religion was not, as is often said, be- gun by Kant. Hume—in virtue of his Natural History of Religion, with its clear

recognition of the distinction between the causes and the reasons of religion —is much more entitled to be considered initiator in this department, but even his claim may be contested. The department is one of which there is as yet no general survey, and of which many portions have been entirely overlooked. What the ordinary psychologists—e.g., Bain, Sully, Thompson, Rabier, Fortlage, Striimpell, Volkmann, Wundt—say regarding it is very vague and meagre. The only two points which have been closely investigated are those as to the nature of religious cognition and the essence of religion, and as to both speculation has been fre- quently allowed to disturb and pervert psychological analysis. For some of the later literature on these points, see notes on article TueEIsM. Neither the general nor the comparative psychology of religion as yet exists in a separate and appropriate form. What religious psychology there is will be found chiefly in the writings of anthropologists like Bastian and Tylor, of comparative philo- logists like Max Miiller and Steinthal, of philosophers like Spencer and Renouvier, of theologians of the school of Schleiermacher, and, above all, in the histories of religions and the philosophies of religion. !

Theological apologetics is not to be confounded with natural

1 Aliiott's Psychology and Theology, Newman Smyth's Religious Feeling, Brinton's: Religious Sentiment, Happel's Anlage des Menschen zur Religion, Ulrici's Gott und Mensch, and Lesbazeille's " Bases Psychologiques de la Reli- gion" (two articles in Rev, Phil., vol. xxi., 1886) may be specially mentioned.

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theology, from which it is as distinct as Christian apologetics is from Christian dogmatics. It lays a foundation for natural theology, inasmuch as it vindicates religion by showing that it rests on objective spiritual truth. It presupposes a knowledge of religion as an historical and psychological phenomenon, but none of natural theology, which it, of course, leaves as a science to establish its own

problems and portions of theological ethics. Thus what has been just indicated as problem first—that as to the relation of religion and morality—has been long much discussed.? The sccond problem demands wide and close historical research ; it has been touched at a multitude of points, but only touched. With the third problem, or rather group of problems, alniost all systems of Christian ethics

doctrines. It has the following tasks to perform. (1) To show that man is capable of apprehending the divine. This requires the refutation of agnosticism and the vindication of the principles implied in religious knowledge and certitude.! (2) To prove the reality of a revelation of the Divine in physical nature, mind, and history. The results of the various sciences will thereby be shown to be data of theology. It requires the refutation of atheism, mate- rialism, positivism, and secularism, and of all principles which

have to some extent dealt ; and with the fourth and fifth problems almost all systems of moral philosophy. We now pass to Christian theology. Its historical section in- Biblical cludes, besides the histories of Isracl and the churcli (as to which and see IsRAEL and CuurcH History), Biblical theology, the history church of Christian doctrine, and Christian symbolics. history. All hermencutical studies are auxiliary to exegesis, and all Biblical Biblical exegesis leads up to that comprehensive and connected theology.

Natural theology.

logically involve these systems. (3) To exhibit the reasons for the true conception of the Divine, and to expose the arguments em- ployed in favour of false conceptions. The defence of theism, for example, must be accompanied by proof of the erroneousness and insufficiency of the polytheistic, dualistic, deistic, and pantheistic hypotheses. (4) To adduce whatever evidence may be contained in general revelation for the immortality of the soul and a future state of rewards and punishments.

Natural theology is the systematic exposition of the truths in natural or general revelation. Its data are the facts and laws of nature, as ascertained by physical, mental, and historical science. Its inductions and inferences relate to God, men, and their rela- tionship. Its appearance as a distinct

science may be dated from the publication of Raymond de Sebonde's Theologia Naturalis in 1436, although portions of it had been admirably presented by ancient philosophers, ¢.g., Socrates, Plato, Aristotle, aud Cicero. It flourished with extraordinary vigour in the latter half of the 17th and throughout the 18th century. It should endeavour to perform the following tasks. (1) To describe the nature,

character, and attributes of God, so far as they are disclosed

by the material world, mind, and history. (2) To treat of God in relation to the world and man, and of the world and man in relation to God, under which head all questions as to creation, pro- vidence, theodicée, optimism and pessimism, education of the human race, &c., will fall to be discussed from the standpoint of general revelation. (8) To determine, so far as can be done from general revelation, what man may reasonably hope for as to deliver- ance from sin and its consequences, and what he may reasonably believe as to the conditions of existence in a future world.- As to this third point the view is prevalent that the light of nature dis- closes nothing regarding man's salvation or future destiny. But does this view not arise from overlooking that the kingdom of God is within, and from falsely supposing that salvation is entrance into an external, non-spiritual heaven on conditions which, being in themsclves non-natural, cannot be naturally known? The heathen nations have certainly not supposed nature to be wholly silent and dark on the subject. In every developed ethnic religion there is a soteriology and eschatology as well as a theology. Man is no-

view of the development of Biblical ideas which it is the aim of Biblical theology to set forth. Biblical theology is not to be under- stood as meaning a theology founded on the Bible—Christian dogmatics under another name. It does not assume that the Bible is either a source or standard of truth. It docs not set forth the ideas which it exhibits as true in themselves, but only as truly in the Bible. It seeks no other truth than truth of exposition. It aims at doing no more than giving a true account of what are the religious ideas in the Bible, of how they are related as set forth in the Bible, and of what their history has been throughout the Biblical period. Its sole business is critically to ascertain and truthfully to exhibit what Scripture teaches, what each writer, even, of Scripture teaches, in a purely objective, organic,

historical manner. It cannot possibly be confounded with Christian dog- matics by any one who has the slightest notion of what it is, although the latter must in great part rest on it and derive most of its materials from it. It is the ultimate direct result and the most comprehensive and perfect product of Biblical exegesis, and related to the history of religious ideas as a part to the whole in which it is included, comparative theology preceding and the history of Christian doctrine following it. It divides into theology of the Old Testament and theology of the New Testament; and its method is one appropriate to an historical discipline, and, there- fore, chronological, genetic, analytic, and synthetic. It is a com- paratively recently constituted department of theological science, both Catholic and Protestant divines having made for ages the enormous mistake of studying Scripture—so far as their interest therein was theoretical and not practical—primarily in order to find proof of the doctrines contained in tlicir creeds and confessions, They failed to apprehend and appreciate the seemingly very simple thought that Scripture should be studied in the first instance with a single eye to find out what was really in it, and that to this end the study of it should be strictly and purely exegetical and *his- torical. J. Ph. Gabler, in his thesis De Justo Discrimine Theologiz Biblice ct Dogmaticx#, published in 1787, was the first clearly to show the true character of Biblical theology as an* essentially historical study. Since then it has been cultivated with great zeal by a host of able labourers. 4

where necessarily without hope any more than without God in the

ae The history of Christian doctrine ouly began to be treated as History of world.

a separate theological discipline in the latter part of the 18th Christian

Theo- Theological ethics differs from natural theology in that it seeks | century. Previously it was dealt with as an appendix to dog- doctrine. logical in nature, viewed as a Divine revelation, laws of spiritual life, not | matics or asa part of church history. It is not an appendix to ethics, merely religious doctrines. Its place is between moral philosophy | dogmatics, but it includes its history and contributes to lay a

and Christian ethics. It is unmistakably distinct from both, and | foundation for it. No doctrine can be either correctly understood

may be more plausibly included in natural theology than in cither. It should endeavour (1) to determine how religion and morality are distinct and how connected ; (2) to ascertain how morality has been affected and modified by the various positive ethnic religions and the various religious but non-Christian philosophies ; (3) to exhibit how the character of God, as delineated by natural theology, stands related to the moral law, the moral life, and the chief ethical end or supreme good of man ; (4) to describe the duties which the light of nature shows that man owes directly to God ; and (5) to trace how piety to God must influence personal and social virtue. Unlike moral philosophy and Christian ethics, it can hardly be said to have been yet treated as a separate discipline and prcsented as a whole. Daub and Marheineke have, indeed, written works nominally on Theological Morals, and Rothe and Von Hofmann on Theological Ethics, but in all these works it is really Christian ethics which is exhibited to us under certain speculative lights. There is, however, a very extensive literature relating to particular

1 For the literature on agnosticism, see above, p, 246 note 2.

3 For the literature of apologetics (theological and Christian), see Redford's Christian Plea against Modern Unbelief, pp. 497-533. For a list of the best works on theological apologetics and natural theology, see Cave's /ntroduction to Theology, pp. 149-161, Indications as to the history and literature of many particular questions and portions of both disciplines are given in the notes to Flint's Theism and Antitheistic Theories. One of the best sketches of the history of natural theology is that in Zéckler's Theologia Naturalis. Here it may be sufficient to mention the followine works :—Butler's Analogy; Paley's Natural Theology ; Chalmers's Natural Theology; the Bridgewater Treatises ; Thompson's Theism ; Tulloch's Theism ; M'Cosh's Method of the Divine Government ; Ulrici's Gott und die Natur, J ules Simon's Vatural Religion (Eng. tr.) ; Janet's Final Causes (Eng. tr.); Caro's Idée de Dieu, 5th ed.; Gratry's Connaissance de Dieu, 7th ed.; and Margerie's Theodicée, 3d ed,

or rightly developed where there is ignorance of its history. The history of Christian doctrine is a part of the history of Christianity, namely, the history

of Christian beliefs, as distinguished, on the one hand, from the history of Christian life and practice, and, on the other hand, from the outward history of the church. It is a part also of the history of religious thought, and_of the history of thought in general, and therefore closely connected with the history of philosophy. Its development must be admitted to be ruled by the general laws of the intellectual history of man. It may be taken, however, in a wider or narrower sense,—in the former being the history of Christian thought and belief as such, and in the latter the history ouly of dogmas strictly so called, 7, of doctrines formulated and promulgated by ecclesiastical authority, and accepted either by the whole church or by large divisions of the church. There ought perhaps to be a history of doctrines in both senses. One in the former sense has only been undertaken recently by Harnack. The method of the history of Christian doctrine must be strictly historical, and at the same time both analytic and synthetic, seeing that both the history of the separate doctrines and the general and connected evolution of the doctrines require to be traced. Its periods will coincide with those of church history, but they ought to be determined from direct examination

3 The following references may be given :—the last chapter of Janet's Za Morale; the first three chapters in Caro's Morale Sociale; many articles and reviews in Renouvier's Critique Philosophique ; Martenscn's Christian Ethics, $§ 5-14; Pfleiderer's Moral und Religion; Bradley's Ethical Studies, pp, 279- 305; and Caird's Introd. to Phil. of Rel., ch. ix.

4 For the history of Biblical theology, see Briggs's Biblical Study ; for the literature Cave, Hagenbach, Rabiger, or Zéckler; for a reference to some of the best works, see THEISM, supra, p, 239 notes 2 and 3,

Sym- bolics.

Biblical psycho- logy.

of the development of the doctrines. It is incorrect, therefore, to represent the discipline as having its gencral distribution into periods given it by church history.!

Symbolics is the historico-comparative study of the dogmatic systems of the various Christian communions, as expressed and involved in their symbolical documents. It treats of the origin, history, and contents, and relations of difference and agreement, of the various creeds and confessions of Christendom. It was pre- ccded by ‘‘polemics” and “controversial theology”—pre-scientific and anti-scientific kinds of theology. The older so-called system- atic theologies and systems of divinity consisted largely of sym- bolical matter treated in an unscientific and ungenerous spirit. Christian dogmatics will never be properly purified until Christian symbolics receives intelligent and due recognition, and has relegated to it the subjects which properly belong to it. Christian symbolics may be said to have made its appearance as a separate scientific discipline with Marheineke’s Symbolik, published in 1810. The chief reason why it appeared tlius late was the difficulty of exercis- ing in this sphere the impartiality of the true historical spirit. The arrangement of its material is determined partly by the order of succession in which the churches appeared in history and partly by the historical importance of the different churches. ‘‘ In some treatises on symbolics the symbolical system of doctrine of each church is treated separately, while in others the several doctrines of the various churches are compared together. Each of these methods has its advantages and disadvantages. Their combina- tion is requisite.””

The psychology of Christianity may be held to include Biblical ©

psychology and the psychology of the Christian life. It must be admitted, however, that the right of the former to a place among psychological sciences is doubtful. It is universally admitted that it ought to present what is taught in the Bible as to the origin, nature, faculties, states, processes, and future development of the human spirit, and also elicit the conceptions implied and _pre- supposed in the Biblical statements on these points. But if it do this in a merely historical manner, and do nothing beyond this, it must manifestly be regarded as simply a section of Biblical theology. To be entitled to be considered a separate psychologico-theological discipline it must at least also discuss the questions as to the truth of the ideas relative to the human spirit expressed and implied in Scripture, as to their accordance with the facts of mind, and their relationship to the conclusions of ordinary

scientific psychology ; and even then it may be held to be rather the result of a peculiar combination of history, apologetics, and psychology than a pro- perly psychological discipline. However this may be, the study is an exccedingly interesting one. It has had a lengthened history, for in almost every generation since the 2d century treatiscs on some of its subjects have appeared. It was inaugurated by Melito and Tertullian, obtained in the 17th and 18th centuries distinct re- cognition under the designation of " psychologia sacra" or '" psycho- logia e sacris literis collecta," and acquired tresh life and scientific form from the publication of Beck's Umriss der biblischen Seelenlehre in 1843.* '

The psychology of the Christian life isa much more comprehensive discipline than Biblical psychology, and one as to the precise place

THEOPHILUS. Nicholas Alemanni, in his notes to the first edition of the Anecdota of Procopius (see Pro- copius), published in 1623, repeatedly quotes a Life of Justinian, which he attributes to "Theophilus Abbas, preceptor Justiniani," but without telling us where he found this Life or who Theophilus was. Subsequent writers have continued to quote Theophilus from Ale- manni's notes for the facts ascribed to him in those notes, and, among others, for the name Upravda, said to have been the original name of Justinian, and other proper names of members of the family of that emperor. Mr Bryce has, since the article JusTINIAN was published, discovered in the Barberini library at Rome what appears to be the MS. of the so-called Life of Justinian used by Alemanni. It is in Latin, and purports to be an extract made by Ivan

| Among the best general histories of Christian doctrine are those of Neander, Gieseler, Hagenbach, Baur, Nitzseh, Thomasius, Harnack, Haag, Shedd, and Sheldon, There is a multitudinous literature relating to doetrine in particular periods and to partieular doctrines.

2 Sce Lumby's History of the Creeds, 1873 ; Sehaff's Creeds of Christendom, 3 vols.,4th ed., 1884; Winer's Confessions of Christendom ; and the Symbolics of Mohler, K6llner, Guericke, Oehler, Hofmann, &c.

3 The following are among the most useful books for the student of Biblieal psyebology :—Beck's Outlines of Biblicul Psychology (Eng. tr.);

Delitzsch's System of Biblical Psychology; Heard's Tripartite Nature of Man; Laidlaw's Bible Doctrine of Man; and Dickson's Baird Lecture for 1883.

theory of personal Christian experience, normal and abnormal, in

It seems doubtful whether this Theophilus Abbas, whom

and scope of which no dubiety need be felt. Its work is to elucidate Christian all the distinctively Christian phenomena both of the individual psycho- and of the collective life. As to the former it should evolve a logy,

its purity and in its perversions. As to the latter, it should explain } the spiritual expericnce of Christian society—the development of | Christian piety—in different ages, countries, and churches. For

the accomplishment of the former task it will find help and material

in religious poetry, religious biography and autobiography, and all

other expressions and records of personal Christian experience ; and

for the accomplishment of the latter in all the sources and contents

of church history, although these must be used in accordance with

the psychological purpose in view. Christian psychology thus understood is a department of theology still to form. And the

difficulties in the way of its formation must be allowed to be very

great. They will only be overcome by men in whom profound psychological science and insight are combined with a rare suscepti-

bility and richness of spiritual life.

For Christian apologetics, see APoLoGETics. For Christian dog- matics, see DOGMATIC.

Christian dogmatics and Christian ethics are the two disciplines Christian included in Christian systematic theology. They ought to be ethics, separated and cultivated apart, and yet must be recognized to be closely connected, and each the necessary complement of the other.

The former sees in Christ the truth and the way thereto; the

latter sees in Him the life and the way thereto. Christian ethics

is much the more recent discipline of the two, and it has not yet

attained the same definiteness and homogeneousness. Alike as to method and distribution there is greater indecision and confusion. Among its earlier cultivators were Daneus, Calixtus, Perkins, Ames, Colville, Mosheim, Crusius, Staéudlin, and Von Ammon. Schleiermacher may justly be regarded as the founder of modern Christian cthics. His superiority to his predecessors was due chiefly to his profounder apprehension of the nature of the problems of philosophical ethics, and to his comprehensive and spiritual concep- tion of the kingdom of God as the highest good, pervasive and regulative of every sphere of human life, industry and art, science and philosophy, family, church and state. The following may be given as a scheme of Christian ethics. I. Determination of the nature, limits, and method of the science, and of its relations to other disciplines, and especially to those which are ethical and theological. JI. Presuppositions of the science: these are—(1) the ethical idca of God as revealed in nature and in Christ ; (2) man as a moral being and in his relation to the law and revelation of God ; (8) ercation and providence as ethical systems; and (4) the king- dom of God in itsclf, in relation to creation and providence, and as the goal of moral life. III. The fundamental conceptions of the scicnce: these are—(1) the Christian ethical law; (2) the Christian conscience ; (8) the Christian ethical ideal; and (4) Christian virtue. IV. The reign of sin in the individual and society viewed in the light of Christianity. V. The origin and progress of the kingdom of God in the individual soul, and its manifestation in the virtues and graces of the Christian character. VI. The realization of the kingdom of God in the various spheres of society—the family, the church, the nation.4 (ROE)

Tomco Marnavich, a Croatian ecclesiastic (1573-1639), from a Life of Justinian by a certain Bogomil (Grace Theophilus), who is alleged to have been the instructor of Justinian, and abbot of St Alexander at Prisrend (in Macedonia), and afterwards bishop of Sardica (now Sofia, in Bulgaria), the original of which Life, in Slavonic, is stated in the Barberini MS. to exist in the Slavonic monastery of Basilian monks on Mount Athos. No such Slavonic MS. (so far as is known) has ever been discovered in Athos or elsewhere; no Slavonic MS. of the age of Justinian could possibly exist; and the contents of the Latin extract preserved at Rome are of so legendary a character as to throw the greatest doubt on the facts cited from Theophilus by Alemanni, including the name Upravda above referred to, and the Slavonic origin of Justinian.

4 The history of Christian ethies has been written by Wuttke, Christian Ethics, vol. i., but mueh better by Gass, Gesch. der christl. Ethik, 2 vols., and by Ziegler, Gesch. d. christ, Eth., 2 vols. Bestmann has written two volumes of a Gesch. d. christl. Sitte. Among well-known treatises on Christian ethics are those of De Wette, Schleiermaeher, Hirseher, Harless, Rothe, Wuttke, Sartorius, Martensen, Oettingen, Lange, Hofmann, Frank, and Dorner. Those of Wuttke, Sartorius (Doctrine of Holy Love), Harless, and Martensen have been translated into English. German literature is extremely rieh, while Freneh and English literatures are miserably poor, in this department. Wardlaw's Christian Ethics may be mentioned, but merely because it is English.

T H K—

the Roman MS. identifies with a certain Doninio, bishop of Sardica in 517 (see Marcellinus Comes, Chronicon, ad ann. 517), ever existed at all. Mr Bryce has printed this Roman MS., with his observations thereon, in the Archivio Storico of the R. Societ&' Romana di Storia Patria, 1887. THEOPHRASTUS, the successor of Aristotle in the Peripatetic school, was a native of Eresus, in Lesbos. The date of his birth is a matter of inference, and has been fixed between 373 and 368 B.c. It is said that his original name was Tyrtamus, and that the name Theo- phrastus was given him by Aristotle on account of his eloquence, but this story is quite as likely to be an after- thought suggested by the name at a later date. After receiving his

first introduction to philosophy in Lesbos fron one Leucippus or Alcippus, he proceeded to Athens, and became a member of the Platonic circle. After Plato's death he attached himself to Aristotle, and in all probability accompanied him to Stagira. The intimate friendship of Theophrastus with Callisthenes, the fellow- pupil of Alexander the Great, the mention made in his will of an estate belonging to him at Stagira, and the repeated notices of the town and its museum in the History of Plants are facts which point to this conclusion. Aristotle's affectionate confidence in his pupil and friend is proved by his making Theophrastus guardian of his children in his will, and designating him as his philosophic

successor at the Lyceum on his own removal to Chalcis. |

Eudemus of Rhodes was not without claims to this posi- tion, but the master, according to the well-known story, delicately indicated his preference by the remark that the wines of Lesbos and Rhodes were both excellent, but the Lesbian was the sweeter. Aristotle also bequeathed to Theophrastus his library and the originals of his own works. Theophrastus presided over the Peripatetic school for thirty-five years, and died in 288 B.c. Under his guidance the school flourished greatly in point of numbers, and at his death he bequeathed to it his garden with house and colonnades as a permanent seat of instruction. His popularity was also shown in the regard paid to him by Cassander and Ptolemy and by the complete failure of a charge of impiety brought against him. He was honoured with a public funeral, in which the whole people took part.

Theophrastus's philosophical relation to Aristotle and his place in the development of Peripatetic doctrine have been sketched under the head PErrpaTEtics, It remains to say a few words about his works. From the lists of the ancients it appcars that the activity of Theophrastus extended over the whole field of con- temporary knowledge. Logical, physical, biological, psychological, ethical, political, rhetorical, and metaphysicai treatises are men- tioned, most of which probably differed little from the Aristotelian treatment of the same themes, though supplementary in details. On the whole, Theophrastus seems to have developed by preference the observational and scientific side of his master, and of this character are the books and fragments that have come down to us. The most important of

these are two large botanical treatises, On the History of Plants (rep) pur@v isropias), in nine books (originally ten), and On the Causes of Plants (wep) putay airiév), in six books (originally cight). Thesc constitute the most important contribu- tion to botanical science till we come to modern times, and furnish proof of the author's extensive and careful observation combincd with a considerable critical sagacity. We also possess fragments of a History of Physics, a fragmentary treatise On Stones, a work On Sensation (rep) aic@4oews) in the same condition, certain meta- physical amopia:, which probably once formed part of a systematic treatise, and the well-known Ethical Characters (401×0l xapakriipes), containing a delineation of moral types, probably an extract or compilation by a later hand from a larger ethical work of Theo- phrastus. Various smaller scientific fragments havc been collected in the editions of J. G. Schneider (1818-21) and F. Wimmer (1886) and in Usener's Analecta Theophrastea.

THEOPHYLACT, a well-known Biblical commentator, was born most probably at Euripus, in Eubcea, about the middle of the 11th century. He became a deacon at Con- stantinople, and attained a high reputation as a scholar, as is shown by the fact that he became the tutor of

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Constantine Porphyrogenitus, son of Michael VIL, for whom he wrote his Madea Baciuxy. About 1078 he went into Bulgaria as archbishop of Achris. In his letter he complains much of the rude manners of the Bulgarians, and he sought to be relieved of his office, but apparently without success. His death took place after 1107.

His commentaries on the Gospels, Acts, the Pauline epistles, and the Minor Prophets are founded on those of Chrysostom, but deserve the considerable place they hold in exegetical literature for their appositeness, sobriety, accuracy, and judiciousness. His other extant works include seventy-five letters and various homilies and orations and other minor pieces. A splendid edition of the whole in Greek and Latin, with a preliminary dissertation, was published in 1754-63 by J. F. B. M. de Rossi (4 vols. fol., Venice).

THEOPHYLACT of Simocatta. See vol. iv. p. 613.

THEOPOMPUS of Chios, a celebrated historian and rhetorician, was born about 378 B.c. In early youth he seems to have spent some time at Athens, along with his father, who had been exiled on account of his Laconian sympathies. Here he became a pupil of Isocrates, and rapidly made great progress in rhetoric : we are told that Tsocrates used to say that Ephorus required the spur but Theopompus the bit (Cic., Brutus, § 204). At first he appears to have composed epideictic speeches, in which he attained to such proficiency that in 352-351 he gained the prize of oratory given by Artemisia in honour of her husband, although Isocrates was himself among the com- petitors. It is said to have been the advice of his teacher that finally determined his career as an historian,—a career for which his abundant patrimony and wide knowledge of men and places (Fr. 26) had singularly fitted him. Through the influence of Alexander, he was restored to Chios about 333, and figured for some time as one of the boldest and most uncompromising leaders of the aristocratical party in his native town. After Alexander's death he was again expelled, and took refuge with Ptolemy in Egypt, where he appears to have met with a somewhat cold reception. The date of his death is unknown.

The works of Theopompus were chiefly historical, and later writers frequently cite them as authorities. They included an Epitome of Herodotus's History, the Hellenics (EAAnvixd, 'EAA nviral ioroptat), the History of Philip (:Aurmixd), and several panegyrics and hortatory addresses, the chief of which was the Letter to Alexander. The genuineness of the epitome of Herodotus has been called in question; we possess only five quotations from it, preserved by grammarians or lexicographers, and consisting only of single words. The Hedlenics was a somewhat ambitious work in 12 books, extending from 411 (where Thucydides breaks off) to 394 —the date of the battle of Cnidus. A few insignificant fragments remain, but do not suffice to give us any idea of the general character of the work. By far the most ambitious history written by Theopompus was,the @:Aurmixd. In this he narrated the history of Philip's reign (360-336) in 58 books, with frequent digressions on the names and customs of the various races and countries of which he had occasion to speak. So numerous were these digres- sions that Philip II]. of Macedon reduced the bulk of the history from 58 to 16 books by cutting out those parts which had no connexion with the achievements of the king. It was from this history that

Diodorus and Trogus Pompeius derived much of their materials. Several fragments, chiefly anecdotes and strictures of various kinds upon the character of nations and individuals, are preserved by Atheneus, Plutarch, and others. Of the Letter to Alexander we possess one or two fragments cited by Athenus, animadverting severely upon the immorality and dissipations of Harpalus. The Attack upon Plato, and the treatise On Piety, which are somctimes referred to as separate works, were perhaps only two of the many digressions in the history of Philip; some writers have doubted their authenticity.

The nature of the extant fragments fully bears out the criticisms of antiquity upon Theopompus. Their style is clear and pure, full of choice and pointed expressions, but lacking in the weight and dignity which only profound thought can supply. As we might expect in a pupil of Isocrates, he is especially careful to avoid hiatus. The artistic unity of his work suffered severely from the frequent episodes with which it was interspersed; his account of Sicily, for example, extended over several books. Another fault was his excessive fondness for romantic and incredible stories (Fr. 33, 66, 76, &c.); a collection of some of these was afterwards made and published under his name, with thie title of Oavydora

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(Diog. Laert., i. 115). He was also severely blamed in antiquity for his censoriousness, and throughout his fragments no feature is more striking than this (Fr. 54, 65, &c.). _Onthe whole, however, he appears to have been fairlyimpartial. Philip himself he censures severely for drunkenness and immorality (Fr. 136, 178, 262, 298), while Demosthenes receives his warm praise (Fr. 239, 263). There ean be no doubt that in the Philippica the world has lost a great variety of pleasant tales and historians much valuable information

upon many difficult points of Greek history and life. See Miiller, Fragmenta Historicorum Grecorum, i. 278-333, Paris, 1885.

THEORBO. See Luts, vol. xv. p. 71.

THEOSOPHY, as its derivation implies, is a term used to denote those forms of philosophic and religious thought which claim a special insight into the Divine nature and its constitutive moments or processes. Sometimes this insight is claimed as the result of the operation of some higher faculty or some supernatural revelation to the indi- vidual; in other instances the theosophical theory is not based upon any special illumination, but is simply put forward as the deepest speculative wisdom of its author. But in any case it is characteristic of theosophy that it starts with an explication of the Divine essence, and endeavours to deduce the phenomenal universe from the play of forces within the Divine nature itself. It is thus differentiated at once from all philosophic systems which attempt to rise from an analysis of phenomena to a know- ledge, more or less adequate, of the existence and nature of God. In all such systems, God is the terminus ad quem, a direct knowledge of whom is not claimed, but who is, as it were, the hypothesis adopted, with varying degrees of certainty in different thinkers, for the explanation of the facts before them. The theosophist, on the other hand, is most at his ease when moving within the circle of the Divine essence, into which he seems to claim absolute insight. This, however, would be insufficient to distin- guish theosophy from those systems of philosophy which are sometimes called “speculative” and “absolute,” and which also in many cases proceed deductively from the idea of God. In a wide sense, the system of Hegel or the system of Spinoza may be cited as examples of what is meant. Both thinkers claim to exhibit the universe as the evolution of the Divine nature. They must believe, there- fore, that they have grasped the inmost principles of that nature: so much is involved, indeed, in the construction of an absolute system. But it is to be noted that, though there is much talk of God in such systems, the known universe—the world that now is—is nowhere transcended ; God is really no more than the principle of unity immanent in the whole. Hence, while the accusation of pantheism is frequently brought against these thinkers, the term theosophical is never used in their regard. A theosoph- ical system may also be pantheistic, in tendency if not in intention ; but the transcendent character of its Godhead definitely distinguishes it from the speculative philosophies which might otherwise seem to fall under the same defini- tion. An historical survey shows, indeed, that theosophy generally arises in connexion with religious needs, and is the expression of religious convictions or aspirations. Now the specifically religious consciousness is

not panthe- istic in any naturalistic sense ; God is rather regarded as the transcendent source of being and purity, from which the individual in his natural state is alienated and afar off. Theosophy accepts the testimony of religion that the present world lies in wickedness and imperfection, and faces the problem of speculatively accounting for this state of things from the nature of the Godhead itself. Theo- sophy is thus in some sort a mystical philosophy of the existence of evil; or at least it assumes this form in some of its most typical representatives.

The name with which it is oftenest coupled is mysticism (see Mysticism). The latter term has properly a practical rather than a speculative reference ; but it is currently

applied so as to include the systems of thought on which practical mysticism was based. Thus, to take only one prominent example, the profound speculations of Meister Eckuart (q.v.) are always treated under the head of Mysticism, but they might with equal right appear under the rubric Theosophy. In other words, while an emotional and practical mysticism may exist without attempting philosophically to explain itself, speculative mysticism is almost another name for theosophy. There is still a certain difference observable, however, in so far as the speculative mystic remains primarily concerned with the theory of the soul’s relation to God, while the theosophist gives his thoughts a wider scope, and frequently devotes himself to the elaboration of a fantastic philosophy of nature.

In the above acceptation of the term, the Neoplatonic doctrine of emanations from the supra-essential One, the fanciful emanation-doctrine of some of the Gnostics (the seons of the Valentinian system might be mentioned), and the elaborate esoteric system of the Kabbalah, to which the two former in all probability largely contributed, are generally included under the head of theosophy. In the two latter instances there may be noted the allegorical interpretation of traditional doctrines and sacred writings which is a common characteristic of theosophical writers. Still more typical examples of theosophy are furnished by the mystical system of Meister

Eckhart and the doctrine of Jacob BorHME (g.v.), who is known as “the theo- sophist.” par excellence. Eckhart’s doctrine asserts behind God a predicateless Godhead, which, though unknowable not only to man but also to itself, is, as it were, the essence or potentiality of all things. From it proceed, and in it, as their nature, exist, the three persons of the Trinity, conceived as stadia of an eternal self-revealing process. The eternal generation of the Son is equivalent to the eternal creation of the world. But the sensuous and phenomenal, as such, so far as they seem to imply independence of God, are mere privation and nothingness ; things exist only through the presence of God in them, and the goal of creation, like its outset, is the repose of the Godhead. The soul of man, which as a microcosmos resumes the nature of things, strives by self-abnegation or self-annihilation to attain this unspeakable reunion (what Eckhart calls being buried in God). Regarding evil simply as privation, Eckhart does not make it the pivot of his thought, as was afterwards done by Boehme, but his notion of the Godhead as a dark and formless essence is a favourite thesis of theosophy. The followers of Eckhart are either practical mystics, or reproduce at most what may be called their master’s speculative theology, till we come to Boehme.

Besides mystical theology, Boehme was indebted to the writings of Paracelsus. This circumstance is not acci- dental, but points to an affinity in thought. The nature- philosophers of the Renaissance, such as Nicholas of Cusa, Paracelsus, Cardan, and others, curiously blend scientific ideas with speculative notions derived from scholastic theology, from Neoplatonism, and even from the Kab- balah. Hence it is customary to speak of their theories as a mixture of theosophy and physics, or theosophy and chemistry, as the case may be. Boehme offers us a natural philosophy of the same sort. As Boehme is the typical theosophist, and as modern theosophy has nourished itself almost in every case upon the study of his works, his dominating conceptions supply us with the best illus- tration of the general trend of this mode of thought. His speculation turns, as has been said, upon the necessity of reconciling the existence and the might of evil with the existence of an all-embracing and all-powerful God, with- out falling into Manichzanism on the one hand, or, on the

other, into a naturalistic pantheism that denies the reality of the distinction between good and evil. He faces the difficulty boldly, and the eternal conflict between the two may be said to furnish him with the principle of his philosophy. It is in this connexion that he insists on the necessity of the Nay to the Yea, of the negative to the positive. Eckhart's Godhead appears in Boehme as the abyss, the eternal nothing, the essenceless quiet (" Un-grund" and "Stille ohne Wesen" are two of Boehme's phrases). But, if this were all, the Divine Being would remain an abyss dark even to itself. In God, however, as the condition of His manifestation, lies, according to Boehme, the " eternal nature" or the mysterrum magnum, which is as anger to: love, as darkness to light, and, in general, as the negative to the positive. This principle (which Boehme often calls the evil in God) illuminates both sides of the antithesis, and thus contains the possi- bility of their real existence. By the " Qual" or torture, as it were, of this diremption, the universe has qualitative existence, and is knowable. Even the three persons of the Trinity, though existing idealiter beforehand, attain reality only through this principle of nature in God, which is hence spoken of as their matrix. It forms also the matter, as it were, out of which the world is created ; without the dark and fiery principle, we are told, there would be no creature. Hence God is sometimes spoken of as the father, and the eternal nature as the mother, of things. Creation (which is conceived as an eternal pro- cess) begins with the creation of the angels. The subse- quent fall of Lucifer is explained as his surrender of himself to the principle of nature, instead of dwelling in the heart of God. He sought to make anger predominate over love ; and he had his will, becoming prince of hell, the kingdom of God's anger, which still remains, however, an integral part of the Divine universe. It is useless to follow Boehme further, for his cosmogony is disfigured by a wild Paracelsian symbolism, and his constructive efforts in general are full of the uncouth straining of an untrained writer. In spite of these defects, his speculations have exercised a remarkable influence within the present century, notably upon the later phases of Schelling's philosophy, upon Franz von Baader, Molitor, and others. Schelling's Philosophical Inquiries into the Nature of Human Freedom (1809) is almost entirely a reproduction of Boehme's ideas, and forms, along with Baader's writ- ings, the best modern example of theosophical speculation. In his philosophy of identity ScHELLING (q.v.) had already defined the Absolute as pure indifference, or the identity of

subject and object (of the ideal and the real), but without advancing further into theogony. He now pro- ceeded to distinguish three moments in God, the first of which is the pure indifference which, in a sense, precedes all existence—the primal basis or abyss, as he calls it, in agreement with Boehme. But, as there is nothing before or besides God, God must have the ground or cause of His existence in Himself. This is the second moment, called nature in God, distinguishable from God, but inseparable from Him. It is that in God which is not God Himself ; it is the yearning of the eternal One to give birth to itself, This yearning is a dumb unintelligent longing, which moves like a heaving sea in obedience to some dark and indefinite law, and is powerless to fashion anything in permanence. But in correspondence to the first stirring of the Divine existence there awakes in God Himself an inner reflexive perception, by means of which—since no object is possible for it but God—God beholds Himself in His own image. In this, God is for the first time as it were realized, although as yet only within Himself. This perception combines as understanding with the primal yearning, which becomes thereby free creative will, and

works formatively in the originally lawless nature or ground. In this wise is created the world as we know it. In every natural existence there are, therefore, two principles to be distinguished—first, the dark principle, through which this is separated from God, and exists, as it were, in the mere ground ; and, secondly, the Divine principle of understand- ing. The first is the particular will of the creature, the second is the universal will. In irrational creatures the particular will or greed of the individual is controlled by external forces, and thus used as an instrument of the universal, But in man the two principles are consciously present together, not, however, in inseparable union, as they are in God, but with the possibility of separation. This possibility of separation is the possibility of good and evil. In Boehme’s spirit, Schelling defended his idea of God as the only way of vindicating for God the conscious- ness which naturalism denies, and which ordinary theism emptily asserts. This theosophical transformation of Schelling’s doctrine was largely due to the influence of his contemporary BaADER (q.v.). Baader distinguishes, in a manner which may be paralleled from Boehme, between an immanent or esoteric process of self-production in God, through which He issues from His unrevealed state, and the emanent, exoteric, or real process, in which God overcomes and takes up

into Himself the eternal “nature” or the principle of selfhood, and appears as a Trinity of persons. The creation of the world is still further to be distinguished from these two processes as an act of freedom or will ; it cannot, therefore, be speculatively constructed, but must be historically accepted. Baader, who combined his theo- sophy with the doctrines of Roman Catholicism, has had many followers. Among thinkers on the same lines, but more or less independent, Molitor is perhaps the most important. SWEDENBORG (g.v.) is usually reckoned among the theosophists, and some parts of his theory justify this inclusion ; but his system as a whole has little in common with those speculative constructions of the Divine nature which form the essence of theosophy, as strictly under- stood. (A. SE.) THERA, or, as it is now called, SANTORIN, is a volcanic island in the Aigean Sea, the southernmost of the group of islands, called Sporades, which intervene between the Cyclades and Crete. From the last-named island it is separated by a space of 60 miles of sea, but the lofty Cretan ranges of Dicte and Ida are clearly visible from it in fine weather. In shape San- torin forms a crescent, and |, encloses a bay | ; on the north, |i Ye) re Qo east, and south, | {7 { “—~S8) AIMENIE SEES, > om, gh AE while on the western _ side lies the smaller island of Ther- asia. The en- circling wall thus formed, which is ellip- tical in shape and 18 miles round in its inner rim, is broken in two places,—towards the north-west by a strait a mile in breadth, where the water is not less than 1100 feet deep, and towards the south-west by an aperture about

3 miles wide, where the water is shallow, and an island called Aspronisi or White Island, lying in the middle, serves as a stepping-stone between the two promontories. The cliffs rise perpendicularly from the waters of the bay, in some places to the height of 1000 feet ; but towards the open sea, both in Santorin and Therasia, the ground slopes gradually away, and has been converted into broad level terraces, everywhere covered with tufaceous agglomerate, which, though extraordinarily bare and ashen to the eye, is the soil which produces the famous Santorin wine. Towards the south-east rises the limestone peak of Mount Elias, the highest point of the island (1887 feet), and the only part that existed before the voleano was formed. In the middle of the basin lie three small islands, which are the

centre of volcanic activity, and are called Pala, Mikra, and Nea Kaumene, or the Old, the Little, and the New Burnt Island ; the highest of these, Nea Kaumene, is 351 feet above the sea-level. Owing to the depth of the water there is no anchorage, and vessels have to be moored to the shore, except at one point in the neighbourhood of the modern town, where there is a slight rim of shallow bottom. The cliffs both of Santorin and Therasia present an extraordinary appearance, being marked in horizontal bands by black lava, white porous tufa, and other volcanic strata, some parts of which are coloured dark red. The modern town of Thera (or Phera, as it is more commonly pronounced) is built at the edge of these, overlooking the middle of the bay at a height of 900 feet above the water, and the houses of which it is composed are themselves peculiar, for their foundations, and in some cases their sides also, are excavated in the tufa, so that occasionally they are hardly traceable except by their chimneys ; and, owing to the absence of timber,—for, with the exception of the fig, the cactus, and the palm, there are hardly any trees in the island,—they are roofed with barrel vaults of stone and cement. Both wood and water have occasion- ally to be imported from the neighbouring islands, for there are no wells, and the rain water, which is collected in numerous cisterns, does not always suffice. The largest of the other towns or villages is that of Apanomeria, near the northern entrance, which is crowded together in a white mass, while the rocks below it are the reddest that are seen in the island.

Santorin has from the earliest times been a centre of volcanic agency, and is elosely connected with the earthquake movements to which the eountries in the neighbourhood of the Adgean are subject, and which have been the chief cause of the destruction of the public buildings of aneient Greece. It is hardly accurate to speak of the basin which forms the harbour as a crater, for most geologists, including Lyell, support the view that the whole of this space was once eovered by a single volcanie cone, the ineline of which is represented by the outward slope of Santorin and Therasia, while the position of the crater was that now oecupied by the Kaumene Islands; and that, at some remote period, owing to the sinking of the strata beneath, the central portion of this, extend- ing over an area which a French writer compares with that included within the fortifications of Paris at the time of the siege, fell in, by which convulsion the basin was formed. The principal erup- tions that have taken place within historic times are that of 196 B.C.,

when, as we Jearn from Strabo (i. 3, § 16, p. 57), flames rose from the water halfway between Thera and Therasia for four days, and the island of Palea Kaumene was ejected; that of 726 a.D., during the reign of the emperor Leo the Isaurian, when an addition was made to that island, and the pumiee-stone that was east forth was carricd by the waves to the shores of Asia Minor and Macedonia ; that of 1578, when Mikra Kaumene appeared; that of 1650, a fearful eruption, which destroyed many lives by its noxious exhala- tions, and ended in the upheaval of an island in the sea to the north-east of Santorin, which afterwards subsided and became a permanent reef below the sea-level; that of 1707, when Nea

Kaumene arose; and, within the recollection of the present genera- tion, that of 1866.

Sautorin and Therasia have been recently the scene of a remark- able archeological diseovery. In the southern parts of both those islands prehistoric dwellings have been found at some height above the sea, and there is no reasonable cause to doubt that these date

from a period antecedent to the falling in of the crater and the formation of the bay. This is proved by their position underneath the layer of tufa which eovers the islands, and, moreover, by these layers of tufa being broken off precipitously, in the same way as the lava-rocks, a fact which ean only be explained by the supposition that they all fell in together. The foundations of the dwellings rested, not on the tufa, but on the lava below it; and here and there between the stones branehes of wild olive were found, accord- ing to a mode of building that still prevails in the island, in order to resist the shocks of earthquakes. Part of the skeleton of a man was discovered, and large vases, some containing grain, others stone instruments very earefully worked. Some of these vases were of fine yellowish earth, ornamented with brown bands; some, of smaller size, were more elaborately decorated, sometimes with lines representing foliage, and in a few instances with figures of animals; some were of red earth, without ornament; while others, of pale red earth, were of very large dimensions. No implements of metal were found. Naturally it has been the subject of mueh discussion what was the origin of this very primitive art. The late M. Dumont, who was the leading authority on the subject (Les Céramiques de la Gréce Propre, pp.

74, 75, 209), though speaking with great caution on account of the insufficiency of the evidence, inelined to the belief that it was partly derived from Phoenician influence, but at the same time that there were evident traces of native originality. Comparing it in respect of date with the other prehistoric developments of art in the neighbourhood of the igean, he would place it later than that of Hissarlik, but earlier than those of Ialysus in Rhodes, and of Mycene.

In Greek legend the island of Thera was connected with the story of the Argonauts, for it was represented as sprung from a clod of earth which was presented to those heroes by Triton (Apollon., Argonaut., iv. 1551 sg., 1731 sg.). According to Herodotus (iv. 147), a Phenician colony was established there by Cadmus—a story which proves at least the belief that there was an early settlement of that race in the island. It has even been conjectured (see vol. xviii. p. 806) that the alphabet was introduced into Greece, not, as was eommonly believed, through Thebes, but by way of Thera. Subsequently, we are told, a colony from Sparta, ineluding some of the Minyz, was led thither by Theras, who gave the island his own name, in place of that of Calliste which it had borne before. But the one event which gave importance to Thera in ancient history was the planting of its famous colony of Cyrene on the north coast of Afriea by Battus in 631 3.c., in accordanee with a command of the Delphic oracle. The ancient capital, which bore the same name as the island, has been identified by an inseription as occupying a site on the eastern eoast called Mesa-Vouno, between Mount Elias and the sea. The other remains of the classical period consist of walls and tombs, together with several heroa or small shrines, one of which, now dedicated to St Nicholas Marmorites, who is so called in honour of his marble structure, is an almost unique specimen of a perfect Greek temple, for even the roof remains intact. After the fourth crusade, when the Byzantine empire was partitioned among the Latins, this island formed a portion of the duehy of the Archipelago; and it was at this period that it received the name of Santorin, i.¢., St Irene, after the patron saint of the place, to whom Tournefort mentions that in his time nine or ten ehapels were dedicated. At the present day Santorin is in a prosperous condition, for, in addition to the wine trade, which is highly remunerative, there is a large export of pozzolana, Which has been much used for the works at Port Said in eonnexion with the Suez Canal, since, when mixed with lime, it

forms a very hard cement which resists the action of the sea. General information with regard to the Thera group will be found in Ross's Inselreisen, and in Lieut. Leyccster's paper in vol. xx. of the Journal of the R. Geogr. Soc.; a very complete account of the scientific phenomena is given in Fouqué's Santorin et ses Eruptions. On the prehistoric antiquities, Lenormant, Revue Archéologique, new ser., vol. xiv., and Fouqué, Archives des Missions, 24 ser., vol. iv., and 'Une Pompéi Antéhistorique," in the Revue des Deux Mondes, vol. Ixxxiii., should be consulted. Of the life of the modern inhabitants a graphic account is given in Mr Bent's Cyclades. rf (H. F. T.)

THERAMENES, an Athenian who played a prominent part in the history of Athens towards the close of the Peloponnesian War and in the revolution which followed it. He was one of the conspirators who, in 411 3.c., abolished the democracy at Athens, and substituted the oligarchy of the Four Hundred. The adhesion of the army in Samos to the democracy, however, created dissensions among the oligarchs at Athens. Theramenes supported the more moderate section, and was the chief means of destroying a fortress which the extreme section had been building at the mouth of the harbour, ostensibly as a protection against any violent movement on the part of the democrats at Samos, but really, according to Theramenes, to admit the enemy. He further accused Antiphon and Archeptole- mus, members of the extreme oligarchical party, who,

according to Lysias, had been his own intimate friends, and secured their capital punishment. In 410 Theramenes commanded one of the three squadrons of the Athenian fleet in the victory over the Spartans at Cyzicus. In 409 he took part in the siege of Chalcedon and the capture of Byzantium. At the battle of Arginuse in 406 he was one of the officers deputed by the generals in command to pick up the crews of the disabled ships ; but the rescue was not effected, on account, it seems, of the storm. Nevertheless, on his return to Athens, Theramenes took a leading part in accusing and procuring the condemnation to death of the generals for neglecting to rescue the men. When Athens was besieged by the Peloponnesians, Thera- menes conducted the negotiations for surrendering the city, traitorously prolonging

them till starvation compelled the Athenians to accept the rigorous terms imposed by Sparta. After the surrender he formed one of the notorious Thirty who, backed by a Spartan garrison, misgoverned Athens. But by opposing their excesses he incurred their suspicions, and, being denounced by Critias, the most violent of the Thirty, he was, in defiance of the forms of law, put to death (404). He submitted to his fate with a fortitude which won the admiration of his contemporaries and of posterity, and which might well have graced the close of a better life. His ability and eloquence are recognized by Thucydides, and Aristotle is said by Plutarch (WVic., 2) to have reckoned him one of the three best patriots of Athens. This latter judgment is not borne out by the facts as we know them. Rather Theramenes appears as a selfish and faithless trimmer, who deserved his nickname Cothurnus (a boot which fitted either foot).

The chief authorities for his life are Thucydides, viii.; Xenophon, Hellenica, i., ii.; Lysias, Contra Hrat.; Diodorus, xiii., xiv.

THERAPEUTE. See Monacuism, vol. xvi. p. 698.

THERESA, Sr (1515-1582). Teresa de Cepeda, perhaps the favourite saint of modern Spain, was born at Avila, in Old Castile, on the 28th of March 1515,—at the very time, adds her biographer, ‘“‘ when Luther was secreting the poison which he vomited out two years later.” She was one of a large family—eight sons and three daughters. Her father was a Spanish gentleman of good family, whose time was chiefly occupied with devotional reading and works of charity. Teresa’s mother, his second wife, was a beautiful woman, confined generally to a sofa by delicate health. From her her daughter appears to have inherited both delicacy of health and a remarkably susceptible imagination. She delighted in the books of knight-errantry which abounded in the library, and her children sat up at night in their nursery over the same romances. But Teresa’s imagination was judiciously diverted by her father to another form of heroism. She was soon as deep in tlie histories of the martyrs as she had been in the tales of chivalry. She learned from these histories that martyrs passed straight to heaven without any detention in purgatory ; and, being eminently practical as well as imaginative, she resolved to secure that blessing for herself. When she was seven years old, she started off with her little brother to go

and seek martyrdom in the country of the Moors. They had reached the bridge on the stream which runs through the town, when an uncle met them and brought them back. Balked thus of their desire, they played at hermits, making themselves cells in the garden, and giving away their pocket-money to beggars. Teresa lost her mother early, and as she grew up the vanities and flirtations of a pretty girl took the place of these pious imaginations. Her father deemed it best to send her to be educated in an Augustinian convent in the town, but without any thoughts of her adopting a religious life. She would probably have married like her Sisters, had it not been for an attack of illness. She was

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sent away for change of air on a visit to one of her sisters, and on her way home spent some days with a saintly uncle, who was on the eve of entering a monastery, and who strongly urged her to withdraw from the world. Her father was greatly opposed to the step, but Teresa was not to be turned from what she conceived to be her duty. She was only eighteen when she left home one morning, and applied for admission at the Carmelite convent of the Incarnation. She was disappointed at first at the slack- ness of discipline. The sisters mixed freely in the society of Avila, receiving visits and returning them, and often absenting themselves from the cloister for months at a time. For the first three years she was constantly subject to attacks of sickness, fainting fits, and paroxysms of pain, but she prayed to St Joseph, after which she became comparatively better, though her nervous system was completely shaken. But she appears afterwards to have accommodated herself with tolerable success to the world- liness of her environment, though not without intervals of religious misgiving. “For twenty years,” she says, ‘I was tossed about on a stormy sea in a wretched condition, for, if I had small content in the world, in God I had no pleasure. At prayer time I watched for the clock to strike the end of the hour. To go to the oratory was a vexation to me, and prayer itself a constant effort.” At one time she abandoned prayer altogether, as she found it impos- sible to fix her thoughts, and she abhorred the hypocrisy of mechanically repeating a form of words. It was in the year 1554 (her noviciate dated from 1534), when she was thus nearly forty, that the event known as her conversion took place, and the second part of her life began. The death of her father roused her to

serious reflexion, and one day, as she entered the oratory, she was struck by the image of the wounded Christ, placed there for an approaching festival. The blood was depicted as stream- ing over the face from the thorns and running from the side and the hands and feet. The spectacle of suffering pierced Teresa's breast ; she fell in tears at the feet of the figure, and felt every worldly emotion die within her. The shock threw her into a trance, and these trances, accompanied by visions, recurred frequently in the subsequent part of her life. They have since been adduced as Divine attestations of her saintship, but the sisterhood in the convent set them down to possession by a devil; her new departure was due in their eyes to no worthier motive than the desire to be peculiar and to be reputed better than other people. Teresa herself was very humble, and thought their explanation might be true ; she took her case to her confessor and to the provincial-general of the Jesuits. The latter put her under a course of discipline : she was to flog herself with a whip of nettles, to wear a haircloth plaited with broken wires that would tear the skin, and to meditate daily on the details of Christ's passion. One day, while thus occupied, her trance came upon her, and she heard a voice say, "Thou shalt have no more converse with men, but with angels." After this the trance or fit always returned when she was at prayers, and she felt that Christ was close to her. Presently she was able to see him, '' exactly as he was painted rising from the sepulchre." Her confessor directed her to exorcise the figure, and she obeyed with pain, but, it is needless to say, in vain. The visions grew more and more vivid. The cross of her rosary was snatched from her hand one day, and when returned it was made of jewels more brilliant than diamonds, visible, however, to her alone. She had often an acute pain in her side, and fancied that an angel came to her with a lance tipped with fire, which he struck into her heart. The 27th of August is kept sacred in Spain to this mystery, which has also formed a favourite subject of Spanish painters; it forms the frontispiece of XXIII. — 36

the biography which is put into the hands of Catholics. She had also visions of another description: she was shown hell with its horrors, and the devil would sit upon her breviary, belabour her with blows, and fill her cell with imps. For several years these experiences continued, and the verdict as to

their source still remained far from unanimous. Meanwhile, on the broad stage of the world, the Reformation continued to spread and establish itself ; and this great falling away became the subject of much searching of hearts to pious Catholics. Teresa reflected like the rest, and her experience led her to find the real cause of the catastrophe in the relaxation of discipline within the religious orders. If the ancient rules could be restored, it appeared to her that the evil might be stemmed; and she formed the project of founding a house in which all the original rules of the Carmelite order before its relaxation would be observed. She met, not unnaturally, with great opposition from the authorities of the order, and in particular from the prioress and sisters of the Incarnation, who looked upon the step as a reflexion upon themselves. Nevertheless, she persevered with her scheme, being encouraged to appeal to the pope by cer- tain priests who saw the benefit which would accrue to the church from her zeal. A private house in Avila was secretly got ready to serve as a small convent, and, when the bull arrived from Rome, Teresa went out on leave from the Incarnation and installed four poor women in the new house dedicated to her patron St Joseph. It was on the 24th of August 1562 that mass was said in the little chapel and the new order constituted. It was to be an order of Descalzos or Barefoots, in opposition to the relaxed parent body, the Calzados. The sisters were not to be literally shoeless, but to wear sandals of rope; they were to sleep on straw, to eat no meat, to be strictly con- fined to the cloister, and to live on alms without regular endowment. . After lodging her four sisters, Teresa re- turned to the Incarnation, as in duty bound; but, when the secret was discovered, Carmelites and townspeople were alike furious. Violence, however, was prevented, and the matter was referred to the council of state at Madrid. Philip II. referred it again to the pope, and after six months a fresh bull arrived from Pius V. ‘The provincial of her order now gave her leave to remove and take charge of her sisterhood. The number of thirteen, to which on grounds of discipline she had limited the founda- tion, was soon filled up, and Teresa spent here the five happiest years of her life. Her visions continued, and, by command of her ecclesiastical superiors, she wrote her autobiography containing a full account of these experi- ences. She herself, however, profoundly as she believed in their reality, saw the danger which attaches to such experiences, and was far from basing any claim to holiness upon them. One of her visions about this time is interesting as illustrating what is called her

mysticism. She fancied that she was a mirror without frame and without dimensions, with Christ shining in the centre of it, and the mirror itself, she knew not how, was in Christ. Teresa was now encouraged to carry her work still further, for the church was girding itself to the work of the Counter-Reformation. The general of the order visited her at Avila, and gave her powers to found other houses of Descalzos, for men as wellas women. ‘The last fifteen years of her life were spent mainly in journeys with this end and in the continually growing labour of organization. She travelled in a rude cart in all weathers, and the story of her hardships and misadventures impresses us with the strength of will that animated her old and shaken frame. Convents were founded at Medina, Malaga, Valladolid, Toledo, Segovia, and Salamanca, and two at Alva under the patronage of the famous duke. Then she had three

years of rest, as prioress of her old convent of the Incar- nation. She next went to Seville to found a house, thus overstepping for the first time the boundaries of the Castiles, to which her authorization limited her. The

latent hostility of the old order was aroused ; the general .

ordered the immediate suppression of the house at Seville, and procured a bull from Gregory XIII. prohibiting the further extension of the reformed houses (1575). But the movement against her came from Italy, and was resented by Philip and the Spanish authorities as undue interfer- ence ; and, after a fierce struggle, during which Teresa was two years under arrest at Toledo, the Carmelites were divided into two bodies in 1580, and the Descalzos obtained the right to elect their own provincial-generals (see CARMELITES). The few remaining years of Teresa’s life were spent in the old way, organizing the order she had founded, and travelling about to open new convents. Sixteen convents and fourteen monasteries were founded by her efforts; she wrote a history of her foundations, which forms a supplement to her autobiography. At Burgos, during the whole of a wet autumn and winter, she endured terrible privations. Her own nuns, too, were not always as single-minded and obedient as the ideal sisterhood of her hopes had been. Those at St Joseph in Avila mutinied for a meat diet; the prioress at Medina answered her impertinently. Her last journey of inspec- tion was cut short at Alva, where she died on the 29th of September 1582,

and was laid in her first, but not her last, resting-place. A violet odour and a fragrant oil were said to distil from her tomb; and when it was opened nine months afterwards the flesh was found uncorrupted. A hand cut off by a fervent brother was found to work miracles, and the order became convinced that their founder had been a saint. It was resolved in 1585 to remove her remains to Avila, where she was born, the sisters at Alva being consoled by permission to retain the mutilated arm. But the family of the duke of Alva pro- cured an order from the pope enjoining that the body should be restored to Alva, and she was accordingly laid there once more in a splendid tomb. But even then she was not allowed to rest: she was again disentombed, to be laid in a more magnificent coffin, and the greed of reveren- tial relic-seekers made unseemly havoc of her bones. Teresa was canonized by Gregory XV. in 1622. The honour was doubtless largely due to her asceticism and mystic visions. She called herself Teresa de Jesus, to signify the closeness of her relation to the heavenly Bridegroom, who directed all her actions. Though she deprecated excess of ascetic severity in others, she scourged herself habitually, and wore a peculiarly painful haircloth. But her life shows her to have been, besides, a woman of strong practicality and good sense, full of natural shrewdness, and with unusual powers of organization. “You deceived me in saying she was a woman,” writes one of her confessors; “she is a bearded man.” She was brave in the face of difficulties and dangers, pure in her motives, and her utterances, some of which have been quoted, have the true ethical ring about them. Her MSS. were collected by Philip II. and placed in a rich case in the Escorial, the key of which the king carried about with him. Besides her autobiography and the history of her foundations, her works (all written in Spanish) contain a great number of letters and various treatises of mystical religion, the chief of which are The Way of Perfection and The Castle of the Soul. Both describe the progress

of the soul towards perfect union with God.

Her works, edited by two Dominieans, were first published in 1587, and have sinee appeared in various editions. They were soon afterwards translated into Italian, Freneh, and Latin; an English translation of the Life and works (exeept the letters) by A. Woodhead appeared in 1669. More recently various transla- tions of the Life have appeared,—by John Dalton

(1851), who also translated the Way of Perfection, and by David Lewis (1870), followed in 1871 by the Founda- tions from the same hand. Biographies appearcd soon after her death by the Jesuit Ribera, who had been her confessor (1602), and by Diego de Yepez, eon- fessor to Philip IT. (1599). Details are also given in Ribadeneyra's Flos Sanctorum and in Alban Butler's Lives of the Saints. A separate biography, with preface by Arehbishop Manning, appeared in 1865, and an interesting and sympathetie aecount of her life is given in the Quarterly Review for October 1883, (A. SE.)

THERESIOPEL, or THERESIENSTADT. See SZABADKA. THERMAL SPRINGS, See Groxoey, vol. x. pp. 223, 270, and MINERAL WATERS:

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THERMODYNAMICS. In a strict interpretation, this branch of science, sometimes called the Dynamical Theory

of Heat, deals with the relations between heat and work, –

though it is often extended so as to include all trans- formations of energy. Either term is an infelicitous one, for there is no direct reference to force in the majority of questions dealt with in the subject. Even the title of Carnot's work, presently to be described, is much better chosen than is the more modern designation. On the other hand, such a German phrase as die bewegende Kraft der Wdrme is in all respects intolerable.

It has been shown in a previous article (ENERGY) that Newton's enunciation of the conservation of energy as a general principle of nature was defective in respect of the connexion between work and heat, and that, about the beginning of the present century, this lacuna was com- pletely filled up by the researches of Rumford and Davy (see also Har). In the same article Joule's experimental demonstration of the principle, and his determination of the work-equivalent of heat by various totally independent processes, have been discussed. .

But the conservation of energy, alone, gives us an altogether inadequate basis for reasoning on the work of a heat-engine. It enables us to calculate

how much work is equivalent to an assigned amount of heat, and vice versa, provided the transformation can be effected ; but it tells us nothing with respect to the percentage of either which can, under given circumstances, be converted into the other. For this purpose we require a special case of the law of transformation of energy. This was first given in Carnot's extraordinary work entitled Aeflexions sur la Puissance Motrice du Feu, Paris, 1824.)

1 The author, N-L-Sadi Carnot (1796-1832), was the second son of Napoleon's celebrated minister of war, himself a mathematician of real note even among the wonderful galaxy of which France could then boast. The delicate constitution of Sadi was attributed to the agitated circumstances of the time of his birth, which led to the proscription and temporary exile of his parents. He was admitted in 1812 to the

cole Polytechnique, where he was a fellow-student of the famous Chasles. Late in 1814 he left the school with a commission in the Engineers, and with prospects of rapid advancement in his profession. But Waterloo and the Restoration led to a second and final proscrip- tion of his father; and, though Sadi was not himself cashiered, he was purposely told off for the merest drudgeries of his service; il fut *'envoyé successivement dans plusieurs places fortes pour y faire son métier d'ingénieur, compter des briques, réparer des pans de murailles, et lever des plans destinés a s'eufouir dans les cartons," as we learn from a biographical notice written by his younger brother. Disgusted with an employment which afforded him neither leisure for original work nor opportunities for acquiring scientific instruction, he presented himself in 1819 at the examination for admission to the staff-corps (état-major), and obtained a lieutenancy. He now devoted himself with astonishing ardour to mathematics, chemistry, natural history, technology, and even political economy. He was an enthusiast in music and other fine arts; and he habitually practised as an amuse- ment, while deeply studying in theory, all sorts of athletic sports, including swimming and fencing. He became captain in the engineers in 1827, but left the service altogether in the following year. His naturally feeble constitution, farther weakened by excessive devotion to study, broke down finally in 1832. A relapse of scarlatina led to brain fever, from which he had but partially recovered when he fell a victim to cholera. Thus died, at the early age of

thirty-six, one of the most profound and original thinkers who have ever devoted them- selves to science. The work named above was the only one he published. Though of itself sufficient to put him in the very fore- most rank, it contains only a fragment of Sadi Carnot's discoveries. Fortunately his manuscripts have been preserved, and extracts from them have been appended by his brother to a reprint (1878) of the Puissance Motrice. These show that he had not only realized for himself the true nature of heat, but had noted down for trial many of the best modern methods of finding its mechanical equivalent, such as those of Joule with the perforated piston and with the internal friction of water and mercury. W. Thomson's experiment with a current of gas forced through a porous plug is also given. One sentence of extract, however, must suffice, and it is astonishing to think that it was written over sixty years ago. "On peut donc poser en thése générale que la puissance motrice est en quantité invariable dans la nature, quelle n'est jamais, 4 proprement parler, ni produite, ni détruite. A la vérité, elle change de forme, c'est-a-dire qu'elle

The chief novelties of Carnot's work are the introduction of the idea of a cycle of operations, and the invaluable discovery of the special property of a reversible cycle. It is not too much to say that, without these wonderful novelties, thermodynamics as a theoretical science could not have been developed.

Carnot's work seems to have excited no attention at the time of its publication. Ten years later (1834) Clapeyron gave some of its main features in an ana- lytical form, and he also employed Watt's diagram for the exhibition of others. Even this, however, failed to call attention properly to the extremely novel processes of Carnot, and it was reserved for Sir W. Thomson (in 1848, and more at length in 1849) to point out to scientific men their full value. His papers on Carnot's treatise, follow- ing closely after the splendid experimental researches of Colding and Joule, secured for the dynamical theory of heat its position as a recognized branch of science. James Thomson, by Carnot's methods, predicted in 1849 the low- ering of the freezing point of water by pressure, which was verified experimentally in the same year by his brother. Von Helmholtz had published, two years before, a strikingly original and compreliensive pamphlet on the conservation of energy. The start once given, Rankine, Clausits, and W.

Thomson rapidly developed, though from very different standpoints, the theory of thermodynamics. The methods adopted by Thomson differed in one special characteristic from those of his concurrents,—they were based entirely on the experimental facts and on necessary principles ; and, when hypothesis was absolutely required, attention was carefully directed to its nature and to the reasons which appeared to justify it.

Three specially important additions to pure science followed almost directly from Carnot's methods :—(1) the absolute definition of temperature ; (2) the thermodynamic function or entropy; (3) the dissipation of energy. The first (in 1848) and the third (in 1852) were given by W. Thomson. The second, though introduced by Rankine, was also specially treated by Clausius.

In giving a brief sketch of the science, we will not adhere strictly to any of the separate paths pursued by its founders, but will employ for each step what appears to be most easily intelligible to the general reader. And we will arrange the steps in such an order that the neces- sity for each may be distinctly visible before we take it.

1. General Notions.—The conversion of mechanical work into heat can always be effected completely. In fact, friction, without which even statical results would be all but unrealizable in practical life, interferes to a marked extent in almost every problem of kinetics,—and work done against friction is (as a rule) converted into heat. But the conversion of heat into work can be effected only in part, usually in very small part. Thus heat is regarded as the lower or less useful of these forms of energy, and when part of it is elevated in rank by con- version into work the remainder sinks still lower in the scale of usefulness than before.

There are but two processes known to us for the con- version of heat into work, viz., that adopted in heat- engines, where the changes of volume of the "working substance" are employed, and that of electromagnetic engines driven by thermoelectric currents (see ELECTRICITY, vol. viii. p. 96). To the latter we will not again refer. And for simplicity we will suppose the working substance to be fluid, so as to have the same pressure throughout, or, if it be solid, to be isotropic, and to be subject only to hydrostatic

pressure, or to tension uniform in all directions and the same from point to point.

produit tantdt un genre de mouvement, tant6t un autre; mais elle n’est jamais anéantie.”

The state of unit mass of such a substance is known by experiment to be fully determined when its volume and pressure are given, even if (as in the case of ice in presence of water, or of water in presence of steam) part of it is in one molecular state and part in another. But, the state being determinate, so must be the temperature, and also the amount of energy which the substance contains. This consideration is insisted on by Carnot as the foundation of his investigations. In other words, before we are entitled to reason upon the relation between the heat supplied to and the work done by the working substance, Carnot says we must bring that substance, by means of a cycle of operations, back to precisely its primitive state as regards volume, temperature, and molecular condition.

2. Watt’s Diagram.—Watt’s indicator-diagram (see SrEAM-ENGINE) enables us to represent our operations graphically. For if OM (fig. 1) represent the volume, at any instant, of the unit mass of working substance, MP its pres- sure, the point P is determinate and correspouds to a definite temperature, definite energy, &c. If the points of any curve, | as PP’, in the diagram repre- Fig. 1. sent the successive states through which the working sub- stance is made to pass, the work done is (oc. cit.) repre- sented by the area MPP’M’. Hence, a cycle of operations, whose essential nature is to bring the working substance back to its primitive state, is necessarily represented by a closed boundary, such as PP’Q’Q, in the diagram. The area enclosed is the excess of the work done by the work- ing substance over that spent on it during the cycle. [This is positive if the closed path be described clockwise, as indicated by the arrow-heads. |

3. Carnot’s Cycle.—For a reason which will immediately appear, Carnot limited the operations in his cycle to two kinds, employed alternately during the expansion and during the compression of the working substance. The first of these involves change of volume at constant temperature ; the

second, change of volume without direct loss or gain of heat. [In his hypothetical engine the substance was supposed to be in contact with a body kept at constant temperature, or to be entirely surrounded by non-conducting materials.]| The corresponding curves in the diagram are called isothermals, or lines of equal temperature, and adiabatic lines respectively. We may consider these as having been found, for any particular working substance, by the direct use of Watt's indicator. It is easy to see that one, and only one, of each of these kinds of lines can be found for an assigned initial state of the working substance ; also that, because in expansion at constant temperature heat must be constantly supplied, the pressure will fall off less rapidly than it does in adiabatic expansion. Thus in the diagram the adiabatic lines PQ, P'Q' cut the lines of equal temperature PP', QQ' downwards and to the right. Thus the boundary of the area PP'Q'Q does not cross itself. To determine the behaviour of the engine we have therefore only to find how much heat is taken in along PP' and how much is given out in Q'Q. Their difference is equivalent to the work expressed by the area PP'Q'Q.

4. Carnot's Principle of Reversibility—tit will. be observed that each operation of this cycle is strictly reversible; for instance, to take the working substance along the path P'P we should have to spend on it step by step as much work as it gave out in passing along PP, and we should thus restore to the source of heat exactly the amount of heat which the working substance took from it during the expansion. In the case of the adiabatics

the work spent during compression is the same as that done during the corresponding expansion, and there is no question of loss or gain of heat directly.

If, however, a transfer of heat between the working substance and its surroundings have taken place on account of a finite difference of temperature, it is clear that such an operation is not reversible. Strictly speaking, isother- mal expansion or contraction is unattainable in practice, but it is (without limit) more closely approximated to as the operation is more slowly performed. The adiabatic condition, on the other hand, is more closely approximated to in practice the more swiftly the operation is

performed, We have an excellent instance of this in the compression and dilatation of air caused by the propagation of a sound- wave.

And now we have Carnot's invaluable proposition, a reversible heat-engine is a perfect engine,—perfect, that is, in the sense that no other heat-engine can be superior to it. Before giving the proof, let us see the immense con- sequences of this proposition. Reversibility is the sole test of perfection; so that all heat-engines, whatever be the working substance, provided only they be reversible, convert into work (under given circumstances) the same fraction of the heat supplied to them. The only circum- stances involved are the temperatures of the source and condenser. Thus we are furnished with a general principle on which to reason about transformation of heat, altogether independently of the properties of any particular substance.

The proof, as Carnot gave it on the hypothesis of the materiality of heat, is ex absurdo, It is as follows. Suppose a heat-engine A to be capable of giving more work from a given amount of heat than is a reversible engine B, the temperatures of source and condenser being the same for each. Use the two as a compound engine, A working direct and B reversed. By hypothesis B requires to be furnished with part only of the work given by A to be able to restore to the source the heat abstracted by A, and thus at every complete stroke of the compound engine the source has its heat restored to it, while a certain amount of external work has been done. This would be the PerpervaL MorIon (¢.v.).

5. The Basis of the Second Law of Thermodynamics.— Carnot's reasoning, just given, is based on the hypothesis that heat (or caloric) is indestructible, and that (under certain conditions) it does work in being let down from a higher to a lower temperature, just as does water when falling to a lower level. It is clear from several expressions in his work that Carnot was not at all satisfied with this view, even in 1824, and we have seen that he soon after- wards reached the true theory. But it is also clear that such an assumption somewhat simplifies the reasoning, for in his hypothetical heat-engine all the heat which leaves the boiler goes to the condenser, and vice versa in the reversed working. The precise point of Carnot's investiga- tion where the supposed indestructibility of heat introduces error is when, after virtually saying compress from Q' to a state Q determined by the condition

that the heat given out shall be exactly equal to that taken in during the expansion from P to P’, he assumes that, on farther com- pressing adiabatically to the original volume, the point P will be reached and the cycle completed. J. Thomson, in 1849, rectified this by putting it in the true form :-— compress from Q’ to a state Q, such that subsequent adiabatic compression will ultimately lead to the state P.

We have now to consider that, if an engine (whether simple or compound) does work at all by means of heat, less heat necessarily reaches the condenser than left the boiler. Hence, if there be two engines A and B as before, and the joint system be worked in such a way that B constantly restores to the source the heat taken from it by

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A, we can account for the excess of work done by A over that spent on B solely by supposing that B takes more heat from the condenser than A gives to it. Such a com- pound engine would transform into work heat taken solely from the condenser. And the work so obtained might be employed on B, so as to make it convey heat to the source while farther cooling the condenser.

Clausius, in 1850, sought to complete the proof by the simple statement that “this contradicts the usual behaviour of heat, which always tends to pass from warmer bodies to colder.” Some years later he employed the axiom, “it is impossible for a self-acting machine, unaided by any external agency, to convey heat from one body to another ata higher temperature.” W. Thomson, in 1851, employed the axiom, “it is impossible, by means of inanimate material agency, to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects.” But he was careful to supplement this by further statements of an extremely guarded character. And rightly so, for Clerk- Maxwell has pointed out that such axioms are, as it were, only accidentally correct, and that the true basis of the second law of thermodynamics lies in the extreme small- ness and enormous number of the particles of matter, and in consequence the steadiness of their average behaviour. Had we the means of dealing with the particles individu- ally, we could develop on the large scale what takes place continually on a very minute scale in every mass of

gas, —the occasional, but ephemeral, aggregation of warmer particles in one small region and of colder in another.

6. The Laws of Thermodynamics.—I. When equal quan- tities of mechanical effect are produced by any means whatever from purely thermal sources, or lost in purely thermal effects, equal quantities of heat are put out of existence, or are generated. [To this we may add, after Joule, that in the latitude of Manchester 772 foot-pounds of work are capable of raising the temperature of a pound of water from 50° F. to 51° F. This corresponds to 1390 foot-pounds per centigrade degree, and in metrical units to 425 kilogramme-metres per calorie (see HEAT). |

II. If an engine be such that, when it is worked back- wards, the physical and mechanical agencies in every part of its motions are all reversed, it produces as much – mechanical effect as can be produced by any thermo-dynamic engine, with the same temperatures of source and refrigerator, from a given quantity of heat.

7. Absolute Temperature.—We have seen that the frac- tion of the heat supplied to it which a reversible engine can convert into work depends only on the temperatures of the boiler and of the condenser. On this result of Carnot's Sir W. Thomson based lis absolute definition of temperature. It is clear that a certain freedom of choice is left, and Thomson endeavoured to preserve as close an agreement as possible between the new scale and that of the air thermometer. Thus the definition ultimately fixed on, after exhaustive experiments, runs :—' The temperatures of two bodies are proportional to the quantities of heat respectively taken in and given out in localities at one temperature and at the other respectively, by a material system subjected to a complete cycle of perfectly reversible thermodynamic operations, and not allowed to part with or take in heat at any other temperature ; or, the absolute values of two temperatures are to one another in the pro- portion of the heat taken in to the heat rejected in a per- fect thermodynamic engine, working with a source and refrigerator at the higher and lower of the temperatures respectively."! If we now refer again to fig. 1, we see that, ¢ and ¢' being the absolute temperatures correspond- ing to PP' and QQ', and H, H' the amounts of heat taken

1 Trans. R.S.H., May 1854.

in during the operation PP’ and given out during the operation Q’Q respectively, we have H/t=H’/t’,

whatever be the values of ¢ and ¢. measured in terms of work, we have

H —- H’=area PP’Q’Q. Thus with a reversible engine working between tempera- tures ¢ and ?¢’ the fraction of the heat supplied which is converted into work is (¢-?’)/t.

It is now evident that we can construct Watt’s diagrain in such a way that the lines of equal temperature and the adiabatics may together intercept a series of equal areas. Thus let PP’ (fig. 2) be the iso- thermal ¢, and on it so take points P’, Pr’, FP”, de, thet, as the working sub- stance passes from P@ FP w P”, &ec., ¢ units of heat (the unit being of any assigned value) shall in each case be taken in. Let QQ’, RR’, &e., be other isothermals, so drawn that the suc- cessive areas PQ’, QR’, &c., between any two selected adiabatics, may be equal. Then, as it is clear that all the successive areas between each one pair of isothermals are equal (each representing the area ¢-<’'), it follows that all the quadrilateral areas in the figure are equal.

It is now clear that the area included between PP’ and the two adiabatics PQR, P’Q’R’ is essentially jincte, being numerically equal to ¢. Thus the temperature for each isothermal is represented by the corresponding area. This is indicated in the cut by the introduction of an arbitrary line SS’, supposed to be the isothermal of absolute zero. The lower parts of the adiabatics also are unknown, so that we may draw them as we please, subject to the con- dition that the entire areas PS’, P’S”, P’S’”, &c., shall all be equal. To find, on the absolute scale, the numerical valus of two definite temperatures, such as the usually employed freezing and boiling points of water, we must therefore find their ratio (that of the heat taken and the heat rejected by a reversible engine working between these temperatures), and assign the number of degrees in the interval.

Thomson and Joule experimentally showed that this ratio is about 1°365. Hence, if we assume (as in the centigrade scale) 100 degrees as the range,

the tempera- tures in question are 274 and 374 nearly. A full discus- sion of this most important matter will be found under Heat.

8. Lntropy.—Just as the lines PP’, QQ’, kc, are

characterized by constant temperature along each, so we figure to ourselves a quantity which is characteristic of each adiabatic line,—being constant along it. The equation of last section at once points out such a quantity. If we write # for its value along PQ, ¢’ for P’Q’, we may define thus ¢’-¢=H/t. From the statements as to the equality of the areas in fig. 2 the reader will see at once that the area bounded by t, t, b, ¢ is ¢-¢t’)(¢’-—¢). We are concerned only with the changes of @, not with its actual magnitude, so that any one adiabatic may be chosen as that for which ¢=0.

9. The Dissipation of Energy.—In the before-cited article ENERGY (vol. vili. p. 210) this part of the subject has already been treated. Since that article was written Sir William Thomson has introduced the term thermodynamic motinty to signify “the possession the waste of which is

Also, if heat be

Fig. 2.

called dissipation.” We speak ofa distribution of heat in a body or system of bodies as having motivity, and we may regard it from without or from within the system.

In the first case it expresses the amount of work which can be obtained by means of perfect engines employed to reduce the whole system to some definite temperature, that, say, of the surrounding medium. In the second case the system is regarded as self-contained, its hotter parts acting as sources, and its colder parts as condensers for the perfect engine.

As an instance of internal motivity we may take the case of a system consisting of two equal portions of the same substance at different temperatures, say a pound of boiling water and a pound of ice-cold water. If

we neglect the (small) change of specific heat with tempera- ture, it is found that, when the internal motivity of the system is exhausted, the temperature is about 46° C., being the centigrade temperature corresponding to the geo- metrical mean of the original absolute temperatures of the parts. Had the parts been simply mixed so as to dissipate the internal motivity, the resulting temperature would have been 50° C. ‘Thus the work gained (z.¢., the original inter- nal motivity) is the equivalent of the heat which would raise two pounds of water from 46° C. to 50° C.

As an instance of motivity regarded from without we may take the simple case of the working substance in § 2, on the hypothesis that there is an assigned lower tempera- ture limit. As there is no supply of heat, it is clear that the maximum of work will be obtained by allowing the substance to expand adiabatically till its temperature sinks to the assigned limit.

Thus if P (fig. 3) be its given position on Watt’s diagram, PQ the adiabatic through P, and P’Q the isothermal of the lower temperature limit, Q p is determinate, and the motivity is the area PQNM. If, again, we wish to find the motivity when the initial and final states P and P” are given, with the @ condition that the temperature || is not to fall below that of the ? af. state P’, the problem is reduced Fig 3. to finding the course PP’ for which the area PP’M’M is greatest. As no heat is supplied, the course cannot rise above the adiabatic PQ, and by hypothesis it cannot fall below the isothermal P’Q,—hence it must be the broken line PQP’. Thus, under the circumstances stated, the motivity is represented by the area MPQP’M’. If any other lawful course, such as PP’, be taken, there is an un- necessary waste of motivity represented by the area PQP’.

10. Elementary Thermodynamic Relations.—From what precedes it is clear that, when the state of unit mass of the working substance is given by a point in the diagram, an isothermal and an adiabatic can be drawn through that point, and thus ¢ and ¢ are determinate for each particular substance when p and v are given. Thus any two of the four quantities p, v, t, ¢ may be regarded as functions of the other two, chosen as independent variables. The change of energy from one state to another can, of course, be expressed as in § 9, above. Thus, putting E for the energy, we have at once

dk=tdp-pdv . .... (1) if ¢ and v be chosen as independent variables, and if heat be measured, as above, in units of work. This equation expresses, in symbols, the two laws of thermodynamics. For it states that the gain of energy is the excess of the heat supplied over the work done, which is an expression of the first law. And it expresses the heat supplied as the product of the absolute temperature by the gain of entropy, which is a statement of the second law in terms of Thomson's mode of measuring absolute temperature.

But we now have two equatious in partial differential co-

efficients :— dk sin ak do}? ()- ~P-

From these we have two expressions for the value of (saig dvdd }°

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Equating them, we are led to the thermodynamic relation

(z)~ – (a5)

the differential coefficients being again partial.

This expresses a property of all " working substances," defined as in § 1. Yo state it in words, let us multiply and divide the right hand side by ¢, and it then reads :—

The rate at which the tenperature falls off per unit increase of volume in adiabatie expansion is equal to the rate at which the pres- sure increases per dynamical unit of heat supplied at constant volume, multiplied by the absolute temperature.

To obtain a similar result with v and ¢ as independent variables, we have only to subtract from both sides of (1) the complete differential d (tp), so that

aK -tp)= — pdt —-pdv. Proceeding exactly as before, we find

(2)

dv dt }°

In words this result runs (when both sides are multiplied by ¢) :— The rate of increase of pressure with temperature at constant

volume, multiplied by the absolute temperature, ts equal to the rate

at which heat must be supplicd per unit increase of volume to keep

the temperature constant. Very slight variations of the process just given obtain the follow-

ing varietics of expression :— (i)~(&p) 4 (Gr)—G) dp dp dt dp)’ which are to be interpreted as above.

11. Increase of Total Energy under various Conditions.—The expression (1) of § 10 may be put in various forms, each convenient for some special purpose. We give onc example, as sufficiently showing the processes employed. Thus, suppose we wish to find how the energy of the working substance varies with its volume when the temperature is kept constant, we must express dE in terms of dv and di. Thus

. an=(52)at+e($F \dv— pao.

But we have, by § 10, under present conditions

dh\ (dp Hence ()-(Z)-».

a result assumed in a previous article (RADIATION, vol. xx. p. 217). If the working substance have the property (that of the so-called “ideal” perfect gas) po= Rt,

PAY

(7)=9

The energy of (unit mass of) such a substance thus depends upon its temperature alone.

12. Specific Heat of a Fluid.—Specific heat in its most general acceptation is the heat required, under some given condition, to raise the temperature of unit mass by one degree. Thus it is the heat taken in while the working substance passes, by some assigned path, from one isothermal ¢ to another ¢+1; and this may, of course, have as many values as there are possible paths. Usually, however, but two of these paths are spoken of, and these are taken parallel respectively to the coordinate axes in Watt's diagram, so that we speak of the specific heat at constant volume or at con- stant pressure. In what follows these will be denoted by ¢ aud & respectively.

Take v and p for the independent variables, as in the diagram, and let « be the specific heat corresponding to the condition

J (v, p)=const.

we see that, for it,"

mtderttl doe ede \y Then nit —tap—t(5 do+ Shap) ; ; af of while 0= qe t ane dt dt and mat ae * i ee *,dvdp* dpdv Thus lin df dt df dvdp dpdv

This expression vanishes iff and ¢ vary together, %.¢., in adiabatic expansion, and becomes infinite if f and ¢ vary together, 7.¢., in isothermal expansion ; as might easily have been foreseen. Other- wise it has a finite value. It is usual, however, to choose v and ¢ as independent variables, while we deal analytically (as distin- guished from diagrammatically) with the subject. From this point of view we have

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wag OE OO

But the last term on the right is, by definition, edt; so that (x o)dt=1SP dv

with the condition

af | et men: es do af laf Thus k-— C= — eee '

which is a perfectly general expression. As the most important case, let f represent the pressure, then we see, by § 10, that

dp dp

dv at’ and the formula becomes

k-c= -«(2 ; ap dt dv

13. Properties of an Ideal Substance which follows the Laws of Boyle and Charles.—Closely approximate ideas of the thermal behaviour of a gas such as air, at ordinary temperatures and pres- sures, may be obtained by assuming the relation

pv=Rt, which expresses the laws of Boyle and Charles. formula of last section, we have at once

2

7/5-R, vj e a relation given originally by Carnot.

Hence, in such a substance,

dgpact b-9@ ’ or $-b)=clogt(k-c)logv. In terms of volume and pressure, this is $- do=clog p/R+klogv, or pote Reb-¥0Nle, the equation of the adiabatics on Watt’s diagram. This is (for @ constant) the relation between p and v in the pro-

pagation of sound. It follows from the theory of wave-motion (HyDROMECHANICS) that the speed of sound is

a/ Eke, Cc

where ¢is the temperature of the undisturbed air. This expres- sion gives, by comparison with the observed speed of sound, a very accurate determination of the ratio &/cin terms of R. The value of R is easily obtained by experiment, and we have just seen that it is equal to k—c; so that & and ¢ can be found for air with great accuracy by this process,—a most remarkable instance of the indirect measurement of a quantity © whose direct determination presents very formidable difficulties.

14. Effect of Pressure on the Melting or Boiling Point of a Sub- stance.—By the second of the thermodynamic relations in § 10,

above, we have #- ag di} \dv/’

d ap— (FP)ae + (FE)av— (5 Jae + (2 oo.

But, if the fraction ¢ of the working snbstauce be in one molecular state (say liquid) in which Vp) is the volume of unit mass, while the remainder 1 —-e is in a state (solid) where V, is the volume of unit mass, we have obviously

v=eVy+(1-c¢)V,. Let L be the latent heat of the liquid, then

(52) a aa dv} UV,-V,)de XV)-V,)° Also, asin a mixture of the same substance in two different states,

the pressure remains the same while the volume changes at con- stant temperature, we have dp/dv=0, so that finally

51 \Vo= Wp,

Thus, by the

k-c=t

so that

which shows how the temperature is altered by a small change of pressure.

In the case of ice and water, V, is greater than Vj, so the temperature of the freezing-point is lowered by increase of pressure. When the proper numerical values of Vo, V;, and L are introduced, it is found that the freezing point is lowered by about 0°°0074 C. for each additional atmosphere.

When water and steam are in equilibrium, we have Vy much greater than V,, so that the boiling-point (as is well known) is raised by pressure. The same happens, and for the same reason,

%

with the melting point, in the case of bodies which expand in the act of melting, such as beeswax, paraffin, cast-iron, and lava. Such bodies may therefore be kept solid by sufficient pressure, even at temperatures far above their ordinary melting points.

This is, in a slightly altered form, the reasoning of James Thomson, alluded to above as one of the first striking applications of Carnot's methods made after his work was recalled to notice.

15. Hiffect of Pressure on Maxinwwin Density Point of Water.— One of the most singular properties of water at atmospheric pres- sure is that it has its maximum density at 4° C. Another, first pointed out by Canton in 1764, is that its compressibility (per atmosphere) is greater at low than at ordinary temperatures, —being, according to' his measurements, 0°000,049 at 34° F., and only 0'000,044 at 64° F. It is easy to see (though it appears to have been first pointed out by Puschl in 1875) that the second of these properties involves the lowering of the maximum density point by increase of pressure. To calculate the numerical amount of this effect, note that the expansibility, like all other thermal properties, may be expressed as a function of any two of the quantities p, », ¢, ; say in the present case pand?t. Then we have for the expan-

sibility 1 /dv a = 5 (ar) =(a) eset.

Also the compressibility may be expressed as

-3(2 —($) 3)

v\dp) \dp ad

The relation between small simultaneous increments of pressure and temperature, which are such as to leave the expansibility

unchanged, is thus (S) Bt-+ (Se =0 di dp JP:

Now the expansibility is zero at the maximum density point, for which therefore this equation holds. But the equations above

give de a de

()-(i)ne—(4)

(9-0

The volume of water at low temperatures under atmospheric pres-

sure varies approximately as Iles

so that

(¢- 4)? 144,000 °

Thus we have nearly; and from Canton's experi-

de_ 1 dt } 72,000 mental result above stated we gather that (roughly at least)

(3) =- 0-000,005 == = — 0‘000,000,3 ; from which the formula gives – 0°02 C. nearly for the change of the maximum density point due to one additional atmosphere.

Recent investigations, carried out by direct as well as by indirect methods, seem to agree in showing that the true value is somewhat less than this, viz., about —0°°018 C.; so that water has its maximum density at 0° C. when subjected to about 223 atmo- spheres. Thus, taking account of the result of § 14 above, we find that the maximum density point coincides with the freezing point at — 2°°8 C. under an additional pressure of about 377 atmospheres, or (say) 2°5 tons weight per square inch.

16. Motivity and Entropy, Dissipation of Energy.—The motivity of the quantity H of heat, in a body at temperature ¢, is

Hit a to)/t ? where t, is the lowest available temperature. The entropy is expressed simply as H/t, being independent of any limit of temperature. If the heat pass, by conduction, to a body of temperature ¢' (less than ¢, but greater than t)), the change of motivity (¢.¢., the dis-

sipation of energy) is al nia ioe 7)

which is, of course Joss; while the corresponding change of entropy

is the gain : el H(F 7) ‘ The numerical values of these quantities differ by the factor to, so that, if we could have a condenser at absolute zero, there could be no dissipation of energy. But we see that Clausius’s statement that the entropy of the universe tends toa maximum is practically merely another way of expressing Thomson’s earlier theory of the dissipation of ellergy. When heat is exchanged among a number of bodies, part of it

being transformed by heat-engines into work, the work obtainable | tures, until Fahrenheit proved that, however much water

(i.e., the motivity) is The work obtained, however, is simply 3(H). Thus the waste, or amount needlessly dissipated, is —t)%(H/t) . This must be essentially a positive quantity, except in the case when perfect engines have been employed in aJ/ the operations. In that case (unless indeed the unattainable condition ¢)—0 were fulfilled) 3(H/t)=0, which is the general expression of reversibility.

17. Works on the Subject.—Carnot’s work has, as we have seen, been reprinted. The scattered papers of Rankine,.Thomson, and Clausius have also been issued in collected forms. So have the experimental papers of Joule. The special treatises on T’hermo- dynamics are very numerous ; but that of Clerk-Maxwell (Theory of Heat), though in some respects rather formidable to a beginner, is as yet far superior to any of its rivals. (2”G.IL)

THERMOELECTRICITY. See Etxcrricity, vol. viii. pp. 94 sg.

THERMOMETER, an instrument for detecting and measuring differences in temperature. The name is usu- ally restricted to instruments adapted for use at moderate temperatures; those for measuring high temperatures are termed pyrometers (see PyRoMETER). Thermometry has been treated

theoretically under Hzat (see vol. xi. p. 558 sq.). It here remains to trace the history of ther- mometers, and to describe the principal forms in use.

History.—The honour of inventing the thermometer has been given to several natural philosophers of the 16th century; the claims of Robert Fludd are more tangible than those of Drebbel and Santorio, but the instrument invented by Galileo before 1597 seems best entitled to be considered the precursor of accurate thermometers. All the early instruments were air thermoscopes, and, until the variations of atmospheric pressure were discovered, their use was only deceptive. Galileo's thermometer (fig. 1) consisted of a glass bulb containing air, terminating below in a long glass tube which dipped into a vessel containing a coloured fluid. The variations of volume of the enclosed air caused the fluid to fall or rise in the tube, to which an arbitrary scale was attached. The great step in advance of inventing the alcohol thermometer is also due to Galileo, but the date (probably 1611 or 1612) is not precisely known. Rinieri

Fig. 1. certainly had alcohol thermometers made before 1647, and they are referred to as familiarly known in the

oldest memoirs of the Accademia del Cimento (1667). In form they resembled those now in use ; they had large spherical (or, occasionally, cylindrical or helical) bulbs, and the degrees in- tended to represent thousandths of the volume of the reservoir were marked with beads of enamel fused on to the stem (fig. 2). All the Florentine instruments were graduated in the same way, but the scale was arbitrary, and the recorded readings were accordingly supposed for a long time to be useless. In 1829 the fortunate discovery by Antinori of a number of those early Florentine thermometers enabled their scale to be ascer- tained and translated into known degrees. The temperature of melting ice was marked by them as 13°5, while 50 corresponded with 55°C. No

means of comparing observations made by ther-

mometers of different manufacture existed until

certain fixed points of universal accessibility were ~ —4 discovered. The thermal coriditions of freezing Fig. 2.

could be cooled down without freezing, the temperature when ice began to form was always the same. Hooke, in 1665 (Micrographia, p. 38), describes the manufacture and graduation of comparable spirit thermometers with the freezing point of water as the zero of their scales, and he evidently recognized it as fixed. Halley in 1693 stated that the temperature of boiling water is constant, and this was again proved by Amoutons in 1702. In 1694 Renaldeni of Padua proposed to graduate thermometers by taking as standards of temperature mixtures of definite volumes of ice-cold and boiling water. This method, although theoretically admirable (see Heat, vol. xi. p. 559), is defective in practice. Seven years later Newton proposed anonymously (Phil. Trans., 1701, vol. xxii. p. 824) a thermometer scale on which the temperature of freezing water was 0°, and that of the blood of a healthy man 12°. Continuing the graduation of a linseed-oil thermometer above this point, he found that water boiled at 34°. Fahrenheit in 1714 took as fixed points the temperature of the human body and that of a mixture of ice and sal ammoniac or common salt. In 1721 he made a mercury thermometer according to Halley's suggestion of 1693, and by means of it he proved the dependence of the boiling point on pressure. It was not until after Fahrenheit's death that the freezing and boiling points of water were universally accepted as fixed points on the thermometric scale. The thermometer has remained un- changed in its main features since the middle of the 18th century. Mercury has been found the most convenient fluid for ordinary use, in spite of the advantages (HEat, vol. xi. p. 561 sq.) presented by lighter and more volatile liquids. Graduation of thermometers, by marking off volumes of the stem equal to a given fraction of the capacity of the bulb, although reintroduced by Réaumur in 1730, has now been entirely discontinued.

The idea of a self-registering thermometer early pre- sented itself. Many forms were devised by natural philo- sophers and instrument-makers. That of Sixe, in 1782, a precursor of which, dating from the 17th century, is preserved amongst the instruments of the Florentine Academy, was the most successful.

Scales.—The absolute zero of temperature is the logical beginning of a thermometric scale, but some point easy of reference is desirable, and this is found in the tempera- ture at which ice melts and water freezes. The second

accepted fixed point is that at which distilled water boils under the pressure of 760 millimetres (29-92 in.) of mer- cury. For the division of the space between the two fixed points into degrees of convenient length only three of the innumerable methods proposed have survived, and one of these, the centigrade, is rapidly becoming universal. The oldest system, that of Fahrenheit, dates from 1724. It is used for meteorological purposes, and popularly, in Great Britain, the British colonies, and the United States. The freezing point is marked 32° and the boiling point of water 212°. At first Fahrenheit employed a scale of 180 degrees ; the zero was placed at "temperate" (9° C.); 90° at " blood-heat," the point to which the alcohol rose when the thermometer was placed under the arm of a healthy man; and ~ 90° at the temperature of a mixture of ice and salt, then believed to be the greatest possible cold. In 1714 Fahrenheit changed his scale at the suggestion of the Danish astronomer Roemer, placed 0° at his "absolute zero," and divided the space between that and the warmth of the human body into 24 degrees. The freezing point of water thus became 8°. For convenience, these long degrees were divided into quarters, which were afterwards

water were studied with great care, but natural congelation | termed degrees ; thus the freezing point became 32° and

was generally supposed to take place at variable tempera- | blood heat 96°.

A mercury thermometer graduated in

this way, with divisions of equal length continued above blood heat, registered 212° in boiling water. Thus the Fahrenheit scale came from a duodecimal reckoning.

De Lisle, in 1724, introduced a scale in which the boiling point of water was marked 0° and the temperature of the cellars of the Paris Observatory 100°. He after- wards adopted the freezing point of water as his upper fixed point, and called it 150°. This scale was used for many years in Russia, but is now obsolete.

In 1730 Réaumur made alcohol thermometers with their zero at the freezing point of water, and degrees of one- thousandth of the volume of the bulb. On some of these the boiling point of water was 80°; but the instruments were defective in principle and very unequal in their indications. Deluc introduced mercury thermometers graduated from 0° in melting ice to 80° in boiling water, and these, with Réaumur's name attached, are in use for popular purposes in Germany, Holland, and other parts of the Continent.

Celsius adopted a centesimal scale in 1742. The boiling point was marked 0° and the freezing point of water 100°. Linnzeus introduced the mode of reckoning from 0° in melting ice to 100° in boiling water, which is now known as the centigrade, and is used universally in laboratories, and in all except English-speaking countries for every scientific purpose.

Fahrenheit's scale is convenient for meteorological work on account of its short degrees, admitting of great accuracy in reading and compactness in recording, and on account of its low zero, which makes it possible in temperate climates to dispense with negative quantities. On the other hand, the centigrade scale is on the whole so con- venient, its use is so nearly universal, and the advantage of a uniform system is so great that it must ultimately be adopted for all purposes.!

Arm THERMOMETER.—Under constant pressure gases expand equally for equal increments of heat. Hencc, when an air thermo- meter is graduated between two fixed points the graduation may be continued above and below these points in degrees of the same length ; and any number of air thermometers so made will agree amongst themselves at every temperature. The principle of air thermometers is treated of in Huar (ut sup.), and examples of special forms are described in that article and in PYROMETER. The air thermometer is the ultimate standard of reference to which all other thermometers are referred.

AtcoHoL THERMOMETER.—Alcohol, the first liquid used for thermometric purposes, possesses numerous advantages, and on account of its low freezing point it is always used for observations in polar regions. Alcohol thermometers are graduated by fixing the freezing point in melting ice and by comparison with a mer- cury or air thermometer at several higher and lower temperatures. Recently low-temperature thermometers have been

verified at Kew in melting mercury at the temperature of —40. The law of expan- sion of alcohol in glass at low temperatures is not known with such precision as to make the minimum indications of Arctic expedi- tions entirely trustworthy. The graduation of ordinary minimum alcohol thermometers used for metcorological purposes is effected by comparison with mercury standards, and their indications, so far as this source of uncertainty is concerned, may consequently be relied on.

Mercury 1N Guass THERMOMETER.—The simplest form is the Weight Thermometer, a large glass bulb terminating in a capillary tube, and filled with a known weight of mercury at 0° C. The weight of mercury that escapes when the apparatus is heated to

‘ The process of converting readings of any one of the three existing scales into those of any other is a simple matter of proportion. They

stand in the ratio of 80; 100: 180 (82 being subtracted from Fahren- |

heit temperatures before the calculation is made, and added to the result when converting from Réaumur or centigrade into Fahrenheit). An easy rule for changing centigrade readings into Fahrenheit mentally 1s—multiply the centigrade temperature by 2, subtract one-tenth of the product, and add 32:e ., 10° C.=20-2+382=50° F. These tules are only to be applied to thermometers made with all modern precautions, When the boiling point was determined by immersing the bulb of the thermometer in boiling water or in steam at any pressure other than 760 mm. appropriate corrections have to be applied. For a detailed historical account, see Renou, “ Histoire du Thermométre,” Annuaire Soc. Mét. de France, 1876.

100° is determined, and the temperature of any enclosure is then ascertained by placing in it the thermometer filled at zero, and weighing the liquid that runs out. Thermometers on this principle were used by Regnault in his celebrated researches on steam.

Standard Thermometers.—The tube is sometimes made with elliptical bore to ensure visibility of the mercury column, but it is usually circular in

section. The internal diameter must be as nearly as possible uniform. This is tested by a preliminary calibration in which a short thread of mercury is measured in different parts of the tube. The length of stem and the range of the thermometer having been decided upon, the size of the bulb is calculated from the known expansibility of mercury and the section of the bore. The bulb is made as nearly as possible the required size, either by blowing it from a tubc or preferably by forming it of a glass cylinder, and attached to the stem. The bulb is usually cylindrical in form and it must be uniform in thickness. The utmost care requires to be exercised to keep the bulb and stem dry and clean and to fill them with pure mercury recently distilled. The mercury is boiled in the thermometer for some time to drive out all traces of air and moisture, and the point of the stem is sealed off. If the thermometer is not intended to measure tem- peratures up to the boiling point of mercury, an expansion should be made at the top of the tube to prevent bursting from accidental overheating. Under Hzrar (vol. xi. p. 561) the changes of volume which thermometer bulbs undergo in cooling and for a long time afterwards are discussed. The process of annealing by heating to a temperature excecding 400° C. for some hours as originally pro- posed by Person,? or in vapour of mercury for several days as recently practised at Kew, renders the thermometer much less liable to suffer change of zero by the lapse of time or by heating to any lower temperature. All instruments of precision should be treated in this way, or kept for several years after they have been filled and sealed before they are graduated.

The first fixed point on the scale is marked at the place whcre the mercury stands when the thermometer is buried in melting ice from which the water is allowed to drain away, the second at the place where the mercury stands when the thermometer is immersed in steam of water boiling freely under the pressure of 760 mm. (29°92 inches) of mercury corrected to 0°C. The space between these may be graduated either in arbitrary equidistant divisions, as it is best to do in delicate instruments, or in degrees of any scale. Each degree centigrade is y4y of the volume of the tube between the freezing and boiling points; if the tube is quite uniform in bore the degrees will be of equal length and may be marked off correctly by a dividing engine. If the preliminary calibration showed the tube to vary in diameter, the degree marks are often adjusted to correspond to intervals of equal volume. It is better in all cases, whether degrees or arbitrary divisions are

adopted, to have them of equal length and correct the readings by the calibration curve. The scale may be continued above and beneath the fixed points in degrees or divisions of the same length.

Calibration consists in measuring the internal volume of the thermometer tube by means of a thread of mercury detached from the main column. There are several ways of doing this, for parti- culars of which reference may be made to the British Association Report on the subject (1882, pp. 145-204), where references to original memoirs,are given. The best and simplest is Gay Lussac's "step by step " method.

The most recent and approved processes of manufacturing, testing, and using standard thermometers of great delicacy and high pre- cision are described by Guillaume in his "Etudes Thermométriques" (Travaux et Mémoires du Bureau International des Poids et Mesures, y., 1886) ;3 for additional information the work of Pickering cited below may also be consulted.

Comparison of Thermometers.—As the apparent expansion of mercury in glass from -39° to 100° C.* is very nearly proportional to the amount of heat imparted to it, a thermometer made and divided as indicated above is anatural standard. Butthe apparent expansion with different kinds of glass differs (see HEAt, vol. xi. pp. 568-4), and, except at the fixed points or near them, mercury thermometers of different construction will only fortuitously agree absolutely among themselves or with the air thermometer. Bosscha® states that at 50° C. the mercury thermometer shows an error of 0°°5, other experimenters place it as high as 1°, but Mascart found it to amount only to 0°06."7. For purposes of ordi- nary experiment thermometers are compared at several tempera- tures with some standard instrument of known value—that of the Kew observatory for Great Britain,—and all results are stated in terms of the standard. The methods of comparison at Kew are

2 Comptes Rendus, xix., 1844, p. 1314.

3 Abstract by Guillaume in the Séances de la Soc. Francaise de Physique, 1886, p. 219.

4 Ayrton and Perry, Phil. Mag. [5], xxii. 1886, p. 325.

5 See also Kraffts, Comptes Rendus, xcv. 836.

§ Comptes Rendus, lxix. 875. See Note by Regnault, idid., 879.

7 Berthelot, Mécanique Chémique, i. 158.

described by Welsh (Proc. R. S., vi. 181) and Whipple (Phil. Mag., [5], xxi., 1886, p. 27).

The reading of thermometers is greatly facilitated by the process of enamelling the back, and still more by that of entirely surround- ing the instrument with enamel except over a narrow strip through which the mercury is seen.1 The enamel must not be allowed to encroach og the bulb, for that would endanger the homogeneity and strength of the glass.

THERMOMETERS EMPLOYED FOR SPECIAL Purposes. —Physical and Chemical Work.—For all purposes of minute accuracy where thermometers are applicable standard instruments must be em- ployed. They must be used in one position only. The stem 1s usually engraved with an arbitrary seale of equal divisions, the total range not exceeding 15° C., and readings are made by a cathetometer at some distance. ‘The use of an intermediate bulb, first recommended by Person, enables the fixed points to be observed on instruments of. very short range. Results of great accuracy, certainly to 0°‘005 C., may be obtained in this way for comparative purposes if suflicient care be taken ; but the greater the sensitiveness of a thermometer the more difficult is it to obtain a series of concordant readings (HEat, vol. xi. p. 562). Pickering? uses thermometers of extreme sensitiveness, in which, by conveying the excess of mercury into an expansion at the top of the stem, he secures that the same part of the short arbitrary scale is used for every temperature that has to be measured. In physical researchies thermoelectric junctions are more often used than thermometers for measuring very small differences of temperature.

For ordinary work in a chemical or ae laboratory thermo- ineters are used which can be read easily to one-tenth of a degree centigrade, and have a range from 0° to 100°, or in some cases to 350°C, They are always either engraved on the stem or graduated on an included scale (see Huar, figs. 4, 5), and are not mounted on frames of any kind. It is not necessary to calibrate such thermo- meters ; but they should be compared with a standard at several temperatures and frequently verified in melting ice and steam of boiling water.

Zincke's chemical thermometer for high temperature has a scale commencing at 100° C. In Geissler's nitrogen thermometer the range is extended by raising the boiling point of the included mer- cury, the upper part of the tube being filled with rarefied nitrogen.

Meteorological.—The thermometer was early applied to the study of differences of climate, and this is still one of its most important uses. The wet and dry bulb thermometers placed in the shade give the temperature and humidity (see HyGrometry) of the surrounding air, but "shade" and "surrounding air" require to be defined. Shade is intended to exclude rain and prevent all radiation; and the surroundiug air is that of the atmosphere in the neighbourhood of the thermometer outside any shelter that may be used. The simplest way of observing is to hang up a thermometer in the shadow of some rather distant object and leave it until it acquires a steady temperature ; but this method has been found impracticable and does not give very exact results.

In different countries different patterns of thermometer shelter are employed and exposure takes place at a different height above the ground, Results so obtained cannot be critically compared, and the relative mean temperatures of the atmosphere in different countries are only known to within one or two degrees. The Stevenson double-louvred screen (see vol. xvi. p. 115), a box open below, provided with a solid roof, is used at all meteorological stations in Great Britain. It is placed 4 feet from the ground, and painted white outside and inside. The results derived from its use are comparable, because the conditions in which it is em- ployed are the same, but the general introduction of a double roof would greatly add to its efficiency. Exposure outside windows or in wall boxes is the rule in Austria. In France

the Renou screen is largely used; it is a flat roof one square metre in extent, and double; the thermometers are hung under it two metres from the ground, A similar roof, but of much larger size, is employed in Australia, in combination with a metal thermometer-box. A metallic box, constructed of double louvres with an air-space between, finds favour in Spain. In Russia and Switzerland Wild's shelter is extensively employed. The thermometers are enclosed in a case composed of two or three concentric zinc cylinders per- forated to admit air, and placed 11 feet above the ground. They are protected by a large shelter of wood, the south wall and roof of which are double and made of solid boards, between which air circulates; the east and west sides are louvred, and the north side entirely open. A similar shelter is used in Canada, to cover a box of single sheet-iron louvres in which the thermometers are placed 4% feet from the ground. Various systems of exposure were authorized in the United States until 1885. It was then decided, as the result of experiments * carried on for nearly two years, that a uniform pattern of shelter be adopted by the Signal Service. It

1 Whipple, Brit, Assoc, Reports, 1885, p. 937.

2 Phil. Mag., (5), xxi, 1886, p. 831; xxiii., 1887, pp. 401, 406.

hs age "Thermometer Exposure," Prof, Papers of Signal Service, No. xviii., é

radiation. Some form of sling ther- mometer should always be used for

THERMOMETER

is a single-louvred wooden box, 8 fect 6 inches long, 8 feet wide and high, with a movable bottom and a double roof. are provided with an upright flange on their inner side, designed to keep rain from the thermometers. to be fixed either 9 feet above a roof or 16 feet above grass.

The louvres The bottom of the shelter is

All these screens are confessedly imperfect, although most of

them are well adapted for the climates in which they are used, Numerous comparisons of different screens with each other have been made,* but in some cases sufficient precautions in the way of using instruments precisely similar and only dissimilarly situated have not been observed, and the results are uncertain. comparison of the leading forms of thermometer shelter in use is still a desideratum.

A critical

The sling thermometer® (thermometre Jronde), a small thermo-

meter whirled in the air at the end of a string, is often used as a standard, and gives more correct readings than most closed screens. devised a series of thermometer boxes on a new principle, radiation being taken advantage of to produce a constant draught over the thermometer bulbs by the use of along blackened chimney. These give admirable results. Very small and bright objects are little affected by radiation: hence thermometers with bulbs of small diameter and coated with a bright deposit of gold or silver have been used with- out screens. has also been calculated by means of a formula from the readings of two similar thermometers, the bulbs

All open screens are untrustworthy. Aitken® has

The air temperature

of which are unequally affected by

observations at sea; the Board of Trade screen generally employed is thoroughly objectionable, and can only give moderately good results by the exercise of great precautions on the part of the observer.”

As a rule, thermometers for meteorological purposes are made with spherical bulbs, although

[ZA

. . . o— am cylindrical reservoirs present cer- URS tain advantages. To ensure per- -_

fect uniformity in registration, the bulbs should all be as nearly as possible of one size, constructed of one kind of glass, and the mount- ing perfectly uniform. Better-class instruments have the bulb clear of the frame, and the stem attached to a slab of metal, of porcelain, Fig. 3.—Aitken's Thermometer Screen or of glass backed by wood; but ioe Waxtrance Theeaeeee sometimes they are simply fixed to a boxwood scale. In all cases they should be graduated on the stem, and compared with a standard, but in view of the uncertainty of the methods of ther- mometer exposure great delicacy is undesirable.

The influence of height on thermometers for ascertaining the temperature of the air 'has been investigated with somewhat con- flicting results ;® the disparity is at lcast partly due to the use of dissimilar instruments.

Registering Thermometers,—Rutherford's maximum, invented before 1790,° was an ordinary mercury thermometer placed horizon- tally ; the eolumn pushed before it a small steel index, which was left at the highest point reached. It is little used now. The maximum thermometers in common use for meteorological pur- poses are Negretti & Zambra's and Phillips's. The former is a modified outflow thermometer. It is made with a constriction in the tube near the bulb, past which the mercury easily expands, but cannot return when the temperature falls, as the column breaks at the narrowed point when the fluid in the bulb begins to contract. The thermometer acts horizontally, but Everett devised a modification which is hung bulb uppermost, and the mercury, as it passes the constriction, falls down and stands as a column in the inverted tube. The thermometer is set by swinging

MMMM WW

4 Gaster, Quart. Weather Report for 1879 (1882), Appendix ii.; Wild, Mitthetl. der naturforsch. Gesellsch. in Bern, 1860, 108; Marriott, Quart. J. Roy. Met. Soc., 1879, v. 217 ; Stow, 2. 1882, viil, 228; Gill, #., 1882, viii. 238; Mawley, 1b., 1884, x. 1; Aitken, Proc. R. S. E£., 1884, xii. 681; Dickson, %)., 1885, xiii. 199; Hazen, Joc. cit.

5 The first use of this instrument is usually stated to have been by Arago (Guvres, 1858, viii, p. 500), but Saussure employed it for wet-bulb

observations, and doubtless invented it (see Voyages dans les Alpes, 1796, iv. p. 267).

6 Proc. R. S. E., 1884, xii. 660; 1885, xiii. 199; 1886, xiii, 632.

7 Caborne, Quart. J. Roy Met. Soc., 1881, vii. 10.

8 Hazen, Joc. cit.; Wild and Cantoni in Report of Vienna Meteorological Con- ference, 1874; Symons, Proc. &. S., 1883, xxxv. 310; Omond, Proc. R. 8. £., 1886-87, 9 Trans. R. S. E., iii., 1794, p. 247.

it. Phillips's maximum, claimed also by Walferdin, has a por- tion-of the mercury thread separated from the rest by a minute bubble of air. It is placed horizontally, and, as temperature increases, the detached portion of mercury is pushed forward and ig not withdrawn when the main column retreats toward the bulb on cooling. It is set for a new observation by bringing it into a vertical position and tapping it slightly. By reducing the length of the index and the bore of the stem this thermometer may be made suitable for use in any position without altering its register. Walferdin's outflow maximum thermometer is a modification of that of Lord Charles Cavendish! and the type of a number of similar instruments. It is set by filling the stem entirely with mereury from a lateral chamber at the top (fig. 4). The instrument is placed vertically, and as temperature rises mercury overflows into the rescrvoir. To be read, the thermometer is brought back to its original tempera- ture, then the number of degree spaces left vacant at the top of the tube shows the excess of maximum tempera- ‘ ture above that at the time of setting.

The minimum thermometer in most frequent use is that of John Rutherford, invented in 1790. It is a spirit thermometer, preferably filled with amyl alcohol to reduce risk of distillation, in the column of which a small poree- lain index is included. The instrument is hung hori- zontally, and, as temperature falls, the index is drawn back by the surface tension of the fluid. When tempera- ture rises, the liquid flows past the index easily, leaving it at the lowest point attained. Baudin invented a modification called the thermometre & marteau in 1862; it acts vertically, the index being

fixed by a spring, as in Sixe's thermometer, and set by a long glass needle included in the stem, which, when the instrument is inverted, falls on the index and drives it to the surface of the alcohol. The mercurial minimum of Casella is an instrument of great delicacy and beauty, extremely difficult to make, and requir- ing careful handling in its 3 use. A side tube of wide = bore ae (fig. 5) is joined to the stem of an ordi- nary mercurial thermo- £ meter near the bulb. This tube terminates in a small chamber a}, cut off by a perpendicular glass diaphragm which is perforated by a hole of greater diameter than the thermometer stem. When set, the mercury in the stem indicates the actual temperature, and the chamber is empty. On the principle of Balfour Stewart's fluctua- tion thermometer,? when the instrument is heated the mercury remains stationary in the stem but expands into the chamber ad, When cooled, the mercury passes out of the chamber; when this is empty, the temperature has returned to that at which the instru- ment was set, the surface attraction of glass and mercury prevents the fluid leaving the diaphragm 3, and all subsequent contraction takes place from the stem. The position of the mercury column in the stem marks the minimum temperature since last setting. The instrument is set by raising the bulb end and allowing all the mercury to flow from the chamber.

Thermometers which record the actual temperature at any required time, by a change of position produced by a clock, were employed by Blackadder® in 1826. His process was complicated and uncertain. Negretti & Zambra have a simpler arrangement that works well. Several of their reversing thermometers (see under Deep-Sea Thermometers) are pivoted on a frame, and held upright by catches whieh are withdrawn in turn at definite intervals by an electrical arrangement regulated by a elock. Each instru- ment, when it reverses, preserves the record of temperature at that moment until it is set again.

No thoroughly satisfactory self-registering maximum or minimum thermometer has yet been produced. In all existing forms the indications are liable to be disturbed by shaking. Where alcohol is the fluid used, it is apt to volatilize and accumulate at the top of the tube, so registering a much lower temperature than actually occurs. It is extremely difficult also to free alcohol thermometers from air, which gradually escapes from solution in the fluid and renders the instrument untrustworthy or even useless.

Radiation Thermometers.—The intensity of solar radiation is measured by the pyrheliometer, which usually consists of a body heated by the sun's rays and a thermometer to measure the rise of temperature. In meteorology radiation is measured by thermo- meters simply exposed with blackened bulbs. Results of the utmost diversity are given by different methods. As thero is no means of determining the true measure of radiation, all that can be done is to have the instruments whose indications are to be compared constructed and exposed in the same way. The usual

1 Phil. Trans., i., 1757, p. 300. Henry Cavendish's register thermometer is on another principle and a much less practical Instrument (see Wilson's Life of

Cavendish, p. 477). Proc, R. S., viii 195. 3 Trans. R. S. E., 1826, x. 8387, 440.

form, as suggested by Herschel, is a maximum thermometer with a spherieal bulb half an ineh in diameter eoated with lamp- blaek and placed in the centre of a spherical vessel of clear glass, 24 inches in diameter, and exhausted of air. The state of the vacuum may be shown by including a small mereurial manometer, or a radiometer, or by soldering in platinum electrodes through which a discharge can be made in the interior. It is not essential that the vacuum be very perfect; some observers prefer to employ a globe filled with dry air. For separate instruments to be com- parable, Whipple 4 and Ferrel ® have shown that the bulbs must be truly spherical, of equal thickness and size (a difference of 8 per cent. in diameter produces variations of several degrees), blackened sufficiently to absorb all radiation falling on them, and placed accu- rately in the centre of perfectly spherical enelosures, which must also be of equal diameter. The stem should be as small as possible in proportion to the bulb; and before being used for comparative purposes all radiation thermometers should be compared with an arbitrary standard by daily exposure for several weeks to sunshine. Minimum radiation thermometers, intended to measure radiation from the earth at night, are usually filled with alcohol, and much ingenuity has been expended on inereasing their delicacy. The bulbs are made very large relatively to the bore, and constructed so as to expose a great surface, the

reservoir being often helical, lenticular, annular, spoon-shaped, forked, or even like a gridiron. Earth Thermometers. Saussure introduced the use of sluggish thermometers packed in non-conducting material for taking the temperature of the soil at different depths. Symon's earth thermo- meter on this principle is a slow-action instrument cased in felt, and is lowered by a chain into an iron tube which has previously been sunk to the required depth. It may be withdrawn and read with- out changing its record. The underground temperature committee of the British Association have used both slow-action and selé-negia- tering thermometers for their observations in mines and shafts. Thermometers with very long stems, which can be read above ground, fitted in deep borings in the rock, are used at the observa- tories of Greenwich and Edinburgh for investigating earth tem- perature. Those at present established at the Royal Observatory, Edinburgh,' are the successors of a sct fixed in the rock in 1837, and broken aecidentally in 1876. They are placed with their bulbs at depths of 25, 12, 6, 3 feet beneath the surface respectively, and one has its bulb just covered. 'The readings of the intermediate thermometers supply data for correcting the long columns of alcohol in the deeper ones for the different temperatures of their different parts. Allowance may be made for this effect without calculation by utilizing the principle applied by Sainte-Claire Deville to pyrometers. A second stem, similar in every way to that of the thermometer, nearly filled with the same fluid, but hermetically sealed at the lower end, is fixed beside the thermo- meter stem. The fluctuations it shows are due solely to causes affecting the stem and not the bulb of the thermometer, and they are eliminated from the readings of the latter by taking account only of the difference of level of the fluid in the two tubes. { Deep-Sea Thermometers. —The earliest ob- } servations of warmth beneath the surface were made by raising samples of water in a valved box and noting the temperature when it was brought on board. Saussure, in addi- tion to this, used sluggish thermometers, which he left immersed for several hours before reading. His latest thermometer for sca-work was filled with alcohol, and had a bulb more than an inch in diameter, which was imbedded in a mass of wax and enclosed in a stout wooden case. It attained the tem- perature of its surroundings very slowly, pre- served it for a long time, and gave, in his hands, thoroughly trustworthy results. On the introduction of registering thermometers these were used, but the unsuspected magni- tude of the effect of pressure at great depths made the earlier records entirely

misleading. A modification of Sixe’s thermometer, pro- tected from pressure by the addition of an outer bulb partially filled with a liquid, is now usually employed on deep-sea expeditions. Those used on the “Challenger,” under the name of Miller-Casella thermometers, were of the form shown in fig. 6. The tube is U-shaped, the bend and part of each limb filled with mercury, the rest of the tube, the bulb, and part of the expansion on the other side with alcohol. A steel index, held in its place by the pressure of a hair, is immersed

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Fic. 6.—Miller-Casella Thermometer,

4 Quart. J. R. Met. Soc., 1879, v. 142; 1884, x. 45.

5 Signal Service Prof. Papers, No. xiii., 1884, p. 34.

6 For a résumé of the methods and work of the committee, see Brit. Assoc. Reports, 1882, p. 74.

7 Trans. R. S. E., 1880, xxix. p. 687,

in the spirit m each limb above the mercury, which pushes one or other before it as the temperature is rising or falling, and leaves them at points denoting the highest and lowest tempera- tures passed through. The indexes are set by a magnet. The ‘‘Challenger” thermometers, which were not graduated on the stems, were secured side by side with porcelain temperature scales to vulcanite frames and placed in copper cases perforated to allow a circulation of water. Tait investigated the whole subject of pres- sure corrections after the return of the expedition, and found that the high result obtained by a previous experimenter was due mainly to heat developed by compression of the vulcanite, which affected the thermometer in the press, but would not do so at sea, The eorrection which had to be applied was rather less than } of a degree Fahr. per mile of depth.! These thermometers require to be immersed from twenty minutes to half an hour before they acquire the temperature of the water, they can only be read

to quarter degrees Fahr., and they simply indicate the extreme tem- peratures through which they have passed. Buchanan has greatly improved the instrument by reducing the bore of the tube on the minimum side, which is that most frequently used, thus giving long degrees. An arbitrary scale is engraved on the stem.* His mereury piezometer is affected by temperature and by pressure, and enables the actual temperature at any known depth to be found. Aimé in 18453 invented a very ingenious arrangement of outflow thermometers, which were inverted by a weight slipping down the line, and registered as they were being drawn up. His instru- ments were aceurate, but very delicate and troublesome / to manage, Within the last few years Negretti and Zambra have patented several forms of modified out- flow thermometers. The first instrument of the kind was complicated and unmanageable, but that now before the public is both simple and convenient. It consists of a mercury thermometer with a cylindrical bulb and a stem AC (fig. 7) of wide bore terminating inasmall pyriform aneurism. The stem is contracted and contorted just above the bulb, and when the in- strument is turned upside down the mercury column breaks at this point and flows down into the tube, which is graduated in the inverted position. To pro- tect it from pressure the thermometer is hermeti- cally sealed in a strong glass tube, the portion of whieh surrounding the bulb contains a quantity of mercury secured by a ring of india-rubber cement. When the thermometer is made to turn over at any depth in water of any temperature, the record remains nearly unaltered, and, until set for a new observa- tion, enables the actual temperature at the instant of reversal to be ascertained at any subsequent time and in any other place. The detached column stand- ing in the tube changes its length slightly by change of temperature. A series of experiments with twelve instruments has shown that for 60° F. change of tem- perature there is a difference of one degree in the reading of the inverted thermometer. Hence a cor- rection must be applied in all cases where the tem- perature at which the thermometer is read differs more than a few degrees from that at which it was inverted, contrary to the opinion of the German observers.4 If a thermometer is inverted in water and read while wet, the temperature by which it should be corrected

is obviously that given by the wet-bulb in air. In ae a a view of the great range of temperature experienced in Fatny deep-sea work in the tropics, the

size of the little Deep-Sea

overflow cell B, which prevents mercury from the bulb Thermometer from entering the tube must be considerably increased Mianeees)s before the thermometer can be used with safety for such purposes. The Negretti and Zambra thermometer acquires the temperature of its surroundings very rapidly (two or three minutes are usually sufficient); it can be read easily to tenths of a degree Fahr.; and, above all, it ascertains temperature at exact points of depth, and has thus revealed layers of remarkably varying temperature > which could not have been detected by the other instruments in use.

The loaded wooden frame originally employed for reversing the thermometer is unsatisfactory, and Magnaghi's reversing gear aetuated by the revolution of a small propeller set in motion by the water when the thermometer is drawn up briskly, is not to be trusted in shallow water or where there are rapid currents. When the pin is withdrawn the thermometer case turns over and is elamped by a side-spring on the frame. Rung® adopted a simpler and better though somewhat clumsy frame, in which the thermometer was made to turn by slipping a weight down the line.

1 " Challenger" Narrative, ii., App. I., 1882.

2 For a general account of dcep-sea thermometers, see Buchanan, Proc. R. S. £., Xx. 1878, 77; and " Chal.' Reports, Narrative, vol. i., 1884, p. 84.

3 Ann. Chim. Phys., [8], 1845, xv. 1.

4 Ergebnisse der Untersuchungensfahrt der Drache, Berlin, 1886, p. 2.

5 Mill, Jour. Scot. Met. Soc. [3], 1886, No. iii. p. 289.

6 Den Tekniske Forenings Tidskrift, 1883.

THERMOMETER

The United States Fish Commission? employ the thermometer in a frame adapted for use on a wire sounding line, and also actuated by a messenger,

but the thermometer is not clamped on turning over. The Scottish marine station produced® a modification of Magnaghi's frame, the propeller being replaced by a forked lever held down by a spiral spring and raised when the thermometer is to be reversed by the impact of a Rung's messenger (fig. 8). A messenger placed on the line below, and hung by a loop to the upper groove of the thermometer, is let go when the thermometer turns and reverses another instrument lower down. Instead of being lashed to the sounding line, the frame is retained by a ram's horn spiral below and clamped byasmallvice 4

at the upper end. Buchanan has modified and simplified the frame, combining its mode of attachment to the line with the American method of reversing.

Neumayer? has attempted to use a photo- graphic thermograph for deep-sea work, the light being supplied by a Geissler tube excited by a small battery. Siemens's electrical ther- mometer has also been experimented with,'° but has hardly been brought to a practicable state, and the same may be said for the use of thermoelectric junctions.

Hypsometer.—The boiling-point thermome- ter or hypsometer may be used to obtain an independent measure of the pressure of the atmosphere, and so to determine an altitude or verify an aneroid barometer. It consists of a very delicate mercury thermometer gradu- ated only for 20 or 25 degrees Fahr. in the neighbourhood of the boiling point of water and divided on the stem into tenths. A large aneurism on the tube a little above the bulb should allow the freezing point to be verified from time to time on the portion of stem beneath it. The thermometer is hung in a cylindrical tin vessel in which water is boiled by a spirit lamp placed underneath. The bulb must be raised considerably above the level of the water, and the whole stem to the top of the mercury column immersed in the steam. After steam has been escaping freely for some time the temperature is read, and by reference to a table the barometric pressure, and consequently the altitude, is obtained.

Clinical Thermometers.—The first use to which thermometers were applied was the study of the temperature of the blood in fevers ; and the constancy of the temperature of the healthy human body was for a century considered sufficient to entitle it to the posi- tion of a fixed point in graduating

thermome- ters. The increased importance now attached to temperature in disease has led to the pro- duction of many forms of clinical thermo- meter. The large instruments intended to be read in sitw are now entirely superseded by small maximum self-registering thermometers. Graduation is carried to one-tifth of a degree, and the usual range is about 25 degrees Fahr., —from 85° or 90° to 110° or 115°. Olive-shaped bulbs have been used, but a cylindrical form is most common. There should be an arrangement like that suggested for hypso- meters to enable the freezing point to be verified. Casella's thermo- meter on Phillips's system has a small cxpansion on the stem, followed by a contraction, to prevent the index following the rest of the mercury into the bulb when the instrument is not in use. The ''half-minute thermometer" is quick in action ; it has a bulb of very sinall diameter and an extremely fine bore, the mercury thread being rendered visible by Hicks's arrangement of a lens- fronted stem. Immisch's avitreous thermometer is recommended for clinical use on account of its small sizc, convenient shape, and non-liability to get out of order.

Thermometers for Technical Purposes.—These are made in an infinite variety of forms, adapted to the various processes of manu- facture and industry. The scale is often dispensed with in these instruments, a movable pointer being fixed at the point at which the mercury is to be kept. Air or steam thermometers (see PyRo- METER) arc rapidly superseding mercury instruments for all tem- peratures above the boiling point of water. The cheap German paper-scale thermometers are largely used, fitted in wooden cases,

Fie. 8.—Scot- tish Frame for Deep-Sea Ther- mometer. Mes- senger descend- ing to reverse the instrument.

7 Report, 1882.

8 Mill, Proc. R. S. E., xii. 1884, 928.

9 Nature, viii. 195. 10 " Challenger" Reports, Narrative, 1884, i. p. 95.

as dairy thermometers, and a larger size for brewing purposes. Alarm thermometers are often employed, in which electrie contact is made and a bell rung when the temperature exceeds or falls short of a certain limit. Thermostats of various forms are made use of, in which a thermometer, by the position of the mercury in the stem, regulates the gas-supply of a burner and thus the heat of au enclosure.

Metallic Thermometers.—Thermometers depending on change in length or form of composite metal bars, such as Crighton's zinc-iron bar and Bréguet's silver-gold-platinum spiral (see PYROMETER), are converted into registering instruments by the addition of two light pointers pushed forward by the index needle as it travels round the graduated are to either side and left at their extreme points. Jirgensen in 1841 constructed a chronometer, the balance wheel of which was arranged so as to exaggerate the effects of change of temperature and thus to affect the rate. It furnished a very close approximation to the mean temperature between the intervals of rating, and was approved by Arago for use in observa- tions. Hermann and Pfister's metallie thermometer! is probably the best adapted for meteorological purposes, and has given satisfactory results at the Zurich observatory. It is a flat spiral of brass and steel, which unrolls and coils up according to changes of temperature, moving an index on a divided horizontal circle and marking the maximum and minimum by light pointers. In order to secure regular results, the instrument must be annealed by heating for some time in boiling linseed oil.

Several instruments known popularly as metallic thermometers depend on a differeut principle, that of the change of form in a thin metallic enclosure containing liquid. ns Immisch's avitreous thermometer (fig. 9) is an example. A minute Bourdon's tube is fixed at one end, and the other bears on the short arm of a lever, the long arm of which acts by a rack on the pinion forming the axis of the pointer. It is only one inch in diameter and extremely accurate. UY

Thermographs.—The first form of thermo- // graph, due to Wheatstone, was an electrical {/ apparatus. It has recently been improved by Van Rysselberghe, in whose hands it has assumed the following form. The thermome- teris of rather wide bore and open above. At intervals of quarter

of an hour a wire is moved gradually down the tube by a clock until it touches the mercury; an electric circuit Avitreous Thermometer. is thus completed, and causes an indentation by a diamond point which moves in the same way as the wire down a rotating cylinder covered with thin sheet copper or zinc. The metal sheet is renewed at each revolution of the cylinder, and it is sufficient to join the indented points with a graver to have a plate from which any number of copies of the record may be printed. Cripp's thermo- = records hourly on a revolving cylinder. It consists essen- tially of a mercury thermometer coiled into a flat spiral and sus- pended on a horizontal axis. Any change of temperature displaces the centre of gravity of the system, and the instrument rotates through an arc, moving a pencil as it does so. A perfectly con- tinuous record is produced by the photographic thermograph. Wet and dry bulb thermometers are so arranged that a beam of light passes through an air-speck, which separates part of the mercury thread, or through the vacant part of the tube, and falls on a rotating cylinder covered with photographic paper on which it traces the curve of temperature fluctuation. This apparatus is probably the most perfect of its kind. In Bowkett's thermograph the change of form of a curved tube containing oil moves a pencil radially over a card turned horizontally by a clock. The resulting curve is referable to polar instead of rectangular coordinates ; the radius measures temperature, the angle time. Richard's thermo- graph is also actuated by means of a sealed metallic capsule con- taining fluid. It draws a continuous curve in ink on a revolving drum on which one sheet lasts for seven days. This instrument is largely employed in observatories to check eye-observations, and is peculiarly adapted for use in positions to which access can only be had occasionally. It is made in many forms, one of which is specially adapted for marine work, the sealed capsule being rolled into the form of a cylinder and exposed to the water on both surfaces. (H. R. M.)

THEROIGNE DE MERICOURT, Anne Joserx (1762-1817), was born at Marcourt (from a corruption of which name she took her usual designation), a small town in Luxembourg, on the banks of the Ourthe, on 13th August 1762. She was the daughter of a well-to-do farmer, Peter Théroigne. She appears to have been well educated, having been brought up in the convent of ee

1 Repert. fiir Meteorologie, i. pt. i. p. 7.

Robermont ; she was quick-witted, strikingly handsome in appearance, and intensely passionate in temper; and she had a strong and almost volcanic power of eloquence, which she used with great effect upon the mobs of Paris during that short space of her life (1789-93) which alone is of historical interest. The story of her having been betrayed by a young sezgneur, and having in consequence devoted her life to avenge her wrongs upon aristocrats, a story which is told by Lamartine and others, is unfounded, the truth being that she left her home on account of a quarrel with her stepmother. She went to Paris, and, on the outbreak of the Revolution, she was surrounded by a coterie of well-known men, chief of whom were Pétion and Desmoulins. She belonged to their party to the last, — became in fact the “Fury of the Gironde.” On 14th July 1789 she came prominently into notice at the fall of the Bastille, and for about four years thereafter she was seen in many of the stormiest scenes of the Revolution, being known as “la belle Liégoise,” and singularly attired in a riding habit, a plume in her hat, pistols in her belt, and a sword dangling by her side. Early in October she took a leading part in the march to Versailles, and the return journey with the king and queen to the capital. No horror appalled her, and the violence of her language and her power with the mob were no less remarkable than the influence which she was able, by combining cajolery, threats, and money, successfully to exert on the royalist soldiers, so winning them over to the Revolution. Being justly accused of dangerous conduct, her arrest was ordered in the following year (1790), and she left Paris for Mar- court, whence after a short stay she proceeded to Liége, in which town she was seized by warrant of the Austrian Government, and conveyed first to Tyrol and thereafter to Vienna, accused of having been engaged in a plot against the life of the queen of France. After an inter- view, however, with Leopold IT., she was released ; and she returned to Paris, crowned of course with fresh laurels because of her captivity, and resumed her influence. In the clubs of Paris her voice was often heard, and even in the National Assembly she would violently interrupt the expression of any moderatist views. She commanded in person the 3d corps of the so- called army of the fau- bourgs on 20th June 1792, and again won the

gratitude of the people. She shares a heavy responsibility for her connexion with the riots of the 10th of August. A cer- tain contributor to Desmoulins's journal, the Acts of the Apostles, Suleau by name, earned her savage hatred by associating her name, for the sake of the play upon the word, with a deputy named Populus, whom she had never seen, On the 10th of August, just after she had watched approvingly the massacre of certain of the national guard in the Place Vendéme, Suleau was pointed out to her. She sprang at him, dragged him among the infuriated mob, and he was stabbed to death in an instant. But the time came when her party was in peril at the hands of one more extreme, and she now wildly urged the mob to more moderate courses. Then the furies of the ‘‘ Mountain ” seized the fury of the Gironde, and they stripped her naked, and flogged her in the public garden of the Tuileries. ‘The infamous affront drove her mad. She was removed to a private house, thence in 1800 to La Salpetriere for a month, and thence to a place of confine-

‘ment called the Petites Maisons, where she remained—a

raving maniac—till 1807. She was then again renioved to La Salpetriere, where she died, never having recovered her reason, on 9th June 1817.

THESEUS, the great hero of Attic legend,? son of

? All the passages in the Jiiad and Odyssey in which his name or allusions to his legend occur are regarded with more or less proba- bility as spurious.

Aigeus, king of Athens, and Aithra, daughter of Pittheus, king of Troezen. Thus through his father he was descended from Erechtheus and the autochthones of Attica; through his mother he came of the Asiatic house of Pelops. A‘geus, being childless, went to Delphi to consult the god, who gave him an ambiguous answer. He went to Treezen, and told the oracle to Pittheus, who, seeing its bearing, contrived that AZgeus should have intercourse with his daughter /Athra. /Zgeus then departed to Athens, and in due time AXthra, who remained at Treezen, brought forth Theseus. It was given out that the child's father was Poseidon, the great god of Troezen, and in after ages the Troezenians pointed to the Holy Isle as the place where

Poseidon and A‘thra met, and where Atthra raised a temple to Athene Apaturia, at which Troezenian maids dedicated their girdles before marriage. For his tutor and guardian young Theseus had one Cannidas, to whom, down to Plutarch’s time, the Athenians were wont to sacrifice a black ram on the eve of the festival of Theseus. On passing out of boyhood, Theseus, in accordance with custom, went to Delphi, and there cut off his front hair. Aigeus had deposited his sword and boots under a heavy rock, telling AXthra that, if she gave birth to a son who, on attaining manhood, should be able to lift the rock and remove the sword and boots, she was to send him with all secrecy to his father at Athens. Theseus now lifted the rock, removed the sword and boots, and set out for Athens. He encountered many adventures on the way. First he met Periphetes, surnamed Corynetes (Clubman). Him Theseus slew, and carried off his club. At the isthmus of Corinth dwelt Sinis, called the Pine-Bender, because he killed his victims by fastening them to the top of a pine-tree (or two pine-trees), which he had bent down and then suffered to fly up. Theseus hoisted the Pine-Bender on his own pine-tree. Now, the deceased Pine-Bender had a pretty daughter, who ran and hid herself in a thicket where asparagus grew plentifully ; and, when Theseus came to look for her, she prayed to the asparagus, and promised that if it would hide her she would never injure asparagus any more. Theseus wiled her from the thicket, and from their union sprang the family of the Joxids, who worshipped asparagus. Next Theseus despatched the Crommyonian sow (or boar), a dreadful monster. Then he flung over the cliff the wicked Sciron, who, while his guests were perforce washing his feet, used to kick them over into the sea. In Eleusis Theseus wrestled with and killed Cercyon. A little farther on he slew Procrustes, who had only one bed for all comers: if his guest was too short for the bed, he stretched him out; if he was too long, he cut him down to the requisite length. At the Cephissus Theseus was met by the Phytalid family, who purified him from the taint of bloodshed. As he passed through the streets of Athens, his curls and long garment reaching to his ankles drew on him the derision of some masons, who were putting on tle roof of the new temple of Apollo Delphinius: ‘“ Why,” they asked, “‘ was such a pretty girl out alone?” In reply Theseus took the bullocks out of their cart and flung them higher than the roof of the temple. He found his father married to Medea, who had fled from Corinth. Being a witch, she knew Theseus before his father did, and tried to persuade ffigeus to poison his son ; but AXgeus at last recognized

him by his sword, and took him to his arms. Theseus was now declared heir to the throne, and the Pallantids, who had hoped to succeed to the childless king, conspired against Theseus, but he crushed the conspiracy. He then attacked the flame-spitting bull of Marathon and brought it alive to Athens, where he sacrificed it to Apollo Delphinius. Now comes the adventure of the Cretan Minotaur (see Minos), whom Theseus slew by the aid of ARIADNE (g.2.).

THESEUS

| While Theseus was in Crete, Minos, wishing to see whether Theseus was really the son of Poseidon, flung his ring into the sea. Theseus dived and brought it up, together with a golden crown, the gift of Amphitrite. On the return voyage the ship touched at Naxos, and there Theseus abandoned Ariadne. He landed also at Delos, and there he and the youths danced the crane dahce, the complicated movements of which were meant to imitate the windings of the Labyrinth.1 In historical times this dance was still danced by the Delians round the horned altar—an altar entirely composed of left-sided horns. Theseus had promised Aigeus that, if he returned success- ful, the black sail with which the fatal ship always put to sea 2 should be exchanged for a white one. But he forgot his promise ; and, when from the Acropolis at Athens Aigeus descried the black sail out at sea, he flung himself from the rock, and died. Hence at the festival which commemorated the return of Theseus there was always weeping and lamentation. Theseus now carried out a political revolution in Attica by abolishing the semi-inde- pendent powers of the separate townships and concen- trating those powers at Athens, and he instituted the festival of the Panathensa,? as a symbol cf the unity of the Attic race. Further, according to a democratic tradi- tion, he abolished the monarchy, and substituted in its place a popular government ; but, to obviate the evils of a pure democracy, he instituted the three classes or castes of the eupatrids (nobles), geomori (husbandmen), and demiurgi (artisans). He also minted coins bearing the figure of an ox. He extended the territory of Attica as far as the isthmus of Corinth.

He was the first to celebrate in their full pomp the Isthmian games in honour of Poseidon ; for the games previously instituted by Hercules in

honour of Melicertes had been celebrated by night, and had partaken of the nature of mysteries rather than of a festival. Of Theseus's adventures with the Amazons there were different accounts. According to some, he sailed with Hercules to the Euxine, and there won the Amazon Antiope as the meed of valour ; others said that he sailed on his own account, and captured Antiope by stratagem. Thereafter the Amazons attacked Athens. Antiope fell fighting on the side of Theseus, and her tomb was pointed out on the south side of the acropolis. By Antiope Theseus had a son, Hippo- lytus. On the death of Antiope, Theseus married Pheedra. She fell in love with her stepson Hippolytus, who, resist- ing her advances, was accused by her to Theseus of having attempted her virtue. Theseus in a rage imprecated on his son the wrath of Poseidon. His prayer was answered :. as Hippolytus was driving beside the sea, a bull issuing from the waves terrified his horses, and he was thrown and killed. This tragic story is the subject of one of the extant plays of Euripides.

The fanious friendship between Theseus and Pirithous, king of the Lapiths, originated thus. Hearing of the

1 The Ostiaks of Siberia have an elaborate crane dance, in which the dancers are dressed up with skins and the heads of cranes (Pallas, Reise durch verschiedene Provinzen des russischen Reichs, ili.

65). ;

2 So, too, the ship that sailed annually from Thessaly to Troy with offerings to the shade of Achilles put to sea with sable sails (Philostratus, Heroica, xx. 25). The ship that was to bring Iseult to the mortally wounded Tristram was to hoist a white sail if she was on board, a black sail if she was not. The black sails recur in the modern Greek version of the tale of Theseus. Researches, ix. 97.

3 Besides the Panathenea, Theseus is said to have instituted the festival of the Synotkia or Metoikia. Wachsmuth ingeniously sup- poses that the latter festival commemorated the local union in a single city of the separate settlements on the Acropolis and its immediate neighbourhood, while the Panathenea commemorated the political union of the whole of Attica (C. Wachsmuth, Die Stadt Athen im Alterthum, p. 453 sq.).

Compare Astatick

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strength and courage of Theseus, Pirithous desired to put them to the test. Accordingly he drove away from Marathon some cows which belonged to Theseus. The latter pursued, but, when he came up with the robber, the two heroes were so filled with admiration of each other that they swore brotherhood. At the marriage of Pirithous to Hippodamia (or Deidamia) a fight broke out between the Lapiths and Centaurs, in which the Lapiths, assisted by Theseus, were victorious, and drove the Centaurs out of the country. Theseus and Pirithous now carried off Helen from Sparta, and when they drew lots for her she fell to the lot of Theseus, who took her to Aphidne, and left her in charge of his mother Aithra and his friend Aphidnus. He now descended to the lower world with Pirithous, to help his friend to carry off Proserpine. But the two were caught, and confined in Hades till Hercules came and released Theseus. Meantime Castor and Pollux had captured Aphidnz, and carried off their sister Helen and JBthra. When Theseus returned to Athens, he found that a sedition had been stirred up by Menestheus, a descendant of Erechtheus, one of the old kings of Athens. Failing to quell the outbreak, Theseus in despair sent his children to Eubeea, and, after solemnly cursing the Athenians, sailed away to the island of Scyrus, where he had ancestral estates. But Lycomedes, king of Scyrus, took him up to a high place, and cast him into the sea, that he died. Others said that he fell of himself over the cliff as he was taking his evening walk. Menestheus reigned at Athens, but, when he died before Troy, the sons of Theseus recovered the kingdom. Long afterwards, at the battle of Marathon (490 3.c.), many of the Athenians thought they saw the phantom of Theseus, in full armour, charging at their head against the Persians. When the Persian war was over, the Delphic oracle bade the Athenians fetch the bones of Theseus from Scyrus, and lay them in Attic earth. It fell to Cimon’s lot in 469 B.c. to discover the hero’s grave at Scyrus, and bring back his bones to Athens. They were deposited in the heart of Athens, and henceforth escaped slaves and all persons in peril sought and found sanctuary at the grave of him who in his life had been a champion of the oppressed. His chief festival was on the 8th of the month Pyanepsion (October 21st), but the 8th day of every month was also sacred to him.

Whatever we may think of the historical reality of Theseus, his legend seems to contain recollections of historical events, e¢.g., the gvvoixiouds, Whether by this we understand the political central- ization of Attica at Athens or a local union of previously separate settlements on the site of Athens. The birth of Theseus at Treezen points to the immigration of an Ionian family or tribe from the south. With this agrees the legend of the contest between Athene and Poseidon for supremacy on the acropolis of Athens, for Theseus is intimately connected with Poseidon, the great Ionian god. Aigeus, the father of Theseus, has been iden- tified by some modern scholars with Poseidon.

The Athenian festival in October, popularly supposed to coin- memorate the return of Theseus from Crete, is interesting, as some of its features are identical with those of harvest-festivals still observed in the north of Europe. Thus the eiresione, a branch of olive wreathed with wool and decked with fruits, bread, &c., which was carried in procession and hung over the door of the house, where it was kept for a year, is the Erntemat (Harvest-may) of Germany.

The well-preserved Doric temple to the north of the acropolis at Athens, commonly known as the Theseum, was long supposed to be the sanctuary in which the bones of Theseus reposed. But archeologists are now much divided on this question. Itis agreed, however, that the temple is of the 5th century 8.c., and that the date of its construction cannot differ widely from that of the Parthenon.? There were several (according to Philochorus, four) temples or shrines of Theseus at Athens. Milchhofer thinks he has found one of them in the ncighbourhood of Pirzus.?

1 See W. Mannhardt, Antike Wald- und Feld-Kulte, p. 212 sq.

- For the literature on the subject, see Milchhéfer, in Baumeister’s Denk:niiler des classischen Alterthums, i. p. 170.

ae Livléuternder Text to the Karten von Attika (Berlin, 1881), i. Pp. of sq.

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- Our chief authority for the legend of Theseus is the life by Plutarch, which is a compilation from earlier writers. G. Gilbert, who has investigated the sources from which Plutarch drew for his life of Theseus, believes that his chief authority was the Atthis of lster, and that Ister mainly followed Philochorus. See Philologus, xxxiii., 1874, p. 46 sg.

There is a modern Greek folk-tale which preserves some features of the legend of Theseus and the Minotaur, but for the Minotaur has been substituted a seven- headed snake. See Bernard Schmidt, Griechische Mahrchen, Sagen, und Volks- lieder, p. 118 sq. (J. G. FR.)

THESMOPHORIA, an ancient Greek festival, cele- brated by women only in honour of Demeter Occpodédpos. At Athens, Abdera, and perhaps Sparta, it lasted three days. At Athens the festival took place on the 11th, 12th, and 13th of the month Pyanepsion (24th, 25th, and 26th October), the first day being called Anodos (ascent), or, according to others, Kathodos (descent), the second Nesteia (fast), and the third Kalligeneia (fair- born).* If to these days we add the Thesmophoria, which were celebrated on the 10th at Halimus, a township on the coast near Athens, the festival lasted four days.° If further we add the festival of the Stenia, which took place on the 9th, the whole festival lasted five days.6 The Stenia are said by Photius to have celebrated the return of Demeter from the lower world (Anodos), and the women railed at each other by night.’ The Thesmophoria at Halimus seem to have included dances on the beach.® The great feature of the next day (the Anodos) is gene- rally assumed to have been a procession from Halimus to Athens, but this assumption seems to rest entirely on an interpretation of the name Anodos, and it loses all pro- bability when we observe that the day was by others called Kathodos.* Probably both names referred to the descent of Demeter or Proserpine to the nether world, and her ascent from it.12 The next day, Nesteia, was a day of sorrow, the women sitting on the ground and fasting.” As to what took place on the Kalligeneia we have no information. Nor can we define the time or nature of the secret ceremony called the “ pursuit,” or the “ Chalcidian pursuit,” and the sacrifice called the “penalty.”

During the Thesmophoria (and for nine days previously, if Ovid, Met., x. 434, is right, and refers to the Thesmo- phoria) the women abstained from

intercourse with their

4 Schol. on Aristoph., Thesmophoriazuse, 80 and 585; Diog. Laer., ix. 48; Hesychius, s.v. tpenwepos (the reading here is uncertain) and &vodos; Alciphron, iii. 89; Atheneus, 307f. Plutarch (Vit. Demosth., 80) states that the Nesteia took place on the 16th of Pyanepsion, but in this he stands alone.

5 Schol. on Aristoph., Thesm., 80; Photius, Lex., s.v. @ecuopoplwr yuépar 3’ (where Naber should not have altered the MS. reading 3’ into 18’); Hesychius, s.v. tpitn Ocopodgopiwr.

6 Schol. on Aristoph., Thesm., 834.

7 Photius, Lex., s.v. orqvia; cf. Apollodorus, i. 5, 1.

8 Plut., Solon, 8; for this passage probably refers to the Thesmo- phoria, the CapeColias mentioned being near Halimus (see Hrlduternder Text to the Karten von Attika, ii. 1 sg.). The Thesmophorium at Halimus is mentioned by Pausanias (i. 31, 1).

® Hesychius (s.v. &vodos) and the Schol. on Arist., Thesm., 585, suppose that the day was so called because the women ascended to the Thesmophorium, which (according to the scholiast) stood on a height. But ro ancient writer mentions a procession from Halimus. For the name Kathodos, see Schol., loc. cit.; Photius, Lez., s.v. Occuopopiwy jucpa 3’. For the statement that at one part of the festival (commonly assumed, by the writers who accept the statement, to be the Anodos) the women carried on their heads the “books of the law,” we have only the authority of the scholiast on Theocritus, iv. 25, who displays his ignorance by describing the women as virgins (see below), and saying that they went in procession to Eleusis. The statement may therefore be dismissed as an etymological fiction. Aristophanes, Hccles., 222, is no evidence for the book-carrying.

10 The Beeotian festival of Demeter, which was held at about the same time as the Athenian Thesmophoria, and at which the megara (see below) were opened, is distinctly stated by Plutarch (De Js. et Osir., 69) to have been a mourning for the descent (Kathodos) of Proserpine.

ll Plut., Dem., 30; Id., De Js. et Osir., 69.

12 Hesychius, s.v. Siwyua; Suidas, s.v. yarnidixby Slwyua; Hesy- chius, s.v. (nula. For flight and pursuit as parts of religious cere- monies, cf. Plutarch, Quest. Grec., 38; Id., Quest. Rom., 63; Id., De Def. Orac., 15; Ailian, Nat. An., xii. 34; Pausanias, i. 24, 4; Id., viii. 58, 3; Diodorus, i. 91; Lobeck, Aglaophamus, p. 676; Mar-

| quardt, Staatsverwaltung, 2d ed., iii. 3238.

husbands, and to fortify themselves strewed their beds with Agnus castus and other plants. The women of Miletus strewed their beds with pine branches, and put fir-cones in the sanctuaries of Demeter.! Whether un- married women were admitted to the festival seems doubt- ful; in Lucian's time it would appear that they were.? The women of each deme (township) elected two married women of their number to preside over them at the festival ; and every married man in the township who possessed property to the value of three talents had to provide a feast for the women on behalf of his wife.* During the festival the women seem to have been lodged by twos in tents or huts, probably erected within the sacred precincts of the Thesmophorium.* They were not allowed to eat the seeds of the pomegranate or to wear garlands of flowers.5 Prisoners were released at the festival,® and during the Nesteia the law-courts were closed and the senate did not meet.7 Aristophanes's play on the festival sheds little light on the mode of its celebration.

At Thebes Thesmophoria were celebrated in summer on the acropolis (Cadmeia) ; at Eretria during the Thes- mophoria the women cooked their meat, not at fires, but by the heat of the sun, and they did not invoke Kalli- geneia (which seems to mean that they did not celebrate the last day of the festival); at Syracuse, during the festival, cakes called mylloi, made of sesame and honey in the shape of pudenda muliebria, were handed round.® Agrigentum, Ephesus, and Dryme, in Phocis, had also their Thesmophoria.®

The above was nearly all that was known about the Thesmo- phoria down to 1870. In that year E. Rohde published in the LRheinisches Museum (N. F. 25, p. 548 sg.) a scholion on Lucian (Dial. Meretr., ii. 1), which he discovered in the Vatiean MS. Palatinus 73, and which furnishes some curions details about the Thesmophoria. It also explains two obscure and corrupt passages of Clemens Alexandrinus and Pausanias, the true meaning of which had been divined by Lobeck (Aglaophamus, p. 828 sg.). The sub- stanee of the scholion is this. When Proserpine was carried off by Pluto, a swineherd called Eubuleus was herding his swine at the spot, and his herd was engulfed in the chasm down which Pluto had vanished with Proserpine. Accordingly at the Thesmo- phoria it was customary, in memory of Eubuleus, to fling pigs into the ‘*chasms of Demeter and Proserpine.” (These ‘‘chasms ” may have been natural eaverns or perhaps vaults. The scholiast speaks of them also as adyta and megara.’°) In these chasms or adyta there wcre supposcd to be serpents, which guarded the adyta and consumed most of the ficsh of the pigs that were thrown

1 Milian, Nat. An., ix. 26; Sehol. on Theocr., iv. 25; Hesyehius, S.v. kvéewpov; Pliny, V. H., 24, 59; Dioseorides, i. 185 (184, ed. Sprengel); Sehol. on Nicander, Ther., 70 sg.; Galen, xi. 808, ed. Ktihn ; Steph. Byz., s.v. MfAnros.

2 Lucian, Dial. Meretr.,ii. 1. On the other hand, we read in Strabo (i. 8, 20) of virgins at Alponus aseending a tower as spectators (kara 6éav) of the Thesmophoria, which would seem to imply that they did not partieipate in it.

3 Iseus, De Cironis Hered., 19; Id., De Pyrrhi Hered., 80.

4 Aristoph., Thesm., 624, 658, with the Sehol. ad il. As to the custoin of camping out at festivals, Plutareh (Quast. Conviv., iv. 6, 2) eompares the Jewish Feast of Tabernaeles with the Greek Dionysia; from whieh we may perhaps infer that the worshippers camped out at the Dionysia. Cp. Gumilla, Wistoire de l’Orenoque, i. p. 256 sq.

5 Clem, Alex., Protrep., 19.; Schol. on Sophoeles, Gd. Col., 681.

§ Marcellinus on Hermogenes, in Rhetores Graeci, ed. Walz, iv. 462; Sopater, tbid., viii. 67.

7 Aristoph., Thesm., 80. The word tpirn seems to mean the Nesteia, as the Schol. ad J. takes it. That the “middle day” was the Nesteia we know from Athenzus, 307f.

8 Xenophon, Heilen., v. 2, 29; Plutareh, Quest. Gr., 31; Athen- wus, 6470,

® Polyenus, v. 1, 1; Herodotus, vi. 16; Pausanias, x. 33, 12.

10 Mr C. T. Newton discovered in the sauetuary of Demeter and the Infernal Deities at Cnidus a chamber whieh may have been one of the megara referred to by the scholiast. It eontained bones of pigs and marble figures of pigs. The ehamber was not, however, originally subterranean. See Newton’s Discoveries at Halicarnassus, &c., ii. p. 883 SY: 5 Id., Travels and Discoveries in the Levant, ii. p. 180 sq. Aecording to Porphyry (De Andro Nympharum, 6) the Infernal Deities had megara, as the Olympian had temples, and the sacrificial pits of the former eorresponded to the altars of the latter.

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in. The decayed remains of the flesh were afterwards fetched by women called “drawers” (antlctriai), who, after observing rules of ceremonial purity for three days, descended into the eaverns, and, frightening away the serpents by clapping their hands, brought up the remains and placed them on the altars.” Whoever got a portion of this deeayed flesh and sowed it with the seed in the ground was supposed thereby to secure a good crop. The rest of the scholion is obscure, and perhaps corrupt, but the following seems to be the sense. The ceremony above described was called the arretophoria, and was supposed to exercise the same quickening and fertilizing influence on men as on fields. Further, along with the pigs, sacred cakes made of dough, in the shape of serpents and of phalli, were cast into the eaverns, to symbolize the productivity of the earth and of man. Branches of pines were thrown in for a similar reason.

The custom described in this important scholion is elcarly the same as that referred to by Clemens Alexandrinus (Protrep., § 17) and Pausanias (ix. 8, 1). From the latter we learn that the pigs were sucking pigs, and from the former (if we adopt Lobeck's emendation peyapois (@vras for weyap{(ovres) that they were thrown in alive. From Pausanias we may further perhaps infer (though the passage is corrupt) that the remains of the pigs thrown down in one year were not fetched up till the same time next year (cp. Paus., x. 82, 14). The question remains, At what point of the Thesmophoria did the eeremony described by the scholiast on Lucian take place? Rohde thinks that it formed part of the cere- monies at Halimus, his chief ground being that Clemens (Protrep., 384) and Arnobius (v. 28) mention phalli in connexion with the "mysteries at Halimus"; but it is not certain that these mysteries were the Thesmophoria. The legend of Eubnleus seems to show that the ceremony commemorated the descent of Proserpine to the nether world; and, if we are right in our interpretation of the name Kathodos as applied to the first day of the Thesmophoria proper, the ceremony described would naturally fall on that day. Further, if our interpretation of Pausanias is correct, the same day must have witnessed the descent of the living pigs and the ascent of the rotten pork of the previous year. Hence the day might be indifferently styled Kathodos or Anodos (‘‘ descent" or ‘"ascent"); and so in fact it was.

It is usual to interpret Thesmophorus "lawgiver" and Thesmo- phoria " the feast of the lawgiver." But the Greek for ‘‘lawgiver" is not Thesmophorus but Thesmothetes (or Nomothetes, when nomos displaced thesmos in the sense of ‘"‘law"). If we compare such names of festivals as Oschophoria, Lampadephoria, Hydro- phoria, Scirophoria (‘‘ the earryings of grapes, of torches, of water, of umbrellas") with the corresponding Oschophorus, Lampade- phorus, Hydrophorus, also Thallophorus and Kanephorus, we can scarcely help concluding that Thesmophoria must originally have meant in the literal and physical sense the earrying of the thesmot, and Thesmophorus the person who so carried them; and, in view of the ceremony disclosed by the scholiast on Lucian (compared with the analogous ceremony observed by the Arrephoroi at Athens), we are strongly tempted to suppose that the women whom he calls Antletriai may have been also known, at one time or other, as Thesmophoroi, and that the thesmoi were the sacra which they carried and deposited on the altar. The

word would then be used in its literal sense, “that which is set down.” How the name Thesmophorus should have been transferred to the goddess from her ministers is of course a difficulty, which is hardly disposed of by pointing to the epithets Amallophorus (“sheaf-bearing”) and Melophorus (“apple-bearing”), which were applied to men as well as to the goddess.

As to the origin of the Thesmophoria, Herodotus (ii. 171) asserts that they were introduced into Grceee from Egypt by the daughters of Danaus; while, according to Plutarch (Fragments, p. 55, ed. Diibner), the feast was introduced into Athens by Orpheus the Odrysian. From these statements we can only infer the similarity of the Thesmophoria to the Orphic rites and to the Egyptian repre- sentation of the sufferings of Osiris, in connexion with which Plutarch mentions them. The Thesmophoria would thus form one of that class of rites, widely spread in Western Asia andin Europe, in which the main feature appears to be a lamentation for the annual decay of vegetation or a rejoicing at its revival. This seems to have been the root, e¢.g., of the lamentations for Adonis and Attis. See W. Mannhardt, Antike Wald- wnd Feld-Kuilte, p. 264 sq.

11 Compare the funetions of the two Arrephoroi at Athens (Paus., For serpents in connexion with Demeter, eompare Strabo, 1s Ly Oh

12’ This, as Mr Andrew Lang has pointed out, resembles the Khond eustom of burying the flesh of the human victim in the fields to fertilize them. The human vietim was with the Khonds, like the pig with the Greeks, a saerifiee to the Earth goddess, See W. Macpher- son, Memorials of Service in India, p. 129.

13 Reading éuBdAdovat, with Rohde, for AawBdvovor. Compare the eustom of Miletus supra. The pine-tree played an important part in the worship of Cybele. Cp. Marquardt, Staatsverwaltung, iii, 371.

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On the Thesmophoria, see Meursius, Gracia Feriata, p. 161 sq.; L. Preller, Demeter und Persephone, p. 335 sq.; Id., Griech. Myth., [8], i. 639 sg.; Fritsche’s ed. of the Thesmophoriazusz, p. 577 sq.; Aug. Mommsen, Heortologie, p. 287 sq.; Rheinisches Museum, xxv. (1870), p. 548; Gazette

Archéologique, 1880, p. 17; Mr Andrew Lang, in Nineteenth Century, April 1887. (J. G. FR.)

THESPL#, an ancient Greek city of Beotia. It stood on level ground commanded by the low range of hills which runs eastward from the foot of Mount Helicon to Thebes. In the Persian invasion the Thespian con- tingent of 700 men voluntarily stayed with the Spartans _at Thermopylae, and shared their fate. or its resistance to the Persians, the city was burned by Xerxes (480 B.c.). Nevertheless, in the next year 1800 Thespians shared in the great victory of Platwa. At the battle of Delium (424) the flower of the Thespians fell fighting against Athens on the side of Thebes, and in the following year the jealous Thebans availed themselves of the weakness of their gallant confederate to pull down the walls of Thespiz. The walls were restored by the Spartans under Agesilaus in 378, but were again destroyed by the The- bans, apparently before the battle of Leuctra (371). After the battle the Thespians, who had taken no part in it, withdrew to a strong place, Ceressus, from which, however, they were expelled by the Thebans. In 343 the city was not yet restored ; but it must have been sub- sequently, for it is mentioned in the Roman wars.

In the 2d century Pausanias mentions that Thespiz contained a theatre, a market-place (agora), and sanctuaries of Aphrodite, the Muses, and Hercules. Love (Eros) was the deity most vener- ated by the Thespians ; they possessed a very ancient image of him in the shape of an unhewn block of stone. The marble statue of Love by Praxiteles was the great sight at Thcspie, and drew crowds to the place. It was carricd off to Rome by Caligula, re- stored by Claudius, and again carried otf by Nero. There was also a bronze statue of Love by Lysippus. From an inscription we learn that one of the deities worshipped was Demeter Achea, the ‘Mater Dolorosa.” The Thespians also worshipped the Muses, and celebrated a festival in their honour in the sacred grove on Mount Helicon. Remains of what was probably the ancient citadel are still to be seen, consisting of an oblong or oval line of fortification, solidly and regularly built. The adjacent ground to the east and south is covered with foundations, bearing witness to the extent of the ancient city. The neighbouring village Eremo- kastro, on higher ground, was thought by Ulrichs to be probably the site of the ancient Ceressus. In 1882 there were discovered, about 1200 yards east of

Eremokastro, on the road to Arkopodi (Leuctra), the remains of a polyandrion, including a colossal stone lion. The tomb dates from the 5th century B.c., and is probably that of the Thespians who fell at Plata, for those who fell at Thermopyle were buried on the field.

See Leake, Zravels in Northern Greece, ii. 479 sq.; Dodwell, Tour through Greece, 1, 258; Bursian, Geogr. von Griechenland, i, 237 sq.; Ulrichs, Reisen u. Forschungen in Griecheniand, ii, 84 sq.; Mitthetl. d. deutsch. archdol. Inst. in Athen, 1879, pp. 190 sq., 278 sq.; Tlpaxriuxa ris év ’AOyvats apxarodoyeKys érarpias, 1882, pp. 65-74.

THESSALONIANS, Eristies To THE. ‘Thessalonica, now SALONIcA (q.v.), was in the time of the Romans the most important town of Macedonia. In consequence of its advantageous situation, on a good harbour and on the Via Egnatia, the great trade road which connected the Adriatic with the Hellespont, the town had surpassed the old capital Pella, and had indeed become one of the chief commercial centres of the ancient world. Since the Roman conquest the seat of the Roman provincial government had been here. Here, as in Corinth, the conditions were favourable for the reception of Christianity. The popula- tion was not purely Greek, but cosmopolitan, a mixture of divers nationalities. Such a population is always more susceptible to religious novelties for good and for evil than one of old, firmly established national growth. The apostle Paul experienced this to his great joy and satis- faction here also, as he for the first time set foot on the

1 Xenophon (J/ellen., vi. 8. 1 and 5) and Diodorus (xv. 46) speak of Thespie as if it had been destroyed and its inhabitants driven away before the battle of Leuctra; but, as the Thespian troops were present with the Thebans immediately before the battle (Paus., ix. 18, 8), it would seem that only the walls, not the city itself, had been previously destroyed. See Grote, Hist. of Greece, ix. p. 379.

shores of Europe with the message of Jesus Christ. It was about the year 52 or 53 that he, on his arrival from Philippi, preached the gospel of Christ in the rich merchant city. As in other places, he began with the Jews. There

wasa Jewish congregation at Thessalonica, as at all the great ports and trading centres of the Medi- terranean, with their own synagogue and regular service. For three Sabbaths Paul stood up in the synagogue, prov- ing by the Scriptures that Jesus was the promised and expected Messiah (Acts xvii. 1-3). He had not much success with the Jews, but this was more than compen- sated by the number of “devout Greeks” (z.e., Gentiles who already had some connexion with Judaism) whom he won to a belief in Christ. He found hearing especially with the chief women (Acts xviii. 4). But Paul had also converted a not smaller number of real heathens. Indeed, they must have constituted the majority of the Christian church there formed, for in his first epistle he says quite generally that his readers, in consequence of his preaching, had turned from idols to the one true God (1 Thess. i. 9).

Paul’s stay in Thessalonica was short. The plots of the Jews soon obliged him to leave the town, and he betook himself to Beroea (Acts xvii. 10), thence to Athens (Acts xvii. 15), and finally to Corinth (Acts xviii. 1). The two epistles were written to the church of Thessalonica during a stay of a year and a half in Corinth (Acts xviii. 11), about 53-54, not before this in Athens, as is asserted in the subscription of both epistles in the Codex Alexandrinus and other MSS. For when Paul wrote the first epistle some time had elapsed since the formation of the church : some members were already dead (1 Thess. iv. 13), and Paul had worked for some time, not only in Macedonia, but also in Achaia (i. 7, 8). On the other hand, the church appears to be comparatively young; the conversions are still spoken of everywhere in Macedonia and Achaia (i. 9). All this points to the conclusion that the first epistle was written in Corinth, and this is confirmed by the opening salutation (i. 1), in which Silvanus (Silas) and Timotheus are named as joint authors, for they were in Corinth with Paul (Acts xviii. 5).

The first epistle gives us a very clear picture of the disposition and state of such a young church, composed of former heathens. They had received with enthusiasm the gospel of Jesus Christ, the Bringer of salvation, the Saviour in the approaching day of judgment (i. 9, 10). But the realization of this salvation is now awaited with impatience, and a sense of disappointment is experienced because some members of the church have died without having seen the advent of the Lord (iv. 13). At the same time many there are still

living in gross heathen sins and vices (iv. 1-8). Paul had sent back Timotheus from Athens to Thessalonica in order to advise the young inexperienced church, and to obtain news concerning it (iii. 1-5). He has just returned to Paul (iii. 6), and the information received through this source is the occasion of the first epistle,? designed to supply the place of Paul's personal presence and bring new exhortation and instruction from the apostle to the young church, which still much needed guidance.

We have no information concerning the effect of this letter. It is conceivable, however, that the church re- quired yet further advice and direction from the apostle, and so far it is not remarkable that Paul saw the need for a second similar letter of teaching and exhortation. This second epistle also, if it is genuine, was written during Paul's stay of a year and a half at Corinth, very soon after

2 According to Acts xvii. 14-15 and xviii. 5, Silas and Timotheus had remained behind in Bercea, and first met Paul again in Corinth. But according to 1 Thess. iii. 1-5 it must be understood that Timotheus was in Athens with Paul, and had been sent thence to Thessalonica.

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the first. For it also is written in the conjoined names of | critics are valid. It has been often said that the author,

Silvanus and Timotheus, who were still with Paul, while we must understand from Acts xviii. 18 that after Paul's departure from Corinth they ceased to be his companions. The occasion of this epistle seems especially to have arisen from the circumstance that the churcli had been put into fear and anxiety about the advent of Christ, perhaps by a pretended letter from Paul. Two passages point to the existence of such a thing: in ii. 2, Paul says that the church shall not let itself be alarmed ‘‘ by word or by letter as from us" (7.e., nominally coming from us), and in ii. 17 again Paul lays emphasis on his signature by his own hand as the token (of genuineness) to be noticed

in each letter. In any case the chief aim of the epistle is to tran- quillize the church concerning the advent of Christ, which is not yet immediately imminent. He particularly exhorts them not to let themselves be shaken in mind, as that the day of Christ is at hand (ii. 1, 2). For before this day comes the “man of sin” must first appear, who seats himself in the temple of God, and gives himself out for God (ii. 3-5). And he too is for the present kept back by another power (ii. 6, 7). Only when the latter is taken out of the way shall ‘that wicked ” be revealed, and the great falling away shall follow (ii. 8-12).

The genuineness of the two epistles has not remained unquestioned by the newer criticism. Baur declared him- self against the genuineness of both epistles,’ and he is followed by Van der Vies? and several others.? But in general the predominant opinion of impartial criticism at present is that the genuineness of the first epistle is certain, while that of the second must be given up.

This is the opinion of Hilgenfeld (Z. f. wiss. Theol., 1862, p. 225-264; 1866, p. 295-301; 1869, p. 441 sq.; 1870, p. 244 sq.), Van Manen (Onderzock naar de echthcid van Paulus tweeden brief aan de Thessalonicensen, Utrecht, 1865), 8. Davidson (Zntrod. to the New Testament, 2d ed., 1882, i. 4-16, 336-351), Weizsiicker (Das apostolische Zeitalter, 1886, p. 249-261); and Holtzmann also leans to the same view, without, however, definitely commit- ting himself (Hinl. in d. N. T., 2d ed., 1886, p. 283-241). The genuineness of the first epistle is vindicated by Lipsius (Zheol. St. u. Kr., 1854, p. 905-984), Von Soden (2bid., 1885, p. 263-310), and Paul Schmidt (Der erste Thessalonicherbrief neu erklért, Berlin, 1885), while, on the other hand, Kern (T%ibing. Zeitschr. f. Theol., 1839, ii. 145-214) and Bahnsen (Jahrb. fiir prot. Theol., 1880, p. 681-705) attack that of the second. Grimm (Zheol. St. wu. Kr., 1850, p. 753-816) and Westrik (De echtheid van den twecden bricf aan de Thessalonicensen, Utrecht, 1879) have entered the lists for the genuineness of both epistles.

like the author of the Apocalypse, regards Nero as the Antichrist, expecting him to reappear as the arch-enemy of Christ. But this interpretation of the short statement of our epistle cannot be proved. ‘The assumption that before the dawn of salvation godlessness would reach its height, through the

appearance of an arch-enemy of God and His church is, so to speak, a dogmatic postulate which rests on the prophecies of Daniel and other prophets of the Old Testament. And, in so far as the picture of this arch-eneiny is endowed with historical features, they can quite as well have been drawn from Caligula as from Nero. For Caligula had already laid claim to the honours of a god, and because of this appeared to the Jews to be the embodiment of godlessness. The assumption of such an Antichrist would not be striking in Paul. Even if it is correct (as is generally and with reason taken for granted) that by the hindrance which keeps back the appearance of Antichrist (2 Thess. ii. 6, 7) the established might of the Roman emperor and empire is to be under- stood, this view would be quite in keeping with Paul's views about the Roman dominion (Rom. xiii. 1-7). Yet it must be conceded that the statements on this head create real difficulty, if we compare them with those of the first epistle, in which all stress is laid on the fact that the day of the Lord comes asa thief in the night, and that man must be prepared for it at any moment (1 Thess. v. 1-11). In the second epistle it is pointed out with equal emphasis that the day of the Lord is not immediately imminent, and that certain events must come first (2 Thess. ii. 1-10). It is certainly very striking that Paul, so soon after the admonitions of the first kind, should have given the quieting assurances of the second. And 2 Thess. ii. 2 and iii. 7 can hardly be explained except by the supposition that the readers had been thrown into alarm by a pretended epistle from Paul. Could this have been dared in that early time, almost under the eyes of the apostle? Finally, it is not to be denied that the style of the second epistle is different from that of the first, and that the contents often appear a mere imitation, except in the eschatological passages on account of which it was written. It must therefore be admitted that weighty if not conclusive considerations have been produced against its genuineness. (z. 8*.)
THESSALONICA. See Satonica.

THESSALY is the district of northern Greece which See vol.

The final decision of the newer criticism is justified by | , ; intervenes between Macedonia and the more purely xi. Plates

the evidence. No real difficulties can be brought against

the genuineness of the first epistle, but they certainly can Hellenic countries towards the south, and between the . a against that of the second. When Baur finds that the | upland region of Epirus and the Aigean Sea. It forms an \,)_ xy,

epistles lack the characteristic Pauline ideas, he is only so | regular square, extending for about sixty miles in each Pl. 111.

far right that the doctrine of justification by faith is not dealt with, for which, however, no occasion arises. It has been asserted that there are traces of imitation of the epistles to the Corinthians, but the points of resemblance are’not such as to justify this conclusion. The connexion of the passage in 1 Thess. ii. 16 (the wrath of God is already come upon the Jews) with the destruction of Jerusalem rests on an arbitrary, nay false, interpretation. And it cannot be maintained. on impartial examination that in 1 Thess. ii. 14, 15, the Jewish churches of Palestine are set forth in a way unlike Paul, as an example for the heathen churches.

The objections to the second epistle are much weightier, though here also not all the arguments adduced by hostile

1 Paulus der Apostel Jesu Christi, 1845, and Theologische Jahr- biicher, 1855, p. 141-168, reprinted in 2d ed. of Paulus, ii. 341-369.

: De beide brieven aan de Thessalonicensen, Leyden, 1865.

- Holsten also (Jahrb. f. prot. Theol. 1877, p. 731 sq.) and Steck (Jahrb. f. prot. Theol., 1883, p. 509-524) dispute the genuineness of the first epistle, presupposing the spuriousness of the second.

direction, and this area, which is for the most part level, is enclosed by well-marked boundaries—by the Cambunian Mountains on the north, and by Othrys on the south, while on its western side runs the massive chain of Pindus, which is the backbone of this part of Greece, and towards the east Ossa and Pelion stand in a continuous line; at the north-eastern angle Olympus rises, and is the keystone of the whole mountain system. The elevation of some of the summits in these ranges is considerable, for three of the peaks of Pindus are over 5000 feet, and Olympus, Ossa, and Pelion reach respectively the height of 9754, 6407, and 5310 feet. The country that is contained within these limits is drained by a single river, the Peneius, which, together with the water of its numerous confluents, passes into the sea through the Vale of Tempe. This place, which the Greeks were accustomed to associate with rural delights, is a chasm, cloven in the rocks, as the fable tells us, by the trident of Poseidon, between Olympus and Ossa; but though it possesses every element of the sublime, yet its features are soft and beautiful, from the

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broad winding river, the luxuriant vegetation, and the glades that at intervals open out at the foot of the cliffs. It is about four miles and a half long, and towards the middle of the pass, where the rocks are highest, the pre- cipices in the direction of Olympus fall so steeply as to bar the passage on that side; but those which descend from Ossa are the loftiest, for they rise in many places not less than 1500 feet from the valley. Owing to the length and narrowness of the ravine, it was a position easily defended, but still it offered a practicable entrance to an invading force, in consequence of which a number of castles were built at different times at the strongest points. On the north side of Thessaly there was an im- portant pass from Petra in Pieria by the western side of Olympus, debouching on the plain northward of Larissa ; it was by this that Xerxes entered, and we learn from Herodotus

(vii. 173) that, when the Greeks discovered the existence of this passage, they gave up all thoughts of defending Tempe. On the side of Epirus the main line of communication passed over that part of Pindus which was called Mount Lacmon, and descended the upper valley of the Peneius to A¢ginium in the north-west angle of Thessaly, near which place now stand the extraordinary monasteries of Meteora. This was the route by which Julius Czesar arrived before the battle of Pharsalia. Another pass through the Pindus chain was that of Gomphi, farther south, by means of which there was com- munication with the Ambracian Gulf. The great southern pass was that of Ccela, which crosses Mount Othrys nearly opposite Thermopyle. These Thessalian passes were of the utmost importance to southern Greece, as commanding the approaches to that part of the country.

Though Thessaly is the most level district of Greece, it does not present a uniform unbroken surface, but is com- posed of a number of sections which open out into one another, divided by ranges of hills. The principal of these were called Upper and Lower Thessaly, the former com- prising the western and south-western part, which con- tains the higher course of the Peneius and all those of its tributaries that flow from the south—the Enipeus, the Apidanus, the Onochonus, and the Pamisus; while the latter, which reaches eastward to the foot of Ossa and Pelion, is inundated in parts at certain seasons of the year by the Peneius, the flood-water from which forms the lake Nessonis, and, when that is full, escapes again and pours itself into the Lake of Beebe. The chief city of the latter of these districts was Larissa ; and the two were separated from one another by a long spur, which runs southwards from the Cambunian Mountains on the western side of that city. Again, when Thessaly is entered from the south by the pass of Ccela, another plain, containing a small lake, which was formerly called Xynias, intervenes, and a line of low hills has to be crossed before the town of Thaumaci is reached, which from its commanding position overlooks the whole of the upper plain. The view from this point has been described by Livy in the following remarkable passage :—‘‘ When the traveller, in passing through the rugged districts of Thessaly, where the roads are entangled in the windings of the valleys, arrives at this city, on a sudden an immense level expanse, resembling a vast sea, is outspread before him in such a manner that the eye cannot easily reach the limit of the plains extended beneath ” (xxxii. 4). To the north-eastwards of this, where a

portion of the great plain begins to run up into the mountains, the Plain of Pharsalia is formed, which is intersected by the river Enipeus; and still farther in the same direction is the scene of another great battle, Cynoscephala. Thessaly was further subdivided into four districts, of which Pelasgiotis embraced the lower plain of the Peneius, and Hestixotis and Thessaliotis respectively

the northern and the southern portions of the upper plain ; while the fourth, Phthiotis, which lies towards the south- east, was geographically distinct from the rest of the country, being separated from it by a watershed. The determining feature of this is the Pagaseeus Sinus (Gulf of Volo), a landlocked basin, extending from Pagasz at its head to Aphetze at its narrow outlet, where the chain of Pelion, turning at right angles to its axis at the end of Magnesia, throws out a projecting line of broken ridges, while on the opposite side rise the heights of Othrys. In the heroic age this district was of great importance. It was the birthplace of Greek navigation, for this seems to be implied in the story of the Argonauts, who started from this neighbourhood in quest of the golden fleece. From it the great Achilles came, and, according to Thucydides (i. 3), it was the early home of the Hellenic race. The site of Ioleus, the centre of so many poetic legends, is at no great distance from the modern Volo. Near that town also, ata later period, the city of Demetrias was founded by Demetrius Poliorcetes, who called it one of the three fetters of Greece, Chalcis and Corinth being the other two.

The history of Thessaly is closely connected with its geography. The fertility of the land offered a teniptation to invaders, and was thus the primary cause of the early migrations. It was this motive which first induced the Thessalians to leave their home in Epirus and descend into this district, and from this movement arose the expulsion of the Beotians from Arne, and their settle- ment in the country subsequently ealled Beotia; while another wave of the same tide drove the Dorians also southward, whose migrations changed the face of the Peloponnese. Again, this rich soil was the natural home of a powerful aristocracy, such as the families of the Aleuade of Larissa and the Scopade of Crannon; and the absence of

elevated positions was unfavourable to the foundation of numerous cities, which might have fostered the spirit of freedom and democracy. The plains, also, were suited to the breeding of horses, and consequently the force in which the Thessalian nation was stroug was cavalry, a kind of troops which has usually been associated with oligarchy. The wealth and the semi-Hellenic character of the people—for in raee, as in geograph- ical position, the Thessalians held an intermediate place between the non-Hellenic Macedonians and the Greeks of pure blood— caused them to be wanting in patriotism, so that at the time of the Persian wars we find the Aleuade making comnion cause with the enemies of Greece. When they were united they were a formidable power, but, like other half-organized communities, they seldom combined for long together, and consequently they influenced but little the fortunes of the Greeks.

For several centuries during the Middle Ages Roumanian immi- grants formed so large a part of the population of Thessaly that that district was called by the Byzantine writers Great Walachia (MeydAn BaAaxtfa): the Jewish traveller, Benjamin of Tudela, who passed through the country in the latter half of the 12th century, describes them as then oceupying it. At the present day only a few colonies of that race remain, the principal of which are found on the western side of Olympus and in some of the gorges of Pindus. The Turkish inhabitants are settled in the larger towns, and here and there in the country districts, the most important eolony being those called Koniarates, who were brought from Konieh in Asia Minor shortly before the taking of Constantinople, and planted‘under the south-west angle of Olympus. The Greeks, however, form the vast majority of the population, so much so that, even while the country belonged to the Ottomans, Greek was employed as the official language. In accordance with the pro- visions of the Berlin treaty, Thessaly was eeded to the Greeks by the Porte in 1881, and since that period it has formed a portion of the Hellenic kingdom. eG IN, ta)

THETFORD, an ancient borough and market-town, partly in Norfolk and partly in Suffolk, is situated on the Thet and Little Ouse, and on the Great Eastern Railway line between Cambridge and Norwich, 36 miles south-west of Norwich, 12 north of Bury St Edmunds, to which there is a branch line, and 96 north-north-east of London. The Little Ouse, which divides the

counties, is crossed by a cast-iron bridge erected in 1829. In the time of Edward III. the town had twenty churches and eight monasteries. There are now three churches—St Peter's, St Cuthbert's, and St Mary's; of these St Mary's, on the Suffolk side, is the largest. There are various monastic

.remains in the town. The most important relic of anti- quity is the castle hill, a mound 1000 feet in circumference and 100 feet in height, probably the largest of the Celtic earthworks in England. The grammar school was founded in 1610. In King Street is the mansion-house occupied as a hunting lodge by Queen Elizabeth and JamesI. Brewing and tanning are carried on; and there are also manure and chemical works, brick and lime kilns, flour-mills, and. agricultural implement works. The Little Ouse is navi- gable from Lynn for barges. The population of the muni- cipal borough (area 7296 acres) in 1871 was 4166 and in 1881 it was 4032.

Thetford is supposed to have been the Sitomagus of the Romans. In the time of the Saxons, by whom it was called Theodford, it was the capital of East Anglia. During the heptarchy it was frequently desolated by the Danes. It was burned by them in 998 after a drawn battle between Swend and Ulfcytel, and again after Ulfcytel's second battle at Ringmere, 10th May 1004. From the reign of Athelstan to that of King John it posscssed a mint. The see of Elmham was removed to it in 1070, but it was trans- ferred to Norwich in 1094. At Domesday it had five burgesses, but by the time of Edward III. they had increased to 953. It was in- corporated by Elizabeth in 1573. Itreturned two members to parlia- ment from the time of Edward VI., but was disfranchised in 1868.

THEVENOT, Jean ve (1633-1667), an eminent Ori- ental traveller, was a native of Paris, where he received his education in the college of Navarre. The perusal of works of travel! moved him to go abroad, and his circum-stances permitted him to please himself. Leaving France in 1652, he first visited England, Holland, Germany, and Italy, and at Rome he fell in with D'Herbelot, who invited him to be his companion in a projected voyage to the Levant. D'Herbelot was detained by private affairs, but Thevenot sailed from Rome in May 1655, and, after vainly waiting five months at Malta, took passage for Constan- tinople alone. He remained in Constantinople till

the end of the following August, and then proceeded by Smyrna and the Greek islands to Egypt, landing at Alexandria on New Year's Day 1657. He was a year in Egypt, then visited Sinai, and, returning to Cairo, joined the Lent pilgrim caravan to Jerusalem. He visited the chief places of pilgrimage in Palestine, and, after being twice taken by corsairs, got back to Damietta by sea, and was again in Cairo in time to view the opening of the canal on the rise of the Nile (August 14, 1658). In January 1659 he sailed from Alexandria in an English ship, taking Goletta and Tunis on the way, and, after a sharp engagement with Spanish corsairs, one of which fell a prize to the English merchantman, reached Leghorn on April 12. He now spent four years at home in studies useful to a traveller, and in November 1663 again sailed for the East, calling at Alexandria and landing at Sidon, whence he proceeded by land to Damascus, Aleppo, and then through Mesopo- tamia to Mosul, Baghdad, and Mendeli. Here he entered Persia (August 27, 1664), proceeding by Kirmanshahan and Hamadan to Ispahan, where he spent five months (October 1664—February 1665), and then, joining company with the merchant TavERNIER (q.v.), proceeded by Shiraz and Lar to Bender-Abbas, in the hope of finding a passage to India. This was difficult, because of the opposition of the Dutch, and, though Tavernier was able to proceed, Thevenot found it prudent to return to Shiraz, and, having visited the ruins of Persepolis, made his way to Basra, and sailed for India November 6, 1665, in the ship " Hope- well," arriving at the port of Surat January 10, 1666. He was in India for thirteen months, and crossed the country by Golconda to Masulipatam, returning overland to Surat, from which he sailed to Bender-Abbas and went up to Shiraz.2_ He passed the summer of 1667 at Ispahan,

1 His uncle Melchisedech had similar tastes, and published a well- known collection of Voyages (fol., Paris, 1663, sq.).

® It was at this time that he met Chardin near Persepolis, but that

disabled by an accidental pistol shot, and in October started for Tebriz, but died on the way at Miyana (November 28, 1667).

Thevenot was an accomplished linguist, skilled in Turkish, Arabic, and Persian, and a curious and diligent observer. He was also well skilled in the natural sciences, especially in botany, for which he made large collections in India. His personal character was admirable, and his writings are still esteemed, though it has been justly observed that, unlike Chardin, he saw only the outside of Eastern life. The account of his first journey was published at Paris in 1665 ; it forms the first part of his collected Voyages. The licence is dated December 1663, and the preface shows that Thevenot himself arranged it for publication before leaving on his second voyage. The second and third parts were posthumously published from his journals in 1674 and 1684 (all 4to).

THIAN-SHAN, or CELEsTIAL MouNTAINS. (vol. ii. p. 686), Syr-Darta, and TURKESTAN.

THIBAUT, Anton Frizpricu Jusrus (1774-1840), one of the greatest of German jurists, was born at Hameln, in Hanover, January 4, 1774, that is, ten years after his contemporary and rival Hugo, about a year before Feuerbach, and five years before Savigny. Thibaut's father was an officer in the Hanoverian army, a skilful matheinatician, and, like his son, a man of much force of character. His mother was the daughter of the oberbiirgermeister of the town. The Thibauts were of French descent; they came from a family which had been driven out of France on the revocation of the edict of Nantes. Asa child and youth, Thibaut lived in Hameln, Harburg, and Hanover. He was fond of rowing, skating, and swimming, and, above all, of music, which remained his passion through life. Asa lad he set his heart, chiefly for romantic reasons, on being a forester, and he actually spent two years as such. But he soon became disenchanted, and in 1792 went to Gottingen to study. In 1793 he moved to Kéuigsberg, where Kant still taught. Thibaut was deeply affected by the critical philosophy; his very latest writings bear traces of it, and it is not unimportant in the history of jurisprudence in Germany that Hugo was equally influenced by it. From Kénigsberg Thibaut moved in 1794 to Kiel, where he formed a friendship with Niebuhr, at that time a student there. They lived for a year in the same house, taking their meals together, and holding much converse on literature and politics. Both already displayed the bent of their minds—Niebuhr despondent and affrighted at the progress of the irench Revolution, Thibaut

hopeful, un- dismayed, and certain that eventually all would be well. In 1798 he was appointed extraordinary professor of civil law, and in the same year appeared his Versuche tiber ernzelne Theile der Theorte des Rechts (Kiel, 1798), a col- lection of essays, of which by far the most important was entitled “Ueber die Einfluss der Philosophie auf die Auslegung der Positiven Gesetze.” Taking as his text an observation of Leibnitz, he sought to show that history without philosophy could not interpret and explain law. The essay was partly by anticipation a corrective of the teaching of the historical school of jurists. It enters into speculations on the possibility of forming an ideal body of law as a measure and mode of exposition of particular law, —speculations which have never been continued, certainly not by Thibaut. In 1799 he was made ordinary professor of civil law. In that year was published his Zheorie der logischen Auslegung des rémischen Rechts, one of his most remarkable works, a favourite book of Austin’s, and, as his well-annotated copy in the Inner Temple library shows, one which he had most carefully studied. In 1800 Thibaut married the daughter of Professor Ehlers at Kiel. In 1802 somewhat envious scholar is wrong in saying that this was Thevenot’s only visit to the ruins (Chardin, Voyages, ed. Langlés, viii. 845). See Thevenot, pt. ii. bk. 3, chap. 6.

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he published a short criticism of Feuerbach’s theory of criminal law. It is an excellent illustration of his good sense; it discriminates between what is good and what is unsound and crude in the writings of criminal law reformers; it recalls in many ways the speculations of Bentham. The same year appeared Thibaut’s essay Ueber Besitz und Verjihrung. In 1803 Thibaut was called to Jena, where he spent three years, made happier than they otherwise would have been by intercourse with Goethe and Schiller. At the invitation of the grand-duke of Baden he went to Heidelberg to fill: the chair of civil law and to assist in organizing the university; and he never quitted that town, though he received in after years, as his fame grew, invitations to Gottingen, Munich, and Leipsic. His class was large, his influence great; and, except Hugo and Savigny, no civilian of his time was so well known. In the work of the university he took an active part; and he

cultivated with rare devotion his favourite art. In 1814 appeared his Civilistische Abhandlungen, of which the prin- cipal was his famous essay, the parent of so much litera- ture, on the necessity of a national code for Germany. He had no wish to enter into official or practical life. ‘‘Tam Professor Thibaut, and wish to be nobody else.” In 1819 he was appointed representative in the first chamber of the Baden parliament. He was also made member of the Scheidungsgericht. In 1825 appeared anonymously his work Ueber die Reinheit der Tonkunst, in which he eulogized the old music, and especially that of his favourite master, Palestrina. It involved him in a contest with Nageli and other admirers of the new school of music, whose merits Thibaut was somewhat slow to

own. This has been translated into English by W. H. Gladstone. In 1836 Thibaut published his Hrérterungen

des rémischen Rechts. One of his last works was a contri- bution in 1838 to the Archiv fiir die civilistische Praxis, of which he was one of the editors (see below). He died peacefully, full of years and honour, on the 29th of March

1840.

Thibaut was of the middle height and broad-shouldered, his eyes bright and piercing, his head noble and striking ; his whole appearance told of power, simplicity, and reserve. All who knew him speak of his strong personality, his manly consistent nature. Young men loved him, and he drew to the young. If he sometimes signed his letters “Semper idem A. F. J. Thibaut,” it was not a phrase. Every incident told of him has a curious flavour. He was much more than a jurist: he deserves to be remembered in the history of music. Palestrina and the early com- posers of church music were his delight. “‘ Jurisprudence is my business; my music room is my temple.” His friend, Dr Baumstark, has left an interesting record of his musical pursuits and of the work of his ‘‘ Sangverein ” at Heidelberg. Among the masters of German prose Thibaut holds no mean place. Nothing could be clearer, more unpedantic and unpretentious, than his exposition ; his prose is scarcely inferior to Lessing’s. Like his speech, his written style was simple and manly, but it is simplicity marked by care, and is rich in the happy accidents of expression which come only to true artists. He liked the old classical

models; he read and reread the classics, ancient and modern, his taste being catholic enough to include Plato and Chrysostom, Montaigne, Hume's Essays, Adam Smith's works, Ferguson's Essay on the History of Civil Society (which he particularly admired), and the later developments of German literature.

Most of Thibaut's works have already been mentioned. Several of them, however, deserve further notice. And first as to his essay on the necessity of a code for Germany ("' Ueber die Nothwendig- keit eines allgemeinen biirgerlichen Rechts fiir Deutschland ").

No more persuasive argument for codification was ever advanced. It has all the vigour of Bentham's arguments for the same cause,

but is without his pamphleteering recklessness of expression. Unlike Hugo, whose education dated back to the time when French ~ literature was supreme in Germany and who felt himself somewhat a stranger to later German culture, Thibaut was of his own time, sensitive to the great change which had come over Germany after the battle of Leipsic, conscious of the insufficiency of Roman law, and eager to promote the greatness of his country. In his con- tribution to the Archiv fir die civilistische Praxis, in 1888, on "the so-called historical and unhistorical school," he tells the history of his memorable essay on the necessity of a code for Germany. He had seen many German soldiers in 1814 about to march to Paris. He realized the change which this denoted ; and out of the fulness of his heart he wrote the essay in a fortnight. The mode of treatment is more comprehensive than the theme ; and to-day, perhaps partly for this reason, the essay is as readable as it ever was; jurists have not yet carried out all the sug- gestions which it contains. For Germany, its soil freed and its honour vindicated, a happy future had, he predicted, been opened up. 'The division into small states was inevitable, and not to be deplored. The existence of great states is always in a sense unnatural ; it implies a warm life only at one point,—a constant repression of individuals for a common object, and no real unity between the rulers and the subjects. Ina land of small states, on the other hand, the peculiarity of each has full play; there is development of variety, and the unity of princes and people is deeper and more living." The

only unity practicable and needful in Thibaut's judgment was one of law; and for such all the German Governments should labour. His review of the state of jurisprudence in Germany is severe ; it recalls the contemporaneous criticisms passed by Bentham on English law. Thibaut pointed out luminously the contrast between the fundamental conceptions of Roman and Gernian society, and the inadequacy of Roman law to supply defects in German jurisprudence. It was not pleasing to many jurists to be told that a few lectures on the laws of the Persians and Chinese would do more to awaken a true judicial sense than minute disquisitions on the Roman law of intestacy— observations the full effect of which Thibaut himself did not perhaps conceive. The essay was as much a condemnation of the entire state of jurisprudence as an argument for codification ; it was a challenge to civilians to justify their very existence. Savigny took up the challenge thus thrown down ; and a long controversy as to points not very clearly defined took place. The glory of the controversy belonged to Savigny; the. real victory rested with Thibaut. By recent legislation Germany has carried out some of the ideas of Thibaut ; and others indicated but not developed in his essay remain to be completed by a scientific school of jurists. One of his works best worth reading is-his Theory of Construction. Though directly applicable to Roman law, it is of general use. The subject is divided into two branches—‘‘ Interpretation nach der Absicht des Gesetzgeber" and ‘‘ Interpretation nach dem Grunde des Gesetzes," or, as Austin expresses the distinction in a marginal note on his copy, ‘‘ What the legislator would have con- templated had he conceived his purpose completely and distinctly, and what the legislator actually contemplated." It would be inter- esting to compare the rules of interpretation stated by Thibaut with the rules of construction, familiar to English lawyers, laid down by Coke in Heydon's Case, 3, 7b, Reports. Thibaut's best-known work is on the Pandects (System des Pandektenrechts, 3 vols., 1808), a part of which was translated by Lord-Justice Lindley. He was one of the earliest to criticize the divisions found in the Institutes, and he carried on with Hugo a controversy as to these points. Thibaut's own classification earlier is unsatisfactory. He divided the subject into public law (that which treats of the relations between Government and subjects), private law, and international law. Public law he subdivided into constitutional law (Staats- recht, the laws binding on the sovereign) and administrative law (Regierungsrecht, or criminal law, and laws relating to finance and police). The laws relating to civil process were dealt with partly

under adininistrative law and partly under private law. Status was placed partly in the former partly in the latter; and the law as to guardianship and parental authority is treatcd as a part of the law of police. Thibaut, however, abandoned in practice this unscientific division. One of his most interesting works is his posthumous treatise on the ‘‘Code Civil,” Lehrbuch. des franzis- ischen Civilrechts in stcter Vergleichung mit dem rémischen Civil-recht. While criticizing the code, which he designates as in the highest degree unsystematic, he recognizes in it merits which German jurists of his time were reluctant to admit.

Jn modern German legal literature Thibaut’s influence is not very perceptible. Even at Heidelberg it was quickly superseded by that of his successor, Vangerow, and in Germany his works are now Httle used as text-books. But those best able to judge Thibaut have most praised him. Austin, who owed much to him, describes him as one “who for penetrating acuteness, rectitude of judgment and depth of learning, and eloquence of exposition may be placed, by the side of Von Savigny, at the head of all living civihans ;” and elsewhere he praises Thibaut’s indefatigable perseverance and

“sagacity not surpassable.” High though such eulogies are, they are scarcely adequate. In Thibaut’s works are promises which he did not fulfil, and they contain fertile suggestions whieh future jurists may utilize. It was not the least of his merits that he introduced seientific methods into legal practice and practical sense into jurisprudence. (J. Mt.)

THIELT, a town of Belgium, in the province of West Flanders, 15 miles south-south-east of Bruges, on a branch line between Ingelmunster and Deynze. It manufactures linen and woollen goods, gloves, vinegar and spirits, and has tanneries and bleacheries. ‘There is also some trade in cattle and grain. The town was of considerable import- ance in the Middle Ages, but was almost entirely destroyed by fire in 1383, a calamity from which it never wholly recovered. The population in 1876 was 10,527.

THIERRY, the name of two excellent French historians, brothers (Augustin and Amédée), both of whom, though their literary and historical faculty was

not quite equal, displayed the same devotion to historical study.

I. Jacques Nicoras Aveustin Tuterry (1795-1856), the elder and most gifted, was born at Blois on the 10th May 1795. He had no advantages of birth or fortune, but was greatly distinguished at the Blois grammar school, and entered the Ecole Normale, an establishment which, designed on the best principles to supply France with perfectly equipped teachers, has on the whole done more service to journalism and literature than to pedagogy. He appears to have been very susceptible to personal influences, and was for a time docile to St Simon and afterwards to Comte. But his real bent was towards more solid studies, and, under the impulse of the strong current setting at the time towards medizval research, he began, and in 1825 published, his History of the Norman Conquest of England, much altered and improved in the later edition of 1840. Two years later he published important Lettres sur Histoire de France, attacking the traditional method of history-writing, and recommending recourse to the original documents. About this time the heavy calamity of blindness threatened him, and by 1830 he had totally lost his sight. His marriage, however, with Julie de Quérengal, a woman of ability, considerably lightened his misfortune, and about the same time he was elected to the Académie des Inscriptions. He continued to pursue his historical studies, now through other eyes, and in 1834 published Dix Ans d'Htudes Historiques, which was followed by his capital work, the Lécits Merovingiens, in 1840. His later years were chiefly occupied in the study of the history of the Tiers Etat, which bore fruit in more than one publication. He died at Paris on May 22, 1856.

The duller school of picturesque Dryasdusts (a rather miraculous combination) who have profited by Thierry's labours and continued his work have sometimes charged both him and his brother with having entered on history with their minds full of Walter Scott, and with having subordinated facts to graphic presentation. The charge is entirely unjust, and is generally found in the mouths of those who are particularly ill qualified to make it, inasmuch as they owe Thierry nearly everything in style. By others he is de- scribed as the founder of the picturesque school, and in this capa- city, nodoubt, he has much to answer for. His own work, how- ever, is of a very high and remarkable character. He had hardly any forerunners, unless Gibbon may be counted as one, and his freedom from the besetting

sin of his own school—the subordina- tion of sober history to picturesque description and romantic narrative—is best seen by comparing him with his contemporary

Barante, who, however, is himself not to be named otherwise than honoris causa.

I]. Amépix Simon Dominique Turerry (1797-1873) was the younger brother of Augustin, and was born on the 2d August 1797. He began life as a journalist (after an essay, like his brother, at schoolmastering), was con- nected with the famous romantic harbinger the Globe, and obtained a small Government clerkship. His first book was a brief history of Guienne in 1825, and three years later appeared the Histoire des Gaulois, which was received

with much favour, and obtained him, from the royalist premier Martignac, a history professorship at Besancon. He was, however, thought too liberal for the Government of Charles X., and his lectures were stopped, with the result of securing him, after the revolution, the important post of prefect of the Haute-Saéne, which he held eight years. During this time he published nothing. In 1838 he was transferred to the council of state as master of requests, which post he held through the revolution of 1848 and the coup d'état till 1860, when he was made senator—a paid office, it must be remembered, and, in effect, a lucrative sinecure. He also passed through all the ranks of the Legion of Honour, became a member of the Académie des Inscriptions in 1841, and in 1862 received the honorary degree of D.C.L. at Oxford. He had, except during the time of his prefecture, never intermitted his literary work, being a constant contributor to the Revue des Deux Mondes, his articles (usually worked up after- wards into books) almost all dealing with Roman Gaul and its period. The chief were the Histoire d Attila (1856), frequently reprinted, the Histoire de la Gaule sous ? Administration Romaine (1840-2), a Tableau de UV Empire Romain, and, in imitation of his brother, certain Récits of Roman history, a book on St Jerome in 1867, and one on Chrysostom and Hudoxia in 1873. He died March 21, 1Ots.

His literary and historical genius was perhaps inferior to his brother's, and he exhibits more of the defects of the anecdotic method of writing history, but he shared Augustin's passion for going to the fountainhead and for animating the dry bones of mere chronicles and mere academic discussions with accounts of the life of peoples.

THIERS, a town of France, chef-lieu of an arrondisse- ment in the department of Puy-de-Déme, on the railway between Clermont and St Etienne, 24 miles east-north- east of the former town. It is most picturesquely situated on the side of a hill, at the foot of which the Durolle rapidly descends through a narrow valley into the Dore, in its turn a tributary of the Allier. The streets, rising in steep rows, contain many wooden and gabled houses, sonie of which are as old as the 15th century, and a fine view of the Plain of Limague and the Dime Hills is obtainable from the terraces. All the processes of making cutlery may be seen at Thiers, giving employment to 12,000 work- men in the town and the villages within a radius of 6 to 7 miles. Sheath-making, tanning, and paper-making (chiefly stamps and playing cards) employ 8000 hands, and the business done reaches £1,200,000 perannum. The churcli of Le Moutier, so named from a Benedictine monastery of which it formed part, contains building of the 7th, 8th, and 11th centuries; the tower is more modern. There were 12,005 inhabitants in 1886 (commune 16,754).

Thiers was sacked in 523 by the soldiers of Thierry, the son of Clovis; and Gregory of Tours speaks of a wooden ehapel which then existed here (on the site of the present church of Le Moutier). The church of St Genez was built in 573 by Avitus, bishop of Clermont, on the site of the ancient Tigernwm Castrwm, was rebuilt in 1016 by Wido, lord of Thiers, and again in the 12th century. There is some curious mosaic work of the 12th century, and a fine tomb of the 13th. The commercial importance of Thiers was greatly increased three centuries ago, when the manufacture of the larger kinds of cutlery was introduced from Chateldon, between Vichy and Thiers.

THIERS, Louis ApotpHE (1797-1877), "liberator of the territory," as even the short-lived gratitude of France continues to call him, was born at Marseilles on April 16, 1797. His family are somewhat grandiloquently spoken of as 'cloth merchants ruined by. the Revolution," but it seems that

at the actual time of his birth his father was a locksmith. His mother belonged to the family of the Chéniers, and he was well educated, first at the Lycée of Marseilles, and then in the faculty of law at Aix. Here he began his life-long friendship with Mignet, and was

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called to the bar at the age of 23. He had, however, little taste for law and much for literature ; and he obtained (it is said by an ingenious trick, and in spite of unfair and prejudiced attempts to deprive him of it) an academic prize at Aix—for a discourse on Vauvenargues. In the early autumn of 1821 Thiers went to Paris, and was quickly introduced as a contributor to the Constitutionnel, at first on literary and then on general and especially political subjects, as well as art and the drama. In each of the years immediately following his arrival in Paris he collected and published a volume of his Constitutionnel articles, the first on the salon of 1822, the second ona tour in the Pyrenees. He was put out of all need of money by the singular benefaction of Cotta, the well- known Stuttgart publisher, who was part-proprietor of the Constitutionnel, and made over to Thiers his dividends, or part of them. Meanwhile he became very well known in Liberal society, especially in the house of Laffitte, and he had begun and was rapidly compiling (at first with the assistance of M. Felix Bodin and afterwards alone) the celebrated Histoire de la Révolution Francaise, which founded his literary and helped his political fame. The first two volumes appeared in 1823, the last two (of ten) in 1827. The book brought him little profit at first, but became immensely popular. The well-known sentence of Carlyle, that it is “as far as possible from meriting its high reputation,” is in strictness justified, not merely in regard to this, but in regard to all Thiers’s historical work, which is only too frequently marked by extreme inaccuracy, by prejudice which passes the limits of accidental unfairness ant sometimes seems to approach those of positive dishonesty, and by an almost complete indifference to the merits as compared with the successes of his heroes. But Carlyle himself admits that Thiers is “a brisk man in his way, and will tell you much if you know nothing.” In other words, the Histoire de la Révolution (again like its author’s other work) possesses in a very high degree the gifts of clearness, liveliness, and intelligible handling which so often distinguish French writing. Coming as it did just when the

reaction against the Revolution was about to turn into another reaction in its favour, it was assured of success.

For a moment it seemed as if the author had definitely chosen the lot of a literary man, even of a literary hack. He planned an Histoire Générale, and was about to survey mankind from China to Peru on the deck of a French man-of-war as a preliminary process. But the accession to power of the Polignac ministry in August 1829 changed his projects, and at the beginning of the next year Thiers, with Armand Carrel, Mignet, and others, started the National, a new opposition newspaper, which openly attacked the older Bourbon line and was foremost in pro- voking the famous and fatal Ordonnances of July. Thiers himself was the soul (or at least one of the souls) of the actual revolution. What share he had in the process sometimes attributed to him of " overcoming the scruples of Louis Philippe" is no doubt a debateable question, with the problem im imine of the debate whether Louis Philippe had any scruples to overcome. At any rate Thiers had his reward. He ranked, if not at once, yet very soon, as one of the radical though not republican supporters of the new dynasty, in opposition to the party of which his rival Guizot was the chief literary man, and Guizot's patron the duke of Broglie the main pillar among the nobility, and which might be called by comparison Conservative. At first Thiers, though elected deputy for Aix, obtained only subordinate places in the ministry of finance. After the overthrow of his patron Laffitte, he seemed to change his politics and became much less radical, and, after the troubles of June 1832, this tend-

ency was strengthened or rewarded by his appointment to the ministry of the interior. He repeatedly changed his portfolio, but.remained in office for four years, became president of the council and in effect prime minister, and began the series of quarrels and jealousies with Guizot which make one of the chief and not the most creditable features of the politics of the reign. At the time of his resignation in 1836 he was foreign minister, and, as usual, wished for a spirited policy in Spain, which he could not carry out. He travelled in Italy for some time, and it was not till 1838 that he began a regular campaign of parliamentary opposition, which in March 1840 made

him president of the council and foreign minister for the second time. But he held the position barely six months, and, being unable to force on the king an anti-English and anti-Turkish policy, resigned on October 29, after having, as was generally thought, with the direct purpose of stir- ring up Anglophobia, begged the body of Napoleon from England. This was made the occasion of the ceremony immortaliy ridiculed by Thackeray, and, it is said, con- demned by Thiers himself as unworthy of the occasion. He now had little to do with politics for some years, and spent his time on the preparation, on a much larger scale than his first work, of his Histoire du Consulat et de Empire, the first volume of which appeared in 1845, and which continued to occupy him for more than twenty years of composition and nearly twenty of publication. During the interval, though he was still a member of the chamber, he spoke rarely, but after the beginning of 1846 his appearances were more frequent, and he was evidently bidding once more for power on the liberal and reforming side. Immediately before the revolution of February he went to all but the greatest lengths, and whien it broke out he and Odillon Barrot were summoned by the king, but it was too late. Thiers was unable to govern the forces he had helped to gather, and he resigned.

Under the republic he took up the position of conserva- tive republican, which he ever afterwards maintained (his acceptance of the republic being not much more heartfelt than his subsequent acceptance, after an interval, of the empire), and he never took office. But the consistency of his conduct, especially in voting for Prince Louis Napoleon as president, was often and sharply criticized, one of the criticisms leading to a duel with a fellow deputy, Bixio. On the whole, his conduct during these years, and still more during the last years of Louis Philippe, may be said to have been not wholly creditable. He was arrested at the coup d’état (when some malicious and apparently false stories were spread as to his cowardice), was sent to Mazas, and then escorted out of France. But in the following summer he was allowed to return. For the next decade his history was almost a blank, his time being occupied for the most part on Zhe Consulate and the Empire. It was not till 1863 that he re-entered political life, being elected by a Parisian constituency in opposition to the Government candidate. For the seven years follow- ing he was the chief speaker among the small band of anti-Imperialists in the French chamber, and was regarded generally as the

most formidable enemy of the empire, — all the more formidable because he never gave occasion for taking any violent steps against him. It has been pointed out that, while nominally protesting against the foreign enterprises of the empire, he perpetually harped on French loss of prestige, and so contributed more than any one else to stir up the fatal spirit which brought on the war of 1870, and that, while constantly criticizing and weakening the Government of his country, he gave it no help nor even offered any. Even when the Liberal- Imperialist Ollivier ministry was formed, he maintained at first an anything but benevolent neutrality, and then

an open opposition, and it would be pleasant to feel more certain than we can feel that his vigorous denuncia- tion of the war with Prussia was the result of honest conviction, and not inerely of the fact that it was not Avs war. At any rate, it brought him great unpopularity for the moment, with a corresponding reaction of gratitude when the crash came. Again it is impossible to be sure whether mere “ canniness,” or something better, kept him from joining the Government of the National Defence, of which he was in a manner the author.

Nevertheless the collapse of the empire was a great opportunity for Thiers, and it was worthily accepted. He undertook in the latter part of September and the first three weeks of October a circular tour to the different courts of Europe, in the hope (which he probably knew to be a vain one, though the knowledge neither daunted his spirit nor relaxed his efforts) of obtaining some inter- vention, or at least some good offices. The mission was unsuccessful; but the negotiator was on its conclusion immediately charged with another—that of obtaining, if possible, an armistice directly from Prince Bismarck. For a time this also failed, as the Provisional Government would not accept the German conditions; but at last France was forced to yield. The armistice having been arranged, and the opportunity having been thus obtained of electing a National Assembly, Thiers was chosen deputy by more than twenty constituencies (of which he preferred Paris), and was at once elected by the Assembly itself practically president, nominally “chef du pouvoir exé- cutif.” He lost no time in choosing a coalition cabinet, and then personally took up the negotiation of peace. Probably no statesman has

ever had a more disgusting task ; and the fact that he discharged it to the satisfaction of a vast majority, even in a nation popularly reputed the vainest, the least ballasted with common sense, and the most ungrateful to public servants who are unsuccessful, is the strongest testimony to Thiers's merits. After contest- ing the matter, on the one side with the determination of Germany to have the pound of flesh, on the other with the reluctance of the Assembly to submit to the knife, he succeeded in convincing the deputies that the peace was necessary, and it was (March 1, 1871) voted by more than five to one.

Thiers held office for more than two years after this event,—a length of tenure which, in the circumstances and considering the French temper, is very surprising, and shows the strength of the general conviction that he alone could be trusted. He had at first to meet and crush at once the mad enterprise of the Paris commune ; and the severity which was undoubtedly shown in doing this is more than justified by two considerations,—first, that failure to suppress it would have meant anarchy through- out France; and, secondly, that the Germans would almost to a certainty have made it a pretext for further demands. Soon after this was accomplished, Thiers be- came (August 30) in name as well as in fact president of the republic, and he set himself with vigour and success to the tasks of rearranging the army, the finances (includ- ing the paying off of the war indemnity), and the civil

service, and of procuring the withdrawal of the German

arnly of occupation.

The strong personal will and inflexible opinions of the president had much to do with the resurrection of France ; but the very same facts made it inevitable that he should excite violent opposition. It seems to be gene- rally acknowledged that to him personally were due the establishment and retention of the republican rather than the monarchical form of government, to which latter the Assembly as first elected was notoriously disposed. He was a confirmed protectionist, and free-trade ideas had

made great way in France under the empire ; he was an advocate of long military service, and the devotees of la revanche were all for the introduction of general and com- pulsory but short service. Both his talents and his temper made him utterly indisposed to maintain the distant, Olympian, apparently inactive, attitude which is supposed to be incumbent ona republican president ; and (for his tongue was never a carefully governed one) he sometimes let drop expressions scarcely consistent with constitutional theories of the relation of the chief of the state, whether president or king, to parliament. In January 1872 he formally tendered his resignation; but the country was then in too manifestly disorganized a condition to allow even his enemies to accept it. His position, however, was clearly one not tenable for long in such a country as France. The Right (and not merely the Extreme Right) hated him for his opposition to the restoration of the monarchy, and with some justice reminded him of former declarations and opinions on the subject ; the Extreme Left could not forgive the suppression of the commune, while some radical leaders, who may have had little sympathy with the commune itself, saw in his great reputation and imperious personality a bar to their own accession to power. His chief supporters—men like Rémusat, Barthélemy Saint- Hilaire, and Jules Simon—were men rather of the past than of the present ; and he had few younger adherents.

The year 1873 was, as a parliamentary year in France, occupied to a great extent with attacks on Thiers. In the early spring regulations were proposed, and on April 13 were carried, which were intended to restrict the executive and especially the parliamentary powers of the president. On the 27th of the same month a contested election in Paris, resulting in the return of the opposi- tion candidate, M. Barodet, was regarded as a grave disaster for the Thiers Government, and that Government was not much strengthened by a dissolution and recon- stitution of the cabinet on May 19. Immediately after- wards the question was brought to a head by an interpel- lation moved by the duke of Broglie. The president declared that he should take this as a vote of want of confidence ; and in the debates which followed a vote of this character (though on a different formal issue, and proposed by M. Ernoul) was carried by 16 votes in a house of 704. Thiers at once resigned (May 24).

He survived his fall four years, continuing to sit in the Assembly, and, after the dissolution of 1876, in the Chamber of Deputies, and sometimes, though rarely, speaking. He was also, on the occasion of this dissolution, elected senator for Belfort, which his exertions had saved for France ; but he preferred the lower house, where he sat as of old for Paris. On May 16, 1877, he was one of the “363” who voted want of confidence in the Broglie ministry (thus paying his debts), and he took considerable part in organizing the subsequent electoral campaign. But he was not destined to see its success, being fatally struck with apoplexy at St Germain-en-Laye on September 3. Thiers had long been married, and his wife and _ sister-in-law, Mlle. Dosne, were his constant companions ; but he left no children, and had had only one—a daughter,—who long predeceased him. He had been a member of the Academy since 1834. His personal appearance was remarkable, and not imposing, for he was very short, with plain features, ungainly gestures and manners, very near-sighted, and of disagreeable voice; yet he became (after wisely giving up anattempt at the ornate style of oratory) a very effective speaker in a kind of conversational manner, and in the epigram of debate he had no superior among the statesmen of his time except Lord Beaconsfield.

Thiers is by far the most gifted and interesting of the group of literary statesmen—not statesmen who have had a penchant for

litcrature, but men of letters whose litcrary distinction has made them politicians—which forms a unique feature in the French political history of this century. Numerous as these are, there are only two who are at all comparable to him—Guizot and Lamartine ; and as a statesman he stands far above both. Noris this eminence merely due to his great opportunity in 1870 ; for Guizot might under Louis Philippe have almost made himself a French Walpole, at

least a French Palmerston, and Lamartine’s opportunitics aftcr 1848

were, for a man of political genius, illimitable. But both failed, —Lamartine almost ludicrously,—while Thiers in hard conditions made a striking if not a brilliant success.

As a man of lettcrs Thiers is very much smaller. He has not only the fault of diffuseness, which is common to so many of the best-known histories of this century, but others as scrious or more so. The charge of dishonesty is one never to be lightly made against men of such distinction as his, especially when their evi- dent confidence in their own infallibility, their faculty of ingenious casuistry, and the strength of will which makes them (unconsciously, no doubt) close and keep closed the eyes of their mind to all ineon- venicnt facts and inferences supply a more charitable explanation. But it is certain that from Thiers's dealings with the men of the first Revolution to his dealings with the battle of Waterloo, constant, angry, and well-supported protests against his unfairness were not lacking. Although his search among doeuments was undoubtedly wide, its results are by no means always accurate, and his admirers themselves admit great inequalities of style in him. These characteristics reappear (accompanied, however, by frequent touches of the epigrammatic power above mentioned, which seems to have come to Thiers more readily as an orator or a journalist than as an historian) in his speeches, which have, since his death, been collected in many volumes by his widow. Sainte-Beuve, whose notices of Thiers are generally kindly, says of him, ''M. Thiers sait tout, tranche tout, parle de tout," and this omniscience and "'cocksureness" (to use the word of a prime minister of England con- temporary with this prime minister of France) are perhaps the chief pervading features both of the statesman and the ian of letters.

His histories, in many different editions, and his specches, as above, are easily accessible; his minor works and newspaper articles have not, we believe, becn collected in any form. Works on him, by M. Laya, M. de Mazade, his colleague and friend M. Jules Simon, and others, are numerous. But a thorough biograph- ical study of him has not yet been made; and, though inonuments enough have been raised in his own country, {t is even there often complained that the incessant and futile political struggles of the last ten years have too much obscured the reputation and weakened the memory of the last great statesman of France. (G. SA.)

THIRLWALL, Connor (1797-1875), bishop of St David's, was born at Stepney on 11th January 1797, and was the son of the Rev. Thomas Thirlwall, at the time lecturer at St Dunstan's, Stepney, and afterwards

rector of Bowers Gifford, in Essex. The family were of North- umbrian extraction. Young Connop showed the most remarkable precocity, learning Latin at three, reading Greek at four, and writing sermons at seven. When he was twelve his admiring father published his Primitiz, sermons and poems, the thoughts of an imitative boy in the style of a grown man. . No especial greatness could have been safely predicted from these performances, which Thirlwall assiduously strove to suppress in after years. He shortly afterwards went to the Charterhouse, where

he wrote a number of letters to a friend named John Candler, some of which have been preserved. They dis- play the same extraordinary prematurity, but are barren of anything original except what he himself calls “ sensi- bility to the great and beautiful in morality.” By a curious coincidence his future rival in Greek history, Grote, and Hare, his coadjutor in the translation of Niebuhr, were among his schoolfellows. He took up his residence at Trinity College, Cambridge, in October 1814, and gained the Craven university scholarship, one of threc recorded instances of this honour being obtained by fresh- men, and the chancellor’s classical medal. In October 1818 he was elected to a fellowship, and immediately went for a year’s travel on the Continent. At Rome he gained the friendship of Bunsen, which had a most import- ant influence on his life. On his return, “distrust of his own resolutions and convictions” led him to abandon for the time his intention of being a clergyman, and he settled down to the study of the law, “with a firm determination not to suffer it to engross my time so as to prevent me from pursuing other branches of knowledge.” This was not the way to become lord chancellor, and, though he afterwards says, ‘‘My aversion to the law has not in- creased,” he adds, “It scarcely could.” How little his heart was with it was shown by the labour he soon im- posed upon himself of translating and prefacing Schleier- macher’s essay on the Gospel of St ~~Luke, “very injudi~~ ciously,” says Maurice, who seems to think that it may have cost Thirlwall the archbishopric of Canterbury. The translation, nevertheless, marks an era in English theology. He further, probably influenced by Hare, who had already translated Tieck, rendered two of the latter’s most recent Novellen into English. In 1827 he at length made up his mind to quit his uncongenial profession, and was ordained deacon the same

year. Beyond all question he might have obtained the highest distinction both as jurist and advocate, had law interested him more, or other things less. No one ever possessed a more judicial mind. Of his oratory, Mill, whom he opposed at a debating society, says, ‘‘ Before he had uttered ten sentences I set him down as the best speaker I had_ever heard, and I have never since heard any one whom I placed above him.”

It is not often that a scholar twice makes an epoch by a translation. Such was Thirlwall’s destiny : he joined with Hare in translating Niebuhr’s ZZistory of Rome ; the first volume appeared in 1828. The translation was attacked in the Quarterly as favourable to scepticism, and the translators jointly replied. In 1831 the friends estab- lished the Philological Museum, which lived through only six numbers, though among Thirlwall’s contributions was his masterly paper on the irony of Sophocles,—“ the most exquisite criticism I ever read,” says Sterling. On Hare’s departure from Cambridge in 1832, Thirlwall became assistant college tutor, which led him to take a memor- able share in the great controversy upon the admission of Dissenters which arose in 1834. Dr Turton, the regius professor of divinity, had written a pamphlet objecting to the admission, on the pretext of the apprehended un- settlement of the religious opinions of young churchmen. Thirlwall replied by pointing out that no provision for theological instruction was in fact made by the colleges except compulsory attendance at chapel, and that this was mischievous. This attack upon a time-hallowed piece of college discipline brought upon him a demand for the resignation of his office as assistant tutor. He complied at once ; his friends generally thought that he ought to have tested the master’s power. ‘The occurrence marked him out for promotion from a Liberal Government, and in the autumn lie received the chancellor’s living of Kirby- under-Dale, in Yorkshire. Though devoted to his par-

ochial duties, he found time to begin the book which has remained the principal work of one whose performance, however great, rarely rose to the level of his power. His History of Greece, unfortunately for him and for us, was a commission from Lardner’s Cabinet Cyclopedia, and was originally

intended to have been condensed into two or three duodecimo volumes. The scale was enlarged, but Thirlwall always felt cramped. He seems a little below his subject, and a little below himself. Yet, such was his ability that his history is usually allowed to fall only just short of Grote's, a work undertaken with far greater enthusiasm, and executed with far greater advantages. Sterling pronounces him "'a writer as great as Thucydides and Tacitus, and with far more knowledge than they." The first volume was published in 1835, the last in 1847. A noble letter from Thirlwall to Grote, and Grote's generous reply, are published in the life of the latter.

In 1840 Thirlwall was raised to the see of St David's. The promotion was entirely the act of Lord Melbourne, an, amateur in theology, who had read Thirlwall's introduction to Schleiermacher, and satisfied himself of 'the propriety of the appointment. 'I don't intend to make a heterodox bishop if I know it," he said. Thirlwall so little expected the honour that he was absent on a pedestrian tour, and it was some days before he could be found. In most essential points he was a model bishop, and in acquainting himself with Welsh, so as to preach and conduct service in that language, he performed a feat which few bishops could have imitated. It cannot be said that he was greatly beloved by his clergy, who felt their intellectual distance too great, and were alternately frozen by his taci- turnity and appalled by his sarcasm. The great monu- ment of his episcopate is the eleven famous charges in which he from time to time reviewed the position of the English Church with reference to whatever might be the most pressing question of the day,—addresses at once judicial and statesmanlike, full of charitable wisdom and massive sense. No similar productions, it may safely be said, were ever so eagerly looked for, or carried with them such weight of authority. His endeavours to allay ecclesi- astical panic, and to promote liberality of spirit, frequently required no ordinary moral courage. He was one of the four prelates who refused to inhibit Bishop Colenso from preaching in their dioceses, and the only one who with- held his signature from the addresses calling upon Colenso to resign his see. He took the liberal side in the questions of Maynooth, of the admission of Jews to parliament, of the Gorham case, and of the conscience clause. He was the only bishop who voted for the disestablishment of the Irish Church, though but as a painful necessity. Concur- rent endowment would have been much more agreeable to him. For many years he was the only statesman on the

bench ; it would have been a great benefit to the Church of England had it been possible to have raised him to the primacy upon the death of Archbishop Howley. But such was the complexion of ecclesiastical politics that the eleva- tion of the most impartial prelate of his day would have been resented as a piece of party spirit.

Thirlwall's private life was happy and busy. He never married, but found sufficient outlet for his deep affection- ateness of nature in his tenderness to the children of others, and to all weak things except weak-minded clergy- men. He was devoted to animals, and rivalled Southey and Jeremy Bentham in his love for cats. Perhaps the most durable monument to his memory will be his incomparable volume of letters to a friend, Miss Johnes of Dolaucothy, a young lady in every way worthy to be the correspondent of such a man. Even as letters these rank with the best in the language ; but as letters from age to youth, sym- pathizing with all its feelings, entering into all its pleasures,

at once inspiring and amusing, guiding without seeming to direct, aud entertaining without seeming to condescend, they are unique in their delightful branch of literature, They are also important as revealing Thirlwall's mind on numerous subjects which he has not elsewhere treated, and most interesting from their picture of simplicity of char- acter associated with greatness of intellect, and of the multiplicity of his intellectual interests, from which novels and fine art were by no means excluded. During his latter years he took great interest in the revision of the authorized version of the Bible, and was chairman of the revisers of the Old Testament. He resigned his see in May 1874, and retired to Bath, where he died on July

27, 1875.

As scholar, critic, and ecclesiastical statesman Thirlwall is almost above praise. He was not a great original thinker ; he lacked the creative faculty and the creative impulse. The world owes such vestiges of his power as it possesses to a series of fortunate accidents—an importunate editor, vexatious church controversies, and an admirable friend. Though not most

fully exerted, the force of his mind is perhaps best appreciated in the volume of his letters edited by Dean Perowne. His treatment of every question is consummate ; the largest and the smallest seem alike to him. His character, with its mixture of greatness and gentleness, was thus read by Carlyle :—‘“‘a right solid honest-hearted man, full of knowledge and sense, and, in spite of his positive temper, almost timid.”

Thirlwall’s History of Greece remains a standard book. His literary and theological remains have been edited by Dean Perowne in three volumes, two of which are oceupicd by his charges. His letters on literary and thcological subjects, with a connecting memoir, have been published by Dean Perowne and the Rev. Louis Stokes. His Letters to a Friend were originally published by Dean Stanley, and there is a revised and corrected edition. For a general vicw of Thirlwall’s life and character, see the Edinburgh Review, vol. cxliii.; for a picture of him in his diocese, Temple Bar, vol. lxxvi. The review of his letters in Blackwood’s Maga- zine for 1852 is by the late Rev. W. Lucas Collins. (R. G.)

THIRSK, a market-town in the North Riding of York- shire, is situated on the North Eastern Railway, and on the Codbeck, a branch of the Swale, 21 miles south of Darlington, 11 north-east of Ripon, and 210 north of London. The Codbeck is crossed by two stone bridges connecting the old and the new town. The church of St Mary, in the Perpendicular style, with parvise, chancel, nave, aisles, porch, and tower 80 feet in height, is the noblest church in the Riding. The chancel was repaired in 1844, and the whole building restored in 1877. The moat of the ancient castle built by the Mowbrays about 980 still remains. The principal modern buildings are the assembly rooms (1849), the mechanics’ institute (1852), and the new court-house (1886). Standing in the fertile district of the Vale of Mowbray, the town has an extensive home and foreign agricultural implement trade. Iron-founding, engineering, tanning, and brickmaking are carried on, and there are large flour-mills. The population of the parliamentary borough, now disfranchised (area 11,828 acres), in 1871 was 5734, and in 1881 it was 6312. The population of the township in 1881 was 3337.

Thirsk owes its origin to the castle of the Mowbrays, and here Roger de Mowbray erected his standard, in conjunction with tho king of Scotland,

against Henry II. Upon tho suppression of the revolt the castle was destroyed. In the rcign of Henry VII., Henr Percy, earl of Northumberland, is said to have bcen put to death beneath an elm tree which formerly grew on St James's Green. Thirsk was a borough by prescription, but was never incorporated. It first returned members to parliament in the reign of Edward I., but not again till the last parliament of Edward VI. In 1882 the

number of representatives was reduced to one, and in 1885 it ceased to be separately represented.

THISTLE. This term, as generally employed, is of vague application, being given to almost any herbaceous plant that is of a spiny character. More strictly, it is ap-

plied to the species of Carduus. These are Composite herbs with very spiny leaves, and similar bracts surrounding a head of purplish-white, tubular, 5-parted flowers seated on a pitted and hairy receptacle. The anthers have append- ages both at the apex and at the base. The style has a ring of hairs at the point of bifurcation of the two stig- mata. The fruit is surmounted by a tuft of silky white hairs. The species are numerous, and some are of great beauty, though not unnaturally looked on with disfavour by the farmer. The Cotton Thistle, remarkable for its covering of white down, is Onopordon Acanthium ; the Blessed Thistle is Carduus benedictus ; the Holy Thistle, the leaves of which are spotted with white, is C. Mari- anus. The common C., lanceolatus seems to be the most suitable prototype for the Scotch Thistle, though that honour is also conferred on Onopordon Acanthium, the cotton thistle, a doubtful native, and on other species. The great objection to thistles from an agricultural point

of view resides in the freedom with which they produce,

seed, and in the vigour of their underground growth, which makes their uprooting a matter of difficulty. Partial up- rooting may indeed, in the case of the perennial species, increase the mischief, for each fragment left behind may grow into a distinct plant. Annual species might be kept in check were they cut down before the flowers appear, but unless all the cultivators in a

particular district co-operate the efforts of individuals are of little avail. The Globe Artichoke and Cardoon are very near allies of the thistles. The Safflower, Carthamus, another thistle, yields a service- able dye; the Burdock, Arctiwm lappa, has an edible root ; and numerous allied species have medicinal properties.

THISTLE, Orper or THE. See KnicHuTHooD, vol. xiv. p. 123.

THISTLEWOOD CONSPIRACY, or Cato STREET Conspiracy, a plot formed in 1820 to murder Lord Castlereagh and other ministers of the British crown, and to seize the Bank and Mansion-House and proclaim a pro- visional government. Its chief instigator was Arthur Thistlewood, or properly Thistlewaite, born in 1770, the son of a civil engineer in Lincolnshire, who had held a commission in the militia and afterwards in the line in the West Indies. In America and in France he had imbibed revolutionary views, and, having lost his wife's fortune in speculation and on the turf, had planned the desperate sclieme probably for his own benefit as well as the good of the nation. The intention was to murder the ministers in the house of the earl of Harrowby in Mansfield Street on the evening of the 23d February. For this przpose between twenty and thirty men assembled in a stable in Cato Street, Edgeware Road, but while they were arming themselves they were pounced upon by the police, and a large number captured, though the majority, including Thistlewood, escaped. A reward of £1000 having been offered for Thistlewood, he was arrested next day at 10 White Street. After a trial Thistlewood and four others were executed on the lst May, while five were transported. On being asked on the scaffold if he repented, Thistlewood replied, '" No,

not at all; I shall soon know the last grand secret."

See the Trials of Arthur Thistlewood, James Ings, John Thomas Brunt, Richard Tidd, William Davidson, and others at the Session of the Old Batley 17-28 April 1820, 2 vols., 1820; and the Genileman's Magazine for the same year.

THOLUCK, Friepricu Aucust Gorrreu (1799-1877), German theologian and preacher, was born at Breslau, March 30, 1799, in humble circumstances. He received his education at the grammar school and

university of his native town, and early distinguished himself by wonder- ful versatility of mind, a phenomenal power of acquiring languages, and an omnivorous appetite for books. A romantic love of the East and its literature led him to exchange the university of Breslau for that of Berlin, that he might study Oriental languages to greater advan-

tage, and there he was received into the house of the Orientalist Von Dietz. He was introduced to Pietistic circles in Berlin, and came specially under the influence of Baron Von Kottwitz, who became his "'spiritual father," and of the historian Neander. Before deciding on the career of theological professor, he had in view that of a missionary in the East. Meanwhile he was feeling the influence to a certain degree of the romantic school, and of Schleier-

'macher and Hegel too, though he never sounded the

depths of their systems. At length, in his twenty-first year, he finally decided to adopt the academical calling. From December 1820 to April 1826 he was ''privat-docent " and " prof. extraordinarius " of theology in Berlin, though he was at the same time most active in the work of home and foreign missions. He lectured on the Old and New Testaments, theology, apologetics, and the history of the church in the 18th century. The first fruit of his Oriental studies and his introduction to his profession was his work

_Ssufismus, sive Theosophia Persarum Pantherstica (1821) ;

following the same line of study he published Lliiten- sammlung aus der morgenldndischen Mystik (1825) and Speculative Trinititslehre des spiiteren Orients (1826). His well-known essay on the nature and moral influence of heathenism (1822) was published by Neander, with high commendation, in his Denkwiirdigkeiten; and his Com- mentary on the Epistle to the Romans (1824) secured him a foremost place amongst the most suggestive, if not the most accurate, Biblical interpreters of that time. An- other work, which was soon translated into all the prin- cipal European languages, Die Lehre von der Stinde und vom Versdhner (1823), the outcome of his own religious history, procured for him the position which

he ever after held of the modern Pietistic apologist of evangelical Christianity. In 1825, with the aid of the Prussian Govern- ment, he visited the libraries of England and Holland, and on his return was appointed professor of theology at Halle, the centre of German rationalism. Here he made it his aim to combine in a higher unity the learning and to some extent the rationalism of Semler with the devout and active pietism of Francke ; and, in spite of the opposition of the theological faculty of the university, he succeeded in changing the character of its theology. This he effected partly by his lectures, particularly his exegetical courses, but, above all, by his personal influence upon the students, and, after 1833, by his preaching. His theological position was that of a mild and large-hearted orthodoxy, which laid more stress upon Christian experience than upon rigid dogmatic belief. On the two great questions of miracles and inspiration he made great concessions to modern criticism and philosophy. The battle of his life was on behalf of personal religious experience, in opposition to the externality of rationalism, orthodoxy, or sacrament- arianism. He fought this battle with weapons taken in the first instance from his own personal history, but also from the wide world of human culture, ancient and modern. Carl Schwarz happily remarks that, as the English apolo- gists of the 18th century were themselves infected with the poison of the deists whom they endeavoured to refute, so Tholuck absorbed some of the heresies of the rationalists whom he tried to overthrow. As a preacher Tholuck ranked amongst the foremost of his time. He was also one of the prominent members of the Evangelical Alliance, and few men were more widely known or more beloved throughout the Protestant churches of Europe and America than he. He died at Halle, June 10, 1877.

After his commentaries (on Romans, the Gospel of John, the Sermon on the Mount, and the Epistle to the Hebrews) and several volumes of sermons, his best-known books are Stunden christlicher Andacht (1889, 8th ed. 1870), intended to take the place of Zschokke’s standard rationalistic work with the same title, and his reply to Strauss’s Life of Jesus (Glaubwiirdigkeit der evangelischen

Geschichte, 1837). He published at various times valuable contribu- tions towards a history of rationalism,—Vorgeschichte des Ration- alismus (1853-62), Geschichte des Rationalismus, i. (1865), and a number of essays connected with the history of theology and espe- cially of apologetics. His views of inspiration were indicated in his work Die Propheten und thre Weissagungen (1860), in his essay on the “Alte Inspirationslehre,” Deutsche Zeitschrift fir christliche Wissenschaft (1850), and in his Gesprdche wiber die vornehmsten Glaubensfragcn der Zcit (1846, 2d ed. 1867).

See Das Leben Tholucks, by L. Witte, 2 vols., 1884-1886; A. Tholuck, ein Lebens- abriss, by M. Kihler (1877), and the same author’s art. ‘‘Tholuck,” in Herzog’s Real-Encyklopédie; ‘‘Zur Erinnerung an Tholuck,” by C. Siegfried, Protestant- ische Kirchzettung, 1885, No. 45, and 1886, No. 47; Carl Schwarz, Zur Geschichte der neuesten Theologie (4th ed., 1869); Nippold’s Handbuch der neuesten Kirchen- geschichte. :

THOMAS, Sz, one of the twelve apostles. The synop- tical Gospels give only his name, associating him in their lists with Matthew (Mat. x. 3; Mark iii. 18; Luke vi. 15); in Acts i 13 he is coupled with Philip. In the Gospel of John (xi. 16; xiv. 5; xx. 24 sq.; xxi. 2) he appears in a characteristic light, full of personal devotion and ready to die with his Master, but slow to grasp the true significance of the redeeming death of Jesus, and incredulous of the resurrection till direct evidence con- vinces him of its truth and at the same time of the Divinity of his risen Lord. John translates the Aramaic name or surname Thomas (N18) by the Greek equiva- lent Didymus (twin). Tradition has it that he was the twin brother of a sister Lysia (his parents being Diophanes and Rhoa, and his birthplace Antioch; “XII. Apost. Patric,” in Chron. Pasch., ii. 142), or of a brother Elieser (Hom. Clem., ii. 1), or, according to the Acta Thome (ed. Bonnet, pp. 11, 23), of Jesus Himself. The last form of the tradi- tion seems to be derived from the name Judas Thomas, which he bears in Edessene legend (cf. Eusebius, ZZ. Z., i, 18, 10), and implies the identification of Thomas with Judas, the brother of the Lord. The most ancient tradi- tion makes Thomas the evangelist of Parthia (Eus., HZ. #., iii. 1, 1); and at Edessa, which claimed to possess his bones, it was related that their missionary Thaddeus (Eus., H. H., i. 13, 10), or Addai (Doctrine of Addai, ed. Phillips,

1876, p. 5), was sent to them by him. Later tradition, originating with the Gnostic Acta Thome, and accepted by catholic teachers from the middle of the 4th century, makes him proceed to India and there suffer martyrdom. The Indian king Gundaphorus of the Acta is, however, certainly identical with the historical Gondophares (see Persia, vol. xviii. p. 603), whose dynasty was Parthian, though his realm included regions loosely reckoned to India. The Parthian and Indian missions of Thomas may perhaps therefore be regarded as derived from a single tradition. Later authors, but not the Acta, give as the scene of his martyrdom the city of Calamine, which the modern Christians of St Thomas (see below) identify with Mylapur, but which Gutschmid would connect with the Calama of Nearchus, on the coast of Gedrosia, which was under the sceptre of Gondophares. Other names of his- torical persons and places can be traced with more or less probability in the Acta, but these do not alter the utterly apocryphal character of the legend, which indeed is in many respects easier to understand if we accept the bold hypothesis of Gutschmid, that it was borrowed by the Gnostic author from a Buddhist story of the conversion of Arachosia (IV. Rhein, Mus., xix. 161 sq.).

The Acta Thomx, very imperfectly published by Thilo (1823) and Tischendorf (1851), have been edited in Greek, together with the Latin De Miraculis and Passio §. Thome, by Bonnet (Leipsic, 1883), and in Syriac, with an English translation, by W. Wright (Apocryphal Acts, 2 vols., London, 1871). See also Lipsius, Die apocryphen Apostelgeschichten, vol. i. (Brunswick, 1883), for these and other versions of the legend. The Acta are said by Photius to be a part of the Meploda: ray &roordéAwy of the Gnostic Leucius Charinus, but this unknown personage is to be thought of asa col- lector of Gnostic ‘* Acts of Apostles,” rather than as the first author.

In spite of extensive catholic revision, they form one of the most Interesting monuments of early Gnosticism. Internal evidence

assigns them with great probability to the school of Bardesanes, and the very ancient allegorical hymn about the soul which is in- serted in the Syriac text (p. 274 sq., Eng. tr., p. 238 sq.) is per- haps by Bardcsanes

himself (cf. Noldeke in Z D. M. G., 1871, p. 676). Itis one of the most remarkable pieces in Syriac literature.

CHRISTIANS OF Sr THOMAS is a name often applied to the members of the ancient Christian churches of southern India, which claim him as their first founder, and honour as their second founder a certain Thomas of Jerusalem, who is said to have led a Christian colony to Malabar in 345 a.p.! According to their tradition, St Thomas went from Malabar to Mylapur, now a suburb of Madras, where the shrine of his martyrdom, rebuilt by the Portuguese in 1547, still stands on Mount St Thomas, and where a miraculous cross is shown with a Pahlavi inscription which may be as old as the end of the 7th century. We know from Cosmas Indopleustes that there were Christian churches of Persian (East-Syrian) origin, and doubtless of Nestorian ereed, in Ceylon, in Malabar, and at Caliana (north of Bombay) before the middle of the 6th century, and even then St Thomas, the reputed apostle of Persia, may have been their special saint. The ancient churches of southern India never died out or wholly lost their sense of con-nexion with their mother church, for we find them sending deputies in 1490 to the Nestorian patriarch Simeon, who furnished them with bishops (Assemani, Bib. Or., iii. 1, 590 sg.). ard pressed by the Moslems, they welcomed the approach of the Portuguese, but proved by no means tractable to efforts to bring them within the Roman obedience. At length a formal union with Rome was carried through in the synod of Diamper (1599). Syriac was to remain the ecclesiastical language, but the service books wero corrected and purified from error. A century anda half of foreign Jesuit rule followed, but the love of independence was not lost. A great schism took place in 1658, and of 200,000 Christians of St Thomas only 400 remained loyal to Rome, though many of their churches were soon won back by the Carmelites. Those who remained independent fell under the influence of the Jacobite Mar Gregorius, styled patriarch of Jerusalem, who reached Malabar in 1665 as an emissary from Ignatius, patriarch of Antioch. From his time the independent Christians have been Jacobites, the counter-efforts of the Nestorians under Mar Gabriel, bishop of Adharbaijan, having apparently come to nothing after his death in 1730. Since the visit of Claudius Buchanan, whose Christian Re- scarches in Asia (1811) excited great interest, much has been done for the Christians of South India by English missionary effort, and Anglicans have cultivated friendly relations

with the clergy of the independent native church, while discouraging dependence on tho Jacobite patriarch of Antioch.

A valuable though tedious and ill-arranged history of the Christians of St Thomas has been written by W. Germann, Die Kirche der Thomaschristen, Giitersloh, 1877. See also La Croze, Histoire du Christianisme des Indes, The Hague, 1724; Alexius de Menezes, Historia Lcclesig Malabarice, Latin by F. Raulin, Rome, 1745 (especially for the synod of Diamper); Paulinus a S. Bar- tholomxo, /ndia Orientalis Christiana, 4to, Rome, 1794.

THOMAS, Sr, or Aquino. See AQuINas. |

THOMAS BECKET, or A Becket. See A Becker.

THOMAS or Crtano, the contemporary and supposed biographer of Francis of Assisi, was born probably towards the end of the 12th century, and died about 1255. He derives his surname from CrLANo (q.v.), in the Abruzzo Ulteriore. His name does not occur among those of the earliest disciples of Francis, but he is recorded by some historians of the order, though not by all, to have held the office of custos in various Franciscan houses (Cologne, Mainz, Worms, Spires) from 1221 onwards. An old biography of Francis, which is incorporated in the Acta Sanctorum, is attributed to Thomas with much probability, and nothing cogent has been urged against his authorship of the Dzes Irx (see Hymns, vol. xii. p. 583), although, so far as is at present known, his name is not associated with that re- markable poem by any writer earlier than 1385.

THOMAS or Ercenpouns, called also the Ruymer (c. 1225-c. 1300), occupies a prominent place as a poet and prophet in the mythical and legendary literature of Scot- land. The historical person of that name figures in two charters of the 13th century, and from these it appears that he owned lands in Erceldoune (now Karlston), in Berwickshire, which were made over by his son and heir to the cloister of the Holy Trinity at Soltra, or Soutra, on

1 See the sketch in Syriac of the history of the church of Malabar printed and translated by Land, Anced. Syr., i. 24 sq. It was sent to Schaaf at

Leyden in 1720 by Mar Gabriel, the last Nestorian bishop in Malabar (see Germann, p. 542),

the borders of the same county. He figures in the works of Barbour and Blind Harry as the sympathizing con- temporary of their heroes, and Wyntoun tells how he prophesied a battle. In the folk-lore of Scotland his name is associated with numerous fragments of rhymed or alli- terative verse of a more or less prophetic and oracular character ; but the chief extant work with which his name is associated is the poem of Sir T'ristrem, edited from the Auchinleck MS. by Sir Walter Scott in 1804, and again in 1886 for the Scottish Text Society by Mr G. P. M'Neill. In the latter edition the claim of Thomas to the authorship of this work (conceded by both editors) is fully discussed.

THOMAS A KEMPIS. See Kempis.

THOMASIUS, Curistian (1655-1728), German jurist and publicist, was born at Leipsic January 1, 1655, and educated by his father Jacob Thomasius, professor of philosophy and eloquence, a learned man, and friend of Spener. Through his father's lectures Christian came under the influence of the political philosophy of Grotius and Pufendorf, and continued the study of law under Stryck at Frankfurt on the Oder. In 168] he commenced the career of professor of law at Leipsic, and soon attracted attention by his abilities, but particularly by his daring attack upon all ancient prejudices. His views on matters of law were heretical; he made the daring innovation of lecturing in German instead of Latin; he published a monthly periodical in which he ridiculed with vast wit.and humour the pedantic weaknesses of the learned; he took valiantly the side of the Pietists in their controversy with the orthodox, and defended mixed marriages of Lutherans and Calvinists. In consequence of these and other sins, he was preached against from the pulpits, forbidden to lecture or to write (May 10, 1690), and his arrest was soon com- manded. He escaped the latter by flight to Berlin, and the elector Frederick ITI. offered him a refuge in Halle, with a salary of 500 thalers and the right to lecture there. He took part in founding the university of Halle (1694), where he became second and then first professor of law and director of the university. He was one of the most

esteemed university teachers and influential writers of his day. He died, after a singularly successful and honourable career, in his 74th year, September 23, 1728.

Though not a profound and systematic philosophical thinker, but rather a clever celectic of the common-sense school, Thomasius prepared the way for great reforms in philosophy, and, above all, in law, literature, social life, and theology. It was his mission to bring all the high matters of divine and human sciences into close and living contact with the everyday world. He made learning, law, philosophy, and theology look at everything from a rational common-sense point of view, and speak of everything in vigorous German. He thus created an cpoch in German hiterature, philo- sophy, and law, and Spittler opens with him the modern period of ecclesiastical history. Tholuck pronounces him ‘‘the personified spirit ofilluminism,” He made it one of the aims of his life to free politics and jurisprudence from the control of theology. He fought bravely and consistently for freedom of thought and speech on religious matters. He is often spoken of in German works as the author of the “‘ territorial system,” or Erastian theory of ecclesi- astical government. But he taught that the state may interfere with legal or public duties only, and not with moral or private ones. He introduced a new definition of heresy, and pronounced it a bug- bear of the theologians. He would not have even atheists punished, though they should be expelled the country. He came forward as an earncst opponent of the prosecution of witches and of the use of torture. In theology he was not a naturalist or a deist, but a believer in the necessity of revealcd religion for salvation. He felt strongly the influence of the Pietists at times, particularly of Spener, and there was a mystic vein in his thought ; but other elements of his nature were too powerful to allow hin to attach himsclf finally to that party.

Thomasius’s most popular and influential German publications were his periodical Monatsgesprdehe, vornehmlich tiber neue Bticher (1688); Kinleitung zur Vernunftlehre (1691, 5th ed. 1719); Verniinft- tge Gedanken tiber allerhand auserleserne, gemisehte, philosophisehe, und juristisehe Hiindel (1723-26); Gesehiehte der Weisheit und Thorheit (3 vols., 1698); Kurze Lehrsditze von dem Laster der

Zauberei mit dem Hexenprocess (1704); Weitere Erlduterungen der neweren Wissenschaft Anderer Gedanken kennen zu lernen (1711).

See Heinrich Luden's Christian Thomasius nach seinen Schicksalen und Schriften, 1805; Zeller's Geschichte der Philosophie in Deutschland, 2d ed., 1875, pp. 162-171; Gass, Geschichte der Protestantischen Dogmatik, ii. 484 sq.; the histories of German literature, especially Hettner's Geschichte der deutschen Lit. im 18ten Jahrh.; Tholuck's article in Herzog's Real-Encyklop.

THOMPSON, Sir Bengamin, Count Rumrorp (1753- 1814), an eminent man of science, enlightened philan- thropist, and sagacious public administrator, was born at Woburn, in Massachusetts, in 1753, and died at Auteuil, near Paris, in 1814. His family had been settled in New England since the middle of the century preceding his birth, and belonged to the class of moderately wealthy farmers. His father died while Thompson was very young, and his mother speedily married a second time. But he seems to have been well cared for, and his education was so far from neglected that, according to his own statement, he was at the age of fourteen sufficiently advanced "in algebra, geometry, astronomy, and even the higher mathe- matics," to calculate a solar eclipse within four seconds of accuracy. In 1766 he was apprenticed to a storekeeper at Salem, in New England, and while in that employment occupied himself in chemical and mechanical experiments, as well as in engraving, in which he attained to some pro- ficiency. The outbreak of the American war put a stop to the trade of his master, and he thereupon left Salem and went to Boston, where he engaged himself as assistant in another store. He afterwards applied himself to the study, with a view to the practice, of medicine, and then (although, as he affirms, for only six weeks and three days) he became a school teacher—it is believed at Bradford on the Merrimack. Thompson was at that period between eighteen and nineteen years old, and at nineteen, he says, ""T married, or rather I was married." His wife was the widow of a Colonel Rolfe, and the daughter of a Mr Walker, '"'a highly respectable minister, and one of the first settlers at Rumford," now called Concord, in New Hampshire. His wife was possessed of considerable pro- perty, and was his senior by fourteen years. This marriage was the foundation of Thompson's success. Within three years of it, however, he left his wife in America to

make his way to wealth and distinction in Europe, and, although his only child by her, a daughter, subsequently joined him, he never saw and, so far as anything appears to the contrary, never attempted or desired to see her again.

Soon after his marriage Thompson became acquainted with Governor Wentworth of New Hampshire, who, struck by his appearance and bearing, conferred on him the majority of a local regiment of militia. He speedily became the object of distrust among the friends of the American cause, and it was considered prudent that he should seek an early opportunity of leaving the country. On the evacuation of Boston by the royal troops, therefore, in 1776, he was selected by Governor Wentworth to carry despatches to England. On his arrival in London he almost immediately attracted the attention of Lord George Germaine, secretary of state, who appointed him to a clerkship in his office. Within a few months he was advanced to the post of secretary of the province of Georgia, and in about four years he was made under- secretary of state. His official duties, however, did not materially interfere with the prosecution of scientific pursuits, and in 1779 he was elected a fellow of the Royal Society. Among the subjects to which he especially directed his attention were the explosive force of gun- powder, the construction of firearms, and the system of signalling at sea. In connexion with the last, he made a cruise in the Channel fleet, on board the " Victory," as a volunteer under the command of Admiral Sir Charles Hardy. On the resignation of Lord North's administra- tion, of which Lord George Germaine was one of the least

lucky and most unpopular members, Thompson left the civil service, and was nominated to a cavalry command in the revolted provinces of America. But the War of Independence was practically at an end, and in 1783 he finally quitted active service, with the rank and half-pay of a lieutenant-colonel. He now formed the design of joining the Austrian army, for the purpose of campaigning against the Turks, and so crossed over from Dover to Calais with Gibbon, who, writing to his friend Lord Sheffield, calls his fellow-passenger "' Mr Secretary-Colonel- Admiral-Philosopher Thompson." At Strasburg he was introduced to Prince Maximilian,

afterwards elector of Bavaria, and was by him irvited to enter the civil and military service of that state. Having obtained the leave of the British Government to accept the prince's offer, he received the honour of knighthood from George III, and during eleven years he remained at Munich as minister of war, minister of police, and grand chamberlain to the elector. His political and courtly employments, however, did not absorb all his time, and he contributed during his stay in Bavaria a number of papers to the Philosophical Transactions. But that he was sufliciently alert as the principal adviser of the elector the results of his labours in that capacity amply prove. He reorganized the Bavarian army; he suppressed mendicity and found employment for the poor ; and he immensely improved the condition of the industrial classes throughout the country by providing them with work and instructing them in the practice of domestic economy. Of the prompt and the business- like manner in which he was wont to carry his plans into execution a single example may serve as an illustra- tion. The multitude of beggars in Bavaria had long been a public nuisance and danger. In one day Thompson caused no fewer than 2600 of these outcasts and depre- dators in Munich and its suburbs alone to be arrested by military patrols, and transferred by them to an indus- trial establishment which he had prepared for their recep- tion. In this institution they were both housed and fed, and they not only supported themselves by their labours but earned a surplus for the benefit of the electoral revenues. The principle on which their treatment pro- ceeded is stated by Thompson in the following memorable words :—" To make vicious and abandoned people happy," he says, "it has generally been supposed necessary first to make them virtuous. But why not reverse this order ? Why not make them first happy, and then virtuous?" In 1791 he was created a count of the Holy Roman Empire, and chose his title of Rumford from the name as it then was of the American township to which his wife's family belonged. In 1795 he visited England, one incident of his journey being the loss of all his private papers, includ- ing the materials for an autobiography, which were con- tained in a box stolen from off his postchaise in St Paul's Churchyard. During his residence in London he applied himself to the discovery of methods for curing smoky chimneys and the contrivance of improvements in the construction of fireplaces. But he was quickly recalled to Bavaria, Munich being threatened at once by an Austrian and a French army. The elector fied from his capital, and it was entirely owing to Rumford's energy and tact that a hostile

occupation of the city was prevented. It was now proposed that he should be accredited ag Bavarian am- bassador in London; but the circumstance that he was a British subject presented an insurmountable obstacle. He, however, again came to England, and remained there in a private station for several years. In 1799 he, in con- Junction with Sir Joseph Banks, projected the establishment of the Royal Institution, which received its charter of incorporation from George III. in 1800. Rumford him- self selected Sir Humphry Davy as the first scientific

lecturer there. Until 1804, when he definitively settled in France, Rumford lived at the Royal Institution in Albemarle Street, or at a house which he rented at Bromp- ton, where he passed his time in the steady pursuit of those researches relating to heat and light and the economy of fuel on which his scientific fame is principally based. He then established himself in Paris, and married (his first wife having been dead for many years) as his second wife the wealthy widow of Lavoisier, the celebrated chemist. With this lady he led an extremely uncomfortable life, till at last they agreed to separate. Rumford took up his residence at Auteuil, where he died suddenly in 1814, in the sixty-second year of his age.

He was the founder and the first recipient of the Rumford medal of the London Royal Society. He was also the founder of the Rumford medal of the American Academy of Arts and Sciences and of the Rumford professorship in Harvard university. His complete works were published by the American Academy of Arts and Sciences at Boston in 1872 ; and a full and extremely interest- ing memoir of the author which was issued with them was repub- lished in London by Messrs Macmillan in 1876. (F. DR.)

THOMPSON, THomas Peronnet (1783-1869), mathe- matician and political writer, was born at Hull in 1783. He was educated at the Hull grammar school, and in October 1798 entered Queens’ College, Cambridge. He entered the navy as midshipman in the “Isis” in 1803, but in 1806 exchanged to the army. Through his ac- quaintance with Wilberforce, he was appointed governor of Sierra Leone in 1808, but was recalled on account of his hostility to the slave trade. In 1812 he returned to his military duties, and, after serving in the south of France, was in 1815 attached as

Arabic interpreter to an expedition against the Wahhabees of the Persian Gulf, with whom he negotiated a treaty (dated January 1820) in which the slave trade was for the first time declared piracy. He was promoted major in 1825, lieutenant- colonel in 1829, and major-general in 1854. He entered parliament as member for Hull in 1835, and afterwards sat for Bradford. He took a prominent part in the corn- law agitation, his Catechism of the Corn Laws (1827) being by far the most effective pamphlet published on the subject. He was joint-editor of the Westminster Review, to which he contributed a large number of articles, repub- lished in 1824 in six volumes, under the title Avxercises, Political and Others. His mathematical publications were of a somewhat eccentric kind. He published a Theory of Parallels (1844), and was also the author of Geometry without Axioms, in which he endeavoured to “get rid” of axioms and postulates. His new Z’heory of Just Intona- tion (1850) is, however, a contribution of great value to the science of musical acoustics, and has gone through many editions. It may be said to form the. basis of the tonic sol-fa system of music. He died 6th October 1869.

THOMSON, Sim Caries WYVILLE (1830-1882), was born at Bonsyde, Linlithgowshire, became professor of natural history in Aberdeen, Cork, Belfast, and finally Edinburgh, and will be specially remembered as a student of the biological conditions of the depths of the sea. Being interested in crinoids, and stimulated by the results of the dredgings of Sars in the deep sea off the Norwegian coasts, which had conclusively disposed of the error of Edward Forbes, that animal life ceased at a depth of a few hundred fathoms, he succeeded, along with Dr W. B. Carpenter, in obtaining the loan of H.M.S. “ Lightning ” and “ Porcupine,” for successive deep-sea dredging expedi- tions in the summers of 1868 and 1869. It was thus shown that animal life existed in abundance down to depths of 650 fathoms, that all invertebrate groups were represented (largely by Tertiary forms hitherto believed to be extinct), and, moreover, that deep-sea temperatures are by no means so constant as was supposed, but vary

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considerably, and indicate an oceanic circulation. Further dredging expeditions at greater and greater depths fol- lowed. The remarkable results

gained for hydrography as well as zoology, in association with the practical needs of ocean telegraphy, soon led to the granting of H.M.S. “Challenger” for a circumnavigating expedition, and Thomson sailed at the end of 1872 as director of the scientific staff, the cruise lasting three years and a half. On his return he received many academic honours, and was knighted. In 1877 he published two volumes of a preliminary account of the results of the voyage, mean- while carrying on his administrative labours in connexion with the disposition of the special collections and publi- cation of the monographs of these. His health, never robust, was meanwhile giving way; from 1879 he ceased to perform the duties of his chair, and he died in 1882.

See obituary notice in Proc. Roy. Soc. Hdin., 1883, also Thom- son’s Voyage of H.M.S. Challenger, London, 1877, and Thom- son and Murray, Reports of the Voyage of H.M.S. Challenger, Edin- burgh, 1885.

THOMSON, James (1700-1748), author of The Seasons, was a native of the Scottish Border country, his father being successively minister of the parishes of Ednam and Southdean, in Roxburghshire. He was born at Ednam on September 11, 1700, and was reared at a dis- tance from the social influences and literary fashions that helped to form and fix the manner of the “classical” school, the monotony of which he was the first to break. Amidst the bare breezy hills and glens of a Border parish, his youth was safe against the ascendency of the taste established in the metropolis. Jedburgh school and Edinburgh university gave him his book learning of the ordinary type; and he was fortunate enough to have neighbours of extraordinary accomplishment, who opened his eyes to the poetic side of nature, and encouraged him in verse-making. The teacher from whom he learnt most was a Mr Riccalton, or Riccaulton, a graduate of Edin- burgh, who had taken to farming, but was afterwards persuaded to enter the church, and made some contribu- tions to theological literature. This scholarly enthusiast taught Latin to the boys of Jedburgh in an aisle of the church, and encouraged Thomson in his poetical turn by example as well as precept. We have the poet’s own acknowledgment that the first hint of the Seasons came from a striking dramatic poem by Riccaulton entitled A Winter’s Day. As a schoolboy Thomson wrote verses, and at the university he continued the practice, but his early efforts were not particularly promising. He was intended for the ministry, and was for five years a

student of divinity ; but in 1725 he determined to follow his friend and classfellow David Mallet to London, and seek his fortune there. Through the influence of Lady Grizel Baillie, herself a song-writer, he obtained a tutorship in the family of Lord Binning; but the plain-looking and plain-mannered poet had not the adroitness of his friend Mallet, and he gave up the post after a few months. It was while he lingered in the neighbourhood of Barnet, without employment, without money, with few friends, saddened by the loss of his mother (his father had died when he was eighteen), that Thomson conceived the idea of the first of his poems on the Seasons, Winter. The lines—

Welcome, kindred glooms, Congenial horrors, hail!

came from the heart; they expressed his own forlorn mood on the approach of the winter of 1725. Winter appeared in the spring of 1726. A publisher, Millan,—not Millar, who afterwards published for him,—gave him three guineas for the poem. ‘The tradition is that it attracted no notice for a month, but that, at the end of that time, a

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houses to proclaim the discovery of a new poet. The town received the discovery with acclamation ; in another month a second edition was called for. No time could have been better suited for the appreciation of Thomson’s striking qualities; they were so entirely unlike what the public had for many years been accustomed to. The fresh treatment of a simple theme, the warm poetical colouring of commonplace incidents, the freedom and irregularity of the plan, the boldness of the descriptions, the manly and sincere sentiment, the rough vigour of the verse, took by surprise a generation accustomed to witty satire and burlesque, refined diction, translations from the classics, themes valued in proportion to their remoteness from vulgar life. Thomson at once became famous, and, his naturally easy temper roused to full exertion, vigorously followed up his success with Swmmer and an Ode to the Memory of Sir Isaac Newton. Spring was completed and published in 1728. A longer interval elapsed before the appearance of Autumn; it was published in 1730, and followed presently by a handsome edition of the whole four Seasons. Meantime, drawn into the ardent political strife of the time, he had produced, in 1729,

his Britannia, and early in 1730 had made his first attempt as a dramatist with Sophonisba. From this time there was a manifest slackening either in his will or in his power to produce. He was appointed travelling tutor to the son of Sir Charles Talbot, travelled with his pupil on the Continent, and in 1733 obtained a small sinecure in the Court of Chancery. It may have been this removal of the spur of necessity that made him take longer over his poems. But it isa fair theory that the rigid taste of the time for finish, which he had unconsciously defied with triumphant results, began to make good an ascendency over him, and that he wrote less because he was cramped by fear of the critics. None of the other Seasons have the same large and careless freedom as Winter ; Autumn especially, the last of them, is much more laboured, and his revisions and enlargements in successive editions show an anxious ambition after the finish of the classical school. How- ever this may be, he hesitated long over his next poem, Liberty ; the first part was published in 1734 and the conclusion in 1736. He intended it to be his masterpiece, but with all his care and pains it has fallen into deserved oblivion. In 1737 he lost his sinecure by the death of his patron, but was recompensed by a pension from the prince. Poverty, rather than natural fitness or inclination, drove him again to dramatic composition. Agamemnon was produced in 17388, with indifferent success. Next year a play, written in the interest of the prince and the oppo- sition, was interdicted by the lord chamberlain. The masque of Alfred, written by Thomson in conjunction with Mallet, and containing the song Rule Britannia, was produced in 1740, Tancred and Sigismunda in 1745. A year before this last event the “poetical posture” of the poet’s income was improved by his appointment to the sinecure office of surveyor-general of the Leeward Islands. The Castle of Indolence was his last work. It was not published till the year of his death (1748), but he had been long engaged upon it. The poem is full of character and humour, with here and there passages of elaborately rich description ; it is fuller than any other of the person- ality of the poet, of the good-nature, generosity, and solid wisdom which gained him the affection of so many friends ; but still it is in the Seasons, and especially in the first of them, that Thomson is seen at his best and strongest.

Till the advent of Scott and Byron, Thomson was the most widely popular poet in our language; and as late as the middle of this century a sumptuous

edition, illustrated by the Etching Club, was printed three times within ten years (1842-52). The

literary clergyman, Whatley, chanced to take it up from a | popular verdict on Thomson has been unanimously justified by

bookseller’s counter, and at once rushed off to the coffee-

critics. (W. M.)

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THOMSON, Jamus (1834-1882), author of Zhe City of Dreadful Night, was born at Port Glasgow, in Renfrew- shire, on November 23, 1834, the eldest child of a mate in the merchant shipping service. His mother was a deeply religious woman of the Irvingite sect, and it is not improbable that it was from her the son inherited his sombre and imaginative temperament. On her death, James, then in his seventh year, was procured admission into the Caledonian Orphan Asylum, from which he went out into the world as an assistant army schoolmaster. At the garrison at Ballincollig, near Cork, he encountered the one brief happiness of his life: he fell passionately in love with, and was in turn as ardently loved by, the daughter of the armourer-sergeant of a regiment in the garrison, a girl of very exceptional beauty and cultivated mind. Two years later, when Thomson was at the training college at Chelsea, he suddenly received news of her fatal illness and death. The blow prostrated him in mind and body; and the former endured a hurt from which it never really recovered. Henceforth his life was one of gloom, disappointment, misery, and poverty, rarely alleviated by episodes of somewhat brighter fortune. While in Ireland he had made the acquaintance of Mr Charles Bradlaugh, then a soldier stationed at Ballincollig, and it was under his auspices (as editor of the London Investi- gator) that Thomson first appealed to the public as an author, though actually his earliest publication was in Tat’s Edinburgh Magazne for July 1858, under the signa- ture “Crepusculus.” In 1860 was established the paper with which Mr Bradlaugh has been so long identified, The National Reformer, and it was here, among other productions by James Thomson, that appeared (1863) the powerful and sonorous verses “To our Ladies of Death,” and (1874) his chief work, the sombre and imaginative City of

Dreadful Night. In October 1862 Thomson left the army, and through Mr Bradlaugh (with whom for some subsequent years he lived) gained employment as a solicitor's clerk. In 1869 he enjoyed what has been described as his "only reputable appearance in respect- able literary society," in the acceptance of his long poem, "Sunday up the River," for Fraser's Magazine, on the advice, it is said, of Charles Kingsley. In 1872 Thomson went to the Western States of America, as the agent of the shareholders in what he ascertained to be a fraudulent silver mine; and the following year he received a com- mission from The New York World to go to Spain as its special correspondent with the Carlists. During the two months of his stay in that distracted country he saw little real fighting, and was himself prostrated by a sunstroke, On his return to England he continued to write in The Secularist and The National Reformer, under the at last well-known initials "B.V."! In 1875 he severed his con- nexion with Zhe National Reformer, owing to a disagree- ment with its editor ; henceforth his chief source of income (1875-1881) was from the monthly periodical known as Cope's Tobacco Plant. Chiefly through the exertions of his friend and admirer, Mr Bertram Dobell, Thomson's best known book, The City of Dreadful Night, and other Poems, was published in April 1880, and at once attracted wide attention ; it was succeeded in the autumn by Vane's Story, and other Poems, and in the following year by Essays and Phantasies. All his best work was produced between 1855 and 1875 ("The Doom of a City," 1857 ; "Our Ladies of Death," 1861; Weddah and Om-el. Bonain : "The Naked Goddess," 1866-7 ; Phe Cig of Dreadful Night, 1870-7 4). In his latter years Thomson too often sought refuge from his misery of mind and body

1 Bysshe Vanolis : '* Bysshe," as the commonly used Christian name

of Shelley, Thomson's favourite writer ; and " Vanolis," an anagram of Novalis, the pseudonym of F. von HARDENBERG (q.v.).

in the Lethe of opium and alcohol. His mortal illness came upon him in the house of a poet friend ; and he was conveyed to University College hospital, in Gower Street, where shortly after he died (June 3, 1882). He

was buried at Highgate cemetery, in the same grave, in uncon- secrated ground, as his friend Austin Holyoake.

To the productions of James Thomson already mentioned may be added the posthumous volume entitled 4 Voice from the Nile, and other Poems (1884), which has the advantage of Mr Bertram Dobell's valuable prefatory memoir and an etched portrait of the poet. This volume contains niuch that is interesting, but uothing to iucrease Thomson's reputation. If an attempt be made to point to the most apparent literary relationship of the author of The City of Dreadful Night, one might venture the suggestion that James Thomson was a younger brother of De Quincey. If he has distinct affinity to any writer it is to the author of Suspiria de Profundis ; if we look further afield, we might perhaps disccrn shadowy prototypes in Leopardi, Heine, and Baudelaire. But, after all, Thomson holds so unique a place as a poet that the effort at classification may well be dispensed with. If he maintains his own lonely little height, it will be as a distinct individuality. His, it is absolutely certain, was no literary pessimism, no assumed gloom, The poem ''Insomnia" is a distinct chapter of bio- graphy ; and in "Mater Tenebrarum" and elsewhere among his writings self-revelative passages are frequent. The merits of Thomson's poetry are its imaginative power, its sombre intensity, its sonorous music ; to these characteristics may be added, in his lighter pieces, a Heine-like admixture of strange gaiety, pathos, and caustic irony. Much the same may be said of his best prose. His faults ave a monotony of epithet, the not infrequent use of mere rhetoric and verbiage, and perhaps a prevailing lack of the sense of form ; to these may be added an occasional vulgar recklessness of expression, as in parts of Vane's Story and in some of his prose writings. Time will reduce his noteworthy work within a harrow compass, but within that limit it will be found as remark- able as it is unique.

THOMSON, Joun (1778-1840), amateur landscape painter—Thomson of Duddingston, as he is commonly styled,—was born on September 1, 1778, at Dailly, Ayr- shire. His father, grandfather, and, as we are informed, great-grandfather also, were clergymen of the Church of Scotland. The father determined that his son should follow the ancestral profession, and, greatly against his natural bent,—for all his thoughts turned instinctively towards art,—he acceded to the parental wish. He studied in the university of

Edinburgh; and, residing with his elder brother, Thomas Thomson, afterwards celebrated as an antiquarian and feudal lawyer, he made the acquaint- ance of Francis Jeffrey and other young members of the Scottish bar afterwards notable. The pursuit of art, how- ever, was not abandoned ; during the recess he sketched in the country, and, while attending his final college session, he studied for a month under Alexander Nasmyth. After his father's death he became, in 1800, his successor as minister of Dailly; and in 1805 he was translated to the parish of Duddingston, close to Edinburgh. The practice of art was now actively resumed, and it came to be continued throughout life—apparently without any very great detriment to pastoral duties. 'Thomson's popu- larity as a painter increased with his increasing artistic skill; and, having mastered his initial scruples against receiving artistic fees, on being offered £15 for a land- scape—reassured by '' Grecian " Williams's stout assertion that the work was "worth thrice the amount "—the minister of Duddingston began to dispose of the produc- tions of his brush in the usual manner. Jn 1830 he was made an honorary member of the Royal Scottish Academy. Besides that of art, Thomson had other singularly varied tastes and aptitudes. He was an accomplished performer on violin and flute, an exact and well-read student of physical science, and one of the writers on optics in the early numbers of the Edinburgh Review. His life passed peacefully away in the kindly and charitable discharge of his clerical duties, varied by the enthusiastic pursuit of his art, and the enjoyment of intercourse with a singularly

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wide and eminent circle of friends, which, among artists, included Turner and Wilkie, and among men of letters Wilson and Scott,—the latter of whom desired that Thomson, instead of Turner, should have illustrated the collected edition of his works. He died at Duddingston on the 27th of October 1840 (not the 20th, as stated by some authorities). Thomson was twice married, and his second wife, the widow of Mr Dalrymple of Cleland, was herself also a skilful amateur artist.

Thomson holds an honourable position as the first powerful landscapist that Scotland produced, and he is still among her greatest. His styled was

founded, in the first instance, upon the practice of the Dutch masters ; but ultimately he submitted to the influence of the Poussins and the Italians, rightly believ- ing that their method—in the richer solemnity of its colour and the deeper gravity of its chiaroscuro—was more truly fitted for the portrayal of the scenery of Scotland, more in harmony with the gloom and the glory of its mountains and its glens and the passion of its wave-vexed cliffs. But to the study of the art of the past he joined a close and constant reference to nature which kept his own work fresh and original, though, of course, he never even approached such scientific accuracy in the rendering of natural form and effect as is expected from even the tyro in our recent schools of landscape. His art is clearly distinguished by ‘‘style” ; at their best, his works show skilful selection in the leading lines of their composition and admirable qualities of abstract colour and tone. Thomson is fairly represented in the Scottish National Gallery ; and the Aberlady Bay of that collection, with the soft infinity of its clouded grey sky, and its sea which leaps and falls again In waves of sparkling and of shadowed silver, is fit to rank among the triumphs of Scottish art.

THOR. See Alster, vol. i. p. 210, and MyrHo.oey, vol. xvii. p. 156.

THOREAU, Henry Davin (1817-1862), one of the most strongly-marked individualities of modern times, spent the greater part of his life in the neighbourhood of the place where he was born—Concord, a village town of Massachusetts, pleasantly situated some twenty miles north- west of Boston, amidst a pastoral country of placid beauty. To Thoreau this Concord country contained all of beauty and even grandeur that was necessary to the worshipper of nature: he once journeyed to Canada; he went west on one occasion ; he sailed and explored a few rivers ; for the rest, he haunted Concord and its neighbourhood as faith- fully as the stork does its ancestral nest. John Thoreau, his father, who married the daughter of a New England clergy- man, was the son of a John Thoreau of the isle of Jersey, who, in Boston, married a Scottish lady of the name of Burns. This last-named John was the son of Philippe Thoreau and his wife Marie le Gallais, persons of pure French blood, settled at St Helier, in Jersey. From his New England Puritan mother, from his Scottish grandmother, from his Jersey-American grandfather, and from his remoter French ancestry Thoreau inherited distinctive traits: the Saxon element perhaps

predominated, but the “hauntings of Celtism ” were prevalent and potent. The stock of the Thoreaus was a robust one; and in Concord the family, though never wealthy nor officially influential, was ever held in peculiar respect. As a boy, Henry drove his mother’s cow to the pastures, and thus early became enamoured of certain aspects of nature and of certain delights of solitude. At school and at Harvard university he in nowise distinguished himself, though he was an intelligently receptive student ; he became, however, pro- ficient enough in Greek, Latin, and the more general acquirements to enable him to act for a time as a master. But long before this he had become apprenticed to the learning of nature in preference to that of man: when only twelve years of age he had made collections for Agassiz, who had then just arrived in America, and already the meadows and the hedges and the stream-sides had become cabinets of rare knowledge to him. On the desertion of schoolmastering as a profession Thoreau became a lecturer and author, though it was the labour of his hands

which mainly supported him through many years of his life : professionally he was a surveyor. In the effort to reduce the practice of economy to a fine art he arrived at the conviction that the less labour a man did, over and above the positive demands of necessity, the better for him and for the community at large ; he would have had the order of the week reversed,—six days of rest for one of labour. It was in 1845 he made the now famous experi- ment of Walden. Desirous of proving to himself and others that man could be as independent of his kind as the nest-building bird, Thoreau retired to a hut of his own construction on the pine-slope over against the shores of Walden Pond,—a hut which he built, furnished, and kept in order entirely by the labour of his own hands. During the two years of his residence in Walden woods he lived by the exercise of a little surveying, a little job-work, and the tillage of a few acres of ground which produced him his beans and potatoes. His absolute independency was as little gained as if he had camped out in Hyde Park; relatively he lived the life of a recluse. He read consider- ably, wrote abundantly, thought actively if not widely, and came to know beasts, birds, and fishes with an intimacy more extraordinary than was the case with St Francis of Assisi. Birds came at his call, and forgot their hereditary fear of man; beasts lipped and caressed him ; the

very fish in lake and stream would glide, unfearful, between his hands. This exquisite familiarity with bird and beast would make us love the memory of Thoreau, if his egotism were triply as arrogant, if his often meaningless paradoxes were even more absurd, if his sympathies were even less humanitarian than we know them to have been. His Walden, the record of this fascinating two years' experi- ence, must always remain a production of great interest and considerable psychological value. Some years before Thoreau took to Walden woods he made the chief friend- ship of his life, that with Emerson. He became one of the famous circle of the transcendentalists, always keenly preserving his own individuality amongst such more or less potent natures as Emerson, Hawthorne, and Margaret Fuller. From Emerson he gained more than from any man, alive or dead; and, though the older philosopher both enjoyed and learned from the association with the younger, it cannot be said that the gain wasequal. There was nothing electrical in Thoreau's intercourse with his fellow-men ; he gave off no spiritual sparks. He absorbed intensely, but when called upon to illuminate in turn was found wanting. It is with a sense of relief that we read of his having really been stirred into active enthusiasm anent the wrongs done the ill-fated John Brown. With children he was affectionate and gentle, with old people and strangers considerate. In a word, he loved his kind as animals, but did not seem to find them as interesting as those furred and feathered. In 1847 Thoreau left Walden Lake abruptly, and for a time occupied himself with lead- pencil making, the parental trade. He never married, thus further fulfilling his policy of what one of his essayist-biographers has termed "indulgence in fine renounce- ments." At the comparatively early age of forty-five he died, on 6th May 1862. His grave is in the beautiful cemetery of Sleepy Hollow, beside those of Hawthorne and Emerson.

Thoreau's fame will rest on Walden, the Excursions, and his Letters, though he wrote nothing which is not deserving of notice. Up till his thirtieth year he dabbled in verse, but he had little ear for metrical music, and he lacked the spiritual impulsiveness of the true poet. He had occasional flashes of insight and could record beautifully, notwithstanding : his little poem '' Haze" is surcharged with concentrated loveliness. His weakness as a philosopher is his tendency to base the laws of the universe on the experience-born, thought-produced convictions of one man—himself. His

weakness as a writer is the too frequent striving after antithesis and paradox. If he had had all his own originality without the itch of appearing

original, he would have made his fascination irresistible. As it is, Thoreau holds a unique place. He was a naturalist, but absolutely devoid of the pedantry of science ; a keen observer, but no rctailer of disjointed facts. He thus holds sway over two domains: he has the adherence of the lovers of fact and of the children of fancy. He must always be read, whether lovingly or interestedly, for he has all the variable charm, the strange saturninity, the contradic- tions, austerities, and delightful surprises, of Nature herself.

See W. E, Channing, Thoreau the Poet Naturalist, Boston, 1873; F. B. San- born, Biography of Thoreau (American Men of Letters Series) ; H. A. Page, Bio- graphy of Thoreau; Emerson, Introduetion to Zxcursions ; J. Russell Lowell, My Study Windows; Will. H. Dircks, Introduction to Walden; Professor Nichol, American Literature, pp. 812 sg.; Mr Burroughs; Mr Henry James, &e. After Thoreau’’s death were published (besides the Excursions, 1863) The Maine Woods (1864); Cape Cod (1865); Letters and Poems (1865); A Yankee tn Canada (1866). In the Atlantic Monthly, in 1862, appeared ‘‘ Walking,” ‘‘ Autumn Tints, and ‘ Wild Apples”; in 1863 “‘ Night and Moonlight.” His best known work, Walden, eonstitutes the second volume of the series called The Camelot Classics ; otherwise Thoreau’s productions are not widely known in Britain.

THORIUM, in chemistry, is the name of the as yet unisolated radical of thoria, one of the now numerous “rare earths.” Thoria was discovered by Berzelius in 1828 in the mineral now called thorite. It is present also in pyrochlor, monazite, orangite, and euxenite. Being similar to the oxides TiO, and ZrO, of titanium and zirconium, thoria is assumed to be a binoxide ThO,. The atomic weight, according to Cleve, is Th= 233, O being 16.

THORN (Polish Zoran), an interesting old town in the province of West Prussia, is situated on the right bank of the Vistula, near the point where the river enters Prussian territory, 26 miles south-east of Bromberg and 92

miles south of Dantzic. Its position near the frontier of Russian Poland makes it a strategic point of importance ; and, strongly fortified since 1818, in 1878 it was converted into a fortress of the first class. The “ old town,” founded in 1231, and the “new town,” founded thirty-three years later, were united in 1454, and both retain a number of quaint buildings dating from the 15th and 16th centuries, when Thorn was a flourishing member of the Hanseatic League. The town-house, of the 14th and 16th centuries, the churches of St John and the Virgin, with aisles as lofty as the nave, the ruined castle of the Teutonic order, and the gates, leaning tower, and fragments of the walls, all of the 13th century, are among the most interesting edifices. The ancient wooden bridge, now burned down, at one time the only permanent bridge across the lower Vistula, has been succeeded by a massive iron railway viaduct, half a mile long. Thorn carries on an active trade in grain, timber, wine, colonial wares, and iron, and has manufactures of leather, hats, starch, candles, and numerous other articles. It is famous for its “ Pfeffer- kuchen,” a kind of gingerbread. Part of the trade is carried on by vessels on the Vistula. In 1885 the popu- lation was 23,914 (in 1816 7909), about three-fifths being Protestants and two-fifths (chiefly Poles) Roman Catholics.

Thorn, founded in 1231 by the Teutonic order as an outpost against the Poles, was colonized mainly from Westphalia. The first peace of Thorn, between the order and the Poles, was con- cluded in 1411, In 1454 the townspeople revolted from the knights of the order, destroyed their castle, and attached them- selves to the king of Poland. This resulted in a war, which was terminated in 1466 by the second peace of Thorn. In the 15th and 16th centuries Thorn was a Hanse town of importance, and received the titles of “queen of the Vistula” and “the beautiful.” It embraced the Reformation in 1557, and in 1645 it was the scene of a “colloquium charitativum,” or discussion betwixt the doctors of the rival creeds, which, however, resulted in no agreement. In 1724 a riot between the Protestant and Roman Catholic inhabitants was seized upon by the Polish king as a pretext for beheading the burgomaster and nine other leading Protestant citizens, an act of oppression which is known as the “bloodbath of Thorn.” The second partition of Poland conferred Thorn upon Prussia; by the treaty of Tilsit it was assigned to the duchy of Warsaw; but since the congress of Vienna it has again been Prussian. was born at Thorn in 1478.

THORNBACK is the name given toa species of ray (Ztaja clavata) which is found all round the coasts of Europe, and locally abundant; it derives its naine from

the peculiar armature of the skin of its body, the upper and lower surfaces of the body of the female being armed with scattered, more or less numerous, large round osseous bucklers, each with a spine in the centre; the tail also is armed with rows of similar bucklers. In the male fish these bucklers are absent, or nearly so. The thornback does not grow to the same large size as the skates, a specimen three feet across being considered large. It is more valued as food than the other rays, and consumed in large quantities, fresh as well as salted.

THORNHILL, Sir James (1676-1734), historical painter, was born at Melcombe Regis, Dorset, in 1676, coming of an ancient but impoverished county family. His father died while he was young, but he was befriended by his maternal uncle, the celebrated Dr Sydenham, and apprenticed to Thomas Highmore, sergeant-painter to King William III., a connexion of the Thornhill family. Little is known regarding his early career. About 1715 he visited Holland, Flanders, and France; and, having obtained the patronage of Queen Anne, he was in 1719-20 appointed her serjeant-painter in succession to Highmore, and was ordered to decorate the interior of the dome of St Paul’s with a series of eight designs, in chiaroscuro heightened with gold, illustrative of the life of that apostle,—a commission for which Louis Laguerre had previously been selected by the commissioners for the repair of the cathedral. He also designed and decorated the saloon and hall of Moor Park, Herts, and painted the great hall at Blenheim, the princesses’ apartments at Hampton Court, the hall and staircase of the Southsea Company, the chapel at Wimpole, the staircase at Easton-Neston, Northamptonshire, and the hall at Green- wich Hospital, usually considered his most important and successful work, upon which he was engaged from 1708 to 1727. Among his easel pictures are the altar-pieces of All Souls and Queen’s College chapels, Oxford, and that in Melcombe Regis church ; and he executed such portrait subjects as that of Sir Isaac Newton, in Trinity

College, Cambridge, and the picture of the House of Commons in 1730, now in the possession of the earl of Hardwicke, in which he was assisted by Hogarth, who married Jane, his only daughter. He also produced a few etchings in a slight and sketchy but effective manner, and executed careful full-size copies of Raphael's cartoons, which now belong to the Royal Academy. About 1724 he drew up a proposal for the establishment of a royal academy of the arts, and his scheme had the support of the lord treasurer Halifax, but Government declined to furnish the needful funds. Thornhill then opened a drawing- school in his own house in James Street, Covent Garden, where instruction continued to be given till the time of his death. He acquired a considerable fortune by his art, and was enabled to repurchase his family estate of Thorn- hill, Dorsetshire. In 1715 he was knighted by George L., and in 1719 he represented Melcombe Regis in parlia- ment, a borough for which Sir Christopher Wren had previously been member. Having been removed from his office by some court intrigue, and suffering from broken health and repeated attacks of gout, he retired to his country seat, where he died on the 4th of May 1734. His son James was also an artist. He succeeded his father as serjeant-painter to George IT., and was appointed "painter to the navy."

The high contemporary estimate of Sir James Thornhill's works a ae since been confirmed; in spite of Dr Young, ''late times "

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"Understand How Raphael's pencil lives in Thornhill's hands."

He is weak in drawing,—indeed, when dealing with complicated figures he was assisted by Thomas Gibson; and, ignorant of the great monumental art of Italy, he formed himself upon the lower

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model of Le Brun. It must, however, be admitted that, in the departments of art which he chose for his own, he was the best native painter of his time.

THORWALDSEN, Bertet (1770-1844), a very able Danish sculptor, was the son of an Icelander who had settled in Copenhagen, and there carried on

the trade of a wood-carver. While very young, Bertel Thorwaldsen learnt to assist his father ; at the age of eleven he entered the Copenhagen school of art, and soon began to show his exceptional talents. In 1792 he won the highest prize, the travelling studentship, and in 1796 he started for Italy ina Danish man-of-war. On the 8th of March 1797 he arrived in Rome, where Canova was at the height of his popularity. Thorwaldsen's first success was the model for a statue of Jason, which was highly praised by Canova, and he received the commission to execute it in marble from Thomas Hope, a wealthy English art-patron. From

that time Thorwaldsen's success was assured, and he did»

not leave Italy for twenty-three years. In 1819 he returned to Denmark, where he was received with the greatest enthusiasm. He was there commissioned to make the colossal series of statues of Christ and the twelve apostles which are now in the Fruenkirche in Copenhagen. These were executed after his return to Rome, and were not completed till 1838, when Thorwaldsen again returned to Denmark. He died suddenly in the Copenhagen theatre in 1844, and bequeathed a great part of his fortune for the building and endowment of a museuni in Copenhagen, and also left to fill it all his collection of works of art, and the models for all his sculpture, —a very large collection, exhibited to the greatest possible advantage. Thor- waldsen is buried in the courtyard of this museum, under a bed of roses, by his own special wish.

On the whole Thorwaldsen was the most successful of all the imitators of classical sculpture, and many of his statues of pagan deities are modelled with much of the antique feeling for breadth and purity of design. His attempts at Christian sculpture, such as the tomb of Pius VII. in St Peter's and the Christ and Apostles at Copenhagen, are less successful, and were not in accordance with the sculptor's real sympathies, which were purely classic. Thorwaldsen's private life was not admirable: he worked some-times with feverish eagerness; at other times he was idle for many months together. A great number of his best works exist in private collections in England. His not very successful statue of Lord Byron, after being refused a place in Westminster Abbey, was finally deposited in the library of Trinity College, Cambridge. The most widely popular among Thorwaldscn's works

have been some of his bas-reliefs, such as the Night and the Morning, which he is said to have modelled in one day. In the main his popularity is now a thing of the past, owing chiefly to the reac- tion against the pseudo-classic style of sculpture.

A well-illustrated account of Thorwaldsen and his works is given by Eugene Plon, Thorwaldsen, sa Vie, &c., Paris, 1880; see also Andersen, B. Thorwaldsen, Berlin, 1845; Killerup, Thorwaldsen's Arbeiten, &c., Copenhagen, 1852; and Thiele, Thorwaldsen's Leben, Leipsic, 1852-56.

THOU, Jacques AuGusTE DE (1553-1617), sometimes known by the Latinized form Tuuanus, as his great history is by the name Zhuana, was born at Paris on October 8, 1553. He belonged to a family of distinction in the Orléanais, of which the elder branch had, he tells us, been noblesse d'épée, though he gives no particulars except of those who had for some generations been noblesse de robe. He and his were closely connected by birth, marriage, and friendship with several of those great legal families—the Harlays, the Huraults, the Brularts, the Lamoignons, and others—which for many generations furnished France with by far her most valuable class of public men. The historian's father was Christophe de Thou, first president of the parlement of Paris, a man whose strong legal and religious prejudices against the Huguenots have rather obscured, in the eyes of historians, his undoubted ability and probity. Christophe's brothers, Adrien and Nicolas, were both men of mark, the former being also a lawyer, and the latter ultimately becoming bishop of Chartres, in which capacity he " instructed"

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Henry IV. at his conversion. De Thou's mother was Jacqueline Tuleu, dame de Céli. He was a delicate child, and seems by his own account to have been rather neglected by his parents ; perhaps it was for this reason that, though he grew stronger with age, he was destined for the church. He took minor orders, and obtained some benefices. It was, however, to the legal side of the ecclesiastical profession that he was devoted, and, after being at school at the Collége de Bourgogne, he studied law at Orleans, Bourges, and Valence, being at the last two places under the tuition of jurists no less celebrated than Hotman and Cujas. It was not, however, till he approached

middle life that he definitely renounced the clerical profession, married, and accepted lay offices. Mean- while he had travelled much and discharged important duties. In 1573, that he might profit by seeing foreign parts, he was attached to the suite of Paul de Foix, who was sent on a circular mission of compliment to the Italian princes, and with him De Thou visited Turin, Milan, Mantua, Venice, Rome, Florence, and many minor places. On his return he studied for four years, tra- velling to the Netherlands in the interval, and in 1579 to Germany. Two years later he was appointed to a royal commission in Guienne, and made the acquaintance of Henry of Navarre and of Montaigne. He had already become the friend of most of the eminent men of letters of the time, from Ronsard downwards, and was particularly intimate with Pierre Pithou, the soul of the future Satire Menippée. De Thou, by all his sympathies, belonged to that later and better phase of the politique party which devoted itself to the maintenance of royalty as the one hope of France; and, when Henry III. was driven from his capital by the violence of the Guises and the League, De Thou followed him to Blois. After his renunciation of orders, he had been made, first, master of requests, and then president @ mortier, which was the highest dignity he ever attained. After the death of Henry III. he attached himself closely to his successor, and in 1593 was appointed (he was a great bibliophile) grand maitre of the royal library, in succession to Amyot, the translator of Plutarch and Longus. It was in this same year that he began his history, the composition of which was inter- rupted, not only by his regular official duties, but by frequent diplomatic missions at home and abroad. His most important employment of all was on the commission which, in face of the greatest difficulties on both sides, successfully carried through the negotiations for the edict of Nantes. Nor were his duties as a diplomatist inter- mitted by the death of Henry IV., though the Govern- ment of Marie de’ Medici refused him the place of premier president which he desired, and hurt his feelings by appointing him instead a member of the financial com- mission which succeeded Sully. This appointment he rather strangely chose to think a degradation. It is, how- ever, absurd to say that the affair, which he survived six years, had anything to do with his death. That, as far as it was hastened by any mental affliction, seems to have been rather due to grief at the death of his second wife, Gasparde de La Chatre, of whom and of his sons and daughters by her (his first marriage with Marie de Bar- bangon had been childless) he was extremely fond. His eldest son, Francois

Auguste, was the friend of Cing Mars, and shared his downfall and fate. But this was a quarter of a century after De Thou's own death, which happened on May 7, 1617.

Although a distinguished ornament of France, De Thou has nothing to do, properly speaking, with French literature. Besides minor works in Latin (a poem on hawking, some paraphrases of the Bible, &c.), he wrote also in Latin the great history which has

made his name known. Entitled Histori# Sui Temporis, it begins shortly before the author's birth (in 1546), and extends to 1607,

ten years before his death. The first part, in eighteen books, was published in 1604; the second, third, and fourth appeared in 1606 and the two following years. The last part, which makes a total of 138 books, did not appear till 1620, under the care of the author's friends Rigault and Dupuy, whom he had named his literary executors. The first named likewise put final touches to De Thou's autobiography, which, also written in Latin, appears in French in most collections of French memoirs. It contains minute details of the author's life down to 1607, mixed with rather miscellaneous descriptions of interesting places which he had visited (such as Mont St Michel, an eagle's eyrie in Dauphiné, &c.); and its com- position is said to have been partly determined by the obloquy cast by bigoted adherents of the papacy on the History. De Thou was indeed obnoxious to these on many grounds. He had helped to nego- tiate the edict of Nantes; he had opposed the acknowledgment in France of the decrees of Trent; he had been a steady Anti-Leaguer ; and he was accused of speaking in the History itself of Protestants and Protestantism, not merely with criminal mildness, but with something like sympathy. It is needless to say that these blots in the History have seemed beauties to later and more dispassionate students. There is no doubt that the charges of partiality on minor and mostly personal points are either disprovable or unim- portant; and the whole seems to be as fair and as carefully accurate as at such a time was possible. On the other hand, the work is undoubtedly planned and executed on much too large a scale, and the inclusion of events in foreign countries, on which the author was often but ill-informed, has not improved it. But it is clearly and on the whole

excellently written, and will always be, as far as any general contemporary history can be so called, the great authority for at least the French part of its subject and period. It was first published as a whole when, as above mentioned, the last part appeared in 1620, and it was several times reprinted. More than a hundred years later, in 1733, an Englishman, Samuel Buckley, working in part on the materials of Thomas Carte, produced at London what is recognized as the standard edition of the original, in 7 vols. folio. The standard French translation was made im- mediately afterwards by a group of literary men, the best known of whom were the Abbé Desfontaines and Prévost, the author of Manon Lescaut, A choice copy of the first edition of the first part, with the arms of Henry IV. on the binding, is in the British Museum library.

THOUSAND AND ONE NIGHTS. The Thousand and One Nights, commonly known in English as The Arabian Nights' Entertainments, is a collection of tales written in Arabic, which first became generally known in Europe in the early part of last century through the French translation by Antoine GALLAND (g.v.), and rapidly attained such universal popularity that it is unnecessary to describe the contents of the book. But the origin of the Arabian Nights claims discussion in this place. In the Journal Asiatique for 1827, p. 253, Von Hammer drew attention to a passage in the Golden Meadows. of Mas'tdt (ed. Barbier de Meynard, iv. 89 sq.), written in 943 a.p., in which certain stories current among the old Arabs are compared with 'the books which have reached us in translations from Persian, Indian, and Greek, such as the book of Hezdr Afséne, a title which, translated from Persian into Arabic, means 'the thousand tales.' This book is popularly called The Thousand and One Nights, and contains the story of the king and his vizier and of his daughter Shirazdd and her slave girl Din4z4d. Other books of the same kind are the book of Ferza and Simas, containing stories of Indian kings and viziers, the book of Sindibad, &e." Von Hammer concluded that the Thousand and One Nights were of Persian or Indian origin. Against this conclusion De Sacy protested in a memoir (Mém. de P Acad. des Inser., 1833, x. 30 sq.), demonstrating that the character of the book we know is genuinely Arabian, and that it must have been written in Egypt at a compara- tively recent date. Von Hammer in reply adduced, in Jour. As., 1839, ii. p. 175 sq., a passage in the Fihrist (987 a.p.), which is to the following effect :-—

‘The ancient Persians were the first to invent tales, and make books of them, and some of their tales were put in the mouths of animals, The Ashghanians, or third dynasty of Persian kings, and after them the Sdsdnians, had a special partin the development of this literature, which found Arabic translators, and was taken

by accomplished Arabic literati, who edited it and imitated it. The earliest book of the kind was the Hezér afsdn or Thousand

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Tales, which had the following origin. A certain Persian king was accustomed to kill his wives on the morning after the consummation of the marriage. But once he married a clever princess called Shahrazad, who spent the marriage night in telling a story which in the morning reached a point so interesting that the king spared her, and asked next night for the sequel. This went on for a thousand nights, till Shahrazad had a son, and ventured to tell the king of herdevice. He admired her intelligence, loved her, and spared her life. In all this the princess was assisted by the king’s stewardess Dinazad. This book is said to have been written for the princess Homai (MSS. Homani), daughter of Bahman…. It contains nearly two hundred stories, one story often occupying several nights. Ihave repeatedly seen the coniplete book, but it is really a meagre and uninteresting production” (Fihrist, ed.

| Fliigel, p. 304).

Persian tradition (in Firdausi) makes Princess Homdi the daughter and wife of Bahman Ardashir, 7.e., Artaxerxes I. Longimanus. She is depicted as a great builder, a kind of Persian Semiramis, and is a half-mythical personage already mentioned in the Avesta, but her. legend seems to be founded on the history of Atossa and of Parysatis. Firdaus{ says that she was also called Shahrazdd (Mohl, v. 11). This name and that of Dinaz4d both occur in what Mas‘tdi tells of her. According to him, Shahraz4d was Homai’s mother (ii. 129), a Jewess (ii. 123). Bahman had married a Jewess (i. 118), who was instrumental in delivering her nation from captivity. In ii. 122 this Jewish

maiden who did her people this service is called Dinazad, but “the accounts,” says our author, “ vary.” Plainly she is the Esther of Jewish story. Tabari (i. 688) calls Esther the mother of Bahman, and, like Firdaust, gives to Homdi the name of Shahrazdd. The story of Esther and that of the original Wights have in fact one main feature in common. In the former the king is offended with his wife, and divorces her; in the Arabian Nights he finds her unfaithful, and kills her. But both stories agree that thereafter a new wife was brought to him every night, and on the morrow passed into the second house of the women (Esther), or was slain (Nights). At length Esther or Shahrazdd wins his heart and becomes queen. ‘The issue in the Jewish story is that Esther saves her people ; in the Wights the gainers are “ the daughters of the Moslems,” but the old story had, of course, some other word than “Moslems.” Esther’s foster-father be- comes vizier, and Shahrazdd’s father is also vizier. Shah- razad’s plan is helped forward in the Wights by Dinazdd, who is, according to Mas‘td{, her slave girl, or, according to other MSS., her nurse, and, according to the Fihrist, the king’s stewardess. The last account comes nearest to Esther ii. 15, where Esther gains the favour of the king’s chamberlain, keeper of the women. It is also to be noted that Ahasuerus is read to at night when he cannot sleep (Esther vi. 1). And it is just possible that it is worth notice that, though the name of Ahasuerus corresponds to Xerxes, Josephus identifies him with Artaxerxes I.

Now it may be taken as admitted that the book of Esther was written in Persia, or by one who had lived in Persia, and not earlier than the 3d century B.o. If now there is real weight in the points of contact between this story and the Arabian Nights—and the points of difference cannot be held to outweigh the resemblances between two legends, each of which is necessarily so far removed from the hypothetical common source—the inference is import- ant for both stories. On the one hand, it appears that (at least in part) the book of Esther draws on a Persian source ; on the other hand, it becomes probable that the Nights are older than the SAs4nian period, to which Lane, iii. 677, refers them.

It is a piece of good fortune that Mas‘idi and the Fihrist give us the information cited above. For in general the Moslems, though very fond of

stories, are ashamed to recognize them as objects of literary curiosity. In fact, the next mention of the Wights is found only after

a lapse of three centuries. Makrizi, describing the capital of Egypt, quotes from a work of Ibn Sa‘id (c. 1250 a.p.), who again cites an older author (Al-Kortobi), who, in speaking of a love affair at the court of the caliph Al-Amir (1097-1130), says “what is told about it resembles the romance of Al-Battal, or the Thousand and One Nights” (itat, Bulak ed., i. 485, ii. 181).

That the Wights which we have are not the original trans- lation of the Jezér Afsdne is certain, for the greater part of the stories are of Arabian origin, and the whole is so thoroughly Mohammedan that even the princes of remote ages who are introduced speak and act as Moslems. It might be conceived that this is due to a gradual process of modernization by successive generations of story-tellers. But against this notion, which has been entertained by some scholars, Lane has remarked with justice that, much as MSS. of the Wights differ from one another in points of language and style, in the order of the tales, and the division into nights, they are all so much at one in essentials that they must be regarded as derived from a single original. There is no trace of a recension of the text that can be looked on as standing nearer to the Hezér Afsdne. And the whole local colour of the work, in point of dialect and also as regards the manners and customs described, clearly belongs to Egypt as it was from the 14th to the 16th century. Some points, as De Sacy and Lane have shown, forbid us to place the book earlier than the second half of the 15th century. Galland’s MS. copy, again, was in existence in 1548. Lane accordingly dates the work from the close of the 15th century or the beginning of the 16th, but this date appears to be too late. For Abw1-Mahdasin, an Egyptian historian who died in 1470, writing of Hamdi, a famous highwayman of Baghdad in the 10th century, remarks that he is probably the figure who used to be popularly spoken of as Ahmed al-Danaf (ed. Juynboll, ii, 305). Now in the Waghts Ahmed al-Danaf really plays a part corresponding to that of the historical Hamdi, being now a robber (Lane, ii. 404) and again a captain of the guard (Lane, ii, 249). Tt would seem that Abu’l-Mah4sin had read or heard the stories in the Mights, and was thus led to compare the historical with the

fictitious character. And, if this be so, the oe must have been composed very soon after

1450.

No doubt the Nights have borrowed much from the Hezér Afsdne, and it is not improbable that even in the original Arabic translation of that work some of the Per- sian stories were replaced by Arab ones. But that our Nights differ very much from the Heedr Afséne is further manifest from the circumstance that, even of those stories in the Nights which are not Arabian in origin, some are borrowed from books mentioned by Mas‘tdi as distinct from the Hezér Afsdne. ‘Thus the story of the king and his son and the damsel and the seven viziers (Lane, chap. xxi. note 51) is in fact a version of the Book of Sindbdd,? while the story of Jalf‘4d and his son and the vizier Shammaés (M‘Naghten, iv. 366 sq.; of. Lane, iii. 530) corresponds to the book of Ferza and Simds.*

Not a few of the tales are unmistakably of Indian or

1 The hypothesis of gradual and complete modernization is also opposed to the fact that the other romances used by Cairene story- tellers (such as those of ‘Antar and of Saif) retain their original local colour through all variations of language and style.

2 On this famous book, the Syriac Sindibdn, the Greek Syntipas, and the Seven Sages of the European West, see Syriac LITERATURE (vol. xxii. p. 850) and Sparn (vol. xxii. p. 354).

3 De Sacy and Lane suppose that the original title of the Arabic translation of the Headér Afsdne was The Thousand Nights. But most MSS. of Mas‘tidi already have The Thousand and One Nights, which is also the name given by Makrizi. Both ciphers perhaps mean only “ very great number,” and Fleischer (De @lossis Habichtianis, p. 4) has shown that 1001 is certainly used in this sense.

Persian origin, and in these poetical passages are rarely inserted. In other stories the scene lies in Persia or India, and the source is foreign, but the treatment thoroughly Arabian and Mohammedan. Sometimes, in- deed, traces of Indian origin are perceptible, even in stories in which Hartn al-Rashid figures and the scene is Bagh- dad or Basra. But most of the tales, in substance and form alike, are Arabian, and so many of them have the capital of the caliphs as the scene of action that it may be guessed that the author used as one of his sources a book of tales taken from the era of Baghdad's prosperity.

The late date of the Nights appcars from sundry ana- chronisms. Inthe story of the men transformed into fish— white, blue, yellow, or red according as they were Moslems, Christians, Jews, or Magians (Lane, i. 99),—the first three colours are those of the turbans which, in 1301, Mohammed b. Kelaun of Egypt commanded his Moslem, Christian, and Jewish subjects respectively to wear.° Again, in the story of the humpback, whose scene is laid in the 9th century, the talkative barber says, '" this is the year 653" (=1255 a.p.; Lane, i. 332, writes 263, but see his note), and mentions the caliph Mostansir (died 1242), who is incorrectly called son of Mostadi.° In the same story several places in Cairo are mentioned which did not exist till long after the 9th century (see Lane, i. 379).7 The very rare edition of the first 200 nights pub- lished at Calcutta in 1814 speaks of cannon, which are first mentioned in Egypt in 1383; and all editions some- times speak of coffee, which was discovered towards the end of the 14th century, but not generally used till 200 years later. In this and other points, ¢.g., in the mention of a mosque founded in 1501 (Lane, iii. 608), we detect the hand of later interpolators, but the extent of such interpolations can hardly perhaps be determined even by a collation of all copies. For the nature and causes of the variations between different copies the reader may consult Lane, iii. 678, who explains how transpositions actually arise by transcribers trying to make up a complete set of the tales from several imperfect copies.

Many of the tales in the Wights have an historical basis, as Lane has shown in his notes. Other cases in point might be added: thus the chronicle of Ibn al-Jauzi (died 1200 a.p.) contains a narrative of Kamar, slave girl of Shaghb, the mother of Al-Moktadir, which is the source of the tale in Lane, i. 310 sg., and of another to be found in M'Naghten, iv. 557 sg. ; the latter is

the better story, but departs so far from the original that the author must have had no more than a general recollection of the narrative he drew on.8 There are other cases in the Nights of two tales which are only variations of a single theme, or even in certain parts agree almost word for word. Some tales are mere compounds of different stories put together without any art, but these perhaps are, as Lane conjectures, later additions to the book; yet the collector himself was no great literary artist. We must picture him as a professional story-teller equipped with a mass of miscellaneous reading, a fluent power of narration, and a ready faculty for quoting, or at a push improvising, verses. His stories became popular, and were written down as he told them,—hardly written by himself, else we should not have so many variations in the text, and such insertions of ‘the narrator says,” “my noble sirs,” and the like. The frequent coarseness of tone is proper to the condition of Egyptian society under the Mameluke sultans, and would not have been tolerated in Baghdad in the age

4 Gildemeister, De Rebus Indicis, p. 89 sq.

5 Quatremére, Sultans Mamloucs, ii. 2, p. 177 sg.

8 Lane, i. 842, arbitrarily writes “ Montasir” for ‘‘ Mostansir.” 7 See also Edinb. Review, July 1886, p. 191 sq.

8 See De Goeje in Gids, 1876, ii. pp. 397-411.

to which so many of the tales refer. Yet with all their faults the Wghts have beauties enough to deserve their popularity, and to us their merit is enhanced by the pleasure we feel in being transported into so entirely novel a state of society.

The original of some of the most interesting tales in Galland’s version, as “‘ Aladdin and the Wonderful Lamp,” ‘“‘ Ali Baba and the Forty Thieves,” has just been dis- covered by Dr Zotenberg in a MS. recently acquired by the National Library at Paris. A careful examination of this MS. and of the Wortley-Montagu MS. in the Bodleian may lead perhaps to a more certain conclusion as to the time of composition.

‘ The Thousand and One Nights became known in Europe through A. Galland’s French version (12 vols., 12mo, Paris, 1704-12) ; the publication was an event in literary history, the influence of which can be traced far and wide. This translation, however, left much to be desired in point of accuracy, and espccially failed to reproduce the colour of the original with the exactness which those who do not read merely for amusement must desire. It was with a special view to the remedying of these defects that Lane produced in 1840 his admirably accurate, if somewhat stilted, translation, enriched with most valuable notes and a discussion of the origin of the work (new edition, with some additional notes, 8 vols., 8vo., London, 1859). Lane’s translation omits the tales which he deemed uninteresting or unfit for a European public. No full translation into English can be published, and, though two such have been privately printed, and one of these (by Sir R. Burton) is being reproduced in an expurgated form, Lane’s version is still unsuperseded for all serious use. Of the Arabic text of the Nights the principal editions are—(1) M‘Naghten’s edition, 4 vols., 8vo, Calcutta, 1839-42 ; (2) the Breslau edition, 12 vols., 12mo, 1835-48, the first 8 vols. by Habicht, the rest by Fleischer (com- pare as to the defects of Habicht’s work, Fleischer, De Glossis Habichtianis, Leipsic, 1836) ; (8) the first Bulak edition, 4 vols., 1862-8. (M. J. DEG.)

THRACE is a name which was applied at various periods to areas of different extent, but for the purposes of this article it will be taken in its most restricted sense, as signifying the Roman province which was so called (Thracia, see Plate of the Roman empire in vol.’ xx.) after the district that intervened between the river Ister (Danube) and the Hemus Mountains (Balkan) had been formed into the separate province of Mcesia, and the region between the rivers Strymon and Nestus, which included Philippi, had been added to Macedonia. The boundaries of this were—towards the N. the Hemus, on the E. the Euxine Sea, on the 8. the Propontis, the Helles- pont, and the Augean, and towards the W. the Nestus. The most distinguishing features of the country were the chain of Rhodope (Despoto-dagh) and the river Hebrus (Maritza). The former separates at its northernmost point from the Hemus, at right angles, and runs southward at first, nearly parallel to the Nestus, until it approaches the sea, when it takes an easterly direction: this bend is referred to by Virgil in the line (@eorg., iii. 351)—

Quaque redit medium Rhodope porrecta sub axem.

The summits of this chain are higher than those of Heemus, and not a few of them range from 5000 to 8000 feet ; the highest point, so far as is at present known (for these mountains have been imperfectly explored), rises towards the north-west, near the point where now stands the famous Bulgarian monastery of Rilo. The Hebrus, together with its tributaries which flow into it from the north, east, and west, drains nearly the whole of Thrace. It starts from near the point of junction of Hemus and Rhodope, and at first takes an easterly direction, the chief town which lies on its banks in the earlier part of its course being Philippopolis ; but, when it reaches the still more important city of Hadrianopolis, it makes a sharp bend towards the south, and enters the sea nearly opposite the island of Samothrace. The greater part of the country is hilly and irregular, though there are considerable plains ; but besides Rhodope two other tolerably definite chains

intersect it, one of which descends from Hzemus to Adrian- ople, while the other follows the coast of the Euxine at no great distance inland. One district in the extreme north-west of Thrace lay beyond the watershed that separates the streams that flow into the Aigean from those that reach the Danube: this was the territory of Sardica, the modern Sophia. In the later Roman period two main lines of road passed through the country. One of these skirted the southern coast, being a continuation of the Via Egnatia, which ran from Dyrrhachium to Thessalonica, thus connecting the Adriatic and the /Zgean ; it became of the first importance after the foundation of Constan- tinople, because it was the direct line of communication between that cityand Rome. The other followed a north- westerly course through the interior, from Constantinople by Hadrianopolis and Philippopolis to the Hemus, and thence by Naissus (Nisch) through Meesia in the direction of Pannonia, taking the same route by which the post-road now runs from Constantinople to Belgrade. The climate of Thrace was regarded by the Greeks as very severe, and that country was spoken of as the home of the north wind, Boreas. The coast in the direction of the Euxine also was greatly feared by sailors, as the harbours were few and the sea proverbially

tempestuous ; but the southern shore was more attractive to navigators, and here we find the Greek colonies of Abdera and Mesambria on the Aigean, Perinthus on the Propontis, and, the most famous of all, Byzantium, at the meeting-point of that sea and the Bosphorus. Another place which proved attractive to colonists of that race was the curious narrow strip of ground, called the Thracian Chersonese, that intervened between the Hellespont and the Bay of Melas, which pene- trates far into the land onits northern side. Among the cities that occupied it, Sestos and Callipolis (Gallipoli) are the most worthy of mention. In order to prevent the incursions of the Thracians, a wall was built across its isthmus, which was less than five miles in breadth. The north-eastern portion of the Aigean, owing to its proximity to the coast of Thrace, was known as the Thracian Sea, and in this were situated the islands of Thasos, Samo- thrace, and Imbros.

There is no sufficient evidence to determine the ethnological affinities of the Thracian race. Their language has perished, and the information respecting them which has come down to us hardly furnishes more than material for conjecture, so that the most that we can affirm on the subject is that they belonged to the Indo- European family. The most striking archeological monuments of the prehistoric period are the sepulchral mounds, which have been compared in appearance to the tumulus on the plain of Marathon; these are found by thousands in various parts of the country, espe- cially in the neighbourhood of the ancient towns. As Roman implements and ornaments have been found in some of them, it is plain that this mode of burial continued to be practised until a late period. The deity whose worship prevailed most extensively in the country was Dionysus. The most powerful Thracian tribe was that of the Odrysx, whose king, Teres, in the middle of the 5th century B.c. extended his dominion so as to include the greater part of Thrace. During the Peloponnesian War his son Sitalecs was an ally of some importance to the Athenians, because he kept in check the Macedonian monarch, who opposed the interests of the Athenians in the Chalcidic peninsula. On the death of that prince his kingdom was divided, and the power of the Thracians was consequently diminished ; but in the time of Philip of Macedon we find Cersobleptes, who ruled the south-eastern portion of the country, exercising an important influence on the policy of Athens. During the early period of the Roman empire the Thracian kings were allowed to maintain an independent

sovereignty, while acknowledging the suzerainty of Rome, and it was not until the reign of Vespasian that the country was reduced to the form of a province. From its outlying position in the northern part of the Balkan peninsula, it was much exposed to the inroads of barbarian invaders, so that it was overrun by the Goths on several occasions, and subsequently by the Huns; but its proximity to Constantinople caused its fortunes to be closely connected with those of that city, from the time when it became the capital of the Eastern empire. In the course of time its inhabitants seem to have been thoroughly Romanized, and to have adopted the Latin language, and there is

much probability in the view that they were the progenitors of the Vlachs, or Roumanians south of the Danube, whose language is of Latin origin, and who at various periods formed an important factor in the countries to the northward of Greece. The first evidence of the development of this nationality is found in a curious story told by Theophanes at the end of the 6th century. At that time a khan of the Avars had overrun the Eastern empire and appeared before the walls of Constantinople; but two generals of the imperial forces, who had concealed themselves in the Balkan, succecded in mustering a considerable body of troops, and were on their way to surprise the rear of the Avars when their project was brought to an end by the following occurrence. One of the beasts of burden happened to fall down in the line of march, on which some one close by called out to its driver, in the language of the country, “Torna, torna, fratre,” that is, “ Turn him round, brother.” The driver did not hear this, but the other soldiers did; and, thinking the enemy were upon them, and that this was the sign for retreat, they took up the cry ‘‘ Torna, torna,” and the whole force fled precipitately. It seems probable that the men who used these words were Roumanian inhabitants of the Balkan. In the course of the Middle Ages the northern parts of Thrace and some other districts of that country were occupied by a Bulgarian popu- lation; and in 1861 the Ottomans, who had previously established themselves in Europe, made themselves masters of Adrianople, which for a time became the Turkish capital. When Constanti- nople fell in 1453, the whole country passed into the hands of the Turks, and in their possession it remained until 1878, when, in accordance with the

provisions of the treaty of Berlin, the northern portion of it was placed under a separate administration, with the title of Eastern Roumelia; this province has now become, to all intents and purposes, a part of the principality of Bulgaria. The population of Thrace at the present day is composcd of Turks, Gyeeks, and Bulgarians. (eile

THRALE. See Prozzi.

THRASYBULUS, an Athenian who played a distin- guished part in the latter years of the Peloponnesian War and in the restoration of the democracy at Athens. In 411 B.c., as an officer in the Athenian armament at Samos, he energetically opposed the oligarchical conspiracy of the Four Hundred, and was mainly instrumental in keeping the fleet and army loyal to the democracy and in procur- ing the recall of the banished Alcibiades. At the battle of Cynnosema, in the same year, he commanded the right wing of the Athenian fleet, and to his valour and conduct the Athenian victory was largely due. He took an active part in the naval operations of the following years, being present at the victories of Cyzicus (410) and Arginuse (406). In 407 he commanded a squadron on the Thracian coast, where he reduced places which had gone over to the Lacedeemonians. When the infamous Thirty Tyrants were at the height of their power in Athens, Thrasybulus, who as a democrat had been banished, marched from Thebes with about seventy men, with the connivance of Thebes, and established himself at Phyle, a strong place in the rear of Athens. There he repulsed an attack directed against him by the Thirty ; his numbers increased, and, after surprising and routing a body of foot and horse, he seized Pirseus, the port of Athens, but, finding the circuit of the walls too great to be defended by his small force, he retired into the adjoining Munychia. Here he was attacked by the troops of the Thirty, but in the street- fighting the democrats had the best of it, and the Thirty were in consequence deposed and retired to Eleusis. Hostilities, however, continued until Pausanias, one of the kings of Sparta, intervened, and by force and craft effected a reconciliation. The democrats marched into Athens with all the pomp of war, and sacrificed to Athene on the Acropolis. This restoration of the democracy by Thrasy- bulus ranked henceforward with the memorable deeds of Athenian history. To his counsels seems due in part the credit for the wise moderation with which the demo- crats used their

victory, and the inviolate good faith with which they observed the political amnesty. The grateful citizens rewarded their champion with an olive crown. In 395, when Thebes was threatened by Sparta, the Athenians, stimulated by Thrasybulus, repaid the

friendly shelter which the Thebans had afforded them in exile by resolving to stand by Thebes against Sparta, and by actually sending a force under Thrasybulus to her aid. In 390, while the war known as the Corinthian was still dragging on, Thrasybulus was sent with a fleet to check the growing power of Sparta in the Aigean. He substituted a, democracy for an oligarchy at Byzantium, and won the friendship of Chalcedon; then, landing in Lesbos, he defeated a joint force of Lacedeemonians and Lesbians. In the following spring he prepared to assist Rhodes, which was threatened by the Lacedemonians ; but to recruit his forces he levied contributions from various cities. At Aspendus, in Pamphylia, an outrage committed by some of his men roused the anger of the people, who fell on him by night, and slew him in his tent. He was buried at Athens, in the Ceramicus, near the graves of Pericles and Phormio.

THREADWORMS. See NEMATOIDEA.

THREE RIVERS, the third city of Quebec province, Canada, and capital of St Maurice county, is situated at the confluence of the rivers St Maurice and St Lawrence. The St Maurice flows in from the north, and, being divided at its mouth by two islands, the channels give the town its name. It is on the line of the Canadian Pacific Rail- way, 78 miles south-west of Quebec, and 92 north-east of Montreal. Founded in 1634, Three Rivers is one of the oldest towns in Quebec. It is the centre of a large lumber trade, which is carried on by the St Maurice and its tributaries. Three leagues from the city are the St Maurice forges, where iron wares were formerly manu- factured extensively. Other industries are furniture and cabinet making, boot and shoe making, and those carried on in the spool factories, brass and lead foundries, sawmills, and carriage factories. The city is the residence of the Roman Catholic bishop whose diocese bears the same name. ‘The chief trade is in lumber, grain, cattle, &c., which find sale in South America, the West Indies, Great Britain, and the United States. The city sends one

member to the Canadian House of Commons and one to the Legislative Assembly. The population of the city in 1881 was 8670 (males 4173, females 4497). The district of Three Rivers comprises the counties of St Maurice, Nicolet, Champlain, and Maskinongé.

THROAT DISEASES. These form a large and import- ant class, and include some of the most serious and fatal of maladies (see Croup and DipurHerta). The present article will be devoted mainly to a general account of the more common diseases affecting the upper part of the re- spiratory passages, but certain morbid conditions of the back of the mouth and of the gullet will also be referred to. The diagnosis of not a few of these diseases has been greatly aided by the introduction into medical practice of the laryngoscope ; but, while the use of this instrument is a part of the education of every well-equipped medical practitioner, the minute investigation and the treatment of the more occult and serious maladies affecting the throat are by general consent, and with much advantage, relegated to the specialist.

Laryngitis, or inflammation of the mucous membrane of the Larynx, may be either acute or chronic.

Acute laryngitis is usually produced by exposure to cold directly, or by a catarrh extending either from the nasal or from the bronchial mucous membrane into that of the larynx. Itisan occasional accom- paniment of certain of the infectious diseascs in which the throat is liable to suffer, such as small-pox, measles, scarlct fever, and crysipelas. Excessive use of the voicc, as in loud speaking or sing- ing, sometimes gives rise to laryngitis. Further, the inhalation of irritating particles, vapours, &c., and the local effects of swallowing very hot fluids, arc well-recognized causes. The chicf changes in the larynx are great redness, with swelling of the parts, which affect the whole interior of the cavity, but are specially marked where the tissues are lax, such as the neighbourhood of the epiglottis and

of the vocal cords. The effect is to produce narrowing of the channel for the entrance of air, and to this the chief dangers are due. The symptoms vary with the intensity of the attack, but, along with more or less feverishness

and constitutional disturbance, there is usually a sense of heat, dryness, and pain in the throat, attended with some difficulty in the act of swallowing. Cough is a constant symptom, and is eithcr loud, barking, or clanging, or else husky and toneless. It is at first dry, but afterwards is ac- companied with expectoration. The voice, like the cough, is rough or husky. The breathing shows evidence of laryngeal obstruction, both inspiration and expiration being prolonged and difficult, with a somewhat hissing sound, and with almost no interval between the two acts. In severe cases the face and surface generally become livid, and suffocation threatens, particularly during the paroxysms of coughing. In favourable cases, which form the majority, the attack tends to abate in a few days, but on the other hand death may oceur suddenly in a suffocative paroxysm, particularly in the case of children. Many cascs of acute laryngitis are so compara- tively slight as to make themselves known only by hoarseness and the character of the cough; nevertheless in every instance the attack demands serious attention. The treatment consists in kecp- ing the patient in bed in an atmosphere of 60° to 70° F., made moist by steam. The use of warm gargles, and the frequent inhalation of the vapour of hot water, containing such soothing substances as benzoin, conitim, hop, &c., and the application of hot fomentations to the throat, will be found of much value. Internally diaphoretics, such as small doses of antimony or Dover’s powder, are also to be recommended. Such remedies usually suffice to re- lieve the attack, but in very severe cases more active interference may be necessary. When there is much swelling of the mucous membrane in the upper portion of the larynx, scarification of the parts with the aid of the laryngoscope may afford relief, but tracheotomy should not be neglected where death appcars to be imminent from suffocation. Attacks of laryngitis may be largely prevented in those liable to them by a regimen calculated to in- vigorate the system, such as the cold bath, regular open-air exer- cise, &c.

Chronic laryngitis may occur as a result of repeated attacks of the acute form, or may arise independently from such causes as habitual exposure (especially where along with this there is over- indulgence in alcohol), the habitual overuse of the vocal organs, &c. The changes taking place in the parts are more permanent than in the acute form, consisting mainly in thickening of the mucous membrane, vocal cords, &. With it may be ulceration, and also sometimes destruction, of the cartilaginous parts of the

larynx. The symptoins vary according to the extent and amount, as well as the duration, of the inflammation. Thus there may simply be a certain huskiness or hoarseness on attempts at the use of the voice, this condition being well exemplified in the so-called clergyman's sore throat (dysphonia clertcorwm) ; while, on the other hand, there may be, not only complete loss of voice, but severe pain in the act of swallowing and great difficulty in breathing, accom- panied sometimes with expectoration of large quantities of matter in the cases where ulceration is present. Under this variety of the disease may be included the ulceration due to syphilis and that occurring in the course of phthisis, both of which are attended with the symptoms now mentioned. The diagnosis and the treat- ment of all such cases is greatly aided by the use of the laryngo- scope, by which a view of the affected parts can be obtained, and the proper remedics more readily applied. In the treatment of the chronic forms of laryngitis rest to the parts is essential, any attempts at continuing the use of the voice only aggravating the condition ; while tonic remedies and regimen should be diligently employed to strengthen the system generally. Applications to the affected parts in the forms of solutions of silver, alum, zinc, tannin, &c., either by means of a sponge-probang introduced into the cavity or by the simpler method of spraying, are often beneficial. The insufflation of powders, such as iodoform, or starch mixed with a minute quantity of morphia, is also of service, as are likewise in- halations of vapours of iodine, carbolic acid, turpentine, eucalyptus, &c. In aggravated forms of this disease tracheotomy is occasion- ally necessary to relieve threatened suffocation.

Symptoms similar to those already described are produced by tumours and other growths in the larynx. Such growths may be of simple character, in the form of isolated fibrous formations attached by a peduncle to some portion of the laryngeal mucous membrane, or as warty excrescences occurring upon or in the neigh- bourhood of the vocal cords. They are detected by means of the laryngoscope, and can often be dealt with effectually by the surgeon. In the more serious malignant tumours (epithcliomatous or cancer- ous), which either take origin in the larynx, or spread into it from adjacent parts, interference by surgical measures can only afford temporary relief.

Certain affections of the larynx are of purely nervous origin, and occur independently of any local disease. One of the most import- ant of these is laryngismus stridulus, otherwise called child-crow- tng or spasmodic croup. This condition occurs chiefly during the

early years of childhood, often in infants during dentition, and manifests itself after premonitory symptoms of a common catarrh, lasting a day or two, by the occurrence of a violent suffocative attack due to sudden spasmodic approximation of the vocal cords, and consequent intcrruption to the breathing. The symptonis are not connected with any local inflammatory condition, but are the result of reflex irritation affecting the nerves supplying the laryn- geal muscles. Such disturbance appears specially apt to occur in rickety or otherwise unhealthy children, in connexion either with dentition or with disorders of the alimentary canal. The onset is sudden, resembling a convulsive seizure, and symptoms of suffoca- tion are at once developed. The child makes strong efforts to inspire, which are accompanied with stridulous or crowing sounds, but, notwithstanding, very little air can enter the chest owing to the spasm of the glottis, and unless relief speedily comes death may be very rapid. In most cases, however, the attack quickly passes off, and the child seems little the worse. A liability to this disorder is sometimes observed in families, and in such instances the attacks are apt to occur in their more serious and fatal forms. Treatment to be of any avail must be promptly applied. It con- sists mainly in the employment of means to allay the spasm. The use of the warin bath is very serviceable for this purpose, as is also chloroform inhalation. But one of the simplest and most effec- tual measures is putting the finger back into the child’s mouth, which is sufficient in many cases to relax the spasm of the glottis, and permit the entrance of air. In impending asphyxia the dash- ing of cold water over the face and chest, and the use of artificial respiration, should be tried, and even trachcotomy or laryngotomy if practicable. In all cases every effort should be made to discover any causes likely to produce nervous irritation, such as teething, intestinal worms, &c., and to deal with these by appropriate reniedies.

Symptoms not unlike those now described sometimes occur in adults as the result of irritation of the recurrent laryngeal nerve, by the pressure upon it of a thoracic aneurism or other tumour. Such pressure, if long continued, results in paralysis of the nerve, occasioning more or less constant trouble in breathing.

In the condition known as nervous aphonia, which occurs mostly in women of hysterical habit or in circumstances of enfecbled health, the voice becomes reduced to a whisper, but there is seldom any affection of the breathing, or cough, and the laryngo- scope reveals a perfectly healthy state of the parts. In such cases the remedies must be directed,to the improvement of the general health. The use of electricity (faradism) applied to the neck is often attended with marked benefit.

Diseases affecting the Trachea are usually associated with laryngeal affections on the one hand or bronchial on the other, and their separate consideration is unnecessary.

The Tonsils are frequently the seat of inflammation, and acute tonsillitis or quinsy is one of the most common forms of sore throat. This affection is usually induced by cold, but it would appear to arise under other conditions also, such as digestive disturbances, &c. It is said to be more common in persons of rheumatic constitution, and one attack predisposes to others. The symptoms come on somewhat suddenly and sharply, with chill followed by fever, the temperature frequently attaining a high point of elevation. Pain is experienced in the act of swallowing from the outset. The inflammation is usually at first confined to one tonsil, but on examining the throat there isscen to be considerable redness and swelling of the whole surrounding mucous membrane, the uvula, soft palatc, &c., while a copious secretion accumulates at the parts, and causes much discomfort. The act of swallowing becomes increasingly difficult, and fluids are apt to regurgitate through the nose. Pain is felt along the Eustachian tube towards the ear, and there are tenderness and swelling in the neck abont the angle of the jaw on the affected side. The voice acquires a peculiar and very characteristic snuffl- ing tone, and there may be some embarrassment to the breathing. In a few days the inflamed tonsil shows signs of suppurating, and an abscess is seen to be bulging forward into the mouth. When this bursts or is evacuated,

speedy relief is obtained, and the patient is soon restored to his usual health. Occasionally, however, the inflammation passes from the onc tonsil to the other, and a similar expcrience has to be gone through again. An attack of quinsy rarely lasts beyond a week or ten days, and is not as a rule attended with danger to life, although it is said that suffocation has occasionally occurred owing to the bursting of a large tonsillar abscess during sleep, and the passage of its contents into the trachea. The treatment fora quinsy is much the sameas that for an ordinary catarrl or cold, —continement to the house, the employ- ment of diaphoretics or mild laxatives, together with light diet, being all that is necessary as regards general management. For the relief of the local inflammation the frequent employment of warm gargles of milk and water or glyccrin and water or the inhalation of vapour afford much relief, as do also hot applications to the neck. Some authorities recommend the sucking of ice and the external application of cold compresses, but on the whole

warmth appears to be the more soothing remedy. When an abscess has formed it may be punctured, but care requires to be observed in doing this that no injury be inflicted on any important blood-vessel.

The tonsils are frequently the seat of permanent enlargement (chronic tonsillitis), which may result from frequent attacks of quinsy or may exist independently. They are often seen in delicate young people, and, in the case of some at least, denote a strumous tendency. They give trouble from the mechanical impediment they present to swallowing and clear articulation, and when very large they cause the breathing to be more or less noisy at all times, but especially during sleep, while again they may give rise to a measure of deafness. They are treated by remedies which promote the general uutrition, such as cod-liver oil, iron, &c., by the use of astringent gargles, and when necessary by excision.

The Pharynax or upper portion of the gullet (seen to a large extent on looking at the back of the mouth) is frequently the seat of a chronic inflammatory condition, usually associated with derangements of the digestive organs, and sometimes the result of excessive tobacco smoking. On inspection the mucous membrane is seen to be unduly red and glazed

looking, with the enlarged follicles standing out prominently. It produces considerable irritation, cough, and discomfort, which may be of long continu- ance unless subjected to appropriate treatment. This consists in removing any local source of irritation, in rectifying by diet and other remedies (see SromMAcH DisEAsEs) any gastric disturb- ance, and by the application to the parts of silver or other mild caustic solution.

The Gsophagus or gullet may be the seat of catarrhal or inflammatory conditions, but the more important ailments affect- ing this tract are those which arise from local injuries, such as the swallowing of scalding or corrosive substances. This may cause ulceration followed with cicatrization which narrows the passage and produces the symptoms of stricture of the esophagus, —namely, pain and difficulty in swallowing, with regurgitation of the food. The severity of the case will necessarily depend upon the amount of narrowing and consequent mechanical obstruction, but in some instances this has occurred to such an extent as practically to occlude the canal. Cases of oesophageal stricture of the kind now referred to may sometimes be relieved by the diligent use of the bougie, but not unfrequently, in order to prevent death by starvation, surgical interference is requisite to form an opening into the stomach by means of which food may be introduced.

A still more serious and frequent cause of cesophageal stricture is that due to cancerous growth in the canal, which may occur at any part, but is most common at the lower end, in the vicinity of the entrance into the stomach. The symptoms of this condition are increasing difficulty in the passage downwards of the food, the steady decline in strength, and the development of the cancer- ous cachexia, together with enlargements of the glands in the neck ; while the diagnosis is rendered the more certain by the absence of any cause, such as local injury, for the formation of a stricture, and by the age (as a rule at or beyond middle life). Treatment here can only be palliative while life continucs, which in general is not long. Feeding by the bowel (enemata) may be advantageously resorted to as supplementary to efforts to admin- ister liquid nutriment in the usual way. It is to be observed in all cases of organic stricture that the food does not necessarily return at once, but seems as if it had passed into the stomach. In reality, however, it has passed into the dilated or pouched portion of the canal, which is almost

always present immediately above the seat of stricture, where it remains until, from its amount, it regurgitates back into the mouth, when it can be seen, by the absence of any evidence of digestion, that it has never been within the cavity of the stomach. While in this way a large quantity of the food returns, it often happens that a small amount of the liquid portion does trickle through the narrowed canal into the stomach, and thus life may be prolonged for a considerable time.

Strictures of the cesophagus may also be produced by the pres- sure of tumours or aneurisms within the cavity of the chest but external to the canal. Further, a variety of cesophageal stricture is not unfrequently met with which is due entirely to nervous causes, and is quite unconnected with organic disease,—namely, that form occurring in hysterical females termed spasmodic stric- ture. Here the attack of difficulty in swallowing comes on usually when the patient is at meals, and the food cannot pass down. The absence, however, of all history of any organic source of disease, and especially the perfect facility with which the cesophageal tube or bougie is passed, together with other manifestations of hysteria com- monly present, serve readily to establish the diagnosis. The remedies most suitable are tonics and the frequent passage of the stomach- tube, which as a rule soon entirely removes the tendency to spasm.

Fiually, difficulty in swallowing sometimes occurs in certain serious nervous diseases from paralysis affecting the nerves supply- ing the muscular coats of the csophagus, which thus loses its propulsive power. When such complications occur they usually denote an advanced stage of the central disease with which they are connected, and a speedily fatal termination. (J. O. A.)

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THRONDHJEM, or TronpasEm (DRontHEIM), the third town of Norway, capital of the Throndhjem stift and of the South Throndhjem amt, is pleasantly situated on the southern shore of the Throndhjem fjord, at the mouth of the Nid, 348 miles by rail to the north of Christiania, in 63° 25’ 52” N. lat. and 10° 33’ 19” E. long. In front of the town is the islet of Munkholm, formerly a monastery and now a fortress; on the high ground to the east is the small stronghold of Christiansten. The houses of Throndhjem,

principally of wood, are substan- tial, spacious, and well lighted ; and the streets are wide, regular, and scrupulously clean. The principal building is the cathedral, partly dating from about 1090, but chiefly belonging to the 12th and 13th centuries (c. 1161-1248). Its extreme length was 325 feet and its extreme breadth 124 feet; but in the 14th, 15th, and 17th centuries it suffered greatly from repeated fires ; after the last of these the nave was completely abandoned, and soon became a heap of ruins. The building, which still ranks as the finest ecclesiastical edifice in Norway, and is the place of coronation of the Norwegian sovereigns, is now undergoing extensive but judicious restoration. The workmanship of its eastern windows and of the marble or steatite columns of the choir is specially noteworthy. Throndhjem possesses three churches in all, and among its other public buildings may be mentioned the residences of the stiftsamtmand and the bishop, the grammar school, the real school, the head office of the Bank of Norway, the deaf and dumb institute, the hospital, and the theatre. It is the seat of the royal Norwegian scientific society, in connexion with which are an excellent library and a good zoological and anti- quarian museum. Throndhjem, which has steamboat com- munication with Christiania, Hamburg, and Hull, and is connected with Sweden by the Meraker Railway (63 miles), carries on an extensive trade in copper (from the Roros mines), timber, oil, and dried and salted fish ; the industries include shipbuilding, sawmilling, distilling, tanning, rope-making, and ribbon-making. The popula- tion in 1875 was 22,152; in 1885 it was estimated at

24,000.

Throndhjem, originally Nidaros, was founded by Olaf Tryggvason, who built a royal residence and a church here in 996. It was made an archbishopric in 1152. The city attained its highest development about the latter half of the 13th century, by which time it had become an important pilgrimage centre and had as many as fifteen churches. It has sustained frequent sieges, as well as devastating conflagrations. Its importance declined about the time of the Reformation, when it ceased to be a resort of pil- grims. At the beginning of the present century its inhabitants numbered only 8882.

THRUSH (A. S. prysce, Icel. préstr, Norw. Trast, O. H. Germ. Drosce, whence the modern German Drossel, to be compared with the analogous English form THRostTLE,? now almost obsolete, both being apparently diminutives), the name that in England seems to have been common to two species of birds, the first now generally distinguished as the Song-Thrush, but known in many districts as the Mavis,? the second called the Mistletoe-Thrush, but having many other local designations, of which more presently.

The former of these is one of the finest songsters in Europe, but. it is almost everywhere so common that its merits in this respect. are often disregarded, and not unfrequently its melody, when noticed, is ascribed to the prince of feathered vocalists, the NIGHTINGALE (vol. xvii. p. 498). The Song-Thrush is too well known to need description, for in the spring and summer there is hardly a field, a copse, or a garden that is not the resort of a pair or more; and the brown-backed bird with its spotted breast,

1 For many interesting facts connected with the words “Thrush” and “ Throstle” which cannot be entered upon here, the reader should consult Prof. Skeat’s Htymological Dictionary.

2 Cognate with the French Jfauvis, though that is nowadays almost restricted to the REDWING (vol. xx. p. 818). Its diminutive is Mauviette, the modern table-name of the Skylark, and perhaps Mavis was in English originally the table-name of the Thrush,

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hopping over the grass for a few yards, then pausing to deteet the movement of a worm, aud vigorously seizing the same a moment after, is one of the most familiar sights. Hardly less well known is the singular nest built by this bird—a deep eup, lined with a thin but stiff eoating of fragments of rotten wood ingeniously spread, and plastered so as to present a smooth interior—in whieh its sea-green eggs spotted with blaek are laid, An early breeder, it builds nest after nest during the season, and there ean be few birds more prolifie. Its ravages on ripening fruits, especially strawberries and gooseberries, exeite the enmity of the imprudent gardener who leaves his erops unproteeted by nets, but he would do well to stay the hand of revenge, for no bird ean or does destroy so many snails, as is testified to the enrious observer on inspcetion of the stones that it seleets against whieh to dash its captures,—stoncs that are besmeared with the slime of the vietims and bestrewn with the fragments of their shattered shells. Nearly all the young Thrushes reared in the British Islands—and this expression includes the storm-swept isles of the Outer Hebrides, though not

those of Shetland—seem to cmigrate as soon as they are fit to journey, and at a later period they are followed by most of their parents, so that many parts of the kingdom are absolutely bereft of this speeies from October to the end of January. On the continent of Europe the autumnal influx of the birds bred in the North is regarded with much interest, as has been already stated (Brrps, vol. iii. p. 765), for they are easily ensnared and justly esteemed for the table, while their numbers make their appearanee in eertain districts a matter of great importanee.

The seeond specics to which the name applies is distinguished as the Mistletoe-Thrush, or, by eorrupt abbreviation, the Missel- Thrush.! It is known also in many districts as the ‘‘ Storm-eoek,” from its habit of singing in squally weather that silences almost all other birds, and ‘‘Holm- (¢.e., Holly-) Thrush,” while the harsh eries it utters when angry or alarmed have given it other loeal names, as *‘ Sereeeh,” ‘‘Shrite,” and ‘‘ Skrike,” all traeeable to the Anglo-Saxon Scric.? This is a larger speeies than the last, of paler tints, and eonspieuous in flight by the white patches on its outer tail-feathers. Of bold disposition, and fearless of the sleety storms of spring, as of predatory birds, the eock will take his stand on a tall tree, ‘like an enchanter ealling up the gale ” (as Knapp happily wrote), and thence with loud voiee proelaim in wild and diseontinuous notes the fervour of his love for his mate ; nor does that love eease when the breeding-season is past, since this species is one of those that appear to pair for life, and even when, later in the year, it gathers in small floeks, husband and wife may be seen in elose company. In defenee of nest and offspring, too, few birds are more resolute, and the Daw, Pie, or Jay that approaehcs with an ill intent speedily reeeives treatment that eauses a rapid retreat, while even the marauding eat finds the precinets of the ‘‘ master of the eoppiee” (Pen y llwyn), as the Welsh name this Thrush, unsuitable for its stealthy operations. The connexion of this bird with the mistletoe, whieh is as old as the days of Aristotle, is no figment, as some have tried to maintain. Not only is it exeecdingly fond of the luscious viseid berries, but it seems to be almost the only bird that will touch them. Of other British Thrushes, the FIELDFARE (vol. ix. p. 142), Repwrne (vol. xx. p. 818), and the Blaekbird and Ring-OvuseEt (vol. xviii. p. 75) have been before notieed in these pages, as has been (under the first of those headings) the so-ealled ‘‘ Robin” of North America.

The Thrushes have been generally considered to form a distinct Family, Z'urdidx, which is placed by some taxo- nomers the highest in rank among birds. An attempt has already been made (ORNITHOLOGY, vol. xviii. pp. 30, 48) to point out the fallacy of this view, and space is here wanting to dwell longer on the matter. This is the more to be regretted, for, though many modern systematists will admit the close connexion of the Turdidz and some of the so-called Family Sylvizdx or WARBLERS (q.v.), the abolition or modification of the latter, by wholly or par- tially merging it in the former, has not yet been satis- factorily effected, and Mr Seebohm, in his portion of the British Museum Catalogue of Birds (v. p. 1), being com-

1 There is no doubt of the bird taking its name from the plant

pelled by the conditions previously laid down by Mr Sharpe (op. ct, iv. pp. 6, 7) to unite them, protests against doing so. His own assignment of the Subfamily Turdine is into 11 genera, of which, however, 6 only would be commonly called Thrushes, and it must be borne in mind that in establishing these he regards coloration as the most valid character. They are Geocichla with 40 species, Zurdus with 48, Merula with 52, Mimocichla with 3, Catharus with 12, and Jfonticola with 10. These last, well known as Rock-Thrushes, make a very near approach to the NIGHTINGALE (vol. xvii. p. 498), REpsTartT (vol. xx. p. 317), and WHEATEAR (q.v.). (A. N.) THUCYDIDES. Thucydides was the greatest historian of antiquity, and, if not the greatest that ever lived, as some have deemed him, at least the historian whose work is the most wonderful, when it is viewed relatively to the age in which he did it. The most important facts which we know about him are those which he has told us himself. It matters very little, fortunately, that the biographical materials are scanty. For posterity, his life is represented by his life's labour, the MZistory of the Pelo- ponnesian War; and the biographical facts are of interest chiefly as aids to the appreciation of that history. He was probably born in or about 471 B.c.

Gellius, who says that in 431 Hellanicus ‘‘ seems to have been” sixty-five years of age, Herodotus fifty-three, and Thucydides forty (oct. Att., 15, 23). The authority for this statement was Pamphila, a compiler of biographical and historical notices, who lived in the reign of Nero. She must have had access to Greek sources of the 4th century B.c.; and her precision—though qualified, in the version of Gellius, by the word “seems ”—would warrant the supposition that she had taken some pains to secure accuracy. Further, the date which she assigns is in good accord with an inference fairly deducible from the language of Thucydides himself, viz., that in 431 he had already reached the full maturity of his powers. Kriiger, indeed, would place his birth earlier than 471, and Ullrich later, but for reasons, in each case, which can scarcely outweigh the ancient authority.

The parentage of Thucydides was suchas to place him Parent- in a singularly favourable position for the great work to 26°

which he afterwards devoted his life. His father Olorus, a citizen of Athens, belonged to a family which derived wealth and influence from the possession of gold mines at Scaptesyle, on the Thracian coast opposite Thasos, and was a relative of his elder namesake, the Thracian prince whose daughter Hegesipyle married the great Miltiades, so that Cimon, son of Miltiades, was a cousin, perhaps first cousin, once removed, of Thucydides. It was in the vault of the Cimonian family at Athens, and near the remains of Cimon’s sister Elpinice, that Plutarch saw the grave of Thucydides, Thus the fortune of birth secured three signal advantages to the future historian: he was rich ; he had two homes—one at Athens, the other in Thrace,—no small aid to a comprehensive study of the conditions under which the Peloponnesian War was waged ; and his family connexions were likely to bring him from his early years into personal intercourse with the men who were shaping the history of his time.

The only definite Date of ‘ testimony on the subject is contained in a passage of Aulus Pirth.

Mistletoe (Viscum album), about the spelling of which there can be po uncertainty—A.S. Misteltan, the final sylable originally signifying

twig,” and surviving in the modern ‘‘tine,” as of a fork or of a deer’s antler.

The development of Athens during the forty years The years from 471 to 431 was, in itself, the best education which 471-431 such a mind as that of Thucydides could have received. **

7 It seems quite possible that the word Surikr (vol. xxi. p 845), though now commonly accepted as the equivalent, in an ornithological sense, of Lantus, may have been originally applied to the Mistletoe- Thrush, In several of the Anglo-Saxon Vocabularies datiug from the 8th to the 11th century, as printed by Thomas Wright, the word Scric, which can be hardly anything else than the early form of '* Shrike," is glossed Turdus.

In the first two decades of his life the expansion and con- solidation of Athenian power was proceeding; between his twentieth and fortieth year the inner resources of the city were being applied to the embellishment and ennoble- ment of Athenian life. As Cimon had been the principal agent in the former period, so Pericles was the central

of surprise or complaint, that the History tells us nothing | simply because they did not belong to his subject. His of the literature, the art, or the social life under whose in- | work was intended to be "a possession for ever." He fluences its author had grown up. The Funeral Oration | could conceive a day when Sparta should be desolate, contains, indeed, his general testimony to the value and | and when only ruins of Athens should remain. But his ner the charm of those influences. There we have the very | imagination never projected itself into a time when the feof essence of the Athenian spirit condensed into a few preg- | whole fabric of Hellenic civilization should have perished. thens- nant sentences, which show how thoroughly the writer was | Could his forecast have extended to an age when men of imbued with that spirit, and how profoundly he appreci- | "barbarian" races and distant climes would be painfully ated its various manifestations. But he leaves us to | endeavouring to reconstruct a picture of that civilization, supply all examples and details for ourselves. Beyond a | —when his own narrative would need the help of side- passing reference to public " festivals," and to " beauti- | lights which seemed to him wholly unnecessary, —then, ful surroundings in private life," he makes no attempt | assuredly, he would have added all that such readers to define those "recreations for the spirit" which the | could require. But he would not have done this in the

Athenian genius had provided in such abundance. No | manner of Herodotus, by free indulgence in digression; writer of any age, perhaps, has rendered a more impressive | rather he would have gathered up the social and intel- tribute to the power of the best art than is implied in | lectual phenomena of his day in a compact and systematic the terse phrase of Thucydides, when, speaking of the | introduction, specially designed for the non-Hellenic reader. works which the Athenian daily saw around him, he The biography which bears the name of Marcellinus declares that ‘the daily delight of them banishes gloom ” | states that Thucydides was the disciple of Anaxagoras in Thucy- (dv Kal’ jpepav 7H répys 76 AuTypdv exdyooe). But it is | philosophy and of Antiphon in rhetoric. Such statements dides and not to Thucydides that we owe any knowledge of the | were often founded on nothing more than a desire to 42tiphon. particular forms in which that art was embodied. He | associate distinguished names, and to represent an eminent alludes to the newly-built Parthenon only as containing | man as having profited by the best instruction in each the treasury ; to the statue of Athene Parthenos which it | kind which his contemporaries could afford. In this case enshrined, only on account of the gold which, at extreme | there is no evidence to confirm the tradition. But it may need, could be detached from the image ; to the Propyleea | be observed that Thucydides and Antiphon at least belong and other buildings with which Athens had been adorned | to the same rhetorical school, and represent the same under Pericles, only as works which had reduced the | early stage of Attic prose. Both writers use words of an surplus of funds available for the war. Among the illus- | antique or decidedly poetical cast ; both point verbal con- trious contemporaries whose very existence would be | trasts by insisting on the precise difference between terms unknown from his pages are the dramatists Alschylus, | of similar import; and both use metaphors somewhat Sophocles, Euripides, Aristophanes ; the architect Ictinus; | bolder than were congenial to Greek prose in its riper the sculptor Phidias; the physician Hippocrates; the | age. The differences, on the other hand, between the philosophers Anaxagoras and Socrates. If Thucydides | style of Thucydides and that of Antiphon arise chiefly had mentioned Sophocles as a general in the Samian War, | from two general causes. First, Antiphon wrote for it may be doubted whether he would have noticed the | hearers, Thucydides for readers ; the latter, consequently, circumstance that Sophocles also wrote dramas, unless it | can use a degree of condensation,

and a freedom in the had been for the purpose of distinguishing him from a | arrangement of words, which would have been hardly namesake. And, had he lived to carry his story down to | possible for the former. Again, the thought of Thucy- the debate in the Athenian ecclesia, after the battle of | dides is often more complex than any which Antiphon Arginus, we may conjecture that Socrates, if named at | undertook to interpret ; and the greater intricacy of the all, would have been barely mentioned as the one prytanis | historian's style exhibits the endeavour to express each out of fifty who resisted an unconstitutional act,—with | thought.) Few things in the history of literary prose are Style of some expression, perhaps, of praise, but without any fuller | more interesting than to watch that vigorous mind in its Thucy- characterization. We think of the countless occasions | struggle to mould a language of magnificent but im- #4 which Herodotus, if he had dealt with this period, would | mature capabilities. The obscurity with which Thucy- have found for invaluable digressions on men and manners, | dides has sometimes been reproached often arises from the on letters and art ; we feel the severity of the loss which | very clearness with which a complex idea is present to the reticence of Thucydides has caused to us; and we | his mind, and his strenuous effort to present it in its might almost. be tempted to ask whether the more genial, | entirety, when the strong consciousness of logical cohe- if laxer, method of Herodotus does not indeed correspond | rence will make him heedless of grammatical regularity. better with a liberal conception of the historian's office. | He never sacrifices the thought to the language, but he No one can do full justice to Thucydides, or appreciate | will sometimes sacrifice the language to the thought. the true completeness of his work, who has not faced this | A student of Thucydides may always be consoled by the question, and found the answer to it. It would be a | reflexion that he is not engaged in unravelling a mere hasty judgment which inferred from the omissions of the | rhetorical tangle. Every light on the sense will be a light History that its author's interests were exclusively polit- | on the words ; and, when, as is not seldom the case, Thucy- ical. Thucydides was not writing the history of a period. | dides comes victoriously out of this struggle of thought Limit His subject was an event —the Peloponnesian War,—a war, | and language, having achieved perfect expression of his an as he believed, of unequalled importance, alike in its | meaning in a sufficiently lucid form, then his style rises sf _ direct results and in its political significance for all time. | into an intellectual brilliancy—

thoroughly manly, and also History, To his task, thus defined, he brought an intense concentra- | penetrated with intense fecling—which nothing in Greek

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figure of the latter. A consciousness of such periods may be traced in the passage of the Funeral Oration where Pericles refers, first, to the acquisition of empire by the preceding generation, and then to the improvement of that inheritance by his own contemporaries (ii. 36. 5). It is anatural subject of regret, though it is not a just cause

tion of all his faculties. He worked with a constant desire to make each successive incident of the war as clear as

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possible. ‘To take only two instances: ‘there is nothing in literature more graphic than his description of the plague at Athens, or than the whole narrative of the Sicilian expedition. But the same temper made him resolute in excluding irrelevant topics. The social life of the time, the literature and the art, find no place in his picture

prose literature surpasses. 1 See Jebb’s Attic Orators, vol. i. p. 35.

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His The History shows not only a thorough insight into the —Thucydides was an exile from Athens. It is not im- ne of relation political ideas of Pericles, but also a sympathy with him, | probable that the charge brought against him was that of Fie to public snd an admiration for his character, which indicate per- | treason (xpodocia), for which the penalty was death, and ““™ a sonal friendship. If, before 431, Thucydides had wished to | that he avoided this penalty by remaining in banish- take a prominent part in the public life of Athens, every- | ment. A special psephism is said to have been required thing was in his favour. But there is no trace of his | before Thucydides could return in 404, which would have having done so; and it is possible that his opportunities | been regular if a capital sentence had been

on record in this respect were modified by the necessity of frequent against him, but not so if he had been merely under visits to Thrace, where the management of such an | sentence of exile. Cleon is said to have been the prime important property as the gold mines must have claimed | mover in his condemnation ; and this is likely enough. the occasional presence of the proprietor. The manner in | Eucles was probably punished also. Grote was the first which he refers to his personal influence in that region is modern writer to state the reasons for thinking that such as to suggest that he had sometimes resided there | Thucydides may have been really guilty of culpable 430. (iv. 105.1). He was at Athens in the spring of 430, when | negligence on this occasion, and that his punishment— The the plague broke out. If his account of the symptoms which had usually been viewed as the vindictive act of plague. hag not enabled physicians to agree on a diagnosis of the | a reckless democracy—may have been well deserved. malady, it is at least singularly full and vivid, He had Everything turns on the question why he was at Thasos himself been attacked by the plague; and, as he briefly | just then, and not at Eion. No one disputes that, after adds, “he had seen others suffer.” The tenor of his | the summons from Eucles, he did all that was possible. narrative would warrant the inference that he had been | It is true that the facts of the situation, so far as we one of a few who were active in ministering to the sufferers know them, strongly suggest that he ought to have been in that fearful time when religion and morality lost all | at Eion, and do not disclose any reason for his being at control over the despairing population of Athens—when | Thasos. But it is only fair to remember, in a case of this all the ordinary decencies of life were set at nought, and | kind, that there may have been other facts which we do when even the nearest relatives failed in the duties of | not know. There issome presumptive evidence of careless- humanity towards the dying. ness ; but we can hardly say more than that. The absence 424, The turning-point in the life of Thucydides came in | of Thucydides from the neighbourhood of Amphipolis at the winter of the year 424. He was then forty-seven (if | that precise juncture may have had some better excuse his birth has been rightly placed in 471), and for the | than now appears. first time he is found holding an official position. He was From 423 to 404 the home of Thucydides was on 423-404, one of two generals entrusted with the command of the | his property in Thrace, but much of his time appears to Travels. regions towards Thrace (ra éxt @pdxys), a phrase which | have

been spent in travel. He visited the countries of denotes the whole Thracian seaboard from Macedonia east- | the Peloponnesian allies,—recommended to them by his ward to the vicinity of the Thracian Chersonese, though | quality as an exile from Athens; and he thus enjoyed often used with more special reference to the Chalcidic | the rare advantage of contemplating the great war from a peninsula. One reason why Thucydides had been chosen | point of view opposite to that at which he had previously for the post was the local influence which he possessed | been placed. He speaks of the increased leisure which his among the people of the Thracian seaboard, through his | banishment secured to his study of events. He refers family connexions and his ownership of the gold mines. partly, doubtless, to detachment from Athenian politics, His colleague in the command was Eucles. About the | partly, also, we may suppose, to the opportunity of visit- end of November 424 Eucles was in the city of Amphi- | ing places signalized by recent events, and of examining polis, on the river Strymon. That city was not merely their topography in the light of such information as he more important to Athens than any other place in the | could collect on the spot. The local knowledge which is region,—it was the stronghold of Athenian power in the | often apparent in his Sicilian books may have been north. To guard it with all possible vigilance was a | acquired at this period. The banishment of Thucydides matter of peculiar urgency at that moment. The ablest | was the most fortunate event that could have occurred for of Spartan leaders, Brasidas, was then in Thrace with a | him and for us, when it enabled him, in this way, to look Peloponnesian army,—not, indeed, close to Amphipolis, | at his subject all round. If it is always hard for an but still within a distance which imposed special caution | historian to be impartial, it is especially so for the historian on Athenian officers. He was in the Chalcidic peninsula, | of a great war in which his own country has been one of where he had already gained rapid success ; and part of | the combatants. The mind of Thucydides was naturally the population between that peninsula and Amphipolis | judicial, and his impartiality—which seems almost super- was already known to be disaffected to Athens. Under | human by contrast with Xenophon’s Hellenica—was in circumstances so suggestive of possible danger, we might | some degree a result of temperament. But it cannot be have expected that Thucydides, who had seven ships of | doubted that the evenness with which he holds the scales war with him, would have been near his colleague Eucles, | was greatly

assisted by the experience which, during these and ready to co-operate with him ata moment’s notice. | years of exile, must have been familiar to him— that of It appears, however, that, with his ships, he was at the | hearing the views and aimsof the Peloponnesians set forth island of Thasos, several miles distant from the Thracian | by themselves, and of estimating their merits otherwise coast. Brasidas, making a forced march from the Chal- | than would have been easy for an observer in a hostile cidic peninsula, suddenly appeared before Amphipolis. | camp. Eucles sent in all haste for Thucydides, who arrived with His own words make it clear that he returned to Athens, 404. his ships from Thasos just in time to beat off the enemy | at least for a time, in 404. Classen supposes that his Return to from Eion at the mouth of the Strymon, but not in time | return took place in the autumn of that year, about six Athens. Fall of to save Amphipolis. Only a few hours before, it had | months after Athens had surrendered to Lysander, and oo capitulated to Brasidas, who had offered exceptionally | while the Thirty were still in power. Finding that the

favourable terms. The profound vexation and dismay felt at Athens found expression in the punishment of the commander who seemed primarily responsible for so grave a disaster. For the next twenty years—z.e., till 404

rule of the oligarchy was becoming more and more violent, Thucydides again left Athens, and retired to his property in Thrace, where he lived till his death, working at his History. The preponderance of testimony certainly goes

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to show that he died in Thrace, and by violence. It would seem that, when he wrote chapter 116 of his third book, he was ignorant of an eruption of Etna which took place in 396. There is some reason then, for believing

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Thucydides has subjected his materials to the most searching Dis- scrutiny. The ruling principle of his work has been strict adher- tinctive ence to carefully verified facts. “As to the deeds done in the war, aim of I have not

thought myself at liberty to record them on hearsay Thucy- from the first informant or on arbitrary conjecture. My account dides,

Death: that he did not survive his seventy-fifth year. According | rests either on personal knowledge or on the closest possible scrutiny before +o ancient tradition, he was killed by robbers. His relics ae Se eae ee by others. The process a ee was 396 : 1a: ; : 1, | laborions, because conflicting accounts were given those who B.C. (2). ae brought to Athens, and laid ae the vault of Cimon's had witnessed the several events, as pantielitey amare or memory family, where Plutarch saw their resting-place. The abrupt || saeced them:" ness with which the History breaks off agrees with the A period of at least twenty years must have elapsed between the Hero- story of a sudden death. The historian's daughter is said dae at Hite Eerie aera ee ang ee ere the dotus * ; istory of Thucydides received its present form. ere can be no and ue have saved the unfinished work, and to have placed " doubt that Thucydides knew the History of Herodotus, and that Thucy- in the hands of an editor. This editor, according to one | in some places he alludes to it. The diligence and the honesty of dides, account, was Xenophon, to whom Diogenes Laertius assigns | Herodotus are alike beyond question, and would, we may be sure, the credit of having '" brought the work into reputation, | have been fully recognized by Thucydides. The work of Herodotus when he might have suppressed it? The tradition is | WS distinct in kind from that of the Ionian chroniclers, and was Aoubeeal, th 3 see ly i of an immeasurably higher order. While they dealt, in a bold however, very doubtiul. In its origin, 1t may Rave been | fashion, with the annals of separate cities or peoples, Herodotus merely a guess, suggested by a feeling that no one then | set the first example of multifarious knowledge subordinated to the living could more appropriately have discharged the office execution of a great historical plan, and also showed for the first of literary executor than the writer who, in his /edlenica, time that a prose history could have literary charm. But Thucy- c i" aie dides doubtless thought of Herodotus as having certain traits in continued the narrative. common with the Ionian chroniclers, and as being liable, so far, to Con- At the outset of the History Thucydides has indicated his general | the same criticism. One such trait would be the inadequate sift- ception eonception of his work, and has stated the principles which governed | ing of evidence; another, the mixture of a fabulous element with of the its composition. His

purpose had been formed at the very begin- | historical fact; and another, perhaps, the occasional aiming at History. ning of the war, in the conviction that it would prove more im- | rhetorical effect. Of this last trait the chief instances would be portant than any event of which Greeks had record. The leading | those imaginary dialognes or speeches with which Herodotus some- belligerents, Athens and Sparta, were both in the highest condition | times enlivens his narrative. This brings us to an important topic, of effective equipment. The whole Hellenic world—including | —the purpose with which Thucydides himsclf has admitted speeches Greek settlements outside of Greece proper—was divided into two | into his History, and the manner in which they have becn com- parties, either actively helping one of the two combatants or medi- | posed. tating such action. Nor was the movement confined within even The speeches constitute between a fourth and a fifth part of the The the widest limits of Hellas; the ‘“‘barbarian” world also was | History. If they were eliminatcd, an admirable narrative would speeches. affected by it,—the non-Hellenic populations of Thrace, Macedonia, | indeed remain, with a few comments, usually brief, on the more Be Sicily, and, finally, the Persian kingdom itself. The aim | striking characters and events. But we should lose all the most Per- of Thucydides was to preserve an accurate record of this war, not | vivid light on the inner workings of the Greek political mind, on manent only in view of the intrinsic interest and importance of the facts, | the motives of the actors, and the arguments which they used,— interest but also in order that these facts might be permanent sources of | in a word, on the whole play of contemporary feeling and opinion. of the oes teaching to posterity. His hope was, as he says, that his | To the speeches is due in no small measure the imperishable war, istory would be found profitable by ‘‘those who desire an exact | intellectual interest of the History, since it is chiefly by the knowledge of the past as a key to the future, which in all prob- | speeches that the facts of the Peloponnesian War are so lit up with ability will repeat or resemble the past. The work is meant to be a | keen thought as to become illustrations of general laws, and to possession for ever, not the rhetorical triumph of an hour.” As | acquire a permanent suggestiveness for the student of politics. this context shows, the oft-quoted phrase, ‘a possession for ever,” When Herodotus made his persons hold conversations or deliver had, in its author’s meaning, a more definite import than any mere | speeches, he was following the precedent of epic poetry; his tone

anticipation of abiding fame for his History. It referred to the | is usually colloquial rather than rhetorical; he is merely making permanent value of the lessons which his History contained. | thought and motive vivid in the way natural to a simple age. Thucydides stands alone among the men of his own days, and has | Thucydides is the real founder of the tradition by which historians no superior of any age, in the width of mental grasp which could | were so long held to be warranted in introducing set speeches of seize the general significance of particular events. The political | their own composition. His own account of his practice is given education of mankind began in Greece, and in the time of Thucy- | in the following words. ‘‘As to the speeches made on the eve Their dides their political life was still young. Thucydides knew only | of the war, or in its course, I have found it difficult to retain a language. the small city-commonwealth on the one hand, and on the other | memory of the precise words which I had heard spoken ; and so the vast barbaric kingdom; and yet, as has been well said of him, | it was with those who brought me reports. But I have made the ‘there is hardly a problem in the science of government which | persons say what it seemed to me most opportune for them to say the statesman will not find, if not solved, at any rate handled, in | in view of each situation; at the same time I have adhered as the pages of this universal master.’ closely as possible to the general sense of what was actually said.”

Such being the spirit in which he approached his task, it is | So far as the language of the speeches is concerned, then, Thucy- interesting to inquire what were the points which he himself con- | dides plainly avows that it is mainly or wholly his own. As a sidered to be distinctive in his method of executing it. His Greek | general rule, there is little attempt to mark different styles. The predecessors in the recording of events had been, he conceived, of | case of Pericles, whom Thucydides mnst have repeatedly heard, is

The epic two classes. First, there were the epic poets, with Homer at their | probably an exception ; the Thucydidean speeches of Pericles offer poets. head, whose characteristic tendency, in the eyes of Thucydides, is | several examples of that bold imagery which Aristotle and Plutarch to exaggerate the greatness or splendour of things past—as, for | agree in ascribing to him, while the Funeral Oration, especially, instance, conceding the historical character of the Trojan war, he | has a certain majesty of rhythm, a certain

union of impetuous supposes the strength of the Greek fleet to be overstated in the | movement with lofty grandeur, which the historian has given to Iliad. Secondly, there were the Ionian prose writers whom he | no other speaker. Such strongly marked characteristics as the The calls “chroniclers” (Aoyoypdgor). These writers are directly known | curt bluntness of the Spartan ephor Stheneledas, or the insolent prose to us only by meagre fragments; but Dionysius of Halicarnassus | vehemence of Alcibiades, are also indicated. But the dramatic chroni- has described their general characteristics in a manner which serve: | truth of the speeches generally resides in the matter, not in the Their clers. to illustrate the differences indicated by Thucydides between their | form. In regard to those speeches which were delivered at Athens matter.

work and his own. Their general object was to diffuse a know- ledge of legends preserved by oral tradition, and of written docu- ments—usually lists of officials or genealogies—preserved in public archives; aud they published their materials as they found them, without any attempt at sifting fact from fable. Thucydides de- scribes their work by the word guy7:0éva1, but his own by tuyypaperv, —the difference between the terms answering to that between com- pilation of a somewhat mechanical kind and historical composition in a higher sense. The vice of the “*chroniclers,” in his view, is that they cared only for popularity, and took no pains to make their narratives trustworthy. In contrast with these predecessors,

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1 Freeman, Historical Essays, 2d ser., iii.

before his banishment in 424,—and seven such speeches are contained in the History,—Thucydides could rely either on his own recollection or on the sources accessible to a resident citizen. In these cases there is good reason to believe that he has repro- duced the substance of what was actually said. In other cases he had to trust to more or less imperfect reports of the ‘‘ general sense”; and in some instances, no doubt, the speech represents simply his own conception of what it would have been ‘‘most opportune” to say. The most evident of such instances occur in the addresses of leaders to their troops. The historian’s aim in

these military harangues—which are usually short—is to bring The out the points of a strategical situation; a modern writer would military have attained the object by comments prefixed or subjoined to speeches.

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his account of the battle. The comparative indifference of Thucy- dides to dramatic verisimilitude in these military orations is curi- ously shown by the fact that the speech of the gencral on the one side is sometimes as distinetly a reply to the speech of the general on the other as if they had been delivered in debate. We may be sure, however, that, wherever Thucydides had any authentic elue to the actual tenor of a speech, he preferred to follow that Voltaire's clue rather than to draw on his own invention. Voltaire has criticism. described the introduction of set speeches as ''a sort of oratorical falsehood, which the historian used to allow himself in old times." The strongest characteristic of Thueydides is his devotion to truth, —his laborious persistence in separating fact from fiction; and it is natural to ask why he adopted the form of set speeches, with the measure of fiction which it involved, instead of simply stating, in his own person, the arguments and opinions which he conceived to have been prevalent. The question must be viewed from the standpoint of a Greek in the 5th century B.c. Epie poetry had then for inany generations exercised a powerful influence over the Greek mind. Homer had accustomed Greeks to look for two ele- ments in any eomplete expression of human energy,—first, an account of a man's deeds, then an image of his mind in the report of his words. The Homeric heroes are exhibited both in action and in speech. Further, the contemporary readers of Thucydides were men habituated to a civic life in which public speech played an all-important part. Every adult citizen of a Greek democracy was a member of the assembly which debated and decided great issues. The law-courts, the festivals, the drama, the market-place itsclf, ministered to the Greek love of animated deseription. Toa Greek of that age a written history of political events would have seemed strangely insipid if specch ''in the first person" had been absent from it, especially if it did not offer some mirror of those debates which were inseparably associated with the central intcr- ests and the decisive moments of political life. In making historical persons say what they might have said, Thucydides confined that oratorical licence to the purpose which

is its best justification : with him it is strictly dramatic, an aid to the complete presentment of action, by the vivid expression of ideas and arguments which were really current at the time. Among later historians who continued the praetice, Polybius, Sallust, and Tacitus most resemble Thneydides in this particular ; while in the Byzantine historians, as in some moderns who followed classical precedent, the speeches were usually mere occasions for rhetorical display. Botta's History of Italy from 1780 to 1814 affords one of the latest examples of the practice, which was peculiarly suited to the Italian genius.

The present division of the History into eight books is one whieh might well have proceeded from the author himself, as being a natural and convenient disposition of the contents. The first book, after a general introduction, sets forth the causes of the Peloponnesian War. The first nine years of the war are contained in the second, third, and fourth books,—thrce years in each. The fifth book contains the tenth year, followed by the interval of the ‘‘insecure peace.” The Sicilian expedition fills the sixth and seventh books. The cighth book opens that last chapter of the struggle which is known as the ‘‘Decelean” or “*Jonian” War, and breaks off abruptly—in the middle of a sen- tence, indeed—in the year 411. The words in which Grote bids farewell, at that point, to Thucydides well express what every careful student must feel. “To pass from Thucydides to the Hellenica of Xenophon is a descent truly mournful; and yet, when we look at Greciah history as a whole, we have great reason to rejoice that even so inferior a work as the latter has reached us. The historical purposes and conceptions of Thucydides, as set forth by himself in his preface, are exalted and philosophical to a degree altogether wonderful, when we consider that he had no pre-existing models before him from which to derive them. And the eight books of his work (in spite of the unfinished condition of the last) are not unworthy of these large promises, either in spirit or in execution.”’

The prineipal reason against believing that the division into eight books was made by Thucydides himself is the fact that a different division, into thirteen books, was also current in antiquity, as appears from Marcellinus (§ 58). It is very improbable—indeed hardly conceivable—that this should have been the case if the eight-book division had come down from the hand of the author. We may infer, then, that the division of the work into eight

books was introduced at Alexandria,—perhaps in the 3d or 2d century B.c. That division was already familiar to the grammarians of the Augustan age. Dionysius of Halicarnassus, who recoguizes it, has also another mode of indicating portions of the work, viz., by stichometria, or the number of lines which they contained. Thus, in the MS. which he used, the first 87 chapters of book i. con- tained about 2000 lines (equivalent to about 1700 lines in Bekker's stereotyped 8vo text).

Ullrich has maintained with much acuteness that Thucydides composed the first three books and about half of book iv. in the years 421-413, and the rest of the work after 404. His general

The Greek view.

The eight books.

Origin of that division.

Order of com- position.

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ground is the existence in i—iv. of passages which seem to imply ignorance of later events. Classen has fully examined the evidence, and, as a result, has arrived at the following conelusion. It is possible that a first rough draft of the History, down to 413, may have been sketehed by Thucydides before 405. But the whole History, from the first book onwards, was worked up into its present form only after 404. This view is confirmed by some passages, found even in the earliest books, which imply that the writer already knew the latest incidents, or the final issue, of the war. We have seen that, after 404, Thucydides may have enjoyed some six or seven years of leisure. Several peculiarities of expres- sion or statement in book viii. suggest that it had not yet received the author's final revision at the time when death broke off the work. The absenee of speeches from the eighth book has also been remarked. But it should be observed that much of the eighth book is occupied with negotiations, either clandestine or indecisive,

or both. Its narrative hardly presents any moment which required such dramatic emphasis as the speeches usually impart. The mere misrepresentations by which Alcibiades and Chalcideus prevailed on the Chians to revolt certainly did not claim such treatinent.

The division of the war by summers and winters (xara @épos xa) Mode of xetuava)-—the end of the winter being considered as the end of the reckoning year—is perhaps the only one which Thucydides himself used, for time. there is no indication that he made any division of the History into books. His ‘‘summer” includes spring and autumn, and extends, generally speaking, from March or the beginning of April to the end of October. His ‘‘winter”—November to February inclusive—means practically the period during which military operations, by land and sea, are wholly or partly suspended. When he speaks of “summer” and “ winter” as answering respect- ively to “half” the year (v. 20. 3), the phrase is not to be pressed: it means inerely that he divides his year into these two parts. The mode of reekoning is essentially a rough one, and is not to be viewed as if the commencement of summer or of winter could be precisely fixed to constant dates. For chronology, besides the festivals, he uses the Athenian list of archons, the Spartan list of ephors, and the Argive list of priestesses of Hera.

There is no reference to the History of Thucydides in the extant Greek writers of the 4th century B.c. ; but Lucian has preserved a tradition of the enthusiasm with which it was studied by Demo- sthenes. The great orator is said to have copied it out eight times, or even to have learnt it by heart. It is at least beyond doubt that the study of Thucydides contributed a very powerful influence to the style of Demosthenes, though that influence rather passed into the spirit of his oratory than showed itself in any marked resemblances of form. The Alexandrian critics acknowledged Thucydides as a great master of Attic. Sallust, Cornelius Nepos, Cicero, and Quintilian are among the Roman writers whose admira- tion for him ean be traced in their work, or has been expressly recorded. The most elaborate ancient criticism on the diction and composition of Thucydides is contained in three essays by Dionysius of Halicarnassus.

Among the best MSS. of Thucydides, the Codex Vaticanus 126 (11th cent.) re- MSS,, &c, presents a reeension made Jn the Alexandrian or Roman age. In the first six books the number of passages in which the Vatieanus alone has preserved a true reading is eomparatively small; in book vii. it is somewhat larger; in book viii, it is so large that here the Vaticanus, as compared with the other MSS., aequires the eharaeter of a revisedtext. Other important MSS, are the Palatinus 252 (11th cent.); the Casselanus (1252 A.p.); the Augustanus Monacensis 430 (1301 a.p.). A collation, in books i. ii., of two Cambridge MSS. of the 15th eentury (Ny. 8. 18, Kx. 5. 19) has been published by Shilleto. Several Parisian MSS. (H.C. A. F.), and a Venetian MSS. (V.) eollated by Arnold, also deserve mention. The Aldine edition was published in 1502, It was formerly supposed that there had been two Juntine editions. Shilleto, in the ‘‘ Notice” prefixed to book i., first pointed out that the only Juntine edition was that of 1526, and that the belief in an earlier Juntine, of 1506, arose merely from the accidental omission of the word vicestmo in the Latin version of the imprint.

Of reeent editions, the most generally useful is Classen’s, in the Weidmann series (Berlin, 1862-78); each book ean be obtained separately. Arnold’s edition (1848-51) eontains much that is still valuable. For books i. and ii. Shilleto’s edition (1872-76) furnishes a eommentary whieh, though not full, deals admirably with many difficult points. Among other important editions, it is enough to name those of Duker, Bekker, Goeller, Poppo, and Kriiger. Bétant’s lexicon to Thucydides (2 vols., Geneva, 1843) is wellexecuted. Jowett’s translation (Oxford, 1883) is supplemented by a volume of notes. Dale’s version (Bohn) also deserves mention for its fidelity, as Crawley’s (London, 1876) for its vigour. Hellenica (London, 1880) contains an essay on ‘‘ The Speeehes of Thueydides,” pp. 266-323, which has been translated into German. The best elue to Thucydidean biblio- grapby is in Engelmann’s Scriptores Grect, pp. 748 sq., 8th ed., 1880. (lt. C. J.)

THUGS. That the Sanskrit root sthag (Pali, thak), “to cover,” “to conceal,” was mainly applied to fraudu- lent concealment, appears from the noun sthaga, “a cheat,” which has retained this signification in the modern vernaculars, in all of which it has assumed the form thag (commonly written thug), with a specific meaning. The Thugs were a well-organized

confederacy of professional assassins, who in gangs of from 10 to 200 travelled in various guises through India, wormed themselves into the confidence of wayfarers of the wealthier class, and, when a favourable opportunity occurred, strangled them by throw-

ing a handkerchief or noose round their necks, and then plundered and buried them. All this was done according to certain ancient and rigidly prescribed forms and after the performance of special religious rites, in which the consecration of the pick-axe and the sacrifice of sugar formed a prominent part. From their using the noose as an instrument of murder they were also frequently called Phdnsigérs, or " noose-operators." Though they them- selves trace their origin to seven Mohammedan tribes, Hindus appear to have been associated with them at an early period ; at any rate, their religious creed and prac- tices as staunch worshippers of Devi (K4li, Durga), the Hindu goddess of destruction, had certainly no flavour of Islam in them. Assassination for gain was with them a religious duty, and was considered a holy and honourable profession. They had, in fact, no idea of doing wrong, and their moral feelings did not come into play. The will of the goddess by whose command and in whose honour they followed their calling was revealed to them through a very complicated system of omens. In obedience to these they often travelled hundreds of miles in company with, or in the wake of, their intended victims before a safe opportunity presented itself for executing their design ; and, when the deed was done, rites were performed in honour of that tutelary deity, and a goodly portion of the spoil was set apart for her. The fraternity possessed also a jargon of their own (Ramisi), as well as certain signs by which its members recognized each other in the remotest parts of India. Even those who from age or infirmities could no longer take an active part in the operations con- tinued to aid the cause as watchers, spies, or dressers of food. It was owing to their thorough organization, the secrecy and security with which they went to work, but chiefly to the religious garb in which they shrouded their murders, that they could, unmolested by Hindu or Moham- medan rulers, recognized as a regular profession and pay- ing taxes as such, continue for centuries to practise their craft. Both the fractions into which they were divided by the Nerbudda river laid claim to antiquity : while the northern,

however, did not trace their origin farther back than the period of the early Mohammedan kings of Delhi, the southern fraction not only claimed an earlier and purer descent, but adhered also with greater strictness to the rules of their profession.

The earliest authenticated mention of the Thugs is found in the following passage of Zidu-d din Barnt's History of Firoz Shah (written about 1356): "In the reign of that sultan," that is, about 1290, "some Thugs were taken in Delhi, and a man belonging to that frater- nity was the means of about a thousand being captured. But not one of these did the sultan have killed. He gave orders for them to be put into boats and to be conveyed into the lower country, to the neighbourhood of Lakhnautt, where they were to be set free. The Thugs would thus have to dwell about Lakhnaut{, and would not trouble the neighbourhood of Delhi any more" (Sir H. M. Elliot's History of India, vol. iii. p. 141). The first European travellers who speak of them without mentioning their name are Thevenot (1665) and Fryer (1673). Though instances of Thuggee had been known to the English rulers in India for many years, and sporadic efforts had been made by them towards the extinction of the gangs, it was not till Lord W. Bentinck (1828-35) took vigorous steps in this matter that the system was gradually un- masked, and finally all but stamped out. His chief agent, Captain (afterwards Sir William) Sleeman, with several competent assistants, and the co-operation of a number of native states, succeeded in completely grappling with the evil, so that up to October 1835 no fewer than 1562

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hanged and 986 transported or imprisoned for life. It is true that, according to the Thuggee and Dacoity Report for 1879, the number of registered Punjabi and Hindus- tani Thugs then still amounted to 344. But all of these had already been registered as such before 1852. It may, therefore, fairly be assumed that none are alive now, and that the whole fraternity may be considered as extinct. Full particulars concerning the system of Thuggee are given by Dr Sherwood, ''On the Murderers called Phansigars," and J. Shake- spear, " Observations regarding Bradheks and Thegs"' (both treat- ises in vol. xiii., 1820, of the Asiatic Researches); [W. N. Sleeman,] Ramaseeana, or a Vocabulary of the Language used by the Thugs, with an

Introduction and Appendix, Calcutta, 1836 ; the Edinburgh Review for Jan. 1837 ; [E. Thornton,] Jllustrations of the History and Practices of the ‘Thugs, London, 1837; Meadows Taylor, Confessions of a Thug, London, 1839 ; Major Sleeman, Report on the Depredations committed by the Thug Gangs, Calcutta, 1840; J. Hutton, Popular Account of the Thugs and Dacotts, London, 1857 ; Yule and Burnell, Glossary of Anglo-Indian Colloquial Words and Phrases, London, 1886, p. 696 sq. (R. R.) THUGUT, Franz Marta von (1734-1818), foreign minister of Austria, was born of humble parentage at Linz in 1734, placed in the Government school of Oriental studies in 1752, and sent to Constantinople as an interpreter in 1757. At Constantinople he rose from post to post in the embassy, until in 1771 he became internuncius or ambassador. In 1776, after the war between Russia and Turkey, he obtained from the latter power the cession of the province of Bukowina to Austria. After thus crown- ing his long service in the East and gaining the confidence of Maria Theresa, he was sent by her without the know- ledge of her son, the emperor Joseph, to Berlin, to avert by a peaceful settlement with Frederick the Great the threatened Bavarian war. In 1790 he was employed in the negotiations of Sistova, and his next mission was to Paris, where he entered into close relations with Mirabeau as the friend of Marie Antoinette. On the invasion of France by the allied armics in 1792, Thugut was sent to the scene of operations. It is well known that Kaunitz, the veteran minister of Austria, condemned the terms of the alliance with Prussia, as securing to Prussia the annexation of a great part of Poland, while only holding out to Austria an uncertain prospect of acquiring its equivalent in Bavaria. Thugut, a politician of the same school, viewed the new alliance with even greater hatred. After the failure of the campaign of 1792 he formed the deliberate opinion that persons around the duke of Bruns- wick had been bribed by the French, and that the retreat had been ordered in consequence. A few months later the anticipations of Kaunitz were realized. Prussia seized western Poland, while Austria remained as far as ever from gaining Bavaria. The emperor Francis now dismissed the ministers responsible for the Prussian alliance, and called Thugut to power. From this critical moment the alliance was doomed, and the allied commanders thwarted rather than assisted one another’s operations on the eastern frontier of France. On the other hand, Thugut drew nearer to Russia, and negotiated at St Petersburg for the seizure of Venice by Austria. With England he desired to stand on a good footing ; but, while Pitt’s object was

the overthrow of the revolutionary Government, Thugut's was simply the acquisition of territory for Austria. This dis- crepancy of aim led to results exasperating to the English ministry, such as the fall of Toulon, to which Thugut neglected to send the troops which he had promised. The evacuation of Belgium in 1794, usually attributed to Thugut's treachery, was, however, due to the incapacity or intrigues of others. In 1795, after the withdrawal of Prussia from the coalition, Thugut obtained financial help from England, gained from Russia a large share of Poland in the last partition, and prepared to carry on the war

Thugs had been committed, of which number 382 were | against France with the utmost energy. The campaign

of the archduke Charles in 1796 drove the French from the east of the Rhine, and Bonaparte, who had conquered northern Italy up to Mantua, narrowly escaped destruc- tion before this fortress. But for the genius of the French commander and the wretched character of the Austrian generals and officers, the immense efforts made by Thugut at this time would have turned the tide of the war. Defeat after defeat seemed to make no impression upon his " world-desolating obstinacy "; and, even when Bonaparte had advanced to within eighty miles of Vienna, it is stated that the empress had to throw herself at her husband's feet when in conference with his minister, in order to overcome the resistance of the latter to an armistice. The subsequent peace of Campo Formio was hotly condemned by Thugut, who tendered his resignation. Then followed the congress of Rastadt and the murder of the French envoys, long attributed, but without any real ground, to Thugut himself. War was renewed ; the French were driven out of Italy by Austrian armies as- sisted by Suwaroff ; and it was determined that the allies should conquer Switzerland, and so invade France where the frontier is most open. Thugut, now at the height of his power, and far more anxious to recover Belgium than to overthrow the republic, took the fatal step of withdraw- ing a great part of the Austrian forces from Switzerland at the very moment when the Russians were entering it. The result was the destruction of the Russians by Masséna and the total failure of the campaign, followed by the se- cession of Russia from the coalition.

Still full of designs for annexation in Italy, Thugut continued the war with the help of England. On the very day when he renewed his engagements with England the news arrived of the battle of Marengo, which at one blow made an end of all that Austria had won in Italy in the preceding year. Nothing daunted, Thugut continued, during the armistice which followed, his preparation for the struggle with Moreau in the valley of the Danube; and, if he could have inspired his master with his own resolute spirit, the result of the war might have been different. But, while Thugut was actually receiving the British subsidies, the emperor, without the knowledge of his minister, surrend- ered the fortresses of Ulm and Ingolstadt to Moreau, in return for an extension of the armistice. Thugut's passionate indignation on learning of this miserable act is impressively described in Lord Minto's despatches from Vienna. He withdrew from office ; but Lord Minto's pro- tests compelled the emperor again to place in his hands the direction of affairs, which he held until the battle of Hohenlinden made all further resistance impossible. He was then, in deference to French influence, banished from Vienna, and never resumed office. In his retirement he was occasionally consulted, as after the battle of Wagram in 1809, when he recommended the emperor to make peace at any cost, stating that the existence of the Austrian monarchy was at stake and that the dissolution of Napoleon's empire was not far off. After the overthrow of Napoleon he returned to the capital, where he died May 29, 1818. Thugut possessed many of the qualities of a great man,—indomitable courage, calmness in danger, devotion to public interests, enormous industry; but all this was spoilt by the persistent disregard of obligations towards allies in the greedy pursuit of Austria's own aggrandizement, and by the intriguing spirit inseparable from this policy. The materials for forming a fair estimate of Thugut's conduct of affairs from 1793 to 1801 have but recently been given to the world. Of his private life next to nothing is known.

THULE was the name given by Greek and Roman geographers to a land situated to the north of Britain, which they believed to be the most northerly portion of

Europe, or indeed of the known world. ‘The first writer who mentioned the name was Pytheas of Massilia, whose statements concerning it have been already given under the heading Pyruzas. But it is impossible for us to deter- mine with certainty what those statements, which have only been transmitted to us at second or third hand, really were, and still more so what was their real signification. It is almost certain that Pytheas did not himself profess

‘to have visited Thule, but had only vaguely heard of its

existence, as a land of unknown extent, situated, accord- ing to the information he had received, six days’ voyage to the north of Britain. This account was adopted by Eratosthenes (though rejected by Polybius and Strabo), and accordingly this unknown land became a cardinal point in the systems of many ancient geographers, as the northern limit of the known world. Nothing more was learnt concerning it until the Romans under Agricola (about 84 a.p.) accomplished the circumnavigation of the northern point of Britain, and not only visited, but according to Tacitus subdued, the Orcades or Orkney Islands. On this occasion, the historian tells us, they caught sight also of Thule,! which in this instance could only mean the group of the Shetland Islands. No further account of this mysterious land is found in any ancient author, except vague statements, derived from Pytheas, but mostly in an inaccurate and distorted form, concern- ing its position and the astronomical phenomena resulting from this cause. It is probable that what Pytheas really reported was that at the summer solstice the days were twenty-four hours in length, and conversely at the winter solstice the nights were of equal duration, a statement which would indicate the notion of its position in about 66° N. lat., or under what we now call the Arctic Circle. The skill of Pytheas as an astronomer would have been quite sufficient to lead him to the conclusion that this would be the case at some point in proceeding northwards, and the rapid changes in this respect that would be reported to him by any navigators that had really followed the shores of Britain to any considerable extent in that direction would confirm him in the correctness of his views. He had, too, a very exaggerated notion of the extent of Britain (see PyrHEas), and hence he would be led to place an island which was six days’ voyage to the north of it much nearer to the Arctic Circle than its true position. The statement of Pytheas on this point

appears to have obtained almost universal belief until the time of Marinus of Tyre and his successor Ptolemy, who were led—apparently from their knowledge that the group of islands to which the name of Thule had been applied by the Romans was really not very far distant from the Orcades—to bring down its position considerably more to the south, so that Ptolemy placcs the island of Thule, which he still regards as the most northerly point of Europe, in only 63° N. lat. Unfortunately this more reasonable view has been discarded by many modern writers, who have gone back to the statements of Pytheas concerning the length of the day, and have in consequence insisted upon placing Thule within the Arctic Circle, and have thus been led to identify it with Iceland. The improbability of such an hypothesis, when we consider the state of ancient naviga- tion, is in itself a sufficient refutation, and there appears no reason- able doubt that the Thule of Pytheas, like that of the Romans and of Ptolemy, was merely an exaggerated and somewhat erroneous conception of the large group of the Shetland Islands, of which the principal, called Mainland, is in fact so predominant that the whole may well have been considered as one large island rather than a scattered group like the Orkneys. If we might trust to the accuracy of Strabo's quotation (ii. 5, p. 114), that Pytheas called Thule ''the most northerly of the British Islands," this would be decisive on the point; but unfortunately the verbal accuracy of such references by ancient writers can seldom be relied on, and Strabo had evidently never seen Pytheas's original work. It appears, however, to be certain that Iceland was really visited by some Irish monks long before its discovery by the Northmen, and is described under the name of Thule by a writer named Dicuil, himself an Irish monk, who wrote in the first half of the

1 "Dispecta est et Thule," Tac., Agric., c. 10.

9th century, in such a manner as to leave no doubt that his state- ments really refer to that extensive but remote island. See Letronne, Recherches sur Dicuil, Paris, 1814.

THUMMEL, Morirz Aucust von (1738-1817), Ger- man writer in prose and verse, one of the imitators of Wieland (see vol. x. p. 541), was born May 27, 1738, in the neighbourhood of Leipsic, was educated at Rosslcben and the

university of Leipsic, and from 1761 till 1783 held various offices in the ducal court of Saxe-Coburg. He died at Coburg on October 26, 1817. -He wrote a comic prose epic, Wilhelmine, oder der vermdhlte Pedant (1764) ; Die Inoculation der Liebe (1771), a tale in verse ; Reise in die mittiglichen Provinzen von Frankreich (1791— 1805), a romance in 10 vols.; and Der heilige Kilian, oder das Liebespaar (1818). An edition of his works was published at Leipsic in 8 vols. in 1854-55.

THUNBERG, Cart Peter (1743-1828), an eminent traveller, and one of the most distinguished botanists of the school of Linneus, was born in 1743. He became a pupil of Linneus at the university of Upsala, where he graduated in medicine in 1770. Obtaining a travelling scholarship, he visited Holland, whence he embarked on a voyage of exploration to Java, in quest of vegetable treasures. He sailed as far as the Cape of Good Hope in 1771, and three years afterwards went to Japan, remain- ing five years, engaged in making collections of plants, and in observing the habits, manners, and language of the people. On his return in 1779 he visited England, and made the acquaintance of Sir Joseph Banks. In 1777 he was made demonstrator of botany at Upsala, and he succeeded Linneus as professor of botany in 1784. Thunberg published in 1784 his Flora Japonica; in 1788 he began to publish his travels. He completed his Prodromus Plantarum in 1800, in 1805 his Icones Plant- arum, and in 1813 his Flora Capensis, Thunberg pub- lished numerous memoirs in the Transactions of many Swedish and foreign scientific societies, of sixty-six of which he was an honorary member. He died in 1828.

THUNDERSTORM. All the more ordinary pheno- mena of thunderstorms had, about 1750, been conclusively

. traced to electrical charges and discharges (ELECTRICITY, vol. viii. p. 6), so that they could easily be reproduced on a small scale in the laboratory. To the article cited we therefore refer for their explanation. Some of the laws of relative frequency of thunderstorms, in different places at the same season or in the same place at different seasons, will be found in MutTsoroxoey (vol. xvi. p. 128). A discussion of the cause of thunder, and of the circum- stances which give rise to a crash, a roll, or a peal of thunder is given under Acoustics (vol. i. p. 107). In what follows, therefore, the

rarer phenomena of thunder- storms, and the possible sources of the atmospheric elec- tricity, will be the chief points treated.

There can be little doubt that atmospheric electricity, at least in the great developments which characterize a thunderstorm, is due in some way to water. LBefore a great thunderstorm the lower air is usually at an abnor- mally high temperature, and fully saturated with water vapour, so that it is in a thoroughly unstable condition. Immense cloud masses, often miles in vertical thickness, which produce almost midnight darkness by day in the region of the storm, and which appear, when seen from a distance, as if boiling upwards, are always a notable feature of great thunderstorms. These are usually accom- panied by torrents of rain, or by violent hail-showers. And it is commonly observed that each flash of lightning is followed, after a brief interval, by a sudden but temporary increase in the rate of rainfall. At what stage of its transformations the electrification is developed by water- substance is, as yet, only guessed at,—though it seems

most reasonable to conclude that it is anterior to the formation of cloud, ze, to the condensation of vapour. And, though the idea was at one time very generally held and still has many upholders, it seems unlikely to be the direct result of evaporation. For, were it due directly either to evaporation or to condensation, it is almost im- possible to doubt that proof would long since have been furnished by careful experiment, even if made on a scale so limited as that afforded by our laboratories. No trace of electrical effect has been found to attend the precipita- tion of moisture ; and the electrical effects, sometimes con- siderable, which have been found associated with evapora- tion have always been accompanied by relatively violent physical and mechanical actions which are not observed in conjunction with atmospheric electricity. It has been suggested by some authorities that the electricity of a thunderstorm is developed during the formation of hail, by others that it is due to the molecular actions which accompany the diminution of total surface when two or more drops of water coalesce into a single one, It has been ascribed to the friction of moist against dry air, and to the dust-particles which appear to be necessary for the condensation of vapour. Again, it has been suggested that it may be a mere phenomenon of

contact electricity, due to the impact of uncondensed vapour particles on particles of air. It is almost unnecessary to observe that, whatever hypothesis we adopt, some explanation must be given of two important points :—(1) What becomes of the electricity equal and opposite to that in each drop, which must be produced simultaneously with it? (2) By what means is the attraction between the drops and the recipient of the opposite charge of electricity overcome so that the drops may be enabled to part with their charge? It is to be presumed that gravity satisfies the second of these questions. As to the first, it seems to necessitate the presence of something besides water, in order that the electric separation may be commenced, and thus appears to be fatal to the capillary theory indicated above. Whatever be the true source of the charge, it is easy to see, by known properties of electricity, that even an exceedingly small charge on each vapour particle would lead to a very high potential as soon asa visible drop is formed, and that as a drop increases in size its potential is proportional to its surface. That drops of rain are often individually electrified to a very high potential is proved by the frequent occurrence of “luminous rain,” when the ground is feebly lit up by the multitude of tiny sparks given out by the drops as they come near it. The flakes of falling snow, also, are often strongly electrified, so that smart sparks have been drawn from an umbrella on which the snow was falling. But the law of electric repulsion shows us at once that, as soon as the drops in a cloud are sufficiently electrified, at least the greater part of their charge must pass to the boundary of the cloud. When this occurs, the nature of the further behaviour of the charge presents no difficulty. The reason for our singu- larly complete ignorance of the source of atmospheric electricity seems to lie in the fact that it can only be discovered by means of experiments made on a scale very much larger than is attainable with the ordinary resources of a laboratory. The difficulties will probably be easily overcome by the first nation which will go to the expense of providing the necessary means.

Numberless other explanations of the origin of thunder- storms have been suggested; but the more reasonable of these do little more than shift the difficulty, for they begin by assuming (without any hint as to its source) an elec- trification of the earth as a whole, or of the lower (some- times the upper) layers of the atmosphere. Induction, convection, é&c., are then supposed to effect the rest.

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Another and much less reasonable class of explanations depends upon magneto-electricity. Some of these introduce the so-called "‘ unipolar" induction supposed to be due to the rotation of the earth, which behaves like a gigantic magnet. Of this nature is the suggestion of Edlund, which was recently crowned by the Academy of Sciences of Paris. That rapid variations in the earth’s magnetic elements, such as often occur on a large scale, as in a ‘magnetic storm," have at least a share in the production of the aurora is a perfectly reasonable and even plausible hypothesis, long ago brought forward by Balfour Stewart. But we have yet to seek the source of these variations.

The brightness of a flash of lightning is usually much underrated. It is true that it rarely gives even at night an illumination greater than that due to moonlight. But it must be remembered that Swan has proved that the impression of a flash on the eye depends upon the duration, being nearly proportional to it, and steadily increasing for about a tenth of a second. Now the duration of a light- ning-flash is (roughly speaking) only about one millionth of asecond. This is proved by the fact that the most rapidly rotating bodies appear to be absolutely steady when illu- minated by it. Hence, if it could be made to last for a tenth of a second, it would give near objects an illumina- tion one hundred thousand times more brilliant than that of moonlight. It must be remembered that the flash is not a mere line, but a column, of intensely heated air, driven outwards from the track of the discharge at a rate initially far greater than that of sound.

What is called "summer lightning" or " wild-fire" is sometimes a rather puzzling phenomenon. In the majority of cases it is merely the effect of a distant thunderstorm. It is also often due to a thunderstorm in the higher strata of the atmosphere overhead,—the reason why we hear no thunder being not so much the distance from the spectator as the fact that sounds generated in rarer air lose rapidly in intensity as they are propagated into denser air. But, besides these more common forms of the phenomenon,

there is certainly a form of sheet lightning which occurs, without either sound or cloud, often close to the spectator. The cause of this is not at all obvious.

But the most mysterious phenomenon is what goes by the name of “globe lightning” or “ fire-ball,” a pheno- menon lasting sometimes for several seconds, and therefore of a totally different character from that of any other form of lightning. The fire-ball is almost incomparably less brilliant than forked lightning, because, though it lasts long enough to give the full impression of its brightness, it is rarely brighter than iron in the state which we call “red-hot.” It is always spherical, often more than a foot in diameter, and appears to fall from a thunder-cloud by its Own gravity, sometimes rebounding after striking the ground. It usually bursts with a bright flash and a‘loud explosion, occasionally discharging flashes of lightning. No experimenter has yet succeeded in producing artificially anything resembling these natural and intensely charged Leyden jars.

The term “ thunderbolt,” which is nowadays rarely used except by poets (and by the penny-a-liners), preserves the old notion that something solid and intensely hot passed along the track of a lightning flash and buried itself in the ground. Two distinct classes of phenomena probably gave rise to this notion. When lightning strikes the ground it often bores a hole of considerable depth, which is found to be lined in its interior with vitrified sand. This presents no difficulty. But AERoxrrss (q.v.) are often found, in the holes which they have made, still intensely hot, in conse- quence of their rapid passage through the air. A hasty generalization seems to have connected these two entirely independent phenomena, and thus given rise to the notion

of the thunderbolt. The ancient notion that a lightning flash could occur ina clear sky is probably to be accounted for by the occasional appearance of these ultramundane visitors.

The sulphurous smell of lightning, which is vividly de- scribed in the Odyssey, is now known to be due to the formation of OZONE (¢.v.).

For the precautions necessary to prevent danger from a thunderstorm, see LIGHTNING CoNnDUCTOR.

A whole volume of Arago's collected works is devoted to thunder- storms, and many important observations are to be found in the writ- ings of M. D'Abbadie and other scientific travellers. (P. G. T.)

THUN-KHWA, or Tuongcwa, a district in the Pegu division of Burmah, lying between 17° 37' and 19° 28' N. lat., and between 95° 53' and 96° 53' E. long., with an area of 5413 square miles. It is bounded on the N. by Henzada, E. by Rangoon, 8. by the Bay of Bengal, and W. by Bassein district. The whole district is a large deltaic plain, divided by the numerous channels of the Irrawaddy into saucer-shaped islands, with deep depressions in the centre. The Irrawaddy traverses Thin-khwa from north to south, throwing off numerous branches until it falls into the Bay of Bengal. Geologically, Thin-khwa is composed of "older alluvial clay," differing from that of the Gangetic basin in being less rich in lime.

The population of Thun-khwa in 1881 was returned at 284,063 (males 150,131, females 133,932); Hindus numbered 723, Moham- medans 1650, Christians 6894, and Buddhists 274,287. The largest towns in the district are Yandoon and Pantanaw, with populations (1881) of 12,673 and 6174 respectively. The land is much less fertile than that of the neighbouring districts. In 1885-86 the area under cultivation was 349,259 acres,-and the cultivable area 1,262,374 acres. The principal crops are rice, fruits, vegetables, and sugar-cane. The total revenue realized in the year 1885-86 amounted to £194,737, of which the land contributed £66,590. Thun-khwa was constituted a district in 1875, and its history previous to that date is identical with that of Henzada, to which adminis- trative division it originally belonged. During the first Burmese war no resistance was offered to the British in the district as it at present exists cxcept at the town of Donabyu. At the time of the second war Donabyu was undefended, but, after the occupation of Prome, Myat Htun, an ex-thigyi of a small circle, sueceeded in collecting a body of men and defied the British. Early in January 1858 the enemy were driven out of Donabyu, but on penetrating into the interior the British were forced to retire. In asubsequent

engagement the British were driven back; but the enemy were eventually dispersed and their works captured.

THURGAU, or Tuureovia, a canton of Switzerland (ranking as seventeenth in the Confederation), takes its name from the river Thur. It is bounded on the N. by the Rhine, on the EK. by the Lake of Constance (the can- tonal frontier being so drawn as to leave the town of Con- stance to Baden), on the S. by a line running from Arbon on the lake west and south-west to Hornli, and on the W. by a line drawn from Hornli passing east of Winterthur and west of Frauenfeld to the Rhine, a little west of Diessen- hofen and opposite Schaffhausen. It is thus shaped like a triangle, of which the Hérnli (3274 feet, the highest point in the canton) is the apex, and comprises the middle basin of the Thur. Its totalareais 381:4 square miles, of which 322°6 (or 84°6 per cent.) is reckoned as " productive land," 69-8 being covered by forests, and 6°9 by vineyards. Of the "unproductive" portion no less than 50°5 square niiles consists of the cantonal share of the Lake of Con- stance. According to the census of 1880, the population amounted to 99,552 (females being in a majority of 1000), an increase of 6252 on the census of 1870; of these, 99,026 are German-speaking. In religion the inhabitants are divided, there being 71,821 Protestants to 27,123 Roman Catholics; the canton till 1815 was in the diocese of Constance, and since 1828 has been in the reconstructed diocese of Basel, though for some time after 1873 the Government would not recognize the authority of Bishop Lachat, in consequence of his support of the dogma of

infallibility at the Vatican council. The capital is Frauen- feld (5811 inhabitants), and Romanshorn (population 3647) is an important railway centre on the lake. The canton has many small villages, and the population is chiefly employed in agricultural pursuits, though cotton-spinning is rapidly increasing. The orchards are so splendid that Thurgau has been called "the garden of Helvetia." A network of well-made roads traverses it in every direc- tion.

The Thurgau originally took in all the country, roughly speaking, between the Reuss, the Lake of Lucerne, the Rhine, and the Lake of Constance; but many smaller districts (Ziirichgau, Toggenburg, Appenzell, St Gall) were

gradually carved out of it, and the county was reduced to about the size of the present canton when in 1264 it passed by the gift of the last count of Kyburg to his nephew Rudolph of Hapsburg, chosen emperor in 1273, In 1415 the count, Duke Frederick of Austria (a Hapsburg), was put under the ban of the empire by the emperor Sigismund for having aided Pope John XXIII. to escape from Constance, and the couuty was overrun, Sigismund in 1417 mortgaging to the city of Constance the appellate jurisdiction in all civil and criminal matters ("landgericht" and "blutbann") arising within the county, which he had declared to be forfeited in consequence of Frederick's conduct. In 1460 some of the Confederates, now becoming very eager for conquests, overran and seized the county. Winterthur was saved, but in 1461 Frederick's son, Duke Sigismund, had perforce to cede the county to the Confederates. Henceforth it was ruled as a ''subject dis- trict" by seven members of the League,—Bern, occupied in the west, not being admitted to a share in the government till 1712, after one of the wars of religion. It was only in 1499 that the Con- federation (then consisting of ten members) obtained from Constance her supreme jurisdiction, through the mediation of the duke of Milan, but there were still forty-two minor jurisdictions belonging to various lords, spiritual and temporal, which went on till 1798 and greatly limited the power of the Confederates. Thurgau had hoped, but in vain, to be admitted in 1499 a full member of the Confederation.

At the time of the Reformation many of the inhabitants became Protestants, and bitter quarrels ensued between the Protestant and Catholic (the latter having a large majority) members of the Confederation who had rights over Thurgau, with regard to the toleration of the new doctrines in the ''subject districts" Thurgau. By the first peace of Kappel (1529) the majority in each ''eommune" was to settle the religion of that ''commune," but by the second (1531, after Zwingli's death) both religions were to be allowed side by side in each "commune." Thurgau thus became a ''canton of parity," as it is to this day. Its rulers, however, continued to watch each other very closely, and Kilian Kesselring, one of the chief military commanders in Thurgau, was in 1633, on suspicion of having connived at the advance of the Swedes through Thurgau on Constance, seized by the Catholic cantons and severely punished. In1798 Thurgau became free, and was one of the nineteen cantons of the Helvetic republic, being formally received (like the other ''subject lands") as a full member of the Swiss Confederation in 1803

by the Act of Mediation. It was one of the very first cantons to revise, in 1830, after the July revolution in Paris, its constitution in a very liberal sense, and in 1831 proposed a revision of the federal pact of 1815. This failed, but the new federal constitutions of 1848 (of which one of the two drafters was Kern of Thurgau) and 1874 were approved by very large majorities. In 1849 the cantonal constitution was revised and the veto introduced, by which the people might reject a bill passed by the cantonal assembly. Finally, in 1869, the existing constitution was drawn up, by which the ‘‘initiative” (or right of 2500 electors to compel the cantonal assembly to take any subject into consideration) and the ‘‘ obligatory referendum” (by which all laws passed by the cantonal assembly, and all financial resolutions involving a capital expenditure of 50,000 francs or an annual one of 10,000, must be submitted to a popular vote) were introduced. The cantonal government consists of a legislative assembly (now of ninety-seven members, one to every 250 electors) and an executive council of five members, both elected directly by the people; 5000 electors can at any time call for a popular vote on the question of the dismissal of either one or the other. Further, to show the very democratic character of the constitution, it may be added that members of both houses of the federal assembly are in Thurgau elected direct by the people. The “communes” in Thurgau are of no less than eleven or twelve varieties. The division of the lands, &c., of the old ‘ burgher communes” between them and the new communes, consisting of all residents (with whom political power rests), was carried out (1872) in all of the 214 communes; but there are still thirty-eight guilds or corporations with special rights over certain forests, &c.

The best history of the canton is that by J. A. Pupikofer, of which a second and very much enlarged edition is now (1887) being published.

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THURII, or Taurivm, a city of Magna Grecia on the Gulf of Tarentum, near the site of the older SyBaris (¢.v.), but farther inland. It owed its origin to an attempt made in 452 B.c. by Sybarite exiles and their descendants to

repeople their old home. The new settlement was crushed by Crotona, but the Athenians lent aid to the fugitives, and in 446, or rather in 443, Pericles sent out to Thurii a mixed body of colonists from various parts of Greece, among whom were Herodotusand the orator Lysias. The pretensions of the Sybarite colonists led to dissensions and ultimately to their expulsion ; peace was made with Crotona, and also, after a period of war, with Tarentum, and Thurii rose rapidly in power and drew settlers from all parts of Greece, especially from Peloponnesus, so that the tie to Athens was not always acknowledged. The oracle of Delphi determined that the city had no founder but Apollo, and in the Athenian war in Sicily Thurii was at first neutral, though it finally helped the Athenians. Thurii had a democratic constitution and good laws, and, though we hear little of its history till in 390 it received a severe defeat from the rising power of the Lucanians, many beautiful coins testify to the wealth and splendour of its days of prosperity. In the 4th century it continued to decline, and at length called in the help of the Romans against the Lucanians, and then in 282 against Tarentum. Thenceforward its position was dependent, and in the Second Punic War, after several vicissitudes, it was de- peopled and plundered by Hannibal (204). In 194 a Roman colony was founded, with Latin rights, known for a time as Copiz, but afterwards by the old name of Thurii. It continued to be a place of some importance, the situa- tion being favourable and the region fertile, and does not seem to have been wholly abandoned till the Middle Ages. Its site, near Terranova di Sibari, is marked by consider- able ruins of the Roman period (cf. Lenormant, in Academy, xvil. 73, and Barnabei, zbid., xvi. 55 sq.).

THURINGIA (Germ. Thiiringen), a territorial term without modern political significance, designates, strictly speaking, only that district in Upper Saxony that is bounded by the Werra, the Harz Mountains, the Saale, and the Thuringian Forest ; but in common parlance it is frequently used as equivalent to the Thuringian states, t.¢., the group of small duchies and principalities lying between Prussia, Hesse-Nassau, Bavaria, and the kingdom of Saxony. The name is derived, with great probability, from that of the Hermunduri, a branch of the great Suevic family ; and the ancient Thuringians, a heathen tribe first mentioned in the 5th century by Vegetius Renatus, are believed to be the descendants of that Teutonic people. The Thuringians seem at one time to have occupied territories stretching from

the Elbe not far from Hamburg to the Danube at Ratisbon ; but about 531 their empire was overthrown by the united Franks and Saxons. The north part of their lands fell to the Saxons, and was known for some time as the North Thuringian gau; the district to the south of the Thuringian Forest was called Franconia after its con- querors ; and the name Thuringia was restricted almost to the narrow limits to which it now properly applies. The advance of the Sorbs to the east bank of the Saale about the middle of the 7th century made the limitation still more exact. Thuringia remained under Frankish dominion, and various Frankish counts ruled in the different "gaus" into which it was divided. Christianity, if not introduced, was confirmed in this district by the British Boniface ; a

1 The Thuringian states are Saxe-Weimar-Eisenach, Saxe-Coburg- Gotha, Saxe-Meiningen, Saxe-Altenburg, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, and the two principalities of Reuss, all of which are separately described. Besides these, the term Thuringia also, of course, includes the various ''exclaves" of Prussia, Saxony, Bavaria, and Bohemia which lie embedded among them.

bishopric was founded at Erfurt ; and under Charlemagne the Thuringian mark was the base of active operations against the heathen Sorbs. In 839 the title of duke of Thuringia (ducatus Toringube) appears ; but that of land-grave seems to have superseded it ; neither dignity implied sovereignty over the whole district. Otto the Illustrious, duke of Saxony (880), added Thuringia to his duchy, but the union was not permanent. About the beginning of the 12th century Louis the Springer, builder of the Wart- burg, rose to eminence among the Thuringian nobles ; and about 1130 his son, also Louis, was appointed land- grave by the emperor Lothair I. Thuringia now began to be a united land under one prince; and the landgraves, who acquired the Saxon palatinate on the fall of Henry the Lion of Saxony in 1180, rose to considerable power. The last landgrave of this line was Henry Raspe (1242-1247), brother and successor of Louis the Saint. His death was followed by a devastating war of succes- sion between his niece Sophia, duchess of Brabant, and Henry the Illustrious, margrave of Meissen (1221-1288), whose mother Jutta was a Thuringian princess. Peace was finally

established in 1263: Sophia received Hesse, and Henry took the rest of Thuringia, the general history of which thenceforth merged in that of Meissen, and later of Saxony, although it maintained its separate name. Thuringia was included in the administrative circle of Upper Saxony (see vol. xxi. p. 352, note 3). For its subsequent fate, and the rise of the present Thuringian states, see under Saxony (vol. xxi. pp. 353 sq.). *

The most striking natural feature of Thuringia is the Thuringian Forest (Thiringerwald), a range or system of hills, extending in an irregular line from the neighbourhood of Eisenach in the north- west to the Lobensteiner Kulm on the Bavarian frontier on the south-east, and forming the southern boundary of Thuringia, separating it from Franconia. On the south-east it is continued directly by the Frankenwald Mountains to the Fichtelgebirge, which is in immediate connexion with the Erzgebirge, while on the north-east it approaches the Harz Mountains, and thus takes its place in the great Sudetic chain of central Germany. The length of the Thuringian chain is 70 miles, and its breadth varies from 8 to 25 miles. It nowhere rises into peaks, and only a few of its rounded summits reach the height of 3000 feet; the successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the north-west slopes are precipitous, and seamed with winding gorges. This mountain- range encloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills. The north-west part of the system is the loftier and the more densely wooded, as well as the more beautiful; the highest sum- mits here are the Grosscr Beerberg (3225 fect), Schneekopf (3179), and the Inselberg (2957), all in the duchy of Gotha. ‘The south- east part of the Thuringian Forest is the more populous and in- dustrial; the chief summits are the Kieferle (2851 feet) at Stein-heid, the Blessberg (2834 feet) near Schalkau, the Wurzelberg (2746 feet) near Oelze, and the Wetzstein (2719) near Lehesten. The crest of the Thuringian Forest, from the Werra to the Saale, is traversed by the Reunsteig or Rainsteig, a broad path of unknown antiquity, though it is belicved to be referred to in a letter of Pope Gregory III. dated 738. The name means probably “ frontier- path” ; and the path marks in fact the boundary between Thuringia and Franconia. It may be also regarded as part

of the boundary- line between North and South Germany, for dialect, customs, local. names and costume are different on the two sides.

THURINGORUM LEX. See Santo Law.

THURLES, an ancient market-town of Ireland, in the county of Tipperary, and the seat of the Catholic arch- diocese of Cashel, is pleasantly situated on the Suir, and on the Great Southern and Western Railway, 46 miles east of Limerick, 29 west from Kilkenny, and 87 south- west of Dublin. The cathedral of St Patrick is a beau- tiful building, erected at a cost of £45,000. The town is the seat of other important Catholic establishments, including an Ursuline convent, in which is a large board- ing-school for young ladies; a Presentation convent ; St Patrick's Catholic college (1829) for ecclesiastical students,

where was held in 1850 the synod of Thurles, composed of all the Catholic bishops of Ireland ; and an establish- inent of Christian Brothers, who devote themselves to the instruction of boys on the Lancastrian method. The town has a considerable agricultural and retail trade. The population was 5008 in 1871, and 4850 in 1881.

Originally the town was called Durlas O'Fogarty. In the 10th century it was the scene of the defeat of the Irish by the Danes. A preceptory was founded here by the Knights Templars; who pos- sessed themselves of a castle erected early in the 18th century. A castle was subsequently erected by James Butler, first lord palatine of Tipperary, of which till recently a tower still remained.

THURLOW, Epwarp Tuurtow, Baron (1732-1806), was born at Bracon-Ash, in the county of Norfolk, in 1732. His father was a clergyman, and held successively the livings of Little Ashfield in Suffolk and of Stratton St Mary's in Norfolk. His mother Elizabeth was the daughter of Robert Smith of Ashfield. Thurlow received his early education at home. He was next placed under the care of Mr Brett at Scarning, where he remained for four years, and was then sent to the grammar school of Canterbury, where he was considered a bold refractory clever boy. In October 1748 Thurlow

entered Caius College, Cambridge, and speedily justified his school reputation. The dean of the college, upon the extent and accuracy of whose classical: acquirements grave suspicion rested, had directed him, as a punishment for sonie act of insubordination, to translate a chapter of the Spectator into Greek. Thurlow executed his task with care, and then gave it for revisal, not to the dean, but to the tutor of the college. When reprimanded for having thus infringed the college rules, Thurlow retorted that he had carried his exercise to one who could inform the dean whether or not he had obeyed his orders. The insult was too grave for rustication, and yet too slight to justify expulsion. Thurlow was therefore permitted to withdraw his name from the college books, and he left Cam- bridge without a degree (1751). He now took chambers, and began regularly to keep terms in the Inner Temple, which he had joined while still an undergraduate. He was for some time a pupil along with the poet Cowper in the office of Mr Chapman, an eminent solicitor in Lincoln's Inn. On 22d November 1754 Thurlow was called to the bar, and subsequently went on the western circuit —at first with little success. But the tide turned. In the case of Luke Robinson v. the Earl of Winchelsea (1758) Thurlow came into collision with Sir Fletcher Norton, then the terror of solicitors and the tyrant of the bar, and put down his arrogance with dignity and success. From this time his practice increased rapidly. In December 1761 he was made a king's counsel, through the influence of the duchess of Queensberry. In January 1762 he was elected a bencher of the Inner Temple. It now became necessary for him to take his side in politics, and, after repeated oscillations, and with some hesitancy, Thurlow threw himself into the ranks of the Tory party. In May 1768 he became member for Tamworth. In 1769 the Douglas Peerage case came on for hearing in the House of Lords, and Thurlow, who had drawn the pleadings some years before (Votes and Queries, 3d ser., iii. 122), led for the appellant in a speech of great ability and analytic power. In March 1770, as a recognition of his defence in the previous January of the expulsion of Wilkes, Thurlow was made solicitor-general on the resignation of Dunning, and in the following year (23d January 1771), after he had enhanced his reputation with the Government by attacking the rights of juries in cases of libel (Rex v. Miller, 20 State Trials, 870-896) and the liberty of the press (16 Parly. Hist., 1144), was raised to the attorney-generalship. Thurlow's public life was as factious as his youth had been

daring, His violent hatred of the Amer- ican colonists, and his extreme and imprudent assertion

that as attorney-general he might set aside by scire facias as forfeited every charter in America (debate on the American Prohibitory Bill, 18 P. H., 999); his speech in aggravation of punishment in the case of Horne Tooke (20 St. Tr., 777-783), when he argued that the prisoner ought to be pilloried, because imprisonment was no penalty to aman of sedentary habits and a fine would be paid by seditious.subscription ; and his consistent opposition to all interference with the slave trade,—are characteristic of the man. In 1778 Thurlow became lord chancellor and Baron Thurlow of Ashfield (June), and took his seat in the House of Lords, where he soon acquired an almost dicta- torial power. He resolutely opposed the economical and constitutional reforms proposed by Burke and Dunning. Under Rockingham he still clung to the chancellorship, while conducting himself like a leader of the opposition. To the short-lived ministry of Shelburne he gave a con- sistent support. Under the coalition of Fox and North (April to December 1783) the great seal was placed in

commission, and Lord Loughborough was made first com-

missioner. But Thurlow, acting as the king's adviser, and in accordance with his wishes, harassed the new ministry, and ultimately secured the rejection of Fox's India Bill (24 P. H., 226). The coalition was at once dissolved. Pitt accepted office, and Thurlow again became lord chancellor (December 23, 1783). At first he sup- ported the Government heartily, but soon his overbear- ing temper asserted itself. Imprudently relying on the friendship of the king, and actuated by scarcely disguised enmity to Pitt, Thurlow passed rapidly from occasional acts of hostility to secret disaffection, and finally to open revolt. He delivered himself strongly against a bill, intro- duced without his privity, for the restoration to the heirs of attainted owners of estates forfeited in the Jacobite rebellion of 1745. Partly to please the king and queen, partly from dislike to Burke, and partly perhaps from a real belief in the groundlessness of the accusation, he supported Warren Hastings on every occasion ' with indecorous violence." His negotiations with the Whigs during the discussion of the Regency Bill (1788-19th

February 1789) went beyond the limits of mere perverse coquetry, and were designed to secure his seat on the woolsack in the event of Fox being called to power. The climax was reached in 1792, when he virulently attacked Pitt's bill " to establish a sinking fund for the redemption of the national debt," not on account of the economic objections to which it was justly liable, but on the trivial ground that it was an unconstitutional attempt to bind future parliaments. The bill was carried, but only by a narrow majority, and Pitt, feeling that co-operation with such a colleague was impossible, insisted successfully on his dismissal (June 15, 1792). The ex-chancellor, who had a few days before (June 12) been created Baron Thurlow of Thurlow, with remainder to his brothers and their male descendants, now retired into private life, and, with the exception of a futile intrigue, under the auspices of the prince of Wales, for the formation of a ministry from which Pitt and Fox should be excluded, and in which the earl of Moira should be premier and Thurlow chancellor (1797), finally abandoned the hopes of office and the dictatorship which he had so long exercised in the House of Lords. In 1795 he opposed the Treason and Sedition Bills without success. In 1801 he spoke on behalf of Horne Tooke—now his friend—when a bill was introduced to render a priest in orders ineligible for a seat in the House of Commons. His last recorded appearance in the House of Lords was on May 4, 1802. He now spent his time between his villa at Dulwich and Brighton, Bognor, Scar- borough, and Bath. He died at Brighton on 12th Septem- ber 1806, and was buried in the Temple church. Thurlow

was never married, but left three natural daughters, for whom he made a handsome provision. The title descended to his nephew, son of the bishop of Durham.

Lord Thurlow was a master of a coarse caustic wit, which habitu- ally in his private and too frequently in his public life displayed itself in profanity. He was a good classical scholar and miade occasional translations in verse from Homer and Euripides. His judicial and his ecclesiastical patronage was wisely exercised; he was the patron of Dr Johnson and of Crabbe, and was the first to detect the great legal merits of Eldon. Thurlow's personal ap- pearance was striking. His dark complexion, harsh but regular features,

severe and dignified demeanour, piercing black eyes and bushy eyebrows, doubtless contributed to his professional and political eminence and provoked the sarcasm of Fox that he looked wiser than any man ever was. Yet he was far from being an impostor. By intense though irregular application he had _ac- quired a wide if not a profound knowledge of law. Clear-headed, self-confident, and fluent, able at once to reason temperately and to assert strongly, capable of grasping, rapidly assimilating, and forcibly reproducing minute and complicated details, he possessed all the qualities which command success. His speeches in the trial of the duchess of Kingston for bigamy (20 S. 7., 355-651) are singularly vigorous and effective, while his famous opening in the Douglas Peerage case and his argument for the crown in Campbell v. Hall (20 S. 7., 812-316) show that he might have rendered high service to the judicial literature of his country had he relied more upon his own industry and less upon the learning of Hargrave and Kenyon

See Lord Campbell's Lives of the Chancellors, vii. 153-338 ; Foss's Judges of England, viii, 374-385; Public Characters, 1798 ; Notes and Queries, 2d ser., iii. 283; 3d ser., iii. 122; Reports of his decisions by Brown, Dickens, and Vesey (Junior); Brougham's Statesmen of the Time of George ILI. (A. W. R.)

THURSO, a seaport, police burgh, and burgh of barony of Caithness, Scotland, is situated at the mouth of the Thurso, on the beautiful Thurso Bay, at the northern terminus of the Highland Railway, 21 miles north-west of Wick, and 367 north of Edinburgh by rail. The new town, regularly built with broad streets and good houses, is steadily increasing in population. In Macdonald Square, now laid out with ornamental walks, there is a statue of Sir John Srncuarr (q.v.). Along the sands a promenade 300 yards in length was formed in 1882. The town-hall (1870) embraces a court-room and rooms for the free public library and the museum, which contains the geological and botanical specimens of Robert Dick, the "Thurso baker," commemorated by Samuel Smiles, as well as a large collection of northern birds. In the neighbourhood are large quarries for Caithness flags, which are cut and dressed in the town. They constitute the principal export, but the trade of the port is hindered by the inconvenience of the harbour. There is, however, communication with the south and west, and with Orkney by

steamer from Scrabster pier, 3 miles to the north. To the east is Thurso Castle, the residence of the Ulbster branch of the Sinclairs. The population in 1871 was 3622 and in 1881 it was 4026.

Thurso was the centre of the Norse power on the mainland when at its height under Thorfinn (1014), and afterwards till the battle of Largs. Count Moddan, nephew of King Duncan, quartered his army for a time at Thurso, which he terms ‘‘the town of Caith- ness,” and was plentifully supplied by spoil till surprised and slain by Thorkel in 1040. In the time of Malcolm II. Ear] Erlend resided in the town. In 1683 it was created a burgh of barony, and was the seat of the sheriff courts of the county till they were removed to Wick in 1828.

THYME. The genus Zhymus (nat. ord. Labiatx) com- prises a number of fragrant aromatic undershrubs, with very small Jeaves and whorls of small lilac flowers in the axils of the leaves or at the ends of the branches. The common garden thyme, a native of the Mediterranean region, is Thymus vulgaris; the wild thyme of our banks is T. Serpyllum. Marjoram (Origanum) is also closely allied. All these plants are remarkable for their essential oil, to which their fragrance is due. From this oil is produced by distillation a substance known as thymol, analogous to camphor. It is homologous with phenol or carbolic acid, and may be used as a disinfectant and germicide.

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TIBBUS, or Tusus, a nomad race of North Africa, occupying the eastern section of the Sahara from about 12°, where they are conterminous with the Tuareg Berbers, to about 24° E. long., and from Fezzan southwards nearly to Lake Tchad, 25° to 15° N. lat. Their westernmost settle- ments are the oases of Agram, Kawar, and Jebddo, their northernmost the district of Qatrin within the Fezzan frontier, while south and south-east they merge gradually in the Negroid populations of Kanem, Bornu (Tchad basin), Wadai, and north-west Dar-Fur. But the heart of the nation is concentrated in the central region of Tibesti or Tu, whence they take their collective name of Tib-bu or Tu-bu, z.¢., “people of Tibesti or Tu.”4 There are two main divisions,—the northern Teda, more or less full-blood Tibbus, and the southern Dasa, more or less mixed or Negroid Tibbus. Somewhat more

distantly connected with the same family are the Baele of the eastern and south- eastern oases and the Zoghawa (Zaghwa) of Dar-Fur, making a total population of about 190,000, distributed

as follows :— Teda (Tibesti, Qatrin, Kawar, Agram, &c.) ...29,000 Dasa (Borku, parts of Kanem, Wadai, Ennedi,

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190,000

The Tibbus, who are not expressly meutioned under this name by any ancient or medieval writer, are usually identified with the Garamantes of Herodotus (iv. 183), whose capital was Garama (Edrisi's Germa) in Phazania (Fezzan), and of whom Ptolemy al- ready spoke doubtfully as Ethiopians (Negroes?): "Ovrwy 6é xal avrav 46n waddov Aldiérwy (i. 8). But Leo Africanus transfers them to the Berber connexion, whose fifth great division he deals with under the names of Gumeri (Garamantes?) and Bardei or Bardoa, that is, the Teda of the Bardai oasis, Tibesti.2 Lastly

Barth on linguistic grounds grouped them with the Kantri of

Bornu, who are undoubtedly Negroes; and since his time (1852-53) the Tibbus have been regarded 'by most ethnologists as a Negro or at least a Negroid people? Nachtigal, who has studied them more carefully than any modern observer, sees good reason to challenge this conclusion (op. cit., ch. vii.); and, although his own inferences are somewhat vague, he supplies sufficient evidence for a solution of this difficult ethnological problem. There can be no doubt that the Teda, or true Tibbu, probably identical with the Tedamansii, a branch of the Garamantes, placed by Ptolemy south of the Samamycii in Tripolitana,4 are physically a Hamitic, uot a Negro people, closely resembling thcir western Tuareg neighbours. They are a pure homogeneous race, who have for ages undergone no perceptible change in their rocky homes, and who are still distinguished by the regular features, long black ringletty hair, haughty bearing, and fierce expression common to so many of the Berber and other Hamitic peoples. middle size, they are finely proportioned in all their limbs, except the somewhat too small hands and feet, with lighter complexion than that of the southern Dasa, and no

trace of the flat nose, thick tumid lips, or other marked characteristics of the true Negro. ‘‘Their women are charming while still in the bloom of youth, unrivalled amongst their sisters of North Africa for their physical beauty, pliant and graceful figures” (Keane’s Reclus, xi. p. 429). But there has been a general displacement of the race southwards ; and, while only a few still linger in the northern Qatrin and Kufara districts, large numbers have since medixval times penetrated into the Kanem, Bornu, Wadai, and Dar-Fur regions of central Sudan. Here they have everywhere merged with the natives, so that in the Dasa, Kanembu, Kanuri, Baele, and Zoghawa groups the Tibbu

Ue iohe Kanem-bu=people of Kanem, bu being the plural personal postfix answering to the Bantu prefix ba, wa (Ba-Suto, Wa-Ganda, &c.), and to the be of Ful-be=Ful people or Fulahs from Pil. In Tedaga the root tu means “rock ”; hence Tu-bu= “‘ rock-dwellers,” as described by Herodotus and as explained in their Arab designation Reshddeh, from reshad =rock, hill.

2 See Vater, Af, ethridates, ii. p. 45 of Berlin ed. 1812, and Nachtigal, Séhara und Sudan, 1881, ii. p. 189.

3 “ Urspriinglich ein Negervolk,” (Kinleitung), Berlin, 1880,

The original inhabitants of the Kufara (Kufra) oasis in south Tripolitana were Teda, some of whom still survive in a small hamlet south of Jebel Nari. Since the beginning of the 18th century they

have been replaced elsewhere in Kufara by the Zwiya Arabs from the Leshkerreh oases,

Lepsius, Vubische Grammatik

Mostly of

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race presents all the shades of transition between the true Negro and the true Hamite that are also found to prevail between the

blacks of western Sudan aud the Tuareg Berbers, aud between the Nubas and other eastern Sudan Negroes and the Hamitic Gallas, Somali, and Bejas.

The saine transitional stages are observed in the Tibbu forms of speech, which constitute a wide-spread linguistic family, whose most archaic and purest branch is the Tedaga of Tibesti (Nachtigal). Through the southern Dasaga the Tedaga merges in the more highly developed and more recent Kanem, Bornu (Kanuri), Ennedi (Baele), and Dar-Fur (Zoghawa) dialects, which, owing to the ab- sence of grammatical gender and some other structural features, are usually classed as Negro languages. But a Negro tongue could not have arisen among the Hamites of the Tibesti uplands, and the explanation of this linguistic difficulty is obviously the same as that of the physical puzzle. The Negro affinities of the southern members of the group have arisen through assimilation with the original and now partly displaced Negro idioms of central Sudan. There remains the final difficulty that Tedaga itself has absolutely nothing in common with the Berber or any other Hamitic tongue. If therefore it is neither Hamitic nor Negro, the only two stock languages recognized by Lepsius in Africa (op. cit., passim), how is it to be placed? First of all Lepsius's hasty generalization, wholly inconsistent as it is with the conditions occurring in other parts of the continent, must be unhesitatingly rejected. Room having thus been found for other linguistic families, the Tedaga of Tibesti may be readily explained as an independent evolution from a primeval Tibbu-Berber germ, analogous to other linguistic evolu- tions in other isolated or inaccessible highland regions, such as the Caucasus, the Pyrenees, and the Anahuac tableland. The comnon germ, essentially evanescent in its nature, has long since perished, or can no longer be detected, and the Tibbu and Berber languages stand side by side as now fundamentally distinct, while the two races still remain physically one. The Tibbus are therefore a Hamitic people, who in their secluded rocky homes have had time to evolve an independent form of speech, which southwards has become largely assimilated to the Sudanese Negro dialects.

Lying on the track of the great caravan route between Fezzan and Lake Tchad, the Tibbus have always been a predatory race, levying blackmail on the convoys passing through their territory, maintaining intertribal feuds,

and carrying on constant warfare with the surrounding Berber and Sudanese populations. This, combined with the severe struggle for existence in their inhospitable upland valleys, has rendered them harsh, greedy, and suspicious, —sentiments reflected in their hard features and stern expression. Till comparatively recent times all were pagans, whence the term Kufra (Kufara), ‘Land of the Unbeliever,” applied by the Arabs to the southern oases of Tripolitana. But for two or three centuries they have been zealous Mohammedans, and some have even lately been brought within the influence of the political Sentisiya sect (see TRipout, below). They are a frugal race, living mostly on goat’s milk, dates, berries, durrha, and the fruit of the dum-palm ; nevertheless they are of robust con- stitution and remarkably agile. They are also intelligent, crossing the wilderness by a sort of instinct quite unintel- ligible to the stranger, and in all ordinary transactions they display surprising tact and shrewdness. The tribal organization embraces dardat or headmen, maina or nobles, and the common folk, while the unwritten law of custom rules supreme over all classes. The women, who are orderly and industrious, are well treated, and the polygamy allowed by the law is little practised. But the vendetta is still a social institution. a HK.)

TIBER. See Iraty, vol. xiii. pp. 438-439.

TIBERIAS, now Tapariya, a city of Palestine, on the western shore of the Sea of Galilee or Lake of Tiberias, occupies a narrow strip of plain under a hill in a feverish but fertile situation. Recent estimates place the popula- tion at from 2000 to 3000,—about half the inhabitants being Jews, and many of the latter immigrants from Poland. The streets are indescribably filthy, and an Arab saying is that “the king of the fleas holds his court at Tiberias.” The walls of the town and the castle on the north were in great part ruined by an earthquake in 1837, when half the population perished. The most interesting building

is a very ancient synagogue by the lake, the lower story of which is said to have been unaffected by the earthquake. Outside the town are the plastered monuments (‘‘ whited sepulchres”) of R. Akiba and Maimonides. Half an hour to the south are the famous hot baths mentioned by Pliny (Z.N., v. 15

[71]). Josephus calls this place Emmaus, which has suggested an identification with Hammoth-dor (Josh. xxi. 32) or Hammon (1 Chron. vi. 76 [61]), names which perhaps point to the existence of thermal springs.

Tiberias was founded by Herod Antipas apparently not before 26 A.D.,! and so was quite a new place at the time of our Lord's min- istry in Galilee. And, though it became the al of Galilee, it was at first a purely Greek city, which accounts for its not appearing among the scenes of the Galilean ministry. It joined in the war of liberty, but yielded without resistance to Vespasian, and was restored by him to its master Agrippa, on whose death in 100 it fell directly under Roman rule. The place came to be a great seat of Jews and Jewish learning: it was the residence of R. Judah, the editor of the Mishnah ; and, though the schools of Palestine were ultimately overshadowed by those of Babylonia, the school of Tiberias was still famous in the time of Jerome. According to Epiphanius, the first Christian church was built by Constantine, and from this time we hear of bishops of Tiberias. The Arabs took Tiberias in 637; it was restored to Christendom by Tancred, but yielded to Saladin in 1187 after the battle of Hittin. It was again in Christian hands from 1240 to 1247. In the middle of the 18th century it was one of the fortresses of the renowned Sheikh Zahir, who for many years defied the Turkish power.

TIBERIUS (42 B.c.~~37 a.p.), emperor of Rome, whose full name was TrBER1IUs CLaupiIus NERo, was born on the Palatine Hill on 16th November 42 B.c. When he became a member of the imperial family, the court genealogists made him out to be one of the ancient patrician Claudii ; but the pedigree is at some points difficult to trace. His father, who bore the same name, was an officer of Julius Czesar, who afterwards proposed to confer honours on the assassins, then joined Mark Antony's brother in his mad attack on Octavian, took refuge with Mark Antony, and returned to Rome when the general amnesty was proclaimed in 39 B.c. Livia, the mother of Tiberius, was also of the Claudian family, out of which her father had passed by adoption into that of the Livii Drusi. Early in 38 Livia was amicably ceded to Octavian (the future Augustus), and three months after her new marriage Drusus, brother to Tiberius, was born. Livia had no children by Augustus, and therefore devoted all her remarkable gifts to the advance~~ ment of her sons. They were treated with high considera- tion by

the emperor, yet Augustus held firmly to the hope that his throne might be filled on his death by one in whose veins ran the blood of the Octavii; and not till Tiberius was past forty did there appear any probability that he would ever rise to be emperor. He passed through the list of state offices in the usual princely fashion, beginning with the questorship at the age of eighteen, and attaining the consulate for the first time at twenty- nine. From the great capacity for civil business which he displayed as emperor it may be inferred that he applied himself with determination to learn the business of government.

But from 22 to 6 Bc, and again from 4 to 10 a.p. by far the greater part of Tiberius's life was spent in the camp. His first service was as legionary tribune in one of the desperate and arduous wars which led to peace in the Spanish peninsula through the decimation, or rather the extermination, of the rebellious tribes. In 20 B.c. Augustus sent Tiberius with an army to seat Tigranes of Armenia on the throne as a Roman vassal. As Tiberius approached the frontier of Armenia, he found its throne vacant through the assassination of the king, and Tigranes stepped into his place without a blow being struck, Tiberius crowned Tigranes king with his own hand. Then the Parthian mon- arch grew alarmed and surrendered "the spoils and the

(OS ea rr eS eee 1 See the discussion in Schiirer, Gesch. d. Jiid. Volkes, ii. 127 sq.

standards of three Roman armies." The senate ordered a thanksgiving such as was usually celebrated in honour of a great victory. The following year was passed by Tiberius as governor of Transalpine Gaul. In the next year (15) he was despatched to aid his brother Drusus in subjugat- ing the Reti and Vindelici, peoples dwelling in the mountainous region whence the Rhine, Rhone, and Danube take their rise.2_ Drusus attacked from the eastern side, while Tiberius operated from the upper waters of the Rhine, and by stern measures the mountaineers were re- duced to a state of quietude, and could no longer cut communications between northern Italy and Gaul, nor prosecute their raids in both countries. In 12 B.c. Agrippa, the great general of Augustus, to whom he may be almost said to have owed his

throne, and who was its chief sup- port, died at the age of fifty-one, leaving Julia, the emperor's only child, a widow. Agrippina, daughter of Agrippa by an earlier marriage, was wife of Tiberius, and had borne him a son, Drusus, afterwards father of Germanicus. Livia with great difficulty prevailed upon Augustus to replace Agrippa by Tiberius, who was com- pelled to exchange Agrippina for Julia, to his bitter grief. During the year of mourning for Agrippa, which delayed his new marriage, Tiberius was occupied with a victorious. campaign against the Pannonians, followed by successful expeditions in the three succeeding summers. For his victories in the Danube regions, the emperor conferred on him the distinctions which flowed from a military triumph in republican times (now first separated from the actual triumph), and he enjoyed the "ovation " or lesser form of triumphal entry into the capital. On the death of Drusus in the autumn of 9 B.c. Tiberius, whose reputa- tion had hitherto been eclipsed by that of his brother, stepped into the position of first soldier of the empire. The army, if it did not warmly admire Tiberius, entertained a loyal confidence in a leader who, as Velleius tells us, always made the safety of his soldiers his first care. In the campaign of the year after Drusus's death Tiberius traversed all Germany between the Rhine and the Elbe, and met with slight opposition. But it would be too much to believe the statement of Velleius that "he reduced Germany almost to the position of a tributary province." He was rewarded with the full triumph, the military title of "'imperator," and his second consulship, though the op- position of the powerful Sugambri had been only broken by an act of treachery, the guilt of which should perhaps be laid at the door of Augustus. In 7 B.c. there was another but insignificant campaign in Germany. Next year Augustus bestowed on his stepson the tribunician authority for five years. Tiberius was thus in the most formal manner associated with the emperor in the conduct of the government on the civil side; but Tacitus (Anv., ili. 56) goes too far when he says that this promotion marked him out as the heir to the throne.

Tiberius now suddenly begged permission to retire to Rhodes and devote himself to study. He seems to have declined absolutely at the time to state his reasons for this course, but he obstinately adhered to it, in spite of the tears of Livia and the lamentations of Augustus to the senate that his son had betrayed him. If we may believe Suetonius, Tiberius determined to commit suicide by abstention from food, and Augustus only gave way when

this design was all but accomplished. The depart- ure from Italy was as secret as it could be made. Years afterwards, when Tiberius broke silence about his motives, he declared that he had retired in order to allow the young princes, Gaius and Lucius, sons of Julia, a free course. There was perhaps a portion of the truth wrapped up in this declaration. Like Agrippa, who retired to Mytilene

2 Horace, Odes, iv. 14.

to avoid the young Marcellus, Tiberius had clearly no taste to become the servant of the two children whom Augustus had adopted in their infancy and evidently destined to be joint emperors after hisdeath, But it may well be believed that Tiberius, unlike Agrippa, had no burning ambition to see himself in the place destined for his stepsons ; and it may have been in his eyes one of the attractions of exile that it released him from the obligation to aid in carrying out the far-reaching designs which Livia cherished for his sake. But the contemporaries of Tiberius were no doubt right in believing that the scandal of Julia's life did more than all else to render his position at Rome intolerable. His conduct to her from first to last gives a strong impression of his dignity and self-respect. When at last the emperor's eyes were opened, and he in- flicted severe punishment upon his daughter, her husband, now divorced by the emperor's act, made earnest interces- sion for her, and did what he could to alleviate her suffer- ing. At Rhodes Tiberius lived simply, passing his time mainly in the company of Greek professors, with whom he associated on pretty equal terms. He acquired a very considerable proficiency in the studies of the day, among which must be reckoned astrology. But all his attempts at composition, whether in prose or verse, were laboured and obscure. After five years' absence from Rome, he begged for leave to return; but the boon was angrily re- fused, and Livia with difficulty got her son made nomin- ally a legate of Augustus, so as in some degree to veil his disgrace. The next two years were spent in solitude and gloom. Then, on the intercession of Gaius, Augustus allowed Tiberius to come back to Rome, but on the ex- press understanding that he was to hold aloof from all public functions,—an understanding which he thoroughly carried out.

He had scarcely returned before death removed (2 A.D.) Lucius, the younger of the two princes, and a year and a half later Gaius also died. The emperor was thus left with only one remaining male descendant, Agrippa Pos- tumus, youngest son of Julia, and still a boy. Four months after Gaius's death Augustus adopted Agrippa and at the same time Tiberius. The emperor now indi- cated clearly his expectation that Tiberius would be his principal successor. The two essential ingredients in the imperial authority —the proconsulare imperium and the tribunicia potestas—were conferred on Tiberius, and not on Agrippa, who was too young to receive them. Tiberius's career as a general now began anew. In two or three safe rather than brilliant campaigns he strengthened im- mensely the Roman hold on Germany, and established the winter camps of the legions in the interior, away from the Rhine.

In 5 a.p. it became necessary to attack Maroboduus, who by combining peoples formerly hostile to each other had constructed a formidable power, with its centre in Bohemia, menacing the Roman acquisitions in Germany, Noricum, and Pannonia. The operations were conducted both from the Rhine and from the Danube, Tiberius being in command of the southern army. Just as the decisive engagement was about to take place, Tiberius learned that Pannonia and Dalmatia were aflame with insurrection in his rear. He was therefore forced to conclude peace on terms honourable to Maroboduus. The terror inspired in Italy by the Pannonian and Dalmatian rebellion under the able chief Bato had had no parallel since the invasion of the Cimbri and Teutones. The four serious campaigns which the war cost displayed Tiberius at his best as a general. As he was about to celebrate his well-won triumphs, the terrible catastrophe to Varus and his legions turned the rejoicing into lasting sorrow, and produced a profound change in the Roman policy towards Germany.

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Although Tiberius with his nephew and adopted son Ger- manicus made in 9 and 10 A.D. two more marches into the interior of Germany, the Romans never again attempted to bound their domain by the Elbe, but clung to the neighbourhood of the Rhine. Tiberius was thus robbed in great part of the fruit of his campaigns; but nothing can deprive him of the credit of being a

chief founder of the imperial system in the lands of Europe. From the beginning of 11, when he celebrated a magnificent triumph, to the time of the emperor's death in 14 Tiberius remained almost entirely in Italy, and held rather the position of joint emperor than that of expectant heir. Agrippa Pos- tumus had proved his incapacity beyond hope, and had been banished to a desolate island. In all probability Tiberius was not present when Augustus died, although Livia spread reports (eagerly amplified by Velleius) of an affectionate interview and a lingering farewell.

Tiberius ascended the throne at the age of fifty-six. What struck his contemporaries most was his absolute impenetrability. As was said of a very different man, the poet Gray, ''he never spoke out." All his feelings, desires, passions, and ambitions were locked behind an impassable barrier, and had to be interpreted by the very un- certain light of his external acts. It is recorded of him that only once did he as commander take counsel with his officers concerning military operations, and that was when the destruction of Varus's legions had made it imperatively necessary not lightly to risk the loss of a single soldier. He was an unparalleled master of passive and silent dissimulation, and the inevitable penalty of his inscruta- bility was widespread dislike and suspicion. But behind his defences there lay an intellect of high power, cold, clear, and penetrating all disguises. Few have ever possessed such mental vision, and he was probably never deceived either about the weaknesses of others' or about his own. For the littlencss and servility of public life in regions below the court he entertained a strong contempt. It isa question whether he ever liked or was liked by a single being ; but he did his duty by those with whom he was connected after a thorough though stern and unlovable fashion. As a general he commanded the full confidence of his soldiers, though he was a severe disciplinarian ; yet the men of his own legions greeted his accession to the throne with a mutiny. 'Tiberius proved himself capable in every department of the state more by virtue of industry and application than by genius. His mind moved so slowly and he was accustomed to deliberate so long that men sometimes made the mistake of deeming him a weakling and a waverer. He was in reality one of the most tenacious of men. When he had once formed an aim he could wait patiently for years till the favourable moment enabled him to achieve it, and if compelled to yield ground he never failed to recover itin the end. The key to much of his character lies in

the observation that he had in early life set before himself a certain ideal of what a Roman in high position ought to be, and to this ideal he rigidly and religiously adhered. He may in one sense be said to have acted a part throughout life, but that part had entered into and interpenetrated his whole nature. His ideal of character was pretty much that of the two Catos. He practised sternness, silence, simplicity of life, and frugality as he deemed that they had been practised by the Fabricii, the Curii, and the Fabii, ‘That Tiberius’s character was stained by vice before he became emperor no one who fairly weighs the records can believe. The persuasion entertained by many at the end of his life that he had been always a monster of wickedness, but had succeeded in concealing the fact till he became emperor, has slightly, but only slightly, discoloured the narratives we possess of his earlier years. The change which came over him in the last years of his life seems to have been due to a kind of constitutional clouding of the spirits, which made him what the elder Pliny calls him, ‘‘the gloomiest of mankind,” and disposed him to brood over mysteries and superstitions. As this gloom deepened his will grew weaker, his power tended to fall into the hands of unworthy instruments, terrors closed in around his mind, and his naturally clear vision was perturbed.

The change of masters had been anticipated by the Roman world with apprehension, but it was smoothly accomplished. Tiberius was already invested with the necessary powers, and it may even be that the senate was not permitted the satisfaction of giving a formal sanction to his accession. Agrippa Postumus was put to death; but Livia may be reasonably regarded as the instigator of this crime. Livia indeed expected to share the im- perial authority with her son. At first Tiberius allowed some recognition to the claim ; but he soon shook himself

Plate IV.

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free, and later became estranged from his mother and held —

no communication with her for years before her death. The history of Tiberius’s relations with other members of his family is hardly less miserable. Perhaps with any other commander than Germanicus the

dangerous mutiny of the troops on the Rhine which broke out soon after Tiberius's accession would have ended ina march of the discontented legions upon the capital. The perilous episode of Arminius caused the recall of Germanicus and his despatch to the East on an honourable but comparatively inactive mission. The pride and passion of Agrippina, the granddaughter of Augustus and wife of Germanicus, tended to open a breach between her husband and the emperor. In his Eastern command Germanicus found himself perpetually watched and even violently opposed by Piso, the governor of Syria, who was suspected to have received secret orders from Tiberius. When Germanicus died at Antioch in 19 A.D., the populace of Rome combined with Agrippina in demanding vengeance upon Piso; and the emperor was forced to disown him. The death of Germanicus was followed four years later by that of Drusus. These two princes had been firm friends, and Livilla, the wife of Drusus, was sister to Germanicus. Years afterwards it was found that Drusus had fallen a victim to the treachery of his wife Livilla, who had joined her ambition to that of the emperor's minister of state Sejanus. When Drusus died, Tiberius nominated two of Agrippina's sons as his heirs. But Sejanus had grown strong by nursing the emperor's suspicions and dislike for the household of Germanicus, and the mother and the princes were im- prisoned on a charge of crime. In his memoirs of his own life Tiberius declared that he killed Sejanus because he had discovered that he entertained a mad rage against the sons of Germanicus. But the destruction of Sejanus did not save Agrippina and her two children. The third son, Gaius Cesar (Caligula), lived to become emperor when Tiberius died in 37.

Throughout his reign Tiberius strove earnestly to do his duty to the empire at large ; his guiding principle was to maintain with an almost superstitious reverence the constitutional forms which had been constructed by Augustus. Only two changes of moment were introduced. The imperial guard, hitherto only seen in the city in small detachments, was by the advice of Sejanus encamped per- manently in full force close to the walls. By this measure the tur- bulence of the populace was kept in check. The officer in command of the guard became at once the most important of the emperor's lieutenants. The other change was the practically complete aboli- tion of the old comitia. But the senate was treated with an almost hypocritical deference, and a pedantically precise compliance with the old republican

forms was observed towards the senatorial magis- trates. The care expended by Tiberius on the provinces was unre- mitting. His favourite maxim was that a good shepherd should shear the flock and not flay it. When he died he left the subject peoples of the empire in a condition of prosperity such as they had never known before and never knew again. Soldiers, governors, and officials of all kinds were kept in wholesome dread of vengeance if they oppressed those beneath them or encouraged irregularity of any kind. Strict economy permitted light taxation and enabled the empcror to show generosity in periods of exceptional distress. Public security both in Italy and abroad was maintained by a strong hand, and commerce was stimulated by the improvement of com- munications. Jurisdiction both within and without the capital was on the whole exercised with steadiness and equity, and the laws of the empire were at many points improved. ‘The social and moral reforms of Augustus were upheld and carried further. Such risings against the emperor’s authority as occurred within the Roman domain were put down with no great difficulty. The foreign or rather the frontier policy was a policy of peace, and it

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was pursued with considerable succcss. With few exceptions the duties of the Roman forces on the borders were confined to watch-

| ing the peoples on the other side while they destroyed each other.

On the Rhine, at least, masterly inactivity achieved tranquillity whicli lasted for a long period.

The disrepute which attaches to the reign of Tiberius has come inainly from three or four sources,—from the lamentable story of the imperial household, from the tales of hideous debauchery prac- tised in deep retirement at Capree during the last eleven years of the emperor’s life, from the tyranny which Sejanus was permitted to wield in his master’s name, and from the political prosecutions and executions which Tiberius encouraged, more by silent compliance than by open incitement. The stories of immorality are recorded chiefly by Suetonius, who has evidently used a poisoned source, possibly the memoirs of the younger Agrippina, the mother of Nero. Tiberius loved to shroud himself in mystery, and such

stories are probably the result of unfriendly attempts to uplift the darkness. If history ventures to doubt the blackness of Theodora, that of Tiberius grows continually lighter under the investigations of criticism. Suetonius makes the emperor's con- dition to have been one of mania, issuing frequently in the aban- donment of all moral restraint. But in that case the authority of Tiberius, which was as firmly upheld during the years spent at Caprese as it had been earlier, must have fallen to pieces and come to an end. With respect to Sejanus it is impossible to acquit Tiberius of blame. If he was deceived in his favourite he must have been willing to be deceived. He conferred on Sejanus a position as great as had been held by Agrippa during the reign of Augustus, and the minister was actually, and all but formally, joint emperor. Of the administrative ability of Sejanus there can be no question ; but the charm and secret of his powcr lay in the use he made of those apprehensions of personal danger which seem never to have been absent from his master's mind. The growth of '¢delation," the darkest shadow that lies on the reign, was in part a consequence of the supremacy and the arts of Sejanus. Historians of Rome in ancient times remembered Tiberius chiefly as the sove- reign under whose rule prosecutions for treason on slight pretexts first became rife, and the hateful race of informers was first allowed to fatten on the gains of judicial murdcr. Augustus had allowed considerable licence of speech and writing against himself, and had made no attempt to set upa doctrine of constructive treason. But the history of the state trials of Tiberius's reign shows conclusively that the straining of the law proceeded in the first instance from the eager flattery of the senate, was in the earlier days checked and controlled to a great extent by the emperor, and was by him acquiesced in after a time with a sort of contemptuous indifference, till he developed, under the influence of his fears, a readiness to shed blood.

The principal authorities for the reign of Tiberius are Tacitus and Suetonius. The Annals of Tacitus were not published till nearly eighty years after the death of Tiberius. He rarely quotes an authority by name. In all probability he drew most largely from other historians who had preceded him; to some extent he availed himself of oral tradition ; and of archives and original records he made some, but comparatively little, use. In his history of Tiberius two influences were at work, in almost equal strength: on the one hand he strives continually after fairness; on the other the bias of a man

steeped in senatorial traditions forbids him to attainit. Tacitus is certainly not among the historians in whom our confidence grows by repeated reading. Suetonius was @ biographer rather than an historian, and the ancient biographer was even less given to exhaustive inquiry than the ancient historian; moreover Suetonius was not gifted with great critical faculty, though he told the truth so far as he could see it. His Lives of the Twelve Cxsars was written nearly at the time when Tacitus was composing the Annals, but was published a little later. Velleius Paterculus is by far the oldest authority for any part of Tibe- rius's life. He had been an officer under Tiberius, and he eulogizes his old general enthusiastically,—feeling it necessary, however, to do less than justice to the achievements of Germanicus. To Velleius all defenders of Tiberius have eagerly appealed. In truth it is his silence alone which affords any external aid in repelling the charges of Tacitus and Suetonius, and the fact that Velleius published his work in the lifetime of his master deprives that silence of its value. The eulogy of Sejanus which is linked with that of Tiberius must needs shake faith in the scrupulousness of the author. It is still doubtful whether Dio Cassius (whose History ended with the year 229) in his narrative of the reign of Tiberius is to any great extent independent of Tacitus. In recent times a considerable mass of inscriptions has added to our knowledge of the adminis- tration of this emperor. The chief account of Tiberius in English is that contained in Dean Merivale's History of the Romans under the Empire. Mr Beesly has written an interesting defence of him in his Catiline, Clodius, and Tiberius. The best recent history of this period is Hermann Schiller's Ge- schichte der rémischen Kaiserzeit (Gotha, 1883). Numerous monographs relating to the reign have appeared in recent times on the Continent. The principles of the imperial administration of the provinces by Tiberius have been treated by Mommsen in the fifth volume of his History of Rome, translated into English under the title of The Roman Provinces from Augustus to Diocletian. (J.8. RB.)

TIBESTL See Samara, vol. xxi. p. 149, and Tipsus.

TiLBiT

IBET,! Thibet, or Tiibet, an extensive and highly elevated region in the heart of Asia, comprising tablelands ranging from 10,000 to 17,600 feet

above sea-

1 The name Tibet is not, as usually alleged, unknown in the country

level. The Himalayan mountain ranges and the transverse ranges of upper Yun-nan constitute the southern scarp,

itself, though only found there in an attenuated form. The following forms are also met with—in Chinese annals 7’u-bat (5th cent.) and

Bound- aries.

Name.

the Yun-ling Mountains of China the eastern scarp, and the Kuen-Lun (Kitn-Liun) ranges the northern scarp, towards Turkestan and Mongolia; on the west, where it narrows considerably, it merges into the Pamir tablelands. Its extreme length from east to west exceeds 1600 miles ; its breadth from north to south ranges from 150 miles in the west to an average of 500 in central Tibet and a maximum of 700 in the east. The area of Tibet exceeds 700,000 square miles.

Much of Tibet is wholly abandoned to wild animals, and much is uncultivable and occupied only by various wan- dering tribes of nomads. The centres of the settled and

it. tee Tie-bu-te, T’u-bo-te (11th cent.); in Mongolian, Tiibet, Tobdt ; in Arabic Tubbet; Rabbi Benjamin (1165), Thibet; J. de Plano Carpini (1247), Thabet ; Rubruquis (1253), Marco Polo (1298), Tebet ; Tbn Batuta (1840), Thabat ; Ibn Haukal (976), Al Biruni (1020), Odoric of Pordenone (c. 1328), Orazio della Penna (1730), Tibet. A Tibetan, arriving at Darchiendo from Lhasa, states that he comes from Teu-peu, meaning High or Upper Tibet,—Stod-Bod in contradistinction to Smad- Bod or Lower Tibet. The former expression, were it supported by any ancient authority, might be

regarded as the etymological origin of ‘* Tibet” ; historical evidence, however, seems to indicate another source, The state of which Lhasa is the capital is often called ‘‘ Deba jung” or ‘land of the Debas” (sdepa Ujongs). The title of the tepa lama is familiar, Chinese records say that the king of the country is called diba ; and Joh. Grueber informs us that the king is styled deva or teva, and is descended from an ancient race of Tangut Tatars. The Chinese annals of the T’ang dynasty record that Fanni Tubat, the historical founder of a state in the east of Tibet in 433, gave to his dominion his surname of Tubat. This was a famous family name proper to several Tatar dynasties which ruled in the north and north- west of China, and belonged to the Sien-pi race, in the language of which fubat meant ‘‘a coverlet.” An appended legend stated that the fifth ancestor of Liluku, the founder of the southern Liang dynasty and family and father of Fanni, derived the surname of Tubat, which became that of his family, from the fact that he was born in a coverlet while his mother Huykshe was sleeping. However worthless the legend, there is complete similarity between the name of the Tubat or Tobat Tatars and that of Tibet, and we may with considerable safety take the latter word as derived from the former, the fact being that it was and is still extensively used in the sense of ‘‘ great,” ‘‘ chief,” among the Tatar tribes. Tibet, however, is not the name by which the modern Tibetans designate themselves and their country. Bod-pa, ‘‘a man of Bod,’ Bod-yul, ‘‘country of Bod,” are the expressions in current use ; but what ‘‘ Bod” means is uncertain. Hodgson has maintained that before the arrival of Indian teachers the people had no name for themselves or their country, and the present Bod comes from the Sanskrit B’ét—an opinion which, though inconsistent with the evidence collected about Tubat, is rather confirmed by a legendary account. According to that account, the country, which was occupied by a race of men not yet emerged from primitive bar- barism, was originally called Bod-rgyal, 7.e., ‘‘ Bod’s victory.” The secondary name then might be in its simple form Bod, a Buddhist appellative suggested by the Sanskrit homonyms of -dat or -b’at, part of the name brought in by the Tatar conquerors. Anyhow there is no occasion for the other etymologies suggested, such as that from Buddha, or that proposed by Schiefner (¢’wb and p’od, both meaning ‘able,’ capable”). An old name for Tibet in the native books is Gdong-mar-gyi-yul, ‘country of the red-faced men,” so called ap- parently from the ancient national custom of painting the face red,— a practice which was forbidden by King

Srong-btsan at the instance of his wife Wan ch’eng, a Chinese princess. Among the Mongols Tibet was simply called Barontala (the ‘‘ right side’’), in contradis- tinction to Dziéntala (the ‘‘left side”), which was among them the name of Mongolia. In China, during the Yuan or Mongol dynasty, it was called Wei-sze-Tsang, in which we recognize the names of the two central provinces of DbUs(U) and Tsang. Khachi, Khache, Khaschi, Kashi, are varions forms of a term which is often met with in books as applied to a part of the plateaus of Tibet, and which cannot without difficulty be identified in positive geography. We take it to be simply a revival of the old name of the Tangut or Hia kingdom, the Khashi or Khoshi of the Mongols (982-1227), on the north-east of Tibet, on the west of the Hoang-ho, whence Ho-si in Chinese history, and per- haps the origin of the name. In the 11th century Milaraspa made use of the term K’aché for Mussulman ; Huc and Gabet have reported the use of the same expression in the central provinces with a similar acceptation. A popular ctymology has confounded it with the words K’a-ché for K’a-chen, literally ‘‘ big mouth,” which is now supposed to be its meaning when applied to Mohammedans. Kashmir is also called K’a-ché, from the fact that it is under Mohammedan rule, says Jaeschke ; but, as this has been the case only since 1605, there is great probability that here the term is simply used as an abridged form of Kashmir. (EEE AL:)

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[GEOGRAPHY,

agricultural population lie to the south, in a region named Bod-yul (meaning Bod-land) by the inhabitants, who are called Bod-pas ; by the Hindus it is called Bhot, and by the Chinese Si-tsang. The greater portion of this region is governed, under the supremacy of China, by lamas and gyalpos, ecclesiastical and lay Bod-pas, the principal seat of government being at Lhasa, the chief city of Bod-yul. Portions are subject to Kashmir and Nepal, and to independent chieftains, and portions are directly subject to China; but the Bod-pa ethnological element prevails more or less throughout.

Tibet was long a terra imcognita to Europeans. It is difficult of access on all sides, and everywhere difficult to traverse. Its great elevation causes the

climate to be rather arctic than tropical, so that there is no gradual blending of the climates and physical conditions of India and Tibet, such as would tend to promote intercourse between the inhabitants of these neighbouring regions ; on the contrary, there are sharp lines of demarcation, in a mountain barrier which is scalable at only a few points and in the social aspects and conditions of life on either side. No great armies have ever crossed Tibet to invade India; even those of Jenghiz Khan took the circuitous route wa Bokhara and Afghanistan, not the direct route from Mongolia across Tibet. for the early European travellers to find their way into and explore Tibet. Friar Odoric of Pordenone is sup- posed to have reached Lhasa circ. 1328, travelling from Cathay; three centuries afterwards the Jesuit Antonio Andrada, travelling from India, entered Tibet on the west, in the Manasarowar Lake region, and made his way across to Tangut and north-western China; in 1661 Fathers Grueber and D'Orville travelled from Peking wa Tangut to Lhasa, and thence through Nepal to India; and during the first half of the 18th century various Capu- chin friars appear to have passed freely between Delhi and Lhasa, by way either of Nepal or Kashmir. The first Englishman to enter Tibet was George Bogle, in 1774, on an embassy from Warren Hastings to the tashi (teshu) lama of Shigatze. In 1811 Thomas Manning made his way from India to Lhasa; he is the only Englishman who has succeeded in reaching the sacred city, and he had soon to leave it. During the 19th century Europeans have been systematically prevented from entering the country or speedily expelled if found in it. In 1844-46 the French missionaries Huc and Gabet made their way to Lhasa from China, but were soon deported back again. In 1866 the Abbé Desgodins travelled through portions of eastern Tibet and reached Chiamdo (in Kham), but was prevented from approaching any closer to Lhasa. Last of all the Russian Colonel Prejevalsky succeeded in exploring portions of northern Tibet, but was unable to penetrate southwards into Bodland.

Geographers have long been in possession of maps of Tibet, com- Maps.

piled from surveys executed early in the 18th century by lamas, under instructions from the Jesuit fathers who made a survey of China for the emperor Kang-he. The lamas' maps were the basis of D'Anville's Atlas, published in 1733, and were employed by Klaproth in constructing his map of Asia in 1824; but they are generally very meagre, only reliable in the

vicinity of the principal roads, and occasionally very misleading. They must have been compiled at best from rude estimates of distance and direction, and in some parts from mere hearsay or conjecture. They are, how- ever, supposed to have becn based on astronomical determinations of position ; but this is improbable, for the latitudes of such im- portant places as Lhasa and Batang are 30 to 60 miles in error, Our knowledge of the geography of the country is complete only for portions of western Tibet, which are subject to the maharajah of Kashmir, and have been regularly surveyed. This knowledge has been largely supplemented during the last twenty years by the work of natives of India—the so-called trans-Himalayan explorers of the Indian Survey, notably Pandits Nain Singh and Krishna (A—K)—who have been trained to carry route surveys through regions which they may, but Europeans may not, enter.

Thus it was no easy matter Euro-

Geogra- phical divisions.

Table- land.

Rivers.

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Tibet is commonly divided into two parts called Great and Little Tibet, the former lying between 102° and 79° E. long., the latter between 79° and 74°. Great Tibet is broadly divisible into a western region, in which there is a considerable preponderance of tableland over hill and mountain and of lake basins over river basins, and an eastern region, in which the reverse holds good and the surface of the ground is so greatly corrugated that the natives call it rong-rtsub, “a rough country full of ravines.” In Little Tibet the Himalayas converge towards the Kuen- Lun, and the breadth of the plateau meridionally diminishes to less than a fourth of what it attains in Great Tibet. The entire region may be broadly divided into three longi- tudinal zones, increasing in elevation from south to north, viz., a southern zone, which contains the centres of the settled and agricultural population ; a middle zone, com- prising the pasture lands of the Bod-pa nomads; and a northern zone, for the most part abandoned to wild animals, but partly

occupied by tribes of Turkic and Mongolian nomads. The southern and middle zones comprise Bod- land proper and are divided into four provinces, viz.,— Nari (Ngari, Ari) on the west, between 74° and 85° E. long. ; Kham, otherwise Do-Kham, on the east, between 92° 30’ and 102°; and in the centre, Tsang, adjoining Nari, and U or Us (otherwise Y or Wei), adjoining Kham; the two central provinces are commonly called U-tséng, as one. A considerable belt of the middle zone is known as the Hor country. The middle and northern zones embrace the greater portion of the region known to Bod-pas as the Chang-tang (Bydn-tang, Jan-tang) or “Northern Plain,” which, however, protrudes southwards and abuts upon the Himalayas from 80° to 85° E. long., thus interposing a nomad population between the settled populations to the east and the west. The northern zone merges on the west into the Pamir tablelands.

The tableland of Tibet attains its maximum elevation, 17,600 feet above sea-level, on the 79th meridian, in the Lingzi-tang plateau of the northern zone; thence there is a gradual fall east, west, and south, the plateau level on the 97th meridian being about 13,500 feet in the northern zone and 10,000 in the southern. Between the 82d and 90th meridians the northern zone is known only from the maps of the lamas’ survey, which indicate a sur- face slightly corrugated with hills and containing numerous lakes, some of great size, but no rivers of importance.

The river basins in this zone apparently commence to the east of the 90th meridian and from them issue the Di-chu! (Chinese Kin-sha-kiang), whose headwaters unite at Dichu Rab-dun, in 94° 30’ E. long.; the Chiamdo river or Lan-tsan-kiang; the Hoang-ho, in about 96°, which flows through the Kiaring and Orin lakes (18,500 feet above the sea and each exceeding 80 miles in circum- ference) and passes northwards out of Tibet through the Kuen-Lun ; and the Ja-chu or Yalung-kiang, also in about 90° E. long., which flows southwards through eastern Tibet. In the middle zone a system of lakes on the 90th meridian gives birth to the Nag-chu, which becomes the Sok-chu and lower down the Giama-Nu-chu— known to the Chinese as the Lu-tse-kiang—and, trending southwards, winds round the eastern extremity of the Himalayas. In the lower zone the Indus and the Yaro-tsanpo rise on either side of the 82d meridian and flow in opposite direc- tions parallel to the Himalayas, and then, passing through openings in those

mountains twenty degrees apart in longi- tude, enter India on the extreme east and west. The Lohit Brahmaputra rises behind the eastern Himalayas and flows

1 Tibetans call rivers either ¢ésanpo=river or chu =water, the former being chiefly employed in southern Tibet, as ‘for the great Yaro-tsanpo (Upper river) and its principal tributaries. Lakes are called cho or tso. A mountain pass is called /é.

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south-westwards into India. The Giama-Nu-chu, Chiam- do-chu, and Di-chu flow southwards into Burma and Yun- nan, through closely contiguous valleys between a system of meridional ranges which project as spurs from the Tibetan plateau. West of 82° a single water-parting between north and south—that of the Mus-tagh and Karakoram, some- times called the Turkic —separates Indo-Tibetan from Turko-Tibetan waters; east of that meridian there are longitudinal water-partings between the basins of the several rivers already mentioned.

The Himalayan Mountains, which constitute so consider- Himala-

able a portion of the southern scarp of Tibet, consist of a yan re-

succession of longitudinal chains, running in general paral-“

lel to each other along the glacis of the plateau. These chains are much higher on their southern than on their northern faces, and are connected in some parts by trans- verse ridges, but in other parts are broken and interrupted by fissures and valleys. The principal chain is the one of high peaks covered with perpetual snow which culminates in Mont Everest, 29,000 feet above the sea. This chain may be regarded as the geographical boundary between Tibet and India. In some parts it is the water-parting ; but at the several points where its continuity is broken the water-parting recedes to an inner chain on the plateau, and basins are formed between the two chains, the waters of which descend in rivers to the plains of India. The

plateau isa region of plains and wide open valleys of little depth; the scarp is a region of mountains and narrow confined valleys of great depth. The narrow valleys of the scarp, being lower, are warmer and more favourably adapted for cultivation than the broad valleys of the plateau.

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Higher than these last are the plains of the Chang-tang, Chang- which are, for the most part, too high and cold for any tang

but pastoral uses. All such tracts the inhabitants call il

chdng-téng, though the word strictly signifies “the Northern Plain”; and all tracts which contain valleys warm enough for cultivation they call rong (signifying a ravine or narrow valley or cleft in a hill), but more par- ticularly the lower and warmer valleys which produce crops twice in the year; the word is also commonly em- ployed to indicate a warm country. The alluvial beds in the valleys are composed of the débris of the surrounding rocks, laid out in horizontal deposits, which in course of time have become furrowed into gigantic ravines with a succession of narrow terraces in steps on each flank. It is on the existing lower alluvial beds and the remnants of higher beds that cultivation is carried on, in plots which are usually well watered and very fertile. The sharp needle-peaks, which are highest of all and bare of soil, but covered with perpetual snow, are met with most frequently in tracts of rong, and the rounded hills coated with grass to altitudes sometimes exceeding 16,000 feet in tracts of chang-tang. The forest-clad mountain slopes which are occasionally met with occur chiefly in the rong. The general direction of the hill and mountain chains is cast and west, but north-west and south-east in western Tibet, north-east and south-west in the province of U, and north and south in eastern Tibet. The peaks rise in many parts to between 20,000 and 25,000 feet—in the Mus-tagh range to 28,250—above the sea-level, but rarely to more than 10,000, and often to not more than a few hundred, feet above the general level of the plateaus from which they spring. The principal water-partings in some dis- tricts follow the crests of low ridges and gentle undulations which are of barely appreciable elevation above the surface of the ground.

Nari, the western province of Bodland, is divided into Nari.

the sub-provinces of Ladak and Balti on the west, between 75° and 79° E. long., now a part of Kashmir; Khorsum,

g.

Khor- sum.

Mang- yul or Dokthol.

U-tsang.

The

Yaro- tsanpo.

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between 79° and 82°, conterminous with the Himalayan provinces of British India; and Mang-yul or Dokthol, between 82° and 87°, conterminous with western Nepal. The last two are under the government of Lhasa. Western Nari is bounded on the south by that portion of the Himalayan chain of snow-peaks which stretches in almost a direct line north-west from the Manasarowar Lake region to the Nanga Parbat peak (26,620 feet), at first facing the plains of the Punjab, then passing north of Kashmir. The provinces appertaining to Kashmir have already been described in the article LADAK AND BALti (q.v.). The Karakoram chain, although its principal pass is 18,500 feet above sea-level, nowhere rises very high above the tableland. It constitutes a portion of the water-parting between India and Turkestan, separating the Lingzi-tang plateau, the highest in all Tibet, from the broad and open valley of Chang-chenmo; it has been traced eastwards to the meridian of 82°, but no farther. Khorsum is mainly chéng-tang, but has some upland cultivation round the capital, Rudok, and in the Gartang valley, and lowland cultivation in the rong of the great plateau (120 miles long by 15 to 60 broad) of Guge or Hundes, the upper basin of the Sutlej. In this province lie, within the small area of a square degree, the sources of four great rivers—the Indus, the Yaro-tsanpo, the Sutlej, and the Karnali—the sacred lakes of Manasarowar and Rakas Tal, 15,300 feet above the sea and each 50 miles in circumference, and two

famous mountains, Nimo Namling (25,360 feet) to the south, believed by the Tibetans to be their highest mountain, and to the north the sacred Kailas Gangri (21,830 feet), the Kantysee of the lamas' survey. From the Kailas Gangri a chain of hills stretches to the north-west, separating the upper basins of the Sutlej and the Indus; to the north of that another chain, running east and west, culminates in the Aling Gangri peaks (24,000 feet) and separates the Indus basin from the Pangong Lake (100 miles long, from 3 to 7 broad, and 14,000 feet in altitude), near which Rudok is situated. Roads pass from Ladak to Lhasa through the plains of Rawang and Sarthol, the gold-fields of Thok Jalung and Thok Daurakpa, and the Hor country. Mang-yul, or Dokthol, contains the upper basins of the Yaro-tsanpo—here known as the Nari-chu—and its prin- cipal affluents, the Cha-chu and the Charta-tsanpo. The province is wholly Chang-tang and its population nomadic, the capital, Sarka Jong, being merely a good-sized village. The common border of the provinces of Nari and Tsang falls nearly on the 87th meridian. Here the Chang-tang recedes from the Himalayas, and its southern scarp, trend-ing north-east, forms the upper fringe of tracts appertain- ing to U-tsang that are capable of producing a single crop annually. This region constitutes the most important portion of the basin of the Yaro-tsanpo, for it contains the chief towns and monasteries of the settled Bod-pas. Cultivation commences on a slight scale where the river enters Tsang on the west. The first town of any import- ance is Junglache (13,600 feet), on the right bank, with a large monastery. Thence goods may be taken down the river for some distance by boats of leather over a wooden framework, light enough to be carried back overland. Kighty-five miles lower down, also on the right bank, are the city of Shigatze or Digarchi (12,000 feet) and the great monastery of Tashilunpo (Teshu-Lumbo), the resi- dence of the "'tashi lama," one of two spiritual incarnations of equal rank, of which the other, the "dalai lama," resides at Lhasa; the monastery contains 3500 lamas. Between Junglache and Shigatze the river receives the Raka-tsanpo from the chang-tang on its left, and the Sakya-Jong-chu from that on its right. The latter descends from the Himalayan water-parting past the monastery of SdAkya

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(13,900 feet), which is surrounded by cultivation and governed by a chief lama called the “sakya-gangma,” who is held in considerable reverence as an avatar. At Shigatze the Yaro-tsanpo receives the Pena-Nyang-chu from a valley to the south-east which contains the towns of Pena-jong and Gyangtse-jong (13,000 feet), and numer- ous monasteries and villages, and through which passes the main road from Bhutan to Shigatze travelled by Bogle in 1774. A little lower down it receives from the left the Shiang-chu, which rises in the Ninchen-thangla range and flows past the town of Namling (12,200 feet, 200 houses), where sheep are employed as baggage animals, the country being too cold for donkeys and the roads too stony for yaks. Then at Shangpa (Jagsa) it receives from the right the Rong-chu from the famous Yamdok-tso or Scorpion Lake to the south-east. This lake is 120 miles in circumference, 13,800 feet above the sea, and is sur- rounded by villages and monasteries; its scorpion claws embrace a peninsula which rises above 16,000 feet, is grass- grown to its summit, and embosoms the Damo-tso, a sacred lake, 24 miles round and 500 feet above the main lake, which is expected some day to rise and destroy all animal life by a flood. Here the roads from India via Bhutan and from Shigatze to Lhasa converge, and after crossing the Khamba-la (15,000 feet) strike the Yaro-tsanpo at Chiak-jam-chori (= “‘the iron bridge at the rocky bank”). The river in its course from Shangpa down to this point is unnavigable, passing over rapids between precipitous hills ; there is no road on either bank. A little below the bridge it receives from the left the Ki-chu, the river of LuAsa (q.v.), the chief city of Bodland. Below the .junc- tion of the Ki-chu the Yaro-tsanpo continues its eastward course through a broad and well-peopled valley. It is crossed at Chetang by a ferry on the road from Lhasa to Tawang in Bhutan wa the Yarlung-chu valley (right bank), which is said to be the pleasantest and most populous in Tibet ; fruits grow in profusion at its lower extremity and the hills are forest-clad. At Chetang the river is 350 yards broad, 20 feet deep, and 11,000 feet above the sea, and has a sluggish current. On crossing the meridian of 92° 30’ E. it passes out of the province of U into that of Kham and enters its eastern basin. After traversing the Kongbo (Khombo) district, it trends north-east for 100 miles—in general parallel with the contiguous Kongbo ranges and the distant Ninchen-thangla—and on reaching 94° turns abruptly to the south. Its course has been ex- plored 20 miles below the bend, to Gya-la-Sindong (8000 feet), but no farther. The basin is bounded on the north and east by the continuous plateaus of

Lharugo, Arig, Pemba and Lhojong, Pashu, Dainsi, and Nagong, and on the south by the inner Himalayan water-parting. Numer- ous tributaries join the river from both sides, but little is known of them. Those from Kongbo, Lharugo, and Arig are said to unite and join it a little above Gya-la-Sindong, and one from Nagong a little below. This last rises near the Ata-Gang-l4, a pass over the Himalayas between the Nagong plateau and the Zayul district, and is said to be on the direct road from Lhasa to Zayul wa Gya-la-Sin- dong ; it is probably joined by the Kenpu river of the lamas' survey, which rises in the southern scarp of the Pemba-Lhojong plateau and probably flows through the Potod and Pomed districts of Kham. The independent Lhoyul country lies to the south of the Nagong-chu (lit. "black water"). The region is generally of a compara- tively low elevation, is said to have much more of rong than of chdng-tang, and probably contains much more forest and luxuriant vegetation than any other part of Tibet north of the Himalayas.

Eastern basin of Yaro- tsanpo.

Lower

The lower course of the Yaro-tsanpo has long been a matter of Yaro-controversy between English and French geographers: the former tsanpo.

South Tibetan basins.

The Giama- Nu-chu.

Eastern plateaus,

have maintained, in accordance with information from natives of Tibet and Assam, that it enters the Assam valley and is the princi- pal source of the Brahmaputra river, of which the Lohit Brahma- putra river is the eastern source; the latter have maintained, on the authority of Chinese geographers, that it flows into Burma and is the principal source of the Irawadi river. But now its eastern basin has been explored, and the Lohit Brahmaputra has been found to have its sources in a range bordering the Giama-Nu-chu ; the

Yaro-tsanpo must therefore necessarily pass into Assam, and measurements of the discharges of the principal rivers entering Assam from the north conclusively identify it with the Dihong. That river, which receives the Lohit Brahmaputra a little below Sadiya (450 feet above the sea), has been explored upwards into the Himalayas to a point within 100 miles of Gya-la-Sindong ; but as yet nothing is known of the connecting channel, except that it must havea fall of about 7000 feet, or as much as the entire fall of the Yaro-tsanpo in its upper course of 900 miles.

The Tibetan basins to the south of the Yaro-tsanpo which are included between the Himalayan chains of water-parting and of high snow-peaks are the Bheri, the Kali Gandak, and the Buria Gandak, subject to Nepal; then the follow- ing, which are subject to Lhasa :—(1) the Tirsuli Gandak, on the direct road from Kathmandu to Dokthol via Kirong (9700 feet); (2) the Bhotia Kosi, through which the road from Kathmandu to Shigatze passes via Nilam Jong or Kuti (13,900 feet) into (3) the Arun-Barun basin, 120 miles by 30, which embraces the Dingri Maidan and Shikar Jong plateaus and the great Chomto Dong Lake (14,700 feet); this same road, after passing Sikkim and western Bhutan, where the chain of high snow-peaks, including Kanchinjinga (27,815 feet), is the water-parting, traverses (4) the Lhobra, (5) the Cha-yul, and (6) the Mon-yul basins, which are also crossed by the road between Chetang and Tawang. East of the 93d meridian the height of the peaks of the outer Himalayan chain falls to about 15,000 feet ; the inner line of water-parting recedes northwards, and with it the boundary of Lhasa rule. The included basins are occupied by independent semi-savage tribes,— Miris, Abors, Mishmis, &e.; but about the 97th meridian Lhasa rule again asserts itself, The mountains again rise to a great height in the Nechin-Gangra range, the eastern- most Himalaya, which terminates about the 98th meridian in spurs thrown off to the north and south, parting the waters of the Lohit Brahmaputra and the Giama-Nu-chu. The southern spur bends westwards in horse-shoe fashion round the Zayul basin, and then merges into the range which separates upper Assam and eastern Bengal from Burma. Lhasa rule extends over Zayul, and for a short distance down the valley of the Giama-Nu-chu, embracing some tracts which lie outside the geographical limits of Tibet, as lower Zayul, where the elevation falls below 4000 feet and the climate is so warm that criminals are sent there from Lhasa as a punishment.

The Giama-Nu-chu is called by the Chinese the Lu-kiang or Lu- tse-kiang. Its course is known down to about 27° 30’N. lat., a few marches below Bonga, on the left bank, where the Abbé Desgodins established a mission station temporarily ; but nothing certain is known of its lower course. It is generally believed to be identical with the Salwin river, which the Chinese also call the Lu-kiang ; but the similarity of name is not conclusive of identity, for the Lu country covers a large area, and its name may be given to a second river rising among the Ly-su and Lu-tse tribes to the south. Nothing certain is known of the Salwin above 25° N. lat.; where it is crossed on the road from Tali-fu to Bamo, it is almost certainly of too small a volume to have its sources farther off than, say, 250 miles in the southern Tibetan scarp, and not far away in the heart of Tibet. There is a considerable probability that the Giama-Nu- chu is the source of the Irawadi, and thus that Chinese geographers have been right in assigning a Tibetan origin to that river, though wrong in identifying it with the Yaro-tsanpo.

The Dayul plateau, with the lofty mountains of Kokarpo to the north near Dayul (11,450 feet) and Dokela to the south near Bonga, lies between the Giama Nu-chu and the Chiamdo or Lan-tsan-kiang ; the latter river is believed to become the Mekong of Cambodia. The Ou-kio river of the Abbé Desgodins rises in an important valley between

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joins the former above Bonga.

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the Giama-Nu and Chiamdo rivers and, flowing past Dayul, Next comes the Makham plateau, between the Chiamdo and the Di-chu, of which the chief town (11,900 feet) is called Gartok by Tibetans and Kiangka by Chinese. East of the Di-chu or Kin-sha- kiang lie the plateaus of Batang, Litang, and Darchendo, which, though geographically and ethnologically Tibetan, are directly under China. The last two are separated by the Ja-chu, which is known as the Yalung in its southerly course to join the Kin-sha; the united streams flow east- wards through China as the Yang-tse-kiang or Blue river.

The western Hor country lies to the north, on the direct Western route between Ladak and Lhasa ; it isa region of extensive Hor grassy plains and numerous lakes, some of great size, and peu occasional hill ranges, which, though often snow-covered, are of no great elevation above the tableland. It is in- habited by nomads—Chang-pas of local origin and Kham- pas from the east—and occasional communities of gold- diggers and of traders in salt and borax, which are plenti- fully found on the margins of the lakes. Thok Daurakpa (15,300 feet), the centre of a large gold-field, is the chief settlement. Within a remarkable basin, surrounded by high hills and enclosing the great Dangra-Yum Lake and a cluster of small but well-built villages, Ombo, are lands which produce a profusion of barley at an altitude of 15,200 feet,—a unique instance of cultivation at so great a height, no other cultivation occurring within 300 miles on either side. The Tengri-nur or Nam-cho, 150 miles in circumference and 15,350 feet above the sea, lies to the north-west of Lhasa; and beyond it there is said to be a still larger lake, the Chargut-cho, and numerous smaller lakes, to one or more of which the sources of the Giama- Nu-chu may perhaps be traced, though as a rule the lakes in this region have no outlet. The Ninchen-thangla range lies between the Tengri-nur and Lhasa ; it is considered by some writers to rival the Himalayas, but is probably not more than 300 miles long nor anywhere higher than 24,000 feet above the sea.

The Chang-tang attains its greatest width (over 500 The

miles) on the meridian of 85°; north of Lhasa it contracts Chang- to 400 miles, and is probably narrowest (140 miles) on the” meridian of 97°. It is covered to a very considerable ex- tent, probably everywhere below 16,000 feet, with a succu- lent grass, which forms from May to August the softest of green carpets and furnishes an abundance of green pasture. Willow and tamarisk are occasionally met with on the margins of the lakes; but as a rule there is little wood or scrub of any kind, and cultivation only in very excep- tional localities, such as Ombo. Myriads of wild animals —chiefly the yak and the antelope, but also the ass and the camel—roam over the entire region, but mostly con- gregate in the uninhabited northern portion ; their argols furnish a plentiful supply of fuel, without which it would be impossible for travellers to cross the country, as there are stretches of hundreds of miles in which no other fuel is procurable. As the Chang-tang

narrows to the east, its surface becomes corrugated with chains of low hills. Here too there is more marsh land than on the west: the Odontala plateau at the sources of the Hoang-ho river is described by Prejevalsky as one vast bog in summer, during the prevalence of the south-west monsoon from the Indian Ocean. The openings between the meridional hill ranges to the south permit the rain clouds to pass up to much higher latitudes before discharging their moisture than on the west, where they are faced by the great longi- tudinal ranges of the Himalayas.

The Kuen-Lun has been identified, geologically, by The Stoliezka, as far west as the Victoria Lake on the great Kuen- Pamir, in 74° E. long. ; it has been surveyed between 77° ee and 82°, where it rises to more than 22,000 feet, and ;

towers above the plains of eastern Turkestan. To the east it is known for some distance as the Toguz-Davan (Eleven Passes) range; Prejevalsky observed a prominent peak (Jingri, 20,000 feet) on the 90th meridian, east of which successive portions are known as the Angirtakshia, Shuga, Namohon, Burkhan Budha, and Dzun-mo-Lun ranges. The rivers flowing north through openings in the Kuen-Lun are generally small, with the exception of the Hoang-ho. East of the 85th meridian the Kuen-Lun constitutes the chord of an are formed by the Altin Tagh, Nan-shan, and Koko- nur ranges, which project northwards and border the plains of the Lob-nur region and the Chinese province of Kan- suh ; several hill ranges and some great plateaus—notably those of Chaidam or Tsaidam—are comprised between the arc and the chord, and the region generally is closely allied to Tibet in its physical aspects. Occasional peaks rise to considerable altitudes and are covered with perpetual snow ; the plateaus form a succession of steps ascending from the plains of Gobi to the Tibetan plateau. Commer- Darehiendo, called Ta-chien-lu by the Chinese, on the extreme cial road eastern boundary of Tibet, is the principal emporium of the trade from between that country and China. Thence two important roads west to lead to Lhasa, one called the Jung-lam or “official road (935 east. miles long), the other the Chang-lam or “northern road” (890 miles), The former, which is the more direct, is the post road and that by which officials

travel between Lhasa and Peking ; but it crosses much rugged and difficult country. The other is preferred by traders, as being less difficult and less harassed by officials, and mostly passing over plains with an abundance of pasture for their baggage animals. The former has long been known from the pub- lished travels of Huc and Gabet and the embassies from Nepal to China, and its eastern section, from Batang to Darchiendo, has been traversed by several Europeans of late years. The latter lies in regions in eastern Tibet into which no European has yet penetrated, but which were recently crossed by Pandit Krishna from north to south ; they belong to the province of Kham, which appears to be split up into a number of districts, each governed by its own gyalpo or chieftain, who in some instances is subject to Lhasa, in others to China, but not unfrequently is independent of both. Darchiendo itself lies in the Minia (Miniak) district, from which the Chang- lam passes through a suceession of petty districts, Tau, Dango, Dau, and Rongbacha or Horko, skirting Niarong (Gyarung?). The inhabitants of this last are said to have conquered the neighbouring distriets and to have even braved the Chinese, but at last to have been won over to Lhasa by bribery. Rongbacha lies in the valley of the Ja-chu and contains the large town and monastery of Kanzego (2500 houses, 2000 lamas; 10,200 feet above the sea). Beyond it lies, in the valley of the Di-chu, the district of Dar-ge (De-gue), said to be one of the richest and most populous in all Tibet, con- taining towns in which the best jewellery, saddlery, guns, and swords are manufactured. The Chang-lam passes through Dar-ge up to Kegudo (11,800 feet), where it meets roads over the Chang- tang from Chaidam on the north and the Koko-nur district in the north-east. Very little is known of the country between the Chang- lam and the frontiers of China ; it is called Sifan or “the country of the western barbarians” by the Chinese ; to the north are the districts of Chiamogolok and Banakhasum, inhabited by marauding tribes, and lower down are tle Amdo and Thochu districts, on the borders of tracts oeeupied by the Manchu tribes of Sze-chuen (China). From Kegudo the Chang-lam trends westwards over the eastern Hor country, all chang-tang, for 300 miles. The route has not yet been explored, but probably passes through the pasture- lands of the Sok-pas ; on reaching Lake Chomora it turns south- wards, then passes the monastery of Shiabden (14,980 feet), a notable resting-place for caravans, crosses the lower scarp of the Chang-tang by the Lani pass (15,750 feet), and finally descends into the Lhasa plateau. Official The Jung-lim or official road from Darchiendo

passes through road, Litang (18,400 feet; 2500 houses) and Batang (8150 feet; 2000 from east houses) to Gartok or Kiangka, crossing en route the Yalung and to west. Kin-sha rivers ; thence it proceeds up the valley of the Chiamdo- ehu or Lan-tsan-kiang, and has been traversed by the Abbé Desgodins via Dayag (his Tchraya) to Chiamdo (his Tchamouto). He says, “To get an idea of the configuration of the ground let any one take a sheet of parchment, crumple it in his hands into many creases, and then spread it out on a table, and he will obtain a map in relief, furrowed with depressions and steep slopes and presenting very little flat surface.” Chiamdo is the chief town of the province of Kham, and, being considered a point of great strategie importanee, is strongly garrisoned ; it has a large monas- tery, containing 3000 lamas. It is situated at the junction of two rivers, which are frozen in winter ; but in summer the valleys are

highly cultivated. Thence the Jung-lam proceeds south-west to the bridge of Shang-ye-Jam (Kia-yu-kiao) over the Giama-Nu-ehu —here ealled the Sok river—and then ascends to Lhojong (18,140 feet)—the Lourondson of the lamas’ survey—where it is joined by the road from Gartok via Zayul and Nagong. It then trends westwards over the plateaus already mentioned as bordering the eastern basin of the Yaro-tsanpo, passes occasional small villages, monasteries, and lakes, erosses two lofty passes—the Nub-Gang-la (17,940 feet) and the Tola-la (17,350 feet)—descends to the little town of Giamda (10,900 feet) in Kongbo, and, passing out of Kham into U, enters the Lhasa plateau. From the capital it is eontinued over a distance of about 900 miles to the western limits of Khorsum, crossing the Yaro-tsanpo at the Chiak-jam-chori bridge and recross- ing at Junglache, midway passing through Shigatze ; it then tra- verses a great breadth of chang-tang and crosses the meridional water-parting at the Muriam-la (15,500 feet). There are twenty- five staging places called tarjwms, from 20 to 70 miles apart, be- tween Lhasa and Rudok, with accommodation—sometimes houses, but more generally tents—for about 200 men; they are under the charge of a jalno, who is bound to provide yaks and other beasts of burden and horses for carrying the mails, impressing them from the nomads encamped near the tarjums. The road is generally well defined : loose stones are cleared away in the narrow defiles, and piles of stones, surmounted by flags on sticks, are erected at places = the open stretches of tableland where the track is liable to be ost.

The climate of Tibet differs greatly in different parts and at Climate.

different seasons of the year. In western Tibet the frost is perma- nent from October to April, and the lakes and rivers down to 8000 feet are frozen every winter ; at 15,000 feet the thermometer falls below the freezing-point every night ; and at 20,000 feet there is probably perpetual frost in the shade. The mean monthly tempera- tures and ranges of temperature, embracing from six to ten years' observations at the meteorological observatory at Leh (in 34° 10' N. lat., height 11,540 feet), are as follows in degrees Fahrenheit :—

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Month. Range.

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31°°2 || Oct. | 41°°3 | 80°°5 81°°3 || Noy.| 82°°2 | 26°°7 31°4 || Dec. | 24°°8 | 25°-2

61°“1 59°°6 52°*8

April May March | 32°°0 | 28°°0 || June

42°°0 | 31°°0 | July 48°°6 | 30°°1 || Aug. 56°°4 | 31°°8 ||Sept.

At Lhasa (in 29° 39’ N. lat., height 11,800 feet) the mean tem- peratures observed by the pandits were 36° in February and March and 61° in June and July. Southern Tibet is described as being delightful in summer,—the land covered with vegetation, streams flowing in every valley, and all nature bright, + peers and fresh. But in winter snow and frost reign supreme ; all vegetation is dried up ; the lakes and rivers are frozen ; the roads and footpaths are paved with ice; and cold cutting winds sweep across the surface of the land. In northern Tibet Prejevalsky found ‘‘a terrible climate” in summer at 14,000 feet: in the second half of May wintry snowstorms were not unfrequent and the frost by night reached — 9° Fahr. ; and in June and July there were frosts (28° Fahr.) every clear night. In the winter the cold is intense ; Huc and Gabet, crossing the Di-chu river in 1846, found a great herd of yaks entombed in ice, the river having frozen whilst they were swimming across. cE We)

InDusTRY, TRADE, AND GOVERNMENT.

The industrial arts are at a somewhat low ebb, though in metal- Industry.

founding the natives display a certain amount of ability and taste. Their statues and small bells are, however, only copies of Indian models. They use the iron from their mines, which is very good, for making excellent blades for sabres and other weapons. The are very fond of precious stones, but do not know how to wor them. Their chief industries are connected with

wool, the great and inexhaustible staple of the country. Weaving is generally the work of women. The cloth usually employed for summer garments is the Jwa-wa, which is dyed with madder or indigo, and sold in pieces eight or ten inches in width and about twelve yards in length. Another sort of cloth largely sold is the chro or p'rug, of a better quality of wool, finer and thicker, which is often manu- factured in DbUs (U), whence it is sometimes ealled DbUs p'rug ; it is generally dyed dark red. TZ'erma is a superior kind of thin woollen cloth, a flannel-like fabric, dyed dark red, of which there are two sorts,—le-t'er, made of shawl wool, and bal-t'er, of common wool. Sag-lad is for fine cloth made of fine shawl wool (Je-na) ; and snam-bu is a woollen cloth, very coarse and loosely woven, the common sort of which is not dyed.

Every Tibetan is more or less a trader. Officers for the super- Trade.

intendence of trade, called garpons, are appointed by the king, the ministers, and the great lamaserais. The import and export traffic is carried on by caravans, which, according to the route and its difficulty, employ yaks or sheep. The two great markets are

Govern- ment.

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Shigatze (or Digarchi) and Lhasa, where the caravans arrive in December and January from China and Mongolia, Kham and Sze-chuen, Bhutan, Sikkim, and Nepal, Kashmir and Ladak. Of the four principal trade routes the two which start from Darchiendo have been mentioned above (p. 342). The third route, 915 miles in length, starting from Si-ning in Kan-su (China), runs along the Koko-nur to Jun, thence to Di-chu Rab-dun, crosses the homa or lower Dangla, and proceeds via Giaro and Lake Choniora to Lhasa; this route, which is forbidden to the Chinese, is less frequented than the others because of the numerous bands of robbers infesting the country towards Si-ning. Much more im- portant is the route which comes from the west, with Leh as its starting point; it runs via Gartok, Lake Manasarowar, Muriam pass, Tadom, and Shigatze to Lhasa. Like the other caravans, the yearly one whieh follows this route stops several times on the way for local fairs; the districts passed through are compelled to fur- nish it with 300 yaks

for carrying goods and to provide food for the travellers. The centres for Tibetan trade on the borders are— for Mongolia and north China, Si-uing ; for Sze-chuen, Darchiendo ; and in Assam, Davangiri and Udalguri, where there is a great fair twice a year in connexion with the Tawang route. Darjiling is the central mart for the Chumbi valley trade, Patna for that passing through Nepal, and Leh and Kashmir in the west. From China come silks of all varieties (Buddhist prejudice not permitting the Tibetans to rear silk-worms and kill them), carpets, and hardware ; from Mongolia leather, saddlery, sheep, and horses; from Kham perfume ; from Sze-chuen brick tea (some six millions of pounds annually ; tea in leaf is not in use in Tibet); from Tawang, Bhutan, and Sikkim rice and tobacco ; from Nepal broadcloth, silk, indigo, coral, pearls, sugar, spices, and Indian manufactures ; from Ladak and Kashmir saffron and Indian commodities. Silver and gold are the most important articles of export ; then follow salt, wool, woollen manufactures, furs, drugs, and musk. By the Nepal and Ladak routes Tibet exports large quantities of yaks' tails, borax, gold, silver, and ponies. In 1882-83 the total exports to India amounted to £58,322 (Punjab £17,710, North-West Provinces and Oudh £40,612). The imports into Tibet reached £24,197 (£1530 from Punjab, £22,667 from North-West Provinces and Oudh). The principal exports were borax (£17,222), salt (£13,978), wool and woollen goods (£4936). The imports included grain (£13,587), eotton goods (£2875), and sugar (£2395). In 1883-84 the export of borax had increased by 12,329 maunds (about 458 tons), that of wool and woollen goods by 2244 maunds (82 tons), while the ex- ports of salt had decreased by 572 maunds (21 tons). The whole of the increase in borax is in the trade with Kumaun, and in weight it is almost double the increase in the export of rice from that district, for which it is bartered in Tibet, the usual rate of exchange being two of borax to one of rice. The total excess of the value of exports over imports amounted to nearly two lakhs of rupees. In 1885-86 the value of the wool and woollen stuffs exported rose from £4800 to £8800. These figures, however, convey no adequate idea of the British trade with Tibet, asa large quantity of goods passes through Nepal. Russian woollen cloths, coarse and loose, of scarlet, green, blue, and violet colour, as well as hearthrugs, thiekly woven and of a flowered pattern, come through Yarkand and are conveyed all over the country.

Since 1720 Tibet has been a dependency of China, and as such is under the Chinese viceroy of Sze-chuen. Chinese authority is re- presented by two imperial delegates, one of whom is the assistant of the other. Thcy direct exclusively the foreign and military ad- ministration of the eountry, leaving the civil and religious govern- ment in the hands of the Tibetans. They are appointed for terms of three years. Subordinate to these are two daluhi or great offieers and two paymasters, residing, one of each grade, at Lhasa and at Bzhikartse (Shigatze or Digarchi), Next in rank are three eommanders, residing at Lhasa, Digarchi, and Dingri near the Nepal frontier. Below these are three tingpuns, non-commis- sioned offieers, who complete the staff of military Chinese officers in the country. The usual number of Chinese troops, all Manchu- Tatars, in Tibet does not exceed 4500 men (2000 at Lhasa, 1000 at Digarchi, 1000 at Giangchi, 500 at Dingri). In matters of civil government the supreme authority belongs to the dalai lama, the rgyal-ba rin-po-cé, residing in the famous temple-palace of Potala (see Lirasa, vol. xiv. p. 500). But he is consulted only in cases of emergeney, when his decision is never questioned. His powers are transmitted to a special offieer for life, nominated by the Chinese Government, who is known by several titles, such as de-srt or the Mongol nomokhan, ‘‘king of the law”; he is the rgyal-po or ‘‘king”’ as well as the prime minister of the dalai lama, and the regent when the latter is a minor. He is selected from among the four head lamas of the Chomoling, Konduling, Tangialing, and Chajoling divisions near Lhasa, so-called from their chief monas-

1 This is still in a disturbed state, the pass being closed by the Tibetans in consequence (1) of the important preparations made in 1886 for a commercial mission to Lhasa by Mr. Macaulay and (2) of the pressure of the Nepalese Government on that of Tibet in a recent treaty, in order that the whole trade should pass through Nepal.

teries or dgonpa (vulg. gomba). Each of the four must be, like the dalai lama, an avatar, 7.c., when removed by death he must reappear in the flesh as a child, and be raised to that position. Of equal rank with the nomokhan is the deba lama of dGa-ldan, the great monastery near Lhasa; he, however,

is not an avatarian lama: his appointment has to be confirmed by the Chinese em- peror. Next to him is the lama gurw or chaplain of the dalai lama, the director of his conscience; he may be an avatar, but his nomination is also in the hands of the Chinese emperor, and this furnishes an interesting clue to the extent of the imperial power over the church of Tibet. The nomokhan rules with the help of five ministers: four of these—laymen—are for the financial, judieial, revenue, and home departments, and a fifth, a lama, for ecclesias- tical affairs. The four provinces of Mngari-Khorsum, DbUs, gTsang (Tsang), and Khams (Kham) are ruled each by a bka-blon or governor, with a proper staff of minor officers, under the authority of the nomokhan. Besides these there are several minor kings or tgyal-pos outside of the four provinces ; but within these provinees there are four principalities which are under the direct government of the Chinese imperial delegates. These are (1) Dayag or Chraya and (2) Kiamdo or Chiamdo, both on the east ; (3) bKra-8is-lhun-po or Tashilunpo, where resides the pan-ten rin-po-té lama, who yields to none but the dalai lama in religious importance, and, though an avatar, requires also the confirmation of the Chinese emperor to his election'; (4) Sakya-Kongma, south-west of the preceding. There is also a Chinese officer (y-tstn) in residence at Lhasa who supcrin- tends several minor principalities scattered over the country. Every five years Lhasa, Chiamdo, and Tashilunpo send envoys with presents to the emperor. In the east of the country is the princi- pality of Darge or Degue, in the upper course of the Yalung-kiang, ruled by a king who recognizes the suzerainty of China, and at the same time since 1863 has managed to keep on good terms with the king of Lhasa, to whom he has promised submission. On the lower course of the same river are the Chentui or Gyarung tribes, who from the conquest of Tibet were subject to China, but since 1864 have been transferred by the Chinese Government to the rule of the king of Lhasa, who is now represented among them by a Tibetan resident. South of the Chentui is the principality of Dar-rtse-mdo or Darchiendo, the Ta-chien-lu (Tatsienlu) of the Chinese, the rGyala of the Tibetans, where the government, under the supervision of Chinese officers, is entrusted to a native king, ealled Ming-chang-se by the Chinese and rGyala rgyal-bo or king of rGyala by the Tibetans.

ETHNOLOGY.

The Tibetans, in a legend of the Tandjur, pretend to be the de- Inhabit-
scendants of an ape, sent to the snowy kingdom (7.e. Tibet) by ants.

Chenresig (Spyan-ras-gzigs=Avalokitéshvara), and of a Tibetan srinmo (a female demon or rakshasi). They had six children, whom, as soon as they were weaned, they abandoned ‘in a forest of fruit trees. Coming back after a few years, the father found to his great surprise that their number had increased to 500. But, as they were starving, he had recourse to his patron Chenresig, who deelared that he would be the guardian of the race. So he went to Mount Tise (or Kaila the Su-Meru), and threw down a great quantity of the five kinds of grain, with which the famished apes long fed themselves. As the consequence of eating this grain the monkeys’ tails and the hair on their bodies grew shorter and shorter, until they finally dis-appeared. The monkeys began to speak and became men, and clothed themselves with leaves. The interest of this legend, when stripped of its Buddhistic adornments, lies in the fact that belief in a monkey ancestor seems to have been common to various branches of the race. The Tang-chang and Peh-lang tribes boasted also of being descended from a monkey ; they were the two great divisions of the Tang-hiang or Tangut, offsets of the same Sien-pi stock as that of the conquerors of Tibet under Fanni Tubat (see note, p. 338 above). The inhabitants of Tibet belong to the Mongoloid races. Besides the Tibetans so called, occupying the greater part of the country, especially in the south from west to east, there are Turkic tribes called Hor in the north-west, Mongol tribes called Sog (Sok) in the north-east, and several ill-defined tribes on the borders of China, who differ from the others. The Tibetan race is not thoroughly homogeneous, as may be seen from the various accounts of travellers. On the west they are described as being short, with an average stature of 5 feet 2 inches, according to the measurements of General Alexander Cunningham ; in central Tibet and the east they are of middle stature, rather tall than short,—a difference resulting ap- parently from their intermingling with the surrounding races. As general characteristics, they are strong, slender in limb, with black eyes slightly oblique, large mouth, brown hair, no beard, a elear ruddy brownish complexion with an intelligent expression. They are a people of good natural gifts, mild in temper, true to their word, kind and simple, fond of music, dancing, and singing, but thoroughly imbued with superstition and lacking enterprise. Ex- ception is made of the people of the eastern borders,

who are described as being cheats and cowards. The most highly gifted are the inhabitants of Amdo, the region beyond Kham, having

Koko-nur on thé north and China on the east. Taller than the Tibetans of the west, they are famed for their quick intelligence and open disposition ; a large proportion of the readers and chief lamas of the great schools and the higher officials belong to this race. The nomad tribes of the north-east are known by the Chinese common appellative of Sifan (‘‘western aliens”). They include Mongol, Tibetan, and other tribes. In the east, near the borders of China, are the numerous tribes called Gyarung or Chentui ; their language has been studied by Hodgson, who has pointed out its remarkable similarity of structure to that of the Tagals in the Philippines. To the south of these are the Laka or Lolo (mainly in Sze-chuen), Liso, and Moso; the last-named have advanced to some extent into Indo-China. The Laka or Lolo are remarkable for their European white features. Their language, along with that of the Liso and Moso, &c., forms a group cognate to the Burmese. Not so far east are the Lutze or Kunung, Mclam, Arru, Pagny or Djion, Telu, and Remepu, all speaking a dialect of Tibetan, mixed with foreign words, for which the name of Melam is appropriate. Savages are found, says the pandit explorer A—K, in some of the valleys of the range north of Saithang (#.¢., the Altin-tagh north of the Syrten plain). They have a thick and dark skin, are well built and apparently well fed. They are clad in skins, and live in caves and dens or under the shelter of overhanging rocks. Being ignorant of the use of arms in the chase, they lie in wait for their prey near springs of water or salt flats. They are remarkable for their fleetness of foot ; even a horseman finds difficulty in over- taking them. Whenever they see a civilized man they run off in great alarm. They are said to know how to kindle a fire by means of a flint; and they flay the animals they kill with sharp-edged stones. This is not the only survival of the Stone Age, for in the case of some religious rites the lamas are shaved with a ‘‘lightning stone.” The country is thinly peopled and large tracts in the upper plateaus and Mngari-Khorsum are quite uninhabited. In the province of Kham the population is very irregularly distributed, and the

nomad character of the tribes occupying a great part of the upper country makes any estimate doubtful. The central provinces of DbUs and gTsang are the most densely peopled, and A—K puts the population of Lhasa at 25,197 (7540 being lamas). The totals lately given by Chinese authorities (4,000,000) and by the Russian staff-officers (6,000,000) are probably nearer the truth than the 11,000,000 and 33,000,000 of former authorities. The Tibetans are a very social people, and all possible circumstances, especially marriages and births, are made occasions for feasting and enjoyment. The burial customs are peculiar. First the hair is plucked out from the top of the head, in order to facilitate transmigration. The corpse is not disposed of everywhere or always in the same way (lack of fuel sometimes preventing cremation), and the lamas decide whether it is to be put away by interment, by throwing into the river, by burning, or by exposure to beasts and birds of prey. The last-named mode (regarded as very honourable) has almost dis- appeared in the west, but is still practised in the central and eastern provinces ; the body is cut in pieces and the bones broken into frag- ments by professional corpse butchers, and, when all the flesh has been devoured at the selected spot, called dur krod, to which the body had been previously carried, it is not unusual to throw the remaining fragments of the broken bones into the river ; sometimes the phalanges of the fingers are preserved to be used in bead-rolls. The lamas are generally inhumed in a sitting posture, the knees being brought up to the chin and corded together as tightly as possible. In the case of the gyalpos or kahlons the body is burned in a metal vessel, the ashes being afterwards carefully collected to be made into an image of the deceased. Polyandry has been practised from the earliest times, and has been carried by the spread of the race into more genial countries, such as Bhutan. The joint husbands are usually, but not always, brothers. The arrangement seems to work smoothly, and women enjoy general consideration, according to all travellers who have spoken of the subject. The wedding ceremony takes place at the house of the bride’s parents, after adequate presents have been offered by the elder brother, husband or bridegroom, and without the assistance of any priest. It consists chiefly in the engagement of the intending sponses and the placing of a piece of butter by the bride’s parent on the head of the bridegroom and by his parent on that of the bride. Unless otherwise stated by the mother in each case, the elder husband is the putative father of the children, and the others are uncles. Polyandry has resulted in the assignment to the wife of a

paramount position, which in the north-east and east of the country has grown among certain tribes into a real sovereignty, of which we hear from the beginnings of Chinese history, and which has left certain sur- vivals among the Lolo and Moso tribes of the present day as well as in the late Burmese court.

There are two religions in Tibet—Buddhism, in the shape of LaMAisM (g.v.), and an earlier creed, generally called the Bon religion, of which not muchisknown. The latter, a creed evolved from Shamanism, does not seem, from what is said in Buddhist books, to have received any regular form either in doctrine or other- wise until the introduction of Buddhism, which incited the Bonpo

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to seek in a better organization the means of holding their own. They borrowed much from the Buddhists, as the latter did from them,—many deities supposed to be Buddhist because of their Buddhist names being simply Bon gods. At the present day the two religions exist peaceably side by side, and the Bon creed has numerous adherents and rich convents in the central provinces of DbUs and gTsang, but few in the western and eastern provinces. The Bonpo are sometimes called the “ Sect of the Black,” as distin- guished from the “Red” or Old and “Yellow” or Reformed Lamaists, both appellations being derived from the colour of their garments, though Bonpo have been seen in red as well as in black. They are also called Grun-drin-pa (see below). The establishment of the Bonpa or Bon-éos, z.¢., the Bon religion, is attributed to Gsen-rabs, also called Bstan-pa GSen-rabs, ¢. ¢., GSen-rabs of the doctrine, the name under which he is worshipped in the temples of his sect, as, for instance, at Tsodam in east Tibet, not far from Bonga ; his statue, which occupies the central place, represents him as squatting, with his right arm outside his red scarf, and holding in his left the vase of knowledge. In a Bon sutra he is said to hold in his right hand the iron hook of mercy, with which he fishes people out of the ocean of transmigration, in his left hand the seal of equality, and to wear on his head the mitra jewel. His full name is Bon gsen- rabs-grun-drun.! Gsen-rabs-mi-po, or “(the) excellent human god,” another name of the same personage,

has been identified by some Tibetan authorities with Lao-tsze or Lao-kiun of China. This identification, however, rests only on the slender basis of an apparent affinity of sound between the sen of gen and a common Chinese appellative for the Taoists. The genuine resemblances between Bonpa and Taoism come from the fact that both reJigions have drawn from similar sources, from the native rude Shamanism which is much the same in both countries, from the tantric and esoteric doctrines of India, and from Buddhist ideas. The identity is sufficient to have deceived the uncritical mind of native scholars, and the matter has not yet been carefully examined by Europeans. The eighth book of the Grub-mthah-sel-kyi-mé-lon, in twelve books, by a Tibetan lama, Chkoikyi Nyima (1674-1740), which, with three others, has been lately translated by Sarat Chandra Das (in Jour. As. Soe. Beng. for 1881-1882), gives some information on the rise of the Bonpa in the region of Shang-shung, identified, not with the modern region of the same name in the north-west of Lhasa, but with Gugé or Ghughé and Knaor or Upper Besahr. Three stages are pointed out in the development of the Bonpa after the time of its mythical founder, who reckoned among his spiritual descendants sages of Persia, Leg-tang-mang (some names of Lao-kiun ?) of China, of Thomo, of Miniak (east Tibet), of Sumpar, and of Shang-shung. The first stage is that of the human and historical founder of the religion, a sage of the name of Shong-hon, who lived in the semi-historical time of Thi-de-tsanpo, the sixth king of Tibet (the first is said to have ruled about 415 B.c.). The second stage, dating from the 3d century B.c., is that at which Bon theories and doctrines began to exist, a beginning coincident with the arrival in the country of three Bon priests from Kashmir, Dusha, and Shang- shung. The recital down to this point gives evidence of the vague- ness of the traditions preserved by the Tibetans with reference to their own beginnings, and shows that the author has striven hard to put together shreds of ancient reminiscence within a fabulous and mythical account. With the third stage we come down to historical times. It is divided into three periods,—the first dating from the arrival of an Indian pandit by way of Kashmir, who wrote some of the Bon books; the second being that of the introduction of Buddhism and the consequent persecution leading the Bonpo to multiply their sacred books, which they concealed ; and the last being that of the revival of the Bonpa and the bring- ing forth of the hidden books subsequent to the overthrow and temporary effacement of Buddhism by gLang-dharma (908-1013). According to this source, which, however, is

certainly tinged by Buddhist prejudice, it was only at the last-mentioned date that the Bonpa reached its complete organization.

Eighteen principal gods and goddesses are enumerated, includ- ing the red wrathful razor spirit, the black wrathful razor spirit, the tiger god of glowing fire (the popular god universally wor- shipped), the messenger demon Rgyal-po, otherwise Pe(d)kar rgyal-po (much dreaded and worshipped in the central provinces : he is said to be identical with the deity Kye-pang of Lhasa, figured as a wooden stick or log decked with rags; see Jaeschke, Dvet., p. 7), the god of sound, the great demon, and the serpent demon. Information is lacking as to the specific characteristics of these gods, and it is not clear to which of them belongs the title of kun-tu bzang-po, frequently cited as the chief Bon god; he is re- puted to have a wife Yom-ki-long-mo, the eternal female principle, and from their union have resulted all the minor gods and the whole world.

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1 The term gyuh-druis (svasti), also applied to his followers, means the cross cramponnée, the svastika, similar to that of the Buddhists, from which it differs only in direction, the Bonpo manner of circumambulation rcund a shrine or deity being from right to left, while the Buddhist manner is from left to right.

Bonpa.

Bonpa litera- ture.

History.

HISTORY. |

Of the Bonpa literature the only text which has been made accessible to Western scholars is a sutra translated by A. Schiefner in Mém. del Acad. de St. Pétersb. (xxviii., No. 1) called Gtsangma klu hbum dkar-po (The holy white naga, the hundred thousand”) ; but Buddhist influence is so manifest in it that no correct idea of the primitive Bon religion can be derived from it. In a native account, dating from the 18th century and translated by Sarat

Chandra Das, the following are enumerated—three works on philo- sophy and metaphysics, four meditative works, nine ritual serials, six series of epistles, and four mystic works of a late period, in all of which the title of the translated sutra is not made known. It is stated in the translation that these Bon scriptures originally consisted of wholesale plagiarisms, subsequently altered in ortho- graphy and terminology from Buddhist canonical works. The Bonpo are said to have got the counterparts of the Kah-gyur in general. As a correlative of the six-syllable prayer of the lamas 6m mani pad-me hum (vulgarly ‘‘om-mani pémé-on”), they have one in eight syllables, which they pronounce ma-tri-mu-tre-sa-la- dzu. The Bonpo are now frequently confounded with the Red Lamas or Buddhists of the Old school, who are distinguished from the Yellow or Reformed sect by their garments.

HISTORY.

From the 11th century B.c. the Chinese used to call by the name of Kiang the tribes (about 150 in number) of nomads and shepherds in Koko-nur and the north-east of present Tibet ; but their know- ledge continued to be confined to the border tribes until the sixth century of our era. In the annals of the T’ang dynasty it is said that the population of the country originated from the Bat-Kian or Fah Kiang; and, as the information collected in the first part of the notice concerning Tu-bat, afterwards Tu-ban, the modern Tu-fan, dates partly (as is proved by internal evidence) froin a time anterior to the T’ang dynasty (618 A.p.), some degree of reliance may be placed on its statements. There we are told that Fanni, a scion of the southern Liang dynasty of the Tu-bat family (which flourished from 397 to 415 at Liang-chu in Kan-suh), who had submitted to the northern Liang dynasty, fled in 433 with all his people from his governorship of Lin-sung (in Kau-chu) westwards across the Yellow river, and founded beyond Tsih-shih (‘‘ heapy stones”) a state amidst the Kiang tribes, with a territory extend- ing over a thousand lz. By his mild and just rule he was soon enabled to establish his sway over an immense territory. His original state was apparently situated along the upper course of the Yalung river, an affluent of the Kin-sha-kiang. The foregoing statements, which are most probably genuine history, are preceded in Tibetan chronicles by a mass of legends invented by the native

Buddhist historians for the purpose of connecting their monarchy with India.

up his residence in the Yarlung country south of Lhasa. This Yarlung, which borrowed its name from the Yalung of the state of Fanni Tu-bat, is a river which flows into the Yaro-tsanpo. The first king and his six successors are known as the seven celestial khrt; the next series consists of six kings known as the earthly legs ; and they were followed by cight terrestrial Jdé. This three- fold succession is apparently an imitation or a debased form of the ancient legend of heavenly, earthly, and human rulers, which was carricd into Persia and China, and from the latter country into Japan and Tibet,—the relative number of kings being altered in the last-named countries to suit local convenience and the small amount of truth which they contain. Whilst giving an Aryan descent to their first kings, the ancient Tibetans assigned to their princesses a divine origin, and called them lhamo, ‘‘ goddess.” The gynecratic habits of the race are manifested in the names of all these kings, which were formed by a combination of those of their parents, the mother’s generally preceding that of the father. The dé kings were followed by four rulers simply called bésan (“mighty ”).

Then occurs a break in the lineal descent, and the king next in order (c. 461) may be the Tatar Fanni Tu-bat, but most probably his son and successor. His name was Lha-tho thori gnyan-btsan, otherwise Gnyan-btsan of Lha-tho thori, according to the custom usual in Tibet of calling great personages after the name of their birthplace. Lha-tho means ‘‘heaps of stones,” and therefore

appears to be a translation of Tsih-shih, “heapy stones,” the country mentioned in connexion with the foundation of a state by FanniTu-bat. It was during his reign that the first Buddhist objects are reputed to have reached Tibet, probably from Nepal. Little is said of his three immediate successors. The fourth was gNam-ri srong btsan, who died in 630. During his reign the Tibetans obtained their first knowledge of arithmetic and medicine from China ; the prosperity and pastoral wealth of the country

were so great that ‘‘the king built his palace with cement moistened with the milk of the cow and the yak.” To the same king is attributed the discovery of the inexhaustible salt mine called Chyang-gi- ts’wa (Byang- gi-ts’wa= ‘‘northern salt”), which still supplies the greater portion of Tibet. The reign of his illustrious son, Srong btsan sgam-po, opened up a new era; he introduced Buddhism aud the art of writing from India, and was the founder (in 639) of Lha-ldan, afterwards Lha-sa. He was greatly helped in his proselytism by his two wives, one a Nepal princess, daughter of King Jyoti varma, the other an imperial daughter of China ; afterwards, they being childless, he took two more princesses from the Ru-yong (=‘‘left corner” ?) aud Mén (general appellative for the nations between Tibet and the Indian plains) countrics. As a conqueror he extended his sway from the still unsubdued Kiang tribes of the north to Ladak in the west, and in the south he carried his power through Nepal to the Indian side of the Himalayas. How far southward this dominion at first extended is not known; but in 703 Nepal and the country of the Brahmans rebelled, and the Tibetan king, the third successor of Srong btsan sgam-po, was killed while attempting to restore his power. It is rather curious that nothing is said of this Tibetan rule in India, except in the Chinese annals, where it is mentioned until the end of the monarchy in the 10th century, as extending over Bengal to the sea,—the Bay of Bengal being called the Tibetan Sea. J. R. Logan has found ethnological and linguistic evidence of this domination, which was left unnoticed in the Indian histories. Mang-srong mang btsan, the second son and successor of Srong btsan sgam-po, continuing the conquests of his father, subdued the Tukuhun Tatars around the Koko-nur in 6638, and attacked the Chinese ; after some adverse fortune the latter took their revenge and penetrated as far as Lhasa, where they burnt the royal palace (Yumbu-lagang), Khri Ide gtsng-brtan-mesag-ts’oms, the grandson of Mang-srong and second in succession from him, promoted the spread of Buddhism and obtained for his son, Jangts’a Lhapon, who was famous for the beauty of his person, the hand of the accomplished princess Kyim- shang, daughter, otherwise kung-chu, of the Chinese emperor Juy- tsung. But the lady arrived after the death of her betrothed, and after long hesitation became the bride of the father. She gave birth in 730 to Khri srong ldeu btsan, in the Buddhist annals the most illustrious monarch of his country, because of the strenuous efforts he made in favour of that religion during his reign of forty- six years (743-789). His son and successor Muni btsan-po, being

determined to raise all his subjects to the same level, enacted that there should be no distinction between poor and rich, humble and great. He compelled the wealthy to share their riches with the indigent and helpless, and to make them their equals in respect of all the comforts and conditions of life. He repeated this experi- ment three times; but each time he found that they all returned to their former condition, the rich becoming still richer and the poor still poorer. The sages attributed this curious phenomenon to the good and evil acts of their former lives. Nothing of im- portance occurred during the following reigns, until that of Ral- pachen, who won glory by his care for the translations of the Buddhist scriptures which he caused to be completed, or rewritten more accurately when required. In this reign a severe struggle took place with China, peace being concluded in 821 at Ch'ang- ngan and ratified at Lhasa the following year by the erection of bilingual tablets, which still exist. Ralpachen was assassinated by the partisans of glang-dharma and the country fell into dis- order. gLang-dharma instituted a violent persecution of Buddhism ; but he was soon assassinated in his turn, and the kingdom divided into a western and an eastern part by his two sons. The partition did not, however, prevent internecine wars. The history for some time now becomes rather intricate, and requires some attention. Pal K'or tsan, the second western king, after a reign of thirteen years died leaving two sons, Thi Tasi Tsegpa-pal and Thi Kyida Nyimagou. The latter went to Ngari (Mmgari) and founded the capital Purang; he left three sons, of whom the eldest declared himself king of Mang-yul (the Monhuil of our maps), the second seized Purang, and the youngest, Detsud-gan, became king of the province of Shang-shung (the modern Ghughé). The revival of Buddhism began with the two sons of the last-named, the elder of whom became a monk. The younger, Khorré, inherited his father's throne, and was followed in his authority by twenty successors. Tasi Tsegpa also had three sons,—Palde, Hodde, and Kyide. The descendants of the first made themselves masters of Gung-t'ang, Lugyalwa, Chyipa, Lhatse, Langlung, and Tsakor, where they severally ruled as petty chiefs. The descendants of Kyide spread themselves over the Mu, Jang, Tanag, Yarulag, and Gyaltse

districts, where they also ruled as petty princes. Hodde left four sons,—Phabdese, Thide, Thich'ung, and Gnagpa. The first and fourth became masters of Tsangrong, the second took possession of Amdo and Tsongkha, the third became king of DbUs, and removed the capital to Yarlung, south of Lhasa. He was followed on his throne from son to son by eleven successors. History is silent as to the fate of the eastern king, the other son of gLang-dharma, and his successors, but the geographical names of the chicftainships enumerated above make it clear that the western kingdom had extended its power to the east. Chronology is deficient for all that period. While the dynasty of Khorré in Shang-shung and that of Thich'ung in DbUs were running, another authority, destined to become the superior of both, had arisen in Tibet. Khorré left his throne to his son Lhade, who was himself succeeded by his three sons, the youngest of whom invited the celebrated Indian Buddhist, Atisha, to leave his monastery Vikrama Shila for Tibet, where he settled in the great lamaserai of Thoding in Ngari. Besides religious books and teachings, he introduced in 1026 the method of computing time by cycles of sixty years, '*obtained from the Indian province of Shambala." He was the first of the several chief priests whose authority became paramount in the country. The kings of DbUs greatly patronized them, as for instance in the case of the celebrated Sakya Pandita by the seventh of these kings. Pandita, at the special request of Kuyuk, the successor of Ogdai, paid a visit to his court in 1246-48. Five years afterwards Kublai Khan conquered all the east of Tibet ; and, aftcr he had ascended the throne of China, the Mongol emperor invited to his court Phagspa Lodoi Gyaltshan, the nephew of the same Pandita. He remained twelve years with the emperor, and at his request franred for the Mongol language an alphabet imitated from the Tibetan, which, however, did not prove satisfactory, and disappeared after eighty-five years without having been very largely used. In return for his services, Kublai invested Phagspa with sovereign power over (1) Tibet proper, comprising the thirtcen districts of U and Tsang, (2) Kham, and (3) Amdo. From this time the Sakya-pa lamas became the universal rulers of Tibet, and remained so, at least nominally, under twenty-one successive lamas during seventy years (1270-1340). Their name was derived from the Sakya monastery, which was their cradle and abode, and their authority for temporal matters was exercised by specially appointed regents. When the

ower of the Sakya began to wane, that of the rival monasteries of Digeaa! Phagdub, and T'shal increased largely, and their respective influence and authority overbalanced that of the successors of Phagspa. It was at this troubled epoch that Chyang Chub Gyalt- shan, better known as Phagmodu from the name of his native town, appeared on the scene. He subdued Tibet proper and Kham, for the continued possession of which he was, however, compelled to fight for several years ; but he succceded in the long run, and with the approval of the court of Peking established a dynasty which furnished twelve rulers in succession. When the Mongol dynasty of China passed away, the Mings confirmed and enlarged the dominion of the Tibctan rulers, recognizing at the same time the chief lamas of the eight principal monasteries of the country. Peace and prosperity gradually weakened the benign rule of the kings of this dynasty, and during the reign of the last but one internecine war was rife between the chiefs and nobles of U and Tsang. This state of things, occurring just as the last rulers of the Ming dynasty of China were struggling against the encroach- ments of the Manchus, their future successors, favoured the inter- ference of a Khoskot Mongol prince, Tengir To, called in the Tibetan sources king of Koko-nur. The Mongols were interested in the religion of the lamas, especially since 1576, when Altan, khakan of the Tumeds, and his cousin summoned the chief lama of the most important monastery to visit him. This lama was Sodnam rGyamtso, the third successor of Gedundub, the founder of the Tashilumbo monastery in 1447, who had been elected to the more important abbotship of Galdan near Lhasa, and was thus the first of the great, afterwards dalai, lamas. The immediate successor of Gedundub, who ruled from 1475 to 1541, had appointed a special officer styled depa to control the civil administration of the country. To Sodnam rGyamtso the Mongol khans gave the title of Vadjra Dalai Lama in 1576, and this is the first use of the widely known title of dalai lama. During the minority of the fifth (really the third) dalai Jama, when the Mongol king Tengir To, under the pretext of supporting the religion, intervened in the affairs of the country, the Pan-ch'en Lo-sang Ch'o-kyi Gyal-ts'ang lama obtained the withdrawal of the invaders by the payment of a heavy war indemnity, and then applied for help to the first Manchu emperor of China, who had just ascended the throne. This step enraged the Mongols, and caused the advance of Gushri Khan, son and successor of Tengir To, who invaded Tibet, dethroned all the petty princes, including the king of Tsang, and, after having subjugated the

whole of the country, made the fifth dalai lama supreme monarch of all Tibet, in 1645. The Chinese Government in 1653 confirmed the dalai lama in his authority, and he paid a visit to the emperor at Peking. The Mongol Khoskotes in 1706 and the Sungars in 1717 interfered again in the succession of the dalai

lama, but the Chincse army finally conquered the country in 1720, and the present system of government was established. The events which have happened since that time have been recorded in the articles LHasaA and LADAK.

LancuacE! AND LITERATURE.

Bod-skad is the general name of the language of Tibet, which Lan- is also occasionally called Gangs-tan-gyi skad (i.e. “the glaciers guage.

language”). This name is specially applied to the forms in use in DbUs-gTsang. The vernacular is called p’dl-skad or common language in contradistinction to the tos-skad or book language. Besides the Bod-skad there are two chief dialects? in Great Tibet, — that of Khams, spoken in the three provinces of Mdo (Darrtse- mdo), Kham, and Gong in the east, and that of Ngari-Khorsum in the west. Jaeschke arranged these dialects under three heads,— (1) western, including those of Balti and Purig, the most archaic, and of Ladak and Lahul; (2) central, including those of Spiti and of DbUsand gTsang ; (3) Khams. To the same Bhot group belong the Changlo or Bhutani or Lhopa, the language of Bhutan, of which we have a grammatical notice by Robinson (1849), and the Serpa and the Takpa, of Tawang, both of which are only known through the vocabularics collected by Hodgson. The later Takpa forms the transition between the Bhot group and the Si-fan group, which in- cludes the Miniak, Sungpan, Lifan, and Thochu dialects, spoken near the eastern borders, as well as the Horpa, spoken on a larger area west of the preceding, and much mixed with Turkic in-

1 The Capuchin friars who were settled in Lhasa for a quarter of a century from 1719 studied the language ; two of them, Francisco Orazio della Penna, well known from his accurate deseription of Tibet, and Cassian di Macerata sent home materials which were utilized by the Augustine friar Aug. Ant. Georgi of Rimini (1711-97) in his Alphabetum Tibetanwm (Roine, 1762, 4to), a ponderous and confused compilation, which may be still referred to, but with great caution. The Tibetan characters were drawn by Della Penna, and engraved by Ant. Fontarita in 1738. In 1820 Abel Rémusat published his Recherches sur les Langues Tartares, a chapter of which was devoted to Tibetan. The next work of importance was a dictionary, intended for European students, which was published, with Tibetan types, at the expense of the East India Company, in 1826 at Serampur, and edited by John Marshman, from a MS. copy made by Fr. Chr. G. Sehroeter, a missionary in Bengal, who had substituted English for the Italian of the original. It was the unsifted result of the labours of an unknown Italian missionary, who had been stationed either in eastern Tibet or close to the frontier in Bhutan. It was properly a collection of all the sentences he could get written by a native teacher, completed with extracts from the Padma tangyig, a popular series of legends about Padma Sambhava. Unfortunately the work was left unfinished, and unrevised, as there was no Tibetan scholar to correct the proofs. Though richer in words than later dictionaries, the work cannot, for these reasons, be accepted as an authority on any doubtful point. The grammatical notice, consisting of forty pages from Schroeter, prefixed to this Dictionary of the Bhotanta, or Butan Language, hardly deserves mention. At Calcutta in 1834 the Hungarian Alexander Csoma de Korés (1784-1842) brought out his Dictionary, Tibetan and English, and his Grammar of the Tibetan Language in English, prepared on the western frontier, where he had resided for several years at the monasteries of Yangla and Pukdal in Zanskar, and finally at Kanum in Upper Besahr, enjoying the help of native scholars. His works are admirable so far as concerns the literary language (chiefly that of the Buddhist translations). At St Petersburg J. J. Schmidt published his Grammatik der Tibetischen Sprache in 1839 and his Tibetisch-Deutsches Worterbuch in 1841, but neither of these works justified the great pretensions of the author, whose access to Mongolian sources had enabled him to enrich the results of his labours with a,certain amount of information unknown to his predecessors. In France, P. E. Foucaux published in 1847 a translation from

the Raya tcher rol pa, the Tibetan version of the Lalita Vistara, and in 1858 a Grammaire Thibétaine; while Ant. Sehiefner had begun at St Petersburg in 1849 his series of translations and researches. His Tibetische Studien (1851-68) is a valuable collection of documents and observations. In 1861 Lepsius published his paper Ueber Chinesische wnd Tibetische Lautverhdltnisse; and since 1864 Léon Feer has brought out in Paris many translations of texts from Tibetan Buddhist literature. In 1849 the Journal of the Asiatic Society of Bengal published comparative vocabularies of spoken and written Tibetan by Bryan H. Hodgson, and grammatical notices of Tibetan (according to Csoina's grammar) and of Changlo, a Tibetan dialect, by W. Robinson. But it was at Singapore in 1852 that the general relationship of the Tibetan and the Burman, now admitted in comparative philology, was established for the first time, by J. R. Logan, in the Journal of the Indian Archipelago. Prof. Max Miller, in his "Letter on the Classification of the Turanian Languages" of 1853, arrived m- dependently at a similar conclusion. In 1857 the Moravian missionaries estab- lished a station at Kyelang, district of Garza, British Lahul, in Ladak, a school, and a lithographic press, and it is to the labours of FE. A. Jaeschke of this mission that we are indebted for the most valuable materials for the practical study of Tibetan. From 1860 to 1867 that scholar made several important com- munications, chiefly with reference to the phonetics and the dialectical pro- nunciation, to the academies of Berlin and St Petersburg, and in the Journal of the Asiatic Society of Bengal. In 1868 at Kyelang he published by lithography A Short Practical Grammar of the Tibetan Language, with special reference to the spoken dialects, and the following year a Romanized Tibetan and English Dic- tionary. He also published in 1871-76 at Gnadau in Prussia by the same process a Tibetan and German dictionary. Afterwards he prepared for the English Government A Tibetan-English Dictionary, with special reference to the prevailing dialects, in 1881. Dr H. Wenzel, one of his pupils, brought out in 1883 from his MS. a Simplified Tibetan Grammar. Major Th. H. Lewin with the help of a lama compiled A Manual of Tibetan, or rather a series of colloquial phrases, which was brought out at Calcutta in 1879. A portion of the New Testament has been translated into Tibetan. As regards native philology, the most ancient work extant is a grammar of the Tibetan tongue, by Tonmi Samb'ota, the introducer of the Indian alphabet, preserved in the Bstan-hgyur (mdo exxiv). This collection also contains other works of the same

kind, diction- aries by later writers, translations of many Sanskrit works on grammar vocabulary, &c., and bilingual dictionaries, Sanskrit and Tibetan. As separate publications there are several vocabularies of Chinese and Tibetan ; Mongol and Tibetan; Chinese, Manchu, Mongol, Oelét, Tibetan, and Turkish; Tibetan, Sanskrit, Manchu, Mongol, and Chinese.

2 There are without doubt many minor skad-lugs or dialects which are still unknown. For instance, in the Pan-yul valley north of Lhasa the inhabitants are said to speak an indistinct skad-lugs.

Philo- logy.

LANGUAGE. |

gredients. With the cxception of the Sokpa, a Mongol dialect, and of the Gyarung, a pre-Chinese dialect, the languages spoken in Tibet belong to the large linguistic family commonly called Tibeto- Burman, a division of the Kuen-lun group, which is a part of the Turano-Scythian stock.

The language is more consonantal than vocalic, though much softened in the central dialect. The consonants, 80 in number, which are deemed to possess an inherent sound a, are the follow- ing :—ka, k’a, ga, nga, ra, ta, dja, nya, ta, ta, da, na, pa, p’a, ba, ma, tsa, ts’a, dza, wa, zha, za, ’h, ya, ra, la, sha, sa, ha,’a; the so- called Sanskrit cerebrals are represented by the letters ta, @’a, da, na, sha turned the other way. Ya, when combined as second con- sonant with k-, p-, m-, is written under the first letter. Ra, when combined as second letter with k-, ¢-, p-, is written under the first, and when combined with another consonant as first letter over the second. The vowels are a, 7, wu, ¢, 0, which are not distinguished as long or short in writing, though they are so in the vernaculars iu the case of words altered by phonetic detrition. Agglomerations of consonants are not objectionable ; and they are often met with as initials, giving the appearance of telescoped words—an appearance which historical ctymology often confirms. Many of these initial consonants are silent in the softened dialects of the central provinces, or have been resolved into a simpler one of another character. The language is much ruled by laws of euphony, which have been strictly formulated by grammarians. Among the initials, five, viz., 9, d, }, m, ’h, are regarded as prefixes, and are called so for all purposes, though they belong

sometimes to the stem. As a rule none of these letters can be placed before any of the same organic class. Post-positions, pa or ba and ma, are required by the noun (sub- stantive or adjective) that is to be singled out ; po or bo (masc.) and mo (fem.) are used for distinction of gender or for emphasis. The cases of nouns are indicated by suflixes, which vary their initials according to the final of the nouns. The plural is denoted when required by adding one of several words of plurality. When several words are connected in a sentence they saline require more than one case element, and that comes last. There are personal, demonstrative, interrogativc, and reflexive pronouns, as well as an indefinite article, which is also the numeral for ‘‘one.” The personal pronouns are replaced by various terms of respect when speaking to or before superiors, and there are many words besides which are only cmployed in ceremonial language. The verb, which is properly a participle, has no element of person, and denotes the conditions of tense and mood by an external and internal inflexion, or the addition of auxiliary verbs and suffixes when the stem is not susceptible of inflexion. The conditions which approximate most closely to our present, perfect, future, and imperative are marked either by aspiration of the initial or by one of the five prefix con- sonants according to the rules of euphony, and the whole looks like a former system thrown into confusion and disorder by phonetic decay. As to the internal vowel, a or ¢ in the present tends to become o in the imperative, the ¢ changing to a in the past and future ; 7 and x are Icss Hable to change. A final s is also occasion- ally added. Only a limited number of verbs are capable of four changes; some cannot assume more than three, some two, and many only one. This deficiency is made up by the addition of auxiliaries or suffixes. There are no numeral auxiliaries or segrega- tives used in counting, as in many languages of eastern Asia, though words expressive of a collective or integral are often used after the tens, sometimes after a smaller numbcr. In scientific and astrological works, the numerals, as in Sanskrit, are expressed by symbolical words. In the order of the sentence the substantive precedes the adjective and the verb stands last; the object and the adverb precede the verb, and the genitive precedes the noun on which it depends. An active or causal verb requires before it the instrumental instcad of the nominative case, which goes only before a neuter or intransitive verb. The chief differences between the classical language of the Tibetan translators of the 9th century and the vernacular, as well as the language of native words, existed in vocabulary,

phraseology, and grammatical structure and arose from the influence of the translated texts.

The Tibetan language, in its written and spoken forms, has a great interest for philologists, on account of its bearing on the history of the so-called monosyllabic languages of eastern Asia. Is the Tibctan a monosyllabic language passing to agglutination ? or the reverse? The latter is the fact, as we shall see further on. The whole question has turned upon the elucidation of the pheno- menon of the silent letters, generally prefixed, which differentiate the spelling of many words from their pronunciation, in the central dialect or current speech of Lhasa. As long as the sounds of this dialect only were known, the problem could not be fully grasped. Rémusat rather dubiously suggested, while Schmidt and Schiefner maintained, that the silent letters were a device of grammarians to distinguish in writing words which were not distinguished in speech. But this convenient opinion was not sufficient for a general explana- tion, being supported by only a few cases. Among these are—(a) the addition of silent letters to foreign words in analogy with older terms of the language (¢g., the Persian ¢adjzk was tran-

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seribed staggzig or ‘‘tiger-leopard,” because the foreign term left untouched would have been meaningless for Tibetan readers) ; (0) the addition for the sake of uniformity of prefixed letters to words etymologically deprived of them; (c) the probable addition of letters by the Buddhist teachers from India to Tibetan words in order to make them more similar to Sanskrit expressions (for instance, xje- for ‘‘king,” written in imitation of raja, though the original word was je or she, as is shown by cognate languages). On the other hand, while phonetically the above explanation was not inconsistent with such cases as rka, dkah, bkah, bska, and nga, rnga, ngag, sngags, Inga, ngad, and brtse, brdzwn, dbyar, &c., where the italicized letters are pronounced iu full and the others are left aside, it failed to ex- plain other cases, such as dgra, mgron, spyod, spyan, sbrang, sbrul, bkra, k’ri, krad, k’rims, k’rus, &c., pronounced da, don, ¢od or $wod, ten, dang, dew, ta, tt, tad or teh, ?im, tu, &c., and many others, where the spoken

forms are obviously the alteration by wear and tear of sounds originally similar to the written forms. Csoma de Kérés, who was acquainted with the somewhat archaic sounds of Ladak, was able to point to only a few letters as silent. But Major Cunningham, in his book on the same country (1854), held that the Tibetan writing, when first applied to the language, was the faithful transcription of speech, and he gave as a proof that the name of the province of U, written DbUs, was the Debasx of Ptolemy. Foucaux, in his Grammaire (1858), quoted a fragment from a native work on grammar several centuries old, in which the pronunciation of the supposed silent letters is carefully described. Since then the problem has been disentangled; and now minor points only remain to be cleared up. Jaeschke devoted special at- tention to the dialectical sounds, and showed in several papers and by the comparative table prefixed to his dictionary that in the western and eastern dialects these sounds correspond more or less closely to the written forms. Thus the valuable testimony of these dialects may be added to the evidence furnished by foreign tran- scriptions of Tibetan words, loan words in conterminous languages, and words of common descent in kindred tongues. And the whole shows plainly that the written forms of words which are not of later remodelling are really the representatives of the pronunciation of the language as it was spoken at the time of the transcription. The concurrence of the evidence indicated above enables us to form the following outline of the evolution of Tibetan. In the 7th century there was no difference between the spoken and the written language. Soon afterwards, when the language was extended to the western valleys, the prefixed and most of the important con- sonants vanished from the spoken words. The ya-tag and ra-tag or y and r subscript, and the s after vowels and consonants, were still in force. The next change took place in the central pro- vinces ; the ra-tags were altered into cerebral dentals, and the ya- tags became&’ Later on the superscribed letters and finals d and s disappeared, except in the east and west. It was at this stage that the language spread in Lahul and Spiti, where the superscribed letters were silent, the d and g finals were hardly heard, and as, os, us, were at, ot, wi. The words introduced from Tibet into the border languages at that time differ greatly from those introduced at an earlier period. The other changes are more recent and re- stricted to the provinces of U and Tsang. The vowel sounds ai, ot, wi, have become é, 6, %; and a, o, u before the finals d and n are now d, 6, % The media# have become aspirate tenues with a low intonation,

which also marks the words having a simple initial consonant; while the former aspirates and the complex initials simplified in speech are uttered with a high tone, or, as the Tibetans say, ‘‘with a woman’s voice,” shrill and rapidly. An inhabitant of Lhasa, for example, finds the distinction between sh and zh, or be- tween s andz, not in the consonant, but in the tone, pronouncing sh and s with a high note and zh and z with a low one. The in- troduction of the important compensation of tones to balance phonetic losses had begun several centuries before, as appears from a Tibetan MS. (No. 4626 St Petersburg) partly published by Jaeschke (Monatsber. Akad. Berl., 1867). A few instances will serve to illus- trate what has been said. In the bilingual inscriptions, Tibetan and Chinese, set up at Lhasa in 822, and published by Bushell in 1880, we remark that the silent letters were pronounced: Tib. spudgyal, now pugyal, is rendered swh-pot-ye in Chinese symbols ; khri, now ¢4, is kich-li; hbrong is puh-lung; snyan is sheh-njoh and su-njoh; srong is su-lun, su-lung, and si-lwng. These tran- scriptions show by their variety that they were made from the spoken and not from the written forms, and, considering the limited capacities of Chinese orthoepy, were the nearest attempt at rendering the Tibetan sounds. Spra or sprew (a monkey), now altered into dew at Lhasa, few in Lahul, Spiti, and Tsang, is still more recognizable in the Gyarung shepri, and in the following degenerated forms—shrew in Ladak, strew-go in Khams and in cognate languages, soba in Limbu, sakew in Lepcha, stmai in Tablung Naga, sibeh in Abor Miri, shibe in Sibsagar Miri, sarrha in Kol, sara in Kuri, &e. Grog- ma (ant), now altered into the spoken oma, is still kyoma in Bhutan, and, without the suffix, Zorok in Gyarung, k’oro- in Sokpa, k’orok, k’alek in Kiranti, &. Grang-po (cold), spoken ¢’ammo, is still grang-mo in Takpa, k’yam in Bur-

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mese, &. A respectful word for “head” is u, written dbu, which finds its cognates in Murmi thobo, Kusunda chipi, Sibsagar Miri ~~tub, &e. Byu (bird), spoken chya, is still pyc in Gyarung. Brjod (to speak), pronounced jod, is cognate to the Burmese pyauhtso, the Garo brot, &. The word for “cowries” is ’gron~~ in written, rum- in spoken Tibetan, and grwa in written

Burmese ; slop (to learn), spoken lop, is slop in Melam. “Moon”’ is zlava in written and dawa in spoken language, in which ~~va is a suffix ; the word itself is zla~~, cognate to the Mongol ssara, Sokpa sara, Gyarung t-stle, Vayu cholo, &c. The comnion spoken word for “head ” is go, written mgo, to which the Munipuri moko and the Mishmi mkura are related. Sometimes the written forms correspond to double words which have disappeared. For instance, gye (eight), which is written brgyad and still spoken vrgyad in Balti in the west and Khams in the east, is gyad in Ladak, Lahul, and U. The same

-word does not appear elsewuere; but we find its two parts separately,

such as Gurung pre, Murmi pre, Taksya phre, and Takpa gyet, Serpa gye, Garo chet, &c. Rta (horse) is reduced to ¢a in speech, but we find ri, rhyi, roh in Sokpa, Horpa, Thochu, Miniak, and ¢d, tah, teh, ?ay in Lhopa, Serpa, Murmi, Kami, Takpa, &c., both with the same meaning. Such are the various pieces of evidence obtained from an endless number of instances. The cases referred to above do not, owing to the difference of the causes, yield to any explana- tion of this kind. And it must be admitted that there are also many cases, some of them caused by irregularities of writing, modification of spelling by decay, and by a probable use of prefixes still unascertained, which also resist explanation, though the account just given stands good whatever solution the question of prefixes may receive in future. ‘ Little is known of the non-religious literature of Tibet. The most popular and widely circulated book is called The Hundred Thousand Songs of the Venerable Milaraspa. Their author Milar- aspa (unless the work should be attributed to his disciples), often called Mila, was a Buddhist ascetic of the 11th century ; according to Jaeschke, during the intervals of meditation he travelled through the southern part of middle Tibet as a mendicant friar, instructing the people by his improvisations in poetry and song, proselytizing, refuting and converting heretics, and working manifold miracles. His legends are not without wit and poetical merit. A number of poems written in an elevated and special style, dramatic works, aad collections of fairy tales and fables are said to be in existence. A very extensive work, the Djrung yg (Sgruhs yg), regarded as the national epic in Kham, has been partly seen by Desgodins and Baber. It isin prose; but the dialogue, interspersed with songs, is metrical, and is much more extensive

than the prose framework. Religious discussions and philosophical dissertations alternate with comic episodes. It includes three divisions,—the Djiwng ling, which describes the invasion of part of Tibet by the Djiung or Moso; the Hor ling, which recounts the conquest of the Hor (Turk tribes) by the Tibetans, and conveys much historical information ina tale of magic and marvel ; and the Djia ling (Chinese division), which narrates a contest of unknown date between the Tibetans and the Chinese. This work has apparently never been published, and even the manuscripts of the three divisions cannot, says Baber, be obtained in a complete form. But every Tibetan, or at least every native of Kham, who possesses any education, is able to recite or to chant passages of great length. Another Tibetan epic, the

TIBULLUS, Atsivs (c. 54-19 B.c.), was the second in the tetrad of the elegiac poets of Rome. As we learn from Ovid, he was the successor of Cornelius Gallus and the immediate predecessor of Propertius. The informa- tion which we possess about him is extremely meagre. Besides the poems themselves—that is to say, the first and second books—we have only a few references in later authors and a short Life of probable but not undoubted genuineness. We do not know his prenomen; and his birthplace is uncertain. It is, however, a plausible con- jecture that he came from Gabii. The year of his birth has been variously assigned; but 54 B.c. may be taken as approximately correct. This would make him about twenty- five when he accompanied Messala on his Aquitanian cam- paign in 29, and thirty-five at his untimely death in 19. His station was that of a Roman knight; and he had inherited a very considerable estate. But, like Virgil, Horace, and Propertius, he seems to have lost the greater part of it in 41 amongst the confiscations which Antony and Octavian found expedient to satisfy the rapacity of their victorious soldiery. Tibullus, like Propertius, seems to have lost his father early. He once mentions his mother

Gyaldrung, praises Dagyolong, a famous warrior who subdued the savage men of Kham. Besides these pocins we find allusions to a sgrung, referring to the Yesser Khan. Dramatic works exist, as well as translations of Galen, also of the Ramayana in the first vol. of the Bstodts’ogs of the Bstan-hgyur. For the religious literature, which is considerable, see LAMAISM.

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sticks (shing-chram) and knotted cords were in current use, but the latter contrivance is only faintly alluded to in the Tibetan records, while of the other there are numerous examples. No mention is anywhere made of a hieroglyphical writing, but on the eastern frontier the medicine-men or tomba of the Moso have a peculiar pictorial writing, which is known in Europe from two published MSS. (in Journ. Roy. As. Soc., 1885, vol. xvii.) ; though apparently now confined solely to purposes of witchcraft, it ve contains survivals of a former extensive system superseded by the alphabetic writing introduced from India. According to tradition —a tradition of which the details are open to criticism—the alpha- bet was introduced from India by Tonmi Samb'ota, who was sent to India in 632 by King Srong btsan to study the Sanskrit language and Buddhist literature. Tonmi Samb'ota introduced the so- called ‘‘ writing in thirty characters" (six of which do not exist in Sanskrit) in two styles,—the ‘‘thick letters" or ‘‘letters with heads," now commonly used iu printed books, and the half-cursive ‘cornered letters," so called from their less regular heads. The former are traditionally said to have been derived from the Landza character. The Landza of Nepal, however, is certainly not the origin of the Tibetan letter, but rather an ornamental development of the parent letter. The close resemblance of the Tibetan char- acters ‘‘ with heads" to the Gupta inscriptions of Allahabad shows them to have been derived from the monumental writing of the period ; and various arguments appear to show that the other Tibetan letter came from the same Indian character in the style in which it was used in common life. The Tibetan half-cursive was further developed into the more current ‘‘headless" characters of which there are several styles. From the monumental writing of Tibet was derived, for the special use of the Mongols in the 138th century, the short-lived writing known as Bagspa, from the name of tle lama who worked it out.

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and sister ; and, according to Ovid’s elegy upon him, they were alive at his death. .

Tibullus’s chief friend and patron was M. Valerius Messala Corvinus, himself an orator and poet as well as a statesman and commander. Messala, like Meecenas, was the centre of’a literary circle in Rome; but the bond between its members was that of literature alone. They stood in no relations to the court; and the name of Augustus is never once to be found in the writings of Tibullus. It was doubtless this community of taste which gained the young poet the friendly notice of Messala, who offered him an honourable position on his private staff when he was despatched at the end of 30 by Augustus to quell the Aquitanian revolt. Tibullus distinguished him- self in the campaign and was decorated for his services. But this did not rouse. in him any military ardour. His tastes lay in quite other directions ; and he always speaks of war with horror and dislike. At the end of the war in 29 Tibullus returned to Rome, and thenceforward his life seems to have been divided between Rome and his country estate, though his own

preferences were altogether for the country life. Soon after his return he made the

acquaintance of his first love, Delia. This is what he calls her in his poems; but we learn from Apuleius that her real name was Plania. Delia seems to have been a woman of middle station. It is impossible to give an exact account of the intimacy. The poems which refer to her are arranged in no chronological order. She appears now as single, now as married; but we do not hear any- thing either of her marriage or of her husband's death. It is clear, however, that it was the absence of her hus- band on military service in Cilicia which gave Tibullus the opportunity of making or renewing the acquaintance. It was not dropped when he returned, probably with Messala in 27. It was not a difficult task to deceive the simple soldier ; and Delia was an apt pupil in the school of de- ception,—too apt, as Tibullus saw with dismay when he found that he was not the only lover. His entreaties and appeals were of no avail; and after the first book we hear no more of Delia. It was during the earlier period of this attachment and probably in the spring of 28 that, yielding to his friend's earnest and repeated requests, Tibullus left Delia to accompany Messala on a mission to Asia. He fell ill, however, and could not get farther than Corcyra. In the second book the place of Delia is taken by Nemesis, which is algo a fictitious name. Nemesis (like the Cynthia of Propertius) was a courtesan of the higher class ; and she had other admirers besides Tibullus. He complains bitterly of his bondage, and of her rapacity and hardheartedness. In spite of all, however, she seems to have retained her hold on him until his death. Tibullus died prematurely, probably in 19, and almost immediately after Virgil, in order, as their contemporary Domitius Marsus pathetically puts it, 'That none might sing of gentle love in clegy's sad lay, Or gallant march of royal war on epic feet.cssay."

The character of Tibullus is reflected in his poems. Though not an admirable it is certainly an amiable one. He was a man of generous impulses and a gentle unselfish disposition. He was loyal to his friends to the verge of self-sacrifice, as is shown by his leaving Delia to accompany Messala to Asia, and constant to his mistresses with a constancy but ill

deserved. His tenderness towards them is enhanced by a refinement and delicacy of feeling which are very rare amongst the ancients. Horace and the rest taunt the cruel fair with the retribution that is coming with the years, when they will exult over the decay of the once imperious beauty. If Tibullus refers to such a fate, he does it by way of warning and not in any petty spirit of triumph or revenge. Cruelly though he may have been treated by his love, he docs not invoke curses upon her head. He goes to her little sister's grave, eae so often with his garlands and wet with his tears, and bemoans his fate to the dumb ashes there. Tibullus has no leanings to an active life: his ideal is a quiet retirement in the country with the loved one at his side. He has no ambition and not even the poet's yearning for immortality. His muse may go packing if it cannot propitiate the fair. As Tibullus loved the country life, its round of simple duties and innocent recreations, so he clung to its faiths, and in an age of crude materialism and the grossest superstition he was religious in the old Roman way. A simple, gentle, affectionate nature such as his could not fail to win esteem ; and his early death caused dcep regret in Rome. Tibullus was remarkable, his biographer tells us, for his good looks and the care that he bestowed upon his person. Asa poet he reminds us in many respects of the English Collins. His clear, finished, and yet unaffected style made him a great favourite with his countrymen and placed him, in the judgment of Quin- tilian, at the head of their elegiac writers. And certainly within his own range he has no Roman rival. For natural grace and tenderness, for exquisiteness of feeling and expression, he stands alone. He has far fewer faults than Propertius, and in particular he never overloads his lines with Alexandrian learning. But, for all that, his range is limited ; and in power and compass of ima- gination, in vigour and originality of conception, in richness and variety of poetical treatment, he is much his inferior. The same differences are perceptible in the way the two pocts handle their metre. Tibullus is smoother and more musical but liable to be- come monotonous ; Propertius, with occasional harshnesses, is more vigorous and varied. It need ouly be added that in many of Tibullus's poems a symmetrical composition is obvious, although the symmetry must never be reduced to a fixed and unelastic scheme.

It is probable that we have lost some of the genuine poems of Tibullus. On the other hand, much has come down to us under

his name which must certainly be assigned to others. Only the first and second books of the usual order, or about 1240 verses, can claim his authorship. The first book consists of poems written at various times between 30 and 26. It was probably published about 25 or 24. The second book seems to have been a posthumous publi- cation. It is very short, containing only 428 verses, and is evi- dently incomplete. In both books occur poems which give evidence of internal disorder ; but scholars cannot agree upon the remedies to be applied.

The third book, which contains 290 verses, is by a much inferior hand. The writer calls himself Lygdamus and the fair that he sings of Newra. He was born in the same year as Ovid, in the consulship of Hirtius and Pansa; but there is nothing Ovidian about his work. He has very little poetical power, and his style is meagre and jejune. He has a good many reminiscences and imi- tations of Tibullus and Propertius ; and they are not always happy. The separation of the fourth book from the third has no ancient authority. They form one in the best MSS., and are quoted as one in the anthologies of the Middle Ages. The division dates from the revival of letters, and is due to the Italian scholars of the 15th century. The fourth book consists of poems of very different quality. The first. is a composition in 211 hexameters on the achievements of Messala ; and very poor stuff it is. The author is unknown ; but he was certainly not Tibullus. The poem itself was written in 31, the year of Messala's consulship. The next eleven poems relate to the loves of Sulpicia and Cerinthus. Sulpicia was a Roman lady of high station and the daughter of Valeria, Messala's sister. She had fallen violently in love with Cerinthus, about whom we know nothing but what the poet tclls us; and he soon reciprocated her feelings. The Sulpicia elegies divide into two groups. The first comprises iv. 2-6, containing ninety-four lines, in which the theme of the attachment is worked up into four grace- ful poems composed for Sulpicia and Cerinthus alternately. The second, iv. 8-12 (to which seven should be added), consists of Sulpicia's own letters. They are very short, only forty lines in all; but they have a quite unique interest as being the only love poems by a Roman woman that have escaped the ravages of time. Their frank and passionate outpourings remind us of Catullus. The style and metrical handling betray the novice in poetical

writing ; and the Latinity is ‘‘feminine.” The thirteenth poem (twenty- four. lines) claims to be by Tibullus ; but it is a miserable forgery. It is little more than a cento from Tibullus and Propertius. The fourteenth is a little epigram of four lines. There is nothing to determine itsauthorship. Last of all comes the cpigram of Domitius Marsus already referred to. To sum up: the third and fourth books appear in the oldest tradition as a single book ; if separated, they would contain only 290 and 373 lines respectively, as against 812 of the first book and 428 of the incomplete second ; and they comprise pieces by different authors and in very different styles, none of which can be assigned to Tibullus with any certainty. The natural conclusion of this is that we have here a collection of scattered compositions relating to Messala and the members of his circle which has been added as an appendix to the genuine relics of Tibullus. When this collection was made cannot be exactly de- termined ; but it was certainly not till after the death of Tibullus, and probably not till after Messala’s. Besides the foregoing, two pieces in the collection called Priapea have been attributed to Tibullus ; but there is very little external and no internal evidence of his authorship. The text of Tibullus is, on the whole, better preserved than that of Catullus, and still more so than that of Propertius. But it still contains many corruptions and several lacune, besides the disarrangements already referred to.

The value of the short Vita Tibulli, which is found at the end of the Ambrosian and Vatican, also of inferior, MSS., has been inuch discussed. E. Baehrens maintains that it is genuine, and possibly an abstract from the book of Suetonius, De Poetis,—a con- jecture supported by the fact that even in so short a piece of writing more than one Suetonian phrase occurs (Baehr., T’ibullische Blatt. , p- 4 sg.),—while Schulze (Zischr. f. d. Gymnasialwesen, Berlin, xxxil. 658) regards it as a mere rifacimento of Horace, Hp., i. 4, and various passages in Tibullus. E. Hiller (Rhein. Mus., xviii. 350) thinks it genuine, but assigns it to the late classical period, —a view quite consistent with an ultimate Suetonian origin. It is as follows : —‘‘ Albius Tibullus, eques R. e Gabiis [Baehrens’s ingeni- ous conjecture for the MS. eques regalis, R. being the customary abbreviation for Romanus], insignis forma cultuque corporis observa- bilis, ante alios Corvinum Messalam ob ingenium [so Baehr., MSS. originem, others oratorem] dilexit, cuius et contubernalis Aquitanico bello militaribus donis

donatus est. Hic multorum iudicio principem inter elegiographos optinet locum. Epistule quoque eius, quam- quam breves, omnino utiles sunt [so the MSS.; Baehrens reads subtitles. The letters referred to are Sulpicia's]. Obiit adulescens, ut indicat epigramma superscriptum" (i.e., the one ascribed to Domitius Marsus. These words seem to be a later addition to the Life).—Another moot question of some importance is whether our poet should be identified with the Albius of Horace (0d., i. 33; Epist., i. 4), as is done by the commentator Porphyrio (200-250

A.D.) in his Scholia. In the former passage Horace tells Albius to moderate his grief at the cruelty of Glycera, nor to descant in piteous elegies on her broken faith and the victory of a younger vival. It is clear that Glycera cannot be Nemesis; for it is a pseudonym, as the context shows, and Horace would, of course, have used the same pseudonym as Tibullus. If, on the other hand, Nemesis were a real name, Horace had no occasion to use a pseudonym. It is possible that Tibullus had another mistress, Glycera, of whom we know nothing further, and that the miserabiles elegi have perished ; but this is a mere supposition. The Albius of the epistle has an estate at Pedum, where Horace conjectures he may be musing or writing. He is handsome, rich, and knows how to enjoy life. He is wise and has the gift of speech, popularity, reputation, and good health abwnde,—an enviable list of attributes, but certainly one which does not agree very well with what we know from elsewhere of 'fibullus. The theory, then, that these passages refer to Albius Tibullus must be pronounced, with Baehrens, unproven ; and the forma of Horace's Albius must not be used, as Schulze uses it, to subvert the credit of the insignis forma of the Life.—Ovid, Trist., iv. 10, 58 sq., 'successor fuit hic [Tibullus] tibi, Galle, Propertius illi, quartus ab his serie temporis ipse raul In the preceding couplet he had said, '' Vergilium vidi tantum nec amara Tibullo tempus amicitie fata dedere mex." Ovid, who was born in 48, would be only twenty-four at Tibullus's death if it occurred in 19.—The loss of Tibullus's landed property is attested by himself (i. 1, 19 sg.), '' Vos quoque felicis quondam, nunc pauperis agri custodes, fertis munera vestra, Lares. Tunc vitula innumeros lustrabat cesa iuvencos ; nunc agna exigui est hostia parva soli" (comp. 41, 42). Its cause is only an inference, though a very probable one. That he was

allowed to retain a portion of his estate with the family mansion is clear from ii. 4, 58, ‘* Quin etiam sedes iubeat si vendere avitas, ite sub imperium sub titulum- que, Lares.” Compare the passages quoted above andi. 1, 77, 78.— Messala composed epigrams (Plin., Hp., v. 3) and bucolic poems (comp. the pseudo-Virgilian Catalepton, ii.) ; but he was more conspicuous as a patron than as a poet. On his circle and that of Mecenas, see Teuffel, Gesch. der rémischen Literatur, 4th ed., p. 481 (vol. i. p. 389 of the Eng. transl.). Other members of the circle were Messala’s brother, Pedius Publicola, Mmilius Macer (probably the Macer addressed in ii. 6), Valgius Rufus, Lygdamus, Sulpicia, and others, and even Ovid to a certain extent (Ov., Pont., i. 7, 28 sq.; Trist., iv. 4, 27 sq.). Tibullus was Messala’s contubernalis in the Aquitanian war (Vita Tib. and Tib., i. 7, 9 sqg., a poem com- posed for Messala’s triumph). It should be stated that the date of the Aquitanian campaign is still undetermined. It has been assigned to 30, 29, and 28. He received militaria dona (Vita); Baehrens unkindly suggests it was for purely poetical services (7%b. £l., p. 15). Tibullus’s dislike of war is always coming to the surface (e.g., 1. 8; i, 10), and so also his love of quiet and retirement (i. 1; ii. 1; 3, 1 sq.).—Apuleius (Apol., 10), ‘‘accusent Tibullum … quod ei sit Plania in animo, Delia in versu”; this is the most probable form of the name, Delia (670s) being a translation of Plania. As regards her station, it should be noticed that she was not entitled to wear the stola, the dress of Roman matrons (i. 6, 68). Her husband is mentioned as absent (i. 2, 67 sq.). She eludes the custodes placed over her (i. 2, 15, and 6, 7). Tibullus’s suit was favoured by Delia’s mother, of whom he speaks in very affectionate terms (i. 6, 57 sq.). For Tibullus’s illness at Corcyra, see i. 3, 1 sq., 55 sq. The fifth elegy was written during estrangement (discidiwm) and the sixth after the return of the husband and during Delia’s double infidelity. On the difficulty of ‘‘harmonizing” the Delia elegies, see F. Leo (in Kiessling and Wilamowitz-Mollendorf’s Philol. Unters., ii. pp. 19-23), who 1s, however, too sceptical. Any other attachments that Tibullus formed (such as the supposed one for Glycera) must have fallen between the end of the Delia and the beginning of the Nemesis connexion.—Ovid, writing at the time of Tibullus’s death (Am., iii. 9, 81), says—“ Sic Nemesis longum, sic Delia, nomen habe- bunt, altera cura recens, altera primus amor.” Nemesis is the sub- ject of book ii. 3, 4, 6. The mention of a lena (ii. 6) settles her position. The connexion had lasted a year when ii. 5 was written (see ver. 109). Itis worth noticing that Martial selects Nemesis as the source

of Tibullus’s reputation, “fama est arguti Nemesis lasciva Tibulli ’ (Hpigr., viii. 73, 7); compare xiv. 193, “ussit amatorem Nemesis lasciva Tibullum, in tota iuvit quem nihil esse domo,” where, however, the second linc is taken from one of the Delia elegies. Ovid, Amores, iii. 9, 58, “me tenuit moriens deficiente manu.” The point of this can only be seen by reference to Tib., i.1, 60, where Delia is addressed, “te teneam moriens deficicnte manu.” —The epigram of Domitius Marsus ou his death is as follows: “Te quoque, Vergilio comitem, non equa, Tibulle, Mors invenem campos misit ad Elysios, ne foret aut elegis molles qui fleret amores aut caneret forti regia bella pede.”—Tibullus condemns the rough handling which the inamorata often suffered from her Roman lover, €.g-, 1. 10, 59-60—“A ! lapis est ferrumque, suam quicumque puellam verberat ; e caelo deripit ille deos.” The tenderness of the passage paraphrased above (ii. 6, 41) is perhaps unmatched in ancient poetry :

desino, ne domine luctus renoventur acerbi. Non ego sum tanti

trey ws

ploret ut illa semel.’’——His love for a rustic life and rustic worship appears throughout whole poems, as in i. 1 and ii, 1, 2, Of his poetry he says (ii. 4, 19), “Ad dominam faciles aditus per carmina quero; ite procul, Muse, si nihil ista valent.”—Specimens of Tibullus at his best may be found ini. 1, 3, 89-94; 5, 19-36; 9, 45-68; ii. 6. Quintilian says (Jnst., x. 1, 93), “Hlegia quoque Grecos provocamus, cuius mihi tersus atque elegans maxime videtur auctor Tibullus ; sunt qui Propertium malint ; Ovidius utroque las- civior sicut durior Gallus.” —Ovid (4Am., i.c.) well calls him cultus, Martial argutus, “fine-toned.” A short but not inadequate account of Tibullus’s prosody is given by L. Mucller in his introduction to Tibullus (Catullus, Tibullus, und Propertius, Leipsic, 1880). Catullus and Tibullus lengthen a short vowel before sp and fr; Propertius always keeps it short in similar conjunctions, even where s is followed by two consonants, as in striges. Catullus, and in three cases Tibullus, allow a trisyllabic verb to close the pentameter. Propertius never permits himself this liberty, al- though in his earlier joa he has as many trisyllabic endings as Tibullus.—The chronology of the first book is discussed amongst others by Baehrens (77%. Bl., pp. 12-24). But the data do not admit in all cases of his precise

determinations. Baehrens and Hiller (Hermes, xviii. 353) agree that the second book was post- humous. If it had been known to Ovid when he wrote his eleg on the poet's death, it seems certain that he would have quoted from it. Hiller assigns 2 B.c. as an inferior limit, by which time Ov., Ars Am., iii. 3, 535 sq., must have been written. Amongst the ''disarranged poems" are i. 1, 4, 6 and ii. 3,5. Proposed re- arrangements of them may be found in Hiller's Tibullus (1885). Charisius (pp. 66 and 105) quotes part of a hexameter which is not found in the extant poems of Tibullus, The Tibullian authorship of book iii. has long ago been sur- rendered by scholars. Its latest defenders have been Fuss (De Elegg. Libro quem Lygdami esse putant, Minster, 1867) and the English translator, J. Cranstoun. It has been suggested that Lygdamus (dv-ydos, white marble) is a Grecizing of Albius, some relation of Tibullus (compare Hiller, Hermes, xviii. 353, n. 2); and this is possible. Gruppe's long-exploded theory that Ovid was the author has been recently revived by J. Kleeman (De Libri ITT, Carminibus que Tibulli Nomine circumferuntur, Strasburg, 1876). Considerable difficulty is caused by iii. 5, 15-20, which contains agreements with three passages of Ovid, Ars Am., ii. 669 sy; Tr., iv. 10, 6: "cum cecidit fato consul uterque pari" (Lygdamus and Ovid using word for word the same expression for the year of their birth, the consulship of Hirtius and Pansa) ; and Am., xi. 14, 23 sq., which are much too close to be accidental, and in which the theory that Ovid was the imitator is excluded by the fact that the lines are much more appropriate to their surroundings in Ovid than in Lygdamus. In consequence Baehrens (7%. b/., 40) regards the poem as written after 13 a.p., the date of the Tristia, while Hiller (2.c., p. 859) regards the lines as a later addi- tion by Lygdamus himself. In either case it would be published after 18. The line quoted above may have obtained proverbial currency before either of the passages was written, as the death of both consuls in one year would have impressed the Ronian imagina- tion as powerfully as the coincident deaths of Adams and Jefferson did the American. In that case no part of book iii. need be later than the Christian era. For Lygdamus's imitations of Tibullus, see Gruppe, Die rémische Elegie, i. 112 sy. There are resemblances between the pseudo-Tibullus and the Catalepton (Baehr., op. cit., p. 52).—The view of Baehrens (7b. Blétt., 49) and others that ili. and iv. originally formed one book may now be considered estab- lished, in spite of Birt's objections (Das antike Buchwesen, 426 sq.) ; and Hiller in his edition prints them as one. They

were published some time after book ii., probably after the death of Messala (Baeh- rens, op. cit., 48, adds, “and of his son Messalinus’’). Further determination of the date is impossible. We do not know when they were added to the genuine poems of Tibullus ; but it was prob- ably before the Life was written.—Most scholars since Lachmann (Kl. Schr., ii. 149) have condemned the ‘‘ Panegyric on Messala.” It is an inflated and at the same time tasteless declamation, entirely devoid of poetical merit. The language is often absurdly exagger- ated, ¢.9., 190 sg. The author himself seems to be conscious of his own deficiencies (1 sy., 177 sq.). All that we know about him is that he, like so many of his contemporaries, had been reduced to poverty by the loss of his estates (181 sq.). The date is fixed by 121 sy.—Sulpicia was the daughter of Servius Sulpicius (iv. 10, 4), and she seems to have been under the tutelage of Messala (ef. 14, 5-8), her uncle by marriage (Haupt, Hermes, iv. 33 sq.). Cerin- thus is a real name. He was probably a Greek (Baehr., p. 41 and note). He is not to be identified with the Cornutus addressed in Tib., ii. 2,8. Gruppe (op. cit., 27) and Teuffel (Studien, 367) attri- bute iv. 2-6 to Tibullus himself; but the style is different, and it is best to answer the question as Baehrens does (p. 46) with a non liquet. For Sulpicia’s style and its feminine Latinity, compare Gruppe (op. cit., 1. 49 sg.).—The direct ascription of iv. 13 (verse 18—* nunc licet e caelo mittatur amica Tibullo’’) to Tibullus prob- ably led to its being included in the collection. Later on, it and

the epigram together caused the addition of the pseudo-Tibulliana to the genuine works. Although not suspected till recently, it is unquestionably spurious ; see the examination by Postgate (Journ. of Phil., ix. 280 sq.).—The authorship of the two Priapea (one an epigram and the other a longer piece in iambics) is discussed by Hiller (Hermes, xviii. 343-9). His conclusions are that, as regards the iambics, the theory that Tibullus was its author, though from the nature of the case it does not admit of complete disproof, rests upon the slightest of foundations, and, as regards the epigram, that the hypothesis of a Tibullian authorship is quite inadmissible.

The text of Tibullus is ina much better condition than it was in Lachmann’s time, thanks to the recent discovery of new MSS. by E. Baehrens. Of these

the Ambrosianus (A), of date about 1374, and the Vaticanus (V), end of the 14th or beginning of the 15th century, agree so closely that they can be referred to an original extant in the early part of the 12th or 13th century but long since lost. A third is the Guelferbytanus (G), written in Lombard characters, but on parchment of the beginning of the 15th century. Baehrens, who attaches great importance to the original readings of this codex, considers it a faithful copy of a 10thor1lthcentury MS. Besides these we havea number of extracts from Tibullus in the Florilegium Parisinum, an anthology from various Latin writers which probably dates back to the llth century, and which we have from two MSS. at Paris (7647 and 17903); see Meyncke, Rhein. Mus., xxv. 369 sg. Baehrens considers that these excerpta Parisina and G are closely con- nected, and that their original and that of A and V were both descended from a more ancient MS., which he calls O, but which was still full of corruptions. The so-called Excerpta Frisingensia, preserved in an 11th-century MS. (now at Munich), but unfortunately very few in number, are extracted from a much better MS. than O. Still better was the Fragmentum Cuiacianuwm, which we know only from Scaliger's collation (in the library at Leyden), and which is to be carefully distinguished from the codex Cuiacianus, a late MS. containing Catullus, Tibullus, and Propertius, and still extant. It only contained from iii, 4, 65 to the end. The codices which Lachmann uscd are later than all the foregoing and full of interpolations. Baehrens's estimate of the MS. authorities for Tibullus has not been accepted in all its details. In particular his high estimate of G has been disputed by Leo, op. cit., p. 3; Rothstein, De Tibulli Codicibus, p. 67 sq. (who also endeavours to raise Lachmann's MSS. to an inde- pendent position again); and others. R. Leonhard, in a careful disserta- tion, De Codicibus Tibullianis Capita Tria (Munich, 1882), agrees with Baehrens in the main, though his pedigree of the MSS. (p. 53) is more elaborate.

Editions.—The first two editions of Tibullus and the pseudo-Tibulliana are that with Catullus, Propertius, and the Silve of Statius by Vindelin de Spira (Venice, 1472) and one of Tibullus separately by Florentius de Argentina, prob- ably printed in the same year. Compare Huschke, Tibullus, Preef., vi. sq., xxiii. sg. Amongst others we may mention those by Scaligcr (with Catullus and Propertius, Paris, 1577, 1582, &c.), Broukhuys (Amsterdam, 1708), Vulpius (Padua, 1749), Heyne (Leipsic, 1817, 4th ed. by Wunderlich

; with supplement by Dissen, 1819), Huschke (Leipsic, 1819, 2 vols.), Lachmann (Berlin, 1829, the first critical edition), Dissen (Gottingen, 1835). The most important edition with critical apparatus is that of E. Baehrens (Leipsic, 1878). The most recent edition, with critical introduction and index, is E. Hiller's (Leipsic, 1885). Recent texts are those of L. Mueller (Leipsic, 1880; also with Catullus and Propertius)and Haupt-Vahlen (Leipsic, 1885). There is no good recent comment- ary on Tibullus ; we have to fall back on Heyneand Dissen. That by B. Fabricius (Berlin, 1881) does not even comprise all the poems. Some contributions are made to the subject in F. Leo's paper in Kiessling's and Wilamowitz-Moellendorf's Philol. Unters., ii. p. 3sg., and by J. Vahlen in the Monatsberichte of the Berlin Academy, 1878, pp. 343-356. For fuller bibliographies, see Engel- mann's Bibliotheca Scriptorum Latinorwm (ed. Preuss, 1882) and J. EB. B. Mayor's Bibliographical Clue to Latin Literature (1875). For the older editions, see the preface to Huschke's. There isan excellent account of Tibullus in W. 8. Teuffel's Gesch. d. rémisch. Literatur (4th ed., L. Schwabe, 1882). Those in the Eng. tr. and Pauly's Real-Encyklopddie are antiquated. The following translations into English verse are known,—by Dart (London, 1720), Grainger (London, 1739, 2 vols., with Latin text and notes, subsequently reprinted), Cranstoun (Edinburgh and London, 1872). An Essay towards a New Edition of the Elegies of Tibullus, with a Translation and Notes (London, 1792), merely con- tains i. 1 and 7, 29-48. Sir C. A. Elton, Specimens of the Classic Poets (London, 1814, vol. xii. 141-171) contains i. 1; ii. 4; iii. 2-4; 6, 33 toend; iv. 2,3. To these should probably be added Tibullus, with other Translations from Ovid, Horace, &c., by Richard Whiffin, London, 1829. Cranstoun's is the only com- plete version of merit ; but it is far inferior to the translations by Elton, from whom Cranstoun seems sometimes to have borrowed. (J. P. P.)

TIBUR. See Tivott.

TIC DOULOUREUX. See Neurateta.

TICINO, or Tesstn, a canton of Switzerland, ranking as eighteenth in the Confederation, consists of the upper basin of the river from which it takes its name,—the Val Leventina, with the tributary valleys of Blegno and

Maggia —and farther south takes in the districts of Lugano and Mendrisio between Lakes Maggiore and Como. Its total area is 1088-2 square miles, which is exceeded by only four other Swiss cantons,—Graubiinden (Grisons), Bern, Valais, and Vaud. Of this 725°8 square miles are classed as pro- ductive, including 215°3 square miles covered by forests and 33°8 by vines; of the unproductive portion 24°3 square miles are occupied by lakes (most of that of Lugano belonging to the canton) and 13:1 by glaciers. The highest points in the canton are the Basodine (10,749 feet) in the north-west and the Valrhein (11,148 feet) in the north-east corners. In 1880 the population was 130,777 (the females exceeding the males by 10,000, doubtless owing to the emigration of the latter), being an increase of 11,158 on that of 1870; the increase was particularly marked in the Val Leventina and is due to the influence of the St Gotthard Railway, which traverses

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the entire canton. Of this population 129,409 speak Italian ; 342 of the remainder form the German-speaking hamlet of Bosco or Gurin in the Val Caverna (in north- west), a colony from the neighbouring valley of Formazza or Pommat, which is politically Italian. In religion 130,017 are Roman Catholics. Until 1859 Ticino was partly (Val Leventina, Val Blegno, and the Riviera) in the metropolitan diocese of Milan, chiefly in that of Como, and is still practically (though not legally) administered by these two bishops,—all attempts made hitherto to incor- porate them with the see of Chur or to secure the erection of a special see for them having failed. The chief towns are Lugano (6129 inhabitants), Airolo (3674), Mendrisio (2749), Locarno (2645), and Bellinzona (2436). Formerly Lugano, Locarno, and Bellinzona were the capital by turns of six years each ; but since 1881 the seat of government has been permanently fixed at Bellinzona. Ticino stands in a comparatively low position as regards moral, educa- tional, agricultural, and commercial matters. It has pro- duced a number of sculptors, painters, and architects. Many of the men migrate during the summer in search of work as picture-dealers, waiters in cafés, chimney-sweeps, and especially as masons, plasterers, labourers, and navvies. A large quantity of fruit is grown; the chief articles ex- ported are cattle, hay, fish, chestnuts, and earthenware. In manners, customs, and general character the inhabitants strongly resemble their Italian neighbours.

The canton is made up of all the permanent conquests (with one or two trifling exceptions) made by different members of the Swiss League south of the main chain of the Alps. From an historical point of view Italian Switzerland falls into three groups :—(1) Val Leventina, 7 by Uri in 1440 (previously held from 1403 to 1426); (2) Bellinzona, the Riviera, and Val Blegno (held from 1419 to 1426), won in 1500 from the duke of Milan by men from Uri, Schwyz, and Nidwald, and confirmed by Louis XII. of France in 1503; (8) Locarno, Val Maggia, Lugano, and Mendrisio, seized in 1512 by the Confederates when fighting for the Holy League against France, ruled by the twelve members then in the League, and confirmed by Francis I. in the treaty of 1516. These districts were governed by bailiffs holding office two years and purchasing it from the members of the League; each member of group 8 sent annually an envoy, who conjointly constituted the supreme appeal in all matters. This government was very harsh and is one of the darkest pages in Swiss history. Yet only one open revolt is recorded—that of the Leventina against Uri in 1755. In 1798 the people were distracted by the Swiss and ‘‘Cisalpine re- public” parties, but sided with the Swiss. On being freed from their hated masters, they were formed into two cantons of the Helvetic republic—Bellinzona (=1 and 2 above) and Lugano (=3). In 1803 all these districts were formed into one canton—Ticino— which became a full member of the Swiss Confederation. From 1810 to 1813 it was occupied by the troops of Napoleon. The roads over the Bernardino (1819-23) and the St Gotthard (1820-30) were made under the constitution of 1814. But many of the old troubles reappeared and were only done away with by the consti- tution of 23d July 1830, which (with subsequent modifications) prevails at the present time. A legislative assembly (112 members) chosen by direct election and an executive (5 members) chosen by the legislature are its principal features. The ‘‘ optional referen- dum” (permitting the submission of any law toa popular vote if asked for by a certain number of citizens) was adopted in 1883. In 1848, on religious grounds and owing to fears as to customs duties, the canton voted in the minority against the Federal constitution of that year; but in 1874, though the people voted against the re- vised constitution, the legislature adopted it, and the canton was counted as one of the majority. Since 1830 the local history of the canton has been very disturbed owing to the fact that, though Roman Catholicism is the state religion, and all the population are Roman Catholic (the few Protestants having been expelled from

Locarno in 1555), they are divided between the Radical and Ultra- montane parties. Since 1876 the intervention of Federal troops (already known in 1870) has been quite common in consequence of conflicts of the local authorities inter se, or against the Federal assembly.

See Der Kanton Tessin, by Stefano Franscini (St Gall, 1835).

TICK. See Mire.

TICKELL, Tuomas (1686-1740), English man of letters, the son of a clergyman, was born at Bridekirk, near Car- lisle, in 1686. After a good preliminary education he

went to Queen's College, Oxford, where in 1708 he took his degree, and of which college he was two years later elected fellow. He did not take orders, but by a dispensa- tion from the crown was allowed to retain his fellowship until his marriage in 1726. Asa poet Tickell displayed very mediocre qualities. His success in literature, as in life, was mainly due to the friendship and patronage of Addison, who procured for him (1717) the under-secretary- ship of state, to the chagrin of Steele, who thenceforth bore Tickell no good will. During the peace negotiations with France Tickell published the Prospect of Peace, which was well spoken of in the Spectator and reached a sixth edition. In 1717 he brought out a translation of the first book of the Zliad contemporaneously with Pope's version. Ken- sington Gardens, his longest poem, which appeared in 1722, is inflated and pedantic, and was doomed to oblivion from its birth. Dr Johnson's criticism of it gives it its due meed of praise and blame. The most popular of Tickell's poeti- cal writings was the ballad of "Colin and Lucy," which will bear comparison with some of the ballad poems of Wordsworth. Whether from fear of Pope's rivalry or from unbiassed choice, Tickell abandoned the translation of the Iliad and set about rendering the Odyssey and Lucan into English. In 1725 he was appointed secretary to the lords justices of Ireland, —a post which he retained until his death, which took place at Bath on 23d April 1740. Tickell rose once above the level of mediocrity, when he wrote his elegy addressed to the earl of Warwick on the death of Addison. Posterity has endorsed Dr Johnson's affirmation that this elegy is equal in

sublimity and ele- gance to any funeral poem which had theretofore appeared, —and this notwithstanding Steele's caustic disparagement, that it was only "prose inrhyme." Tickell also contributed to the Spectator and the Guardian.

See ''T. Tickell," in Johnson's Lives of the Poets ; the Spectator ; Anderson's English Poets; Ward's English Poets.

TICKNOR, Grorcz (1791-1871), historian of Spanish literature, was born at Boston (Mass.), on Ist August 1791. He received his early education from his father, Elisha Ticknor, who, though at that time in business, had been principal of the local Franklin public school and was the originator both of the system of free primary schools in Boston and of the first New England savings-bank. He studied at Dartmouth College from 1805 to 1807, and on leaving it was placed for nearly three years under Dr Gardiner, a pupil of Dr Parr. In the autumn of 1810 Ticknor entered the office of a leading Massachusetts lawyer, and, though his studies appear to have been liter- ary rather than legal, he was admitted to the bar in 1813. He at once commenced practice ; but a year's experiment convinced him that scholarship and letters would be more congenial to his abilities. In the spring of 1815 he set sail for England. Attractive in appearance, cultured, vivacious, and sympathetic, he had won many influential friends in America, and his introductions gave him access to most of the men then worth knowing in Europe. He spent nearly two years at Gdéttingen; but he also visited the chief towns on the Continent, meeting Prescott for the first time at Paris, and spending some months in Spain and Portugal, the life and literatures of which had already strong attrac- tions for him. Returning to America in the summer of 1819, he was inducted in the August following to the Smith professorship of French and Spanish literature and to the college professorship of belles-lettres at Harvard. The history and criticism of Spanish literature was in many respects a new subject at that time even in Europe, —the Spaniards themselves having no adequate treatment of their literature as a whole, and both Bouterwek and Sismondi having worked with scanty or second-hand re- sources. 'To supply this want, therefore, he gave his most

serious thought, developing in his lectures the scheme of his more permanent work. In June 1821 his father died, and in September he married Anna, daughter of Samuel Eliot, a merchant and founder of the chair of Greek literature at Harvard College. In the years following 1821 Ticknor made a vain effort to introduce measures of university reform. The death of his only son in 1834 and the subsequent failure of his wife's health led him to resign his post at Cambridge to Longfellow ; and in the spring of 1835 he again went to Europe, where he re- mained until 1838. From that time till his death he lived chiefly at Boston. Till 1849 he published only occasional reviews and papers, such as his essays on Moore's Anacreon, on Milton's Paradise Lost, and on Thatcher's Sermons, in 1812; on Michael Stiefel, in 1816 ; on Griscom's Zour in Hurope and on General La Fayette, in 1824; on amusements in Spain and on changes in Har- vard College, in 1825; on Chateaubriand, in 1827; on Daniel Webster, in 1831; and on the best mode of teach- ing living languages, in 1832. His History of Spanish Interature, the first editions of which appeared in New York and London in 1849, was welcomed on all hands as the standard work on the subject, and was rapidly translated into Spanish and other Continental languages. Whatever its defects, it at least reduced to system and clearness a large mass of varied historical material hitherto only vaguely known ; and its copious references to authori- ties and editions and its loving exploration of the byeways of the literature made it as valuable to scholars as its direct and unpretentious style made it popular with general readers. In many respects it was the admirable literary complement of the historical work of Prescott. Like his, the bent of Ticknor's mind was expository rather than critical ; and in both cases the standards applied were of a conventional rather than of an advanced nature. As with Prescott the glow of vivid narration often hides rather than reveals the underlying problems of social and philo- sophic import, so with Ticknor a certain fund of graceful and genial commonplace is apt to gloss over the really vital critical issues of the subject-matter. At crucial moments in place of the keener edge of criticism one is apt to find only the paper-knife intelligence of the ordinary book-lover. The defect, however, was common to the critical schools of the time. The merits of the work in its accurate survey of comparatively untrodden ground were individual and of an exceedingly high order. Ticknor subsequently took an active part in the establishment of the Boston public library, in the interests of which he paid in 1856 another visit to Europe, and to which he left at his death his fine

collection of Spanish and Portuguese works. In 1859, on the death of Prescott, he at once began to collect materials for a life of his friend, which was published in 1864. His death took place at Boston on 26th January 1871.

A Life of Ticknor, with his letters and journals, was edited by George 8. Hillard, Boston, 1876.

TICONDEROGA, a village and township of the United States, in Essex county, New York, situated upon the stream connecting Lakes George and Champlain, and ex- tending back upon an abrupt promontory which separates the two lakes. Two railroads enter the village,—the Delaware and Hudson and a branch of the Central Ver- mont. The population in 1880 was 3304.

Commanding the direct route from the St Lawrence to the Hudson, Ticonderoga was early seized by the French and fortified under the name of Fort Carillon. In July 1758 it was unsuccess- fully attacked by Abercrombie. In the same month of the suc- ceeding year it was abandoned by the French upon the approach of an English army under Amherst, who occupied it and greatly strengthened its works. At the beginning of the Revolution, in 1775, the fort was surprised and captured by Ethan Allen anda

party of Vermont militia. In 1778 it was retaken by the English under Burgoyne and was held by them until the close of the war.

TIDES

J. On THE NATURE oF TIDES. 8 1. Definition of Tide.

HEN, as occasionally happens, a ship in the open sea meets a short succession of waves of very unusual magnitude, we hear of tidal waves; and the large wave caused by an earthquake is commonly so described. The use of the term “tide” in this connexion is certainly incor- rect, but it has perhaps been fostered by the fact that such waves impress their records on

automatic tide-gauges, as, for example, when the wave due to the volcanic outbreak at Krakatoa was thus distinctly traceable in South Africa, and perhaps even faintly at Brest. We can only adequately define a tide by reference to the cause which produces it. A tide then is a rise and fall of the water of the sea pro- duced by the attraction of the sun and moon. A rise and fall of the sea produced by a regular alternation of day and night breezes, by regular rainfall and evaporation, or by any influence which the moon may have on the weather cannot strictly be called a tide. Such alternations may, it is true, be inextricably involved with the rise and fall of the true astronomical tide, but we shall here distinguish them as meteorological tides. These movements are the result of the action of the sun, as a radiating body, on the earth, Tides in the atmosphere would be shown by a regular rise and fall in the barometer, but such tides are undoubtedly very minute, and we shall not discuss them in this article, merely referring the reader to the Mécanique Céleste of Laplace, bks. i. and xiii, There are, however, very strongly marked diurnal and semi-diurnal inequalities of the barometer due to atmospheric meteorological tides. ‘Sir William Thomson in an interesting speculation ! shows: that the interaction of these quasi-tides with the sun is that of a thermodynamic engine, whereby there is caused a minute secular acceleration of the earth’s rotation. This matter is, however, beyond the scope of the present article. We shall here extend the term “tide” to denote an elastic or viscous periodic deformation of a solid or viscous globe under the action of tide-generating forces. In the techni- cal part of the article by the term ‘a simple tide” we shall denote a spherical harmonic deformation of the water on the surface of the globe, or of the solid globe itself,

multiplied by a simple harmonic function of the time.

§ 2. General Description of Tidal Phenomena.?

If we live by the sea or on an estuary, we see that the water rises and falls nearly twice a day; speaking more exactly, the average interval from high water to high water is about 122 25™, so that the average retardation from day to day is about 50”. The times of high water are then found to bear an intimate relation with the moon’s position. Thus at Ipswich high water occurs when the moon is nearly south, at London Bridge when it is south-

west, and at Bristol when it is east-south-east. For a very rough determination of the time of high water it is suffi- cient to add the solar time of high water on the days of new and full moon (called the “establishment of the port”) to the time of the moon’s passage over the meridian, either Vari- visibly above or invisibly below the horizon. The interval ability of between the moon’s passage over the meridian and high _ water varies sensibly with the moon’s age. From new moon’s moon to first quarter, and from full moon to third quarter transit. (or rather from and to a day later than each of these

phases), the interval diminishes from its average to a mini-

Defini- – tion.

Atmo- spheric tides.

High water retarded 50™ per diem.

1 Société de Physique, September 1881, or Proc. Roy. Soc. of Edinburgh, 1881-82, p. 396. 2 Founded on Airy’s “Tides and Waves,” in Ency. Metrop.

mum, and then increases again to the average; and in the other two quarters it increases from the average to a maxi- mui, and then diminishes again to the average.

The range of the rise and fall of water is also subject Spring

to great variability. On the days after new and full moon 22 the range of tide is at its maximum, and on the day after ™@P- the first and third quarter at its minimum. The maximum is called “spring tide” and the minimum “ neap tide,” and the range of spring tide is usually between two and three times as great as that of neap tide. At many ports, how- ever, especially non-European ones, two successive high waters are of unequal heights, and the law of variability of the difference is somewhat complex ; a statement of that law will be easier when we come to consider tidal theories. In considering any tide we find, especially in estuaries, that the interval from high to low water is longer than that from low to high water, and the difference between the intervals is greater at spring than at neap.

In a river the current continues to run up stream for River some considerable time after high water is attained and tes. to run down similarly after low water. Much confusion has been occasioned by the indiscriminate use of the term “tide” to denote a tidal current and a rise of water, and it has often been incorrectly inferred that high water must have been attained at the moment of cessation of the upward current. The distinction between “rising and Distinc- falling” and “flowing and ebbing” must be carefully #7 of

SSS ae ; : d rise and maintained in rivers, whilst it vanishes at the seaboard. fa1; from If we examine the progress of the tide-wave up a river, flood and we find that high water occurs at the sea earlier than ebb. higher up. If, for instance, on a certain day it is high water at Margate at noon, it is high water at Gravesend at a quarter past two, and at London Bridge a few minutes before three. The intervalfrom low to high water diminishes also as we go up the river ; and at some distance up certain rivers—as, for example, the Severn—the rising water spreads over the flat sands in a roaring surf and travels up the river almost like a wall of water. This kind of sudden rise is called a “bore.” In other cases where the differ- ence between the periods of rising and falling is consider- able, there are, in each high water, two or three rises and falls. A double high water exists at Southampton.

When an estuary contracts considerably, the range of tide becomes largely magnified as it narrows ; for example, at the entrance of the Bristol Channel the range of spring tides is about 18 feet, and at Chepstow about 50 feet.

This augmentation of the height of the tide-wave is due Aug-

to the concentration of the energy of motion of a large na yen mass of water into a narrow space. At oceanic ports the holgh ‘iy tidal phenomena are much less marked, the range of tide estuaries. being usually only 2 or 3 feet, and the interval from high

to low water sensibly equal to that from low to high water.

The changes from spring to neap tide and the relation of

the time of high water to the moon’s transit remain, how-

ever, the same as in the case of the river tides.

In long and narrow seas, such as the English Channel, Land-

the tide in mid-channel follows the same law as at a station locked near the mouth of a river, rising and falling in equal times; *“*“* the current runs in the direction analogous to up stream for three hours before and after high water, and down stream for the same period before and after low water. But near the sides of channels and near the mouths of bays the changes of the currents are very complex; and near the headlands separating two bays there is usually at certain times a very swift current, termed a “ race.”

3 See a series of papers bearing on this kind of wave by Sir W. Thomson, in Phil. Mag., 1886-87. 2 ae:

Wind.

Atmo- spheric pressure,

Tide- generat- ing forces.

Theory of equa- torial canal on earth.

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In inland seas, such as the Mediterranean, the tides are nearly insensible except at the ends of long bays. Thus at Malta the tides are not noticed by the ordinary observer, whilst at Venice they are conspicuous. ;

The effect of a strong wind on the height of tide is generally supposed to be very marked, especially in estu- aries. In the case of an exceptional gale, when the wind veered round appropriately, Airy states! that the water has been known to depart from its predicted height at London by as much as 5 feet. The effect of wind will certainly be different at each port. The discrepancy of opinion on this subject appears to be great,—so much so that we hear of some observers concluding that the effect of the wind is insensible. Variations in barometric pressure also cause departures from the predicted height of water, high barometer corresponding to decrease of

height of water. Roughly speaking, an inch of the mercury column will correspond to something less than a foot of water, but the effect seems to vary much at different ports.”

§ 3. General Explanation of the Cause of Trdes.

The moon attracts every particle of the earth and ocean, and by the law of gravitation the force acting on any par- ticle is directed towards the moon’s centre, and is jointly proportional to the masses of the particle and of the moon, and inversely proportional to the square of the distance between the particle and the moon’s centre. If we imagine the earth and ocean subdivided into a number of small portions or particles of equal mass, then the average, both as to direction and intensity, of the forces acting on these particles is equal to the force acting on that particle which is at the earth’s centre. For there is symmetry about the line joining the centres of the two bodies, and, if we divide the earth into two portions by an ideal spherical surface passing through the earth’s centre and having its centre at the moon, the portion remote fron the moon is a little larger than the portion towards the moon, but the nearer portion is under the action of forces which are a little stronger than those acting on the further portion, and the resultant of the weaker forces on the larger portion is exactly equal to the resultant of the stronger forces on the smaller. If every particle of the earth and ocean were being urged by equal and parallel forces, there would be no cause for relative motion between the ocean and the earth. Hence it is the departure of the force acting on any particle from the average which constitutes the tide-generating force. Now it is obvious that on the side of the earth towards the moon the departure from the average is a small force directed towards the moon; and on the side of the earth away from the moon the departure is a small force directed away from the moon. Also these two departures are very nearly equal to one another, that on the near side being so little greater than that on the other that we may neglect the excess. All round the sides of the earth along a great circle perpendicular to the line joining the moon and earth, the departure is a force directed inwards towards the earth’s centre. Thus we see that the tidal forces tend to pull the water towards and away from the moon, and to depress the water at right angles to that direction. If we could neglect the rotations of the bodies, and could consider the system as at rest, we should find that the water was in equilibrium when elongated

into a prolate ellipsoid with its long axis directed towards and away from the moon.

But it must not be assumed that this would be the case when there is motion. For, suppose that the ocean con- sisted of a canal round the equator, and that an earthquake or any other cause were to generate a great wave in the canal, this wave would travel along it with a velocity de-

1 Airy, “Tides and Waves.” 2 Airy, op. cit., §§ 572-573.

pendent on the depth. If the canal were about 13 miles deep, the velocity of the wave would be about 1000 miles an hour, and with depth about equal to the depth of our seas the velocity of the wave would be about half as great. We may conceive the moon’s tide-generating force as making a wave in the canal and continually outstripping the wave it generates, for the moon travels along the equator at the rate of about 1000 miles an hour, and the sea is less than 13 miles deep. The resultant oscillation of the ocean must therefore be the summation of a series of partial waves generated at each instant by the moon and always falling behind her, and the aggregate wave, being the same at each instant, must travel 1000 miles an hour so as to keep up with the moon.

Now it is a general law of frictionless oscillation that, if a slowly varying periodic force acts on a system which would. oscillate quickly if left to itself, the maximum ex- cursion on one side of the equilibrium position occurs simultaneously with the maximum force in the direction of the excursion ; but, if a quickly varying periodic force acts on a system which would oscillate slowly if left to itself, the maximum excursion on one side of the equili- brium position occurs simultaneously with the maximum force in the direction opposite to that of the excursion. An example of the first is a ball hanging by a short string, which we push slowly to and fro ; the ball will never quit contact with the hand, and will agree with its excursions. If, however, the ball is hanging by a long string we can play at battledore and shuttlecock with it, and it always meets our blows. The latter is the analogue of the tides, for a free wave in our shallow canal goes slowly, whilst the moon’s tide-generating action goes quickly.

is low water under and opposite to the moon, whilst the forces are such as to make it high water at those times.

If we consider the moon as revolving round the earth, the water assumes nearly the shape of an oblate spheroid with the minor axis pointed to the moon. The rotation of the earth in the actual case introduces a complexity which it is not easy to unravel by general reasoning. We can see, however, that if water moves from a lower to a higher latitude it arrives at the higher latitude with more velocity from west to east than is appropriate to its latitude, and it will move accordingly on the earth's surface. Following out this conception, we see that an oscillation of the water to and fro between south and north must be accompanied by an eddy. Laplace's solution of the difficult problem involved in working out this idea will be given below.

The conclusion at which we have arrived about the tides of an equatorial canal is probably more nearly true of the tides of a globe partially covered with land than if we were to suppose the ocean at each moment to assume the prolate figure of equilibrium. In fact, observation shows that it is more nearly low water than high water when the moon is on the meridian. If we consider how the oscillation of the water would appear to an observer carried round with the earth, we see that he will have low water twice in the lunar day, somewhere about the time when the moon is on the meridian, either above or below the horizon, and high water half way between the low waters.

If the sun be now introduced, we have another similar Sun's in- tide of about half the height, and this depends on solar fluence.

time, giving low water somewhere about noon and mid- night. The superposition of the two, modified by friction and by the interference of land, gives the actually observed aggregate tide, and it is clear that about new and full moon we must have spring tides and at quarter moons neap tides, and that (the sum of the lunar and solar tide- generating forces being about three times their difference)

Hence, Tides in- when the system is left to settle into steady oscillation, it verted.

Diurnal tides,

Evanes- cent in ocean of uniform depth.

Kepler.

Newton.

TiD ES

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the range of spring tide will be about three times that | this to the fact that the oscillations would last for some

of neap tide.

So far we have supposed the luminaries to move on the equator ; now let us consider the case where the moon is not on the equator. Jt is clear in this case that at any place the moon's zenith distance at the upper transit is different from her nadir distance at the lower transit. But the tide-generating force is greater the smaller the zenith or nadir distance, and therefore the forces are different at successive transits. This was not the case when the moon was deemed to move on the equator. Thus there is a tendency for two successive lunar tides to be of unequal heights, and the resulting inequality of height is called a "diurnal tide." This tendency vanishes when the moon is on the equator; and, as this occurs each fortnight, the lunar diurnal tide is evanescent once a fort- night. Similarly in summer and winter the successive solar tides are generally of unequal height, whilst in spring and autumn this difference is inconspicuous.

One of the most remarkable conclusions of Laplace's theory of the tides, on a globe covered with ocean to a uniform depth, is that the diurnal tide is everywhere non- existent. But this hypothesis differs much from the reality, and in fact at some ports the diurnal tide is so large that during two portions of each lunation there is only one great high water and one great low water in each twenty- four hours, whilst in other parts of the lunation the usual semi-diurnal tide is observed.

§ 4. Historical Sketch.

In 1687 Newton laid the foundation for all that has since been added to the theory of the tides when he brought his grand generalization of universal gravitation to bear on the subject. Kepler had indeed at an earlier date recognized the tendency of the water of the ocean to move towards the centres of the sun and moon, but he was unable to submit his theory to calculation. Galileo expresses his regret that so acute a man as Kepler should have produced a theory which appeared to him to rein-

troduce the occult qualities of the ancient philosophers.-

His own explanation referred the phenomenon to the rota- tion and orbital motion of the earth, and he considered that it afforded a principal proof of the Copernican system.

In the 19th corollary of the 66th proposition of book i. of the Principia, Newton introduces the conception of a canal circling the earth, and he considers the influence of a satellite on the water in the canal. He remarks that the movement of each molecule of fluid must be accelerated in the conjunction and opposition of the satellite with the molecule, and retarded in the quadratures, so that the fluid must undergo a tidal oscillation. It is, however, in propositions 26 and 27 of book iii. that he first deter- mines the tidal force due to the sun and moon, The sea is here supposed to cover the whole earth, and to assume at each instant a figure of equilibrium, and the tide-gener- ating bodies are supposed to move in the equator. Con- sidering only the action of the sun, he assumes that the figure is an ellipsoid of revolution with its major axis directed towards the sun, and he determines the ellipticity of such an ellipsoid. High solar tide then occurs at noon and midnight, and low tide at sunrise and sunset. The action of the moon produces a similar ellipsoid, but of greater ellipticity. The superposition of these ellipsoids gives the principal variations of tide. He then proceeds to consider the influence of latitude on the height of tide, and to discuss other peculiarities of the phenomenon. Observation shows, however, that spring tides occur a day and a half after syzygies, and Newton falsely attributed

1 Founded on Laplace, Afécanique Céleste, bk. xiii. chap. i.

time if the attractions of the two bodies were to cease. The Newtonian hypothesis, although it fails in the form which he gave to it, may still be made to represent the

axes always directed towards a fictitious moon and sun, which are respectively at constant distances from the true bodies; these distances are such that the syzygies of the fictitious planets occur about a day or a day and a half later than the true syzygies. In fact, the actual tides may be supposed to be generated directly by the action of the real sun and moon, and the wave may be imagined to take a day and a half to arrive at the port of observation.

This period has accordingly been called “the age of the Age of

“ Astres tides, if the lunar and solar ellipsoids have their major fictifs.”

tide.” In what precedes the planets have been supposed to tide.

move in the equator ; but the theory of the two ellipsoids cannot be reconciled with the truth when they move in orbits inclined to the equator. At equatorial ports the theory of the ellipsoids would at spring tides give morn- ing and evening high waters of nearly equal height, what- ever the declinations of the bodies. But at a port in any other latitude these high waters would be of very different heights, and at Brest, for example, when the declinations of the bodies are equal to the obliquity of the elliptic, the evening tide would be eight times as great as the morning tide. Now observation shows that at this port the two tides are nearly equal to one another, and that their greatest difference is not a thirtieth of their sum.

Newton here also offered an erroneous explanation of the phenomenon. In fact, we shall see that by Laplace’s dynamical theory the diurnal tide is evanescent when the ocean is of uniform depth over the earth. At many non- European ports, however, the diurnal tide is very iniportant, and thus as an actual means of prediction the dynamical theory, where the ocean is treated as of uniform depth, may be hardly better than the equilibrium theory.

In 1738 the Academy of Sciences of Paris offered, as a D. Bern- The authors ote —

subject for a prize, the theory of the tides. of four essays received prizes, viz., Daniel Bernoulli, Euler, Maclaurin, and Cavalleri. The first three adopted not only the theory of gravitation but also Newton's method of the superposition of the two ellipsoids. Bernoulli's essay contained an extended development of the conception of the two ellipsoids, and, under the name of the equilibrium theory, it is commonly associated with his name. Laplace gives an account and critique of the essays of Bernoulli and Kuler in the Mécanique Céleste. The essay of Mac- laurin presented little that was new in tidal theory, but is notable as containing those theorems concerning the attraction of ellipsoids which we now know by his name. In 1746 D'Alembert wrote a paper in which he treated the tides of the atmosphere; but this work, like Maclaurin's, is chiefly remarkable for the importance of collateral points.

The theory of the tidal movements of an ocean was Laplace.

therefore, as Laplace remarks, almost untouched when in 1774 he first undertook the subject. In the Mécanique Céleste he gives an interesting account of the manner in which he was led to attack the problem. We shall give below the investigation of the tides of an ocean covering the whole earth; the theory is substantially Laplace's, although presented in a somewhat different form. This theory, although very wide, is far from representing the tides of our ports. Observation shows, in fact, that the irregular distribution of land and water and the variable depth of the ocean produce an irregularity in the oscilla- tions of the sea of such complexity that the rigorous solu- tion of the problem is altogether beyond the power of analysis. Laplace, however, rested his discussion of tidal observation on this principle—The state of oscillation of a system of bodies in which the primitive conditions of move-

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Principle ment have disappeared through friction is coperiodic with of forced the forces acting on the system. Hence, if the sea is solicited ne by a periodic force expressed as a coefficient multiplied by the cosine of an

angle which increases proportionately with the time, there results a partial tide, also expressed by the cosine of an angle which increases at the same rate ; but the phase of the angle and the coefficient of the cosine in the expression for the height may be very different from those occurring in the corresponding term of the equilibrium theory. The coefficients and the constants or epochs of the angles in the expressions for the tide are only derivable from observation. The action of the sun and moon Is ex- pressible in a converging series of similar cosines ; whence there arise as many partial tides, which by the principle of superposition may be added together to give the total tide at any port. In order to unite the several constants of the partial tides Laplace considers each tide as being produced by a fictitious satellite moving uniformly on the equator. Sir W. Thomson and others have followed La- place in this conception; but in the present article we shall not doso. The difference of treatment is in reality only a matter of phraseology, and the proper motion of each one of Laplace's astres jictifs is at once derivable from the argument (or angle under the sign of cosine), which we shall here associate with the partial tides. ; Lubbock, Subsequently to Laplace the most important workers in Whewell, this field were Sir John Lubbock (senior), Whewell, and andAiry. Airy, The work of Lubbock and Whewell (see § 34 below) is chiefly remarkable for the coordination and analysis of enormous masses of data at various ports, and the con- struction of trustworthy tide-tables and of cotidal maps. Airy contributed an important review of the whole tidal theory. He also studied profoundly the theory of waves in canals, and explained the effects of frictional resistances on the progress of tidal and other waves. Of other authors whose work is of great importance we shall speak below.

Amongst all the grand work which has been bestowed on this difficult subject, Newton, notwithstanding his errors, stands out first, and next to him we must rank Laplace. However original any future contribution to the science of the tides may be, it would seem as though it must perforce be based on the work of these two.

A complete list of works bearing on the theory of the tides, from the time of Newton down to 1881, is contained in vol. ii. of the Bibliographie de ? Astronomie by Houzeau and Lancaster (Brussels, 1882). This list does not con- tain papers on the tides of particular ports, and we are not aware of the

existence of any catalogue of works on practical observation, reduction of observations, prediction, and tidal instruments. References are, however, given below to several works on these points.

Biblio- graphy.

II. TipE-GENERATING FoRCEs. § 5. Investigation of Tide-generating Potential and Forces.

We have already given a general explanation of the nature of tide-generating forces ; we now proceed to a rigorous investigation.

If a planet is attended by a single satellite, the motion of any body relatively to the planet's surface is found by the process described as reducing the planet's centre to rest. The planet's centre will be at rest if every body in the system has impressed on it a velocity equal and opposite to that of the planet's centre ; and this is accomplished by impressing on every body an accelera- tion equal and opposite to that of the planet's centre.

Let Mf, m be the masses of the planet and the satellite; 7 the radius vector of the satellite, measured from the planet's centre ; p the radius vector, measured from the same poiut, of the particle whose motion we wish to determine ; aud z the angle between r and p. The satellite moves in an elliptic orbit about the planet, and the acceleration relatively to the planet's centre of the satellite is (Af + m)/r? towards the planet along the radius vector r. Now the centre of inertia of the planet and satellite remains fixed in space, and the centre of the planet describes an orbit round that centre of inertia similar to that described by the satellite round the planet, but with linear dimensions reduced in the proportion of m to M-+m.

Tide- gener- ating forces.

rip hs

'are the differential coefficients with respect to p&, pn, pf of the

Hence the accelcration of the planet's centre is m/r® towards the centre of inertia of the two bodies. Thus, in order to reduce the planet's centre to rest,

we apply to every particle of the system an acceleration m/r? parallel to 7, and directed from satellite to planet.

Now take a set of rectangular axes fixed in the planet, and let M,r, Myr, Mgr be the coordinates of the satellite referred thereto ; and let ép, np, ¢p be the coordinates of the particle P whose radius is p. Then the component accelerations for reducing the planet's

centre to rest are —mM,/72, — mM,/7?, —mM,/r* ; and since these

i m, — — TPM E+ Mon + Myg), and since eos z=M,£+M.n+Ms3f, it follows that the potential of the forces by whieh the planet's centre is to be reduced to rest is

amp — Fx C0S 2

Now let us consider the other forces acting on the particle. The planet is spheroidal, and therefore does not attract equally in all directions ; but in this investigation we may make abstraction of the ellipticity of the planet and of the ellipticity of the ocean due to the planetary rotation. This, which we set aside, is considered in the theories of gravity and of the figures of planets. Outside of its body, then, the planet contributes forces of which the poten- tial is M/p. Next the direct attraction of the satellite contributes forces of which the potential is the mass of the satellite divided by the distance between the point P and the satellite ; this is—

m n/ (7? p? — 2rp cosz} To determine the forces from this potential we regard p and 2 as the variables for differentiation, and we may add to this potential any constant we please. As we are seeking to find the forces which urge P relatively to MJ, we add such a constant as will make the whole potential at the planet's centre zero, and thus we take as the potential of the forces due to the attraction of the satellite— m m {P p—2Qrpcosz} 7

It is obvious that 7 is very large compared with p, and we may therefore expand this in powers of p/r. This expansion gives us

M(Pn Pn PF 7 {2+ oP + BPet ke}

where P,= cos 2, P,=% cos? z~4, P3=$cos?z-$cosz, &c. The reader familiar with spherical harmonic analysis of course recog- nizes the Legendre's functions; but the result for a few terms, which is all that is necessary, is easily obtainable by simple algebra. Now, collecting together the various contributions to the potential,

and noticing that – . A =4 cosz, and is therefore equal and oppo-

?

site to the potential by which the planet's centre was reduced to rest, we have as the potential of the forces acting on a particle whose coordinates are pf, pn, pf

2

can i (2cos? z—4) ie cos?z—%cosz)+ .....(1). Potential. The first term of (1) is the potential of gravity, and the terms of the series, of which two only are written, constitute the tide-gener- ating potential. In all practical aged this series converges so rapidly that the first term is amply sufficient, and thus we shall generally denote

=e (COSSZ = F)Meaeassuscsaecesaues (2)

as the tide-generating potential.

In many mathematical works the tide-generating force is pre- Moon sented as being due to an artificial statical system, which produces and anti- nearly the same force as the dynamical system considered above. moon, This statical system is as follows. Stopping all the rotations, we divide the satellite into two equal parts, and place them diametri- cally opposite to one another in the orbit. Then it is clear that, instead of the term

m m a] {72+ p?—2rp coszt or" we have 4m 4m ™ Ce ef + aan oc nnannenen EE Solio n/ {72+ p?—Qrp cosz} | s/{72+p%+2rpcosz} 7 And this reduces to m m p3aP bat phat. ae The first term is the same as before; hence the statical system produces approximately the same tide-generating force as the true system. The "moon" and "anti-moon," however, produce

rigor- ously the same force on each side of the planet, whereas the true system only satisfies this condition approximately.!

1 The reader may refer to Thomson and Tait's Natural Philosophy (1883), part ii. §§ 798-821, for further considerations on this and analogous subjects, together with some interesting examples.

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§ 6. Form of Equilibrium.

Let us consider the shape assumed by a layer of fluid of density o, lying on a globe of mass Jf, when acted on by disturbing forces RE CY Wc. aneiiinn ec (3). Suppose the layer to be very thin, and that the mean radius of the layer is a, and let the equation to the boundary of the fluid be

Pee Clee ete iateansennsaveaneses (4). We assume this form, becausc the theory of harmonic analysis tells us that the departure from sphericity must be represented by a function of the form cos?z—4. That theory also gives us as the potential of a layer of matter of depth ea(cos* z— 4), and density o, at an external point the value

a\3 troa*(*) seus" a).

Hence the whole potential, outside of and up to the fluid layer, is

va ame (cos? z— 3) + $roa%(") e(cos? 2— 4) .....(5)s The first term of (5) is the potential of the globe, the second that of the disturbing force, and the third the potential due to departure from sphericity.

Now the fluid must stand in a level surface ; hence, if we equate this potential to a constant, we must get back to the equation (4), which was assumed to be that of the surface. In other words, if we put p=a[1+2(cos?z — 4)] in (5), the result must be constant, provided the departure from sphericity is small In effecting the substitution for p, we may put p=a in the small terms, but in the first term of (5) we put

Hit – e(c0s*2— 8} The whole potential (5) can only be constant if, after this substitu- tion, the coefficient of cos? z- 4 vanishes. Thus we must have

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The axis of C is taken as the polar axis, and AB is the equatorial planc, so that the functions of £, 7, ¢ are functions of the latitude and longitude of the point P, at which we wish to find the potential.

The functions of M,, M,, M; depend on the moon’s position, and we shall have occasion to develop them in two different ways,— first in terms of her hour-angle and declination, and secondly (§ 23) in terms of her longitude and the elements of the orbit.

Now let A be on the equator in the meridian of P, and B 90° east of A on the equator. Then, if M be the moon, the inclination of the plane MC to the plane CA is the moon’s easterly local hour-angle. ee h=\local hour-angle of moon and 6=moon’s declination : we

ave M,=cosdécosh, M,=cosdsinh, M,=sin 6, whence 2M,M,=cos? 6 sin 2h, M,2-M,? =cos?6 cos 2h, 2M.M,=2 sin 6 cos 6 sin h, 2M,M3=2 sin 6 cos 6 cos h, M,?+ M,? -2M,?

3

Also, if \ be the latitude of P, €=cosA, y=0, ¢=sind,

= = T =1cos*r, Ef=4sin Q, &n=0,

3(€2 4 7? — 2¢?)=1-sin?d.

3

Hence (10) becomes : cos z— 4=4 cos? cos” 6 cos 2h+ sin 2A sin 6 cos 6 cos h +# (4 —sin? 5)(}—sim? A) 00… eee Gabe

The angle h, as defined at present, is the eastward local hour-angle, and therefore diminishes with the time. As, however, this function does not change sign with f, it will be more convenient to regard it as the westward

local hour-angle. Also, if hy be the Greenwich westward hour-angle at the moment under consideration, and / be the west longitude of the place of observation P, we have

=i -sin?6.

and

ém=0,

DE SO go gps 0 aT ae Ril Lhe scone (12) But if 3 be the mean density of the planet J7=47a8, and gravity | Hence we have at the point P, whose radius vector is a, g=H/a. Then we easily find that 3ma? oom 1 6 i 55 {4 cos? \ cos? 6 cos 2(h — 7) + sin 2A sin 5 cos 6 cos (Ay — Z) Or TL, cs RO (6). 45344 ain 6)(9 Sagi? N) pisses sates. one (13). Potential Nae of Thus the equation to the surface is The tide-generating forces are found by the rates of variation of y devel- ‘tee ee { T We liat a (ate z-4)} (7). for latitude and longitude, and also for radius a, if we care to find oped in un. elas me the radial disturbing force. ee — If o be a compared en 6, ine ee ae is a ; thus we en. sce that 1/(1— 20/5) is the coefficient by which the mutual attrac- : y ies ; ; = 1 tion of the fluid augments the deformation of the fluid under the ree sie Rea Sel One Ee, 8. action of the disturbing force. If the density of the fluid be the sunt : . same as that of the sphere, the augmenting factor becomes $, and The westward component of the tide-generating force at the earth’s we have e=4,5ma/gr®, which gives the form of equilibrium of a fluid surface, where p=a, 1s dV Ja cos ddl, and the northward component ; 38mg 36 is dV/ady ; the change of apparent level is the ratio of these to sphere under the action of these forces. Since a= 2(1 — Bs)& | gravity g. dREReIOt, differentiating (18), changing signs, and it follows that, when the form of equilibrium is p=a[1 +e(cos? z—4)], | writing sis) for pie we have component change of level south- the potential of the forces is 2M\r 2gr8 rat =r)e (cos? z— $) (8) = 3 : a 55)? ~~ ee fi pas = rads) {sin 2A cos? 6 cos 2(hy — 2) — 2 cos 2A sin 26 cos (49-4) Lunar More gencrally, if we neglect the attraction of the fluid on itself, 4M\r +sin 2A(1—3sin?6)}; so that o/6 is treated as small, and if p=a(1+s) be the equation to the surface of the fluid, where s is a function of latitude and longi- | component change of level westward tude, then the potential of the forces under which this is an equi- 3m (a3 : librium form is =i) {cos\cos*dsin 2(hy—1) v= Ie (9) +sin

Asin 26 sin (fig —Z)} .....sereee (14). ; a RR tarae The westward component is made up of two periodic terms, one going Tide- It thus appears that we may specify any tide-generating forces by through its variations twice and the other onee a day. The south- generat- means of the figure of equilibrium which the fluid would assume | ward component has also two similar terms; but it has a third ing foree under them, and in the theory of the tides it has been found prac- | term, which does not oscillate about a zero value. If A be a de- specified tically convenient to specify the forees in this way. clination such that the mean value of sin?6 is equal to sin? A, by equi- | By means of the principle of ‘ forced vibrations” referred to in | then, to determine the southward component so that it shall be librium the historical sketch, we shall pass from the equilibrium form to | a truly periodic function, we must subtract from the above form. the actual oscillations of the sea. sin 2\(1—8 sin? A), and the last term then becomes 4 in2 2 § 7. Development of Tide-generating Potential in Terms of asin oNeu A ‘ — ; ne Hour-Angle and Declination. In the case of the moon, A varies a little according to the position Develop- We now proceed to develop the tide-generating potential, and of the moon’s node, but its mean value is about 16 31.

ment of shall of course implicitly (§ 6) determine the equation to the equili- tide-gen- brium figure.

erating

We have already seen that, if z be the moon’s zenith distance at

potential. the point P on the earth’s surface, whose coordinates referred to

A, B, C, axes fixed in the earth, are aé, an, af, then

cos 2= —M, ar 1M. ae Ms, where M,, M,, M, are the moon’s direction cosines referred to the same axes. Then with this value of cos z—

7? M.2-M.2 eos? 2 — |= 287MM, +2*- CaN

5 =o + 2yfM.M, + 2é¢M,M, . 8 <u>725? M</u> M-2M;? a a

The constant portion of the southward component of force has its effect in causing a constant heaping up of the water at the equator ; or, in other words, the moon’s attraction has the effect of causing a small permanent ellipticity of the earth’s mean figure. This augmentation of ellipticity is of course very small, but it is necessary to mention it in order that the meaning to be attributed to lunar deflexion of gravity may be clearly defined.

If we consider the motion of a pendulum-bob during any one day, we sec that, in consequence of the semi-diurnal changes of level, it twice describes an ellipse with major axis east and west, with ratio of axes equal to the sine of the latitude, and with linear dimensions proportional to cos?6, and it once describes an ellipse whose north and south axis is proportional to sin 26 cos 2\ and whose east and

west axis is proportional to sin2ésind. Obviously the latter is eireular in latitude 30°. When the moon is on the equator, the maximum deflexion occurs when the moon’s loeal hour-angle is 45°,

and is then equal to 3m (a\3 oi *) cosi.

At Cambridge in latitude 52° 43’ this angle is 00216.

An attempt, made by George and Horace Darwin,’ to measure the lunar deflexion of a pendulum failed on account of incessant variability of level occurring in the supports of the pendulum and arising from unknown terrestrial changes. The work done, therefore, was of no avail for the purposes for which it was instituted, but remained asa contribution to an interesting subject now be- ginning to be studied, viz., the small changes which are always taking place on the upper strata of the earth.

§ 9. Correction to Equilibrium Theory for Continents.

Effect of In the equilibrium theory as worked out by Newton and Ber- land in noulli it is assumed that the figure of the ocean is at each instant equili- one of equilibrium under the action of gravity and of the tide- brium generating forces. Sir W. Thomson has, however, reasserted? a theory. point

which was known to Bernoulli, but has since been overlooked, namely, that this law of rise and fall of water cannot, when por- tions of the globe are continents, be satisfied by a constant volume of water in the ocean. The law would still hold if water were appropriately supplied to and exhausted from the ocean ; and, if in any configuration of the tide-generating body we imagine water to be instantaneously so supplied or exhausted, the level will every- where rise or fall by the same height. Now the amount of that rise or fall depends on the position of the tide-generating body with reference to the continents, and is different for each sucli position. Conversely, when the volume of the oeean remains con- staut, we have to correct Bernoulli's simple equilibrium theory by an amount which is constant all over the globe at any instant, but which changes in time. Thomson's solution of this problem has since been reduced to a form which is easier to grasp intelligently than in the shape in which he gave it, and the results have also been reduced to numbers.3 It appears that there are four points on the earth's surface at which in the corrected theory the semi- diurnal tide is evanescent, and four others where it is doubled. A similar statement holds for the diurnal tide. As to the tides of long period, there are two parallels of latitude of evanescent and two of doubled tide.

Now in Bernoulli's theory the semi-diurnal tide vanishes at the poles, the diurnal tide at tlie poles and the equator, and the tides of long period in latitudes 35° 16' north and south. The numerical solution of the corrected theory shows that the points and lines of doubling and evanescence in every case fall close to the points and lines where in the uncorrected theory there is evanescence. Whcn in passing from the uncorrected to the corrected theory we speak of a doubled tide, the tide doubled may be itself 222, so that the result may still be nz2. The conclusion, therefore, is that Thomson's cor- rection, although theoretically interesting, is practically so small that it may be left out of consideration.

III. DynamicaL THEORY OF TIDES.

§ 10. Historical Explanation.

The problem of tidal oscillation is essentially a dynamical one. Even when the ocean is taken as covering the whole earth, it pre- sents formidable diffieulties, and this is the only case in which it has been hitherto solved.*

Laplace gives the solution in bks. i. and iv. of the Afécanigue Céleste; but his work is unnecessarily complicated by the inappropriate introduction of spherical harmonic analysis, and it is generally admitted that his investigation is difficult. Airy, in his ‘‘Tides and Waves” (in Ency. Mctrop.) presents the solution free from that complication, but he has made a eriticism of Laplace’s method which we believe to be wrong. Sir W. Thomson has written some interesting papers (in Phil. Mag., 1875) in justification of Laplace, and on these we base the following paragraphs. This portion of the article is given more fully than others, because there exists no complete presentment of the theory free from objections of some kind.

§ 11. Equations of Motion. Let r, 0, ¢ be the radius vector, co-latitude, and east longitude of a point with reference to an origin, a polar axis, and a zero-meridian rotating with a uniform angular velocity m from west to east. Then, if K, H, = be the radial, co-latitudinal, and longitudinal accelerations of the point, we have

Dyna- mical theory.

Equa- tions of motion.

1 Reports to the British Assoc., 1881 (York) and 1882 (Southampton).

2 Thomson and Tait, Nat. Phil., § 807.

3 Darwin and Turner, Proc. Roy. Soc., 1886.

4 Sir W. Thoinson’s paper ‘‘On the Gravitational Oscillations of Rotating Water,” in Phil. Mag., August 1880, bears on the same subject. It is the only attempt which has hitherto been made to consider the effects of the earth’s rotation on the oscillations of land-locked seas.

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air don? ig gfe y

R=7p-” a) —r sin o(Geen é

mat S ae —r sin 6 cos o(+n) Pear: (15). ee (=) = ep a sin? 0 apt

Now suppose that the point never moves far from a zero position and that its displacements é, 7 sin@ co-latitudinally and longi- tudinally are very large compared with its radial displacement p, aud that the velocities are so small that their squares and products are negligible compared with n?r?; then we have dr_dp dt dt yao ‘ r sin 6 10 Ly sin 6), do _dé “di dt Hence (15) is approximately R= —n*rsin? 0

DY

ae dn

, avery small quantity ;

ede = ee Cle ER eer caCace (16). Com- a ” dé ponent H=sin 0-7 + 2n cos Oa accelera- tions.

With regard to the first equation of (16), we observe that the time has disappeared, and that 2 has exactly the same form as if the system were rendered statical by introducing a potential 4n?r*sin2@ and annulling the rotation of the axes. Bice inertia plays no sensible part radially, it follows that, if we apply these expressions to the formation of equations of motion for the ocean, the radial motion need not be considered. We are left, therefore, with only the last two equations of (16).

We now have to consider the forces by which an element of the Com- ocean is urged in the direction of co-latitude and longitude. These ponent forces are those due to the external disturbing forces and to the forces. pressure of the surrounding fluid, the attraction of the fluid on itself being supposed negligible. We have seen in (9) that, if fluid on a sphere of radius a be uuder the action of disturbing forces whose potential is Ur?, and if r=a+ be the equation to the sur- face, then must gj=Ua?. Hence, if ¢ be the equilibrium height of tide, the potential of the disturbing force is ger*/a*. But, if the elevation be }, the potential under which it would be in equili- brium is ghr?/a?. Therefore, if } be the elevation of the tide in our dynamical problem, the forces due to hydrostatie pressure on an element of the ocean are the same as would be caused by a potential — gh7?/a®. Hence it

follows that the whole forces on the clement are those due to a potential — g(-¢)r?/a. Therefore from (16) we see that the equations of motion are

oe 2nsinOcosé = 7d =e) dé at i d ..(17). Equa- Tp pe SS 2. we eee tions of sin 0 apt 2n cos 6 i can © 3 t) mere

It remains to find the equation of continuity. This may be deduced geometrically from the consideration that the volume of an element of the fluid remains constant ; but a shorter way is to derive it from the equation of continuity as it occurs in ordinary hydrodynamical investigations. If V be a velocity potential, the equation of con- tinuity for incompressible fluid is

df av . d smpecaVy AG “sind 5050) +305(7 sind cr?) d WGA The element referred to in this equation is defined by 7, 0, ¢,

r+6r, 6+60, +6. The co-latitudinal and longitudinal veloci- ties are the saine for all the elementary prism defined by 6, ¢,

dV dV 0+60, @+6¢, and the sea bottom. Then = Poe

sin Pall and, since the radial velocity is dh/dt at the surface of the

at ocean, where r=a+y, and is zero at the sea bottom, where r=a, adV_r-ady : : : we have a 7 ae Hence, integrating with respect to 7 from

r=a+y to r=a, and again with respect to ¢ from the time ¢ to the time when }, é, 7 all vanish, and treating y and as small com- pared with a, we have

Ha sin 6+ id. (yé sin 8) + IS og S100) = Olsens (18). Equa-

a6 dp tion of

This is the equation of continuity, and, together with (17), it forms continu- the system which must be integrated in the general problem of the jty, tides. The difficulties in the way of a solution are so great that none has hitherto been found, except on the supposition that y, the depth of the ocean, is only a function of latitude. In this case (18) becomes

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Led : ‘dn _ Bat ag gg VE 80 A) tga Oe vrerrerreree (19).

§ 12. Adaptation to Forced Oscillations.

Adapta- | Since we may suppose that the free oscillations are annulled by tion to friction, the solution required is that corresponding to forced oscil- forced lations. Now we have seen from (18) that e¢ (which is proportional oscilla- to VY) has terms of three kinds, the first depending on twice the tions. | moon’s (or sun’s) hour-angle, the second on the hour-angle, and the third independent thereof. The coefficients of the first and second terms vary slowly, and the whole of the third varies slowly. Hence e has a semi-diurnal, a diurnal, and a long period term. We shall see later that these terms may be expanded in a series of approxi- mately semi-diurnal, diurnal, and slowly varying terms, each of which is a strictly harmonic function of the time. Thus we may assume for ¢ a form e cos (2n/t-+kp +a), where f and & are numbers, aud where e is only a function of co-latitude and of the elements of the orbit of the disturbing body. According to the usual method of treating oscillating systems, we may therefore make the follow- ing assumption for the form of solution e=e cos (2nft+kp+a) h=h cos (2ft +k + a) ~=x cos (Qnft+kd +a) n=y sin (2nft+ko+a) where e, h, x, y are functions of co-latitude 9 only. Substituting these values in (19), we have

1 @ : ae go™ sin 0)+kyy +ha=0 Then, if we write u for h—e, and put m=n”a/g, substitution from (20) in (17) leads at once to . 1 du

xf?+y/ sin 0 cos =

...(20),

yf? sin 0+xfcos 0= -— Ey, Solving (22) for x and y, we have 1 (/du k&_ cosé Priel AN ee ee a aie 008 t= GN ae* f° ane -l1fcos@du ku . bas 2 es hae FORE – ee os 4m\ f d@- sin @ Then substituting from (28) in (21), we have

Final 1d sin 6 ty ucos@) | _ oe ‘do * sin 0 equation. sin 6 dé a = ne sin 0(f2 —- cos? @) SATO DE 6} =‘0). vse ccceesvones en eecasiane (24). This is Laplace’s equation for tidal oscillations in an ocean whose

depth is only a function of latitude. When u is found from this equation, its value substituted in (23) will give x and y.

»+-(23).

cosOdu ku

§ 13. Preparation for Solution.

The ocean which is considered in this case is not like that on the earth’s surface, and therefore it does not seem desirable to pursue the integration of (24) except in certain fier cases.

In (13) we have the expansion of the disturbing potential and implicitly of the disturbing forces in three terms, the first of which is variable in half a day, the second in a day, and the third in half the period of revolution of the tide-raising body. Forestal- ling the results of chapter iv.—each of these terms may be expressed as the sum of a series of strictly harmonic functions of the time ; the first set of these have all approximately semi-diurnal periods, the second approximately diurnal periods, and the third vary slowly in dependence on the periodic time of the tide-generating body. The first set involve twice the terrestrial longitude, the second the longitude, and the third set are independent of the longitude of the place of observation. From these statements compared with (138) we see that in the semi-diurnal terms / is approximately unity, 4=2, and e=E sin? 0; in the diurnal terms f is approximately 4, k=1, and e=E sin 6 cos @; in the terms of long period f is a small fraction (for the fortnightly tide about +g), k=0, e=E(4-cos? 6). The departure from exactness in the rela- tion f=1 for the semi-diurnal, and f=4 for the diurnal terms is generally (except for certain critical depths of ocean) not such as to greatly change the nature of the results from those obtained when Laplace’sf=1 and 3 rigorously. Hence the integration of (24) will be

Prepara- tion for solution.

three pursued on these three hypotheses, giving Laplacc’s three kinds of kinds of oscillation. The hypothesis which will be made with regard to y

oscilla. is that y=/(1—g cos? 6), and in the case of the semi-diurnal tides tion. we shall be compelled by mathematical difficulties to suppose g to

be either unity or zero. The tides of zonal seas may be worked out, and more complex laws of depth may be assumed; but for the discussion of such cases the reader is referred to Thomson’s papers in Phil. Mag., 1875.

There might be reason to conjecture that the form of u would be similar to that of e, and this isin fact the case for the diurnal tides

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for any value of g and for the semi-diurnal tides when q is unity. Preli- Before proceeding further it will be convenient to exhibit two minary purely analytical transformations of the first two terms of (24) transfor- which hold true for certain values of & and f, and when u has such mations. a form as that suggested. If we put k=1, f=4, y=U(1-q¢ cos? 6),

then, if v= sin 6 cos @, it will be found on substitution that

. av dv v pee 1 a (sin apt 200086) i 2 cot “0 ate ye a sin 6 dé — cos? 6 Y + – cos? 0 = oe :

Again, if we put E=2, f=1, g=1, y=U(1— cos? 6)=1 sin? 6, and if v= sin? 6,

= naw dv 2Qv 1 ag Hsin egg +20c0s0) redo nO _ S. sin 6 d6 1 – cos? 6 YT costo v …(26).

Another general property of (24) is derived from the supposition that u is expressed in a series proceeding by powers of J; thus

2

lel as ia a oe Let v, %, 2, &e., be so chosen that, when u is substituted in (24), the coefficient of each power of / vanishes independently ; then the term independent of J obviously gives v= —e, and the connex-

ion between successive 2’s is cos 6 dup,

Gt, COSA Mm | kUm

(sin 0 +m cos 0) a f de + Sin 6

at 7 sin 0 (f*- cos? 6) SAUL UNO) salecisorrs(osersianssesaicies (28).

We shall suppose below that u is expansible in the form (27), and shall use (28) in conjunction with (25) or (26) for finding the successive values of the v's.

id sin 6 dé

§ 14. Diurnal Tide.

Let us first consider the diurnal tides. We have e=E sin 6 cos 6, Diurnal k=1, and f=; then %»=—-Esin@cos@. Hence by (28) and (25) tide. —Blgy + 41 =O) oo… sennnadsoreensie '

Applying the same theorem a second time,

V_=(2q/m)y,, and so on ; therefore u=%,[1 + 2l¢/ma + (2lg/ma)?+...]

and therefore 0= hoy

cs Soe : ee ie (30). Butu=h-—e; hence, —_—_2lq/ma he T— 2lq/ma° sae cee cesceeseersnreeees (81).

It appears, therefore, that the tide is " inverted," giving low water where the equilibrium tide gives high water. If q=0, so that the ocean is of uniform depth, the tide vanishes,

§ 15. Semi-Diurnal Tide, with Variable Depth.

Next let us consider the semi-diurnal tide in the case where y=1, Semi- so that y=/ sin? 6. Then e=E sin? 0, k=2, f=1; also y= —e= diurnal -—Esin?@. Hence by (28) and (26) — 8/x)+ 4mlv,=0, whence v,= tide. 2/mvy. Applying the same theorem a second time, 7.=(2/m)*%», and so on ; therefore u=%,[1 + 21/ma + (21/ma)?+...]

~ % ar € $_{1-2i/ma}$ = 1 —2l/ma’ -_ _ _ _2d/ma Hence h=u+e= 1— 2i/ma° 5 ad, eisle/ele”alo(ale oid wna vies (32),

If 22/ma =}, the height of tide is equal to the equilibrium height ; but it is inverted, giving low water where the equilibrium theory gives high water. In the case of the earth m=1/289, and therefore this relation is satisfied if? 7=a/1156. Hence in a sea 3000 fathoms deep at the equator, and shallowing to the poles, we have inverted semi-diurnal tides of the equilibrium height.

§ 16. Semi-Diurnal Tide, with Uniform Depth.

The method of development used above, where we proceed by powers of the depth of the ocean, is not applicable where the depth is uniform, because it leads to a divergent series. We have there- fore to resume equation (24). In the case of the semi-diurnal tides we have for the depth y=/ (a constant by hypothesis), 4=2, f=1 approximately, and e=Esin?@. Now for brevity let B=4ma/I, y=sin 6, so that e=Ev*, Then we find that on development (24) becomes da T du

v1 – Yh ras (8 — 2v? – By4)u= – BES ..... (33). Let us now assume as the solution of this equation u=(K,—- Ey*?+ Ky4+ Keo +... + Kow*+... ..... (84), Substituting from (34) in (33), and equating to zero the coefficients of the successive powers of v, we find K,=£, K, apparently inde- terminate, and 2i(2¢ + 6) Kop14 — 20(24+ 3) Kao + BKo=0 Since K,=0, this equation of condition may be held to apply for all positive integral values of z, beginning withi=0. It is obvious that Kg is determinable in terms of K, and K,, Kg in terms of K,

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and K,, &c., so that all the X’s are to be found in terms of UE, which is known, and of K, which is apparently indeterminate.

The condition for the convergency of the series (34) for u and for the series du/dv is that Koi40/K2 shall tend to a limit less than

Again, under the same circumstances we have in the limit when 7 is very large—

(Qi+4)Ko p43 2344 ; 2143 ea(14 il ya a. 8 Vy?

(Qi +2) Korot)” 2142 2746 é+1 2(¢4+ 8) =(1 — 1/27)». ws But the ratio of successive terms of (1 —»*)~4 tends to (1 – 3/0)r*. Hence, if Kaj4o/Ko; does not tend to become infinitely small, du/dy=C+ D(1- v?)-4, where C and D are finite for all values of ». an _ {= FECN I-A +.

i .

Therefore at the cquator, where y=1, du/d0=D, a finite quantity. Hence the hypothesis that Ko:+2/Ks; tends to be not infinitely small

Now

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Since h vanishes when »=0, there is no rise and fall of water at the poles. When v=1 at the cquator, we find

p=40, h= —7:434E

B=10, h= 11:267E

p= 5,h= POAe.

The negative sign in the first case shows that the tide is inverted at the equator, giving low water when the disturbing body is on the meridian. Near the pole, however, that is, for small values of v, the tides are direct. In latitude 18° (approximately) there is a nodal line of evanescent semi-diurnal tide. In the second and third cases the tides are everywhere direct, increasing in magnitude from pole to equator. As § diminishes the tides tend to assume their equilibrium value, because all the terms, save the first, become evanescent. When S=1 (depth y; of radius) the tide at the equator still exceeds its equilibrium value by 11 per cent. As diminishes from 40 to 10 the nodal line of evanescent tide contracts round the ole, and when it is infinitely small the tides are infinitely great. “he particular value of 8 for which this occurs is that where the free oscillation of the ocean has the same period as the forced oscilla- tion. The values chosen by Laplace were

not well adapted for the illustration of the results, because in the cases of B=40 and B=10 the depth of the ocean is not much different from that value which would give infinite semi-diurnal tide. For values of 6 greater than 40 we should find other nodal lines dividing the sphere into regions of direct and inverted tides. We refer the reader to Sir W. Thomson's papers for further details on this interesting point.

§ 17. Tides of Long Period ; Laplace's Argument Srom Friction.

leads to the conclusion that u and du/dé are finite at the equator. But on account of the symmetry of the system the co-latitudinal displacement £ must vanish at the equator, and therefore x also. By (28), when f=1, k=2, v=sin 8,

1 /du) oo pasbe 6). vex ial got cos

In treating these oscillations Laplace remarks that a very small Laplace's — amount of friction will be sufficient to cause the surface of the argu- ocean to assume at each instant its form of equilibrium, and he ment adduces in proof of his conclusion the considerations given below. from The friction here contemplated is such that the integral effect is friction represented by a retarding force proportional to the velocity of the unsound,

But we have just seen that this hypothesis makes u finite when v=1 or 0=90", and therefore at the equator _1 dua = Fin do? Now symmetry necessitates a vanishing value of du/d@ at the equator. Thus the hypothesis that Kei+2/Ko: tends to be not in- finitely small is negatived, and we conclude that, on account of the symmetry of the motion, it is infinitely small for infinitely great values of i, This being established, let us write (36) in the form

a finite quantity.

Koso

water relatively to the bottom. Although proportionality to the square of the velocity would probably be nearer to the truth, yet Laplace's hypothesis suffices for the present discussion.

n oscillations of this class the water moves for half a period north, and then for halfa period south. In oscillating systems, where the resistances are proportional to the velocities, it is usual to specify the resistance by a modulus of decay, namely, that period in which a velocity is reduced to e~! of its initial value by friction. Now the friction contemplated by Laplace is such that the modulus of decay is short compared with the semi-period of oscillation. The quickest of the important tides of long period is the fortnightly (see chapter

Ku 207436 — (22 M5 Goes (36a). ner ponies as eee ct oe me a modulus sipesics , of decay mus ri red w 5 it seems prac- oli le — —— ene) meee be! te spe al ae 2 the bed of the root opie a : are = P+3t : ‘ materially affect the velocity of a slow ocean current in a day or two. se Ko 20430 – TESTE TESy _ [+1 1364 8 Hence we cannot accept Laplace’s discussion as satisfactory. How- fraction. 2(é+2)?+3(¢+2) —&c. (87). | ever this may be, we now give what is substantially his argument. And we know that this is a continuous approximation to Ko;40/Ko;, Let us write 6 for the reciprocal of the modulus of decay. Then which must hold in order that the latitudinal velocity may vanish | the frictional forces introduced on the left-hand side of (17) are at the equator. Writing N;=Ko:40/Ko, all the V’s may be com- | + édé/dt in the first and sin 66dn/dt in the second. Laplace’s puted from the continued fraction (37). Then hypothesis with regard to the magnitude of the frictional forces K,=E, K,/E=M, Kp/E=N No, Ke/E=N,N.N3, &e. enables us to neglect the terms d7£/d¢# and sin 6 d°n/dé? compared We cannot compute K, from K,, Kz from Kg, and so on; for, if we | with the frictional forces. Then, if we observe that in oscillations do, then, short of infinite accuracy in the numerical values, we shall | of this class the motion is entirely latitudinal, equations (17) and be gradually led to successive values of the K’s which tend to | (19) become de : dn gdy_ aa —2 — 2n sin 0 cos 8 = = (h- 2) equality. ; dt dt a ado This process was followed by Laplace without explanation. It ‘ dn dé was attacked by Airy in his ‘‘ Tides and Waves” (in Ency. Metrop.) sin 067 2n cosO- =O hse aees (38). and by Ferrel in his Tidal Researches (U.S. Coast Survey, 1873), but . d ; was justified by Sir W. Thomson in the Phil. Mag. (1875, p. 280). ha sin 6 aoe sin #)=0 The investigation given here is substantially Thomson’s. ’ : ; Solu- Laplace gives numerical solutions for -three different depths of From the first two of Ue we easily obtain tions. the sea, g2s5y, ras, sates Of the

earth’s radius. Since m=-4,, (6+ ae cos2 0) ee ae er (39). these correspond respectively to the cases of 8=40, 10, 5, and the &° dt a dé

solutions are

B=40, h=E{v?+ 20°1862»4 10°1164y8 — 18°1047v8 —15°4488r10 — 7:4581v12— 9:1975y14— 0:4501v18— 0:0687r18 — 0°0082»29 0-0008»22— 0:0001y7...}

B=10, h=E{v?7+ 6:1960v4 + 324746 + 0°7238y8 + 0-0919r1° 0°00767” 0:0004!4…}

B= 5, h=Elv?+ 0°75044 + 0°1566r5 + 0°0157v8+ 0:0009r1° + ...}

1 Thomson calls this a dissipation of accuracy. It may be illustrated thus. Consider the equation x2-32+2=0, which may be written either =3+4322 or x=3-2/c. Now letz,, 41=3+322,, and suppose we start with any value zo, less than unity, and compute a, 9,...,. Then, starting with x, in the equation %__1=3 — 2/a,,if we work backwards, we ought to come to the original value %. In fact, however, we shall only do so if there is infinite accuracy in all the numerical values. For, start with z9=4, then 2;=°75, x= “8542, #3= “9099, %4= “9527, x= “9692; and the values go on approximating to 1, which is a root of theequation. Next start backwards with z5;=-97, and we find 24=-938, x3= 868, X= “696, 7) = “127, x9 = -— 12°75, w_y=8°157, w_9=2°367, &_3=2°155, x_4=2°072; and the values go on approximating to 2, the other root of the equation.

As a first approximation we treat dt/dt as zero, and obtain h=z, or the height of water satisfies the equilibrium theory. In these tides (see chap. iv.) e=% (4- cos? 9) cos zt, so that from the third equation of (38) we can obtain a first approximation to £; then, sub- stituting in (39), we obtain on integration a second approximation to . Laplace, however, considers as adequate the first approxima- tion, which is simply the conclusion of the equilibrium theory.

§18. Tides of Long Period in an Ocean of Uniform Depth.

As it seems certain that these tides do not satisfy even approxi- Tides of mately the equilibrium law, we now proceed to find the solution long In the case of thesc tides k=0, f a small period

where there is no friction. fraction, and e=E(4-—cos?@), The equation (24) then becomes = 7a = d *+4ma(u+e)=0; sin 0 d@0* ——_—

\f’? — cos?

Method of con- tinued fraction.

TIDES

or, writing « for cos @ and e=E (4 — 2),

d (_1-# du ii (vies a.) = 27077 (U1. 30) besenEOeBReBbon (40). We shall confine the investigation to the case where y=/, a con- stant, and where the sea covers the whole surface of the globe. The symmetry of the motion in this case demands that u when ex- panded in a series of powers of « shall only involve even powers. Let us assume, therefore, that

1 d we = Tum Bue + Bus + aon + Bopp ywttt + sea peeeee tall): Th EE: : – we a az Bul (Bs = Bet alta (Boia — Boj) 241 + oe

—s —_—_——,. — — — 2 eee du = ae) B, + 8(B; — By)? +

+(2¢+1) (Bory — Bo-a)w#+ 20.0 oe. (42). Again, a= —f°B w+ (By, —/?Bs uF +... + (Bai — Bap) te… (48),

1 ;

u=C-$/°B yw? + 4(B, —f/?Bs)u4+ ... + 5; Bai-s —f*Boj-1)* + (44),

where C is a constant. Then, writing 6 for 4ma/J, as in the case of the semi-diurnal tide, substituting from (42), (48), and (44) in (40), and equating to zero the successive coefficients of the powers of p, we find C= wee Se)

By-B,(1- 535 778) +46B=0

; (45).

1 2 B = Bai – Ban(1 “For JB) SCT ED) Ba-3=0 Thus the constant C and Bs, B,, &c., are all expressible in terms of B,, and B, is apparently indeterminate. We may remark that, if

2 Bas 1E, or B-,= — 2E,

the equation of condition (45) may be held to apply for all values of ¢, from one to infinity. Let us write (45) in the form

Bort 1 ‘ B Bas

Baa) age 1)! Ot aR By When 7 is large Boj+1/Bo:-1 either tends to become infinitely small or it;does not do so. Let us ey punee that it does not tend to become infinitely small. Then it is obvious that the successive B’s tend to become equal to one another, and so also do the values of (Boj-2 —/*Bo:-1) /2¢ and the coefficients of du/du. Hence we have dujdu = D+M)/(1—m”), for all values of u, where Z and M are finite. Hence this hypothesis gives infinite velocity to the fluid at the pole, where ~=1. But with a water-covered globe this infinite velocity is impossible, and therefore the hypothesis is negatived, and By4:/Bs:-1 must tend to become infinitely small. This being established, let us write (46) in the form

pak Pie Bo-1_——:2t(2¢ +1) Bus ,_ FB Bawa 2i(2t+1) Boa By repeated applications of (47), we have in the form of a con- tinued fraction

B Baa 24(27+1) BO Boi-3 JB (20+ 2)(2¢+ 3) B 226-41) TB (24 +4)(27+5) (26+ 2)(2¢ + 8) 7B ~(Bi+ 4)(2545) + &c. (48).

And we know that this is a continuous approximation, which must hold in order to satisfy the condition that the water covers the whole globe. Let us denote this continued fraction by – V;. Then, if we remember that B_;= — 2E, we have B,=2EM,, B,/B,= — NV», B;/B3= — 3, B,/Bs= – My, &c., so that B,= —-2EN,N,, B;5=2EN|N,N3, By= ~~2EN, N,N,N, &c., and C= —~~ $E+2EN,/p. Then h=u+e =C+4E-(E+3/°B,)y? +4(B,—/°B,)u4 + 4(B, —/7B;) uo +... = E{2M1/8 -—(1 +f?)u? + 3.4 (1 + F722) ut 4 4N,N.(1 +f7N 5) uo +. . ny Now we find that, when 8=40, which makes the depth of

the sea 3000 fathoms or zg55 of the radius of the earth, and with J=‘0365012, which is the value for the fortnightly tide (see chap. iv.), N,=3°040692, N,=1:20137, N,=°66744, V,=‘42819, V;=:29819, N,= 21950, p= 16814, N= BRASH. LV — ll Ove Nive ale These values give

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2N,/B=“15208, 1+f2N,=1-0041, 4N,(1+f2N,) =1°5298, EN,W(1+f2N,)=1:2187, 40,N,NQ(1+f2N,) =-60988 EN ,....N4(1 +f2N5) = “20888, AN, ...N5(1 725) =-05190, Ny… Ne(1/2N;)= “00976, 1N,... W(1 4/25) =-0014, ak Dia \ ase a RN, ...N9(1+f2Np) = 00017, a

h/e= {1520 – 1:0041 u? + 1°5228u4— 1:2187 48+ 6099u8 — 2089419 Solutions,

+ 0519)? — -0098 4 + 001436 — 000218} + (4 — 2) (50). At the pole, where w=1, h= —Ex ‘1087=e x “1556 5 and at the equator, where »=0, h= +E x ‘1520=e x ‘4561 } (51). Now let us take a second case, where 8=10, which was also one of those solved for the case of the semi-diurnal tide by Laplace, and we find h/E= ‘2363 —1-0016u? + °5910u4— 1627+ 02588 — ~~0026u1° + °0002.}2, At the pole, where w=1, we find h= —~~ E x ‘3187=e x ‘471, and at the equator h= +E x :2363=ex ‘709. With a deeper ocean we should soon arrive at the equilibrium value for the tide, for IN foe, Jsiee &c., become very small, and 2N,/8 becomes equal to 3. In this case, with such oceans as those with which we have to deal, the oe of long period are considerably smaller than the equilibrium value.

§ 19. Stability of the Ocean.

Imagine a globe of density 6, surrounded by a spherical layer of Stability water of density o. Then, still maintaining the spherical figure, and of the with water still covering the nucleus, let the layer be displaced ocean.

sideways. The force on any part of the water distant 7’ from the centre of the water and r from the centre of the nucleus is 4707″ towards the centre of the fluid sphere and 47(5—«)r towards the centre of the nucleus. If 6 be greater than o there is a force tend- ing to carry the water from places where it is deeper to places where it is shallower ; and therefore the equilibrium,

thus arbitrarily dis- turbed, is stable. If, however, 6 is less than o (or the nucleus lighter than water) the force is such that it tends to carry the water from where it is shallower to where it is deeper, and therefore the equilibrium of a layer of fluid distributed over a nucleus lighter than itself is unstable. As Sir William Thomson has remarked,}

if the nucleus is lighter than the ocean, it will float in the ocean Stabilities with part of its surface dry. Suppose, again, that the fluid layer of various be disturbed, so that its equation is r=a(1+s;), where s; is a sur- orders.

face harmonic of degree 7; then the potcntial due to this deforma-

t+3 tion is rat = s;, and the whole potential is

4rrda® dro wits Br | +1 rit *

If, therefore, o/(2i+1) is greater than }6, the potential of the forces due to deformation is greater than that due to the nucleus. But we have seen that a deformation tends to increase itself by mutual attraction, and therefore the forces are such as to increase the deformation. If, therefore, s=}(2/+1)é, all the deformations up to the ith are unstable, but the 7+1th is stable? If, however, o be less than 6, then all the deformations of any order are such that there are positive forces of restitution. For our present purpose it suffices that this equilibrium is stable when the fluid is lighter than the nucleus.

§ 20. Precession and Nutation.

Suppose we have a planet covered with a shallow ocean, and that Preces- the ocean is set into oscillation. Then, if there are no external dis- sion and turbing forces, so that the oscillations are ‘‘free,” not ‘‘forced,” nutation.

the resultant moment of momentum of the planet and ocean remains constant. And, since each particle of the ocean exccutes periodic oscillations about a mean position, it follows that the oscillation of the ocean imparts to the solid earth oscillations such that the re- sultant moment of momentum of the whole system remains constant. But the mass of the ocean being very small compared with that of the planet, the component

angular velocities of the planet necessary to counterbalance the moment of momentum of the oscillations of the sea are very small compared with the component angular velocities of the sea, and therefore the disturbance of planetary rotation due to oceanic reaction is negligible. If now an external disturbing force, such as that of the moon, acts on the system, the resultant moment of momentum of sea and earth is unaffected by the interaction between them, and the precessional and nutational couples are the same as if sea and earth were rigidly connected together. Therefore the additions to these couples on account of tidal oscillation are the couples due to the attraction of the moon on the excess or deficiency of water above or below mean sea-level. The tidal oscillations are very small in height compared with the equatorial protuberance of the earth, and the density of water is viths of that of surface rock ; hence the additional couples are very small compared with the couples due to the moon's action on the

1 Thomson and Tait, Nat. Phil., § 816. 2 Compare an important paper by Poincaré, in Acta Math. (1885), 7; 3, 4.

Correc- tions to preces- sion and nutation insen- sible.

Tides in rivers.

Inter- ference of waves in shal- low water.

solid equatorial protuberance. Therefore precession and nutation take place sensibly as though the sea were congealed in its mean position. If the ocean be regarded as frictionless, the principles of energy show us that these insensible additional couples must be periodic in time, and thus the corrections to nutation must consist of semi-diurnal, diurnal, and fortnightly nutations of absolutely insensible magnitude. 'We shall have much to say below on the results of the introduction of friction into the conception of tidal oscillations as a branch of speculative astronomy.

§ 21. Some Phenomena of Tides in Rivers.

In § 2 we have given a description of some of the phenomena of the tide-wave in rivers. As a considerable part of our practical knowledge of tides is derived from observations in estuaries and rivers, we give an investigation of two of the most important features of the tide-wave in these cases. It must be premised that when the profile of a wave does not present the simple harmonic form it is convenient to analyse its shape into a series of partial waves superposed on a fundamental wave ; and generally the principle of harmonic analysis is adopted, in which the actual wave is regarded as the sum of a number of simple harmonic waves.

The tide-wave in a river is a “long” wave in which the vertical motion of the water is very small compared with the horizontal, the river very shallow compared with the wave-length, and the water which is at any moment in a vertical plane always remains so throughout the oscillation.

Suppose that the water is contained in a straight and shallow canal of uniform depth ; then take an origin of coordinates at the bottom, with the x axis horizontal in the direction of the canal, and the y axis vertical ; let % be the undisturbed depth of water ; let 4+ 7 be the ordinate of the surface corresponding to that fluid whose undisturbed abscissa is x and disturbed abscissa x + & ; and

let g be gravity. The equations of motion and continuity } are

PE oy CHa

ae 9″ (1+ dé/dx)s . _ ~Adéldae_ see eeeecceeeenere (52). = 14 dé/de

For brevity we shall write ?=gh and u=t-2. Since for “ long” waves dt/dx is small, the equations (52) become approximately

f. (1-82)

aide. (aN 58 aes eh aes sieen aa h- ~ de® \de

For finding a first approximation we neglect the second term on the right of each of (53). The solution is obviously E=a cos m(vi — %) =a cos mu n= — mah sin mu (54) gives the height of the water whose undisturbed

abscissa is x, and since é is small this is approximately the height at the point on the bank whose abscissa is. But now suppose that at the origin (the mouth of the river) the canal communicates with a basin in which there is a forced oscillation of water-level given by = AORN eapanes PR he poner (55).

Fig. the over-tide is th of the fundamental and has a range of 2 feet. If the river shallows very gradually, the formula will still hold, and we see that the height of over-tide varies as (depth) 3.

Fig. 12 read from left to right exhibits the progressive change

of shape. The steepness of the advancing crest shows that it is a shorter time from low to high water than vice versa. The law of the ebb and flow of currents mentioned in § 2 may also be easily determined from the above investigation. We leave the reader to determine the effect of friction, which is given by inserting a term — pdé/dt on the right-hand side of (57).

(ii.) Compound Tides (see § 24).—We shall now consider the mutual influence of two waves of different periods travelling up the river together. In the first approximation they are quite inde- peudent, and we may assume

t=a cos m(vt—x)+bcos[n(vt—-x) +e] .....006 (61).

In proceeding to the second approximation, we only take notice of those terms which result from the interaction of the two, and omit all others, writing for the sake of brevity

wigs =(m—-n)\(vt-x) -«, {m+n} =(m+n)(vt ~— x) +e. With the value of £ assumed in (61), we find, on substituting in (53)

and only retaining terms depending on mutual influence, that the equations for the second approximation are

1 See, for example, Lamb’s Hydrodynamics, chap. vii. 2 From Airy, ‘‘Tides and Waves.” : 4

TIDES

This represents the oceanic tide, and n is that which we call below (§ 23) the speed of the tide. Then obviously m=1/v, so that at any point x up the river

x =H sin nf = =.) 2 f gh (56) gives the first approximation to the forced tide-wave, and it is clear that any number of oscillations may be propagated inde- pendently

the river. the investigation into two branches.

up the river with the velocity \/gh due to the depth of Over In passing to the second approximation we must separate tides.

(i.) Over- Tides (see § 24).—We now suppose that the tide at the .

river mouth is simply (55). On substituting the approximate values (54) in (53) our equations become

DE oh Bandy land of

ana sin 2mu tig n_ _ a eg ee ee = dat ee £m’a? cos 2mu

We have now to assume an appropriate form for the solution of (57), such as t=a cos mu+ Ax cos 2mu+ B sin 2mu 58). We have here in effect assumed that the second and third terms of (58) are small compared with the first. It is clear, however, that at a distance from the origin the term in A will become large. This difficulty may be eluded by taking the canal of finite length, and supposing that, where the canal debouches into a second basin, a second appropriate forced oscillation is maintained. The length of the canal remains arbitrary, save- that the second term of (58) shall still be small compared with the first. On substituting from (58) in (57) we have B indeterminate and A= — §a*m ; hence nlh=kma?—masinmu + fmsarasin 2mu + (2mB-} m’a?)cos2mu (59). This gives the elevation of the water whose undisturbed abscissa is 2, that is to say, at the point whose abscissa along the bank is X=a+é If we put <=X-—é in the largest term of (59), and treat ¢as small, and put =X in the small terms, (59) becomes

nlh= — ma sin m(vt — X) + §miarX sin 2m(vt — X)

+ (2mB — §m?a*) cos 2m(vt — X).

But at the origin (55) holds true, therefore B=;me’, – mah=H,

and mv=n. ‘Thus the solution is x ox,) 8H (e.g = ~—= J+ —=NXsi = . n= Hsin aft Jah a al sin 2n\ ¢ =a) (60)

From (60) we can see what the proper forced oscillation at the further end of the canal must be; but this matter has no present interest. The first term of (60) being called the fundamental, the second gives what is called the first over-tide; and by further approximation we can get the second, third, &c. The over-tide travels up the river at the same rate as the fundamental, but it has double frequency or me rae the ratio of its amplitude to that N

4h h g As a numerical example, let the range of tide at the river mouth be 20 feet and the depth of river 50 feet. The “speed” of the

semi-diurnal tide is about 1/1°9 radians per hour ; «/g=27 miles 8H nX_ 1

—_— —?

4h /gh 342

of the fundamental is

per hour ; hence X. Therefore 34 miles up the river

TE = oth + geabmnf(m +n)sin {m+n} —(m-n)sin{m— “he) n[h= — abmn{cos {m+n} — cos {m—n}]—-dé/dx

Now let us assume as the solution t=acos m(vt —x)+Azcos{m+n} + Bsin {m+n} (63) ;

+b cos [n(vt — x) €] Cx cos{m—n}+Dsin{m—n} J . and let us elude the difficulty about the increasing magnitude of the second term in the same way as before. Substituting in the equation of motion, we have for all time,

2(m+n)A sin {m+n} +2(m—n)C sin {m—n} +3abmn[(m +n) sin {m+n} — (m—n) sin {m—n}]=0. This gives A= — fabmn and C= +4abmn. B and D

remain arbi- trary as before, and will be dropped, because they are to be deter- mined by the condition that at the origin the terms of dé/dx in cos {m+n}, cos{m—n} are to vanish, whence n —amsin m(vt — x) — bn sin [n(vt — x) +€] + 2abmn[(m+n)a sin{m +n} —(m—n)ax sin ym — ny] + terms in cos{m+n}and cos {m—n}. Then we pass from x to X as in the last section, and make the terms in cos {m+n} and cos {m—}vanish by proper values of Band D, and we have n=amhsin m(vt — X) — bnhsin{[n(vt — x) +€] +8abmnX[(m+n) sin {m+n} —(m—n) sin {m—n}] (64).

Now at the river's mouth, where x=0, suppose that the oceanic tide is represented by 7=H, sin 2,¢ +H, sin (Mot + €).

Solution giving first over-tide,

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Then -am=HJh, – bn=H,/h, habmn=H,H,/h,

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of heights and times of high and low water, soon shows that the

fe Ny te fusion of two simple harmonic or periodic funetions is insufficient MV=M, NV=Nq, V=A/gh, Mtn= /gh ? to represent the state of tide; and the height and time of high so that (64) becomes water are found to need corrections for the variations of declination, x ; xX of motion in right ascension, and of the parallaxes of both bodies.

Solutions n=A,sIin na(i = ~~.) + Hy, sin EG —-———)+ c| But when eontinuous tide-gauges were set up far more extended for com- a gh Noh data than those of the older observations became accessible to the pound 3H) i 1 + No ¢ dia [ie i(t- x) +e| investigator, and more and more corrections were found to be ex- tides. 4h / oh Nie gh pedient to adapt the formule to the facts. A systematic method 3H,H, nm, – Nay os a gs of utilizing all the data became also a desideratum. This state of

oa | Wen sin [= m)(t-Fa) = 1 (65). matters led Sir W. Thomson to suggest the analytic method.! It Analytic

As a numerical example, suppose at the mouth of a river 50 feet deep that the solar semi-diurnal tide has a range 2H,=4 feet, and thelunar 2H, =12 feet ; then n, +.=$#radians per hour, 2, — %.= #7

is true that the dynamical foundations of that method have always method.

lain below the surface of the synthetic method, and have constantly been appealed to for the theoretical determination of corrections ; nevertheless, we must regard the explicit adoption of the analytic

radians per hour, and as before \/gh=27 miles per hour. With | method asa great advance. In this method we conceive the tidal these figures 8H Hy m+ y_ 1 x forces or potential due to each disturbing body to be developed into Ah n/gh 70” a series of terins each consisting of a constant (determined by the

Thus 15 miles up the river the quater-diurnal tide (in § 24 below, called MS) has a semi-range of an inch. But the luni-soiar fort- nightly tide (called MSf in § 24) would have a semi-range of gyth of aninch. Where the two interacting tides are of nearly equal speed, the summation compound tide is very large compared with the differential tide. As before, when the river shallows gradually this formula will still hold.

It is interesting to note the kind of effect produced by these compound tides. When the primary tides are in the same phase

elements of the planct’s orbit and the obliquity of the ecliptic) multiplied by a simple harmonic function of the time. Thus in place of the terms of the synthetic method for the three classes of tides we have an indefinitely long series of terms for each of the three classes. The loss of simplicity in the expression for the forces is far more than counterbalanced by the gain of facility for the discussion of the oscillations of the water. This facility arises from the great dynamical principle of forced oscillations, which we have explained in the historical sketch. Applying this principle, we see that each individual term of the harmonic development of the tide-

x se al x generating forces corresponds to an oscillation of the sea of the Then (my +){ ¢- >=) +e=2n,t — (ny n.) 5 same period, but the amplitude

~~and phase of that oscillation must 1 n/, 1 1 2)) 4 : afpateree epend on a network of causes of almost inextricable complication. gh NV gh depend on a network of f almost inextricable complicat x x The analytic method, then, represents the.tide at any port by a (7 — No) oe = = (m — 9) 7 series of simple harmonic terms whose period is determined from and g 9 theoretical considerations, but whose amplitude and phase are found xX oH. a4 xX from observation. Fortunately the series representing the tidal n=(H, H,sinm,(t~~ mm Th an fe asin] Qmt—(m +N) | forces converges with sufficient rapidity to permit us to consider NV gh 4 gh NV gh only a moderate number of harmonic terms in the series. _ 8H Hy m4 – . (=e) + Now it seems likely that the corrections which have been applied sin Xx ; y. PP 4h Joh oq in the use of the synthetic method might have been elothed in a

Hence the front slope of the tide-wave is steeper at spring than at neap tide, and the compound tide shows itself in the form of an augmentation of the first over-tide ; and the converse statements hold of neap tide. Also mean-water mark is lower and higher alternately up the river at spring tide, and higher and lower alter-

more satisfactory and succinct mathematical form had investigators first carried out the harmonic development. In this article we shall therefore invert history and come back on the synthetic method from the analytic, and shall show how the formule of correction stated in harmonic language may be made comparable with them

in synthetic language. One explanation is expedient before pro- Fusion of ceeding with the harmonic development. There are certain terms terms

in the tide-generating forces of the moon, depending on the longi- affected tude of the moon’s nodes, which complete their revolution in 18°6 by mo- years. Now it has been found practically convenient, in the appli- tion of cation of the harmonic method, to follow the synthetic plan to the moon’s

nately at neap tide, by a small amount which depends on the dif- ferential tide. With the river which we were considering, the alternation would be so long that it would in actuality be either all lower or all higher.

IV. Toe Harmonic ANALYSIS.

Two ee : :

; F extent of classifying together terms whose speed differs only in node. ets § 22. Methods of applying Theory to Practice. , consequence of ‘he mdvenient of the moon’s abe, and at the bane Seat §=6The comparison between tidal observations and tidal theories, | time to conceive that there is a small variability in the intensity of ing ob- and the formation of tables predicting the tidal oscillations of the | the generating forces.

Serva- —_ sea, have been carried out in two different ways, which may be mi – a tions. = called the “synthetic” and the “analytic.” § 28. Development of Equilibrium Theory of Tides in Terms Syn- The semi-diurnal rise and fall of tide with the weekly alternation of the Elements of the Orbits. thetic of spring and neap would naturally suggest to the investigator Within the limits at our disposal we cannot do more than in- Equili- method. to make his formula conform to the apparent simplicity of the | dicate the processes to be followed in this development. brium phenomenon. He would seek to represent the height of water by We have already seen in (8) that the expression for the moou’s theory; either one or two periodic functions with a variable amplitude ; | tide-generating potential is elements such a representation is the aim of the synthetic method. That yao” —— or orbits method has been followed by all the great investigators of the past, ~ Ors Kan +>), intro- lege Bernoulli, La ops mpage Lubbock, Whewell, Airy. | and in (10) that duced. Since at European ports the two tides which follow one another on —7* M,?~~M,? any one day are nearly equal, or, in other words, there is scarcely cos? z— }=2)M,M, 2 2 aan 2 2 2ngMoM, + 26MM, a sensible diurnal tide, these investigators bestowed comparativel 2 NY.2 Ei 2 little attention to the diurnal wise If these are maeicctad, the eee eee synthetic method is simple, for a single function suffices to repre~~ as A pas the tide. In aca eaten hoiee however, the diurnal ed is | Where M,,M,,M; are the direction cosines of the moon referred to sometimes so large as to mask the semi-diurnal, and to make only | @X¢s fixed in the earth. We hy ers ba a single instead of a double high water in twenty-four hours. To find the functions M,M,, 3(M,’— Mz y represent this diurnal tide in the synthetic method we are compelled | &¢-» of the moon’s direction cosines. c to

introduce at least one more function. There should also be a | Let_A, B, C (fig. 2) be the axes ye third function representing the tides of long period ; but until the | 1 the Ny C being ba ae ‘ a last few years these tides have scarcely been considered, and there- and AB t a. e vu a he a fore we shall have little to say of them in explaining the synthetic | Second set of oe : (4 a the plane Three method. The expression for the tide-generating forces due to either | f the moon’s orbit ; bi ae ., age elasses sun or moon consists of three terms, involving the declinations and of the moon in her orbit; J=ZC, the 7 of tides. hour-angles of the planet. One of these terms for each goes through | °bliquity of the lunar orbit to the a

its period approximately twice a day, a second once a day, and the third varies slowly (§ 7). The mathematical basis of the synthetic method consists of a synthesis of the mathematical formule. The semi-diurnal term for the moon is fused with that for the sun, aud the same process is carried out for the diurnal and slowly varying terms. A mass of tidal observation at a place where the diurnal tide is small, even if, as in all the older observations, it consists merely

equator ; x=AX=BCY ; J=MX, the Fig. 2.

1 Airy, and after him Chazallon, appear to have been amongst the first to use a kind of harmonic analysis for reducing tidal observations ; but, as Airy did not emancipate himself from the use of hour-angles, declinations, &c., his work can hardly be considered as an example of the analytic method ; see his ‘‘ Tides and Waves,” and Hatt’s Phénoméne des Marées, Paris, 1885,

2 For further details of the analysis of this section, see the Report ‘‘On Harmonic Analysis, &c.,” for 1883 to the British Association (Southport).

Moon’s moon’s longitude in her orbit measured from X, the intersection of longitude the equator with the lunar orbit, hereafter called the “‘intersection. and obli- Then quity of orbit in- M,= —cos/ sin x+sin cos x cos if troduced. . M,= sinlsinl Writing for brevity p=cos $1, Y=Sin $I….sssceeeseereeeeeerenees (67), we find that M,?-M,2=p* cos 2(x — 1)

+ 2p°q cos 2x + qf cos 2(x +1) —2M,M,=the same with sines in place of cosines M.M,= — p*q cos(x — 20) +992? – g?) cos x + percos(x + 21) M,M,=the same with sines in place of cosines. 4 — Mg?= 4(p4 — 4p°q? +94) + 2p”q? cos 2 These are the required functions of My, Mg, M3. ee Now let ¢ be the moon’s mean distance, ¢ the eccentricity of the moon’s orbit, and let

M,= coslcosx+sin jose |

(68).

Moon’s distance and ec- centricity intro-

duced. Then, putting

— 72 f xe —)}iy,, ¥= 1a) ify, 2 =e) Fat, (70), we have _ 2_ v2 Ve gets enV + of at ON” + Ong VL-+ 2EXZ

2 2 92 KX21V2-972 OCCT gg Saba oles) (71).

2 3 3

Corresponding to the definition of a simple tide given in § 1, the expression for each term of the tide-generating potential should consist of a solid spherical harmonic, multiplied by a simple time- harmonic. In (71) p%n, p(é2—7?), &c., are solid spherical har- monics, and in order to complete the expression for V it is necessary to develop the five functions of X, Y, Z in a series of simple time- harmonics. But (71) may be simplified in such a way that the five functions are reduced to three. The axes fixed in the earth may be taken, as in § 7, to have their extremities as follows :—the axis C the north pole, the axis B 90° E. of A on the equator, and the axis A on the equator in the meridian of the place of observa- tion. Thus, if \ be the latitude of that place, we have

t=cos\, 7=0, f=sin X. Tide- Then, writing a for the earth’s radius at the place of observation, generat- (71) becomes

ing po- rae. . etal. A= aa cos? \(X? a Y?)+sin 2AXZ + $(4 — sin? \)§(X24 Y?2-22?)]_…...(7a).

The process of developing the three functions of X, Y, Z consists in the introduction of the formule of elliptic motion into (66) and (70), the subsequent development of the X-Y-Z functious in a series of trigonometrical terms, and the rejection of terms which appear numerically to be negligible. The terms depend- ing on the principal lunar inequalities— evection and variation— are also introduced. Finally, the three X-Y-Z functions are ob- tained as a series of simple time-harmonics, with the arguments of the sines and cosines linear functions of the earth's rotation, the moon's mean motion, and the longitude of the moon's perigee. The next step is to pass, according to the principle of forced oscillations, from the potential to the height of tide generated by the' forces corresponding to that potential. The X-Y-Z functions being simple time-harmonics, the principle of forced vibrations allows "us to conclude that the forces corresponding to V in (71a) will gencrate oscillations in the ocean of the same periods and types as the terms in V, but of unknown amplitudes and phases. Now let ¥?- 3%', XZ, 4(X?+ WW? – 22?) be three functions having respectively similar forms to those of RAS? d d-e -ey 3 a – ea but differing from them in that the argument of each of the simple time-harmonics has some angle subtracted from it, and that the term is multiplied by a numerical factor. Then, if g be gravity and h the height of tide at the place of observation, we must have

2

h =" lh cos?h(X2—I9) +- sin QAXZ + $(4—sin2A)4(F2 4 W"-22Z")] (72).

1(X?+V2— 272)

Height of tide at any port.

The factor ra*/y may be more conveniently written sa) %

where A/is the earth's mass. It has been so chosen that, if the equili- brium theory of tides were fulfilled, with water covering the whole _ earth, the numerical factors in the X-1J-Z functions would be each Defini- unity and the alterations of phase would be zero. The terms in tion of | 4(X* + 9? —

22”) require special consideration. The function of the high tide latitude being 4—sin?A, it follows that, when in the northern of tide of hemisphere it is high water north of a certain critical latitude, it long is low water on the opposite side of that parallel; and the same is period. true of the southern hemisphere. It is best to adopt a uniform

Thp i’s

system for the whole earth, and to regard high tide and high water as consentaneous in the equatorial belt, and of opposite meanings outside of the critical latitudes. We here conceive the function always to be written L-sin?\, so that outside of the critical lati- tudes high tide is low water. We may in continuing the develop- ment write the ¥-39-Z functions in the form appropriate to the equilibrium theory, with water covering the whole earth; for the actual case it is only then necessary to multiply by the reducing factor, and to subtract the phase alteration x. As these are un- known constants for each place, they would only occur in the development as symbols of quantities to be deduced from observa- tion. It will be understood, therefore, that in the following schedules the “argument” is that part of the argument which is derived from theory, the true complete argument being the “‘argu- ment” —x, where x is derived from observation.

Up to this point we have supposed the moon’s longitude and the earth’s position to be measured from the intersection ; but in order to pass to the ordinary astronomical formule we must measure the longitude and the earth’s position from the vernal equinox. Hence we determine the longitude and right ascension of the intersection in terms of the longitude of the moon’s node and the inclination of the lunar orbit, and introduce them into our formule for the X-B-Z functions. The expressions for the functions corresponding to solar tides may be written down by symmetry, and in this case the intersection is actually the vernal equinox.

The final result of the process sketched is to obtain a series of Explana- terms each of which is a function of the elements of the moon’s or tion of sun’s orbit, and a function of the terrestrial latitude of the place of schedules observation, multiplied by the cosine of an angle which increases below. uniformly with the time. We shall now write down the result in the form of a schedule ; but we must first state the notation em- ployed :—e,

e,=eccentvicities of lunar and solar orbits; J, w=ob- liquities of equator to lunar orbit and ecliptic ; p, p,=longitudes of lunar and solar perigees ; «,a,=hourly increments of p, p,; 3, h= moon’s and sun’s mean longitudes ; ¢, »=hourly increments of s,

h; t=local mean solar time reduced to angle ; y—7=15″ per hour ; A=latitude of place of observation ; £, y=longitude in lunar orbit,

and R.A. of the intersection ; NW=longitude of moon’s node; ¢= inclination of lunar orbit. The speed of any tide is defined as the Speed rate of increase of its argument, and is expressible, therefore, as defined. a i function of y, 7, o,@; for we may neglect w, as being very

small.

The following schedules, then, give h the height of tide. The arrangement is as follows. First, there is a universal coefficient ots) ® which multiplies every term of all the schedules. Secondly,

there are general coefficients, one for each schedule, viz., cos? A for the semi-diurnal terms, sin 2d for the diurnal, and }-$ sin?) for the terms of long period. In each schedule the third column, headed “coefficient,” gives the functions of Zand e (and in two cases also of p). In the fourth column is given the mean semi-range of the corresponding term in numbers, which is approximately the value of the coefficient in the first column when J=w; but we pass over the explanation of the mode of computing the values. The fifth column contains arguments, linear functions of 4, h, s,p,»,£. In [A, i.] 2¢ +2(h-v) and in (A, ii] ¢+(k—v) are common to all the arguments. The arguments are grouped in a manner convenient for subsequent computation. Lastly, the sixth is a column of speeds, being the hourly increase of the arguments in the preceding column, estimated in degrees per hour. It has been found practi- cally convenient to denote each of these partial tides by an initial letter, arbitrarily chosen. In the first column we ere a descriptive name for the tide, and in the second the arbitrarily chosen initial. In some cases no initial has been chosen, and here we indicate the tide by the analytical expression for its speed, or hourly increase of argument.

The schedule for the solar tides is drawn up in precisely the same manner, the only difference being that the coefficients are absolute constants. The eccentricity of the solar orbit is so small that the elliptic tides may be omitted, except the larger elliptic semi- diurnal tide. In order that the comparison of the importance of the solar tides with the lunar may be complete, the same universal – , om coefficient OM term is made to involve the factor = Here 7=9—% m, being the

1

With

M a 2

ee ae 46085 => T7996

To write down any term, take the universal coefficient, the Mode of general coefficient for the class of tides, the special coefficient, and reading multiply by the cosine of the argument. The result, taken with schedules the positive sign, is a term in the equilibrium tide, with water cxplained. covering the whole earth. The transition to the actual case by the introduction of a factor and a delay of phase (to be derived from observation) has been already explained. The sum of all the terms is the complete expression for the height of tide h.

3

(*) a is retained, and the special coefficient for each

sun’s mass.

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Schedule of Lunar Tides. [B.]—Schedule of Solar Tides.

: : i 38 mas , : ; 3 M/a\3 [A, i.]—-Universal Coefficient = amc)” Solar Tides; Universal Coefficient =5 = (<) a. Semi-diurnal Tides ; General Coefficient =cos?). : Gy > ae = og Speed in & Pr Speed in jesciptive = Coefficient. #9 | Argu- | Degrees – Descrip- |-8 Ccosmerent a O’s Argument

Degrees a A hs ment. | per m.s. tive Name. |= lala sae 2t+2(h -¥.) per m.s, ae) Hour. s > § Hour. | aa {i.]—Semi-diurnal Tides ; General Coefficient = cos? . Principal 530 on | Prinei Gn, ! ier ay | ACSA ewseaT 4406 -2(s-é) 2gr-os41042, | | Principal |g) | (1 – fe2)keostdw j2ts7] 22 |s0~-0000000 Luni-solar ’ wo Luni-solar (lunar {Ky} = (1+ ge*)sin?T_—|-03929 30°-0821872) | | “(solar por-| Kg} —Q+4e2)tsintw —_|-o1se8| otter |s0°-0821372 portion). tion). a = OPA valletic, N 3. 4ecos44I “08796 -2(s-£)-(s-p) 28°-4397296) Se. el-} = le,cost}w [01248 |2t—- (h – p,) |29°-9589314 Sealer feaeocthT x wears Fe a ag ae {ii.]—Diurnal Tides ; General Coefficient = sin 2). elliptic.’ | 1] {1-12tn?=cos(2p-28)} 4 tanR=— sin 2p-8) | Solar diur-) p | 711 — ge2)ksin.w cos?4w |08775| t-h-+-Jar |14°-9580814 Elliptic, cot24I-6cos2(p-é) | Luni-solar Z ‘ second PN] g.Ye2oostyT —O1I78 -2(6-8)-2s-p) __arreosssas| | (Solar por Ky | -C+4e7bsinwcosw [08407] r+-4— 4a j15”-o410689 % { i0n). Largan – }.49$mecosthI re 3 ~~2(s~~)-+(s-p)+2h-2s |28°-5125830] | | [iii.]}—Long Period Tides ; General Coefficient =} -— 3 sin? X. , 5 | Semi-an- T, ‘ eveoHonal. FH mecost4r — | ‘OOTY _o(s_£)-(s-p)-ah-+ 284m [09°-4556254 | | nual. [ss | zl —feMasin? w |-os64s| 2h | 0°-0821372 Varia- 007368 5 ; ; tional.4 | 3. 38m2cos# hI bei 4 ~~2(s~~&)+2h-2s 27 site From the fourth columns we sce that the coefficients in de- Scale of

scending order of magnitude are M., K, (both combined), S,, import- O, Ky (lunar), N, P, K, (solar), K, (both combined), K, (lunar), Mf, ance of Q, Mm, K, (solar), Ssa, », My, J, L, T, 2N, p, 00, 380-a, tides. y—80-@4+2n, y-40+20, o—-2n+a0, 2(o-7), X.

-{A, ii.]—Diurnal Tides ; General Coefficient =sin 2).

— a3 = Speed in The tides depending on the fourth power of the moon’s parallax

escrip- eae 5 =| A t | D i 2

tive Naine.| ‘nitial. Coefficient. see PEGE. peri. arise from the potential V=aP ($ cos?z-3cosz). They give rise : our. . . . .

| a wee a toa onal diurnal nee 0 and to a small ter-diurnal tide M;; but

ee 0 (1—§e2)Esin Tooe™}7118896 | —afe-B-eae his~-o4sesa we shall not give the analytical development.

ele Og epee tiealieay Oona) | eG s)aen jee leuiey § 24, Meteorological Tides, Over-Tides, and Compound Tides,

Ce aa – G+ ge*)isinIcosl |-18115 -iT 15°-0410686 All tides whose period is an exact multiple or submultiple of a Meteoro- Larger ; -2(5-8) mean solar day, or of a tropical year, are affected by meteorological logical elliptic. | @ fe.gsinI cos? $I |“03651 i aes 133986609] | conditions. ‘Thus all the tides of the principal solar astronomical tides,

. Gob io-er series 8S, with speeds y-—7, 2(y-7), 38(y—7), &c., are subject to

Smaller M e.p8inT cos” X |-005226| where tan 14-4990501| | More or less meteorological perturbation. An annual inequality in clliptic. v {5+ $c0s2(p-)} |-01649 =} tan(p-£) the diurnal meteorological tide S, will also give rise to a tide y— 2n, . ; and this will be fused with and indistinguishable from the astro-

Bsue, fegsinIcosl |-01485 | +(s-p)-}m |15°-5854483 cee P ; it will also give rise to a tide with speed -y, which will b elt: | soleupee sacle -2(s-£)-2(s—p)|aoocarac e indistinguishable from the astronomical part of K,. Similarly pe ail Go aaa al +27 128542862) | the astronomical tide K, may be perturbed by a semi-anuual in- ‘

[A, iii. Long Period Tides ; General Coefficient 4—%sin?A.

we 0 gos 5 : a, we ,| Initial. Coefficient. es | Argument. i a at AEs Hour ate) i a: Ss) Of variable oa i (1+ $e2)}(1-2sin2Z) -252948)

partis N,the/19°-34 per annum e } long. ofnode montily. Mm 8e.4(1-$sin2D) |-04136 s—p 0°*5443747 Q i r ’ 9 2C= Moathhy, (2-27-+| APmenA—gsin2z) “HEP 4 OD), 0°-4715911 Luni-solar : fort- MSf | Sm23(1-gsin2z) [[004229 945-1) 1°-0158958 nightly. 10 Fort- 5o2\L atn2 . ° nightly. Mf (1-$e2)ksin2I |-07827 2(s—&) 1°-0980330 Ter- 80-oF Je.4sin2I 01516 \(s—p)+2(s-£)| — 1°-6494077

inensual. |

1 Fused with 2y—o+o.

2 m is the ratio of the moon’s mean motion to the sun’s.

3 In these three entries the lower number gives the value when the co-efficients of the evection and variation have their full values as derived from lunar theory.

4 Indicated by 2MS as a compound tide (see below, § 24).

5 A fusion of y-o-k a, of which the latter is the tide named.

6 The upper number is the mean value of the coefficient of the tide y-7-@; the lower applies to the tide Mj), compounded from the tides y-o-@ and y-T+D.

7 The lower number gives the value when the coefficients in the evection have their full value as derived from lunar theory. aps ;

8 The mean value of this coefficient is (1+#e2)(1 — sin®/)(1 -$sin2w)=“25, and the variable part is approximately – (1+ $c) sint cosi sinw cosw cosN=

— 0328 cos N.

9 The lower of these two numbers gives the value when the coefficients in the evection and variation have their full values as derived from lunar theory. :

10 Indicated by MSf as a compound tide.

and annual tides of speeds 27 and 7 are all probably quite insensible as arising from astronomical causes, yet they have been found of sufficient importauce to be considered. ‘The annual and semi- annual tides are of enormous importance in some rivers, representing in fact the yearly flooding in the rainy season. In the reduction of these tides the arguments of the S series are ¢, 2¢, 3t, &c., and of the annual, semi-annual, ter-annual tides h, 2h, 3h. As far as can be forescen, the magnitudes of these tides are constant from year to year. :

We have in § 21 considered the dynamical theory of over-tides. Over- The only tides of this kind in which it has hitherto been thought tides,

necessary to represent the change of form in shallow water belong to the principal lunar and principal solar series. Thus, besides the fundamental astronomical tides M, and S,, the over-tides M,, Mg, Mg, and S,, S, have been deduced by harmonic analysis. The height of the fundamental tide M, varies from year to year, according to the variation in the obliquity of the lunar orbit, and this variability is represented by the coefficient cos‘4/. It is probable that the variability of M,, Mg, Mg will be represented by the square, cube, and fourth power of that coefficient, and theory (§ 21) indicates that we should make the argument of the over-tide a multiple of the argument of the fundamental, with a constant subtracted.

Compound tides have been also considered dynamically in § 21. Com- By combining the speeds of the important tides, it will be found that pound there is in many cases a compound tide which has itself a speed tides,

identical with that of an astronomical or meteorological tide. We thus find that the tides O, K,, Mm, P, M,, Mf, Q, M,, L are liable to perturbation in shallow water. If either or both the component tides are of lunar origin, the height of the compound tide will change from year to year, and will probably vary proportionally to the product of the coefficients of the component tides. For the purpose of properly reducing the numerical value of the compound tides, we require not inerely the speed, but also the argument. The following schedule gives the adopted initials, argument, and speed of the principal compound tides. The coefficients are the products of those of the two tides to be compounded.

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¢ has simply to be reversed, with the difference that the instant of time to which to refer the argument is 04 of the first day of the

3606

[C.]—Sehedule of Compound Tides.

Imme-

itial Arguments com- need Speed in Degrees new year, and we must take note of the different value of wand f sal bined. sia pepe, Higur. for the new year. Tables* have been computed for f and w for i he moon’s node and for each kind of tide, and es By – 20 44°-0251728 all longitudes of the : . aes M4-O the mean longitudes of moon, sun, and lunar perigee may be ex- MS Mp+Se 4y- 20-29 58°-9841042 tracted from any ephemeris. Thus when the mean semi-range H MSf So -Mo eg 1°-0158958 and retardation x of any tide are known its height may be com- OMK aC : By – 40 42°-9271398 puted for any instant. The sum of the heights for all the principal 2 i in K Bey- 27 45°-0410686 tides of course gives the actual height of water. MN Mo+N a, Wises § 26. Numerical Harmonie Analysis for Tides of Short Period. eee ; ‘ ‘ : ‘ ; “2 es y+20-27 16°-0569644 The tide-gauge (described below, § 36) furnishes us with a con- Treat- OSM a _M Qy+20 -4N 31°-0158958 tinuous graphical record of the height of the water above some ment of , ees : 6y – 20-47 _ 88°-9841042 known datum mark for every instant of time. The first operation tide OMS is Qy ~~40~~+27 27°-9682084 performed on the tidal record is the measurement in feet and deci- curves, : M+83 6y — 40-2 87°-9682084 mals of the height of water above the datum at every mean solar

bs § 25. On the Form of Presentation of Results of Tidal Observations. Supposing n to be the speed of any tide in degrees per mean solar

diate re- hour, and ¢ to be mean solar time elapsing since 04 of the first day

sult of

of (say) a year of continuous observation, then the immediate result

harmonic of harmonic analysis is to obtain A and B, two heights (estimated analysis, in feet and tenths) such that the height of this tide at the time ¢

Final But hs pi yo results of the analysis are presented ae a erat A ‘a bet einai: 0 Be = — Sa rms of the form } ‘ ton ass anaililins fH cos (V+ -k) Commencing with 0» of the first day, we begin counting 0, 1, 2, ; , 2 : i) longi. | &¢ 98 the T-hand comes up to its hour-marks. But, as the S-hand con- where V isa linear function of the moon’s and sun’s mean iongi- | ,ains on the T-hand, there will come a time when, the T-hand stants. tudes, the mean longitude of the moon’s and sun’s perigees, and being exactly at the p hour-mark, the S-hand is nearly as far as the local pepe solar time at the place of observation, reduced to p+. When, however, the T-hand has advanced to the »+1 hour- angle at 15° per hour. /” increases uniformly with the time, and | ‘park the S-hand will be a little beyond p+1+4,—that is to say, its rate of increase per mean solar hour is the n of the first method, | «isto less thati half am hour before p+2. Counting, then, in and is called the speed of the tide. It is supposed that w stands | miiine by reference to S-time, we jump from p to pee. The for a certain function of the longitude of the node of the lunar | (ountin g will go on continuously for a number of hours nearly orbit at an epoch half a year later than 0» of the first day. Strictly | equal to 2p, and then another number will be dropped, and so on speaking, « should be taken as the same function of the longitude | phioy ghout the whole year. If it had been the T-hand which of the moon’s bon ee vey Thai bay 8 oon ssn ea oe Ask went faster than the S-hand, it is obvious that one number would tion is but small in the course of a year, u may be treated a8 a | 1. repeated at two successive hours instead of one being dropped. constant and put equal to an average value for the year, which | w, may deseribe cach such process as a ‘‘ change.” avenee value is taken as on ae value e. can lee) mie ua Now, if we have a sheet marked for entry of heights of water Method Tageta Vie oor eae t _ ae toe gin 4 yeatih ‘s according to T-hours from results measured at S-hours, we must of analy- as the “argument” in the schedules of § 28. nn : ~4 are t0- | enter the S- measurements continuously up to p, and we then come sis. gether the whole argument according to the equilibrium theory of | to a change; dropping one of the S-series, we go on again continu- tides, with sea covering the whole

earth, it follows that /n is the | 4ys17 until another change, when another is dropped; and so on. lagging of the tide which arises from kinetic action, friction of the | ging, g change occurs at He. Hae anhen a Toker talleudlaeae water, imperfect elasticity of the earth, and the distribution of land. exactly half-way between two S-hours, it will be more accurate at A . ‘ ais : It is supposed that His the mean value in British feet of the | . change to insert the two S-entries which fall on each side of semi-range of the particular tide in question; f is a numerical | the truth. If this be done the whole of the S-series of measure- factor of augmentation or diminution, due to the variability of | jonts is entered on the T-sheet. ‘Similarly, if it be the T-hand the obliquity of the lunar orbit. The value of fis the ratio of the | J hich goes faster than the Soleaidiuate may leave a gap in the ‘coefficient ” in the third column of the preceding schedules to the Tseriee instead of duplicating an entry. For the analysis of the mean value of the same term. For example, for all the solar tides | Pp tide there is therefore prepared a sheet arranged in rows and f be Dae y saa for the principal lunar tide M, it is equal to columns ; each row corresponds to one T-day, and the columns are cos g1 cos: fareas – ; for the mean value of this term has @ | marked Oh, 1h,... 23; the 0’s may be called T-noons. A dot coefficient cos*4w cos! 4%. It is obvious, then, that, if the tidal | j. put in each space for entry, and where there is a change two observations are consistent from year to year, H and x should come | gots are put if there is to be a double entry, and a bar if there is out the ma from each year’s reductions. It is only when the | to pe no entry. The numbers entered in each column are summed ; results are ie aa in such a form as this that it will be possible | the results are then divided, each by the proper divisor for its column, to judge whether the harmonic analysis is yielding satisfactory | 414 ¢hus the mean value for that column is obtained. In this way ae ee oe of giving the tidal results is also essential | 94 numbers are found which give the mean height of water at each Re ee zs garage ae ine se Rand I of the 24 special hours. It is obvious that if this process were con- ‘an as He show how to determine H and x from Rand ¢. It | tinued over a very long time we should in the end extract the tide a ved bss él =R/ 4 oi bi tee legal of f a eons under analysis from amongst all the others; but, as the process depends on the evaluation of the mean value of each of the terms | onjy extends over about a year, the elimination of the others is not in the ede into which we shall not enter. If Vy be the value quite complete. The elimination of the effects of the other tides Me OT! Cay — ml may be

improved by choosing the period for analysis not exactly cove use V4 = equal to one year. 1 dace (iit ; Let us now return to our general notation, and consider the 24 ie the rule for the pobre aes of kis: Add to the value of | mean values, each pertaining to the 24 T-hours. We suppose that ei 5 ie value of the argument at Oh of the first day. a all the tides except the T-tide are adequately eliminated, and, in = e results of harmonic analysis are usually tabulated by giving | fact, a computation of the necessary corrections for the absence con- H, « under the initial letter of each tide; the results are thus | of complete elimination, which is given in the Tidal Report to the stants. comparable from year to year.!_ For the purpose of using the tide- | British Association in 1872, shows that this is the case. It is

is given by A cos nf+B sin nt. If we put R=/(A?+ B?) and tan ¢=B/A, then the tide is represented by Rcos (nt — $).

In this form BR is the semi-range of the tide in British feet, and ¢is an angle such that {/n is the time elapsing after 04 of the first day until it is high water of this particular tide. It is obvious that ¢ may have any value from 0° to 360°, and that the results of the analysis of successive years of observation will not be com- parable with one another when presented in this form.

predicting machine the process of determining H and « from R and

1 See, for exam ple, a collection of results by Baird and Darwin, Proc. Roy. Soc., No. 239, 1885.

hour. The period chosen for analysis is about one year and the first measurement corresponds to noon,

If T be the period of any one of the diurnal tides, or the double period of any one of the semi-diurnal tides, it approximates more or less nearly to 24 m.s. hours, and, if we divide it into twenty- four equal parts, we may speak of each asa T-hour. We shall for brevity refer to mean solar time as S-time. Suppose, now, that we have two clocks, each marked with 860°, or 24 hours, and that the hand of the first, or S-clock, goes round once in 24 S-hours, and that of the second, or T-clock, goes round once in twenty-four T-hours, and suppose that the two clocks are started at 0° or 02 at noon of the

initial day. For the sake of distinctness, let us imagine that a T-hour is longer than an S-hour, so that the T-clock goes slower than the S-clock. The measurements of the tide curve give us the height of water exactly at each S-hour ; and it is re- quired from these data to determine the height of water at each T-hour. For this end we are, in fact, instructed to count T-time,

RR Nr A ne =e a _ 2 Report on Harmonic Analysis to Brit. Assoc., 1883, and more extended table in Baird's Manual of Tidal Observation, London, 1887.

3 A sample page is given in the Report to the Brit. Assoc., 1883.

Neces- obvious that any one of the 24 values does not give the true height sity for of the T-tide at that T-hour, but gives the average height of the augment- water, as due to the T-tide, estimated over half a T-hour before ing fac- and halfa T-hour after that hour. A consideration of this point tors. shows that ccrtain augmenting factors, differing slightly from unity, must be applied. In the reduction of the S-serics of tides, the numbers treated are the actual heights of the water exactly at the S-hours, and therefore no augmenting factor is requisite.

We must now explain how the harmonic analysis, which the use of these factors presupposes, is carried out.

If ¢ denotes T-time expressed in T-hours, and m is 15°, we express the height h, as given by the averaging process above explained, by the formula .

h=A)+ A, cos nt+ B, sin nt+ A, cos 2nt+B, sin 2nt+..., where ¢ is 0, 1, 2,...28. Then, if = denotes summation of the series of 24 terms found by attributing to ¢ its 24 values, it is obvious that Ag=¢ Zh; A,= 7, Zheos nt ; B, =p, Zhsin ne ; Ag=7z Zhecos 2nt; By=py Dhsin Qnt ; &c., &.

Since » is 15° and ¢ is an integer, it follows that all the cosines and siles involved in these scries are equal to one of the following, viz., 0, +sin 15°, tsin 30°, +sin 45°, tsin 60°, tsin 75°, £1. Itis found convenient to denote

these sines by 0,+8,,+S,,+S,, +S,, +§,,~~1. The multiplication of the 24 h's by the various S's and the subsequent additions may be arranged in a very neat tabular form, like that given in a Report to the British Association in 1883. The A's and B's having been thus deduced, we have R= \/(A?+B*), R must then be multiplied by the augmenting factor. We thus have the augmented R. Next the angle whose tangent is B/A gives ¢ The addition to ¢ of the appropriate V)+u gives x, and the multiplication of R by the appropriate 1/f gives H. The reduction is then complete. An actual numerical example of harmonic analysis is given in the Admiralty Scientific Manual (1886) in the article "Tides" ; but the process there employed is slightly different from the above, because the series of observations is sup~~ posed to be a short one.

§ 27. Harmonic Analysis for Tides of Long Period.

For the purpose of determining the tides of long period we have to climinate the oscillations of water-level arising from the tides of short period. As the quickest of these tides has a period of many days, the height of mean water at one instant for each day gives sufficient data. Thus there will in a year's observations be 365 heights to be submitted to harmonic analysis. To find the daily mean for any day we take the arithmetic mean of 24 consecutive hourly values, beginning with the height at noon. This height will then apply to the middle instant of the period from 08 to 23h, —that is to say, to 11> 30™ at night. The formation of a daily mean does not obliterate the tidal oscillations of short period, be- cause none of the tides, except those of the principal solar series, have commensurable periods in mean solar time. A small correc- tion, or "' clearance of the daily mean," has therefore to be applied for all the important tides of short period, except for the solar tides. Passing by this clearance, we next take the 365 daily means, and find their mean value. This gives the mean height of water for the year. We next subtract thre mea height from each of the 365 values, and find 365 quantities dh, giving the daily height of water above the mean height. These quantities are to be the subject of the harmonic analysis, and the tides chosen for evaluation are those which have been denoted above as Mm, Mf, MSf, Sa, Ssa.

Let dh= A cos(o-a)t+B sin(o-a)t

+C cos 2ot +D sin 2ot

C’ cos 2(6 — n)t D’ sin 2(o — n)é

+E cos nt +F sin nt

+G cos 2nt +H sin 2nt where ¢ is time measured from the first 112 30™. If we multiply the 365 oh’s by 365 values of cos («- @)t and effect the summation, the coefficients of B,C,D, &c., are very small, and that of A is nearly 1823. Similarly, multiplying by sin (¢ — a), cos 2ot, &c., we obtain 10 equations for A, B,C, &c., in each of which one coefficient is nearly 1825 and the rest small. These equations are easily solved by successive approximation. In this way A,B,C, &c, are found, and afterwards the clearance to which we have alluded is applied. Finally the cleared A,B,C, &c., are treated exactly as were the components of the tides of short period. Special forms and tables have been prepared for facilitating these operations.

Analysis,

Tides of long period.

Ifarmo- nically analysed.

V. SYNTHETIC METHOD. § 28. On the Method and Notation.

Synthetic The general nature of the synthetic method has been already method. explained ; we now propose to develop the expressions for the tide fron the result as expressed in the harmonic notatiou. If it should be desired to make a comparison of the results of tidal observation as expressed in the synthetic method with those of the harmonic method, or the converse, or to compute a tide-table from the har- monic constants by reference to the moon’s transits and from the

declinations and parallaxes of sun and moon, the analytical ex- pressions of the following sections are necessary.

In chapter iv. the mean semi-range and angle of retardation or lag of any one of the tides have been denoted by H andx«. We shall here, however, require to introduce several of the H's and K'S into the same expression, and they must therefore be distinguished from one another. This may in general be conveniently done by writing as a subscript letter the initial of the corresponding tide ; for example Hm, «Km will be taken to denote the H and x of the principal lunar tide Mz. This notation docs not suit the K, and Kj tides, and we shall therefore write H", x" for the semi-diurnal K,, and H', x' for the diurnal K, tide. These two tides proceed according to sidereal time and arise from the sun and moon jointly, and a synthesis of the two parts of each is effected in the harmonic method, although that synthesis is not explained in chapter iv. The ratio of the solar to the lunar part of the total K, tide is '46407 ; hence *683 H" is the lunar portion of the total K,. There will be no occasion to separate the two portions of K,, and we shall retain the synthesis which is effected in the harmonic method.

§ 29. Semi-Diurnal Tides.

The process adopted is to replace the mean longitudes and ele- Mean ments of the orbit in each term of the harmonic development of the longi- schedules of § 23 by hour-angles, declinations, and parallaxes. tude and

At the time ¢ (mean solar time of port reduced to angle) let elements a, 6, y be)'s R.A., declination, and hour-angle, and J)'s longitude replaced measured from the ''intersection." These and other symbols when by hour- written with subscript accent are to apply to the sun. Then pv angle, being the R.A. of the intersection, we have from the right-angled declina- spherical triangle of which the sides are 1, 5, a—y the relations tion, and

tan(a—v)=cosItanl, sind=sinZsin2 …..... (74). parallax. Now s—£ is the)'s mean longitude measured from the intersection and s—y is the mean anomaly ; hence approximately l=s—&+2esin (s—p) . From (74) and (75) we have approximately a=s-+ (v— £)+ 2esin (s—p) — tan? 4J sin 2(s — £). Now, h being the ©'s mean longitude, ¢+A is the sidereal hour- angle, and p=t+h-a. Hence t+h—s—(v—£)=y + 2esin (s—p) – tan?4Jsin 2(s—£) (76). Again, if we put

COSA HT PSMA oo ec. soc ssesesseeses ol CZ) we have approximately from (74) and (75) cos*6 — cos?A 5 = 00S 2(8— &) _ sin A (78) whence Sun ee one sin 2(s—&)

osin’A dt Obviously A is such a declination that sin? A is the mean value of sin?6 during a lunar month. Again, if P be the ratio of the)’s parallax to her inean parallax, the equation to the ellipse described

gives 1(P-1)=00s (s—p) i 1 dP _ on me re (79). whence eee p

Now it appears in schedule A of § 23 that the arguments of all the lunar semi-diurnal tides are of the form 2(¢+h—v)+2(s-—&) or +(s—p). It isclear, therefore, that the cosines of such angles may by the relations (76), (78), (79) be expressed in terms of hour-angles, declinations, and parallaxes. Also by means of (77) we may intro- duce A in place of Zin the coefficients of each term. An approxi- mate formula for A is 16°°51+3°°44 cos V—0°°19 cos 2. In the Report to the British Association for 1885, the details of the processes indicated are given.

Before giving the formula it must be remarked that the result Age of is expressed more succinctly by the introduction of the symbol 6’ declina- to denote the)’s declination at a time earlier than that of observa- tional tion by an interval which may be called the ‘‘age of the declina- and pa- tional inequality,” and is computed from the formula tan (x” — km)/2o rallactic or 522-2 tan (k”—Kkm). Similarly, it is convenient to introduce P’ correc- to denote the value of P at a time earlier than that of observation tions. by the ‘‘age of the parallactic inequality,” to be computed from tan (Km—Kn)/(o —-@) or 1055°3 tan (km—x,). These two ‘‘ages” probably do not differ in general much from a third period, com- puted from (ks—m)/2(6— 7), which is called the ‘‘ age of the tide.”

The similar series of transformations when applied to the solar tides leads to simpler results, because A, is a constant, being 16°38, and the “ages” may be treated as zero ; besides the terms depend- ing on dB, [at and dP, /dt are negligible. If now we denote by hy the height of water with reference to mean water-mark, in so far as the height is affected by the harmonic tides M,, S,, K,, N, L,

T, R,! the harmonic expression is transformed into

does to N amongst the lunar tides. It was omitted as unimportant in schedule [B, i.] of § 23.

Total semi- diurnal tide.

Com- mence- ment of synthesis.

One solar and one lunar term.

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cos? A he ~ FH, cos (2W — Km) + H, cos (2, — 2 cos? ny ™m ‘ y m) & (y, s) cos? 6’ — cos*A , ‘é 7 9 = ig aa A, 683 H’ cos (2y — x”) cos? § — cos? A,, j ; a

fe sin 6 cos 6 dof ‘683 H” gsin? A, dt\cos(x” — km)

cos? A Hy C08 Kn — Hy, cos %

oe, (P -1) cos (2p — €)

€ cose +(P,- pes = Fle cos (2y, — ks) H

cost?A dP/dt Be 1] : hi

ecos? A, (o— a fine CO8 COSKi—Km) sin(2¥— Km) (80), where ¢ is an auxiliary angle defined by ?

3 sin oa Hz sin Ky a re (81).

The first two terms are the principal tides, and the physical origin of the remaining small terms is indicated by their involving 6’, 6,, dé/dt, P, P,, dP/dt, The terms in dé/dt and dP/dt are generally smaller than the others.

The approximation may casily be carried further. But the above isin some respects a closer approximation than the expression from which it is

derived, since the hour-angles, declinations, and paral- laxes necessarily involve all the lunar and solar inequalities.

§ 30. Syntheses of Solar and of Lunar Portions of the Semi-Diurnal Tide.

= Hytan®A, | sin (2 — Km)

+

tan e=

Let us write

M= or Se “oe A 68311” cos (x” — Kin) + or z (paz) Bete — Hoos wae=nee cp=Kkm+ ae -683H” sin (x” — km) St py) Hat Te a ak Z Pita * Km) H, tan? A,]

cos*A dP/dt ecos*A, ¢-@

H,, H, [ttn scat) alee |

cos?6, —cos?A, , ; H,-H,. M,=H,—— a 317H’(P,-1)

pa A é, 2m,=K,

Since observation and theory agree in showing that x” is generally

very nearly equal to x, we are justified in substituting «, for x” in

the small solar declinational term of (80) involving ‘317 H”. Then,

using (82) in (80),

he=M cos 2(y — w) + M, cos 2(y, — M,)...eeeseeeee (83).

If the equilibrium theory of tides were true, each H would be pro- portional to the corresponding term in the harmonically developed potential. This proportionality holds nearly between tides of almost the same speed; hence, using the expressions in the column of co- efficients in schedule [B, i.], § 28

(with the additional tide R there omitted, but having a coefficient (7,/7)4.4¢, cos*4w, found by sym- metry with the lunar tide L), and introducing A, in place of w in the solar tides, we may assume the truth of the proportion

cos? A, , ¢_ qian sin? A, sud =u any With this assumption, M, reduces to M a 00% Oey 3(P A *~ cos? A, st (i) += Cost a Hdl + 8(P,—1)} cos? 5, Hence M,=P? 3 Se eres a ee (84).

This is the law which we should have derived directly from the equilibrium theory, with the hypothesis that all solar semi-diurnal tides suffer nearly equal retardation. Save for meteorological influ- ences, this must certainly be true.

_A similar synthesis of M cannot be carried out, because the con- siderable diversity of speed amongst the lunar tides makes a similar appeal to the equilibrium theory incorrect. It may be seen, how- ever, that it would be more correct to write cos? 6’ instead of cos? A in the coefficient of the parallactic terms in M and 2y.

The three terms of M in (82) give the height of lunar tide with its declinational and parallactic corrections, and similarly the formula for « in (82) gives its value and corrections.

If now 7 denotes the mean solar time elapsing since the moon’s upper transit and y the angular velocity of the earth’s rotation, it is clear that the moon’s hour-angle

y=(y-da/dt)r;

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and, since M cos2(y—#) is a maximum when y=» or differs from pw by 180°, it follows that h/(y —da/dt) is the “interval” from the moon’s upper or lower transit to high water of the lunar tide. Since 7 is necessarily less than 12, we may during the interval from transit to high water take as an approximation da/dt=o, the moon’s mean motion.! Hence that interval is u/(y—¢), or vou hours nearly, when p is expressed in degrees. Thus (82) for

» gives by its first term the mean interval for the lunar tide, and by the subsequent terns the declinational and parallactic corrections.

We have said that the synthesis of M cannot be carried out as Approxi- but the partial synthesis below will give fairly mate

in the case of M,, good results. The proposed formula is

_ 3 cost A – cos? 6’ — cos? A, 5 5c ae, M= Pj Bet — a, OE cos? 6’ — cos? A, ; 2p = Km + — 9 A, +683 H” sin (x” — Km) 5 cos?6 a, = Pro? Ae

Dp, Hes. sont sseindossapsuniaidn aber 0 Meuierguasseemsmas dren aay (85). These formulse have been used in the example of the computation

§ 31. Synthesis of Lunar and Solar Semi-Diurnal Tides,

Let A be the excess of)’s over ©’s R.A., so that A=a-a,

Y=V+A, and h,=M cos 2(p — «)+M, cos (y+ A— H,) The synthesis is then completed by writing H cos 2(u—-¢)=M+M, cos 2(A – 4, +4), H sin 2(u-¢)= M, sin 2(A – 4, #), so that hg =H cos 2(Y— p)eveesereeeeereerererers (87). Then H is the height of the total semi-diurnal tide and /(y — da/dt) or ¢/(y—¢) or x5 ¢, when ¢ is given in degrees, is the ‘interval ” from the moon’s transit to high water. The formule for H and ¢ may be written H= v e Ae cos 2(A — 1, +#)} } *ay*__ M,sin 2A-#, +4) (88) a A et M+M, cos 2(A -#,+#)

They may be reduced to a form adapted for logarithmic calculation. Fort-

it follows that H nightly a period of half a lunation. These inequal- are called the ‘fortnightly or semi-menstrual inequalities ” in the ity.

Since A goes through its period in a lunation,

and ¢ have inequalities wit.

height and interval.

Spring tide obviously occurs when A=y,~ M. Since the mean value of A is s —h (the difference of the mean longitudes), and since the mean values of and 4, are $Xm, 4X, it follows that the mean value of the period elapsing after full moon and change of moon up to spring tide is («,—Kkm)/2(¢-%). The association of spring tide with full and change is obvious, and a fiction has been adopted by which it is held that spring tide is generated in those configura- tions of the moon and sun, but takes some time to reach the port of observation. Accordingly (xs— «m)/2(¢- 7) has been called the “age of the tide.” observations have yet been made. in general to differ very much from the ages of the declinational and parallactic inequalities.

In computing a tide-table it is found practically convenient not to use A, which is the difference of R.A.’s at the unknown time of high water, but to refer the tide to Ao, the difference of R.A.’s at the time of the moon’s transit. It is clear that Ay is the apparent time of the moon’s transit reduced to angle at 15° per hour. We have already remarked that $/(y- da/dt) is the interval from transit to high water, and hence at high water kn + dafat — da, [dt

~O y — daldt

the second term their mean values, and we then have

A=Aj+—— ye

and A= pt p= Ay — H+ Twa Ao mt Be v++0+e(90).

This approximate formula (90) may be used in computing from (88) the fortnightly inequality in the “ height ” and “‘ interval.” In this investigation we have supposed that the declinational and parallactic corrections are applied to the lunar and solar tides be- fore their synthesis ; but it is obvious that the process might be reversed, and that we may form a table of the fortnightly inequality based on mean values H,, and H,, and afterwards apply corrections. This is the process usually adopted, but it is less exact. The labour of computing the fortnightly inequality, especially by graphical methods, is not great, and the plan here suggested seems preferable. 1 The tide has been referred by Lubbock and others to an earlier transit, and not to the one immediately preceding the time under consideration. In

this case we cannot admit with great accuracy that da/di—c, since the interval may be 30 or 40 hours.

The average age is about 36 hours as far as Age of The age of the tide appears not tide.

As an approximation we may attribute to all the quantities in Refer-

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§ 32. Diurnal Tides.

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§ 33. Explanation of Tidal Terms in eommon use > Datum Levels.

Diurnal These tides have not been usually treated with completeness in The mean height at spring tide between high and low water is Tidal tides not the synthetic method. In the tide-tables of the British Admiralty | called the spring rise, and is equal to 20H»+H,). The height termsex- easily _ we find that’ the tides at some ports are ‘‘affected by diurnal in- | between mean high-water mark of neap tide and mean low-water plained. treated equality” ; such a statement may be interpreted as meaning that | mark at spring tide is called the neap rise, and is equal to 2H». synthet- the tides are not to be predicted by the information given in the | The mean height at neap tide between high and low water is called ically. so-called tide-table. The diurnal tides are indeed complex, and do | the neap range ; this is equal to 2(H,,~~H,). Neap range is usually not lend themselves easily to a complete synthesis. In the har~~ | about one-third of spring range. The mean period between full or monic notation the three important tides are K,,0,P, and the lunar | change of moon and spring tide is called the age of the tide; this portion of K, is nearly equal to O in height, whilst the solar portion “A ae ie (Ks el — 7), or, if a eg oe Lg is nearly equal to P. A complete synthesis may be carried out on OE X (Ks — Km) § Ks — Km 18 commonly about 36°, and the age about the ties Eo ated in pen the sot at sal MCs ds, but the ad- | 36%, The period elapsing from the moon’s upper or lower transit vantage of the plan is lost in consequence of large oscillations of | until it is high water is called the interval or the lunitidal interval. the amplitude through the value zero, so

that the tide is often | The interval at full moon or change of moon is called the establish- represented by a negative quantity multiplied by a circular function. | ™ent of the port or the vulgar establishment. The interval at spring It is best, then, only to attempt a partial synthesis, and to admit a called ia ee seat ssi at gaat ; Bric the existence of two diurnal tides. e€ mean establishmen may € joun rom € vulgar establish- We see from schedules [A, ii.] and [B, i.], § 23, that the principal | ment by means of the spring and neap rise and the a of the tide, diurnal tides are those Icttered O, P, K,. Of these K, occurs both | 48 rsnigel fe a ne ae for the moon and the sun. The synthesis of the two parts of K, is ok & De the age o € tide reduced to angle a € rate 0 effected without difficulty, and ae elt is a feaik fer the total 1°-016 to the hour. Then the mean establishment in hours is equal to K, tide like that in [A, ii.], but with the » which occurs in the argu- the vulgar establishment in hours, diminished by a period expressed ment replaced by a different angle denoted as »'. If, then, we write | in hours numerically equal to zs of the angle whose tangent is Vo=t-+h—23—y +2440 H, sin a/(Hm + H, cos a), expressed in degrees. Also H,/H,, is equal V' =t+h—v! —4r } aed eaneecaones (91), to the ratio of the excess of spring rise over neap rise to neap rise. HIRIRSS Hides O'R: P itt Sota 'The French have called a quantity which appears to be identical Eee ee Urey ATO WEILLen as Lollows' :—- with H,,+H,, or half the spring rise, the unit of height, and then O =f, Hy cos (Vo = Ko), define the height of any other tide by a tidal coefficient. Pat pele ehee =n))_| nf tee tet ming nee ponding Ade Sey: = — Kp)} verre . 1 -tabl w-Wwa ar ordinary spring tides." alty The last two tides have very nearly the same speed, so that we | This datum is found by taking the mean of the low-water marks of datum. may assume «'=«,, and that H, has the same ratio to H' as in the such observations at spring tide as are available, or, if the obser- equilibrium theory. Now, in schedules [A, ii.], [B, ii.], § 23, the | vations are very extensive, by excluding from the mean such spring coefficient of Ky, viz., H' (the sum of the lunar and solar parts), is | tides as appear to be abnormal, owing to the largeness of the moon's '26522, and the coefficient of P, viz., H,, is '08775, so that H' | parallax at the time or any other cause. The Admiralty datum is =0'023 H,, or say=3H,. Hence we have not, then, susceptible of exact scientific definition ; but, when it Partial K,+P=H' [f – cos (2h —»')] cos (V' — x') has once been fixed with reference to a bench mark ashore, it is synthesis. — H' § sin(2h —') sin (VW —«'), Pes to adhere to it, by whatever process it was first

fixed. If. theref cit t 1s now proposed to adopt for any new Indian tidal stations a Indian Maar’, WEP low-water datum for the tide-table to be called ‘Indian low-water datum. Rr cos Y= H’ [f’ — 3 cos (2h = on he (98) mark,”? and to be defined as H,,+H,+H’+H, below mean-water R’ sin y=} H’ sin (2h -»’) F level. Although such a datum is uot chosen from any precise K,P=R’ cos (V’ p—«’). scientific Pott esetions it is susceptible of exact definition, is It is clear that y and R’ have a semi-annual inequality, and there- | low enough to exclude almost all negative entries from the table (a fore for several weeks together R’ and y may be treated as constant. | sine qua non for a good datum), and will differ but little from the Now suppose that we compute V, and V’ at the epoch—that is, at | Admiralty datum, however that may be determined. A valuable the initial noon of the period during which we wish to predict the | list of datum levels is given by Mr J. Shoolbred in a Report to the tides—and with these values put British Association in 1879. $o=Ky— Vo at epoch, {’=«’—- V’ at epoch — y. . . . 2 3 § 34. On the Reduetion of Observations of High and Low Water? Then the speed of Vo is y—20, or 13994303 per hour, or} A continuous register of the tide or observation at fixed intervals Observa- 860″ — 25°‘3673 id day j and the speed of V” is y, or 15 0410636 | of time, such as each hour, is certainly the best; but for the tions of per hour, or 360°9856 per day. Hence, if t be the mean solar time adequate use of such a record some plan analogous to harmonic H.W. – on the (x +1)th day since = na moment or epoch, analysis is necessary. Observations of high and low water only andL.W. , Vo~ ky= 860° + 13°943 t — — 25°°367n, have, at least until recently, been more usual. Some care has to V+ y—«’=360°n +15°°041 t-¢’ + 0°-986n. be taken with respect to these observations, for about high and low Diurnal Therefore the diurnal tides at time t of the (x +1)th day are given by | water an irregularity in the rise and fall becomes very noticeable, _ O=f,H, cos [13°-943t — ¢ — 25°-367n] (94) pele cared oS pm vee Ps ilies a i ae ee ions to K,+P=R’ cos [15041 t- ¢/+0°986n] © fre ions should therefore be taken every five or ten minutes for ha height of sie , 7 an hour or an hour, embracing the time of high and low water. H.w. If we substitute for t the time of high or low water as computed | The time and height of high aa low water Sy then be found andL.W, Simply from the semi-diurnal tide, it is clear that the sum of these by plotting down a curve of heights, and by taking as the true two expressions will give the diurnal correction for height of tide | tiqe-curve a line which presents a sweeping curvature and

smoothes at high or low water, provided the diurnal tides are not very large, away the minor irregularities. A similar but less elaborate process If we consider the maximum of a function would render hourly observations more perfect. In the reduction A cos 2(t — a) +B cos n(t— B), the immediate object is to connect the times and heights of high where B is small compared with A and n is nearly unity, we see | 224 low water with the moon's transits by means of the establish- that the time of maximum is given approximately by t=a, with a | ment, age, and fortnightly inequality in the interval and height. correction 6t determined from The reference of the tide to the establishment is not, howcver, —2A sin (23t) — nB sin n(a— B)=0; soo oe ce ae it is at ir pings the cit a a? establishment, which is the mean interval from the moon's transi a oe 180″ 5 nB sin n(a — B). to high water at spring tide, and the age of the tide, which is the w 4A mean period from full moon and change of moon to spring tide. Diurnal In this way we find that the corrections to the time of high water For these purposes the observations may be conveniently treated Graphi- correc- from O and K,+P are graphically.» An equally divided horizontal scale is taken to cal treat- tion to e tte i represent the twelve hours of the clock of civil time, regulated to ment. time of dt)= — 05-988 (1 zs —.) "T sin [13°943t — ¢ — 25° °3677]) (the time of the port, or—more accurately—arranged always to show H.W. D 2 2. ee and L.W. 6t'= — o-98s(1 +2) a sin [15°041t — ¢' + 0°:986n] (1 See Hatt, Phénoméne des Marées, p. 151, Paris, 1885. Meme H 2 See Prefaces to Indian Official Tide-Tables for 1887.

H denoting the height and t the time of high water as computed from the semi-diurnal tide. If t next denotes the time of low water the same corrections with opposite sign give the corrections for low water.

If the diurnal tides are large a second approximation will be necessary. These formule have been used in computing a tide-table in the example given in the Admiralty Scientific Manual (1886).

3 Founded on Whewell's article "Tides", in Admiralty Sc. Manual (ed. 1841), and on Airy's 'Tides and Waves," in Ency. Metrop.

4 Waves with a period of from five to twenty minutes are very common, and appear to be analogous to the ''seiches" of Geneva and other lakes. See Forel, Bulletin Soc. Vaud. Sci. Nat., 1873, 1875, 1877, and 1879; Ann.

Chimie et Physique, vol. ix., 1876; Comptes Rendus, 1879; Arch. Sci., Ph., et Nat., Geneva, 1885; also Airy, ‘‘On the Tides of Malta,” Phil. Trans., 1878, part i.

5 For a numerical treatment, see Directions for Reducing Tidal Observations, by Commander Burdwood, R.N., London, 1876.

Xx — 47

Graphi-

apparent time by being fast or slow by the equation of time ; this

cal deter- time-scale represents the time-of-clock of the moon’s transit, either

fair approximation. We find the time-of-clock of the moon’s upper or lower transit on the day, correct by the equation of time, read off the corresponding heights of high and low water from the figures,

‘nation upper or lower. The scale is perhaps most conveniently arranged 4 ? pany hes the order VW, Vie 4 ws XII F : _ TIL Then each interval | and the intervals being also read off are added to the time of the lishment, of time from transit to high water is set off as an ordinate above | moon’s transit and give the times of high and low water. At all &e. ” the corresponding time-of-clock of the moon’s transit. Asweeping | ports there is, however, an irregularity of heights and intervals

curve is drawn nearly through the tops of the ordinates, so as to cut off minor irregularities. Next along the same ordinates are set

off lengths corresponding to the height of water at each high water. A second similar figure may be made for the interval and height at low water.+ corresponding to XII is the establishment, since of high water at full high-water intervals t of high-water heights gives the mean establishment.

In the curve of high-water intervals the ordinate it gives the time moon and change of moon. That ordinate of which is coincident with the greatest ordinate Since the

between successive tides, and in consequence of this the curves pre- sent more or less of a zigzag appearance. Where the zigzag is perceptible to the eye, the curves must be smoothed by drawing them so as to bisect the zigzags, because these diurnal inequalities will not present themselves similarly in the future. When, as in some equatorial ports, the diurnal tides are large, this method of tidal prediction fails.

This method of working out observations of high and low water was not the earliest. In the Mécanique Céleste, bks.iand v., Laplace

Graphi- eal pre- diction,

Methods of La-

st it falls about fifty minutes later on each day, in setting | treats a large mass of tidal observations by dividing them into place, off Re cas dawn will be about five days for each | classes depending on the configurations of the tide-generating bodies. Lubbock, four times-of-clock of the upper transit. Hence in these figures we | Thus he separates the two syzygial tides at full moon and change Whewell. may regard each division of the time-scale I to II, II to III, &c., | of moon and divides them into equinoctial and solstitial tides. ing – instead of one hour. ‘Then the | He takes into consideration the tides of several days embracing ag teprpeeniing fran ty a oe f hiol ter heights to XII | th configurations. He goes through the tides at quadratures distance from the greatest ordinate of high-water heights to ese ; ‘ides is called the age of ie tide. From these two figures the times and | on the same general plan. ‘The effects of declination and parallax heights of high and low water may in general be predicted with | and the diurnal inequalities are similarly treated. Lubbock (Phil A.M. Midnight P.M. ae a Sel ¥ 2 VY WV nf ele: & 2:2 & 22 2 See Bas Pa 18 £t. ; L}14 #2. IRft. AKL £- \0f¢. : 4 Vas 8 ft. 416 fe 4 ft. 2 ft. Fic. 3.—Tide-curve for Bombay from the beginning of the civil year 1884 to the midnight ending Jan. 14, 1884, or from 12h Dec. 31, 1883, i > to 12h Jan. 14, 1884, astronomical time. > Trans., 1831 sq.) improved the method of

Laplace by taking into | graduated staff fixed in the sea, with such allowance as is possible account all the observed tides, and not merely those appertaining | made for wave-motion. It is far better, however, to sink a tube to certain configurations. He divided the observations into a | into the sea, into which the water penetrates through small holes. number of classes. First, the tides are separated into parcels, one | ‘The wave-motion is thus annulled. In this calm water there lies : for each month ; then each parcel is sorted according to the hour | a float, to which is attached a cord passing over a pulley and of the moon’s transit. Another classification is made according to | counterpoised at the end. The motion of the counterpoise against declination ; another according to parallax; and a last for the | a scale is observed. In either case the observations may be made diurnal inequalities. This plan was followed in treating the tides | every hour, which is referable, or the times and heights of high of London, Brest, St Helena, Plymouth, Portsmouth, and Sheerness. | and low water may be noted. We have cxplaincd in § 34 the Whewell (Phil. Trans., 1834 sq.) did much to reduce Lubbock’s | methods of reducing the latter kind of observation. Although results to a mathematical form, and made a highly important | more appropriate for rough observations, this method is susce tible J L] ghiy imp Pprop 1g P advance by the introduction of graphical methods by means of | of great accuracy when carefully used. It has been largely super- curves. The method explained above is due to him. Airy remarks | seded by the harmonic method, but is still adhered to by the British of Whewell’s papers that they appear to be ‘‘ the best specimens of | Admiralty. In more careful observations than those of which we reduction of new observations that we have ever secn.” are speaking the tidal record is automatic and continuous ; the reduction may be, and ‘wong at some future time will be, VI. TrpAu INSTRUMENTS AND TIDAL PREDICTION. mechanical ; and the prediction is so already. We shall therefore devote some space to general descriptions of the three classes of Obse : , § 35. General Remarks. instrument. The harmonic reductions are at present (1887) actu- ybserva- Practical tidal work is divisible into the three stages of observa- ally done numerically, and in chapter iv. we have indicated the tion and vation, reduction of observations, and prediction. 7 ical : : : : nature of the arithmetical processes. < The simplest observation is that of the height of water on a 10n, — el em 5 1 An example of this kind of curve for the high-water heights for Bombay, § 36. The Tide-Gauge. mae “iouptiet’ as te ta Wp ve anon os rent wee The site for the erection of a tide-gauge depenas on local circum- Tide- may be constructed for the low waters. In this case, however, the hours stances. It should be placed so as to present a fair representation gauge.

of the clock are repeated twice over, so that the morning and evening tides occur in different halves of the figure, and the hours are not hours of the moon’s transit, but the actual times of high water. It is obvious that the separation of the morning and evening tides prevents the occurrence of the zigzags referred to.

of the tidal oscillations of the surrounding arca. A tank is gener- ally provided, communicating by a channel with the sea at about 10 feet (more or less according to the prevalent surf) below the lowest low-water mark. In many cases on open coasts and fre-

quently in estuaries the tank may be dispensed with. At any rate we suppose that water is provided rising and falling with the tide, without much wave-motion. The nature of the installation de- pends entirely on the cireumstances of the case. A vertical pipe is fixed in the water in such a way as to admit it only through holes small enough to annul wave-motion and large enough to make no sensible retardation of its rise and fallin the pipe. The diameter of the pipe differs greatly in different instruments : some- times that which we have described as the tank serves as the pipe, and sometimes the pipe alone dips into the sea. A cylindrieal float, usually a hollow metallic box or a block of green-heart wood, hangs and floats in the pipe, and is of such density as just to sink without support. In Sir W. Thomson’s gauge the float hangs by a fine platinum wire, in Newman’s (used in India) by a metallic ribbon. In the latter a chain hangs at the bottom of the float of such weight that, whether the water be high or low, there is the same upward force on the float. It is necessary that the pull on the float should be eonstant, otherwise a systematic error is intro- duced between rising and falling water. The suspension wire is wrapped round a wheel, and imparts to it rotation proportional to the rise and fall of tide. By a simple gearing this wheel drives another, by which the range is reduced to any convenient extent. A fine wire wound on the final wheel of the train drags a pencil or pen up and down or to and fro proportionately to the tidal oscillations. The pencil is lightly pressed against a drum, which is driven by clockwork so as to make one revolution per day. The

en leaves its trace or tide-curve on paper wrapped round the Bai Generally, however, the paper is fixed to the drum, and the record of a fortnight may be taken without change of paper. An example of a tide-curve for Apollo Bunder, Bombay, from Ist to 15th January 1884, is shown in fig. 8. Sometimes the paper is in a long band, which the drum picks off from one coil and delivers on to another.

harmonic oscillatory motion, with a period proportional to the lunar half-day, whilst the sphere moves, relatively to the centre of the table, proportionately to the tide-heights on the same time-scale, then, at the end of a sufficient number of lunar days, we shall find that the total angie turned through by the cylinder is proportional to either the A or B eomponent of the lunar semi-diurnal tide. An index, which points to a dial, may be fixed to the cylinder, so that the required result may be read off.

In the harmonic analyser the tide-curve diagram is wrapped on a drum, which is turned by one hand, whilst with the other a pointer is guided to follow the tide-curve. As the drum turns proportion- ately to mean solar time, appropriate gearing causes two tables to execute harmonie oscillations in phases at right angles, with lunar semi-diurnal period. Atthe same time a fork attached to the pointer guides the two spheres so that their distances from the centres of their tables are equal to the tide-height in the diagram. The in- dexes attached to the two cylinders give the two components of the lunar semi-diurnal tide, and the approximation improves the longer the tide-curve which is passed through the machine. Corresponding to each of the principal lunar and solar tides there are a pair of tables, spheres with guiding forks, and cylinders similarly geared, and there is another sphere and another table, which last always turns the same way and at the same rate as the drum, from which the mean height of water isdetermined. Such an instrument has been constructed under the supervision of Sir W.. Thomson, but has not yet been put into practical use, so that we cannot say how it will compete with the arithmetical harmonic analysis.

§ 38. The Tide-Predicting Instrument.

The contact of the pen must be such that the work done in dragging it over the paper is small, otherwise a varying tension is thrown on to the float wire. Hence, if the fric- tion is considerable, the float must be large.

The first suggestion for instrumental prediction of tides was given, Tide- we believe, by Sir W. Thomson in 1872, and the instruments since predict- made have been founded on the principles which he then laid down. ing in- Mr Edward Roberts bore a very important part in the first practical strument.

The conditions necessary fora good tide-gauge appear to be better satisfied by Sir W. Thomson's than by any other; but, as his in- strument is recent, other forms have been much more extensively used, and have worked well. The peculiarity of Thomson's tide- gauge is that, by giving the drum an inclination to the vertical, the pressure of the pen on the paper and on its guides is very deli- cately regulated to the minimum necessary for effecting the purpose. In other gauges the drum has been either vertical or horizontal, and the amount of friction has necessarily been considerably greater.

§ 37. The Harmonie Analyser.

realization of such a machine, and a tide-predicter was constructed by Légé for the Indian Government under his direction. Thomson's is the only instrument in Europe as yet in regular practical nse for navigational purposes. It requires much skill and care in manipu- lation, and it has been ably worked by Mr Roberts for the pra tion of the Indian tide-tables ever since its completion. We refer the reader to Sir W. Thomson's paper on "Tidal Instruments," in Inst. C.#., vol. lxv., and to the subsequent discussion, for a full account of the several instruments, and for details of the share borne by the various persons concerned in the realization of the idea. Fig. 5 illustrates diagrammatically the nature of the instrument.

Har- If a function H be expressed as a series of harmonic terms, and | A cord passes over and under a succession of pulleys, being fixed at monic if one pair of these terms be A cos né+B sin nt, then, if Z' be a | one end and having at the other a pen which analyser. multiple of the complete period 27/n, we have touches a revolving drum. If all the pulleys but

Te sine J Hoos nt dt, B=”. vA Ti sin né dt. a4 4 TS o

Thus a machine whieh will effect these integrations will give A and Such a machine has been invented by Prof. James Thomson

and perfected by Sir W. Thomson. In fig. 4 let TT’ be a circular table, capable of rotation about the t inclined shaft s. Let S be a sphere touching the table anywhere along its horizontal diameter. Let C bea cylinder, of somewhat smaller diam- ¥, Ke eter than the sphere, capable of rota- i tion about a horizontal axis parallel to the table, and touching the sphere so that CS is parallel to TT’. Sup- pose that the point of contact of the sphere with the table is distant x ; Ss from the centre of the table, and F’- 4.—Harmonic analyser. nearer to us than the shaft; then, when the shaft sand the table TT’ turn in such a direction that T rises from the paper and T’ goes below it, the sphere will turn in the direction of its arrow. If the radius of the sphere is a, and that of the cylinder 0, then, when the table turns through a small angle 60, the sphere turns through 266/a and the cylinder through xd0/b. This angle vanishes if S touches the table at the centre, and is reversed if the sphere be moved across to the other side of the centre. Also whilst the table is turning the sphere may be rolled backwards and forwards without rubbing, and thus transmits motion from the table to the cylinder without slipping. Now suppose the turning of the table is so constrained that 64=k cos wdy, whilst x is constrained to be equal to the arbitrarily varying quantity H. Then the total angle turned through by the cylinder, as the machine runs, is proportional to fH cos ydy. If we impart to the table a simple 1 For further details concerning the establishment of tide-gauges, see Major

Braid’s Manual of Tidal Observation, London, 1887, and Sir W. Thomson, “ On Tidal Instruments,” in Inst. Civ. Eng., vol. lxv. p. 10.

one be fixed, and if that one executes a simple harmonic motion up and down, the pen will exe- cute the same motion with half amplitude. Ifa second pulley be now given an harmonic motion, the pen takes it up also with half amplitude. The same is true if all the pulleys are in harmonic motion. Thus the pen sums them all up, and leaves a trace on the revolving drum. When the drum and pul- leys are so geared that the angular motion of the drum is proportional to mean solar time, whilst the har- monic motions

of the pulleys cor- respond in range and phase to all the important lunar and solar tides, the trace on the drum is a tide-curve, from which a tide-table may be constructed. The harmonic motion of the pulley is given by an arrangement in- dicated only in the case of the lower pulley in the figure. The pulley frame has attached to its vertical portion a horizontal slot, in which slides a pin fixed to a wheel. Suppose that whilst the drum turns through 15° the wheel turns through 28°984. Nowa lunar day is 24°842 mean solar hours; hence as the drum turns through 15° x 24°842 the wheel turns through 24°842 × 28°-984 or 720°. Thus, if the drum turns with an angular velocity pro- portional to solar time, the wheel turns with twice the angular velocity proportional to lunar time,and the pulley geared to the wheel executes lunar semi-diurnal harmonie oseillations. When the throw of the pin and its angular position on its wheel are adjusted so as to correspond with the range and phase of the observed lunar scmi- diurnal tide, the oscillation of the pulley remains rigorously ac- curate for that tide for all future time, if the gearing be rigorously accurate, and with all needful accuracy for some ten years of tide

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Fic. 5.—Tide-predicting instrument.

2 For further details, see Appendixes iii., iv., v., to Thomson and Tait's Nat. Phil., 1879, vol. i., part i.; James Thomson, Proc. Roy. Soc., vol. xxiv., 1876, p. ne and (Sir W. Thomson) pp. 269, 271; Sir W. Thomson, Proc. Inst, C.E., vol. lxy.

Tides on Indian instru- ment.

Lines crowded near land.

with gearing as practically constructed. The upper pulleys have to be carefully counterpoised as indicated. It has not been found that any appreciable disturbance is caused by the inertia of the moving parts, even when the speed of working is high. The pre- dicter of the India Office takes about four hours to run off a year's tides, but greater speed seems attainable

by modification in the gearing. The Indian instrument, in the store department at Lam- beth, has pulleys for the following tides (see chap. iv.) : —M,, My, My K,, 8, 6s 0, N, P, Ke Q, », ‘ L, 4, 2MS, 25M, MS, Ssa, Sa.

§ 39. Numerical Harmonic Analysis and Prediction.

In chapter iv. we have discussed the application of the numerical harmonic method to a long series of hourly observations. An actual numerical example of this analysis, with modifications to render it applicable to a short series, such as a fortnight, is given in the Admiralty Seientific Manual, 1886, where also an example of the numerical and graphical prediction of the tides may be found. The formule used are those given in chapter v.

VII. Procress oF THE TIDE-WAVE OVER THE SEA, AND THE TIDES OF THE BRITISH SEAS. § 40. Meaning of Cotidal Lines.

Sufficient tidal data would of course give the state of the tide at every part of the world at the same instant of time, and if we were

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to follow the successive changes we should be able to picture mentally the motion of the wave over the ocean and the successive changes in its height. The data are, however, as yet very incom- plete and only a rough scheme is possible. A map purporting to Cotidal give the progress of ‘the tide-wave is called a man of cotidal lines. lines, For a perfect representation three series of maps would be required, one for the semi-diurnal tides, a second for the diurnal tides, and a third for the tides of long period. Each class of map would then show the progress of the wave for cach configuration of the tide- generators. But as yet the only cotidal maps made are those for the mean semi-diurnal tide, and only for the configuration of new and full moon. The knowledge of the tides is not very accurate throughout the world, and therefore in the maps which we give it is assumed that the same interval elapses at all places between new. and full moon and spring tide.

At spring tide, as we have seen in (87) and (88),

h,=(M+M,) cos 2 (y — 4),

since A —, becomes then equal to— 4. As a rough approximation spring tide occurs when the moon’s transit is at one o’clock at night orin the day. We only assume, however, that it occurs simultan- eously everywhere. Now let 7 be the Greenwich mean time of high water, and / the E. long. in hours of the place of observation, then, the local time of high water being the time of the moon’s transit plus the interval, and local time being Greenwich time plus E. bere tite is re ee ede l=35 w—1+1),

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where # is in degrees. Therefore, if we draw over the ocean a succession of lines defined by equidistant integral values of the Greenwich time of high water, and if we neglect the separation of the moon from the sun in longitude i in twelve hours, the successive lines will give the motion of the semi-diurnal tide-wave in one hour.

§ 41. Cotidal Lines of the World.

No recent revisal of cotidal lines has been made with the aid of the great mass of tidal data which is now being accumulated, and we therefore reproduce (fig. 6) the chart of the world ‘prepared by Sir George Airy for

his article on ‘‘Tides and Waves.” The parts of the world for which data are wanting are omitted. The Roman numerals upon the cotidal lines denote the hour in Greenwich time of high water on the day of new or full moon. Airy remarks (§§ 575-584) that the cotidal lines of the North Atlantic are accurately drawn, that those of the South Atlantic are doubtful, and in the Pacific east of New Zealand are almost conjectural. The embodiment of recent observations in a cotidal chart would neces- sitate some modification of these statements.

When a free wave runs into shallow water it travels with less velocity and its height is increased. This is observable in the flexure and crowding of the cotidal lines near continents and oceanic islands, as, for example, about the Azores, the Bermudas, and the coast of South America. The velocity of the tide-wave gives good information as to the depth of the sea. In the North Sea it appears to travel at about 45 miles an hour, which corresponds to a depth

of 140 feet, and we know that the depth along the deeper channel

is greater and along the sides less than this. In the Atlantic the

wave passes over 90° of latitude, from the southern to the northern i one o’clock line, in twelve hours, that is at the rate of 520 miles an

hour. If the Atlantic tide could be considered as a free wave

generated by the Pacific tide, this velocity would correspond to a

depth of 18,000 feet. Airy considers, however, that the Atlantic

forms too large a basin to permit the neglect of the direct tidal

action, and thinks that the tides of this ocean derive extremely

little of their character from the Pacific.

‘‘There is another consideration,” he says, ‘‘ which must not be Sir G.

left out of sight. It is that, supposing the cotidal lines to be accu- Airy. rately what they profess to be—namely, the lines connecting all the

points at which high water is simultaneous—they may, nevertheless, : with a compound series of tide-waves, not at all represent the ridge of the tide-wave which actually runs over the ocean. Thus an eye at a great distance, capable of observing the swells of the tide-waves, might see one huge longitudinal ridge extending from the mouth of the Amazon to the sea beyond Iceland, making high water at one time from Cape de Verde to the North Cape, ‘and at auother time from Florida to Greenland, and another ridge transversal to the former, travelling from the coast of Guiana to the northern sea; and the cotidal lines which we have traced may depend simply on the combination of these waves. It does not appear likely that we can ever ascertain whether itis so or not; but it is certainly possible that the original waves may have these or similar forms ;

Sir G. Airy.

TIDES

and if so it is vain for us to attempt entirely to explain the tides of the Atlantic.”

He sums up the discussion of the chart by saying :—

‘‘Upon the whole, therefore, we are driven to the conclusion that we cannot at all explain the cause of the form of the cotidal lines in the ocean, so far as they have been traced with any prob- ability. And, supposing us to know with tolerable certainty those corresponding to the semi-diurnal tide, we cannot at all predict those which should hold for the diurnal tide.”

§ 42. Cotidal Lines of the British Seas.

Fig. 7 shows the cotidal lines in the seas surrounding the British Islands. Here the lines refer to full moon and change of moon and not to spring tide. The small figures along different parts of the coast denote the extreme range of the tide in yards. This figure is from the same source as the preceding one, and we again reproduce a portion of Airy’s remarks.

‘*The tides in the English Channel claim notice as having been the subject of careful examination by many persons, English and

& s * 2 o 2 4 s 8 o AT Whee (le | 4 a :

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Aisthe point at which Captain Hewitt observations ware made.

The small figures along the Coasts denote the whole range of the tide in yards,

The Roman numerals on the Cotidal

Lines denote the hour of High water

in Greenwich time an the dsya of

new and full moon

Fig. 7.—Cotidal lines of British seas.

French. It appears that in the upper part of the Channel the water flows up the Channel nearly three hours after high watcr and runs down nearly three hours after low water (this continuance of the current after high water, if it last three hours, is called by sailors tide-and-half-tide ; if it last one hour and a half, it is called tide-and-quarter-tide). On the English side of the Channel, especi- ally opposite the entrance of bays, the directions of the currents turn in twelve hours in the same direction as the hands of a watch ; on the French side they turn in the opposite direction. This is entirely in conformity with theory. The same laws are recognized as holding in the British [Bristol ?] Channel, and in the German or North Sea near the Scotch and English coasts.

‘‘ With regard to the Irish Channel we have only to remark that there is a very great difference in the height of the tide on the different sides, the tide on the east side being considerably the greater. They are also greater in the northern part (north of Wicklow on one side, and of Bardsey Island on the

other side) than in the southern part. Between Wexford and Wicklow they are very small. ;

‘‘ The tides of the German Sea present a very remarkable peculiar- ity. Along the eastern coast of England, as far as the mouth of the Thames, the tide-wave, coming from the Atlantic round the Orkney Islands, flows towards the south. Thus, on a certain day, it is high water in the Murray [Moray] Firth at eleven o’clock, at Berwick at two o’clock, at Flamborough Head at five o’clock, and so on to the entrance of the Thames, But on the Belgian and Dutch coasts immediately opposite, the tide-wave flows from the south towards the north. Thus, on the day that we have sup- posed, it will be high water off the Thames at eleven o’clock (the tide having travelled in twelve hours from the Murray Firth) and at Calais nearly at the same time; but at Ostend it will be at twelve, off The Hague at two, off the Helder at six, and so on.

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‘‘We believe that a complete explanation may be found in the arrangement of the great shoals of the North Sea. It must be remarked that (except within a very small distance of Norway) the North Sea is considerably deeper on the English side than on the German side ; so much so that the tide-wave coming from the north runs into a deep bay of deep water, bounded on the west side by the Scotch and English coasts as far as Newcastle, and on the east side by the great Dogger Bank. As far as the latitude of Hull, the English side is still the deep one ; and, though a species of channel through the shoal there allows an opening to the east, yet immediately on the south of it is the Wells Bank, which again contracts the deep channel to the English side. After this (that is, in the latitude of Yarmouth) the deep channel expands equally to both sides. It seems reasonable to conclude from this that the great set of north tide is on the English side of the North Seca, both between the Dogger Bank and England and betwcen the Wells Bank and England (a branch stream of tide having been given off to the east between these two banks), and that any passage of tide- wave over these banks may be neglected. Now this view is sup- ported in a remarkable degree by the tidal observations on two dangerous shoals called the Ower and Leman, lying between Cromer and the Wells Bank, but nearer to the

latter. It appears that on these shoals the direction of the tide-current revolves in the same manner as the hands of a watch, proving conclusively that the Ower and Leman are on the left hand of the main stream of tide (supposing the face turned in the direction in which the tide pro- ceeds), or are on its eastern border, and therefore that the central stream is still nearer to the coast of Norfolk. From a point not far south of this we may suppose the tide to diverge in a fan-shaped form over the uniformly deep Belgian Sea. Along the English coast the wave will flow to the south; but it will reach the whole of the Belgian and Dutch coast at the same instant; and, if this tide alone existed, we doubt not that the time of high water would be sensibly the same along the whole of that coast.

“ But there is another tide of great magnitude, namely, that which comes from the English Channel through the Straits of Dover. This also diverges, we conceive, in a fan form, affecting the whole Belgian Sea: the western part turns into the estuary of the Thames ; the eastern part runsalong the Dutch coast, producing at successive times high water (even as combined with the North Sea tide) along successive points of that coast from Calais towards the Helder. And this we believe to be the complete explanation of the apparently opposite tide-currents. The branch tide of the North Sea running between the Dogger Bank and the Wells Bank will assist in propa- gating the tide along the German coast from the Helder towards the mouth of the Elbe. We have gone into some detail in this explanation for the purpose of showing the importance of consider- ing the form of the bottom in explanations of specific tides.

“ A set of observations has been made by Captain Hewett (at the point A, fig. 7) on the depth and motion of the water at a strictly definite point a few miles south of the Wells Bank, near the middle of the Belgian Sea. The result was that the change of elevation of the surface was insensible, but that there was a considerable stream of tide alternately north-east and south-west (magnetic). The point in question corresponds pretty well to the intersection of the cotidal lines of nine o’clock of the North Sea tide and three o’clock of the English Channel tide (ordinary establishment), and these tides would therefore wholly or partially destroy each other as regards elevation. As regards the compound tide-stream, the greatest positive current from oue tide will be combined with the greatest negative current of

the other, and this will produce a stream whose direction agrees well with observation. At 34 on the day of new moon, the North Sea tide would be running north (magnetic), and the English Channel tide would be running east, and therefore the compound current would be running north-east ; at 92 it would be running south-west. Both currents, and consequently the com- pound current, would cease at about 04, 6, &c., on the day of new moon ; and, as the observations were made rather more than a day before new moon, the slack water would occur an hour or more before noon. ‘The whole of this agrces well with the observations.”

VIII. TipAt DEFORMATION OF THE SOLID EARTH. § 43. Elastic Tides.

The tide-generating potential varies as the square of the distance Elastic from the earth’s centre, and the corresponding forces act at every tides.

point throughout its mass. No solid matter possesses the property of absolute rigidity, and we must therefore admit the sfohalile existence of tidal elastic deformation of the solid earth. The problem of finding the state of strain of an elastic sphere under given stresses was first solved by Lamé;! he made, however, but few physical deductions from his solution. An independent solution was found by Sir W. Thomson,” who drew some interesting conclu- sions concerning the earth.

1 Théorie Math. de l Elasticité, 1866, p. 213. 2 Thomson and Tait, Nat. Phil., §§ 732-737 and 833-842, or Phil. Trans., pt. ii., 1863, p. 583.

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parison with the rigidity of steel falls to the ground, the investiga-

tion remains as an important confirmation of Thomson’s conelusion

as to the great effeetive rigidity of the earth. When extensive and accurate knowledge of the tides has been attained, the attempted evaluation of the rigidity may conceivably be possible, because The 19- there is a minnte tide with a period of 18°6 years (§ 23, schedule yearly [A, iii.]) of which

Laplace’s argument must hold good. Great accu- tide. racy will, however, be necessary, because the height of the tide at

the equator only amounts to one-third of an inch, and a preliminary inquiry seems to show that there are other relatively considerable variations of sea-level arising from unexplained causes.”

Sir W. Thomson’s solution of the strain of an elastic sphere has Weight been also used to determine what degree of strength the materials of con- of the earth must have in order that the great continental plateaus tinents. and mountains may not sink in.* In another investigation it has been shown that local elastic yielding on the coast-lines of conti-

His problem, in as far as it is now material, is as follows. Let a sphere, of radins a and density w, be made of elastic material whose bulk and rigidity moduli are & and , and let it be subjeeted to forees due toa potential wr?S, per unit volume, where S, is a surface spherical harmonie of the second order. ‘Then it is required to find the strain of the sphere. We refer the reader to the original sources for the methods of solution applicable to spherieal shells and to solid spheres. In order to write Thomson’s solution we put 7, d, for radius vector, latitude, and longitude, and p, p, v for the corresponding displacements. Then the solution is as follows :— = 2 2 _ 22) In 4 22 p= (ioe + anal ®* 8r°)k + 2an]rSy 7 w P=9(19k + 4n)n

v [(8a? — 5r*)k + 3(a@? — rn}

aSe an

r ds, cosA dl

[(8a2 — 57?) + §(a2 — 7°) n]r (96).

= w ~ 2(19k + $n)n For either tidal or rotational stresses S,=1(sin?A — 4),

in the case of tides r=3m/c, m and ¢ being the moon’s mass and distance, and in the ease of rotation r= — 4w*, w being the angular velocity about

the polar axis. The equation to the surface is found by putting r=a+p, where in the expression for p we put r=a, Hence from (96) the form of surface is given by

nents may produce an augmentation of apparent tide in certain places on account of the flexnre of the upper strata, when a great weight of water is added and subtracted from the adjacent oceanic area at high and low tide.4 There is reason to believe that snch flexure has actually been observed by a delicate form of level on the coast of the Bay of Biscay.®

§ 45. Viscous and Elastico-Viseous Tides.

It might be supposed that the earth is composed of a viscous Viseous fluid of great stiffness, or that it possesses an elasticity which and breaks down under continued stress. Both these hypotheses have elastico- been considered, and the results are confirmatory of the conclusion viseous

_ 15wa? gsnfk oly a } oe SI): raa{ 1+” | 1+7) alk (sin? \ — 4) (97)

In most solids the bulk modulus is considerably larger than the and in this discussion it is sufficient to negleet n

rigidity modulus, : compared with % With this approximation, the ellipticity ¢ of the surface becomes _ 5wa? (08) Cag T ceieesrtseteteseeserees : Now suppose the sphere to be endued with the power of gravitation, and write 29

where g is gravity at the surface of the globe. Then, if there were

that the earth is made of very stiff material.® appear to have been worthy of attack, although the existcnee of measurable oceanic tides of long period negatives the adoption of the hypothesis of true viscosity, at least under stresses comparable with tide-generating forces.

If a sphere of radins a, density w, viscosity modulus v, be under the action of forces due to a potential per unit volume wr?S,cos nt, so that 2 is the speed of the tide, the solution of the problem shows that the tide of the sphere is expressed by

no elasticity, the ellipticity would be given by e=7/q, and without A gravitation bye=7/r. And it may be proved in several ways that, 8 C05 € COS (E— €).ccscsseserseeeens …(101), gravity and elasticity co-operating, Ge T es 16 19v 2 9 a ee ee (100). where tiic=”—, YSegg a: t+y g 1+12/g

If 2 be the rigidity of steel, and if the globe have the size and mean density of the earth, t/y=2, and with the rigidity of glass t/q =3. Hence the ellipticity of an earth of steel under tide-generating force would be + of that of a fluid earth, and the similar fraction for glass would be . If an ocean be superposed on the globe, then, if the globe rises and falls with the tide as though it were fluid, there will obviously be no tide visible to an observer carried np and down with the solid; and with any degree of rigidity the visible tide will be the excess of the fluid tide above the solid tide. Hence on an earth with rigidity of steel the oceanic tides wonld be reduced to 3, and with rigidity of glass to 2 of the tides on a rigid earth.

§ 44, Rigidity of the Earth.

Thus the tides of the viscous globe are to the equilibrium tides of a fluid globe as cos € to unity, and there is a retardation ¢/n of the time of high tide after the passage of the tide-generator over the meridian. Further, by arguments similar to that applied in the case of elastic tides, it is found that oceanic tides are reduced by the yielding in the proportion of sin ¢ to unity, and that there is an apparent acceleration of the time of high water by (4m —e)/n. It appears by numerical calculation that, in order that the oceanic semi-diurnal tide may have a value equal to two-thirds of the full amount on a rigid globe, the stiffness of the globe must be about twenty thousand times as great as that of pitch at freezing temperature, when it is hard and brittle. We must here pass by the results of the hypothesis of an elasticity degrading uuder the influence of continued stress.

Rigidity _ Although the computation of oceanic tides is as yet impossible, ofthe it cannot be admitted that perfect rigidity in the earth would aug- earth. ment the tides in the proportion of 5 to 2, although they might IX. Trpau FRIcTION.

perhaps be augmented in the proportion 4 to 3. Thus Thomson

§ 46. General Explanation.

These problems tides,

concludes that the earth’s mass must have an effective rigidity at least as great as that of steel. If it were true, as was held until recently, that the earth is a fluid ball coated with a crust, that crust must be of fabulous rigidity to resist the tidal surgings of

The investigation of the tides of a viscous sphere has led us to the General consideration of a frictionally retarded tide. The effects of tidal] explana- friction are of such general interest that we give a sketeh of the tion of principal results without the aid of mathematical symbols. In fig, tidal frie-

subjacent fluid. Hence we are led to the conclusion that far the larger portion of the earth’s mass, if not all of it, is a solid of great rigidity. Up to the present time the argument by which the tides of long period were proved to have approximately their equilibrium height has generally been accepted without much doubt, but we have (§ 17) shown good cause for rejecting Laplace’s argument, at

Attempt least fora fortnightly tide. It appeared formerly that, from nnmeri- to evalue cal data as to the heights of the tides of long period, we should

8 the paper is supposed to be the plane of the orbit of a satellite M tion.

revolving in the direction of the arrow abont the planet C, which rotates in the direction of the arrow about an axis perpendicular to the paper. The rotation of the planet is supposed to be more rapid than that of the satellite, so that the day is shorter than the month. Let us suppose that the planet is either entirely fluid, or has an ocean of such depth that it is high watcr under or nearly under the satellite. When there is no friction, with the satellite at m, the

rigidity be able to compute the actual effective rigidity of the earth’s mass. | planet is elongated into the ellipsoidal shape shown, cutting the by tides But from § 18 we see that, although these tides remain incalculable, | ean sphere, which is dotted. But, when there is friction in the of long yet with

such oceans as ours the tides of long period must conform | fluid motion, the tide is retarded, and high tide occurs after the period. much more nearly to the equilibrium laws than do the tides of | satellite has passed the meridian. Then, if we keep the same figure

short period. Thus a comparison of the observed heights of the tides of long period with the equilibrium law still remains of interest, although the evalnation of the earth's rigidity appears with present data nnattainable. Acting on the old belief, Mr G. H. Darwin has compared the lunar fortnightly and monthly tides, as observed for thirty-three years at various Indian and European ports, with the equilibrium theory, and has fonnd that the tide- heights were about two-thirds of the equilibrium height. From this the conclusion was drawn that the effective rigidity of the earth was as great as that of steel. Whilst, then, this preeise com-

1 Thomson and Tait, Nat. Phil., vol. i. pt. ii., 1883, § 847 sq.

to represent the tidal elongation, the satellite must be at M, instead of at m. If we number the four quadrants as shown, the satellite must be in quadrant 1. The protuberance P is nearer to the satellite than P', and the deficiency Q is further away than the deficiency

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2 Darwin, "On 19-yearly Tide at Karachi," in Brit. Assoc. Report, 1886.

3 G. H. Darwin, Phil. Trans., pt. i., 1882, p. 187, with correction, Proc. Roy. Soc., 1885. ;

4 Td., Brit. Assoc. Rep., 1882, or Phil. Mag., 1882. ; ; 5 D'Abbadie, Annales Soc. Sc. de Bruxelles, 1881, or quotation by Darwin, 0c. cit.

6 G. H. Darwin, Phil. Trans., pt. i., 1879, p. 1; see also Lamb, "On the Oscillations of a Viscous Spheroid," Proc. Lond. Math. Soc., Nov. 1881, p. 51.

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Q’. Hence the resultant action of the planet on the satellite must be in some such direction as MN. The action of the satellite on the planet is equal and opposite, and the force in NM, not being through the planet’s centre, must produce a_ retarding couple on the planet’s rotation, the magnitude of which depends on the

been and will be given for such changes. Let C’ be the moment of inertia of the planet about its axis of rotation, r the distance of the satellite from the centre of the planet, & the resultant moment of momentum of the whole system, e the whole energy, both kinetic and potential, of the system. It is assumed that the figure of the planet and the distribution of its internal density are such that the attraction of the satellite causes no couple about any axis perpen- dicular to that of rotation. A special system of units of mass, length, and time will now be adopted such that the analytical re- sults are reduced to their simplest forms. Let the unit of mass be

length of the arm CN. Mm|(M+m). Let the unit of length y be such a distance that the This tidal frictional moment of inertia of the planet about its axis of rotation may be couple varies as the equal to the moment of inertia of the planet and satellite, treated

height of the tide, and also depends on the sa-

as particles, about their centre of inertia, when distant y apart from one another. This condition gives

Planet’s tellite’s distance ; its in- my \2 My

rotation tensity in fact varies as M sp +m +m +m) — 73

retarded. the square of the tide- Fic. 8 OM + 4 generating force, and = whence y= —— :

therefore as the inverse sixth power of the satellite’s distance. Thus tidal friction must retard the planetary rotation. Let us now con- sider its effect on the satellite. If the force acting on M be resolved along and

perpendicular to the direction CM, the perpendicular component tends to accelerate the satellite's velocity. It alone would carry the satellite further from C than it would be dragged back by the central force towards C. The satellite would describe a spiral, the coils of which would be very nearly circular and very nearly coincident. If now we resolve the central component force along CM tangentially and perpendicular to the spiral, the tangential component tends to retard the velocity of the satellite, whereas the disturbing force, already considered, tends to accelerate it. With

Satcllite's the gravitational law of force between the two bodies the retarda-

Let the unit of time 7 be the time in which the satellite revolves through 57°3 about the planet, when the satellite's radius vector is equal to y. In this case 1/r is the satellite's orbital angular velocity, and by the law of periodic times we have

7 P= w(M +m), where uw is the attraction between unit masses at unit distance. Then by substitution for y

_ f O(M+m) 4

~ etn J

This system of units will be found to make the thrce following Special functions each equal to unity, viz., piMm (M+m)3, wMm, and C. units.

The units are in fact derived from the consideration that these

velocity tion must prevail over the acceleration.! The moment of mo- f : h : retarded. mentum of the whole system remains unchanged, and that of the peg 5 ras tobeunity. In the case of the earth and moon, planetary rotation diminishes, so that the orbital moment of if we take the moon's mass as gyd of the earth's and the earth's momentum must increase ; now orbital moment of momentum in- nia ye "og as $dfa* (as is Mas nearly the case), it may easily creases with increasing distance and diminishing linear and angular ° a a the unit of mass is zy of the earth ae oe velocity of the satellite. The action of tidal friction may appear | ° lyre : en earth's radii or 33,506 se Jl (20,807 miles), somewhat paradoxical, but it is the exact converse of the

accelera- bass ‘ e unit of time 2 hrs. 41 minutes. _ In these units the present tion of the linear and angular velocity and the diminution of dis- pty _ Ng ey of the earth’s diurnal rotation Js eee by oo teas tance of a satellite moving through a resisting medium. The latter Me el the moon’s present radius vector by fs pri The two oes result is generally more familiar than the action of tidal friction, | °0°/*S pos supposed to revolve in circles about their RSS “ a and it may help the reader to realize the result in the present case. racer a with an angular velocity , the moment of momen- mentum. Tidal friction then diminishes planetary rotation, increases the tum of orbital motion is . . satellite’s distance, and diminishes the orbital angular velocity. .) Q+ ou Mr Vo 29 The comparative rate of diminution of the two angular velocities M+m) '" \M+m) M+m | is generally very different. If the satellite be close to the planet Then, by the law of periodic times in a circular orbit, the rate of increase of the satellite’s periodic time or month is large 7 = p(M +m) 5 compared with the rate of increase of the period of planetary rota- | whence Or? =p2(M+myirs, tion or day; but if the satellite is far off the converse is true. | The moment of momentum of orbital motion Hence, if the satellite starts very near the planet, with the month = ptMm(M+ m)-trt a little longer than the day, as the satellite recedes the month soon Ain a ati net i lt : Mig datizamiek, of increases, so that it contains many days. The number of days in | 20° ™ = 4 pci ie : “= = TO e a0=1 : fay cial the month attains a maximum and then diminishes. Finally the bo rg Th, - f planet’s rokalion i a — two angular velocities subside to a second identity, the day and | “™”* iat i at a (102). month being identical and both very long. Since the moon’s present radius vector is 11°454, it follows that We have supposed that the ocean is of such depth that the tides | the orbital momentum of the moon is 3°384. Adding to this the are direct ; if, however, they are inverted, with low water under or | rotational momentum of the earth, which is ‘704, we obtain 4°088 nearly under the satellite, friction, instead of retarding, accelerates for the total moment of momentum of the moon and earth. The the tide; and it would be easy by drawing another figure to see | ratio of the orbital to the rotational momentum is 4°80, so that that the whole of the above conclusions hold equally true with | the total moment of momentum of the

system would, but for the inverted tides. obliquity of the ecliptic, be 5‘80 times that of the earth’s rotation. Again, the kinetic energy of orbital motion is $47. Exact Investigation of the Secular Effects of Tidal Friction. 4 u(5f” 02+ dan *Mr Vow 4 Mm* ogg, Hm Tidal The general conclusions of the last section are of such wide in- M+m M+m M+m P friction. terest that we proceed to a rigorous discussion of the principal effects | The kinetic energy of the planet’s rotation is 4Cn*. The potential of tidal friction in the elementary case of the circular orbit. In | energy of the system is—Mm/r. Adding the three energies to- order, however, to abridge the investigation we shall only consider | gether, and transforming into the special units, we have the case when the planetary rotation is more rapid than the satel- SAU 0. eigge gine (108). lite’s orbital motion. | : , } Now let a=rt, y=n, Y=. Suppose an attractive particle or satellite of mass m to be moving | 1; wil] be noticed that x, the moment of momentum of orbital ‘ L gee : ; es Taig oat ta Berg the hn og Rp a ne ais ae motion, is equal to the square root of the satellite’s distance from : if oe : the planet. Then equations (102) and (103) become perpendicular to the plane of the orbit, with an angular velocity aebs (104) n; suppose, also, the mass of the planet to be partially or wholly ra ta(h yt 1 fat ee (105) imperfectly elastic or viscous, or that there are oceans on the sur- i” ge ae ae ee a ee coe face of the planet ; then the attraction of the satellite must produce (104) is the equation of conservation of moment of momentum, or, a relative motion in the parts of the planet, and that motion must shortly, the equation of momentum ; (105) is the equation of energy. be subject to friction, or, in other words, there must be frictional Now consider a system started with given positive moment of Energy tides of some sort or other. The system must accordingly be losing momentum / ; and we have all sorts of ways in which it may be ’ dimin- energy by friction, and its configuration must change in such a way started. If the two rotations be of opposite kinds, it is clear that Maxi- ished by that its whole energy diminishes. Such a system docs not differ we may start the system with any amount of energy however great, mumand friction. much from those of actual planets and satellites, and, therefore, the but the true maxima and minima of energy compatible with the minimum

given moment of momentum are supplied by d Y/dx=0, or e-h+1/2=0, that is to say, Gt — fice tM Oe, onnaateepecnuceesteeee (106).

We shall presently see that this quartic has either two real roots

results deduced in this hypothetical case must agree pretty closely Siete yc

with the actual course of evolution, provided that time enough has i EEE EEE

1 This way of presenting the action of tidal friction is due to Professor Stokes.

No rela- tive mo- tion be- tween satellite and. planet when energy maxi- mum or minimum,

Equa- tions of mo- mentum, energy, and no relative motion.

Graphical illustra- tion.

and two imaginary, or all imaginary roots. The quartic may be derived from quite a different cousideration, viz., by finding the con- dition under which the satellite may move round the planet so that the planet shall always show the same face to the satellite, —in fact, so that they move as parts of one rigid body. The condition 1s simply that the satellite's orbital angular velocity Q=n, the planet's angular velocity of rotation, or y=1/23, sincen=y and rt=O0-t=2. By substituting this value of y in the equation of momentum (104), we get as before xt —hae+1=0

At present we have only obtained one result, viz., that, if with given moment of momentuni it is possible to set the satellite and planet moving as a rigid body, it is possible to do so in two ways, and one of these ways requires a maximum amount of energy and the other a minimum ; from this it is clear that one must be a rapid rotation with the satellite near the planet and the other a slow one with the satellite remote from the planet. In the three equations

De cuss Fen Sl td ad (107), a ee ee eee (108), * OS hl lh (109),

(107) is the equation of momentum, (108) that of energy, and (109) may be called the equation of rigidity, since it indicates that the two bodies move as though parts of one rigid body. To illustrate these equations geometrically, we may take as abscissa 2, which is the moment of momentum of orbital motion, so that the axis of « may be called the axis of orbital momentum. Also, for equations (107) and (109) we may take as ordinate y, which is the moment of momentum of the planet's rotation, so that the axis of y may be called the axis of rotational momentum. For (108) we may take as ordinate Y, which is twice the energy of the system, so that the axis of Y may be called the axis of energy. Then, as it will be convenient to exhibit all three curves in the same figure, with a parallel axis of x, we must have the axis of energy identical with that of rotational momentum. It will not be necessary to consider the case where the resultant moment of momentum h is negative, because this would only be equivalent to reversing all the rotations ; is therefore to be taken as essentially positive. Then the line of momentum whose equation is (107) is a straight line inclined at 45° to either axis, having positive intercepts on both axes. The curve of rigidity whose equation is (109) is clearly of the same nature as a rectangular hyperbola, but it has a much more rapid rate of approach to the axis of orbital momentum than to that of rotational momentum. The intersections (if any) of the curve of rigidity with the line of momentum have abscissex which are the two roots of the quartic x4—ha?+1=0. The quartic has, therefore, two real roots or all imaginary roots. Then, since x=a/r, the intersection which is more remote from the origin indicates a configuration where the satellite is remote from the planet; the other gives the configuration where the satellite is closer to the planet. We have already learnt that these two cor- respond respectively to minimum and maximum energy. When x is very large, the equation to the curve of energy is Y=(h-—x)', which is the equation to a parabola with a vertical axis parallel to Yand distant A from the origin, so that the axis of the para- bola passes through the intersection of the line of momentum with the axis of orbital momentum. When « is very small, the equation becomes Y= —1/a*. Hence the axis of Y is asymptotic on both sides to the curve of energy. Then, if the line of mo- mentum intersects the curve of rigidity, the curve of energy has a maximum vertically underneath the point of intersection nearer the origin and a minimum underneath the point more remote. But, if there are no intersections, it has no maximum or minimum.

Fig. 9 shows these curves when drawn to scale for the case of the earth and moon, that is to say, withh=4. The points a and 8, which are the maximum and minimum of the curve of energy, are supposed to be on the same ordinates as A and B, the intersections of the curve of rigidity with the line of momentum. The in- tersection of the line of momentum with the axis of orbital momentum is denoted by D, but ina figure of this size it neces-

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Fig. 9.

sarily remains indistinguishable from B. As the zero of energy is quite arbitrary, the origin for the energy curve is displaced down- wards, and this prevents the two curves from crossing one another in a confusing manner. On account of the limitation imposed we

neglect the case where the quartic has no real roots. Every point

of the line of momentum gives by its abscissa and ordinate the square

root of the satellite’s distance and the rotation of the planet, and

the ordinate of the energy curve gives the euergy corresponding to

each distance of the satellite. Part of the figure has no physical meaning, for it is impossible for the satellite to move round the

planet at a distance less than the sum of the radii of the planet

and satellite. For example, the moon’s diameter being about 2200

miles, and the earth’s about 8000, the moon’s distance cannot be

less than 5100 miles. Accordingly a strip is marked off and shaded

on each side of the vertical axis within which the figure has no physical meaning. The point P indicates the present configura-

tion of the earth and moon. The curve of rigidity z*y=1 is the

same for all values of h, and by moving the line of momentum

parallel to itself nearer to or further from the origin, we may represent all possible moments of momentum of the whole system.

The smallest amount of moment of momentum with whicli it is Least mo- ~ — to set the system moving as a rigid body, with centrifugal mentum orce enough to balance the mutual attraction, is when the line of for which momentum touches the curve of rigidity. The condition for this no rela- is clearly that the equation a4 ~ha?+1=0 should have equal roots. tive mo- If it has equal roots, each root must be 3h, and therefore tion pos-

(3h)4 — h(8h)?+1=0, sible.

whence A4= 44/33 or h=4/3t=1°75. The actual value of /% for the

moon and earth is about 4; hence, if the moon-earth system were started with less than 7% of its actual moment of momentum, it

would not be possible for the two bodies to move so that the earth Maxi- should always show the same face tothe moou. Again, if we travel mum along the line of momentum, there must be some point for which number yx? is a maximum, and since yx*=n/Q there must be some point of daysin for which the number of planetary rotations is greatest during one month. revolution of the satellite; or, shortly, there must be some con- figuration for which there is a maximum number of days in the month. Now yz? is equal to #*(h-«), and this is a maximum

when «= h and the maximum number of days in the month is (3h)?(h — 8h) or 83h4/44; if A is equal to 4, as is nearly the case for

the earth and moon, this becomes 27. Hence it follows that we now

have very nearly the maximum number of days inthe month. A

more accurate investigation in a paper on the ‘‘Precession of a Viscous Spheroid” in Phil. Trans., part i., 1879, showed that, taking account of solar tidal friction and of the obliquity to the ecliptic,

the maximum number of days is about 29, and that we have already

passed through the phase of maximum. We will now consider the Discus- physical meaning of the figure. It is assumed that the resultant sion of moment of momentum of the whole system corresponds to a positive figure. rotation. Now imagine two points with the same abscissa, one

on the momentum line and the other on the energy curve, and suppose the one on the energy curve to guide that on the momentum

line. Then, since we are supposing frictional tides to be raised on

the planet, the energy must degrade, and however the two points

are set initially the point on the energy curve must always slide

down a slope, carrying with it the other point. Looking at the

figure, we see that there are four slopes in the energy curve, two running down to the planet and two down tothe minimum. There

are therefore four ways in which the system may degrade, according

to the way it was started; but we shall only consider one, that corresponding to the portion ABba of the figure. For the part of

the line of momentum AB the month is longer than the day, and

this is the case with all known satellites except the nearer one of History of Mars. Now, ifa satellite be placed in the condition A—that is to satellite say, moving rapidly round a planet which always shows the same as energy face to the satellite—the condition is clearly dynamically unstable, degrades. for the least disturbance will determine whether the system shall degrade down the slopes ac or ab—that is to say, whether it falls

into or recedes from the planet. If the equilibrium breaks down

by the satellite receding, the recession will go on until the system

has reached the state corresponding to B. It is clear that, if the intersection of the edge of the shaded strip with the line of mo- mentum be identical with the point A, which indicates that the satellite is just touching the planet, then the two bodies are in

effect parts of a single body im an unstable configuration. If, therefore, the moon was originally part of the earth, we should expect to find this identity. Now in fig. 9, drawn to scale to re- present the earth and moon, there is so close an approach between

the edge of the shaded band and the intersection of the line of momentum and curve of rigidity that it would be scarcely possible

to distinguish them. Hence, there scems a probability that the

two bodies once formed parts of a single one, which broke up in consequence of some kind of instability. This view is confirmed

by the more detailed consideration of the case in the paper on the "'Precession of a Viscous Spheroid," already referred to, and sub- sequent papers, in the Philosophical Transactions of the Royal Society.?

1 For further consideration of this subject see a series of papers by MrG. H. Darwin, in Proceed. and Trans. of the Royal Society from 1878 to 1881, and Appendix G (b) to part ii. vol. i. of Thomson and Tait's Nat. Phil., 1883.

Accelera- tion of moon's motion due to tidal friction.

Various esti- mates of amount.

Numeri- cal result as to earth's rotation.

§ 48. Amount of Tidal Retardation of Earth’s Rotation.

With respect to the actual amount of retardation of the earth’s rotation, we quote the following from Thomson and Tait’s Nat. Phil. (1883), § 830.1

‘In observational astronomy the earth’s rotation serves as a time- keeper, and thus a retardation of terrestrial rotation will appear astronomically as an acceleration of the motion of the heavenly bodies. Itis only in the case of the moon’s motion that such an apparent acceleration can be possibly detected. Now, as Laplace first pointed out, there must be a slow variation in the moon’s mean motion arising from the secular changes in the eccentricity of the earth’s orbit around the sun. At the present time, and for several thousand years in the future, the variation in the moon’s motion is and will be an acceleration. Laplace’s theoretical calculation of the amount of that acceleration appeared to agree well with the results which were in his day accepted as represent- ing the facts of observation. But in 1853 Adams showed that Laplace’s reasoning was at fault, and that the numerical results of Damoiseau’s and Plana’s theories with reference to it consequently require to be sensibly altered. Hansen’s theory of the secular acceleration is vitiated by an error of principle similar to that which affects the theories of Damoiseau and Plana ; but, the mathe- matical process which he followed being different from theirs, he arrived at somewhat different results. From the erroneous theory Hansen found the value of 1218 for the coefficient of the term in the moon’s mean longitude depending on the square of the time, the unit of time being a century ; in a later computation given in his Darlegung he found the coefficient to be 1256.”

“In 1859 Adams communicated to Delaunay his final result, namely, that the coefficient of this term appears from a correctly con- ducted investigation to be 5”°7, so that at the end of a century the moon is 57 before the position it would have had at the same time if its mean angular velocity had remained the same as at the begin- ning of the century. Delaunay verified this result, and added some further small terms which increased the coefficient from 5”°7 to 6”1.

‘Now, according to Airy, Hansen’s value of the ‘advance’ represents very well the circumstances of the oy of Agathocles, Larissa, and Thales, but is if anything too small. Newcomb, on the other hand, is inclined from an

elaborate discussion of the ancient eclipses to believe Hansen's value to be too large, and gives two competing values, viz., 84 and 109.8

"In any case it follows that the value of the advance as theoreti- cally deduced from all the causes, known up to the present time to be operative, is smaller than that which agrees with observation. In what follows 12" is taken as the observational value of the advance, and 6" as the explained part of this phenomenon. About the beginning of 1866 Delaunay suggested that the true explana- tion of the discrepancy might be a retardation of the earth's rota- tion by tidal friction. Using this hypothesis, and allowing for the consequent retardation of the moon's mean motion by tidal reaction, Adams, in an estimate which he has communicated to us, founded on the rough assumption that the parts of the earth's retardation due to solar and lunar tides are as the squares of the respective tide-generating forces, finds 22 sec. as the error by which the earth, regarded as a time-keeper, would in a century get behind a perfect clock rated at the beginning of the century. Thus at the end of a century a meridian of the earth is 330" behind the position in which it would have been if the earth had continued to rotate with the same angular velocity which it had at the beginning of the century. ...

" Whatever be the value of the retardation of the earth's rotation it is necessarily the result of several causes, of which tidal friction is almost certainly preponderant. If we accept Adams's estimate as applicable to the outcome of the various concurring causes, then, if the rate of retardation giving the integral effect were uniform, the earth as a time-keeper would be going slower by '22 ofa second per year in the middle, and by '44 of a second per year at the end, than at

the beginning of the century. The latter is , of the present

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717 ×10 angular velocity ; and, if the rate of retardation had been uniform during ten million centuries past, the earth must have been rotat- ing faster by about one-seventh than at present, and the centri-

1 See also G. H. Darwin's Address to Sect. A, Brit. Assoc. meeting, 1886.

2 ‘*Tt appears not unusual for physical astronomers to use an abbreviated phraseology, for specifying accelerations, which needs explanation. Thus, when they speak of the secular acceleration being, ¢.g., ‘12”°56 in a century,’ they mean by ‘acceleration’ what is more properly ‘the effect of the accelera- tion on the moon’s inean longitude.’ The correct unabbreviated statement is ‘the acceleration is 25°12 per century per century.’ Thus Hansen’s result is that in each century the mean motion of the moon is augmented by an angular velocity of 25°12 per century, so that at the end of a century the mean longi- tude is greater by 4 of 25712 than it would have been had the moon’s mean motion remained the same as it was at the beginning of the century. Con- sidering how absurd it would be to speak of a falling body as experiencing an acceleration of 16 feet in a second, or of 64 feet in two seconds, and how false and inconvenient it is to speak of a watch being 20 seconds fast when it is 20 seconds in advance of where it ought to be, we venture to suggest that, to attain clearness and correctness without sacrifice of brevity, ‘advance’ be sub- stituted for ‘acceleration’ in the ordinary astronomical phraseology.”

3 Researches on the Motion of the Moon, Washington, 1878.

fugal force must have been greater in the proportion of 8172 to Thom- 717? or of 67 to 51. If the consolidation took place then or earlier, gon’s ar- the ellipticity of the upper layers must have been >}, instead of gument about 3$5, asitisat present. It must necessarily remain uncertain as to age whether the earth would from time to time adjust itself completely of eon- to a figure of equilibrium adapted to the rotation. But it is clear go}ida- that a want of complete adjustment would leave traces in a pre- tion of ponderance of land in equatorial regions. The existence of large earth. continents and the great effective rigidity of the earth’s mass

render it improbable that the adjustinents, if any, to the appropri-

ate figure of equilibrium would be complete. The fact then that

the continents are arranged along meridians rather than in an equatorial belt affords some degree of proof that the consolidation

of the earth took place at a time when the diurnal rotation differed

but little from its present value. It is probable, therefore, that

the date of consolidation is considerably more recent than a thou-

sand million years ago. It is proper, however, to add that Adams Great lays but little stress on the actual numerical values which have yncer- been used in this computation, and is of opinion that the amount tainty of tidal retardation of the earth's rotation is quite uncertain." in pre-

§ 49. Effects of Tidal Friction on the Elements of the Moon's a Orbit and on the Earth's Rotation. ;

It would be impossible within the limits of the present article to Effects of discuss completely the effects of tidal friction ; we therefore confine tidal} ourselves to certain general considerations which throw light on friction. the nature of those effects. We have in the preceding sections supposed that the planet's axis is perpendicular to the orbit of the satellite, and that the latter is circular ; we shall now suppose the orbit to be oblique to the equator and eccentric, and shall also consider some of the effects of the solar perturbation of the moon- earth system. For the sake of brevity the planet will be called the earth, and the satellite the moon. The complete investigation was carried out on the hypothesis that the planet was a viscous spheroid, because this was the only theory of frictionally resisted tides which had been worked out. Although the results would be practically the same for any system of frictionally resisted tides, we shall Se below of the planet or earth as a viscous body.'

We shall show that if the tidal retardation be small the obliquity Obli- of the ecliptic increases, the earth's rotation is retarded, and the quity of moon's distance and periodic time are increased. Fig. 10 represents the the earth as seen from above the ecliptic south pole, so that S is the pole increases, and the outer circle the equator. The earth's rotation is in the direction of the curved arrow at S. The half of the inner circle /, f whieh & dciwn with » fil Base sama ee a semi-small-circle of south lati- tude, and the dotted semicircle is a semi-small-circle in the same north latitude. Generally dotted lines indicate parts of the figure which are below the plane of the Fic. 10. paper. It will make the explana- z tion somewhat simpler if we suppose the tides to be raised by a moon and anti-moon diametrically opposite to one

another. Let M and M’ be the projections of the moon and anti-moon on to the terrestrial sphere. Ifthe fluid in which the tides are raised were perfectly frictionless,> or if the earth were a perfect fluid or per- fectly elastic, the apices of the tidal spheroid would be at M and M’. If, however, there is internal friction, due to any sort of viscosity, the tides will lag, and we may suppose the tidal apices to be at T and T’. Now suppose the tidal protuberances to be replaced by two equal heavy particles at T and T’, which are in- stantaneously rigidly connected with the earth. Then the attrac- tion of the moon on T is greater than on T’, and that of the anti-moon on T’ is greater than on T. The resultant of these forces is clearly a pair of forces acting on the earth in the direction TM, T’M’. These forces clearly cause a couple about the axis in the equator, which lies in the same meridian as the moon and anti- moon. The direction of the couple is shown by the curved arrows at L,L’. If the effects of this couple be compounded with the existing rotation of the earth according to the principle of the gyroscope, the south pole S tends to approach M and the north pole to approach M’. Hence, supposing the moon to move in the ecliptic, the inclination of the earth’s axis to the ecliptic dimin-

‘ishes, or the obliquity increases. Next the forces TM, T’M’ clearly

produce, as in the simpler case considered above, a couple about the earth’s polar axis, which tends to retard the diurnal rotation.

This general explanation remains a fair representation of the state of the case so long as the different harmonic constituents of the aggregate tide-wave do not suffer very different amounts of re-

4 These explanations, together with other remarks, are to be found in the abstracts of Mr G. H. Darwin’s memoirs in Proc. Roy. Soc., 1878 to 1881. 5 We here suppose the tides not to be inverted. If they are inverted the conclusion is precisely the same. XXL — 48

TInelina- Suppose the motions of the planet and of its solitary satellite to : | trom | ; ‘ tion of — be Haterved to the invariable Tia of the system. The axis of | be some intermediate periodic time of the satellite for which the plane of resultant moment of momentum is normal to this plane, and the eccentricity does not tend tovary, = orbit component rotations are that of the

planet about its axis of figure But the preceding general explanation is in reality somewhat less generally and the orbital motion of the planet and satellite round their eom- | satisfaetory than it seems, _beeause it does not make clear the deereases. mon centre of inertia; the axis of this latter rotation is clearly the | existence of certain antagonistic influences, to which, however, we normal to the satellite’s orbit. Hence the normal to the orbit, the | shall not refer. The rigorous result, for. a viscous planet, shows axis of resnitant moment of momentum, and the planet’s axis that in. general the eccentricity of the orbit will increase ; but, if of rotation must always lie in one plane. From this it follows | the obliquity of the planet’s equator be nearly 90°, or if the viscosity that the orbit and the planet’s equator must necessarily have a | be so great as to approach perfect rigidity, or if the periodic time common node on the invariable plane. Ifcither of the component of the satellite (measured in rotations of the planet) be short, the rotations alters in amount or direction, a corresponding change eccentricity will slowly diminish. When the viscosity is small the must take place in the other, such as will keep the resultant | law of variation of eccentricity is very simple: if eleven periods moment of momentum constant in direction and magnitude. It | of the satellite occupy a longer time than eighteen rotations of the has been shown that the effeet of tidal friction is to increase the | planet, the eccentrieity increases, and vice versa. Henee in the distance of the satellite from the planet, and to transfer moment | case of small viscosity a circular orbit is only dynamically stable of momentum from that of planetary rotation to that of orbital if the eleven periods are shorter than the eighteen rotations. motion. If, then, the direction of the planet’s axis of rotation does not change, it follows that the ee to the lunar a must | X. CosMoGonic SPECULATIONS FOUNDED ON TIDAL FRICTION. approach the axis of resultant moment of momentum. y drawing : i othe of parallelograms on the same diameter and kecping one § 50. History of the ont and Moon. side constant in direction, this may be easily seen to be true. This We shall not attempt to discuss the mathematical methods by is equivalent to saying that the inclination of the satellite’s orbit | Which the complete history of a planet, attended by one or more will decrease. But this decrease of inclination does not always satellites, is to be traced. The laws indicated in the preceding neccssarily take place, for the previous investigations show that | sections show that there 18 such a problem, and that it may be another effect of tidal frietion may be to increase the

obliquity of solved, and we refer to Mr Darwin’s papers for details (Phil. Trans., the planet’s equator to the invariable plane, or, in other words, to | 1879-81). It may be interesting, however, to give the various increase the inclination of the planet’s axis to the axis of resultant results of the investigation 1 the form of a sketch of the possible moment of momentum. Now, if a parallelogram be drawn with evolution of the earth and moon, followed by remarks on the other a constant diameter, it is seen that by increasing the inclination planetary systems and on the solar system as a whole. alae ; of one of the sides to the diameter (and even decreasing its length) _We begin with a planet not very much more than 8000 miles in Conjec- the inclination of the other side to the diameter may also be in- | diameter, and probably partly solid, partly fluid, and partly gaseous. tural creased. The most favourable case for such a change is when the It is rotating about an axis inclined at about 11” or 12° to the nor- genesis of side whose inclination is increased is nearly as long as the diameter. | ™al to the ecliptic, with a period of from two to four hours, and is moon From this it follows that the inclination of the satellite’s orbit to the | Tevolving about the sun with a period not much shorter than our from invariable plane may increase, and that it is most likely to increase, | Present year. The rapidity of the planet’s rotation causes so great earth. when the moment of momentum of planetary rotation is large com- | compression of its figure that it cannot continue to exist In an

tardation ; and this is the case so long as the viscosity is not great. The rigorous result for a viscous planet shows that in general the obliquity will increase, and it appears that, with small viscosity of the planet, if the period of the satellite be longer than two periods of rotation of the planet, the obliquity increases, and vice versa. Henee zero obliquity is only dynamically stable when the period of the satellite is less than two periods of the planet’s rotation.

pared with that of the orbital motion. The analytical solution of the problem agrees with these results, for it shows that if the vis- cosity of the planet be small the inclination of the orbit always diminishes, but if the viscosity be large, and if the satellite moves with a short periodic time (as estimated in

rotations of the planet), the inclination of the orbit will increase. These results convey some idea of the physical causes which may have given rise to the present inclination of the lunar orbit to the ecliptic. For the analytical investigation shows that the inclination of the lunar orbit to a certain plane, which replaces the invariable plane when the solar attraction is introduced, was initially small, that it then

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Then, when the satellite is in perigee, it is moving faster than the planet rotates, and when in apogee it is moving slower ; hence at apogee the tides lag, and at perigee they are aecelerated. Now the lagging apogean tides give rise to an accelerating force on the satellite, and increase the perigean distance, whilst the accelerated perigean tides give rise to a retarding force, and deerease the apogean distance. Henee in this ease the eccentrieity of the orbit will diminish, It follows from these two results that there must

ellipsoidal form with stability ; or else it is so nearly unstable that complete instability is induced by the solar tides. The planet then separates into two masses, the larger being the earth and the smaller the moon. It is not attempted to define the mode of separation, or to say whether the moon was initially a chain of meteorites. At any rate it must be assumed that the smaller mass beeame more or less conglomerated and finally fused into a spheroid, perhaps in consequence of impacts between its constituent mete- orites, which were once part of the primeval planet. Up to this point the history is largely speculative, for the conditions of insta- bility of a rotating mass of fluid have not yet been fully investigated.

increased to a maximum, and that it finally diminished and is still We now have the earth and moon nearly in contact with one Earth diminishing. another, and rotating nearly as though they were parts of one rigid and But the laws above referred to would, by themselves, afford a very body. This is the system which was the subject of dynamical moon unsatisfactory explanation of the inclination of the lunar orbit, be- investigation. As the two masses are not rigid, the attraction of subjeet cause the sun’s attraction is a matter of much importance. It has each distorts the other ; and, if they do not move rigorously with of inves- been found that, if the viscosity of the planet be small, the in- the same periodic time, each raises a tide in the

other. Also the tigation. clination of the orbit of the solitary satellite to the invariable plane | SU” raises tides in both. In consequence of the frictional resistance will always diminish ; but, when solar influence is introduced, the | these tidal motions, such a system 1s dynamically unstable. If corresponding statement is not true with regard to the inclination the moon had moved orbitally a little faster than the carth rotated, of the lunar orbit to the proper plane, for during one part of the she must have fallen back into the earth ; thus the existenee of moon’s history the inclination to the proper plane would have the moon compels us to believe that the equilibrium broke down increased even if the viscosity of the earth had been small. by the moon revolving orbitally a little slower than the earth Eecen- Consider a satellite revolving about a planet in an elliptic orbit, | Totates. In consequence of the tidal friction the periodic times both tricity of with a periodic time which is long compared with the period of rota- of the moon (or the month) and of the earth’s rotation (or the day) orbit tion of the planet ; and suppose that frictional tides are raised on | 12Crease ; but the month increases in length at a much greater generally the planet. The major axis of the tidal spheroid always points in rate than the day. At some early stage in the history of the system increases, advance of the satellite, and exereises on it a force which tends to | the moon was conglomerated into a spheroidal form, and acquired accelerate its linear velocity. When the satellite is in perigee the | 2 rotation about an axis nearly parallel to that of the earth. — tides are higher, and this disturbing force is greater than when the The axial rotation of the moon is retarded by the attraction of The satellite is in apogee. The disturbing force may therefore be repre- the earth on the tides raised in the moon, and this retardation takes moon. sented as a constant force, always tending to accelerate the motion place at a far greater rate than the similar retardation of the earth’s of the satellite, and as a periodic force which accelerates in perigee rotation. As soon as the moon rotates round her axis with twice and retards in apogee. The constant force causes a secular inerease’ the angular velocity with which she revolves in her orbit, the of the satellite’s mean distance and a retardation of its mean motion. | Position of her axis of rotation (parallel with the earth’s axis) The aceelerating force in perigee causes the satellite to swing out becomes dynamically unstable. The obliquity of the lunar equator further than it would otherwise have done, so that when it comes | t¢ the plane of the orbit increases, attains a maximum, and then round to apogee it is more remote

from the planet. The retarding diminishes. Meanwhile the lunar axial rotation is being reduced force in apogee acts exactly inversely, and diminishes the perigean towards identity with the orbital motion. Finally, her equator is distanee. Thus, the apogean distance increases and the perigean nearly coincident with the plane of the orbit, and the attraction of But i distance diminishes, or, in other words, the eccentricity of the orbit the earth on a tide, which degenerates into a permanent ellipticity may de-increases. Now consider another case, and suppose the satellite's 1 itici 7 ; erease. periodic time to be identical with that of fe Pareles rotation. youre ee ie SCA ER amen a eee

Pepi s

of the lunar equator, eauses her always to show the same face to

the earth. Theearth All this must have taken place early in the history of the earth, andlunar to which we now return. As the month increases in length the orbit. lunar orbit becomes eccentric, and the eccentricity reaches a maximum when the month occupies about a rotation and a half of the earth. The maximum of eccentricity is probably not large. After this the eccentricity diminishes. The plane of the lunar orbit is at first practically identical with the earth's equator, but as the moon recedes from the earth the sun's attraction begins to make itself felt. We must therefore introduce the eonception of two ideal planes (here called the proper planes), to which the motion of the carth and moon must be referred. The lunar proper plane is at first inclined at a very small angle to the earth's proper plane, and the orbit and equator coincide with their respective proper planes. As soon as the earth rotates with twice the angular velocity with which the moon revolves in her orbit, a new instability sets in, The month is then about twelve of our present hours, and the day about six such hours in length. The inclinations of the lunar orbit and of the equator to their respective proper planes increase. That of the lunar orbit to its proper plane increases to a maximum of 6° or 7°, and ever after diminishes, that of the equator to its proper plane increases to a maximum of about 9° 45', and ever after diminishes. The maximum inclination of the lunar orbit to its proper plane takes place when the day is a little less than nine of our present hours, and the month a little less than six of our present days. The maximum inclination of the equator to

its proper plane takes place earlier than this. Whilst these changes have been going on the proper planes have been themselves changing in their positions relatively to one another and to the eeliptic. At first they were nearly coincident with one another and with the earth's equator, but they then open out, and the inclination of the lunar proper plane to the ecliptie continually diminishes, whilst that of the terrestrial proper plane continually increases. At some stage the earth became more rigid, and oceans were formed, so that oceanic tidal friction ey came to play a more important part than bodily tidal riction. If this be the case, the eccentricity of the orbit, after passing through a stationary phase, begins to increase again. We have now traced the system to a state in which the day and month are increasing, but at unequal rates, the inclination of the lunar proper plane to the ecliptic and of the orbit to the proper plane are diminishing, the inclination of the terrestrial proper plane to the ecliptic is increasing and of the equator to its proper plane is diminishing, and the eccentricity of the orbit is increasing. No new phase now supervenes and at length we have the system in its present configuration. The minimum time in which the changes from first to last can have taken place is 54,000,000 years. There are other collateral results which must arise from a sup- posed primitive viscosity or plasticity of the earth's mass, For during this course of evolution the earth's mass must have suffered a screwing motion, so that the polar regions have travelled a little from west to east relatively to the equator. This affords a possible explanation of the north and south trend of our great eontinents. Also a large amount of heat has been generated by friction deep down in the earth; and some very small part of the observed in- ercase of temperature in underground borings may be attributable to this cause. The preceding history might vary a little in detail according to the degree of viscosity which we attribute to the earth's mass, and according as oeeanie tidal friction is or is not, now and in the more recent past, a more powerful cause of change than bodily tidal friction. The argument reposes on the imperfect rigidity of solids and on the internal friction of semi-solids and fluids ; these are vere cause. Thus changes of the kind here dis- theory cussed must be going on, and must have gone onin the past. And postu- for this history of the earth and moon to be true throughout, it is lates suf- only necessary to postulate a sufficient lapse of time, and that there ficient is not enough matter diffused through space to materially resist lapse of the motions of the moon and earth in perhaps 200,000,000 years. time. It seems hardly too

much to say that, granting these two postu- lates, and the existence of a primeval planet, such as that above described, a system would necessarily be developed which would bear astrong resemblance to ourown. A theory, reposing on vere cause, which brings into quantitative correlation the lengths of the present day and month, the obliquity of the ecliptic, and the inclination and eccentricity of the lunar orbit should have claims to acceptance.

§ 51. The Other Planetary Subsystems.

Other If this has been the evolution of the earth and moon, a similar planet- process must have been going on elsewhere. So far we have only ary sub- considered a single satellite and the sun, but the theory may of systems. course be extended, with modifications, to planets attended by several satellites. We will now, thercfore, consider some of the other members of the solar system. A large planet has much more energy of rotation to be destroyed, and moment of momentum to be redistributed, than a small one, and therefore a large planet ought to proceed in its evolution more slowly than a sinall one.

Distor- tion of plastic planet.

The

Therefore we ought to find the larger planets less advanced than the smaller ones. The masses of such of the planets as have satel- lites are, in terms of the earth’s mass, as follows :—Mars=4; Jupiter=340 ; Saturn=100; Uranus=17 ; Neptune=20.

Mars should therefore be furthest advanced in its evolution, and Mars. it is here alone in the whole system that we find a satellite moving orbitally faster than the planet rotatcs. This will also be the ultimate fate of our moon, because, after its orbital motion has been reduced to identity with that of the earth’s rotation, solar tidal friction will further reduce the carth’s angular velocity ; the tidal reaction on the moon will then be reversed, and the moon’s orbital velocity will increase and her distance from the earth

diminish. But, since the moon’s mass is very large, she must recede to an enormous distance from the earth before this reversal takes place. Now the satellites of Mars are very small, and therefore they need only recede a very short distance from the planet before the reversal of tidal reaction. The periodic time of the satellite Deimos is 30h 18™, and, as the period of rotation of Mars is 245 37™, Deimos must be still receding from Mars, but very slowly. The periodic time of the satellite Phobos is 7h 39™; therefore it must be approaching Mars. It does not seem likely that it has ever been remote from the planet.!_ The eccentricities of the orbits of both satellites are small: that of Deimos is 0057 and that of Phobos ‘0066. If the viscosity of the planet be small, or if oceanic tidal friction be the principal cause of change, both eccentricities are diminishing ; but, if the viscosity be large, both are increasing. As we have no means of knowing whether the eccentricities are increasing or diminishing, the larger eccentricity of the orbit of Phobos eannot be a fact of much importance either for or against the present views. But it must be admitted that it is a slightly unfavourable indieation. The position of the proper plane of a satellite is determined by the periodic time of the satellite, the oblateness of the planet, and the sun’s distance. The inclination of the orbit of a satellite to the proper plane is not determined by anything in the system. Hence it is only the inclination of the orbit which ean afford any argument for or against the theory. The proper planes of both satellites are necessarily nearly eoincident with the equator of the planet; but it is in accordance with the theory that the inclinations of the orbits to their respective proper planes should be small. Any change in the obliquity of the equator of Mars to the plane of his orbit must be entirely due to solar tides. The present obliquity is about 30°, and this points also to an advanced stage of evolution, at least if the axis of the planet was primitively at all nearly per- pendicular to the ecliptie.

We now come to the system of Jupiter. This enormous planet Jupiter. is still rotating in about ten hours; its axis is nearly perpendicular to the ecliptic ; and three of its satellites revolve in seven days or less, whilst the fourth has a period of 164 165, This system is obviously far less advanced than our own. The inclinations of the proper plancs to Jupiter’s equator are neccssarily small, but the inclinations of the orbits to the proper planes appear to be very interesting from a theoretical point of view. They are in the case of the first satellite 0° 0’ 0”, in the case of the second 0° 27’ 50”, in

that of the third 0° 12’ 20”, and in that of the fourth 0° 14’ 58”. We have shown above that the orbit of a satellite is first coincident with its proper plane, and that the inclination afterwards rises to a maximum and finally declines. If then we may assume, as seems reasonable, that the satellites are in stages of evolution corresponding to their distances from the planet, these inclinations aceord well with the theory. The eccentricities of the orbits of the two inner satellites are insensible, those of the outer two small. This does not tell strongly either for or against the theory, because the history of the eccentricity depends eonsiderably on the nature of the friction to which the tides are subject. Yet it on the whole agrees with the theory that the eccentricity should be greatcr in the more remote satellites. It appears that the satel- lites of Jupiter always present the same face to the planet, just as does our moon. This was to be expected.

The case of Saturn is not altogether so favourable to the theory. Saturn. The extremely rapid rotation, the ring, and the short periodic time of the inner satellites point to an early stage of development; whilst the longer periodic time of the three outer satellites and the high obliquity of the equator indicate a later stage. Perhaps both views may be more or less eorrect, for successive shedding of satellites would impart a modern appearance to the system. It has probably been previously remarked that the Saturnian system bears a strong analogy to the solar system, Titan being analogous to Jupiter, Hyperion and Japetus to Uranus and Neptune, and the inner satel- lites to the inner planets. Thus anything which aids us in forming a theory of the one system will throw light on the other. The details of the Saturnian system seem to be more or less favourable to the theory. The proper planes of the orbits (except that of Iapetus) are nearly in the plane of the ring, and the inclinations of all the orbits thereto appear not to be large. As the result of

1 Mr Nolan considers the theory inapplicable to the case of Mars ; see Nature, 29th July 1886.

a careful series of observations made at Washington in 1873, Prof. Asaph Hall! finds that the eccentricities of the orbits of Mimas, Enceladus, Tethys,

Dione, and Rhea are insensible, that of Titan is 0284, of Hyperion ‘1000, and that of Iapetus 0278. The satel- lite Iapetus appcars always to present the same face to the planet.

Concerning Uranus and Neptune there is not much to be said, as their systems are very little known ; but their masses are much

Neptune. larger than that of the earth, and their satellites revolve with a

Solar system as a whole.

Planet- ary sub- systems.

Distribu- tion of satellites amongst the planets,

The retrograde motion and_high inclination

short periodic time. The theory of the

of the satellites of Uranus are very remarkable.

inclination of the orbit has been based on an assumed smallness of

inclination, and it is not very easy to see to what results investi- gation might lead if the inclination were large. It must be ad- mitted, however, that the Uranian system points to the probability of the existence of a primitive planet, with retrograde rotation, or at least with a very large obliquity of equator.

It appears from this review that the other members of the solar system present some phenomena which are strikingly favourable to the tidal theory of evolution, and none which are absolutely con- demnatory. We shall show in the following section that there are reasons why the tidal friction arising in the planetary systems cannot have had so much effect as in the case of the earth and moon. That the indications which we have just noted were not more marked, but yet seemed to exist, agrees well with this conclusion.

§ 52. Influence of Tidal Friction on the Evolution of the Solar System.

According to the nebular hypothesis, the planets and the satcllites are portions detached from contracting nebulous masses. In the following discussion that hypothesis will be accepted in its main outline, and we shall examine what modifications are necessitated by the influence of tidal friction. It may be shown that the reaction of the tides raised in the sun by the planets must have had a very small influence in changing the dimensions of the

lanetary orbits round thesun. Froma consideration of numerical nega with regard to the solar system and the planetary subsystems, it appears improbable that the planetary orbits have been sensibly enlarged by tidal friction since the origin of the several planets. But it is possible that some very small part of the eccentricities of the planetary orbits is due to this cause. From arguments similar to those advanced with regard to the solar system as a whole, it appears unlikely that the satellites of Mars, Jupiter, and Saturn originated very much nearer the present surfaces of the planets than we now observe them. But, the data being insufficient, we cannot feel sure that the alteration in the dimensions of the orbits of these satcllites has not been considerable. It remains, however, nearly certain that they cannot have first originated almost in con- tact with the present surfaces of the planets, in the same way as in the preceding sketch (§ 50) has been shown to be probable with regard to the moon and earth. Numerical data concerning the distribution of moment of momentum in the several planetary sub-systems exhibit so striking a difference between the terres- trial system and those of the other planets that we should from this alone have grounds for believing that the modes of evolution have been considerably different. The difference appears to lie in the genesis of the moon close to the present surface of the planet, and we shall see below that solar tidal friction may be as- signed as a reason to explain how it has happened that the terres- trial planet had contracted to nearly its present dimensions before the genesis of a satellite, but that this was not the case with the exterior planets. The efficiency of solar tidal friction is very much greater in its action on the nearer planets than on the further ones. The time, however, during which solar tidal friction has been operating on the external planets is probably much longer than the period of its efficiency for the interior ones, and a series of numbers proportional to the total amount of rotation destroyed in the several planets would present afar less rapid

decrease as we recede from the sun than numbers simply expressive of the efficiency of tidal friction at the several planets. Nevertheless it must be admitted that the effect produced by solar tidal friction on Jupiter and Saturn has not been nearly so great as on the interior planets. And, as already stated, it is very improbable that so large an amount of momentum should have been destroyed as to materially affect the orbits of the planets round the sun.

We will now examine how the differences of distance from the sun would be likely to affect the histories of the several planetary masses. According to the nebular hypothesis, a planetary nebula contracts, and rotates quicker as it contracts. The rapidity of the revolution causes it to become unstable, or perhaps an equatorial belt gradually detaches itself ; it is immaterial which of these two really takes place. In either case the separation of that part of the mass which before the change had the greatest angular momentum permits the central portion to resume a planetary shape. The contraction and the increase of rotation proceed continually until another portion is detached, and so ou. There thus recur at inter- vals a series of epochs of instability or of abnormal change. Now

1 See Brit. Assoc. Report, 1886, p. 543.

tidal friction must diminish the rate of increase of rotation due to contraction, and therefore if tidal friction and contraction are at

work together the epochs of instability must recur more rarely

than if contraction alone acted. If the tidal retardation is suffi- ciently great, the increase of rotation due to contraction will be so

far counteracted as never to permit an epoch of instability to occur.

Since the rate of retardation due to solar tidal friction decreases rapidly as we reccde from the sun, these considerations accord with

what we observe in the solar system. For Mercury and Venus

have no satellites, and there is a progressive increase in the number

of satellites as we recede from the sun. Moreover, the number of | satellites is not directly connected with the mass of the planet, for Venus has nearly the same mass as. the earth and has no satellite,

and the earth has relatively by far the largest satellite of the whole system. Whether this be the true cause of the observed distribu-

tion of satellites amongst the planets or not, it is remarkable that

the same cause also affords an explanation, as we shall now show,

of that difference between the earth with the moon and the other planets with their satellites which has caused tidal friction to be

the priucipal agent of change with the former but not with the Case of latter. In the case of the contracting terrestrial mass we may earth and suppose that there was for a long time nearly a balance between moon the retardation due to solar tidal friction and the acceleration different due to contraction, and that it was not until the planetary mass from had contracted to nearly its prescnt dimensions that an epoch others, of instability could occur. It may also be noted that if there be

two equal planetary masses which generate satellites, but under

very different conditions as to the degree of condensation of the masses, the two satellites will be likely to differ in mass; we caunot of course tell which of the two planets would generate the

larger satellite. Thus, if the genesis of the moon was deferred

until a late epoch in the history of the terrestrial mass, the

mass of the moon relatively to the earth would be likely to differ

from the mass of other satellites relatively to their planets. If

the contraction of the planetary mass be almost completed before

the genesis of the satellite, tidal friction, due jointly to the satellite

and to the sun, will thereafter be the great cause of change in the system ; and thus the hypothesis that it is the sole cause of change

will give an approximately accurate explanation of the motion of

the planet and satellite at any subsequent time. We have already

seen that the theory that tidal friction has been the ruling power

in the evolution of the earth and moon coordinates the present motions of the two bodies and carries us back to an initial state

when the moon first had a separate existence as a satellite; and the initial configuration of the two bodies is such that we are led to believe that the moon is a portion of the primitive earth detached

by rapid rotation or other causes. There seems to be some reason

to suppose that the earliest form in which the moon had a separate existence was as a ring or chain of meteorites ; but this condition precedes that to which the dynamical investigation leads back.

Let us now turn to the other planetary sub-systems. The satcllites of the larger planets revolve with short periodic times ; this admits of a simple explanation, for the smallness of their masses would have prevented tidal friction from being a very efficient cause of change in the dimensions of their orbits, and the largeness of the planet's masses would have caused them to proceed slowly in their evolution. Ifthe planets be formed from chains of meteorites or of nebulous matter, their rotation has arisen from the excess of orbital momentum of the exterior over that of the interior matter.

As we have no means of knowing how broad the chain may have

been in any case, nor how much it may have closed in on the sun

in course of concentration, we are unable to compute the primitive angular momentum ofa planet. A rigorous method of comparison

of the primitive rotations of the several planets is thus wanting.

If, however, the planets were formed under similar conditions, then

we should expect to find the exterior planets now rotating more rapidly than the interior ones. On making allowance for the differ-

ent degrees of concentration of the planets, this is the case. That

the inner satellite of Mars revolves with a period of less than a third of the planet's rotation is perhaps the most remarkable fact Satel- in the solar system. The theory of tidal friction explains this lites of perfectly ; and this will be the ultimate fate of all satellites, be- Mars. cause the solar tidal friction retards the planetary rotation without directly affecting the satellite's orbital motion. Numerical com- parison shows that the efficiency of solar tidal friction in retarding

the terrestrial and martian rotations is of about the same degree

of importance, notwithstanding the much greater distance of the planet Mars. In the above discussion it will have been apparent

that the earth and moon do actually differ from the other planets

to such an extent as to permit tidal friction to have been the most important factor in their history.

By an examination of the probable effects of solar tidal friction Sum- on a contracting planetary mass, we have been led to assign a mary. cause for the observed distribution of satellites in the solar system, and this again has itself afforded an explanation of how it happencd that the moon so originated that the tidal friction of the lunar tides in the earth should have been able to exercise so large an

influence. We have endeavoured not only to set forth the in- fluence which tidal friction may have, and probably has, had in the history of the system,

if sufficient time be granted, but also to point out what effects it cannot have produced. These investi-

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paramount importance in determining the present condition of the planets and their satellites. Throughout the whole of this dis- cussion it has been supposed that sufficient time is at our dis- posal ; Sir W. Thomson and others have, however, adduced reason-

gations afford no grounds for the rejection of the nebular hypo- | ing which goes to show that the history of the solar system must Limita- thesis; but, while they present evidence in favour of the main | be comprised within a period considerably less than a hundred tion of outlines of that theory, they introduce modifications of consider- | million years.' It would perhaps be premature to accept this as time.

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able importance. 'Tidal friction is a cause of change of which Laplace's theory took no account; and, although the activity of that cause may be regarded as mainly belonging to a later period

'than the events described in the nebular hypothesis, yet it seems

that its influence has been of great, and in one instance of even

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the final and definite conclusion of science. If, however, it be con- firmed, we shall only be permitted to accept the doctrine that tidal friction has effected considerable modification in the configuration of the moon and earth, and must reject the earlier portion of the

history sketched above.

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§ 40. Meaning of cotidal lines.

TIDOR, or Trporg, an island (0° 39’ N. lat. and 127° 23’ E. long.) of the East Indian Archipelago, off the west coast of JiLoxo (g.v.) and south of Ternate, is nearly cir- cular in form, and has an area of about 58 square miles. A volcano (5900 feet), now quiescent, rises in the centre and occupies nearly the whole of the island ; its sides are densely covered with forests. The principal productions are sago, rice, cocoa-nuts, and bananas. The capital, Tidor, on the east coast, is a walled town and the seat of a sultan tributary to the Dutch. The population is estimated at 7500. Tidor, which is included in the residency of Ter- nate, is administered by a ‘‘controleur.”

TIECK, Lupwie (1773-1853), the most conspicuous figure of the German romantic school of literature, was born at Berlin on 31st May 1773. His father, a rope- maker, was dry, sarcastic, and matter-of-fact; his mother, gentle and pious, with a leaning to mysticism. Tieck par- took of both characteristics: half his work and half his genius seem a sceptical commentary on the other half. He emancipated himself from the prosaic influence of his father’s house by a passionate study of Shakespeare. After a brilliant career at school he repaired in 1792 to the university at Halle, and, returning to Berlin in 1794, devoted himself to authorship, in which he had already made experiments. As is so commonly the case with young writers of genius, his first tales (Abdallah, William Lovell) partook too largely of the melodramatic, and have little permanent value. But the romantic school of Germany, a movement comparable to the Lake school of England, was already in the air, and Tieck was deeply sensitive to its influence. He was strongly fascinated by two of its aspects in particular—the reaction in favour of German medizval art and the revived interest in fairy tales and

folk-lore in general. Inspired by his friend Wackenroder, a youth of pious ardour and most pious simplicity, he wrote his unfortunately unfinished romance Sternbald's Travels, a very gospel for the artist, at once the comple- ment and the antitype of Wilhelm Meister. His studies in popular literature resulted in the entertaining adaptation

of Blue Beard entitled Peter Lebrecht and several kindred works. Fair Eckbert, his masterpiece, and the master- piece of all romantic fiction, came to him, he said, by inspiration. He may well be believed: no artifice could have created the pervading sensation of dreamy solitude or the intense thrill of the catastrophe. The happy idea of dramatizing popular legend led to the production of a greatly improved Blue Beard, and subsequently of Puss in Boots, a satire on Kotzebue and Iffland, such an alliance of broad humour and dainty irony as we might expect to find in the lost Middle Comedy of Athens.

It might almost have been better if Tieck had con- tinued to walk in his own way. His was a susceptible nature, too sensitive for perfect independence. In 1798 he made the acquaintance of the Schlegels, and was drawn into their circle. Novalis, undoubtedly the greatest genius of the romantic school, was for a time a compensation to him for the death of Wackenroder, whose essays on art he edited with additions of his own. But Novalis himself soon died, and the influence of the Schlegel circle, with its bickerings and its "chopping and changing of ribs," was not wholly salutary either in a moral or a literary point of view. August Schlegel inspired Tieck with a passion for the Spanish drama. He also spent much time on a translation of Don Quixote, certainly a masterpiece, and rendered Ben Jonson's Silent Woman, having previously adapted Volpone. One important production of his own nevertheless belongs to this period, the romantic drama of Genoveva, enthusiastically admired by so clear-headed and impartial a judge as Bishop Thirlwall. He also pro- duced his delightful miniature drama of Lzttle Red Riding Hood, and was working with great spirit on The Emperor Octavian when he was suddenly attacked by rheumatic gout, which tormented him more or less for the remainder of his life. Between pain and unpleasant literary disputes his activity was long greatly impeded. 'The narrowness of his means also troubled him. He had married the

1 Thomson and Tait’s Nat. Phil., App. E; Nature, 27th January 1887 ; Wolf, Théories Cosmogoniques, 1886.

daughter of Pastor Alberti, and, although he was an ami-

able man and nothing is alleged against his wife, his

household does not seem to have been entirely comfort- able. He lived alternately in Jena, Berlin, and Dresden, where he became very intimate with Steffens, and wrote his powerful but dismal tale, Zhe Runenberg. The Emperor Octavian was completed in 1804, with less success than had been hoped. In the following year Tieck repaired to Italy, nominally to visit the baths of Pisa; but he made this medical injunction the plea for a long stay in the country. The effect of Italian scenery, plastic art, and new impressions in general was to wean him from much of the mysticism in which he had hitherto indulged, and to direct him to the criticism of life. The transition to his new manner is indicated by the additions to his former tales and dramas, which, after several years spent In wan- dering and in sickness, he published in 1812. The Elves, The Philtre, and The Goblet are tales, distinguished, the last two more especially, by brilliant colouring and elabo- rate art. ortunatus, a drama in two parts, added in 1816, wants the spirit of its predecessors, but is pervaded by a quiet sarcastic humour exceedingly enjoyable. Plays and stories were set in a framework of esthetic conversa- tion, and the entire collection was entitled Phantasus. By this publication Tieck settled accounts with the romantic school, and could no more be regarded as its leader. Tieck’s power of original composition failed him for some years. He devoted himself especially to antiquarian and dramatic studies. In pursuance of the latter he visited England, saw Kemble and Kean on the stage, and renewed acquaintance with Coleridge, whom he had known in Italy. The friendship of Solger was highly important to him, and helped him to the clear definite principles of composition and. criticism in which he had previously been deficient. The period of reflexion gradually worked itself into a period of productiveness, beginning with his charming novelette of Zhe Pictures, translated by Thirlwall. It was followed by a series of similar works extending over nearly twenty years, very unequal in value, but in their best examples belonging to a very high class of art. Their

great peculiarity is the blending of narrative with disquisition and comment, so thoughtful and ingenious that, interest- ing as the action commonly is, the interruption is not resented. They have usually a strongly marked ironical element, as though the writer were only half in earnest, a self-criticism of which a great creative genius would have been incapable, but which bestows unusual piquancy on productions of the second order. Zhe Pictures, already mentioned, is a fine instance of the masterly conduct of a story, and contains a very original figure, the shrewd, sottish, graceless old painter Eulenbéck, who, with talent enough to have made a name and a fortune, gains a pre- carious livelihood by forging old masters. Zhe Betrothal, also translated by Thirlwall, is a severe satire on hypo- critical pietism. Among the best of the other novelettes in this style may be mentioned Zhe TZ'ravellers, one of the most perfect specimens of the author's irony; Luck brings Brains, a fine study of the power of a weak charac- ter to rise to its opportunities when elevated by a sense of responsibility ; and Zhe Superfluities of Life, an anecdote delightfully told. Zhe Old Book and The Scarecrow, two of the most fantastically imaginative, resolve themselves into literary satire. The motive of the latter was bor- rowed by Hawthorne in his Mother Rigby's Pipe. Of fictions with an historical basis, the most popular are those derived from the lives of poets—A Poet's Life, of which Shakespeare is the hero, and A Poet's Death, relating the sad history of Camoens. he Revolt in the Cevennes is an historical romance of considerable compass; but Tieck's masterpiece in this department is his Witches' Sabbath, a

tale almost unparalleled in literature for its delineation of heart-breaking, hopeless misery. Zhe Young Carpenter (1836, but commenced much earlier) can hardly be as- signed to any of these classes. It has a strong affinity to Wilhelm Meister, and may be compared with Sternbald, both for its resemblance and its contrast. Finally, in Vittoria Accorambona (1840) Tieck takes yet another new departure, indicating affinities with the modern French school of fiction. The novel has been translated into English, but is probably best known to English readers by Mrs Carlyle's half-earnest half-mocking admiration of the hero Bracciano, a Blue Beard on the highest

principles, and her wish that she could have lived two hundred years before, ‘‘to have been—his mistress, not his wife.”

These novels were all written at Dresden, where Tieck had settled in 1819. He enjoyed especial favour at court, took an active part in the direction of the royal theatre, and gained a new description of celebrity by his semi-public readings from dramatic poets in the court circle. According to the almost unanimous testimony of his hearers, he was the finest dramatic reader of hisage. His daughter Dorothea, who united her father’s literary talent to her grandmother’s mystic piety, was of great assistance to him, especially in the translation of Shakespeare which passes under his name. Schlegel had translated seventeen plays. Tieck had undertaken to translate the remainder, and it has been generally supposed that he kept his word. In fact the translation was almost entirely executed by Dorothea Tieck and Count Wolf Baudissin, Tieck contributing hardly anything but his advice and his name. The truth slips out quite innocently in the pages of his biographer K6pke, and is fully told by Gustav Freytag (Jm Neuen eich, January 1880). During his residence at Dresden he collected his critical writings, produced his excellent translation of the English dramatists anterior to Shakes- peare, and edited the works of Novalis, Kleist, Lenz, and other contemporaries. In 1842 he accepted the invitation of Frederick William IV. to settle in Berlin, where he had already been to conduct the representation of the Antigone with Mendelssohn’s music. He found himself but little in his element in the city of his birth, and the dramatic representations directed by him, including revivals of some of his own plays, were rarely successful. In 1851 his health failed entirely, and he withdrew altogether from the world. He died on 28th April 1853.

Though not a writer of the highest rank, Tieck is nevertheless a most original genius, very unjustly neglected by his countrymen. The best of his compositions in the taste of the romantic school are absolute masterpieces; and his later productions, if imperfect, oceupy @ unique position in literature. He may be compared to Wieland, whom he decidedly surpasses, and to Ariosto, whom he would have more than rivalled if he had been capable of a great sustained effort. His susceptibility and self-distrust checked his genius, but at the same time gave it that peculiar ironic flavour which constitutes its special distinction. He is like an exquisite side dish,

not sufficiently substantial for a full meal. The attempts to extract a moral significance from the stories in Phantasus seem entirely thrown away; the purpose of his later writings, when there is any, is always definite. Perhaps the soundest criticism upon him, at bottom, is Heine's in his Romantic School, though

written at a time when it was his cue to show the works of that school as little quarter as possible. Carlyle's criticism is cxcellent, but only refers to the Phantasus.

The principal contribution to Tieck's biography is the delightful book of Rudolf Képke (Leipsic, 1855), chiefly drawn from his oral communieations and containing his opinions on a number of subjects. Particulars of his residence at Dresden, more especially of his con- nexion with the theatre, are given in the memoirs of Friesen (Weimar, 1871). Tales from Phantasus have been translated in Carlyle's Speciinens of German Romance, and are reprinted in his miseellanies. A greatly inferior version, in some places unscrupu- lously altered from Carlyle, was published in 1845 with an elaborate preface signed by J. A. F., who does not, however, appear to have been the translator. Several of Tieek's other works have been translated into English, but the only remarkable rendering is Bishop Thirlwall's of The Pictures and The Betrothal. A com-

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plete chronological list of his writings is appended to Képke's work. (R. G

TIEDEMANN, Friepricu (1781-1861), German anato- mist and physiologist, the son of a philosopher and psychologist of considerable repute, was born at Cassel on 23d August 1781. He graduated in medicine at Marburg in 1804, but soon abandoned practice owing to disappoint- ment at his failure to check his father's last illness. Re- pelled on the one hand by the brilliant but unsubstantial discourses of Schelling on the ‘‘ Naturphilosophie,” and attracted on the other hand by the practical skill and in- telligence of the surgical anatomist S6mmering, he returned to the study of natural science. He betook himself to Paris, and became an ardent follower of Cuvier. On his return to Germany he maintained the claims of patient and sober anatomical research against the prevalent specu- lations of

the school of Oken (see OKEN and MorpPHo.oey), whose foremost antagonist he was long reckoned. His manifold labours in the field of Cuvierian anatomy cannot be recorded here; but his remarkable studies of the de- velopment of the human brain, as correlated with his father's studies on the development of intelligence, may be mentioned. He spent most of his life (from 1816) as professor of anatomy and physiology at Heidelberg, and died at Munich on 22d January 1861.

TIENTSIN is the largest commercial city in Chih-li, the metropolitan province of China. It is situated in 39° 7' N. lat. and 117° 11' E. long., at the junction of the Peiho and the Wan-ho, which is connected by the Grand Canal with the Yang-tsze-kiang. It is a prefectural city, and the residence of the viceroy of the province during a great portion of the year. The town is built on a vast alluvial plain, which extends from the mountains beyond Peking to the sea, and through which the Peiho runs a circuitous course, making the distance by water from Tientsin to the coast about 70 miles, as against 35 miles by road. The soil of the surrounding country being strongly impregnated with soda and nitre is not fertile, but produces sorghum and other coarse grains. The city walls are well built, though not always kept in good order, and measure about three quarters of a mile each way. As in all Chinese cities, the more wealthy inhabitants live in the suburbs, but even their houses have a mean appear- ance, being built mainly of mud or dried bricks. The streets are for the most part unpaved, and in wet weather are little better than quagmires. Some improvements have, however, been made in this respect of late. The city has always been a great commercial depot. In 1885 the foreign imports amounted to £3,226,972 and the ex- ports to £980,852, and 375 foreign vessels of 279,829 tons visited the port, tea to the value of about £904,496 being landed for carriage overland, via Kalgan and Kiachta, to Siberia. During the winter the river is frozen, so that communication has to be carried on overland to Chin-kiang on the Yang-tsze-kiang, to which point also a line of tele- graph (now extended to Peking) was opened in 1881. The principal articles of import are shirtings, drills, T-cloths, jeans and twills, opium, woollens, steel, lead, needles, Japanese sea-weed, and sugar; and of export, skins, beans and pease, straw braid, coal, dates, wool, tobacco, and rhubarb. The coal exported is brought from the Kaiping colliery to the east of T'lentsin; its output in 1885 was

181,039 tons, 54,976 tons more than in 1884. An ex- perimental railway nearly two miles long has lately been constructed at T'ientsin.

In 1853 T'ientsin was besieged by an army of Taiping rebels, which had been detached from the main force at Nanking for the capture of Pcking. The defences of T'ientsin, however, saved the capital, and the rebels were forced to retreat. Five years later Lord

Elgin, accompanied by the representative of France, steamed up the Petho, after having forced the barriers at Taku, and took peaceable

possession of the town. Herc the treaty of 1858 was signed. Two years later, in consequence of the treacherous attack made on the English plenipotentiary the preceding year at Taku, the city and suburbs were occupied by an allied English and French force, and were held for two years. The city was constituted an open port. On the establishment of Roman Catholic orphanages some years later the pretensions of the priests so irritated the people that on the occurrence of an epidemic in the schools they attacked the French and Russian establishments and murdered twenty of the foreign inmates, besides numbers of their native followers. The Chinese Government at once suppressed the riot, and sent a repre- sentative to Europe to apologize for the outbreak.

TIERNEY, Georce (1761-1830), an English Whig politician, was born at Gibraltar on 20th March 1761, being the son of a wealthy merchant resident in Spain. He was sent to Peterhouse, Cambridge, where he took the degree of LL.D. in 1784, and was called to the bar; but, having inherited an ample fortune, he abandoned law and plunged into politics. He contested Colchester in 1788, when both candidates received the same number of votes, but Tierney was declared elected. He was, however, de- feated in 1790. He sat for Southwark from 1796 to 1806, and then represented in turn Athlone (1806-7), Bandon (1807-12), Appleby (1812-18), and Knaresborough (1818- 30). When Fox seceded from the House of Commons, Tierney became a prominent, if not the leading, opponent of Pitt's policy. It was perhaps for this reason that he was disliked by Fox. In 1797—such was the height of political passion at this epoch—Wilberforce noted in his diary that Tierney's conduct was "truly Jacobinical"; and in May 1798 Pitt accused him of want of patriotism. As the words were not

withdrawn, a duel ensued at Putney Heath on Sunday, 27th May 1798; but neither combatant was injured. In 1803 Tierney, partly through gratitude for the peace which had been ratified with France and partly because Pitt was out of office, joined the ministry of Addington as treasurer of the navy, and was created a privy councillor; but this ill-advised step alienated many of his supporters among the middle classes, and offended most of the influential Whigs. On the death of Fox he joined (1806) the Grenville ministry as president of the board of control, with a seat in the cabinet, and thus brought himself. once more into line with the Whigs. After the death of Ponsonby in 1817 Tierney became the recognized leader of the opposition in the House of Com- mons. In the neutral ministry of Canning, the place of master of the mint was held by him, and when Lord Goderich succeeded to the lead Tierney was admitted to the cabinet ; but he was already suffering from ill-health and took little part in its deliberations. He died suddenly at Savile Row, London, on 25th January 1830.

Tierney was a shrewd man of the world, with a natural aptitude for business. His powers of sarcasm were a cause of tcrror to his adversaries, and his presence in debate was much dreaded. His arguments were felicitous, and, though he never aimed at the high- est flights of eloquence, his choice of language was the theme of constant admiration. Lord Lytton, in his poem of St Stephen's, alludes to ‘‘ Tierney's airy tread," and praises his "light and yet vigorous" attack, in which he inflicted, ‘‘ with a placid smile," a fatal wound on his opponent.

TIERRA DEL FUEGO, a large archipelago at the southern extremity of South America, from which it is separated by Magellan Strait, at the Narrows and other points scarcely a mile wide. The group lies between 52° 40' and 55° 59' §. lat. and 63° 30' and 74° 35' W. long. stretching nearly in a line with the Patagonian Andes for over 400 miles north-west and south-east, between Capes Pillar and Horn, and for about 270 miles west and east from Cape Pillar to Cape Espiritu Santo (Catherine Point) in the north; southwards it tapers to 120 miles between Capes Horn and St Diego, the latter being continued east- wards to Staten Island, which is not usually included in the group. Although on ordinary maps this region pre- sents to the eye a hopelessly confused aggregate of islands,

channels, and fjord-like inlets, as if it had been submerged sufficiently to convert its deep valleys and gorges into

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“STIERRA DEL” FUEGO Fuegian Archipelago

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Map of Tierra del Fuego.

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marine passages, bays, and bights, it is nevertheless clearly disposed in three main sections, which may be conveniently named East, West, and South Fuegia.

East Fuegia consists of the single island of King Charles’s South Land (eastern Tierra del Fuego), which is very much larger than all the rest of the group together, being considerably over 200 miles long from north to south. It obviously forms a southern extension of the Patagonian pampas, which it greatly resembles in its phy- sical constitution, climate, flora, and fauna. The low- lying, flat or slightly rolling plains are covered with a rich growth of tall herbage, which is frequented by the rhea, guanaco, and other animals common to the adjoining main- land, and also peopled by a branch of the

same Tehuelche (Patagonian) family. In the south a long peninsula pro- jects westwards to the Pacific. This western limb as- sumes a mountainous character, Mount Darwin (6800 feet) being situated about midway on its south side and Mount Sarmiento (6900, or perhaps 7000 feet), the culminating point of the archipelago, much nearer the Pacific. Although generally supposed to be volcanic, this peak presents such extremely precipitous, in fact, almost vertical flanks that John Ball considers it more probably “a portion of the original rock skeleton that formed the axis of the Andean chain during the long ages that preceded the great vol- canic outbursts that have covered the framework of the western side of South America.”! This is altogether an alpine region with numerous snow-clad summits and gla- ciers descending down to the sea (Darwin).

Along the south side of East Fuegia flows Beagle Channel, about 55° S. lat., separating it from South Fuegia, which comprises the islands of Hoste, Navarin, Gordon, Londonderry, Stewart, Wollaston, and numerous islets, disposed in triangular form with the base on Beagle Channel and the apex at the rocky headland of Cape Horn. At its western end Beagle Channel takes the name of Darwin Sound, which leads to the Pacific at Londonderry and Stewart Islands. North of these lies Brecknock Peninsula, the westernmost extension of East Fuegia, cut- ting off South Fuegia from Clarence Island and Desola- tion Land, which with Dawson Island and numerous rocks and islets constitute West Fuegia. Desolation Land, so named by Cook, who supposed it to form a continuous mass stretching from the western entrance of Magellan Strait to Cockburn Channel, really consists of at least three, and possibly more islands, separated from each other by very narrow channels flowing between the Pacific and the western branch of Magellan Strait. The name Desolation has been reserved for the northern member of

1 Notes of a Naturalist in South America, London, 1887, p. 245.

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has been called Santa Ifiez; the other or others are still unnamed, When Ball passed through the strait, he was shown one of the narrow sounds “which have lately been ascertained to penetrate entirely through what used to be

considered a single island” (op. cit., p. 241).

Lying almost in a line with the main Andean axis, both West and South Fuegia are essentially highland regions, conforming in their general characteristics to the intervening western extension of East Fuegia. As compared with the great mass of the latter, they are everywhere extremely rugged and mountainous, having a mean elevation of not less than 3000 feet, a much moister climate, and arboreal instead of grassy vegetation. The isothermals of 32° Fahr. for July (winter) and 50° Fahr. for January (summer), with a mean annual temperature of 42° Fahr., show that tolerably mild winters are followed by cool summers, both seasons being accompanied by overcast skies, constant and sudden changes from fair to foul weather; whilst fogs, mists, rains, snows, and high winds (prevailing throughout the year) endanger the navigation of the intricate inland channels, and render the archipelago one of the dreariest regions on the globe.

A botanical parting line seems to be constituted by the range of hills running back of Punta Arenas along the east side of Brunswick Peninsula (which, although attached by a narrow neck of land to Patagonia, belongs physically to the insular domain), and termin- ating at Cape Froward (58° 54’ S. lat.), the southernmost point of the American mainland. West and south of this line the pampas are replaced by lofty mountains clothed with a dense forest vege- tation from the water’s edge to heights of 1000 and 1200 feet, above which stretches a zone of peaty soil with stunted alpine plants as far as the snow line (3000 to 3500 feet). The forest species are chiefly an evergreen beech (Fagus antarctica, 8.) and the winter bark (Winteria aromatica), also evergreen, with tall smooth stem and glossy leaves like the laurel. Wild celery, cress, cochlearia, and other anti-scorbutic plants occur on both sides of Magellan Strait, and the beech nourishes a large yellow mushroom, which, with the berries of a dwarf shrub, is the only vegetable food of the natives.

In West and South Fuegia the fauna is restricted mainly to two species of fox, a bat, rats, mice, the sea otter, the penguin and other aquatic birds, and various cetaceans in the surrounding waters.

To the three geographical divisions correspond three well-marked ethnical groups,—the Onas of East, the Yaghans of South, and the Alacalufs of West Fuegia. The first are estimated to number 2000, the others 3000 each, making a total population of some 8000 for the whole archipelago. The Onas are Patagonians who have crossed the strait. ‘The Alacalufs are also immigrants from the mainland, but probably they came at an earlier date, and from the western uplands, being apparently a branch of the Auca (Araucanian) race of the Patagonian and Chilian Cordilleras. They differ altogether in speech both from the Onas, with whom they come scarcely anywhere in contact, and from the Yahgans, who are the true aborigines of the archipelago. These last are in exclusive possession of South Fuegia, and also occupy the north side of Beagle Channel about Mount Darwin and further west. To them alone missionary enterprise has hitherto been extended, and the English station of Ushiwaya on Beagle Channel has for some years been the only centre of civilizing ifluences in the archipelago. As Lieutenant Bove of the Italian Antarctic expedition has made a special study of this branch,’ they are much better known than either of the neighbouring races. If they represent an earlier Araucanian immigration than that of the Alacalufs, their ex- tremely low social state, on which all observers are unanimous, may be regarded as the result of degradation from a higher con- dition during their long sojourn in their present inhospitable en- vironment. But it seems more probable that they are the direct descendants of the primitive race by which the archipelago has been occupied from a vastly remote period, as is shown by the very great number of kitchen-middens recently discovered on the coast. Although taller than the Negritoes of the eastern hemisphere (4 feet 10 inches to 5 feet 4 inches), the Yahgans present in some respects a more debased type, characterized by low brows, prominent zygomatic arches, large tumid lips, flat nose, loose wrinkled skin (* pelle grinzosa e cadente,” says Bove), black restless eyes very wide apart, coarse black unkempt hair, and head and chest disproportionately large compared with the extremely slender and outwardly curved legs, conveying an impression of top-heaviness like that of the Akkas of equatorial Africa. Their mental qualities are on the same low level, as is indicated by the almost total absence of clothing under such inclement skies, by the brutal treatment of their women, who when old and useless are often eaten, by the lack of human affections or love of offspring, who in rough weather are thrown overboard (Dr Fenton), either as a peace offering

to the spirits of the storm or to lighten the canoe, and by many repulsive practices connected with their food and social habits. The tribal organiza-

1 See Guido Cora's Cosmos for May 1883.

tion has not yet been reached, each family circle living apart and combining only in small groups against some common enemy, but recognizing no hereditary chief or even any temporary leader. Yet the missionaries, who have reduced the language to writing (Gospel of St Luke, London, 1881), assert that it contains no less than 30,000 words, although the numerals stop at jive, already a compound form (cz-pash-pa), and although the same word expresses both hand and jinger. But they have obviously failed to distinguish between distinct terms and the endless grammatical intricacies in which this, like so many other rude forms of speech, is still involved.

Since 1881 the eastern portion of Fuegia (with Staten Island) has belonged to the Argentine Republic and the western to Chili. The boundary line, which is purely conventional, runs from Cape Kspiritu Santo due south to Beagle Channel. Neither power has hitherto occupied any part of Fuegia, except Punta Arenas (Sandy Point) on the Patagonian side of Magellan Strait, where the Chilians have for some years maintained a convict and coaling station.

Fuegia was discovered by Magellan in 1520, when he sailed through the strait named after him, and called this region the '*Land of Fire," either from now extinct volcanic flames, or much more probably from the fires kindled by the natives along parts of his course. In 1578 Drake first sighted the point which in 1616 was named Cape Hoorn (Anglicized Horn) by the Dutch navi- gators Lemaire and Schouten. In 1619 the brothers Nodal first circumnavigated the archipelago, which was afterwards visited at intervals by Wood and Narborough (1670), Gennes and Froger (1696), Byron (1764), Wallis and Carteret (1767), Cook (1768), and Weddell (1822). But no systematic exploration was attempted until the British Admiralty undertook a thorough survey of the whole group by King (1826-28) and Fitzroy (1831-36). The latter expedition (Voyage of the '' Beagle") was accompanied by Charles Darwin, then a young man. To these admirable

surveys is due most of the present geographical terminology of the archipelago. Since then the work of exploration has been continued and nearly completed by Dumont d'Urville (1837), Charles Wilkes (1839), Parker Snow (1855), Bove (1883), aud various English, American, and Roman Catholic missionarics.

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TIFFIN, a city of the United States, in Seneca county (of which it is the county seat), Ohio, stands upon the Sandusky river, in 41° 7' N. lat., 83° 11' W. long., 42 miles south-east of Toledo. The city is situated in the midst of an agricultural region, for which it serves as a shipping and supply point, and has three railroads—the Baltimore and Ohio, the Indiana, Bloomington, and Western, and the North-Western Ohio. It is the seat of Heidelberg College, one of the minor educational institutions of the State. Tiffin had in 1880 a population of 7879, an increase of 2231 over that in 1870.

TIFLIS, capital of the province of the same name and of Russian Caucasia, is picturesquely situated (44° 48' E. long., 41° 42' N. lat.) at the foot of high mountains, on both banks of the river Kur, some 500 feet above the level of the Black Sea. The heat in summer is excessive, owing to the confined position ; but the surrounding hills (1350 to 2400 feet) shelter the town effectively from the cold winds of a generally severe winter. A large

square, the cathedral, one or more handsome streets, gardens, bridges, many fine or neat buildings—among them the grand-ducal palace, the opera-house, and the museum—European shops, the club or circle, hotels, and public offices are evidence that Western civilization has not only penetrated but has long prevailed in this geographically remote town. Of its 54 churches 26 are Armenian, 2 Lutheran, and 1 Catholic, The (Sion) cathedral traces back its origin to the 5th cen- tury ; but in the interval it has suffered much and often. Other churches date from the 14th and 15th centuries, the Armenian cathedral of Vank from 1480, and the Catholic church from the 14th century. Tiflis has two

gymnasia and pro-gymnasia for boys and two for girls, and a number of other schools; several scientific societies, of which the Caucasian branch of the geographical society is well known ; an astronomical and a physical observatory ; anda public library. The manufactures of the place are limited to a few cotton and silk factories, tanneries, soap- works, and brick-works. But the petty trades are largely developed ; and the artisans of Tiflis (about 8000) are re- nowned as silversmiths, gunsmiths, and sword-makers, Since 1883 Tiflis has been in railway connexion with Poti and Batum on the Black Sea and with Baku on the Cas- pian ; but the line from Russia to Vladikavkaz has not yet crossed the main chain of the Caucasus. The trade is of great importance, as Tiflis is the chief centre for the import of raw silk and silken goods, raw cotton, carpets, and dried fruits from Persia, as well as from trans-Caucasia, while a variety of manufactured wares are imported from Russia. The foreign trade of trans-Caucasia with Asia, mostly carried on from Tiflis, in 1884 reached the value of £1,729,800 for exports, and £857,070 for imports. In 1883 the population numbered 104,024, as against 71,051 in summer 1865 and 60,085 in winter, exclusive of a garrison of 6800. Ethnologically, the numbers are—Ar- menians 31,180, Georgians 14,787, and Russians 12,142, with an admixture of about 1200 Germans, 7150 Persians (in summer), 1500 Tatars, and some Jews and Greeks.

Many chroniclers and travellers have written about Tiflis. Per- haps one of the fullest accounts is contained in Brosset’s edition of the Description Géographique de la Géorgic (St Petersburg, 1842), by the illegitimate son of Wakhtang VL., king of Karthli, who became a pensioner of Peter the Great. English travellers since 1849 de- scribe Tiflis in its main features

much in the same terms. Lady Sheil, writing in 1849, calls it “most thriving, active, and bustling.” Edward Eastwick (1860), estimating its population at 40,000 and the height of the mountains overhanging it at 3000 feet, represents the plain in which the city is situated to be so barren that ‘even the Kur… imparts to it but a limited fertility.” Mounsey (1866) speaks in warm terms of its social charms and the great hospitality of its inhabitants, and notes it as the seat of governinent for the ‘Caucasian provinces of Russia, headquarters of an army of 150,000 men, and the residence of the governor-general.” In the old division of Tiflis three distinct towns were included,—Tiflis, Kal‘a (the fort), and Isni; subsequently Tiflis seems to have become known as Sdaiyidabad, Kal‘a as Tiflis, and Isni as Aulabar. Kal’a and Isni possessed citadels ; that of the former contained the church of St Nicholas and a royal palace, that of the latter the church of the Holy Virgin and the residence of the archimandrite. The town is now divided into quarters:—the Russian (the finest of all), the German, the Armenian, and that in which are congregatcd Jews, Mohammedans, and the mass of Orientals. ‘Tiflis can lay claim to a very considerable antiquity. In 455 the chieftain of Georgia, Wakhtang, transferred his capital from Mhtset to the warm springs of Tpilisi, where he erected several churches and a fort. In 570 the Persians took the place and made it the residence of their rulers, but retained it only for ten years. Tiflis underwent successive plunderings and devastations at the hands of the Greeks in 626, of one of the commanders of Omar in 781, of the Khazars in 828, and of the Saracens in 851. The Georgians, however, always managed to return to it and to keep it in their permanent posses- sion. Inthe course of the succeeding centuries Tiflis fell repeatedly into Persian hands ; and it was plundered by Timur about the end of the 14th century. Afterwards the Turks seized it several times, and towards the end of the 17th century the Lesghians made attacks upon it. In 1795, when the shah of Persia plundered Tiflis, Russia sent troops to its protection, and the Russian occupation became permanent in 1799. ; ;

TIGER. Although this name is often applied by settlers and sportsmen to several of the larger Melidx, as the leopard of Africa and the jaguar of America, it should properly be restricted to the well-known striped species of Asia, Melis tagris of Linnzeus, an animal which is only rivalled by the lion in size, strength, and ferocity among the cat-like beasts of prey. It is a true cat ona large scale, and possesses all the essential characters of the

genus as defined in the article Mamata (vol. xv. p. 434). It belongs to the section in which the pupil of the eye con- tracts under the stimulus of light into a round spot and not a vertical slit, and in which the hyoid bone is con-

nected loosely with the skull by a long ligament, instead of by a continuous chain of bones. In these points it agrees with the lion and the leopard and differs from the common cat. Almost everything that is said in the article Lion (vol. xiv. pp. 680-681) of the structure of the skele- ton, teeth, and claws of that animal will apply equally well to the tiger, the difference between the two lying mainly in the skin and its coverings. There are, however, slight distinctions in the proportionate size of the lower teeth, the general form of the cranium, and the relative length of the nasal bones and ascending processes of the maxillaries by which the skull of the lion and tiger can be easily discriminated by the practised observer. _ Although examples of both species present considerable variations in size, and reliance cannot always be placed upon alleged dimensions, especially when taken from skins

stripped from the body, it seems well ascertained that the length of the largest-sized Bengal tiger may exceed that of any lion. Larger specimens are certainly recorded, but 10 feet from the tip of the nose to the end of the tail is, ac- cording to Jerdon, an unusual length fora large male tiger. The female is somewhat smaller and has a lighter and nar- rower head. ‘The tiger has no mane, but in old males the hair of the cheeks is rather long and spreading. The ground colour of the upper and outer parts of the head, body, limbs, and tail is a bright rufous fawn, and these parts are beautifully marked with transverse stripes of a dark, almost black colour. The markings vary much in different individuals, and even on the two sides of the same individual. The under parts of the body, the inside of the limbs, the cheeks, and a large spot over each eye are nearly white. The tigers which inhabit hotter regions, as Bengal and the south Asiatic islands, have shorter and smoother hair, and are more richly coloured and distinctly striped than those

of northern China and Siberia, in which the fur is longer, softer, and lighter colourcd.

The tiger is exclusively Asiatic, but has a very wide range in that continent, having been found in almost all suitable localities south of a line drawn from the river Euphrates, passing along the southern shores of the Caspian and Sea of Aral by Lake Baikal to the Sea of Okhotsk. Its most northern range is the territory of the Amur, its most southern the islands of Sumatra, Java, and Bali. Westward it reaches to Turkish Georgia and eastward to the island of Saghalin. It is absent, however, from the great elevated plateau of Central Asia, nor does it inhabit

Ceylon, Borneo, or the other islands of the Indo-Malayan Archipelago, except those named. ‘

The principal food of the tiger in India is cattle, deer, wild hog, and pea-fowl, and occasionally human beings. The regular “man-eater” is generally an old tiger whose vigour is passed, and whose teeth are worn and defective ; it takes up its abode in the neighbourhood of a village, the population of which it finds an easier prey than the larger or wilder animals named above. Though chiefly affecting grassy plains or swamps, it is also found in forests, and seems to be fond of haunting the neighbourhood of old ruins. As a rule, tigers do not climb trees ; but when pressed by fear, as during an inundation, they have been known to do so. They take to the water readily and are good swimmers. The tigers of the Sundarbans (Ganges delta) continually swim from one island to the other to change their hunting-grounds for deer. The following extract from Sir J. Fayrer’s Royal Tiger of Bengal (1875) may complete this notice of the tiger’s habits.

“The tigress gives birth to from two to five, even six cubs; but three isa frequent number. She is a most affectionate and attached mother, and generally guards and trains her young with the most watchful solicitude. They remain with her until nearly full-grown, or about the second year, when they are able to kill for themselves and begin life on their own account. Whilst they remain with her she is peculiarly vicious and aggressive, defending them with the greatest courage and energy, and when

robbed of them is terrible in her rage ; but she has been known to desert them when pressed, and even to eat them when starved. As soon as they begin to require other food than her milk, she kills for them, teaching them to do so for themselves by practising on small animals, such as deer and young calves or pigs. At these times she is wanton and extravagant in her cruelty, killing apparently for the gratification of her ferocious and bloodthirsty nature, and perhaps to excite and instruct the young ones, and it is not until they are thoroughly capable of killing their own food that she separates from them. The young tigers are far more destructive than the old. They will kill three or four cows at a time, whilst the older and more experienced rarely kill more than one, and this at intervals of from three or four days to a week. For this purpose the tiger will leave its retreat in the dense jungle, proceed to the neighbourhood of a village or gowrie, where cattle feed, and during the night will steal on and strike down a bullock, drag it into a secluded place, and then remain near the “murrie,” or ‘‘kill,” for several days, until it has eaten it, when it will proceed in search of a further supply, and, having found good hunting ground in the vicinity of a village or gowrie, continue its ravages, destroying one or two cows or buffaloes a weck. It is very fond of the ordinary domestic cattle, which in the plains of India are generally weak, half-starved, under-sized creatures. One of these is easily struck down and carried or lo off. The smaller buffaloes are also easily dis- posed of ; but the buffalo bulls, and especially the wild ones, are formidable antagonists, and have often been known to beat the tiger off, and even to wound him seriously.” (W. H. F.)

TIGER CAT. See Ocetor.

TIGRANES, or DrKRAn, a name borne by several kings of ancient Armenia. According to the legend of the Ar- menians, the first of these kings was the Tigranes who in Xenophon’s romance appears as the schoolfellow of Cyrus, and to him they ascribe the foundation of Tigranocerta (Dikranagerd) on the Tigris. But in reality, as classical writers relate, this city was built by the first historical Tigranes of Armenia, variously known as Ticranzs II. and T1GRANES I., for whose history see Persia, vol. xviii. p. 595 sq. His son Tigranes is known by his rebellion against his father (PERSIA, wt supra). TicRanes III. (IL.), grandson of Tigranes II. (I.), hada short reign, which he owed to a revolution at home

and the favour of Augustus. He came to the throne in 20 8.c., having previously been an exile at Rome. Tigranes IV. (III.) was seated on the throne by the Parthians (PErsta, p. 600). For Tigranes V. (c. 60 a.D.), a great-grandson on his mother's side of Herod the Great, see Persta, vol. xvili. p. 602.

TIGRIS,! the shorter of the two large rivers rising in

1 The Tigris is the Hiddekel of the Bible, the Diklat or Idiklat of the cuneiform monuments. The old Persian form Tigra (''swift as an arrow"), whence Tigris, seems to be connected etymologically with

the highlands of Armenia and Kurdistan, and (when turned southward) running each its own independent course to the Persian Gulf. Like the Euphrates, the Tigris rises from two principal sources, of which the western and more distant—in 38° 10' N. lat. and about 39° 20' E. long—is a little south of Lake Giuljek, in a peninsula formed by the Euphrates, and some 2 or 3 miles only from the channel of that river. The names and sources of the different streams forming the Western Tigris—or that part: of the upper river which runs, roughly speaking, from Diarbekr to the junction with the Eastern Tigris, about 50 miles north-north-west from Jezira Ibn Omar—are given by Consul Taylor as the Arganeh M'adan and the Dibeneh Su, uniting at Ammaneh castle; the Ambar Su, rising at Heyni; the Batman Su, formed by the Kulp, the Kaushan, and the Sarum, rising north and north-west of Nerjiki; and the Khuzu or Huzu and the Arzen-Redhwan or Yezid Khaneh Su. Of the Eastern Tigris the chief tributaries are the Bohtan Su and its feeder the Bitlis (which receives the Keyzer or Shirwan), the Méx, the Shattak, the Cham- kari, and the Sarhal Su. Of these the most northerly points may be found on the Kulp or Dibeneh Su about 38° 40' N. lat. and the most easterly on the Shattak in 42° 50' E. long.

After the junction of the eastern and western branches (see the accompanying map) the river pursues a winding

Miles. oO

Map showing the tributaries of the Tigris.

course, generally south-east, for about 800 iniles, via Mosul and Baghdad, to the point of union with the Euphrates at Kurna, whence it becomes known as the Shattu ’l-Arab, and falls into the sea some 70 miles farther down. Between Mosul and Baghdad the Tigris receives from its left the Great and the Little Zab and other tributaries from the Kurdish Mountains. Below the confluence of the latter it is joined by the Diyala, also from the left, while on the right canals and watercourses connect it more or less directly with the Euphrates, which in the vicinity of Bagh- dad it approaches to within 30 or 35 miles. The Tigris is navigable for light freight-bearing steamers up to Bagh- dad, and for vessels of lighter draught to 20 miles below Mosul, but thence to Diarbekr only for rafts. ‘‘ But owing to the rapidity of the current the traffic is all down stream, carried on mainly by a primitive style of craft, which is broken up at Baghdad and transported by camels back to Mosul. The journey between these points occupies three or four days during the floods and from twelve to fourteen at other times.”

TILBURG, or Titpore, a town of Holland, in the

these names.

The modern Arabic name is Dijla (Aramaic Deklath, Digla).

province of North Brabant, 13 miles to the east-south-east of Breda, contains numerous and extensive woollen-fac- tories, employing from 5000 to 6000 persons, and also some calico-printing establishments. It has the usual public buildings, including four Roman Catholic churches, a Reformed church, and a synagogue, but none of architec- tural or historical interest. The population in 1879 was 28,390 and in 1887 32,016.

TILDEN, Samvuet Jonzs (1814-1886), American states- man, was born at New Lebanon, New York, on the 9th of February 1814. He studied at Yale and at the university of New York, but ill-health prevented him from finishing his course. He studied law and rose rapidly to the first rank at the New York bar. From boyhood he had had a fondness for politics, but had sacrificed it to the practice of law. After 1860 he drifted into New York State politics, and became chairman of the Democratic State Committee in 1866. The Tweed “ring” in New York city dreaded him, and in 1869 attempted to remove him from his chairmanship. Tilden then became the soul of the legal attacks upon the “ring,” and worked for the removal of the corrupt judges who were their tools; and in the “ring trials” he accomplished the mathematical feat of ascertaining and demonstrating from bank-books the principle on which the spoils had been divided. In 1874 he was elected governor of the State by the Democrats. For years another “ring” had been making money out of the State canals. This, too, Tilden succeeded in breaking up. In 1876 the National Democratic Convention nomi- nated him for the presidency, the Republicans nominating Governor Hayes of Ohio. The result was the disputed election of 1876-77, when each party secured about the same number of electors outside of the three Southern states of Florida, South Carolina, and Louisiana, The Democrats had a majority in these States ; but the return- ing boards, by rejecting votes which they believed had been obtained by fraud or intimidation, gave their States to the Republicans. Two sets of certificates were therefore sent to Washington, and as no provision had been made in the United States constitution for a dispute of this kind there was no power authorized to decide between the two parties. In this emergency Tilden consented to the ap- pointment of an extra-constitutional body, an “electoral commission,” to decide disputed cases, the decisions of which were to hold good unless reversed by concurrent vote of the two houses. The commission decided all the cases in favour of the Republican candidates, and Tilden was de- feated. He continued in retirement until his death, which took place at Greystone, New York, on 4th August 1886.

TILES (Saxon tigel, connected with Lat. tegu/a) are used for a great variety of architectural purposes, such as cover- ing roofs, floors, and walls, and are made of many different materials.

1. Roofing Tiles.1—In the most important temples of ancient Greece the roof was covered with tiles of white marble, fitted together in the most perfect way so as to exclude the rain. In most cases, as in the Athenian Parthenon and the existing temple at Augina, the tiles were large slabs of marble, with a flange along each side, over which joint-tiles (dppo/) were accurately fitted (see A in fig. 1). In the temple of Apollo at Bassx, though the main building was of limestone, the roof was covered with very beautiful tiles of Parian marble, which are specially mentioned by Pausanias as being one of the chief beauties of the temple. Some of these were found by Mr Cockerell during his excavations at Basse early in the 19th century.? In design they resemble the other examples mentioned

1 In Egypt and Assyria temples and palaces were mostly roofed with stone, while inferior buildings had flat roofs covered with beaten clay. 2 See Cockerell, Temples of Aigina and Basse, London, 1860.

above, but are peculiar in having the joint-piece worked out of the same slab of marble as the adjacent tiles (see B in fig. 1), at a great additional cost of both material and labour, in order to secure a more perfect fit. Fig. 2

Fic. 1.—Examples of roofing tiles from Greek temples. A, B, marble tiles from gina and Basse, showing two methods of working the joint-tiles. ©, C, clay tiles from Olympia. D, sketch showing method of jointing at the lower edge. EH, longitudinal section of a clay joint-tile (apuds). Fy, joint-tile with peg to fix it.

shows the way in which they were set on the roof. Great

splendour of effect must have been gained by continuing

the gleaming white of the columns and walls on to the roof. All along the eaves each end of a row of joint-tiles was usually covered by an antefiva, an oval-topped piece

Fie. 2.—Perspective sketch showing the arrangement of tiles B in fig. 1, at Basse. B, B, Dowels to fix the joint-tiles. , tilting piece. a, a, flat surface of

tiles.

of marble with honeysuckle or some other conventional

pattern carved in relief. In most cases the Greeks used

terra-cotta roofing tiles, shaped like the marble ones of fig. 1, A. Others were without a flange, being formed with

a concave upper surface to prevent the rain getting under

the joint-tiles. The lower edge of the tile, whether of

marble or of clay, was usually half-lapped and fitted into

a corresponding rebate in the upper edge of the next tile

(see D in fig. 1). The dppoé also were half-lapped at the

joints (see E in fig. 1). All these were usually fastened

with bronze nails to the rafters of the roof. In some cases each joint-tile had a projecting peg to fix it to the next appos, as shown at F. In the temples of imperial

Rome marble roofing tiles were used like those shown at

fig. 1. These were copied from the Greeks along with

most other architectural features. For domestic and other less important work clay tiles (tegule) were em- ployed, of the form shown in A, fig. 3. These are narrower

1 Marble tiles are said to have been first made by B zes of Naxo about 620 B.c. ; see Pausanias, v. 10, 2. oe –

at the lower edge, so as to fit in to the upper edge of the next tile, and the joints were covered with a semicircular joint-tile (¢mbrex). Rows of terra-cotta antefixe were set along the eaves of the roof, and were often moulded

with very beautiful reliefs. In localities which supplied lami- nated stone, such as Gloucestershire and Hampshire in

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WC UY Fic, 3.—A, section and elevation of the clay tiles commonly used in ancient Rome. 3B, Roman stone tiles, each fixed with one iron nail at the top angle. C, pan-tiles used in medixval and modern times. Britain, the Romans often roofed their buildings with stone tiles, fastened with iron nails. Fig. 3, B, shows an example from a Roman villa at Fifehead Neville in Dorset, England. Each slab had a lap of about 2 inches over the row of tiles below it; many large iron nails were found with these stone tiles. In a few cases, in the most magni- ficent temples of ancient Rome, as in those of Capitoline Jupiter and of Venus and Rome, and also the small circular temple of Vesta,? tiles of thickly gilded bronze were used, which must have had the most magnificent effect. Those of the last-named building are specially mentioned by Pliny (H._W., xxxiv. 7) as having been made of Syracusan bronze,’ —an alloy in great repute among the Romans. The bronze tiles from the temples of Jupiter Capitolinus and of Venus and Rome were taken by Pope Honorius I. (625-638) to cover the basilica of St Peter, whence they were stolen by the Saracens during their invasion of the Leonine city in

846.4

In medizval times lead or copper ® in large sheets was used for the chief churches and palaces of Europe; but in more ordinary work clay tiles of very simple form were employed. One variety, still very common in Italy, is shown in O, fig. 3. In this form of so-called “ pan-tile” each tile has a double curve, forming a tegula and imbrex both in one, Stone tiles were also very common through- out the Middle Ages. Another kind of roofing tile, largely used in pre-Norman times and for some centuries later for certain purposes, was made of thin pieces of split wood, generally oak; these are called “shingles.” They stand the weather fairly well, and many old examples still exist, especially on the wooden towers and spires of East Anglia. At the present day, when slate is not used, tiles of burnt clay are the ordinary roofing material, and many compli- cated forms have been invented to exclude rain. Most of these are, however, costly and do not

answer better than a plain rectangular tile about 9 by 6 inches, fastened with two copper or even stout zinc nails, and well bedded on mortar mixed with hair. For additional security clay tiles are usually made with two small projections at the

2 The dome of the Pantheon was covered with tiles or plates of bronze thickly gilt, as were also the roofs of the forum of Trajan.

3 Bronze tiles for small buildings such as this were usually of a pointed oval form, something like the feathers of a bird. This kind of tiling is called pavonacewm by Pliny, H.N., xxxvi. 22.

4 Part of the bronze tiles had been stripped from the temple of Jupiter by the Vandals in 455; see Procopius, Bell. Van., i. 5.

5 The gilt domes of Moscow are examples of this use of copper.

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TILES

upper edge, which hook on to the battens to which they are nailed. Broseley (Shropshire) is one of the chief places in England for the manufacture of roofing tiles of the better sort. The common kinds are made wherever good clay exists. In some places pan-tiles are still used and have a very picturesque effect ; but they are liable to _let in the rain, as they cannot be securely nailed or well bedded in mortar. In Gloucestershire, Yorkshire, and other counties of England, stone tiles are still employed, but are rapidly going out of use, as they require very strong roof-timbers to support them, and the great extension of railways has made the common purple slates cheap in nearly every district.

Some of the mosques and palaces of Persia are roofed with the most magnificent enamelled lustred tiles, decorated with elaborate painting, so that they shine like gold in the sun. They were specially used from the 13th

to the 15th century. In style and method of manufacture the finest of them resemble the frieze shown in fig. 5.

2. Wall Tiles.—These have been partly described under Mora DEcoraTION Th A 6 Gy SRR (vol. xvii. p. 35).! Jj ‘Ys In most Oriental # countries tiles were used in themostmag- nificent way through- PA out the Middle Ages, WZ especially in Damas- |! cus, Cairo, Moorish Spain, and in the} chief towns of Persia. Fig. 4 shows a fine example from a mosque in Damas- | cus. From the 12th to the 16th century a special kind of |f lustred tile was // largely employed for [Bf dadoes, friezes, and other wall surfaces, (4 being frequently made in large slabs 22ORiwMN ep Rts ayo NO? and modelled boldly Fic. 4.—Wall tiles from Damas in relief, with sen- lita tences from sacred books or the names and dates of reign- ing caliphs. The whole was picked out in colour, usually dark or turquoise blue, on a ground of cream-white enamel, and in the last firing minute ornaments in copper lustre were added over the whole design, giving the utmost splendour of effect (see fig. 5). Great skill and taste are shown by the way in which the delicate painted enrich- ments are made to contrast with the bold decoration in relief. These lustred tiles sometimes line the prayer-niche in houses and mosques ; in such cases the slabs usually have a conventional representation of the kaaba at Mecca, with a lamp hanging in front of it and a border of sentences from the Koran. The mosques of Persia are specially rich in this method of decoration, magnificent examples existing at Natenz, Seljuk, Tabriz, Ispahan, and other places.2 In the 16th and 17th centuries tiles of a coarse kind of majolica were used for wall decoration in southern Spain; some rich examples still exist in Seville. These appear to be the work of Italian potters who had settled in Spain. The azulejos (wall tiles) in the Alhambra and

1 For the enamelled wall tiles of ancient Egypt, see Porrrry, vol. xix. p. 603.

2 The South Kensington Museum, London, contains many fine ex- amples, as well as of the later sorts, like those shown in fig, 4.

2 See Coste, Monuments de la Perse, Paris, 1867.

other buildings in Spain are among the most beautiful productions of Hispano-Moorish art. In technique they resemble majolica ; but the finest kinds, dating from the SSN m * é Es; at PS i

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z Fic. 5.—Persian lustred tiles of the 13th ceutury, forming part ofa frieze. (South Kensington Museum.)

14th and 15th centuries, have designs taken from mosaic patterns, with complicated lines of geometrical interlacings.®

3. Floor Tiles.—From the 12th to the 16th century floor tiles in most northern countries of Europe were made by filling up with clay of a different colour patterns sunk in slabs of clay (see Encaustic Tixxs). In Italy, during the latter part of the 15th and the first half of the 16th century, majolica tiles, rich both in pattern and in colour, were used for pavements in many places. Comparatively few examples now exist; the majolica enamel was too soft to stand the wear of feet. One of the small south chapels in the church of 8. Maria del Popolo in Rome has a very fine pavement of these tiles, executed, probably at Forli, about 1480 for Cardinal della Rovere (Julius II.), whose arms—an oak tree—are repeated frequently among the rich decorations. A still more magnificent tile floor in the uppermost of Raphael's Vatican loggie is mentioned

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é ') . S > : & 4 Fia. 6.—Majolica paving tiles from Siena, made in 1509. (South Kensington Museum.) Robbia made as a border for the tomb of Bishop Federighi at Florence. Fine examples of tile paving of 1487 exist in the basilica of 8. Petronio at Bologna, and others of 4 The method of manufacture employed by Moslem races for tiles is the same as that used for their pottery; see vol. xix. p. 620, also Murat Decoration, vol. xvii. pp. 35-86.

5 For the decorative use of tiles, see Julien Foy, La Céramique des Constructions, Paris, 1883,

rather earlier date in S. Paolo at Parma. The chapel of St Catherine at Siena and the church of 8. Sebastiano at Venice have majolica paving of about 1510. Fig. 6 shows an example of about this date from the Petrucci Palace in Siena, now in the South Kensington Museum.' In the early part of the 16th century majolica tiles from Spain were occasionally imported into England. At. the south-east of the mayor's chapel at Bristol there exists, though much worn, a fine pavement of Spanish tiles dating from about 1520. Others have been found in London, at Newington Butts, and in other places. At the present time imitations of the unfortunately named " encaustic tiles" are almost the only sort employed in England and other northern countries. Very coarse and poorly designed majolica tiles are still made and used for paving in Italy and Spain. (J. H. M.)

TILLEMONT, Stpastien LE Narn pe (1637-1698), ecclesiastical historian, was born at Paris on 30th Novem- ber 1637, and received his education in the "petites écoles" of the Port Royalists, Nicole being his principal master. At an early age he became an admiring student of Livy and Baronius and began to accumulate those vast collec- tions which form the basis of his monumental works. He continued to carry on his studies in the seminary at Beau- vais, where the bishop was a warm patron; but it was not until 1676, two or three years after his return to Paris, that, under the influence of Isaac de Sacy, he entered the priesthood. He took up his abode in a humble dwelling at Port Royal des Champs, where he remained till the dis- persion of the "solitaires" in 1679, after which event he spent the remainder of his life (with the exception of a visit to Arnauld in Holland in 1685) at Tillemont, between Montreuil and Vincennes. He died on 28th January 1698 and was buried at Port Royal; in 1711 his remains were removed to the church of St André des Arcs, Paris.

His great work, Mémoires pour servir & Vhistoire ecclésiastique des six premiers siéeles to 518 A.D. (1693-1712, 16 vols., 4to), is a model of patient, exhaustive, and what Gibbon has called '' sure-footed " erudition (see vol. v. p. 765). Of his equally learned Histoire des emperewrs et des

autres princes qui ont régné durant les six premiers siecles de Véglise (1690-1738, 4to) no more than four volumes were published. Tillemont also gave valuable assistance to Hermant, Du Fossé, and other Port Royalists in their historical work.

TILLOTSON, Joun (1630-1694), archbishop of Can- terbury, was the son of a Puritan clothier in Sowerby, Yorkshire, where he was born in October 1630. He en- tered as a pensioner of Clare Hall, Cambridge, in 1647, graduated in 1650, and was made fellow of his college in 1651. Chillingworth's Religion of Protestantism biassed his mind against Puritanism, and the bias was further confirmed by intercourse with Cudworth and others at Cambridge. In 1656 he became tutor to the son of Edward Prideaux, attorney-general to Cromwell. In what year he took orders is unknown, but, according to the Life published in 1717, the person who ordained him was Dr T. Sydserf, a Scottish bishop. 'Tillotson was present at the Savoy Conference in 1661, and remained identified with the Presbyterians till the passing of the Act of Uni- formity in 1662. Shortly afterwards he became curate of Cheshunt, Herts, and in June 1663 rector of Keddington, Suffolk. or several years after his ordination he devoted himself to an exact study of the Scriptures, ancient ethics, and the writings of the early fathers, especially Basil and Chrysostom. The result was seen in the general tone of his preaching, which was practical rather than theological, and, though regarded by some as latitudinarian, was char- acterized by the earnestness of sincere conviction and the balanced wisdom gained by thoughtful reflexion. He was, moreover, a man of the world as well as a divine, and in

1 See Vanzolini, Fabbriche di Matioliche, Pesaro, 1879, ii. p. 229 sq. ; and Frati, Pavimento nella Bas. Petroniana, Bologna, 1853.

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his sermons he exhibited a certain indefinable tact which

enabled him at once to win the ear of his audience. His

style is chiefly remarkable for its simplicity and clearness,

and in this respect it mirrored his own candour and sin-
cerity. The qualities above mentioned. won him in his
lifetime the reputation of “having brought preaching to
perfection”; and probably it was because he was neither
brilliant, original, nor profound that his preaching was so
universally admired. ‘His sermons,” says Burnet, ‘were
so well heard and liked, and so much read, that all the
nation proposed him as a pattern and studied to copy
after him.” In 1664 he became preacher at Lincoln’s
Inn. The same year he married Miss French, daughter
of the canon of Christ Church, Oxford, and niece of Oliver
Cromwell; and he also became Tuesday lecturer at St
Lawrence, Jewry. ‘Tillotson employed his controversial
weapons with some skill against “atheism” and ‘“Popery.”
In 1663 he published a characteristic sermon on “The
Wisdom of being Religious,” and in 1666 replied to
Sergeant’s Sure Footing in Christianity by a pamphlet
on the Rule of Faith. The same year he received the de- gree of D.D. In
1670 he became prebendary and in 1672
dean of Canterbury. Through his wife Tillotson became

connected with Dr Wilkins, the second husband of her mother. In 1675 he edited Wilkins's Principles of Natural Religion, completing what was left unfinished of it, and in 1682 his Sermons, with a preface in which he vindicated Wilkins from certain misrepresentations of Wood in his

History and Antiquities of the University of Oxford. In

1680 he brought out Barrow's Treatise of the Pope's Su- premacy, and in 1683 his Sermons. On 5th November 1678 Tillotson preached a sermon against Popery before the House of Commons, in which he maintained that it

was their duty to make provision against the propagation

of a religion more mischievous than irreligion itself; but in a sermon on the Protestant religion in 1680 before the. king he propounded the proposition that Catholics could enjoy their own faith, but not openly draw men off from

the profession of the established religion. Along with

Burnet, Tillotson attended Lord Russell on the scaffold in

1683, and after the publication of Lord Russell's speech was appointed to appear before the privy council ; but his

explanations were regarded as satisfactory, the chief sus- picions in connexion with the speech resting on Burnet.

Tillotson afterwards enjoyed the friendship of Lady Rus- sell, and it was partly through her that he obtained so

much influence with Princess Anne, who followed his ad- vice in regard to the settlement of the crown on William of Orange. He possessed the special confidence of William and Mary, and was made clerk of the closet to the king,

27th March 1689. It was chiefly through his advice that the king appointed an ecclesiastical commission for tlie reconciliation of the Dissenters, and he

was regarded as the representative in the commission of the views of the king and queen. In August of this year he was appointed by the chapter of his cathedral to exercise the archiepis- copal jurisdiction of the province of Canterbury during the suspension of Sancroft. He was also about the same time named dean of St Paul's. Soon afterwards he was elected to succeed Sancroft; but he accepted the promo- tion with extreme reluctance, and it was deferred from time to time at his request till April 1691. His attempts to reform certain abuses of the church, especially that of non-residence among the clergy, awakened against him much ill-will, and of this the Jacobites took every possible advantage and pursued him to the end of his life with

insult and reproach. ' This," Burnet says, " could neither provoke him, nor fright him from his duty; but it affected his mind so much that this was thought to have shortened

his days." He died of palsy on 24th November 1694.

For his manuscript sermons Tillotson's widow received 2500 guineas, then an unexampled sum, and for many years their popu- larity remained unrivalled. During his lifetime he published Ser-

- mons on Several Occasions, 1671, republished with a second volume

added in 1678 ; Fifty Sermons and the Rule of Faith, 1691; Four Sermons concerning the Divinity and Incarnation of our Blessed Saviour, 1693 ; Six Sermons on Several Occasions, 1694. His Post- humous Sermons, edited by Dr Ralph Baker, appeared in 14 vols., 1694; third edition, 1704. His Works were published in 1707- 1710, and were frequently reprinted. In 1752 an edition appeared in 3 vols. with Life by Thomas Birch, D.D., compiled from Tillot- son's original papers and letters. Ofthe many subsequent editions the best is that, with Life by Birch, of 1820,10 vols. Various selec- tions from his sermons and works have been published separately.

See in addition to Birch's Life, Welford's Memorials, Burnet's Own Times, and Macaulay's History of England.

TILLY, Jonann TsERcLAES, Count oF (1559-1632), a famous general, was born in February 1559 at the chateau of Tilly in Brabant. It was originally intended that he should become a priest, and he was strictly educated by the Jesuits. He preferred, however, the life of a soldier, and began his military career in the Netherlands, under Alessandro Farnese, in the Spanish service. Afterwards he joined the imperial army, and as lieutenant-colonel under Duke Philip Emmanuel of Lorraine greatly distin- guished himself in Hungary in the war against the Turks. For his brilliant achievements he was raised to the rank of field-marshal. In 1610 he was put by Maximilian I. at the head of his Bavarian army ; and soon after the out- break of the Thirty Years' War he was made commander- in-chief of the troops of the Catholic League. In this position he displayed qualities which placed him among the foremost generals of the age. After the battle of. Prague (the White Hill) in 1620 he thoroughly subdued Bohemia, and in 1622 conquered the Palatinate,—a ser- vice for which Ferdinand II. gave him the title of count. In 1623 he defeated Christian of Brunswick at Stadtlohn in Westphalia, and in 1626 Christian IV. of Denmark at Lutter in Brunswick. The consequence of the latter victory was that Tilly and Wallenstein were able to cross the Elbe; but, as Tilly was wounded before Pinneberg in Schleswig-Holstein, the task of finally compelling the king of Denmark to accept terms of peace had to be left to Wallenstein alone. When Wallenstein was obliged in 1630 to withdraw for a while into private life, Tilly added to the functions he already discharged those of commander of the imperial forces. From this time the only important success achieved by him was the storming of Magdeburg (May 1631), a success accompanied by frightful cruelties, for which he was at least in part responsible. Gustavus Adol- phus had now come forward as the champion of Protest- antism, and Tilly, with all his genius and tenacity, was not a match for the Swedish king. Four months after the capture of Magdeburg Tilly was defeated at Breitenfeld in Saxony, and was himself so severely wounded that he escaped from the field with difficulty. In March 1632 he drove the Swedes from Bamberg and placed himself in an entrenched camp at Rain to prevent them from passing over the Lech. Gustavus Adolphus crossed the stream, and in the fight which ensued Tilly was mortally wounded. He died in April 1632 at Ingolstadt, and was buried at Alt-Oetting in Bavaria.

Tilly was of medium height, reserved in manner, and wholly indifferent to external marks of honour. The Roman Church never had a more devoted servant, and he gave evidence of the essential simplicity of his character by declining the offer of the emperor to make him a prince and to grant to him the principality of Calen- berg. As he was not married, his title and estates descended to his nephew.

See Klopp, Tilly im dreissigjdhrigen Kriege, Stuttgart, 1861, and Villermont, Tilly, Tournay, 1859.

TILSIT, a commercial town of East Prussia and the capital of Prussian Lithuania, is situated on the left bank of the Memel or Niemen, 52 miles south-east of the town of Memel and 60 north-east of Kénigsberg. The town

is spacious, and has a number of handsome modern build- ings, including a town-house, post-office, law-courts, and a large hospital. It contains three Protestant churches, a Roman Catholic church, and a Jewish synagogue. The manufactures include soap, leather, shoes, glass, and other articles, and there are iron-foundries and steam flour and saw mills. ‘Tilsit carries on trade in timber, grain, hemp, flax, herrings, and other northern produce; but its trade with Russia, at one time considerable, has fallen off since the construction of the railway from Kénigsberg via Inster- burg and Gumbinnen to Kovno. The river is navigable beyond the town. The market-gardening of the neigh- bourhood deserves mention, and the annual horse-fair and markets are of considerable local importance. In 1783 the population was 8060; in 1880 it had increased to 21,400, and in 1885 to 22,428.

Tilsit, which received town-rights in 1552, grew up around a castle of the Teutonic order, known as the ‘‘Schalauner Haus,” founded in 1288. It owes most of its interest to the peace signed here on 9th July 1807, the preliminaries of which were settled by the emperors Alexander and Napoleon on a raft moored in the Memel. The peace of Tilsit, which constituted the kingdom of Westphalia and the duchy of Warsaw, registers the nadir of Prussia’s humiliation under Napoleon (see Prussia, vol. xx. p. 11). The poet Max von Schenkendorf (1784-1817) was born at Tilsit.

TIMBER. See Buirprne, Forests, and StreNcTH oF Mareriazs ; also Fir, Oak, Prnz, Trax, &e.

TIMBUKTU, or Trmpvucroo (Sonrhai, Zimbutu ; Berber, Tumbutku ; Arab, Tin-buktu), a city of the Sahara, on the southern verge of the desert, in 18° 4’ N. lat. and 1° 45’ W. long., at the north-east extremity of the Fulah state of Moassina (Massina), 9 miles north of its riverine port Kabara, on the left bank of the Niger, at the confluence of the numerous branches of the Joliba (upper Niger) where it trends eastwards, and at the converging point of the main trade routes from the Gulf of Guinea and from the Mediterranean across the western Sahara. Timbuktu lies on a terrace formed by the southern scarp of the desert, about 800 feet above sea-level, and overlooking a chain of dhayas or marshy hollows, fringed here and there with a few mimosas and palm thickets, amid the surround- ing sandy wastes. These dhayas, which are flooded every three or four years, converting the lowland tracts between the terrace and the main stream into a labyrinth of channels and backwaters, mark the bed of a navigable creek which formerly branched from the Niger northwards to the foot of the scarp, and which in 1640 inundated a low-lying quarter of the city. According to Pouyanne and Sabatier, the main stream followed this course before it took its present easterly curve to Burum, where it bends southwards to the coast. Here also it was probably joined at some remote period by the now dried up Wady Messaura from the Tudt oases south of Algeria, although the rough levels taken by Oscar Lenz and others make it uncertain whether the flow through this depression was northwards or southwards. In any case Timbuktu has been left, so to say, high and dry by the general process of desiccation going on throughout the Saharian region. It was founded, or more probably captured, by the Tuareg Berbers about the 11th century, and under the Mandingo kings of Mali (Mallé) was a noted mart for gold and salt in the 14th century, mention of “Timboutch” occurring on a Catalan map dated 1373. Under Askia, founder of the extensive but short-lived Sonrhai empire (1492), it rose to great splendour and became with Gogo a chief centre of Moham- medan culture for the peoples of western Sudan. But since the overthrow (1591) of the Sonrhai dynasty by the Morocco captain, the Andalusian Jodar with his Ruma followers, Timbuktu has continued to be the prey of the surrounding unruly populations—Tuaregs, Arabs or Arab- ized Berbers, Fulahs (1800), and

Toucouleurs (1865). Being thus at the mercy of all, it has ceased to rebuild its

dismantled walls, being content to pay tribute to each in turn and sometimes to more than one simultaneously, for which it indemnifies itself by peaceful intervals of trade whenever the land routes are open and the upper and lower reaches of the Niger are clear of pirates. But at times even the short tract separating it from Kabara is so beset with marauders that it bears the ominous name of “Uyr-immandess,” that is, “He (God) hears not.” Recently, however, it has enjoyed a considerable interval of peace, and the population, estimated by Barth at 11,000 in 1853, had risen to 20,000 in 1880 (Lenz). These form a motley group of Sonrhais, Tuaregs, Mandingoes, Arabs from Mor- occo, Berabish Arabs, Bambaras, Fulahs, and since 1850 a few Jewish traders. Apart from some Christian captives, the place was reached during the 19th century by only four Europeans—Laing from Tripolitana (1826), who was murdered on his return journey, Caillié from the north (1828), Barth from central Sudan (1853), and Lenz from Morocco (1880). Since 1884, however, regular relations have been opened with the French on the upper Niger. From the ruins covering extensive tracts on the north and west sides, it is evident that Timbuktu was formerly a much larger place than at present. Even the great mosque, which must at onc time lave stood in the centre, now lies near the outskirts, where its high but unsightly earth tower forms a striking landmark. The aggregate of mean hovels or mud houses of which the place consists is only relieved by a few structures of a better class. As in former times, a great staple of trade is salt from Taudeni and other parts of the Sahara, here exchanged with gold dust for kola nuts from the south, Manchester goods, and some other European wares, which with tea are imported from Morocco or penetrate from the British protected territories along the lower Niger. Cowries, slowly peli to European moneys, are the chief currency. The local industries are mainly confined to some fancy and other leatherwork prepared by the Tuareg women. The local adminis- tration is in the hands of an hereditary kahia, a kind of mayor, descended from one of the Ruma families. The kahia is himself more or less under the control of a neighbouring Tuareg chief and of the powerful Bakhai family, who, as “TIME, MEASUREMENT oF.

Time is measured by suc- cessive phenomena recurring at regular intervals. The only astronomical phenomenon which rigorously fulfils this condition, and the most striking one,—the apparent daily revolution of the celestial sphere caused by the rotation of the earth,—has from the remotest antiquity been employed as a measure of time. The interval between two successive returns of a fixed point on the sphere to the meridian is called the sidereal day; and sidereal time is reckoned from the moment when the “first point of Aries” (the vernal equinox) passes the meridian, the hours being counted from 0 to 24. Clocks and chrono- meters regulated to sidereal time are only used by astro- nomers, to whom they are indispensable, as the sidereal time at any moment is equal to the right ascension of any star just then passing the meridian. For ordinary pur- poses solar time is used. In the article Astronomy (vol. ii. p. 771) it is shown that the solar day, as defined by the successive returns of the sun to the meridian, does not furnish a uniform measure of time, owing to the slightly variable velocity of the sun’s motion and the inclination of its orbit to the equator, so that it becomes necessary to introduce an imaginary mean sun moving in the equator with uniform velocity. The equation of time (loc. cit., pp. 772-773) is the difference between apparent (or true) solar tine and mean solar time. The latter is

that shown by clocks and watches used for ordinary pur- poses. Mean time is converted into apparent time by applying the equation of time with its proper sign, as given in the Vautical Almanac and other ephemerides for every day at noon. As the equation varies from day to day, it is necessary to take this into account, if the appar- ent time is required for any moment different from noon. The ephemerides also give the sidereal time at mean noon, from which it is easy to find the sidereal time at any moment, as 24 hours of mean solar time are equal to 24 3™ 565554 of sidereal time. About 21st March of each year a sidereal clock agrees with a mean-time clock, but it gains on the latter 3″ 56°5 every day, so that in the course of a year it has gained a whole day. For a place not on the meridian of Greenwich the sidereal time at noon must be corrected by the addition or subtraction of 98565 for each hour of longitude, according as the place is west or east of Greenwich.

While it has for obvious reasons become customary in all civilized countries to commence the ordinary or civil day at midnight, astronomers count the day from noon, being the transit of the mean sun across the meridian, in strict conformity with the rule as to the beginning of the sidereal day. The hours of the astronomical day are also counted from 0 to 24. An international conference which met in the autumn of 1884 at Washington, to con- sider the question of introducing a universal day (see below), has recommended that the astronoinical day should commence at midnight, to make it coincide with the civil day. The great majority of American and Continental astronomers have, however, expressed themselves very strongly against this change; and, even if it should be made in the British Nautical Almanac, it appears very doubtful whether the other great ephemerides will adopt it, the more so as astronomers have hitherto felt no in- convenience from the difference between the astronomical and the civil day.

Determination of Time.—The problem of determining the exact time at any moment is practically identical with that of determining the apparent position of any known point on the celestial sphere with regard to one of the fixed (imaginary) great circles appertaining to the observer's station, the meridian or the horizon. The point selected – is either the sun or one of the standard stars, the places of which are accurately determined and given for every tenth day in the modern ephemerides. The time thus determined furnishes the error of the clock, chronometer, or watch employed, and a second determination of time after an interval gives a new value of the error and thereby the rate of the timekeeper.

The ancient astronomers, although they have left us very ample information about their dials, water or sand clocks (clepsydrx), and similar timekeepers, are very re- ticent as to how these were controlled. Ptolemy, in his Almagest, states nothing whatever as to how the time was found when the numerous astronomical phenomena which he records took place; but Hipparchus in the only book we possess from his hand gives a list of forty-four stars scattered over the sky at intervals of right ascension equal to exactly one hour, so that one or more of them would be on the meridian at the commencement of every sidereal hour. In a very valuable paper! Schjellerup has shown that the right ascensions assumed by Hipparchus

agree within about 15’ or one minute of time with those calculated back to the year 140 B.c. from modern star-places and pro- per motions. The accuracy which, it thus appears, could be attained by the ancients in their determinations of time

1 “Recherches sur l’Astronomie des Anciens : I. Sur le chronométre

céleste d’Hipparque,” in Copernicus: An International Journal of As- tronomy, i. p. 25.

was far beyond what they seem to have considered neces- sary, as they only record astronomical phenomena (e.., eclipses, occultations) as having occurred “towards the middle of the third hour,” or “about 84 hours of the night,” without ever giving minutes! The Arabians had a clearer perception of the importance of knowing the accurate time of phenomena, and in the year 829 we find it stated that at the commencement of the solar eclipse on 30th November the altitude of the sun was 7° and at the end 24°, as observed at Baghdad by Ahmed ibn Abdallah, called Habash.? This seems to be the earliest determina- tion of time by an altitude; and this method then came into general use among the Arabians, who on observing lunar eclipses never failed to measure the altitude of some bright star at the beginning and end of the eclipse. In ‘ Europe this method was adopted by Purbach and Regio- montanus, apparently for the first time in 1457. Bernhard Walther, a pupil of the latter, seems to have been the first to use for scientific purposes clocks driven by weights : he states that on 16th January 1484 he observed the rising of the planet Mercury and immediately attached the weight to a clock having an hour-wheel with fifty-six teeth; at sunrise one hour and thirty-five teeth had passed, so that the interval was an hour and thirty-seven minutes. For nearly two hundred years, until the application of the pendulum to clocks became general, astronomers could place little or no reliance on their clocks, and consequently it was always necessary to fix the moment of an ob- servation by a simultaneous time determination. For this purpose Tycho Brahe employed altitudes observed with quadrants ; but he remarks that they are not always of value, for if the star is taken too near the meridian the altitude varies too slowly, and if too near the horizon the refraction (which at that time was very imperfectly

known) introduces an element of uncertainty. He therefore pre- ferred azimuths, or with the large “armillary spheres” which played so important a part among his instruments he measured hour-angles or distances from the meridian along the equator. Transits of stars across the meridian were also observed with the meridian quadrant, an instru- ment which is alluded to by Ptolemy and was certainly in use at the Mardgha (Persia) observatory in the 13th cen- tury, but of which Tycho was the first to make extensive use, It appears, however, that he chiefly employed it for determining star-places, having obtained the clock error by the methods already described.

In addition to these methods, that of “ equal altitudes ” was much in use during the 17th century. That equal distances east and west of the meridian correspond to equal altitudes had of course been known as long as sun-dials _ had been used ; but, now that quadrants, cross-staves, and parallactic rules # were commonly employed for measuring altitudes more accurately, the idea naturally suggested it- self to determine the time of a star’s or the sun’s meridian passage by noting the moments when it reached any par- ticular altitude on both sides of the meridian. But Tycho’s plan of an instrument fixed in the meridian was not for- gotten, and from the end of the 17th century, when Roemer invented the transit instrument, the observation of transits across the meridian became the principal means of deter- mining time at fixed observatories, while the observation of altitudes, first by portable quadrants, afterwards by re- flecting sextants, and during the 19th century by port- able alt-azimuths or theodolites, has been used on journeys.

1 For astronomical purposes the ancients made use of mean- time hours—Gpar lonuepwal, hore equinoctiales—into which they translated all indications expressed in civil hours of varying length—@paz xaipixal, hore temporales. Ptolemy counts the mean day from noon.

2 Caussin, Le livre de la grande table Hakémite, Paris, 1804, p. 100.

3 See his Epistole astronomice, p. 78. 4 See NAVIGATION, vol. xvii. pp. 251 and 258.

During the last fifty years the small transit instrument, with what is known as a “broken telescope,” has also been much employed on scientific expeditions; but great caution is necessary in using it, as the difficulties of getting a per- fectly rigid mounting for the prism or mirror which reflects the rays from the object-glass through the axis to the eye- piece appear to be very great, for strange discrepancies in the results have often been noticed. The gradual develop- ment of astronomical instruments has been accompanied by a corresponding development in timekeepers. From being very untrustworthy, astronomical clocks are now made to great perfection by the application of the pendu- lum and by its compensation, while the invention of chronometers has placed a portable and equally trust- worthy timekeeper in the hands of travellers.

We shall now give a sketch of the principal methods of determining time.

In the spherical triangle ZPS’ between the zenith, the pole, and a star the side 7P=90° — ¢ (¢ being the latitude), PS=90° — 6 (6 being the declination), and 7S or 7=90° minus the observed alti- tude. The angle ZPS=¢ is the star’s hour-angle or, in time, the interval between the moment of observation and the meridian pass- age of the star. We have then cos Z— sin @ sin 6

cos @ cos 6 which formula can be made more convenient for the use of logarithms by putting 7+¢+6=2S, which gives 21; sin(S— ¢) sin(S — 6) oo cos S cos(S—Z) ~

According as the star was observed west or east of the meridian, t will be positive or negative. Ifa be the right ascension of the star, the sidereal time =‘t+a, a as well as 6 being taken from an ephemeris. Ifthe sun had been observed, the hour-angle ¢ would be the apparent solar time. The altitude observed must be cor- rected for refraction, and in the case of the sun also for parallax, while the sun’s semi-diameter must be added or aibeeeteds accord- ing as the lower or upper limb was observed. The declination of the sun being variable, and being given in the ephemerides for noon of each aay: allowance must be made for this by interpolating with an approximate value of the time. As the altitude changes very slowly near the meridian, this method is most advantageous if the star be taken near the prime vertical, while it is also easy to see that the greater the latitude the more

uncertain the result. If a number of altitudes of the same object are observed, it is not necessary to deduce the clock error separately from each observa- tion, but a correction may be applied to the mean of the zenith distances. Supposing 2 observations to be taken at the moments T;, Tx, Ts,..., the mean of all being 7, and calling the z corre- sponding to this Z, we have

aZ 1 4=4+—7(T- Ty) +5

cost= A

a2Z apts — To? 3

dZ 1 &@Z t= 4+ (Ty — Th) +5 “gpl Fe- To)”;

and so on, ¢ being the hour-angle answering to Z>. As 2(7’- Ty) =0, these equations give gait tot tet ee ee (i Eo WPS oy = i n 2 ai? nN _mtetegt… @Z T2sin*4(T— TZ) – a ~ at? n ‘

But, if in the above-mentioned triangle we designate the angles at Z and S by 180°—4 and p, we have

sin z sin 4d=cos 6 siné; sinz cos d= —cos¢ sin 6+sin ¢ cos 6 cost; and by differentiation @Z_cos¢ cosdé cos A cosp

dt? sin Z ; in which 4 and p are determined by : sin t ‘ siné sin d= FZ cos 6 and sinp =sng °° @.

With this corrected mean of the observed zenith distances the hour- angle and time are determined, and by comparison with 7, the error of the timekeeper.

The method of equal altitudes gives very simply the clock error equal to the right ascension minus half the sum of the clock times corresponding to the observed equal altitudes on both sides of the meridian. When the sun is observed, a correction has to be applied for the change of declination in the interval between the observa- tions, Calling this interval 22, the correction to the apparent noon

given by the observations x, the change of declination in half the interval Ad, and the observed altitude 2, we have

sinh =sin ¢ sin (6 — Ad) + cos ¢ cos (5 — AS) cos (£ x) and sin h=sin ¢ sin (6 AS) + cos ¢ cos (6 + Ad) cos (f — x), whence, as cosx may be put=1, sinw=2, and tan Ad=Ad,

one tang tand

7 siné tant : which, divided by 15, gives the requircd correction in seconds of time. Similarly an afternoon observation may be combined with an observation made the following morning to find the time of apparent midnight.

The observation of the time when a star has a certain azimuth may also be used for determining the clock error, as the hour-angle can be found from the declination, the latitude, and the azimuth. As the azimuth changes most rapidly at the meridian, the observa- tion is most advantageous there, besides which it is neither neces- sary to know the latitude nor the declination accuratcly. In the article GropEsy (vol. x. p. 166) it has been shown how the observed time of transit over the meridian is corrected for the deviations of the instrument in azimuth, level, and collimation. This corrected time of transit, expressed in sidereal time, should then be equal to the right ascension of the object observed, and the difference is the clock error. In observatories the determination of a clock's error (a necessary operation during a night's work with a transit circle) is generally founded on observations of four or five "clock stars," these being standard stars not near the pole, of which the absolute right ascensions have been determined with great care, besides observation of a close circumpolar star for finding the error of azimuth and determination of level and collimation error.}

Observers in the field with portable instruments often find it inconvenient to wait for the meridian transits of one of the few close circumpolar stars given in the ephemerides. In that case they have recourse to what is known

as the method of time deter- mination in the vertical of a pole star. The alt-azimuth is first directed to one of the standard stars near the pole, such as a or 6 Urs Minoris, using whichever is nearest to the meridian at the time. The instrument is set so that the star in a few minutes will cross the middle vertical wire in the field. The spirit-level is in the meantime put on the axis and the inclination of the latter measured. The time of the transit of the star is then observed, after which the instrument, remaining clamped in azimuth, is turned to a clock star aud the transit of this over all the wires is observed. The level is applied again, and the mean of the two results is used in the reductions. In case the collimation error of the instrument is not accurately known, the instrument should be reversed and another observation of the same kind taken. The observations made in each position of the instrument are separately reduced with an assumed approximate value of the error of collimation, and two equations are thus derived from which the clock error and correction to the assumed collimation error are found. This use of the transit or alt-azimuth out of the meridian throws considerably more work on the computer than the meridian observations do, and it is therefore never resorted to except when an observer during field operations is pressed for time. The formule of reduction as developed by Hansen in the Astronomische Nachrichten (vol. xlviii.

p- 113 sq.) are. given by Chauvenet in his Spherical and Practical }

Astronomy (vol. ii. pp. 216 sq., 4th ed., Philadelphia, 1873). The subject has also becn treated at great length by Déllen in two memoirs, Die Zeitbestimmung vermittelst des tragbaren Durchgangs- instrument im Verticale des Polarsterns (St Petersburg, 1863 and 1874, 4to).

Longitude.—Hitherto we have only spoken of the de- termination of local time. But in order to compare ob- servations made at different places on the surface of the earth a knowledge of their difference of longitude becomes necessary, as the local time varies proportionally with the longitude, one hour corresponding to 15°. Longitude can be determined either geodetically or astronomically. The first method supposes the earth to be a spheroid of known dimensions. Starting from a point of departure of which the latitude has been determined, the azimuth from the

meridian (as determined astronomically) and the distance –

of some other station are measured. This second station then serves as a point of departure to a third, and by repeating this process the longitude and latitude of places at a considerable distance from the original starting-point may be found. Referring for this method to the articles EartH (FIGURE OF THE), GzopEsy, and SURVEYING, we

1 The probable error of a clock correction found in this way from oue star with the Dunsink transit circle was £08:052.

shall here only deal with astronomical methods of deter- mining longitude.

The earliest astronomer who determined longitude by astronomical observations seems to have been Hipparchus, who chose for a first meridian that of Rhodes, where he observed ; but Ptolemy adopted a meridian laid through the "'Insule Fortunate" as being the farthest known place towards the west.2, When the voyages of discovery began the peak of Teneriffe was frequently used as a first meri- dian, until a scientific congress, assembled by Richelieu at Paris in 1630, selected the island of Ferro for this purpose. Although various other meridians (e.g., that of Uranienburg and that of San Miguel, one of the Azores, 29° 25' west of Paris) continued to be used for a long time, that of Ferro, which received the authorization of Louis XIII. on 25th April 1634, gradually superseded the others. In 1724 the longitude of Paris from the west coast of Ferro was found by Louis Feuillée, who had been sent there by the Paris Academy, to be 20° 1' 45"; but on the proposal of Guil- laume de Lisle (1675-1726) the meridian of Ferro was assumed to be exactly 20° west of the Paris observatory. Modern maps and charts generally give the longitude from the observatory of either Paris or Greenwich according to the nationality of the constructor; the Washington meri- dian conference of 1884 has recommended the exclusive use of the meridian of Greenwich. On the same occasion it was also recommended to introduce the use of a "uni- versal day," beginning for the whole earth at Greenwich midnight, without, however, interfering with the use of local time.?

The simplest method for determining difference of longi- tude consists in observing at the two stations some celestial phenomenon which occurs at

the same absolute moment for the whole earth. Hipparchus pointed out how ob- servations of lunar eclipses could be used in this way, and for about fifteen hundred years this was the only method available. When RecioMonTANUS (q.v.) began to publish his ephemerides towards the end of the 15th century, they furnished other means of determining the longitude. Thus Amerigo Vespucci observed on 23d August 1499, some- where on the coast of Venezuela, that the moon at 7″ 30™ P.M. was 1°, at midnight 54° east of Mars; from this he concluded that they must have been in conjunction at 6″ 30”, whereas the Nuremberg ephemeris announced this to take place at midnight. This gave the longitude of his station as roughly equal to 54 hours west of Nuremberg. The instruments and the lunar tables at that time being very imperfect, the longitudes determined were very er- roneous ; see NAVIGATION (vol. xvii. p. 251), to which article we may also refer for a history of the long-discussed problem of finding the longitude at sea. The invention of | the telescope early in the 17th century made it possible to observe eclipses of Jupiter’s satellites; but there is to a great extent the same drawback attached to these as to lunar eclipses, that it is impossible to observe with suffi- cient accuracy the moments at which they occur.

Eclipses of the sun and occultations of stars by the moon were also much used for determining longitude be- fore the invention of chronometers and the electric tele- graph offered better means for fixing the longitude of observatories. These methods are now hardly ever em- ployed except by travellers, as they are very inferior as regards accuracy. For the necessary formule see Chau-

2 This was probably first done in the first century by Marinus of Tyre.

3 This proposal was chiefly dictated by a wish to facilitate the inter- national telegraph and railway traffic. In the United States, where the large extent of the country in longitude makes it impossible to use the time of one meridian, four standard meridians were adopted in 1888, viz., 75°, 90°, 105°, 120° west of Greenwich, so that clocks show- ing ‘‘ Eastern, Central, Mountain, or Pacific time” are exactly five, six, seven, or eight hours slower than a Greenwich mean-time clock.

TIM E

venet’s Spherical and Practical Astronomy, vol. i. pp. 518- 542 and 550-557.

We now proceed to consider the four methods for find- ing the longitudes of fixed observatories, viz., by (1) moon culminations, (2) rockets or other signals, (3) transport of chronometers, and (4) transmission of time by the electric telegraph.

1. Moon Culminations.—Owing to the rapid orbital motion of the moon the sidereal time of its culmination is different for different meridians. If, therefore, the rate of the moon’s change of right ascension is known, it is casy from the observed time of culmina- tion at two stations to deduce their difference of longitude. Let the right ascension of the moon a and its differential coefficients be computed for the Greenwich time 7’, and let the culmination be observed at two places whose longitudes from Greenwich are \ and N, the time of observation being 7+¢ and 7’+¢’ Greenwich time, or in local time 7+¢+A=0 and 7’+¢’+N=6’; we have then

ee Oe gee alae 6’- 9=(t’-)+5(t?-B)aat eo

and, as the difference of longitude is \’-A=(0’-0)-(¢’-Z), we have only to determine ¢’ —¢ from the first equation. This is simply done by a suitable selection of 7. Calling 7+4(¢+?t’)=7”, we have to put 7’-4(¢’-¢) and 7”’+3(¢’-¢) for T7+¢ and T+/. It is then easy to see that

1 gaye — peta dy _ psa 0 -O=(t — +t – OP 93

and, solving this equation by first neglecting the second term ou the right side and then substituting the value of ¢ -¢, thus found

ie 170-078 &a

“dafdt 24|_da/déi| dt In order to be as much as possible independent of instrumental elrors, some standard stars nearly on the parallel of the moon are observed at the two stations; these “‘moon-culminating stars” are given in the ephemerides in order to secure that both observers take the same stars. As either the preceding or the following limb, not the centre, of the moon is observed, allowance must be made for the time the semi-diameter

takes to pass the meridian and for the change of right ascension during this time. This method was

roposcd by Pigott towards the end of the 18th century, and has Bach much used ; but, thongh it may be very serviceable on journeys and expeditions to distant places where the chronometric and tele-

raphic methods cannot be employed, it is not accurate enough for

xed observatories. This is due, not only to the difficulties attend- ing the observation (the difference of personal error in observing the moon and stars, the different apparent enlargement of the moon by irradiation in different telescopes and under different atmo- spheric circumstances, &c.), but chiefly to the large coefficient with which 6’ — @ has to be multiplied in the final equation for V’ —X. Errors of four to six seconds of time have therefore frequently been noticed in longitudes obtained by this method from a limited number of observations: the longitude of the Madras observatory was for mapy years assumed to be 54 21™ 38-77, but subsequently by a telegraphic determination this was found to be 48°37 too great.

2. Signals.—In 1671 Picard determined the difference of longi- tude between Copenhagen and the site of Tycho Brahe’s observa- tory by watching from the latter the covering and uncovering of a fire lighted on the top of the observatory tower at Copenhagen. Powder or rocket signals have been in use since the middle of the 18th century; they are nowadays never used for this purpose, although several of the principal observatories of Europe were con- nected in this manner early in the 19th century.}

3. Transport of Chronometers.—This means of determining longi- tude was first tried in cases where the chronometers could be brought the whole way by sea, but the improved means of communication on land led to its adoption in 1828 between the observatories at Greenwich and Cambridge, and in the following years between many other observatories. A few of the more extensive expedi- tions undertaken for this object deserve to be mentioned. In 1843 more than sixty chronometers were sent sixteen times backwards and forwards between Altona and Pulkowa, and in 1844 forty chronometers were sent the same number of times between Altona and

Greenwich.? In 1844 the longitude of Valentia on the south- west coast of Ireland was determined by transporting thirty pocket chronometers via Liverpool and Kingstown and having an inter- mediate station at the latter place. ‘The longitude of the United States naval observatory has been frequently determined from Greenwich. The following results will give an idea of the accuracy of the method.?

in that term, ts

1 For instance, Greenwich and Paris in 1825 (Phil. Trans., 1826). The result, 6™ 215-6, is only about 0s°6 too great. ,

2 Asa great many of the chronometers used in 1844 were made by Dent and were of superior excellence, a smaller number was considered sufficient.

3 Gould, Transatlantic Longitude, p. 5, Washington, 1869.

Previous to 1849, 373 chronometers ……. 5h §m 128+52 Expedition of 1849, Bond's discussion …….. 118-20 os SICTS ice ccces 128° 06 rs »,. Bond's second result …….. 128° 26+0s-20 an 1835, 52 chronometers, 6 trips, Bond .. 138°490s-19

The value now accepted from the telegraphic determination is 5h §m 12509. The probable errors of the results for Pulkowa- Altona and Altona-Greenwich were supposed to be £05039 and 08-042. It is of course only natural tat the uncertainty of the results for the trans-Atlantic longitude should be much greater, considering the length of time which elapsed between the rating of the chronometers at the observatories of Boston (Cambridge, Massachusetts) and Liverpool. The difficulty of the method con- sists in determining the "travelling rate." Each time a chrono- meter leaves the station 4 and returns to it the error is determined, and consequently the rate for the time occupied by the journeys from 4 to B and from B to 4 and by the sojourn at B. Similarly a rate is found by each departure from and return to B, and the time of rest at A and B is also utilized for determining the station- ary rate. In this way a series of rates for overlapping intervals of time are found, from which the travelling rates may be interpolated. It is owing to the uncertainty which necessarily attaches to the rate of a chronometer during long journeys, especially by land, where they are exposed to shaking and more or less violent motion, that it is desirable to employ a great number. It is scarcely neces- sary to mention that the temperature correction for each chrono- meter must be carefully investigated, and the local time rigorously determined at each station during the entire period of the operations. 4. Telegraphic Determination of Longitude.—This was first sug- gested by the American astronomer 8. C. Walker, and owed its de- velopment to the United States Coast Survey, where it was employed from about 1849. Nearly all the more important public observa- tories on the continent of Europe have now been connected

in this way, chiefly at the instigation of the “Huropiiische Gradmessung,” while the determinations in connexion with the transits of Venus and those carricd out in recent years by the American and French Governments have completed the circuit of the greater part of the globe. The telegraphic method compares the local time at one station with that at the other by means of electric signals. If a signal is sent from the eastern station 4 at the local time 7, and received at the western station B at the local time 7, then, if the time taken by the current to pass through the wire is called 2, the difference of longitude is and similarly, if a signal is sent from B at the time 7, and received at A at Ts, we have A= 7, — T,- 2,

from which the unknown quantity x can be eliminated.

The operations of a telegraphic longitude determination can be arranged in two ways. KEither the local time is determined at both stations and the clocks are compared by telegraph, or the time determinations are marked simultancously on the two chronographs at the two stations, so that further signals for clock comparison are unnecessary. The first method has to be used when the tele- graph is only for a limited time each night at the disposal of the observers, or when the climatic conditions at the two stations are so different that clear weather cannot often be expected to occur at both simultaneously, also when the difference of longitude is so considerable that too much time would be lost at the eastern station waiting for the arrival of the transit record of one star from the western station before observing another star. The independent time determination also offers the advantage that the observations may be taken either by eye and ear or by the chronograph, and that the signals may be either audible beats of a relay or chrono- graphic signals, the rule being to have observations and signals made by similar operations. ‘The best way of using audible beats of a relay is to let the circuit pass through an auxiliary clock, which from second to second alternately makes and breaks the current, the making of the current being rendered audible by the tapping of the relays at both stations. If, now, the auxiliary and the observing clocks are regulated to a different rate, the coinci- dences of the beats of the relay with those of the observing clock can be noted with great accuracy, from which the difference between the two observing clocksis found. It has been proved by experience that the degree of accuracy with which the clock comparison can be made by one

coincidence is exactly equal to that of one chrono- graph signal, the probable error being in both cases about £05-015. It should, however, be mentioned that the interval between two consecutive coincidences cannot be made less than two minutes, whereas the chronograph signals may be given every second, and, as the observations made with the chronograph are also somewhat more accurate than those made by eye and ear, the chronograph should be used wherever possible. The other method, that of simultaneous registration at both stations of transits of the same stars, has also its advantages. Each transit observed at both stations furnishes a value of the difference of longitude, so that the final result is less dependent on the clock rate than in the first method, which necessitates the combination of a series of clock

errors determined during the night to forma value of the clock error for the time when the exchange of signals took place. When using this method it is advisable to select the stars in such a manner that only one station at a time is at work, so that the intensity of the current can be readjusted (by means of a rheostat) between every despatch and receipt of signals. This attention to the intensity of the current is necessary whatever method is em- ployed, as the constancy of the transmission time (x in the above equations) chiefly depends on the constancy of the current. The probable error of a difference of longitude deduced from one star appears to be! P

for eye and ear transits =£0%-08,

for chronograph transits 05-07 ; while the probable error of the final result of a carefully planned and well executed series of telegraphic longitude operations is gener- ally between £05015 and +£05‘025. .

It is evident that the success of a determination of longitude de- pends to a very great extent on the accurate determination of time at the two stations, and great care must therefore be taken to de- termine the instrumental errors repeatedly during a night’s work. But, in addition to the uncertainty which enters into the results from the ordinary errors of observation, there is another source. of error which becomes of special importance in longitude work, viz., the so-called personal error. The discovery of the fact that all

observers differ more or less in their estimation of the time when a star crosses one of the spider lines in the transit instrument was made by Bessel in 18207; and, as he happened to differ fully a second of time from several other observers, this remarkably large error naturally caused the phenomenon to be carefully examined. Bessel also suggested what appears to be the right explanation, viz., the co-operation of two senses in observing transits by eye and ear, the ear having to count the beats of the clock while the eye com- pares the distance of the star from the spider line at the last beat before the transit with the distance at the first beat after it, thus estimating the fraction of second at which the transit took place. It can easily be conceived that-one person may first hear and then see, while to another these sensations take place in the reverse order ; and to this possible source of error may be added the sensible time required by the transmission of sensations through the nerves to the brain and for the latter to act upon them. As the chronographic method of observing dispenses with one sense (that of hearing) and merely requires the watching of the star's motion and the pressing of an electric key at the moment when the star is bisected by the thread, the personal errors should in this case be much smaller than when the eye and ear method is employed. And it is a fact that in the former method there have never occurred errors of between half and a whole second such as have not unfrequently appeared in the latter method.

In astronomical observations generally this personal error does not cause any inconvenience, so long as only one observer is em- ployed at a time, and unless the amount of the error varies with the declination or the magnitude of the star; but when absolute time has to be determined, as in longitude work, the full amount of the personal equation between the two observers must be care- fully ascertained aud taken into account. And an observer's error has often been found to vary very considerably not only from year to year but even within much shorter intervals ; the use of a new instrument, though perhaps not differing in construction from the accustomed one, has also been known to affect the personal error. For a number of years this latter circumstance was coupled with another which seemed perfectly incomprehensible, the personal error appearing to vary with the reversal of the instrument, that is, with the position of the illuminating lamp east or west. But in 1869-70 Hirsch noticed during the longitude operations in Switzerland that this was caused bya shifting of the

reflector inside the telescope, by means of which the field is illuminated, which produced an apparent shifting of the image of the spider lines, unless the eye-piece was very accurately focused for the observer's sight. The simplest and best way to find the equation between two observers is to let one observe the transits of stars over half the wires in the telescope, and the other observe the transits over the remainder, each taking care to refocus the eye-piece for himself in order to avoid the above- mentioned source of error. The single transits reduced to the middle wire give immediately the equation ; and, in order to eliminate errors in the assumed wire-intervals, each observer uses alternately the first and the second half of the wires. Another method is in vogue at Greenwich, where each observer with the transit circle from a series of stars determines the clock error and reduces this to a common epoch (0 sid. time) by means of a clock rate found independently of personal error. The differences between the clock

1 Albrecht, Bestimmung von Ldngendifferenzen mit Hiilfe des elec- trischen Telegraphen, p. 80, Leipsic, 1869, 4to.

2 Maskelyne had in 1795 noticed that one of his assistants observed transits more than half a second later than himself, but this was sup- posed to arise from some wrong method of observing adopted by the assistant, and the matter was not further looked into.

errors thus found are equal to the personal equations. This method cannot, however, be recommended, as the systematic errors in the right ascensions of the stars and any slight variation of the clock rate would affect the personal equation ; the first method is there- fore generally used in longitude work. It is advisable to let the observers compare themselves at the beginning, middle, and end of the operations and, if possible, at both the instruments employed. A useful check on the results is afforded by simultaneous experi- ments with one of the instruments contrived by C. Wolf, Kaiser, and others (sometimes called ‘‘time collimators”), by which the absolute personal error of an observer can be determined. Though differing much in detail, these instruments are all constructed on the same principle: an artificial star (a lamp shining through a minute hole in a screen mounted on a small carriage moved by clockwork) passes in succession

across a nuinber of lines drawn on oiled paper, while an electric contact is made at the precise moment when the star is bisected on each line by the carriage passing a number of adjustable contact makers. The currents thus made register the transits automatically on a chronograph, while the observer, viewing the apparatus through his telescope, can observe the transits in the usual manner either by eye and ear or by chrono- graph, thus immediately finding his personal error. On the Conti- nent these contrivances have frequently been used to educate pupils learning to observe, and experience has repeatedly shown that a considerable personal error can be generally somewhat diminished

through practice.

Literature.—General treatises on spherical astronomy, such as Briinnow's Lehrbuch der sphirischen Astronomie (8d ed., Berlin, 1871; translated into English and several other languages) aud Chauvenet's Manual, treat very fully of the numerous methods of determining time by combination of altitudes or azimuths of several stars. The best handbook of telegraphic longitude work is Albrecht's already mentioned ; but any one engaging in practical work of this kind should consult the accounts of the numerous longitude determinations carried out during recent years, Fon sed the Publicationen des kon. Patel ad geodatischen Instituts ; Telegraphic Determination of Differences of Longitude by Officers of the United States Navy (Washington, 1880); Telegr. Determ. of Longi- tudes in Mexico, Central America, and on the West Coast of South America (Wash- ington, 1885); the Reports of the United States Coast and Geodetic Survey ; vol. ix. of the Account of the Great Trigonometrical Survey of India; and vol. iii. of Dun Echt observatory Publications. A discussion of all the investigations on personal errors up to 1875 was published by Dreyer in Proc. R. Irish Acad., 2d series, vol. ii., 1876, pp. 484-528. (J. L. E. D.)

TIMOLEON. The life of Timoleon, one of the noblest and most interesting of the men of old Greece, is closely bound up with the history of Si1crty (q.v.), and more par- ticularly of SyRacusE (g.v.), in the latter half of the 4th century B.c. It is as the champion of Greece against Carthage, and of constitutional government against violence and oppression, that he stands out as such a grand figure. His early career in his native Corinth was shaped

by a tragic incident. Timoleon had saved the life of his brother, Timophanes, on the field of battle; but, when that same brother, at the head of a band of mercenary soldiers, took possession of the acropolis and made himself practically a military despot and master of the city, Timoleon, after an ineffectual protest, let him be struck down by his brother- in-law and one or two other friends who had joined in his remonstrance. By the public opinion of Corinth generally his conduct was approved as patriotic ; but the curses of his mother and the cold looks of some of his kinsfolk and acquaintances drove him from the city into the solitude of the fields, and there, it would seem, for some years he pined away, hating life and even bent on ending it by voluntary starvation. He must have reached middle life when, in 344 B.c., envoys came from Syracuse to Corinth to appeal to the mother-city for relief from the intestine feuds and foreign mercenaries under which the Syracusans, and all the Greeks of Sicily, suffered. Carthage too, their old and bitter foe, after some years of quiet, was again bestirring herself and intriguing with the local des- pots. Corinth could not refuse her help, though her chief citizens declined the responsibility of attempting to estab- lish a settled government in the factious and turbulent Syracuse. By a sort of Divine inspiration, says Plutarch (Tim., 3), Timoleon, being named by an unknown voice in the popular assembly, was chosen by a unanimous vote to undertake the mission. THe sailed for Sicily with a few of the leading citizens of Corinth and a small troop of Greek mercenaries. On arriving at Rhegium he found that his movements were watched by a Carthaginian squadron, act- ing under the advice of a Syracusan, Hicetas, who had

made himself master of Leontini and aimed at supplanting with Carthaginian aid the younger Dionysius, still nomin- ally tyrant of Syracuse, but actually in possession only of the island citadel. Hicetas, whilst seeming to favour Corinthian intervention, was really working with Carthage on behalf of the tyrants. Timoleon, however, slipped away from the Carthaginian watch and landed at Tauromenium (Taormina), where he had a very friendly reception. At Adranum, an inland town, to which he came by invitation from a party among the citizens, he surprised Hicetas, and drove him back, with his troops utterly defeated, to Syra- cuse. The

Sicilian Greeks now rallied round him, and the following year (343) saw the surrender of Dionysius and Timoleon master of the entire city. Hailed by the citizens as a heaven-sent deliverer, he at once began the work of restoration, bringing in a multitude of new settlers from the mother-city and from Greece generally, and establishing a popular government on the basis of the laws of Diocles, which had been forgotten under the Dionysian régime. The impress of Timoleon's reforms seems to have lasted to the days of Augustus. The tyrants, too, in the other Sici- lian cities were put down, and his old enemy Hicetas went back to Leontini, where he lived as a private though power- ful citizen. He made one more attempt to overthrow Timoleon, and induced Carthage to send (340-339) a great army, which landed at Lilybeum (Marsala). The Syra- cusans could hardly be brought to face the invader; but with a miscellaneous levy of about 12,000 men, most of them mercenaries, Timoleon marched westwards across the island into the neighbourhood of Selinus and won a great and decisive victory on the Crimisus. The Carthaginian host is said to have outnumbered Timoleon's army in the proportion of seven to one. The general himself led on his infantry in person (Plut., Z'm., 27), and their enemy's dis- comfiture was completed by a blinding storm of rain and hail driven straight in their faces (Diod., xvi. 79). This victory gave the Greeks of Sicily many years of peace and safety from Carthage. Carthage made, however, one more effort and despatched some mercenaries to prolong the con- flict between Timoleon and the tyrants. But it soon ended (338 B.c.) in the defeat of Hicetas, who was taken prisoner and put to death, and in a treaty which confined the dominion of Carthage in Sicily to the west of the Halycus (Platani). Timoleon, having put down the despots and given freedom to the Greek cities of Sicily, retired into private life, though he remained practically supreme not only at Syracuse but throughout Sicily. This island, not- withstanding the many elements of discord which political revolution, with the return of exiles and the influx of new settlers, must have brought in, seems to have been during Timoleon's lifetime tranquil and contented. There are some characteristic stories told of his last days. Although blind, he used to come in his car into the assembly in the theatre and give his opinion, which was commonly accepted by a unanimous vote. An officious person once insisted on his giving the ordinary bail in a lawsuit ; but he replied that he had himself always been the consistent champion of law and of legal rights for them all. Again, when his military strategy was

unfavourably criticized, he expressed his grati- tude to heaven that he had won for the Syracusans the privilege of liberty of speech. He died in 337, and was buried at the cost of the citizens of Syracuse, who erected a grand monument to his memory in their market-place. Plutarch's Life of Timoleon and portions of Diodorus Siculus are our chief sources of original information. There is an admirable

and most interesting account of his life and work in chap. lxxxv. of Grote's History of Greece.

TIMON of Athens, a noted misanthrope, lived during

the Peloponnesian War. He is more than once alluded to by Aristophanes and other comedians of the Attic stage.

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Plutarch takes occasion to introduce a short account of his life in the biography of Mark Antony (ch. 70), and he gives his name to one of Lucian's dialogues. Shakespeare probably derived his knowledge of Timon mainly from Plutarch ; but the Timon of Shakespeare resembles the Timon of Lucian in so many points that some critics think Shakespeare (or whoever wrote the first sketch of the play) must have had access to the dialogue in question.

TIMON of Phlius, the well-known sillograph and scep- tic philosopher, flourished about 280 B.c. He studied philosophy under Stilpo the Megarian and Pyrrho of Elis, the famous sceptic. Thereafter he spent some time in Chalcedon, where he made a fortune by teaching and lec- turing. The rest of his life was passed chiefly at Athens, where he died at an advanced age.

The writings of Timon, if we may trust Diogenes Laertius (ix. ch. 12), were exceedingly numerous both in prose and in verse : besides the Zé\dor, he is asserted to have written epic poems, tragedies, comedies, satyric dramas, and other varieties. But he is best known as the author of the ZéA\o or sarcastic hexameter verses written against the Greek philosophers. They were divided into three books; in the first the author spoke in his own person, while in the second and third Xenophanes of Colophon replied to

inquiries addressed to him by Timon about early and late philo- ° sophers. From the fragments that remain (about 140 lines or parts of lines, printed in Mullach, Frag. Phil. Grexc., i. pp. 84-98) we see that Timon possessed some of the qualities of a great satirist together with a thorough command of the hexameter ; but there is no trace of any loftier aim than to awaken derisive laughter. Philosophers are ‘‘ excessively a ae murderers of many wise saws’ (ver. 96); the only two whom he spares are Xenophanes, ‘‘the modest censor of Homer’s lies” (v. 29), and Pyrrho, against whom ‘no other mortal dare contend” (v. 126). Besides the ZidXot we have some lines preserved from the Ivdaduol, a poem in elegiac verse, which appears to have inculcated the tenets of scepti- cism, and one or two lines or parts of lines which cannot be with certainty assigned to either poem.

TIMOR, an island of the East Indian Archipelago, the easternmost and largest of the lesser Sundanese group, stretching south-west and north-east for 300 miles between 8° 40’ and 10° 40’S. lat. and 123° 30’ and 127° E. long. It has a mean breadth of 60 miles, an area of over 11,000 square miles, and a population roughly estimated at about 500,000. Timor lies in deep water a little to the west of the hundred fathofn line, which marks in this direction the proper limit of the shallow Arafura Sea, flowing between it and northern Australia. It differs considerably from the other members of the Sundanese group both in the lie of its main axis (south-west and north-east instead of west and east), and in the great pre- valence of old rocks, such as schists, slates, sandstones, carboniferous limestones, and other more recent sediment- ary formations, and in its correspondingly slighter volcanic character. It comes, however, within the great volcanic zone which sweeps in a vast curve from the northern extremity of Sumatra, through Java and the other Sundan- ese islands, round to Amboina, Tidor, Ternate, Jilolo, and the Philippines. There appear to be at least two quiescent and other extinct cones, and the surface is everywhere ex- tremely rugged and mountainous, with numerous irregular ridges from 4000 to 8000 feet high, forming altogether a very confused orographic system. Mount Kabalaki in the eastern district of Manufahi rises above 10,000 feet (H. O. Forbes) ; the culminating point appears to be Mount Allas (11,500 feet) near the south coast. Owing to the preva- lent dry easterly winds from the arid plains of North Australia, Timor, like Ombay, Flores, and other neigh- bouring islands, has a much drier climate, with a corre- spondingly poorer

vegetation, than Java, and has few perennial streams and no considerable rivers. Hence, apart from almost untouched and unsurveyed stores of mineral wealth, such as iron, copper, and gold, which occur apparently in considerable quantities at several points, the island is poor in natural resources. The uplands, however,

yield good wheat and potatoes, while the woodlands, which nowhere form veritable forests, contain much excellent sandalwood. This and a noted breed of hardy ponies form the chief articles of export. Owing doubtless to the zone of deep water flowing between Timor and the Arafura Sea, the fauna of Timor presents, beyond a marsupial cuscus, scarcely any Australian types. The few mammals, such as a deer, a civet, a pig, a shrew, and monkeys, as well as the birds and insects, resemble ordinary Malayan forms as met with in Java and more especially in Celebes and the Moluccas. In its natural history, as well as its physical constitution and oceanic surroundings, Timor is thus entirely separated from Australia and should perhaps be grouped with Celebes, Buru, Ceram, and Jilolo as the surviving fragments of a Miocene continent intervening between Asia and Australia, but at no time connected with either.

The bulk of the population is certainly Papuan, but inter- mingled in the most varied proportions with Malayan, Indonesian, and other elements; hence it presents an extraordinary diversity of physical types, as is clearly shown by the portraits figured in H. O. Forbes’s Naturalist’s Wanderings in the Eastern Archipelago. The natives, still mainly independent of thcir nominal Dutch and Portuguese rulers, are divided into a large number of more or less hostile tribes, speaking as many as forty distinct Papuan and Malayan languages or dialects. Some are extremely rude and still addicted to head-hunting, at least during war, and to other bar- barous practices. In their wma-luli, or sacred (tabooed) enclosures, rites are performed resembling those of the Pacific islanders.

Politically Timor is divided between Holland and Portugal, the Dutch claiming the western section of 4500 square miles and 200,000 inhabitants, the Portugucse the eastern of nearly 6500 square miles and 300,000 inhabitants; the respective capitals, centres of govern- ment, and outports

are Kupang at the western extremity and Deli on the north-east coast. But there are a large number of practically independent petty states, as many as forty-seven in the Portuguese territory alone, where they take the name of ‘‘renos,” or kingdoms, under absolute ‘‘leoreis” or kinglets. The Dutch section forms with Sumba, Savu, Rotti, and the surrounding islets a residency administered by a Dutch resident stationed at Kupang, which has a population of 8000.

TIMOR LAUT (“Seaward Timor”), called also Trn- IMBER, an insular group in the East Indian Archipelago, forming the central and largest link in a double chain of islands which stretches from Timor through Kei and Aru to New Guinea. It lies nearly midway between Timor and Aru, and forms, not one continuous mass, as used to be supposed, but a group of three large islands,—Yamdena in the centre, separated by Wallace Channel from Larat in the north and by Egeron Strait from Selaru in the south, besides a cluster or chain of islets on the west and north sides. From one of these the name Yenimber appears to have been extended to the whole group, which stretches for about 100 miles south-west and north-east, nearly parallel with Timor, from which, however, it differs altogether in its physical constitution. H. O. Forbes, who surveyed Wallace Channel and the northern districts in 1882, describes it as a low coralline group seldom rising above 100 feet, except at Egeron Strait, where the cliffs are 400 feet high, and at Laibobar, apparently a volcanic islet on the west side, which has an extinct crater 2000 feet high. There are no streams, and the poor soil, covered with a typically coral island flora, yields little beyond maize—the staple food—manioc, sweet potatoes, tobacco, some sugar-cane, cotton, and a little rice. The fauna includes buffaloes in a wild state, a marsupial cuscus, some bats, the beautiful scarlet lory, new or rare varieties of the ground-thrush, honey-eater, and oriole. The birds seem to have come mainly from New Guinea, the insects from Timor, and a few of both from Australia.

The aborigines are evidently Papuans, with a language like that of the Kei Islanders ; but there isa large intermingling of Malayan and perhaps Indonesian elements. They are a fine race, often over 6 feet, and, like all Papuans, noted for their artistic sense, which is shown especially in their wood and ivory carvings. In other respects they are pagans in a low state of culture, mostly

divided into hostile communities and addicted to piracy. The group belongs to the Dutch, who have a “‘ post-holder ” stationed at Ritabel on the west coast of Larat, a trading station of the Bughis from Celebes.

TIMOTHEUS, a distinguished Athenian general, was a son of Conon, who restored the walls of Athens. To the military qualities of his father he added a love of letters, which found scope in his friendship with Isocrates. The considerable fortune which he inherited from his father seems to have been exhausted by him in the public service. In 375 B.c. the Athenians, then at war with Sparta, sent Timotheus with a fleet to the Ionian Sea, where he gained over Cephalonia and secured the friendship of the Acar- nanians and of Alcetas, king of the Molossians. He also made himself master of Corcyra, but used his victory with a moderation which won the goodwill of the conquered. At the same time he defeated a Spartan fleet at Alyzia on the Acarnanian coast. In 373 he was appointed to the command of a fleet destined for the relief of Corcyra, then beleaguered by the Spartans. But his ships were not fully manned, and to recruit their strength he first cruised in the Aigean. The delay excited the indignation of the Athenians, who brought him to trial; but, thanks to the exertions of his friends, Jason, tyrant of Phere, and Al- cetas, king of the Molossians, both of whom came to Athens personally to plead his cause, he was acquitted, but removed from the command, Iphicrates being appointed in his room. Being reduced to great poverty—for he had pledged his private property in order to put the fleet in an efficient state—he left Athens and took service with the king of Persia. We next hear of him in 367 or 366, when le was sent by the Athenians with an armament to support Ariobarzanes, satrap of Phrygia. But, finding that the satrap was in open revolt against Persia, Timotheus ab- stained from helping him and turned his arms against Samos, which was occupied by a Persian garrison. He took it after a ten months’ siege (365 B.c.). Sailing north, he then captured Sestus, Crithote, Torone, Potidza, Methone, Pydna, and many more cities. In 358 or 357, when Eubcea was in danger of falling into the hands of Thebes, the Athenians, in response to a spirited appeal of Timotheus, crossed over into the island and expelled the Thebans in three days. In the course of the Social War, which broke out shortly afterwards, Timotheus was de- spatched with Iphicrates,

Menestheus, son of Iphicrates, and Chares to put down the revolt. The hostile fleets sighted each other in the Hellespont ; but a gale was blow- ing, and Iphicrates and Timotheus decided not to engage. Chares, disregarding their opposition, lost many ships, and in his despatches he incriminated his colleagues so bitterly that the Athenians recalled them and put them on their trial for having taken bribes from the enemy to betray the fleet. The accusers were Chares and Aristophon. The former was an officer of notoriously bad character; the latter had himself stood in the dock no less than seventy- five times. Iphicrates was not above browbeating the jury, who accordingly acquitted him and his son. Timo- theus, who condescended to no such means of securing an acquittal, was condemned to pay avery heavy fine. Being unable to pay, he withdrew to Chalcis. The time and place of his death are not mentioned by ancient writers. The Athenians afterwards did what they could to repair the wrong they had done to Timotheus by remitting the greater part of the fine to his son Conon, by burying his remains in the Ceramicus, and by raising statues to his memory in the agora and the acropolis.

Our materials for the life of Timotheus are very imperfect, and the chronology is in some points uncertain. The chief authorities are Isocrates, Or., xv.; Xenophon, Hellenica, v. and vi.; Diodorus, xv. and xvi.; Cornelius Nepos, Vit. Zim.; and Polyznus, Strat.,

iii, 10. Other scraps are to be gleaned from the orators, Plutarch, &c. The speech Against Timotheus which has come down to us

under the name of Demosthencs is probably not by the orator. It is chiefly interesting as illustrating the straits to which Timotheus was reduced by his sacrifices in the public cause.

TIMOTHEUS, a celebrated Greek musician and poet, was a native of Miletus, and died, according to the Parian marble, in 357 or 356 B.c., at the age of ninety. He added one or more strings (the number is uncertain) to the lyre, whereby he incurred the displeasure of the con- servative Spartans. The few fragments of his poems are collected by Bergk in his Poetx Lyrici Greet.

TIMOTHY, or Trmoruevs (Acts xvi. 1, xvii. 14, c&c.), a Lycaonian, the son of a Gentile father but of a Jewish mother, Eunice (2 Tim. i. 5), became a disciple of Paul at the time of his visit to Derbe and Lystra, and in deference to Jewish feeling was circumcised. He accompanied the apostle on many of his journeys, and was employed by him on important missions (1 Thess. iii. 2; 1 Cor. iv. 17, xvi. 10). His name is associated with that of Paul in the opening salutations of both epistles to the Thessalonians, the second epistle to the Corinthians, and those to the Philippians and Colossians. He was therefore with Paul at Rome. At a later date he is mentioned in Heb. xiii. 23 as having undergone imprisonment but been released. For the epistles of Paul to Timothy, see PAsToRAL EPIsTLEs (vol. xviii. p. 348). On the basis of them he is tradition- ally represented as bishop of Ephesus, and tradition also tells that he suffered under Domitian. His martyrdom is celebrated on 24th January. The apocryphal Acta Timothei (Greek and Latin) have been edited by Usener en 1877); compare Lipsius, Apokr. Apostelgeschichten, ii, 2 (1884),

TIMUR Trmtr Bey or Trutr Lane (Timur ¢ Leng), “the lame Timur”—vulgarized into TAMERLANE—the renowned Oriental conqueror, was born in 1336 at Kesh, better known as Shahr-i-Sabz, “the green city,” situated some 50 miles south of Samarkand in Transoxiana. His father Teragai was head of the tribe of Berlas. Great- grandson of Karachar Nevian (minister of Jagatai, son of Jenghiz Khan, and commander-in-chief of his forces), and distinguished among his fellow-clansmen as the first con- vert to Islamism, Teragai might have assumed the high military rank which fell to him by right of inheritance ; but like his father Burkul he preferred a life of retirement and study. Under the paternal eye the education of young Timur was such that at the age of twenty he had not only become an adept in manly outdoor exercises but had earned the reputation of being an attentive reader of the Koran. At this period, if we may credit the Memoirs (Malfizdt), he exhibited proofs of a tender and sympathetic nature.

About 1358, however, he came before the world as a leader of armies. His career for the next ten or eleven years may be thus briefly summarized from the Memoirs. Allying himself both in cause and by family connexion with Kurgan, the dethroner and destroyer of Kezan, chief of the Jagatai, he was

deputed to invade Khorasan at the head of a thousand horse. This was the second warlike expedition in which he was the chief actor, and the accomplishment of its objects led to further operations, among them the subjection of Khwarizm and Urganj. After the murder of Kurgan the contentions which arose among the many claimants to sovereign power were arrested by the invasion of Tughlak Timur of Kashgar, a descendant of Jenghiz. Timur was despatched on a mission to the invader's camp, the result of which was his own appoint- ment to the government of Mdawar4'lmahr (Transoxiana). By the death of his father he was also left hereditary head of the Berlas. The exigencies of his quasi-sovereign position compelled him to have recourse to his formidable patron, whose reappearance on the banks of the Sihon

created a consternation not easily allayed. Maward'lnahr was taken from Timur and entrusted to a son of Tughlak; but he was defeated in battle by the bold warrior he had replaced at the head of a numerically far inferior force. Tughlak's death facilitated the work of reconquest, and: a few years of perseverance and energy sufficed for its accomplishment, as well as for the addition of a vast extent of territory. During this period Timur and his brother-in-law, Hosain—at first fellow-fugitives and wan- derers in joint adventures full of interest and romance— became rivals and antagonists. At the close of 1369 Hosain was assassinated and Timur, having been formally proclaimed sovereign at Balkh, mounted the throne at Samarkand, the capital of his dominions.

The next thirty years or so were spent in various wars and expeditions. He not only consolidated his rule at home by the subjection of intestine foes, but sought extension of territory by encroachments upon the lands of contemporary potentates. His conquests to the west and north-west led him among the Mongols of the Caspian, and to the banks of the Ural and the Volga; those to the south and south-west comprehended almost every province in Persia, including Baghdad, Kerbela, and Kurdistan. To this time belong the vestiges of his presence that still remain, such as the ruined monastery at Keghut near the Aras (Araxes), the cleft stone in the church at Dayiru '1- 'Omar (M'ar Jibrail) near Mardin, and the ruinless sites of such

ancient cities as Zaranj in Sistan. In 1398, when Timur was more than sixty years of age, Farishta tells us that, “informed of the commotions and civil wars of India,” he “began his expedition into that country,” and on 12th September ‘‘arrived on the banks of the Indus.” His passage of the river and upward march along the left bank, the reinforcement he provided for his grandson Pir Mohammed (who was invested in Multan), the capture of towns or villages accompanied, it might be, with de- struction of the houses and the massacre of the inhabitants, the battle before Delhi and the easy victory, the triumphal entry into the doomed city, with its outcome of horrors,— all these circumstances belong to the annals of India. In April 1399, some three months after quitting the capital of Mahmud Tughlak, Timur was back in his own capital beyond the Oxus. It need scarcely be added that an im- mense quantity of spoil was conveyed away. According to Clavijo, ninety captured elephants were employed merely to carry stones from certain quarries to enable the conqueror to erect a mosque at Samarkand. The war with the Turks which succeeded the return from India was rendered notable by the capture of Baghdad, Aleppo, and Damascus, and especially by the defeat and imprisonment of Sultan Bayazid. This was Timtr’s last campaign. Another was projected against China, but the old warrior was attacked by fever and ague when encamped on the further side of the Sthon (Syr-Daria) and died at Atrér (Otrar) on the 17th February 1405. Markham, in his introduction to the narrative of Clavijo’s embassy, states that his body “was embalmed with musk and rose water, wrapped in linen, laid in an ebony coffin, and sent to Samarkand, where it was buried.” Timur had carried his victorious arms on one side from the Irtish and the Volga to the Persian Gulf

and on the other from the Hellespont to the Ganges. Timtr’s generally recognized biographers are—‘Ali Yazdi, commonly called Sharifu ’d-Din, author of the Persian Zafar- nama, translated by Petis de la Croix in 1722, and from French into English by J. Darby in the following year; and Ahmed ibn Mohammed ibn Abdallah, al Dimashki, al ‘Ajmi, commonly called Ibn ‘Arabshah, author of the Arabic ‘Ajaibu °l Makhinkdt, trans- lated by the Dutch Orientalist Golius in 1636. In the work of the former, as Sir William Jones remarks, “the Tartarian conqueror is represented as a liberal, benevolent, and illustrious prince” ; in that of the latter he is ‘‘deformed and

impious, of a low birth and detestable principles.” But the favourable account was written

under the personal supervision of Timur’s grandson, Ibrahim, while the other was the production of his direst enemy. Few indeed, if any, original annals of this class are written otherwise than to order, under patronage, or to serve a purpose to which truth is secondary. Among less reputed biographies or materials for bio- graphy may be mentioned a second Zafarndma, by Maulana Nizému ’d-Din Shanab Ghazdni (Nizim Shami), stated to be ‘‘ the earliest known history of Timur, and the only one written _in his lifetime”; and vol. i. of the Matla‘u’s-Sa‘dain—a choice Persian MS. work of 1495—introduced to Orientalists in Europe by Ham- mer, Jahrbiicher, Dorn, and (notably) Quatremére. There are also the Memoirs (Malfizdt) and Institutes (Tuzwkdt), of which an important section is styled Designs and Enterprises (Tadbirdt wa Kangdshahd). Upon the genuineness of these doubt has been thrown. The circumstance of their alleged discovery and presenta- tion to Shah Jahan in 1637 was of itself open to suspicion. Alhazen, quoted by Purchas in his quaint notice of Timur, and referred to by Sir John Malcolm, can hardly be accepted as a seri- ous authority. His assumed memoir was printed for English readers in 1597 by William Ponsonby under the title of a Historie of the Great Emperor Tamerlan, drawn from the ancient monuments by Messire Jean du Bec, Abbot of Mortimer ; and another version of the same book is to be found in the Histoire du Grand Tamerlan, by De Sainctyon, published at Amsterdam in 1678. But, although the existence of this Alhazen of Jean de Bec has been believed by many, the more trustworthy critics consider the history and histo- rian to be equally fictitious. : ,

Reference may be made to two more sources of information. (1) Supposed likenesses of Timur are to be found in books and in the splendid collection of Oriental manuscripts and drawings in the British Museum. One contained in the Shah Jahén Néma—a gorgeous specimen of illuminated Persian manuscript and exquisite caligraphy—represents a most ordinary, middle – aged Oriental, with narrow black whisker fringing the cheek and meeting the tip of the chin in a scanty, pointed beard; a thin moustache

sweeps in a semicircle from above the upper lip; the eyebrow over the almond-shaped eye is marked but not bushy. But it were vain to seek for an expression of genius in the countenance. Another portrait is ree in a set of sketches by native artists, some of which, taken probably from life, show great care and cleverness. Timur is here displayed as a stoutish, long-bodied man, below the middle-height, in age and feature not unlike the first portrait, but with thicker and more straggling hair, and dis- tincter, though not more agreeable character in the facial expres- sion, yet not a sign of power, genius, or any elements of grandeur or celebrity. The uncomfortable figure in the Bodleian Library does not give much help. Sir John Malcolm has been at some pains to invest his portrait of Timur with individuality. But an analysis of his results leaves the reader in more perplexity than satisfaction at the kind of information imparted, and he reverts insensibly to the sources from which his instructor has himself been instructed. (2) As regards plays, in Marlowe's Tamburlainc Timur is described as tall of stature, straightly fashioned, large of limb, having joints strongly knit, long and sinewy arms, a breadth of shoulders to ‘‘ bear old Atlas's burden," pale of complexion, and with ‘amber hair wrapp'd in curls." The outline of this de- scription might be from Sharifu 'd-Din, while the colours are the poet's own. A Latin memoir of Tamerlane by Perondinus, printed in 1600, entitled Magni Tamerlanis Scytharum Imperatoris Vita, describes Timur as tall and bearded, broad-chested and broad- shouldered, well-built but lame, of a fierce countenance, and with receding eyes, which express cruclty and strike terror into the lookers-on. But Jean du Bec's account of Timur's appearance is quite different. Now Zamburlaine was written in 1586. The first English translation of Jean du Bec is dated in 1595, the Life by Perondinus in 1600, and Petis de la Croix did not introduce Sharifu 'd-Din or ‘Ali Yazdi to European readers till 1722. The dramatist must have heard of Timur in other quarters, equally reliable it may be with those available in the present stage of Oriental research. At the beginning of the 18th century Timur was represented in Rowe's Tamerlane as a model of valour and virtue. The plot, however, has little to do with history, and is improbable and void of interest. By Matthew Gregory Lewis again ‘‘Timour" is depicted as the conventional tyrant of a gorgeous melodrama, slaying, burning, slaughtering, and commit- ting every possible atrocity until checked by violent death and a poetical climax.

Apart from modern European savants and historians, and the more strictly Oriental chroniclers who have written in Persian, Turkish, or Arabic, the following authorities may be cited—Laonicus Chalcondylas, Joannes Leunclavius, Joachimus Camerarius, Petrus Perondinus, Lazaro Soranzo, Simon Mairlus, Matthew Michiovius. A score or so of other names are given by Samuel Purchas. See also Clements Markham's Clavijo, in the Hakluyt Society's pub- lications ; White's edition of Davy's translation of the Institutes (1783); Stewart's translation of the Malfigdt ; Malcolm's History of Persia; and Trans. Roy. Soc., 1885. (F. J. G.)

TIN—TIN

TIN (Lat. stannum, whence the chemical symbol "Sn"; atomic weight=117°6, O=16), being a component of bronze, was used as a metal thousands of years prior to the dawn of history. But it does not follow that pre- historic bronzes were made of metallic tin. When the un- alloyed metal was first introduced cannot be ascertained with certainty. All we know is that about the lst century the Greek word xacairepos designated tin, and that tin was imported from Cornwall into Italy after, if not before, the invasion of Britain by Julius Cesar. From Pliny's writings it appears that the Romans in his time did not realize the distinction between tin and lead: the former was called plumbum album or candidum to distinguish it from plum- bum nigrum (lead proper). The word stannum definitely assumed its present meaning in the 4th century (H. Kopp).

Grains of metallic tin occur as a subordinate admixture in the gold ores of Siberia, Guiana, and Bolivia. Of tin mineral compounds (which are not numerous) tinstone, SnO,, is the most important ; besides it only tin pyrites, which, according to Rammelsberg, exists in two varieties, FeCu,Sn8, and ZnFeCu,8n,8,, need be named here.

Tinstone or Cassiterite.—This native oxide of tin, SnO,, forms very hard quadratic crystals of specific gravity 6°8. The pure mineral is colourless, and it is very scarce ; most specimens are brown owing to the presence of ferric or manganic oxide. The faces of the crystals exhibit diamond lustre. There is also another native form, known as ‘‘ wood tin," occurring in roundish masses with a fibrous radiating fracture. The ore is found in veins or layers within the older crystalline rocks and slates. Being much more

highly proof against the action of water and carbonic acid than its matrix, the ore often presents itself in loose crystals as part of the sand of rivers (stream tin). The oldest known deposit of tinstone is that of Cornwall, where it occurs in granite and in the “killas” (a kind of metamorphic clayish slate), associated with wolframite, apatite, topaz, mica, tourmaline, arsenide of iron, and other minerals. Cornish tin ore is characteristically rich in arsenic. Minor Euro- pean deposits occur in the Erzgebirge, in Brittany, and in Galicia (Spain). A very considerable deposit of pure ore (chiefly stream tin) exists in the island of Banca; and in Malacca tinstone is found. Other relatively abundant deposits occur in Bolivia and Peru, and in Queensland and New South Wales (lately discovered).

Metallurgy.—In the extraction of tin from tinstone ore the first step is to pound the crude ore and wash away the lighter gangue with water (see METALLURGY, vol. xvi. p. 59). The washed ore is “roasted” to burn away the arsenic and sulphur and to convert the iron, originally present in the heavy and compact form of pyrites or arsenide, into light friable oxide, which is removed by a second washing process. If much oxide of copper is con- tained in the product, it is extracted with dilute sulphuric acid, and from the solution is recovered by precipitation with metallic iron (see CopPER, vol. vi. p. 347). The puri- fied ore, known as “black tin,” goes to the smelting furnace. During the roasting process the ore must be constantly agitated to prevent caking, and to bring the arseniferous, d&c., parts to the surface. To save manual labour, Oxland and Hocking have constructed a mechanical roaster. It consists of a slanting tube of boiler-iron, coated inside with fire-brick. The lower end opens into the fire-place ; the upper communicates with a set of chambers for the con- densation of the white arsenic produced. The washed ore, after being dried on the top of the chamber, is run thence by a funnel into the pipe, which is made to rotate about its axis from three to eight times per minute. Before the ore has travelled far down the arsenic and sulphur catch fire, and by the time it reaches the bottom it is fully roasted. It falls into a receptacle below the level of the

fire. Of the impurities of the ore the wolframite (tungstate of iron and manganese) is the most troublesome, because on account of its high specific gravity it cannot be washed away as gangue. ‘To remove it, Oxland fuses the ore with a certain proportion of carbonate of soda, which suffices to convert the tungsten into soluble alkaline tungstate, with- out producing noteworthy quantities of soluble stannate from the oxide of tin; the tungstate is easily removed by treatment with water.

Smelting.—The purified ore is mixed with about one- fifth of its weight of anthracite smalls, the mixture being moistened to prevent it from being blown off by the draught, and is then fused on the sole of a reverberatory furnace for five or six hours. The slag and metal pro- duced are then run off and the latter is cast into bars; these are in general contaminated with iron, arsenic, copper, and other impurities. To refine them, the bars are heated cautiously on an inclined hearth, when relatively pure tin runs off, while a skeleton of impure metal remains. The metal run off is further purified by poling, ze, by stirring it with the branch of a tree,—the apple tree being preferred traditionally. This operation is no doubt in- tended to remove the oxygen diffused throughout the metal as oxide, part of it perhaps chemically by reduction of the oxide to metal, the rest by conveying the finely diffused oxide to the surface and causing it to unite there with the oxide scum. After this the metal is allowed to rest for a time in the pot at a temperature above its freezing point and is then ladled out into ingot forms, care being taken at each stage to ladle off the top stratum. The original top stratum is the purest, and each succeeding lower stratum has a greater proportion of impurities ; the lowest consists largely of a solid or semi-solid alloy of tin and iron.

To test the purity of the metal, the tin-smelter heats the bars to a certain temperature just below the fusing point, and then strikes them with a hammer or lets them fall on a stone floor from a given height. If the tin is pure it splits into a mass of granular strings. Tin which has been thus manipulated and proved incidentally to be very pure is sold as grain tin. A lower quality goes by the name of block tin. Of the several commercial varieties Banca tin is the purest; it is indeed almost chemically pure. Next comes English grain tin. For the preparation of chemically pure tin two methods are employed. (1) Commercially pure tin is treated with nitric acid, which converts the tin proper into an insoluble hydrate of SnO,, while the

copper, iron, é&c., become nitrates; the oxide is washed first with dilute nitric acid, then with water, and is lastly dried and reduced by fusion with black flux or cyanide of potassium. (2) A solution of pure stannous chloride in very dilute hydrochloric acid is reduced with a galvanic current. According to Stolba, beautiful crystals of pure tin can be obtained as follows. A platinum basin, coated over with wax or paraffin outside, except a small circle at the very lowest point, is placed on a plate of amal- gamated zinc, lying on the bottom of a beaker, and is filled with a solution of pure stannous chloride. The beaker also is cautiously filled with acidulated water up to a point beyond the edge of the platinum basin. The whole is then left to itself, when crystals of tin gradually separate out on

the bottom of the basin.

Properties of Pure Tin.—An ingot of pure tin is pure white (ex- cept for a slight tinge of blue); it exhibits considerable lustre and is not subject to tarnishing on exposure to normal air. The metal is pretty soft and easily flattened out under the hammer, but almost devoid of tenacity. That it is elastic, within narrow limits, is proved by its clear ring when struck with a hard body under circumstances permitting of free vibration. The specific gravity of ingot tin is 7°293 at 18° C. (Matthiessen). A tin ingot, though seemingly amor- phous, has a crystalline structure, consisting of an aggregate of quadratic octahedra ; hence the characteristic crackling noise which

a bar of tin gives out when being bent. This structure can be rendered visible by superficial etching with dilute acid. As the minuter crystals dissolve more quickly than the larger ones, the surface assumes a frosted appearance (moirée métallique), not unlike that of a frozen window-pane in winter time. _ Its crystalline struc- ture must account for the striking fact that the ingot, when exposed for a sufficient time to very low temperatures (to ~~39° C. for 14 hours), becomes so brittle that it falls into powder under a pestle or hammer ; it indeed sometimes crumbles into powder spontaneously. At ordinary temperatures tin proves fairly ductile under the hammer, and its ductility seems to increase as the temperature rises up to about 100°C. At some temperature near its fusing point it be~~ comes brittle

(vide supra), and still more brittle from —14° C. downwards. This behaviour of the mctal may probably be explained by assuming that in any tin crystal the coefticient of thermic ex- pansion has one value in the direction of the principal axis and another in that of either of the subsidiary axes. From 0° to 100° the two coefficients are practically identical; below -14° and from somewhere above 100° C. upwards they assunie different valucs ; and, as the several crystals are oriented in a lawless fashion, this must tend to disintegrate the mass. Tin fuses at 232°-7 (Persoz) ; ata red heat it begins to volatilize slowly ; at 1600° to 1808° C. (Carnelley and Williams) it boils. The hot vapour produced com- bines with the oxygen of the air into white oxide, SnO,.

Industrial Applications. —Commereially pure tin is used (princi- pally in Germany) for the making of pharmaceutical apparatus, such as evaporating basins for extracts, infusion pots, stills, &c. It is also employed for making two varieties of tin-foil,—one for the silvering of mirrors (see Mirror, vol. xvi. p. 500), the other for wrapping up chocolate, toilet soap, tobacco, &c. The mirror foil must contain some copper to prevent it from being too readily amalgainated by the mercury. For making tin-foil the metal is rolled into thin sheets, pieces of which are beaten out with a wooden mallet. As pure tin does not tarnish in the air and is proof against acid liquids, such as vinegar, lime juice, &c., it is utilized for culinary and domestic vessels. But it is expensive, and tin vessels have to be made very heavy to give them sufficient stability of form ; hence it is generally employed merely as a protecting coating for utensils made essentially of copper or iron. The tinning of a copper basin is an easy operation. The basin, made scrupulously clean, is heated over a charcoal fire to beyond the fusing point of tin. Molten tin is then poured in, a little powdered sal-ammoniac added, and the tin spread over the inside with a bunch of tow. The sal- ammoniac removes the last unavoidable film of oxide, leaving a purely metallic surface, to which the tin adheres firmly. For tinning small objects of copper or brass (7.e., pins, hooks, &c.) a wet-way process is followed. One part of cream of tartar, two of alum, and two of common salt are dissolved in boiling water, and the solution is boiled with granulated metallic tin (or, better, mixed with a little stannous chloride) to produce a tin solution ; and into this the articles are put at a boiling heat. In the absence of metallic tin there is no visible change ; but, as soon as the metal is introduced, a

galvanic action sets in and the articles get coated over with a firmly adhering film of tin. Tinning wrought iron is effected by immersion. The most important form of the operation is mak- ing tinned from ordinary sheet iron (making what is called ‘‘ sheet tin”). The iron plates, having been carefully cleaned with sand and muriatic or sulphuric acid, and lastly with water, are plunged into heated tallow to drive away the water without oxidation of the metal. They are next steeped in a bath, first of molten ferrugin- ous, then of pure tin. They are then taken out and kept suspended in hot tallow to enable the surplus tin to run off. The tin of the second bath dissolves iron gradually and becomes fit for the first bath. To tin cast-iron articles they must be decarburetted superficially by ignition within a bath of ferric oxide (powdered hematite or similar material), then cleaned with acid, and tinned by immersion, as explained above. By far the greater part of the tin produced metallurgically is used for making tin alloys, the majority of which have been treated of in preceding articles; see LED, vol. xiv. p. 378 ; PEWTER, vol. xviii. p. 725; Bronze, vol. iv. p. 866; PHosPHORUS, vol. xviii. p. 817.

Tin Compounds.—The most important of these may be arranged into two classes, namely, stannous compounds, SnX,, and stannic compounds, SnX,4, where X stands for Cl, Br, 40, &c. Stannous compounds are, in general at least, characteristically prone to pass into the stannic form by taking up additional X, in the form of oxygen, chlorine, &c.

Stannous Chloride, SnCl,.—This can be obtained pure only by heating pure tin in a current of pure dry hydrochloric acid gas. It is a white solid, fusing at 250° C. and volatilizing at a red heat in nitrogen, a vacuum, or hydrochloric acid, without decomposition. The vapour density below 700° C. corresponds to Sn,Cl,, above 800°C. to nearly SnCl, (Von Meyer and Ziiblin). The chloride readily com- bines with water into an easily soluble crystallizable hydrate (‘‘ tin crystals”). This is made without difficulty by dissolving tin in strong hydrochloric acid and allowing it to crystallize. For its industrial preparation Nollner passes sufficiently hydrated hydro-

chloric acid gas over granulated tin contained in stoneware bottles and evaporates the concentrated solution produced in tin basins over granulated tin. The basin itself is not attacked. The crystals contain one H,O according to Berzelius, while Marignac finds two ; probably both are right. The crystals are very soluble in cold water, and if the salt is really pure a small proportion of water forms a clear solution ; but on adding much water most of the salt is decomposed, with the formation of a precipitate of oxy-chloride— 28nCl, +3H,0 =2HCl + Sn,0Cl,.2H,0. According to Michel and Kraft, one litre of cold saturated solution of tin crystals weighs 1827 grammes and contains 1333 grammes of SnCl,. The same oxy-chloride is produced when the moist crystals, or their solution, are exposed to the air; by the action of the atmo- spheric oxygen * 04+8SnCl,=Sn,Cl,0 +SnCl,. Hence all tin crystals as kept in the laboratory give with water a turbid solution, which contains stannic in addition to stannous chloride. The complete conversion of stannous into stannic chloride may be effected by a great many reagents,—for instance, by chlorine (bromine, iodine) readily ; by mercuric chloride, HgClo, in the heat, with precipitation of calomel, HgCl, or metallic mercury ; by ferric chloride in the heat, with formation of ferrous salt, FeCl, ; by ar- senious chloride in strongly hydrochloric solutions, with precipita- tion of chocolate-brown metallic arsenic. All these reactions are available as tests for stannosum or the respective agents. In opposi- tion to stannous chloride, even sulphurous acid (solution) behaves as an oxidizing agent. If the two reagents are mixed, a precipitate of yellow stannic sulphide is produced. By first intention SO,H, + 8Sn”Cl, = 388n’¥Cl,0 + HS. The stannic oxy-chloride readily exchanges its O for Cl, at the ex- pense of the hydrochloric acid, which is always present, and the H,S decomposes one-half of a molecule of SnCl, with formation of SnS,. A strip of metallic zinc when placed in a solution of stan- nous chloride precipitates the tin in crystals and takes its place in the solution. Stannous chloride is largely used in the laboratory as a reducing agent, in dyeing as a mordant.

Stannous Oxide.—This as a hydrate is obtained from a solution of stannous chloride by addition of carbonate of soda; it forms a white precipitate, which can be washed with air-free water and dried at 80°C. without much change by oxidation. If the hydrate is heated in carbonic acid, the black anhydride SnO remains (Otto). Precipi- tated stannous hydrate dissolves

readily in caustic potash ley ; if the solution is evaporated quickly, it suffers decomposition, with formation of metal and stannate,

28n0 + K,O =Sn0,K,0 +Sn. If it is evaporated slowly, anhydrous stannous oxide crystallizes out at a certain stage (Otto). Dry stannous oxide, if touched with a glowing body, catches fire and burns into binoxide, SnO,. Stan- nous oxalate when heated by itself in a tube leaves stannous oxide (Liebig).

Stannic chloride, SnCl,, is obtained by passing dry chlorine over granulated tin contained in a retort; the tetrachloride distils over as a heavy liquid, from which the excess of chlorine is easily re- moved by shaking with a small quantity of tin filings and re-dis- tilling. It is a colourless fuming liquid of specific gravity 2°269 at 0° (Pierre) and 2°234 at 15°C. (Gerlach), is fluid at — 29°C., and boils at 115°:4 C. under 753°1 mm. pressure (Pierre). The chloride unites energetically with water into crystalline hydrates (ex. SnCl,,3H,0), easily soluble in water. It combines readily with alkaline and other chlorides into double salts: thus SnCl,+2KCl=SnCl,K,, analogous to the chloro-platinate; another example is the salt SnCl,(NH,)., known industrially as ‘‘ pink salt,” because it is used asamordant to producea pink colour. The plain chloride solution is similarly used. It is usually prepared by dissolving the metal in aqua regia.

Stannic Oxide, SnO,.—This, if the term is taken to include the hydrates, exists in a variety of forms. (1) Jinstone (see above) is proof against all acids. Its disintegration for analytical purposes can be effected by fusion with caustic alkali in silver, with the formation of soluble stannate, or by fusion with sulphur and car- bonate of soda, with the formation of a soluble thio-stannate, SnS.+xNa,S. (2) A similar oxide is produced by burning tin in air at high temperatures or exposing any of the hydrates to a strong red heat. Such ¢in-ash, as it is called, is used for the polishing of optical glasses. (8) Meta-stannic acid (H,OSnO,, generally written

199N;0};, to account for the complicated composition of meta- stannates, ¢.g., the soda salt H,Na,Sn,0,,) is the white hydrate produced from the metal by means of nitric acid. It is insoluble in water and in nitric acid and apparently so in hydrochloric acid ; but if heated with this last for some tine it passes into a hydro- chlorate, which, after the acid mother liquor has been

decanted off, dissolves in water. The solution when subjected to distillation behaves pretty much like a physical solution of the oxide in hydro- chloric acid, while a solution of ortho-stannic acid in hydrochloric acid behaves like a solution of SnCl, in water, z.2., gives off no hydrochloric acid and no precipitate of hydrated SnO,. (4) Ortho-

stannic acid is obtained as a white precipitate on the addition of carbonate of soda or the exact quantity of precipitated carbonate of lime to a solution of the chloride. This hydrate, SnO,H.0, is readily soluble in acids forming stannic salts, and in caustic potash and soda, with the formation of ortho-stannates. Of these stannate of sodium, Na,SnO,, is produced industrially by heating tin with Chili saltpetre and caustic soda, or by fusing very finely powdered tinstone with caustic soda in iron vessels. A solution of the pure salt yields fine prisms of the composition Na,SnO;+10H,0, which effloresce in the air. The salt is much used asa mordant in dyeing and calico-printing. Alkaline and other stannates when treated with aqueous hydrofluoric acid are converted into fluo-stannates (e.g., K,SnO; into K,Sn¥F,), which are closely analogous to, and iso- morphous with, fluo-silicates.

Sulphides.—If tin is heated with sulphur the two unite very readily into stannous sulphide, SnS, a lead-grey mass, which under the circumstances refuses to take up more sulphur. But, if a mixture of tin (or, better, tin amalgam), sulphur, and sal-ammoniac in proper proportions be heated, stannic sulphide, SnS,, is produced in the beautiful form of aurum musivum (mosaic gold),—a solid consisting of golden yellow, metallic lustrous scales. It is used chiefly as a yellow ‘‘ bronze” for plaster-of-Paris statuettes, &c.

Analysis. —Tin compounds when heated on charcoal with car- bonate of soda in the reducing blowpipe flame yield metal and a scanty ring of white SnO,. The reduction, however, succeeds better with cyanide of potassium asa flux. Stannous salt solutions yield a brown precipitate of SnS with sulphuretted hydrogen, which is insoluble in cold dilute acids and in real sulphide of ammonium, (NH,),S ; but the yellow, or the colourless reagent on addition of sulphur, dissolves the precipitate as SnS, salt. The solution on acidification yields a yellow precipitate of this sulphide. Stannic salt,

SnCl,, solutions give a yellow precipitate of SnS, with sulphur- etted hydrogen, which is insoluble in cold dilute acids but readily soluble in sulphide of ammonium, and is re-precipitated therefrom as SnS, on acidification. Only stannous salts (not stannic) give a precipitate of calomel in mercuric chloride solution. A mixture of stannous and stannic chloride when added to a sufficient quantity of solution of chloride of gold, gives an intensely purple precipitate of gold purple (purple of Cassius),—a compound which, although known for centuries, is to this day little understood chemically. It behaves on the whole like a compound of Sn,0, with Au,O. The test is very delicate, although the colour is not in all cases a pure purple. ; ; (W. D.)

TINAMOU, the name given in Guiana to a certain bird as stated in 1741 by Barrere (France Hquinomale, p. 138), from whom it was taken and used in a more general sense by Buffon (Hist. Vat. Oiseaux, iv. p. 502). In 1783 Latham (Synopsis, ii. p. 724) adopted it as English, and in 1790 (Index, ii. p. 633) Latinized it Zinamus, as the name of a new and distinct genus. The ‘“‘Tinamou” of Barrere has been identified with the “Macucagua” described and figured by Marcgrave in 1648, and is the Zinamus major of modern authors.

Buffon and his successors saw that the Tinamous, though passing among the European colonists of South America as “ Partridges,” could not be associated with those birds, and Latham’s step, above mentioned, was generally ap- proved. The genus he had founded was usually placed among the Galline, and by many writers was held to be allied to the Bustards, which, it must be remembered, were then thought to be “‘Struthious.” Indeed the likeness of the Tinamou’s bill to that of the Raza (vol. xx. p. 506) was remarked in 1811 by LIlliger. On the other hand L’ Herminier in 1827 saw features in the Tinamou’s sternum that in his judgment linked the bird to the Ralliidx. In 1830 Wagler (Wat. Syst. Amphibien, &c., p. 127) placed the Tinamous in the same Order as the Ostrich and its allies ; and, though he did this on very insufficient grounds, his assignment has turned out to be not far from the mark, as in 1862 the great affinity of these groups was shown by Prof. Parker’s researches, which were afterwards printed in the Zoological T’ransactions (v. pp. 205-232, 236-238, pls. xxxix.-xli.), and was further substantiated by him in the Philosophical Transactions (1866,

pp. 174-178, pl. xv.). Shortly after this Prof. Huxley in his often-quoted paper in the Zoological Proceedings (1867, pp. 425, 426)

1 Brisson and after him Linnzus confounded this bird, which they had never seen, with the TRUMPETER (q.v.).

was enabled to place the whole matter in a clear light, urging that the Tinamous formed a very distinct group of birds which, though not to be removed from the Carinatz, presented so much resemblance to the fatite as to indicate them to be the bond of union between those two great divisions.!| The group from the resemblance of its palatal characters to those of the Emeu (vol. viii. p. 171), Dromezus, he called Dromexognathx, and his decision, if not his name,

has since been widely accepted.

The Tinamous thus—by whatever name we call them, Dromxo- gnathex, Tinami, or Crypturi—will be seen to be of great importance from a taxonomer's point of view, though in regard to numbers they are comparatively insignificant. In 1873 Messrs. Sclater and Salvin in their Nomenclator (pp. 152, 153) recognized nine genera and thirty-nine species, since which time about half a dozen other species may have been described ; but in 1880 Schlegel (Mus. Pays- Bas, viii., Monogr. 41, pp. 1-51) would only admit five genera and thirty-one 5 Sige latter because it was the number possessed by the Leyden museum. They are peculiar to the Neotropical Region—four species only finding their way into southern Mexico and none beyond. Some of them inhabit forests and others the more open country ; but setting aside size (which in this group varies from that of a Quail to that of a large common Fowl) there is an unmis- takable uniformity of appearance among them as a whole, so that almost. anybody having seen one species of the group would always recognize another. Yet in minor characters there is considerable difference among them ; and first of all the group may be divided into two sub-families, the first, Zinaminw, having four toes, and the second, Tinamotiding, having but three—the latter containing, so far as is known, but two genera, Calopezus and Tinamotis, eac consisting of a single species, while the former, according to Messrs.

Sclater and Salvin (wt supra), may be separated into seven genera, two being Tinamus and Nothocercus, characterized by the roughness of their posterior tarsal scales, the others, Crypturus, Rhynchotus, Nothoprocta, Nothura, and Taoniscus, having smooth legs.

To the ordinary spectator Tinamous have much the

look of Partridges, but the more attentive observer will

Rufous tinamou (Rhynchotus rufescens).

notice that their elongated bill, their small head and slender neck, clothed with very short feathers, give them a different air. The plumage is generally inconspicuous : some tint of brown, ranging from rufous to slaty, and often more or less closely barred with a darker shade. or black, is the usual style of coloration; but some species are characterized by a white throat or a bay breast. The wings are short and rounded, and in some forms the feathers of the tail, which in all are hidden by their coverts, are soft. In bearing and gait the birds show some resem- blance to their distant relatives the Ratitz, and Mr

1M. Alix also has from an independent investigation of the osteo-

logy and myology of Nothwra major come to virtually the same con- clusion (Journ. de Zoologie, iti. pp. 169 and 252, pls. Viii. -xi.).

Bartlett shows (Proc. Zool. Society, 1868, p. 115, pl. xii.) that this is especially seen in the newly-hatched young. He also notices the still stronger Ratite character, that the male takes on himself the duty of incubation. The eggs are very remarkable objects, curiously unlike those of other birds ; and, as before stated (Brrps, vol. iii. p. 775), their shell? looks as if it were of highly-burnished metal or glazed porcelain, presenting also various colours, which seem to be constant in the particular species, from pale primrose to sage-green or light indigo, or from chocolate- brown to pinkish orange. All who have eaten it declare the flesh of the Tinamou to have a most delicate taste, as it has a most inviting appearance, the pectoral

muscles being semi-opaque. Of their habits not much has been told. Darwin (Journal, chap. iii.) has remarked upon the silliness they show in allowing themselves to be taken, and this is wholly in accordance with what Prof. Parker ob- serves of their brain capacity, and is an additional testi- mony to their low morphological rank. At least one species of Tinamou has bred not unfrequently in confine- ment, and an interesting account of what would have been a successful attempt by Mr John Bateman to naturalize this species, Rhynchotus rufescens, in England, at Brightling- sea in Essex, appeared in Zhe Meld (23d Feb. 1884 and 12th Sept. 1885). The experiment unfortunately failed owing to the destruction of the birds by foxes. (A. N.

TINDAL, Matruew (1656-1733), one of the ablest and most popular of the English deists, the son of a clergyman, was born at Beer Ferris, Devonshire, in 1656. He studied law at Lincoln College, Oxford, where he came under the influence of the High Churchman George Hickes, dean of Worcester ; and in his twenty-second year he was elected fellow of All Souls College, and held his fellowship till his death. About 1685 he saw “that upon his High Church notions a separation from the Church of Rome could not be justified,” and accordingly he joined the latter. But, discerning the baselessness and absurdity of Rome’s claims, he returned to the Church of England at Easter 1688. In 1694 he published an Essay of Obedience to the Supreme Powers, in which he justified the Revolution against notions of passive obedience and jus divinwm ; in 1697 an Essay on the Power of the Magistrate and the Rights of Mankind in Matters of Religion, an able vindica- tion of liberty of conscience, though he allows no right of toleration to “atheists”; and in 1698 an essay on Zhe Liberty of the Press, a vigorous exposure of the proposal to appoint licensers of the press and a powerful plea for the free discussion of religion. The first of his two larger works, Zhe Rights of the Christian Church associated against the Romish and all other priests who claim an independent power over it, part i, appeared anonymously in 1706 (2d ed., 1706; 3d, 1707; 4th, 1709). The book was regarded in its day as an extremely forcible defence of the Erastian theory of the supremacy of the state over the church, and at once provoked a storm of counter-argument and abuse on the part of those who maintained the independent rights and authority of the church. The law also was invoked against it, and, after several attempts to proscribe the work had failed, one against the author, publisher, and printer succeeded on 12th December 1707, and another against a bookseller for selling a copy the next

day. The prosecu- tion did not prevent the issue of a fourth edition and gave the author the opportunity of issuing A Defence of the Rights of the Christian Church, in two parts (2d ed., 1709). The book continued to be the subject of denunciation for years, and.Tindal believed he was charged by Dr Gibson, bishop of London, in a Pastoral Letter, with having under- mined religion and promoted atheism and infidelity,—a

2 Herr von Nathusius has described its microscopic structure (Journ. fir wissensch. Zoologie, 1871, pp. 3380-355),

charge to which he replied in an anonymous tract, An Address to the Inhabitants of London and Westminster, a second and larger edition of which appeared in 1730. In this tract} he makes a valiant defence of the deists and of the use of reason in religious matters, and anticipates here and there his Christianity as Old as the Creation ; or the Gospel a Republication of the Religion of Nature, London, 1730 (2d ed., 1731; 3d, 1732; 4th, 1733), which was re- garded by friends and foes alike as the “ Bible” of deism. It was really only the first part of the whole work, and the second, though written and entrusted in manuscript to a friend, never saw the light. It was said that Dr Gibson prevented its publication. ‘The first part made a great noise, and the answers to it were numerous, the most able being by Dr James Foster (1730), Dr John Conybeare (1732), Dr John Leland (1733), and Bishop Butler (1736). It was translated into German by J. Lorenz Schmidt (1741), and from it dates the influence of English deism on German theology. It is by this book that Tindal is now chiefly remembered ; but he had probably adopted substantially the principles it expounds before he wrote his essay of 1697. He objected to be called a simple deist, and claimed the name of “ Christian deist,” as he held that true Christianity is identical with the eternal religion of nature. He died at Oxford on 16th August 1733.

The religious system expounded in Tindal’s Christianity as Old as the Creation, unlike the earlier system of Lord Herbert of Cher- bury, was based on the empirical principles of Locke’s philgonly: It assumed the traditional deistic antitheses of external and in- ternal, positive and natural, revelations and religions, and perpetu- ated at the same time the prevalent

misconceptions as to the nature of religion and revelation, The system was, moreover, worked out by the purely a priori method, with all but a total disregard of the facts of religious history. It starts from the tremendous assump- tions that true religion must, both from the nature of God and the nature of things, be eternal, universal, simple, and perfect ; it main- tains that this religion can consist of ae but the simple and universal duties towards God and man, the first consisting in the fulfilment of the second,—in other words, the practice of morality. The author's moral system is somewhat confused and inconsistent, but is essentially utilitarian. From such principles it follows neces- sarily that the true revealed religion can be nothing more nor less than a republication of the religion of nature or reason, and that, if Christianity is the perfect religion, it can only be that republica- tion, and inust be as old as the creation. The special mission of Christianity, therefore, was simply to deliver men from the super- stition which had in course of time got mixed up with the religion of nature. True Christianity consequently must be a perfectly ''reasonable service"; arbitrary and positive precepts can form no true part of it; revelation and reason can never disagree ; reason must be supreme, and the Scriptures as well as all religious doc- trines must submit to its tests; and only such writings can be re- garded as Divine Scripture which tend to the honour of God and the good of man. Thus tested, much in the Old and the New Testaments must be rejected as defective in morality or erroneous in fact and principle. The strength of Tindal's position was the underlying conviction of the essential harmony between man's re- ligious and rational nature, and consequently of the rationality of Christianity. Its weakness was that, like the whole religious philosophy of the time, it was founded on a total misconception of the nature of religion and of revelation, and on as complete a disre- gard of the course of man's religious development. Weak points in it were ably exposed by Foster, Conybeare, Butler, and others ; but its radical errors needed for their complete exposure the higher conceptions of religion and religious history which were originated by Lessing, Schleiermacher, and Hegel.

See Leland, View of the Principal Deistical Writers (London, 1798); Lechler, Geschichte des Englischen Deismus (Stuttgart, 1841); Theological Review, November 1864; Hunt, Religious Thought in England from the

Reformation to the End of Last Century (London, 1870-73); Leslie Stephen, History of English Thought in

He onl Century (London, 1876-80); A. S. Farrar, Bampton Lecture (1862), ect. iv.

TINGHAE. See Cuusan.

TINNE, Anexanprine (1839-1869), African traveller, born at The Hague on 17th October 1839, was the daughter of an English merchant and his wife, Baroness van Steen- gracht-Capellen. Her father died when she was five years ee en i a

1 A Second Address to the Inhabitants, &c., with replies to some of

the critics of that book, bears the same date, 1730, though some of the works it refers to appeared in 1731.

old, leaving her the richest heiress in the Netherlands, After travelling in Norway, Italy, and the East, and visit- ing Egypt, when she ascended the Nile to near the equator, Mademoiselle Tinné left Europe again in 1861 for a pro- longed sojourn in the Nile regions. Accompanied by her mother and her aunt, she set out from Cairo on 9th Janu- ary 1862. After a short stay at Khartoum, the party ascended the White Nile as far as Gondokoro and explored a part of the Sobat, returning to Khartoum in November. Baron von Heuglin and Dr Steudner having meantime joined the ladies at Khartoum, the whole party set out in February 1863 to explore the Bahr-el-Ghazal. The limit of navigation at the Bahr-el-Homr was reached on 10th March. From Lake Rek a journey was made overland, across the Bahr Jur and south-west by the Bahr Kosango, to Jebel Kosango, on the borders of the Niam-Niam country. During the journey all the travellers suffered severely. Steudner died in April and Madame Tinné in June, and after many fatigues and dangers the remainder of the party reached Khartoum in July 1864. Made- moiselle Tinné returned to Cairo by Berber and Suakim. The geographical and scientific results of the expedition, largely into a new country, were highly important, as will be seen in Heuglin’s narrative in Petermann’s Mittheilungen (Erg.-hft, Nov. 15, 1865), and in his own Travels in the Legion of the White Nile (1869). At Cairo Mademoiselle

Tinné lived in somewhat Oriental style during the next four years, visiting Algeria, Tunis, and other parts of the Mediterranean. In January 1869 she started from Tripolis with a caravan, intending to proceed to Lake Tchad, and thence by Wadai, Darfur, and Kordofan to the Upper Nile. In July, however, on the route from Murzuk to Rhat, she was murdered by her escort.

Besides the references already given, see John A. Tinné's Geogra- phical Notes of an Expedition in Central Africa by three Dutch Ladies, Liverpool, 1864.

TINNEVELLI, or TrNavetty, a district of British India, in the Madras presidency, lying between 8° 9' and 9° 56' N. lat. and 77° 16' and 78° 27' E. long. It has an area of 5381 square miles, and a coast-line of nearly 100 miles, Madura district bounds it on the N. and N.E., on the 8. and §.E. the Gulf of Mannar, and on the W. the southern Ghats. Tinnevelli is a large plain, with an aver- age elevation of 200 feet, sloping to the east with slight undulations. Along the western boundary the mountains rise to 4000 feet; but they send out no spurs into the district, nor are there any isolated hills. The district is watered by numerous short streams, the principal being the Tambraparni (length 80 miles). In the north the scenery is unattractive and the soil poor; in the south red sandy soil prevails, in which little save the Palmyra palm will grow. But along the banks of the rivers are rice-fields and a variety of trees and crops. Many shoals occur near the shore, and in the north-east numerous rocks and reefs. The hills which divide Tinnevelli from Travan- core are chiefly granite and gneiss; and along the coast stretches the broad belt of alluvium common to the whole east coast of India, and in it are many salt marshes, divided by sand-dunes from the sea. Several veins of cale spar cross the district from east to west, and the beds of all the rivers are more or less encrusted with a deposit of lime. The district contains many ancient and magnificent build- ings; but the most interesting antiquities are the large sepulchral earthen urns of prehistoric races which have been found at several places, especially along the course of the Tambrapani, and which contain bones, pottery of all sorts, beads and bronze ornaments, iron weapons, imple- ments, &c. As the seat of Dravidian civilization Tinnevelli possesses more antiquarian interest than any other part of Madras. The climate is very hot and dry except at

the season of the monsoons; the average annual rainfall throughout the district is less than 25 inches, Tinnevelli possesses several roads, but no canals. The South Indian Railway enters the district five miles north of Virudupatti and runs to Tuticorin (77 miles) ; a branch line (18 miles) connects this last town with Tinnevelli.

In 1881 the population numbered 1,699,747 (males 825,887, females 873,860), of whom 1,468,977 were Hindus, 89,767 Moham- medans, and 140,946 Christians. Tinnevelli has twelve towns with over 10,000 inhabitants each, viz., TINNEVELLI (see below) ; Srivil- liputur, 18,256; Palamcotta, 17,964; Tuticorin, 16,281 ; Kulase Kharapatnam, 14,972; Sivagiri, 18,632; Viravanallur, 12,318 ; Rajapalayam, 12,021; Tenkasi, 11,987 ; Kayalpatnam, 11,806 ; Kalladakurchi, 10,936; and Sivakasi, 10,838. Out of the total area of 5381 square miles 1408 are uncultivable waste. In 1885-86 cereals, chiefly rice and spiked millet or kambu, the staple food of the district, occupied 842,741 acres, pulses 192,841, oil seeds 78,127, and cotton 206,717. The total area of forest is roughly estimated at 1500 square miles. Tuticorin is the only port of any importance. The chief exports are cotton, coffee, jaggery, chillies, &c. ; sheep, horses, cattle, and poultry are also sent to Ceylon. There is a con- siderable inland trade with Travancore. The pearl fishery on the coast is now unimportant. Coastal navigation is dangerous. In 1885-86 the total revenue of the district was £365,744, of which the land-tax yielded £305,850.

The early history of Tinnevelli is mixed up with that of Madura and Travancore. Down to 1781 it is a confused tale of anarchy and bloodshed. In that year the nawab of Arcot assigned the revenues to the East India Company, whose officers then undertook the internal administration of affairs. Several risings subsequently took place, aud in 1801 the whole Carnatic, including Tinnevelli, was ceded to the British. Tinnevelli is now the most Christian district of all India, both Roman Catholic and Protestant.

TINNEVELLL, chief and largest town of the above dis- trict, is situated 14 miles from the left bank of the Tam- braparnt in 8° 43’ 47” N. lat. and 77° 43’ 49” E. long. The town was rebuilt about 1560 by Visvandatha, the founder of the Nayakkan dynasty of Madura, who erected many temples,

&c., among them the great Siva temple. Tinnevelli is an active centre of Protestant missions in south India. In 1881 the population was 23,221 (10,963 males and 12,258 females).

TINTORETTO. See Rosustt.

TIPPERAH, a district of British India, in the Chitta- gong division of the lieutenant-governorship of Bengal, situated between 23° 0’ and 24° 16’ N. lat. and 90° 36’ and 91° 39’ E. long., with an area of 2491 square miles. It is bounded on the N. by Maimansinh and Sylhet, on the S. by Noakhalf, on the W. by the river Meghna, separating it from Maimansinh, Dacca, and Bakarganj, and on the E. by the state of Hill Tipperah. The district presents a continuous flat and open surface, with the exception of the isolated Lalmai range (100 feet), and is for the most part laid out in well-cultivated fields, intersected in all direc- tions by rivers and khals (creeks), which are partially affected by the tides. In the lowlands the soil is uni- formly light and sandy; but in the higher parts a deep alluvial soil alternates with bands of clay and sand. The principal rivers are the Meghna, which is navigable through- out the year for boats of 4 tons burden, and the Gumti, Dakatid, and Titds, which are also navigable for craft of 4 tons for a considerable portion of their course. There are many marshes or bhils. The principal road is the grand trunk (63 miles), which traverses the district from east to west. The wild animals include elephants, tigers, leopards, wild boars, jackals, and buffaloes. The climate is mild, agreeable, and healthy.

The population of the district in 1881 was 1,519,338 (males 770,893, females 748,445); of these Hindus numbered 511,025, Mohammed- ans 1,007,740, and Christians 199. There are only two towns with more than 10,000 inhabitants each, viz., Comillah (13,372) and Brahmanbéria (17,438). Comillah is the chief town of the district and is situated on the south bank of the Gumti, in 23° 28’ N. lat. and 91°14’ E. long. Rice is the staple crop of the district ; wheat and barley, Indian corn and millet, pease, gram, and several other pulses are also cultivated, as well as betel-leaf and betel-nut, sugar-cane, tobacco, &c. The chief exports are rice, jute, and betel-

nuts; and the principal imports sugar, timber, cotton goods, cocoa- nut oil, bamboos, spices, salt, tobacco, &c. In 1885-86 the net revenue of the district amounted to £181,481, the land-tax contri- buting £102,866. Tipperah came under the East India Company in 1765 ; but more than a fifth of its present area was under the immediate rule of the raja of Hill Tipperah, who paid a tribute of ivory and elephants. At that tinie Tipperah formed part of Jalal- pur ; but in 1822 it was separated, and since then great changes have been made in its boundaries. With the exceptiqn ofa serious raid in 1860 by the Kukis or Lushais, nothing has disturbed the peace of the district.

TIPPERARY, an inland county of Ireland, in the pro- vince of Munster, is bounded N.W. by Galway, N.E. by King's county, E. by Queen's County and Kilkenny, 8. by Waterford, and W. by Cork, Limerick, Clare, and Galway. Its greatest length north to south, from the confluence of the Little Brosna and the Shannon to the Knockmealdown Mountains, is 70 miles, and its greatest breadth west and east 40. The area is 1,061,731 acres, or about 1659 square miles.

The surface is extremely varied and picturesque. The Knockmealdown Mountains on the southern border (2609 feet) are principally of clay slate formation. To the north of this range are the picturesque Galtees, composed of Silurian strata overlaid by Old Red Sandstone (Galtymore 3015 feet). To the east, bordering Kilkenny, are the Slieveardagh Hills, composed of coalstone shales and sand- stones, and near Templemore the Devil's Bit Mountains, with a curious gap on the summit. In the north-west there is a Silurian and sandstone group (Keeper Hill 2265 feet). The greater part of the county is a gently undulating plain, belonging to the central Carboniferous limestone plain of Treland. From the rich level country the rock of Cashel, also composed of limestone, rises with great boldness and abruptness. Tipperary has only one river, the Suir, which has its source in the Devil's Bit Mountains, and flows south- wards by Templemore, Thurles, Caher, and Clonmel. The Nore, which also rises in the Devil's Bit Mountains, soon passes into Queen's county, and the Shannon forms part of the western border. A spur of the Leinster coal-field, the most important in Ireland, runs into Tipperary, extend- ing to Cashel, a distance of 20 miles with an average breadth of 5 miles. All the measuresare represented. The

productive portion of the field is at Killenaule. It con- sists of a narrow trough ranging in a north-east direction, the beds dipping towards the axis at a high angle. The coal is anthracite and the seams are thin, the workable portion being of limited extent. In the lower measures are marine fossils, and plant impressions are numerous. Copper is obtainable at Lackamore and at Hollyford near Thurles, but only in small quantities. There is a vein of lead at Shallee, and zinc has recently been dug in consider- able quantities at Silvermines on the north side of the Keeper Mountains. Manganese, malachite, galena, and barytes are also obtainable. There are slate quarries at Killaloe. Between Caher and Clonmel are extensive de- posits of fine pipe-clay. The Mitchelstown stalactite caverns, discovered accidentally in 1833, attract a large number of visitors.

Agriculture.—Tipperary ranks among the best agricultural dis- tricts of Ireland. The subsoil in the lower grounds is limestone, which is overlaid by a rich calcareous loam, capable of yielding the finest crops. The centre of the county is occupied by the Golden Vale, the most fertile district in Ireland, which stretches from Cashel to the town of Limerick. On the higher districts the soil is light and thin, partaking much of the character of the clay slate and sands on which it rests. Detached portions of the Bog of Allen encroach on the north-eastern parts of the county. The total num- ber of holdings in 1885 was 23,768, of which 14,369 were under 30 acres in extent, —4841 between 15 and 380 acres, 4444 between 5 and 15, 2861 between 1 and 5, and 2223 less than 1 acre. Of the total area 24°8 per cent. was under crops, including meadow and clover, 57°9 under grass, ‘1 fallow, 2°5 plantations, 4°9 bog and marsh, 6°4 barren mountain land, and 3-4 water, roads, fences, &c. The area under corn crops decreased from 85,883 acres in 1876 to

78,758 in 1885, the decrease having taken place since 1882, the areas in the previous years having been remarkably uniform. The area under wheat decreased from 13,423 acres in 1882 to 5474 in 1885, and that of oats from 57,332 to 50,196. But the area under barley, for which distillation canses a steady demand, rose from 13,551 acres in 1876 to 17,998 in 1885. The area under green crops manifests also a tendency to decrease ; the total area in

1885 was 58,8338 acres, 33,042 being under potatoes, 19,196 turnips, 2096 mangolds and beetroot, and 4499 other green crops. The area under meadow and clover has been steadily increasing, being 114,149 in 1876 and 127,478 in 1885. The total number of horses in 1885 was 27,365, of which 17,173 were used for agriculture ; the number of cattle 254,488, of which 80,508 were milch cows, the manufac- ture of butter occupying considerable attention ; of sheep 203,798, pigs 80,475, goats 13,011, and poultry 681,239. According to the latest landowners' Return (1876), the county was divided among 2372 proprietors owning 1,042,457 acres of an annual value of £676,683, the average value of the land being uearly 13s. per acre. The following possessed upwards of 10,000 acres each :—Viscount Lismore, 34,945; Lord Dunalley, 21,081; G. K. S. M. Dawson, 19,093 ; Lady Margaret Charteris, 16,617 ; marquis of Ormonde, 15,765 ; Viscount Hawarden, 15,272; N. Buckley, 13,260 ; earl of Clonmel, 11,098 ; and A. Moore, 10,200. =

Manufactures.—A few persons are employed in mining, but the occupation of the inhabitants is chiefly agricultural. There are a considerable number of meal and flour mills. 4 ; ;

Railways.—The county is remarkably well supplied with rail- ways. A branch of the Great Southern and Western runs from Roscrea to Nenagh, where it joins a branch of the Limerick and Waterford, which in its progress south-eastwards from Limerick crosses the southern corner of the county by Limerick Junction, Tipperary, Caher, and Clonmel. The main line of the Great Southern and Western to Cork and Killarney crosses the centre of the county by Templemore, Thurles, and Limerick Junction. A branch of the Limerick and Waterford connects Thurles with Clonmel.

Administration and Population.—Tipperary is divided into a north and south riding, each consisting of six baronies. For parlia- mentary purposes it is separated into four divisions—EKast, Mid, North, and South—each returning one member. It contains 193 parishes and 3253 town lands. Itis in the Leinster circuit. Assizes for the north riding are held in Nenagh and for the south riding in Clonmel. Quarter sessions are held at Cashel, Clonmel, Nenagh, Roscrea, Thurles, and Tipperary. There are twenty-four petty sessions districts and parts of six others. The county is within the Cork

military district. Ecclesiastically it belongs to the dioceses of Cashel, Emly, Killaloe, and Lismore. Since 1841 the population has decreased more than one-half. From 485,553 in that year it fell to 216,718 in 1871 and to 199,612 in 1881. The following towns in 1881 possessed over 4000 inhabitants each, viz.—Clonmel (partly in Waterford), 9325 ; Tipperary, 7274 ; Carrick-on-Suir (partly in Waterford), 6583; Nenagh, 5422; and Thurles, 4850. The number of persons who could read and write was 115,185, who could read only, 24,886; the remainder—60,041—were unable to read or write. There were 248 persons who spoke Irish only and 28,558 able to speak Irish as well as English.

History and Antiquities—Anciently Tipperary was included in the territory of the Tuatha Dé Danann, and afterwards probably of the clan of Degaid. Henry II., who landed at Waterford in October 1172, received at Cashel the homage of Donald O'Brien, king of Thomond. It was made a county by King John in 1210; in 1328 Edward III. made it a county palatine in favour of the earl of Ormonde ; and, though the king shortly afterwards resumed his regal prerogative, the county was regranted in 1837. In 1372 the grant was confirmed to James, second earl of Ormonde, the lands belonging to the church retaining, however, a separate jurisdiction, —a division which continued till the Restoration. In 1617 James I. took the county palatine into his own hands. It was, however, restored in 1661 to James, twelfth earl and first duke, whose re- galities were further made to include the portions of the county formerly under ecclesiastical jurisdiction. On the attainder of James, second duke, in 1715 the jurisdiction reverted to the crown. There are two round towers within the county,—one at Roscrea and the other on the rock of Cashel. Of the old castles there are few important examples. That built by the first earl of Ormonde at Thurles has now disappeared. On the rock of Cashel there are a massive guard tower and some remains of the ancient wall. The stronghold of Caher, now occupied as a barrack, is still in good pre- servation. At Roscrea one of the towers of the castle built by King John still remains, and the stronghold of the Ormondes, erected in the reign of Henry VIIL., forms the depédt attached to the barracks. The ecclesiastical ruins on the rock of Cashel are among the most remarkable in Ireland. They consist of a cathedral in the Pointed style of the 13th century, partly destroyed by fire in 1495 ; a curi- ous Saxon chapel, ascribed to Cormac MacCullinan, archbishop of Cashel (b. 831); the bishop's palace ;

the “vicar’s choral-house,’”— all on the summit of the rock ; and Hore abbey at its foot, founded

for Benedictines in 1272. The abbey of Holy Cross was fonnded in 1182 for Cistercian monks, and is one of the finest monastic ruins in Ireland. The relic of the true cross, from which the abbey takes its name, is in possession of the Catholic hierarchy of the district. The other principal ecclesiastical ruins are the priory of Athassel, founded for Augustinian monks about 1200; Fethard abbey, founded in the 14th century, now used as a chapel; the gable and porch of the abbey of Roscrea, founded by St Cronan in the 7th century ; and a portion of the Franciscan friary founded in the same town in 1490.

TIPPERARY, a market town in the above county, is beautifully situated near the base of the Slieve-na-muck or Tipperary Hills, a branch of the Galtee range, on the Waterford and Limerick Railway, 3 miles south-east of Limerick junction and 110 south-west of Dublin. It con- tains a handsome Protestant church, a Catholic chapel, an endowed grammar-school, a town-hall, and a new corn and butter market. Owing to its situation in the centre of a fine agricultural district, it enjoys considerable prosperity, and its butter market ranks next to that of Cork. The town is of great antiquity, but first acquired importance by the erection of a castle by King John, of which there are now no remains, A monastery founded for Augustin- ians by Henry III., which has also disappeared, gave a second impulse to its growth. Formerly it was a corpora- tion from a grant made in 1310 by Edward IL., but is now governed by commissioners under provision of the Town Improvement Act of 1854. The population in 1871 was 6638, and in 1881 it was 7274.

TIPPOO SAHIB (1749-1799), sultan of Mysore, was the son of HypER ALI (q.v.), and was born in 1749. He received a careful Mohammedan education, and was in- structed in military tactics by the French officers in the employment of his father. In 1767 in the invasion of the Carnatic he commanded a corps of cavalry, and he subsequently distinguished himself in the Mahratta War of 1775-79. On the outbreak of the first Mysore War in 1780 he was put at the head of a large body of troops, with which he

achieved several successes ; in particular he entirely defeated Brathwaite on the banks of the Colerun in February 1782. He succeeded his father in December 1782, and in 1784 concluded a treaty of peace with the English. In the same year he assumed the title of sultan. In 1787-88 he subjugated the Nairs of Malabar, and in 1789 provoked English invasion by ravaging the territories of the rajah of Travancore. When the English entered Mysore in 1790, he retaliated by a counter-invasion, but he was ultimately compelled by Cornwallis's victory at Arikera, near Seringapatam, to purchase peace by the cession of the half of his dominions (16th March 1792). The English having deemed it necessary to renew hostilities in March 1799, he was in less than two months shut up in Seringapatam and accidentally killed during the siege (4th May 1799). See Inp1a, vol. xii. pp. 803-4.

TIPTON, a town of England, in Staffordshire, is situated in the valley of the Stour, on the London and North- Western Railway, 44 miles south-east of Wolverhampton and 121 north-west of London. It is built in a somewhat scattered and irregular manner, with coal-pits and iron and other works interspersed. Branches of the Birming- ham Canal supply it with water communication. It de- pends chiefly on its iron manufactures, especially of a heavy kind, and has numerous large furnaces and rolling- mills. Its principal goods are rails, engine-boilers, tubes, fenders, and fire-irons. It also possesses works for making iron bridges and stations, cement-works, brick-works, and maltings. There are no public buildings of importance. Tipton has six churches. The parish church is of very ancient date, and its registers go back to the year 1513. Formerly the town was sometimes called Tibbington. It is under the government of a local board formed in 1866. The population of the urban sanitary district

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(area, 2697 acres) in 1871 was 29,445, and in 1881 it was 30,013.

TIRABOSCHI, Grrotamo (1731-1794), the first his- torian of Italian literature, was born at Bergamo on 18th December 1731. He studied at the Jesuit college at Monza, entered the order, and was appointed in 1755 professor of eloquence in the university of Milan. Here he produced (1766-68) Vetera Humiliatorum Monumenta (3 vols.), a his- tory of the extinct

order of the Umiliati, which gave him at once a distinguished place in literature. Nominated in 1770 librarian to Francis III., duke of Modena, he turned to account the copious materials there accumulated for the composition of his Storia della Letteratura Italiana. This vast work, in which the progress of Italian literature from the time of the Etruscans to the end of the 17th century is traced in detail, occupied eleven assiduous years, 1771- 82, and the thirteen quarto volumes embodying it appeared successively at Modena during that period. A second en- larged edition (16 vols.) was issued from 1787 to 1794, and was succeeded by many others, besides abridgments in German, French, and English. ‘Tiraboschi died at Modena on 3d June 1794, leaving a high reputation for virtue, learning, and piety.

Tiraboschi wrote besides Biblioteca Modenese (6 vols., 1781-86) ; Notizie de’ Pittort, Scultori, Incisori, ed Architettt Modenesi (1786) ; Memorie Storiche Modenesi (5 vols., 1793-94), and many minor works. He edited the Nuovo Giornale dei Letterati d’ Italia (1773- 90), and left materials for a work of great research entitled Dizion- ario Topografico-Storico degli Stati Estensi (2 vols. 4to, Modena,

1824-25),

TIRESIAS, a famous Theban seer of Greek legend, was ason of Everes and Chariclo, and a descendant of Udeus, one of the men who had sprung up from the serpent’s teeth sown by Cadmus. He was blind, for which various causes were alleged. Some said that the gods had blinded him because he had revealed to men what they ought not to know. Others said that Athene (or Artemis) blinded him because he had seen her naked; when his mother prayed Athene to restore his sight, the goddess instead purged his ears so that he could understand the speech of birds and gave him a staff wherewith to guide his steps. Another story was that on Mount Cyllene (or on Cytherum) he saw two snakes coupling; he killed the female and became himself a woman. Seven years afterwards he saw the same sight, and killing the male became himself a man again. When Zeus and Hera disputed whether more pleasure was enjoyed by the male or the female sex, they referred the question to Tiresias, as he had experience of both. He decided in favour of the female sex, and Hera in her anger blinded him ; but Zeus

gifted him with long life and infallible divination. He lived for seven or, according to others, nine generations. In the war of the Seven against Thebes he foretold to the Thebans that they would be victorious if Menceceus offered himself in sacrifice. In the war of the Epigoni he advised the Thebans to flee. They fled, and he with them ; but coming to the Tilphusian well he drank of it and died. According to others, Tiresias was taken prisoner by the victorious Argives and died while they were taking him to Delphi. The Argives took his daughter Manto (or Daphne) prisoner and sent her to Apollo at Delphi, where, being as skilled a seer as her father, she gave oracles. A different version of the legend of Tiresias was given by the elegiac poet Sostratus (reported by Eustathius on Od., x. 492). According to him, Tiresias was originally a girl, but had been changed into a boy by Apollo at the age of seven ; after undergoing several more transformations from one sex to the other, she (for the final sex was feminine) was turned into a mouse and her lover Arachnus into a weasel. ‘Tiresias’s grave was at the Tilphusian spring; but there was a cenotaph of him at Thebes, where also in later times his “observatory,” or

place for watching for omens, was pointed out. He had an oracle at Orchomenus, but during a plague it became silent and remained so in Plutarch’s time. According to Homer, Tiresias was the only person in the world of the dead whom Proserpine allowed to retain intelligence. He figured in the great paintings by Polygnotus in the Lesche at Delphi. The story of his transformation into a woman is perhaps to be explained by the custom of medicine-men dressing like women, which prevails in Borneo, Patagonia, Kadiak (off Alaska), and probably elsewhere.!

TIRHUT, or TrrHoor, a district of. British India, was formerly the largest and most populous in Bengal. On lst January 1875 it was divided into the two districts of Darbhangah and Muzaffarpur. For the latter, see Muzar-FARPUR. The former, with an area of 3335 square miles, lies between 25° 30’ and 26° 40’ N. lat. and 85° 34’ and 86° 46’ E. long., and is bounded on the N. by Nepal, on the E. by Bhagalpur, on the 8. by Monghyr, and on the W. by Muzaffarpur. The population of Darbhangah in 1881 was 2,633,447 (males 1,295,788, females 1,337,659) ; of these Hindus numbered

2,323,979, Mohammedans 308,985, and Christians 325. Its chief towns are Dar- bhangah, the capital, with 65,955 inhabitants; Madhu- bani, 11,911; and Rusera, 11,578. The total revenue of Darbhangah district in 1885-86 amounted to £157,037, of which the land revenue yielded £80,442.

The alluvial tract of country formerly known as Tirhut is varied by undulations, with groves, orchards, and woods. The principal rivers are the Ganges, Gandak, Baghmati, Tiljuga, and Karai, which are rarely navigable, except during the rainy season, when they are mostly rapid and dangerous. Tirhut produces all sorts of crops, rice being the principal ; others are wheat, barley, maize, oil-seeds, &c.; opium and tobacco are largely grown for export. The chief industries include the manufacture of indigo, saltpetre, coarse cloth, pottery, and mats. The Tirhut State Railway runs from Mokameh on the left bank of the Ganges through Darbhangah and Muzaf- farpur districts north-west into Champaran district as far as Bettia. A ferry over the Ganges at Mokameh connects it with the East Indian Railway. There are two branches, one extending from Muzaffarpur south-west to Hajipur (to be connected with the Bengal and North-Western Railway at Sonapur by a bridge over the Gan- dak), the other (226 miles open for traffic in March 1886) from Samastipur via Darbhangah to Janjarpur, from which it will ex- tend eastwards to Partabganj, a mart upon the Kosi river near the Nepal frontier.

TIRLEMONT (Flem. Thienen), a town of Belgium, in the province of Brabant, 294 miles by rail to the east of Brussels, on the Great Geete. The old walls, dismantled since 1804, are nearly 6 miles in circuit, but enclose a large extent of arable and garden ground. The streets are regular, and there are some spacious squares; the market-place contains the town-hall, recently restored, and the church of Notre Dame du Lac, founded in 1298, en- larged in the 15th century, but still unfinished. The church of St Germain dates partly from the 9th century. The industries of the place include the making of steam- engines, brewing, distilling, soap-making, tanning, and various woollen and cotton manufactures. The population in 1876 was 13,296.

Tirlemont was once a much larger and more flourishing town than it now is; it has suffered much in war and was taken by the French in 1635, by

Marlborough in 1705, and again by the French in 1793. John Bolland, the famous editor of the Acta Sanctorum, was born here in 1596.

TIRYNS, the Tipuvs rexideooa of Homer (/1., ii. 559), was a small Peloponnesian city, in the prehistoric period of the Achzan race, long before the Dorian immigration. It stood on a small rock in the marshy plain of Argolis, about 3 miles from the sea, and was fabled to have

1 On this custom see Journals of James Brooke of Sarawak, ii. p. 65 sq.; H. Low, Sarawak, p. 175 sq.; Perelaer, Ethnogr. Beschrijving der Dajaks, p. 32 sq.; Carl Bock, Head Hunters of Borneo, p. 222 n.; Falkner, Description of Patagonia, p. 117; Trans. Ethnolog. Soc. Lond., new series, vii. p. 323; Holmberg, ‘Ethnogr. Skizzen,” in Acta Soc, Scient. Fennice, iv. p. 400 sq.

been founded by King Preetus, the brother of Acrisius, who was succeeded by the hero Perseus. It was the scene of the early life of Heracles, who is hence called Tiryn- thius. ‘The massive walls were said to have been the work of Cyclopean masons. Its period of greatest splen- dour was during the 11th and 10th centuries B.c.; but the city continued to exist till about 468 B.c., when it was destroyed through the jealousy of the inhabitants of the neighbouring Argos,! who had not assisted in the final de- feat of the Persians at Platza.?

Excavations made in 1884-85 by Schliemann and Dérpfeld over part of the rock on which Tiryns stood have exposed a most interesting building, quite unique as an example of a Greek palace of the 11th or 10th century B.C., and of special interest from the way in which it closely illustrates the Homeric palaces of Alcinous and Odysseus, and throws a new light on scenes such as the slaughter of

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Fia. 1.—Plan of the palace in the upper part of Tiryns. outer wall. 2. Inner gate, approached between massive walls. 38. Main propyleum. 4. Inner propyleum. 5. Court (av\%) of the men, surrounded by a colonnade on three sides; the altar to Zeus Herceus is by the entrance. 6. Al@ovca, portico of the men’s megaron. 7. IIpédou0s, inner porch. 8. Men’s megaron, with roof supported on four columns, and the circular hearth in the middle. 9. Bath-room and small Gaddor. 10,10. Chambers round the great court. 11, 11. Guard chambers by the main propyleum. 12. Passage (Aavpy) from the main propyleum to the women’s part. 13, 13. Courts of the women. 14. Women’s megaron. 15. Chambers (@addor) in the women’s part. 16. Passage from women’s part to the rock-cut stairs. 17. Small postern door in the semicircular bastion, approached by flight of rock-cut steps. 18, 18. Massive outer wall of city. 19. Inner wall to guard

the entrance passage. 20. Part of outer wall with intermedi rows of chambers, as shown in fig. 2. ; een

The rock on which Tiryns is built is of an irregular oval shape about 330 yards long by 112 at the widest part, and is culvounital

Homer (Z.., ii. 559) speaks of the Tirynthians as subject to Argos. See Diod., iv.10; Paus., ii. 25; and Herod., vi. 83, ix.28. Schlie- mann (Tiryns, London, 1886) and Mahaffy (in Hermathena, Dublin), however, deny the truth of this statement, believing that Tiryns ceased to exist some centuries earlier, in spite of the strong evidence given by the inscription on the bronze column (now in Constantinople), formed by three twisted serpents, which once supported the golden tripod dedicated to Apollo out of the spoils from Platea. Tiryns occurs in the list of allied states present at that battle; moreover, recent dis-

Coveries have.brought to light remains of i ildi Lane toes mn g an important building of

1. Main gate in the

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by a very massive wall, varying from 30 to 40 feet in thickness and averaging when complete about 50 feet in height, measuring from its base outside. Inside, the wall was probably not more than 10 or 12 feet high above the ground, so the masonry acts as a retaining wall to a considerable depth of earth which covers the rock (see fig. 2 below). The wall is built of very large hammer- dressed blocks, some as much as 10 feet long by 3 feet 8 inches or 3 feet 6 inches wide, with smaller ones to fill up the interstices, The whole was bedded, not in mortar, but in clay, which has mostly been washed out of the joints; originally the surface was probably protected with a coating of stucco. The only important gateway, which was on the east side, away from the sea, probably resembled the ‘‘lion gate” at Mycene. The other entrances are mere slits in the wall. One of these and the chief gate are shown in fig.1. Internally the area of the city was divided by cross walls into three parts at successive levels. The lowest and middle divi- sions have not yet been excavated ; the upper part at the south end of the rock

was completely exposed in 1884-85 by Schliemann aud Dérpfeld, and the almost complete plan of the various struc- tures clearly made out. This division contains the palace of the ruler of Tiryns, a building which shows careful and skilful con- struction, elaborate decoration, and a well-arranged plan, suitable to the wants of a wealthy autocratic chief, who lived in a manner which partly recalls the luxury of an Oriental king, and also re- sembled the feudal state of a medieval baron, surrounded by a crowd of vassals, From’the main gate, which was defended by a tower, a strong passage led between the outer wall and an inner one to an inner gate, thence to a propyleum or double porch, with two wooden columns on each side,? idisliens which were chambers for guards. Then came another similar, but smaller propyleum, and opposite to that was the entrance to the great court (avn), nearly 53 by 70 feet, in which stands the altar to Zeus Herceus, with a circular pit beneath it to catch the victims’ blood. This court was surrounded by wooden columns supporting a roof, like a medieval cloister ; on the south side are chambers for attend- ants (@addpo). On the north side is the

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_ hall (ué-yapov 4), supported. by o~ TU columns (at@ovea)

and an inner vesti- bule (apédouos) with three doors.5 The hall is about 40 by 30 feet, with a cir- cular hearth-stone in the centre (éorla or éoxdpa). Four col- umns supported the roof, the central part of which probably rose above the rest like a medieval ‘‘lantern”; and in this there was prob- ably a door leading out to the flat roof

Mi dda) :

Fic. 2.—Section through the outer wall of the city at 20 in fig. 1. A. Outer base of wall. B. Inside level of city. C. Intermediate platform for the garrison. D. Chambers opening on to it, with roof formed of

it—— ; projecting courses of stone in large blocks. E. Top —

Homer (0Od., xxii. 126), through which one of the suitors escaped and so got arms from the treasury or armoury, which was on an — floor (see Od., xxii. 142 and xxi. 5). On the west side of the hall are a number of small chambers (@addor) for the unmarried men, and a bath-room about 12 by 10 feet, with its floor formed of one great slab of stone, sloped so as to drain out at one side through a pipe which passes through the wall. The women's part of the house is of equal importance to that of the men, and has its hall and two open courts with pillars. It is approached in a very cir- cuitous way,® either by a passage (Aavpy) leading from a side

ing a porticus or covered walk along the top of the wall. G. Outer wall of the colonnade built of brick, now missing. H. Probable roof of the colonnade of wood, covered with beaten clay.

3 The arrows in fig. 1 show the way from the city gate to the palace court and hall.

4 The women's hall is also called the megaron ; see Od., xviii. 198.

5 The mpédouos is mentioned by Homer (J1., ix. 473, and Od., iv. 302) ; but in the palace of Odysseus the af#ovea seems to have been the only vestibule to the megaron. In several respects the palace of Tiryns is more magnificent than that of Odysseus, whose hall was paved with clay, not concrete as at Tiryns ; see Od., xxi. 122, where Telemachus audi dé yaiay évagte, after cutting a trench to fix the row of axes.

6 The way to the harem in a modern Oriental house is similarly made as circuitous as possible, for the sake of privacy.

door in the main propyleum or by anothcr long passage wliich winds round the back of the men's hall, and so leads by a long flight of steps, cut in the rock, to the little postern door in the semicircular bastion. The many small rooms in this part of the palace were probably the bedrooms of the women and married couples of the chief's family. A staircase at 16 led to an upper floor, like the cdjuak bynrH of Od. xxi. 5. The circuit wall round the palace is more strongly constructed than the rest. On the south side it is built in

two offsets, forming a level platform for the garrison halfway up. In the upper and thinner part of the wall two narrow passages at different levels are formed in its thickness. They are roofed by projecting courses of stone in large blocks. The wall on the east side has a similar intermediate platform, on to which open a series of small chambers formed in the mass of the upper wall (see fig. 2). At the top level the wall was covered by a colonnade of wood pillars resting on circular stone blocks. This supported a flat roof and was open to the inside of the city. The back of the colonnade was built of brick, and is now missing, as are all the brick parts of the city, owing to the bricks having been only sun-dried.

The methods of construction employed in the Tiryns palace are of the highest interest. The foundations and about 3 feet of the walls above the ground are madc of large blocks of stone bedded in clay; above this the wall was of brick, sun-dried, and covered with stucco. The upper story was probably of wood. Some of the thresholds of the doors were massive blocks of stone (Adivos o¥d6s) 5 others were of wood (dptivos o¥5és). Wood was also used for all the columns, doorposts, and ante (rapacrdées), and in some cases the walls of the rooms were lined with wood, carefully fixed by dowels, the holes for which still exist.1 The doors had pivots of bronze revolving in well-fitted bronze cup-like sockets let into the thresholds. In the megaron and other rooms the floors are of good concrete, decorated with a simple series of incised lines, coloured blue and red. The stucco of the internal wall is decorated with bold and very effective patterns—birds aud scroll-work of semi-Oriental style ; in many cases the motives are obviously taken from textile ornaments, as in the most archaic style of vase painting. One example of rich and costly decoration remains,—part of a frieze of white alabaster, sculptured in relief with rosettes and interlacing patterns, and studded with jewel-like pieces of blue glass or enamel, the Opvyxds kvdvoo of Od. vii. 87.2 Further excavations in the lower parts of the city will probably bring to light the dwellings of the citizens who garrisoned the place. The great bulk of the Tirynthians must have lived in houses outside the citadel, but under the shelter of its protection, just as in medieval Italy villages grew up round the castles of any powerful lord. (J. H. M.)

TISCHENDORF,‘* Losecotr Frieprich KonsTANTIN (1815-1874), an eminent Biblical critic, the son of a physician, was born on 18th January

1815 at Lengenfeld, near Plauen, in the Saxon Voigtland. From the gymnasium at Plauen he passed in 1834 to the university of Leipsic, where he was mainly influenced by Winer, and began to take special interest in New Testament criticism. In 1840 he qualified as university lecturer in theology with a dissertation on the recensions of the New Testa- ment text, the main part of which reappeared in the follow- ing year in the prolegomena to his first edition of the New Testament. The importance of these early textual studies was that they convinced him of the absolute neces- sity of new and exacter collations of MSS., and to this work he now gave himself. Above all he desired to go to Rome; but lack of help and money compelled him to turn first towards Paris, where he remained from October 1840 till January 1843, busy with the treasures of the great library, eking out his scanty means by making collations for other scholars, and producing for Didot several editions of the Greek New Testament, one of them exhibiting the form of the text corresponding most closely to the Vulgate. The great triumph of these laborious months was the de- cipherment of the palimpsest Codex Ephraemi Rescriptus, of which the New Testament part was printed before he left Paris and the Old Testament in 1845. His success in dealing with a MS. much of which had been illegible

1 The marks of the wooden wall linings are specially clear in the little bathroom.

2 The genuineness of this line has been questioned, but apparently without much reason.

3 In modern Italian castello means a “village” as well as a “ castle.”

4 In 1869 he became Konstantin von Tischendorf, having been raised to a place in the hereditary nobility of Russia.

to earlier collators brought him into note and gained public and private support for more extended critical expeditions. From Paris he had paid short visits to Holland (1841) and England (1842). In 1843 he visited Italy, and after a stay of thirteen months went on to Egypt, Sinai, Palestine, and the Levant, returning by Vienna and Munich. From Sinai he brought a great

treasure, forty-three leaves of what is now known as the Codex Stnaiticus (&). For the time he kept the place of discovery a secret, hoping to return and procure the rest of the book, and the fragments were published in 1846 as the Codex Friderico-Augustanus, a name given in honour of the king of Saxony. He now became professor in Leipsic and married (1845). His teaching was apparently not very remarkable; but his vacations were often occupied by fruitful critical journeys, and in 1853 and 1859 he made a second and a third voyage to the East. In the last of these, in which he had

the active aid of the Russian Government, he at length got access to the remainder of the precious Sinaitic codex, and persuaded the monks to present it to the czar, at whose

cost it was published in 1862. To gain for critical study

a manuscript in point of age second only to the famous Vatican Bible was a splendid triumph, but Tischendorf's Eastern journeys were rich enough in other less sensational discoveries to deserve the highest praise.®

Side by side with his industry in collecting and collating MSS., Tischendorf pursued a constant course of editorial labours, mainly on the New Testament, until he was broken down by over- work in 1873. He died on 7th December 1874 at Leipsic.

The great edition, of which the text and apparatus appeared in 1869 and 1872," was called by himself editio viii.; but this number

is raised to twenty or twenty-one if mere reprints from stereotype plates and the minor editions of his great critical texts are anced

posthumous prints bring up the total to forty-one. Four main

recensions of Tischendorf's text may be distinguished, dating respect-

ively from his editions of 1841, 1849, 1859 (ed. viz.), 1869-72 (ed. viit.). The edition of 1849 may be regarded as historically the most

important from the mass of new critical material it used ; that of

1859 is distinguished from Tischendorf's other editions by coming nearer to the received text ; in the eighth edition the testimony of the Sinaitic MS. received great (probably too great) weight. The readings of the Vatican MS. were given with more exactness and certainty than had been possible in the earlier editions, and the editor had also the advantage of using the published labours of Tregelles. Whatever judgment may be passed on Tischendorf's critical tact and power, the apparatus of this final edition will not soon be superseded, and sums up a vast series of most important services to Biblical study.

Much less important was Tischendorf's work on the Greek Old Testament. His edition of the Roman text, with the variants of the Alexandrian MS., the Codex Ephraemi, and the Friderico- Augustanus, was of service when it appeared in 1850, but being stereotyped was not greatly improved in subsequent issues. Its imperfections, even within the limited field it covers, may be judged of by the aid of Nestle's appendix to the sixth issue (1880). Besides this may be mentioned editions of the New Testament Apocrypha (Acts of Apostles, 1851; Gospels, 1853, 2d ed. 1876; Apocalypses, 1866), and various minor writings, in part of an apologetic character, such as Wann wurden unsere Evangelien verfasst? (1865) and Haben wir den echten Schrifttext der Evangelisten und Apostel ? (1878).

TISIO, or Tist, BeNvENUTO (1481-1559), commonly called In GaroraLo, a painter of the Ferrarese school. He was born in 1481 at Garofolo, in the Ferrarese terri- tory, and constantly used the gillyflower (garofalo) as a symbol with which to sign his pictures. He took to draw- ing in childhood, and was put to study under Domenico Panetti (or Laneto), and afterwards at Cremona under his maternal uncle, Niccolé Soriani, a painter of credit, who died in 1499; he also frequented the school of Boccaccia

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5 See his Reise in den Orient, Leipsic, 1845-46.

6 The MSS. brought to Europe on the first two journeys are cata- logued in the Anecdota Sacra et Profana (Leipsic, 1855, enlarged 1861). See also the Monumenta Sacra Inedita (Leipsic, 1846), and Nova Collectio of the same

(1855-69). The third volume of the Nova Coll. gives the results of his last Eastern journey.

7 The prolegomena remained unfinished at his death, and are being supplied by C. R. Gregory.

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Boccaccino. Removing to Rome, he stayed fifteen months with Giovanni Baldini, acquiring a solid style of draughts- manship, and finally to Mantua, where he remained two years with Lorenzo Costa. He then entered the service of the marquis Francesco Gonzaga. Afterwards he went to Ferrara, and worked there four years, showing diligence and delicacy without much severity or elevation of style. Attracted by Raphael’s fame, and invited by a Ferrarese gentleman, Geronimo Sagrato, he again removed to Rome, and found the great painter very amicable ; here he stayed two years, rendering some assistance in the Vatican frescos. From Rome family affairs recalled him to Ferrara; there Duke Alphonso I. commissioned him to execute paintings, along with the Dossi, in the Villa di Belriguardo and in other palaces. Thus the style of Tisio partakes of the Lombard, the Roman, and the Venetian modes. He painted extensively in Ferrara, both in oil and in fresco, two of his principal works being the Massacre of the Innocents (1519), in the church of 8. Francesco, and the Betrayal of Christ (1524), accounted his masterpiece. For the former he made clay models for study and a lay figure, and executed every- thing from nature. Both in the Ferrarese territory and in Rome his pictures of small dimensions are very numerous. He continued constantly at work until in 1550 blindness overtook him,—an affliction which he bore with patience, being a man of pleasant friendly disposition and of devout feeling. In the later years of his work he painted on all feast-days in monasteries for the love of God. He had married at the age of forty-eight and died at Ferrara on 6th (or 16th) September 1559, leaving two children. Garofalo combined sacred inventions with some very familiar details. A certain archaism of style, along with a strong glow of colour, suffices to distinguish from the true method of Raphael even those pictures in which he most closely resembles the great master, and this is sometimes very closely. He was a friend of

Giulio Romano, Giorgione, Titian, and Ariosto; in a picture of Paradise he painted this poet between St Catherine and St Sebastian. In youth he was fond of lute-playing and also of fencing. He ranks as the best of the Ferrarese painters; his leading Pau was Giro- lamo Carpi. The Adoration of the Magi, in the church of St George near Ferrara, and a Peter Martyr, in the Dominican church, Ferrara (sometimes assumed to have been done in rivalry of Titian), are aniong his principal works not already mentioned. The Palazzo Chigi and the Palazzo Borghese contain numerous examples, and

the London National Gallery four, one of them being a Madonna and Christ enthroned, with St Francis and three other saints.

TITANIUM (atomic weight!=48-08, O=16), desig- nates in chemistry a relatively rare element, which is cus- tomarily classed with the metals, although it comes nearer in its character to silicon than to any of the ordinary metals. Its discovery as an element was due to William Gregor, who found in the mineral menaccanite a new earth, which was regarded as the oxide of a new metal, menachin. Independently of him Klaproth in 1793 discovered a new metal in rutile and called it titanium; he subsequently found that it was identical with Gregor’s element. The latter name was, however, retained. Titanium, although pretty widely diffused throughout the mineral kingdom, is not found in abundance. The commonest titanium mineral is rutile (TiO,); anatase and brookite, though mineralogically different from rutile and each other, are forms of the same binoxide.

Metallic titanium is little known. In 1822 Wollaston examined a specimen of those beautiful copper-like crystals which are occa- sionally met with in iron-furnace slags, and declared them to be metallic titanium. This view had currency until 1849, when Wohler showed that the crystals are a compound, TiNC),+3Ti,No, of a cyanide and a nitride of the metal. Real titanium was made by Wohler and Deville in 1857 by heating to redness fluo-titanate of potassium (see below) in vapour of sodium in an atmosphere of dry hydrogen, and extracting the alkaline fluoride formed by water. The metal thus produced had the appearance of iron as obtained

by the reduction of its oxide in hydrogen. When heated in air, it burns brilliantly, with the formation of binoxide. Its most curi- ems IRA Speech et

1 According to T. E. Thorpe’s researches, published in 18838.

ous property is the readiness with which it unites with nitrogen gas intoa nitride. The exact composition of this nitride is not known ; but when heated in hydrogen it loses part of its nitrogen as am- monia, and becomes Ti;Ng, a metallic-looking yellow solid, and this when heated in nitrogen gas passes into higher nitrides, which are again available for the production of ammonia. Tessi¢d du Mothay in 1872 proposed to utilize these reactions for the production of ammonia from atmospheric nitrogen. Of other titanium compounds the most important are those formed on the type of TiX,, when X=Cl, Br, or 40, &c.

The binoxide TiO, exists as rutile. One method of preparing a purer oxide from the mineral is to fuse it, very finely powdered, with six times its weight of bisulphate of potash in platinum, then extract the fuse with cold water, and boil the filtered solution for alongtime. Titanic oxide separates out as a white hydrate, which, however, is generally contaminated with ferric hydrate and often with oxide of tin, SnO,. A better method is Wohler’s. He fuses the finely powdered mineral with twice its weight of carbonate of potash in a platinum crucible, pounds the fuse, and treats it in a platinum basin with aqueous hydrofluoric acid. The alkaline titan- ate first produced is converted into crystalline fluo-titanate, TiF,K., which is with difficulty soluble, and is extracted with hot water and filtered off. The. filtrate, which may be collected in glass vessels if an excess of hydrofluoric acid has been avoided, deposits the greater part of the salt on cooling. The crystals are collected, washed, pressed, and recrystallized, whereby the impurities are easily removed. The pure salt is dissolved in hot water and decomposed with ammonia to produce a slightly ammoniacal hydrated oxide ; this, when ignited in platinum, leaves pure TiO, in the form of brownish lumps, the specific gravity of which varies from 3°9 to 4°25, according to the temperature at which it was kept in igniting. The more intense the heat the denser the product. The oxide is fusible only in the oxy-hydrogen flame. It is insoluble in all acids, except in hot concentrated sulphuric, when finely powdered. Sup- posing the excess of vitriol to have

been boiled away, the residue, after cooling, dissolves in cold water. The solution, if boiled, de- posits its titanic oxide as a hydrate called meta-titanic acid, be- cause it differs in its properties from ortho-titanic acid, obtained by decomposing a solution of the chloride in cold water with alka- lies. The ortho-body dissolves in cold dilute acids; the meta-body does not. If titanic oxide is fused with excess of alkaline carbonate it expels CO, parts of carbonic acid for TiO, parts of itself. The salt R,OTiO, is decomposed by water with the formation of a solu- tion of alkali free of titanium, and a residue of an acid titanate, which is insoluble in water but soluble in cold aqueous mineral acids.

The chloride TiCl, is obtained as a distillate by heating to dull redness an intimate dry mixture of the binoxide and ignited lamp- black in dry chlorine. The reaction may be carried out in a hard glass tube. For methods of purification we refer to the handbooks of chemistry. The pure chloride is a colourless liquid of 1°7604 specific gravity at 0°C., boiling at 136°4 under 753°3 mm. pressure (T. E. Thorpe). It fumes strongly in moist air. When dropped very cautiously into cold water it dissolves into a clear solution, which, however, when boiled, deposits most of its oxide in the meta-hydrate form. There are, at least, two lower chlorides of titanium,—one of the composition Ti,Cl, and another of the com- position TiCl,, both solids and both extremely prone to pass into titanic compounds. A solution of the tetrachloride in water, as well as of the soluble hydroxide in dilute acid generally, when kept in contact with metallic zinc, is reduced to one of the lower chlorides with development of a violet colour. With regard to the detection of titanium we need not add much to what we have already given incidentally. Acid solutions of TiO, are not precipitated by sul- phuretted hydrogen ; but sulphide of ammonium acts on them as if it were ammonia, the H,S being liberated. Oxide of titanium when fused with microcosmic salt (¢.e., NaPOg) in the oxidizing flame yields a bead which is yellowish in the heat but colourless after cooling. In the reducing flame the bead becomes violet, more readily on the addition of tin; in the presence of iron it becomes blood-red. Titanic oxides when fused on charcoal, even with cyan- ide of potassium, yield no metal.

TITANS, powerful beings of Greek mythology, the children of Sky and Earth. According to Hesiod, the male Titans were Oceanus, Coeus, Crius,

Hyperion, Iapetus, and Cronus; the female were Thea, Rhea, Themis, Mnemosyne, Phoebe, and Tethys, to whom Apollodorus adds Dione. For the rebellion of the Titans against their father Sky (Uranus), the success and reign of Cronus, and the final consignment of the Titans to Tartarus by Zeus, see Myruo- Loey, vol. xvii. p. 155, and Saturn, vol. xxi. p. 320 sg.

TITHES. It has been explained in Sacririce (vol. xxi. p. 133) that among ancient peoples sacrificial gifts frequently assume the character of a tribute in kind, paid

to the deity in acknowledgment of the fruits of the land, or the increase of flocks attributed to his blessing. At first this tribute is not measured or enforced by law: the gift is a voluntary one, the magnitude of which may be fixed by a vow, or influenced by public opinion as to what is reasonable, but is not prescribed by any stated authority having power to exact what is prescribed. In the oldest Hebrew legislation sacrificial gifts to Jehovah (firstlings and first-fruits) are demanded; but apart from the consecra- tion of the firstlings, which is imperative (Exod. xxii. 29 sy., xxxiv. 19 sq.), the amount is not fixed. In Deutero- nomy (xiv. 22 sqg.), on the other hand, the tithe or tenth of corn, wine, and oil is required in addition to the firstlings of the flock and the herd. This precept, written down in the 7th century B.c., is plainly no innovation, but rests on older usage (cp. Gen. xxviii. 22; Amos iv. 4); the new point emphasized is not that tithes must be paid, but that they must be consumed at the central, instead of a local, sanctuary (Deut. xii. 6, 11, xiv. 23 sqq.), apparently at the great autumn feast or Feast of TABERNACLES (¢.2.).1 Such a tithe is still nothing more than the old offering of first-fruits (bikkwrim) made definite as regards quantity, and it was only natural that as time went on there should be some fixed standard of the due amount of the annual sacred tribute.2 The establishment of such a standard does not necessarily imply that full payment was exacted ; in Gen. xxviii. 22 Jacob vows of his own free will to pay tithes, just as the Arabs used to vow the tithe of the in- crease of the flock (schol. on Harith, Moall., 1. 69, ed. Arnold), The Arab did not always fulfil his vow, and there was no force to make him do so. But, however in- exactly it may often have been paid, the proportion of one part in ten seems to have been accepted in

many ancient nations as the normal measure of sacred tribute paid from the gains of husbandry, trade, or even of war.? The tithe, in fact, appears to have been a common form of tax upon the produce of land or other revenues, for civil as well as for sacred purposes. We find it in Greece (as at Athens), and in Sicily and Asia, under the Roman empire ; but its special home was in the East. It was exacted on agricultural products and flocks by Hebrew kings (1 Sam. viii. 15, 17), and on imports by the monarchs of Babylon (Aristotle, @con., ed. Berlin, p.1352b). Aristotle gives the tithe on fruits of the soil the first place among the revenues of satraps (Jdid., p. 1345b), and it still forms an important element in the fiscal system of Mohammedan states. It will be observed that the proportion of one in ten has been applied in the East, and in antiquity generally, to imports of very different kinds, and in Mohammedan taxation we find the name retained in cases where much less than a tenth is actually taken. In like manner Aris- totle (wt supra) makes Sexé7y a mere synonym of éexdptoy, or tax on produce; the proportion of one to ten, it would seem, was so commonly taken in antiquity as the basis of ad valorem taxes that any such tax or tribute might be called a tithe. As regards the sacred tithe of the Hebrews, a distinction is drawn in Deuteronomy between the ordi- nary annual tithe, which may not have been a full tenth, and the “whole” or “full tithe,” paid once in three years

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1 Cp. Deut. xxvi. with 1 Sam. i. 21 (Sept.), and Jerome on Ezek, i. 3; and see Wellhausen, Prolegomena, p. 94 (Eng. tr., p. 92 sq.).

2 In Deuteronomy, accordingly, the first-fruits (bikkarim) are not mentioned ; the tithe takes their place. The word translated “ first- fruits” in Deut. (réshith) is a small gift to the priests, a mere basket- ful (xviii. 4, xxvi. 2 sq.).

3 For instances see Spencer, De Legibus Hebrworum, lib. iii., cap. 10, § 1. Among the Semites in particular note the tithe paid by the Carthaginians to the Tyrian Melkarth (Diod., xx. 14), and the tithe of frankincense paid in Arabia to the god Sabis (Pliny, H.N., xii. 32 ; and comp. W. R. Smith, Prophets of Israel, p. 382 sq.). A tithe of cattle appears in Lydia (Nic. Damasc., fr. 24).

(Deut. xiv. 28, xxvi. 12), which the legislator directs to be stored at home, and spent in feeding the poor.

From Amos iv. 4 it is sometimes inferred that in the 8th century B.C. the sacrificial tithe, presented at a sanctuary, was triennial. But when the prophet, mocking the false zeal of the people, says, '* Bring your sacrifices every morning and your tithes every three days" (not ''years," as E.V.), he hardly implies more than that occasions of sacrifice were three times as frequent as tithe-day, and so alludes to the fact that there were by old usage three annual feasts and one annual tithe. A triennial sacrificial tithe is inconceivable when it is remembered that the tithe is only an extension of the first-fruits. The triennial tithe in Deuteronomy seems to be rather an innovation necessary in the interests of the poor, when sacrificial feasts were transferred to the central sanctuary, and ceased to benefit the neighbours of the offerer, who had a prescrip- tive claim to be considered on such occasions (comp. 1 Sam. xxv. 8 sqq.; Neh. viii. 10; Luke xiv. 18).

The priests of the sanctuaries had of old a share in the sacrificial feasts, and among those who are to share in the triennial tithe Deuteronomy includes the Levites, 2.¢., the priests of the local sanctuaries who had lost their old perquisites by the centralization of worship. After the return, and before the work of Ezra, when Deuteronomy was still the law of the new Israel, but the Levites had become subordinate ministers of the temple, and required a more regular provision, the '' whole tithe" was naturally fixed on for this purpose ; but, instead of remaining in the hands of the tithe-payers to be doled out in charity, it was stored in the temple. Such, at least, was the plan pro- posed, though from Mal. iii. 8 sgg. it appears that it was very imperfectly carried out. As Malachi speaks in Deuteronomic phrase of the "whole tithe," the payment to the Levites was perhaps still only triennial; and, if even this was difficult to collect, we may be sure that the minor sacrificial tithe had very nearly disappeared. The indifference complained of in Mal. i. was in great part due to the fundamental changes in the religion of Israel, which made private altar gifts and feasts almost meaningless. On the other hand, the provision of regular support for the priests and Levites, the ministers of the public ritual, was now all important, and received

special attention from Ezra and Nehemiah (Neh. x. 37 sqq., xiii. 10 sqq.). They effected it by enforcing the new law of the priestly code (Num. xviii. 21 sgq.), in which it is formally laid down that the tithe is a tribute paid to the Levites, who in turn pay a tithe of it to the priests. The plain inten- tion of the priestly code is to allow the old tithe of Deuteronomy to drop; but the harmonistic interpretation of the later scribes was to the effect that two tithes were to be paid every year, and a third tithe, for the poor, on every third year (Tob. i. 7 sg.; Jos. Ant., iv. 8, § 22). The last change in the system was the appropriation of the Levitical tithe by the priests, which apparently was effected by John Hyrcanus, though a tradition glaringly inconsistent with Nehemiah ascribes it to Ezra (Mishnah, " Ma'aser Sh.," v. 15; "Sota," ix. 10, and Wagenseil's note).* (Ww. RB. 8.)

Tithes in Law. Tithes were generally regarded up to the 17th century as existing jure divino, and as having been payable to the support of the church ever since the earliest days of Christianity. History, as Selden showed in his learned and exhaustive treatise (History of Tithes, 1618), does not bear out this view.® In the words of Hallam, "the slow and gradual manner in which parochial churches became independent appears to be of itself a sufficient answer to those who ascribe a great antiquity to the universal payment of tithes." §

4A cattle tithe is demanded in Levit. xxvii. 32, and spoken of in 2 Chron. xxxi. 6. It is doubtful if this was ever acknowledged in practice. See Kuenen, Godsdienst, ii. 269 sq., and Wellhausen, op. cit., Vv. 1, § 2 (Eng. tr., p. 155 sq.), who argue that the passage in Leviticus isa later addition. The tendency of the Pharisees was to pay tithe on everything, and to make a self-righteous boast of this (Matt. xxiii. 23 ; Luke xviii. 12).

5 It was his denial of the divine right of tithes that brought down the wrath of the Star Chamber upon the author. He was forced to retract an opinion too liberal for the time. See SELDEN.

6 Hallam, Middle Ages, ii. 205.

Long before the 8th century payment of tithes was enjoined by ecclesiastical writers and by councils of the church ; but the earliest authentic example of anything like a law of the state enforcing payment appears to occur in the Capitularies of Charlemagne at the end of the 8th or beginning of the 9th century. Tithes were by that enactment to be applied to the maintenance of the bishop and clergy, the poor,! and the fabric of the church. In course of time the principle of payment of tithes was extended far beyond its original intention. Thus they became transferable to laymen and saleable like ordinary property, in spite of the injunctions of the third Lateran council, and they became payable out of sources of income which were not originally tithable. The canon law con- tains numerous and minute provisions on the subject of tithes. The Decretwm forbade their alienation to lay proprietors, denounced excominunication against those who refused to pay, and based the right of the church upon Scriptural precedents." The Decretals contained provisions as to what was and what was not tithable property, as to those privileged from payment, as to sale or hypo- thecation to laymen, as to priority over state taxes, &c.* Various questions which arose later were settled by Boniface VIII.* The council of Trent enjoined due payment of tithes, and excommuni- cated those who withheld them.° ae i ;

In England the earliest example of legal recognition of tithes is, according to Selden, a decree of a synod in 786.6 Other examples before the Conquest occur in the Fadus lfredi et Guthruni and the laws of Athelstan, Edgar, and Canute." The tripartite division of tithes does not appear to have been recognized in England by any genuine legal enactment except as what Mr. Frecman calls ''a counsel of perfection."® The earliest mention of tithes in statute law proper is in the Statute of Westminster the Second in 1285, ce. 5 of which deals with the patron's writ de advocatione dectmarum. From that date until the present year (1887) there have been a large number of Acts dealing with tithes,—the earliest which is still law being 2 Hen. IV. c. 4, making it an offence to purchase a bull from the pope for the discharge of land from tithes. The law has only attained its present condition by slow degrecs, and by the combined effect of statutes and judicial decisions. The effect of the Tithe Commutation Act of 1836 has been to make most of the old law of merely historical interest, as in the course of the commutation all the questions of law as to prescription, exemptions, &c., would have been

duly considered by the commissioners before the rent- charge was finally apportioned.

Tithes in English law are of three kinds,—predial, arising imme- diately from the soil, as ofcorn; mixed, arising from things nourished by the soil, as of milk or wool; personal, as of the profits of manual occupations or trades. The right to the last was considerably re- stricted by 2and 3 Edw. VI. c. 13. They are also divided from other points of view into ordinary and extraordinary,—the latter being a tithe at a heavier rate charged on hop and market gardens,—and into great and small, as a rule those which go to the rector and vicar respectively. In general great tithes are predial, small are mixed and personal. It is not everything that is tithable; ex- emptions are claimable either from the nature of the property or the privilege of the owner. Stone, lime, and such other substances as are not of annual increase are exempt. So are creatures fera nature. Exempt by privilege are the crown by its prerogative, and spiritual corporations in accordance with the maxim recognized equally by canon and common law, cecclesia decimas non solvit ecclesiz. Thus a rector pays no tithes to his vicar, or a vicar to his rector. On the same principle it is a ground of exemption that lands were anciently the property of the privileged orders (at the time of the dissolution of monasteries, the Cistercians and Hos- pitallers), or were lands of the greater monasteries discharged from tithe by 31 Hen. VIII. c. 13. Exemption may also be claimed by redemption, by substitution of a rent-charge, by a real composition (that is, an agreement between the incumbent and the landowner, with the consent of the ordinary and patron, for the discharge from payment of tithe by means of satisfaction by giving of land or some other real recompense), ‘by a modus (that is, a partial discharge owing to some customary method of tithing or modus decimandt), or by prescription under 2 and 8 Will. IV.c. 100. Tithes in extra- parochial places belonged at common law to the crown, except by custom. Tithes are incorporeal hereditaments (sec REAL EstTATe), and may be dealt with like any other real estate of that nature. Thus they are, if in lay hands, tenements which may be entailed or leased, are subject to dower and curtesy, are assets for the pay- ment of debts, and are (whether in lay hands or not) within the Statute of Limitations. They do not, however, issue out of the land like rents, but are collateral to it. Accordingly tithes are always freehold, even though they are charged on copyhold lands. Tithes

: See Dante, Par. xii. 98, ** decimas que sunt pauperum Dei.”

Pt. ii. 16, 7. 3 Bk. iii. 30. 4 Extrav. Comm., bk. iii. 7.

5 Sess. xxv. 12. 6 C. viii. s. 2.

7 The grant said to have been made by Athelwulf in 855, to which the general payment of tithes in England has been commonly traced, appears not . iach ery, evidence; see Hallam, Middle Ages, Supplemental

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8 See Rev. Morris Fuller in National Review, November 1886.

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are presumed to go to the parson of the parish. This presumption may be rebutted by proof that some or all the tithes go to the vicar, where the rector is in holy orders, or to a lay impropriator. It is said that about a third part of the tithes in England is in the hands of laymen. At one time arbitrary consecration of tithes was allowed,—that is, payment to any priest at the will of the tithe- payer. This was forbidden by a decretal epistle of Innocent IIL, about 1200. ‘‘This epistle decretall,” says Coke, ‘‘ bound not the subjects of this realm, but the same being just and reasonable they allowed the same, and so became lex terre.” A vestige of the arbitrary consecration perhaps exists in the rarely occurring right of the parson of one parish toa portion of the tithes of another. Tithes are payable by all persons alike, whether members of the Church of England or not. Special enactments deal with their recovery fromm Roman Catholics and Quakers. Up to 1836 tithes were paid in kind, unless where any other method of payment applied in a particular case, such as a modus in the nature of a pecuniary compensation, or a pecuniary payment under the terms of a public or private Act, as in the city of London by 37 Hen. VIII. c. 12, 22 and 28 Car. II. c. 15, and other Acts. Even before 1836, however, the bulk of the tithes had been commuted, but such commutation was in ordinary cases good only during the tenure of a particular ineumbency, and did not bind the incuinbent’s successors. The Act of 1836 merely completed and gave legislative sanction to a tendency which had been long on the increase.

The effect of the Tithe Commutation Act, 1836 (6 and 7 Will. IV. c. 71, frequently amended since), was to substitute for the tithe paid in kind or the fluctuating commuted tithe a rent- charge—commonly called the tithe rent-charge—equivalent to the market value from time to time on a septennial average of the exact quantities of wheat, barley, and oats which made up the legal tithes by the estimate in 1836. Excepted from the operation of the Act are (unless where there is a special provision approved by the commissioners) tithes of fish or of fishing, or any personal tithes other than those of mills, or any mineral tithes, or pay- ments or rent-charges in lieu of tithes in London and other places, resting on the authority of local Acts. The Act has not been wholly successful in its working. By the transfer of estates, and by changes in local agriculture, the old estimates are no longer fairly applicable in all cases. The commutation has been, on the whole, to the advantage of the landowners, for the tithe remains fixed while the rental of land since 1836 has risen, accord- ing to Sir James Caird, from 33 millions to 52 millions per annum. Commutation under the Act is either by a voluntary agreement, confirmed by the tithe commissioners," or by an award of the commissioners. The machinery for determining the tithe for any given year is as follows:—the Board of Trade is to cause the average prices per imperial bushel of each sort of British corn to be computed from the summaries sent by the inspectors of corn returns, obtained from the averages stated by the inspectors, and published in the London Gazette weekly, quarterly, and yearly, and a septennial average is to be obtained from the sum of the annual averages divided by seven (45 and 46 Vict. c. 37, supersed- ing sect. 56 of the Actof 1836). The rent-charge is computed on the basis of one-third for wheat, one-third for barley, and one-third for oats. The respective prices were originally fixed by 7 Will. IV. and 1 Vict. c. 69, s. 7 (as altered by the London Gazette of 9th December 1837), at 7s. 14d. for wheat, 3s. 11d. for barley, and 2s. 9d. for oats per bushel. The prices for 1887 were 4s. 1ld., 3s. 10d., and 2s. 7$d. respectively. Owing to this fall in prices, tithe rent-charge which stood at £100 in 1836 was worth in 1887 only £87, 8s. 10d.

After the coming into force of the Act of 1836 all lands were discharged from tithe, and the tithe rent-charge was substituted, payable by equal half-yearly payments, each Ist of July and Ist of January. A tenant paying the rent-charge is to be allowed the same in account with his landlord. The

charge thus ultimately falls upon the landlord, whether or not he pays it in the first in- stance to the tithe-owner. Land may be given instead of a rent-charge where the tithe-owner is an ccclesiastical person. Gardens or small tenements may be exempt from tithe by 3 and 4 Vict. ¢. 15. Later Acts give.a power of redemption of rent-charge in the case of land required for pnblic purposes, settled land, &c. (9 and 10 Vict. c. 73; 23 and 24 Vict. c. 98; 41 and 42 Vict. c. 42; 45 and 46 Vict. c. 38). Merger of the rent-charge is allowed by tenants in fee or in tail under the Act of 1836, and by persons having powers of appointment, tenants for life, and owners of glebes under 1 and 2 Vict.c. 64 and 2 and 3 Vict. c. 62. The mode of recovery of arrears provided by the Act of 1836 was a new one. Up to that time arrears could not be distrained for, unless in exceptional cases. The remedy of the parson was a suit for subtraction of tithes, which, by 2 and 3 Edw. VI. c. 13, could only be brought in a spiritual court. The remedy of the lay holder was a suit or action in any temporal court by 32 Hen. VIII. ee ee eee

9 2 Inst., 641. 10 By the Settled Land Act, 1882, the tithe commissioners have, with other bodies, been merged in the land commissioners constituted by the Act.

ce. 7. Itis provided by the Act of 1836 that, if the rent-charge be

in arrear for twenty-one days, the person entitled to it may, after ten days' notice in writing, distrain upon the lands liable to the payment of it. If it be in arrear for forty days, and there be no sufficient distress on the premises, a writ of habcre facias posses- sionem may issue, directing the sheriff to summon a jury to assess arrears. Not more than two years' arrears can be recovered by either means. It appears from these sections of the Act that the charge binds the land alone, and that there is no personal liability of either landlord or tenant. Though the charge is on the land, it is not on the inheritance, and it has been recently decided that arrears are not recoverable by sale of the lands out of which the rent-charge issues. The assessment of the rent-charge on wastes, common or Lamnias lands, coppice wood, turnips, cattle agisted, &c., and the commutation of corn rents created by local Acts, are the subject of special provisions. The Act of 1836 and later Acts pro- vided for the division of the charge upon hop grounds, orchards,

fruit plantations, and market gardens into the ordinary and extra- ordinary charge, the latter to be a rate per acre in addition to the ordinary charge. The extraordinary tithe applies only while the land is cultivated as a hop ground, &c., and in case of new cultiva- tion comes into operation gradually, the full rate not being levied atonce. The incidence of the extraordinary tithe having been found an impediment to agriculture, especially in Kent, the Extraordinary Tithe Commutation Act, 1886 (49 and 50 Vict. c. 54), was passed as aremedy. It provides that no extraordinary tithe is to be charged upon any land newly cultivated after the passing of the Act. With regard to land subject at the passing of the Act to extraordinary tithe, the Act enables the land commissioners to certify the capital value of the extraordinary tithe on each farm or parcel of land, the land to be charged in lieu of the tithe with the payment of an annual rent-charge equal to 4 per cent. on the capital value. The owner or any other person interested in the land may redeem the charge at its capital value. Tithe rent-charge is subject by the Act of 1836 to all parliamentary, parochial, and county rates, and is an hereditament within the Poor Rate Act of the same year (6 and 7 Will. IV. c. 96). The latter Act further enacts that in estimating the net annual value of rateable hereditaments, the rent is to be estimated free, inter alia, of tithe commutation rent-charge, if any.

Scotland. —The terms “tithes” and “ teinds” are both in use, but the latter is the more common. Teinds are either drawn in kind, valued, or redeemed. Originally they were all drawn in kind, as in England, but their commutation or redemption was the subject of many Acts of the Scottish parliament, especially those passed in 1638, the practical effect of which has been to make a fixed burden on the land take the place of_a fluctuating payment, and to sub- stitute a payment of one-fifth of the rent for one-tenth of the pro- duce. In the first instance all teinds went to the church; but, when at the Reformation the crown became proprietor of the church lands, grants were made by it to the lords of erection or titulars of the tithes, laymen holding of the crown. The Act 1587, c. 29, annexed the church lands to the crown, with certain exceptions in favour of lay holders and others. All bishops’ teinds and those formerly part of the revenue of the chapel royal are now crown property. The Church Patronage Act of 1874 does not affect the right to teinds of a patron or titular. Teinds in lay hands are sub- ject to the burden of providing a suitable provision for the minister,

the stipend being fixed by the Court of Teinds. All lands are sub- ject to teinds except those which before the Reformation were feued cum decimis inclusis ct nunquam antca separatis, so that the grantee held lands and teinds together. In order to prove such an exemp- tion, the person claiming under a decimez inclusw title must show that the lands and teinds belonged to a monastery, that the lands were never teindable, that they were novalia, or reclaimed by the monks themselves, that the title bears that the lands are held cum decimis inclusis, &c., and that it is previous to 1587. The judges of the Court of Session sit as commissioners of teinds,—a jurisdic- tion specially preserved by art. xix. of the Act of Union,—and exercise wider powers than any existing body in England, as they possess at once the jurisdiction of a court of justice and of the English land commissioners. The constitution and procedure of the Court of Teinds is regulated by 48 Geo. III. c. 188 and sub- sequent Acts." .

Treland.—Many Acts of the Irish parliament deal with tithes, both generally and locally, the earliest being 83 Hen. VE coals based upon the English Act, 28 Hen. VIII. c. 20. After the ''tithe war" at the beginning of the 19th century, a tithe composi- tion payable by the occupier was fixed by 4 Geo. IV. c. 99. In 1888 an annual rent-charge equal in amount to three-fourths of the tithe ne

1 See, in addition to the authorities already cited, Montesquieu, Esprit des Lois, bk. xxxi. c. 12; Prideaux, On Tithes; Eagle, On Tithes; Shelford, On the Tithe Commutation Acts ; Phillimore, £c- clesiastical Lanw, vol. ii., 1488; Stephen, Comm., vol. ii. bk. iv. pt. ii. ch, iii.

2 See Selden, History of Tithes, c. vii. s. 9; G. J. Bell, Principles, §$ 837, 1147; W. Bell, Law Dict. and Digest, " Teinds."

composition was substituted for the latter by 1 and 2 Vict. c. 109. The rent-charge is recoverable by distress where the person liable is the occupier, in other cases by action in the High Court of Justice, or by civil bill in claims under £20. The Irish Church Act, 1869 (32 and 33 Vict. c. 42), vests all tithe rent-charge then belonging to clergy of the Irish Church in the commissioners of church tem- poralities in Ireland. By that Act and the

amending Act, 35 and 36 Vict. c. 90, the commissioners are enabled to purchase the surrender or assignment of any subsisting lease of tithe rent-charge made by an ecclesiastical person or corporation, and to sell any rent-charge vested in them to the owner of the land charged therewith for a sum equal to twenty-two and a half years' pur- chase. (J. Wt.)

TITHONUS, a character of Greek mythology, a son or, according to others, a brother of Laomedon, king of Troy. He was beloved by Eos (the Morning), who carried him away and dwelt with him at the limit of the world, by the Ocean stream. Eos begged of Zeus that her lover might live for ever, and her request was granted ; but she forgot to ask immortal youth for him, so he shrivelled up into a hideous old man, whom Eos kept shut up in a chamber. At last Tithonus prayed to be rid of the burden of old age and was turned into a grasshopper. Eos had two sons by him—Memnon, king of Aithiopia, and Emathion. Memnon was killed before Troy by Achilles; but the legend is later than the Jiéad, which does not mention it. As to Eos her-self, her name is etymologically identical with the Sanskrit ush and the Latin aurora, both meaning "morning." Ac- cording to Hesiod, Eos was a daughter of Hyperion and Thea, and sister of the Sunand Moon. Homer represents her arising every morning from the couch of Tithonus to carry light to gods and men, drawn ina chariot up the sky by her swift steeds Lampus and Phaethon. Her com- mon epithet in Homer is "rosy-fingered," the meaning of which is disputed. Besides Tithonus she loved Orion, till Artemis shot him with an arrow in Ortygia. She also loved and carried off the youthful hunter Cephalus ; he was already married to Procris, to whom, in spite of his infidelity, he was afterwards reconciled. A peculiar form of the Cephalus legend is given by Apollodorus (iii. 14, 3): Cephalus, a son of Hermes and Herse, was carried off by Eos, and from their union in Syria sprang Phaethon. By Astreeus, Eos became the mother of the Morning Star and all the starry host.

With regard to representations in art, the combat between Achilles and Memnon was figured on the chest of Cypselus (Pausanias, v. 19, 1), and it appears on early Greek vases of Melos, Corinth, and Chalcis. There was a group of Eos carrying off Cephalus on the roof of the Stoa Basileios at Athens, and the same scene was repre- sented on the throne at Amycle

(Paus., i. 8, 1; iii. 18, 12). It also appears on vases, and formed an acroterion group on the temple

at Delos. Eos in her chariot is represented on vases. See Roscher, Ausfiihrliches Lewikon der griech. u. rom. Mythologie, p. 1252 sq.

TITIAN (1477-1576). Tiziano Vecellio, or Vecelli, one of the greatest painters of the world, and in especial the typical representative of the Venetian school, was com- monly called during his lifetime “Da Cadore,” from the place of his birth, and has also been designated ‘Tl Divino.” The country of Cadore, in the Friuli, barren and poor, is watered by the Piave torrent poured forth from the Carnic Alps, and is at no great distance from Tyrol. ‘Titian, therefore, was not in any sense a Venetian of the lagoons and Adriatic, but was native to a country, and a range of association, perception, and observation, of a directly different kind. Venice conquered Friuli at a date not very remote from the birth of Titian; and Cadore, having to choose between Venetian and imperial allegiance, declared for the former. Approaching the castle of Cadore from the village Sotto Castello, one passes on the right a cottage of humble pretensions, inscribed as Titian’s birth- place ; the precise locality is named Arsenale. The near mountain—all this range of hills being of dolomite for- mation—is called Marmarolo. At the neighbouring village of Valle was fought in Titian’s lifetime the battle of

Cadore, a Venetian victory which he recorded in a paint- ing. In the 12th century the count of Camino became count also of Cadore. He was called Guecello; and this name descended in 1321 to the podest&a (or mayor) of Cadore, to the stock to which the painter belonged. Titian, one of a family of four, and son of Gregorio Vecelli, a distinguished councillor and soldier, and of his wife Lucia, was born in 1477.

It used to be said that Titian, when a child, painted upon the wall of the Casa Sampieri, with flower-juice, a Madonna and Infant with a boy-angel; but modern connoisseurs say that the picture is a common work, of a date later than Titian’s decease. He was still a child when sent by his parents to Venice, to an uncle’s house. There he was placed under an art-teacher, who may per- haps have been Sebastiano Zuccato, a mosaicist and painter now forgotten. He next became a pupil of Gentile Bellini, whom he left after a

while, because the master considered him too offhand in work. Here he had the opportunity of studying many fine antiques. His last instructor was Giovanni Bellini; but Titian was not altogether satisfied with his tutoring. The youth was a contemporary of Giorgione and Palma (Vecchio); when his period of pupilage expired, he is surmised to have entered into a sort of partnership with Giorgione. A fresco of Hercules on the Morosini Palace is said to have been one of his earliest works; others were the Virgin and Child, in the Vienna Belvedere, and the Visitation of Mary and Elizabeth (from the convent of S. Andrea), now in the Venetian academy. In 1507-8 Giorgione was com- missioned by the state to execute frescos on the re-erected Fondaco de' Tedeschi. Titian and Morto da Feltre worked along with him, and some fragments of Titian's paintings, which are reputed to have surpassed Giorgione's, are still discernible. According to one account, Giorgione was nettled at this superiority, and denied Titian admittance to his house thenceforth. Stories of jealousies between painters are rife in all regions, and in none more than in the Venetian,—various statements of this kind apply- ing to Titian himself. One should neither accept nor re- ject them uninquiringly ; counter-evidence of some weight can be cited for Vecelli's vindication in relation to Moroni, Correggio, Lotto, and Coello. Towards 1511, after the cessation of the League of Cambrai—which had endea- voured to shatter the power of the Venetian republic, and had at any rate succeeded in clipping the wings of the lion of St Mark—vVecelli went to Padua, and painted in the Scuola di 8, Antonio a series of frescos, which con- tinue to be an object of high curiosity to the students of his genius, although they cannot be matched against his finest achievements in oil painting. Another fresco, dated 1523, is St Christopher carrying the Infant Christ, at the foot of the doge's steps in the ducal palace of Venice. From Padua Titian in 1512 returned to Venice : and in 1513 he obtained a broker's patent in the Fondaco de' Tedeschi, termed " La Sanseria " or " Senseria " (a pri- vilege much coveted by rising or risen artists), and became superintendent of the Government works, being especially charged to complete the paintings left unfinished by Gio- vanni Bellini in the hall of the great council in the ducal palace. He set up an atelier on the Grand Canal, at S. Samuele,—the precise site being now unknown. It was not until 1516, upon the death of Bellini, that he came into actual enjoyment of his patent; at the same date an arrangement for painting was entered into with Titian alone, to the exclusion of other artists who had heretofore been

associated with him. The patent yielded him a good annuity —120 crowns —and exempted him from certain taxes,——he being bound in return to paint likenesses of the successive doges of his time at the fixed price of eight

for his productions.

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crowns each. The actual number which he executed was five. all but centenarian life of incessant artistic labour and productiveness, was now in the fortieth year of his age. The same year, 1516, witnessed his first journey to Fer- rara. the church of the Frari, one of his most world-renowned masterpieces, the Assumption of the Madonna, now in the Venetian academy. indeed the most extraordinary piece of colourist execution on a great scale which Italy had yet seen. took note of the facts, and did not fail to observe that Titian was neglecting his work in the hall of the great council.

Titian, it may be well to note as a landmark in this

Two years later was produced, for the high altar of It excited a vast sensation, being

The signoria

Vecelli was now at the height of his fame; and towards 1521, following the production of a figure of St Sebastian

for the papal legate in Brescia (a work of which there

are numerous replicas), purchasers became extremely urgent It may have been about 1523, after some irregular living and a consequent fever, that he married a lady of whom only the Christian name, Cecilia, has come down to us; her first child, Pomponio, was born in 1525, and two (or perhaps three) others followed. Towards 1526 he became acquainted, and soon exceedingly intimate, with Pietro Aretino, the literary bravo, of influ- ence and audacity hitherto unexampled, who figures so strangely in the

chronicles of the time. Titian sent a portrait of him to Gonzaga, duke of Mantua. A great affliction befell him in August 1530, in the death of his wife. He then, with his three children—one of them being the infant Lavinia, whose birth had been fatal to the mother—removed to a new home, and got his sister Orsa to come from Cadore and take charge of the household. The mansion, difficult now to find, is in the Biri Grande, then a fashionable suburb, being in the extreme end of Venice on the sea, with beautiful gardens and a look-out towards Murano. In 1532 he painted in Bologna a portrait of the emperor Charles V., and was created a count pala- tine and knight of the Golden Spur, his children also being made nobles of the empire,—for a painter, honours of an unexampled kind.

The Venetian Government, dissatisfied at Titian's neg- lect of the work for the ducal palace, ordered him in 1538 to refund the money which he had received for time unemployed ; and Pordenone, his formidable rival of recent years, was installed in his place. At the end of a year, however, Pordenone died; and Titian, who had meanwhile applied himself diligently to painting in the hall the battle of Cadore, was reinstated. This great picture, which was burned with several others in 1577, represented in life-size the moment at which the Venetian captain, D'Alviano, fronted the enemy, with horses and men crashing down into the stream. Fontana's engraving, and a sketch by Titian himself in the gallery of the Uffizi in Florence, record the energetic composition. Asa matter of professional and worldly success, his position from about this time may be regarded as higher than that of any other painter known to history, except Raphael, Michelangelo, and at a later date Rubens. In 1540 he received a pen- sion from D'Avalos, Marquis del Vasto, and an annuity of 200 crowns (which was afterwards doubled) from Charles V. on the treasury of Milan. Another source of profit— for he was always sufficiently keen after money—was a contract, obtained in 1542, for supplying grain to Cadore, which he visited with regularity almost every year, and where he was both generous and influential. This reminds us of Shakespeare and his relations to his birthplace, Stratford-on-Avon ; and indeed the great Venetian and the greater Englishman had something akin in the essen- tially natural tone of their inspiration and performance,

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and in the personal tendency of each to look after practical success and “the main chance” rather than to work out aspirations and pursue ideals. Titian had a favourite villa on the neighbouring Manza Hill, from which (it may be inferred) he made his chief observations of landscape form and effect. The so-called Titian’s mill, constantly discernible in his studies, is at Collontola, near Belluno. A visit was paid to Rome in 1546, when he obtained the freedom of the city, his immediate predecessor in that honour having been Michelangelo in 1537. He could at the same time have succeeded the painter Fra Sebastiano in his lucrative office of the piombo, and he made no scruple of becoming a friar for the purpose; but this project lapsed through his being summoned away from Venice in 1547 to paint Charles V. and others in Augsburg. He was there again in 1550, and executed the portrait of Philip If., which was sent to England and proved a potent auxiliary in the suit of the prince for the hand of Queen Mary. In the preceding year Vecelli had affianced his daughter Lavinia, the beautiful girl whom he loved deeply and painted various times, to Cornelio Sarcinelli of Serra- valle ; she had succeeded her aunt Orsa, now deceased, as the manager of the household, which, with the lordly in- come that Titian made by this time, was placed on a cor- responding footing. The marriage took place in 1554. She died in childbirth in 1560. The years 1551 and 1552 were among those in which Titian worked least assiduously,—a circumstance which need excite no surprise in the case of a man aged about seventy-five. He was at the council of Trent towards 1555, of which his admirable picture or finished sketch in the Louvre bears record. He was never in Spain, notwithstanding the many statements which have been made in the affirmative. Titian’s friend Aretino died suddenly in 1556, and another close inti- mate, the sculptor and architect Sansovino, in 1570. With his European fame, and many sources of wealth, Vecelli is the last man one would suppose to have been under the necessity of writing querulous and dunning letters for pay- ment, especially when the defaulter addressed was lord of Spain and of the American Indies ; yet he had constantly to complain that his pictures remained unpaid for and his pensions in arrear, and in the very year of his death (February) he recites the many pictures which he had sent within the preceding twenty years without receiving their price. In fact, there is ground for thinking that all his pensions and privileges, large as they were nominally, brought in but precarious returns. It has been pointed out that in the summer of 1566 (when he was elected

into the Florentine academy) he made an official declaration of his income, and put down the various items apparently below their value, not naming at all his salary or pensions. Possibly there was but too much reason for the omission. In September 1565 Titian went to Cadore and designed the decorations for the church at Pieve, partly executed by his pupils. One of these is a Transfiguration, another an Annunciation (now in §. Salvatore, Venice), inscribed "'Titianus fecit fecit," by way of protest (it is said) against the disparagement of some persons who cavilled at the veteran's failing handicraft. He continued to accept com- missions to the last. He had selected as the place for his burial the chapel of the Crucifix in the church of the Frari ; and, in return for a grave, he offered the Franciscans a picture of the Piet', representing himself and his son Orazio before the Saviour, another figure in the composition being asibyl. This work he nearly finished ; but some differences arose regarding it, and he then settled to be interred in his native Pieve. 'Titian was ninety-nine years of age (more or less) when the plague,' which was then raging 1n

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60,000.

Venice, seized him, and carried him off on 27th August 1576. He was buried in the church of the Frari, as at first intended, and his Piet&' was finished by Palma Giovane. He lies near his own famous painting, the Madonna di Casa Pesaro. No memorial marked his grave, until by Austrian command Canova executed the monument so well known to sightseers. Immediately after Titian's own death, his son and pictorial assistant Orazio died of the same epidemic. His sumptuous mansion was plundered during the plague by thieves, who prowled about, scarce controlled.

Titian was a man of correct features and handsome person, with an uncommon air of penetrating observation and self – possessed composure, —a Venetian presence worthy to pair with any of those "most potent, grave, and reverend signors" whom his pencil has transmitted to posterity. He was highly distinguished, courteous, and winning in society, personally

unassuming, and a fine speaker, enjoying (as is said by Vasari, who saw him in the spring of 1566) health and prosperity unequalled. The numerous heads currently named Titian's Mistress might dispose us to regard the painter as a man of more than usually relaxed morals; the fact is, however, that these titles are mere fancy-names, and no inference one way or the other can be drawn from them. He gave splendid entertain- ments at times; and it is related that, when Henry III. of France passed through Venice on his way from Poland to take the French throne, he called on Titian with a train of nobles, and the painter presented him as a gift with all the pictures of which he inquired the price. He was not a man of universal genius or varied faculty and accomplishment, like Leonardo da Vinci and Michelangelo ; his one great and supreme endowment was that of painting.

Ever since Titian rose into celebrity the general verdict has been that he is the greatest of painters, considered technically. In the first place neither the method of fresco painting nor work of the colossal scale to which fresco painting ministers is here in question. Titian's province is that of oil painting, and of painting on a scale which, though often large and grand, is not colossal either in dimension or in inspiration. Titian may properly be regarded as the greatest manipulator of paint in relation to colour, tone, luminosity, richness, texture, surface, and harmony, and with a view to the production of a pictorial whole conveying to the eye a true, dignified, and beautiful impression of its general subject- matter and of the objects of sense which form its constituent parts. In this sense Titian has never been deposed from his sovereignty in painting, nor can one forecast the time in which he will be deposed. For the complex of qualities which we sum up in the words colour, handling, and general force and harmony of effect, he stands unmatched, although in particular items of forcible or impressive execution—not to speak of creative invention—some painters, one in one respect and another in another, may indisput- ably be preferred to him. He carried to its acme that great colourist conception of the Venetian school of which the first masterpieces are due to the two Bellini, to Carpaccio, and, with more fully deve- loped suavity of manner, to Giorgione. Pre-eminent inventive power or sublimity of intellect he never evinced. Even in energy of action and more especially in majesty or affluence of composition the palm is not his; it is (so far as concerns the Venetian school) assignable to

Tintoretto. ‘Titian is a painter who by wondrous magic of genius and of art satisfies the eye, and through the eye the feelings,—sometimes the mind.

Titian’s pictures abound with memories of his home-country and of the region which led from the hill-summits of Cadore to the queen ~~city of the Adriatic. He was almost the first painter to exhibit an appreciation of mountains, mainly those of a turreted type, exemplified in the Dolomites. Indeed he gave to landscape generally a new and original vitality, expressing the quality of the objects of nature and their control over the sentiments and ima~~ gination with a force that had never before been approached. The earliest Italian picture expressly designated as ‘‘Jandscape”’ was one which Vecelli sent in 1552 to Philip II. His productive faculty was immense, even when we allow for the abnormal length of his professional career. In Italy, England, and elsewhere more than a thousand pictures figure as Titian’s; of these about 250 may be regarded as dubious or spurious. There are, for instance, 9 pictures in the London National Gallery, 18 in the Louvre, 16 in the Pitti, 18 in the Uffizi, 7 in the Naples museum, 8 in the Venetian academy (besides the series in the private meeting-hall), and 41 in the Madrid museum.

Naturally a good deal of attention has been given by artists, connoisseurs, and experts to probing the secret of how Titian managed to obtain such astonishing results in colour and surface. The upshot of this research is but meagre ; the secret seems to be not so much one of workmanship as of faculty. His figures were put in with the brush dipped in a brown solution, and then altered and worked up as his intention developed. The later pictures were

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touched off rapidly, telling well from a distant view. He himself averred that after his visit to Rome in 1546 he had greatly im- proved in art; and in his very last days he said—certainly with the modesty of genius, perhaps also with some of the tenacity of old age —that he was then beginning to understand what painting meant. In his earlier pictures the gamut of colour rests mainly upon red and green, in the later ones upon deep yellow and blue. The pigments which he used were nothing unusual; indeed they were both few and common. Palma Giovane records that Vecelli would set

pictures aside for months, and afterwards, examining them with a stern countenance as if they were his mortal enemies, would set to work upon them like a man possessed ; also that he kept many pictures in progress at the same time, turning from one to the other, and that in his final operations he worked far more with finger than with brush. It has been said, and probably with truth, that he tried to emulate Palma Vecchio in softness as well as Giorgione in richness. Michelangelo's verdict after inspecting the picture of Danae in the Rain of Gold, executed in 1546, has often been quoted. He said, "That man would have had no equal if art had done as much for him as nature." He was thinking principally of severity and majesty of draughtsmanship, for he added, 'Pity that in Venice they don't learn how to draw well. As a draughtsman of the human figure Titian was not only competent but good and fine, and he is reported to have studied anatomy deeply ; but one can easily understand that he fell nota little short of the standard of Michelangelo, and even of other leading Florentines. He was wont to paint in a nude figure with Venetian red, supplemented by a little lake in the contour and towards the extremities. He observed that a colourist ought to manipulate white, black, and red, and that the carnations cannot be done in a first painting, but by replicating various tints and mingling the colours. He distanced all predecessors in the study of colour as applied to draperies,—working on the principle (in which Giorgione may perhaps have forestalled him) that red comes forward to the eye, yellow retains the rays of light, and blue assi- milates to shadow. In his subject-pictures the figures are not very numerous, and the attitudes are mostly reserved; even in bacchanals or battles the athletic display has more of facility than of furor. His architectural scenes were sometimes executed by other persons, especially the Rosas of Brescia. The glow of late afternoon, or the passionate ardour of early sundown, was much affected by Titian in the lighting of his pictures. Generally it may be said that he took great pains in comes his works, and pains also in concealing the traces of labour. He appears to have had little liking for teaching, partly from distaste of the trouble, and partly (if we are to believe biographers) from jealousy. He was quite willing, however, to turn to some account the work of his scholars: it is related that on going out-of-doors he would leave his studio open, so that the pupils had a clandestine opportunity of copying his works, and if the copies proved of saleable quality he would buy them cheap, touch them up, and resell them. Titian's family relations appear to have been happy, except

as regards his eldest son Pomponio. This youth, at the age of six, was launched upon the ecclesiastical career; but he proved wasteful and worthless, and Titian at last got so disgusted with him that he obtained the transfer to a nephew of a benefice destined for Pomponio. The fortune which he left was, after his decease, squandered by the tonsured prodigal. The other son Orazio, born towards 1528, who (as we have seen) assisted Titian professionally, became a portrait-painter of mark,—some of his likenesses, almost comparable with Titian's own, being often confounded with his by owners and connoisseurs. He executed an important picture in the hall of the great council, destroyed by fire. He gave to alchemy some of the time which might have been bestowed upon painting. Several other artists of the Vecelli family followed in the wake of Titian. Francesco Vecelli, his elder brother, was in- troduced to painting by Titian (it is said at the age of twelve, but chronology will hardly admit of this), and painted in the church of S. Vito in Cadore a picture of the titular saint armed. This was a noteworthy performance, of which Titian (the usual story) became jealous ; so Francesco was diverted from painting to soldiering, and afterwards to mercantile life. Marco Vecelli, called Marco di Tiziano, Titian's nephew, born in 1545, was constantly with the master in his old age, and learned his methods of work. He has left some able productions, —in the ducal palace, the Meet- ing of Charles V. and Clement VII. in 1529; in S. Giacomo di Rialto, an Annunciation ; in SS. Giovanni e Paolo, Christ Fulminant. A son of Marco, named Tiziano (or Tizianello), painted early in the 17th century. From a different branclr of the family came Fabrizio di Ettore, a painter who died in 1580. His brother Cesare, who also left some pictures, is well known by his book of engraved costumes, biti Antichi e Moderni. Tommaso Vecelli, also a painter, died in 1620. There was another relative, Girolamo Dante, who, being a scholar and assistant of Titian, was called Girolamo di Tiziano. Various pictures of his were touched up by the master, and are difficult to distinguish from originals. Apart from mem- bers of his family, the scholars of Titian were not numerous ;

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Paris Bordone and Bonifazio were the two of superior excellence. Domenico Teoscopoli (or Domenico Greco) was employed by the master to

engrave from his works. It is said that Titian himself engraved on copper and on wood, but this may well be questioned.

We must now briefly advert to Titian's individual works, taking them in approximate order of time, and merely dividing portraits from other pictures. Details already given indicate that he did not exhibit any extreme precocity ; the earliest works which we procced to mention may date towards 1505. In the chapel of S. Rocco, Venice, is his Christ Carrying the Cross, now greatly dilapidated, which was an object of so much popular devotion as to produce offerings which formed the first funds for building the Scuola di S. Rocco; in the scuola itself is his Man of Sorrows. The singu- larly beautiful picture (see ScHooLs or PaInTING, vol. xxi. p. 436, fig. 16) in the Borghese Palace in Rome, commonly named Divine and Human Love (by some, Artless and Sated Love), bears some obvious relation to the style of Palma Vecchio. The story goes that Titian was enamoured of Palma's daughter; but nothing distinct on this point is forthcoming. The Tribute Money (Christ and the Pharisee), now in the Dresden gallery, dates towards 1508; Titian is said to have painted this highly finished yet not "niggling" picture in order to prove to some Germans that the effect of detail could be produced without those extreme minutie which mark the style of Albert Diirer. The St Mark in the church of the Salute—the evangelist enthroned, along with SS. Sebastian, Roch, Cosmo, and Damiano—a picture much in the style of Giorgione, belongs to 1512. Towards 1518 was painted, also in the same class of style, the Three Ages, now in Bridgewater House,—a woman guiding the fingers of a shepherd on a reed-pipe, two sleeping children, a cupid, an old man with two skulls, and a second shepherd in the distance, —one of the most poetically impressive among all Titian's works. Another work of approximate date was the Worship of Venus, in the Madrid museum, showing a statue of Venus, two nymphs, numerous cupids hunting a hare, and other figures. Two of the London National Gallery pictures—the Holy Family and St Cathe- rine and the Noli Me Tangere—were going on at much the same time as the great Assumption of the Madonna. In 1521 Vecelli finished a painting which had long been due to Duke Alphonso of Ferrara, probably the Bacchanal, with Ariadne dozing over her wine-cup, which is now in Madrid. The famous Bacchus and Ariadne in the National Gallery was produced for the same patron, in 1523. The Flora of the Uffizi,

the Venus of Darmstadt, and the lovely Venus Anadyomene of the Bridgewater Gallery may date a year or so earlier. Another work of 1523 is the stupendous En- tombment of Christ in the Louvre, whose depth of colour and of shadow stands as the pictorial equivalent of individual facial expression; the same composition, a less admirable work, appears in the Manfrini Gallery. The Louvre picture comes from the Gonzaga collection and from the gallery of Charles J. in White- hall. In 1580 Titian completed the St Peter Martyr for the church of SS. Giovanni e Paolo; for this work he bore off the ae in competition with Palma Vecchio and Pordenone. Of all

is pictures this was the most daring in design of action, while it yielded to none in general power of workmanship and of feeling. It showed the influence of Michelangelo, who was in Venice while Vecelli was engaged upon it. A calamitous fire destroyed it in 1867 ; the copy of it which has taken its place is the handiwork of Cardi da Cigoli. To 1530 belongs also the Madonna del Coniglio (Louvre), painted for Gonzaga; to 1536 the Venus of Florence; to 1538 the portraits of the Twelve Cesars, for Gonzaga; and to 1539 the Presentation of the Virgin in the Temple,—one of the conspicuous examples in the Venetian academy, yet not of the first interest or importance. About 1540 were done the forcible but rather uninspired paintings for S. Spirito, Venice, now in the church of the Salute—Cain Killing Abel, the Sacrifice of Abraham, and David and Goliath ; in 1543 the Ecce Homo of the Vienna gallery, where Aretino figures as Pilate. The Venus and Cupid of Florence, the Venus of Madrid, and the Supper of Emmaus in the Louvre were still in hand, or just completed, when Titian was summoned to Augsburg in 1547. In 1554 he sent to Philip IJ. in England a second Danae and a Venus and Adonis. About the same time he sent to Charles V. a Trinity (or, as Titian himself termed it, Last Judgment), which represented the emperor, with his family and others, all in shrouds, praying to the God- head; Moses and various other personages are also portrayed. This was the object upon which Charles continued to keep his eyes fixed until the film of death closed on them. Later pictures, from 1558 onwards, are the Martyrdom of St Lawrence, Christ Crowned with Thorns (Louvre), Diana and Acton, Diana and Callisto, Jupiter and Antiope, the Magdalene, Christ in the Garden, and Europa,—the last six for Philip II.; of the two Diana subjects there are duplicates in London and in Vienna. Philip, it will be observed, was equally aw fait with nudities and with sanctities.

The Jupiter and Antiope, now much restored, is commonly called La Vénus del Pardo, having at first been in the Pardo Palace. The Magdalene here spoken of (1561) seems to be the picture now in the Uffizi of Florence ; Titian, in one of his letters, said that it was the most

popular picture he had ever painted. In 1563 Vecelli offered to Philip II. his Last Supper, which had been in hand for six years ; it was cut down in the Escorial to suit-a particular space, and offers now little noticeable beyond the fine grouping. The St Jerome of the Brera Gallery in Milan, a work of wonderful energy, spirit, and force, especially for a more than octogenarian hand, was probably rather earlier than this; there is a replica of it in the Escorial. One of the master's latest pictures (1574-75) is in Madrid, and commemoratcs the Battle of Lepanto ; it is a work of failing power—but still the power of a Titian. Two of the mosaics in St Mark's church, Venice, —the Mark in pontificals, and the sword-sheathing angel on the right of the high altar,—are after Vecelli's designs ; but they are contrary to the true spirit of mosaic work, and the Mark in especial is a decided eyesore.

We now turn to the portraits, —works so great in style, so stately, and in the best sensc so simple in perception and feeling that, after allowing everything which can be said on behalf of some other masters of the craft, such as Raphael, Velazquez, Rubens, and Rembrandt, one is still compelled to say that Titian stands on the whole supreme. Among the highest examples are—Alphonso, duke of Ferrara (Madrid); the same duke and his second wife Laura Dianti (Louvre), commonly called Titian and his Mistress; Francis I. (Louvre), painted towards 1536, but not from direct sittings, for Titian never saw the French king; various likenesses of himself, one of about 1542, and another of 1562; Paul III., also the same pope with his grandsons Cardinal Alessandro and Duke Ottavio (Naples),—the former, done in about four weeks, was presented to the pontiff in May 1543, and cost two gold ducats; Pietro Aretino (Pitti); Titian's daughter Lavinia (with a fan in the Dresden gallery, with a jewelled casket in Lord Cowper's collection) ; the Cornaro Family (Alnwick Castle); L'Homme au Gant (Louvre), an unknown personage, youthful and handsome, the ne plus ultra of portraiture ; Sansovino, Eleonora duchess of Urbino, Francesco duke of

Urbino, Catherine Cornaro queen of Cyprus (these four are in the Uffizi) ; Charles V. on horseback (Madrid) ; Cardinal Bembo (Naples), discovered in an uncared-for condition in 1878, very unlike the portrait in the Barberini Gallery. The female portraits done by Titian are few, and are almost invariably of women of exalted rank. Of Ariosto, with whom Titian was intimate in Ferrara, though there may probably have been nothing approach- ing to a romantic friendship between them, the painter is said to have done three portraits. Much uncertainty, however, besets this matter. One of the three appears as a woodcut in an edition of the Orlando Furioso. A second, now at Cobham Hall, corresponds with the woodcut likeness, and is signed ‘‘Titianus F.” The third, a work of admirable beauty, and a most fitting likeness of a poct, is in the National Gallery of London. It is difficult, how- ever, to reconcile the features here with the other portraits, and some connoisseurs do not admit that the work is really a Titian.

Authorities—For English readers, the Life and Times of Titian by Crowe and Cavalcaselle (1877) has superseded all previous works, such as those of Sir Abraham Hume (1829) and Northcote (1830). Mr Josiah Gilbert’s book, Cadore, or Titian’s Country (1869), supplies many interesting side-lights on the subject. Mr R. F. Heath’s monograph (1885) is founded mainly on Crowe and Cavaleaselle and on Gilbert, and forms a very convenient compendium. In Italian, see the usual authorities—Ticozzi, Ridolfi, Lanzi, &c. (W. M. R.)

TITLES OF HONOUR are words and phrases used for marking and distinguishing the rank or station of the persons to‘whom they are assigned and appropriated. Whatever may have been their actual or verbal origin, it is certain that among nations which have made any con- siderable progress in civilization their immediate derivation has been in the great majority of cases from some kind of public office or employment. As Mr Freeman has pointed out,! the principal exceptions to this rule are the merely complimentary additions which it is usual to accord in Europe and America to persons who have no ascertained place or precedence in the social scale. Among ourselves “mister” or “master” (magister) and its feminine equiva- lents, and on the Continent signor, sefior, and sieur (senior) and their feminine equivalents, are the leading examples. They are employed simply to avoid the necessity of calling those to whom they are applied by their

proper names only, and are not indicative of any special rank or station. In France, however, mattre, which answers to our mister or master, is the professional designation of an avocat, and in England “sir,” which answers to segnor, senor, and sieur, is the appropriate prefix to the Christian name and surname of a baronet or a knight. Of the derivatives of dominus—don, donna, and dame—the last in French compounded like stewr with the possessive pro-

1 In Longman’s Mag., vol. ii. p. 477 sq.

noun in ordinary speech and appearing in madame as the feminine equivalent of monsiewr, much the same may be said as of the derivatives of magister and senior. And, although our word “lord” has a special reference to the House of Lords, as the German Herr has to the Herrenhaus in certain of its uses, it largely partakes of the character which belongs to them. Its derivation is analogous to theirs, and within somewhat narrower limits it is almost as indiscriminately employed. More strictly lord and lady are the equivalents of baron and baroness, the fifth grade of the British peerage? But colloquially it is applied to all grades of the peerage except the first ; and, though duchesses are not called ladies in society, dukes are unquestionably lords in their capacity as members of the second chamber of the legislature. Certain of the sons and daughters of peers are lords and ladies by courtesy, while the wives of baronets are legally and the wives of knights are conventionally called ladies, although the wives of knights are more accurately described as dames. But besides this we have our lord the king and our lady the queen, lord bishops, lord lieutenants, lord justices, lord advocates, lord mayors, lord provosts, lords of the council, lords of the treasury, lords of the admiralty, lords of manors, and a variety of other lords who have no neces- sary connexion with the nobility. Lord and lady in fact are among the titles of honour which have never been historically associated with any particular function. Lord was originally in Anglo-Saxon Aldford, probably a corrup- tion of hldfweard, “the warden of bread.” ‘Lady in Anglo-Saxon is Alexfdige, and has also some connection with Aldf. Neither name acquired by means of official association any definite signification beyond the more or less general ascription of superiority.’

It is exceedingly difficult to distribute titles of honour into rigidly distinct categories. The following is as near an approximation as we are able to make.

I. Supreme Sovereign Titlcs.—Among titles implying sovereignty the first place is occupied by ‘‘emperor” and “king.” Under existing international arrangements the crowned heads of Europe take precedence according to the date of their accession, and their rank is precisely the same, whether their style is imperial or royal. But the proper meaning of emperor is the chief of a confederation of statcs of which kings are members. The German emperor is an emperor in this scnse, and he of course has precedence of the kings of Saxony, Bavaria, and Wiirtcmberg, whose dominions are in- cluded in his empire. But neither he nor the emperors of Russia and Austria have any precedence as such of the queen of the United Kingdom or the kings of Italy and Spain. Originally the title of king was superior to that of emperor, and it was to avoid the assumption of the superior title of rea that the chief magi- strates of Rome adopted the names of Cwxsar, imperator, and prin- cops to signalize their authority. As émperator was the distinctive title of the ruler of the Western empire, so Baow\e’s was the dis- tinctive title of the ruler of the Eastern empire, and the Greek Baoweds is the exact equivalent of the Latin rex. The emperor of the East was called avroxpdrwp as well as Baowte’s. But Bacrdevs came to mean the same as imperator in so special a way that the word p#£ was borrowed to express what had grown to be the in- ferior dignity of king.4 Under Charlemagne the imperial style of Rome and the royal style of Germany were united.’ It was,

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3 Miiller, Lect. Sci. Lang., 2d ser., p. 255.

4 Freeman, Comparative Politics, pp. 161-162. ¥

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however, from Cesar, whieh was common to the Western and the Eastern emperors alike, that the Teutonic word for emperor— kaiser —was derived. Until recent times, in faet, uo sovereign thought of ealling himself emperor unless he claimed in some way to represent the Roman Cexsars. Down to the beginning of the 19th eentury a German emperor who was not Roman emperor would have been an anomaly. At remote periods more than one of the West-Saxon kings ealled himself emperor of Britain, and more than one king of Castile called himself emperor of the Spains. But these assumptions appear to have been merely intended as protests against the assertion of superiority over them by the Roman emperors, German or Greek. Later on the kings of Portu- gal called themselves emperor of the Indies. But that title, like the queen of the United Kingdom's title of empress of India, was secondary only and did not affect their official designation in the hierarehy of European sovereigns. ; ; The title of king does not suggest any of the questions which have been raised by that of emperor. ''There is," as Mr Freeman says, ''a common idea of kingship which is at onee reeognized, however hard it may be to define it. This is shown among other things by the faet that no difficulty is ever felt as to translating the word king and the words which answer to it in other languages. Etymologically indeed the Romanee and Teutonie words for king have quite distinct origins. The Latin rex eorresponds to the Sanskrit rajah, and meant originally steersmanu. The Teutonie king on the contrary corresponds to the Sanskrit ganaka, and '''simply meant father, the father of a family, the king of his own kin, the father of a elan, the father of a people."? In English there is no feminine form of king like kénigin, the feminine form of kénig in German. As the feminine equivalent of king, queen is used, whieh Prof. Max Miiller says is ''the old word for mother." He also eites the translation of the Bible by Ulfilas in the 4th eentury to prove its meaning at that early period as wife or woman. The queen was in faet in a special sense ''the woman," or ''the wife," the highest of women and the highest of wives in the king- dom.? King should properly deseribe the head of a nation in distinetion from the head of a tribe, as emperor should properly deseribe the head of a confederation in distinetion from the head ofanation. The idea of territorial sovereignty, of kingship over a land instead of over a people, grew up under the feudal system, In Britain it was unknown until long after the Norman Conquest. William the Conqueror, like Harold or Edward, was king of the English, and it was only from the reign of Henry II. that his suceessors were

transformed into kings of England. The Eastern titles of sultan and shah are aeeepted as equivalent to those of em- peror and king in the West. The sovereigns of China and Japan are called emperors both in eommon and in diplomatie parlanee. II. Honorary Religious Titles of Sovercigns.—The German em- perors were formerly styled ‘‘ defenders of the chureh,” while the kings of Franee were ealled ‘“‘ very christian majesty” and “ eldest sons of the chureh.” The queen of England is ‘‘ defender of the faith,” the emperor of Austria as king of Hungary ‘‘apostolie majesty,” the emperor of Russia as king of Poland “orthodox majesty,” the king of Spain ‘‘eatholie majesty,” and the king of Portugal ‘‘ very faithful majesty.” All these titles were originally eonferred by the popes. But the queen of the United Kingdom

1 Freeman, Comp. Pol., p. 138.

2 Max Miiller, Lect. Sci. Lang., 2d ser., p. 255. “All people, save those who fancy that the nante king has something to do with a Tartar khan or with a ‘‘ canning” or “ eunning”’ man, are agreed that the English cyning and the Sanskrit ganaka both eome from the same root, from that widely spread root whence eomes our own cyn or kin and the Greek yévos. The only question is whether there is any eon- nexion between cyning and ganaka closer than that which is implied in their both coming from the same original root. That is to say, are we to suppose that cyning and ganaka are strictly the some word eom- mon to Sanskrit and Teutonie, or is it enough to think that cyning is an independent formation made after the Teutons had separated them- selves from the eommon stock? ... The differenee between the two derivations is not very remote, as the cyn is the ruling idea in any case; but if we make the word immediately cognate with ganaka we bring in a notion about ‘ the father of his people’ which has no place if we simply derive cyning from cyn” (Freeman, Comp. Pol., pp. 450-451; see also his Norm. Cong., vol. i. p. 583, and Growth of the English Constitution, p. 171).

3 “The king’s wife was ealled regina in Latin from the beginning ; but there is no English word answering to regina: we have not and never had any word like the German kénigin. The queen is simply queen (cwen), woman, wife, the highest of wives in her husband’s dominions, So the earl’s wife was simply the earl’s wife; the Nor- man style of countess now eame in to

fill up what was thought a defect. So with all strictly English titles, knight, sheriff, portreeve, alderman: they have no feminines; in most cases the wife does not share her husband's dignity. But the mayor, being a French title, has his mayoress, just as the duke has his duchess " (Freeman on "Titles," in Longman's Magazine, vol. ii. p. 489).

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and the emperor of Austria alone employ them as part of their offieial deseription.

III. Inferior Titles of Sovereignty.—Grand-dukes rank next to kings. Grand-duke was the original title of the czars and was introdueed into western Europe by Pope Pius V., who ereated Cosimo de' Mediei grand-duke of Tuseany in the last half of the 16th eentury. There are now seven reigning grand-dukes in Germany. Prinee and duke are titles also borne by the reigning ehiefs of minor Germanic states. There are reigning prinees of Monaeo and Montenegro. 'The Eastern equivalents for these sub- ordinate titles are khedive, emir, khan, and bey.

IV. Titles of Nobility.—The titles of the greater nobility are prinee, duke, marquis, earl or count, viseount, and baron, and most of them exist in all European empires and kingdoms. In the United Kingdom there are no prinees outside the royal family. In Russia there are no dukes except the imperial grand-dukes and neither marquises nor viscounts. In Germany there are no viseounts. Among the titles of the lesser nobility or gentry baronet and esquire are peeuliar to the United Kingdom. Knight, chevalier, and ritter are recognized throughout Europe, and as far as Persia and Japan. Of old time in Seotland baron, now represented by laird, was not a title of the greater nobility, and the same may be said of frethcrr in Germany. The peeuliar designations of the ehiefs of some of the Seottish clans and Irish septs, as The Chisholm, The O'Donoghue, Cameron of Lochiel, Maegillieuddy of the Reeks, aud others must also be ineluded among titles of honour. It would be improper to prefix "'mister," or to affix ''esquire," to their names in addressing them either orally or in writing, and their wives are always ealled madam. Pasha, bey, and effendi are the most familiar of

the Eastern titles of nobility. The ecclesi- astical titles of arehbishop, bishop, dean, &e., and the military and naval titles of field-marshal, admiral, general, colonel, major, eaptain, &c., are eommon to all the eountries of Europe, and are expressed by words in their several languages whieh are the preeise equivalents ofeach other. But their incidentally dignified charaeter is so overshadowed by their essentially administrative eharaeter that they can be regarded as titles of honour only in the same sense as the titles of offieers of state or justice.

To the foregoing titles of honour may be added the large assort- ment of complimentary epithets whieh are attendant on them, and whieh are used as alternatively deseriptive of the persons by whom they are borne. The Roman Cesars were by decree of the senate ealled in Latin awgustus, or saered, which was rendered in Greek by oeBaorés, or adorable. They were also habitually styled divi, pius and felix, clemens, tranquillus, and sanctissimus. Augustalis majestas and ayia Baoitela were among the styles of the Western and Eastern emperors respeetively. Majesty, saered majesty, or Cesarean majesty, was the peculiar title of the emperors, and it was not assumed by any of the other sovereigns of Europe until eomparatively modern times. But it is said to have been adopted in Franee as early as the reign of Louis XI.; in England the first king who used it was Henry VIII. Before that the kings of Eng- land had beeu ealled grace and highness, and sometimes exeellent graee and kingly highness. All emperors are now imperial majes- ties, and all kings majesties, while grand-dukes, royal highnesses, and all inferior reigning potentates are highnesses of one sort or another. Imperial or royal highness is the proper title of the sons and daughters of emperors and kings, serene highness, or highness merely, being that of the members of prineely families. The German hohct, although it is eemmonly employed as the equivalent of highness or altcsse, has a special signifieation of its own. It holds an intermediate rank between altesse royal or royal highness and altesse sérénissime or serene highness, unless it is qualified by the adjectives kaiserliche or kinigliche. For many years, however, it has been appropriated to the less important reigning and the mediatized prineely houses, to distinguish them from the priueely houses of new ereation and the mediatized eountly houses, to whom the titles of durchlaucht and erlaucht are severally assigned. In the United Kingdom graee is the title of dukes and duehesses, and lordship and

ladyship of all other grades of the peerage and the bearers of eourtesy titles of superior rank to any one of them. Dukes and duehesses are styled most noble, marquises and mar- chionesses most honourable, and all other peers and peeresses, lords and ladies by courtesy ; privy couneillors and the lord mayor of London are styled right honourable. Honourable is the title of the younger sons of earls, the sons and daughters of viseounts and barons, and the judges of the High Court of Justice. Arehbishops are most reverend, bishops right reverend, deans very reverend, arehdeacons venerable, and all elerzymen reverend. The pope is his holiness, and eardinals are eminenees, Vieeroys, ambassadors, and governors are exeellencies. But we have not yet rivalled the niece gradations in the deseending seale of ¢llwstres, spectabiles, clar- tssimi, perfectissimi, and egregit which eharacterized the official or administrative hierarchy of the later Roman empire. (F. DR.)

‘ TITMOUSE (Anglo-Saxon Mase and Tytmase, German Meise, Swedish Mes, Dutch Mees, French Mésange), the

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name! long in use for several species of small English birds, which are further distinguished from one another by some characteristic appellation. These go to make up the genus Parus of Linneus, and with a very uncertain number of other genera form the Family Paridex of modern ornithology. Its limits are, however, very ill- defined ; and here only the species best known to English readers can be noticed.

The first to be mentioned is that called from its comparatively large size the Great Titmouse, P. major, but known also in many parts as the Oxeye,? conspicuous by its black head, white cheeks, and yellow breast, down which runs a black line, while in spring the cock makes himself heard by a loud love-note that resembles the noise made in sharpening a saw. It is widely distributed throughout the British Islands, and over nearly the whole of Europe and northern Asia. The next is the Blue Titmouse, Blue- cap, or Nun, P. ceruleus, smaller than the last and more common. Its names are so characteristic as to make any description needless. A third common species, but not so numerous as either of the foregoing, is the Coal-Titinouse, P. ater, distinguished by its black cap, white cheeks, and white nape. Some interest attaches to this species because of the difference observable between the

race in- habiting the scanty remnants of the ancient Scottish forests and that which occurs throughout the rest of Britain. The former is more brightly tinted than the latter, having a clear bluish grey mantle and the lower part of the back greenish, hardly either of which colours are to be seen in the same parts of more southern examples, which last have been described as forming a distinct species, P. britannicus. But it is to be observed that the denizens of the old Scotch fir-woods are nearly midway in coloration between the dingy southern birds and those which prevail over the greater part of the Continent. It would therefore seem unreasonable to ‘en of two species only: there should be either three or one, and the latter alternative is to be preferred, provided the existence of the local races be duly recognized. Much the same thing is to be noticed in the next species to be mentioned, the Marsh-Titmouse, P. palustris, which, sombre as is its plumage, is subject to con- siderable local variation in its very extensive range, and has been called P. borealis in Scandinavia, P. alpestris in the Alps, and P. lugubris in south-castern Europe, to say nothing of forms like P. baicalensis, P. camchatkensis, and others, whose names denote its local variations in northern Asia, while no great violence is exercised if to these be tacked on P. atricapilla with several geographical races which inhabit North America. A fifth British species is the rare Crested Titmouse, P. cristatus, only found in limited districts in Scotland, though common enough, especially in pine-woods, in many parts of Europe.

It is impossible to state how many species of Parus exist, their oo at present being wholly subjective to the view taken by the investigator of the group. Its latest monographer is Dr Gadow (Cat. B. Br. Museum, viii. pp. 3-53), who recognizes forty- eight, besides several sub-species. North-American ornithologists include some fifteen as inhabitants of Canada and the United States ; but scarcely two writers agree on this point, owing to the existence of sosmany local forms. Of the species inhabiting the Indian and Ethiopian Regions there is no space here to treat, and for the same reason the presumably allied forms of Australia and New Zealand must be left unnoticed. During the greater part of the year the various species of the genus Parws associate in family parties in a way that has been already described (Birps, vol. iii., p. 766), and only break up into pairs at the beginning of the breeding-season. The nests are nearly always placed in a hollow stump, and consist of a mass of moss, feathers, and hair, the last

being worked almost into a kind of felt. Thereon the eggs, often to the number of eight or nine, are laid, and these have a translucent white shell, freckled or spotted with rust-colour. The first plumage of the young closely resembles that of the parents ; but, so far as is known, it has always a yellower tinge, very apparent on the parts, if there be such, which in the adult are white. Few birds are more restless in disposition, and if “irritability” be the test of high organiza- tion, as a much bepraised systematist asserts, the Paridx should stand very near the top of the list. Most of the European species and some of the North-American become familiar, haunting the neighbourhood of houses, especially in winter, and readily availing Poet on eee ee

1 The prefix ‘‘ Tit,” by heedless writers often used alone, though equally proper to the Titlark (cf. Preri, vol. xix. p. 112), is perhaps cognate with the Greek riris, which originally meant a small chirping bird (Ann. Nat. History, ser. 4, x. p. 227), and has a diminutive form in the Icelandic Titlingur—the English or at least Scottish Titling. It is by false analogy that the plural of Titmouse is made Zitmice ; it should be Titmouses. A nickname is very often added, as with many other familiar English birds, and in this case it is “Tom.”

2 The signification of this name is obscure. It may perhaps be correlated with a Swedish name for the bird—Talgoze.

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themselves of such scraps of food, about the nature of which they are not particular, as they can get. By gardeners every Tit- mouse is generally regarded as an enemy, for it is supposed to do infinite damage to the buds of fruit-trees and bushes; but the accusation is wholly false, for the buds destroyed are always found to be those to which a grub—the bird’s real object—has got access, so that there can be little doubt that the Titmouse is a great benefactor to the horticulturist, and hardly ever more so than when the careless spectator of its deeds is supposing it to be bent on mischief.

Akin to the genus Parus, but in many respects differing from it, is Acredula, containing that curious-looking bird the Long-tailed or Bottle-Titmouse, with its many local races or species, which must be here passed over

without a word. The bird itself, having its tail longer than its body, is unlike any other found in the northern hemisphere, while its nest is a perfect marvel of construction, being in shape nearly oval with a small hole in one side. The exterior is studded with pieces of lichen, worked into a firm texture of moss, wool, and spiders' nests, and the inside is profusely lined with soft feathers—2379 having been, says Macgillvray, counted in one example. Not inferior in beauty or ingenuity is the nest built by the Penduline Titmouse, Agithalus pendulinus, of the south of Europe, which differs, however, not merely in composition but in being suspended to a bough, while the former is nearly always placed between two or more branches.

The so-called Bearded Titmouse, Panurus biarmicus, has habits wholly unlike those of any of the foregoing, and certainly does not belong to the Family Paride, though its real affinity has not yet been clearly shown. It was formerly found in many parts of England, especially in the eastern counties, where it bore the name of Reed- Pheasant?; but through the draining of meres, the destruc- tion of reed-beds, and (it must be added) the rapacity of collectors it now only exists as a native in a very few localities. It is a beautiful little bird of a bright tawny colour, variegated with black and white, while the cock is further distinguished by a bluish grey head and a black tuft of feathers on each side of the chin. Its chief food seems to be the smaller kinds of freshwater mollusks, which it finds among the reed-beds it seldom quits.

The general affinities of the Paridx seem to lie rather with the Sittide (cf. NurHatcs, vol. xvii. p. 665) and the Tree-Creepers; and those systematists who would ally them to the Laniide (SHRIKE, vol. xxi. p. 845), or still more interpose the last between the former Families, have yet to find grounds for so doing. (A. N.)

TITUS. By this, his Roman pranomen, is usually known the eleventh of the Twelve Ceesars, Tirus FLavius SaBinus VESPASIANUS, emperor from 79 to 81 a.p. With his father Vespasian, who rose to empire from the camp, began the Flavian line of emperors, the last three Ceesars. Titus was born in 40, the year of the assassination of the fourth Czesar, Caius Caligula, and was brought up in the household of Claudius, with that emperor's son,

Britanni- cus. There was a story that he was dining at Nero’s table when Britannicus was poisoned, and that he himself tasted the fatal cup, and had in consequence a serious illness. Some time afterwards he erected two statues to the young prince’s memory. Educated in the imperial court, he was thoroughly trained in all elegant accom- plishments: he could speak Greek fluently, and could compose verses; he was a proficient in music; he could write shorthand, and could imitate handwriting so skil- fully that he used to say that he might have been a most

3 Persons fond of watching the habits of birds may with little trouble provide a pleasing spectacle by adopting the plan, practised by the late Mr A. E. Knox, of hanging a lump of suet or tallow by a short string to the end of a flexible rod stuck aslant into the ground close to the window of a sitting-room. It is seldom long before a Titmouse of some kind finds the dainty, and once found visits are made to it until every morsel is picked off. The attitudes of the birds as they cling to the swinging lure are very diverting, and none but a Titmouse can succeed in keeping a foothold upon it.

4 The common names given to this bird are so very inapplicable that it is a pity that ‘‘Silerella’’’ (from siler, an osier) bestowed upon it by Sir T. Browne, its original discoverer, cannot be restored.

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successful forger. He was very handsome, with a fine commanding expression, and a vigorous frame, well trained in all the exercises of a soldier. As a young man he served with credit in Germany and in Britain, and he practised at the bar. Soon he had the command of a legion, and joined his father in Syria; he took an active part in the Jewish war, capturing several important fort- resses, among them Taricheze and Gamala. In 68 he went at his father’s bidding on a visit of congratulation to the newly proclaimed emperor, Galba; but, hearing of Galba’s death and of the general confusion in the Roman world, he returned to his father in Palestine, having in the meantime consulted the oracle of the Paphian Venus as to his prospects and received a favourable answer. In the following year

Vespasian, who, through his son's pleasing manner and adroit management, had made a friend of Mucianus, the governor of Syria, became em- peror, and left Titus to finally settle the Jewish war by the capture of Jerusalem. Titus conducted the siege of the city, which for some months was defended amid in- credible horrors, with signal ability, and took and destroyed it in September 70. The army saluted their victorious general by the title of "imperator"; in the East Titus was now supreme, and practically emperor. On his return to Italy by way of Alexandria he fell in with that strange professor of mystical philosophy and magic, Apollonius of Tyana, and listened, it is said, to his pedantic talk and advice. As soon as he arrived at Rome there was the usual triumph for a decisive victory, and both father and son shared it. On the arch of Titus, as it is called, erected some few years afterwards (see vol. xx. p. 830), may still be seen sculptured representations of Jewish captives and of the captured trophies. Titus was now formally associated with his father in the government, with the title of Czesar, and during the nine remaining years of Vespasian's reign he controlled the administration, and was in fact emperor. He was anything but popular; he had the character of being luxurious, self-indulgent, pro- fligate, and cruel. Summary execution of obnoxious per- sons seems to have been not uncommon. There was a bad scandal too about his connexion with the shameless Jewish beauty Berenice, the sister of the Agrippa of the Acts of the Apostles; both brother and sister followed Titus to Rome, and were allowed to reside in the imperial palace. Public opinion at Rome was outraged, and Titus, though he had promised Berenice marriage, felt obliged to send her back to the East. Vespasian died in 79, leaving his son a safe throne and a well-filled treasury. The forebodings of the people were agreeably disappointed, for Titus, who, it was feared, would be a second Nero, was known as the "love and delight of mankind." It is possible that his popularity was in some degree due to the fears which the depravity of his brother Domitian, who, it was known, was to succeed him, had begun to excite ; but he had the tact to make himself liked by all. He seems to have been thoroughly kindly and good- natured; he delighted in giving splendid presents, and his memorable saying, "I have lost a day," is said to have been uttered one evening at the dinner table when he suddenly remembered that he had not bestowed a gift on any one that day.

Titus, like his father, spent money on great public works and in adding to the magnificence of Rome. The Colosseum was completed and dedicated in his reign, with combats of gladiators, shows of wild beasts, and sham sea-fights and representations of some of the great Greek naval battles. He gave the city what we should now call “a people’s palace” in his splendid baths, which surpassed those of Agrippa and of Nero, and supplied the mob with every luxurious appliance free of cost.

During his reign, in 79, occurred the memorable erup-

tion of Vesuvius which destroyed Herculaneum and Pompeii. and contributed liberally to the relief of the distressed inhabitants.

The emperor visited the scenes of desolation

During his absence a fire raged for three days at Rome, in which the Capitol was burnt; then followed a pestilence, and again Titus not only helped freely with his purse, but took pains to acquaint himself with the sufferers and gave them his personal sympathy. Italy and the Roman world generally were quict and peace- ful during this brief reign. The only fighting was in Britain under Agricola, who in the year 80 carried the Roman arms into Scotland as far as the Tay. In the following September Titus died, being in his fortieth year, after a reign of two years and rather more than two months. On his deathbed he said, so the story went, that there was but one thing of which he repented : this was commonly supposed to point to his having spared to punish his brother Domitian, who had more than once plotted against his life, and whose succession to empire he must have felt would be a calamity for Rome. The verdict of history is on the whole favourable to Titus, and perhaps deservedly so; but the general feeling throughout the Roman world after his death was that he had been fortunate in the briefness of his reign.

An admirable account of this emperor will be found in Merivale’s History of the Romans under the Empire, ch. 60. (W. J. B.)

TITUS, one of the companions of St Paul, was of Greek origin (Gal. ii. 3), and appears to have been among the apostle's earliest converts; he is first mentioned (Gal. ii. 1) as having accompanied Paul, then in the course of his second missionary journey, from Antioch to Jerusalem. Here the Judaizing brethren desired that he should be circumcised ; but the liberty of the gospel was successfully maintained. He was afterwards sent by Paul from Ephesus to Corinth, with, it would seem, a letter, no longer extant, more than once referred to in 2 Corinthians (ii, 3, vii. 8; comp. vol. vi. p. 401). He rejoined the apostle with favourable reports from Corinth in Mace- donia, and was again sent (from Philippi) with another epistle, probably what is now known as the second, to the Corinthians, and charged with the further duty of promot- ing the proposed collection for poor Christians in Judea. This is practically all that is known of him from the un- disputed Pauline epistles. He is nowhere mentioned in the Acts. In the pastoral epistle with which his name is associated he is represented (Tit. i. 5) as having been left by Paul in Crete to "set in order the things that are wanting, and ordain elders in every city." He is expected afterwards to join Paul at Nicopolis (iii. 12). In 2 Tim. iv. 10 he is spoken of as having gone to Dalmatia. Tradi- tion, obviously resting on the Epistle to Titus, has it that he died in Crete as bishop at an advanced age.

TITUS, Epistte To. See Pastorat Epistizs, vol. xviii. p. 348 sq.

TITUSVILLE, a city of the United States, in Craw- ford county, Pennsylvania, in 41° 38' N. lat. and 79° 42' W. long., stands upon Oil Creek, in the midst of the oil region of north-western Pennsylvania. Its predomin- ant industries have reference to the production, refining, and transportation of petroleum. It has two railroads— the Dunkirk, Allegheny, and Pittsburg, and the Buffalo, New York, and Philadelphia. The city had a population of 8639 in 1870 and of 9046 in 1880.

Titusville, originally a small lumbering town, began its carccr of prosperity in 1859, when oil was discovered in this region, and during the succeeding years it was the scene of very great activity. It was chartered in 1867, when at the zenith of its prosperity.

Since that time it has settled down to a less feverish and more healthy growth.

TIUMEN. See Tyumen.

TIV—TLA

TIVERTON, a borough of Devonshire, England, is finely situated in the midst of beautiful scenery at the con- fluence of the Lowman and the Exe, 144 miles north of Exeter and 184 west-south-west of London. A branch line connects it with the Great Western, and the Exe Valley Railway with Exeter and Dulverton. The greater part of the town is on the left bank of the Exe ; the four principal streets are wide and regular. Since 1262, when Amicia, countess of Devon, caused a stream of water to be directed from Norwood to Tiverton, a distance of 5 miles, every street has had a constantly flowing supply. At points now spanned by bridges there were formerly two fords, one over the Exe and the other over the Lowman ; hence Twofordton and Twyfordton the former names of the town. There still remain the principal gateway and an octagonal turret of the ancient castle (now a private residence), built in 1106 by Richard de Riparus or Redvers, first earl of Devon, and the chief residence of the Redvers till the execu- tion of Henry Courtenay, marquis of Exeter, in 1539. The most ancient part of the church of St Peter is the Norman doorway ; the embattled western tower is 120 feet in height. For Blundell's free grammar-school (1604) new buildings have recently been erected in the Tudor style. Among other educational establishments are the school of science and art, the blue coat charity school (1714; re- established as a middle boys' and middle girls' school in 1876), and the Chilcott free school (1611). The other principal public buildings are the market-house (1830-31), the infirmary (1852), the town-hall (1864), and several almshouses. 'Tiverton was formerly famed for its woollen manufacture, introduced in the 14th century; its annual returns in 1612 were estimated at £300,000, about 8000 persons being employed in the industry. It is now chiefly noted for its lace manufacture, established by John Heath- coat, the inventor of the bobbin net frame. The popula- tion of the municipal borough (area, 17,491 acres) in 1871 was 10,024, and in 1881 it was 10,462.

The town existed in Saxon times. In the reign of Edward the Confessor it was held by vassals or servants, and in Domesday it is entered as terra regis. In 1200 it had amarket and three annual fairs. After the introduction of the

woollen trade in 1353 it rapidly increased, and Camden states that the trade had brought it “much gain and glory.” The town and castle were taken by Fairfax in 1645. Tiverton suffered from the plague in 1591 (when it had 5000 inhabitants), and from fire in 1598, 1612, and 1731. It was incorporated by James I. in 1615; but in 1732 its charter was forfeited, and a second was not bestowed till 1737. The borough was deprived

of parliamentary representation in 1885. See Harding’s History of Tiverton, 2 vols., 1845.

TIVOLI (Lat. Tibur), a town of Italy, situated 17 miles east-north-east of Rome on one of the spurs of Monte Ripoli, 830 feet above the sea. Its position is very striking and beautiful; it stands partly at the edge of the lofty cliff over which the river Anio falls in a most imposing mass of water. The present aspect of the fall is very different from what it was in ancient times, as the water has undermined and carried away great masses of the rock. In 1881 the population of the town was

9730, and of the commune 10,297.

Ancient Tibur was founded, according to the legend adopted by the Roman poets, many centuries before Rome, by the Siculi.t They were expelled by a Greek named Tiburtus, the son of Catil- lus, who became the eponymous hero of Tibur.?_ During the carly historic period Tibur, which stood on the borders of the Sabine territory, was always a bitter enemy of Rome, and on many occasions allied itself to various peoples, even the Gauls, in their attacks ou the city. With the rest of Latium, Tibur was finally conquered by Rome in 335 8.c., and on account of its constant cnmity was treated with much severity, not being admitted to the Roman franchise till towards the close of the republican period. Almost no mention of Tibur occurs during the time of the empire ; but the town is recorded to have suffered severely during the Gothic invasion in the 6th century.

1 Dion., i. 16, and Plin., H. W., xvi. 87. 2 Hor., Od., i. 18, 2; Ov., Fast., v. 74; Virg., @n., vii. 670.

Remains of its city wall still exist, built of squared blocks of tufa ; but the whole circuit is not clearly determinable. Even the site of the large and wealthy temple of Hercules is doubtful, which stood in an extensive temenos, containing libraries and a porticus, where Augustus sometimes administered justice. At the edge of the cliff still stands a small circular temple, of doubtful dedication, which once had eighteen columns, and closely re- sembled that in the Forum Boarium of Rome. Its cella walls are of concrete faced with opus reticulatum, and its columns of tra- vertine ; it dates from about the time of Christ. Its popular name is the ‘‘temple of the Sibyl.”4 Close by is another small prostyle-tetrastyle temple resembling that (so called) of Fortuna Virilis in Rome. Remains of the circuit wall of the forum also exist, with a large apsidal projection, as well as an extensive crypto-porticus, faced with blank arcading and divided internally by a row of twenty-eight columns. Tibur was a favourite summer residence of many wealthy Romans under the empire, and especially of Horace and Mecenas.° One of the chief aqueducts of Rome, “‘Anio vetus,” started from the Anio at Tibur. The ancient ‘“‘lapis Tiburtinus” (modern travertine) was so called from its chief quarries at Tibur, where it has been during long ages deposited by the water of the river Anio.

Hadrian’s villa, which stands at the foot of the Tibur spur of hill about 2 miles distant, is one of the most important Roman remains in the world. Between 1870 and 1882 the greater part of its immense area was excavated ; the whole circuit was once no less than 8 miles. The scheme of this wonderful group of build- ings was the fancy of the rich and highly educated emperor Hadrian, who desired to reproduce, within a short distance of Rome, a number of the chief Greek sites and buildings which he had visited in different parts of the world. Besides his own palace he built a large stoa peecile, copied from that at Athens, an odeum, a lyceum, an academy (with its gardens, halls, and porticus), libraries, Latin and Greek theatres, a stadium, palestra, hippo- drome, baths, and many temples. Large gardens, divided into an artificial ‘‘ Vale of Tempe,” ‘Elysian Fields,” and ‘‘ Tartarus,” were watered by a winding stream named the “Euripus.” In another place stood a “serapeum,”’ copied from that at Alexandria, and filled with pseudo-Egyptian statues and reliefs, many of which have been recently unearthed. Barracks for the pretorian guard and rows of dwellings for slaves completed this magnificent group of buildings. In many parts the

existing remains are wall pre- served and in some cases the uses of the different buildings can be determined. The main walls are of concrete faced with mixcd brick and opus reticulatum, once wholly covered with magnificent Oriental marbles and crowded with fine Greek and Greco-Roman sculpture ; mosaic of marble and glass was lavishly used for floors, walls, aud vaults, together with the most elaborate painted decora- tions. A large number of fine works of art have been discovered here, such as the mosaic of " Pliny's doves" and the Faun in rosso antico now in the Capitol. It is probable that the Venus de' Medici came from this villa, together with many other statues found in the 16th century whose provenance is now forgotten.

TLAXCALA (Zlascala, i.e., "' House of Bread"), an his- torical city of Mexico, capital of the state of Tlaxcala, which nearly coincides with the old native republic of Tlaxcala, occupying the easternmost of the four sections into which the Anahuac plateau is here divided by ranges of hills, between 19° and 20° N. lat. The modern town, standing on the site of the old Indian capital, lies (in 19° 19' N. lat., 98° 6' W. long.) on the little river Papagallo (Atoyac, formerly Zahuatl), which flows between two hills at an altitude of considerably over 7000 feet, some 30 miles north of La Puebla and 170 by rail from Vera Cruz. Tlaxcala was founded probably about the close of the 13th century, when the Tlaxcaltecs, a branch of the Nahuatl race closely akin to the Aztecs, withdrew from the western side of the central lacustrine district and established a powerful democratic state in a somewhat secluded, hill-encircled, but highly productive tract, 90 miles in length by 70 in breadth, with a total area of over 1550 square miles. The Tlaxcaltecs, hereditary foes of the Aztecs, became, after a short resistance (September 1519), the firm allies of the Spaniards, their co-operation

contributing largely, if not mainly, to the overthrow of

3 See App., Bell. Civ., v. 24; and Suet., Aug., 72.

4 It has also been called the temple of Vesta, but the real site of this last was on the other side of the river.

5 Hor., Od., i. 7, 10, and ii. 6, 5.

6 Many of the names given to different parts by the Roman anti- quaries are based on mere conjecture.

the Mexican empire. But the result was the enslavement of Tlaxcala itself, the general decay of the country, and the dispersion of most of the inhabitants by Cortes. Although now reduced to a population of a little over 5000, or, including the commune, to 36,000, and with no monuments beyond a fine church, an old episcopal palace, and a town-hall, the city at the time of the conquest was a very large place, containing nearly as many inhabitants as the whole of the modern state (130,000). When occupied by the Spaniards, its size and splendour excited the admiration of Cortes, who describes it in somewhat exaggerated language as ‘‘ much larger and much stronger than Granada, with as fine buildings and much more people than Granada had at the time it was captured, also much better supplied with the things of the earth” (Cartas, 67). It was disposed in four distinct quarters separated by high stone walls, each with a palace for the ruling chief, besides temples, and stone buildings for the nobles. But most of the other houses were low mud or adobe structures. In the daily market, which was said to be frequented by 30,000 people, were exposed for sale the products of the surrounding country,—maize, maguey (extracted from the aloe), and chilli pepper; to these are now added wheat, barley, pease, lentils, and a great variety of fruits.

A prominent feature of the landscape is the Sierra de Malintzi, or Malinche, that is, “ Lord of Marina,” a name given to Cortes after his alliance with the ‘‘heroine of the conquest.” The Sierra (originally Matlacuezatl), which rises grandly (more than 16,000 feet) above the plateau, takes a prominent plaee in Tlaxcalteean mythology, owing to the peculiar shape of its summit, representing in rough outline the body of a native woman lying at full length in its grave and partly wrapped in its cerements. There are some woollen manufactures, centred chiefly in the capital, and also a few silver, copper, lead, and coal mines in the San Ambrosio and San Mateo ranges ; but the state is essentially agricultural, yielding large annual crops of maize and wheat, the total produce being valued at over £1,000,000.

TLEMCEN, or TitrmsAn, a town of Algeria, chef-lieu of an arrondissement in the department of Oran, lies 86 miles S.W. of Oran, 2625 feet above the sea, on a terrace on the northern slope of a range of rocky hills (3430 feet). Its white minarets, towers, and battlements rise picturesquely above the surrounding verdure, which is nourished by numerous springs, and even in ancient days gave rise to the Roman name Pomaria. The various quarters are grouped around the principal mosque,—the Jewish to the south- west, the Moorish to the south-east, that of the merchants to the north-east, while the new town with the civic build- ings lies to the north-west. Of the sixty-four mosques which existed at the period of the French conquest, several have disappeared. The great mosque has a minaret adorned with marble columns, and cased with mosaic of the most varied designs; a fountain of alabaster stands in the alabaster-paved inner court; and seventy-two columns support the pointed arches of the interior. The mosque of Abul Hasan, now used as a French and Arab school, has two series of arches, which rest on alabaster pillars, and the courts are ornamented by sculptures of great beauty and richness; the delicately carved cedar ceiling bears traces of polychromatic painting. The mosque of E~~Halawi is specially interesting for the sculptured capitals of its magnificent alabaster columns. Tlemcen, besides numerous other mosques, possesses a fine modern Roman Catholic church in the Byzantine style and five syna~~ gogues. The military authorities occupy the Mehuar or citadel, built in 1145, which separates the Jewish and Moorish quarters, and was formerly the palace of the rulers of Tlemcen. Only the mosque and the battlemented wall, flanked by two towers, remain of its former magnifi- cence. Among the antiquities preserved in the museum is the epitaph of Boabdil, the last king of Granada, who died at Tlemcen in 1494. The vast basin under the old

walls, now used as a reservoir (720 feet in length, 490 in width, and 10 in depth), was apparently made for naval exhibitions by the sovereigns of Tlemcen. The barracks of the Spahis occupy all that remains of Kissaria, a settlement of European merchants from Pisa, Genoa, Catalonia, and Provence. Leather, saddles, Turkish slippers, arms, and woollen goods are manufactured in Tlemcen ; the production of oil and flour and market-gardening occupy Europeans and natives; good tobacco is also grown.

There is an active trade in cattle, wool, grain, and fruit. A railway (37 miles) is being built (1887) to connect Tlemcen with Rahgun, its port. In 1886 the population (natives, Europeans, and Jews) was 19,745 (26,395 in the commune).

The town was originally at Agadir (Pomaria), to the east of the present site, where Roman inscriptions have been found. At the time of the Arab invasion the district was held by the Beni Ifren tribe of Zenata Berbers, who ultimately founded here the sove- reignty of the Beni Ya'la (1002-1080). In 1080 the Almoravid king, after besieging and sacking the place, built a new town on the site of his camp. His successors reigned sixty-five years, when, after holding Agadir four years against the enemy, they were overcome by the Almohades, who massacred the inhabitants, rebuilt, enlarged, and repeopled the ruined town, and surrounded Tlemcen and Agadir with a common wall. Tlemeen now flourished greatly under the 'Abd al-Wad, also a Zenadta dynasty, who ruled first for the Almohades and after 1242 as nominal vassals of the Hafsites of Tunis. In 1337 their power was temporarily extin- guished by the Merinids, who built the town of Mansura, west of Tlemcen. They left some fine monuments of the period of their ascendency, which lasted tweuty-two years. Once more, under the 'Abd al-Wad, from 1359 to 1553, Tlemcen enjoyed prosperity, when it had a population of 125,000, an extensive trade, a brilliant court, a powerful army, and its finest buildings were reared. The Spanish occupation of Oran struck a fatal blow at the European commerce of the town, which gradually lost all its territory to the Turks after they had seized Algicrs. When the Freneh entered Algeria the sultans of Morocco were worsted by the Kuluglis in their attempt to hold the town. In 18384, and again in 1837, Abd el-Kader sought to re-establish the ancient empire of Tlemcen, but the French definitely took possession in January 1842,

TOAD. This animal belongs to the Anurous division of the Amphibia, and toads and frogs are the only repre- sentatives of the Anura or Batrachia indigenous to Britain. To an ordinary observer the toad is proved to be an am- phibian by its moist soft skin, an anuran or tailless am- phibian by the want of a separate tail. The toad differs from the frog in the following points :—It has no teeth on either of its jaws or on the roof of its mouth, while the frog has a series of fine teeth on the upper jaw and also teeth on

the palate; the tongue in both animals is attached in front and free behind, but that of the frog is forked at its free extremity, that of the toad is not; the skin of the toad is rough with large protuberant warts, while that of the frog is smooth; the body of the toad is more globular and puffy than that of the frog; the hind legs in the toad are shorter, and the posterior digits not so completely webbed, the animal being more terrestrial in its habits than the frog. In the toad, as in the frog, there are four digits anteriorly, five posteriorly. The warts of the toad's skin contain large cutaneous glands, which secrete a thick yellowish fluid with acrid properties, capable of irritating and producing slight inflammation on the human skin, The use of this secretion is probably to protect the toad from being devoured by carnivorous animals. Like other Amphibia, it has a large membranous bladder communi- cating with the terminal part of the intestine—the allantoic bladder,—in which fluid accumulates, probably from the kidneys, though the ureters do not open directly into the bladder. The toad, when handled or alarmed in any way, ejects the contents of its bladder. Owing to these peculi- arities and its appearance, the animal is commonly regarded with loathing, and credited with far more poisonous pro- perties than it possesses. In its breeding habits the toad resembles the frog: its eggs are fertilized externally at the

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TO B—

moment of extrusion, as in the frog, the parents resorting to the water for the purpose of reproduction. The ova are laid in spring, and are arranged, not in shapeless masses, but in a string containing a double series of eggs adher- ing by their gelatinous envelopes ; the string extends toa length of three or four feet. The tadpoles are similar to those of the frog, but blacker ; their metamorphosis takes place in the same manner, the three pairs of external gills being first absorbed and replaced for a time by internal gills, which are in their turn lost, the branchial slits being closed by the coalescence of the opercular membrane with the skin. The metamorphosis is complete in autumn. The toad is carnivorous, feeding on flies and other insects and worms. It hibernates in winter, passing its period of torpidity in holes or burrows in the earth, The finding of toads in a state of hibernation

has given rise to stories of their being found in the centre of trunks of trees or imbedded in solid rock. The myth of the jewel in the head (Shakespeare) is probably founded on the brightness of the eyes, in which the iris is flame-coloured.

There are two kinds of toad in Britain,—the Common Toad, which is almost black in colour, and the Natter-jack Toad, which is lighter, smaller, and has a bright yellow line along the middle of the back. The length of the common toad is 34 inches, of the natter-jack 2} inches. The male natter-jack possesses a bladder or vocal sack beneath the throat communicating with the mouth, which acts as a resonator to its voice ; its cry is ‘“ gluck-gluck.” The vocal sack is absent in the common toad, and only in-completely developed in the Green Toad of the Continent.

In zoological classification the toad belongs to the genus Bufo, tirst constituted by Laurenti in the Synopsis Reptilium, of which the fol- lowing diagnosis is given in the Brit. Mus. Cat. Bair. Sal., 1882:—

Pupil horizontal, Tongue elliptical or pyriform, entire and free behind. Vomerine and maxillary teeth none. Tympanum dis- tinct or hidden, seldom absent. Fingers free; toes more or less webbed; the tips simple or dilated into small disks. Outer meta- tarsals united. Omosternum generally missing; if present cartila- ginous; sternum a cartilaginous plate, sometimes more or less ossified along the median line. Diapophyses of sacral vertebrae more or less dilated. Terminal phalanges obtuse or triangular. Distribution cosmopolitan, except Australia.

Bufo vulgaris, Laurenti, the Common Toad, is thus distinguished. Crown without bony ridges. First finger as long as or longer than the second. Parotids distinct. Tympanum smaller than the eye. Toes half webbed; no tarsal fold; subarticular tubercles of toes double. The species is widely distributed, occurring throughout Europe, Asia, and north-west Africa.

Bufo calamita, Laurenti, the Natter-jack Toad, shows the follow- ing differences from B. vulgaris :—toes not half webbed; tympanum rather indistinct; a tarsal fold. It is distributed throughout Europe.

According to Boulenger there are 77 species of Bufo known, of which 35 are confined to the Old World, the rest to the American continent. No species is common to the two grcat continents. The only other species occurring in Europe besides the two which are found in Britain is Bufo viridis, Laurenti, which ranges through- out Europe, Asia, and North Africa.

TOBACCO consists of the leaves of several species of Nicotiana (nat. ord. Solanacex), variously prepared for use aSa narcotic. While it is principally manufactured for smoking, a large amount is also prepared for chewing, and to a more limited extent it is taken in the form of snuff. Under one or other of these forms the use of tobacco is more widely spread than is that of any other narcotic or stimulant.

Although the fact has been controverted, there cannot be a doubt that the knowledge of tobacco and its uses came to the rest of the world from America. In Novem- ber 1492 a party sent out by Columbus from the vessels of his first expedition to explore the island of Cuba brought back information that they had seen people who carried a lighted firebrand to kindle fire, and perfumed themselves with certain herbs which they carried along with them. The habit of snuff-taking was observed and

described by Ramon Pane, a Franciscan, who accompanied Columbus on his second voyage (1494-6), and the practice of tobacco-chewing was first seen by the Spaniards on the coast of South America in 1502. As the continent of America was opened up and explored, it became evident that the consumption of tobacco, especially by smoking, was a universal and immemorial usage, in many cases bound up with the most significant and solemn tribal ceremonies.

The term tobacco appears not to have been a commonly used original name for the plant, and it has come to us from a peculiar instrument used for inhaling its smoke by the inhabitants of Hispaniola (San Domingo). The instru- ment, described by Oviedo (Historia de las Indias Occiden- tales, Salamanca, 1535), consisted of a small hollow wooden tube shaped like a Y, the two points of which being in- serted in the nose of the smoker, the other end was held into the smoke of burning tobacco, and thus the fumes

were inhaled. This apparatus the natives called “ tabaco ”; but it must be said that the smoking pipe of the con- tinental tribes was entirely different from the imperfect tabaco of the Caribees. Benzoni, on the other hand, whose Travels in America (1542-56) were published in 1565, says that the Mexican name of the herb was “ tabacco.”

The tobacco plant itself was first brought to Europe in 1558 by Francisco Fernandes, a physician who had been sent by Philip II. of Spain to investigate the products of Mexico. By the French ambassador to Portugal, Jean Nicot, seeds were sent from the Peninsula to the queen, Catherine de’ Medici. The services rendered by Nicot in spreading a knowledge of the plant have been commemo- rated in the scientific name of the genus Wicotiana. At first the plant was supposed to possess almost miraculous healing powers, and was designated ‘“‘herba panacea,” “ herba santa,” “sana sancta Indorum ” ; “divine tobacco ” it is called by Spenser, and “our holy herb nicotian” by William Lilly. While the plant came to Europe through Spain, the habit of smoking it was initiated and spread through English example. Ralph Lane, the first governor of Virginia, and Sir Francis Drake brought with them in 1586, from that first American possession of the English crown, the implements and materials of tobacco smoking, which they handed over to Sir Walter Raleigh. Lane is credited with having been the first English smoker, and through the influence and example of the illustrious Raleigh, who “ tooke a pipe of tobacco a little before he went to the scaffolde,” the habit became rooted among Elizabethan courtiers. During the 17th century the indulgence in tobacco spread with marvellous rapidity throughout all nations, and that in the face of the most resolute opposition of statesmen and priests, the ‘* counter- blaste ” of a great monarch, penal enactments of the most severe description, the knout, excommunication, and capital punishment. :

The species of Nicotiana number about fifty, but those of which Botany. the leaves are used as sources of tobacco are few. With the excep- tion of two species, one native of New Caledonia, the other proper to Australia, they are all of American origin. They form two well-defined groups, the first of which is characterized by the possession of an elongated corolla tube, red in colour, the plants having a single unbranched stalk which attains a height of from 5 to 7 feet; while to the second group belong such as have a swollen

corolla tube of a greenish-yellow colour, and a much- branched stem reaching a height of only from 2 to 5 feet. The type of the first group is the Virginian Tobacco, N. Tabacum, while the best known representative of the second is the Green Tobacco, WN. rustica. These two species, together with their numerous varieties, and with the Persian Tobacco, WV. persica,—the source of the famous Tumbeki or Shiraz tobacco,—are the sole sources of commercial tobacco. NV. Tabacum is the species from which the tobaccos of Cuba, the United States, and the Philippine Islands, and the Latakia of Turkey, are derived, and it is thus the source of not only the greater proportion of the tobacco of commerce but also the most highly prized and valuable of its varieties. N. rustica, originally a native of Brazil, is cultivated

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to a considerable extent in South Germany, Hungary, and the East Indies,

The Virginian tobacco-plant, WV. Tabacum, is a eoarse rank- growing annual, with a simple unbranched cylindrical stem which attains a height of 6 feet and upwards, terminating in a panicle It has alternate simple oblong lanceolate leaves,

of pink flowers,

Fic. 1.—Flowering Top of V. Zabacum.

those at the lower part of the stem being slightly stalked, and of large size, reaching to two feet in length, while the upper are semi- amplexicaul and of variable outline. The seeds are brown in colour, with a rough surface, of minute size, and exceedingly numerous, as many as 40,000 having been counted ona single plant. The whole of the green parts of the plant are covered with long soft hairs which exude a viscid juice, giving the surface a moist glutinous feeling. The hairs are multicellular, and of two kinds, one

branching and ending in a fine point, while the other, unbranched, |

terminates in a elump of small cells. Stomata occur on both surfaces of the leaves, and, with the peculiar hair structure, render the microscopic appearance of the plant highly characteristic.

Fic. 2.—Microscopic Structure of Tobacco Leaf.

Tobacco will flourish over wide areas and in very dissimilar climates, but it is best suited for regions having a mean tempera- ture of not less than 40° F, and where early autumn frosts do not occur. It develops the most highly appreciated qualities in tropical lands possessed of a comparatively dry climate. ‘Tobacco is a most exhausting crop, and requires rich and abundant manuring, the eharacter of which exercises a distinct influence on the quality of the product. A crop grown under such widely different conditions of climate and agriculture as is the case with tobacco must of necessity be subject to varied treatment both in cultivation and in curing, and here we can refer only to the gencral features of the growing and securing of the crop.

In European cultivation, the tobacco-seed is sown in a hotbed about the end of March. The seed-beds are kept covered with damp straw or withered leaves till the seedlings appear above the ground, after which the eovering is removed, and, to protect the young plants from frost, to which they are extremely sensitive, the

‘manure.

beds are covered at night with mats. So soon as the plants can be handled, they are nicked out in rows in a garden bed, where they remain protected from night frost till they have developed five or six leaves and have a height of 3 to 4 inches. They are then ready for transplanting, by preference in moist weather, into prepared drills 20 to 25 inches apart in the field. The transplanting is done about the end of May, or earlier in localities free from night frosts, and in dry weather the field is plentifully soused with liquid The plants are carefully weeded and attended to, and the soil is frequently stirred with narrow hoes until the period when they show symptoms of flowering. This may be when they are only 3 feet high, or not until they

have reached their proper height_of 6 or 8 feet ; but the flowers must not be allowed to form, except in the case of a few plants left purposely for seed. To obtain fine and strong leaves on the plant is the great object of the cultivator, and a fine tobacco plant ought to have from eight to twelve large succulent leaves. Cultivators commonly diminish the number of leaves by ‘‘topping” or breaking off the top, under the

‘idea that the remaining ones will afford the strongest tobacco.

Suckers or shoots near the root are carefully removed, and every- thing7is done to concentrate the strength of the plant in the leaves. Every leaf injured by insects is removed, and the crop is watched until the leaves have a yellowish tint and begin to droop, when they are fit to be gathered. This is usually in September, so that the plants, from the time of their insertion on the mounds, have occupied the ground four months, during which time they have been subject to many vicissitudes,—from the attacks of insects, from a disease called “firing,’’ caused by the long continuance of very wet or very dry weather, and from the occurrence of autumn frosts while the crop is yet in the field.

In the harvesting of the tobacco crop several distinct methods are followed. In ordinary European cultivation the ripe leaves are separated from the standing stalks in the field. The three lower root-leaves are first stripped off and laid, face downward, arouud the root to wilt, after which they are bundled and carried to the barn. Afterwards the remainder of the leaves are separated, working from the top downwards, and, similarly, they are spread on the ground till by wilting they lose their brittleness. They are then bundled and packed, tops upward, closely on the floor of the barn for some time to sweat, by which the uniform ripening and subsequeut favourable drying are promoted. The bundles are carefully watched to prevent overheating, which would blacken and injure the leaves. In the tobacco-growing districts of the United States the entire plant is cut down in the field close to the ground, then the stalks are spitted on long rods or laths, care being taken to keep the leaves from touching each other, and on these rods they are carried and hung in the barn or curing-house for drying.

The curing of the leaves which follows has for its objects the Curing.

drying and preservation of the tobacco, and, by a process of slow fermentation, the modification of certain of the leaf constituents, and the development of the eharacteristic aroma of the substance. Subject to various minor modifications, the process of curing is carried out either slowly by the air-cure process or rapidly by ks. curing. The European cultivators, who generally cure by the slow process, either spit the leaves through the middle on a long rod or string them on a cord, taking care to keep each leaf from touehing its neighbour. These rods or cords of leaves are suspended in a barn or curing-shed in a way which allows the free circulation of the air, and at the same time brings the whole contents of the shed equally under the drying influence of the air currents. When the weather is clear and dry, free eirculation of the air is in every way promoted, but on humid days the moist air is excluded and sometimes artificial heat is required to prevent mildew and rotting of the leaves. Under Rvonnable circumstances the tobacco will be dry and ready for further treatment in from six to eight weeks, and the leaves should then have a fine bright warm brown colour.

In the United States the quick-drying process by artificial heat is employed principally for the preparation of export tobacco. Formerly the heat was obtained by means of an open charcoal fire within the curing-barn, but now the structure is heated by a system of flues which permits of the burning of any kind of fuel. For dark shipping tobacco, the entire plants, cut down close to the ground, are immediately housed, and at once dried off. Red shipping qualities are prepared by leaving the cut stems either in the field or hung on scaffolds in the barns for a few days to wilt and wither in the air, after which they are dried by artificial heat. In the treatment of both dark and red kinds the temperature within the barn is gradually raised till it reaches 170° F., and the drying is complete in from four to five days.

By whichever way treated, the tobacco-leaf at this stage is brittle, and cannot be handled without crumbling to powder. The contents of the barn are therefore left till moist weather occurs, and then by the admission of atmospherie air the leaf blades absorb moisture and become soft and pliant. In this condition the leaves are stripped from the stems, sorted into qualities, such as ‘‘ lugs,” or lower leaves, ‘‘ firsts,” and ‘‘seconds.” These are made up into

Chemis- try.

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“hands,” or small bundles of from six to twelve leaves. Each bundle is tied round with a separate leaf, and in this condition the tobacco is ready for bulking for fermentation.

For fermentation the tobacco, whether in bundles, hands, or separate leaves, is piled up or bulked on the floor in a barn into a solid stack to the height of 5 or 6 feet. Within this stack a process of fermentation is quickly set up, and the temperature of the mass rises steadily till it reaches about 130° F. Great care is now taken to prevent overheating, and to secure the uniform fermentation of all the tobacco. taken down and rebuilt, the tobacco from the top going to the bottom, and that exposed at the edges being turned in to the centre. In from three to five weeks the fermentation should be sufficiently carried out, and the leaves then have a nice uniform brown colour. The cured stack may in this condition be piled up in store without fear of further fermentative activity, till, with increasing summer heat, it is subject to the May sweat, which renders further watch- fulness necessary.

The components of tobacco, like those of all vegetable matters, arrange themselves under the three heads of water, mineral acids and bases (which pass into the ash on combustion), and organic substances. According to an investigation carried out by Beauchef in Gay-Lussac’s laboratory, the amount of ash from 100 parts of matter dried at 100° C. is in the roots 6 to 8, in the stems 10 to 13, and in the ribs and leaves 18 to 22 per cent. The greater part of the ash consists of insoluble salts, principally carbonate of lime. The soluble part consists largely of potash salts (KCl, K,COg, K,S80,), which may amount to from 5 to 35 per cent., and it is remarkable that tobacco contains no soda, In addition to the mineral salts proper, tobacco contains salts of ammonia and nitrates. In the leaf the proportion of nitrates is greater in the rib than in the lamine. In the former it may amount to as much as 10 per cent. (calculating the nitric acid as KNOg). According to Schloesing (Ann. Chim. Phys., [3], xl. 479), the proportion of (combined) nitric acid in tobacco has nothing to do with its combustibility, that is, the length of time a lighted cigar will glow spontaneously. This quality is a function chicfly of the potash present in combination with

organic acids. An incombustible tobacco, 7.€., a tobacco which does not keep a glowing ash, contains its organic acids in the form of lime and magnesia salts. The explanation is that, while organic potash salts, being fusible, yield when heated a porous charcoal which glows readily, the corresponding infusible lime salts yield a compact charcoal which is far less combustible. A combustible tobacco can be rendered incombustible by the incor- poration of sulphate or chloride of calcium or magnesium. By cultivation experiments in a potash-free soil, it has been ascertained that chloride of potassium used as a manure does not add to the organic potash salts in the leaves, but the sulphate, carbonate, and nitrate do give up their potash for the formation of organic salts.

Subjoined is an enumeration of the proximate organic com- ponents of tobacco leaves, and their relative proportions in 100 parts, according to the numerous analyses made in the laboratories of the French state tobacco factories :—

Nicotine, C,)H,,No, a liquid volatile alkaloid, from 1°5 to 9 per cent,

Essential oil, according to Schloesing, an important element in the flavour of tobacco, although its proportion is exceed- ingly small.

Nicotianine, a solid camphor-like body to which, according to other authorities, the odour of tobacco is principally due.

Malic and citric acids, together 10-14 per cent., calculated as anhydrides.

Acetic acid, very little in fresh leaves, but increasing in their fermentation. In snuff it may rise to 3 per cent.

Oxalic acid, 1 to 2 per cent.

Pectic acid, about 5 per cent.

Resins, fats, and other bodies extractable by ether, 4 to 6 per cent.

Sugar, little in the leavcs, more in the stems; in the fer- mentation it disappears.

Cellulose, 7 to 8 per cent.

Albuminoids, calculated from the nitrogen not present as nicotine, nitrates, or ammonia, about 25 per cent,

Excepting the nicotine, the several organic components of the leaves develop, roughly speaking, part passw until fructification, when certain components are attracted to the fruit, suffering ehemical changes while so moving. The nicotine determines the strength of a tobacco, but not its flavour or aroma. The manure supplied to a tobacco field does not increase the proportion of nicotine, but affects only the weight of the crop. The percentage of nicotine in the leaves may to some extent be modificd in cultiva- tion, —plants wide apart developing few leaves, but these thick, fleshy, and rich in nicotine, while closely packed plants throw out numerous but thin and membranous leaves having little nicotine. The proportion of nicotine present increases with the age of the plant. Schloesing found in leaves at various stages of growth the following percentage of nicotinc :— May 25 (very young leaves),

The pile is from time to time –

0°79; July 18, 1°21; Aug. 6, 1°93; Aug. 27, 2°27; Sept. 8, 3°36; Sept. 25, 4°32.

Regarding the changes which take place in the manufactured leaf, we take the case of snuff, because with it the chemical changes are carried farthest, and yet, qualitatively speaking, they are of the game nature as those which smoking tobacco undergoes. In the fermentation begun in curing and continued in the sauced leaf, the malie and citric acids and the nicotine undergo partial oxidation. The oxalate of lime and the pectates remain almost unchanged, and there are formed, of intermediate (not fully oxidized) bodies, ammonia, acetic acid, and black humic acid, the last giving to snuff its dark colour. A little methyl-alcohol is also at the same time formed. At this stage the tobacco-leaf is acid in reaction ; but after it is powdered, and again submitted for a prolouged period ‘to a slow fermentation in air-tight boxes, it becomes decidedly alkaline by the

ammonia, because, while acctic acid continues to be formed and the anmonia and nicotine remain what they are, the malic and citric acids are progressively destroyed. Uniess suuff contains free ammonia it is ‘flat,’ and destitute of pungency.

As to the composition of tobacco smoke, numerous investigations have been made, Kissling (Ding. Polyt. Jour., ccliv. 234-246), experimenting on cigars, found that a large proportion of the nicotine passes unaltered into the smoke. Dealing with a tobacco containing 3°75 per cent. of nicotine, he recovered from the sinoke 52°02 per cent. of the total nicotine consumed, while in the uncon- summed remains of the tobacco the proportion of nicotine was increased to 5°03 per cent. With a second sample of tobacco, having likewise 3°75 per cent. of nicotine, the smoke yielded only 27°83 per cent. of the total nicotine consumed, and the percentage in the unconsumed remains was raised to 4°51. From a tobacco containing only 0°30 of nicotine he recovered 84°23 of nicotine in the smoke. The composition of tobacco smoke is highly complex, but beyond nicotine the only substances found in appreciable quan- tities are the lower members of the picoline series.

The commercial varieties and the sources of supply of lcaf- Commer- Special qualities of tobacco, as cial varie- outside of which they ties.

tobacco are exceedingly numerous. of wines, &c., belong to particular localities, cannot be cultivated. These tobaccos are therefore natural mono- polies. Moreover, as is also the case ‘with wines, the erops vary in richness and delicacy of flavour with the seasons of their growth, so that in certain years the produce is of much greater value than in others. Further, the properties of certain classes of tobacco render them specially suitable for cigar-making. Others are best fitted for smoking in pipes; and there are numerous qualities which are valuable for snuff-making. National tastes and habits again frequently determine the destination of tobacco. Thus heavy, strong, and full-flavoured cigars and tobaccos are in favour in the United Kingdom, while on the Continent lighter and more brisk- burning qualities are sought after, and the materials consumed in the kalians of Persia and the Kast are not suitable for use in the short pipes of the Western nations.

Of cigar tobaccos the most valuable qualities in the world are cultivated in the north-west portions of the island of Cuba. The district of Vuelta Abajo is the source of the highest quality, after which comes the produce of Partidas and Vuelta Arriba.

Of ordinary smoking tobacco, among the most esteemed quali- ties are Varinas or kanaster, grown in the districts of Varinas, Merida, Margarita, &c., in Venezuela. The name kanaster, which covers several varieties of tobacco from South America, is given on account of the wicker baskets (Span. kanastra) in which the material is packed for export. The tobacco regions of the United States—Kentucky, Maryland, Virginia, and Ohio—send great sup- plies of smoking leaf of various qualities into the European market, especially into the United Kingdom, which is almost exclusively supplied from these sources. Smoking tobaccos of the highest quality, rivalling indeed the cigar tobacco of Cuba in flavour and value, are grown in Turkey, and specially in the province of Salonica. The famous Latakia of the English smokers is pro- duced in the province of Saida, in the northern part of Syria (see

Xe. — 54

Manu- facture.

Smoking mixtures.

Roll tobacco,

Cake tobacco,

Cigars.

LATAKIA), and thoughout Asiatic Turkey there is an extensive cultivation and export of smoking tobacco.

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shaped piece made to enclose the whole in a spiral manner, begin- ning at the thick end of the cigar and working down to the pointed

In the manufacture of tobacco for smoking, we have to do with |-end, where it is dexterously finished by twisting to a fine point

the numerous forms of tobacco used for smoking in pipes, embrac- ing cut smoking mixtures, cake or plug, and roll or spun tobacco. Under this heading come also the cigar and cigarette manufacture.

The raw material in the warehouses is of various qualities : some is strong, rough, and harsh, and so is unfit for ordinary smoking ; other samples are mild and fine, with aromatic and pleasant flavour, but devoid of strength. By a proper mixing and blending the manufacturer is enabled to prepare the smoking mixture which is desirable for his purpose; but certain of the rough, bitter qualities cannot be manufactured without a preliminary treatment by which their intense disagreeable taste is modified. The storing of such tobacco for a lengthened period matures and deprives it of harshness, and the same result may be artificially hastened by macerating the leaves in water acidulated with hydrochloric acid, and washing them out with pure water. The most efficient means, however, of improving strong, ill-tasting tobacco is by renewed fermentation artificially induced by moisture and heat.

The manufacturer having prepared his mixture of leaves, proceeds to damp them, pure water alone being used in the United Kingdom, whereas on the Continent and in America certain ‘‘sauces” are employed, which consist of mixtures of aromatic snbstances, sugar, liquorice, common salt, and saltpetre, &., dissolved in water. The primary object is to render the leaves soft and pliant; the use of the sauces is to-improve the flavour and burning qualities of the leaves used. When uniformly damped, the leaves are separately opened out and smoothed, the inidrib, if not already removed, is torn out, execpt when “‘bird’s eye” cut is to be made, in which mixture the midrib gives the peculiar “‘bird’s eye” appearance. The prepared tobacco, while still moist and pliant, is pressed between cylinders into a light cake, and cut into fine uniform shreds by a machine analogous to the chaff-cutter. The cut tobacco is now roasted, partly with the view of driving off moisture and bringing the material into a condition for keeping, but also partly to

improve its smoking quality. The roasting is most simply effected by spreading it on heated slabs, on which it is constantly turned ; but such a method does not yield uniform results, and it exposes the workers to a most deleterious atmosphere and noxious fumes. A roasting machine is in use, which consists of a revolving drum in which the tobacco is rotated, gradually passing from one end to the other, and all the time under the influeuce of a current of heated air passing through it.

For roll, twist, or pigtail tobacco the raw material is damped or sauced as in the case of cut tobacco. The interior of the roll consists of small and broken leaf of various kinds, called <‘ fillers” ; and this is enclosed within an external covering of large whole leaf of bright quality, such leaves being called “covers.” The material is supplied to the twisting machinery by an attendant, and formed into a cord of uniform thickness, twisted, and wound on a drum by mechanism analogous to that used in rope-spinning. From the drum of the twisting machine the spun tobacco is rolled into cylinders of various sizes. These arc enclosed in canvas, and around the surface of each stout hempen cord is tightly and closely coiled. In this form a large number, after being cooked or stoved in moist heat for about twenty-four hours, are piled between plates in an hydraulic press, and subjected to great pressure for a month or six weeks, during which time a slow fermentation takes place, and a considerable exudation of juice results from the severe pressure, The juice is collected for use as a sheep-dip.

Cake or plug tobacco is made by enveloping the desired amount of fillers within covering leaves of a fine bright colour. A large number of such packages are placed in moulds, and submitted to powerful pressure in an hydraulic press, by which they are moulded into solid cakes. Both cake and roll tobacco are equally used for smoking and chewing ; for the latter purpose the cake is frequently sweetened with liquorice, and sold as honey-dew or sweet cavendish.

For cigar-making the finest and most delicately flavoured qualities of tobacco are generally selected. A cigar consists of a core or central mass of fillers enveloped in an inner and an outer cover or tobe. The fillers or inner contents of the cigar must be of uniform quality, and so packed and distributed in a longitudinal direction that the tobacco may burn uniformly

and the smoke can be freely drawn from end to end. For the inner cover whole leaf of the same quality as the fillers is used, but for the outer cover only selected leaves of the finest quality and colour, free from all injury, are employed. The covers are carefully cut to the proper size and shape with a sharp knife, and, being damped, a pile of them smoothed out are placed together. In making cigars by the hand, the operator rolls together a sufficient quantity of material to form the filling of one cigar, and experience enables him or her to select very uniform quantities. This quantity is wrapped in the inner cover, an oblong piece of leaf the length of the cigar to be made, and of width sufficient to enclose the whole material. The cigar is then rolled in the hand to consolidate the tobacco and bring it into proper shape, after which it is wrapped in the outer cover, a

between the fingers. The finished cigars are either spread out in the sunlight to be dried, or, where that is impracticable, they are exposed to a geutle heat. They are then sorted into qualities according to their colour, packed and pressed in boxes, in which they are stored forsale. Machinery is now employed for forming and moulding the fillings of cigars.

Havana cigars are, as regards form, classification, method of putting up, and nomenclature, the models followed by manufacturers of all elasses of the goods. Genuine (‘‘legitimas”’) Havana cigars are such only as are made in the island; and the cigars made in Europe and elsewhere from genuine Cuban tobacco are classed as “‘Havanas.” Other brands of home manufacture contain sonie proportion of Cuban tobacco ; and very good cigars may be made in which the name only of that highly-prized leaf is employed. When we come to the inferior classes of cigars, it can only be said that they may be made from any kind of leaf, the more ambitious imitations being treated with various sauces designed to give them a Havana flavour. The highest class of Cuban-made cigars, called “‘vegueras,” are prepared from the very finest Vuelta Abajo leaf, rolled when it is just half dry, and consequently never damped with water at all. Next come the “‘regalias,” similarly made of the best Vuclta Abajo tobacco; and it is only the lower qualities, ‘‘ ordinary regalias,” which are commonly found in com- merce, the finer, along with the ‘‘vegueras,” being exceedingly high-priced. The cigars, when dry, are carefully sorted according to strength, which is estimated by their colour, and classed in a

scale of increasing strength as claro, colorado claro, maduro, and oscuro, They are pressed into the cigar boxes for sale, and branded with the name or trade mark of their makers. Cheroots differ from ordinary cigars only in shape, being either in the form of a trun- cated cone, or of uniform thickness throughout, but always having both ends open and sharply cut across. Cheroots come princi- pally from Manila, but there are now large quantities imported into the United Kingdom from the East Indies and Burmah.

Cigarettes consist of small rolls of fine cut tobacco wrapped in a Cigar- Origin- ettes,

covering of thin tough paper specially made for such use. ally cigarettes were entirely prepared by the smoker himself ; but, now that the consumption of cigarettes has attained gigantic pro- portions, especially in France, they are very largely made with the aid of an elaborate system of automatic machinery. The machines cut the paper, gum its edge, measure out the proper quantity of tobacco, wrap it up, make the gummed edge adhere, cut the ends, and pack the cigarettes in boxes.

The manufacture of snuff is the most complex, tedious, and Snuff,

difficult undertaking of the tobacco manufacturer; but it is an art now of relatively little and of decreasing importance. The tobacco best suited for snuff-making is thick fleshy leaf of a dark colour, the finest qualities of snuff being made with dark Virginia leaf and the Amersfoort leaf of Holland; but manufacturers work up many kinds with fragments from the making of smoking tobacco, midribs, &c. The varieties and qualities of snuff are many, the differences being dependent on the material employed, the sauces with which it is treated, and the method of manufacture. The sauces for snuff consist of solutions of common salt, with various aromatic substances according to the flavour desired in the finished snuff, aud with occasional additions of potash, sal ammoniac, and other salts. The following is an outline of the method adopted in making snuff on the great scale in the state manufacture of France. The tobacco leaves are moistened with about one-fifth of their weight of salt and water (sp. gr. 1°089), made up into blocks, and piled in large rectangular heaps, in quautities of 40 or 50 tons. The temperature gradually rises to 140° F., and sometimes reaches

170°; but the heat must be regulated, or parts of the mass would become black as if charred. The heaps are made up in spring and autunin, and the fermentation is continued for five or six months, when the temperature remains stationary or begins to decline, The heap is then opened, and the tobacco is ground, by which means a pale brown dryish powder (rdépé sec) is obtained. ‘This is mixed with about four-tenths of its weight of a solution of common salt, and is passed through a sieve, that the powder may be uniformly moistened. It is then packed in large open chests in quantities of froin 25 to 50 tons, where it remains for nine or ten months, and undergoes another fermentation, the temperature rising in the centre of the mass to 120° or 130°. During this process the snuff acquires its dark colour and develops its aroma, But it is not uniform in quality throughout, and is removed to a second chest, in such a way as thoroughly to mix all the different parts together, and, after the lapse of two months, it is again turned over ; and the process is sometimes repeated a third time. When the snuff is ripe, the contents of the various chests are mixed together in a large room capable of holding 350 tons of snuff, where it is left for about six weeks, and the whole mass being uniform in quality is sifted into barrels for the market. The process of manufacture occupies in all from eighteen to twenty months. During these

Fiscal restric- tions,

Physio- logical effects.

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repeated fermentations about two-thirds of the nicotine is destroyed, the acidity of the snuff disappears, and the mass becomes distinctly alkaline, notwithstanding that acetic acid is continuously evolved. The destruction of malic and citric acids continues, and the bases thereby set free saturate the acetic acid formed, leaving free ammonia in the snuff. The properties of snuff are dependent on the presence of free nicotine, free ammonia, and the peculiar aromatic principle developed in the fermentation.

The reduction of tobacco-leaf to a snuff powder is a task of con- siderable difficulty, owing to the gummy nature of the substance, which tends to coat and clog grinding surfaces. In early times the duly sauced and fermented

leaves were made up into “ carottes,” —tightly tied up spindle-formed bundles, from the end of which the snuffer, by means of a “snuff rasp,” rasped off his own supply, and hence the name ‘‘rapé,” which we have still as ‘‘ rappee,” to indicate a particular class of snuff. The practice of tying up the leaves in the form of carottes is still followed by makers of fine snuff, as the very slow fermentation which goes on within the bundles is favourable to the development of a rich aroma. For eee the leaves are first cut to shreds with a revolving

nife, and then powdered either by a kind of mortar and pestle mill, or by falling stampers supplied with knife cutting edges, or more commonly they are treated in a conical mill, in which both the re- volving cone and the sides have sharp cutting edges, so that the material undergoes a cutting rather than a grinding action. The snuff from the mill is sifted, and that which remains on the sieve ig returned to the mill, the remainder being passed on as rdpé sec for further treatment as described above.

In nearly all civilized countries the cultivation of tobacco and its manufacture are conducted under state supervision, and form an important source of public revenue. In France, Austria-Hungary, Italy, and Spain the cultivation is a state monopoly, and in other countries the crop is subject to heavy excise duties. Since the time of Charles II. the growth of tobacco in England has been practically prohibited, the original legislative exactment to that effect having been passed with the view of encouraging trade with the young colony of Virginia. When that motive ceased to have force the supposed difficulties of collecting the internal taxation still influenced the legislature to continue their prohibition, and consequently a penalty or prohibitive tax equal to sixteen hundred pounds per acre is exigible on the cultivation of tobacco in the United Kingdom. In Ireland the duty on the cultivation of tobacco was abandoned between 1822 and 1880, and in that interval the cultivation grew till about a thousand acres were under the crop. In 1886 the Government permitted the experimental cultivation of tobacco in England, under certain precautions and restrictions for the security of the revenue. Several proprietors in Kent, Norfolk, and other counties grew experimental patches with such success as to warrant the continuance of the experiment and to prove the entire practicability of cultivating tobacco as an English agricultural crop. The climate is, however, so variable that, were all

restric- tions removed, and tobacco grown subject only to excise supervision for collecting an equitable tax, it is more than doubtful whether its growth would be a safe and profitable undertaking.

The intlueuce of tobacco on health and morals has, ever since its introduction into Europe, becn a fruitful subject of controversy. On all grounds, except as a medicine, it met the most uncom- promising opposition when it first became known ; but it was precisely the expectations entertained regarding its medicinal virtues which were completely disappointed. Burton, in the Anatomy of Melancholy, gives strong expression to the two views : “Tobacco, divine, rare, superexcellent tobacco, which goes far beyond all the panaceas, potable gold, and philosopher’s stones, is a sovereign remedy in all diseases. A good vomit, I confess, a vir- tuous herb if it be well qualified, opportunely taken, and medi- cinally used ; but, as it is eommonly abused by most men, whieh take it as tinkers do ale, ’tis a plague, a mischief, a violent purge of goods, lands, health, —hellish, devilish, and danined tobacco, the ruin and overthrow of body and soul.” Burton’s meaning— that tobacco in moderation is a good thing, while its excessive use causes many physical and other evils—has many sympathizers ; but the difficulty is to define moderation and excess. Among modern authorities, Dr Jonathan Pereira says, ‘‘ I am not acquainted with any well-ascertained ill effects resulting from the habitual practice of smoking.” Similarly Sir Robert Christison eoncludes, ‘‘ In many individuals who use it habitually, the smoke has an extra- ordinary power in removing exhaustion, listlessness, and restless- ness, especially when brought on by bodily or mental fatigue, and this property is the basis of its general use as an article of luxury.” Dr E. A. Parkes sums up his observations thus : ‘‘ I confess myself quite uncertain. I can find nothing like good evidence in books ; too often a foregone conclusion, without any evidence to back it, is given, I think we must decidedly admit injury from excess ; from moderate use I can see no harm, except it may be in youth.” On the other hand, it is asserted by the opponents of tobacco, and by the anti-tobacco societies, that the habitual use of this narcotic leads, especially in the young, to decrease of bodily and mental

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vigour, and specially produces symptoms of anemia, palpitation, intermittent pulse, and other affections of the heart and circula- tion. It is an admitted fact that a disease of the vision—tobacco amblyopia—is contracted by sinokers, and is not uncommon among those using strong heavy preparations, such as blaek twist. Allowing that such incidental evils may arise from even compara- tively moderate indulgenee in tobacco, they are after all as nothing compared to the vast aggregate of gentle exhilaration, soothing, and social comfort, extracted from the Virginian weed.

With the almost universal prevalence of the use of tobacco, it must be obvious that the amount consumed yearly is very great. In the United Kingdom, which ——-—¥—_-~—

is much less a tobacco-consuming Total Per country than the United States Conéumption. | Hend. or many European countries, the ib ne consumption per head hassteadily | 1821 15,598,152 11-71 increased, as is shown in the | jSil 19,533,841 12°80 accompanying table. aa iee ae : 1851 28,062,978 16°87 _ The customs duty derived from | 1871 42,775,334 21°49 imports of tobacco amounted in | 1881 49,820,493 22°60

1886 to £9,298,990, and there cer- tainly is a considerable quantity of manufactured tobacco smuggled into the kingdom which comes into no official reeord. In the United States the production of tobaceo was in 1840 219,163,319 tb, in 1850 199,752,655 tb, in 1860 484,209, 461 tb, in 1870 262,735,341 th, and in 1880 472,661,157 tb. During the ten years ending 1881 the average annual production was 472,000,000 tb, cultivated on from 600,000 to 700,000 acres, the value of the crops ranging from $40,000,000 to $45,000,000. In the same ten years 2,540,818,001 tb of leaf were exported, 1,897,606,249 Ib were manufactured for home consumption, and the quantity consumed by growers was estimated to be equal to 280,000,000 Ib.

For Tobacco Pipe, see PIPE.

The literature of tobacco is very extensive. The late Mr William Bragge of Birmingham published in 1880 a revised bibliography of the subject, Bibliotheca Nicotiana, extending to 248 quarto pages. From such a mass of

authorities it would be vain here to make selections, but mention may be made of Fairholt's capital gossiping work, Tobacco, its [Jtstory and Associations (2d ed., 1876). As modern standard works there may also be quoted Tiedemann's Geschichte des Tabaks (1856) and Wagner's Tabakeultur, Tabak- und Cigarren-Fabrication (1884). In the Tenth Census Reports of the United States (1883), vol. ifi., there are a series of elaborate papers on the cultivation, manufacture, and statistics of American tobacco. (J. PA.—W. D.)

TOBAGO, the most southerly of the Windward group of British West Indian Islands (11° 9' N. lat., 60° 12' W. long.), 20 miles north-east from Trinidad, is 26 miles in length and 74 at its greatest breadth, with an area of 114 square miles (73,313 acres). Its formation is volcanic, and the physical aspect irregular and picturesque, with conical hills and ridges; the main ridge is 1800 feet high and 18 miles long. There are several excellent harbours. The products are sugar, rum, molasses, and fruits of various kinds, only the low ground being cultivated; production is not increasing. In 1885 the revenue was £10,826 and the expenditure £12,031, while the imports were £30,758 and the exports £26,414. The population in 1885 was 19,363 (9368 males and 9995 females), princi- pally of African race, the whites being very few. Tobago has a small legislative council and an administrator under the Government of the Windward Islands. Its capital is Scarborough (1200 inhabitants), on the south-east coast.

Tobago was discovered by Columbus in 1498, and the British flag was first planted in 1580, the island being then occupied by Caribs. It has subsequently been held by the Duteh and the French, but ultimately was ceded to the British crown in 1814.

TOBIT, THe Book or, one of the Old Testament apocrypha, relates with many marvellous' circumstances the virtues, trials, and final deliverance of Tobit, a pious Jsraelite who was carried to Nineveh in the captivity of the ten tribes, and, after rising into favour and wealth as a trader at the royal court, was reduced to poverty because he habitually buried those of his nation whom the tyrant slew and ordered to be cast forth unburied. Besides this he lost his eyesight through an accident. Reduced almost to despair, like Job, and taunted like Job by his wife ("where are thy alms and righteous

deeds 2”), he yet puts his faith in God and prepares to die, but first resolves to send his son Tobias to Rhagz (Rai), in Media, to reclaim an old loan. Now his prayers are heard and his righteous-

Com- merce.

ness rewarded, for Raphael, one of the seven angels that present the prayers of the saints before God, is sent in human form to conduct Tobias on his journey. Thus aided, Tobias not only recovers his father’s money, but by killing a fish which attacks him as he washes his feet in the Tigris, becomes possessed of two invaluable drugs, its liver with the heart and its gall. By fumigation with the former he drives away the demon Asmodeus, who had slain the seven bridegrooms of a virtuous Jewish maiden, Sara of Ecbatana, his own kinswoman, and so wins a good wife, and with the gall he heals his father’s eyes. In spite of the absurd machinery and other puerilities, the story is ingeniously constructed, and the picture of Tobit’s piety is natural and touching, so that the whole is a very good exhibition of the weakness and the strength of Judaism as It was among the Israelites of the dispersion.

The date of the book cannot be precisely determined. It was written before the destruction of the temple (xiv. 5), and is cited by early Christian writers. On the other hand, it is in the highest degree probable that the Greek text is original,! in which case the book can hardly be earlier than the 2d century B.c. A date about the middle of this century, or a little earlier, at the time of bitter conflict with the Greeks, seems to accord best with the tone of the book. The sympathy shown for the victims of tyranny, to whom burial was denied, acquires fresh mean- ing when compared with such a passage as 2 Mac. v. 10, and the prominence given to eschatological hopes in the closing verses fits a time when interest in the prophecies of Israel’s future glory was revived by the struggle for national independence in Judzxa.

That Tobit was written by a Jew of the Eastern dis- persion (so, e.g., Ewald, Gesch., iv. 269) will hardly be maintained by any one who accepts the Greek text as original. The book remained almost unknown to the Syriac church, a fact which tells strongly against the hypothesis of an Eastern origin; and at the period to which the work can be best referred Egypt is the

only probable place for a Jewish-Greek composition. The writer knows nothing about the geography of the East beyond a few names which every Jew must have heard,— the Tigris, which, by an error common among the Greeks but hardly possible to an Oriental Jew, he regards as flowing between Nineveh and Media; Rhage, which was a royal residence of the Parthians; the famous city of Ecbatana ; and Elymais (ii. 10), which was associated with the disaster of Antiochus Epiphanes. And in both forms of the Greek text (vi. 9 in the common text, and v. 6 in the longer) Rhagzw is falsely represented as quite near Ecbatana.? Noldeke surmises, as others have done before him, that the “ fish ” which attacked Tobias was the Egyptian crocodile, and this conjecture is raised almost to certainty when we read in Kazwini i. 132 that the smell of the smoke of crocodile’s liver cures epilepsy and that its dung and gall cure leucoma, which was the cause of Tobit’s blindness.? Thus the cures of Sara and Tobit are natural (cf. the longer Greek text, vi. 4 sq.); the angel’s help is necessary only to secure the medicaments and explain their use.

But though the story may have been written in Egypt it contains Persian elements. There is no inconsistency in

SSS eee eee eee eee eee ae 1 See the arguments of Noldeke, Monatsh. Berl. Ak., 1879, p. 45 Sq. This paper also contains the best discussion of the relation of the various texts of the book, , ? Néldeke shows that the same error in a less gross form appears in both texts in chap. ix. The further erroneous statement of the longer text that Ecbatana lies in a plain occurs also in Diod., ii. 18, 6, in a passage dependent on Ctesias, from whom the addition may have been taken. 3 Very similar statements as to the medical virtues of the crocodile (aquatic or terrestrial) occur in Greek and Latin writers,

this, for the authors of Jewish Haggada generally borrowed the themes which they embellished, and that from very various quarters. In fact, at the close of our book there is a brief allusion to another story,* quite unknown to us, which the author evidently did not invent. The proof of a Persian element in the tale lies, not in the localities, but in the angelology and demonology. Asmodeus is the Iranian evil spirit Aeshma Daeva, and

Raphael, as the guardian of Tobias, has a strong resemblance to the Iranian Craosha. Such precise adaptations of Zoroastrian ideas were hardly the common property of Judaism at so early a date; they lead us to conjecture that the writer borrowed from an Jranian story.® And only in this way can we explain the appearance of the dog who goes out and returns with Tobias and Raphael. This trait is so inconsistent with Jewish feelings towards the unclean animal that it is omitted in the Hebrew and Chaldee versions. But to the Iranians the dog was not only a sacred animal, the pro- tector of herds and homes, but was the companion of the protecting spirit Graosha (Bundahesh, chap. xix.), to whom Raphael in our tale corresponds.

The Greek text of Tobit is found in a shorter recension (the usual text) and in a longer form preserved in the Codex Sinaiticus (published by F. H. Reusch, 4to, Bonn, 1870). ‘There are frag- ments of another form of the longer text in several cursives. All the forms are given in Fritzsehe’s Libri Apoeryphi, Leipsic, 1871. The shorter text, in the judgment of Fritzsche and Néldeke, is the earlier. The longer text is also represented by the Latin versions, the second part of the rare Syriac version (the first part is from the hexaplar Greek), and two closely allied Jewish versions, the Aramaic (published by Neubauer, from a unique Midrash in the Bodlcian, Oxf., 1878) and the Hebrew, first printed in Coustantin- ople (1516), reprinted by Miinster in 1542 (whenee its common name Hebreus Munsteri) and included in Neubauer’s edition. The Aramaic scems to be a late form of the text known to Jerome, and of which he made use for the Vulgate Latin; it is certainly a trauslation from the Greek. There are recent commentarics on Tobit by Fritzsche (Kurzgef. Handb. zu den Apoer., ii., Leipsie, 1853), Reusch (Freiburg, 1857), Sengclmann (Hamburg, 1857), and Gutberlet (Theissing, 1877). Noldeke’s paper already quoted is indispensable. For other literature, see Schiirer, WTliche Zeit- gesch., li, 609. (W. R. 8.)

TOBOLSK, a government of Western Siberia, having the Arctic Ocean on the N., Archangel, Vologda, Perm, and Orenburg on the W., Akmolinsk and Semipalatinsk on the S., and Tomsk and Yeniseisk on the E., is one of the largest provinces of the Russian empire, occupy- ing nearly 7 per cent. (531,980 square milés) of its total area. It borders on the Arctic Ocean, from: the river Kara to the Bay of the Ghida, the broad peninsula of Yatmat projecting between the Kara Sea on the west and the Bay of the Ob; this last

penetrates into the continent for more than 550 miles, with a width of from 60 to 70 miles, and receives another long and wide outlet—the bay of the Taz (Tazovskaya). Another wide bay of the Kara Sea—the Baidaratsk, or Kara Bay—runs up into the Yatmat peninsula from the north-west. The islands be- longing to the government are few; Byelyi, at the ex- tremity of Yatmat, and a few small ones along the west coast of the peninsula, as also in the Obi Bay, are for the most part ice-bound. This extensive province occupies the greater part of the lowlands of north-western Asia, which extend eastward from the Urals, and only in the far north does it include the eastern slopes of these mountains. The Pai-ho coast-ridge only touches Tobolsk with its south- eastern extremity. The Urals proper, which run south- west from the Kara Sea as far as to the Tell-péss group (5540 feet), and thence take a southerly direction, form the boundary between Tobolsk and Vologda as far as the

- The story of Nadab and Achiacharus. The names are uncertain, and one text substitutes Aman (Haman) for Nadab. But the allusion is not to the book of Esther.

> Compare what is said under THOUSAND AND ONE Nicuts (p. 312) as to the probable influence of an Iranian legend on the book of Esther.

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sources of the Petchora (61° 30’ N. lat.), but farther south their eastern slopes are included in the Russian government of Perm, and only their lowest spurs, 200 miles from the main ridge, belong to Tobolsk. The aver- age height of the northern Urals is about 3000 feet, and several of their summits range from 3300 to 4000 and even 4370 feet (Net-yu, in 68° N. lat.). The remainder of the government is of lowland character, hardly at any point rising above the sea by more than a few hundred feet, but these lowlands vary greatly in their different parts. They assume the character of grassy steppes or prairies in the south, of immense marshes sparsely covered with forest in the north, and of treeless tundras as the shores of the Arctic Ocean are approached. The southern steppes, in their turn, may be subdivided into two distinct portions,—the Tobot and Ishim steppe in the west, and the Baraba in the east. The former, nearly 43,000 square miles in area, is one of the most fertile parts of the empire. One-third is under forest,

and the remainder has a soil of very fertile black earth, which has the further advant- age of being sufficiently watered. The climate, indeed, is very severe, the mean annual temperature (30° to 34° F.) being such as is found only in the north of Sweden and in Archangel; but the warm summer (65° to 68° in July) and the amount of light received from a bright sky combine to make vegetation develop with a rapidity quite unknown to western Europe. This region now has a population of more than 800,000, almost all Russians (only 14,000 aborigines), so that it may be said to be more thoroughly Russian than the Volga provinces. The area under crops every year is 3} million acres, and the region promises to become a regular granary for Siberia and north-eastern Russia. The second portion of the southern plains, which might be called the Baraba region, being mostly occupied by the Baraba steppe, covers about 55,000 square miles. Only its western borders belong to Tobolsk. It also is perfectly flat, and covered with recent deposits ; but, as there is no definite slope, the surface waters move slowly, and accumulate into a very large number of lakes and marshes. The climate is moister and the summer still shorter and less hot than in the preceding region. Forests, consisting chiefly of birch, are spread in clusters over its surface. The soil of this region also is very pro- ductive, but the fertile patches are separated by marshy grounds, and the dense clouds of mosquitoes which float over it in summer are a positive plague to both man and beast. The population numbers only 250,000, also almost all Russians (only 4000 aborigines), and the area annually under crops is about 1,350,000 acres. To the north of the regions just specified is that occupied by the administra- tive districts of Tura, Tobolsk, and Tara, with an area of about 110,000 square miles; this may be described as the taiga region. It is covered throughout with impenetrable forests and quivering marshes—the dreadful wrmans, which are penetrated by man only for some 20 to 50 miles around the widely separated settlements. Immense cedar- trees, larches, firs, pines, birches, and maples grow very densely, and the underwood is so thick that a passage can be forced only with the aid of the hatchet, the difficulties being further increased by the layers of decayed wood and by the marshes. To cross these, which are treacherously concealed under a swaying layer of grassy vegetation, a kind of snow-shoe must be used even in the summer, and many can be crossed only in winter. Immense areas of the urmans, especially on the Vasyugan, have never been visited by man; but still, from time to time a Russian settlement arises in the

forests, mostly founded by Non- conformists in hiding, who freely receive all sorts of fugitives. The south-western parts of this region are crossed by the Siberian highway, and to this circumstance

‘alone is it indebted for its population of nearly 450,000

(32,000 aborigines). Only 2 per cent. of this area is under culture. Farther north extend the tundras, where the aver- age temperature rapidly decreases from the 25° F. found in the preceding region to 15°, 10°; and 7°. The frozen soil during the hottest part of the summer thaws only for a few inches beneath the surface. The frost sets in early, and a thick envelope of snow lowers the spring. tempera- ture. Forests cover the southern parts, but the trees become poorer, shorter, and thinner, and huddle into im- penetrable thickets ; while, farther north, only the creep- ing variety of birch and the dwarf varieties of willow hold their ground. Within the Arctic Circle the last traces of arboreal vegetation disappear, their northern limit being pushed south by the double bay of the Ob and the Taz, and by the proximity of the Kara Sea.

Apart from the Urals, there are no traces of hard rock anywhere in Tobolsk. Down to its southern borders it is covered with Post-Pliocene deposits, which are met with as far as the water- parting between the Irtish and the Aral-Caspian depression. This range of flat hills rises a few hundred feet above the sea-level, and it seems to mark the limit of extension of the Post-Glacial gulf of the Arctic Ocean which covered western Tobolsk during the Glacial period. Contrary to Humboldt’s hypothesis, it remains, however, doubtful whether it was connected in Post-Glacial times with the Aral-Caspian Sea otherwise than by means of narrow straits, which disappeared at any rate at an early stage in that geological period.

The climate of Tobolsk is one of great extremes, the differences between the averages for the hottest and coldest months reaching as much as 70° F. The average temperatures at Berezoff, Narym, Tobolsk, and Ishim respectively are 24°, 28°, 31°°8, and 382° (January, ~8°°3, — 8°, — 2°, and — 4°; July from 62° to 67°). Only 194 days at Ishim and 153 at Berezoff

have a temperature above 32°; and the Ob at Obdorsk continues ice-bound for 219 days (the Irtish 176 days at Tobolsk).

The government is watered by the Ob, which traverses it for more than 1300 miles, and is navigable throughout. It receives many tributaries, some of which are 200 to 350 miles long, but flow through quite uninhabited regions. The Irtish, a left-hand tribu- tary of the Ob, covers all the southern part of Tobolsk with its numerous tributaries. It waters Tobolsk for 760 miles, and is navigable for the whole of its length ; it receives the great Tobot, about 420 miles long, also navigable, the Ishim, and a number of less important streams; while the Tura, a tributary of the Tobot, is also a channel for navigation. The navigation lasts for nearly six months in the south. The first steamer on the Ob system was launched in 1845 and the second in 1860; since the latter date steam navigation has steadily developed.

Lakes, some of them salt, occur in great numbers on the water- parting between the Irtish and the Aral-Caspian, and everywhere in South Tobolsk. Lake Tchany, the largest, covers 1265 square miles. All are being rapidly dried up, and even within the last hundred years they have undergone great changes. Thus, in the group of lakes of Tchany, in the Baraba steppe, whole villages have arisen on ground that was under water in the earlier years of this century.! Immense marshes cover Tobolsk beyond 57°N. lat., —the Vasyugan marshes in the east,-the Kondinsk and Berezovsk marshes in the wést, both joining farther north the tundras of the Arctic shores.

The population reached 1,288,000 in 1882. Although recent immigrants, the Russians already constitute 94 per cent. of the aggregate population, ‘and their numbers are steadily increasing by immigration, and partly also by the arrival of exiles. No fewer than 43,750 immigrants from Russia settled at Tobolsk between 1846 and 1878, but of late this figure has greatly increased. In 1879 as many as 59,134 exiles were on the registers, but of these more than 20,000 had left their abodes and disappeared. As a rule the exiles belong to the poorest elass of population. Aeeording to M. Yadrintseff,?2 the native population of Tobolsk was repre- sented in 1879 by 29,150 Tartars and 8730 other Turkish inhabit. ants, chiefly in the south, 22,350 Ostiaks, chiefly on the Ob, 6920 Samoyedes in the north, and 6100 Voguls in the north-west; the total amounted to 74,220,—that is, 6°1 per

cent. of the aggregate population (1,206,000 in 1879). The OstTraKs (q.v.) are in a very miserable condition, having come under heavy obligations to the Russian merchants, and being compelled to hand over to them nearly all the produce of their hunting and fishing. The Tartar settlements in the south are prosperous, but not in the Tobolsk district, where their lands have been appropriated for the Russian Sinan Alibi? Scepter nN 2 =” tS ae eee

1 See Yadrintseff in Jzvestia Russ. Geogr. Soc., 1886. 2 Siberia as a Colony (Russian).

settlers. Of the Russians nearly 35,000 are Nonconformists, accord- ing to official figures, but the number is greatly understated. Many of the Samoyedes, Ostiaks, and Voguls are nominally Christians. The Russians and the Tartars, who chiefly inhabit South Tobolsk, mostly live by agriculture. Of the total area of land regarded as suitable for cultivation (28,400,000 acres), 15,600,000 are owned by the peasant communities. Summer wheat, rye, oats, barley, and some buckwheat are raised. Flax and hemp and tobacco are cultivated in the south, where cattle-brceding also is extensively carried on. The ravages of anthrax, however (see MURRAIN, vol. Xvi. p. 58), are very severe, especially in the marshy parts of the province. The indigenous inhabitants of the north had, in the same year, more than 100,000 reindeer. Dogs are used in sledges in the far north. In the forest region the chief means of cxistence are found in the forests. The pursuit of bears, wolves, foxes, squirrels, ermines, stags, elks, as also of sables and beavers (rapidly disappearing), is a regular occupation with the Russian peasants as well as with the indigenous inhabitants; sledges and cars, mats, sicves, wooden vessels, and pitch and tar are also manu- factured to a considerable extent in the villages (valued at about £150,000). Cedar-nuts (from 5000 to 8000 ewts. every year) are gathered, partly for the sake of their oil. The fisherics of the Ob and the southern lakes are important ; no fewer than 1700 Ostiaks are engaged in them on the Ob. No less than 200,000 ewts. of fish are annually caught in the district of Tara alonc, and Surgut exports it to the value of £10,000, while in the Narym region 10,000 ewts. of salt are used for preserving the fish.

The industries are insignificant (chiefly tanning, distilling, and tallow-melting); iron-works and woollen-cloth mills are still in their infancy. The export of cattle, hides, tallow, corn, flour, fish, and furs to Russia, both from Tobolsk and from the Kirghiz steppe, is of some importance. Spirits are sent farther east, to Tomsk; while all kinds of manufactured wares are imported from Russia. The fairs of Irbit and Ishim are the chief centres for trade.

The educational institutions are few. It is worthy of remark that of ‘‘secondary schools” (gymnasia and pro-gymnasia) there were in 1883 eight for girls, with 1065 scholars, and only four for boys, with 711 scholars; of primary schools there were 250, with 5844 boys and 1403 girls.

Tobolsk is divided into ten distriets (okrugs), the chief towns (with populations in 1883) being Tobolsk (20,130), Berezoff (1990), Ishim (7100), Kurgan (8570), Surgut (1460), Tara (8640), Turinsk (4650), Tyukatinsk (3900), Tyumefi (14,300), and Yalutorovsk (4500). Ofthese towns, only Topoisk and TyuMEN (q. v.) are really entitled to the designation, the others being mere villages, of less importance than many others on the great Siberian highway which crosses the government from Tyumefi to Tomsk. (ES AN i)

TOBOLSK, capital of the above government, is situated on the right bank of the Irtish, near its junction with the Tobot. It is 1535 miles from Moscow, and since the alteration of the course of the great Siberian highroad from Tyumefi to Tomsk it has become an out-of-the-way place, and is no longer either capital of Western Siberia or even an administrative centre for exiles, as it was for- merly. Viewed from the Irtish, the town has a picturesque aspect, with its kreml, or stone walls, built on a crag 200 feet high, its twenty-one churches, and several elegant buildings. The kreml, built under Peter I. by Swedish prisoners, in imitation of the kreml of Moscow, is 430 yards long by 200 yards in breadth, and contains two cathedrals erected towards the end of the 17th century. The bell of Uglitch, which rang the alarm when the czarevitch Dmitri was assassinated by order of Boris Godunoff, and therefore had its “ear torn away,” and was exiled to Siberia, stands close by. The palace of the governor, the administrative offices, the seminary where the historian of Siberia, Slovtsoff, received his education, the gymnasium where Mendeléeff the chemist was trained, and the Marie

school for girls, which now supplies Siberia with so many teachers, are in the upper part of the town, where broad grassy spaces separate the wide streets paved with thick planks. A monument to Yermak, the rebel Cossack who conquered Siberia, stands in a prominent place; and one of the sides of the large square on the crag is occupied by the immense prison, where more than 2000 exiles are gathered during the period of navigation. The lower part of the town stands on a sandy beach of the Irtish, and often suffers from floods. Its sanitary condition is very bad. The merchants of Tobolsk carry on a fairly brisk

trade in corn from the south, salt from Semipalatinsk, timber and fish from the lower Ob. The population is almost stationary (20,130 in 1883, as against 15,500 in 1839 and 15,200 in 1772). Some 12 miles to the south-east are the ruins of the “ fort of Kutchum,”—the seat of the capital of Siberia, Isker, before the Russian conquest.

Tobolsk was founded in 1587 by 500 Cossacks who left Tyumefi under Tchulkoff, and built a wooden fort at the mouth of the Old Tobot. During the next fifteen years several other forts were erected on the territory now occupied by Tobolsk. The Ostiaks and Samoyedes soon submitted to Russian rule, but the Tartars and Bashkirs made frequent raids, so that a line of forts had to be built in the 17th century from Orenburg to Ishim. In 1752 a new line of forts was erected some 150 miles farther south, and since that time Russian settlers have been able quietly to colonize the most fertile parts to the south of Tobolsk.

TOCQUEVILLE, Atexis Henri Crartes Cutret, ComTe DE (1805-1859), was born at Verneuil on July 29, 1805. His family on the father’s side were of good descent, and distinguished both in the law and in arms, while his mother was the granddaughter of Malesherbes. Alexis de Tocqueville was brought up for the bar, or, rather, according to the division of that profession in France, for the bench, and became an assistant magistrate in 1830. A year later he obtained from the Government of J uly a mission to examine prisons and penitentiaries in America, and proceeded thither with his lifelong friend Gustave de Beaumont. He returned in somewhat less than two years, and published a report on the subject of his mission, but the real result of his tour was the famous De la Démocratie en Amérique, which

appeared in 1835, and very soon made his reputation. It was at once caught up by influential members of the Liberal party in England, which country Tocqueville soon after visited, and where he married an Englishwoman. Returning to France, and beginning life as a country gentleman at Tocqueville, he thought to carry out the English ideal completely by standing for the chamber of deputies. But, with a scruple which illus- trated his character, he refused Government nomination from Molé, and was defeated. Later he was successful, and sat for several years both before and after the revolu- tion of February, becoming in 1849 vice-president of the assembly, and for a few months minister of foreign affairs. He was a warm supporter of the Roman expedition, but an equally warm opponent of Louis Napoleon, and after being one of the deputies who were arrested at the coup @état he retired from public life. Twenty years after his first, he produced another book, De l'Ancien Régime, which almost, if not quite, equalled its success. His health was never very strong, and in 1858 he broke a blood-vessel. He was ordered to the south, and, taking up his residence at Cannes, died there on the 16th of April 1859. Tle had published some minor pieces during his lifetime, and his complete works, including much un- published correspondence, were produced after his death in uniform shape by De Beaumont.

During the last twenty ycars of his life, and for perhaps half that time after his death, Toequeville had an inercasing European fame, which for the last ten or fifteen years has been stationary if not diminishing. Both phenomena are susceptible of explanation. Although he has been accused by some of his own countrymen of having "le style triste," his manner, which is partly imitated from Montesquieu, has considerable charm; and he was the first and has remained the chicf writer to put the orthodox liberal ideas which governed European politics during the first half or two- thirds of the 19th century into an orderly and attractive shape. He was, moreover, as has been said, much taken up by influen- tial persons in England,—Senior, John Stuart Mill, and others, — and he had the great advantage of writing absolutely the first book of reasoned politics on the facts of demoeratic government as observed in America. Besides all this he was, if not an entircly impartial writcr, neither a fanatical devotee of democracy nor a fanatical opponent of it. All this gave him a very great advantage

which he has not yet wholly lost. “At the same timc he had defects which were certain to make themselves felt as time went on, even

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without the altcration of the centre of liberal opinion which has taken place of late years. The chief of these was a certain weakness which can hardly be described in English by any word morc dig- nified than the familiar term “‘ priggishness.” His correspondence with Molé above alluded to is an instance of this, and it was also reflected on in various epigrams by countrymen and contemporaries ; one of these accuses him of having unluckily “ begun to think before he had begun to learn,” while another, with more real than apparent inconsistency, declares that he ‘‘avait l’air de savoir de toute éternité ce qwil venait d’apprendre.” His book on America, though undoubtedly a very remarkable piece of political deduction, has the drawback of proceeding on very insufficient premisses and of trying to be too systematic. His book on the Ancien Régime is also want- ing in solid information, and commits the great error of assuming rather than proving that the Revolution of 1789 was a proceed- ing of unmixed good, which delivered France from a state (not of unmixed evil, for Tocqueville was too careful a student to imagine that, but) of cvil exclusively caused by the existence of monarchical and aristocratic institutions. In fact, the fault of both books is that their author is not a practical politician, a fault which is constantly illustrated and exhibited in his correspondence. He appears both in reading history and in conducting actual political business (of which, as has been seen, he had some experience) to have been constantly surprised and disgusted that men and nations did not behave as he expected them to behave. This excess of the deductive spirit explains at once both the merits and the defects of his two great works, which will probably remain to some extent political classics, thongh they are less and less likely to be used as practical guides.

TODAS. See Niterr1 Hits, vol. xvii. p. 509.

TODLEBEN, or TorLesEn, EpuarpD Ivanovicx (1818- 1884), Russian general, was born at Mittau, in Courland, on May 20, 1818. His parents,

who seem to have been of German descent, were of the mercantile class, and he him- self was intended for commerce, but a strong instinct led him to seek the career of a military engineer. He entered the school of engineers at St Petersburg in 1835, and passed from that into the army in 1838. In 1847 and the two following years he was employed, as captain of engineers, in the campaigns against Schamyl in the Caucasus, where he directed the siege operations against the principal mountain fortresses. On the outbreak of war between Russia and the Porte in 1853, he was placed at the head of the staff of General Schilder-Schuldner, by whom Silistria was besieged. This general being wounded, Todleben acted in his place until the siege was raised. He was then transferred to the Crimea. Sebastopol, while strongly fortified toward the sea, was almost unprotected on the land side. Todleben, though still only of colonel's rank, became the animating genius of the defence. By his advice the fleet was sunk, in order to blockade the mouth of the harbour, and the de- ficiency of fortifications on the land side was made good before the allies could take advantage of it. The con- struction of earthworks and redoubts was carried on with extreme rapidity, and to these was transferred, in great part, the artillery that had belonged to the fleet. In what- ever direction the besiegers drew their lines, there Todleben met them with counterworks, until, with the arrival of heavy Russian reinforcements, the besiegers almost became the besieged. It was in these improvised operations by means of earthworks that Todleben's peculiar power and originality showed itself; he was not a great military leader in the wider sense, nor was he the creator of a great permanent system of defence like Vauban. But for the special problems of Russian warfare, both in 1854 and at a later epoch, he was exactly the man wanted. Until June 1855 he conducted the operations of defence at Sebastopol in person ; he was then wounded in the foot, and at the operations which immediately preceded the fall of the fortress he was not present. When he recovered from his wounds he was employed in strengthening the fortifications at the mouth of the Dnieper, and also those of Cronstadt. In 1856 he visited England, where his merits were well understood. In 1860 he was appointed assistant to the grand-duke Nicholas, and he became

subsequently chief of the department of engineers. For reasons which are not known he was given no command when war with Turkey began in 1877. It was not until the disasters before Plevna had heaped discredit upon the incompetent leaders of the Russian army that the soldier of Sebastopol was called to the front. Todleben saw that Plevna could not be taken by assault, and that it would be necessary to reduce it by drawing works round Osman Pasha, and cutting him off from communication with the other Turkish commanders. In due time Plevna fell. Todleben then undertook the siege of the Bulgarian for- tresses. After the conclusion of preliminaries of peace, he was placed in command of the whole Russian army, and became responsible for the government and administra- tion of the occupied districts. In the discharge of these duties he is said to have distinguished hiniself by his combined firmness and good temper in dealing both with Turkish authorities and with the native population. He received the highest military honours and commands when the war was over, and became governor of Odessa. But his health was broken; and after much suffering he died at a German watering-place in June 1884. He was buried with great solemnity at Sebastopol.

TODMORDEN, a market-town of England, partly in Lancashire but chiefly in the West Riding of Yorkshire, stands on the Calder, on the Rochdale Canal, and on the Lancashire and Yorkshire Railway, 13 miles west of Halifax, 9 north of Rochdale, and 2074 north-north-west of London. It lies in three valleys amidst scenery originally romantic, and still in part retaining that characteristic. The town- hall (1875) bridges the counties boundary, the Calder, enabling the magistrates to exercise jurisdiction in both counties. Of the other buildings, the Unitarian church, the market-hall, the free endowed school, and the Unita- rian free school may be mentioned. A bronze statue has been erected to John Fielden, to whose energy in develop- ing the cotton manufacture the town owes much of its prosperity. The staple industry is the spinning and weav- ing of cotton, and there are also foundries and machine- works. The population of the township of Todmorden and Walsden (area 7007 acres) in 1871 was 9333, and in 1881 it was 9237. In addition to this (situated wholly in Yorkshire), the urban sanitary district includes parts of Langfield and Stansfield in Yorkshire, and of Cliviger in Lancashire, the total area being 15,690 acres, with a population in 1871 of 21,764, and in 1881 of 23,862.

As early as the reign of Edward III. Todmorden was in the possession of the Radcliffes, a branch of the Radcliffes of Radcliffe Tower, but it was sold by them about the close of the 17th century. Todmorden Hall is an interesting old building of various dates.

TODY, Pennant's rendering (Gen. Burds, pp. 19, 61) through the French Zodier of Brisson (Ornithologie, iv. p. 528) of the somewhat obscure Latin word Todus,! not unhappily applied in 1756 by Patrick Browne (Civ. and Nat. Hist. Jamaica, p. 476) to a little bird remarkable for its slender legs and small feet, the "Green Sparrow" or (ee ee De ee

1 In Forcellini's Lexicon (ed. De Vit, 1875) we find "Todus genus parvissime avis tibias habeus perexiguas." Ducange in his Glossa- rium quotes from Festus, an ancient grammarian, "Toda est avis que non habet ossa in tibiis; quare semper est in motu, unde Todius (al. Todinus) dicitur ille qui velociter todet et movetur ad modum tode, et todere, moveri et tremere ad modum todx." The evidence that such a substantive as Todus or Toda existed seems to rest on the adjectival derivative found in a fragment of a lost play (Syrus) by Plautus, cited by this same Festus. It stands "cum extritis [ewtortis] talis, cum todillis [¢odinis] crusculis"; but the passage is held by scholars to be corrupt. Among naturalists Gesner in 1555 gave currency (Hist. Animalium, iii. p. 719) to the word as a substantive, and it is found in Levins's Manipulus Vocabulorum of 1570 (ed. Wheatley, 1867, col. 225) as the equivalent of the English " Titmouse." Ducange allows the existence of the adjective todinus. Stephanus suggests that ¢odi comes from ru7@oi, but his view is not accepted. The verb todere may perhaps be Englished to "toddle"!

"Green Humming-Bird" of Sloane (Voyage, ii. p. 306). The name, having been taken up by Brisson (loc. cit.) in 1760, was adopted by Linnzeus, and has since been recog- nized by ornithologists as that of a valid genus, though many species have been referred to it which are now known to have no affinity to the type, the Zodus viridis of Jamaica, and accordingly have since been removed from it. The genus Zodus was at one time placed among the Musci- capidex (cf. FiycaTcHER, vol. ix. p. 351); but Dr Murie's investigations (Proc. Zool. Society, 1872, pp. 664-689, pl. lv.) have

conclusively proved that it is not Passerine, and is nearly allied to the Momotide (af. Mormot, vol. xvii. p. 3) and Alcedinide (cf. KINGFISHER, vol. xiv. p. 81), though it should be regarded as forming a distinct Family Todidex, peculiar to the Greater Antilles, each of which islands has its own species, all of small size, the largest not exceeding four inches and a half in length.

Of the species already named, 7'. viridis, Mr Gosse (B. Jamaica, pp. 72-80) gives an interesting aceount, "Always conspicuous

from its bright grass-green coat and crimson-velvet gorget, it is still a very tame bird; yet this secms rather the tameness of

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Tody (Todus viridis). (After Gosse.) indifference than of confidence; it will allow a person to approach very near, and, if disturbed, alight on another twig a few yards distant . . . . commonly it is seen sitting patiently on a twig, with the head drawn in, the beak pointing upwards, the loose plumage puffed out, when it appears much larger than it is. It certainly has an air of stupidity when thus seen. But this abstraction js more apparent than real; if we watch it, we shall see that the odd- looking grey eyes are glancing hither and thither, and that ever and anon the bird sallies out upon a short feeble flight, snaps at something in the air, and returns to his twig to swallow it." Mr Gosse goes on to describe the engaging habits of one that he for a short time kept in captivity, which, when turned into a room, immediately began catching all the insccts it could, at the rate of about one a minute. The birds of this Family also shew their affinity to the Kingfishers, Motmots, and Bee-caters by burrowing holes in the ground! in which to make their nest, and therein laying eggs with a white translucent shell. The sexes differ little in plumage.

All the four species of Z’odus, as now restricted, present a general similarity of appearance, and, it may be pre- sumed, possess very similar habits. The genus has been monographed by Mr Sharpe (Jbis, 1874, pp. 344-355) ; but he was unfortunately misled by an exceptionally bright- eee Se et oe ee oe ee

1 This habit and their green colour has given them the French name of Perroquet or Todier de terre, by which they have been distinguished from other species wrongly assigned to the genus by some systematists 3 and, if we may believe certain French travellers, they must in former

days have inhabited some of the Lesser Antilles; but that is hardly probable.

coloured specimen to add a fifth and bad species to those that exist —and even these, by some ornithologists, might be regarded as geographical races. The Cuban form is T. multicolor; that of Hispaniola is 7. subulatus or domi- nicensis; and that of Porto Rico, originally named in error 7’. mexicanus, has since been called hypochondriacus. Apart from their structural peculiarities, one of the chief points of interest attaching to the Z’odidz is their limitation, not only to the Antillean Sub-region, but, as is now believed, to its greater islands. (A. N.)

TOGA. See Costume, vol. vi. p. 456.

TOGO-LAND, one of the portions of the African con- tinent under the protection of the German empire. It forms part of the territory on the west coast formerly dis- tinguished as the Slave Coast, and is bounded on the E. by Little Popo, on the 8,W. by the British Gold Coast Colony, and on the N.W. by the still independent territory of the Anlo tribes. The coast-line is only 22 miles in length, and with an area of about 500 square miles Togo-land is estimated to have a population of 40,000 souls. The great physical feature of the country is the Togo, Hakko, or Avon lagoon, which is cut off from the ocean by the narrow belt of sandy soil on which are situated Bagida, Porto Seguro, and Bay. The town of Togo lies on the east side of the Togo lagoon, where it extends eastward to Little Popo Lake. The lagoon

is fed by a stream from the north, the Haho or Hakko, first discovered by John Duncan in 1846.

See Hugo Zoller, Togoland; Petermann's Mittheilungen (1886) ; and Scott. Geogr. Mag. (1886), all of which give maps.

TOKAT, a decayed provincial town of Turkey, in the vilayet of Sivas, and capital of the upper basin of the Iris (Yeschil Irmak), is a poorly-built place of about 10,000 inhabitants, in a hot, narrow valley, dominated by the ruins of a Byzantine castle, and surrounded by gardens watered by the Iris. It was once an important commercial station, and has still copper foundries. Six miles up the valley are the ruins of the Pontic Comana (g.v.).

TOKAY, or Toxas, a small town in the county of Zemplén, in the north-east of Hungary, at the influx of the Bodrog into the Tisza, in 48° 7' N. lat., 21° 4' E. long. The slopes of the adjacent mountains of Hegyallya, which are of volcanic origin, produce excellent wine, several kinds of which are of perhaps the best, sweetest, and strongest quality in the world. Of these, however, none or hardly any come into the market, the wine usually sold under the name of Tokay not being a natural wine, and often not coming from the district at all. Tokay, along with about twenty-five neighbouring villages, pro- duces annually an average of 2,200,000 gallons. The vine culture has been greatly improved of late years by a company in Budapest. The timber trade, fishing, and export of fruits are also considerable. The population was 4479 in 1880.

TOKIO, formerly called YEpo, the present capital of the empire of Japan, is situated in 35° 41' N. lat. and 139° 46' E. long., at the head of the bay of the same name, on the south-east coast of Hondo (mainland), the largest of the group of Japanese islands. It is connected with the seaport of Yokohama by a railway 18 miles in length. The bay of Tokio is shallow, and therefore not well suited for the navigation of large vessels. The wide river Sumida, also called Okawa ("great river") near its mouth, runs through the town. For administrative pur- poses Tokio proper is divided into fifteen kw (districts), of which thirteen lie to the west and two to the east of the Sumida. Each ku is presided over by an official appointed by the Government, called the ku-chio (chief of the ku), and an assembly (Ku-Kwai) for local administrative purposes is elected every four years by the inhabitants. These ku and

six gun (suburban districts) collectively form the Tokio-Fu, and are under the general superintendence of the fu-chaji (governor). Matters affecting the interests of the whole fu are discussed by an assembly (Fu-K wai) composed of repre- sentatives from all the kuand gun. Order is maintained by a well-organized body of police (3648 men in 1885) under the command of a keishisokan (chief commissioner), who, like the fu-chiji, is responsible to the central Government. Since the establishment of this system crime has very materially decreased. There is also a fire brigade of 2000 men, which is connected with the police system, and renders effective service in checking the spread of the fires to which the town is peculiarly liable. Buildings of brick and stone have lately been erected in many parts of the town. The fifteen ku which form Tokio proper cover an area of 4°01 square ri, and the six gun 27°94 square ri, the whole fu thus extending to about 32 square ri (about 190 square miles). The greater part of the town is flat, particularly near the Sumida, and is intersected by numerous moats and canals, which, with the bridges cross- ing them, form a distinctive feature. There are hills vary- ing in height from 50 to 100 feet in the six districts of

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Environs of Tokio.

Hongo, Koishikawa, Ushigome, Yotsuya, Akasaka, Azabu, and in part of Shiba. The numerous residences of the old daimios were the chief characteristics of the town, especi- ally in the Kéjimachi-ku. Many of these have been de- molished and Government offices erected on their sites ;

some have given place to new streets and houses ; others, having survived the downfall of the shogunate, still remain surrounded by large gardens, which are celebrated for their elaborate rock-work, artificial lakes, and magnificent trees. Nearly in the centre of the Kéjimachi-ku, on an eminence, surrounded by moats, stood the residence of the shoguns, which was burnt down in 1872. An imperial palace is now in course of construction on this site. Outer moats connected with those already mentioned enclose the whole K6jimachi-ku and a greater portion of Kanda-ku; one of the moats terminates at the Sumida. The Nihonbashi, Kiobashi, and Kanda-ku, through which the O-dori (main street) passes, are the business quarters of the town. The Nihonbashi (Bridge of Japan), in the ku of the same name, also in the O-dori, is the centre from which all distances are calculated. Nearly all the principal buildings of the city—such as the Gwaimushé (Foreign Office), the Nai- inushé (Home Office), the Okurashé (Ministry of Finance), the Monbushé (Ministry of Education), and other Govern- ment offices, &c.—are situated in those four ku. Among the parks, those of Shiba and Uyeno rank first in size and beauty, the latter containing a large sheet of water. In

1868, when the imperial army entered the city, a body of men called the shogitai, loyal to the cause of Tokugawa, here made a last stand, and during the fighting the mag- nificent temple of Téyesau, on the hills of Uyeno, was burnt down. This park, as also the Mukojima (the em- bankment of the Sumida), and the Asukayama park, which is at some distance north-west of Uyeno, are celebrated for their sakura trees (species of cherry), which, when in full bloom, attract crowds of all classes. The famous temple of Kwannon (goddess of mercy) is in the Asakusa park, in which a continual fair is held, with the usual ac- companiments of booths, shows, tea-houses, &c. The dis- tricts of Fukagawa and Honjé lie on the east bank of the river, and are connected with the rest of the town by five wooden bridges of considerable length; they are inter- sected by numerous canals, and the streets there are regu- larly laid out. The means of communication are imperfect ; the streets of Tokio are in general irregular, and many are so narrow that they are unsuitable for carriages. The jinrvkisha, a kind of chaise drawn by one or in some cases by two or more men, supplies their

place to a great extent. The introduction of tramways in some parts of the town has had the good effect of diminishing the number of second-rate carriages drawn by miserable horses.

There are no reliable data as to the population of Yedo during the shogunate (see below). Owing to the influx caused by the periodical visits of the daimios with their numerous attendants, it probably exceeded one million during the early part of the present century. At the abolition of the shogunate there was a marked decrease, but the returns of recent years (1,121,560 in 1881; 1,173,603 in 1883; 1,300,073 in 1885) indicate a rapid increase. Of the 1,519,781 who constituted the popula- tion in 1886, 1,211,357 are to be classed as belonging to the town proper, and 308,424 to the six suburban districts. The sanitary condition of the city leaves much to be desired, but extensive improvements are now being carried out. The general health, however, is good, and the enforcement of vaccination has virtually stamped out the scourge of small-pox. The deaths from cholera are occasionally very numerous, especially among the lower classes.

A well-organized system of education exists, under the supervision of the ministry of education. In 1885 there were in the Tokio-Fu 658 public and private elementary schools, with 1563 teachers,—the cost of maintaining public schools being 145,152 yen (Japanese dollars). In the same year the boys and girls of school age numbered 172,653, of whom 77,001 attended schools recognized by the Government. Kindergartens on the European system have been introduced. There are also the shihangakko (normal schools), the chugakko (middle schools), and schools, both Government and private, for special branches. In the district of Hongo is the imperial university, sub- divided into the four branches of law, science, medicine, and literature. Many of the students attain a high degree of proficiency.

No mention is made of Tokio in Japanese history before the end of the 12th century. It appears to have assumed no importance till about 1457, when Ota Dokwan, a general in the service of Uyesugi Sadamasa, governor of Kamakura, bnilt a castle there. About thirty years later the town fell into the hands of H6jé of Odawara, and subsequently, on his overthrow by Hideyoshi and Iyeyasu, the castle was granted to the latter, who was the founder of the shogun house of Tokugawa. In 1590 Iyeyasu made his

formal entry into the castle of Yedo, the extent of which he greatly enlarged. From this date the real importance of Yedo commenced. The family of the Tokugawas furnished the shoguns (or tycoons) of Japan for nearly three hundred years, and these resided during that period at Yedo. Under them the town was vastly extended, land was reclaimed from the bay, canals were constructed, and a water supply introduced. The shoguns compelled the daimios (feudal lords) to reside at Yedo with their numerous retinues dur-

ing a considerable portion of their lives, and thus the prosperity of the town rapidly increased. At the restoration of the supreme authority of the emperor in 1868 the shogunate was abolished, and the population of Yedo specdily decreased. A fresh vitality was again imparted by the transfer of the court from Kioto, and the town then received its present name Tokio (eastern capital). It has since been the seat of the imperial Government, and may be considered the centre of the political, commercial, and literary activity of Japan. It is the channel through which the stream of European civilization pours into the country, and all recent pro- gress has there taken its rise. (R. 8S. L.)

TOLAND, Joun (1670-1722), or Janus Junius, as his sponsors are said to have named him, usually described as a chief leader of the English deists, was born November 30, 1670 or 1671, in the north of Ireland, near Londonderry. He was the son, perhaps illegiti- mate, of Catholic parents, and was brought up in their faith. But in his fifteenth year he became a zealous Protestant, and in 1687 he passed from the school at Redcastle to Glasgow university, recommended by the magistrates of Redcastle “for his affection to the Protest- ant religion.” Thus early in life he became “ accustomed to examination and inquiry, and was taught not to cap- tivate his understanding to any man or society.” After three years at Glasgow he entered the university of Edin- burgh, taking his M.A. degree there June 30, 1690. He then spent a short time in some Protestant families in England, and with their assistance went to Leyden univer- sity, to qualify him for entering the Dissenting ministry. He spent about two years in Leyden, studying ecclesi- astical history especially under the famous scholar Fred-

erick Spanheim. At the expiration of that time he took up his abode, January 7, 1694, at Oxford, having good introductions to Creech, Mill, and others. Here he made large use of the Bodleian Library, and soon acquired the reputation of being "'a man of fine parts, of great learn- ing, and of little religion," though there is no evidence to show that the last distinction was justly his due. His letters show that he then claimed to be a decided Christian, and that he was too orthodox to be classed with the Arians or the Socinians. At the same time the characteristic freedom and originality of his mind were displayed by his anticipation of subsequent doubts of the integrity of the book of Job, and the separation of the historical prologue and the speeches of Elihu from the original poem. While at Oxford he commenced the book which called him into notoriety, and became one of the standard " deistical writings"—his Christianity not Mys- terious.1 The book gave great offence, and several replies to it were immediately published. The author was pro- secuted by the grand jury of Middlesex the year of its publication ; and, when he attempted to settle in Dublin at the beginning of 1697, he was greeted with dangerous denunciations from the pulpits and elsewhere. He was soon prosecuted before the court of King's Bench, and on September 9th his book was condemned by the Irish parliament to be burned and its author to be arrested. He escaped the latter part of the sentence by flight to England. The title and the philosophical principles of Toland's book were singularly akin to those of Locke's famous work, Zhe Reasonableness of Christianity, pub- lished the year before ; and Locke's opponents seized the opportunity of fathering upon the philosopher the doc- trines of his more heterodox and less guarded disciple. Thus Toland's work became the occasion of the celebrated controversy between Stillingfleet and Locke, in which Locke takes pains to show the difference between his posi- tion and Toland's. Toland's next work of importance was

1 The first edition, London, 1696, was anonymous; the second, published the same year, bore on the title-page his name, and received a preface and some slight alterations ; and the third appeared in 1702 with an appended Apology for Mr Toland.

his Life of Milton (1698), in which, in connexion with his exposure of the fictitious authorship of the Hzkon Basilike, he found occasion to make reflexions on “the numerous supposititious pieces under the name of Christ and His apostles and other great persons.” This provoked the charge that he had called in question the genuineness of the New Testament writings, and he replied in his Amyntor, or a Defence of Milton’s Life (1699), to which he added a remarkable list of what are now called apocryphal New Testament writings. In his remarks he really opened up the great question of the history of the canon, towards the examination of which Stephen Nye, Jeremiah Jones, and Nathanael Lardner made in reply to him the first valu- able contributions. The next year his Amyntor and Chris- tianity not Mysterious were under discussion in both Houses of Convocation, and the Upper House declined to proceed against the author. In 1701 Toland spent a few weeks at Hanover as secretary to the embassy of the earl of Macclesfield, and was received with favour by the electress Sophia in acknowledgment of his book Anglia Libera, a defence of the Hanoverian succession. On his return from the Continent he published a defence of himself, and of the bishops for not prosecuting him, Vindicius Liberius (1702), and several political pamphlets. The next year he visited Hanover and Berlin, and was again graciously received by the electress and her daughter Sophia Char- lotte, queen of Prussia. On his return to England (1704) he published Letters to Serena, and afterwards acknowledged that the queen of Prussia was intended by the pseudonym. In these letters he anticipated some of the speculations of modern materialism, The next year appeared his Account of Prussia and Hanover, of which Carlyle has made use in his Life of Frederick the Great. From 1707 to 1710 he is again on the Continent,—at Berlin, Hanover, Diissel- dorf, Vienna, Prague, and The Hague, with very varying fortunes, but generally of an adverse character. In 1709 he published Adetsidemon and Origines Judaice (The Hague), in which, amongst other things, he maintained that the Jews were originally Egyptians, and that the true Mosaic institutions perished with Moses. This work pro- voked a number of replies from Continental theologians. In 1710 he returned to England, living chiefly in London and latterly at Putney, loving the country and his books, and subsisting precariously upon the earnings of his pen and the benevolence of his patrons. His literary projects were numerous (see the incomplete list in Mosheim); and the nobler traits of his warm Irish nature appear in his projected history of the ancient Celtic

religion and his chivalrous advocacy of the naturalization of the Jews. The last of his theological works were Nazarenus, or Jewish, Gentile, and Mahometan Christianity (1718), and Tetra- dymus (1720), a collection of essays on various subjects, in the first of which, ‘‘ Hodegus,” he set the example subsequently followed by Reimarus and the rationalistic school in Germany, of interpreting the Old Testament miracles by the naturalistic method, maintaining, for in- stance, that the pillar of cloud and of fire of Exodus was a transported signal-fire. His last and most offensive book was his Pantheisticon (Cosmopoli, 1720). He died May 11, 1722, as he had lived, in great poverty, in the midst of his books, with his pen in his hand, and left behind him a characteristic Latin epitaph, in which he could justly claim to have been “veritatis propugnator, libertatis assertor.”

Toland is generally classed with the deists, but at the time when he wrote his first book, Christianity not Mysterious, he was decidedly opposed to deism, nor does Leland deal with that work as an exposition of deistical views. The design of the work was to show, by an appeal mainly to the tribunal of Scripture, that there are no facts or doctrines of the ‘‘ gospel,” or ‘“‘the Scriptures,” or ‘Christian revelation” which, when revealed, are not perfectly

plain, intelligible, and reasonable, being neither contrary to reason nor incomprehensible to it. The work undoubtedly aimed a blow at some of the dogmas of later Christian times, but it claimed to be “a vindication of God’s revealed will against the most unjust imputations” which occasioned ‘‘so many deists and atheists.” Toland’s line of argument is to show that the supposition of the doctrines of the gospel being repugnant to clear and distinct ideas and common notions leads into absurdities and inevitable scep- ticism; that the proof of the Divinity of Scripture is its self-evidencing power; that, though men are dependent on Divine revelation for the knowledge of the most important truths, the truths must themselves be plain and intelligible when revealed ; that all the doctrines, precepts, and miracles of the New Testament are perfectly intelligible and plain; that, though reason is dis- ordered in the case of many men, the disorder is not in the faculty itself but in the use made of it; that in the New Testament

“mystery” never means anything inconceivable in itself, but things naturally intelligible enough, which are either so veiled by figurative words or rites, or so lodged in God’s sole knowledge and decree, that they could not be discerned without special revela- tion; that no miracle of the gospel is contrary to reason, for they were all produced according to the laws of nature, though above its ordinary operations, which were therefore supernaturally assisted ; that mysteries were first introduced into Christianity by the early admission into the church of Levitical ceremonics and heathen rites and mysteries, and especially by mixing up heathen philo- sophy with the simple religion of Christ. The work was intended to be the first of three discourses, in the second of which he was to attempt a particular and rational explanation of the reputed mysteries of the gospel, and in the third a demonstration of the verity of Divine revelation against atheists and all encmies of re- vealed religion, But, like so mauy other of his numerous projects, this failed of execution. After his Christianity not Mysterious and his Amyntor, Toland’s Nazarenus was of chief importance, as calling attention to the right of the Ebionites to a place in the early church, thongh it altogether failed to establish his main argument or to put the question in the true light. His Pantheis- ticon, sive Formula celebrandx Sodalitatis Socratice, of which he printed a few copies for private circulation only, gave great offence as a sort of liturgic service made up of passages from heathen authors, in imitation of the Church of England liturgy. The title also was in those days alarming, and still more so the mystery which the author threw round the question how far such societies of pantheists actually existed. Poor Toland had been outlawed by the churches of his day, and took a most imprudent delight in alarming and mystifying his persecutors. This and all his later works must be read from the point of view first suggested by Herder: ‘‘ Who can refuse to see in Toland the man of wide reading and of clear intellect, and the earnest inquirer, although, as em- bittered by persecutions, with every fresh book he dipped his pen in a more biting acid?”

See Mosheim’s Vindicia# Antique Christianorum Discipline, 1st ed., 1720, 2d ed., 1722 (the life of Toland prefixed to the 2d edition of this essay gives still the best and most learned account we have of his life and writings); ‘‘ Memoirs of the Life and Writings of Mr John Toland,” by Des Maizeaux, prefixed to The Miscellaneous Works of Mr John Toland, in 2 vols.,

London, 1747; Leland’s View of the Principal Deistical Writers; Herder’’s Adrastea; Lechler’s Geschichte des englischen Detsmus ; Isaae Disraeli’s Calamities of Authors; Theological Review, November 1864; Hunt’s article in Contemporary Review, vol. viii., and his Reli- gious Thought in England; Leslie Stephen’s History of English Thought in High- teenth Century; Cairns’s Cunningham Lectures for 1880, On Toland’s relation to the subsequent Tiibingen school, as presented in his Wazarenus, see Theological

Review, Oct., 1877; and on his relation to materialism, F, A. Lange’s Geschichte des Materialismus. (J. F. S.)

TOLEDO, a province of Spain, in New Castile, is bounded on the N. by Avila and Madrid, on the KE, by Cuenca, on the S. by Ciudad Real, and on the W. by Caceres, and has an area of 5620 square miles. The surface is throughout lofty, and in a great part of its extent mountainous. ‘Towards the centre, indeed, there are extensive plains or tablelands, but the whole of the south and east is occupied by the Montes de Toledo, which separate the waters of the Tagus on the north from those of the Guadiana on the south. These mountains are of no great height; and they were once densely covered with forests, whicll have now been almost entirely cut down, although there are still woods and groves of considerable extent on their lower slopes. Branches of this chain enclose the province on the east and west, and part of the range that stretches north of the Tagus approaches its north-western frontier. Toledo is well watered by the Tagus and its affluents, —the Tajuna, Jarama, Guadar- rama, Alberche, and Tietar on the north, and the Algodor, Torcon, Pusa, Sangrera, and Cedron on the south, The

Guadiana forms for a short distance the south-western frontier, and its tributary the Giguela waters the eastern part of the province. The country is rich in minerals, as yet almost entirely unworked, containing veins of gold, silver, lead, iron, quicksilver, copper, and tin. Coal, alum, cinnabar, &c., are also found. The soil produces corn, pulse, potatoes, oil, wine, flax, oranges, lemons, chestnuts, and melons in fair abundance, but the trade in agricultural products is almost confined to the province itself. The number of sheep and goats is few, of horses and mules still less; while the only oxen

are those used in agri- culture. Bees and silkworms are kept in considerable number. Manufactures once flourished, but are now in a very low state,— silk and woollen cloth, earthenware, soap, oil, chocolates, wine, rough spirit (aguardzente), guitar strings, and arms being almost the only articles made. The province is traversed by three lines of railway,— that of Madrid-Seville-Cadiz in the east, Madrid-Toledo- Ciudad Real through the centre, and Madrid-Caceres- Lisbon in the north. There are 12 partidos judiciales and 206 ayuntamientos; and three senators with eight deputies are returned to the cortes. The total population in 1885 was 332,000; the only towns with a population exceeding 10,000 are Toledo (20,251) and Talavera de la Reina (11,986). Some of the most brilliant fighting of the Peninsular War took place in Toledo and the neigh- bouring province of Caceres, the battle of Talavera de la Reina being fought on the 27th and 28th of July 1809. TOLEDO, the capital of the above province, and once of the whole of Spain, stands upon a circle of seven hills, 2400 feet above the sea, and washed on three sides by the Tagus. It is 37 miles west-south-west of Madrid. The river is spanned by two fine stone bridges,—the Alcantara, a Moorish bridge of a single arch, giving entrance to the city from the east, and the other, that of San Martin, from the west, while between them the river makes a sweep southwards. The place is enclosed on the land side by two walls, still in fairly perfect condition,—the inner one being built by King Wamba in the 7th century, the outer by Alfonso VI. in 1109. The gates are numerous and well preserved, the most noteworthy being the famous Puerta del Sol, the Puerta Visagra, and the Cambron. Some Roman remains (a circus, é&c.) lie without the walls, on the plain to the north-west. The appearance of Toledo from a distance is imposing in the extreme, from its noble situation and the terraced lines of its buildings; but upon a nearer approach it reveals itself as dull and decayed enough, with little or no traffic in the streets, and a strange silence brooding over all its ways, The houses are large, massive, and gloomy, generally Moorish in style, of the 12th, 13th, and 14th centuries, with a great central patio (courtyard), and yielding abundant traces of Arabic decoration. The principal public square is the Zocodover. It forms the favourite promenade, and from it the one fairly wide street of the city leads to the cathedral. The latter is the glory of Toledo, and one of the finest monuments of art in Spain. Built upon the site of an ancient mosque, and commenced in 1227, it was completed in 1492 ; and, though sacked over and over again,—finally by the French under La

Houssaye in 1808,—it is still, with the excep- tion, perhaps, of the cathedral of Seville, the richest and most magnificent foundation in the Peninsula. The ex- terior is unfortunately hidden to a great extent by mean surrounding buildings, but the fine western facade, with its two towers, one rising 325 feet, is effective. The interior is somewhat dwarfed in appearance by the immense width. It is 404 feet long by 204 feet broad, and is divided by 84 pillars into five naves, with central lantern and choir, and a complete series of side chapels. Most of these latter are late additions, of the 15th and 16th

centuries, and are very magnificent in detail. The 16th- century stained-glass windows, chiefly of Flemish work, are superb ; and the treasury, reliquaries, and library, not- withstanding their repeated despoilings, are not unworthy of the see which styles itself the “first of all the Spains.” In the Muzarabic chapel the ritual known by that name is still performed daily. Within the precincts of the cathedral are interred the archbishops and cardinals Tenorio, Fonseca, Mendoza, Ximenez, the great constable Alvaro de Luna, and a long array of kings and heroes. The archbishop is primate of Spain, and has for suffragans Coria, Cuenca, Siguenza, and Palencia. Besides the cathedral Toledo still possesses a great number of fine churches and other religious buildings, together with numerous Moorish and Jewish monuments. The most important church is the 15th-century florid Gothic San Juan de los Reyes, built by Ferdinand and Isabella. The best Moorish work is to be found in the old Jewish synagogues of Santa Maria la Blanca and El Transito, in the mosques of Cristo de la Luz and Las Tornerias, in some private houses, and in the later churches of San Roman, Santo Tomé, Santiago, and Santa Leocadia. The patio and staircase of the hospital of Santa Cruz pre- sent some of the finest Renaissance work extant. Seen from afar, the Alcazar, or royal palace, is one of the most conspicuous features of the city. It stands upon a com- manding position overlooking the Tagus, and was origin- ally built by King Wamba, but has been repeatedly altered and pulled about. It was almost entirely rebuilt by Charles V. and Philip IL, under the architects Covarrubias and Herrera, and has lately been converted into a huge military academy. The city is provided with numerous elementary schools, a public library, museum, town-hall, and several large hospitals. The well-known manufactory of swords is about a mile to the

north-west, beyond the Cambron gate. It is in excellent order, and produces blades as perfect as ever, but is no longer of great im- portance, employing only about 120 hands.

Toledo existed in the time of the Romans, who conquered it in 193 B.c. They strengthened the fortifications, and built an aqueduct to supply the place with water. By the Goths, who captured the city in 467 a.p., these works were kept up and improved ; and, under the Moorish domination, from 714 to 1085, Toledo was second only to Cordova in rank and importance, with a population of 200,000 souls. Alfonso VI. of Castile and Leon recovered the stronghold in 1085; and under him and his succes- sors it continued to flourish until the permanent establishment of the court at Madrid gave a deathblow to its prosperity. The population now is no more than 20,000.

TOLEDO, a city of the United States, the county seat of Lucas county, Ohio, is situated in 41° 40’ N. lat. and 83° 33’ W. long., chiefly upon a peninsula between the Maumee on the south and the Ottawa upon the north, just above their points of discharge into Maumee Bay, and 5 miles from Lake Erie. A small part of it, for- merly known as Maumee City, lies south of the Maumee. Toledo includes an area of 21°5 square miles within its corporate limits. The bay and river form an excellent harbour and roadstead. The harbour is easily made and is well sheltered, and the bottom affords good holding ground. Besides being open to the navigation of the Great Lakes, Toledo is the terminus of the Miami and Erie Canal, connecting it with Cincinnati (184 miles distant). Seventeen railroad lines enter it, making it one of the principal railroad centres of the country. The site of Toledo and the surrounding country are very level, and only slightly elevated above Lake Erie. The soil is very productive, and is highly cultivated, being largely devoted to market gardening. There are three public parks, having a total area of 41 acres. The city is well sewered. Water is obtained by pumping. The city, which is divided into eight wards, had in 1880 a population of

50,137. The number is probably now (1887) not far from 65,000. In 1840, 1850, 1860, and 1870 respect- ively the population was returned at 1224, 3829, 13,768, and 31,584.

Besides its large commercial interests, as one of the principal ports upon the Great Lakes, and its importance as one of the leading railroad centres of the country, Toledo holds high rank as a manu- facturing city. The capital invested in this class of industries in 1880 exceeded $5,500,000, and the products were valued at double this sum. They employed nearly 7000 persons, and paid in wages over two and a quarter millions of dollars. These industries are very varicd in character, but consist largely in lumber manufactures, brewing, and iron and stccl manufactures.

The first settlement within what are now the corporate limits of Toledo was made, shortly after the war of 1812, upon the south bank of the Maumee. North of the river no settlements were attempted until 1832, when the villages of Port Lawrence and Vistula were commenced in what is now the heart of the city. In the following year they were united under the present name. The city was incorporated in 1837. In 1852 it was made the county seat, and in 1874 its corporate limits were considerably enlarged.

TOLL is a sum of money paid for the use and enjoy- ment of a privilege. In England it is now always or almost always a sum of money; but formerly tolls in kind were not unknown. An instance is afforded by the Act of 36 Geo. III. c. 85, substituting a money payment for tolls of corn in kind taken by millers, with an exception in favour of tolls taken by custom in soke mills. Such customary tolls, if any such now exist, are apparently the only examples remaining of tolls in kind. The Weights and Measures Act, 1878, enacts that all tolls are to be charged and collected according to imperial weights and measures.

The word toll, in its earliest use, appears to have signified a franchise enjoyed by lords of manors, and is defined by Glanvill as the liberty of buying and selling in one’s own land: ‘tol, quod nos vocamus theloneum, scilicet libertatem emendi et vendendi in terra sua.” The word then became used to denote duties payable to the crown, especially on wool, generally with an inseparable epithet indicative of unpopularity. It thus took the form of “maletote” or ‘‘malum tolnetum,’’! against which many early statutcs

were directed, from the Magna Carta of John till the final abandonment of the duty by Edward III. In modern English law toll is either an incident of a FRANCHISE (q.v.), as of a market or fair, or is independent of franchise. In the latter case it is claimed by prescription, as toll traverse or toll thorough, or is created by Act of Parliament, as in the case of turnpikes, railways, harbours, navigable rivers, and canals. Toll traverse is paid for passing over a private way, bridge, or ferry. No consideration need be proved. Toll thorough is paid for the use of a highway. In this case, if charged by a private person, some consideration, such as repair of the highway, must be shown, as such a toll is against common right. In one case, that of the Cornish custom of tin-bounding, the right to tin tolls may depend upon custom. At common law a toll must be reasonable. The same principle appears in various Acts of Parliament. The Statute of Westminster the First, 8 Edw. I. c. 31, inflicts a penalty for taking excessive toll. The Railway Clauses Consolidation Act, 1845, and most special Acts of railway companies provide, by what are known as “the Shaftesbury clauses,” for the equality of tolls, that is, that all persons and classes of goods shall under like circumstances be treated alike as to charges. A right of distress is incident to the right to impose tolls, but the distress cannot be sold unless an Act of Parliament expressly authorizes the sale. Tolls are rateable for the relief of the poor where they are appurtenant to land, but not where they are extrinsic profits not arising from the possession of land. Exemption from tolls may be claimed by the prerogative, by grant or prescription, or by Act of Parliament. The king pays no toll, and may grant to another exemption from toll. The exemptions by Act of Parliament mainly affect persons in the public service, clergy on their parochial duty, and persons going to or returning from their usual place of religious worship. Most of the exceptions from turnpike tolls will be found in 3 Geo. IV. ce. 126. Turnpike tolls, bridge money, and causeway niail were abolished in Scotland by the Roads and Bridges Act, 1878, as from the Ist June 1888. In England there has been no such general abolition, but the abolition of tolls has been facilitated by several recent Turnpike Acts, and their entire disappearance is only a question of time.

In the United States tolls are a subject for State legislation,

1 The same term was known in medieval Italy. Dante, in /nferno, xi. 36, alludes to “ tollette dannose.”’

except in a few instances in which Acts of Congress have dealt with tolls in rivers and harbours (see Reviscd Statutes, tit.]xiii.).

The question of tolls was at one time an important one in international law. Tolls were cxacted on certain straits and tidal rivers by virtue of the sovereignty of a particular state. Such tolls have mostly ceased or been redeemed. Notable instances were the Scheldt tolls and the Sound dues levied by Denmark. See NavicaTion LAws.

TOLUCA, or Totoccan, a city of Mexico, the capital of the state of Mexico, on the Mexican National Railway, 45 miles south-west from the federal capital. It lies on the west side of the Anahuac tableland, at the foot of Mount San Miguel de Tutucuitlalpillo, at an elevation of 8653 feet above the sea, being the highest town in the republic next to the mining station of Ameca-meca (which is 8800 feet). Toluca had in 1886 a population of about 12,000, and is usually described as a well-built flourishing town, with fine buildings and clean well-drained streets. But T. M. Brocklehurst, who visited it in 1880, gives an un- favourable impression of the place, which presented nothing attractive beyond the Portales, a fine arcade running round a large block of central buildings, with a number of good shops under the arches (Mexico To-day, p. 222). There is also a good theatre, and in the Plaza de los Martires a well-executed white marble monument to the patriot Miguel Hidalgo y Costilla. But the Carmen, Vera Cruz, and one or two other churches are dirty and tawdry, with- out presenting any striking architectural features. The city is traversed by a foul stream flowing at the bottom of a barranca or deep ravine, along whose banks are herded numerous swine in a half-wild state, which supply the hams and sausages for which the place is noted. Here also soap and wax candles are manufactured and supplied to the surrounding districts. In the south-west the Nevado de Toluca, an extinct snow-clad volcano with a flooded crater, rises to a height of 15,156 feet above sea-level.

Although Toluca appears to have been one of the earliest Toltec settlements in Anahuac, its foundation dating probably from the 6th century, it has preserved no remains of its ancient grandeur, nor have any monuments been discovered in the district in any way comparable to those of Cholula, Tula, Teotihuacan, and other ancient centres of Toltec culture. Aecording to M. Charnay, Toluca formed one of the chief starting points of the great migrations which, after the overthrow of the Toltec empire by the Chichimec irruption in the 11th century, moved in two parallel streams south- wards, converging at Copan and spreading their arts and industries over Chiapas, Yucatan, and Guatemala (Ancient Cities of the New World, 1887, p. 125).

TOMATO. See HorticuLTurs, vol. xii. p. 288.

TOMPA, Mrmdty (= Micaaer) (1817-1868), one of the best and tenderest Hungarian lyric poets, was born in 1817 at Rima-Szombat, in the county of Gémor, of very humble parentage, his father being village bootmaker. He studied law and theology in Saros-Patak, and subse- quently at Budapest ; but, feeling little inclination for the first-mentioned career, after many vicissitudes he, at the age of thirty, accepted the post of Protestant minister in Beje, a small village in his native county, whence, in two years, he removed to Kelemér, and four years later to Hanva, in the county of Borsod, where he remained till his death in 1868.

At the age of four-and-twenty Tompa published his first poems in the Athenxwm, which soon procured for him a high reputation. His first volume, Népregék és Népmonddk (‘‘Folk-Legends and Folk-Tales”), in 1846, met with great success, and the same may be said of the first volume of his ‘“‘ Poems” in 1847. In 1848 he took part in the war of independenee, acting as field ehaplain to the volunteers of his eounty and seeing several battles; but the unfortunate close of that heroic struggle sileneed his poetic vein for a considerable time, and, when in 1852 and 1853 he gave vent to his patriotic grief in some masterly allegories on the state of oppressed Hungary, he was twice arrested by the Austrian authori- ties. After being released he published his Virdgregék (‘‘ Legends of Flowers”), a collection of poems of the highest order, showing great imagination and love of nature, and displaying the loftiest

humanity and great meditative power. Soon after this he became oppressed with nielancholy and abandoned this braneh of poetry. Indeed from this time he produced comparatively little. He pub- lished three volumes of sermons, ‘‘ which,” says his biographer, Charles Szisz, Protestant bishop of Budapest, “are among the best in Hungarian literature, and will favourably compare with those of Robertson, Monod, or Parker.” His colleeted poetieal works, in six volumes, were published at Budapest in 1870, and again, in four volumes, in 1885.

TOMSK, a government of Western Siberia, extending from the Chinese frontier to 60° N. lat., is bounded by Tobolsk on the N.W., by Yeniseisk on the N.E., by the Chinese province of Khobdo on the 8.E., and by Semi-palatinsk on the 8.W. Its area, 329,040 square miles, is fully one and a half times that of France. The surface is most varied, including in the south-east the high alpine tracts of the Altai Mountains, with an elevated steppe which skirts these, and in the north-west and west the lowlands of the Irtish and the marshy tracts of the Ob.

The Altai Mountains, which cover within the limits of the Russian empire an area of 53,000 square miles, or three times that of the whole of Switzerland, although visited by many geologists, still remain very imperfectly known, even as regards their orography. The country has been mapped only along the rivers and the course of a few footpaths, and great confusion still prevails with reference to the directions of the different chains of the Altai and their mutual relations (compare Srperta). The best descrip- tions, however (including the most recent by M. Potanin),} indicate in that part of Asia the very same leading orograph- ical features that are seen in the Tian-Shan Mountains farther south, and in the West Sayan range farther north. A plateau with an average altitude of more than 4000 feet, watered by the tributaries of the upper Yenisei, all flowing in open valleys 3000 to 4000 feet above the sea, is known to rise in that part of north-western Mongolia which is drained by the upper Yenisei and Selenga. The surface of this plateau is diversified by ridges, and by depressions like that of the Ubsa-nor—a relic of what was formerly a much larger lake. A lofty mountain chain, which has its south-east foot on the plateau and its north-

west foot in the valley of the Us, fringes the plateau, and has all the characters of a border-ridge. The present writer has proposed to call this Erghik-shan. It runs from north-east to south-west along the Russo- Chinese frontier, and is pierced by a deep gorge through which flows the Yenisei. A belt, some 200 miles in width, of alpine tracts, made up of three or four chains parallel to the border ridge, fringes the outer border of the plateau, and fills up the Minusinsk region. The structure of the hilly tracts (watered by the Kemtchik) between the Yenisei and the Altai remains quite unknown, no scien- tific man or topographer having ever visited it. But the very same orographical features as those already described reappear in the Altai region. There is now no doubt that the backbone of the Altai is a huge and lofty border-ridge, the Sailughem, which includes the small alpine plateaus of Ukek, the upper Tchuya, and Juvlu-kul, and runs from south-west to north-east, being a continuation of the border-ridge of the West Sayan. Its flat dome-shaped summits rise to about 10,000 feet, and the small alpine plateaus just named range from 7800 to 8200 feet in elevation. It has a very steep slope towards the north- west, 7.e., towards the broad valleys of the upper Bukh- tarma and Tchuya, and a very gentle slope towards the south-east, and its south-eastern hillfoots are on the level of the plateau of Khobdo (from 4500 to 5000 feet). A broad alpine region spreads to the north-west of the border- ridge, but in the imperfect state of our knowledge it is

1 Jivopisnaya Rossiya, vol. xi.; Sketches of N. W. Mongolia, vols. i. and iii.; Addenda to Ritter’s Asia.

difficult to discriminate the real directions of its chains. Nevertheless, another lofty chain, containing the snow-clad Alps of the Katuii (Katunskiye Byetki) and those of the Tchuya, and running also from south-west to north-east, parallel to the Sailughem border-ridge, can be distin- guished in the labyrinth of confusedly scattered mountains seen on our present maps. It is one of the most pictur- esque chains of the region, and contains the Byelukha peak, estimated at 11,000 feet, and the Alas-tu, of nearly the same height. It is pierced, however, by so many rivers, which rise on the north-west edge of the plateau, and find their way to the lowlands by

a series of gorges, that its continuity could be easily overlooked. Farther to the north-east it joins, in the opinion of the present writer, the high chain on the left bank of the Kemtchik, which is continued by the picturesque Alps on the northern bank of the Us. A third system of mountain chains, also parallel to the above, can be distinguished in the succes- sion of the Terektinsk Mountains, those which are pierced by the Tchulyshman and those which follow the right bank of the Abakan ; while traces of a fourth plication of the rocks may be discovered in the Tigeritsk Mountains, those pierced by the Biya below Lake Teletskoye, and tlie Kuznetskiy Atatau, on the left bank of the Abakan. A number of smaller, much lower, and shorter chains faintly appear as outer walls of this extensive alpine region. As for the Great Altai, or Altain-Nauru, our knowledge of which has been greatly increased by the recent explora- tions of M. Potanin,! it may be regarded as a south-western border-ridge of the Khobdo plateau, with its steep slope facing towards the wide Dzungarian depression, or rather to the broad trench of the Ulungur. Its direction is nearly at right angles to the above, running from north- west to south-east, like the Tarbagatai Mountains (see TURKEsTAN), and it is continued farther to the south-east by the Irdyn-ula and Artsa-bogdo Mountains, which separ- ate the eastern Gobi from the Tarim depression. It is most probable that upheavals, having the same north- western direction (which, according to M. Mushketoff, are in Central Asia more recent than the north-eastern ones), have to a certain extent modified the old north-eastern chains of the Altai,’and complicated the chains of its alpine region. If so, the structure of the Altai would be very similar to that of the Turkestan mountains. A chain having a north-western direction—the Salair Mountains— shoots off from the main ranges of the Altai, between the Tom and the Tchumysh ; it is about 170 miles in length, with a width of nearly 60 miles, and contains the best silver-mines of the region, as also several gold-washings. Its upheaval belongs to a more recent epoch than that of the Sailughem ridge, and (like the mountains of Turkestan, having a north-west direction) it is due to dioritic rocks. In the Kuznetsk depression it is covered with deposits of the Lower and Upper Carboniferous, containing beds of coal. The Kuznetskiy Atatau, in which Humboldt saw one of his meridional upheavals, consists of a series of ridges running south-west to north-east, with further con- tinuations within South Yeniseisk.?

The alpine region of the Altai is most picturesque; most of its chains, rising over 8000 and 9000 feet, are snowclad, and a great glacier descends from the hollows under the Byelukha peak ; several othcr tess known glaciers occur in the different ‘‘ byetkis” (snowclad chains). A thick forest vegetation clothes the mountain stopes, while beautiful valleys, often of great length, such as that of the Bukhtarma (180 miles) or that of the Uimon and Koksu, offer on their fertile and well-sheltered floors most favourable conditions for agriculture. Several lakes are met with, some, like the Juvlu-kul

and Kendykty-kul on the small alpine plateaus, at heights where only the dwarf birch grows and the polar marmot takes up its abode,

1 Sketches of N. W. Mongolia, St Petersburg, 1883 (Russian). ? Kropotkine, “ Orographical Sketch of the Districts of Minusinsk and Krasnoyarsk,” in Mem. Russ. Geogr. Soc., vol. v., 1875.

while two others, Lakes Kotyvanskoye and Teletskoye, respectively 1170 and 1600 feet above the sea, from thcir position amidst steep and picturesque mountains, recall those of Geneva and Lucerne.

The Altai flora is very rich. Although the Europcan flora (in- cluding the beech) which clothed the Altai at a recent period has disappeared, and the Siberian flora invades its hillfoots from the north-west, while the steppe flora is advancing from the south, still in a zone ranging from 1000 to 6000 feet above the sea the botanist has to admire a flora rich in bright flowers, tall grasses, and shrubs, several of which are now common ornamental plants in Europcan gardens; and the zoologist discovers in the Altai the meeting-place of the northern fauna (including the reindeer) with that of the high Central-Asian plateau (including the tiger and the two-humped cainel of Bactriana).

A strip of elevated plains or grassy steppes, also about 200 miles in breadth, girdles the alpine region upon the north-west. Its outer border can be roughly indicated by a line running north-east from Lake Gorkoye to Tomsk. They have an average altitude of from 700 to 1000 feet above the

sea, and are covered with a luxuriant grass vegetation; the conditions for agriculture are excel- lent, and Russian villages are rapidly springing up. The south-west portion is known as the Kumandinsk steppe. An innumerable succession of small lakes—rivers in the process of formation —cover this steppe, where we have a system of parallel undulations, resulting in tributaries of the Ob, all flowing north-eastward with remarkable regularity.

Beyond the high plains, that is, all over north-western Tomsk, are the lowlands, which may be subdivided into two portions,—the Baraba steppe in the south-west (see Toxsoxsk), and the marshy region of the Ob (the Vasyugan and Narym regions). The latter is one boundless marsh, a few settlements of native hunters occurring only along the rivers. The interior is for the most part inaccessible alike to boats and to human feet. Low hills, or rather swellings, intersect it, but even the highest points, barely 200 or 300 feet above the sea, are covered with marshy forests. The forests themselves grow on marshy ground ; but where the trees disappear one sees for hundreds of miles nothing but green flowery carpets, which, when trodden on, treacherously yield under the unwary traveller. Similar in character must have been the marshes in which the Siberian mammoths and rhinoceroses of the Quater- nary epoch found their graves. Only the light and broad-hoofed reindeer, but not the elk, can cross them. This inhospitable region is inhabited only by Ostiaks, who have been driven into it by stress of circumstances, and support themselves partly by fishing and partly by hunting.

The Sailughem ridge, and the high Khobdo plateau as well, con- sist of granites, syenites, porphyries covered only with the oldest metamorphic slates belonging to the Archaic formation (Huronian and Laurentian). The structure of the outer chains of the Altai is more complicated. Their backbone is also composed of granites, porphyries, and porphyrites covered with metamorphic slates which are intersected by layers of crystalline limestones, breccias, and veins of jade.? Diorites, diabases, augitic porphyries, and hyper- sthenites also appear, but they are of a more recent origin. Silurian clay-slates are widely spread in the southern Altai. Devonian slates and limestones are also developed in the southern Altai, and the metalliferous deposits of Zmeinogorsk, Petrovsk, Riddersk, &c.,

belong to that age. Carboniferous dolomitic limestones and slates are widely spread both in the southern and northern Altai, After the Carboniferous epoch the southern Altai was not again sub- merged, while the northern Altai was covered by the Jurassic sea, and has thick Jurassic deposits containing a copious fossil flora and rich beds of coal. Basaltic eruptions, dating from the Jurassic period, have been found in the Salair Mountains. Thick diluvial deposits cover the whole area, and in many valleys arc traces of immense former glaciers ; in fact, the whole of the Sailughem ridge must at one timc have been clothed with an ice-cap.4

The southern Altai is rich in silver, copper, lead, and zine; while in the Atatau are concealed its chief auriferous alluvial (or diluvial) deposits, iron-ores, and coal-seams. The mineral wealth of the Altai

is really immense, but only a very few of the mines already known are worked. In 1881 4030 tb of gold, 14,820 fb of silver, 13,100

3 Prof. Mushketoff in Picturesque Russia, vol. xi. * See Potanin, Sketches of N. W. Mongolia, vol. iii. pp. 6, 9 sq.

cwts. of lead, 6720 cwts. of copper, 240,000 cwts. of coal, 330,000 ewts. of salt, and 30,000 cwts. of bitter salt were obtained. In the same year only 3000 ewts. of iron were inanufactured, and that metal is still imported from the Urals. The jade, beautiful porphyries, and the like of the district, which are cut into works of art at the crown works of Kotyvafi, are well known through the urns and vases shown at the St Petersburg Hermitage. The mineral waters of the Altai are of high quality.

Tomsk is watered mainly by the Ob and its tributaries, only its south-east corner draining into the Abakan, a tributary of the Yenisei. The Ob, formed by the union of the Biya and Katufi, has within the government a course of more than 800 miles, and is navigated as far as Barnaut and Biysk. Its tributaries, the Tom (450 miles), the Vasyugan (530 miles), the Ket (230 miles), and the Tym (200 miles), are all navigable. The Tchutym and the Tchumysh are also great rivers. Of tributaries of the Irtish, the Bukhtarma, the Om, the Uba, and the Tara are worthy of notice. As many as 1500 lakes

have been counted on the maps, but this number is exceeded by the reality. Some of them are alpine; others dot the steppes or the marshy tracts. Lake Tchany, not- withstanding its rapid desiccation, still covers 1265 square miles. Many brackish lakes, Kutundinsk, Kutchuk, &c., attain a great size, and some small salt lakes yield about 100,000 ewts. of salt.

The climate is very severe, and has, moreover, the disadvantage of being very wet in the north-west. The average yearly tempera- tures at Tomsk, Kainsk, and Barnaut arc 30°°2, 31°, and 32°°7 (January, 4°, —6°°2, and 3° °7; July, 65°°5, 68°°5, and 62°°2). The Altai steppes, enjoying a much drier climate than the low- lands, are covered with a beautiful vegctation, and in the sheltered valleys corn is grown to heights of 8400 and 4250 feet.

The population, which is rapidly increasing, in 1882 reached 1,134,750. The Russians are ina large majority, the indigenous inhabitants numbering in 1879 only 68,600, or 6°6 per cent. of the aggregate population. They include 23,600 Altaian Tartars, 5730 Teleutes, 17,020 Mountain Kalmucks (see TaRTARs), 10,000 Tomsk Tartars, 2920 Samoyedes, and 4210 Ostiaks. The prevail- ing religion is Greek-Orthodox, but there are also some 50,000 Nonconformists, 7320 Catholics, 2600 Jews, 10,700 Mohammedans, and about 28,000 pagans.

Agriculture is the prevailing occupation. It is most productive on the elevated plains of Tomsk, Mariinsk, Barnaut, Kuznetsk, and Biysk. Cattle-breeding is much developed, especially in the Kutundinsk steppe; and bee-keeping is an important source of wealth. Fishing and hunting are extensively carried on in the forest region. Mining occupies several thousands of men in the Altai. Manufactures are insignificant, the aggregate production —chiefly from distilleries and tanneries—hardly amounting to £250,000. Trade is actively carried on at Tomsk and Barnaut, which are two great centres for the export and import trade of Siberia with Russia. The Biysk merchants carry on exchange trade with Mon- golia and China. There are eight gymnasia (696 boys and 569 girls in 1888) and 225 primary schools (5680 boys, 1780 girls). The government is divided into six districts, the chief towns of which (with populations in 1884) are Tomsk (31,380), Barnaut (17,180), Biysk (18,960), Kainsk (4050), Kuznetsk (7810), and Mariinsk (18,090). Narym (1600) also has municipal

institutions ; it is the centre for the administration of the wide Narym region. Of the above towns only Tomsk and Barnant have the aspect of European towns. Barnaut, capital of the mining district of the Altai, which belongs to the “ Cabinet of the Emperor,” is a wealthy city, with a mining school and laboratory, a botanic garden, a museum of mining and natural history, and a meteorological observatory. Kotyvaf, with a stone-cutting manufactory, has 12,250 inhabitants. Several mining villages are more important than the district towns :—Zyryanovsk (silver-mine ; 4500 inhabit- ants), Riddersk, Zmeinogorsk (6160), Suzunsk (5400), and Salairsk (3500). (P. A. K.)

TOMSK, capital of the above government, is situated on the Tom at its confluence with the Ushaika, 27 miles above its junction with the Ob, and 2377 miles from Moscow. It is one of the chief cities of Siberia, second only to Irkutsk in population and trade importance. The great Siberian highway from Tyumeii to Irkutsk passes through Tomsk, and it is the terminus of the navigation by steamer from the Urals to Siberia. It has, moreover, communication by steamer with Barnaut and Biysk in the Altai. The position of Tomsk determines its character, which is not that of an administrative centre, like so many Russian cities, but that of an entrepot of wares, with many storehouses and wholesale shops. Before 1824 it was a mere village; but after the discovery of gold in the district it grew rapidly ; and, although the immense

1 Yadrintseff’s Siberia.

wealth that accumulated suddenly in the hands of a few proprietors of gold diggings was as rapidly squandered, it continued to maintain its importance, owing to the navigation on the Irtish and the Ob, which meanwhile had grown up. It is built on two terraces on the high right bank of the Tom, and is divided into two parts by the Ushaika. The streets are rather narrow and steep ; many houses of the richer merchants are of stone, but rather heavy in appearance, and altogether the aspect of the streets is not attractive. The best building is that of the future university, which is a spacious and elegant struc- ture, with ample accommodation for library, museums, and clinical hospitals. The Government has not as yet given permission to inaugurate

the building. A large cathedral, begun some five-and-twenty years ago by proprietors of gold diggings, collapsed after considerable progress had been made. The industries are almost entirely confined to tanning and the manufacture of carriages. The trade is of great importance, Tomsk being not only a centre for traffic in local produce, in which sledges (50,000 every year) and cars are prominent items, but also for the trade of Siberia with Russia. The population in 1884 was 31,380. TONGA. See Frrenpty Istanps.

TONG-KING, Tune-Kine, Tonquin, or, as it is called See vol. by the Annamese, Donc-K1NG, consists of that portion of xxi. Pl. Annam between 18° N. lat. and the frontiers of the 1:

Chinese provinces of Kwang-se and Yun-nan, with an area of 60,000 square miles. On the W. it is bounded by the Tran-ninh range, which forms the limit of the Lao states, and on the E. by the sea. In shape it resembles, roughly speaking, an isosceles triangle, having its apex at its junc- ture with Annam and its base along the Chinese boundary. The name Tong-king, “the eastern capital,” was originally applied to Hanoi, but was eventually adopted as that of the whole country. It is the same word as ToxKIo (q.v.). Geographically Tong-king is divided into three well- defined areas. First, there is the delta of the Song-koi (“Red river”) and its affluents, which, beginning at Sontay, widens out into the low lands which constitute the most fertile district in Tong-king, and within which are situated the principal cities of the country. Here is grown the rice which constitutes 39 per cent. of the total exports from Tong-king, and which is reckoned in the Hong-Kong market to be equal in quality to the rice from Siam and superior to that from Cochin-China. During the rainy season this part of the country, with the exception of the embankments, is under water, but notwithstanding this the climate is fairly healthy, and the prevalence of fever and dysentery is not so great as might be expected. From the delta northward and westward rise plateau districts, while westward of 103° E. long. there stretches a forest region about which very little is known, but which is said by the natives to be inhabited only by savages and wild beasts. Politically the country is divided into sixteen provinces, of which the following seven are in the delta mentioned :— Bac-ninh, Sontay, Hanoi, Hai-Dzuong, Hung-yen, Nam- Dinh, and Ninh-Binh. Five provinces constitute the upland districts, viz., Cao-Banh, Lang-son, Thai-Nguyen, Tuyen-Kwan, and

Kwang-yen; while the forests form the province of Hung-hoa. The main geographical feature in the country is the Song-koi, which, taking its rise near Tali Fu, in Yun-nan, enters Tong-king at Lao-kai ("the Lao boundary"), and flows thence in a south-easterly direction to the Gulf of Tong-king. It was this river which mainly in the first instance attracted the French to Tong- king, as it was believed by the explorers that, forming the shortest route by water to the rich province of Yun-nan, it would prove also to be the most convenient and expedi- tious means of transporting the tin, copper, silver, and

gold which are known to abound there. This belief has, however, proved fallacious. The upper course of the stream is constantly impeded by rapids, the lowest being about 30 miles above Hung-hoa. Beyond this point navi- gation is impracticable during the dry season, and at all other times of the year goods have to be there transferred into flat-bottomed boats built for the purpose. Within the limits of Yun-nan the navigation is still more difficult. Near Sontay the Song-koi receives the waters of the Black river, the Clear river, and other streams, and from that point divides into a network of waterways which empty themselves by countless outlets into the sea.

Hanoi, the capital, is a fine city, and stands on the right bank of the Song-koi, at a distance of 80 miles from the sea. The commercial town extends along the water face for a distance of a mile and a half, while behind it stands the citadel, which encloses within its walls the palace, the treasury, the court of justice, the royal pagoda, the prison, the barracks, public offices, and official residences. Em- broidery and mother-of-pearl work are the principal in- dustries of Hanoi, which never has been and probably never will be a great commercial centre. But, notwithstanding this, the population is said formerly to have numbered 150,000, a number which has of late years probably been reduced by at least one-third.

Next in importance to Hanoi is Nam-Dinh, on one of the lower branches of the Song-koi. It is the centre of an extremely rich silk and rice district, and was before the war a great resort of Chinese merchants. But the chief place of trade is Hai-phong, on the Song-tam-bac Canal, 14 miles from the sea. This is the port of Tong-king, and its trade represents the foreign commerce

of the country. In 1880, the last year of anything like normal trade, goods were imported to the value of 5,467,315 francs, and the exports amounted to 7,507,528 francs. Of the imports 34 per cent. consisted of English cotton goods and yarn, 21 per cent. of opium, 11 per cent. of Chinese medi- cines, 9 per cent. of Chinese water-pipe tobacco, 5 per cent. of tea, and 20 per cent. of miscellaneous goods. From 97 to 98 per cent. of these goods came from Hong-Kong, Saigon furnished about 4 per cent., and rather more than 2 per cent. represented the trade from Annam and else- where. The exports were in the following proportions :— rice, 39 per cent.; raw silk and silk piece goods, 21; tin, 16; lacquer oil, 6; and miscellaneous goods, 18. Of these 79 per cent. were shipped to Hong-Kong, 16 per cent. went to Saigon, and the remaining 5 per cent. were distributed among the coast ports.

The mineral wealth of the country is doubtless con- siderable, though so little has been done in the direction of working it that it is impossible to form any idea of its richness. According to Major-General Mesny, there are flourishing gold-fields in seventeen districts, while silver and copper mining occupies a great deal of native and Chinese labour. Only very small quantities of these min- erals, however, are produced in evidence.

The population of Tong-king is estimated at about 12,000,000, and consists of Tong-kingese, Chinese, and an admixture of Lao from beyond the western frontier. The Tong-kingese belong to the Indo-Chinese stock. They are taller and a finer people than the Annamese, and they are more frivolous and excitable than their northern neigh- bours, the Chinese. Their intelligence is, generally speak- Ing, of a very low order ; they are dirty in their habits; and their natural timidity serves to make them deceitful. As traders they show little enterprise, and are quite unable to compete with the Chinese, into whose hands the com- merce had, before the arrival of the French, entirely fallen. Their spoken language is allied to the Cambodian, while Chinese forms the medium of literary communication.

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The Chinese records carry the history of Tong-king as far back as the 22d century B.c., but, as the data are neither well authenti- cated nor particularly

interesting, we need not dwell upon them. There is, however, one mention of Tong-king, or Yueh, as it was then called, in the 12th century B.c., which acquires importance from the fact that ambassadors from that country are said to have arrived at the Chinese court, bringing with them ‘‘ south-pointing chariots.” These are supposed by some to have been mariner’s compasses, but it is difficult to pronounce any opinion on a state- ment so obscure. During the reign of Che Hwang-te (218 B.c.), the emperor who made himself famous by building the Great Wall of China and burning the books, a Chinese army invaded Tong-king and captured the town of Luliang, possibly the modern Hanoi. The occupation, however, was only temporary, and it was not until the rise to power of the Han dynasty that any serious attempt was made to subjugate the country. At that time a Chinese general, Chaou T’o, who had established a principality consisting of the two modern provinces of Kwang-tung and Kwang-se, with his capital at Canton, invaded Tong-king, but was defeated and driven out of the country by the ruler, An-yang, whose victories were achieved mainly by the help of a foreign ‘‘divine mechanic.” This man, whoever he may have been, seems to have been thrown aside after serving his immediate purpose; and, having thus deprived himself of his right hand, An-yang fell an easy victim when attacked by a second army sent by Chaou T’o. On the subjugation of the empire by the Han sovereign, Chaou T’o’s principality was absorbed with the rest, and in 116 B.c. Tong-king became a dependency of China.

But this connexion brought no peace to the country, and for centuries rebellion followed on rebellion. A particular uprising in the Ist century is noticeable from two sisters, Chéng ‘I’séh and Chéng Urh, leading the rebel forces against the Chinese garrisons, with such success that the celebrated Ma Yuen had to be sent against the malcontents. After an arduous campaign Ma dis- persed the rebels and captured and executed the two sisters, thus putting an end to the rebellion. The next fourteen centuries fur- nish a perpetual record of wars and rumours of wars, the discon- nected narrative of which is generally uninteresting and sometimes unintelligible. In 1427 Li Loi acquired the throne, as so many of his predecessors had done, by violent means, but, unlike them, he established some degree of peace and order in the land. In the following century, however, the spirit of revolt broke out, and one of his successors owed the maintenance of his throne to the skill of his general Nguyen Dzo, on whom the title of hereditary viceroy

was consequently conferred. This viceroy gradually assumed the supreme authority in the district under his control and virtually separated Tong-king from Annam, pee the first under his own sway and leaving the southern portion of the country to the rot Jainéant. In this disunited condition the two countries remained during the 17th century and part of the 18th, till a successor of Nguyen invaded Annam, captured the imperial city of Hué, and dethroned the king, Gia Long, who fled to Siam. The Siamese sovereign entertained the fugitive with hospitality, but declined to help him to recover his throne. It happened, however, that at this time (1787) the Jesuit establishment of Bangkok was presided over by Bishop Pigneaux de Betaine, who thought he saw in the political condition of Annam a ineans of establishing the power of France in the eastern portion of Indo-China. With this object he proposed to Gia Long that he should accompany him to Paris to enlist the aid of Louis XVI. for the recovery of his throne. This the king declined to do, but as a compromise he sent his eldest son. The young prince was cordially received by Louis, before whom the bishop laid the following reasons for the interference of France on behalf of Gia Long. ‘‘The balance of political power in India appears at the present moment to be largely in favour of the English, and one may be justified in looking upon it as a matter of no little difficulty to restore the equilibrium. In my opinion the establish- ment of a French colony in Cochin-China will be the surest and most efficacious means to the end. .. . The most certain way of damaging the English in India is to ruin, or at any rate to weaken, her commerce in time of peace. Being situated nearer to China, we should undoubtedly absorb much of her trade. . In time of war it would be still more easy to stop all commerce between China and any hostile nation. ... From such a coign of vantage it would be easy to interfere with the designs which the English evi- dently have of extending their frontier more to the east.”

The embassy resulted in a treaty with Gia Long, by which the French king engaged to restore that monarch to his throne on con- dition that he accepted the virtual protectorship of France over Annam. But even before the initial steps towards the fulfilment of this contract could be carried out, the political uprising which finally brought the Freuch king to the scaffold made all interference in the East impossible. In these circumstances the bishop deter- mined to raise a sufficient force from the French and other

adven- turers who then frequented India and the neighbouring countries, and, with an army so recruited, he landed in Annam. The Anna- mese resistance was of the feeblest kind ; the usurper's power was

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broken at the first encounter, and Gia Long once again ascended his throne. As a reward for the services thus rendered to him, he extended a liberal protection to the Roman Catholic missionaries and their converts, and engaged French officcrs to fortify his towns and to drill his troops. He soon found, however, that his new allies had more ambitious designs than could be satisfied by doing him service. He therefore withdrew his countenance from them, and emphasized his displeasure by leaving his throne away from his eldest son, who had pleadcd his cause in Paris, and by giving it to his youngest son. This change of policy told, as was natural, with greatest force on the missionaries and their converts in the interior of the country. From 1833 to 1839 eleven missionaries were put to death, and thousands, it is said, of the native Christians suffered martyrdom. Neither change of sovereign nor varying circumstances brought any relief to the persecuted Christians, until in 1859 the French Government determined to intervene on their behalf. In that year Admiral Rigault de Genouilly took Saigon by assault, and was attempting to open negotiations with the king of Annam, when the outbreak of the China war compelled him to satisfy him- self with holding the captured town. So soon, however, as the Peking treaty was signed, the French resumed active operations in the neighbourhood of Saigon and took possession of the provinces of Mitto and Bienhoa in Cochin-China. These victories led to the conclusion of a treaty with the king, Tu Duc, which, howcver, did not prevent the French from adding the provinces of Kinh- luong, Chandoc, and Ha-tien to their acquired territory.

Having thus firmly established themselves in Annam, thcy began to turn their attention to Tong-king, attracted by the rcported richness of its mincral wealth. They found a ready pretext for interfering in its affairs in the disturbances arising from the in- vasion of its northern provinces by the disbanded followers of the Tai-ping rebels. Acting on the protectorship which they professed to exercise over all the territorics of Tu Duc, they proposed to him that a joint expedition composed of French and Annaniese

troops should be sent to quell the disturbances. On Tu Duc declin- ing to acecde, the French admiral was on the point of starting “to protect” Tong-king, when as before the outbreak of war put an cnd to the enterprise. The events of 1870 forbade any advance in the direction of Hoa mking but the return of peace in Europe was once more the signal for the renewal of hostilities in the East. The appearance of Garnier’s work on his expedition up the Mekong uted again an interest in Tong-king, and the reported wealth of the country added the powerful motive of self-interest to the yearn- ings of patriotism. Already M. Dupuis, a trader who in the pursuit of his calling had penetrated into Yun-nan, and had thus discovered that the higher waters of the Song-koi were navigable, had visited Hanoi with a small force of desperadoes, and was attempting to negotiate for the passage up the river of himself and a cargo of mili- tary stores for the Chinese authorities in Yun-nan. Meanwhile Captain Senez appeared from Saigon, having received instructions to open the route to French commerce. But to neither the trader nor the naval officer would the Tong-kingese lend a favourable ear, and in default of official permission Dupuis determined to force his way uptheriver. This he succecded in doing, but arrived too late, for he found the rebellion crushed and the stores no longer wanted.

On his return to Hanoi, Dupuis found that the opposition of the authorities had gathered strength during his abscnce. His arrival served to restore the position of the French, and, not wishing to niake an open attack upon them, the Tong-kingese general wrote to the king, begging him to induce the governor of Saigon to remove the intruder. An order was thereupon issued calling upon Dupuis to leave the country. This he declined to do, and, after some negotiations, Garnier with a detachment was sent to Hanoi to do the best he could in the difficult circumstances. Garnier threw himself heart and soul into Dupuis’s projects, and, when the Tong-kingese authorities refused to treat with him except on the subject of Dupuis’s expulsion, he attacked the citadel on November 20, 1873, and carried it by assault. Having thus secured his posi- tion, he sent to Saigon for reinforcements, and meanwhile sent small detachments against the five other important fortresses in the delta (Hung-yen, Phu-ly, Hai-Dzuong, Ninh-Binh, and Nam- Dinh), and captured them all. The Tong-kingese now called in the help of Liu Yung-fu, the leader of the ‘ Black Flags,” who at oncc marched with a large force to the scene of action, Within a few days he recaptured several villages near

Hanoi, and so threatening did his attitude appear that Garnicr, who had hurried back after capturing Nam-Dinh, made a sortie from the citadel. The movement proved a disastrous one, and resulted in the death of Garnier and of his second in command, Balny d'Avricourt.

Meanwhile the news of Garnier's hostilities had alarmed the governor of Saigon, who, having no desire to be plunged into a war, sent Philastre, an inspector of native affairs, to offer apologies to the king of Annam. When, however, on arriving in Tong- king Philastre heard of Garnier's death, he took command of the French forces, and at once ordered the evacuation of Nam-Dinh, Ninh-Binh, and Hai-Dzuong,—a measure which, however advan- tageous it may have been to the French at the moment, was most

disastrous to the native Christian population, the withdrawal of tlle French being the signal for a general massacre of the converts. In pursuance of the same policy Philastre made a convention with the authorities (February 6, 1874), by which he bound his country- men to withdraw from the occupation of the country, retaining only the right to trade at Hanoi and Hai-phong, and agreed to put an end to Dupuis's aggressive action. On the 15th of March a treaty was signed at Saigon.

For a tine affairs remained in statu quo, but in 1882 Le Myre de Villers, the governor of Saigon, sent Riviére with a small force to open up the route to Yun-nan by the Song-koi. With a curious similarity the events of Garnier's campaign were repeated. Find- ing the authorities intractable, Riviere stormed and carried the citadel of Hanoi, and then, with very slight loss, he captured Nam-Dinh, Hai-Dzuong, and other towns in the delta. And once again these victorics brought Liu Yung-fu and his Black Flags into the neighbourhood of Hanoi. As Garnier had done, so Riviére hurried back from Nam-Dinh on news of the threatened danger. Like Garnier also he headed a sortie against his enemies, and like Garnier he fell a victim to his own impetuosity.

In the meantime the Annamese court had been seeking to enlist the help of the Chinese in their contest with the French. The tic which bound the tributary nation to the sovereign state had been for many generations

slackened or drawn closer as circumstances determined, but never had it been entirely dissevered, and from the Annamese point of view this was one of the occasions when it was of paramount importance that it should be acknowledged and acted upon. With much more than usual regularity, therefore, the king despatched presents and letters to the court of Peking, and in 1880 he sent a special embassy, loaded with unusually costly offerings, and with a letter in which his position of a tributary was emphatically asserted. Far from ignoring the responsibility thrust upon him, the emperor of China ordcred the publication of the letter in the Peking Gazette. The death of Riviére and the defeat of his troops had meanwhile placed the French in a position of extreme difficulty. The outlying garrisons, with the cxception of Nam-Dinh and Hai-phong, were at once withdrawn to Hanoi, and that citadcl was made as secure as circumstances permitted. The Black Flags swarmed round its walls, and the reinforcements brought by Admiral Courbet and General Bouet were insufficient to do more than keep them at bay. So continued was the pressure on the garrison that Bouet determined to make an advance upon Sontay to relieve the blockade. After gaining some trifling suc- cesses, he attacked Vong, a fortified village, but he met with such resistance that, after suffering considerable loss, he was obliged to retreat to Hanoi. In the lower delta fortune sided with the French, and almost without a casualty Hai-Dzuong and Phu-Binh fell into their hands. These successes led to an ultimatum being sent to the king of Annam, in which were demanded the fulfilment of the treaty of 1874 and the acceptance of the protectorate of France over the whole of Annam, including Tong-king. This document met with no favourable reception, and, as at this moment a rein- forcement of 7000 men arrived from France, Courbet, determining to supersede diplomacy by arms, appeared with his fleet before Hué. He found that, though Tu Duc was dead, his policy of resistance was maintained, and he therefore stormed the city. After a feeble defence it was taken, and the admiral concluded a treaty with the king (August 25, 1883), in which the French pro- tectorate was fully recognized, the king further binding himself to recall the Annamese troops serving in Tong-king, and to con- struct a road from Saigon to Hanoi.

Though this treaty was exacted from the king under pressure, the French lost no time in carrying out that part of it which gave them the authority to protect the country, and on the 1st September Bouet again advanced in the

direction of Sontay. But again the resistance he met with compelled him to retreat, after capturing the fortified post of Palan. The serious nature of the opposition experienced in these expeditions induced the French commanders to await reinforcements before again taking the field. Meanwhile, on the determination to attack Sontay becoming known in Paris, the Chinese ambassador warned the ministry that, since Chinese troops formed part of the garrison, he should consider it as tanta- mount to a declaration of war. But his protest net with no con- sideration. On the arrival of reinforcements an advance was again made; and on the 16th December, after some desperate fighting, Sontay fell.

The immediate object of the French commanders was at this time to make themselves secure in the dclta, and to inflict such chastisement on the Black Flags and their allies as would prevent their disturbing the peace of the garrisons. This could not be attained so long as Bac-Ninh remained in the hands of the enemy. Generals Négrier, Briére de l'Isle, and Millot accordingly marched against the town, and began to shell it. But it was alrcady deserted, and Millot entered the gatcs without striking a blow. Thus, while one part of the programme was fulfilled to the letter, the other part, which was to have sealed the fate of the garrison, failed conspicuously. In these circumstances it was thought

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advisable to push on along the great north-eastern road to China ; and Négrier advanced about 30 miles towards Lang-son, captured a village there, and then returned to Bac-Ninh.

Meanwhile Briére de 1'Isle followed up that portion of the Bac- Ninh garrison which had escaped along the northern road in the direction of Thai-Nguyen. He captured the fort of Yen-Te, and marched on to Thai-Nguyen, where, as on so many occasions, there was a great display of martial ardour so long as the French were beyond firing distance, but the discharge of a few shells com- pletely discomfited the defenders, who fled out of the north gate as the French marched in at the south. As Briére de 1'Isle had _posi- tive orders not to hold the town, he burnt some of the buildings, and

evacuated it. The Chinese troops immediately returned, and again were driven out a month later, only to return again ou the withdrawal of the French. Once more, however, a column was sent against the city, which on this occasion was burnt to the ground.

The whole of the lower delta was thus made secure in the hands of the French. Hung-Hoa (a town about 15 miles north-east of Sontay) and Tuyen-Kwan (a fortified place about 40 iniles farther north) both fell before the invaders, but from both the garrisons escaped practically unscathed.

In the meantime M. Fournier, the French consul at Tientsin, had been negotiating for peace, so far as China was concerned, with Li Hung-chang, and on May 17, 1884, had signed and sealed a memorandum by which the Chinese plenipotentiary agreed that the Chinese troops should evacuate the northern provinces of Tong- king ‘‘immédiatement.” This expression was undeniably vague, and the French general in Tong-king, impatient of delay, in June dispatched Colonel Dugenne at the head of a strong force to occupy Lang-son. The expedition was badly arranged; the baggage train was far too unwieldy; and the pace at which the men were made to march was too quick for that scorching time of the year. They advanced, however, within 25 miles of Lang-son, when they suddenly came upon a Chinese camp. Aun irregular engagement commenced, and, in the pitched battle which ensued, the Chinese broke the French lines, and drove them away in headlong flight. This brought the military operations for the season to a close.

During the rainy season fevers of all kinds became alarmingly

revalent, and the number of deaths and of men invalided was very fais, In the meantime, however, an expedition, led by Colonel Donnier, against the Chinese garrison at Chu, about 10 miles south- east from Lang-kep, was completely successful ; and in a battle fought near Chu the Chinese were defeated, with a loss of 8000 killed, the French loss being only 20 killed and 90 wounded. In the skirmishes which followed the French were generally victorious, but not to such a degree as to warrant any enlargement of the campaign.

The arrival in January 1885 of 10,000 men having brought up the force under Briére de l’Isle to 40,000, he ordered an advance towards Lang-son.

The difficulties of transport greatly impeded his movements, still the expedition was successful. On the 6th February three forts at Dong-Song, with large supplies of stores and ammunition, fell into the hands of the French. Three days' heavy fighting made them masters of a defile on the road, and on the 18th Lang-son was taken, the garrison having evacuated the town just before the entrance of the conquerors. With his usual energy Négrier pressed on in pursuit to Ki-hea, and even captured the frontier town of Cua-ai. But Briere de l'Isle had now to hurry back to the relief of Tuyen-Kwan, which had been attacked by a Chinese force, and Négrier was left in command at Lang-son. The withdrawal of Briére de l'Isle's division gave the Chinese greater confidence, and, though for a time Négrier was able to hold his own, on the 22d and 23d of March he sustained a severe check between Lang-sou and Thatke, which was finally converted into a complete rout, his troops being obliged to retreat precipi- tately through Lang-son to Than-moi and Dong-Song. Briére de lIsle reached Tuyen-Kwan on the 3d of March, and found the Black Flags and Yunnan braves strongly posted on the side of an almost inaccessible pass. After having sustained a succession of attacks for eighteen days, and seven actual assaults, the delight of the garrison at seeing Briere de I'Isle's relieving force may be imagined. It was while matters were in this position that Sir Robert Hart succeeded in negotiating peace between the two coun- tries. By the terms agreed on (April 6, 1885), it was stipulated that France was to take Tong-king under its protection and to evacuate Formosa. The Chinese undertook at the same time to expend 80,000,000 francs on the construction of roads in South China.

The future fortunes of the colony must depend greatly on the administrative ability of the governors selected to rule over it. The death of Paul Bert was in this respect a great loss to Tong-king,

See France and Tong-King, by J. G. Scott, 1885; Tonkin, by C. B. Norman, 1884; Tungking, by W. Mesney, 1884. ip Ga 9)

TONGUE. See Anatomy, vol. i. p. 895, and Taste.

TONNAGE, Recister Tonnace, or INTERNATIONAL REGISTER ToNNAGE, is the unit on which the assessment of dues and charges on

shipping is based. The system at pre- sent in force is known asthe Moorsom system. A register

ton is 100 cubic feet of internal volume. Thus a vessel of 100,000 cubic feet of internal space within the points of measurements prescribed by the law is 1000 tons register. Vessels are sometimes bought and sold under this unit. The tonnage rules, which are very full and elaborate, are contained in part ii. of the Merchant Shipping Act, 1854, sections 20 to 29 inclusive, and in section 9 of the Merchant Shipping Act, 1867, the latter being a special section in reference to a deduction from the gross tonnage in respect of crew space, which space must be fit for the proper accommodation of the men who are to occupy it to entitle to such deduction. This enactment has led to great improvement in seamen's quarters.

Section 60 of the Merchant Shipping Act, 1862, pro- . vides on the point of international tonnage as follows :— "Ships belonging to foreign countries which have adopted the British system of tonnage need not be remeasured in this country." The British system has been adopted by the following countries at the dates named :—United States, 1865 ; Denmark, 1867 ; Austria-Hungary, 1871 ; Germany, 1873 ; France, 1873; Italy, 1873 ; Spain, 1874 ; Sweden, 1875; Netherlands, 1876; Norway, 1876; Greece, 1878; Russia, 1879; Finland, 1877; Hayti, 1882; Belgium, 1884; Japan, 1884. It is also under consideration by China.

There are slight differences in the rules for deduction for engine room in some of the countries, but owners or masters of foreign steamships, where this difference exists, may have the engine-rooms remeasured in the United Kingdom if they desire; in other words, their net tonnage may be reduced to exact English measure.

The British system was also mainly adopted by the International Tonnage Commission assembled at Constan- tinople in 1873, the rules of such commission forming the basis of dues levied on the ships of all countries passing through the Suez Canal. A special certificate is issued in the respective countries for this purpose. The main point of difference from the British system is with respect to the deduction for engine room.

There are three terms used in respect of the tonnage of ships,—namely, tonnage under decks, gross tonnage, and register tonnage.

In obtaining the gross measurement the space under the tonnage deck is first measured—sections 20 and 21 (1), (2), and (3); then the space or spaces, if any, between the tonnage deck (the tonnage deck is the second deck from below in all vessels of more than two decks and the upper deck in all other vessels) and the upper deck— section 21 (5) of Act; and finally the permanent closed-in spaces above the upper deck available for cargo, stores, passengers, or crew—section 21 (4) of Act.

The allowance for engine room is governed by the percentage the net engine room—that is, the space ex- clusive of the coal bunkers—bears to the gross tonnage, and varies in paddle- and screw-steamers as laid down in section 23 of the Act.

In obtaining the tonnage under tonnage deck, ships are divided in respect of their length into five classes as follows :—

Class 1. Length 50 feet and under…....,....0.000 into 4 equal parts. re 2 5 » und not exceeding 120 feet, 6 is ” 3, ” 120 ” ” ” ” 8 ” ” 4. ” 180 ” » » 225 ” 10 2: sites o> – 225’gg- ANA UPWATAS.....cccceseeesees 12 if

The following is an epitome of the rule for tonnage under the tonnage deck :—

Length is taken inside on tonnage deck, from inside of plank at stern to inside of midship stern timber or plank; the length so taken, allowing for rake of bow and of stern in the thickness of the deck, and one-third of the round of beam, is to be divided into the prescribed number of equal parts (which determines the stations of the areas), according to the length of vessel, as above.

Area 1 is at the extreme limit of the bow. Area 2 is at the first point of division of the length. The rest are numbered in succes- sion, the last being at the extreme limit of the stern.

Depths are taken at each point of division of the length, or station

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of each area, from the underside of the tonnage deck to ceiling at inner edge of timber strake, deducting therefrom one-third of the round of the beam. The depths so taken are to be divided into four equal parts, if midship depth should not exceed 16 feet; otherwise into six equal parts.

Breadths are taken at each point of division of the depths and also at the upper and lower points of the depths. The upper breadth of each area is to be set down in its respective column in a line with No. 1 (left-hand numerals), and the rest in succession.

The number of eolumns for areas will vary according to the length, as in the several classes, and will be equal to the number of parts into which the length is divided plus one.

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The space or spaces between decks above the tonnage deck are dealt with by a similar formula. A mean horizontal area of the space, or each space if more than one, is found and multiplied by the mean height.

The permanent closed-in spaces above the upper deck available for cargo, stores, passengers, or crew are measured in the same manner by finding a mean area and multiplying by a mean height.

The measurement of net engine room is governed by the arrange- ment of the space, and is measured as a whole or in parts as may be required by its particular form.

The following is an example under class 2, depth under 16 feet, of tonnage under tonnage deck :—

Length 112°75 Feet + 6=18°791 Feet, the Common Interval between Areas.

Depths + 4, the Middle Depth being less than 16 Feet.

Area 1. Area 2, Area 3. Area 4. Feet. Feet. Feet. Feet. Wepthsiasssyacssece Ss 12°65 12°3 11°85

val between 3°162 3°075

breadths…..

Common wen} Pro- Baths,

No. of | Multi- | Being | Bdths, | Pro- | Baths. Pro:

Baths. | pliers. | sharp | Feet. | ducts, | Feet. | ducts. | Feet ducts 1 1 atthe | 19°35 | 19°35 20°2 20°2 20°4 20°4 2 4 18°85 5 20°4 81°6 20°5 82-0 8 2 “68 5 20°15 | 40°38 20°25 | 40°5 4 4 ‘ : 19°6 78°4 19°85 | 79:4 5 1 area. 1°85 1°85 3°0 30 6°35 6°35

}eommon inter- 223°5 228°65 val between 1:03 99 breadths…...

6705 205785 22350 205785

186°165 230°205 226°363

ai | ff

Area 2. Area 3. | Area 4,

This formula is also applicable for finding displacement tonnage of ships, that is, the external displacement measured by taking transverse areas to the height of the load water-line to find the cubie content, which content divided by 35 gives the displacement in tons weight, the difference between the light and load displace- ment representing the carrying powers of a vessel in tons.

‘«The rule,” says Mr Moorsom, ‘‘is founded on the purest mathe-

matical principles. It was first published in the Philosophical Transactions of the Royal Society of 1798 by Attwood, in his ‘Disquisition on the Stability of Ships,’ who there describes it as one of those formule invented by Sterling for measuring spaces bounded by irregular curves, founded on Sir Isaac Newton’s dis- eovery of a theorem—a discovery which the immortal author himself considered amongst his happiest inventions—by which the areas of all curvilinear spaces not geometrically quadrible nor

discoverable by any known rules of direct investigation are so closely approxi- mated as to amount to geometrical exactness.”

Mr Allan Gilmour at the middle of the present century expressed his opinion, after a careful consideration of the tonnage question, which was receiving much attention at that time owing to the law 8 and 9 Vict. cap. 89, which had been adopted in place of the old tonnage law 18 Geo. III. cap. 74, not giving satisfaction, that the ‘‘system framed by Mr Moorsom will as it were eompel every one to build strong, fast-sailing, and good seagoing ships, and that, in fact, it will stand as long as the world remains.” It will be admitted that great progress has been made in every way in British shipping of late years, and for this due praise must be given to the influence of the present tonnage laws. (W. M*.)

TONNAGE anp POUNDAGE were customs duties anciently imposed upon exports and imports, the former being a duty upon all wines imported in addition to prisage and butlerage, the latter a duty imposed ad valorem at the rate of twelvepence in the pound on all merchandise imported or exported. The duties were levied at first by agreement with merchants (poundage in 1302, tonnage in 1347), then granted by parliament in 1373, at first for a limited period only. They were con- sidered to be imposed for the defence of therealm. From the reign of Henry VI. until that of James I. they were usually granted for life. They were not granted to Charles I., and in 1628 that king took the unconstitutional course of levying them on his own authority, a course denounced a few years later by 16 Car. I. c. 18, when the Long Parliament granted them for two months. After the Restoration they were granted to Charles II. and his two

Area 5. Area 6, Area 7.

Cubie Content and Register

Feet. Feet. Feet. Tonnage. 11°4 10°9 ann 2°85 2°795 . eeeens 3 No. of | Multi- | brought} Pro- Areas, | pliers, up. ducts. DEM La | ~~nic. | l = L Sq. Ft Bdths. | Pro~~ | Bdths. | Pro- | Being 1 1 0 0 Feet. ducts. | Feet. | ducts. | sharp 2 4 186°17 | 744°68 20°2 20°2 19-1 19-1 at the 3 2 230°21 | 460-42 20°35 81°4 18°65 74°6 |sternno 4 4 226°36 | 905-44 20-0 40-0 14°95 29°9 meas- 5 2 208°19 | 416°38 17°8 ele? 8°75 35°0 ured 6 4 145-24 | 580°96 6°85

6°35 1-0 1-0 area. vi 1 0 0 219-15 159°6 3107°88 “95 “91 6°26=} eommon interval between areas.

109575 1596 1864728 197285 14364 621576

— 1864728 208°192 145236 ere eet Tons 19455°32+100=194°55 under deck. Area 5. Area 6. Area 7.

successors for life. By Acts of Anne and George I. the duties were made perpetual, and mortgaged for the public debt. In 1787 they were finally abolished, and other modes of obtaining revenue substituted, by 27 Geo. III. c. 13. Poundage also signifies a fee paid to an officer of a court for his services, ¢.g., to a sheriff’s officer, who is entitled by 28 Eliz. c. 4

to a poundage of a shilling in the pound on an execution up to £100, and sixpence in the pound above that sum.

TONQUA BEAN. The Tonqua, Tonka, or Tonquin bean, also called the coumara nut, is the seed of Dupterix odorata, a Leguminous tree growing toa height of 80 feet, native of tropical South America. The drupe-like pod contains a single seed possessed of a fine sweet ‘‘ new- mown hay ” odour, due to the presence of a crystallizable principle called coumarin, to which also the dried stalks of Melilotus officinalis and the vernal grass Anthoxanthum odoratum owe their odour. Tonqua beans are used principally for scenting snuff and as an ingredient in perfume sachets and in perfumers’ “ bouquets.”

TONQUIN. See ToncG-KING.

TONSILLITIS. See THroat DIsEasEs.

TONSURE. The reception of the tonsure, in the Roman Catholic Church, is the initial ceremony which marks admission to orders and to the rights and privileges of clerical standing. It is administered by the bishop with an appropriate ritual. Candidates for the rite must have been confirmed, be adequately instructed in the elements of the Christian faith, and be able to read and write. Those who have received it are bound (unless in exceptional circumstances) to renew the mark, consisting of a bare circle on the

crown of the head, at least once a month, otherwise they forfeit the privileges it carries. A very early origin has sometimes been claimed for the tonsure, but the earliest instance of an ecclesiastical precept on the subject occurs in can. 41 of the council of Toledo (633 A.D.): “ omnes clerici, detonso superius capite toto, inferius solam circuli coronam relinquant.” Can. 33 of the Quini- sext council (692) requires even singers and readers to be tonsured. Since the 8th century three tonsures have been more or less in use, known respectively as the Roman,

the Greek, and the Celtic. The first two are sometimes distinguished as the tonsure of Peter and the tonsure of Paul; in the latter the whole head was shaven, but when now practised in the Eastern church this tonsure is held to be adequately shown when the hair is shorn close. In _ the Celtic tonsure (tonsure of St John, or, in contempt, tonsure of Simon Magus) all the hair in front of a line drawn over the top of the head from ear to ear was shaven.

TONTINE. ‘This system of life insurance owes its name to Lorenzo Tonti, an Italian banker, born at Naples early in the 17th century, who settled in France about 1650. In 1653 he proposed to Cardinal Mazarin a new scheme he had devised for promoting a public loan. His plan was to the following effect. A total of 1,025,000 livres was to be subscribed in ten portions of 102,500 livres each by ten classes of subscribers, the first class consisting of persons under 7, the second of persons above 7 and under 14, and so on to the tenth, which consisted of persons between 63 and 70. The whole annual fund of each class was to be regularly divided among the survivors of that class, and on the death of the last individual the capital was to fall to the state. This plan of operations was authorized under the name of “ tontine royale” by a royal edict, but this the parlement refused to register, and the idea remained in abeyance till 1689, when it was revived by Louis XIV., who established a tontine of 1,400,000 livres divided into fourteen classes of 100,000 livres each, the subscription being 300 livres. Although the classes were not quite filled, this tontine was carried on till 1726, when the last beneficiary died,—a widow who at the time of her decease was deriving from this source an annual income of 73,500 livres. Several other Government ton- tines were afterwards set on foot; but in 1763 restric- tions

were introduced, and in 1770 all tontines at the time in existence were wound up. Private tontines con- tinued, however, to flourish in France for some years, the “tontine Lafarge ” having been opened as late as 1791.

The tontine principle has often been applied in Great Britain, chiefly to the purchase of estates or the erection of buildings for which the necessary funds could not be procured by ordinary methods. The speculative element in the system has proved an attraction, The investor stakes his money on the chance of his own life or the life of his nomince enduring fora longer period than the othcr lives involved in the speculation, iu which case he expects to win a large prize. The only thing which will serve to distinguish this from au ordinary lottery is the assumption that some may apply greater care or skill in the selection of lives than others of the players. The tontine principle is nearly the converse of ordinary life assurance, where it is the man who dies early who obtains an advantage for his heirs at the expense of the long liver. But it has been occasionally introduced into life assurance in the distribution of profits or surplus, and so far it tends to redress the inequalities of the original contract, the profits being assigned to the longest livers to a larger extent than in the common life assurance system. The tontine principle has been brought into considerable prominence by some American life offices (see Insur- ANCE, vol. xiii. p. 183). All that is wanted to make the system fair is that every one should understand that in order to secure a dis- proportionate share of profits in the event of his surviving and keeping up his policy he must make a corresponding sacrifice if he dies early or discontinues his insurance.

TOOKE, Joun Horne (1736-1812), an ardent poli- tician and an erudite philologer, was the third son of John Horne, a poulterer in Newport Market, whose business the son, when a pupil at Eton with other boys of a more aristocratic position, in early life happily veiled under the title of a “Turkey merchant.” He was born in Newport Street, Long Acre, Westminster, on 25th June 1736. Some portion of his school days was passed, when he was about seven years old, in “an academy in Soho Square,” and when three years older he went to a school in a Kentish village. For a time (1744-46) he was at Westminster School, but the greater part of his educa- tion was got at Eton, and then under private tuition,

first at Sevenoaks in Kent (1753) and then at Raven- stone in Northamptonshire. In 1755 he was entered at St John's College, Cambridge, and took his degree of B.A. in 1758, as last but one of the senior optimes, Beadon, his life-long friend, afterwards bishop of Bath and Wells, being among the wranglers in the same year. Strange to say, the object of all this care and expense found hinself'doomed to the drudgery of ushership at a boarding school at Blackheath, and the pleasures of his lot were not enhanced by his father's strongly expressed desire that he should take orders in the Church of England. A strange vacillation marked his career at this period, a vacillation probably due to a constant struggle between his own inclination and the wishes of his father. He was admitted to the diaconate of the church, and almost at the same time was entered at the Inner Temple. He studied for the bar for some time, mostly in the company of Dunning and Kenyon, and then was ordained as a priest of the national church by the bishop of Salisbury. After this event his father obtained for him the next presentation to the small vicarage of New Brentford, to which Horne was duly admitted, and he retained its scanty profits until 1773. During a part of this time he was absent on a tour in France, acting as the bear-leader of a son of the miser Elwes. To his credit be it said that while he resided at Brentford he discharged with exem- plary regularity all the duties of his profession, and that, reviving a practice of the previous century, he studied medicine for the benefit of his poorer parishioners. Under the excitement created by the actions of Wilkes and the blunders of his ministerial opponents, Horne plunged into politics with consuming zeal, The newspapers abounded with his productions, but his chief effort was a. scathing pamphlet on Lords Bute and Mansfield, setting out the "petition of an Englishman." In 1765 he again went abroad as tutor, and on this occasion he escorted to Italy the son of a Mr Taylor, who lived near his Middlesex parish, a young man subject to fits of insanity. It was while passing through Paris on this tour that he made the personal acquaintance of Wilkes, and it was while at Montpellier, in January 1766, that a letter addressed by Horne to Wilkes laid the seeds of that personal antipathy which afterwards grew so rapidly. In the summer of 1767 the travelled parson landed again on English soil, and, in spite of his latent distrust of the so-called ‘‘ patriot," his exertions quickly obtained for Wilkes that seat for

the county of Middlesex which ensured his fortune. Horne was deeply concerned in all the proceedings of the corpo- ration of London in support of the popular cause, and he advised, if he did not actually draw up, the celebrated speech which Alderman Beckford addressed to his sovereign. As an incidental act in this struggle with the court and the majority of the House of Commons, Horne involved himself in a dispute with George Onslow, the member for Surrey, which culminated in a civil action, ultimately decided in Horne's favour, and in the loss by his oppo- nent of his seat in parliament. An influential association, called "the Society for Supporting the Bill of Rights," was founded, mainly through the exertions of Horne, in 1769, but the members were soon divided into two opposite camps of the thick and thin partisans of Wilkes and of those who refused to be labelled by the name of any combatant, and in 1770 Horne and Wilkes broke out into open warfare. Into this controversy, carried on with that unflagging zeal which always springs from personal hatred, none will now care to enter; it benefited the fortunes of neither of the combatants, and it damaged the success of the cause for which they had both laboured energetically. In 1771 Horne obtained at Cambridge, though not with- out some opposition fron. members of both the political

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parties, his degree of M.A., and in the same year he em- barked on a more laborious and costly undertaking, that of vindicating the right of printing an account of the debates in parliament, in which, after a protracted struggle between the ministerial majority and the civic authorities, the right' was definitely established. The energies of the indefatigable parson knew no bounds. In the same year (1771) he crossed swords with Junius, and ended in dis- arming his masked antagonist. It is a curious corollary to this controversy that more than one speculator has identified him with Junius. "Horne had now passed more than half the allotted span of life, and his only fixed income consisted of those scanty emoluments attached to a position which galled him daily. He resigned his bene- fice, and betook himself to the study of the law and to his studies in philology. An accidental circumstance, however, occurred at this moment which largely affected his future. His friend Mr William Tooke had purchased a consider- able estate south of the town of Croydon in Surrey, part of which seems to have

consisted of Purley Lodge in Coulsdon. The possession of this property brought about frequent disputes with an adjoining landowner, and, after many actions in the law courts, the friends of Mr Tooke's opponent endeavoured to obtain, by a bill forced through the Houses of Parliament, the privileges which the law had not assigned to him. Horne thereupon, bya bold libel on the Speaker, drew public attention to the case, and, although he himself was placed for a time in the custody of the sergeant-at-arms, the clauses which were injurious to the interests of Mr Tooke were eliminated from the bill through the publicity which his conduct had given to the matter. Mr Tooke's gratitude knew no bounds; he declared his intention of making his friend the heir to his fortune, and, if the design was never carried into effect, Horne derived from the generous old man during his life- time large gifts of money. No sooner had this matter been happily settled than Horne found himself involved in a more serious trouble than any that had yet befallen him. For his conduct in signing the advertisement soli- citing subscriptions for the relief of the relatives of the Americans murdered by the king's troops at Lexington and Concord, he was tried at the Guildhall in July 1777 before Lord Mansfield, found guilty, and committed to the King's Bench prison in St George's Fields, from which he only emerged after a year's durance, and after a loss, in fine and costs, amounting to £1200. Soon after his deliverance, as he had thrown off, as he thought, his clerical gown, he applied to be called to the bar, but his application was negatived on the ground that his orders in the church were indelible. To return to the church was now impossible ; and Horne tried his fortune, but without success, in farming some land in Huntingdonshire. Two tracts which were penned by him, one before and the other after this failure in practical life, exercised great influence in the country. One of them, criticizing the measures of Lord North's ministry, passed through nume- rous editions; the other set out a scheme of reform which he afterwards withdrew in favour of that advocated by Pitt. On his return from his voluntary banishment in Huntingdonshire, he became once more a frequent guest at Mr Tooke's house of Purley, and in 1782 assumed the name of Horne Tooke, which is now invariably assigned to him. In 1786 Horne Tooke conferred perpetual fame upon his benefactor's country house by adopting as a second title of his elaborate philological treatise of "Ezeo. Irepdevra, the more popular though misleading title of The Diversions of Purley. The treatise at once attracted attention in England and the Continent,

was universally read by the vulgar as well as the learned, and, while its conclusions, if not always carrying conviction to the erudite, were

deemed by them worthy of consideration as proceeding from a mind of extensive learning and singular acute- ness, the fame given to Purley by the choice of the title gratified its owner. The first part was published in 1786, the second in 1805, The best edition is that which was published in 1829, under the editorship of Richard Taylor, with the additions written in the author's interleaved copy. °

Between 1782 and 1790 Tooke gave his support to Pitt, and in the election for Westminster, a constituency in which Fox was vitally interested, he threw all his energies into the ministerial cause. With Fox he was never on terms of friendship, and Samuel Rogers, in his 7'able Talk, asserts that their antipathy was so pronounced that at a dinner party given by a prominent Whig not the slightest notice was taken by Fox of the presence of Horne Tooke. It was after the election of Westminster in 1788 that Tooke depicted the two rival statesmen in his celebrated pamphlet of Zwo Pair of Portraits. At the general election of 1790 he came forward as a candidate for that distinguished constituency, in opposition to Fox and Lord Hood, but was defeated; and, though he again sought the suffrages of its voters in 1796, and his speeches at the hustings were never exceeded in ability, he was again at the bottom of the poll. Meantime the excesses of the French republicans had unhinged the minds of all sections of society in England, and the actions of the Tory min- istry faithfully represented the feelings of the country. Horne Tooke was arrested early on the morning of 16th May 1794, and conveyed to the Tower. His trial for high treason lasted for six days (October 17-23) and ended in his acquittal, the jury only requiring the short space of eight minutes to settle their verdict. The evi- dence which the crown could adduce in support of the charge proved to be of the slightest description, and the demeanour of the accused throughout the proceedings furnished abundant proofs of the resolution of his mind and the force of his abilities. His public life after this event was only distinguished by one act of importance. Through the influence of Lord Camelford, the fighting peer, he was returned to parliament in 1801 for the pocket borough of Old Sarum.

No sooner was he returned to the House of Commons than Lord Temple endeavoured to secure his exclusion on the ground that he had taken orders in the church, and one of Gillray's caricatures delineates the two politicans, Temple and Camelford, playing at battledore and shuttlecock, with Horne Tooke as the shuttlecock. The ministry of Addington would not support this suggestion, but a bill was at once introduced by them and carried into law, which rendered all persons in holy orders ineligible to sit in the House of Commons. The parliamentary life of the member for Old Sarum was preserved through one parliament, but at its expiration he was excluded for ever.

The last years of Tooke's life were spent in retirement in a house on the west side of Wimbledon Common, and there he was visited by the leading members of the party of progress. The traditions of his Sunday parties have lasted unimpaired to this day, and the most pleasant pages penned by his biographer describe the politicians and the men of letters who gathered round his hospitable board. His con- versational powers rivalled those of Dr Johnson ; and, if more of his sayings have not been chronicled for the benefit of posterity, the defect is due to the absence of a Boswell. Through the liberality of his friends, his last days were freed from the pressure of poverty, and he was enabled to place his illegitimate son in a position which soon brought him wealth, and to leave a competency to his two illegiti- mate daughters. llness seized him early in 1810, and for the next two years his sufferings were acute. He died in his house at Wimbledon on 18th March 1812, and his body

was buried with that of his mother at Ealing, the tomb | which he had prepared in the garden attached to his house at Wimbledon being found unsuitable for the interment. An altar-tomb still stands to his memory in Ealing church- yard. A catalogue of his library was printed in 1813.

The Life of Horne Tooke, by Alexander Stephens, is written in an unattractive style, and was the work of an admircr only admitted to his acquaintance at the close of his days. Its main facts are reproduced with more brightness in an essay by Mr J. E. Thorold Rogers in the second series of his Historical Gleanings. Many of Horne Tooke's wittiest sayings are

preserved in the Zable Talk of Samuel Rogers and 8S. T. Coleridge. (ive 12, (Ch)

TOPAZ. It appears that the stone described by ancient writers under the name of tomagos, in allusion to its occurrence on the island of Topazion in the Red Sea, was the mineral which we now know as the chrysolite or PERIDOTE (9.v.). The topaz of modern mineralogists was unknown to the ancients. Topaz occurs either crystallized, in association with granitic roeks, or in the form of rolled pebbles in the beds of streams. The crystals are ortho- rhombic prisms, with a perfect cleavage parallel to the base, or transverse to the long axis of the prism. This cleavage is recognized by the lapidary as the “ grain” of the stone. It is notable that crystals of topaz are com- monly hemimorphic ; in other words, the prisms are ter- minated by dissimilar faces. This hemimorphism is asso- ciated with the property of pyroelectricity (see MrIner- ALOGY, vol. xvi. p. 376). The chemical composition of the topaz has given rise to much discussion, but the mineral is now generally regarded as a silicate of aluminium associ- ated with the fluorides of aluminium and silicon. When strongly heated it suffers considerable loss of weight. Brewster, examining the topaz microscopically, detected numerous fluid cavities, whence he concluded that it had been formed in the wet way. Two of the fluids obtained from these cavities have received the names of brewster- linite and cryptolinite. Some of the finest topazes are almost colourless, and may be occasionally mistaken for diamonds. The topaz, however, is inferior in hardness ; it lacks “fire”; and it becomes electric when heated—a, pro- perty not possessed by the diamond. Colourless topazes are known to French jewellers as gouttes d’eau, and in Brazil as pingas d@agoa—names which refer to the limpi- dity of the stone —while in England they pass in trade under the curious name of minas novas. The beauty of the stone is best developed when in the form of a brilliant. The topaz is cut on a leaden wheel by means of emery, and is polished with tripoli. Coloured topazes are usually either yellow or blue. The pleochroism of the stone is very marked: thus the colour of the sherry-yellow crystals from Brazil is resolved by the dichroiscope into brownish yellow and rose-pink. The colour is unstable, the yellow topaz especially being liable to suffer bleaching by exposure to sunlight. Hence the fine series of crystals of Siberian topaz from the Kochscharow collection, now in the British Museum, is carefully protected from light by means of opaque

pasteboard caps. In 1750 a Parisian jeweller named Dumelle discovered that the yellow topaz of Brazil, when exposed to a moderate heat, assumed a rose-pink colour. It is generally believed that all the pink topaz occurring in jewellery owes its tint to artificial treatment. Formerly it was the practice to heat the stone in a sand- bath, but the change of colour is now generally effected by wrapping the stone in German tinder, which is then ignited. This “burnt topaz” is sometimes known to jewellers as “ Brazilian ruby.” In like manner the blue topaz occasionally passes under the name of “Brazilian sapphire,” and the pale green as “aquamarine ’—a name which is strictly applicable only to the sea-green beryl. The largest known cut topaz is a fine brilliant, weighing 368 carats, and termed the “ Maxwell Stuart topaz.”

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The topaz is occasionally found in Britain, but usually in small erystals ‘unfit for jewellery. It occurs in granite at St Michael’s Mount in Cornwall, in Lundy Island, and in Arran, but the finest British specimens are obtained from the Highlands of Scotland. Ben-a-bourd, one of the Cairngorm group, yiclds good blue crystals. Topaz occurs in colourless and blue crystals in the granite of the Mourne Mountaius in Ireland; and microscopic crystals are not uncommon in certain other granites. The famous topaz-rock of the Schneckenstein, in Saxony, yields pale yellow crystals of great beauty as mineralogical specimens, but not suited for cutting. The yellow Saxon topaz does not scem to change colour on exposure to heat. Some of the finest topaz comes from near Odon Tchelon, in Siberia; while the well-known deep-yellow crystals of Brazil occur near Villa Rica (Ouro Preto). Fine topaz, pale blue and colourless, is found, as rolled crystals, in Tasmania aud on Flinders Island in Bass’s Strait. It also occurs in the tin-drifts of New South Wales ; and beautifully-formed limpid crystals, of small size, accompany stream-tin at Durango, in Mexico. Fine topaz fit for jewellery has recently been worked at the Platte Mountain, near Pike’s Peak, Colorado. One stone, weighing 125 carats, has been described as being “as fine a gem as America has produced of any kind” (Kunz, 1885). Topaz also occurs in cavities in rhyolite at Nathrop and Chalk Mountain, Colorado, and

in trachyte near Sevier Lake, Utah. It is likewise found in Arizona, in New Mexico, and at Stoneham, Maine.

Oriental topaz is the name sometimes given to yellow corundum, a mineral which is readily distinguished from ordinary topaz by its superior hardness and density. The yellow and smoky varicties of quartz, or cairngorm, are often known in trade as Scotch topaz, but these are inferior to true topaz in hardness and in density. The chief differences between the three may be thus expressed :—

+ Scotch Topaz.

7

2°6

True Topaz.

8

3°5 Orthorhombic.

Oriental Topaz.

9 4

Hexagonal.

Mlandine@ssin…0.-.c0e+

Specific gravity Crystallization. ..... Hexagonal.

TOPEKA, a city of the United States, the county seat of Shawnee county and the capital of the State of Kansas, is situated (39° 3’ N. lat. and 95° 39’ W. long.) for the most part upon the south bank of the Kansas or Kaw river, upon a level prairie bench considerably elevated above the river. A small portion, known locally as North Topeka, lies upon the north side of the river. Besides the State capitol, which is an imposing building in the midst of an extensive park, the city contains the State insane asylum and the

reform school. The Atchison, Topeka, and Santa Fé Railroad. Company has its offices and work- shops here, and the city is also intersected by a branch of the Union Pacific line. In 1860 Topeka had only 759 inhabitants ; in 1870 the number had risen to 5790. In 1880 the population was 15,452 (8140 males and 7312 females) ; and in 1886 the number is returned at 25,005, making Topeka the second largest city in the State. The assessed valuation in 1886 was $6,547,079, and the debt of the corporation only $422,900.

TORCELLO, a small island 6 miles north-east of Venice, now almost deserted, but once a place of much importance. Torcello was one of the parent islands from which Venice was colonized, and possessed a cathedral church long before St Mark's was founded. In the 11th century Torcello had already begun rapidly to decline. The existing cathedral of S. Maria is a building of the highest ecclesiological importance, unique in Europe as a perfect example of the arrangement of the choir in the 6th or 7th century, when the original cathedral was built, and, though most of the upper structure was rebuilt by Bishop Orseolo! about 1008, the plan of the church and the fittings of the choir still exist as they were originally designed. The church consists of a nave, with ten bays of arches on marble monoliths, and three aisles each terminated by an apse. Round the walls of the central apse are six tiers of seats for the officiating clergy, and, in the centre, raised above the others, a marble throne

| for the bishop, approached by a flight of steps (see vol.

1 Son of the Venetian doge Pietro Orseolo I.

iii. p. 418, fig. 16). The high altar stood in front of the steps, and the celebrant stood with his back to the apse, looking over the altar towards the congregation. An exactly similar arrangement still exists in many of the early Coptic churches of Old Cairo: the church of Abu Sergeh is a specially perfect example! When the church was reconstructed in 1008, Bishop Orseolo did not interfere with the older and then obsolete arrangements of the choir, but added a later choir, formed by marble screens, projecting three bays into the nave, with seats along three sides of the enclosure,—an arrangement like that which still exists in the church of S. Clemente in

Rome (see Roms, vol. xx. p. 833). The present choir-stalls date from the 15th century. A fine marble ambo was at the same time placed outside the cancelli, and the position of the celebrant at the high altar was reversed. The vaults of the three apses are covered with fine glass mosaics, added probably in the 12th century: in the centre is a large figure of the Virgin, with the twelve apostles below ; other mosaics cover the vaults of the aisle-apses and the whole entrance wall. The latter, much restored, has scenes of the Crucifixion, the Doom, and Heaven and Hell. The sculpture of the nave capitals and on the marble cancelli is very graceful work of Byzantine style, closely resembling similar panels at Ravenna. One remarkable peculiarity of this church is the marble shutter which closes each window on the right wall; these have pivots which revolve in projecting corbels—a very early method of closing windows of which very few examples still exist. Even when the shutters were closed some dim light passed through the semitranslucent marble slabs.2 An octagonal baptistery, also built by Bishop Orseolo, stood outside the main entrance to the church, but has been rebuilt on a smaller scale. The crypt under the central apse of the cathedral is probably part of the original church, unaltered by any later changes.? The small church of 8. Fosca, which is connected with the cathedral by a loggia, is also a building of exceptional interest, dating from the 10th cen- tury. ‘It is purely Oriental in plan, and much resembles that of St Mark’s at Venice and 8. Vitale at Ravenna, on a small scale. It has a cruciform nave, with a large dome supported on eight columns, and a projecting choir with three apses. Externally it is surrounded by a loggia, supported on marble columns with rich Byzantine capitals. 8. Fosca was partially rebuilt in the 12th century, and has since been much modernized, but its original very interest-ing plan still remains but little changed.

TORGAU, a fortified town in the Prussian province of Saxony, is situated on the left bank of the Elbe, 30 miles north-east of Leipsic and 26 miles south-east of Witten- berg. Its most conspicuous building is the Schloss Hartenfels, on an island in the Elbe, begun in 1481 and completed in 1544 by the elector John Frederick the Magnanimous. This castle is one of the largest Renais- sance buildings in Germany, and contains a chapel con-secrated by Luther in 1544. The town-house is a quaint building of the middle of the 16th century, and there are several other large and fine buildings, chiefly modern. The parish church contains the tomb of

Catherine von Bora, Luther’s wife. The once flourishing weaving and brewing industries of Torgau have declined in modern times ; but the town has manufactures of gloves and

1 See Middleton in Archeologia, vol. xlviii. p. 398.

2 Similar marble slabs, not made to move, still exist in the apse windows of 8. Miniato, near Florence, and once existed in the basilica of S. Lorenzo fuori le Mura, Rome.

®’ The cathedral of Patenzo, in Istria, a work of the 6th century, much resembles the cathedral of Torcello (see vol. iii. p. 418, fig. 17). Similar plans are also to be seen in many of the early churches of Syria (see De Vogiié, Syrie Centrale, Paris, 1865) as well as in the Coptic churches of Egypt.

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miscellaneous articles, and carries on trade in grain, &c., on the Elbe and by rail. The fortifications, begun in 1807 at Napoleon’s command, are largely surrounded with water ; they include a ¢éte-de-pont at the end of the bridge across the Elbe. In 1885 the population was 10,988 (in 1783 4000), a large proportion of them soldiers.

Torgau is said to have existed as the capital of a distinct princi- pality in the time of the emperor Henry I., but by 1305 it was in the possession of the margrave of Meissen. It was a frequent resi- dence of the electors of Saxony. In Reformation times Torgau appears as the spot where John of Saxony and Philip of Hesse formed their league against the Roman Catholic imperial estates ; and the Torgau Articles, drawn up here by Luther in 1530, were the basis of the Augsburg Confession. The Thirty Years’ War inflicted great suffering on the town. In 1760 Frederick the Great defeated the Austrians in the neighbourhood of Torgau. The town capitulated to Tauentzien on January 10, 1814, after a siege of three months.

TORONTO, the capital of the province of Ontario and the second largest city in the Dominion of Canada, is situated on a large and finely sheltered bay on the north shore of Lake Ontario, between the rivers Don and

Humber. The magnetical and meteorological observatory, in the university grounds, stands at a height of 108 feet above the lake, and approximately 342 feet above the level of the sea, in lat. 43° 39’ 35” N., long. 79° 23’ 39” W. Toronto is 39 miles north-east of Hamilton, at the head of Lake Ontario, and 310 miles west-south-west of Montreal. The bay is formed by a peninsula or island about 6 miles long, enclosing a fine basin of 3°44 square miles, with a narrow entrance at the west end. This forms a safe and commodious harbour. The city stands on a thick deposit of boulder clay, overlying shaly sandstones of the Cin- cinnati or Hudson River group, practically equivalent in

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Plan of Toronto.

1. Front Street. 10. Bay Street. 17. Metropolitan Church. 2. King Street (West). 11, Yonge Street.. ; 18. Free Library.

8. King Street. 12, Parliament Build- | 19. St James’s Cathedral. 4, King Street (East). ings. 20, River Don.

5. Richmond Street. 13. Government House. 21. Knox College.

6. Queen Street (West). 14. Upper Canada Col- | 22. University College.

7. Queen Street. lege. 23. Magnetic Observatory. 8. Queen Street (East). 15. Osgoode Hall. 24, Queen’s Park.

9. York Street. 16. St Michael’s Cathedral. | 25. St James’s Park.

position to the Caradoc horizon of British geology. These thin-bedded sandstones crop out on the lake shore, and have been quarried for flagging and building purposes at the mouth of the Humber. In the northern part of the city the boulder clay is overlaid by stratified clays of the Post-Glacial age, largely used in the manufacture of bricks, of which many of the houses are built. The site slopes gradually from the margin of the bay for a distance

of 3 miles to a terrace or ancient lake margin immediately outside the northern limits of the city, which occupies an area of 12°83 square miles, or of 17-99 square miles including the harbour and island. The streets cross each other at right angles. Yonge Street, the main thorough-

fare running north and south, was constructed as a great military road in 1796, and extends under the same name, for upwards of 30 miles, to Lake Simcoe. It constitutes the dividing line of the city, the streets being reckoned east or west according to their relation to it.

The city is the seat of the provincial Government, with the official residence of the lieutenant-governor, the parliament buildings and Government offices, the courts of law, and the educational departmental buildings for Ontario. The provincial legislature occupies the old par- liament buildings erected in 1849, when Toronto was the capital of Upper Canada; but they have long been recog- nized as inadequate for the purpose. Plans have accord- ingly been prepared, and the new buildings are now in process of erection. ‘The site is in the centre of the Queen’s Park, a finely wooded park of upwards of 30 acres, originally laid out for the provincial university, and on which the old buildings of King’s College stood. The new university building occupies a fine site immediately to the west. It is an imposing structure, of great architec- tural beauty, in the Norman style, with a massive central tower. The buildings of the provincial school of practical science, and of the magnetical observatory, are also erected in the university grounds. The observatory is one of the meteorological stations established by the British Govern- ment, on the recommendation of the Royal Society, in 1840. It is now maintained by the Dominion Government.

The university, University College, and the school of practical science embrace in their conjoint teaching a comprehensive system of training in arts and science ; and in them upwards of 500 students receive their training in arts, in the natural and applied sciences, and in engineering. There is also a medical faculty, reorganized under a recent Act, in conjunction with the department of science in the university. The university and college constitute unitedly the state institution maintained by public funds, and strictly secular. But it is surrounded with the theological and training

colleges of different denominations in affiliation with it, the students of which pursue their undergraduate course in the university for a degree in arts. The affiliated colleges, some of which give degrees in divinity, include Knox College (Presby- terian), Wycliffe College (Church of England), St Michael's College (Roman Catholic), Macmaster Hall (Baptist), and Victoria College (Methodist). Besides the provincial uni- versity and its affiliated colleges, Trinity College (Church of England) gives instruction in divinity and arts, and confers degrees in all the faculties. Toronto and Trinity medical schools occupy convenient buildings in the imme- diate vicinity of the general hospital, the Burnside lying-in hospital, and the Mercer eye and ear infirmary. The students in medicine number nearly 500, including a small number of lady students, for whom special instruction is provided. Upper Canada College, founded in 1829, is a provincial institution analogous to one of the great English public schools. It has about 300 students. The Collegiate Institute occupies a fine building immediately to the west of the horticultural gardens. It is the higher school, forming an important feature in the provincial system of education, and is maintained, along with the free public schools, from local taxes. Its students number 443, of whom 182 are females.

Osgoode Hall, the seat of the superior courts of law and equity, is an ornate Italian building, extended at various dates. The provincial asylum for the insane affords accommodation for upwards of 700 patients; it is sur- rounded with recreation grounds extending to 50 acres.

The city charities are numerous and well organized. The churches include some large and handsome buildings. Among the more important public buildings are those of

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the educational department, including a museum and gallery of art, normal and model schools; the custom- house, a fine Renaissance building, with extensive ware- houses attached; and the post-office, also of tasteful architectural design. The free city library occupies a com- modious building in Church Street, in addition to branch libraries in different parts of the city. It contains upwards of 47,000 vols. There are 35 city public schools, occupying large and commodious buildings, with 262 teachers and 20,213

children. The separate (Roman Catholic) schools number 13, with 60 teachers and 3792 children.

Toronto is the seat of many flourishing industries, in- cluding foundries, tanneries, furniture, stove, shoe, and other manufactories, flour-mills, breweries, &c. The site of the city is favourable to commerce. It is the centre of a rich agricultural district ; and its harbour is of easy access to the largest vessels that navigate the lakes. It lies directly opposite the mouth of the Niagara river, distant 40 miles; and throughout the season of navigation well- appointed steamers maintain communication with the prin- cipal routes of travel in the United States and Canada. By means of the Grand Trunk, the Great Western, the Northern, the Canada Pacific, and other railways, it forms an important commercial centre for distribution ; and it is the seat of the head offices of most of the banks and of the chief wholesale trade of western Canada. The direct route from the lower lakes to Lake Superior and the great North-West is by the Northern Railroad to Georgian Bay, where lines of steamers maintain constant communication from Collingwood and Owen Sound to Prince Arthur's Landing and the railways to Manitoba and the North-West.

In 1861 the population numbered 44,821 ; in 1871 it had increased to 56,092 ; in 1881 to 86,415; and in 1887 it is believed to amount to 140,000. The actual number on the assessment rolls is 111,800. The estimated value of real estate in Toronto is $105,000,000. The assessed value in 1886 was $83,556,811. The annual revenue of the city is estimated for 1887 at $1,812,941. The amount of customs duties for the fiscal year ending 30th June 1887 was $4,273,038. The value of exports to the same date was $3,192,157, and of imports $21,020,528. The city returns three members to the Canadian House of Commons, and three to the provincial legislature of Ontario.

In the despatches of Canadian officials of Louis XIV. in the 17th century Toronto means the country of the Hurons, a region lying between Lake Simcoe and Lake Huron, about 40 miles north. The river Humber, which enters Lake Ontario immediately to the west of the Bay of Toronto, though navigable only for a short distance eveu by canoes, formed with its portages a line of communication between Lake Ontario and the Huron country.

Hence the station near the mouth of the river became the common landing-place for trading and hunting parties bound for the region known of old as Toronto, and so received its name. A French trading post, built there in 1749, and originally named Fort Rouillé, after the French colonial minister Antoine Louis Rouillé, comte de Jouy, was familiarly known as Fort Toronto. The Northern Railway, the first one constructed in Upper Canada, followed the route of the old Indian trail, and established a direct line of comniunication, by means of steamers from Collingwood, with Lakes Huron, Michigan, and Superior. The railway passes through a fine agri-cultural country, and is uuw exteuded into the Muskoka and Nippitsing districts, bringing an extensive lumbering region into direct communication with Toronto.

The site for the town was surveyed inl 793 by Surveyor-General Bouchette, under the instruction of the lieutenant-governor, General Simcoe; and in his narrative of the original survey Bouchette describes the untamed aspect of the scene, with the

‘ group of wigwams of a little band of Mississaga Indians who con-

stituted the sole occupants of the land; while the waters of the bay and the neighbouring marshes were the haunts of innumerable coveys of wildfowl. The first parliament of Upper Canada held its second session in May 1793 at the town of Newark, at the mouth of the Niagara river; but in the following August the scat of government was transferred to Toronto, to which General Simcoe gave the name of York, in honour of the duke of York, the second son of George III. Under its new name the embryo metropolis

slowly progressed as the surrounding country was cleared and settled. The entrance to the harbour was guarded by two block houses ; provision was made for barracks and garrison stores; buildings were erected for the legislature ; and there the members of parliament, summoned by royal proclamation to ‘‘meet us in onr provincial parliament in our town of York,” assembled on the 1st of June 1797. Sixteen years later the population numbered only 456. The town was twice sacked in the war of 1812. General

Dearborn captured it at the head of a force of upwards of 2000 drawn from the neighbour- ing States. On their advance to the outworks of the garrison, the magazine of the fort exploded, whether by accident or design, killing many of the invaders. The halls of legislature and other buildings were burnt, and the town pillaged. On the restoration of peace the work of creating a capital for Upper Canada had well nigh to begin anew. But the city advanced with the general progress of the country. Trade centred in the little capital; the population in- creascd ; and needful manufactures were established. The organiza- tion of Upper Canada College in 1830, with a staff of teachers nearly all graduates of Cambridge, gave a great impetus to the city and pro- vince. In 1834 the population of York numbered fully 10,000; and an Act of the provincial legislature conferred on it a charter of in- corporation, giving it for the first time an efficient system of munici- pal government, with a mayor, aldermen, and councilmen, entrusted with the administration of its affairs. Under this charter it was constituted a city, with the name of Toronto. (D. W.)

TORPEDO. ‘Torpedoes may be briefly described as charges of some explosive agent, enclosed in water-tight cases, and moored or propelled under water at such depths that by their explosion they may sink or seriously damage a vessel in their vicinity. The use of torpedoes in naval warfare was proposed and even attempted in the end of the last and beginning of the present century, but no successful application of them was made until the American Civil War of 1861-64. The word “submarine mine” is generally substituted for “torpedo” when speaking of defensive or stationary mines, the latter term being reserved for loco- motive torpedoes, or others used in offensive operations.

1. Submarine Mines.—Submarine mines are divided into three classes:—(1) observation mines, fired by an electric current when the enemy is observed to be within the de- structive area of the mine; (2) electro-contact mines, which, when struck, fire by automatically completing the electric

The explosion of 500 ib of gun-cotton at a horizontal distance of 30 feet would seriously injure a vessel, and 30 ib in contact with the bottom below the armour would probably blow a hole through the outer and inner skin.

The depths given above are approximately the best depths to get the fullest effect out of the charges mentioned. When the water is so deep that if the mine were placed on the bottom it could not exert its full destructive effect on the bottom of a ship, it is given enough buoyancy to allow it to float above its moorings,—a mine on the bottom being termed a “ ground mine,” and a mine floating above its moorings a “ buoyant mine.”

If mines are placed too close together the explosion of one will damage those near it, the interval which must be left between them being—for a 100 tb mine, 100 feet ; for a 250 ib mine, 250 feet ; and for a 500 ib mine, 300 feet. There is therefore always a possibility of a ship passing through a single line of mines without coming within the destructive area of any. Mines are therefore generally arranged in two or more lines, the mines of one line covering the spaces left between the mines of the next, or several mines may be laid close together, and the whole exploded sinmultaneously.

The electric circuit of all electrical mines is very similar. A voltaic battery ashore has one pole put permanently to earth and the other pole joined to the electric cable lead- ing to the mine. This cable passes into the mine case through a water-tight joint, and is connected up to one pole of the electric detonator, the other pole of the deton- ator being connected to the mouth-piece of the mine and consequently to earth. To prevent the mine being fired until the proper moment has arrived, this circuit must be broken somewhere, and means provided for completing it when the mine is to be fired. In the case of observation inines this is done by inserting a firing key in the electric cable near the battery, and in electro-contact mines by a circuit closer in the mine.

The right moment to fire an observation mine is determined by Obser- two observers ashore, who have each adjusted two sights in line vation with the mine, as it was lowered into position,—the stations for mines,

circuit from the battery ashore; (3) mechanical mines, which, when struck, fire through the action of some con-

trivance within themselves, andare not connected with the shore. Mines of the first class are used in places where a channel has to be kept clear for screw steamers to pass, the second class in those parts of the channel where

there is little traffic, and the third class in channels which it is intended to bar equally against friend or foe.

Electrical mines have the advantage over mechanical that by the removal of the firing battery the passage of a ship is rendered perfectly safe, and that the condition of the mine can be ascertained by electrical tests, but the electric cables are able to damage, and add greatly to the expense of the defence.

Gun-cotton and dynamite are the explosives generally used in mines, the charges varying from 30 ib to 500 Ib, according to the description of mine. In all mines the charge is exploded by means of a detonator con- taining fulminate of mercury. In mines loaded with gun-cotton the detonator is inserted in a priming charge of dry gun-cotton, this priming charge being in a metal case, closely surrounded by the wet gun-cotton comprising the remainder of the charge. Where dynamite is employed the priming charge is not necessary. Experiments made to determine the horizontal distance at which an ironclad will be vitally injured by different charges have yielded the following general results :—

Charge. Submergence. Distance. DME TION oi… iccecss see eisessceeens 10 to 15 ft. 4 ft. 250 Ib ground mine…..... Seon ite 30 ft 10 ft. 500 ib ground mine…….....~~—/del>.++ 60 ft Wont:~~

these observers being chosen so that their lines of sight may be as nearly as possible at right angles to each othcr. The electric cable from the mine is led past both observers and connected to a firing battery, one pole of which is put permanently to earth. A firing key inserted in the circuit at the station of each observer renders the simultaneous pressure of both keys necessary to explode the mine. If each observer depresses his firing key as the centre of the enemy crosses his own line of sight, both keys can only be pressed simultaneously if the enenty arrives at the intersection of the two lines of sight, and consequently over the mine. When many inines are placed in one channel, it is usual to moor them in three lines, the prolongation of each line converging to an observing station, where the direction of each line is marked by sights. The electric cables from all the mines come to another observing station, and are there connected to separate firing keys, each of which has one pole joined up to a firing battery. The observer at this station

is also provided with a scparate sight marking the dircction of each mine in all the lines. The former station is termed the “ converg- ing” and the latter the “firing” station. The observer at the converging station telegraphs to the firing station the instant at which the centre of the enemy is on one of the lines of mines, the observer at the firing station determining by means of his sights which individual niine the enemy is over, and he can fire it by pressing the corresponding key.

Instead of separate sights for each mine, observing ares nay be used. These instruments are furnished with a telescope, which can be constantly directed on the enemy, a bar attachment auto- inatically closing the circuit when the direction of the enemy cor- responds toa mine. The camera obscura has also been used for determining the position of an enemy in the mine field.

Electro-contact mines are buoyant mines moored about 10 feet Electro- below the surface, and are in connexion with an electric battery contact ashore. They are arranged to explode on being struck by a passing mines.

ship, by means of an apparatus contained in the mine itself, called a circuit closer. Many different kinds of circnit closers are in ‘use, but they all depend upon there being a break in the electric circuit while the circuit closer is at rest, the circuit closer completing the circuit when the mine receives a blow. That most commonly used

Mechan- ical mines.

Electro- mechan- ical mines.

Counter- mining.

450

(fig. 1) consists of a steel spindle @ carrying a weight 6 on its upper end. This steel spindle carries an insulated brass ring ¢, to which the wire from the detonator d is attached, the other pole of the detonator being connected to the cable ¢ leading to the electric battery. On the mine being struck the inertia of the weight causes the steel rod to vibrate sufficiently to bring the insulated ring in contact with brass springs in connexion with the earth, thus com- pleting the circuit of the electric battery through the detonators. Another form of circuit closer is a tube of ee mercury, which by splashing up when the mine is struck completes the electric circuit between two previously insulated points.

A single main cable from the battery may have several clectro-contact mines attached to it; the expense of leading a separate wire from each mine to the battery is therefore avoided. If one mine was fired the broken end of its branch wire from the main cable would be left in the water, and on another mine being struck it would only receive a

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Fig. 1. portion of the current, as the battery would be connected to earth

through the broken branch. Each branch wire must therefore havo a disconnector in circuit, clear of the explosion. The discon- nector consists of a platinum wire fuse contained in a strong iron case, and the same current which fires the detonator in the mine fuses the platinuin wire bridge of the disconnector, and the circuit to the broken branch remains insulated.

Mechanical mines, of which there are many different patterus, contain the means of ignition within themselves, and are nncon- nected with any apparatus ashore. They may be ignited by per- cussion, frietion, chemical action, and electricity.

A simple form of mechanical mine has a heavy top, which, on being pushed off by a passing ship, either pulls out a pin and re- leases a plunger, which is then forced by a powerful spring into a detonator, or a friction tube is fired when the weight falls on a line attached to it. Another form, known as Abel's mechanical ex- ploder, consists of a glass tube containing sulphuric acid, and sur- rounded by chlorate of potash and sugar. The whole is contained in an india-rubber tube, which projects from the top of the mine, the lower end being in communication with the charge. When struck, the india-rubber tube bends, and, the glass tube breaking, the sulphuric acid mixes with the chlorate of potash and sugar and inflames the charge.

Electro-mechanical mines can be made by placing a voltaic battery inside the mine itself and joining it wp toa fuse and circuit closer, the circuit closer completing the circuit when the mine is struck. Another form of electro-mechanical mine (fig. 2) has several projecting horns (a, a, a) of lead tubing. Inside each horn is a glass tube containing bichromate of potash, and immediately under it a row of small zine and carbon plates, 6, in a contain- ing cell. On any one of the lead horns being bent, the glass tube is broken, and the bichromate of potash drops into the eell, converting the arrangement into a voltaic battery, which, being already eounected to the electric fuse c, fires the mine.

All mechanical and clectro-mechanical mines are provided with some contrivance to gnard against accidental explosion during the process of laying. 1n mechanical mines a safety pin can be with- drawn after the miue is in position, or, in the case of Abel's exploder, the projecting tube is surrounded by iron segments which fall off when the mine is in position. In electro-mechanical nines two of the wires forming part of the circuit inside the mine may be brought through to the outside and kept apart till the mine is in position, these wires being long enough to allow of the operator retiring clear of the explosion before joining them up and rendering the mine dangerous.

Mechanical mines have the advantage over electrical that they require fewer trained men –

Fig. 2.

TOR? ED 0

charges in an enemy’s mine field. Mines containing heavy charges would be used for the purpose, several of these mines being dropped in succession from a boat towed by a fast steamer, the whole line being exploded together as soon as the last mine had been dropped. Numerous experiments have proved that the explosion of a 500 Ib mine will effectually destroy any mine within a radius of 100 feet; the countermines would therefore be dropped at double this distance apart, and the channel so cleared marked by buoys. Electric cables can also be caught and raised to the surface by grapnels; or the grapnel may have a ease of explosive between its arms, so that, instead of raising the wire, it may be cut by firing the charge.

2. Locomotive Torpedoes.—Locomotive torpedoes are a numerous class, the principal being the Whitehead, Lay, Sims, Brennan, and Ericsson. The Whitehead is the only one which can be considered a well-developed naval weapon.

This torpedo (fig. 3) is made in different sizes, varying

inches in diameter ; the cross section is circular, tapering to a point at each end. It is capable of being so adjusted that on being discharged it will travel at any depth be- tween 5 and 15 feet below the surface, and it will maintain this depth for its entire run. The torpedo travels at a uniform speed for the whole of its range, the speed and range varying for different patterns; the latest type has a speed of 24 knots for 600 yards. The torpedo can be set so that, in the event of its not striking the ship aimed at, it will stop at the end of its range and sink. Jor exercise it can be set to stop at any distance within the limits of its range, rise to the surface, and float. The torpedo is divided into several compartments. ‘The foremost A con- tains a charge of from 30 to 100 tb of gun-cotton, accord- ing to the size of the torpedo. This charge is fired on the torpedo striking a ship by a pistol which screws into the nose of the torpedo. On impact the point of the pistol is driven inwards and forces

the point of a steel striker into a detonator. By means of powerful air-punips air is com- pressed into the air-chamber B to a pressure of 1000 tb on the square inch, and actuates a three-cylinder engine, which drives two propellors revolving in opposite directions in the tail, The mechanism in the balance-chamber C works two exterior rudders on each side of the tail, which keep the torpedo at a uniform depth during its run. This device has never been patented, but is a secret; the details of it, however, have been purchased by all prominent maritime nations.

The tail F is fitted with four broad fins, which tend to keep the torpedo on a straight course and prevent it roll- ing. The horizontal tail fins carry four rudders, two hori- zontal and two vertical. The horizontal rudders worked from the balance-chamber keep the torpedo at its set depth ; the vertical rudders are permanently adjusted so as to cause the torpedo to travel in a straight line.

The air-chamber of a torpedo is usually made of fluid compressed steel, the remaining compartments of thin steel plate, and the interior mechanism of phosphor-bronze. In Germany torpedoes are now made entirely of phosphor- bronze.

The torpedo can be discharged from above or below

for their manipulation, aro

cheaper, and can be placed in

position very rapidly. But no really efficient method

has yet been devised that

will ensure a mechanical

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mine, after it has been Ye placed in position, being safely taken up again for examination or removal, nor can any tests be applied to ascertain if it remains in an efficient condition.

All mines, especially thoso with electric cables attached, must be protected by gun fire or guard boats, as, if the mine field is un- protected, they can be easily destroyed by countermining or creep-

ing. Countermining is carried out by exploding a succession of

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| by an air-tight door.

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White- from 12 feet to 19 feet in length and from 12 to 15 head

torpedo,

Lay torpedo.

Sims torpedo.

Brennan torpedo.

Ericsson torpedo.

Out- rigger, drifting, and tow- ing tor- pedoes,

Torpedo boats.

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compressed air, the contents of which, by means of a suit- able firing valve d, can be instantaneously admitted into the gun. When the torpedo is to be discharged this firing valve is opened, and the compressed air in the reservoir forces the torpedo out at a high velocity, a tripper 6 pro- jecting through the top of the gun throwing back the starting lever of the torpedo on its way out. From below water the torpedo is discharged through a tube, the muzzle of which forms part of the stem of the ship, the tube being fitted with an outside valve which prevents the water from entering while the

torpedo is placed in the tube. Latterly powder has been used instead of compressed air for the ejecting force.

The Lay torpedo is a boat of cylindrical form, the fore part being charged with an explosive. The motive power is carbonic acid gas generated in the usual way. As only a very small portion of the boat is visible on the surface, two guide rods, one on each end of the vessel, mark its position at any part of itsrun. The boat ean be started, stopped, and steered by means of-an eleetrie cable, con- taining several insulated wires, which is paid out from the boat as it travels,

The Sims torpedo is cigar-shaped, and is suspended to a boat- shaped float. The torpedo is propelled by screws driven by an electric motor situated in the body, the current for which is supplied from a dynamo ashore. The electric cable is coiled on a drum in the torpedo, and pays out as the torpedo advances. The torpedo is also stecred from the shore by an eleetric current. Its speed is about 12 knots.

The principle of the Brennan torpedo is as follows. The torpedo contains two drums upon which a large amount of pianoforte wire is wound. One end of the wire from each drum is taken to large drums ashore, which are revolved by a steam-engine. By winding up on the large drums ashore a rotatory motion is imparted to the drums in the torpedo, which by means of gearing revolve two serew propellers, aud these drive the torpedo through the water. The torpedo can be steered from the shore in any direction, by winding on one drum faster than the other, which alteration in motion moves a vertical rudder on the torpedo.

The Ericsson torpedo is a long fish-shaped weapon, made of wood, and weighted so as to have little or no buoyancy. The charge is contained in a metal ease at the fore end. It is pro- pelled by a charge of gunpowder, out of a submarine gun fixed in the bows of a ship. Its range is about 300 feet, and it fires on impact.

Outrigger, Drifting, and Towing Torpedoes.—Before the introduc- tion of the Whitchead, vesscls armed with torpedoes were princi- pally supplied with the outrigger torpedo. The explosive is con- tained in a mctal case secured to the end of a steel or wooden pole, which lies fore and aft in the

vessel carrying it. The pole can _be rigged out until the torpedo is submerged a short distance ahead of the vessel, and is fired on contact with the euemy's side, either by an operator in the boat completing the electric cireuit, or by the eireuit being eompleted by a circuit closer in the torpedo. In rivers, or places with a current, drifting torpedoes can be used. They should be suspended from floats, and arranged in groups or pairs connected together by a rope, so that they may catch across the bows of a vessel at anchor. They can be fired after a given lapse of time by clockwork and other devices, or can be so arranged that the firing arrangement is released on a catch being withdrawn by the action of a propeller wheel, which remains stationary as long as the torpedo drifts with the current, but is revolved by the force of the current when the torpedo is stopped. Towing torpedoes are constructed to diverge from either side of a ship when towed, which is effeeted by shaping the torpedo like an otter. The torpedo tows on the surface, and, on striking a ship's side, the head con- taining the charge drops off, and fires as its weight tautens a line eonnecting it to the body.

Torpedo Boats.—The great improvements made of late years in machine guns have rendered the outrigger and towing torpedo of little value for torpedo boats, as it would be almost impossible to approach a vessel near enough to use them before the boat would be destroyed by the storm of missiles which would be fired at her. All torpedo boats under construction, and most of those already completed, are therefore armed with the Whitehead torpedo. A modern torpedo boat is built entirely of steel, the plates often not exceeding 7s inch in thickness, as, in order to get the necessary high speed, the minimum of weight consistent with the necessary strength is of the firstimportance. There are three classes of boats, known as first, second, and third. The first are eapable of keeping the sea on their own account ; the second are for harbour defence ; and the third ean be carried on board a ship.

The following table gives the dimensions and other details of a boat of each type :—

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| Full tnicaea Boiler | Distance —_ is- Horse- | Pressure,| €2 steam with th Length.) Beam. | place-, si Power ib per ") Coal carried at ' nent! rots. | at

Hull || Square. | ————_———= Speed. | Inch. | Full | Half Speed. | Speed. Ft. Ft. in.| Tons. Knots. | Knots. Ist class..; 135 13 0] 88 23 1150 140 400 2000 | 2d class…) 86 11 0] 30 20 450 125 150 400 3d elass…| 64 7 G6{ 125] 16°5 150 120 100 250

The boilers and machinery are protected by coal, and an armoured tower protects the steering gear and telegraphs for controlling the engines.

Torpedo Nets.—The introduetion of the modern torpedo boat has Torpedo caused great attention to be paid to any means which will protect nets.

a ship from the torpedo. Most nations are adopting steel-wire netting, suspended from booms attached to the ship's side, the booms keeping the nets sufficiently far off to prevent any damage being done to the bottom by the explosion of the largest charge carried by a Whitehead. This netting, besides being cumbersome and heavy, cannot be used unless the ship is stationary or nearly so, so that in many cases it would be useless, but for ships at anchor it is of great value. Increased cellular subdivision is also being given to ships under construction, and special vessels, called '* torpedo catchers," are being built by most nations. A torpedo catcher is a vessel of superior size and strength, but with the same high speed as a torpedo boat, the principal arm of the torpedo catcher being machine guns. (iy, BG)

TORQUATUS. See MANLivs.

TORQUAY, a watering-place of England, is finely situated on the northern recess of Tor Bay, Devonshire, and on the Dartmouth and Torbay branch of the Great Western Railway, 12 miles north of Dartmouth, 23 south of Exeter, and 220 west-south-west of London. Owing to the beauty of its site and the equability of its climate, it is the favourite watering-place of Devon, and, being screened by lofty hills on the north, east, and west, and open to the sea breezes'of the south, it has a high reputa- tion asa winter resi-

SOs Mary dence. The tem- a han oe perature seldom Wes "Qu

rises as high as 70° in summer or falls below freezing point in winter The lower ground is oecupied by shops, hotels, and the plainer class of houses,

while man- sions and _ villas occupy the pictur- esque acclivities of the _ well-wooded limestone cliffs, commanding a great variety of fine views. There are still some remains of the original Torre abbey, founded for Praemonstratensians by William, Lord Brewer, in 1196. They stand to the north of the modern man- sion, but, with the exception of a beautiful pointed-arch portal, are of comparatively small importance. On the south of the gateway is an old 13th-century building, known as the Spanish barn. On Chapel Hill are the remains of a chapel of the 12th century, dedicated to St Michael, supposed to have formerly belonged to the abbey. St Saviour's parish church of Tor-Mohun, or Tormoham, an ancient stone structure, was restored in 1874, The old church at St Mary Church, to the north of Torquay, has been rebuilt in the Early Decorated style; and in 1871 a new tower was also erected as a memorial to Dr Phillpotts, bishop of Exeter, who with his wife is buried in the churchyard. St John's church, by Street, is a very fine example of modern Gothic. Among the principal

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Environs of Torquay.

secular buildings are the town-hall with square tower (1852), the post-office (1865), the museum of the natural history society (1874), the theatre and opera-house (1880), the county police court, the market, and the schools of art and science (extended in 1887). There are a number of benevolent institutions, including the Torbay infirmary and dispensary (1843), the homeeopathic dispensary (1848), the Western hospital for consumption (1852), Crypt House institution for invalid ladies (1854), and the Mildmay home for incurable consumptives (1886). In 1886 the local board purchased from the lord of the manor, at a cost of £85,000, the harbours, piers, baths, assembly rooms, &e., including 60 acres of pleasure grounds and open

spaces. The town is supplied with water from the Dart- moor hills, 16 miles distant, at a cost of £120,000. There is a convenient harbour, extended in 1870 at a cost of £70,000, and having a depth of over 20 feet at low water. The principal imports are coals, timber, and slates, and the principal exports are stones of the Transi- tion limestone or Devonshire marble, which is much valued for building purposes. In the town are a number of marble-polishing works. ‘Terra-cotta ware of very fine quality is also manufactured from a deposit of clay at Watcombe and at Hele. The population of the urban sanitary district (Tormoham with Torquay, area 1465 acres) in 1871 was 21,657, and in 1881 it was 24,767. There was a village at Torre even before the foundation of the abbey, and in the neighbourhood of Torre are remains of Roman occupation. The manor was granted by William the Conqueror to Richard de Bruvere or de Brewere, and was subsequently known as Tor Brewer. After the defeat of the Spanish Armada, Don Pedro’s galley was brought into Torbay; and William, prince of Orange, landed at Torbay 5th November 1688. The bay was a rendezvous for the British flect during the war with France, and the first good houses at Torquay were built for the officers. Until

half a century ago it was an insignificant fishing village. See Blewitt’s Panorama of Torquay, 1832, and White’s History of Torquay, 1878.

TORQUEMADA, Juan bE (1388-1468), or rather JOHANNES DE TURRECREMATA, cardinal, was born at Valladolid in 1388, and at an early age joined the Do- minican order, early distinguishing himself for learning and devotion. In 1415 he accompanied the general of his order to the council of Constance, whence he proceeded to Paris for study, and took his doctor’s degree in 1423. After teaching for some time in Paris, he became prior of the Dominican house first in Valladolid and then in Toledo. In 1431 Pope Eugenius IV. called him to Rome and made him “‘ magister sancti palatii.” At the council of Basel he was one of the ablest and most prominent supporters of the view of the Roman curia, and he was rewarded with a cardinal’s hat in 1439. He died in

1468.

His principal works are In Gratiani Deeretum Commentarii, 4 vols., Venice, 1578; Haxpositio Brevis et Utilis super Toto Psalterio, Mainz, 1474;

Questiones Spirituales super Evangelia Totius Anni, Brixen, 1498; Summa LEcelesiastica, Salamanca, 1550. The last- named work has the following topics:—(1) De Universa Ecclesia ; (2) De Ecclesia Romana et Pontificis Primatu; (3) De Universali- bus Conciliis; (4) De Schismaticis et Hereticis.

TORQUEMADA, Tomas DE, inquisitor-general for Castile and Leon, was born early in the 15th century, and died in 1498. When called to the work with which his name is so unenviably associated he was prior of the Dominican house in Segovia. See INQUISITION.

TORRE ANNUNZIATA, a town of Italy, in the pro- vince of Naples, 124 miles south-east from that city, on the Bay of Naples, at the southern base of Vesuvius. The inhabitants are mainly occupied in fishing and in a brisk coasting trade; there are also manufactures of Sa io and macaroni. The population in 1881 was

TORRE DEL GRECO, a town of Italy, in the province of Naples, 74 miles to the south-east of that city, lies

at the south-west foot of Vesuvius, on the shore of the Bay of Naples. It is built chiefly of lava, and stands on the lava stream of 1631, which destroyed two-thirds of the older town. Great damage was done by the erup- tions of 1737 and 1794, when immense streams of lava flowed through the town into the sea; the earthquake of 1857 and the eruption of December 8, 1861, were even more destructive. After each disaster the people have returned and repaired the ruin, the advantage de- rived from the rich land on the flanks of the volcano and the proximity to the sea and to Naples being more than enough to overcome apprehensions of danger. In the outskirts are niany beautiful villas and gardens. The inhabitants are largely employed in fishing (tunny, oyster, sardine, and especially coral), and the neighbourhood is famed for its fruit and wine. The population in 1881 was 21,588.

TORREY, Joun (1796-1873), a distinguished American botanist, was a member of an old New England family which contributed several officers to the War of Independ- ence. He was born at New York, and spent his school days there, save for the concluding year at Boston. When he was 15

or 16 years of age his father received a prison appointment at Greenwich, and there he made the ac- quaintance of Amos Eaton, one of the foremost pioneers of natural history studies and popular science teaching in America. He thus learned the elements of botany, as well as something of mineralogy and chemistry, so deter- mining the studies of his life. In 1815 he commenced the study of medicine, meanwhile finding time to prepare his first catalogue of plants, and to establish a correspondence with American and foreign botanists, and in 1818 he com- menced practice. Stimulated by Elliott's account of the flora of South Carolina and Georgia, Torrey commenced a systematic account of the botany of the Northern States, of which the first and only volume appeared in 1824. In the same year he obtained the chair of chemistry and geology at West Point military academy, whence he was translated three years later to the chemical professorship in the college of physicians, New York. He next de- scribed the collections of the first exploration of the Colorado Territory, so laying the foundation of all subse- quent work upon the flora of the Rocky Mountains. In these years he also monographed the sedges, and did good service in substituting the natural for the Linnzean system. In 1836 he was appointed botanist to the State of New York, producing his Flora of the State in 1843; while from 1838-43 he carried on the publication of the earlier portions of ora of North America, with the assistance of his pupil Asa Gray. Becoming more and more immersed in chemical labours, which from 1857 passed partly and soon completely into those of U.S. assayer, he notwith- standing continued to accumulate and work up masses of material for this vast undertaking, which still awaits com- pletion at the hands of his colleague and successor, Prof. Gray. He evinced a continued interest in botanical teach- ing, and made over his valuable herbarium and library to Columbia College two or three years before his death. He will be remembered not only as the father of American systematic botany, and an accurate and faithful, if some- what excessively cautious, investigator, but also as an eminent teacher, and for an excellence of personal char- acter and simplicity of beliefs mucli resembling Faraday's. His memory is literally kept green by the beautiful Con- iferous genus Zorreya, and his labours commemorated and continued in the valuable memoirs of the Torrey Botanical Club.

See Gray, in Silliman's Journal, 1873.

TORRICELLI, Evaneceista (1608-1647), physicist and mathematician, was born at Faenza, October 15, 1608.

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Left fatherless at an early age, he was carefully educated under the care of his uncle, a Camaldolese monk, who in 1627 sent him to Rome to profit by the scientific teachings of Benedetto Castelli. The perusal of Galileo's Dialoghi delle Nuove Screnze (1638) inspired his fertile mind with many fresh developments of the new mechanical principles there sct forth, which he embodied in a treatise De Motu (printed amongst his Opera Geometrica, 1644). Its communication by Castelli to Galileo in 1641 led to the adoption as a disciple by the Florentine sage of one who seemed not unworthy to become his successor. 'Torricelli accordingly, repairing to Florence, October 10, 1641, resided with Galileo, and acted as his amanuensis during the three remaining months of his life. On its close his contemplated return to Rome was anticipated by his nomination as grand-ducal mathematician and professor of mathematics in the Florentine academy. The discovery which has perpetuated his fame was made in 1643. Galileo had failed to perceive why water rcfuses to rise above 33 fect in a closed tube. It occurred to Torricelli to try the experiment in a more compendious form. The anticipated result ensued that the suspended column of mercury was shorter than that of water in the proportion of its greater specific gravity. He immediately concluded both to be sustained by atmospheric pressure, and con- structed the " siphon-barometer " expressly for the purpose of measuring its fluctuations. By this momentous dis- covery the obscure notion of a fuga vacut was banished from physical science, and its progress most notably quickencd. The mercurial barometer was long known as the " Torricellian tube," and the vacuum it includes is still designated the " Torricellian vacuum."

The publication amongst Torricelli's Opera Geometrica (Florence, 1644) of a tract on the properties of the cycloid involved him in a controversy with Roberval, who accused him of plagiarizing his earlier solution of the problem of its quadrature. There seems, however, no room for doubt that Torricelli's was arrived at independently, The matter was still in debate when he was seized with fever and pleurisy, and died at Florence, after

twenty days' illness, October 25, 1647, at the age of 39. He was buried in San Lorenzo, and a commemorative statue of him erected at Faenza in 1864, He was of a singularly amiable dis- position, and possessed qualities the most felicitous for the investigation of nature. Among the new truths detected by him was the valuable mechanical principle that if any number of bodies be so connected that, by their motion, their ccntre of gravity can neither ascend nor descend, then those bodies are in equilibrium. He also discovered the remarkable fact that the parabolas described (in a vacuum) by indefinitely numerous projectiles discharged from the same point with equal velocities, but in all directions, are situated within a paraboloid which is a tangent to all of them. His theorem that a fluid issues from a small orifice with the same velocity (friction and atmospheric resistance apart) which it would have acquired in falling through the depth from its surface is of funda- mental importance in hydraulics. He greatly improved both the telescope and microscope, and invented the simple microscope composcd of a globule of melted glass. Several large object lenses, engraven with his name, are preserved at Florence. He uscd and developed Cavalieri's method of indivisibles.

A selection from Torricclli's manuscripts was published by Tominaso Bonaventura in 1715, with the title Leziont Accademiche (Florence). They include an address of acknowledgment on his admission to the Accademia della Crusca. His essay on the inundations of the Val di Chiana was printed in Raceolta d@ Autori che trattano del Moto dell' Aeque (vol. iv. p. 115, Florence, 1768) and amongst Opuscoli Idraulici (vol. ili. p. 347, Bologna, 1822).

For his life, see Fabroni, Vitzw Italorum, vol. i. p. 345; Ghinassi, Lettere fin qui Inedite di Evangelista Torricelli (Faenza, 1864);

Tiraboschi, Storia della Lett. It., vol. viii. p. 302 (ed. 1824); Montnela, Hist. des Math., vol. ii.; Marie, Hist. des Sciences, vol. inpe pelos:

TORRIGIANO, Pierro (c. 1470-1522), a Florentine sculptor, was, according to Vasari, one of the group of talented youths who studied art

under the patronage of Lorenzo the Magnificent in Florence. Ben. Cellini, report- ing a conversation with Torrigiano, relates that he and

‘Michelangelo, while both young, were copying the frescos

in the Carmine chapel, when some slighting remark made by Michelangelo so enraged the violent temper of Torri- giano that he struck him on the nose, and thus caused that disfigurement which is so conspicuous in all the portraits of Michelangelo. Soon after this Torrigiano visited Rome, and helped Pinturicchio in modelling the elaborate stucco decorations in the Appartamenti Borgia for Alexander VI. After some time spent as a hired soldier in the service of different states, Torrigiano was invited to England to execute the magnificent tomb for Henry VIL and his queen which still exists in the lady chapel of Westminster Abbey. This appears to have been begun before the death of Henry VII. in 1509, but was not finished till 1517. It consists of two colossal recum- bent effigies in gilt bronze on an altar-tomb of black marble, decorated with very graceful medallions of the patron saints of Henry and his wife, and other enrichments in bronze. The two effigies are well modelled, and have life-like but not too realistic portraits. After this Torri- giano received the commission for the altar, retable, and baldacchino which stood at the west, outside the screen of Henry VII.’s tomb, The altar had marble pilasters at the angles, two of which still exist, and below the mensa was a life-sized figure of the dead Christ in painted terra-cotta. The retable consisted of a large relief of the Resurrection. The baldacchino was of marble, with enrichments of gilt bronze ; part of its frieze still exists, as do also a large number of fragments of the terra-cotta angels which sur- mounted the baldacchino and parts of the large figure of Christ. The whole of this work was destroyed by the Puritans in the 17th century.!. Henry VIII. also com- missioned Torrigiano to make him a magnificent tomb, somewhat similar to that of Henry VII., but one-fourth larger, to be placed in a chapel at WinDsor (q.v.); it was, however, never completed, and its rich bronze was melted by the Commonwealth, together with that of Wolsey’s tomb. The indentures for these various works still exist, and are printed by Neale, Westminster Abbey, London, 1818, vol. i. p. 54-59. These interesting documents are written in English, and in them the Florentine is called “ Peter Torrysany.” For Henry VII.’s tomb lie contracted to receive £1500, for the altar and its

fittings £1000, and £2000 for Henry VIII.'s tomb. Other works attributed from internal evidence to Torrigiano are the tomb of Margaret of Richmond, mother of Henry VII., in the south aisle of his chapel, and a terra-cotta effigy in the chapel of the Rolls.

While these royal works were going on, Torrigiano Vis- ited Florence in order to get skilled assistants. He tried to induce Ben. Cellini to come to England to help him, but Cellini refused, partly from his dislike to the brutal and swaggering manners of Torrigiano, and also because he did not wish to live among "such beasts as the Eng- lish." The latter part of Torrigiano's life was spent in Spain, especially at Seville, where some terra-cotta sculp- ture by him still exists. His violent temper got him into

1 An old drawing still exists showing this elaborate work ; it is en- graved in the Hierurgia Anglicana, London, 1848, p. 267. Many hundreds of fragments of this terra-cotta sculpture were found a few years ago hidden under the floor of the triforium in the abbey; they are unfortunately too much broken and imperfect to be fitted together.

difficulties with the authorities, and he ended his life in 1522 in the prisons of the Inquisition.

TORSHOK, a district town of Russia, in the govern- ment of Tver, on the river Tvertsa, 38 miles by rail to the south-west of the Ostashkovo station of the St Petersburg and Moscow railway. It dates from the 11th century, and the very name (" market-place ") shows that this de- pendency of Novgorod was a commercial centre. It was strongly fortified with a stone wall, which, however, only partially protected it from the attacks of Mongols, Lithu- anians, and Poles. Torshok is now celebrated in Russia for its embroidered leather-work and manufacture of travel- ling bags, and for its trade in corn and flour. The popu- lation in 1884 was 12,900.

TORT, as a word of art in the law of England and the United States, is the name of civil wrongs (not being merely breaches of contract) for which there is a remedy by action in courts of common law jurisdiction. It may be said to correspond approximately to the term "delict" in Roman law and the

systems derived from it. But this is only a rough approximation. For in English usage tort includes, not only those matters which in Roman law are classed under obligations quasi ex delicto, but various others which Roman or modern Continental lawyers would refer to the law of ownership or real rights, and not to any such head as “delict.” The truth is that the actual development of tort as a legal genus has been purely historical and to no small extent accidental. Nothing can be learnt, of course, from the word itself. It is merely the French word for “ wrong,” specialized into a technical meaning by a process which was com- pleted only in the latter years of the 17th century and the earlier of the 18th.

The early common law had no theory of obligations in the Roman sense, and hardly any theory of contract. Its remedies were directed either to the restitution of some- thing which the defendant unjustly detained from the plaintiff—were it land, goods, or money—or to the repres- sion of violent wrongdoing. Only the former class of remedies was purely civil; the latter included a penal element of which formal traces remained long after the substance had vanished. A man who trespassed on his neighbour with force and arms offended the king as well as his neighbour, and was liable not only to pay damages to his neighbour but to make a fine to the king. Gradu- ally the category of “force and arms” was held to include all manner of direct injuries to person, land, or goods, though the force might consist in nothing more than the bare setting foot without lawful cause on the soil pos- sessed by one’s neighbour. But this was still a long way from making room for the modern growth of the law of torts. The decisive opening was given by the Statute of Westminster, which enabled actions to be framed “on the case “—in consimili casu,—that is, allowed legal remedies to be extended by analogy to the forms of action already recognized. Now those forms and their incidents were archaic and inelastic: the procedure was cumbrous, and plaintiffs were hable in many ways to irrational and irreparable discomfiture. The more modern action on the case was free from these drawbacks. Hence it was the aim of ingenious pleaders to extend the action on the case as much as possible ; and so successful was this movement that in the 16th century a special form of ‘ trespass on the case” became, under the name of assumpsit, the common and normal method of enforcing contracts not made by deed, and remained so till the middle of the present century. It still holds its place in those Amer- ican States where the old

forms of action have not been abolished. Note that ‘‘assumpsit” had become a sub- stantive title of the law, and was consciously referred to

its proper genus of contract, before the genus or order of torts was formed. Meanwhile other actions on the case, framed mostly on the analogy of trespass, but partly on that of other generically similar remedies of the old law, were applied to the redress of miscellaneous injuries to person or property which for one and another reason could not be touched, or could not be conveniently dealt with, by the old action of trespass itself. Some of these actions on the case acquired fixed forms of their own and became distinct species; others did not; there remained (and there still remains in theory) an undefined region of pos- sible new actions applying the principles of legal right and duty to new exigencies of fact.

The extension of forms of remedy grounded on trespass caused those forms which were grounded on restitution to fall into the background, with the curious result that in the modern-common law nothing is left answering to the vindicatio of the Roman law. We have an elaborate law of property, but when it comes to the practical protection of our rights we find that we can recover our property only by complaining of a wrong done to our possession or right to possession. The law puts the actual possessor in the first line, and allows an owner definitely out of posses- sion to sue only for “injury to the reversion,” though an owner who can resume possession at will is indeed more favourably treated. Its remedies are made efficient, but at the cost of straining the theory at various points. Hence many difficulties of detail and much obscurity of principle. The distinction between dominium and _obli- gatio exists, of course, in English law, but it is pecuharly hard for an English lawyer, with the usual unsystematic training, to grasp it with certainty or trace it with accuracy.

There is also a region of considerable obscurity about the points of contact between contract and tort. The questions thus raised are too technical for discussion here. Since pleadings have ceased to be formal they are much less likely to arise; on the other hand, they are more likely, in the exceptional cases where they may still arise, to be unexpected and baffling.

For the practical purposes of modern law we may dividc torts into three groups,—wrongs of a personal character, wrongs affecting property, and wrongs affecting person and property, either or both. Under the first group come the wrongs of physical violence and restraint, namely, assault and false imprisonment; then the wrong done to men's good name by libel and slander, in which kind there are sundry curious and not wholly rational distinctions; and we must here rather than elsewhere count deceit, and a somewhat ill- defined class of wrongs of a like nature, of whieh the generic mark is the necessary presence of a fraudulent intention, or at least reck- less disregard of good faith. In one case, that of malicious prose- eution, evil motive must be shown; in fact, the much-tormented word "malice" has very nearly its natural and ordinary meaning. So-called slander of title belongs to this class, being in truth a special form of deceit. Wilful interference with the exercise of public or private rights may be an actionable wrong, though the competitive exercise of like rights is none; and it is held, though not without doubt, that procuring a person to break his contract for one's own advantage (for example, a singer engaged by a rival opera manager, or a specially skilled workman in a rival factory) is on this principle a wrong to the other contracting party.

With regard to property the broad rule of the common law is that a man meddles with whatever belongs to others at his peril. This has been established and worked out only through a series of intricate formal distinctions. But the result is that, special excep- tions excepted, even the most innocent assumption of dominion without a real title makes one liable to the true owner.

Wrongs of the mixed kind atfeeting both person and property arise from the usc of one's own property, or the doing of acts lawful in themselves, in a manner inconsistent with the safety and con- venience of others. The accustomed heads of such wrongs are nuisanee and negligence. Generally some failure in due diligence is involved; but in some cases the law has, on grounds of general policy, imposed an absolute or all but absolute duty of avoiding harmful results. One must do certain things at one's peril, if at all, though the doing of them is not in itself unlawful; others are done not at one's peril, and yet under a wider responsibility than

the common run of lawful acts. It is not wrong to make an artificial reservoir of watcr on one's own land; but the landowner who does so must answer for all damage, though no failure in due diligence be shown, if the water escapes by any cause whieh reason- able human care could possibly have provided against. Again, the occupier of a place of business must keep it in safe repair, for the benefit of customers and others lawfully coming there; and, if harm is done through the want of repair, it is no excuse for him to say that he had engaged an apparently competent person to keep things in order. These are modern principles in the law, and seem to have hardly yct reached their full development. The doctrine of negligence is also mostly modern. Questions of much interest and difficulty are raised by "contributory negligence," ¢.¢., when it is alleged by way of defence that the party complaining suffered wholly or mainly by his own want of care. The true principle appears to be that, if under the circumstances the harm suffered by the plaintiff was the natural and probable consequence of the defendant's want of care, the defendant is liable,—and this whether the plaintiff, or some third person, has or has not in any degree contributed to the final result by want of care on his own part, or cven by a voluntary act, provided that the act be such as might have been foreseen and expected. But if the plaintiff has done something which, though induced by the defendant's default, was not a natural and probable consequence of it, or if the harm suffered is due to some act of a third person which could not have been reasonably foreseen or expected, then the defendant will not he liable.

A great number of special duties have been imposed on different classes of persons—public officers, undertakers of public oceupa- tions, and so forth —by modern Acts of Parliament, and are enfore- able by penalties. In some cases the breach of such a duty confers a separate right of action upon a person who thereby suffers damage, in others not, according to what appears to be the inten- tion of the enactment. No general rule can be laid down.

In practice, a large proportion of actionable injuries, especially injuries by negligence, are due to the acts or defaults of servants or workmen, from whom no substantial redress could be obtained or expected. It is held in the

common law, and appears to be held in all modern systems, that a master is liable for the acts and defaults of the servants employed by him, provided those acts or defaults occur in the course of the servant's employment, that is, while the servant is about the master's business, and acting with a view to the master's interest, and not for some different private purpose of his own, But a man is not generally liable for the conduet of an 'independent contractor"—a person who under- takes to do or get done certain work, but not to be under the employer's control as to the manner of doing it. One may be so liable, however, in virtue of special duties attached to particular situations by positive rules of lav. When a servant is injured by the act or default of another servant working under the same employer, the general rule of liability has been largely modified in the employer's favour, on grounds which have neither been con- sistently expounded nor generally reccived as satisfactory. The Employers' Liability Act of 1880 has remedied the most obvious hardships consequent on the decisions, but only by way of particu- lar exceptions, so that the law as a whole, if more just than it was, is much more intricate, and does not appear to rest on any intel- ligible principle. The Scottish courts were in a way to develop a more rational doctrine, but the House of Lords, instead of adopting it, forced the law of Scotland into conformity with judgments which were still of only recent authority in England. The subject, however, has given trouble everywhere, and legislative experiments have been tricd in many Continental countries. See Parliamentary Papers, Commercial, No. 21, 1886.

Literature,—There are several modern English and American text-books on the law of torts :—C, G, Addison, Wrongs and their Remedies, being a Treatise on the Law of Torts, 6th ed., by Horace Smith, London, 1887, la. 8vo; M. M. Bigelow, Leading Cases on the Law of Torts, Boston, Mass., 1875, la. 8vo: Id., Elements of the Law of Torts, 3d ed., Boston, Mass., 1886, sm. 8vo; C. Collett, Manwal of the Law of Torts and of the Measure of Damages, 6th ed., Madras, 1886, Svo; T. M. Cooley, A Treatise on the Law of Torts, Chicago, 1880, 8vo; S. Hastings, A 7'rea- tase on Torts, London, 1885, la. Svo; F. Hilliard, The Law of Torts or Private Wrongs, 4th ed., Boston, Mass., 1874, la. 8vo, 2 vols.; F. I. Piggott, Principles of the Law of Torts, London, 1885, 8vo ; F. Pollock, The Law of Torts, London, 1887, 8vo; A. Underhill, A Sununary of the Law of Torts, 3d ed., London, 1881, 8yo, There are also well-known works of a wider scope which touch

on many parts of the subject, such as that of Mayne on Damages; and monographs on special parts, such as those on Negligence by Campbell, Horace Smith, Shearman and Redfield, and Wharton, and those on Libel and Slander by Starkie (recent ed. by Yolkard) and Blake Odgers. The Government of India has taken steps to codify the law of civil wrongs (Whitley Stokes, The Anglo-Indian Codes). The general institutional books (Blackstone and Kent, and the later adaptations of Blackstone

in England) are of little use, as in almost every branch the law has been largely developed and modified by the decisions of the last fifty years. (F. PO.)

TORTOISE. Of the three names generally used for this order of reptiles, viz., Tortoise, Turtle, and Terrapin, the first is derived from the old French word tortis, 0 twisted, and was probably applied first to the common European species on account of its curiously bent fore-

| Seas, sometimes stray beyond those limits.

legs. Turtle is believed to be a corruption of the same word, but the origin of the name terrapin is unknown: since the time of the navigators of the 16th century it has been in general use for freshwater species of the tropics, and especially for those of the New World. The name tortoise is now generally applied to the terrestrial members of this group of animals, and that of turtle to those which live in the sea or pass a great part of their existence in fresh water.

Tortoises and turtles constitute one of the orders of Reptiles, the Chelonia. They are characterized by having the trunk of the body incased in a more or less ossified carapace, Which consists of a dorsal more or less convex portion, and of a flat ventral one, the so-called plastron. These portions are generally more or less firmly united on the side, but leave a wide opening in front through which the head and neck and the fore-limbs protrude, and one behind for the tail and hind-limbs. The dorsal carapace is (with the exception of Sphargis) formed by the dorsal vertebrae, by the ribs which are so much expanded as to form sutures with each other, and by a number of

lateral dermal ossifications (marginals). The plastron consists of from eight to eleven more or less dilated dermal bones, the sternal elements of higher Vertebrata being absent. This osseous case or shell receives in its interior the organs of the chest and abdomen, the humeral and pelvic bones, and the muscles for the humerus and femur. In many species, especially those of the family Testudinidz, or tortoises proper, the neck and head and the limbs can be withdrawn within the shell, the cervical and the proximal caudal vertebrae retaining their mobility. In the majority of Chelonians the osseous shell is covered with a hard epider- moid coat, which is divided into large symmetrical plates (commonly called “ tortoise-shell” in those species from which the article of commerce is obtained), which can be detached from the underlying bones. These epidermoid plates do not correspond in arrangement or extent with the bones of the carapace ; they vary considerably in form, and are therefore generally noticed in the descriptions of species. Their arrangement and terminology may be learned from the accompanying illustrations (figs. 1, 2).

The integuments of the head, neck, tail, and limbs are either soft and smooth or tubercular or scaly, the tubercles and scales having frequently an osseous nucleus.

Other parts also of the skeleton show remarkable pecu- liarities, so that the sometimes very fragmentary remains of Chelonians can almost always be recognized as such. All the bones of the skull are suturally united, with the exception of the mandible and hyoid bone; the dentary portion of the mandible consists of one bone only. The pectoral arch is composed of the scapula, with which the precoracoid is united, and the coracoid. Clavicles (epi- plastra) are represented by the anterior elements of the plastron. Two pairs of limbs are invariably present.

All Chelonians possess a tail, which is generally short, but sometimes elongate, and always provided with strong muscles at the base. No Chelonian possesses teeth ; but their jaws are provided with horny sheaths, with hard and sharp edges, forming a beak like that of a parrot.

The number of Chelonians known at present may be estimated at about 220, the freshwater species being far the niost numerous, and abundant in well-watered districts of the tropical and subtropical zones. Their number and

variety decrease beyond the tropics, and in the north they disappear entirely about the 50th parallel in the western and about the 56th in the eastern hemisphere, whilst in the southern hemisphere the terrestrial forms seem to advance to 36°S. lat. only. The marine turtles, which are spread over the whole of the equatorial and subtropical As in other

orders of Reptiles, the most specialized and the largest | ever, are but few in number: the large cats of South

forms are restricted to the tropics (with the exception of Macroclemmys) ; but, unlike lizards or snakes, Chelonians

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Fig. 2.

Fics. 1, 2.—Shell of Zestudo pardalis, to show the divisions of the integument, which are marked by entire lines, and of the osseous earapace, these being marked by dotted lines. Fig. 1, Upper or dorsal aspeet. Fig. 2, Lower or ventral aspect.

Dermal Seutes :—co, eostals; v, vertebrals; m, marginals; 9, gulars; pg, post- gulars; p, pectorals; ab, abdominals; pa, preanals; an, anals.

Bones of the Carapaee:—co’, eostals; ze, neurals; nu, nuehal; py, pygul; m’, marginals; ent, entoplastron, ep, epiplastron; Ayo, hyoplastron ; hyp, hypo-plastron; zxyp, xyphiplastron.

are unable to exist in sterile districts or at great altitudes.

Chelonians are strictly animals of plains, or at least of low

country.

Chelonians show a great divergence in their mode of life, some living constantly on land, others having partly terrestrial partly aquatic habits, others again rarely leav- ing the water or the sea. The first-mentioned, the land tortoises proper, have short club-shaped feet with blunt claws, and a very convex, heavy, completely ossified shell. In the freshwater forms the joints of the limb bones are much more mobile, the digits distinct, armed with sharp claws, and united by a membrane or web; their shell is less convex, and is flattened, and more or less extensive areas may remain cartilaginous to lessen its specific gravity. As a rule, the degree of development of the interdigital web and of convexity of the shell indicates the prevalence of aquatic or terrestrial habits of a species of terrapin. Finally, the marine turtles have paddle-shaped limbs re- sembling those of Cetaceans.

Land tortoises are sufficiently protected by their cara- pace, and therefore have no need of any special modi- fication of structure by means of which their appearance would be assimilated to the surroundings, and thus give them additional security from their enemies. These, how-

America are said to be able to tear them out of the shell with their claws ; and the ancient tale of Aischylus having been killed by a tortoise carried aloft by an eagle and dropped on the head of the unfortunate poet seems to be founded on the fact that tortoises are a favourite prey of the Liimmergeyer (Gypaetus), which has the habit of dropping them from a height on rocks in order to break the shell. On the other hand, among the carnivorous terrapins and freshwater turtles instances of protective resemblance are not scarce, and may even attain to a high degree of specialization, as in Chelys ; their shells offer them less protection, and their enemies (crocodiles and alligators) are more numerous; they also require this special provision to enable them to approach or seize their prey with greater ease. The colours of land tortoises are generally plain or in simple patterns, whilst those of many terrapins are singularly varied, bright, and beautiful.

Chelonians are diurnal animals ; only a few are active during the night, habitually or on special occasions, as, for instance, during oviposition. Land tortoises are slow in all their movements, but all kinds living in water can execute extremely rapid motions, either to seize their prey or to escape from danger. All Chelonians are stationary, residing throughout the year in the same locality, with the exception of the marine turtles, which periodically migrate to their breeding-stations. Species inhabiting temperate regions hibernate.

Chelonians possess great tenacity of life, surviving injuries to which other Reptiles would succumb in a short time. The heart of a decapitated tortoise continues to beat for many hours after every drop of blood has been drained from the body, and the muscles of the trunk and head show signs of reflex action twenty-four hours after the severance of the spinal cord. The longevity of tor- toises is likewise a well-known fact, to which reference will again be made.

Land tortoises, a few terrapins, and some of the marine turtles are herbivorous, the others carnivorous, their prey consisting chiefly of fish, frogs, and other small aquatic animals.

All Chelonians are oviparous, and the eggs are generally covered with a hard shell.

In the system! proposed by Duméril and Bibron, and afterwards modified by Gray and Strauch, the Chelonians are arranged according to their mode of life, and divided into terrestrial, paludine, fluviatile, and marine forms. However natural such an arrangement may appear at first, a more careful examination proves it to be (as all arrange- ments based solely upon the mode of life) at variance with the structural affinities, whether the recent forms alone be considered or the fossil as well. The division of the bulk of the order into Cryptodira and Pleurodira, as suggested by Agassiz, Cope, and Riitimeyer, was a decided progress, as is also the elimination of the suborders Atheca and Trionychoidea recently proposed by Cope and Baur.

The order of Chelonians may then be divided into the following suborders and families :*—

SusorpEr I. ATHECA, Vertebre and ribs free, separated from a bony exoskeleton. Family 1. Srnarcipz.

Limbs paddle-shaped, clawless; phalanges without eondyles. Plastron reduced to an annular series of eight small bones. Exo- skeleton eonsisting of numerous small bony plates arranged like mosaie. Pelagic.

Genns: Dermatochelys (Sphargis).

Fossil genera: Psephophorus (Pliocene), Protosphargis (Cretaceous), Protostega (Cretaeeous), Psephoderma? (Triassie).

1 The more important works on this order of Reptiles have been enumerated in the article REPTILES, vol. xx. p. 440.

2 Only the more important and best known of the extinct genera are admitted into this synopsis.

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SuporDer Il. TESTUDINATA.

Dorsal vertebree and ribs immovably united and expanded into bony plates forming a carapace, which is bordered by a complete series of marginal bones. Lpiplastra (clavicles) in contact with hyoplastra; entoplastron (interclavicle), if present, oval, rhom- boidal, or T-shaped. Sacral and caudal ribs articulating with the centrum and the neural arch. Digits with not more than three phalanges.

Series A. CRYPTODIRA.

Neck retractile by a sigmoid curve in a vertical plane. Pelvis not anchylosed to the carapace and plastron. Rarely one or two epidermic scutes (intergular) in addition to the normal six pairs.

Group A. Digitata. Digits short or moderately elongate; phalanges with condyles; claws four or five. Neck completely retractile.

Family 1. TestuDInIpz.

Plastral bones nine. Nuchal bone without costiform processes. Carapace with epidermic seutcs. Caudal vertebre procclous. Tropical and tempcrate zones, with the exception of Australia.

Recent genera: Dermatemys, Batagur, Clenmys, Pangshura, Geoemyda, Cycle- mys. Emys, Cistudo, Manouria, Testudo, Ilomopus, Cinyxis, Pyxis.

Fossil genera; Eurysternum (Jurassic), Chitracephaius (Cretaceous), Adocus (Cretaceous), Paleochelys (Miocene), Ptychogaster (Miocene), Colossochelys (Plio- cene).

Family 2, PLATYSTERNIDA.

Plastral bones nine. Nuchal bone without costiform processcs. Carapace with epidermic scutes. Caudal vertcbre mostly opistho- ecelous. Indian region.

Genus: Platysternum.

Family 3. BAENIDA.

Plastral bones cleven, mesoplastra being present. without costiform processes. Caudal vertebre opisthoccelous.

Fossil genera: Platychelys (Jurassic); Baena (Eocenc).

Family 4, CNELYDRIDA.

Plastral bones nine. Nuchal bone with long costiform processes, extending below the marginals, Carapace with epidermic scutes. Caudal vertebree mostly opisthocelous, Northern and tropical American regions.

Recent gen¢ra: Chelydra, Macroclemmys.

Fossil genus: 7relosternum (Cretaceous),

Family 5. Sravroryrip#H (Boulenger).

Plastral hones nine. Nuchal bone with short costiform pro- cesses, extending below the marginals. Carapace with epidermic scutes. Caudal vertebre proccelous. Ccntral-American district.

Genera: Staurotypus, Claudius.

Family 6. CINOSTERNIDZ.

Plastral bones eight, the entoplastron being absent. Nuchal bonc with short costiform processes, extending below the marginals. Carapace with epidermic scutes. Caudal vertebra proccelous.

Northern and tropical American regions. Genera: Aromochelys, Cinosternum.

Family 7. PseuporrionycmIp& (Boulenger). Shell without epidcrmic seutes. Fossil gencra: Pseudotrionyx and Anostira (Eocene). i Group B, Pinnata, Limbs paddle-shaped; phalanges without condyles; claws one

or two. Neck imperfectly rctractile; cervical vertebre short, | mostly articulated by amphiarthrosis.

Family 8. CHELONID&,

Plastral bones nine. Nuchal without costiform processes. Carapace with epidermic scutes. Hyo- and hypo-plastra not meet- ing mesially. Pelagic.

Recent genera: Chelone, Caouana, Caretta.

Fossil genus: Puppigerus (Miocene and Eocene)

Series B. PLEURODIRA.

Neck not retractile, bending laterally. Pelvis anchylosed to the | carapace and plastron. When epidermic scutes are present, onc or two intcrgulars in addition to the normal plastral scutes.

Nuchal bone Carapace with cpidermic scutes.

Family 1. CueLypip&,

Plastral bones nine. Carapace with epidermic scutes. Limbs with four or five claws. Australian and tropical American regions.

Recent genera: Platemys, Chelymus, Elseya, Chelodina, Hydraspis, Hydro-medusa, Chelys.

Fossil genera: Dlesiochelys (Jurassic), Craspedochelys (Jurassic), Jdiochelys (Jurassic), Votomorpha (Eocene),

Family 2. PELOMEDUSIDE. Plastral bones eleven, mesoplastra being present.

with epidermic seutcs. Limbs with four or five claws.

and tropical American regions.

Recent genera: Pelomedusa, Sternotherus, Dumerilia, Podocnemis, Pelto-cephalus. ! Fossil genera: Pleurosternum (Cretaceous, Eocene), Bothremys (Cretaccous).

Taphrosphys (Cretaceons).

Carapace African

Oils & 457

Family 3. CARETTOCHELYDID2.

Plastral bones nine. No epidermic scutes on the shell.

paddle-shaped, with only two claws. New Guinea. Genus: Carettochelys.

Family 4. MroLaniipa (Boulenger). Caudal vertebree opisthoccelous ; tail long and encased in a bony

sheath. Australia. Fossil genus : Miolania (Pleistocene).

SuzorpER II]. TRIONYCHOIDEA.

Dorsal vertebree and ribs immovably united, forming a carapace ; no pygal plate; marginal plates absent or forming an incomplete series. Plastron formed of nine bones, epiplastra separated from the hyoplastra by the entoplastron, which is A-shaped, without longitudinal process. Sacral and caudal ribs attached to transverse processes of the neural arch. Fourth digit with four or five phalanges.

Limbs

Family 1. TrioNycHIpa. No epidermic scutes. Limbs with three claws.

and American regions. Genera: Chitra, Heptathyra, Trionyx, Cyclanosteus, Emyda,

We add a few notes on such of the genera enumerated in this synopsis as have some special interest attached to them, either from a scientific or an

economic point of view.

The family Sphargidx is represented in the recent fauna by a single specics, Dermatochelys or Sphargis coriacea, the Leathery Turtle, the range of which extends over the tropical and subtropical seas of both hemisphercs, and which occasionally strays into the northern parts of the Atlantic, its ocewrence on the British coast having been recorded three or four times within the last century. It differs from all other Chelonians by its carapace being formed by ossifications of the skin only. Neither the vertebre nor the ribs cnter into its formation; the lattcr remain free, and are not patticularly dilated. During the life of the animal the carapace is flexible like thick leather, the bony deposits being arranged like mosaic, with several longitudinal ridges of larger osseous tubercles. The limbs are, as in othcr marine turtles, paddle- or fin-shaped, the anterior much longer than the postcrior, and all destitute of claws. This turtle is probably the largest living Chelonian, exceeding 6 feetin length. The names Testrdo lyra, Sphargis mercurialis, &c., have reference to the myth that the shell of this or some other turtle was used by Mercury in his construction of the lyre.

The family Z’estudinide is composcd of an unbroken series, from thoroughly -aquatic freshwater tortoises like Dermatemys and Batagur to the tortoiscs which live exclusively on land and are perfectly helpless in water. In the Central-American genus Der- matemys the digits are very broadly webbed, the cpidermic scutes are thin, and the nose is much produced,—characters which, together with the strong depression of the shell, give these terrapins some- what the aspect of the freshwatcr turtles or Z’’rionychide. ‘They feed exclusively upon leaves, grass, and especially fruit, and are eaten by the natives. Of the freshwater tortoises of the Old World the most thoroughly aquatic are the Batagurs, which inhabit the East Indies, and attain to a length of 2 feet. Like their American representative, Dermatemys, they are essentially herbivorous, and their flesh is eaten. The genus Clemmys is extremely abundant in species, most of which are of small size, and elegantly ornamented with symmetrical markings of bright colour. The majority of the species occur in North America and Mexico, and are of amphibious habits. Only one species, C. leprosa, inhabits southern Europe. A second European species belongs to the genus Hmys, £. orbi- cularis, which, towards the end of the Quatcrnary period appcars to

have been distributed over a great part of northern Europe, remains having been found in peat in England, Belgium, Denmark, and Sweden. Its habitat is now restricted to southern Europe, south-western Asia, and north-western Africa; but singularly it has survived in a few isolated northern stations, for instance, in the neighbourhood of Berlin and Konigsberg, although it is there on the verge of extinction. The mobility of the lobes of the

Indian, African,

| plastron, which distinguishes Emys from Clemmys, is carried a | degree further in the North-American genus Cistudo, the Box

Tortoisc; this terrapin possesses a hinge in the plastron, rendcring its antcrior and posterior portions movable, and converting them into lids by which the openings of the shell can be complctely closed when the head and limbs are retracted. A similar protective apparatus cxists in the tortoises of the genus Cinosternnm. In the African terrestrial genus Cinyzxis it is the posterior portion of the

| carapace that is movable, and separated from the anterior by a

hinge. True land tortoises, Zestwdo, occur in Africa, southern Europe, southern Asia, South America, and the southern parts of North America. Those best known in Europe are Testudo greca and the Moorish Tortoise, Zestudo mauritanica, large numbers of which are imported into the United Kingdom, chiefly from Morocco. But the most interesting are the gigantic tortoises which formerly inhabited in cxtreme abundance the Mascarene and Galapagos Islands, and are now on the verge of extinction, or have actually

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beeome extinet. At the time of their discovery those islands were | 870 Ib, and, although known to have been more than eighty years uninhabited by man or any large mammal; the tortoises, therefore, | old, was still growing at the time of its death. There is no evidence

to show that any of these tortoises were indigenous in the Seychelles; the speei- mens kept there in a semi-domestieated

ee ae:

Fia. ‘8,—Alligator Terrapin (Chelydra serpentina).

enjoyed perfect security; and this, as well as their extraordinary degree of longevity, aecounts for their enormous size and their large numbers. They could be captured in any quantity with the greatest ease within a few days, and proved to the ships’ companies who during their long voyages had to subsist mainly on salt provisions a most welcome addition to their table. They eould be carried in

Fig.4 Loggerhead (Caouana caretta)

the hold of a ship, without food, for months, and were slaughtered as oceasion required, each tortoise yielding, aecording to size, from 80 to 300 pounds of exeellent and wholesome meat. Under these cireumstances the numbers of these helpless creatures deereased so rapidly that in the beginning of this eentury their extermination was accomplished in the Masearenes, and now only a few remain in a wild state in Aldabra and in some of the islands of the Gala- pagos group. Singularly, the majority of these islands were in- habited each by one or more peculiar forms, specifically distinet

Fig. 5.—Green Turtle (Chelonta viridis). from those of the other islands. Aldabra, whieh was imported into London some years ago, weighed

A large male speeimen from

state have been either direetly imported from Aldabra or are the deseendants of imported individuals.

The family of Chelydride ineludes freshwater tortoises, whieh are known under the names of Snappers or Alli- gator Terrapins (fig. 3), on aceount of their ferocity and long compressed erested tail. They are now confined to North Ameriea east of the Roeky Mountains, Central America, and north-

west South Ameriea, but remains of two speeies of Chelydra, elosely related to their reeent representative, have been found in the Oligocene and Miocene A second genus, closely allied to Chelydra,

of central Europe. Macroclemmys temminckit, the shell of which attains to a length of 3 feet, and which is the largest known freshwater Chelonian, is restricted to the river-systems tributary to the Gulf of Mexico. The family of Cinosternide contains a rather large number of small-sized speeies, distributed from the northern parts of the

United States to the northern parts of Brazil. They are of amphibious habits. The front and hind lobes of the plastron are movable, and in certain species of Cinosternwm the animal can eompletely shut itself up in its shell.

The Chelonidx, or marine turtles, contain but few species, which are referred to three genera,—Caowana, Chelone, and Caretta. Their limbs are wholly modified into paddles, by means of whieh they ean propel themselves with extraordinary rapidity through the water, but which are entirely unfit for locomotion on land, where the progress of these animals is as awkward as that of a seal. The toes are enclosed ina common skin, out of whieh only one or two elaws project. The carapace is broad and much de-pressed, so that when the turtles are surprised on shore and turned

lic. 6.—Hawksbill Turtle (Caretta imbricata).

over on their baek, they eannot regain their natural position. Their capture forms a regular pursuit wherever they oecur in any numbers. Comparatively few are caught in the open sea, others in stake nets, but the majority are intercepted at well-known periods and loealities where they go ashore to deposit their eggs. These are very numerous, from 100 to 250 being produced by one female, and buried by her in the sand; they are eagerly searehed for and eaten, Some of the marine turtles are highly esteemed for the delicacy of their meat and of the gelatinous skinny parts of their neek and fins; others yield oil, and others again the tortoise- shell of eommerce. Probably the largest of these marine turtles is the Loggerhead (Caowana), which possesses fifteen vertebral and costal shields, and oceurs in the Atlantie as well as in the Indian

Ocean (fig. 4). It is carnivorous, feeding on fish, molluscs, and crustaceans, and not estcemed as food, although it is caten by the native fishermen.

Fic. 7.—The Matamata (Chelys fimbriata), with side view of head, and separate view of plastron.

way into the market is obtained from the Atlantic species of this genus; also tortoiseshell of an inferior quality is obtained from it.

The Green Turtle (fig. 5), which yields the mate- rials for the celebrated soup, belongs to the genus Chelonia; it is dis- tinguished from Caouana by having thirteen ver- tebral and costal shields only, which are not im- bricate. These animals

are herbivorous, feeding on marine Alg# only; they occur in the Indo-Pacificand Atlantic; and, although several species have been distinguished, they all may possibly be referable to one only, The turtle imported into Europe comes chiefly

Frc. 8.—Upper View of the Turtle of the Euphrates (7rionyx euphratica).

from the West Indies.

Instances are recorded of the flesh of this

species having aequired poisonous qualities. The Hawksbill Turtle, Caretta (fig. 6), so named from its rather elongate and eompressed

curved upper jaw, does not reach the same size as the other turtles and is readily recognized by the thirteen imbricate seutes of its carapace. It seems to be more abundant in the Indian than in the

Atlantic Oeean, but is he ae oe only in eertain ocalities. As, however, these turtles always re- sort to the locality where they were born, or where they have been wont to propagate their kind,and as their capture is very

scarcer and scarcer at places where they are known to have been abundant formerly. If the plates of tortoise- shell are detached from the animal when decom- position has set in, their colour becomes clouded

profitable, they become and milky, and hence

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Fic. 9.—Lower View of Trionyx euphratica.

the cruel expedient is resorted to of suspending the turtle over fire till heat makes the shields start from the bony part of the cara- pace, after which the creature is permitted to escape to the water. There is no doubt that turtles thus allowed to escape to the water after such an operation may survive ; but it is very improbable that the epidermal shields are ever sufficiently regenerated to be fit for use. At Celebes, whence the finest tortoiseshell is exported to China, the natives kill the turtle by blows on the head, and immerse the shell in boiling water to detach the plates; dry heat is only resorted to by the unskilful. The natives eat the flesh of this turtle, but it is unpalatable to Europeans; the eggs, however, are regarded as equal to those of the other turtles.

Of the family Chelydidez the most remarkable type is the Matamata, Chelys fimbriata, a native of the Guianas and northern Brazil (fig. 7). In its strongly depressed and flat head, long tube- like snout, weak jaws, minute eyes, skinny tentacles, it bears a striking similarity to the Surinam toad, Pipa americana, which inhabits the same countries. The neck is very broad and depressed, and fringed with foliated tentacles, floating inthe water like some vegetable growth, whilst the rough bossed carapace resembles a stoue,—an appearance which evidently is of as great use to this ereature in escaping the observation of its enemies as in alluring to it unsuspicious animals on whieh it feeds.

The family of Carettochelydide contains a single genus, Caretto- chelys, quite recently discovered in the Fly river, New Guinea, and exhibiting a remarkable combination of characters. Its limbs are formed very much like those of the marine turtles, whilst the shell lacks epidermic scutes, as in the Trionychide.

In the freshwater turtles, or 7’rionychide (figs. 8 and 9), the eara- pace is reduced to a flat disk, which is eovered with soft skin. The

_ neck and limbs ean be lodged under the broad skinny borders of

the carapace ; also the plastron is very imperfectly ossified, and some- times dilated into large flexible lobes which may eover the limbs. The latter are much flattened and broadly webbed, and only the three inner toes armed with claws. The jaws are concealed under broad, fleshy lips, the nose projecting like a short proboscis. These

| turtles are carnivorous, and very ferocious; when they want to bite

or seize their prey they project their neck and head with lightning rapidity. They are well known on the upper Nile, Euphrates, Ganges, Yangtse-kiang, and Mississippi, and, indeed, distributed over all the large fresh waters of the geographical regions to which

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In the United States, where twospecies, Trionyx muticus and T’rionyx ferox, occur, the flesh of the latter is said to be most delicate to eat, far surpassing in flavour that of the green turtle. (A. CG.)

TORTOISESHELL. The tortoiseshell of commerce consists of the epidermic plates of the hawksbill turtle, Caretta imbricata. The plates of the back or carapace, technically called the head, are 13 in number, 5 occupying the centre, flanked by 4 on each side. These overlap each other to the extent of one-third of their whole size, and hence they attain a large size, reaching in the largest to 8 inches by 13 inches, and weighing as much as 9 ounces. The carapace has also 24 marginal pieces, called hoofs or claws, forming a serrated edge round it; but these, with the plates of the plastron, or belly, are of inferior value. The plates of tortoiseshell consist of horny matter, but they are harder, more brittle, and less fibrous than ordinary horn. Their value depends on the rich mottled colours they display—a warm translucent yellow, dashed and spotted with rich brown tints—and on the high polish they take and retain. ‘The finest tortoiseshell is obtained from the Eastern Archipelago, particularly from the east coast of Celebes to New Guinea; but

the creature is found and tortoiseshell obtained from all tropical coasts, large supplies coming from the West Indian Islands and Brazil.

Tortoiseshell is worked precisely as horn; but, owing to the high value of the material, care is taken to prevent any waste in its working. The plates, as separated by heat from the bony skeleton, are keeled, curved, and irregular in form. They are first flattened by heat and pressure, and superficial inequalities are rasped away. Being harder and more brittle than horn, tortoise- shell requires careful treatment in moulding it into any form, and as high heat tends to darken and obscure the material it is treated at as low a heat as practicable. For many purposes it is necessary to increase the thickness or to add to the superficial size of tortoise- shell, and this is readily done by careful cleaning and rasping of the surfaces to be united, softening the plates in boiling water or sometimes by dry heat, and then pressing them tightly together by means of heated pincers or a vice. The heat softens and liquefies a superficial film of the horny material, and that with the pressure effects a perfect union of the surfaces brought together. Heat and pressure are also employed to mould the substance into boxes and the numerous artificial forms into which it is made up.

Tortoiseshell has been a prized ornamental material from very early times. It was one of the highly esteemed treasures of the far East brought to ancient Rome by way of Egypt, and it was eagerly sought by wealthy Romans as a veneer for their rich furniture. Jn modern times it is most characteristically used in the elaborate inlaying of cabinet work known as buhl furniture. It is also employed as a veneer for small boxes and fraines. It is cut into combs, moulded into snuffboxes and other small boxes, formed into knife-handles, and worked up into many other similar minor articles. The plates from certain other tortoises, known commercially as turtle-shell, possess a certain industrial value, but they are either opaque or soft and leathery, and cannot be mis- taken for tortoiseshell. A close imitation of tortoiseshell can be made by staining translucent horn. See Comp, vol. vi. p. 178.

TORTOLA. See Vircin Istanns.

TORTONA, a town of Italy, in the province of Ales- sandria, on the right bank of the Scrivia, at the northern foot of the Apennines, 13 miles to the

east of Alessandria,

was formerly a place of strength until its fortifications | were destroyed by the French after Marengo (1799); the |

ramparts are now turned into shady promenades. The cathedral, erected by Philip II., is architecturally uninter- esting, but contains a remarkably fine Roman sarcophagus. Silk-weaving, tauning, and hat-making are the chief indus- tries; and there is some trade in wine and grain. The population in 1881 was 9023 (commune 14,442).

Dertona is spoken of by Strabo as one of the most important towns of Liguria, and is alluded to by Pliny as a Roman colony. In the Middle Ages it was zealously attached to the Guelphic cause, on which account it was twice laid waste by Frederick Barbarossa (in 1155 and 1168).

TORTOSA, a fortified city of Spain, in the province of Tarragona, and 40 miles by rail to the south-west of that town, is picturesquely situated on the left bank of the

these rivers belong. Some of the species exceed a length of 3 feet. | Ebro (here crossed by a bridge of boats), 22 miles above

its mouth. It is for the most part an old walled town, with narrow, crooked, and ill-paved streets ; the houses are lofty, and massively built of granite. The slope on wliich it stands is crowned with an old ruined castle, com- manding a splendid view. The cathedral is a conspicuous building near the river; it occupies the site of a mosque built in 914 by ‘Abd al-Rahman ; the present structure, which dates from 1347, has its Gothic character disguised by a classical fagade with Ionic pillars and much tasteless modernization. ‘The stalls in the choir, carved by Cristo- bal de Salamanca in 1588-93, and the sculpture of the pulpits, as well as the ironwork of the choir-railing and some of the precious marbles with which the chapels are adorned, deserve notice. None of the other public build- ings, which include an episcopal palace, a town-hall, and numerous churches, require special mention. The manu- factures of Tortosa include paper, hats, leather, porcelain, majolica,

soap, and spirits. There is an important fishery in the river, and an active trade is carried on through thie harbour, which is accessible to vessels of 100 tons burden, corn, wine, oil, wool, silk, fruits, and liquorice (a specialty of the district) being among the leading articles of export. Near Tortosa are rich quarries of marble and alabaster, and the whole surrounding country is very fertile and beautiful. The population within the municipal boundaries in 1878 was 24,057.

Tortosa, the Dertosa of Strabo and the Colonia Julia Augusta Dertosa of numerous coins, was a city of the Iercaones in Hispania Tarraconensis, Under the Moors it became a place of great import- ance as the key of the Ebro valley. It was taken by Louis the Pious in 811 (after an unsuccessful siege two years before), but was soon recaptured. Having become a haunt of pirates, and exceed- ingly injurious to Italian commerce, it was made the object of a crusade proclaimed by Pope Eugenius III. in 1148, and was accord- ingly captured by Raymond Berengar, assisted by ‘‘emplars, Pisans, and Genoese. Tortosa fell into the hands of the duke of Orleans in 1708, and was again surrendered in the War of Independence in 1811 to the French under Suchet, who held it till 1814.

TORTURE. It is proposed to treat in this place not so much the innumerable modes of inflicting pain which have been from time to time devised by the perverted ingenuity of man as the subject of legal torture as it existed in the civilized nations of antiquity and of modern Europe, that is to say, torture inflicted with more or less appearance of legality by a responsible executive or judi- cial authority. From this point of view torture was always inflicted for one of two purposes—(1) as a means of eliciting evidence from a witness or from an accused person either before or after condemnation, (2) as a part of the punishment. Torture, as a part of the punishment, may be regarded as including every kind of bodily or mental pain beyond what is necessary for the safe custody of the offender (with or without enforced labour) or the destruc- tion of his life, —in the language of Bentham, an ajlictive as opposed to a simple punishment. Thus the unnecessary sufferings endured in English prisons before the reforms of Howard (see Howarp and Prison Discrping) and the drawing and quartering in the old executions for treason fall without any straining of terms under the category of . torture. The whole subject is now one of only historical interest as far as

Europe is concerned. It was, however, up to a comparatively recent date an integral part of the law of most countries (to which England, Aragon, and Sweden! formed honourable exceptions), as much a commonplace of law as trial by jury in England. One reason for its long continuance was no doubt the view taken in an age of judicial perjury? that truth was only to be attained by violent means, if not by torture then by ordeal or trial by battle. Speaking generally, torture may

1 But even in these countries, whatever the law was, torture certainly existed in fact. 2 Hallam, Afiddle Ages, vol. i. p. 282.

be said to have succeeded the ordeal and trial by battle (compare ORDEAL). Where these are found in full vigour, as in the capitularies of Charlemagne, there is no provision for torture. It was no doubt accepted reluctantly, but tolerated in the absence of any better means of eliciting truth, especially in cases of great gravity, on the illogical assumption that extraordinary offences must be met by extraordinary remedies.

The opinions of the best authorities have been in theory almost unanimously against the use of torture, even ina system where it was as completely established as it was in Roman law. “ Tormenta,” says Cicero,! in words which it is almost impossible to translate satisfactorily, “ oubernat dolor, regit quzesitor, flectit libido, corrumpit spes, infirmat metus, ut in tot rerum angustiis nihil veritati loci relinqua- tur.” Seneca says bitterly, “it forces even the innocent to lie.” St Augustine? recognizes the fallacy of torture. “ i” says he, “the accused be innocent, he will undergo for an uncertain crime a certain punishment, and that not for having committed a crime, but because it is unknown whether he committed it.” At the same time he regards it as excused by its necessity. The words of Ulpian, in the Digest of Justinian,® are no less impressive. ‘The torture (questio) is not to be regarded as wholly deserving or wholly undeserving of confidence ; indeed, it is untrust- worthy, perilous, and deceptive. For most men, by patience or the severity of the torture, come so to despise the torture that the truth caunot be elicited from them ; others are so

impatient that they will lie in any direction rather than |

suffer the torture ; so it happens that they depose to con- tradictions and accuse not only themselves but others.” Montaigne’s* view of torture as a part of the punishment is a most just one :—‘‘All that exceeds a simple death appears to me absolute cruelty ; neither can our justice expect that he whom the fear of being executed by being beheaded or hanged will not restrain should be any more awed by the imagination of a languishing fire, burning pincers, or the wheel.” Montesquieu? speaks of torture in a most guarded manner, condemning it, but without giving reasons, and eulogizing England for doing without it. The system was condemned by Bayle and Voltaire with less reserve. Among the Italians, Beccaria,® Verri,’ and Man- zoni® will be found to contain most that can be said on the subject. The influence of Beccaria in rendering the use of torture obsolete was undoubtedly greater than that of any other legal reformer. The great point that he makes is the unfair incidence of torture, as persons’ minds and bodies differ in strength. Moreover, it is, says he, to con- found all relations to expect that a man should be both accuser and accused, and that pain should be the test of truth, as though truth resided in the muscles and fibres of a wretch under torture. The result of the torture is simply a matter of calculation. Given the force of the muscles and the sensibility of the nerves of an innocent person, it is required to find the degree of pain necessary to make him confess himself guilty of a given crime. Benthain’s® objection to torture is that the effect is exactly the reverse of the intention. ‘‘ Upon the face of it, and probably enough in the intention of the framers, the object of this institution was the protection of innocence ; thie protection of guilt and the aggravation of the pressure upon innocence was the real fruit of it.” The apologists of torture, even among jurists, are not numerous. In fact, theoretical objections to it are often urged by the authors of books of practice, as by Damhouder, Von Rosbach, Von

De Civ. Dei, bk. xix. c. 6. Essay Ixv. (Cotton’s trans.). Des Delitti e delle Pene, c. xvi. Storia della Colonna Infame.

1 Pro Sulla, c. 28.

3 Dig., xiviii. 18, 28.

5 Espr. des Lois, bk. vi. c. 17. 7 Osservazioni sulla Tortura. 9 Works, vol. vii. p. 520.

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Boden, and Voet. It is worthy of note, however, as illus-

| trative of the feeling of the time, that even Bacon !° com-

pares experiment in nature to torture in civil matters as the best means of eliciting truth. Muyart de Vouglans 1 derives the origin of torture from the law of God. Other apologists are Simancas, bishop of Badajos,’* Engel,!* and in England Sir R. Wiseman.*

Greece,—The opinion of Aristotle was in favour of torture as a mode of proof. It is, he says, a kind of evidence, and appears to carry with it absolute credibility because a kind of constraint is applied. It is classed as one of the “artless persuasions” (dreyvat wioress).!° At Athens slaves, and probably at times resident aliens, were tortured, but it was never applied to free citizens,!© such application being forbidden by a psephism passed in the archonship of Scamandrius. After the mutilation of the Herme in 415 B.c. a proposition was made, but not carried, that it should be applied to two senators named by an informer. In this particular case Andocides gave up all his slaves to be tortured.!’ Torture was sometimes inflicted in open court. The rack was used as a punishment even for free citizens. Antiphon was put to death by this means.18 The torture of Nicias by the Syracusans is alluded to by Thucydides !° as an event likely to happen, and it was only in order to avoid the possibility of inconvenient disclosures that he was put to death without torture. Isocrates and Lysias refer to torture under the generic name of oTpe- Brwows. As might be expected, torture was frequently inflicted by the Greek despots, and both Zeno and Anax- archus are said to have been put to it by such irresponsible authorities. At Sparta the despot Nabis was accustomed, as we learn from Polybius,” to put persons to death by an instrument of torture in the form of his wife Apega, a mode of torture no doubt resembling the Jungfernkuss once in use in Germany.

Rome.—The Roman system was the basis of all subse- quent European systems which recognized torture as a part of their procedure. The law of torture was said by Cicero to rest originally on custom (mores majorum).

There are frequent allusions to it in the classical writers 2! both of the republic and the empire. The law, as it existed under the later empire, is contained mainly in the titles De Questionibus 2 of the Digest and the Code,**—the former consisting largely of opinions from the Sententix Receptzx of Paulus," the latter being for the most part merely a re- petition of constitutions contained in the Theodosian Code." Both substantive law and procedure were dealt with by these texts of Roman law, the latter, however, not as fully

10 Nov. Org., dk. i. aph. 98. In the Advancement of Learning, bk. iy. ch. 4, Bacon collects many instances of constancy under torture.

1l Instituts du Droit Criminel, Paris, 1757.

12 De Catholicis Institutionibus Liber, ad precavendas et extirpandas Hereses admodum necessarius, Rome, 1575.

3 De Tortura ex Foris Christianis non proscribenda, Leipsic, 1738.

4 Law of Laws, p. 122, London, 1686.

15 Rhet., i. 15, 26.

16 The opinion of Cicero (De Partitionibus Oratoriis, § 34), that it was so applied at Athcns and Rhodes, seems, as far as regards Athens, not to be justified by existing evidence.

7 See Grote, Hist. of Greece, vol. vii. p. 274.

18 See Dict. of Antig., s.v. Bdoavos. In the Rane of Aristophanes, v. 617, there is a list of kinds of torture, and the wheel is alluded to in Lysistrata, v. 846. 19 vii. 86. 7

Psst Pe 21 'An interesting one, illustrating the uselessness of torture in the face of courage and resolution, is the abortive result of the torture of a Spanish peasant in 25 a.D. on the charge of being the murderer of Lucius Piso ('Tac., Anz., iv. 45). A somewhat similar case, occurring in Sicily, is given by Valerius Maximus, bk. iii. c. iii, The horrible torture of Epicharis,

a freed woman, is described by Tacitus, Ann., xv. 57. In Pliny's letter to Trajan (dpist., x. 97), he mentions having put to the torture two Christian deaconesses (ministre).

22 Qugstio included the whole process of which torture was a part. In the words of Cujacius, "questio est interrogatio qui fit per tormenta, vel de reis, vel de testibus qui facto intervenisse dicuntur.

23 Dig., xiviii. 18 ; Cod., ix. 41. 22 Wael. locales Bo) Ge

as in medieval codes, a large discretion being left to the judges. Torture was used both in civil and criminal trials,

but in the former only upon slaves and freedmen or | ae | were conceived in a spirit of as much fairness as such rules

infamous persons—such as gladiators—and where the truth could not be otherwise elicited, as in cases affecting the inheritance (7s hereditariz). Its place in the case of free citizens was taken by the reference to the oath of the party (see OatH). During the republic torture appears to have been confined to slaves in all cases, but with the empire (according to Dion Cassius under Tiberius) a free man became liable to it if accused of a crime, though not as a witness. 1 high a condition, he was subject to torture during the period between the edict of Diocletian in 303 and the edict of toleration of Galerius in 311. This short period excepted, the liability of a free man depended upon two conditions, the nature of the accusation and the rank of the accused. On an accusation of treason every one, whatever his rank, was liable to torture, for in treason the condition of all was equal.1_ The same was the case of those accused of sorcery (magi), who were regarded as humani generis inimici.2 A wife might be tortured (but only after her slaves had been put to the torture) if accused of poisoning her husband. In accusations of crimes other than treason or sorcery, certain persons were protected by the dignity of their position or their tender age. The main exemptions were contained in a constitution of Diocletian and Maximian, and included soldiers, nobles of a particular rank, 7.¢., eminentissimi and perfectissimi, and their descendants to the third generation, and decuriones

and their children to a limited extent—that is to say, they were subject to the torture of the plumbate in certain cases, such as fraud on the revenue and extor- tion. In addition to these, priests (but not clergy of a lower rank), children under fourteen, and pregnant women were exempt. A free man could be tortured only where he had been inconsistent in his depositions. No one was to be chained in prison before trial, nor could a prisoner be tortured while awaiting trial. The rules as to the torture of slaves were numerous and precise. It was a maxim of Roman law that torture of slaves was the most efficacious means of obtaining truth.? They could be tortured either as accused or as witnesses, but against their masters only in accusations of treason, adultery, frauds on the revenue, coining, and similar offences (which were regarded as a species of treason), attempts by a husband or wife on the life of the other, and in cases where a master had bought a slave for the special reason that he should not give evidence against him. The privilege from accusations by the slave extended to the master's father, mother, wife, or tutor, and also to a former master. On the same principle a freedman could not be tortured against his patron. The privilege did not apply where the slave was joint property, and one of his masters had been murdered by the other, or where he was the property of a corporation, for in such a case he could be tortured in a charge against a member of the corporation. Slaves belonging to the inheritance

could be tortured in actions concerning the inheritance. |

The adult slaves of a deceased person could be tortured where the deceased had been murdered. In a charge of adultery against a wife, her husband's, her own, and her father's slaves could be put to the torture. A slave manu- mitted for the express purpose of escaping torture was regarded as still liable to it. Before putting a slave to torture without the consent of his master, security must be given to the master for his value. The master of a slave tortured on a false accusation could recover double his value from the accuser. The undergoing of torture had at one time a serious effect upon the after-life of the

1 Cod., ix. 8, 4. 2 Cod., ix. 18, 7. 3 Cod., i. 3, 8.

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slave, for in the time of Gaius a slave who had been tortured could on manumission obtain no higher civil rights than those of a dediticrus.4 The rules of procedure

could be. Some of the most important were these. The amount of torture was at the discretion of the judge, but it was to be so applied as not to injure life or limb. The examination was not to begin by torture ; other proofs must be exhausted first. The evidence > must have ad- vanced so far that nothing but the confession of the slave was wanting to complete it. Those of weakest frame and tenderest age were to be tortured first. Except in treason, the unsupported testimony of a single witness was not a sufficient ground for torture. The voice and manner of the accused were to be carefully observed. A spon- taneous confession, or the evidence of a personal enemy, was to be received with caution. Repetition of the torture could only be ordered in case of inconsistent depositions or denial in the face of strong evidence. There was no rule limiting the number of repetitions. Leading questions were not tobe asked. A judge was not liable to an action for anything done during the course of the examination. An appeal from an order to torture was competent to the accused, except in the case of slaves, when an appeal could be made only by the master. The appellant was not to be tortured pending the appeal, but was to remain in prison.' The principal forms of torture in use were the equuleus, or rack (mentioned as far back as Cicero), the plumbatz, or leaden balls, the wngule, or barbed hooks, and the jidiculx, or cord compressing the arm. Other allusions in the Digest and Code, in addition to those already cited, may be shortly noticed. The testimony of a gladiator or infamous person (such as an accomplice) was not valid without torture. This was no doubt the origin of the medizval maxims (which were, however, by no means universally recognized),—Vilitas persone est justa causa torquendi testem, and Tortura purgatur infamia. Torture could not be inflicted during the forty days of Lent.® Robbers and pirates might be tortured even on Easter Day, the Divine pardon being hoped for where the safety of society was thus assured.!° Capital punishment was not to be suffered until after conviction or confession under torture.1!_ Withdrawal from prosecution (abolitio) was not to be allowed as a rule after the accused had undergone the torture.!2 In

charges of treason the accuser was liable to torture if he did not prove his case. The infliction of torture, not judicial, but at the same time countenanced by law, was at one time allowed to creditors. They were allowed to keep their debtors in private prisons, and most cruelly ill-use them, in order to extort payment.!4 Under the empire private prisons were forbidden. In the time of Juvenal, if his sixth satire may be believed, the Roman ladies actually hired the public torturors to torture their domestic slaves. As a part of the punishment torture was in frequent use. Crucifixion, mutilation, ex- posure to wild beasts in the arena, and other cruel modes

4 Gains, i. 18.

5 The evidence on which the accused might be torturcd was ex- pressed in Roman law by the terms argumentum and indicium. The latter term, as will be seen, afterwards became one of the most im- portant in the law of torture, but the analysis of indictum is later than Roman law. Jndiciiwm was not quite the same thing as semiplena probatio, though the terms appear to be occasionally used as synonyms. Indicium was rather the foundation or cause of probatio, whether plena or semiplena. An indictwm or a concurrence of indicia might, according to circumstances, constitute a plena or semiplena probatio. The difference between the words may be illustrated by a passage from Justin, '* Ad cujus rei probationem immittit indices," xxxii. 2.

6 Dig., xlix. 1, 15. 7 Cod., vii. 62, 12.

Dig, sean, 1), PIL, B I (Cliyche, thuls WOH,

0 Cod,, iii. 12, 10. 11 Cod., ix. 47, 16. 2 Cod., ix. 42, 3. 8 Cod., ix. 8, 3. 14 See, for instance, Livy, vi. 26. ae (Cuiiag ve, Cy 28H ibs,

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of destroying life were common, especially in the time of the persecution of the Christians under Nero.' Cruci- fixion as a punishment was abolished by Constantine in 315, in veneration of the memory of Him who was crucified for mankind. The punishment of mutilation was mode- rated by Justinian, who forbade amputation of both hands or feet or of any limb, and confined

it in future to ainpu- tation of one hand.2 Scourging was inflicted only on slaves ; free men were exempt by the Lex Porcia and Lex Valeria, except in a few cases, such as that of adultery, the penalty for which was scourging and cutting off the nose.2 On the other hand, where the interests of the church were concerned, the tendency was in favour of greater severity. Thus, by the Theodosian Code, a heretic was to be flogged with lead (contusus plumbo) before banishment,‘ and Justinian made liable to tortnre and exile any one insulting a bishop or priest in a church.°

The Church.—As far as it could the church adopted the Roman law, with the important and characteristic difference (dating from the severe edicts of Theodosius the Great in 381) that heresy took the place of treason, it being regarded as a kind of treason against God (“ crimen lesee majestatis divine”). The doctrine of confiscation for treason was so convenient and profitable that it was rapidly adopted by the church.” As most instances in which torture was inflicted by ecclesiastical tribunals would be accusations of heresy or Judaism—a specially revolting form of heresy to medieval Christians—this theory practi- cally equalized all persons for the purpose of torture, in accordance with the doctrine that in treason all were equal. The church generally secured the almost entire immunity of its clergy, at any rate of the higher ranks, from torture by civil tribunals.® In many instances councils of the church pronounced against torture, e.g., in a synod at Rome in 384.9 Torture even of heretics seems to have been originally left to the ordinary tribunals. Thus a bull of Innocent IV., in 1252, directed the torture of heretics by the civil power, as being robbers and murderers of souls, and thieves of the sacraments of God.!° The church also enjoined torture for usury.1! A character- istic division of torture, accepted by the church but not generally acknowledged by lay authorities, was into spiritual and corporal, the latter being simply the imposi- tion of the oath of purgation, the only form originally in use in the ecclesiastical courts. The canon law contains little on the subject of torture, and that little of a com- paratively humane nature. It laid down that it was no sin in the faithful to inflict torture,!* but a priest might not do so with his own hands,!° and charity was to be used in all punishments.‘4 No confession was to be extracted by torture. The principal ecclesiastical tribunal by which torture was inflicted in more recent times was of course the

1 The well-known lines of Juvenal (Sat., i. 155),

‘*Teda lucebis in illa, Qua stantes ardent qui fixo gutture fumant,” will serve as an example of such punishments.

2 Nov., exxxiv. 13. D (Oink we Oy Bie 2 ay BBE

5 Nov., cxxiii. 81. On the subject of torture in Roman law refer- ence may be made to Westphal, Die Torturer der Griechen, Romer, und Deutschen, Leipsic, 1785; Wasserschleben, JZistoria Quexstionum per Tormenta apud Romanos, Berlin, 1836.

6 This term, which included blasphemy and cognate offences, is used both by ecclesiastical and secular jurists, e.g., by Suarez de Paz and by Jousse, Zraité de la Justice Criminelle.

7 See an article by Mr Lea in Zhe English MWistorical Review, April 1887, ‘‘ Confiscation for Heresy in the Middle Ages.”

8 See Escobar, Mor. Theol., tract. vi. c. 2. They were to be tortured only by the clergy, where possible, and only on indicia of special gravity.

9 Lea, Superstition and Force, p. 419, 3d ed., Philadelphia, 1878.

10 Leges et Constitutiones contra Mereticos, § 26.

1l Lecky, Rationalism in Europe, vol. ii, p. 34, n.

12 Deer, pt. ti. 28, 4, 45. 13 Decr., pt. i. 86, 25. Ewer, ptai. Leia, 11. 16 Decr., pt. ii. 15, 6, 1.

INQUISITION (q.v.). The code of instructions issued by Torqueniada in Spain in 1484 provided that an accused person might be put to the torture if semiplena probatio existed against the accused,—that is, so much evidence as to raise a grave and not merely a light presumption of guilt, often used for the evidence of one eye or ear witness of a fact. If the accused confessed during torture, and afterwards confirmed the confession, he was punished as

convicted ; if he retracted, he was tortured again, or sub- jected to extraordinary punishment. One or two inquis- itors, or a commissioner of the Holy Office, were bound to be present at every examination. Owing to the occurrence of certain cases of abuse of torture, a decree of Philip II. was issued, in 1558, forbidding the administration of torture without an order from the council. But this decree does not appear to have been fully observed. By the edict of the inquisitor-general Valdés, in 1561, torture was to be left to the prudence and equity of the judges. They must consider motives and circumstances before decreeing torture, and must declare whether it is to be employed in caput proprium, 1.e., to extort a confession, or im caput alienum, 7.e., t@ incriminate an accomplice. The accused was not to be informed of the grounds of torture. He was not to be questioned on a particular fact, but was to be allowed to say what he pleased. ‘Torture was not to be decreed until the termination of the process, and after defence heard, and the decree was subject to appeal, but only in doubtful cases, to the Council of the Supreme. It was also only in doubtful cases that the inquisitors were bound to consult the council; where the law was clear (and of this they were the judges) there need be no consultation, and no appeal was allowed. The judges, the registrar, and the executioners were the only persons allowed to be present at the torture. They were to be careful that the jailer suggested nothing to the accused during the tor- ture. On ratification twenty-four hours afterwards of a confession made under torture, the accused might be re- conciled, if the inquisitors believed him to be sincerely repentant. If convicted of bad faith, he might be relaxed, 7.e., delivered to the secular power to be burned. The inquisitors had a discretion to allow the accused to make the canonical purgation by oath instead of undergoing corporal torture, but the rule which allows this to be done at the same time discountenances it as fallacious. It is remarkable that the rules do not allow much greater efficacy to torture. They speak of it almost in the terms of Roman law as dangerous and uncertain, and depending for its effects on physical strength.!® Torture had ceased to be inflicted before the suppression of the Inquisition, and in 1816 a papal bull decreed that torture should cease, that proceedings should be public, and that the accuser should be confronted with the accused.!” It was still, however, customary for the fiscal, even in the latest times, to end the requisition by demanding torture as a matter of form. The rules in themselves were not so cruel as the con- struction put upon them by the inquisitors. For instance, by Torquemada’s

instructions torture could not be repeated unless in case of retractation. This led to the subtlety of calling a renewed torture a continuation, and not a repe- tition. The rules of Torquemada and of Valdés are those of the greatest historical importance, the latter forming the code of the Holy Office until its suppression, not only

16 The rules will be found in Llorente's List. of the Inquisition, cc. vi., xxii.

17 A case of actual torture occurred in Spain in the case of Van Halen, in 1817, in spite of the papal bull. In South America, as late as 1809, power to torture was conferred on inquisitors by the dean and chapter of Santiago. See Francisco Moyen, or the Inquisition in South America, by B. V. Mackenna (transl. by J. W. Dutffy, 1869), p. 217.

18 Prescott, Ferdinand and Isabella, vol. i. p. 327.

in Spain, but in other countries where the Inquisition was established. But several other codes of procedure existed before the final perfection of the system by Valdés. The earliest is perhaps the instructions for inquisitors (Diree- torium Inquisitorum) compiled a century earlier than Torquemada by Nicholas Eymerico, grand inquisitor of Aragon about 1368.1 Rules of practice were also framed two centuries later by Simancas, whose position as an apologist has been already stated. The text-book of pro- cedure of the Italian Inquisition was the Sacro Arsenale.? In the Netherlands, Francis Van der Helst was appointed inquisitor-general in 1521, with authority to torture heretics without observing the ordinary forms of law, and without appeal. In 1545 and 1550 instructions for the guidance of inquisitors were issued by Charles V.4 The liability of a judge for exceeding the law was not always recognized by the Inquisition to the same extent as by the lay tribunals. Llorente gives an instance of a warrant by an inquisitor to a licentiate ordering the torture of an accused person, and protesting that, in case of death or fracture of limbs, the fact is not to be imputed to the licentiate.°

Thus far of the law. In practice all the ingenuity of cruelty was exercised to find new modes of torment.® These cruelties led at times to remonstrance from the civil power. One example is the edict of Philip IL. just mentioned.

Another and an earlier one is an ordonnance of Philip the Fair, in 1302, bidding the Inquisition confine itself within the limits of the law.' At Venice the senate decreed that three senators should be present as inquisitors. Further details of the varieties of torture will be found, by those curious in such matters, in the works of Llorente, Herculano (Zistory of the Inquisition in Portugal), Motley, Garrido and Cayley, and Picart, to which may be added works giving accounts of the sufferings of individuals under the Inquisition, such as the narrative of the sutfer- ings of William Lithgow at Malaga in 1622 and of Van Halen in 1817, and (in the Spanish and Portuguese colonies) the cases of Francisco Moyen in Chili, and of Dellon at Goa in 1673.8 Mental torture may be exempli- fied by ExcoMMUNICATION (¢.v.), and by the secrecy and uncertainty of the proceedings of the inquisitors.

As the practice of torture, both by the civil and ecclesiastical power, became more systematized, it grew to be the subject of casuistical inquiry by churchmen, to an extent far exceeding the scanty discussion of the question in the text of the canon law. It will be sufficient here to cite as an example the treatment of it by Liguori, who incorporates the opinions of many of the Spanish casuists. On the whole, his views appear to be more humane than the prevailing practice. The object of torture he defines very neatly as being to turn semiplena into plena probate. For this proper indicia are necessary. He then proceeds to decide certain questions which had arisen, the most interesting of which deal with the nature of the sin of which the accused and the judge are guilty in particular instances. A judge sins gravely if he does not attempt all

1 An edition was published at Rome in 1558, and a compendium at Lisbon in 1762, and by Marchena at Montpellier in 1821.

2 The only edition which the writer has seen is dated Genoa and Perugia, 1653.

3 Motley, Dutch Republic, vol. i. p. 528.

olde paca 5 Llorente, c¢. xiv.

6 Among others were the gradual pouring of water drop by drop on a particular spot of the body, the ¢tormento de toca, or pouring of water into a gauze bag in the throat, which gradually forced the gauze into the stomach, and the péndola, or swinging pendulum, so graphi- cally described in one of Edgar Poe's tales.

7 Ordonnances des Rois, vol. i. p. 346.

8 The history of Dellon's narrative of his experiences in the prison of the Inqnisition is remarkable. It was translated into English in 1688 by the Rev. R. Wharton, a chaplain of Archbishop Sancroft, but was refused a licence, as being contrary to the king's religion, and the publisher was imprisoned.

YO TURE

| milder means of discovering truth before resorting to tor- ture. He sins in a criminal cause, or in one of notable infamy, if he binds the accused by oath to tell the truth before there is proof against him. It is tlie same if with- out oath he uses threats, terror, or exhibition of torments to confound the witness.? If any one, to avoid grave torments, charges himself with a capital crime, he does not sin mortally..° It was a doubtful question whether he sinned gravely in such a case.

England.—It is the boast of the common law of England that it never recognized torture as legal. One, perhaps the chief, reason for this position taken by the law is the difference of the nature of the procedure in criminal cases from that in general use in Continental countries. To use words more familiar in foreign jurisprudence, the English system is accusatorial as distinguished from inquisitorial. The common law of England has always shown itself averse to the inquisitorial system, and so (at least in theory) to the torture which may be regarded as an outcome of the system whose one end was to obtain a confession from the accused. The tendency of the small amount of statute law bearing on the subject is in the same direction. It was provided by Magna Charta, § 29, "that no free man… .~~should be destroyed in any way unless by legal judgment of his equals or by the law of the land." On this Sir E. Coke comments, " No man destroyed, &c., that is, forejudged of life or limb, dis~~ inherited, or put to torture or death.""! The Act of 27 Hen. VIII. c. 4 enacted that, owing to the frequent escape of

pirates in trials by the civil law, “the nature whereof is that before any judgment of death can be given against the offenders they must plainly confess their offence (which they will never do without torture or pains),” such persons should be tried by jury before commissioners under the Great Seal. Finally, the Bill of Rights provided that cruel and unusual punishments ought not to be inflicted. The opinions of tle judges have been invariably against torture in theory, however much some of them may have been led to countenance it in practice. The strongest authority is the resolution of the judges in Felton’s case (1628), “ that he ought not by the law to be tortured by the rack, for no such punishment is known or allowed by our law.” 2 in accordance with this are the opinions of Sir John Fortescue,!? Sir Thomas Smith, and Sir E. Coke, The latter says,—“ As there is no law to warrant tortures in this land, nor can they be justified by any prescription, being so lately brought in.” In spite of all this torture in criminal proceedings was inflicted in England with more or less frequency for some centuries, both as a means of obtaining evidence and as a part of the punishment. But it should be remarked that torture of the former kind was invariably ordered by the crown or council, or by some tribunal of extraordinary authority, such as the Star Chamber, not professing to be bound by the rules of the common law. In only two instances was a warrant to torture issued to a common law judge.’

A licence to torture is found as early as the Pipe Roll of 34 Hen. II.7 The Templars (see TEMPLARS) were tortured in 1310 by royal warrant addressed to the mayor

9 Theol. Mor., bk. ix. § 202. 10 § 274. 11 2 Inst., 480.

2 3 State Trials, 371. B De Laudibus Legun Anglia, c. 22.

14 Commonwealth of England, bk. ii. c. 27, It is curious that Sir T. Smith, with all his hatred of torture, was directed by a warrant under the queen’s seal alone (not through the council) to torture the duke of Norfolk’s servants in 1571. Ina letter to Lord Burghley he pleaded for exemption from so thankless a task.

15 3 Inst., 35. Nevertheless, in the trial of Lords Essex and Sonth- ampton, Coke is found extolling the queen’s mercy for not racking or torturing the

accused, 1 State Trials, 1338.

16 Jardine, Reading on the Use of Torture in the Criminal Law of England (1837), p. 52.

17 Pike, Hist. of Crime in England, vol. i. p. 427.

and sheriffs of London.! In this case it is recorded that torture was unknown in England, and that no torturer was to be found in the realm.? A commission was issued con- cerning the tortures at Newgate in 1334.3 -The rack in the Tower is said to have been introduced by the duke of Exeter in the reign of Henry VI., and to have been thence called “the duke of Exeter’s daughter.” 4 In this reign torture seems to have taken its place asa part of what may be called extraordinary criminal procedure, claimed, and it may be said tacitly recognized, as exercisable by virtue of the prerogative, and continued in use down to 1640.° The infliction of torture gradually became more common under the Tudor monarchs. Under Henry VIII. it appears to have been in frequent use. Only two cases are recorded under Edward VI. and eight under Mary.6 The reign of Elizabeth was its culminating point. In the words of Hallam, “the rack seldom stood idle in the Tower for all the latter part of Elizabeth’s reign.”? The varieties of torture used at this period are fully described by Dr Lingard,® and. consisted of the rack, the scavenger’s daughter,® the iron gauntlets or bilboes, and the cell called ‘‘ Little Ease.” The registers of the council during the Tudor and early Stuart reigns are full of entries as to the use of torture, both for state and for ordinary offences.?° Among notable prisoners put to the torture were Anne Ascue, the Jesuit Campion, Guy Fawkes,” and Peacham (who was examined by Bacon “before torture, in torture, and after torture”).!2 The prevalence of torture in Elizabeth’s reign led to the well-known defence attributed to Lord Burghley, ‘A declaration of the favourable dealing of Her Majesty’s commissioners appointed for the examin- ation of certain traitors, and of tortures unjustly reported to be done upon them for matter of religion,” 1583.! The use of torture in England being always of an extra-ordinary and extra-judicial nature, it is comparatively certain that it could hardly have been applied with that observation of forms which existed in countries where it was regulated by law. There were no rules and no re-

sponsibility beyond the will of the crown or council. This irresponsibility is urged by Selden * as a strong objection to the use of torture.

So far of what may be called torture proper, to which the common law professed itself a stranger. There were, however, cases fully recognized by the common law which differed from torture only in name. The pene forte et dure was a notable example of this. If a prisoner stood mute of malice instead of pleading, he was condemned to the peine, that is, to be stretched upon his back and to have iron laid upon him as much as he could bear, and more, and so to continue, fed upon bad bread and stagnant water through alternate days until he pleaded or died. It

1 Rymer, edera, vol. iii. 228, 232.

2 Hallam, ALiddle Ages, vol. iii. p. 232.

3 Pike, vol. i. p. 481. 43 Inst., 34.

5 This is the date of the latest warrant in Mr Jardine's work.

6 Tt is to be noticed, as Mr Jardine observes, that all these are cases of an ordinary nature, and afford no ground for the assertions made by Strutt and Bishop Burnet that torture was used to heretics as heretics. 7 Const. Hist., vol. i. p. 201.

8 Hist. of England, vol. viii., appendix, note v.

9 These two were cxactly opposite in principle. The rack stretched the limbs of the sufferer; the scavenger's daughter compressed him into a ball.

10 Fifty-five of these will be found in the appendix to Mr Jardine's work. An ordinary robber of plate was threatened with torture in 1567.—Froude, Hist. of England, vol. viii. p. 386.

M1 Jt is not certain whether he was racked, but probably he was, in accordance with the king's letter :—"If he will not otherwise con- fess, the gentlest tortures are to be first used to him, and so on, step by step, to the most severe, and so God speed the good work."

12 Dalrymple, Memoirs and Letters of James I., p. 58 ; Macaulay's Essay on the Works of Bacon.

18 Lord Somers's Tracts, vol. i. p. 189. 4 Table Talk, " Trial." 18 Stephen, Jist. of the Criminal Law, vol. i. p. 297,

was abolished by 12 Geo. III. c. 20. 7 and 8 Geo. IV. c. 28 enacted that a plea of "not guilty " should be entered for a prisoner so standing mute. A case of pene occurred as lately as 1726. At times tying the thumbs with whip- cord was used instead of the peine. This was said to be a common practice at the Old Bailey up to the last century.16 In trials for witchcraft the legal proceedings often partook of the nature of torture, as in the throwing of the reputed witch into a pond to see whether she would sink or swim, in drawing her blood,!' and in thrusting pins into the body to try to find the insensible spot. Confessions, too, appear to have been often extorted by actual torture, and torture of an unusual nature, as the devil was supposed to protect his votaries from the effects of ordinary torture.

Torture as a part of the punishment existed in fact, if not in name, down to a very recent period. Mutilation as a punishment appears in some of the pre-Conquest codes, such as those of Alfred, Athelstan, and Canute. Bracton, who does not notice torture as a means of obtain- ing evidence, divides corporal punishment into that inflicted with and without torture.!® Later instances are the punish- ment of burning to death inflicted on heretics under the Six Articles (31 Hen. VIII. c. 14) and other Acts, and on women for petit treason (abolished by 30 Geo. III. c. 48), the mutilation inflicted for violence in a royal palace by 33 Hen. VIII. c. 12, the punishment for high treason, which existed nominally until 1870 (see TrEAson), the pillory (abolished by 7 Will. IV. and 1 Vict. c. 23), the stocks, and the burning in the hand for felony (abolished by 19 Geo. III. c. 74). Corporal punishment now exists only in the case of juvenile offenders (see SUMMARY JURISDICTION) and of robbery with violence (see THEFT). It was abolished in the army by the Army Act, 1881.19

Scotland.—Torture was long a recognized part of Scottish criminal procedure, and was acknowledged as such by many Acts and warrants of

the Scottish parliament, and warrants of the crown and the privy council. Some of the more important instances arc the following. In 1542 the forfeiture of John, Lord Glaminis, was reduced by the parliament as having proceeded on a confession extorted by threats of the ‘‘pynebankis.” In 1567 four persons were ordered by the Privy Council to be tortured for complicity in Darnley’s murder.?° In 1591 a commission issued to torture certain persons accused. of witchcraft! James VI., in 1596, empowered the provost and bailies of Edinburgh to try rioters by torture. The torture was applied to Rhynd in 1600, on a charge of being privy to the Gowrie House couspiracy.22. Two Acts in 1649 dealt with torture: onc took the form of a warrant to examine witnesses against William Barton by any form of probation,’ the other of a warrant to a committee to inquire as to the use of torture against persons suspected of witch- eraft.24 In 1650 the parliament ordaincd the committee appointed for the examination of prisoners to intimate to Colonel Sibbald that if his examination were not satisfactory the parliament would ordain him to be tortured. The judges, in 1689, wcre empowered by the estates to torture Chiesly of Dalrye, charged with the murder of the Lord President Lockhart, in order to discover ac- complices. In the same ycar the use of torture without evidence or in ordinary cases was declared illegal in the Claim of Right. The careful wording of this will be noticcd: it does not object to torture altogether, but reserves it for cases where a basis of evidence had already been laid, and for crimes of great gravity, thus admitting the dangerous principle, founded on Roman law, that the importance of the crime is a reason for departing from the ordinary rules of justice. However great the crime, it is no more certain than in the case of a crime of less gravity that the person accused was the person who committed it. A warrant issued in the same year to put to the torture certain persons accused of con- spiring against the Government, and also certain dragoons suspected of corresponding with Lord Dundee. In 1690 an Act passed recit- ing the torture of William Carstares, a ministcr, in 1688, and re-

16 Stephen, vol. i. p. 800; Kelyng, Reports, p. 27.

7 The superstition was that any one drawing a witch’s blood was free from her power. This is alluded toin Henry VTI., pt. i. act i. sc. 5; ‘Blood will I draw on thee ; thou art a witch.”

18 1040. PAA Vict. c. 9, § 7.

20 Register of the Privy Council, vol. i. p. 525.

21 Tbid., vol. iv. p. 680. 22 Ibid., vol. vi. p. 156.

ae (, SEB} Be, B70.

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establishing his competencyasa witness.! The last warrant appears to be one in 1690 for torturing a man accused of rape and murder. In 1708 torture in Scotland was finally abolished by 7 Anne e. 21, § 5. Many details of the tortures inflicted will be found in Pitcairn's Criminal Trials and the introduction to Maclaurin's Criminal Cascs. Among other varieties—the nature of some of them can only be guessed—were the rack, the pilniewinkis, the boot," the caschie-laws, the lang irnis, the narrow-bore, and, worst of all, the waking, or artificial prevention of sleep.? The ingenuity of torture was exercised in a special degree on charges of witchcraft, uotably in the reign of James VI., an expert both in witchcraft and in torture. The Act of 1649 already cited shows that the prin- ciple survived him. Under the government of the dukes of Lauderdale and York torture as a practice in charges of religious and political offences reached its height. " The privy council was accustomed to extort confessions by torture; that grim divan of bishops, lawyers, and peers sucking in the groans of each undaunted enthusiast, in hope that some imperfect avowal might lead to the gacrifice of other victims, or at least warrant the execution of the present."4 With such examples before them in the law, it is scarcely to be wondered at that persons in positions of authority, especially the nobility, sometimes exceeded the law and inflicted torture at their own will and for their own purposes. There are several instances in the register of the privy council of suits against such persons, ¢.g., against the earl of Orkney, in 1605, for putting a son of Sir Patrick Bellenden in the boots. :

Treland seems to have enjoyed a comparative immunity from torture. It was not recognized by the common or statute law, and the cases of its infliction

do not appear to be numerous. In 1566 the president and council of Munster, or any three of them, were empowered to inflict torture, ‘‘in cases necessary, upon vehement presumption of any great offence in any party committed against the Queen’s Majesty.”® In 15838 Hurley, an Irish priest, was tortured in Dublin, by ‘toasting his fect against the fire with hot boots.”® In the case of Myagh, in 1581, the accused was brought over from Ireland by command of the lord deputy to be tortured in the Tower.? In 1615 one O’Kennan was put to the rack in Dublin by virtue of the lord deputy’s commission.® In 1627 the lord deputy doubted whether he had authority to put a priest named O’Cullenan to the rack. An answer was returned by Lord Killultagh to the effect that ‘‘you ought to rack him if you saw cause and hang him if you found reason.” ®

British Colonies and Dependencies. —The infliction of torture in any British colony or dependency has usually been regarded as contrary to law, and ordered only by arbitrary authority. It is true that in the trial of Sir Thomas Picton in 1806, for subjecting, while governor of Trinidad, a woman named Luisa Calderon to the torture of the picquet,!° one of the grounds of defence was that such torture was authorized by the Spanish law of the island, but the accused was convicted in spite of this defence, and the final decision of the Court of King’s Bench, in 1812, decrecing a respite of the defendant’s recognizances till further order, was perhaps not so much an affirmation of the legality in the particular instance as the practical expression of a wish to spare an eminent public servant.’ As to Tats, the second charge against Warren Hastings was extortion from the begums of Oude by means of the torture of their servants.” In the present Indian Penal Code and Evidence Act there are pro- visions intended, as Sir James Stephen says, to prevent the practice of torture by the police for the purpose of extracting con- fessions from persons in thcir custody.44 In Ceylon torture, which had been allowed under the Dutch government, was expressly abolished by royal proclamation in 1799.

United Statcs.—One instance of the peine forte et dure is known. It was inflicted in 1692 on Giles Cory of Salem, who refused to plead when arraigned for witchcraft.!° The constitution of the United States provides, in the words of the Bill of Rights, that cruel and unusual punishments are not to be inflicted.1® This is repeated in the constitutions of most States. The

infliction of cruel and unusual punishment by the master or officer of an American vessel on the high seas, or within the maritime jurisdiction of the United States, is punishable with fine or imprisonment, or both.?”

1 The thumbserew with which Carstares lad been tortured was afterwards presented to him as a remembrance by the Privy Council.

2 Persons subjected to more than usual torture from the boot were said to be ‘Sextremely booted.”

3 This seems to have been used in one ease in England. Lecky, Rationalism in Europe, vol, i. p. 122.

4 Hallam, Const. Hist., vol. iil. p. 436, p. 583, and ScoTLAND, vol. xxi. p. 516.

5 Froude, Hist. of England, vol. viii. p. 386.

7 Jardine, p. 29.

9 Jardine, p. 54.

10 In the picquet the sufferer was supported only on the great toe (which rested ona sharp stake), and by a rope attached to one arm.

11 30 State Trials, 449.

12 See the Report of the Proceedings, vol. i., and Macaulay’s Essay on Warren Hastings. 13 Stephen, Jndian Evidence Act, p. 126.

14 §§ 327-331 of Code; §§ 25-27 of Act.

15 Bouvier, Law Dict., s.v. ‘‘Peine Forte et Dure.”

16 Amendments. Art. viii. 17 Revised Stat., § 5347.

See Burnet, (ist. of Own Time, vol. i.

6 Jbid., vol. xi. p. 263. 8 Cal. State Papers (Irish series, 1615-1625), p. 78.

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Continental States. —The principles of Roman law were generally adopted. Want of space unfortunately prevents a detailed exaini- nation of the law of other countries, but that of Italy may fairly

be taken as the type of a system which reached at its maturity a

certain revolting completeness of which it is difficult to speak with patience. The law as it existed in Italy is contained in a long line of authorities, chiefly supplied by the school of Bologna, beginning with the glossatores and coming down through the post-glossatores, until the system attained its perfection in the vast work of Farinaccius, written early in the 17th century, where every pos- sible question that could arise is treated with elaborate minuteness. The writings of jurists were supplemented by a large body of legis- lative enactments in most of the Italian states, extending from the constitutions of the emperor Frederick II. down to the last century. It is not until Bartolus (1314-1357) that the law begins to assume a definite and complete form. In his commentary on book xlviii. of the Digest he follows Roman law closely, but introduces some further refinements: ¢.g., though leading questions may not be asked in the main inquiry they are admissible as subsidiary. There is a beginning of classification of indicia. A very full discussion of the law is contained in the work on practice of Hippolytus de Marsiliis,!8 a jurist of Bologna, notorious, on his own admission, as the inventor of the torture of keeping without sleep. He defines the question as inquisitio veritatis per tormenta et cordis dolorem, thus recognizing the mental as well as the physical elements in torture. It was to be used only in capital cases and atrocious crimes. The works of Farinaccius and of Julius Clarus nearly a century later were of great authority from the high official positions filled by the writers. Farinaccius was procurator-general to Pope Paul V., and his discussion of torture is one of the most complete of any. It occupies 251 closely printed folio pages with double columns, The length at which the subject is treated is one of the best proofs of the science to which it had been reduced. The chief feature of the work is the minute and skilful analysis of indicia, fama, presunptio, and other technical terms. Many definitions of indiciwm are suggested, the best perhaps being conjectura ex probabilibus ct non necessariis orta, a quibus potest abesse veritas scd non

verisimilitudo. For every infliction of torture a distinct ¢dictwm is required. But this rule does not apply where it is inflicted for discovering accomplices or for discovering a crime other than that for which it was originally inflicted. Torture may be ordered in all criminal cases, except small offences, and in certain civil cases, such as denial of a depositum, bankruptcy, usury, treasure trove, and fiscal cases. It may be inflicted on all persons, unless specially exempted (clergy, minors, &c.), and even those exempted may be tortured by command of the sovereign. There are three kinds of torture, levis, gravis, and gravissima, the first and second corresponding to the ordinary torture of French writers, the last to the extraordinary. The extraordinary or gravissima was as much as could possibly be borne without destroying life. An immense variety of tortures is mentioned, the most usual being the tying of one hand only with the cord. The judge could not begin with torture ; it was only a subsidium. If inflicted without due course of law, it was void asa proof. The judge was liable to penaltics if he tortured without proper tndicia, if a privileged person, or if to the extent that death or permanent illness was the result. An immense variety of tor- tures is mentioned, and the list tended to grow, for, as Farinac- cius says, judges continually invented new modes of torture to please themselves. Numerous casuistical questions are treated at length. Could a priest reveal an acknowledgment of an intended crime made to him in confession? What kinds of reports or how much hearsay evidence constituted fame? How far was a con- fession allowed to be extorted by blandishments or false promises on the part of the judge? Were there three or five grades in torture? Julius Clarus of Alessandria was a member of the council of Philip 11.2” Toa great extent he follows Farinaccius. He puts the questions for the consideration of the judge with great clear- ness. They are —whether (1) a crime has been committed, (2) the charge is one in which torture is admissible, (3) the fact can be proved otherwise, (4) the crime was secret or open, (5) the object of the torture is to elicit confession of crime or discovery of accomplices. He admits the tremendous power given toa judge of torturing a witness should he suspect that the latter knows the truth and is concealing it. An accuser may not be racked with the accused in order to test his sincerity. The clergy can be tortured only in charges of treason, poisoning, and violation of tombs. On the great question whether there are three or five grades, he decides in favour of five, viz., threats, taking to the place of torment, stripping and binding, lifting on the rack, rack- ing. Other

Italian writers of less eminence have been referred to for the purposes of this article. The burden of their writings is practically the same, but they have uot attained the systematic perfection of Farinaccius. Citations from many of them are made by Manzoni (see below). Among others are Guido de Suzara, Paris

18 Practica Criminalis que Averolda nuncupatur, Venice, 1532. 19 Praxis et Theorica Criminalis, bk. ii. tit. v. quest. 36-51, Frankfort, 1622, 20 Practica Criminalis Finalis, Lyons, 1637. .

Kinds of

de Puteo, Agidins Bossius of Milan, Casonus of Venice, Decianus, Follerius, and Tranquillus Ambrosianus, whose works cover the period from the 13th to the end of the 17th century. The law depended mainly on the writings of the jurists as interpreters of custom. At the same time in all or nearly all the Italian states the customary law was limited, supplemented, or amended. by legislation. That a check by legislative authority was necessary appears from the glimpses afforded by the writings of the jurists that the letter of the law was by no means always fol- lowed. The earliest legislation after the Roman law seems to be the constitutions of the emperor Frederick II. for Sicily pro- mulgated in 1231.

Several instanees of the torture of eminent persons occur in Italian history. The historical case of the greatest literary interest is that of the persons accused of bringing the plague into Milan in 1630 by smearing the walls of houses with poison. Aun analysis of the case was undertaken by Verri? and Manzoni,® and puts in a clear light some of the abuses to which the system led in times of popular panic. Convincing arguments are urged by Manzoni, after an exhaustive review of the authorities, to prove the ground- lessness of the charge on which two innocent persons underwent the torture of the canape, or hempen cord (the effect of which was partial or complete dislocation of the wrist), and afterwards suffered death by breaking on the wheel. The main arguments, shortly stated, are these, all based upon the evidence as recorded, and the law as laid down by jurists. (1) The unsupported evidenee of an accomplice was treated as an indiciwm in a

case not one of those exceptional ones in which such an indiciwm was sufficient. The evidence of two witnesses or a confession by the accused was neces- sary to establish a remote indiciwm, such as lying. (2) Hearsay evidence was received when primary evidence was obtainable. (8) The confession made under torture was not ratified afterwards. (4) It was made in consequcnee of a promise of impunity. (5) It was of an impossible crime.

Much general information on the subject will be found in the works of Mr Lea and Mr Lecky, to which reference has already been made, in the Penny Cyclo- pedia, s.v. “Torture,” in Zedler’s Universal Lexicon, s.v. “Tortur,” and in Meyer’s Esprit des Institutions Judiciaires. For England, Jardine’s work is the standard authority. Thirty-six kinds of torture are described in Meyer’s Kon- versations-Lexikon, s.v. “Tortur.” Instruments of torture are still preserved in the Tower of London and in the muscums of Munich, Ratisbon, Nuremberg, The Hague, and other places, Those at the Tower are the iron eollar, the bilboes, the thumbscrew, and the scayenger’s daughter. There is also a model of one of the forms of the rack. (J. Wt.)

TORY. See Wuic AnD Tory.

TOTEMISM. A totem is a class of material objects which a savage regards with superstitious respect, believing that there exists between him and every member of the class an intimate and altogether special relation. The name is derived from an Ojibway (Chippeway) word which was first introduced into literature, so far as appears, by J. Long, an Indian interpreter of last century, who spelt it totam.4 The connexion between a man and his totem is mutually beneficent: the totem protects the man, and the man shows his respect for the totem in various ways, by not killing it if it be an animal, and not cutting or gathering it if it be a plant. As distinguished from a fetich, a totem is never an isolated individual, but always a class of objects, generally a species of animals or of plants, more rarely a class of inanimate natural objects, very rarely a class of artificial objects.

Considered in relation to men, totems are of at least

totems. three kinds :—(1) the clan totem, common to a whole clan,

Clan totem.

and passing by inheritance from generation to generation ; (2) the sex totem, common either to all the males or to all the females of a tribe, to the exclusion in either case of the other sex; (3) the individual totem, belonging to a single individual and not passing to his descendants. Other kinds of totems exist and will be noticed, but they may perhaps be regarded as varieties of the clan totem. The latter is by far the most important of all; and where we speak of totems or totemism without qualification the reference is always to the clan totem.

The Clan Totem.—The clan totem is reverenced by a body of men and women who call themselves by the name

1 For instanee, Paris de Puteo illustrates the extra-legal cruelties sometimes practised by asserting that he saw a judge seize an aecused

by the hair of the head and dash his head against a pillar in order to extort a confession. 2 QOsservaziont sulla Tortura.

3 Storia della Colonna Infame. 7 + Voyages and Travels of an Indian Interpreter, p. 86, 1791.

AGT of the totem, believe themselves to be of one blood, de- scendants of a common ancestor, and are bound together by common obligations to each other and by a common faith in the totem. Totemism is thus both a religious and a social system. In its religious aspect it consists of the relations of mutual respect and protection between a man and his totem; in its social aspect it consists of the rela- tions of the clansmen to each other and to men of other clans. In the later history of totemism these two sides, the religious and the social, tend to part company ; the social system sometimes survives the religious; and, on the other hand, religion sometimes bears traces of totemism in countries where the social system based on totemism has disappeared. We begin with the religious side. Totemism as a Religion, or the Relation between a Man

Totem-

and his Totem.—The members of a totem clan call them- ism as a

selves by the name of their totem, and commonly believe themselves to be actually descended from it. Thus the Turtle clan of the Iroquois are descended from a fat

turtle, which, burdened by the weight of its shcll in walking, con- from trived by great exertions to throw it off, and thereafter gradually totem.

developed into a man.® The Cray-Fish clan of the Choctaws were originally eray-fish and lived underground, coming up oecasionally through the mud to the surface. Once a party of Choetaws smoked them out, and, treating them kindly, taught them the Choctaw language, taught them to walk on two legs, made them eut off their toe nails and pluck the hair from their bodics, after which they adopted them into the tribe. But the rest of their kindred, the cray-fish, are still living underground.® The Osages are desecnded from a male snail and afemale beaver. The snail burst his shell, developed arms, feet, and legs, and became a fine tall man; after- wards he married the beaver maid.? Some of the elans of western Australia are descended from ducks, swans, and other waterfowl.® In Senegambia each family or clan is descended from an animal (hippopotamus, scorpion, &c.) with which it counts kindred.®

Somewhat different are the myths in which a human ancestress is said to have given birth to an animal of the totem species. Thus the Snake clan among the Moquis of Arizona are descended from a woman who gave birth to snakes.!° The Bakalai in western equatorial Africa believe that their women once gave birth to the totem animals; one woman brought forth a calf, others a crocodile, hippopotamus, monkey, boa, and wild pig.”

Believing himself to be descended from, and therefore akin to, his totem, the savage naturally treats it with respect. If it is an animal he will not, as a rule, kill nor eat it. In the Mount Gambier tribe (South Australia) “a man does not kill or use as food any of the animals of the same sub- division with himself, excepting when hunger compels; and then they express

sorrow for having to eat their wingong (friends) or twmanang (their flesh). When using the last

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word they touch their breasts, to indicate the close relation- ship, meaning almost a part of themselves.

To illustrate :—One day one of the blacks killed a crow, Three or four days afterwards a Boortwa (crow) named Larry died. He had been ailing for some days, but the killing of his wingong hastened his death. The tribes about the Gulf of Carpentaria greatly reverence their totems: if any one were to kill the totem animal in presence of the man whose totem it was, the latter would say, ‘“‘ What for you kill that fellow ? that my father!” or ‘‘ That brother belonging to me you have killed ; why did you do it?” 8 Sir George Grey says of the western Australian tribes that a man will never kill ‘an animal of his kobong (totem) species if he finds it asleep; ‘‘indeed, he always kills it reluctantly, and never without affording it a ehance to escape. This arises from the family belief that some one individual of the species is their nearest friend, to kill whom would be a great crime, aud to be earefully avoided.” 4 Amongst the Indians of British Columbia a man will

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5 Second Annual Report of the Bureau of Ethnology, Washington, 1883, p. 77. 6 Catlin, North American Indians, ii. p. 128.

7 Schoolcraft, The American Indians, p. 95 sq. ; Lewis and Clarke, Travels to the Source of the Missouri River, London, 1815, i. p. 12.

8 Sir George Grey, Vocabulary of Dialects of S. W. Australia.

9 Revue d’ Ethnographie, iii. p. 396, v. p. 81.

10 Bourke, Snake Dance of the Moquis of Arizona, p. 177.

1 Du Chaillu, Hxplorations in Equatorial Africa, p. 308.

12 Stewart in Fison and Howitt, Kamilaroi and Kurnat, p. 169.

13 Jour. Anthrop. Inst., xiii. p. 300.

14 Grey, Journals of Tivo Expeditions in North- West and Western Australia, ii. p. 228.

Respect shown to totem.

Split totems.

Plant totems,

Totem taboos.

Totem kept in captivity.

Totem buried and mourned,

his face for shame, and afterwards demand compensation for the act. Whenever one of these Indians exhibits his totem badge (as by painting it on his forehead), all persons of the same totem are bound to do honour to it by casting property before it.! The Damaras in South Africa are divided into totem clans, called “eandas”; and according to the clan to which they belong they refuse to partake, ¢.g., of an ox marked with black, white, or red spots, or ofa sheep without horns, or of draught oxen. Some of them will not even touch vessels in which such food has been eooked, and avoid even the smoke of the fire which has been used to cook it.2 The negroes of Senegambia do not eat their totems.* The Mundas (or Mundaris) and Oraons in Bengal, who are divided into exogamous totem clans, will not kill or eat the totem animals which give their names to the clans. A remarkable feature of some of these Oraon totems is that they are not whole animals, but parts of animals, as the head of a tortoise, the stomach of a pig. In such cases (which are not confined to Bengal) it is of eourse not the whole animal, but only the special part, that the clans- men are forbidden to eat. Such totems may be distinguished as split totems. The Jagannathi Kumhar in Bengal abstain from killing or injuring the totems of their respective claus, and they bow to their totems when they meet them.®

When the totem is a plant the rules are such as these. A native of western Australia, whose totem is a vegetable, ‘may not gather it under certain circumstances and at a particular period of the year.”® An Oraon clan, whose totem is the kujrar tree, will not eat the oil of that tree, nor sit in its shade.’ The Red Maize clan of the Omahas will not eat red maize. Those of the people of Ambon and Uliase who are descended from trees may not use these trees for firewood.

The rules not to kill or eat the totem are not the only taboos ; the clansmen are often forbidden to touch the totem or any part of it, sometimes even to look at it.

Thus the Elk clan of the Omahas neither cat the flesh nor touch any part of the male elk. The Deer-Head clan of the Omahas may not touch the skin of any animal of the deer family, nor wear moccasins of deer skin, nor use the fat of the deer for hair-oil; but they may eat the flesh of deer.® Of the totem clans in Bengal it is said that they “are prohibited from killing, cating, eutting, burning, carrying, using, &c.,” the totem. The Bechuanas in South Africa, who havea well- developed totem system, may not eat nor clothe themselves in the skin of the totem animal.4!_ They even avoid, at least in some cases, to look at the totem. Thus to a man of the Bakuena (Bakwain) or Crocodile clan, it is ‘‘hateful and unlucky” to meet or gazc ona crocodile ; the sight is thought to cause inflammation of the eyes.

Sometimes the totem animal is fed or even kept alive in captivity. Among the mountaineers of Formosa each clan or village keeps its totem (serpent, leopard, &c.) in a cage.”® A Samoan clan whose totem was the eel used to present the first fruits of the taro planta- tions to the eels. Amongst the Narrinyeri in South Australia men of the Snake clan sometimes catch snakes, pull out their teeth or sew up their mouths, and keep them as pets. In a Pigeon clan of Samoa a pigeon was carefully kept and fed. Amongst the Kalang in Java, whose totem is the red dog, each family asa rule keeps one of these animals, which they will on no account allow to be struck or ill-used by any one. 16

The dead totem is mourned for and buried like a dead clansman. In Samoa, if a man of the Owl totem found a dead owl by the road side, he would sit down and weep overit and beat his forehead with stones till the blood

flowed. The bird would then be wrapped up and buried with as much ceremony as if it had been a human being. “This, however, was not the death of the god. He was supposed to be yet alive, and incarnate in all the owls in existence,’’!7 The generalization here implied is characteristic of totemism; it is not mercly an individual but the species that is reverenced. The

Wanika in eastern Africa look on the hyena as one of their

1 R. C. Mayne, British Columbia, p. 258. 2 C. J. Anderson, Lake Ngami, 222 sq. 3 Rev, d’ Ethn., iti. 396. “ Dalton in Trans. Ethnolog. Soc., new series, vi. p. 36; Id., Ethnol. of Bengal, pp. 189, 254; As. Quart. Rev., July 1886, p. 76. 5 As. Quart. Rev., July 1886, p. 79. 8 Grey, Journals, ii. 228 sq. 7 Dalton, Ethn. of Bengal, 254; Id., Trans. Ethnol. Soc., vi. 36. 8 E. James, Expedition from Pittsburgh to the Rocky Mountains, ii. p. 47; Third Rep. Bur. Ethnol., p. 225. 9 James, loc. cit.; Third Rep., 245. As. Quart. Rev., July 1886. 1 Casalis, The Basutos, 211. 12 Verhandl. der Berliner Gesell. f. Anthropologie, 1882, p. (62). 13 Turner, Samoa, p. 71. M Native Tribes of S. Australia, p. 63. 15 Turner, op. cit., p. 64. 16 Rafiles, Hist. of Java, i. p. 328, ed. 1817. 1 Turner, op. cit., p. 21, ef. 26, 60 sq.

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never kill his totem animal ; if he sees another do it, he will hide] ancestors, and the death of an hyena is mourned by the whole

people; the mourning for a chief is said to be as nothing compared to the mourning for an hyena.?® A tribe of southern Arabia used to bury a dead gazelle wherever they found one, and the whole tribe mourned for it seven days.4® A Californian tribe which reverenced the buzzard held an a1nual festival at which the chief ceremony was the killing of a buzzard without losing a drop of its blood. It was then skinned, the feathers were preserved to make a sacred dress for the medicine-man, and the body was buried in holy ground amid the lamentations of the old women, who mourned as for the loss of a relative or friend.?°

As some totem clans avoid looking at their totem, so others are Totem careful not to speak of it by its proper name, but usc descriptive not re-

epithets instead. The three totems of the Delawares—the wolf, ferred to” turtle, and turkey—were referred to respectively as ‘‘round foot,” by name, **‘crawler,” and “not chewing,” the last referring to the bird’s habit of swallowing its food ; and the clans called theniselves, not Wolves, Turtles, and Turkeys, but “ Round Feet,” “ Crawlers,” and “ Those who do not ehew.”**!_ The Bear clan of the Ottawas called them- selves not Bears but Big Feet.” The object of these circumlocu- tions is probably to give no offence to the worshipful animal.

The penalties supposed to be incurred by acting disre- Conse-

spectfully to the totem are various. The Bakalai think quences that if a man were to eat his totem the women of his ome clan would miscarry and give birth to animals of the totem to totem. kind, or die of an awful disease.** The Elk clan among the Omahas believe that if any clansman were to touch any part of the male elk, or eat its flesh or the flesh of the male deer, he would break out in boils and white spots in different parts of the body.2* The Red Maize subclan of the Omahas believe that, if they were to eat of the red maize, they would have running sores all round their mouth.*° And in general the Omahas believe that to eat of the totem, even in ignorance, would cause sickness, not only tothe eater, but also to his wife and children.” The worshippers of the Syrian goddess, whose creed was saturated with totemism, believed that if they ate a sprat or an anchovy their whole bodies would break out in ulcers, their legs would waste away, and their liver melt, or that their belly and legs would swell up.??

The Samoans thought it death to injure or eat their totems. The totem was supposed to take up his abode in the sinner’s body, and there to gender the very thing which he had eaten till it caused his death.?$

Thus if a Turtle man ate of a turtle he grew very ill, and the Samoan voice of the turtle was heard in his inside saying, ‘‘ He ate me ; mode of Iam killing him.”*? In such cases, however, the Samoans had a appeasing mode of appeasing the angry totem. The offender himself or one totem. of his clan was wrapped in leaves and laid in an unheated oven, { as if he were about to be baked. Thus if amongst the Cuttle-Fish clan a visitor had caught a cuttle-fish and cooked it, or if a Cuttle- Fish man had been present at the eating of a cuttle-fish, the Cuttle- Fish clan met and chose a man or woman

who went through the pretence of being baked. Otherwise a cuttle-fish would grow in the stomach of some of the clan and be their death.*° 4

In Australia, also, the punishment for eating the totem Aus- appears to have been sickness or death.?! But it is not ie merely the totem which is tabooed to the Australians, jopoos,

they have, besides, a very elaborate code of food prohibi- tions, which vary chiefly with age, being on the whole

strictest and most extensive at puberty, and gradually : relaxing with advancing years. Thus young men are for-

bidden to eat the emu; if they ate it, it is thought that | they would be afflicted with sores all over their bodies.*?

18 Charles New, Life, Wanderings, &c., in Eastern Africa, p. 122.

12 Robertson Smith, Kinship and Marriagein Karly Arabia, p. 195.

20 Boscana, in Alfred Robinson’s Life in California, p. 291 sq.; Bancroft, Native Races of the Pacific States, iii. p. 168.

*1 Brinton, The Lenape and their Legends, p. 39; Morgan, Ane. Soc., / p. 171; Heckewelder, p. 247.

22 See Acad., 27th Sept. 1884, p. 203.

23 Du Chaillu, Hquat. Afr., p. 309. 24 Third Rep., 225.

I (ikihes OB Ip 26 James, Hxped. to the Rocky Mountains, ii. p. 50.

°7 Plutarch, De Superst., 10; Selden, De Dis Syris, p. 269 sq., Leipsic, 1668. 28 Turner, Samoa, p. 17 sq. ae Histo, B00):

80 Turner, Samoa, p. 31 sq. Sh vale eh, sath iy HG.

32-7. L. Mitchell, Three Expeditions into the Interior of Eastern Australia, li, p. 341.

Totem helps clansman,

Totem ‘omens.

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The relation between a man and his totem is one of mutual help and protection. Ifthe man respects and cares

for the totem, he expects that the totem will do the same ®

y him. In Senegambia the totems, when they are dangerous animals, will not hurt their clansmen; e¢.g., men of the Scorpion clan affirm that scorpions (of a very deadly kind) will run over their bodies without biting them.) A Snake clan (Ophiogenes) in Asia Minor, believing that they were descended from snakes, and that snakes were their kinsmen, submitted to a practical test the claims of any man amongst them whom they suspected of being no true clansman. They made a snake bite him; if he survived, he was a true clansman ; if he died, he was not.” The Psylli, a Snake clan in Africa, had a similar test of kinship ; they exposed their new-born children to snakes, and if the snakes left them unharmed or only bit without killing them, the children were legitimate ; otherwise they were bastards.2 In Senegambia, at the present day, a python is expected to visit every child of the Python clan within eight days after birth.*

Other totem clans regard a man who has been bitten by the totem, even though he survives, as disowned by the totem, and therefore they expel him from the clan. Among the Crocodile clan of the Bechuanas, if a man has been bitten by a crocodile, or merely had water splashed over him by a crocodile’s tail, he is expelled the clan.°

But it is not enough that the totem should merely abstain from injuring, he must positively benefit the men who put their faith in him. The Snake clan (Ophiogenes) of Asia Minor believed that if they were bitten by an adder they had only to put a snake to the wound and their totem would suck out the poison and soothe away the inflammation and the pain.© Hence Omaha medicine- men, in curing the sick, imitate the action and voice of their (individual) totem.’ Members of the Serpent clan in Senegambia profess to

heal by their touch persons who have been bitten by serpents. A similar profession was made in antiquity by Snake clans in Africa, Cyprus, and Italy.®

Again, the totem gives his clansmen important informa- tion by means of omens. Jn the Coast Murring tribe of New South Wales each man's totem warned him of com- ing danger; if his totem was a kangaroo, a kangaroo would warn him against his foes.19 The Samoan totems gave omens to their clansmen. Thus, if an owl flew before the Owl clan, as they marched to war, it was a signal to go on; but if it flew across their path, or back- wards, it was a sign to retreat.11 Some kept a tame owl on purpose to give omens in war.!?

When the conduct of the totem is not all that his clansmen could desire, they have various ways of putting pressure on him.

Thus, in harvest time, when the birds eat the corn, the Sinall Bird clan of the Omahas take some corn which they chew and spit over the field. This is thought to keep the birds from the crops.¥ If worms infest the corn the Reptile elan of the Omahas eatch some of them and pound them up with some grains of corn which have been heated. They make asoup of the mixture and eat it, believing that the corn will not be infested again, atleast forthat year.4 During a fog the men of the Turtle subclan of the Omahas used to draw

1 Revue d' Ethnographie, iii. p. 396.

2 Varro in Priscian, x. 32, vol. i. p. 524, ed. Keil. For the snake descent of the clan, see Strabo, xiii. 1, 14; Allian, V. A., xii. 39.

3 Varro, loc. cit.; Pliny, NV. H., vii. § 14. Pliny has got it wrong end on. He says that if the snakes did not leave the children they were bastards. We may safely correct his statement by Varro's.

4 Revue d' Ethnographte, iii. p. 397.

5 Livingstone, South Africa, p. 255.. 8 Strabo, xiii. 1, 14.

7 James, Expedition to the Rocky Mountains, i. p. 247,

8 Revue d’ Ethnographie, iii. p. 396.

9 Pliny, V. H., xxviii. 30. ih, Zila She Satins WDB 0}, Sia AHO.

11 Turner, Samoa, 21, 24, 60. LEE Hite, BB) BER.

18 Third Report, p. 288 sg. The idea perhaps is that the birds eat in the persons of their clansmen, and give tangible evidence that they have eaten their fill. 14 Third Rep., 248.

the figure of a turtle on the ground with its face to the south. On the head, tail, middle of the back, and on each leg were placed small pieces of a red breech-cloth with some tobacco. This was thought to make the fog disappear. ®

In order, apparently, to put himself more fully under Man

the protection of the totem, the clansman is in the habit 2ssimi- ates

of assimilating himself to the totem by dressing in the skin

himself

or other part of the totem animal, arranging his hair and to totem.

mutilating his body so as to resemble the totem, and repre- senting it on his body by cicatrices, tattooing, or paint.

Among the Thlinkets on solemn occasions, such as dances, memorial festivals, and burials, individuals often appear disguised in the full form of their totem animals ; and, as a rule, each clans- man carries at least an easily recognizable part of his totem with him.!® Amongst the Omahas, the smaller boys of the Black Shoulder (Buffalo) clan wear two locks of hair in imitation of horns.’ The Small Bird clan of the Omahas ‘leave a little hair in front, over the forehead, for a bill, and some at the back of the head, for the

bird’s tail, with much over each ear for the wings.” 18 The Turtle subclan of the Omahas ‘‘ cut off all the hair from a boy’s head, except six locks ; two are left on each side, one over the forehead, and one hanging down the back in imitation of the legs, head, and tail of a turtle.” 1% The practice of knocking out the upper front teeth at puberty, which prevails in Australia and elsewhere, is, or was once, probably an imitation of the totem. The Batoka in Africa who adopt this practice say that they do so in order to be like oxen, while those who retain their teeth are like zebras. °°

The Haidas of Queen Charlotte Islands are universally tattooed, the design being in all cases the totem, executed in a conventional style. When several families of different totems live together in the same large house, a Haida chief will have all their totems tattooed on his person.*! Tribes in South America are especially distinguished by their tattoo marks, but whether these are totem marks is not said.2? The Australians do not tattoo but raise cicatriees ; in some tribes these cicatrices are arranged in patterns which serve as the tribal badges, consisting of lines, dots, circles, semicircles, &e.23 According to one authority, these Australian tribal badges are sometimes representations of the totem.*4

Again, the totem is sometimes painted on the person of the elans- man. This, as we lave seen (p. 468), is sometimes done by the Indians of British Columbia. Among the Hurons (Wyandots) each clan has a distinctive mode of painting the face; and, at least in the case of the chiefs at installation, this painting represents the totem.*° Ainong the Moquis the representatives of the clans at foot-races, dances, &c., have each a eonventional representation of his totem blazoned on breast or back.*6

The clansman also affixes his totem mark as a signature to treaties and other documents,’ and paints or carves it on his weapons, hut, canoe, &c.

The identification of a man with his totem appears further to have been the object of various ceremonies observed at birth, marriage, death, and on other occasions.

Tattoo-

ing.

Birth Ceremonies.—On the fifth day after birth a child Birth of the Deer-Head clan of the Omahas is painted with red Ste:

onies.

spots on its back, in imitation of a fawn, and red stripes are painted on the child's arms and chest. All the Deer- Head men present at the ceremony make red spots on their chests.22 When a South Slavonian woman has given birth to a child, an old woman runs out of the house and calls out, " A she-wolf has littered a he-wolf," and the child is drawn through a wolfskin, as if to simulate actual birth from a wolf. Further, a piece of the eye and heart of a

15 Third Report, 240.

16 Holmberg in Acta Soc. Scient. Fennicx, iv. 293 sqg., 328; Petroff, Report on Population, Industries, and Resources of Alaska, p. 166.

W Third Rep., 229. SDI 230% 19 Toid., 240.

20 Livingstone, South Africa, p. 532.

21 Geolog. Surv. of Canada, Rep. for 1878-79, pp. 108B, 1358; Smithsonian Contrib. to Knowl., vol. xxi. No. 267, p. 3 sq.; Nature, 20th Jannary 1887, p. 285; Mourth Annual Report of the Bureau of Ethnology, Washington, 1886, p. 67 sq.

22 Martius, Zur Ethnographie America's, zumal Brasiliens, p. 55.

23 Brough Smyth, Aborigines of Victoria, i. p. xli. sq., 295, ii. 313; Eyre, Jour., ii. 888, 335; Ridley, Kamilaroi, p. 140 ; Jour. and Proc. R. Soc. N. S. Wales, 1882, p. 201.

24 Mr Chatfield, in Fison and Howitt, Kamilaroi and Kurnai, p. 66 n, On tattooing in connexion with totemism, see Haberlandt in Mittheil. der anthrop. Gesell. in Wien, xv. (1885) p. [53] sq.

25 First Rep., pp. 62, 64. 26 Bourke, Snake Dance, p. 229.

27 Heckewelder, Indian Nations, p. 247.

°3 Third Rep., p. 245 sq.

Marriage cere- monies.

Death cere- monies.

Cere- moniesat puberty.

wolf are sewed into the child's shirt, or hung round its neck ; and, if several children of the family have died before, it is called Wolf. The reason assigned for some of these customs is that the witches who devour children will not attack a wolf.) In other words, the human child is disguised as a wolf to cheat its supernatural foes. The same desire for protection against supernatural danger may be the motive of similar totemic customs, if not of totemism in general.

Marriage Ceremonies.—Among the Kalang of Java, whose totem is the red dog, bride and bridegroom before marriage are rubbed with the ashes of a red dog's bones." Among the Transylvanian Gipsies, bride and bridegroom are rubbed with a weasel skin.? The sacred goatskin (zgis) which the priestess of Athene took to newly married women may have been used for this purpose.* At Rome bride and bridegroom sat down on the skin of the sheep which had been sacrificed on the occasion.° An Italian bride smeared the doorposts of her new home with wolf's fat.6 It is difficult to separate from totemism the custom observed by totem clans in Bengal of marrying, the bride and bridegroom to trees before they are married to each other. The bride touches with red lead (a common marriage ceremony) a mahwé tree,

clasps it in her arms, and is tied to it. The bridegroom goes through a like cereniony with a mango tree.’

Death Ceremonies.—In death, too, the clansman seeks to become one with his totem. Amongst some totem clans it is an article of faith that, as the clan sprang from the totem, so each clansman at death reassumes the totem form. Thus the Moquis, believing that the ancestors of the clans were respectively rattlesnakes, deer, bears, sand, water, tobacco, &c., think that at death each man, accord- ing to his clan, is changed into a rattlesnake, a deer, d&c.® Amongst the Black Shoulder (Buffalo) clan of the Omahas a dying clansman was wrapped in a buffalo robe with the hair out, his face was painted with the clan mark, and his friends addressed him thus: “ You are going to the animals (the buffaloes). You are going to rejoin your ancestors. You are going, or your four souls are going, to the four winds. Be strong.” ®

Ceremonies at Puberty.—The attainment of puberty is celebrated by savages with ceremonies some of which seem to be directly connected with totemism. The Australian rites of initiation at puberty include the raising of these scars on the persons of the clansmen and clanswomen which serve as tribal badges or actually depict the totem. They also include those mutilations of the person by knocking out teeth, &c., which we have seen reason to suppose are meant to assimilate the man to his totem.

At one stage of these Australian rites a number of men appear on the scene howling and running on all fours in imitation of the dingo or native Australian dog; at last the leader jumps up, clasps his hands, and shouts the totem uame ‘‘wild dog.”!” The Coast Murring tribe in New South Wales had an initiatory cere- mony at which the totem name ‘‘ brown snake” was shouted, and a medicine-man produced a live brown snake out of his mouth.!! As the fundamental rules of totem societies are rules regulating social intercourse, perhaps these pantomimes were intended to

supply the youths with a symbolic language by means of which they might communicate with persons speaking different languages,

1 Krauss, Sitte und Brauch der Stidslaven, p. 541 sq.

Rattles, List. of Java, i, 328. On rubbing with ashes as a religious ceremony, ef Spencer, De Legibus Hebreorum Ritualibus, vol. ii. diss. iii. lib, iii, cap. 1.

3 Original-Mittheil. aus der ethnolog. Abtheil. der kinigl. Museen zu Berlin, i. p. 156. 4 Suidas, s.v. avis.

> Servius on Virgil, d2n., iv. 374; Festus, s.v. In pelle.

8 Pliny, Wat. Wist., xxviii. 142.

7 Dalton, Hthn. of Bengal, 194 (Mundas), 319 (Kurmis). Among the Mundas, both bride and bridegroom are sometimes married to mango trees. For Kurmi totems, see As. Quart. Rev., July 1886, p. 77.

8 Schooleraft, Ind. Tr., iv. 86. 9 Third Rep., p. 229.

wh Fil HAS oan 250 1 Tbid., xvi. p. 43.

fo Tt Wiss

and thus ascertain whether they belonged to clans with which marriage was allowed. ‘The totem clans of the Bechuanas have each its special dance or pantomime, and when they wish to ascertain a stranger’s clan they ask him, “ What do you dance?” #2 We find elsewhere that dancing has been used as a means of sexual selection.

But in some cases these dances seem to be purely re- ligious. At their initiatory rites the Yuin tribe in New South Wales mould figures of the totems in earth and dance before them, and a medicine-man brings up out of his inside the “magic” appropriate to the totem before which he stands: before the figure of the porcupine he brings up a stuff like chalk, before the kangaroo a stuff like glass, &e.18

Again, it is at initiation that the youth is solemnly forbidden to eat of certain foods; but, as the list of foods prohibited to youths at puberty both in Australia and America extends far beyond the simple totem, it would seem

that we are here in contact with those unknown general ideas of the savage, whereof totemism is only a special product.

Thus the Narrinyeri youth at initiation are forbidden to eat twenty different kinds of game, besides any food belonging to women. If they eat of these forbidden foods it is thought they will grow ugly.“ In the Mycoolon tribe, near the Gulf of Carpentaria, the youth at initiation is forbidden to eat of eagle- hawk and its young, native companion and its young, some snakes, turtles, ant-eaters, and emu eggs. The Kurnai youth is not allowed to eat the female of any animal, nor the emu, nor the poreupine. He becomes free by having the fat of the animal smeared on his face.4® On the other hand, it is said that ‘‘initiation confers many privileges on the youths, as they are now allowed to eat many articles of food which were previously forbidden to them.” Thus in New South Wales before initiation a boy may eat only the females of the animals which he catches ; but after initiation (which, however, may not be complete for several years) he may eat whatever he finds. In North America the Creek youths at puberty were forbidden for twelve months to eat of young bucks, turkey-cocks, fowls, pease, and salt.

These ceremonies seem also to be meant to admit the Adinis- youth into the life of the clan, and hence of the totem. sion to

The latter appears to be the meaning of a Carib ceremony, in which the father of the youth took a live bird of prey, of a particular species, and beat his son with it till the bird was dead and its head crushed, thus transferring the life and spirit of the martial bird to the future warrior. Further, he scarified his son all over, rubbed the juices of the bird into the wounds, and gave him the bird’s heart to eat.2° Amongst some Australian tribes the youth at initia- tion is smeared with blood drawn from the arms either of aged men or of all the men present, and he even receives the blood to drink. Amongst some tribes on the Darling this tribal blood is his only food for two days. Among some tribes the youths at initiation sleep on the graves of their ancestors, in order to absorb their virtues.”! It is, however, a very notable fact that the initiation of an Australian youth is said to be conducted, not by men of the same totem, but by men of that portion of the tribe into which he may marry.?2 In some of the Victorian tribes no person related to the youth by blood can interfere or assist in his initiation.2?

Whether this is true of all tribes and of all the rites at initiation does not appear.

Connected with totemism is also the Australian cere- Resurree:

ife of

clan,

mony at initiation of pretending to recall a dead man to tio.

life by the utterance of his totem name. An old man lies

12 Livingstone, South Africa, p. 13; J. Mackenzie, Zen Years worth of the Orange River, p. 391, cf. p. 185n.; 1. A. LZ, xvi. 83.

18 Jour. and Proc. R. Soc. N. S. Wales, 1882, p. 206.

MU Nat. Tribes of S. Austral., p. 17. IG ale day Zcbbe jon Le

16 7bid., XivespeeilG. W Tbid., 360.

18 Jour. and Proc, R. Soc. N. S. Wales, 1882, pp. 208.

19 Gatschet, Migration Legend of the Creck Indians, i. p. 185.

20 Rochefort, Hist. nat. et mor. des les Antilles (Rotterdam, 1666), p. 556; Du Tertre, Wistotre générale des Antilles, vol. ii. p. 377.

21 Jour. and Proc. R. Soc. NV. S. Wales, 1882, p. 172:

22 Howitt in J. A. 1, xiii. 458.

*3 Dawson, Australian Aborigines, p. 80.

_ New birth.

Piacular sacrifice of totem,

down in a grave and is covered up lightly with earth ; but at the mention of his totem naine he starts up to life. Sometimes it is believed that the youth himself is killed by a being called Thuremlui, who cuts him up, restores him to life, and knocks out a tooth.2 Here the idea seems to be that of a second birth, or the beginning of a new life for the novice ; hence he receives a uew name at the time when he is circumcised, or the tooth knocked out, or the blood of the kin poured on him. Amongst the Indians of Virginia and the Quojas in Africa, the youths after initiation pretended to forget the whole of their former lives (parents, language, customs, &c.), and had to learn everything over again like new-born babes. A Wolf clan in Texas used to dress up in wolf skins and rnn about on all fours, howling and mimicking wolves; at last they scratched up a living clansman, who had been buried on purpose, and, putting a bow and arrows in his hands, bade him do as the wolves do—rob, kill, and murder.' This may have been an initiatory ceremony, revealing to the novice in pantomime the double origin of the clan—from wolves and from the ground. For it isa common belief with totem clans that they issued originally from the ground.

Connected with this mimic death and revival of a clans- man appear to be the real death and supposed revival of the totem itself. We have seen that some Californian Indians killed the buzzard, and then buried and mourned over it likea clansman. But it was believed that, as often as the bird was killed, it was made alive again. Much the same idea appears in a Zuni ceremony described by an eyewitness, Mr Cushing. He tells howa procession of fifty men set off for the spirit-land, or (as the Zunis call it) "'the home of our others," and returned after four days, each man bearing a basket full of living, squirming turtles. One turtle was brought to the house where Mr Cushing was staying, and it was welcomed with divine honours. It was addressed as, "Ah! my poor dear lost child or parent, my sister or brother to have been! Who knows which? May be my own great great grandfather or mother?" Nevertheless, next day it was killed and its flesh and bones deposited in the river, that it might "return once more to eternal life among its comrades in the dark waters of the lake of the dead." The

idea that the turtle was dead was repudiated with passionate sorrow ; it had only, they said, "'changed houses and gone to live for ever in the home of 'our lost others.'"® The mean- ing of sucli ceremonies is not clear. Perhaps, as has been suggested,' they are piacular sacrifices, in which the god dies for his people. This is borne out by the curses with which the Egyptians loaded the head of the slain bull.®

Sex Totems.—In Australia (but, so far as is known at present, nowhere else) each of the sexes has, at least in some tribes, its special sacred animal, whose name each individual of the sex bears, regarding the animal as his or her brother or sister respectively, not killing it nor suffer- ing the opposite sex to kill it. These sacred animals therefore answer strictly to the definition of totems.

Thus amongst the Kurnai all the men were called Yeerung (Emu-Wren) and all the women Djeetgun (Superb Warbler). The birds called Yeerung were the 'brothers' of the men, and the birds called Djcetgun were the women's "'sisters." If the men killed an emu-wren they were attacked by the women, if the

women killed a superb warbler they were assailed by the men. Yeerung and Djectgun were the mythical ancestors of the Kurnai.®

UWpeAe Ja, Sill 405 7s0- 2 Ib., xiv. 358.

3 Angas, i. 115; Brough Smyth, i. 75n; J. A. F., xiv. 357, 359; Nat. Tr. of S. Austr., pp. 232, 269.

4 R. Beverley, Wistory of Virginia (London, 1722), p. 177 s@.; Dapper, Description de V Afrique, p. 268.

5 Schoolcraft, Ind. Tr., v. 683.

6 Mr Cushing in Century Magazine, May 1883.

7 See Sacriricg, vol. xxi. p. 137.

8 Herod., ii. 39. 9 Fison and Howitt, 194, 201 sg., 215, 235.

The Kulin tribe in Victoria, in addition to sixteen clan totems, has two pairs of sex totems: one pair (the emu-wren and superb warbler) is identical with the Kurnai pair; the other pair is the bat (male totem) and the small night jar (female totem). The latter pair extends to the extreme north-western confines of Vic- toria as the “man’s brother” and the ‘‘woman’s sister.”!° The Ta-ta-thi group of tribes in New South Wales, in addition to regu- lar clan totems, has a pair of sex totems, the bat for men and a small owl for women; men and women address each other as Owls and Bats; and there is a fightif a woman kills a bat or a man kills asmallowl.!! Of some Victorian tribes it is said that “ the common bat belongs to the men, who protect it against injury, even to the half killing of their wives for its sake. The fern owl, or large goat- sucker, belongs to the women, and, although a bird of evil omen, creating terror at night by its cry, it is jealously protected by them. If a man kills one, they are as much enraged as if it was one of their children, and will strike him with their long poles.”

The sex totem seems to be still more sacred than the clan totem ; for men who do not object to other people killing their clan totem will fiercely defend their sex totem against any attempt of the opposite sex to injure it.!8

Individual Totems.—It is not only the clans and the sexes that have totems; individuals also have their own special totems, 7.¢., classes of objects (generally species of animals), which they regard as related to themselves by those ties of mutual respect and protection which are characteristic of totemism. ‘This relationship, however, in the case of the individual totem, begins and ends with the individual man, and is not, like the clan totem, transmitted by inheritance. The evidence for the existence of indi- vidual totems in Australia, though conclusive, is very scanty. In North America it is abundant.

In Australia we hear of a medicine-man whose clan totem through his mother was kangaroo, but whose ‘‘secret”’ (i.e. individual) totem was the tiger-snake. Snakes of that species, therefore, would not hurt him. An Australian seems usually to get his individual totem by dreaming that he has been transformed into an animal of the specics. Thus a man dreamcd three times he was a kangaroo; hence he became one of the kangaroo

kindred, and might not eat any part of a kangaroo on which there was blood; he might not even carry home one on which there was blood. He might eat cooked kangaroo; but, if he were to eat the meat with the blood on it, the spirits would no longer take him up aloft.

In America the individual totem is usually the first animal of which a youth dreams during the long and generally solitary fasts which American Indians observe at puberty. He kills the animal or bird of which he dreams, and henceforward wears its skin or feathers, or some part of them, as an amulet, especially on the war-path and in hunting.4® A man may even (though this scems exceptional) acquire several totems in this way; thus an Ottawa medicine-man had for his individual totems the tortoisc, swan, woodpecker, and crow, because he had dreamed of them all in his fast at puberty. The respect paid to the individual totem varies in different tribes. Among the Slave, Hare, and Dogrib Indians a man may not eat, skin, nor if possible kill his individual totem, which in these tribes is said to be always a carnivorous animal. Each man carries with him a picture of his totem (bought of a trader); when he is unsuccessful in the chase, he pulls out the picture, smokes to it, and makes it a speech.”

The Indians of Canada changed their okki or manitoo (indivi- dual totem) if they had reason to be dissatisfied with it; their women had also their okkis or manitoos, but did not pay so much heed to them as did the men. They tattooed theirindividual totems on their persons. Amongst the’Indians of San Juan Capistrano, a figure of the individual totem, which was acquired as usual by fasting, was moulded in a paste made of crushed herbs on the right arm of the novice. Fire was then set to it, and thus the figure of the totem was burned into the flesh.!® Sometimes the individual totem is not acquired by the individual himself at puberty, but is

WI, Ale Thy, Foi J CGS GA Sahl Tw, OY.

ll Jbid., xiv. 350. 22 Dawson, Australian Aborigines, p. 52.

Wh ilo thy Sabi FO Si50) LEN HGHihn, Seals, Te, 0), Tbid., 45.

16 Catlin, V. Amer. Indians, i. p. 36 sq.; Schoolcraft, Ind. Tr., v. p. 196; Id., Amer. Ind., p. 213; Sproat, Scenes and Studies of Savage Life, p. 178 sg.;

Bancroft, i. 283 sq.; Id., iti. 156; Mayne, Brit. Columb., p. 302; P. Jones, Hist. Ojebway Ind., p. 87 sq., &e.

W Annual Report of the Smithsonian Institution for 1866, p. 307.

18 Charlevoix, Hist. de la Nouv. Fr., vi. 67 sq. The word okki is Huron; manitoo is Algonkin (ibid.; Sagard, Le grand Voyage du pays des IIurons, p. 231).

19 Boscana in A. Robinson's Life in California, pp. 270 sq., 273; Bancroft, i. 414, iii, 167 sg.

Indi- vidual totems.

Blood feud.

Exo- gamy.

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fixed for him independently of his will at birth. Thus among the tribes of the isthmus of Tehuantepec, when a woman was about to be confined, the relations assembled in the hut and drew on the floor figures of different animals, rubbing each one out as soon as it was finished. This went on till the child was born, and the figure that then remained sketched on the ground was the child's ¢ona or totem. When he grew older the child procured his totem animal and took care of it, believing that his life was bound up with the animal's, and that when it died he too must die Similarly in Samoa, at child-birth the help of several '' gods" was invoked in succession, and the one who happened to be addressed at the moment of the birth was the infant's totem. These " gods" were dogs, eels, sharks, lizards, &c. A Samoan had no objection to cat another man's "god"; but to eat his own would have been death or injury to him.2. Sometimes the okkis or mauitoos acquired by dreams are not totems but fetiches, being not classes of objects but individual objects, such as a particular tree, rock, knife, pipe, &c.®

Besides the clan totem, sex totem, and individual totem, there are (as has been indicated) some other kinds or varieties of totems; but the consideration of them had better be deferred till after the consideration of the social organization based on totemism.

Social Aspect of Totemism, or the relation of the men of w totem to each other and to men of other totems.—(1) All the members of a totem clan regard each other as kins- men or brothers and sisters, and are bound to help and protect each other. The totem bond is stronger than the bond of blood or family in the modern sense. This is ex- pressly stated of the clans of western Australia and of north-western America,‘ and is probably true of all societies where totemism existsin full force. Hence in totem tribes every local group, being necessarily composed (owing to exogamy) of members of at least two totem clans, is liable to be dissolved at any moment into its totem elements by the outbreak of a blood feud, in which husband and wife must always (if the feud is between their clans) be arrayed on opposite sides, and in which the children will be arrayed against either their father or their mother, according as de- scent is traced through the mother or through the father.° In blood feud the whole clan of the aggressor is responsible for his deed, and the whole clan of the aggrieved is entitled to satisfaction.6 Nowhere perhaps is this solidarity carried farther than among the Goajiros in Colombia, South Ame- rica. The Goajiros are divided into some twenty to thirty totem clans, with descent in the female line; and amongst them, if a man happens to cut himself with his own knife, to fall off his horse, or to injure himself in any way, his family on the mother’s side immediately demand payment as blood-money from him. “ Being of their blood, he is not allowed to spill it without paying for it.” His father’s family also demands compensation, but not so much.’

(2) Exogamy.—Persons of the same totem may not marry or have sexual intercourse with each other. The Navajos believe that if they married within the clan “their bones would dry up and they would die.”* But the penalty for infringing this fundamental law is not merely natural; the clan steps in and punishes the offenders. In Australia the regular penalty for sexual intercourse with a person of a forbidden clan is death.

It matters not whether the woman be of the same local group or has been captured in war from another tribe ; a man of the wrong

1 Bancroft, i. 661. 2 Tumer, Samoa, 17.

3 Lafitau, Murs des Sauvages Ameriquains, i. 370 sq.; Charlevoix, Hist. dela Nouv. Fr., vi. 68; Kohl, Kitcht Gami, i. 85 sq.

4 Grey, Jour., ii. 231; Report of the Smithsonian Inst. for 1866, p. 315; Petroff, Rep. on Alaska, p. 165. Other authorities speak to the superiority of the totem bond over the tribal bond (Morgan, League of the Iroquois, p. 82; Mayne, Brit. Columb., p. 257; American Antiquarian, ii. p. 109).

5 Grey, Journals, ii. 280, 288 sq.; Smithsonian Rep., loc. cit.

6 Fison and Howitt, 156 sq., 216 sg. Sometimes the two clans meet and settle it by single combat between picked champions (Jour. and Proc. R. Soc. N. S. Wales, 1882, p. 226).

7 Simons in Proc. R. Geogr. Soc., Dec. 1885, p. 789 sg.

8 Bourke, Snake Dance of the Moquis of Arizona, p. 279.

clan who uses her as his wife is hunted down and killed by his clansmen, and go is the woman; though in some cases, if they suc- ceed in eluding capture for a certain time, the offence may be con- doned. In the Ta-ta-thi tribe, New South Wales, in the rare eases which occur, the man is killed but the woman is ouly beaten or speared, or both, till she is nearly dead; the reason given for not actually killing her being that she was probably coerced. Even in casual amours the clan prohibitions are strictly observed ; any violations of these prohibitions ‘‘are regarded with the utmost abhorrence and are punished by death.”® An important exccption to these rules, if it is correctly reported, is that of the Port Lincoln tribe, which is divided into two clans, Mattiri and Karraru, and it is said that though persons of the same clan never marry, yet “they do not seem to consider less virtuous connexions between parties of the same class [clan] incestuous.”

Again, of the tribes on the lower Murray, lower Darling, &c., it is said that though the slight- est blood relationship is with them a bar to marriage, yet in their sexual intercourse they are perfectly free, and incest of every grade continually occurs,!!

In America the Algonkins consider it highly criminal for a man to marry a woman of the same totem as himself, and they tell of cases where men, for breaking this rule, have been put to death by their nearest relations.”

In some tribes the marriage prohibition only extends to Phratries,

a man’s own totem clan; he may marry a woman of any totem but his own. ‘This is the case with the Haidas of the Queen Charlotte Islands,!° and, so far as appears, the Narrinyeri in South Australia,1# and the western Aus- tralian tribes described by Sir George Grey. Oftener, however, the prohibition includes several clans, in none of which is a man allowed to marry. For such an exogamous group of clans within the tribe it is convenient to have a name ; we shall therefore call it a phratry (L. H. Morgan), defining it as an exogamous division intermediate between the tribe and the clan. The evidence goes to show that in many cases it was originally a totem clan which has undergone subdivision.

The Choctaws, for example, were divided into two phratries, American each of which included four clans; marriage was prohibited be- phratries.

tween members of the same phratry, but members of either phratry could marry into any clan of the other.1® The Seneca tribe of the Iroquois was divided into two phratries, each including four clans,—the Bear, Wolf, Beaver, and Turtle clans forming one phratry, and the Deer, Snipe, Heron, and Hawk clans forming the other, Originally, as among the Choctaws, marriage was prohibited within the phratry but was permitted with any of the clans of the other phratry; the prohibition, however, has now broken down, and a Seneca may marry a woman of any clan but his own. Hence phratries, in our sense, no longer exist among the Senecas, though the organization survives for certain religious and social purposes. Bf

The phratries of the Thlinkets and the Mohegans deserve especial attention, because each phratry bears a name which is also the name of one of

theclans included in it. The Thlinkets are divided as follows :—Raveu phratry, with clans Raven, Frog, Goose, Sea- Lion, Owl, Salmon ; Wolf phratry, with clans Wolf, Bear, Eagle, Whale, Shark, Auk. Members of the Raven phratry must marry members of the Wolf phratry, and vice versa.‘® Considering the prominent parts played in Thlinket mythology by the ancestors of the two phratries, and considering that the names of the phratries are also names of clans, it seems probable that the Raven and Wolf were the two original clans of the Thlinkets, which afterwards by subdivision became phratries. This was the opinion of the Russian missionary Veniaminoff, the best carly authority on the tribe.29 Still more clearly do the Mohcgan phratries appear to have been formed by subdivision from clans. They are as follows a —Wolf phratry, with clans Wolf, Bear, Dog, Opossum; Turtle

9 Howitt in Rep. of Smithsonian Inst. for 1883, p. 804; Fison and Howitt, pp. 64-67, 289, 344 sq.; J. A. 1., xiv. p. 351 sq.

10 Nat. Tr. of S. Australia, p. 222.

11 Jour. and Proc. R. Soc. N. S. Wales, 1883, p. 24; Transactions of the Royal Society of Victoria, vi. p. 16.

12 James in Tanner’s Narr., p. 313.

13 Geol. Sur. of Canada, Rep. for 1878-79, p. 1348.

14 Nat. Tr. of S. Austr., p. 12; J. A. L, xii. p. 46.

15 Grey, Jour., ii. p. 226.

16 Archxologia Americana, Trans. and Collect. Americ. Antig. Soc., vol.‘ii. p. 109; Morgan, A. S., pp. 99, 162.

W Morgan, op. cit., pp. 90, 94 sq.

18 A, Krause, Die Tlinkit-Indianer, 112, 220; Holmberg, op. cit., 293, 318; Pinart in Bull. Soc. Anthrop. Paris, 7th Nov. 1872, p. 792 sq.; Petroff, Rep. on Alaska, p. 165 sq.

19 Petroff, op. cit., p. 166. 20 Morgan, p. 174.

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phratry, with clans Little Turtle, Mud Turtle, Great Turtle, Yellow Eel; Turkey phratry, with clans Turkey, Crane, Chicken. Here we are almost forced to conclude that the Turtle phratry was origin- ally a Turtle clan which subdivided into a number of clans, each of which took the name of a particular kind of turtle, while the Yellow Eel clan may have been a later subdivision. Thus we get a probable explanation of the origin of split totems; they seem to have arisen by the segmentation of a single original clan, which had a whole animal for its totem, into a number of clans, each of which took the name either of a part of the original animal or ofa subspecies of it. We may conjecture that this was the origin of the Grey Wolf and Yellow Wolf and Great Turtle and Little Turtle

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In such tribes the freedom of marriage is still more curtailed. A subphratry is not free to marry into either subphratry of the other phratry ; each subphratry is restricted in its choice of partners to one subphratry of the other phratry; Muri can only marry Kumbo, and vice versa; Kubi can only marry Ipai, and vice versa. Hence (supposing the tribe to be equally distributed between the phratries and subphratries), whereas under the two phratry and clan system a man is free to choose a wife from half the women of the tribe, under the phratry, subphratry, and clan system he is restricted in his choice to one quarter of the women.

A remarkable feature of the Australian social organiza- Equiva-

tion is that divisions of one tribe have their recognized lence equivalents in other tribes, whose languages, including the pa ea names for the tribal divisions, are quite different.

clans of the Tuscarora-Iroquois;! the Black Eagle and White Eagle and the Deer and Deer-Tail clans of the Kaws ;? and of the Highland Turtle (striped), Highland Turtle (black), Mud Turtle, and Smooth Large Turtle clans of the Wyandots (Hurons).? Warren actually

states that the numerous Bear clan of the Ojibways was formerly subdivided into subclans, cach of which took for its totem some part of the Bear's body (head, foot, ribs, &e.), but that these have now merged into two, the Common Bear and the Grizzly Bear.' The subdivision of the Turtle (Tortoise) clan, which on this hypo- thesis has taken place among the Tuscarora-Iroquois, is nascent among the Onondaga-Iroquois, for among them ''the name of this clan is Hahnowa, which is the general word for tortoise; but the clan is divided into two septs or subdivisions, the Hanyatengona, or Great Tortoise, and the Nikahnowaksa, or Little Tortoise, which together are held to constitute but one clan." ®

On the other hand, fusion of clans is known to have taken place, as among the Haidas, where the Black Bear and Fin-Whale clans have united ;° and the same thing has

happened to some extent among the Omahas and Osages.'

that "he was furnished with temporary wives by the various tribes with whom he sojourned in his travels; that his right to these women was recognized as a matter of course; and that he could always ascertain whether they belonged to the division into which he could legally marry, 'though the places were 1000 miles apart, and the lan- guages quite different.'"11 Again, it is said that "in cases of distant tribes it can be shown that the class divisions correspond with each other, as for instance in the classes of the Flinders river and Mitchell river tribes; and these tribes are separated by 400 miles of country, and by many intervening tribes. But, for all that, class corresponds to class in fact and in meaning and in privileges, although

Aus- In Australia the phratries are still more important than | 41. name may be quite different and the totems of each tralian jin America. Messrs Howitt and Fison, who have done | 4… +1.» io a : ; phratries. dissimilar. Particular information, however, as to the

so much to advance our knowledge of the social system of the Australian aborigines, have given to these exogamous divisions the name of classes; but the term is objection- able, because it fails to convey (1) that these divisions are kinship divisions, and (2) that they are intermediate divisions ; whereas the Greek term phratry conveys both these meanings, and is therefore appropriate.

We have seen examples of Australian tribes in which members of any clan are free to marry members of any clan but their own; but such tribes appear to be excep- tional. Often an Australian tribe is divided into two (exogamous) phratries, each of which includes under it a nuniber of totem clans; and oftener still there are sub- phratries interposed between the phratry and the clans, each phratry including two subphratries, and the sub-phratries including totem clans. We will take examples of the former and simpler organization first.

The Turra tribe in Yorke Peninsula, South Australia, is divided into two phratries, Wiltii (Eaglehawk) and Milta (Seal). The Faglehawk phratry includes ten totem clans (Wombat, Wallaby, Kangaroo, Iguana, Wombat-Snake, Bandicoot, Black Bandicoot, Crow, Rock Wallaby, and Emu); and the Seal phratry includes six (Wild Goose, Butterfish, Mullet, Schnapper, Shark, and Salmon). The phratries are of course exogamous, but (as with the Choctaws, Mohegan, and, so far as appears, all the American phratries) any clan of the one phratry may intermarry with any clan of the other phratry.8 But the typical Australian tribe is divided into two exogamous phratries; each of these phratries is subdivided into two subphratries; and these subphratries are subdivided into an indefinite number of totem clans. The phratries being exogamous, it follows that their subdivisions (the subphratries and clans) are so also. The well-known Kamilaroi tribe in New South Wales will serve as an example. Its subdivisions are as follows : °—

equivalent divisions is very scanty.13 This systematic cor- respondence between the intermarrying divisions of distinct and distant tribes, with the rights which it conveys to the members of these divisions, points to sexual communism on a scale to which there is perhaps no parallel elsewhere, certainly not in North America, where marriage is always within the tribe, though outside the clan.1* But even in Australia a man is always bound to

marry within a certain kinship group; that group may extend across the whole of Australia, but nevertheless it is exactly limited and defined. If endogamy is used in the sense of prohibition to marry outside of a certain kinship group, whether that group be exclusive of, inclusive of, or identical with the man's own group, then marriage among the totem societies of Australia, America, and India is both exogamous and endogamous ; a man is forbidden to marry either within his own clan or outside of a certain kinship group.

(3) Rules of Descent.—In a large majority of the totem Rules of tribes at present known to us in Australia and North descent.

America descent is in the female line; ze. the children belong to the totem clan of their mother, not to that of their father. In Australia the proportion of tribes with female to those with male descent is as four to one; in America it is between three and two to one,

As to the totem tribes of Africa, descent among the Damaras is in the female line,!® and there are traces of female kin among the Bechuanas.!" Among the Bakalai property descends in the male line, but this is not a conclusive proof that descent is so reckoned ; all the clans in the neighbourhood of the Bakalai have female descent both for blood and property.48 In Bengal, where there is a considerable body of totem tribes, Mr Risley says that after careful search he and his coadjutors have found no tribe with female

Phratries. Subphratries. Totem Clans, 0 et ——_ = ————4 descent, and only a single trace of it in one.'? Among the totem Muri.10 (Kangaroo, enee ag de aag aed ilbi. { eee d Iguana, Blac uc aglehawk, Scru jl. we . ¥ Dilb Kubi. Tarker Yellow-Fish, Honey-Fish, Bream, * Fison and Howitt, p. 58 sq.; ¢f Brough Smyth, i. p. 91. , (| Ipai. (| Emu, Carpet-Snake, Black Snake, Red Kan- J. A. J., xii, p. 300. ' : Kupathin. | Kumbo. {| garoo, Honey, Walleroo, Frog, Cod-Fish. 13 For a few particulars see Fison and Howitt, 38, 40; Brough

1 Morgan, op. cit., p. 78. " Morgan, p. 156. 3 First Rep., p. 59. 4 Collections of the Minnesota Historical Society, v. p. 49. 5 H. Hale, The Iroquois Book of Rites, p. 58 sq.

8 Geol. Surv. of Canada, Rep. for 1878-79, p. 1348. 7 Third Rep., p. 235; American Naturalist, xviii. p. 114.

8 Fison and Howitt, p. 285. Melisa deer aly 003

® Corresponding female forms are made by adding tha to these male

names: Muri—Matha (for Muritha), Kubi—Kubitha, &e.

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Smyth, ii. 288; J. A. L., xiii, 804, 306, 346, xiv. 348 sg., 351.

MW First Rep., p. 68. Between North-American tribes “ there were no intermarriages, no social intereourse, no intermingling of any kind, exeept that of mortal strife” (Dodge, Our Wild Indians, p. 45).

1S Of. First Rep., loc. cit.; As. Quart. Rev., July 1886, p, 89 sg.

16 Anderson, Lake Ngami, p. 221.

W Casalis, The Basutos, p. 179 sq.

18 Du Chaillu, Journey to Ashango Land, 429; Id., EHquat. Afr., 308 sq. 19 As, Quart. Rev., July 1886, p. 94.

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tribes of Bengal descent is male.! In Assam the exogamous totem clans of the Kasias have female descent,? as also have the exogamous clans of the Garos, but it does not appear whether their clans are totem clans, though some of their legends point to totemism.?

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to the father’s sister to suckle. It is then spoken of as belonging to the paternal aunt, and is counted to its father’s clan.!° Among the Delawares

descent is regularly in the female line ; but it is possible to transfer a child to

wares In the Australian tribal organization of two phratries, its father’s clan by giving it one of the names which are ami ae ee # aoe a ee aia ee ig fe ape appropriated to the father’s clan. In the Hervey Islands, TUBS GEG NIL TOL 8 tt Laie! eek aerate : South Pacific, the parents settled beforehand whether the hgen ‘oieved. ~ 1b sepme that 1 all tribes thus tie child should belong to the father’s or mother’s clan. The the ciuldren are poe ynte the subphratry nether or ther | father usually had the preference ; but sometimes, when the father nor of their mother, and that descent in such cases | others clan was one which was bound to furnish human is either female or male, according as the subphratry nto | i ctims from its ranks, the mother had it adopted into her which the children are born 1s the ia apa subphratry | clan by having the name of her totem pronounced over it.!? of their mother’s or of their father’s subphratry. a ae In Samoa at the birth of a child the father’s totem was usu- former ease we have whee may be called ae 7 ally prayed to first; but if the birth was tedious, the mother’s descent ; in the latter, indirect male descent. Dut 1 1S | totem was invoked ; and whichever happened to be invoked only in the subphratry that descent is thus indirect. In at the Wioment of birth Pasha chilesmecwe foulae © seas ; , : t :

es poe : ae i e etl maior: ‘. He ee When a North American tribe is on the march, the members of Arrange- \ e clan aed of us pe Ege Oe eS Tae us, IN TAC | each totem clan camp together, and the clans are arranged in a ment of typical Australian organization, descent, whether female | fixed order in camp, the whole tribe being arranged in a great clans on or male, is direct in the phratry, indirect in the sub- | circle or in several concentric circles.4 When the tribe lives in the march,

phratry, and direct in the clan.

To take examples, the following is the scheme of descent, so far as the phratries and subphratries are concerned, in the Kamilaroi:—

Phratries, Male. Marries Children are one Muri. Kumbo. lpai. ea { Kubi. pai. Kumbo . lpai. Kubi. Muri. Kupathin. { Kumbo. Muti. Kubi.

This is an exainple of indirect female descent, because the child- ren belong to the companion subphratry of thcir mother, not to the companion subphratry of their father. But in the totems the female descent is direct ; e.g., if the father is Muri-Kangaroo and

settled villages or towns, each clan has its separate ward. The clans of the Osages are divided into war clans and peace clans; when they are out on the buffalo hunt, they camp on opposite sides of the tribal circle; and the peace clans are not allowed to take animal life of any kind; they must therefore live on vegetables unless they can obtain meat in exchange for vegetables from the war clans.‘6 Members of the same clan are buried together and apart from those of other clans; hence the remains of husband and wife, belonging as they do to separate clans, do not rest together.!”7_ It is remarkable that among the Thlinkets the body must always be carried to the funeral pyre and burned by men of another totem,’® and the presents distributed on these occasions by the representatives of the deceased must always be made to men of a different clan.

&e.

the mother is Kumbo-Emu, the children will be Ipai-Emu; if the | . Here we must revert to the religious side of totemism, i mother is Kumbo-Bandicoot, the children will be Ipai-Bandicoot.4 | 1 order to consider some facts which have emerged from 2” sub: The following is the scheme of descent in the Kiabara tribe:5— | the study of its social aspect. We have seen that some aoe Saas mine ana ames phratries, both in America and Australia, bear the names ; a ee of animals ;° and in the case of the Thlinkets and Mohegans Dilebi. { Baring. Bundah. Turowine, we have seen reason to believe that the animals which Turowine. Bulcoin, Baring. : : : eiieniane § Bulcoin. Tnrowine. Bundah. give their names to the phratries were once clan totems. ; EEE pail ee OES Bulcoin. The same seems to hold of the names of the Australian This is an example of indirect male descent, because the children phratries, Eaglehawk, Crow, and Seal, or at least of Eagle- belong to the companion subphratry of their father, not to the | hawk and Crow, for these are clan totems in other tribes, companion subphratry of their mother. We have no information | and are, besides, important figures in Australian mytho- as to the totems, but on the analogy of indirect female descent we

logy. Indeed, there appears to be direct evidence that both should expect them to be taken from the father. This at any rate Ne ely : desde . saagall we 1 : is true of a large tribe or group of tribes to the south of the Gulf the p ratries cerhaabibais 2 es: sMbomsinig

mother's or his father's clan. Among the Haidas, children regularly belong to the totem clan of their mother; but in very exceptional cases, when the clan of the father is reduced in numbers, the newly-born child may be given

1 As. Quart. Rev., July 1886, p. 94.

2 Dalton, Hthn. of Beng., p. 56 sq.; W. W. Hunter, Statistical Ac- count of Assam, ii. p. 217 sq.

2 Dalton, op. cit., 60, 63; Hunter, op. cit., ii. 154 sq.

- Fison and Howitt, p. 37 sq.; J. A. ZL, xiii. 335, 341, 344.

© Wf A. I., xiii, 336, 341. 6 Joid., xii. 504.

7 Tbid., xii. 500. 8 Letter of Mr S. Gason to the present writer.

he Zila Loy Sas X09):

W Adair, [ist. Amer. Ind., 183 sq.; Morgan, A.S., 83 sg.; Brinton, The Lenape and their Legends, 54; Id., Myths of the New World, 87 n; A. Hodgson, Letters from North America, i. p. 259; Dalton, Eth. of Beng., 56; cf. Robertson Smith, Kinship and Marriage in Early Arabia, 315 sq. 18 Holmberg, op. ctt., 324.

19 Krause, Die Tlinkit-Indianer, 223.

20 As among the Chickasas, Thlinkets, and Mohegans in America, and the Turra, Ngarego, and Theddora tribes in Australia. The sub- phratries of the Kiabara also bear animal names.

21 Fison and Howitt, 38 sq., 40.

22 Wison and Howitt, p. 41. The totems of the phratries and sub- phratries are given by different authorities, who write the native names of the subphratries differently. But they seem to be speaking of the same tribe; at least Mr Fison understands them so.

TO CPE

As the subphratries of this tribe are said to be equivalent to the subphratries of the Kamilaroi, it seems to follow that the subphratries of the Kamilaroi (Muri, Kubi, Ipai,

Mis MM 475

division might have become hot wind carpct-snake had not civilization rudely stopped the proeess by almost extinguishing the tribe.”

Geographical Diffusion of Totemism.—In Australia Diffusion totemism is almost universal.6 In North America it may of totem- be roughly said to prevail, or have prevailed, among all the

and Kumbo) have or once had totems also. Hence it ap- pears that in tribes organized in phratries, subphratries,

Sub- totems.

and clans each man has three totems—his phratry totem, his subphratry totem, and his clan totem. If we add a sex totem and an individual totem, each man in the typical Australian tribe has five distinct kinds of totems. What degree of allegiance he owes to lus subphratry totem and phratry totem respectively we are not told; indeed, the very existence of such totems, as distinct from clan totems, appears to have been generally overlooked. But we may suppose that the totem bond diminishes in strength in proportion to its extension; that therefore the clan totem is the primary tie, of which the subphratry and phratry totems are successively weakened repetitions.

In these totems superposed on totems may perhaps be discerned a rudimentary classification of natural objects under heads which bear a

certain resemblance to genera, species, &c. This classification is by some Australian tribes extended so as to include the whole of nature. Thus the Port Mackay tribe in Queensland (see above) divides all nature between the phratries; the wind belongs to one phratry and the rain to another ; the sun is Wutaru and the moon is Yungaru ; the stars, trees, and plants are also divided between the phratries.! As the totem of Wutaru

is kangaroo and of Yungaru alligator, this is equivalent to

making the sun a kangaroo and the moon an alligator.

The Mount Gambier tribe in South Australia is divided into two phratries (Kumi and Kroki), whieh again are subdivided into totem

tribes east of the Rocky Mountains,' and among all the Indian (but not the Eskimo) tribes on the north-west coast as far south as the United States frontier. On the other hand, highly competent authorities have failed to find it among the tribes of western Washington, north-western Oregon, and California. In Panama it exists apparently among the Guaymies: each tribe, family, and individual has a guardian animal, the most prevalent being a kind of parrot.2 In South America totemism is found among the Goajiros on the borders of Colombia and Venezuela,!? the Arawaks in Guiana,!! the Bosch negroes also in Guiana," and the Patagonians.!* Finding it at such distant points of the continent, we should expect it to be widely prevalent ; but, with our meagre knowledge of the South American Indians, this is merely conjecture. The aborigines of Peru and the Salivas on the Orinoco believed in the descent of their tribes from animals, plants, and natural objects, such as the sun and earth ;!* but this, though a presumption, is not a proof of totemism.

In Africa totemism prevails in Senegambia, among the Bakalai on the equator, on the Gold Coast and in Ashantee, and among the Damaras and Bechuanas in southern Africa. There are traces of totemism elsewhere in Africa. In east- ern Africa the Gallas are divided into two exogamous sec- tions, and have certain forbidden foods.!® In Abyssinia certain districts or families will not eat of certain animals

clans. Everything in nature belongs to a totem elan, thus: ?— or parts of animals.!’ The territory of the Hovas in Mada- Se) I ee gascar is divided and subdivided into districts, the names (| 1. Mila=Fish-Hawk. Smoke, honcysuckle, trees, &c. of the subdivisions referring “rather to clans and divi- 2, Parangal = Pelican. Dogs Packwood trees, fre, frost) | sions of people than to place.” One of these names is “ the Kumi. <| 3, Wa=Crow. Rain, thunder, lightning, winter, | | powerful bird,” 7.¢., either the eagle or the vulture, The 4, Wila= Black Cockatoo. Stars, moon, &c. sane clan is found occupying separate districts.° One 5. Karato=A harmless Snake. fe ish, stringybark trees, seals, | | Madagascar tribe regard a species of lemur as “an embodi- 1, Werio=Tea-Trec, Ducks, wallabies, owls, eray-fish, dc. ment of the spirit of their ancestors, and therefore they feces are Ce Pe ner oo fovich @ small) | look with horror upon killing them.” Other Malagasy 8. Kardal= Black evestioss Cock-| | Kangaroo, seta rest Go| | tribes and families refrain from eating pigs and goats;

With reference to this classifieation Mr D. S. Stewart, the authority for it, says, “I have tried in vain to find some reason for the arrangement. I asked, ‘To what division does a bullock belong?’ After a pause came the answer, ‘It eats grass: it is Boortwerio.’ I then said, ‘A eray-fish does not cat grass; why is it Boortwerio?’ Then eame the standing reason for all puzzling questions: ‘That is what our fathers said it was.’”3 The natural objeets thus classed under and sharing the respect due to the totem may be conveniently called, as Mr Howitt proposes,* subtotems. Again, the Wotjoballuk tribe in north-western Victoria has a system of subtotems, thus :°—

Totem Clans. | Subtotems.

Phratries. |

1, Hot Wind. | Each totem has subordinate to it 2. White crestless Cockatoo.| a number of objects, animal or | 3. Belonging to the Sun. | vegetable, ¢.g., kangaroo, red 4. Deaf Adder. gum-tree, &.

| 5. Black Cockatoo. Do

6, Pelican. 5

Gamutch

Krokitch. ;

- :

Of the subtotems in this tribe Mr Howitt says, “ They appear to me to be totems in a state of development. Hot wind has at least five of them, white eockatoo has seventeen, and so on for the others. That these subtotems are now in process of gaining a sort of inde- pendence nay be shown by the following instance: a man who is Krokitch-Wartwut (hot wiud) claimed to own all the five subtotems of hot wind (three snakes and two birds), yet of these there was one which he specially claimed as ‘belonging’ to him, namely, Moiwuk (carpet-snake). Thus his totem, hot wind, seems to have been in process of subdivision into minor totems, and this man’s

EE ae eee ec ne ies: AS Ae 1 Brough Smyth, i. 91; Fison and Howitt, 168; cf J. A. L, xiii, 300. 2 Fison and Howitt, loc. cit. 4 In Smithson. Rep. for 1883, p. 818.

3 Fison and Howitt, 169. 5 Ibid.

others will not eat certain vegetables nor even allow them to be carried into their houses.19 The only occasion when the Sakalava tribe in Madagascar kill a bull is at the cir- cumcision of a child, who is placed on the bull’s back during the customary invocation.”°

In Bengal, as we have seen, there are numerous totem tribes among the non-Aryan races. In Siberia the Yakuts

6 Perhaps the only known exceptions are the Kurnai in eastern and the Gournditch-mora in western Vietoria. For the latter see Fison and Howitt, p. 275.

7 Gatschet, Migration Legend of the Creek Indians, 153; H. Hale, The Iroquois Book of Rites, p. 51.

8 George Gibbs in Contrib. to N. American Ethnol., i. 184; 8. Powers, Tribes of Calif., 5.

9 A, Pinartin Revue d’ Ethnographie, vi. p. 36.

10 Simons in Proc. R. Geog. Soc., Dec. 1885, pp. 786, 796.

11 Brett, Ind. Tribes of Guiana, 98; Im Thurn, Among the Indians of Guiana, 175 sq.

12 Crevaux, Voyages dans l’ Amérique du Sud, p. 59.

13 Falkner, Descr. of Patagonia, 114.

14 Garcilasso de la Vega, Royal Commentaries of the Incas, pt. i. bk. i. chs. 9, 10, 11, 18; Gumilla, Mist. de l’Orénoque, i. 175 sq.

1 Revue d’ Ethnologie, iii. 396 sg., v. 81; A. B. Hllis, The Tshi- speaking People of the Gold Coast, p. 204 sq.; Bowdich, Mission to Ashantee, ed. 1873, p. 216; Du Chaillu, Hquat. Afr., 308 sq.; Id., Journey to Ashango Land, 427, 429; C. J. Anderson, Lake Ngami, 221 sq.; Livingstone, Travels in S. Africa, 138; Casalis, The Basutos, 211; J. Mackenzie, Ten Years North of the Orange River, 393; Us PARLE xVie GOs].

16 Charles New, Life, Wanderings, &c., in Eastern Africa, 272, 274.

17 Mansfield Parkyns, Life in Abyssinia, 2938; Tr. Ethnol. Soc., new series, vi. 292. 18 Ellis, Hist. of Madagascar, i. 87.

19 Folk-Lore Record, ti, 22, 30. a stiri). Tey, CS).

are divided into totem clans; the clansmen will not kill their totems (the swan, goose, raven, &c.);1 and the clans are exogamous.? The Altaians, also in Siberia, are divided into twenty-four clans, which, though interfused with each other, retain strongly the clan feeling; the clans are exo- gamous ; each has its own patron divinity and religious ceremonies ; and the only two names of clans of these and kindred tribes of which the meanings are given

are names of animals. Totemism exists among the mountaineers of Formosa,* and there are traces of it in China.’ In Polynesia it existed, as we have seen, in Samoa. In Melanesia it appears in Fiji,° the New Hebrides,’ and the Solomon Islands. Amongst the Dyaks there are traces of totemism in the prohibition of the flesh of certain animals to certain tribes, respect for certain plants, &c.9 Tt exists in the islands of Ambon, Uliase, Leti, Moa, Lakor, Keisar (Makisar), Wetar, and the Aaru and Babar archipelagos.!° In the Philippine Islands there are traces of it in the reverence for certain animals, the belief that the souls of ancestors dwell in trees, &ec.12

With regard to ancient nations, totemism may be re- garded as certain for the Egyptians, and highly probable for the Semites,! Greeks, and Latins. If proved for one Aryan people, it might be regarded as proved for all; since totemism could scarcely have been developed by any one Aryan branch after the dispersion, and there is no evi- dence or probability that it ever was borrowed. Prof. Sayce finds totemism among the ancient Babylonians, but his evidence is not conclusive.18

No satisfactory explanation of the origin of totemism has yet been given. of totemism in a ‘misinterpretation of nicknames”: savages first named themselves after natural objects, and then, confusing these objects with their ancestors of the same names, reverenced them as they already reverenced their ancestors.14 But this view attributes to verbal mis- understandings far more influence than, in spite of the so-called comparative mythology, they ever seem to have exercised.

Literatwre.—Apart from the original authorities, the literature on totemism is very scanty. The importance of totemism for the early history of society was first recognized by Mr J. F. M‘Lennan in papers published in the Fortnightly Review (Oct. and Noy. 1869, Feb. 1870). The subject has since been treated of by E. B. Tylor, Early History of Mankind, p. 284 sq.; Sir Jolin Lubbock, Origin of Civilization, 260 sq.; A. Lang, Custom and Myth, p. 260, &c.; Id., Myth, Titual, and Religion, i. p. 58 sq., &c.; E. Clodd, Myths and Dreams, p. 99 sq.; W. Robertson Smith, Kinship and Marriage in Early Arabia. See also SacrIFIcE, vol. xxi. Ds 135. For fuller details, see J. G. Frazer, Totemism (Edinburgh, 1887). (J. @ BR.)

TOTILA. See Jusrrnzan and Narsxs.

1 Strahlenberg, Description of the North and Eastern Parts of Hurope and Asia, London, 17388, p. 383.

2 Middendorf, Siber. Reise, p. 72, quoted by Lubbock, Origin of Civilization, p. 1385. The present writer has been unable to find the passage of Middendorf referred to.

3 W. Radloff, Aus Siberien, i. 216, 258. The Ostiaks, also in Siberia, are divided into exogamous clans, and they reverence the bear (Castren, Vorlesungen tiber die Altaischen Volker, 107, 115, 117). This, however, by no means aniounts to a proof of totemism.

4 Verhandi. d. Berl. Gesell. Anthropologie, &c., 1882, p. (62).

- Morgan, A. S., p. 364 sg, One of the aboriginal tribes of China worships the image of a dog (Gray, China, ii. 306).

6 Williams, Fiji and the Ijians, ed. 1860, i. 219 sq.

? Turner, Samoa, 334, 8 Fison and Howitt, p. 37 n.

® Low, Sarawak, 265 sg., 272-274, 306; St John, Life in the Forests of the Far East, i. 186 sq., 203; cf. Wilken in Ind. Gids, June 1884, p. 988 sq.; Ausland, 16th June 1884, p. 470.

1 Riedel, De sluik- en kroesharige rassen tusschen Papua en Selebes, pp. 82, 61, 258, 334, 341, 376 sq., 414, 432.

11 Blumentritt, Der Ahnencultus und die religidsen Anschauungen der Malaien des Philippinen-Archipel, 159 Sq.

12 See W. R. Smith, Kinship and Marriage in Early Arabia.

13 A. H. Sayce, The Religion of the Ancient Babylonians, p. 279 sq.

4 Spencer, Principles of Sociology, i. 367.

TOTTENHAM, or Torrennam Hicu Cross, a suburb of London, in the county of Middlesex, is situated on the old “Great Northern” road, about 44 miles north from Shoreditch. The cross at Tottenham is not a market-cross, and its origin is doubtful. Towards the close of the 16th century it consisted of a column of wood, capped with a square sheet of lead. The present cross of brick was erected by Dean Wood about 1600, and the ornamental work of stucco was added in 1809. In the time of Isaak Walton there stood over it a shady arbour of woodbine, sweetbriar, jessamine, and myrtle. Formerly Tottenham

| was noted for its “ greens,” in the centre of one of which _ stood the famous old elm trees called the “Seven Sisters” :

these were removed in 1840, but the name is preserved in the Seven Sisters Road. Bruce Castle, occupying the site of the old mansion of the Bruces, but built probably by Sir William Compton in the beginning of the 16th century,

| 1s now occupied as a private boarding school. The church

of All Hallows, Tottenham, was given by David, king of Scotland, probably when he visited Henry in 1126, to the canons of the church of Holy Trinity, London. It has frequently been restored and altered. The older parts are the tower, nave, and south aisle of the Perpendicular period and the south porch of the 16th century. There are a large number of monuments and brasses. Tottenham consists chiefly of an irregular line of houses for about two miles along the high road, with short side streets at intervals. There area number of almshouses, including the Sanchez almshouses, founded in 1596 by Balthazar

| Sanchez, or Zanchero, confectioner to Philip of Spain ; Mr Herbert Spencer finds the origin |

Reynardson’s (1685); Pheasunt’s, or “The Pound,” for poor widows, originally founded by George Hynningham in 1536, and further endowed by Pheasunt and Saunders ; and the sailmakers’ almshouses, founded in 1869 by the Drapers’ Company for forty-five inmates. The free gram- mar school was enlarged and endowed in 1686 by Sarah, dowager duchess of

Somerset. The population of the urban sanitary district (area 4642 acres) in 1871 was 22,869, and in 1881 it was 46,456.

In the reign of the Confessor the manor of Tottenham was pos- sessed by Earl Waltheof, who in 1070 married Judith, niece of the Conqueror, aud was created in 1072 earl of Northumberland, Huntingdon, and Northampton, but joined the conspiracy against William, was betrayed by his wife, and was beheaded at Winchester, It was inherited by his daughter Maud, who was married first to Simon de St Liz and afterwards to David, sou of Malcolm IU oe king of Scotland, who was created by Henry I. earl of Hunting- don, and received possession of all the lands formerly held by Earl Waltheof. In 1184 the manor was granted by William the Lion, king of Scotland, to his brother David, earl of Augus and Gallo- way, the grant being confirmed in 1199 by King John of England, who created him earl of Huntingdon. He married Maud, heiress of Hugh, earl of Chester, and his son John inherited both earldoms. The son married Helen, daughter of Llewelyn, prince of Wales, by whom he was poisoned in 1237, dying without issue. She retained possession till 1254, when the manor was divided between his coheirs Robert de Brus, John de Baliol, and Henry de Hastings, each division forming a distinct manor bearing the name of its owner. In 1429 they all came into the possession of Alderman Gedeney. William Bedwell, the Arabic scholar, was vicar of Tottenham, and published in 1682 a Briefe Description of the Towne of Tottenham, in which he printed for the first time the burlesque poem, the “ Turnament of Tottenham.”

Sce Robinson’s Wistory of Tottenham, 1840.

TOUCAN, the Brazilian name of a bird,’ long since adopted into nearly all European languages, and apparently first given currency in England (though not then used as an English word) in 166816 by Charleton (Onomasticon, p. 115) ; but the bird, with its enormous beak and feather-

© Commonly believed to be so called from its cry; but Prof. Skeat (Proc. Philolog. Society, 15th May 1885) adduces evidence to prove that the Guarani Tucd is from ¢7, nose, and cdng, bone, 7.e., nose of bone.

36 In 1656 the beak of an ‘‘Aracari of Brazil,” which was a Toucan of some sort, was contained in the Museum Tradescantianum (p82); but the word

Toucan does not appear there.

mow ¢ AN

like tongue, was described by Oviedo in his Sumario de la |

Natural Historia de las Indias, first published at Toledo in 1527 (chap. 42),1 and, to quote the translation of part of the passage in Willughby's Ornithology (p. 129), 'there is no bird secures her young ones better from the Monkeys, which are very noisom to the young of most Birds. For when she perceives the approach of those Enemies, she so settles her self in her Nest as to put her Bill out at the hole, and gives the Monkeys such a welcom therewith, that they presently pack away, and glad they scape so." Indeed, so remarkable a bird must have attracted the notice of the earliest European invaders of America, the more so since its gaudy plumage was used by the natives in the decoration of their persons and weapons. In 1555 Belon (Hist. Nat. Oyseaux, p. 184) gave a characteristic figure of its beak, and in 1558 Thevet (Singularitez de la France Antarctique, pp. 88-90) a somewhat long descrip- tion, together with a woodcut (in some respects inaccurate, but quite unmistakable) of the whole bird, under the name of "Toucan," which he was the first to publish. In 1560 Gesner (Icones Avium, p. 130) gave a far better figure (though still somewhat incorrect) from a drawing received from Ferrerius, and suggested that from the size of its beak the bird should be called Burhynchus or Ramphestes. This figure, with a copy of Thevet's and a detailed descrip- tion, was repeated in the posthumous edition (1585) of his larger work (pp. 800, 801). By 1579 Ambroise Paré (Quvres, ed. Malgaigne, iii. p. 783) had dissected a Toucan that belonged to Charles IX. of France, and about the same time Léry (Voyage fait en la Terre du Bresil, chap. xi.), whose chief object seems to have been to confute Thevet, confirmed that writer's account of this bird in most respects. In 1599 Aldrovandus (Ornithologia, i. pp. 801-803), always ready to profit by Gesner's information, and generally without acknowledgment, again described and repeated the former figures of the bird ; but he cor- rupted his predecessor's Ramphestes (which was nearly right) into amphastos, and in this incorrect form the name, which should certainly be Rhamphestes or Rham- phastas, was subsequently adopted by Linnzeus and has since been recognized by systematists. Into the rest of the

early history of the Toucan's discovery it is needless to go.? Additional particulars were supplied by many succeeding writers, until in 1834 Gould completed his Monograph of the family? (with an anatomical appendix by Sir R. Owen), to which, in 1835, he added some supplementary plates; and in 1854 he finished a second and much improved edition. The latest systeniatic compendium on Toucans is Cassin's "Study of the Ramphastide," in the Proceedings of the Philadelphia Academy for 1867 (pp.

100-124),

By recent systematists 5 genera and from 50 to 60 species of the Family are recognized; but the characters of the former have never been satisfactorily defined, much less those of numerous snbdivisions which it has pleased some writers to invent. There can be little

doubt that the bird first figured and described by the earliest authors above nained is the 2. toco of nearly all ornithologists, and

1 The writer has only been able to consult the reprint of this rare work contained in the Biblioteca de Autores Hspanoles (xxii. pp. 473- 515), published at Madrid in 1852.

2 One point of some interest may, however, be noticed. In 1705 Plot (NV. £. Oxfordshire, p. 182) recorded a Toucan found within two miles of Oxford in 1644, the body of which was given to the repository in the medical school of that university, where, he said, ''it is still to be seen." Already in 1700 Leigh in his Laneashire (i. p. 195, Birds, tab. 1, fig. 2) had figured another which had been found dead on the coast of that eounty about two years before. The bird is easily kept in captivity, and no doubt from early times many were brought alive to Europe. Besides the one disseeted by Paré, as above mentioned, Joh. Faber, in his additions to Hernandez's work on the Natural History of Mexieo (1651), figures (p. 697) one seen and described by Putens (Dal Pozzo) at Fontainebleau.

3 Of this the brothers Sturm in 1841 published at Nuremberg a German version.

as such is properly regarded as the type of the genus and therefore of the Family. It is one of the largest, measuring 2 feet in length, and has a wide range throughout Guiana and a great part of Brazil. The huge beak, looking like the great claw of a lobster, more than 8 inches long and 38 high at the base, is of a deep orange colour, with a large black oval spot near the tip. The eye, with its double iris of green and yellow, has a broad blue orbit, and is surrounded by a bare space of deep orange skin. The plumage generally is black, but the throat is white, tinged with yellow and commonly edged beneath with red; the upper tail-coverts are white, and the lower scarlet. In other species of the genus, 14 to 17 in number, the bill is mostly particoloured—green, yellow, red, chestnut, blue, and black variously combining so as oftcn to form a ready diagnosis; but some of these tints are very fleeting and often leave little or no trace after death. Alternations of the brighter colours are also displayed in the feathers of the throat, breast, and tail-coverts, so as to be in like manner characteristic of the species, and in several the bare space round the eye is yellow, green, blue, or lilac. The sexes are almost alike in coloration, and externally differ chiefly in size, the males being largest. The tail is nearly square or moderately rounded. In the genus Pteroglossus, the ** Aracaris ” (pronounced Arassari), the sexes more or less differ in appearance, and the tail is gradnated. The species are smaller in size, and nearly all are banded on the belly, which is generally yellow, with black and scarlet, while except in two the throat of the males at least is black. One of the most remarkable and beautiful is P. beauharnaisi, by some authors placed in a distinct genus and called Beauharnaisius ulocomus. In this the feathers of the top of the head are very singular, looking like glossy cnrled shavings of black horn or whalebone, the effect being due to the dilatation of the shaft and its coalescence with the consolidated barbs. Some of the feathers of the straw-coloured throat and cheeks partake of the same structure, but in a less degree, while the subterminal part of the damina is of a lustrous pearly-white.4 The beak is richly coloured, being green and crimson above and lemon below. The upper plumage generally is dark green, but the mantle and rump are crimson, as are a broad abdominal belt, the flanks, and many crescentic markings on the otherwise yellow lower parts. The group or genus Selenodera, proposed by Gould in 1837 (Icones Aviuwm, pt. 1), contains

some 6 or 7 species, having the beak, which is mostly transversely striped, and tail shortcr than in Péeroglossus, Here the sexcs also differ in coloration, the males having the head and breast black, and the females the same parts chestnut; but all have a yellow nuchal crescent (whence the name of the group). The so-called Hill-Toucans have becn separ- ated as another genus, Andigena, and consist of some 5 or 6 species chiefly frequenting the slopes of the Andes and reaching an eleva- tion of 10,000 feet, though one, often placed among them, but perhaps belonging rather to Pteroglossus, the A. bailiont, remark- able for its yellow-orange head, neck, and lower parts, inhabits the lowlands of sonthern Brazil. Another very singular form is 4. laminirostris, which has affixed on either side of the maxilla, near the base, a quadrangular ivory-like plate, forming a feature unique in this or almost in any Family of Birds. The group

The monstrous serrated bill that so many Toucans possess was by Buffon, after his manner, accounted a grave defect of Nature, and it must be confessed that no one has given what seems to be a satisfactory explanation of its precise use, though on evolutionary principles none will now doubt its fitness to the bird's require- ments. Solid as it looks, its weight is inconsiderable, and the perfect hinge by which the maxilla is articulated adds to its efficiency as an instrument of prehension. Swainson (Classi/. Birds, ii. p. 188) imagined it merely ''to contain an infinity of nerves, disposed like net-work, all of which lead immediately to the nostrils," and add to the olfactory faculty. This notion seems to be borrowed from Trail (Trans. Linn. Society, xi. p. 289), who admittedly had it from Waterton, and stated that it was 'fan admirable contrivance of nature to increase the delicacy of the organ of smell;'' but Sir R. Owen's description shews this view to be groundless, and he attributes the extraordinary develop- ment of the Toucan's beak to the need of compensating, by the additional power of mastication thus given, for the absence of any of the grinding structures that are so characteristic of the in- testinal tract of vegetable-eating birds—its digestive organs posscss- ing a general simplicity of formation. The question is one worth deciding, and would not be difficult to decide by those who have the opportunity. The nostrils are placed so as to be in most

4 This curious peeuliarity naturally attracted the notice of the first discoverer of the speeies, Poeppig, who briefly deseribed it in a letter

published in Froriep’s Notizen (xxxii. p. 146) for December 1831.

> Readers of Mr Bates’s Naturalist on the River Amazons will reeolleet the aecount (ii. p. 344) and illustration there given of his encounter with a flock of this species of Toucan. His remarks on the other species with which he met are also exeellcnt.

forms invisible until sought, being obscured by the frontal feathers or the backward prolongation of the horny sheath of the beak. The wings are somewhat feeble, and the legs have the toes plaeed in pairs, two before and two behind. The tail is eapable of free vertical motion, and controlled by strong muscles, so that, at least in the true Toueans, when the bird is preparing to sleep, it is re- verted and lies almost flat on the back, on which also the huge bill reposes, pointing in the opposite direction.

As may be inferred from the foregoing, the Toucans are a Neotropical form, and by far the greater number inhabit the northern part of South America, especially Guiana and the valley of the Amazons. Some three species occur in Mexico, and several in Central America. One, R. witell- tnus, which has its headquarters on the mainland, is said to be common in Trinidad, but none are found in the Antilles proper. The precise place of the Family in the heterogeneous group Picariz cannot yet be determined. Its nearest allies perhaps exist among the Capitonide; but none of them are believed to have the long feather-like tongue which is so characteristic of the ‘Toucans, and is, so far as known, possessed besides only by the Momotide (cf. Moroz, vol. xvii. p. 3). But of these last there is no reason to deem the Toucans close relatives, and, according to Swainson (w supra, p. 141), who had opportunities of observing both, the alleged resemblance in their habits has no existence. Those of the Toucans in confinement have been well described by Broderip and Vigors (Zool. Journal, i. p. 484; ii. p. 478), and indeed may be partially observed in many zoological gardens. Though feeding mainly on fruits, little seems amiss to them, and they swallow grubs, reptiles, and small birds with avidity. They are said to nest in hollow trees, and to lay white eggs. (a. N.)

TOUCH may be defined as a sense of pressure, referred usually to the surface of the body. It is often understood asa sensation of contact as distinguished from pressure, but it is evident that, however gentle be the contact, a certain amount of pressure always exists between the sensitive surface and the body touched. Mere contact in such circumstances is gentle pressure ; a greater amount of force causes a feeling of resistance or of pressure referred to the skin; a still greater amount causes a feeling of muscular resistance, as when a weight is supported on the palm of the hand; whilst, finally, the pressure may be so great as to cause a feeling of pain. The force may not be exerted vertically on the sensory surface, but in the opposite direction, as when a hair on a sensory surface is pulled or twisted. Touch is therefore the sense by which mechanical force is appreciated, and it presents a strong resemblance to hearing, in which the sensation is excited by intermittent pressures on the auditory organ. In addition to feelings of contact or pressure referred to the sensory surface, contact may give rise to a sensation of temperature, according as the thing touched feels hot or cold. These sensations of contact, pressure, or tempera- ture are usually referred to the skin or integument cover- ing the body, but they are experienced to a greater or less extent when any serous or mucous surface is touched. The skin being the chief sensory surface of touch, it is there that the sense is most highly developed, both as to delicacy in detecting minute pressures and as to the char- acter of the surface touched. ‘Tactile impressions, pro- perly so called, are absent from internal mucous surfaces, as has been proved in men having gastric, intestinal, and urinary fistule. In these cases, touching the mucous surface caused pain, and not a sensation of touch.

Organs of Touch.—Comparative Sketeh.—The organs of toueh present many varieties of form, from a simple filament of sensitive protoplasm to a highly complex end-organ connected with the eommeneement of a sensory nerve-fibre. The bodies of the lowest organisms are formed of contraetile protoplasm, and mechanical con- taet with any resisting substances causes a change of form. Here is the simplest kind of touch—a response on the part of any portion of the surface of the body to a mechanical stimulus. The pseudopodia

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of the Rhizopoda are also organs of touch, and probably the cilia, the flagella, and the short rod-like bodies seen on many Jnfusoria belong to the same class of sensory organs. Among the Celentera (hydroid polyps, tubularians, Hydromeduse, Medusx%, Anthozoa or sea-anemones) tentacles are found, usually arranged in circles around the mouth or on portions of the body engaged in loeomo- tion, as on the margins of the umbrella of Medusw. These have a large amount of sensibility, and serve as organs of touch. In some also there are stiff hairs on the tentacles and around the mouth, more differentiated tactile organs. The Vermes show organs of touch in the form of modified cells of the integument, eonnected with sensory nerves. These cells often assume the form of stiff rods projected from the surface (tactile sete). Such are often found over the whole body of Turbellaria and Nemertina, on the tentacles of Bryozoa, on the head segment of Lumbricide, and on the tentacles and antenne of Chetopoda. In the latter group of animals tactile organs are also found in ring-like arrangements, called eirrhi, on the foot-stumps or parapodia. In some Hirudinea (leeches) compli- eated tactile rods are embedded in cup-shaped organs scattered over the body. Large prominenees of the euticle, called tactile papille, are also found in many of the Vermes near the oral and genital orifiees. The Echinodermata have also special parts devoted to touch, and these show their highest differentiation in the tentaeles of the Holothuroida. Arthropoda show tactile organs in the form usually of rod-like bodies projecting from the surface of the appendages and chiefly connected with nerves passing to ganglionic cells. In Crustacea such organs are found on the antenne and other appendages, and on the antenne in Myriapoda and Jnseeta. In the latter they are also found on the tarsal joints of the feet. The ap- pearance of these rod-like bodies is seen in fig. 1.

Ciliated tentacular processes exist in the larva of Braehiopoda which are probably touch organs, but there are no definite organs of this kind in the adult form. The Jfol- lusea have’the sense of toueh widely diffused. All the soft parts of the body are capable of feeling when touehed, and in various situations there arefine hair-like prolongations Fie. 1, —Nerve-ending from eells, These are supplied with ric tactile rods, from iy nerves, and are touchorgans. Such ; wade ae are found on the edge of the mantle ganglionic

swelling; s, tactile rods; in Lamellibranchiata, where they < fine hairs of cuticle (Leydig). may be in rows; they also exist on the siphons, and ‘‘they serve to watch over the particles that get into the mantle cavity with the water” (Gegenbaur). Processes of a tactile kind are also found on the epipodium, the edge of the mantle, and the cephalic tentacles in many Gasteropoda, and on the dorsal tufts of the Vudibranchiata, Here and there also there are enlargements of the integument covered with cilia and supplied by a nerve which have been regarded as touch organs, but are by some supposed to be eonneeted with smell (see SMELL). The 7wnieata have cells with long filamentous processes in the integument, which are probably tactile in function,

In the great majority of fishes touch is limited to the lips, to parts of the fins, and to special organs called barbels, In the Cyprinoids there is a fold of skin bordering the mouth which is highly tactile. The lip of the sturgeon is eovered with numerous papille; the sucking lip of the lamprey is papillose and highly sensitive. The fins are in many fishes modified to serve as organs of touch. Thus the gurnards (7riglidz) have three soft flexible rays detached from the fin, and ‘‘the filiform radial appendages of the Polynemide, the prolonged ventral fins of Osphromenus, T’richo- gaster, and other Labyrinthibranehs, and of the Ophidiide,” are examples of this class of organs (Owen). The barbels are long slender processes of skin, either single or in pairs, found in the Silwridx, loaches, barbels, cods, sturgeons, and in the parasitic Myzinidw. The nerves for the barbels come from the fifth pair of cranial nerves. ‘‘A cod, blind by absence or destruetion of both eyeballs, has been captured in good eondition, and it may be sup- posed to have found its food by exploring with the symphysial barbule, as well as by the sense of smell” (Owen). Bodies some- what similar to the Paeinian corpuscles (to be afterwards described) were discovered by Savi in 1844 in the torpedo; they are arranged in linear series on the anterior part of the mouth and nostrils, and over the fore part of the electrical organs. Each is composed of two capsules, one connected with the other, and containing a granular substance in which the nerve end is embedded. Peculiar mucous glands are also found outside the electrical organs of the torpedo which are believed to minister to touch. Similar organs exist in sharks, and John Hunter dissected the snout of the spotted dog-fish (Scylliwm) ‘‘ to show the manner of the nerves ramifying,

as also their apparent termination in this part, each ultimate nerve appearing to terminate in the bottom of a tube or duct, the sides of which secrete and convey a thick mucus to the skin.” These ‘‘nervo-mucous” organs are found in the sides and under part of the head and on the fore part of the trunk.

The Amphibia and Reptilia do not show any special organs of touch. The lips of tadpoles have tactile papille. Some snakes have a pair of tentacles on the snout, but the tongue is probably the chief organ of touch in most serpents and lizards. All reptiles possessing climbing powers have the sense of touch highly developed in the feet.

Birds have epithelial papille on the soles of the toes that are no doubt tactile. These are of great length in the capercailzie (Tetrax urogallus), ‘enabling it to grasp with more security the frosted branches of the Norwegian pine trees” (Owen). It has been sug- gested that the delicate ‘‘papillose” digits of the smaller birds assist thein in nest-building by having the sense of touch highly developed. Around the root of the bill in many birds there are special tactile organs, assisting the bird to use it as a kind of sensi- tive probe for the detection in soft ground of the worms, grubs, and slugs that constitute its food. Special bodies of this kind have been detected in the beak and tongue of the duck and goose, called the tactile corpuscles of a Merkel, or the corpuscles of Grandry (fig. 2). Sim- ilar bodies have been { found in the epidermis \ of man and mammals, in the outer root-sheath of tactile hairs or feelers. They consist of small j bodies composed of a ead capsule enclosing two or Fie. 2.—Tactile Corpuscles from duck’s tongue. more flattened nucleated il as cells, piled ina row. Each corpuscle is separated from the others by a transparent protoplasmic disk. Nerve fibres terminate either in the cells (Merkel) or in the protoplasmic intercellular matter (Ranvier, Hesse, Izqui- erdo). Another form of end-organ has been described by Herbst as existing in the mucous membrane of the duck’s tongue. These cor- puscles of Herbst are like small Pacinian cor- puscles with thin and very close lamelle. Developments ofintegument devoid of feathers, such as the ‘‘wattles” of the cock, the ‘‘ca- runcles” of the vulture and turkey, are not tactile in their function.

In the great majority of Mammalia the general surface of the skin shows sensitive- ness, and this is developed to a high degree on certain parts, such as the lips, the end of Fre. 3.—Tactile Corpuscle a teat, and the generative organs. Where from the hand. touch is highly developed, the skin, more especially the epidermis, is thin and devoid of hair. Inthe Monkeys tactile papille are found in the skin of the fingers and palms, and in the Z skin of the prehensile tails of various species (Ateles). Such papille also abound in the naked skin of the nose or snout, as in the shrew, mole, pig, tapir, and elephant. In the Or- nithorhynchus the skin covering the mandibles is tactile (Owen). In many animals certain hairs acquire great /\// size, length, and stiffness. These con- ‘(3))/ stitute thevibrissz, or whiskers. Each large hair grows from a firm capsule sunk deep in the true skin, and the hair bulb is supplied with sensory nerve filaments. In the walrus the capsule is cartilaginous in texture. The marine Carnivora have strong vibrisse which “act as a staff, in a » wayanalogous to that held and applicd by the hand of a blind man” (Owen). Each species has hairs of this kind developed on the eyebrows, lips, or cheeks, to suit a particular mode of existence, as, for example, the long fine whiskers of the night-prowling felines, and in the aye-aye, a monkey having nocturnal habits. In the Ungulata the hoofs need no delicacy of tonch as regards the discrimination of minute points. Such animals, however, have broad, massive sensations of touch, enabling them to appreciate the firmness of the soil on which they tread, and under the hoof we find highly vascular and sensitive lamelle or papille, contributing no doubt, not only to the growth of the hoof, but also toits sensitiveness. The Cetacea have numerous papille in the skin, regarding which John Hunter remarks : “ These villi are soft and pliable ; they float in water ; and each is longer or shorter according to the size of the animal. In the spermaceti

Fia. 4.—Tactile Corpuscles from clitoris of rabbit. m, nerve.

whale they are about a quarter of an inch long; in the grampus, bottlenose, much shorter; in all they are extremely vascular; they are sheathed in corresponding hollows of the epiderm.” In some whales the skin is thrown into numerous longitudinal plaits on the under and fore part of the body

(Balznoptera). Prof. Owen remarks regarding these: ‘‘It is peculiar to the swifter swimming whales that pursue mackerel and herring, and may serve to warn them of shoals, by appreciation of au impulse of the water rebounding therefrom, and so conveying a sense of the propinquity of sunken rocks or sand-banks. Sensitiveness to the movements of the ambient ocean is indicated by certain observed phenomena. The whale-fishers aver that when a strageler is attacked its fellows will bear down from some miles’ distance, as if to its assistance; and it may be that they are attracted by perception of the vibration of the water caused by the struggles of the harpooned whale or cachalot” (Owen’s Comparative Anatomy, vol. iii. p. 189). Bats have the sense of touch strongly developed in the wings and external ears, and in some species in the flaps of skin found near the nose. These “nose-leaves” and expanded ears frequently show vibratile movements, like the antenne of insects, enabling the animal to detect slight atmospheric impulses. In the vampires (Desmodz) and fruit-eating bats (Pteropi) the auricular and nasal appendages are small; ‘‘such sensitive tactile guides or warners in flight are only needed in the bats of active food, which must follow in swift evolutions, like the swallows, but in gloom, the volatile insects that people the summer air at dawn or dusk” (Owen), There is little doubt that many special forms of tactile organs will be found in animals using the nose or feet for burrowing. A peculiar end- organ has been found in the nose of the mole, while there are ‘‘ end- capsules ” in the tongue of the elephant and ‘‘ nerve rings” in the ears of the mouse.

End-Organs of Touch in Man.—In man three special forms of tactile end-organs have been described, and can be readily demonstrated.

(1) The End-Bulbs of Krause.— These are oval or rounded bodies, from 5} to z+ of an inch long. Each consists of a delicate capsule, composed of nucleated con- nective tissue enclosing numerous minute cells. On tracing the nerve fibre, it is found that the nerve sheath is con- tinuous with the capsule, whilst the axis cylinder of the nerve divides into branches which lose themselves among the cells. Waldeyer and Longworth state that the nerve fibrils terminate in the cells, thus making these g bodies similar to the cells described by Merkel (ut supra). See fig.5. These bodies are found in the deeper layers of the con- junctiva, margins of the lips, nasal mu- cous membrane, epi-

glottis, fungiform Fre. 5.—End-Bulb from human ‘ conjunctiva, a, nucleate

and circumvallate capsule; 6, core Cc, entering

papillee of the nerve-fibre terminating in the

: core at d. tongue, glans penis

and clitoris, mucous membrane of the rectum of man, and they have also been found on the under surface of the “toes of the guinea-pig, ear and body of

the mouse, and in the wing of the bat” (Landois and Stirling). In the genital organs aggregations of end-bulbs occur, known as the “genital corpuscles of Krause” (fig. 4). In the synovial mem- brane of the joints of the fingers there are larger end-bulbs, each connected with three or four nerve-filaments.

(2) The Touch Corpuscles of Wagner and Meissner.—These are oval bodies, about 3p of an inch long by z$,5 of an inch in breadth. Each consists of a series of layers of connective tissue pi 6 Ena-B

xs – } ulb from arranged transversely, and containing in conjunctiva ofealf. n,

. . nerve. the centre granular matter with nuclei

(fig. 7). One, two, or three nerve fibres pass to the lower end of the corpuscle, wind transversely around it, lose the

white substance of Schwann, penetrate into the corpuscle, where the axis cylinders, dividing, end in some way un- known. ‘The cor- puscles do not con- tain any soft core, but are apparently built up of irregu- lar septa of con- nective tissue, in the meshes _ of which the nerve fibrils end in ex- pansions similar to Merkel’s cells. Dr Thin describes simple and com-

pound corpuscles according to the number of nerve j Fig. 7.—Vertical Section of the Skin of the palm of the rey fibres enterin © hand. a, blood-vessel ; 6, papilla of the cutis vera; them. These bodies c, capillary; d, nerve-fibre passing to a touch-cor- are found abun- puscle; e, Wagner's touch-corpuscle; jf, nerve-

fibre, divided transversely; g, cells of the Malpighian

layer of the skin. (From Landois and Stirling,

after Biesiadecki.)

dantly in the palm of the hand and sole of the foot, where there may be as many as 21 to every square millimetre (1 mm.= ;; inch). They are not so numerous on the back of the hand or foot, mamma, lips, and tip of the tongue, and they are rare in the genital organs. '" Kollmann describes three special tactile areas in the hand :—(1) the tips of the fingers, with 24 touch corpuscles in a length of 10 mm. ; (2) the three eminences lying on the palm behind the slits between the fingers, with 5:4-2°7 touch-corpuscles in the same length; and (3) the ball of the thumb and little finger, with 3-1-3°5 touch corpuscles. The first two areas also contain many of the corpuscles of Vater or Pacini, whilst in the latter these corpuscles are fewer and scattered. In the other parts of the hand the nervous end- organs are much less developed" (Landois and Stirling).

(3) The Corpuscles of Vater or Pacini.—These, first described by Vater so long ago as 1741, are small oval bodies, quite visible to the naked eye, from +; to =, of an inch long and =; to 5 of an inch in breadth, attached to the nerves of the hands and feet. They can be readily demonstrated in the mesentery of the cat (fig. 8). Each corpuscle consists of 40 to 50 lamellee or coats, like the folds of an onion, thinner and closer to- gether on approaching the centre. Each lamella is formed of an elastic material mixed with delicate con- nective tissue fibres, and the inner surface of each is lined by a single continuous layer of endothelial cells. A double-contoured nerve fibre passes to each, The white substance of Schwann becomes continuous with the lamelle, whilst… ¢ vater's or Pacini's Cor- the axis cylinder passes into the puscle. a, stalk; 6, nerve-fibre body, and ends in a small knob or png lee eeact Sieve in a plexus. Sometimes a blood- 4er, with

its end divided at 7. vessel also penetrates the Pacinian body, entering along with the nerve. Such bodies are found in the subcutaneous tissue on the nerves of the fingers and toes, near joints, attached to the nerves of the abdominal plexuses of the

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sympathetic, on the coccygeal gland, on the dorsum of the penis and clitoris, in the meso-colon, in the course of the intercostal and periosteal nerves, and in the capsules of lymphatic glands (William Stirling).

Physiology of Touch in Man.—Such are the special end- organs of touch. It has also been ascertained that many sensory nerves end in a plexus or network, the ultimate fibrils being connected with the cells of the particular tissue in which they are found. Thus they exist in the cornea of the eye, and at the junctions of tendons with muscles. In the latter situation “ flattened end-flakes or plates” and “elongated oval end-bulbs” have also been found (Sachs, Rollett, Golgi). A consideration of these various types of structure show that they facilitate inter- mittent pressure being made on the nerve endings. They are all, as it were, elastic cushions into which the nerve endings penetrate, so that the slight variation of pressure will be transmitted to the nerve. Probably also they serve to break the force of a sudden shock on the nerve endings.

Sensitiveness and Sense of Locality. —The degree of sensitiveness of the skin is determined by finding the smallest distance at which the two points of a pair of – compasses Can hi be felt. This method, first followed by Weber, is em- ployed by phy- sicians in the diagnosis of nervous affections involving the sensitiveness of the skin. The following table shows the sensitiveness in millimetres for an adult, whilst the corresponding numbers for a boy 12 years of age are given within brackets (Landois and Stirling, after

Fic. 9.—sthesiometer of Sieveking.

Weber) :-— Millimetres. Tip of tongué…..... eSaincten aac Onn pee este 1 ‘1] Third phalanx of finger, volar surface…..... 2-2°3 [1°7] Red part of the lip…....csccsssssesseseeeeceeeeseees 4°5 [3°9] Second phalanx of

finger, volar surface……... 4-4°5 [3°9] First phalanx of finger, volar surface…….....-. 5-5‘5 Third phalanx of finger, dorsal surface……..... 6°8 [4°5] Tip Of OSG... cvasimsyeros denned seatipang s+ ay senniages 68 [4°5] Head of metacarpal bone, volar…….....:0+-+ 5-6°‘8 [4‘5] Ball. Of Wace 5 eerwceeewmnes atementeoeien sett ey 6°5-7 Ball of Little fim ger seccas si o0es: aaeetees enews acien- oes 5°5-6 Contre Of pales. sc. svc .nersssnsiancacsaw nanacs yeraenere 8-9 Dorsum and side of tongue ; white of the lips ;

metacarpal part of the thumb….....++ 9 [6°8] Third phalanx of the great toe, plantar surface, 11:3 [6°8] Second phalanx of the fingers, dorsal surface… 11°38 [9] PRR derccee avs nasiownmins HSA cient Prige Raves pox 11°3 [9] i. reer. Cece cee. ales [9] Centre of hard palate. .....cssssseseeseseeeeeneeees 13°5 [11°3] Lower third of the fore-arin, volar surface…..... 15 In front of the 7yZoMa…….....:scccseeereeeee serene 15°8 [11°3] Plantar surface of the great t0@.....seeeeeeeee 15°8 [9] Inner surface of the lip. ..... -secsecseanseeeess 20°3 [13 °5] Behind the zygoma…….....cc.seccerseenseenense een ens 22:6 [15°8] OreliGatl in. «ince stem cerehen wavelet lias tecsioubearns 22°6 [18] QCCIBIG fn… eicrs aaveT ev nsavioeainsaipaewrenmamesiimeenines 271 [22°6] Baeke Of Wie RAI ose: andar romero ters asielsnsoweiioeisice meanest 81 °6 [22°6 Under: tite @b ins « 5 cesnceeciep sews etentes soereeea pe om 338 [226] Wr RPO Eh wat naciiocda 2. one nee OM aeer gee pace seem dere 338 [22-6] amiee rag. os fisicsagydaane eae beteor a nner veto ase aes ebetinens 36°1 [31°6] Sacrum (gluteal region).....s6sceeeeeeeeeeees 44°6 [33°8] Pare-aim and Magis. sess sesin.s .sensmee, suoravanyapieneans 45 ‘1 133 °8] TING cso acct acs ata he eects eee wow ern ee eae ce 54:1 [361] Back of the fifth dorsal vertebra ; lower dorsal

and. Tumibar TegiOWi…ci…sece0saeren snaaes teres 54:1

Middle of the neck 67°7 ; Upper arm; thigh; centre of the back…..... 67°7 [31°6-40°6]

These investigations show not only that the skin is sensitive, but that one is able with great precision to distinguish the part touched. This latter power is usually called the sense of locality, and it is influenced by various conditions. ‘he greater the number of sensory nerves in a given area of skin

the greater is the degree of accnracy in distinguishing different points. Contrast in this way the tip of the finger and the back of the hand. Sensi- tiveness increases from the joints towards the extremities, and, as pointed out by Vierordt, sensitiveness is great in parts of the body that are actively moved. The sensibility of the limbs is finer in

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the transverse axis than in the long axis of the limb, to the extent of 4 on the flexor surface of the upper limb and } on the extensor surface (Landois). It is doubtful if exercise improves sensitive- ness, as Francis Galton found that the performances of blind boys were not superior to those of other boys, and he says that “the guidance of the blind depends mainly on the multitude of col- lateral indications, to which they give much heed, and not their superiority to any one of them.” When the skin is moistened with indifferent fluids sensibility is increased. Suslowa made the curious discovery that, if the area between two points distinctly felt be tickled or be stimulated by a weak electric eurrent, the impressions are fused. Stretching the skin, and baths in water containing carbonic acid or common salt, increase the power of localizing tactile impressions. In experimenting with the com- passes, it will be found that a smaller distance can be distinguished if one proceeds from greater to smaller distances than in the re- verse direction. A smaller distance can also be detected when the points of the compasses are placed one after the other on the skin than when they are placed simultaneously. If the points of the compasses are unequally heated, the sensation of two contacts becomes confused. Ananemic condition, ora state of venous con- gestion, or the application of cold, or violent stretching of the skin, or the use of such substances as atropine, daturin, morphia, strychnine, alcohol, bromide of potassium, cannabin, and hydrate of chloral blunt sensibility. The only active substance said to increase it is caffein.

Absolute sensitiveness, as indicated by a sense of pressure, has been determined by various methods. “wo different weights are placed on the part, and the smallest difference in weight that can be perceived is noted. Weber placed small weights directly on the skin; Aubert and Kammler

loaded small plates; Dohrn made usc of a balance, having a blunt point at one end of the beam, rest- ing on the skin, whilst weights were placed on the other end of the beam to equalize the pressure; Eulenberg invented an instrument like a spiral spring paper-clip or balance (the baresthesiometer), having an index showing the pressure in grammes; Goltz employed au india-rubber tube filled with water, and this, “to ensure a con- stant surface of contact, bent at one spot over a piece of cork, is touched at that spot by the entaneous part to be examined, and, by rhythmically cxerted pressure, waves analogous to those of the arterial pulse are produced in the tube” (Hermann); and Landois invented a mercurial balance, enabling him to make rapid variations in the weight withont giving rise to any shock (figured in Landois and Stirling’s Physiology, p. 1155). These methods have given the following general results. (1) The greatest acuteness is on the forehead, temples, and back of the hand and forearm, which detect a pressure of ‘002 gramme; fingers detect ‘005 to ‘015 gramme; the chin, abdomen, and nose ‘04 to ‘05 gramme. (2) Goltz’s method gives the same general results as Weber’s experiment with the compasses, with the exception that the tip of the tongue has its sensation of pressnre much lower in the scale than its sensation of touch. (3) Eulenberg found the following gradations in the fineness of the pressure sense:—the forehead, lips, back of the cheeks, and temples appreciate ditferences of gy to = (200: 205 to 300 : 310 grammes). The back of the last phalanx of the fingers, the forearm, hand, Ist and 2d phalanges, the palmar surface of the hand, forearm, and upper arm distinguish differences of zy to ay (200: 220 to 200: 210 grammes). The front of the leg and thigh is similar to the forearm. Then follow the back of the foot and toes, the sole of the foot, aud the back of the leg and thigh. Dohrn placed a weight of 1 gramme on the skin, and then determined the least additional weight that could be detected, with this result:~~— 3d phalanx of finger, 499 gramme ; back of the foot, °5 gramme ; 2d phalanx, ‘771 gramme; Ist phalanx, ‘82 gramme; leg, 1 gramme; back of hand, 1°156 grammes; palm, 1‘108 grammes ; patella, 1°5 grammes; forearm, 1°99 grammes; umbilicus, 3°5 grammes ; and back, 3°8 grammes (Landois and Stirling). (4) In passing from light to heavier weights, the acuteness inereases at once, a maximum is reached, and then with heavy weights the power of distinguishing the differences diminishes (Hering, Bieder~~ mann). (5) A sensation of pressure after the weights have been removed may be noticed (after-pressure sensation), especially if the weight

be considerable. (6) Valentine noticed that, if the finger were held against a blunt-toothed wheel, and the wheel were rotated with a certain rapidity, he felt a smooth margin. This was ex- perienced when the intervals of time between the contacts of suc- cessive teeth were less than from z}y to yty of a second. The same experiment can be readily made by holding the finger over the holes in one of the outermost circles of a large syren rotating quickly : the sensations of individual holes become fused, so as to give rise to a feeling of touching a slit. (7) Vibrations of strings are de- tected even when the number is abont 1500 per second ; above this the sensation of vibration ceases. By attaching bristles to the prongs of tuning forks, and bringing these into contact with the lip or tongue, sensations of a very acute character are experienced, which are most intense when the forks vibrate from 600 to 1500 per second.

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Information from Tactile Impressions.~~—These enable us to come to the following conclusions. (1) We note the existence of some~~ thing touching the sensory surface. (2) From the intensity of the sensation we determine the weight, tension, or intensity of the pres- sure. This sensation is in the first instance referred to the skin, but after the pressure has reached a certain amount muscular sensa- tions are also experienced—the so-called muscular sense, (3) The locality of the part touched is at once determined, and from this the probable position of the touching body. Like the visual field, to which all retinal impressions are referred, point for point, there is a tactile field, to which all points on the skin surface may be referred. (4) By touching a body at various points, from the difference of pressure and from a comparison of the positions of various points in the tactile field we judge of the configuration of the body. A number of ‘tactile pictures” are obtained by pass- ing the skin over the touched body, and the shape of the body is further determined by a knowledge of the muscular movements necessary to bring the cutaneous surface into contact with different portions of it. If there is abnormal displacement of position, a false conception may arise as to the shape of the body. Thus, if a small marble or a pea be placed between the index and iniddle finger so as to touch (with the palm downwards) the onter side of the index finger and the inner side of the middle finger, a sensation of touching one ronnd body is experienced ; but if the fingers be

crossed, so that the marble touches the inner side of the index finger and the outer side of the middle finger, there will be a feeling of two round bodies, because in these circumstances there is added to the feelings of contact a feeling of distortion (or of muscular action) like what would take place if the fingers, for pur- poses of touch, were placed in that abnormal position, Again, as showing that our knowledge of the tactile field is precise, there is the well-known fact that when a piece of skin is transplanted from the forehead to the nose, in the operation for removing a deformity of the nose arising from lupns or other ulcerative disease, the patient feels the new nasal part as if it were his fore- head, and he may have the curious sensation of a nasal instead of a frontal headache. (5) From the number of points touched we judge as to the smoothness or roughness of a body. A body having a uniformly level surface, like a billiard ball, is sinooth ; a body having points irregular in size and number ina given area is rough ; and if the points are very close together it gives rise to a sensation, like that of the pile of velvet, almost intolerable to some indivi. duals. Again, if the pressure is so uniform as not to be felt, as when the body is eaepeed in water (paradoxical as this may seem, it is the ease that the sensation of contact is felt only at the limit of the fluid), we experience the sensation of being in contact with a fluid. (6) Lastly, it would appear that touch is always the result of varia- tion of pressure. No portion of the body when touching anything can be regarded as absolutely motionless, and the slight oscillations of the sensory surface, and in many cases of the body touched, prodnce those variations of pressure on which touch depends.

Theories as to Towch.—To explain the phenomenon of the tactile field, and more especially the remarkable variations of tactile sensibility above described, various theories have been advanced, (1) The one most generally known is that of E. H. Weber, as modified or restated by Lotze, Meissner, Czermak, and others. It assumes that, whilst we refer every tactile sensation to a certain position in the tactile field, we do not refer it merely toa point, but to a circular or oval area on the skin, called a circle of sensibility. Further, it is assumed that if two such circles touch or ov erlap they

| cannot be individually perceived, and that they can only be so

individually perceived when one or more circles of sensibility inter- vene, or, in other A 6

words, when there is a ‘non-irri- tated sensory ele- ment” between the two points touched (figs. 10 and 11).

Hach circle of sensibility may be supposed to be innervated by a distinct fibre. Thus, suppose the sensitive surface of the skin to be diagrammatically represented as in figs. 10 and 11, each square would be a “ circle of sensibility.” In more sensitive regions the squares would be smaller and the number of nerve terminations greater than in less sensitive regions. In fig. 10 the area contains nine “circles” and has nine nerve terminations, whilst in fig. 11, although the total area is the same, there are thirty-six ‘‘ circles ” and thirty-six nerve filaments. If the points of the compasses be placed at a and c in fig. 10 the sensation will be that of one point ;

Fig. 10. Fig. 11. Figs. 10 and 11.—Diagrams of Tactile Innervation. (From Beaunis, Physiologie Humaine.)

| there would also be a sensation of one point if they were placed at ¢

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and ; but if the points touch ¢ and e there will be a double sensa- tion, because the “circle” d intervenes. Again, in fig. 11, where the ‘‘ circles ” are much smaller and more numerous, the minimum distance at which two sensations are experienced is much less than in fig. 10, for this would happen when the compasses touch a@ and d. It will also be observed that the same distance d e in fig. 10 would give a single sensation, whilst it would give a double sensation in fig. 11. But ce in fig. 10 gives a double sensation, and yet the same distance would give a single sensation if the points of the com- passes touched adjoining ‘‘circles.” A ‘‘circle of sensibility, ‘a however, cannot be regarded as an anatomical magnitude or ‘ cutaneous sensory unit,” or, in other words, the area of distribu- tion of a single nerve-fibre. The extent of any such hypothetical circle can be altered by practice and attention, and we may therefore assume

that the circles overlap, and that even the same area of skin receives numerous nerve fila- ments, and that consequent- ly, when a body is touched, it excites at once many fila- ments, This is illustrated / by fig. 12.

It will be seen that each area receives a certain num- ber of nerve fibres and each nerve fibre supplies fibrils that cross the fibrils of ad- joining nerves. Ifthe point of the compass touch at a, it will irritate all the fibres from 1 to 7, but these will not be excited with equal in- tensity ; the excitation will be at a maximum at 4, more feeble for 3 and 5, and still more feeble for 2 and 6; so that the intensity of the excitation may be represented by the curve above a. In this case the sensation will be that of one point, because all the fibrils have been excited. If the other point of the compass be placed at b, there will be an intermediary region not excited, and two points will be felt. Suppose now the second point of the com- passes is moved to ¢, all the fibrils between the two points a and ¢ are excited, and there is likely a sensation of single contact ; but the excitation of the fibrils 7 and 8 is very feeble, and it is possible, by attention and practice, to leave these out, and then there will be a sensation of two contacts (Beaunis). This mechanical theory has no anatomical basis, except it be the statement made by Krause that the distance of the two points of the compasses at which two points are felt includes in the mean 12 tactile corpuscles. Whilst atten- tion has been mainly directed to the skin as the locality where an anatomical explanation is to be sought for, it must not be forgotten that processes may be in operation in the nerve centres. It is well known that irradiation of nervous impulses occur in the nerve centres (see PHysroLoGy, vol. xix. p. 29), and it is not unlikely that, when a nervous impression reaches the brain from a particular area of skin, this may be diffused to neighbouring nerve-cells, exciting these, and that then the effect on these cells, in accordance with the law that sensations in nerve centres are referred to the origins in the periphery of the sensory nerve fibres reaching them, will be referred to adjoining areas of skin, or, in other words, to adjoining points in the tactile field.

Wundt has propounded a psycho-physiological theory that every part of the skin with tactile sensibility always conveys an impres- sion of the locality of the sensation, Each area of skin has a ‘local colour,” and this diminishes from area to area. The grada- tion is sudden where the sense of locality is

acute and gradual where it is obtuse. ‘A circle of sensation is an area where the local colour changes so little that two separate impressions fuse into one ” (Landois). Practice enables one to notice the changes of local colour, and thus more and more accurately to discriminate points closer and closer together. This theory does not appear to explain anything; it simply restates the phenomena for which an explana- tion is desired.

SENSATIONS OF TEMPERATURE. —The skin is not merely the seat of tactile impressions, but also of impressions of temperature. This depends on thermic irritation of the terminal organs, as proved by the following cxperiment of E. H. Weber :—‘‘If the elbow be dipped into a very cold fluid, the cold is only felt at the immersed part of the body (where the fibres terminate); pain, however, is felt in the terminal organs of the ulnar nerve, namely, in the finger points; this pain, at the same time, deadens the local sensation of cold.’”” If the sensation of cold were due to the irritation of a specific-nerve fibre, the sensation of cold would be referred to the tips of the fingers. When any part of the skin is above its normal mean temperature, warmth is felt ; in the opposite case, cold. The normal mean temperature of a given area varies according to the distribution of hot blood in it and to the activity of nutritive changes occurring in it. When the skin

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Fia. 12.—Diagram showing overlapping of ‘*circles of sensibility.” (From Beaunis.)

| affections of the skin.

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is brought into contact with a good conductor of heat there isa sensation of cold. A sensation of heat is experienced when heat is carried to the skin in any way. The following are the chief facts that have been ascertained regarding the temperature sense. (1) FE. H. Weber found that, with a skin temperature of from 15°‘5 C. to 85° C., the tips of the fingers can distinguish a difference of 25° C. to ‘2° C. Temperatures just below that of the blood (33° C.- 27° C.) are distinguished by the most sensitive parts, even to ‘05° C. (2) The thermal sense varies in different regions as follows :

— tip of tongue, eyelids, cheeks, lips, neck, belly. The ‘‘perceptible minimum” was found to be, in degrees C: :—breast, *4°; back, ‘9°; back of hand, °8°; palm, °4°; arm, °2°; back of foot, °4°; thigh, *B°; leg, *6° to ‘2°; cheek, 4°; temple, ‘3°. (8) If two different teniperatures are applied side by side and simultaneously, the impressions often fuse, especially if the areas are close together. (4) Practice is said to improve the thermal sense. (5) Sensations of heat and cold may curiously alternate ; thus ‘‘ when the skin is dipped first into water at 10° C. we feel cold, and if it be then dipped into water at 16° C. we have at first a feeling of warmth, but soon again of cold” (Landois). (6) The same temperature applied to a large area is not appreciated in the same way as when applied to a small one; thus “‘the whole hand when placed in water at 29°°5 C. feels warmer than when a finger is dipped into water at 32° C,

There is every reason to hold that there are different nerve fibres and different central organs for the tactile and thermal sensations, but nothing definite is known. The one sensation undoubtedly affects the other. Thus the minimum distance at which two com- pass points are felt is diminished when one point is warmer than the other. Again, a colder weight is felt as heavier, ‘‘ so that the apparent difference of pressure becomes greater when the heavicr weight is at the same time colder, and less when the lighter weight is colder, and difference of pressure is felt with equal weights of unequal temperature” (E, H. Weber). Great sensibility to differ- ences of temperature is noticed after removal, alteration by vesi- cants, or destruction of the epidermis, and in the skin affection called herpes zoster. The same occurs in some cases of locomotor ataxy. Removal of the epidermis, as a rule, increases tactile sensibility and the sense of locality. Increased tactile sensibility is termed hyperpselaphesia, and is a rare phenomenon in nervous diseases. Paralysis of the tactile sense is called hypopselaphesia, whilst its entire loss is apselaphesia. Brown-Séquard mentions a case in which contact of two points gave rise to a sense of a third point of contact. Certain conditions of the nerve centres affect the senses both of touch and temperature. Under the influence of morphia the person may feel abnormally enlarged or diminished in size. As arule the senses are affected simultaneously, but cases occur where one may be affected more than the other. Herzen states that ‘limbs which are sleeping” feel heat and not cold (Landois).

Pain.—In addition to sensations of touch and of temperature referred to the skin, there is still a third kind of sensation unlike either, namely, pain. This sensation cannot be supposed to be excited by irritations of the end-organs of touch, or of specific thermal end-organs (if there be such), but rather to irritation of ordinary sensory nerves, and there is every reason to believe that painful impressions make their way to the brain along spinal tracks in the spinal cord. If we consider our mental condition as regards sensation at any moment, we notice numerous sensations more or less definite, not referred directly to the surface, nor to external objects, such as a feeling of general comfort, free or im- peded breathing, hunger, thirst, malaise, horror, fatigue, and pain. These are all caused by the irritation of ordinary sensory nerves in different localities, and if the irritation of such nerves, by chemical, thermal, mechanical, or nutritional stimuli, passes beyond a certain inaximum point of intensity the result is pain. Irritation of a nerve, in accordance with the law of ‘‘ peripheral reference of sensation,” will cause pain. Sometimes the irritation applied to the trunk of a sensory nerve may be so intense as to destroy its normal function, and loss of sensation or anesthesia results. If then the stimulus be increased further, pain is excited which is referred to the end of the nerve, with the result of producing what has been called anzsthesia dolorosa. Pains frequently cannot be distinctly located, probably owing to the fact of irradiation in the nerve centres and subsequent reference to areas of the body which are not really the seat of irritations. Theintensity of pain depends on the degree of excitability of the sensory nerves, whilst its mas- siveness depends on the number of nerve fibres affected. The quality of the pain is anal produced by the kind of irritation of the nerve, as affected by the structure of the part and the greater or less continuance of severe pressure. Thus there are piercing, cutting, boring, burning, throbbing, pressing, gnawing, dull, and acute varieties of pain. Sometimes the excitability of the cutaneous nerves is so great that a breath of air or a delicate touch may give rise to suffering. This hyperalgia is found in inflammatory In neuralgia the pain is characterized by its character of shooting along the course of the nerve and by

severe exacerbations, In many nervous diseases there are dis- ordered sensations referred to the skin, such as alternations of heat and cold,

burning, creeping, itehing, and a feeling as if inseets were crawling on the surface (formieation). This condition is termed paralgia. The term hypalgia is applied to a diminution and analgia to paralysis of pain, as is produced by anestheties. MuscuLar Sense.—The sensory impressions considered in this article are elosely related to the so-ealled muscular sense, or that sense or feeling by which we arc aware of the state of the muscles of a limb as regards eontraction or relaxation. Some have held that the muscular sense is really due to greater or less stretching of the skin and therefore to irritation of the nerves of that organ. That this is not the case is evident from the faet that disordered move- ments indicating perversion or loss of this sense are not affeeted by removal of the skin (Claude Bernard). Further, cases in the human being have been noticed where there was an entire loss of cutaneous sensibility whilst the muscular sense was unimpaired. It is also known that muscles possess sensory nerves, giving rise, in eertain circumstanees, to fatigue, and, when strongly irritated, to the pain of cramp. Muscular sensations are really excited by irritation of sensory nerves passing from the muscles themselves. We arc thus made conseious of whether or not the museles are eontracted, and of the amount of eontraction necessary to overcome resistanee, and this knowledge enables us to judge of the amount of voluntary im- pulse. Loss or diminution of the museular sense is seen in chorea and especially in locomotor ataxy. Increase of it is rare, but it is seen in the curious affection called anxietas tibiarum, “a painful eon- dition of unrest, whieh leads to a continual change in the position of the limbs” (Landois). See also PaysioLoay. (J. G. M.)

TOUL, a town of France, chef-lieu of an arrondissement in the department of Meurthe-et-Moselle, on the left bank of the Moselle, 199 milés east of Paris by the railway to Nancy, at the point where the Marne Canal joins those of the Rhine and the East. The isolated hills of St Michel and Barine respectively rise 548 feet and 574 feet above the town, which is a stronghold of the first order, the centre of an entrenched camp protected by numerous forts and redoubts, and a link in the chain of fortifications which extends from Verdun to Belfort. The light and elegant church of St Etienne (formerly the cathedral) has a fine choir and transept, dating from the 13th century ; the nave and aisles are of the 14th, and the beautiful recently restored fagade and the towers (246 feet) of the 15th. The interior (118 feet in height, 289 in length, and 89 in width) has fine glass, a remarkable

organ-loft, and some interesting monuments. charming Gothic cloister (13th and 14th centuries) were much damaged during the Revolution. The choir and transept of St Gengoult, a fine church of the 13th century with a fagade of the 15th, contain some interesting 13th- century glass ; and the light groups of supporting columns, and the sculptures in the cloisters (first half of the 16th century), should also be mentioned. The old episcopal palace (18th century) is now used as the town-hall ; it contains the museum and library, in which is preserved the golden bull by which the emperor Charles IV. in 1367 contirmed the liberties of the city. The population, 9632 in 188], was 9981 in 1886 (commune 10,459).

Toul (Zudiwm) is one of the oldest towns of France; originally capital of the Leuei, in the Belgic eonfederation, it acquired great importanee under the Romans. It was evangelized by St Mansuy in the latter half of the 4th century, and beeame one of the leading sees of north-east Gaul. After being sacked successively by Goths, Burgtindians, Vandals, and Huns, Toul was conquered by the Franks in 450. Under the Merovingians it was governed by counts, assisted by elective officers. The bishops, who had beeome increasingly powerful, were invested with sovereign rights in the 10th century, holding only of the emperor, and for a period of 300 years (18th to 16th centuries) the citizens maintained a long struggle against them. The town was forced to yield for a time to the count of Vaudemont in the 12th eentury, and twice to the duke of Lorraine in the 15th, and was thrice devastated by the plague in the 16th, Charles V. made a solemn entry into the town in 1544, but in the following year, at the instance of the Cardinal de Lorraine, it placed itself under the perpetual protection of the kings of France. Henry II. took possession in 1552, but the town with its territory was not officially incorporated with France till 1648. Henry IV. was received in state in 1603, and in 1637 the parlement of Metz was transferredto Toul. In 1700 Vauban recon-

structed the fortifications of the town, and in 1790 the bishopric was suppressed and the diocese united to that of Nancy. Toul eapitulated in

1870, after a bombardment of twelve days from heights now inelnded in the new fortifications.

TOULON, a French fortress of the first class, chef-lieu of an arrondissement in the department of Var, of the 5th naval arrondissement, and of a military subdivision, is situated on the Mediterranean, 42 miles east-south-east of Marseilles by the railway to Nice. The bay, which opens to the east, has two divisions, the “grand rade” and the “petite rade”; it is sheltered on the north and west by high hills, closed on the south by the peninsula of Capes Sicié and Cépet, and protected on the east by a huge

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Environs of Toulon.

break water,—the entrance, 1300 feet wide, being defensible by torpedoes. A ship coming from the open sea must first pass the forts of St Marguerite, of Cape Brun, of La Malgue, and of St Louis to the north, and the battery of the signal station to the south; before reaching the petite rade it must further pass under the guns of the battery of Le Salut to the east, and of the forts of Balaguier and L’Eguillette to the west. The Bay of La Seyne lies west of the petite rade, and is defended by the forts of Les Six-Fours, Napoleon (formerly Fort Cairo), and Malbous- quet, and the batteries of Les Arénes and Les Gaus. To the north of Toulon rise the defensive works of Mont Faron and Fort Rouge, to the east the forts of Artigues and St Catherine, to the north-east the formidable new fort of Le Coudon, and to the south-east that of La Colle Noire, respectively dominating the highway into Italy and the valley of Hyéres with the Bay of Carqueyranne. The port of Toulon consists of the old dock, of which one-third is reserved for the national navy, a new dock, wholly so devoted, a harbour capable of receiving trading vessels drawing from 16 to 18 feet, but only used for car- goes of wood and wine, and the Castigneau dock. The naval arsenal (including the arsenal of Castigneau, which is contiguous with it, in the direction of La Seyne) extends over 4 miles, has an area of 667 acres, and employs from 12,000 to 13,000 men. It contains the offices connected with the administration of the port, the office of naval construction, a well-stored naval museum, and a

great variety of workshops. These last include a rope-work 1050 × 66 feet, covered building yards, careening basins, forges, armourers' and joiners' shops, general magazines, recoustructed ona fireproof principle since the conflagra-

tion of 1793, in which are stored all materials required in the arsenal and on board ship, a park of artillery, a splendid collection of arms, and separate storehouses for various classes of rigging. The Castigneau arsenal con- tains the navy bakery of twenty ovens, capable of cooking 600,000 rations daily, the foundry and_boiler-making works, engineers' workshops, forges, three large careening basins, a washing house, a slaughter house, stores of pro- visions, coals, anchors and machinery, and the like. The Mourillon arsenal, to the south-east of the town, has stores of wood, building yards, and appliances for naval con- struction in wood and iron. The town, enlarged to the north under the second empire, has on that side a fine new quarter; but in the old town the streets are for the most part narrow, crooked, and dirty, and to their insanitary state the cholera epidemic of 1884 has been attributed. The chief buildings are the old cathedral of St Marie Majeure, the church of St Louis, the town-hall, the theatre (seating 2000 persons), the museum, the library (18,000 volumes), the naval and military hospital, with a natural history collection and an anatomical museum attached, a naval school of medicine, a school of hydrography, and large barracks. The imports are wine (2,470,000 gallons in 1881), corn, wood, coal, hemp, iron, sugar, coffee, and fresh fish; the exports are salt, copper ore, barks for tanning, and oils. In 1882 the movement of the port was represented by 280 vessels (41,000 tons). The in- teresting buildings and gardens of the hospital of St Mandrier stand on the peninsula of Cape Cépet, and near them is the lazaretto. In 1881 the population of Toulon was 48,832, and in 1886 it was 53,941, exclusive of 12,487 soldiers, sailors, &c. (commune 70,122).

The Roman Telo Martius is supposed to have stood near the lazaretto. The town was successively sacked by Goths, Burgun- dians, Franks, and Saracens. During the early Middle Ages, and till conquered by Charles of Anjou in 1259, it was under lords of its own, and entered into alliance with the republics of Marseilles and Arles. St Louis, Louis XII., and Franeis I.

strengthened its fortifications. It was seized by the emperor Charles V. in 1524 and 1536. Henry IV. founded a naval arsenal at Toulon, which was further strengthened by Richelieu, and Vauban made the new doek, a new eneeinte, and several forts and batteries. In 1707 the town was unsuccessfully besieged by the duke of Savoy, Prince Eugene, and an English fleet. In 1721 there was an outbreak of the plague. In 1792, after great and sanguinary disorder, the royalists of the town sought the support of the English and Spanish fleets eruising in the neighbourhood. The eonvention having replied by putting the town ‘‘ hors la loi,” the inhabitants opened their harbour to the English. The army of the republic now laid siege to the town, and it was on this oecasion that Napoleon Bona- parte first made his name as a soldier. The forts eommanding the town having been taken, the English ships retired after setting fire tothearsenal. Theconflagration was extinguished by the prisoners, but not before 38 out of a total of 56 vessels had been destroyed. Under the Directory Toulon became the most important French mili- tary fort on the Mediterranean ; it was here that Napoleon organized the Egyptian campaign, and the expedition against Algiers set out from Toulon in 1830. The fortifications have been strengthened by Napoleon I., Louis Philippe, Napoleon III., and since 1870.

TOULOUSE, chef-lieu of the French department of Haute-Garonne, 478 miles south from Paris and 160 south- east from Bordeaux, stands on the right bank of the Garonne, which here describes a bold outward curve to the east. On the left bank is the Faubourg St Cyprien. The river is spanned by three bridges, —that of St Pierre to the north, that of St Michel towards the south, and tlie Pont Neuf in the centre ; the last-named, a fine construction of seven arches, was begun in 1543. The city is peculiarly subject to great floods, such as that of 1855, which de- stroyed the suspension bridge of St Pierre, or the still more disastrous one of June 1875, which, besides carrying away that of St Michel, laid the Faubourg St Cyprien under water, destroyed 7000 houses, and drowned 300 people. East and north of the city runs the great Canal du Midi (from the Mediterranean), which here joins the Garonne.

Between this canal and the city proper extends the long line of boulevards (Boulevards Lacrosses, d’Arcole, du 22 Sen- tembre, é&c.) leading by the

Allée St Etienne to the Boulid- grin, whence a series of allées shoot out in all directions. South-west the Allée St Michel leads towards the Garonne, and south the Grande Allée towards the Faubourg St Michel. These boulevards take the place of the old city walls. Between them and the canal lie the more modern

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Plan of Toulouse.

The more ancient part of the city consists of narrow irregu- lar pebble-paved streets. Most of the houses are of brick, and none of any great architectural pretensions, except those which date back at least to the 17th century. In 1868 the municipal authorities determined to construct two entirely new streets, broad and straight, intended to cut one another at right angles near the centre of the city. Of these the first, the Rue de Metz, starts eastward from the Pont Neuf, and will ultimately intersect the Rue d'Alsace- Lorraine running from north to south. These alterations, however, go on very slowly. The Place du Capitole may be regarded as the centre, whence streets branch out in every direction. Eastward and north-east the Rue La Fayette leads across the boulevards towards the Allée La Fayette, beyond which, across the Canal du Midi, are the Kole Vétérinaire and the railway station, and still farther off the obelisk erected to commemorate the battle of Toulouse (April 10, 1814), and the observatory. From the north-west of the Place du Capitole the Rue du Taur runs due north past the ancient Eglise du Taur to the great Kglise St Sernin, the largest and most famous church of southern France. From the north-west corner of the same Place the Rue des Lois conducts towards the Ecole de Droit and the arsenal. Ina more westerly direction the Rue Pargamin- iére stretches towards the venerable church and the bridge of St Peter From the south-west corner the Rue des Balances extends towards the Rue de Metz and the Pont Neuf. From the south the Rue St Rome, Rue des Changes, and Rue des Filatiers lead to the Place des Carmes or de la République ; while from the south-east corner the Rue de la Pomme and the Rue Boulbonne lead across the Rue d'Alsace-Lorraine to the cathedral of St Stephen. In the

south of the city lies the palais de justice, near which are the ancient church.of the Inquisition and several of the finest houses in Toulouse. Going northwards, the traveller passes the Eglise de la Dalbade on his way towards the Pont Neuf, immediately to the north of which is the Eglise de la Daurade. North of this church, but somewhat farther from the river, is the military hospital, to the immediate east of which lie the lycée, the church of the Jacobins, and the public library. South-east from this, about half- way towards the cathedral, is the museum. North of the military hospital and beyond the Rue Pargaminiére lie the arsenal and the Faubourg St Pierre. Slightly to the north- west of the Pont St Pierre the Canal de Brienne (finished 1778) cuts across the angle formed hy the Garonne and Canal du Midi. Between the Canal de Brienne and the Garonne is the chief manufacturing part of the city, where the great Bazacle flour-mill stands. Along the right bank of the river run the various quays of St Pierre, &e. In the Faubourg St Cyprien, just north of the Pont Neuf, is the Hotel Dieu St Jacques, said to have been founded before the 12th century, with its large gardens. Close to the Pont St Pierre is the hospital of St Joseph de la Grave, which makes up 1432 beds, and affords shelter to found- lings and the aged. South of the Allée St Michel is the Jardin des Plantes, founded by the ill-fated La Pérouse. The most interesting building is the church of St Sernin or Saturninus, whom legend represents as the first preacher of the gospel in Toulouse, where he was perhaps martyred towards the middle of the 3d century. The oldest part of the present building was consecrated by Urban II. in 1096. This church is now the largest edifice of southern France, being 375 feet from east to west and 217 feet in its utmost breadth. The nave (12th and 13th cen- turies) is remarkable for having double aisles. Four pillars, sup- porting the central tower, are surrounded by heavy masonry, which somewhat spoils the general harmony of the interior. In the southern transept is the “ portail des comtes,” so named because hear it lie the tombs of William Taillefer, Pons, and other early counts of Toulouse. The little chapel in which these tombs (as- cribed to the 11th century) are found was restored by the capitols of Toulouse in 1648. Another chapel contains a Byzantine Christ of late 11th-century workmanship. The choir (11th and

12th cen- turies) ends in an apse, or rather chevet, surrounded by a range of columns, marking off an aisle which in its turn opens into five chapels. The stalls are of 16th-century work and very grotesquely carved. Against the northern wall is an ancient table d'autel, which an 11th-century inscription declares to have belonged to St Sernin. In the crypts are many relics, which, however, were robbed of their gold and silver shrines during the Revolution. 'he finest gate is on the south, and is surmounted by a fine representation of the Ascension in Byzantine style. The capitals of the St Sernin pillars are sometimes ornamented with leaves and sometimes with grot- esque animals, &c. The belfry consists of five stories, of which the two highest are of later date, but harmonize very well with the three lower ones. The cathedral, dedicated to St Stephen, datcs from three different epochs. The nave, commenced by Raymond VI. towards the beginning of the 13th century, still displays the sculptured arms of its founder, and a few years ago preserved the pulpit in which St Bernard and St Dominic are said to have preached. The choir, commenced by Bertrand de Lille (c. 1272), was burned in 1609, but restored in the same century. It is sur- rounded by seventeen chapels, which were finished by the Cardinal d'Orléans, nephew of Louis XI , towards the beginning of the 16th century. These chapels are adorned with glass dating from the 15th to the 17th century. The great western gate was constructed by Peter du Moulin, archbishop of Toulouse, from 1439 to 1451. It has been greatly battered, and presents but a poor approximation to its ancient beauty. Over this grand gate, which was once ornamented with the statues of St Sernin, St Exuperius, and the twelve apostles, as well as those of the two brother archbishops of Toulouse, Denis (1423-1439) and Peter du Moulin, there is a beauti- ful 13th-century rose-window, whose centre, however, is not in a perpendicular line with the point of the Gothic arch below. In the same way the choir and the nave have not the same axis. Among other remarkable churches may be noticed those of St Pierre des Cuisines (12th century), with its beautifully sculptured eapitals; of Notre Dame de la Daurade, near the Pont Neuf, built on the site of a 9th-century Benedictine abbey, but reconstructed in 1764; and of Notre Dame de la Dalbade, perhaps existing in the 11th century but in its present form dating from the 15th. The Eglise des Jacobins, held by Viollet le Duc to be 'one of the most beautiful brick churches constructed in the Middle Ages,"

was built towards the end of the 13th century, and originally con- sisted of but one structure divided into two aisles by a range of columns. It has a beautiful octagonal belfry. Before the Revolu- tion it contained the mausoleum of Thomas Aquinas. On the left of the Garonne stands the church of St Nicholas, also with an octa- gonal belfry and a spire dating from the 15th century. There are many other churches of considerable antiquity.

Of secular buildings the most noteworthy are the capitole, the museum, and the lycee. The capitole (16th-17th centuries) has a long Ionic fagade constructed by Cammas (1750-60). The theatre is situated in the left wing. Running along almost the whole length of the first floor is the ‘‘ salle des illustres” adorned with the busts of forty-four great natives of Toulouse; the word “native” has, however, been construed very liberally. In the capitole the Académie des Jeux Floraux holds its annual meetings. Themuseum (opened 1795) occupies the church and other buildings of the Augus- timian convent (14th-15th cent.). It contains a splendid collection of antiquities arranged in two cloisters, and a collection of pictures, The natural history museum is at the Jardin des Plantes. ‘The lycée occupies the group of buildings known as ‘‘Les Jacobins,” the Hotel Bernui (16th century), &c. Here is the public library (65,000 volumes).

Toulouse is singularly rich in mansions of the 16th and 17th centuries. Several of these are richly adorned by Bachelier, Michel- angelo’s pupil. The Hétels d’Assezat, de St Jean, Las Bordes, Fel- zins, Duranti, and Maison de Pierre may be specially mentioned. A few houses are said to date from the 14th century or even earlier. Near the Allée St Michel is the palais de justice, the old meeting house of the parlement of Toulouse. Close by was the old Chateau Narbonnais.

Besides its university, which ranks next to those of Paris and Lyons, and has faculties of law, science, letters, and medicine, Toulouse possesses many educational and learned societies, among which may be mentioned the Ecole des Beaux Arts et des Sciences Industrielles, the Ecole Normale, the Ecole de Musique, the Aca- démies des Jeux Floraux, des Sciences et des

Belles Lettres et Arts, and de Législation, the Société d'Agriculture, and the archeological Société du Midi.

The geographical position of Toulouse, on the plain of Languedoc, has made it the chief entrepét of the district for wine, corn, and almost all the industries of the neighbourhood. Besides the grind- ing of flour, its leading industries are cabinetmaking, hat-making, calico printing, the manufacture of pots and pans, macaroni, and starch, leather-making (morocco), cloth and paper making, glass- blowing, saddlery, and pottery. The tobacco factory occupies 1250 hands, and manufactures 1000 tons of snuff, a corresponding quantity of tobacco, and 250 tons of cigars annually.

The population of the city, 127,196 in 1881, numbered 133,775 in 1886, that of the commune being 147,617.

Tolosa (ToAéoca), chief town of the Volee Tectosages, does uot seem to have been a place of great importance during the early centuries of the Roman rule in Gaul, though one incident in its early history gave rise to the famous Latin proverb ‘‘ habet aurum Tolosanum” (Aul. Gell., iii. c. 12). It was possessed of a circus and an amphitheatre, but its most remarkable remains are to be found on the heights of Old Toulouse (vetus Tolosa) some 6 or 7 miles to the east, where huge accumulations of broken pottery and fragments of an old earthen wall mark the site of an ancient settlement. The numerous coins that have been discovered on the same spot do not date back farther than the 2d century B.c., and seem to indicate the position of a Roman manufacturing centre then beginning to occupy the Gallie hill-fortress that, in earlier days, had in times of peril been the stronghold of the native tribes dwelling on the river bank. Tolosa does not seem to have been a Roman colony; but its importance must have increased greatly towards the middle of the 4th century. Itis to be found entered in more than one itinerary dating from about this time; and Auson- ius, in his Ordo Nobilium Urbium, alludes to it in terms implying thatit then hada large population. In 419 it was taken by Wallia, king of the Visigoths, under whom or whose successors it became the seat of the great Teutonic kingdom of the West-Goths, —a king- dom that within fifty years had extended itself from the Loire to Gibraltar and from the Rhone to the Atlantic. On the defeat of Alaric II. (507) Toulouse fell into the hands of Clovis, who carried away the

royal treasures to Angouléme. Under the Merovingian kings it seems to have remained the greatest city of southern Gaul, and is said to have been governed by dukes or counts dependent on one or other of the rival kings descended from the great founder of the Frankish monarchy. It figures prominently in the pages of Gregory of Tours and Sidonius Apollinaris. About 628 Dagobert erected South Aquitaine into a kingdom for his brother Charibert, who chose Toulouse as his capital. For the next cighty years its history is obscure, till we reach the days of Charles Martel, when it was besieged by Seina, the leader of the Saracens from Spain (ec. 715-20), but delivered by Eudo, ‘‘princeps Aquitaniz,” in whom later writers discovered the ancestor of all the later counts of Toul- ouse. Modern criticism, however, has discredited this genealogy ;

and the real history of Toulouse recommences in 780 or 781, when Charlemagne appointed his littie son Louis king of Aquitaine, with Toulouse for his chief city.

During the minority of the young king his tutor Chorson ruled at Toulouse with the title of duke or count. Being deposed at the eouncil of Worms (790), he was succeeded by William Courtnez, the traditional hero of southern Franee, who in 806 retired to his newly founded monastery at Gellone, where he died in 812, In the un- happy days of Louis the Pious and his children Toulouse suffered in common with the rest of western Europe. It was besicged by Charles the Bald in 844, and taken four years later by the Normans, who in 848 had sailed up the Garonne as far as its walls. About 852 Raymond I., eount of Querci, succeeded his brother Fridolo as count of Rouergue and Toulouse; it is from this uoble that all the later counts of Toulouse trace their deseent. Raymond I.’s grandchildren divided their parent’s estates; of these Raymond IL, the elder (d. 924), became eount of Toulouse, and Ermengaud, the younger, count of Rouergue, while the hereditary titles of Gothia, Querei, and Albi were shared between them. Raymond II. ’s grand- son, William Taillefer (d. c. 1037), married Emma of Provence, and handed down part of that lordship to his younger son Bertrand.! William’s elder son Pons left two children, of whom William IV. sueceeded his father in Toulouse, Albi, Querci, &c.; while the younger,

Raymond IV. of St Gilles (c. 1066), made himself master of the vast possessions of the counts of Rouergue, married his eousin the heiress of Provence, and about 1085 began to rule the immense estates of his elder brother, who was still living.

From this time the counts of Toulouse were the greatest lords in sonthern France. Raymond IV., the hero of the first crusade, assumed the formal titles of marquis of Provence, duke of Nar- bonne, and count of Toulouse. While Raymond was away in the Holy Land, Toulouse was seized by William IX., duke of Aquitaine, who claimed the city in right of his wife Philippa, the daughter of William IV., but was unable to hold it long (1098-1100). Raymond's son and successor Bertrand followed his father's exaniple and set out for the Holy Land in 1109, leaving his great estates at his death to his brother Alphonsc-Jourdain. The rule of this prince was disturbed by the ambition of William IX. and his grand- daughter Eleanor, who urged her husband Louis VII. to support her claims to Toulouse by war. On her divorce from Louis and her marriage with Henry II., Eleanor's claims passed on to this monarch, who at last forced Raymond V. to do him homage for Toulouse in 1178. Raymond V., the patron of the troubadours, died in 1194, and was succeeded by his son Raymond VI., under whose rule Languedoc was desolated by the remorseless crusaders of Simon de Montfort. Raymond VII., the son of Raymond VI. and Princess Joan of England, succeeded his father in 1222, and died in 1249, leaving an only daughter Joan, married to Alfonso the brother of Louis IX. On the death of Alfonso and Joan in 1271 the vast inheritance of the eounts of Toulouse lapsed to the crown.?

From the middle years of the 12th century the people of Toulouse seem to have begun to free themselves from the most oppressive feudal dues. An act of Alphonse-Jourdain (1141) exempts them from the tax on salt and wine; and in 1152 we have traces of a "commune consilium Tolose" making police ordinances in its own name " with the advice of Lord Raymond, count of Toulouse, duke of Narbonne, and marquis of Provence." This act is witnessed by six ''capitularii," four duly appointed judges (judices constituti), and two advocates. Twenty-three years later there are twelve eapitularii or consuls, six for the city and six for its suburbs, all of them elected and sworn to do justiee in whatever municipal matters were brought

before them. In 1222 their number was increased to twenty-four; but they were forbidden to touch the city property, which was to remain in the eharge of certain “commun- arli” chosen by themselves. Early in the 14th century the consuls took the name of ‘‘domini de capitulo,” or, a little later, that of ‘‘capitulum nobilium.” From the 13th century the consuls met in their own house, the ‘‘palatium commmunitatis Tolose ” or hétel- de-ville. In the 16th century a false derivation changed the ancient consuls (domint de capitulo) into the modern “‘ capitouls ” (domini capitolit Tolosant), a barbarous etymology which in its turn has, in the present eentury, transformed the old assembly house of Toulouse into the capitole.

_ The parlement of Toulouse was established as a permanent court in 1448. Louis XI. transferred it to Montpellier in 1467, but restored it to Toulouse before the close of the next year. This

1 About 975 there was a partition of the estates which William Taillefer and his cousin Raymond I1. of Auvergne held in common,—Albi, Querci, &c., falling to William, and Gothia, &c., to Raymond.

2 List of the counts of Toulouse, mainly from De Vic and Vaissete :—

Chorson…....00+. 778-790 | Raymond II.. 918-924 | Bertrand…..... 1096-1109 SWiilliainitece…:. seco 790-806 | Raymond Ill. 924-c.950 | Alphonse-Jour-

eertes | Garsende, for GAIN ee cscees ss 1109-1148 Berenger sees 817-835 herson:.-... c.950-c. 975 | Raymond V…. 1148-1194 Ecfrid Lace . 835-845 | William Tail- Raymond VI… 1194-1222 Fridolo… . 845-852 1Gfereeesr.se: c.975-c.1037 | Raymond VII. 1222-1249 Raymond f…..... 852-864 | Pons…...-..00 1037-1060 | Alfonso and Bernard COURSED 864-875 | William IV… 1060-c.1093 ORM sc. cose.c08 1249-1271 WO se icncesesessses 875-918 | Raymond IV. 1093-1105

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parlement was for Languedoc and southern France what the parle- ment of Paris was for the north. Towards the end of the 16th cen- tury, during the wars of the League, it was split up into three different sections, sitting respectively at Carcassonne or Beziers, at Castel Sarrasin, and at Toulouse. The three were reunited in 1596. Under Francis I. it began to perseeute heretics, and in 1618 rendered itself notorious by burning the philosopher Vanini. The univer- sity of Toulouse owes its origin to the action of Gregory IX., who in 1229 bound Raymond VII. to maintain four masters to teaeh theology and eight others for canon law, grammar, and the liberal arts. Civil law and medicine were taught only a few years later. The famous ‘‘ Floral Games” of Toulouse, in which the poets of Languedoc contended (May 1-3) for the prize of the golden violet and other gold or silver flowers, given at the expense of the city, were instituted in 1323-24.

See, besides the various guide-books, De Vie and Vaissete, Histotre de Lan- guedoc, ed. 1878 sq.; Catel, Histoire de Toulouse, 1623; La Faille, Histoire de Toul- ouse, 1687, 1701; Du Mége, Histoire des Institutions de Toulouse, 4 vols., 1844— 46; D’Aldeguier, Histotre de la Ville de Toulouse, 1833-35, (T. A. -A.)

TOUNG-NGU, a district in the extreme north of the Tenasserim division of Burmah, with an area of 6354 square miles, and lying between 17° 37’ and 19° 28’ N. lat., and between 95° 53’ and 96° 53’ E. long. It is bounded on the N. by Upper Burmah, on the E. by a high mountain range known as the “Great Watershed,” on the S. by Shwe-gyeng district, and on the W. by the Pegu Yomas. Three mountain ranges traverse the district—the Pegu Yomas, the Poung-loung, and the Nat-toung or “Great Watershed,”—all of which have a north and south direc- tion, and are covered for the most part with dense forest. The Pegu Yomas have a general elevation of from 800 to 1200 feet, while the central range averages from 2000 to 3000 feet. The rest of Toung-ngt forms the upper portion of the valley of the Tsit-toung (Sittang) river, the only large river in the district, the chief tributaries of which are the Tshwa, Khaboung, Hpyu, Thouk-re-gat, and Rouk- thwa-wa, all being navigable for a great portion of their course. Limestone appears in various places, and in the north-east a light grey marble is quarried for lime. The rivers form the chief means of communication during the rainy season. Of

late years some good roads have been constructed, and the Burmah State Railway, when com- pleted, will intersect the district from south to north.

In 1881 the population numbered 128,848 (males 68,484, females 60,364), of whom 93,997 were Buddhists, 17,448 Christians, 2086 Hindus, 1962 Mohammedans, and 12,612 aborigines. The only town in the district is Toung-ngt, on the Tsit-toung river in 18° 55’ 24” N. lat. and 96° 31’ 4” E. long., with a population of 17,199 in 1881. Of the total area only 59 square miles are actually under cultivation, owing mainly to the hilly nature of the country. Rice is the chief produet; other crops include oil-seeds, sugar-cane, cotton, fruit, and vegetables. The principal manufactures are silk, saltpetre, and gunpowder. In 1885-86 the gross value of the district was £15,098, of which the land produced £5880.

TOUR, Maurice QUENTIN DE LA (1704-1788), the renowned pastellist, was born at St Quentin on the 5th September 1704. On leaving Picardy for Paris he entered the studio of an artist nanied Du Pouclie, and then that of Spoéde,—an upright man, but a poor inaster, rector of the Academy of St Luke, who still continued, in the teeth of the Royal Academy, the traditions of the old guild of the master-painters of Paris. This possibly contributed to the adoption by De la Tour of a line of work foreign to that imposed by an academical training ; for pastels, though occasionally used, were not a principal and distinct branch of work until 1720, when Rosalba Carriera brought them into fashion with the Parisian world. In 1737 De la Tour exhibited the first of that splendid series of a hundred and fifty portraits which formed the glory of the Salon for the succeeding thirty-seven years. In 1746 he was received by the Academy; and in 1751, the following year to that in which he received the title of painter to the king, he was promoted by that body to the grade of councillor. His work had the rare merit to satisfy at once both the taste of his fashionable models and the judgment of his brother artists. His art, consummate of its kind, achieved

the task of flattering his sitters, whilst hiding that flattery behind the just and striking likeness which, says Mariette, he hardly ever missed. His portraits of Rousseau, of Voltaire, of Louis XV., of his queen, of the dauphin and dauphiness, are at once documents and masterpieces un-

surpassed except by his life-size portrait of Madame de Pompadour, which, exhibited at the Salon of 1755, is still the chief ornament of the cabinet of pastels in the Louvre. It is and will probably always be the most perfect model of this class of work as long as time and damp spare the fragile dust to which it owes its beauty. The museum of St Quentin, however, also possesses a magnificent collection of works which at his death were in his own hands. De la Tour retired to St Quentin at the age of 80, and there he died on 17th February 1788. The riches amassed dur- ing his long life were freely bestowed by him in great part before his death ; he founded prizes at the school of fine arts in Paris and for the town of Amiens, and endowed St Quentin with a great number of useful and charitable institutions. He never married, but lived on terms of warm affection with his brother (who survived him, and left to the town the drawings now in the museum) ; and his relations to Mdlle. Fel, the celebrated singer, were dis- tinguished by a strength and depth of feeling not common to the loves of the 18th century.

Sec, in addition to the general works on French art, Desmaze, three works, of which the most important is Le Reliquaire de la Tour; Guiffrey and Tourneux, Correspondance Inédite de M. Q. de la Tour; Champfleury, De la Tour, and Peintres de Laon et de St Quentin; and Dréolle de Nodon, Eloge Biographique de M. Q. de la Tour.

TOURACO, the name, evidently already in use, under which in 1743 Edwards figured a pretty African bird,} and presumably that applied to it in Guinea, whence it had been brought alive. It is the Cuculus persa of Lin-

; Ba \ v = Pd iy White-Crested Touraco (Turacus albicristatus). After Schlegel.

neus, and 7’wracus or Corythaix persa of later authors, who perceived that it required generic separation. Cuvier, in 1799 or 1800, Latinized its native name (adopted in the meanwhile by both French and German writers) as above, for which barbarous term Illiger, in 1811, substituted a

1 Apparently the first ornithologist to make the bird known was Albin, who figured it in 1788 from the life, yet badly, as ‘‘ The Crown- bird of Mexico.” He had doubtless been misinformed as to its proper country; but Touracos were called ‘‘ Crown-birds”’ by the Europeans in West Africa, as

witness Bosman’s Description of the Coast of Guinea (1721), ed. 2, p. 251, and W. Smith’s Voyage to Guinea (1745), p. 149, though the name was also given to the Crowned Cranes, Balearica.

more classical word. In 1788 Isert described and figured (Beobacht. Gesellsch. naturf. Freunde, iii. pp. 16-20, pl. 1) a bird, also from Guinea, which he called Musophaga violacea. Its affinity to the original Touraco was soon re- cognized, and both forms have been joined by modern sys- tematists in the Family Musophagide, commonly Englished Plantain-eaters or Touracos, sometimes spelt Tourakoos.

To take first the Plantain-eaters proper, or the genus Musophaga, of which only two species are known. Oue about the size of a Crow is comparatively common in museums, and is readily recog- nized by having the horny base of its fine yellow bill prolonged backwards over the forehead in a kind of shield. The top of the head, and the primaries, except their outer edge and tip, are deep crimson ; a white streak extends behind the eye; and the rest of the plumage is of a rich glossy purple. The second species, MV. ross&, Which is rare, chiefly differs by wanting the white eye-streak, Then of the Touracos—the species originally described is about the size of a Jay, and has the head, crest (which is vertically com- pressed and tipped with red), neck, and breast of a fine grass-green, varied by two conspicuous white streaks—one, from the gape to the upper part of the crimson orbit, separated by a black patch from the other, which runs beneath and behind the eye. The wing- coverts, lower part of the back, and tail are of a bright steel-purple, the primaries deep crimson, edged and tipped with bluish-black. Over a dozen other congeneric species, more or less resembling this, have now been described, and all inhabit some district of Africa; but there is only room here to mention that found in the Cape Colony and Natal, where it is known as the ‘‘ Lory” (ef. vol. xv. p. 7, note 1), and, though figured by Daubenton and others, first differentiated in 1841 by Strickland (Ann, Nat. History, vii. p. 33) as Turacus albicristatus—its crest having a conspicuous white border, while the steel-purple of 7’. persa is replaced by a rich and glossy bluish-green of no less beauty. In nearly all the species of this genus the nostrils are almost completely hidden by the frontal feathers;

but there are two others in which, though closely allied, this is not the case, and some systematists wonld place them in a separate genus Gallirex; while another species, the giant of the Family, has been moved into a third genus as Corythgola cristata. This differs from any of the foregoing by the absence of the crimson coloration of the primaries, and seems to lead to another group, Schizorrhis, in which the plumage is of a still plainer type, and, moreover, the nostrils here are not only exposed but in the form of a slit, instead of being oval as in all the rest. This genus contains about half a dozen species, one of which, S. concolor, is the Grey Touraco of the colonists in Natal, and is of an almost uniform slaty- brown. A good deal has been written about these birds, which form the subject of one of the most beautiful monographs ever published —De Tocrako'‘s afgebeld en beschreven,—by Schlegel and Westerman, brought out at Amsterdam in 1860; while the latest collected information is contained in an elaborate cssay by Herr Schalow (Jour. f. Ornithologie, 1886, pp. 1-77). Still, much remains to be made known as to their distribution throughout Africa, and their habits. They seem to be all fruit-eaters, and to frequent the highest trees, seldom coming to the ground. Very little can be confidently asserted as to their nidification, but at least one species of Schizorrhis is said to make a rough nest and therein lay three eggs of a pale blue colour. An extraordinary peculiarity attends the crimson coloration which adorns the primarics of so many of the Musophagide. So long ago as 1818, Jules Verreaux observed (Proc. Zool. Society, 1871, p. 40) that in the case of 7'. albicristatus this beautiful hue vanishes on exposure to heavy rain and reappears only after some interval of time and when the feathers are dry.?

The Musophagide form a very distinct Family of Prof. Huxley's Coccygomorphx, having perhaps the Colidex and Cuculide as their nearest allies. Eyton pointed out (Ann. Nat. History, ser. 3, ii. p. 458) a feature possessed in common by the latter and the Musophagidz, in the ‘‘ process attached to the anterior edge of the ischium," which he likened to the so-called ‘“ marsupial" bones of Didelphian Mammals. J. T. Reinhardt has also noticed (Vidensk. Meddels. Naturhist. Forening, 1871, pp. 326-341) another Cuculine character offered by the os uncinatum affixed

2 The fact of this colouring matter being soluble in water was inci- dentally mentioned at a meeting of the Zoological Society by Mr Tegetmeier, and

brought to the notice of Prof. Church, who, after experiment, published in 1868 (Student and Intellectual Observer, i. pp. 161-168) an account of it as “ Tnracin, a new animal pigment con- taining copper.” Further information on the subject was given by Monteiro (Chem. News, xxviii. p. 201; Quart. Jour. Science, ser. 2, iv. p. 132). The property is possessed by the crimson feathers of all the Lirds of the Family.

to the lower side of the ethmoid in the Plantain-eaters and Touracos; but too much dependence must not be placed on that, since a similar structure is presented by the FRicaTs-BirD (vol. ix. p. 786) and the Perrexs (vol. xviii. p. 711). A corresponding process seems also to be found in TroGon (q.v.). The bill of nearly all the species of Musophayidx is curiously serrated or denticulated along the margin, and the feet have the outer toe reversible. No inember of the Family is found outside of the conti- nental portion of the Ethiopian Region. (A. N.)

TOURCOING, a manufacturing town of France in the department of Nord, 7 miles north-east of Lille on the railway to Ghent, is rapidly becoming one with the neigh- bouring town of Rovupaix (q.v.). Wool, cotton, linen, and silk are spun in more than 65 mills (40,000 spindles) ; there are upwards of 25 combing establishments (by machine and hand), 50 to 55 manufactories of velvet-pile carpets, furniture stuffs, and all kinds of woven goods, be- sides dye-works, soap-works, a sugar refinery, and machine workshops. The total industrial production of Tourcoing may be set down at about £6,800,000 per annum. Tour- coing possesses a chamber of commerce, a conseil de prud- hommes, a consultative chamber of arts and manufactures, a wool ‘‘conditioning” bureau, schools of drawing, paint- ing, music, and architecture, and a horticultural society. In 1866,a pyramid was erected to commemorate a battle gained by Jourdan and Moreau in the neighbourhood in 1794. The population, 34,415 in 1881, was 41,570 in 1886 (commune 58,008).

Famed since the 14th century for its woollen manufactures, Tourcoing was fortified by the Flemings when Louis XI. of France disputed the inheritance of Charlesthe Bold with Mary of Burgundy. The town suffered much from the French in 1477, from the Huguenots in 1556, aud by fire in 1607 and

1711. The inhabitants, 18,000 in 1789, were reduced by the French Revolution to 10,000, but a new era of prosperity hegan in 1832. In 1801 the popula- tion of the commune was 23,493, and in 1871 it was 43,322.

TOURGUENTEFYF, Ivan (1818-1883), the descendant of an old Russian fainily, was born at Orel, in the govern- ment of the same name, in 1818. His father, the colonel of a cavalry regiment, died when our author was sixteen years of age, leaving two sons, Nicholas and Ivan, who were brought up under the care of their mother, the heiress of the Litvinoffs, a lady who owned large estates and many serfs. Ivan studied for a year at the university of Mos- cow, then at St Petersburg, and was finally sent in 1843 to Berlin. His education at home had been conducted by German and French tutors, and was altogether foreign, his mother only speaking Russian to her servants, as became a great lady of the old school. For his first acquaintance with the literature of his country the future novelist was indebted to a serf of the family, who used to read to him verses from the Rossiad of Kheraskoff, a once-celebrated poet of last century. Tourguenieff's early attempts in literature, consisting of poems and trifling sketches, may be passed over here ; they were not with- out indications of genius, and were favourably spoken of by Bielinski, then the leading Russian critic, for whom Tourguenieff ever cherished a warm regard. Our author first made a name by his striking sketches "'The Papers of a Sportsman " (Zapiski Okhotnika), in which the miser- able condition of the peasants was described with startling realism. The work appeared in a collected form in 1852. It was read by all classes, including the emperor himself, and it undoubtedly hurried on the great work of eman- cipation. Tourguenieff had always sympathized with the

muzhiks; he had often been witness of the cruelties

of his mother, a narrow-minded and vindictive woman. Ta some interesting papers recently contributed to the "European Messenger " (Viestnik Evropt) by a lady brought up in the household of Mme Tourguenieff, sad

details are given illustrative of her character. Thus the dumb porter of gigantic stature, drawn with such power in Afumu, one of our author's later

sketches, was a real person. We are, moreover, told of his mother that she could never understand how it was that her son became an author, and thought that he had degraded himself. How could a Tourguenieff submit himself to be criticized ?

The next production of the novelist was “A Nest of Nobles” (Deorianskoe Gniezdo), a singularly pathetic story, which greatly increased his reputation. This ap- peared in 1859, and was followed the next year by “On the live ” (Nakanuné),—a tale which contains one of his most beautiful female characters, Helen. In 1862 was published “ Fathers and Children ” (Otzi ¢ Dieti), in which the author admirably described the nihilistic doctrines then beginning to spread in Russia, he himself inventing the word nihilism, which seems likely to become permanent. In 1867 appeared “Smoke” (Dim), and in 1877 his last work of any length, “Virgin Soil” (Nov). Besides his longer stories, many shorter ones were produced, some of great beauty and full of subtile psychological analysis, such as Rudin, “ The Diary of a Useless Man” (Dnevnik Lishnago Chelovieka), and others. These were afterwards collected into three volumes. The last works of the great novelist were “Poetry in Prose” and “Clara Milich,” which appeared in the pages of the ‘“‘ European Messenger.”

Tourguenieff, during the latter part of his life, did not reside much in Russia; he lived either at Baden Baden or Paris, and chiefly with the family of the celebrated singer Viardot Garcia, to the members of which he was much attached. He occasionally visited England, and in 1879 the degree of D.C.L. was conferred upon him by the university of Oxford. He died at Bougival, near Paris, on September 4, 1883 ; according to his wish, his remains were taken to St Petersburg, and buried in the Volkoff cemetery, near those of the critic Bielinski.

Unquestionably Tourguenieff may be considercd one of the greatest novelists of our own or any other times, and worthy to be ranked with Thackeray, Dickens, and George Eliot: with the genius of the last of these he has many affinities. His studies of human nature are profound, and he has the wide sympathies which are essential to genius of the highest order. A melancholy, almost pessimist, feeling pervades his writings, but perhaps this is always found in those who have truly listened to the “still, sad music

of humanity.” This morbid self-analysis seems natural to the Slavonic mind, and Tourguenieff has given abundant proof of possessing it. The elosing chapter of ‘‘A Nest of Nobles” is one of the saddest and at the same time truest pages in the whole range of existing novels.

The writings of Tourguenieff have been made familiar to persons unacquainted with Russian by French translations. There are some versions in English, but the only two worthy of notice are the translation of the ‘‘ Nest of Nobles” under the name of “ Lisa,” by Mr Ralston, and ‘‘ Virgin Soil,” by the late Mr Ashton Dilke.

TOURMALINE. See Execrrictrry, vol. viii. p. 99; Gxo- Locy, vol. x. p. 228; and MineRazoey, vol. xvi. p. 409.

TOURNAI (Flem. Doornik), a town of Belgium, capital of an arrondissement in the province of Hainault, 53 miles by rail west-south-west from Brussels, is divided into two parts by the Scheldt, which is here spanned by seven bridges and lined with spacious tree-shaded quays. The older, which is also the busier and more important portion of the town, stands on the left bank; the new town is distinguished by its neat regular streets and modern architecture. The cathedral, which is a fine example of the Romanesque style, is a cruciform basilica, with a series of chapels and five towers. The nave was probably consecrated in 1171; the transepts date from the 13th century; and the (Gothic) choir was completed in 1338, at which time also the Romanesque facade was altered, and a porch in the Pointed style added. The sculptures in the porch range in date from the 13th to the

17th century, and deserve special notice, particularly those of later date by native artists. The general effect of the interior is harmonious and impressive. The capitals of the pillars are rich and varied ; the passage round the choir contains several pictures of the Flemish school ; the richly sculptured Renaissance roodloft dates from 1566; and most of the stained glass in the transept dates from about 1456. The adjacent belfry, dating originally from 1187, and partly rebuilt in 1391, was restored in 1852. In the Grande Place, not far from the cathedral, is the church of St Quentin,

sometimes spoken of as “la petite cathédrale,” in the Transition style, and nearly of the same date as the cathedral. The church of St Jacques dates from the 13th and 14th centuries, and that of St Brice from the 12th. The buildings of the old monastery of St Martin, on the south-west side of the town, are now used as an hétel de ville, in connexion with which there is a small picture gallery containing some examples of Rembrandt, Rubens, and Van Dyck. The town contains courts of law, an athenzeum, a theatre, a school of arts and manufactures, an episcopal palace and seminary, a natural history museum, besides other public buildings. The fortifications of Vauban, extended after the second treaty of Paris, are now demolished, and their place taken by boulevards. The lead- ing objects of manufacture are stockings and “ Brussels” carpets ; the other industries include paper-making, thread- making, and the spinning of wool and flax. The trade of the place is very considerable, as vessels of 150 tons burden can ascend the river to this point, and its railway communications are good. The population in 1876 was

32,145.

Tournay, supposed to be the Civitas Nerviorwm of Cesar, and afterwards known as Tournacus, was onc of the first places con- quered by the Franks, and Clovis made it for a time his capital. In modern times, standing as it does on the frontier between Belgium and France, it has been frequently besieged and taken. History records specially the siege by Alexander of Parma in 1581, when it was bravely but unsuccessfully defended by the princess D’Epinoy, whose statue now stands in the Grande Place. Perkin Warbeck was a native of Tournai.

TOURNAMENTS. Tournaments and jousts were the chief military exercises and displays of the age of chivalry. Besides being the appropriate sports and pastimes of a warlike era and caste, they were intended to test the skill and exhibit the prowess of the knights and squires who took part in them. Considered under their more serious aspect, apart from their association with pomp and festivity, they were, practically speaking, the equivalents of the reviews and sham-fights of later times, and were designed as a preparation for the actual manceuvres and real conflicts of the battlefield. Tournaments and jousts differed from one another principally in

the circumstance that in the first several combatants on each side were engaged at once, and in the second the contention was between two combatants only. The former consisted of the mutual charges of equal troops of cavalry, while the latter consisted of a duel on horseback. Du Cange says that the French towrnoi, English ‘ tournament,” ‘“ was a general expression which comprehended all sorts of com- bats that were performed by way of exercise. But it more properly meant such as were performed by companies, where many were in conflict against the same number, representing the form of a battle. When those general combats were ended, then single ones commenced ; for all who were desirous of displaying their address, and attract- ing public notice for their valour, offered single combat with sword or lance against all who should present them- selves”; and he adds that these combats were called by the old French writers “ joustes,” which is the same word as the English “‘jousts.” But jousts were held far more frequently than, and quite independently of, regular

tournaments throughout the period in which the customs of chivalry were observed, and, according to some author- ities, the lance alone was used in them, while in the others all weapons except firearms were employed. In both cases such weapons were usually although not invariably rendered innocuous, and it was only rarely that the combatants were killed or injured by wounds, as distinguished from falls and bruises. But in one way or another tournaments and jousts were always extremely dangerous, and a long list of eminent persons met their deaths in them, from Raoul, Comte de Guines, to Henry IT. of France. It may be assumed that jousts in some shape existed at all periods, in which men fought in armour and on horseback, and were in the habit of practising themselves in time of peace for the exigencies of warfare. But it is very doubtful when and where tournaments, in the proper sense of the term, were originally instituted. The older writers on the subject sought to connect them with the “Troja” or “ludus Trojz ” among the Romans. But this is a piece of archeology of the same sort as that which identified the knighthood of the Middle Ages with the ancient ‘“ordo equestris,” and will not, of course, bear examination. Much reliance again has been placed by some of them on the account of a sham-fight which was held at the celebrated interview between the emperor Louis and

Charles the Bald in 841, which in certain respects bore a close resemblance to a tournament, and was no doubt the kind of exhibition out of which the tournament of a later age was developed. Others attribute the institution of tournaments to the emperor Henry the Fowler, who died in 936, or to Geoffrey de Preuilly, the ancestor of the counts of Tours, who died in 1066. However this may be, it is certain that they were in vogue on the Continent at the end of the 11th century, and that in the early part of the 12th century they were introduced into England. In the 13th and 14th centuries they were common all over Christendom, including the Eastern as well as the Western empire and the states comprised in or adjacent to it. It was not until the end of the 16th century that tilts and hastiludes passed out of fashion in Britain, and even in the earlier years of the 17th century they were occasionally celebrated under the patron- age of Henry, prince of Wales, son of King James I.

The older authorities on tournaments and jousts are exceedingly numerous. But all that is material in what they have written will be found in Ste Palaye's Mémoires sur l_Aneienne Chevalerie and Mills's History of Chivalry. The " Dissertations" of Du Cange at the end of Joinville's Memoirs and the Chronieles of Froissart and Monstrelet may also be consulted. Ste Palaye aud Mills were both industrious compilers, and the second is much indebted to the first.

TOURNEBOUT, a wind instrument of wood, in which a cylindrical column of air is set in vibration by a reed. The lower extremity is turned up in a half circle, and from this peculiarity it has gained the French names towrnebout and cromorne,—the latter a corruption of the German name Krummhorn. There appears to be no English equivalent. The reed of the tournebout, like that of the bassoon, is formed by two tongues of cane, adapted to the small end of a conical brass tube, the large end being inserted in the body of the instrument. It presents, however, this differ- ence, that it is not, like that of the bassoon, in contact with the player's mouth, but is covered again by a cap pierced with a hole in the upper part, through which opening the air is introduced which sets the reed in vibration, the reed being therefore subject to no pressure of the lips. The compass of the instrument is naturally limited to the simple fundamental sounds which the successive opening of the lateral holes gives rise to. The tournebouts have not much length for the

deep sounds they produce, which arises from these instruments sounding, like all tubes of cylindrical bore provided with reeds, the same as the stopped pipes of an organ. That is to say, theoretically

they require only half the lengths necessary for the open pipes of an organ, or for conical tubes pro- el

vided with reeds, to produce notes of the E same pitch. Moreover, when, to obtain a harmonic, the column of air is divided, the tournebout will not give the octave like the oboe and bassoon, but the twelfth, corre- sponding in this peculiarity with the clarinet jg and all stopped pipes or bourdons. With & the ordinary boring of eight lateral holes, the tournebout possesses a limited scale em- bracing a ninth. Sometimes, however, the deeper sounds are completed by the addition of one or more keys, By its structure the tournebout is one of the oldest wind instru- ments ; it is evidently derived from the Greek aulos and the Roman tibia, which consisted equally of a simple cylindrical pipe of which the column of air was set in vibration by a double reed. |

Notwithstanding the successive improve- 4 ments that were introduced in the manu- jj facture of wind instruments, the tournebout |), scarcely ever varied in the details of its |)’ construction. Such as we see it represented |) in the treatise by Virdung! we find it again “= about the epoch of its dis- . appearance, in L’Art du Faiseur eg a’Enstruments de Encyclopédie de Diderot et d Alembert (Paris,

1751-80).

The tournebouts existed as a com- plete family from the 15th century. According to Virdung, it was formed of four individual instru- ments; Pretorius? cites five,—the deep bass, the bass, the tenor

or alto, the cantus or soprano, and the high soprano, with com- of

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Bass Tournebout,

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~o- . —__—._ A band, or, to use the expression of Pre- and —=——f#— torius, an “accort,” of tournebouts compre- a @

== hended—1 deep bass, 2 bass, 3 alto-tenor, 2 cantus (soprano), 1 high soprano=9.

The tournebouts were not always an orchestra by themselves; they allied themselves also to other instruments, and notably to flutes and oboes. It was thus that the little groups of musicians in the service of princes, or those engaged by some large town on the occasion of a festival or public ceremony, were composed of several tournebout players combined with some flautists and oboe players. In 1685 the orchestra of the Neuc Kirche at Strasburg comprised two tournebouts, and until the middle of the last century these instruments formed part of the music called ‘‘la grande écurie” in the service of the French kings. Tournebouts have in our days become of extreme rarity, and scarcely exist in collections. The museum of the Conservatoire Royal de Musique at Brussels has the good fortune to possess a complete family, which is regarded as having belonged to the duke of Ferrara, Alphonso II. d’Este, a prince who reigned from 1559 to 1597. The soprano (cantus or discant) has the same compass as above, while the alto, the tenor (furnished wants key), and bass have an extent respectively of

The bass (see accompanying figure), besides having two keys, is distinguished from the others by a kind of small bolt, two of which slide in grooves and close the two holes that form the lowest notes of the instrument. It is very curious to observe that the employ- ment of these bolts, placed at the extremity of the tourncbout and out of reach of the fingers of the instrumentalist, forces him to require the assistance of a person whose sole mission is to attend to these bolts during the performance.

The ‘‘ Platerspil” of which Virdung gives a drawing is only a kind of tournebout. It presents especially the peculiarity that,

1 Musica getutscht und auszgezogen, Basel, 1511. ? Organographia, Wolfenbiittel, 1618.

instead of having a cap to cover over the reed, there is a spherical receiver surrounding the reed, to which the tube for insufflation is adapted. This receiver was of wood worked round, or perhaps consisted of a simple gourd. (V. M.)

TOURNEFORT, Josepn Pirron pr (1656-1708), a botanist of considerable reputation, was born at Aix, in Provence, in 1656. He studied in the convent of the Jesuits at Aix, and was destined for the church, but the death of his father left him free to follow his botanical inclinations. After a couple of years collecting, he studied medicine at Montpellier, but soon returned to his favourite pursuit, and was appointed professor of botany at the Jardin des Plantes in 1683. By the king’s order he travelled through western Europe, where he made very ex- tensive collections, and subsequently spent three years in Greece and Asia Minor (1700-1702). Of this journey a description in a series of letters was posthumously pub- lished in 3 vols. (Relation d’un Voyage du Levant, Lyons, 1717). His principal work is entitled Jnstitutiones Rei Herbarrz (3 vols., Paris, 1700), and upon this rests chiefly his claims to remembrance as one of the most eminent of the systematic botanists who prepared the way for Linneeus. His exact position

among these has been dis- cussed at length by Sachs (Geschichte d. Botanik, Munich, 1875). He died December 28, 1708.

TOURNEUR, Cyrm, a tragic poet of the first order, has left no record of his existence beyond the respective dates of his first and last extant works (1600-1613), An allegorical poem, worthless as art and incomprehensible as allegory, is the earliest of these ; an elegy on the death of Prince Henry, son of James I., is the latest. The two plays on which his fame rests, and on which it will rest for ever, were published respectively in 1607 and 1611, but all students have agreed to accept the internal evidence which assures us that the later in date of publication must be the earlier in date of composition. His only other known work is an epicede on Sir Francis Vere, of no great merit as poetry, but of some value as conveying in a straightforward and masculine style the poet's ideal con- ception of a perfect knight or "happy warrior," comparable by those who may think fit to compare it with the more nobly realized ideals of Chaucer and of Wordsworth. But if Tourneur had left on record no more memorable evi- dence of his powers than might be supplied by the survival of his elegies, he could certainly have claimed no higher place among English writers than is now occupied by the Rev. Charles Fitzgeoffrey, whose voluminous and fervent elegy on Sir Francis Drake is indeed of more actual value, historic or poetic, than either or than both of Tourneur's elegiac rhapsodies. The singular power, the singular originality, and the singular limitation of his genius are all equally obvious in Zhe Atheist's Tragedy, a dramatic poem no less crude and puerile and violent in action and evolution than simple and noble and natural in expression and in style. The executive faculty of the author is in the metrical parts of his first play so imperfect as to sug- gest either incompetence or perversity in the workman; in The Revenger's Tragedy it is so magnificent, so simple, impeccable, and sublime, that the finest passages of this play can be compared only with the noblest examples of tragic dialogue or monologue now extant in English or in Greek. 'There is no trace of imitation or derivation from an alien source in the genius of this poet. The first editor of Webster has observed how often he imitates Shakespeare ; and, in fact, essentially and radically inde- pendent as is Webster's genius also, the sovereign influence of his master may be traced not only in the general tone of his style, the general scheme of his composition, but now and then in a direct and never an unworthy or

imperfect echo of Shakespeare’s very phrase and accent. But the resemblance between the tragic verse of Tourneur

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and the tragic verse of Shakespeare is simply such as |

proves the natural affinity between two great dramatic poets, whose inspiration partakes now and then of the quality more proper to epic or to lyric poetry. The fiery impulse, the rolling music, the vivid illustration of thought by jets of insuppressible passion, the perpetual sustenance of passion by the implacable persistency of thought, which we recognize as the dominant and distinctive qualities of such poetry as finds vent in the utterances of Hamlet or of Timon, we recognize also in the scarcely less magnificent

poetry, the scarcely less fiery sarcasm, with which Tourneur has informed the part of Vindice—a harder-headed Hamlet, a saner and more practically savage and serious Timon. He was a satirist as passionate as Juvenal or Swift, but with a finer faith in goodness, a purer hope in its ultimate security of triumph. This fervent constancy of spirit

relieves the lurid gloom and widens the limited range of |

a tragic imagination which otherwise might be felt as oppressive rather than inspiriting. His grim and trenchant humour is as peculiar in its sardonic passion as his elo- quence is original in the strenuous music of its cadences, in the roll of its rhythmic thunder. As a playwright, his method was almost crude and rude in the headlong straightforwardness of its energetic simplicity; as an artist in character, his interest was intense but narrow, his power magnificent but confined ; as a dramatic poet, the force of his genius is great enough to ensure him an

enduring place amoug the foremost of the followers of Shakespeare. (A. ©. 8.) TOURS, a town of France, formerly the capital of Touraine, now chef-lieu of the department of Indre-et- Loire, the see of an archbishop, and the headquarters of the 9th corps d’armée, lies 145 miles (by rail) south-west of Paris, on the left bank of the Loire, a little above the

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Plan of Tours.

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junction of the Loire and Cher. Many foreigners, especi- ally English, live at Tours, attracted by the town itself, its mild climate, its beautiful situation in “the garden of France,” and the historic chateaus of the neighbourhood. The Loire is crossed by two suspension bridges, by a rail- way bridge, and by a fine stone bridge, but its waters too often either expose large stretches of sand, or come down in devastating flood. Many of the inhabitants belong

_astical and civil architecture.

to the leisured class, and the town possesses societies of | science, art, and literature, of agriculture, of horticulture, of archaeology, of medicine, and a library (50,000 volumes, _and 1200 MSS., including a gospel of the 8th century, on ‘which the kings of France took oath as honorary canons of the church of St Martin). The industrial establishments

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include four large silk mills, the printing and publishing works of Mame (1200 workmen), manufactories of cloth, carpets, files, white lead, stained glass, boots and shoes, and pottery. A considerable trade is carried on in wine, brandy, and dried fruits, and the sausages and confection- ery of the town are well known. The population, 52,209 in 1881, was 59,585 in 1886.

Tours, under the Gauls the capital of the Turones or Turons, originally stood on the right bank of the Loire, a little above the present village of St Symphorien. At first called Altionos, the town was afterwards officially known as Cexsarodunum. The Romans removed the town from the hill where it originally stood to the plain on the left bank of the river. Behind the present cathe- dral, remains of the amphitheatre (443 feet in length by 394 in breadth) built towards the end of the 2d century might till lately beseen. Tours became Christian about 250 through the preaching of Gatien, who founded the bishopric. The first cathedral was built a hundred years

later by St Litorius. The bishopric became an archbishopric when Gratian made Tours the capital of Lugdunensis Tertia, and about the same time the official name of Cesarodunum was changed for that of Civitas Turonorwm. St Martin, the great apostle of the Gauls, was bishop of Tours in the 4th century, and he was buried in a suburb which soon became as important as the town itself from the number of pilgrims who flocked to his tomb. Towards the end of the 4th century, apprehensive of barbarian inva- sion, the inhabitants pulled down some of their earlicr buildings in order to raise a fortified wall, the course of which can still be traced in places. Their advanced fort of Larcay still overlooks the valley ofthe Cher. Affiliated to the Armorican confederation in 435, the town did not fall to the Visigoths till 478, and the new masters were always hated. It became part of the Frankish dominions under Clovis, who, in consideration of the help afforded by St Martin, presented the church with rich gifts out of the spoils taken from Alaric, confirmed and extended its right of sanctuary, and accepted for himself and his successors the title of canon of St Martin. The basilica, built under Bishop St Perpetuns from 472 to 477, was the largest and finest church of France, and one of the most important built in the West during the decline of the Roman empire ; it is said by St Gregory of Tours to have been 160 feet long, 60 wide, and 45 high. It seems to have been one of the first which had an ambulatory round the choir. Tours grew rapidly in prosperity under the Merovingians, but abuse of the right of sanctuary led to great disorder, and the church itself became a hotbed of crime. Charlemagne re-established discipline in the disorganized monastery and set over it the learned Alcuin, who established at Tours one of the oldest public schools of Christian philosophy and theology. The abbey was made into a collegiate church in the 11th century, and was for a time affiliated to Cluny, but soon came under the direct rule of Rome, and for long had bishops of its own, The suburb in which the monastery was situated became as important as Tours itself under the name of Martinopolis, The Normans, attracted by its riches, pillaged it in 853 and 903. Strong walls were erected from 906 to 910, and in the 12th century the name was changed to that of Chateauneuf. Philip Augustus abolished the dis- orderly commune in 1212, but the innumerable offerings of princes, lords, and pilgrims maintained the prosperity of the town all through the Middle Ages. A 13th-century writer speaks with enthusiasm of the wealth and luxury of the inhabitants, of the beauty and chastity of the women, and of the rich shrine of the saint. A third

church, replacing one which had been built after the burning of that of St Perpetuus in 997, was begun in 1175, and finished in the 13th century. It was 374 feet long and 85 feet high, and had five towers, of which only two remain. The rest of the church, sold to speculators after the Revolution, disappeared under the first empire. Of the monastic buildings, only a beautiful inclosed gallery, built by Bastien Frangois, nephew of Michel Colomb, ‘in the time of the Renaissance, remains, but the streets which formerly belonged to Chateauneuf show many interesting relics of ecclesi-
About 1130 Archbishop Hildevert built a cathedral in the old Roman town itself, on the ruins of those successively erected by Litorius and Gregory of Tours. This was burnt in 1166 during the quarrel between Louis VII. of France and Henry II. of England, the latter being lord of Tours and count of Anjou. The work was resumed in 1175, but not finished till 1547. Part of the towers belong to the 12th century; the choir to the 13th; the transept and first bays of the nave to the 14th; the remaining bays, the cloister on the north, and the fine fagade to the 15th; and the two Renaissance towers (217 feet and 223 feet) to the 16th. The building is nevertheless remarkable for the

| harmony and regularity of its construction; specially noteworthy

details are the triple western portal, the upper staircase of the north tower, a Renaissance staircase in the cloister, the old wood- work in chestnut-wood, and the splendid glass of the 13th, 14th, and 15th centuries. A pretty little mausoleum, built in 1506 by Jean Juste, is the burial-place of three young sons of Charles

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VIII. The archbishop’s palace is to the right of the cathedral, with an interesting chapel of the 12th century, and an outside pulpit of the 16th. During the 10th century the Benedictine abbey of St Julien was re-established by Archbishop Théotolon, and a Romanesque church built, of which the great square tower still remains. St Julien has a fine nave and double aisles; the straight terminal wall has two 16th-century apses attached. There are some paintings of the 12th century under the tower.

The magnificence of Tours declined in the 14th century; it was then united to Chateauneuf by a common wall, of which an elegant round tower (the Tour de Guise) remains near the quay, and both towns were put under the same government. The numerous and long-continued visits of Charles VII., Louis XI., and Charles VIII. in Touraine during the 15th century favoured the commerce and industry of the town, then peopled by 75,000 inhabitants. To the flourishing school of art which existed at the Renaissance are due several private houses, a fountain, and the church of Notre Dame La Riche, with splendid windows by Pinaigrier. An unimportaut building, part of a modern chateau, is all that remains of the royal residence and magnificent gardens of Plessis-lés-Tours, where Louis XI. shut himself up and died, the states in 1506 proclaimed Louis XII. the father of his people, and Henry III. and Henry of Navarre united in 1589 against the Leagne. From that year Tours was deserted by the kings of France. A fine bridge of fifteen arches was built across the Loire from 1765 to 1777 by Bayeux. The chief modern buildings are the theatre, the church of St Joseph, the railway station, and a museum with collections of antiquities, pictures, pottery, and mineralogy. There are also antiquities in the museum of the archeological society of Indre-et-Loire. The gardens and a remarkable portal of the archbishop's palace, a magnificent iron gate of the 18th century in the prefecture, once the convent of the Visitation, and the general hospital (1200 beds) should also be mentioned. In 1870 Tours was the seat of the government of the national defence. Tours is the birthplace of the heretic Berengarius, the two marshals Boucicaut, the novelist Honoré de Balzac, the poet Destouches, the painters Fouquet and Clouet, and Madame de la Valliére.

TOUSSAINT LOUVERTURE, Prerre- Dominique (1746-1803), one of the liberators of Hayti, claimed to be descended from an African chief, his father, a slave in Hayti, being the chief's second son. He was born 20th May 1746 at Breda, and was at first surnamed Breda, which was changed to Louverture in token of the results of his valour in causing a gap in the ranks of the enemy. From childhood he manifested unusual abilities, and succeeded, by making the utmost use of every opportunity, in obtaining a remarkably good education. He obtained the special confidence of his master, and was made super- intendent of the other negroes on the plantation. After the insurrection of 1791 he joined the insurgents, and, having acquired some knowledge of surgery and medicine, acted as

physician to the forces. His rapid rise in influ- ence aroused, however, the jealousy of Jean Francois, who caused his arrest on the ground of his partiality to the whites. He was liberated by the rival insurgent chief Baisson, and a partisan war ensued, but after the death of Baisson he placed himself under the orders of Jean Frangois. Subsequently he joined the Spaniards, but, when the French Government ratified the Act declaring the freedom of the slaves, he came to the aid of the French. In 1796 he was named commander-in-chief of the armies of St Domingo, but, having raised and disciplined a power- ful army of blacks, he made himself master of the whole country, renounced the authority of France, and announced himself "the Buonaparte of St Domingo." For further details of his career see Haytt (vol. xi. p. 545). He was taken prisoner by treachery on the part of France, and died

in the prison of Joux, near Besancon, 27th April 1803. See Mémoires written by himself, 1853; Saint-Remy, Vie de

Toussaint Louverture, 1850 ; Gragnon-Lacoste, Toussaint Louver-

ture, Général en Chef de ? Armée de Saint-Domingue surnommé le

Premier des Noirs, based on private papers of the Louverture family, 1877.

TOWN, TOWNSHIP. See Borovueu, Crry, Munt- CIPALITY, and Unirep Srarss, pp. 731, 827.

TOWNSHEND, CHar.es TowNsHEND, SEconD Vis- count (1674-1738), a statesman of unsullied integrity, was the eldest son of Horatio, the first viscount, and was

born in 1674. He succeeded to the peerage in December 1687, and was educated at Eton and King's College, Cam- bridge. When he took his seat in the House of Lords his sympathies leant to Toryism, but this predilection soon faded away, and in February 1701-2 it was rumoured among the

courtiers that he would hold the office of privy seal in the Whig ministry which William ITI. had in view. For some years after the accession of Queen Anne he remained without office, but on 29th September 1707 he was created captain of the yeomen of the guard, and in the same year he was summoned to the privy council, a distinction renewed by the queen's two successors on the throne. The command of the yeomen remained in his hands until 13th June 1711, but its responsibilities did not prevent him from acting as joint plenipotentiary with the duke of Marlborough in the peace negotiations with France which were carried on at Gertruydenberg, near Breda, or from serving as ambassador extraordinary at The Hague congress (2d May 1709-26th March 1711). Town- shend was high in favour with George I., and on that king's arrival at The Hague in September 1714 he pub- lished the appointment of Townshend as secretary of state for the southern department, and entrusted to his new minister the privilege of nominating his own colleague. Horace Walpole, his brother-in-law and private secretary, recommended Stanhope for the vacant post, and Stanhope was duly appointed. Townshend did not neglect to avail himself of the advantages afforded by his attendance on the king, and before the arrival of George I. in England he had obtained complete ascendency both over his mind and the dispositions of the advisers by whom his line of conduct was generally determined. The policy of the new ministers at home and abroad lay in the promotion of peace. With this object they endeavoured to limit the charges against their predecessor Harley, Lord Oxford, to high crimes and misdemeanours. To gain this end they brought about, in 1716, an alliance between those ancient rivals in arms, France and England. In spite of their success, their influence was gradually undermined by the intrigues of Lord Sunderland and by the discontent of the Hanoverian favourites, who deemed the places and the pensions which they had gained an insufficient reward for their exertions. In October 1716 Stanhope accompanied the king on his journey to Hanover, and during this visit was seduced from his allegiance to his colleagues by the wily Sunderland, who had ingratiated himself into the royal favour. George I. was induced to believe that Townshend and Walpole were caballing with the prince of Wales, and were forming designs against the royal authority. Town- shend was dismissed in December 1716 from his place of secretary of state, and was offered in lieu thereof the splendid banishment of lord-lieutenant of Ireland, a gilded sinecure which he at first contemptuously declined and

only condescended ultimately to accept on the condition that he was not required to set foot on Irish soil. His latent spirit of hostility to this arrangement quickly devel- oped into open antagonism, and in March 1717 Townshend was dismissed from his position. At the close of May 1720 a partial reconciliation took place between the op- posing Whig sections of Stanhope and Townshend. The latter was readmitted into the ministry as lord president of the council (11th June 1720), and his devoted relation and colleague Sir Robert Walpole became paymaster-general. When the South Sea Bubble burst, the fortunes of the principal members of the ministry shared in the misfortune of the scheme which they had promoted. Stanhope, in a paroxysm of passion during a heated debate, broke a blood- vessel, and Sunderland, though acquitted of the charge of personal corruption, was forced to retire into private life. The withdrawal of these statesmen assigned to their rivals

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the chief prizes in the state: Townshend became (10th February 1721) secretary of state, and Walpole gained the position of first lord of the treasury and chancellor of thie exchequer. The death of George I. threatened a change of advisers, but the dismay of the new king’s favourite, Spencer Compton, at being called upon to draw up the royal speech, led to the old ministers of the crown being retained in their places. What the attacks of the opposi- tion could not effect, the internal strife of the administra- tion accomplished. Townshend was of a proud, impetuous disposition, born with a nature more accustomed to rule than to obey. His family had for several generations stood higher in the social life of Norfolk than Walpole’s progenitors, and when he himself attained to distinction in politics his position as a member of the Upper House was greater than that enjoyed by his friend in the Commons. As the power of the Lower House increased, and as Walpole became more and more the object of the attacks of the Tories, the pre-eminence of Townshend passed from him. So long, to use the witty remark of Sir Robert Walpole, as the firm was Townshend and Walpole, things went well with them, but when the positions were re- versed jealousies arose between the partners. ing alienation was hastened by the death, in 1726, of the secretary’s wife, the sister of Walpole. At the close of 1729 Townshend endeavoured to obtain the appoint- ment of his old and

attached friend, Lord Chesterfield, as his fellow secretary of state, and the failure of the attempt brought about a fierce scene between Walpole and himself. They broke out into passionate words, seized one another by their coat-collars, and would have come to blows had they not been prevented by their friends who were pre- sent. After this outbreak of passion further co-operation was impossible, and Townshend, having the good sense to recognize the position, retired into private life on 15th May 1730. The chief domestic events of his ministry were the impeachment of Bishop Atterbury, the partial restoration of Lord Bolingbroke, and the troubles in Ireland over the granting to a man called Wood of a patent for coining pence. Its concluding act was the signing of the treaty of Seville (9th Noveniber 1729). Townshend died of apoplexy 21st June 1738.

Townshend was slow in forming, but resolute in adhering to, his opinion, and, like most other men of that stamp, was impaticnt of contradiction. His manners have been styled ‘‘coarse, rustic, and seemingly brutal,” but these defects were not visible in his domestic lite. Never did minister leave office with eleaner hands; he did not add one acre to his estate nor leave large fortunes to his younger children.

TOWNSHEND, Cuartxs (1725-1767), a politician ever to be remembered as the embodiment of wit and in- discretion, was the second son of Charles, third Viscount Townshend, who married Audrey, the daughter and heiress of Edward Harrison of Ball’s Park, near Hertford, a lady who rivalled her son in brilliancy of wit and frankness of expression. Charles was born 29th August 1725, and was sent for his education to Leyden and Oxford. At the Dutch university, where he matriculated 27th October 1745, he associated with a small knot of English youths, afterwards well known in various circles of life, among whom were Askew, the book-collector, Dowdeswell, his subsequent rival in politics, Wilkes, the witty and un- principled reformer, and Alexander Carlyle, the genial Scotchman, who devotes some of the pages of his Autodio- graphy to chronicling their sayings and their doings. He represented Great Yarmouth in parliament from 1747 to 1761, when he found a seat in the treasury borough of Harwich.

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Public attention was first drawn to his abilities | in 1753, when he delivered a lively attack, as a younger – son who might hope to promote his advancement by allying | himself in marriage to a wealthy heiress, against Lord |

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Hardwicke's marriage bill. Although this measure passed into law, he attained this object in August of the follow- ing year by marrying Caroline, tlie eldest daughter of the second duke of Argyle and the widow of Francis, Lord Dalkeith, the eldest son of the second duke of Buccleugh. In April 1754 Townshend was transferred from the posi- tion of a member of the Board of Trade, which he had held from 1749, to that of a lord of the admiralty, but at the close of 1755 his passionate attack against the policy of the ministry, an attack which shared in popular estimation with the scathing denunciations of Pitt, the supreme success of Single-Speech Hamilton, and the liope- less failure of Lord Chesterfield's illegitimate son, caused his instant dismissal. In the administration which was formed in December 1756, and which was ruled by Pitt, the lucrative office of treasurer of the chamber was given to Townshend, and in the following spring he was sum- moned to the privy council. With the accession of the new monarch in 1760 this volatile politician transferred his attentions from Pitt to the young king's favourite, Bute, and when, at the latter's instance, several changes were made in the ministry, Townshend was promoted to the post of secretary of war. In this place he remained after the great commoner had withdrawn from the cabinet, but in December 1762 he threw it up. Bute, alarmed at the growth in numbers and in influence of his enemies, tried to buy back Townshend's co-operation by sundry tempting promises, and at last secured his object in March 1763 with the presidency of the Board of Trade. When Bute retired and George Grenville accepted the cares of official life, the higher post of first lord of the admiralty fell to Townshend's lot, but with his usual impetuosity he pre- sumed to designate one of his satellites to a place under him at the board, and the refusal to accept the nomination led to his exclusion from the new administration. While in opposition his mind was swayed to and fro with con- flicting emotions of dislike to the head of the ministry and of desire to share in the spoils of office. The latter feeling ultimately triumphed ; he condescended to accept

in the dying days of Grenville's cabinet, and to retain through the " lutestring" administration of Lord Rockingham,— 'pretty summer wear," as Townshend styled it, " but it will never stand the winter,'—the highly-paid position of paymaster-general, refusing to identify himself more closely with its fortunes as chancellor of the exchequer. The position which he refused from the hands of Lord Rocking- ham he was forced to accept from the imperious Pitt (August 1766), and a few weeks later his urgent appeals to the great minister for increased power were favourably answered, and he was admitted to the inner circle of the cabinet. Dowdeswell, his predecessor at the exchequer, resented his removal for his brilliant rival. The new chancellor proposed the continuance of the land tax at four shillings in the pound, while he held out hopes that it might be reduced next year to three shillings, where- upon his predecessor, by the aid of the landed gentlemen, carried a motion that the reduction should take effect at once. This defeat proved a great mortification to Lord Chatham, and in his irritation against Townshend for this blow, as well as for some acts of insubordination, he meditated the removal of his showy colleague. Before this could be accomplished Chatham's mind became im- paired by some mysterious malady, and Townshend, who was the most determined and influential of his colleagues, swayed the ministry as he liked. His wife was created (August 1767) Baroness Greenwich, and his brother was made lord-lieutenant of Ireland. He hiniself delivered in the House of Commons many speeches unrivalled in parliamentary history for wit and recklessness; and one of them still lives in history as the 'champagne speech,"

His last act was to pass through parliament resolutions which even his colleagues deprecated in the cabinet, for taxing several articles, such as glass, paper, and tea, on their importation into America, which he estimated would produce the insignificant sum of £40,000 for the English treasury, and which shrewder observers prophesied would lead to the loss of the American colonies. Shortly after this event he retired to his wife's country seat in Oxford- shire, where he died on 4th September 1767, from a fever which he had neglected.

The universal tribute of Townshend's colleagues allows him the possession of boundless wit and ready eloquence, set off by perfect melody of intonation, but marred by an unexampled lack of judg- ment and discretion. He shifted his ground in politics with every new moon, and the world fastened on him the nickname, which he himself adopted in his ''champagne" spcech, of the Weathercock. His official knowledge was considerable; and it would be unjust to his memory to ignore the praises of his contemporaries or his profound knowledge of his country's commercial interests. The House of Commons recognized in him its spoilt child, and Burke happily said that ''he never thought, did, or said anything " with- out Judging its effect on his fellow-members. Charles Townshend is the subject of a memoir by Mr Percy Fitzgerald.

TOXICOLOGY. See Poisons.

TRACHIS, a city of ancient Greece, at the foot of Mount (Eta, a little to the north-west of Thermopyle. As commanding the approach to Thermopyle from Thes- saly, it was a place of great military importance. Accord- ing to Homer, it was one of the places subject to Achilles, and was famed in legend as the scene of Hercules's death— an event which forms the subject of Sophocles's play The Trachinian Women. In historical times it first attained importance on the foundation of Heraclea by the Spartans in 426 B.c. The Thessalians, jealous of the establishment of a Spartan outpost on their borders, attacked Heraclea, and in 420 the Heracleots were defeated by them with heavy loss. In the winter of 409-8 Heraclea sustained another disastrous defeat. In 395 the Thebans expelled the Spartans, and restored the city to the old Trachinian and Citzan inhabitants. In later times Heraclea was one of the mainstays of the Etolian power in northern Greece, In 191 3.c., after the defeat of Antiochus at Thermopylae, Heraclea was besieged and taken from the AStolians by the Romans under the consul Acilius Glabrio. From Livy's account of the siege (xxxvi. 24), it appears that the citadel was outside the town, which lay on the low ground be- tween the rivers Karvunaria (Asopus) and Mavra-Neria (Melas). There are still traces of the citadel on a lofty rock above.

TRACT SOCIETIES are associations for publishing or circulating religious treatises or books. The circulation of short treatises for the promotion of

Christian know- ledge is older than the invention of printing. Wickliffe, for instance, was a great writer and circulator of tracts, employing his Oxford friends and pupils to multiply copies. So was Luther in his day, with the help by that time of printer and bookseller. In later times John Wesley was a busy worker in this way; and Hannah More, from her own pen, produced what were known as the " Cheap Repository Tracts," highly lauded by Bishop Porteus, and widely used towards the close of the 18th century. Before this time there had been efforts of associated labour for the same object, a "book society for promoting religious knowledge among the poor" having been estab- lished in 1750. A similar society was formed at Edin- burgh in 1793. But it was at the close of the century, in 1799, that there was founded in London the Religious Tract Society, an institution unparalleled in the extent and variety of its operations, and the parent of numerous societies in different parts of the empire as well as in the United States and on the continent of Europe. There are other associations with kindred objects, but in connexion

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with particular ecclesiastical systems. Thus the tract department of the Christian Knowledge Society is specially connected with the Church of England; and the Wesleyans, Baptists, and other denominations have their own tract societies. The Church of Rome also has now similar associations. The Religious Tract Society is alone in being confined to the diffusion of religious truth common to all Protestant Christians, to the exclusion of topics touched by ecclesiastical divisions. This catholicity is secured by the fundamental rules of the society, and by its managing committee being composed half of Churchmen and half of Nonconformists of all denominations.

A brief statement of the proceedings of the Religious Tract Society, as presented in its latest annual Report, will best serve to show the general objects and operations of all such organizations, — any special or varied action elsewhere adopted being noted as we proceed. The main object of the society is the preparation and publication of religious literature. At first this consisted mostly of tracts and small treatises. After a time larger books

were pub- lished, including series of reprinted works of the early Reformers and English Protestant theologians and Biblical expositors, and also books on common subjects treated in a religious spirit. The society also issues magazines for all classes. Four of these period- icals, the Leiswre Hour, the Sunday at Home, the Boys' Own Paper, and the Girls' Own Paper, have a united circulation, including monthly parts and yearly volumes, of nearly 600,000 numbers weekly, or above 30 millions in the year. The total annual issue, including books, tracts, &c., at home and abroad, is nearly 86 millions.

The distribution of this is chiefly through the ordinary channels of trade, with the exception of the tracts, which are circulated by home and foreign missionary societies, and varions agencics public and private. Almost every missionary agency is indebted to the Religious Tract Society for the work carried on through the press. Grauts are made, either free or as nearly as possible at cost price ; and, when it is advisable to produce publications at foreign stations, grants of paper and other material, as well as money payments, are voted. The publications are in almost every tongue, the list containing works in 174 languages and dialects.

The funds for this large and varied work come partly from donations, subscriptions, and legacics, but chiefly from the profits of the sales of the society's publications. The total missionary and evangelistic expenditure in the ycar euding March 31, 1886, amounted to £47,722, of which £19,019 was supplied from the trade funds, which have also borne the entire cost of management, both of the business and missionary departments. The total amount received from sales, subscriptions, and all other sources was £212,731, 11s. 8d.

The American Tract Socicty and some of the Continental societies undertake the distribution as well as the production of tracts and books, by means of paid colportenrs and other agents. The Continental societies produce most of their own books and tracts, aided largely by grants of money and paper from the Religious Tract Society.

TRACTION, Execrric. The driving of vehicles by electricity was made commercially practicable by the in- vention of the dynamo-electric machine, which gave a ready means of producing electrical energy by the

expendi- ture of mechanical work, and by the further discovery that the function of the dynamo could be reversed,—that it was capable of acting efficiently as a motor to do mechan- ical work when supplied with energy in the electrical form. Experiment has shown that when a dynamo is used to produce an electric current, which, in its turn, drives another dynamo serving as a motor, the double con- version of energy may be performed with no very serious loss. In favourable cases, when the dynamo and motor are close together, the motor will yield more than 80 per cent. of the work which is spent in driving the dynamo. When they are far apart there is an additional loss, due to the resistance of the conductor which connects them, and a further loss due to its imperfect insulation. The use of high electromotive force, which reduces the first of these, tends to increase the second ; it is, however, practicable to keep both within reasonable limits. Early attempts to apply electricity to traction were made by Robert David- son, who placed an electromagnetic locomotive on the Edinburgh and Glasgow Railway in 1837, and by Jacobi

of St Petersburg, who propelled a boat on the Neva in 1839 by an electromagnetic engine driven by a battery of Grove’s cells. The inefficiency and bulkinesssof early electromotors, and the cost of producing electric energy when a galvanic battery was the source, made it impossible for electricity under such conditions as these to compete with other methods of traction. A good battery using zinc as the active metal consumes from 1 to 2 1b of zinc per hour per horse-power developed ; a good steam-engine consumes from 2 to 3 tb of coal in doing the same amount of work, and the cost of zinc is about fifty times that of coal. Hence, notwithstanding modern improvements in electro- motors, the cost of producing mechanical power by means of electricity, when a zinc-consuming battery is the source, is still prohibitive.

The earliest practical electric railway was constructed at the Berlin exhibition of 1879 by Dr Werner Siemens. At one station was a dynamo driven by a steam-engine. The current was conducted to the moving car through a special rail placed between the ordinary rails and insulated from the ground by blocks of wood. From this rail it passed through a motor-

dynamo on the car, and the ordinary rails completed the circuit. Electrical contact with the ordinary rails was made by the wheels, and with the central rail by a pair of brushes made of copper wire which rubbed against its sides. Spur-wheels were used to connect the motor shaft with the wheels and to effect a suitable reduc- tion of speed. The line was half a mile long and of 2-feet gauge. ‘The motor developed about 34 horse-power, and

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placed on passenger cars; their speed is regulated by means of resistance coils, which the driver of the car switches into the circuit. A similar tramway, 3 miles long, connecting Bessbrook and Newry, was opened in 1885; there also water-power is made use of to drive the generating dynamos. On these lines the train usu- ally consists of a motor car with passengers, followed by two or three goods waggons, and the whole working ex- penses are from 3d. to 4d. per train-mile. The speed is 10 miles an hour.

Amongst early electrical railways Mr Volk’s short line on the beach at Brighton deserves mention. There the rails themselves act as conductors, and are insulated only by wooden sleepers lying on the shingle. The line has been in operation since 1883, with a working expense of only 2d. per car-inile.

Other English and Continental lines will be referred to later ; it is, however, in America that electrical traction has hitherto found its widest development. In 1880 Mr Edison ran an electric locomotive on an experimental track near his laboratory at Menlo Park. Soon after the Chicago exhibition of 1883, at which an electric railway was shown in action, a large number of permanent lines were estab- lished. There are now more than twenty electrical tram- ways at work in the United States, under the patents of Edison, Field, Daft, Van Depoele, Sprague, and others. Many more lines are projected, and experiments are in progress on the application of electrical traction on a large scale to the elevated railways of New York.

In all the instances which have been referred to above, electricity Electric is employed as a means of transmitting power as it is wanted from traction a

generating station to the cars, through a conductor extending by storage along the track. Another method of effecting electric traction is batteries.

was carried by a separate truck, forming a locomotive which drew a car with 20 passengers at a speed of from 4 to 7 miles an hour.

The success of the Berlin experiment was complete, and Messrs Siemens followed it up in 1881 by the construction of a permanent electric tramway, 1} miles in length, at Lichterfelde, which has now (1887) been in continuous operation for six years. At Lichterfelde the ordinary rails, insulated by wooden sleepers, are the only con- ductors. Where roads cross the line the rails are cut out of circuit, and the current is carried past the gap by underground cables, but switches are provided by which the current can be sent into the insulated sections if re- quired. Each car takes 24 passengers, and runs at a speed of 12 miles an hour. There is no separate locomotive, the motor-dynamo being on the car itself. In 1882 Messrs Siemens constructed an electric tramway in the mines of Zankerode, in Saxony, and built for it a locomotive able to draw 8 tons at a speed of 74 miles an hour. Overhead conductors were employed, consisting of a pair of insulated j-shaped rails fixed to the roof of the workings; the current was conveyed to and from the locomotive by means of a pair of contact carriages sliding on these conductors, and connected with the car by short flexible cables. A similar line was opened in 1883 at the Hohenzollern col- liery in Upper Silesia.

The same year witnessed the completion of another pioneer undertaking of the first importance, an electric tramway 6 miles long connecting Portrush and Bushmills, in the north of Ireland. Here the insulated conductor is a special rail, carried alongside of the line on wooden posts

to carry a store of energy on the car or on a special locomotive, by using secondary batteries which are charged from time to time at the gencrating station. This system, which was introduced in England by Mr Reckenzaun and on the Continent by M. Julicn, has been successfully employed on several lines.

The system of storage, by means of secondary batteries, has the great advantage over the system of transmission through a con- ductor that it

makes each car independent and that it is applicable to ordinary tramway lines. As regards economy of power, we have in the storage system a more complex series of transformation of energy, aud therefore a larger number of items of loss. In both systems alike we have a ccrtain loss of energy at the dynamo and at the motor. A secondary battery yiclds in the electrical form only about 70 per cent. of the encrgy given toit. In comparing the two methods, the loss which this involves has to be set off against that which occurs in the transmission system in the process of conduc- tion, an item which may be very small in favourable cases, but which becomes large when there are many cars to be driven, when the line is long, and when, owing to the use of an exposcd conductor, the electromotive force has to be kept low. Under average con- ditions it is probable that the conductor system has a slight ad- vantage over the other in this respect, but the difference is not material, especially as the cost of power is a comparatively small part of the whole working expense of a line. The difference is slightly affected by the fact that in the storage system there is an extra weight to be carried—namely, the batteries—amounting to about 4 or 4 of the whole weight, and the tractive force required to overcome friction is increased in a corresponding degree. A serious objection to the storage system is the probable cost of renewing batteries. In respect, however, both of durability and of power (in relation to weight) secondary batteries have of late undergone a marked improvement; and it is likely that the storage system will prove the most applicable to tramways in city strects, where conductors on the level of the road are impracticable and overhead conductors would not be permitted.

at a height of 14 feet above the ground. Contact is made by springs shaped like carriage-springs, which project from one side of the car at both ends, so that the length of the car enables continuous contact to be maintained at cross- roads, where there are gaps in the conducting rail, past which the current is taken by underground cables. The ordinary rails serve as return conductors. The dynamos are driven by turbines at a station nearly a mile distant from the line; they supply a current of 100 amperes with an electromotive force of 250 volts. The motors are

The existing methods of electrical traction as applied to tramways Classifica- mnay be classified as follows :— tion of I. Motor driven by

storage batteries, the batteries and motor systems. being carried either (a) in the car itself or (b) on a separate truck forming a locomotive. Reckenzaun's and Julien's cars, in which the battcries are under thé seats, are examples of the first plan, which is in operation on lines at Antwerp, Hamburg, Brussels, and New York. Mr Elieson's tramway locomotive working in London on the North Metropolitan tramways is an example of the second plan, It is obviously preferable, when space can be found on the car itself for the motor and batteries, to place them there rather than on a separate truck. When a separate locomotive is used it

iust be heavy enough to grip the rails, and the whole weight to be drawn is then considerably greater.}

II. Conductor systems, which may be classified thus:—

(a) Those using the ordinary rails as the only conductors. The lines at Lichterfelde and Brighton, already mentioned, are exam- ples of this plan, which is quite inapplicable where the rails are laid flush with the roadway as in city streets.

(b) Those using a third (insulated) rail, above ground. To this class belong the Portrush, the Bessbrook, and several American lines. This plan, like the last, is not applicable to city streets.

(c) Those using one (or in some cases two) overhead conductors. A line of this type has been successfully worked between Modling and Hinterbriihl, near Vienna, and another between Frankfort and Offenbach, both since 1884, at a cost of about 34d. per car-mile. The conductors consist of slotted tubes 1 inch in bore supported on posts 18 feet high and stayed by wires at intermediate points to keep them from sagging. The contact carriages are pistons sliding in the tubes.2 The Daft lines at Baltimore and other places in America, and the Van Depoele lines, of which some 30 miles are in operation, are mostly worked by means of overhead conductors.

(d) Those using underground conductors in a slotted channel or conduit. This system, which has the obvious advantage that the eonductor is placed

entirely out of the way of street traffic, has been introduced at Blackpool by Mr Holroyd Smith, and, in America, at Cleveland by Messrs Bentley and Knight and at Philadelphia by Mr Schlesinger. In the Blackpool line the conductor is split into two parts which run parallel to each other within the conduit on its two sides, and are touched by a contact arin which reaches down through a narrow central slot at the level of the street; an electromotive force of 200 volts is employed. The conduit is placed midway between the rails, but it may be questioned whether, in view of the conditions of ordinary street traffic, a better place for it would not be at one side. Mr Field has proposed a tramway with two conduits, one beside each rail, containing two conductors, one to be charged positively and the other negatively, so that a comparatively high resultant difference of potential is available for the motor although the potential of neither conductor differs to a dangerous degree from that of the earth.

(e) One system remains to be described, which was proposed in 1881 by Messrs Ayrton and Perry as specially applicable to electric railways of considerable length, in which an exposed conductor would give rise to much loss through leakage. Their plan is to use a well-insulated conductor in a closed channel underground. The line is divided into short sections; each of these has an exposed conductor, which may be one of the rails, and this is placed in temporary contact with the insulated conductor as the train passes, by the pressure of the wheels on a flexible rail or stud, or by means of automatic electromagnetic switches. Leakage is thus restricted to the continuous and well-insulated conductor, together with that section of the surface conductor which is in contact with the former at any one time; and the system has the further advantage that it gives the means of providing an automatic block by which suc- cessive trains are kept from overtaking oue another.

The form and disposition of the motor-dynamo and the mode by which it is connected with the driving-axle of the car are matters in which much variety of practice exists. The question of gearing is complicated by the fact that the frame of the car oscillates verti- cally with respect to the axles. Spur-wheels, worm-gear, friction- gear, belts, multiple-band gear, and chain-gear are or have been used. Mr Reckenzaun’s car is carried by two bogie trucks, one under each end, and each bogie carries a motor whose

axle, placed longitudinally, drives a central spur-wheel on one axle of the bogie by means of a worm. An advantage possessed by two inotors is that, by coupling them in series or parallel, or by using one only, the driver is able to command different grades of power without the use of resistance coils.

TRACTION

volume of traffic requires it, a nearly continuous stream. Each train consists of a series of buckets or skeps whieh hang each from a single running wheel or pair of wheels, and are spaced by wooden connecting bars. A small electric motor, which hangs below the line and is geared by spur and chain gearing to a pair of driving- wheels, forms the locomotive. In general, the line is slpctricalle divided into equal sections, which have the same length as a single train, so that the front carriage is always on the section in advance of the rear carriage. The train is furnished with a continuous conductor from end to end, through which it makes electric con- taet between the section in front and the section behind, and the motor is included in the circuit of this conductor. Two systems of working are used, which enable trains to be run either in electrical series or ‘‘ parallel.” In the series system the successive sections of the line are electrically connected, so long as no train is on them, by means of switches at the joints between the sections, so that the whole forms one continuous conductor, When a train comes on any one section it breaks contact at the joint between that section and the one behind it; the circuit, however, remains closed through the conductor on the train itsclf, and in this way the motor receives the current which is passing through the line. Other trains at other places in the line receive the same current, each by breaking for the time the ordinary contact between the two sections it touches, and substituting a contact through its own conductor and motor. When a train leaves a section it replaces the switch that makes contact with the section behind. If, how- ever, there are more than one train on the line, an automatic block system is added to prevent one from overtaking another by letting the section which a train leaves stand insulated for a time. No control is exercised from the vehicles themselves; in fact, the trains run without attendants. In the simplest parallel system of tel- pherage a continuous conductor distinct

from the line is stretched alongside of it; tho trains make contact between the two. The

figure shows another plan, known as the cross-over parallel system,

Cross-over Parallel System of Telpherage.

which is suitable where a double line of trains is desired. There A,, B,, Ag… form successive sections of one line, and By, Ag, B. . of another. Aj, As, A,... are electrically continuous, an are connected to one pole of the dynamo. 8, B,, B;.. . are also continuous, and are connected to the other pole. Thus the sections of each line are alternately positive and negative, Any train, such as P or Q, bridges the gap between two sections and receives a current which suffers reversal as the train passes from one section to the next. It is to be regretted that space does not admit of any description of the details of telpherage, many of which present the utmost ingenuity. The system was shown to be practicable by experiments on an experimental line at Weston. The first telpher line on a commercial basis was erected in 1885 at Glynde, in Sussex, and has been maintained in operation notwithstanding many diffi- culties inseparable from so completely novel an undertaking.

The electrical propulsion of boats, by means of storage batteries, Pro- has been the subject of several successful experiments, but has not pulsion In this connexion reference should of boats.

found systematic application. be made to a scheme proposed by Ayrton and Perry for the haulage of boats on canals or of waggons upon roads. Their proposal was to have a conductor ranged along the towing path, or along the side of the road. A motor running on this was to pull itself along and drag the boat or waggon after it.

In aerial navigation, storage batteries working an electric motor Aerial

In cars driven by storage batteries the same | have been used to drive the propeller of a “ dirigible” balloon. navigatiou.

object may be secured by various groupings of the cells. Space does not admit of more than the briefest reference to the Theory Tel- Telpherage.—\n all the methods of electrical traction to which | theory of electric motors. A motor may be regarded as a dynamo of | pherage. reference has been made the road on which the cars run is essen- | acting to produce an electromotive force ¢ which is opposite in motors.

tially a railway or tramiway of the kind used in horse traction and steam traction. In 1881 the late Prof. Fleeming Jenkin devised a system of electric locomotion in which the vehicles are hung upon what resembles an exaggerated telegraph line. To this he gave the name of telpherage. As developed by the inventor, in conjunction with Messrs Ayrton and Perry, the system is especially adapted to the transport of goods at a slow speed, in localities where the traffic would be insufficient to support an ordinary railway.

The telpher line is a steel rod or cable, suspended from brackets on posts about 70 feet apart; it serves at once as carrier of weights and conductor of electricity. The line may be made rigid, and in that case a high speed of transit may be attained; but in general the line is flexible aud the trains travel slowly in what may be, if the ; 1 For a comparison of the weights to be drawn and the tractive force required in different systems, see a paper by Mr Reckenzaun, lect. Rev., May 21, 1886.

. 2 For details of the construction and working expenses of these and other lines, see the valuable paper by Mr Reckenzaun, Jour. Soc. of Arts, April 20, 1887.

Statistics of American lines will be found in a paper by T. C. Martin, read before the American Institute of Electrical Engineers, May 18, 1887,

direction to the externally impressed electromotive force E. The resultant electromotive force is E—e, and on this, together with the resistance of the circuit, the strength of the current C depends. The electrical power supplied is CE, and of this the motor utilizes Ce. The efficiency is e/E. It is easily seen, as was first shown by Jacobi, that the power developed by the motor (Ce) is a maximum when c=}E, But this condition of maximum power involves that half the energy supplied is wasted ; to secure higher efficiency,

motors are in practice run at much less than their maximum power, so that e may approach more nearly to equality with E. The field magnets of motors, like those of dynamos, may be wound with coils in series with the armature coil, or with coils forming a shunt to the armature, or with a combination of both. A very important part of the theory deals with the automatic regulation of speed by the use of compound winding. In a paper of fundamental importance with regard to this part of the subject, Messrs Ayrton and Perry* have shown that a motor may be made to run

3 “Electromotors and their Government,” Jour. Soc, Tel. Eng. , 1883.

at constant speed under varying loads when the external electro- motive force is eonstant, provided that a differential combination of direct shunt and reverse series winding be employed,—the shunt coil serving to energize the magnets and the series eoil to reduce their magnetism to a certain extent when the current in the arma- ture is increased. The proportion of series to shunt winding neeessary for this result depends on the relation of the resistance of the armature to that of the shunt coil, and it is an easy deduction from the theory that, when the resistance of the armature is negligibly small, the speed of a simple shunt-wound motor driven by means of a constant external electromotive force is sensibly constant, a result which has been experimentally demonstrated by Mr Mordey (Phil. AMag., Jan. 1886). It is shown in the same paper that a similar means of governing may be used when the current passing through the motor is kept constant, instead of the external electromotive force. The principle of differential com- pound winding to secure automatic regulation of speed has been applied in several American motors, notably by Mr Sprague.

Details of most of the electrical tramways and railways mentioned in the text will be found in the journals Electrical Review, Electrician, and Electrical World (New York) of the dates referred to. See also he Electric Motor and its Appli- cations, by T. C, Martin and J. Wetzler (New York, 1887). The Portrush line is described by E. Hopkinson and A. Siemens in a paper read before the Society of Arts, April 1883. For telpherage, in addition to articles in the journals named, see Fleeming Jenkin, ‘‘On

Telpherage," Jour. Soc. Arts, May 1884; also Profes- stonal Papers of the Corps of Royal Engineers, Chatham, vol. x., 1884. (J. A. E.)

TRACY, Antoine Louis Craupre Dersturt, ComTE DE (1754-1836), was born in Bourbonnais on July 20, 1754. The noble family to which he belonged was of Scottish descent, tracing its origin to Walter Stutt, a gentleman who in 1420 accompanied the earls of Buchan and Douglas to the court of France, and whose family afterwards rose to be counts of Tracy. The father of Destutt de Tracy (as he is usually called) was a soldier, and died a field-marshal. Destutt de Tracy began his studies under the superintend- ence of his mother, and afterwards prosecuted them at the university of Strasburg. During his student days, how- ever, he was chiefly noted for his skill in every kind of manly exercise. On leaving the university he enibraced a military career, in which his advance was rapid. When the Revolution broke, Tracy, who was then thirty-five years of age, took an active part in the provincial assembly of Bourbonnais. He was elected a deputy of the nobility to the states-general, where he sat alongside of his friend La Fayette. In the spring of 1792 he received the rank of field-marshal, along with the sole command of the cavalry th the army of the North ; but, as the conduct of affairs fell more and more into the hands of the extremists, he took an indefinite leave of absence, and settled with his family at Auteuil. Here, in the society of Condorcet and Cabanis, he devoted himself to scientific studies. Under the Reign of Terror he was arrested and imprisoned for nearly a year. It was his solitary meditations at this period, we are told, which discovered to him his true bent. Under the influence of Locke and Condillac he aband- oned the natural sciences for tlle study of mind. On the motion of Cabanis he was named associate of the Institute in the class of the moral and political sciences. He soon began to attract attention by the mémovres which he read before his colleagues—papers which formed the first draft of his comprehensive work on ideology. The society of "ideologists" at Auteuil embraced, besides Cabanis and Tracy, who have been called respectively the physiologist and the metaphysician of the school, Volney, who has been called its moralist, and Garat, its professor in the National Institute. Under the empire he was a member of the senate, but took little part in its deliberations. Under the Restoration he became a peer of France, but protested against the reactionary spirit of the Government, and re- mained in opposition. In 1808

he was elected a member of the French Academy in room of Cabanis, and in 1832 he was also named a member of the Academy of Moral Sciences on its reorganization. He appeared, however, only once at its conferences. He was old and nearly blind, and filled with sadness, it is said, by the loss of his friends and the discredit into which his most firmly

cherished opinions had fallen. “His only distraction was to have Voltaire read aloud to him.” He died at Paris on the 9th of March 1836.

Destutt de Tracy. was the last eminent representative of the sensualistic school whieh Condillac founded in France upon a one- sided interpretation of the doctrines of Locke. He pushed the sensualistic principles of Condillae to their last consequences, being in full agreement with the materialistic views of his friend Cabanis, though the attention of the latter was devoted more to the physio- logieal, that of Tracy to the psychological or ‘‘ ideological ” side of man. His ideology, he frankly stated, formed ‘‘a part of zoology,” or, as we should say, of biology. To think is to feel. The four faculties into which he divides the eonscious life—perception, memory, judgment, will—are all varieties of sensation. Pereeption is sensation caused by a present affection of the external extremities of the nerves; memory is sensation caused, in the absence of pre- sent exeitation, by dispositions of the nerves which are the result of past experiences; judgment is the perception of relations between sensations, and is itself a spccies of sensation, beeause if we are aware of the sensations we must also be aware of the relations between them; will he identifies with the feeling of desire, and therefore includes it as a variety of sensation. It is easy to see that such eonclusions ignore important distinctions, and are, indced, to a large éxtent an abuse of language. As a psychologist Destutt de Tracy deserves eredit for his distinction between active and passive touch, which has developed into the modern theory of the museular sense. His account of the notion of external existence, as derived, not from pure sensation, but from the experience of action on the one hand and resistanee on the other, may be compared with the account of Bain and later psyehologists. Tracy worked up his separate monographs extending over a number of years into the Eléments d’ Idéologie (1817-18 and 1824-5), which presents his complete doctrine. He also wrote in 1806 a Commentaire sur l’ Esprit des Lois de Montesquieu, in which he argues ably in sup- port of a free constitution on grounds whieh hardly admit of being harmonized with his general philosophieal prineiples. The book was translated in America by his friend President Jefferson, who reeommended it for use in the colleges. The first Freneh edition appeared in 1817, and it was several times reprinted.

TRADE, Boarp or. The greater part of such super- vision of commerce and industry as exists in the United Kingdom is exercised by the “ Committee of Privy Council . for Trade ” (see Privy Councit), or, as it is usually called, the Board of Trade. As early as the 14th century councils and commissions had been formed from time to time to advise parliament in matters of trade, but it was not till the middle of the 17th century, under the Commonwealth, that any department of a pernianent character was attempted. Cromwell’s policy in this respect was continued under the Restoration, and in 1660 a committee of the privy council was appointed for the purpose of obtaining information as to the imports and exports of the country, and improving trade. A few years later another committee of the council was appointed to act as intermediaries between the crown and the colonies, or foreign plantations, as they were then called. This joint commission of trade and plantations was abolished in 1675, and it was not until twenty years later that the Board of Trade was revived under William III. Among the chief objects set before this board were the inquiry into trade obstacles and the employment of the poor ; the state of the silver currency was also a subject on which John Locke, its secretary, lost no time in making representations to the Government. Locke’s retirement in 1700 removed any chance of the Board of Trade advo- cating more enlightened opinions on commercial subjects than those generally held at that time. It had only a small share in making the constitutions of the colonies, as all the American ones except Georgia and Nova Scotia were formed before the reign of Charles II.; and in 1760 a secretary of state for the colonies was appointed, to whom the control drifted away. In 1780 Burke made his cele- brated attack on the public offices, which resulted in the abolition of the board. In 1786, however, another per- manent committee of the privy council was formed by order in council,‘and with one or two small exceptions the legal constitution of the Board of Trade is still regulated by that order. Under it all the principal officers of state,

including the first lords of the treasury and admiralty, the secretaries of state, and certain members of the privy council, among whom was the

archbishop of Canterbury, obtained seats at the board ex officio; and ten unofficial members, including several eminent statesmen, were also placed on the committee.. The duties of the revived board were made the same as they were in the beginning of the century, but, in addition, the regulation of the food supply of the country, by restricting or relaxing the export and import of corn, was brought into prominence owing to a larger population requiring to be fed. New duties were thrown on the board by the growth of joint-stock com- panies, the development of railways, and the increase in shipping, and it was necessary to break it up into depart- ments charged with the administration of the various Acts of Parliament. The Board of Trade thus became a mere name, the president being practically the secretary of state for trade, and the vice-president became, in 1867, a parlia- mentary secretary, with similar duties to those of a par- liamentary under-secretary of state. At present, besides the president, who has usually a seat in the cabinet, the parliamentary secretary, and a permanent secretary, there are six assistant secretaries, each in charge of a department.

1. The Commercial Department is the real remains of the original Board of Trade, as it combines the charge of the trade statistics with the general consultative duties with which King Charles II.'s board was originally entrusted. The statistical work includes compiling the abstracts relating to the United Kingdom, the col- onies, and foreign countries, the supervision of the trade accounts, and the preparation of shipping, railway, emigration, and fishery statistics. A record of the prices of corn has been obtained from actual sales in the chief market towns for about a hundred years, the original object being the sliding scale of corn duties, but these are now continued to govern the tithe payments, and form an un- broken series of prices based on actual transactions, and not mere market quotations. Foreign and colonial customs tariffs and regulations are also matters on which information is published, and labour statistics are for the future to have special attention. In 1872 one of the most important functions of the commercial department, viz., the negotiation of commercial treaties, was trans- ferred to the Foreign Office, but the Board of Trade is still con- sulted on these matters by the Foreign Office, as well as by the Colonial Office on colonial commercial matters, and by the other public departments. The Bankruptcy Act of 1883 added a new branch of work, but for this there is now a separate establishment under an inspector-general. The last new work

undertaken by the department is the publication (begun August 1886) of a Monthly Journal of commercial information, chiefly from official sources.

2. The Railway Department was originally constituted in 1840, and performs multifarious duties under various Railway Acts, including the inspection of railways before they are open, inquiries into accidents, reports on proposed railways, approval of bye-laws, appointment of arbitrators in disputes, as well as many duties under private Railway Acts. The inspection of tramways, their bye-laws and ‘‘ provisional orders,” are all dealt with here, as are similar orders relating to gas and water schemes and to electric lighting. Patents, designs, and trade marks are now dealt with by the Patent Office, which is subordinate to the railway department, and copy- right, art unions, and industrial exhibitions are also among the matters dealt with by the departinent.

8. The Marine Department was created a separate branch of the Board of Trade in 1850, about which time many new and import- ant marine questions came under the Board of Trade, such, for example, as the survey of passenger steamers, the compulsory examination of masters and nates, the establishment of shipping offices for the engagement and discharge of seamen. Further work fell to the marine department by the Act of 1853, which gave it the control of lighthouse funds, and to a certain extent of pilotage. The consolidating Merchant Shipping Act of 1854 and subsequent legislation so much increased the department that in 1866 it was divided into three, viz., the present marine department, which deals with ships and seamen, the harbour department, and the finance department.

4. The Harbour Department was, as stated above, a branch of the marine department until 1866, so far as it is connected with the physical adjuncts of navigation, but various other matters have since been added, ¢.g., the charge of the foreshores belonging to the crown, formerly managed by the commissioners of woods and forests, and the protection of navigable harbours and channels, long under the control of the Admiralty. Lighthouse funds, pro- visional orders for oyster and mussel fisheries, the management of

Holyhead and Ramsgaté harbours and of Dover pier, wreck, and quarantine are all ainong the matters dealt with by this depart- ment, which also has charge of the standards department for weights and measures.

5. The Finanee Department was, like the harbour department, separated in 1866 from the marine department. The accounts of all the branches of the Board of Trade are in its charge, including the subordinate officcs. It also deals with the accounts of harbours, lighthouses, and mercantile marine offices, and of the merchant, seamen's fund, and with the consuls' accounts for disabled scamen abroad. Savings banks and seamen's money orders are also among the accounts and payments with which it is charged, and outside these marine matters it has to prepare for parliament the life in- surance companies' accounts and to take charge of the bankruptcy estate accounts.

6. The Fisheries Department.—By a recent Act the powers of the Home Office over salmon and other fisherics have been transferred to the Board of Trade, and a small department has consequently been created charged with the care of those industries.

TRADE-MARKS. There seems no reason to doubt that the practice of employing a mark to denote the goods of a particular trader (not necessarily the manufacturer) grew out of the use of signs, which, first affixed to the dealer's shop, were afterwards represented on his tokens, and eventually placed on the goods themselves. Trade- marks proper appear to have been in use in England in the reign of Elizabeth. The first reported case was in 1783, when Lord Mansfield decided that the sale by the defendants of a certain medicine under the name or mark of the plaintiff was a fraud. By other decisions it was affirmed that the use of another's trade-mark was action- able, even without the intent to defraud. The law, how- ever, remained in an unsatisfactory condition till, by the Merchandise Marks Act in 1862, it was made a misdemean- our to forge or counterfeit a trade-mark, while penalties were inflicted for the sale of articles bearing a forged mark.

In 1875 the Trade Marks Registration Act established for the first time a registry of trade-marks in Britain, greatly facilitating the proof of title. A more precise definition of a trade-mark was also provided. In 1883 this Act was repealed by the Patents, Designs, and Trade Marks Act, in which its principal provisions were incorporated. All proceedings for the registration

of trade-marks are now regulated by the Patents Act. A trade-mark may be a name printed or otherwise delineated in some particular or distinctive manner, or a signature, or a device, mark, brand, &c. Registration is compulsory, at least in the sense that the owner cannot prevent infringement or sue for damages for infringement unless he has registered, though it would appear that this disability exists only in the case of a mark capable of being registered under the Act. There are certain ¢xdicia which cannot be registered because they do not fall within the definition of a trade-mark, but which may yet be protected at equity. Registration is deemed equivalent to public use of the mark, and, after the expira- tion of five years, is conclusive evidence of right to exclusive use. Applications for registration have to be addressed to the comptroller of patents ; should he refuse to register, there is an appeal to the Board of Trade. If there is opposition, the matter goes to the High Court of Justice. Registration holds good for fourteen years, at the end of which time it has to be renewed. Special provision is made in the Act for the retention of certain of the ancient privileges of the Cutlers Company of Sheffield. The total number of marks now upon the register is nearly 50,000.

The Customs Consolidation Act, 1876, forbids the importation of articles of foreign manufacture bearing any mark purporting to be the mark of manufacturers resident in the United Kingdom, or stating or implying that such articles were manufactured in the United Kingdom. The Merchandise Marks Act, 1887, consolidated and amended the law of offences relating to trade-marks and trade descriptions. It repealed the Act of 1862 and replaced it by fuller provisions. It is now an offence to forge a trade-mark, to falsely

apply to goods any trade-mark or any mark so nearly resembling a trade-mark as to deceive, to make any die, &c., for the purpose of

forging or for being used for forging a trade-mark, to apply any false trade description to goods, to dispose of or have in possession any die, &c., for the purpose of forging a trade-mark, or to cause any of the above-mentioned things to be done. There are special sections in the Act dealing with its application to watches and watch-cases. Where a watch-case is of foreign manufacture it must, if stamped at an assay office in the United Kingdom,

bear a mark differing from the mark placed upon watches manufactured in the United Kingdom. A warranty is implied in the sale of goods bearing a trade-mark or trade description. See WARRANTY.

In most foreign countries provisions have long existed for the registration of trade-marks ; and they also form one of the classes of “industrial property” for the protection of which an inter- national convention was formed in 1883. This convention now includes sixteen states,—the more important being Belgium, France, Great Britain, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United States. The subjects of all the contracting states enjoy in each state the same rights and privileges as that state grants to its own subjects for the pro- tection of trade-inarks. Registration also in one of the states con- fers certain rights of priority in the others.

United States.—The legislation of the different States and Territories varies considerably, some providing for the registration of trade-marks either with or without protection for unregistered trade-marks, while others provide only for protection without registration. On March 3, 1881, Congress passed an Act ‘‘to authorize the registration of trade-marks and to protect the same,” which provides that owners of trade-marks used in commerce with foreign nations or with the Indian tribes, provided such owners be domiciled in the United States or located in any foreign country or tribe which affords similar privileges to citizens of the United States, may obtain registration of trade-marks under the Act. Registration is not compulsory ; failure to register a trade-mark, or to renew registration, does not deprive the owner of any remedy he might have at law or in equity; and the courts will, generally speaking, protect the unregistered equally with the registered.

For fuller information see L. B. Sebastian’s Law of Trade Marks, or R. W. Wallace’s edition of the Patents, Designs, and Trade Marks Act ; and in Amcrica Rowland Cox’s American Trade-Mark Cases, Cox’s Manual of Trade-Mark Cases, and William Henry Brown’s Treatise on the Law of Trade Marks.

TRADE UNIONS are combinations for regulating the relations between workmen and masters, workmen and

tive conditions on the conduct of any industry or business. By the common law all such combinations were, with cer- tain rare and unimportant exceptions, regarded as illegal. They were considered to be contrary to public policy, and were treated as conspiracies in restraint of trade. Those who were engaged or concerned in them were liable to be criminally prosecuted by indictment or information, and to be punished on conviction by fine and imprisonment. The offence was precisely the same whether it was committed by masters or by workmen. But, although the provisions of the common law applied mutatis mutandis to both of them alike, it was, practically speaking, in reference rather to the latter than to the former that their effects were developed and ascertained. While it was held to be perfectly lawful for workmen, as individuals, to consent or to refuse to labour for any remuneration or for any time they pleased, when two or more of them joined together, and agreed to labour only on certain stipulated terms with respect either to the payment or the duration of their labour, they were guilty ¢pso facto of a miisdemeanour. It was immaterial whether the end they had in view was to determine wages or to limit work; or whether the means they adopted for promoting its attainment was a simul- taneous withdrawal from employment, an endeavour to prevent other workmen from resuming or taking employ- ment, or an attempt to control the masters in the manage- ment of their trade, the engagement of journeymen or apprentices, or the use of machinery or industrial processes ; or whether in seeking to enforce their demands they relied merely on advice and solicitation, or resorted to reproach and menace, or proceeded to actual violence. In any event their combination in itself constituted a criminal conspiracy, ~~and rendered them amenable to prosecution aud punish~~ ment.

| tion laws," in the session of 1824. workmen, or masters and masters, or for imposing restric- |

| proper."

From the reign of Edward I. to the reign of George | IV. the operation of the common law was enforced and |

enlarged by between thirty and forty Acts of Parliament, all of which were more or less distinctly and explicitly designed to prohibit and prevent what we have learned to describe and recognize as the “ organization of labour.” But the rise of the manufacturing system towards the end of the last century, and the revolution which accompanied it in the industrial arrangements of the country, were attended by a vast and unexpected extension of the move- ment which the legislature had for so long and with so much assiduity essayed to suppress. Among the multi- tudes of workmen who then began to be employed in single factories or in neighbouring factories in the same towns, trade unions in the form of secret societies speedily became numerous and active, and to meet the novel requirements of the situation a more summary method of procedure than that which had hitherto been available was provided by the 40th Geo. III. cap. 106. By this statute, passed in 1800, it was enacted that all persons combining with others to advance their wages or decrease the quantity of their work, or in any way to affect or control those who carried on any manufacture or trade in the conduct and management thereof, might be convicted before one justice of the peace, and might be committed to the common jail for any time not exceeding three calendar months, or be kept to hard labour in the house of correction for a term of two calendar months. The discontent and disorder of which, in conjunction with a state of commercial depres- sion and national distress, the introduction of steam and improved appliances generally into British manufactures was productive in the first quarter of the current century led to the nomination of a select committee by the House of Commons, to inquire into the whole question of what were popularly and comprehensively designated the “combina- After taking evidence, the committee reported to the House that “those laws had not only not been efficient to prevent combinations either of masters or workmen, but on the contrary had, in the opinion of many of both parties, had a tendency to produce mutual irritation and distrust, and to give a violent character to the combinations, and to render them highly dangerous to the peace of the community.” They further reported that in their judgment “ masters and workmen should be freed from such restrictions as regards the rate of wages and the hours of working, and be left at perfect liberty to make such agreements as they mutually think They therefore recommended that “the statute laws which interfered in these particulars between masters and workmen should be repealed,” and also that “the common law under which

a peaceable meeting of masters or workmen might be prosecuted should be altered.” In pursuance of their report, the 4th Geo. IV. cap. 95 was at once drafted, brought in, and passed. But the immediate results of the change which it effected were regarded as so inconvenient, formidable, and alarming that in the session of 1825 the House of Commons appointed another select committee to re-examine the various problems, and review and reconsider the evidence which had been submitted to their predecessors in the previous year. They reported without delay in favour of the total repeal of the 4th Geo. IV. cap. 95, and the restoration of those provisions of the combination laws, whether statutory or customary, which it had been more particularly intended to abrogate. The consequence was the enactment of the 6th Geo. IV. cap. 129, of which the preamble declares that the 4th Geo. IV. cap. 95 had not been found effectual, and that combinations such as it had legalized were “injurious to trade and commerce, dangerous to the tranquillity of the country, and especially prejudicial to the interests of all who were concerned in them.” The effect of the 6th Geo. IV. cap, 129 was to leave the common law of conspiracy

in full force against all combinations in restraint of trade, except such as it expressly exempted from its operation as it had been before the 4th Geo. IV. cap. 95 was passed. It comprised, however, within itself the whole of the statute law relating to the subject, and under it no persons were liable to punishment for meeting together for the sole purpose of consulting upon and determining the rate of wages or prices which they, being present, would require for their work or pay to their workmen, or the hours for which they would work or require work in any trade or business, or for entering into any agreement, verbal or written, for the purpose of fixing the rate of wages or prices which the parties to it should so receive or pay. But all persons were subjected to a maximum punishment of three months’ imprisonment with hard labour who should by violence, threats or intimidation, molestation, or obstruction do, or endeavour to do, or aid, abet, or assist in doing or endeavouring to do, any of a series of things inconsistent with freedom of contract which the Act enumerated and defined. Afterwards, in order to remove certain doubts which had arisen as to the true import and meaning of the words “molestation” and ‘

obstruction," it was provided by the 22d Vict. cap. 34 that "no person, by reason merely of his endeavouring peaceably and in a reasonable manner, and without threat or intimidation direct or indirect, to persuade others to cease or abstain from work, in order to obtain the rate of wages or the altered hours of labour agreed to by him and others, should be deemed to have been guilty of ' molestation ' or 'obstruction.'" In spite of the partial recognition which trade unions had thus received, they continued to be un- lawful, although not necessarily criminal, associations. In certain cases, they were by statute exempted from penal consequences, and their members were empowered to combine for specified purposes, and to collect funds by voluntary contributions for carrying them into effect. But in the estimation of the common law the special privileges which had been accorded to them under particular circum- stances did not confer any general character of legality upon them, and where their rules were held to be in restraint of trade, as in the prohibition of piece-work or the limitation of the number of apprentices, they were still regarded as conspiracies. Hence they were practically excluded from the advantages in regard to the security of their property and the settlement of their disputes which, under the Friendly Societies Act, 18th and 19th Vict. cap. 63, had been granted to all associations established for any purposes which were not illegal. In this condition the law was when what became notorious as the " Sheffield and Manchester outrages " suggested the appointment of the royal commission on trade unions, which investigated the subject from 1867 to 1869. The outcome was, first, a temporary measure for the more effectual protection of the funds of trade unions, passed in 1869, and, secondly, the two measures which, as amended and amending, are cited together as the "Trade Union Acts 1871 and 1876"— the 34th and 35th Vict. cap. 22 and the 39th and 40th Vict. cap. 31.

By these statutes, construed with tne Conspiracy an Protection of Property Act, 1875, the 38 and 39 Vict. cap. 86, the law relat- ing to combinations, whether of workmen or of masters, assumed the shape in which it exists at the present time. In connexion with trade disputes no person'can now be prosecuted for conspiracy to commit an act which would not be criminal if committed by him singly, and consequently employers and employed alike may lawfully do in combination all that they would be entitled to do as individuals. The purposes of a trade union arc not to be deemed illegal

merely because they are in restraint of trade, and the cir- cumstance that they are in restraint of trade is not to render any member of it liable to prosecution, nor is it to avoid or make void- able any agreement or trust relating to it. No court, however, can entcrtain legal proccedings with the object of directly enforcing or recovering damages for the breach of an agreement between the

members of a trade union as such, concerning the conditions on which the members for the time being shall or shall not sell their goods, transact their business, employ or be employed, or the pay- ment by any person of any subscription or penalty to a trade union, or for the application of the funds of a trade union to provide benefits or to furnish contributions to any employer or workman not a member of such trade union in consideration of such employer or workman acting in conformity with the rules or resolutions of such trade union, or to discharge any fine imposed upon any person by any court of justice or any agreement made between one trade union and another, or any bond to secure such agreements. But such incapacity to sue on such agreements is not to be taken as constituting any of them illegal. Every person, however, com- mits a misdemeanour, and on convietion is liable to a maximum fine of £20, or to a maximum imprisonment of three months with hard labour, who wilfully and maliciously breaks a contract of service or hiring, knowing, or having reasonable cause to believe, that the probable consequence of his so doing, either alone or in combination with others, will be to endanger human life or cause serious bodily injury, or to expose valuable property, whether real or personal, to destruction or serious injury ; or who, being em- ployed by a municipal authority or by any company or contractor on whom is imposed by Act of Parliament, or who have otherwise assumed, the duty of supplying any place with gas or water, wilfully and maliciously breaks a contract of service or hiring, knowing, or having reasonable cause to believe, that the probable consequence of his so doing, alone or in combination with others, will be to deprive the inhabitants of that place, wholly or in part, of their supply of gas or water; or who, with a view to compel any other person to do or to abstain from doing any act which such other person has a right to abstain from doing or to do, wrongfully and

without legal authority uses violence to or intimidates such other person or his wife or children, or injures his property; or who persistently follows such person about from place to place ; or who hides any tools, clothes, or other property owned or used by such other person, or deprives him of or hinders him in the use thereof; or who watches or besets the house or other place where such person resides or works or carries on business or happens to be, or the approach to such house or place; or who follows such other person with two or more other persons in a disorderly manner in or through any street or road. But attending at or near the house or eis where a person resides or works or carries on busi- ness in order mercly to obtain or communicate information is not watching or besetting within the statute. In regard to registration, trade unions are placed on a similar footing with friendly and provident and industrial societies, and they enjoy all the privileges, advantages, and facilities which those associations possess and command. On their side, however, they have to comply with the same conditions, are subject to the same liabilities, and are com- pelled to make the same periodical returns.

Although there are several large and influential societies among the employers of labour which come within the legal definition of trade unions, what are commonly as well as more accurately meant by trade unions are societies exclusively composed of the employed, —the suppliers of labour whether skilled or unskilled. Of trade

‘unions in this sense, —those of which the members are all artisans or

labourers, —the organization is everywhere pretty much the same, although the rules and regulations of various associations differ in detail more or less distinctly and widely from one another. Their ordinary constitution is that of a society divided into districts, and again into smaller local bodies. The seat of the governing authority —the general or executive council—is usually fixed at some large centre of industry or commerce, as London, Manchester, or Bir- mingham, and it is often changed at stated intervals by a vote of the society at large. Itis the policy of the trade unions, by this method of organization, to extend the area of their influence, and so to increase their power in dealing with the masters or in con- trolling their own members in any emergency. Each of the branches has a separate government for special

purposes. But for general purposes all the branches are under the command of the exccutive council or central committec, which is constituted of members or officers who are elected by the whole society. The terms on which members are admitted are different in different associations. But in all of them there are certain limits as to age and the number of years during which the candidate has been apprenticed to or has worked in the trade. The revenne and reserve of all the societies are derived from admission fees and weekly or monthly subscriptions, together with the amount of the fines which are imposed for neglect of duty and breaches of the rules and regulations. These sources of income arc sufficient for ordinary purposes ; and extraordinary charges, such as are entailed by a “strike” or a ‘‘lock-out,” are nearly always, if not invari- ably, met by means of ‘‘ levies” made on the members by order of the executive council or central committec. The following account of the Amalgamated Society of Engineers may be accepted as furnishing a typical example of the organization and management of a large and flourishing trade union.

TRADE

According to the thirty-third annual Report of that society, it appears that in 1883 the union consisted of 424 branches, chiefly in towns in the British Isles, but with a fair sprinkling in Canada, the United States, Australia, India, and other parts of the globe. The number of members was 50,418.

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Amalgamated Society of Engincers the contribution of each member is generally 1s. a week, and if a man be in arrears he is suspended from the benefits of the society, unless indeed he is out of work or in distressed circumstances. At the end of 1883 the union had a balance in hand of £178,128, or upwards of £3, 10s. a man.

In some trade unions—for example, those of the compositors— there is a special body (“fathers of chapels”) whose business it is to see that the rules and regulations of the societies they belong to are faithfully observed in the establishments where they are employed. In others again—for instance, in the National Agricultural Labourers Union, as distinguished from the Federal Union of Agricultural Labourers—the system of management is

completely centralized, the secretary or the executive committee having entire control of the funds and business of the whole association. In all large towns there are trade councils formed of delegates from the different trade unions within their area, whose function it is to discuss and supervise the general interests of the unionists in the several trades of which they are representative. Morcover, an annual trade unions congress is held in some great centre of industry and population in one of the threc kingdoms, at which delegates from almost all the trade unions throughout the realm are present and take part in debating questions, whether social or political, which are of special interest to the working classes, At these assemblies, which have now been held for twenty consecutive years, a parliamentary com- mittee, which remains in existence for the ensuing twelvemonth, is chosen, to whom the whole body of trade unionists looks for counsel and assistance with respect to legislation intended or desired on their behalf. To the action of the trade unions congress and their parliamentary committee much of the legislation which has been recently effected on questions affecting the welfare of the order of the community to which they belong is to be attri- buted,—notably the Employers' Liability Act and the amended Factory and Mines Acts. (See Trade Unions, &c., by William Trant.)

The objects of trade unions are twofold, —first, those of a friendly or benefit society, and, secondly, those of a trade society or guild. In the former capacity they afford relief to their members when they are out of work from any cause, including sickness or accident ; they occasionally provide them with superannuation allowances, and they almost always make burial allowances on account of deceased members and their wives. In the latter capacity it is their special business to promote what they conceive to be the interests of the trade with which they are connected by placing the workmen, so far as combination will fulfil that purpose, on a footing approaching to equality with the capitalists by whom they are employed in the disposal of their labour. Of course this is the great object for which the unions really exist. But, as the com- missioners on trade unions have pointed out, it is found desirable to conjoin the objects of a friendly or benefit society with it, because by that means additional members and funds are obtained, and the authority which the union as a trade society has over its members is thus augmented. The leading aims of all trade union- ism are to increase wages and to diminish the labour by

which it is needful to earn them, and further to secure a more equal distribution of work among the workmen in any given trade than would be the case under a régime of unrestricted competition. Hence their rules prescribe a minimum amount of wages to be accepted and a maximum amount of work to be done by their members, and prohibit piece work or working overtime. The methods by which the unionists endeavour to accomplish their end, which is in a sense the monopoly of the labour market, are either direct or indirect. The direct method is a "strike," or simultaneous cessation of labour on the part of the workmen. It is the ultimate sanction as between the employed and their em- ployers of the demands made by the union. But, where the unionists are strong, the mere threat of a strike is often sufficient to fulfil the intended purpose, and arbitration is still more frequently found effectual for bringing about a settlement or com- promise. The indirect methods to which the trade unionists resort for reaching their aims are by limiting the number of workmen to be employed in any trade and by repressing or discountenancing competition among those who are actually employed in it. Most of them forbid the admission of more than a stipulated proportion of apprentices, and some of them prohibit the engagement of women to do work which can be done by men. Nearly all of them resist the common employment of unionists and non-unionists, and do their best to exclude non-unionists from employment altogether. But the amount expended by trade unions in the conduct of trade disputes is very much less than is generally imagined. Mr George Howell, for instance, showed conclusively in the Contemporary Review that such was the case three or four years ago, and Mr Murchie, the chairman of the parliamentary committee, stated at the trade unions congress at Stockport in the autumn of 1885 that Mr Howell's contentions had been signally confirmed by more recent experience. Taking the seven largest trade unions, those whose statistics had been relied on by Mr Howell—namely, the Amalgamated Engineers, the Ironfounders, the Boiler Makers

and Iron Shipbuilders, the Steam-Engine Makers, Ironmoulders of Scotland, Amalgamated Tailors, and Amalgamated Carpenters and Joiners—he affirmed that, while in the nine years preceding 1884 their receipts were £2,818,548, thcir expenditure was £2,963,186, of which amount £1,207,180

was spent in unemployed benefit, £592, 273 in sick benefit, £975,052 in compensation for loss of tools, superannuations, accidents, funerals, minor grants and benefits, and expense of management, only £188,680 had been spent in connexion with “trade movements,” or about 64 per cent. of the whole sum expended.

There are no really trustworthy means of arriving at anything approaching to an accurate estimate of the actual numerical strength of the trade unions in the United Kingdom. According to the last Report of the registrar general of friendly societies, there were in the year 1883 registered in his office 195 trade unions with 253,088 members and £431,495 funds, of which 12 returned over £10,000 funds, 9 over 10,000 members, and 6 over £10,000 income. But this of course conveys a very inadequate notion of the dimensions to which trade unionism has attained, since many of the largest and most influential societies are still unregistered.

The following table shows the number of delegates and the ageregate membership of the societies represented by them at the trade unions congresses in the years from 1880 to 1886, both inclusive :—

Number} mage | Trade Total Number | Number | of — |gouncils| Unions Ppsiieltos ars sented of Bodies repre- repre- (0) Persons sented by directly Delegates.| repre- Beited sented repre- Trade (approxi- sented. ‘ |directly.| sented. | Councils. mate). 1880 122 105 | (7 88 474,213 92,511 | 381,702 1881 154 122 18 104 460,797 86,376 | 374,421 1882 153 126 23 103 508,337 102,972 | 405,365

1883 173 135 21 114 561,091 94,166 466,925

1884 | 142 116 21 95 597,636 109,984 487,652 1885 162 136 27 109 631,606 131,368 | 500,238

1886 143 121 24 97 635,380 122,207 513,173

Weshallnotbefar wrong, perhaps, ifwesetdownthenumberof trade unionists in all the three kingdoms at about 800,000. (F. DR.)

TRAGEDY. See Drama.

TRAJAN (c. 538-117 a.p.). Marcus Utprus TRAIANus, the fourteenth Roman emperor, was a native of Italica, in Spain. The family to which he belonged was probably Italian and not Iberian by blood. His father began life as a common legionary soldier, and fought his way up to the consulship and the governorship of Asia. He was one of the hardest fighters in Judea under Vespasian and Titus ; he served too against the Parthians, and won the highest military distinction open to a subject, the grant of the triumphal insignia. Thus he acquired a prominent place among the brand new patricians created by the Flavians as substitutes for the nobles of old descent who had succumbed to the cruelty and rapacity of the emperors from Tiberius to Nero. The younger Trajan was rigor- ously trained by his father, and deeply imbued with the same principles and tastes. bred. No better representative of the true old hardy Roman type, little softened either by luxury or educa- tion, had come to the head of affairs since the days of Marius. The date of his birth was probably 53 a.p. His training was almost exclusively military, but his ex- perience as an officer gave him an acquaintance with almost every important province of the empire which was of priceless value to him when he came to the throne. For ten years, he held a commission as military tribune, which took him to many lands far asunder ; then he filled important posts in Syria and Spain. How much actual warfare Trajan saw in those days we can hardly tell ; he certainly went through some severe service under his father’s command against the Parthians. he had achieved a considerable reputation. At that time L. Antonius Saturninus headed a rebellion in Germany, which threatened seriously to bring Domitian’s rule to an

end. ‘Trajan was ordered in hot haste from Further Spain Although he carried his troops over that |

to the Rhine. long and arduous march with almost unexampled rapidity,

TR A—

He was a soldier born and |

By the year 89 |

i A

But his promptitude raised him higher in the favour of Domitian, and he was advanced to the consulship in 91.

| Of the next five years of his life we know nothing posi-

tively. It is not unlikely that they were spent at Rome or in Italy in the fulfilment of some official duties. When the revolution of 96 came, and Nerva replaced the murdered Domitian, Trajan had conferred upon him one of the most important posts in the empire, that of consular legate of Upper Germany. An officer whose nature, as the event showed, was interpenetrated with the spirit of legality was a fitting servant of a revolution whose aim it was to substitute legality for personal caprice as the dominant principle of affairs. The short reign of Nerva really did start the empire on a new career, which lasted more than three quarters of a century. But it also demon- strated how impossible it was for any one to govern at all who had uo claim, either personal or inherited, to the respect of the legions. Nerva saw that if he could not find an Augustus to control the army, the army would find another Domitian to trample the senate under foot. In his difficulties he took counsel with L. Licinius Sura, a lifelong friend of Trajan, and in October 97 he ascended the Capitol, and with all due solemnity proclaimed that he adopted Trajan as his son. The senate confirmed the choice, and acknowledged the emperor's adopted son as his successor. In a letter which Nerva sent at once to Trajan he quoted most significantly a line from the begin- ning of the Iliad, where Chryses, insulted by Acliilles, prays to Apollo: " May thy shafts afford me vengeance on the Greeks for my tears." After a little hesitation Trajan accepted the position, which was marked by the titles of imperator, Cesar, and Germanicus, and by the tribunician authority. He immediately proceeded to Lower Germany, to assure himself of the fidelity of the troops in that province, and while at Cologne he received news of Nerva's death (January 98). The authority of the new emperor was recognized at once all the empire over. The novel fact that a master of the Romans should have been born on Spanish soil seems to have passed with little reinark, and this very absence of notice is significant. Trajan's first care as emperor was to write to the senate an assurance like that which had been given by Nerva, that he would neither kill nor degrade any senator. He ordered the establishment of a temple and cult in honour of his adoptive father, but he

did not present himself at Rome for nearly two years after his accession. Possibly he had taken measures before Nerva's death to secure the revenge which Nerva craved, but probably did not live to see. In his dealings with the mutinous pretorians the strength of the new emperor's hand was shown at once. He ordered a portion of the force to Germany. They did not venture to disobey, and were distributed among the legions there. Those who remained at Rome were easily overawed and reformed. It is still more surprising that the soldiers should have quietly submitted to a reduction in the amount of the donative or gift which it was custom- ary for them to receive from a new emperor, though the civil population of the capital were paid their largess (congt- arium) in full. By politic management Trajan was able to represent the diminution as a sort of discount for immediate payment, while the civilians had to wait a con- siderable time before their full due was handed to them. The secret of Trajan's power lay in his close personal relations with the officers and men of the army and in the soldierly qualities which commanded their esteem. He possessed courage, justice, and frankness to a high degree. Having a good title to military distinction himself, he could afford, as the unwarlike emperors could not, to be generous to his officers. The common soldiers, on the

he only arrived after the insurrection had been put down, | other hand, were fascinated by his personal prowess and

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his somewhat ostentatious caniaraderie. His features were firm and clearly cut; his figure was tall and soldierly, and exhibited the sinewy hard health of a veteran cam- paigner. His hair was already grey before he came to the throne, though he was not more than forty-four years old. The stoutness of the emperor's arm had been proved in the face of his men in manya hard fight. When on service he used the mean fare of the common private, dining on salt pork, cheese, and sour wine. Nothing pleased him better than to take part with the centurion or the soldier in fencing or other military exercise, and he would applaud any shrewd blow which fell upon his own helmet. He loved to display his acquaintance with the career of dis- tinguished veterans, and to talk with them of their bat- tles and their wounds. Probably he lost nothing of his popularity with the army by occasional free

indulgence in sensual pleasures, with which, as Bacon remarks, the soldier is apt to pay himself for the perils he encounters. Yet every man felt and knew that no detail of military duty, however minute, escaped the emperor's eye, and that any relaxation of discipline would be rigidly punished, yet with unwavering justice. Trajan emphasized at once his personal control and the constitutionality of his sway by bearing on his campaigns the actual title of " proconsul," which no other emperor had done. All things considered, it is not surprising that he was able, without serious opposition from the army, to remodel the whole military institutions of the empire, and to bring them into a shape from which there was comparatively little departure so long as the army lasted. In disciplinary matters no emperor since Augustus had been able to keep so strong a control over the troops. Pliny rightly praises Trajan as the lawgiver and the founder of discipline, and Vegetius classes Augustus, Trajan, and Hadrian together as restorers of the morale of the army. The confidence which existed between Trajan and his army finds expression in some of the coins of his reign.

For nearly two years after his election Trajan did not appear in Rome. He had decided already what the great task of his reign should be—the establishment of security upon the dangerous north-eastern frontier. Before visiting the capital he determined to put affairs in train for the attainment of this great object. He made a thorough in- spection of the great lines of defence between the Danube and the Rhine, and framed and partly carried out a vast scheme for strengthening and securing them. The policy of opposing uncivilized tribes by the construction of the limes, a raised embankment of earth or other material, intersected here and there by fortifications, was not his invention, but it owed in great measure its development to him. It is probable that the northernmost part of the great limes Germanizx, from the Rhine at Rheinbrohl, nearly midway between Coblenz and Bonn, to a point on the Main east of Frankfort, where that river suddenly changes its course from north to west, was begun by Domitian. The extension of this great barrier southwards was undertaken by Trajan, though we cannot say how far he carried the work, which was not entirely completed till long after his time. The dimes leaves the Main at Milten- berg, a point at which the north and south course of the river is broken by a great angle, and then follows a hne generally parallel to the stream of the Neckar, till it reaches Lorch, a place between Stuttgart and

Aalen. Here it meets the so-called dimes Retizx, which trends eastward till it cuts the Danube at Kelheim, a place some distance short of Ratisbon, the ancient Castra Regina. This grand work, which would have excited the envy of Augustus, is trace- able in its main extent at the present day. We may with- out hesitation follow the opinion of Mommsen, who main- tains that the dimes was not intended, like Hadrian's wall

between the Tyne and the Solway, and like the great wall of China, to oppose an absolute barrier against incursions from the outside. It was useful as marking definitely the boundary of the Roman sway, and as assuring the Romans that no inroad could be made without intelligence being had of it beforehand, while the limes itself and the system of roads behind it enabled troops to be directed rapidly to any threatened point, and the fortified positions could be held against large numbers till reinforcements arrived. Great importance was no doubt attached to the perfection of the lines of communication bearing on the dimes. Amonga people of roadmakers, Trajan was one of the greatest, and we have definite evidence from inscriptions that some of the military roads in this region were constructed by him. The more secure control which the Romans now maintained over the territory within the limes tended to its rapid civilization, and the Roman influence, if not the Roman arms, soon began to affect powerfully the regions beyond.

After his careful survey of the Rhine end of the great defensive barrier, Trajan proceeded to consider it and plan it from the Danube. From the age of Tiberius onwards the Romans possessed the whole southern bank of the river from its source to the Euxine. But the precarious tenure of their possession had been deeply impressed on them by thie disasters and humiliations they had under- gone in these districts during the reign of Domitian. A prince had arisen among the Dacians, Decebalus by name, worthy to be placed at the head of all the great barbarian antagonists of Rome. Like Maroboduus, he was able to combine the forces of tribes commonly hostile to each other, and his military ability almost went the length of genius. After he had swept the province of Mcesia bare, he was defeated by one of Domitian's lieutenants, but the position of affairs on the

Danubio-Rhenish border was still so threatening that the emperor was glad to conclude a treaty which conferred extraordinary advantages on his foe. Not only did the Romans stipulate to pay to Dece- balus an annual subsidy, which he must have regarded as a tribute, but they agreed to supply him with engineers and craftsmen skilled in all kinds of construction, but particularly in the erection of fortifications and defensive works. During the nine or ten years which had elapsed since the conclusion of this remarkable treaty, the Dacian prince had immensely strengthened the approaches to his kingdom from the Roman side. He had also equipped and drilled his formidable army after the Roman fashion. It was impossible for a soldier like Trajan to endure the conditions laid down by Domitian; but the conquest. of Dacia had become one of the most formidable tasks that had ever confronted the empire. ‘Trajan no doubt planned a war before he left the Danube for Rome late in 99.

The arrival of the emperor had been awaited in the capital with an impatience which is expressed by Pliny and by Martial.! All that had happened since Trajan’s eleva- tion to the throne had raised high at Rome.the hope of a prosperous and glorious reign. As he entered the city and went on foot to the Capitol, the plaudits of the people were unmistakably genuine. During his stay in the city he riveted more firmly still the affections both of the senate and of the people. The reconciliation of the empire with liberty, inaugurated, as Tacitus says, by Nerva, seemed now to be securely achieved. Trajan was absolutely open and simple, and lived with men at Rome as he had lived with his soldiers while on service. He

1 Tt has been conjectured, not improbably, that the Germania of Tacitus, written at this period, had for one of its aims the enlighten- ment of the Romans concerning the formidable character of the Ger- mans, so that they might at once bear more readily with the emperor’s prolonged absence and be prepared for the necessity of decisive action on the frontier.

realized the senate’s ideal of the citizen ruler. The assur- ance that no senator should suffer was renewed by oath. All the old republican formalities were most punctiliously observed—even those attendant on the emperor’s election to the consulate, so far as they did not involve a restora-

tion of the old order of voting at the comitia. The vene- ration for republican tradition is curiously attested by the reproduction of many republican types of coin struck by senatorial officers. Trajan seized every opportunity for emphasizing his view that the princeps was merely the greatest of the magistrates, and so was not above but under the laws. He was determined, he said, to be to his subjects such a ruler as he had desired for himself when a subject. There is a pretty story to the effect that he handed the commander of the preetorians his sword, and said, “ Use it for me if I do well, but against me if I do ill.” Martial, who had called Domitian his lord and his god, now cried, “In him we have no lord, but an imperator!” Real power and influence were accorded to the senate, which had now, by the incorporation of members whose origin was provincial, become in a manner representative of the whole empire. Trajan associated with the senators on equal terms, and enjoyed in their company every kind of recreation. All pomp was dis- tasteful to him, and discarded by him. There was practi- cally no court, and no intrigues of any kind were possible. The approach to his house was free, and he loved to pass through the city unattended, and to pay unexpected visits to his friends. He thirsted for no senator’s blood, and used severity against the delatores alone. There was but one insignificant conspiracy against him during his whole reign. Though not literary himself, Trajan conciliated the literary men, who at all times had close relations with the senate. _ His intimate, M. Licinius, played an excellent Meecenas to his Augustus. In his efforts to win the affec- tions of Roman society, Trajan was excellently aided by his wife Plotina, who was as simple as her husband, bene- volent, pure in character, and entirely unambitious. The hold which Trajan acquired over the people was no less firm than that which he maintained upon the army and the senate. His largesses, his distributions of food, his public works, and his spectacles were all on a generous scale. The exhibitions in the arena were perhaps at their zenith during his tenure of power. Though, for some un- explained reason, he abolished the mimes, so beloved of the populace, at the outset of his reign, he availed himself of the occasion of his first triumph to restore them again. The people were delighted by the removal of the imperial exedra in the circus, whereby five thousand additional places were provided. Taxation was in many directions reduced, and the financial exactions of the imperial officers controlled by the erection of a special court. Elaborate precautions were taken to save Italy from famine ; it is said

that corn for seven years' consumption at the capital was retained in the granaries. Special encouragement was given to merchants to import articles of food. The corporation of bakers was organized, and made more effective for the service of the public. The internal trade of Italy was powerfully stimulated by the careful maintenance and extension of the different lines of road. But the most striking evidence of Trajan's solicitude for his people's welfare is found in his institution of the alimenta, whereby means were provided for the rearing of poor and orphan children in Italy. The method had been sketched out by Nerva, but its great development was due to Trajan. The moneys allotted by the emperor were in many cases sup- plemented by private benevolence. As a soldier, Trajan realized the need of men for the maintenance of the empire against the outer barbarians, and he preferred

carrying a step farther the policy of Augustus, who by a system of rewards and penalties had tried to encourage marriage and the nurture of children. The actual effect of Trajan's regulations is hard to measure; they were probably more effectual for their object than those of Augustus. The foundations were confiscated by Pertinax, after they had existed less than a century.

During the year 100, when Trajan was consul for the third time, Pliny, who had been designated consul for a part of it, was appointed to deliver the " Panegyric" which has come down to us, and which forms the most important source of our knowledge concerning this emperor. Pliny's eulogy of Trajan and his denunciation of Domitian are alike couched in extravagant phrases, but the former per- haps rests more uniformly on a basis of truth and justice than the latter. The tone of the " Panegyric" certainly lends itself to the supposition of some historians that Trajan was inordinately vain. That the emperor had an honest and soldierly satisfaction in his own well-doing is clear; but, if he had had anything like the vanity of a Domitian, the senate, ever eager to outrun a ruler's taste for flattery, would never have kept within such moderate bounds.

Towards the end of 100, or early in 101, Trajan left Rome for the Danube. Pretexts for a Dacian war were not difficult to find. Although there was no

lack of hard fighting, victory in this war depended largely on the work of the engineer. The great military road connecting the posts in Upper Germany with those on the Danube, which had been begun by Tiberius, was now extended along the right bank of the river as far as the modern Orsova. The year 101 was spent mainly in road-making and fortifica- tion. In the following campaign, after desperate fighting to the north of the Danube in the mountainous region of Transylvania, such as Ceesar never encountered in all his Gaulish wars, the capital of Decebalus was taken, and he was forced to terms. He agreed to raze all fortresses, to surrender all weapons, prisoners, and Roman deserters, and to become a dependent prince under the suzerainty of Rome. Trajan came back to Italy with Dacian envoys, who in ancient style begged the senate to confirm the con- ditions granted by the commander in the field. The em- peror now enjoyed his first Dacian triumph, and assumed the title of Dacicus. At the same time he royally enter tained the people, and no less royally rewarded his brave officers. But the Dacian chief could not school his high spirit to endure the conditions of the treaty, and Trajan soon found it necessary to prepare for another war. A massive stone bridge was built across the Danube, near the modern Turn Severin, by Apollodorus, the gifted architect who afterwards designed the forum of Trajan. In 105 began the new struggle, which on the side of Decebalus could now only lead to victory or to destruction. The Dacians fought their ground inch by inch, and their army as a whole may be said to have bled to death. The prince put an end to his own life. His kingdom became an imperial province ; in it many colonies were founded, and peopled by settlers drawn from different parts of the empire. The work done by Trajan in the Danubian regions left a lasting mark upon their history. The emperor returned to the capital in 106, laden with cap- tured treasure. His triumph outdid in splendour all those that went before it. Games are said to have been held continuously for four months. Ten thousand gladiators contended in the arena, and eleven thousand beasts were killed in the contests. Congratulatory embassies came from all lands, even from India. The grand and enduring monument of the Dacian wars is the noble pillar which still stands on the site of Trajan’s forum at Rome.

The end of the Dacian wars was followed by seven years

that these men should be of Italian birth. He was only | of peace. During part of that time Pliny was imperial

legate in the provinces of Bithynia and Pontus, and in constant communication with Trajan. The correspondence is extant, and gives us the means of observing the prin- ciples and tendencies of the emperor as a civil governor.

The provinces (hitherto senatorial) were in considerable disorder, which Pliny was sent to cure. It is clear from the emperor's letters that in regard to nine out of ten of the matters which his anxious and deferential legate referred to him for his decision he would have been better pleased if the legate had decided them for him- self, Trajau's notions of civil government were, like those of the duke of Wellington, strongly tinged with military prepossessions. He regarded the provincial ruler as a kind of officer in command, who ought to be able to discipline his province for himself, and only to appeal to the commander-in-chief in a difficult case. In advising Pliny about the different free communities in the pro- vinces, Trajan showed the same regard for traditional rights and privileges which he had exhibited in face of the senate at Rome. At the same time, these letters bring home to us his conviction that, particularly in financial affairs, it was necessary that local sclf-government should be carricd on under the vigilant super- vision of impcrial officers. The control which he began in this way to exercise, both in Italy and in the provinces, over the '"municipia " and ''libere civitates," by means of agents entitled (then or later) "correctores civitatium liberarum," was carried continually farther and farther by his successors, and at last ended in the complete centralization of the government. On this account the reign of Trajan constitutes a turning point in civil as in military history. In other directions, though we find many salutary civil measures, yet there were no far-reaching schemes of reform. Many details in the administration of the law, and particularly of the criminal law, were improved. To cure corruption in the senate the ballot was introduced at elections to magis- tracies, The finances of the state were economically managed, and taxpayers were most carefully guarded from oppression. Trajan never lacked money to expend on great works of public

utility; as a builder, he may fairly be compared with Augustus. His forum aud its numerous appendages were constructed on a magnificent scale. Many regions of Italy and the provinces besides the city itself benefited by the care and munificence which the emperor bestowed on such public improvements. His attitude towards religion was, like that of Augustus, moderate and con- servative. The famous letter to Pliny about the Christians is, according to Roman ideas, merciful and considerate. It was im- possible, however, for a Roman niagistrate of the tinie to rid him- self of the idea that all forms of religion must do homage to the civil power. Hence the conflict which made Trajan appear in the eyes of Christians like Tertullian the most infamous of monsters. On the whole, Trajan's civil administration was sound, careful, and sensible, rather than brilliant or epoch-making.

In 113 or 114 Trajan left Italy to make war in the East. The never-ending Parthian problem confronted him, and with it were more or less connected a number of minor difficulties. Already by 106 the position of Rome in the East had been materially improved by the peaceful annexa- tion of districts bordering on the province of Syria. The district of Damascus, hitherto a dependency, and the last remaining fragment of the Jewish kingdom, were incor- porated with Syria; Bostra and Petra were permanently occupied, and a great portion of the Nabathean kingdom was constituted the Roman province of Arabia. Rome thus obtained mastery of the most important positions lying on thie great trade routes from East to West. These changes could not but affect the relations of the Roman with the Parthian empire, and the affairs of Armenia be- came in 114 the occasion of a war which has been described under Prrsta, vol. xviil. p. 603. Trajan's campaigns in the East ended in complete though brilliant failure. In the retreat from Ctesiphon (117) the old emperor tasted for almost the first time the bitterness of defeat in the field. He attacked the desert city of Hatra, westward of the Tigris, whose importance is still attested by grand ruins. The want of water made it impossible to maintain a large force near the city, and the brave Arabs routed the Roman cavalry, Trajan, who narrowly escaped being killed, was forced to withdraw. A morealarming difficulty lay before him. Taking advantage of the absence of the emperor in the far East, and possibly by an understanding with the leaders of the rising in Armenia and the annexed portions of

Parthia, the Jews all over the East had taken u parms at the same moment, and at a given signal. The massacres they committed were portentous. In Cyprus 240,000 men are said to have been put to death, and at Cyrene 220,000. At Alexandria, on the other hand, many Jews were killed. The Romans punished massacre by massacre, and the complete suppression of the insurrection was long delayed, but the Jews made no great stand against disciplined troops. Trajan still thought of returning to Mesopotamia, and of avenging his defeat at Hatra, but he was stricken with sickness and compelled to take ship for Italy. His illness increasing, he landed in Cilicia, and died at Selinus in that country about the end of July 117. Trajan, who had no children, had continually delayed to settle the suc- cession to the throne, though Pliny in the " Panegyric " had pointedly drawn his attention to the matter, and it must have caused the senate much anxiety. Whether Hadrian, the cousin of Trajan, was actually adopted by him or not is impossible to determine ; certainly Hadrian had not been advanced to any great honours by Trajan. Even his military service had not been distinguished. Plotina asserted the adoption, and it was readily and most fortunately accepted, if not believed, as a fact.

The senate had decreed to Trajan as many triumphs as he chose to celebrate. For the first time a dead general triumphed. When Trajan was deified, he appropriately retained, alone among the emperors, a title he had won for himself in the field, that of " Parthicus." He wasa patient organizer of victory rather than a strategic genius. He laboriously perfected the military machine, which when once set in motion went on to victory. Much of the work he did was great and enduring, but the last year of his life forbade the Romans to attribute to him that felicitas which they regarded as an inborn quality of the highest generals. Each succeeding emperor was saluted with the wish that he might be " better than Trajan and more fortunate than Augustus." Yet the breach made in Trajan's felicitas by the failure in the East was no greater than that made in the felicitas of Augustus by his retirement from the right bank of the Rhine. The question whether Trajan's Oriental policy was wise is answered emphatically by Mommsen in the affirmative. It was certainly wise if the means existed which were necessary to carry it out and sustain it. But succeeding history proved that those

means did not exist. The assertion of Mommsen that the Tigris was a more defensible frontier than the desert line which separated the Parthian from the Roman empire can hardly be accepted. The change would certainly have created a demand for more legions, which the resources of the Romans were not sufficient to meet without danger to their possessions on other frontiers.

The records of Trajan's reign are miserably deficient. Our best authority is the 68th book of Dio Cassius; then comes the " Pane- gyric" of Pliny, with his correspondence, The facts to be gathered from other ancient writers are scattered aud scanty. Fortunately the inscriptions of the time are abundant and important. Of modern histories which comprise the reign of Trajan the best in English is that of Merivale; but that in German by H. Schiller (Geschichte der rémischen Kaiserzett, Gotha, 1883) is more on a level with recent inquiries. There are special works on Trajan by H. Francke (Giistrow, 1837), De la Berge (Paris, 1877), and Dierauer (in M. Biidinger's Untersuchungen zur rémischen Kaisergeschichte, Leipsic, 1868). A paper by Mommsen in Hermes, iii. pp. 30 sg., entitled "Zur Lebensgeschichte des jiingeren Plinius," is important for the chronology of Trajan's reign, (Jp SeRs)

TRALEE, a market-town and seaport, and the chief town of Kerry, Ireland, is situated on the Ballymullen or Leigh river, about a mile from where it discharges itself into Tralee Bay, and on the Great Southern and Western Railway, 21 miles north-west of Killarney and 18 south- west of Listowel. It is a neat, well-built, and compara- tively prosperous town. The principal public buildings are XXIII. — 64

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the court-house, the town-hall, the corn exchange, the chamber of commerce, the workhouse, the infantry barracks, the county hospital, and the fever hospital. A ship canal, permitting the passage of ships of 200 tons burden, and constructed at an expense of £30,000, connects it with Tralee Bay. Coal, iron, and timber are imported, and there is a considerable export of grain. There is a large trade in butter. The population of the town in 1871 was 9506 and in 1881 it was 9396.

Tralee, anciently Traleigh, the “strand of the Leigh,” owes its origin to the foundation of a Dominican monastery in 1213 by John Fitz-Thomas, of the Geraldine family. During the reign of Elizabeth it was in the possession of Earl Desmond, on whose for- feiture it eame into possession of the Dennys. At the time of the rebellion in 1641 the English families in the neighbourhood asked to be placed in the castle under the charge of Sir Edward Denny, but during his absence a surrender was made. The town was in- corporated by a charter in the 10th of James I., and had the privi- lege of sending two members to the Irish parliament. Though disfranchised at the Union, it obtained the privilege of returning one member in 1832, but in 1885 it was merged in the county.

TRAMWAY. Originally a tramway signified a wheel track laid with timbers, and afterwards with iron plates, having a flange on the inner edge by which wheels of the ordinary sort were kept in the track (see Ramuway). The introduction of the flanged wheel and edge rail caused tramways to be superseded by railways, but not until many miles of tramroads had been laid and successfully worked in various parts of the United Kingdom. Although the name is sometimes given to a light railway, by a tramway is now generally understood a street railway, constructed so as to interfere but little with the ordinary traffic, on which vehicles having flanged wheels are propelled by animal or mechanical power. Tramways in this sense originated in the United States.

A street railway for passengers was laid in New York in 1832, but it was soon removed on account of the accidents caused by it. In 1852 a French engineer, Loubat, revived tramways in New York, and they were soon afterwards laid in other American cities. A short line was also laid in Paris in 1853. The rails used were of wrought-iron, 5 inches wide, having a groove for the flanged wheels of the cars 1¢ to 24 inches wide and 1 to 14 inches deep (fig. 1). To lessen the inconvenience to

ordinary traffic occasioned by 7 , oe

this rail, the “step rail” (fig. 2) BOG ITAL / 1A iy

was introduced, consisting of a flat surface 3 to 5 inches wide, which can be used by ordinary [’ wheels, and a raised tread on [7 the outer side 1 inch

higher and | 12 inch wide, on which the flanged wheels of the cars run.

Fig. 2.

This form of rail is still very general in America, and is a good one for the tramways, though not for the general public. In 1858-9 Train, an American, endeavoured to obtain an Act of Parliament authorizing tramways in London ; failing in that, he laid tramways, by consent of the road author- ity, first in 1860 at Birkenhead, and soon afterwards in

London. The rail laid at Birkenhead had a step of ? inch between flat surfaces 3 inches and 14 inches wide. That laid in London was narrower, with a step of half an inch, but the slippery flat surface and the step of the rail caused serious inconvenience and numerous accidents to carriages, and the tramways were removed in a few months, after one of them had been successfully indicted asa nuisance. In Birkenhead, in spite of complaints of the inconvenience caused to the general traffic, the original rails remained until 1864, when, after a short length had been laid as an experiment with a rail of the grooved section now in general use (fig. 3), the whole of the tram- way, several miles in length, was. relaid with it. The

tramway was subsequently indicted as a nuisance, but the trial resulted in a verdict in favour of the grooved rail. In 1868 an Act of Parliament authorizing the construction of about 63 miles of tramways in Liverpool was obtained ; and in 1869-71 Acts for 61 miles of tramways in London were passed, and were soon followed by other Acts for tramways in Glasgow, Dublin, Edinburgh, and other pro- vincial towns.

In 1870 the Tramways Act was passed, enabling the Tram. Board of Trade to make provisional orders authorizing the Ways

construction of tramways in Great Britain, with the con- sent of the local authorities, and giving considerable powers for regulating their construction and working. By the Act the gauge, unless otherwise prescribed by special Act, is to be such as will admit of the use of carriages con- structed for use on railways of a gauge of 4 feet 8} inches. Tramways for which Acts had

been previously obtained were of 4 feet 84 inches gauge, to comply with a standing order intended for railways, and not to make them available for railway rolling stock, which the narrow groove of an ordinary tramway rail will not admit. There is reason to think that a narrower gauge, such as 3 feet 6 inches, is often sufficient and preferable to the 4 feet 84 inches gauge.

Tramways in towns, authorized by provisional order, are to be constructed in the middle of the road, and are not to be so laid that for 30 feet and upwards a less space than 9 feet 6 inches shall be left between the outside of the footpath and the rail, if one-third of the owners or occupiers of premises abutting upon that part of the road object. Vehicles are thus enabled to stop at the road side without hindrance from the tramears. To leave 9 feet 6 inches on each side of a single line of tramway of 4 feet 84 inches gauge a street must be upwards of 24 feet wide. No carriage used on a tramway must extend more than 11 inches beyond the outer edge of the wheels, and there must be a space of at least 15 inches between the sides of the widest carriages or engines to be used, when passing one another. A width of uot less than 3 feet 2 inches between double lines and at passing places is thus necessary, anda double line of tramway, leaving 9 feet 6 inches space on each side, requires a street at least 32 feet 6 inches wide between the footways. In nar- row roads there is a convenience in having the tramway at the side, and it is sometimes provided for in special Acts. The space between the rails, and for 18 inches beyond them, is repairable as part of the tramway. Power is given to local authorities to purchase tramways at the expiration of twenty-one years, and they may be removed under certain circumstances.

It appears from a parliamentary return that in 1886 there were 779 miles of street tramways open for traffic in Great Britain, on which a capital of £11,503,438 had been expended, the net receipts for the year being £563,735, and the working expenses 79 per cent. of the gross receipts.

ct.

The grooved rail first laid in England was 44 inches wide and Con-

an inch thick, having a tread or rolling surface for the wheel 1$ inches wide, and a groove # inch deep, ? inch wide at the bottom, and 1} inches wide at

the top (fig. 3). The rail was spiked through to a longitudinal timber laid on cross sleepers, and secured to them by angle brackets and spikes. This rail and method of laying were gene- rally adopted, but it was found that the heads of the spikes wore off, and the rails required re- spiking, and split and worked loose at the joints. A rail known as the box-rail was introduced, having flanges below on each side, through holes in which clips are driven to fasten the rail to the tim-

Fig. 3.

struc- tion.

Paving.

TRAMWAY

ber. This constitutes a good fastening, and the flanges give stiffness to the rail, but the clips cause gaps between the rail and the paving stones, which lcad to the formation of ruts alongside the rails. The longitudinal timbers, instead of being laid on cross sleepers, on which the paving does not bed well, are often fixed in cast-iron chairs con- nected by transverse tie-bars.

Fig. 5

Steel rails of a flatfooted or a bridge section, and of such a depth as to constitute both rail and sleeper, are also used. In some of the latest and best examples the rail is of a flatfooted section (fig. 5), 6 or 7 inches deep, and 6 or 7 inches wide at the base, weighing 65 to 93 Ib per yard. The head has a groove either planed out or rolled in it, giving the usual profile to the upper surface. The joints are fished in the ordinary way, and are as strong as the rail itself. Cross ties are sometimes used, but when the rail is slightly bedded in the concrete foundation they are dispensed with. The paving is set in cement close against the rail, and is bedded directly or in sand on the base of the rail, upon which there is a bearing of 14 or 2 inches. Such a tramway will stand steam traction and the heaviest strect traffic, but the rail, which is of an expensive section, requires entire renewal when the head is worn out. Iron or stcel continuous bearings are less elastic, and therefore more jarring and noisy than timber sleepers.

The profile of the upper surface of tram rails has been little altered since the first grooved rail was devised for Birkenhead in 1868, though slight modifications have been made in the form of the groove with the ‘object of lessening tractive resistance. For the sake of the ordinary traffic the groove should not exceed 1 inch in width, and a rounded section with sides splaying outwards facili- tates the forcing out of the mud and dirt. A nearly upright side next the tread or rolling surface with a splay on the inner side throws the mud away from the wheel. The upper corners of the rail should be angular, to make as thin a joint as possible between the rail and the paving. There has been a tendency to diminish the width, and a rail as narrow as 8 inches has been laid. A deviation from the usual profile has been adopted in Liverpool, where the groove is in the middle of a rail 3} inches wide.

A tramway must not only afford a good rolling surface capable of bearing the weights running on it, but it must also be able to resist the shocks of heavy vehicles crossing the rails in all directions. The space between the rails, and for 18 inches beyond them, which is repairable with the tramway, is always paved, sometimes in pro- vincial towns and in the suburbs of London with wood, but generally with stone sets in the best manner ou a concrete foundation. The sets alongside the rail should be carefully dressed and fitted to make a thin joint. There is much extra wear, and a tendency to form a rut alongside the rail, arising from ordinary wheels using the tram rail, and unless the surface of the paving is kept to the level of the rail the wheels of carriages are caught by the rail, and damage and accidents are caused. To resist the wear near the rails, chilled cast- iron blocks have been used where the traffic is great. Ona mac- adamized road there is the same tendency to form a rut along the outer edge of the tramway paving, which is to some extent prevented by giving a serrated edge to the paving. There is always great diffi- culty in keeping the road surface to the level of the paving, and it is better to pave the entire width of a strect in which a tramway is laid.

Although cars can be drawn round very sharp curves, the latter Curves,

should be as easy as possible. A radius of 150 to 200 feet is the least that should be used when there is any choice, but necessity may compel the use of curves of 50 or even 30 feet radius. On such curves, however, the cars are liable to be strained, and the resistance to traction is greatly increased.

A single line of tramway must have passing places for the cars, Passing consisting of pieces of double line of length sufficient to hold two places.

cars at least, with connecting curves and the necessary points and crossings. Where steam or other mechanical power is to be used the passing loops should be at Icast 200 feet in length. There is inevitable delay and interference with the street traffic at passing places, and where cars are to be run at frequent intervals it is better to lay down a double line if the street is wide enough. It is a great advantage to the ordinary traffic to have the cars moving always in the same direction on the same line of rails.

For horse traction fixed points of chilled cast-iron or steel are Points sufficient, as the driver can turn his horses and direct the car on to and When mechanical power is used, drop points cross- In the former the groove leading ings.

either line of rails. or movable points are required. into the road to be taken is of the full depth, and the other groove shallow, so that the engine and cars naturally take the former. On coming out of the shallower groove to the deeper there is, how- ever, a drop encountered which is damaging to the rolling stock, and especially to the engines. Movable points require setting by hand, or they are actuated by a spring or balance weight. In one form of spring point one groove is filled up by a tongue which is pressed down by wheels passing out of a loop, but which forms the side of the groove for wheels running the opposite direction. A spring point of steel, which is forced aside by the flange of the wheel passing out, and shuts close again by its own elasticity, is also successfully used. A movable point on one side of the way is sufficient. Crossings are either built up from rails cut to the required angle, or they are cast solid in steel or chilled iron. Fill- ing 4 apis of the same material, roughened on the surface for foot- hold, are inserted between the rails at the angles of points and crossings. Both points and crossings wear rapidly, and are trouble- some to maintain in good condition, and when uot so maintained are dangerous to ordinary traffic.

The tramcars generally in use in the United Kingdom are con- Cars.

structed to carry 22 persons inside and 24 outside. They are 16 feet pe in the body, or 24 feet including the platforms at each end, and weigh 24 to 2? tons when empty and about 54 tons when fully loaded. Smaller cars to carry 20 or 14 persons inside, drawn by one horse, are useful to run at short intervals when the traftic is not great, a frequent service of cars being a great element of success. The car wheels are usually of steel or chilled iron, with a flange half an inch deep, and are fitted with powerful brakes. The axles are about 6 feet apart, giving a short wheel-base to enable the cars to pass sharp curves, but with the disadvantage of overhanging ends. Cars to be drawn by mechanical power, espe- cially if outside passengers are to be carried, should have a flexible wheel-base, either by means of bogie frames or radiating axles. In Hamburg and Copenhagen tramcars have wheels without flanges, and a small guiding wheel running in the groove, which can be raised to allow the car to leave the track.

The tractive force required on a straight and level tramway is Traction.

found to vary from zy to 2p of the load, according to the con- dition of the rails. On a tramway in average condition it is about z3,. The resistance is thus at the best nearly double that on a railway, and sometimes as much as on a good’ pavement. This is due to the friction of the flange of the wheel in the grooved rail, and to tlie circumstance that the latter is always more or less clogged with dirt. The clearance between the flange and the groove is necessarily small, as the former must have sufficient strength, and the latter must be narrow. The least inaccuracy of gauge, therefore, causes extra friction, which is greatly increased on curves. By removing the flanges from two of the four wheels of a tramway car Tresca found that the resistance was reduced from z}, to qi, of the load. The resistance due to gravity is of course not lessened on a tramway ; and, if ;$, of the load be the tractive force required on the level, twice as much, or #5 of the load, will be required on a gradient of 1 in 100 and three times as much on a gradient of 1 in 50. To start a tramear, four or five times as great a pull is required as will keep it in motion afterwards, and the constant starting after stoppages, especially on inclines, is very destructive to horses. Horses employed on tramways are worked only a few hours a day, a day’s work being a journey

of 10 or 12 miles, or much less on steep gradients. In London a tram- car horse bought at the age of five years has to be sold at a low price after about four years' work. On the Edinburgh tramways, in consequence of the steep gradients, the horses last a less time, and they have to be constantly shifted from steep to easier gradients. The cost.of traction by horses is generally 6d. or 7d. per mile for two horses, and more when the gradients are steep.

The application of steam as a motive power on street tramways Steam is attended with special difficulties, arising from the conditions traction.

Fireless engines,

Com- pressed air.

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under which the engines have to work. A tramway engine must be able to draw its load up steep gradients, demanding perhaps seven or eight times the power required on a level, and it must have the necessary adhesion without being too heavy for the permanent way. It must be capable of traversing sharp curves, of going backwards or forwards with safety, and of stopping and starting quickly. For the safety and convenience of the public the Board of Trade require that tramway engines shall have brakes to each wheel, to be applied by hand and by steam, a governor so arranged as to shut off the steam and apply the brakes when the engine excceds the speed of 10 miles an hour or other stated speed, an indicator to show the speed, a whistle or bell to be sounded as a warning, and a fender to push aside obstructions; the engine must be free from noise produced by blast, and from clatter of machinery such as to constitute a reasonable ground of complaint ; and the machinery and fire must be concealed from view; no smoke or steam must be emitted so as to constitute any reasonable ground of complaint to passengers or the public. ;

The first attempt to use steam on a modern tramway was with Grantham's combined engine and car. It was about 25 feet long, having a vertical boiler in a central compartment, with the steam cylinders below, driving one pair of wheels 2 feet 6 inches in diameter. It carried 20 passengers inside and 24 outside, weighing 64 tons empty and 12 tons when fully loaded. In a later

car the boiler and machinery were at one end, and the body of the car was carried on a bogie frame. In a combined engine and car the weight of the car and passengers is utilized for adhesion of the driving wheels, and this is conveniently effected in Rowan's car, in which there are two four-wheel bogies, the leading one carrying the engine and boiler, and half the body of the car and passengers. The engine can be detached from the car for repair and another engine can be substituted in a few minutes. Economy of rolling stock, and the advantage of being able to use cars intended for horses, are in favour of independent engines. They are usually in general construction similar to locomotives, but are enclosed so as to resemble in outward appearance a short tramcar. The cylinders are 6 to 9 inches in diameter, with a stroke of 10 to 12 inches. The wheels are coupled, 2 to 3 feet in diameter, and the engines weigh 4 to 6 tons with fucl and water. The governor to shut off steam and apply the brakes when any determined speed is attained is actuated either by the engine wheels or by an independent wheel to prevent the possibility of the brakes being put on when the driving-wheels slip. An effectual way of rendering the exhaust steam invisible is to condense it by passing it throngh water in a tank, or through a shower of water let off at each blast, but when the water gets hot it must be changed, and in streets it is difficult to get rid of the hot water. Several methods of superheating by passing the exhaust steam through the fire have been adopted, but they are all attended with an increased consumption of fuel, which in cold damp weather is considerable. _ It is now preferred to pass the steam into tubes exposed to the air on the top of the engine car, from which the condensed water is returned to the feed-tank, to be again pumped into the boiler at a high temperature. Any steam remaining uncondensed passes into the smoke-box. Com- pound cylinders have been applied to tramway engines, giving a greater range of power, economizing fuel, and rendering the exhaust steam easier to deal with. The extra complication of a compound engine is, however, a drawback.

The cost of steam traction with engines of ordinary size is gene- rally 3d. to 4d. per mile run by the engine, and more on lines with steep gradients. 'To this must be added for depreciation 10 per cent., or, according to some authorities, 15 per cent. on the original cost of the engines, making altogether 4d. to 6d. per mile run on a tramway with average gradients.

Fireless engines were first tried in New Orleans, and have been in snecessful use on tramways in France for some years. The motive power is obtained from water heated under pressure to a very high temperature in stationary boilers and carried in a reservoir, where it gives off steam as the pressure and temperature are reduced. Two tons of water heated to give a steam-pressure of 250 Ib to the square inch serves for a run of 8 or 10 miles, leaving more than 3% of the water and a pressure of 20 to 25 tb above the atmosphere on returning to the boiler. Large boiler-power is required to reheat the engine reservoirs quickly, and this cannot be afforded for only a fewengines, but, when worked on a sufficient scale, the fireless engines are claimed to be economical, the economy Li Ps from the generation of the steam in large stationary

oilers.

Compressed air as a motive power offers the advantage of having neither steam nor the products of combustion to be got rid of. In Scott Moncrieff's engine, which was tried on the Vale of Clyde tramways in 1876, air was compressed to 310 ib on the square inch, and expanded in the cylinders from a uniform working pressure to that of the atmosphere. There is a considerable loss of heat during the expansion of the air which is attended with a serious loss of pressure, and in Mékarski's system, which has been in use for the ptopulsion of tramcars at Nantes for seven years, the loss of pres-

sure is considerably lessened by heating the air during expansion. The air, at a pressure of 426 Ib per square inch, is stored in cylindrical reservoirs beneath the car, and before use is passed through a vessel three quarters full of water heated to 300° F., by which it is heated and mixed with steam. The heat of the latter is absorbed by the air during its expansion, first to a working pressure which can be regulated by the driver, and then to atmospheric pressure in the cylinders. At Nantes the average cost for three years for propel- ling a car holding 34 persons was about 6d. per mile.

In San Francisco a main charged with air at a pressure of about 120 Ib per square inch has been laid along the tram route, from which reservoirs on the

cars are charged by means of standpipes and flexible connexions at convenient points, the operation taking a very short time. The inventor claims to utilize 30 per cent. of the power applicd to the compressor.

Street tramways worked by means of a wire rope have been in successful operation in San Francisco since 1873. There are now upwards of 24 miles of double line in San Francisco, and 10 miles in Chicago, and the system is being adopted in other American and colonial cities. It has also been in operation in England at Highgate Hill for several years, and is about to be adopted in other localities. The motive power is trans- mitted from a stationary engine by a rope of steel wire running always in one dircction up one track and down the other, in a tube midway between the rails, on pulleys which are arranged so as to suit curves and changes of gradient as well as straight and level lines, Over the rope is a slot ? inch wide, in which travels a flat arm of steel connecting the dummy car with the gripper which grasps the cable. The flat arm is in three pieces, the two outer ones constituting a frame which carries the lower jaw of thegripper, with grooved rollers at each end of it, over which the cable runs when the gripper is not in action. The upper jaw is carried by the middle piece, which slides within the outer frame, and can be de- pressed by a lever or screw, pressing the cable firston the rollers, and then on the lower jaw until it is firmly held. The speed of the cable, which is gene- rally 6 to 8 miles an hour, is thus imparted to the car gradually and without jerk. The arrangements for pass- ing the pulleys, for changing the dummy and cars from one line to the other at the end of the road, for keeping the cable uniformly taut, and for crossings and junctions with other lines are of considerable ingen- uity. When the cars are cast off from the = cable they must be stopped by hand brakes, which on steep gradients especially must be of great power.

The system has advantages on double lines with few and easy curves when the m gradients are long and steep, and it can be = employed on gradients too steep for steam 5S traction. On level lines it is doubtful if it could compete in economy with steam, or even with horse traction, unless with a very frequent service of cars, though then it presents the advantages of being comparatively quiet, and free from smoke and steam, and of admitting a frequent service of cars with little extra cost. On the cable roads of San Francisco it has been found that, of the average daily power em-

ployed, 68 per cent. is expended in moving the cables, &c., 28 per cent. for the cars, and 4 per cent. for passengers. It is considered that it is practicable to utilize in moving cars and passengers as much as 50 per cent. of the power, provided the cars are fully loaded and run at short intervals.

Electricity has been applied as a motive power on a tramway about 2 miles long at Blackpool. The current is conveyed by two copper conductors in a central channel beneath the roadway, and is communicated to the motors in the ear by a collector running

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Fia. 6.—Gripper.

Fig. 7.—Carrying Pulley.

Cable tram- ways.

Electric motors.

See vol. Xxii. Plate I.

TR A—

upon the conductors and passing through a narrow slit in the channel. The return current passes through the rails. The cars carry.as many as 56 passengers on a level line. Tramways have also been worked by accumulators at Antwerp and Brussels, but the weight of them appears to be at present prohibitory to this method of applying electricity, except for short trips. See TRACTION.

For fuller information, see D, K. Clark, Tramways, their Construction and Maintenance; F, Sérafon, Les Tramways et les Chemins de Fer sur Routes; ** Street Tramways," Proc. Inst. C. E., vol. 1.~~vol. Ixvii.; " The Working of~~

~~Train~~ ways by Steam," Jd¢d., vol. Ixxix.; and F. B. Smith, Cable Tramways. (T. C.)

TRANCE. See SieeP; also Magnetism (ANIMAL).

TRANI, a seaport of Italy, on the Adriatic, in the province of Bari, and 26 miles by rail west-north-west of that town, still retains its old walls and bastions, with the citadel, now used as a prison. Some of the streets remain much as they were in the medieval period, and many of the houses display more or less of Norman decoration. The cathedral, on a raised open site near the sea, dating from about the year 1100, is a basilica with three apses, a large crypt, and a lofty tower. The arches of the Roman- esque portal are beautifully ornamented, in a manner suggestive of Arab influence ; the bronze doors, executed by Barisanus of Trani in 1175, rank among the best of their period in southern Italy. The capitals of the pillars in the crypt are fine examples of the Romanesque. The interior of the cathedral has been barbarously modernized. The vicinity of Trani produces an excellent wine (Moscado di Trani); and its figs, oil, almonds, and corn are also pro- fitable articles of trade. The harbour was once deep and good, but latterly has got silted up. The population of the town in 1881 was 25,173 (commune 25,647).

Trani is the Zwrenwm of the itineraries. It first became a flourishing place under the Normans and during the crusades, but attained the acme of its prosperity as a seat of trade with the East under the Angevine princes. Several synagogues continue to afford an indication of its former commercial prosperity.

TRANQUEBAR, a seaport town in the Tanjore district of Madras presidency, India, in 11° 1' 37" N. lat. and 79° 55' EK. long. In the 17th century it belonged to the Danes ; it was taken by"the British with other Danish settlements in 1807, but restored in 1814, and finally purchased in 1845 for a sum of £20,000. In Danish times Tranquebar was a busy port, but its prosperity has fluctuated considerably of late years, and is now at a very lowebb. It was the first settlement of Protestant mis- sionaries in India, founded by Ziegenbalg and Plutschau (Lutherans) in 1706; and as a mission station it. still retains its importance.

TRANSBAIKALIA (Zabatkalskaya Oblast), a province of Eastern Siberia, to the east of Lake Baikal, has Irkutsk on the west, Yakutsk on the north, the province of Amur on the east, and Mongolia on the south. Its area (240,780 square miles) is about as great as that of Austria- Hungary, but its population is under half a million. With regions of a purely Siberian character on the one hand, and including on the other the outer borders of the Mongolian steppes and the upper basin of the Amur, Transbaikalia forms an intermediate link between Siberia, Mongolia, and the northern Pacific littoral. The mountains of the Yablonovoi Khrebet, which run in a north-easterly direction from the sources of the Kerulefi to the bend of the Olekma in 56° N. lat., divide the province into two quite distinct parts : to the west the upper terrace of the high East Asian plateau continued from the upper Selenga and Yenisei (from 4000 to 5000 feet high) towards the plateau of the Vitim (3500 to 4000 feet) ; and to the east the lower terrace of the same plateau (about 2800 feet high), which appears as a continuation of the eastern Gobi. The continuity of the high plateau extending from the upper Selenga to the upper Vitim was for a long time overlooked in consequence of a broad and deep valley by which it is intersected. Beginning at Lake Baikal, it pierces the huge north-western border-ridge of the plateau,

and runs eastward up the Uda, with an imperceptible

gradient, like a gigantic railway cutting enclosed between two steep slopes, sending another branch south towards Kiakhta. After having served, through a succession of geological periods, as an outlet for the water and ice which accumulated on the plateau, it is now utilized for the two highways which lead from Lake Baikal over the plateau (3500-4000 feet) to the Amur in the east and the Chinese depression in the south. Elsewhere, the high and massive border-ridge on the north-western edge of the plateau can be crossed only by difficult footpaths. The border-ridge just mentioned, pierced by the wide opening of the Selenga, runs from south-west to north-east under different names, being known as Khamar-daban to the south of Lake Baikal (the Khamar-daban peak raising its bald summit to a height of 6900 feet above the sea), and as the Barguzin Mountains (7000 to 8000

feet) along the eastern bank of the Barguziu river, while farther to the north-east it has been described by the present writer under the names of the South Muya and Tchara Mountains (6000 to 7000 feet). Resting its south-east base on the plateau, it descends steeply on the north-west to the lake, or to the broad picturesque valleys of the Barguzin, the Muya, and the Tchara. Larch, fir, and cedar forests thickly clothe the ridge, whose dome-shaped rounded summits (goltsy) rise above the limits of tree vegetation, but do not reach the snow-line (here above 10,000 feet). The high plateau itself has the aspect of an undulating table-land, intersected by low ranges, which rise some 1500 or 2000 feet above its surface, and are separated by broad, flat, and marshy valleys, which the rivers languidly traverse till they find their way across the border-ridges. Those of the valleys which are better drained have fine meadow lands, but as a whole the plateau has the appearance, especially in the north, of a wet or marshy prairie in the hollows, while the hills are thickly clothed with forests (almost exclusively of larch and birch). Numberless lakes and ponds occur along the river courses. Tungus hunters find a livelihood in the forests and on the meadows, but permanent agricultural settlements are impossible, corn seldom ripening on account of the early frosts. The lower parts of the broad and flat valley of the Djida have, however, a few Cossack settle- ments, and on the upper Selenga and Yenisei Mongolian shepherds (Uryankhes and Darkhates) inhabit the high grassy valleys about Lake Kossogol (5560 feet above the sea). Quite different is the lower terrace of the plateau, occupied by the eastern Gobi and the Nertchinsk region of Transbaikalia, and separated from the above by the Yablonovoi ridge. This last is the south-eastern border

ridge of the higher terrace. It rises to 8250 feet in the Sokhondo peak, but elsewhere its dome-shaped summits do not exceed 5000 or 6000 feet. When crossing it from the north-west, about Tchita, the traveller hardly perceives that he is approaching the great water-parting between the Arctic and the Pacific oceans. Numberless lakes, with flat : undetined borders, feed streams which flow lazily amidst marshes, some of them to join the great northward rivers,

others to find their way to the Amur and the Pacific. Low hills rise gently above the edge of the plateau, but an abrupt slope descends towards the south-east, where the hill-foots of the Yablonovoi are nearly 1500 and 2000

feet lower than on the north-west. Climate, flora, and fauna suddenly change as soon as the Yablonovoi has been crossed ; the steppes of Dauria (continuations of those of the Gobi), covered with a bright luxuriant vegetation, meet the view of the spectator. The Siberian flora gives way to the much richer Daurian flora, which in turn is exchanged for the Pacific littoral flora as soon as the traveller descends from the lower terrace of the plateau towards the Manchurian plains and lowlands.

The lower terrace, occupied in Transbaikalia by the Nertchinsk district, has the character of a steppe, but is also intersected by a number of ranges, all running south- west to north-east, and all being plications of Silurian and Devonian rocks, containing silver, lead, and copper, and also auriferous sands. Agriculture can be easily carried on in the broad prairies, the only drawbacks being droughts, and also frosts in the settlements in the higher close valleys of the Nertchinsk or Gazimur Mountains. The lower terrace is in its turn fringed by a border-ridge—the Great Khingan —which has, with reference to the lower terrace, the same characters as the Yablonovoi in relation to the upper, and separates Siberia from northern Manchuria. This import- ant ridge, as shown elsewhere (vol. xxii. pp. 3, 4), does not run from south to north, as represented on the old maps, but from south-west to north-east ; it is pierced by the Amur near Albazin, and joins the Okhotsk ridge, which in its turn does not join the Yablonovoi Mountains. The mountains drawn west and east on older maps to connect the Yablo- novoi with the Okhotsk ridge have no actual existence.

The rivers belong to three different systems,—the affluents of Lake Baikal, of the Lena, and of the Amur. Of the first the Selenga (800 miles long) rises in the Hanghai Mountains of north- western Mongolia, one of its great tributaries (the Ebin-gol) being an emissary of Lake Kossogol. It flows past Selenghinsk and enters Lake Baikal from the south-east, forming’a wide delta. The Tchikoi, the Khitok, and the Uda are its chief tributaries in Transbaikalia.1 The Barguzin and the Upper Angara are two large tributaries of Lake Baikal from the north-east. Of the tributarics of the Lena, the Vitim with its affluents (Karenga, Tsipa, Muya, Katar, Katakan) flows on the high plateau through uninhabited regions, as also does the

Olekma. The tributaries of the Amur, which is formed by the junction of the Shilka and the Arguii, are much more important. The Argufi, which at a quite recent epoch received the waters of the Dalai-nor, and thus had the Kerulefi for its source, is no longcr in communication with the rapidly drying Mongolian lake, and has its sources in the Gafi, which flows from the Great Khingan. It is not navigable, but receives the Gazimur and several other streams which water the Nertchinsk mining district. The Shilka is formed by the union of the Onon and the Tchita rivers, and is navigable from the town of Tehita, thus being an important channel of transit to the Amur.

Lake Baikal, with an area of 12,430 square miles (nearly equal to that of Switzerland), extends in a half crescent from south-west to north-east ; it has a length of over 400 miles and a width of from 20 to 53 miles. Its level is 1561 feet above the sea.? About the middle it is divided into two parts, the Great Lake and the Little Lake, by the island Olkhon and the peninsula of Svyatoi Nos, which closely approach one another. Between the two there is a submerged ridge, which must be considered as a continuation of the Barguzin Alps. The wide delta of the Selenga narrows the Great Lake in its middle part, and renders it more shallow in the east than in the west—the greatest depth (4186 feet) having been reached by Dr Godlevski in the south-west. The depth of the Little Lake does not exceed 210 feet. According to Tchersky, the trough now occupied by the base had its origin in three sepa- rate synclinal valleys, which date from the Azoic epoch, and were gulfs of the ocean during the Silurian or Huronian period. They coalesced at a much later epoch.? Of other lakes, the Gusinoye and Lake Baunt on the Vitim plateau, and Oron at its base, are worthy of notice. Many lakes yield common salt or sulphate of natron.

The high plateau consists of granites, gneisses, and syenites, covered with Laurentian schists. Silurian and Devonian marine deposits occur only on the lower terrace. Since that time the region has not been under the sea, aud only freshwater Jurassic deposits and coal-beds are met with in the depressions. During the Glacial period most of the high terrace of the plateau and its border ridges were undoubtedly covered with vast glaciers. Volcanic rocks of more recent origin (Mesozoic ?) are met with in the north-western border ridge and on its slopes, as well as on the Vitim

plateau. During the Glacial period the fauna of the lowest parts of Trans-baikalia was decidedly arctic; while during the Lacustrine or Post-Glacial period it was covered with numberless lakes, the

1 Steamers have ascended the lower Selenga and the Uda up to Verkneudinsk.

2 According to the levelling made in 1875-76 from Zverinogoloysk, in Oren- burg, to Lake Baikal. There is uncertainty as to the absolute altitude, that of Zverinogolovsk, 318 feet, having still to be verified. See Mem. Russ. Geogr. Soc.: Phys. Geogr., vol. xv., 1885.

3 I, Tchersky, ‘‘ Results of the Exploration of Lake Baikal,” in Mem. Russ. Geogr. Soe. , Phys. Geogr., vol. xv., 1886, with a geological map on a scale of 7 miles to an inch; Fr, Schmidt’s report inthe yearly Report of the Russian Geo- graphical Society for 1886 (both Russian).

shores of which were inhabited by Neolithicman. Only few traces of these have remained, and they are rapidly drying up. Earth- quakes are very frequent on the shores of Lake Baikal, especially at the mouth of the Selenga, extending as far as Irkutsk, Barguzin, and Selenghinsk; in 1862 an extensive area was submerged by the lake. Numerous mineral springs, some of them of high repute, are spread all over Transbaikalia. The chief of them are the hot alkaline springs (130° F.) at Turka, at the mouth of the Barguzin, whither hundreds of patients resort annually, those of Pogromna on the Uda (very similar to the Seltzer springs), those of Motokova near Tchita, and those of Darasun in the Nertchinsk district (very rich in carbonic acid and phosphate of iron).

The flora and fauna of Transbaikalia, owing to their intermediate character between a purely Siberian flora and fauna and those characteristic of the Mongolian and Manchurian regions, have been the subject of many careful investigations since the time of Pallas down to those of Turczaninoff, Middendorff, Schrenck, Radde, and Polyakoff. Their various characters in different parts of this ex- tensive territory could not be described without

entering too largely into details. The reader may consult the works of the authors just named (see vol. xxii. p. 12).

The climate is, as a whole, exceedingly dry and extreme. The winter is cold and dry; snow is so trifling that the horses of the Buriats find their food throughout the winter on the steppes, and in the very middle of the winter wheeled vehicles are used all over the west. To the east of the Yablonovoi ridge the Nertchinsk district feels the influence of the North Pacific monsoon region, and snow falls more thickly, especially in the valleys, but the summer continues to be hot and dry. On the high plateau, even the summer is cold, owing to the altitude and the humidity arising from the marshes, and the soil is frozen to a great depth. In the vicinity of Lake Baikal the moderating influence of the great water-basin is felt to some extent, and there is a cooler summer; in winter exceedingly deep snow covers the goltsys and valleys of the mountains around the lake.*

The population (497,760 in 1882) is exceedingly sparse, unless the immense uninhabitable spaces of the plateaus be left out of account. Even on the lower terrace nearly the whole of the region on the left bank of the Shilka is unsuited for agriculture, as also are the Gazimur Mountains, where only a few settlers gain a liveli- hood in some of the valleys, struggling against an unhealthy climate and the influcnce of goitre. The Russian population there gathers around the crown mines of the Nertchinsk district, while the steppes are occupied by Buriats. A succession of villages, supported partly by agriculture and partly by hunting and trade with Mongolia, are settled along the Shilka between Tchita and Sryetensk, while farther down the river flows in such a wild mountain region that only a few families are settled, at distances some 20 miles apart, to maintain communication, The same is true with regard to the lower Argufi. The valleys of the Uda, the lower Selenga, and especially the Tchikoi and the Khitok have been occupied since the beginning of the century by Raskolniks, who have received the name of Semeiskiye on account of their large (compound) families, and there one finds, in a condition of prosperity such as is unknown in Russia proper, some of the finest represen- tatives of the Russian race. The remainder of the steppe of the Uda is occupied by Buriats, while the forests and marshes of the plateau are the hunting

grounds of the nomad Tunguses. Only the valley of the Djida in the south of the Khamar-daban is settled in its lower parts.

The Russians of Transbaikalia present a great variety of ethno- logical types. Mainly owing to the difficulties of communication, many Great Russian Raskolniks and Little Russian settlers have preserved their ethnographical features pure from any admixture; while there are, on the other hand, villages in the Nertchinsk district, chiefly composed of the earliest Russian settlers, where a great admixture of Tungusian or Mongolian blood is observable. On the upper Argufi the Cossacks are in features, character, lan- guage, and manners largely Mongolian. The Russians along the Chinese frontier constitute a separate voisko of the Transbaikalian Cossacks, There is great uncertainty as to the numbers of the Buriats ; they are estimated at about 150,000. The Tunguses num- ber only a very few thousands.

Agriculture is carried on to a limited extent by the Buriats and in all Russian settlements; but it prospers only in the valleys of west Transbaikalia, and partly in the Nertchinsk region, while in the steppes of the Argufi and Onon even the Russians resort chiefly to cattle-breeding and trade, or to hunting. On the whole, corn has to be imported ; summer wheat and summer rye, oats, and barley are the chief crops in the east, winter rye not being sown in con- sequence of the want of snow. Cattle-rearing is extensively carried on, especially by the Buriats, but their herds and flocks, which wander freely over the steppes throughout the winter, are often destroyed in great numbers by the snow-storms of spring. Hunt- ing is an important occupation, even with the Russians, many of

4 “Das Klima yon Ost-Sibirien,” by A. Woyeikoff, in Meteor. Zettsch., 1884.

See vol. ii. Plate XXVI.

whom leave their homes in October to spend six weeks in the taiga (forest-region). The fisheries of Lake Baikal and the lower parts of its affluents are important. Enormous quantities of Salmo omul arc taken every year; and,

although the curing is most primitive, the annual yield is valued at £20,000. The Salmo thymalus, S. oxyrhynchus, and S. fluviatilis are also taken largely.

The possibilities of discoverics of gold are absorbing all the industrial forces of Transbaikalia. Gold-diggings occur chiefly in the basins of the Shilka and the upper Vitim, also on the Tchikoi and the Khilok. No less than 25,400 Ib is extracted annually by private enterprise, and about 3200 to by the crown, at the Kara gold-diggings, where nearly 1400 convicts are employed. The silver mining formerly carried on at several crown works is now on the decrease (see NERTCHINSK); the quantity extracted in 1884 was only 241 Ib. Every kind of manufactured ware has to be imported from Russia; and even petty trades are almost unknown in the villages.

The trade of the province is chiefly represented by that of Kiakhta. The Cossacks on the frontier carry on some trade in brick-tea, cattle, and hides with Mongolia. The export of furs is of considerable value.

The communications of Trausbaikalia are limited to the great Amur highway, which fringes the south coast of Lake Baikal and passes through Verkhneudinsk, Tchita,and Nertchinsk to Sryetensk, whence steamers ply down to the mouth of the Amur; in winter, further communication with the Amur beyond Sryctensk is main- tained on sledges on the ice of the Shilka, but in the autumn and spring a horseback journey as far as Kumara is the only possible method of reaching the middle Amur. Steamer communication is also maintained for six or seven months across Lake Baikal, from Posolskoye, at the mouth of the Selenga, to Listvenichnaya, 40 miles from Irkutsk. A highway connects Verkhneudinsk with Seleng- hinsk and Kiakhta, and communication on the steppes of the Argufi and the Onon as well as up the Barguzinis easy. The rest of Trans- baikalia can be visited only on horseback.

Transbaikalia is divided into five districts, the chief towns of which (with populations in 1880) are Tchita, capital of the province (12,600 inhabitants), Barguzin (800), Nertchinsk (4070), Seleng- hinsk (1150), and Verkhneudinsk (4150). Kiakhta has 4290 inhabitants, and Sryetensk, being at the head of the navigation, is a rising town. (BoA)

TRANSCASPIAN REGION (Zakaspiyskaya Oblast), an extensive territory to the east of the Caspian, annexed by Russia within the last fifteen years, is bounded on the S. by the highlands of Khorasan and Afghanistan, on the N. by Uralsk (from which it is divided by a line drawn from the Mortvyi Kuttuk Bay of the Caspian to the south extremity of Lake Aral), on the N.E. by Khiva and Bokhara, and on the S.E. (where it penetrates towards Herat on the slopes of the Paropamisus, and includes the Badhyz plateau) by Afghan Turkestan. So defined, it has an area of 220,000 square miles.

Although nine-tenths of this territory consists of unin- habitable desert, an interest attaches to it on account of the great physical changes it has undergone during the Post-Glacial period. Since Pallas visited its borders, and still more since Humboldt discussed its history, it has never ceased to attract the attention of geographers. In fact, some of the most interesting problems of geography, such as those relating to the changes in the course of the Jaxartes and the Oxus, the bifurcation and the oscillation of a great river, and the supposed periodical disappearance of Lake Aral, are connected with the Transcaspian deserts ; and it is here that we must look for a clue to the great physical changes which transformed the Mediterranean of Western Asia—the Aral-Caspian and Pontic basin—into a series of separate seas, and desiccated them, powerfully influencing the distribution of floras and faunas, and com- pelling the inhabitants of Western and Central Asia to enter upon their great migrations. But down toa very recent date the dry and barren deserts, peopled only by wandering Turcoman bands, remained almost a terra incog- nita, and only now are we beginning to make the very

first steps towards their really scientific exploration.

A mountain chain, in length comparable to the Alps, separates the deserts of the Transcaspian from the highlands of Khorasan. It runs from north-west to south-east, and appears as a continua- tion of the Caucasus. It begins in the Krasnodovsk peninsula of

the Caspian, under the names of Kuryanin-kara and Great Balkans, whose masses of granite and other crystalline rock reach a height of more than

5000 feet. Farther to the south-east these are con- tinued in the much lower Little Balkans and Kyuren-dagh (2000 fect), the Kopepet-dagh, Kosty-dagh, Asilma, and Zaryn-kul,—the name of Kopepet-dagh or Kopet-dagh being often now used to designate the whole chain which rises steep and wild above the flat deserts from the Caspian to the river Murghab,—a stretch of 600 miles. In structure itis homologous with the Caucasus chain; it appears as an outer wall of the Khorasan plateau, and is separated from it by a broad valley, which, like the Rion and Kura valley of Transcaucasia, is watered by two rivers flowing in opposite directions,—the Atrek, which flows north-west into the Caspian, and the Keshefrud, which flows to the south-east, and is a tribu- tary of the Murghab. On the otlicr side of this valley the Allah- dagh and the Binalund border-ridges (9000 to 11,000 feet) fringe the edge of the Khorasan plateau. At its south-eastern extremity this outer wall loses its regularity where it meets with the spurs of the Hindu-kush. Descending towards the steppe with steep stony slopes, it rises to heights of 6000 and 9000 feet to the east of Kizil-arvat, while the passes which lead from the Turco- man deserts to the valleys of Khorasan are seldom as low as 3500, usually rising to 5000, 6000, and even 8500 feet, and in most eases being very difficult. This wall is pierced by but one wide opening, that between the Great and Little Balkans, through which the sea which once covered the steppe maintained connexion with the Caspian.

While the Allah-dagh and Binalund border-ridges are chiefly composed of crystalline rocks and metamorphic slates covered with Devonian deposits, a series of more recent formations—Upper and Lower Cretaceous, and Miocene—are shown in the outer wall of the Kopet-dagh. Here again we find that the mountains of Asia which stretch towards the north-west continued to be uplifted at a geologically recent epoch. Quaternary deposits have an extensive developinent on its slopes, and its hillfoots are bordered by a girdle of loess.

The loess terrace, called ‘‘Atok” (‘‘mountain base”), is but narrow, ranging in width from 10 to 20 miles; still its chain of settlements have rendered it possible to lay down a railway which now connects the Caspian with Sarakhs. It is very fertile, but could produce nothing without irrigation, and the streams flowing from the Kopet-dagh are few and meagre. The winds which reach the northern slope of the mountains have been deprived of all

their moisture in crossing the Kara-kum—the Black Sands of the Turcoman desert ; and even such rain as falls on the Kopet-dagh (104 inches at Kizil-arvat) too often reaches the soil in the shape of showcrs which do not saturate it, so that the average relative humidity is but 56 and the average nebulosity only 3°9, as against 62 and 4°1 at even so dry a place as Krasnovodsk. Still, at those places where the mountain streams are closer to one another, as at Geok-tepe, Askabad, Lutfabad, and Kahka, the villages are more populous, and the houses are surrounded by gardens, every square yard and every tree of which is fed by irrigation.

Beyond this narrow strip of irrigated land begins the desert, — the Kara-kum,—which extends from the mountains of Khorasan to Lake Aral and the Ust-Urt, and from the Caspian to the Amu, interrupted only by the oases of Merv and Tejefi. It appears, how- ever, that the terrible shifting sands blown into barkhans, or elongated hills, sometimes 50 and 60 feet in height, are grouped chiefly in the west, where the country has more recently emerged from the sea. Farther to the east the barkhans are more stable, their slopes being covered with bushes (for the most part leafless); the caravans sometimes follow their crests, and the shifting sands occupy restricted spaces. Large areas amidst the sands are occupied by takyrs, or flat surfaces covered with clay which is hard as a rule, but becomes alniost impassable after heavy rains. In these takyrs the Turcomans dig ditches, draining into a kind of cistern—the kak—where the water of the spring rains keeps for a few months. Wells are sunk also along the routes of the caravans, and water is found in them at depths of 10 to 50 or occasionally 100 feet and more. All is not desert in the strict sense ; in spring there is for the most part a covering of grass, which allows of journeys across the desert. There are footpaths in several directions, especially from the irrigated and cultivated Atok towards Khiva.

The vegetation of the Kara-kum cannot be described as poor ; the typical representative of the sand deserts of Asia, the saksaul (Anabasis Ammodendron), has been almost destroyed within the last hundred years, and never appears in forests, but the borders of the spaces covered with salted clay are brightened by forests of tamarisk, which are inhabited by great numbers of the desert warbler (Atraphornis aralensis)—a typical inhabitant of the sands,—sparrows, and ground-choughs (Podoces); the

Houbara macquennii, Gray, though not frequent, is characteristic of the region. Hares and foxes, jackals and wolves, marmots, moles, hedgehogs, and one species of marten live in the steppe, especially in spring. As a whole, the fauna is richer than might be sup- posed, while in the Atok it contains representatives of all the

species known in Turkestan, mixed with Persian and Himalayan species.

The Uzboi.—A feature distinctive of the Turcoman desert is secn in tle very numerous shors, or elongated depressions, the lower portions of which are occupied mostly with sand impregnated with brackish water. They are obviously the remains of brackish lakes, and, like the lakes of the Kirghiz steppes, they often follow one another in close succession, thus closely resembling river-beds. As the direction of these shors is generally from the higher terraces watered: by the Amu-Daria towards the lowlands of the Caspian, they were usually regarded as old beds of the Amu-Daria, and were held to support the idea of its once having flowed across the Turco-man desert towards what is now the Caspian Sea.

As for the ancient texts with regard to the Jaxartes and Oxus, it becomes more and more probable that their interpretation, if possible at all, is only so when it is admitted that, since the epoch to which these relate, the outlines of the Caspian Sea and Lake Aral have undergone notable changes, commensurate with those which are supposed to have occurred in the courses of the Central Asian rivers, The desiccation of the Aral-Caspian basin proceeded with such rapidity that the shores of the Caspian could not possibly maintain for some twenty centuries the outlines which they have at present. When studied in detail, the general configuration of the Transcaspian region leaves uo doubt that both the Jaxartes and the Oxus, with its former tributaries, the Murghab and the Tejeii, once flowed towards the west; but the Caspian of that time

1 See N. Zarudnyi, ‘Les Oiseaux de la Contrée Transcaspienne,” in Bull. Soc. Nat. Mosc., 1885.

2 It is to be observed that on the original Russian map of the Transcaspian, drawn immediately after the survey of the Uzboi had been completed, the Uzboi has not the continuity which is given to it on subsequent maps,

3 Their original papers are printed in the Jzrestta of the Russian Geogr. Soc., 1883 to 1887, as also in the Journal of the Russian Ministry of Roads and Com- munications,

4 According to A. E. Hedroitz and A. M. Konshin the old Tonu-Daria bed of the Amu contains shells of molluscs now living in the Amu (Cyrena fluminalis, Dreissena polymorpha, and Anodonta). The Sary-kamysh basin is characterized by deposits containing Neritina liturata, Dreissena polymorpha, and Lymnzus, characteristic of this basin. Below thc Sary-kamysh there are no more deposits containing shells characteristic for the Amu; Anodontz are found quite occasion- ally on the surface, not in beds, in company with the Caspian Cardium (Didacna) trigonoides, var. crassum, Cardium ptramidatum, Dreissena polymorpha, D. rostriformis, Hydrobia caspia, Neritina liturata, and Dreissena brardit; the red clays with these fossils extend for 130 miles to the east of the Caspian (/zvestia of Russ. Geog. Soc., 1883 and 1886).

5 As by Jenkinson, who mentions a sweet-water gulf of the Caspian within six

days' march from Khwarezm, by which gulf he could mean nothing but the Sary- Kamysh depression.

was not the sea of our days; its gulfs penetrated the Turcoman steppe, and washed the base of the Ust-Urt plateau, as is shown by the deposits of its shells described by the Russian engineers.

Kelif-Uzboi.—There is also no doubt that, instead of flowing north-westward of Kelif, the Amu once flowed to join the Murghab and Tejeii; the succession of depressions described by the Russian engineers as the Kelif-Uzboi® supports this hypothesis, which a geographer cannot avoid making when studying a map of the Transcaspian region; but the date at which the Oxus followed such a course, and the extension which the Caspian basin then had towards the east, remain unsettled. Much, however, has still to be

done before we can fully reconstruct the geological history of that region since the Phocene epoch, or show how far the data of Pliny, Strabo, and Ptolemy were descriptions of actual facts.”

Population.—With the exception of some 35,000 Kirghiz en- camped with their herds on the Ust-Urt plateau (a swelling some 600 to 1000 feet in height and nearly 92,000 square miles in extent, which, owing to its dryness and cold winter, can be inhabited only by nomad cattle-breeders) and a few Persians in the Lutfabad and Shilghyan villages of the Atok, the whole of the population of the Transcaspian region consists of Turcomans. Until a very recent date their chief occupation was cattle-rearing and robbery. Even those Turcomans who had settled abodes on the oases of the Atok, Tejei, and Merv were in the habit of encamping during spring in the steppes, and there practising robbery. Robber bands were easily formed, and on their powerful horses they extended their excursionsto distances of 200 and 300 miles from their abodes. They infested the Astrabad province ; and the villages of the khanates of Afghan Turkestan, from Balkh to Meshhed, were periodically devastated by them. The aspect of the steppe has, however, greatly changed since the Russian advance, the fall of the Turco- man stronghold of Geok-tepe, and the massacres which ensued ; the Persians are already beginning to avenge themselves on the inhabitants of the Atok by disputing with them the supplies of water coming from the Kopet-dagh.

The chief oasis of the Turcoman desert is the Atok, which extends along the base of the Kopet-dagh, and is now traversed by the Transcaspian railway. The Akhal and the Arakadj oases, collectively called Atok, now have a population of about 42,000 Tekke-Turcomans, who have recently settled there, and live for the most part in miserable clay huts or in felt tents (kibitkas), They raise wheat, barley, aud lucerne ; and the Persians have excellent gardens. Some cotton is also grown, and the culture of the silk-worm is beginning to spread. The chief settlements are Askabad, Kizil-arvat, and Geok-tepe.

The oasis of MERv (qg.v.) is inhabited by Akhal-tekkes (about 160,000), mostly poor. In January 1887 they submitted to Russia.

The oasis of Tejefi has recently sprung up where the river Tejefi (Heri-rud) terminates in the desert. Formerly it was only tem- povarily visited by the

Tekkes who came to cultivate the fields in summer. In 1883 it was estimated to have 7500 inhabitants.

South-West Turcomania.—The region between the Heri-rud and the Murghab, as they issue from the highlands, described in English maps under the name of Badhyz, and by the Russians as South- West Turcomania, has of late attracted a good deal of attention since the Russian occupation of Sarakhs on the Tejefi (see AFGHANISTAN and PersiA) and Penjdeh on the Murghab. It has the characters of a plateau reaching about 2000 feet above the sea, with hills 500 and 600 feet high covered with sand, the spaces between being filled with loess. The Borkhut Mountains which conuect the Kopet-dagh with the Sefid-kuh, reach 3000 to 4000 feet, and are crossed in a gorge by the Heri-rud. Thickets of poplar and willow follow the courses of both the Murghab and Heri-rud, and the trecsreach a considerable size. Pistachio and mulberry trees grow in isolated groups on the hills; but there are few places available for culture, and the Saryks (some 60,000 in number) congregate in only two oases at Yot-otan and Penjdeh. Cattle-breeding is their chiefoccupation, and enables thein to live in a certain degree of affluence. Brigandage, formerly a notable source of income, is now being suppressed. The Sarakhs oasis is now occupied by the Salors, hereditary enemies of the Tekkes, who number about 3000 tents at Old Sarakhs, and 1700 more on the Murghab, at Tchardjui, at Maimene, and close to Herat.

Great modifications in the life of the steppe have of course been brought about by the Russian conquest, which was followed with

6 In connexion with this southern ‘told bed,” it is worthy of notice that the Ersari-Turcomans call it Unghyuz or Onguz (‘‘dry old bed”), and there can be no doubt that when the Bolshoi Tehertezh of the 16th century (speaking from anterior information) mentions a river, Ughyuz or Ugus, flowing to the west from the Amu towards the Caspian, it is merely describing as a river what its very name shows to have been a dry bed, only supposed to have been once occupied bya river. The similarity of the names Ongus and Ugus with the Ogus and Ochus is so striking that one is inclined to see in the Ogus or Ochus nothing but the mention of a dry old bed. Compare

Petrusevitch, ‘‘ The South-East Shores of the Caspian,” in Zapiski of the Caucasian Geogr. Soc., vol. xi., 1880.

7 Such an intermingling of modern data with older traditions is not unknown to geographers. A striking instance of it is given in the supposed connexion of Lake Aral with the Arctic Ocean during historical times; pliysical changes are procecding so rapidly in Asia that we find traces of like survivals of traditions even in this age of accurate surveys.

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great rapidity by the construction of a railway from Mikhailovsk on the Caspian to Kizil-arvat and Sarakhs, and thence to Merv and north-eastward to T’chardjui on the Amu, from which point it is now being continued across Bokhara towards Samarkand. Attempts at growing cotton and tea are being made, and land has been rented at Merv for cotton plantations. Cotton is to be pressed by steam at Bokhara and Tchardjui, to be sent to Russia by the Trans- caspian railway.

Caspian Lttoral.—The Caspian littoral is divided into two districts, Krasnovodsk and Manghishtak. The former has about 15,500 settled inhabitants and 3056 Turcoman kibitkas (partly shifted in summer to Persian territory). The chief settlements of the district are Krasnovodsk on the Krasnovodsk Gulf; Mikhailovsk, the terminus of the Transcaspian railway, in regular communication by steamer with Baku; and Tchikishlyar, close to the mouth of the Atrek. The Manghishtak district, which includes the Ust-Urt plateau, has a population of about 34,500 Kirghiz. Its chief settlement is Alexandrovsk.

The total population of the Transcaspian region was estimated in 1883—that is, before the annexations in South-West Turcomania —at from 214,000 to 260,000 inhabitants (EAP EK)

TRANSCAUCASIA, the name given to that portion of the Russian empire (in Caucasus, Armenia, and Asia Minor) which lies to the south of the main Caucasus ridge. It comprises the governments of Kutais (inclusive of the

province of Batum), Tiflis, Elisabethpol, Erivaii, and Kars, with parts of Daghestan and most of Baku, and the separate military districts of Tchernomorsk and Zakataty. Sometimes Transcaucasia is identified with Southern Caucasus, and then it is intended to include the whole of Daghestan. So defined, it would have an area of 95,930 square miles, and a population of 4,173,380.

Three regions must be distinguished :—(1) the narrow strip of land between the main Caucasus ridge and the Black Sea (TCHERNoMoRsK district, g.v.) ; (2) the broad valley, watered by the Rion in the west and the Kura in the east, which separates the main Caucasus ridge from the region next to be mentioned; (3) the highlands, mountains, and plateaus of Lazistan, Kars, and Armenia.

The valley referred to, which crosses the isthmus from the Black Sea to the Caspian, consists of two widely different sections, —the drainage-area of the Rion, which is Mediterranean in its physical characteristics, and the valley of the Kura and Araxes, which slopes to the Caspian, and in its lower parts becomes purely cis-Caspian. The Mesques or Meshik Mountains (3000-5000 feet), a ridge running south-west to north-east, and probably a con- tmuation of the Black Sea coast ridge (Tchorokh Moun- tains), separate the two, The drainage area of the Rion, which corresponds approximately to the government of Kutais, includes the former provinces of Imeritia, Min- grelia, Guria, and Swanetia on the upper Ingur and Tshenis- tshali. With the exception of the valley of the Rion (some 25 miles broad), and the sandy and marshy littoral, it is wholly occupied by spurs of the main Caucasus ridge, the Meshik, and the Wakhan Mountains; the last-named rise to 10,000 and 11,000 feet above the sea in their highest summits, and are intersected by deep and fertile valleys. The region is characterized by a heavy rainfall and a moist maritime climate. The vegetation, which is luxuriant, is of a circum-Mediterranean character: fine forests of de- ciduous trees clothe the mountain slopes, and the high- land villages nestle amid thickets of azalea, almond, and rhododendron. Maize, the mulberry, the vine, and a great variety of fruit trees are cultivated. Mingrelia and Imeritia are the real gardens of Caucasus ; but the high valleys tributary to the Ingur, inhabited by Swanians, are wild and difficult of access ; in some of them, which are narrow and marshy, fevers and

scurvy prevail. The Rion is not navigable, and of its tributaries only the Tshenis-

! No Russian sea shows so rapid a growth of navigation as the Caspian Sea during the last fifteen years. In 1884 no less than 1945 steamers (611,000 tons), engaged in foreign trade, entered the Russian ports of the Caspian, as against 409 (113,000 tons) in 1876.

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tshali and the Kvirila are worthy of mention. Several lakes (such as the Paleostom, surrounded by marshes at the mouth of the Rion) occur in the coast region. The popu- lation consists of Imeritians, Mingrelians, Gurians, and Swanians, all belonging to the Kartvelian branch of Caucasians (see vol. x. p. 433), with a few Ossetians, J ews, Armenians, and Tartars. Russians are not numerous.

The pass of Suram, by which the Transcaucasian railway now crosses the Mesques Mountains, leads from the valley of the Rion to that of the Kura. Spurs from the Caucasus and the Anti- caucasus fill np the broad longitudinal depression between these, so that above Tiflis the bottom of the valley is but a narrow strip. But below that city it suddenly widens, and stretches for nearly 350 miles eastward towards the Caspian with a steadily increasing breadth, until it becomes nearly 100 miles wide in the steppe of Mugafi on the Caspian littoral. The snow-clad peaks of the main Caucasus, descending by short steep slopes, fringe the valley on the north-east ; while a huge wall, much lower, and having the characters of a border-ridge of the Armenian plateau, bounds the valley on the south-west.?_ The floor of the valley gently slopes from 12900 feet at Tiflis to 500 feet in its middle, and to 85 feet below the level of the ocean on the Caspian shore; but a plateau ranging from 2000 to 3000 feet in height, very fertile along the Ataza, a left-hand tributary of the Kura, stretches along the southern hill- foots of the main ridge. In its lower course the Kura is joined by the Araxes, a river nearly as large as itself, which brings to it the waters of the Armeuian plateau.

The highest mountains of the Caucasus enclose the upper parts of the valley (now the government of Tiflis), An unbroken series of peaks, from 10,000

to 12,600 feet in height, mostly snow-clad and separated by but slight depressions, is seen in profile as one looks from some height of the Anticaucasus towards the main chain and the broad valley of the Kura. Deep short gorges and valleys indent the steep slopes which are inhabited by Ossetians, Tushes, Pshavs, and Khevsurs in the west, and by the various tribes of the Lesghians in the east. Every available patch is used in these high and stony valleys for the culture of barley, even at heights of 7000 and 8000 feet above the sea; but cattle-breeding is the chief resource of the mountaineers, whose little communities are separated from one another by passes in few cases lower than 10,000 feet. The steppes which cover the bottom of the valley are for the most part too dry to be cultivated without irrigation. It is only nearer the hillfoots in Kahetia, where multitudinous streams supply the fields and the gardens of the plateau of the Atazaii, that wheat, millet, and maize are grown, and orchards, vineyards, and mulberry-tree plantations are possible. Lower down the valley cattle-rearing becomes the chief source of wealth, while in the small towns and villages of the former Georgian kingdom (see GxoreiA) various petty trades, testifying to a high development of artistic taste and technical skill, are widely diffused. Further down the Kura, in the government of Elizabethpol, and especially on the right bank of the river, a population of Russian agriculturists—chiefly Nonconformists —is rapidly springing up, so that corn is exported from the villages on the Ganja. The slopes of the Anticaucasus are covered with beautiful forests, and the vine is grown at their base, while in the broad and wide steppes the Tartars rear cattle, horses, and sheep. The lower part of the Kura valley, which belongs mainly to the province of Baku, assumes the character of a dry steppe where the rainfall hardly reaches 13°7 inches at Baku, and is still less in the Mugah steppe (in most striking contrast with the moistness of the Lenkorafi region close by). The steep slopes of the Great Caucasus are still covered with thriving forests ; but forests and meadows dis- appear in the steppe, whose scanty vegetation has a Central-Asian character. Only tugais, or thickets of poplar, dwarf oak, tama- risk, and so on, follow the actual] course of the Kura, whose delta is covered with impenetrable growths of rushes. The Mugafi steppe, however, does not deserve its ancient evil reputation; the serpents with which it was said to abound are entirely fabulous, and in the winter it is full of life; herds of antelopes roam over it, and its southern irrigated parts promise to become the granary of Caucasus,? although its unirrigated parts will probably never

recover their former richness, the Kura having’excavated its bed to a much greater depth. The Apsheron peninsula, in which the Great Caucasus terminates at Baku, to be continned farther south-east by a sub- marine plateau of the Caspian, is the seat of those remarkable naphtha springs which have recently given rise to an important industry and now supply most of the Volga steamers with fuel; while the western shores of the wide Kizil-agatch Bay—the Tatysh, or Lenkoraii district on the slopes of the Armenian plateau—on account of their rich vegetation, fertile soil, and moist climate, are one of the most beautiful possessions of Russia in Asia.

2? For this valley and the contrasts between the Caucasus and Anti-caucasus, see Raddes Ornis Caucasica, Cassel, 1884. 3 Seidlitz, Spiski naselennykh myest Bakinskot gubernii. Se, — 65

The population includes only a few Russians (about 16,000); the |

majority are Tartar shepherds, next to whom eome the Iranian Tates and Talyshes (the latter probably aborigines of Baku), who eonstitute 23°1 per cent. of the population; some 27,000 Armenians, chiefly about Shemakha, and 35,000 Kurins, or Lezghians, on the slope of the Great Caucasus, must be added, as also some Jews and Arabs.

A mining industry of some importance has been growing up of late in this part of Transcaucasia. The copper works of Kedabek in Elizabethpol yield from 10,000 to 15,000 cwts. of eopper annually; nearly 300,000 cwts. of manganese are extracted in Kutais, and 30,000 ewts. of sulphur in Daghestan and Baku ; the coal-mines of Kutais, the alum ores of Elizabethpol, and the fire-clay and cement of Tchernomorsk, are but recently opened up.

The highlands of Transcaucasia, which extend from north-west to south-east for nearly 375 miles, with an average width of 160 miles, must in their turn be sub- divided into two sections—the Armenian plateau, including the provinces of Erivaii and Kars and parts of Baku, and the Black Sea coast-region, including the former province of Batum (now the Batum and Artvin districts of Kutais).

The former of those is an immense plateau separated by the valley of the Araxes from the highlands of Adherbaijan and of Turkish Armenia, which belong to the drainage-areas of the Euphrates or those of Lakes Van and Urmia. All over Kars and Erivafi is a series of plateaus ranging in altitude from 5000 to 6500 feet, sometimes quite flat, sometimes broadly undulating, covered with rich meadows, and for the most part available for agriculture. Dome-shaped mountains, isolated, or grouped into relatively low ridges, rise from these plateaus to heights which range from 8000 to 9500 feet, and occasionally reach 10,000 or 11,000 above sea-level. Several summits in the east exceed that height, and the Alaghéz reaches 13,436 feet.

This plateau region is bounded on the south by the valley of the Araxes, the river which forms the frontier with Turkey, except where it is crossed by Russia in the south of Kars and west of Erivafi.. There the river flows in a broad valley 4500 feet above sea-level, and the Kars plateau falls towards it by a steep slope, while on the other side a steep, rocky ridge of exeeedingly wild aspect rises as the northern border-ridge of the South Armenian (Alashkert) plateau and the water-parting between the Caspian Sea and the Indian Ocean. This ridge, which includes the Allah-dagh and Késa-dagh (10,720 and 11,260 feet respectively), as also the Great and Little Ararats (17,100 and 12,990 feet), has no general name, but is described under the names of Shah-ioly, or Agri-dagh.?

A number of lakes occur on the plateau, especially along its northern border-ridge, the chief being that of Goktcha, an extensive alpine basin (500 square miles 6310 feet above sea-level) sur- rounded by wild mountains. Most of the depressions of the plateau bear traces of having been under water during the Lacustrine (Post-Glacial) period. Granites and other unstratified rocks con- stitute the nucleus of the Armenian and Kars plateaus. These are eovered with Azoic slates, and partly with Devonian and Carbonifer- ous deposits; Jurassic and Cretaceous are wanting, but the Tertiary (Eocene and Miocene) are widely spread both in the valley of the Rion and Kura and in the depressions of the plateau. Rocks of volcanic origin are widely diffused all over Erivafi: the Alexandropol plateau, surrounded by extinct volcanoes, is all covered with volcanic products, which overlie the Tertiary deposits and in turn are covered with Glacial boulder-elay.

The Alaghoz, the Ararats, and the peaks around Lake Goktcha are huge trachitic masses surrounded by volcanic rocks. Iron and copper ores are widely spread; alum and rock-salt are obtained, the latter at Kulpi and Nakhichevafi. Mineral springs are numer- ous. ‘The region is watered by the upper Araxes—too rapid and rocky to be navigated—and its tributaries, most of which flow at the bottoms of deep gorges. The upper Kura waters western Kars. The climate presents all the varieties which might be expected in a region of so varied altitudes. While eotton grows in the dry and hot climate of the valley of the lower Araxes, the winter is severe on the plateau, and Alexandropol (5010 feet) has an average temperature of only 41°°5 (Jan. 12°°8; July, 73°°6). The difference between summer and winter is still more striking at Erivafi (3210 feet), which has in January an average of only 5° while that of August reaches 77°°7.. On the Kars plateau the winter is still more severe. Kaghyzman (4620 feet) and Sary-kamysh (7800 feet) have the winter temperature of Finland, and the latter place, with an annual mean the same as that of Hammerfest (36° F.), has frosts of

1 ‘W. Massalsky, ‘‘Government of Kars,” in Zgvestia of Russ. Geogr. Soc., vol. xxiii., 1887.

27° and heats of 99°. The vegetation of the Kars plateau reflects these extremes of climate, and, besides the alpine vegetation of the high yailas (alpine meadows), we find there the Anatolian, Armenian, and Pontic floras meeting. The population of Erivafi consists of Armenians (54 per cent.), Tartars (40 per cent.), some 28,000 Kurds, and some 4400 Russians, together with a few Greeks and Jews. In localities under 4000 feet eotton and rice are the chief crops, oil-yielding plants, the vine, the mulberry, and fruit trees being also cultivated. Higher up wheat and barley are grown, while at altitudes above 6000 and 7000 feet the Tartars aud Kurds support themselves by rearing cattle. Many petty trades are developed in the towns among the Armenians, and the trade of Erivai with Persia and Turkey amounts to about 10,000,000 roubles.

The population of the provinee of Kars (167,610 in 1883) is very mixed. In a remote antiquity it was inhabited by Armenians, whose capital Ani, Mren with its beautiful ruins of a grand cathedral, and several other towns now in

ruins testify to the former wealth and populousness of the country. After the fall of the Armenian empire the Turks occupied the region ; Kurds from Kurdistan and Diarbekr invaded the alpine pasturages of the valley of the Araxes; later on, Kabards, Circassians, Osses, and Karapapakhs found refuge there; and finally, after the last war the Mohammedans emigrated to Asia Minor (82,760 in 1878-81), while Christian Armenians, Greeks, Russian Raskolniks, and some Yezids took their place. The population consists now of Turks, Armenians, Turcomans, Greeks, Kurds, Adherbaijan Tartars, Gipsies, and Russians. The Kars sanjak, which was one of the granaries of Turkey, has lost this reputation; but the crops (chiefly wheat and barley) are now again increasing where the early frosts do not interfere with agriculture. Cotton is raised in the Olty region; and in the valley of the Araxes gardening and the eulture of the silkworm are widely diffused; while cattle-rearing is the chief source of income in the highlands, especially with the Kurds, who move their felt tents on the yailas to higher levels as the summer sun burns up the vegetation.

The western part of the Transcaucasian highlands com- prises the Batum and Artvin districts, which now belong to Kutais. The whole of the region is occupied by alpine ridges—the Pontic ridge in the west, and those of Arjar and Arsian in the east, whose highest peaks rise to 10,000 and 11,000 feet, without, however, reaching the limits of perpetual snow. The Tchorokh and its tributaries, moun- tain streams enclosed in deep valleys, water the region ; the Tchorokh is navigable by small boats for 60 miles.

The coast region enjoys an excellent climate; the average yearly temperature at Batum is 65° F., that of the coldest month (February) being 41°°5, and that of July 76°°5. During the last four years the thermometer never fell lower than 39°°5 at Batum. The rainfall is excessive (93°4 inches), and days are recorded on which the amount of rain exceeded 10 inches. The region has accordingly a very luxuriant and subtropical vegetation, and even higher up the hills the villages are literally buried amidst gardens. The higher hills have luxuriant meadows. Rice is eultivated in the coast region, and millet, barley, tobacco, and a variety of fruit- trees on higher altitudes. The inhabitants (about 90,000 in 1884) are chiefly Georgians, approaching the Gurians most nearly. The Lazes number about 2000 and the Kurds about 1000.

Towns.—The chief towns of Trarscaucasia are more important than those of northern Caucasus. TIFLIS (q.v.), with 104,024 in- habitants in 1888, is the capital of Caucasia. KurTais (q.v.) (18,000), to which tradition assigns an age of 4000 or 5000 years, has grown rapidly of late, owing to its sitnation at the head of the alluvial plain of the Rion and the proximity of the Tkvibula coal deposits and the Kvirila manganese mines. Khoni (4060) and Orpiri are mere administrative centres of Kutais. Redut-kale (620) has lost its importance as a seaport, and Poti (3110), at the mouth of the Rion, has not yet become an important port, notwithstanding efforts to improve its roadstead and its railway connexion with Tiflis and Baku. The chief Black Sea port of Transcaucasia is BATUM (q.v.), which has been diligently fortified of late, and has now a popula- tion of 12,000. Artvin (5860) and Ardjari are the two other ehief towns of the Batumi region. The chief towns of the government of Tiflis besides its eapital are Gori, capital of Georgia (population 4800), Mtzhet (770) at the junction of the Vladikavkaz highway with the Transcaucasian railway, Telav (7020), Dushety (8600), Zakataty (1080), chief town of a separate military district, and Sig- nakh (10,340), which are built in the spurs of the main chain; while Akhattsikh (18,270), on the upper Kura and on the Kars plateau, is a busy centre for petty trades. The old city of Ahatkataki (3200) on the same plateau is now a Russian fort. ELIZABETHPOL, NUKHA, and SHUSHA (gq.v.) are the principal towns in the provinee of Elizabethpol. Baxv (g.v.), the terminus of the Transcaucasian

railway, and in regular steamer communication with Mikhailovsk in the Transcaspian region, derives its importance from the naphtha wells which surround it. SHEMAKHA (g.v.) (28,810), and Saliany (10,170), at the head of the delta of the Kura, and notable for its fisheries, are the only places of importance in the province of Baku. ERIVAN (q.v.) (12,450), capital of the province of Erivafi, and the chief city of the Armenian plateau, is one of the oldest cities of the country, and, owing to its position, would be much more important than itis, but foritselimate. Etchmiadzin, or Vagarshapad (2910), is the real capital (the Rome) of Armenia, for its antiquities, mon- astery, library, and printing offices. Nakhitchevahi (5390)—the Naxuana of Ptolemy—is another centre of Armenia. The most populous town of the

region, however, is Alexandropol (23,010) or GuMRI (q.v.),.the ehief Russian fortress of Transcaucasia, —the other towns of Erivai being Ani, or Oni, Novobayazet at Lake Goktcha, and Ordubad (8600). The long-disputed Kars (q.%.), which has now 7340 inhabitants, is the chief town of the new Russian province of the same name, annexed in 1878. Kaghyzman (3700), on the upper Araxes, is but a collection of clay houses sur- rounded by rich gardens; Ardahan (1270), on the upper Kura, and Olty (580) are the only other towns of Kars worthy of notice as administrative centres. (BEAL IS)

TRANSIT CIRCLE, or Merrpi1an Crrcie, an instru- ment for observing the time of a star's passing the meridian, at the same time measuring its angular distance from the zenith. The idea of having an instrument (quadrant) fixed in the plane of the meridian occurred even to the ancient astronomers, and is mentioned by Ptolemy, but it was not carried into practice until Tycho Brahe constructed a large meridian quadrant. This instru- ment enabled the observer to determine simultaneously right ascension and declination, but it does not appear to have been much used for right ascension during the 17th century, the method of equal altitudes by portable quad- rants or distance measures with a sextant being preferred (see OBSERVATORY and TimE). These methods were, how- ever, very inconvenient, which induced RoEMER (q.v.) to invent the transit instrument about 1690. It consists of a horizontal axis in the direction east and west resting on firmly fixed supports, and having a telescope fixed at right angles to it, revolving freely in the plane of the meridian. At the same time Roemer invented the altitude and azimuth instrument for measuring vertical and horizontal angles, and in 1704 he combined a vertical circle with his transit instrument, so as to determine both coordinates at the same time. 'This latter idea was, however, not adopted elsewhere, although the transit instrument. soon came into universal use (the first one at Greenwich was mounted in 1721), and the mural quadrant continued till the end of the century to be employed for determining declinations. The advantage of using a whole circle, as less liable to change its figure, and not requiring reversal in order to observe stars north of the zenith, was then again recog- nized by RamspEN (g.v.), who also improved the method of reading off angles by means of a inicrometer microscope as described below. The making of circles was shortly afterwards taken up by TRovueHTon (¢.v.), who in 1806

constructed the first modern transit circle for Mr Groom- bridge's observatory at Blackheath, but he afterwards abandoned the idea, and designed the mural circle to take the place of the mural quadrant. In the United Kingdom the transit instrument and mural circle continued till the middle of the present century to be the principal instru- ments in observatories, the first transit circle constructed there being that at Greenwich (mounted in 1850), but on the Continent the transit circle superseded them from the years 1818-19, when two circles by Repsoup (¢.v.) and by REICHENBACH (g.v.) were mounted at Géttingen, and one by Reichenbach at Kéonigsberg.1 The firm of Repsold was for a number of years eclipsed by that of Pistor and Martins in Berlin, who furnished the observatories of

1 The most notable exception was the transit instrument and vertical circle of the Pulkova observatory, specially designed by the elder Struve for fundamental determinations:

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Copenhagen, Albany, Leyden, Leipsic, Berlin, Washington, and Dublin with first class instruments, but since the death of Martins the Repsolds have again taken the lead, and have of late years made transit circles for Strasburg, Bonn, Wilhelmshafen, Williamstown (Massachusetts), Madison (Wisconsin), &c. The observatories of Harvard College (United States), Cambridge, and Dun Echt have large circles by Troughton and Simms, who also made the Greenwich circle from the design of Airy.?

We shall describe the principal features of a transit circle, referring for smaller transit instruments and altazi- muths to the article SURVEYING (vol. xxii. p. 719).

In the earliest transit instrument the telescope was not placed in the middle of the axis, but much nearer to one end, in order to prevent the axis from bending under the weight of the telescope. It is now always placed in the centre of the axis. The latter consists of one piece of brass or gun-metal with carefully turned cylindrical pivots at each end. The centre of the axis is shaped like a cube, the sides of which form the basis of two cones which end in cylindrical parts. The pivots rest on -shaped bearings, either let into

the massive stone or brick piers which support the instrument or attached to metal frameworks bolted on the tops of the piers. In order to relieve the pivots from the weight of the instrument, which would soon destroy their figure, the cylindrical part of each end of the axis is supported by a hook supplied with friction rollers, and suspended from a lever supported by the pier and counterbalanced so as to leave only about 10 pounds pressure on each bearing. Near each end of the axis is attached a circle or wheel (generally of 3 or 34 feet diameter) finely divided to 2’ or 5’ on a slip of silver let into the face of the circle near the circum- ference. The graduation is read off by means of microscopes, generally four for each circle at 90° from each other, as by taking the mean of the four readings the eccentricity and to a great extent the accidental errors of graduation are eliminated.? In the carlier instru- ments by Pistor and Mar- wards they let the piers be tins the microscopes were ¢=S* made narrower, so that the fixed in holes drilled = microscopes could be at the through the pier, but after- sides of them, attached to

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Transit Circle.

radial arms starting from near the bearings of the axis. This is preferable, as it allows of the temporary attachment of auxil- iary microscopes for the purpose of investigating the errors of graduation of the circle, but the plan of the Repsolds and of Simms, to make the piers short and to let the microscopes and supports of the axis be carried by an iron framework, is better still, as no part of the circle is exposed to radiation from the pier, which may cause strain and thereby change the angular distance between various parts of the circle. Each microscope is furnished with a micrometer screw, which moves a frame carrying a cross, or

2 This instrument differs in many particulars from others: the important principle of symmetry in all the parts (scrupulously followed in all others) is quite discarded ; there is only one circle ; and the instrument cannot be reversed. There is a similar instrument at the Cape observatory.

3 On Reichenbach’s circles there were verniers instead of micro- scopes, and they were attached to an alidade circle, the immovability of which was

tested by a level.

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better two close parallel threads of spider’s web, with which the distance of a division line from the centre of the field can be measured, the drum of the screw being divided to single seconds of arc (0.1 being estimated) while the number of revolutions are counted by a kind of combin the field of view. The periodic errors of the screw must be investigated and taken into account, and care must be taken that the microscopes are placed and kept at such a distance from the circle that one revolution will corre- spond to 1’, the excess or defect (error of run) being determined from time to time by measuring standard intervals of 2’ or 5’ on the circle.

The telescope consists of two slightly conical tubes screwed to the central cube of the axis. It is of great importance that this connexion should be as firm and the tube as stiff as possible,! as the flexure of the tube will affect the declinations deduced from the observations. The flexure in the horizontal position of the tube may be deter- mined by means of two collimators or telescopes placed horizontally in the meridian, north and south of the transit circle, with their object glasses towards it. If these are pointed on one another (through holes in the central cube of the telescope), so that the wire-crosses in their foci coincide, then the telescope, if pointed first to one and then to the other, will have described exactly 180°, and by reading off the circle each time the amount of flexure will be found. M. Loewy has constructed a very ingenious apparatus? for determining the flexure in any zenith distance, but generally the observer of standard stars endeavours to eliminate the effect of flexure in one of the following ways : —either the tube is so arranged that eye-piece and object-glass can be interchanged, whereby the mean of two observations of the same star in the two positions of the object-glass will be free from the effect of flexure, or a star is not only observed directly (in zenith distance Z), but also by reflexion from a mercury trough (in zenith distance 180° — Z), as the mean result of the Z.D. of the direct and reflexion observa- tions, before and after reversing the instrument east and west, will only contain the terms of the flexure depending on sin2Z, sin4Z, &e. In order to raise the instrnment a reversing carriage is provided which runs on rails between the piers, and on

which the axis with circles and telescope can be raised by a kind of screw-jack, wheeled out from between the piers, turned exactly 180°, wheeled back, and gently lowered on its bearings.

The eyc end of the telescope has in a plane through the focus a number of vertical and oue or two horizontal wires (spider lines). The former are used for observing the transits of the stars, each wire furnishing a separate result for the time of transit over the iniddle wire by adding or subtracting the known interval between the latter and the wire in question. The intervals are determined by observing the time taken by a star of known declination to pass from one wire to the other, the pole star being hest on account of its slow motion.? The instrument is provided with a clamping apparatus, by which the observer, after having beforehand set to the approximate declination of a star, can clamp the axis so that the telescope cannot be moved except very slowly by a handle pushing the end of a fine screw against the clamp arm, which at the other side is pressed by a strong spring. By this slow motion the star is made to run along one of the horizontal wires (or if there are two close ones, in the middle between them), after which the microscopes are read off. The field or the wires can be illuminated at the observer's pleasure ; the lamps are placed at some distance from the piers in order not to heat the instrument, and the light passes through holes in the piers and through the hollow axis to the Eure, whence it is directed to the eye-end by a system of prisms.

The time of the star's transit over the middle wire is never exactly equal to the actual time of its meridian passage, as the plane in which the telescope turns never absolutely coincides with the meridian. Let the production of the west end of the axis meet the celestial sphere in a point of which the altitude above the horizon is 6 (the error of inclination), and of which the azimuth is 90° —a (the azimuth being counted from south through west), while the optical axis of the telescope makes the angle 90°+¢ with the west end of the axis of the instrument, then the correction to the sin (¢— 8) ~, cos(p ee 5,

cos 8 cos 6 where ¢ is the latitude of the station and 8 the declination of the star (see GEODESY, vol. x. p. 166). This is called Tobias Mayer's formula,

and is very convenient if only a few observations have to be reduced. Putting db sin ¢~-a cos ¢=n, we get Hansen's for-

1 Reichenbach supplied his tubes with counterpoising Ievers like those on the Dorpat refractor (see TELESCOPE, fig. 20).

2 Comptes Rendus, vol. 1xxxvii. p. 24.

3 The transits are either observed by “‘eye and ear,” counting the second beats of the clock and comparing the distance of the star from the wire at the last beat before the transit over the wire with the distance at the first beat after the transit, in this way estimating the time of transit to 08°1; or the observer employs a“ chronograph,” and by pressing an electric key causes a mark to be

made on a paper stretched over a uniformly revolving drum, on which the clock beats are at the same time also marked electrically.

observed time of transit will be a

4 The idea of illuminating through the axis is due to Ussher, professor of |

astronomy in Dublin (a. 1790).

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mula, which gives the correction =0 sec $+ 7 (tan 6 — tan @)+¢sec 8, which is more convenient for a greater number of observations, The daily aberration is always deducted from c¢, as it is also multiplied by secd (being 0”.3lcospsecd). The above correc- tions are for upper culmination ; below the pole 180°-—36 has to be substituted for 6. The constant cis determined by pointing the instrument on one of the collimators, measuring the distance of its wire-cross from the centre wire of the transit circle by a vertical wire movable by a inicrometer screw, reversing the instrument and repeating the operation, or (without reversing) by pointing the two collimators on one another and measnring the distance of first one and then the other wire-cross from the centre wire. The inclin- ation b is measured directly by a level which can be suspended on the pivots. Having thus found

0 and c, the observation of two stars of known right ascension will furnish two equations from which the clock error and the azimuth can be found. For finding the azimuth it is most advantageous to use two stars differing as nearly 90° in declination as possible, such as a star near the pole and one near the equator, or better still Gf the weather permits it) two successive meridian transits of a close cireumpolar star (one above and one below the pole), as in this case errors in the assumed right ascension will not influence the result.

The interval of time between the culminations or meridian transits of two stars is their difference of right ascension, 24 hours corresponding to 360° orl hour to15°. If once the absolute right ascensions of a number of standard stars arc known, it is very simple by means of these to determine the R.A. of any number of stars. The absolute R.A. of a star is found by observing the interval of time between its culmination and that of the sun. If the inclination of the ecliptic (e) is known, and the declination of the sun (8) is observed at the time of transit, we have sin a tan e =tan 6, which gives the R.A. of the sun, from which together with the observed interval of time corrected for the rate of the clock, we get the R.A. of the star. Differentiation of the formula shows that observations near the equinoxes are most advautageous, and that errors in the assumed ¢ and the observed 5 will have no influence if the Aa is observed at two epochs when the sun's R.A. is A and 180-A oras near theretoas possible. A great number of observations of this kind will furnish materials for a standard catalogue ; but the right ascensions of many important catalogues have been found by making use of the R.A.'s of a previous cata- logue to determine the clock error and thus to improve the indi- vidual adopted R. A.'s of the former catalogue.

In order to determine absolute declinations or polar distances, it is first necessary to determine the co-latitude (or distance of the pole froin the zenith) by observing the upper and lower culmination of a number of circumpolar stars. The difference between the circle reading after observing a star and the reading corresponding to the zenith is the zenith distance of the star, and this plus the co-latitude is the north polar distance or 90°—5. In order to determine the zenith point of the circle, the telescope is directed vertically downwards and a basin of mercury is placed under it, forming an

absolutely horizontal mirror. Looking through the telescope the obsérver sees the horizontal wire and a reflected image of the same, and if the telescope is moved so as to make these coincide, its optical axis will be perpendicular to the plane of the horizon, and the circle reading will be 180°+zenith point. In observations of stars refraction has to be taken into account as well as the errors of graduation and flexure, and, if the bisection of the star on the horizontal wire was not made in the centre of the field, allowance must be made for curvature (or the deviation of the star's path from a great circle) and for the inclination of the hori- zontal wire to the horizon. The amount of this inclination is found by taking repeated observations of the zenith distance of a star during the one transit, the pole star being most suitable owing to its slow motion.

Literature.—The methods of investigating the errors of a transit circle and correcting the results of observations for them are given in Briinnow's and Chauvenet's manuals (see Time). For detailed descriptions of modcrn transit circles, see particularly Annalen der Sternwarte in Leyden (vol. i.), the Washington Observations for 1865, and the Publications of the Washburn observatory (vol. ii.).

The Greenwich circle is described in an appendix to the Greenwich Observations for 1852.

TRANSMIGRATION. See Merempsycuosis. TRANSPORTATION. See Prison Discipiine. TRANSUBSTANTIATION. See Eucnwarist,

TRANSVAAL, or Soura Arrican REPUBLIC, a country See vol. i.

in South Africa, northernmost of the European states, lying between 22° 15' and 28° §. lat., and 25° and 32° 10' E. long., is bounded N. and N.W. by the Limpopo, separat- ing it from the Makalaka and Bamangwato countries; W. partly by the Marico and the Hart, partly by an irregular line between these streams, separating it from the new British protectorate of Bechuanaland ; S. by the Vaal and the Buffalo, separating it from the Orange Free State and

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Natal; E. by the Libomba Mountains, separating it from | basins. The water-parting between these two river systems

Zululand and the Portuguese East African possessions.! Transvaal thus forms a compact inland territory nearly as broad as long, not more than 45 or 50 miles from the Indian Ocean at Delagoa Bay, but otherwise lying com- pletely within the outer rim of the vast South African tableland. A line drawn from the south-west extremity, where it touches Griqualand West, north-eastwards to the Limpopo-Shasha confluence, gives an extreme length of 500 miles, the distance from the same confluence southwards to the Natal frontier being 425, and the greatest length east and west between the Zulu and Bechuana frontiers about 400 miles. Inthe absence of accurate surveys, the total area has been variously estimated at from 110,000 to 120,000 square miles, with a population (including aborigines) roughly calculated at from 750,000 to 800,000.

Physical Features.—Physically Transvaal forms a well- marked section of the great South African plateau, an elevated shallow basin with a mean altitude of over 3000 feet, whose conformation has been compared to that of a saucer. On the south and east this basin is separated from the coast by a lofty inner and less elevated outer rim, the former from 6000 to 10,000, the latter about 2000 feet high, sweeping round in curves concentric with that of the seaboard, from Cape Colony through Natal and the east side of Transvaal northwards to the equatorial regions. The inner rim, whose various sections in the extreme south are known as the Roggeveld, Nieuweveld, and Quathlamba ranges, takes in Natal and Transvaal the general name of the Drakenberg Mountains. From the Natal frontier to the Lipalule (Olifant) tributary of the Limpopo, the Drakenberg maintains the aspect of a more or less continuous range 5000 to 7000 feet high, culminating in the Mauchberg (8725), the highest point in Transvaal. A little to the east is the Spitskop (5637), and further south the Klipstad (6020) and Holnek (5600). This section, whose several ridges are known as the Verza- melberg, Randberg, Slangapiesberg, and Komatiberg, falls everywhere precipitously eastwards towards the Libomba range, or outer rim of the plateau, which maintains a mean elevation of 2000 feet along the eastern border of Trans- vaal. Beyond the Lipalule, the Drakenberg loses the character of a well-defined mountain system, broadening out into

uplands moderately elevated above the surround- ing plateau, and breaking into ridges, such as the Murchi- son and Zoutpansberg ranges, which run east and west between the Lipalule and Limpopo. The whole system slopes gently westwards to the central tableland, which is itself intersected by several broken ranges, such as the Maquassieberg, Gat Rand, Witwater Rand, and Magalies- berg in the south, the Dwarsberg, Marikele, Hanglip, Waterberg, and Blauberg in the north, all mostly trending in the direction from east to west. But few of these ridges rise much above 4000 feet, and, as the plateau has a mean altitude of considerably over 3000 feet, they detract little from the aspect of a vast level or slightly rolling upland plain, almost everywhere presented by Transvaal west of the Drakenberg orographic system.

The numerous fossil remains of aquatic life, together

with extensive sandy tracts and the presence in several |

places of water-worn shingle, give to the central tableland the appearance of an upheaved lacustrine basin, whose waters escaped at one time through the Limpopo to the Indian Ocean, at another through the Vaal to the Orange river, and thence to the Atlantic. The Vaal and Limpopo are still the two great fissures in the plateau, which carry off most of the surface waters to the surrounding marine

1 The boundaries of Transvaal, long a subject of dispute with Great Britain and the other conterminous states, were at last precisely defined by the convention of February 27, 1884.

les, not in the Drakenberg, itself pierced by the Lipalule and several of its affluents, but in the Witwater Rand towards the south-west of the state. From this point the Limpopo, or Crocodile, sweeps round first to the west, then to the north-east, describing a semicircle of about 1000 miles to the Limvuba (Pafuri) confluence, where it leaves Transvaal, flowing thence for nearly 340 miles through

| Portuguese territory south-east to the Indian Ocean.

Captain G. A. Chaddock has shown (1884) that it is navigable for steamers to this confluence, above which it is obstructed by the Tolo Azime and other rapids. Throughout its whole course it receives nunierous affluents on both sides, such as the Shasha and Nuanetsi from the north, the Marico, Nyl, Limvuba, Lipalule, and others from Transvaal, of which region it drains fully 95,000 square miles. With the exception of a few tracts watered by the headstreams of the Buffalo (Tugela), Mvolozi, Usutu, and Umcomati (King George), flowing in independent channels eastwards to the Indian Ocean, all the rest of Transvaal is drained by the Vaal westwards to the Orange and Atlantic. The Vaal has its easternmost sources in the Wakkerstroom district on the west slope of the Draken- berg, whence it flows for about 450 miles, partly within, but mainly along, the southern frontier of Transvaal, of which, with the Hart and other tributaries on its right bank, it drains about 20,000 square miles altogether. Besides these perennial streams, there are numerous shallow lagoons or saltpans scattered over the western and northern districts, as well as thermal and mineral waters, such as the Warmbad in the Nyl valley. But the only lake pro- perly so called is Lake Chrissie, a sheet of water nearly 40 miles round, and in parts very deep, which lies on the west side of the Drakenberg, 5755 feet above sea-level.

Climate.—Although lying on the border of and partly within the tropics, Transvaal, thanks to its great elevation above the sea, and to the absence of extensive marshy tracts, enjoys on the whole a healthy invigorating climate, well suited to the European consti- tution. Owing to the dryness of the air, due to the proximity of the Kalahari desert, the western and central districts are specially favourable to persons suffering from consumption and other chest complaints. But some of the low-lying moist tracts along the Limpopo and other river valleys, close to or within the torrid zone, are extremely insalubrious, fever of the general African type being here endemic, and its prevalence usually marked by the presence of the destructive tsetse fly. The route from Delagoa Bay to the interior also traverses a fever-stricken coast district between the sea and the Libomba escarpment, dangerous especially in the rainy summer season. The rains generally begin about October, some- times a little before or after, and last intermittently till April. But the rainfall is very unequally distributed, most of the moisture-bear- ing clouds from the Indian Ocean being arrested by the great barrier of the Drakenberg, or counteracted by the dry west winds from the Kalahari desert. Thus, while

there is abundance of rain in the east, the country gradually becomes drier as it approaches Bechuana-. land. During the dry winter season (April to September) keen frosty winds blow from the south, sweeping freely over the central plains and carrying the moisture to be precipitated as snow along the eastern highlands. Nevertheless, according to the careful meteorological observations made by Mr Lys at Pretoria between 1877 and 1880, the mean annual temperature is considerably over 68° F., falling to about 40° in June and rising to 90° and occasion- ally even 95° in January. The rainfall in the same central district seldom reaches 30 inches, which is probably a fair average for the whole of Transvaal, falling to 12 towards the western and rising to 60 on the eastern frontier.

Mineral Resources. —Transvaal yields to no other African region in the abundance of its mineral resources, while it is altogether un- rivalled in their extraordinary variety. These include, besides the precious metals and diamonds, iron, copper, lead, cobalt, sulpliur, saltpetre, and coal, this last with gold, copper, and iron being probably the most abundant and widely distributed. Gold, largely diffused throughout the Drakenberg and in the northern Zoutpans- berg and Waterberg districts and in the Rustenburg and Marico districts in the extreme west, as well as in the highlands between Transvaal and the Zambesi, has hitherto been worked chiefly in the rich auriferous region of Lydenburg about Mount Mauchberg and Mount Spitskop in the central parts of the Drakenberg range, and farther south in the Johannesburg and Lower Kaay (Sheba)

district, Middelburg. The Lydenburg deposits, discovered in 1878, lie at an elevation of 4500 to 5000 feet 40 miles south of the Lipalule river and 125 north-west of Lorenzo Marques on Delagoa Bay, the chief diggings being at Pilgrim’s Rest and Mac Mac close to the Spitskop. In the Middelburg district the chief centres of mining operations are the recently founded towns of Barberton and Johannesburg. In some years the Lydenburg, Marabastad, and other diggings have jointly yielded over £300,000, obtained by washing and without any quartz-crushing. Iron ores are also widely distributed, and the Yzerberg (“Iron Mountain”) near Marabastad (24° S., 30° E.) consists of an enormous mass of rich iron ore, which the

natives have worked for ages. Diamonds are chiefly confined to the Bloemhoff district on the Vaal above the great diamantiferous region of Kimberley in Griqualand West. Coal abounds in the south-eastern districts (Wakkerstroom, Utrecht), and also farther north in Middelburg (Nazareth) and Lydenburg. In some places seams 7 or 8 feet thick lie so near the surface that they are quarried and the coal carted away by the natives. The prevailing formations where this great mineral wealth is embedded are quartz, porphyry, granites, clay slates, greenstone, Lower Devonian strata, conglomerates, and limestones.

Flora. —In Transvaal, as in most of the continent, an herbaceous flora prevails largely over forest growths, which are here confined chiefly to the deep kloofs (gorges) of the mountain ranges, and to the courses of the larger streams. Bush, including mimosas, thorn thickets, and creepers, covers extensive tracts on the northern and southern plains, and the Wakkerstroom and Utrecht districts to- wards Natal are well wooded. But elsewhere the characteristic features are grasslands, downs, hill slopes, flats, and even many parts of the higher uplands being covered with savannahs generally affording good pasturage and fodder for cattle. In the woodlands the prevailing species are three varieties of yellow wood (Podo- carpus), often growing to an enormous size, the Cape beech (Myr- sine), several varieties of the wild pear (Olinia) and of stinkwood (Oreodaphne), ironwood, and ebony. The Boers and other settlers have hitherto occupied themselves chiefly with stock-breeding (sheep, cattle, and horses), but there can be no doubt that much of the country is eminently suited for the cultivation of cereals, yield- ing two annual crops and producing some of the finest wheat in the world. Tobacco, the vine, and most European fruits and vegetables also thrive well, while semi-tropical products, such as cotton, sugar, and coffee, might be raised in the warmer northern districts.

Fauna,—By the early settlers Transvaal was described as the ‘‘naradise of hunters,” ! abounding in the characteristic large animals, such as the lion, leopard, rhinoceros, elephant, giraffe, zebra, quagga, several varieties of antelope, and the ostrich, which roam over the continent from Soudan to the Cape. All these animals still exist, but in greatly reduced numbers, being now largely replaced by the domestic animals—cattle, sheep, and horses —introduced by the white settlers. All the large rivers are in- habited by the

hippopotamus and crocodile, the ‘fatter giving an alternative name to the Limpopo; the buffalo, gnu, eland, spring- bok, wildbeeste, baboon, and several other members of the ape family are also frequently met with. The country is sufictonielly swept by destructive flights of locusts; but the greatest enemy of the stock-breeder is the tsetse fly, which infests the coastlands and many of the riverine tracts, but shows a tendency to disappear with the large game, retreating with the advance of the plough. A tsetse belt 40 miles wide along the whole course of the Limpopo still bars the spread of European settlements beyond Transvaal in the direction of the Zambesi.

Inhabitants. —Of the population not more than 50,000 are whites, mostly Boers (descendants of the early Dutch, French, and German immigrants to the Cape), with a large and increasing percentage of British settlers, attracted in recent years especially to the Lyden- burg and other mining districts. All the rest are natives, belong- ing mainly to the Basuto and Bechuana branches of the Bantu family, and consequently allied in speech and to a large extent in physique to their Zulu-Kaffre neighbours. A considerable number of these natives have abandoned the tribal state and taken service, either freely or by compulsion, with the whites as farm labourers in the rural districts, and as domestic servants in the towns, and are now also largely employed in mining operations. The great bulk of the rest, who retain their national usages and recognize the authority of more or less independent tribal chiefs, are concentrated in the northern and eastern provinces of Zoutpansberg (364,000), Waterberg (174,000), and Lydenburg (123,000). There are also about 40,000 in Bloemhoff (extreme south-west), and the same number in the western provinces of Rustenburg and Marico, but only a few scattered groups in all the rest of the country. These western and south-western tribes (Barolongs, Batlapins, Bakwenas, Bakhatlas, &c.) are all Bechuanas; the others mainly Makatis, as the Basutos are here collectively called. It may be stated in a general way that the whole country south of the Lipalule is now free of native claims and open to European colonization, while

1 On the route between the Orange and Vaal (1835-37) the “ voor-trekkers ” hre said to have Killed as many as 200 lions:

the northern region between that river and the Limpopo is still to a large extent occupied by unreduced or nnbroken Basuto communities.

Natural and Political Divisions.—Transvaal has been divided into three more or less distinct natural regions, determined chiefly by the relief of the land, and its climatic and economic conditions. These are—(1) the Hooge veld, or uplands, comprising the southern districts drained by the Vaal and the Drakenberg highlands as far north as the Lipalule, about 35,000 square miles altogether, with an altitude ranging from 4000 to 7000 feet; (2) the Banken veld, or terrace lands, comprising the low eastern zone between the Drakenberg and Libomba ranges, falling in many places down to a level of 2000 feet, with an area of 15,000 to 20,000 square miles; (3) the Bosch veld, or bush country, comprising all the rest of the land, with an altitude of 3000 to 4000 feet and an area of 60,000 square miles. For administrative purposes the country is again divided into thirteen provinces :—Zoutpansberg and Waterberg in the north; Lydenburg, Middelburg (formerly Nazarcth), Pretoria, Rustenburg, and Marico in the centre; Utrecht, Londina, Wak- kerstroom, Heidelberg, Potchefstroom, and Bloemhoff in the south, In the southern part of Lydenburg lies the somewhat detached district of New Scotland, comprising some 500,000 acres selected by the late Mr M‘Corkindale as a Scotch pastoral and agricultural settlement. It isa healthy prosperous country, lying on the slopes of the Drakenberg, within 310 iniles of Durban, Natal. But the most thickly settled province is Potchefstroom, a fertile tract, 3500 to 5000 feet high, abundantly watered by the Mooi, Schoen, and other streams flowing to the Vaal, and well suited for tillage and pasturage. Its capital of like name (derived from elernents in those of Potgieter, Scherf, and Stockenstroom, three popular Boer leaders during the early migrations) is the most settled and one of the largest towns in Transvaal. The only other placcs deserving the name of town are Pretoria, capital of the province of like name and of the state, occupying a somewhat central position 100 miles north-east of Potchefstroom, 980 from Cape Town, 820 from Port Elizabeth, and 400 from Durban; Barberton, in the Lower Kaap mining district, 150 miles by road from Delagoa Bay, only three years old, but already by far the largest place in the state, with a population (1887) of 15,000; and Johannesburg, centre of the gold- fields of the same name, 30 miles south-east of Pretoria, and 72 east of

Potchefstroom, founded in 1886, but already larger than Pretoria, with a population of over 4000.

Administration and Statistics.—Transvaal enjoys representative institutions, with a volksraad or parliament of forty-four members elected for four years, one-half retiring every two years, the executive being entrusted to a president elected for five years by the whole body of electors, assisted by a council of four, the ex- officio vice-president and the state secretary, with two others appointed by the volksraad. The revenue, derived chiefly from land sales, quit rents, stamps, hut-tax, and customs, balanced the expenditure in 1885, and exceeded it by £15,000 in 1886, the re- spective sums being £260,000 and £245,000. In 1884 the public debt was £396,000, the exports (gold, ivory, corn, wool, hides, cattle, ostrich feathers, &c.) about £600,000, and the imports probably over £1,000,000. The long-projected railway, intended to afford an outlet to the coast at Delagoa Bay, was completed in 1887 from Lorenzo Marques, the seaward terminus, to the Transvaal frontier, a distance of 50 miles. Transvaal is in telegraphic communication with the Cape and the rest of the world through the Orange Free State.

History.—The historic life of Transvaal begins with the “ Great Trek,” or general exodus of the Cape Colony Boers, who, being dis- satisfied, especially with the liberal policy of the British Government towards the natives, removed northwards in large numbers between the years 1833 and 1837. By 1836 some thousands had already crossed the Vaal, that is, had reached the “Trans-Vaal” country, which at that time was mostly under the sway of the powerful refugee Zulu chief Moselekatzc, whose principal kraal was at Mosega in the present Marico district on the west frontier. To avenge the massacre of some emigrant bands, the Boers under Maritz and Potgieter attacked and utterly defeated Moselekatze at this place in 1837. Next year the Zulu chief withdrew beyond the Limpopo, where he founded the present Matebele state between that river and the Zambesi, thus leaving the region betwecn the Vaal and Limpopo virtually in the hands of the Trekkers. But their position was rendered insecure on the east side by the military despotism of the fierce Zulu chief Dingaan, who, after the murder of his brother Chaka, had asserted his authority over the whole of Zululand and most of the present Natal. The situation was rendered almost desperate by

the complete rout and wholesale massacre (1838) of the right division of the emigrant Boers, who had ventured to cross the Buffalo under Pieter Retief, and who were defeated by Dingaan, first at Umkongloof (“ Aceldama ”), then at Wecnen (“ Weeping”), and again soon after under Uys, Maritz, and Potgieter, when as many as 800 fell before the irresistible onslaught of the disciplined Zulu warriors. At this critical juncture the Trekkers were saved from utter extermination by

TR A—

Andries Pretorius of Graaff Reinet, by whom Dingaan met with a first check before the close of 1838, followed in January 1840 by a still more crushing defeat. Dingaan having been soon after murdered, the friendly Panda was set up in his place, and Natal proclaimed a Boer republic. But the British occupation of that territory in 1843 induced the Boers to retire in two bands across the Drakenberg, the southern division settling in the present Orange Free State, the northern again passing into Transvaal. But, owing to internal dissensions, and the perpetual bickerings of the two most prominent personalities, Pretorius and Potgieter, all attempts at establishing an organized system of government through- out Transvaal ended in failure, till Pretorius induced the British Government to sign the Sand River convention (January 17, 1852), which virtually established the political independence of that region. The death both of Pretorius and Potgieter in 1853 pre- pared the way for a period of internal peace under Pretorius’s eldest son Marthinus Wessels Pretorius, first president of the ‘ Dutch African Republic,” whose title was afterwards altered (1858) to that of the “South African Republic.” But a fatal element of weakness lay in the persistent refusal of the Boers to treat the natives on a footing of equality, or even with common justice. The murder of Hermann Potgieter and family (1854), avenged by Pretorius at Makapan’s Cave, was followed (1856) by the “ Apprentice Law,” establishing a system of disguised slavery, which was further strengthened by the sanction (1858) of the Grond wet, or ‘‘ Funda- mental Law,” declaring that the ‘‘ people will admit of no equality of persons of colour with the white inhabitants either in state or church.” Owing to this policy opposition was constantly shown both to the English traders, disposed to deal fairly with all, and to the missionaries, preachers of universal equality, as illustrated by the plunder of Livingstone’s house by

the commando sent against the native chief Secheli in 1852. A brief chronicle must here suffice of subsequent events down to the present time : — 1857. Invasion of the Orange Free State by Pretorius; dispute settled without bloodshed by the treaty of June 1. 1859. Pretorius elected president of the Free State; fails to effect the union of the two states. Return of Pretorius, during whose absence affairs had fallen into confusion ; continued troubles with the natives ; quarrels with the Batlapins, Barolongs, and Griquas in the west; in the cast with Ketchywayo, king of Zululand, about the Boers' right to the Wakkerstroom and Utrecht districts. Discovery of diamonds, and Mauch's announcement of gold- fields in the interior. Pretorius's proclamation extending the boundaries of the state west to Lake Ngami, east to Delagoa Bay, whence disputes and negotiations with England and Portugal, Delagoa Bay being ultimately awarded (July 1875) to Portugal by the French president, Marshal MacMahon, to whose decision the matter had been referred. Boundary disputcs towards the south-west settled by the award of Lieutenant-Governor Keate of Natal, leading to the resignation of Pretorius and appointment of President Burgers. The Fundamental Law forces Burgers to measures leading to the war with Sikokuni, chief of the Bapedi, south of the Olifant river, who claimed large part of Lydenburg and even of Pretoria; Burgers's visit to Europe in connexion with the Delagoa Railway scheme; on his return he finds everything in the greatest confusion; Boers dispirited by repeated reverses in the Sikokuni war; an empty treasury; broken credit; the state practically bankrupt and exposed to in- minent danger of invasion by Bapedis and Zulus. Hence 1876-77. Intervention of England, and Sir Theophilus Shepstone's proclamation (April 12, 1877) annexing Transvaal, followed by the appointment of Sir W. Owen Lanyon as British administrator. 1880-81. Revolt of the discontented Boers, who, being snccessful in a few contests with British troops, induced the British Government to restore the republic nnder the " suzerainty " of the queen, by the treaty of peace of March 21, 1881, a British resident being appointed, with the functions of a consul-gcneral. S. J. Paul Kriiger elected president. Convention of London (February 27, ratified by the volks- raad, August 8) recognizing the state as the South African Republic, and considerably restricting the British suzerainty. Proclamation (March 23) of the British protectorate over

1863.

1867.

1868.

1871.

1875.

1883, 1884.

1885.

Bechuanaland, thereby arresting the westward advance of

the Boers into the Bamangwato, Bakwena, Bangwaketsi, and Barolong territories, and keeping open the great trade route from Cape Colony through Hopetown and Shoshong to the Zambesi.

Fresh discoverics of rich auriferous deposits especially in the Middelburg province, followed by a great influx of English- speaking populations, threatening to swamp the Boer element.

1886.

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1886. Projected South African confederation, opposed by Kriiger, but supported by the Orange State, Cape Colony, and a majority of the Transvaal Boers. Connected with this scheme is the proposal of a uniform tariff and the immediate construction of a through railway from Cape Town to Delagoa Bay. GAS ERK)

TRANSVERSE FLUTE, Tur,—or German Furs, as it was formerly designated in Great Britain,—may be de- scribed as a musical instrument in which a column of air is set in vibration by regular pulsations derived from a current of air directed by the lips of the executant against the side of an orifice serving as an embouchure, pierced laterally in the substance of the pipe and towards its upper extremity. This mode of blowing appears to be of very ancient origin: the Hindus, Chinese, and Japanese claim to have

used it from time immemorial ; in Europe the high antiquity of a lateral embouchure is generally admitted, although it does not really rest, so far as our present knowledge goes, on any conclusive evidence.}

The oblique flute of the Greeks was of Egyptian origin, and it is therefore safest to suppose it to have been like the instrument frequently figured on the monuments of ancient Egypt, which, held obliquely, was blown through the orifice itself of the pipe at its upper extremity. The same instrument (called “nay ”) is still used in Moham- medan countries. The flute is often mentioned in medieval poetry, but no details of its construction are given. It was the custom, moreover, to designate various instru- ments by this name. The oldest representation we know of the transverse flute is found in the 11th-century frescos of the cathedral of St Sophia at Kieff. Eustache Des- champs, a French poet of the 14th century, in one of his ballads, makes mention of the “ flute traversaine,” and we are justified in supposing that he refers to the transverse flute. It had certainly acquired some vogue in the 15th century, being figured in an engraving in Sebastian Vird- ung’s celebrated work,? where it is called “‘ Zwerchpfeiff,” and, with the drums, it already constituted the principal ele- ment of the military music. Agricola? alludes to it as the “ Querchpfeiff” or ‘Schweizerpfeiff,” the latter designa- tion dating, it is said, from the battle of Marignan (1515), when the Swiss troops used it for the first time in war.

From Agricola onwards transverse flutes formed a complete family, said to comprise the discant, the alto and tenor, and the bass,—- a : = respectively. There is evidently (oe oO: an error in the indications of

? ——o—’ —__— pitch here given, for the instru- @ ments must in fact have produced

“@m sounds an octave higher than those noted. Pretorius,4 who in a special note warns his readers against inaccuracies of this kind which were then frequent, designates the transverse flute as “traversa Querpfeiff” and “ Querflot,” and notifies the bass in

je the tenor —_— andthe — = asvarieties then ope — , Amd ab —t—, diseant ¥#y=wZ— in use. A flute in Cee. in concert at that

tiie included two discants, four altos or tenors, and two basses. The same author distinguishes between the ‘‘Traversa” and the “‘Schweizerpfeiff” (which he also calls ‘‘ Feldpfeiff,” 7.¢., mili- tary flute), although the construction was the same. There were

two kinds of —— respectively; they were ent- “Feldpfeiff,” (ay—S— and (pj—— ployed exclusively with the in —— —~o— military drum.®

1 The Louvre has two ancient statues (from the Villa Borghese) representing satyrs playing upon transverse flutes. Unfortunately these marbles have been restored, especially in the details affecting our present subject, and are therefore examples of no value to us. Another statue representing a flute-player occurs in the British Museum. The instrument has been supposed to be a transverse flute, but erroneously, for the insufflation of the lateral tube against which the instrumentalist presses his lips, could not, without the intervention of a reed, excite the vibratory movement of the column of air.

2 Musica getutscht und auszgezogen, Basel, 1511.

3 Musica Instrumentalis, Wittenberg, 1529

4 Organographia, Wolfenbittel, 1618.

5 It is from the word Pfeif that the French Fifre and the English Fife, still applied to the military flutes in present use, are evidently derived.

Mersenne’s! account of the transverse flute, then designated “flite d’allemand” or ‘‘flfte allemande” in France, is obscure enough; but the tablatures and an ‘‘ Air de Cour” for four flutes in his work lead_us to believe that there were then in use in France

the sopra- the tenor —{7——— and _ the bass 7=——— no flute => or salto flute descend- =e in -o— flute in > — ing to el eal

The Museum of the Conservatoire @ Royal of Brussels pos- sesses specimens of all varieties hitherto mentioned except the last. All of them are laterally pierced with six finger holes;? they have a cylindrical bore, and are fashioned out of a single piece of wood. Their compass consists of two octaves and a fifth. The successive opening of the lateral holes gives rise to a series of fundamental notes forming the first octave. By a stronger pres- sure of the breath these notes are reproduced in the next octave higher, and the extent of eompass of the instrument is completed in the higher region by the production of other harmonics.®

The largest bass flute in the Brussels museum is in

; at the French normal pitch A 435 double ©): ~~be— vibrations per second. It measures 0°95 ———— m. from the centre of the blow orifice to the lower extremity of the tube. The disposition of the lateral holes is such that it is impossible to cover them with the fingers if the flute is held in the ordinary way. The instrument must be placed | against the mouth in an almost vertical direction, inclining the extremity of the tube either to the |} right or the left. This inconvenient position makes | it necessary that the instrument should be divided into two parts, enabling the player to turn the head joint that the embouchure may be most com~~ modiously approached by the lips, which is not at all easy. The first and fourth of the six lateral holes are double, but those holes are stopped up with wax which have become useless through the player’s habit of using the fingers of the right or left hand to eover the higher three holes. The bass flute shown in fig. 1 is the facsimile of an instrument in the Museo Civico of Verona. The original, unfortunately no longer fit for use, is nevertheless sufficiently well preserved to allow of all its proportionate measurements being given. The lowest note, Eb, is obtained with a remark- able amplitude of sound, thus upsetting a very prevalent opinion that it is impossible to produce ti by lateral insufflation sounds which go a little Fig. 1. Fig. 2. rhe ae the ordinary limit downwards of the modern orchestral flute.

The bass flute cited by Mersenne should not differ much from that of the Musco Civico at Verona. We suppose it to have been in 2 and that it was furnished with an open key like that **—e6— which was applied to the recorders (fldtes dowees) of the —— same epoch, the function of the**

key being to augment by another note the compass of the instrument in the lower part. Following Quantz, it was in France and about the middle of the 17th century that the first modifications were introduced in the manufacture of the flute. The improvements at this period con- sisted of the abandonment of the cylindrical bore in favour of a conical one, with the wide part in the head of the instrument. At the same time the flute was made of three separate pieces called head, body, and foot, which were ultimately further subdivided. The body or middle joint was divided into two pieces, so that the instrument could be tuned to the different pitches then in use by a replacement with longer or shorter pieces. It was probably about 1677, when Lully introduced the German flute into the opera, that recourse was had for the first time to keys, and that the key of Df was applied to the lower part of the instrument. The en- graving of B. Picart, dated 1707, which ornaments the work of the French flautist Hotteterre-le-Romain,' represents the flute as having reached the stage of improvement of which we have just spoken, but the body was still formed of one piece only. In 1726 Quantz,® finding himself in Paris, had a second key applied to

1 Harmonie Universelle, Paris, 1636.

_2 It is usual to indicate the tonality of flutes by the note produced when the six lateral holes are covered by the fingers. This custom is objectionable, because it is the disposition of the fingers which is made use of to sound D, The prac- tice has for its result that the tonality is always a note lower than the signature used. : Thus the flute in D is really in C; that in F in Ep, &e.

3 Victor Mahillon, Hints on the Fingering of the Boehm Flute, London, 1884.

4 Fétis, Rapport sur la Fabrication des Instruments de Musique 4 l Exposition Universelle de Paris, en 1856.

5 Versuch einer Anweisung die Fléte traversiére zu spielen, Berlin, 1752.

6 Unless where the contrary is stated, we have always in view, in describing the successive improvements of the fiute, the treble flute in D, which is considered to be typical of the family. 7 Principes de la Flite Traversiére.

; 8 Herrn Johann Joachim Quantzius Lebenslauf, von ihm selbst entworfen," in the fistorisch-Kritische Beitrdége zur Aufnahme der Musik, by Marpurg Berlin, 1754. Quantz was professor of the flute to Frederick the Great. ,

the flute, placed nearly at the same height as the first, that of the , intended to differentiate the DZ and the Eb. This innovation was generally well reeeived in Germany, but — does not appear to have met with corresponding success in other countries. In France and England manufacturers adopted it but rarely; in Italy it was declared useless. About the samme time flutes were construeted with the lower extremity lengthened and furnished with two supplementary keys to produce the Cg and C. This innovation, spoken of by Quantz, did not meet with a very favourable reception, and was shortly afterwards abandoned. Passing mention may be made of the drawing of a flute with a C key in the Musie-Saal of J. F. B. Mayers, Nuremberg, 1741.

The tuning of the instrument to different pitches was effected, as already explained, by changes in the length, and notably by substituting a longer or shorter upper piece in the middle joint. So wide were the differences in the pitches then in use that seven such pieces for the upper portion of it were deemed necessary. The relative proportions between the different parts of the instru- ment being altered by these modifications in the length, it was conceived that the just relation eould be re-established by dividing the foot into two pieces, below the key. These two pieces were adjusted by means of a tenon, and it was asserted that, in this way, the foot eould be lengthened proportionately to the length of the middle joint. Flutes thus improved took the name of ''flfites & registre." The register system was, about 1752, applied by Quantz to the head joint, and, the embouchure section being thus capable of elongation, it was allowable to the performer, according to the opinion of this professor, to lower the pitch of the flute a semitone, without having recourse to other lengthening pieces, and without disturbing the accuracy of intonation.

The upper extremity of the flute, beyond the embouchure orifice, is closed by means of a cork stopper. On the position of this cork depends, in a great

measure, the accurate tuning of the flute. It – is in its right place when the accompanying octaves are oti true. Quantz, in speaking of this accessory, mentions as the use of a nut-screw to give the required position to a the cork. He does not name the inventor of this ap- pliance, but, according to Tromlitz,! the improvement was due to Quantz himself. The invention goes back to 1726.

When the Method of Quantz appeared there were still in use, besides the orchestral flute in D, the little fourth flute in G, the low fourth flute in A, and the fifite d'amour a note higher; in France they had, moreover, the little octave flute in D (octave). A bass flute in D had also been attempted (see fig. 2). When Ribocq published his Bemerkungen tiber die Flite' the flute had already the five keys here shown. This author does not cite the inventor of these new keys, but some claim them for Kusder, a musical-instru- ment maker in London, others for Johann George Tromlitz of Leipsic, and Ribocq declares he has seen no flutes so constructed other than by these two makers. But Tromlitz lays no claim for himself to the credit of this improvement. He only says that ''he had occupied himself for several years in applying these keys so as not to augment the difficulty of playing, but, on the contrary, to render the handling of them as easy as possible." " We may therefore regard the London maker as the author of the first flute with five keys, with, however, a reservation as to the G key, which, from 1727, had been applied by Hoffmann of Rasten- berg }8 to the transverse flute and the oboe, The higher key of Ch, adopted from 1786 by Tromlitz, we believe to have been first re- commended by Ribocq (1782).

In 1785 Richard Potter, of London, improved Quantz's slide applied to the head joint as well as to the register of the foot by a double system of tubes forming double sliding air-tight joints. In the document?4 describing this improvement Potter patented the idea of clothing the holes which were covered by keys formed by metal conical valves. The keys mentioned in the patent were four,—Df, F, GE, Ag. The idea of extending the compass of the flute downwards was taken up again about the same time by two players of the flute in London named Tacet and Florio. They de- vised a new disposition of the keys C and C@, and confided the execu- tion of their invention to Potter. In Dr Arnold's New Instructions for the German Flute occurs a tablature, the engraving of which goes back to the end of the 18th

century, and bears the following title, “A Complete Drawing and Concise Scale and Description of Tacet and Florio’s new invented German Flute, with all the addi- tional keys explained.” It explains the use of six keys,—C, CH, Dg, F, Ge, ‘—that are not always figured, because the employ- ment of so many keys was at onee admitted. Tromlitz himself, who, however, made flutes with nine keys,—adding Eb, another F, and Ch, declared that he was not in favour of so great a complica- tion, and that he preferred the flute with only two keys, Dg and Eb,

9 Antonio Lorenzoni, Saggio per ben sonare tl flauto traverso, Vicenza, 1779. 10 Ausfiihrlicher und griindlicher Unterricht die Fidte zu spielen, Leipsic, 1797. Compare Schilling, Univ.-Lexicon, Leipsic, 1835. 11 Stendal, 1782. 12 Kurze Abhandlung von Flétensptelen, Leipsic, 1786. 13 Gerber, Lexicon der Tonkiinstler, Leipsic,1790. 14 English patent, No. 1499,

with a register foot joint and a cork nut-screw at the head joint. This-instruinent met all requirements. He was even against the use of the keys for Ch and CZ, because they altered the recognized quality of tone of the instrument. When Tromlitz published his method, the family of flutes had become modified. It compre- hended only the typical flute in D, the fidte d’amour a minor third lower, a ‘‘third” flute a minor third higher, and, finally, the little octave flute.

While Tromlitz was struggling in Germany with the idea of augmenting the compass of the flute downwards by employing open keys for CQ and CZ, an Italian, Giovanni Batista Orazi,! increased the scale of the instrument downwards by the application of five new keys, viz., B, Bh, A, Ab, and G. At the same time that he produced this invention? he conceived the plugging of the lateral holes by the valve keys then recently invented by Potter. But it was hardly possible to obtain a perfect plugging of seven lateral holes with the aid of as many keys, for the control of which there were only the two little fingers, and therefore this invention of Orazi proved a failure.

In 1808 Frederick Nolan,? of Stratford, near London, conceived an open key, the lever of which, terminating by a ring, permitted the closing of a lateral hole at the same time the key was being acted upon. The combination in this double action is the embryo of the mechanism that a little later was to transform the system of the flute. Two years later Macgregor,‘ a imusical-instrument maker in London, constructed a bass flute an octave lower than the ordi- nary flute. The idea was not new, as is proved by the existence of the bass flute mentioned above, The difference between the two instruments lies in the mechanism of the keys. ‘That employed by Macgregor consisted of a double lever, a contrivance dating from before the middle of the 18th century, of which the application is seen in an oboe of large dimensions preserved in the National Museum at Munich.®

About 1830 the celebrated French flautist Tulou added two more keys, those of FZ and CE, and a key, called s “de cadence,” to facilitate the accompany- a Bheodr ie” ing shakes. i go- eases

To increase the number of keys, to improve eel a. their system of plugging, and to extend the = scale of the instrument in the lower region, —— = — these had hitherto been the principal problems dealt with in the improvement of the flute. No maker, no inventor whose labours we have called attention to, had as yet devoted his atten- tion to the rational division of the column of air by means of the lateral holes. In 1831 Theobald Bochm, a Bavarian, happening to be in London, was struck with the power of tone the celebrated English performer Charles Nicholson drew from his instrument. Boehm learned, and not without astonishment, that his English colleague obtained this result by giving the lateral holes a much greater diameter than was then usually admitted. About the same time Boehm made the acquaintance of an amateur player named Gordon, who had effected certain improvements ; he had bored the lateral hole for the lower E, and had covered it with a key, while he had replaced the key for F with aring. These innova- tions set Boehm about attempting a complete reform of the instru- ment.§ He went resolutely to work, and during the year 1832 he produced the new flute which bears his name. This instrument is distinguished by a new mechanism of keys, as well as by larger holes disposed along the tube in geometrical progression.

Boehm’s system had preserved the key of GE open ; Coche,’ a professor in the Paris Conservatoire, assisted by Auguste Buffet the younger, a musical-instrument maker in that city, modified Boehm’s flute by closing the GZ with a key, wishing thus to render the new fingering more conformable, to the old. He thus added a key, facilitating the shake upon ce with Dé, and brought about some other changes in the instrument of less importance.

Boehm had not, however, altered the bore of the flute, which had been conical from the end of the 17th century. In 1846, however, he made further experiments, and the results obtained were put in practice by the construction of a new instrument, of which the body was bored cylindrical, but the head was modified at the embouchure. The inventor thus obtained a remarkable equality in the tones of the lower octave, a greater sonorousness, and a perfect accuracy of intonation, by establishing the more exact proportions which a column of air of cylindrical form permitted.

The priority of Boehm’s invention was long contested, his detractors maintaining that the honour of having reconstructed the flute was due to Gordon. But an impartial investigation

‘ Saggio per costrutre e suonare un flauto traverso enarmonico che ha % suont basst del Violino, Rome, 1797

2 The idea of this large flute was taken up again in 1819 by Trexler of Vienna, who called it the ‘‘panaulon.” 3 Patent, No. 3183. 4 Patent, No. 3349.

5 Another specimen, almost the same, constructed about 1775, and called ‘“* Basse de Musette,” may be seen in the Museum of the Paris Conservatoire.

6 See Ueber den Flotenbau und die neuesten Verbesserungen desselben, Mainz, 1847; and W. S. Broadwood, An Essay on the Construction of Flutes originally written by Theobald Boehm, published with the addition of Correspondence and

other Documents, London, 1882. ‘ Examen critique dela Flite Ordinaire comparée & la Flite Boehm, Paris, 1838.

vindicates the claim of the former to the invention of the large lateral holes.§ His greatest title to fame is the invention of the mechanism which allows the production of the eleven chromatie semitones intermediate between the fundamental note and its first harmonic by means of eleven holes so disposed that in opening them successively they shorten the column of air in exact propor- tional quantities.? Boehm? has published a diagram or scheme to be adopted in determining the position of the note-holes of wind instruments for every given pitch. This diagram gives the position of the intermediate holes which he had been enabled to establish by a rule of proportion based on the law of the lengths of strings.

The Boehm flute, notwithstanding the high degree of perfection it has reached, has not secured unanimous favour ; even now there are players who prefer the ordinary flute. The change of fingering required for some notes, the great delicacy and liability to derange- ment of the mechanism, have something to do with this. In Eng- land especially, the ordinary flute retains many partisans, thanks to the improvements introduced by a clever player, Abel Siccama, in 1845.” He bored the lateral holes of E and A lower, and covered them with open keys. He added some keys, and made a better disposition of the other lateral holes, of which he increased the diameter, producing thus a sonorousness almost equal to that of the Boehm flute, while yet preserving the old fingering for the notes of the first two octaves. But in spite of these improvements the old flute will not bear an impartial comparison with that of Boehm, (VY. M.)

TRANSYLVANIA (Germ. Stebenbiirgen), a mountain- ous principality (Gross-Fiirstenthum) forming the extreme eastern portion of Austria-Hungary, is bounded on the W. and N. by Hungary proper, on the E. by Bukowina and Moldavia, and on the S. by Walachia. The German name is usually derived from the seven principal fortified towns or “burgs” founded by the German colonists, though some authorities prefer to connect it with the Zibin Mountains on the south frontier. The Latin name appears first after the 12th century, and signifies “beyond the woods,” 2.¢., from Hungary ; the Magyar and Roumanian names (Erdély and Ardealu) both mean “ forest-land.” For all political and administrative ends, and in the

official statistics and returns, Transylvania is now wholly incor- porated with Huneary (q.v.), and to all intents and pur- poses is a part of that kingdom. The principality has the form of an irregular circle, with an area of about 21,000 square miles, and is on all sides surrounded by mountain chains, while the interior is barred and striped with lower ranges. On the west or Hungarian side there are various wide and comparatively easy passes into the interior, but on the east and south frontiers the lofty bounding mountains present steep and rugged faces outwards, giving to Transyl- vania the general aspect of a huge natural fortress. These niountains are a continuation of the Hungarian and Galician Carpathians ; in fact, the mountains of Transyl- vania may be regarded together as forming the south- eastern main group of the Carpathian system. The loftiest and most rugged peaks are on the north and south boundaries. On the north the highest summit is the Pietross (7534 feet), one of the Rodna Alps; on the south are the Butshetsh (8262 feet), the Kénigstein (7357 feet), and the Negoi (8340 feet). The east is bounded by several parallel chains, the highest peak in which is the Pietrossul (6910 feet) ; and on the west border the greatest height is attained towards the south, where several peaks reach 7200 feet. On the west are the Transylvanian Ore Mountains (Erzgebirge), with the curious Detunata (“thunder-smit ”), and the Bihar group, with its numerous caverns. There are numerous valleys, ravines, and cations in the network of mountains covering the interior of the country, but it is only along the courses of the principal rivers that plains of any size are found. The chief rivers are the Aluta or Alt, which flows south, pierces the southern boundary mountains at the Rother Thurm Pass,

8 They existed long before, however, in the Chinese Ty and the J. apanese Fuye.

9 The reader may consult with advantage Mr C. Welch’s History of the Boehm Flute (London, 1883), wherein all the documents relating to this interesting dis- cussion have been collected with great impartiality.

10 See the Essay on the Construction of Fi tutes, already cited.

11 Patent, No. 10553. ASL, — 66

and joins the Danube, and the Maros, to the west, and the Szamos, to the north, both tributaries of the Theiss, which also falls into the Danube. All these are navigable, and are fed by various tributaries. The largest lake is the Hodoser or Eseger See, 13 miles long. Transylvania abounds in mineral springs of all kinds, especially saline and chaly- beate. The climate is tolerably severe: hot summers alter- nate with very cold winters; but the rainfall is not great.

The mineral wealth of Transylvania is very considerable. Gold is found in eertain quantity in mines, and it is also “washed” in some of the streams, chietly by Gipsies. The gold is often found in conjunction with tellurium (first discovered in Transylvania in 1782, and until the present century not found anywhere else, see TELLURIUM). Silver, copper, lead, and iron are also worked to some profit. Coal occurs in considerable abundance, and it is mined in the Schilthal, but the superabundance of timber has re- tarded its exploitation. Hills largely formed of pure salt are met with here and there, and there are also very rich subterranean deposits of salt, sometimes cropping upon the surface. Some of the saline springs also yield salt enough to render their evaporation profitable. The vegetation of Transylvania is luxuriant, except of course in the higher mountain zoncs. Fruits abound, as apples, pears, peaches, apricots, plums, cherries, chestnuts, and almonds ; mulberries are also cultivated. The vine flourishes best in the valley of the Maros. Agriculture is one of the most important industries, though the available good land is by no means fully taken up. The chief crop is maize ; but wheat, rye, and other grains, potatoes, saffron, hemp, flax, and tobacco are also grown. Extensive forests clothe much of the country, but are in a some- what neglected condition. On the boundary mountains the trees are mainly coniferous ; in the interior oaks, elms, beeches, and ashes are conspicuous.

The forests afford cover for many wild animals. Bears, wolves, foxes, boars, and various varieties of game are found, and on some of the mountains the chamois. There is abundant pasturage on which excellent cattle are reared; and in some districts bnftaloes are bred for draught purposes. More important is the breeding of a sturdy race of horses, thousands of which are annually exported. The mountains maintain very large flocks of sheep, of which two kinds are distinguished—with a fine

short-stapled and a coarse long-stapled wool respectively. Silkworms are bred, and some silk is spun; and the export of honey and wax, from both wild and domestic bees, is not ineonsiderable. Neither the means of com- munication with the external world nor the manufacturing industry in Transylvania is developed to any important extent; the latter, indeed, has to a certain extent gone back. The most industrious and in general the most advanced of the population are the “Saxons”; and trade, the great bulk of which is with Roumania, is mainly in the hands of Armenians and Greeks. The chief com- mercial centres and principal towns are Herrmannstadt, Kronstadt, Bistritz, and Szamos-Ujvar.

Perhaps the most interesting point in connexion with Transyl- vania is the variety of its population, which in 1880 numbered 2,084,048 in all. Until 1848 the chief influence and privileges, as well as the only political rights, were divided among the three ‘‘ privileged nations” of the Hungarians, Szeklers, and Saxons. The first are the descendants of the Magyar conquerors. The Szeklers, 7.c., “ guardians,”’ chiefly on the east borders, settled in eastern Transylvania to act as guardians of the frontiers. The Saxons are the posterity of the German immigrants brought by King Geisa IJ. (1141-1161) from Flanders and the lower Rhine to cultivate and repeople his desolated territories. At first these were known as Teutones, Teutonici Hospites, and Flandrenses, but since the beginning of the 13th eentury the general name of ‘‘ Saxons,” as tantamount to “Germans,” has prevailed (cf. Saxony, vol. xxi. p- 351). The Hungarians and Szeklers together number 609,208, and the Saxons 204,713, but by far the most numerous element, though long excluded from power and political equality, is formed by the Walachians or Roumanians, 1,146,611 in number, a mixed race, not entitled to the descent which they elaim from the early Roman colonists of Dacia. The Gipsies of Transylvania, who are heard of under a voivode or prince of their own in 1417, are esti- mated at 46,460; many of them have abandoned a nomadie life and have taken to agriculture or gold-washing. Jews, Armenians, Bulgarians, Ruthenians, and Greeks are also represented in the medley of peoples. About 70,000 (chiefly children) are returned, unclassed, as “‘not able to speak.” The Magyars are mostly Roman Catholics or Unitarians, the Germans Protestants, and the Roumanians adherents of the Greek Church.

Transylvania formed part of the Roman provinee of Dacia. After the withdrawal of the Romans the country became for centuries the prey of the various peoples who swept across it in their restless migrations. At the beginning of the 11th century (1004) Stephen I. of Hungary made himself master of the land, which was thenceforward governed as an Hungarian province by a

voivode. In 1538 the voivode, John Zapolya, succeeded in render- ing himself independent, and he and his suceessors, who were generally elected by the people, were supported by the Turks against the house of Austria, while the difficult nature of their couutry preserved them on the other hand from becoming too dependent on their powerful allies. After the defeat of the Turks at Vienna in 1683, thcir influence in Transylvania waned, and in 1699, by the peace of Carlowitz, the Porte acknowledged the suzerainty of Leopold 1. of Austria over Transylvania. By the Leo- poldine diploma of 1691 Leopold had guaranteed the ancient rights and laws of the land, and united it formally with the Hungarian crown. In 1765 Maria Theresa made it a grand principality (Gross- Fiirstenthum). The efforts of the Roumanian inhabitants to secure recognition as a fourth “nation,” and the opposition of the non-Magyar population to a closer union with Hungary, led to troubles and disagreement early in the 19th century, culminating in bloody internecine struggles in 1848. In 1849 Transylvania was divided from Hungary by an imperial decree, and became an Austrian crown-land ; but in 1860 the old order was renewed, and the complete incorporation with Hungary was perfected in 1868. Since that time the policy of the Hungarian party has on the whole prevailed, and the Magyarization of the principality is steadily being carried through, in spite of the bitter protests and discontent of both the Saxons and Roumanians. An Hungarian university was founded at Klausenburg in 1872; and Hungarian is recognized as the official language. (F. MU.)

TRAPANT, a seaport of Italy, capital of the province of Trapani, and an episcopal see, lies on the extreme north-west coast of Sicily, 19 miles to the north-north-east of Marsala and 4 miles to the west-south-west of Monte St Giuliano. It lies on a sandy peninsula resembling a sickle (whence the

name, from épéravov), projecting west- ward and concave towards the north. It is a place of considerable enterprise; the streets are, comparatively speaking, regularly built and well kept; and the popula- tion are above the average in industry and intelligence. The town is still surrounded by a wall with bastions. Some of the medizval houses are interesting architec- turally, but none of the public buildings require special notice. Among the institutions of Trapani may be men- tioned the lyceum (with natural history collection and picture gallery), the gymnasium, the technical and navi- gation schools, and the library. Some of the churches contain choice works of art. The industries of the place include linen manufacture and works in coral, wood, iron, marble, alabaster, mother-of-pearl ; there are also extensive salt lagoons in the immediate neighbourhood, and there is considerable traffic in salt, soda, sulphur, and grain. The harbour, on the south-west side of the sickle, is sheltered by a mole and protected by a fort in the islet of Colum- bara; it has a lighthouse at the entrance, and is accessible to vessels of about 400 tons. The population in 1881 was

32,020.

Trapani, the ancient Drepanum or Drepana, was the seaport of Eryx (see Eryx and Monte San GIULIANO), and is represented by Virgil as the scene of the death of Anchises, and of the funeral games celebrated in his honour. Towards the beginning of the First Punic War (c. 260 B.c.) it was made a fortress by Hamilcar Barca, who removed hither the greater number of the inhabitants of Eryx, the remainder being transferred in 249. It fell into the hands of the Romans at the end of the war, and does not figure again in ancient history. It appears, however, to have continued to flourish as a commercial town, being mentioned both by Cicero and by Pliny. In the Middle Ages it became a royal residence.

TRAPPISTS. The abbey of Notre Dame de la Maison- Dieu de la Trappe was founded in 1140 by Rotrou, count of Perche, at Soligny-la-Trappe, a village of Haut-Perche, now in the arrondissement of Mortagne, department of the Orne, so named from the narrow gorge which forms its entrance, comparable to a trap-door. It was at first attached to the congregation of Savigny, a minor off- shoot of the order of Fontevrault, but that congregation was united in 1148 to the Cistercian order, and, by the special

intervention of St Bernard, was affiliated, with all its dependencies, to his own abbey of Clairvaux. No medizval monastic order fell more rapidly and signally from the spirit of its original institute than the

Cistercian, and La Trappe formed no exception to the general decay. Indeed, its geographical position in a district fiercely contested during the long war between France and England hastened its declension, for it was several times taken and pillaged, while the members of the community, at last compelled to break up and disperse, returned at the close of the war with their traditions interrupted, their discipline relaxed, and their moral tone deteriorated. Nor was this the worst. The introduction of the "commendam" system into the French Church, whereby secular ecclesiastics were empowered to hold monastic benefices without residence or conformity to the rule of the society in which they ranked as heads, wrought yet further mischief; and, though the Trappists at first endeavoured to resist Jean du Bellay, the celebrated bishop of Paris (afterwards cardinal-bishop of Ostia), whom Francis I. nominated in 1526 as abbot commend- atory, and were upheld by the pope in continuing to elect their own abbots, yet their efforts were fruitless, and Du Bellay was succeeded by a series of titular abbots, under whose nominal rule the estates of the abbey were impov- erished, the buildings suffered to fall into nearly total ruin, and the conduct of the monks became a public scandal. In fact, the community was broken up, the dismantled monastic buildings were abandoned to a few domestics and their families, and the scattered Trappists seldom reas- sembled save for hunting parties and similar amusements. Such was the condition of things when a reformer arose in the person of one of those very abbots commendatory who had been the ruin of the institute.

Armand Jcan Bouthillier de Rancé, second son of Denis Bouthillier de Rancé and Charlotte Joly his wife, was born in Paris on January 9, 1626. By his father's side he was sprung from a patrician family of Breton origin long settled in Normandy; by his mother's he was con- nected with powerful members of the official hierarchy. His near kindred were wealthy, titled, and highly placed in the magistracy, the army, and the dignities of the church ; while the fact that Cardinal Richelieu was one of his sponsors and gave him

his own fore-names sufficiently attests the political influence just then at their disposal. The child showed early tokens of considerable abilities, and was intrusted by his father to accomplished tutors, under whom he made rapid progress. He was originally intended to enter the order of the Knights of Malta, but the death of his elder brother in 1637, after a long illness, changed his father's plans, and the child (who had been tonsured in 1635 by way of precaution against such a contingency) was at once put in possession of the various benefices which had been secured for his elder; so that, while still under eleven years of age, he was canon of Notre Dame de Paris, abbot of La Trappe, of Notre Dame du Val, and of St Symphorian of Beauvais, and prior of Boulogne, near Chambord, and of St Clementin, in Poitou. In 1642 he was sent to the Collége d'Harcourt, where he began the usual course of philosophy, but addicted himself almost at ouce to the then popular study of judicial astro- logy, which he soon forsook for the cognate delusion of alchemy. Nevertheless, he distinguished himself in the more accredited studies of the college, and graduated as M.A. in 1644. It was then usual for Parisian students in theology to attend the course of lectures delivered at the Sorbonne, but De Rancé preferred to return home and pursue his theological studies under private instruction, He was ordained deacon in 1648, and, being in the hey- day of youth, with high spirits and popular manners, fell readily into the dissipations of the time, leading a very irregular life, yet not so as to forfeit the goodwill of even his stricter acquaintance. He was ordained priest in 1651, but made no alteration in his habits, and yet so far kept

up his studies that, when examined in 1652 for his licence as bachelor in theology, he came out at the head of the candidates, while the famous Bossuet ranked only as third. In 1653 he lost his father, who bequeathed property to him which doubled his already large income, and in 1654 he graduated as doctor of divinity, when his uncle, the archbishop of Tours, made him one of his archdeacons, hinting that this preferment would be merely the prelim- inary of a mitre. He never so much as pretended to discharge the duties of his new office, but spent his time amusing himself at his chateau of Véretz; in despite of which his uncle nominated him as deputy from the diocese of Tours to the general assembly of the French

clergy convoked by the king in 1655 to discuss the Jansenist controversy. The chief matter of intcrest in this connexion is that he was one of the minority of 65 doctors of the Sorbonne who refused to vote, with the majority of 127, a censure upon the Jansenist leader Arnauld, though he took part later against that school. The sudden death of the duchess of Rohan-Montbazon, with whom he was intimate, and whose relations with him were the subject of much hostile comment, is said to have been the first great shock which began the process of change in his views of life and duty. A story, which was first given currency in an anonymous account of his con- version published at Cologne in 1668, much heightens this by alleging that De Rancé arrived at the duchess's house unaware of her death, and went direct to her apartment without being warned by the servants, only to find her head lying apart from her decapitated body, having been cut off because the coffin was too short and there was no time to procure another. The truth of this story (itself containing several improbable incidents) was promptly denied by Maupeou, the earliest of De Rancé's biogra- phers, and has been rejected by Bayle and St Simon, though accepted by La Harpe and Voltaire. What is cer- tain is that the alteration in his habits nearly synchronizes with the death of Madame de Montbazon, and that the years 1657, 1658, and 1659 were mainly spent in solitary studies or in visits to the monasteries of which he was titular head, varied by conferences with eminent ecclesi- astics whose advice he sought, while in 1660 the death of the duke of Orleans, whose chief almoner he was, appears to have given the final direction to his thoughts, though it was not for some years that he carried out his new plans to the full. His first resolution was to sell his patrimony and resign his benefices, and in 1662 he actually sold his chateau of Véretz, made over two man- sions in Paris to the hétel-dieu, and obtained permission to transfer all his abbeys except Boulogne and La Trappe to resident heads chosen by himself. His canonry of Notre Dame had been resigned so far back as 1653 because of some difficulty about residence. After making provision for family claims, and retaining a comparatively small sum for the repair of Boulogne and La Trappe, he distributed the remainder of his property to the poor. In 1662 he visited La Trappe, which he found in a deplorable condi- tion, and the few resident monks so indisposed to listen to his projects of reform that they threatened to murder him and throw his body into the abbey ponds. In his turn he threatened them with the king's direct interfer- ence, and such was the terror of Louis XIV.'s

name that they at once submitted, and consented to retire upon the payment of a moderate pension; whereupon De Rancé filled their places in 1663 with monks of the strict Cistercian observance, and carefully repaired the monastic buildings there and at Boulogne. In that same year he finally decided to enter the monastic lifc, and began his

| noviciate at the Cistercian abbey of Perseigne in Maine, _assulning, on his profession in 1664, the actual headship

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of the abbey of La Trappe, whose nominal abbot he had been for nearly thirty years. Associating himself with other personages who desired to revive the Cistercian dis- cipline, he made two journeys to Rome to obtain papal sanction for their plans, and after considerable delay a brief was procured from Alexander VII. authorizing the abbot of Citeaux, as general of the Cistercians, to hold a grand chapter of the order to discuss the proposed reforms, which actually did meet in 1667. But De Rancé's ideas went much beyond the mere re-establishment of the strict observance ; and, though he judged some details of the original rule unsuited to his own day, and blended with it some particulars borrowed trom the Benedictine rule, yet he was so far from diminishing its general austerity that he added to the protracted fasts, the total abstinence froin flesh-meat, fish, eggs, and wine, the laborious manual occupations, the hard beds, and the severe asceticism, even in the church services, which made part of the original rule, also the obligation of perpetual silence, save at prayers (to which eleven hours daily are devoted), and save also the "“‘ Memento mori" with which the Trappists greet each other on first meeting, which is the distinguishing feature of La Trappe, a rule from which none are dispensed save the abbot and the guest-master, as obliged to hold some degree of intercourse with outsiders; and he further or- dained that each monk should spend some time each even- ing digging his own grave, and should sleep on straw in his coffin for a bed. These austerities, though cheerfully embraced by the monks of La Trappe, and attracting enthusiasts from without, were far from being approved generally, even in the Cistercian order itself, and, when a decree was issued by the council of state in 1675 giving the abbot of Citeaux absolute authority over all Cistercians of the strict observance, De Rancé took alarm,

and, think- ing it possible that an attempt might be made to mitigate the severities he had introduced (particularly as the mor- tality amongst the members of his society had been very large, and was currently attributed to insufficient nutri- ment), induced them to renew their vows and to pledge themselves against the admission of any relaxations. Nor was he content with opposing this kind of resistance to the bishops, abbots, and others who remonstrated with him upon the subject, but he also took up his pen in defence of his views, and published in 1683 his treatise De la Sainteté et des Devoirs de la Vie Monastique, which involved him in much controversy, notably with the learned Benedictine Mabillon, who replied to him in his well-known work Z'raité des Etudes Monastiques, published in 1691. Advancing years and unremitting asceticism told even on the strong constitution of De Rancé, and he found himself unable to take his share of the manual labours of the house, or even to be present in chapter, so that in 1695 he felt obliged to resign the abbacy, and pro- cured the nomination of the prior Zosimus to succeed him, but he died before the arrival of the bulls for his instal- lation, and Dom Francis-Armand was substituted in his room, and inducted into office in 1696. He proved a failure as a ruler, and La Trappe broke up into two fac- tions during his headship, some holding to him and others to De Raneé, till the new abbot resigned in a fit of disgust of which he soon repented, but could not succeed in recalling his abdication. Dom Jacques de la Tour, a man in sympathy with De Rancé, was then nominated by the crown, and while he was still abbot De Rancé died, on October 20, 1700, in the seventy-fifth year of his age. De Rancé was a tolerably copious author, though most of his writings were little more than occasional pamphlets suggested by the controversies in which he was engaged, short devotional treatises, and notices of deceased members of his community, but his reputation for ability and scholar-

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ship was never contested. He was a successful admini- strator, and, though the extreme severity of his institute resulted in the failure of fully six-sevenths of the postu- lants who presented themselves, he gathered round him during his government of the abbey no fewer than three hundred ascetics, French, Belgians, Germans, Italians, and Jrishmen, one-third of whom were drawn from less austere communities or from the ranks of the

parochial clergy and candidates for the priesthood. Of lay outsiders who joined him, the largest proportion consisted of rural artisans and labourers, and of soldiers, from officer to private (a class for which La Trappe has always continued to have attrac- tions), with a small sprinkling of the legal profession ; while two physicians and a single tradesman complete the tale of those who persevered out of the two thousand or so who presented themselves. No daughter houses were founded from La Trappe during De Rancé's life, for, though he was ready enough to send some of his monks for a time or even permanently to revive the Cistercian discipline in other monasteries, he was opposed on principle to every scheme which tended to drain the resources of La Trappe itself, and it was not till 1705 that the first offshoot of the Trappists was planted at Buon-Solazzo, near Florence, at the solicitation of Cosmo III., grand-duke of Tuscany.

No remarkable events occurred in connexion with La Trappe till the French Revolution, when the order was included in the general suppression of monastic societies by the Constituent Assembly in 1790. Even then the high character borne by La Trappe, and honourably distin- guishing it from too many monasteries at that time, seemed likely toexempt it from the common fate, and great efforts were made to obtain its exclusion from the operation of the decree. A petition addressed by the Trappists to the National Assembly was referred to the council-general of the department of the Orne at Alengon, which reported against it to the ecclesiastical committee of the assembly, though admitting that all the local municipalities which they had consulted were in favour of sparing the abbey. Dom Augustin (Louis Henri L'Estrange), at that time master of the novices, foreseeing the result of the inquiry, went to Switzerland to provide a refuge for the brethren, and obtained permission from the authorities of canton Freiburg to take possession of Val-Sainte, an unoccupied Cistercian monastery, and to bring no more than twenty- five persons thither. This necessitated leaving more than a hundred at La Trappe to await the coming storm, which burst upon Trinity Sunday, June 3, 1792, when com- missioners seized all the movable goods scheduled in their inventory, and compelled the inmates to disperse. Some betook themselves to Soleure; a few retired singly into private dwellings ; but various groups set out together to found colonies in Spain, Germany, England, and Canada ; while the earlier Swiss and Tyrolese houses were compelled to break up and seek refuge elsewhere from the

French invaders. But amidst all difficulties and discouragements the order not merely maintained itself, but grew and strengthened, and in 1808 ventured to plant anew two houses in France itself. This same year, however, saw the division of the order into two congregations, because the Trappists of Darfeld, under their prior Eugene de Prade, resisted what they considered to be the excessive demands made upon them by the abbot of the order, that very L'Estrange who had led out the colony of Val-Sainte (and who had been constituted its head, and that of the whole society, by a brief of Pius VI. in 1794), and the dispute was appealed to Rome, with the result that in June 1808 judgment was given against L'Estrange, and Darfeld was erected into an independent abbey under De Prade as abbot, and subjected to the jurisdiction of the bishop of Miinster. Nearly every Trappist house at this date was

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within Napoleon's dominions, and, as the order sided with the pope against the emperor, the latter expelled its monks from all monasteries in the empire, and imprisoned not a few of them. With his fall they revived again, and ob- tained permission to return to France, whither between 1814 and 1825 they drifted back from most of their places of exile, though 1450 were expelled anew in 1880 under the operation of the Ferry laws. La Trappe itself was repurchased by L'Estrange, and became once more the mother house, while there are fifteen other French mon- asteries of the order, four Belgian, two English (Mount St Bernard, Leicestershire, and Stape Hill, Dorset), two in Ireland, one each in Germany, Savoy, and Algiers, two in Italy, two (Gethsemane in Kentucky and New Melleray in Iowa) in the United States, and one originally settled in Pennsylvania, but now at Tracadie in Nova Scotia. An order of Trappistine nuns was founded by Dom Augustin in 1827, and has nine French houses and one English. The total numbers are computed at 3000 members of both sexes.

The bibliography relating to De Rancé and the Trappists is copious, and the following list is not exhaustive. Savary (Bishop of Séez), Imago R. P. Dom. Arm. Joan. le Bouthillier de Raneé, Abbatis de Trappa, 1701; Maupeou, Viede M. l' Abbé de la Trappe, Paris, 1702; Marsollier, Vie del Abbé Bouthillier de Raneé, Paris, 1702; Le Nain (brother of Tillemont), Vie de Le

Bouthillier de Raneé, Abbé et Réformateur dela Trappe, Rouen, 1715; Inguimbert, Genuinus Character D. Arm. Joannis Buttilieri Rancei, Rome, 1718; Charles Butler, ‘‘ Life of De Rancé,” Afiseellanies, vol. iii., London, 1817 ; Dubois, Histoire de 1 Abbé De Rancé et de sa Réforme, 2 vols., Paris, 1866; Félibien, Desertption de la Trappe, Paris, 1672; Helyot and Badiche, Histoire des Ordres Religicux, art. “ La

Trappe,” Paris, 1859; Wetzer and Welte, Kirehenlexicon, art.“ Trap- pisten,” Freiburg, 1849. (GR. 1, 1b.)

TRAS-OS-MONTES (i.¢., ‘Behind the Mountains ”) is the north-east frontier province of Portugal, situated on the other side of the Serra de Mara&o from Oporto. On the W. it is bounded by Entre Minho e Douro, and on the 8. by Beira. The area is 4260 square miles, and the popula- tion increased from 393,279 in 1878 to 396,676 in 1881. Physically the province is a mountainous plateau, the most elevated in Portugal, and characterized by the picturesque- ness and wildness of its scenery. Monte Zinho reaches a height of 7445 feet. Vast tracts are covered with heath ; but in certain parts the soil is fertile, and the rich wine- growing district on the upper Douro (Alto Douro) is the uiative country of port. Silk-growing is also carried on ; and wheat, rye, hemp, and flax appear among the exports. The province is divided into the two administrative dis- tricts of Villa Real and Braganza. Besides the two towns thus named, two only, Chaves and Miranda do Douro, are of any considerable size.

TRAVANCORE, a native state in Madras presidency, India, between 8° 4’ and 10° 22’ N. lat. and between 76° 12’and 77° 38’ E. long., with an area of 6730 square miles. It is bounded on the N. by the native state of Cochin, on the E. by the British districts of Madura and Tinnevelli, and on the S. and W. by the Indian Ocean. This state is described as one of the most picturesque portions of southern India. Its most marked physical feature is furnished by the Western Ghats, which rise to an elevation of 8000 feet and are clothed with magnificent primeval forest ; they throw out spurs towards the coast, along which there is a belt of flat country of about 10 miles in width, covered with an almost unbroken mass of cocoa- nut and areca palms, which to a great extent constitute the wealth of the country. The whole surface is undulat- ing, and presents a series of hills and valleys

traversed from east to west by many rivers, the floods of which, arrested by the peculiar action of the Arabian Sea on the coast, spread theniselves out into lagoons or backwaters, connected here and there by artificial canals, and forming an inland line of smooth-water communication for nearly

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the whole length of the coast. The chief river is the Periyar, which is navigable for 60 miles; other important rivers are the Pambai and its tributary the Achinkoil, the Kallada, and the Western Tambraparni. Iron is abundant. Elephants are numerous, and tigers, leopards, bears, bison, elk, and various kinds of deer abound in the forests. The state possesses some good roads, and, on the whole, internal communication is tolerably complete. Travancore has an abundant rainfall, with every variety of climate and temperature.

In 1881 the population of Travancore was found to number 2,401,158 (males 1,197,134, females 1,204,024), of whom 1,755,610 were Hindus,146,909 Mohammedans, and 498,542 Christians. The chief towns are TRIVANDRUM (q.v.), the capital, Aleppi, the com- mercial centre and chief seaport of the state, and Quilon, another seaport and military headquarters. Among the principal articles which the state produces are rice, cocoa-nut palm, pepper, areea- nut, cardamoms, tamarind, coffee, timber, &c. The manufaetures comprise cocoa-nut, gingelly, lemon-grass, and laurel oils, jaggery and molasses, salt, arrack, eotton cloths and yarns, pottery, and coir yarn, rope, aud matting. Its revenue in 1884-85 was esti- mated at £640,548, Travancore state is in subsidiary alliance with the British Government, to which it pays a tribute of £80,000 a year. Itis one of the few states which have never turned against the British. Under the enlightened rule of the late maharajah the country made great progress, and it now stands very high among native states. It is free from debt, and has a surplus of revenue over expenditure. The sovereignty as well as the inheritance of property passes in the female line.

TRAWLING. See Fisuerizs.

TREASON. The law which punishes treason is a necessary consequence of the idea of a state, and is essen- tial to the existence of the state. Most, if not

all, nations have accordingly, at an early period of their history, made provision by legislation or otherwise for the punishment of those offences against public order which consist in more or less direct attacks upon the safety of the state or its chief. The principle is universal; it is the application of the principle which leads to differences of opinion. What would have been a capital crime at Rome under Tiberius may be no offence at all in England. It is to the advantage of both the state and the citizen that what is treason and what is not should be clearly defined, so that as little as possible discretionary power, apt to be strained in times of popular excitement, should be left to the judicial or executive authorities. The importance of this was seen by Montesquieu. Vagueness in the crime of treason, says he, is sufficient to make the government degenerate into despotism.! At the same time, it may be observed that despotic Governments have not always left the crime undefined. The object of Henry VIII., for instance, was rather to define it as closely as possible by making certain acts treason which would not have been so without such definition. In both ancient and modern history treason has generally been a crime prosecuted by exceptional procedure, and visited with afflzctive as distinguished from simple punishments (to use the termino- logy of Bentham).

In Roman law the offences originally falling under the head of treason were almost exclusively those committed in military service, such as in England would be dealt with under the Army Act. The very name perduellio, the name of the crime in the older Roman law, is a proof of this. LPerduelles were, strictly, public enemies who bore arms against the state; and traitors were regarded as having no more rights than public enemies. The Twelve Tables niade it punishable with death to communicate with the enemy or to betray a citizen to the enemy. Other kinds of perduellio were punished by interdiction of fire and water. The crime was tried before a special tribunal, the duumvirt perduellionis, perhaps the earliest permanent criminal court existing at Rome. At a later period the

1 Esprit des Lois, bk. xii. e. 7.

name of perduellio gave place to that of lxsa majestas, deminuta or minuta majestas, or simply majestas. The lex Julia majestatis, to which the date of

48 3n.c. has been conjecturally assigned, continued to be the basis of the Roman law of treason until the latest period of the empire. The original text of the law appears to have still dealt with what were chiefly military offences, such as sending letters or messages to the enemy, giving up a standard or fortress, and desertion. With the empire the law of majestas received an enormous development, mainly in the reign of Tiberius, and led to the rise of a class of pro- fessional informers, called delatores.t The conception of the emperor as divine? had much to do with this. It became a maxim that treason was next to sacrilege? in gravity. The law as it existed in the time of Justinian is

contained chiefly in the titles of the Digest * and Code |

“Ad legem Juliam majestatis.” The definition given in the Digest (taken from Ulpian) is this : ‘‘majestatis crimen illud est quod adversus populum Romanun vel adversus securi- tatem ejus committitur.” Of treasons other than military offences, some of the more noticeable were the raising of an army or levying war without the command of the emperor, the questioning of the emperor’s choice of a suc- cessor, the murder of (or conspiracy to murder) hostages or certain nagistrates of high rank, the occupation of public places, the meeting within the city of persons hostile to the state with weapons or stones, incitement to sedition or administration of unlawful oaths, release of prisoners justly confined, falsification of public documents, and failure of a provincial governor to quit his province at the expiration of his office or to deliver his army to his successor, The intention (volwntas) was punishable as much as an overt act (efectus).6 The reported opinions as to what was not treason show the lengths to which the theory of treason must have been carried by at least some person in authority. It was not treason to repair a statue of the emperor which had decayed from age, to hit such a statue with a stone thrown by chance, to melt down such a statue if unconsecrated, to use mere verbal insults against the emperor, to fail in keeping an oath sworn by the emperor, or to decide a case contrary to an imperial constitution. Treason was one of tlie “ publica judicia,” i.c., one of those crimes in which any citizen was entitled to prosecute. The law went further than this, and deprived the accused in a charge of treason of his ordinary remedy for malicious prosecution. It also took from him the privilege (which those accused of other crimes generally possessed) from

accusation by women or infamous persons, from liability to be put to the torture, and from having his slaves tortured against him (see Torrurz). The punishment from the time of Tiberius was death (usually

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by beheading)” and confiscation of property, coupled with |

complete civil disability. A traitor could not make a will or a gift or emancipate a slave. Even the death of the accused, if guilty of treason of the gravest kind, such as levying war against the state, did not extinguish the charge, but the memory of the deceased became infamous, and his property was forfeited as though he had been con- victed in his lifetime.

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1 See Merivale, Hist. of the Romans under the Empire, vol. iii. p. 467, vol. v. p. 141.

® «*Principes instar deorum esse” are the words of Tacitus.

3 This crime was called lasa majestas diving in later law.

4 xlviii, 4. 1b, tele

° A similar provision was contained in the Golden Bull of Charles IV. c. 24. In English law, with the one exception of a statute of Richard H. (21 Ric. IL. c. 3) repealed in the first year of Henry IV., an overt act las always been necessary. he difficulty of proving a mere intention is obvious. In French and German law the overt act (attentat or Unternehmen) is as indispensable as in English. –

7 To harbour a fugitive enemy was punishable only by deportation, Dig., xlviii. 19, 40.

TREASON

The law of England corresponds to a considerable extent with Roman law; in fact, treason is made by Blackstone the equivalent of the crimen lesx

majestatis. The history of the crime in the two systems agrees in this that in both the law was settled by legislation at a com- paratively early period, and subsequently developed by judicial construction. In both, too, there were exceptional features distinguishing this crime from other offences.' For instance, at comnion law treason was not bailable (except by the Queen's Bench) or clergyable, could not be cleared by sanctuary, and did not admit of accessories, for all were principals, nor could a married woman plead coercion by her husband. To stand mute and refuse to

| plead did not save the lands of the accused, as it did in

felony, so that the "peine forte et dure " (see Torrurn) was unnecessary in treason. These severities were due to the conception of treason as a breach of the oath of allegiance. Other differences introduced by statute will be mentioned later. In some cases a statute simply affirmed the common law, as did the Statute of Treasons to a great extent, and as did 26 Hen. VIII. c. 13, depriving those accused of treason of the benefit of sanctuary. How far the Roman law was consciously imitated in England it is impossible to determine. It was certainly not adopted to its full extent, for many acts were majestas which were never treason, even in the most despotic periods. Treason was the subject of legislation in many of the pre-Conquest codes. 'The laws of Alfred® and A®thelred !° punished with death any one plotting against the life of the king. Soon after the Conquest the Leyes Henrict Primi put any one slaying the king's messenger in the king's mercy. The crime was shortly defined by Glanvill!2 and at greater length by Bracton,!° who follows Roman law closely. He includes under treason sedition and coining. Treason seems to have rested chiefly, if not wholly, upon common law until the year 1352, when the famous Statute of Treasons (25 Edw. III. st. 5, ¢ 2) was passed. The statute appears to have arisen from a petition of the Commons in 1348, praying for a definition of the offence of accroaching royal power, a charge on which several persons—notably Gaveston and the Despencers—had suffered, The offences made treason by the statute are. these :—(1) to compass or imagine the death of the king, the queen, or their eldest son and heir; (2) to violate the king's companion, or his eldest daughter unmarried, or the wife of his eldest son and heir; (3) to levy war against the king in his realm, or be adherent to the king's enemies in his realm, giving them aid and com- fort in the realm or elsewhere; (4) to

counterfeit the king’s great or privy seal or his money ; (5) to bring false money into the realm, counterfeit to the money of Eng- land, as the money called Lushburgh,!® knowing the money to be false; (6) to slay the chancellor, treasurer, or the king’s justices of the one bench or the other, justices in eyre, or justices of assize, and all other justices assigned to hear and determine, being in their places doing their offices. The statute further defined petty treason to be the slaying of a master by his servant, a husband by his wife, or a prelate by a man secular or religious owing him allegiance. In all cases of treason not specified in the statute the justices before whom the case came were to tarry without going to judgment until the cause had been

8 The position of treason as a special crime prosecuted by special procedure is one common to most legal systems at some period of their existence. For instance, in Germany, by a constitution of Henry VIL. the procedure was to be summary, sine strepitu et figura judicti.

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14 These words, according to Luders (Law Tracts, note ad fin.), mean to attempt or contrive.

1 This by 1 Mary, sess. 8, c. 1 includes a queen regnant:

16 ¢.¢,, Luxemburg.

TREASON

showed and declared before the king and his parliament whether it ought to be judged treason or felony. The statute, so far as it defines the offence, is still law, except the clauses as to counterfeiting the seal, coining, and petit treason, repealed respectively, after a considerable amount of intermediate modification by statute, by 11 Geo. IV. and 1 Will. IV. c. 66, 2 and 3 Will. IV. c. 34, 30 Geo. IIL. c. 48, and 9 Geo. IV. c. 31. Petit treason is now treated as murder, 24 and 25 Vict. c. 100.1 From the time of the passing of the Statute of Treasons the limits of treason were continually being extended for a time, and again reduced to the bounds fixed by the statute. It protected only the king’s life, and its insufficiency was supplemented

in periods of danger by legislation, often of a temporary |

nature. Under Richard JI. and Henry VIII. many new offences were made treason,? but the Acts creating these new treasons were repealed at the earliest opportunity by the parliaments of their successors, and the Statute of Treasons was made the final standard by 1 Mary, sess. 1, ce. 1. The reign most prolific in statutory additions to the Jaw of treason was undoubtedly that of Henry VIII. Legislation in this reign was little more than a register of the fluctuating opinions of the monarch. Thus, by 25 Hen. VIII. c. 22 it was treason not to believe Mary illegitimate and Elizabeth legitimate; by 28 Hen. VILL. ce. 7 it was treason to believe either legitimate; by 35 Hen, VIII. c. 1 it was treason not to believe both legitimate. An interesting act of this reign, 37 Hen. VIL ¢. 10, shows that a class of men like the Roman delatores must have been called into existence by all the new legislation, ‘The Act constituted it felony to make anonymous charges of treason without daring to appear in support of them before the king or council. Out of the mass of Henry VIII.’s Acts, only two are still law,—28 Hen. VIII. c. 15 and 35 Hen. VIII. c. 2, giving power to try treasons committed within the jurisdiction of the admiralty and out of the realm. Many other instances of offences of a temporary kind made treason at different times occur among the statutes, especially in those levelled at the papal jurisdiction by the parliaments of Elizabeth. A few of the more interesting of other kinds may be briefly noticed. It was treason by 21 Ric. Il. c. 4 to ‘attempt to appeal or annul judgments made by parliament against certain traitors; by 2 Hen. V. st. 1, c. 6, and 29 Hen. VI. c. 2 to break a truce or safe-conduct ; by 5 and 6 Edward VI. c. 11 to hold castles, fortresses, or muni- tions of war against the king; by 17 Car. IIc. 5 to adhere to the United Provinces; by 9 Will. IIL ¢. 1 to return without licence if an adherent of the Pretender ; by 12 and 13 Will. IIL. c. 3 to correspond with the Pre- tender ; and by 57 Geo. III. c. 6 to compass or imagine the death of the prince regent. In addition to these, many Acts of attainder were passed at different times. One of the most severe was that against Catherine Howard, 33 Hen. VJIL c. 21, which went as far as to make it treasonable for any queen to conceal her ante-nuptial incontinence. Other Acts were those against Archbishop Scrope, Owen Glendower, Jack Cade, Lord Seymour, Sir John Fenwick, James Stuart, and Bishop Atterbury. In one case, that of Cromwell, Ireton, and

Bradshaw, an Act of attainder was passed after the death of those guilty of the treason, 12 Car. II. c. 30. At times

1 Since the disappearance of petit treason as a distinct crime, it seems useless to retain the old name of high treason by which what may be called treason proper was formerly known.

2 One reason for making these offences treason rather than felony was no doubt to give the crown rather than the lord of the fee the right to the real estate of the criminal on forfeiture. Had the offences been felony the king would have had only his year, day, and waste on the estate escheating to the lord, as was the case in treason before the Statute of Treasons (see FELONY).

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Acts of indemnity were passed to relieve those who had taken part in the suppression of rebellion from any possible Hability for illegal proceedings. Three such Acts were passed in the reign of William IIL.

The Statute of Treasons, as interpreted by the judges, is still the standard by which an act is determined to be treason or not. The judicial interpretation has been sometimes strained to meet cases scarcely within the contemplation of the framers of the statute: é.g., it became established doctrine that a conspiracy to levy war against the king’s person or to imprison or depose him might be given in evidence as an overt act of compassing his death, and that spoken words, though they conld not in themselves amount to treason, might constitute an overt act, and so be evidence. Besides decisions on particular cases, the judges at different times came to general resolutions which had an appreciable cffect on the law. The principal resolutions were those of 1397 (confirmed by 21 Ric, II. ce, 12), of 1557, and those agreed to in the case of the regicides at the Restoration and reported by Sir John Kelyng. A remarkable resolution in favorem ret among the latter was that a prisoner ought not to be ironed during trial. The result of judicial decisions on the Statute of Treasons was summed up in Acts passed in 1786, made permanent in 1817 and in 1848 (57 Geo. III. c. 6 and 11 Vict. c. 12, the latter often called the Treason Felony Act). The effect of this legislation, according to Mr Justice Stephen, is that such of the

judicial constructions as extend the imagining of the king's death to imagining his death, destruction, or any bodily harm tending to death or destruction, maim or wounding, im- prisonment or restraint, have been adopted, while such of the con- structions as make the imagining of his deposition conspiring to levy war against him, and instigating foreigners to invade the realm, have not been abolished, but are left to rest on the authority of decided cases. The present state of the law has been incorpor- ated by skilled lawyers in the draft criminal code, which will no doubt become an Act when parliament has leisure to devote to matters of this kind. The code draws a distinction between treason and treasonable crimes, the former including such acts (omitting those that are obviously obsolete) as by the Statute of Treasons and subscquent legislation are regarded as treason proper, the latter including the crimes contained in the Act of 1848. In the words of the code (§ 76) "treason is (a) the act of killing Her Majesty, or doing her any bodily harm tending to death or destruction, maim or wounding, and the act of imprisoning or restraining her; or (d) the forming and manifesting by an overt act an intention to kill Her Majesty, or to do her any bodily harm tending to death or destruc- tion, maim or wounding, or to imprison or to restrain her; or © the act of killing the eldest son and heir-apparent of Her Majesty, or the queen consort of any king of the United Kingdom of Great Britain and Ireland; or (d) the forming and manifesting by an overt act an intention to kill the cldest son and hcir-apparent of Her Majesty, or the quecn consort of any king of the United Kingdom of Great Britain and Ireland; or (e) conspiring with any person to kill Her Majesty, or to do her any bodily harm tending to death or destruction, maim or wounding, or conspiring with any person to imprison or restrain her ; or (/) levying war against Her Majesty either with intent to depose Her Majesty from the style, honour, and royal name of the imperial crown of the United Kingdom of Great Britain and Ireland or of any other of Her Majesty's dominions or countries; or in order by force or constraint to compel Her Majesty to change her measures or counsels, or in order to intimidate or overawe both Houses or either House of Parliament ; or (g) conspiring to levy war against Her Majesty with any such intent or for any such purpose as aforesaid; or (h) instigating any foreigner with force to invade this realm or any other of the dominions of Her Majesty; or (2) assisting any public enemy at war with Her Majesty in such war by any means whatso- ever; or (j) violating, whether with her consent or not, a queen consort, or the wife

of the eldest son and heir-apparent for the time being of the king or queen regnant.”” There are a few other Acts still in force besides those of 1817 and 1848 which have dealt with substantive law. By 11 Henry VII. c. 1 obedience to the de facto sovereign for the time being is not treason. By 1 Anne st. 2, c. 21, it is treason to endeavour to hinder the next successor to the crown from succeeding, and by 6 Anne ec. 41 it is treason to maliciously, advisedly, and directly by writing or printing main- tain and affirm that any person has a right to the crown otherwise than according to the Acts of Settlement and Union, or that the crown and parliament cannot pass statutes for the limitation of the succession to the crown.

The Acts dealing with procedure and punishment are more nnmerous, and are characterized by a slowly increasing favour shown to the accused,—in fact, considerably greater than in felony, for counsel were not allowed to prisoners in charges of felony until 1836, and such prisoners are still not entitled to a copy of the indictment or the names of the witnesses or jury. With respect to the mode of trial, the effect of common law and legislation is that there are now four varieties, —IMPEACHMENT (g.v.), trial of a peer

by the peers, court martial, and trial by a judge of the High Court of Justice and a jury. The offence cannot be tried at quarter sessions. Trial by battle in cases of treason ceased in the 14th century, as far as regards appeals in the common law courts or in parliament, by the effect of several statutes passed between 1332 and 1399, Appeals of treason were finally abolished in 1819 (see APPEAL). In the court of the lord high constable an award of battle occurred as lately as 1631 in the case of Lord Rea.’ Traitors in the reign of Edward 1V., and perhaps later, were at times tried by martial law. The issue of commissions of martial law in time of peace was declared illegal by the Petition of Right in 1628. The prerogative of the crown to try traitors by martial law in time of open rebellion still exists, and is recognized by statute. In two Acts, for instance, dealing with Ireland, 48 Geo. III. ¢. 117 and 8 and 4 Will. IV. c. 4, it was provided that nothing in the Acts was to take away the undoubted prerogative of the crown for the public safety to resort to the exercise of martial law against open enemies and traitors. A

peer is tried before the House of Lords, or the court of the lord high steward if the trial be during the recess of parliament. Procedure in such trials is regulated by 7 and 8 Will. III. ¢. 3, and other Acts. The last trial of a peer for treason was that of Lord Lovat in 1746-47. Persons subject to naval or military law are triable by court martial in certain cases under the powers given by the Naval Discipline Act, 1866, and the Army Act, 1881. The trial of treason committed out of the realm is regulated by 35 Hen. VIII. c. 2, 5 and 6 Edw. VI. c. 11, and 7 Anne c. 21. Lord Macguire was tried by jury in England under 35 Hen. VIII. c. 2 for treason committed in Ireland." Procedure before and at the trial depends upon a large number of Acts, of which the most important is one passed in 1695 (7 and 8 Will. IIL. ce. 3). It enacted that persons indicted for treason are to have a copy of the indictinent delivered to them five days before trial. The court is empowered to assign counsel for the prisoner (a power extended to impeachments by 20 Geo. II. c. 80). The oath of two witnesses, or confession in open court, or refusal to plead, or per- emptory challenge of more than thirty-five jurors is necessary for conviction. The witnesses must be both to the same overt act or one to one and the other to another overt act of the same treason. If two or more treasons of divers kinds are alleged in one indict- ment, one witness to prove oue treason and another to prove another are not sufficient. No person is to be indicted unless within three years after the offence, except on a charge of attempted assassination of the king. The accused is to have copies of the panel of the jury® two days before trial. He is entitled to the sane process to compel his witnesses to appear as is usually granted to compel the witnesses for the prosecution. No evidence is to be given of any overt act not expressly laid in the indictment. The Act expressly denied the prisoner the names of the wituesses against him. The law on this point was altered by 7 Anne c. 21, which enacted that a list of such witnesses was to be delivered to him ten days before trial. Such witnesses had previously been made examinable upon oath by 1 Anne st. 2,¢. 9. By 5 and 6 Vict. c. 51 (extending the provisions of an Act of 1800) the advantages given by the Act of William II1. are not to extend to a prisoner charged with treason in comipassing or imagining any bodily harm tending to the death or destruction, maiming or wounding of the queen, where the overt act is an attempt to injure the person of the queen. In such a case the trial is to proceed in every respect and on the like evidence as if it were for murder. By 11 Vict. c. 12 no prosecution for a felony under the Act, in so far as it is

expressed by open and advised speaking only, is to be instituted unless information be given to a justice or sheriff within six days and a warrant issued within ten days of the information, and no person is to be convicted of such an offence except on con- fession in open court or proof by two witnesses. The prisoner is not to be acquitted if the facts amount to treason. There may be accessories to felonics under this Act, which, as has been already stated, there cannot be to treason. The prosecutor and witnesses are not entitled to costs. By a later Act of the same year (11 and 12 Vict. ¢. 42, § 23) a person charged with treason is not to be admitted to bail except by order of a secretary of state or by the Queen's Bench Division or a judge thereof in vacation.

The punishinent of treason at common law was barbarous in the extreme.4 The sentence was that the offender, if a man, be drawn on a hurdle to the place of execntion, that there he be hanged by the neck till he be dead, that his head be severed from his body, and that his body be divided into four quarters, the head and quarters to be at the disposal of the crown. A woman was drawn to the place of execution, and there burned alive. The Acts of 30 Geo. III. c. 48 and 54 Geo. III. ce. 146 changed the sentence to

1 Shakespeare twice makes effective usc of the trial by battle in treason, in King Lear and Richard 1/, 2 4 State Trials, 653.

3 By the Bill of Rights the jurors in trials for treason must have been free-holders, This provision of the Act was repealed by 9 Geo. IV. c. 50.

4 The exceptional character of the punishment, like that of the procedure, may be paralleled from Germany. The punishment of traitors by Frederick II. by wrapping them in lead and throwing them into a furnaee is alluded to by Dante, Inferno, xxiii. 66.

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hanging in the case of women, and in tlie case of men enabled the erown, by warrant under the sign manual countersigned by a secretary of state, to change the sentence to beheading or remit it altogether. By the Felony Act, 1870, the punishment is hanging only, but 54 Geo. III. ¢. 146 appears to be still so far in force that beheading may be substituted by warrant of the

crown where the crininal isa man. Attainder and forfeiture are abolished by the Felony Act, 1870, except where the offender has been outlawed.° The maximum penalty for a felony under the Act of 1848 is penal servitude for life. In every pardon of treason the offence is to be particularly specified therein (see Panpon).

Trials for treason in Great Britain and Ireland have been very numerous, and occupy a large part of the numerous volumes of the State Trials. Some of the more interesting may be mentioned. Before the Statute of Treasons were those of Gaveston and the Despensers in the reign of Edward II. on charges of accroaching the royal power. After the Statute were those (some before the peers by trial or impeachment, most before the ordinary criminal courts) of Empson and Dudley, Fisher, More, the earl of Surrey, the duke of Somerset, Anne Boleyn, Lady Jane Grey, Sir Thomas Wyatt, Cranmer, the queen of Scots, Sir Walter Raleigh, Strafford, Laud, Sir Henry Vane and other regicides, William, Lord Russell, Algernon Sidney, the duke of Monmouth, and those implicated in the Pilgrimage of Grace, the Gunpowder, Popish, Rye House, and other plots, Cases where the proceeding was by bill of attainder have been already mentioned. Occasionally the result of a trial was confirmed by statute. In some of these trials, as is well known, the law was considerably strained in order to insure a con- viction. Since the Revolution there have been the cases of those who took part in the risings of 1715 and 1745, Lord George Gordon in 1780, Hardy and Horne Tooke in 1794, the Cato Street con- spirators in 1820, Frost in 1840, and the Fenians in 1867. It should be noticed that mauy cases of proceedings for treason against foreigners occur. Treason committed by them within the realm is a breach of what has been called local allegiance, due to the sovereign of the country in which they reside. Such are the cases of Leslie, bishop of Ross, ambassador to Elizabeth from the queen of Scots, the Marquis de Guiscard in Queen Anne’s reign, aud Gyllenborg, the ambassador from Sweden to George I]. Pro- ceedings against ambassadors for treason have never gone beyond imprisonment, more for safe custody than as a punishment. No amount of residence abroad will suffice to exempt a native-born subject from the penalty of treason if he bear arms against the country of his birth.®

Misprision (from the old French mespris) of treason, in the words of Blackstone, “ consists in the bare knowledge and concealinent of treason, without any degree of assent thereto, for any assent makes the party a principal traitor.” At common law even the eonccal- ment was treason, but 5 and 6 Edw. VI. ec. 11 and 1 and 2 Ph. and M. c. 10 made concealment a misprision only. The offence was dealt with by many Acts, under some of which rather remark- able crimes were made misprision; ¢.g., 14 Eliz. c. 3 constituted the counterfeiting of foreign coinage a inisprision. The procedure in trials for misprision is in general the same as that followed in trials for treason, most of the Acts regulating procedure including both crimes. The punishment is loss of the profit of the lands of the offender during life, and imprisonment for life.

Cognate Offences.—Under this head may be conveniently grouped certain offences against public order which, though not technically treason or treasonable offences (to use the language of the draft criminal code), are so nearly allied to them as to make it convenient to treat them under the head of treason. The most interesting of these for historical reasons is premunire. The word is derived from premunire or premonert facias, the introductory words of the writ of summons to the defendant to answer the charge. From this the word came to be used to denote the offences prosecuted by means of such a writ, usually of an ecclesiastical kind. The Statute of Premunire, specially so called, is 16 Ric. II. c. 5, enact- ing that the procuring at Rome or elsewhere of any translations, bulls, &c., against the king puts the persons offending out of the king’s protection, subjects their goods to forfeiture and themselves to attachment or process of premunire facias. The Act introduced no new principle, but simply continued the anti-papal policy visible in the Statutes of Provisors, the earliest of which dated from 1807. At different times many other Acts were passed, extending the penaltics of premunire to other crimes, usually those connected with the supremacy of the pope (2 Hen. IV. c. 4, mentioned under TITHES, isan example), but sometimes of a more distiuctly political as distinguished from religious nature. Thus it is premunire by 13 Car. I. c. 1 to affirm the power of parliament to legislate with- out the crown, by the Habeas Corpus Act to send a prisoner beyond seas, and to verbally assert the right of a person to the crown con-

5 Proceedings after the death of an alleged traitor might at one time have been taken, but only to a very limited cxtent as compared with what was allowed in Roman and Scots law. Sir E. Coke (4 Rep., 57) states that there might have been forfeiture of the land or goods of one slain in rebellion on view

of the body by the lord chief justice of England as supreme coroner. 6 See neas Maedonald's case, 18 State Trials, 857.

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trary to the Acts of Settlement and Union is premunire by 6 Anne c. 41. To do so by writing or printing is, as has been said, treason. The latest Act constituting a premunire is the Royal Marriage Act, 12 Geo. III. c. 11, which subjects to the penalties of premunire any one guilty of a breach of the provisions of the Act. A peer charged with premunire is not entitled to trial by his peers, but is to be tried by a jury. The most famous historical instance of a prosecution on the Statute of Premunire was that of Wolsey in 1529. Other offences cognate to treason are publishing scandalous stories about the king (the leasing-making of Scotch law), mal- administration and sale of public offices, coining, offences against the Foreign Enlistment Act, and the crimes specially provided against by 33 Hen. VIII. c. 12 and 5 and 6 Vict. c. 51. The former Act punished malicious striking in the king's palace by perpetual imprisonment, fine, and loss of the right hand. The minute provisions for the mutilation of the offender are very curious, but not of immediate interest, as that part of the Act which inflicted mutilation was repealed by 9 Geo. IV. c. 31. By 5 and 6 Vict. c. 51 it is a high misdemeanour, punishable by penal servitude for seven years, to wilfully discharge, point, aim, or present at the person of the queen any gun or other arms, loaded or not, or to strike at or attempt to throw anything upon the queen's person, or to produce any firearms or other arms, or any explosive or dangerous matter, near her person, with intent to injure or alarm her or to commit a breach of the peace. For other offences which are more or less nearly connected with treason refer- ence may be made to the articles Lipet, OATHs, PeriTIoNn, Riot, and SrpirTion.?

Scotland. —Treason included treason proper, or crimes against the crown or the state, such as rebellion, and crimes which, though not technically

treasonable, were by legislation punished as treason. Examples of the latter were the remaining in England against the king's will, 1480, c. 19; wilful fire-raising, 1526, c. 10; kidnapping, 1567,c. 27; theft, reset, and stouthrief by banded men, 1587, c. 34. There were also many acts dealing with offences in the nature of resistance to authority, such as unlawful convocations, and with treasons of a merely transitory nature, such as attempting to restore the Ruthvens (1600), taking or owning the Covenants (1685), or corresponding with James VII. (1698). Acts of forfeiture were sometimes directed against individuals, as 1645, c. 23, against the marquis of Huntly. Scottish procedure was as a rule less favour- able to the accused than English. In one matter, however, the opposite was the case. Advocates compellable to act on behalf of the accused were allowed him by 1587, c. 57, more than a century before the concession of a similar indulgence in England. At one time trial in absence and even after death was allowed, as in Roman law. In the case of Robert Leslie, in 1540, a summons after death was held by the estates to be competent, and the bones of the deceased were exhumed and presented at the bar of the court.? The Act 1542, c. 18, confined this revolting procedure to certain treasons of the more heinous kind. By 7 Anne c. 21 trial in absence—the last instance of which had occurred in 1698—was abolished. The same Act assimilated the law and practice of treason to that of England in other respects by enacting that no crime should be treason or misprision in Scotland but such as was treason or misprision in England. The Act further provided that the trial was to be by a jury of twelve, not fifteen asin other crimes, before the court of justiciary, or a commission of oyer and terminer containing at least three lords of justiciary. To slay a lord of justiciary or lord of session, or to counterfeit the great seal, was made treason. The Act also contained provisions as to forfeiture,? qualification of jurors, and procedure. Outlawry for treason was regulated by 22 Geo. II. c. 48. The punishment still remains the same as it was in England before the Felony Act, 1870, and attainder and forfeiture are still the effects of condemnation for treason, the Act of 1870 not extending to Scotland. One or two other statutory provisions may be briefly noticed. The trial of a peer of Great Britain for treason committed in Scotland is to be by a commission from the crown, on indictment found by a jury of twelve (6 Anne c. 23, 6 Geo. IV. c. 66). Bail in treason-felony is only to be allowed by consent of the public prosecutor or warrant of the high or circuit court (11 Vict. c.12). The term lese-majesty was sometimes

used for what was treason proper, ¢.g. in 1524, c. 4, making it lese-majesty to transport the king out of the realm, sometimes as a synonyni of leasing-making. This crime (also called

1 Authorities.—The text-writers on criminal law, such as Hale and Hawkins; Bacon, Law Tracts, Cases of Treason; Coke, 3 Jnst., 1-39; Sir R. Holbourne, Reading on the Statute of Treasons; Luders, Law Tracts; Foster, Discourse of Treason; Stephen, Comm., vol. iv. bk. vi. ch. vi. The Statute of Treasons is noticed by Hallam, Const. Hist., vol. iii. p. 203; Stubbs, Const. Hist., vol. iii. p. 513. The most valuable modern authorities are Stephen, Hist. of the Criminal Law, vol. ii. ch. xxifi., and Willis Bund, Selection of Cases from the State Trials.

2 In the one instance in England—that of Cromwell, Ireton, and Bradshaw — where the bodies of alleged traitors were exhumed after dcath they were not brought to the bar of a court as in Scotland. ;

3 The provisions in the Act as to forfeiture (now repealed) were, according to Blackstone, Comm., vol. iv. p. 384, the result of a compromise between the House of Lords, in favour of its continuance, and the House of Commons, supported by the Scottish nation, struggling to secure a total immunity from this disability.

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verbal sedition) consisted in the engendering discord between king and people by slander of the king.4 The earliest Act against leasing-making eo nomine was in 1524. The reign of James VI. was pre-eminently prolific in legislation against this crime. It is now of no practical interest, as prosccutions for leasing-making have long fallen into desuetude. Atone time, however, the powers of the various Acts were put into force with great severity, especially in the trial of the earl of Argyll in 1681. The punishment for leasing-making, once capital, is now, by 6 Geo. IV. c. 47, fine or imprisonment, or both. The offence of premunire was introdueed into Scotland at a comparatively late period. By 6 Anne c. 28 it is premunire for the peers of Scotland assembled to elect represen- tatives to treat of any other matter.®

Ireland.—Numerous Acts, beginning with 18 Hen. VI. c. 2, were passed by the Ivish parliamcent—in many cases mere echoes of previous English legislatiou. As in England and Scotland, there was a tendency to include under treason crimes of quite another character. Murder was made treason by 10 Hen. VII. c. 21, and arson by 13 Hen. VIII. c. 1. Apparently the law must sometimes have been strained against accused persons, for 3 and 4 Ph. and M. c. 11 enacted that trials for treason were to be according to the common law. ‘Treasons of a temporary nature were often the subject of legislation. Anexample is 11 Eliz. c. 6, making it treason to assume the name and authority of O’Neill. The provisions of the English Act of William III. as to witnesses, &c., were not extended to Ireland until 1821 by 1 and 2 Geo. IV. c. 24. Many Acts of indemnity were passed both by the parliaments of Ireland and of the United Kingdom. Among the more important were an Irish Act of 1799 (89 Geo, III. c. 3), indemnifying those who had been active in suppressing the treasonable rising of the previous year, and one of the parliament of the United Kingdom (41 Geo. III. c. 104), iudemnifying those who had taken part in the suppression of rebellion subsequent to 1799. The law is now practically the same as that of England, unless where exceptional political cireum- stances have led to exceptional legislation. Thus a series of enact- ments called the ‘‘ Whiteboy Acts” (passed by the Irish and the United Kingdom parliaments between 1775 and 1830) was intended to give additional facilities to the executive for the suppression of tumultuous risings. Many Irish Acts dealt with unlicensed posses- sion and manufacture of arms. A similar policy was eontinued after the Union, and appears in the Peace Preservation Act, 1881, continued in 1887 for five years. Some Acts, such as 3 and 4 Will. IV. c. 4, went as far as to make offenders in a proclaimed district triable by court-martial. By the Prevention of Crime Act, 1882, now expired, the lord-lieutenant was empowered to issue special commissions for the trial without jury of treason and treason-felony. The power was never exercised. The Criminal Law and Procedure (Ireland) Act, 1887, deals with resistance to authority and offences of a treasonable nature, especially “dangerous associations,” though treason is not mentioned by name.

British Colonies and Dependencies.—The law in the main agrees with that of the mother country, but it is quite competent for a colony to deal with treason by its own legislation which need not necessarily be in accordance

with English law, and is sometimes ex- pressed in more definite terms. Thus the Indian penal code makes it punishable with transportation for life to wage war against the Government of any Asiatic power in alliance or at peace with the queen, or to attempt to excite feelings of disaffection to the Govern- ment. Numerous temporary Acts were passed about the time of the mutiny, one of the most characteristic being an Act of 1858 making rebellious villages liable to confiscation. By the Cape of Good Hope statutes it is treason to deliver arms or gunpowder to the queen's enemies. Many colonies adopt the English legislation as to procedure, and some, as New South Wales, &c., enact the Treason Felony Act. A striking feature of colonial legislation on this subject is the great number of Acts of indemnity passed after different rebellions. Instanees of such Acts occur in the legislation of Canada, Ceylon, the Cape of Good Hope, New Zealand, St Vin- cent, and Jamaica. The most important in the history of law is the Jamaica Act of 1866, indemnifying Mr Hyre for any aets com- mitted during the suppression of the rising in the previous year. It was finally held by the Exchequer Chamber in 1870 that this Act protected Mr Eyre from being sued successfully in England on a cause of action arising out of his acts during the outbreak (‘‘ Phil- lips v. Eyre,” Law Reports, 6 Queen's Bench, 1).

United States.—The law is based upon that of England. By Art. 3 s. 8 of the constitution ‘‘ treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court. The Congress shall have power to declare the punishment of treason; but no attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted.” By Art. 2 s. 4

4 Itis called by Hallam ‘‘the old mystery of iniquity in Scots law.” 5 For the existing Scots law of treason see Macdonald, Criminal Law, p. 220. For leasing-making see Hume, Comm., vol. i. p. 345.

impeachment for and conviction of treason is a ground for remov- ing the president, vice-president, and other civil officers. The punishment by an Act of 1790 was declared to be death by hanging. But during the Civil War a new Act (17 July 1862) was passed, providing that the punishment should be death, or, at the diseretion of the court, imprisonment at hard labour for not less than five years, and a fine of not less than 10,000 dollars to be levied on the real and personal property of the offender, in addition to disability to hold any office under the United States. The Act of 1862 and other Acts also deal with the crimes of ineiting or engaging in rebellion or insurrection, criminal correspondence with foreign Governments in relation to any disputes or controversies witli the United States, or to defeat the measures of the Government of the United States, seditions, conspiracy, recruiting soldiers or sailors and enlistment to serve against the United States. The Act of 1790 further provides for the delivery to the prisoner of a copy of the indictment and a list of the jurors, for defence by counsel, and for the finding of the indietment within three years after the commission of the treason. Misprision of treason is de- fined to be the crime committed by a person owing allegiance to the United States, and having knowledge of the commission of any crime against them, who conceals and does not as soon as may be disclose and make known the same to the president or to some judge of the United States, or to the governor or to some judge or justice of a particular State. The punishment is imprisonment for not more than seven years and a fine of not more than 1000 dollars (see Revised Statutes, §§ 1033, 1034, 1048, 5331-5338; Story, Constitution of the United States, §§ 1296-1301, 1796-1802). Treason against the United States cannot be inquired into by any State court, but the States may, and some of them have, their own constitutions and legislation as to treasons committed against themselves, generally following the lines of the constitution and legislation of the United States. In some cases there are differ- ences whieh are worth notice. Thus the constitution of Massa- chusetts, § 25, declares that no subjeet ought in any case or in any time to be declared guilty of treason by the legislature. The same provision is contained in the constitutions of Vermont, Connecticut, Pennsylvania, Alabama, and others. In some States the erime of treason cannot be pardoned ; in others, as in New York, it may be pardoned by the legislature, and the governor may suspend the sentence until the end of the session of the legislature next following conviction. In some States a person convicted of treason is

disqualified for exercising the franchise. In New York conviction carries with it forfeiture of real estate for the life of the convict and of his goods and chattels. (J. WT.)

TREASURE-TROVE is defined by Blackstone to be money or coin, gold, silver, plate, or bullion found hidden in the earth or other private place, the owner thereof being unknown. This definition is simply an extension of the Roman law definition of thesaurus inventus as an ancient deposit of money (vetus depositio pecunie) found by accident and without actual search. The right to treasure- trove was not, however, the same in Roman and English law. The former at its latest stage divided it between the finder and the owner of the land on which it was found, except where it was found on public or imperial property, when one-half went to the fisc. Ifa man found treasure on his own land, he had a right to the whole. The rights of the crown, modified by those of the feudal lord, gradu- ally became more extensive in the feudal law of Europe, so much so as to become, in the words of Grotius, " jus commune et quasi gentium." In more recent times there has been a return, at any rate in the case of France, to the division made by the Roman law. In England the com- mon law, which at one time apparently conferred treasure- trove, wherever found, upon the finder, now gives it all to the king, in accordance with the maxim "quod uullius est fit domini regis." This is always provided that the owner cannot be known or discovered. If he can be, he and not the king is entitled to it.

A right to treasure-trove may be granted by the British crown as a FRANCHISE (g.v.). It is the duty of one finding treasure to make it known to the coroner. By the statute De Officio Coronatoris (4 Edw. I. st. 2), the coroner is to inquire of treasure that is found, who were the finders and likewise who is suspected thereof, and that may be well perceived where one liveth riotously, haunting taverns, and hath done so of long time. Concealment of treasure- trove is a mlisdemeanour at common law. There can be no lareeny

of it until it has been found by the coroner to be the property of the crown. The Home Office has recently issued a notification

modifying the existing regulations so far as to permit the finders of coins and antiquities coming under the description of treasure- trove to retain

artieles not actually required for national institu- tions, and the sum received from such institutions as the antiquarian value of any articles retained, subject to a deduction of 20 per,cent. from the antiquarian value of the objects retained and 10 per cent. from the value of other objects. In the United States treasure- trove is usually vested in the State as bona vacantia. Louisiana follows the French Code Civil, and gives half to the finder and half to the landowner. The importance of treasure-trove in India led to the passing of the Indian Treasure-Trove Act (Act vi. of 1878). It provides that treasure is to be delivered to the finder if no owner appears. If the owner can be found, three-fourths go to the finder and one-fourth to the owner, power being reserved to the Govern- ment to acquire it by payment of a sum equal to one-fifth more than the value of the material.

TREATIES. 1. A treaty is a contract between two or Termino-

more states. The term “ tractatus,” and its derivatives, though of occasional occurrence in this sense from the 13th century onwards, only began to be commonly so employed, in lieu of the older technical terms “conventio publica,” or ‘“‘fcedus,” from the end of the 17th century. In the language of modern diplomacy the term “ treaty” is re- stricted to the more important international agreements, especially to those which are the work of a congress, while agreements dealing with subordinate questions are de- scribed by the more general term “convention.” The present article will disregard this distinction.

2. Tlie making and the observance of treaties is neces- Anti- sarily a very early phenomenon in the history of civilization, quity.

and the theory of treaties was one of the first departments of international law to attract attention. Treaties are recorded on the monuments of Egypt and Assyria ; they occur in the Old Testament Scriptures; and questions arising under owOjKa and “foedera” occupy much space in the Greek and Roman historians.1

3. Treaties have been classified on many principles, Classifica of which it will suffice to mention the more important. A tion.

‘personal treaty,” having reference to dynastic interests, is contrasted with a “real treaty,” which binds the nation irrespectively of constitutional changes ; treaties creating outstanding obligations are opposed to “ transitory con- ventions,” e.g., for cession of territory, recognition of inde- pendence, and the like, which operate irrevocably once for all, leaving nothing more to be done by the contracting parties ; and treaties in the nature of a definite transaction (Kechtsgeschdft) are opposed to those which aim at estab- lishing a general rule of conduct (Rechtssatz). With refer- ence to their objects, treaties may perhaps be conveniently classified as (1) political, including treaties of peace, of alliance, of cession, of boundary, for creation of inter- national servitudes, of neutralization, of guarantee, of submission to arbitration ; (2) commercial, including con- sular and fishery conventions, and slave trade aud naviga- tion treaties ; (3) confederations for special social objects, such as the Zollverein, the Latin monetary union, and the still wider unions with reference to posts, telegraphs, sub- marine cables, and weights and measures; (4) relating to criminal justice, ¢g., to extradition and arrest of fugitive seamen ; (5) relating to civil justice, e.g., to the protection of trade-mark and copyright, to the execution of foreign Judgments, to the reception of evidence, and to actions by and against foreigners ; (6) providing general rules for the conduct of warfare, e.g., the declaration of Paris and the convention of Geneva. It must be remarked that it is not always possible to assign a treaty wholly to one or other of the above classes, since many treaties contain in com- bination clauses referable to several of them.

1 For the eelebrated treaty of 509 B.c. between Rome and Carthage, see Polybius iii. 22; and, on the subject generally, Barbeyrac’s full but very uneritical Histoire des Anciens Traitéz, 1739; Miiller- Jochmus, Geschichte des Vilkerrechts im Alterthum, 1848; BE. Egger,

Ftudes Historiques sur les Traités Publics chez les Grees et chez les Romains, new ed., 1866,

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4. The analogy between treaty-making and legislation is striking when a congress agrees upon general principles which are afterwards accepted by a large number of states, as, for instance, in the case of the Geneva convention for improving the treatment of the wounded. Many political treaties containing “transitory” conventions, with reference to recognition, boundary, or cession, become, as it were, the title-deeds of the nations to which they relate! But the closest analogy of a treaty is to a contract in private law, as will appear fron the immediately following paragraphs.

5. The making of a valid treaty implies several re- quisites. (1) It must be made between competent parties, 2.€., sovereign states. A “concordat,” to which the pope, as a spiritual authority, is one of the parties, is therefore not a treaty, nor isa convention between a state and an individual, nor a convention between the rulers of two states with reference to their private affairs. Semi- sovereign states, such as San Marino or Egypt, may make conventions upon topics within their limited competence. It was formerly alleged that an infidel state could not be a party to a treaty. The question where the treaty- making power resides in a given state is answered by the municipal law of that state. It usually resides in the executive, though sometimes, as in the United States, it is shared by the legislature, or by a branch of it. (2) There must be an expression of agreement. This is not (as in private law) rendered voidable by duress ; e.g., the cession of a province, though extorted by overwhelming force, is nevertheless unimpeachable. Duress to the individual negotiator would, however, vitiate the effect of his signa- ture. (3) From the nature of the case, the agreement of states, other than those the government of which is auto- cratic, must be signified by means of agents, whose authority is either express, as in the case of plenipoten- tiaries, or implied, as in the case of, e.g., military and naval commanders for matters, such as truces, capitulations, and cartels, which are necessarily confided to their discretion. When an agent acts in excess of his implied authority he is said to make no treaty, but a mere “sponsion,” which, unless adopted by his Government, does not bind it, e., the affair of the Caudine Forks (Livy, ix. 5) and the con- vention of Closter Seven in 1757. (4) Unlike a contract in private law, a treaty, even though made in pursuance of a full power, is, according to modern views, of no effect till it

is ratified. (5) No special form is necessary for a treaty, which in theory may be made without writing. It need not even appear on the face of it to be a contract between the parties, but may take the form of a joint declaration, or of an exchange of notes. Latin was at one time the language usually employed in treaties, and con- tinued to be so employed toa late date by the emperor and the pope. ‘Treaties to which several European powers of different nationalities are parties are now usually drawn up in French (the use of which became general in the time of Louis XIV.), but the final act of the congress of Vienna contains a protest against the use of this language being considered obligatory. A great European treaty usually commences ‘“‘In the name of the Most Holy and Indivisible Trinity,” or, if the Porte is a party, “In the name of Almighty God.” (6) It is sometimes said that a treaty must have a lawful object, but the danger of accepting such a statement is apparent from the use which has been made of it by writers who deny the validity of any cession of national territory, or even go so far as to lay down, with Fiore, that “all should be regarded as void which are in any way opposed to the development of the free activity of a nation, or which hinder the exercise of its natural rights.” (7) The making of a treaty is some-

NS) EE ee 1 Qf, Sir Edward Hertslet’s very useful collection entitled The Map

of Europe by Treaty, 1875.

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times accompanied by acts intended to secure its better performance. The taking of oaths, the assigning of ‘‘con- servatores pacis,” and the giving of hostages are now obsolete, but revenue is mortgaged, territory is pledged, and treaties of guarantee are entered into for this purpose.

6. A “ transitory convention ” operates at once, leaving no duties to be subsequently performed, but with reference to conventions of other kinds questions arise as to the duration of the obligation created by them, in other words, as to the moment at which those obligations come to an end. This may occur by the dissolution of one of the contracting states, by the object-matter of the agreement ceasing to exist, by full performance, by performance be- coming impossible, by lapse of the time for which the

agree- ment was made, by contrarius consensus or mutual release, by “denunciation” by one party under a power reserved in the treaty. By a breach on either side the treaty usually becomes, not void, but voidable. A further cause of the termination of treaty obligations is a total change of circumstances, since a clause “‘rebus sic stantibus” is said to be a tacit condition in every treaty.2. Such a conten- tion can only be very cautiously admitted. It has been put forward by Russia in justification of her repudiation of the clauses of the treaty of Paris neutralizing the Black Sea, and of her engagements as to Batoum contained in the treaty of Berlin. The London protocol of 1871, with a view to prevent such abuses, lays down, perhaps a little too broadly, “that it is an essential principle of the law of nations that no power can liberate itself from the engagements of a treaty, nor modify the stipulations thereof, unless with the consent of the contracting powers, by means of an amicable arrangement.” Treaties are in most cases suspended, if not terminated, by the outbreak of a war between the contracting parties, and are therefore usually revived in express terms in the treaty of peace.

7. The rules for the interpretation of treaties are not so different from those applicable to contracts in private law as to need here a separate discussion.

8. Collections of treaties are either (i.) general or (ii.) national.

(i.) The first to publish a general collection of treaties was Leibnitz, whose Codex Juris Gentium, containing documents from 1097 to 1497, ‘‘ea que sola inter liberos populos legum sunt loco,” appeared in 1698, and was followed in 1700 by the Mantissa. The Corps Universel Diplomatique du Droit des Gens of Dumont, con- tinued by Barbeyrac and Rousset in thirteen folio volumes, con- taining treaties from 815 A.D. to 1730, was published in 1726-39. Wenck’s Corpus Juris Gentium Recentissimi, 3 vols. 8vo, 1781-95, contains treaties from 1735 to 1772. The 8vo Recueil of G. F. de Martens, continued by C. de Martens, Saalfeld, Murhard, Samwer, Hopf, and Stoerk, commenced in 1791 with treaties of 1761, and is still in progress. The series in 1887 extended to sixty-four volumes. See also the following periodical publications:—Das Staatsarchiv, Sammlung der officiellen Actenstiiche zur Geschichte der Gegenwart, Leipsic, commencing in 1861; Archives Diplo- matiques, Stuttgart, since 1821;

Archives Diplomatiques, Reeucil Mensuel de Diplomatie et d' Histoire, Paris, since 1861; and Herts- let's British and Forcign State Papers, from the termination of the War of 1814 to the latest period, compiled at the Foreign Office by the Librarian and Keeper of the Papers, London, since 1819, and still in progress.

(ii.) The more important collections of national treaties are those of M. Neumann and M. de Plassan for Austria, 1855-84; Beutner for the German empire, 1883; Calvo for ''l'Amérique Latine," 1862-69 ; De Clereq for France, 1864-86 ; De Garcia de la Vega for Belgium, 1850-83; Lagemans for the Netherlands, 1858-82; Soutzo for Greece, 1858 ; Count Solar de la Marguerite for Sardinia, 1836-61 ; De Castro for Portugal, 1856-79 ; Rydberg for Sweden, 1877 ; Kaiscr (1861) and Eichmann (1885) for Switzer- land ; Baron de Testa (1864-82) and Aristarchi Bey (1873-74) for Turkey ; F. de Martens for Russia, 1874-85 ; Mayers for China, 1877. The official publication for Italy begins in 1864, for Spain in 1843, for Denmark in 1874. The treaties of Japan were pub- lished by authority in 1884. Those of the United States are con-

tained in the Statutcs at Large of the United States, and in the ee

"2 Of, Bynkershoek, Quest. Jur. Pub., ii. c. 10.

Duration.

Interpre- tation.

Collec-

tions :

general ;

national.

collections of J. Elliott (1884) and H. Minot (1844-50); see also Mr Bancroft Davis's Notes upon the Treatics of the United States with other

Powers, preceded by a List of the Treaties and Conventions with Foreign Powers, chronologically arranged, and followed by an Analytical Index and a Synoptical Index of the Treaties, 1873. In England no treaties were published before the 17th century, such matters being thought ‘“‘not fit to be made vulgar.” The treaty of 1604 with Spain was, however, published by authority, as were many of the treaties of the Stuart kings. Rymer’s Federa was published, under the orders of the Government, in twenty volumes, from 1704 to 1732. Treaties are officially published at the present day in the London Gazette, and are also presented to parliament, but for methodical collections of treatics made by Great Britain we are indebted to private enterprise, which pro- duced three volumes in 1710-18, republished with a fourth vol- ume in 1732. Other three volumes appeared in 1772-81, the collection commonly known as that of C. Jenkinson (8 vols.) in 1785, and that of Chalmers (2 vols.) in 1795. J. Macgregor pub- lished (1841-44) eight volumes of commercial treaties, but the great collection of the commercial treaties of Great Britain is that of L. Hertslet, librarian of the Foreign Office, continued by his son and successor in office, Sir Edward Hertslet, entitled 4 Complete Collec- tion of the Treaties and Conventions and Reciprocal Regulations at present subsisting between Great Britain and Foreign Powers, and of the Laws and Orders in Council concerning the same, so far as they relate to Commerce and Navigation, the Slave Trade, Post Office, &c., and to the Privileges and Interests of the Subjects of the Contracting Parties, 1820-86,16 vols. Sir Edward Hertslet also com- menced in 1875 a series of volumes containing T’reaties and Tariffs regulating the Trade between Britain and Foreign Nations, and Extracts of Treaties between Foreign Powers, containing the Most Favoured Nation Clauses applicable to Great Britain. The treaties affecting British India are officially set out, with historical notes, in A Collection of Treaties, Engagements, and Sannuds relating to India and Neighbouring Countries, by C. W. Aicheson. This work, with the index, extends to eight volumes, which appcared at Calcutta in 1862-66.

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(ii.) For the innumerable conventions to which Great commer.

Britain is a party as to commerce, consular jurisdiction, fisheries, and the slave trade, it must suffice to refer to the exhaustive and skilfully devised index to Hertslet's Commercial Treaties, forming volume xvi., 1885.

(iii.) The social intercourse of the world is facilitated by conventions, such as those establishing the Latin monetary union, 1865; the international telegraphic union, 1865; the universal postal union, 1874; the international bureau of weights and measures, 1875; and providing for the protection of submarine cables in time of peace, 1884. Such treaties are somewhat misleadingly spoken of by recent writers (L. von Stein and F. de Martens) as con- stituting a "' droit administratif international."

(iv.) The following are the now operative treaties of as to ex-

extradition to which Great Britain is a party:—with the United States, 1842; Brazil and Germany, 1872; Austria, Denmark, Italy, Norway and Sweden, 1873 ; Hayti and Netherlands, 1874; Belgium and France, 1876 ; Spain, Portugal (as to India only), 1878 ; Tonga, 1879 ; Luxemburg, Equador, and Switzerland, 1880 ; Salvador, 1881; Uruguay, 1884; Guatemala, 1885; Russia, 1886. It will be observed that all these, except the treaty with the United States, are subsequent to and governed by the provisions of 33 and 34 Vict. c. 52, "The Extradition Act, 1870." Before the passing of this general Act, it had been necessary to pass a special Act for giving effect to each treaty of extradition. The most complete collec- tion of treaties of extradition is that of F. J. Kirchner, L?Extradition, Recueil, dc., London, 1883.

List of 9. It may be worth while to add a list of some of the (v.) General conventions, to which most of the Euro-as to import- more important treaties, now wholly or partially in force, pean states are parties, were signed in 1883 at Paris for Copyright, fee especially those to which Great Britain is a party, classified | the protection of industrial, and in 1886 at Bern for the *™? " according to their objects, in the order suggested in para- | protection of literary and artistic, property. graph 3. (vi.) Certain bodies of rules intended to mitigate the as to the political; (i) The principal treaties affecting the distribution of | horrors of war have received the adhesion of most civilized conduct

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states. Thus the declaration of Paris, 1856 (to which, pare however, the United States, Spain, Mexico, Venezuela,

territory between the various states of Central Europe are those of Westphalia (Osnabriick and Miinster), 1648;

Utrecht, 1713; Paris and Hubertsburg, 1763; for the parti- tion of Poland, 1772, 1793; Vienna, 1815; London, for the separation of Belgiuin from the Netherlands, 1831, 1839 ‘ Zurich, for the cession of a portion of Lombardy to Sardinia, 1859; Vienna, as to Schleswig-Holstein, 1864; Prague, whereby the German Confederation was dissolved, Austria recognizing the new North German Confederation, trans- ferring to Prussia her rights over Schleswig-Holstein, and ceding the remainder of Lombardy to Italy, 1866 ; Frank- fort, between France and the new German empire, 1871. The disintegration of the Ottoman empire has been regu- lated by the great powers, or some of them, in the treaties of London, 1832, 1863, 1864, and of Constantinople, 1881, with reference to Greece ; and by the treaties of Paris, 1856 ; London, 1871 ; Berlin, 1878 ; London, 1883, with reference to Montenegro, Roumania, Servia, Bulgaria, and the navigation of the Danube. The encroachments of Russia upon Turkey, previous to the Crimean War, are registered in a series of treaties beginning with that of Kutchuk-Kainardji, 1774, and ending with that of Adrian- ople in 1829. The independence of the United States of America was acknowledged by Great Britain in the treaty of peace signed at Paris in 1783. The boundary between the United States and the British possessions is regulated in details by the treaties of Washington of 1842, 1846, 1871. Switzerland, Belgium, Corfu and Paxo, and Lux- emburg are respectively neutralized by the treaties of Vienna, 1815, and of London, 1839, 1864, 1867.

Columbia, Bolivia, and Uruguay have declined to accede), prohibits the use of privateers and protects the commerce of neutrals ; the Geneva convention, 1864, gives a neutral character to surgeons and hospitals; and the St Peters- burg declaration, 1868, prohibits the employment of ex- plosive bullets weighing less than 400 grammes.

It were greatly to be wished that the official publication of treaties could be rendered more speedy and more methodical than it now is. The labours of the publicist would also be much lightened were it possible to con- solidate the various general collections of diplomatic acts into a new Corps Diplomatique Universel, well furnished with cross references, and with brief annotations showing how far each treaty is supposed to be still in force.

10. In addition to the works already citcd in the course of this Litera- article the following are for various reasons important :—Joh. Lupus, ture.

De Confederatione Principum, Strasburg, 1511 (the first published monograph upon the subject); Bodinus, Dissertatio de Contractibus Summarum Potestatum, Halle, 1696; Neyron, De Vi Foderum inter Gentes, Gott., 1778; Neyron, Hssai Historique et Politique sur les Garanties, &c., Gott., 1797; Wachter, De Modis Tollendi Pacta inter Gentes, Stuttg., 1780; Dresch, Ucber die Dawer der Volkervertrdége, Landshut, 1808; C. Bergbohm, Staatsvertriige und Gesetze als Quellen des Volkerrechts, Dorpat, 1877; Jellinek, Die rechtliche Natur der Statenvertridgen, Vienna, 1880; Holzen- dorff, Handbuch des Volkerrechts, vol. iii., 1887. On the history of the great European treaties generally, see the Histoire Abrégée des Traités de Paia entre les Puissances de 0 Europe, by Koch, as recast and continued by Schéll, in 1817 and 1818, and again by Count de Garden in 1848-59; as also the Recueil Manuel of De Martens and Cussy, now continued by Geffcken. For the peacc of West- phalia Piitter’s Geist des westphilischen Friedens, 1795, is useful; for the congress of Vienna, Kliiber’s Acten des Wiener Congresses, 1815-19, and Le Congres de Vienne et les Traités de 1815, précédé des Conférences de Dresde, de Prague, et de Chatillon, suivi des Congrés d’ Aiu-la-Chapelle, Troppau, Laybach, et Vérone, by Count

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Angeberg. The last-mentioned writer has also published collec- tions of treaties relating to Poland, 1762-1862; to the Italian question, 1859; to the congress of Paris, 1856, and the revision of its work by the conference of London, 1871; and to the Franco- German War of 1870-71. For the treaties regulating the Eastern question, see The European Concert in the Eastern

Question, by T. E. Holland, 1885, and La Turquie et le Tanzimat, by E. Engelhardt, 1882-84, (DERE)

TREBIZOND, in Greek Trapezus, a city of Asia Minor, situated on the Black Sea, near its south-eastern angle, from the time of its foundation as a Greek colony to the present day has always been a considerable emporium of commerce, and at one time was for two centuries and a half the capital of an empire. Its importance is due to its geographical position, because it commands the point where the chief and most direct trade route from Persia and Central Asia to Europe, over the tableland of Armenia by Bayazid and Erzeroum, descends to the sea. Its safety also was secured by the barrier of rugged mountains which separates its district from the rest of Asia Minor, rising to the height of 7000 or 8000 feet above the sea-level. So complete is the watershed that no streams pass through these ranges, and there is hardly any communication in this direction between the interior of Asia Minor and the coast. For the same reason, together with its northern aspect, the climate is humid and temperate, and favourable to the growth of vegetation, unlike that of the inland regions, which are exposed to great extremes of heat in summer and cold in winter. The position which was occupied by the Hellenic and medieval city is a sloping table of ground (whence the original name of the place, Trapezus, or the “ Tableland”), which falls in steep rocky precipices on the two sides, where two deep valleys, de- scending from the interior, run parallel at no great distance from one another down to the sea. The whole is still inclosed by the Byzantine walls, which follow the line of the cliffs, and are carried along the sea-face ; and the upper part of the level, which is separated from the lower by an inner cross wall, forms the castle; while at the highest point, where a sort of neck is formed between the two valleys, is the keep which crowns the whole. The fortifications and their surroundings are singularly pictur- esque, for the towers, some round, some angular, which project from them are in many cases covered with creepers, and the gardens that occupy the valleys below teem with luxuriant vegetation. On each side, about half-way be- tween the keep and the sea, these ravines are crossed by massive bridges, and on the further side of the western- most of these, away from the city, a large tower and other fortifications remain, which must have served to defend the approach from that quarter. The area of the ancient city is now called the Kaleh, and is inhabited by the Turks ; eastward of this is the extensive Christian quarter,

and beyond this again a low promontory juts northward into the sea, partly covered with the houses of a well-built suburb, which is the principal centre of commerce. The harbour lies on the eastern side of this promontory, but it is an unsafe roadstead, being unprotected towards the north-east, and having been much silted up, so that vessels cannot approach within a considerable distance of the shore. The neighbourhood of this is the liveliest portion of the city, as it is from here that the caravans start for Persia, and at certain periods of the year long trains of camels may be seen, and Persian merchants conspicuous by their high black caps and long robes. The total population of the place is estimated at 32,000, of whom 2000 are Armenians, 7000 or 8000 Greeks, and the rest Turks.

The city of Trapezus was a colony of Sinope, but it first comes into notice at the time of the Retreat of the Ten Thousand, who found repose there. Notwithstanding its commercial importance,

the remoteness of its position prevented it from being much known to fame eithcr in the Hellenic or the early medieval period ;

its greatness dates from the time of the fourth crusade (1204), when the Byzantine empire was dismembered and _ its capital occupied by the Latins. During the confusion that followed that event a scion of the imperial family of the Comneni, called Alexius, escaped into Asia, and, having collected an army of Iberian mercenaries, entered Trebizond, where he was acknowledged as the legitimate sovereign, and assumed the title of Grand Comnenus. Though only twenty-two years of age, Alexius was a man of ability and resolute will, capable of establishing order in a time of anarchy; and thus he succeeded without difficulty in making himself master of the greater part of the southern coast of the Black Sea. The empire that was thus founded continued to exist until 1461, when the city was taken by Mohammed II., eight ycars after he had captured Constantinople. The cause of this long duration, and at the same time the secret of its history, is to be found in the isolated position of Trebizond and its district,.between the moun- tains and the sea, which has already been described. By this means it was able to defy both the Seljiks and the Ottomans, and to maintain its independence against the emperors of Nica and Constantinople. But for the same reason its policy was always narrow, so that it never exercised any beneficial influence on the world at large. It was chiefly in the way of matrimonial alliances that it was brought into contact with other states. The imperial family were renowned for their beauty, and the princesses of this race were sought as brides by Byzantine emperors of the dynasty of the Palzologi, by Western nobles, and by Mohammedan princes; and the connexions thus formed originated a variety of diplomatic relations and friendly or offensive alliances. The palace of Trebi- zond was famed for its magnificence, the court for its luxury and elaborate ceremonial, while at the same time it was frequently a hotbed of intrigue and immorality. The Grand Comneni were also patrons of art and learning, and in consequence of this Trebi- zond was resorted to by many eminent men, by whose agency the library of the palace was provided with valuable manuscripts and the city was adorned with splendid buildings. The writers of the time speak with enthusiasm of its lofty towers, of the churches and monasteries in the suburbs, and especially of the gardens, orehards, and olive groves. It excited the admiration of Gonzales Clavijo, the Spanish envoy, when he passed through it on his way to visit the court of Timur at Samarkand (Clavijo, Historia del Gran Tamorlan, p. 84); and Cardinal Bessarion, who was a

native of the place, in the latter part of his life, when the city had passed into the hands of the Mohammedans, and he was himself a dignitary of the Roman Church, so little forgot the im- pression it had made upon him that he wrote a work entitled “The raise of Trebizond” (Eyxdéuiov TpareCodvros), which exists in manuscript at Venice. Little was known of the history of the empire of Trebizond until the subject was taken in hand by Prof. Fallmerayer of Munich, who discovered the chronicle of Michael Panaretus among the books of Cardinal Bessarion, and from that work, and other sources of information which were chiefly unknown up to that time, compiled his Geschichte des Kaiserthums von Lrapezunt (Munich, 1827). Finlay’s account of the period, in the fourth volume of his History of Greece, is based on this. From time to time the emperors of Trebizond paid tribute to the Seljuk sultans of Iconium, to the grand khans of the Mongols, to Timur the Tartar, to the Turcoman chieftains, and to the Ottomans; but by means of skilful negotiations they were enabled practically to secure their independence. We find them also at war with many of these powers, and with the Genoese, who endeavoured to monopolize the commerce of the Black Sea. The city was several times besieged, the most formidable attack being that which occurred in the reign of Andronicus I., the second emperor, when the Seljuks, under the command of Melik, the son of the great sultan Ala-ed-din, first assaulted the northern wall in the direction of the sea, and afterwards endeavoured to storm the upper citadel by night. They failed, however, in both attempts; and in the latter, owing to the darkness, and to the occurrence of a violent storm which suddenly swelled the torrents in the ravines, their force was thrown into inextricable confusion, and they were com- pelled to abandon their camp and make the best of their eseape from the country. So great was the strength of the fortifieations that, when Mohammed II. turned his thoughts towards the subju- gation of this state, he might have experienced much difficulty in reducing it, and might have been disposed to offer favourable terms, had it not been for the pusillanimous conduct of David, the last emperor, who surrendered the place almost unconditionally. Several interesting monuments of this period remain at Trebizond in the form of churches in the Byzantine style of architecture. One of these is within the area of the old city, viz., the chureh of the Panaghia Chrysokephalos, or Virgin of the Golden Head, a large and massive but excessively plain building, which is now the Orta-hissar mosque. On the further side of the eastern ravine stands

a smaller but very well proportioned structure, the church of St Eugenius, the patron saint of Trebizond, now the Yeni Djuma djami, or New Friday mosque. Still more important is the church of Haghia Sophia, which occupics a conspicuous position overlook-

ing the sea, about two miles to the west of the city. The porches of this are handsomely ornamented, and about a hundred feet from it rises a tall campanile, the inner walls of which have been covered in parts with frescos of religious subjects, though these are now much defaced. But the most remarkable memorial of the Middle Ages that exists in all this district is the monastery of Sumelas, which is situated among the mountains, about 25 miles from Trebizond, at the side of a rocky glen, at a height of 4000 feet above the sea. Its position is most extraordinary, for it occupies a cavern in the middle of the face of a perpendicular cliffa thousand feet high, where the white buildings offer a marked contrast to the brown rock which forms their setting. It is approached by a zigzag path at the side of the cliff, from which a flight of stone steps and a wooden staircase give access to the monastery. ‘Dike valley below is filled with the richest vegetation, the undergrowth being largely composed of azaleas and rhododendrons. An antiquity of 1500 years is claimed for the foundation of the monastery, but it is certain that the first person who raised it to importance was the emperor Alexius Comnenus III. of Trebizond; he rebuilt it in 1360, and richly endowed it. The golden bull of that emperor, which became thenceforth the charter of its foundation, is still preserved; it is one of the finest specimens of such documents, and contains portraits of Alexius himself and his queen. The monastery also possesses the firman of Mohammed II. by which he accorded his protection to the monks when he became master of the country. (Gh 1d, Jes)

TREDEGAR, a town of Monmouthshire, England, is situated on the Sirhowy river, and on the London and North Western Railway system, 7 miles east-north-east of Merthyr Tydvil and 249 west of London. The town owes its existence to the establishment in the beginning of the century of the works of the Tredegar Iron and Coal Company, who lease the soil and minerals from Lord Tredegar. The iron-works, chiefly for the smelting of

iron and the manufacture of iron and steel rails, are of enormous extent, and employ upwards of 4000 men. The town is also surrounded by iron and coal mines, the pro- perty of the company. It consists chiefly of workmen's houses, but is built with regularity and neatness, the prin- cipal streets diverging from an open space called the Circle, in the centre of the town, where there are a number of good shops. The church of St George is a tasteful modern building in the Norman style. The temperance hall, union workhouse, and literary institute and library deserve notice. The population of the urban sanitary district (area 7029 acres), a small portion of which is in Brecknockshire, in 1871 was 16,989 and in 1881 it was bese

TREE-CREEPER, one of the smallest of British birds, and, regard being had to its requirements, one very gene- rally distributed. It is the Certhia familiaris of ornitho- logy, and remarkable for the stiffened shafts of its long and pointed tail-feathers, aided by which, and by its com- paratively large feet, it- climbs nimbly, in a succession of jerks, the trunks or branches of trees, invariably proceed- ing upwards or outwards and generally in a spiral direc- tion, as it seeks the small insects that are hidden in the bark and form its chief food. When in the course of its search it nears the end of a branch or the top of a trunk, it flits to another, always alighting lower down than the place it has left, and so continues its work.

Inconspicuous in colour, for its upper plumage is mostly of various shades of brown mottled with white, buff, and tawny, and beneath it is of a silvery white, the Tree-Creeper is far more common than the incurious suppose; but, attention once drawn to it, it can be frequently seen and at times heard, for though a shy singer its song is loud and sweet. The nest is neat, generally placed in a chink formed by a half-detached piece of bark, which secures it from observation, and a considerable mass of material is commonly used to partly stuff up the opening and give a sure foundation for the tiny cup, in which are laid from six to nine eggs of a translucent white, spotted or blotched with rust-colour. The Tree-Creeper inhabits almost the whole of Europe as well as Algeria, and has been traced across Asia to Japan. It is now recognized as an inhabitant of the greater part of North America, though for a time examples from that part of the world, which differed slightly in the tinge of the plumage, were accounted a distinct species (C. americana), and even those from Mexico and Guatemala (C.

mexicana) have lately been referred to the same. It therefore occupies an area not exceeded in extent by that of many Passerine birds, and is one of the strongest witnesses to the close alliance of the so-called Nearctic and Palearctic Regions.

Allied to the Tree-Creeper, but wanting its lengthened and stiff tail-feathers, is the genus Tichodroma, the single member of which is the Wall-Creeper (7. muraria) of the Alps and some other mountainous parts of Europe and Asia, and occasionally seen by the fortunate visitor to Switzerland fluttering like a big butterfly against the face of a rock, conspicuous from the scarlet-crimson of its wing-coverts aud its white spotted primaries. Its bright hue is hardly visible when the bird is at rest, and it then presents a dingy appearance of grey and black. Itis a species of wide range, ex- tending from Spain to China; and, though but seldom leaving its cliffs, it has wandered even so faras England. Merrett (Pinaz, p. 177) in 1667 included it as a British bird, and the correspondence between Marsham and Gilbert White (Proc. Norf. and Norw. Nat. Society, ii. p. 180) proves that an example was shot in Norfolk, 30th October 1792; while another is reported (Zoologist, ser. 2, p. 4839) to have been killed in Lancashire, 8th May 1872.

The genus Certhia as founded by Linnzeus contained 25 species, all of which, except the two above mentioned, have now been shewn to belong elsewhere ; and for a long while so many others were referred to it that it became a most heterogeneous company. At present, so few are the forms left in the Family Certhude that systematists are not wanting to unite it with the Sittide (cf. NurHatcn), for the two groups, however much their extreme members may differ, are linked by so many forms which still exist that little violence is done to the imagination by drawing upon the past for others to complete the series of descend- ants from a common and not very remote ancestor, one that was possibly the ancestor of the WRENS (q.v.) as well. One thing, however, has especially to be noticed here. The Certhiide have not the least affinity to the Picidx (cf. WoopPECKER, infra), but are strictly Passerine, though the Australian genus Climacteris may possibly not belong to them. Ca)

TREE-FERN. In old and well-grown specimens of some of the familiar ferns of our temperate climates the wide-spreading crown of fronds may be observed to rise at a distance often of a good many inches above the surface of the ground, and from a stem of considerable thickness. The common male fern Mephrodium (Lastrxa) furnishes the commonest instance of this ; higher and thicker trunks are, however, occasionally presented by the royal fern (Osmunda regalis), in which a height of 2 feet may be attained, and this with very considerable apparent thick- ness, due, however, to the origin and descent of a new series of adventitious roots from the bases of each annual set of fronds. Some tropical members and allies of these genera become more distinctly tree-like, e.g., Zodea ; Pteris also has some sub-arboreal forms. Oleandra is branched and shrub-like, while Angiopteris and Marattia (Marat- tiacex) may also rise to 2 feet or more. But the tree-ferns proper are practically included within the family Cyathe- acee. This includes five genera (Cyathea, Alsophila, Hemitelia, Dicksonia, Balantium) and nearly 200 species, of which a few are herbaceous, but the majority arboreal and palm-like, reaching frequently a height of 50 feet or more, Alsophila excelsa of Norfolk Island having some- times measured 60 to 80 feet. The fronds are rarely simple or simply pinnate, but usually tripinnate or decom- pound, and may attain a length of 20 feet, thus forming a splendid crown of foliage. The stem may occasionally branch into many crowns. The genera are of wide geo- graphical range, mostly of course within the tropics of the Old and New World ; but South Australia, New Zealand, and the Southern Pacific islands all possess their tree-ferns. In Tasmania Alsophila australis has been found up to the snow-level, and in the humid and mountainous regions of the tropics tree-ferns are also found to range up to a con- siderable altitude. The fronds may either contribute to the apparent thickness of the stem by leaving more or less

of their bases, which become hardened and persistent, or they may be articulated to the stem and fall off, leaving characteristic scars in spiral series upon the stem. The stem is frequently much increased in apparent thickness by the downgrowth of aerial roots, forming a black coating several inches or even a foot in thickness, but its essential structure differs little in principle from that familiar in the rhizome of the common bracken

(Pteris). To the ring or rather netted cylinder of fibro-vascular bundles character- istic of all fern stems scattered internal as well as external bundles arising from these are superadded ; and in a tree- fern these are of course in greater numbers. The outer bundles give off branches to the descending roots from the region where they pass into the leaves.

Tree-ferns are of course cultivated for their beauty alone; a few, however, are of some economic applications, chiefly as sources of starch. Thus the beautiful Alsophila excelsa of Norfolk Island is said to be threatened with extinction for the sake of its sago-like pith, which is greedily eaten by hogs; Cyathea medullaris also furnishes a kind of sago to the natives of New Zealand, Queens- land, aud the Pacific islands. A Javanese species of Dicksonia (D. chrysotricha) furnishes silky hairs, which have been imported as a styptic, and the long silky or rather woolly hairs, so abundant on the stem and frond-leaves in the various specics of Cibotiwm, have not only been put to a similar use, but in the Sandwich Islands furnish wool for stuffing mattresses and cushions, which was formerly an article of export. The ‘‘Tartarian lamb,” or Agnus scythicus of old travellers’ tales in China and Tartary, is simply the woolly stock of C. Barometz, which, when dried and inverted and all save four of its frond-stalks cut away, has a droll resemblance to a toy sheep.

See Fern; J. Smith, Historia Filicum; Luerssen, Med. Pharm. Botanik; and

pa the structure of the stem, De Bary’s Vergleich. Anatomie d, Phanerog. u. ‘arne.

TREGELLES, Samvet Pripgavx (1813-1875), New Testament scholar, was born at Wodehouse Place, near Falmouth, on January 30, 1813. His parents were Quakers, and he himself for many years was in communion with the (Darbyite) Plymouth Brethren, but latterly he became a member of the Church of England. He was educated at Falmouth grammar school, and afterwards, without having attended any university, held various modest educational appointments, but finally devoted himself entirely to a laborious student life, until he was incapacitated for literary work by paralysis in 1870. He died at Plymouth on April 24, 1875.

Most of his numerous publications had reference to his great critical edition of the New Testament (see BIBLE, vol. ili. p. 648). They include an Accownt of the Printed Text of the Greek New Testament (1854), a new edition of Horne's Introduction (1860), and Canon Muratorianus: Earliest Catalogue of Books of the New Testament (1868). As early as 1844 he published an edition of the Apocalypse, with the Greek text so revised as to rest almost entirely upon ancient evidence. Tregelles wrote Heads of Hebrew Grammar (1852), translated Gesenius's Hebrew Lexicon, and was the author of a little work on the Jansenists (1851) and of various works in exposition of his special eschatological views (Remarks on the Prophetic Visions of Daniel, 1852, new ed. 1864).

TREMATODA, popularly known as "flukes," form one of the three main divisions of the flatworms or Platyhel- minthes. They have been defined thus (Jackson, 1) :1—

'"'Unisegmental Vermes, with a flattish, leaf-like, more or less cylindrical body provided with organs of adhesion in the shape of suckers and sometimes of chitinoid hooks. The cuticle, so called, appears to be a metamorphosed layer of cells. There is a well-developed nervous system, the ganglia of which are entirely supra-pharyngeal, 2.e., dorsal. There is a mouth, and an alimentary canal which is usually forked, but no anus. The excretory system has the form of more or less branching tubes commencing with flame- cells, and either ending in a contractile vesicle or opening by two independent orifices. Hermaphrodite self-impreg- nation occurs, as well as reciprocal impregnation. The embryo either develops direct into the sexual form (mono- genetic 7''rematoda) or gives origin to a series of inter-

1 These figures refer to the bibliography at the end of the article.

mediate non-sexual dimorphic forms (digenetic 7'rematoda). Parasitic."

Llistorical Sketch.—Some of the more salient points in the history of our knowledge of these animals have already been alluded to in the article Parasirism (q.v.); a few additional facts must, however, be mentioned here. The Trematoda were first formed into a group by Rudolphi (2), who included in it the following genera :—dMonostoma, Amphistoma, Distoma, Tristoma, Pentastoma, and Poly- stoma ; the name had reference to the

suckers, which Rudolphi regarded as being for the most part openings into the body (Gr. tpjya, an aperture). Some of these forms were soon perceived to have but small connexion with the others; and Cuvier (8) reduced the whole to one genus, for which he adopted the name Fasciola, Linn. The Pentastomes have since been transferred to the ARACHNIDA (qg.v.).

Our scientific acquaintance with the group may be said to date from 1831, when Mehlis noticed that the eggs of certain Distomes hatched into a minute ciliated body with an eye-speck resembling an Infusorian, an observation which gave the key to the life-history of these forms. Von Siebold in 1835 (4) supplemented this discovery by the observation that the ciliated embryo of donostomum mutabile contained, as a “necessary parasite,” as it was termed, an organism identical with the ‘“ kingsyellow worm” (#edia), found by Bojanus in pond-snails, and Von Baer had previously shown (5) that these gave rise to free-swimming organisms not unlike tailed Trematodes. The materials were thus ready to hand for a co-ordination of the whole life-history, and Steenstrup recognized it as an instance of the so-called “alternation of generations ” (6). These researches received important additions at the hands of Pagenstecher (7) and others, who showed experi- mentally that encysted Distomes grow mature directly after their transference from one host to another, and thus that a migration is necessary to the attainment of their mat- urity. Diesing’s great work (8) appeared in 1850, and has formed the groundwork of all subsequent treatises on the systematic arrangement of parasitic worms, although it included forms which really belong to quite different groups. In 1861 Van Beneden gained a prize offered by the French Academy by his elaborate memoir on the intes- tinal worms (9), in which he not only described many new and interesting forms, but gave anatomical details regard- ing others previously known, and entered into detailed comparisons between the Cestodes and Trematodes, both in their adult and immature states. Of recent years the chief additions to our knowledge have been more in the direction of further details regarding the structure and life-history of special forms than the elaboration of new general principles.

Anatomy.—In endeavouring to give a very bricf account of the more salient points in the anatomy of the Z’rematoda it has been thought expedient to select some well-known form as a type, and afterwards to indicate the

characters in which other species differ from it ; for this purpose the common liver-fluke, Hasciola (Distomumr)' hepatica has been chosen, as it is not unfrequently found in the bile-ducts of sheep and other domestic animals, and constitutes a scourge much dreaded by farmers. The account here given is in the main abstracted from Sommer (10).

External Appearance. —The animal has a flattened oval shape, with a sub-triangular process on the broader end, which represents the head. The total length varies from 20 to 35mm., the breadth from 6to 12mm. On superficial examination two narrower lateral areas may generally be distinguished from a broader median one ; the former are occasionally of a coarsely granular appearance and reddish-brown or orange in colour, and increase in breadth towards the posterior end of the body, where they commonly unite. The median area is commonly greyish-yellow in colour, sometimes spotted with black ; its anterior portion corresponds to the uterus, the posterior to the testes. Two suckers (fig. 1, A, 0, s) are in the middle line of the body; one is at the anterior extremity, and is directed forwards and somewhat downwards ; it is known as the

anterior or oral sucker, being perforated by the cesophagus. The posterior or ventral sucker is situated, as its name implies, on the inferior surface of the body, just behind the head-papilla. The

Fig. 1.—A, Fasciola hepatica, from the ventral surface (X 2); the alimentary and nervous systems only shown on the left side of the figure, the excretory only on the right. a, right main branch of the intestine; c, a diverticulum ; G lateral ganglion ; 7, lateral nerve; 0, mouth; p, pharynx; s, ventral sucker; ¢s, cirrus sac; d, left anterior dorsal excretory vessel; m, main vessel; », left anterior ventral trunk; «, excretory pore, B, Anterior portion more highly magnified (from Marshall and Hurst, after Sommer). cs, cirrus sac; d, ductus ejaculatorius ; , female aperture; o, ovary: od, oviduct; p, penis; s, shell- gland; ¢, anterior testis; w, uterus ; va, vp, vasa deferentia; vs, vesicula semin- alis; y, yolk-glaud; yd, its duct. ©, Genital sinus and neighbouring parts (from dohaaorh 4, ventral sucker; 6, cirrus sac; c, genital pore; d, evaginated cirrus sac (? penis); ¢, end of vagina; /, vasa dcferentia; g, vesicula seminalis; h, ductus ejaculatorius; ¢, accessory gland. D, A

ciliated funnel from the éx- cretory apparatus, highly magnified (from Fraipont.) 0, orifice of the funnel. E, Egg of Fasciola hepatica; x 330 (from Thomas).

suckers measure on an average about 1 mm. in diameter, the ven- tral being slightly the larger. The internal organs communicate with the outer world by four apertures :—(1) the mouth (0), situated at the anterior pole of the body and perforating the oral sucker ; (2) the excretory pore (x), placed at the opposite extremity, and giving exit to the effete products; (8) the porus genitalis (fig. 1, B, p), leading into a sinus into which the ducts of both sets of genital organs open,—it is to be found on the under surface of the head-papilla at or near its centre; (4) the opening of the Laurer-Stieda canal, situated on the dorsal surface of the animal, near the junction of the two portions of the median area,—it is excessively minute and difficult of detection. and leads by a narrow canal into the duct of the yolk-gland.

Internal Structure.—All Trematoda have been commonly re- garded, like other flat-worms, as devoid of a body-cavity (ccelom), and as consisting of parenchymatous tissue, in which the various organs were embedded. Recent researches of Fraipont (15) appear to show, however, that the intercellular spaces in this tissue are to be regarded as the homologue of a celom. The ‘body is enclosed by a complex sheath (cortex), which may be resolved into several layers, which will be discussed in order, proceeding from without inwards. (1) The cuticle, which encloses the whole body, is a thin, pellucid, structureless membrane; at the margin of the mouth it is reflected so as to form a lining for the cesophagus, and similarly at the opening of the genital sinus it passes inwards to form a lining to the vagina. The same phenomenon is observed at the excret- ory aperture. By the application of ammonia the cuticle may be separated from the subjacent tissues and its peculiarities demon- strated; although apparently smooth to the naked eye, it presents under the microscope numerous sharp backwardly directed pro- cesses, each of which encloses a hard stylet-shaped body. These prominences are closely set over the whole body except immediately

around the suckers, extending even into the interior of the sinus genitalis. The cuticle is furthermore perforated by innumerable fine pores, directed

outwards and somewhat backwards. With regard to the homology of the cuticle of Trematodes the same un- certainty prevails as in the case of Cestodes (see TapE- Worms); the general opinion is that it is not comparable with the chitin. ous cuticle of Arthropoda, but is either a s ecially developed base- ment-membrane (Kerbert, 11) or a layer of modified cells (Ziegler, 12, and Schwarze, 18). (2) The outer cellular layer is the matrix of the cuticle. (8) The muscular coat consists of three different layers :—(i.) a thin layer of circular fibres; (ii.) the longitudinal | muscles, which form a series of separate bundles; (iii.) the oblique muscles, confined to the anterior half or third of the body, and crossing so as to form a rhomboidal lattice-wor »—they are espe- cially strong on the anterior ventral aspect of the animal. (4) The inner cellular layer consists of elements which closely resemble those of the outer, but are somewhat larger; they have been mistaken by various observers for cuticular glands. The suckers may be con- sidered as parts of the cortical layer ; speaking generally, each has the form of the segment of a sphere, although the anterior one is shallower at the lower than at the upper margin, and is penetrated by the esophagus. Each consists of three sets of muscles, —a thin outer equatorial layer, a second meridional, and a mass of radially disposed fibres forming the greater part of the substance. It would appear that the function of the first two of these groups is to flatten out the sucker, whilst the radial ones restore its cavity and thus produce a suctorial action. To the ventral sucker are attached a number of muscular fibres belonging to the dorso-ventral system, and in particular a strong bundle, which passes from behind down- wards and forwards.

The digestive system (fig. 1, A), the presence of which furnishes Digestive one of the most characteristic differences between Trematodes and system.

Cestodes, extends throughout the body on a plane between the peripheral nervous and reproductive systems. It has only one aperture, as above- mentioned, in the centre of the anterior sucker. The anterior portion or pharynx, although very short, measuring not much more than 1 mm. in length, is again divisible into two sections. The hinder of these is the larger, and is sometimes spher- oidal but more commonly fusiform in shape ; it has strong muscular walls, which, in conjunction with protractor and retractor muscles, bring about a kind of pumping action whereby nutritive fluids are

taken into the stomach, which name may be applied to the larger posterior section of the alimentary tract, since in it the digestive processes are carried on. The canal, which leads from the posterior end of the pharynx, divides almost immediately into two branches, which diverge at first rapidly and then run almost parallel, as far as the hinder end of the body. Each of these gives off from its outer aspect some 16 or 17 lateral branches ©, which divide and sub- divide till their ramifications fill nearly the whole area of the body. The digestive tract is lined by a layer of simple cells, resembling a cylinder epithelium. These behave towards the blood corpuscles and other contents of the intestine exactly as would a number of Amebx, putting out processes or pseudopodia, which ingest them,— so that, in common with many of the lower Invertebrates, the liver-

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fluke lives by ‘intracellular digestion” (see Metschnikoff, 14),

The canals of the excretory system (m) may be divided into three Excretory consists of very fine tubules system.

groups. (1) The collecting network which anastomose freely with each other: they are situated on the boundary between the cortical and middle layers, and are therefore visible from either side of the body. (2) Conducting vessels (v, d) receive the contents of this network. Each of these is formed by the union of a larger or smaller number of the delicate canals just described, and after a longer or shorter course opens into the median excretory canal (m). On the way, however, it communicates with the neighbouring vessels, so that a second network is formed, which is distinguished from that of the collecting tubules by the greater size of its meshes and by the fact that it is specially visible from the dorsal surface of the animal. In the head four of these con- ducting vessels arise, which are disposed in two pairs, one situated dorsally and one ventrally. As they pass backwards they receive many branches, the dorsal unites with the ventral of its own side, and the two tubes thus formed unite to constitute the last division of the excretory system. (3) The median vessel (mm) passes along the body for the posterior two-thirds of its length, immediately beneath the dorsal cortical layer. It is widest near the commence- ment, where it measures about 0°5 mm. in diameter, and finally opens at the posterior

extremity of the body. The wall of the excretory apparatus is constituted everywhere by an exceedingly delicate elastic membrane, which exhibits neither a cellular lining nor cilia; furthermore, neither valves nor muscles have been de- monstrated in connexion with it. It contains a thin colourless fluid, in which very small highly refractive drops are suspended. The details of the termination of the excretory system seem to have been first clearly made out by Fraipont (15), who worked upon species in which they are more distinct than in the form now under consideration. The spaces between the round connective- tissue cells of the body are star-shaped in form, and into these the

Repro- ductive organs,

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finest excretory tubules, above mentioned, open by funnels (fig. 1, D), into each of which projects a vibratile cilium, thus constituting the so-called ‘‘flamc-cells.” These researches have given rise to numerous differences of opinion, as regards questions both of fact (16) and of priority (17).

The liver-fluke contains a complete set of male and female organs, which form the most conspicuous part of its anatomy, and both of which open into the genital sinus which has been described above. A. The Male Organs. (i.) The testes (fig. 1, B, ¢) are two in number, situated one behind the other in the hinder division of the median area. They rest upon the ventral cortical layer in the parenchyma

‘of the body, and immediately above them are the ramifications of

the digestive tract. Each consists of a large number of ramifying tubes, often with slightly dilated extremities. These unite into three or four, and eventually into two, main excretory ducts (va, vp), which terminate at the base of the cirrus-pouch. Within the testicular tubules may be found spermatozoa in all stages of de- velopment; the first stage appears to consist of small roundish membranelcss cells with a single nucleus; the nucleus then divides and the cells become polygonal from mutual pressure. These large cells lie in the middle rather than at the sides of the tube, and among them are a number which, while they possess on one side a smooth evenly

rounded contour, are on the other very irregularly and deeply serrated. These serrations elongate until they become the delicate filameuts of spermatozoa, the small shining heads of which are still embedded in the protoplasm of the cell. (ii.) The vasa deferentia (va, vp) are a pair of slender elongated canals, which lie on the two sides of the middle line, and unite at the inner extremity of the cirrus-pouch, which they penetrate in common. Their walls eonsist of a very delicate homogeneous but resistant membrane, upon which contractile fibres are disposed, close together and parallel to the axis. (iii.) The cirrus-pouch (¢ s) is a muscular egg- shaped organ; the upper pole, which receives the united vasa deferentia, is situated above the ventral sucker and separated by only a very slight interval from the dorsal cortical layer, whilst the position of the lower pole is indicated by the porus genitalis (p). The inuscles are disposed in two layers, of which the inner is thin and composed of circular fibres; the outer longitudinal layer is much thicker, and its fibres are disposed in bundles; furthermore its apex receives a large number of dorso-ventral fibres. Within the cirrus-pouch the two terminal sections of the male conducting apparatus are situated. (iv.) The first of these is the vesicula semin- alis (fig. 1, B, vs; C, g), a large, spindle-shaped dilatation of the canal usually more or less curved upon itself. Its wall is somewhat more complex than that of the vasa defcrentia, consisting of a layer of tissue with many nnclei but no distinct cell-boundaries, succeeded by a delicate layer of circular muscular fibres, which is again fol- lowed by a layer of longitudinal ones. (v.) The ductns ejaculatorius (fig. 1, C, 2), which immediately succeeds the vesicula seminalis, is a long slender tube, disposed in coils, and usually projecting like a papilla into the base of the sinus genitalis. Its walls are furnished with a number of unicellular glands. B. The Female Organs. The female reproductive apparatus may be roughly divided into two portions, that which produces the eggs and that which conveys them to the outside of the body ; in the former of these processes three organs take part—one producing the geri, another the second- ary or food-yolk, and a third the egg-shell. (i) The germarium or ovary (fig. 1, 13, 0) is situated between the anterior testis and the ven- tral sucker, in about three cases out of four on the right hand side of the body. It has the form of a branching tubular gland, the rami- fication being dichotomous throughout; in most cases the branches are about as large as the stems which give rise to them. The ovi- duct passes towards the shell-gland, narrowing as it approaches this, and finally unites with the excretory

duct of the yolk-glands. (ii.) The yolk-glands (y) of the liver-fluke are paired organs of consider- able size; they extend over both lateral areas, to which they impart the opaque appearance and reddish colour above alluded to. They are composed of innumerable small acini, spheroidal in shape and situated in groups on minute ductules, which unite to form a longi- tudinal canal on either side of the body. These canals are on the whole parallel to the margins of the animal and distant from it about one-fifth of its greatest breadth. At the anterior margin of the testicnlar area each longitudinal canal gives off a transverse branch, which unites with its fellow of the opposite side in the middle line to form a pear-shaped reservoir, situated just behind the posterior margin of the shell-gland. From this reservoir the eomimon yolk-duct passes forwards in the substance of the shell- gland and there unites with the oviduct. Previously to this, how- ever, it gives off a minute canal, which after an upward course opens on the dorsal surface of the animal; it is known as the Laurer- Stieda canal, and its function has been the subject of much discus- sion. It has been supposed (1) ‘‘ to serve for copulatory purposes,” as has been seen by Zeller (18) in Polystomum, and as is supported by its structure in Axine and Mierocotyle, and (2) “ to act as a safety tube for the escape of over-abundant or altered vitelline products and spermatozoa,” the main argument in support of which is that its ealibre is too narrow to admit of copulation taking place by

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its means; compare Sommer (10), Kerbert (11), Poirier (19), Looss (20), and Lorenz (21). (iii.) The uterus or female conducting appa- ratus (7) originates at the union of the ducts of the germarium and yolk-gland. Its first portion, which lies within the shell-gland, is a delicate narrow canal, except when it is distended either by eggs or by semen. The median section of the organ is by far the largest both in length and breadth; it occupies almost the whole of the anterior part of the median area of the animal, betwcen the ventral sucker and the shell-gland, and forms four or five large coils lying alternately right and left, which as a rule are filled with com- pletely formed eggs. The third section of this organ includes the coils which lie above and anterior to the ventral sucker ; it is some- times called the vagina. When it contains eggs these are generally ina single file, and thus give ita moniliform appearance ; it lies en- tirely on the left side of the

body, gradually approaching the middle line as it passes forward, until it ends below the cirrus-pouch at the left and postcrior aspect of the genital pore (fig. 1, C,c). (iv.) The shell-gland (fig. 1, B, s), which (as its name implies) furnishes the external coating of the eggs, has been already several times men- tioncd. In the Trematodes, as in the tape-worms, it forms a kind of central point of the female generative system; it is a spheroidal mass of unicellular glands, each of which opens by its own special duct into the commencement of the utcrus. The secretion of the shell-gland is liberated in the form of small pellucid droplets, which unite to form drops ; afterwards it becomes thick and viscid and of a mahogany brown colour. In this condition the drops are dis- persed through the uterus mixed with the secretions of the other genital glands, and they apply themselves to the recently formed eggs, producing a delicate membrane around them. This process is carried on in those coils of the uterus which lie immediately out- side the shell-gland, corresponding to the ‘‘ootype” described by Van Beneden in other Trematodes.

The eggs undergo a gradual development as they pass along the uterus. ‘The ripe primitive ovum, on entering the female conduct- ing apparatus, becomes coated with a larger or smaller number of spherules of secondary yolk, and then undergoes the process of segmentation which leads to the formation of a morula. At this point it receives the secretion of the shell-gland. The completely formed egg (fig. 1, E) hasa length of 0°13 mm, and is ovoid in shape, with a small lid or operculum at the broader end; its contents consist of a number of roundly polygonal cells, with only a small quantity of secondary yolk remaining among them. All of these but one have a thick granular protoplasm, the exceptional cell having homogeneous and strongly refracting contents. It usually lies immediately under the operculum, and is partly embedded in the other cells. They are often present in the bile-ducts in such quantities as to form a stiff brownish mass resembling wet sand, and the number produced by a single fluke has been estimated at half a million.

The mode of fertilization of the liver-fluke has given rise to much discussion. According to Sommer, the organ which has usually been described as a cirrns or penis is merely the genital sinus eva- ginated by abnormal pressure (fig. 1, C, d) ; it is furthermore but ill-adapted to enter

either of the canals which could possibly serve as a vagina. He is therefore of opinion that self-impregnation occurs, the external aperture being closed by the oblique muscles, and the semen passing directly from the vas deferens through the genital sinus into the uterus. The whole question of the fertiliza- tion of the Trematodes is a matter on which very varied opinions have been expressed, even by authors who have examined the same forms. The assertion of Von Siebold that a direct internal com- munication exists between the male and female organs has been denied by Stieda (22) and by many subsequent writers, but has been restated by Lorenz (21) and by Zeller in the case of Polystomum integerrimum (18); however this may be, there can be no doubt that self-impregnation does occur in certain cases. The structure of the organs renders it more than probable in some species (see Poirier, 19, p. 582) ; Zaddach has observed it actually taking place in Distomum eirrigerum encysted in Astacis (23), and a single Poly- stomam tnategerrimum has been found in a frog's bladder with sperm in the female passages. Reciprocal fertilization, in which two in- dividuals act both as male and female simultaneously, has been recorded by Zeller in Polystomwum integerrinvum, by Looss (20) in Distomum elavigerum, and by Cobbold in Distomwm eamputla.

The nervous system consists of a commissure passing round the Nervous cesophagus very obliquely, and swelling out into ganglia at three system.

points. Tristomwm molx possesses eyes of an extremely simple type, the retina being merely a ganglion cell (Lang, 24). Life-History and Development.—The life-history of Fasciola hepatiea was worked out independently by Thomas (25) and Leuckart (26); regarding the question of priority see Jackson (27). The development of the embryo can only take place outside the body of the host and at a lower temperature, the most favourable being from 23° to 26° C., at which the process occupies two or three weeks. The free embryo (fig. 2, A) is conical in shape, with a rounded apex, its average length being 0‘13 mm. At the broader anterior end is a retractile head-papilla, with the exception of which the body

is ciliated allover. The interior of the body is composed of granular nucleated cells, and it contains a double eye-spot, composed of two erescentic masses of pigment. There are also two ciliated funnels forming the rudiments of the excretory system and a granular mass behind the head-papilla, probably representing the digestive tract. The embryo swims actively about, but if it does not succced in meet- ing the appropriate host for its next stage of development (Limnexus truncatulus, a small pond snail) its period of vitality seems to be limited to about eight hours. If it should meet with one of these

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E Fig, 2.—Five stages in the life-history of Fasctola hepatica; all highly magnified. A, The free-swimming embryo. B, A sporocyst containing young rediz. C, A young redia, the digestive tract shaded. D, An adult redia, containing a daughter-redia, two almost mature cercarize, and germs, E, A free cercaria. The letters have the same significance throughout. c, nearly ripe cercarie ; cc, cystogenous cells; dr, daughter-redia; dt, limbs of the digestive tract; J, head-papilla; h, eye-spots ; h’, same degenerating ; &’, germinal cell ; J, cells of the anterior row; m, embryo in optical section, gastrula stage ; m, pharynx of redia ; 0, digestive sac; oe, esophagus ; p, lips of redia ; qg, collar; 7, processes serving as rudimentary feet; s, embryos; ¢, trabeculz crossing body-cavity of redia ; uw, glandular cells (?); v, birth-opening; w, w’, morule ; y, oral sucker; y’, ventral sucker; z, pharynx. (All from Marshall and Hurst after Thomas.) snails it applies the head-papilla to some part of its surface and begins to bore, twisting round and round on its axis by means of its cilia, the head-papilla becoming pointed and elongated to four or five times its original length. Eventually the tissues of the snail are separated as if by a wedge, and a gap is formed through which the embryo forces an entrance into its body. Here it under- goes a metamorphosis, losing its organs of locomotion and becom- – ing what is termed a ‘‘sporocyst” (fig. 2, B). This is an elliptical sac, which commonly attains a length of 0°7 mm. Its wall con- sists of a structureless cuticle, beneath which are external, circular, and internal longitudinal muscle-fibres. These are succeeded by an epithelium, the elements of which vary greatly in size. These sporocysts may be produced by a process of transverse fission. Within the sporocyst rounded masses of cells are formed (morule),

which undergo a process of invagination, producing a gastrula, which again develops by the formation of a digestive tract into what is known as a ‘‘redia”’ (fig 2, C, D). This forces its way through the wall of the sporocyst, which heals up immediately, and then wanders through the tissue of the snail, most commonly finding its way to the liver. If many redie are present the snail usnally perishes. The adult redia may attain a length of 16 mm. It has an elongated cylindrical form, and near its posterior extremity are two processes directed backwards, which probably serve as aids to locomotion. At the anterior extremity is the mouth, leading into a muscular pharynx, followed by a saccular digestive tract. A ring-shaped thickening is seen a little way behind the mouth, and immediately posterior to this a special aperture for the exit of the germs formed within the redia. About a score of these are usually to be found in all stages of development, the earliest being a rounded mass of cells (morula), which elongates, one end at the

same time becoming more attenuated than the other, and gradually forming an elongated tail, while the body becomes oval and de- pressed (fig. 2, E). ‘Two suckers and the rudiment of the future digestive tract make their appearance. As soon as the “ cercaria,” this being the name given to the present organism, has attained this stage of development it emerges from the redia, and by the aid of its suckers and tail wriggles its way out of the host, swimming freely about in the water. Like other cercarie developed in rediee this one has no head-spine, but in mature examples the anterior of the body often exhibits a number of very minute spines. An interesting feature in the animal is the presence of the ‘‘cysto- genous cells,” two lobate masses arranged one on each side of the body. These cells contain small rod-like bodies, whence they have been termed ‘‘cellules & batonnets,” and similar bodies have been found in the protective cyst which they excrete; Sonsino (28) has suggested that they may assist in imparting stiffness to this strue- ture, and has noticed that they are more abundant in those forms which encyst in the open air. When the cercaria has swum about for a short time it finds its way to the water-plants, and encysts itself on their stems and leaves. During this process the tail is swung vigorously about, until finally a more violent motion de- taches it; at the same time the cells just mentioned throw out a gummy secretion, which rapidly hardens and encloses the ecercaria in a kind of case. It is in this condition that the larve

are swallowed by the grazing sheep to form sexually mature flukes in their livers.

The life-history of a typical digenctic Trematode may be summed up as follows:—(1) the egg, produced sexually; (2) the ciliated embryo; (3) the sporocyst; (4) the redia, produced asexually ; (5) the cercaria, produced asexually; (6) the adult Trematode. Hence it would appear that the digenetic forms have at least one, usually many, asexual generations before the sexual one appears. The embryo may form either a sporocyst or a redia, these two forms being distinguished by the presence of a digestive tract and of a special birth-opening in the latter. Within these parent forms the germs may arise from two sonrces,—the eclls which occupy the central region of the young sporocyst or redia, or the epithelium lining the body-walls. “The germs to which a sporocyst gives origin may develop in some instances into sporocysts, in others into rediz or into cercarie. And it does not seem certain that there is any limit to the possible number of successive generations of redi. Both cercarie and redie may occur side by side in the same nurse. The last term in the series is, however, invariably a eercaria.”

Pagenstecher, Ercolani (29), and others have stated that the tail of a cercaria may become a sporocyst and produce germs, but this has not met with general acceptance, and the supposition is not supported by the structure of the tail, which consists of a “con- tractile substance, occupying the axis and periphery, with large vesicular cells between” (Schwarze, 13). Ercolani (29) has also published striking statements to the effect that the structure of these entozoa is so profoundly modified by their habitat that what have been hitherto described as distinct species may be only ‘“‘ local varieties’; thus he finds that Cercaria armata develops in Tropi- donotus into Distomum signatum, whilst in Aus nuusculus and MM. decumanus it becomes a distinct dwarfed form, D. muris.

Pathological and Economic Relations.—Although the number of Trematodes which have been recorded from the human body is about equal to that of the Cestodes, the medical significance of the former is much less than that of the latter, because as a rule they occur in smaller numbers and are less apt to invade organs of vital importance. The Trematodes which have been found in man are—

Fasciola hepatica, Linn., . in the liver.

Distomum lanceolatum, Mehlis, : , . oo iwer:.

D. ophthalmobium, Diesing, . 5 : 5 » lens ofthe eye, D. heterophyes, Bilharz, . 4 * . < », Small intestine, D. crassum, Busk=D, buskii, Wedl, : : » intestine.

D, capense, Harley, . . : 5 : 5 »» eggs in the blood. D. spatulatum, Leuckart, . “ F 3 ‘5 sy diver.

D, endemicum, Baelz, ; 5 ‘ 3 : 45 Liven.

D, hepatis innocuum, Baelz, . . : o9 abyer:

D. rathouisi, Poirier (42), , F : : sy diver

Bilharzia hematobia, Cobbold, s ; i » veins of bladder, &c. Monostomum lentis, Nordmann, 7 5 »» lens of the eye. Hexathyridium pinguicola, Treutler, 5 a 3) ovary.

i, venarum, Treutler, . veins,

For the general principles which govern the pathological effects of Trematodes in common with other entozoa, reference may be made to the article TapE-Worms; only a few special cases need be alluded to here. The occurrence of most of the forms in the above list has only been recorded very few times, and in many cases the effects produced were very inadequately studied, so that we can hardly be said to possess a knowledge of their individual pathology. Ina case of Distomwm lanceolatum which occurred in Bohemia, the liver was enormously enlarged and the contracted gall-bladder contained eight calculi and forty-seven flukes; the symptoms during life were emaciation, pain over the liver, and distention of the abdomen.

The effects produced by Bilharzia hematobia are very well de- fined and exceedingly disastrous. The mature worms in eouples

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inhabit the veins, especially those of the urinary bladder and mesentery ; extravasations of blood and villous growths or ulcera- tions of the mucous membrane of the bladder present themselves, and thus the eggs of the parasite find their way into the urine, in which they are evacuated, and can be detected by microscopic examination. With the characteristie presence of the eggs are associated colic, anemia, and great prostration of the vital powers, more particularly in the later stages; the disease when once fairly established is almost always fatal ; see Cobbold (1).

From a practical point of view by far the most important Trema- tode is Fasciola (Distomum) hepatiea, which gives risc to the disease known as ‘‘liver rot” in sheep. It is always more or less abund- ant in certain districts, and it is estimated that in the United Kingdom the annual loss of sheep due to it is not less than 1,000,000. The symptoms are said to be emaciation, tenderness in the loins, harshness and dryness of the wool, and a scaly con- dition of the skin. On post-mortem examination fluid is found in the peritoneal cavity and the viscera have a blanched appearance ; the liver is dark chocolate or sometimes pale in colour, nodular, and uneven, the ducts are thickened and Distomes are found within them. Dead flukes have been known to furnish the nuclei of gall-stoncs in the gall-bladder. Briefly stated, the principal preventive measures seem to be as follows :—(1) destruction of the

eggs, and especially abstention from putting manure of rotten sheep on damp ground ; (2) slaughter of sheep which are badly

fluked ; (3) adequate drainage of pastures ; (4) an allowance of salt and a little dry food to the sheep; and (5) dressings of lime or salt on the ground to destroy the embryos (Thomas, 25). A series of wet seasons increases the prevalence of the malady, and animals which have been allowed to graze in low-lying ill-drained lands are specially liable to infection—facts which are readily explicable on a consideration of the life-history given above.

: chat Arrangement.—The Trematoda may be classified as ollows :—

1. MONOGENEA, Van Beneden; development direct, that is, without the media- tion of nurse forms.

(i.) Tristome, Leuckart; body roundish or elongate; posterior extremity never specially developed. Two adoral suckers often present; a large ventral sucker often armed with chitinoid structures. Sexual apertures on the left side or sdmedian. Laurer-Stieda canal single or double. Ova with a filament at one pole only.

1, Tristomide, Van Beneden.—l. Zristomum, Cuvier; about a dozen genera of previous writers are here included; over 14 species are known, all parasitic on fishes ; Taschenberg (80).

2. Monocotylidz, Taschenberg.—1. Calicotyle, Diesing; only species C. kréyeri (31). 2. Pseudocotyle, Taschenberg. 3. Monocotyle, Taschen- berg; only one species, M@. myliobatis, on the gills of the eagle-ray (Myliobatis aquila).

3. Udonellidz, Johnston.—l. Udoneila, Jhnst.; five species, the type being U. caligorum, parasitic on a erustacean (Caligus), which in its turn in- fests the holibut (Zippoglossus vulgaris).

(ii,) Potystommm, Leuckart; body elongate, pointed and narrow anteriorly; broad behind and generally provided with special organs of adhesion in the shape of suckers or chitinoid hooks, of suckers or claspers with chitinoid strnctures. Two adoral suckers in some instances. Sexual apertures median. Laurer-Stieda canal single or double. Male sexual aperture often armed with chitinoid hooks. Ova frequently provided with two long appendages.

1. Octobothriidz, Taschenberg.-—1. Octobothrium, Nordmann; about a dozen genera of various authors are here included by Taschenberg (80), containing fourteen species, parasitic on fishes, and almost invariably on the gills. 2. Anthocotyle, Hesse and Van Beneden; one species (A. merlucti), found in the hake. 38. Phyllocotyle, Hesse and Van Beneden; one species, from the gurnard. 4. Platycotyle, Hesse and Van Beneden ; one species, from the gurnard. 5, Pleurocotyle, Gervais and Van Beneden (=G@rubea cochlear, Dies.); one species, from the gills of the mackerel. 6. Diplozoon, Nordmann (see below). 7. Hexacotyle, Blainville ; one species, from Thynnus brachypterus. 8, Plectanocotyle, Dies.; from the gills of Labrax mucronatus.

2. Polystomide, Van Beneden.—1. Polystomum, Zeder; two species, best known P. integerrimum (see below); Hexathyridium is probably a synonym. 2. Onchocotyle, Dies.; tive species, from the gills of sharks and rays. 38. Erpocotyle, Hesse and Van Beneden; one species, from the gills of Mustelus levis. 4. Diplobothrium, F. S. Leuckart; one species, from the gills of a sturgeon.

3. Microcotylide, Taschenberg.—l. Axine, Abildgaard, two species. 2. Microcotyle, Van Beneden ; about half a dozen species, all parasitic on the gills of fishes (see below). 3. Gastrocotyle, Hesse and Van Bene- den; one species, from the gills of Caranz trachurus. 4. Aspido- gaster, Von Baer (sce below). 5. Cotylaspis, Leidy; one species, occurring in Anodonta. 6, Aspidocotyle, Dies.

4, Gyrodactylide, Van Beneden.—1. Gyrodactylus, Nordmann (see below). 2. Dactylogyrus, Dies.; about twenty species, all parasitic on fishes, mostly on the gills. 8. Zetraonchus, Dies.; three species, on the gills of freshwater fishes. 4. Dtplectanum, Dies. 5. Calceostomum, Van Beneden; one species, on the gills of Sctwna aquila. 6. Sphyranura, Wright (34, 45); one species, from the mouth of Menobranchus lateralis.

IT. DIGENEA, Van Beneden ; one or more non-sexual forms intervene between two successive sexual forms.

(i.) Monosromipz, Van Beneden ; elongate, oval, or rounded in shape ; one oral sucker.—l. Monostomum, Zeder ; fifty to sixty species in mammals, birds, and fishes; type, 4. mutabile, Zeder, found in the body-cavity and eye of water-birds. 2 Notocotyle, Dies.; MW. triseria’e, Dies. (=Monostomum verrucosum).

“i.) Distomipa, Van Beneden; body flattish, more or less leaf-like or clougate; an oral and a ventral sub-median or posterior sucker.—l. Distomum, Retzius (see below). 2. Fasciola, Linn.; three species are known; F. hepatica is described above ; F. giganiea inhabits the liver of the giraffe: 3. Bilharzia, Cobbold (= G@ynxcophorus, Dies.) ; one species (sée below). 4: Echinostomum, Dujardin; &. gadorum, Van Beneden, in the intestine of Gadus carbonarius (the coal-fish), and tweuty-five

other species in the alimentary canal of mammals, birds, and fishes, 5, Amphistomum, Rudolphi; about twenty species in different Verte- brates ; A. subclavatum (G6ze) in the rectum of the frog. 6. Gastrodts~ cus (?), Leuckart (see also 37). 7. Homalogaster, Poirier (38). 8. Gas- trothylaz, Poirier. 9. Euryceelium, Brock (44), has the excretory vessels dilated into wide chambers (? ccelom).

(iii.) GASTEROSToM1D#, Von Siebold; oral sucker sub-median and ventral; also an anterior sucker.—1. Gasterostomum, Von Siebold; eight species, all in fishes; larval form Bucephalus (see below).

(iv.) Hotostomip", Claus (48); body flattened, and divided into an antcrior and posterior part, the former bearing an anterior and ventral sucker; two adoral lobes with glands in connexion, or a circumoral fold with lobes.—1. Holostomum, Nitzsche; twenty-three species, most in water- birds; H. variabile, in various raptorial birds; larval forms Tetracotyle and Diplostomum. 2. Hemistomum, Dies.; three species, one in the wild-cat, two in birds. 3. Hustemma, Dies.

The true position of the following is doubtful:—Nematobothrium, Van Bene- den (9); Didymozoon, Von Linstow (30); Stichocotyle, Cunningham (89).

Dipiozoon paradoxum (18) infests the gill of the minnow in large numbers. The eggs hatch in the water, continuing to be attached to the gill by a filament at

Fie. 3.—A, Diplozoon paradoxum, two united specimens, B, Polystomum inte- gerrimum; Xabout 100 (after Zeller). C, Microcotyle mormyri; x7. D, E, two views of the chitinous framework of a sucker of Axine belones; highly magnified (after Lorenz). F,

one extremity. The embryo is elongated oval in shape, and ciliated all over ; on its back are two eyes, consisting of a cup-shaped mass of pigment, with a spheroidal lenticular body. It presents also the mouth with two peculiar suckers, the ceso- phagus and intestine, and the two claspers of the Diporpa.

The embryo swims vigorously about until it finds its way to the gill of a minnow, failing which it dies in about six hours. Attached to its host it may live isolated for a considerable time, increasing in size; usually, however, it unites with another individual in a kind of reciprocal copulation (fig. 3, A). One individual by means of its ventral sucker seizes the dorsal papilla of another, and then the two twist across each other so that the sucker of tlie second seizes the papilla of the first. After this a complete fusion of the individuals takes place, the papillz and suckers growing together so firmly as to be anatomically inseparable. Both individuals continne to grow and develop a second, third, and sometimes a fourth pair of claspers.

In Polystomum integerrimum (18), which inhabits the bladder of the frog, the eggs are developed during the winter and are laid in the spring, when the frogs resort to the water. 1t appears probable that the worm protrudes its body from the frog and thus deposits the egg directly in the water. The young worm, as it escapes from the egg, which takes place aftcr a lapse of six or eight weeks, measures about 0°3 mm. in length, and swims vigorously about by the aid of a coating of cilia. At its posterior extremity is a rounded disk (fig. 3, B_, round the margin of which sixteen delicate hooks are placed at equal intcrvals. Above the four hindmost of these are two others still smaller and more delicate. Upon the back are situated four eyes disposed in pairs. The mouth is wide and leads into a pharynx, and this into the intestine; two excretory vessels are present, but there is no trace of generative organs. The hindermost pair of suckers is the first to be developed, and they enclose those two hooks which lie at the outer side of the very delicate ones mentioned above, which eventually become the strong terminal hooks of the adult. The other two pairs of suckers are formed in a similar manner, the development of all three being usually completed during the month of July. The young Polystomum attacks not the full-grown frog but the tadpole, entering the gill-cavity and subsequently proceeding to the bladder. Like the frog it requires four or five years to attain sexual maturity. In certain cases the Polystomum does not migrate; it then becomes prematurely sexual and dies when the tadpole nndergoes meta:norphosis ; under these circumstances the sexual organs are simpler than usual: the testis is simple; the germarium is long and coiled; there is neither prostate nor Laurer-Stieda canal; and the oviduct has no dilated anterior portion.

Microcotyle mormyri, Lorenz (21) (fig. 3, C), has no penis, the semen issuing by an opening posterior to the spiked birth-opening; the vagina opens medially, not

marginally. The posterior extremity is pointed. Aine belones, Abildg.,resembles it, but is broad and obliquely truncated behind, this margin bearing a row of fifty to seventy peculiar attaching organs, which are of the form of a hand-satchel (fig. 3, D, E), the metal clasp being represented by a complicated chitinous framework. There are four groups of hooks and one ring of the same round the genital open- ing. The mouth has a sucker at cither side, and above it an oval body which can be evaginated like the proboscis of a Dendrocele Plauarian.

Aspidogaster conchicola (32) is found in the pericardial cavity of the freshwater mussel; it is conical anteriorly with a terminal oral sucker; the ventral sucker is very large and divided into rectangular areas; the excretory pore is at the pos- terior extremity of the body, and the genital organs open on the left side of the fore-part of the anlmal (fig. 3, F).

Gyrodactylus elegans (38) is found on the fins and surfaee of the body of the pike, stickleback, and other freshwater fishes, and measures about 0°56 mm. in length ; it is flattened in form and tapers towards cither end (fig. 38, G). At the anterior extremity are two lappets, while the postcrior is furnished with a sub- triangular plate, which bears the organs of attachment in the shape of two large curved hooks inits centre and sixteen smaller ones on its circumference. The most interesting peculiarity, however, of this form is to be found in the fact that each embryo before it is extruded (the animal is viviparous) contains another embryo, and this in its turn another, so that three embryonic generations are present simultaneously. oles A

The genus. Distomum is by far the most extensive in the group, containing at the present time over 300 species, which occur almost exclusively in Vertebrates ; the most important are perhaps D. lanceolatum, which inhabits the same situa- tions as Fasciola hepatica, D. clavigerum, from the frog, and De militare, Van Beneden, from the intestine of the duck. The name Fasciola (Linn.) has the priority over Distomum (Distoma) of Retzius,

which, however, has obtained ex- tensive currency. The name Fasciola may appropriately be used in a restricted sense for forms which have a branched digestive tract, F. hepatica above de- scribed being taken as the type. This separation has not met with gencral recog- nition, although supported by Blanchard and Cobbold (1). W einland has proposed to substitute the term Dicroceelium, used by Dujardin, for Distomun, retaining Fasciola for the type-species, but this proposal has not met with acceptance. The Distomes vary in size from forms almost microscopic to those which, like D. ingens, Moniez (35), measure 6 cm. long in alcohol, or even 12°5 cm. in the fresh condition (D. gigas, Nardo). Distomum halosaurz, Bell (86), is parasitic upon a dcep-sea fish taken in 1090 fathoms, Distomum macrostomum (fig. 4, B) of the woodpecker (Apternus tridactylus) has a remarkable larval form known as Leuco- chloridium paradoxum, which is parasitic on Succinea putris, and consists of a number of branching threads, from which are developed one or two contractile sacs (fig. 4, C, D). Their growth distends the tentacle until it bursts and the sac

Fic. 4.—A, Bilharzia hematobia, the thin female in the gynecophoric canal of the stouter male; x15 (after Leuckart), B, Distomuwm macrostomum, showing the digestive and the greater part of the genital apparatus with the cirrus pro- truded; x30. C, Snail (Succinea), the tentacles deformed by Leucochloridium ; natural size. D, Leucochloridiun: removed from the tentacle; natural size (after Zeller). E, Bucephalus polymorphus; highly magnified (after Zieglcr). F, Portion of a sporocyst containing Bucephalt in process of development; xX about 50 (after Lacaze- Duthiers).

hangs outwards. The threads within the Succinea contain only granular cells» whilst the contractile sac is occupied by an organism ovoid in form, with a thick clear border, the rudiments of two suckers, a digestive tract, and excretory system.

Bitharzia hematobia, Cobbold (1), is one of the most dangerous human parasites, and occurs in the blood of the portal vein and in the veins of the mesentery and bladder. The sexes are distinct, the female being from 16 to 20 mm. in length, and somewhat resembling a Nematode on superficial examination. The male is only from 10 to 14 nm. in length, but much thicker. The surface of the female is covered with fine spines most distinct

towards the tail; at the anterior pointed extremity is the oral sucker, from which a narrow opening leads into a wide pharynx, followed by the intestine, which at first forms two branches, these ugain uniting posteriorly to the generative organs. The ventral sucker is placed

only 0°2 mm. behind the oral one, and it is immediately succeeded by a long narrow groove, which extends down the ventral surface and corresponds to the canalis gynzcophorus of the male (see fig. 4, A).

The stages in the life-history of Gasterostomum are so remarkable that a short account of them must be given. From the egg there escapes (1) a club-shaped embryo, which in a manner hitherto unobserved enters the freshwater mussel, Anodonta or Unio, where it forms (2) the sporocyst (fig. 4, F); this is several centi- metres long and provided with lateral branches; it occurs chiefly in the liver and ovary, and it is best developed near the skin. The wall of the sporocyst consists of cells, muscles, and perhaps a cuticle; the extremities are pointed and filled with cells, and it is here that growth takes place. Within moniliform dilatations of these ramified tubes are formed balls of cells, each of which develops into (3) a *“bucephalus.” This organism (fig. 4, E) consists of a small oval body about 0°25 mm. in length with a double tail. At one extremity is a mass of glands with an invagination of the integument, which has been mistaken by many observers for the alimentary canal. This, however, opens about the middle of the body, and consists of a muscular pharynx, a forwardly directed oesophagus, and a simple saccular intestine. The excretory system terminates in an S-shaped vesicle, which opens posteriorly in such a way that its contraction drives the fluid into the tail, whence it prebably finds its exit by osmosis. Traces of genital

organs are found in the form of an elongated plug of cells in the hinder fourth ‘

of the body, and two rounded masses of undifferentiated cells situated dorsally. The tail is double, and from about 0°5 to 2°56 mm. long according to its state of contraction. Each half consists of a spheroidal basal portion, and an elongated tapering filament. These caudal appendages contain many nucleated connective- tissue cells with fine protoplasmic processes, The larve swim freely in the water, but sink and perish after about twelve hours,

unless they enter-the mouth of certain fishes (e.g., Leuciscus erythrophthalmus), when (4) they lose their tails and become encapsuled under the skin. The generative organs now become further developed; cuticular spines and the anterior sucker are formed. [If the fish thus infected be swallowed by a pike or perch the cyst is dissolved, and the worms (5) become adult, eontinuc to live in the intestine, and produce eggs. For further details, see Ziegler (12).

Phylogenetic Relations—The detailed comparisons of Van Beneden (9) and the subsequent researches of others leave no doubt that the Trematoda are closely related to the Cestoda. A considcration of their peculiarities leads moreover to the opinion that the former are more primitive than the latter; that is to say, the common ancestors of the two groups resembled Trematodes rather than Cestodes. The ancestry of the 7'rematoda is probably to be sought in types such as the Planarians rather than the Leeches ; characters uniting them with the former are the possession of a commonly branched alimentary canal without an anus, but with a powerful pharynx; the gencrative system is hermaphrodite, and similar arrangements obtain in the excretory vessels, nerves, and muscles, while histological agreements also are not wanting. Furthermore, certain forms are known which help to fill up the gap between the two groups: Monocelis cwudatus has a discoid posterior organ of attachment, and I. protractilis a true sucker. Such forms as these could scarcely be distinguished from ectoparasitic Trematodes ex- cept for their ciliated epithelium (Leuckart, 1). In this connexion, however, it is worth while to call attention to the researches of Fewkes (40) on a marine cercaria, which had a tail distinctly annelid in character, with bundles of bristles disposed at intervals along it. Compare also Schauinsland (41).

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TRENCH, RicHarp CuHeENEVIx (1807-1886), arch- bishop of Dublin, poet, scholar, and divine, was born at Dublin, September 9, 1807, and graduated at Trinity College, Cambridge, in 1829. While incumbent of Curd- ridge Chapel, near Bishop Waltham in Hampshire, he published (1835) The Story of Justin Martyr and other Poems, which, having been very favourably received, was followed in 1838 by Sabbation, Honor Neale,

and other Poems, and in 1842 by Poems from Eastern Sources. ‘These volumes revealed the author as decidedly the most gifted

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of the immediate disciples of Wordsworth, with a warmer colouring and more pronounced ecclesiastical sympathies than the master, and strong affinities to Tennyson, Keble, and Milnes. In 1841 he resigned his living to become curate to Samuel Wilberforce, then rector of Alverstoke, and upon Wilberforce’s promotion to the deanery of West- minster, in 1845, he was presented to the rectory of Itchenstoke. In 1845 and 1846 he preached the Hulsean lecture, and in the former year was made examining chaplain to Wilberforce, now bishop of Oxford. He was shortly afterwards appointed theological professor and examiner at King’s College, London. In 1851 he estab- lished his fame as a philologist by his charming little work on The Study of Words, originally delivered as lectures to the pupils of the Diocesan Training School, Winchester. His purpose, as stated by himself, was to show that in words, even taken singly, “‘ there are boundless stores of moral and historic truth, and no less of passion and im- agination laid up ”—a truth enforced by a number of most apposite illustrations. The book may be regarded as a comment on the saying that “language is fossil poetry.” It was followed by two equally delightful little volumes of similar character—Knglish Past and Present (1855), and A Select Glossary of English Words (1859). All have gone through numerous editions, aud they have probably con- tributed more than all the labours of severer but less cultured and tasteful philologists to promote the historival study of the English tongue. Yet Trench did little more than indicate the existence of a vast region of research extending over all literary languages. Another great service to English philology was rendered by his paper, read before the Philological Society, ‘On some Deficiencies in our English Dictionaries” (1857), which gave the first impulse to the great enterprise now proceeding under the auspices of Dr Murray. His advocacy of a revised translation of the New Testament (1858) powerfully aided to promote another great national undertaking. In 1856 he published a valuable essay on Calderon,

with a transla- tion of a portion of Life is a Dream in the original metre. He had not, meanwhile, been forgetful of professional claims upon his pen. In 1841 he had published his Votes on the Parables, and in 1846 his Notes on the Miracles, works which, containing much to gratify every school of thought, and little to offend any, obtained the most exten- sive popularity, and have been resorted to by English theologians of all persuasions, who have turned the author to the same account as he has turned his patristic, Romanist, and Lutheran predecessors. There is, in fact, very little originality in these volumes, but they are treasuries of erudite and acute illustration, selected from various quarters with admirable judgment, and displayed with consummate taste.

In 1856 Trench was raised to the deanery of West- minster, probably the position in the whole church which suited him best. In January 1864 he was advanced to the more dignified but less congenial post of archbishop of Dublin. Stanley had been named, but rejected by the Trish Church, and, according to Bishop Wilberforce's corre- spondence, Trench's appointment was favoured neither by the prime minister nor the lord lieutenant. It was, more- over, unpopular in Ireland, and a blow to English litera- ture; yet the course of events soon proved it to have been most fortunate. Trench, indeed, could do nothing to prevent the disestablishment of the Irish Church, though he resisted with dignity, and repelled the insidious pro- posal that she should do execution upon herself. But, when the disestablished communion had to be reconstituted under the greatest difficulties, it was found of the highest importance that the occupant of his position should be a man of a liberal and genial spirit, able to ward off the

narrowness which would have alienated the sympathies of English churchmen, and sown the seeds of schism in a body beyond all others in need of amity and unity. This was the work of the remainder of Trench's life; and, if less personally agreeable and of less general utility than the literary performances which might have been expected from him if he had remained at Westminster, it was much more weighty and important. It exposed him at times to considerable misconstruction and obloquy, but he came to be appreciated, and, when in November 1884 he resigned his

archbishopric from infirmity, clergy and laity unani- mously recorded their sense of his ‘‘ wisdom, learning, dili- gence, and munificence.” He had found time for Lectures on Medizxval Church History (1878) ; his poetical works were rearranged and collected in two volumes (last edition 1885). He died in London, after a lingering illness, on March 28, 1886.

As a man Trench was universally beloved and esteemed. He was remarkable fora high spirit, munificence, and general elevation of sentiment. Asa prose author he ranks among the most useful and agreeable of his generation, and may almost be said to gain in both respects by his deficiency in originality. Both as Biblical commen- tator and philologist, he has done far more by popularizing the researches of more exact scholars and more profound thinkers than he could have done by striving to make discoveries of his own. For durable fame as a poet originality is indispensable, and here Trench fails. The style of his poems is frequently admirable, but even when not obviously derived from some other writer it wants the stamp of strong individuality. He has written little beyond the reach of any man uniting exquisite culture to the accomplish- ment of verse: the pieces where poetry seems a natural language with him are chiefly to be found among his elegiac poems, which express real personal experience, and appeal movingly to the heart. (R. G.)

TRENCK, the name of two barons of old German extraction, who, endowed with exceptional physical powers, and each blending to a singular if not to an insane degree the hero and the Bobadil, have left startling records of not wholly dissimilar adventures and misfortunes.

1. Franz, BARON VoN DER TRENCK (1711-1749), was born at Reggio, Calabria, where his father was lieutenant- colonel in the Austrian service. After his rough early training in the camp, he made himself so unendurable at the college of Vienna that he was speedily removed, and entered in 1727 as ensign in the Palfy regiment, from which, however, after a brief but riotous course of duelling, gambling, and love-making, he received a new dismissal. He returned to his father, and, on the outbreak of war between the Russians and Turks, raised a corps of 300 men at his own expense and joined the Russian army on the Hungarian frontier. His brilliant exploits won him the favour of his commander, but a breach of orders, followed by

an assault on his colonel, brought him under sentence of death, from which a daring feat of arms alone saved him. A sentence of exile to Siberia, incurred soon after by a second affray with a superior officer, was commuted to imprisonment at Kieff and expulsion from the country. His term of imprisonment having expired, he retired to his estate, where he armed and drilled his vassals, and in a series of encounters compelled the Slavonian brigands to seek refuge in Turkish territory. From these marauders he recruited in 1740 the formidable body of pandours with which he joined the levies in aid of Maria Theresa. Repulsing the French near Linz, he penetrated into Bavaria, took Deckendorf and Reichenhall, and destroyed Cham,—the conduct of his troops being marked not less by atrocity than by desperate courage. Recalled to Vienna to render account for the cruelties practised, he refused to defend himself, and, being set at liberty, rejoined his men, opened in 1743 a passage across the Rhine for the army, and became as much the terror of Alsace as he had been of Bavaria. On tle retreat of the army to Bohemia he covered the rear and took several towns, but had his right

foot crushed by a cannon-ball. surgeon, and, having made a species of triumphal entry into Vienna, he resuined his command. But in September 1745, after having boldly penetrated with his pandours to the tent of Frederick II., he suffered the king to escape him while his followers were stopping to plunder, and he was thereupon accused of having been bribed by that monarch to release him. He was condemned on inquiry to pay an indemnity for peremptory dismissal to the officers accusing him, but he refused to acknowledge the sentence, and, raising new troops, added to the list of his exploits. His conduct leading to a renewal of the inquiry, he laid hands on the president of the court-martial and was thrown into prison, but was enabled to escape by the baroness Lestock, with whom he fled to Holland. He was brought back to Vienna, and condemned to perpetual im- prisonment in the Spielberg, where, finding escape impos- sible, he poisoned himself, October 1749, at the age of 38.

See his autobiography—Merkwiirdiges Leben und Thaten des Freiherrn Franz von der Trenck, Vienna, 1770; also, Franz von der Trenck, by E. F.

Hiibner, with preface by Schubart, 3 vols., 1788.

2. FRIEDRICH, FREIHERR VON DER TRENCK (1726-1794), cousin of the preceding, born at Konigsberg, 16th February 1726. His precocious abilities won him the favour of Frederick the Great, in wliose guards he was enrolled at an early age as cadet, and by whom he was made cornet in 1743 and aide-de-camp for his gallantry in 1744. An intrigue with the princess Amelia, sister of the king, led to his temporary confinement until the campaign of 1745 recalled him to the army. He was again thrown into prison, however, on the discovery of a correspondence between him and his cousin, then fighting with his pandours in the service of Maria Theresa, but in December 1746, after many failures, he succeeded in escaping from the fortress of Glatz. He went to Vienna, was involved in several duels by his cousin, who was too closely confined to give expression to his animosities except by proxy, and finally accepted a company in the service of the ezar. On the declaration of peace the empress Elizabeth bestowed on him a diamond-hilted sword, and a Russian princess left him a fortune, which was still further increased by the death of his cousin, who, on condition of his entering none but the Austrian service, made him his heir. The latter inheritance being heavily burdened, he spent the next three years in a series of lawsuits, and then, after a journey to Italy, became a captain in an Austrian regiment of cuirassiers. At the death of his mother he revisited Ger- many, but was promptly seized by the unforgetful king and closely imprisoned in the fortress of Magdeburg, his efforts to escape securing him the honour of a specially constructed cell, a heavy burden of chains, and the additional punishment of being roused every quarter of an hour by the sentries, Still unsubdued, he found means to remove his chains in the brief intervals afforded him, and occupied himself with French and German composition. In the meantime the princess Amelia had not ceased to move in favour of his release, and Trenck, having been set free in 1763, returned to Vienna only to be recoufined there as a lunatic. He was speedily released by the inter- vention of the king, and raised to the rank of major by way of compensation ; but, being by this time satiated with

royal patronage and prisons, he retired to Aix-la-Chapelle, |

commenced business as a wine merchant, and devoted his leisure to literature and politics, publishing, among other works, a gazette entitled the Friend of Man and an attack on Frederick II. as the ‘‘ Macedonian hero.” His com- mercial experiences, however, were not encouraging, and, after spending three years (1774-1777) in England, he returned to Vienna, became the secret agent of Maria Theresa, and at her death withdrew to his castle of Zwer-

Maria Theresa sent him a | bach, where he gave himself to agriculture and wrote his

famous autobiography. Not until 1787 was he permitted to return to his own country, where he is said to have had an affecting interview with the princess Amelia a few days before her death. The publication of his memoirs (Lebens- geschichte) in 1786, translated into French by himself in 1789, gave him immediate and wide notoriety, and wax effigies of the illustrious prisoner in his chains were exhi- bited on the Parisian boulevards &@ deux sous en sortant. Despite the grounds which the memoirs undoubtedly furnish for Carlyle’s terse characterization of him as an “ extensively fabulous blockhead,” they took a strong hold of the popular imagination, and obliterated for a time the fame of his more darkly passionate pandour cousin. The tragic elements in the story were, however, to be empha- sized by a still more tragic close. His ready advocacy of the French Revolution involved him in disgrace with the Austrian authorities, and, after deprivation of his pension and further imprisonment, he set out towards the close of 1791 for Paris. In place of an enthusiastic reception, he was arrested by order of the Committee of Public Safety as a secret emissary of the king of Prussia, and, after con- finement in the St Lazarus prison, was literally dragged to the guillotine on 25th July 1794. His Sdimmtliche Gedichte und Schriften were published at Leipsic in 1786.

TRENDELENBURG, Friepricu ApotF (1802-1872), one of the chief revivers of Aristotelian study in the pre- sent century, was born on November 30, 1802, at Eutin, near Liibeck. He received his education at the gymnasium of his native town and at the universities of Kiel, Leipsic, and Berlin, displaying from his earliest years an extra- ordinary industry and

thirst for knowledge. He was intro- duced to philosophy by Konig, the rector of the gymnasium a Kantian ; and at Kiel he came under the influence of Reinhold and Von Berger, to the latter of whom, a follower of Schelling, some of his own most characteristic views may be traced. At Berlin he heard Hegel and Schleiermacher ; but his university studies lay chiefly in the direction of classics and classical philology under Wachsmuth, Hermann, and Boeckh. The combination of the philosopher and the philologist, together with a defi- nitely historical turn of mind, is what is most distinctive of all Trendelenburg's work. He became more and more attracted to the study of Plato and Aristotle, and his doctor's dissertation, published in 1826, was an attempt to reach through Aristotle's criticisms a more accurate knowledge of the Platonic philosophy (Platonis de Ideis et Numeris Doctrina ex Aristotele Illustrata). Recognizing the sphere in which his best life-work could be done, he declined the offer of a classical chair at Kiel, and accepted instead a post as tutor to the son of Herr von Nagler, postmaster-general, and an intimate friend of Altenstein, the enlightened minister of education in Prussia. He held this position for seven years (1826-33), occupying his leisure time with the preparation of a critical edition of Aristotle's De Anima, and conscientiously extending his knowledge in all directions. His acquaintance with Karl Ferdinand Becker, the philologist and scientific gram- marian, was of importance for his own views on the origin of the logical categories and the relation of thought to language. In 1833 Trendelenburg was appointed extra- ordinary professor in Berlin, and four years later he was advanced to an ordinary professorship. During nearly forty years he proved himself markedly successful as an academical teacher, treating in turn all the usual philo- sophical disciplines, besides holding more select classes for the study of Aristotle with advanced students. During the greater part of that time he had also to examine in philo- sophy and pedagogics all candidates for the scholastic pro- fession in Prussia. He died on the 24th of January 1872.

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It was with a view to the philosophical preparation in the gymnasia that he published (1836) his Elements Logices Aristo- telice. This useful little book contains a selection of passages from the Organon, giving ina connected form the substance of Aristotle's logical doctrine. The Greek text is

furnished with a Latin transla- tion and notes, and at a later date Trendelenburg supplemented this book with further explanations for the use of tcachers (Erlauterungen zu den Elementen der aristotelischen Logik, 1842). The Elementa has passed through eight editions, and the Hrlduter- wngen through three. In 1840 appeared the first of his important works, which, under the modest title of Logische Untersuchungen, develops a coherent philosophical theory, besides acutely criticiz- ing other standpoints, and in particular the then dominant Hegelian system. The Logisehe Untersuehungen were, indeed, an important factor in the reaction against Hegel which set in about that time in Germany. ‘Two articles written by Trendelenburg in the con- troversy which ensued were republished separately, under the title Die logisehe Frage in Hegel’s System (1848). A second and en- larged edition of the Logisehe Untersuchungen appeared in 1862, and a third in 1870. In 1846 he published the first volume of his “Historical Contributions to Philosophy” (Historische Beitréige sur Philosophie), containing a history of the doctrine of the cate- gories, which forms a pendant to his own elaboration of the same subject in the Logische Unterswehungen. A second volume of the ‘‘ Historical Contributions’ appeared in 1855, and a third in 1867, consisting of detached essays on points of interest in the history of philosophy. A number of these are papers originally read before the Prussian Academy of the Sciences, of which Trendelenburg was made a member in 1846. He was secretary of the philosophico- historical section from 1847 till 1871, and devoted much of his valuable time to the duties devolving upon him.

Trendelenburg’s philosophizing is conditioned throughout by his loving study of Plato and Aristotle, whom he regards not as opponents but as building jointly on the broad basis of idealism, His own standpoint may almost be called a modern version of Aristotle thus intcrpreted. While denying the possibility of an absolute method and an absolute philosophy, as contended for by Hegel and others, Trendelenburg was emphatically an idealist in the ancient or Platonic sense; his whole work was devoted to the demonstration of the ideal in the real. But he maintained that the procedure of philosophy must be analytic, rising from the particular facts to the universal in which we find them explained. We divine the system of the whole from the part we know, just as from a torso we may reconstruct a work of art; but the process of reconstruction must, in the case of

philosophy, remain approxi- mative. Our position forbids the possibility of a final system. Instead, therefore, of constantly beginning afresh in speculation, it should be our duty to attach ourselves to what may be considered the permanent results of historic developinent. The classical expression of these results Trendelenburg finds mainly in the Platonico-Aristotelian system. The philosophical question is stated thus—How are thought and being united in knowledge? how does thought get at being? and how does being enter into thought? Proceeding on the principle that like can only be known by like, Trendelenburg next reaches a doctrine peculiar to himself (though based upon Aristotle) which plays a central part in lis speculations. Motion is the fundamental fact common to being and thought; the actual motion of the external world has its counterpart in the constructive motion which is involved in every instance of percep- tion or thought. From motion he proceeds to deduce time, space, and the categories of mechanics and natural science. ‘These, being thus derived, are at once subjective and objective in their scope. It is true matter can never be completely resolved into motion, but the irreducible remainder may be treated like the mpdérn tan of Aristotle as an abstraction which we asymptotically approach but never reach. The facts of existence, however, are not ade- quately explained by the mechanical categories. The ultimate inter- pretation of the universe can only be found in the higher category of End or final cause. Here Trendclenburg finds the dividing line between philosophical systems. On the one side stand those which acknowledge none but efficient causes, —which make force prior to thought, and explain the universe, as it were, a tergo. This may be called, typically, Democritism. On the other side stands the “organic” or teleological view of the world, which interprets the

ae ir 543 parts through the idea of the whole, and sees in the efficient causes only the vehicle of ideal ends. This may be called in a wide sense Platonism. Systems like Spinozism, which seem to form a third class, neither sacrificing force to thought nor thought to force, yet by their denial of final causes inevitably fall back into the Demo- critic or essentially materialistic standpoint, leaving us with the great antagonism of the mechanical and the organic systems of philosophy. ‘The latter view, which receives its first support in the facts of life, or organic nature as such, finds its culmination and ultimate verification in the ethical world, which

essentially consists in the realization of ends. Trendelenburg's Naturreeht may, therefore, be taken as in a manner the completion of his system, his working out of the ideal as present in the real. The ethical end is taken to be the idea of humanity, not in the abstract as formulated by Kant, but in the context of the state and of history. Law is treated throughout as the vehicle of ethical requirenients. In Trendelenburg's treatment of the state, as the ethical organism in which the individual (the potential nan) may be said first to emerge into actuality, we may trace his nurture on the best ideas of Hellenic antiquity. (A. SE.)

TRENT (Tridentum ; Ital. Trento; Germ. Trient), a city of the Austrian empire, capital of Italian or ‘‘ Welsch ” Tyrol, stands on the left bank of the Adige, where it is joined by the Fersina, on the Brenner Railway, 35 miles below Botzen and 60 miles above Verona. It has a very picturesque appearance, especially when approached from the north, with its embattled walls and towers filling the whole breadth of the valley, a conspicuous feature being the rocky citadel of Dos Trento (the Roman Verruca) on the right bank of the river. Of the old walls some massive remains are attributed by local tradition to Theodori¢c the Goth. Notwithstanding many symptoms of decay, Trent, with its numerous palaces, substantial houses, broad streets, and spacious squares, still retains the aspect of a flourish- ing Cisalpine town. In appearance it is quite Italian, and the inhabitants speak Italian only. The cathedral, on the south side of the spacious Piazza del Duomo, was begun in its present form in 1212, and finished about the beginning of the 15th century. It preserves, however, some Lombardic features of ornamentation in the portals and elsewhere which possibly date from the 7th or 8th century. The church of St Maria Maggiore, a simple but good example of the Italian style of the 15th century, was the meeting-place of the famous council (see below), and possesses a picture containing portraits of the members. Trent is the seat of a prince-archbishop, and has all the public offices according with its administrative rank. It has a museum and library, a gymnasium, a “lyceum,” a seminary, and a deaf and dumb institute. The chief industries are silk-spinning and weaving, tanning, sugar-refining, and glass-blowing ; and there is considerable trade in wine, grain, and fruit, as also in marble from the extensive quarries in the neighbourhood. The population in 1880 was 19,585.

Tridentum is mentioned by the geographers as capital of the Tri- dentini, and seems ultimately to have been made a Roman colony. It suffered much during the period of barbaric invasion, but was resuscitated by Theodoric, becoming the seat successively of Gothic and Lombard dukes and Frankish counts. In 1027 it passed under the rule of its bishops, with whom it had frequent disputes, in which it sought the favour and alliance of the lords of Tyrol. The Venetians made repeated efforts to set up the lion of St Mark within the walls of Trent, but were decisively and finally repulsed in 1487.

TRENT, THe Councit or, which may be described as the watershed of Roman Catholicism and Protestantism, is the most important occurrence in post-medizval church history. It is the culminating event in a long series of similar assemblies, convoked to remedy the evils occasioned during and by the great schism of the papacy, and by the dissolution of lay and clerical morals to which the pagan temper of the Renaissance had largely contributed. But the councils «f Pisa, Constance, Basel, Fcrrara-Florence, and the Lateran had met and parted without attempting to deal effectually with any of the practical scandals and abuses in the church which were sapping the loyalty and

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affection it had formerly enjoyed; and these repeated fail- ures, by destroying all hope of redress at the hands of the constituted authorities, precipitated the crash of the Re- formation, which was in its inception scarcely concerned with doctrinal issues directly, but aimed mainly at faults of administration and morals.

Consequently a largely new problem presented itself for solution, and necessitated a fundamental change in the attitude of those concerned. Hitherto, whatever may have been the fierceness and bitterness of the disputes which the 15th-century councils had attempted to allay, they were, so to speak, family quarrels between members of the same great household, accustomed to the same mode of looking at religious questions, acknowledging the same hierarchy, and accepting the same standards, and thus with a vast body of agreement to go upon as a basis of reconciliation, leaving only comparatively minor details to beadjusted. But the German and Swiss Reformation had generated new conimunions, novel alike in their

polity and much of their theology, and in active revolt, not merely against this or that detail or abuse, but against the Roman Catholic Church in its entirety, hierarchical, doctrinal, and political, The movement had not been confined long to its earlier limits, but had spread over all western Europe, had virtually conquered Holland and Scandinavia, was mak- ing great strides in France and England, and was begin- ning to threaten even Italy and Spain. Thus, the task was no longer the comparatively simple one of satisfying the demands of friendly remonstrants, but of winning back alienated nations, and, if that were too much to hope for, at least of saving the remnant of the Roman obedience from further disintegration. And for this purpose it was no longer sufficient, as it would have been a few years earlier, to discuss administrative details alone, but a review of the whole theological fabric of Latin Christianity, no part of which had been left wholly unimpeached, became a necessary factor in any possible scheme of reconcilia- tion. ‘True, a precedent had been set in the theological discussions at the council of Ferrara-Florence, with its abortive effort to reunite Oriental and Latin Christendom, but the area and number of differences to be reconciled upon that occasion were incomparably smaller than those which had subsequently arisen, and the situation was thus one of extreme difficulty and delicacy, since there was always the danger of alienating many who had continued loyal so far, if very large concessions were made to the revolted Protestants, not a few of whom, besides, had already passed beyond the possibility of reconciliation. But, on the other hand, Luther had himself appealed to a general council from the bull “ Exsurge Domine” launched at him by Leo X. in 1520, and his demand was taken up by the emperor and the princes of Germany, whether Catholics or Protestants, as the only conceivable means of terminating a crisis whose religious and political results might prove far more serious than even the least hopeful ventured to forecast. There was thus steady pressure from one side put upon the Roman curia to obtain the con- vocation of such a council, while scarcely less resistance to the proposal was offered by two very unlike parties in the Roman Church itself. For not only did those oppose it who were interested in the maintenance of the principal abuses complained of, and who feared that sweeping measures might be taken for their abolition, but some of

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the ablest champions of internal reforms, such as Cardinals | Sadolet, Contarini, and Reginald Pole, were equally hostile |

to it, for the very different reason that they believed any such council likely to contain a majority determined on making it as abortive as those great synods had been which were fresh in the memory of all. Accordingly, this section gave its voice for the alternative scheme of pro-

ceeding by way of less formal conferences, at which mutual explanations and concessions night be made by Catholics and Protestants, whereby a modus vivende could be established, with less chance of the whole effort being wrecked by the intrigues of those who desired nothing less than practical reforms. A fresh difficulty was pre- sented by the opposition of the German princes to the assemblage of the council at Rome or anywhere outside Germany, as they distrusted the probable action of the Italian element, certain to preponderate in that event; and, as the curia was equally bent on holding it within the sphere of direct papal influence, this dispute made it impracticable to agree even on the preliminaries during the pontificates of Hadrian VI. and Clement VII. The diet of Spires in 1529 renewed the demand for a general council, to be held in some large German city ; and the diet of Augsburg in 1530 summoned the Lutherans to return into Catholic communion at once and uncondition- ally, leaving their doctrines (formulated in the Confession of Augsburg that very year) to be judged of in a future council, which the emperor Charles V. pledged himself to obtain within a brief space. Clement VII. then pope, was displeased at this initiative on the emperor’s part, but offered to convoke a council in some Italian city, such as Mantua or Milan, belonging to the empire, and outside the States of the Church,—expressing his wish that Charles V. should personally attend it. But he hampered this pro- posal with conditions which made it valueless for the main object of such an assembly, by declaring that no theo- logical questions upon which the church had spoken could be reopened, and that, if Protestants were to be admitted to the council at all, it must be, not as disputants, but as on their trial, and pledged beforehand to submit to the decisions of the council. No result, consequently, followed upon this step, nor was an embassy which Clement

sent in 1533 to the German princes and to the kings of France and England with very similar provisions more successful, for it merely drew out a peremptory rejection of the scheme from the Protestants assembled at Schmalkald, by the emperor's desire, for the purpose of discussing it. So the matter rested till the accession of Alexander Farnese to the papal throne as Paul III. in 1534, A much abler man than his predecessor, he was also more alive to the imperative need of at least appearing to approve some measure of reform, if the church was to be saved from impending dangers (indeed, a report on this subject, drawn up at his desire by a committee of cardinals in 1536, is one of the most important documents of the era), and he was thought to be favourable to the project of a council, whereas there is little doubt that Clement VII. had weighted his acceptance of the plan with impossible con- ditions, in order to avoid its realization, yet so as to let the responsibility of refusal rest with others than himself. Paul III. sent Vergerio as envoy into Germany, to confer with the emperor and the princes, offering to convoke a council at Mantua, and urging the danger of attempting to hold it in Germany, by reason of the violent lengths to which the Anabaptists were then proceeding. But, while the Catholic princes were content with this offer, it was refused by the Protestants, and the ambassadors of France and England supported them in their attitude. Vergerio, who had also a fruitless interview with Luther, returned to Rome early in 1536, but Paul ILI. was not discouraged by his failure, and proposed, in a consistory on April 8, to convoke a council at Mantua. This plan was in turn upset, not only by the continued resistance of the Protestants, but by the refusal of the duke of Mantua to permit the use of his city for such a purpose, unless upon conditions which the pope was unwilling to accept. Notice was accordingly given of a council to be opened

at Vicenza on May 1, 1538, and legates were despatched thither to make the preliminary arrangements, and to preside so soon as the members should assemble. But when the appointed time was only five days off not one bishop had arrived, and the pope was forced to prorogue the council again and again. Meanwhile, the method which Contarini and Sadolet had recommended, that of conferences between the Catholics and Protestants, was being acted on in Germany, and meetings of this nature were convened

successively at Haguenau, Worms, and Ratisbon, at the last of which, in 1541, Contarini was present as legate of the pope, and showed so much tact, moderation, and sympathy that he succeeded in securing a large measure of agreement upon the controversies in dispute, notably on the vexed question of Justification. But, as his concessions and explanations were promptly repudiated at Rome, no practical result followed. In 1542 Paul IIT. sent Morone as his envoy to the diet of Spires to offer Trent as his final concession of the place of assembly, on the ground that its position in Tyrol, and its being part of the dominions of the king of the Romans, ought to meet all the reasonable requirements of the German princes. Ferdinand, king of the Romans, who presided at the diet, was content with this offer, as were the Catholic princes generally, but the Protestants con- tinued to object, and refused any council which should not be completely free from papal influence and authority. However, the pope issued, on May 22, 1542, a bull appointing the meeting of the council for November 1 fol- lowing. He sent three legates to Trent to make prepara- tions,—Morone, Parisio, and Reginald Pole; but they did not reach the city till three weeks later than the appointed date for opening the council, and so few bishops arrived during seven months from that time that it was necessary to prorogue the assembly. In fact, the idea of the council was distasteful to a very large proportion of the Latin clergy, especially such as apprehended danger to their private interests from the reforming plans of the pope, and also such as were alarmed lest serious religious innova- tions might be made in order to conciliate the Protestants. While this delay continued, another diet at Spires in 1544 resulted in great advantages to the Lutherans, who availed themselves of the political straits of Charles V. to extort several important concessions from him. The obnoxious edicts passed against them s Worms and Augsburg were rescinded ; they were permitted to retain such ecclesiastical property as they had seized ; they were made eligible for such civil and ecclesiastical offices as had been previously barred against them; and general tolera- tion for the time being was established. This policy was extremely distasteful to the pope, who addressed a brief to the emperor, strongly remonstrating against it, and renewing his offer of a council. Charles V., who had not been a free agent in the matter, was much of the pope’s mind, and proceeded to relieve himself of one difficulty in the way of reversing his action, by concluding peace with Francis I. of France on September 8, 1544. Hereupon Paul III. directed public thanksgivings to be

offered throughout the whole Latin Church, and issued a bull removing the suspension of the council, and summoning it to meet at Trent on March 15, 1545. Unable from age and illness to be present himself, as he had wished, he named Giammaria del Monte, bishop of Palestrina (after- wards Pope Julius III.), Marcello Cervini (afterwards Pope Marcellus II.), and Reginald Pole as his legates. The ex- perience of former abortive openings was repeated, for they found but one bishop awaiting them, and so few con- tinued to arrive that a fresh prorogation was forced upon the legates, and the pope, in the bull authorizing this action, added a proviso that no proxies should be received,

but that all bishops summoned should attend in person, under severe penalties for contumacy. On November 7, 1545, the legates received final instructions to open the council upon December 13, and did so with solemn cere- monial, but only as a formal initiative of the proceedings, for the first session was postponed till January 7, 1546. When that time arrived, no more than some five and twenty archbishops and bishops, five generals of religious orders, and the ambassadors of King Ferdinand had as- sembled, and none of the conciliar officers had yet been nominated, nor any programme of procedure sketched out. The most important question arising under this last head was whether the voting should be taken by nations, as at the council of Constance, or by individuals, and the matter was referred to the pope, who gave his decision for the latter, as at once the more ancient (since Constance and Basel were the only precedents for the national vote) and the more convenient. Moreover, this ruling secured from the outset a working majority of Italian bishops in the assembly, at once by reason of the small size of the average Italian diocese, and of the greater ease with which Trent could be reached from Italy than from any other country which sent representatives thither, besides enabling the pope to swell the majority (as in the Vatican council three centuries later) with bishops im partibus, having no dioceses or jurisdiction, thus amply justifying the objec- tion taken all along by the German Protestants to the assemblage of the council anywhere outside Germany.

Some preliminaries had to be settled before the second session, and the plan of holding private ‘‘ general congregations,” where theologians of non-episcopal rank could sit and share in the dis- cussion and preparation of the decrees to be proposed and voted on in public session, was at once adopted and observed thenceforward. And first, the question was raised whether any persons except bishops should be allowed to vote upon matters of doctrine. The decision was that the vote should be allowed to the generals of religious orders also, and that the right of the proxies of absent bishops to vote should be referred to the pope. The title to be given to the council at the head of the deerces in each session was then discussed, and a proposal to add the words “‘ representing the church universal” (as at Basel and Constance) to the usual formula ‘‘weneral and cecumenical” was rejected at the instance of the legates, as indirectly menacing to papal autocraey. The legates also privately informed the pope that the majority of the members desired to take up the question of practical reforms before that of doctrine, and that it might be necessary to yield the point to avoid scandal or the imputation of sympathy with abuses, but that they would insist, in that case, on making the measures of reform apply all round, to princes and laymen as well as to ecclesiastics, which would probably damp the ardour of its advocates.

The aetual business of the second session (January 7, 1546) was confined to the promulgation of a decree touching the discipline to be observed by the members of the council during its progress, as well in the matters of their private devotion and their food as in the conduct of the debates. The congregations which preceded the third session were mainly occupied with debating the thorny question of the order in which the discussion of faith and of dis- cipline was to come, and it was at last agreed to take them simultancously.

So few additional bishops had arrived up to this time that it was judged inexpedient to pronmlgate any decrees in the third session (February 4, 1548), and little was done except the publie recitation of the Niceno-Constantinopolitan creed as the authoritative con- fession of the Roman Church, and, as the council worded it, ‘‘ that firm and only foundation against which the gates of hell shall not prevail.” A fortnight after this third session Martin Luther died (February 18, 1546), just as the situation in

Germany was becoming more strained, and the emperor, alarmed at the rapid advance of Reformed opinions and practices (notably in the Palatinate, where the elector had made large concessions), was taking measures for suppressing the religious revolt by force of arms. The canon of Scripture was proposed in the congregations before the fourth session as the subject for discussion, and the three following questions were raised :—(1) Were all the books of both Testaments to be approved and received? (2) Was there to be a fresh inquiry into their canonical character before giving such approval? (38) Should there be any distinction drawn between the books, as being some of them read merely for moral instruction, and others for proving the doctrines of Christian belief? The first of these . guestions was decided affirmatively. The second led to much de-

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bate; the conclusion arrived at was that a secret examination of the evidence should be made, but not suffcred to appear in the public acts of the council. The third question was decided nega- tively. These congregations were the first whercin theological experts and canonists, not being members of the council, were admitted to a share in the discussions. The nature and function of tradition was also debated at this time, and the legates informed the pope that there was a strong tendency in the council to set it aside altogether, and to make Scripture the sole standard of appeal. Another burning question debated was that of vernacular transla- tion and lay study of Scripture. The result, in the fourth session (April 8, 1546), was the promulgation of two decrees, the first of which enacts, under anathema, that Scripture and tradition are to be received and venerated equally, and that the deutero-canonical books are part of the canon of Scripture. The second decree de- clared the Vulgate to be the sole authentic and standard Latin version, and gave it such authority as to supersede the original texts; forbade the interpretation of Scripture contrary to the sense received by the church, ‘‘or even contrary to the unanimous con- sent of the fathers”; imposed various restrictions upon printers and vendors of Bibles; made licences to read any Biblica).iinanu- script or publication compulsory; and prohibited the application of Scripture language to profane and superstitious

purposes. The subjects next taken up were the doctrine of original sin and the reformation of abuses concerned with preachers and lecturers, which were made the matter of two decrees in the fifth session (June 17, 1546). The most noticeable point in the former is the saving clause, whereby the tenet of the Immaculate Conception of the Blessed Virgin is excepted from decision, and left open; the latter enjoins the erection of a lectureship of Scripture in all cathedrals, collegiate churches, and monasteries, imposes the duty of preaching upon all bishops and persons with cure of souls, lays down stringent rules as to preaching licences, and forbids the “questors” (that is, the collectors of alms commissioned by the mendicant orders) to preach anywhere. There was a treaty concluded between the pope and the emperor a few days after this session, to make war against the German Protestants on the express ground of their refusal to submit to the council, and from this may be dated the end of any serious effort in the council itself to deal with the question of reconciliation, although the original motive for its convocation. Moreover, so little interest was felt even by the Roman episcopate in the proceedings at Trent that, instead of fresh accessions coming to recruit the small numbers present, constant defections took place, and a proposal to stop this by forbidding any bishop to quit Trent without formal permission was carried. The doctrine of Justification, made a burning question by the pro- minence given to it in Lutheran theology, was next taken up, and, this being, so to speak, a new controversy, with few precedents to guide the council, the discussion was proportionably protracted. It is noteworthy that Luther’s views found some supporters, and the resignation of the legateship at this time by Reginald Pole, and his departure from the council, never to return, is attributed to his dissatisfaction with the conclusions arrived at upon this subject in itsdecree. The disciplinary question discussed at this time was that of the obligation of residence, especially as regards bishops; and decrees upon both these subjects were promulgated in the sixth session (January 18, 1547),—that on Justification being a formal dogmatic treatise in sixteen chapters, thirty-three canons; that on residence reviving former canons, and imposing new penaltics, but avoiding the solution of a question hotly debated in the council, whether the residence of bishops was obligatory jure divino, or merely by ecclesiastical precept. Meanwhile, Charles V. was victorious in his war with the Protestants, and had all Germany in his power, but, instead of using the opportunity, as the pope expected, to put down the Reformers,

he alleged that the recent war had not been one of religion, and assumed an attitude of tolera- tion, Hereupon Paul IIL, in order to break up this truce, sent instructions to the legates to press on decrees displeasing to the Protestants, judging that the emperor's well-known interest in the council would cause him to be accounted responsible for its measures, and thus lose all credit for his recent forbearance. In the seventh session, held on March 8, 1547, two decrees were promulgated, —one defining the sacraments as seven in number, and as being all channels of grace, also adding special canons concerning baptism and confirmation; the other dealing with pluralities, unions of benefices, repair of churches, and kindred matters, but with no great stringency. A more important part of the business of this session was the open declaration of a measure which the pope and the legates had been privately planning for some time, the trans- ference of the council from Trent to some city more directly under papal control; for, while Trent sufficed for headquarters as against Protestants, yet it was found that a virtual coalition between the Spanish, French, and German bishops to resist the Italians inter- fered with the intentions of the papal court, and could be most effectively broken up by a change of place. Occasion was accord- ingly taken from an outbreak of disease, alleged to be infections, at Trent to issue a bull transferring the council to Bologna, which

was read in the seventh session, while the promulgation of a decree in accordance with it formed the whole business of the eighth session (March 11, 1547). When it had been passed, the legates produced a brief which they had obtained more than two years before, empowering them to transfer the council as they pleased. But, while they themselves quitted Trent the next day, and were followed by the majority of the bishops, those of the emperor's party continued in session at Trent, and refused to leave it without

the permission of their sovereign, though they abstained from all –

conciliar action, in order to avoid the charge of schism. Charles V., incensed at the pope's action, sent a mandate approving and confirming their

conduct. The ninth session, held at Bologna (April 21, 1547), and the tenth also (June 2, 1547), were merely formal, nothing being done save to prorogue the council. The practical result of this split in the council was to relieve the Pro- testants fron1 imminent peril; for, while the emperor's successes enabled him to put severe pressure upon them to submit to its decrees, it was itself incapacitated for valid action, as neither the bishops at Bologna nor those at Trent could claim to be the whole council, nor demand acceptance of their acts as binding. Hence Charles V. was urgent for the return of the entire body to Trent, and threatened, in case of refusal, to go to Rome, and hold the council there himself. Aud he took an even more peremptory step by constituting himself arbiter of the whole controversy, appointing Julius Pflug, bishop of Naumburg, a prelate known to be friendly to the Lutherans, Michael Holding, called Sidonius, afterwards bishop of Merseburg, and John Agricola, a Lutheran writer of some mark, to draft an eirenicon yee the points in dispute, which was published under the title of the '' Interim," by the emperor's authority, at the diet of Augsburg, May 15, 1548. It proved, however, inefficacious, and was formally repudiated and answered by the Catholic princes and states of the empire, and yet more peremptorily by the Protestants, its only result being the " In- terimistic controversy." It was succeeded by another formulary concerning reformation, accepted by the diet. While the emperor was endeavouring to force the " Interim" upon his dominions, the pope, on his part, strove to remove the dead-lock of the divided council, and convoked a committee to consist of members of both the Bolognese and the Tridentine sections to confer upon ecclesi- astical reforms. But the bishops at Trent, having communicated with the emperor, and waited three weeks for his sanction, re- fused to leave that city, and the pope was compelled to direct the legates at Bologna to dismiss the bishops assembled there, and to announce the suspension of the council, which was accordingly done upon September 17, 1549. Paul III. died on November 10, 1549, and was succeeded on February 7, 1550, by Cardinal del Monte, the chief legate at the council, who took the title of Julius III. The break in the continuity of the council occasioned by these proceedings lasted till May 1, 1551, when the eleventh session was held at Trent under the presidency of Cardinal Crescenzio, sole legate in title, but with two nuncios, Pighini and Lippomani, as co-ordinate assessors. It was merely formal, as was also the twelfth session, on September 1, 1551. Just at this time Henry II., king of

France, having quarrelled with the pope about the duchy of Parma, sent an envoy to the council at Trent, with letters styling it a ‘‘convention,” denying its cecumenical character, declaring that it was not accessible to himself or to the French bishops, and notifying a protest against the validity of its proceedings, which he desired might be registered, and a copy of the register returned to him. No reply was made to this demand; so Henry dismissed the papal nuncio from his court, and published a

manifesto to justify himself, at the same time that, in order to .

repel any charge of sympathy with the Protestants, he promulgated a severe edict against them. But the absence of French bishops, and the comparatively scanty attendance from Germany, threw matters more than ever into the hands of the Italian majority, as appeared from the decrees promulgated in the thirteenth session (October 11, 1551), and indeed from the attitude taken up by the legates just before it. For the obstinate refusal of the Protestants to attend or even recognize the council was on the point of giving way, and the imperial ambassadors demanded a safe-conduct for such as might present themselves, with some warranty that it should be really safe. They also desired the postponement of any decision on the doctrine of the Eucharist, and especially as regards the communion of the laity in the chalice. The pope expressed himself willing to grant both these demands, but no real attention was paid to either of them. As respects the attendance of the Protestants, the letters of Francis Vargas, fiscal (attorney-general) in Spain to Charles V., and his agent at the council, state plainly that the legates merely pretended to desire it, and were secretly doing everything to prevent it, while the very points as to which delay had been promised were made the subject of the decrees in the above-named session. The decree on the Eucharist was specially directed against Lutheran and Zwinglian opinions then recently broached, and was couched in eight chapters with eleven canons appended. It reasserted the doctrine of Transubstantiation, already defined by the fourth Lateran council in 1216, while, by

the third of the canons, which declares that the wnole sacrament is entire in each kind, it indirectly, though effectively, ruled against the grant of the

chalice to the laity; and in fact the Reformed thesis that they were entitled to it by divine right, and could not be debarred from it without sin, was unanimously condemned in the previous congregation. Some unimportant decrees affecting the criminal jurisdiction of bishops, and for referring the trials of bishops themselves to the pope, were enacted at the same time; but more noteworthy was a decree for postponing the decision upon lay and infant communion, and for granting a safe-conduct to the Protestants, which was the last business transacted upon this occasion. But the safe-conduct was worded so as to excite general and reasonable suspieion on the part of thosc to whom it was ‘offered, and Vargas, who was no friend to their opinions, comments freely upon its deceptive ambiguity. In the fourteenth session (November 25, 1551) decrees upon penance and extreme unction, prepared in the congregations, and embodied in twelve chapters upon the former and three on the latter topic, followed severally by fiftecn’and four canons, were promulgated. Some disciplinary

enactments affecting the clergy, and corrective of minor abuses, ’

were enacted at the same time, the most important provisions being the abolition of the papal dispensations exempting their holders from the jurisdiction of the ordinary, and the restriction of the action of titular bishops. But the reforming party in the council was much discontented with the inadequacy of these measures, which added little to the very small progress made so far in the revival of discipline. Although no Protestant theologians had yet presented themselves at Trent, representatives of the duke of Wiirtemberg arrived at this time, who were instructed to lay the Wiirtemberg Confession before the council, and to say that Pro- testant divines who could give explanations of it were waiting some forty miles from Trent, and were prepared to attend the council so soon as a safe-conduct exactly conformable with that granted to the Bohemians by the council of Basel was issued, and on the further conditions that the discussions actually going on should be suspended and all the matters so far decided be reopened, that the pope should cease to preside by legates or otherwise, but declare lis own submission to the decrees of the council, and absolve the bishops from their oath of allegiance to himself in order to secure their liberty of action. The envoys refused to treat with the legates at all, and condueted their negotiations through the imperial ambassadors.

Crescenzio was very angry, and refused all concession, even going so far as to abstract the conciliar seal, lest the safe-conduet might be granted; but pressure was put upon him by the imperial ambassadors, and he was forced to eonsent to the admission of the Protestant envoys at a private congregation to be held in his own house, though he resisted the demand for introducing them to a public session. And, when the safe-conduct was recast, it was found to differ seriously from that proposed as its model, especially by failing to give the Protestants the rights of session and suffrage, of observing their own religion in their houses, and of being guaranteed against insults to their creed. To the remonstrances made in consequence the legate returned a per- emptory reply, refusing to make any further change, and only the instanees of the emperor, then at Innsbruek, but three days' journey from Trent, induced the Protestant envoys to remain a little longer, to find if any better terms could be obtained. Some more Protestant envoys from Strasburg and other cities, and from Maurice of Saxony, arrived early in 1552, and were admitted to a congregation held on January 24, where they renewed the demands already mentioned, and required also that the decrees of Constance and Basel, declaring the pope inferior and subject to a general council, should be reaffirmed. They were promised an answer in due time, and the fifteenth session was held the next day (January 25, 1552), wherein the council was prorogucd, anda safe-eonduct more in aceordance with the Protestant demands was drawn up and pub- lished. It is remarkable, however, for one omission, and for one significant clause. The omission is that of toleration for the private exercise of their religion; the insertion is a proviso pledging the council not to avail itself, ''for this one occasion," of any laws or canons whatever, '"'especially those of Constanee and Siena," as against the Protestants. The reference is to the canon of Constance by means of which John Huss was tried and burnt, declaring a safe-conduct no protection against trial for heresy, even if the accused has come in reliance on the safe-conduct, and would not have come without it, which canon was reaffirmed at the council of Siena in 1423. While the negotiations occasioned by these proceedings were in course, war broke out anew in Germany, and Maurice of Saxony obtained considerable successes over the emperor, took Augsburg, and was marching down upon Tyrol, so that Charles V. fled in haste from Innsbruck, and the legate convened the sixteenth session (April 28, 1552) of the council, wherein a decree was promulgated suspending it for two years in

consequence of the perils of war. There was a general stampede from Trent at once, and the legate Crescenzio, then very ill, had just strength to reach Verona, where he died three days after his arrival,

So ended what is styled by some historians, and cor- rectly, the first council of Trent, for, although the usual computation recognizes only one such council, yet an in- terruption of ten years, a widely changed personality, and a marked alteration in tone make the resumed synod virtually another assembly, and one by no means entitled to the degree of respect which the ability and learning of many members of that first convoked won for it. When the council dispersed, Julius III. at once in consistory repeated the policy of Paul IJI., and nominated a com- mittee to prepare a scheme of reform, but it never took action of any kind; and at the close of the two years' suspension of the council the question was put in con- sistory as to the resumption of the sessions, and decided, with the pope's approval, in the negative. Julius ITI. died on March 23, 1555, and was succeeded on April 11, 1555, by Cardinal Marcello Cervini, one of the former legates at the council, a man of high reputation for personal devoutness and freedom from that sympathy with abuses which marked too many of the dignitaries of the time. He took the title of Marcellus II., and his first public utterance was to intimate his purpose of re- assembling the council, and of carrying out a plan of thorough reform in discipline, particularly directed to abating the pomp and luxury of the prelacy. But he was in feeble health when elected, and the fatigues of his new position brought on an attack of apoplexy which carried him off three weeks after his accession. In his room was chosen, on May 23, 1555, Cardinal Giovanni Pietro Caraffa, who took the title of Paul IV. He was known to profess great austerity of life, to have actually founded the Theatines, an ascetic community, and to be a stern and implacable advocate for several measures of repression against innovators in matters of religion or impugners of papal prerogative, as he quickly showed by setting up the Inquisition in Rome, and taking care that it should not be idle. His election consequently caused much alarm, and was especially displeasing to the emperor ; and the earlier acts of his pontificate seemed to justify the

estimate formed of his character and the fears of those who apprehended that he would proceed to reform discipline in a swifter and more drastic fashion than had hitherto been essayed. For in fact he pledged himself to this effect in the first bull published after his accession, follow- ing it up with a show of activity by at once setting some minor reforms on foot.

During these three years important events had taken place in Germany. By the peace of Passau in 1552, the Protestants of the Augsburg Confession were secured from all molestation, and in the free exercise of their religion and of their civil rights, and this was followed up by a decree of the diet of Augsburg, on September 25, 1555, that, failing a national council to settle the religious disputes, the emperor, the king of the Romans, and the other Catholic princes should not interfere in any way with the religious liberties of the Lutherans holding to the Confession of Augsburg, provided they in their turn would exhibit equal tolerance towards Catholics; that no penalty, save the loss of benefices, should be imposed on any Catholic ecclesiastics joining the Lutheran body ; and that such benefices as the Protestants had already annexed for the support of their schools and ministers should remain in their possession. Paul IV. was much incensed at these proceedings, and used all efforts to procure their repeal, on the failure of which he openly broke with the emperor, formed an alliance with the French king against him, and imprisoned the cardinals and other personages of the imperial party on whom he could lay hands, confiscating the property of such as saved themselves by flight. He continued for a time in the measures of reform with which

he began his reign, striking against jobbery, pluralities, dispensations, and laxity of clerical manners ; but all this short-lived zeal was speedily neutralized by his nepotism, surpassing that of any of his predecessors, and throwing the government of the States of the Church into the hands of his dissolute nephews, upon whom he rained all the wealth, honours, and authority in his power to bestow. And, as was to be expected, he set himself steadily to oppose every one of the class of reforms which touched doctrinal questions, just those for which the Protestants were urgent, encouraging only such as promoted the unity and discipline of the Roman Church itself,

and made it more capable of effective resistance to the Reformation. Fle was not favourable to the reassembling of the council, not merely because of his experience of its languid action, nor even his dislike of the struggles of the non-Italian minority to assert some measure of independence against the coercive tutelage exerted by the several papal legates from the very first, but because he regarded himself as the sole and proper person to consider such matters at all, and a bull of his own promulgation a better mode of procedure, at once in fulness of authority and swiftness of formulation, than any conciliar decree. Consequently, no step for the resumption of the council was taken during his reign, which ended on August 18, 1559, After a longer inter- regnum than usual, Giovanni Angelo de' Medici (not a member of the great Florentine house, but of humble Milanese extraction) was elected on December 26, 1559, as Pius IV. Markedly unlike his predecessor in almost every personal quality, he was much his superior in practical shrewdness and tact, and had none of that dislike to a council which Paul IV. had shown. So great, too, had been the strides made by the Reformation during his predecessor's reign that he might well think Paul IV.'s policy undesirable, and he had this special motive for reversing it, that a movement was going on in France for the convocation of a national council there to consider the whole religious situation, which might very conceivably result in a revolt like that of England from the Roman obedience. Accordingly, Pius IV. determined on the resumption of the council of Trent, and issued a bull on November 29, 1560, convoking it anew.

But the whole face of Western Christendom, the whole religious situation, had materially changed since the ori- ginal assemblage of the synod in 1545. First, the imposing personality of Charles V. was removed from the scene, and Ferdinand I., his successor, enjoyed neither his per- sonal ascendency nor his political power, and could not be accounted as a possible competitor with the pope for the first place in the Catholic world, nor even as an ally with means for crushing the Reformation. Next, the Reformation itself was by this time an accomplished fact, a consummated revolt from medizeval Christianity. It had taken definite shape in various countries; it had its own theological systems and traditions ; besides that a whole generation had now grown up under its influence, never having had any personal associations with Latin

Christianity. And, on the other hand, the very lengths

to which some of the Reformers had gone in their revolt generated a corresponding reaction in the Roman Church, so that many influential persons who had been in favour of moderate reforms and of explaining disputed points of theology were convinced that no limits could be logically or practically set to concessions in this direction, and therefore that it was necessary to make a stand against any concessions at all. And, what is more, one noticeable effect of the wave of controversy which had swept over western Europe was to accentuate points of difference, to close questions previously open, to make the current beliefs more incisive and, so to speak, legal in form, to diminish

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seriously the neutral area between the competing religious systems, and thus to bring them face to face as irrecon- cilable foes. One factor more, of greater importance at the time than any other, contributed to the revolution which is marked by the second council of Trent. As Spain took the political lead in the earlier half of the 16th century, so it took also the lead in theology. The Spanish divines were abler and more learned than all save the very foremost in any other country, and their influence was throughout the greatest at the council of Trent on purely theological issues. Now, the political and the theological genius of Spain had both just found their highest exponent in one person and the organization which he devised, Ignatius Loyola and the Company of the Jesuits. Two of his immediate disciples and recruits, Salmeron and Laynez, were chosen to be the pope's theologians at the council of Trent, and exercised a greater influence than any other divines there in the formulation of its dogmatic decrees. But the Jesuits were to do more than this. The militant spirit of their founder had nothing in common with the alarm and vacillation which had for the most part marked the action of the Roman Church in dealing with the Lutheran and Calvinist revolt; and, instead of being con- tent with devising schemes for standing on the defensive, and saving the remnant yet left to the Roman obedience, he conceived the bolder and safer plan of vigorous aggres- sion, to reconquer all that had been lost, and to add fresh acquisitions thereto.

The Counter-Reformation which he initiated was in full operation when the second council of Trent assembled, and it was by this spirit that it was guided in its deliberations and decrees. ‘The very thought of compromise was abandoned in fact, if not in open expression, and the only reforms thenceforward taken into consideration were such as would remove causes of weak- ness and scandal in the Latin Church, enabling it, without sacrificing one of its claims, to overcome by superior mass and discipline, by closer unity and more organized enthusi- asm, the heterogeneous, disordered, and already dissociated forces of Protestantism. The most obvious effect of these principles upon the second council of Trent was that the diminution, tlie all but disappearance, of variety of opinion amongst its members, and the resolution to crush Protest- antism rather than to parley with it in any scheme of mutual concession or accommodation, tended to shorten the preliminary discussions in a marked degree, so that little is to be noted of the long and animated debates of the earlier period, and the last few sessions exhibit even tokens of actual hurry to end the matter anyhow.

There was no intention on the pope’s part to proclaim the Counter-Reformation as the policy of the council, even if it may be safely assumed that he could predict its action, and he sent nuncios to the Protestant sovereigns as well as to the Catholics to signify the approaching resumption of its sittings. Francis II. of France had died between the promulgation of the bull and its notification in France, but the young king Charles IX., by the advice of the parlement of Paris, directed all the bishops of the kingdom to be in readiness for journeying to Trent. Three nuncios were despatched to Germany, but the princes assembled in diet at Naumburg received them unfavourably, asserting anew their determination to recognize no council which did not avow Scripture as its standard of appeal and give right of free discussion to Protestants, denying the right of any one save the emperor to convene a general council at all, and inveighing strongly against the papacy. The king of Denmark declined to admit the nuncio on any terms, declaring that neither he nor his father had ever had any dealings with the pope ; and Martinenghi, the nuncio commissioned to Elizabeth of England, was stopped by a messenger while still on the

Continental side of the Channel, and informed that he would not be permitted to land on the English coast. The free cities of the empire also refused the summons, as did five of the Swiss cantons; and even a large number of Roman Catholic prelates, while professing unqualified obedience to the pope's commands, showed much unwilling- ness to act upon them, and pleaded age, illness, or dio- cesan business as excuses for absenting themselves from the council. In this unprontising posture of affairs the preparations for the council were pressed on, and Cardinals Ercole Gonzaga, bishop of Mantua, Seripando, Hosius, Simoneta, and (later on) Altemps, the pope's nephew, were named as legates, being directed to open the session of the council upon Easter Day, April 6, 1561. But they did not even arrive in Trent until April 16, and found no more than nine bishops awaiting them. Several causes conduced to this disappointment: the king of Spain had not yet accepted the bull convoking the council; the French bishops were more than fully occupied with the rapid advances of the Reformation in their midst; and the Germans had no great inclination for the repetition of their experience ten years before. It was thus necessary to postpone the assemblage till January 1 and then to January 18, 1562. That there might be a sufficient number of Italian bishops present to outvote any possible combination of others, the pope collected a large number of prelates, appointed them salaries for maintenance, and sent them off to Trent. Two questions of the highest practical importance came up for discussion in the pre- liminary congregation, wherein ninety-two bishops were present :—(1) Was the council to be styled a " continua- tion" of the previous one, or to be reckoned as a new synod? (2) Should the unprecedented clause in the papal decree for opening the council (but not found in the bull of convocation), " proponentibus legatis ac prasidentibus," be accepted and acted on, or rescinded? 'To declare the council a "continuation" of its precursor was to accept and ratify all which had been done therein ; to treat it as a new one was to make every decree of the earlier sessions merely provisional and alterable. To adopt the novel clause embodied in the papal decree was to gag the council from the outset and deprive it of freedom by concentrat- ing the initiative in the hands of the legates ; and Guerrero, archbishop of Granada, pressed this objection with much urgency. On the other hand, this same prelate, acting on the orders of Philip II., demanded that the council should be plainly declared a continuation of its precursor, for Philip had already introduced some of the

regulations of that synod into his dominions, and would lose credit if they were rescinded, or even treated as lacking full sanction. Contrariwise, the bishops of other nations present held that there was no prospect of inducing the Germans, English, and other partly alienated nationalities to send representatives, unless the proceedings so far should be regarded as capable of reconsideration and alteration at the hands of the actual assembly. The authorities at Rome were not unprepared for some difficulty on this head, and had endeavoured to evade it by using the indeterminate word "celebrated," which might be taken either way, and the Spanish remonstrants were privately told that it was understood that business should be taken up just where it had left off under Julius IIL, thus making the synod a continuation of the former one, but that any express statement to that effect had been carefully avoided, lest the Protestants should take offence, and thus one aim of the council might be defeated. The Spaniards were partly contented with this reply, but urged that nothing which could be interpreted as the convocation of a new council should be suffered to appear in the wording of the decree about to be publicly read, which was conceded.

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The seventeenth session was held (January 18, 1562) in the presence of the legates, —106 bishops, 4 abbots, 4 generals of orders, and the duke of Mantua, nephew of the chief legate, being present. Four Spanish bishops lodged a protest against the proposing clause —two of them unreservedly, two in a more qualified manner—and they particularly objected to the novelty of the clause, and to the manner in which it had been sprung upon the council, the arch- bishop of Granada and the bishop of Orense pointing out that it was not in the original bull, with which the subsequent decree ought to be in complete agreement, and the former adding that it was not even in the copy of the decree shown to him. But the Italian majority was too strong, and the protest was overruled,— the prorogation of the council to February 26, 1562, being the only further business transacted. But a very important question was laid before the congregations which followed this session, that of providing some remedy for the injury done to the Roman Catholic Church by the circulation of more or less hostile books, a difficulty

made incomparably greatcr from the middle of the 15th century onwards than at any previous time in history, by reason of the invention of printing. The council of Lateran in 1515 had made a licence from the ecclesiastical authorities requisite before any book could be printed, under pain of excommunication, but this penalty did not affect Protestant printers, and the issue of a catalogue of books forbidden to Catholics became a necessary addi- tion. Such a catalogue was issued by Paul IV. in 1559, but some machinery for supplementing it as fresh books poured from the press could alone meet the permanent danger. Another matter debated in these congregations was the invitation of Protestants to attend, and inwhatcharacter. In the eighteenth session (February 26, 1562) two decrees on these subjects were promulgated,—one appointing a committee to report to the council on the whole question of heretical books; the other publishing a safe-conduct to the German Protestants, extended by a rider to those of other nations. The congregations held after this session were busied chiefly with the questions of residence and the abuse of indulgences, besides several less important details of reform. A warm debate arose as to the nature of the obligation to reside,—the Spaniards holding it to be of divine right, the Italians to be of no more than ecclesiastical precept. So powerful a body in the council took the Spanish view that the legates were alarmed, especially as ominous speeches were made to the effect that the Roman curia must be re- formed on the basis of the report of cardinals to Paul III. before anything of moment could be done in the way of real improvement. Accordingly, they sent a messenger to the pope, bringing with him a schedule of the proposed reforms, and asking for advice in the crisis. The pope desired them to counteract the opposition bishops, to postpone the question of residence, if they could not suppress it altogether, and despatched Visconti, bishop of Ventimiglia, as extra nuncio to the council, to report accurately to him everything said or done there, and with him sent also all the bishops who could be collected at Rome to swell the Italian vote, and thus defeat the opposition indirectly. There was much debate also on the scope of the safe-conduct, as the Spaniards were anxious that it should not protect those against whom the Inquisition had taken action, while others desired to sce its terms enlarged sufficiently to meet the requirements of the Protestants, who objected to its suspicious silence on several weighty particulars. As the French ambassadors were expected, nothing was done in the nineteenth session (May 14, 1562) save to prorogue

the council. On May 26, 1652, De Lanssac (who had been lately French envoy at Rome), Du Ferrier, and De Pibrac, envoys from Charles IX., were ad- mitted to audience, and demanded, amongst other matters, that the council should be formally declared a new one, wherein the imperial ambassadors supported them, while Philip II. of Spain, contrariwise, insisted that it should be declared a continuation of the former synod. The legates strove to satisfy both parties, and received contradictory directions from Rome, at first ordering them to announce the continuation of the former council, and afterwards leaving the matter to their discretion. So little agreement could be arrived at that the twentieth session (June 4, 1562) was held merely to prorogue the council. The question of communion in both kinds was the next to come up for consideration. It was such a capital one, if any hope of winning back the Protestants was to be entertained, that the imperial and French ambassadors had special injunctions to forward by all means in their power an affirmative decision. 'The Frenchmen saw little prospect of carry- ing this matter in the temper of the Italian majority, and were for opposing the discussion which the legates had announced, but the imperial ambassadors were more hopeful, and persuaded them to give way. While the question was being debated in the con- gregations, the Venetian and Bavarian ambassadors arrived, the latter armed with a formidable schedule of complaints against pre- valent abuses, and of demands for correspondingly drastic reforms, beginning with the pope and the curia, and making havoc amongst cardinals, dispensations, exemptions, pluralities, office-books, ex- clusively Latin services, and othcr like matters, thus threatening all manner of vested interests and long-rooted customs. The

legates put them off, alleging the pressure of other business, notably the question of communion in both kinds, which was, in fact, being discussed and decided in accordance with the views of the Italians and Spaniards, and against those of the French and Germans. In the twenty-first session (July 16, 1562) a decree couched in four dogmatic chapters and four canons was promul- gated upon it, to the following purport:—laymen, and priests other than the actual celebrant, are not bound by divine right to com- municate in both kinds; the church has full power to make what changes it pleases in the mode of administering sacraments; the whole sacrament of the Eucharist is

received entire under either kind singly; and little children are not bound to communicate. The canons pronounce anathemas against maintainers of the con- trary propositions. At the same time a decree upon reformation was enacted, most of the clauses dealing with the duties of bishops in the matters of ordination, patronage, division, and union of beuefices, discipline of ineffective parish priests, and visitation of monasteries, but a more permanent interest attaches to the ninth and concluding chapter of the decree, whereby the name and office of the ‘‘questors of alms,” that is to say, the vendors of indulg- ences, are abolished on the ground of the impossibility of other- wise putting a stop to the abuses and depravity of their proceedings. All privileges and customs to the contrary, even if of time im- memorial, are rescinded; the publication of indulgences is confined thenceforth to the ordinaries of each place, assisted by two members of the chapter; and these same officers are directed to collect the alms and charitable donations of the people, but forbidden to receive any commission or payment for so doing. ‘This decree is a virtual confession of the justice of the agitation against Tctzel and his fellows which served as the signal for beginning the great religious strife of the 16th century; and it is noticeable that it was the pope’s own voice against the system which decided the action of the council, wherein a powerful niinority was found to defend it. Several weighty mattcrs then came before the congregations, that of residence again being pressed by the Spaniards, while the imperial and Bavarian ambassadors renewed their requisition for permissive communion in both kinds (for the decree on that subject had gone no further than to declare it unnecessary, and had not explicitly forbidden it), and the French ambassador not only sup- ported them in their demand, but added on his own part that in France they desired vernacular services, the abolition of image- worship, and permission for the clergy to marry. The nuncio Visconti wrote to the pope in great alarm, expressing apprehensions at the very free language employed by the fathers of the council on these matters, the probability of their conceding the emperor’s demands, and of similar ones being advanced thereupon, all making in the same direction. An intrigue to compel the resignation of Cardinal Gonzaga, who was not thought sufficiently opposed to these measures, and who was far less peremptory in his presidency of the council and use of the closure than Crescenzio had been, was set on foot, and defeated only by the strong representations made at Rome by the archbishop of Lanciano, who said that

there was already so much division in the council that it could but just hold together, and would almost certainly be broken up by any step of the kind. The next subject which was brought on for considera- tion was the sacrifice of the Mass, and the debates thereon were very animated, disclosing considerable variety of opinion amongst the theologians,—no fewer than five clearly distinct views of the tenet, apart from mere verbal or minor differences, being adduced and argued for. As sixty French bishops, to be accompanied by twelve theologians, and headed by Charles de Guise, cardinal of Lorraine, were undcr orders to repair to Trent, the French ambas- sador presscd the legates to postpone the next session till their arrival, as De l'Isle, ambassador at Rome, did the pope; but each replied evasively, referring the applicant to the other. The question of communion in both kinds was also very warmly dis- cussed, and the council was warned that a negative decision would lead to the secession of multitudes who had not yet broken with the Roman Church; but the Jesuit Laynez, who was the chief advocate for refusal, replied that to diminish the church would not destroy it, and that anything was better than concession in the matter. The numbers in the division taken on the question were as follows:—29 were in favour of granting communion in both kinds ; 31 agreed thereto, but desired the execution of the decree to be left to the pope's discretion; 38 were for total refusal; 24 strove to evade responsibility by referring the matter to the pope entirely; 19 were willing to make the concession to the Bohemians and Hungarians, but would refuse it to all others; 14 asked for a postponement; and 11 remained neutral, declining to vote any way—being a total of 166 suffrages, so split up as to make it im- practicable to frame a decrce. In this difficulty, the legate seized the opportunity of persuading the council to refer the matter to the pope's decision, thereby at once checkmating the reforming section, and indirectly ruling the vexed point of the relative superiority of pope and council in favour of the former, and so virtually reversing those decrees of Constance and Basel which had long been thorns in the side of the Roman curia. In point of

fact, the pope had written some time before to the legates, recom- mending them to yield to the emperor’s demand of the chalice for the laity, but they had replied that it would be impolitic to make it a conciliar act, and that it would be more expedient to frame a mere general declaration that it might be proper to make the con- cession in certain cases, but that the pope should be the sole judge of them. In the twenty-second session (September 17, 1562) the decree on the sacrifice of the Mass was promulgated in nine chapters and as many canons, directed for the most part against current Protestant objections to the doctrine and ceremonial of the Missal. Rules to secure greater order and reverence in the celebration of Mass, and for the suppression of sundry superstitious observances connected therewith, were also enacted,—besides some minor re- forms of little note, and a decree referring to the pope the whole question of the concession of the chalice. The meagreness and insignificance of the reforms enacted thus far caused much dis- pleasure in France, and the king directed his ambassador to press once more for delay till the arrival of the French, German, and Polish bishops who were expected at Trent, as the emperor also instructed his envoy. But the pope was busy in recruiting the Italian majority, and was unfavourable to this request, lest the Italians should be outvoted by the new-comers; yet so contentious were the debates on the sacrament of orders, and on the nature and ex- tent of the rights of bishops—notably whether they were inherently above priests, and whether they were necessarily subject to the pope, deriving their jurisdiction and other powers solely through delegation from him, or if they were not of Divine institution, and his colleagues rather than his deputies (which latter thesis was steadily maintained by the Spaniards)—that it proved impossible to frame the decrees and hold the session before the arrival of the cardinal of Lorraine, who reached Trent on November 18, 1562, accompanicd by fourteen bishops, three abbots, and eighteen theo- logians. The discussions, further complicated with the question of residence, were renewed hereupon, and long before any signs of agreement were visible the French ambassadors laid before the legates a schedule of reform in thirty-four articles, requiring, not only the removal of various abuses in patronage, and the punish- ment of negligence on the part of the parochial and monastic clergy, but also that vernacular services should be permitted, and communion in both kinds enjoined, while all abuses and supcrsti- tions connected with image-worship, indulgences, pilgrimages, and relics should be summarily

abolished. Lorraine, on being asked how far he agreed with these demands, said that he disapproved of some of them, but that if he had not consented to take charge of them in their actual form, they would have been made still more drastic. No definite action was taken upon them either at Trent or at Rome, and the proceedings dragged on inefiectively for some months longer. On March 2, 1563, Cardinal Gonzaga, first legate, died, and was speedily followed by Cardinal Seripando. The impcrial and French ambassadors endeavoured to get the cardinal of Lorraine named as first legate and president, but he was not acceptable at Rome, and the post was given to Cardinal Morone, with whom Cardinal Navagero was associated, to fill the place of Seripando. All these events delayed the twenty-third session until July 15, 1563, nearly ten months later than the preceding oue.

was promulgated, the most noticeable points of which are the assertion that the church can constitute other impediments to matrimony besides the forbidden degrees of the Levitical code, and can dispense with such impediments ; that clerks in holy orders and regulars vowed to celibacy cannot contract valid marriage ; and that celibacy is superior to matrimony. The simultaneous decrec on reformation lays down rules for the creation of bishops and cardinals, so as to avoid unfit promotions; directs that diocesan synods shall be held yearly, and provincial synods trien- nially ; lays down rules for episcopal visitations, and for the quali- fications to be exacted of persons promoted to cathedral dignities and canonries ; appoints the provincial synod the judge of minor causes against bishops, referring graver causes to the pope’s de- cision ; and enacts various other technical regulations. By this time all concerned were thoroughly weary of the council, and the remaining matters for discussion were hurriedly discussed, result- ing, in the twenty-fifth and last session (December 3 and 4, 1563), in a decree, very cautiously worded, upon purgatory, the cultus of saints, and that of relics and images. In this same session was also enacted a dccree in twenty-two chapters, regulating several matters affecting the discipline of convents of monks and nuns ; and another decree on reformation, in twenty-one chapters, the most important of which enjoin all cardinals and bishops to keep modest households, and not to enrich their kindred with church property ; that all prelates shall receive and publish the decrees of the

council ; that duelling shall be prohibited under severe penal- ties ; and that the authority of the Holy See both is, an _is to be understood to be, untouched by any decrees of the council touch- ing the reform of morals and discipline. On the last day of the session was passed a somewhat indefinite decree upon indulgences, forbidding all evil gains connected therewith, and directing that, wherever abuses or superstitions are prevalent concerning them, the bishops shall collect the facts, lay them before the provincial synod, and after discussion there refer them to the pope for ulti- mate decision. The distinction of meats, and the duc observance of festivals and fasts, were also enjoined ; and a formal statement was made that the committees whieh had been engaged upon the index of prohibited books, on the draft of a catechism, and on the revision of the Missal and Breviary, thinking that the synod could not deal with them conveniently, had determined to lay their reports before the pope to ratify and publish at his pleasure. Formal acclamations, and an anathema agaiust all hereties, closed the session; and the legates, after forbidding any bishop, under pain of excommunication, to leave Trent till he had either signed his assent to the decrees, or left documentary proof of such assent, gave the blessing and dissolved the assembly.

Two hundred and fifty-five signatures were attached to the decrees, and also those of the ambassadors still remain- ing at Trent. The bull of confirmation was issued at Rome on January 26, 1564, and followed by another fixing May 1, 1564, as the date from which the decrees should be

held binding. The bull of confirmation forbade all persons

whatsoever, whether ecclesiastics or laymen, to gloss or

interpret the decrees upon any pretext whatever, without papal authority for the purpose. The republic of Venice was the first power to signify its reception of the decrees, followed speedily by the other Italian states (except Naples) and by Portugal ; but the king of Spain, though receiving the decrees, issued them at first in his own name, and not in that of the pope ; the emperor and the king of Bohemia demanded the lay use of the chalice and the marriage of priests as the terms on which they would accept the council, and obtained a partial concession of the former demand, but were refused the latter ; and in France, while the dogmatic decrees were

accepted, the disciplinary ones were not, and have never, in spite of efforts many times renewed, made part of French ecclesiastical law. The pro- vision referring the explanation of the council to the pope was given shape by Sixtus V., who erected in 1588 a Con- gregation of the Council of Trent to sit permanently at Rome, where it has ever since continued to be included amongst those standing committees which divide among them the adininistration of the pontifical government.

Two questions remain to be considered in relation to this great synod :— how far was it free, and representative of the mind of Latin Christianity at that time ? and what have been its effects upon dogma and discipline? Ample materials exist for answering the first question, in the form of contemporary letters, either separately published, as

those of Vargas, or included in the great collection of documents made by Le Plat, and in the official acts of the council itself, drawn up by the secretaries Paleotto and Massarelli. From these it is perfectly clear that the council was never free for a moment, but was hampered and fettered, not merely by the permanent fact of a large Italian majority, subsidized by the pope,! but by the method of procedure in the congregations, since by a skilful distribution of the members into groups or classes, so as to prevent combined action, and by careful packing of the sub-committees to which the preparation of business for debate was entrusted, little could be done save when and how the majority pleased ; and, above all, the vigilant supervision exercised by the legates, their constant refer- ence to Rome of every point of any importance before they would permit it to come on for regular discussion (so that Lanssac, one of the French envoys, somewhat profanely said that the Holy Spirit was brought to the council in a carpet-bag from Rome), and their uncompromising use of their presidential authority to interrupt or silence un- acceptable speakers (as frequently appears in the Acts) effectually bound the council hand and foot ; and thus its decisions, as a whole, represent little more than the Italian and, to some extent, Spanish opinions of the time, and not those of German, French, or Hungarian Catholics. The demeanour of the legates differed much, and

there is a wide interval between the open browbeating employed by Crescenzio and the high-bred dignity of Gonzaga or the diplomatic subtlety of Morone ; but the policy was alike in all cases, and its results the same. As to the dogmatic effect of the council, it went much further than merely restating the current Catholic theology of the pre- Reformation era; for it marks a new departure, closing many questions previously left open (nothing is more noteworthy in the debates than the manner in which several divines of unquestioned ability and loyalty delivered themselves of opinions closely allied to those advocated by leading Reforniers, and then still tenable within the Roman obedience), re-wording old propositions, or framing new ones, in an incisive fashion. It recovered for papal authority all it had lost, or was likely to lose, through the action of Basel and Constance ; and, above all, it unified Roman teaching for the first time, and crystallized it into rigid compactness. Thus it made concessions and explana- tions for the reconciliation of the revolted Protestants, although the primary cause of the council, practically im- possible thenceforward, since the Roman Catholic system, thus hastily consolidated out of a former condition of partial flux, became like a ‘Prince Rupert’s drop,” from which, if the smallest fragment be broken, the mass is at once resolved into disintegrated powder. In the matter of disciplinary reform the council enacted but little of an effective nature, except in the abolition of the traffic in indulgences, and the establishment of theological seminaries, which has proved the most effectual agency for creating that doctrinal uniformity which now prevails throughout the Roman obedience ; and the real honours of the Counter-Reformation rest with the Jesuits, to whose unremitting diligence, powerful organization, and ceaseless precept and example must be attributed by far the larger part of the abatement of ecclesiastical abuses and scandals which marks the succeeding era. Doubtless, the Tridentine decrees, in strong and resolute hands, proved most useful subsidiary weapons to compel local reforms ; but decrees of little less stringency had been enacted by previous

1 The Italian character of the eouneil of Trent ean best be exhibited by a classified table, showing the nationality of the bishops present in the later sessions :—Italians, 189; Spaniards, 31; Freneh, 26; Greeks (titulars), 6; Portuguese, 3; Ilyrians, 3; Irish, 3; Germans, 2; Flemish, 2; Polish, 2; Croatian, 1; Moravian, 1; English, 1.

synods, and had rusted unused, because there was no one able and willing to put them in operation against the passive resistance of powerful vested interests.

The bibliography of the council of Trent is very extensive, but a comparatively small number of volumes really suffices the student. The first work of import- ance is F. Paolo Sarpi's Jstorta del Concilio Tridentino, originally published in London (1619) by Antonio de Dominis, archbishop of Spalato, under the pseudonym of Pietro Soave Polano (an imperfect anagram of Paolo Sarpi Veneto), but better studied in the French version by Pere Le Courayer, with valuable notes (see Sarpi). The rival work of Sforza Palavicino, Zstoria del Conctlio di Trento (1656-57), written to order as a refutation of Sarpi's work, is also indispensable. He had free access to many official documents which Sarpi could not consult, and often corrects lim upon points of detail, but a careful reader will find that he confirms him far oftener than he refutes him. It is not enough, as Ranke points out, to compare those two, and take the mean statement as a guide, for they are sometimes in blank contradiction, and other witnesses must be called in to decide the matter. The Acts of the council, so far as they were drafted by Paleotto, were first published by Mendham in 1842; the complete Acts, by both Paleotto and Massarelli, were not accessible till published as Acta Genuina Ccumenict Conctlti Tridentint by Theiner in 1874. The vast compilation of Jodocus Le Plat, Monumentorum ad Historiam Concilii Tridentint Amplissima Collectio (7 vols. 4to, 1781-87), is full of valuable and interesting matter. The speeches of the Jesnit Laynez, which had snch a powerful effect npon the council, have been recently published under the title of Lainez, Disputationes Tridentinex, 2 vols., 1886, Vargas, Lettres e¢ Mémoires concernant le Conctle de Trent (1700, partly translated in Geddes, The Council of Trent no Free Assembly, 1714), is of much value. The canons and decrees of the council have been many times published, and are readily accessible; the best edition is that by Richter and Schulte (1853). There is a convenient abridgment of Palavicino's history prefixed to the Rev. James Waterworth's English version of the Decrees and Canons of Trent (1848), but it is not trustworthy, for the translator has suppressed many statements of the original which tellin various ways against the

freedom of the action of the council. To these may be added Sickel, Axktenstticke zur Geschichte des Konzils zu Trient, 1872; Calenzio, Documentt Inediti e Nuovt Lavort Letterarti sul Con- cilio dt Trento, 1874; Dollinger, Sammlung von Urkunden zur Geschichte des Concils von Trient, 1876; and the article on the council in Wetzer and Welte's Kirchenlexicon, (R. F. L.)

TRENTON, a city of the United States, county seat of Mercer county, New Jersey, and capital of the State, is situated in 40° 14' N. lat. and 74° 45' W. long., 33 miles north-east of Philadelphia and 57 sonth-west of New York. It lies very near sea-level (under 45 feet), upon the left (eastern) bank of the Delaware river, at the head of navi- gation. The city is irregularly built, the streets of different sections running in various directions, without any appear- ance of system; this is doubtless due to the fact that different portions of the city were originally settled as independent villages. 'Till recently Trenton was rather backward in the matter of municipal improvements, but an extensive system of paving and sewage has now been entered on. The water supply is obtained by pumping into a reservoir. Street cars run upon one or two of the principal streets; and the city is traversed by the main line of the New York division of the Pennsylvania Rail- road. Manufactures are the leading industry, the capital invested in 1880 having been $6,966,830 and the produc- tion $12,712,762. In iron and steel manufactures over $2,000,000 were invested, the industry next in importance being the manufacture of stone and earthen ware, for which this city has a national reputation. Rubber goods, watches, and woollen cloths are also made. The population, 22,874 in 1870, was 29,910 in 1880.

Trenton was formed by a consolidation under onc charter of several independent villages, known as Falls of the Delaware (settled in 1680), Kingsborough, Bloomsburg, and Lamberton. The name Trenton was given to the settlements about 1720. Its early growth was slow. In 1790 it was selected as the State capital, and two years later it received a city charter. Its growth since that time has been steady, and during the past thirty years has been very rapid.

TREPANG. See Bécux-pz-Mzr.

TRESPASS, in law, is any transgression of the law less than treason, felony, or misprision of either. The term includes a great variety of torts committed to land, goods, or person, distinguished generally by names drawn from the writs once used as appropriate to the particular trans- gression, such as wi et armis, quare clausum fregit, de bonis asportatis, de uxore abducta cum bonis vir, quare jilium et heredem rapuit, kc. Up to 1694 the trespasser was regarded, nominally at any rate, as a criminal, and was liable to a fine for the breach of the peace, commuted for a small sum of money, for which 5 W. and M. c. 12 sub- stituted a fee of 6s. 8d. recoverable as costs against the defendant. ‘Trespass is not now criminal except by special

statutory enactment, e.g., the old statutes against forcible entry, the Game Acts, and the private Acts of many rail- way companies. When, however, trespass is carried suffi- ciently far it may become criminal, and be prosecuted as assault if to the person, as nuisance if to the land. At one time an important distinction was drawn between trespass general and trespass special or trespass on the case, for which see Tort. The difference between trespass and case was sometimes a very narrow one; the general rule was that where the injury was directly caused by the act of the defendant the proper remedy was trespass, where indirectly, case. The difference is illustrated by the action for false imprisonment: if the defendant himself imprisoned the plaintiff the action was trespass; if a third person did so on the information of the defendant it was case. A close parallel is found in Roman law in the actio directa under the lex Aquilia for injury caused directly, the actio utilis for that caused indirectly. One of the reasons for the rapid extension of the action on the case, especially that form of it called asswmpsit, was no doubt the fact that in the action on the case the defendant was not allowed to wage his law (see WacER).

In its more restricted sense, trespass is generally used for entry on land without lawful authority by either a man, his servants, or his cattle. To maintain an action for such trespass the plaintiff must have possession of the premises. The quantum of possession necessary to enable him to bring the action is often a question difficult to decide. In most instances the tenant

can bring trespass, the reversioner only case. By the Judicature Act, 1873, a mortgagor in possession can sue for trespass in his own name. Remedies for trespass are either judicial or extra- judicial. The most minute invasion of private right is trespass, though the damages may be nominal if the injury was trivial. On the other hand, they may be exemplary if circumstances of aggravation were present. Pleading in the old action of trespass was of a very tech- nical nature, but the old-fashioned terms alia enormia, replication de injuria, new assignment, &ec., once of such frequent occurrence in the reports, are of merely historical interest since the introduction of a simpler system of pleading, unless in those American States where the old pleading has not been reformed. The VENUE (¢.v.) in trespass was formerly local, in case transitory. In addi- tion to damages for trespass, an injunction may be granted by the court. The power to grant injunctions against threatened or apprehended trespass has been considerably enlarged by the Judicature Act, 1873. The principal instances of extra-judicial remedies are distress damage feasant of cattle trespassing, and removal of a trespasser without unnecessary violence, expressed in the terms of Latin pleading by molliter manus inyposuit.

Trespass may be justificd by exercise of a legal right, as to serve the process of the law, or by invitation or licence of the owncr, or may be excused by accident or inevitable necessity, as deviation from a highway out of repair. Where a man abuses an authority given by the law, his wrongful act relates back to his entry, and he becomes a trespasser ab initio, that is, liable to be treated as a trespasser for the whole time of his being on the land. Mere breach of contract, such as refusal to pay for wine in a tavern which a person has lawfully cntered, does not constitute him a trespasser ab initio. A trespass of a permancnt naturc is called a continuing trespass; such would be the perinitting of one’s cattle to feed on another’s land without authority.

In Scots law trespass is used only for torts to land. By the Trespass (Scotland) Act, 1865, trespassers are liable on summary conviction to fine and imprisonment for encamping, lighting fires, &c., on land without the consent and permission of the owner.

TREVES (French, 7Z’réves; German, Zier), formerly the capital of an archbishopric and spiritual electorate of the empire, and now the seat of a

Roman Catholic bishop and the chief town of a governmental! district in the Prussian province of the Rhine, is situated on the right

TR E—

bank of the Moselle, pleasantly surrounded by low vine- clad hills, 60 miles south-west of Coblentz and 86 miles south of Cologne. It lies in the midst of a carefully cultivated and fertile plain, the rich vegetation of which forms a pleasing setting to its red sandstone walls and venerable towers. Most of the old streets of the town are quaint and irregular; but much of the space enclosed within the circuits of the walls is now occupied by orchards and gardens. The population of Treves in 1885 was 26,125, five-sixths of whom were Roman Catholics. Their chief occupations are fruit-growing and vine-dressing ; the industries of the place, including the manufacture of cotton and linen, dyeing, and tanning, are not very exten- sive. A specialty of Treves is the preparation of stones for Gothic churches, which are sent off ready to be at once placed in position. A river traffic is carried on in wine, cattle, and wood.

Treves claims to be the oldest town in Germany, and it contains more important Roman remains than any other place in northern Europe. The most remarkable of these is the Porta Nigra, a huge fortified gateway, 115 feet long, 70 to 95 feet high, and 30 feet deep. It is formed of uncemented blocks of sandstone, held together by clamps of iron, and now blackened with time; the details are very rude. Opinions vary widely as to the date of its erection, but recent authorities refer it to the 1st century of the Christian era. During the Middle Ages the structure was converted into two churches, one above the other; alk additions have, how- ever, now been removed, except the apse at the east end. The basilica, long used as the archiepiscopal palace and now consccrated as a Protestant church, probably dates from the reign of Constan- tine. The so-called Roman baths are in all probability the relics of an extensive impcrial palace. Just outside the town are the remains of an amphitheatre, capable of accommodating 30,000 spectators, where Constantine caused several thousand Franks and Bructeri to be butchered for the public amusement. Perhaps the oldest Roman remains in Treves are some of the piers of the bridge over the Moselle, dating from about 28 3.c. This bridge, which is at one corner of modern Treves, lay near the middle of

the much more extensive Roman city. There are also numerous Roman antiquities in the neighbourhood of Treves, the most important of which are the Igel column, a sepulchral monument of the 2d century, and the mosaic pavements at Nennig and Fliessem.

Another group of interesting buildings belongs to the second period of prosperity enjoyed by Treves under the rule of its medizval prelates. The cathedral, described by Ltibke as the most important example of pre-Carlovingian building in Germany, mirrors the entire history of the town. Its kernel consists of part of a Roman basilica of the 4th century, which seems to have been converted into a Christian church at a very early period. It was restored by Bishop Nicetius about 550, and in the 11th and 12th centuries it was again restored and greatly extended by Archbishop Poppo and his successors, who added an apse at each cnd and left it substanti- ally in its present form. The cathedral is connected by beautiful cloisters of the 13th century with the circular Liebfrauenkirche, one of the most interesting early Gothic churches in Germany (1227-43), catching up the architectural thread at the point dropped by the cathedral. Among the treasures of the latter is. the ‘‘ holy coat of Treves,” belicved by the devout to be the seamless garment worn by our Saviour at the crucifixion, and said to have been pre-sented to the town by the empress Helena, the central figure in Treveran Christian legend. Its exhibition in 1844 attracted a million and a half of pilgrims to Treves. According to recent authorities, the earliest churches in Treves were those of Sts Eucharius, Maximin, Matthew, and Paul, all without the walls, now rebuilt or convertcd to sccular purposes. Of the modern buildings none call for special remark, The town library contains about 100,000 volumes, including several valuable specimens of early printing. Its greatest treasure is the Codex Aureus, a manuscript of the Gospels presented to the abbey of St Maximin by Ada, sister of Charlemagne. The same building also contains an interesting collection of Roman and medieval antiquities.

A medieval legend, preserved in an inscription on the old Rothes Haus inn, places the foundation of Treves 1300 years before that of Rome, and ascribes it to Thebetas, son of Ninus, king of Assyria. But, fable apart, we must still allow that Treves has good claim to call itself the oldest town in Germany. It is a little doubtful whether the Treviri were of Teutonic or

Celtic stock. St Jerome records that the language of the Treviri of the 4th century resembled that of the Gauls of Asia; but, even if we admit this evidence as conclusive of their Celtic origin, we must recognize the fact that they were Celts who were long under Teutonic influence. Their authentic history begins with the story of their subjection by Julius

Cesar (56 B.c.), who describes them as a warlike race, with the best cavalry in Gaul. The Roman town, Colonia Augusta Trevirorum (or Treverorum), was probably founded by the emperor Claudius,and rapidly obtained a wealth and importance which justified the poet Ausonius (4th century) in describing it as the second metropolis of the empire, or ‘‘ Rome beyond the Alps.” It became the capital of Belgica Prima, and during the 4th century was a favourite residence of Constantine and other Roman emperors. Most of the palaces and public buildings, of which the remains arc still extant, were built at this period, while the surrounding hills were covered with villas. Treves was laid in ruins by Attila in 451, and about 465 was permanently taken possession of by the Franks. It was included in the kingdom of Austrasia, and became a German city in 870. Like its prototype Rome, it attained a second era of prosperity and importance as an ecclesiastical capital (see below), and in the Middle Ages the ‘‘ Sancta Civitas Trevirorum ’’ swarmed with ‘‘religious” of all kinds and grades. Unlike most of the German episcopal cities, however, it did not succeed in shaking off the ecclesiastical yoke, nor did it attain, except transitorily, the position of a free imperial city. Wars and sieges occasionally checked but did not stop its growth. Art and science were sedulously fostered in the monastic schools, and a university, founded in 1478, existed down to 1798. The importance of Treves departed with the overthrow of the ecclesiastical principality. In 1786 the last elector shifted his residence to Coblentz, and from 1794 to 1814 Treves was capital of the French department of the Sarre. Since the latter date it has belonged to Prussia.

The archbishopric and ecclesiastical electorate of Treves, bounded by Nassau, Cologne, Luxemburg, Lorraine, the Rhenish Palatinate, Hesse-Rheinfels, and Katzenelnbogen, had an area of about 3200 square miles and a population of 250,000 to 300,000. Itssuffragan bishops were those of

Metz, Toul, and Verdun, and after 1777 also those of Nancy and St Dié. As elector of the German empire the archbishop took thesecond place, and borethe styleof arch-chancellor of Gaulor Burgundy. Legend places the foundation of the bishopric of Treves in the 1st century of the Christian era, but the first bishop known to history is Agricius, who flourished about 314. The see appears as an archbishopric in the 9th ccntury, and in the Middle Ages the archbishops attained considerable tciporal power. Among the most prominent were Baldwin of Luxemburg (1307- 1854), brother of the emperor Henry VII., who may be regarded as the founder of the territorial greatness of the see, and Richard von Greiffenklau (1511-1531), who distinguished himself by his successful opposition to the Reformation. The last archbishop was Clemens Wenceslaus (1768-1802) of Saxony. The part of the archbishopric on the left bank of the Rhine was taken by France in 1801, and the rest was secularized in favour of the prince of Nassau-Weilburg in 1803. After the fall of Napoleon the archbishopric was incorporated with Prussia. A new bishopric of Treves was instituted in 1821, the boundaries of which are almost conterminous with those of the old archbishopric; the bishop is a suffragan to the archbishop of Cologne.

See ‘‘Augusta Treverorum,” an article by E. A. Freeman in the British Quarterly Review for July 1875.

TREVIRANUS, Gortrriep RemnnoLtp (1776-1837), German naturalist, was born at Bremen, February 4, 1776, studied medicine at Gottingen, in 1797 became professor of mathematics in the Bremen lyceum, and died at Bremen, February 16, 1837.

He made numerous important contributions to comparative anatomy, especially in regard to birds and spiders. Though noted for his learning and acute observation, his studies in geographical distribution cannot be said to have led to any very definite results. It is rather on account of his contributions to xtiology that he de- serves to be remembered, though his work in this department has been to a great extent overlooked. In the first of his larger works, Biologie oder Philosophie der lebenden Natur, which appeared from 1802-1805, he gave clear expression to the theory of ‘‘ descent with modification.” He believed that simple forms (Protists), which he termed ‘‘zoophytes,” were ‘‘the primitive types from which all the

organisms of the higher classes had arisen by gradual development." '¢ Every living creature has a potentiality of endless modification of adapting its structure to the changes in the external world." He also maintained that each species has its day or pcriod, at the end of which it does not become extinct, but has simply ceased to be, because it has become something else. That he stated the theory of descent with much elearness, and with a sufficient background of actual knowledge of forms, must be acknowledged by all; the only difficulty relates to the question of priority. The first volume of his biology was published in 1802, but he states that this had been written about 1796. Now it was not till 1801 that Lamarck first began to free himself from the traditional dogma of the immuta- bility of species, and to publish his views of evolution. Neither Goethe nor Oken can be said to have done much more than follow up the ironical insinuations of Buffon (1753-76) and the ingenious suggestions of Erasmus Darwin, whose Zoonomia was translated

into German between 1795 and 1797, while both Treviranus and Lamarck tackled the problem not merely of the theory of descent but of the mechanism of evolution. On this point the merits of Lamarck certainly outweigh those of his contemporary. Trevir- anus laid down as a fundamental proposition "that all living forms are the results of physical influences which are still in operation, and vary only in degree and direction." Like many after him, he directed attention to the influence of the male elements in fertiliza- tion as a source of variation, but laid emphasis only on the intra- organismal power of adaptation to surroundings. Whatever opinion he entertained in regard to the priority and the importance of the contribution made by Treviranus to the theory of evolution, it is at least certain that he was a learned naturalist and an acute thinker. His most important later work of a synthetic nature was entitled Erscheinungen und Gesctze des organischen Lebens

1831).

\ See — E. Haeckel’s Schépfungsgeschichte, pp. 83-5; Carus, Geschichte der Zoologie, p. 610.

TREVISO, a town of Italy, in the province of the same name, lies in the midst of a district of great fertility, at the confluence of the Piavesella with the Sile, which is here navigable for large boats and communicates by canals with the lagoons of Venice (17 miles distant). It is an old town, with narrow irregular colonnaded streets and some good squares. The cathedral of San Pietro, dating from 1141 and restored and enlarged in the 15th century by Pietro Lombardo, but still unfinished, contains a fine Annunciation by Titian (1519), an Adoration of the Shepherds, the masterpiece of Paris Bordone (born at Treviso in 1500), and frescos by Pordenone. There are numerous statues and reliefs by Pietro, Tullio, and Martino Lombardo, and by Sansovino. The Gothic church of San Niccold (1310-52) contains a fine tomb by Tullio Lombardo, frescos by Giovanni Bellini, and a large altar-piece by Fra Marco Pensabene and others ; in the adjoining chapter-house are forty portraits of celebrated Dominicans by Tommaso da Modena (1352). The Monte di Piet’ contains an Entomb- ment by Pordenone (according to others by Giorgione). The churches of S. Leonardo, 8. Andrea, S. Maria Maggiore, and S. Maria Maddalena also contain precious art treasures, and the town is enriched besides by various open-air frescos. The town-hall and theatre are also conspicuous buildings. Silk and cotton goods, cutlery, majolica, and paper are the chief manufactures of the place, and an active trade is also carried on in corn, fruit, and cattle. The population in 1881 was 31,249.

Treviso, the ancient Tarvisiwm, is not mentioned by any of the ancient geographers, though Pliny speaks of the Silis as flowing “ex montibus Tarvisanis.” In the 6th century it appears as an important place. From 1318 it was for a short time the seat of a university (see UNIVERSITIEs). In 1339 it came under the Venetian sway. In the 15th century its walls and ramparts were renewed under the direction of Fra Giocondo, two of the gates being built by the Lombardi. Treviso was taken in 1797 by the French under Mortier (duke of Treviso). In March 1848 the Austrian garrison was driven from the town by the revolutionary party, but in the follow- ing June the town was bombarded and compelled to capitulate.

TREVITHICK, Ricuarp (1771-1833), inventor of the locomotive, was descended froma family of great antiquity in the county of Cornwall, and was born 13th April 1771, in the parish of Illogan. Shortly afterwards the family re- moved to Penponds, near Camborne, where the boy attended his first and only school, his attainments being limited to reading, writing, and arithmetic. Though slow and obstin- ate as a scholar, he spent much time drawing lines and figures on his slate, and possessed such instinctive skill in mechanics that while still a youth he was able to solve a difficulty in the correction of underground levels which had puzzled some of the mine agents. He inherited more than the average strength for which his family were famous, standing 6 feet 2 inches in height, while his frame was the very model of an athlete. His feats in wrestling and lift- ing and throwing weights were unexampled in the district. At the age of eighteen he began to assist his father as mine manager, and, manifesting great fertility of mechanical in-

vention, was soon recognized as the great rival of Watt in improvements on the steam-engine (see vol. xxii. p. 476). On the death of his father in 1797, he succeeded him as leading engineer in Cornish mining. He married the same year. His earliest invention of importance was his improved plunger pole pump (1797), which has superseded all others for deep mining. In 1798 he applied the principle of the plunger pole pump to the construction of the water- pressure engine, which he subsequently improved in various ways. About this time he also perfected a high-pressure non-conducting steam-engine, which became a successful rival of the low-pressure steam-vacuum engine of Watt. At an early period he had begun experiments in the con- struction of locomotives, and a model constructed by him before 1800 is now in the South Kensington Museum. On Christmas eve 1801 his common road locomotive carried the first load of passengers ever conveyed by steam, and on 24th March 1802 he and Andrew Vivian applied for a patent for steam-engines in propelling carriages. In 1803 his locomotive was run in the streets of London, from Leather Lane by Gray’s Inn Lane and along Oxford Street to Paddington, the return journey being made by Islington. The cost was, however, found too great, and his thoughts were now directed to the construction of a steam loco- motive for tramways, with

such success that in February 1804 he worked a tramroad locomotive in Wales, running with facility up and down inclines of 1 in 50. In 1808 he constructed a circular railway in London near Euston Square, on which the public were carried at the rate of twelve or fifteen miles an hour round curves of 50 or 100 feet radius. The ideas of Trevithick were successfully developed by Stephenson so as to revolutionize the system of modern travelling, but Trevithick had made consider- able progress towards this before Stephenson had begun his experiments. Trevithick applied his high-pressure engine with great success to rock boring and breaking, as wellas to dredging. In 1806 he entered into a twenty- one years' engagement with the board of Trinity House, London, to lift ballast from the bottom of the Thames, at the rate of 500,000 tons a year, for a payment of 6d. a ton. The following year he was appointed along with Vazie to execute the Thames driftway, but the work was abandoned owing to disputes about payment when unex- pected difficulties had occurred. He then set up work- shops at 72 Fore Street, Limehouse, for the construction of iron tanks and buoys and model iron ships. He was the first to recognize the importance of iron in the construction of large ships, and in various ways his ideas have also influenced the construction of steamboats. In the appli- cation of steam to agriculture the name of Trevithick occupies one of the chief places. A high-pressure steam threshing engine was erected by him in 1812 at Trewithen, the property of Sir Charles Hawkins, while, in the same year, in a letter to the Board of Agriculture, he stated his belief that every part of agriculture might be performed by steam, and that such a use of the steam-engine would "double the population of the kingdom and make our markets the cheapest in the world." In 1814 he entered on an agreement for the construction of engines for the Peruvian mines, and to superintend their working renioved to Peru in 1816. Thence he went in 1822 to Costa Rica. He returned to England in 1827, and in 1828 petitioned parliament for a reward for his inventions, but without success. He was equally unsuccessful in his endeavours to induce the lords commissioners of the Admiralty to afford him facilities for demonstrating the value of certain improvements he claimed to have made in steam navigation. He died 22d April 1833.

See Life of Richard Trevithich, with an Account of his Inventions,

| by Francis Trevithick, C.E., 2 vols., 1872.

TRIAL, in law, is the examination of a cause before a court of justice. It is the stage in the cause next after PLEADING (qg.v.). Advance in legal development is generally marked by difference in the mode of trial. This was especially the case in the history of Roman law, and it has been the same in England (see Action). Many forms of trial, notably those by ORDEAL (q.v.), by wager of battle or of law (see WAGER), and by grand assize, have become obsolete, and new forms have been created by legislation in order to meet altered circumstances of society. Up to a very recent date the tendency of the Roman and English systems was in opposite directions. In the former and in systems founded on it, such as the Scotch, trial by the judge became the rule, in the latter trial by judge and jury. But the Judicature and Summary Jurisdiction Acts have recently made considerable innovations upon the old common-law right to trial by Jury (¢.v.) or per pais, as it was also called. The modes of trial in England are very numerous, as to a certain extent each Court (q.v.) has its own procedure. Certain broad rules of justice are observed by all courts, such as that both sides are to be heard, or to have an opportunity of being heard, before decision, and that (unless in very exceptional cases) the trial is to be in public.

For purposes of convenience rather than as a scientific division trials may be divided into civil and criminal. An ordinary trial in a civil case may be either in a court of appellate jurisdiction (in which case it is perhaps more properly called a hearing), in the High Court of Justice before a judge or referee, or in an inferior court. Where the trial is in a court of first instance, it may be either with or without a jury. In Chancery and Admiralty proceedings a jury is not used, and the right to a jury in the Queen’s Bench Division has been considerably restricted by the Rules of the Supreme Court, 1883, Order xxxvi. Before these rules either party had an absolute right to have issues of fact in an action in that division tried by jury. Now, unless in certain actions, mainly of tort, in which a jury is as of right, a jury can only be obtained by application of a party to the action, subject to the power of the court to direct trial without a jury of any issue requiring prolonged examination of documents or accounts or scientific or local investi- gation. The question of VENUE (g.v.) in civil actions lias ceased to

be of importance since the Judicature Acts. Most courts are en- titled in proper cases to the assistance of assessors. Trial with assessors is in frequent use in the Admiralty Division. A trial whether by jury or not may be by affidavit or on viva voce evidence. The latter is the rule where the trial is by jury. In a county court a jury of five is allowed in certain cases on application. In other inferior courts of local jurisdiction a jury is sometimes the rule, as in the (London) Lord Mayor's Court, sometimes not, as in the Chancellor's Court at Oxford or Cambridge. In criminal cases the trial is by jury, except where a court of SUMMARY JURISDICTION (g.v.) is empowered to try offences of a comparatively unimportant nature. The right to trial by due process of law before condemna- tion is secured to the subject by sec. 29 of Magna Charta. A new trial may be ordered in civil actions and in misdemeanours (in the latter case only after conviction of the defendant) on various grounds, the most usual of which are misdirection by the judge, improper ad- mission or rejection of evidence, and the finding of a verdict against the weight of evidence. In actions in the High Court new trials are less liberally granted than was the case before the Judicature Acts, Order xxxix. considerably restricting the right. An applica- tion for a new trial of an action is no longer made by ex parte motion in the first instance, as was the course before 1883, but upon notice of motion. Besides the ordinary modes of trial, there are others of an exceptional nature or of rare occurrence. In a trial by arbitration, the tribunal is chosen by the parties themselves, and they are not entitled to object to the trial as conducted by the arbitrator as long as it couforms to rules of ordinary justice. Peers are tried for treason or felony before the House of Lords, or the court of the Lord High Steward if the trial takes place duriug the recess of parliament. A trial at bar—a survival of the universal mode of trial before the writ of Nist Prius (q.v.) was given by the Statute of Westminster the Second—takes place before three or four judges of the Queen's Bench Division, and is in use as of right where the crown is interested in the litigation, or at the discretion of the court in other cases where questions of unusual importance or difficulty are raiscd. The trial of a petition of right (see PETITION, vol. xviii. p. 705) is now assimilated to that in civilactions. Trials by record, by certificate, and by inspection, though not expressly abolished, appear to have become obsolete. IMPEACHMENT (9.2.) is still a right of the House of Commons, but has not recently been

exercised. CouRT-MARTIAL (q.v.) is the mode of trial for offences committed by persons in the naval or military service of the crown.

In Scotland and the United States trials are either with or with- out a jury. The most usual trials in Scotland are those before a judge of the Court of Session or the High Court of Justiciary or in a sheriff court. In the United States trials are either ina United States or a State court ; in the latter case they are regulated by State legislation.

TRIBONIAN, the famous jurist and minister of Justi- nian, was born in Pamphylia in the latter part of the 5th century. Adopting the profession of an advocate, he came to Constantinople and practised in the prefectural courts there, reaching such eminence as to attract the notice of the emperor Justinian, who appointed him in 528 one of the ten commissioners directed to prepare the first Codex of imperial constitutions. In the edict creat- ing this commission (known as Hec Que) Tribonian is named sixth, and is called "' virum magnificum, magisteria dignitate inter agentes decoratum" (see J/ec Que and Summa Reipublice, prefixed to the Codex). When the commission of sixteen eminent lawyers was created in 530 for the far more laborious and difficult duty of com- piling a collection of extracts from the writings of the great jurists of the earlier empire, Tribonian was made presi- dent and no doubt general director of this board. He had already been raised to the office of queestor, which at that time was a sort of ministry of law and justice, its holder being the assessor of the emperor and his organ for judi- cial purposes, something like the English lord chancellor of the later Middle Ages. The instructions given to these sixteen commissioners may be found in the constitution Deo Auctore (Cod., i. 17,1), and the method in which the work was dealt with in the constitution Tanta (Cod., i. 17, 2), great praise being awarded to Tribonian, who is therein called ex-queestor and ex-consul, and also as magister offici- orum. This last constitution was issued in December 533, when the Digest was promulgated as a law-book. During the progress of the work, in January 532, there broke out in Constantinople a disturbance in the hippodrome, which speedily turned to a terrible insurrection, that which goes in history by the name of Nika, the watchword of the insurgents. 'Tribonian was accused of having pros- tituted

his office for the purposes of gain, and the mob searched for him to put him to death (Procop., Pers., i. 24-26). Justinian, yielding for the moment, removed him from office, and appointed a certain Basilides in his place. After the suppression of the insurrection the work of codification was resumed. A little earlier than the publication of the Dzgest, or Pandects, there had been published another but much smaller law-book, the Jnsti- tutes, prepared under Justinian's orders by Tribonian, with Theophilus and Dorotheus, professors of law (see Preface to Institutes). About the same time the emperor placed Tribonian at the head of a fourth commission, consisting of himself as chief and four others,—Dorotheus, professor at Beyrut, and three practising advocates, who were directed to revise and re-edit the first Codex of imperial constitu- tions. The new Codex was published in November 534 (see constitution Cord? Nobis prefixed to the Codex), With it Tribonian's work of codification was completed. But he remained Justinian's chief legal minister. He was re- instated as queestor some time after 534 (Procop., Pers., 1. 25; Anecd., 20), and seems to have held the office as long as he lived. He was evidently the prime mover in the various changes effected in the law by the novels of Justi- nian (Wovelle Constitutiones), which became much less frequent and less important after death had removed the great jurist. The date of his death has been variously assigned to 545, 546, and 547. Procopius says (Anecd., 20) that, although he left a son and many grandchildren, Justinian confiscated part of the inheritance.

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The above facts, which are all that we know about Tribonian, rest on the authority of his contemporary Proeopius and of the various imperial constitutions already eited. There are, however, two articles in the Lexicon of Suidas under the name "Tribonianos." They appear to be different articles, purporting to refer to different persons, and have been generally so received by the editors of Suidas and by modern legal historians. Some authorities, how- ever, as for instance Gibbon, have supposed them to refer to the same person. 'The first article is unquestionably meant for the jurist. It is based on Procopius, whose very words are to some extent copied, and indeed it adds nothing to what the latter tells us, except the statement that Tribonian was the son of Macedonianus, was dd ducnydpwv trav

biwdpywy, and was a heathen and atheist, wholly averse to the Christian faith. The second article says that the Tribonian to whom it refers was of Side (in Pamphylia), was also dd Sukyyspwv Trav brdpxwv, was a man of learning, and wrote various books, among which are mentioned certain astronomical treatises, a dialogue On Happiness, and two addresses to Justinian. None of these books relate to law; and the better opinion seems to be that there were two Tribonians, apparently contemporaries, though possibly some of the attributes of the jurist have been, by a mistake of the compilers or transcribers of the Lexicon of Suidas, extended to the man of letters of the same name.

The character which Procopius gives to the jurist, even if touched by personal spite, is entitled to some credence, because it is con- tained in the Histories and not in the scandalous and secret Anecdota. It is as follows: —‘‘Tribonian was a man of great natural powers, and had attained as high a culture as any one of his time; but he was greedy of money, capable of selling justice for gain, and every day he repealed or enacted some law at the instance of people who purchased this from him according to their several needs… . He was pleasant in manner and generally agree- able, and able by the abundance of his accomplishments to cast into the shade his faults of avarice’ (Pers., i. 24, 25). In the Anecdota Procopius adds as an illustration of Justinian’s vanity the story that he took in good faith an observation made to him by Tribonian while sitting as assessor, that he (Tribonian) greatly feared that the emperor might some day, on account of his piety, be suddenly carried up into heaven. This agrees with the character for flattery which the minister seems to have enjoyed. The charge of heathenism we find in Suidas is probable enough ; that is to say, Tribonian may well have beeu a crypto-pagan, like many other eminent courtiers and litterateurs of the time (including Procopius himself), a person who, while professing Christianity, was at least indifferent to its dogmas and rites, cherishing a sentimental recollection of the older and more glorious days of the empire.

In modern times Tribonian has been, as the master workman of Justinian’s codification and legislation, charged with three offences, —bad Latinity, a defective arrangement of the legal matter in the Code and Digest, and a too frec handling of the extracts from the older jurists included in the latter

compilation. The first of these charges cannot be denicd ; but it is hard to see why a lawyer of the 6th century, himself born in a Greck-speaking part of the empire, should be expected to write Latin as pure as that of the age of Cicero, or cven of the age of Gaius and the Antonines. To the second charge also a plea of guilty must be entered. The Code and Digest are badly arranged according to our notions of scientific arrangement. These, however, are modern notions. The ancients generally cared but little for what we call a philosophic distribu- tion of topics, and Tribonian seems to have merely followed the order of the Perpetual Edict which custom had already established, and from which custom would perhaps have refused to permit him to depart. He may more fairly be blamed for not having arranged the extracts in each title of the Digest according to some rational principle ; for this would have been easy, and would have spared much trouble to students and practitioners ever since. As to the third complaint, that the compilers of the Digest altered the ex- tracts they collected, cutting out and inserting words and sentences at their own pleasure, this was a process absolutely necessary ac- cording to the instructions given them, which were to prepare a compilation representing the existing law, and to be used for the actual administration of justice in the tribunals. The so-called Emblemata (insertions) of Tribonian were therefore indispensable, though, of course, we cannot say whether they were always made in the best way. Upon the whole subject of the codification and legis- lation in which Tribonian bore a part, see JUSTINIAN,

Tribonian, from the little we know of him, would seem to have been a remarkable man, and in the front rank of the great ones of his time, — There is nothing to show that he was a profound and philosophical jurist, like Papinian or Ulpian. But he was an energetic clear-headed man, of great practical force and skill, cul- tivated, accomplished, agreeable, flexible, possibly unserupulous, Just the sort of person whom a restless despot like Justinian finds useful. His interest in legal learning is proved by the fact that he had collected a vast legal library, which the compilers of the Digest found valuable (see const. Tanta).

The usual criticisms on Tribonian may be found in the Anti-Tribonianus

(1567) of Francis Hotman, the aim of which is shown by its alternative title, Sive discursus in quo jurisprudentie Tribonianew sterilitas et legum patriarum excellentia exhibetur ; and an answer to them in J, P. von Ludewig, Vita Jus- tiniani et Theodore, nec non Triboniant, (J. BR.)

TRIBUNE (tribunus) was a name assigned to officers of several different descriptions in the constitution of ancient Rome. The connexion of the word with tribus, “tribe,” is obvious. The original tribunes were no doubt the commanders of the several contingents of cavalry and infantry which were supplied to the Roman army by the early gentilician tribes,—the Ramnes, the Tities, and the Luceres. In the historical period the infantry in each legion were commanded by six tribunes, and the number six is probably to be traced to the doubling of the three tribes by the incorporation of the new elements which received the names of Mamnes secundi, Tities secundi, Luceres secundi. The tribuni celerum or commanders of the cavalry no longer existed in the later times of the republic, having died out with the decay of the genuine Roman cavalry.!. So long as the monarchy lasted these tribunes were doubtless nominated by the commander-in- chief, the king; and the nomination passed over on the establishment of the republic to his successors, the consuls. But, as the army increased, the popular assembly insisted on having a voice in the appointinents, and from 362 B.c. six tribunes were annually nominated by popular vote, while in 311 the number was raised to sixteen, and in 207 to twenty-four, at which figure it remained. The tribunes thus elected ranked as magistrates of the Roman people, and were designated tribunz militum a populo, while those who owed their office to the consuls bore the curious title of tribuni rufuli. The rights of the assembly passed on to the emperors, and “the military tribunes of Augustus” were still contrasted with those nominated in the camp by the actual commanders. The obscure designation tribunus zrarws, “tribune of the treasury,” had also, in all prob- ability, a connexion with the early organization of the army. The officer thus designated was at any rate the paymaster of the troops, and the soldier who was defrauded of his pay was allowed to exact it from this tribune by a very summary process. There was still another and im- portant class of tribunes who owed their existence to the army. In the long struggle between the patrician and plebeian sections of the population, the first distinctions in the public service to which the plebeians forced their way were military, and the contest for admission to

the consulate was in large part a contest for admission to the supreme command of the national forces. In 445 3.c., the year in which mixed marriages of patricians and plebeians were for the first time permitted, power was given to the senate (then wholly patrician) of determining from year to year whether consuls or military tribunes with consular authority (tribunit militares consulari potestate or imperio) should be appointed. But, even when the senate decided in favour of electing tribunes, no election was valid without the express sanction of the senate superadded to the vote of the centuriate assembly. If it happened to be too in- vidious for the senate openly to cancel the election, it was possible for the patricians to obtain a decision from the sacred authorities to the effect that some religious practice had not been duly observed, and that in consequence the appointment was invalid. According to tradition, recourse was had to this device at the first election, a plebeian having been successful. Forty-five years elapsed after the creation of the office before any plebeian was perntitted to fill it, and it was held by very few down to the time at which it was abolished (367 B.c.) and the plebeians were fully admitted to the consulate. The number of consular

1 In the legends of the foundation of the republie Brutus is repre- sented as having exercised authority, when the king was banished, merely by virtue of holding the office of tribunus celerwm.

tribunes elected on each occasion varied from three to six ; there was no year without a patrician, and to the patrician members were probably confined the most highly esteemed duties, those relating to the administration of the law and to religion.

But by far the most important tribunes who ever existed in the Roman community were the tribunes of the com- mons (¢ribuni plebis). These; as has been explained in Rome (vol. xx. p. 736 sq.), were the most characteristic outcome of the long struggle between the two orders, the patrician and the plebeian. When in 494 B.c. the plebeian legionaries met on the Sacred Mount and bound themselves to stand by each other to the end, it was determined that the plebeians should by themselves annually appoint ex- ecutive officers to stand over against the patrician officers, —

two tribunes (the very name commemorated the military nature of the revolt) to confront the two consuls, and two helpers called zdiles to balance the two patrician helpers, the questors. The name edile is obviously connected with ades, “a temple,” and is an indication of the-fact that there was a religious core to the insurrection, just as there was a religious core to the patrician opposition. The temple of Diana and Ceres on the Aventine Hill became for a time to the plebeians what the temple of Saturn was to the patricians,—their official centre and their record office. The insurgent leaders also pressed religion into their service in another way. The masses assembled on the Sacred Mount bound themselves by a solemn oath to re- gard the persons of their tribunes and eediles as inviolable, and to treat as forfeited to Diana and Ceres the lives and property of those who offered them insult. That this purely plebeian oath was the real ultimate basis of the sanctity which attached to the tribunate during the whole time of its existence can hardly be believed, though this view has had powerful support both in ancient and in recent times. The revolution must have ended in something which was deemed by both the contending bodies to be a binding compact, although the lapse of time has blotted out its terms. The historian Dionysius may have been only technically wrong in supposing that peace was con- cluded between the two parties by the fetial priests, with the forms adopted by Rome in making treaties with a foreign state. If this were fact, the “sacrosanctity” of the tribunes would be adequately explained, because all such formal fadera were “sacrosanct.” But, notwithstanding that the plebeians may safely be assumed to have been conscious of having to a large extent sprung from another race than the patricians and their retainers, it is not likely that the feeling was sufficiently strong to permit of the compact taking the form of a treaty between alien powers. Yet there must have been a formal acceptance by the patricians of the plebeian conditions ; and most probably the oath which was first sworn by the insurgents was after- wards taken by the whole community, and the “sacro- sanctity” of the plebeian officials became a part of the constitution. There must also have been some constitu- tional definition of the powers of the tribunes, These rested at first on an extension of the power of veto which the republic had introduced. Just as one consul could annul an act or order of his colleague, so a tribune could annul an act or order of a consul, or of any officer inferior to him. There was no doubt a vague understanding that only acts or orders which sinned against the just and established

practice of the constitution should be annulled, and then only in cases affecting definite individuals. The tribune was to give his help against illegality in concrete instances. The cases which arose most commonly concerned the administration of justice and the levying of troops.

Although the revolution of 494 gave the tribunes a foot- hold in the constitution, it left them with no very definite

resources against breaches of compact by the patricians. The traditional history of the tribunate from 494 to 451 B.C. is obscure, and, so far as details are concerned, nearly worthless ; but there is a thread running through it which may well be truth. We hear of attacks by patricians on the newly won privileges, even of the assassination of a tribune, and of attempts on the part of the plebeians to bring patrician offenders to justice. The assembled plebeians attempt to set up a criminal jurisdiction for their own assembly parallel to that practised by the older centuriate assembly, in which the nobles possess a pre- ponderating influence. Nay, more, the plebs attempts something like legislation ; it passes resolutions which it hopes to force the patrician body to accept as valid. As to details, only a few are worth notice. In the first place, the number of tribunes is raised to ten, how we do not know; but apparently some constitutional recognition of the increase is obtained. Then an alteration is made in the mode of election. As to the original mode, the ancient authorities are hopelessly at variance. Some of them gravely assert that the appointment lay with the assembly of the curiz—the most ancient and certainly the most patrician in Rome, even if we allow the view, which, in spite of great names, is more than doubtful —that the plebeians were members of it at any time when it still possessed political importance. The opinion of Mommsen about the method of election is more plausible than the others. It was in accordance with the Roman spirit of order that the tribunes, in summoning their assemblies, should not ask the plebeians to come en masse as individuals, and vote by heads, but should organize their supporters in bands. The curia was certainly a territorial district, and the tribunes may have originally used it as the basis of their organization. If tribunes were elected by plebeians massed curtatim, such a meeting would easily be mistaken in later times for the

comitia curiata. At any rate, a change was introduced in 471 by the Publilian Law of Volero, which directed that the tribunes should be chosen in an assembly organized on the basis of the Servian or local tribe, instead of the cura. This assembly was the germ of the comitia tributa. The question by what authority the Law of Volero was sanctioned is difficult to answer. Possibly the law was a mere resolution of the plebeians with which the patricians did not interfere, because they did not consider that the mode of election was any concern of theirs. In the first period of the tribunate the tribunes almost certainly agitated to obtain for their supporters a share in the benefits of the state domain. And, whatever view may be taken of the movement which led to the decemvirate, an important element in it was of a certainty the agitation carried on by the tribunes for the reduction of the law of Rome toa written code. Until they obtained this, it was impossible for them effectually to protect those who appealed against harsh treatment by the consuls in their capacity of judges.

During the decemvirate the tribunate was in abeyance. It was called into life again by the revolution of 449, which gave the tribunes a considerably stronger position. Their personal privi- leges and those of the ediles were renewed, while sacrosanctity was attached to a body of men called judices decemviri, who seem to have been the legal assistants of the tribunes. The road was opened up to valid legislation by the tribunes through the assembly of the tribes, but in this respect they were submitted to the control of the senate. The growth of the influence of the tribe assembly over legislation belongs rather to the history of the ComrTrA (qg.v.) than to that of the tribunate. After the Hortensian Law of 287 B.c. down to the end of the republic nearly all the legislation of Rome was in the hands of the tribunes. The details of the history of the tribunate in its second period, from 449 to 367 B.c., are hardly less obscure than those which belong to the earlier time. There was, however, on the whole, undoubtedly an advance in dignity and importance. Gradually a right was acquired of watching and inter- fering with the proceedings of the senate, and even with legislation.

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Whether the absolute right of veto had been achieved before 367 may well be doubted. But the original awxiliwm, or right of pro- tecting individuals,

was, during this period, undergoing a very remarkable expansion. From forbidding a single act of a magis- trate in relation to a single person, the tribunes advanced to for- bidding by anticipation all acts of a certain class, whoever the persons affected by them might prove to be. It therefore became useless for the senate or the comitia to pass ordinances if a tribune was ready to forbid the magistrates to carry them out. Ultimately the mere announcement of such an intention by a tribune was sufficient to cause the obnoxious project to drop: that is to say, the tribunes acquired a right to stop all business both in the delibera- tive assembly, the senate, and in the legislative assemblies, the comitia. The technical name for this right of veto is intercessio. To what extent the tribunes during the time from 449 to 367 took part in criminal prosecutions is matter of doubt. The XII. Tables had settled that offenders could only be punished in person by the centuries, but tradition speaks of prosecutions by tribunes before the tribes where the penalty sought was pecuniary. The two main objects of the tribunes, however, at the time of which we are speak- ing were the opening of the consulate to plebeians and the regula- tion of the state domain in the interests of the whole community. Both were attained by the Licinio-Sextian Laws of 367. ’

Then a considerable change came over the tribunate. From being an opposition weapon it became an important wheel in the regular machine of state. The senate became more and more plebeian, and a new body of nobility was evolved which comprised both orders in the state. The tribunes at first belonged to the same notable plebeian families which attained to the consulate. The old friction between senate and tribunes disappeared. It was found that the tribunate served to fill some gaps in the constitution, and its power was placed by common consent on a solid constitutional basis. From 357 to 134 B.c. (when Tiberius Gracchus became tribune) the tribunate was for the most part a mere organ of senatorial govern- ment. As the change made by the Gracchi was rather in the practice than in the theory of the tribunate, it will be convenient at this point to give a definite sketch of the conditions and _privi- leges attaching to the office.

Even after the difference between patrician and tae birth had ceased to be of much practical consequence in other directions, the plebeian character was a necessity for the tribune. When the patricians P. Sulpicius Rufus and,

later, P. Clodius (the antagonist of Ciccro) desired to enter on a demagogic course, they were com- pelled to divest themselves of their patrician quality by a peculiar legal process. Even the patricians who became so by mere fiat of the emperors were excluded from the tribunate. The other neces- sary qualifications were for the most part such as attached to the other Roman magistracies,—complete citizenship, absence of certain conditions regarded as disgraceful, fulfilment of military duties. The minimum age required for the office was, as in the case of the queestorship, twenty-seven. The tribunate stood outside the round of magistracies the conditions of which were regulated by the Villian Law of 180 B.c. The election took place in a purely plebeian assembly, ranged by tribes, under the presidency of a tribune selected by lot. The tribune was bound by law to see a complete set of ten tribunes appointed. Technically, the tribunes were reckoned, not as magistrates of the Roman people, but as magis- trates of the Roman plebs; they therefore had no special robe of office, no lictors, but only messengers (viatores), no official chair, like the curule seat, but only benches (subsellia). Their right to summon the plebs together, whether for the purpose of listening to a speech (in which case the meeting was a contio) or for passing ordinances (comitia tributa), was rendered absolute by the ‘‘laws under sacred sanction” (leges sacratx), which had been incorpor- ated with the constitution on the abolition of the decemvirate. The right to summon the senate and to lay business before it was acquired soon after 367, but was seldom exercised, as the tribunes had abundant means of securing what they wanted by pressure applied to the ordinary presidents,—the consuls or the urban pretor, When an interregnwm came about and there were no ‘“magistrates of the Roman people,” the plebeian tribunes became the proper presidents of the senate and conductors of ordinary state business. At the end of the republic there were interregna of several months’ duration, when the tribunes held a position of more than usual importance. A tenure of the tribunate did not, until a comparatively late period (probably about the time of the Second Punic War), confer a claim to a permanent seat in the senate. The candidates for the office were mainly young men of good family who were at the beginning of their political career, but the office was often filled by older men of ambition who were struggling upwards with few advantages. The plebeian cdiles very soon after 367 became dissociated from the tribunes and as- sociated with the

curule ediles, so that in the political hierarchy they really ranked higher than those who were originally their superior officers.

The real kernel of the tribune’s power consisted in his inter- cessio or right of annulling ordinances, whether frained by the senate

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or proposed by a magistrate to the comitia, or issued by a magistrate in pursuance of his office. From 367 B.c. down to the time of the Gracchi the power of veto in public matters was on the whole used in the interests of the aristocratic governing families to check opposition arising in their own ranks. A recalcitrant consul was most readily brought to obedience by an exercise of tribunician power. But, although modern readers of the ancient historians are apt to carry away the idea that the tribunate was an intensely political office, it is safe to say that the occasions on which tribunes found it possible to play a prominent part in politics were extremely few, even in the late republic. On the other hand, the tribunes found a field for constant activity in watching the administration of justice and in rendering assistance to those who had received harsh treatment from the magistrates. The tribunes were in fact primarily legal functionaries, and constituted in a way the only court of appeal in republican Rome. It was to this end that they were forbidden to pass a whole night away from the city, except during the Latin festival on the Alban Mount, and that they were expected to keep their doors open to suppliants by night as well as by day. They held court by day in the Forum close by the Porcian basilica, and frequently made elaborate legal inquiries into cases where their help was sought. Naturally this ordinary hum- drum work of the tribunes has left little mark on the pages of the historians, but we hear of it not unfrequently in Cicero’s speeches and in other writings which deal with legal matters. According to the general principle of the constitution, magistrates could forbid the acts of magistrates equal to or inferior to themselves. For this purpose the tribunes were deemed superior to all other officers. If a tribune exercised his veto no other tribune could annul it, for the veto could not be itself vetoed, but it was possible for another tri- bune to protect a definite individual from the consequences of dis- obedience. The number of the tribunes (ten) made it always pos- sible that one might baulk the action of another, except at times when popular feeling was strongly roused. In any case it was of little use for a tribune to move in any important matter unless he had secured the co-

operation or at least the neutrality of all his colleagues. The veto was not, however, absolute in all directions. In some it was limited by statute: thus the law passed by Gaius Gracchus about the consular provinces did not permit a tribune to veto the annual decree of the senate concerning them. When there was a dictator at the head of the state, the veto was of no avail against him. One of the important political functions of the tri- bunes was to conduct prosecutions of state offenders, particularly ex-magistrates, These prosecutions began with a sentence pro- nounced by the tribune upon the culprit, whereupon, exercising the right given him by the XII. Tables, the culprit appealed. If the tribune sought to inflict punishment on the culprit's person, the appeal was to the assembly of the centuries; if he wished for a large fine, the appeal was to the assembly of the tribes. As the tribune had no right to summon the centuries, he had to obtain the necessary meetings through the urban pretor. In the other event he himself called together the tribute assembly and proposed a bill for fining the culprit. But the forms of trial gone through were very similar in both cases.

It is commonly stated that a great change passed over the tri- bunate at the time of the Gracchi, and that from their day to the end of the republic it was used as an instrument for setting on foot political agitation and for inducing revolutionary changes. This view is an inversion of the facts. The tribunate did not create the agitation and the revolutions, but these found vent through the tribunate, which gave to the democratic leaders the hope that acknowledged evils might be cured by constitutional means, and in the desperate struggle to realize it the best democratic tribunes strained the theoretic powers of their office to their ruin. For the bad tribunes did not hesitate to use for bad ends the powers which had been strained in the attempt to secure what was good. But herein the tribunate only fared like all other parts of the republican constitution in its last period. The consuls and the senate were at least as guilty as the tribunes. After a severe restriction of its powers by Sulla and a restoration by Pompey, which gave a twenty years' respite, the tribunate was merged into the imperial con- stitution, of which indeed it became the chief corner-stone. The emperors did not become tribunes, but took up into their privileges the essence of the office, the "tribunician authority." This dis- tinction between the essential principle of the office and the actual tennre of the office was a creation of the late republic. Pompey, for example, when he went to the East, was not made

proconsul of all the Eastern provinces, but he exercised in them a “pro-consular authority” which was superior to that of the actual pro- consuls,—an authority which was the prototype of the imperial authority on its military side. Similarly the emperor, as civil governor, without being tribune, exercised powers of like quality with the powers of the tribune, though of superior force. By virtue of his tribunician authority he acquired a veto on legislation, he became the supreme court of appeal for the empire, and to his per- son was attached the ancient sacrosanctity. Augustus showed the highest statesmanship in founding his power upon a metamorphosed

tribunate, rather than upon a metamorphosed dictatorship, upon traditions which were democratic rather than upon traditions which were patrician and optimate. The tribunes continued to exist till a late period, with gradually vanishing dignity and rights ; but it is not necessary here to trace their decay in detail.

The name “tribune” was once again illuminated by a passing glory when assumed by Cola di Rienzi. The movement which he headed was in many respects extremely like the early movements of the plebeians against the patricians, and his scheme for uniting Italy in one free republic was strangely parallel with the greatest dream of the Gracchi. See Roms, vol. xx. p. 800 sq.

The history of the tribunate is interwoven with that of Rome, and must, to a large extent, be sought for in the same sources. The principles attaching to the office are profoundly analysed by Mommsen in his Staatsrecht, and are clearly set forth by E. Herzog in his Geschichte u. System der romischen Staatsverfassung (Leipsic, 1884). (.S8. R.)

TRICHINA, TRICHINOSIS. See NemarorpgEa, and PARASITISM, vol. xvill. p. 270.

TRICHINOPOLI, a district of British India, in the Madras presidency, lying between 10° 37’ and 11° 30’ N. lat. and 78° 12’ and 79° 30’ E. long. Its area is 3561 square miles. It is bounded on the north and north-west by Salem, on the north and north-east by South Arcot, on the east and south-

east by Tanjore, on the south by Pudukottai state and Madura, and on the west by Coim- batore. The surface is generally flat, though diversified by masses of crystalline rock, of which the Trichinopoli rock in the fort is a well-known example. The district is well wooded, though nothing worthy of the name of forest is to be found in it. The only mountains are the Pachaimalais, which rise to 2500 feet and extend into Salem district. The Kaveri (q¢.v.) and its branch the Colerun are the only rivers of any importance. Trichi- nopoli has numerous roads, and the South Indian Railway traverses it from east to west. The climate is very hot, and not liable to great variations; the annual average rainfall is about 38 inches.

In 1881 the population of the district was 1,215,033 (males 586, 434, females 628,599), of whom Hindus numbered 1,119,484, Moham- medans 34,104, and Christians 58,809. The only town with a population exceeding 10,000 is Trichinopoli, the capital, with 84,449 inhabitants. This city is chicfly noticeable for its strong fort, perched on a granite peak 500 feet high, and the group of temples and temple buildings situated on and around it. The town next in importance is SRIRANGAM (q.v.). The chief crops of the district are rice, cotton, tobacco, indigo, sugar-cane, cocoa-nut, plantain, areca-nut, and chillies; and the most important local industries are weaving and the manufacture of cigars. The prin- cipal exports are grain of all kinds, especially rice ; the imports, tobacco and salt. In 1885-86 the gross revenue of the district was £225,896, the land-tax yielding £185,889. Trichinopoli dis- trict, along with the rest of the Carnatic, of which it formed part, passed to the British by treaty in 1801.

TRIC TRAC. See Backeammon, vol. il. p. 199.

TRICYCLE. Though velocipedes were made and used more than one hundred years ago, none were practically successful until the brothers Starley constructed in 1876 the Coventry tricycle. One of the earliest descriptions of a cycle occurs in the Journal de Paris of 17th July 1779. Somewhat later M. Richard invented a machine driven by mechanism almost identical with that of the modern omnicycle, but without the expanding segments. Early in the 19th century the cranked axle worked by treadles and levers came into fashion; then the heavy four-wheelers were preferred. All these machines, how- ever, laboured under three fatal defects:

it was almost impossible to drive them up-hill, to check them in going down-hill, and to prevent their overturning in rounding a corner.

It was the success of the early bicycle (see Bricycur) which suggested the belief that a serviceable tricycle could be made. One of these bicycles was specially constructed for ladies, the hind wheel being placed well on one side ; but, though it could be ridden, it was not a commercial success. The brothers Starley, by putting a second small wheel in front of the large driving wheel and on the same side as the small hind wheel, gave stability to the machine;

it was steered by turning the small wheels opposite ways, and driven by the large wheel by means of cranks and connecting rods. The same machine with chain driving —the Coventry rotary—is still very largely used. In 1877 James Starley, it is believed without any knowledge of the gear used by Fowler for traction engines, re-in- vented the same differential gear for tricycles. By this the same force is, under all circumstances, applied to each of two equal driving wheels, and the evil effects of driving a single wheel are done away with. This gear was used in the original Salvo tricycle, which is the type of the surest machine at the present day. In the early days of the modern tricycle other designs were carried out, which have now become practically obsolete. In one form the hind wheel of a bicycle was replaced by a pair of equal wheels, one’ on each side, but the instability of such a construction was fatal. In another, the Challenge, the two wheels were placed in front of the large driver and turned together to steer the machine; stability was ob- tained by putting the rider in front of the large wheel and lower down, the power being communicated by cranks and connecting rods. But the weight of this machine and the small proportion of the load on the driving wheel were serious defects.

Single-driving rear-steerers were at this time very com- mon, and, though highly objectionable, are still to be seen. Rear-steerers were improved by making both front wheels drivers and allowing for the overrunning of one or the other by clutch, as in the Cheylesmore, or by ratchet driv- ing ; but steering by the hind wheel is essentially wrong, and these machines are avoided by experienced riders. Rear-steerers have, however, lately been

made with a through axle and differential gear (Rover), the rider being placed further back so as to increase the load on the steering wheel; but the evil of rear-steering is only re- duced, not removed. The clutch is also employed on some front-steerers ; and, though in certain respects it has an advantage over the differential gear, for general use it is not so suitable. The differential gear is an essential feature of the modern tricycle.

In 1878 Messrs Doubleday and Humber patented the Humber machine, which is both driven and steered by the two front wheels, the rider being seated on a trailing backbone and hind wheel as in the bicycle. This machine requires skill to manage: the steering is at first difficult to control and a spill over the handles is quite possible ; under a skilful rider, however, the Humber is generally recognized as one of the fastest machines. It is steered by a cross handle, like the bicycle, and this method of steering, in spite of the fact that it boxes the rider into the machine, is becoming very general in front steerers in place of the rack and pinion steering hitherto in use. The Cripper is a very popular example. The brake is an im- portant feature in roadster tricycles. It is always made to act on the box of the differential gear where that is used ; but in clutch or single-driven machines one or two independent band-brakes or spoon-brakes are used.

In early days the steering wheel was made small to save weight ; the drivers were often 50 inches or more in diameter; and the machine was as short as possible. Owing to the discomfort attending a small wheel anda short base the tendency at present is to increase the size of the steering wheel and the length of the base, and to diminish the diameter of the drivers,—two notable examples being the Quadrant and the Crescent. It is usual, especially when small driving wheels are used, to gear the machine up, just as in the old days they were commonly geared down; that is, the chain wheel on the crank axle has more or fewer teeth than that on the wheel axle, and thus the wheels turn faster or slower than the

cranks, or are equivalent to larger or smaller wheels. Two- speed gears are becoming general, among which may be especially mentioned the Cryptodynamic. By means of these it is possible to change the gear of the machine so as to havea high gear under favourable conditions and a low

gear when mud, wind, or an ascent make travelling difficult. Although chain gearing is used in nearly every machine made, connecting rods, wheels, or bands are fitted instead to some machines. The necessity for such mechan- ism has been avoided by making the wheel axle also the

treadle axle; but great instability is the result.

Machines in which the arms instead of the legs supply the power are made, and are of immense service to those who have lost the use of their legs. .

Owing to the inconvenience caused by doorways being often too narrow to allow a tricycle to pass through, many machines are made to fold up into a narrower space or to shut up like a telescope.

It is important that the rider should be so placed that he can, without leaning forward, put most of his weight on the treadles, and this is more than ever needed as the steepness of an ascent in- creases, becausc the slope of the machine has a contrary effect. Slid- ing seats were arranged for this purpose; but Mr Warner Jones has made use of a swinging frame which the rider can lock in any posi- tion he pleases. It is this same swinging frame which gives such comfort to the rider of the Otto bicycle, placing him at all times in the position most suitable for the occasion,

Carrier tricycles, in which due provision is made for the proper distribution of the load, are largely used by the post-office and by tradesmen in their business. The “Coventry chair” is a kind of bath chair driven as a tricycle by a rider behind. When invalids have overcome a certain prejudice as to the danger of this kind of vehicle, it will no doubt be more-generally used,

In machines for two riders the riders sit side by side (sociables) or one is placed before the other (tandems). Sociable machines are both front-steering and rear-stcering. Rear-steerers with each rider driving the wheel on his side only are nearly as objectionable as the single-driving rear-stecrer. Front-steering sociables with dif- ferential gear are safe and comfortable ; but all sociables are slow machines. For nearly every imake of single tricycle there is a corresponding tandem. The Coventry rotary in the tandem form suffers more from the single-side driving than in the single form, the rear-steering machines not so much, owing to the greater weight

which the stecring wheel has to bear. The Humber is less sen- sitive in the steering, owing to the greater moment of inertia of the frame and the front rider. The front-steerer cannot be made safer, but an excellent tandem is formed by placing the rear-rider on a trailing tail asin the Humber. Tandems have an advantage over sociables and perhaps over single tricycles in the matter of speed ; they are, however, not quite so safe, and their appearance alone prevents many from riding them. Many sociables and tandems are convertible into single machines with but little trouble.

The following tables of quickest times which have been accomplished up to the end of 1886 (certified by the National Cyclists' Union) will show the com- parative value of the bicycle and tricycle as racing machines.

On a prepared racing path.

Distance. | Time, tricycle. Time, bicycledt | Sa a a nn 2 min. 32°4 sec.

Ud 5, 28! os |

2 min. 46°8 sec. LTO 4s

Sd nite Satta ads ne ne 59 10°6

bal a ? +2 ? 6 hrs. 43 min. 32°5 sec. 5 hrs. 50 min. 5°4 sec. |

: . . 20 miles 460 yds., tricycle. Greatest distance in one hour { 20 , 560 4, i bicycle.

On a public road.

Land's End to John o' Groats1 { 5 days 10 hrs., tricycle. (about 870 miles) 5 1 ,, 45 min., bicycle.

" i i 2504 miles, tricycle. Greatest distance in 24 hours 295°, ar cycle, (C. V. B.)

TRIESTE (Germ. 7'riest, Slav. Z'rst, Lat. Tergeste), the principal seaport of the Austrian-Hungarian empire, is picturesquely situated at the north-east angle of the Adriatic Sea, in the Gulf of Trieste and at the foot of the barren

Karst Hills. The old town, nestling round the hill on which the castle stands, consists of narrow, steep, and irregular streets. It is connected by the broad and hand- some Corso with the well-built new town, which lies on the flat expanse adjoining the crescent-shaped bay, partly on ground that has been reclaimed from the sea. The prevailing air of the town is Italian rather than German. The castle, built in 1680, is believed to occupy the site of

1 These two by the same rider.

the Roman capitol (see below). Near it is the cathedral of S. Giusto, an unimposing but interesting building, mainly of the 14th century, and incorporating fragments of a Roman temple and early Christian churches, Don Carlos of Spain (d. 1855) is interred in the south aisle, and Fouché, Napoleon’s minister of police, in front of the church, while the churchyard contains the grave and monument of Winckelmann, the archzologist, who was murdered at Trieste in 1768. The Arco di Riccardo, also in the old town, derives its name from a popular delusion that it was connected with Richard Cceur-de-Lion, but is probably an arch of a Roman aqueduct. A collection of Roman antiquities found in or near the town has been formed near the castle. The most prominent building in the new town is the Tergesteo, a huge edifice containing the exchange and numerous shops and offices. The new municipal buildings, with the handsome hall of the pro- vincial diet, the Palazzo Revoltella, the offices of the Austrian Lloyd’s, and the handsome old exchange are also noteworthy. The church of 8. Maria Maggiore is Ty TTY AY LT

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Plan of Trieste,

a characteristic specimen of Jesuit architecture, and the new Greek church is one of the handsomest Byzantine structures in the empire. The city hospital has accom- modation for 2000 patients. The huge Politeama is the largest theatre. In front of the Palazzo Revoltella is a monument to the emperor Maximilian of Mexico, who had been an admiral in the Austrian service. His sumptuous chateau of Miramar is one of the lions of the neighbour- hood. The capacious harbour, consisting of two parts, the old and the new, is protected by extensive moles and breakwaters, and has been greatly improved within the last ten or fifteen years. From the harbour the Canal Grande extends into the town, allowing large vessels to unload at the warehouses. At the end of the Molo Sta Teresa is a lighthouse upwards of 100 feet high. The population of the town (6424 in 1758) and district of Trieste in 1880 was 144,844, of whom 74,544 belonged to the town proper and 133,019 to the town and suburbs, The town population is very heterogeneous, but the Italian element far exceeds all the rest. There are about 5000

Greek.

Indian.

Germans and also numerous Greeks, English, and French. The population includes 26,000 Slavs, most of whom live in the country districts and are engaged in agriculture. Trieste has been a frec imperial port since 1719. It may be said to nearly monopolize the trade of the Adriatic, and has long eclipsed its ancient rival Venice. The anuual value of its exports and imports is about 30 millions sterling. Among the chief im- ports are coffee, wine, fruit, grain, tobacco, petroleum, cotton, coals, and manufactured goods of various kinds; the exports include spirits, liqueurs, sugar, meal, timber, glass, and machinery. Large quantities of fish are sent to Vienna. In 1885 the port was entered by 6971 vesscls with an aggregate burden of 1,267,946 tons. The trading fleet of Trieste numbers about 500 ships of 100,000 tons burden. The chief shipping company is the Austrian Lloyd’s, founded in 1836, the steamers of which ply to the Mediterranean ports, Alexandria, Constantinople, the Black Sea, &c. The exten- sive wharfs and dockyards of the company lie to the south of the town. The chief branches of industry

practised at Tricste are shipbuilding, soap-boiling, machine -making (especially marine engines), tanning, brewing, rope-making, and the manufacture of liqueurs (rosoglio). Trieste is the seat of government for the so-

TR iG O N

RIGONOMETRY is primarily the science which is concerned with the measurement of plane and spherical triangles, that is, with the determination of three of the parts of such triangles when the numerical values of the other three parts are given. Since any plane tri- angle can be divided into right-angled triangles, the solu- tion of all plane triangles can be reduced to that of right- angled triangles; moreover, according to the theory of similar triangles, the ratios between pairs of sides of a right-angled triangle depend only upon the magnitude of the acute angles of the triangle, and may therefore be regarded as functions of either of these angles. The primary object of trigonometry, therefore, requires a classi- fication and numerical tabulation of these functions of an angular magnitude ; the science is, however, now under- stood to include the complete investigation not only of such of the properties of these functions as are necessary for the theoretical and practical solution of triangles but also of all their analytical properties. It appears that the solution of spherical triangles is effected by means of the same functions as are required in the case of plane triangles. The trigonometrical functions are employed in many branches of mathematical and physical science not directly concerned with the measurement of angles, and hence arises the importance of analytical trigonometry. The solution of triangles of which the sides are geodesic lines on a spheroidal surface requires the introduction of other functions than those required for the solution of triangles on a plane or spherical surface, and therefore gives rise to a new branch of science, which is from analogy frequently called spheroidal trigonometry. Every new class of surfaces which may be considered would have in this extended sense a trigonometry of its own, which would consist in an investigation of the nature and properties of the functions necessary for the measurement of the sides and angles of triangles bounded by geodesics drawn on such

surfaces.

HIsTory.

An account of Greek trigonometry is given under PTOLEMY (q.v.).

The Indians, who were much more apt calculators than the Greeks, availed themselves of the Greek geometry which came from Alexandria, and made it the basis of trigonometrical calculations. The principal improvement which they introduced consists in the formation of tables of half-chords or sines instead of chords. Like the Greeks, they divided the circumference of the circle into 360 degrees or 21,600 minutes, and they found the length in minutes of the arc which can be straightened out into

called Kiistenland or Coast district, and is the seat of naval and military commanders and other officials. The town council, pre- sided over by the podesta, is also the diet of the crownland of Trieste (35 square miles). Trieste is the seat of the bishop of Capo d'Istria.

History At the time of the foundation of Aquileia by the Romans, the district which now includes Trieste was occupied by Celtic and Illyrian tribes ; and the Roman colony of Tergeste does not seem to have been established till the reign of Vespasian. After the break-up of the Roman dominion Trieste shared the general for- tunes of Istria and passed through various hands. From the em- peror Lothaire it received an independent existence under its count- bishops, and it maintained this position down to its capture by Venice in 1203. For the next 180 years its history consists chiefly of a series of conflicts with this city, which were finally put an end to by Trieste placing itself in 1882 under the protection of Leopold III. of Austria. The overlordship thus established in- sensibly developed into actual possession; and except in the Napoleonic period (1797-1805 and 1809-1813) Trieste has since remained an integral part of the Austrian dominions.

TRIGGER-FISH. See Fitz-Fisu.

Ont Th ¥

the radius to be 3438’. The value of the ratio of the circumference of the circle to the diameter used to make this determination is 62832 : 20000, or t= 31416, which value was given by the astronomer Aryabhata (476-550 ; see SANSKRIT, vol. xxi. p. 294) in a work called Arya- bhatiya, written in verse, which was republished? in Sanskrit by Dr Kern at Leyden in 1874. The relations between the sines and cosines of the same and of complementary arcs

were known, and the formula sin $a = »/1719(34388 — cos a) was applied to the determination of the sine of a half angle when the sine and cosine of the whole angle were known. In the Stirya-Siddhdnta, an astronomical treatise which has been translated by Ebenezer Bourgess in vol. vi. of the Journal of the American Oriental Society (New Haven, 1860), the sines of angles at an interval of 3° 45’ up to 90° are given; these were probably obtained from the sines of 60° and 45° by continual application of the dimidi- ary formula given above and by the use of the complement- ary angle. The values sin 15°=890’, sin 7° 30’= 449’, sin 3° 45’ = 225’, were thus obtained. Now the angle 3° 45’ is itself 225’; thus the arc and the sine of z’gth of the cir- cumference were found to be the same, and consequently special importance was attached to this arc, which was called the right sine. From the tables of sines of angles at intervals of 3° 45’ the law expressed by the equation sin (n+ 1. 225’) — sin (1. 225’) =sin (n . 225’) — sin (7 — 1. 225’) (1. 225’)

225

was discovered empirically, and used for the purpose of recalculation. Bhaskara (fl. 1150) used the method, to which we have now returned, of expressing sines and cosines as fractions of the radius; he obtained the more correct values sin 3° 45’=100/1529, cos 3° 45’= 466/467, and showed how to form a table, according to degrees, from the values sin 1° = 10/573, cos 1° = 6568/6569, which are much more accurate than Ptolemy’s values. The Indians did not apply their trigonometrical knowledge to the solution of triangles ; for astronomical purposes they solved right- angled plane and spherical triangles by geometry.

The Arabs were acquainted with Ptolemy’s Almagest, and they probably learned from the Indians the use of the sine. The celebrated astronomer of

Batnee, Abu ‘Abdallah Mohammed b. Jabir al-Battani (Bategnius), who died in 929/930 a.D., and whose Zables were translated in the 12th century by Plato of Tivoli into Latin, under the title De sctentia stellarum, employed the sine regularly, and was fully conscious of the advantage of the sine over the chord ; indeed, he remarks that the continual doubling is saved

— sin

1 See also vol. ii. of the Asiatic Researches (Calcutta).

by the use of the former. He was the first to calculate sin¢ from the equation sin¢/cos¢=4, and he also made a table of the lengths of shadows of a vertical object of height 12 for altitudes 1°, 2°,...of the sun; this is a sort of cotangent table. He was acquainted, not only with the triangle formule in the Almagest, but also with the formula cos a=cos 6 cose+sinb sine cos A for a spherical triangle ABC. Abu ’1-Wafa of Baghdad (b. 940) was the first to introduce the tangent as an independent function : his ““‘umbra” is the half of the tangent of the double are, and the secant he defines as the ‘diameter umbre.” He employed the umbra to find the angle from a table and not merely as an abbreviation for sin/cos; this improvement was, however, afterwards forgotten, and the tangent was re-invented in the 15th century. Ibn Yunos of Cairo, who died in 1008, showed even more skill than Al-Battdénf in the solution of problems in spherical trigonometry and gave improved approximate formule for the calculation of sines. Among the West Arabs, Abu Mohammed Jabir b. Aflah, known as Geber b. Aflah, who lived at Seville in the 11th century, wrote an astronomy in nine books, which was translated into Latin in the 12th century by Gerard of Cremona and was published in 1534. The first book con- tains a trigonometry which is a considerable improvement on that in the Almagest. He gave proofs of the formule for right-angled spherical triangles, depending on a rule of four quantities, instead of Ptolemy’s rule of six quantities. The formule cos B=cos 6 sin A, cos c=cot A cot B, ina triangle of which C is a right angle

had escaped the notice of Ptolemy and were given for the first time by Geber. Strangely enough, he made no progress in plane trigono- metry. Arrachel, a Spanish Arab who lived in the 12th century, wrote a work of which we have an analysis by Purbach, in which, like the Indians, he made the sine and the arc for the value 3° 45’ coincide.

Purbach (1423-1461), professor of mathematics at Vienna, wrote a work entitled Zractatus super propositiones Ptole- met de sinubus et chordis (Nuremberg, 1541). This treatise consists of a development of Arrachel’s method of inter- polation for the calculation of tables of sines, and was pub- lished by Regiomontanus at the end of one of his works. Johannes Miiller (1436-1476), known as Recromontanus (q.v.), was a pupil of Purbach and taught astronomy at Padua ; he wrote an exposition of the Almagest and a more important work, De triangulis planis et sphericis cum tabulis sinuum, which was published in 1533, a later edition ap- pearing in 1561. He re-invented the tangent and calcu- lated a table of tangents for each degree, but did not make any practical applications of this table, and did not use formule involving the tangent. His work was the first complete European treatise on trigonometry, and contains a number of interesting problems; but his methods were in some respects behind those of the Arabs. Copernicus (1473-1543) gave the first simple demonstration of the fundamental formula of spherical trigonometry ; the T’rigo- nometria Copernici was published by Rheticus in 1542. George Joachim (1514-1576), known as Ruxricus (¢.v.), wrote Opus Palatinum de triangulis (see TaBius, p. 9 above), which contains tables of sines, tangents, and secants of ares at intervals of 10” from 0° to 90°. His method of calculation depends upon the formule which give sin na and cosa in terms of the sines and cosines of (n—1)a and (n — 2)a; thus these formule may be regarded as due to him. Rheticus found the formule for the sines of the half and third of an angle in terms of the sine of the whole angle. In 1599 there appeared an important work by Pitiscus (1561-1613), entitled Trigonometriz seu de dimen- stone triangulorum; this contained several important theo- rems on the trigonometrical functions of two angles, some of which had been given before by Finck, Landsberg,

and Adriaan van Roomen. Francois Viéte or Viera (q.v. (1540-1603) employed the equation (2 cos}¢)3 — 3(2 cosd¢) = 2cos ¢ to solve the cubic x — 3a*x =a*b(a> 4b); he ob- tained, however, only one root of the cubic. In 1593 Van Roomen proposed, as a problem for all mathematicians, to solve the equation

45y — 3795y° + 95634y —... + 945y41 — 459/43 4. 5 = 0.

Viéte gave y=2sin 7:4, where C’ =2sin ¢, asa solution, and also twenty-two of the other solutions, but he failed to obtain the negative roots. In his work Ad angulares sectiones Vitte gave formule for the chords of multiples of a given arc in terms of the chord of the simple are.

A new stage in the development of the science was commenced after Napier’s invention of logarithms in 1614. Napier also simplified the solution of spherical triangles by his well-known analogies and by his rules for the solution of right-angled triangles. The first tables of logarithmic sines and tangents were constructed by Edmund Gunter (1581-1626), professor of astronomy at Gresham College, London ; he was also the first to employ the expressions cosine, cotangent, and cosecant for the sine, tangent, and secant of the complement of an arc. A treatise by Albert Girard (1590-1634), published at The Hague in 1626, con- tains the theorems which give areas of spherical triangles and polygons, and applications of the properties of the supplementary triangles to the reduction of the number of different cases in the solution of spherical triangles. He used the notation sin, tan, sec for the sine, tangent, and secant of an arc. In the second half of the 17th century the theory of infinite series was developed by Wallis, Gregory, Mercator, and afterwards by Newton and Leibnitz. In the Analysis per xquationes numero terminorum infinitas, which was written before 1669, Newton gave the series for the are in powers of its sine; from this he obtained the series for the sine and cosine in powers of the arc; but these series were given in such a form that the law of the formation of the coefficients was hidden. James Gregory discovered in 1670 the series for the arc in powers of the tangent and for the tangent and secant in powers of the arc. The first of these series was also discovered inde- pendently by Leibnitz in 1673, and published without proof in the Acta eruditorum for

1682. The series for the sine in powers of the are he published in 1693; this he obtained by differentiation of a series with undetermined coefficients.

In the 18th century the science began to take a more analytical form ; evidence of this is given in the works of Kresa in 1720 and Mayer in 1727. Oppel's Analysis triangulorum (1746) was the first complete work on analytical trigonometry. None of these mathematicians used the notation sin, cos, tan, which is the more surprising in the case of Oppel, since Euler had in 1744 employed it in a memoir in the Acta eruditorum. John Bernoulli was the first to obtain real results by the use of the symbol —1; he published in 1712 the general formula for tan n¢ in terms of tan¢, which he obtained by means of trans- formation of the arc into imaginary logarithms. The greatest advance was, however, made by Euler, who brought the science in all essential respects into the state in which it is at present. He introduced the present nota- tion into general use, whereas until his time the trigono- metrical functions had been, except by Girard, indicated by special letters, and had been regarded as certain straight lines the absolute lengths of which depended on the radius of the circle in which they were drawn. Euler's great im- provement consisted in his regarding the sine, cosine, &c., as functions of the angle only, thereby giving to equations connecting these functions a purely analytical interpreta- tion, instead of a geometrical one as heretofore. The

Concep- tion of angles of any mag- nitude,

_ Numeri-) cal meas- urement of angu- lar mag- nitudes.

exponential values of the sine and cosine, De Moivre's theorem, and a great number of other analytical properties of the trigonometrical functions are due to Euler, most of whose writings are to be found in the Memoirs of the St Petersburg Academy.

The preceding sketch has been mainly drawn from the following sources : —Cantor, Gesch. d. Math.; Hankel, Gesch. d. Math. ; Marie, Hist. des sc. math. ; Suter, Gesch. d. Math. ; Kliigel, Math. Worterbuch.

Plane Trigonometry.

Imagine a straight line terminated at a fixed point O, and initially coincident with a fixed straight line 0A, to revolve round Q, and finally to take up any position OB.

We shall suppose that, when this re-

volving straight line is turning in one

direction, say that opposite to that in

which the hands of a clock tum, it is

describing a positive angle, and when

it is turning in the other direction it 0 is describing a negative angle. Before finally taking up the position OB the straight line may have passed any num- ber of times through the position OB, making any number Of complete revo- lutions round O in either direction. Each time that the straight line makes a complete revolution round O we consider it to have described four right angles, taken with the positive or negative sign according to the direction in which it has revolved; thus, when it stops in the position OB, it may have revolved through any one of an infinite number of positive or negative angles any two of which differ from one another by a positive or negative multiple of four right angles, and all of which have the same bounding lines 04 and OB. If OB” is the final position of the revolving line, the smallest positive angle which can have been described is that described by the revolv- ing line making more than one-half and less.than the whole of a complete revolution, so that in this case we have a positive angle greater than two and less than four right angles. We have thus shown how we may conceive an angle not restricted to less than two right angles, but of any positive or negative magnitude, to be generated.

Two systems of numerical measurement of angular magnitudes are in ordinary use. For practical measurements the sexagesimal system is the one employed: the ninetieth part of a right angle is taken as the unit and is called a degree ; the degree is divided into sixty equal parts called minutes ; and

the minute into sixty equal parts called seconds; angles smaller than a second are usually measured as decinials of a second, the “thirds,” “fourths,” &c., not being in ordinary use. In the common notation an angle, for ex- ample, of 120 degrees, 17 minutes, and 14°36 seconds is written 120° 17’ 14”°36. The decimal system measurement of angles has never come into ordinary use. In analytical trigonometry the circular measure of an angle isemployed. In this system the unit angle is the angle subtended at the centre of a circle by an arc equal in length to the radius. The constancy of this angle follows from the geometrical propositions—(1) the circumferences of different circles vary as their radii; (2) in the same circle angles at the centre are proportional to the arcs which subtend them. It thus follows that the unit mentioned above is an angle independent of the particular circle used in defining it. The constant ratio of the circumference of a circle to its diameter is a quantity incommensurable with unity, nsually denoted by 7, We shall indicate later on (p. 571 sq.) some of the methods which have been employed to approximate to the value of this quantity. Its value to 20 places is 3°14159265358979823846 ; its reciprocal to the same number of places is °31830988618379067153. In circular measure every angle is measured by the ratio which it bears to the unit angle. Two right angles are measured by the quantity 7, and, since the same angle is 180°, we see that the number of degrees in an angle of circular measure @ is obtained from the formula 180 × 6/7. The value of the unit of circular measure has been found to 41 places of decimals by Glaisher (Proc. London Math.

Soc., vol. iv.); the value of B from which the unit can be easily

4a

a Fig. 1.

calculated, is given to 140 places of decimals in Grunert’s Archiv, vol, i., 1841. To 10 decimal places the value of the unit angle is 57° 17’ 44”-8062470964, The unit of circular measure is too large to be convenient for practical purposes, but its use introduces a simplification into the series in analytical trigonometry, owing to the fact that the sine of an angle and the angle itself in this measure, when the magnitude of the angle is indefinitely diminished, are ultimately in a ratio of equality.

If a point moves from a position 4 to another position B on a straight line, it has described a length AB of the straight line. It is convenient to havea simple mode of indicating in which direction on the straight line the length 4B has been described ; this may

be done by supposing that a point moving in one specified direction Sign of is describing a positive length, and when moving in the opposite portions direction a negative length. Thus, if a point moving from 4 to B of an in- is moving in the positive direction, we consider the length AB as finite positive ; and, since a point moving from B to J is moving in the straight negative direction, we consider the length BA as negative. Hence line. any portion of an infinite straight line is considered to be positive

or negative according to the direction in which we suppose this

portion to be described by a moving point ; which direction is the positive one is, of course, a matter of convention.

If perpendiculars AZ, BM be drawn from two points 4; B on Projec- any straight line, not necessarily in the same plane with AB, the tions of length LY, taken with the positive or negative sign according to straight the convention as stated above, is called the projection of «42 on lines on the given straight line; the projection of BA being MZ has the each opposite sign to the projection of AB. If two points A, B be joined other. by a number of lines in any manner, the algebraical sum of the projections of all these lines is LM,—that is, the same as the pro- Jection of AB. Hence the sum of the projections of all the sides of any closed polygon, not necessarily Se on any straight line, is zero. This principle of projections we shall apply below to ob- tain some of the most important propositions in trigonometry.

Let us now return to the conception of the generation of an Defini- angle as in fig. 1. Draw BOB’ at right angles to and equal to 4.4’. tion of

£ We shall suppose that the direction from 4’ trigono- to A is the positive one for the straight line metrical ‘ s AOA’, and that from B’ to B for func- rai BOB’. Suppose OP of fixed length, tions.

equal to OA, and let PM, PN be

drawn perpendicular to 4’A, B’B

oe respectively ; then OJ and ON,

taken with their proper signs, are the projec-

7 tions of OP on A’A and BB. The ratio of

Fig. 2. the projection of OP on B’B to the absolute

‘ length of OP is dependent only on the magni-

tude of the angle POA, and is called the sine of that angle; the ratio of the projection of OP on 4’ to the length OP is called the cosine of the angle POA. The ratio of the sine of an angle to its cosine is called the tangent of the angle, and that of the cosine to the sine the cotangent of the angle; the reciprocal of the cosine is called the secant, and that of the sine the cosecant of the angle. These functions of an angle of magnitude a are denoted by sin a, cos a, tan a, cot a, sec a, cosec a respectively. If any straight line RS be drawn parallel to OP, the projection of RS on either of the straight lines 4’A, B’B can be easily seen to bear to RS the same ratios which the corresponding projections of OP bear to OP: thus, if a be the angle which RS makes with 4’, the projections of RS on A’A, BB are RS cos a and RS sin a respectively, where

RS denotes the absolute length RS. It must be observed that

the line SZ is to be considered as parallel not to OP but to OP”,

and therefore makes an angle r+a with 4’; this is consistent

with the fact that the projections of SR are of opposite sign to

those of RS. By observing the signs of the projections of OP for

the positions P, P’, P”, P’”’ of P we see that the sine and cosine of

the angle POA are both positive ; the sine of the angle P’OA is posi-

tive and its cosine is negative ; both the sine and the cosine of the

angle P”OA are negative; and the sine of the angle POA is

negative and its cosine positive. If a be the numerical value of

the smallest angle of which OP and OA are boundaries, we see

that, since these straight lines also bound all the angles 2nr+a,

where m is any positive or negative integer, the sines and cosines

of all these angles are the same as the sine and cosine of a. Hence

the sine of any angle 2n7+

and negative if a is between m and 27, and the cosine of the same

angle is positive if a is between 0 and $7 or $7 and 2m and negative if a is between 47 and 37.

In fig. 2 if the angle POA is a, the angle POA is —a, P’OA is w—a, P’OA is r+a, POB is =” a. By observing the signs of the

projections we see that

sin(-—a)=-sina, sin(r—a)=sina, sin(r+a)=—sina, cos(—a)=cosa, cos(r—a)=-cosa, cos(r+a)=—cosa, sin(47 —a)=cosa, cos(4m—a)=sina. Also sin(jr+a)=sin(r7-4r-a)= sin(hr—a)= cosa, cos(4a + a)=cos(r — 44 —a)= — cos(4r —a)= — sina, From these equations we have tan(— a) = — tana, tan(w — a)= — tana, tan(7-+a)=—tana, tan(4r—a)=cota, tan($r+a)=—cota, with

corresponding equations for the cotangent.

The only angles for which the projection of OP on B'B is the same as for the given angle PO.A (=a) are the two sets of angles bounded by OP, 04 and OP', OA; these angles are 2n7+a and 2nm +m —a,and are all included in the formula rr +(—1)"a, wherer is any integer ; this therefore is the formula for all angles having the same sine asa, The only angles which have the same cosine as aare those bounded by OA, OP and OA, OP", and these are all included in the formula 2n7-+a. Similarly it can be shown

Rela- tions be- tween trigono- metrical func- tions.

that na+a includes all the angles which have the same tangent as a.

From the Pythagorean theorem, the sum of the squares of the projections of any straight line upon two straight lines at right angles to one another is equal to the square on the projected line, we get sin2a+cos'a=1, and from this by the help of the definitions of the other functions we deduce the relations 1+tan?a=sec'a, 1+cot?a=cosec?a. We have now six relations between the six functions; these enable us to express any five of these functions in terms of the sixth. The following table shows the values of the trigonometrical functions of the angles 0, 47, 7, 37, 27, and the signs of the functions of angles between these values; J denotes numerical increase and D numerical decrease.

'Angle ….| 0 |0…40| 9 ljw.f.a| @ |w…97 gm im… 20 or | = = – — | = eS ID Mash, i 0 iB J D p70 nh l= il -~D 0 Cosine aeor 4 tD 0) ty | -1 =D a) 10 al 1} i\Tangent ..| 0] +7 |e) -D j 0] 41 estes)» ID "us Cotangent ||} +D oO) ar

|e) =p oh on | |Secant …. 1] +2 |e) -D | -1) -I tx lif 1| Cosecant ..| boo! +D 1) eee Vices! aD. -1 a + «|

The correctness of the table may be verified from the figure by con-

Values of trigono- metrical functions for some angles.

Formule for sine and co- sine of sum and differ- ence of two angles.

sidering the magnitudes of the projections of OP for different positions.

The following table shows the sine and cosine of some angles for which the values of the functions may be obtained geometrically :— oT sine cosine 5 aa ot Vb- SJB R‘4sn oo – i™ i. 4 4 7 | as VB-1 | 10425 | yg | 10 | é 4 4 5 1 [3 ° 1 a = vas 60 <7 6 | ro 2 2 8 7 ss 4/10 — 24/5 a/b La os 4 | ~s – 10 J i 1 Tv | ° — — ° oa | 4 45 JE Vi 45 ee cosine | sine |

These are obtained as follows. (1) – The sine and cosine of this angle are equal to one another, since sin 1 = 098 (G -j7 the sum of the squares of the sine and cosine is unity each is Je (2) 4 and – Consider an equilateral triangle ; the projection of

) ; and since iL

one side on another is obviously half a side; hence the cosine of

an angle of the triangle is t or cos – =), and from this the sine is x uw Que 3a : : : P (3) 10’ B’ 5’ 10° In the triangle constructed in Euc. iv.

10 each angle at the base is =, and the vertical angle is – If a

found.

be a side and b the base, we have by the construction a(a — b)=0? ;

hence 2b=a(/5-1); the sine of a is = or V5- 1 and cos 5 is ee a eee Te

Ota (4) 79’ jo’ Consider a right-angled triangle, hav- ing an angle 7. Bisect this angle, then the opposite side is cut by the bisector in the ratio of 4/8 to

2; hence the length of the smaller segment is to that of the whole in the ratio of 4/3 to \/3 +2,

afi

therefore tan 737 = ToT tan $0 or tan fy7=2— 4/3, and from this

3+

we can obtain sin 77 and cos yr.

Draw a straight line OD making any angle 4 with a fixed straight line OA, and draw OF making an angle B with o OD, this angle being measured positively in the same direction as A; draw FZ a perpendicular on DO (produced if necessary). The projection a of OF on O4 is the sum of the projections of E OE and EF on OA, Now OF is the projection ; of OF on DO, and is therefore equal to OF cos B, * ‘Fig. 3. and LF is the projection of OF on a straight line making an angle +47 with OD, and is therefore equal to OF sin B; hence

OF cos(A+B)=OE cos A+ EF cos (47+ A) =OF (cos A cos B-sin A sin B),

or cos (4+ B)=cos A cos B—sin A sin B.

The angles 4, Bare absolutely unrestricted in magnitude, and thus this formula is perfectly general. We may change the sign of B, thus cos (4 — B)=cos A cos(—B)-—sin 4 sin (— B),

or cos (4 — B)=cos A cos B+sin A sin B. If we projected the sides of the triangle OZF on a straight line making an angle +47 with OA we should obtain the formule

ae 7

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sin (4+ B)=sin A cos Btcos A sin B,

which are really contained in the cosine formula, since we may put 4n-— Bfor B. The formule tan Attan B cot A cot B1 = (223) =72eae tan B’ cot B£cot A

are immediately deducible from the above formule. The equations

sin C+sin D=2 sint (C+D) cost (C- D),

sin C-sin D=2 sin} (C— D) cosh (C+D),

cos D+cos C=2 cost (C+D) cos4 (C— D),

cos D—cos C=2 sin} (C+D) sin} (C- D), may be obtained directly by the method of projections. Take two equal straight lines OC, OD, making angles C, D with O04, and draw OF perpendicular to CD. The angle which O# makes with OA is 4(C+ JD) and that which DC makes “ is $47+C+D); the angle COZ is 34(C—D). é The sum of the projections of OD and DE# ou o OA is equal to that of O#, and the sum of the projections of OD and DE is equal to that of OC; hence the sum of the projections of OC and OD is twice that of O#, or cos C +cos D=2 cos 4(C+D) cos3(C-—D). Theos ‘ a difference of the projections of OD and OC Fig. 4. on OA is equal to that of HD, hence we have the formula cos D— cos C=2 sin $(C+D)sin}(C-D). The other two formule will be obtained by projecting on a straight line inclined at an angle +47 to OA, –

[PLANE.

cot (A+B)=

As another example of the use of projections, we will find the sum Sum of of the series cosa+cos(a+f)+cos(a+28)+...+cos(a+n— 1). series of Suppose an unclosed polygon each angle of which is 7 — to be in- Cosines scribed in a circle, and let 4), A,, A,..~~, An be n+1 consecutive im arith~~ angular points ; let D be the diameter of the circle ; and suppose a metical straight line drawn making an angle a with 44,, then a+, Progres- a+26,...are the angles it makes with 4,4, .4,A;,...; we have by S10l.

projections

i=

AA,, cos(a+ “5-*) =AA,(cosa+cosa+B+... +cosa+x-— 1),

Ae Dein :

also AAy=Dsin® e

2?

hence the sum of the series of cosines is cos (« + os =f) sin – cosec a

By a double application ot the addition formule we may obtain the Formule

formule sin (4, + 4,-A,)=sin 4, cos A, cos 4, cos A, sin A, cos As + cos A, cos A, sin A, -~ sin A, sin A, sin A, ; cos (.4, + 4,+-A43)=cos A, cos A, cos A,—cos A, sin A, sin A, — sin A, cos A, sin A, – sin A, sin A, cos Ag. We can by induction extend these formule to the case of 7 angles. Assume sin (4,4,...+4An)=S)—-834+8,~~... cos (4, + Agt … +An)=So—~~ Sot+8y- .. where S,, denotes the sum of the products of the sines of 7 of the angles and the cosines of the remaining n—,r angles ; then we have sin (4, + 4,+ ... +A,An,1)=008 A, 1(8) — 83 85 – ...) +sin 4,,,1(S)—- S2+Sy-...). The right-hand side of this equation may be written (S, cos A,,,) +S) sin 4,1) — (S3 608 4,4) +S, sin 4,41) + +++ or 8’, – S’g+ eee where S’, denotes the quantity which corresponds for n+1 angles to S, for m angles; similarly we may proceed with the cosine for- mula. The theorems are true for n=2 and n=3; thus they are true generally. The formule cos 2.4 =cos?4 — sin*4 =2 cos*4 —-1=1-2sin?4, : 2 tan A sin 24=2sin A cos A, tan 24= 7 ene sin 84=8sin 4-4sin®4, cos34=4cos*4 —38 cos A, n(n —1)(n – 2) .

sinnA=n cos”—14 sin 4 — os”-34 sin? 4+...

| 3 n ~un—1)...(n—2r) ee +(ee oo oral cos*—*r-1 4 sin?*t+1 4, n(n —1) sh cos 2.4 =cos nA — re cos”-2.4 sin? 4 +... n(n —1)...(n—2r+1)

+(~~1)” [2r cos”~~*” 4 sin’“A +...

may all be deduced from the addition formule by making the angles all equal. From the last two formule we obtain by division tan nA

n(n -1yfn-2 m-1)...(n-2r) ntan 4 MOSTAR tanta… (mPa tan27 +144… = -1) -1)...(n-2r4+1 – 1-9) tanta t… 4-1 1) 3c OD ee Bas me ; Mais 3 tan A — tan?4

In the particular case of n=3 we have tan 3.4 =~ sa

Proper- ties of triangles.

Solution of tri- angles.

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The values of sin}.A, cos$A, tan} are given in terms of cos A by the formule

sin 34=(-19(=S4)F, cos 34=(~~1)”(~~ acy i r{1—cos A\% tan $4=(-1) (Cae A

; ‘ ; ae ol where p is the integral part of oa? 2 the integral part of int 2

and r the integral part of S

Sin 4.4, cos 4.4 are given in terms of sin A by the formule 2sinsA=(-1)”(1+sin Aji+(- 1)”(1 ~~‘sin .4)3, 2. cos $A =(— 1)””(1+sin A)P~~ (—1)”(1 - sin 4), where p’ is the integral part of oe and q the integral part of A_}l or 4 In any plane triangle ABC we will denote the lengths of the sides BC, CA, AB by a, b, ¢ respectively, and the angles BAC, ABC, ACB by A, B, C respectively. The fact that the projections of b and c ona straight line perpendicular to the side a are equal to one another is expressed by the equation bsin C=csin B; this equation and the one obtained by projecting c and a on a straight ; ‘ ; a C line perpendicular to a may be written ee The equation a=b cos (+c cos B expresses the fact that the side a is equal to the sum of the projections of the sides 6 and c on itself ; thus we obtain the equations a=bcosC+e cos B b=c cosA+acosC }. c=acosB+bcos A If-we multiply the first of these equations by —a@, the second by b, and the third by c, and add the resulting equations, we obtain

6? +c? — a?

the formula ?+¢?- a?=2bc eos A or eos A= , Which gives

2be the cosine of an angle in terms of the sides. From this expression for cosA the formule sin}.4A = { ae } cosh A= os) 7

tan34= ee : sin A =; {s(s — a@)(s— b)(s — c)}4, where s denotes}(a +6 +c),can be deduced by means of thedimidiary formula.

From any general relation between the sides and angles of a triangle other relations may be deduced by various methods of transformation, of which we give two examples.

(a) In any general relation between the sines and cosines of the angles 4, B,C of a triangle we may substitute pA +qB+r0, rA+pB+qC, gA+rB+pC for A, B, C respectively, where p, 9g, 7 are any quantities such that p+q+r+l1 is a positive or nega- tive multiple of 6, provided that we change the signs of all the sines. Suppose pt+g+r+1=6n, then the sum of the three angles one —- (pA +qB+r0), ne ~~, 2nw~~(GgA+rB+pC) is a; and, since the given relation follows from the condition 4+B +O=7, we may substitute for 4, B, C respectively any angles of which the sum is 7; thus the transformation is admissible.

(8) It may easily be shown that the sides and angles of the triangle formed by joining the feet of the perpendiculars from the angular points 4, B, Con the opposite sides of the triangle ABC are ee a cos A, bcos B, ccos CO, r- 2A, r- 2B, r- 20; we may therefore substitute these expressions for a, b,c, A, B, C re- spectively in any general formula. By drawing the perpendiculars of this second triangle and joining their feet as before, we obtain a triangle of which the sides are —acos.4 cos2A, —bcos Bcos 2B, —ccos (cos 20 and the angles are 44-7, 4B-7,4C—m; we may therefore substitute these expressions for the sides and angles of the original triangle ; for example, we obtain thus the formula

as a? cos? A cos? 2.4 — b? cos? B cos? 2B — ¢ cos® C eos? 2C eis 2be cos B cos C’cos 2B cos 2C : This transformation obviously admits of further extension.

(1) The three sides of a triangle ABC being given, the angles can be determined by the formula

Ltan 4 =10+$ log (s—3) +4 log (s~0)- blog s— blog (s— a)

and two eorresponding formule for the other angles. (2) The two sides a, b and the included angle C being given, the angles 4A, B ean be determined from the formule: . A+B=r7-C, Ltan}(4 -B)= log (a — b) – log(a+b)+Lcot 30, and the side c is then obtained from the formula log c= loga+Lsin C-Lsin A. (3) The two sides a, 6 and the angle 4 being given, the value of sin B may be found by means of the formula | Lsin B=Lsin A+logb-loga;

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this gives two supplementary values of the angle B, if bsin A

If dbsin 4>a there is no solution, and if bsin d=a there is one solution. In the case bsin.4 a, but the acute value only of B is admissible if b

The other side c can then be determined as in case (2).

(4) If two angles A, B and a side a are given, the angle C is de- termined from the formula C=r-A-JB and the side 0 from the formula log b= loga+Lsin B-Lsin A.

The area of a triangle is half the product of a side into the per- Areas pendicular from the opposite angle on that side; thus we obtain of tri- the expressions $dcsin A, {s(s — a)(s — b)(s — c)}3 for the area of a angles triangle. A large collection of formule for the area of a triangle and are given in the Annals of Mathematics for 1885 by M. Baker. quadri-

Let a, b, c, d denote the lengths of the sides 4B, BC, CD, DA laterals. respectively of any plane quadrilateral and 4+C=2a; we may obtain an expression for the area S of the quadrilateral in terms of the sides and the angle a. We have 2S=ad sin A +bcsin (2a—.A) and 4(a2+d?-0?-c?) =ad cos A — be cos (2a — A) ; hence 48?+4(a?+d?-3?-¢?)?=a7 d? +0? & — Qabcd cos 2a.

If 2s=a+b+c+d, the value of S may be written in the form S= {s(s— a)(s— b)(s —¢)(s — d) — abcd cos? a} 4,

Let R denote the radius of the circumscribed circle, r of the in- Radii of

scribed, and 7}, 7s, 73 of the escribed circles of a triangle ABC; the circum-

values of these radii are given by the following formule. scribed, Pes in- ~ 4S 2sin A' scribed, mo. per er , and =e (s—a) tant A =4Rsin} A sing B sin} C, enosbed S ' circles qs tan} A=4R sin} A cos} B coss C. of a tri- angle.

Spherical Trigonometry.

We shall throughout assume such elementary propositions in spherical geometry as are required for the purpose of the investiga- tion of formule given below.

A spherical triangle is the portion of the surface of a sphere Defini- bounded by three arcs of great circles of the sphere. If BC, CA, tion of AB denote these arcs, the circular measure of the angles subtended spherical by these ares respectively at the centre of the sphere are the sides triangle. a, b, ¢ of the spherical triangle ABC; and, if the portions of planes passing through these ares and the centre of the sphere be drawn, the angles between the portions of planes intersecting at 4, B, C respectively are the angles 4, B, O of the spherical triangle. It is not necessary to consider triangles in which a side is greater than 7, since we may replace such a side by the remaining arc of the great circle to which it belongs. Since two great circles intersect each Asso- other in two points, there are eight triangles of which the sides are ciated arcs of the same three great circles. If we consider one of these triangles. triangles ABC as the fundamental one, then one of the others is equal in all respects to 4.BC, and the remaining six have each one side equal to, or common with, a side of the triangle 4BC, the opposite angle equal to the corresponding angle of ABC, and the other sides and angles supplementary to the corresponding sides and angles of ABC. These triangles may be called the associated Transfor- triangles of the fundamental one ABC. It follows that from any mation. general formula containing the sides and angles of a spherical triangle we may obtain other formule by replacing two sides and the two angles opposite to them by their

supplements, the remain- ing side and the remaining angle being unaltered, for such formule are obtained by applying the given formule to the associated triangles.

If A’,B’,C’ are those poles of the arcs BC, CA, AB respectively which lie upon the same sides of them as the opposite angles 4, B, C, then the triangle .4‘B’C’ is called the polar triangle of the triangle ABC. The sides of the polar triangle are r— 4, 7— B, r—C, and the angles r—a, t—b, w—c. Hence from any general formula connecting the sides and angles of a spherical triangle we may obtain another formula by changing each side A

into the supplement of the opposite angle and

each angle into the supplement of the op-

posite side.

Let O be the centre of the sphere on which Funda- is the spherical triangle ABC. Draw AL per- mental pendicular to OC and AM perpendicular too 8 equa- the plane OBC. Then the projection of O04 P tions be- on OB is the sum of the projections of OL, re tween LM, MA on the same straight line. Since AIT ncaa sides and

has no projection on any straight line in the plane OBC, this gives angles, OA cosc=OL ecosa+LM sin a.

Now OL=O4A cosb, LM=AL cosC=OA4 sind cosC;

therefore cosc=cosa cosb+sina sin b cos C.

We may obtain similar formule by interchanging the letters a, 8, ¢,

thus cosa@=cosb cosc+sind sine cos A cos b=cose cosa+sine sina cosB cosc=cosa cosb+sina sind eosC

Formule for sine and co- sine of half angles ;

These formule (1) may be regarded as the fundamental equations connecting the sides and angles of a spherical triangle ; all the other relations which we shall give below may be deduced analytically from them ; we shall, however, in most cases give independent proofs. By using the polar triangle transformation we have the formule cos A = — cos B cos C''+sin B sin C cosa cos B= — cos C cos 4 +sin C sin A cnt cos (= — cos A cos B+sin A sin B cose In the figure we have 4M=AL sin C=rsind sin@, where r denotes the radius of the sphere. By drawing a perpendicular from 4 on OB, we may in a similar manner show that 4M/=r sinc sin B: therefore sin B sin c=sin C sin b. By interchanging the sides we have the equation sind sinB_ sinC_ sin@ sind sine — we shall find below a symmetrical form for &. If we eliminate cos} between the first two formule of (1) we have cos @ sin*c=sin b sine cosA+sine cose sina cos B;

: sin b therefore cota sinc= a cos.4+cosc cos B

=sin B cot 4+ cosc cos B. We thus have the six equations cotasin b=cot A sin C+ cos b cos C cot bsina=cot B sin C+cosacosC cot bsin c=cot Bsin.4+ cos ccosA

cot csin b=cot CsinA+cosbcosdA fost (4). cot csina=cot Csin B+cosacos B cotasin c=cotA sin B+cos ccos BJ

7 ; 4 <2

Sands 2 formula (1) gives C08. C=€06 @ COBD .... ciassssencevend (a), and (3) gives sin b=sin B sin ¢ f = sng=anA gine ("eee (8) ; from (4) we get tana=tan A sin b=tan ccosB (y) tand=tanBsina=tanccosA§ cc –

cos c= COtd COtB…....0.000s00s00 (e) cos 4d=cos asin B

cos B=cos b sin A follow at once from (a), (8), (y). These are the formule which are used for the solution of right-angled triangles. Napier gave muemonical rules for remembering them.

The following proposition follows easily from the theorem in equation (3) : —If AD, BE, CF are three ares drawn through 4, B, C to mect the opposite sides in D, E, F respectively, and if these arcs pass through a point, the

segments of the sides satisfy the relation sin BDsin CE sin AF’=sin CD sin AE sin BF; and conversely if this velation is satisfied the arcs pass through a point. From this theorem it follows that the three perpendiculars from the angles on the opposite sides, the three bisectors of the a angles, and the three arcs from the angles to the middle points of the opposite sides, each pass through a point.

If D be the point of intersection of the three bisectors of the angles 4, B, C, and if DE be? ¢ drawn perpendicular to BC, it may be shown Fic 6 that BH=}(a+c-b) and CH=}(a+b-0), salad and that the angles BDE, ADC are supplementary. We have

The formulee and

ales sine sin ADB snd. sin ADC a A 5 =. a) a i oe ee 4 ‘fee sin BD sin 4 sin CD gis A 2

_ Sin BD sin CD sin ODE sin BDE

—, ~; But sin BD sin BDE=sin BE sin 6 sine

=sin ite!) , and sin CD sin CDE=sin CE=sin a — ; there- ~- a@+e-—b . atb —c)? sin —>-— sin 5 fore sin — = ; ey (5). 2 sin bsinc

Apply this formula to the associated triangle of which 7-4, a —B, Care the angles and r- a, w—b, c are the sides ; we obtain

(– b+c-a ,. atb+e sin —~— sin —< a the formula cos = = aetna (6). 2 sin 6 sinc By division we have sin (1-4 sin tO = * a ints 2 a, (7); 2 b+c-a , at+b+e

2) Se SR) z 2

and by multiplication

sin 4 = { sin © se sin

b+c-a@. cta-b., ay a sin 6 sine Ce 2

i = = {1 – cos? a — cos? b — cos? 2 Sart sinc’ s*b—cos*c+2 cosa cosh cos c}

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Hence the quantity & in (3) is ee Te ee } yee my 5 > cos* a — cos? b — cos?¢ +. 2 cosa cos b cos as (8).

App

[SPHERICAL.

ly the polar triangle transformation to the formule (5), (6), Of half.

(7), (8) and we obtain sides, ‘ a_ {cos AtOr® ,,,4+B-C)3 cos 5 = ——i. te Vig Ma ee re (9); : ateao B+C-A At BseCys : ar ~ = — om ips oan } ona loig (10) ; sin B sin@ ; – cos 240-4 wees 7 tan 5= ALOLB ALBoOt Oe (11). Cos —S— cos

, 1 9 9

Ifk = eee {1 — cos”. — cos?.B- cos? C’~ 2.cos.A cos Beos}3, we have a) eee a ay ee (aN Let # be the middle point of AB; draw ED at right angles to De- AB to meet AC in D; then DE bisects d lambre’s the angle ADB. Let CF bisect the angle formule, DCB and draw FG perpendicular to B C, Fy then og= 2″ aree.***, =cos or eo ee (16). The four formule (13), (14), (15), (16) were first given by Delambre in the Connaissance des Temps for 1808, Formule equivalent to these were given by Mollweide in Zach’s Monatliche Correspondenz for November 1808. They were also given by Gauss (7’heoria motus, 1809), and are usually called after him. From the same figure we have tan F@=tan FOG sin CG =tan FBG sin BG ; Napier’s Low C. se A-B. a+b analogies. therefore cot au =tan 9 sn-~>> — A-B 2 C or tan = = ote cot 2 4 Faata Cewvatevsianayacere Ga) $111 “a

Apply this formula to the associated triangle (7 -—a, b, r-¢, r- A, L, t-C), and we have a+b

or 9

If we apply these formule (17), (18) to the polar triangle, we have

deg tee a—b 2 (3 hus * “yee a indie megoras 4 (19) ; sin

2

ite a+b my c ws FS A ee (20). cos 5

The formule (17), (18), (19), (20) are called Napier’s ‘‘ Analogies” ; they were given in the Miri. logar. canonis descriptio.

Schmeis- ser’s formule.

Cagnoli’s formule.

Solution of tri- angles ;

Ambigu- ous cases,

) Radii of yj circles

| related to y triangles. ib

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Tess tL 1 Pies ie geen a b Cite we use the values of sin5, sing, sin 5, cos5, cos5, cos 5 give by (9), (10) and the analogous formule obtained by interchanging

the letters, we obtain by multiplication one Gane Bar Oe 2) slll 2 cos 3 sinoG>=sm 9 cos aa aan 608 cos g sin C’=cos £ cos fe | pa Fax Z | sin ® sin z sin C’=cos < cos aa 2 2 i”) 2 jj These formule were given by Schmeisser in Crelle’s Journ., vol. x.

The relation sin bsinc + cosbcosccosA =sinBsin C— cosB cos Ccosa was given by Cagpoli in his 7rigonometry (1786), and was redis- covered by Cayley (Phil. Mag., 1859). It follows from (1), (2), and (3) thus: the right-hand side of the equation equals sin B sin -+ cos a(cos.é — sinBsinC cosa) =sinB sinC'sin2a + cosacosA, and this is equal to sin b sin ¢+cos A (cos a —sin bsine cos A) or sind sine+ cos b cos¢ cos A.

The formule we have given are sufficient to determine three parts of a triangle when the other three parts are given ; moreover such formule may always be chosen as are adapted to logarithmic calcu- lation. The solutions will be unique except in the two cases (1) where two sides and the angle opposite one of them are the given parts, and (2) where two angles and the side opposite one of them are given.

Suppose a, b, A are the given parts. We determine B from the

: sind. Bo formula sin B= Sng 2 A; this gives two supplementary values of

B, one acute and the other obtuse. Then Cand care determincd from

sin tie sin ae c 2 A-B c a—b the equations tan = = eee cot z 7 tan =. ae tan 2 sin —— sin =

2 2

Now tan g tan 5 must both be positive ; hence 4 —- Band a—-b must have the same sign. We shall distinguish three cases. First,

suppose sindsin a, there is no solution when sin db sin A>sina; but if sin dsin 4A-B, is negative ; hence there are two solutions if 4 is acute and none if 4 is obtuse. These two solutions fall together if sind sin 4 =sina. If a is obtuse there is no solution unless 4 is obtuse, and in that case there are two, which coincide as before if sin }sin_A=sin a.

Hence in this case there are two solutions if sindsin.AXsina and the two parts 4, a are both acute or both obtuse, these being coinci- dent in case sin bsin d=sin a; and there is no solution if one of the two A, a is acute and the other obtuse, or if sindsin A>sina. Thirdly, ifsindb=sina then B=A or r- A. If

@ is acute, a—bdis zero or negative, hence 4 — B is zero or negative ; thus there is no solution unless 4 is acute, and then there is one. Similarly, if a is obtuse, 4 must be so too in order that there may be a solution.

If a=b=5, there is no solution unless 4 =3 and then there are an

infinite number of solutions, since the values of C and c become indeterminate.

The other case of ambiguity may be discussed in a similar manner, or the different cases may be deduced from the above by the use of the polar triangle transformation. The method of classification

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according to the three cases sin b=sin a was given by Professor

Lloyd Tanner (AZessenger of Math., vol. xiv.). If r is the angular radius of the small circle inscribed in the “Ages triangle ALC, we have at once tan r=tan “3 Sin (s—a@), where 2s=a+b+c; from this we can derive the formule fied Nill wee al pemes ee ee tan r=% cosec $= “9 S&C -p Sec 5 seco =sin@ sin> sin 9 sec 7) (21), where », WV denote the expressions {sin s sin (s—@) sin (s— 8) sin (s —c)t4, 5 — cos S’cos (S — A) cos (S— B) cos (S – C)} 2.

The escribed circles are the small circles inscribed in three of the associated triangles ; thus, applying the above formule to the triangle (a,7 — b, r—c, A, – B,w— C), we have for 7), the radius of the escribed circle opposite to the angle 4, the following formule

t me (s—a) a cosec = cosec g = = — = fs oa roe ‘ an 7, =tan 3 Sin s=n cosec 9 5) 9 2

i ye see eee =sin @ cos = = =

2 2 2

tro Owow ET R Y

The pole of the circle circumscribing a triangle is that of the circle inscribed in the polar triangle, and the radii of the two circles are complementary ; hence, if 22 be the radius of the circum- scribed circle of the triangle, and R,, Ry, Rs the radii of the circles

circumscribing the associated triangles, we have by writing 57 8 for 7, & ~f, for r,, r-a@ for A, &c., in the above formulz Q = fee S= Al = oawec f cose” cos °— _Nsec S cot &=co 9 ms 5) 9 cosec g— —Nsec : b =sin A cos 9 COs 5 cosee 5 SCO OcE A OEEAOR (28) ; a n a Oe 2 cot &, = — cot 5 cosS=5 cosec 5 sec 5 sec ga sec (S— A) ‘ 7 a. O a Ss Y Z sd D) sin A sin g SID 5 COSEE Foeeeereeeeessesns (24),

The following relations follow from the formule just given :— 2 tan & =cotr, +cotr,+cot 7; — cot7, 2 tan k,=cotr +cotry+cotr;—cotry, tanr tan7, tan7, tan7,=n”, sin*s=cotr tan 7, tan 7, tan rs, sin? (s—a)=tanr cotr, tan7, tan 7. If L=A+B+C-7, it may be shown that Z multiplied by the Formule square of the radius is the area of the triangle. We give some of for the more important expressions for the quantity HZ, which is called spherical

the spherical excess. excess, bee wee gone fqn oa 2 7 D 2 We have —— – age |; ———— a: sin 2 cos 3 cos 2 cos 2 é E a+ C a—b sin rie : gt OS (5-7 co; mE ‘ sin C cos 2 cos S cos oS a 2 2 2 C . (C-E c a+b sin 5 — sin (3 – COS 5 — Cos —>— . oe en ae eh sins +sin (= =) cos gt 60s oF E Bae 8 s- ¢ therefore ——G— p= tan 5 tan om tan* rm Similarly tan ? tan? c= tan = tan s—* :

;

therefore tan Z= tan 5 tan = tan 5 a tan al Cee (eR: This formula was given by L’Huillier.

cos iad Also sin 2 cos a cos g sin = = a sin ge : 2, i, 2 2 iC 2 cos = vy) cos gaa! cos aye Ee i cos a Ph Pe 2 7} c Qe Cos 5

whence, solving for cos = we get

E_1+cosa+cosb+ cose

5 eM a Bor eR Pree

2 2 2

This formula was given by Euler (Nova acta, vol. x.).

cos

If we find sing from this formula, we obtain after reduction a 4 “Boa cos d cos ¢

2 2 2

a formula given by Lescell (Acta Petrop., 1782). From the equations (21), (22), (28), (24) we obtain the following formule for the spherical excess :—

sin? A =tan & cot R, cot &, cot Ry

4(cot 7, + cot ry + cot 7s)

(cot r — cot 7, + cot 72+ cot 7s) (cot 7+ cot 7 — cot 7, + cot 73) (cot r+cotr, + cot 7, — cot 7’) The formula (26) may be expressed geometrically. Let Jf, N be the middle points of the sides 4B, AC. Then we find cos MN _1+cosa+cos b+-cose

; hence cos 4 =cos MN sec”, 4 asa” cos © . :

2 2

A geometrical construction has been given for # by Gudermann (in Crelle’s Journ., vi. and viii.). It has been shown by Cornelius Keogh that the volume of the parallelepiped of which the radii of

Proper- ties of spherical quadri- lateral inscribed in small circle,

Periodi- city of functions,

Connex- ion with theory of

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the sphere passing through the middle points of the sides of the triangle are edges is sin 5 .

Let ABCD be a spherical quadrilateral inscribed in a small circle ; let a, b, c, d denote the sides 4B, BC, CD, DA respectively, and z, y the diagonals AC, BD. It can easily be shown by joining the angular points of the quadrilateral to the pole of the circle that A+OC=B+D. If we use the last expression in (23) for the radii of the circles circumscribing the triangles BAD, BCD, we have

: a d Tee b Cc y = ~¢C <—gin C’cos = cos = cosec = ; sin A cos g 68 5 cosec 5 sin C 5 5 93 sin A sin C whence ee tie ce eae 0S = COS cos — cos oad eal he.

This is the proposition corresponding to the relation 4 +C=7 for a plane quadrilateral. Also we obtain ina similar manner the theorem

. 2 ae} an =_—s me on ute sin B cos 5 sin 4 COS 5

analogous to the theorem for a plane quadrilateral, that the diagonals are proportional to the sines of the angles opposite to them. Also the

3 Ee ote 0) ee Ct eee chords 4B, BO, CD, DA are equal to 2 sin 9 2 sin 2 2 sin » 2 sin 5

respectively, and the plane quadrilateral formed by these chords is inscribed in the same circle as the spherical quadrilateral ; hence by Ptolemy’s theorem for a plane quadrilateral we obtain the analogous theorem for a spherical one

in ~ sin ¥=sin © sin © sin 2 sin –

sin 5 sin 5=sing 3 5 9

It has been shown by Remy (in Crelle’s Jowrn., vol. iii.) that for

any quadrilateral, if z be the spherical distance between the middle points of the diagonals,

cos a+cosb+cos¢+cosd=4 cos $x cos $y cos $2.

This theorem is analogous to the theorem for any plane quadri- lateral, that the sum of the squares of the sides is equal to the sum of the squares of the diagonals, together with twice the square on the straight line joining the middle points of the diagonals.

A theorem for a right-angled spherical triangle, analogous to the Pythagorean theorem, has been given by Gudermann (in Crelle's Jowrn., vol. xhii.),

Analytical Trigonometry.

Analytical trigonometry is that branch of mathematical analysis in which the analytical properties of the trigonometrical functions are investigated. These functions derive their importance in ana- lysis from the fact that they are the simplest singly periodic functions, and are therefore adapted to the representation of undu- lating magnitude. 'The sine, cosine, secant, and cosecant have the single real period 27 ; 7.¢., each is unaltered in value by the addi- tion of 27 to the variable. The tangent and cotangent have the period 7. The sine, tangent, cosecant, and cotangent belong to the class of odd functions ; that is, they change sign when the sign of the variable is changed. The cosine and secant are even func- tions, since they remain unaltered when the sign of the variable is reversed.

The theory of the trigonometrical functions is intimately con- nected with that of complex quantities,—that is, of quantities of

the form x+.y (.=s/-1). Suppose we multiply together, by the

complex yules of ordinary algebra, two such quantities, we have

quanti- ties,

(21 + 64),)(q + Yo) = (22y%q — YyYo) + (Yo + ZaY)y)- We observe that the real part and the real factor of the imaginary part of the expression on the right-hand side of this equation are similar in form to the expressions which occur in the addition formule for the cosine and sine of the sum of two angles; in fact, if we put %=7, cos), y,=7, Sin 0), To=72 COS Oy, Yo=1_ SID Oy, the above equation becomes

7(cos 6, +4 Sin 6)) x 7,(cos 0. +4 sin 6.) =7y7'o(cos 9, + 45+ Sin 6; + 9p).

We may now, in accordance with the usual mode of representing complex quantities, give a geometrical interpretation of the meaning of this equation. Let P, be the point whose coordinates referred to rectangular axes Ox, Oy are x, y,; then the point P, isemployed to represent the quantity z,+:y,. In this mode of representation real quantities are measured along the axis of x and imaginary ones along the axis of y, additions being performed according to the parallelogram law. The points 4,.4, represent the magnitudes +1, the points a,a, the magnitudes +1. Let P, represent the expression q+tYo and P the expression (+1y)(%_+tY). The quantities 14,9};7o)92 are the polar coordinates of P, and P, respectively referred

to Oas origin and Oz as initial line; the above equation showse= that 7,7, and 6,+ 4, are the polar coordinates of P; hence OA |, ~ : OP, ::OP,: OP and the angle POP, is equal to the angle P,OA. Thus we have the following geometrical construc- tion for the determination of the point P. On OP, draw a triangle similar to the triangle OAP, so that the sides OP,, OP are homologous to the sides OA, OP, and so that the angle POP, is positive; then the vertex P represents the product of the expressions represented by P,P, If x+y, were to be divided » by 2, +1%, the triangle OP'P, would be drawn on the negative side of P,, similar to the triangle OAP, and having the sides OP', OP, homologous to OA, OP, and 2" would represent the quotient.

If we extend the above to » complex quantitics by continual repeti- tion of a similar operation, we have—

(cos 6, ++ sin 4) (cos .+¢sin 6,)... (cos 6, ++ sin 8,,)

we

a De Moivre’s

A, theorem,

et teal +n) +eSin(0, +094… Ia, Fig. 8. + On). If 0,=6,=... =0,=9,, this equation becomes (cos #+1 sin @)”=

cos 26+. sin 2; this shows that cos +1 sin@ is a value of (cos7@ + .sinné) 4 Ifnow we chieye 6 into 4 we see that cos . +c sin 2 is a value of (cos@+csin @)n; raising each of these quantities to any positive integral power 2, cos ey sin = is one value of (cos 8 2 Also

m m it 2 ee) i cos(0 +esin(4) ie”

m : cos—O +1 sin —0 n n

+csin 0)”,

hence the expression of the left-hand side is one value of

(cosé +e sin 6)” or of (cos + «sin)~ 2. We have thus De Moivre’s theorem that cosk+.sin k6 is always one value of (cos 6+. sin 6)*, where & is any real quantity.

The principal object of De Moivre’s theorem is to enable us to The »

‘ = roots of a find all the values of an expression of the form (a+1b)”, where m complex

and # are positive integers prime to each other. If w=7 084, quantity. m

™m b=rsin 6, we require the values of 7” (cos 0+. sin)", One value is immediately furnished by the theorem ; but we obscrve that, since the expression cos 6+. sin is unaltered by adding any multiple of

m.0+2si4r . m.0+ 287 ———- + es

m Q7 to O, the th power ofr” (cos is a+ub,

if s is any integer; hence this expression is one of the values re- quired. Suppose that for two values s, and s, of s the values of this

m.@ + 28y0 _ Mm. + 2somr ; nN a multiple of 2m or s;—s, must be a multiple of x. Therefore, if we give s the values 0,1, 2,... 2-1 successively, we shall get » differ- m

expression are the same; then we must have

ent values of (a+.b)”, and these will be repeated if we give s other

™ values ; hence all the values of (a +10)” are obtained by giving s

m the values 0, 1, 2,...%-—1 in the expression r® (cos m0 2″ tek

nN

m. 0+ 239 ‘“

csin), where r=(a? b*)sand 6=are tan =

We now return to the geometrical representation of the complex quantities. If the points B,, By Bs, ... By Trepre- sent the expression x+vy, (x+cy)*, (wtwy),...(e+ey)” respectively, the triangles OAB,, OB,B,,... OB,_)B,, are all similar. Let (x+cy)”=a+.b, then the con- verse problem of finding the nth root of a+16 is equivalent to the geometrical problem of describ- ing such a series of triangles that O4 is the first side of the first triangle and OB, the second side of the ath. Nowit is obvious that this geometrical problem has more solutions than one, since any number of com- plete revolutions round O may be made in travelling from B, to B, The first solution is that in which the vertical angle of each triangle Fig. 9. is + BOA ; the second is that in which each is *(B,OA + 2a), In

this case one complete revolution being made round 0; the third

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has * (ByOA+4n) for the vertical angle of each triangle ; and so

on. There are n sets of triangles which satisfy the required condi- tions. For simplicity we will take the

case of the determination of the values ‘ed of (cos6+csin 0)%. Suppose B to re- 7

present the expression cos@+ Sin 0. 4%

If the angle AOP, is 46, P, represents {

the root cos +esin 3 the angle AOB a

is filled up by the angles of the three

similar triangles AOP,, P,Op,, p,OB.

Also, if P,, P; be such that the angles

P,OP,, P\OP, are oa = respectively, me the two sets of triangles AOP,, P,Ops, mae p,0B and AOP;, P;O0p, p,VB satisfy the conditions of simi- larity and of having OA, OB for the bounding sides; thus P,, 1 204+ 2m 6+ 49 . O+40 +cesin 3 , COS a +esin 3 respectively. If B coincides with A, the problem is reduced to that of finding the three cube roots of unity. One will be repre- sented by 4 and the others by the two angular points of an cqui- lateral triangle, with 4 as one angular point, inscribed in the circle. The nth The problem of determining the values of the mth roots of unity roots of is equivalent to the geometrical problem of inscribing a regular unity. polygon of 7 sides in a circle. Gauss has shown in his Disquisi- tiones arithmetice that this can always be done by the compass

and ruler only when 7 is a prime of the form 2°+1, The determina- tion of the nth root of any complex quantity requires in addition, for its geometrical solution, the division of an angle into m equal parts, ; ; Factoriz- ~ Weare now in a position to factorize an expression of the form ations. 2”-(a+.b), Using the values which we have obtained above for

1

i

x

2

P; represent the roots cos =

(a+1b)”, we have

s=n-1 ds x” —(a+i)=P [=-” (cos? =” +1 sin “tet | s(); s=0 n e If }=0, a=1, this becomes s=n—~1 27 s. Qsm e-1l=P [#- cos SF ~« sin s=0 U nN T

s=5-1

=(x%-1)(@+1)P S (» — cos Lah sin cad s=1 n W

3

s=5-1 =(a%—-1)(@+1)P ; (2 — 2x cos 2 1) (neven)(2) s=

n-1 s=“9_ a” —1=(x%-1)P . (22-2 cos = +1) (n odd) ...(8). s=1 If in (1) we put a= —1, D=0, and therefore 0=7, we have s=n-1 Ona i Rec 1 e+1=P [2-cos ##*—. in| s=0 117 zt = aoe =P * [28-2008 seit +1] (n even) ..... (4). s=0 n n-3 —_= a> oF itp 2s +11 41a (e+1)P [22-22 cos . +1] (m oda) (8). s=

Also x?” — Quy” cos n@ +” = (a — y* cos nO +1 sin n0)(a” — y” cos nO — 1 sin 26)

s=n-1 =? (e-y a te, sin = ST) s=0 n s=n-1 ~~ eee =F [# — 2xy cos 0+ _— +y| ern ae (6). s=0 ie

Airy and Adams have given proofs of this theorem which do not involve the use of the symbol « (see Camb. Phil. Trans., vol. xi.).

A large number of interesting theorems may be derived from De Moivre's theorem and the factorizations which we have deduced from it; we shall notice one of them.

Example In equation (6) put y=, take logarithms, and then differentiate of De

Moivre's theorem.

each side with respect to x, and we get Qn(a2n-1 = gn) s=n-1 a" — 2 cosnd+-a-2"" 59

2(x — 2-8) 2s w-2 cos 6 + —— +a?

Put war, then we have the expression

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mate — bn) : (a? — b?) (a2" — 2a"b" cos no +b) for the sum of the series

s=n-1 1

y i

s=0 9 237 a a" — 2ab cos 0+ arr

We shall now consider what meaning can be assigned to the Complex symbol +4, 'The quantity ¢ is defined as the limit of (1 +2)", = u where 7 is a positive quantity, and is increased indefinitely ; then, €xP00-

for a real value of x, ¢" is the limit of € +2 r or of (1 e)", ae: where m=nx, when m is increased indefinitely. We may define e* TY as the limit of € nad when m is increased indefinitely. To determine the value of this limit put 1 < =r cos i,2-=r sin 0;

then e*+ is the limit of r"(cosm6+.csin m@), and 7" is equal to

22 ety

aly a 1 2 or ultimately to (+2) 2, which has e” for m mm n

Also @ is are tan —2— or —¥

; e+ xe+m hence m@ is ultimately equal to y, and thus the equation

e+ —¢(cos y+ sin y) follows from our definition. It may be

shown at once that &+4 x its e”+1t+Y+), and, if we suppose

that a®t denotes e@+)!°8% we may show that complex expon-

ents defined thus obey the same laws as real ones.

When the exponent is entirely imaginary we have, in accordance Expon-
with the above definition, ential

eY¥=cosy+csin yand e~Y=cos(—y)+csin(-y)=cosy—csiny; values of we
thus obtain the exponential values of the sine and cosine— sine and t _
cosine. iad +e7%),

If we give imaginary or complex values to the variables in alge- Expan-
braical expansions we obtain analogous trigonometrical theorems ; sions of
it is, however, necessary to consider the convergency of the serics sines so
obtained in order to determine within what limits the values of and the
variables must lie. If we expand e” and e~ by putting vy cosines

m 3 and their

its limiting value, in the limit ;

sin y=ale¥ —e~),cosy=

‘ ; ae y and—vcy in the series l+yt+ 79+ T79-3t ae

powers.

we obtain the series sin y=y — Fat – ir + Ree $ ea es as = ee ak cos y=1 j2 tj Sage These serics are convergent for all finite values of y. They may also be got from the expressions which we have obtained for the cosine and sine of a multiple of an angle in terms of the cosine and sine of the angle, and would thus be made to rest upon a basis independent of the symbol «. Consider the binomial theorem Expan- (a-+by=a”-+narto um Van m524. wie oe | 2 powers 4 ar Pee 3 bn. ere Putting a=e, b=e~“, we obtain asi ‘of (2 cos 0)” =2 cos nO + n2 cos n — 26 4 MoD cosn— 40+... sines and : ‘ | 2 cosines of 4 Man)...(m—7+) eosn BAI} ay multiple r are.

When 7 is odd the last term is gtin= 1)... Xn +8)

| $a —1) n(n—1)...(4u+1) , we obtain the formula

(- 1)2(2 sin 6)”=2 cos n6 — 2n cos(n — 2)0 ae Pe. cos(n — 4)0—...

cos @,

and when v is even it is

If we put a=e4, b= -e~# nN

5n(a-1)...(yn+1)

n-rn(n-1)...(n—7 +1) i ie [an

+(-1

when 7 is even, and n-1

(-1) ? (2sin@)”=2sinnd — n.2sin(n —2)0+

2cos(n—2r)0…+(-1)

n(n —1)

“Tg 2sin(n – 4)6…

n(n —1)...3(1+ 3) an 9 | (a – 1)

when 7 is odd. These formule enable us to express any positive

integral power of the sine or cosine in terms of sines or cosines of

multiples of the argument. There are corresponding formule when

n is not a positive integer. XXIIL — 72

nal +(-1) ?

570

Expan- Consider theidentity log (1—pz) + log (1-qxz) =log(1-p + qu+pq2x*). sion of Expand both sides of this equation in powers of x, and equate the sines and coefficients of x”, we then get

cosines of u(n—3 multiple 2″ +9”=(p+q)”—n@+q)““pa+ oo (p+q) “pig? ++ wri of = 1 ee r—1)\(n—r—2)...(n—2r4+ Dnt gpg” +. : sines and [7

cosines of If we write this series in the reverse order, we have are, My eS NTS 2 9 %n2-92 Le 4 n +q n*(n?—-27) 3 P+9 prsar=2t1)| (99)? (og) (25) tg oe

oe) a) ~(e)’+ = 1)s(n+9) |

CS when ” is even, and Se

n-1 n-1 =

aon — n(n? — 1? > (pt+ay3 prpgr=2-1) ® [n(oa) ? (252) -M* Pipe) * (PE2)

2 12 2 32 n-5 a 9 5 _ n=l a i (nq) (73) sare Gee) a yo+ar |

when 2 is odd. If in these three formula we put p=c®, g=e-%, we obtain the following scrics for cos n# :—

nn —3 2 cos nO =(2 cos 0)” — n(2 cos 8)” + Mahe cos 6)r-4—,.,

SENS SB) = EE ean

ap (a il) Nl , when 7 is any positive integer; ly 2 2 92 2/992 2_ 42 = n> n? (n? — 2?) wn? —2)\(n?- 47) 2 =1-,~cos*@ +—-_—— cos#@ — +‘ cos89 (~~1)*cosn@=1 2 cos*6 + [2 cos#é [6 = n tines $C = 1)72”~~) COS... cose ee ceeeecoee (8) when 7 is an even positive integer ; n-1 Fe 2_ 122 2 — nn? —-1 n(n? — 1?) 2? — 8?) (-1) 2 cosnd=ncosné — Lae deere 6 +. -—-——-.>+————“‘c0s°6 — [8 5 n-1 i,

A ae 0 i <. e (9) when 7 is odd. Ifin the same three formule we put p=e”, g= —e~, we obtain the following four formule :—

x n(n — 8)

(- 1)22 cos 20=(2 sin 6)” — n(2 sin 6)”-2 4+ — (2 sin 0)”-4- ...

i2 ” pas = = ews Ya sin 0)”-®” ,,.(meven)(10); a (~~1) * 2sinn@=the same series (nm odd) ..... (11); 2 2(4)2 — 92 ‘ 2/2 _ 92 2_ 42 . cosna=1— 7 sin?g4 “2 sintg~~ Se) sin? aa +... $971 sin "6 (m even) cicceeeeecceees (12) ; 2_ 42 2 _ 12)(n2_ 92 sinnd=n sin 6 — oc sin +e) sin’ §— ae ii +(-1) 2 21 sin” 6 (0 Odd) c.ccsceseses. (13). P q P-Yq

Next consider the identity pe Toe (pees one Expand both sides of this equation in powers of x, and equate the coefficients of a”-1, then we obtain the equation

nan -38)(n—4 oe =(p+qp*—(n-2)(p+ 9)“pq + Ny Oe…

+(-1/ ws = Mea COTE (ie ee oles

If, as before, we write this in the reverse order, we have the series

(2 i n(252) a)? tan Ge oe

2 _ 92)(n2_ 42 a 2. nr a is PE eo? ee eee ‘(+a |

when x is even, and n-1 n-1

(-1) ®[(om)? – HOLM) on) F

n~5 ee en +... een

when 7 is odd. _ If we put p=e%, g=e-, we obtain the formule

n-1

= (p+ a |

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(a — 8)(n— 4) Le mo 2) 9 cosa)n—2-14.,,. } (14),

sin n@=sin@ (2cos@)”—1 — (n — 2)(2 cos6)”-3 +.

(ea ore Daal

where 7 is any positive integer ;

n ‘ ae 92 2 92 AZ u ue) py ae) Me : legs

(2cos0)r-5

LSS 4 (-1 ie sinvé=sin8 { coca: & Li Do n

=-1

+(-1)? (2cos6)r-1 C1) (Gl) n-1 pas ihe G 2 12 ones 12 2_ 92 (-1) 2 sinné=sine ee r2 00389 4 sty ae wees on (=)? 2 cosayr-t | (n CS) aR (16). If we put in the same three formula p=e, ¢= — e-, we obtain the series 7 3)\(n —4 (-1) 2 sinne =cos6[sin”~~18 (n—2)sinn~~%9 4. e3) vee Sieg eee

r (n—r—1)(n—7r-2)...(n—2r) .

+(~~1) ie sin?~~%r19 +... a even) (17); mal” (—1) ? cosn@= the same series (grodd) #3. (18) ; ya —~ 92 2 Ag sin n0 =cos6 nm sin 6 — os) sin?@ + —e

sin’é + o=5 _ wee t(- 1)? (2 sin)r-1 } (WEVEN) .occccccees (19) ; 2_ 72 2 _ 12)/n2_ 92 cos nd =coso {1-1 inte y CO Vn? = 8) sag ae, [2 | 4 + (2sin)n-1 } Cc (20).

We have thus obtained formule for cos 7@ and sinné both in ascending and in descending powers of cos and sin . Viéte ob- tained formule for chords of multiple arcs in powers of chords of the simple or complementary arcs equivalent to the formule (18) and (19) above. These are contained in his work Theoremata ad angulares scctiones, James Bernoulli found formule equivalent to (12) and (13) (Mém. de ? Académie des Sciences, 1702), and trans- formed these series into a form equivalent to (10) and (11). John Bernoulli published in the Acta eruditorum for 1701, among other formule already found by Viéte, one equivalent to (17). These formule have been extended to cases in which n is fractional, nega- tive, or irrational ; sec a paper by D. F. Gregory in Camb. Math. Jowrn., vol. iv., in which the series for cos 26, sin 26 in ascending powers of cos @ and sin 6 are extended to the case of a fractional value of m. These series have been considered by Euler in a memoir in the Nova acta, vol. ix., by Lagrange in his Calcul des Sonctions (1806), and by Poinsot in Recherches sur Vanalyse des scc- tious angulaires (1825).

The gencral definition of Napierian logarithms is that, if e7+” Theory =a-+0b, then x+w=log (a+b). Now we know that e+ = ¢%os y of loga-

+ve* sin y; hence ¢* cos y=a, e” sin y=b, or c=(a2+0%)t, y= Tthms are tan qt where m is an integer. If }=0, then m must be even or odd according as a is positive or negative ; hence

log. (a+b) =log, (a2 +82) +: (are tan ° £2nm)

or loge (a+b) =log, (a2 +b)? +2 (are tan “ +2n+7),

according as a is positive or negative. Thus the logarithm of any complex or real quantity is a multiple-valued function, the differ- ence between successive values being 2m ; in particular, the most general form of the logarithm of a real positive quantity is obtained by adding positive or negative multiples of 27 to the arithmetical logarithm. On this subject, see

De Morgan’s Trigonometry and Double Algebra, chap. iv., and a paper by Prof. Cayley in vol. ii. of Proc. London Math. Soc.

We may suppose the exponential values of the sine and cosine Hyper- extended to the case of complex arguments; thus we accept bolic early) 4 ¢- Ua+ty) early) _ ¢- Katey) a trigono-

a 7 as the definitions of the metry,

functions cos (x+y), sin (a+vy) respectively. If z=0, we have ey +¢e7 y e +e7 y 2 Bo}

cos wy =

and sin y= 5(el —e-“), The quantities wv—e-y , F : 5 are called the hyperbolic cosine and sine of y and are

written cosh y, sinh y; thus cosh y=cosvy, sinh y= -—csinvw. The functions cosh y, sinh y are connected with the rectangular hyperbola in a manner analogous to that in which the cosine and sine are

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connected with the circle. We may easily show from the definitions that cos*(a +uy)+sin*«+ry)=1, cosh? y — sinh? y= 1; cos(a + wy) = cos x cosh y—csin# sinh y, sin(x+cy) =sin # cosh y+ cos xsinh y, cosh(a.+ 8) =cosh a cosh 8 sinh a sinh f, sinh(a 8) =sinh a cosh 8 — cosh a sinh 8. These formule are the basis of a complete hyperbolic trigonometry. The connexion of these functions with the hyperbola was first pointed out by Lambert.

Expan- If we equate the coefficients of x on both sides of equation (13), sionofan we get 3 5 angle in ran O45 sin?@ 1.3 sin’? 1.3.5 sin’) (21); powers of 3 2.4 fl 4.4.0 -h. its sine. » must lie between the values +2 5° This equation may also be written in _ form a #2 1.3 ane 3.5 o re sin 2a 53 45 *o.4.677°” when « lies between £1. By equating the coefficients of n? on both sides of equation (12) we get 2sin4o 2.4 sin’? 2.4.6 sin in

-

6?=sin? O+3 5 S08. os + 2a. 74 (22), which may also be written in the form 20 2k 2.4.6 H > ee eo ie (arc sin) @+5 5 +35 3 +e oa when x is between +1. Differentiating this equation with regard to x, we get

= 24

i= [= + Fat Stas 4S re ge tees if we put arc sin «=arc tan A this equation becomes y 2 ¥ 2.4/7 :) end eS t+ 3 ioe 3.51 +y2 tJ (23). This equation was given with two proofs by Buler i in the Nova acta for 1798. L+e_ LS oe ae Gregory's We have Slog *® tte te + aes5 – put vy for «, the left side ee becomes 3} {log (1 +cy) — log (1 —«y)} or care tan ykinr ; ; . hence arc tan y=nr = =y-% + = ae The scrics is convergent if y lies 'shea +1; if we suppose arc tan y restricted to values between #7, we have 3. of arctany=y —"% 4% -,,, bauenseeasestore (24), which is Gregory's series. 305 = Various series derived from (24) have been employed to calculate oat OF the value of r. At the end of the 17th century 7 was calculated – — to 72 places of decimals by sain eherp; by means of the

series obtained by putting arc tan y=" 8 v=Z5 in (24). The cal-

culation is to be found in Sherwin's Mathematical Tables (1742). About the same time Machin employed = serics obtained from — arc, tan 555

939 5=7 to calculate mw to 100 de-

Long afterwards Euler employed the series obtained

the equation 4 are tan ; 5 cimal places. from — =are tan, +are tang, which, however, gives less rapidly con-

4

verging series (Introd., Anal. infin., vol. i.). Lagny employed the

formula arc tan a= 5 communicated to the Paris Academy in 1719. Vega calculated 7 to 140 ra places by means of the series sa from the

to calculate m to 127 places ; the result was

3 1

equation z =5 arctan 7 2arctan-.. The formula 3 7 =arc tan gt

10°

are tan 5 tare tan 5 was used by Dase to calculate m to 200 decimal places. Rutherford used the equation =4 arc tan —are tan 5 + are tan 99° If in (23) we put y=5 was 7 we have 1 tt | 24. 264. } St ER 1+3. tot 3-5 102 +.. 42 2 ft nie kel eS +7 5 00) + of,

a rapidly convergent series for which was first given by Hutton in Phil. Trans. for 1776, and afterwards by Euler in Nova acta for 1798. Euler gives an ee sesh al in the same manner from

the identity r= 20 are jae +8arctan-~. The calculation of r has

7 B been carried out to 707 places of decimals ; see Proc. Roy. Soc., xxi. and xxii. ; also SQUARING THE CIRcLE (vol. xxii. p. 435 sq.).

THRIiGUNOUME TRY

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We shall now obtain expressions for sina and cos 2 as infinite Faetoriz-

products of eee pee We have : ation of MMe Ai os i sinv=2sin ~ sin —— =2° sin — sin a sin gol sin eat sa one 2 2 2. 46 4 4 ? eosine. proceeding continually in this way with each factor, we obtain ‘ ct. em… pom : ~ sinv=2”-! sin — sin aol 6 ee lr n D n g «£ where 7 is any positive integral power of 2. Now

EO “CR — TT et+rmT . rT—-x EOE ice sin sin =sin ——— sin ——— =sin? — ~sin?-, n n n n n n

. e+4n0 ze

and sin ——~— =cos -.

n 2

Hence the above may be written c a oh a | eee SNOT kc sinz=2”” sin ® (sin? — —sin?—) sin? — —sin?-)... n n n n n mg eure ae x sin? — —sin? =) cos~, n 7 where K=4n-1. Let x be ae small, then we have

Qa BN SE * sin? — ... sin? n n- n

sin? a/n sin? x/n — EC aa a il = a ars soe 1 ae sin? a/n sin? 2a/n We may write this

x sin? x/n sinz= nsin= cos— 1- Soe ie

sin* m/n

;

hence

f . & x

sinx=nsin — cos —(1 nv n

sin? a/n)

sin? kr/n]° where & denotes bo product

sin? z/n /) R, sin? m+ wera T n? sin

sin? ma/n sin’ = n m m+ 2Qn m+ 29 and m is any fixed integer ‘igen of n. It is necessary, a we niake » infinite, to determine the limiting valne of the quantity

sin?

se

sing . sing R; then, since the limit of ——————is——, and that of : c die inte m sin — cos = Gi sre, is unity, we have

=o 0-S)0-m) Cae)

Now 2 is less than unity, since sin” is less than sin red m+2r =

, sin

.; also by an elementary algebraical proposition F is aio m +l n

het 1 -sin? 2 (cosec? +... +cosec? Lf) and cosec 6 a if n n 20

0< = ; Ris therefore greater than

_@ ik 1 al

- ase m+2 fue = 2

1 1 1

or hee 1-9 m a aeitmein m+2 +e i ~~z)> or than 1~~ 2 Hence R=1- = where @ is some proper fraction ; 4m 4m’ i

whence

sinw=e (1-%)(1-385)... (1-55) (1-%

When m is indefinitely increased this becomes

9 2 n=+0 sine=a(1~)(1-gra)---=0P (1 a} (25). T Oh ge nT

n=—- © The expression for cos x in factors may be found in a similar manner

by means of the equation cosxv=2 sin = cos 2 rk or may be

deduced thus 4 4

sin 27 _ P(1- set) =) =(1-4 =)(1 – jee) (1-3 = ai): r

Qsinz rae) = =) n 4

+a (1 + =~) ee (26). n=-o ak

If we change x into ww, we have the formule for sinhz, cosha as infinite products—

cos v=

n=O N=O 4g? sinh x=x2P , cosha=P 1 +). n=0 n=0 2n+1 x Se

In the formula for sin z as an infinite product put 2=e 9? We then

® Wn did Di 0s get1= 5° ee ee ; if we stop after 2n factors in the numer- ator and denominator, we obtain the approximate equation 17.37, 57… (2n=1) 13 9.20… Cnr

ivi TRIGONOMETRY [ANALYTICAL.

Oull ba These scries were given by Schellbach (in Crelle's Journ., Vol. xviii.).

or 5-3-2 5, — = Var, where n is a large integer. This ex- 9 1.3.5…2v=1 4 : i AD ieee Oe pression was obtained in a quite different manner by Wallis (Arith- If in the same series (12), (13) we put 6 g) US gas WEES metien infinitorwm, vol. i. of Opp.). 4a? 400?(4ax2— 2?) dap doe? — 2?ar?)(dan? — 4272) a o+y)P(1+2=4) Cost= 1 Tee ee ie ee es ee sin(+y) 9″ Nr , Qa Qax(dee®— mr?) Qar(doe? — ®)(4a? — 3292) a ae aP(1+=) Le ee 1.2.94.0R 7 age We have of course assumed the legitimacy of the substitutions or cos y¥+sin y cot x made. These last series have been discussed by M. David (Bull. =(1 +1 ee \(a fees \(1 4. -)(1 – .) rn Soc. Math. de Franee, vol. xi.) and ia: as i vol. vii.). . a ot eoae : : If U,, denotes the sum of the series sacheeithicn + «an Von that Equating the coefficients of the first power of y on both sides we seaginet I Be Bae ‘ obtain the series age ios ee 4 ; 1 i 1 . 1 4 1 2 ae of the series jn tamt int -»., and W,, that of the series [mam cote=~+ ——+——_ 4. —__ wien See ‘ e e+e ex-w “£+20 w- 2Qr : ir : : kj ‘ / From this we may deduce a corresponding series for cosec x, for, since | T5m~ Fmt +++» we one by taking logarithms in the formule ; 25) and (26 eosec a= cot = — cot 2, we obtain ico Nangi(es) Ney nl a\4 1. /e\s ~ log (a cosec z)=0,(2) +5U,(2) 300(2) ee 1 j 1 Le ee (28), Hi 7 2 7 3 1

Seg atm -T atin non x+80 23m log (sec x) = va F) +57(=) +h) 4 By resolving oe ay) into factors we should obtain in a similar v6 7 2 by 8 T y h eosrt and differentiating these series we get manuer the series 1 t og ZF piigses 2 2 + 20 % By cnt P ra 2 4, (20) 9 Cob w= yt — had — eo Huiesvarnalaienarstevetave) site (31), ae, ag — Soe et | Bee Be In Sw — We Ba Oe ; . Ss and thence ek 2 2 2 = tan = —2 2% 4+ <p Ota +. — 2a ts... (82). ssowmtan(T +2) —tana=— 7 42 =P 2 T T 1% 42 m—2e m+ Qn 3m — 2 In (31) must lie between +7 and in (32) between +47. Write Barc ' . | equation (30) in the form SSR ee (30). | ed (seo Sete Oe These four formule may also be derived from the product formule = Serer 2 for sina and cos by taking logarithms and then differentiating. oe ee Glaisher has proved them by resolving the expressions for "*" | and expand each term oe this scries in powers of 2°, then we get per sec en ae ie (33) and |. '++ 48 products into partial fractions (see Quart. Journ, i 7 (aaah On a ; SEES . c : : where x must lie between 4m, By comparing the scrics (31) (32) Math., vol. xvii.). The series for oe es ale TP quieuise by ® (33) with the expansions of cot a, tan x, sec x obtained otherwise, continued use of the equation cota = (cots + cot 5") (see a paper | we can calculate the values of U2, U,... Vo, V,..0and Wy, W.... hil, meat , 2 2 When U,, has been found, Vp may be obtained from the formula by Dr Sehréter in Schlémilch's Zeitschrift, vol. xiii.). OY, =k IU Seriesfor Various series for may be derived from the series (27), (28), (29), For Lord Brounker's series of 7, see SQUARING THE CIRCLE (vol. m derived (30), and from the series obtained by differentiating them one or more | xxii, p. 485). It can be got at once by putting a=1, b=3, from times. For example, in the formule (27) and (28), by putting : ie 7 i B2 eae pa o=5.... in Huler's theorem =——=-——-...,.=— _* 7 series for a= "we get b¢ + b-a+ e~b+ eot and n Sylvester gave (Phil. Mag., 1869) the continued fraction eosec. ay 211 - oe aye re it } 1. I eed De 8} Si, dl a = eee ee are Ne 2 ie Ieee > r=nsin Z {14 1. z, mon! a \; which is equivalent to Wallis's formula for 7. This fraction was nD w —-1l m+1 Mm-1 A411 originally given by Euler (Comm. Acad. Petropol., vol. xi.) ; it

if we put n=8, these become is also given by Stern (in Credle’s Journ. 5 Wola

It may be shown by means of a transformation of the scries for 5 eee ee r=8VB(1-545-5+7-at), cos wand = that tan a= @ tt This may be also 85/37 ee 2 2 ae Wis = let st tatoe easily shown as follows. Let y=cos 4/2, and let y’, y”... denote : 2 ee the differential coefficients of y with regard to x then b formi

Byer yw y forming Epa itienoeiinayeat | : ‘welebh 1 1 1 these we can show that 4ay’+2y’+=0, and thence by Leibnitz’s

theorem we have Aary+2) 4. (44 2)y™+D 4 y(™) = 0, y 4dr ym)

(etm? (emp (ea ome* eon

cosee’an= om iG oe aes tees 5 = 2 = Yi, put =e, and we get 7?=9 l+patmtigat-.

4x 2 Therefore +{=-2-—,, “= — 2(2n+1)-—__—___ These series, among others, were given by Glaisher (Quart. Jowrn. Y _ yiy” year) 4 4 sag al Math., vol. xii.), i ’ hence ~~2V x cot Vz= — 2~~ = = =a vee Sums of | We have sinh wax meP(1 3), cosh ra= P(14 ——) R abt = . 72 eertain a n ; 2n+ 1/2 f Replacing N/ x by x we have tan x=—— a series, We differentiate these formule after taking logarithms, we obtain Seno

the series

7 oe] ome _ 7% tan w (n?— 1) tan® (n? – 4) tan2x (n?~ 9) tan2x ; py, Coth mx Qe? ae | Ppt Wage eS ee Te iy, pe ume drei 1 this was published in Mém. de l’Acad. de St Pétersb. i VOlsNG, De ~ [2p ge” 2 g2 tb Bea i on Glaisher has remarked (Mess, of Math., vol. iv.) that this may be

derived by forming the differential equation

(1 = a2%)h™+2) _ (om 4 Lacy™*D + (n2 – m)y™=0, where 7/=cos(n arc cos x), then replacing x by cos x, and procecding as in the former case. Ifwe

put »=0, this becomes pa on tan®s 4 tan2e 9 tan’ ~1P BP oe jae whence we have

These series were given by Kummer (in Crelle’s Journ., vol. xvii.),

1 1 1

Pen qo gant Q2n 1 an ax 82n 4 o2n +..., has been fonnd by Glaisher (Proe. Lond. Math. Soc., vol. vii.). Certain If in the series (12) and (18) we put n= Qe, 6=-, we get series for 6 sine and

The sum of the more general series

. 2 yWq2— 12) 9(g2 — 12) (42 92 eosine, cos a1 -— 7 dale) once = Wags col x mw? 4? Oy? eae 3 |2 [4 16 are tan e=.-— at = wa — 1) al 2_ 12) 2 _ 92) 1+ 34+ 54+ 7+ 2n+1+ sin J = ve{ ee —— _ i It is possible to make the investigation of the properties of the

simple circular functions rest on a purely analytical basis. The sine

Sums of powers of reei- proeals of natu- ral num- bers.

Con- tinued faetors for 7.

Con- tinued fraetions for trigo- nometri- eal fune- tions,

TRI-TRI

Purely of x would be defined as a function such that, if z= _ , then analyti- * wi- y*

eal treat- y=sina; the quantity = would be defined to be the complete integral ment of f! dy We shdul k om ieee 1 dy

circular wary 6 shou on have 5-2= | ——— Now change func- 0 y F et

tions. the variable in the integral to z, where y?+2°=1, we then have

eg a= | —— and 2 must be defined as the cosine of x, and is

Je “2 thus equal to sin G – “), satisfying the cquation sin®x+cos’v=1.

Next consider the differential equation dr

dy + —— = 0. V1i-y NI-# This is equivalent to d(yN1—-2+2V1-y?)=0; hence the integral is

yNV1—-#@+2V1-y2=

whence yNI-B4eN1- Yau.

TRILOBITES. See Crustacga, vol. vi. p. 659 sq.

TRINCOMALEE, a town and naval station in the island of Ceylon, is situated on the north-east coast— which is bold, rocky, and picturesquely wooded—by road 113 miles north-north-east of Kandy, in 8° 33’ 30” N. lat. and 81°13’ 10” E. long. It is built on the north side of the Bay of Trincomalee, on the neck of a bold peninsula separating the inner from the outer harbour. There is a lighthouse on the extremity of Foul Point at the southern side of the bay, and another on the summit of Round Island. The inner harbour is landlocked, with a safe anchorage and deep water. close to the principal wharves ; the outer harbour has an area of about 4 square miles, with a depth of about 70 fathoms. There is an admiralty dockyard, and the town is the principal naval station in the Indian seas. The breadth of the streets and esplan- ades somewhat atones for the mean appearance of the houses, but the town generally has a gloomy and im- poverished aspect. Pearl oysters are found in the lagoon of Tambalagam to the west of the bay. The Government buildings include the barracks, the public offices and re- sidences of the civil and naval authorities, and the official house of the officer commanding-in-chief in the Indian seas. There is an hospital and outdoor dispensary, and also a friend-in-need society. ‘The population of Trincomalee in 1881 was 10,180.

The town was one of the earliest settlements of the Malabar race in Ceylon, who at a very early period erected on a height at the extremity of the peninsula, now crowned by Fort Frederick, a temple dedicated to Konatha, or Konasir, named the “ temple of a thousand columns.” The building was desecrated aud destroyed in 1622, when the town was taken by the

Portuguese, who made use of the materials for the erection of the fort. The town was successively held by the Dutch (1639), the French (1678), the Dutch (1674), the French (1782), and the Dutch (1783). After a siege of three weeks it surrendered to the British fleet in 1795, and with other Dutch possessions in Ceylon was formally ceded to Great Britain by the treaty of Amiens in 1801. Its fortifications have lately been strengthened. :

TRINIDAD, a West Indian island, lying north-east of Venezuela, between 10° 3’ and 10° 50’ N. lat. and 61° 39’ and 62° W. long., being the most southern of the chain of islands separating the Atlantic from the Caribbean Sea. Its area is 1754 square miles, or nearly 1,123,000 acres. In shape the island is almost rectangular, but from its north-west and south-west corners project two long horns towards Venezuela, enclosing the Gulf of Paria. The north-west horn terminates in several islands, in one of the channels between which (the Boca Grande) lies the small British island of Patos. The general aspect of Trini- dad is level. But three parallel ranges, varying from 600 to 3100 feet in height and clothed with forests, run from

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The integral may also be obtained in the form ye- V1 =n 1 —-2=V 1-2 ¥ dy es an uw du Let a= ——— = ee; = ————e vi-¥ oV1-2 . pVl- we? we have a+$=y7, and siny=sina cos#+cosa sin f,

cos y=cos a cos 8—sina sin 8, By means of the addition theorems and

the values sin 3= 1, cos 320 we can prove thatsin G

cos (5+<) =-sinw; and thence by another use of the addition

the addition theorems.

+0) =00s 2,

theorems that sin (r+) = —sinx cos (7 +x)= — cos x, from which the periodicity of the functions sin x, cos x follows. We have also [ope —t loge (VI=y+ey) 5

ao

whence log, (V1-y?+1y) log. (V1- 2.) =a constant. Therefore (V1=yeuy(N1 —- 2 +2) = V1 v2 +00, since w=y when z=0 ; whence we have the equation (cosa+esin a)(cos8+csin 8)=cos (a+ 8)+csin (a+ 8), (E. W.

from which De Moivre's theorem follows.

H.)

east to west. The plains are watered by numerous streams, and the mountains are deeply furrowed by innumerable ravines. The rivers falling into the gulf are somewhat ob- structed by shallows, especially the Caroni and the Couva. Geologically, as well as botanically and zoologically, Trini- dad differs little from the adjacent mainland, with which at one time it probably was connected. The soil, which is

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Cascaal P* a

Paria

San Fernandoft—ge> La Brea ProZone.

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ENGLISH MILES Orrxvene ‘2

Map of Trinidad.

fertile, consists of clay, loam, and alluvial deposits. ‘The Moriche palm and mountain cabbage, as well as the cedar and the balata, are prominent objects. Poisonous and medicinal plants grow everywhere, and the woods contain an inexhaustible supply of timber. There are two mineral springs. The most curious natural feature of the island is the pitch lake! in La Brea, 90 acres in extent, which furnishes an important export. The climate is healthy, the mean temperature being in January 76° Fahr, and in September 79°; it occasionally reaches 90”.

The population, which numbered 109,638 in 1871, was returned in 1881 at 153,128 (83,716 males and 69,412 females), and in 1885 at 171,914. Of these about 100,000 are natives of the island, prin- cipally of African race, 50,000 are coolies introduced from India (an industrious and prosperous element of the population), while the remainder includes the English and other European settlers. About 2000 coolies are introduced annually. Many French families from other parts of the West Indies settled in Trinidad many years ago, and traccs of this and of the Spanish occupation are obvious in laws, municipal arrangements, language, and population. The two principal towns are Port of Spain and San Fernando. The former (34,000 inhabitants), the capital of the island, is built on a gently inclined plain near the north-east angle of the Gulf of Paria,

1 This is vividly described by Charles Kingsley in A¢ Last.

and is a fineand safe port. In the town there are two cathedrals (the Roman Catholic and the Anglican), and outside it a botanical gardcn. San Fernando, about 30 miles southward, with a popula- tion of 7000, is an important shipping place.

Of the total area about 300,000 acres are cultivated. The principal productions of the island are sugar and cocoa; coffee is also becoming important. Trinidad has suffered much from the effect of foreign state

bounties, especially the export premiums of Germany and France. The sugar production in 1871 was 53,000 tons, in 1881 44,000 tons, and in 1885 64,000 tons. The prin- cipal exports in 1885 were—sugar, 64,000 tons (value £684,675) ; rum, 72,525 galls. (£7878) ; molasses, 2,416,761 galls. (£45,835) ; cocoa, 14,904,840 lbs. (£421,974) ; coffee, 20,270 lbs. ; asphalt, 28,505 tons raw and 6731 tons boiled ; cocoa-nuts, 9,645,700 ; bitters (Angostura and others) and liquors, 32,240 galls. ; the total value was £2,246,664, including £707,421 specie and bullion. The imports in 1885 (including bullion and specie) were £2, 241,478. Among the principal items are cottons, linens, woollens, and textiles generally (largely from the United Kingdom), £235, 895 ; fish, flour, and provisions (principally from the United States), £270,000 ; lunber (from Canada), £43,075; rice (half from India), £113,940; hardware and machinery (principally from the United Kingdom), £116,894 ; gold (principally from Venezuela in transit), £651,398. The sailing vessels entering Trinidad ports in 1885 had a burden of 150,219 tons, the steamers a burden of 385,950 tons. The total public revenue in 1885 was £429,307, of which £240,444 was for customs and excise. The total expenditure was £443,920. There are 145 public schools, of which 61 are Government and 61 assisted, with a total attendance of 13,282 scholars. The principal towns are connected by railway lines.

Trinidad was discovered by Columbus on 31st July 1496. It remained in Spanish possession (although its principal town, San José de Oruia, was burnt by Sir Walter Raleigh in 1595) until 1797, when a British expedition from Martinique caused its capitu- lation, and it was finally ceded to Great Britain in 1802 by the treaty of Amiens. Its real starting-point as a productive country was in 1781, when the Madrid Government began to attract foreign immigrants. Trinidad is still strictly a crown colony of Great Britain. The legislative council includes the governor as president, and six official and eight unofficial members, all appointed by the crowu. During the labour crisis caused by emancipation and the subsequent equalization of the British duties on free and slave- grown sugar, the colony was greatly assisted by the skilful ad-

ininistration of Lord Harris, governor from 1846 to 1851. See De Verteuil, Trinidad; Colonial Office List ; Guppy, Trinidad Almanac; and Government Geological Swrvey.

TRINITARIANS (Ordo Sanctx Trinitatis et Captorum), a religious order instituted about the year 1197 by Inno- cent IIL. at the instance of John de Matha (1160-1213) and Felix de Valois (0b. 1212), for the ransom of captives among the Moors and Saracens. The rule was the Augus- tinian, the dress white with a red and blue cross. De Matha was the first general and De Valois the first abbot of the mother house at Cerffroid near Meaux, where the idea of the institution had originated in a miraculous ap- parition. By 1200 as many as 200 Christians had been redeemed out of slavery in Morocco by the order, which accordingly spread rapidly not only in France but also in Italy and Spain. Further favoured by Honorius III. and Clement IV., the Trinitarians spread into Portugal, the United Kingdom, Bohemia, Saxony, Poland, and Hungary, and even into America. In the 18th century they had in all about 300 houses; but the order is now almost extinct. About the middle of the 17th century it was stated that in France the "redemptions" up to that time had numbered 246, the number of prisoners bought off being 30,720; for Castile and Leon the corresponding figures were 362 and 11,809. The order is sometimes spoken of as the "ordo asinorum" from the circumstance that originally its members were not permitted to use any other beast of burden. In France they were known as Mathurins from the chapel of St Mathurin or Mathelin in Paris, which belonged to them.

TRINITY HOUSE, Corporation or. An association of English mariners, which originally had its head-quarters at Deptford in Kent. In its first charter, received from Henry VIII. in 1514, it was described as the " guild or fraternity of the most glorious and undividable Trinity of St Clement," the court being made to consist of master,

wardens, and assistants, numbering thirteen in all and elected annually by the brethren. Deptford having been made a royal dockyard by Henry VIIL, and being the station where outgoing ships were supplied with puots, the corporation rapidly developed its influence and useful- ness. By Henry VIII. it was entrusted with the direction of the new naval dockyard. From Elizabeth, who con- ferred on it a grant of arms in 1573, it received authority to erect beacons and other marks for the guidance of navi- gators

along the coasts of England. It was also recog- nized as the authority in the construction of vessels for the royal navy. In 1604 a select class was constituted called elder brethren, the other members being called younger brethren. By the charter of 1609 the sole management of affairs was conferred on the elder brethren, the younger brethren, however, having a vote in the election of master and wardens. The practical duties of the fraternity are discharged by the acting elder brethren, who have all had experience in naval affairs; but as a mark of honour persons of rank and eminence are admitted as elder brethren and now form a large proportion of the mem- bers. In 1647 the corporation was dissolved by parlia- ment, but it was reconstructed in 1660, and the charter was renewed by James II. in 1685. A new hall and almshouses were erected at Deptford in 1765 3 but for some time the offices of the corporation had been trans- ferred to London, and in 1798 their headquarters were removed to Trinity House, Tower Hill, built from the designs of Wyatt. By an Act of 1836 they received powers to purchase from the crown, as well as from private proprietors, all interests in coast lights. For the maintenance of lights, buoys, é&c., they had power to raise money by tolls, the surplus being devoted to the relief of old and indigent mariners or their near relatives. In 1858 the control of the funds collected by the corpora- tion was transferred to the Board of Trade, and the money over which the brethren were allowed independent control was ultimately reduced to the private income derived from funded and trust property. Their practical duties in the erection of lighthouses, buoys, and beacons remain as im- portant as ever, the number of persons employed in their service being over 800. They also examine navigating lieutenants in the royal navy, and act as nautical advisers in the High Court of Admiralty.

TRINITY SUNDAY, which immediately follows Whit- sunday, was in the older liturgies regarded merely as the “Octave” of Pentecost. The habit of keeping it as a distinct festival seems to have sprung up about the 11th century. According to Gervase of Canterbury, it was Thomas Becket who introduced it into England in 1162. The universal observance of it was established by Pope John XXII. in 1334.

TRIPOLI, a North African state, bounded by the Medi- Plate V. terranean on the north, by the desert of Barca (or Libyan Desert), which separates it

from gypt, on the east, by the Sahara and Fezzan on the south-east, south, and south- west, and by Tunis on the north-west. The country is made up of a strip of fertile soil adjacent to the sea, with vast sandy plains and parallel chains of rocky moun- tains, which finally join the Atlas range near Kairwén in Tunis. It is naturally divided into five parts, viz.,—Tripoli proper, to the north-east of which is the plateau of Barca and Jebel al-Akhdar, to the south the oasis of Fezzan, to the south-east that of Aujala, and to the south-west that of Ghaddmes.1 It is very badly watered: the rivers are

‘ Concerning the last-named districts full information can be found in Sahara und Sudan (Berlin, 1879-81) by Dr Nachtigal, who continued the explorations of southern Tripoli commenced by Barth and Rohlfs. Consult also Narrative of Travels and Discoveries in Northern and Central Africa, by Denham, Clapperton, and Oudney, London, 1826.

small and the desert wells and watering places are often dry. As regards the coast, it is extremely difficult to fix the exact border between Egypt and Tripoli. The sea- board of the Libyan Desert is so little known to Europeans that the spacious harbours of Tebruk (Tabraca and Tabarka) and Bomba (Bomba) have almost escaped notice. The land bordering the sea to the west of Cape Ras al-Tin does not partake of the sterile character of the wastes of Barca. The district of Jebel al-Akhdar (“the Green Mountain ”), which intervenes between Ras al-Tin and Benghazi, abounds in wood, water, and other resources; but its ports are scarcely worthy of the name, except Derna (Darnis), where vessels from Alexandria call to embark honey, wool, and wax. From Mersd Suza (Apollonia, later Sozusa), now a mere boat cove, but once a powerful city of Cyrenaica, to Benghazi the coast abounds in extensive ruins. Benghazi itself, on the Bay of Sidra (Syrtis Major), is an insignificant fortified town trading in cattle and other produce. The principal products of the country are corn, barley, olives, saffron, figs, and dates,—these last being perhaps the finest in the whole of North Africa. Fruit also is abundant in cer- tain parts, and so are many kinds of vegetables. The horses and mules, though small, are capable of much hard work. The native tissues and pottery are almost as good as those of Tunis.

Great quantities of castor oil come from Tad- jura. In consequence of recent events in Tunis, Tripoli has become the last surviving centre of the caravan trade to Northern Africa. It is at least 250 miles nearer the great marts of the interior than either Tunis or Algiers. A large proportion of the commerce of Tripoli is in the hands of British merchants or dealers in British goods, who send cloth, cutlery, and cotton fabrics southwards and re- celve in return esparto grass, ivory, and ostrich feathers. The sirocco blows with great force at times during the autumn, and the heat is asa rule much greater than in Tunis. The climate is very variable; cold nights often succeed warm days; storms are of frequent occurrence ; and rain is at times wanting for many months. In addi- tion to the capital TRipoxt (see below), called Tardbulus al-Gharb to distinguish it from the town of the same name in Syria, the only important places are Murzuk and Ghadames in the interior and Benghazi (Berenice) on the coast. The population of the country consists of Moors, Arabs, Kabyles, Kuluglis (descendants of Turkish fathers and Moorish mothers), Turks, Jews, Europeans, and Negroes. Nothing like a census has ever been attempted, and the number of inhabitants is purely a matter of con- jecture. In the interior the population is very scattered, and it is not probable that the total exceeds from 800,000 to a million. The Europeans (2500 or 3000) on the coast are nearly all Maltese. There is a Jewish colony of about 4000 in the capital, and the trade is almost entirely in their hands and in those of the Maltese.

Since 1835 Tripoli has lost the semi-independent character of a regency which it formerly enjoyed in common with Tunis, and has become a vilayet or outlying province of the Turkish empire. For administrative purposes it is divided into five districts, which are again subdivided into twenty-five cantons, the former being governed by inotasarrifs and the latter by caimacams. Each vill- age has its sheikh, who is assisted by a sort of municipal council. Since the invasion of Tunis by the French, the Turkish garrison of Tripoli has been considerably reinforced, and many new fortifi- cations are partially erected on the coast. The chief judge or cad? is nominated by the Porte; the mu/tis are subject to his authority. There are also a criminal court and a commercial tribunal, The taxes are collected by a receiver-general, also nominated from Constantinople, and they press very heavily on all classes of the

1 The best kuown English work on Tripoli is F. W. and H. W. Beechey's Proceedings of the Hxpedition to Explore the Northern Coast of Africa from Tripoli Hastwards, London, 1828. Admiral W. H. Smyth's Afediterranean, London, 1854, contains a description of the coast. See also Rae, Country of the Moors, London, 1877, and Broad- ley, Tunis Past and Present, London and Edinburgh, 1882.

inhabitants. The principal sources of revenue are the usual Mo- hammedan taxes. The constant succession of Turkish governors, each of whom invariably follows a different policy from that of his predecessor, has been fatal to the material progress of the country. There are few elementary schools in the capital, and instruction in the interior is entirely limited to the Koran.

History.—After falling successively into the hands of the Phe- nicians, Romans (a four-sided triumphal arch, erected in honour of Aurelius Antoninus and Aurelius Pius, still stands near the Marina gate), Vandals, and Greeks, Tripoli was finally conquered by the Arabs twelve centuries ago, and has remained a Moslem state ever since. In 1510 Ferdinand the Catholic of Spain took it, and thirteen years later it was given to the Knights of St John, who were expelled in 1553 by the Turkish corsairs Dragut and Sinan. Dragut, who afterwards fell in Malta, lies buried in a much vener- ated kubba close to one of the mosques. After his decease the con- nexion between Tripoli and Constantinople seems to have been considerably weakened. But the Tripolitan pirates soon became the terror and scourge of the Mediterranean; half the states of Europe seem at some time or other to have sent their fleets to bombard the capital. In 1714, when Hosain ibn 'Ali founded the present line of the beys of Tunis,? Ahmed Pasha Caramanli achieved independ- ence, and his descendants governed Tripoli until 1835. In that year the Turks took advantage of a civil war to reassert their authority, and since that date Tripoli has been governed by repre- sentatives of the sultan.

The khouan (ikhwdn) or semi-religious semi-political fraternities which exercise such considerable influence in Tunis, Algeria, and Morocco are perhaps still more powerful in Tripoli. The most remarkable is that of the

Senzstya, the centre of whose authority is Jaghbub or Jerabub, north-west of the oasis of Stwa. The sectaries of Senustya are found in all parts of North Africa, but exist in unusual force in Tripoli, and particularly in Ghadames and Murzuk. A certain halo of romance surrounds the history of this powerful sect; but its chief has, up to the present time (1887), not played any conspicuous part in the affairs of the Soudan or in those of the North African littoral. Mohammed el-Semisi came originally in 1830 from Mostaghanem in Algeria. He acquired a high reputation for sanctity at Fez in Morocco. After a visit to Mecca and the holy places he started a zéwiya or convent-college at Alexandria, but, being excommunicated by the sheikh al-Islam at Cairo, he fled across the Libyan Desert to the Jebel al-Akhdar near Benghazi. He afterwards removed to Jaghbub, which has never been visited by any European traveller. Here he established his zawiya in the midst of palm-groves and soon gathered nearly a thousand followers. His austere doctrines are received with enthusiasm in the Moslem states of Northern and Central Africa. He established some one hundred sanctuaries in every considerable place between Morocco and Mecca, and appointed mukaddemin or lieutenants in nearly every part of Islam. Senusi the elder died in 1860 and was succeeded by his son, who bore the title of Al- Mahdi. Under his rule the prosperity of the zawiya at Jerabub is said to have greatly increased. Pilgrims to Mecca from North Africa, as well as those coming from Bornou and the Saharan pro- vinces, flock there to seek his blessing. He not only receives caravans of ivory and ostrich feathers from the different sultans of the in- terior, but cargoes of arms and ammunition often arrive for him at the almost unknown harbours of the coast. Rohlfs, Nachtigal, and Duveyrier found their passage barred by Senusian agents. It was confidently expected Scnusi would make some demonstration at the beginning of the 14th century of the Hijra (November 1882). His followers were, however, doomed to disappointment. Most of the Tripolitan sheikhs are affiliated to the Senusiya confraternity.

From an archeological point of view Tripoli possesses an interest equal to, if not greater than, that which attaches to Tunis. On this subject the fullest information is afforded by the book of the Beecheys, and in a less degree by that of Mr Rae. The former is illustrated by numerous plans and engravings and still affords the safest guide to the antiquities of Tripoli. CAQ E BS)

TRIPOLI, the capital of the above country, is situated in 32° 53’ 40” N. lat. and 13° 11’ 32” E. long., on a pro- montory stretching out into the Mediterranean and forming a small bay. Its crenellated enceinte wall has the form of an irregular pentagon. A line of small half-ruined forts is supposed to protect one side of the harbour, and the castle of the governor the other. The desert almost touches the western side of the city, while on the east is the ver- dant oasis of Meshiga, where are still to be seen the tombs of the Caramanlian sultanas and the twelve-domed mar- about of Sy Hamonda. In the town itself there are seven

? The Letters (London, 1819) of Richard Tully, who was consul at Tripoli from 1783 to 1793, throw a strange and vivid light on Tri- politan life during the 18th century.

principal mosques, six of them possessing lofty minarets in the Turkish style. The streets are narrow, dirty, and unpaved ; there is no European quarter properly so called : Tripoli is still a typical Moorish city. Its population num- bers about 20,000.

TRIPOLI (Zardbulus), a town of Syria, capital of Liwa, on the river Kadisha or Abi ‘Ali, in 34° 26° N. lat. and 35° 50’ E. long., is situated in a fertile maritime plain covered with orchards and dominated by a castle over- hanging a gorge of the river, some parts of which are, perhaps, the work of the crusaders. The port (Al-Mind) is about two miles distant, on a small peninsula. The population is estimated at 17,000, with the port at 24,000 or a little more. Nearly half of these are Christians, the Maronites preponderating. There is a considerable export of silk cocoons and a native silk manufacture; the sponge fishery is a large industry ; tobacco is exported; and soap is made from the olive oil of the district. There are eighteen churches, and several monasteries, nunneries, and large khans.

The ancient Phcenician city which we know only by its Greek name of Tripolis was the seat in Persian times of the federal council of Sidon, Tyre, and Aradus, each of which cities had its separate quarter in the ‘“‘triple town” (see vol. xviii. p. 809). In the second and first centuries B.c. it struck coins, on which it is designated a ‘‘holy and autonomous” city. These are

succeeded by imperial coins ranging from 32 B.c. to 221 a.p, About 450, and again in 550, it was destroyed by earthquake. The Arabs took it in 638 after a prolonged siege, the inhabitants withdrawing by sea. It appears from Beladhori (p. 127) that at this time the city still consisted of three fortified places. Mo‘aiwiya recruited the population by a colony of Jews and gave it fortifications and a garrison against the naval attacks of the Greeks, who, notwith- standing, retook it for a brief space in the time of Abdalmalik (Beladh., wt sup.). It was again taken by the Greeks in the war of 966-69 and was besieged by Basil II. in 995, after which date it was held by a garrison in the pay of the Fatimite caliphs of Egypt, who treated the city with favour and maintained in it a trading fleet. At this time, according to the description of Nasiri Khosrau (ed. Schefer, p. 40 sgq.), who visited it in 1047, it lay on the peninsula of Al-Mina, bathed on three sides by the sea, and had about 20,000 inhabitants and important industries of sugar and paper-making. Of the great sea-walls and towers there are still imposing remains. From this date tillit was taken by the crusaders, after a five years’ siege, in 1109, the ruling family was that of ‘Ammar, who founded a library of over 100,000 volumes. Under the crusaders Tripoli continued to flourish, exported glass to Venice, and had 4000 looms (Quatremére, Hist. des Sultans Mamlouks, ii, 103). In 1289 it was taken and destroyed by the sultan Kalatin of Egypt, and a new city was begun on the present site, which rapidly rose to importance (Ibn Battta, i. 137). Its medizval prosperity has obliterated most relics of remoter antiquity.

See Renan, Mission de Phénicie, p. 129 sqq.

TRIPOLITZA, officially Trrpotis, a town of Greece, capital of the nomarchy of Arcadia, is situated in a plain 3000 feet above sea-level, 22 miles south-west of Argos. The name has reference to the three ancient cities of Man- tinea, Pallantium, and Tegea, of which Tripolitza is the modern representative. Before the war of independence it was the capital of the Morea and the seat of a pasha, with about 20,000 inhabitants; but in 1821 it was taken and sacked by the insurgents, and in 1825 its ruin was com- pleted by Ibrahim Pasha. The town has since been re- built, and now (1887) contains about 10,000 inhabitants.

TRISMEGISTUS. See Hermes TRISMEGISTUS.

TRISTAN. See Romances, vol. xx. p. 644 sq.

TRISTAN DA CUNHA, a group of three small vol- canic islands, situated in the South Atlantic nearly midway between the Cape of Good Hope and the coast of South America, the summit of the largest being in 37° 5’ 50” S. lat. and 12° 16’ 40” W. long. They rise from the low submarine elevation which runs down the centre of the Atlantic and on which are likewise situated Ascension, St. Paul’s Rocks, and the Azores ; the average depth on this ridge is from 1600 to 1700 fathoms, while depths of 3000 fathoms are found on each side of it. The depth between

the islands is in some places over 1000 fathoms. Tristan, the largest and northernmost island, is nearly circular in form, about 7 miles in diameter, with a volcanic cone in the centre (7640 feet). Precipitous cliffs, 1000 to 2000 feet in height, rise directly from the ocean on all sides, except on the north-west, where there is an irregular plain, 100 feet above the sea, and 24 miles in length and 4 mile in breadth. The crater of the central cone is said to be filled with a freshwater lake which never freezes. Inac- cessible Island, the westernmost of the group, is about 20 miles from Tristan. It is quadrilateral in form, the sides being about 2 miles long. The highest point (1840 feet) is on the west side ; all round there are perpendicular cliffs 1000 feet in height. At the base of these are in some places narrow fringes of beach a few feet above the sea- level. Nightingale Island, the smallest and most southern of the group, is 10 miles from Inaccessible Island. Its coasts, unlike those of the other two islands, are surrounded by low cliffs, from which there is a gentle slope up to two peaks, the one 1100 feet, the other 960 feet high. There are two small islets—Stoltenkoff (325 feet) and Middle (150 feet)—and several rocks adjacent to the coast. The rocks are feldspathic basalt, dolerite, augite-andesite, side- romelane, and palagonite; some specimens of the basalt have porphyritic augite. The caves in Nightingale Island indicate that it has been elevated several feet. On almost all sides the islands are surrounded by a broad belt of kelp, the gigantic southern sea-weed (Macrocystis pyrifera), through which a boat may approach the rocky shores even in stormy weather. There is no good or safe anchorage. The beaches and lower lands are covered with a dense growth of

tussock grass (Spartina arundinacea), 8 to 10 feet in height, which shelters millions of penguins (Hudyptes chrysocoma), which there form their rookeries. There is one small tree (Phylica nitida), which grows in detached patches on the lower grounds. Independently of introduced plants, fifty-five species have been collected in the group, twenty-nine being flowering plants and twenty-six ferns and lycopods. A majority of the species are characteristic of the present general flora of the south temperate zone rather than any particular part of it: botanically the group is generally classed with the islands of the Southern Ocean. A finch (Wesospiza acunhe), a thrush (Wesocichla eremita), and a water hen (Gallinula nesiotis) are the only land birds—the first two being peculiar to the islands. In addition to the penguins numerous Other sea birds nest on the islands, as petrels, albatrosses, terns, skuas, and prions. One or two land shells, a few spiders, several Coleoptera, a small lepidopter, and a few other insects are recorded, but no Orthoptera or Hymenoptera. The prevailing winds are westerly. De- cember to March is the fine season. The climate is mild and on the whole healthy, the temperature averaging 68° Fahr. in summer, 55° in winter,—sometimes falling to 40°. Rain is frequent ; hail and snow fall occasionally on the lower grounds. The sky is usually cloudy. The islands have a cold and barren appearance. The tide rises and falls about four feet.

The islands were discovered and named by the Portuguese in 1506. The Dutch described them in 1643. D'Etcheverri landed on them in the year 1767, when he gave Nightingale and In- accessible Islands their names. Their exact geographical position was determined by Captain Denham in 1852, and the "Challenger" completed the exploration of the group in 1873. When first dis- covered the islands were uninhabited. Towards the end of the 18th and in the beginning of the 19th century several sealers resided on them for longer or shorter periods. In 1816 the islands were taken possession of by Great Britain. In 1817 the garrison was withdrawn, but Corporal William Glass, his wife and family, and two men were allowed to remain. This small colony received addi-

tions from time to time from shipwrecks, from whalers, and from the Cape of Good Hope. In 1826 there were 7 men and 2 women

besides children. In 1873 there were 84 inhabitants, in 1886 97. They possess cattle, sheep, and geese. There are usually good potato crops. The settlement has always been on the flat stretch of land on the north-west of Tristan, and is called Edinburgh. Two Germans lived for several years on Inaccessible Island, but with this exception there have been no settlements either on this or on Nightingale Island.

TRITON. The genus Z’riton was constituted by Lau- renti, in his Synopsis Reptiliwm, and the name was adopted by nearly all writers on Amphibia. In Brit. Mus. Cat. – Batrachna Gradentia, by G. A. Boulenger, the genus is expanded and called by the name MMolge, which was used by Merrem in his Zentamen Syst. Amphibia, 1820. The genus belongs to the division Mecodonta of the family Salamandrida in Strauch’s classification (see AMPHIBIA, vol.i.p. 771). The definition of Molge given by Boulenger, which closely agrees with that of Triton adopted by Strauch, is as follows. Tongue free along the sides, adherent or somewhat free posteriorly. Palatine teeth in two straight or slightly curved series. Fronto-squamosal arch present (except in JZ. cristatus), ligamentous or bony. Toes five. Tail compressed. In Bell’s British Reptiles, 2d ed., 1849, four species were described as occurring in Britain, Ac- cording to Boulenger, there are only three British species, Molge cristata, Boul. (Laurenti), M. vulgaris, Boul. (Linn.), and MM. palmata, Boul. (Schneider). We give a short ac- count of these under the names Z’riton cristatus, 7’. vul- garis, and 7’. palmatus respectively.

The name 7’riton cristatus for the first species has been used by a great number of authoritative writers on Amphibia, including Laureuti, Tschudi, Bonaparte, Duméril and Bibron, and Strauch, and also by Bell and Fleming among students of British fauna.} The diagnosis of 7. cristatus is as follows: —The males have a dorsal crest which is toothed ; the fronto-squamosal arch is absent ; the colour of the ventral surface is orange with black spots. This species is commonly known as the great water-newt. The average length of the adult is 6 inches. The colours are most brilliant in the male, and more developed in the breeding season—spring and summer—than in winter. The back is blackish or yellowish brown, with round black spots; the sides of the tail are white. The dorsal crest of the male is separated entirely from the tail crest, and both disappear in winter. The skin is covered

with warty tubercles, There are no parotids ; but glandular pores are present over the eyes and in a longitudinal series along each side. The species is pretty common in ponds and ditches in most parts of Britain, but more abundant in the south than in the north; in the neighbourhood of London it is found in great numbers. Its food consists of aquatic insects and other small animals; in the spring it devours the young tadpoles of the frog with avidity, and occasionally it feeds on the smaller species, 7. vulgaris. In winter it hibernates, either quitting the water and hiding under stones or remaining torpid at the bottom of the water. It breeds chiefly in May and June. As in all Salamandrida, a true copulation takes place and the fertilization of the ova is internal. The female deposits each egg separately in the fold of a leaf, which she bends by means of her hind feet; the adhesive slime surrounding the vitellus keeps the leaf folded. The tadpole when first hatched is much more fish-like in form than that of the frog, the body dimin- ishing in thickness gradually to the end of the tail. A continuous median fin runs along the back from the head, round the end of the tail, along the ventral median line, to the region of the gills, thus extending, as in many fish larve, in front of the anus. The larva possesses three pairs of branched external gills, and in front of these a pair of processes by which it can adhere to fixed objects in the water. 7. cristatus is abundant throughout Europe, ranging from Sweden and Russia southwards to Greece, and from Britain to the Caucasus.

The diagnosis of 7. vulgaris, the Lissotriton punctatus of Bell, is :—Males with a dorsal crest continuous with the caudal, and

with an even margin and continuous with the caudal; fronto- squamosal arch long; toes in male webbed. Other less distinctive features are that the back is flattened, with a raised line on each side, and the tail in the male truncate, terminating in a short slender filament. This species is not so common in Britain as the other two; it is widely distributed throughout Europe. It was first discovered in Britain in 1848.

Boulenger recognizes nineteen species of Molge, of which nine besides those found in Britain are European. Only two species occur in America.. Strauch gives twenty species.

TRIUMPH, an honour awarded to generals in ancient Rome for decisive victories over foreign enemies; for victories in civil war or over rebels a triumph was not allowed. The power of granting a triumph rested with the senate; and it was a condition of granting it that the victorious general, on his return from the war, should not have entered the city until he entered it in triumph. Lucullus on his return from Asia waited outside of Rome three years for his triumph. The triumph consisted of a solemn procession, which, starting from the Campus Martius outside the city walls, passed through the city to the Capitol. Rome was en féte, the streets gay with garlands, the temples open. The procession was headed by the magis- trates and senate, who were followed by trumpeters and then by the spoils, which included not only arms, standards, statues, &c., but also representations of battles, and of the towns, rivers, and mountains of the conquered country, models of fortresses, &c. Next came the victims destined for sacrifice, especially white oxen with gilded horns. They were followed by the prisoners who had not been sold as slaves but kept to grace the triumph; they were put to death when the procession reached the Capitol. The chariot which carried the victorious general (riwmphator) was crowned with laurel and drawn by four horses. The general was attired like the Capitoline Jupiter in robes of purple and gold borrowed from the treasury of the god; in his right hand he held a laurel branch, in his left an ivory sceptre with an eagle at the point. Above his head the golden crown of Jupiter was held by a slave who re- minded him in the midst of his glory that he was a mortal man. Last came the soldiers shouting Jo triumphe and singing songs both of a laudatory and scurrilous kind. On reaching the temple of Jupiter on the Capitol, the general placed the laurel branch (in later times a palm branch) on the lap of the image of the god, and then offered the thank-offerings. A feast of the magistrates and senate, and sometimes of the soldiers and people, con- cluded the ceremony, which in earlier times lasted one day but in later times occupied several. A naval or maritime triumph was sometimes celebrated for victories at sea. Generals who were not allowed a regular triumph by the senate had a right to triumph at the temple of Jupiter Latiaris on the Alban Mount.

TRIVANDRUM, a town of India, capital of the native state of TRAVANCORE (q.v.), is situated in 8° 29’ 3” N. lat. and 76° 59’ 9” KE. long., near the coast, not far from Cape Comorin. It is the residence of the

maharajah, and con- tains an observatory and a museum, besides several other fine buildings. Commercially it is inferior in importance to Aleppi, the trade centre of the state. In 1881 it had a population of 37,652.

TROAD anp TROY. The Troad (77 Tpeds), or land of Geogra- Troy, is the north-western promontory of Asia Minor, Phical The name “ Troad” is never used by Homer,—who calls oun

festooned ; belly not brilliantly coloured; back spotted. This species, often called the common or small newt, has a smooth skin,

ion.

no glandular pores on the sides, but two patches on the head. It is as abundant in Britain as the former, or more so, but differs somewhat in habits, in autumn and winter being almost entirely terrestrial, and only living in water during the breeding season. Like the former species it is carnivorous, It is found in most parts of Britain, and throughout Europe, except in the south of France, Spain, and Portugal ; it also extends into temperate Asia.

T. palmatus Tschudi (Schneider), the Lissotriton palmipes of Bell, is thus distinguished :—Male with dorsal crest, which is low

1 The species of Triton are called in English efts, evets, or newts.

the land, like the city, Tpot,—but is already known to Herodotus. The Troad is bounded on the north by the Hellespont and the westernmost part of the Propontis, on the west by the Aigean Sea, and on the south by the Gulf of Adramyttium. The eastern limit was variously defined by ancient writers. In the widest acceptation, the Troad was identified with the whole of western and south- western Mysia, from the Alsepus, which flows into the XXIII. — 73

Natural divisions.

Propontis a little west of Cyzicus, to the Caicus, which flows into the AZgean south of Atarneus. But the true eastern boundary is undoubtedly the range of Ida, which, starting from near the south-east angle of the Adramyttian Gulf, sends its north-western spurs nearly to the coast of the Propontis, in the region west of the Ausepus and east of the Granicus. Taking Ida for the eastern limit, we have the definition which, as Strabo says, best corresponds with the actual usage of the name Troad. Ida is the key to the physical geography of the whole region ; and it is the peculiar character which this mountain-system 1mparts to the land west of it that constitutes the real distinctness of the Troad from the rest of Mysia. Nature has here provided Asia Minor with an outwork against invaders from the north-west ; and as in the dawn of Greek legend the Troad is the scene of the struggle between Agamem- non and Priam, so it was in the Troad that Alexander won the battle which opened a path for his further advance.

The length of the Troad from north to south—taking a straight line from the north-west point, Cape Sigeum (Yeni Shehr), to the south-west point, Cape Lectum (Baba-Calessi) —may be roughly given as forty miles. The breadth, from the middle point of the west coast to the main range of Ida, is not much greater. The whole central portion of this area is drained by the Mendere (the ancient Scamander), which rises in Ida and is by far the most important river of the Troad. The basin of the Mendere is divided by hills into two distinct parts, a southern and a northern plain. The southern—anciently called the Samonian plain —is the great central plain of the Troad, and takes its modern name from Bairamitch, the chief Turkish town, which is situated in the eastern part of it near Ida. It is of an elongated form, the extent from north to south being large in proportion to the average width, and is en-

runs parallel with the Adramyttian Gulf from east to west, forming a southern barrier to the valley of the Touzla, and walling it off from a thin strip of seaboard. This plateau seems to have been formed by a volcanic upheaval which came late in the Tertiary period, and covered the limestone of the south coast with two successive flows of trachyte. The lofty crag of Assus, washed by the sea, is like a tower standing detached from this line of

mountain- wall, The western coast is of a different character. North of the Touzla extends an undulating plain, narrow at first, but gradually widening. Much of it is covered with the valonia oak (Quercus dgilops), one of the most valuable products of the Troad. Towards the middle of the west coast the adjacent ground becomes higher, with steep acclivities, which sometimes rise into peaks; and north of these, again, the seaboard subsides towards Cape Sigeum into rounded hills, mostly low.

The timber of the Troad is supplied chiefly by the pine- Natural But nearly all the products.

forests on the slopes of Mount Ida. plains and hills are more or less well wooded. Besides the valonia oak, the elm, willow, cypress, and tamarisk shrub abound. Lotus, galingale, and reeds are still plentiful, as in Homeric days, about the streams in the Trojan plain. The vine, too, is cultivated, the Turks making from it a kind of syrup and a preserve. In summer and autumn water-melons are among the abundant fruits. Cotton, wheat, and Indian corn are also grown. The Troad is, indeed, a country highly favoured by nature—with its fertile plains and valleys, abundantly and continually irri- gated from Ida, its numerous streams, its fine west sea- board, and the beauty of its scenery. Under a good government, it could not fail to be exceedingly prosperous. Under Turkish rule, the natural advantages of the land suffice to mitigate the poverty of the sparse population, but have scarcely any positive result.

In the Homeric legend, with which the story of the Early Troad begins, the people called the Troes are ruled by a history ; king Priam, whose realm includes all that is bounded by); 07.

closed by hills which, especially towards the south, are low and undulating. From the north end of the plain of Bair-

amitch the Mendere winds in large curves through deep ngdoum

Coasts.

gorges in metamorphic rocks, and issues into the northern plain, stretching to the Hellespont. This is the plain of Troy, which has an average length of

seven or eight miles from north to south, with a breadth of some two or three from east to west. The hills which enclose it on the south and east are quite low, and towards the east the acclivities are in places so gentle as to leave the limits of the plain somewhat indefinite. Next to the basin of the Mendere, with its two plains, the best marked feature in the river- system of the Troad is the valley of the Touzla, the ancient Satniois. The Touzla rises in the western part of Mount Ida, south of the plain of Bairamitch, from which its valley is divided by hills; and, after flowing for many miles almost parallel with the south coast of the Troad, from which, at Assus, it is less than a mile distant, it enters the Aigean about ten miles north of Cape Lectum. Three alluvial plains are comprised in its course. The easternmost of these, into which the river issues from rugged mountains of considerable height, is long and narrow. ‘The next is the broad plain, which is overlooked by the lofty site of Assus, and which was a fertile source of supply to that city. The third is the plain at the embouchure of the river on the west coast. This was anciently called the Halesian (‘AAjovov) plain, partly from the maritime salt-works at Tragase, near the town of Hamaxitus, partly also from the hot salt-springs which exist at some distance from the sea, on the north side of the river, where large formations of rock-salt are also found. Maritime salt-works are still in operation at the mouth of the river, and its modern name (Touzla =salt) preserves the ancient association. A striking feature of the southern Troad is the high and narrow plateau which

“Lesbos, Phrygia, and the Hellespont” (J/., xxiv. 544), 2.€., the whole ‘‘ Troad,” with some extension of it, beyond Ida, on the north-west. According to Homer, the Achzeans under Agamemnon utterly and finally destroyed Troy, the capital of Priam, and overthrew his dynasty. But there is an Homeric prophecy that the rule over the Troes shall be continued by Aineas and his descendants. From the “* Homeric” Hymn to Aphrodite, as well as from a passage in the 20th book of the Ilad (75-353)—a passage un- doubtedly later than the bulk of the book—it is certain that in the seventh or sixth century B.c. a dynasty claim- ing descent from Auneas reigned in the Troad, though the extent of their sway is unknown. The Homeric tale of Troy is a poetic creation, for which the poet is the sole witness. The analogy of the French legends of Charle- magne warrants the supposition that an Achzan prince once held a position like that of Agamemnon. We may

suppose that some memorable capture of a town in the Troad had been made by Greek warriors. But we cannot regard the Zéiad in any closer or more exact sense as the historical document of a war. The geographical compact- ness of the Troad is itself an argunient for the truth of the Homeric statement that it was once united under a strong king. How that kingdom was finally broken up is unknown. Thracian hordes, including the Treres, swept into Asia Minor from the north-west about the beginning of the seventh century B.c., and it is probable that, like the Gauls and Goths of later days, these fierce invaders made havoc in the Troad. The Ionian poet Callinus has recorded the terror which they caused further south.

A new period in the history of the Troad begins with the foundation of the Greek settlements. The earliest

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and most important of these were olic. Lesbos and Cyme in Afolis seem to have been the chief points from which the first Holic colonists worked their way into the Troad. Commanding positions on the coast, such as Assus and Sigeum, would naturally be those first occupied ; and some of them may have been in the hands of Aolians as early as the 10th century B.c. It appears from Hero- dotus (v. 95) that about 620 B.c, Athenians occupicd Sigeum, and were resisted by olic colonists from Myti- lene in Lesbos, who had already established themselves in that neighbourhood. Struggles of this kind may help to account for the fact noticed by Strabo, that the earlier colonies had often migrated from one site in the Troad to another. Such changes of seat have been, he observes, frequent causes of confusion in the topography ; and the fact has an important bearing on attempted identifications of the more obscure ancient sites.

Among the Greek towns in the Troad, three stand out with especial prominence—Ilium in the north, Assus in the south, and Alexandria Troas

in the west. The site of the Greek Ilium is marked by the low mound of Hissarlik (“place of fortresses”) in the Trojan plain, about three miles from the Hellespont. The early Greek settlers in the Troad naturally loved to take Homeric names for their towns. The fact that Homer places the town of Dardania far inland, on the slopes of Ida, did not hinder the founders of the Aolic Dardanus from giving that name to their town on the shores of the Hellespont. The site of the historical Thymbra, again, cannot be reconciled with that of the Homeric Thymbra. Similarly, the choice of the name Ilion in no way justifies the assumption that the Greek settlers found that spot identified by tradition with the site of the town which Homer calls Ilios. It does not even warrant the hypothesis that they found a shrine of Athene Ilias existing there. For them, it would be enough that the sounding name could be safely appro- priated,—the true site of Homeric Ilias being forgotten or disputed,—and that their town was at least in the neigh- bourhood of the Homeric battlefields. The Greek Ilium may have been founded about 700 B.c. It is noticeable that no ancient writer suggests a later date than the time of Croesus (c. 550 B.c.); and Strabo says that the establishment of the colony at Hissarlik—after previous occupation of a different site—took place “in the time of the Lydians” (eri Avdav). It would be reasonable to infer that the Greek Ilium preserved some well-marked traces of Lydian influence, perhaps in architecture or art, perhaps in manners or traditions. The traces of Lydian workmanship found in the excavations at Hissarlik are thus easily explained, without recourse to the shadowy hypothesis of a distinct Lydian settlement on the spot. When Xerxes visited the Trojan plain, he “went up to the Pergamon of Priam,” and afterwards sacrificed to the Tlian Athene (Herod., vii. 42). It is doubtful whether the “Pergamon” meant was at the Greek Ilium, or at another site (to be mentioned presently), Bunarbashi; strong reasons in favour of the latter have lately been adduced by Mr George Nikolaides, in his “IAcddos ZrparnyeKy Avacxevj. In the 4th century Ilion is mentioned among the towns of the Troad which yielded to Dercyllidas (399 B.c.), and as captured by Charidemus (359 B.c.). It pos- sessed walls, but was a petty place, of little strength. In 344 p.c. Alexander, on landing in the Troad, visited Tlium. In their temple of Athene the Ilians showed him arms which had served in the Trojan war, including the shield of Achilles. Either then, or after the battle of Granicus, Alexander directed that the town should be enlarged, and should have the rank of “city,” with politi- cal independence, and exemption

from tribute. The battle of Ipsus (301 B.c.) added north-western Asia Minor to the

dominions of Lysimachus, who executed the intentions of Alexander. He gave Ilium a wall 5 miles in circum- ference, incorporating with it some decayed towns of the neighbourhood, and built a handsome temple of Athene. In the 3d century B.c. Ilium was the head of a federal league (xowdv) of free Greek towns, which probably in- cluded the district from Lampsacus on the Hellespont to Gargara on the Adramyttian Gulf. Twice in that century Ilium was visited by Gauls. On the first occasion (278 B.c.) the Gauls, under Lutarius, sought to establish a stronghold at Ilium, but speedily abandoned it as being too weak for their purpose. Forty years later (218 B.c.) Gauls were brought over by Attalus I. to help him in his war against Acheus. After deserting his standard they proceeded to pillage the towns on the Hellespont, and finally besieged Ilium, from which, however, they were driven off by the troops of Alexandria Troas. At the beginning of the 2d century B.c. Ilium was in a state of decay. As Demetrius of Scepsis tells us, the houses "' had not even roofs of tiles," but merely of thatch. Such a loss of prosperity is sufficiently explained by the incursions of the Gauls and the insecure state of the Troad during the latter part of the 3d century. The temple of the Ilian Athene, however, retained its prestige. In 192 B.c. Antiochus the Great visited it before sailing to the aid of the Mtolians. In 190 B.c., shortly before the battle of Magnesia, the Romans came into the Troad. At the moment when a Roman army was entering Asia, it was politic to recall the legend of Roman descent from A®neas. Lucius Scipio and the Ilians were alike eager to do so. He offered sacrifice to the Ilian Athene; and after the peace with Antiochus (189 B.c.) the Romans annexed Rheeteum and Gergis to Ilium, "not so much in reward of recent services, as in memory of the source from which their nation sprang." The later history of [lium is little more than that of Roman benefits. A disaster befell the place in 85 B.c., when Fimbria took it, and left it in ruins; but Sulla presently caused it to be rebuilt. Augustus, while confirming its ancient privileges, gave it new terri- tory. Caracalla (211-217 a.p.) visited Ilium, and like Alexander paid honours to the tomb of Achilles. The latest coins found on the site are those of Constantius II. (337-361). In

the 4th century, as some rhetorical “Letters” of that age show, the Jlians still did a profit- able trade in attracting tourists by their pseudo-Trojan memorials. After the 4th century the place is lost to view. But we find from Constantine Porphyrogenitus (911-959) that in his day it was one of the places in the Troad which gave names to bishoprics.

While the Greek Ilium at Hissarlik owed its importance Assus.

to a sham pretension, which amused sight-seers and occa- sionally served politicians, Assus, on the south coast, has an interest of a more genuine kind, and is, indeed, a better type of ancient town-life in the Troad. Its situation is one of the most magnificent in all the Greek lands. The seaward faces of the isolated and sea-washed rock on which Assus stood are carved to south and south-west into terraces. The natural cleavage of the trachyte into joint planes had already scarped out shelves which it was comparatively easy for human labour to shape; and so, high up on this cone of trachyte, the Greek town of Assus was built, with its colonnades, baths, theatre, its public walks and its monuments of the dead, mounting tier above tier, till the summit of the crag was crowned with a Doric temple of Athene. The view from the summit is not only very beautiful but also of great historical interest. In front is Lesbos, one of whose towns, Methymna, is said to have sent forth the founders of Assus, as early, perhaps, as 1000 or 900 B.c. The whole south coast-line of the Troad is seen, and in the south-east the ancient territory

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of Pergamum, from whose masters the possession of Assus passed to Rome by the bequest of Attalus III. (133 B.c.). The great heights of Ida rise in the east. Northward the Touzla is seen winding through its rich valley from a rocky defile in the east to the oak-forests in the western hills, This valley was traversed by the road which St Paul must have followed when he came overland from Alexandria Troas to Assus, leaving his fellow-travellers to

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fortified with towers at regular intervals. Remains of some ancient buildings, including a bath and gymnasium, can be traced within this area.

The harbour had two large basins, now alniost choked with sand. A Roman colony was sent to the place, as Strabo mentions, in the reign of Augustus. The abridged name “Troas” (Acts xvi. 8) was probably the current one in later Roman times. The site is now called Eski Stambul.

Many classical sites of less note in the Troad have been Other identified with more or less certainty. Neandria seems to ancient be rightly fixed by Mr F. Calvert at Mount Chigri, a hill 4

proceed by sea. The north-west gateway of Assus, to which this road led, is still flanked by two massive towers, of Hellenic work, and of an age which leaves no doubt

that they are the same between which St Paul entered the town. On the shore below, the ancient mole at which he embarked for Mytilene with his companions can still be traced by large blocks under the clear water. Assus affords the only harbour on the 50 miles of coast between Cape Lectum and the east end of the Adramyttian Gulf ; hence it must always have been the chief shipping-place for the exports of the southern Troad. Too much off the highways to become a centre of import trade, it was thus destined to be a commercial town, content with a modest provincial prosperity. The great natural strength of the site protected it against petty assailants; but, like other towns in that region, it has known many masters,— Lydians, Persians, the kings of Pergamum, Romans, and Ottoman Turks. From the Persian wars to about 350 B.c. Assus enjoyed at least partial independence. It was about 348-345 B.c. that Aristotle spent three years at Assus with Hermeas, an ex-slave who had succeeded his former master Eubulus as despot of Assus and Atarneus. Aristotle has left some verses from an invocation to Arete (Virtue), commemorating the worth of Hermeas, who had been seized by Persian treachery and put to death. Under its Turkish name of Beihram, Assus! is still the

not far from Alexandria Troas, remarkable for the fine view of the wholé Troad which it commands. Cebrene has been conjecturally placed in the eastern part of the plain of Bairamitch, Palescepsis being further east on the slopes of Ida, while the new Scepsis was near the site of Bairamitch itself. The evidence for this, however, is ambiguous. At the village of Kulaklee, a little south of the mouth of the Touzla, some Corinthian columns and other

fragments mark the temple of Apollo Smintheus and (approximately) the site of the Homeric Chryse. Colonze was also on the west coast, opposite Tenedos. Scamandria occupied the site of Eneh, in the middle of the plain of Bairamitch, and Cenchree was probably some distance north of it. The shrine of Palamedes, mentioned by ancient writers as existing at a town called Polymedium, has been discovered by Mr J. T. Clarke on a site hitherto unvisited by any modern traveller, between Assus and Cape Lectum. It proves to have been a sacred enclosure (temenos) on the acropolis of the town; the statue of Palamedes stood on a rock at the middle of its southern edge. Another interesting discovery has been made by Mr Clarke,—viz., the existence of very ancient town walls on Gargarus, the highest peak of Ida.

commercial port of the southern Troad, being the place to which loads of valonia (acorn-cups for tanning) are con- veyed by camels from all parts of the country. The

The modern discussion as to the site of Homeric Troy Site of may be considered as dating from Lechevalier's visits to Homeric the Troad in 1785-86. Homer describes Troy as "a great 1?°Y:

recent excavations at Assus, conducted by explorers repre- senting the Archeological Institute of America, have yielded results far more valuable for the history of Greek art and architecture than any excavations yet undertaken in the Troad. The sculptures form one of the most important links yet discovered between Oriental and early Greek art, especially in respect of the types of animals, The later Hellenic town-walls of Assus also well repay the new study which they have received. With their ramparts, towers, and posterns they form the finest and most instructive extant specimen of Greek military engineering. The director of the exploration, Mr J. T. Clarke, published in 1882 an excellent report on the,work so far as it had then been carried.

town," "with broad streets," and with a high acropolis, or ""Pergamus," rising above it, from which precipitous rocks descend abruptly to the plain beneath. These are the precipices over which the Trojans proposed to hurl the wooden horse, "' when they had dragged it to the summit." Homer marks the character of the acropolis by the epithets "lofty," "windy," and

more forcibly still by “ beetling.” One site in the Trojan plain, and one only, satisfies this most essential condition. It is the hill at its southern edge called the Bali Dagh, above the village of Bundar- bashi. It has a height of about 400 feet, with sheer precipices descending on the south and south-west to the valley of the Scamander (Mendere), Remains found upon it—though it has never yet been thoroughly explored—

ae Alexandria Troas stood on the west coast at nearly its | show it to have been the site of an ancient city. Homer ok middle point, a little south of Tenedos. It was built by | describes two natural springs as rising a little to the

Antigonus, perhaps about 310 B.c., and was called by him Antigonia Troas. Early in the next century the name was changed by Lysimachus to Alexandria Troas, in honour of Alexander’s memory. As the chief port of north-west Asia Minor, the place prospered greatly in Roman times, and the existing remains sufficiently attest its former importance. The site is now covered with valonia oaks; but the circuit of the old walls can be traced, and in several places they are fairly well preserved. They had a circumference of about 6 English miles, and were

7 The name Assus probably means “ dwelling,” ‘‘town,” being con- nected with the Sanskrit vas, “to dwell,” which appears in the Greek astu, and also in the ending of such names as Mylasa and Larissa, where in Greek the s is alternatively single or double—an ending which, as Fligier has shown, is found in old town names from India to Dacia. Homer supplies an example in his “steep Pedasus ”

on the Satniois, and it has been suggested by Mr J. T. Clarke that Pedasus may have been identical in site with the later Assus.

north-west of Homeric Troy. A little to the north-west of Bundrbashi these springs still exist. “This pair of rivu- lets are the immutable mark of nature by which the height towering above is recognized as the citadel of Ilium” (E. Curtius).

The low mound of Hissarlik—the site of the Greek Rejec- Ilium—stands only 112 feet above the level of the open tion of To call it “beetling ” Hin

plain in which it is situated. (o¢pudecoa) would have been a travesty of poetical licence on which no poet could have ventured, and to describe it as “lofty” or “windy” would have been not less strange. There are no natural springs near it, such as Homer mentions. The folic settlers, having called the place Ilion, naturally persisted in maintaining its identity with Troy. Polemon, a native of the Greek Ilium, who lived about 200 z.c., declared that his fellow- townsmen could show the very stone on which Palamedes

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had given lessons in the game of draughts. The only other ancient writer who is known to have admitted the Ilian claim is Hellanicus of Lesbos (c. 482-397 B.c.), who, as Strabo remarks, wished “to gratify the Ilians, as is his wont.” Like the Ilians, Hellanicus was of Alolian origin ; and in compiling the local legends of various places he is known to have been wholly uncritical, merely repeating what was told to him as he had heard it. On the other hand, the claim of the Greek Ilium to stand on the site of Troy was decisively rejected by the general consent of those ancient writers who had any claim to critical authority. The orator Lycurgus (c. 332 B.c.) speaks of the site of Troy as desolate, and this at a moment when the recent visit of Alexander the Great to the Greek Ilium (334 B.c.) had drawn attention to the claim made by its inhabitants. Demetrius, a native of Scepsis in the Troad, who flourished about 160 B.c., wrote a book entitled Tpwikds Avaxoopos (“The Marshalling of the Trojans”), an exhaustive commentary on the catalogue of the Trojan forces in the second book of the Jliad. Demetrius knew the topography of the Troad as thoroughly as he knew the text of Homer. The extant notices of his work, which had a great reputation in antiquity, warrant the belief that he was not only learned but acute. In the Diacosmus, which was the chief work of his life, he must have bestowed much thought on the question as to the site of Homeric Troy,—the central point of his subject. He pronounced decidedly, as we know from Strabo, against the claim of the Greek Ilium. It has been suggested that Demetrius

rejected the Ilian claim because, as a native of Scepsis, he was jealous of Ilium,—a suggestion which is not only absurd in itself, since it assumes that such a motive would have induced Demetrius to mar his life's work, but also betrays ignorance of Strabo's text. Scepsis was not a possible claimant of the contested honour, since it was not in the plain of Troy but in the plain of Bairamitch ; and further, Demetrius had already provided in another manner for the Homeric dignity of Scepsis by making it the royal seat of Aineas on the strength of its position relatively to Lyrnessus. The verdict of Demetrius against the Ilian claim was also the general verdict of the other ancient writers consulted by Strabo, as the latter's language shows. From the passage in which Strabo notices the various definitions of the Troad (xiii. § 4) it appears that among such writers were the following historians and geographers :—Charon of Lamp- sacus (flor. 500 B.c.), Damastes of Sigeum (400 B.c.), Scylax of Caryanda (350 3.c.), Ephorus of Cyme (340 B.c.), Eudoxus of Cyzicus (130 B.c.). It is to such writers as these that Strabo refers when he indicates the general consent of his authorities. In favour of the claim of the Greek Ilium, on the other hand, there are only two literary witnesses, and these, as we have seen, are alike worthless. Equally valueless from a critical pot of view is the fact that the Ilian claim was sometimes allowed by soldiers or statesmen who wished to utilize Trojan memories. They required an official Troy, and they cared not where they found 'it. Nothing could more curiously illustrate the extreme poverty of the case for the Greek Ilium than the fact that some of its advocates have been reduced to arguing as if Alexander and Lucius Scipio, when they led their armies through the Troad, had been conducting archeological excursions, and as if their acquiescence in a convenient local myth had the weight of independent critical testimonies.

In negativing the Ilian claim the conclusion of ancient criticism has been confirmed by a great preponderance of modern opinion. Since Lechevalier visited the Troad in 1785-86 an overwhelming majority of competent judges have favoured his belief that the Bali Dagh above Bunar-

bashi was the Pergamus of the Homeric poet's conception. Before Leake's visit this opinion had been expressed by Choiseul-Gouffier, Morritt,

Hawkins, Gell, and Hamilton. Leake spoke with a decision which derives additional weight from the habitual sobriety of his acute judgment, and from the care with which, in this case, he had ex- amined the alleged objections to the view which he finally adopted. He remarks that no one accustomed to observe the sites of ancient Greek towns could fail to fix on Bunar- bashi ‘‘for the site of the chief place of the surrounding country.” So Mr Tozer, in his Highlands of Turkey, says: “‘ A person accustomed to observe the situation of Hellenic cities would at once fix on this as far more likely to have recommended itself to the old inhabitants of the country than any other in the neighbourhood.” Count von Moltke has expressed the same opinion, that ‘he knew no other site in the Trojan plain for a chief town of ancient time.” Another supporter of Bundrbashi is Forchhammer. Another is Kiepert. The opinion of Ernst Curtius has been already cited. But space precludes more names; it is enough to say that the correspondence of the Bali Dagh with the Homeric Pergamus—a correspondence absolutely unique in the Trojan plain—has been recognized with virtual una- nimity by modern travellers who have patiently inspected the scenery of the Jdiad, having competent knowledge, and being free from bias in favour of a theory formed before their visit. Partial excavations on the summit of the Bali Dagh have been more than once undertaken, with the result of discovering ancient walls. Pottery, too, has been found there, part of which is allowed on all hands to be probably as old, at least, as 900 B.c. But the Bali Dagh has never yet been explored with any approach to thoroughness.

The result of the excavations conducted by Dr Schlie- The re- mann on the mound of Hissarlik has been to lay bare mains at

the remains of the Greek Ilium, and also, below these, some prehistoric remains of a rude and poor kind. In Troy, his first book on the subject, the explorer held that the remains of the Greek Ilium ceased at a depth of 6 feet below the surface, and that all the other remains, down to 524 feet, were prehistoric. He distinguished the latter into five groups, representing five prehistoric “cities” which had succeeded each other on the site; and in his second work, Jlios, he added to these a sixth prehistoric city, on the strength of some scanty vestiges of supposed Lydian workmanship, found at a depth of 64 feet. In both books, Homeric Troy was identified with the third prehistoric city from the bottom, which was supposed to have been

destroyed, though not totally, by fire. Professor Jebb was the first to show (1) that the lines of demarcation between the alleged prehistoric strata, as drawn in Llios, could not be accurate, and (2) that, if any part of the prehistoric remains could be supposed to represent Homeric Troy, it must be that part which Dr Schliemann had called the second city from the bottom, and the destruction of which by fire appeared to have been total. In 1882 the architects employed by Dr Schliemann proved that the stratification given in Jlios had in fact been incorrect. The errors, too, affected precisely that region of the deposit which was most important to the Trojan hypothesis, viz., the lower strata. In Dr Schliemann's third volume, 7'roja, these errors were admitted ; and Troy was now identified, no longer with the third city, but with the second, of which the supposed area was now enlarged. Another fact to which the English critic had drawn attention was that the remains of the Greek Ilium must extend to a considerably greater depth than 6 feet below the surface. Further examination confirmed this view also. It showed that the remains on the mound at Hissarlik belong to the following periods or groups. (1) At the top, the remains of the Greek Ilium as it existed in the Roman age, 7.e., as rebuilt

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after its destruction by Fimbria in 85 B.c. (2) A city which, like the former, extended beyond the mound of Hissarlik (its acropolis) over the adjacent plain. This corresponds with the Greek Ilium of the Macedonian age, as embellished and enlarged by Lysimachus, c. 300 B.c. (3) A smaller city, probably confined to the mound. Here we may recognize the Greek [lium as it existed before the Macedonian age. It was a small and poor place, as appears from the known incidents of its history in the 5th and 4th centuries B.C., owing its chief importance to the shrine of Athene Ilias. (4) A petty town or village, confined to the mound, and poorly built. The evidence of architecture fails to decide whether it was Hellenic or not; if Hellenic, it might represent the primitive settlement of the Holic colonists, perhaps c. 700 B.c. It was a small house in this village that Dr Schliemann at first identified with Priam's palace. The ground-plan shows four rooms, of which the largest measured 24 feet 4 inches by 12 feet. (5) A large town, to which the mound was only acropolis, and which extended to some distance south and south-east over the plain. These remains are unquestionably

prehistoric. (6) A few remains of a small settlement which, if indeed distinct from No. 5, preceded it. The reason for distinguishing 6 from 5 is that some of the acropolis buildings of 5 are above those of 6, and seem to have been built on carefully levelled ground. Apart from architectural evidence, objects found in the excavations prove that the remains of the historical age extend much below 6 feet. One of these was a terra-cotta disk, stamped with the head of a warrior, in an advanced style of workmanship, found at 26 feet 3 inches below the surface (Z'roy, p. 294). Another is a terra- cotta ball, found at 26 feet, which cannot be older than c. 360 B.c. Then, at 20 feet, was found another terra-cotta, marked with the Greek letter P, A piece of ivory, belong- ing to a seven-stringed lyre, and therefore not older than c. 660 B.c., was found at 26 feet. Thus we have at His- sarlik the remains of the Greek Ilium in three successive phases,—Roman, Macedonian, and Aiolic, and below these the remains of at least one prehistoric settlement, the age and origin of which are unknown. Their re- We can no longer either prove or disprove that these lation to prehistoric remains are those of a town which was once Homer. taken after a siege, and which originally gave rise to the legend of Troy. But most certainly it is not the "lofty " Troy of which the Homeric poet was thinking when he embodied the legend in the Iviad. The conception of Troy which dominates the Iliad is based on the site at Bunarbashi, and suits no other. The sole phrase in the epic which favours Hissarlik occurs in book xx. (216 sq.), where Dardania is said to have been built on the spurs of Ida, when Ilios "had not yet been built in the plain"; and this phrase occurs in a passage which, as the best recent critics agree, is one of the latest interpolations in the Jliad, having been composed after the Greek Ilium had actually arisen "'in the plain." Its purpose was the same as that which appears in the Hymn to Aphrodite, viz., to glorify reputed descendants of Aineas, and it probably belongs to the same age, the 7th century B.c. The tactical data of the Lliad —those derived from the incidents of the war—can- not be treated with such rigour as if the poem were a military history. But Nikolaides has shown that they can at least be brought into general agreement with the site at Bunarbashi, while they are hopelessly incompatible with Homeric Hissarlik, The Jliad makes it clear that the general

ne description of the Trojan plain was founded on accurate Troy. knowledge. At this day all the essential Homeric features

can be recognized. And it is probable that the poet who created the Troy of the Jliad knew, personally or by description, a strong town on the Bali Dagh above Bunar- bashi. The legend of the siege may or may not have

arisen from an older town at Hissarlik, which had then disappeared. The poet might naturally place his Troy in a position like that of the existing strong city on the Bali Dagh, giving it a “ beetling” acropolis and handsome buildings, while he also reproduced the general course of the rivers and that striking feature,—an indelible mark of the locality,—the natural springs at the foot of the hill, just beyond the city gates on the north-west. But, while he thus imagined his Troy in the general likeness of the town on the Bali Dagh, he would retain the privilege of a poet who was adorning an ancient legend, and whose theme was a city that had long ago vanished. Instead of feeling bound to observe a rigorous accuracy of local detail, he would rather feel impelled to avoid it; he would use his liberty to introduce some traits borrowed from other scenes known to him, or even from imagination. To this extent, and in this sense, his topography would be eclectic. Such a consideration might suffice to explain the fact, well known to those who have studied this question on the spot, that neither Bundrbashi nor any other one site can be harmonized with every detail of the poem. The re-commendations of Bundrbashi are, first, that it satisfies the capital and essential conditions, while no other site does so, and secondly, that the particular difficulties which it leaves unsolved are relatively slight and few. This character of Homeric topography becomes still easier to understand, if, as most critics would now concede, our Iliad contains work of various hands and ages. Few questions, perhaps, of equal literary interest have been so much confused by inattention to the first conditions of the problem. The tale of Troy, as the Iliad gives it, is essentially a poetical creation; and we have no evidence other than the Ldiad. That is, our sole data are (1) of the mythical class, (2) of inadequate precision, and (3) of un- certain origin. But they show a general knowledge of the ground ; and the question is how far particular features of the ground can be recognized in the poem. It may be doubted whether the case admits of any solution more definite than that which has been indicated above.

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LEGEND oF TRoy.

According to Greek legend, the oldest town in the Troad was that founded by Teucer, who was a son of the river Scamander and the nymph Idea. 'Tzetzes says

that the Scamander in question was the Scamander in Crete, and that Teucer was told by an oracle to settle wherever the "'earth-born ones" attacked him. So when he and his company were attacked in the Troad by mice, which gnawed their bow-strings and the handles of their shields, he settled on the spot, thinking that the oracle was fulfilled. He called the town Sminthium and built a temple to Apollo Sminthius, the Cretan word for a mouse being sminthius. In his reign Dardanus, son of Zeus and the nymph Electra, daughter of Atlas, in con- sequence of a deluge, drifted from the island of Samo- thrace on a raft or a skin bag to the coast of the Troad, where, having received a portion of land from Teucer and married his daughter Batea, he founded the city of Dardania or Dardanus on high ground at the foot of Mount Ida. On the death of Teucer, Dardanus succeeded to the kingdom and called the whole land Dardania after himself. He begat Erichthonius, who begat a son Tros by Astyoche, daughter of Simois. On succeeding to the throne, Tros called the country Troy and the people Trojans. By Callirrhoe, daughter of Scamander, he had three sons,—TIlus, Assaracus, and Ganymede. From Ilus and Assaracus sprang two separate lines of the royal house,—the one being Ilus, Laomedon, Priam, Hector; the other Assaracus, Capys, Anchises, Aineas. [lus went to Phrygia, where, being victorious in wrestling, he received as a prize from the king of Phrygia a spotted cow, with an injunction to follow her and found a city wherever she lay down. The cow lay down on the hill of the Phrygian Até; and here accordingly Ilus founded the city of Ilios. It is stated that Dardania, Troy, and Ilios became one city. Desiring a sign at the foundation of Ilios, Ilus prayed to Zeus and as an answer he found lying before his tent the Palladium, a wooden statue of Pallas, three cubits high, with her feet joined, a spear in her right hand, and a distaff and spindle in her left. Ilus built a temple for the image and wor- shipped it. By Eurydice, daughter of Adrastus, he had a son Laomedon. Laomedon married Strymo, daughter of Scamander, or Placia, daughter of Atreus or of Leucippus. It was in his reign that Poseidon and Apollo, or Poseidon alone, built the walls of Troy. In his reign also Hercules besieged and took the city, slaying Laomedon and his children, except one daughter Hesione and one son Pod- arces. The life of Podarces was granted at the request of Hesione; but Hercules stipulated that Podarces must first be a slave and then be redeemed by Hesione; she gave her veil for him; hence his name of Priam (from priasthat to buy). Priam married first Arisbe and after- wards Hecuba and had fifty sons and

twelve daughters. Among the sons were Hector and Paris, and among the daughters Polyxena and Cassandra. To recover Helen, whom Paris carried off from Sparta, the Greeks under Agamemnon besieged Troy for ten years. (See ACHILLEs, Agamemnon, Agax, Hector, HELEN, Paris.) At last they contrived a wooden horse, in whose hollow belly many of the Greek heroes hid themselves. Their army and fleet then withdrew to Tenedos, feigning to have raised the siege. The Trojans conveyed the wooden horse into Troy ; in the night the Greeks stole out, opened the gates to their returning friends, and Troy was taken.

See Homer, JU., vii. 452 sq., xx. 215 sq., xxi. 446 sg. ; Apollo- dorus, ii. 6, 4, iii. 12 ; Diodorus, iv. 75, v. 48; Tzetzes, Sehol. on Lyeophron, 29, 72, 13802 ; Conon, Narrat., 21; Dionysius Halicarn., Antig. Rom.,i. 68 sg. The Iliad deals with a period of fifty-one days in the tenth year of the war. For the wooden horse, see Homer, Od., iv. 271 sq.; Virgil, 4n., ii. 13 sq.

TROGLODYTES (rpwyAodira:), a Greek word mean- ing '"cave-dwellers." Caves have been widely used as human habitations both in prehistoric and in historic times (see Cave), and ancient writers speak of Troglodytes in various parts of the world, as in Moesia near the lower

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Danube (Strabo, vii. 5, p. 318), in the Caucasus (Id., xi. 5, p- 506), but especially in various parts of Africa from Libya (Id., xvii. 3, p. 828) to the Red Sea. Herodotus (iv. 183) tells of a race of Troglodyte Ethiopians in inner Africa, very swift of foot, living on lizards and creeping things, and with a speech like the screech of an owl. The Garamantes hunted them for slaves. It has been supposed that these Troglodytes may be Tibbus, who still in part are cave-dwellers. Aristotle also (//tst. An., vii. 12) speaks of a dwarfish race of Troglodytes on the upper course of the Nile, who possessed horses and were in his opinion the Pyg- mies of fable. But the best known of these African cave- dwellers were the inhabitants of the "Troglodyte country" on the coast of the Red Sea, who reached as far north as the Greek port of Berenice, and of whose strange and sav- age customs an interesting account has been preserved by Diodorus and Photius from Agatharchides.1_ They were a pastoral people, living entirely on the flesh of their herds, or, in the season of fresh pasture, on mingled milk and blood.

But they killed only old or sick cattle (as indeed they killed old men who could no longer follow the flock), and the butchers were called “unclean”; nay, they gave the name of parent to no man, but only to the cattle of which they had their subsistence. This last point seems to be a confused indication of totemism. They went almost naked; the women wore necklaces of shells as amulets. Marriage was unknown, except among the chiefs, —a fact which agrees with the prevalence of female kin- ship in these regions in much later times. They practised circumcision or a mutilation of a more serious kind. The whole account, much of which must be here passed by, is one of the most curious pictures of savage life in ancient literature.

The Biblical Horim, who inhabited Mount Seir before the Edom- ites, bore a name which means cave-dwellers, and may probably have been a kindred people to the Troglodytes on the other side of the Red Sea. Jerome, on Obadiah 5, speaks of this region as con- taining many cave-dwellings, and such habitations are still some- times used on the borders of the Syro-Arabian desert.

TROGON, a word apparently first used as English? by Shaw (Mus. Leverianum, p. 177) in 1792, and now for many years accepted as the general name of certain birds forming the Family Zrogonidx of modern ornithology, the species Trogon curucur of Linneeus being its type. But, since doubts exist as to whether this is that which was subsequently called by Vieillot 7. collaris or the 7. melan- urus of Swainson, though evidence is in favour of the former (cf. Cabanis, Mus. Heineanum, iv. p.177, and Finsch, Proc. Zool. Society, 1870, p. 559), several recent writers have dropped the Linnean specific term.

The Trogons are birds of modcrate size: the smallest is hardly bigger than a Thrush and the largest less bulky than a Crow. In inost of them the bill is very wide at the gape, which is invariably beset by recurved bristles. They seize most of their food, whether caterpillars or fruits, on the wing, though their alar power is not exceptionally great, their flight being described as short, rapid, and spasmodic. Their feet are weak and of a unique structure, the second toe, which in most birds is the inner anterior onc, being re- verted, and thus the Trogons stand alone, since in all other birds that have two toes before and two behind it is the outer toe that is turned backward.

The plumage is very remarkable and charac- teristic. There is not a species which has not beauty beyond most birds, and the glory of the group culminates in the QUEZAL (q.¥.). But in others golden green and steely blue, rich crimson ? and tender

1 See also Artemidorus in Strabo, xvi. 17, p. 785 sg.

2 Trogonem (the oblique case) occurs in Pliny (H. N., x. 16) as the name of a bird of which he knew nothing, save that it was mentioned by Hylas, an augur, whose work is lost ; but some would read Trygonem (Turtle-Dove). In 1752 Méhring (4v. Genera, p. 85) applied the name to the ‘‘Curucui’”’ (pronounced ‘‘Suruqua”’ jide Bates, Nat. Amazons, i. p. 254) of Marcgrave (Hist. Nat. Brasilix, p. 211), who described and figured it in 1648 recognizably. In 1760 Brisson (Ornithologie, iv. p. 164) adopted Trogon as a generic term, and, Lin- neus having followed his example, it has since been universally accepted.

3M. Anatole Bogdanoff determined the red pigment of the feathers

pink, yellow varying from primrose to amber, vie with one another in vivid coloration, or contrasted, as happens in many species, with awarm tawny or asombre slaty grey—to say nothing of the delicate freckling of black and white, as minute as the markings of a moth’s wing—the whole set off by bands of white, produeing an effect hardly equalled in any group. It is impossible within brief space to describe its glowing tints ; but the plumage is further remarkable for the large size of its contour-feathers, whieh are extremely soft and so loosely scated as to come off in scores at a touch, and there is no down. The tail is generally a very characteristic feature, the rectrices, though in some cases pointed, being often curiously squared at the tip, and when this is the case they are usually barred ladder- like with white and black.! According to Gould, they are larger and more pointed in the young than in the old, and grow squarer and have the white bands narrower at each succeeding moult. He also asserts that in the speeies which have the wing-coverts freckled, the freckling becomes finer with age. So far as has been observed, the nidification of these birds is in holes of trees, wherein

are laid without any bedding two roundish eggs, generally white, but certainly in one species (Quezal) tinted with bluish green.

The Trogons form a very well-marked Family, belonging to the multifarious group treated in the present series of articles as Picariz; but, instead of being (so far as is known) like all the rest of them and, as Prof. Huxley believed, " desmognathous," they have been shown by W. A. Forbes (Proc. Zool. Society, 1881, p. 886) to be "schizognathous "—thus demonstrating, in the words of the latter, "'that the structure of the palate has not that unique and peculiar significance that has been claimed for it in the classification of birds." Perhaps the explanation of this anomaly may lie in the fact that the Trogons are a very old form. The remains of one, 7. gallicus, have been recognized by Prof. A. Milne-Edwards (Ois. foss. de la France, ii. p. 895, pl. 177, figs. 18-22) from the Miocene of the Allier, and it may not be too much to suppose that the schizognathous structure was more ancient than the desmognathous. Again too this fortunate discovery of that emincnt paleontologist seems to account for the remarkable distribution of the Trogons at the present day. While they chiefly abound, and have developed their climax of magnificence, in the tropical parts of the New World, they yet occur in the tropical parts of the Old. The species now inhabiting Africa, forming the group Hapaloderma, can hardly be separated gencrically from those of the Neotropical Trogon, and the difference between the Asiatic forms, if somewhat greater, is still comparatively slight. It is plain then that the Trogons are an exceptionally persistent type ; indeed in the whole Class few similar instances occur and perhaps none that can be called parallel. The extreme development of the type in the New World just noticed also furnishes another hint. While in some of the American Trogons (Pharomacrus, for instance) the plumage of the females is not very much less beautiful than that of the males, there are others in which the hen birds retain what may be fairly deemed a more ancient livery, while the cocks flaunt in brilliant attire. Now the plumage of both sexes in all but one? of the Asiatic Trogons, Harpactes, resembles rather that of the young and of those females of the American species which are modestly clothed. The inference from this fact would seem to be that the general coloration of the Trogons prior to the establishment, by geographical estrangement, of the two types was a russet similar to that now worn by the adults of both sexes in the Indian region, and by a portion only of the females in the

Neotropical. The Ethiopian type, as already said, very closely agrees with the American, aud therefore would be likely to have been longer in connexion therewith. Again, while the adults of most of the American Trogons (Pharomacrus and Luptilotis excepted) have the edges of the bill serrated, their young have them smooth or only with a single notch on either side near the tip, and this is observable in the Asiatic Trogons at all ages. At the same time the most distinctive features of the whole group, which are easily taken in at a glance, but are difficult to express briefly in words, are equally possessed by both branches of the Family, showing that they were in all likelihood—for the possibility that the peculiarities may have been evolved apart is not to be over- looked—reached before the geographical sundering of these branches (whereby they arc now placed on opposite sides of the globe) was effected.

It remains to say that about sixty species of Trogons are recognized, which Gould in the second edition of his Monograph of the Family (1875) divides into seven genera ; but their characters are hardly laid down. Pharomacrus,

Euptilotis, and Trogon inhabit the mainland of tropical

of Pharomacrus auriceps to be a substance which he ealled “zooxan- thine” (Comptes Rendus, 2d November 1857, xlv. p. 690).

1 In the Trogon of Cuba, Prionotelus, they are most curiously seooped out, as it were, at the extremity, and the lateral pointed ends diverge in a way almost unique among birds.

. Or two speeies if H. macloti be more than a local form of H. remnwardti,

| sums).

America, no species passing to the northward of the Rio Grande nor southward of the forest district of Brazil, while none occur on the west coast of Peru or Chili. Prionotelus and Tmetotrogon, each with one species, are peculiar respectively to Cuba and Hispaniola. The African form /lapaloderma has two species, one found only on the west coast, the other of more general range. The Asiatic Trogons, L/arpactes (with eleven species according to the same authority), occur from Nepal to Malacca, in Ceylon, and in Sumatra, Java, and Borneo, while one species is peculiar to some of the Philippine Islands. (A. N.)

TROGUS, Cy. Pompgius, a Roman historian, nearly contemporary with Livy. Although the epitome of his historical writings by Justin, and a few fragments, are all that have come down to us, there is abundant reason to believe that he deserves a place in the history of Roman literature by the side of Sallust, Livy, and Tacitus. Of his life little is known. He was almost certainly of Greek descent. His grandfather served with Pompey in the war against Sertorius, and received through the influence of that general the Roman citizenship; hence the name Pompeius, which was adopted as a token of gratitude to the benefactor. The father of Trogus was an officer of Cesar. Trogus himself seems to have been a man of encyclopedic knowledge. He wrote, after Aristotle and Theophrastus, books on the natural history of animals and plants, used by the elder Pliny, who calls Trogus ‘one of the most precise among authorities” (auctor ipse e severis- But the principal work of Trogus consisted of forty-four Libri Historiarum

Philippicarum. This was a great history of the world, or rather of those portions of it which came under the sway of Alexander and his successors. The tale began with Ninus, the founder of Nineveh, and ceased at about the same point as Livy's great work, viz.,9 a.D. The last event recorded by the epitomator JusTIN (q.v.) is the recovery of the Roman standards captured by the Parthians (20 3.c.). The history of Rome was treated as merely subsidiary to that of Greece and the East. The work was based upon the writings of Greek historians, such as Theopompus, Ephorus, Timeus, Polybius. It has been contended that Trogus did not gather together the information from the leading Greek historians for himself, but that it was already combined into a single book by some Greek, whom Trogus followed closely with some superficial errors. But the assumption appears improbable in itself, merely on a review of the remains of the historical writings, and is moreover incon- sistent with what we know of the works in natural history, for which Trogus certainly went back to what were re-garded in his time as first-hand authorities. It is generally admitted that Trogus had genuine qualifications for writing history, though he could not rid himself entirely of the faults of his authorities. His idea of history was more severe and less rhetorical than that followed by Sallust and Livy, whom he blamed for putting elaborate speeches in the mouths of the characters of whom they wrote. Yet his own Latin style had a vivid force which is still to be recognized in the extracts made by Justin. For the ancient history of the East, Trogus, even in the present mutilated state of his historical work, often proves to be an authority of great importance.

The chief modern editions are those of Gronovius (Leyden, 1719 and 1760); Frotscher (Leipsic, 1827-30); and Jeep (Leipsic, 1859 and 1862). In Engelmann's Bibliotheca Scriptorum Classicorwm, ii., under Justin and Trogus, will be found a large number of references to scattered modern articles. Perhaps the most important is that of A. v. Gutschmid on the sources of the history of Trogus, in the ce supplementary vol. of the Jahrbb..f. class, Philol. (Leipsic,

TROITSK, a district town of Russia, in the government of Orenburg, situated in a fertile steppe 392 miles to the

north-east of Orenburg, on the Siberian highway, is one of those towns which have grown rapidly of late in the south-east of Russia. The Troitskiy fort, erected in 1743, became a centre for the exchange trade with the Kirghiz steppe and Turkestan, and in that trade Troitsk is now second only to Orenburg. Cotton, silk, and especially horses and cattle are imported, while leather, cotton, and woollen and metal wares are exported. An active trade in corn for the Ural gold-mines is carried on, The popu- lation in 1884 was 13,000.

TROLLOPE, Anruony (1815-1882), English novelist, was born in Keppel Street, Russell Square, London, accord- ing to most authorities, on 24th April 1815; in his own Autobiography he merely gives the year. His father, a barrister, who had been fellow of New College, Oxford, brought himself and his family into the sorest straits by unbusiness-like habits, by quarrelling with his profession, or at least with the attorneys, and by injudicious specu- lations, especially in farming. ‘Trollope’s mother, Frances Milton, according to her son, was nearly thirty when she married in 1809. By her husband’s wish she made a strange journey to America in 1827, for the purpose of setting up a kind of fancy shop in Cincinnati, which failed utterly. Her visit, however, furnished her with the means of writing Zhe Domestic Manners of the Americans. This at once brought her in a considerable sum, and thence- forward she continued to be the mainstay of her family. Her husband being obliged at last actually to fly the country from his creditors, his wife maintained him by her pen, at Bruges, till his death there in 1835. For some time Mrs Trollope wrote chiefly travels ; but she soon be- came known as a novelist, and was very industrious. Her novels, the best of which are probably The Vicar of Wrea- hill and The Widow Barnaby, are now rarely read, and indeed were never at their best above good circulating library level: they are written with cleverness indeed, and a certain amount of observation, but with many faults of taste, and with an almost total want of artistic complete- ness and form. Her late beginning, her industrious career (for she wrote steadily for more than thirty years, till her death in October 1863, at Florence), and the entire absence in her of any blue-stocking or femme-savante weakness would have made her remarkable, even if she had not transmitted, as she undoubtedly did transmit, her talent, much increased, to her children.

Anthony Trollope was the third son. By his own account few English men of letters have had an unhappier childhood and youth. He puts down his own misfortunes, at Harrow, at Winchester, at Harrow again, and elsewhere, to his father's pecuniary circumstances, which made his own appearance dirty and shabby, and subjected him to various humiliations. But it is permissible to suspect that this was not quite the truth, and that some peculiarities of temper, of which in after life he had many, contributed to his unpopularity. At any rate he seems to have reached the verge of manhood as ignorant as if he had had no edu- cation at all. While living abroad he tried ushership ; but at the age of nineteen he was pitchforked by favour (for he could not pass even the ridiculous examination then usual) into the post-office. Even then his troubles were not over. He got into debt; he got into ridiculous entanglements of love affairs, which he has very candidly avowed ; he was in constant hot water with the authori- ties ; and he seems to have kept some very queer company, which long afterwards stood him in stead as models for some of his novel pictures. At last in August 1841 he obtained the appointment of clerk to one of the post-office surveyors in a remote part of Ireland, with a very small nominal salary. This salary, however, was practically quadrupled by allowances ; living was cheap ; and the life

suited Trollope exactly, being not office work, which he always hated, but a kind of travelling inspectorship. And here he not only began that habit of hunting which (after a manner hardly possible in the stricter conditions of official work nowadays) he kept up for many years even in England, but within three years of his appointment engaged himself to Miss Rose Heseltine, whom he had met in Ireland but who was of English birth. They were married in June 1844, His headquarters had previously been at Banagher ; he was now transferred to Clonmel. Trollope had always dreamt of novel-writing, and his Irish experiences seemed to supply him with promising subjects. With some assistance from his mother he got his first two books, Zhe Macdermots of Ballycloran and The Kellys and the O'Kellys, published, the one in 1847, the other the next year. But neither was in the least a. success, though the second perhaps deserved to be; and a third, Za Vendée, which followed in 1850, besides being a much worse

book than either, was an equal failure. Trollope made various other literary attempts, but for a time ill fortune attended all of them. Meanwhile he was set on a new kind of post-office work, which suited him even better than his former employment—a sort of roving commission to inspect rural post deliveries and devise their extension, first in Ireland, then throughout the west of England and South Wales. That he did good work is undeniable ; but his curious conception of official

~~duty (on his discharge of which he prided himself im~~

mensely) is exhibited by his confessions that he “got his hunting out of it,” and that he felt “the necessity of travelling miles enough [he was paid by mileage] to keep his horses.” It was during this work that he struck the vein which gave him fortune and fame—which might per- haps have given him more fame and not much less fortune if he had not worked it so hard—by conceiving The Warden. This was published in 1855. It brought him little immediate profit, nor was even Barchester Towers, which followed, very profitable, though it contains his fresh- est, his most original, and, with the exception of The Last Chronicle of Barset, his best work. The two made hima reputation, however, and in 1858 he was able for the first time to sell a novel, The Three Clerks, for a substantial sum, £250. A journey on post-office business to the West Indies gave him material for a book of travel, The West Indies and the Spanish Main, which he frankly and quite truly acknowledges to be much better than some subse- quent work of his in the same kind. From this time his production (mainly of novels) was incessant, and the sums which he received were very large, amounting in one case to as much as £3525 fora single book, and to nearly £70,000 in the twenty years between 1859 and 1879. All these particulars are given with great minuteness by himself, and are characteristic. The full high tide of his fortunes began when the Cornhill Magazine was established in the autumn of 1859. He was asked at short notice to write a novel, and wrote Framley Parsonage, which was extremely popular; two novels immediately preceding it, The Ber- trams and Castle Richmond, had been much less successful.

As it will be possible to notice few of his subsequent works in detail, the list of them, a sufficiently astonishing one, may be given here :— Tales of All

Cowntries (3 series, 1861-1870); Orley Farm, North America (1862); Rachael Ray (1863); The Small House at Allington, Can You Forgive Her? (1864); Miss Mackenzie (1865) ; The Claverings, Nina Balatka, The Last Chronicle of Barset (1867); Linda Tressel (1868); Phineas Finn, He Knew He Was Right (1869); Brown, Jones, and Robinson, The Vicar of Bullhampton, An Editor's Tales, Cxsar (1870); Sir Harry Hotspur of Humblethwaite, Ralph the Heir (1871); The Golden Lion of Granpere (1872) ; The Eustace Diamonds, Australiaand New Zealand (1873); Phineas Redux, Harry Heathcote of Gangotl, Lady Anna (1874); The Way We Live Now (1875) ; The Prime Minister (1876) ; The American Senator (1877); Is He Popenjoy ? South Africa (1878) ; John Caldigate, An Eye for

an Hye, Cousin Henry, Thackeray (1879); The Duke's Children, Cicero (1880); Ayala's Angel, Dr Wortle's School (1881); Frau Frohmann, Lord Palmerston, The Fixed Period, Kept in the Dark, Marion Fay (1882); Mr Searborough's Family, The Land Leaguers (1883) ; and An Old Man's Love (1884).

How this enormous total was achieved in spite of official work (of which, lightly as he took it, he did a good deal, and which he did not give up for many years), of hunting three times a week in the season, of whist-playing, of not a little going into general society, he has explained with his usual curious minuteness. He reduced novel-writing to the conditions of regular mechanical work—so much so that latterly he turned out so many words in a quarter of an hour, and wrote at this rate so many hours a day. He divided every book beforehand into so many days' work and checked off the tallies as he wrote.

A life thus spent could not be very eventful, and its events may be summed up rapidly. In 1858 he went to Egypt also on post-office business, and at the end of 1859 he got himself transferred from Ireland to the eastern dis- trict of England. Here he took a house at Waltham. He took an active part in the establishment of Zhe Jort- nightly Review in 1865; he was editor of St Paul's for some time after 1867; and at the end of that year he resigned his

position in the post-office. He stood for Beverley and was defeated; he received from his old department special missions to America and elsewhere (he had already gone to America in the midst of the Civil War). He went to Australia in 1871, and before going broke up his household at Waltham. When he returned he established himself in London, and lived there till 1880, when he removed to Harting on the confines of Sussex and Hampshire. He had visited South Africa in 1877 and travelled elsewhere. On 3rd November 1882 he was seized with paralysis, and died on 6th December.

Of Trollope's personal character it is not necessary to say much. Strange as his conception of official duty may seem, it was evidently quite honest and sincere, and, though he is said to have been as an official popular neither with superiors nor inferiors, he no doubt did much good work. Privately he was much liked and much dis- liked,—a great deal of real kindness being accompanied by a blus- tering and overbearing manner, and an egotism, not perhaps more deep than other men's, but more vociferous. His literary work needs more notice. Nothing of it but the novels is remarkable for merit. His Cesar and the Cicero are curious examples of a man's under- taking work for which he was not in the least fitted. Thackeray exhibits (though Trollope appears to have both admired Thackeray as an artist and liked him as a man) grave faults of taste and judg- ment and a complete lack of real criticism. The books of travel are not good, and of a kind not good. Nina Balatka and Linda Tressel, published anonymously and as experiments in the romantic style, have been better thought of by the author and by some competent judges than by the public or the publishers. Brown, Jones, and fobinson was still more disliked, and is certainly very bad as a whole, but has touches of curious originality in parts. The rest of the novels have been judged very differently by different persons. There is no doubt that their enormous volume prejudiced readers against them even long before the author let the public into the secret of their manufacture, which has made the prejudice deeper. There is also no doubt that Trollope seldom or never creates a character of the first merit (Mr Crawley in the Last Chroniele of Barset is the one possible exception), and that not one of his books can be called a work of genius. At the same time no one probably has produced anything like such a volume of anything like such merit. He claims for himself that his characters are always more or less alive, and they are. After

his first failures he never pro- duced anything that was not a faithful and sometimes a very aniusing transcript of the sayings and doings of possible men and wonien. His characters are never marionettes, much less sticks. He has some irritating mannerisms, notably a trick of repetition of the same form of words. He is sometimes absolutely vulgar, — that is to say, he does not deal with low life, but shows, though always robust and pure in morality, a certain coarseness of taste. He is constantly rather trivial, and perhaps nowhere out of the Barset series (which, however, is of itself no inconsiderable work) has he produced books that will live. The very faithfulness of his representation of a certain phase of thought, of cultivation, of society, uninformed as it is by any higher spirit, in the long run damaged, as it had first helped, the popularity of his work. But,

allowing for all this, it may and must still be said that he held up his mirror steadily to nature, and that the mirror itself was fashioned with no inconsiderable art. (G. SA.)

TROMBONE, a musical instrument of brass. It has a cupped mouthpiece, and is formed of two principal parts ——the bell, the bore of which gradually widens, and the slide, which is composed of two cylindrical tubes parallel to each other, upon which two other tubes, communicating at their lower extremities by a pipe curved in a half-circle, glide without loss of air. The mouthpiece is adapted to one of the upper ends of the slide and the bell to the other end. When the slide, which is moved by the right hand, is closed, the instrument is at its highest pitch ; the note is lowered in proportion as the column of air is lengthened by drawing out the slide.

Formerly the trombone was known as the sackbut; its modern designation —great trumpet—comes from the Italian. The Germans call it posaune. It is difficult to say where or at what epoch the instrument was invented. In a manuscript of the 9th century, preserved at Boulogne, there is a drawing of an instrument which bears a great resemblance to a trombone deprived of its bell. Virdung! says little about the trombone, but he gives an engraved representation of it, under the name of busawn, which shows that early in the 16th century it was almost the same as that employed in our day. By that time the trombone had come into vogue in England: the band of musicians

in the service of Henry VIII. included ten sack- but players, and under Elizabeth, in 1587, there were six. English instrumentalists then enjoyed a certain reputa- tion and were sought for by foreign courts; thus in 1604 Charles IIT. of Lorraine sought to recruit his sackbut players from English bands. Pretorius? classes the trom- bones in a complete family, the relative tonalities of which were thus composed :—1 alt-posaun, 4 gemeine rechte pos- aunen, 2 quart-posaunen, | octav-posaun,—S8 in all. The alt- posaun was in D. With the slide closed it gave the first of the accompanying harmonics: e_#._ =: The gemeine rechte posaunen, a or ordinary trombones, were in A. Without using the slide they gave the subjoined sounds: = f. The quart-posaun was made

either in E, the fourth below oe the gemeine rechte posaun, or in D, the lower fifth. In the latter case it was exactly an octave below the alt-posaun. The octav-posaun was in A. It was constructed in two different fashions : either it had a length double that of the ordinary trom- bone, or the slide was shortened, the length of the column of air being still maintained by the adaptation of a crook. ‘The first system, which was invented by Hans Schreiber four years before the work of Pretorius appeared, gave the instrumentalist a slide by which he could procure in the lower octave all the sounds of the ordinary trombone. ‘The second system, which Pretorius had known for years, was distinguished from the first, not only by modifications affecting the form, but also by a larger bore. Mersenne® calls the trombone trompette har- monique, but he does not appear to have made himself acquainted with its construction, for we can scarcely find an allusion in the confused text of his work to the tonality of the trombone then in vogue. He established this fact, however, that it was customary in France to lower the instrument a fourth below the pitch of the ordinary trom- bone by means of a tort, a kind of crook with a double turn that was fitted between the bell and the slide, “in order,” he said, ‘to make the bass to hautbois concerts.” The compass of the trombone is not limited to the mere harmo-

1 Musica getutscht wnd auszgezogen, Basel, 1511. 2 Organographia, Wolfenhbiittel, 1619. 3 Harmonie Universelle, Paris, 1627.

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TR O—

nics obtained by leaving the instrument at its shortest length— that is, with the slide close up ; it in fact comprises seven positions, which are obtained by shifting the slide as many lengths and in such a way that each of these produces a series of harmonics a semitone lower than the length which has preceded. This system, so simple and rational, might have been expected always to serve for the basis of the technique of the instrument; but from the middle of the 18th century the art of playing the trombone became the object of purely empiric teaching. Only four positions were made use of.' By the first—that is, with the slide close up—there was obtained from the ordinary trombone, then called the tenor trom- bone, the first series of the subjoined harmonics (the numerals indicating the order):

the fundamental or first note e——— —_———— being difficult to obtain; the et Te ae second position produced

@: the third : — ; : 2 Sa position == e=—_ ——$=————__ produced ea

: — In thus lowering by semitones, the and the fourth = sounds avnichéd bw the four positions ave the tenor trombone a diatonic scale from — i his scale was formed with notes that could ——_ a. be perfectly just, but the result would have — been less satisfactory to the ear if the player had strictly observed the rules laid down by the teaching of that period for the production of the chromatic intervals. Thus to pass from a note furnished by one of the four positions to another a semitone lower it was necessary to lengthen the slide by two fingers ; if the semitone higher was required the slide had to be shortened to the same extent.2 A consideration of the laws

affecting lengths of pipes will show the viciousness of that rule.

Of all wind instruments the trombone has perhaps been least modificd in form; changes have occasionally been attempted, but for the most part with only trifling success. The innovation which has had the most vogue dates from the end of the 18th century ; it consisted in bending the tube of the bell in a half circle above the head of the executant, which produced a very bizarre effect. It also gave rise to very serious inconveniences: by destroying the regularity of the proportions of the bell it pre- judicially affected the quality of tone and intonation of the instru- ment. For a long

time the curved bell with its serpent’s mask was maintained in military music, and it is only about twenty years ago that it was completely given up. By giving a half turn more to the bell tube its opening was directed to the back of the exccutant ; but this form, in fashion for a little while about 1830, was not long adhered to, and the trombone reassumed its primitive form, which is still maintained. As appears from a patent de- posited by Stolze] and Bliimel at Berlin on 12th April 1818, the application of ventils or pistons was then made for the first time.® The ventils, at first two in number, effected a decided lengthening of the instrument. The first augmented the length of the tube by a tone, lowering by as much the natural harmonics. The second produced a similar effect for a semitone, and the simultaneous em- ployment of the two pistons resulted in the depression of a tone and ahalf. The principle, therefore, of the employment of ventils or pistons is the same as that which governs the use of slides. For instance, a trombone is provided with three pistons, and without their help it produces the first of the following sets of harmonics (the numbers indicating the order). 5, Then by pressing down the second (1) * z= piston we obtain a ig a: of the Sf a = eee eo

column of air that lowers the in- a

1 2 3 =

strument by a semitone and makes

6 8

it produce the second set of harmonics (g = here shown ; with the aid of the first = ~ = piston we relengthen the column, so S——y—— i

£

as to get a whole tone lower, produc- ing the third set of sounds; the third

@) «a piston, in the same way, lowers the —a aa

instrument a tone and a half, as in “—bg—-—- —— —— (4) o f = (4); by the simultaneous employ-

= —=ment of the second and third pis- — —— tons we arrive at two tones, as in (5);

(5) b Be: the combination of the first and

—— ee third pistons lowers the instrument = two tones and a half, as shown in (6);

= =

1 Der sich selbst informirende Musicus, Augsburg, 1762, by Johann Jacob Lotter.

2 It need hardly be remarked that the higher semitone cannot be produced in the first position.

3 This was mentioned in the Leipsic Allgemeine musikalische

Zeitung in 1815, the merit of the invention being assigned to Heinrich Stolzel of Pless in Silesia.

(6) oe “& ‘nally, uniting the three pistons lowers ee = the trombone three tones and a half, —— as shown in (7).

(7) is a esateing the increased facility SSeeeee = obtained by the use of pistons, the —— — very far from having gained the

suffrages of all players: many prefer the slide, believing that it gives a facility of emission that they cannot obtain with a piston trombone. For this illustration of the use of pistons, we have taken a tenor trombone in Bh; the flat tonalities having been preferred for military music since the commencement of the 19th century, the pitch of each variety of trombones has been raised a semitone. At present six trom- boues are more or less in use, viz., the alto trombone in F, the alto in Eb (formerly in D), the tenor in Bb (formerly in A), the bass in G, the bass in F (formerly in E), the bass in Eb (formerly in D). This transposition has uo reference to the number of vibrations that may be officially or tacitly adopted as the standard pitch of

any country or locality. A trombone an octave lower than the tenor has recently been reintroduced into the orchestra, principally by Wagner. The different varieties just cited are con- structed with pistons or slides, as the case nay be. (Vv. M.)

TROMP, the name of two famous Dutch admirals.

I. Martin Harpertzoon Tromp (1597-1653) was born at Brielle, South Holland, in 1597. At the age of eight he made a voyage to the East Indies in a merchantman, but was made prisoner and spent several years on board an English cruiser. On making his escape to Holland he entered the navy in 1624, and in 1637 was made lieutenant- admiral. In February 1639 he surprised, off the Flemish coast near Gravelines, a large Spanish fleet, which he com- pletely destroyed, and in the following September he de- feated the combined fleets of Spain and Portugal off the English coast—achievements which placed him in the first rank of Dutch naval commanders. On the outbreak of war with England Tromp appeared in the Downs in command of a large fleet and anchored off Dover. On the approach of Blake he weighed anchor and stood over towards France, but suddenly altered his course and bore down on the English fleet, which was much inferior to his in numbers. In the engagement which followed (19th May 1652) he had rather the worst of it and drew off with the loss of two ships. In November he again appeared in command of eighty ships of war, and a convoy of 300 merchantmen, which he had undertaken to guard past the English coast. Blake resolved to attack him, and, the two fleets coming to close quarters near Dungeness on the 30th November, the English, after severe losses, drew off in the darkness and anchored off Dover, retiring next day to the Downs, while Tromp anchored off Boulogne till the Dutch merchantmen had all passed beyond danger. The statement that he sailed up the Channel with a broom at his masthead in token of his ability to sweep the seas is probably mythical. In the following February (1653), while in charge of a large convoy of merchantmen, he maintained a running fight with the combined English fleets under Blake, Penn, and Monk off Portland to the sands of Calais, and, though baffling to some extent the purposes of the English, had the worst of the encounter, losing nine ships of war and thirty or forty merchantmen. On 3d June he fought an indecisive battle with the English fleet under Dean in the Channel, but the arrival of

reinforcements under Blake on the following day enabled the English to turn the scale against him and he retired to the Texel with the loss of seventeen ships. Greatly discouraged by the results of the battle, the Dutch sent commissioners to Cromwell to treat for peace, but the proposal was so coldly received that war was imme- diately renewed, Tromp again appearing in the Channel towards the end of July 1653. In the hotly-contested conflict which followed with the English under Monk on the 29th Tromp was shot by a musket bullet through the heart. He was buried with great pomp at Delft, where there is a monument to his memory in the old church.

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II. Cornetivs Tromp (1629-1691), the second son of the preceding, was born at Rotterdam on 9th September 1629. At the age of nineteen he commanded a small squadron charged to pursue the Algerian pirates. In 1652 and 1653 he served in Van Galen's fleet in the Mediter- ranean, and after the action with the English fleet off Leghorn, 13th March 1653, in which Van Galen was killed, Tromp was promoted to be rear-admiral. On 13th July 1665 his squadron was by a hard stroke of ill fortune de- feated by the English under the duke of York. In the fol- lowing year Tromp served under De Ruyter, and on account of De Ruyter's complaints of his negligence in the action of 5th August he was deprived of his command. He was, however, reinstated in 1673 by the stadtholder William, afterwards king of England, and in the actions of 7th and 14th June, against the allied fleets of England and France, manifested a skill and bravery which completely justified his reappointment. In 1675 he visited England, when Charles II. created him a baron. In the following year he was named lieutenant-admiral of the United Pro- vinces. He died at Amsterdam, 29th May 1691, shortly after he had been appointed to the command of a fleet against France. Like his father he was buried at Delft.

See H. de Jager, Het Geslacht Tromp, 1883.

TROMSO, a town of Norway, capital of the amt of the same name and an episcopal see, stands on the eastern shore of a low fertile islet of the same name between Hvaloe and the mainland, in 69° 38' N. lat. and 18° 55' E. long. It consists principally of one wide street of wooden houses ; the chief

public buildings are the town-hall, the national church, the Roman Catholic church, and the museum, which contains a good zoological collection. The town has a high school and a normal seminary. The main specialty of the place is bears' skins and other kinds of fur. The herring fishery of Tromsé is very productive, and the activity of the town is further increased by the circum- stance that it is the port of call for ships making for the seal fishing and walrus hunting on Spitzbergen and Nova Zembla. Tromsé was founded in 1794. The population, which in 1816 did not exceed 300, was 5409 in 1882.

TRONDHJEM. See THronpHJeEm.

TROPIC-BIRD, so called of sailors from early times,! because, as Dampier (Voyages, i. p. 53) among many others testifies, it is 'never seen far without either Tropick," and hence, indulging a pretty fancy, Linnzeus bestowed on it the generic term, continued by modern writers, of Phaethon, in allusion to its attempt to follow the path of the sun.2 There are certainly three well-marked species of this genus, but their respective geo- graphical ranges have not yet been definitely laid down. All of them can be easily known by their totipalmate condition, in which the four toes of each foot are united by a web, and by the great length of the two middle tail-quills, which project beyond the rest, so as to have gained for the birds the names of " Rabijunco," " Paille- en-queue," and " Pijlstaart" among mariners of different nations. These birds fly to a great distance from land and seem to be attracted by ships, frequently hovering round or even settling on the mast-head.

The Yellow-billed Tropic-bird, P. flavirostris or candidus, appears to have habitually the most northerly, as well, perhaps, as the

1 More recently sailors have taken to call it '' Boatswain-bird "»— a name probably belonging to a very different kind (ef. Sxua).

- Occasionally, perhaps through violent storms, Tropic- birds wander very far from their proper haunts. In 1700 Leigh, in his 1. H. Lancashire (i. pp. 164, 195, Birds, pl. i, fig. 3), described and figured a "Tropick Bird" found dead in that county. Another is said by Mr Lees (Zoologist, ser. 2, p. 2666) to have been found dead at Cradley near

Malvern—apparently before 1856 (J. H. Gurney, jun., op. cit., p. 4766) —which, like the last, would seem (W. H. Heaton, op. cit., p. 5086) to have been of the species known as P. aethereus. Naumann was told (Rhea, i. p. 25) of its supposed occurrence at

widest range, visiting Bermuda yearly to breed there, but also occurring numerously in the southern Atlantic, the Indian, and a great part of the Pacific Ocean. In some islands of all these three it breeds, sometimes on trees, which the other species are not known to do. However, like the rest of its congeners, it lays but a single egg, and this is of a pinkish white, mottled, spotted, and smeared with brownish purple, often so closely as to conceal the ground colour. This is the smallest of the group, and hardly exceeds in size a large Pigeon ; but the spread of its wings and its long tail make it appear more bulky than it really is. Except some black markings on the face (common to all the species known), a large black patch partly covering the scapulars and wing-coverts, and the black shafts of its elongated rectrices, its ground colour is white, glossy as satin, and often tinged with roseate. Its yellow bill readily distinguishes it from its larger con- gener P. aethereus, but that has nearly all the upper surface of the body and wings closely barred with black, while the shafts of its elongated rectrices are white. This species has a range almost equally wide as the last; but it does not seem to occur in the western part of the Indian Ocean. The third and largest species, the Red-tailed Tropic-bird, P. rubricauda or phenicurus, not only has a red bill, but the elongated and very attenuated rectrices are of a bright crimson red, and when adult the whole body shows a deep roseate tinge. The young are beautifully barred above with black arrow-headed markings. This species has not been known to occur in the Atlantic, but is perhaps the most numerous in the Indian and Pacific Oceans, in which last great value used to be attached to its tail-feathers to be worked into ornaments.?

That the Tropic-birds form a distinct family, Phaethon- tidz, of the Steganopodes (the Dysporomorphe of Prof. Huxley), was originally maintained by Brandt, and is now generally admitted, yet it cannot be denied that they differ a good deal from the other members of the group‘; indeed Prof. Mivart in the Zoological Transactions (x. p. 364) will hardly

allow Fregata and Phaethon to be steg- anopodous at all; and one curious difference is shown by the eggs of the latter, which are in appearance so wholly unlike those of the rest. The osteology of two species has been well described and illustrated by Prof. Alph. Milne-Edwards in M. Grandidier's fine Ocseaua de Mada- gascar (pp. 701-704, pls. 279-281a). A. N.)

TROPPAU (Slavonic Opava), the chief town of Austrian Silesia, is a busy commercial place on the right bank of the Oppa, close to the Prussian border. A well-built town with extensive suburbs, it has two market-places and con- tains six churches, an old town-house recently restored in the Gothic style, and numerous educational, benevolent, and commercial institutions. The site of the former fortifica- tions is laid out in pleasant promenades. Troppau manu- factures large quantities of cloth, especially for the army ; and its industrial establishments include a large sugar- refinery and manufactories of machines and stoves. In 1880 the population was 20,562. German is spoken in the town proper, buta dialect of Polish prevails in the suburbs.

Troppau was founded in the 13th century ; but almost its only claim to historical mention is the fact that in 1820 the monarchs of Austria, Russia, and Prussia met here to deliberate on the tend- encies of the Neapolitan revolution. 'This congress of Troppau, however, left nearly the whole matter to be considered and decided at Laibach. The former principality of Troppau is now divided be- tween Austria and Prussia, the latter holding the lion's share.

TROTZENDORFF, or Troceporrivs, VALENTIN FrieDLAND (1490-1556), called Trotzendorff from his birthplace, near Gorlitz, in Prussian Silesia, was born on 14th February 1490, of parents so poor that they could not keep him at school. The boy taught himself to read and write while herding cattle; he made paper from birch bark, and ink from soot. When difficulties were overcome and he was sent for education to Gorlitz, his mother's last

Heligoland, and Col. Legge (B. Ceylon, p. 1174) mentions one taken in India 170 miles from the sea. The case cited by MM. Degland and Gerbe (Ornith. Européenne, ii. p. 863) seems to be that of an Albatros.

3 A fourth species, P. indicus, has been described from the Gulf of Oman, but doubt is expressed as to its validity (cf Legge, ué supra, pp. 1178, 1174).

4 Sulide (Gannet), Pelecanide# (PELICAN), Plotide (SNAKE-BIRD), Phalacrocoracidse (CORMORANT), and Fregatide (FRIGATE-BIRD).

words were ‘‘stick to the school, dear son.” The words determined his career : he refused all ecclesiastical promo- tion, and lived and died a schoolmaster. He became a distinguished student, learned Ciceronian Latin from Peter Mosellanus and Greek from Richard Croke, and after graduation was appointed assistant master in the school at Gorlitz. There he also taught the rector and other teachers. When Luther began his attack on indulgences, Trotzendorff resigned his position and went to study under Luther and Melanchthon, supporting himself by private tuition. Thence he was called to be a master in the school at Goldberg in Silesia, and in 1524 became rector. There he remained three years, when he was sent to Lieg- nitz. He returned to Goldberg in 1531 and began that career which has made him the typical German school- master of the Reformation period. His system of educa- tion and discipline speedily attracted attention. He made his best elder scholars the teachers of the younger classes, and insisted that the way to learn was to teach. He organized the school in such a way that the whole ordi- nary discipline was in the hands of the boys themselves. Every month a “consul,” twelve ‘“senators,” and two “censors” were chosen from the pupils, and over all Trot- zendorff ruled as “dictator perpetuus.” One hour a day was spent in going over the lessons of the previous day. The lessons were repeatedly recalled by examinations, which were conducted on the plan of academical disputa- tions. Every week each pupil had to write two “ exercitia styli,” one in prose and the other in verse, and Trotzendorff took pains to see that the subject of each exercise was something interesting. The fame of the Goldberg school extended over all Protestant Germany, and a large number of the more famous men of the following generation were taught by Trotzendorff. He died on 20th April 1556.

See Herrmann, Merkwiirdige Lebensgeschichte eines beriihmtes Schulmans, V. F. Trotzendorffs, 1727 ; Frosch, V. F. Trotzendorff, Rektor zw Goldberg, 1818; Pinzger, V. F. Trotzendorff (with the Goldberg portrait,

and a complete list of his writings), 1825 ; Koehler, V. F. Trotzendorff, ein biographischer Versuch, 1848. These biographies appear to take al/ their facts from a funeral or memorial oration delivered by Balthasar Rhau in the university of Wittenberg on 15th August 1564, and published in an edition of Trotzendorff's Rosarium, 1565.

TROUBADOURS. See Provencan LITERATURE, vol. xx, p. 873, and Franck, vol. ix. p. 646.

TROUGHTON, Epwarp (1753-1835), instrument maker, was born in the parish of Corney in Cumberland in October 1753. He joined his elder brother John in carrying on the business of mathematical instrument makers in Fleet Street, London, and continued it alone after his brother's death, until he in 1826 took W. Simms as a partner. He died in London on 12th June 1836.

Troughton was very successful in improving the mechanical part of most nautical, geodetic, and astronomical instruments. He was completely colour-blind, which prevented him from attempting ex- periments in optics. The first modern transit circle (see RobMER) was constructed by him in 1806 for Groombridge; but Troughton was dissatisfied with this form of instrument, which a few years afterwards was brought to great perfection by ReicHrnbacn and REPSOLD (qq.v.), and designed the mural circle in its place. The first instrument of this kind was erected at Greenwich in 1812, and ten or twelve others were subsequently constructed for other obser- vatories; but they were ultimately superseded by Troughton's earlier design, the transit circle, by which the two coordinates of an object can be determined simultaneously. He also made transit instru- ments, equatorials, &c.; but his failure to construct an equatorial mounting of large dimensions, and the consequent lawsuit with Sir James South, embittered the last years of his life.

TROUT. See Satmonip#; also ANGLING, vol. il. p. 41.

TROUVILLE, a fashionable seaside town of France, chef-lieu of the department of Calvados, and a port of the English Channel, is situated at the mouth of the river Touques, on the right bank, 136 miles west-north-west of Paris and 34 north-east of Caen by rail. The climate is

mild, and the neighbourhood well wooded ; there are villas

in all styles of architecture, a casino, and vast stretches of sand where the visitors (15,000 in 1881) bathe and walk. With Havre, which lies on the other side of the estuary of the Seine, 8 or 10 miles off, there is continual steamer com- munication. In 1886 the population was 5750 (commune 6300). Deauville, on the left bank of the Touques, opposite Trouville, is remarkable for its casino, terrace, and fine mansions, but, except during the race-week in August, is comparatively deserted. In 1886 its population was 2100 (commune 2220). In 1866 a dock, 985 feet in length by 262 in breadth, with 24 feet of depth at high water, was constructed between Trouville and Deauville; in 1882 292 vessels (54,391 tons) entered and 283 (53,510 tons) cleared.

TROVER, or trover and conversion, the name of a form of action in English law no longer in use, corresponding to the modern action of conversion. It was brought for damages for the detention of a chattel, and differed from detinue in that the latter was brought for the return of the chattel itself. The name trover is due to the action having been based on the fictitious averment in the plaintiff's de- claration that he had lost the goods and that the defendant had found them. The necessity for this fictitious aver- ment was taken away by the Common Law Procedure Act, 1852. An action of trover lay (as an action of con- version still lies) in every case where the defendant was in possession of a chattel of the plaintiff and refused to de- liver it up on request, such refusal being prima facie evidence of conversion. The damages recoverable are usually the value of the chattel converted. In an action for detention of a chattel (the representative of the old action of detinue), the plaintiff may have judgment and execution by writ of delivery for the chattel itself or for its value at his option. An action for conversion or detention must be brought within six years. The corresponding action in Scotch law is the action of spuilzie. It must be brought within three years in order to entitle the pursuer to violent profits, otherwise it prescribes in forty years.

TROWBRIDGE, an ancient town of Wilts, England, is situated on the river Mere or Biss, a feeder of the Avon, and on a branch of the Great Western

Railway, 33 miles north-west of Salisbury and 974 west of London. The parish church of St James is an ancient stone structure in the Gothic style, with a west square tower, surmounted by a spire 159 feet in height, and a baptistery (1885). The site of the ancient castle was at the mound called Courthill, but all traces of it have long disappeared, it having been demolished before the reign of Henry VIII. Among the charitable institutions are the Edward and Yerbury alms- houses (1698), the old men's almshouses, and the cottage hospital (1886). There are a market house and a town hall. Public gardens 4 acres in extent were opened in 1884, A water company (incorporated in 1873) supplies the town with water from the chalk hills in the neigh- bourhood of Biss. The principal industry is the manu- facture of kerseymere and of broad and other woollen cloths, established as early as the reign of Henry VIII. The town is governed by a local board of health of twenty- one members. The population of the urban sanitary dis- trict (area 2080 acres) in 1871 was 11,508, and in 1881 it was 11,040.

The town was defended in behalf of Matilda against Stephen by Humphrey de Bohun. By Leland it is called Throughbridge or Thoroughbridge. Anciently it was a royal manor forming part of the duchy of Lancaster, having been grantcd by the crown to John of Gaunt. Afterwards it reverted to the crown and was given by Henry VIII. in the 28th ycar of his reign to Sir Edward Seymour. It again lapsed to the crown under Elizabeth, and in the 24th year of her reign was assigned to Edward, earl of Hertford. By mar- riage it passed to the Rutland family, who, however, eventually sold it. It formerly gave the title of baron to the Seymour family. The poet Crabbe was rector of the parish from 1814 to 1832.

TROY. See Troan.

TROY, a city of the United States, county seat of Rensselaer county, New York, is situated in 42° 44' N. lat. and 73° 41' W. long., upon the east bank of the Hudson river, at the head of tide water. It is nearly north of New York City (147 miles) and somewhat north of west from Boston (136 miles). The city, which has a length of about 4 miles, with an average breadth of 1 mile, is built mainly upon a level terrace slightly elevated above the river, but of

late years the residence portion has extended up the hills (rising to 400 feet) which limit this plain on the east. It is in the main regularly laid out, and is traversed by street railways. Troy is situated at what is practically the terminus of the Erie Canal, con- necting the Hudson river (here navigable for vessels of 8 to 10 feet draught) with Lake Erie, and of the Champlain Canal. It has three railroads, by which it is connected with New York on the south, Buffalo on the west, and also with the east and north. The principal industries, which

in 1880 gave employment to 22,434 persons, are metal- working, especially in iron and steel, and the making of

stoves and linen goods. The value of the products was $26,497,163. The city is the seat of the Rensselaer

Polytechnic Institute, which was for many years the lead- ing engineering school of the United States, and still The population, which in 1810 was only 3895, had in 1830 risen to 11,556, and by 1880 to 56,747 (27,154 males and 29,593 females, the

maintains a high reputation.

excess of the latter being explained by the large number of women employed as factory operatives). tion of foreign born (16,938) was large.

The city was founded in 1787 by the Vanderheyden, and two years later the present name was adopted.

In 1794 it was incorporated as a village, and in 1816 it received a The opening of the Erie and the Champlain Canals

city charter. in 1823 insured its prosperity and rapid growth.

TROY, Jean FRAncors pe (1679-1752), a French painter, highly endowed by nature, was born at Paris in

1679. He received his first lessons from his father, him-

self a skilful portrait-painter, who afterwards sent his son to Italy. There his amusements occupied him fully as much as his studies; but his ability was such that on his return he was at once made an official of the Academy and obtained a large number of orders for the decoration of public and private buildings, executing at the same time a quantity of easel pictures of very unequal merit. Amongst the most considerable of his works are thirty- six compositions painted for the hotel of De Live (1729), and a series of the story of Esther, designed for the Gobelins whilst De Troy was director of the school of France at Rome (17 38-51),—a post which he resigned in a fit of irritation at court neglect. He did not expect to be taken at his word, but found himself forced to return to France, and was making ready to leave when he died suddenly (24th January 1752) of an attack on the lungs,

His desire to make a figure in the world led him to neglect his more serious duties and injured his professional reputation. The life-size painting (Louvre) of the First Chapter of the Order of the Holy Ghost held by Henry IV., in the church of the Grands Augustins, is one of his most complete performances, and his dramatic composition, the Plague at Marseilles, is widely known through the excellent engraving of Thomassin. The Cochins, father and son, Fessard, Galimard, Bauvarlet, Herisset, and the painters

Boucher and Parrocel have engraved and etched the works of De Troy.

TROY, Wzst. See Wusr Troy.

TROYES, a town of France, formerly the capital of Champagne, and now chef-lieu of the department of Aube, and an episcopal see, is 104 miles south-east of Paris by the railway to Belfort, at the junction of the line from Orleans to Chalons. Several arms of the Seine and also

The propor-

Dutch, under the name of

the Haute-Seine Canal run through the town. The cathedral of St Peter and St Paul, the building of which lasted from 1206 till the 16th century, still

wants the south tower. The choir, the end chapels, and the sacristry were restored in 1849-1866. The 16th-century facade, with mutilated bas-reliefs and statues, is surmounted by the tower of St Peter (230 feet). The choir, one of the most beautiful in France, belongs to the 13th century, as does also its ré- markable glass. The treasury contains gospels of the 11th and 12th centuries, precious stones brought from the East at the time of the crusades, and ancient and beautiful lace. The unfinished church of St Urban, begun in 1262 at the expense of Urban IV., is a charming specimen of the best period of Gothic architecture, the side portals being remarkably light and delicate. The church of St Madeleine, built at the beginning of the 12th century, enlarged in the 16th, and recently restored, contains a rich rood-screen by Jean de Gualde (1508). In 1420 the treaty of Troyes was signed in the church of St John, where Henry V. of England and Catherine of France were sub- sequently married. The church of St Remy, with a Romanesque tower, the churches of St Nizier and St Nicholas, both of the 16th century, and that of St Pantaléon, of the 16th and 17th, should also be noticed. There are some curious fireplaces in the town hall (17th century), and the municipal archives contain the correspondence of the dukes of Lorraine and Guise. The old abbey of St Loup is occupied by the library (80,000 volumes and 2720 manuscripts) and a museum containing numerous collec- tions ; that relating to natural history is rich in ornithology and entomology, and has many aerolites. Most of the old houses of Troyes are of wood, but some of stone of the 16th century are remarkable for their beautiful and original architecture. The chief industry of Troyes and the surrounding district is the manufacture of cotton and woollen hosiery, which is woven almost entirely by hand, and is exported to America and Switzerland. One-fourth of the population live by subsidiary industries. There are 14 cotton mills with 10,000 spindles, bleaching, dressing, and dye works, workshops for making looms, needle factories, iron and copper foundries, 8 flour mills, and nursery and market gardens. A trade is carried on in pork and cheese. A few miles from the town stands the curious church of St Andrew (16th century), with a remarkable portal. The population in 1886 was 46,972 (46,067 in 1881).

At the beginning of the Roman period Troyes (Augustobona) was the principal settlement of the Tricassi. It was christianized in the 8rd century, and its bishop St Loup (426-479) founded renowned schools, and averted

the fury of Attila. In 484 Troyes passed into the hands of Clovis, and belonged sometimes to Neustria, sometimes to Austrasia, till all Gaul was united under Charles Martel, In 878 Pope John VIII. presided at a council in Troyes. The town was fired and sacked by the Saracens in 720, and by the Normans in 889 and 905. In’ 1229 Theobald IV., besieged in his capital, was delivered by king Louis IX., and in 1230 he granted the inhabitants a municipal charter. From this time the fairs of Troyes became celebrated. During the captivity of King John in England, Troyes resisted all attacks, and after Agincourt took the part of the Burgundians. In 1417 the rule of Queen Isabeau of Bavaria was established in Troyes, where in 1418 the parlement of Paris met ; and on 21st May 1420 Henry V. of England, Charles VI. of France, Isabeau, and Philip of Burgundy signed the famous treaty of Troyes. On 9th July 1429 the town capitulated to Joan of Arc. In the 16th century Protestantism made rapid progress, but in 1562 the Huguenots were forced to retire to Bar-sur-Seine ; after the massacre of St Bartholomew in Paris, the Calvinists in the prisons of Troyes met the same fate. In 1577 the inhabitants Joined the League, and only opened their gates to Henry IV. in 1594. In 1787 the parlement of Paris again met here. In 1814 both the allied and the imperial armies occupied Troyes; and in 1870 the town was occupied by the Germans.

TROYES, Curestren pr. See CHRESTIEN DE TROYEs, and RoMANc#E, vol. xx. p. 645. TRUCE OF GOD. The orderly administration of

justice and the universal peace, which the Roman empire

established from the Euphrates to the Atlantic, did not long survive the inroads of the Teutonic tribes who in western Europe divided the inheritance of the Latin world. All the early Teutonic codes, being based, however remotely, on the right of private war and private vengeance, might discourage, but were powerless to abolish, the instinct which impels the members of half-civilized communities to avenge their own wrongs. Hence the pax Romana died with the empire ; nor could the splendid organization of Charlemagne do more than effect a very partial resusci- tation of it. Throughout the 9th and 10th centuries, as the life-benefices of the later

Carolingian kings became gradually transformed into hereditary fiefs, the insecurity of life and property grew greater ; for there was no central

power to curb the injustice of the petty dukes and counts.

who warred and pillaged at their will. At this moment, when western Europe threatened to sink back into the chaos from which it had been won by Rome, the church came forward to arrest the process of its dissolution. Speaking at first in her own interest and in that of the poor, whose great protector she claimed to be, she decreed a special peace for the unarmed clerk and the industrious husbandman. The council of Charroux in Poitou led the way in 989, With the opening of the next century the movement spread over Aquitaine and the rest of France. Everywhere the bishops set themselves to exact from the whole diocese, noble and simple alike, a novel oath to abstain from violence and to respect the sanctity of churches. William V. of Aquitaine, the most powerful lord of southern France, lent his influence to the cause at the councils of Limoges (994) and Poitiers (999). The latter council prescribed the methods by which all who violated their solemn engagement should be punished. The times, however, were hardly ripe for the inauguration of an era of peace. Gerard of Soissons, perhaps, was not the only bishop who eyed this dream of universal harmony askance, as tending to encroach on the king's prerogative (see Bouquet, x. 201); and, on the whole, it may be said that the "Peace of God" was at best but a somewhat ineffectual protection to churches, priests, and labourers. If there was any hope of restraining the mutual feuds of the barons it must be by other means. And here the church again, re- cognizing the impossibility of absolutely stopping all feudal warfare, endeavoured to limit it. This limitation of the right of perpetual warfare, reduced to writing, sanctioned by an oath, and confirmed by the decrees of councils, assumed the name of the "Truce of God" (éreva or treuga Dei). The truce of God seems to have been first estab- lished at the synod of Tuluges, near Perpignan in Roussil- lon, on 16th May 1027. In accordance with its decrees all warfare was to be suspended from noon on Saturday till prime on Monday ; and the peace of God was perman- ently extended to all monks, clerks, bishops, and churches. Like the paz ecclesiz, this laudable example was soon fol- lowed elsewhere. About 1041 it extended itself over Aquitaine and all France; in 1042 the council of Caen, under the sanction of Duke William, established

it in Normandy—a country in which, according to a contempo- rary writer (Rodolph Glaber, v. 1), it was not at first accepted. By this time its terms had been much enlarged ; and we may perhaps take the provisions of a second synod at Tuluges (1041) as representing its normal form. According to this synod the treuga Dei was to last from the Wednesday evening to the Monday morning in every week, from the beginning of Advent to the octave of the Epiphany, from the beginning of Lent till the octave of Pentecost, for the feasts of the Holy Cross, the three great feasts of the Virgin, and those of the twelve apostles and a few other saints. More usually the interval between the Epiphany octave and Lent and that from Easter to

Rogations were left subject to the weekly truce only. Thus from being a mere local institution it spread rapidly over all France, and seems to have crossed into Germany, Italy, Spain, and England. It had also its special courts and methods of procedure. Excommunication and banish- ment for seven or thirty years were its penalties. Before long both the pax ecclesrx and the treuga Dei were sanc- tioned by the holy see. Special clauses were added to protect pilgrims, women, merchants, monks, and clerks ; while the cattle and agricultural implements of the peasant —his ox, horse, plough, and even his olive-trees—were covered by the egis of the church. The first olause of the council of Clermont (1095), at which Urban IT. preached the first crusade, proclaimed the weekly truce for all Christendom, and perhaps enjoined it in its most extended form, adding also a clause by which the oath was to be renewed every three years by all men above the age of twelve, whether noble, burgess, villain, or serf.1_ The same council seems to have accorded safety to all who took re- fuge at a wayside cross (cap. 29) or at the plough (homines ad carrucas fugientes). The truce of God was most powerful in the 12th century, during which period it was sanctioned both by local and papal councils, such as that held at Rheims by Calixtus IT. in 1119, and the Lateran councils of 1139 and 1179. With the 13th century its influence began to decline, as the power of the king gradually led to the substitution of the king’s peace for that of the church.

For an exhaustive account of the whole question, see M. Semi- chon’s book, to which the above article is largely indebted.

TRUCK SYSTEM. See Lazovr, vol. xiv. p. 172, and WAGES.

TRUFFLE, the name of several different species of sub- terranean fungi which are used as food. The species sold in English markets is Zuber xstivum; the commonest species of French markets is.7. melanosporum, and of Italian the garlic-scented Z. magnatum. Of the three, the English species is the least excellent, and the French is possibly the best. The truffle used for Perigord pie (pdté de foie gras) is TZ. melanosporum. When, however, the stock of Z’. melanosporum happens to be deficient, some manufacturers use inferior species of Zuber, such as the worthless or dangerous Cheromyces meandriformis. Even the rank and offensive Scleroderma vulgare (one of the puft- ball series of fungi) is sometimes used for stuffing turkeys, sausages, &c. Indeed, good truffles, and then only 7’. xsti- vum, are seldom seen in English markets. The taste of 7. melanosporum can be detected in Perigord pie of good quality. True and false truffles can easily be distinguished under the microscope.

Tuber xstivum, the English truffle, is roundish in shape, covered with coarse polygonal warts, black in colour outside and brownish and veined with white within ; its average size is about that of a small apple. It grows from July till autumn or winter, and pre- fers beech, oak, and birch woods on argillaceous or calcareous soil, and has sometimes been observed in pine woods. It grows gregari- ously, often in company with 7. brwmale and (in France and Italy) T. melanosporum, and sometimes appears in French markets with these two species, as well as with 7’. mesentericum. The odour of T. xstivum is very strong and penetrating ; it is generally esteemed powerfully fragrant, and its taste is considered agreeable. Its price in England is two or three shillingsa pound. The common French truffle, 7. melanosporwm, is a winter species. The tubers are globose, bright brown or black in colour, and rough with polygonal warts ; the mature flesh is blackish grey, marbled within with white veins. It is gathered in autumn and winter in beech and oak woods, and is frequently seen in Italian markets, where it is some- times sold for 12s. 6d. a pound. The odour of 7. melanosporwm is very pleasant, especially when the tubers are young, then

some- what resembling that of the strawberry ; with age the smell gets very potent, but is never considered really unpleasant. The com- mon Italian truffle, 7. magnatum, is pallid ochreous or brownish buff in colour, smooth or minutely papillose, irregularly globose, and lobed ; the interior is a very pale brownish liver colour veined

1 Labbe's Concilia, xx. 816 ; with which ¢f Semichon, La Paix et la Tréve de Dieu, Paris, 1869, p. 125.

with white. It grows towards the end of autumn in plantations of willows, poplars, and oaks, on clayey soil. Sometimes it occurs in open cultivated fields. The odour of the mature fungus is very potent, and is like strong garlic, onion, or decaying cheese. 7. brumale, referred to above, grows in Britain. It is a winter truffle, and is found chiefly under oaks and abele trees from October to December. It is black in colour, globose, more or less regular in shape, and is covered with sharp polygonal warts; the mature flesh is blackish grey marbled with white veins. The odour is very strong and lasts a long time ; the taste is generally esteemed agree- able. Cheromyces meandriformis, which occurs in Britain, is some- times sold for 7. magnatwm, the colour of the flesh of both species being somewhat similar. Scleroderma vulgare, the a false truffle,

is extremely common on the surface of the ground in woods, and is gathered by Italians and Frenchmen in Epping Forest for the inferior dining-rooms of London where Continental dishes are served. It is a worthless, offensive, and possibly dangerous fungus. A true summer trufile, 7. mesentericwm, found in oak and birch woods on calcareous clay soil, is frequently eaten on the Continent. It is esteemed equal to 7. awstivum. It probably grows in Britain. Another edible species, 7. macrosporum, also grows in Britain, in clayey places under young beeches and oaks, on the borders of streams and roads, and sometimes in fields ; more rarely it grows in plantations of willow and poplar. j onions or garlic. Terfezta leonis, a famous truffle of Italy, Algeria, Sardinia, &c., resembles externally a potato. It grows in March, April, and May. Some persons eat it in a raw state, sliced, and dipped in oil or egg. It is not scented, and its taste is generally considered insipid or soapy. Sometimes an ally of the puff-balls, and

therefore (like Scleroderma) not a true trufile, Melanogaster variegatus, is eaten in England and France. It has been, and possibly still is, occasionally sold in England under the name of “red truffle.” It is a small ochreous brown species with a strong aromatic and pleasant odour of bitter almonds. When the plant is eaten raw the taste is sweet and sugary, but when cooked it is hardly agreeable. The odour belonging to many truffles is so potent that their places of growth can be readily detected by the odour exhaled from the ground. Squirrels, hogs, and other animals commonly dig up truffles and devour them, and pigs and dogs have long been trained to point out the places where they grow. Pigs will always eat truffles and dogs will do so occasionally ; it is there- fore usual to give the trained pig or dog a small piece of cheese or some little reward each time it is successful. Truffles are repro- duced by spores, bodies which serve the same urpose as seeds in flowering plants ; in true truffles the spores are borne in transparent asci or sacs, from four to eight spores in each ascus. The asci are

Spores of the chief European trufiles,

Enlarged 500 diameters. zstivum; 2, T. brumale; 8, T. melanosporum; 4, T. mesentericum ; 5, I’. mag- natum ; 6, Cheromyces meandriformis ; 7, Scleroderma vulgare; 8, Melanogas- ler variegatus,

1, Tuber

embedded in vast numbers in the flesh of the truffle. In false truffles the spores are free and are borne on minute spicules or supports. The spores of the chief European truffles, true and false, enlarged five hundred diameters, are shown in the accompanying illustration. Many references to truffles occur in classical authors. The truffle Elaphomyces variegatus was till quite recent times used, under the name of Hart’s nut or Lycoperdon nut, on account of its supposed aphrodisiac qualities.

TRUMBULL, the surname of more than one individual of note in the literature, art, and politics of America.

1. Bensamin TRUMBULL was born at Hebron, Connecti- cut, on 19th December 1735, and died at North Haven, Connecticut, on 2d February 1820. He graduated at Yale in 1759, and entered the ministry. His literary

work was considerable, the most important being the standard His- tory of Connecticut to 1764.

2. Joun TRUMBULL was born at Waterbury, Connecti- cut, on 24th April 1750, and died at Detroit, Michigan, on 12th May 1831. He graduated at Yale in 1767 , and became a lawyer and author of high reputation. His best

It has a strong scent of

joined.!

TRU—TRU

work is M‘Fingal, a Hudibrastic poem, intended to serve the Whig side in the American Revolution.

3. JOHN TRUMBULL, son of the following, was born at Lebanon, Connecticut, on 6th June 1756, and died at New York City, on 10th November 1843. He graduated at Harvard in 1773, studied painting with Benjamin West in London, and left at his death a number of historical works. The earlier of these are the better; the later and larger were painted for the capitol at Washington.

4, JONATHAN TRUMBULL was born at Lebanon, Con- necticut, on 10th June 1710, and died at the same place on 17th August 1785. He graduated at Harvard in 1727, and became a lawyer and colonial politician. His place in American history was gained as governor of Connecticut from 1769 until 1783, through the whole period of the American Revolution. He was a trusted supporter and confidential adviser of Washington, who was accustomed to speak of him as “brother Jonathan,” and the term has since passed into popular use as equivalent to the people of the United States.

5. JONATHAN TRUMBULL, son of the preceding, was born at Lebanon, Connecticut, on 26th March 1740, and died at the same place on 7th August 1809. He graduated at Harvard in 1759, and served as member of congress, 1789-95 (being speaker of the house of representatives dur- ing the last two years of his term), as United States senator, 1795-96, and as governor of Connecticut, 1798-1809.

TRUMPET, a musical instrument, consisting of a long, narrow brass tube, cylindrical for the greater part of its length: the fusiform development which terminates in the bell or opening of the lower end only begins at a point that varies from a third to a fourth of the total length from that extremity. The air inside is set in vibration by the lips (which act as true reeds) applied to the edges of a basin-like mouthpiece fitted to the upper part of the instrument. The material has nothing to do with the production of that brilliant quality of tone by which the trumpet is so easily distinguished from every other mouth- piece instrument: the difference is partly due to the dis- tinct form given to the basin of the mouthpiece, but prin- cipally to the proportions of the column of air determined by the conical or cylindrical form of its envelope.

The possibility of producing sonorous disturbance of a mass of air through a mouthpiece, or more simply through the orifice of the tube, has been known from a very early period, —a shell bored at its extremity, or a horn with the point removed, being without doubt the most ancient instrument for producing sound. Nearly all the nations of antiquity had mouthpiece instruments; but the greater number of these, though grouped under the general de- signation of trumpets, have only a very distant relationship to the modern instrument. The Romans had four such instruments,—the tuba, buccina, cornu, and lituus. The tuba, represented in the bas-reliefs of the triumphal arch of Titus, was a kind of straight bronze clarion, with a conical column of air. It is ordinarily designated the Roman trum- pet, and was about 39 inches long ; its compass should not go beyond the first six proper notes of the harmonic scale. The Roman tuba and the Greek salpinx are supposed to be one and the same instrument. The buccina was also of bronze, with a tube measuring fully 11 feet in length. The tube is only slightly conical, and the quality of tone bears a striking resemblance to that of the bass trombone in G; the proper tones for har- — oe Aen hee those sub- = = ———— The cornu was Soe often made of a bullock’s horn, but bronze was also employed,

1 The difficulty of producing the fundamental or first proper note increases with the length and narrowness of the tube. The propor- tions of the buccina render the production of this note very difficult.

as in a specimen in the British Museum. This instrument measured 4 feet 6 inches in length, and the scale was that herewith shown. The Roman cornu was probably like the Greek keras. The three preceding instruments were used in giving signals to the infantry. The cavalry calls were given with the lituus, a specimen of which exists in the museum of the Vatican, found in 1827 in a tomb at Cerveteri (Czre). The tube is cylindrical for the greater part of its length, its conical development beginning only at the lower end, where the instrument begins to curve. The lituus easily produces the accompanying -~—-——— ae proper notes; its quality of == =

tone is like that of a trumpet =

in G. In Ireland and Denmark numerous mouthpiece instruments in bronze have been found, sixteen different specimens being preserved in the museum of the Royal Irish Academy at Dublin, and six (of which facsimiles exist in South Kensington Museum) in the museum at Copenhagen. But none of these have the proportions of a trumpet ; all, by the conical development of the tube as well as by the curved form, recall their first model, the horn, successive transformations of which have given rise to the clarion and the numerous family of bugles.

We have no precise information as to the form which the lituus, the ancestor of the modern trumpet, assumed during the Middle Ages. A miniature in the Bible! pre- sented in 850 to Charles the Bald places the lituus in the hands of one of the companions of King David, but we are not warranted in concluding from this that the Etruscan instrument was in use in the 9th century. The earliest representation of the trumpet with its present proportions of tube and form of bell seems to belong to the 15th century. Fra Angelico (d. 1455) has painted angels with trumpets having either straight or zigzag tubes, the shortest being about 5 feet long. The perfect representation of the details, the exactness of the propor- tions, the natural pose of the angel players, suggest that the artist painted the instruments from real models.

The credit of having bent the tube of the trumpet in three parallel branches, thus creating its modern form, has usually been claimed for a Frenchman

named Maurin

(1498-1515).

Italy about the middle of the 15th century, as is proved by the bas-reliefs of Luca della Robbia intended to orna- ment the organ chamber of the cathedral of Florence (see vol. xx. p. 588); there a trumpet having the tube bent back as just described is very distinctly figured. From the beginning of the 16th century we have numerous sources of information. Virdung? cites three kinds of mouthpiece instruments—the /felttrumet, the clareta, and the thurner horn ; unfortunately he does not niention their distinctive characters, and it is impossible to make them out by examination of his engravings. Probably the felttrumet and the clareta closely resembled each other ; but the compass of the former, destined for military sig- nals, hardly went beyond the 8th proper tone, while the latter, reserved for high parts, was like the clarino (see below). The thurner horn was probably a kind of clarino or clarion used by watchmen on the towers. The trummet and the jdger trommet are the only two mouth- piece instruments of the trumpet kind cited by Preetorius.? The first was tuned in D at the chamber pitch or " kam- merton," but with the help of a shank it could be put in C, the equivalent of the "chorton" D, the two differ- ing about a tone. Sometimes the trummet was lowered

1 Tn the Bibliothéque Nationale.at Paris. 2 Musica getutscht und auszgezogen, Basel, 1511. 3 Organographia, Wolfenbiittel, 1619.

But the transformation was really made in °

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to Band even Bb, The jaiger trommet, or "trompette de chasse," was composed of a tube bent several times in circles, like the posthorn, to make use of a comparison employed by Pretorius himself. His drawing does not make it clear whether the column of air was like that of the trumpet ; there is therefore some doubt as to the true character of the instrument. The same author further cites a wooden trumpet (Aélzern trommet), which is no other than the Swiss alpen-horn or Norwegian luur. Mersenne's* information is not very instructive; but he gives a description of the sowrdine, a kind of

mute or damper introduced into the bell, already employed in his time, and still made use of to weaken the sound. The shape of the trumpet, as seen in the bas-reliefs of Luca della Robbia, was retained for more than three hundred years: the first alterations destined to revolutionize the whole technique of the instrument were made about the middle of the 18th century. Notwithstanding the im- perfections of the trumpet during this long period, the performers upon it acquired an astonishing dexterity. The usual scale of the typical trumpet, that in D, is

Pretorius exceeds the limits of this compass in the higher range, for he says a good trumpeter could produce the subjoined notes. 2 e: = This opinion is shared by Bach, who, eee EE in a trumpet solo which ends the ——————— cantata “Der Himmel lacht,” wrote up a to the twentieth of these sounds. So considerable a compass could not be reached by one instrumentalist : the trumpet part had therefore to be divided, and each division was designated by a special name.’ The fundamental or first proper note was called jflattergrob, the second grobstimme, the third faulstimme, the fourth mittelstimme. The part that was called principal went from the fifth to the tenth of these tones. The higher region, which had received the name of “clarino,” was again divided into two parts: the first began at the eighth proper tone and mounted up towards the extreme high limit of the com- pass, according to the skill of the executant ; the second, beginning at the sixth proper tone, rarely went beyond the twelfth. Each of these parts was confided to a special trumpeter, who executed it by using a larger or a smaller mouthpiece.

Playing the clarino differed essentially from playing the military trumpet, which corresponded in compass to that called principal. Compelled to employ very small mouthpieces to facilitate the emis- sion of very high sounds, clarino players could not fail to alter the tone of the instrument, and instead of getting the brilliant and energetic quality of tone of the mean register they were only able to produce more or less doubtful notes without power and splendour. Apart from this inconvenience, the clarino presented numerous deviations from just intonation. Hence the players of that time failed to obviate the bad effects inevitably resulting from the natural imperfection of the harmonic scale of the trumpet. in that extreme part of its

compass; in the execution, for instance, of the works of Bach, where the trumpet should give sometimes

, and —, the instrumentalist could only com- == some- — mand the eleventh proper tone, which times is neither the one nor the other of these.

Further, the thirteenth proper tone, for which ~9-—@—. is written, is really too flat, and it is absolutely im- == possible to remedy this defect, since it entirely depends the laws of resonance affecting columns of air.

Since the abandonment of the clarino (about the middle of the 18th century) our orchestras have been enriched with trumpets that permit the execution of the old clarino parts, not only with perfect justness of intonation, but with a quality of tone that is not deficient in character when compared with the mean register of the old principal instrument. The introduction of the clarinet or little clarino is one of the causes which led to the abandonment: of the older instrument and may explain the preference given by the composers of that epoch to the mean register of the trumpet. The clarino having disappeared before Mozart’s day, he had to. change the trumpet parts of Handel and Bach to allow of their execution by the performers of his own time. It was now that. crooks began to be frequently used. Trumpets were made in F instead of in D, furnished with a series of shanks of increasing length for the tonalities of E, Eh, D, Dp, C, B, Bh, and sometimes. even A.

4 Harmonie Universelle, Paris, 1636.

> Der sich selbst informirende Musicus, Augsburg, 1762, by Lotter.

upon

The first attempts to extend the limited resources of the instru- ment in its new employment arose out of Hampel’s idea of lowering the harmonic sounds by introducing the hand into the bell. But, instead of fixing the

shanks between the mouthpiece and the upper extremity, they were adapted to the body of the instrument itself by a double slide, upon the two branches of which tubes were in- serted bent in the form of a circle and gradually lengthened as required. This modified instrument became known as the “in- vention horn.” This system was applied to the trumpet by Michel Woegel (born at Rastatt in 1748), whose “invention trumpet” had a great success, notwithstanding the unavoidable imperfection of a too great disparity in quality of tone between the open and the closed sounds. The idea of applying the trombone slide to the trumpet is obvious. The slide trumpet is mentioned by T. E. Altenburg,! who compares it, and with reason, to the alto trombone; and there are grounds for identifying it with the “tromba da tirarsi” employed by J. S. Bach in some of his com- positions. The slide trumpet is still used in England in a some- what modified form. About 1760, Kolbel, a Russian musician, applied a key to the horn, and soon afterwards the trumpet re- ceived a similar addition. By opening this key, which is placed near the bell, the instrument was raised a diatonic semitone, and by correcting errors of intonation by the pressure of the lips in the mouthpiece the following diatonic succession was obtained.

ee This invention was improved === = o—*-— in 1801 by Weidinger, trum- : peter to the imperial court at Vienna, who increased the number of keys and thus made the trumpet chromatic thoughout its scale. The instrument shown in the accompanying figure is in G; the keys are five in number, and as they open one after another or in combination

it is possible to connect the second proper tone with the third by chromatic steps, and thus

produce the following succession. The number

———————— of keys

SSS wee ap- — — 2 ew

= : fF = a. plied to

A fill wp the

gaps between the extreme sounds of the interval of a fifth ; and a like result was arrived at more easily for the intervals of the fourth, the major third, &c., furnished by the proper tones of 8, 4, 5, &c. But, though the keyed trumpet was a notable improvement on the invention trumpet, the sounds obtained by means of the lateral open- ings of the tube did not possess the qualities which distinguish sounds caused by the reson- ance of the air-column vibrating in its entirety. But in 1815 Stolzel made a genuine chromatic trumpet PY the invention of the ventile or piston; for this ingenious mechanism, see S ‘Tromsone. The simple trumpet is now no i longer employed except in cavalry regiments, Keyed trumpet. It is usually in Eh. The bass wane in Eb, which is an octave lower, is sometimes, but rarely, used. Trumpets with pistons are generally constructed in F, with crooks in E and Eb. In Ger- many trumpets in the high Bb with a crook in A are very often used in the orchestra. They are easier for cornet A piston players than the trumpet in F. The present writer has recently constructed for the concerts of the Conservatoire at Brussels trumpets in the high D, an octave above the old trumpet in the same key. They permit the execution of the high trumpet parts of Handel and J. 8. Bach. The bass trumpet with pistons used for Wagner’s tetralogy is in Eb, in unison with the ordinary trumpet with crooks of D and C ; but, when constructed so as to allow of the production of the second proper tone as written by this master, this instrument belongs rather to the trombones than to the trumpets. (V. M.) TRUMPET, Speakine anp Hzarine. The speaking trumpet, though some instrument of the kind appears to have been in earlier use in more than one part of the world, 1s connected in its modern form with the name of Athanasius Kircher and that of Sir Samuel Morland, who in 1670 proposed to the Royal Society of London the ques- tion of the best form for a speaking trumpet. Lambert, in the Berlin Memoirs for 1763, seems to have been the first to give a theory of the action of this instrument, based on an altogether imaginary analogy with the behaviour of light. In this theory, which is still commonly put forward, it is assumed that sound, like light, can be propagated in rays.

This, however, is possible only when the aperture through

1 Versuch einer Anleitung zur heroisch-mustkalischen Trompeter- und Pauker-Kunst, Halle, 1795,

which the wave-disturbance passes into free air is large compared with the wave-length. If the fusiform mouth of the speaking trumpet were half a mile or so in radius, Lambert's theory might give an approximation to the truth. But with trumpets whose aperture is only a foot in diameter at most the problem is one of diffraction ; and it has not yet been seriously studied from this point of view.

In the case of the hearing trumpet, the disturbance is propagated along the converging tube much in the same way as the tide-wave is propagated up the estuary of a tidal river.

Until the theory has been rigorously worked out the only safe course to adopt in manufacturing either class of instruments is to be guided by the results of varied trials.

The theoretical foundations of the subject will be found in Lord Rayleigh's Sound and in Sir G. Airy's Tides and Waves, respectively. In speaking and hearing trumpets alike all reverberation of the instrument should be avoided by making it thick and of the least elastic materials, and by covering it externally with cloth.

TRUMPETER, or Trumprt-Birp, the literal rendering in 1747, by the anonymous English translator of De la Condamine's travels in South America (p. 87), of that writer's " Oiseau trompette" (Mém. de l'Acad. des Sciences, 1745, p. 473), which he says was called "Trompetero " by the Spaniards of Maynas on the upper Amazons, from the peculiar sound it utters. He added that it was the '"Agami" of the inhabitants of Para and Cayenne," wherein he was not wholly accurate, since those birds are specifically distinct, though, as they are generically united, the state- ment may pass. But he was also wrong, as had been Barrere (France Equinowiale, p. 132) in 1741, in identify- ing the "Agami" with the "Macucagua" of Marcgrave,

ep STG

— = SSS SS : — Wie — (E Steep —__ . sage

White-winged trumpeter (Psophia leucoptera). After Mitchell.

for that is a TrnaMmou (q.v.); and both still more wrongly accounted for the origin of the peculiar sound just men- tioned, whereby Barrere was soon after led (Ornith. Spec. Novum, pp. 62, 63) to apply to the bird the generic and vulgar names of Psophia and " Petteuse," the former of which, being unfortunately adopted by Linneeus, has ever since been used, though in 1766 and 1767 Pallas (Miscel- lanea, p. 67, and Spicilegia, iv. p. 6), and in 1768 Vosmer (Descr. du Trompette Américain, p. 5), showed that the

2 Not to be confounded with the "Heron Agami" of Buffon (Oiseaux, vii. p. 382), which is the Ardea agami of other writers.

notion it conveys is erroneous. Among English writers the name "Trumpeter" was carried on by Latham and others so as to be generally accepted, though an author may occasionally be found willing to resort to the native 'A gami," which is that almost always used by the French.

Messrs Sclater and Salvin in their Nomenclator (p. 141) admit 6 species of Trumpet-Birds—(1) the original Psophia crepitans of Guiana ; (2) P. napensis of eastern Ecuador (which is very likely the original ''Oiseau trompette" of De la Condamine) ; (3) P. ochroptera from the right bank of the Rio Negro ; (4) P. lewcoptera from the right bank of the upper Amazons ; (5) P. viridis from the right bank of the Madeira; and (6) P. obscwra from the right bank of the lower Amazons near Para. And they have remarked in the Zoological Proceedings (1867, p. 592) on the curious fact that the range of the several species appears to be separated by rivers, a statement confirmed by Mr Wallace (Geogr. Distr. Animals, ii. p. 358) ; and in connexion therewith it may be observed that these birds have short wings and seldom fly, but run, though with a peculiar gait, very quickly. A seventh species, P. cantatrix, from Bolivia, has since been indicated by Prof. W. Blasius (Journ. f. Ornith., 1884, pp. 208-210), who has given a monographic summary of the whole group very worthy of attention. The chief distinctions between the species lie in colour and size, and it will be here enough to describe briefly the best known of them, P. crepitans. This is about the size of a large barndoor Fowl ; but its neck and legs are longer, so

that it is a taller bird. The head and neck are clothed with short velvety: feathers ; the whole plumage is black, except that on the lower front of the neck the feathers are tipped with golden green, changing according to the light into violet, and that a patch of dull rusty brown extends across the middle of the back and wing-coverts, passing into ash-colour lower down, where they hang over and conceal the tail. The legs are bright pea-green. The habits of this bird are very wonderful, and it is much to be wished that fuller accounts of them had appeared. The curious sound it utters, noticed by the earliest observers, has been already mentioned, and by them also was its singularly social disposition towards man described ; but the information supplied to Buffon (Oiseaux, iv. pp. 496-501) by Manoncour and De la Borde, which has been repeated in many works, is still the best we have of the curious way in which it becomes semi-domesticated by the Indians and colonists and shows strong affection for its owners as well as for their living property—poultry or sheep—though in this re- claimed condition it seems never to breed.1 Indeed nothing can be positively asserted as to its mode of nidification ; but its eggs, according to Mr E. Bartlett, are of a creamy white, rather round, and about the size of Bantams'. Waterton in his Vanderings (Second Journey, chap. iii.) speaks of falling in with flocks of 200 or 800 ‘‘ Waracabas,” as he called them, in Demerara, but added nothing to our knowledge of the species; while the contributions of Trail (Mem. Wern. Society, v. pp. 528-532) and Dr Hancock (Mag. Nat. History, ser. 2, ii. pp. 490-492) as regards its habits only touch upon them in captivity.

To the Trumpeters must undoubtedly be accorded the rank of a distinct Family, Psophiide ; but like so many other South-American birds they seem to be the less specialized descendants of an ancient generalized group — perhaps the common ancestors of the Aalhde and Gruidx—and they are therefore rightly placed in Prof. Huxley's Geranomorphe.? The structure of the syrinx is stated by Trail (ut supra) to be quite unique; but his description of it is unsatisfactory, and he clearly had not an adult male to dissect or he would have hardly failed to notice the curious arrangement of the trachea in that sex made known by Hancock (ut supra). This, though different from that described in any CRANE (q.v.), sug- gests an early form of the structure which in some of the Gruidx is so marvellously developed, for in Psophia the windpipe runs down the breast and belly immediately under the

skin to within about an inch of the anus, whence it returns in a similar way to the front of the sternum, and then enters the thorax. Analogous instances of this forma- tion occur in several other groups of birds not at all

1 In connexion herewith may be mentioned the singular story told by Montagu (Orn. Dict., Suppl. Art. ‘‘ Grosbeak, White-winged”’), on the authority of the then Lord Stanley, afterwards president of the Zoological Society, of one of these birds, which, having apparently escaped from confinement, formed the habit of attending a poultry- yard. On the occasion of a pack of hounds running through the yard, the Trumpeter joined and kept up with them for nearly three miles !

2 Cf. Parker, Trans. Zool. Soc., x. p. 502 sq.

allied to the Psophiide. The skeleton and some of the detached bones are figured in Eyton’s Osteol. Avium (pls. xxix, and 5 R). (a. N.) TRURO, a city, municipal borough, and port of Corn- wall, England, is situated on a kind of peninsula formed by the rivers Allen and Kenwyn, which below the town unite with a branch of Falmouth harbour called Truro ereek or river. Truro is 300 miles south-west of London by the Great Western Railway, and 11 north of Falmouth, to which theré is a branch line. The town is regularly built, chiefly of granite, with spacious streets, through the principal of which there flows a stream of water. The new cathedral of St Mary by Mr Pearson, R.A., one of the most important modern ecclesiastical buildings in England, is a fine example of Early English at its best period. The old south aisle of the church previously existing is ingeniously incorporated in the new edifice. The secular buildings include the town-hall and market-house in the Italian style (1846), the corn exchange, the theatre, the public rooms, the music-hall, and the county library (1792). There is also a theological library, presented by Bishop Phillpotts in 1856 and largely augmented by a bequest of books in 1883. Among the educational and benevolent institutions are the grammar-school (founded by a member of the Borlase family, and having two exhibitions at Exeter College, Oxford), the cathedral divinity schools, the Wesleyan middle schools, the literary institution, the royal Cornwall infirmary, the dispensary, and a hospital for ten widows. There is sufficient depth of water in the channel of Truro creek to permit

vessels of 70 tons burden to come up to the town quay. The principal imports are coal from Wales and timber from Norway, and the exports consist of tin, iron ores, lead, and zinc, from the mines in the neighbourhood. The population of the municipal borough (area 1171 acres) in 1871 was 11,049, and 10,619 in 1881.

Truro is one of the oldest towns in England. It is the seat of the stannary and other courts connected with the duchy of Corn- wall (see CORNWALL, vol. vi. p. 427). It was one of the ancient — privileged tin coinage towns. Anciently it was called Tueura, Treura, and Truruburgh. It was a borough by prescription, but was incorporated by Reginald, earl of Cornwall. in the 12th cen- tury it belonged to Richard de Lucy. Ina charter of Henry VII. it is called the ‘‘ ville de Teuro.” The government was vested in a mayor and burgesses by Elizabeth, who gave the corporation juris- diction over the port of Falmouth, the port dues of that town being collected by them until its incorporation by Charles II. Norden, writing of Truro in 1574, says, “there is not a towne in the west part of the shire more commendable for neatness of buyldinges, nor more discommendable for the pride of the people.” In 1642 Sir Ralph Hopton levied here a large body of men for the king. By the Municipal Act Truro was divided into two wards, and is governed by a mayor, six aldermen, and eighteen councillors. The corporation act as the urban sanitary authority. Truro sent two represent- atives to parliament from the 23d year of Edward I., but ceased to be separately represented in 1885. By Act 89 and 40 Vict. c. 54 it was constituted the head of a new diocese comprising the archdeaconry of Cornwall.

TRUST. In Roman and English law alike that legal relation between two or more persons implied in the word trust was of comparatively late growth. The trust of English law is probably based upon a combination of the Roman conceptions of wsus and jfidercommissum. To usus is perhaps due the name as well as the idea of that right over property, coordinate with the right of the nominal owner, possessed by the person having the use. To jidecommissum appears to be due the name as well as the idea of that confidence reposed in another which is the essence of the modern trust. Usus was in Roman law a personal servitude, or right of one person over the land of another, confined to his personal wants and without the right to the produce and profits which wsusfructus carried. It has little in common

with the use of English law but the name and the conception of a dual ownership. The jidetcom- missum 18 more important; see Roman Law, vol. xx. p.

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707. By the legislation of Justinian the law of legata was practically assimilated to that of jideccommissa. The only thing that distinguished the one from the other was the mode in which the gift was made: if by words of direct bequest, it was a legatum, if by precatory words, a Jideicommissum. It may be noticed, as an illustration of the course afterwards taken by the law in England, that Jideicommissa in favour of the church were so far favoured over others that if paid over by mistake they could not be recovered. In addition to wsus and jideicommissum, the Roman division of ownership into quiritary and bonitary (to use words invented at a later time) may perhaps to some extent have suggested the English division into legal and equitable estate. The two kinds of ownership were amalgamated by Justinian. Legal and equitable estate are still distinct in England, though attempts have been made in the direction of amalgamation. The gradual manner in which the beneficiary becanie subject to the burdens attaching to the property of which he enjoyed the benefit was a feature common to both the Roman and the

English system.

Uses in Early English Law.—The use or trust} is said to have been the invention of ecclesiastics well acquainted with Roman law, the object being to escape the provisions of the laws against MorrMAIN (g.v.) by obtaining the conveyance of an estate to a friend on the understanding that they should retain the use, 4.¢., the actual profit and enjoyment of the estate. Uses were soon ex- tended to other purposes. They were found valuable for the defeat, of creditors, the avoiding of attainder, and the charging of portions. A use had also the advantage of being free from the incidents of feudal tenure: it could be alienated inter vivos by secret conveyance, and could be devised by will. In many cases the feoffee? to uses, as he was called, or the person seised to the use of another, seems to have been specially chosen on account of his rank and station, which would enable him to defy the common law and protect the estate of his cestut gue use, or

the person entitled to the beneficial enjoyment. The Act of 1 Ric. Il. c, 9 was directed against the choice of such persons. This alienation of land in use was looked upon with great disfavour by the common law courts, in whose eyes the cestui que use was only a tenant at will. Possibly the ground of their refusal to recognize uses was that the assizes of the

ing's court could only be granted to persons who stood in a feudal relation to the king. The denial of the right followed the denial of the remedy. The use was on the other hand supported by the Court of Chancery, and execution of the confidence reposed in the feoffee to uses was enforced by the court in virtue of the general jurisdiction which as a court of conscience it claimed to exercise over breach of faith. Jurisdiction was no doubt the more readily assumed by ecclesiastical judges in favour of a system by which the church was generally the gainer. A double ownership of land thus gradually arose, the nominal and ostensible ownership,—the only one acknowledged in the courts of common law,—and the beneficial ownership protected by the Court of Chancery. The reign of Henry V. to a great extent corresponds with that of Augustus at Rome, as the point of time at which legal recognition was given to what had previously been binding only in honour. The means of bringing the feoffee to uses before the court was the writ of subpena, said to have been invented by John de Waltham, bishop of Salis- bury and master of the rolls in the reign of Richard II. By means of this writ the feoffee to uses could be compelled to answer on oath the claim of his cestui que use. The doctrine of the Court of Chancery as to the execution of a use varied according as there was transmutation of possession or not. In the former case it was unnecessary to prove consideration ; in the latter, generally a case of bargain and sale, the court would not enforce the use unless it was executed in law,—that is, unless there was a valuable considera- tion, even of the smallest amount. Where no consideration could be proved or implied, the use resulted to the feoffor. This theory led to the insertion up to a recent date in deeds (especially in the lease of the lease and release period of conveyancing) of a nominal consideration, generally five shillings. Lands either in possession, Teversion, or remainder could be granted in use. Most persons could be feoffees to uses. The king and corporations aggregate

1 Use seems to be an older word than trust, Its first occurrence in statute law is in 7 Ric. II. c. 12, in the form eps. In Littleton ‘‘con- fidence” is the word employed. The Statute of Uses seems to regard use, trust, and confidence as synonymous. According to Bacon, it was its permanency that distinguished the use from the trust.

? Feoffment, though the usual, was not the only mode of conveyance to uses. The preamble of the Statute of Uses mentions fines and re- coveries, and other assurances,

TR Us?

were, however, exceptions, and were entitled to hold the lands dis- charged of the use. On the accession of Richard III., who from his position of authority had been a favourite feoffee, it was necessary to pass a special Act (1 Ric. III. c. 5), vesting the lands of which he had been feoffee either in his co-feoffees or, in the absence of co- feoffees, in the cestui que use. The practical convenience of uses was so obvious that it is said that by the reign of Henry VII. most of the land in the kingdom was held in use. The freedom of uses from liability to forfeiture for treason must have led to their general adoption during the Wars of the Roses. The secrecy with which a use could be transferred, contrary as it was to the publicity required for livery of SEIsrn (¢.v.) at common law, led to the inter- ference of the legislature on several occasions between the reigns of Richard II. and Henry VIII., the general tendency of the legislation being to make the cestui que usemoreand more subject to the burdens incident to the ownership of land. One of the most important statutes was the Statute of Mortmain (15 Ric. II. ¢. 5), forbidding evasion of the Statute De Religiosis of Edward I. by means of feoff- ments to uses. Other Acts enabled the cestui que use to transfer the use without the concurrence of the feoffee to uses (1 Ric. III. c. 1), made a writ of formedon maintainable against him (1 Hen. VII. e. 1), rendered his heir liable to wardship and relief (4 Hen. VII. c. 17), and his lands liable to execution (19 Hen. VII. c. 15). At length in 1535 the famous Statute of Uses (27 Hen. VIII. c. 10) was passed.* The preamble of the statute enumerates the mischiefs which it was considered that the universal prevalence of uses had occa- sioned, among others that by fraudulent feoffments, fines, recoveries, and other like assurances to uses, confidences,

and trusts lords lost their feudal aids, men their tenancies by the curtesy, women their dower, manifest perjuries in trials were committed, the king lost the profits of the lands of persons attainted or enfeoffed to the use of aliens, and the king and lords their rights of year, day, and waste, and of escheats of felons' lands. To remedy this state of things it was enacted, inter alia, that, where any person was seised of any here- ditaments to the use, confidence, or trust of any other person by any means, the person having such use, confidence, or trust should be seised, deemed, and adjudged in lawful seisin, estate, and possession of such hereditaments. Full legal remedies were given to the cestui que use by the statute. He was enabled to distrain for a rent charge, to have action, entry, condition, &c. The effect of this enactment was to make the cestui que use the owner at law as well as in equity (as had been done once before under the ex- ceptional circumstances which led to 1 Ric. III. oc. 5), provided that the use was one which before the statute would have been en- forced by the Court of Chancery. For some time after the passing of the statute an equitable as distinct from a legal estate did not exist. But the somewhat narrow construction of the statute by the common law courts in Tyrrel's case® (1557) enabled estates cognizable only in equity to be again created. In that case it was held that a use upon a use could not be executed; therefore in a feoffment to A and his heirs to the use of B and his heirs to the use of C and his heirs only the first use was executed by the statute. The use of B being executed in him, that of C was not acknowledged by the common law judges; but equity regarded C as beneficially entitled, and his interést as an equitable estate held for him in trust, corresponding to that which B would have had before the statute. The position taken by the Court of Chancery in trusts may be compared with that taken in MorTGacE (q.v.). The Judicature Act, 1873, while not going as far as the Statute of Uses and combining the legal and equitable estates, makes equit- able rights cognizable in all courts. From the decision in Tyrrel's case dates the whole modern law of uses and trusts. In modern legal language use is restricted to the creation of legal estate under the Statute of Uses, trust is confined to the equitable estate of the cestui que trust or beneficiary.

Uses since 1535.—The Statute of Uses is still the basis of con- veyancing. A grant in a deed is still, after the alterations in the law made by the Conveyancing Act, 1881, made ''to and to the use of A." The statute does

not, however, apply indiscriminately to all cases, as only certain uses are executed by it. It does not apply to leaseholds or copyholds, or to cases where the grantee to uses is anything more than a mere passive instrument, ¢.g., where there is any direction to him to sell the property. The seisin, too, to be executed by the statute, must be in another than him who has the use, for where A is seised to the use of A it is a common law grant. The difference is important as far as regards the doctrine of PossEssIon (g.v.). Constructive possession is given by a deed operating under the statute even before entry, but not by a common law grant (at any rate sufficient to entitle the grantee to be registered as a voter), until actual receipt of rent by the

3 The use, as in later times the trust, was, however, forfeited to the crown on attainder of the feoffee or trustee for treason.

+ It was adopted in Ireland exactly a century later by 10 Car. I. ce. 1 (Ir.), The law of uses and trusts in Ireland is practically the same as that in England, the main differences being in procedure rather than in substantive law. ® Dyer's Reports, 155a.

grantee. The operation of the Statute of Uses was supplemented by the Statute of Inrolments and that of Wills. (See Writ.) The Statute of Inrolments (27 Hen. VIII. c. 16) enacted that no bargain and sale should pass a freehold unless by deed indented and inrolled within six months after its date in one of the courts at Westminster or with the custos rotulorwm of the county. As the statute referred only to freeholds, a bargain and sale of a lease- hold interest passed without inrolment. Conveyancers took advan- tage of this omission (whether intentional or not) in the Act, and the practical effect of it was to introduce a mode of secret aliena- tion of real property, the lease and release, which was the general form of conveyance up to 1845. (See Rau Estars, SALe.) Thus the publicity of transfer, which it was the special object of the Statute of Uses to effect, was almost at once defeated. In addition to the grant to uses there were other modes of conveyance under the statute which are now obsolete in practice, viz., the covenant to stand seised and the bargain and sale. Under the statute, as before it, the use has been found a valuable means of limiting a remainder to the person creating the use and of making an estate take effect in

derogation of a former estate by means of a shifting or springing use. At common law a freehold could not be made to commence in futuro; but this end may be attained bya shifting use, such as a grant (common in marriage settlements) to A to the use of B in fee simple until a marriage, and after the celebration of the marriage to other uses. An example of a springing use would be a grant to A to such uses as B should appoint and in default of and until appointment to C in fee simple. The difficulty of deciding where the seisin was during the suspension of the use led to the invention of the old theory of scintilla juris, or continued possibility of seisin in the grantee to uses. This theory was abolished by 28 and 24 Vict. c. 38, which enactcd that all uses should take effect by force of the estate and seisin originally vested in the person seised to the uses. The most frequent instances of a springing use are powers of appointment, usual in wills and settlements. There has been ei legislation on the subject of powers, the main effect of which has been to give greater facilities for their execution, release, or abandonment, to aid their defective execution, and to abolish the old doctrine of illusory appointments.

Trusts. —A trust in English law is defined by Mr Lewin, adopt- ing Coke's definition of a use, as ''a confidence reposed in some other, not issuing out of the land, but as a thing collateral, annexed in privity to the estate of the land, and to the person touching the land, for which cestui que trust has no remedy but by swbhpena in Chancery." The term trust or trust estate is also used to denote the beneficial interest of the cestui que trust. The term éruster is not used, as it is in Scotland, to denote the creator of the trust.

tive trust. The present law governing trusts rests upon the doc- trines of equity as altered by legislation. Its great importance has led to its becoming one of the most highly developed departments of equity. The devolution of successive interests in wills and settlements is almost wholly attained by means of trusts.

Who may be a Trustee or Cestui que Trust.—The modern trust is considerably more extensive in its operation than the ancient use. Thus the crown and corporations aggregate can be trustees, and personalty can be held in trust. Provision is made by the Muni- cipal Corporations Act, 1882,

for the administration of charitable and special trusts by municipal corporations. The crown does not appear to be a trustee to as complete a degree as a subject may be. Unsuccessful attempts have recently been made to impress the crown, or a secretary of state as agent of the crown, with trusts of funds voted by parliament for the public service, of booty of war granted by royal warrant, and of money paid over by a foreign state in pursuance of a treaty. There are certain persons who for obvious reasons, even if not legally disqualified, ought not to be appointed trustees. Such are infants, lunatics, persons domiciled abroad, felons, bankrupts, and cestwis que trustent. The appointment of any such person, or the falling of any existing trustee into such a position, is generally ground for application to the court for ap- pointment of a new trustee in his place. Any one may be a cestui que trust except a corporation aggregate, which cannot be a cestui que trust of real estate without a licence from the crown.

Creation and Extinction of the Trust.—A trust may be created either by act of a party or by operation of law. Where a trust is created by act of a party, the creation at common law ueed not be in writing. The Statute of Frauds (see FRAvuD) altered the common law by enacting that all declarations or creations of trusts or con- fidences of any lands, tenements, or hereditaments shall be mani- fested and proved by some writing, signed by the party who is by law enabled to declare such trust, or by his last will in writing, or else they shall be utterly void and of none effect. Trusts arising or resulting by implication or construction of law are excepted, and it has been held that the statute applies only to real estate and chattels real, so that a trust of personal chattels may still be declared by parol. The declaration of a trust by the crown must be by letters patent. Trusts created by will must conform to the require- ments of the Wills Act (see WiLL). Except in the case of charitable trusts, the cestui que trust must be a definite person. A trust, for instance, merely for keeping up family tombs is void. Alteration of the trust estate by appointment of a new trustee could up to 1860 only be made where the instrument creating the trust gave a power to so appoint, or by order of the Court of Chaucery. But now by the Conveyancing Act, 1881 (superseding Lord St Leonards's Act of 1860), the surviving or continuing trustee or trustees, or the personal representative of the last surviving or continuing trustee, may nominate in writing a new trustee or new trustees. On such appointment the number of trustees may be increascd. Existing

trustees may by deed consent to the discharge of a trustee wishing to retire. Trust property may be vestcd in new or continuing trustees by a simple declaration to that effect. By the Conveyancing Act, 1882, a separate set of trustees may be appointed for any part of the property held on distinct trusts. Trusts created by opera- tion of law are either those which are the effect of the application of rules of equity or those which have been constituted by a judicial authority. They include resulting and constructive trusts. A resulting trust is a species of implied trust, and consists of so much of the equitable interest as is undisposed of by the instrument creating the trust, which is said to result to the creator and his representatives. An example is the purchase of an estate in the name of the purchaser aud others, or of others ouly. Here the beneficial interest is the purchaser's. An example of a constructive trust is a renewal of a lease by a trustee in his own name, where the trustee is held to be constructively a trustee for those interested in the beneficial term. An instance of a constructive trust upon which the courts have often been called upon to decide is the fiduciary relation between the promoter of a proposed joint-stock company and the members of the company when formed. The other trusts falling under the head of trusts by operation of law would be those imposed upon a trustee by order of a court, even though they are imposed in pursuance of provisions contained in a trust created by a party. Such would be the trusts which have come within the cognizance of the court by virtue of the Trustee Act, 1850, or in any other way. The powers of the court over trusts have been much extended by legislation. The Act of 1850 (13 and 14 Vict. c. 60) enabled the Court of Chancery to appoint new trustees where expedient, and to make vesting orders in many cases where such orders could not previously have been made, as where a trustee was a lunatic, or an infant, or refused to convey. This Act was extended by the Trustee Extension Act, 1852 (15 and 16 Vict. c. 55). By the Conveyancing Act, 1881, a trustec ap- pointed by the Chancery Division is to have the same powers as if he had been originally appointed a trustee by the instrument creating the trust. The Bankruptcy Act, 1883, enables the court to appoint a new trustee in the place of a bankrupt trustee. Be-

sides being duly created, it is necessary for the validity of the trust that it should be a lawful one. An unlawful trust is one which contravenes the-policy of the law in any respect. Examples of such trusts are trusts for a corporation without licence, for a per- petuity, and for purposes subversive of morality, such as trusts for illegitimate children to be hereafter born. Superstitious uses (see RoMAN CATHOLIC CuuRCcH, vol. xx. p. 632) also fall under this head. There are also certain trusts which are avoided by statute under particular circumstances, such as settlements in fraud of creditors (see BANKRUPTCY, SETTLEMENT). The law cannot be evaded by attempting to constitute a secret trust for an unlawful purpose. If an estate be devised by words prima facie carrying the beneficial interest, with an understanding that the devisee will hold the estate in trust for such a purpose, he may be compelled to answer as to the secret trust, and on acknowledgment or proof of it there will be a resulting trust to the heir-at-law. In the case of an advowson suspected to be held for the benefit of a Roman Catholic patron, there is a special enactment to the same effect (see QUARE ImpEpiT). The rules of equity in charitable trusts (whieh include all those mentioned in the preamble to 48 Eliz. ¢, 4)l are less strict than those adopted in private trusts. Charitable trusts must be lawful, e.g., they must not contravene the Statutes of Mortmain; but a wider latitude of construction is allowed in order to carry out the intentions of the founder, and they will not be allowed to fail for want or uncertainty of objects to be benefited. The court, applying the doctrine of ey prés, will, on failure of the original ground of the charity, apply the funds as nearly as possible in the same manner. On this principle gifts originally made for purely charitable purposes have been extended to educational pur- poses. Further, trustees of a charity may act by a majority, but ordinary trustees cannot by the act of a majority (unless specially empowered so to do) bind a dissenting minority or the trust pro-

erty. A trust estate is subject as far as possible to the rules of fie applicable to a legal estate of a corresponding nature, in pur- suance of the maxim, ‘‘ Equity follows the law.” Thus trust pro- perty is assets for payment of debts, may be taken in execution, passes to creditors in bankruptcy, and is subject to dower and curtesy, to the rules against perpetuities, and to the Statutes of Limitation. This assimilation of the legal and equitable estates has been produced partly by judicial decisions, partly by legisla- tion. A trust is

extinguished, as it is created, either by act of a party or by operation of law. An example of the former mode of extinction is a release by deed, the general means of discharge of a trustee when the purposes of the trust have been accomplished. Extinction by operation of law takes place when there is a failure of the objects of the trust: ¢.g., if the cestui que trust die intestate without heirs or next of kin, the trustee retains the property dis- charged of the trust if it be real estate, if it be personalty it falls to the crown. Equitable interests in real estate abroad are asa rule subject to the lex loci rei site, and an English court has no jurisdiction to enforce a trust or settle a scheme for the administra- tion of a charity in a foreign country. An English court has, however, jurisdiction to administer the trusts of a will as to the whole real and personal estate of a testator, even though only a very small part of the estate, and that wholly personal, is in England. ae a decided by the House of Lords in a well-known case in

hights and Duties of the Trustee.—The principal general properties of the office of trustee, as given by Mr Lewin, are these :—(1) A trustee having once accepted the trust cannot afterwards renounce. (2) He cannot delegate it. (8) In the case of co-trustees the office must be exercised by all the trustees jointly. (4) On the death of one trustee there is survivorship: that is, the trust will pass to the survivors or survivor. (5) One trustee shall not be liable for the acts of his co-trustee. (6) A trustce shall derive no personal benefit from the trusteeship. The office cannot be renounced or delegated, because it is one of personal confidence. It can, however, be resigned, and recent legislation, as has been already stated, has given a retiring trustee large powers of appointing a successor. In the case of the death ofa single or last surviving trustee of real estate, the trust estate by the Conveyancing Act, 1881, now devolves upon his personal representative instead of upon his heir or devisee. The liability of one trustee for the acts or defaults of another often raises very difficult questions. A difference is made between trustees and executors. An executor is liable for joining in a receipt pro forma, as it is not necessary for him to do so, one executor having authority to act without his co-executor ; a trustee can show that he only joined for conformity, and that another received the money. A trustee’s receipt in writing is, under the Conveyancing Act, 1881 (superseding Lord St Leonards’s Act of 1860), a sufficient discharge, and exonerates the person paying from seeing that the money paid is duly applied according to the

trust. If one trustee be cognizant of a breach of trust committed by another, and conceal it or do not take active measures to protect the cestui que trust's interests, he will be liable for the breach of trust. An indemnity

‘ See Craritigs, where the preamble of the statute is set out in full, Ewing v. Orr-Ewing, Law Reports, 9 Appeal Cases, 34,

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clause is now implied by statute in every trust deed, but this does not protect a trustec against liability which would attach at law. A trustee, if he commit a breach of trust at the request of his cestui que trust, may secure himself by an indemnity, provided that the cestui que trust has been fully informed of the facts of the case, and is not under any disability to consent, such as infancy. The rule that a trustee is not to benefit by his office is subject to some ex- ceptions. He may do so if the instrument creating him trustee. specially allows him remuneration, as is usually the case where a solicitor is appointcd. Where the trust entirely fails, as has been said above, the trustee is indirectly remunerated by his right to retain the trust estate. The main duties of trustees are to place the trust property in a proper state of security, to keep it (if per- sonalty) in safe custody, and to properly invest and distribute it. A trustee must be careful not to place himself in a position where his interest might elash with his duty. Asa rule he cannot safely purchase from his cestui que trust while the fiduciary relation exists between them. In all purchases with trust money he is bound to obtain the best price, unless where an Act of Parliament, like the Housing of the Working Classes Act, 1885, specially authorizes sale at an under value. Investments by trustees demand special notice. The general rule is that a trustee must take as much care of the trust property as of his own. He is, therefore, justified in following the usual course of business adopted by prudent men in making investments, ¢.g., by employing a stock-broker in the ordinary way. At the same time he has not an uncontrolled power of investment, for (unless authorized by the instrument creating the trust) he cannot lend trust money on personal security or invest in shares of a private company. A trustee of shares may be liable as a beneficial owner, even though his name appears on the register of the company as a trustee. By recent legislation trust- ees, where not expressly forbidden by the

instrument creating the trust, have either an absolute or qualified right to invest in certain securities. They have an absolute right to invest in real sccurities in the United Kingdom (but not on a second mortgage), in charges or mortgages under the Improvement of Land Act, 1864, in con- sols, exchequer bills, or any security the interest whereon is guar- anteed by parliament, in Bank of England, Bank of Ireland, East India, and Metropolitan Board of Works stock. They have a qualified power of investment (that is, an extension of powers already given in the instrument) in debentures or debenture stock of railway and other companies, and of corporations and local authorities under the Local Loans Act, 1875, in mortgage deben- tures under the Mortgage Debenture Acts of 1865 and 1870, and in securities of the Isle of Man Government. Trustees under the Settled Land Act, 1882, have somewhat larger powers as to railway stock, In many cases there are restrictions on investment in stock certificates payable to bearer, although in authorized securities. A power of varying investments is generally implied, though not expressly given by statute, as in Scotland. The duties of trustees in the distribution of trust fands have been made less onerous by the Trustee Relief Acts of 1847 and 1849, which: enabled trustees or a majority of them to pay into the Bank of England to the account of the particular trust any moneys belonging to the trust, thus bringing the property within the jurisdiction of the court, from which it can only be obtained on petition. Similar powers were conferred upon trustees of charities by 18 and 19 Vict. c. 124. By more recent Acts (22 and 23 Vict. c. 85, 23 and 24 Vict. c. 88) application for advice may be made by a trustee to a judge of the . Chancery Division on a petition or summons. The liability of a trustee to his cestui que trust on any claim for property held on an express trust or in respect of breach of such trust is not barred by any statute of limitations, 86 and 37 Vict. c. 66, s. 26 (2). The powers of trustees have lately been considerably extended by the Conveyancing Act, 1881, and the Settled Land Act, 1882, in other matters besides those that have been already noticed. One of the most important of the new powers is that of compounding, compromising, or abandoning claims relating to the trust. For the trustee in bankruptcy, see BANKRUPTCY. The trustee to pre- serve contingent remainders, at one time common in conveyancing, has ceased to be necessary (see REMAINDER, TERM). A bare trustee is one to whose office no duties were originally attached, or who, though such duties were attached, would

on the requisition of the cestui que trust be compellable to convey the estate to him or by his direction. The term is used in some Acts of Parliament, for instance the Vendor and Purchaser Act, 1874.8

Rights and Duties of the Cestut que Trust.—These may be to a great extent deduced from what has been already said as to the correlative duties and rights of the trustee. The cestui que trust has a general right to the due management of the trust property, to proper accounts, and to enjoyment of the profits. He can asa rule only act with the concurrence of the trustec, unless he seeks a remedy against the trustee himself. Thus the trustee must be a party to an action brought in respect of the trust estate, and must join in presenting a petition in bankruptey on aceount of a debt

3 The phrase ‘‘ bare trust” oceurs as long ago as 1686, Nevil v. Saunders, 1 Vernon’s Rep., 415.

due to the estate, but the cestui que trust on giving indemnity can require the trustee to lend his name asa party. He may also require the trustee to execute conveyances of the legal estate according to his dircctions. Trust property, if parted with by the trustee in fraud of the trust may be followed by the cestui que trust, even into the hands of a purchaser for value with notice of the trust. The cestui que trust may lose his rights by fraud, by laches, and by concurrence or acquiescence in a breach of trust. Though no lapse of time bars his remedy against the trustee personally, he cannot, by the terms of the Real Property Limitation Act, 1874, recover land or rent vested in a trustee upon an express trust after twelve years from the time when the right accrued or six years after the cesser of any disability. The equitable right of the cestui que trust has sometimes been recognized by statute in cases where it would be manifestly unjust that he should suffer dis- ability by virtue of his having merely an equitable interest. The cestui que trust has the right of voting for members of parliament, and is qualified to serve as a juror. On bankruptcy of the trustee the trust estate is not affected. Nor was it affected even before the Felony Act, 1870, by the conviction and attainder of the trustee for felony. Attainder of the trustee for treason involved, however, forfeiture of a trust estate of inheritance. (See TrEa- son.) The recognition of the cestui que trust as owner is still not

complete. Thus no notice of a trust is recognized in certain public documents, as the books of the Bank of England and the registers kept under the Merchant Shipping Act, 1854, the Com- panies Act, 1862, the Land Transfer Act, 1875, and the Colonial Stock Act, 1877.

Procedure.—This is regulated almost entirely by legislation. Proceedings relating to a trust may be brought in different courts of first iustance,—(1) the Chancery Division of the High Court of Justice or the Chancery Court of the County Palatine of Lancaster, (2) a court of bankruptcy, (3) a county court, (4) a criminal court. (1) By the Judicature Act, 1878, § 34, the execution of trusts, charitable or private, is assigned to the Chancery Division. The rules of the Supreme Court, 1883, provide for special indorse- ment in an action on a trust, for the partics to the action, for interrogatories and pleading, and for proceeding by originating summons. (See Summons.) Forms of pleading are given in the appendix to the rules. An injunction rather than an action may sometimes be the proper remedy, as in the case of threatened breach of trust. The Trustee Relief Acts, the Trustee Act, and Lord St Leonards's Act of 1859 provide for proceeding by petition or sum- mons. Applications under the Conveyancing Act must be in chambers in the first instance, and so must applications under the Trustee Relief Acts where the money or securities in court do not exceed £1000 or £1000 nominal value. The procedure in charit- able trusts differs to some extent from that in use in private trusts. The most usual course of proceeding is by information in the name of the attorney-general, Another mode is by petition under Sir Samuel Romilly's Act, 52 Geo. III. c. 101, superseding the cumbrous procedure by commission which had been previously in use under 43 Eliz. c. 4. A third mode is under the powers of the Charitable Trusts Acts, the first of which was passed in 1853. No proceeding under these Acts can be taken without the authority of the charity commissioners. (2) The equitable debt duc from the trustee to the cestui que trust will support a petition in bankruptcy, and is a debt provable in bankruptcy. An order of discharge in bankruptcy does not release the bankrupt from any debt or liability incurred by means of fraudulent breach of trust, nor does it release a co-trustee of the bankrupt. (3) The County Courts Equitable Jurisdiction Act, 1865, confers on county courts the authority of the High Court in the execution of trusts and proceedings under the Trustee Acts where the trust estate does not exceed £500 in amount or

value. By the County Courts Act, 1867, applications may be made at chambers for transfer to a county court of an action pending in the High Court where the property does not exceed £500 in amount or value. The same Act allows trust funds not exceeding that limit to be paid into the post office savings bank in a county court town in the name of the registrar. A county court has jurisdiction in charitable trusts where the income of a charity does not exceed £50. The county court rules, 1886, contain orders regulating the practice with respect to both private and charitable trusts. Powers similar to those given to county courts in England have been conferred upon the civil bill courts in Ireland. (4) At common law trustees committing a fraudulent breach of trust could not be punished criminally. This was altered by the Fraudulent Trustees Act of 1857, now superseded by the Larceny Act, 1861, under which a trustee on an express trust, whether public or private, created by dced, will, or instru- ment in writing, who with intent to defraud converts to his own use or benefit or the use or benefit of any other person than the cestui que trust, or for any purpose other than the public or charit- able purpose, or otherwise disposes of or destroys such property or any part thereof, is guilty of misdemeanour and punishable with penal servitude for a term not exceeding seven years. No prosecu- tion is to be commenced without the sanction of the attorney-

general or—where civil proceedings have been already taken against the trustee—without the sanction of the civil court. The offence cannot be prosccuted at quarter sessions. !

Scotland.—The history of the law differs considerably from that of England, though perhaps the position of the Scotch trustee is now not very different from that of the trustee in England. The Statute of Uses did not apply to Scotland, since neither that nor any similar legislation was necessary in a system in which law and equity were administered by the same tribunals. Trusts seem to have existed from time immemorial, and have been frequently regulated by statute. The policy of the English Statute of Frauds was no doubt intentionally imitated in the Act 1696, c. 25, enacting that no action of declarator of trust should be sustained as to any deed of trust made for thereafter, except upon a declaration or back- bond of

trust lawfully subscribed by the person alleged to be trustee and against whom or his heirs or assignees the declarator should be intended, or unless the same were referred to the oath of the party simpliciter. The Act does not apply to all cases, but only to those in which by the act of parties documents of title are in the name of a trustee, but the beneficial interest in another. The person creating the trust is called the trustcr, a term unknown in England. On the other hand the term cestwi que trust is unknown in Scotland. The office of trustee is prima facie gratuitous, as in England, it being considered to fall under the contract of mandate. Some of the main differences between English and Scotch law are these. There is no presumption in Scotland of a resulting trust in favour of a purchaser. A trust which lapses by the failure of a beneficiary goes to the crown as wltimus heres, not to the trustee. The office of trustee is not a joint office, therefore there is no right of survivorship, and on the death of a trustee the survivors are in- competent to act, unless a certain number be declared or presumed to be a gworwm, or the office be conferred on trustees and the accedors and survivors of them. Sometimes the concurrence of one trustee is rendered absolutely necessary by his being named sine quo non. The Court of Session may appoint new trustees, but generally appoints a judicial factor. There has been a considerable amount of recent legislation, chiefly in the direction of extending the powers of trustees and of the court, in trust matters. By 24 and 25 Vict. c. 84 (amended by 26 and 27 Vict. c. 115) an agpecnae of gratuitous trustees by deed or local act was to be held to include certain provisions usually included in deeds of appointment, 7.c., powers of resignation and of assumption of new trustees, and provisions that the majority of trustees accepting and surviving should be a guorum, and that each trustee should only be liable for his own acts and intromissions and should not be liable for omissions. The Trusts Act, 1867 (30 and 31 Vict. c. 97), added to the common law powers of trustees by giving them authority to appoint factors and law agents, to discharge trustees who have resigned, to grant leases for a limited period, to uplift, discharge, or assign debts, to compromise claims, to grant all necessary deeds, and to pay debts due by the truster or the trust estate. It also gave the Court of Session power (exercisable by the lord ordinary in the first instance) beyond what it possessed by its nobele offictum, in cases of expediency, of selling the trust estate, of granting feus or long leases, and of borrowing and excambion. Power was given to trustees to appoint

additional trustees by deed of assumption, and where such assumption could not be made the court might appoint. Authority was conferred upon the beneficiary of a lapsed trust to complete title on petition. The powers of investment given to trustees have since been largely increased by the Trusts Amendment Act, 1884. They are now much the same as those allowed in England. The principal differences are that in Scotland there is a statutory power to vary securities, and that statutory investment by a Scotch trustee is not allowed in Bank of Ireland stock or on real security in Ireland. The Titles to Land Consolida- tion Act, 1868 (31 and 32 Vict. c. 101), contained provisions as to the mode of completing title by a judicial factor on a trust estate and by trustees in sequestration and as to the vesting in trustees of heritable property conveyed for religious or educational purposes, The Conveyancing Act, 1874 (37 and 38 Vict. c. 94), dealt with compositions payable by trustees on the death of a vassal, and with completion of title by the heir of a sole or last sur- viving trustee, by a successor of an ex officio trustee, and by trustees where words of conveyance are not expressed to be in favour of such trustees. Forms of documents relating to trust property will be found in Juridical Styles and in the schedules to the Acts of 1867, 1868, and 1874. A conveyance in trust may be either absolute with a back-bond or in form a conveyance in trust. A trustee is responsible for the due execution of the trust, subject to the limitations contained in 24 and 25 Vict. c. 84. The provision of the Companies Act, 1862, that no trust is to be entered on the

1 The principal authority is Lewin's Law of Trusts (Sth ed., 1885). The powers of trustees under the Conveyancing and Settled Land Acts will be found summarized in the treatises on these acts by Wolstenholme and Turner. The principal authorities on charitable trusts are Shelford and Tudor (1862). For the history may be consulted Bacon, Law Tracts; Reading, On the Statute of

Uses; Gilbert, On Uses; Sanders, On Uses and Trusts; Spence, Equitable Juris- diction, vol. i. p. 485; Digby, Hist. ofthe Law of Real Property, chaps. vi. vii.

register, does not apply to Scotland. A trustee, a member of a joint-stock company, though entered on the register as a trust disponee, may incur personal liability as a partner, unless the con- trary be expressed. Liability under such circumstances was established in the litigation which followed the suspension of the City of Glasgow Bank in 1878.1 A sheriff court has jurisdiction over actions of declarator, relating to questions of heritable right or title, where the value of the subject in dispute does not exceed £50 by the year or £1000 in value (40 and 41 Vict. c. 50). A judicial factor may be appointed by the sheriff court where the yearly value of the estate does not exceed £100 (43 and 44 Vict. c. 4). Fraudulent trustees are criminally liable at common law, not by statutory enactment, as in England. Adjudication on a trust bond isa mode of obtaining the decision of the Court of Session on a bond by a fictitious creditor, for the purpose of giving title to the heir, by preventing his liability to possible passive representation. It is regulated by 1695, c. 24.?

United States.—In New York and some other States uses and trusts have been abolished (with certain exceptions), and every estate, subject to those exceptions, is deemed a legal right cogniz- able in courts of law. The exceptions are in New York implied trusts and express trusts to sell land for the benefit of creditors, to sell, mortgage, or lease lands for the benefit of legatees, or for the purpose of satisfying any charge thereon, to receive the rents and profits of lands and apply them to the use of any person during the life of such person or any shorter term, or to receive such rents and profits, and accumulate the same within the limits allowed by the law. Trusts of personalty for public purposes are very generally allowed in States where private trusts do not exist. Provisions similar to those of the English Statute of Frands have been generally adopted by the States which recognize private trusts. Some States go further than the statute and allow the creation of trusts (other than those arising by implication or operation of law) only by means of will or deed. Where the trust is of real estate, the deed must generally be registered (see REGISTRATION). Forms of deeds of trust are given in the Statutes of Virginia and other States. The English doctrine of cy prés seems to have been adopted only in Pennsylvania. Conveyances in trust for the settlor are generally void against creditors by the policy of the Acts of Eliza- beth. By the legislation of some States a freehold may commence in futuro without the operation of the Statute of Uses. Societies

of professional trustees, receiving a percentage of the income of the property as payment for their trouble and liability, are frequently recognized by law. Such societies are generally under an obliga- tion to make periodical returns of their receipts and expenditure. A public trustee as a corporation sole exists in some States. Trustee process in the New England States is what is generally known as garnishee process in England, that is, a means of reaching pro- perty and credits of a debtor in the hands of third persons for the benefit of an attaching creditor.3 (J. Wt.)

TSARITSYN, a district town of the government of Saratoff, Russia, situated on the right bank of. the lower Volga where it suddenly turns towards the south-east, only 40 miles distant from the Don. It is the terminus of a railway line which begins at Riga and, running south-eastwards, crosses all the main lines which radiate from Moscow to the south. It is also connected by rail with Katatch on the Don, where merchandise from the Sea of Azoff is disembarked and transported by rail to Tsaritsyn, to be sent thence by rail or steamer to different parts of Russia. Corn from Middle Russia for Astrakhan is trans- ferred from the railway to boats at Tsaritsyn ; timber and wooden wares from the upper Volga are unloaded here and sent by rail to Katatch ; and fish, salt, and fruits sent from Astrakhan by boat up the Volga are here unloaded and despatched by rail to the interior of Russia. The town has grown rapidly since the completion of the rail- way system, and has a large trade in naphtha from Baku, which is shipped up the Volga to Tsaritsyn and sent thence by rail to the interior of Russia. The railway between the Baskunchak salt lakes of Astrakhan and the Volga has made Tsaritsyn also a depét for the salt trade. In 1882 10,000,000 ewts. of merchandise, valued at one mil- lion sterling, were landed at Tsaritsyn, and since then the

1 The principal case was Muir v. City of Glasgow Bank, Law Re- ports, 4 Appeal Cases, 337.

2 See G. J. Bell, Principles, §§ 1991-2001; R. Bell, Law Dict., s.v. “Trust” and “Trustee,”

< See Washburn, Real Property, vol. ii, bk. ii., chaps. ii, iii. ; Stimson, American Statute Law, $$ 1700-1754.

figures have notably increased. In addition Tsaritsyn is the centre of the trade connected with the mustard plantations of Sarepta, Dubovka, and the neighbourhood ; 170,000 cwts. of mustard seed are either ground or converted into oil annually, the exports being 70,000 ewts. of mustard and half the corresponding quantity of oil (valued at £250,000). The fisheries of the place are also important. The population (6750 in 1861) numbered 31,220 in 1882. It is still larger in summer, Tsaritsyn having become the gathering-place of poor people in search of work, and the misery and filth in its poorer quarters are very great. The buildings of the town do not improve proportionately with the increase of wealth. They include a (wooden) theatre, a public library, and two gymnasia for boys and girls. The old church of St John (end of 16th century) is a fine specimen of the architecture of its period.

Tsaritsyn was founded in the 16th century, when a fort was erected to prevent the incursions of the free Cossacks and runaway serfs who gathered on the lower Volga, as also those of the Kalmucks and Circassians. In 1606 Tsaritsyn took part in the rising in favour of the false Demetrius, and Razin took the town in 1670. The Kalmucks and Circassians of the Kubafi attacked it repeatedly in the 17th coef so that it had to be fortified by a strong earthen and palisaded wall, traces of which are still visible.

TSARSKOYE SELO, a district town of Russia, in the government of St Petersburg, and an imperial residence, 18 miles to the south of the capital, is situated on the Duderhof Hills and consists of the town proper, surrounded by several villages and a German colony, which are summer resorts for the inhabitants of St Petersburg, and the imperial parks and palaces. The town is built according to a regular plan, and its houses, a great number of which have been erected by the crown, are nearly all surrounded by gardens. The cathedral of St Sophia is a miniature copy of that at Constantinople. The town has two gymnasia for boys and girls. The imperial parks and gardens cover 1680 acres; the chief of them is the “old” garden containing the “old palace,” built by Rastrelli, the gallery of Cameron adorned with fine statues, and numerous pavilions and kiosks. The population numbered 15,000 in 1885.

When Peter I. took possession of the mouth of the Neva a Finnish village, Saari-mois, stood on the site now occupied by the town, and its Russified name Sarskaya was changed into Tsarskoye when Peter I. presented it to his wife Catherine. It was especially em- bellished by Elizabeth. Under Catherine II., a town, Sophia, was built close by, but its inhabitants were transferred to Tsarskoye Selo under Alexander J. The railway connecting the town with St Petersburg (1838) was the first to be constructed in Russia.

TSCHUDI, or Scuupy, the name of one of the oldest and most distinguished families of the land of Glarus, Switzerland. From 1029 to 1253 a member of the clan held the office of steward of the abbess of Sickingen on the Rhine, the lady of the manor ; and after Glarus joined the Swiss Confederation in 1352 various members of the family held high political offices at home, and were dis- tinguished abroad as soldiers and in other ways. In litera- ture, its most eminent member was GILES or ANGIDIUS TscHupi (1505-1572), who, after having served his native land in various offices, in 1558 became the chief magistrate or "'landammann." Originally inclined to moderation, he became later in life more and more devoted to the cause of the counter-Reformation. It is, however, as the his- torian of the Swiss Confederation that he is best known ; by incessant wanderings and unwearied researches amongst original documents he collected material for three great works, which therefore can never wholly lose their value, though his researches have been largely supplemented and corrected by those of more recent students. In 1538 his book on Rhetia, written in 1528, was published in Latin and in German—De prisca ac vera Alpina Rhetia, or Die

uralt wahrhaftig Alpisch Rhétva. His other works were not published until long after his death.

The Beschreibung Galliz Comatz appeared under Gallati's editorship in 1758, and is mainly devoted to a topographical, historical, and antiquarian description of ancient Helvetia and Rhetia, the latter part being his early work on Rhetia revised and greatly enlarged. This book was designed practically as an introduction to his mag- num opus, the Chronicon Helveticwm, part of which (from 1100 to 1470) was published by J. R. Iselin in two stately folios (1734-36) ; the rest (to 1564) consists only of

rough materials. The value of the work rests very largely on the constant use of original docu- ments, no fewer than 750 being printed in Iselin's edition, eet the transcripts do not always in point of accuracy come up to the standard demanded by the modern critical historian. Many ballads are incorporated and also many oral traditions, both being employed to give life and picturesqueness to his story, though often at the expense of historical truth, the stock instance of which is the manner in which he completed and elaborated the Tell legend (see TELL). In many ways his book, save in its flowing and quaint German, is rather like the work of a 14th-century chronicler than a critical history ; but it has been the source from which all later Swiss writers have drawn their information, and in many cases preserves the evi- dence of original documents which have since disappeared. It is in short a history rather resembling that of Livy than that of Hallam or Stubbs.

Subjoined is a list of other prominent members of the family. Dominic (1596-1654) was a Benedictine monk at Muri and wrote a painstaking work, Origo et genealogia gloriosissimorum comitum de Habsburg (1651). JosEpu, a Benedictine monk at Einsiedeln, wrote a useful history of his abbey (1823). The family, which be- came divided in religious matters at the Reformation, also includes several Protestant ministers,—Joun Henry (1670-1729), who wrote Beschreibung des Lands Glarus (1714) ; Joun Tuomas (1714-1788), who left behind him several elaborate MSS. on the local history of Glarus ; and Joun JAMES (1722-1784), who compiled an elaborate family history from 900 to 1500, and an account of other Glarus families. JoHN Louis (d. 1784), who settled in Metz and contri- buted to the Encyclopédie, and Frizpricu (1820-1886), the author of Das Thierleben der Alpenwelt, were distinguished naturalists. Among the soldiers may be mentioned CurisToPHER (1571-1629), a knight of Malta and an excellent linguist, who served in the French and Spanish armies ; while the brothers Lovis Lronarp (1700- 1779) and JosepH ANTHONY (1703-1770) were in the Neapolitan service. VALENTINE (1499-1555), the cousin of Giles, was, like the latter, a pupil of Zwingli, whom he afterwards succeeded as pastor of Glarus, and by his moderation gained so much influence that during the thirty years of his ministry his services were attended alike by Catholics and Protestants.

TSE-NAN FOO, the capital city of the province of Shan- tung in China, stands in 36° 40’ N. lat. and 117° 1’ E. long. It is situated in one of the earliest settled districts of the empire, and figures repeatedly in the records of the wars which troubled the country during the six centuries that preceded the Christian era. On the establishment of the Han dynasty (.c. 206) it had the name which it now bears; but during the next 200 years it was known at different periods as P’ing-yuen, Ts’ien-sh’ing, and Po-hai. In the 4th century its name was changed to Tse; and by the founder of the T’ang dynasty (618-907) it was christened Lin-tsze, by which name it was known until the overthrow of the Mongol dynasty in the 14th century, when the name of Tse-nan was restored to it. The city, which lies in the valley of the present channel of the Yellow river (Hoang-Ho), and at a short distance from its banks, is surrounded by a triple line of defence. First is the city wall, strongly built and carefully guarded, outside this a granite wall, and beyond this again a mud rampart. The streets are full of good shops, among which book, picture, and flower shops are conspicuous. There are two fine examination halls, one for bachelors of arts and the other for doctors of law, several handsome temples, and a metropolitan “drum” tower. The most noticeable feature about the city is three springs outside the west gate, which throw up as many streams of tepid water to a height of about 2 feet. This water, which is pleasant to the taste, and is highly prized for its healing qualities, flows in such abundant quantities that it fills the moat and forms a fine lake in the northern quarter of the city. With the taste which Chinamen always show in such matters, the lake is divided into a number of water avenues

by floating banks, on which flowers and trees are skilfully

/more painful than that of a gnat.

arranged, and is further adorned with several picturesque summer houses, which form points of attraction to picnic parties and pleasure-seekers during the warmer months. Its waters abound with many species of edible fish. The population of the town is reckoned at about 100,000, among whom are 2000 Mohammedan families. The city is the centre of a Roman Catholic see, and has opened its gates to several Protestant missionary bodies.

See Williamson, Jowrneys in North China, London, 1870.

TSETSE FLY (Glossina morsitans). The tsetse fly, so much dreaded by the traveller in South Africa, belongs to the sub-family Muscine and is closely allied to Stomowys. It is scarcely larger than the common house fly, which it resembles in its general shape. It can, however, be easily distinguished by its colour and the position of its wings. These are longer than the abdomen, and when at rest they project behind it, overlapping one another at their tips. This gives the fly a longer and narrower outline than that of the house fly. The colour is somewhat like that of the honey bee: the thorax is chestnut brown x with four longitudinal black stripes, the abdomen light yellow with transverse bars of dark brown on its dorsal surface. The proboscis, with which the fly inflicts its sting, is grooved and contains two long styles; and it is guarded by a pair of setose palps. At the base of the proboscis is a dilated horny bulb, and in this swelling it is supposed that | the poison is secreted. The bite of the Tsetse fly (Glossina tsetse is innocuous to man and is not morsitans). Large game, goats, and apparently all animals whilst suckling, are also un- affected by it. But to the horse, ox, and dog it is fatal. The poison may take effect after a few days, or the animal may remain apparently unaffected for some months; but eventually symptoms of poisoning appear. These symptoms seem to be rather variable; as a rule swellings arise under the jaws and around the navel, the eyes and nose begin to run, and, although the animal con- tinues to graze, it becomes more and more emaciated, suffers violently from purging, and at length succumbs to extreme exhaustion. Post-mortem examination shows that the muscles, and especially the heart, are in a very soft and flabby condition. The lungs and liver are affected, the gall bladder distended with bile. The fat is of a greenish yellow colour and oily consistency, the blood small in quantity and very thin, with hardly any power of staining. At present no cure is known for the bite, nor does inoculation seem to afford any protection. The fly is said to avoid animal excreta, and in some parts a paste composed of milk and manure is smeared on cattle which are about to pass through the “fly-belts.” This affords a certain amount of protection. Lion’s fat is used in the same way, and is said to be efficacious.

The fly is found as a rule in the neighbourhood of water, and its habitat is usually sharply defined. Often it occurs on one side of a stream but not on

the other. The limits of the ‘‘fly-belts” are well known to the natives, and travellers can ensure comparative safety to their cattle by passing through these districts after sun- down. The northern limits of the area inhabited by the tsetse are not known. It is found throughout the valley of the Limpopo river, but does not come much south of this, except in the eastern borders of the Transvaal. Here it extends far south of Delagoa Bay, and infests the Lobombo Mountains and the Amatonga country, reaching to the confines of Santa Lucia Bay. It appears to be gradually retreating northwards, following the big game.

The fly is figured in Proc. Zool. Soc., 1850, and by Frank Oates, Matabele Land and the Victoria Falls, 1881.

TUAM, a market town and episcopal city of Galway, Treland, is the terminus of the Athenry and Tuam Railway, and lies 20 miles north-east of Galway and 129 west of Dublin. An abbey was founded here towards the end of the

a2, == 96

5th century, and in the beginning of the 6th an episcopal see by St Jarlath. The new Protestant cathedral of St Mary occupies the site of the original cathedral, built in 1130, and includes the chancel arch of the ancient building, now forming the great doorway,—a very fine specimen of the old Romanesque. The Roman Catholic cathedral in the later Early English style is one of the finest modern Catholic churches in Ireland. Adjoining it is the Roman Catholic college of St Jarlath, usually called the “New College,” founded in 1814 for the education of candidates for the priesthood. To the west are the archbishop’s palace and a convent of Presentation nuns. The other public buildings are the workhouse, the dispensary, and the market-house. The town has a considerable retail trade, and is a centre for the disposal of agricultural pro- duce, From 4223 in 1871 the population decreased to 3567 in 1881.

The see of Tuam was raised to an archbishopric about 1152. Under the Church Temporalities Act of 1839 it was reduced to a bishopric, but is still

the seat of a Roman Catholic archbishop. It received its first charter in the 11th year of James I. It formerly returned two members to parliament, but was disfranchised at the Union.

TUAMOTU ARCHIPELAGO,! a broad belt of seventy coral islands lying between 14° 5’ and 23° 22’ §. lat. and 134° 25’ and 148° 40’ W. long., and now under the pro- tection of France. They trend in irregular lines in a north- west and south-east direction, and cover 1500 miles of the Pacific, the easternmost Tuamotus being 3600 miles from Peru.2 With the exception of a few insignificant islands the archipelago consists of atolls (see CoraLs and Pactric OcEan), mostly chains of low islets that crown the reefs and sometimes also obstruct the deep lagoons which they encircle. The largest island, Nairsa (Dean’s Island), with a lagoon 45 miles long by 15 wide, is made up of twenty islets. Fakarava, the next in size, consists of fifteen islets, and its oblong lagoon affords the best anchorage in the group. Hao has fifty islets, and its lagoon is dangerously studded with coral. The symmetrically placed eleven islets of Anao suggested to Captain Cook the name of Chain Island. Matahiva, Niau, and Mururoa are good specimens of the horse-shoe-shaped atoll. Nengonen- gone, Fangataufa, and Marutea, true lagoon islands, form unbroken rings round their lake-like lagoons. In a few of the smaller atolls the lagoons have been completely silted up. To the south-east lie the Gambier Islands, a cluster of four larger and many smaller volcanic islets, enclosed in one wide reef. The wooded crags of Mangareva, the largest islet, 5 miles in length, rise to a height of 1300 feet and are covered with a rich vegetation, quite Tahitian in character; but, as in the other Tuamotus, there is a dearth of animal life. This group was discovered by Captain Wilson of the London Missionary Society in 1797. Tahitian teachers were sent thither in 1834; but Catholic missionaries followed in 1836, and converted the entire population. The natives, once very numerous, now number less than a thousand, and are still decreasing. Cannibal- ism was formerly prevalent. In physique, language, re- ligion, and custom the Gambier Islanders closely resemble the Rarotongans. Beechey surveyed the group in 1826, and D’Urville in 1838. Pitcairn Island and a few unin- habited rocks lie still farther to the south-east. The Tuamotus are healthy and as a rule have a lower mean

1 There is uo collective name for the archipelago among the Tuamotuans themselves, but the Tahitians call it Paumotu (7.e., Cloud of Islands). The group is Bougainville's Dangerous Archipelago, Fleurieu's Bad Sea, Krusenstern's Low Islands, and the Pearl Islands of traders.

2 Distinct names have been given to eight clusters of the archi- pelago,—Disappointment Islands, King George's Islands, Palliser Islands, Raeffsky Islands, Two Groups, Duke of Gloucester Islands, Acton or Amphitrite group, and Gambier Islands.

temperature than Tahiti. The easterly trade winds prevail. Rain and fogs occur even during the dry season. The stormy season lasts from November to March, when de- vastating hurricanes are not uncommon and a_ south-westerly swell renders the western shores dangerous. Plants and animals are very meagrely represented, even more so than in the atolls of Micronesia. Cocoa-palms and the pandanus thrive on many of the islets, and the bread-fruit, banana, pine-apple, and arum have been intro- duced from Tahiti into the western islands. Mammals are represented by a rat; among land-birds a parakeet, a thrush, and a dove are noticeable ; and of reptiles there is only one lizard. Insects are scarce. But the sea and lagoons teem with turtle, fish, mollusks, crustaceans, and zoophytes. Coral grows luxuriantly everywhere. From the abundance of pearl-oysters the archipelago gets its name of Pearl Islands; pearl-fishing indeed is the only remunerative industry. Under French control the newest appliances for obtaining shells have now mostly superseded the laborious diving of the natives. The Tuamotus are very thinly inhabited by a fine strong Polynesian race, more muscular and mostly darker-skinned than that inhabit- ing Tahiti. In the west considerable intermixture with other races has taken place. Of the habits of the people little is known, and many of the islands are still marked 'hostile inhabitants" on the English Admiralty charts. In the eastern islands cannibalism existed. Tattooing is not universal. Clothing and ornaments are very scanty. The huts are mean square buildings, often mere shelters of leaves. Good outrigger and single and double canoes are built, the larger ingeniously stitched together of small pieces of drift wood. Fishing with net and hook is much

practised. Food besides fish consists almost exclusively of cocoa-nuts and pandanus fruit. Water is scarce.

Magellan's first discovery of land after reaching the Pacific in 1520 was one of the Tuamotus. Various portions of the archipelago were in turn crossed by Queiros (1605), Lemaire and Schouten (1616), Roggeween (1722), Byron (1765), Wallis (1767), Bougain- ville (1768), Cook (1769), the " Duff" (1797), Krusenstern (1803), Kotzebue (1816), Fitzroy (1835), D'Urville (1838), and Belcher (1840). The first systematic survey was instituted in 1818 by Bellinghausen, and was continued in 1823 by Duperry, in 1826 by Beechey, and in 1889 by Wilkes. Thanks to these many explorers, the islands have been christened and rechristened with a chaos of Spanish, Dutch, English, French, German, and Russian names.

See the narratives of the various explorers cited above, and Meinicke, Inseln

des stillen Oceans (Leipsic, 1876); for general statistics and an account of the pearl-fisheries, see Notices Coloniales, Paris, 1886.

TUBERCLE. See PatnHouoey, vol. xviii. p. 405, and PHTHISIS.

TUBEROSE. The cultivated tuberose (Polianthes tuber- osc) is allied to the Mexican agaves and is a native of the saine country. The tuberous root-stock sends up a stem 3 feet in height, with numerous lanceolate leaves and terminal racemes of white funnel-shaped, very fragrant flowers. Each flower is about 14 inches long, with a long tube and a six-parted limb. The stamens are six in number, emerging from the upper part of the tube, and bear linear anthers. The ovary is three-celled ; but the mature fruit and seed are not botanically known. The plant is largely grown in the United States and at the Cape of Good Hope for export to England, as it is found that imported bulbs succeed better than those grown in the United Kingdom. The cultivated plants have double flowers and require a rich soil, considerable heat, and, at first, abundance of water.

TUBINGEN, the university town of Wiirtemberg, is picturesquely situated on the hilly and well-wooded banks of the Neckar, at the junction of the Ammer and Stein- lach, 18 miles south of Stuttgart, and on the S.E. border

of the Black Forest. The older town is irregularly built and unattractive, but the newer suburbs, the chief of which is the Wilhelmsstrasse, are handsome. The most

conspicuous building is the old ducal castle of Hohen- tiibingen, built in 1507-1540 on a hill overlooking the town, and now containing the university library, observa- tory, chemical laboratory, &c. Among the other chief buildings are the quaint old Stiftskirche (1469-83), and the new aula and numerous institutes of the university, all of which are modern. A monument was erected in 1873 to the poet Uhland (1787-1862), who was born and is buried here. Tiibingen's chief claim to attention lies in its famous university, founded in 1477 by Duke Eberhard. The university adopted the Reformed faith in 1534, and in 1536 a Protestant theological seminary—the so-called Stift—was incorporated with it. In 1817 a Roman Catholic theological faculty (the 'Convict ") and a faculty of politics and economics were added, and in 1863 a faculty of science. The leading faculty has long been that of theology, and an advanced school of theological criticism, the founder and chief light of which was F. C. Baur (q.v.), is known as the Tiibingen school. Melanchthon was lec- turer at Tiibingen before he was summoned to Wittenberg. The university is attended by about 1400 students, a con- siderable proportion of whom are foreigners, and has a teaching staff of 53 professors, 17 extraordinary professors, and 10 lecturers. The commercial and manufacturing industries of the town are slight. Printing, book-selling, the manufacture of surgical and philosophical instruments, and the cultivation of hops, fruit, and vines are among the leading occupations of the inhabitants. The population in 1885 was 12,660 (11,708 in 1880). The country in the neighbourhood of Tiibingen is very attractive ; one of the most interesting points is the former Cistercian monas- tery of Bebenhausen, founded in 1185, and now a royal hunting-chateau.

Tubingen is mentioned as a strong fortress in 1078. In 1342 it was purchased by the count of Wiirtemberg, whose descendants afterwards acquired the title of duke. The treaty of Tiibingen is the name given in German history to an arrangement made in 1514 between Duke Ulrich and

his subjects, by which the latter acquired various rights and privileges on condition of relieving the former of his debts. The town was captured by the Swabian League in 1519, by Turenne in 1647, and again in 1688 by the French, who destroyed the fortifications. Tiibingen was made a garrison town in 1875.

TUCKER, Asranam (1705-1774), holds a place of his own among the English moralists of the 18th century. He was born in London, of a Somerset family, on 2d September 1705. His father, a wealthy city merchant, died in his son's infancy, leaving him to the guardianship of his uncle, Sir Isaac Tillard, a man of a rare integrity of character, to whom Tucker never failed to acknowledge a deep debt of gratitude. In 1721 Tucker entered Merton College, Oxford, as a gentleman commoner. Here he devoted himself chiefly to philosophical and mathematical studies, but also found leisure to master French and Italian, and to acquire considerable proficiency in music. He after- wards studied law at the Inner Temple, but as his fortune made him independent of a profession he was never called to the bar. In 1727 he bought Betchworth Castle, near Dorking, where he passed the remainder of his life, occu- pied, in addition to his favourite studies, with the usual pursuits of a well-to-do country gentleman. He took no part in politics, however, and even wrotea pamplilet, The Country Gentleman's Advice to his Son on the Subject of Party Clubs (1755), cautioning young men against the dangers of rashly pledging themselves to political principles and measures of which their riper judgment may disapprove. In 1736 Tucker married Dorothy Barker, the daughter of a neighbouring landed proprietor. His wife, to whom he was fondly attached, died in 1754, leaving him with two daughters. 'As soon as the first excess of his grief was somewhat mitigated," we are told, "he occupied himself in collecting together all the letters that had passed between

them at periods when they were accidentally separated from each other, which he transcribed twice over, under the title of 'The Picture of Artless Love.' One copy he gave to Mr Barker, his father-in-law, and the other he kept, and frequently read over to his daughters." He took an active part in the education of his daughters, and from this time onward began to occupy

himself with the composition of the work by which he is known—The Light of Nature Pursued. He made several sketches of the plan of his work, one of which—in dialogue—he went the length of printing before finally deciding on the method he should pursue. He also sought to qualify himself for authorship by the study of the most elegant Greek and Latin classics and by translating the most adniired passages of Cicero, Demosthenes, and Pliny several times over. Moreover, after his work was written, he twice transcribed it with his own hand. In 1763 he published a specimen under the title of "Free Will." The strictures of a critic in the Monthly Review of July 1763 drew from him a pamphlet called Man im Quest of Himself, by Cuthbert Comment. This, as its sub-title states, is "'a defence of the individu- ality of the human mind or self"; it has been reprinted in Parr's Metaphysical Tracts (1837). In 1765 the first four volumes of his work were published under the pseudo- nym of Edward Search. The remaining three volumes did not appear till after his death. His eyesight failed him completely in 1771, but his cheerfulness did not leave him. He contrived an ingenious apparatus which enabled him to write so legibly that the result could easily be tran- scribed by his daughter. In this way he completed the later volumes, which were ready for publication when he was seized by his last illness. He died on 20th November 1774.

A second edition of The Light of Nature aupained in 1805, with a short life of the author by his grandson, Sir H. P. St John Mild- may, which forms the sole biographical source. The work has siuce been repeatedly re-published in two large closely printed volumes. A useful abridgment was published (anonymously) by Hazlitt in 1807; for, as he truly says, it is "swelled out with endless repetitions of itself The author was a private gentleman, who wrote at his ease, and for his own amusement. When a subject presented itself to him, he exhausted all he had to say upon it, and then dismissed it for another. If the same subject recurred again in a different connexion, he turned it over in his thoughts afresh ; as his ideas arose in his mind, he committed them to paper ; he repeated the same things over again or inserted any new observa- tion or example that suggested itself to him in confirmation of his argument ; and thus by the help ofa new title, and by giving a different application to the whole, a new chapter was completed. By this means, as he himself remarks, his writings are rather a tissue of loose essays than a regular work." In spite of Tucker's elaborate care in

composition, there is no doubt that this fairly characterizes the rambling prolixity of his book; but it may be questioned whether an epitome can convey the real merits of such a style and treatment—qualities which have earned for Tucker from Sir James Mackintosh the designation of a ‘‘ metaphysical Montaigne.” These are his sound hearty common sense, the origin- ality of a man who looks at everything for himself completely untrammelled by system, a remarkable aptness in illustration, and occasional gleams of a mild humour. Though the The Light of Nature embraces in its scope many psychological and more strictly metaphysical discussions, it is chiefly in connection with cthics that Tucker’s speculations are remembered. This is the subject which the author puts into the foreground himself; from his earliest youth, he tells us, his thoughts took a turn “toward searching into the foundations and measures of right and wrong.” In some important points Tucker anticipates the utilitarianism shortly afterwards systematized by Paley, and Paley, it may be noted, expresses in the amplest terms his obligations to his prede- cessor, ‘ Every man’s own satisfaction” Tucker holds to be the ultimate end of action ; and satisfaction or pleasure is one and the same in kind, however much it may vary in degree. This universal motive is further connected, as by Paley, through the will of God, with the ‘ general good, the root where out all our rules of conduct and sentiments of honour are to branch.” Tucker adopts from Hartley the principle of association, or, as he calls it, ‘‘ translation,” to explain the formation of the moral sentiments and the phenomena of disinterested action generally. In his general analysis of the mind he professes to follow Locke, though with great latitude in details, and even in much that is not matter of detail.

TUCKER, Jostax (1711-1799), dean of Gloucester from 1758, a sagacious and candid writer on politics and political economy. See PorrticaL Economy (vol. xix. p. 365).

TUCSON, a city in Pima county, Arizona Territory, United States, is situated in 32° 13’ N. lat. and 110° 53’ W. long. at an elevation of 2403 feet above the sea, upon the Santa Cruz river and on the Southern Pacific Railroad, about 70 miles from the Mexican frontier. The surround- ing

country is arid and barren, except where it has been fertilized by irrigation. The climate is exceedingly hot and dry. The principal industries of Tucson, besides stock- rearing, are connected with mining, as it is a supply point for mining districts in the neighbouring mountains and has several smelting works. The population, which in 1860 was 915, in 1870 3224, had grown by 1880 to 7007, and in 1887 was estimated to number nearly 10,000. About one-half are of foreign birth, a large proportion being Mexicans. ‘Tucson is one of the oldest settlements in the United States, having been founded as a Jesuit mission by the Spaniards in the 17th century.

TUCUMAN, or, more fully, San MicuEen pE Tucuman, capital of the province of Tucuman, in the Argentine Re- public, is a straggling town, on the right bank of the Tala (a subtributary of the Rio Salado), at the eastern base of the Sierra de Aconquija, in 26° 50’ 8. lat. and 64° 35’ W. long. It is connected by rail with Cordova and Rosario. The surrounding district is fertile, and also produces excel- lent timber. Leather and sugar are the principal objects of industry. The population was recently estimated at

17,000.

TUDELA, a city of Spain, in the province of Navarre, is situated on the right bank of the Ebro where it is joined by the Queyles, and on the railway from Zaragoza to Pamplona, about 50 miles to the north-west of the former city. The Ebro is here crossed by a fine old bridge, 400 yards in length, consisting of seventeen arches. The only building within the town of any interest is the fine church of Santa Maria, founded in 1135 and consecrated in 1188, the doorways and cloisters being specially rich in sculptural ornamentation. The manufactures of the place (cloth, silk, pottery) are unimportant. There is some trade in wine and oil. The population within the municipal boundaries in 1877 was 10,086.

Tudela, anciently Z’utela, was the birthplace of the celebrated

medieval traveller BENJAMIN (g.v.) of Tudela, It was made an episcopal see in 1783, which was suppressed in 1851.

TUDOR, Hovuss or. See Henry VII. and Lancaster, Hous of, vol. xiv. p. 257.

TUKE, Samven (1784-1857), English philanthropist, son of Henry Tuke, born at York in 1784, greatly advanced the cause of the amelioration of the condition of the in- sane, and devoted himself largely to the York Retreat, the methods of treatment pursued in which he made more widely known by his Description of the Retreat near York, &e. (York, 1813). His writings on the construction of asylums and on other subjects connected with the insane are well known. He died in 1857.

TUKE, Wint1am (1732-1822), English philanthropist, was born at York in 1732. He devoted himself to many philanthropic objects, but his name is more especially known in connexion with the humane treatment of the insane, for whose care he projected in 1792 the Retreat at York, which became famous both abroad and in Great Britain aS an institution in which a bold attempt was made to manage lunatics without the excessive restraints then regarded as essential. Not less remarkable was the departure from the beaten track of treatment in regard to copious bleedings and the frequent administration of emetics and depressing remedies. The asylum was entirely under the management of the Society of Friends, and

remains so at the present time, but there are a large number of inmates not connected in any way with this body. The original character of the methods pursued at the Retreat attracted much attention, and its marked suc- cess led to comparisons being made between it and other establishments, the abuses in some of which became so notorious as to be brought under the notice of parliament, and led to more stringent legislation in the interests of the insane. The condition of this unfortunate class became greatly improved in consequence. William Tuke did not live to see the most important of the Acts passed, but when he died, in 1822, the superiority of the treatment adopted at the Retreat was fully acknowledged.

See Report of the Seleet Committee of the House of Commons, 1815- 1816; Dr Conolly, Treatment of the Insane without Mechanical Restraints, 1856; Dr Hack Tuke, Chapters in the History of the Insane in the British Isles, 1882.

Henry TuKE (1756-1814), son of the preceding and father of Samuel Tuke, co-operated with his father in the reform at the York Retreat. He was the author of several moral and theological treatises, which have been translated into German and French.

TULA, a government of central Russia, bounded by Moscow on the N., Ryazaii on the E., Tamboff and Orel on the 8., and Kaluga on the W., has an area of 11,950 square miles. It is intersected from south-west to north- east by a gently undulating plateau, from 950 to 1020 feet in height, which separates the drainage area of the Oka from that of the Don. The average elevation of Tula is about 800 feet, and its surface is an undulating plain ; but the rivers flow in valleys so deeply cut and so scored with ravines that in their neighbourhood the country assumes the aspect of a hilly region. Devonian limestones, dolomites, and sandstones appear chiefly in the south-west ; Lower and Middle Carboniferous limestones and clays occupy the remainder of the area. The former contain deposits of coal, which are now worked (chiefly at Malevka and Novoselsk) to the extent of nearly one and a half million ewts. annually. Jurassic clays are found in patches here and there. Glacial boulder clay covers most of the region, while Lacustrine deposits are widely spread in the valleys and depressions. Iron-ore is found all over the government ; limestone, fire-clay, and pottery clay are also obtained. The soil is black earth in the south and east and clay or sandy clay in the north-west. Tula is watered chiefly by the Oka and its tributaries (Upa, Zusha, Osetr, and Pronya). The Don rises in Lake Ivan-Ozero (which feeds also a tributary of the Oka), and has a course of 35 miles within Tula. It is not navigable, and Peter I.’s attempt to connect it with the Oka by means of a canal was never carried out. Lakes and marshes (chiefly in the north-west) are few. Forests (8 per cent. of the area) are rapidly disappearing. The climate is less rigorous than that of Moscow, the average yearly temperature being 40°°2 Fahr. (January, 13°°8 ; July, 67°°5).

The flora of Tula deserves some attention as marking the trans- ition from that of the south-east steppes to that of north-west Russia. A line drawn on the northern slope of the watcr-parting already mentioned (a few miles to the south of the city of Tula) divides the province into two parts, of which the southern is a black earth region and the other is chiefly covered with boulder clay. The boundary is marked by a series of crown forests—

formerly a means of defence against the nomad tribes, whence their name Zasyeka—which at the same time constitute a line that is not passed by several species characteristic of the steppe region, such as the Lilia of the steppes, Lilium Martagon, Linum flavum, Lathyrus pisiformis, Geranium sanguineum, Pyrethrum corym- bosum, and Serratula heterophylla. On the other hand, several northern species, which are quite common in the marshes of Mos- cow, do not penetrate into Tula, and several others, such as Linnxa borealis, Viola palustris, Cirsium palustre, Pedicularis palustris, do not cross the Zasyeka. The same forests shelter several northern species which do not appear either in northern or southern Tula, as also several southern herbaceous plants which. are now only occasionally met with in the black earth steppes of south Russia. Several West-European plants (Sanicula ewropea, Carex remota,

Cephalanthera ensifolia, Allium ursinwm) find their eastern limits in Tula, Another interesting feature is the extension down the valley of the Oka, not ouly of pine-forests, which are not found elsewhere within the province, but also of many herbaceous plants originally from the south or south-west. The steppe flora of Tula is being rapidly impoverished in consequence of the spread of agri- culture: many steppe plants are now found only in their last retreats on the dry uncultivated limestone crags.

The population of the government (750,000 in 1777) in 1888 was 1,360,000, of whom 115,770 were urban. They are all Great Russiaus, and either Orthodox Greeks or Raskolniks. Their chief occupation is agriculture, 70 per cent. of the area being arable. Nearly one-half of the soil belongs to landlords and merchants, and the other half to the peasant communities (53 per cent. of the area, and 58 per cent. of the land under culture). ‘The crops for 1883-85 averaged 7,574,200 quarters of grain and 10,172,000 bushels of potatoes, largely used for distilleries. Beet-root culture is increasing (8520 acres in 1885, yielding 59,800 cwts. of sugar). The growth of tobacco is also spreading (10,000 cwts. in 1885). There were in 1883 380,620 horses, 203,500 cattle, and 786,000 sheep. Manu- factures are rapidly developing; their aggregate production was valued at £1,649,720 in 1888 (distilleries £293,956, sugar-works £601,827, tanneries £148,356, iron works, brass

works, &c., about £150,000). Petty trades, especially the manufacture of tea-urns, small brass ware, and harmoniums, and also weaving, arc extensively carried on and support a lively export trade; timber, raw metals, and various manufactured wares are imported. The government is traversed by the Moscow and Sebastopol and the Ryazhsk and Vyazemsk Railways, as well as by the Oka. The government is divided into twelve districts, the chief towns of which, with their population in 1882, are Tuta (see below), Alexin (4960), Bogoroditsk (8030), Byeleff (9300), Epifai (3820), Efremoff (7770), Kashira (4610), Krapivna (1560), Novosil (4660), Odoeff (5140), and Tcheriit (2675). Byeleff, Alexin, and Kashira are important loading places on the Oka. The villages Malevka (coal-mines) and Niki- tino have more than 5000 inhabitants each.

History.—Before the Slavonic immigration, the territory of Tula was inhabited by the Mordves on the north and the Mestchers in the south. The Slavs who occupied the Oka belonged to the branch of the Vyatichis, who were soon compelled to pay a tribute to the Khazars. Subsequently the territory on the Oka belonged to the principality of Tchernigoff, thus maintaining its connexion with south-west Russia. In the 14th century part of it fell under the rule of Ryazafi and Moscow, while the remainder was under Lithu- anian dominion till the 15th century. Several of the towns of Tula were founded in the 12th century, but the colonization of this fertile region went on slowly on account of the raids of the Tatars.

TULA, capital of the above government, is situated on the Upa, 120 miles by rail to the south of Moscow. Other railway lines connect it with Ryazafi and Orel. It is built in the broad but low, marshy, and unhealthy valley of the Upa and is divided into three parts,—the Posad on the left bank, the Zaryetskaya or Oruzheinaya on the right bank, and Tchulkova between the Upa and the Tulitsa. It is an old town of Old Russia, but its growth began only towards the end of the 18th century after the manufacture of arms had commenced, and now (1887) its population has reached 65,100 (63,500 in 1882). They are employed chiefly either at the imperial gun factory or at numerous private factories (about 130, with 4350 men) and small workshops. The main branch of the industry is the making of rifles (from 20,000 to 30,000 annually). Next in im- portance comes the manufacture of samovars (tea-urns), in which more than 5000 persons are engaged. All

sorts of cutlery and ironmongery are manufactured in the small workshops of Tula, which have a high repute in Russia. No fewer than 240,000 harmoniums are turned out annually; nearly 150,000 cewts. of steel, iron, and brass are imported

every year for this industry alone.

The town of Tula is first mentioned in 1147 ; but its former site scems to have been higher up the Tulitsa. Its wooden fort was replaced in 1514-1521 by a stone ‘‘kreml,” which still exists. Boris Godunoff founded a gun factory at Tula in 1595, and in 1632 a Dutchman, Winius, established an iron foundry. Michael Alexis and Peter I., especially the last-named, took great intercst in the gun factories, and large establishments were built in 1705 and 1714, which soon turned out 15,000 rifles in a year. Catherine IJ. and Paul I. further improved the manufactures, which during the wars with France supplied more than half a million rifles.

TULIP (Zulipa), a genus of bulbous herbs belonging to the Lilvaceex, The species are found wild along the

northern shores of the Mediterranean, in the Levant, Armenia, Caucasus, Persia, Central Asia, and Afghanistan. The cup-shaped flowers have six regular segments in two rows, as many free stamens, and a three-celled ovary with a sessile stigma, which ripens into a leathery many-seeded capsule. The species are numerous, and are distinguished one froin another by the scales of the bulb being woolly or smooth on the inner surface, by the character of the flower- stalks, by the filaments being hairy or otherwise, and by other characters. Owing to the great beauty of the flowers they have been favourites in European gardens for two or three centuries, and have been crossed and recrossed till it has become almost impossible to refer the plants to their original types. The early flowering “Van Thol” tulips, the segments of which are mostly scarlet with yellow edges, are derived from 7. suaveolens, a native of the Caspian region. 7’, Gesneriana, a native of Armenia and central Russia, is the origin of some of the later flowering varieties. 7’. pubescens, thought by Mr Baker to be a hybrid between the two species just named, is the source of some of the early

flowering kinds known as “pottebakker,” &c. 7. oculus solis and 7’. Clusiana are lovely species, natives of southern France, and 7”. silvestris, with elegant yellow pendulous flowers, is a doubtful native of England. During the last few years, owing to the exertions of Russian naturalists, a large number of new species have been discovered in Turkestan, and introduced into Europe. Some of these are very beautiful, and render it probable that by intercrossing with the older species still further difficulties will be presented in the way of identification. These difficulties are further enhanced by the fact that, quite apart from any cross-breeding, the plants, when subjected to cultivation, vary so greatly in the course of two or three years from the original species from which they are directly descended that their parentage is scarcely recognizable. This innate power of variation has enabled the florist to obtain, and ultimately to “fix,” so many re- markable varieties. At the present day tulips are less fashionable than they once were, and consequently the enormous prices given for new or improved varieties no longer obtain, though, even now, two and three guineas are asked for special bulbs. It must, however, be remembered that the “tulipomania” of the 17th century was really a form of gambling, in which admiration of the flower and interest in its culture were very secondary matters. Tulips were introduced into the Low Countries in the 16th century from Constantinople and the Levant by way of Vienna and Venice. There is a legend that an Antwerp merchant, to whom bulbs were sent, cooked them for onions; and to this day the natives of some parts of Persia and Afghanistan use the bulbs of Z’ulipa chrysantha for food. The mode of growth of a tulip bulb is worthy of attention. In spring, at the flowering period, each bulb is a composite structure. It consists, first, of the bulb of the year, which produces the flowers and the leaves. From the axil of one (or more) of the scales of the flowering bulb emerges a secondary bulb, destined to form leaves and flowers for the next season’s growth. In like manner from the side of the second generation are produced tertiary bulbs, which flower in the third year after their formation. Each bulb, there- fore, has an existence of three years, flowering in the third year, and dying afterwards, so that the bulb planted in the autumn is not the same one that flowered in the spring, but a second generation. For the cultivation of tulips, see HorTIcULTURE, vol. xii. p. 259.

TULLE, a town of France, chef-lieu of the department of Corréze and a bishop's see, is 61 miles east-north-east of Périgueux by the railway from Bordeaux to Clermond- Ferrand. The town rises picturesquely on both banks of the Corréze, a sub-tributary of the Dordogne. The Corréze,

crossed by four bridges, flows between embankments, and the narrow streets on the steep left bank are connected by stairs. Of the 12th-century cathedral only the porch and the nave of six bays remain, the choir and transept having been destroyed in 1793; but there is a 14th-century tower, with a fine stone steeple. The neighbouring cloister (13th century) is being restored. The abbot's house (15th century) has a carved doorway and well-preserved windows ; and some curious houses of the 12th, 13th, and 14th centuries still exist. Tulle possesses normal schools for male and female teachers, and is the headquarters of the Historical Society of Lower Limousin. The principal industry is the manufacture of firearms. The Government establishments employ from 1500 to 3000 workmen, and can turn out 70,000 guns annually. Manufactories for the variety of lace called "tulle" were first established here. There is a collection of the firearms of all nations. The population in 1886 was 10,635 (commune 16,275).

Tulle (Tutela Lemovicum) owed its importance in the Middle Ages to an abbey founded by St Martin, or, according to another authority, in the 7th century, which was raised to a bishopric in 1317. Mascaron was bishop in the 17th century. The town was taken by the English in 1346, and was subsequently ravaged by the Black Death. It was again conquered by the English in 1369 ; but, when the inhabitants succeeded in freeing themselves, they were exempted from all imposts by Charles V. The viscount of Turenne, leader of the Protestauts, tried in vain to seize Tulle in 1577, but was successful in 1585.

TULLE, a term restricted in England to a fine bobbin- net of silk, used for veils, scarves, millinery purposes, and trimmings of ladies' dresses, &c. The French used the word to mean all machine-made lace the basis of which is the intertwisted net-work made on the bobbin-uet machine. The word is derived from the town of Tulle in France (see above).

TULLOCH, Joun (1823-1886), Scottish theologian, was born at Bridge of Earn, Perthshire, in 1823, went to school at Perth, and received his university education at St Andrews and Edinburgh. In 1845 he became minister of St Paul's, Dundee, and in 1849 of Kettins, in Strath- more, where he remained for six years. His literary gifts, shown in his contributions to various reviews, as well as his talent for society drew attention to him, and in 1854 he was appointed to the principalship of St Mary's College, St Andrews. The appointment was immediately followed by the appearance of his Burnet prize essay on Z'heasm. At St Andrews, where he held along with the principal- ship the post of professor of systematic theology and apologetics, his work as a teacher was distinguished by several features which at that time were new. He lectured on comparative theology and treated doctrine historically, as being not a fixed product but a growth. From the first he secured the attachment and admiration of his students. In 1862 he was appointed one of the clerks of the General Assembly, and from that time forward he took a leading part in the councils of the Church of Scotland. In 1878 he was chosen moderator of the Assembly. No one, except perhaps Dr Robert Lee, has done more during the last generation to widen the national church. Two positions on which he repeatedly insisted in the Assembly have taken a firm hold of the mind of that church,—first, that it is of the essence of a church to be comprehensive of various views and tendencies, and that a national church

especially should seek to represent all the elements of the

life of the nation; secondly, that subscription to a creed can bind no one to all its details, but only to the sum and substance, or the spirit, of the symbol. For three years before his death he was convener of the church interests committee of the Church of Scotland, which had to deal with a great agitation for disestablishment. He was also deeply interested in the reorganization of education in Scotland, both in school and university, and acted as one

of the temporary board which settled the primary school system under the Education Act of 1872. His death took place at Torquay on 13th February 1886. .

Tulloch’s best known works are collections of biographical sketches of the leaders of great movements in church history, such as the Reformation and Puritanism. His most important book, Rational Theology and Christian Philosophy (1872), is one in which the Cambridge Platonists and other leaders of dispassionate thought in the 17th century are similarly treated. He delivered the second series of the Croall lectures, on the Doctrine of Sin, which were afterwards published. He also published a small work, Zhe Christ of the Gospels and the Christ of History, in which the views of Renan on the gospel history were dealt with; a monograph on Paseal for Blackwood’s Foreign Classics serics ; and a little work, Beginning Life, addressed to young men, written at an earlier period. A Life of Tulloch by Mrs Oliphant is in preparation.

TULLUS HOSTILIUS, third legendary king of Rome, is represented as having reigned for thirty-two years (670-638 B.c.). His successful wars with Alba, Fidena, and Veii shadow forth the earlier conquests of Latian territory and the first extension of the Roman domain beyond the walls of Rome. See Rong, vol. xx. p. 733.

TUMKUR, or Toomxoor, a district of India, in the west of the Nandidrug division of Mysore, situated between 12° 43’ and 14° 10’ N. lat. and 76° 10’ and 77° 30’ E. long., with an area of 3420 square miles. It is bounded on the north by the Bellary district, on the east by Kolar and Bangalore, on the south by Mysore, and on the west by Chitaldrig and Hassan. Tumkur consists chiefly of elevated land intersected by river valleys. A range of hills rising to nearly 4000 feet crosses it from north to south, and forms the water-parting between the systems of the Krishna and the Kaveri. The principal streams are the Jayamangala and the Shimsha, The mineral wealth of Tumkur is con- siderable: iron is obtained in large quantities from the hill sides ; and excellent building stone is quarried. The slopes of the Devaray-durga Hills, a tract of 18 square miles, are clothed with forests, in which large game are numerous, including tigers, leopards, bears, and wild hogs. The climate of Tumkur is generally considered as equable and healthy ; the average annual rainfall amounts to nearly 33 inches. The Mysore State Railway enters the district at the south-east corner and traverses it to the west.

In 1881 the population of Tumkur numbered 413,183 (males 208,258, females 209,930), embracing 395,443 Hindus, 17,130 Mohammedans, and 6038 Christians. Tumkur town, situated at the base of the Devaray-durga Hills, 43 miles north-west of Bangalore, with a population of 9909, is the administrative headquarters. The cultivated products consist chiefly of vdgi, millet, wheat, sugar- cane, various pulses, and oil seeds. Of the total area 745 square miles are cultivated and 1544 cultivable. The chief industries are the making of coarse cotton cloths, woollen blankets, and ropes. The exports comprise rdgi, unhusked rice, cocoa-nuts, areca-nuts, earth salt, pulses, and vegetables ; the imports include European piece goods, rice, spices, cotton, &c.

The history of Tumkur is comnion to the rest of Mysore. After the assumption of the administration of Mysore by the British in 1832 the district received its present name and limits.

TUMOUR. See Parnotoey, vol. xviii. p. 367, and SurGErRY, vol. xxii. p. 687.

TUMULUS. See Arcuirecturs, vol. ii. p. 384, and Barrows, vol. ii. 397.

TUNBRIDGE, or TonBRIDGE, a town of Kent, England, is situated on rising ground above the Medway, and on the South-Eastern Railway, 41 miles (by rail) south-east of London and 33 north-west of Hastings. The Medway is crossed by a stone bridge, erected in 1775. The town consists chiefly of one long main street and a large number of suburban villas. The church of St Peter and St Paul, chiefly Decorated and Perpendicular with some portions of an earlier date, has lately been restored. The grammar school, founded by Sir Andrew Judd, an alderman of London, in the lst year of Edward VI., was rebuilt in 1865, remodelled in 1880, and extended in 1887. Among other public buildings are the town hall and market house, the

public hall, and the free library. Some traffic is carried on by the Medway, which has been made navigable for barges. Tunbridge ware, chiefly sold at Tunbridge Wells, is largely manufactured. There are gunpowder mills on the banks of the Medway; and wool-stapling, brewing, and tanning are

carried on. The population of the urban sanitary district (area 1200 acres) in 1871 was 8209 and in 1881 it was 9317,

Tunbridge owed its early importance to the castle built by Richard, earl of Clare, in the reign of Henry I. The castle was besieged by William Rufus, was taken by John in the wars with the barous, and again by Prince Edward, son of Henry III. Subsequently it became the property of the Staffords, and on the attainder of the duke of Buckingham in the reign of Henry VIII. was taken posses- sion of by the crown. It was dismantled during the Civil War. The remains now consist chiefly ofa finely preserved gateway flanked by two round towers. Formerly it was defended by three moats, one of them formed by the Medway. The lords of ‘the castle had the right of attending the archbishops of Canterbury on state occasions as chief butlers.

TUNBRIDGE WELLS, an inland watering-place of England, chiefly in Kent but partly in Sussex, is situated in the midst of charming and picturesque scenery, on the South-Eastern Railway and at the terminus of a branch line of the London, Brighton, and South Coast Railway, 46 miles (by rail) south-east of London and 5 south of Tunbridge. It owes its popularity to its chalybeate spring and its romantic situation. The wells are situated near the Parade (or Pantiles), a walk associated with fashion since the time of their discovery. The houses and shops in tue Parade somewhat resemble the Rows at Chester. It was paved with pantiles in the reign of Queen Anne. The town is built in a picturesquely irregular manner, and a large part of it consists of districts called “ parks,” occupied by villas and mansions. On Rusthall common, about a mile from the town, is the curiously shaped Toad Rock, and about a mile south-west the striking group called High Rocks. The principal public buildings are the pump-room, the town-hall, the corn exchange, the public hall, the mechanics’ institute, the friendly society’s hall, the dis- pensary and infirmary, and the provident dispensary. The Tunbridge Wells sanatorium is situated in grounds sixty acres in extent, and is capable of receiving 150 visiters. There is a large trade in Tunbridge ware, which is made chiefly at Tunbridge, and includes work tables, boxes, toys, &c., made of hard woods, such as beech, sycamore, holly, and cherry, and inlaid with mosaic. The town is governed by a local board of twenty-four members. The population of the urban sanitary district (area 3351 acres) in 1871 was 19,410 and in 1881 24,308.

The town owes its rise to the discovery of the medicinal springs by Dudley, Lord North, in 1606. Henrietta Maria, wife of Charles I., retired to drink the waters at Tunbridge after the birth of her eldest son Charles. Soon after the Restoration it was visited by Charles II. and Catherine of Braganza. It wasa favourite residence of Anne previous to her accession, and from that time became one of the special resorts of London fashion. It reached the height of its comparative popularity in the latter half of the 18th century, and is specially associated with Colley Cibber, Samuel Johnson, Cumberland the dramatist, Garrick, Richardson, Reynolds, Bean Nash, Miss Chudleigh, and Mrs Thrale. The Tunbridge of that period is sketched with much graphic humour in Thackeray's Vir- ginians. Though it still attracts an increasing number of visiters, its importance in refcrence to London society has considerably declined.

TTUNG-CHOW, a sub-prefectural city in Chih-li, the metropolitan province of China, is situated on the banks of the Peiho in 39° 54' N. lat. and 116° 41' E. long., about 12 miles south-east of Peking. Like most Chinese cities, T'ung-Chow has appeared in history under various names. By the founder of the Han dynasty (206 B.c.) it was called Lu-Hien ; with the rise of the T'ang dynasty (618 a.p.) its name was changed to Heuen-Chow; and at the begin- ning of the 12th century, with the advent of the Kin dynasty to power, Heuen-Chow became T'ung-Chow. The

city marks the highest point at which the Peiho is navi- gable, and here merchandise for the capital is transferred to a canal, by which it reaches Peking. The city, which is faced on its eastern side by the river, and on its other three sides is surrounded by populous suburbs, is upwards of 3 miles in circumference. The walls are about 45 feet in height and about 24 feet wide at the top. They are being allowed to fall into decay. Two main thoroughfares run through the city, one connecting the north and south gates, and the other the east and west gates. The place derives its importance from the fact that it is the port of Peking. Its population was estimated at about 50,000 in

1887.

It was at T’ung-Chow that Sir Harry Parkes, Sir Henry Loch, and their escort were treacherously taken prisoners by the Chinese when

they were sent forward by Lord Elgin to negotiate terms of peace after the troubles of 1860.

TUNGSTEN (Germ. wolfram, or, antiquated, scheel), one of the metallic elements of chemistry. The mineral tungsten (meaning in Swedish “heavy stone”) used to be taken for a tin ore until this was disproved by Cronsted. Scheele showed in 1781 that it is a compound of lime with a peculiar acid, the metallic nature of which was recog- nized in the same year by Bergmann. It occurs only as a component of a number of relatively rare minerals, the most important of which are wolfram or wolframite, (Fe, Mn)O.WO,, and scheelite (tungsten), CaOWO, (see MineRALocy). The metal is prepared from the pure oxide WO, by reduction with hydrogen in a platinum tube at a high temperature. It forms resplendent tin-white or grey plates, or a dull black powder similar to hydrogen-reduced iron, Sp. gr.=19°129, water of 4° C.=1 (Roscoe). It is more difficult to fuse than even MANGANESE (q.v.). It is unalterable in ordinary air; oxygen and even chlorine act upon it only at a high temperature. Hydrochloric and sulphuric acid do not attack it. Nitric acid attacks it slowly, aqua regia readily, with formation of the trioxide WO. Impure tungsten is now being prepared industrially for the production of a peculiar kind of steel (see Ion, vol. xiii. p. 352),

Chlorides.—Tungsten forms four chlorides, —WCl,, WCl,, WCl;, WCly. _ The highest, WCle, is obtained by heating the pure powdery metal in a current of absolutely pure chlorinc. In the presence of moisture or air oxy-chlorides are produced. It sublimes off as a dark red liquid, freezing into crystals. ‘These fuse at 275° C. and re-solidify at 270° ; the liquid boils at 846°-7. The sp. gr. of the vapour is in accordance with the formula at 350° ; at higher tempera- tures it dissociatcs into WCl, and free Cl, (Roscoe). When the vapour of WCl, is passed over heated trioxide, the two bodies unite, WO, with 2WCl, into 3WOCl,, forming magnificent red needles, which fuse at 210°:4 and boil at 227°°5 C. (Wohler). Both compounds, WCl, and WOCI,, are decomposed by water, the oxy-chloride more readily,

with formation of hydrochloric acid and trioxide. For other chlorides and oxy-chlorides, see the ordinary hand-books of chemistry.

Oxides, WO, and WO;, and Compounds of These with Each Other. —The trioxide, popularly known as tungstic acid, is the more important. Impure trioxide is producible by treating scheelite (WO;CaO) with hot hydrochloric acid. Wolframite is not so readily decomposed ; but when fused with twice its weight of chloride of calcium it passes into lime salt, obtainable as an insoluble residue by lixiviation of the fuse with water. The oxide obtained forms a yel- low powder insoluble in water and in hydrochloric acid. To purify it, it is washed, dissolved in aqueous ammonia, and the filtered solution evaporated, when an acid tungstate of ammonia separates out in scales of great purity. These, when heated in air, leave behind them a psendo-morphose of pure yellow oxide. Trioxide of tungsten combines with basic oxides into tungstates ; but the pro- portion in which it unites with a given base is subject to great variation : for instance, the quantity Na,O of soda unites into so many definite tungstates with 1, 14, 2, 23, 22, 24, 4 times Wo, and in each case more or less of watcr. To each of these soda salts corresponds theoretically a certain tungstic acid,—to the salt Na,OW.0,, for instance, the acid H,OW,0, or H,W.0,. But few of these hydrates actually exist, and they are not individual acids in the sense in which the three phosphoric acids are, except per- haps that remarkable substance known as metatungstic acid,

H,W,0\,+7H,O. This acid forms crystals 6f the stated composi- tion ; it dissolves in water and the solution unites with bases into meta-tungstates. Most meta-tungstates are soluble in water; of the tungstates proper only the alkali salts are so soluble. The soda tungstate, 5Na,O .12W0O,+«H.0, known as para-tungstate of soda, is made industrially by fusing wolframite with carbonate of soda and lixiviating the fuse with water. The insoluble oxides of iron and manganese are filtered off ; the filtrate, while still hot, is nearly neutralized with hydrochloric acid and allowed to crystallize. It forms large crystals containing twenty-one, twenty-five, or twenty- eight times H,O according to the temperature at which they are formed. The salt has been recommended as a mordant in dyeing and calico-printing, but has

not taken root in these industries. Oppenheim and Versmann recommended it before 1862 as the best means for rendering textile fabrics uninflammable. If,a solution of the para-tungstate is boiled with hydrated tungstic acid (as ob- tained by precipitating any ordinary alkaline tungstate solution with hydrochloric acid in the heat), or is simply mixed with excess of acetic acid, the meta-tungstate is formed ; in the latter case it separates out as a heavy oil. Meta-tungstate of soda forms octa- hedral crystals of the composition Na,O.4WO,;+10H,0. If con- centrated warm solutions of this salt and the equivalent quantity of chloride of barium are mixed and allowed to cool after addition of a little hydrochloric acid, 1neta-tungstate of barium crystallizes out as BaO.4W0,+9H,0, in large quadratic pyramids which are very easily soluble in water. From this salt the free acid is easily produced by addition of the exact quantity of sulphuric acid re- quired to precipitate the baryta, and from it any other meta- tungstate is easily produced. Meta-tungstic acid solution is a sensitive and characteristic precipitant for almost all alkaloids (strychnine, quinine, &c.). The alkaloid, whatever its name, goes down as a flocculent insoluble meta-tungstate. Tungstic acid com- bines with phosphoric acid and with silicic acids into highly com- plex phospho-tungstic acids and silico-tungstic acids. Of the for- iner there is quite a series, eaeh consisting of one P,O, united with respectively fourteen, sixteen, eighteen, twenty, twenty-two, twenty- four times WO, aud six H,O of basic water. Of silico-tungstic acids three are known, namely, one 4H,0 .Si0,. 10W0O,+3Aq and two Si0,.12WO,xH,O. All these complex acids (both kinds) are easily soluble in water. The phosphio-acids are delicate precipitants for all alkaloids.

The binoxide, WO,, is obtained when the trioxide is reduced by hydrogen at a dull red heat. This oxide is very prone to pass into trioxide or tungstate. An interesting and beautiful class of con- pounds of WO,, WOy, and bases are known as tungsten bronzes. The first of these was discovered by Wohler. Normal tungstate of soda, Na,OW0Os, is fused, and trioxide added to it as long as it dissolves. The product is then heated in hydrogen as long as water goes away, and the substance thus reduced is exhausted successively with water, hydrochloric acid, caustic potash ley, and again with water. A residue of the composition Na,O. W20g+ WO, remains in the shape of magnificent gold-like lustrous cubes, of specific gravity 6°617, which conduct electricity like a metal. Only hydrofluoric acid dissolves this

soda-tungsten bronze. There are a number of other tungsten bronzes, all distinguished by metallic lustre and magni- ficent purple, red, yellow, or blue colours.

Analysis. —Oxides of tungsten dissolve in fused microcosmic salt, Na,OP,O; ; the bead becomes blue in the reducing flame, in the presence of iron blood-red, and in the oxidizing flame colourless. Whien heated on charcoal with (not too much) carbonate of soda or cyanide of potassium in the reducing flame, they yield a grey heavy powder of metal, obtainable by elutriation. The process fails in the presence of too much alkali. Insoluble tungstates (¢.g., the ordi- nary tungsten minerals) are disintegrable by fusion with alkaline carbonate ; the fuse, when treated with water, yields a solution of alkaline tungstate. This solution, when mixcd with excess of hydro- chloric acid, gives a white precipitate of hydrated trioxide, whieh on boiling becomes yellow by partial dehydration. The yellow unignited precipitate is soluble in aqueous ammonia, If tungstate of alkali solutions are mixed with hydrochloric acid and then treated with metallic zinc, they become blue through the formation of a compound of WO, and WO, or rather the respective chloride ; this reaction gains in definiteness through the presence of phosphoric acid. (W. D.)

TUNGUSES, a wide-spread Asiatic people, forming a inain branch of the Mongol division of the Mongol-Tatar family. They are the Z’ung-hu of the Chinese, probably a corrupt form of tonki or donki, that is, “men” or “people.” The Russian form Z’ungus, wrongly supposed to mean “lake people,” appears to occur first in the Dutch writer Massa (1612); but the race has been known to the Russians ever since they reached the Yenisei. The Tungus domain, covering many hundred thousand square miles in central and east Siberia and in the Amur basin, stretches from

the Yenisei eastwards to the Pacific, where it occupies most of the seaboard between Corea and Kamchatka. It also reaches the Arctic Ocean at two points, in the Nisovaya tundra, west of the Khatanga river, and ina comparatively small enclosure in the Yana basin over against the Liakhoff (New Siberia) Archipelago. But the Tunguses proper are chiefly centred in the region watered by the three large eastern tributaries of the Yenisei,

which from them take their names of the Upper, Middle or Stony, and Lower Tunguska. Here the Tunguses are known to the Samoyedes by the name of Aya or “younger brothers,” implying a comparatively recent immigration (confirmed by other in- dications) from the Amur basin, which appears to be the original home both of the Tunguses and of the closely-allied Manchus. The Amur is still mainly a Tungus river almost from its source to its mouth: the Oroches (Orochus), Daurians, Birars, Golds, Manegrs, Sanagirs, Ngatkons, Nigidals, and some other aboriginal tribes scattered along the main stream and its affluents,—the Shilka, Sungari, and Usuri,—are all of Tungus stock and speech. On the Pacific the chief subdivisions of the race are the Lamuts, or “ sea people,” grouped in small isolated hunting communities round the west coast of the Sea of Okhotsk, and further south the Yu-pi-ta-tze (“fish clad”), the Tazi of the Russians, between the Amur delta and Corea. The whole race, exclusive of Manchus, numbers probably about 80,000, of whom 15,000 are in the Amur basin, the rest in Siberia.

The Tungus type is essentially Mongolic, being characterized by broad flat features, small nose, wide mouth, thin lips, small black and somewhat oblique eyes, black lank hair, dark olive or bronze complexion, low stature, averaging uot more than five feet four inches ; they are distinguished from other Mongolic peoples by the square shape of the skull and the slim, wiry, well-proportioned figure. This description applies more especially to the Tunguska tribes, who may be regarded as typical Tuiguses, and who, unlike most other Mongols, betray no tendency to obesity. They arc classed by the Russians, according to their various pursuits, as Reindeer, Horse, Cattle, Dog, Steppe, and Forest Tunguses, A few have become settled agriculturists; but the great bulk of the race are still essentially forest hunters, using the reindeer both as mounts and as pack animals. Nearly all lead nomad lives, in pursuit of fur-bearing animals, whose skins they supply to Russian and Yakut traders, in exchange for provisions, clothing, and other necessaries of life. The picturesque and even elegant national costuine shows in its ornamentation and general style decided Japanese influence, due no doubt to long-continued intercourse with that nation at some period previous to the spread of the race from the Amur valley to Siberia. Many of the Tungus tribes have been baptized, and are, therefore, reckoned as ‘‘ Greek Christians’’; but Russian orthodoxy has not penetrated far below the

surface, and most of them are still at heart Shamanists and nature-worshippers, secretly keeping the teeth and claws of wild animals as idols or amulets, and observing Christian rites only under compulsion. But, whether Christians or pagans, all alike are distinguished above other Asiatics, perhaps above all other peoples, for their truly noble moral qualities. All observers describe them as ‘‘ cheerful under the most depressing circumstances, persevering, open-hearted, trustworthy, modest yet self-reliant, a fearless race of hunters, boru amidst the gloom of their dense pine-forests, exposed from the cradle to every danger from wild beasts, cold, and hunger. Want and hardships of every kind they endure with surprising fortitude, and nothing can induce them to take service under the Russians or quit their solitary wood- lands” (Keane’s Asia, p. 479). Their numbers are steadily de- creasing owing to the ravages of small-pox, scarlet fever, and especially famine, their most dreaded enemy. Their doniain is also being continually encroached upon by the aggressive Yakuts from the north and east, and from the south by the Slavs, now settled in compact bodies in the province of Irkutsk about the upper course of the Yenisei. It isremarkable that, while the Russians often show a tendency to become assimilated to the Yakuts, the most vigorous and expansive of all the Siberian peoples, the Tunguses everywhere yield before the advance of their more civilized neighbours or become absorbed in the surrounding Slav communities. In the Amur valley the same fate is overtaking the kindred tribes, who are disappearing before the great waves of Chinese migration from the south and Russian encroachments both from the east and west. In 1880 the Oroches were already reduced to about 260, and the Tazi to a little over 200. For the philological relations of the Tunguses, see vol. xviii. p. 779.

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TUNICATA

HIS group of animals was formerly regarded as con- stituting along with the Polyzoa and the Brachio-

poda the invertebrate class Molluscoidea. It is now known to be a degenerate branch of the Chordata, and to be more

in the test of some Ascidians of “tunicine,” a substance very similar to cellulose, and in the following year Lowig and Kolliker (7) confirmed the discovery and made some additional observations upon this substance and upon the

nearly related to the Vertebrata than to any group of the

structure of the test in general. Huxley (8), in an im- Huxley. Invertebrata

portant series of papers published in the 7’ransactions of the Royal and Linnean Societies of London from 1851 on- wards, discussed the structure, embryology, and affinities of the pelagic Tunicates Pyrosoma, Salpa, Doliolum, and Appendicularia. These important forms were also investi- gated about the same time by Gegenbaur, Vogt, H. Miiller, Krohn, and Leuckart. The most important epoch in the history of the Z’unicata is the date of the publication of Kowalevsky’s celebrated memoir upon the development of Kowa. a Simple Ascidian (9). The tailed larva had been previously levsky. discovered and investigated by several naturalists— notably Tailed

Hisrory,}

More than two thousand years ago Aristotle gave a short account of a Simple Ascidian under the name of Tethyum, He described the appearance and some of the more important points in the anatomy of the animal. From that time onwards to little more than a century ago, although various forms of Ascidians had been briefly de- scribed by writers on marine zoology, comparatively little advance was made upon the knowledge of Aristotle.

Simple Ascid- ians.

| tion.

later Kuhl and Van Hasselt’s investigations upon the same animal resulted in the discovery of the alternation in the directions in which the wave of contraction passes along the heart and in which the blood circulates through the body. It has since been found that this observation holds good for all groups of the Tunicata. In 1826 H. Milne- Edwards and Audouin made a

series of observations on living Compound Ascidians, and amongst other discoveries they found the free-swimming tailed larva, and traced its development into the young Ascidian. Milne-Edwards

Ss: (5) also founded the group of “Social” Ascidians, now

known as the Olavelinidx, and gave a classification of the Compound Ascidians which was universally accepted for many years. From the year 1826 onwards a number of new and remarkable forms were discovered, as, for instance,

Com- Schlosser and Ellis, in a paper containing a description of . larva. pound = Botryllus, published in the Philosophical Transactions of H. Milne-Edwards (5), J. P. van Beneden (ro), and Krohn Best 4.4 Roval Society for 1756. first beo ee Re Con oma (zz); but its minute structure had not been sufficiently ians. ane y. i ac vont ee examined, and the meaning of what was known of it had Ascidians into notice ; but it was not until the commence- Meant d aot df ky j ; ment of the 19th century, as a result of the careful ana- Dot ae aagusboort. git ee Kow alevsky in Relation- Ne Fecal invdsiiontions an Cuvier ® upon the Simple 1866 to demonstrate the striking similarity in structure ship to Rend Aséititans and = Savigny (2) upon the ae ae man and in development between the larval Ascidian and the Sere | Savigny. : Bp ey P a : vertebrate embryo. He showed that the relations between the close relationship between these two groups of the ih h : Tunicata was conclusively demonstrated. Up to 1816, ea eee eee ae uel a tania ae the date of publication of Savigny’s great work (2), the hiouh eeouan —- leet ioe st ‘We. few Compound Ascidians then known had been generally 1 s t Th di y — 4; Ae hie regarded as Alcyonaria or as Sponges; and, although pga) ee many new Simple Ascidians had been eoeaied by 0. F Tunicata are closely allied to Amphioxus and the Verte- Miiller (z) and others, their internal structure had ot ye ot i ve koe ie Be is saaarabi the aa) Lamarck. been investigated. Lamarck (3) in 1816, chiefly as the | °” see i eat es eee ae ie “- pa result of the anatomical discoveries of Savigny and Cuvier, Wasa Esacui inal ee — dy prin: | SUE 4 anes : 5 ‘ emia th cles Pointe hich he pled between te | Gogengate side trendh fm the lower end of he Pin The Tunicata included at that time, besides the Simple Mec eee ae = i ma get da), seat ‘ i 4 oaus (Cephalochorda), and the Vertebrata. Kowalevsky’s SS ee cei ee

great discovery has since been confirmed and extended to Saipag deaemiciWls, Honeealtin 177 y all other groups of the Z'unicata by Kupffer (72), Giard Kupffer, Gham Chamisso in 1820 made the important discovery that (73 and 75), and others, Important observations upon Giard, &e. isso and qa in its life-history passes through the series of changes we Se ote oeation': od the formation of colonies in Gemma- eo ich wows aiterwands moredally desesihed by Stecusiian (ene forms of Compound Ascidians have been made by tion. jtionof 2 Hi) ae Cael PeeteN f y te eiig its a f P Krohn, Metschnikoff, Kowalevsky, Ganin, Giard, Della jgenera- 10 Sigh itas ue S.C Valle, and others, and have gradually led to the establish-

ment of the general principle, that all the more important layers of the bud are derived more or less directly from the corresponding regions in the body of the parent.

In 1872 Fol (74) added largely to the knowledge of the Fol, &e.

Appendicularude, and Giard (75) to that of the Compound Ascidians. The latter author described a number of new forms and remodelled the classification of the group. The most important additions which have been made to the Compound Ascidians since Giard's work have been those described by Von Drasche (z6) from the Adriatic and those discovered by the "Challenger" expedition (77). The structure and the systematic arrangement of the Simple Ascidians have been mainly discussed of recent years by Alder and Hancock (78), Heller (79), Lacaze-Duthiers (20), Traustedt (27), and Herdman (77, 22). In 1874

some of the Bolteninx (Macleay), Chelyosoma (Broderip and Sowerby, and afterwards Eschricht), Oikoplewra (Mertens), Perophora (Lister), Pelonaia (Forbesand Goodsir), Chondro- stachys and Diplosoma (Denis Macdonald), Diazona (Forbes and Goodsir), and Ahodosoma (Ehrenberg, and afterwards Lacaze-Duthiers).

In 1845 Carl Schmidt (6) first announced the presence

Ussoff (23) investigated the minute structure of the nervous gyp. system and of the underlying gland, which was first dis- neural covered by Hancock, and showed that the gland has a sland duct which communicates

with the front of the branchial — sac or pharynx by an aperture in the dorsal (or “olfactory ”) tubercle. tubercle. In an important paper published in 1880 Julin (24) drew attention to the similarity in structure and rela- tions between this gland and the hypophysis cerebri of the vertebrate brain, and insisted upon their homology. He suggests that they perform a renal function. The 7haliacea XXII. — 77

1 Only the more important works can be mentioned here. Fora more detailed account of the history of the group and a full biblio- graphy, see (7) in the list of works at the end of this article.

7

Thali- aced.

Van Beneden and Julin.

Ascidia mentula.

External charac- ters.

The test.

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have of late years been the subject of several very import- ant memoirs. The researches of Todaro, Brooks (25), Salensky (26), and others have elucidated the embryology, the gemmation, and the life-history of the Salpidx ; and Grobben, Barrois (27), and more especially Uljanin (28) have elaborately worked out the structure and the details of the complicated life-history of the Doliolidx. Finally, in an important work published in 1886 on the morpho- logy of the Twnicata, E. van Beneden and Julin (30) have, mainly as the result of a close comparison of the embryo- logy of Ascidians with that of Amphiowus and other Chordata, added considerably to our knowledge of the position and affinities of the Z’wnicata, and of the exact relations of their organs to the corresponding parts of the body in the Vertebrata.

ANATOMY.

As a type of the Tunicata, Ascidia mentula, one of the larger species of the Simple Ascidians, may be taken. This species is found in most of the European seas, generally in shallow water on a muddy bottom. It has an irregularly ovate form, and is of a dull grey colour. It is attached to some foreign object by one end (fig. 1). The opposite end of the body is usually nar- br row, and it has a terminal i opening surrounded by eight rounded lobes. This is the mouth or branchial aperture, and it always indicates the anterior end } of the animal. About half-way back from the anterior end, and on a rounded projection, is the atrial or cloacal aperture— an opening surrounded by six lobes—which is always placed upon the dorsal re- gion. When the Ascidian is living and undisturbed, water is being constantly drawn in through the branchial aperture and passed out through the atrial. If coloured par- ticles be placed in the water near the apertures, they are seen to be sucked into the body through the branchial aperture, and after a short time some of them are ejected with consider- able force through the atrial aperture. The current of water passing in is for re- spiratory purposes, and it also conveys food into the animal, The atrial current is mainly the water which has been used in respiration, but it also contains all excretions from the body, and at times the ova and spermatozoa or the embryos.

The outer grey part of the body, which is attached at or near its posterior end and penetrated by the two aper- tures, is the ‘“‘test.” This is a firm gelatinous cuticular secretion from the outer surface of the ectoderm, which is a layer of flat cells lining its inner surface. Although at first produced as a cuticle, the test soon becomes organized by the migration into it of cells derived from the ectoderm (see fig. 2). These test cells may remain as rounded or fusiform or stellate cells imbedded in the gelatinous matrix, to which they are constantly adding by secretions on their

Fic. 1.—Ascidia mentula from the right side. at, atrial aperture ; br, branchial aperture ; ¢, test. (Original.)

1 Some writers use a different nomenclature of regions ; see (77).

TUATCaAaAT «&

surfaces; or they may develop vacuoles in their proto- plasm, which become larger and fuse to form a huge ovate

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clear cavity (a “bladder cell”), — sur- rounded by a delicate film of protoplasm and having the nucleus still visible at one point ; or they may form pigment gran- ules in the pro- toplasm ;_ or, lastly, they ,, may deposit carbonate of lime, so that one or several of them together produce a calcareous spicule in the test. Only the unmodified test cells and the bladder cells are found in Ascidia mentula. Calcareous spicules are found chiefly in the Didemnidx, amongst Compound Ascidians ; but pigmented cells may occur in the test of almost all groups of Zunicata. The matrix in which these structures are imbedded is usually clear and apparently homogeneous ; but in some cases it becomes finely fibrillated, especially in the family Cynthiidx. It is this matrix which contains tunicine. At one point on the left side near the posterior end a tube enters the test, and then splits up into a num- ber of branches, which extend in all directions and finally terminate in rounded enlargements or bulbs, situated chiefly in the outer layer of the /

test. These tubes are known as the “ vessels” of the test, and they contain blood. Each vessel is bounded by a layer of ec- toderm cells lined by con- nective tissue (fig. 3, B), and is divided into two tubes by a septum of con- nective tissue. The septum

‘Fe 1G. 2.— Diagrammatic section of part of mantle and test of an Ascidian, showing the formation of a vessel aud

Prine tin

the structure of the test. m, mantle; e, ectoderm; tc test cell; tm, matrix; ble, bladder cell; s,s’, blood sinus in mantle being drawn out into test; mc, mantle cells ; y, septum of vessel. (From Herdman, Challenger Report.

Fig. 8.—A, a vessel from the test. B, dia-

does not extend into the grammatic transverse section of a ves- sel. ec, ectoderm; ct, connective tissue ;

terminal bulb, and conse- 5, ¥, the two tubes; y, septum ; tk, ter- quently the two tubes com- minal bulb. (Original.)

municate at their ends (fig. 3,4). The vessels are formed by an outgrowth of a blood sinus (derived originally from the blastoccele of the embryo) from the body wall (mantle) into the test, the wall of the sinus being formed by con- nective tissue and pushing out a covering of ectoderm in front of it (fig. 2, s'). The test is turned inwards at the branchial and atrial apertures to line two funnel-like tubes, —the branchial siphon leading to the branchial sac and the atrial siphon leading to the atrial or peribranchial cavity.

The body wall, inside the test and the ectoderm, is formed Mantle.

of a layer (the somatic layer of mesoderm) of connective tissue, inclosing muscle fibres, blood sinuses, and nerves. This layer (the mantle) has very much the shape of the test outside it, but at the two apertures it is drawn out to form the branchial and atrial siphons (fig. 4). In the walls of these siphons the muscle fibres form powerful circular bands, the sphincter muscles. Throughout the rest of the mantle the bands of muscle fibres form a rude irregular network. They are numerous on the right side of the body, and almost totally absent on the left. The muscles are all formed of very long fusiform non-striped fibres. The con- nective tissue of the mantle is chiefly a clear gelatinous

Bran- chial sac and neigh- bouring organs.

TURLC ATA

matrix, containing cells of various shapes ; it is frequently pigmented and is penetrated by numerous lacunz, in which the blood flows. In- dt side the mantle, in , all parts of the body, except along the ven- tral edge, there is a cavity,—the atrial or peribranchial cavity, —which opens to the exterior by the atrial aperture. This cavity is lined by a layer of cells derived origin- ally from the ecto- derm! and directly continuous with that layer through the atrial aperture (fig. 5); consequently the mantleiscovered both externally and inter- nally by ectodermal cells. @ q

The branchial aper- pdr---~~ ture (mouth) leads in- to the branchial si-

phon (buccal cavity Fia. 4.—Diagrammatic dissection of A. mentula to

show the anatomy. at, atrial aperture; br, or stomodeeum), and branchial aperture; a, “anus ; brs, branchial this opens into the sac; dl, dorsal lamina; dt, dorsal tubercle ; anterior end of a very

end, endostyle; h, heart; 7%, intestine; m, mantle; ng, nerve ganglion; o, cesophagus; large cavity (the bran- chial sac) which ex-

@a, cesophageal aperture; ov, ovary; por, tends nearly to the

peribranchial cavity; 7, rectum; st, stomach ; t, test; tm, tentacles; vd, vas deferens; ngl, subneural gland. (Original.)

posterior end of the body (see figs. 4 and 5). This branchial sac is an enlarged and modified pharynx, and is therefore properly a part of the ali-

mentary canal, The ceso- phagus opens from it far back on the dorsal edge (see below, p. 612). The wall of the branchial sac is pierced by a large number of ver- tical slits,—the stigmata, —placed in numerous trans- verse rows. These slits “ place the branchial sac in communication with the

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chial and peribranchial cavities. represents a section taken along the dotted line A-Bin A.

The lettering is the same as for fig. 4. B (Original.)

peribranchial or atrial cavity, which lies outside it (fig. 5, 2B). Between the stigmata the wall of the branchial sac is traversed by blood-vessels, which are arranged in three regular series (fig. 6),—(1) the transverse vessels, which run horizontally round the wall and open at their dorsal and ventral ends into large longitudinal vessels, the dorsal and ventral sinuses ; (2) the fine longitudinal vessels, which run vertically between adjacent transverse vessels and open into them, and which bound the stigmata; and (3) the internal longitudinal bars, which run vertically in a plane

1 According to E. van Beneden and Julin’s recent investigations (30) only the outer wall of the atrium is lined with epiblast, the inner wall being derived from the hypoblast of the primitive branchial sac.

internal to that of the transverse and fine longitudinal vessels. These bars communicate with the transverse vessels by short side branches where they

cross, and at these »…. points are prolonged into the lumen of the sac in the form of hollow papille. The edges of the stigmata are richly set with cilia, which drive the water from the bran- chial sac into the peribranchial ca-

vity, andso cause

the currents that _, flow in through

SS SS

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VS

= eer the branchial – ; aperture and SS “7 out through the lo i atrial. Miss

Alo 5 Fic. 6.—A. Part of branchial sac of Ascidia from inside. ongitsvent- B. Transverse section ’ same. tr, a pee Seeeal ed, connecting duct; hm, horizontal membrane; 7 ral edge the wall internal longitudinal bar ly, fine longitudinal vessels: of the branchial p, p’, papille; sg, stigmata. A and B are drawn to sac is continu-

different scales. (From Herdman, Challenger Report.) ous externally with the mantle (fig. 5, B), while internally it is thickened to form two parallel longitudinal folds

bounding a groove, the “‘ endostyle,” hypobranchial groove, Endo- The endoderm cells style.

or ventral furrow (figs. 4, 5, end). which line the endostyle are greatly enlarged at the bottom and on parts of the sides of the furrow so as to form' projecting pads, which bear very long cilia. It is generally supposed that this organ is a gland for the pro- duction of the mucous secretion which is spread round the edges of the branchial sac and catches the food particles in the passing current of water; but it has recently been pointed out that there are comparatively few gland cells in the epithelium of the endostyle, and that it is more prob- able that this furrow is merely a ciliated path along which the mucous secretion (produced possibly by the subneural gland) is conveyed posteriorly along the ventral edge of the branchial sac.

of the posterior of two circular ciliated ridges,—the peri- pharyngeal bands, —which run parallel to one another round the front of the branchial sac. The dorsal ends of

the posterior peripharyngeal band bend posteriorly (en- Dorsal closing the epibranchial groove), and then join to form lamina.

the anterior end of a fold which runs along the dorsal edge of the branchial sac as far as the cesophageal aperture. This fold is the dorsal lamina (figs. 4, 5, dl). It probably serves to direct the stream of food particles entangled in a string of mucus from the anterior part of the dorsal lamina to the cesophagus.

mentula, is represented by a series of elongated triangular processes—the dorsal languets,—one attached in the dorsal median line opposite to each transverse vessel of the branchial sac. The anterior peripharyngeal band is a complete circular ridge, having no connexion with either the endostyle or the dorsal lamina. In front of it lies the prebranchial zone, which separates the branchial sac behind from the branchial siphon in front. The prebranchial zone is bounded anteriorly by a muscular band—the pos- terior edge of the sphincter muscle,—which bears a circle

of long delicate processes, the tentacles (figs. 4, 7, 8, tn). Ten- These project inwards at right angles so as to form a net- tacles.

work across the entrance to the branchial sac. Each tentacle consists of connective tissue covered with epithe-

At its anterior end the edges of the Peri- endostyle become continuous with the right and left halves pharyn-

In many Ascidians this organ, Dorsal instead of being a continuous membranous fold as in A, languets.

lium (endoderm), and contains two or more cavities which are continuous with blood sinuses in the mantle. In the

Subneur- dorsal median line near the anterior end of the body, and al gland. imbedded in the mantle on the ventral surface of the nerve

Dorsal

tubercle.

Nervous system.

ganglion, there lies a small glandular mass—the subneural gland—which, as Julin has shown (24), there is reason to regard as the homologue of the hypo- fy physis cerebri of the vertebrate brain. Ae Julin and E. van Beneden have sug- gested that the function of this organ may possibly be renal! The sub- neural gland, which was first noticed ~. f by Hancock, communicates anteriorly, as Ussoff (27) pointed out, by means of a narrow duct with the front of the branchial sac (pharynx). The opening of the duct is enlarged to form a funnel-shaped cavity, which may be folded upon itself, convoluted, or even broken up into a number of smaller openings, so as to form a complicated projection, called the dorsal tubercle, situated in the dorsal part of the prebranchial zone (fig. 7). The dorsal tubercle in A. mentula is somewhat horse-shoe-shaped (fig. 8) ; it varies in form in most Ascidians |) according to the genus and species, //) and in some cases in the individual also. Possibly, besides being the F opening of the duct from the sub- neural gland, it may be a sense-organ for testing the quality of the water entering the branchial sac.

The single elongated ganglion in the median dorsal line of the mantle “eu”, ay is sg between the branchial and atrial si- ialsiphon. (Original.) phons is the only nerve-centre in A. mentula and most other Tunwata. It is the degenerate remains of the anterior

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1a. 7.—Diagrammatic sec- tion through anterior dor- sal part of A. mentula, showing the relations of the nerve ganglion, sub- neural gland, &c. Letter- ing as for fig. 4; , nerve; m’, myelon; pp, peripha- ryngeal band; sgl, sub- neural gland; sgd, its

\—__tn

Fic. 8.—Dorsal tubercle and neighbouring organs of A. mentula. Lettering as before ; egr, epibranchial groove; z, prebranchial zone. (Original.)

part of the cerebro-spinal nervous system of the tailed larval Ascidian (see below, p. 614). The posterior or spinal part has entirely disappeared in most Z’unicata. It persists, however, in the Appendiculariide, and traces of it are found in some Ascidians (e.g., Clavelina ; see Julin). The ganglion gives off distributory nerves at both ends, ee Oe CEE EY Se ee ee ee ee ee

1 See also Herdman, Nature, vol. xxviii. p. 284.

which run through the mantle to the neighbourhood of the apertures, where they divide and subdivide. The only sense-organs are the pigment spots between the branchial and atrial lobes, the tentacles at the base of the branchial siphon, and possibly the dorsal tubercle and the languets or dorsal lamina. These are all in a lowly developed con- dition. The larval Ascidians on the other hand have well- developed intra-cerebral optic and auditory sense-organs ; and in some of the pelagic Z’unicata otocysts and pigment spots are found in connexion with the ganglion.

The mouth and the pharynx (branchial sac) have already been described. The remainder of the alimentary canal is a bent tube which in A. mentula and most other Ascid- ians lies imbedded in the mantle on the left side of the body, and projects into the peribranchial cavity. The cesophagus leaves the branchial sac in the dorsal middle line near the posterior end of the dorsal lamina (see fig. 4, ea). It is a short curved tube which leads ventrally to the large fusiform thick-walled stomach. The intestine emerges from the ventral end of the stomach, and soon turns anteriorly, then dorsally, and then posteriorly so as to form a curve—the intestinal loop—open posteriorly. The intestine now curves anteriorly again, and from this point runs nearly straight forward as the rectum, thus com- pleting a second curve —the rectal loop—open anteriorly (see fig. 4). The wall of the intestine is thickened inter- nally, to form the typhlosole, a pad which runs along its entire length. The anus opens into the dorsal part of the peribranchial cavity near to the atrial aperture. The walls of the stomach are glandular; and a system of delicate tubules with dilated ends, which ramifies over the outer wall of the intestine and communicates with the cavity of the stomach by means of a duct, is probably a digestive gland.

A mass of large clear vesicles which occupies the rectal loop, and may extend over the adjacent walls of the in- testine, is a renal organ without a duct. Each vesicle is the modified remains of a part of the primitive ccelom or body-cavity, and is formed of cells which eliminate nitro- genous waste matters from the blood circulating in the neighbouring blood-lacunze and deposit them in the cavity of the vesicle, where they form a concentrically laminated concretion of a yellowish or brown colour. These concre- tions contain uric acid, and in a large Ascidian are very numerous. The nitrogenous waste products are thus de- posited and stored up in the renal vesicles in place of being excreted from the body. In other Ascidians the renal organ may differ from the above in its position and structure; but in no case has it an excretory duct, unless the subneural gland is to be regarded as a renal organ.

The heart is an elongated fusiform tube placed on the ventral and posterior edge of the stomach, in a space (the pericardium) which is part of the original ccelom or body- cavity, the rest of which exists merely in the form of lacune and of the cavities of the reproductive organs and renal vesicles in

the adult Ascidian. The wall of the heart is formed of a layer of epithelio-muscular cells, the inner ends of which are cross-striated ; and waves of contraction pass along it from end to end, first for a certain number of beats in one direction and then in the other, so as to reverse the course of circulation periodically. At each end the heart is continued into a vessel (see fig. 9), a large sinus or lacuna lined with a delicate endothelial layer. The sinus leaving the ventral end of the heart is called the branchio-cardiac vessel,? and the heart itself is merely the differentiated posterior part of this sinus and is therefore a ventral vessel. The branchio-cardiac vessel, after giving off a branch which, along with a corresponding branch from the cardio-visceral vessel, goes to the test, runs along the

2 On account of the periodic reversal of the circulation none of the vessels can be called arteries or veins.

Sense organs.

Aliment-

ary canal.

Excre- tory organs.

Blood- vascular system

coelom,

PFURYCAT A

ventral edge of the branchial sac externally to the endostyle, and communicates laterally with the ventral ends of all the transverse vessels of the branchial sac. The sinus leaving the dorsal end of the heart is called the cardio-visceral vessel, and this, after giving off to the test the branch above mentioned, breaks up into a number of sinuses, which ramify over the alimentary canal and the other viscera, These visceral lacune finally communicate with a third great sinus, the viscero-branchial vessel, which runs forward along the dorsal edge of the branchial sac exter- nally to the dorsal lamina and joins the’ dorsal ends of all the transverse vessels of the

branchial sac. Besides these three chief systems there are numerous lacunz in all parts of the body, by means of which anastomoses are established between the different currents of blood. All these blood spaces and lacunz are to be regarded as derived from the blastoccele of the embryo, and not, as has been usually

Course of supposed, from the ccelom (30). When the heart contracts

circula- tion.

Repro- ductive organs.

ventro-dorsally, the course of the circulation is as follows: the blood which is flowing through the vessels of the branchial sac is collected in an oxygenated condition in the branchio-cardiac vessel, and, after receiving a stream of blood from /

the test, en-

ters the heart. It is then pro- pelled from the dorsal

t end of the Fic. 9.—Diagram of circulation in Ascidia. Lettering as be- hy t int fore; bc, branchio-cardiac or ventral vessel; cv, cardio- ear m O visceral vessels; vb, viscero-branchial or dorsal vessel ; the cardio-

vt, vessels to test. (Original.) visceral vessels, and so reaches the test and digestive and other organs ; then, after circulating in the visceral lacuna,

‘it passes into the viscero-branchial vessel in an impure

condition, and is distributed to the branchial vessels to be purified again. When the heart on the other hand contracts dorso-ventrally, this course of circulation is reversed. As the test receives a branch from each end of the heart, it follows that it has afferent and efferent vessels which- ever way the blood is flowing. In some Ascidians the vessels in the test become very numerous and their end branches terminate in swollen bulbs close under the outer surface of the test. In this way an accessory respiratory organ is probably formed in the superficial layer of the test. The blood corpuscles

are chiefly colourless and amoeboid ; but in most if not all Ascidians there are also some pigmented corpuscles in the blood. These are gener- ally of an orange or reddish brown tint, but may be opaque white, dark indigo-blue, or of intermediate colours. Pre- cisely similarly pigmented cells are found throughout the connective tissue of the mantle and other parts of the body.

A. mentula is hermaphrodite, and the reproductive organs lie, with the alimentary canal, on the left side of the body. The ovary is a ramified gland which occupies the greater part of the intestinal loop (see fig. 4). It contains a cavity which, along with the cavities of the testis, is derived from a part of the original ccelom, and the ova are formed from its walls and fall when mature into the cavity. The oviduct ig continuous with the cavity of the ovary and leads forwards alongside the rectum, finally opening near the anus into the peribranchial cavity. The testis is com- posed of a great number of delicate branched tubules, which ramify over the ovary and the adjacent parts of the intestinal wall. Those tubules terminate in ovate swell- ings. Near the commencement of the rectum the larger tubules unite to form the vas deferens, a tube of consider- able size, which runs forwards alongside the rectum, and, like the oviduct, terminates by opening into the peri-

1 See Herdman, Nature, vol. xxxi. p. 247.

branchial cavity close to the anus. The lumen of the tubules of the testis, like the cavity of the ovary, is a part of the original ccelom, and the spermatozoa are formed from the cells lining the wall. In some Ascidians repro- ductive organs are present on both sides of the body, and in others (Polycarpa) there are many complete sets of both male and female systems, attached to the inner surface of the mantle on both sides of the body and projecting into the peribranchial cavity.”

Empryo.ocy? anp Lire History.

In most Ascidians the eggs are fertilized in the peribranchial Embryo- cavity, and undergo most of their development before leaving the logy.

parent ; in some cases, however, the eggs are laid, and fertilization takes place in the surrounding water. The segmentation is com- plete and regular (fig. 10, A) and results in the formation of a spherical blastula, which then undergoes invagination (fig. 10, B). The embryo elongates, and the blastopore or invagination opening comes to be placed on the dorsal edge near the posterior end (fig. 10, C). The hypoblast cells lining the archenteron are columnar in form, while the epiblast cells are more cubical (fig. 10, B, C, D). The dorsal surface of the embryo now becomes flattened and then depressed to form a longitudinal groove, extending forwards from the blastopore to near the front of the body. This ‘‘ medullary groove” now becomes converted into a closed canal by its side walls growing up, arching over, and coalescing in the median dorsal

Fic. 10.—Stages in the embryology of a Simple Ascidian (after Kowalevsky). A to F. Longitudinal vertical sections of embryos, all placed with the dorsal surface uppermost and the anterior end at the right, A. Early blastula stage, during segmentation. B. Early gastrula stage. C. Stage after gas- trula, showing commencement of notochord. D. Later stage, showing forma- tion of notochord and of neural canal. HE. Embryo showing body and tail and completely formed neural canal. F. Larva just hatched; end of tail cut off. G. Transverse section of tail of larva.

adp, adhering papille of larva; at, epiblastic (atrial) involution; au, auditory organ of larva; ar, archenteron; bc, blastoccele; bp, blastopore; ch, noto- chord; ep, epiblast; hy, hypoblast; mc, neural canal; nec, neurenteric canal; oc, ocular organ of larva; g, gelatinous investment of embryo; m, muscle cells of tail; mes, mesenteron; mc, mesoderm cells; nv, cerebral vesicle at anterior end of neural canal.

line (fig. 10, D). This union of the lamingw dorsales to form the neural canal commences at the posterior end behind the blastopore and gradually extends forwards. Consequently the blastopore comes to open into the posterior end of the neural canal (fig. 10, D), while the anterior end of that cavity remains open to the exterior, In this way the archenteron communicates indirectly with the exterior. The short canal leading from the neural canal to the archenteron is known as the neurenteric canal (fig. 10,

2 For structure of other forms, see p. 614 sg. below. 3 For reproduction by gemmation, see under ‘‘ Classification,” p. 614 sq. below.

Larval The embryo is hatched about two or three days after fertilization,

stage. in the fort st a tadpole-like larva, which swims actively through pre fag eee the sea by vibrating its long tail. The anterior end of the body pe iia: – ke reproduction is provided with three adhering papille (fig. 10, F, adp) in the exaasaition: oe euadadvarg han form of epiblastic thickenings. In the free-swimming tailed larva “ inweitia in the Wie diator the nervous system, formed from the walls of the neural canal, Gis di -case of he Sand e. becomes considerably differentiated. The anterior part of the Honetthen wdene of tive Pak: cerebral vesicle remains thin-walled (fig. 10, F), and two unpaired ors ete es der Seager iain sense organs develop from its wall and project into the cavity. pletel hea aia af tia govt These are a dorsally and posteriorly placed optic organ, provided a ae a ses lactating | with retina, pigment layer, lens, and cornea, and a ventrally placed encotmal forme. Tt ae Wns auditory organ, consisting of a large spherical partially pigmented daadae Midd or’ae decen. otolith, attached by delicate hair-like processes to the summit of a oad ch aadae bier hollow crista acoustica (fig. 10, F, aw). The posterior part of the Semaeds he ie 4 ae A cerebral vesicle thickens to form a solid ganglionic mass traversed rin ea allasce) mm diti vad by a narrow central canal. The wall of the neural canal behind the thar te the adult Jorn of cerebral vesicle becomes differentiated into an anterior thicker the other groups, ‘The order region, placed in the posterior part of the trunk and having a Fra. 11.—Othopleuna eophocdven in Hane” imeludes a single family, the superficial layer of nerve fibres, and a posterior narrower part which | * (atter Fol) a ou vak { side, magnified APPENDICULARIUDA, all the traverses the tail, lying on the dorsal surface of the notochord, and | ix times.’ The arrows indicate the course members of whi ck ane waite gives off several pairs of nerves to the muscles of the tail. Just in of the water; «, lateral reticulated parts Of snq free-swimmin The front of the anterior end of the nervous system a dorsal involution “Haus.” wisiy ak, ke aa of aL, of the epiblast breaks through into the upturned anterior end of | .., in most parts of the world. They possess the power to form Struc- the mesenteron and thus forms the mouth opening. Along the | ith great rapidity an enormously large investing gelatinous layer ture of ventral edge of the

mesenteron, which becomes the branchial sac, (fig. 11), which corresponds to the test of other groups. This was Appen- the endostyle is formed as a narrow groove with thickened side = ‘ dicianin walls. It probably corresponds to the median portion of the thyroid Ep Oe ; body of Vertebrata. A curved outgrowth from the posterior end of the mesenteron forms the alimentary canal (cesophagus, stomach, and intestine), which at first ends blindly. An anus is formed later by the intestine opening into the left of two lateral epiblastic involutions (the atria), which rapidly become larger and fuse dorsally to form the peribranchial cavity. Outgrowths from the wall of the branchial sac meet these epiblastic involutions and fuse with them to give rise to the first formed pair of stigmata, which thus come to open into the peribranchial cavity ; and these alone correspond to the gill clefts of Amphioxus and the Vertebrata.

Metamor. After a short free-swimming existence the fully developed tailed

phosis larva fixes itself by its anterior adhering papille to some foreign

to adult object, and then undergoes a remarkable series of retrogressive

form. changes, which convert it into the adult Ascidian. The tail atro- phies, until nothing is left but some fatty cells in the posterior part of the trunk. The adhering papille disappear and are replaced functionally by a growth of the test over neighbouring objects. The nervous system with its sense organs atrophies until it is re- Gems tothe ainigis areal ganghion, placed on the dorrel aan Bite Fia. 12.—Semi-diagrammatic view of Appendicularia from the right. a, anus 5

D, nec). Previous to this stage some of the hypoblast cells at the front edge of the blastopore and forming part of the dorsal wall of the archenteron (fig. 10, C, ch) have become separated off, and then arranged to form an elongated band, two cells wide, underlying the posterior half of the neural canal (fig. 10, D, E, ch.). This is the origin of the notochord. Outgrowths from the sides of the archenteron give rise to laterally placed masses of cells, which are the origin of the mesoblast. These masses show no trace of meta- meric segmentation. The cavities (reproductive and renal vesicles)

which are formed later in the mesoblast represent the ecelom. Consequently the body-cavity of the Tunicata is a modified form of enteroceele. The anterior part of the embryo, in front of the notochord, now becomes enlarged to form the trunk, while the posterior part elongates to form the tail (fig. 10, E). In the trunk the anterior part of the archenteron dilates to form the mesenteron, the greater part of which becomes the branchial sac; at the same time the anterior part of the neural canal enlarges to form the cerebral vesicle, and the opening to the exterior at the front end of the canal now closes. In the tail part of the embryo the neural canal remains as a narrow tube, while the remains of the wall of the archenteron—the dorsal part of which becomes the notochord—are converted into lateral muscle bands (fig. 10, G) and a ventral eord of cells, which eventually breaks up to form blood corpuscles. As the tail grows longer, it becomes bent round the trunk of the embryo inside the egg-membrane. About this period the epiblast cells begin to form the test as a enticular deposit upon their outer surface.

The test is at first devoid of cells and forms a delicate gelatinous |

investment, but it shortly afterwards becomes cellular by the migration into it of test cells formed by proliferation from the epi- blast.?

pharynx, and a slight nerve cord running for some distance pos- teriorly (Van Beneden and Julin). Slight changes in the shape of the body and a further growth and differentiation of the branchial sac, peribranchial cavity, and other organs now produce gradually the structure found in the adult Ascidian.

The most important points in connexion with this process of development and metamorphosis are the following. (1) In the Ascidian embryo all the more important organs (¢.g., notochord, neural canal, archenteron) are formed in essentially the same

1 Some of the first test cells are also probably derived from the epithelium of the egg follicle.

manner as they are in Amphiowus and other Chordata. (2) The free-swimming tailed larva possesses the essential characters of the Chordata, inasmuch as it has a longitudinal skeletal axis (the noto- chord) separating a dorsally placed nervous system (the neural canal) from a ventral alimentary canal (the archenteron); and therefore during this period of its life-history the animal belongs to the Chordata. (3) The Chordate larva is more highly organized than the adult Ascidian, and therefore the changes by which the latter is produced from the formcr may be regarded as a process of degeneration (77). The important conclusion drawn from all this is that the Tunicata are the degenerate descendants of a group of the primitive Chordata (sce below p. 618).

CLASSIFICATION AND CHARACTERS OF Groups, Order JL—LARVACEA.

Free-swimming pelagic forms provided with a large locomotory Char-appendage (the tail), in which there isa skeletal axis (the urochord). acters of A relatively large test (the ‘‘Haus”) is formed with Larvacea.

great rapidity as a secretion from the ectoderm ; it is (\ merely a temporary structure, which is cast off and (\ replaced by another. The branchial sae is simply an \ enlarged pharnyx with two ventral ciliated openings x (stigmata) leading to the exterior. There is no se-

[ee peribranchial cavity. The nervous

f 3 of re

system consists of a large dorsally placed ganglion and a long nerve cord, which y stretches backwards over the alimentary canal to reach the tail, along which it runs on the left side of the urochord. The anus opens

at, one of the atrial apertures; app, tail; br, branchial aperture ; brs, branchial sac; dt, dorsal tubercle; end, endostyle; h, heart; i, intestine; m, muscle band of tail ; n, nerve cord in body ; 7’, nerve cord in the tail; @, esophagus ; ot, otocyst ; ov, ovary ; pp, peripharyngeal band ; ng, cerebral ganglion ; ng’, caudal ganglion; ng’, enlargement of nerve cord in tail; so, sense organ

(tactile) on lower lip ; sg, ciliated aperture in pharynx; st, stomach ; tes, testis ; u, urochord ; w’, its cut end. (Original.)

first described by Von Mertens and by him named ‘‘Haus.” It is only loosely attached to the body and is frequently thrown off soon after its formation. The tail in the Appendiculartide is at- tached to the ventral surface of the body (fig. 12), and usually

Thali- acen.

Charac- ters of Cyclo- MYATIC.

Struc- ture of Dolio- lum.

TURPCATA

points more or less anteriorly. It shows distinct traces of meta- meric segmeutation, having its muscle bands broken up into myo- tomes, while the nerve cord presents a series of enlargements from which distributary nerves are given off (fig. 12, ng”). Near the base of the tail there is a distinct elongated ganglion (fig. 12, ng’). The anterior (cerebral) ganglion has connected with it an otocyst, a pigment spot, and a tubular process opening into the branchial sac and representing the dorsal tubercle and associated parts of an ordinary Ascidian. The branchial aperture or mouth leads into the branchial sac or br pharynx. ‘There are no tentacles. The endostyle is short. ; There is no dorsal lamina, and the peripharyngeal bands run ; dorsally and posteriorly. The wall of the branchial sac has 4r 2“. only two ciliated apertures, They are homologous with the primary stigmata of the typical Ascidians and the gill clefts of Vertebrates. They are placed far back on the ven- tral surface, one on each side of the middle line, and lead

into short funnel-shaped tubes which open on the surface of so“

the body behind the anus (fig. 12, aé). These tubes corre- spond to the right and left atrial involutions which, in an ordinary Ascidian, fuse to form the peribranchial cavity. The heart, according to Lankester, is formed of two cells, which are placed at the opposite ends and connected by delicate con- tractile protoplasmic fibrils. The large ovary and testis are placed at the

posterior end of the body. The remainder of the structural details can be made out from fig. 12.

The family Appendiculariidew comprises the genera, —Otkopleura (Mertens), and Appendicularia (Cham.), in both which the body is short and compact and the tail relatively long, while the endostyle is straight; Fritillaria (Q. and G.), in which the body is long and composed of anterior and posterior regions, the tail relatively short, the endostyle recurved, and an ectodermal hood is formed over the front of the body ; and Kowalevskia (Fol), a remarkable form de- scribed by Fol (rg), in which the heart, endostyle, and intestine are said to be absent, while the branchial sac is provided with four rows of ciliated tooth-like processes.

Order II.—THALIACEA.

Free-swimming pelagic forms which may be either simple or compound, and the adult of which is never provided with a tail or a notochord, The test is permanent and may be either well developed or very slight. The musculature of the mantle is in the form of more or Jess complete circular bands, by the contraction of which locomotion is effected. The branchial sac has either two large or many small apertures, leading to a single peribranchial cavity, into which the anus opens. Alternation of generations occurs in the life- history, and may be complicated by polymorphism. The Thaliacea comprises two groups, Cyclomyaria and Hemimyaria.

Sub-order 1.—Cyclomyaria.

Free-swimming pelagic forms which exhibit alternation of genera- tions in their life-history but never form permanent colonies. The body is cask-shaped, with the branchial and atrial apertures at the opposite ends. The test is more or less well developed. The mantle has its musculature in the form of circular bands surrounding the body. The branchial sac is fairly large, occupying the anterior half or more of the body. Stigmata are usually present in its posterior part only. The peribranchial cavity is mainly posterior to the branchial sac. The alimentary canal is placed ventrally close to the posterior end of the branchial sac. Hermaphrodite reproductive organs are placed ventrally near the intestine.

This group forms one family, the DoLioLipa, including two genera, Doliolum (Quoy and Gaimard) and Anchinia (C. Vogt).

Dolioltum, of which several species are known from various seas, has a cask-shaped body, usually from 1 to 2 cm. in length. The terminal branchial and atrial apertures (fig. 13) are lobed, and the lobes are provided with sense organs. The test is very slightly developed and contains no cells. The mantle has eight or nine circular muscle bands surrounding the body. The most anterior and posterior of these form the branchial and atrial sphincters. e wide branchial and atrial apertures lead into large brauchial and peribranchial cavities, separated by the pos- terior wall of the branchial sac, which is pierced by stigmata ; con- sequently there is a free paee for the water through the body along its long axis, and the animal swims by contracting its ring- like muscle-bands, so as to force out the contained water posteriorly. Stigmata may also be found on the lateral walls of the branchial sac, and in that case there are corresponding anteriorly directed diverticula of the peribranchial cavity. There is a distinct endo- style on the ventral edge of the branchial sac and a peripharyngeal band surrounding its anterior end, but there is no representative of the dorsal lamina on its dorsal edge. The csophagus com- mences rather on the ventral edge of the posterior end of the branchial sac, and runs backwards to open into the stomach, which is followed by a curved intestine opening into the peribranchial cavity. The alimentary canal as a whole is to the right of the middle line. The hermaphrodite reproductive organs are to the left of the middle line alongside the alimentary canal. They open

into the peribranchial cavity. The ovary is nearly spherical, while the testis is elongated, and may be continued anteriorly for a long

distance, The heart is placed in the middle line ventrally, be- “Ze n / sgl i

é br

end : Sg .s ast . ov

brs tee yt z Fia. 13.—Doliolum denticulatum, sexual generation, from the left side. Letter- ing as for fig. 12; ml—m8, muscle bands; ng, nerve ganglion; sg, stigmata; sgl, subneural gland ; pbr, peribranchial cavity ; atl, atrial lobes; so, sense organs; bri, branchial lobes. (Original.) tween the posterior end of the endostyle and the oesophageal aperture. The nerve ganglion lies about the middle of the dorsal edge of the body, and gives off many nerves. Under it is placed the subneural gland, the duct of which runs forward and opens iuto the anterior end of the branchial sac by a simple aperture, surrounded by the spirally twisted dorsal end of the peripharyngeal band (fig. 13, df). The ova of the sexual generation produce tailed larve; these Develop- develop into forms known as “nurses” (blastozooids), which are ment of asexual, and are characterized by the possession of nine muscle Dolio- bands, an auditory sac on the left side of the body, a ventrally- Zum. placed stolon near the heart, upon which buds are produced, and a dorsal outgrowth near the posterior end of the body. The buds give rise eventually to the sexual generation, which is polymor- phous, having three distinct forms, in two of which the reproduc- tive organs remain undeveloped. The buds while still very young migrate from their place of origin on the stolon, divide by fission, aad become attached to the dorsal outgrowth of the body of the nurse, where they develop. The three forms produced are as follows. (1) Nutritive forms (trophozooids), which remain permanently at- tached to the nurse and serve to provide it with food ; they have the body elongated dorso- ventrally, and the musculature is very slightly developed. (2) Foster forms (phorozooids), which, like the preceding, do not become sexually mature, but, unlike them, are set free as cask-shaped bodies with eight muscle bands and a ventral outgrowth, which is formed of the stalk by which the body was formerly united to the nurse. On this outgrowth the (3) forms (gonozooids) which become sexually mature are attached while still young buds, and after the foster forms are set free these reproductive forms gradually attain their complete development, and are event- ually set free and lose all trace of their connexion with the foster forms. They resemble the foster forms in having a cask-shaped body with eight muscle bands, but differ in having uo outgrowth or process, and in having the reproductive organs fully developed.! Anchinia, of which only one species is known, 4. rubra, from Anchinia. the Mediterranean, has the sexual forms permaneutly attached to portions of the dorsal outgrowth from the body of the unknown nurse. The

body is elongated dorso-ventrally. The test is well developed and contains branched cells. The musculature is not so well developed as in Doliolum. There are two circular bands at the anterior end and two at the posterior, and two on the middle of the body. The stigmata are confined to the obliquely placed posterior end of the branchial sac. The alimentary canal forms a U-shaped curve. The reproductive organs are placed on the right side of the body. The life-history is still imperfectly known. As in the case of Doliolum the sexual generation is polymorphous, and has three forms, two of which remain in a rudimentary condition so far as the reproductive organs are con- cerned. In Anchinia, however, the three forms do not occur to- gether on one stolon or outgrowth, but are produced successively, the reproductive forms of the sexual gencration being independent of the ‘‘ foster forms” (see Barrois, 27).

Sub-order 2.—Hemimyaria.

Free-swimming pelagic forms which exhibit alternation of genera- Charac- tions in their life-history and in the sexual condition form colonies. ters of The body is more or less fusiform, with the long axis antero-posterior, Hemi- and the branchial and atrial apertures nearly terminal. The test myaria. is well developed. The musculature of the mantle is in the form of a series of transversely-running bands, which do not form com- plete independent rings as in the Cyclomyaria. The branchial and

1 For further details see Uljanin (28).

Salpide.

peribranchial cavities form a continuous space in the interior of the body, opening externally by the branchial and atrial apertures, and traversed obliquely from the dorsal and anterior end to the ventral and posterior by a long narrow vascular band, which represents the dorsal lamina, the dorsal blood-vessel, and the neighbouring part of the dorsal edge of the branchial sac of an ordinary Ascidian. The alimentary canal is placed ventrally. It may either be stretched out so as to extend for some distance anteriorly, or—as is more usual—be concentrated to form along with the reproductive organs a rounded opaque mass near the posterior end of the body, known as the visceral mass or ‘‘nucleus.” The embryonic development is direct, no tailed larva being formed.

This sub-order contains two very distinct families, the SALPIDs, which are the typical members, and the OcTACNEMIDA, including a single very remarkable form (Octacnemus bythius), which in some respects does not conform with the characters given above. :

The Salpide includes the single genus Salpa (Forskal), which, however, may be divided into two well-marked groups of species, —(1) those, such as 8S. pinnata, in which the alimentary canal is stretched out along the ventral surface of the body, and (2) those, such as S. fusiformis (fig. 14, A), in which the aliment- ary canal forms a compact globular mass, the “nucleus,” near the posterior end of the body.

jecting into the branchial sac. The nerve ganglion, subneural gland, dorsal lamina, peripharyngeal bands, and endostyle are placed in the usual positions. A pigment spot and an otocyst are found in connection with the ganglion. ‘The large spaces at the sides of the dorsal lamina (often called the gill or branchia of Salpa), by means of which the cavity of the branchial sac is placed in free communication with the peribranchial cavity, are to be regarded as gigantic stigmata formed by the suppression of the lateral walls of the branchial sac. Fig. 16 represents an aggre- gated or sexual Salpa which was once a member of a chain, since it shows a testis and a

developing embryo. The ova (always few in number, usually only one) appear at a very early period in the developing chain Salpa, while it is still a part of the gemmiparous stolon in the body of the solitary Salpa. This gave rise to the view put forward by Brooks (25), that the ovary really belongs to the solitary Salpa, which is therefore a female producing a series of males by asexual gemmation, and depositing in each of these an ovum, which will afterwards, when fertilized, develop in the body of the male into a solitary or female Salpa. This idea would of course entirely destroy the view that Salpa is an example of alterna- tion of generations. The sexual or chain Salpa, although really hermaphrodite, is always protogynous: %.e., the female elements or ova are produced at an earlier period than the male organ or testis.

About fifteen species altogether are known ; they are all pelagic forms and are found in nearly all seas. ach species occurs in two

This prevents self-fertilization. The ovum is fertilized by the Develop- spermatozoa of an older Salpa belonging to another chain, and ment of the embryo is far advanced in its development before the testis is Salpa.

forms—the solitary asex- ual (proles solitaria) and)\ gz the aggregated sexual | (proles gregaria)—which are usually quite unlike

ma OF

end. 7 \—3 one another. ‘The soli- MSt-~ tary form (fig. 14, B)

2 Wes gives rise by internal

~~visc Ag ed 7 gemmation to a complex 4~~-asc tubular stolon, which

gem. — \ 7 contains processes from

ray all the more important 1 organs of the parent body and which becomes seg- mented into a series of Fic. 14.—Salpa runcinata-fustformis, A. Aggre- buds or embryos. As gated form. B. Solitary form. Lettering as the stolon elongates, the before ; 1-9, muscle bands ; a pots a embryos near the free i . + vi. h A

Goramilbatomn Beales ey Seem 7 Coes end which have become

mass (nucleus), (Original.) sivahead ir thee dame, lopment are set free in groups, which remain attached together by processes of the test, each enclosing a diverticulum from the mantle so as to form ‘‘chains” (fig. 15). Each member of the chain isa Salpa

formed. Atan early period in its development a part of the embryo becomes separated off, along with a part of the wall of the cavity in which it lies, to form the “ placenta,” in which the embryonic and the maternal blood streams circulate in close proximity (or actually coalesce during one period) and so allow of the passage of nutriment to the developing embryo. At a somewhat later stage a number of cells placed at the posterior end of the body alongside the future nucleus become filled up with oil-globules to form a mass of nutrient material—the eleoblast—which is used up later on in the develop- ment. Many suggestions have been made as to the homology of the eleoblast. The most probable is that it is the disappearing rudiment of the tail found in the larval condition of most Ascidians.

The family Octacnemidw includes the single remarkable form Qcta- Octacnemus bythius, found during the “ Challenger” expedition, and cnemide.

first described by Moseley (29). Itis apparently a deep- & sea representative of the pelagic Sai- pid, and may pos- sibly be fixed. The body is somewhat discoid, with its margin prolonged

Fie. 17.— Diagrammatic vertical longitudinal section of Octacnemus bythius (after Moseley). 67, branchial aperture; m, opening of cesophagus; 7, rectum; at, atrial aperture ; rm, rm, radiating muscles ; n, nucleus ;

to form eight taper- ing processes, on to which the muscle

of the sexual or aggregated form, and when mature may—either still attached to its neighbours or se-

h, les of nucleus; g, respiratory membrane; parated from them (fig. 14, A)— poe gh 4 thickened margin of eee of Ttest : be, pedicle of produce one or

several embryos, mantle are con- attachment. which develop into the solitary tinued. The aili- ; Salpa. Thus the two forms alter- mentary canal forms a compact nucleus (fig. 17); the endostyle is

Struc- nate regularly. The more import- very short ; and the dorsal lamina is apparently absent. The re- ture of ant points in the structure of a production and life-history are entirely unknown. Salpa. typical Salpa are shown in fig. 16.

Order III.—ASCIDIACEA.

Fixed or free-swimming Simple or Compound Ascidians which in A scid- the adult are never provided with a tail and have no trace of a iacea. notochord. The free-swimming forms are colonies, the Simple Ascidians being always fixed. The test is permanent and well developed ; as a rule it increases with the age of the individual.

The branchial sac is large and well developed. Its walls are per- forated by numerous slits (stigmata) opening into the peribranchial cavity, which communicates with the exterior by the atria] aperture. Many of the forms reproduce by gemmation, and in most of them

The branchial and atrial apertures are at opposite ends of the body, and each leads into a large cavity, ; / the branchial and peribranchial i a eg ON Me oe oa; which rae in free see ecg! Sil showing a cain of embryos nearly tion at the sides of the obliquely- ready to be set free. gem, young running dorsal lamina or “gill.” aggregated Salpw forming the chain ; The teat’ig swell developed. gud 20) 3) senaa’lRns of ue adheres closely to the surface of a en

the mantle. ‘The muscle bands of the mantle do not completely encircle the

t emb the sexually-produced embryo develops into a tailed larva. body. They are sgdngdim = The Ascidiacea includes three groups,—the Simple Ascidians, present dorsally ean SE ie the Compound Ascidians, and the free-swimming colonial Pyrosoma. and _ laterally,

Sub-order 1.—Ascidize Simplices.

Fixed Ascidians which are solitary and very rarely reproduce by Simple gemmation ; if colonies are formed, the members are not buried in Ascid- a common investing mass, but each has a distinct test of its own. ians. No strict line of demarcation can be drawn between the Simple and the Compound Ascidians, and one of the families of the former group, the Clavelinidx (the Social Ascidians), forms a transition from the typical Simple forms, which never reproduce by har to the Compound forms, which always do (see p. 618 below), The Ascidie Simplices may be divided into the following families :—

Family I.—CLavELINIDm. Simple Ascidians which reproduce by gemmation to form small colonies in which each ascidiozooid has a distinct test, but all are connected by a common blood-system.

but the major- ity do not reach the ventral sur- face. In many cases neigh- bouring bands join in the med- ian dorsal line, = (fg. 14). The “ene anterior end of

Semi-diagrammatic representation of Salpa from

left side. Lettering as before; emb, embryo; m, mantle ;

1, languet; sgd, duct of subneural gland; 1-11, muscle

the dorsa] Ja- bands of mantle; ¢’, thickening of test over nucleus; dl, : 6 gill or branchia. (Original.)

mina is pro-

longed to form a prominent tentacular organ, the languet, pro-

Com- pound Ascid- jans.

TUNICATA

Buds formed on stolons which are vascular outgrowths from the pos- terior end of the body, containing prolongations from the ectoderm, mesoderm, and endoderm of the ascidiozooid. Branchial sac not folded ; internal longitudinal bars usually absent; stigmata straight; tentacles simple. This

family contains three genera: Ecteinascidia (Herdman), with internal longitudinal bars in branchial sac ; Clavel- ina (Savigny), with intestine extending behind branchial sac; and Perophora (Wieginann), with intestine alongside branchial sac.

Family 11.—Ascrpi1pa&. Solitary fixed Ascidians with gelatinous test ; branchial aperture usually eight-lobed, atrial aperture usually six-lobed. Branchial sac not folded; internal longitudinal bars usually present ; stigmata straight or curved; tentacles simple. This family is divided into three sections :—

Sub-family 1—Hyrosyruina. Branchial sac with no internal longitudinal bars. One genus, Hypobythius (Moseley).

Sub-family 2.—Ascipinaz. Stigmata straight. Many genera, of which the following are the more importaut :—Ciona (Fleming), dorsal languets present ; Ascidia (Linneus, = Phallusia, Savigny), dorsal lamina present (see figs. 1 to 10); Rhodosoma (Ehrenberg), anterior part of test modified to form operculum; Abyssascidia (Herdman), intestine on right side of branchial sac.

Sub-family 3.—CorELLINa#. Stigmata curved. Three genera :— Corella (Alder and Hancock), test gelatinous, body sessile ; Coryn- ascidia (Herdman), test gelatinous, body pedunculated; Chelyo- soma (Brod. and Sow.), test modified into horny plates.

Family I11.—Cynruips. Solitary fixed Ascidians, usually with leathery test; branchial and atrial apertures usually both four-lobed. Branchial sac longitudinally folded ; stigmata straight ; tentacles simple or compound. This family is divided into three sections :—

Sub-family 1.—SryEnin#, not more than four folds on each side of branchial sac ; tentacles simple. The more important genera are —Styela (Macleay), stigmata normal, and Bathyoncus (Herdman), stigmata absent or modified.

Sub-family 2.—CynTuin#, more than eight folds in branchial sac; tentacles compound; body sessile. The chief genus is Cynthia (Sa- vigny), with a

large number of species.

Sub-family 3.—Bot- TENIN#, more than eight |

y

folds in branchial sac ; | tentacles compound ; |\/7 body pedunculated (fig. |/ 18, A). The chief genera are—Joltenia (Savigny), branchial aperture four- ee ae lobed, stigmata normal; br f il and Culcolus (Herd- Fic. 18,—Culeolus willemesi. A. Entire body, man), branchial aper- natural size. B. Part of branchial sac mag- : nified. at, atrial aperture; br, branchial aper- ture with less than four ture; ped, peduncle; bdr f, slight fold of branch- lobes, stigmata absent or ial = o4 as silgeove coe heed : ae] sp, calcareous spicules In vessels ; tr, Sverse fo ee (fg. i meee vosnels, (After. Herdman, Challenger Report.) genus discovered by the ‘‘ Challenger” expedition (see 77).

Family IV.—Mo.ievutipaz. Solitary Ascidians, sometimes not fixed ; branchial aperture six-lobed, atrial four-lobed. Test usually incrusted with sand. Branchial sac longitudinally folded ; stigmata more or less curved, usually arranged in spirals; tentacles compound. The chief genera are—Molgula (Forbes), with distinct folds in the branchial sac, and Hugyra (Ald. and Hanc.), with no distinct folds, but merely broad internal longitudinal bars in the branchial sac. In some of the Molgulide (genus Anurella, Lacaze-Duthiers, 20) the embryo does not become converted into a tailed larva, the development being direct, without metamorphosis. The embryo when hatched assumes gradually the adult structure, and never shows the features characteristic of larval Ascidians, such as the urochord and the median sense-organs.

Sub-order 2.—Ascidiz Composite.

Fixed Ascidians which reproduce by gemmation, so as to form colonies in which the ascidiozooids are buried in a common invest- ing mass and have no separate tests. This is probably a somewhat artificial assemblage formed of two or three groups of Ascidians which produce colonies in which the ascidiozooids are so intimately united that they possess a common test or investing mass. This is the only character which distinguishes them from

the Clavelinida, but the property of reproducing by gemmation separates them from the rest of the Ascidiw Simplices. The Ascidiew Composite may be divided into the following families :—

Family I.—Distromipa. Ascidiozooids divided into two regions, thorax and abdomen ; testes numerous; vas deferens not spirally coiled. The chief genera are—Distoma (Gaertner) ; Distaplia (Della Valle); Colella (Herdman), forming a Peep colony (see fig. 19, A) in which the ascidiozooids devclop incubatory pouches, connected with the peribranchial cavity, in which the embryos undergo their development (77) ; and Chondrostachys (Macdonald).

- on the inner surface next to the central

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Family II.—Canocormips. Colony not fixed, having a large axial cavity with a terminal aperture. Branchial apertures five-lobed. This includes one species, Celocormus huxleyi (Herdman), which is a transition form between the ordinary Compound Ascidians (@.9. Distomidsx) and the Ascidix Salpiformes (Pyrosoma). ;

Family I1].—Dipemnipz. Colony usually thin and incrusting Test containing stel- late calcareons spi- cules. Testis single, large; vas deferens pews coiled. The chief genera are—Di- demnum (Savigny), in which the colony is thick and fleshy Az and there are only Fig. 19.—Colonies of Ascidia: Composite (natural size). three rows of stig- A. Colella quoyi. B. Leptoclinum neglectum. C. Pha- mata on each side of ‘yngodictyon mirabile. D. Botryllus, showing ar-

: . rangement of ascidiozooids in circular systems each =~ ree 4 of which has a central common cloaca. (After Herd-

man, Challenger Report.) (Milne-Edwards), in which the colony is thin and incrusting (fig. 19, B) and there are four rows of stigmata on each side of the branchial sac.

Family IV. —ipaoadyipa: Test reduced in amount, rarely con- taining spicules. Vas deferens not spirally coiled. In Diplosoma (Macdonald), the most important genus, the larva is gemmiparous.

Family V.—Potyciinip#. Ascidiozooids divided into three regions,—thorax, abdomen, and post-abdomen. Testes numerous ; vas deferens not spirally coiled. The chief genera are—Pharyngo- dictyon (Herdman), with stigmata absent or modified, containing one species, Ph. mirabile (fig. 19, C), the only Compound Ascidian known from a depth of 1000 fathoms ; Polyclinuwm (Savigny), with a smooth-walled stomach ; Aplidium (Savigny), with the stomach wall longitudinally folded ; and Amarouciwm (Milne-Edwards), in = ae ascidiozooid has a long post-abdomen and a large atrial

anguet.

Family VI.—Borryiuipa. Ascidiozooids having the intestine and reproductive organs alongside the branchial sac. Dorsal lamina present ; internal longitudinal bars present in branchial sac. The chief genera are—Botryllus (Gaertn. and Pall.), with simple stellate systems (fig. 19, D), and Botrylloides (Milne- Edwards), with elongated or ramified systems,

Family VII.—PotysTyE.ipa. systems. Branchial and atrial apertures four-lobed. Branchial sac may be folded; internal longitudinal bars present. The chief genera are—Thylaciwm (Carus), with ascidiozooids projecting above general surface of colony; Goodsiria (Cun- ningham), with ascidiozooids completely imbedded in investing mass; and Chorizo- cormus (Herdnian), with ascidiozooids united in little groups which are connected by stolons. The last genus contains one species, Ch. reticulatus, a transition form between the other Polystyelidew and the Styeling amongst Simple Ascidians.

The methods of reproduction by gemma- tion differ in their details in the various groups of Compound Ascidians ; but in all cases the process is essentially a giving off from the parent body of groups of cells re- presenting the ectoderm, the mesoderm, and the endoderm, which develop into the corresponding layers of the bud. The first ascidiozooid of the colony produced by the tailed larva does not form sexual repro- ductive

organs, but reproduces by gemma- tion so as to make a colony. Thus there is alternation of generations in the life- history. In the most completely formed colonies (¢.g., Botryllus) the ascidiozooids are arranged in groups (systems or cceno- bii), and in each system are placed with their atrial apertures towards one another, and all communicating with a common cloacal cavity which opens to the exterior = in the centre of the system (fig. 19 D).

Ascidiozooids not grouped in

Sub-order 3.—Ascidie Salpiformes.

Free-swimming pelagic colonies having the form of a hollow cylinder closed at one end. The ascidiozooids forming the colony yy, 99, are imbedded in the common test in such a manner that the branchial apertures open on the outer surface aud theatrial apertures

x

natural size. A. Side view of entire colony. B. End view of open extremity. (Original.)

cavity of the colony. The ascidiozooids are produced by gemmation from a rudimentary larva (the cyathozooid) developed sexually.

XXIII. — 78

Repro- duction by gem- mation.

Ascidiz Salpi-

Pyrosoma elegans, Sormes.

618 TUNLTCATA

Struc- This sub-order includes a single family, the Pyrosomrpa, con- | branchial cavity, and consist of a lobed testis and a single ovum at ture of taining one well-marked genus, Pyrosoma (Péron), with several | a time. The development takes place in a part of the peribranchial Develop- Pyro-

species. They are found swimming near the surface of the sea, | cavity (fig. 21, ein). The segmentation is meroblastic, and an ment of soma. chiefly in tropical latitudes, and are brilliantly phosphorescent. elongated embryo is formed on the surface of a mass of yolk. The Pyro-

A fully developed Pyrosoma colony may be from an inch or two to embryo, after the formation of an alimentary cavity, a tubular soma.

upwards of four feet in length. The shape of the colony is seen in fig. 20. It tapers slightly towards the closed end, which is rounded. The opening at the opposite end is reduced in size by the presence of a membranous prolongation of the common test (fig. 20, B). The branchial apertures of the ascidiozooids are placed upon short papilla projecting from the general surface, and most of the ascidio- zooids have long conical processes of the test projecting outwards beyond their branchial apertures (figs. 20, 21, and 22). There is only a single layer of ascidiozooids in the Pyrosoma colony, as all the fully developed ascidiozooids are placed with their antero- posterior axes at right angles to the surface and communicate by their atrial apertures with the central cavity of the colony (fig. 21).

evn

em

Fic. 21.—Part of a longitudinal section through wall of Pyrosoma, showin, arrangement of ascidiozooids, magnified (partly after Savigny). at, atria apertures; br, branchial apertures ; asc, young ascidiozooid of a future colony produced by budding from cy, cyathozooid ; em, embryos in various stages ; t, test ; tp, processes of test ; brs, branchial sac ; yas, young ascidiozooid,

Their dorsal surfaces are turned towards the open end of the colony. The more important points in the structure of the ascidiozooid of Pyrosoma are shown in fig. 22. A circle of tentacles, of which one, placed ventrally (fig. 22, tn), is larger than the rest, is found just inside the branchial aperture. From this point a wide cavity, with a few circularly-placed muscle bands run- ning round its walls, leads) back to the large branchial sac, which occupies the

greater part of the = body. The stigmata = wees are elongated trans- ==”

versely and crossed by internal longitu- dinal bars. The dor- sal lamina is repre- sented by a series of eight languets (7).

The nerve ganglion “~~ {on which is placed a small pigmented ete sense organ), the sub- am neural gland, the dor- sal tubercle, the peri- pharyngeal _ bands, and the endostyle are

placed in the usual sa cee positions. Ca ceeh Fig. 22.—Mature ascidiozooid of Pyrosoma, from left

A ‘ side (partly after Keferstein). Lettering as before ; side of the anterior cm, cellular mass, the seat of phosphorescence; end of the branchia] ¢m’, posterior cellular mass; gs, gemmiparous sac, close to the peri- stolon; mb, muscle band; ngl, subneural gland ; pharyngeal bands, is

pig, pigment spot on ganglion; tp, process of test. a mass of rounded gland cells which are the source of the phosphores- cence. The alimentary canal is placed posteriorly to the branchial sac, and the anus opens into a large peribranchial (or atrial) cavity,

of which only the median posterior part is shown (pdr) in fig. 22. The reproductive organs are developed in a diverticulum of the peri-

sa

Ov.

nervous system, and a pair of laterally placed atrial tubes, divides into an anterior and a posterior part. The anterior part then segments into four pieces, which afterwards develop into the first ascidiozooids of the colony, while the posterior part remains in a rudimentary condition, and was called by Huxley the ‘‘cyatho- zooid”’ ; it eventually atrophies. As the four ascidiozooids increase in size, they grow round the cyathozooid and soon encircle it (fig. 21, ase and cy). The cyathozooid absorbs the nourishing yolk upon which it lies, and distributes it to the ascidiozooids by means of a heart and system of vessels which have been mcanwhile formed. When the

cyathozooid atrophies and is absorbed, its original atrial aperture remains and deepens to become the central cavity of the young colony, which now consists of four ascidiozooids placed in a ring, around where the cyathozooid was, and enveloped in a common test. The colony gradually increases by the formation of buds from these four original ascidiozooids,

PHYLOGENY,

The accompanying diagram shows graphically the probable Phylo- origin and course of evolution of the various groups of T’uwicata, geny.

and therefore exhibits their relations to one another much more correctly than any system of linear classification can do. The ancestral Proto-Tunicata are here regarded! as an offshoot from the Proto-Chordata—the common ancestors of the Tunicata (Uro- chorda), Amphioxus (Cephalochorda), and the Verte- brata. The ancestral Tunicata were probably free- swimming forms, not very unlike the existing Appendiculariide, and are represented in the life-history

MOLG,

of nearly all 6. sections of the . Tunicata by = the tailed lar-

val stage. The a

Larvacet are

% Bor. shoot from %, the ancestral forms which ra Yemiw 2 ‘opto.

gave rise to the two lines of descendants, the Proto-Thaliacca and the Proto-Ascidiacea. The Proto-Thaliacea then split into the ancestors of the existing Cyclomyaria and Hemimyaria. The Proto-Ascidiacea gave up their pelagic mode of life and became fixed. This ancestral process is repeated at the present day when the free-swimming larva of the Simple and Compound Ascidians becomes attached. The Proto-Ascidiacea, after the change, are probably most nearly repre- sented by the existing genus Clavelina. They have given rise directly or indirectly to the various groups of Simple and Com- pound Ascidians and the Pyrosomidex. hese groups form two lines,

which appear to have diverged close to the position of the family Clavelinidw. The one line leads to the more typical Compound Ascidians, and includes the Polyclinide, Distomide, Didemnidz, Diplosomide, Celocormide, and finally the Ascidia Salpiformes. The second line gave rise to the Simple Ascidians, and to the Botryllide and Polystyelide#, which are, therefore, not closely allied to the other Compound Ascidians. The later Proto- Ascidiacea were probably colonial forms, and gemmation was retained by the Clavelinid# and by the typical Compound Ascidians (Distomide, &c.) derived from them. The power of forming colonies by budding was lost, however, by the primitive Simple Ascidians, and must, therefore, have been regained independently by the ancestral forms of the Botryllide and the Polystyelide. If this is a correct interpretation of the course of evolution of the Tunicata, we arrive at the following important conclusions. (1) The Z'wnicata, as a whole, form a degenerate branch of the Proto- Chordata ; (2) the Ascidiw Salpiformes (Pyrosoma) are much more closely related to the typical Compound Ascidians than to the other

' pelagic Twnicata, viz., the Larvacea and the Thaliacca ; and (8) the Ascidie Composite form a polyphyletic group, the sections of which have arisen at several distinct points from the ancestral Simple Ascidians.

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1 By Dohrn and others their point of origin is placed considerably further up on the stem of the Chordata, thus causing the Tunicata to be regarded as very degenerate Vertebrata (see 32).

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TUNING FORK, a small bar of cast tool steel with tolerably defined edges, bent into a fork with two prongs. A handle of the same metal extending from the bend of the fork serves as a sound-post to transmit the vibrations of the fork to any resonance board or body convenient for reinforcing the sound. The fork is set in vibration by striking one of the prongs against any hard substance, by pressing the prongs together if the fork is a light one, or, if it is large, by drawing a double bass bow across one of the prongs. The larger forks are sometimes made with a worm upon the handle in order that they may be screwed into a resonance box, the dimensions of which should agree with the pitch of the fork. The ordinary use of a tuning fork is to serve as a pitch carrier or standard, for which it is particularly suited owing to the permanence with which it maintains the pitch to which it may be tuned. It is flattened by heat and sharpened by cold about 1 vibration in 20,000 for every degree Fahr., so that the exact pitch always depends upon the temperature. A tuning fork is tuned by filing the ends of the prongs or between them near the ends to make it sharper, or by filing between them near or at the bend to make it flatter. Less filing is required to flatten than to sharpen. It should be allowed to rest after tuning, on account of the disturbance of the molecular structure by the filing, and after a few days should be compared again with the pitch required, and corrected. The tuning fork is also of value in certain physical investigations, from the

constancy of its rate of vibration. In England it is generally tuned to C in the treble clef, because organ-builders start their tuning from that note; in France it is tuned to A in the treble clef, which is the note of the third open string of the violin. The French diapason normal is tuned to A at 15°C. (=59° Fahr.) and is fixed at 435 double vibrations in a second. The inventor of the tuning fork was John Shore, royal trumpeter in 1711, sergeant trumpeter at the entry of George I. in 1714, and lutanist to the chapel royal in 1715.

According to Chladni, whose analysis of the tuning fork has been generally accepted, it has two nodes or points of least vibration at the bend, with a ventral or vibrating loop between, by which its vibrations are transmitted to the handle. That this is not the case has been shown by Mr W. F. Stanley.' The fundamental note appears to be an octave bclow the note which the ear recognizes as the pitch of the fork. Helmholtz, Tyndall, and others accept the latter as the fundamental, and Helmholtz expressly says that each prong may be regarded as an elastic rod fixed at one end.?_ The fork is really a bent elastic rod vibrating at both ends, with a node at the bend, through which, and in the same way as with the bridge of any stringed instrument, the vibrations are conducted. As well as the second partial, the third and fourth are in large forks fre- quently distinguishable, but such partials above the octave are very weak, In addition to the lower harmonic partials it is generally easy to produce with a blow a very high inharmonic tinkle or ringing metallic note, that will continue to sound for some time without blending with the true note of the fork. The precise interval varies, but is usually two octaves and between a flat fifth and a major sixth above the recognized pitch of the fork. With ordinary tuning forks this tinkling note is to be found amongst the highest treble notes of the pianoforte. Theorists give other inharmonic proper tones in due ascending order; they are derived from calculation on the assumption that they proceed as the squares of the odd numbers, but are beyond practical verification owing to

1 Nature, vol. xxvi. pp. 166, 243, 2 Sensations of Tone ; Eng. transl. by A. J. Ellis, 2d ed., 1885, p. 70.

*'Untersuch. u. d. Tunic. d. Adriat. Meeres," in Denkschr. d. k. Akad. Wiss., 1875-77 ; (20) Lacaze-Duthiers, " Asc. Simp. d. Cétes d. 1.

Manche,” in Arch. Zool. Huper., 1874, 1877; (27) Traustedt, in Vidensk. Medd. Naturh. For., Copen- hagen, 1881-84; (22) Herdman, ‘‘Notes on British Tunicata, &e.,” in Journ. Linn. Soc., Zool., vol. xv., 1880; (297) Ussoff, in Proc. Imp. Soc. Nat. Hist., Moscow, vol. xviii., 1876; (2¢) Julin, “Rech. s. l’Org. d. Asc. Simp.,” in Arch. d. Biol., vol. ii., 1881; (25) Brooks, ‘Development of Salpa,” in Bull. Mus. Comp. Zool., Harvard, vol. iii. p. 291; (26)Salensky, Zischr. f. wiss. Zool., 1877; (27) Barrois, Journ, d. Anat. et Phys., vol. xxi., 1885; (28) Uljanin, Fauna, &c., d. Golfes von Neapel, vol. x., 1884; (29) Moseley, ‘‘On Deep-Sea Ascid.,” in Trans. Linn. Soc., ser. ii., vol. i., 1876; (30) E. van Beneden and Julin, “ Morph. d. Tuniciers,” in Arch. d. Biol., vol. vi., 1886; (37) Lankester, Degeneration (Nature series), London, 1880; (32) Dohrn, “Stud. z. Urgesch. d. Wirbelth.,” in Mitth. Zool. Stat. Neapel. CW. A. HE)

their extreme position in the scale of musical sounds and the varia- tion of power in diffcrent ears to distinguish them.

The tuning fork was used by Scheibler (1777-1837) as the easiest means for correctly determining the pitch numbers of vibrations. To make a Scheibler tonometer, take a fork in which the octave can be easily heard and intercalate as many forks as, giving count- able beats with each other, will fill up the octave. ‘The addition of the whole number of beats and thcir fractions in the octave will be the vibrating number, in double vibrations per second, of the lower fork. In order to measure the fractions of vibrations accu- rately forks should be chosen that are audible for 40, or at least 20 seconds. For instance, 60 beats counted in 20 seconds would be 3 a second, and 65 in the same time 3:25. The forks should remain for three months after filing before their differences are finally detcrmined, and the whole examination should be conducted in a known, uniform temperature. Scheibler considered four beats a second between two forks a good number for counting; but Mr A. J. Ellis, who has used Scheibler’s invention as a basis for an exhaust- ive historical statement of musical pitch? and as the novel and exact means for determining the non-harmonic musical scales of various nations, especially Eastern nations,‘ considers three beats a second the best counting number. This would increase the number of intermediate forks.

Attempts have been made to use tuning forks instead of strings for key-board instruments, the object being to obtain permanence of tuning with the soft, unexciting quality of tone furnished by the fork. The inventions of Clagget, London, 1788, of Riffelsen (the melodikon), Copenhagen, 1808, and of Schuster (the adiaphonon), Vienna, 1819, were of this nature. The latest adaptation of a key- board to tuning forks has been effected by Mr Machell of Glasgow ; it was shown at the Inventions Exhibition, South Kensington, London, 1885.

TUNIS, Rxcency or, formerly one of the Barbary states Plate V.

of north Africa, but since 1881 a dependency of France, whose resident-general exercises all real authority in the nominal dominions of the bey. Is bounded on the west by Algeria, on the north by the western basin of the Mediter- ranean, on the east from Cape Bon to the Gulf of Gabes (Kabis) by the eastern basin of the same sea, and on the south-east by the province of Tripoli. On the south the boundary is the Sahara and the frontier line is indefinite. The greatest breadth from east to west is about 150 miles, the length from north to south about 300 miles. The population does not exceed a million and a half.

Physical Features.—Tunis is formed by the prolongation towards the east of the two great mountain chains of ALGERIA (q.v.), and closely resembles that country in its physical features, products, and climate; see Arrica, vol. i, p. 265. The northern Algerian chain (the Little Atlas) is prolonged through Tunis to Ras Sidi “Alf al-Makki, the highest summits never attaining an altitude of 4000 feet. It forms a picturesque, fertile, and well-watered region, with extensive cork woods in its western parts, and sepa- rated from the southern mountains by the valley (the ancient Zeugitana) of the Mejerda (the ancient Bagradas), the most important river of north Africa, which after a tortuous course of nearly 300 miles falls into the Gulf of Tunis at Porto Farina. The basin of the Mejerda, which is now tra- versed by the railway from Algiers to Tunis, is very fertile, and many important ruins testify to its prosperity in Roman times. The rich lacustrine deposits in the Dakhila, or plain of Bulla Regia, show that it was only in relatively recent times that its upper waters found a passage to the sea by

3 “On the History of Musical Pitch,” in Journ. Soc. of Arts, 5th

March and 2d April 1880 ; see also 7th January 1881. 4 “On Musical Scales,” ibid., 27th March and 30th October 1885,

cutting a deep gorge through the cretaceous barrier that shuts in this upland plain upon the east. The southern wall of the Mejerda valley and of the Gulf of Tunis is formed by a branch of the southern Algerian chain, con- nected with Jebel Auras (Mount Aurés) by the plateau of Tebessa (Theveste) and running north-east to Cape Bon. Its highest summits (Zilk and Zaghwan) rise above 5000 feet. Another branch of the southern chain runs from the Sahara side of Mount Aurés south-east towards the head of the Lesser Syrtis or Gulf of Gabes. Between these two branches lies a mountainous plateau, whose waters descend eastward but do not reach the sea. Arrested by a line of hills running parallel to the coast, they form a chain of lakes and marshes, which for the most part dry up in summer. It is to this region of inland drainage (the ancient Byzacene) that the plain of Kairwan belongs. Its southern part from Sbeitla (Sobaitala) to the Syrtis is relatively sterile, and even in antiquity appears to have formed an exception to the general fertility of the country, which was one of the granaries of Rome. The upland district from Tebessa southward sinks into the desert by a step-like series of great plateaus, separated by rugged walls of variegated marls, sands, and alluvium, torn into fantastic shapes, and scored with deep ravines by streams which at some remote period of copious rainfall poured down into the Sahara. Farther east the plateaus disappear and the mountains rise like a rampart from the Sibakh (sing. Sebkha), or Saharian marshes and salt-flats. The depression to which the Sibakh belong terminates to the east in the Shott (Shatt) al-Jerid, which is separated from the Lesser Syrtis only by a narrow isthmus; see SAHARA, vol. xxi. p. 151. Even the Sahara of Tunis abounds in

fertile oases.

Climate.—The mean annual temperature at Susa is 75° Fahr., the mean of the winter or rainy season 60° and of the hot season 97°. At Tunis the temperature rarely exceeds 90°, except with a wind from the Sahara. The prevailing winds from May to Sep- tember are east and north-east and during the rest of the year meri: west and east. A rainy season of about two

months usually begins in January ; the spring season of verdure is over in May ; summer ends in October with the first rains. Violent winds are common at both equinoxes.

Flora and Fawna.—Both are generally the same as those of ALGERIA (q.v.). The lion and panther are almost extinct, but the sportsman finds in abundance the wild boar, partridge, Carthage fowl, quail, and snipe. The African moufflon still exists in the southern mountains. Herds of buffaloes are found in the district of Mater. The stag occurs in the eastern districts. The camel, now so important, was hardly known here before the Roman sovereignty. Red mullet, tunny, and other fish abound around the coast ; and fishing stations are numerous. The town of Bizerta and the Kerkenna Islands are mainly dependent on their fisheries. The coral and sponge fisheries, of which Sfax and the island of Jerba (Djerba) are centres, are also considerable. Of noxious creatures may be named the scorpion, much more formidable than that of Algiers, a venomous tree snake (Hchis carinata), in the sandy lands between Kafsa and Sfax, and a species of python called taguerga, which infests some parts of the southern mountains.

Cork and ‘‘zen” trees cover about 360,000 acres towards the Algerian frontier, and the pine and deciduous oak almost as large an area south of the Mejerda ; but the country is uch less wooded than in antiquity. The richness of the grain crops is still remark- able, in spite of imperfect cultivation. Olives and many excellent fruits are largely produced, and vineyards have been much extended since the French occupation. Esparto grass abounds in the uplands. The oases of the Jerid are devoted to the date palm and produce the best dates known in the European market.

_ Minerals.—The mineral wealth of Tunis, like that of Algeria, is considerable, but it has been imperfectly explored. The iron mines of the northern mountains and the argentiferous lead mines of Al-Resas near Tunis were worked in antiquity, as were also the marble quarries of Simittu (Chemtou), on the upper Mejerda, which are now in the hands of a Belgian company. The thermal springs of Hammam al-Anf on the Bay of Tunis are supposed to have heal- ing virtues ; they are now connected with the capital by rail.

_ Inhabitants. —The industrious Berbers (Kabyles), the oldest stock in the country, are less sharply marked off from the Arabs than in Algeria, but are distinguishable by their lighter complexion and often fair hair. They form a large part of the population in the

northern and eastern mountains, and in the island of Jerba (Jirba). They are organized in tribes with purely democratic self- government, and laws of their own, which are not those of the Koran. The pastoral Arab nomads are descended from the second Arab invasion, which began in the 11th century (see below). They have little agriculture and are still as indolent and unruly as their ancestors. ‘The Arabs of the towns are usually known as Moors; among them the Spanish Moors, descendants of the Andalusian refugees, form an exclusive and aristocratic class. The pure Turks and the Kuluglis (sons of Turkish fathers by Moorish women or slave girls) are no longer numerous. Of Kuropeans there are some 10,000 Italians, 8000 Maltese, and 4000 French (exclusive of the army). The Jews number some 50,000, of whom perhaps half are in the capital. The trade of the country is largely in their hands.

Towns.—For the capital Tunis, see below. Of the coast towns Srax and Susa have separate notices; Bizerta(Benzert), the ancient Hippo Zarytus, is the chief place on the north coast, with 5000 in- habitants. It stands on a canal connecting the sea with a lake which might easily be converted into a magnificent land-locked harbour. On the east coast are Hammamet (Hamamat), with 3700 inhabitants; Monastir, with 5600 inhabitants and a trade in cereals and oils; Mahdiya (Mehedia), with 6300 inhabitants, the fallen city of the Fatimites, which since the French occupation has begun to rise again, and has a new harbour; and Gabes (Kabis) on the Syrtis, a group of small villages, with an aggregate population of 14,000, the port of the shott country and a depot of the esparto trade. Of the inland towns the holy city of KArRWAN (q.v.) is the most remarkable. Its fine mosques are now open to visiters. Sbeitla (Lat. Sufetula), in the mountains south-west of Kairwan, is remarkable for its magnificent Roman remains, the triumphal arch of Constantine, and the three temples which form the hieron. The principal towns of the Mejerda basin are Bedja (Baja), the ancient Vaga, an

important corn market, and higher up, near the border, the fortress of Kéf (Sicca Veneria), with 4000 inhabitants, boldly perched on the steep slope of a volcanic mountain.

Commerce.—The total imports of the regency in 1885 were valued at £1,098,047, of which about 27 per cent were British goods, chiefly cotton fabrics. In 1884 the imports were valued at £1,157,182. The most important export is olive oil, and after it come wheat, esparto grass, barley, sponges. The value of the total exports in 1884 was £745,554, and in 1885 £882,946. In 1885 1,085 vessels (71,188 tons) entered the port of Goletta, and the entries at other ports were 3033 (55,050 tons).

History.—The history of Tunis begins for us with the establish- ment of the Pheenician colonies; see vol. xviii. p. 806, PHa@NICIA and CARTHAGE. The Punic settlers Semitized the coast, but left the Berbers of the interior almost untouched. The Romans entered into the heritage of the Carthaginians and of the vassal kings of Numidia, and Punic speech and civilization gave way to Latin, a change which from the time of Cesar was helped on by Italian colonization. Rich in corn, in herds, and in later times also in oil, and possessing valuable fisheries, mines, and quarries, the province of Africa, of which Tunis was the most important part, attained under the empire a prosperity to which Roman remains in all parts of the country still bear witness. Carthage was the second city of the Latin part of the empire, ‘‘ after Rome the busiest and perhaps the most corrupt city of the West, and the chief centre of Latin culture and letters.” In the early history of Latin Christ- ianity Africa holds a more important place than Italy. It was here that Christian Latin literature took its rise, and to this province belong the names of Tertullian and Cyprian, of Arnobius and Lactantius, above all of Augustine. Lost to Rome by the invasion of the Vandals, who took Carthage in 4389, the province was re- covcred by Belisarius a century later (533-4), and remained Roman till the Arab invasion, for which see vol. xvi. p. 567. The con- queror ‘Okba founded the city of Kairwan (c. 670), which was the residence of the governors of Africa under the Omayyads and there- after the capital of the Aghlabite princes, the conquerors of Sicily, who ruled in merely nominal dependence on the ‘Abbasids (see vol. xvi. p. 579).

The Latin element in Africa and the Christian faith disappeared in a single generation; the Berbers of the mountains, who had never been Latinized and never really Christianized, accepted Islam without difficulty, but showed their stubborn nationality, not only in the character of their Mohammedanism, which has always been mixed up with the worship of living as well as dead saints (mara- bouts) and other peculiarities, but also in political movements. The empire of the Fatimites (see vol. xvi. p. 587) rested on Berber support, and from that time forth till the advent of the Turks the dynasties of north Africa were really native, even when they claimed descent from some illustrious Arab stock. When the seat of the Fatimite empire was removed to Egypt, the Zirites, a house of the Sanhaja Berbers, ruled as their lieutenants at Mahdiya, and about 1050 Mo‘izz the Zirite, in connexion with a religious movement against the Shi’ites, transferred his very nominal allegiance to the Abbasid caliphs. The Fatimites in revenge let loose upon Africa a vast horde of Bedouins from Upper Egypt (B. Hilal and Solaim),

the ancestors of the modern nomads of Barbary. All Africa was ravaged by the invaders, who, though unable to found an empire or overthrow the settled government in the towns, forced the agricul- tural Berbers into the mountains, and, retaining from generation to generation their lawless and predatory habits, have ever since made order and prosperity almost impossible in the open parts of the country. The Zirite dynasty was finally extinguished by Roger I. of Sicily, who took Mahdiya in 1148 and established his authority over all the Tunisian coast. Even Moslem historians speak favourably of the Norman rule in Africa ; but it was brought to an early end by the Almohade caliph ‘Abd al-Mu’min, who took Mahdiya in 1160. The Almohade empire soon began to decay, and in 1336 Abu Zakariya, prince of Tunis, was able to proclaim himself independent and found a dynasty, which subsisted till the advent of the Turks. The Hafsites (so called from Abu Hafs, the ancestor of Abu Zakariya, a Berber chieftain who had been one of the intimate disciples of the Almohade mahdi) assumed the title of Prince of the Faithful, a dignity which was acknowledged even at Mecca, when in the days of Mostansir, the second Hafsite, the fall of Baghdad left Islam without a titular head. In its best days

the empire of the Hafsites extended from Tlemcen to Tripoli and they received homage from the Merinids of Fez; they held their own against repeated Frankish invasions, of which the most notable were that which cost St Louis of France his life (1270) and that of the duke of Bourbon (1390), when English troops took part in the unsuccessful siege of Mahdiya. They adorned Tunis with mosques, schools, and other institutions, favoured letters, and in general appear to have risen above the usual level of Moslem sovereigns, But their rule was troubled by continual wars and insurrections ; the support of the Bedouin Arabs was imperfectly secured by pensions, which formed a heavy burden on the finances of the state ;! and in later times the dynasty was weakened by family dissensions. Leo Africanus, writing early in the 16th century, gives a favourable picture of the "'great city" of Tunis, which had a flourishing manufacture of fine cloth, a prosperous colony of Christian traders, and, including the suburbs, nine or ten thousand hearths ; but he speaks also of the decay of once flourishing provincial towns, and especially of agri- culture, the greater part of the open country lying waste for fear of the Arab marauders. Taxation was heavy, and the revenue very considerable: Don John of Austria in a report to Philip II. states that the land revenue alone under the last Hafsite was 375,935 ducats, but of this a great part went in pensions to the Arabs. The conquest of Algiers by the Turks gave a dangerous neighbour to Tunis, and after the death of Mohammed the Hafsite in 1525 a disputed succession supplied Khair al-Din Barbarossa with a pretext for occupying the city in the name of the sultan of Constantinople. Al-Hasan, the son of Mohammed, sought help from the emperor, and was restored in 1535 as a Spanish vassal, by a force which Charles V. commanded in person, while Andrea Doria was admiral of the fleet. But the conquest was far from complete, and was never consolidated. The Spaniards remained at Goletta and made it a strong fortress; but the in- terior was a prey to anarchy and civil war, until in 1570 'Ali Pasha of Algiers utterly defeated Hamid, the son and successor of Hasan, and occupied Tunis. In 1573 the Turks again retreated on the approach of Don John, who had dreams of making himself king of Tunis ; but this success was not followed up, and in the next year Sultan Selim II. sent a strong expedition, which drove the Spaniards from Tunis and Goletta, and reduced the country to a Turkish province. The civil administration was now placed under a pasha ; but ina few years a military revolution transferred the supreme power to a dey elected by the janissaries, who

formed the army of occupation. The government of the deys lasted till 1705, but was soon narrowed or overshadowed by the authority of the beys, whose proper function was to manage the tribes and collect tribute. From 1631 to 1702 the office of bey was hereditary in the descendants of Murad, a Corsican renegade, and their rivalry with the deys and internal dissensions kept the country in con- stant disorder. Ibrahim, the last of the deys (1702-1705), destroyed the house of Murad and absorbed the beyship in his own office ; but, when he fellin battle with the Algeriaus, Hosain b. ‘Ali, the son of a Greek renegade, was proclaimed sovereign by the troops under the title of “bey,” and, being a prince of energy and ability, was able to establish the hereditary sovereignty, which has lasted without change of dynasty to the present time. Frequent wars with Algiers, which need not detain us, form the chief incidents in the internal history of Tunis under the beys. Under deys and beys alike Tunis was essentially a pirate state. Occasional acts of chastisement, of which the bombardment of Porto Farina by Blake in 1655 was the most notable, and repeated treaties, extorted by European powers, checked from time to time, but never put an end to, the habitual piracies, on which indeed the public revenue of Tunis was mainly dependent. The powers were

1 In the 13th and 14th centuries the Hafsites also paid tribute to Sicily for the freedom of the sea and the right to import Sicilian corn, —a clear proof of the decline of Tunisian agriculture.

generally less concerned for the captives than for the acquisition of trading privileges, and the beys took advantage of the com- mercial rivalry of England and France to play off the one power against the other. The release of all Christian slaves was not effected till after the bombardment of Algiers; and the definite abandonment of piracy may be dated from the presentation to the bey in 1819 of a collective note of the powers assembled at Aix-la- Chapelle. The Government had not elasticity enough to adapt itself to so profound a change in its ancient traditions ; the finances became more and more hopelessly embarrassed, in spite of ruinous taxation ; and attempts at European innovations in the court and army made matters only worse, so long as no attempt was made to improve the internal condition of the country. In the third quarter of the 19th century not more than a tenth part of the fertile land was under cultivation, and the yearly charge on the

public debt exceeded the whole annual revenue. In these circum- stances only the rivalry of the European powers that had interests in Tunis protracted from year to year the inevitable revolution. The French had long regarded the dominions of the bey as their natural inheritance, and in 1881, having got a grievance against the bey in a commercial transaction of the French African Society, with the execution of which he had interfered (the affair of the Enfida estate), a French force crossed the Algerian froutier under pretext of chastising the independent Kroumir or Khomair tribes in the north-east of the regency, and, quickly dropping the mask, advanced on the capital and compelled the bey to accept the French protectorate. The actual conquest of the country was not effected without a serious struggle with Moslem fanaticism ; but all Tunis was brought completely under French jurisdiction and administra- tion, supported by military posts at every important point. The power of the bey is null and his dignity merely nominal,—a fact acknowledged by Great Britain by the surrender in 1883 of Her Majesty's consular jurisdiction in the regency.

Literature.—Of Arabic sources accessible in translations the geographical works of Ya'kubi (Descriptio al Magribi, by De Goeje, Leyden, 1860), Al-Bakri

(Deser. de l'Afrique septentr., by De Slane, Paris, 1859; Arabic text, ibid., 1857), and Hdrisi (Descr, de l' Afrique, &c., by Dozy and De Goeje, Leyden, 1866) belong to the 10th, 11th, and 12th centuries respectively ; the history of Ibn Khaldun (Hist. des Berbéres, by De Slane, 4 vols., Algiers, 1852-56) includes the earlier Hafsites, that of Al-Kairawani (Hist. de l' Afrique, by Pellissier aud Rémusat, Paris, 1845, in Expl. Scient. de U' Algérie, vol. vii.; Arabic text, Tunis, 1286 AH.) deals especially with Tunis, and goes down to 1681. The geography of Tunis is treated by EH. Pellissier (Hxplor. Scient. de lV Algérie, vol. xvi., Paris, 1853), C. Tissot (Géog. Comparée de la Province Romaine d'Afrique, vol. i., Paris, 1884), and Piesse (Itinéraire de l' Algérie, &c., new ed., Paris, 1887), and in Murray's Handbook, by Sir R. Playfair (1887), who has also published Travels in the Foot- steps of Bruce in Alg. and Twnis(London, 1887). A French survey is in progress, and some of the maps are published. For the modern history, see Rousseau, Annales Tunisiennes (Algiers, 1864), and Broadley, Tunis Past and Present (Edinburgh, 1882); for the archeology, Davis, Carthage

and her Remains (Lon- don, 1860), Guérin, Voyage Archéologique (1862), and D'Herisson, Mission Archéol. en Tunisie (Paris, 1881). The excellent description of Africa by Leo Africanus is in Ramusio and Purchas. Shaw's Travels (1788) may still be consulted. Of other books of travels Maltzan's Reise (Leipsic, 1870) deserves mention.

TUNIS, capital of the regency of the same name, in 36° 50' N. lat. and 10° 12' E. long., is situated on an isthmus between two salt lakes, a marshy sebkha to the south-west and the shallow Boheira to the north-east. The latter is twelve miles in circumference, and on the side opposite Tunis is connected with the Bay of Tunis at the port of Goletta (Halk al-Wad) by a short canal. The old town, of which the walls have in great part disap- peared, lies between two suburbs, the Ribdt al-Soweika on the north and the Ribdt Bab al-Jezira on the south. These suburbs were surrounded by a wall in the beginning of the 19th century. Between the old town and the Marine Gate on the Boheira a European quarter, containing the palace of the resident, public offices, the provisional cathedral, and huge blocks of new houses in the French style, has sprung up. At the extreme west of the old town is the citadel, now used as barracks, whose lofty circuit includes the mosque built by Abu Zakariyé the Hafsite in 1232. To the same century belongs the great mosque of the Olive Tree (Jami' al-Zeittuna) in the centre of the town, with its many domes and spacious cloister, which possesses a library and serves as a college for some 450 students of Moslem learning. To the north near the walls of the old town rises the dome of the mosque named after Sid{ Mahrez, a re- nowned saint of the 5th century of the Flight, whose tomb gives it a right of sanctuary for debtors. There are many other mosques and chapels, but all are closed against Christians. The palace of the bey, between the citadel and the mosque of the Olive Tree, is partly in bad French taste, but contains some rooms of the 18th century with admir-

able Moorish decoration in the delicate stucco arabesque work for which Tunis was formerly famous. The chief attraction of the old town lies in its bazaars, which retain their Oriental character unimpaired. Water is supplied to numerous fountains by an ancient aqueduct from Jebel Zaghwan, repaired at a cost of half a million sterling by the late Bey Mohammed al-

Sédik. The principal educational establishments besides that of the great mosque are the Sddikiya college, founded in 1875 for gratuitous instruction in Arabic and European subjects, the college of St Charles, conducted by priests and open to Christians and Moslems alike, and the normal school, founded in 1884 by the bey to train teachers in the French language and European ideas. The population of Tunis is about 125,000, of whom one-fifth are Jews and one-fifth Europeans, chiefly Maltese and Italians.

The environs of Tunis are admirable from the beautiful views they present ; the finest prospects are from the hill on the south- east, which is crowned by a French fort, and from the Belveder on the north of the town (Jebel al-Tuba), on which stands a very ancient fortress. Half-an-hour's drive west of the town is the decaying palace called the Bardo, a little town in itself, remarkable for the "lion court" and some apartments in the Moorish style. The port of Goletta, with 4000 inhabitants, is connected with Tunis by a railway 10 miles long. The older or southern part of the town next the canal has a fortress, now used as barracks, built by the Turks on the site of the Spanish fortress destroyed in 1574. The ruins of Carthage lie a few miles north of Goletta. The chief manufactures of Tunis are still textiles, as in the time of Leo Africanus. The manufacture of silk dates from the settlement of Moorish refugees from Spain abont 1600. There are also tanneries, a tobacco factory, and some minor industries. The annual exports of grain, oil, stuffs, hides, and essences are valued at £720,000, and the imports, chiefly of cotton goods, at £560,000. There are two French steamers weekly between Marseilles and Goletta, and the coast towns are served and connected with Malta both by French and Italian packets.

History.—Tunis was a Carthaginian city and is repeatedly men- tioned in the history of the Punic wars. Strabo speaks of its hot baths and quarries. Under the Arabs it rose to importance, be- came the usual port for those going from Kairwan to Spain, and was one of the residences of the Aghlabites. In the 10th century it suffered severely, and was repeatedly pillaged in the wars of the F4timites with Abu Yazid and the Zendta Berbers. For its later fortnnes see above in the history of the country, of which since the accession of the Hafsites it has been the capital.

TUNNELLING. The process of making a more or less horizontal underground. passage, or tunnel, without removing the top soil is known as tunnelling. In former times any long tube-like passage, however constructed, was called a tunnel. At the present day the word is sometimes popularly applied to an underground passage constructed by trenching down from the surface to build the arching and then refilling with the top soil; but a passage so con- structed, although indistinguishable from a tunnel when completed, is more correctly termed a “covered way,” and the operations ‘‘cutting and covering,” instead of tunnel- ling. Making a small tunnel, afterwards to be converted into a larger one, is called “driving a heading,” and in mining operations small tunnels are termed “ galleries,” “‘ driftways,” and “adits.” If the underground passage is vertical it is a shaft; if the shaft is commenced at the surface the operations are known as “sinking,” and it is called a “rising” if worked upwards from a previously constructed heading or gallery.

Tunnelling has been effected by natural forces to a far greater extent than by man. In limestone districts innumerable swallow-holes, or shafts, have been sunk by the rain water following joints and dissolving the rock, and from the bottom of these shafts tunnels have been excavated to the sides of hills in a manner strictly analogous to the ordinary method of executing a tunnel by sinking shafts at intervals and driving headings therefrom. Many rivers find thus a course underground. In Asia Minor one of the rivers on the route of the Mersina Railway extension pierces

a hill by means of a natural tunnel, whilst a little south at Seleucia another river flows through a tunnel, 20 feet wide and 23 feet high, cut 1600 years ago through rock so hard that the chisel marks are still discernible. The Mammoth cave of Kentucky and the Peak caves of Derbyshire are examples of natural tunnelling. Mineral springs bring up vast quantities of matter in solution. It has been estimated that the Old Well Spring at Bath has discharged since the commencement of the 19th century solids equivalent to the excavation of a 6 feet by 3 feet heading 7 miles long; and yet the water is perfectly clear and the daily flow is only the 150th part of that pumped out of the great railway tunnel under the Severn. Tunnel- ling

is also carried on to an enormous extent by the action of the sea. Where the Atlantic rollers break on the west coast of Ireland, on the seaboard of the western Highlands of Scotland, and elsewhere, numberless caves and tunnels have been formed in the cliffs, beside which artificial tunnelling operations appear insignificant. The most gigantic subaqueous demolition hitherto carried out by man was the blowing up in 1885 of Flood Rock, a mass about 9 acres in extent, near Long Island Sound, New York. To effect this gigantic work by a single instantaneous blast a shaft was sunk 64 feet below sea level, from the bottom of which four miles of tunnels or galleries were driven so as to completely honeycomb the rock. The roof rock ranged from 10 feet to 24 feet in thickness, and was supported by 467 pillars 15 feet square; 13,286 holes, averaging 9 feet in length and 3 inches in diameter, were drilled in the pillars and roof. About 80,000 cubic yards of rock were excavated in the galleries and 275,000 re- mained to be blasted away. The holes were charged with 110 tons of “rackarock,” a more powerful explosive than gunpowder, which was fired by electricity, when the sea was lifted 100 feet over the whole area of the rock. Where natural forces effect analogous results, the holes are bored and the headings driven by the chemical and mechanical action of the rain and sea, and the explosive force is ob- tained by the expansive action of air locked up in the fissures of the rock and compressed to many tons per square foot by impact from the waves. Artificial breakwaters have often been thus tunnelled into by the sea, the com- pressed air blowing out the blocks and the waves carrying away the débris.

With so many examples of natural caves and tunnels in existence it is not to be wondered at that tunnelling was one of the earliest works undertaken by man, first for dwellings and tombs, then for quarrying and mining, and finally for water supply, drainage, and other requirements of civilization. A Theban king on ascending the throne began at once to drive the tunnel which was to form his final resting place, and persevered with the work until death. The tomb of Menptah at Thebes was driven at a slope for a distance of 350 feet into the hill, when a shaft was sunk and the tunnel projected a further length of about 300 feet, and enlarged into a chamber for the sarcophagus. Tunnelling on a large scale was also carried on at the rock temples of Nubia and of India, and the architectural features of the entrances to some of these temples might be studied with advantage by the

designers of modern tunnel fronts. Petrie has traced the method of underground quarrying followed by the Egyptians opposite the Pyramids. Parallel galleries about 20 feet square were driven into the rock and cross galleries cut, so that a hall 300 to 400 feet wide was formed, with a roof supported by rows of pillars 20 feet square and 20 feet apart. Blocks of stone were removed by the workmen cutting grooves all round them, and, where the stone was not required for use, but merely had to be removed to form a gallery, the grooves were wide enough for a man to stand up in.

TUNNELLING

Where granite, diorite, and other hard stone had to be cut, the work was done by tube drills and by saws supplied with corundum, or other hard gritty material, and water, —the drills leaving a core of rock exactly like that of the modern dianiond drill. As instances of ancient tunnels through soft ground and requiring masonry arching, re- ference may be made to the vaulted drain under the south- east palace of Nimrud and to the brick arched tunnel, 12 feet high and 15 feet wide, under the Euphrates. In Algeria, Switzerland, and wherever the Romans went, re- mains of tunnels for roads, drains, and water-supply are found. Pliny refers to the tunnel constructed for the drainage of Lake Fucino as the greatest public work of the time. It was by far the longest tunnel in the world, being more than 34 miles in length, and was driven under Monte Salviano, which necessitated shafts no less than 400 feet in depth. Forty shafts and a number of “ cuniculi” or inclined galleries were sunk, and the excavated material was drawn up in copper pails, of about ten gallons capacity, by windlasses. The tunnel was designed to be 10 feet high by 6 feet wide, but its actual cross section varied. It is stated that 30,000 labourers were occupied eleven years in – its construction. With modern appliances such a tunnel could be driven from the two ends without intermediate shafts in eleven months.

No practical advance was made on the tunnelling methods of the Romans until gunpowder came into use. Old en- gravings of mining operations early in the 17th century show that excavation was still accomplished by pickaxes or hammer and chisel, and that wood fires were lighted at the ends of the headings to split and soften the rock in advance (see fig. 1). Crude methods of ventilation by

Cr RD Rae

EY S SS) a, Basel, 1621.) shaking cloths in the headings and by placing inclined boards at the top of the shafts are also on record. In 1766 a tunnel 9 feet wide, 12 feet high, and 2880 yards – long was commenced on the Grand Trunk Canal, England, and completed eleven years later; and this was followed by many others. On the introduction of railways tunnel- ling became one of the ordinary incidents of a contractor’s work ; probably upwards of 4000 railway tunnels have been executed.

Subaqueous Tunnelling.—In 1825 Brunel commenced and in 1843 completed the Thames tunnel, which was driven at points through liquid mud by the aid of a ‘“‘shield” at a cost of about £1300 per lineal yard. It is now used by the East London Railway. In 1872 Chesborough began tunnelling under the Detroit river, between Canada po Michigan, U.S., but the work was abandoned

owing to continued irruptions of water after some 600 yards of headings had been driven.

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The most important subaqueous work yet accomplished — the Severn tunnel, 44 miles in length—was commenced in 1873 and finished in 1886, Messrs Hawkshaw, Son, Hayter, and Richardson being the engineers and Mr T. A. Walker the contractor. The bed of the Severn is formed principally of marls, sandstones, and con- glomerates in nearly horizontal strata, overlying highly inclined coal measures, shales, and sandstones, which are also exposed in the bed of the river. The tunnel is made almost wholly in the Trias and Coal Measure formations, but for a short distance at its eastern end it passes through gravel. The lowest part of the line is below the “Shoots,” where the depth is 60 feet at low water and 100 feet at high water, and the thickness of Pennant sandstone over the brickwork of the tunnel is 45 feet. Under the Salmon Pool, a de- pression in the bed of the river on the English side, there is a cover of only 30 feet of Trias marl. Much water was met with through- out. In 1879 the works were flooded for some months by a large land spring on the Welsh side of the river. The water which sup- plied the spring came from fissures in the carboniferous limestone, which

was met with only at this place, and it is now conveyed by a side heading parallel to the tunnel to a shaft 29 fect in diameter, in which are fixed pumps of adequate power. On another occasion the works were flooded by water which burst through a hole in the river bed at the Salmon Pool. This hole, which was in the Trias marl] and had an area of 16 feet by 10 feet, was subsequently filled with clay and the works were completed beneath it. The tunnel is for a double line of railway and is lined throughout with vitrified bricks set in Portland cement mortar. A heading was first driven entirely across the river to test the ground and sub- sequently another heading at a lower level. ‘‘ Breakups” were made at intervals of two to five chains and the arching was carried on at each of these points. All parts of the excavation were timbered, and the greatest amount excavated in any one week was 6000 cubic yards. Owing to the inrush of water it was frequently necessary to completely roof the timbering with felt or corrugated iron before the bricklayers could commence the arching. The total amount of water raised at all the pumping stations is about 27,000,000 gallons in twenty-four hours; but the total pumping power provided is equal to 66,000,000 gallons in twenty-four hours. The ventilation is effected by a fan of the Guibal pattern, 40 feet in diameter and 12 feet wide, making forty-three revolutions and drawing 447,000 cubic feet of air per minute from the tunnel through an 18-feet shaft at Sudbrooke (Monmouth).

Another example of subaqueous tunnelling, second only in im- portance to the foregoing, is the Mersey tunnel, the length of which between the pumping shafts on each side of the river is 1 mile. From each shaft a drainage heading was driven through the red sandstone with a rising gradient towards the centre of the river. This heading was partly bored out by a Beaumont machine to a diameter of 7 feet 4 inches, and at a rate attaining occasionally 65 lineal yards per week. All of the tunnel excavation, amounting to 820,000 cubic yards, was got out by hand labour, since heavy blast- ing would have shaken the rock. The minimum cover between the top of the arch and the bed of the river is 30 feet. Pumping machinery is provided for 27,000,000 gallons per day, which is more than double the usual quantity of water ; and ample ventila- tion is secured by two 30-feet diameter and two 40-feet diameter Guibal fans. Messrs Brunlees and Fox were the engineers, and Messrs Waddell the contractors

for the works, which were opened in 1886, about 6 years after the commencement of operations,

Proposals for the construction of a tunnel about 30 miles in length to connect England and France have been brought forward periodically from the commencement of the 19th century, but nothing was done until 1881, when preliminary works of some im- portance were commenced by Sir Edward Watkin and the South- Eastern Railway Company. At the proposed point of crossing the deepest part of the channel is 210 feet, and, as the beds on the English side and those on the French side, so far as relates to the grey chalk and chalk miarl, are each 225 feet thick, it is assumed that those strata are continuous and that the tunnel would be driven through a water-tight material. Shafts have been sunk near Folkestone, and experimental headings have been driven 2000 yards under the sea, on the line of the tunnel. The heading, 7 feet in diameter, was cut by a Beaumont boring machine, having two arms with steel teeth, and driven by compressed air; the usual rate of progress was 15 lineal yards per day. ,

A partially constructed subaqueous tunnel now lies drowned under the Hudson river at New York. An attempt was made to drive a double tunnel through the mud and silt forming the river bed. In 1880, when about a hundred yards had been a geet the water burst in, and twenty men were drowned. Work was sub- sequently resumed on the following plan (see fig. 2). A pilot tunnel, consisting. of an iron tube of 6 feet 6 inches in diameter, was advanced from 30 to 40 feet ahead of the main tunnel, to form a firm support for the iron plates of the latter by means of radial screws. Compressed air, pumped into the tunnel at a pressure of about 20 Ib per square inch, prevented the weight of silt and water from crushing the plating and flowing into the tunnel. The excavated

gilt was mixed with water and ejected by compressed air. Between the shafts the length of the proposed tunnel is 1 mile, and about

MEAN HICH WATER

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YY YYW YY wi fy YY, Fig. 2.—Hudson river tunnel—method

one-eighth of the distance had been accomplished when the works were stopped for financial reasons.

Small subaqueous tunnels have been driven through clay without difficulty under Lakes Michigan and Erie, and elsewhere in America. In England a heading was driven nearly across the Thames in 1807, and eighty years later two 10 feet 6 inch iron-lined tunnels were constructed under the river close to the foundation of London Bridge by Mr Greathead, with the aid of a simple annular shield advanced by six hydraulic presses. Where open gravel or water has to be tunnelled through a diaphragm must be fitted to the shield. Mallet proposed in 1858 to carry in this way a tubular tunnel across the English Channel. Various plans have been suggested for the removal of the soil in advance of the shield. Mr Greathead would effect it by the circulation of a closed current of water, carrying the stuff through the shield from front to back ; and an American plan provides for forcing it bodily out of the way by a lock slonteh shield, aided by jets of water at a very high pressure.

Tunnelling through Mountains. —Where a great thickness of rock overlies a tunnel, it is necessary to do the work wholly from the two ends, without intermediate shafts. The problem resolves itself into devising the most

expeditious way of excavating aud removing the rock, and there are none of the uncertainties and difficulties which make subaqueous tunnelling of so high an interest. Ex- aera has led to great advances in speed and economy, as will

e seen from the following particulars of the three tunnels through the Alps, the longest yet constructed.

Tunnel. Length. | Progress per Day. Cost.

Miles Lineal Yards. Per Lineal Yard. Mont Conia)... cis as newie 74 2°57 £226 St Gotthard …..... 9% 6°01 143

Arlberg

In 1857 the first blast was fired in connexion with the Mont Cenis works; in 1861 machine drilling was introduced ; and in

1871 the tunnel was opened for traffic. With the exception of about 300 yards the tunnel is lined throughout with brick or stone. Little interest now attaches to the method of tunnelling adopted at Mont Cenis, as it is in several respects obsolete. During the first four years of hand labour the average progress was not more than 9 inches per day on each side of the Alps ; but with compressed- air rock-drills the rate towards the end was five times greater.

In 1872 the St Gotthard tunnel was commenced and in 1881 the first locomotive ran through it. Mechanical drills were used from the commencement. Tunnelling was carried on by driving in advance a top heading about 8 feet square, then enlarging this sideways, and finally sinking the excavation to invert level (see figs. 8 and 4). Air for working the rock-drills was compressed to seven atmospheres by turbines of about 2000 horse-power. Six to to eight Ferroux drills, making about 180 blows a minute, were mounted on a carriage and pushed up to the point of attack. From thirteen to eighteen holes were drilled by the machine and its sixteen attendants to depths of from 2’ 7” to 4’ 3” in three to five hours, and the work of charging with dynamite, firing, and clearing away was then done

by twenty-two men in three to four hours. The charge per hole averaged 12 fb, and after firing a strong current

of compressed air was directed over the face of the excavation. Four sets of holes were under favourable circumstances drilled in

Fies. 8 and 4,—Method of excavation in St Gotthard tunnel,

twenty-four hours, which rendered a progress of 18 feet per day in such rock as gneiss attainable in each heading.

The driving of the Arlberg tunnel was commenced in 1880 and the work was completed in little more than three years. The main heading was driven along the bottom of the tunnel and shafts were opened up 25 to 70 yards apart, from which smaller headings were driven right and left. The tunuel was enlarged to its full section at different points simultaneously in lengths of 8 yards, the excava- tion of each occupying about twenty days, ee the masonry 14 days. Ferroux percussion air drills and Brandt rotary hydraulic drills were used, and the performance of the latter was especially satisfactory. After each blast a fine spray of water was injected, which assisted the ventilation vaptnctaly. In the St Gotthard tunnel the discharge of the air drills was relied on for ventilation. In the Arlberg tunnel over 8000 cubic feet of air per minute were thrown in by ventilators. In a long tunnel the quick transport of materials is of equal importance with rapid drilling and blasting. In the Arlberg, to keep pace with the miners, 900 tons of excavated material had to be removed, and 350 tons of masonry to be introduced, daily at each end of the tunnel, which necessitated the transit of 450 wagons. This traffic was carried on over a length of 34 miles on a single track of 27-inch gauge with two sidings. When the locomotives ran into the tunnel the fires were damped down, and, as the pressure in the boiler was fifteen atmospheres, the stored- up heat in the water furnished the necessary power. The cost per lineal yard varied according to the thickness of masonry lining and the distance from the mouth of the tunnel. For the first 1000 yards from the entrance the prices per lineal yard were £11, 8s. for the lower heading; £7, 12s. for the upper one; £380, 10s. for the unlined tunnel; £45 for the tunnel with a thin lining of masonry; and £124,

5s. with a lining 3 feet thick at the arch, 4 feet at the sides, and 2 feet 8 inches at the invert.

Long Tunnels.—The new Croton aqueduct tunnel fron Croton dam to the reservoir in New York is worthy of note both for its The distance

Fras. 5 and 6.—-Great Northern Railway tunnel. Method of tunnel- ling under the Metropolitan cattle market, London,

have to be taken to avoid settlement. The important Metropolitan tunnels constructed by Sir John Fowler have already been de- scribed under Rartway (vol. xx. p. 239). Another successful ex-

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ample of such work is the tunnel driven in 1886 by Mr Johnson, the Great Northern Company's engineer, under the Metropolitan cattle market. Where clear of buildings the tunnel was executed in 12-feet lengths measured from the finished brickwork, the ex- cavation extending another 5 feet. The face of the excavation was carried out in four sections, the first between the head trees and the first sill was formed with a rake of 1 in 43, the second and third with a rake of 1 in 6, and the fourth was vertical, the whole face being close boarded (see figs. 5 and 6). The arch and sidc walls were eight rings and the invert six rings thick.

Where open ballast and running sand heavily charged with water are met with a tun- nel cannot be driven E23 on the ordinary sys- "7 tem without seri- «, ously endangering [adjoining buildings. ~~: To meet such cases, | and also to provide a safe means of tun~~ nelling under dock basins, canals, and rivers, the pneu- matic shield (see fig. 7) was designed by Mr Benjamin Baker. The shicld is supported against external pressure by vertical girders about 6 feet apart. Horizontal shelves of steel plates with cutting edges are spaced about 4 feet apart, and the face of the shield is closed by vertical plates and_ slides ; the arrangement is such that any slide can be opened to admit of the ballast or sand being excavated, whilst the compressed air filling the tunnel pre- vents the influx of water during the proccss. Where

hard water- tight clay is encountered, sections of the shield plates are unbolted to admit miners. When sufficient material has been excavated the shield is advanced by hydraulic pressure and the brick arching built.

See Aquepucr and Rartway; also Drinker's Tunnelling, New York, 1878 (a most important work); and Proc. Inst. Civ. Eng., art. ''Tunnels." (B. B.)

TUNNY (Thynnus thynnus), one of the largest fishes of the family of Mackerels, belongs to the genus of which the Bonito (7h. pelamys) and the Albacores (Th. albacora, Th. dlalonga, &c.) are equally well-known members. From the latter the tunny is distinguished by its much shorter pectoral fins, which reach backwards only to, or nearly to, the end of the first dorsal fin. It possesses nine short fin- lets behind the dorsal, and eight behind the anal fin. Its colour is dark bluish above, and greyish, tinged and spotted with silvery, below. The tunny is a pelagic fish, but periodically approaches the shore, wandering in large shoals, at least in the Mediterranean, within well-ascer- tained areas along the coast. The causes by which its wanderings are regulated in the Atlantic Ocean are much less understood ; it not unfrequently appears in small com- panies or singly in the English Channel and in the German Ocean, probably in pursuit of the shoals of pilchards and herrings on which it feeds. The regularity of its appear- ance on certain parts of the coasts of the Mediterranean has led to the establishment of a systematic fishery, which has been carried on from the time of the Phcenicians to the present day. Immense numbers of tunnies were caught

Fia. 7.—Mr B, Baker's pneumatic shield.

on the Spanish coast and in the Sea of Marmora, where, however, this industry has much declined. The Sardinian tunnies were considered to be of superior excellence. The

Tunny (Thynnus thynnus).

greatest number is now caught on the north coast of Sicily, the fisheries of this island supplying most of the preserved tunny which is exported to other

parts of the world. In ancient times the fish were preserved in salt, and that coming from Sardinia, which was specially esteemed by the Romans, was known as Salsamentum sardicum. At pre- sent preference is given to tunny preserved in oil. Many of the fishes, especially the smaller ones, are consumed fresh. The tunny occurs also in the South Pacific; but several other species seem to take its place in the Indo- Pacific Ocean. It is one of the largest fishes, attaining to a length of ten feet and to a weight of more than a thousand pounds.

On the tunny fisheries of ancient and modern times, see Cuvier and Valenciennes, Hist. Nat. des Poissons (vol. viii. pp. 71-92).

TUNSTALL, a market town of Staffordshire, England, is situated on a branch line of the London and North- Western Railway and on the Trent and Mersey Canal, 4 miles north-west of Stoke and 168 north-west of London. Among the public buildings are the market (1858), town hall (1884), old court-house (now used as a free library and reading room), and board schools (1880). The chief manufactures are those peculiar to the Potteries district ; there are also large iron-works (coal and iron being obtained in the neighbourhood), and brick and tile works. The town is chiefly the growth of the 19th century, and in 1811 numbered only 1677 inhabitants. In 1885 it was included for parliamentary purposes in the borough of Newcastle-under-Lyme. It is governed by a local board of twenty-four members. The population of the urban sanitary district (area 690 acres) was 13,540 in 1871, and 14,244 in 1881.

TURANIAN. This word means etymologically no more than “not Iranian,” and in this sense the word Turan was used by Sasanian monarchs to cover those parts of their realm that did not belong to Iran. The application of the word to denote the Ural-Altaic family of languages is extremely unfortunate and seems to be falling out of use. See PuiLonoey, vol. xviii. p. 779.

TURBINE. See Hypromecuantcs, vol. xii. p. 524.

TURBOT)! the largest and best known of a genus of flat fishes, khombus, which bears the appropriate systematic name of Lh, maximus. The turbot has great width of body, and is scaleless, but is covered with conical bony tubercles. The eyes are on the left side of the body, the lower being slightly

in advance of the upper; the mouth is large and armed with teeth of uniformly minute size. The turbot is found all round the coasts of Europe (except in the extreme north), preferring a flat sandy bottom with from 10 to 50 fathoms of water. The broad banks off the Dutch coast are a favourite resort. It is a voracious fish, and feeds on other fish, crustaceans, and mollusks. It

1 The word ‘‘ turbot” is of great antiquity, perhaps of Celtic origin ; it is preserved in French in the same form as in English, and is com- posed of two words, of which the second is identical with the ‘but ”

in holibut and with the German ‘‘ Butte,” which signifies flat fish. The German name for the turbot is ‘‘ Steinbutte.”

seems to constantly change its abode, wandering northward during the summer, and going into deeper water in the cold season. Some thirty years ago it was estimated that the Dutch supplied turbot to the London market to the value of £80,000 a year. At present (1887) the value of turbot annually sold in London cannot be ascertained ; but it must be several times that amount, and is principally earned by English line-fishermen and trawlers. Although the turbot abounds off the west coast of Ireland, the fishing is not carried on with the same energy and success as in the English Channel and German Ocean. The turbot is also common, though not abundant, in the Mediterranean, and is replaced in the Black Sea by an allied species with much larger bony tubercles (2h. mexoticus). Both species grow to a large size, being usually sold at from 5 to 10 tb ; but the common turbot is stated to attain toa weight of 30 tb. Both from its size and the excellent flavour of its flesh it ranks next after the codfish among British sea-fishes.
TURENNE, Henri DE LA Tour dD’ AUVERGNE, VICOMTE pE (1611-1675), a famous French general of the 17th century, was the second son of Henri, Duc de Bouillon, by Elizabeth, daughter of William I., prince of Orange, and was born at Sedan on 11th September 1611. carefully educated in the strictest doctrines of the Reformed religion, and at the age of thirteen was sent to learn war from his uncles Maurice and Henry of Nassau in the

campaigns of these princes against the Spaniards. In 1626 he received a commission as captain of infantry in the service of Holland, and by 1630 had shown such military capacity that Richelieu invited him back to France and appointed him colonel of a regiment. He was present at the relief of Casale, and on 21st June 1635 was made a maréchal de camp for his services at the siege of La Motte in Lorraine under De la Force. In that year he took com- mand of a division in the army under Cardinal La Valette in the defence of Mainz, and, when the cardinal's army had to fall back on Metz from want of provisions, Turenne commanded the rear-guard, covering the retreat with admirable skill. In 1636 he was present under La Valette at the siege of Saverne, where he was wounded, and in the campaign in Franche Comté; in 1637 he served under the same commander in Flanders, took Landrecies, and drove back the cardinal infant from Maubeuge. In 1638 he served under Bernhard of Saxe-Weimar at the siege of Breisach, and in the following year was transferred to the army of D'Harcourt in Italy. It was at this epoch that he established his fame as a general. In November 1639 he covered the retreat of the army, and fought a famous engagement, known as the battle of the "route de Quiers" ; in 1640 he saved Casale, and insisted upon not abandoning the siege of Turin, which town surrendered on 24th Sep- tember ; in 1641 he took Coni, Ceva, and Mondovi; and on 11th March 1642 he was promoted to the rank of lieutenant-general. After he had served for a short time in Roussillon, he was appointed by Richelieu in 1643 to the command of the army in Italy, under Thomas of Savoy, although his brother, the Duc de Bouillon, had just before been arrested as an accomplice in the conspiracy of Cing Mars. Mazarin did not exhibit quite so much confi- dence in Turenne, and in December 1643 removed him from Italy, sending him to collect the remains of Bernhard of Saxe-Weimar's army and form them once more into an organized force ; but he softened the transference by creat- ing Turenne a marshal of France on 16th May 1644. Turenne's four campaigns in Germany, which largely contributed to the peace of Westphalia, have always been regarded as models in the art of war. In June 1644 he crossed the Rhine at Breisach, and was marching against the Comte de Mercy, the Imperialist general, who was at Freiburg, when he was superseded by the Duc d'Enghien,

He was

better known by his later title of the Prince de Condé. D'Enghien, after fighting the three days' battle of Freiburg, left the army again to Turenne, who took Philippsburg and Mainz, and then went into winter quarters. In May 1645 Turenne was surprised by Mercy at Marienthal and de- feated ; but he skilfully concentrated the remains of his army and retreated into Hesse, where he was soon joined by D'Enghien. The two marshals, having reorganized their army, marched against Mercy and totally defeated him at Nordlingen on 3d August 1645, when Mercy was killed. D'Enghien again left the army to Turenne, who in con- junction with the Swedish army under Wrangel overran Franconia and Swabia, taking all the fortresses there in 1646. In 1647 he conducted a still more masterly cam- paign, and after beating the Bavarians and Imperialists in two engagements he and the Swedes occupied Bavaria, — and drove the old duke out of his dominions.

When the troubles of the Fronde (see France, vol. ix. p-. 572, and Mazarrn) broke out, Turenne, who was in com- mand of the veteran troops of Bernhard of Saxe-Weimar in Alsace, hesitated which side to take, till the Duchesse de LONGUEVILLE (9.v.), with whom he fell violently in love, persuaded him to side with the parlement. But his troops refused to follow him, and he had to fly with her to Flanders. He there took a command in the Spanish army under Don Estevan Gomar, and, when trying to raise the siege of Réthel, was utterly defeated by Du Plessis-Praslin. But in 1652 he defeated Condé at Gien, and nearly an- nihilated his army in the battle of the Faubourg St. Antoine. When the troubles of the Fronde were over, Turenne marched upon the frontier, and in several cam- paigns defeated the Spaniards over and over again, by these victories paving the way for the peace of the Pyrenees (1659), the natural complement of the peace of West- phalia. In these campaigns he had once more to fight against Condé, general-in-chief of the armies of Spain, and in 1654 he showed his superiority by raising the siege of Arras and driving the Spaniards from their lines. In 1656 Condé, assisted by Don John of Austria, won an exactly similar victory and relieved Valenciennes, which Turenne was besieging. The prolonged contest between the two was decided in 1658 by Turenne's victory of the Dunes, in which Cromwell's contingent of 6000 soldiers took part.

Louis XIV. now began to rule in reality, and one of his first acts was to create Turenne in 1660 marshal-general of the armies of France. Seven years later Turenne occupied French Flanders and took all the fortresses in that province, though the king was nominally in com- mand of the army,—an exploit equalled in the following year by Condé's rapid occupation of Franche Comté. It was in 1668 that Turenne made his notorious change of faith. Born of Calvinist parents and educated a Protestant, he had in compliance with the tenets of his religion refused to marry one of Richelieu's nieces in 1639, and had eventually married a daughter of the Protestant Marshal de la Force. But it can hardly be believed that he was converted at the age of fifty-seven from religious convictions. In 1672 the second great European war broke out, brought about by the ambition of Louis XIV. Turenne once more took command of the army, which the king accompanied, and speedily occupied the greater part of Holland, which, however, they were forced to evacuate owing to the Dutch cutting their dykes. In the following year Turenne marched into Westphalia to oppose the imperialist forces, and, though his army was small com- pared to that of Montecuculi, the imperialist general, he managed to make head against both him and the elector of Brandenburg. In 1673 he was compelled to act on the defensive; but in 1674 in spite of his inferiority of numbers

he boldly resumed the aggressive. Crossing the Rhine at Philippsburg in June, and marching rapidly to Sinsheim, he defeated the imperialist general Caprara and the duke of Lorraine. He then retired for a time, but in December of the same year he made a sudden rush into the enemy's winter quarters and utterly routed the elector of Branden- burg, who was then general of the imperialists, at Colmar. Between the battle of Sinsheim and the dash at Colmar, Turenne, under orders from Louvois, committed the acts which are the greatest blot upon his fame by devastat- ing the Palatinate. After the rout of Colmar, and the defeat of Tiirkheim which followed it, he laid waste the greater part of Alsace, as a defensive measure against another advance of the imperialists. He then advanced into the heart of Germany, and again met Montecuculi, who had succeeded the elector of

Brandenburg as general- in-chief. The two generals manceuvred for four months in much the same way as Wellington and Marmont marched and counter-marched before the battle of Salamanca; at last, on 27th July 1675, their field of battle was chosen, and, as Turenne was directing the position of a battery, he was struck by a cannon ball and killed on the spot. The news of his death was received with universal sorrow ; Fléchier, Mascaron, Saint-Evremond, and Lamoignon wrote éloges of him; and Madame de Sevigné describes the consternation caused by his sudden loss. His body was taken to St-Dénis, and buried with the kings of France. Even the extreme revolutionists of 1793 respected it, and, when the bones of the sovereigns were thrown to the winds, the remains of Turenne were preserved at the museum of natural history until 23rd September 1800, when they were removed by order of Bonaparte to the church of the Invalides at Paris, where they still rest. Turenne's fame rests on his military achievements ; as a man he was not more distinguished for his virtues than the duke of Marlborough, whom in many respects he resembled. He had indeed the calmness of all philosophic, cold-minded temperaments, but few other praiseworthy qualities. As a politician he holds no high place. (H. M. 8.) TURGAI, a Russian province in Central Asia, formerly a part of the Kirghiz steppe, and now embodied in the governor-generalship of the Steppes, is bounded by Uralsk and Orenburg on the W. and N., by Akmolinsk on the E., and by Syr-Daria and the Sea of Aral on the S. This extensive and irregularly-shaped territory, which has an area (176,800 square miles) as large as that of Caucasia and Transcaucasia taken together, belongs to the Aral- Caspian depression. It has, however, the Mugojar Hills on its western border and includes a part of the southern Urals ; and from Akmolinsk it is separated by a range of hills which runs between the two chief rivers of the Kirghiz steppe—the Turgai and the Sary-su. In the north it includes the low belt of undulating land which stretches from the Mugojar Hills towards the north-east and sepa- rates the rivers belonging to the Aral basin from those which flow towards the Arctic Ocean, and beyond this range it embraces the upper Tobot. The remainder is steppe land, sloping gently towards the Sea of Aral. The Mugojar Hills consist of an undulating plateau nearly 1000 feet in height, built up of Permian and Cretaceous deposits, and deeply grooved by rivers. They are not the independent chain which our maps make them out to be!: they merely continue the Urals towards the south, and are connected with the Ust Urt plateau by a range of hills which was formerly an island of

the Aral-Caspian Sea. Their northern extremity joins the undulating plateau (400 to 600 feet), built up of sandstones and marls, which separates the tributaries of the Tobot from those of the

Ural, and falls by a range of steep crags—probably an old

1 See P. S. Nazaroff, in “Recherches Zoologiques dans les Steppes des Kirghizes,” in Bull, Soc. des Natur. de Moscow, 1886, No. 4.

shore-line of the Aral basin—towards the steppes. The steppe-land of Turgai is only some 300 feet above the sea-level, and is dotted with lakes, of which the Tchotgar- denghiz, which receives the Turgai and its tributary the Irghiz, is the largest. The Turgai was, at a recent epoch, a large river flowing into the Sea of Aral and receiving an extensive system of tributaries, which are now lost in the sands before joining it. Remains of aquatic plants buried in the soil of the steppe, and shells of A/ytclus and Cardium, both still found in the Sea of Aral, show that during the Glacial period this region was covered by the waters of the Aral-Caspian Sea.

The climate of Turgai is exceedingly dry and continental. Orsk, a town of Orenburg, on its north-western border, has a January as cold as that of the west coast of Nova Zembla (— 4° Fahr.), while in July it is as hot as July in Morocco (78°); the corresponding figures for Irghiz, in the centre of the province, are 7° and 77°. At Irghiz and Orsk the annual rainfall is somewhat undcr 10 and 12 inches respectively (3 inches in summer). Thc west winds are desiccated before they reach the Turgai steppes, and the north- east winds, which in winter bring cold, dry snows from Siberia, raise in suinmer formidable clouds of sand. A climate so dry is of course incompatible with a vigorous forest growth. There is some timber on the southern Urals, the Mugojar Hills, and the water- parting of the Tobot; elsewhere trees are rare, —only shrubs, such as the wild cherry (Cerasus Chamecerasus) and the dwarf almond (Amygdalus nana) growing on the hilly slopes, while the rich black- earth soil of the steppe is chiefly covered with feather grass (Stipa pennata), the well-known ornament of the south Russian steppes. In spring the grass vegetation is luxuriant, and geese and cranes are attracted in vast numbers by the fields of the Kirghiz from the depth of the steppe. The

jerboa (Dipus jaculus) and the mar- mot (Spermophilus rufescens) are characteristic of the fauna of the region ; another species of marmot (Arctomys bobac) and the Canis corsac are common ; and the saiga antelope of Central Asia is occa- sionally met with. Further south the black earth disappears and with it the feather grass, its place being taken by its congener, Stipa capillata. Trees disappear, and among the bushes along the banks of the rivers willows and the pseudo-acacia or Siberian pea tree (Caragana microphyla) are most prevalent. In the imiddle parts of the province the clayey soil is completely clothed with worm- wood (Artemisia fragrans and A. monogyna), with a few grassy plants on the banks of the rivers and lakes (Lasiagrostis splendens, Alhagi camelorum and A. kirghizorum, Obione portulacoides, Hali- modendrum argentewm); while large areas consist of shifting sands, salt clays clothed with a rich carpet of various Salsolacex, and dried beds of old Jakes. Such lakes as still exist, notwithstanding the rapid desiccation now going on, are surrounded by rush thickets, —the retreat of wild boars. Turgai is thus the borderland between the flora of Europe and that of Central Asia.

In 1882 the population of Turgai was estimated at 323,110, all nomad Kirghiz, with the exception of some 3600, who are settled in four villages officially described as towns. Agriculture is in its earliest stage of development ; but some 100,000 quarters of corn are raised in the south-west by the Kirghiz, who sell some of it in Orenburg. Cattle-breeding is the chief occupation, and within the province there are some 800,000 horses, 335,000 cattle, about 200,000 camels, and more than two million sheep. But the want of fodder in spring occasions violent murrains, which sometimes result in actual famine among the Kirghiz. Endeavours have recently been made to induce the people to make communal stores of hay, but the 300,000 cwts. yearly collected in this way are in- sufficient. The Kirghiz of the southern parts go in winter to the better sheltered parts of Syr-Daria, while in the summer some 30,000 kibitkas (felt tents) of nomads come from the neighbouring provinces to graze their cattle on the grassy steppes of Turgai. Some 80,000 cwts. of salt are annually got from the lakes. The four settlements of the province are Turgai, chief town and seat of the provincial administration, with less than 400 inhabitants, and the ‘‘district towns’’ of Irghiz (920), Ak-tube (400), and Kara- butak (300), the last two being more or less fortified. Several merchants in these carry on trade with the Kirghiz,

exchanging manufactured goods for wool and skins, which are sent to the fronticr settlements of Orcnburg. ‘Therc is a brisk caravan traffic through Turgai.

TURGOT. Anne Ropert Jacques Turcot, Marquis DE L’AULNE (1727-1781), French statesman and economist, was born at Paris, 10th May 1727. He was the third son of Michel Etienne Turgot and of Madeleine Francoise Martineau. His family, which was ancient and noble, is said to have been originally Scottish, but had long been settled in Normandy. His ancestors early abandoned the

sword for the robe. Both his father and grandfather had been in the civil service of the state: his father was ‘“‘prévot des marchands” at Paris, and won a high reputa- tion as a magistrate and administrator. Turgot in his childhood was timid, and showed in company an absent and embarrassed air, from which he never afterwards entirely freed himself, and which in later life was some- times unjustly attributed to hauteur. His mother, through excessive or injudicious efforts to correct these faults, ap- pears to have aggravated them. He obtained his early education at the Collége Louis-le-Grand, and was after- wards a student of the Collége du Plessis. He then entered the seminary of St Sulpice, and thence passed to the Sor- bonne with the view of taking his licence in theology. But he decided finally in 1751 not to follow the ecclesi- astical profession. His opinions were inconsistent with that calling, and he said “he could not consent to wear a mask all his life.” He showed at this time an enthusiastic love of literature and powers of memory which are de- scribed as ‘‘ prodigious,” as well as a penetrating intellect and a sound judgment. We have the testimony of the Abbé Morellet, who was then his intimate acquaintance and constant companion, to the singular purity, the simplicity, modesty, and frank gaiety which characterized him.

As prior of the Sorbonne (an honorary office conferred annually on some distinguished student) he wrote and delivered publicly in 1750 two remarkable pieces,—one On the Benefits which the Christian Religion has conferred on Mankind, the other On the Historical Progress of the Human Mind. Having chosen the law as his profession, he was appointed in 1752

“conseiller substitut du pro- cureur général,” and afterwards “‘conseiller au parlement.” The controversy arising from the refusal of the sacraments to the Jansenists by the archbishop of Paris being then agitated between the parlement and the clergy, Turgot wrote (1753) Letters to a Vicar-General on Toleration and a pamphlet entitled Le Conciliateur, in favour of religious liberty and against the interference of the temporal power in theological disputes. In 1753 he became ‘maitre des requétes.” He discharged his professional duties with scrupulous purity and conscientious industry. He con- tinued at the same time his studies in ancient and modern literature (including English and German), mathematics, astronomy, chemistry, and natural history, and frequented the salons of Madame de Graffigny (authoress of Les Lettres Pérumennes), Madame Geoffrin, and Madame du Deffand. Whilst he enjoyed the acquaintance and society of D’Alem- bert, Baron d’Holbach, Raynal, Marmontel, Morellet, Galiani, Helvétius, and other notabilities of the time, he maintained his intellectual independence and refused to connect himself with any party or political group. About this time he also entered into relations with Quesnay and Gournay—the principal members of the physiocrats. He was attracted to them by the similarity of their sentiments on social questions and their opinions on economic policy to those which he himself entertained. Turgot accompanied Gournay in 1755 and 1756 in his official tours of inspec- tion as intendant of commerce, and on Gournay’s death in 1759 he wrote his Hloge. He then made a short visit to eastern France and a part of Switzerland. When he arrived at Geneva he went to see Voltaire at Les Délices, and formed with him what proved to be a lasting friendship. He contributed about this period several articles to the Encyclopédie. In 1761 the controller-general Bertin ap- pointed him intendant of the généralité of Limoges. In that district thé mass of the people were sunk in poverty and barbarism ; the corvées for the construction of roads and the transport of military equipages were oppressive ; the country was depopulated by the requisitions for the militia ; the taxation was excessive and unfairly distri-

buted ; the state of the roads was wretched; and the general condition of agriculture was deplorable. Turgot’s administration of the district lasted for thirteen years, and was marked by a steady pursuit of the public good, and a

firm resistance to inertia, prejudice, and corruption. In particular he strongly maintained the cause of the in- dustrious poor, and insisted on a more equitable assess- ment of the public charges which pressed unduly upon them. With nobly disinterested spirit he refused to be transferred to other généralités in which the salary was higher and the administration easier. Rising above the common prejudices of the philosophes, he sought the co-operation of the clergy, both to inform him of everything relating to the circumstances of the people which it was desirable for him to know, and to explain to their flocks the nature and objects of the measures he proposed to put in operation ; and he acknowledges that he found in them earnest and active auxiliaries. But he was not seconded as he ought to have been by the central Government, and had often to remonstrate with the Abbé Terray, minister of finance. During the scarcity of 1770 and 1771, which was particularly severe in Limousin, he devoted himself with untiring assiduity to the relief of the distressed, and, when he had exhausted such public funds as were avail- able, incurred for the same object a personal debt of more than 20,000 livres. Shortly after the accession of Louis XVI. Turgot was appointed by Maurepas (19th July 1774) minister of marine, and in that capacity began at once to initiate important reforms and to conceive far-reaching projects. But he filled the post only for five weeks, being then (21st August) promoted to the ministry of finance. In his new office he addressed to the young king a declara- tion of the principles by which he intended to be guided : “No bankruptcy, no increase of taxation, and no borrow- ing.” Economy and wise management were to be his only resources, Fearing the opposition he must encounter, he appealed to Louis to support him. By a decree of the 13th September 1774, he re-established free trade in grain within the kingdom, which had been suspended by Terray, and authorized the importation of supplies from abroad ; the traffic in other alimentary substances was also relieved of many impediments, and various monopolies and exclu- sive privileges were abolished; the octvoi taxation was reformed, public works promoted, and improvements in agriculture encouraged. Some of these measures were made the pretext for disturbances, known as la guerre des farines, which Turgot always suspected the Prince de Conti of having fomented. The riots had to be suppressed by armed force, and the energetic action of the minister against them was made a ground of attack by his enemies. The parlement had been weakly recalled by Louis from the exile to which in the preceding reign

Maupeou had condemned it. It now constituted itself the organ of the resistance of menaced interests to the measures of Turgot, who would gladly have abolished it, providing in its place better political securities and courts of justice on a new plan. In January 1776 he presented to the king a memoir proposing, amongst other things, the abolition of the corvée, to be replaced by a territorial tax, from which the privileged classes were not to be exempt, and the suppression of the jurandes (exclusive trade corporations). The edicts for these purposes were submitted to Miromesnil, keeper of the seals, a secret enemy of Turgot, who, spurred on by Maurepas, wrote a memoir against them, and opposed them in the king's council. The courtiers, the nobility, the clergy, and the leading members of the industrial corpora- tions now combined against the minister, and were joined by a large part of the common people, who did not under- stand his policy. The Count de Provence, afterwards Louis XVIIL., wrote a pamphlet, entitled Zhe Dream of M. de

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aurepas, against Turgot. The parlement refused to register the decrees; but the king held a lit de justice, which Voltaire proposed to call a lit de bienfaisance, and compelled the registration, This forced submission only aggravated the rancour of Turgot's enemies, and the king had not the firmness to sustain his minister against the coalition. A vile conspiracy having poisoned Louis's mind against him, he addressed to the king an eloquent letter in which he pointed out the grave perils impending over the throne and the state, and warned Louis that princes who are tempted to give themselves up to the direction of courtiers should remember the fate of Charles I. The minister received his dismissal on the 12th of May 1776. He had been in office only twenty months, of which he had lost six in repressing sedition, and for seven more had been con- fined to his bed by the gout; but he had done during his tenure an extraordinary amount of work. Voltaire, how- ever, nobly avenged Turgot on his enemies in his Epttre aun Homme, The fallen minister devoted his remaining years to his favourite studies, especially to physical science and the ancient poets ; he enjoyed the society of Lavoisier, D'Alembert, Condorcet, Bossut, Rochon, and Rouelle, and attended the meetings of the Academy of Inscriptions, of which he was elected vice-director in 1777. He also cor- responded with

Price and Franklin, and, if we may believe Condorcet, with Adam Smith, whose acquaintance he had made at Paris in 1766.1! Turgot died at Paris on 18th March 1781.

Turgot's official career is for ever memorable in the history of social politics. Never did a public man give himself to the service of the community with more earnest and unselfish devotion. He made it his object to convince before commanding, in order that his aims might be better understood and his directions more surely obeyed ; wd, in issuing any instruction, making any decision, or advising any legislative act, he stated fully, by way of preamble, the grounds on which he proceeded. In the documents which he prepared on these occasions we have a body of valuable materials on administrative and economic questions ; some of them contain the substance of chapters in the Wealth of Nations. When he became minister, the finances were in what seemed a desperate condition, and the general state of affairs justified the prediction of Louis XV.—''aprés moi le déluge." Turgot framed a vast plan of reform, at once administrative and economic, as the only hope for the salvation of the state. He speaks of his system of measures as intended for '' the regulation of the kingdom," thus showing that he contemplated nothing less than a pacific revolution. But the first condition of success in such an effort was wanting, namely, the entire confidence and unfaltering support of the king, and the energetic exercise of the royal power in carrying out a policy of thorough reform against all adverse influences.* Turgot's struggle, though it failed from causes independent of himself, cannot be re- garded without profound synipathy and admiration. Nor was it without a large measure of inimediate success. Whilst he scrupu- lously observed all the pecuniary obligations of the state, he greatly diminished the crushing deficit which he found on his accession to office, and re-established the public credit in such a degree that the Dutch bankers offered him a loan of sixty millions of livres at less than 5 per cent. His financial and other plans, of course, fell with him, and his most important measures were annulled; but his policy and his writings exercised a lasting influence, and many of his projects were realized by the Revolution. Turgot is alto- gether one of the most massive and imposing figures of the 18th century. His whole character and public action are marked by an air of austere grandeur. Single-mindedness and veracity were of the very essence of his nature. Absolutely unbiased by selfish ends, he

lived only for France, for truth, and for his duty. Be- lieving intensely in a definite system of social and economic princi- ples, which he had early formed by independent study and reflexion, he was prepared to carry them out with dauntless determination,

1 Dugald Stewart, however, eannot find any evidenee of a ecorre- spondenee between Turgot and Smith. It has also been said that during this period Turgot corresponded with Hume. But little more than three months intervened between his dismissal and the death of Hume (25th August 1776) and there appears to be no trace of letters having passed between them in this interval. They had corresponded, but at a much earlier date; see Burton's Life of Hume, ii. 352, 381.

2 Some have thought that the cardinal error in Turgot's policy lay in his not having convoked the states-general ; that would, however, have been simply to open the flood-gates.

and with a lofty contempt for the interested or prejudiced opposi- tion they were sure to encounter. He has been accused of a doc- trinaire rigidity, and it is possible that, as a practical man, he wanted flexibility ; yet he was often willing, not indeed to disguise his convictions, but to postpone the realization of his plans. In his public acts he always showed a lively concern for the poor and the suffering ; in private life he was humane and benevolent; in his relations with his friends, amiable and affectionate. Malesherbes, the only other minister of his time who was worthy to be his col- league, said of him that ''he had the head of Bacon and the heart of L'H6pital," and, on the moral side at least, this was no exagger- ated estimate.

Possessed of a many-sided culture, Turgot wrote on a great variety of subjects—philosophic, scientific, and literary—though political economy is the branch of knowledge with which his name must always be most closely associated. Already in 1749, whilst a student at St Sulpice, he addressed to his friend, Abbé de Cicé, afterwards bishop of Auxerre, a Letter on Paper Money, in which he asserted, in opposition to the views of Law and his followers, doctrines similar to those now accepted by all competent

authorities. In one of his discourses at the Sorbonne in 1750, moving into the higher regions of the philosophy of society, he makes a remarkable attempt to work out the pregnant conception, already enunciated by Pascal, of the continuity of the intellectual movement of our race, thus preparing the way for Condorcet's Esquisse, and ulti- mately for the sociology of Comte. In 1753 he translated under the title of Questions Importantes sur le Commeree, a tract of Dr Josiah Tucker on the expediency of naturalizing foreigners. He contributed to the Eneyelopédie the articles Etymologie, Existence, Expansivbilité, Fondations, and Foires et Marehés. The first of these contains much that is just as well as interesting, though in the time of Turgot the subject could not yet be treated on genuinely scientific bases. In the second he undertakes a refutation of the Berkeleian theory. The third contains some ingenious suggestions in practical physics. The article on foundations maintains the right of the Government to dispose of them for the public good, suppressing them if hurtful, and directing the funds to more useful objects; the policy advocated in it was afterwards carried into effect by the constituent assembly. In the paper on fairs and markets he argues that these are institutions adapted only for an immature state of commercial relations, and that more good would be done by liberating trade from the legislative fetters which every- where impeded it than by bestowing special privileges or other encouragements on particular localities as centres of exchange. Iu the Eloge of Gournay he combines with his tribute to the memory of his friend a vindication of the principle of industrial freedom, which that friend had condensed in the oft-repeated maxim, "Vaissez faire, laissez passer." To the period of Turgot's intend- ance belong his unfinished Valeurs et Monnaies, intended to form an article in the Dietionnaire de Commeree of Morellet ; his Letters (to the Abbé Terray) on the Freedom of the Oorn-Trade ; his memoir Sur les Préts @ Argent, in which he insists on the necessity of leaving free the interest on loans; and that on the principles which should direct legislation respecting mines and quarries, as well as the work on which his reputation as a systematic economist mainly rests, namely, his Réflexions sur la Formation et la Distribution des Riehesses, This treatise was written for two Chinese youths who had been sent over by the Jesuit missionaries to study in France. The work was first published in 1766 in the Ephémérides du Citoyen, edited by Dupont de Nemours, and speedily passed through four editions. It gives in brief compass a luminous statement of some of the most

important principles relating to the economic con- stitution of societies—the division of labour, the origin and use of money, the nature of capital and the different modes of its employ- ment, the necessary rise of capitalist chiefs of industry, the legiti- macy of interest on loans, and the impossibility of arbitrarily fixing the rate of that interest. It unfortunately contains, along with many truths, the erroneous doctrines of the physiocrats on the exclusive productiveness of agriculture and on the consequent pro- priety of imposing taxes only on the land of a country. This book was erroneously represented by Condorcet as ‘‘the germ of the Wealth of Nations,” and has been spoken of by others as “anticipating some of the leading principles” of Smith. The truth is, most of what it contains had either been fully set forth by the earlier economists or was familiar to Quesnay and his group. It is, in fact, not a work of research but of exposition, and, regarded in this light, has real originality and may justly be pronounced a masterpiece.

Fuller information on the life, administrative labours, and writings of Turgot will be found in the following works :—Dupont de Nemours, Notes et Mémoires sur la Vie, ? Administration, et les Ouvrages de Turgot, 1782, and enlarged in his edition of Turgot’s works mentioned below; Condorcet,,Vie de Turgot, 1786; A. Batbie, Turgot, Philosophe, Economiste, Administrateur, 1861; J. Tissot, Turgot, sa Vie, son Administration, ses Ouvrages (a mémoire couronné), 1862; A. Neymarck, Turgot et ses Doctrines, 1885. The last-named contains the most complete treat- ment of the subject. See also an Floge by Dupuy (1781) in the Mémoires de Académie des Inscriptions et Belles-Lettres, vol. xlv.; L. de Lavergne, Les Economistes Francais au Dix-Huitiome Sidcle, 1870, and Mr. John Morley’s article in his Critical Miscellanies, 2d scries, 1877. A collected edition of Turgot’s

writings was published for the first time by Dupont in 9 vols. (Paris 1808-11); the most complete and in every respect best edition is that contained in the Collection des Principaux Economistes of Coquelin and Guillaumin, 2 vols., 1844, with a biographical notice by pegens Daire. An English translation of The Formation and Distribution of Wealth was published in London in 1793, and was reprinted in 1859 in Lord Overstone’s Select

Collection of Scarce and Valuable Economical Tracts, edited by J. R. M‘Culloch. @. K. 1.)

TURIN, a city of northern Italy, formerly the capital of Piedmont and the Sardinian states and now the chief town of a province in the compartimento of Piedmont, 1s situated in 45° 4′ 8” N. lat. and 7° 48’ 22” E. long. in the alluvial valley of the Po, just above the confluence of the Dora Riparia. By rail it is 54 miles from the Mount Cenis tunnel. The communal ‘palace stands 788 feet above the sea, The Monte dei Cappuccini in the neighbourhood reaches 922 and La Superga 2405 feet. As viewed from the east the city stands out boldly against the Alps. Taken as a whole Turin may be described as a very modern city, with broad and regular streets, and large squares and public gardens. ‘The cathedral of St John the Baptist is a cruci- form Renaissance building dating from the close of the 15th century. The site was first occupied by a church erected, it is said, by the Lombard duke Agilulf (7th century). Be- hind the high altar of the cathedral (from which it is separated by a glass screen) is the chapel of the Sudario or Sidone, built (1657-1694) by Guarini as a royal burial- place. The “sudario” from which it takes its name is asserted to be ‘the shroud in which Joseph of Arimathea wrapped the body of Jesus. La Beata Vergine della Con- solata, another of Guarini’s works, has a tower which originally belonged to the church of St Andrew, founded by the monk Bruning in 1014, and attracts attention by Vin-

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1. Madama palace. 5. Carignano palace. 2. Royal palace. 6. Di Citta palace.

3. Cathedral. 7. Academy of science. 4. University.

8. Academy of art. 9. Museum. 10. Arsenal,

cenzo Vela's beautiful kneeling statues of Queen Maria Teresa and Queen Maria Adelaide, as well as by the image of the Madonna, which has the credit of having warded off the cholera in 1835. Other churches of some note are San Felippo Neri (1672-1772), the dome of which fell in just as it was approaching completion under the hands of Guarini, and La Gran Madre de Dio, erected to commemor- ate the return of the royal family in 1814. Of the secular buildings the more interesting are the Madama palace, first erected by William of Montferrat in the close of the 13th century, and the extensive royal palace begun in the 17th century. The university, founded in 1400 by Lodovico di Acaja, has faculties of jurisprudence, medicine and surgery, literature and philosophy, and the mathematical, physical,

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and natural sciences. The number of students enrolled was 2132 in 1886. About 1876 the old university build- ings erected in 1713 by the Genoese architect Ricca began to prove too small for their purpose; and at the present time (1887) new buildings, fitted more especially for the medical and scientific departments, are being erected. The area of the botanical gardens has also been extended and the observatory enlarged. The medical school derives advantage from the number of important hospitals in the city. The royal lunatic asylum can accommodate 980 patients. Turin has a prison on the cell system (672 cells) and a female penitentiary for 300, besides two houses of correction. The academy of sciences was founded in 1757. It

occupies a building erected in 1687 by Guarini as a Jesuit college. The museum of antiquities and the picture gallery, of which it has the custody, are both of high in- terest—the former for the local antiquities of Piedmont and Sardinia (notably from Industria) and for the Egyp- tian treasures collected by Donati and Drovetti, and the latter for its Van Dycks. There is a museum of zoology and mineralogy in the royal palace (another of Guarini's buildings), and the Castello palace contains the royal armoury (a collection made by Charles Albert in 1833) and the royal library with its rich manuscript collection and its 20,000 drawings, among which are sketches by Raphael, Michelangelo, and Da Vinci. The civic museum has a great variety of artistic and literary curiosities, among them a remarkable collection of autographs and the Lom- bard missal (1490). The Jewish synagogue, a striking and conspicuous building, erected in 1863 by Alessandro Anto- nelli, was purchased by the municipality in 1879 for a Renaissance museum. Other public institutions are the Albertine academy of the fine arts, the geographical society, and the Alpine club,

The industries of Turin and its suburbs give employment to 17,936 persons (13,305 men, 4631 women). Spinning-mills, weav- ing-factories, ‘‘ vesta” factories (De Medici), breweries, and iron- works are among the more extensive establishments. The com- mercial relations of the city are very extensive. It is the seat of the central offices of the North Italian Railway ; and the central station is one of the most imposing buildings of its class in the country. The mean annual temperature at Turin (1866-84) is 53° Fahr, (Jan. 36°, July 74°), with a maximum of 96° and a minimum of 4°“1. Mists are frequent in the winter mornings, and to a less degree in autumn. Snow seldom falls in any great quantity, and on an average only on 7 days per annum. The rainfall, distributed over 100 days, reaches 32 inches—December being 1°6 and April 4°3. Water of good quality is brought to the city from a distance of 15 miles. The population of Turin was only about 4200 in 1377 and 9000 in 1580; but by 1702 it was returned as 48,866. In 1848 it had risen to 136,849, and in 1861 to 204,715. In spite of the changes caused by the removal of the capital, first to Florence and then to Rome, the census of 1881 showed 283,124 inhabitants (commune 252, 832).

Turin, Augusta Taurinorum, took its name from the Taurini or Taurisci, an ancient Ligurian people. The town is first alluded to (but not distinctly by

name) in the year 218 B.c., when it was cap- tured by Hannibal after a three days' siege, being at that time a

lace of great strength. A colony of Roman veterans was intro- 'tba into the city, possibly after the battle of Philippi, or at any rate after the battle of Actium. It was assigned to the Stcllatine tribe. Of Roman architecture scarcely any trace remains even in the oldest parts of Turin, but the arrangement of the streets of the old town recalls the alignments of the Roman military settlement. The Palazzo delle due Torri, often designated the Porta Palatina, is probably part of a building of the 8th century. Turin continued

'to be a place of importance and military strength under numcrous

vicissitudes, till at length it was made the chief town of Piedmont by Amadeus, first duke of Savoy. Under Emmanuel Philibert it became the usual residence of the ducal family, and in 1515 the bishopric was raised to metropolitan rank by Leo X. Between 1536 aud 1562 Turin was occupied by the French, and in 1630 it lost 8000 of its citizens by the plague. The French were masters once more from 1640 to 1706, and again from 1798 till 1814, when the Sardinian states were restored to the house of Savoy. Between 1859 and 1865 Turin was the capital of united Italy. Among the many men of mark born in Turin it is cnough to mention Lagrange, Gioberti, Cesare Balbo, Cavour, Marochetti the sculptor, D' Azeglio, and Sommellier.

Meaning of term Central Asia.

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TURKRESTAN

HE terms "Turkestan" and "Central Asia" are often used indiscriminately to describe the whole of the immense territory to the east of the Caspian, comprised between Siberia on the north and Khorasan (Persia), Afghanistan, and Tibet on the south, or to designate separate, sometimes arbitrarily determined, parts of the same region. In the beginning of the 19th century the whole of the territory just named, with its great variety of

altitudes, climate, inhabitants—these last differing as much in their history as in their present characteristics— was comprised under the vague denomination of High Tartary, or High or Interior Asia. After the appearance of Humboldt's first draft of Asie Centrale in 1831, the term "Central Asia" came into favour. But Humboldt's limits of Central Asia were too mathematical (from 39}° to 494° N. lat.), and were further unsatisfactory because influenced by his erroneous conception of the mountains of Central Asia, which he' supposed to run either along parallels or along meridians. Richthofen made an attempt to limit the sense of the term, proposing to apply it only to that region—embracing the Tarim drainage area and the Gobi —which has no outlet either towards the ocean or to the Sea of Aral and Lake Balkash (Balkhash), and which constitutes the Hang-hai of the Chinese and the supposed bed of the Tertiary Asiatic Mediterranean. But this ter- minology, besides the drawback of including within Central Asia the steppes of the Gobi as far east as Transbaikalia

and the Great Khingan, notwithstanding the broad differ-

ences by which they are distinguished from the drainage area of the Tarim, was open to another objection, which has been pointed out in M. Mushketoff's Z'urkestan. It excluded from Central Asia Turkestan proper, which never- theless has had the same recent geological history as the Tarim region, and therefore has so many features in com- mon with it as regards soil, climate, flora, fauna, popula- tion, and even civil history. On the other hand, if Central or Interior Asia were to include West Turkestan, and its limits to be determined by those of the drainage-areas which have no outlet to the ocean, the basins of the Volga and Ural,—that is, territories purely European in charac- ter,—would have to be comprised under the same denomi- nation. The fact is that in Asia, as so often elsewhere, hydrographical considerations alone furnish no sound basis for geographical delimitations,. and that these last must result from a complicated variety of considerations, chiefly orographical, inasmuch as orographical are indicative of other physical characters, such as geology, climate, flora, fauna, and soon. Such were the views of Ritter and Hum- boldt, and we are now brought back to their conceptions, but corrected into accordance with improved knowledge of the Asiatic continent. The name Central Asia can still be used with great advantage to designate that

immense por- tion of the continent to the east of the Caspian and the Ust-Urt plateau which is limited on the north by the im- portant climatic and geo-botanic boundary of the Irtish and Aral water-parting and the Great or Ektagh Altai, on the east by the eastern Gobi, and on the south by the northern border of the Khor plateau (Attyn-Tagh and Kuen-Lun), the Hindu-Kush, and the Kopet-Dagh. Ex- tensive as it is, this territory has its own climatic and geo- botanic features ; it forms a distinct part of the continent, when the orography of Asia is broadly viewed; and its inhabitants have a number of common characteristics re- sulting directly from the physical features of the territory. But this immense area must be subdivided ; and its sub- divisions become apparent as soon as the orographical features are grasped.

Two great plateaus constitute the two backbones, as it were, of the orographical structure of Asia,—that of east- ern Asia, an immense triangle stretching north-eastwards, having the Himalayas for its base and the peninsula of the Tchuktchis for its apex; and that of western Asia, which extends at right angles to the above, from the lower Indus to the Black Sea. The Hindu-Kush connects these two massive swellings, both continents of the oldest forma- tion in Asia. Both are fringed on their northern edges by lofty chains of mountains. The Tian-Shan, the Altai, the Sayan, and the Vitim Mountains rise in a long succes- sion on the borders of the former, while a series of chains, which might be described under the general name of Kopet-Dagh, continued into the Transcaucasian chains, rise on the north-eastern edge of the western plateau.

An inimmense trapezoidal depression occupies the angle on the west where the great plateaus meet, and this de- pression is West Turkestan. Its south-eastern limits are the Hindu-Kush and the Tian-Shan ; on its south-western edge it has the Iranian plateau; and its north-west and north-east boundaries correspond with the edge of the Ust- Urt and the Irtish and Aral water-parting, which separates it from Siberia. The trapezium is 1100 miles long from south-west to north-east, and 900 miles wide from south- east to north-west. It thus includes, not only the depres- sion at the junction of the two plateaus, but also the girdle of alpine tracts which fringes them, and in whose deep and sheltered valleys the Turkish and partly Iranian popu- lation of Turkestan find a fertile soil and plenty of water for their fields,

while their herds graze on the rich alpine meadows in the very heart of the Tian-Shan. Not oro- graphically only but also in respect of its recent geological past, its climate, flora, fauna, and inhabitants, this region forms a geographical domain by itself, quite distinct from the steppes of south-eastern Russia, the prairies of Siberia, and the two great plateaus by which it is inclosed ; and, although it is easily subdivided into two parts—the dry lowlands of the Transcaspian depression and the plains and highlands of Turkestan proper—it presents one geo- graphical whole when contrasted with the surrounding regions. Some doubt may arise as to the propriety of including in it the plateau of Pamir; but its flora and fauna are so closely connected with those of the Tian-Shan that, although better treated as a separate sub-region, like the Transcaspian Turcoman steppes, it cannot be separated from the above. For the orographer, the “Roof of the World” is merely a succession of the wide syrts or alpine plateaus that are characteristic of the Tian-Shan. Most of this territory has within recent years been annexed to the Russian empire. Bokhara, with its vassal khanates in the gorges of the Pamir slopes, and Khiva, although they are still described as independent, are in reality rapidly becoming dependencies of Russia, and the railway from the Caspian, which is about to connect Merv with Samar- kand, will complete the annexation of Bokhara. West Turkestan, therefore, is often called Russian Turkestan, as distinguished from Chinese or East Turkestan.

Great Asiatic

plateaus.

West Turk- estan.

This second great region of Central Asia also has well- East

defined limits. there is in the great eastern plateau a depression bordered by the deep slopes of the Pamir (Humboldt’s Bolor) on the W., the border-ridges of Tibet (Kuen-Lun and Attyn- Tagh) on the §., the eastern Tian-Shan on the N., and the western Gobi on the E.!_ Although we call it a depression,

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1 Tn the map (issued October 1887) embodying the results of Prje- valsky's fourth journey, East Turkestan is plainly demarcated from the Gobi. This last falls by a steep slope towards the Tarim depression,

A glance at any recent map shows that Turk-] estan.

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because it is much lower than the surrounding plateaus, it is itself a plateau, ranging from 3000 to 4000 feet above sea-level, This depression-—the Hang-hai of the Chinese, which, during the later Tertiary and earlier Quaternary period, was covered by a sea, of which a very small sur- vival still exists in Lob-Nor—is now drained by the Tarim. Its deserts, in which human settlements are now very rare, though formerly the population was much denser, have been described under a variety of names (Little Bokhara, Alty-shar or Jity-shar, Kashgaria, and so on); but the name of East Turkestan has prevailed, and there is no reason for abandoning it, provided it is not confounded with Dzun- GaRIA (q.v.) in the north and the great Desert of Gobi in the east. Dzungaria is a deep trench leading from the lowlands to the central plateau, and has special physical

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its vassal khanates, and parts of Afghan Turkestan. (B) East Turkestan, comprising the Tarim region as far east as Lob-Nor. (C) Dzungaria, limited on the north-east by the Tarbagatai, Altai-Nauru, Irdyn-ula, and Artsa-bogdo Mountains.

West TURKESTAN.

As comprised within the above limits, West Turkestan has an area of nearly 1,680,000 square miles, and a population of nearly 8,500,000.? It presents a very great variety of aspects, including the lonely plateau of Pamir,

which narrows to the east of Lob-Nor and terminates about Aii-si, some 4800 feet above sea-level.

- See also the following maps :—Htmanaya, vol. xi. Pl, XVI. ; SIBERIA, vol. xxii. Pl. I.; and Trser, Pl. IV. above.

2 Separate portions of it are described under AFGHANISTAN, BoK-HARA, Kuiva, Oxus, Syr-Daria, SEMIPALATINSK, SEMIRYETCHENSK, TRANSCASPIAN REGION, ZERAFSHAN.

TUREKESTAN

Map of East and West Turkestan?

[WEST.

features and a history of its own. The Mongolian Gobi, on the other hand, owing to its position on the lower terrace of the plateau of eastern Asia, must be regarded as a separate unity. In fact, it appears to be more closely connected with the plateau of the Selenga on the north and that of Ordos on the south than with East Turkestan; and it, too, has its own physical features, its own inhabit- ants, and its own history.

The expression Central Asia thus includes the following countries. (A) West Turkestan, comprising the Tian-Shan highlands, the Balkash plains, and the Aral-Caspian low- lands, politically divided into Russian Turkestan (the general-governorship of Turkestan and the Aral-Caspian slope of Turgai and Akmolinsk), the Chinese oasis of Kulja (Kuldja), the Transcaspian region, Khiva, Bokhara and

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in height second only to that of Tibet; the immense com- plex of alpine tracts described under the general name of Tian-Shan (three times as long as the Alps of Europe), which lift their snow-clad peaks four and nearly five miles above the sea, and feed huge glaciers, while their deep valleys and gorges partake of almost every variety of climate and vegetation ; rich prairies and still wider lowlands descend- ing below the level of the ocean;

and deserts where the winds, burning hot or icy, but always dry, have free scope to modify the surface, which is bare of vegetation.

Nevertheless West Turkestan is sharply divided into two Highland parts,—the highlands in the south-east and the plains and region.

deserts in the north-west. The former cover an area nearly 1000 miles long by 270 broad, of which the northern parts are described under the general name of Tian-Shan (pro- perly, T'han-Shaii). Their distinctive feature is that, like the highlands of Siberia, they constitute a high border-

Pamir plateau.

WEST. |

ridge, running W.S.W. to E.N.E. on the edge of the great plateau of eastern Asia. This plateau is fringed on its outer side by a complex of shorter ranges, which mostly run parallel to the border-ridges and send off a series of isolated chains, due to a later system of upheaval, through the plains and steppes in a north-western direction. Down to the middle of the 19th century these highlands were almost absolutely unknown, and the orography of Central Asia as shown on our maps was quite hypothetical. Numer- ous surveys by Russian and British explorers have, how- ever, recently disclosed the real structure of those regions ; and it has now become possible to discriminate the leading features of the orographical conformation of the country. The Hindu-Kush, with its snow-clad summits of 18,000 and 20,000 feet, limits the highlands of Turkestan to the south-east. It appears now to be settled that this ridge runs from north-east to south-west, as far at least as the latitude of Cabul, and possibly still farther south; and the last Russian surveys of the Pamir show that it extends north-east as far as Tash-Kurgan (37° 45' N. lat., 75° E. long.). At the foot of its north-western slope it has the plateau of Pamir—the 'Roof of the World,"—with an area of about 37,000 square miles. A series of chains, gently sloping and dome-shaped, rising 4000 or 5000 feet above the level of the plateau, traverse it from south-west to north-east, with a remarkable parallelism, dividing it into a series of broad parallel flat-bottomed grooves or valleys,

Lake Balkash and the Sea of Aral. Thus the border-ridge

of the Central Asian plateau would have a length of more

than 1000 miles from the Amu to Kulja, and the valleys of the upper Naryn and Tekkes would therefore be homologous with that of the Atai.

A girdle of alpine tracts, from 150 to 180 miles in Alpine width, which fringes the outer edge of the Pamir plateau, tracts.

consists of shorter chains running parallel to the border ridge and ranging from 11,000 to 17,000 and 20,000 feet in altitude. They are separated by deep valleys, mostly with three separate foldings of Azoic rocks. Some of these ranges are covered with perennial snow and feed great glaciers, among which Schurovsky and Fedtchenko glaciers around the lofty Kok-su group are especially worthy of mention. These subsidiary chains all belong to the oldest system of upheavals, which have had a north-east direction, and which at four different places are modified by more modern ones having a north-western direction. In lat. 47° N. the orographical structure becomes more complicated, the alpine region being pierced by the broad Dzungarian trench, which leads from the lowlands of the Irtish to the heights of the Central Asian plateau. A high ridge—the Tarbagatai—continued in the Tchinghiz (Jinghiz) and Karkaralinsk Mountains, branches off north-westwards, separating Turkestan from Siberia. Further east the Tian- Shan is continued on our maps in an eastern direction ; but our knowledge of it still remains very imperfect.?

which do not sink below 10,000, and sometimes 14,000, feet above sea-level. Thus the features of the lower plateaus of north-eastern Asia reappear here on a greater scale, hav- ing the same characters and the same direction in the

A series of deep depressions,—Balkh, Ferghana, Issyk- Lacus- kul, and Kulja,—sinking to low levels amidst the Tian-Shan ene f highlands follow

one another ina north-east direction. That jp. °

of Issyk-kul is occupied by the lake of the same name ghan.

plaitings of the earth’s crust.

Nearly 150 miles to the north-west of the Hindu-Kush lies the north-western border of the Pamir, fringed by the lofty Trans-Atai Mountains. Their crest, covered with snow, rises nearly 4 miles above the sea (Kaufmann Peak 23,000 feet); but the traveller approaching them from the south would hardly guess their height, because their southern slope towards the wildernesses of the plateau, themselves 13,000 feet high, is very gentle. The great elevation of the border-chain is only realized when it is seen from the Atai valley on the north, where its steep and deeply furrowed sides tower up like a dark wall, from 11,000 to 14,000 feet high, above the high and broad valley of the Kizil-su. The geological structure of the Atai valley must not be inferred from its orographical features, otherwise we should describe it as longitudinal. It is watered by the Kizil-su, which flows towards the west- south-west and joins the Amu-Daria under the name of Vaksh (or Wakhsh). On the north it has the lofty Atai- Tagh range, also partially snow-clad. On our best maps the Trans-Atai Mountains are figured as an isolated range, some 120 miles in length; and it cannot yet be affirmed with certainty which chains of the Tian-Shan, possessing the same border-ridge characters, ought to be considered as its continuations. Further research is needed to determine whether it is continued south-west by the Darvaz, or Lahor, Mountains, where the group of lofty Sel-tau peaks feed the extensive Fedtchenko glacier, or by the Hoja-Mahomet chain on the left bank of the Amu-Daria.1_ Thus the real north-western limits of the Pamir are still unsettled. As for the north-eastern continuations of the Trans-Atai, the present writer is inclined to trace them, not in the Kokshat-tau, but in the Terskei Ala-tau and the high mountains of Sary-yassy, where the Khan-Tengri lifts its snow-clad granitic cap 24,000 feet above the sea, and is surrounded by numerous vast glaciers (Semenoff’s and Mushketoff’s Muz-art), It would thus separate, broadly speaking, the drainage area of the Tarim from those of T See G. Grum-Grzimailo, in Zzvestia of Russ. Geog. Soc., vol. xxii.,1886.

(5000 feet above the sea), while the second and fourth, now desiccated, are lacustrine basins. A great number of smaller lacustrine basins, mostly filled with Tertiary con- glomerates, occur higher up in the mountains. For the orographer and the geologist they are homologous with those of the Altai and east Siberia (Bukhtarma, Us, Irkut, Bar- guzin, and others). The rivers that issued from the high alps had to pierce many parallel ridges in order to reach the plains, and they frequently expanded into wide lakes before cleaving through the chains of mountains the narrow and deep transverse gorges by which they descended to the lower terraces.

Like the highlands of Siberia, those of Turkestan are Lowland fringed by a girdle of plains, having an altitude of froni plains.

1000 to 1500 feet, and these again are skirted by an im- mense lowland area reaching only 400, 300, and 150 feet, or even sinking below the level of the ocean. These plains and lowlands cover nearly 650,000 square miles. Some geographers divide them into two portions,—the higher plains of the Balkash (the Ala-kul and Balkash drainage areas) and the Aral-Caspian depression, which occupies nearly two-thirds of the whole and has been ably described by M. Mushketoff under the appropriate name of Turanian basin,—the Kara-tau Mountains being considered as the dividing line between the two. The Balkash plains, more than 1000 feet above the sea, and covered with clay, with a girdle of loess at their foot, are well watered by the Ili and other feeders of Lake Balkash (see SEMIRYETCHENSK) and on their rich prairies are the homes of numerous Kirghiz. In the south-west the clayey soil becomes saline. There is the Famine steppe (Bek-pak-data), while in the Ak-kum steppe, which surrounds Lake Kara-kul, large areas are covered with sands, partly shifting. A gulf of clayey plains penetrates up the Ili into the in-

- The present writer is inclined to consider the “ Eastern Tian-Shan ” of our maps, which runs east-south-east to Bagratch-kul, as a separate chain belonging to the more modern system of north-western upheavals, meeting at its eastern extremity a chain which trends towards the

north-east. Sill, — 86

terior of the mountains, and its thick layers of loess form the Kulja oasis. Another gulf, penetrating much more deeply into the highlands up the trench occupied by Lakes Ebi-Nor and Ayar, and joining the trench of the upper Irtish, leads by an imperceptible gradient up to the plateau of Central Asia. It is known as the " Dzungarian Gate," and a gate it has been since the dawn of history for whole nations of nomads who have migrated from the rapidly desiccating plateau down to the grassy prairies of Siberia and Russia. The plains and lowlands of the Turanian basin are subdivided by a line drawn from north-east to south-west along a slight range of hills running from the sources of the Ishim towards the south-east corner of the Caspian (Bujnurd and Elburz edge of Khorasan). This low range, which most probably separated the lowlands of the Aral-Caspian region (submerged during the Post-Plio- cene period) from the higher plains which had emerged by the end of the Tertiary period, now divides the Transcas- pian steppes from the somewhat different higher plains (see TRaNscAsPIAN Recron). In the Turanian basin the contrast between desert and oasis is much stronger than in the Balkash region. Fertile soil, or rather soil which can be rendered fertile by irrigation, is limited to a narrow terrace of loess along the foot of the mountains (see SyR- Daria), and is surrounded by barren deserts. Even where the loess spreads over terraces at some distance from the mountains, as in the south-east Transcaspian region, it can be cultivated only when irrigated. The dryness of the climate is excessive: rain falls only where the hills cause the clouds to condense, the soil elsewhere being moistened only occasionally by a few showers. Two rivers only— the Syr and the Amu—succeed in crossing the desert and reaching the Sea of Aral. But their former tributaries no longer run their full course: the glacier-fed Zerafshan dries up amidst the gardens of Bokhara soon after emerging from the highlands ; and the Tejeii, the Murghab, and the Andkho lose themselves amidst the fields of the Turcomans. The only tributaries which the Amu retains are those which have the whole of their course in the highlands. In the north such formerly important tributaries of the Syr-Daria as the Tchu, with its subtributary the Sary-su, now dry up

some hundreds of miles distant from the main stream. The arid desert absorbs every drop of running water which reaches its borders.

The whole area is now undergoing geological changes on a vast scale. Rivers have changed their courses, and lakes their outlines. Far away from their present shores the geologist finds indubitable traces of the recent presence of the lakes in the shells they have left amidst the sands. Traces of former rivers and channels, which were the main arteries of prosperous regions within the period of written history, have now disappeared. Of the highly developed civilizations which grew up and flourished in Bactriana, Bokhara, and Samarkand the last traces are now under- going rapid obliteration with the desiccation of the rivers and lakes. The great ‘ Blue Sea ” of Central Asia, the Sea of Aral, which at a recent epoch (Post-Glacial) extended south-west to Sary-kamysh, and the shells of which are found north and east of its present shores from 50 to 200 feet above its present level (162 feet above the ocean, and 245 above the Caspian), now occupies but a small portion of its former extent. It covers a shallow depression, some 23,000 square miles in area, which is drying up with as-tonishing rapidity, so that the process of desiccation can be shown on surveys separated only by intervals of ten years ; large parts of it, like Gulf Aibughir, have dried up since the Russians took possession of its shores. Steamers regularly ply on its waters and ascend both its tributaries. The whole country is dotted with lakes, which are rapidly disappearing under the hot winds of the deserts; and the

clayey takyrs of the steppes give evidence of thousands of lakes which have quite recently ceased to exist, leaving beds of clay kept wet by the condensed moisture of winter and the few rain-showers of early spring.

Like the highlands of eastern Asia, those of Turkestan are mostly Geology,

built up of Azoic euotind aud metamorphic slates, resting upon granites, syenites, old orthoclase porphyries, and the like. These upheavals date from the remotest geological ages; and since the Primary epoch a triangular

continent having its apex turned to- wards the north-east, as Africa and America have theirs pointing southward, rose in the middle of what now constitutes Asia. It is only in the outer foldings of the highlands that Primary fossiliferous deposits are found,—Devonian, Carboniferous, and Permo-Carbonic. Within that period the principal valleys were excavated, and their lower parts have been filled wp subsequently with Jurassic, Creta- ceous, and Tertiary deposits. One of the most striking instances of this is the very thick Cretaceous and Tertiary deposits which cover the bottom of the valley of the Vaksh (right tributary of the Amu) and are continucd for about 300 miles to the north-east, as far as the Atai valley,—probably along the edge of the Pamir plateau. The deposits of the Secondary period have not maintained their hori- zontal position. While upheavals having a north-eastern strike continued to take place after the Carboniferous epoch,} another series of upheavals, having a north-western strike, and occasioned by the expansion of diabases, dolerites, melaphyres, and andesites, occurred later, subsequently at least to the close of the Tertiary period, if not also before it, dislocating former chains and raising rocks to the highest levels by the addition of new upheavals to the older ones. Throughout the Triassic and Jurassic periods nearly all Turkestan remained a continent indented by gulfs and lagoons of the south European Triassic and Jurassic sea. Immense fresh-water lakes, in which were deposited layers of plants (now yielding coal), filled up the depressions of the country. Cretaceous and Tertiary deposits occur extensively along the edge of the highlands. Upper and Middle Cretaceous, containing phosphates, gypsum, naphtha, sul- phur, and alum, attain thicknesses of 2000 and 5000 feet in Hissar. Representatives of all the Tertiary formations are met with in Turk- estan ; but, while in the highlands the strata are coast ~~deposits, they assume an open sea character in the lowlands, and their rich fossil fauna furnishes evidence of the gradual shallowing of that sea, until at last, after the Sarmathian period, it became a closed Medi~~ terranean. During the Post-Pliocene period this sea broke up into several parts, united by narrow straits. The connexion of Lake Balkash with the Sea of Aral can hardly be doubted ; but this por- tion of the great sea was the first to be divided. While the Sea of Aral remained in connexion with the Caspian, the desiccation of the Lake Balkash basin, and its break-up into smaller separate basins, were already going on. The Quaternary epoch is repre- sented by vast morainic deposits in the valleys of the Tian-Shan. About Khan-Tengri glaciers descended to a level of 6800 feet above

the sea,* and discharged into the wide open valleys or syrts. It is most probable that, when allowance has been made for the oblitera- tion of glacial markings, and the region has been better explored, it will appear that the glaciation of Turkestan was on a scale at least as vast as that of the Himalayas. In the lowlands the Aral-Caspian de- posits, which it is difficult to separate sharply from the later Tertiary, cover the whole of the area. They contain shells of molluscs now inhabiting the Sea of Aral, and in their petrographical features are exactly like those of the lower Volga. The limits of the Post-Pliocene Aral-Caspian sea have not yet been fully traced. It extended some 200 miles north and more than 90 miles east of the present Aral shores. A narrow strait connected it with Lake Balkash. The Ust- Urt plateau and the Mugojar Mountains (see Turca1) prevented it from spreading north-westward, and a narrow channel connected it along the Uzboi (see p. 512 supra) with the Caspian, which sent a broad gulf to the cast, spread up to Volga, and was connected by the Manytch with the Black Sea basin. Great interest, geological and historical, thus attaches to the recent changes undergone by this basin ; but much still remains to be done before the numcrous questions arising in connexion with it can be settled. Since the theory of geological cataclysms was abandoned, and that of slow modifications of the crust of the earth accepted, new data have been obtained in the Aral-Caspian region to show that the rate of modi- fication after the close of the Glacial period, although still very slow, was faster than had been supposed from the evidence of similar changes now going on in Europe and America. The effects produced by desiccating agencies are beyond all comparison more powerful than those which result from the earthquakes that are so frequent in Turkestan. All along the base of the highlands, from Khojend to Vyernyi, earthquakes are frequent ;? but, however destructive of life, their effects lie beyond the scope of our observational methods.

1 Mushketoff’s Turkestun (pp. 35, 681) seems to justify this con- clusion.

2 See I. Ignatieff, in Jzvestia of Russ. Geogr. Soc., vol. xxiii., 1887.

3 For a list of them, see Jzvestia of Russ. Geogr. Soc., vol. xxiii., 1887 ; also Orloff, in Mem. of Kazan Naturalists, 1878, iii.

Climate.

Fauna.

WEST. |

The climate of West Turkestan is exccedingly dry and con- tinental. Although the country is comprised within the lati- tudes of Sicily and Lyons, it has a south Norwegian January and a Persian summer. Temperatures of more than 100° Fahr. in the shade are common, and the heat is rendered still more unbearable by the reflexion from a soil destitute of vegetation. The winter is for the most part so cold that the average temperature of January is below the freezing point, and even reaches 0° Fahr. Snow falls for several months on the lower Syr-Daria, and, were it not blown away by the winds, sledge-communication would be possible. This river is frozen for an average of 123 days every year in its lower parts, and nearly 100 days at Perovsk. At'Tashkend there is snow during two months and temperatures of —10° Fahr. have been measured. In 1876, on 24th October, almond-trees, vines, and cotton crops were buried under a heavy snowfall. To the south of Khojend the winter becomes more clement. Absence of rain is the distinctive feature of the climate. Although it rains and snows heavily on the mountains, only 11 inches of rain and snow fall throughout the year at Tashkend, at the base of the highlands; and the steppes of the lower Amu have less than 3 inches.

showers are all that fall from the almost invariably cloudless sky The following table will illus-

above the Transcaspian steppes. trate the climate of Turkestan :—

Lati- | Height | Average temperature. Rain in

tude. | in feet. Year. | January. | July. inches. Akmolinsk …..... 51°12' | 1020 | 28°°8 0°°0 69°-2 9°2 Semipalatinsk …... 50° 24' 590 | 27°-0 Oia d 72°°5 77 MONT Zia isco pieisis vie 8ie's 48° 37' 360 | 21°°8 34 76°2 671 Kazalinsk …....... 45° 45' 160 | 45°°5 10°°6 78°°0 7:9 Alexandrovsk …... 44° 33' | -30 | 51°:2 25°°0 78°°0 a aa ecan ss Onna 43° 51' | 2100 | 48°7 | 144 | 76°5 mi BNUESESIatel eer etalelolei ere ei eie 2 OME! 215 53°°0 19°°4 79°°6 2-9 Petro-Alexandrovsk | 41° 28' 325 | 55°*0 oH " 24 Tashkend …..... 41°19 | 1480 | 583 29°*0 775 | 113 Krasnovodsk …..... 40°

00’ | -70 | 59°8 36°°3 83°°2 am Yarkand(EastTur.)..| 38° 21’ | 4120 §4°°2 21°:2 81°°7 .

The fauna of Turkestan belongs to the great zoo-geographical domain of northern Asia, and is only differentiated by the presence of species which have disappeared from the peripheric parts of the Old World and now find a refuge in the remotest regions of the uninhabited plateau. From the great Paleoarctic region it is distinguished by the presence of Himalayan species. The distinct- ive animal of the Pamir plateau is the magnificent Ovis poli (con- jectured to be the ancestor of our common sheep), mentioned by Marco Polo and rediscovered by Syevertsoff. It breeds by thousands on the Pamir, climbing the highest ridges, which it prefers to the valleys. The region to which it is confined has the shape of an ellipse, with its longer axis running south-west to north-east. The animal is rare on the upper Naryn, and never penetrates to the west of Sel-su. In the alpine tracts of the Tian-Shan, on the borders of the Pamir, their horns and skulls are frequently met with, but there the place of the species is now taken by Ovis karelint. The wild horse, which occurred in Poland a few centuries ago, has been discovered by Prejevalsky in the highlands of Dzungaria and described as Equus prjcvalsktt by Polyakoff. The wild camel in- habits the lonely plateaus south of the Ala-Shan ; but no descrip- tion of it has been published. The other mammals of Turkestan are mostly those which are met with elsewhere in north Asia, The large light-coloured Himalayan bear (Ursus isabellinus) has its home on the Pamir, and the smaller, strong, white-clawed Lewconyx up to the highest levels on the Tian-Shan, Antelopes, Lepus lehmanni, Lagomys rutilus, various species of Arvicole, and the Himalayan long-tailed marmot (Arctomys caudatus), the most char- acteristic inhabitant of the alpine meadows, are the only mammals of the Pamir proper. In the alpine region are found the badger (Meles taxus), the ermine (Fetortus ermineus) and six other Jfus- telidx, the wild dog (Canis alpinus), the common and the black- eared fox (C. melanotis), while the corsac fox (C. corsae) is met with only on the plains. Two species of lynx, the cheetah (Felis jubata), Felis manui, and Felis irbis, this last extending westwards as far as the Persian Gulf and eastwards as far as the river Amur, must be added to the above. The tiger is met with only on the lower Amu-Daria, except when it wanders to the alpine region in pursuit of the maral deer (Cervus maral). The jackal is charac- teristic of the steppes; it banishes

the wolves and foxes. Hares are represented by several species, Lepus lehmannt being the most characteristic. Both the common and the long-tailed marmot (4. baibacinus and A. caudatus) are found at the foot of the mountains, as also four species of Spermophilus, three of voles, two of the mouse, and three of the hamster. The Meriones (four species) and the jerboa (five species) are only met with in the steppe region. Of ruminants, besides the sheep (0. poli, O. karelini, 0. nigrimontana, O. heinsit), we find one mufflon (Musimon vignet), formerly known only in the Himalayas, the Chinese antelope (Antilope subgutiturosa) and the saiga antelope in the steppes, the Siberian ibex and another goat, the yak, the zcbu or Indian ox, the common ox, the camel,

and the dromedary. The wild boar is common in the reed thickets along the rivers and lakes, where it stays during the winter, migrating to the highlands in summer. The hedgehog and porcu- pine are common in the plains.

It would be impossible to describe in a few words the avifauna. No fewer than 385 species are recorded, most of them being middle- European and Mediterranean. A large number were formerly known only in the Himalayas, or in Persia, while others have their origin in east Asia. The commonest are mostly European acquaintances. As for the very rich insect fauna, of which full descriptions are now accessible, it is worthy of note that among the Lepidoptera of the Pamir there is an interesting mixture of Tian-Shan with Himalayan species. M. Grum-Grzimailo found on the Pamir the Colias nastes, a species characteristic of Labrador and Lapland ; like the alpine plants which bear witness to a Glacial period flora in the Himalayas, this butterfly is a survival of the Glacial period fauna of the Pamir.}

Asa whole the flora of Turkestan belongs to that of Central Asia, which was formerly continued by geo-botanists as far west as the steppes of Russia, but which must now be considered as a separate region subdivided into two, —the Central Asian proper and that of the Gobi. It has its own habitus, notwithstanding the number of species it has in common with Siberia and south-east Russia on the one haud and with the Himalayas on the other, and

this habitus is due to the dryness of the climate and the consequent changes undergone by the soil. Towards the end of the Glacial period the Tian-Shan Mountains had a flora very like that of northern Caucasus, combining the characters of the floras of the European Alps and the Altai, while the prairies had a flora very much like that of the south Russian steppes. During the Stone Age the human inhabit- ants lived in forests of maple, white beech, and apple trees. But the gradual desiccation of the country resulted in the immigration from the Central Asian plateau of such species as could adapt them- selves to the dry climate and soil, in the disappearance of European and Altaic species from all drier parts of the region, in the survival of steppe species, and in the adaptation of many of the existing species to the needs of an arid and extreme climate and a saline soil." At present the flora of Turkestan has a variety of characters, depend- ing on the various physical aspects of the separate regions, the Pamir vegetation and oe of the Aral-Caspian steppes constituting two types with numberless intermediate gradations.

There is no arboreal vegetation on the Pamir, except a few willows and tamarisks along the rivers. Mountain and valley alike are covered with soft carpets of grass, various species of Festuca predominating almost to the exclusion of all others. In the immediate vicinity of water the ryang (Carex physoides) grows, and a few patches are covered with Allium. To these may be added a few Ranunculacex, some Myosotis, low Scabiose, the common Taraxacum, one species of Chamomitla, and a few Leguminose. In the north and west the Stipa of the Russian steppes superscdes Festuea and affords splendid pasture for the herds of the Kara- Kirghiz. In the gorges and on the better-watered slopes of the mountains the herbaceous vegetation becomes decidedly rich. Be- sides the above-named there are many other Graminex, such as the beautiful Lasiagrostis splendens, and whole seas of Seabiose. Eremurus, of a variety of colours and 6 to 7 feet in height, forms thickets along with the tall Seorodosma fetida. The northern slopes of the Atai chain are richer in trees. Up to 12,000 feet full- grown specimens occur of the artcha (Juniperus pscudo-Sabina), characteristic of the whole northern slopes of the Turkestan high- lands, the poplar, a very few birches (B. Sogdiana), and a rich underwood of shrubs familiar in European gardens, such as Rhodo- dendron chrysanthum, Sorbus aucuparia (rowan), Berberts heteropoda (berberry), Lonicera Tatarica (honeysuckle), and Cratx#gus

(haw- thorn). Farther east and north comes the Turkestan pine (Picca Schrenkiana), while at lower levels there grow numerous willows, black and white poplars, tamarisk, large Celtis, as well as shrubs of Eleagnus (wild olive), Hippophae rhamnoides (sallow thorn), Rubus frueticosus (blackberry), Prunus spinosa (blackthorn), and P. Ar- meniaca (apricot). The characteristic poplar, Populus diversifolia, which does not seem to have found yet the shape of leaves best suited to the climate, and therefore produces them in most striking variety, and the dwarf Acer Lobelii—very different, however, from the European maple—also occur.

The above applies to most of the highlands of the Tian-Shan, The drier southern slopes are quite devoid of arboreal vegetation.

1 For ampler information, see Syevertsoff's ‘‘ Vertical and Horizontal Distri- bution of Turkestan Animals,” in Izvestia of the Moscow Soc. of Amateurs of Nat. Science, 1873; Fedtchenko's “Travels to Turkestan,” extending over 18 parts of vols. xi., xix., xxi., xxiv., and xxvi. of the same Fzvestia, and forming a series of monographs by specialists which deal with separate divisions of the animal and vegetable kingdom (the flora by Regel); Oshanin's Zo0-Geographical Problems in Turkestan, Tashkend, 1880; Gruin-Grzimailo's ‘‘ Flora and Fauna of Pamir,” in Izvestia of Russ. Geogr. Soc., 1886; Works of the Aral-Caspian Expedition; Butleroff's ‘‘Ornith. of Nukus,” in Mem. St Petersb. Soc. Nat., vol. x., 1879; and the journeys of Borschoff, Semenoff, Syevertsoff, Osten-Sacken (Sertum Tian-Shanicum), Regel, Prjevalsky, and many others. Cf. also for the southern parts of the region Reports of the Afghan Boundary Commission.

2 See M. Krasnof's researches in Jzvestia of Russ. Geogr. Soc., vol. xxili., 1887.

On the northern slopes, at the higher levels, only the Juniperus pseudo-Sabina grows on the mountains, and rich meadow grasses cover the syrts. Lower down, at about 7500 to 8000 feet the conifer zone begins, characterized by the Pieca Schrenkiana, which furnishes the inhabitants

with timber and fuel. Of course the artcha and a few other deciduous trees also occur. The richest zone is that which comes next, extending downwards to 5000 and 4500 feet. There woods of birch, several species of poplar, the maple (decr Semenovit), and a rich underwood spread over the mountain slopes. Orchards of apple and apricot surround the villages. The meadows are covered with a rich vegetation,—numberless bright Pxonie, variegated Scabiosx, large Convolvulacex, all kinds of Campanule, dark-coloured Eremarus, splendid Umbellifcre, yellow-flowered Gat- liwm, a mass of Rosacex, Althex, Glycyrrhize, high-stemmed. Seorod- osma fetida, and tall Gramince. But, as soon as the soil loses its fertile humus, it produces only a few of Phlomis, Alhagi camelorum, Psammex, Salsolacex, Artemisix, Peganwm, and some poppies and

exact numbers. Murrains are of frequent occurrence ; a recent one resulted in a terrible famine among the Kirghiz. Live eattle, hides, wool, came]-hair, tallow, felt, and leather are exported to a considerable extent.

The mineral wealth of Turkestan is considerable. auriferous sands have been discovered at many places, but the per- centage of gold is too poor to make the working remunerative. Silver, lead, and iron ores occur at several places ; but the want of fue] is an obstacle to their exploitation. The vast coal-beds of Kulja and several inferior ones in Turkestan are not yet seriously worked, the total yearly output being only some 120,000 ecwts. The naphtha wells of Ferghana and the layers of graphite about Sairam-Nor are also neglected. There are abundaut deposits of gypsum, alum, kaolin, marble, and similar materials. Notwith- standing the salt springs of Ferghana and Syr-Daria, the salt lakes of the region, and the rock-salt strata of the Alexandrovsk Mountains, salt is imported.

Traces of Minerals,

Chamomillz, but only in the spring. The invading steppe plants appear everywhere in patches in the Turkestan meadows. Very often—almost invariably on the drier southern slopes of the

Turkestan has no manufacturing industry carried on by means Industry of machinery, except a few distilleries and two establishments for and dressing raw cotton. But there is a great variety of artisan work, trade.

Vege-

mountains—the steppe vegetation climbs up to the level of the alpine. Nowhere, perhaps, is the effect of various soils—loess, clay, salt clay, and sand—upon vegetation better observable than in the recently-emerged and arid regions of Turkestan. a

The ‘‘culture” or ‘‘ apricot” zone is followed by the prairie belt, in which black-earth plants (Stipa and the like) struggle for exist- ence against invading Central Asian forms. And then come the lowlands and deserts with their moving sandy barkhans, shors, and takyrs (see TRANSCASPIAN REGION). Two species of poplar (P. pruinosa and P. diversifolia), Eleagnus angustifolia, the ash, and a few willows grow along the rivers. Large areas are wholly destitute of vegetation, and after crossing 100 miles of such a desert the traveller will occasionally come upon a forest of saksaul (Anabasis Ammodcndron). Contorted stems, sometimes of consider- able thickness, very hard, and covered with a grey cracked bark, rise out of the sand, bearing green plumes of thin branches, with smal] greyish leaves and pink fruit. Sometimes the tree is a mere knot peeping above the sand with a crown of thin branches. But even these fantastic growths are rapidly being destroyed by the Kirghiz herdsmen, who use them for fuel.!’ In spring, however, the steppe assumes quite another aspect, being covered, except where the sands are shifting, with a rich vegetation. Persian species penetrate into Bokhara and the region of the upper Amu.

As already stated (p. 685), the climate of Turkestan varies con-

tablepro- siderably from north to south. In Akmolinsk and Semiryetchensk

which, however, has been for some time declining and now stands at a rather low level. Trade is very actively carried on. Its importance may be judged by the fact that in 1876 27,900 camels were used for the transport of wares to Tashkend. This town and Bokhara are the chief commercial centres, the principal articles of export to Russia, via Orenburg and

Semipalatinsk, being raw cotton and silk, cattle and their products, while manufactured wares are imported in return. There is also an import and export trade to and from Urumtchi and China, via Kulja and Ak-su.

Turkestan has been the theatre of so many migrations and con- Ethno-

quests that its present population could not fail to be very mixed. Both Aryans and Mongols (especially the Ural-Altaic branch) have their representatives there, the former settled for the most part, the latter chiefly nomad. The Ural-Altaians, or Turanians, are numerically the predominant element, and consist of Turcomans, Kirghiz, Uzbegs, and Sarts. The Turcomans inhabit chiefly that part of Turkestan which is now known as the TRANSCASPIAN Recion (g.v.). They number less than one million. The Kara- Kalpaks (‘‘ Black Bonnets”) may number about 50,000 in Turke- stan, and some 300,000 in the Russian empire altogether. Very little is known of their history. They are supposed to be but recent immigrants to Syr-Daria, having come from the former Bulgarian empire on the middle Volga. Their language and habits are the same as those of the Kirghiz; but for the last century and a half they have had some acquaintance with agricul-

ducts. most of the kinds of corn which characterize Middle Russia ture. Their pacific temper exposed them to_the raids of the are grown. South of the Tchu and the Syr-Daria gardening is a | Kirghiz, Who compelled them first to settle in Dzungaria, then to considerable industry ; and, although rye and wheat continue to change their dwellings several times, and ultimately (in 1742) to be the chief crops, the culture of the apple, and especially of the | recognize the sovereignty of Russia. Even since that time they apricot (wryuwk), acquires importance. Attempts are also made to have been driven by the persecutions of their old enemies to cultivate the vine. The inhabitants of the neighbourhood of Tash- | cross the Aral-Caspian steppes and seek refuge near Astrakhan. kend and Samarkand, as well as those of the much more northern | The real masters of the steppes and highlands of Turkestan are but better sheltered Kulja oasis, add the cultivation of the almond, the Kirghiz, of whom there are two branches, —the Kazak (Cossack) pomegranate, and fig. Vines are grown and cotton planted in | Kirghiz and the Kara (Black) Kirghiz or Burut (see Krreuiz). those districts.

Finally, about Khojend and in Ferghana, where | The Uzhegs, who played a predominant political part in Turkestan the climate is milder still, the vine and the pistachio tree cover the | before the Russian conquest, are of Turco-Tartar origin and speak hills, while agriculture and horticulture have reached a high degree | a pure Jagatai dialect ; but they are mixed to a great extent with of perfection. Successful attempts are now being made to grow | Persians, Kirghiz, and Mongols. They are subdivided into clans and the tea-plant in the Transcaspian region. lead a semi-nomadic life, preserving most of the attractive features Agri- The arable land, being limited to the irrigated terraces of loess | of their Turkish congeners—especially their honesty and independ-

culture. already spoken of, occupies less than a fiftieth of the whole area of

West Turkestan, even when the Transcaspian deserts are left out of account. The remainder is nearly equally divided between pasture land and desert (sandy steppe and ‘barren mountain). Owing to a very equitable distribution of irrigation water in accord- ance with Moslem law, agriculture and gardening have reached a high stage of devclopment in the oases. Two crops are usually taken every year? Wheat, barley, millet, pease, lentils, rice, sorghum, lucerne, and cotton are the chief agricultural products. Carrots, melons, vegetable marrows, and onions are extensively grown. Rye and oats are cultivated in Kazalinsk and Kopat. Corn is exported. Owing to the irrigation, total failure of crops and consequent famines are unknown, unless among the Kirghiz shepherds. The kitchen gardens of the Mohammedans are, as a rule, admirably kept. Potatoes are grown only by the Russians. The cultivation of cotton is rapidly extending (32,000 acres in 1886), as also is sericulture, which is chiefly carried on in Ferghana, whence silk cocoons are an important item of export. Cattle-breeding is extensively pursued, and in Russian Turkestan alone recent estimates show 400,000 camels, 1,600,000 horses, 1,200,000 cattle, and 11,000,000 sheep. This last figure, however, is but a very rough estimate,—the flocks on the Kirghiz steppe being so large that the proprietors themselves do not know their

1 See Olga Fedtchenko and Prof. Sorokine’s drawings of saksaul forests in Album of Views of Russ. Turkestan ; also Bull. Soc. Nat. Mose., 1884, No.

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2 See Middendorff’s very valuable sketches of agriculture in Ferghana in Mem. Acad. Sc. of St Petersburg, 1881. ~ .

ence. When settled they are mostly designated as Sarts—a name which has reference more to manner of life than to anthropological classification, although a much stronger admixture of Iranian blood is evident in the Sarts, who also speak Persian at Khojend and Samarkand. Tarantchi or Taranji (‘labourer” in Chinese) is the name given to those Sarts who were settled in the Kulja region by the Chinese Government after the rising of 1758. They coustitute about two-fifths of the population of Kulja. After defeating the Dzungaiis in the year 1865, they took the political power in Kulja’ into their own hands, offering shelter to the Kirghiz who made inroads on the Russian dominions. This was made a pretext for the annexation of Kulja by Russia in 1871; but it has been since restored to China, The origin of the Dzungatis is somewhat prob- lematical. They number nearly 20,000, and inhabit the valley of the Ili in Kulja and partly are settled in Russian Turkestan, They are Mohammedans, but have adopted Chinese manners of life. The Mongolian branch is represented in Turkestan by Kalmucks and Torgoutes (Torgod) in the north-east and in Kulja, where they are mixed with Solons, Sibos, and Chinese. The Aryan Tajak (see Tasak), the aborigines of the fertile parts of Turkestan, were subdued by the Turco-Mongolian invaders and partly com- pelled to emigrate to the mountains, where they are now known as Galtchas. They constitute the intellectual element of the country and are the principal owners of the irrigated land,—the Uzbegs being their labourers,—merchants, and mollahs or priests. They are Sunnite Mussulmans. The other representatives of Aryan 3 See N. Mayett’s Turkestan Exhibition of 1886, Tashkend, 1886,

Cities.

General

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condi- tion of the eountry.

Effeets of

Russian

influence. life, elsewhere, where both civilizations—the European and the Asiatic.

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EAST. |

race in Turkestan are a few Persians, mostly liberated slaves ; Indians, who carry on trade and usury in the cities; a few Gipsies; and the Russians. Among these last two distinct elements must be noticed,—the Cossacks, who are settled on the borders of the Kirghiz steppe and have assumed many Kirghiz features, and the peasant-settlers who are beginuing to colonize the valley of the Ili and to spread farther south. Exclusive of the military, the Russians number about 75,000, nearly two-thirds being in Semiryetehensk (Cossacks and peasants).

Turkestan has no lack of populous cities, which, notwithstanding recent vicissitudes, continue to be important for their trade, while several others are widely famous for the part they have played in history. Kuoxanp,? Marcuinay, Namangan, and Andijan in Ferghana ; TasHKEND and Kuoyenp in Syr-Daria ; SAMARKAND in Zerafshan; BoxHara and Kuiva in the independent khanates have each from 30,000 to 100,000 inhabitants.

Populous cities adorned with fine monuments of Arabian archi- tecture, numerous ruins of cities decayed, grand irrigation canals now lying dry, and written monuments of Arabian literature testify to a time when civilization in Turkestan stood at a much higher level than at present. This period was during the first centuries after its conversion to Islam. Now all is in decay. The beautiful mosques and madrasas are dilapidated ; no astronomers watch the sky from the tops of their minarets; and the scholars of the madrasas waste their time on the most deplorably puerile scholas- ticism. The inspiration of early belief has disappeared ; the ruling motive of the mollahs (priests) is the thirst for personal enrichment, and the people no longer follow the khojas (see p. 639 below). The agricultural labourer has

preserved the uprightness, diligence, and sobriety which characterize the Turkish peasant in Asia as well as in Europe; but the richer inhabitants of the cities are grossly sensual. Centuries of wars, followed by massacres and cruel vengeance, an unceasing eivil strife between parties disputing for supremacy in the name of religion, conspiracies, appeals to foreigners, and endless intrigues have hastened the decay of Mohammedan civilization in the khanates of Turkestan and paved the way for Russian conquest.

It remains, however, an open question whether the Russians will be able to bring new vigour to the country and awaken intellectual They have failed to do so in eastern Russia, at Kazan, and

—remain as thoroughly estranged from one another as they were three centuries ago. This estrangement is not merely religious, but soeial and economical. The followers of Islam, whose common law and religion know only of a temporary possession of the land, which belongs wholly to the Prophet, cannot accept the principles of unlimited property in land which European civilization has borrowed from Roman law; to do so would put an end to all public irrigation works, and to the system by which water is used according to each family's needs, and so would be fatal to agricul- ture. When taking possession of Turkestan, the Russians began to grant deeds establishing property rights over land in accordance with Roman law. Buta study of the Mohammedan system soon put an end to so erroneous a policy, and Mussulman law is still respected. The Russians have abolished slavery in Turkestan ; and their rule has put an end to the interminable intestine struggles, which had weakened and desolated the whole region. The barbar- ous tortures and executions which rendered Khiva notorious in the East are no longer heard of; and the continual appeals of the khojas for "'holy" war against their rivals find no response. But the Russian rule has imposed many new taxes, in return for which Turkestan only gets troops of Russian merchants and officials, who, instead of becoming the exponents of what is best in European civilization, too often accept the worst features of the depraved Mussulman civilization of the higher classes of the country. New tribunals and new justices of the peace are about to be introduced (1887) ; schools are being diligently spread ; but the wants of the natives are set behind those of the children of the Russian officials and merchants and the supposed necessities of Russification. A consulting hospital for

Mohammedan women has receutly been opened by women graduates in medicine at Tashkend.

East TURKESTAN.

As already stated, by this name we designate that vast depression in the great plateau of eastern Asia which lies between the Tian-Shan Mountains in the north-west ; the steep slopes of the Pamir and of the Tibet plateau, bordered by the Kuen-Lun, in the south-west and south ; the Attyn-Tagh in the south-east as far as Lake Lob-Nor ; and in the north-east the still imperfectly known mountains

1 See Collection of Papers on Turkestan, St Petersburg, 1876, by MM. Syevertsoff and Khoroshkin.

? Each of these towns in small eapitals is deseribed in a separate article.

which run east-south-east fron the Tian-Shan, having the Bagratch-kul on their northern slope. Farther east the Kuruk-Tagh and the steep slope of the Gashuii Gobi separate East Turkestan from the higher terrace of the plateau, so that about Lob-Nor the Tarim depression is narrowed to a width of about 100 miles ; and on the 98th meridian, at Lake Tchin-shen-ho, the steep edge of the Gobi meets the spurs of the Nan-Shaii Mountains.4 This region has been and still is designated by a variety of names, such as the Tangut Plain, West Gobi (a most in- appropriate name, as already pointed out by Ritter), Alty- shar or Jity-shar (the land of six or seven cities), Little Bokharia, Kashgaria, and so on. In its physical features it forms a connecting link between the Chinese territories and the Aral-Caspian depression. It covers about 465,000 square miles, but has hardly more than 1,000,000 inhabit- ants.

Although lying at a high altitude (Kashgar 4000 feet Physical and Yarkand 4120 feet), it has the character of a depres- features.

sion in comparison, not only with the mountains, but also with the lofty plateaus which surround it,—Tibet, Pamir, and the Tian-Shan syrts. It has a general slope towards the east, and its lowest portions (formerly occupied by a great lacustrine basin) are only 2600 feet above the sea.® At its north-east edge, ¢.¢, at the foot of the remotest offshoots of the Tian-Shan, M. Prjevalsky measured an altitude of only 2600 feet. Its average altitude ranges from 3100 to 3700 feet, increasing to 4200 at its outer rim. No mountains or hills diversify its surface, which is that of a high plain. All the mountains which enclose it rise to considerable heights, far above the snow line. The steep slopes of the Pamir culminate in Tagharma Peak (25,360 feet). In the north the snowclad Kokshat-tau and Kirghiznyn Ala-tau form a series of uninterrupted chains, which reach a height of 24,000 feet in the Khan- Tengri and have at their southern base the broad and high alpine plateaus, or syrts, of which the Yutduz, dotted with lakes, has acquired historical fame as the meeting- place of the armies of Timur before his Dzungarian march. On the southern borders of East Turkestan, in the Kuen-Lun and Karakorum Mountains, is the Dapsang—one of the highest peaks of the globe ; and farther east the Attyn- Tagh and the Nan-Shafi (with Humboldt and Ritter ranges), which are among the highest mountains of Asia, separate it from the lofty Chaidam or Tsaidam plateau.6 East Turkestan is thus secluded by high mountains and plateaus from the rest of the continent. passes which lead to it climb to altitudes of 14,000 feet. It is open only towards the east, where it is connected with the Gobi depression. Its position as the highway from China to West Turkestan and the Dzungarian empire has made it known, though only very imperfectly until lately, through Chinese documents, the narratives of the journeys of Buddhist missionaries, and the travels of Marco Polo, Rubruquis, and a few Jesuits. From a remote antiquity it was crossed by caravans going from China to Lake Balkash, Ferghana, and the Oxus. The route, after crossing the Gobi, proceeded either to the Dzungarian Gate, or, wa Kashgar, to the high passes of Terek-Davan and Muz-art, which led to Ferghana and Issyk-kul. Both passes have a wide renown in Central Asia, the latter especially, on account of its difficulties, one of which is a

3 See the map of Asia, by A. Petermann, in Stieler’s Hand-Atlas, No. 58, where the orography of Asia is represented, in the present writer’s opinion, in a more trustworthy manner than on other maps of Asia,

4 See map to Prjevalsky’s fourth journey in Zzvestia of Russ. Geogr. Soc., 1887.

> Barometrieally observed, the possible error being about 300 feet.

§ Prjevalsky, Reisen in Tibet und am oberen Laufe des Gelben Flusses, Jena, 1884.

Even the few Passes.

River Tarim.

Deserts.

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huge glacier, which has to be ascended with the help of the ice axe,

One river only, the Tarim—now lost in the marshes of Lob-Nor—and its tributaries, water this region. It is formed by the confluence of several rivers flowing from the semicircle of mountains which fence in East Turkestan on the south, west, and north. The Kashgar-Daria rises under the name of Kizil-su on the Atai. The Yarkand- Daria has its origin in a high valley between the Kuen- Lun and Karakorum Mountains, at the base of Dapsang, from several streams, such as the auriferous Zerafshan, which is fed by the glaciers of the Karakorum pass ; after piercing the Kuen-Lun, it enters the plain, where its waters are soon diverted to the fields and gardens of the Yarkand oasis. ‘The Khotan-Daria rises farther east in the same valley, and also pierces the Kuen-Lun, its two branches— the Kara-kash and Urung-kash—being renowned for their “black” and “white” jade. This river only reaches the Tarim during the summer. The Tian-Shan Mountains contain the sources of several feeders of the Tarim; but some of them no longer reach the main stream. The Kizil-Kunghei disappears after having watered Utch-Turfan (Uj-Turfan); the Ak-su meets the Khotan-Daria at its junction with the Tarim; but the Baidu-gol and the Kutcha are lost in Lakes Baba-kul and Sary-kamysh. From the Yutduz plateau comes the Haidu-gol, which flows past Kara-Shar and enters the Bagratch-kul Lake, whence it issues under the name of Kontcha-Daria, and, crossing the east of East Turkestan from north

to south, joins the marshes of Lob-Nor ; thus the long-doubted con- nexion between these two lakes—the northern and the southern—really exists. The Tarim is navigable for steamers from the confluence of the Yarkand and Khotan rivers all the way to Lob-Nor.! These rivers, however, do not bring life to the immense deserts, the aspect of which recalls partly the Aral-Caspian depression and partly the Mongolian Gobi. Their undulating surface is covered with a gravelly soil, out of which all the finer particles have been winnowed by the wind, and it resounds under the hoofs of the passing hordes; grass covers it only in the beginning of spring. Here and there occur clayey deposits with an efflorescence of salt, which is hard in summer but impassable after rains. Then come immense areas of loose sand, which is raised in clouds by storms of wind, and the hills of which, moving on like waves, invade the cultivated fields that have been conquered by laborious effort from the desert. The features with which the traveller in the Sahara, or on the plateau of eastern Iran about Lake Zareh (Hamun) is familiar, are here reproduced on the same large scale. The Takla-makan desert north of Khotan covers 93,000 square miles—an area nearly equal to that of Great Britain. As one approaches Lob-Nor, and thus touches upon territory that has emerged at a still more recent epoch, the desert becomes still drearier and still less passable on account of the shifting sands. Lob-Nor now consists of two basins; but the largest of them, although it has an area four times as large as that of the Lake of Geneva, can hardly be called a lake, since its greatest depth is less than 20 feet, while reeds rise 20 feet above the thin film of water and extend far beyond its shores. In fact the whole of the region, notwithstanding its considerable altitude above the ocean, has but recently emerged from under water. During the later portion of the Tertiary period it was covered with an immense Mediterranean sea, and even during the Post-Pliocene period was occupied by a lake. But, as we see on a smaller scale in Finland and Sweden, where the higher

} At the confluence the Tarim has at low water a depth of 8 to 5

feet and a width of 190 yards; towards Lob-Nor the depth increases to 14 feet (Prjevalsky, in Zzvestia of Russ. Geog. Soc., 1887).

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lacustrine depressions are more advanced in the process of desiccation than those situated at lower levels, so in Central Asia the more elevated Tarim region is more advanced in its desiccation than the Balkash basin, and this latter again is ina more advanced stage of the same process than the Aral-Caspian depression. The desiccation of East Turkestan must have gone on, however, within historical times at a much more rapid rate than geologists seen pre- pared to admit. East Turkestan has not always been the desert it now is. Many cities, in which Greek and Byzan- tine coins have been found, lie buried beneath the sands, and in one of these Buddhist statues have been discovered. Indeed it is very probable that the great migration of the first centuries of our era resulted from the necessity of abandoning East Turkestan.

The climate is severc: a cold winter follows a burning summer. Climate,

A few showers slightly moisten the surface in spring ; but the summer and autumn are rainless. The airis continually charged with dust, and often with sand.

The vegetation of the interior of East Turkestan is very poor, Flora,

being the same as that of the steppes of West Turkestan. On the sandy hills are some tamarisks and Elxagnus, rapidly being used up as fuel ; along the rivers are copses of poplars, which have diffi- culty in maintaining themselves, because no humus gathers in their shade, the dry leaves being blown away by the storms and scattered as dust over the desert ; and, finally, along the old beds of rivers and lakes grow dense and rank beds of reeds, where the wild boar has his habitat. Immense areas are covered with Salsolacex, and the gravelly ground is clothed in spring with a rich carpet of grass. The oases possess all the plants which are cultivated in West Turkestan,—the inulberry, walnut, pear, apple, apricot, olive, and vine. Cotton, rice, maize, millet, and wheat are grown; and Middendorff’s* remark, that on the edge of the desert we find the best cultivated fields and the richest gardens, is still more appli- cable to the oases of East than to those of West Turkestan. But outside the oases desolation reigns. Wind freely modifies the sur- face, carrying away the finest particles of the

gravelly soil, breaking down the barkhans as soon as man has destroyed the vegetation which grew on them, and lifting the sand into the air and whirling it along in columns of the most fantastic shapes.

As a rule, the mammals are not numerous, and the fauna closely Fauna,

resembles that of the Tian-Shan. It seems to be owing to the loneliness of its deserts that East Turkestan has preserved the wild ancestors of our domestic animals. Besides the wild ass (Zquus hemionus), Prjevalsky discovered in the Dzungarian steppes the wild horse—the real ancestor of our domestic horse—and on the plateau of Tsaidam the wild camel and the wild yak.®

Raw cotton and silk are exported to a considerable amount ; but Indus- of manufactured cottons only arough mata is sent to Semiryetchensk tries and Some silk wares, carpets, and silk “‘ grain” are minerals.

for the Kirghiz. exported from Khotan, leather-ware from Yarkand, polished and copper ware from Ak-su, and small iron ware from Kutcha. Stock-breeding is of paramount importance, and cattle, asses, camels, and sheep are reared in considerable numbers. Mineral resources are not wanting, but the mining industry is in a primitive condition. Gold is obtained from alluvial deposits at Kiria, coal at Kashgar, jade in Khotan, and sulphur and saltpetre at Utch-Turfan.

It is only along the base of the mountains, where there is a fringe Oases.

of loess, and where streams bring the necessary moisture, that human settlements have sprung up, or rather maintained them- selves until now. The series of oases skirts the base of the Tian- Shan and the Kuen-Lun. Kashgar stands at the apex of the angle made by those two ranges, while Yanghi-hissar, Yarkand, Khotan, and Kiria lie along the Kuen-Lun, and Utch-Turfan, Ak-su, Bai, Kutcha, Kurta, Karashar, and Turfan along the Tian-Shan. Many miles of desert separate these oases from each other; and their population could be, and has been, much greater than it is, for there is no Jack of water in the streams which rise beneath the snow covering of the mountains. The various oases, which arc named after their chief towns, have always been nearly independent of each other. Still, in the course of their much disturbed history, Khotan, Yarkand, Kashgar, and Ak-su, one

after another acquired a kind of supremacy over the rest. At present Yarkand and Kash- gar are the most important. The city of Yarkand has ncarly 60,000 inhabitants ; it is surrounded by walls, and has a separate fort, Yanghi-hissar ; ruins of old settlements are scattered around. Its Chinese merchants carry on an active trade, and the Turkish popu- lation are breeders of cattle on an extensive scale. Wheat, barley, rice, beans, sorghum, mulberries, and a variety of fruit trees are

2 Op. cit. * Prjevalsky, Reisen in Tibet, &c. ; aud Wilkins (naturalist of M. Kuropatkin's expedition) in the Russian periodical Priroda, 1887, No. 3.

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grown in the gardens. KASHGAR (q.v.), surrounded by a series of populous villages, is the chief commercial centre, owing to its posi- tion on the highway to Lake Issyk-kul. It is surrounded by forts, one standing at the confluence of the Kashgar and Yarkand rivers. Kuoran (9.v.) or Iltchi (also Yu-thian), a very populous city under the Han dynasty of China (206 B.0.-1 A.p.), has much deelined of late. It is renowned for its gold mines, and especially for its jade and its musk. Copper kettles, carpets, some silk, and felt ware are manufactured. Sanju (7000 houses), Kilian, Pialma, Guma, Kargatyk, and Posgan, on the slopes of the Kuen-Lun between Yarkand and Khotan, are the richest parts of the region. Naya, Kiria, Tchira, all on small rivers flowing from the Kuen-Lun, con- tinue the line of oases towards the east, terminating in Tchertchef, which now consists of but a few score of houses. The oases at the base of the Tian-Shan are Utch-Turfan (Ust-Turfan), Ak-sn (formerly the capital of Sairam), Bai, Kutcha with Shah-yar, Bugur, Kurta, Karashar, and Turfan. Their inhabitants grow eorn to a consider- able amount, and keep numerous herds of cattle and flocks of sheep. The chief exports are wool, fowls, and the horns of the maral deer. On the lower Tarim, where a few settlements, supported chiefly by fishing, continue to struggle against the encroaching desert, the ruins of formerly populous towns testify that the region was not always the dreary waste it now is,

The population is mixed, Aryans and Turanians being thoroughly intermingled. On the slopes of the Pamir, about Sary-kol, there is a purely Aryan population of Persian Galtchas. Kirghiz and Kara-Kirghiz inhabit the slopes of the Tian-Shan. Kalmucks occur in the north-east ; and in the central parts the population consists of Turkish Sarts and Uzbegs and of Persian Tajak,—the Mongolian element increasing towards the north-east. The language is Turkish, like that spoken in West Turkestan, with several varieties of pvtots and a eonsiderable addition of Chinese words. As arule, the inhabitants of East Turkestan have an air of poverty. There are no rich mosques in their towns, sueh as those of Samarkand and Bokhara ; the houses are of unbaked brick and poorly furnished. The dress is that customary in West Turkestan. But the habits of the people differ to some extent and the women enjoy greater liberty than in other Mohammedan countries: they go in the streets unveiled ; free marriages, contracted for short terms, are not un- frequent. Asarule, the position of women is inore independent —a feature noticed even by the earliest travellers in the country.

The aggregate population of East Turkestan, estimated between 575,000 and 1,500,000 in 1825, is now (1887) hardly more than 1,000,000. Kuropatkin estimates it at 1,200,000, Forsyth at 600,000. The population of the chief towns may be stated approximately as follows—Yarkand, 60,000; Kashgar, 50,000; Khotan, 40,000 ; Sanjn, 35,000; Ak-su, 20,000 ; Kiria, 15,000; Yanghi-hissar, 10,000 ; Kargatyk, 10,000 ; Kurta, 6000.

It appears very probable that at the dawn of history East Turke- stan was inhabited by an Aryan population, the ancestors of the present Slavonic and Teutonic raees, and that a civilization not inferior to that of Bactriana had already developed at that time in the region of the Tarim.’! Our knowledge, however, of the history of the region is very fragmentary until about the beginning of the Christian era. When the Huns (Hiong-nn) occapied west and east Mongolia in 177 b.c., they drove before them the Yue-chi (Yutes, Yetes, or Ghetes), who divided into two hordes, one of whieh in- vaded the valley of the Indus, while the other met the Sace in East Turkestan and drove them over the Tian-Shan into the valley of the li. ‘Thus by the beginning of our era the Tarim region had a mixed population of Aryans and Ural-Altaians, some being settled agriculturists and others nomads.

There were also several inde- pendent cities, of which Khotan was the most important. One portion of the Aryans emigrated and settled in what is now Wakhan (on the Pamir plateau), the present language of whieh seems very old, dating anterior to the separation of the Vedic and Zend languages. In the 1st century the Chinese extended their rule westwards over East Turkestan as far as Kashgar. But their dominion seems to have been merely nominal, for it was soon shaken off. By the end of the 5th century the western parts fell under the sway of the ‘‘ White Huns” or Ephthalites, while the eastern parts were under Tangut (Thygun) dominion. The Chinese, how- ever, still retained the region about Lob-Nor. Buddhism penetrated into the country at an early date; but in East Turkestan there were also followers of Zoroastrianism, of Nestorian Christianity, and even of Manicheism. An active trade was carried on by means

1 Such is the conclusion reached by Lassen (Indische Alterthumskunde), and supported by M. Grigorieff (Ritter’s Asien in Russ. transl. ; Addenda to “ Hast Turkestan,” in Russian). In connexion with the objection based upon the sub-boreal character of the regions which were the cradle of the Aryals, as proved by the so-called paleontology of the Aryan languages, it may be ob- served that by the end of the Glacial, and during the earlier Lacustrine (Post- Glacial) period, the vegetation of Turkestan and of Central Asia was quite different from what it is now. It was Siberian or north European. The researches by M. Krasnoff (see above, p. 635) as to the characters of the former flora of the Tian-Shan, and the changes it has undergone in consequence of the extremely rapid desiccation of Central Asia, must be carefully borne in mind in all speculations founded upon the testimony of language as to the original home of the Aryans.

of numerous caravans. The civilization and political organization of the country were dominated by the Chinese, but were also in- fluenced to some extent by Greco-Bactrian civilization. Buddhism spread rapidly in the south-west, and the study of Pali beeame widely diffused. Our information as to the state of the country from the 2d century to the first half of the 7th is slight, and is chiefly derived from the Journeys of the Buddhist pilgrim

Fa-hien in 399, Song-yun in 518, and Hwen-t’sang in 629. By this time Buddhism had reached its culminating point ; in Khotan there were 100 monasteries and 5000 monks, and the Indian sacred literature was widely diffused; but already there were tokens of its deeay. Even then the eastern parts of the Tarim basin seem to have been growing less and less populous. To the east of Khotan cities which were prosperous when visited by Song-yun had a century later fallen into ruins, while their inhabitants had migrated westwards. Legend has it that all the inhabitants of Go-lao-lo-tsia were buried in a sandstorm, and this seems to be but a poetical way of represent- ing a phenomenon which was steadily going on in East ‘Turkestan.

Little is known about these regions during the 7th, 8th, and 9th centuries. In the 7th century the Tibetan king, Srong-btsan, with the help of the western Turks, subjugated the western part of the Tarim basin. During the following century the Mohammedans under Kotaiba, after several excursions into West Turkestan, took Samarkand, Ferghana, Tashkend, and Khokand (712-713), and invaded East Turkestan, penetrating as far as Turfan and China. The Chinese supremacy was not shaken by these invasions. But, on the outbreak of internal disturbances in China, the Tibetans took possession of the western provinces of China, and intercepted the communications of the Chinese with Kashgaria, so that they had to send their troops through the lands of the Hui-khe (Hoei-ke, or Hoei-hu). In 790 the Tibetans were masters of East Turkestan ; but their rule was never strong, and towards the 9th century we find the country under the Hoi-he. Who these people were is somewhat uncertain. According to Chinese documents, they came from the Selenga ; but most Orientalists identify them with the Uigurs. In the opinion of M. Grigorieff, whom we follow in this sketch,” the Turks who succeeded the Chinese in the western parts of Hast Turkestan were the Karluk Turks, who extended farther south-west up to Kashmir, while the north-eastern parts of the Tarim region were subdued by the Uigurs. Soon Mongolian hordes, the Kara-Kitais, entered East Turkestan (11th century), and theu ne into West Turkestan, Khiva falling under their dominion.

uring the following century Jenghiz Khan overran China, Turke- stan, India, Persia, Russia, and Hungary; Kashgaria fell under his rule in 1220, though not without strenuous resistance followed by massacres. The Mongolian

rule was, however, not very heavy, the Mongols merely exacting tribute. In fact, Kashgaria flourished under them, and the fanaticism of Islam was considerably abated. Wonien again acquired greater independence, and the religions toleration then established permitted Christianity and Buddhism to spread freely. This state of affairs lasted until the 14th century, when Tughlak Timur, who extended his dominions to the Kuen- Lun, accepted Islam. He transferred his capital from Ak-su to Kashgar, and had a summer residence on the banks of Issyk-kul. His son reigned at Samarkand, but was overthrown by Timur-lang (see TimuR), and the reign of the great conqueror was a fertile source of suffering to the region. To put an end to the attacks of the wild Tian-Shan tribes, he undertook in 1389 his renowned march to Dzungaria, which was devastated ; East Turkestan also sutfered severely.

The re-introduction of Islam was of no benefit to the Tarim region. In the 14th and 15th centuries Bokhara and Samarkand beeame centres of Moslem scholarship, and sent great numbers of their learned doctors to Kashgaria. Rubruquis, who visited East Turkestan in 1254, Marco Polo between 1271 and 1275, and Hois in 1680, all bore witness to great religious tolerance; but this entirely disappeared with the invasion of the Bokharian mollahs. They created in East Turkestan the power of the khojas, who afterwards fomented the many intestine wars waged between the rival factions of the White and the Black Mountaineers. In the 17th century a powerful Kalmuck confederation arose in Dzungaria, and extended its sway over the Ili and Issyk-kul basins, having its capital on the Ili. To this power or to the Kirghiz the ‘‘ Whites” and ‘‘ Blacks” alternately appealed in their struggles, in which Yarkand supported the latter and Kashgar the former. These struggles paved the way for a Chinese invasion, which was supported by the White khojas of Kashgar. The Chinese entered Dzungaria in 1758, and there perpetrated a terrible massacre, the vietims being estimated at one million. The Kalmucks fied and Dzungaria be- eame a Chinese province, with a military colonization of Sibos, Solons, Dahurs, Chinese criminals, and Moslem Dzungars. The Chinese next re-conqucred East Turkestan, marking their progress by massacres and transporting 12,500 partisans of independence to the Ili valley. Hercupon the dissentient khojas fled to Khokand and there gathered armies of malcontents and fanatic followers of

2 See Ritter's Asien, " Kast Turkestan " (Russ. trans.), ii. 282; also Kuropat- kin's Kashgaria.

Islam. Several times they succeeded in overthrowing the Chinese rule—in 1825, in 1830, and in 1847—but their successes were never permanent. After the ''rebellion of the seven khojas" in 1847 nearly 20,000 families from Kashgar, Yarkand, and Ak-su fled to West Turkestan through the Terek-Davan pass, many of them perishing on the way. In 1857 another insurrection broke out ; but a few months later the Chinese again took Kashgar (for the details see Kasucar). In the course of the Dzungarian outbreak of 1864 the Chinese were again expelled; and Yakub Beg became master of Kashgar in 1872. But five years later he had again to sustain war with China, in which he was defeated, and East Turkestan once more became a Chinese province.

Bibliography.—The literature on Turkestan has of late years become very voluminous, especially in the form of papers scattered through the periodicals published by the European Geographical Societies and other scientific bodies. The reader is referred to the following works as fitted to facilitate research. Vols. vi. and vii. of Elisée Reclus's Géographie Universelle contain maps showing the routes of the chief explorers. Prof. Mushketoff's Turkestan (in Russian, vol. i. 1886) contains an excellent critical analysis of all explorations of Turke- stan and works thereupon, and the information they contain with regard to

researches into the geography and history of East Turkestan down to 1873. Amu and Uzbot (Saratoff, 1879), by the chief of the Amu-Daria expedition, and Bogdanoff's Review of Expeditions and Explorations in the Aral-Caspian Region from 1720 to 1874 (St Petersburg, 1875) are most useful works. Prof. Lenz's paper '' Ueber den friiheren Lauf des Amu-Daria, in Mem. Acad. Sc. St Petersburg, discusses valuable information borrowed from ancient sources, Mezhoff's Turkestanskiy Sbornik is a catalogue of the Central-Asian library at Tashkend, and his annual " Index" contains full classified lists of Russian geographical literature. Of works of a general

character, with descriptions of both regions (apart from travels), the following, arranged in chronological order, are worthy of mention :— Semenoff's "Tian-Shan," being vol. i. of Ritter's Asien (Russ. trans., 1856); Grigorieff's " East Turkestan," forining two vols. of Ritter's Asien (Russ. transl., 1869 and 1873); Syevertsoffs "Vertical and Hori- zontal Distribution of Mammalia in Turkestan," in Izvestia Lub. Est. of Moscow, 1873; Wenjukoffs Die Russisch-Asiatischen Grenzlande (trans. from Russian by Krahmer, Leipsic, 1874); Hellwald's Centralasien, 1875; Petzholdt's Umschau im Russ. Turk., 1877; Kuropatkin's Kashgaria, 1879 (partially translated into French); Kostenko's Turkestanskiy Krai, 3 vols., 1880, very copious translations from which are embodied in Lansdell's Central Asia, but unhappily too inti- mately combined with less useful information ; Schlagintweit's Reisen in Indien und Hochasien, vol. iii, Hast Turkestan; Prjevalsky's three journeys to Central Asia (the first two translated into English ; all three in German); Olga Fedtchenko's Albwm of Views of Russ. Turk., 1885; Nalivkin's History of the Khanate of Kokand (in Russ.), Kazan, 1885; Vambéry's Das Tiirkenvolk, 1885;

the physical geography and geology of West Turkestan. Prof. Grigorieff's addenda to Ritter's Asie embody the whole of the older and more modern

before had succeeded his father, first coined money and Found- caused the khutba, or public prayer for the reigning ing of monarch, to be read in his name—the two prerogatives of Ottoman

Roskoschny's Afghanistan u. angrenz. Lander (for Afghan Turk.); and Mushke- toffs Turkestan, vol. i. (in Russian), 1886. (P. Aw Ke)

Part I.—HiIstTory. OMEWHERE about the second decade of the 13th

Er-Togh-Shah, its hereditary chief.

rul,

century the little Turkish tribe which in due course was to found the Ottoman empire fled before the Mongols from its original home in Central

Asia, and, passing through Persia, entered Armenia, under the leadership of Suleyman His son, Er-Toghrul, who succeeded him as head of the tribe, when wandering about the country with his warriors came one day upon two armies engaged in a furious battle. Er-Toghrul at once rode to the assistance of the weaker party, who were on the point of giving way, but who through the timely aid thus rendered not only regained what they had lost but totally defeated their enemies. The army thus saved from destruction proved to be that of ‘Ald4-ud-Din, the Seljuk sultan of Asia Minor, and their adversaries to be a horde of marauding Mongols. By way of recompense for this service ‘Al4-ud-Din granted to Er-Toghrul a tract of land on the Byzantine frontier, including the towns of Sugut

an independent sovereign in the East—may be regarded as the birth-year of the Ottoman empire; and it was about this time that his followers and subjects began to call themselves ‘Osmanlis, or, as we might render it, ‘Osmanites. Having thoroughly established his authority in his capital of Yeni Shehr, ‘Osman began to wrest from the Greeks many of the neighbouring towns and strongholds, among others Ayina Gol and Koyun Hisdri, routing before the last named a large Byzantine army. He then turned his attention to the administration of his state, and such was the feeling of security he succeeded in establishing that large numbers of people from the surrounding districts flocked into his dominions and became his subjects. After six years of peace several of the Byzantine castellans of the neighbourhood, instigated by the governor of Brusa (Broussa), made a simultaneous attack upon the Ottomans, but “Osman totally defeated them and sent in pursuit Kara

‘Osmin, and Eski Shehr. ‘Osman, the son of Er-Toghrul and the | ‘Ali Alp, who took possession of all their domains. Ghazan, prince from whom the race derives its name of ‘Osmanli (see | the khan of the Mongols, who had entered into an alliance Turks, p. 661 below), corrupted by Europeans into Otto- | with the emperor of Constantinople, sent to all the Turkish man, was born in Sugut in 1258 (4.4. 656). While still | princes an arrogantly worded message forbidding them to young ‘Osman won from the Greeks Karaja Hisdr (Kara- | do any hurt to the Byzantine territories. To show how hissar) and some other towns, on which account he received | light he held this menace, ‘Osm4n assembled an army from his suzerain, the Seljuk sultan of

Konya (Konieh), the | forthwith, marched to Niceea and thence to the Bosphorus, title of beg or prince, along with the drum and the horse- | laying waste the country as he went and taking possession tail standard, the symbols of princely rank. of a number of towns and villages. Michael, called by Early In 1300 (699) the Seljuk empire (see Sztsuxs) fell to | the Turkish historians Késa Mikhal or Michael Scant- Turkish pieces under the onslaught of the Mongols, who were, how- | beard, the governor of one of these, embraced Isl4m and palities, ever, powerless to replace it by any government of their | became one of the most trusted officers of ‘Osman and

own. Thereupon ten separate Turkish dynasties arose from its ruins: that of Karasi sprang up in ancient Mysia, the houses of Saru Khan and Aydin in Lydia, of Mentesha in Caria, of Tekka in Lycia and Pamphylia, of Hamfd in Pisidia and Isauria, of Karaman in Lycaonia, of Kermiyan in Phrygia, of Kizil Ahmedli in Paphlagonia, and of ‘Osindn in Phrygia Epictetus. These principalities were all eventually merged in that of the ‘Osmanlis, once the least among them, and the inhabitants assumed the name of Ottoman. Hence by far the greater portion of the people called Ottomans owe their name to a series of political events. On the collapse of the Seljuk power the Greeks retained hardly any possessions in Asia except Bithynia and Trebizond. Armenia was abandoned for a time to roving Tatar or Turkman tribes, till some sixty or seventy years later one or two petty local dynasties sprang up and founded short-lived states.

The year 1301 (700), in which ‘Osman, who shortly

of his son and successor Orkhan. The descendants of this Michael were the hereditary commanders of the akinjis, a corps of light cavalry who played a great part in the early Ottoman wars. The first service on which Michael was employed was to destroy, along with Orkhan, a Mongol horde that had taken and pillaged the Ottoman town of Karaja Hisar. Meanwhile ‘Abd-ur-Rahman and Akcha Koja, two of “Osman’s generals, were adding to the Ottoman dominions in the north, capturing several towns and laying siege to the city of Nicwa. The Ottoman chiefs next resolved to acquire Brusa, the natural capital of these parts, So they built round it a series of towers, in which they placed garrisons, with the view of intercepting communications

and eventually starving the city into sub- mission. At length, in 1326 (726), after a desultory siege of eight years, the keys were, through the intervention of Mikhal, handed over to Orkhan, who was in command of the Ottomans, and the townspeople were allowed to ransom

ower,

Orkhan.

| Battle of Xosovo,

[HISTORY. |

themselves for 30,000 sequins. Very soon after this ‘Osman died, aged seventy, at Sugut, whence his remains were carried for burial to Brusa. ‘Osman was distinguished for piety and generosity as well as for equity and courage. He cared nothing for amassing wealth, and on his death his personal effects were found to consist of two or three suits of clothes, a few weapons, some horses, and a flock of sheep. And so high was his reputation for justice that, we are told, many of the Asiatic subjects of the Cesars fled to him for that protection which their own rulers would not or could not give them.

Orkhan, who succeeded his father ‘Osman, continued the war against the Greeks, taking from them Nicomedia, Nicea, and many of the towns which they still retained in Asia. Hitherto the Ottomans had not interfered with the other Turkish states; but now Orkhan, granting a short respite to the Byzantines, took advantage of a dis- pute regarding the succession to the throne of Karasi, entered that principality, and annexed it to his own dominions. To his son Suleyman the Ottomans owe their first establishment in Europe: one night that prince, accom- panied by a few companions, crossed the Hellespont on a raft and surprised the town of Galipoli (Gallipoli). The next day he brought over a number of Turkish troops, with whose assistance he possessed himself of many of the neighbouring towns and villages; but his career was cut short by a fatal fall from his horse when out hunting. Orkhan did not long survive his son, grief at whose un- timely end is said to have hastened his own death, in 1359 (761). This monarch is celebrated for the number of mosques, colleges, and other public institutions that he

founded. During his reign the Ottoman army was thoroughly organized, and a body of regular paid soldiers was raised, which formed the nucleus of the military power of the state, though the old irregular militia was still called out whenever a campaign was to be undertaken. The famous corps of the janissaries (Turkish yeni cher, i.c., ‘‘new troop”) was instituted at this time. It consisted of the children of Christian subjects, who were educated as Mussulmans and brought up to a military life.

Having taken the city of Angora from certain territorial lords who, incited by the prince of Karaman, had attacked the Ottoman dominions, Murad I., the son and successor of Orkhan, found himself free to extend his possessions across the Hellespont. He forthwith passed over into Europe, where he and his generals soon reduced almost all Roumelia, capturing Adrianople, Philippopolis, and many other places of importance. These successes alarmed the Christian princes, who determined to make a vigorous effort to drive the Turks back into Asia. The kings of Bosnia, Hungary, and Servia accordingly marched with a large army upon Adrianople, but were surprised during the night and completely defeated by an inferior Turkish force. Some time after this victory Murad returned to Asia, where he celebrated the wedding of his son Bayezid with the daughter of the prince of Kermiyan, a large portion of whose territory was made over to the ‘Osmanli monarch as the dower of the bride. Next year, when Murad set out to inspect his new possessions, he met the prince of Hamid, whom he constrained to sell all his dominions. The Karaman prince, ever the jealous rival of the Ottoman, now stirred up some of the Turkman tribes to ravage his enemy’s land; but Murdd was beforehand with him, and, entering his country, defeated him and annexed the district of Ak-Shehr to his own kingdom. The Bosnian and Bulgarian princes having allied themselves against the sultan, the Turkish commander in Europe invaded Bulgaria, which was speedily subdued and added to the Ottoman possessions. Murad next entered Servia and advanced to the plain of Kosovo, where he found awaiting him the

levies of Servia, Bosnia, Hungary, Albania, and Walachia. The Turks, though far inferior in number to their adver- saries, gained a complete victory, 1389 (791), but it was purchased with their sovereign's life. After the battle Murad was riding over the field with some of his people, when a wounded Servian, who was lying among the slain, sprang up and stabbed him so that he died almost im- mediately afterwards. In consequence of this battle Servia became subject to the Turk.

Bayezid I., surnamed Yildirim, "Thunderbolt," on account Bayezid

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of the fury of his attack and the rapidity of his movements, | received the oath of fealty on the battlefield of Kosovo. He did much to secure the position of the Ottomans, in Europe, taking many of the towns which still remained to the Christians in Roumelia. In Asia he annexed the remaining Turkish principalities, and pushed his conquests as far as Cesarea and Sivas. The Christians made another great effort to free themselves from their Eastern foes: whilst Bayezid was absent in Asia, the king of Hungary led a powerful army, in the ranks of which were many knights of France and Germany, into the Ottoman domin- ions and laid siege to Nicopolis. Bayezid sped to the

"rescue, and inflicted an overwhelming defeat on the Chris-

tians. He next turned his attention to Constantinople, the reduction and annexation of which he had long medi- tated, when he was summoned to meet Timur, the Tatar conqueror, who had invaded his Asiatic dominions and taken Sivas. The Ottoman and Tatar hosts encountered each other outside Angora, and there the former sustained their first disastrous overthrow, Bayezid being taken prisoner and his army practically annihilated. Next year, 1403 (805), he died in captivity ; the story of his having been imprisoned in an iron cage is not confirmed by the Turkish historians, and is most probably fictitious. After this victory Timur overran the Ottoman territories in Asia, taking and sacking Brusa, Nicwa, and many other cities. With a view to the complete annihilation of the 'Osmanli power, he restored the independence of the Turkish princi- palities which Bayezid had annexed, and placed them under the rule of their former emirs.

On the withdrawal of Timur from Asia Minor the four surviving sons of Bayezid fought for what was left of their father’s kingdom; after ten years of civil war success

finally rested with Muhammed, who alone of the four is Muham- The attention med I.

reckoned among the Ottoman sovereigns. of the new sultan, whom his people called Chelebi Muham- med or Muhammed the Debonair, was turned rather to the restoration of his father’s empire than to the conquest of neighbouring countries. In Europe he lived on amicable terms with the Byzantine emperor, and the Christian kings further north did not venture to make any serious attack upon him. But in Asia he had to contend with many enemies, the most formidable of whom was the emir of Karaman, who, having been defeated and made prisoner, was generously pardoned and restored to liberty. Another difficulty with which Muhammed had to deal was a strange religious outbreak: a vast number of fanatic dervishes, headed by an apostate Jew and a Turkish adventurer of low birth, rose in revolt, and were only dispersed after several bloody battles. This sultan, who was much be- loved by his subjects and is spoken of with praise by the Byzantine historians, was stricken with apoplexy while riding in Adrianople, and died almost immediately in the thirty-third year of his age, 1421 (824).

The first care of his son and successor Murad II. was Murda

to rid himself of a pretender to the throne who, aided by I. the Greek emperor, had made a descent upon the Asiatic shore of the Dardanelles. This adventurer was soon de- feated and pursued to Adrianople, where he was taken and hanged. In revenge for the assistance rendered to XXIII. — 81

Muham- med II.

Fall of Constan- tinople.

his enemy, the sultan invested Constantinople, but he was compelled to relinquish the siege in order to subdue a revolt headed by his brother, which had broken out in Asia. Murad again annexed all the Turkish principali- ties which had been restored by Timur, except those of Kizil Ahmedli and Karaman, which did not finally become incorporated with theeempire till the time of Muhammed II. The Turks were now called upon to face the most formidable Christian enemy they had yet encountered, namely Hunyady, the illegitimate son of Sigismund, king of Hungary. This famous general, after having inflicted several severe though not very important defeats upon his adversaries, invaded European Turkey with a large army of Hungarians, Poles, Servians, Bosnians, Walachians, and Frankish crusaders, the last-named being under the command of Cardinal Julian. The Ottoman army was utterly routed, Sophia taken, and the chain of the Balkans forced ; and Mur4d was compelled to sign a treaty for ten years, by which he resigned all claims to Servia and gave over Walachia to Hungary. Weary of the cares of state, and thinking that peace was, for a time at least, secured, Murd4d abdicated in favour of his young son Muhammed and sought a quiet retreat in the town of Magnesia. But he was not allowed to enjoy repose for long: the Chris- tian princes, incited by Cardinal Julian and in direct violation of the treaty, assembled their forces, and, under Hunyady as commander-in-chief, without declaring war, entered the Turkish dominions and took many of the Ottoman strongholds in Bulgaria. When the news reached MurAd he resumed the imperial power, put himself at the head of his troops, and advanced to meet the invaders, who had just captured Varna. Outside that town a great battle was fought, in which a copy of the violated treaty, raised high upon a lance, formed one of the standards of the Ottomans. The conflict, which was long and bloody, resulted in the total overthrow of the Christians, the Polish king, Ladislaus, and Cardinal Julian being among the slain, 1444 (848). Murad again abdicated and sought the retirement of Magnesia ; but once again he had to take up the reins of government. This time the janissaries and sipAhis, accustomed to the firm rule of the victor of Varna, had refused obedience to the young Muhammed. The sultan remained at the head of the state until his death, which occurred in 1451 (855).

Muhammed II., who now ascended the throne for the third time, determined to accomplish the long-cherished design of his house, and make

Constantinople the capital of the ‘Osm4nli empire. He easily found a pretext for declaring war against Constantine Paleologus and in the spring of 1453 (857) led an immense army to beleaguer the city. His troops covered the ground before the land- ward walls between the Sea of Marmora and the Golden Horn; but he found that even his monster cannon could do but little against the massive fortifications. At length he resolved to assail the city from its weakest side, that facing the Golden Horn. But the Greeks, having foreseen the likelihood of an attack from this quarter, had thrown a great chain across the entrance to the harbour, thereby blocking the passage against the hostile ships. The Ottomans, however, constructed a road of planks, five miles long, across the piece of ground between the Bosphorus, where their own fleet lay, and the upper part of the Golden Horn. Along this road they hauled a number of their galleys, with sails set to receive the aid of the favouring wind, and launched them safely in the harbour, whence they cannonaded with more effect the weaker defences of the city. This compelled the Greek emperor to withdraw a portion of his little garrison from the point where the more serious attack was being made, to repair the destruc- tion wrought in this new quarter. At dawn on May 29th

the Ottomans advanced to storm the city. The Christians offered a desperate resistance, but in vain. . The emperor died fighting in the forefront of the battle, and at noon Muhammed rode in triumph into his new capital and went straight to the cathedral of St Sophia; there, before the high altar, where the preceding night Constantine had received the Holy Sacrament, he prostrated himself in the Moslem act of worship. The capture of Constantinople is not the only exploit to which Muhammed owes his sur- name of Fatih, or the Conqueror: he also reduced Servia and Bosnia, overthrew and annexed the Greek empire of Trebizond and the Turkish principality of Karaman, acquired the suzerainty of the Crimea, and won many of the islands of the Greek Archipelago from the Venetians and Genoese. But before Belgrade, which he had besieged as the first step to an attack upon the northern kingdoms, he suffered a serious defeat, being

driven wounded from the field by Hunyady and John Capistran, with the loss of 300 cannon and 25,000 men. Rhodes, whither an Ottoman force was despatched, was the scene of another failure: here the Knights of St John gallantly and suc- cessfully withstood their Muhammedan foes, and compelled them to retire from the island. In Albania a long and, for a time, successful resistance was offered to the Turkish arms by the famous George Castriot, the Iskender Beg of the Turks. This chieftain had been in his youth in the service of Murad II., and was by him appointed governor of his native Albania, whereupon he revolted and tried to restore the independence of his country. Among the favourite designs of Muhammed were the subjugation of Italy and the establishment of the Mussulman dominion in the capital of Western Christendom. A Turkish army crossed the Adriatic and stormed the city of Otranto; but its further progress was stopped, and for ever, by the death of the Conqueror, which occurred a few months later, in 1481 (886). The Muhammedan soldiers besieged in Otranto, being unsupported from Turkey, were, after a long and brave defence, forced to surrender.

Bayezid II. was hardly seated on the throne before he Bayeaid was called upon to face a formidable revolt raised by his 1. younger brother Jem. This youthful pretender, who was both talented and high-spirited, was, after a number of adventures, finally compelled to fly the country. He sought the protection of the Knights of St John at Rhodes, who, however, retained him a prisoner, and made an arrangement with Bayezid whereby they received from that monarch a yearly sum of 45,000 ducats as the price of the compulsory detention of his brother. After thirteen years of captivity the unfortunate prince was murdered by Pope Alexander VI. (Borgia), who, it is said, received 300,000 ducats from the sultan as the reward of his crime. Though frequently compelled to engage in defensive wars, Bayezid was of a peace-loving and unambitious disposition, and a few towns in the Morea were all the additions made to the empire while he was on the throne. It was during his reign, however, that the Ottoman fleet began to be formidable to Christendom, the desperate battle off Sapienza, won by Kemal Re’is against the Venetians, being the first of the Turkish naval victories over the Mediterranean powers. Bayezid, whose pacific habits had alienated the sympathies of the janissaries, was in 1512 (918) forced by these dreaded guards to abdicate in favour of Selim, the youngest of his three sons. This

prince had already been in open revolt against his father; but his determined and warlike char- acter had won for him the esteem of the Turkish preetorians. Bayezid's health, which had long been failing, gave way under this blow; and the old sultan died three days after his deposition, at a little village on the way to Demitoka, whither he was going to end his life in retirement.

Selim I. was personally the greatest of the Ottoman

monarchs : his unflinching courage and tireless vigour were not more remarkable than his political sagacity and his literary and poetic talents; but so merciless was he that he has always been known in Turkish history as Yawuz Selim or Selim the Grim. Happily for Europe he turned his attention to the neighbouring Muhammedan states and left the Christian powers in peace. Having caused both his brothers to be put to death, he marched against Persia, the king of which country had given refuge to the family of one of the hapless Turkish princes. The quarrel between them was further embittered by religious hatred: the shah of Persia was the pillar of the Shi'ites, as the Ottoman sultan was of the Sunnites. Selim in his fanatical zeal had ordered a massacre of his Shf'ite subjects, in which forty-five thousand persons suffered death. The shah was eager to avenge the slaughter of his co-religionists. The janissaries showed signs of insubordination upon the march, but Selim resolutely maintained order and reduced them to submission. At length they came upon the Persian host drawn out on the plain of Chaldiran, where a great battle was fought, which ended in the rout of the Persians and left the way to Tabriz, the residence of the Persian king, open to the sultan. Thither Selim proceeded; but eight days later he set out on his homeward march. The battle of Chaldiran brought no addition of importance to the empire; but the districts of Diydér-Bekr (Diarbekr) and Kurdistan, through which the army had passed on the way to Persia, were completely subdued and annexed to the Ottoman dominions. Selim's next important campaign was against the Memluks of Egypt. This body of Eastern chivalry offered a most gallant resistance to the 'Osmanlis ; but, possessing no artillery, which they disdained as un-

becoming men of valour, they were defeated in a series of engagements, and Selim and his army entered Cairo as conquerors in 1517 (923). The results of this war were momentous and far-reaching: the Ottoman empire was greatly increased by the addition of Egypt, Syria, and the Hejaz, of all of which the Memluks had been lords; the ealiphate of Islam was won for the house of ‘Osman, Selim constraining the representative of the old ‘Abbasid family, who resided, a purely spiritual prince, at Cairo, to make over to him and his heirs the rights and privileges of the successors of the Prophet. The sultan at the same time acquired from him the sacred banner and other relics of the founder of Islam, which had been handed down to the Arabian prince from his fathers, and which are now pre- served in the seraglio at Constantinople. On his return Selim set himself to strengthen and improve his fleet, doubtless with a view to the conquest of Rhodes. He died, however, in 1520 (926), before his extensive prepara- tions were completed. This sultan reigned only eight years, but in that short time he almost doubled the extent of the Ottoman empire.

Suleyman I., who succeeded his father Selim as sultan, had not been long on the throne before he found himself involved in a war with the king of Hungary. He marched northwards with a powerful army and wrested from the enemy several places of importance, including the strongly fortified city of Belgrade. Having left a large garrison in this city, which was regarded as the key to the Chris- tian lands north of the Danube, the sultan returned to Constantinople, where he continued his father’s work of creating a strong and efficient Ottoman fleet. When all was ready Suleyman set out for Rhodes, determined to

- wipe away the disgrace of his ancestor’s second failure, as

he had done that of his first. The conquest of Egypt had, moreover, rendered the possession of Rhodes necessary to the Turks, as the passage between Constantinople and their new acquisition could never be safe so long as that island remained in hostile hands. The Knights of St

John met the attack in a manner worthy of their illustri- ous order ; but the overwhelming force of the Ottomans and the hopelessness of any relief compelled them to accept the sultan's terms. These were highly honourable to the de- fenders, who were permitted to retire unmolested, while Suleyman pledged himself to respect the Christian religion in the island, which now, 1522 (929), became his. Four years after the conquest of Rhodes the sultan again invaded Hungary, where in the renowned battle of Mohacz he annihilated the army of the Magyars and slew their king. Thence he marched along the Danube to Buda- Pesth, which opened its gates to him, and there he rested a little while before starting on his homeward way. The disturbed state of Asia Minor hastened Suleyman's depart- ure ; but in three years (1529) he was back at Buda, osten- sibly as the ally of Zapolya, an Hungarian who claimed the throne left vacant by Louis, who fell at Mohacz. Ferdinand of Austria had opposed the claim of Zapolya, who thereon had applied to the sultan for aid, which that monarch was most willing to accord. The troops of Ferdinand being driven from Buda, Suleyman, accom- panied by his protégé, advanced upon Vienna. On 27th September 1529 the vast Turkish host, under the personal command of one of the greatest of the family of 'Osman, laid siege to the capital of the German empire, and on the 14th of the following month, after a most desperate assault carried on for four days, the invaders were compelled to retire, leaving the city in the possession of its heroic defenders. The torrent of Turkish military might had now reached its northern limit : once again it vainly swept round the walls of Vienna, but further it never went. Suleymén next directed his arms against Persia, from which country he won a large portion of Armenia and 'Irak as well as Baghdad, the old capital of the 'Abbasid caliphs. In 1542 he was again in Hungary, having been appealed to by the widow of Zapolya on behalf of her infant son against the pretensions of Ferdinand. Suleyman promised to place the child upon the throne when he should be of a proper age; in the meantime he treated Hungary as an Ottoman province, dividing it into sanjaks or military dis- tricts, and garrisoning Buda and other important cities with Turkish troops. Six years later a truce for five years was concluded between the sultan and Ferdinand, whereby almost all Hungary and Transylvania were made over to the former, who was also to receive a yearly present, or more correctly tribute, of thirty thousand ducats. The Turks, now at the zenith of their

power, were the terror of all around them. The achievements of the Ottoman navy

during the reign of Suleyman were hardly, if at all, less Annexa- Khayr-ud-Din, the tion of

remarkable than those of the army. Barbarossa of the Europeans, won Algiers for Turkey, and

held the Mediterranean against the fleets of Spain and py ip0}j,

Italy ; Torghud added Tripoli to the empire; and Piydla routed the galleys of Genoa, Florence, Naples, and Malta off the isle of Jerba. But fortune did not always smile upon the crescent. In 1565 (973) Suleyman sustained the second great check he was destined to encounter. The Turks once more measured swords with the Knights of St John and drove them from Malta, which had been given to the order by Charles V. on its expulsion from Rhodes. A powerful Turkish army and fleet, commanded by officers of renown, were accordingly despatched to win Malta for the Ottoman crown ; but so valiantly was it defended that the Turks were forced to withdraw with a loss of twenty- five thousand men. Suleyman died in harness. In 1566 (974), when seventy-six years of age, he entered Hungary for the last time, summoned thither to aid his vassal, young Sigismund Zapolya. Sziget, a place which had foiled the Turks on previous occasions, was the first object of attack. Count Zrinyi, the governor, determined to resist to the last,

Selim Il.

Murad Il.

so the Ottomans found themselves compelled to undertake the siege of this comparatively unimportant town. There on the night of 4th September the great sultan died, and a few hours later Count Zrinyi and his brave companions perished amid the smoking ruins of the fortress they had most nobly held. Under Suleyman I., whom European historians call the Magnificent, but whom his own people style Kanuni or the Lawgiver, the

Turkish empire attained the summit of its power and glory. The two great dis- asters, at Vienna and Malta, were eclipsed by the number and brilliancy of the sultan's victories, by which large and important additions were made to the empire in Europe, Asia, and Africa.

Selim II., the unworthy son and successor of the Magni- ficent Suleyman, was the first Ottoman monarch who shrank from leading his army in person. He was a man of mean and ignoble character, whose sole pleasure seems to have consisted in the indulgence of his degraded tastes and vicious appetites. The first conflict between the Turks and the Russians occurred in his reign. In view of a threatened war with Persia, the grand vizier Sokolli con- ceived the idea of uniting the rivers Don and Volga by a canal, by means of which an Ottoman fleet could be sent into the Caspian. But in order to carry out this scheme it was necessary that the town of Astrakhan should be in the hands of the Turks. A considerable force was accord- ingly despatched from Constantinople to take possession of that city; but the Russian army which Ivan the Terrible sent to its relief drove back the Turks and their Tatar allies from before the walls, 1569 (977). Cyprus was the next object of attack. This island, which belonged to Venice, was assailed and taken, though not without heavy loss, at a time of peace between the republic and the Porte, 1570-71 (978). The Christian powers of the Mediterranean were roused and alarmed by this act of treachery, and a maritime league was formed through the efforts of Pope Pius V., with Spain, Venice, and Malta for its most important members. On 7th October 1571 the Christian fleet, under the command of Don John of Austria, encountered the Ottoman ships, led by the galley of the kapudan pasha, Mu'ezzin-zdda 'Ali, just outside the Gulf of Lepanto. A furious conflict ensued, which resulted in the utter defeat of the Turks, their admiral being killed and their fleet almost annihilated. This famous fight, although it brought little immediate material advantage to the victors, was of the highest moral value to them ; for it broke the spell of Barbarossa, and showed that the Ottoman was no longer invincible on the seas. The only other event of importance during this reign was the final conquest of Tunis for Turkey by Kilij 'Alf, who won it from the Spaniards in 1574 (982). Selim IT. died miser- ably the same year.

Murad III., who now succeeded to the Ottoman throne, was no improvement upon his father; he ruled in name only, all real power being in the hands of worthless favour- ites. As a natural consequence the empire began rapidly to decay ; corruption infected all ranks of official society, the sultan himself selling his favours for bribes; while the other great curse of old Turkey, military insubordina- tion, showed itself in a more threatening aspect than ever. The janissaries mutinied on several occasions, and each time compelled the weak Murad to accede to their demand. Notwithstanding this wretched state of affairs, some exten- sive and important, though not permanent, additions were made to the empire. These, consisting of Azerbijan and Georgia—the latter had been in alliance with Persia—were the result of a campaign against the last-named country, the internal condition of which was then even worse than that of Turkey. Transylvania, Moldavia, and Walachia rose in revolt, encouraged by the war which broke out in

KEY

1593 between Turkey and Austria. In 1594 hostilities with Persia were resumed; and early in the following year Murad died, leaving the empire to his eldest son Muhammed III.

[HISTORY,

Things had been going very badly in the war with Muham-

Austria, when in June 1596 the grand vizier and the muftt, joining their voices with that of Sa‘d-ud-Din the historian, prevailed upon the new sultan, whose character resembled only too closely that of his father, to place himself at the head of the Ottoman army which was about to march into Hungary. Four months later Muhammed met the imperi- alists under the archduke Maximilian, and the Transyl- vanians led by Prince Sigismund, on the marshy plain of Keresztes, where a battle lasting three days took place. Although at one time things looked so hopeless for the Turks that the sultan would have fled but for the entreaties and remonstrances of Sa‘d-ud-Din, the ‘Osmanlis gained a complete and decisive victory. But nothing came of it; for Muhammed, instead of following up his success, hastened back to Constantinople to receive the

congratu- lations of his courtiers and to resume his indolent and voluptuous life. Nothing else worthy of note occurred during his inglorious reign. He died in 1603 (1012).

Muhammed III. was the last heir to the Ottoman throne who was entrusted with the government of a pro- vince during his father's lifetime ; henceforth all the sons of the sultan were kept secluded in a pavilion called the Kafes or cage in the seraglio gardens. This new system, which was necessarily very prejudicial to the character of the future rulers, had its origin in the same dread of rivals that caused a sultan in those times to put all his brothers to death immediately on his accession.

The reign of Ahmed I. is not marked by any event of Ahmed],

importance. The peace of Sitavorok (Zsitvatorok) between Turkey and Austria, 1606 (1015), made no change of any moment in the territorial possessions of either power, but is interesting as being the first treaty in which an Ottoman sultan condescended to meet a Christian prince on a footing of equality. Hitherto the Turkish monarchs had affected to grant merely short truces to their European enemies. But this peace was to be permanent ; the annual payment or tribute of thirty thousand ducats by Austria was to be discontinued ; and the ambassadors sent from the Porte were now to be officials of rank, and not, as formerly, menials of the palace or camp.

Ahmed died in 1617 (1026) and was succeeded by his Mustafa

brother Mustafa I. Up till this time the succession had I. been regularly from father to son; but, as Mustafa's life had been spared by his brother on his accession, that prince now ascended the throne in preference to 'Osman, the eldest son of Ahmed I. This arose from the peculiar nature of the Turkish law of succession, which gives the throne to the eldest male relative of the deceased sovereign. Mustafa was, however, imbecile ; so after a reign of three nionths he was deposed, and his nephew 'Osman, though only fourteen years of age, seated on the throne in his stead.

An unsuccessful war with Persia, which had been going 'Osman

on for some time, was now brought to an end by a treaty 1. which restored to the shah all the territories conquered since the days of Selfm II. In 1621 the sultan led his troops against Poland, partially with the view of weakening the janissaries, whom he justly regarded as the most deadly enemies of his empire. This expedition was not attended by any important results, neither Turks nor Poles gaining a decisive advantage. On his return “Osman formed another plan for freeing himself from his tyranni- cal soldiery: he gave out that he was going to make the pilgrimage to Mecca, but his real intention was to proceed only as far as Damascus, there place himself at the head

Murad IV.

Ibrahim.

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of an Asiatic army, and march against the janissaries and sip4his in Constantinople. But the janissaries heard of this design and rose in revolt. Incited by a vizier whom ‘Osmdn had deposed, they seized their sovereign and dragged him to the state prison of the Seven Towers, where shortly afterwards he was foully murdered by the traitor minister, 1622 (1031).

The wretched Mustafa was again raised to the throne, only to be deposed fifteen months afterwards in favour of Murad, the eldest surviving brother of ‘Osman.

In Murad IV., who succeeded to the supreme power in 1623 (1032), when a child of eleven years, Turkey had once more a sultan of the old ‘Osmanhi type. Since the death of Suleyman the empire had been cursed with a succession of rots fainéants, under whom it had rapidly fallen to decay. The vigour and courage of the new sultan stayed it for a while upon its downward course, and re- stored to it something of its bygone glory. While still quite young, Murd4d had been compelled by the mutinous janissaries to deliver into their cruel hands his favourite vizier, Hafiz Pasha. This embittered him against that corps, and, when soon afterwards the soldiers began openly to discuss his deposition, Murdd swiftly and suddenly cut off the ringleaders and all others whom he suspected of disloyalty ; this struck fear into the hearts of the dis- affected soldiers, who, finding themselves without any to organize or direct them, returned to their allegiance. Murad next turned his attention to checking the intoler- able corruption and abuses which pervaded every depart- ment of the state. He had but one simple though terribly drastic method of reform,—the execution of every official wliom he even suspected of any malpractice. Having re- stored some sort of order in his capital, Murdd marched against Persia and recaptured the city and district of Erivan. In 1638 (1048) he undertook a second and more important campaign against the same power. His object was the recovery of Baghdad, which had been taken by the shah’s troops some sixteen years before. The Persians resisted long and gallantly, but at length the Turks carried the city by storm, when Murad disgraced himself by the slaughter of a vast number of the inhabitants. By the peace which followed Turkey restored Erivan to Persia, but retained Baghdad, which has been in its hands ever since. Murdd on his return entered Constantinople in triumph. This sultan died in 1640 (1049); his death is said to have been hastened by habits of intemperance, which he had contracted towards the close of his life.

Ibrahim, the brother of the late sultan, now mounted the Ottoman throne. He was another of those wretched princes who gave themselves up to the indulgence of their own follies and vices without bestowing a thought upon the welfare of their people or the prosperity of their country. All the evils that had been curbed for a time by the stern hand of Murad broke out afresh and in worse form than before. The sultan himself was the most venal of the venal. Shut up in the seraglio, he thought of nothing but the gratification of

his own and his favourites' caprices ; gem-encrusted coaches and pleasure-boats, and carpets and hangings of richest sable for his rooms, were among the objects for which he plundered his people and sold every office to the highest bidder. This went on for eight years, till at length his subjects, weary of his ex- actions and tyranny, deposed him, and made his son Muhammed, then only seven years of age, sultan in his room. The only events of note that occurred during Ibrahim's tenure of power are the capture of Azoff from the Cossacks and the occupation of Crete. This island, which was then in the hands of Venice, was soon overrun, but it was not till well on in the next reign, after a siege of twenty years, that the Ottomans succeeded in taking Candia the capital.

1566-1687,]

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The minority of Muhammed IV., who became sultan in Muham- 1648
(1058), was marked by all the troubles and evils that med IV.

might have been anticipatéd, until the grand vizierate was conferred on Képrili Muhammed in 1656 (1067). This statesman, who was seventy years old when he entered upon the duties of prime minister of Turkey, was the founder of an illustrious family of viziers, whose integrity and strength of character did much to counteract the per- nicious influence of degenerate sultans and to prop up for a season the declining empire. Old Képrili accepted the office of grand vizier only upon condition of receiving absolute power ; this he employed much in the same way as Murad IV. had done when he set about the work of reform: he executed every one who fell under his suspicion. He died in 1661 (1072), leaving the vizierate to his son Fazil Ahmed. Ahmed was, like his father, a man of great ability, and happily for Turkey he enjoyed the complete confidence of the young sultan, who cared for nothing but the chase, whence he is called in the Ottoman histories Avji Muhammed or Muhammed the Huntsman. Before long Ahmed was called on to lead the Turkish army against Austria. He took Neuhiiusel and several places of little importance ; but near the convent of St Gotthard (on the Raab) he was completely defeated in 1664 (1075) by a smaller Christian force under Montecuculi. A truce for twenty years on the basis of the treaty of Sitavorok was the result of this battle ; the Ottomans,

however, re- tained Neuhausel. Ahmed next appeared in arms in Crete, for the purpose of bringing to a close the siege of Candia, which had been going on ever since 1648; but it was not till other three years had passed that the brave garrison opened the gates to the grand vizier, in 1669 (1079). The sultan himself was induced to head the next campaign, which was undertaken on behalf of the Cossacks of the Ukraine, who had craved the protection of the Porte against Poland. The Turks took the cities of Kamenetz and Lemberg, whereupon King Michael sued for peace, 1672 (1083), and promised to make over Podolia and the Ukraine to Turkey and to pay an annual tribute of 220,000 ducats. The sultan accepted these terms and returned home in triumph ; but the Poles refused to be bound by them, and under the command of Sobieski they attacked and defeated the troops of Ahmed Pasha. The war lasted till 1676, when it was brought to an end by the treaty of Zurawno, which left the sultan in possession of Podolia and almost all the Ukraine. Three days after this peace was signed Ahmed Pasha died. Few men have done more to ruin their country than Kara Mustafa, who succeeded Ahmed in the grand vizierate. His pet scheme was the conquest of Germany and the establishment of a great Turkish province between the Danube and the Rhine, with himself as nominal viceroy but virtual sovereign. He

accordingly marched with an enormous army, probably not Siege of In the Vienna.

far off half a million strong, against Vienna. summer of 1683 (1094) this mighty host appeared before the walls of the Austrian capital. For an account of the siege, see vol. xix. p. 296. A few weeks after his discom- fiture Kara Mustafa was executed at Belgrade by the sultan’s orders. Venice and Russia now declared war against Turkey; misfortune followed misfortune ; city after city was rent away from the empire; the Austrians were in possession of almost the whole of Hungary, the Italians of almost all the Morea. At length a severe defeat at Mohacz, where Suleyman had triumphed years before, exhausted the patience of the soldiery, and Muhammed TV. was deposed in 1687 (1099).

The first year of the reign of Suleyman II., who suc- Suley- ceeded his brother, was marked by a serious mutiny of the ™én IL

janissaries of the capital, who, aided by the dregs of the population, created a reign of terror in Constantinople,

Ahmed II.

Mustafa Il.

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during which they pillaged the palaces of the principal officers of the government and murdered the grand vizier, along with many of the members of his household. The Austrians, under Charles of Lorraine, Louis of Baden, and Prince Eugene, were carrying all before them in the north : Erlau, Belgrade, and Stuhlweissenburg fell into their hands; and by the end of 1689 the Ottomans had lost almost all their former possessions beyond the Danube. Meanwhile the Venetian leader, Morosini, was equally successful in the Morea, completing the conquest of that province, which he added to the dominions of St Mark. When matters had come to this pass, the sultan summoned an extraordinary meeting of the divan to consult on the measures to be taken to meet the danger threatening on every hand. By the unanimous advice of his ministers, Suleyman appointed to the grand vizierate Képrili-zada Mustafa, another son of old Képrili Muhammed. This statesman, who had been trained in the duties of office under his father and brother, worthily upheld the high name of his house. He gave up the whole of his gold and silver plate to be coined into money wherewith to pay the troops; he sought out the best men to fill positions of trust and responsibility in the army and navy; and he exercised and encouraged a wise and just policy of toleration towards the Christian subjects of the sultan. Such was the confidence which his high character and illustrious connexion inspired that large numbers of volunteers hastened to join the Turkish hosts ; and in a very few weeks from the time when he took com- mand of the army Mustafa had driven the Austrians out of Servia, and Belgrade once more received a garrison of Ottoman troops. Mustafa returned in triumph to Con- stantinople, where, early in the summer of 1691 (1102), Suleyman IIL. died, and was succeeded on the throne by his brother Ahmed II.

The most important event which occurred during the brief and disastrous reign of this monarch was the defeat and death at Slankamen (Szlankament)

of K6prili-zada Mustafa, who in August 1691 advanced from Belgrade to attack the Austrians under Louis of Baden. The un- fortunate result of the battle was in great measure owing to the rashness of the vizier, who, in opposition to the advice of the oldest and most experienced of his officers, refused to await behind the lines the attack of the enemy. The Ottomans fought with desperate courage ; but the day was decided against them by the death of Mustafa, who was shot while cutting his way through the Christian ranks. Ahmed II. reigned for four years, during which the hapless empire, besides continuing to suffer defeat at the hands of foreign foes, was visited with the curses of pestilence and domestic insurrection.

On the death of Ahmed II. in the year 1695 (1106) Mustafa IL, son of Muhammed IV., was girt with the sword of ‘Osman. The new sultan, aware of the pitiful condition to which the empire had sunk, in part, at least, through the negligence and indifference of his pre- decessors, resolved to restore the old Ottoman usages, and placed himself at the head of his armies. His first cam- paign was altogether successful: he recaptured several important fortresses and totally defeated a great Austrian army. During the following winter he worked hard to repair the finances and bring the forces of the empire into a higher state of efficiency ; and, when he set out in the spring against the Austrians, fortune continued to smile upon his banners. He defeated the duke of Saxe, raised the siege of Temesvar, and strengthened the garri- sons of those fortresses which Turkey still held in Hungary. But in the next year, 1697, all was changed : Prince Eugene was at the head of the Austrians, and on the banks of the Theiss, near Zenta, the Turks sustained an overwhelming defeat, which compelled the sultan to

retreat to Temesvar. ‘Thence he returned to Constanti- nople, and never again led an army against the enemy. Recourse was once more had to the house of K6prili, and Amuja-zida Huseyn, a nephew of old K6prili Muhammed, was promoted to the grand vizierate. Huseyn raised fresh troops ; but he saw that what was really needful was peace, and this he succeeded in bringing about.

on the one hand and Austria, Venice, Russia, and Poland on the other. The basis of the treaty, agreed to with certain modifications, was that each power should retain the territories in its possession at the time of opening negotiations. This arrangement left Austria in possession of Transylvania and almost all Hungary and Slavonia ; Venice remained mistress of its conquests in Dalmatia and the Morea; Poland received Podolia; and Russia, which under Peter the Great was only now becoming con- scious of its strength, retained Azoff, which it had wrested from Turkey three years before. Huseyn Pasha took advantage of the restoration of peace to check the disorders which had sprung up in various parts of the empire, and to endeavour to effect much-needed reforms in many de- partments of the state. But unfortunately his efforts were thwarted by others less disinterested than himself; and, broken-hearted by the calamities of his country, he retired from office three years after the peace of Carlowitz, and very shortly afterwards died. Mustafa II. very soon followed the example of his minister, and abdicated in 1703 (1115) in favour of his brother Ahmed III.

Although the peace of the empire was often broken Ahmed during his reign, Ahmed III. was not of a warlike disposi- UL

tion, and all the representations and entreaties of Charles XII. of Sweden, who after the disaster of Pultowa had taken refuge in Turkey, failed to induce him to re-open hostilities with the czar. In 1710 Nu‘man Pasha, son of Amuja-zida Huseyn, and the last of the Képrili family, was appointed grand vizier. Though able and tolerant, he was so much addicted to interfering in the business of his sub- ordinates that he became the object of general dislike, and was dismissed from his office after holding it for four- teen months. The menacing preparations of Russia in the south had more influence with the Porte than the prayers of the Swedish king, and in 1711 the new grand vizier, Baltaji Muhammed, marched into Moldavia to meet the forces of Peter the Great, who had formed an entrenched camp near the village of Hush, on the right bank of the Pruth. Here the vizier blockaded him, and after two days’ severe fighting compelled him to surrender with all his army. By the treaty which followed the czar pledged himself, among other things, to restore the fortress of Azoff and all its dependencies to the sultan, and to grant the king of Sweden a free and safe passage to his own

country through the Muscovite dominions. The lenity of Baltaji Muhammed in not destroying the czar and his army when they were within his grasp caused such discontent at Con- stantinople that he was dismissed from the vizierate, which was conferred on ‘Alf Pasha, known as Damad ‘Alf or ‘Ali the Son-in-Law, from the circumstance of his having married a daughter of the sultan. This vizier distinguished himself by winning back from Venice the whole of the Morea in a single campaign (1715). His next venture, a war against Austria, undertaken in the following year, had a very different issue, he himself being slain and his army routed in a great battle at Peterwardein. Next year Prince Eugene, the conqueror of Damdd ‘Alf, laid siege to Belgrade, which he forced to capitulate after driving off a large army sent by the Turks to its relief.

acquired that portion of Hungary which had remained in ™’

At Carlowitz Peace of on 26th January 1699 a peace was arranged, through the Carlo- intervention of England and Holland, between Turkey “

These events Treaty of – led to the peace of Passarowitz in 1718, by which Austria Passat

‘Mahmud I,

Wars with Russia.

1687-1791.]

the possession of Turkey, as well as extensive territories in Servia and Walachia. The grand vizier Ibrdhim, another son-in-law of the sultan, who was at the head of affairs from 1718 to 1730, contrived to secure for the empire an un- usually long respite from internal disorders ; but the sultan’s love of costly pomp and splendour and the luxurious magni- ficence of his court rendered him so unpopular that, in consequence of a riot in the autumn of 1730 (1143), he voluntarily abdicated the throne, and his nephew Mahmud I. became padishah in his stead. (z. J. W. G.)

LMistory from 1718.

With the treaty of Passarowitz the Venetian republic disappears from the scene of Turkish warfare. Russia gradually becomes a more formidable enemy than Austria ; and the subject Christian races imperceptibly enter on the first stages of national consolidation and revival. After the long and resultless war with Persia hostilities again broke out with Russia in 1736. Marshal Miinnich stormed the lines of Perekop and devastated the Crimea; but he was unable to maintain his army there and retreated with greatly diminished forces. Azoff was taken by General Lascy ; and in the following year Otchakoff fell into the hands of Miinnich, while the Crimea was again invaded and ravaged. Austria now joined Russia, and the Porte had to sustain a war in Servia and Bosnia as well as on the coasts of the Black Sea. The double combat was carried on with very different results. While the Russians won victory after victory, and finally penetrated into the heart of Moldavia, the Austrians were defeated and driven across the Danube. On their advancing from Belgrade in the summer of 1739 they were defeated with great loss at Krotzka, and compelled to sue for peace. The treaty of Belgrade, which was signed on lst September 1739, restored to the Porte Belgrade and Orsova, with the portions of Servia, Bosnia, and Walachia which it had ceded to Austria at the peace of Passarowitz. Russia, unable to continue the war with a victorious Turkish army ready to fall upon its flank, had to conclude peace on very moderate terms. It received Azoff, but under a stipulation that the fortifications should be razed, and that no Russian vessels of war should be kept either on the Black Sea or on the Sea of Azoff. The peace was the last advantageous one made by the Porte without allies; and the succeeding thirty years were on the whole a period of respite from misfortune.

After this followed the wars with the empress Catherine, before whose genius and resources it seemed as if Turkey must inevitably sink into nothingness. The first contest was provoked by the arnied intervention of the empress in Polish affairs and her well-known intrigues with rebellious subjects of the Porte. War was rashly declared by Mustafa III. in October 1768. In 1769 the Russians entered Moldavia and captured the fortress of Choczin (Chotim) ; in the following year their armies made good the conquest of Moldavia and Walachia, while a fleet from the Baltic entered the Greek Archipelago and landed troops in the Morea. The Greeks of the Morea rose in insurrection ; they were, however, overpowered, and the

small Russian force withdrew, leaving the Greeks to the vengeance of their conquerors. At sea the Turks suffered a severe defeat near Chios, and their fleet was subsequently blockaded and set on fire in the Bay of Tchesme, the principal officers in the Russian navy being Englishmen. Assistance was, moreover, given by the Russians to Ali Bey, a Mameluke chieftain who was in rebellion against the Porte in Egypt, and to Tahir, a sheikh who had made himself independent at Acre. In 1771 the Russians invaded and conquered the Crimea. Austria now took alarm, and signed a con- vention with the Porte preparatory to armed intervention.

But the partition of Poland reunited the three neighbour- ing Christian powers and prevented a general war. An armistice was agreed upon between Russia and the Porte, and negotiations followed. These were broken off in 1773. The Russians crossed the Danube, and, though unsuccess- ful in their attempts upon Silistria and Varna, so com- pletely defeated the Turkish forces in the field that on 21st July 1774 the Porte concluded peace at Kutchuk- Kainardji under conditions more unfavourable than those which it had rejected in the previous year. The Tartar territory of the Crimea, with Kuban and the adjoining districts, was made into an independent state, Russia retaining Azoff, Kertch, and Kinburn. Moldavia and Walachia were restored, but on the condition that, as occasion might require, the Russian minister at Constan- tinople might remonstrate in their favour. Russia, in fact, was given a species of protectorate over these provinces. Permission was given to Russia to erect a church in Con- stantinople, and the following engagement was made: “The Porte promises to protect the Christian religion and its churches; and it also allows the court of Russia to make upon all occasions representations as well in favour of the new church at Constantinople as on behalf of its ministers, promising to take such representations into con- sideration.” Out of this clause arose the claim of Russia to the right of protection over all the Christian subjects of the Porte, though the specific right of intervention was clearly attached only to a single church and its ministers. By other clauses in the treaty the obligations restraining Russia from making fortifications and placing ships

of war on the Black Sea were annulled. It received the right of free navigation for its merchant ships on all Turkish waters, and the right of placing consuls at all Turkish ports. These last two conditions were of great historical importance through their effect upon Greece. The consuls appointed were usually Greek traders, and permission to carry the Russian flag was indiscriminately given to Greek vessels. Hence there followed that great development of Greek commerce, and of the Greek merchant navy, which in half a century made the insurgent Greeks more than a match for the Turks at sea.

The stipulation that the Crimea and adjoining districts should be made into an independent state was of course not intended by Russia to be anything more than a veil for annexation ; and in 1783 Catherine united this territory to her dominions. She had now definitely formed the plan of extinguishing Turkish sovereignty in Europe and placing her younger grandson on the throne of a restored Greek kingdom. The boy was named Constantine; his whole education was Greek and such as to fit him for the throne of Constantinople.

besieged Otchakoff, Joseph invaded Bosnia; but he was unsuccessful and retired ingloriously into Hungary. Otcha- koff was stormed by Suwaroff on 16th December 1788. In the following year the Turkish armies were overthrown by Suwaroff in Moldavia and by the Austrian Laudon on the south of the Danube. The fate of the Ottoman empire seemed to tremble in the balance; it was, how- ever, saved by the convulsions into which Joseph’s reckless autocracy had thrown his own dominions, and by the triple alliance of England, Prussia, and Holland, now formed by Pitt for the preservation of the balance of power in Europe. Joseph died in 1790; his successor Leopold II. entered into negotiations, and concluded peace at Sistova in August 1791, relinquishing all his conquests except a small district in Croatia. Catherine continued the war alone. Ismail was captured by Suwaroff with fearful slaughter, and the Russian armies pushed on south of the Danube. Pitt, with

Joseph IT. of Austria threw himself War with eagerly into the plan for a partition of the Ottoman empire, Russia and in 1788 followed Russia into war. While the Russians 224

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the triple alliance, attempted to impose his mediation on the empress Catherine, and to induce her to restore all her conquests. She refused, and both Prussia and Eng- land armed for war ; but public opinion declared so strongly against the minister in England that it was impossible for him to pursue his plan. Catherine nevertheless found it in her interest to terminate the war with the Porte. Poland claimed her immediate attention; and, adjourning to a inore convenient season her designs upon Constantinople, she concluded the treaty of Jassy in January 1792, by which she added to her empire Otchakoff, with the sea- board as far as the Dniester. The protectorate of Russia over Tiflis and Kartalinia was recognized.

Catherine's successor Paul (1796-1801) made it his business to reverse his mother's policy by abandoning the attack on Turkey. Bonaparte's invasion of Egypt and

in Evypt the destruction of the French fleet by Nelson at the battle

and Syria.

Internal condi- , tion of empire.

of the Nile led the Porte to join the second coalition against France. Bonaparte, invading Syria, was checked and turned back at Acre, where Jezzar Pasha was assisted in his strenuous defence by an English squadron under Sir Sidney Smith. A Turkish army was meanwhile trans- ported from Rhodes to the Egyptian coast. This army was destroyed by Bonaparte on his return to Egypt at the battle of Aboukir on 25th July 1799, after which Bona- parte set sail for France, leaving the Egyptian command to Kléber. Kléber, cut off from all communication with France and threatened by superior Turkish forces, entered into a convention at El Arish for the evacuation of Egypt. This convention, however, was annulled by Lord Keith, the English admiral, and Kléber replied by giving battle to the Turks and defeating them at Heliopolis on 20th March 1800. Egypt was finally wrested from the French by the English expedition under Abercromby, and

restored to the sultan. The Ionian Islands, which France had taken from Venice at the time of the treaty of Campo Formio, were conquered by a combined Russian and Turkish force, and were established as a republic, at first under the joint protectorate of Russia and the Porte, afterwards under the sole protectorate of Russia. The former Venetian ports on the mainland of Epirus and Albania were given up to Turkey. Somewhat later, under pressure from St Peters- burg, the sultan undertook not to remove the hospodars, or governors, of Walachia and Moldavia without consult- ing Russia, and to allow no Turks except merchants and traders to enter those territories.

On the restoration of peace France reassumed its ancient position as the friend and ally of the Porte. The sultan now on the throne was Selim III. (1789-1807). Though the results of the war of the second coalition had been favourable to Turkey, the Ottoman empire was in a most perilous condition. were making themselves independent of the sultan’s author- ity ; a new fanatical sect, the Wahhabees, had arisen in Arabia and seized upon the holy places; the janissaries were rebellious and more formidable to their sovereign than to a foreign enemy; and the Christian races were beginning to aspire to independence. It had seemed for a while as if the first to rise against the Porte would be the Greeks, among whom the revolutionary influences of 1789 and the songs of the poet Rhegas, put to death by the Turks in 1798, stirred deep feelings of hatred against their oppressors. Circumstances, however, postponed the Greek revolt and accelerated that of the Servians. In the country immediately south of the Danube the sultan’s authority was defied by the janissaries settled about Belgrade and by Passwan Oglu, ruler of Widdin in Bulgaria. The pasha of Servia, hard pressed by these rebels, called upon the rayas to take up arms in defence of the sultan. They did so, and in 1804 the janissaries

Everywhere the provincial governors

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answered by a series of massacres in the Servian villages.

[HISTORY.

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The Servians now rose as a nation against the janissaries, Servian

Kara George became their chief, and in combination with revolt.

the pasha of Bosnia, acting under the sultan's orders, ex- terminated the janissaries or drove them out of the country. Victorious over one oppressor, the Servians re- fused to submit to another. They carried on the war against the sultan himself, and at the suggestion of Russia sent envoys to Constantinople demanding that for the future the fortresses of Servia should be garrisoned only by Servian troops.

When the third European coalition against France was Difficul-

in course of formation Russian and French influences were ties of

in rivalry at Constantinople. The victories of Napoleon

in 1805 gave him the ascendency, and his envoy prevailed eign.

upon the sultan to dismiss, without consulting Russia, the hospodars of Walachia and Moldavia, who were considered to be agents of the court of St Petersburg. This was a breach of the engagement made by the sultan in 1802, and it was followed by the entry of Russian troops into the principalities. England, as the ally of Russia, sent a fleet under Admiral Duckworth through the Dardanelles to threaten Constantinople. While the admiral wasted time in negotiations, the French ambassador, General Sebastiani, taught the Turks how to fortify their capital. The English admiral found that he could do nothing, and repassed the Dardanelles, suffering some loss on the passage. The war on the Danube was not carried on with mucli vigour on either side. Alexander was occupied with the struggle against Napoleon on the Vistula ; Selim ITI. was face to face with mutiny in Constantinople, having brought upon himself the bitter hatred of the janissaries by attempt- ing to form them into a body of troops drilled and discip- lined after the methods of modern armies. While the military art in Europe had been progressing for centuries, Turkey had made no other changes in its military system than those which belonged to general decay.

Its troops were a mere horde, capable indeed of a vigorous assault and of a stubborn defence, but utterly untrained in exer- cises and manceuvres, and almost ignorant of the meaning of discipline. Selim was a reformer in government and administration as well as in military affairs. He broke from the traditions of his palace, and began a new epoch in Turkish history; but the influences opposed to him were too strong, and a mutiny of the janissaries in Con- stantinople deprived him of his crown, He was allowed to live, but as a prisoner, while the puppet of the janis- saries, Mustafa IV., was placed on the throne (May 1807).

A few weeks after this event the treaty of Tilsit ended the war between France and Russia, and provided for the nominal mediation of Napoleon between Russia and the Porte. A truce followed between the armies on the Danube. Among the Turkish generals who had understood the neces- sity of Selim's reforms, and who were prepared to support

him against the janissaries, was Bairaktar, commander at Bairak-

Rustchuk. As soon as the truce gave him freedom of tar.

action, Bairaktar marched upon Constantinople. Leading his troops against the palace, he demanded the restoration of Selim. As the palace gates were closed, Bairaktar ordered an assault; but at the moment when his troops were entering Selim was put to death. Besides Mustafa there was only one member of the house of Osman remain- ing, his brother Mahmud, who concealed himself in the furnace of a bath until the palace was in the hands of Bairaktar's soldiers. (July 1808). vizier. He was rash enough, however, to dismiss part of his own soldiers from Constantinople. The janissaries attacked him in his palace. A tower in which he defended himself was blown up, and after a battle in the streets of

He was then placed on the throne Mahmud For a while Bairaktar governed as grand ll.

17oi-11827.]

Constantinople between the janissaries and the remainder of Bairaktar's troops, during which the dethroned sultan Mustafa was put to death, the

janissaries remained con- querors, and Mahmud was forced to submit to their de- mands. The innovations of the late reign were abolished, and for a while Mahmud seemed content to reign as ser- vant of the reaction.

It is well known that plans for the partition of the Otto- man empire occupied Napoleon and Alexander at Tilsit. Austria, though unwilling to see Russia aggrandized, was prepared in the last resort to combine with the dismember- ing powers, if all attempts to prevent the execution of the plan by diplomatic means should fail. But after a few years the alliance declined and a war between France and Russia was seen to be inevitable. Meanwhile the conflict on the Danube had been resumed, and the Servians were still in arms. The Russians had advanced into Bulgaria and captured Silistria. England, which had made peace with Turkey in 1809, sought to reconcile the belligerents, in order that the czar might be free to employ his whole Peace of force against Napoleon. In May 1812 a treaty was signed Bucha- at Bucharest, by which Bessarabia was ceded to Russia, vest. the river Pruth becoming the boundary of the two empires. The Porte in this treaty promised to grant an amnesty to the Servians, to leave to them the management of their internal affairs, and to impose upon them only moderate taxes. These promises, however, were neither accepted by the Servians as a sufficient concession, nor were they observed by the Porte. The Servians continued to fight, and ultimately secured their autonomy about 1817 without help from Russia.

Mahmud II. (1808-1839) was the only sultan of modern times who possessed the qualities of a great ruler. Brought up in the seclusion of the seraglio till the age of twenty- three, when he was suddenly placed on the throne, it is surprising that he should have shown the power, the re- solution, and the intelligence which marked his govern- ment. The difficulties of his reign were enormous. He belonged to an epoch when the Ottoman empire might fairly be considered as in actual dissolution. This he to some extent arrested, and the reforms which he effected, partial and imperfect as they were, have prolonged the existence of the Turkish state to our own day. The first and most obvious internal danger to be met was the insub- ordination of the provincial pashas. Against these rebelli- ous servants Mahmud waged a persistent and unwearying war, now employing them against one another, now crush- ing them by his own armed force.

One of the most for- AliPasha midable was Ali Pasha of Janina, who had made himself fJanina. master of Albania and part of Greece. When Mahmud in 1820 threw his armies upon this chieftain, the outbreak of hostilities in Epirus was the signal for the insurrection of Greece. While Hypsilanti, grandson of a hospodar of Moldavia who had been put to death by the Porte, raised the standard of revolt.in Moldavia, asserting that Russia had promised the Chri8Wans its support, the Greeks of |sreek re- the Morea rose and exterminated the Turkish population polt. among them. Hypsilanti was soon crushed ; and the ris- ing in the Morea was answered by massacres of the Greeks in the principal cities of the empire, and by the execution of Gregory, patriarch of Constantinople, the head of the Greek Church. These deeds of violence excited the utmost indignation in Russia. A despatch was sent to Constanti- nople, calling upon the Porte to restore the churches which had been destroyed, to guarantee the inviolability of Christian worship in the future, and to discriminate in its punishments between the innocent and the guilty. These demands were presented as an ultimatum by the Russian ambassador, who, not receiving an answer within the time allowed, quitted Constantinople (27th July 1821). The

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influence of Austria and England, however, restrained the emperor Alexander from declaring war, and the Greeks were left to sustain their combat by themselves. As long as Ali Pasha was unsubdued, the only forces which the sultan could employ against the Greeks were irregular bands of volunteers. It was by one of these hordes that the fearful massacres of Chios, in the spring of 1822, were perpetrated. In that same spring, however, the overthrow and death of Ali set free the regular troops. Two armies of considerable strength now moved southwards from Thessaly, with the object of reducing the country north of the Gulf of Corimth and then uniting to conquer the Morea. The western army, commanded by Omer Brionis, was checked by the Suliotes, and subsequently beaten back by the defenders of Missolonghi. The eastern army, after advancing under the command of Dramali into the Morea, was compelled to retreat. But the passes in its rear had been seized by the Greeks; on all sides the enemy

closed in upon it; and it was only through the disorders of the Greeks themselves that Dramali's force escaped annihila- tion. _Of those who survived the encounter most perished by sickness and famine in the neighbourhood of Corinth. Nor was the fortune of the Ottomans better at sea. The destruction of their admiral's vessel with all its crew by the fire-ship of the Greek captain, Kanaris, caused such terror that all further attempts to reduce the islands were abandoned, and the fleet returned to the Dardanelles. After an interval of ineffective land warfare, the sultan determined to call upon Mehemet Ali, pasha of Egypt, for assistance. Mehemet had risen to power in the disturbed period that followed the expulsion of the French from Egypt. He had a more powerful fleet than that of his sovereign, and an army disciplined after the European system. In calling upon his powerful vassal for help the sultan must have been aware of the dangers which his ag- grandizement would involve. Mehemet eagerly responded Mehemet to Mahmud's call; and his son Ibr4him, in command of a Ali's as- powerful armament, set sail in the spring of 1824 from 'ince Alexandria against Crete. This island was rapidly con-purkey, quered, and Ibrahim, after failing in some combined opera- tions against Samos, crossed over to the Morea. Here he marched across the peninsula, carrying all before him. Nauplia alone maintained its defence, while the Egyptian sent out his harrying columns, slaughtering and devastat- ing in every direction. From the Morea Ibrahim was summoned to assist the Turks, who had been for nine months unsuccessfully engaged in a second siege of Mis- solonghi. Ibrdhim began his siege operations in the beginning of 1826; but it was not for three months more that Missolonghi fell. The tide of Ottoman conquest moved on eastwards, and the acropolis of Athens capitu- lated in the following year. But the defence of Misso- longhi had lasted long enough to bring the powers of Europe into the field. On the death of the emperor Alexander at the end of 1825, Canning sent the duke of Wellington to St Petersburg to negotiate conditions of joint diplomatic action on the part of England and Russia. A protocol signed at St Petersburg on 4th April 1826 fixed the conditions on which the mediation of Great Britain was to be tendered to the Porte. Greece was to remain tributary to the sultan, but to be governed by its own elected authorities and to be independent in its com- mercial relations, The surviving Turkish population was to be removed from Greece; all property belonging to Turks, whether on the continent or the islands, was to be purchased by the Greeks. This protocol was

developed into the treaty of London between England, Russia, and France, signed in July 1827, by which the three powers bound themselves to put an end to the conflict in the East. In pursuance of this treaty the mediation of the XXIII. — 82

Battle of Hydra.

Nava- rino,

Suppres- sion of janis- saries.

War with Russia.

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powers was offered to the Porte, and an armistice demanded. It was contemptuously refused. The united fleets of the powers consequently appeared before Navarino, where Ibra- him was assembling his forces for an expedition against After a vain attempt at negotiation, they entered the harbour and fought the battle of Navarino, on 20th October 1827, in which the Turco-Egyptian fleet was totally destroyed. Canning had just died; his successors could only speak of Navarino as an “untoward event” and with- draw from further interference, leaving Russia and the Porte face to face. After a proclamation by the sultan calling the Mohammedans to arms, war was declared by Russia in April 1828. The moment was singularly favourable for Russia, for Mahmud had, little more than a year before, exterminated the janissaries. After bringing over soldiers from Asia to make him secure of victory in the event of a conflict, he had called upon the janissaries to contribute a certain number of men to the regiments about to be formed on the European pattern. The janissaries refused and raised the standard of rebellion. Mahmud opened fire on them with cannon, and the slaughter did not cease until the last of them had perished. The great difficulty in the way of a military reorganization was thus removed, and the newly-modelled regiments were raised to about 40,000 men. Small as the army was with which he had to meet the Russian invasion in 1828, the campaign of that year was honourable to the Turkish arms. Though Varna fell into the hands of the Russians, Silistria and Shumla were successfully defended, and the Russians, after suffering great losses, were compelled to

withdraw to winter quarters on the Danube. In the following year they advanced through Bulgaria, defeated the Turks at Kulevtcha, and, after the surrender of Silistria, crossed the Balkans under the command of Diebitsch. They reached Adrianople, which immediately capitulated. Diebitsch, concealing the real weakness of his force, sent out detachments towards the Euxine and the Mgean, while the centre of his army marched on Constantinople. Had the sultan known the insignificant number of his enemy, he might safely have defied him. But the wildest exaggerations were current in the capital; Kars and Erzeroum had fallen into the hands of Paskiewitch, commander of the czar's forces in Asia ; and in Constantinople the friends of the slaughtered janissaries threatened revolt. Mahmud listened to the advocates of peace, and on 14th September hostilities were

Treaty of brought to a close by the treaty of Adrianople. This treaty

Adrian- ople.

gave Russia the ports of Anapa and Poti on the eastern coast of the Black Sea; but its most important clauses were those which confirmed and extended the protectorate of the czar over the Danubian principalities. The office of hospodar, hitherto tenable for seven years, was now made an appointment for life, and the sultan undertook to permit no interference on the part of neighbouring pashas with these provinces. No fortified point was to be re- tained by the Turks on the left bank of the Danube ; no Mussulman was to reside or hold property within the principalities. The Bosphorus and the Dardanelles were declared free and open to the merchant ships of all nations. The Porte further gave its adherence to the treaty of London relating to Greece, and accepted the act entered into by the allied powers for regulating the Greek frontier. An indemnity in money was declared to be owing to Russia; and by leaving the amount to be fixed by subsequent agreement Russia retained in its own hands the most powerful means of enforcing its influence at Constantinople. The suzerainty over Greece, which the powers had at first agreed to leave to the sultan, was by common consent abandoned, and Greece became an independent kingdom. At the close of eight years of warfare Mahmud's south- ernmost provinces were even more completely severed from

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the empire than Servia and the Danubian principalities. Conflict It was in vain that he had borne the humiliation of calling with upon his vassal, Mehemet Ali, for help, and Mehemet's Mehemet

[HISTORY.

reward had now to be paid. Crete was offered to him; this, however, was far from satisfying his ambition, and in November 1831 he threw an army under Ibrahim into Palestine and began the conquest of Syria. The sultan now declared Mehemet and his son to be rebels, and de- spatched an army against them. The first encounter took place in the valley of the Orontes. The Turks were put to the rout, and retired into Cilicia. Ibrdhim following gained a second victory at the pass of Beylan, and, after crossing Mount Taurus, destroyed the last army of the sultan at Konieh, on 21st December 1832. In this ex- tremity Mahmud looked for help to the European powers, and Russia at once tendered its aid. At the request of the sultan a Russian fleet appeared before Constantinople. The French ambassador thereupon threatened to quit the capital; and finally, under French mediation, terms of peace were signed with Ibrahim at Kutaya (April 1833), the sultan making over to his vassal, not only the whole of Syria, but also the province of Adana between Mount Taurus and the Mediterranean.

Scarcely had this treaty been concluded when Russian Alliance influence again won the ascendency at Constantinople, and with a treaty of alliance between Turkey and Russia was signed 8%

at the palace of Unkiar Skelessi, which in fact reduced Turkey to the condition of a vassal state. The form of the treaty was skilfully framed to disguise the relation of dependence which it created and the right of intervention in the internal affairs of the Ottoman empire which it gave to Russia. Each power pledged itself to render assistance to the other not only against the attack of an external enemy but wherever its peace and security might be en- dangered. Another article declared that, in order to diminish the burdens of the Porte, the czar would not demand the material help to which the treaty entitled him, but that in lieu thereof the Porte undertook, when- ever Russia should be at war, to close the Dardanelles to the war-

ships of all nations. The control of the Dardanelles was thus transferred from Turkey to Russia, and the en- trance to the Black Sea converted into a Russian fortified outpost. In this treaty, brilliant as it appeared, Russia had gone too far. The Western powers declared that they would not recognize it, and the most strenuous and system- atic efforts were henceforth made both by France and England to diminish Russian influence in the East. France, anxious to gain in Egypt a counterpoise to England's naval power in the Mediterranean, made itself the patron and ally of Mehemet Ali. England adhered to the cause of the sultan, and on many occasions showed its hostility to Mehemet. Thus the two Western powers, though both in antagonism to Russia, were directly in conflict with one

another in their Eastern policy. Mahmud in the mean- Renewal time was steadily preparing to renew the war with his rival. of war

He obtained the services of Moltke and other Prussian

officers in organizing his army, and, after a successful met,

campaign against the rebellious tribes of Kurdistan, as- sembled his troops in the spring of 1839 on the upper Euphrates, and marched against Ibrahim. In the opera- tions which followed the advice of the European officers was persistently disregarded by the pasha in command; and on 24th June the Turkish army was annihilated by Ibréhim at Nisib. To complete the ruin of the empire, the Turkish admiral, Achmet Fewzi, sailed into the port of Alexandria and handed over his fleet to Mehemet Ali. The sultan did not live to hear of the overthrow of his hopes. He died in the same week in which the battle of Nisib was fought, leaving the throne to his son 'Abd-ul-Mejid (1839-1861).

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'ing in massacres of the former.

1827-1876.]

The very suddenness of these disasters contributed ulti- mately to the preservation of the Ottoman empire, inas- much as it compelled the powers

of Europe to take action. The French and English fleets appeared in the Dardan- elles. The czar saw that it was impossible to maintain the treaty of Unkiar Skelessi, and this treaty was tacitly abandoned. Russia now addressed itself to the task of widening the existing differences between France and England. France insisted on far more favourable condi- tions for Mehemet Ali than England would allow, demand- ing that Egypt and all Syria should be given to him in hereditary dominion, with no further obligation towards the sultan than the payment of an annual tribute. Russia and the other powers took part with England, and ulti- mately, without asking the sanction of France, the four powers signed a treaty pledging themselves to enforce upon Mehemet the terms proposed by England, which practically reduced him to the position of an ordinary pasha in Palestine, while leaving him the hereditary govern- ment of Egypt. On the publication of this treaty Thiers, the French minister, prepared for war. He was, however, dismissed by Louis Philippe, and his successor, Guizot, accepted the situation. As Mehemet Ali refused to give up his conquests, an Anglo-Austrian naval squadron was sent to co-operate with a Turkish force in attacking the coast-towns of Syria. Acre was captured, and Ibrahtm, assailed by the mountain tribes of the interior, was forced to retire to Egypt. A convention made between Mehemet and Sir Charles Napier, who had appeared at Alexandria with part of the fleet, formed the basis of the ultimate settlement, by which Mehemet, after formal submission to the sultan, was recognized as hereditary governor of Egypt. Russia now united with the other powers in a declaration that the ancient rule of the Ottoman empire, forbidding the passage of the Dardanelles to the war-ships of all nations, except when the Porte should itself be at war, was accepted by Europe at large.

The young sultan entered on his reign nominally as an

- independent sovereign, but really under the protection of ‘the European powers.

His minister, Reshid Pasha, who had gained in an unusual degree the confidence of Western statesmen, understood the necessity of bringing the Turkish system of government more into harmony with the ideas of the civilized world. An edict, known as the Hatti- sherif of Gulhane, announced

the speedy establishment of institutions ‘‘which should insure to all subjects of the sultan perfect security for their lives, their honour, and their property, a regular method of collecting the taxes, and an equally regular method of recruiting the army and fixing duration of service.” Scarcely had this edict been published when Reshid was driven from power by a palace intrigue. His reforming efforts, like those of Mahmid, were not wholly ineffective ; yet little was realized in com- parison with what was promised and what was needed. The Turkish Government was soon discredited, and the intervention of Europe required, by conflicts between the Christian and Mohammedan tribes in the Lebanon, result- After the convulsions of 1848 the sultan incurred the enmity of the autocratic courts by refusing to give up Kossuth and other exiles who had taken refuge within his dominions. The suppression of the national Hungarian Government by Russia in 1849 had heightened in the emperor Nicholas the sense of his own power. He now looked forward to the speedy extinction of Turkey, and in 1853 proposed to the British ambassador, Sir H. Seymour, a plan for the division of ‘the sick man’s” inheritance as soon as he should expire. Disputes between France and Russia relating to the rights of the Latin and Greek Churches in certain sacred places were made the occasion for the assertion of a formal claim on the part of

the czar to a protectorate over all Christians in Turkey belonging to the Greek Church. This claim not being acknowledged by the Porte, a Russian army entered the Danubian principalities. After ineffective negotiations war was declared by the sultan on 4th October 1853. Hostilities commenced in Walachia, and the Turkish fleet was attacked and destroyed at Sinope. England and France allied themselves with the Porte, and landed an army at Varna in the spring of the following year. Silistria was successfully defended by the Turks; and, on the occupation of the Danubian principalities by Austria, the allies took

up the offensive and transferred their forces to the Crimea. Crimean The siege of Sebastopol followed, ending in its capture in War.

September 1855. Meanwhile Russian and Turkish forces were opposed in Asia. Kars maintained a gallant defence, but succumbed to famine two months after the fall of Sebastopol. The peace of Paris followed, in which Russia ceded to Turkey the portion of Bessarabia adjacent to the mouth of the Danube. The Black Sea was neutralized, Russia and the Porte alike engaging to keep no war-ships and to maintain no arsenals there. The exclusive pro- tectorate of Russia over the Danubian principalities was abolished, and the autonomy of these provinces, as well as of Servia, placed under the guarantee of all the powers. The Porte published a firman, the Hatt:~~Humaiun, profess~~ ing to abolish "every distinction making any class of the subjects of the empire inferior to any other class on account of their religion, language, and race," and establishing complete equality between Christians and Mahommedans ; the powers in return declared the Porte admitted to the advantages of the public law and concert of Europe. The absurd stipulation was added that no right should thereby accrue to the powers to interfere either collectively or separately in the relations of the sultan with his subjects.

The Crimean War gave to part of the Balkan population Internal twenty years more of national development under the 4is-

slackened grasp of the Porte; and by extinguishing the friendship of Austria and Russia it rendered the liberation of Italy possible. But each direct proviso of the treaty of Paris seemed made only to be mocked by events. Scarcely a year passed without some disturbance among the Christian subjects of the sultan, in which the interfer- ence of the powers invariably followed in one form or another. A new series of massacres in the Lebanon in 1860 caused France to land a force in Syria. Walachia and Moldavia formed themselves into a single state under the name of Roumania, to which the house of Hohenzollern soon afterwards gave a sovereign. Bosnia and Montenegro took up arms. Servia got rid of its Turkish garrisons. Crete fought long for its independence, and seemed for a moment likely to be united to Greece under the auspices of the powers; but it was ultimately abandoned to its Turkish masters. The overthrow of France in the war of 1870 and the consequent isolation of England led Russia to declare the provision of the treaty of Paris which excluded its ships of war and its arsenals from the Black Sea to be no longer in force. To save appearances,

the British Government demanded that the matter should be referred to a Huropean conference, where Russia's will was duly ratified.

A few years later the horizon of eastern Europe visibly darkened with the coming storm. Russian influences were no doubt at work; but the development of national feeling which had so powerfully affected every other part of Europe during the 19th century could not remain without effect among the Christian races of the Balkan peninsula. In 1875 Bosnia and Herzegovina revolted. In the meantime the government of 'Abd-ul-'Aziz (1861- 1876) had become worse and worse. The state was bank- rupt. Ignatieff, the Russian ambassador, gained complete ascendency in the palace, and frustrated every attempt on

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the part of the better Turkish statesmen to check the torrent of misrule. His creature, Mahmud Pasha, main- tained his place in spite of universal contempt, until a conspiracy was formed at Constantinople, which cost the sultan his throne (30th May 1876) and a few days later his life. His imbecile successor, Murad V., gave place after a reign of three months to 'Abd-ul-Hamid II. The Bosnian insurrection had already extended to Bulgaria, and the slaughter of the Turkish inhabitants in certain villages had been avenged by massacres of the most fearful character. Servia and Montenegro took up arms. The resources of European diplomacy were exhausted in fruit- less attempts to gain from the Porte some real securities

Warwith for better government, and in April 1877 Russia declared

Russia.

Treaties of San Stefano and Berlin.

war. The neutrality of Austria had been secured by a secret agreement permitting that country to occupy Bosnia and Herzegovina, if Russia should extend its influ- ence beyond the Balkans. The Bulgarian massacres had excited such horror and indignation in England that Lord Beaconsfield was forced to remain neutral. The ministry contented itself with stating that England would not per- mit Egypt to be the scene of hostilities, nor

acquiesce in any prolonged occupation of Constantinople by Russian troops. Turkey was thus left without anally. The Russians entered Bulgaria in June; and, while Rustchuk was besieged, their advanced guard under Gourko hurried across the Balkans. Meanwhile Osman Pasha, coming from Widdin, occupied and fortified Plevna on the Russian line of march. Against his redoubts the Russians, ill commanded, threw themselves in vain, and Gourko was compelled to fall back on the Shipka Pass. But in December the capture of Plevna, in which Roumanian troops cooperated, set free the invading army, and the march on Constantinople was resumed, The Balkans were passed in mid-winter ; Adrianople was occupied; and the Turkish armies were captured or annihilated. The Russians now pressed forward to the very suburbs of Constantinople, and on 3d March 1878 peace was concluded at San Stefano. In Asia the Russians had captured Kars and were besieging Erzeroum. The treaty of San Stefano ceded to Russia the portion of Bessarabia taken from it in 1856, together with the Dobrudja, and also Kars, Batoum, and the adjoining territory in Asia. It recognized the independence of Servia, Montenegro, and Roumania, and largely extended the territory of the first two. Bulgaria was constituted an autonomous state, though tributary to the Porte, and was defined so as to extend to the A‘gean Sea and to include the greater part of the country between the Balkans and the coast. Crete, Thessaly, and Epirus were to receive the necessary reforms at the hands of a European com- mission. To this treaty Great Britain refused to give its assent, and vigorous preparations were made for war. The fleet was at the Dardanelles, and Indian troops were brought to Malta. Russia could no longer count on the neutrality of Austria. Under these circumstances the court of St Petersburg consented to submit the treaty to a European congress, which, after a secret agreement had been made between Russia and England on the principal points of difference, assembled at Berlin. The treaty of San Stefano received various modifications, the principal being a reduction of the territory included in Bulgaria and the division of that state into two parts. Bulgaria north of the Balkans was constituted an autonomous prin- cipality ; Bulgaria south of the Balkans was made into a province, with the title of Eastern Roumelia, subject to the authority of the sultan, but with a Christian governor and an autonomous administration. Austria received Bosnia and Herzegovina. The territory ceded to Servia and Montenegro by the treaty of San Stefano, as well as that ceded to Russia in Asia, was somewhat diminished.

The Porte was advised to make some cession of territory to Greece, and the line of frontier subsequently recom- mended gave to Greece Janina as well as Thessaly. The usual promises of organic reform were made by Turkey. By a separate convention England undertook the defence of Asiatic Turkey and received Cyprus. The organization of Eastern Roumelia was duly taken in hand by a Euro- pean commission and brought to a favourable conclusion ; but it was not until a naval demonstration had been made by England that the final cession of Dulcigno to the Monte- negrins was effected, and that Thessaly, without Epirus, was

given up to Greece. Alexander of Battenberg became prince Bul- By a popular movement in 1885 Bulgaria garian

of Bulgaria.

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and Eastern Roumelia were united into a single state. question,

This revolution occasioned the utmost displeasure at St Petersburg ; and under Russian influence Prince Alexander was kidnapped and forced to abdicate. The Porte offered

no armed resistance to the union. (cae)

Literature.—The best work on Ottoman history is Von Hammer’s Geschichte des Osmanischen Reiches (Buda-Pesth, 1834-35), which covers the period between 1300 and 1774. The author availed himself of the writings of the Turkish annalists as well as of those of his European predecessors; and all later Western historians of the empire have borrowed directly or indirectly from his volumes. This valuable work has been translated into French by Hellert, Histoire del’ Empire Ottoman (Paris, 1835-41), The best English work is Creasy’s History of the Ottoman Turks (London, 1854-56); it is compiled for the most part from Von Hammer.

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SULTANS OF THE Hovsz oF ‘OSMAN.

The dates are those of the sultan’s accession, according to the Moslem and Christian eras.

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Plate VI.

Bound- aries.

Area and popula- tion.

“graphy.

GEOGRAPHY. |

Part IL—GEroGRAPHY AND STATISTICS.

Turkey, or the Ottoman empire (Osmanii Vilateti), embraces extensive territories in south-eastern Europe, western Asia, and northern Africa, grouped mainly round the eastern waters of the Mediterranean, and along both sides of the Red Sea, the west coast of the Persian Gulf, and the southern and western shores of the Black Sea. These territories form an aggregate of provinces and states, some under the direct control of the sultan, some enjoying a large share of political autonomy, some practically independ- ent, either administered by foreign powers or ruled by hereditary vassals or tributary princes. The present (1887) extent of the Ottoman empire is about 1,692,150 square miles, and its popula- tion 42,346,000.

EvROPEAN TURKEY.

Since the Russo-Turkish War of 1878 (see above), the extremely irregular frontiers of European Turkey are conterminous with Greece in the south, and in the north with Montenegro, Austria, Servia, and Roumania, being separated from the last country partly by the Danube, partly by a conventional line drawn from Silistria on that river to Mangalia on the Black Sea. By the’Berlin congress Roumania and Servia, hitherto vassal states, were made absolutely independent kingdoms, Roumania at the same time receiving the district of Dobrudja between the lower Danube and the Black Sea, and Servia those of Nish and Leskovatz about the upper Morava river. Montenegro was also recognized as an independ- ent principality, with an increase of territory, which gave ita sea

frontier limited southwards by the river Boyana, and including °

the Albanian ports of Dulcigno and Antivari on the Adriatic. The Greco-Turkish frontier was also shifted north, Greece obtaining most of Thessaly and a strip of Epirus (south Albania), so that since 1881 the border line runs from near Mount Olympus on the Gulf of Saloniki (40° N. lat.) west to the Pindus range, then south- west to the Gulf of Arta on the Ionian Sea. A still

more serious step was taken towards disintegration by the withdrawal of Bulgaria and Eastern Roumelia from the immediate jurisdiction of the Sublime Porte. The former was constituted a tributary principality, with representative institutions, and Eastern Roumelia was erected into an autonomous province, both under the guarantee of the European powers. But in 1885 the latter province declared for union with Bulgaria, and since then these two territories have practically formed one state administered from Sophia, Europe assenting and Turkey consenting (imperial firman of 6th April 1886) on the retrocession to Turkey of the Moslem districts of Kirjali and the Rhodope. In the year 1878 Austria occupied and assumed the civil administration of the north-western provinces of Bosnia and Herzcgovina, besides taking military possession of the contiguous strategical district of Novi-Bazar. The direct possessions of the sultan have thus been reduced in Europe to a strip of territory stretching continuously across the Balkan Peninsula from the Bosphorus to the Adriatic (29° 10’ to 19° 20’ E. long.), and lying in the east mainly between 40° and 42° and in the west between 39° and 48° N. lat. It corre- sponds roughly to ancient Thrace, Macedonia with Chalcidice, Epirus, and a large part of Illyria, constituting the present administrative divisions of Stambul (Constantinople, including a small strip of the opposite Asiatic coast), Edirneh (Adrianople), Saloniki with Kosovo (Macedonia), Janina (parts of Epirus and Thessaly), Shkodra (Scutari or upper Albania). To these must be added the Turkish islands in the Aigean usually reckoned to Europe, that is, Thasos, Samothrace, Imbros, and, in the extreme south, Crete or Candia, with estimated (1887) areas and populations as under :—

a Area in q Provinces. Square Miles. Population. COTSEATIAMOM Cerie ets cieie ce syoisctrlec jeu ea ascne gests 1,100 1,200,000 FNOTIAMOPIC faceseclec 2 da. 0s cit 12,800 560,000 Saloniki and Kosovo .. 32,000 1,900,000 AMINA Ge eee. «oc 14,000 1,440,000 SYCTUEy GPCR Omen ence 13,000 390,000 Candia and other islands 8,800 230,000 Iinmediate possessions…….....6- 76,700 5,720,000 Bulgaria, tributary principality……..... 24,300 2,008,000 Hast Roumelia, antonomous province …..... 14,000 975,000 Bosnia, Herzegovina, and Novi-Bazar, occupied SV SPAMLUGUTIAMRE cc tater ere rents eiiave 0 e%alescee a eoare 23,570 1,504,000 Total European Turkey since 1878 .. 188,570 10,207,000 Dobrudja, ceded to Roumania…….....+.- 4,200 150,000 Nish

and Leskovatz, ceded to Servia……..... 4,250 367,000 Dulcigno, &c., ceded to Montenegro……..... 2,000 116,000 Parts of Thessaly and Epirus, ceded to Greece 2,000 100,000 (?) Total European Turkey before 1878.. 151,020 10,940,000

For detailed accounts of the physical features, climate, fauna, and flora of these regions, the reader is referred to the articles ALBANIA, Bosnia, BunGaria, CONSTANTINOPLE, Erirus, Hrrzrcovina, Macrponia, and Turacr. Here it will suffice to remark in a general way that the territory still directly administered from

Stambul comprises one of the most favoured regions of the temperate zone. The extensive igneous and metamorphic system of the Great Balkans and Rhodope (Despoto-Dagh), culminating in the Rilo Dagh (9000 feet), interspersed in the Pindus range farther west by Permian formations of unknown age, and succeeded in the extreme east (both sides of the Bosphorus) by Lower Devonian sandstones and some more recent volcanic rocks, is pierced by the four rich alluvial valleys of the Maritza, Kara-su or “Blackwater,” Struma (Strymon), and Vardar. These rivers, flowing in nearly parallel south-easterly courses to the Mgean, collect most of the drainage of Roumelia, as Thrace and Macedonia are commonly called by the Turks. The whole region thus enjoys a somewhat southerly aspect, sheltcred from the north by the lofty crests of the Rilo Dagh and northern Pindus, and in every way admirably suited for the culti- vation of most cereals, as well as of cotton, tobacco, madder, the mulberry, the vine, and fruits. Here maize yields such a bountiful harvest that, although originally introduced from America, it has long been regarded as indigenous, and for the Italians is simply the Turkish corn (“gran turco’’) in a pre-eminent sense, The inhabit- ants also, Greeks intermingled with Turks in the east, with Bul- garians in the west, are intelligent and industrious, noted for their skill in the manufacture of carpets and other woven goods, of saddlery, arms, and jewellery.

Asiatic TURKEY.

The mainstay of the Ottoman dynasty is the Asiatic portion of the Bound- ee where the Mohammedan religion is absolutely predominant, aries. an

where the naturally vigorous and robust Turki race forms in Asia Minor a compact mass of many millions, far outnumbering any other single ethnical element and probably equalling all taken collectively. Here also, with the unimportant exception of the islands of Samos and Cyprus and the somewhat privileged district of Lebanon, all the Turkish possessions constitute vilayets directly controlled by the Porte. They comprise the geographically distinct regions of the Anatolian plateau (Asia Minor), the Armenian and Kurdish highlands, the Mesopotamian lowlands, the hilly and partly mountainous territory of Syria and Palestine, and the coast- lands of west and north-east Arabia. The changes caused by the Russo-Turkish War of 1878 were the cession to Persia of the little district of Kotur on the eastern frontier and to Russia of the districts of Kars and Batoum on the north-east frontier, while to England were conceded the military occupation and administration of Cyprus. Asiatic Turkey is conterminous on the east with Russia and Persia; in the south-west it encloses on the west, north, and north-east the independent part of Arabia. Towards Egypt the frontier is a conventional line drawn from Akabah at the head of the Gulf of Akabah north-westwards to the little port of El Arish on the Mediterranean. Elsewhere Asiatic Turkey enjoys the ad- vantage of a sea frontage, being washed in the north-west and west by the Euxine, Agean, and Mediterranean, in the south-west by the Red Sea, and in the south-east by the Persian Gulf. The above enumerated five natural divisions of Asiatic Turkey are divided for administrative purposes into about twenty vilayets, which, however, have been and still are subject to considerable

fluctuations. The subjoined grouping, with areas and populations, Area and is based mainly on data lately communicated confidentially to the popula- His estimates of population tion.

British Government by Mr Redhouse. have been strikingly confirmed by the official returns that have for the first time just been made for certain provinces in Asia Minor and the Armenian highlands. Thus the census of the Trebizond vila-

yet, completed in 1886, gave a total of 1,010,000, which differs only by 7000 from Mr Redhouse’s estimate for 1878 (1,017,000). So also the just completed (1887) census for the Erzeroum vilayet gives 583,000, or 998,000 including the territory ceded to Russia in 1878, which is 45,000 higher than Mr Redhouse’s estimate.

Natural . Area in .

Divisions. Provinces. Square Miles. Population.

(Broussa with Bigaand Ismid 32,000 1,900,000

Aidin (Smyrna) 23,000 1,610,000

HASHUSIGEVTINLLTL Voretele efolerahelelalepetstars 21,000 1,260,000

‘ A ANGORA ase. 27,000 860,000

Asia Minor Konieh ey ae te 39,000 1,280,000

C102 i CneOReIo oD 65 Gani 16,000 470,000

[Siva with Janik……..... 26,000 1,770,000

duel nigel Gannocoacenrs 0000 12,000 1,010,000

Armenia and Erzeroum and Van…..... 40,000 ; rT aan oa

Kurdistan Diarbekr with Aziz …... 38,000 560,000

z (GCC ccscscarrorstonr en’s 100,000 4,750,000

Mesopotamia /) Basra with El-Hasa |... 31,000 1,085,000

(25 Se) me ReeiowaeMleleoiaes serhirrnei 46,000 1,450,000

Syria and Damascus ‘ 1,560,000

Palestine WEGDANTOM, OF oi edceie ever ae 35,000 450,000

cee 890,000

Arabia TRO F corns ceaaneeye 200,000() | { 120009

aoe Me shad cs tracunstarants 1,700 525,000

ULILOSMEMey sneer catia rsiaotoaceisvemonters 210 41,000

OVADEUISS .sorerer eters ere nasuteis anes 3,670 235,000

Total Asiatic Turkey….; 691,580 | 24,339,000

Physieal features.

654

Detailed descriptions of Asiatic Turkey will be found under the separate articles ARABIA, ARMENIA, ASIA MiNor, KURDISTAN, MESOPOTAMIA, PALESTINE, and Syria. Of these natural divisions Asia Minor or Anatolia is by far the most important for extent, population, and natural resources. It constitutes an elevated and fertile plateau enclosed by irregular mountain ranges, which in the Taurus and Antitaurus on the south and east rise to from 7000

PUR ic i

[GEOGRAPHY.

two holy cities of Mecca and Medina. These are held by military occupation, probably at a loss to the imperial exchequer, and cer- tainly against the wishes of the inhabitants. But these drawbacks are supposed to be more than compensated by the political prestige derived from the possession of the Holy Land of Islam.

AFRICAN TERRITORIES.

Since the abandonment of eastern or Egyptian Soudan in 1884, Area and consequent on the revolt of the Mahdi, and the occupation of popula. Tunis by the French in 1881, Turkey in Africa has been reduced tion,

to 10,000 feet, culminating in the voleanic Erjish-Dagh, or Argeus, nearly 12,000 feet high. ‘The plateau, which has a mean altitude

of some 3000 feet, is depressed in the centre, where the Tuz-gol (Tatta Palus) and several other lacustrine basins have at present no outflow, but which appear to have formerly drained through the Sakaria (Sangarius) northwards to the Euxine. In the same di- rection, and in curiously parallel curves, flow the more easterly Kizil-Irmak (Halys) and Yeshil-Irmak (Iris), which carry otf most of the surface waters of the plateau. The western rivers —Granicus, Xanthus (Scamander), Hermus, Simois, Meander—although re- nowned in song and history, are comparatively insignificant coast-streams, rushing from the escarpment of the plateau down to their fjord-like estuaries in the Aigean. None of the rivers are navigable to any distance from their mouths, and in the absence of good means of communication the very rich resources of the plateau in minerals and agricultural produce have hitherto been little deve- loped. Owing to the different elevations and varied aspects of the land towards the Euxine, Mgean, and Mediterranean, the climate is extremely diversified, presenting all the transitions from intense summer heat along most of the seaboard to severe winters on the lofty tablelands of the interior, which are exposed to biting winds from the Russian steppes. Anatolia has an endless variety of natural products, from the hardy boxwood of Lazistan (Trebizond vilayet) to the sub-tropical figs and grapes of the western coast- lands. On the plateau thrives the famous breed of Angora goats, whose soft, silky fleece (mohair) forms a staple export.

Of far less economic importance are the Armenian uplands, form- ing a rugged plateau of limited extent, above which rise many lofty peaks, culminating in the tower-crested Ararat (16,916 fect), the converging point of three empires. The long and terribly severe winters, intolerably hot short summers, and generally poor soil of Armenia present a marked contrast to the far more temperate climate, rieh upland valleys, and densely wooded slopes of the more southern Kurdistan highlands. But these advantages are counter- balanced by the generally inaccessible nature of the country, the want of good highways, and especially the lawless character of its inhabitants, who have undergone little social change since the days of their wild Karduchi forefathers. In the heart of this savage region lies the

magnificent basin of Lake Van, which, like Tuz-gol and the more easterly Urmiya, has no present outflow, but formerly, no doubt, discharged to the Tigris valley.

In the Van district lie the sources of most of the head streams of the Tiaris (¢.v.) and EupHRATEs (q.v.), which have created the vast and fertile alluvial plains of Mesopotamia. This latter region, the seat of the ancient Accadian and Assyrian and the more recent Moslem cultures, forms a continuous plain from the escarpments of the Kurdistan highlands to the Persian Gulf, broken only in the north by the Sinjar Hills, and capable of yielding magnificent crops wherever water is available. But under Osmanli rule the splendid system of irrigation works, dating from the dawn of history, has fallen into decay: the lower Euphrates now overflows its banks and converts much of the region above and below Kurnah, at the confluence of the two great arteries, into malarious marshlands. Hence the populous cities and innumerable villages formerly dotted over the Babylonian plains have been succeeded by the scattered hamlets of the Montefik and othcr amphibious Arab tribes.

This lowland region is separated by the morc elevated Syrian desert or steppe from the much smaller and less productive pro- vinces of Syria and Palestine. Here the main physical features are at once simple and yet striking. The narrow, hilly region dis- posed north and south between the Mediterranean and the desert, and stretching for over 400 miles between Anatolia and the Sinai Peninsula, culminates towards the centre in the parallel Libanus and Antilibanus (10,000 to 11,000 feet), enclosing between them the fertile depression of the Beka‘ (Ceele-Syria). The stupendous ruins of Baalbek, standing at the highest point of this depression in 30° N. lat., mark the parting line between the northern and southern watersheds of the region. Northwards flows the El-‘Asi (Orontes), southwards the Liténi (Leontes), both through the Beka‘ in moderately sloping beds to the Mediterranean. For further particulars, see the articles LEBANON, JORDAN, PALESTINE. In the Lebanon the Christian Maronite communities enjoy a mea- sure of self-government under the guarantee of France, while their pagan neighbours and hereditary foes, the Druses, are gradually withdrawing to the hilly Hauran district beyond Jordan.

Turkey’s Arabian possessions comprise, besides El-Hasa on the Persian Gulf, the low-lying, hot, and insalubrious Tehama and the south-western highlands (vilayets of Hejaz and Yemen) stretehing continuously along the east side of the Red Sea, and including the

-their own officials” (Proc. R. Geog. Soc., August 1887, p. 487).

to the two territories of Egypt and Tripolitana with Barca and Fezzan, jointly occupying the north-east corner of the continent. Of these Tripolitana alone is directly administered, constituting the pashalik or vilayet of Tripoli. Egypt, whose southern frontier was temporarily fixed in January 1887 at the station of Akashe above Wady Halfa, near the second cataract in Lower Nubia (22° N. lat.), has formed a practically independent principality under the dynasty of Mehemet Ali since 1841, subject only to an annual tribute of £695,000 to the Porte. The areas and populations of Turkey in Africa were estimated as follows in 1887:—

Area in . Sq. Miles. Population. Tripoli, with Barca and Fezzan, a vilayet …..... 485,000 1,000,000 Eeypt, tributany principality …....00ce-0-++ ses: 374,000 6,800,000 Total Mur keyiiPAtnieay ss fcc ave\sce ste visie. elepereiays 862,000 7,800,000

THE EMPIRE.

Turkey is essentially a theocratic absolute monarchy, being sub- Adminis. ject in principle to the direct personal control of the sultan, who tration,

is himself at once a temporal autocrat and the recognized caliph, that is, ‘‘ successor” of the Prophet, and consequently the spiritual head of the Moslem world (see MOHAMMEDANISM). But, although the attempt made in 1876 to introduce representative institutions proved abortive, this theoretical absolutism is nevertheless tem- pered not only by traditional usage, local privilege, the juridical and spiritual precepts of the Koran and its ‘wlemd interpreters, and the privy council, but also by the growing force of public opinion and the direct or indirect pressure of the European powers. The ‘ulema! form a powerful corporation, whose head, the sheikhu ’U- Islam, ranks asa state functionary scarcely sccond to the grand vizier, or prime minister. Owing to their intensely conservative and fanatical spirit,

the ‘ulema have always been determined oppo- nents of progress, and are at present one of the greatest obstacles to reform in a political system where the spiritual and temporal functions are inextricably interwoven. Besides these expounders of Koranic doctrine, the sovereign is to some extent bound also by the Multeka, a legal code based on the traditional sayings of Mohammed and the recorded decisions of his successors, having the force of precedents.

The grand vizier (sadr-azam), who is nominated by the sultan, presides ex-officio over the privy council (mejliss-i-khass), which, besides the sheikhu ’l-Islim, comprises the ministcrs of home and foreign affairs, war, finance, marine, trade, public works, justice, public instruction, and worship, with the president of the council of state and the grand master of artillery. For administrative purposes the immediate possessions of the sultan are divided into vilayets (provinces), which are again subdivided into sanjaks or mutessariks (arrondissements), these into kazas (cantons), and the kazas into nahiés (parishes or communes). A vali or governor- general, nominated by the sultan, stands at the head of the vilayet, and on him are directly dependent the pashas, effendis, beys, and other administrators of the minor divisions. All these officials unite in their own persons the judicial and executive functions, and all alike are as a rule thoroughly corrupt, venal in the dispen- sation of justice, oppressors of the subject, embezzlers of the public revenues, altogether absorbed in amassing wealth during their mostly brief and precarious tenure of office.* Foreigners settled in the country are specially protected from exactions by the so-called “capitulations,” in virtue of which they are exempt from the juris- diction of the local courts and amenable for trial to tribunals pre-

1 See Sunnirtes, vol. xxii. p. 660.

2 Major-General F. T. Haig, who travelled through the heart of Yemen in the winter of 1886-87, thus speaks of the administration in that almost exclu- sively Moslem province: ‘‘The fiscal system of the Turks, if it were really carried into effect, would be by no means bad; but like every other depart- iment of the government it is ruined by the utter corruption that prevails in every branch of the administration from top to bottom. No more

eloquent expounders of the evils and hopelessness of their whole system are to be found

than the Turks themselves, as I found from conversation with two or three of Mr G. P. Devey also, consul at Erzeroum, reports that in a part of that province the sheep-tax for 1885 was collected three times over: ‘On the first occasion the real number had been underestimated, and the collector therefore came again, and, finding that such was the case, made the villagers pay the whole sum of 14,000 piastres (9000 had been levied on the previous occasion), instead of the difference, on the ground that they had cheated the Government in not declaring their whole stock. A third time a collector visited the caza, and, when the villagers could produce no receipt that the tax had been paid (for none had been given), a third time the full sum was taken” (Cons. Rep., July 1887, p. 3).

sided over by their respective consuls, Cases between foreigners of different nationalitics are heard in the court of the defendant, and between foreigners and Turkish subjects in the local courts, at which a consular dragoman attends to see that the trial is conducted according to law.

The trade returns for the last few years show that the country is slowly recovering from the disastrous consequences of the Russo- Turkish War. For the four years 1882-86 the exports from and imports to Turkey were valued as under :—

Exports.1 Imports. Exports,1 Imports. 1882-3 | £10,900,000 | £17,000,000 1884-5 | £11,326,000 | £18,263,000

1883-4 9,550,000 17,350,000 1885-6 10,690,000 17,702,000

The share of the chief foreign states in these exchanges is shown in the subjoined table? for the years 1884-85 and 1885-86 :—

Imports from Exports to

1884-5. 1885-6. 1884-5, 1885-6,

£8,304,000 £7,755,000 | £3,923,000 | £4,031,000

2,225,000 2,050,000 4,083,000 3,296,000 3,800,000 3,468,000 1,113,000 1,001,000 1,556,000 366,000 341,000 536,000 339,000 327,000 318,000 500,000 437,000 166,000 63,000 107,000 482,000 7,990 7,450

Roumania 565,000 88,000 96,000 Ist; leh WR ge nenoneee 254,000 261,000 2,525 9,486

The chief staples of the export trade are raisins (£1,370,000 in 1884-85), wheat (£900,000), cotton (£700,000), opium (£500,000), olive oil (£450,000), valonia (£450,000), barley (£332,000), figs (£200,000), sesame (£196,000), maize (£194,000), pulse (£185,000), nuts (£184,000), mohair (£145,000), wool (£140,000), dates (£115,000); and of the import trade cotton and cotton stuffs (£4,350,000, in 1883-84), cereals and flour (£1,350,000), sugar (£1,150,000), draperies, hosiery, &c. (£735,000), woollen stuffs (£650,000), coffee (£535,000), metals (£516,000), ironmongery (£475,000), dyes (£450,000), silk and silk stuffs (£400,000), petroleum (£375,000), hides and skins (£255,000), live stoc (£236,000), cheinicals (£167,000), coal (£135,000).

In the next table are given the principal seaports of the empire with their imports, exports, and shipping for 1886 :—

——$__,

Exports. | Imports. Jee Tonnage. PMOXONATIAL G)0.665.ccci ees eves £11,710,000|£9,417,000 | 1249 | 1,020,000 Constantinople ……. Sout o8 Or 9072 | 5,195,000 | SIM UMATereleieiscisisisissisieeisic se ses eee 4,331,000 | 2,706,000 | 1645 | 1,363,000 Salen tol igehpoics os. cannon amen 1,362,000 | 1,660,000 | 5440 574,000 Iskanderoon and Tripoli …..... 022,000 | 1,670,000 626 351,000 Samsun, with Ordu and Unieh ..| 806,000 787,000 478 455,000 Trebizond and Kirasun …..... 15,000 {| 1,904,000 | 6063 478,000 Beyrut, with Akka and Haifa ..} 602,000 995,000 | 4009 618,000 HES hve Oa Wevatac copes ec cia WINER, wc se: 457,000 201,000 778 145,000 Cretei(Six OBIS). ..cccs’s aos e sss 385,000 | 633,000 | 3760 491,000 , WC COARAUGIIR a teleteis.sissistsielsieiee sere 298,000 HGDO00!|| 5… Face Tripoli (Africa) ..... 231,000 310,000 501 272,000 |

SS By Sb. chCU ene Cee mene 222,000 281,000 | 1371 115,000 | Gallipoli and Rodosto ……..... 212,000 185,000 | _…. Bh | BEM Rerevereoceiesvokeray «, ocecsysielevereactiets 172,000 709,000 712 1,109,000 SOHRUOOCHUAODHE DEB ecc 121,000 111,000 261 54,000 easuefeLeveliorebernicsasisscsliehe; sustale eratene 120,000 240,000 | 1000 459,000 Ghoe 5 abo Geken o OM OORmadDC 119,000 ? 1040 | 317,000

All branches of the foreign trade, together with most of the local traffic and the banking business, are almost exclusively in the hands of Greeks, Armenians, Jews, and foreigners. The Turks and other Mohammedans are engaged nearly altogether in agricultural and pastoral pursuits. But the land, especially in Anatolia, is gradu- ally passing from its Moslem owners into the possession of Christian mortgagees. Scarcely any accurate agricultural returns are avail- able, except for one or two districts. In the Erzeroum vilayet in 1886? the live-stock stood as under,—sheep 1,485,000, goats 645,000, oxen 470,000, buffaloes 48,000, horses 61,000, asses 42,000, mules 5000; beehives numbered 80,000. The chief agricultural produce for the same year was—wheat 16,690,000 bushels, barley 13,297,000 bushels, beans 46,250 cwts., melons 17,000 ewts., mulberries 10,000 ewts., other fruits 40,000 cwts. In the same year of the 12,000 square miles constituting the Trebizond vilayet 2100 were under cultiva- tion, 1860 uncultivated, 2520 woodland, and 5520 highland pastur- age, the annual yield being about 2,300,000 cwts. of cereals, 1,000,000 ewts. of nuts, fruits, vegetables, &c., and 500,000 ewts. of fodder ;

1 Exclusive of tobacco, which for fiscal reasons is not included in the general trade returns, but the export of which amounted to £11,500,000 in value for 1884-5, and nearly £11,000,000 for 1885-6,

2 Consul-General Fawcett’s Report for July 1887, p. 81.

3 Cons. Rep. for July 1887.

FURKE Y

whilst of live-stock there were 300,000 sheep and goats, 150,000 horses, 25,000 mules and asses, 60,000 oxen.4

Previous to 1880 Turkey was commonly regarded as practically Finance.

bankrupt. But since then a considerable improvement has been effected. Trustworthy data are still wanting; but a careful estimate gave the gross revenue and expenditure of 1884 at £T16,313,000 and £116,223,000 respectively, the expenditure including over £T4,000,000 available for state creditors, The public debt stood at £106,437,000 in 1882. The sultan is reported to draw a sum of from £1,000,000 to £2,000,000 annually from the public revenues for the support of the seraglio or imperial household of over five thousand persons.

Until 1886 the military service, compulsory on all Moslems over Army.

18 years of age, was kept up by 45,000 annual recruits drawn by ballot ; but in November of that year universal conscription of the whole able-bodied male population was decreed. By this measure the army, hitherto reckoned at about 160,000 men, with a war strength of from 450,000 to 500,000, will be probably raised to a permanent footing of 1,000,000 effectives under the flag and in the reserves, These will continue to be grouped in the three categories of the nizam or regulars in active service, the redif or first reserve, and the mustahfiz or second reserve. There is to be a considerable increase of cavalry, all conscripts being allowed to join that branch of the service who have the means of providing themselves with mounts and equipment. For military purposes the empire is divided into seven divisions, with headquarters at Constantinople, Adrianople, Monastir, Erzingian, Teagan Damascus, and Sanaa, all except Sanaa (for Yemen) hitherto furnishing an army corps for the nizam and two for the redif.

The navy at the beginning of 1887 comprised 15 large and Navy.

several smaller ironclads (monitors, gunboats, &c.), a number of mostly old-fashioned steamers, and 14 torpedo boats, and was manned by 80,000 sailors and 10,000 marines (nominal strength), raised by conscription or voluntary enlistment and serving for 12 years in the active and reserve elasses.

Public instruction is much more widely diffused throughout the Educa- empire than is commonly supposed, This is due partly to the tion.

Christian communities, notably the Maronites and others in Syria, the Anatolian and Roumelian Greeks, and the Armenians of the castern provinces and of Constantinople. Education is practically limited amongst the Mohammedans to reading and writing and the study of the Koran, But amongst the Christians, especially the Armenians, the Greeks of Smyrna, and the Syrians of Beyrut, it embraces a considerable range of subjects, such as classical Hellenic, Armenian, and Syriac, as well as modern French, Italian, and English, modern history, geography, and medicine. Large sums are freely contributed for the establishment and support of good schools, and the cause of national education is seldom forgotten in the legacies of patriotic Anatolian Greeks. Even the Turks are be- stirring themselves in this respect, and great progress has been made aug the last twenty years in the Erzeroum vilayet.5 In 1886 that province contained 1216 schools and 163 madrasas (colleges), with a total attendance of 25,680, including 1504 girls. Elsewhere few official statistics are available.

Besides administrative and financial reforms, one of the most Commu- pressing needs is improved means of communication. In Trebizond nication.

the route from the coast at Unieh through Niksar to Sivas has recently been completed to the limits of the vilayet. But the works on the more important road from Kirasun to Kara-hissar for the silver and lead mines at Lijessy are still suspended, owing to dis- putes between the contiguous provincial administrations, Many of the great historic highways are also much out of repair. At the end of 1885 only 1250 miles of railway were completed in the em- pire, of which 903 were in Europe and 347 in Asia. The chief lines are those connecting the capital with Adrianople (210 miles), Adrianople with Saremby (152), Saloniki with Uskub (150), Zenica with Brod (118), Uskub with Mitrovitza (75), and Kulleli with Dégéagatch (70) in Europe, and, in Asia, Scutari with Ismid (40), Smyrna with Ala-Shehr (130), and Smyrna with Denizli (170). By imperial decree (August 1887) a contract was granted to an English syndicate for the extension of the Ismid line and the

construction of a system of Asiatic railways to extend to Baghdad within the space of ten years.

The telegraph system is much more developed, comprising (1885) 14,620 miles, with 26,100 miles of wire and 470 stations. The yearly average of letters and packages of all sorts sent through the 710 post-offices scarcely exceeds 2,600,000. Most of the foreign postal service is conducted through the British, Austrian, German, French, and Russian privileged post-offices.

For the ethnography of the Turks, see Turxs. (Ay iy Ky)

Part ITI.—Literatvre, In all literary matters the Ottoman Turks have shown themselves a singularly uninventive people, the two great schools, the old and the new, into which we may divide their literature, being closely

4 Cons. Rep., May 1887. 5 Cons, Rep., July 1887, p. 4.

Old school.

General

character in tone, sentiment, and form.

of Otto- man litera- ture,

Pre- classical period,

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modelled, the one after the classics of Persia, the other after those of modern Europe, and more especially of France. The old or Persian school flourished from the foundation of the empire down to about 1830, and still continues to drag on a feeble existence, though it is now out of fashion and cultivated by none of the lead- ing men of letters. These belong to the new or European school, which sprang up some fifty or sixty years ago, and which, in spite of the bitter opposition of the partisans of the old Oriental system, has succeeded, partly through its own inherent superiority and partly through the talents and courage of its supporters, In expel- ling its rival from the position of undisputed authority which it had occupied for

upwards of five hundred years. For the present purpose it will be convenient to divide the old school into three periods, which may be termed respectively the pre-classical, the classical, and the post-classical. Of these the first extends from the early days of the empire to the accession of Suleyman I., 1301- 1520 (700-926); the second from that event to the accession of Mahmud I., 1520-1730 (926-1143); and the third from that date to the accession of ‘Abd-ul-‘Aziz, 1780-1861 (1143-1277).

The works of the old school in all its periods are entirely Persian We find in them the same beauties and the same defects that we observe in the productions of the Iranian authors. The formal elegance and conventional grace, alike of thought and of expression, so characteristic of Persian classical literature, pervade the works of the best Ottoman writers, and they are likewise imbued, though in a less degree, with that spirit of mysticism which runs through so much of the poetry of Iran. But the Ottomans did not stop here: in their romantic poems they chose as subjects the favourite themes of their Persian masters, such as Leyli and Mejnun, Khusrev and Shirin, Yusuf and Zuleykha, and so on; they constantly allude to Persian heroes whose stories occur in the Skadh-Ndma and other storehouses of Iranian legendary lore; and they wrote their poems in Persian metres and in Persian forms. The mesnevi, the kasida, and the ghazel,—all of them, so far at least as the Ottomans are concerned, Persian,—were the favourite verse-forms of the old poets. A mesnevi is a poem written in rhyming couplets, and is usually narrative in subject. The kasida and the ghazel are both monorhythmic ; the first as a rule celebrates the praises of some great nan, while the second discourses of the joys and woes of love. Why Persian rather than Arabian or any other literature became the model of Ottoman writers is explained by the early history of the race (see TuRKs). Some two centuries before the arrival of the Turks in Asia Minor the Seljuks, then a mere horde of savages, had overrun Persia, where they scttled and adopted the civilization of the people they had subdued. Thus Persian became the language of their court and Government, and when by and by they pushed their conquests into Asia Minor, and founded there the Seljuk empire of Rum, they carried with them their Persian culture, and diffused it among the peoples newly brought under their sway. It was the descendants of those Persianized Seljiks whom the early Ottomans found ruling in Asia Minor on their arrival there. What had happened to the Seljuks two centuries before

happened to the Ottomans now: the less civilized race adopted the culture of the more civilized ; and, as the Seljuk empire fell to pieces and the Ottoman came gradually to occupy its place, the sons of men who had called themselves Seljuks began thenceforth to look upon themselves as Ottomans. Hence the vast majority of the people whom we are accustomed to think of as Ottomans are so only by adoption, being really the descendants of Seljttks or Seljukian subjects, who had derived from Persia whatever they possessed of civilization or of literary taste. An extraordinary love of precedent, the result apparently of conscious want of original power, was sufficient to keep their writers loyal to their early guide for centuries, till at length the allegiance, though not the fashion of it, has been changed in onr own days, and Paris has replaced Shiraz as the shrine towards which the Ottoman scholar turns. While conspicu- ously lacking in creative genius, the Ottomans have always sliown themselves possessed of receptive and assimilative powers to a remarkable degree, the result being that the number of their writers both in prose and verse is enormous. Of course only a few of the most prominent, either through the intrinsic merit of their work or through the influence they have had in guiding or shaping that of their contemporaries, can be mentioned in a brief review like the present. It ought to be premised that the poetry of the old school is greatly superior to the prose.

Ottoman literature may be said to open with a few mystic lines, the work of Sultan Veled, son of Maulana Jelal-ud-Din, the author of the great Persian poem the Mathnawi. Sultan Veled flourished during the reign of ‘Osman I., though he did not reside in the territory under the rule of that prince. Another mystic poet of this early time was ‘Ashik Pasha, who left a long poem in rhyming couplets, which is called, inappropriately enough, his Divén. The nocturnal expedition across the Hellespont by which Suleyman, the son of Orkhan, won Galipoli and therewith a foothold in Europe for his race, was shared in and celebrated in verse by a Turkish noble or chieftain named Ghazi Fazil. Sheykhi of Kermiyan, a

Torr kon

[LITERATURE |

contemporary of Muhammed I. and Murad II., wrote a lengthy and still esteemed mesnevi on the ancient Persian romance of Khusrey and Shirin; and about the same time Yaziji-oghlu gave to the world a long versified history of the Prophet, the Muhammedtya. The writers mentioned above are the most important previous to the capture of Constantinople ; but there is little literature of real merit prior to that event. ‘The most notable prose work of this period is an old collection of stories, the History of the Forty Vezirs, said to have been compiled by a certain Sheykh-zada and dedicated to Murad II.

With the accession of Selim’s son, Suleyman I., the classical Classical period begins. Hitherto all Ottoman writing, even the most highly period.

finished, had been somewhat rude and uncouth; but now a marked improvement becomes visible alike in the manner and the matter, and authors of greater ability begin to make their appearance. Fuzuli, one of the four great poets of the old school, seems to have been a native of Baghdad or its neighbourhood, and probably became an Ottoman subject when Suleyman took possession of the old capital of the caliphs. His language, which is very peculiar, seems to be a sort of mixture of the Ottoman and Azerbijan dialects of Turkish, and was most probably that of the Persian Turks of those days. Fuzuli showed far more originality than any of his predecessors ; for, although his work is naturally Persian in form and in general character, it is far from being a mere echo from Shiraz or Ispahan. He struck out a new line for himself, and was indebted for his inspiration to no previous writer, whether Turk or Persian. An intense and passionate ardour breathes in his verses, and forms one of the most remarkable as well as one of the most attractive characteristics of his style ; for, while few even among Turkish poets are more artificial than he, few seem to write with greater earnestness and sincerity. His influence upon his suc- cessors has scarcely been as far-reaching as might have been ex- pected,—a circumstance which is perhaps in some measure owing to the unfamiliar dialect in which he wrote. Besides his Divdn, he left a beautiful mesnevi on the story of Leyli and Mejnun, as well as some prose works little inferior to his poetry. Baki of Constantinople, though far from rivalling his contemporary Fuzul, wrote much good poetry, including one piece of great excellence, an elegy on Suleyman I. The Ottomans have as a rule been

particu- larly successful with elegies ; this one by Baki has never been sur- passed. Ruhi, Lami‘i, Nev’i, the janissary Yahya Beg, the mufti Ebu-Su’id, and Selim II. all won deserved distinction as poets. During the reign of Ahmed I. arose the second of the great poets of the old Ottoman school, Nef‘i of Erzerim, who owes his pre- eminence to the brilliance of his kasidas. But Nef’i could revile as well as praise, and such was the bitterness of some of his satires that certain influential personages who came under his lash in- duced Murad IV. to permit his execution. Nef‘, who, like Fuzuli,

formed a style of his own, had many to imitate him, of whom Sabri Shakir, a contemporary, was the most successful. Nwili, Jevri, and Fehim need not detain us; but Nabi, who flourished under Ibrahim and Muhammed IV., calls for a little more attention. This prolific author eopied, and so imported into Ottoman litera- ture, a didaetic style of ghazel-writing which was then being

(1141) appeared the first book printed in that country ; it was Van- kuli’s Turkish translation of Jevhert’s Arabic dictionary.

Coming now to the post-classical period, we find among poets Post- worthy of mention Beligh, Nevres, Hishmet, and Sunbuli-zada elassieal Vehbi, each of whom wrote in a style peculiar to himself. Three period, poets of note—Pertev, Neshet, and Sheykh Ghalib—flourished

“lassical

introduced in Persia by the poet Sd’ib ; but so closely did the pupil follow in the footsteps of his master that it is not always easy to know that his lines are intended to be Turkish. A number of poets, of whom Seyyid Vehbi, Raghib Pasha, Rahm of the Crimea, Kelim, and Sami are the most notable, took Nabi for their model. Of these, Sami is remarkable for the art with which he constructed his ghazels. Among the writers of this time who did not copy Nabi are Sabit, Rasikh, and Talib, each of whom endeavoured, with no great success, to open up a new path for himself. We now reach the

reign of Ahmed III., during which flourished Nedim, the greatest of all the poets of the old school. Little appears to be known about his life further than that he resided at Constan- tinople and was alive in the year 1727 (A.u. 1140). Nedim stands quite alone: hc copied no one, and no one has attempted to copy him. There is in his poetry a joyousness and sprightliness which at once distinguish it from the work of any other Turkish author. His ghazels, which are written with great elegance and finish, con- tain many graceful and original ideas, and the words he makes use of are always ehosen with a view to harmony and cadence. His kasidas are almost cqual to his ghazels; for, while they rival those of Nef in brilliancy, they surpass them in beauty of diction, and are not so artificial and dependent. on fantastic and far-fetched conceits. The classical period cames to an end with Nedim ; its brightest time is that which falls between the rise of Nef‘{ and the death of Nedim, or, more roughly, that extending from the acces- sion of Ahmed I., 1603 (1012), to the deposition of Ahmed III.,

1730 (1148).

We will now glance at the prose writers of this period. Under the name of Humdyin Ndma (Imperial Book) ‘Ali Chelebi made a highly esteemed translation of the well-known Persian classic Anvér-i Suheyli, dedieating it to Suleyman I. Sa‘d-ud-Din, the preceptor of Murad III., wrote a valuable history of the empire from the earliest times to the death of Selfm I. This work, the Tdj-ut-Tevdrikh (Crown of Chronicles), is reckoned, on account of its ornate yet clear style, one of the masterpieces of the old school, and forms the first of an unbroken series of annals which are written, especially the later among them, with great minutencss and detail. Of Sa‘d-ud-Din’s successors in the office of imperial historiographer the most remarkable for literary power is Na‘imé. His work, which extends from 1591 (1000) to 1659 (1070), contrasts strongly with that of the earlier historian, being written with great directness and lucidity, combined with much vigour and picturesqueness. Evliya, who died during the reign of Muhammed IV., is noted for the record which he has left of his travels in different countries. About this time Tash-képri-zdda began and ‘Atd-ulldh continued a celebrated biography of the legists and sheykhs who had flourished under the Ottoman monarchs. Haji Khalifa (see vol. xi. p. 377), frequently termed Katib Chelebi, was one of the most famous uien of letters whom Turkey has

produced. He died in 1658 (1068), having written a great number of learned works on history, biography, chronology, geograpliy, and other subjects. The Persian- izing tendency of this school reached its highest point in the pro- ductions of Veysf, who left a Life of the Prophet, and of Nergisi, a miscellaneous writer of prose and verse. Such is the intentional obscurity in many of the compositions of these two authors that every sentence becomes a puzzle, over which even a scholarly Otto- man must pause before he can be sure he has found its true mean- ing. The first printing press in Turkey was established by an Hungarian who had assumed the name of Ibrahim, and in 1728

TURKEY, an abbreviation for TurKry-Cock or TuRKEY- Hun as the case may be, a well-known large domestic gallinaceous bird. How it came by this name has long been a matter of discussion, for it is certain that this valu- able animal was introduced to Europe from the New World, and in its introduction had nothing to do with Turkey or with Turks, even in the old and extended sense in which that term was applied to all Mahometans. But it is almost as unquestionable that the name was origin- aly applied to the bird which we know as the GurnEa- Fown (g.v.), and there is no doubt that some authors in the 16th and 17th centuries curiously confounded these two species. As both birds became more common and better known, the distinction was gradually perceived, and the name “Turkey” clave to that from the New World— possibly because of its repeated call-note—to be syllabled

under Selim III. The last-named is the fourth great poet of the old school. Husn wu ‘Ashk (Beauty and Love), as his great poem is called, is an allegorical romance full of tenderness and imaginative power. Ghalib’s style is as original as that of Fuztl{, Nef, or Nedim. The most distinguished of the prosc writers of this period are perhaps Rashid, the imperial historiographer, ‘Asim, who trans- lated into Turkish two great lexicons, the Arabic Kdmuis and the Persian Burhdn-t Kati‘, and Kani, the only humorous writer of merit belonging to the old school.

When we reach the reign of Mahmid IL. the great transition Transi- period of Ottoman history, during which the civilization of the tion West began to struggle in earnest with that of the East, we find period.

the change which was coming over all things Turkish affecting literature along with the rest, and preparing the way for the ap- pearance of the new school. The chief poets of the transition are Fazil Bey, Wasif, notable for his not altogether unhappy attempt to write verses in the spoken language of the capital, ‘Izzet Molla, Pertev Pasha, ‘Akif Pasha, and the poetesses Fitnet and Leyla. In the works of all of these, although we occasionally discern a hint of the new style, the old Persian manner is still supreme.

More intimate relations with western Europe and a pretty general Modern and literature, together with the sehool.

study of the French language steady progress of the reforming tendency fairly started under Mahmud II., have resulted in the birth of the new or modern school, whose objects are truth and simplicity. In the politieal writings of Reshid and ‘Akif Pashas we have the first clear note of change; but the man to whom more than to any other the new departure owcs its success is Shinasi Efendi, who employed it for poetry as well as for prose. The European style, ou its introduc- tion, encountered the most violent opposition, but now it alone is used by living authors of repute. if any of these does write a pamphlet in the old manner, it is merely as a tour de force, or to prove to some faithful but clamorous partisan of the Persian style that it is not, as he supposes, lack of ability which causes the modern author to adopt the simpler and more natural fashion of the West. The whole tone, sentiment, and form of Ottoman litera- ture have been revolutionized by the new sehool : varieties of poetry hitherto unknown have been adopted from Europe ; an altogether new branch of literature, the drama, has arisen ; while the sciences are now treated and seriously studicd after the system of the West. Among writers of this school who have won distinction are Ziydé Pasha, Jevdet Pasha, the statesman and historian, Ekrem Bey, the author ofa beautiful series of miscellaneous poems, Zemzema, Hamid Bey, who holds the first place among Ottoman dramatists, and Kemal Bey, the leader of the modern sehool and one of the most illustrious men of letters whom his country has produced. He has written with conspicuous success in almost every branch of literature,—history, romance, ethics, poetry, and the drama. For the Turkish language, see p. 661 below.

There is no work in existence which gives a satisfactory account of Ottoman literature. Von Hammer-Purgstall's Geschichte der Osmanischen Dichtkunst (Pesth, 1836) is not always trustworthy and leaves much to be desired in many ways. Other works on the poetry are La Muse Ottomane, by Servan de Sugny (Paris, 1853); On the History, System, and Varieties of Turkish Poetry, by Red- house (London, 1878); Ottoman Poems, by Gibb (London, 1882), Of transla- tions we have Baki's Divan, by Hammer (Vienna, 1825); the Travels of Evliyd, by Hammer (London, 1834); Rose wid Nachtigall (a poem of Fazli, a mediocre writer of the time of Suleyman I.), Turkish and German, by Hammer (Pesth) ; Les Conseils de Nabi Efendi, by Pavet de Courteille (Paris, 1857); The History of the Forty Vezirs, by Gibb (London, 1886). An interesting and valuable sketch of Ottoman poetry is given by Kemal Bey in a series of articles in the Turkish literary journal Mejmiu' a-i Ebu-z-Ziyd. (E. J. W. G.)

turk, turk, turk, whereby it may be almost said to have named itself (cf, Votes and Queries, ser. 6, iii. pp. 23, 369). But even Linnzus could not clear himself of the confusion, and unhappily misapplied the name Meleagris, undeniably belonging to the Guinea-Fowl, as the generic term for what we now know as the Turkey, adding thereto as its specific designation the word gallopavo, taken from the Gallopava of Gesner, who, though not wholly free from error, was less mistaken than some of his contemporaries and even successors. }

' The French Cog and Poule d' Inde (whenee Dindon) involve no contradietion, looking to the general idea of what India then was. One of the earliest German names for the bird, Kalekuttisch Hin (whence the Seandinavian Kalkon), must have arisen through some

mistake at present inexplieable; but this does not refer, as is generally supposed, to Caleutta, but to Calieut on the Malabar coast (cf. Notes

and Queries, ser. 6, x. p. 185). XXIII. — 83

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The Turkey, so far as we know, was first described by Oviedo in his Sumario de la Natural Historia de las Indias} (cap. xxxvi.), said to have

been published in 1527. He, not unnaturally, includes both Curassows and Turkeys in one category, calling both “ Pavos”’ (Peafowls) ; but he carefully distinguishes between them, pointing out among other things that the latter make a wheel (hacen la rueda) of their tail, though this was not so grand or so beautiful as that of the Spanish ‘‘Pavo,” and he gives a faithful though short description of the Turkey, The chief point of interest in his account is that he speaks of the species having been already taken from New Spain (Mexico) to the islands and to Castilla del Oro (Darien), where it bred in a domestic state among the Christians. Much labour has been given by various naturalists to ascertain the date of its introduction to Europe, to which we can at present only make an approximate attempt ;* but after all that has been written it is plain that evidence concurs to show that the bird was established in Europe by 1530—a very short time to have elapsed since it became kuown to the Spaniards, which could hardly have been before 1518, when Mexico was discovered. The possibility that it had been brought to England by Cabot or some of his successors earlier in the century is not to be overlooked, and reasons will presently be assigned for supposing that one of the breeds of English Turkeys may have had a northern origin ;> but the often quoted distich first given in Baker’s Chronicle (p. 298), asserting that Turkeys came into England in the same year—and that year by reputation 1524—as carps, pickerels, and other commodities, is wholly untrustworthy, for we know that both these fishes lived in the country long before, if indeed they were not indigenous to it. The earliest documentary evidence of its existence in England is a “constitution” set forth by Cranmer in 1541, which Hearne first printed (Leland’s Collectanca, ed. 2, vi. p. 38). This names “Turkey- cocke” as one of ‘‘the greater fowles” of which an ecclesiastic was to have ‘‘but one in a dishe,” and its association with the Crane and Swan precludes the likelihood of any confusion with the Guinea-Fowl. Moreover the comparatively low price of the two Turkeys and four Turkey-chicks served at a feast of the serjeants- at-law in 1555 (Dugdale, Origines, p. 185) points to their having become by that time abundant, and indeed by 1573 Tusser bears witness to the part they had already begun to play in “Christmas husbandlie fare.” In 1555 both sexes were characteristically figured by Belon (Oyseaua, p. 249), as was the cock by Gesner in the same year, and these are the earliest representations of the bird known to exist.

There is no need to describe here a bird so familiar and in these days so widely distributed. As a denizen of our poultry-yards (see Poutrry, vol. xix. p. 646) there are at least two distinct breeds, though crosses between them are much commoner than purely-bred examples of either. That known as the Norfolk breed is the taller of the two, and is said to be the more hardy. Its plumage is almost entirely black, with very little lustre, but the feathers of the tail and some of those of the back have a brown- ish tip. The chicks also are black, with occasionally white patches on the head. The other breed, called the Cambridgeshire, is much more variegated in colour, and some parts of the plumage have a bright metallic gloss, while the chicks are generally mottled with brownish grey. White, pied, and buff Turkeys are also often seen, and if care be taken they are comimonly found to ‘‘ breed true.” Occasionally Turkeys, the cocks especially, occur with a top-knot of feathers, and one of them was figured by Albin in 1788. It has becn suggested with some appearance of probability that the Norfolk breed may be descended from the northern form, Jlelcagris gallopavo or americana, while the Cambridgeshire breed may spring from the southern form, the Jf mexicana of Gould (Proc. Zool. Socicty, 1856, p. 61), which indeed it very much resembles, especi-

1 Purchas (Pilgrimes, iii. p. 995) in 1625 quoted both from this and from the same author's Hystoria General, said to have been pub- lished a few years later. Oviedo's earlier work is only known to the present writer by the reprint of 1852.

2 The bibliography of the Turkey is so large that there is here no room to name the various works that might be cited. Recent research has failed to add anything of importance to what has been said on this point by Buffon (Oiseaux, ii pp. 132-162), Pennant (Arctic Zoology, pp. 291-300),—an admirable summary, —and Broderip (Zo0- logical Recreations, pp. 120-137)—not that all their statements can be wholly accepted. Barrington's essay (Aiscellanies, pp. 127-151), to prove that the bird was known before the discovery of America and was trausported thither, is an ingenious piece of special pleading which his friend Pennant did him the real kindness of ignoring.

3 In 1672 Josselin (New England's Rarities, p. 9) speaks of the settlers bringing up ' great store of the wild kind " of Turkeys, " which remain about their houses as tame as ours in Englaud." The bird was evidently plentiful down to the very seaboard of Massachusetts, and it is not likely to have been domesticated by the Indian tribes there, as, according to Hernandez, it seems to have beeu by the Mexicans, It was probably easy to take alive, and, as we kuow, capable of endur- ing the voyage to England.

ally in having its tail-coverts and quills tipped with white or light ochreous, —points that recent North-American ornithologists rely upon as distinctive of this form. If this supposition be true, there would be reason to believe in the double introduction of the bird into England at least, as already hinted, but positive information is almost wholly wanting.* The northern form of wild Turkey, whose habits have been described in much detail by all the chief writers on North-American birds, is now extinct in the settled parts of Canada and the eastern States of the Union, where it was once so numerous ; and in Mexico the southern form, which would seem to have been never abundant since the conquest, has been for many years rare. Further to the south, on the borders of Guatemala and British Honduras, there exists a

perfectly distinct species, J/. ocellata, whose plumage almost vies with that of a Peacock in splendour, while the bare skin which covers the head is of a deep blue studded with orange caruncles (Proc. Zool. Socicty, 1861, pl. x1.).

The genus Meleagris is considered to enter into the Family Phasianide, in which it forms a Subfamily Jfele- agrine, peculiar to North and Central America. The fossil remains of three species have been described by Prof. Marsh—one from the Miocene of Colorado, and two, one much taller and the other smaller than the existing species, from the Post-Pliocene of New Jersey. Both the last had proportionally long and slender legs. (A. N.)

TURKS. The use of the name “Turks” has never been limited in a clear and definite way from the time of the Byzantine authors to the present day. To the former, as also to the Arabs, it has a collective sense like Scythians or Huns;° at the present day we are wont to restrict the name to the Osmanli Turks, though they themselves refuse to be called Turks, having, as they hold, ceased to be such in becoming imbued with Arabo-Persian culture. On the other hand, when we speak of Uigurs and Tatars, we mean tribes who style themselves Turks and really are such. It is only by the aid of historical and linguistical evidence that we can determine the true limits of the Turkish name.

The national Turkish traditions, preserved by the Origin.

Persian historians Rashid ed-Din and Jowaini from Uigurian books which are now lost, point to the region watered by the river Selenga and its affluents, the Orkhon and the Tugila, as the primitive seat of the Turkish people. Rashid ed-Din combines this tradition with that of the Mohammedan descendants of Oghuz, who, in accordance with Moslem traditions, derive the whole Turkish stock from Japhet, the son of Noah, or more accurately from Turk, the son of the former (Yafiz-oglan), and pretend that he pitched his tents in the vicinity of Lake Issyk-kul (in Semiryetchensk). wander so far to the west, and even farther, in remote antiquity, it seems pretty certain that the Uigurian tradi- tion has preserved the memory of the true origin of the race, that Turks and Mongols were originally different stems of a single people, and that these two members of the Urat-Aurtaic (¢.v.) family were more closely related to each other than

to any other member of the same family (Finno- Ugrians, Samoyedes, Tungus-Manchus). The evidence for this rests, not on the ethnological system of Rashid ed-Din, though it affords a secondary argument, but on the in- dubitable affinity of the Mongolian and Turkish languages and the similarity of the ethnological characters of the two races. Here, of course, we do not argue from the Osmanlis, who have lost all their original race-characters and have become “Caucasians” of the best type, but rather, for in- stance, from the Kirghiz, who are considered as the typical Turks of the present day, and are described by Ujfalvy as being midway between the Mongol and the Caucasian. We must now turn our attention to the wanderings of the Turks and their subsequent fate,—a rather difficult task,

4 The results of a comparison of the skulls of wild and domesticated Turkeys are given by Dr Shufeldt in Journ. of Comp. Medicine and Surgery, July 1887.

5 Constantine Porphyrogenitus calls the Magyars Turks, even in contradistinction to the truly Turkish Petchenegs.

But, though Turkish tribes did Ethno-

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owing to the want of accurate information. The only truly historical records are to be found in the Chinese chronicles and encyclopzedias,! where, however, the Turkish proper names appear in such distorted forms as to be un- recognizable ; yet, till the 6th century of our era, no other accounts are available.

It is generally admitted that the first Turkish people mentioned by the Chinese are the Hiong-nu, who, wander- ing to the west, occupied the country south of the Altai Mountains and expelled (about 177 3.c.) the former occupants of those regions, the Yue-chi,? Kan-goi, and Usun (U-ssun),—tribes of unknown nationality, but possibly also Turks. The Hiong-nu were identified by Deguignes with the Huns, this denomination being used in a political or collective sense, and including, besides the Huns proper, the Ephthalites or White Huns, Avars, Bulgars, Magyars, Khazars, and Petchenegs, who are styled by several scholars Hunnic or Scythian

peoples,—a term of no scientific value whatever, as the main body of these peoples consisted really of Mongol-Turks or Finno-Ugrians. As, however, separate articles have been devoted to most of these ethnical names, we abstain from further details, as also from discussion of the question of the Turkish origin of the Magyars and the Khazars, though that of the former seems to us as improbable as that of the latter is certain.* Be this as it may, the Hiong-nu are, so to speak, proto- Turks, and the history of the Turks proper begins with the Tu-kiu, the Chinese equivalent of the word Turk. Originally a division of the Hiong-nu, almost extirpated by wars, but miraculously saved from complete destruction, the Tu-kiu settled south of the Kin-Shan (Altai?) Moun- tains, and were miners and iron-smelters in the service of the Juen-Juen® ("les Tartares Geou-gen" of Deguignes). About 552 a.p., however, they conquered their former masters and founded a mighty empire under princes who took the title of Ili khan. In these Tu-kiu Deguignes re- cognized the Turks who entered into friendly relations with Byzantium, and to whom Justin II. sent two ambassadors, —Zemarchus (568) and Valentinus (575). The narratives of these ambassadors are preserved in the fragments of Menander Protector ; and (comparing the variations of the corrupt text with the record of Tabari) from him we learn that at the first date the reigning prince was Sinjibulus (Arabic Sinjibu).6 From the Greek and the Arabo-Persian accounts it seems that Sinjibu put an end to the empire of

1 Translated in the well-known works of Deguignes, Visdelou, &c.; for a French translation by Stanisl. Julien of the accounts of the Pien-i-tien, referring to the Tu-kiu, see Journ. Asiat., 1864, p. 325 sq.

2 Comp. Persta, vol. xviii. pp. 592-4, 600, 603.

3 Radloff, for instance, thinks that the name U-ssun, and perhaps remnants of the people denoted by it, survive in the present Uisuns, a division of the Great Horde of the Kirghiz. At the time of Alexander the Great's expeditions against the Scythians beyond the Jaxartes, we find in that region certain traces of the Turkish language in names of places and persons (cp. vol. xviii. p. 582, note 4), It is therefore certain that long before the age of the Hiong-nu Turkish tribes had spread to the borders of the Jaxartes, and even along the northern coast of the Caspian to the rivers Ural and Volga.

But the ethnical denominations of antiquity—Scythians, Parthians, Massagete, Sace, &c.—do not convey to our mind clear ethnical distinctions, so that the true nationality of these peoples has been much debated. Neither are the pre-Semitic culture of Babylonia and the supposed "Turanian" origin of the Accads facts of such character that from them we can infer the presence of Turks in these regions in remote antiquity.

4 On the Petchenegs see below.

5 From their Chinese name it may be inferred that the Juen-Juen were a Mongolian people, in which case the Avars, who are supposed to have been a division of them, were also Mongols.

6 See Nildeke, Geschichte der Perser und Araber, p. 158. The first part of this name is without doubt the Turkish siinjii, stingit, which means 'lance,' a Turkish proper name of the same kind as Kilij= "sword," which in its Persian form, Nizek, was afterwards borne by a prince of Transoxiana, often mentioned in the accounts of the Arabic conquest.

the Ephthalites or Haitals in those regions. He shared the conquered country with Khosrau I., the Oxus becoming the frontier between Iran and Turin. The memory of the empire of Sinjibu and of its political strength has been preserved by the Arabic authors Ibn Khordadbeh and Mas'udi, who inform us that the Turkish tribe of the Karluks, settled in the provinces of Ferghana and Shash (Tashkend), were of old the mightiest of all the Turks, and that their sovereign, the khakan of khakans, was obeyed by all the neighbouring princes. To them they reckon the mythical Afrasiab and the historical Shawa.' It is un- certain at what epoch the empire of the Karluks came to an end; but the Chinese assert that about 650 they reduced the inhabitants of the Ili and Jaxartes territory, though they were unable to protect them afterwards against the inroads of the Arabs under Kotaiba b. Moslim (706-714). The latter defeated the armies sent to their aid under Kurbogha Noyon, a sister's son of the Chinese emperor.' It is also doubtful if the so-called Afrasiab kings or Ilek- khans, who reigned in the 10th century at Kashgar and Balasaghun and conquered (999) the dominions of the

Samanids in Transoxiana, belonged to the Karluks, as is supposed by Grigorieff and Lerch, or to the Uigurs, as others think.

The name Uigurs is very common during the Mongolian The period, and Rashid ed-Din and others use it (by an ana- Vigurs.

chronism) in speaking of remote antiquity, though it is wholly unknown to the Arabic geographers, and, as Vambéry has shown, to the Uigurs themselves,—nay, even impossible in the old Turkish language, in which the form would be Utkur. The name Ugur, Ogur, or Ogor of Byzantine authors is really different ; but Grigorieff has recognized the name in the corrupt Arabic form of Tagazgaz, which must be read Toguz-Ugur,® the "Nine Ugurs," to dis- tinguish them from another division of the same tribe, the On-Ugur or "Ten Ugurs." In the time of Ibn Khor- dadbeh and Mas'udi these Turks had gained the supremacy amongst their brethren, and had their residence at Kushan, which has been identified with the Kiao-chang of the Chinese. According to their accounts, the Kiao-chang form the southern division of the Hui-khe (Hoei-ke of Deguignes), and were settled before the Christian era south and east of the Tian-Shan up to the Pamir plateau and the Kuen-Lun. The Arabic authors make them adherents of Manichzism ; but, as the original Turkish Shamanism has developed into a dualistic system, this statement may rest on a partial misapprehension. It seems, however, certain that Buddhism reached these Turks on its way towards China, for we know that this religion spread in the 2d century B.c. throughout the adjacent kingdom of Bactria, and was still flourishing when Hwen-T'sang visited (7th century) those regions. Thus we can understand why the old Ural-Altaic religion bears a Sanskrit name. The northern division of the Hui-khe, which remained unknown to the Arabs, wandered from the Selenga region to the sources of the Yenisei, vanquished the Tu-kiu (745), and founded an empire from the Selenga to Lake Balkash, till they were overthrown (841) by the Ha-kas (identified with the Kirghiz), These northern Uigurs are called by the Chinese Kao-che, Chi-le, Di-li, and Te-le. The history of the southern branch is unknown, for the chronological data of Rashid ed-Din and Abu-'1-Ghazi are contradictory and useless, though their statements that the prince bore the title of Idi-kut and submitted to the Mongols have full historical weight. That the Uigurs rose during the

7 Cp. Mas‘udi, ed. Paris, i. 288; Noldeke, ut sup., p. 269, n. 1.

8 The title Noyon, if the present writer’s conjecture on the text of Tabari, ii. 1195, is right, proves that Kurbogha was a Mongolian prince.

® Before this Reinaud had conjectured that the Tagazgaz were the same as the Uigurs, but failed to correct the Arabic corruption.

The Petch- enegs.

The Comans.

The Ghuzz.

Mongolian epoch to a certain supremacy by higher culture is attested by Rashid ed-Din and Jowaini, who often men- tion Uigurian books.

The Petchenegs (Gr. Ilar€waxa1, Uargwaxirar; Mag- yar Besenyd; Lat. Bisseni) were of old, as Constantine Porphyrogenitus tells us, settled about the lower Ural and Volga, but were driven thence (894-899) by the Ghuzz (Ouzoi). A part of them returned afterwards to their ancient abode, but the great majority wandered westward and settled on both sides of the Dnieper, driving the Hungarians before them to the Carpathians. Here they annoyed the neighbouring peoples by their raids, and en- gaged readily in the Russian expeditions against the Greek empire, till the policy of the Byzantine court incorporated large numbers of them with its own armies, sometimes with fatal result, as was experienced by Romanus Diogenes, when these auxiliaries passed to the camp of his antagonist Alp Arslan. At the period of the first crusade the Christian armies met with them on their march through Servia and Bulgaria ; but the Petchenegs are not mentioned after the 13th century. The learning of Orientalists has discovered faint traces of the language once spoken by them in the Turkish dialect of the Bosnians.1

Comans or Cumani (Russ. Polowtze, Magyar Palocz and Kun) is a term chiefly used by Europeans for the Turkish tribes that occupied Moldavia

and the adjacent regions of south Russia. The origin of the name is uncertain ; but it seems to be Turkish, though it rarely occurs in Oriental records. The most probable conjecture regarding the people denoted by it is that they were a mixture of Ghuzz and Petchenegs. Oriental authors know much more of their neighbours to the east, the Kipchaks, a very common name of Turkish clans down to the present day. Some- times both names are combined: Rubruquis speaks of the Coman Kipchaks. Anna Comnena informs us that the Comans spoke the same dialect as the Petchenegs, a dialect well known to European scholars from the so-called Codex Cumanicus.2. On the arrival of the Mongols in these regions, the Kipchaks suffered great hardships, and large numbers of them were sold as slaves throughout the Mohammedan world. From them sprang the Bahrite Mameluke sultans of Egypt (1250-1380). The Comans sought refuge amongst the Hungarians and became Chris- tians; but their arrival, causing internal dissensions in Hungary, greatly favoured the advance of the Mongolian arms. The remnants of the Comans, Kipchaks, and other Turkish tribes continued to dwell in southern Russia under Mongolian rule (see Moncoxs), whilst others became merged with the Hungarians.

The Ghuzz dwelt originally in the far East amongst the Toguz-Ugur, but migrated in the reign of the caliph Al- Mahdi (775-785) to Transoxiana, where they adhered to the cause of the famous Al-Mokanna‘, not from religious predilection, but to satisfy their love of war and plunder. In the same manner they afterwards served every warlike prince in their neighbourhood, and entered like other Turks into the service of the caliphs. The main body of the life-guard of the ‘Abbasids consisted of Turks, and some individuals rose very soon to high commands. En- trusted with the administration of distant provinces, they founded independent princely houses, such as those of the Tulunids and Ikhshids in Eeypr (vol. vii. p. 750) and the Ghaznavids (see Guaznt). In the meantime fresh bands of the Ghuzz poured from the east and the north into Turkestan, the region becoming overstocked with a nomadic population. Some of them sought and found an outlet to the west by occupying the territory of the Petchenegs and jorping Che Tunisie Dep aie a sae eee aa

‘ Comp. Blau, Bosnisch- Tiirkische Sprachdenkméler (Leipsic, 1868), p. 815. * Edited by Geza Kuun, Buda-Pesth, 1880-83,

the great majority, seeing the ruined state of the empire of the caliphs, crossed the Oxus and overran the northern and eastern provinces of Persia. How these loose desul- tory bands were guided to subsequent victories, and moulded with the peoples amongst whom they settled into regular political bodies, has been already narrated under SELJUKS (q.v.).

Meanwhile they underwent a great change in their out- ward appearance, habits, &c., as Rashid ed-Din relates, owing to the influence of the air and the water, and, we may add, to frequent intermarriage with the inhabitants of the countries invaded by them. After some generations the change was great enough to strike their Iranian neigh- bours, who called them Turkmans (Turcomans),? a term implying resemblance to Turks. It is therefore quite natural that the modern Osmanlis should have become Caucasians ; for, if Rashid ed-Din in the 13th century noticed the difference between a Turkman and a genuine Turk, the six centuries which have elapsed since amply suffice to have obliterated all original Ural-Altaic charac- teristics. The old name Ghuzz, originally, as it seems, the Turkish Oghuz (an eponymous hero of whom Turkish chronicles tell many fables) was wholly superseded by the new name Turkman and by other political names.

During the Seljukian period there arose in Transoxiana the empire of the Kharizm shahs, founded by Mohammed b. Anushtegin, upon whom the government of Kharizm (Khiva),—which down to 995 had belonged to princes of Iranian descent—was conferred (1097) by the Seljuk prince Barkiyarok. His son Atsiz became independent (1138), but his empire seemed destined to early ruin by the arrival of the Kara-Chitai, who defeated the Seljuk prince Sinjar (1141) and became for a time supreme masters of Turkestan. Nevertheless the Kharizmian dynasty held its place as a tributary sovereignty, and developed great power under the princes Takash and Mohammed his son. The former defeated and killed (1194) the last Seljuk prince of ‘Irak, and the latter ex- tended his dominion from the Caspian to the Indus and from the Jaxartes to the coast of ‘Oman. His cunning antagonist, the “Abbasid caliph An-Nasir, invoked the aid of Jenghiz Khan, who scarcely required this invitation to attack Mohammed. The sack of Bokhara was followed in the same year (1220) by that of the

other principal cities of Transoxiana and by the persecution of the un-happy prince, who died in a forgotten island of the Cas- pian. His son Jelal-ed-Din was driven towards India, but by a change of fortune ascended once more the throne of his fathers, till the new Mongol khan, Ogdai, sent fresh armies against him and forced him to seek refuge in the Kurdish Mountains, where he was murdered (1231). The fate of the Turks of Transoxiana was shared by their brethren in Asia and Europe, and new Mongol-Turkish empires arose, of which an outline has been given under Moncots. As the Mongol rule grew weaker, there arose in Persia and on the frontiers of Asia Minor the Turkman dynasties of the Ak Koyun-lu, the Kara Koyun-lu, the Zw'1-kadria, and the Ramazan Oglu, whose history is closely connected either with that of the rise of the Ottoman power (see below) or with the history of Pzrsia (see vol. XVili. p. 632 sq.).

At the present day the Turkish people occupy a very extensive area, the centre of which lies in Khiva, Bokhara, and Khokand,

and which stretches from the lower Lena in Siberia to the Danube and from the Crimea to Kerman and India. Politically they be-

3 The term " Turkman" occurs in Arabic chronicles of the Seljukian period, and even in Mokaddast, p. 274. Rashid ed-Din therefore exaggerates in stating that it only came into use in his lifetime. But Vambeéery's statement that it was applied of old to the descendants of Oghuz is contradicted by the genuine Persian text of Rashid ed-Din and the unanimous testimony of history. His objections against the popular etymology mentioned above are, however, not quite unfounded.

Turk- mans,

Empire of Khar. izm.

Modern tribes.

TURKS

long to Russia, Turkey, Persia, China,and Afghanistan. In religion the great majority are Mohammedans; a few tribes in Russia are baptized Christians;

and some others adhere to the original Sha- manism, which has also influenced the religious conceptions of the Christian and Mohammedan Turks. The principal Turkish peoples are the following. (I.) By a popular distinction the Turks of Siberia and Russia, with some colonies in Turkey, are styled Tatars (see Tarrars), though the Yakuts of northern Siberia are not usu- ally included in this term. The Yakuts, who are perhapsa mixture of Turkish and Tungus tribes, deviating from the ordinary course of Turkish wanderings, are settled about the lower Lena, and number probably 200,000 (Rittig, 80,000; Lansdell, 210,000).1_ They are nominally Christians. (II.) On the Kirghiz (Kara-Kirghiz and Kazaks) and Kara-Kalpaks sce Kireuiz; but note that the Kip- chaks, named there as a separate tribe, really form a subdivision of the Kazak-Kirghiz, and are perhaps akin to the Kitai-Kipchaks, who are reckoned to the Uzbegs. (III.) Uzbeg is a political, not an ethnological denomination, originating from Uzbeg Khan of the Golden Horde (1812-1340). It was used to distinguish the followers of Shaibani Khan (16th century) from his antagonists, and became finally the name of the ruling Turks in the khanates as opposed to the Sarts, Tajiks, and such Turks as entered those regions at a later date and are known to be Kirghiz, Kara-Kalpaks, or Taranjis. The Uzbegs are therefore a mixed race of different Turkish tribes. According to Kostenko,? they number 201,972 in the Russian pro- vinces of Sir-Daria, Ferghana, Zerafshan, and Amu-Daria, and Vambéry conjectures that there are 1,000,000 more in Bokhara, 700,000 in Khiva, and 200,000 under Afghan supremacy, giving a total number of about 2,000,000. They are agriculturists or inhabit the cities; a few are semi-nomads. (IV.) The castern Turks on the southern slopes of the Tian-Shan Mountains at Kashgar, Ust- turfan, Ak-su, Sairam, Kutcha, Yarkand, Khotan, &c., are the rem- nants of the ancient Uigurs; and of the same origin are the Taranjis (=agriculturists), settled in the Ili valley and elsewhere. The number of the latter is given as about 50,000; that of the former may be estimated from the statements of Forsyth? and Kuropatkin 4 at about 1,000,000 for the whole district, the great majority being Turks and the rest Mohammedan Chinese (Sungans). (V.) The Turcomans (properly Turkmans) inhabit the steppe east of the Cas- pian and south of the Oxus from Astrabad to the Paropamisus. The term is sometimes taken to include their brethren in Persia and Asia Minor, who will be treated separately. The following are the principal tribes:—(1) the Tchaudors and Imrailis, in the north- western part of the Ust-Urt to the Gulf of Karaboghaz; (2) the

Yomuts, extending from Khiva across the Ust-Urt to the Caspian, and along the sea-board to Persia ; (3) the Goklen, on Persian ter- ritory, between the upper Gorgen and Atrek; (4) the Tekkes, the most numerous tribe at the present day, divided into the Akhal Tekkes and the Merv Tekkes, so named after the centres where their greatest nuinbers are found ; (5) the Sakars, on the left bank of the Oxus, to the east of Tcharjui, considered by Vambéry as a division of the Tekkes; (6) the Sariks, at Penjdeh and Yul-utan on the north-western slopes of the Paropamisus; (7) the Salors, one of the oldest Turkman tribes, who suffered greatly from the Tekkes, till they finally migrated (1857) to Zurabad in Persia, and left their former districts to the Tekkes and Sariks; (8) the Ersaris, on the Oxus about Khoja Salih; and (9) the Ali-elis, about Andkhui. Their total number, inclusive of sonie Turkmans who do not belong to any of these tribes, and are scattered throughout the provinces of Syr-Daria, Amu-Daria, Zerafshan, and Astrakhan (about 16,000), is estimated by Vambéry at about 1,000,000, and by Grodekoff at 1,170,000. The Turkmans are, with few exceptions, nomads, and were formerly the terror of their neighbours, who feared them as the ‘‘man-stealing Turks” ; but since Merv has been annexed to Russia (1884) they have been compelled to abandon their predatory habits.° (VI.) The Turkish nomads scattered throughout Persia are partly the descendants of the Ghuzz tribes that invaded the country at the Seljukian period ; others have migrated thither in the following centuries. They are known by the name of [lat or Iliyit (meaning tribes or peoples) and consist of sevcral tribes, having each its own chieftain, the Ilkhani, appointed by the shah. An accurate list of the names of these tribes does not exist; but the most powerful and most numerous are the following. (1) The Kajars, who dwelt in Transcaucasia down to the time of Abbas the Great, by whom one division of them was compelled to settle at the south-east corner of the Caspian near Astrabad. To this division belongs the present dynasty of Persia. (2) The Afshars or Aushars, avery numerous tribe, in the province of Adarbaijan (Azerbijan). A division is also settled in the mountainous regions of the Anti- taurus; its members are nominally subjects of the Ottomian empire but really independent. (3) The Shekakis and Shah-sewen. The

1 Cp. HE. Petri, ‘‘Neueres iiber die Jakuten,” in Peterm. Mitth., 1887, vol. xxxiil. p. 102 sq. 2 Turkestanskit Krai, St Petersburg, 1880, p. 326.

3 Report of a Mission to Yarkand.

4 Kashgaria, translated by W. E. Gowan, Calcutta, 1882.

5 Cp. N. Petrusevitch, The Turcomuns, translated by R. Michell; O'Donovan,

The Merv Oasis, London, 1882; and the journals of travellers in these regions, Vambéry, Schuyler, Lessar, &c.

latter is not a tribal, but a political hame, meaning those who

the shah, t.¢., partisans of the Safawi dynasty (1459-1736) mene Shiite faith. (4) The Kara Koyun-lu, near the town of Khoi, the remnants of the once powerful tribe named above. Besides these

many other names are recorded of tribes wandering in the Trans- caucasian regions and in the provinces of Adarbaijan and Mazen- deran, but many of them are very uncertain. All these Turks are comprehended under the general denomination of Adarbaijani Turks; they are nomads or semi-nomads and speak a peculiar Turkish dialect, the Turk Azeri or Adarbaijani Turkish. Some specimens of it have been published by Chodzko, Bergé, Melgunoff, and Barbier de Meynard. In the southern provinces of Persia are settled the (5) Kashkais, (6) Abul-werdis, (7) Kara-Gozliis, (8) Bahar-lu, and (9) Inan-lu. To the first named are reckoned by some the Khalaches,* an old Turkish tribe which was already settled near Herat before the Seljukian period and has given rise to some Indian dynasties. Vambéry thinks that the total number of Iranian Turks may amount to about two millions, or, if we add the Caucasian Turks under Russian supremacy, three millions." (VI1). The Osmanlis, under which term are comprehended all the Turkish sub- jects of the sultan of Turkey, consist chiefly of the following elements. (1) Turkmanian tribes and Turks of every description, who poured into Asia Minor after the defeat of Romanus Diogenes (1071) ; to these we may also reckon the Ottomans proper, though they did not enter the country till after the downfall of the Kharizmian empire. The Mongolian invasion drove the obscure ancestors of this the most illustrious Turkish dynasty to

Asia Minor, whence they gradually spread to the province of Khodawendikyar (Bithynia). (2) Tatars scattered amongst the rest of the population, but forming a large colony in the Dobrudja. In part they occupied their present settlements before the conquest of Constautinople ; but others have immigrated into Asia Minor during the last two centuries from the Crimea and Caucasus, since the Russian conquests of those regions. They have fared very badly under Turkish rule, as is attested by Captain Wilson. That tribes of Turkish origin were settled in Europe long before the rise of the Ottoman power is known from the Byzantine authors, who mention a colony of them (about 30,000) as early as the 10th century in the Vardar valley in Macedonia.® (3) The so-called Kizil-bashis or "Red Heads," a nickname of the Shi'itic Turkish immigrants from Persia, who are found chiefly in the plains from Kara-hissar along Tokat and Amasia to Angora. During the wars with Persia the Turkish sultans forced them to settle here. They are agriculturists and highly praised by several travellers for their honesty and laborious habits. (4) Turkmenian tribes—Yuruks and Gétchebes (words meaning "nomads" and characteristic of their most distinctive quality),—who occupy the mountains in summer and descend into the plains in winter, though some are settled in the plains of Cilicia near Tarsus and Adana, the rest being scmi-nomads. Reclus estimates the total number of Turks in Europe at 1,500,000 and 35,000 Tatars. For Asia Minor statistics are wanting ; but P. de Tchihatchef, the chief authority for matters relating to this peninsula, thinks that 6,000,000 is a fair estimate for the total population, including Greeks, Armenians, Kurds, &c., but excluding the islands. It appears therefore neces- sary to reduce the already moderate number of Osmanlis given by Vambéry (10,000,000) to about 6,000,000.

LANGUAGE.

The Turkish, or, as some prefer to say, the Turco-Tatar language, is a member of the Ural-Altaic family (see UrAL-ALTAIC) and comprehends many dialects, which differ considerably in their vocabulary and in a less degree also in their grammar. The study of these dialects has made great advances during the 19th cen- tury. Abel Remusat in 1820 knew only of four, viz., the Uigurian, Jagatai, Tatar, and Osmanli. Béresine in 1848 distinguished nine- teen, grouped round three types, viz., (1) Jagatai dialects

(Uigur, Coman, Jagatai, Uzbegian, Turkmani, Kazani literary language); (2) Tatar dialects (Kirghizian, Bashkiri, Nogai, Kumi, Karatchai, Kara-Kalpaki, Meshtcheryaki, and Siberian) ; (8) Turki dialects (Derbendi, Adarbaijani, Krimmi, Anadoli,and Rumili). Bohtlingk (1851) added the Yakuti, and Shaw (1877) the Eastern Turki. Radloff (1882) subdivided the one Siberian dialect of Béresine into more than a dozen different dialects.

6 Cp. the Tabakat i-Ndsirt, by Major Raverty, p. 553 sg., where the name is incorrectly written Khalj.

? Cp. Lady Sheil, Glimpses of Life and Manners in Persia (London, 1856), and various articles by Von Seidlitz in the Russische Revue, &c.

8 Cp. Lejean, ‘ Ethnographie der Europdischen Tiirkei,” in Peterm. Ergtnz.-Heft 4 (1861), p. 38.

Turks of southern Persia.

Osman- lis.

Dialecti- cal varie- ties,

Alpha- bet.

Ety- mology.

Syntax.

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On the phonetical characteristics of each of these dialects ample information is given in his Phonetik der nérdlichen Tiirk. Sprachen. These great dialectical varieties are easily accounted for by the want of a common Turkish literary language understood every- where. The most developed and refined Turkish tongue, that of the Osmanlis, which is very rich in literary monuments, has admitted too many Arabic and Persian words, grammatical forms, and even whole sentences, and has been too much spoiled by the precepts of Persian rhetoric, to produce a popular literature. With the exception of some tales and novels, this literature has remained an

exotic production, unintelligible even to the people who are sup- posed to speak the same language (see TURKEY, p. 656 above). The Jagatai and Uzbegian dialects would have answered the purpose better, and present the best type of a (hypothetical) general Turkish language, of which the most prominent features may be here given. : E

The Arabic alphabet is in general use, though some tribes in Russia make use of Russian and others in Asia Minor of Armenian and Greck characters. But the oldest Turkish alphabet, the Uigurian, is a direct transformation of the Syriac, and has fourteen characters. When and by whom it was invented is uncertain ; the Arabic author of the Fihrist does not mention it, and the Uigurian MSS. which we possess date for the most part from the 15th century. Itis commonly supposed to be the work of Nestorian missionaries, who may have preached the Gospel amongst the Turks as early as the 6th or 7th century.' In the age of Sinjibu the Turks seem to have used the Sogdian characters in their political inter- course with Byzantium ; but as a rule they remained illiterate till their conversion to Islam. As the Semitic languages are charac- terized by the three-radical system and the constancy of the con- sonants, all Ural-Altaic languages are dominated by the law of vowel harmony and agglutination. We have therefore in Turkish a double range of vowels, commonly eight in number, of which a, %, 0, wv denote the hard or guttural aud , 7, 6, the soft or palatal vowels, the vowels in every separate word being of the same range. The z only is in most dialects indifferent. The law of agglutination is derived from the same principle, but has regard, not only to the vowels, but also to the consonants and the syllables ; it is an abuse of the term if it is taken to mean that in Turkish no real ctymology exists, but only an agglutination of themes and roots.

As regards the etymology we observe the absence of gender, of a separate form for the dual, and of the nominative in the nouns. There are commonly five oblique cases—genitive, dative, accusa- tive, commorative, and ablative—though Bohtlingk has shown that in the Yakut dialect, which distinguishes ten cases, the genitive is wanting. The adjective, unless used as substantive, is uninflected both as attribute and as predicate ; the comparative is formed by the suffix -rak (~~rck), and takes the compared noun in the ablative ; the superlative has no specific form, though a peculiar intensive is formed by prefixing to the adjective (though in writing always~~

~~as two words) a syllable beginning with the same consonant, and ending in a labial » or m: for instance, kap kara, “intensely black” ; kip kizil, “intensely red.” The decimal system has prevailed over an original septimal system. The article does not exist. The relative pronoun has been borrowed from the Persian in many dialects ; it is absent in the original Turkish. The theme of the verb is seen in the impcrative, from which are derived various participles aud gerunds, used either separately or combined with pronominal suffixes. These combinations supply the forms of the simple tenses and moods, though different dialects use different forms of participle and gerund for this purpose. Compound tenses and moods are expressed by means of auxiliary verbs. The theme of the imperative may, by the addition of a simple consonant, vowel, or syllable, be modified into a negative, passive, reflexive, reciprocal, impossible, causative, or doubly causative form, which are con~~ jugated in the same manner as the original form. The causative forms again admit of a passive negative, &c., so that in fact the number of possible verbal forms derived from a single theme has been calculated by Shaw at 29,000. There are no prepositions, only postpositions.

In syntax the order of the words and clauses of a period is almost the inverse of what seems natural to us, the subject and its predicate being placed at the end, while all hypothetical, causal, prohibitive,—in short all subordinate—clauses come first. In the simple style of illiterate peasants, and in popular romances and tales, this method presents no inconvenience as regards easy under- standing, but in the artificial, often excessively long periods of an Osmanli stylist, it presents serious difficulties to a European reader.

Bibliography.—(a) General works on the history and ethnography of the Turks: Deguignes, Histoire des Huns; Vambéry, Das Tiirkenvolk (Leipsic, 1885), Ursprung der Magyaren (Leipsic, 1882), and several other publications ; Radloff, Aus Sibirien (Leipsic, 1884); W. Grigorieff, Zemlewjedjenie K. Rittera Wostotschnt ili Kitaiski Turkestan; Neumann, Die Volker des stidlichen Russland (Leipsic, 1847). We may add the historians of the Mongols—D’Ohsson,

oworth, and others—the numerous journals of travellers amongst Turkish peoples, and several articles in the Russische Revue, Journal of the Royal

Asiatic

1 For details about the spread of Christianity amongst the Turks, –

see Yule, Cathay and the Way thither, i. 90-100.

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Soc., &e. A full bibliography of works relating to Central Asia may be found in V. J. Mejoff, Recueil du Turkestan (St Petersburg, 1878-84), and a useful ex- cerpt at the end of vol. ii. of Lansdell's Russian Central Asia. Other works have already been cited in the course of this article.

(b) For the study of Turkish dialects the subjoined books may be used. (1). Osmanli: the grammars and dictionaries of Redhouse, Mallouf, Zenker, Barbier de Meynard, &c. (2) Uigur: the works of Klaproth ; Abel Rémusat. Recherches sur les Langues Tartares (Paris, 1820); and Vambéry, Uigurische Sprachmonu- mente und das Kudatku Bilik (Innsbruck, 1870). (8) Jagatai: the dictionary of Pavet de Courteille, and Vambéry, Jagataische Sprachstudien (Leipsic, 1867). (4) Eastern Turki: Shaw's grammar and vocabulary (Jour. Roy. As. Soc. of Bengal, 1877). (5) Tatar dialects: the grammars of Kasimbeg-Zenker (Leipsic, 1848), Ilminski (Kazan, 1869), and Radloff (Leipsic, 1882); Dictionary of Trojanski (Kazan, 1833); the chrestomathies of Béresine (Kazan, 1857), Terentieff, and specially Radloff, Proben der Volksliteratur der ttirkischen Stamme Stid-Sibiriens (St Petersburg, 1872). And (6) Yakuti: Bohtlingk, Die Sprache der Jakuten (St Petersburg, 1851).: ' M. T. H.)

TURMERIC, the tuberous root of Curcuma longa, L., an herbaceous perennial plant belonging to the natural order Zingiberacex. It is a native of southern Asia, being cultivated on a large scale both on the mainland and in the islands of the Indian Ocean. Turmeric has been used from a remote period both as a condiment and as a dye stuff, and to a more limited extent as a medicine. In Europe it is employed chiefly as a dye, also as an ingre- dient in curry powder and as a chemical test for alkalies. The root is prepared by cleaning it and drying it in an oven. There are several varieties

(Madras, Bengal, Gopalpur, Java, China, and Cochin turmeric), differing chiefly in size and colour and to a slight degree in flavour. Some of these consist exclusively of the ovate central tubers, tech- nically known as “ bulbs,” and others of the somewhat cylindrical lateral tubers, which are distinguished in trade as “fingers.” Both are hard and tough, but break with a short resinous or waxy fracture, which varies in tint from an orange brown to a deep reddish brown.

Turmeric has a characteristic odour and an aromatic taste. The aroma it owes to a complex essential oil, which consists princi- pally of an alcohol called turmerol (formula CygH,.0), which differs from carvol in being unable to combine with hydrogen sulphide ; the other constituents of the oil have not been determined. The colour is due to curcumin, C,4H,,0, of which the drug contains about 0°3 per cent. It possesses the properties of an acid, forming red-brown salts with alkalies and being precipitated from alkaline solutions by acids. When pure it forms yellow crystals having a vanilla odour and exhibiting a fine blue colour in reflected light. It is soluble in alcohol, in chloroform, and in alkaline solutions, but only sparingly in water. Paper tinged with a tincture of tur- meric exhibits on the addition of an alkali a reddish brown tint, which becomes violet on drying. This peculiarity was pointed out by Vogel in 1815, and since that date turmeric has been utilized as a chemical test for detecting alkalinity. In India the drug is considered to possess cordial and stomachic properties: a decoction made with milk and sweetened is used as a remedy for colds. Externally it is employed in skin diseases and in the form of a cooling lotion for relieving the pain of conjunctivitis ; the fumes of the burning tubers directed into the nostrils relieve congestion in cases of coryza. The cultivation of turnieric is carried on most successfully in light rich soil in well-watcred districts. The plant is easily propagated by offsets. An acre yields about 2000 Ib. Turmeric is said to grow in large quantities on the slopes of hills bordering the plains of the Beni in Bolivia and also in Panama. Several species of Cwrcwma and of allied genera yield yellowish aromatic roots. In Sierra Leone a kind of turmeric is obtained from a species of Canna.

TURNER, Cuarues (1773-1857), an English engraver, was born at Woodstock in 1773. He entered the schools of the Royal Academy in 1795; and, engraving in stipple in the manner of Bartolozzi, he was employed by

Alderman Boydell. His finest plates, however, are in mezzotint, a method in which he engraved J. M. W. Turner's Wreck and twenty-four subjects of his Liber Studiorum, Reynolds's Marlborough Family, and many of Raeburn's best portraits, including those of Sir Walter Scott, Lord Newton, Dr Hamilton, Profs. Dugald Stewart and John Robison, and Dr Adam. He also worked after Lawrence, Shee, and Owen. He was an admirable engraver, large, broad, and masterly in touch ; and he reproduced with great fidelity the characteristics of the various painters whose works he translated into black and white. In 1828 he was elected an associate engraver of the Royal Academy. He died in London on Ist August 1857.

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TURNER, JosepH Matiorp Witiiam (1775-1851), one of the greatest painters of the English school, was born in London on 23d April1775. His father, William Turner, a native of Devonshire, kept a barber's shop at 26 Maiden Lane, in the parish of St Paul's, Covent Garden ; he was "'a cheerful, talkative little man, with small blue eyes, a parrot nose, projecting chin, and a fresh complexion indicative of health." Of the painter's mother, Mary Marshall or Turner, little is known; she is said to have been a person of ungovernable temper and towards the end of her life became insane. Apparently the home in which Turner spent his childhood was not a happy one, and this may account for much that was unsociable and eccentric in his character. The earliest known drawing by Turner, a view of Margate Church, dates from his ninth year. It was also about this time that he was sent to his first school at New Brentford. Of education, as the term is generally understood, he received but little. His father taught him to read, and this and a few months at New Brentford and afterwards at Margate were all the schooling he ever had; he never mastered his native tongue, nor was he able in after life to learn any foreign language. Notwithstanding this lack of scholarship, one of his strongest characteristics was a taste for associating his works with personages and places of legendary and historical interest, and certain stories of antiquity seem to have taken root in his mind very strongly. By the time Turner had completed his thirteenth year his school days were over and his choice of an artist's career settled. In 1788-89 he was receiving lessons from Palice, '"'a floral drawing master," from T. Malton, a perspective draughtsman, and from Hardwick, an

architect. He also attended Paul Sandby's drawing school in St Martin's Lane. Part of his time was employed in making drawings at home, which he exhibited for sale in his father's shop window, two or three shillings being the usual price. He coloured prints for engravers, washed in backgrounds for architects, went out sketching with Girtin, and made draw- ings in the evenings for Dr Munro "for half a crown and his supper." When pitied in after life for the miscellaneous character of his early work, his reply was 'Well! and what could be better practice?" In 1789 Turner became a student of the Royal Academy. He also worked for a short time in the house of Sir Joshua Reynolds, with the idea, apparently, of becoming a portrait painter ; but, the death of Reynolds occurring shortly afterwards, this intention was abandoned. In 1790 Turner's name appears for the first time in the catalogue of the Royal Academy, the title of his solitary contribution being "View of the Arch- bishop's Palace, Lambeth." About 1792 he received a commission from Walker, the engraver, to make drawings for his Copper-Plate Magazine, and this topographical work took him to many interesting places. The natural vigour of his constitution enabled him to cover much of the ground on foot. He could walk from 20 to 25 miles a day with ease, his baggage at the end of a stick, making notes and memoranda as he went. He rose early, worked hard all day, wasted no time over his simple meals, and his homely way of living made him easily contented with such rude accommodation as he chanced to find on the road. A year or two after he accepted a similar conimission to make drawings for the Pocket Magazine, and before his twentieth year he had travelled over many parts of England and Wales. None of these magazine drawings are remarkable for originality of treatment or for artistic feeling.

Up to this time Turner had worked in the back room above his father's shop. His love of secretiveness and solitude had already begun to show itself. An architect who often employed him to put in backgrounds to his drawings says, "he would never suffer me to see him draw, but concealed all that he did in his bed-room."

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On another occasion, a visitor entering unannounced, Turner instantly covered up his drawings, and, in reply to the intimation, "I've come to see

the drawings for oe the answer was, ‘‘ You shan’t see ’em, and mind that next time you come through the shop, and not up the back way.” Probably the increase in the number of his engage- ments induced Turner about this time to set up a studio for himself in Hand Court, not far from his father’s shop, and there he continued to work till he was elected an associate of the Royal Academy (1799).

Until 1792 Turner’s practice had been almost exclusively confined to water colours, and his early works show how much he was indebted to some of his contemporaries. There are few of any note whose style he did not copy or adopt. His first exhibited oil picture appeared in the Academy in 1793. In 1794-95 Canterbury Cathedral, Malvern Abbey, Tintern Abbey, Lincoln and Peterborough Cathedrals, Shrewsbury, and King’s College Chapel, Cambridge, were among the subjects exhibited, and during the next four years he contributed no less than thirty-nine works to the Academy. In the catalogue of 1798 he first began to add poetic quotations to the titles of his pictures ; one of the very first of these—a passage from Milton’s Paradise Lost—is in some respects curiously prophetic of one of the future characteristics of his art.

‘Ye mists and exhalations that now rise From hill or steaming lake, dusky or grey

Till the sun paints your fleecy skirts with gold, In honour of the world’s great author rise.”’

This and several other quotations in the following years show that Turner’s mind was now occupied with something more than the merely topographical element of landscape, Milton’s Paradise Lost and Thomson’s Seasons being laid under frequent contribution for descriptions of sunrise, sunset, twilight, or thunderstorm. Turner’s first visit to Yorkshire took place in 1797. It seems to have braced his powers and possibly helped to change the student into the painter. Until then his work had shown very little of the artist in the higher sense of the term: he was little more than a painstaking and tolerably accurate topographer, but even under these conditions he had begun to attract the notice of his brother artists and of the critics. England was, at the time, at a low point both in literature andart. Among the artists De Loutherbourg and Morland were almost the only men of note left.

Hogarth, Wilson, Gainsborough, and Reynolds had passed away. Beechey, Bourgeois, Garvey, Farington—names well-nigh forgotten now—were the Academicians who painted landscape. The only formidable rivals Turner had to contend with were De Loutherbourg and Girtin, and after the death of the latter in 1802 he was left undisputed master of the field.

It is not therefore surprising that the exhibition of his works in 1798 was followed by his election to the associ- ateship of the Royal Academy. That he should have attained to this position before completing his twenty-fourth year says much for the wisdom and discernment of that body, which further showed its recognition of his talent by electing him an Academician four years later. Turner owed much to the Academy. Mr Ruskin says, “It taught him nothing.” Possibly it had little to teach that he had not already been able to learn for himself; at all events it was quick to see his genius and to confer its honours, and Turner, naturally generous and grateful, never forgot this. He enjoyed the dignity of Academician for nearly half a century, and during nearly the whole of that period he took an active share in the direction of the Academy’s affairs. His speeches are described as “‘con-fused, tedious, obscure, and extremely difficult to follow”; but at council meetings he was ever anxious to allay anger and bitter controversy. His opinions on art were always

listened to with respect ; but on matters of business it was often difficult to know what he meant. His friend Chantrey used to say, ‘‘He has great thoughts, if only he could express them.” When appointed professor of per-spective to the Royal Academy in 1808, this painful lack of expression stood greatly in the way of his usefulness : he was often at a loss for words to express his ideas, and when he had recourse to his notes he found difficulty in reading them. Mr Ruskin says, ‘‘The zealous care with which Turner endeavoured to do his duty is proved by a series of large drawings, exquisitely tinted, and often completely coloured, all by his own hand, of the most difficult perspective subjects, illustrating not only directions of line, but effects of light, with a care and completion which would put the work of any ordinary teacher to utter shame.” In teaching he would neither waste time nor spare it. ‘If a student would take a hint, Turner was delighted

and would go on with him giving hint after hint ; if he could not follow, he left him. Explanations are wasted time; a man who can see understands a touch ; a man who cannot misunderstands an oration." With his election to the associateship of the Academy in 1799, Turner's early struggles may be considered to have ended. He had emancipated himself from hack work, had given up making topographical drawings of castles and abbeys for the engravers—drawings in which mere local fidelity was the principal object —and had taken to composing as he drew. Local facts had become of secondary importance compared with effects of light and colour. He had reached manhood, and with it he abandoned topographical fidelity and began to paint his dreams, the visionary faculty— the true foundation of his art—asserting itself, nature being used to supply suggestions and materials.

His pictures of 1797-99 had shown that he was a painter of no ordinary power, one having much of the poet in him, and able to give expression to the mystery, beauty, and inexhaustible fulness of nature. His work at this period is described by Mr Ruskin as "stern in manner, reserved, quiet, grave in colour, forceful in hand."

Turner's visit to Yorkshire in 1797 was followed a year or two later by a second, and it was on this occasion that he made the acquaintance, which afterwards ripened into a long and staunch friendship, of Fawkes of Farnley Hall. From 1803 till 1820 Turner. was a frequent visitor at Farnley. The large number of his drawings still preserved there—English, Swiss, German, and Italian, the studies of rooms, outhouses, porches, gateways, of birds shot while he was there, and of old places in the neighbour- hood—prove the frequency of his visits and his affection for the place and for its hospitable master. A caricature, made by Fawkes, and "thought by old friends to be very like," shows Turner as 'a little Jewish-nosed man, in an ill-cut brown tail-coat, striped waistcoat, and enormous frilled shirt, with feet and hands notably small, sketching on a small piece of paper, held down almost level with his waist." It is evident from all the accounts given that Turner's personal appearance was not of a kind to com- mand much attention or respect. This may have pained his sensitive nature, and led him to seek refuge in the solitude of his painting room. Had he been inclined he had abundant opportunity for social and friendly intercourse with his fellow-men, but he gradually came to live more and more in a state of

mental isolation, keeping himself to himself, entirely absorbed in his art. “This man must be loved for his works, for his person is not striking nor his conversation brilliant,” is the testimony of Dayes, the water-colour painter (and Girtin’s master), in 1804. Turner could never make up his mind to visit Farnley again after his old friend’s death, and his voice would falter when he spoke of the shores of the Wharfe.

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Turner visited Scotland in 1800, and in 1801 or 1802 he made his first tour on the Continent. In the following year, of the seven pictures he exhibited six were of foreign subjects, among them Bonneville, the Festival upon the Opening of the Vintage of Macon, and the well-known Calais Pier in the National Gallery. The last-named picture, although heavily painted and somewhat opaque in colour, is magnificently composed and full of energy. A better idea of its masterly composition can be formed from Mr Seymour Haden’s vigorous etching than from the picture itself, which is now greatly darkened by time.

In 1802, the year in which Turner became a Royal Academician, he took his old father, who still carried on the barber business in Maiden Lane, to live with him. The powder tax, imposed in 1795, drove out wigs and spoiled the old man’s trade. ‘‘It is precisely,” says Mr Hamerton, ‘‘ when the painter wins the full honours of the Academy—honours which give a recognized and envied position in London society—that he takes his father home ; a meaner nature would have tried to keep the old man at a safe distance.” Turner’s relations with his father were of the most dutiful and filial kind to the last.

In 1804 Turner made a second tour on the Continent, and in the following year painted the Shipwreck and Fishing Boats in a Squall (in the Ellesmere collection), seemingly in direct rivalry of Vandervelde, in 1806 the Goddess of Discord in the Garden of the Hesperides (in rivalry of Poussin), and in 1807 the Sun rising through Vapour (in rivalry of Claude).? The last two are notable works, especially the Sun. In after years it was one of the works he left to the nation, on the special condition of its being hung beside the Claudes in the National Gallery. In this same year (1807) Turner commenced his most serious rivalry. Possibly it arose out of a desire to

break down Claude worship, the then prevailing fashion, and to show the public that there was a living artist not un- worthy of taking rank beside him. That the Leber Studt- orum was suggested by the Liber Veritatis of Claude, and was intended asa direct challenge to that master, is be- yond doubt. There is, however, a certain degree of un- fairness to Claude in the way in which the challenge was given. Claude made drawings in brown of his pictures as they left the easel, not for publication, but merely to serve as private memoranda. Turner's Liber drawings had no such purpose, but were intended as a direct appeal to the public to judge between the two artists. The first of the Liber drawings were made in the autumn of 1806, the cthers at intervals till about 1815. They are of the same size as the plates and carefully finished in sepia. About fifty of them are now to be seen in the Turner rooms of the National Gallery. The issue of the Zber began in 1807 and continued at irregular intervals till 1819, when it stopped at the fourteenth number. 'Turner had resolved to manage the publishing business himself, but in this he

1 Turner's father died in 1880, and the loss of " poor old Dad," as he used to call him, left a terrible void, He had lived in his son's house for nearly thirty years, looking after the frugal affairs of his household, and making himself useful in various ways. It is said that he used to prepare and strain his son's canvases and varnish them when finished, which may explain a saying of Turner's that ''his father used to begin and finish his pictures for him." He also attended to the gallery in Queen Anne Street, showed in visiters, and took care of the dinner, if he did not himself cook it. Turner was never the same man after his father's death, living a life of almost complete isolation.

2 This spirit of rivalry showed itself early in his career. He began by pitting himself against his contemporaries, and afterwards, when his powers were more fully developed, against some of the old masters, notably Vandervelde and Claude. During these years, while he kept up a constant rivalry with artists living and dead, he was continuing his unresting and untiring study of nature, and, while seemingly a mere follower of the ancients, was accumulating that immense store of knowledge which in after years, when his true genius asserted itself, he was to use to such purpose.

was not very successful. He soon quarrelled with his engraver, I. C. Lewis, on the ground that he had raised his charges from five guineas a plate to eight. He then employed Charles Turner, who agreed to do fifty plates at the latter sum, but, after finishing twenty, he too wished to raise his price, and, as a matter of course, this led to another quarrel. Reynolds, Dunkarton, Lupton, Say, Dawe, and other engravers were afterwards employed—Turner himself etching and mezzotinting some of the plates. Each part of the Zcber contained five plates, the subjects, divided into “historical,” “ pastoral,” ‘ marine,” &c., embracing the whole range of landscape art. Seventy- one plates in all were published (including one as a gift of the artist to his subscribers); ten other plates—more or less completed—intended for the fifteenth and sixteenth numbers were never published, the work being stopped for want of encouragement. Absence of method and business habits may account for this. Turner is said to have got up the numbers in his own house with the help of a female servant. The plates, which cost the subscribers only five shillings apiece, were’ so little esteemed that in the early quarter of the 19th century they were sometimes used for lighting fires. So much has fashion, or public taste, changed since then that a fine proof of a single plate has sold for £210. The merit of the plates is un- equal; some—for example, Solway Moss, Inverary Pier, Hind Head Hill, Ben Arthur, Rizpah, Junction of the Severn and Wye, and Peat Bog—are of great beauty, while a few are comparatively tame and uninteresting. Among the unpublished plates Stonehenge at Daybreak and Sheep Washing, Windsor Castle take a high place. The Liber shows strong traces of the influence of Cozens and Girtin, and, as a matter of course, of Claude. In most of the designs the predominant feeling is serious; in not a few, gloomy, or even tragic. A good deal has been written about Turner’s intention, and the “lessons” of the Liber Studiorum. Probably his only intention in the beginning was to show what he could do, to display his art, to rival Claude, perhaps to educate public taste, and at the same time make money. If lessons were intended they might have been better conveyed by words. “Silent always with a bitter silence, disdaining to tell his meaning,”—such is Mr Ruskin’s explanation; but surely Turner had little reason for either silence or contempt because the public failed to see in landscape art the means of teaching it great moral lessons. almost complete

epitome of Turner’s art. Already in this work are seen strong indications of one of his most remark- able characteristics—a knowledge of the principles of struc- ture in natural objects: mountains and rocks are drawn, not with topographical accuracy, but with what appears like an intuitive feeling for geological formation ; and trees have also the same expression of life and growth in the drawing of stems and branches, This instinctive feeling in Turner for the principles of organic structure is treated of at con- siderable length in the fourth volume of Modern Painters, and Turner is there contrasted with Claude, Poussin, and some of the Dutch masters, greatly to their disadvantage.

After 1797 Turner was little concerned with mere topo- graphical facts: his pictures might be like the places re- presented or not; much depended on the mental impression produced by the scene. He preferred to deal with the spirit, rather than with the local details of places.

1 “The strange unity of vertebrated action and of a true bony con- tour, infinitely varied in every vertebra, with this glacial outline, together with the adoption of the head of the Ganges crocodile, the

The seventy plates of the Liber contain an’

in the Apollo, exhibited in 1811. Both these monsters are imagined with such vividness and reality, and the sense of power and movement is so completely expressed, that the spectator never once thinks of them as otherwise than representations of actual facts in natural history. It needs but a little comparison to discover how far Turner surpassed all his contemporaries, as well as all who pre- ceded him, in these respects. The imaginative faculty he possessed was of the highest order, and it was further aided by a memory of the most retentive and unerring kind. A good illustration of this may be seen at Farnley Hall in a drawing of a Man-of-War taking in Stores. Some one, who had never seen a first-rate, expressed a wish to know what it looked like. Turner took a blank sheet of paper one morning after breakfast, outlined the ship, and finished the drawing in three hours, Fawkes sitting beside him from the first stroke to the last. The size of this drawing is about 16 in. by 11 in. Mr Ruskin thus describes it ¢

“The hull of a first-rate occupies nearly one half of the picture to the right, her bows toward the spectator, seen in sharp per- spective from stem to stern, with all her port-holes, guns, anchors, and lower rigging elaborately detailed, two other ships of the line in the middle distance drawn with equal precision, a noble breezy sea, full of delicate drawing in its waves, a store ship beneath the hull of the larger vessel and several other boats, and a complicated cloudy sky, all drawn from memory, down to the smallest rope, in a drawing-room of a mansion in the middle of Yorkshire.”

About the year 1811 Turner paid his first visit to Devonshire, the county to which his family belonged, and a curious glimpse of his simple manner of life is given by Redding, who accompanied him on some of his ex- cursions. On one occasion they spent a night together in a small road-side inn, Turner having a great desire to see the country around at sunrise.

‘‘ Turner was content with bread and cheese and beer, tolerably good, for dinner and supper in one. In the little sanded room we conversed by the light of an attenuated candle and some aid from the moon until nearly midnight, when Turner laid his head upon the table and was soon fast asleep. Three or four hours rest was thus obtained, and we went out as soon as the sun was up to ex- plore the surrounding neighbourhood. It was in that early morning Turner made a sketch of the picture Crossing the Brook.” In another excursion to Borough Island, “‘the morning was squally and the sea rolled boisterously into the Sound. Off Stakes Point it became stormy ; our Dutch boat rode bravely over the furrows. Two of the party were ill. Turner was all the while quiet, watch- ing the troubled scene. Bolt Head, to seaward, against which the waves broke with fury, seemed to absorb his entire notice, and he scarcely spoke a syllable. While the fish were getting ready Turner mounted nearly to the highest point of the island rock, and seemed writing rather than drawing. The wind was almost too violent for either purpose.”

This and similar incidents show how careless of comfort Turner was, and how devoted to his art. The tumult and discomfort by which he was surrounded could not distract his powers of observation; and some thirty years later there is still evidence of the same kind. In the catalogue of the exhibition of 1842 one of his pictures bears the following title, “‘Snow-

Storm: steam-boat off a harbour's mouth making signals in shallow water, and going by the lead. The author was in that storm the night the 'Ariel' left Harwich."

From 1813 till 1826, in addition to his Harley Street residence, Turner had a country house at Twickenham. He kept a boat on the river, also a pony and gig, in which he used to drive about the neighbouring country on sketch- ing expeditions. The pony, for which Turner had a great love, appears in his well-known Frosty Morning in the National Gallery. He appears to have had a great affec-

fish-eater, to show his sea descent (and this in the year 1806, when hardly a single fossil saurian skeleton existed within Turner's reach), renders the whole conception one of the most curious exertions of the imaginative intellect with which I am acquainted in the arts" (Ruskin, Mod. Painters, vol. v. p. 318).

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tion for animals, and one instance of his tenderness of heart is given by one who often joined him in the amuse- ment of fishing, of which Turner was very fond. "I was often with him when fishing at Petworth, and also on the banks of the Thames. His success as an angler was great, although with the worst tackle in the world. Every fish he caught he showed to me, and appealed to me to decide whether the size justified him to keep it for the table or to return it to the river; his hesitation was often almost touching, and he always gave the prisoner at the bar the benefit of the doubt."

In 1813 Turner commenced the series of drawings, forty in number, for Cooke's Southern Coast. This work was not completed till 1826. The price he at first received for these drawings was £7, 10s. each, afterwards raised to £13, 2s. 6d.

Crossing the Brook appeared in the Academy of 1815. It may be regarded as a typical example of Turner's art at this period, and marks the transition from his earlier style to that of his maturity. It represents a piece of

Devonshire scenery, a view on the river Tamar. On the left is a group of tall pine-trees, beautifully designed and drawn with great skill and knowledge of structure, in the foreground a couple of children, with a dog carrying a bundle in its mouth across the brook, and beyond, a vast expanse of richly-wooded country, with glimpses of a winding river, an old bridge, a mill, and other buildings, and, in the far distance, the sea. Both in design and execution this work is founded upon Claude. Some critics consider it one of Turner's greatest works; but this is open to question. It can hardly be called a work in full colour: it is limited to greys and quiet greens for the earth and pale blues for the sky. It is a sober but very admirable picture, full of diffused daylight, and in the painting of its distance better than any master who had preceded him. The fascination of the remote, afterwards so distinctive an element in Turner's pictures, shows itself here. Perhaps nothing tests the powers or tries the skill of the landscape-painter more severely than the representa- tion of distant effects. They come and go so rapidly, are often in a high key of light and colour, and so full of mystery and delicacy, that anything approaching to real imitation is impossible. Only the most retentive memory and the most sensitive and tender feeling will avail. These qualities Turner possessed to a remarkable degree, and as his powers matured there was an ever-increasing tendency in his art to desert the foreground, where things were definite and clear, in order to dream in the infinite suggestiveness and space of distances. Dido Building Carthage also belongs to this period. It hangs beside the Claudes in the National Gallery. It pertains to the old erroneous school of historical painting. Towering masses of Claudesque architecture piled up on either side, porticoes, vestibules, and stone pines, with the sun in a yellow sky, represent the Carthage of Turner's imagination. With all its faults it is still the finest work of the class he ever painted. Carthage and its fate had a strange fascination for him, It is said that he regarded it asa moral example to England in its agricultural decline, its increase of luxury, and its blindness to the insatiable ambition of a powerful rival, He returned again to this theme in 1817, when he exhibited his Decline of the Carthaginian Empire: Host- ages Leaving Carthage for Rome,—a picture which Mr Ruskin describes as "little more than an accumulation of academy student's outlines coloured brown."

In 1818 Turner was in Scotland making drawings for

1 Crossing the Brook was a great favourite with Tumer. It was painted for a patron, who, dissatisfied with it, left it on the painter's hands. The price asked (£500) seems to have been part of the objec- tion. Turner subsequently refused an offer of £1600 for it.

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the Provincial Antiquities for which Sir Walter Scott supplied the letterpress, and in 1819 he visited Italy for the first time. One of the results of this visit was a great change in his style, and from this time his works became remarkable for their colour. Hitherto he had painted in browns, greys, and blues, using red and yellow sparingly. He had gradually been advancing from the sober grey colouring of Vandervelde and Ruysdael to the mellow and richer tones of Claude. His works now begin to show a heightened scale of colour, gradually increasing in richness and splendour and reaching its culminating point in such works as the Ulysses, Childe Harold's Pilgrimage, the Golden Bough, and the Fighting Téméraire. All these works belong to the middle period of Turner's art (1829- 39), when his powers were entirely developed and entirely unabated. Much of his most beautiful work at this period is to be found in his water-colour drawings: those exe- cuted for Whitaker's History of Richmondshire (1819-21), for Cooke's Southern Coast (1814-26), for The Rivers of England (1824), for England and Wales (1829-38), Pro- vincial Antiquities (1826), Rogers's [taly (1830), Scott's Works (1834), and The Rivers of France (1833-35) are in many instances of the greatest beauty. Of the Richmond-shire drawings Mr Ruskin says, 'The foliage is rich and marvellous in composition, the rock and hill drawing in- superable, the skies exquisite in complex form."

But perhaps one of the greatest services Turner rendered to the art of England was the education of a whole school of engravers. His best qualities as a teacher came from the union of strength and delicacy in his work ; subtle and delicate tonality was almost a new element for the engraver to deal with, but with Turner's teaching and careful supervision his engravers by degrees mastered it more or less successfully, and something like a new de- velopment of the art of engraving was the result. No better proof can be found of the immense advance made than by

comparing the work of the landscape engravers of the pre-Turnerian period with the work of Miller, Goodall, Willmore, Cooke, Wallis, Lupton, C. Turner, Brandard, Cousen, and others who worked under his guidance. The art of steel engraving reached its highest development in England at this time. Rogers's Italy (1830) and his Poems (1834) contain perhaps the most beautiful and delicate of the many engravings executed after Turner's drawings. They are vignettes,? a form of art which Turner understood better than any artist ever did before,—perhaps, we might add, since. The Alps at Daybreak, Columbus Discovering Land, and Datur Hora Quiett may be given as examples of the finest.

In 1828 Turner paid a second visit to Italy, this time of considerable duration, on the way visiting Nimes, Avignon, Marseilles, Genoa, Spezzia, and Siena, and in the following year he exhibited the Ulysses Deriding Polyphe- mus, now in the National Gallery. It marks the beginning of the central and best period of Turner's power. 'This work is so well known that description is hardly needed. The galley of Ulysses occupies the centre of the picture ; the oars are being thrust out and the sailors flocking up the masts to unfurl sail, while Ulysses waves the blazing olive tree in defiance of the giant, whose huge form is seen high on the cliffs above; and the shadowy horses of Phoebus are traced in the slanting rays of the rising sun. The impression this picture leaves is one of great power and splendour. The painting throughout is magnificent, especially in the sky. Leslie speaks of it as "a poem of

2 «© Of all the artists who ever lived I think it is Turner who treated the vignette most exquisitely, and, if it were necessary to find some par- ticular reason for this, I should say that it may have been because there was nothing harsh or rigid in his genius, that forms and colours melted

into each other tenderly in his dream-world, and that his sense of gradation was the most delicate ever possessed by man" (Hamerton).

matchless splendour and beauty." From this period on- ward till about 1840 Turner's life was one of unceasing activity. Nothing is more astonishing than his prodigious fertility ; he rose early, worked from morning till night,

entirely absorbed in his art, and gradually became more and more solitary and isolated. Between 1829 and 1839 he sent fifty-five pictures to the Royal Academy, painted many others on private commission, made over four hundred drawings for engravers, besides thousands of studies and sketches from nature. His industry accounts for the immense quantity of work he left behind him. There is not the slightest evidence to show that it arose from a desire to make money, which he never cared for in com- parison with his art. He has been accused, perhaps not without some cause, of avarice and meanness in his busi- ness dealings, and many stories are told to his discredit. But in private he often did generous things, although owing to his reserved disposition his virtues were known only toa few. His faults on the other hand—thanks to the malice, or jealousy, of one or two individuals—were freely talked about and, as a matter of course, greatly ex- aggerated. “Keep it, and send your children to school and to church,” were the words with which he declined repayment of a considerable loan toa poor drawing-master’s widow. On another occasion, when interrupted in his work, he roughly chid and dismissed the applicant, a poor woman; but she had hardly left his door before he followed her and slipped a £5 note into her hand. His tenants in Harley Street were in arrears for years, but he would never allow his lawyer to distrain; and if further proof of his generosity were needed his great scheme for bettering the condition of the unfortunate in his own profession should suffice. On one occasion he is known to have taken down a picture of his own from the walls of the Academy to make room for that of an unknown artist.

The first of Turner’s Venetian pictures (Bridge of Sighs, Ducal Palace and Custom House, Venice, Canaletti Painting) appeared in the Academy in 1833. Compared with the sober, prosaic work of Canaletti, Turner’s pictures of Venice appear like poetic dreams. Splendour of colour and carelessness of form generally characterize them. Venice appeared to him “‘a city of rose and white, rising out of an emerald sea against a sky of sapphire blue.” Many of these Venetian pictures belong to his later manner, and some of them, the Sun of Venice Going to Sea (1843), Approach to Venice (1844), and Venice, Evening, Going to the Ball (1845), to his latest. As Turner grew older his love of brilliant colour and light became more and more a characteristic. In trying to obtain these qualities he gradually fell into an unsound method of work, treating oil as if it had been water-colour, using

both indiscrimi- nately on the same canvas, utterly regardless of the result. Many of his finest pictures are already in a ruined state, mere wrecks of what they once were.

The Fighting Téméraire Tugged to her Last Berth to be Broken up (see vol. xxi. p. 441, fig. 43) was exhibited in the Academy of 1839. By many it is considered one of his finest works. Turner had all his life been half a sailor at heart: he loved the sea, and shipping, and sailors and their ways; many of his best pictures are sea pieces ; and the old ships of Collingwood and Nelson were dear to him. Hence the pathetic feeling he throws around the fighting Téméraire. The old three-decker, looking ghostly and wan in the evening light, is slowly towed along by a black, fiery little steam tug,—a contrast suggesting the passing away of the old order of things and the advent of the new; and behind the sun sets red in a thick bank of smoke or mist. The Slave Ship, another important sea picture, was exhibited in the following year, and in 1842 Peace: Burial at Sea, commemorative of Wilkie.

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Turner had now reached his sixty-seventh year, but no very marked traces of declining power are to be seen in his work. Many of the water-colour drawings belonging to this period are of great beauty, and, although a year or two later his other powers began to fail, his faculty for colour remained unimpaired almost to the end. He paid his last visit to the Continent in 1843, wandering about from one place to another, and avoiding his own country- men, an old and solitary man. At his house in Queen Anne Street they were often ignorant of his whereabouts for months, as he seldom took the trouble to write to any one, Two years later (1845) his health gave way and with it both mind and sight began to fail. The works of his declining period exercised the wit of the critics. Turner felt these attacks keenly. He was naturally kind- hearted and acutely sensitive to censure. ‘A man may be weak in his age,” he once remarked, “but you should not tell him so.”

After 1845 all the pictures shown by Turner belong to the period of decay, —mere ghosts and shadows of what once had been. In 1850 he exhibited for the last time. He had given up attending the meetings of the Academi- cians ; none of his friends had seen him for months; and even his old

housekeeper had no idea of his whereabouts. Turner's mind had evidently given way for some time, and with that love of secrecy which in later years had grown into a passion he had gone away to hide himself in a corner of London. He had settled as a lodger in a small house in Chelsea, overlooking the river, kept by his old Margate landlady, Mrs Booth. To the children in the neighbourhood he was known as "Admiral Booth." His short, sailor-like figure may account for the idea that he was an impoverished old naval officer. He had been ill for some weeks, and when his Queen Anne Street house- keeper at last discovered his hiding-place she found him sinking, and on the following day, the 19th December 1851, hedied. He was buried in St Paul's cathedral, in deference to a wish he had himself expressed.

He left the large fortune he had amassed (about £140,000) to found a charity for the ‘‘ maintenance and support of male decayed artists, being born in England, and of English parents only, and of lawful issue." His pictures he bequeathed to the nation, on con- dition that they were to be exhibited in rooms of their own, and that these rooms were to be called ‘‘Turner's Gallery." The will and its codicils were so confused that after years of litigation, during which a large part of the money was wasted in legal expenses, it was found impossible to decide what Turner really wanted.

It is unnecessary here to do more than allude to the charges which have been brought against Turner's moral character. Like most men of note he had his enemies and detractors, and it is to be regretted that so many of the stories they set in circulation should have been repeated by one of his biographers, who candidly admits having ‘spared none of his faults," and excuses himself for so doing by ‘‘ what he hopes" is his ‘‘ undeviating love of truth." The immense quantity of work accomplished by Turner during his lifetime, work full of the utmost delicacy and refinement, proves the singularly fine condition of his nervous system, and is perhaps the best answer that can be given to the charge of being excessively addicted to sensual gratification. In his declining years he possibly had recourse to stimulants to help his failing powers, but it by no means follows that he went habitually to excess in their use. He never lost an opportunity of doing a kindness, and under a rough and cold exterior there was more good and worth hidden than the world imagined. ‘‘ During the ten years I knew him,"

says Mr Ruskin, ‘‘years in which he was suffering most from the evil-speaking of the world, I never heard him say one depreciating word of any living man or man’s work; I never saw him look an unkind or blameful look; I never knew him let pass, without sorrowful remonstrance, or endeavour at mitigation, a blameful word spoken by another. Of no man but Turner, whom I have ever known, could I say this.” Twice during his earlier days there are circumstances leading to the belief that he had thoughts of

marriage, but on both occasions it ended in disappointment, and his home after his father died was cheerless and solitary, without solace or comfort of any kind.

If Turner had died early his reputation as an artist would have been very different from what it ultimately became. He would not have been recognized as a colourist. It was only after the year 1820 that colour began to assert itself strongly in his work. He painted for many a year in greys and greens and browns, went steadily through ‘‘ the subdued golden chord,” and painted yellow mists and suns rising through vapour; but as time went on that was no longer enough, and he tried to paint the sun in his strength and the full glories of sunshine. The means at the painter’s dis- posal are, however, limited, and Turner, in his efforts after brilliancy, began to indulge in reckless experiments in colour. He could not endure even the slightest restraints which technical limitations im- pose, but went on trying to paint the unpaintable. As a water- colour painter Turner stands pre-eminent ; he is unquestionably the greatest master in that branch of art that ever lived. If his work is compared with that of Barrett, or Varley, or Cozens, or Sandby, or any of the earlier masters, so great is Turner’s superior- ity that the art in his hands seems to be lifted altogether into a higher region. ;

In 1843 a champion, in the person of Mr Ruskin, arose to defend Turner against the unjust and ignorant attacks of the press, and what at first was intended as a “short pamphlet, reprobating the manner and style of these critics,” grew into the five volumes known as Modern Painters. The writer employs all his eloquence and his great critical faculty to prove how immeasurably superior ‘Turner was to all who had ever gone before, hardly restricting his supremacy to landscape art, and placing him among the

“‘seven supreme colourists of the world.” Two lives of Turner have been written, one by Mr Thornbury, the other by Mr Hamerton. The work of the latter deserves the highest commendation ; it gives a clear and consistent history of the great artist, and is characterized by refined thought and critical insight. An excellent little book by Mr W. C. Monkhouse should also be noticed. (G. RE.)

TURNHOUT, a town of Belgium, in the province of Antwerp, 25 miles east-north-east from Antwerp and 6 from the Dutch frontier, stands in the middle of a wide plain. It is a prosperous manufacturing and commercial centre, the chief industries being the weaving of cottons and linens (especially ticking), lace-making, paper-making, brick-making, dyeing, bleaching ; there is also an establish- ment for the rearing of leeches. The population of the commune in 1876 was 15,743.

TURNING. See Larue.

TURNIP. See AcricuLturE, vol. i. pp. 365-368, and HorvricuLtTurgE, vol. xii. p. 288.

TURNIP-FLY, Turntp-Fuea, or Earta FLEA-BEETLEz, the name applied to several species of Haltica which infest turnip fields and do considerable damage to crops. The genus belongs to the family Chrysomelidz, and includes about 100 species. ‘The turnip-fly most usually met with, Haltica nemorum, is scarcely 2mm. in length and of a shining black colour, with two och- reous yellow longitudinal bands run- ning along each wing-case; the bands are slightly sinuous and bend inwards at the hinder end. Of the eleven- jointed antenne the first three seg- ments are yellow and the remainder black. The cox are black, the rest of the legs having a yellowish hue.

Turnip fly (Haltica nemorum).

it The coxe and

tibize are stout and formed for leaping, especially in the

posterior pair of legs. The remarkable power of jumping has given rise to the name turnip-flea. The females are slightly longer and decidedly stouter than the males.

Another species, H. concinna, has a greenish yellow or brassy appearance, and the tibiz of the two posterior legs are armed with a thorn-like hook. A third species, #. consobrina, is of a dark blue colour above, whilst another species, H. obscurella, often very abundant, is of a lighter blue colour, and larger than those mentioned above.

The life-history of Haltica nemorwm may be taken as an example of that of the genus. The beetles begin pairing during April, and continue all through the summer. The female lays but few eggs,

usually one a day. The eggs are deposited on the under surface of a leaf, close under one of the projecting veins ; they possess a pro-

tective colouring. The development within the egg lasts ten days, at the end of which a small larva creeps out, and at once eats its way through the lower epidermis of the leaf into the mesophyll and there forms long winding burrows. The larva or maggot is of a yellowish colour and somewhat cylindrical in form. It has three pairs of legs anteriorly and a pair of pro-legs at its hinderend. The most anterior aud the most posterior segment bear a black spot. The mouth is provided with a pair of mandibles, by means of which the larva eats its way through the soft tissue of the leaf. This larval condition lasts about six days; the maggot then leaves the leaf and buries itself some one or two inches beneath the surface of the earth; here it turns into a chrysalis. From this the full- grown beetle emerges after an interval of fourtéen days, and it is in this stage of its life-history that it proves most destructive to the turnip crop. Several broods may be produced each season; the beetle lives through the winter sheltered under fallen leaves, pieces of wood, clods of earth, &c., until the warmth of spring awakens it, when it soon begins to lay eggs.

Since the chief damage to the crop is due to the perfect beetle devouring the young leaves of the turnip plant, one of the most important methods of dealing with the pest is to ensurc a strong and healthy growth of the plant, by means of manuring, watering, &c. Another preventative is the removal of such weeds as the shepherd's purse and charlock, which harbour the insect in great numbers, and the removal of any stubble in which it might pass the winter. When a crop is badly attacked dressings of soot and gas-lime mixed with sulphur and lime, or of soot or lime alone, prove efficacious, but these must be applied whilst the dew is on the leaves or the ''fly" will escape.

TURNSTONE, the name long given! to a shore-bird, from its habit of turning over with its bill such stones as it can to seek its food in the small crustaceans or other animals lurking beneath them. It is the Tringa interpres? of Linneus and Strepsilas interpres of most later writers, and is remarkable as being perhaps the most cosmopolitan of birds; for, though properly belonging to the northern hemisphere, there is scarcely a sea-coast in the world on which it may not occur: it has been obtained from Spitzbergen to the Strait of Magellan and from Point Barrow to the Cape of Good Hope and New Zealand— examples from the southern hemisphere being, however, almost invariably in a state of plumage that shows, if not immaturity, yet an ineptitude for reproduction. It also, though much less commonly, resorts to the margins of inland rivers and lakes; but it is very rarely seen except in the neighbourhood of water, and salt water for preference.

The Turnstone is about as big as an ordinary Snipe; but, com- pared with most of its allies of the group Limicolx, to which it be- longs, its form is somewhat heavy, and its legs are short. Still it is brisk in its movements, and its variegated plumage makes it a pleasing bird. Seen in front, its white face, striped with black, and broad black gorget attract attention as it sits, often motionless, on the rocks ; while in flight the white of the lower part of the back and white band across the wings are no less conspicuous even at a distance. A nearer view will reveal the rich chestnut of the mantle and upper wing-coverts, and the combination of colours thus ex- hibited suggests the term " tortoise-shell" often applied to it—the quill-feathers being mostly of a dark brown and its lower parts pure white. The deeper

tints are, however, peculiar to the nuptial plumage, or are only to be faintly traced at other times, so that in winter the adults—and the young always—have a much plainer appearance, ashy-grey and white being almost the only hues observ- able. From the fact that Turnstones may be met with at almost any season in various parts of the world,' and especially on islands as the Canaries, Azores, and many of those in the British seas, it has been inferred that these birds may breed in such places. In some cases this may prove to be true, but in most evidence to that effect is wanting. In America the breeding-range of this species has not been defined. In Europe there is good reason to suppose that it

1 The name seems to appear first in Willughby's Ornithologia (p. 231) in 1676; but he gave as an alias that of Sea-Dottrel, under which name a drawing, figured by him (pl. 58), was sent to him by Sir Thomas Browne.

2 Linneus (Cl. och Gothlandska Resa, p. 217), who first met with this bird on the island of Gottland, 1st July 1741, was under the mis- taken belief that it was there called Tolk (=interpres). But that name properly belongs to the REDSHANK (q.v.), from the cry of warning to other animals that it utters on the approach of danger.

3 The authors of The Water Birds of North America (i. p. 123) in reference to this fact raise the ingenious question, " Do birds, after they have become old, effete, or barren, prefer to stay in a warm climate ?"

includes Shetland ; but it is on the north-western coast of the continent, from Jutland to the extreme north of Norway, that the greatest number are reared. The nest, contrary to the habits of most Limicol#, is generally placed under a lcdge of rock which shelters the bird from observation,! and therein are laid four eggs, of a light olive-green, closely blotched with brown, and hardly to be mistaken for those of any other bird. A second species of Turn- stone is admitted by some authors and denied by others. This is the S. melanocephalus of the Pacific coast of North Amcrica, which is said to be on the average larger than S. interpres, and it never exhibits any of the chestnut colouring.

Though the genus Strepsilas seems to be rightly placed among the Charadriidx (cf. PLovEr), it occupies a some- what abnormal position among them, and in the form of its pointed beak and its variegated coloration has hardly any very near relative. (A. N.)

TURPENTINE consists of the oleo-resins which exude from certain trees, especially from some conifers and from the terebinth tree, Prstacia Terebinthus, L. It was to the product of the latter, now known as Chian turpentine, that the term was first applied. The terebinth tree (réppuvOo0s of Theophrastus) and its resin (fytivy teppivOwn) were well known and highly prized from the earliest times. The tree is a native of the islands and shores of the Medi- terranean, passing eastward into Central Asia; but the resinous exudation found in commerce is collected in the island of Scio. Chian turpentine is a tenacious semi-fluid transparent body, yellow to dull brown in colour, with an agreeable resinous odour and little taste. On exposure to the air it becomes dry, hard, and brittle. In their general characters, turpentines are soft solids or semi-fluid bodies, consisting of a mixture of one or more resins with essential oils, which, although differing in physical pro- perties, have a composition corresponding to the formula C,,)H,,. They also contain minute quantities of oxygenated oils. Formerly they had considerable reputation in medi- cine, and they still continue to be employed in plasters and ointments ; but their great use is in the arts, for which they are separated by distillation into rosin or colophony (see Rosin, vol. xx. p. 852) and oil or spirit of turpentine.

Crude or common turpentine is the commercial name which embraces the oleo-resiu yielded by several coniferous trees, both Kuropean and American. The principal European product, some- times distinguished as Bordeaux turpentine, is obtained from the sea pine, Pinus maritima, in the Landes department of France. Crude turpentine is further yielded by the Scotch fir, P. sylvestris, throughout northern Europe, and by the Corsican pine, P. Laricio, in Austria and Corsica. In the United States the turpentine-yielding pines arc the swamp pine, P. palustris, and the loblolly, P, Tzda, both inhabiting North and South Carolina, Georgia, and Alabama. Venice turpentine is yiclded by the larch tree, Larix europexa, from which it is collected principally in Tyrol. Stras- burg turpentine is obtained from the bark of the silver fir ; but it is collected only in small quantities. Less

known turpentines are obtained from the mountain pine, P. Pwmilio, the stone pine, P. Cembra, the Aleppo pine, P. halepensis, &c. The so-called Canada balsam, from Abtes balsamea (see BALSAM, Vol. ili. p. 293), is also a true turpentine.

Oil of turpentine as a commercial product is obtained from all or any of these oleo-resins, but on a large scale only from crude or common turpentine. The essential oil is rectified by redistilla- tion with water and alkaline carbonates, and the water which the oil carries over with it is removed by a further distillation over calcium chloride. Oil of turpentine is a colourless liquid of oily consistence, with a strong characteristic odour and a hot disagree- able taste. Its boiling point ranges from 152° to 172° C. at ordinary temperature ; its sp. gr. is between 0°856 and 0°870 ; and in optical properties it rotates the plane of polarized light both to right and left in varying degrees according to its sources. It is soluble in alcohol, ether, benzol, other essential oils, and the fixed oils, and itself is a solvent of resins and caoutchouc. On exposure to the air it dries to a solid resin, and when oxidized in the presence of water gives off peroxide of hydrogen—a reaction utilized in the preparation of a disinfectant called ‘‘sanitas.” Oil of turpentine is largely used in the preparation of varnishes, and as a medium by painters in their ‘‘ flat” colours.

1 There is little external difference between the sexes, and the brightly-contrasted colours of the hen-bird seem to require some kind of concealment.

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TURPIN, archbishop of Rheims and the supposititious author of Historia Karoli Magni et Rotholandi, is probably to be identified with Tilpin, who was archbishop of Rheims towards the end of the 8th century. This Tilpin is alluded to by Hinemar (845-882), his third successor in the see. According to Flodoard (0b. 969), Charles Martel drove Ragobert, bishop of Rheims, from his office, putting in his place a warrior-clerk, Milo. The same writer repre- sents Milo as discharging a mission among the Vascones or Basques, the very people to whom authentic history has ascribed the great Carolingian disaster at Roncesvalles. It is possible that we owe the warlike legends that have accumulated round the name of Turpin to some confusion

of his identity with that of his martial predecessor. Flodoard says that Tilpin was originally a monk of St Denis; and we know from Hinemar that, after his appoint- ment to Rheims, he occupied himself in securing the re- storation of the metropolitan rights and landed property of his church, whose revenue and prestige had been im- paired under Milo's rule. He was, according to the latter authority, elected in the days of Pippin, the son of Charles Martel, 2.¢., between 752 and 768. He died, if we may trust the evidence of a diploma alluded to by Mabillon, in 794. Hinemar, who composed his epitaph, makes him bishop for forty years and more, from which it is evident that he was elected somewhere about 754. Flodoard, however, states that he died in the forty-seventh year of his bishopric. Tilpin was present at the synod of Rome in 769 ; and Pope Hadrian, at the request of Charlemagne, sent him a pallium and confirmed the rights of his church (Gallia Christiana, ix. 28-30). According to Flodoard, he substituted monks for canons in the monastery of St Remigius; and 17th-century tradition ascribed to him an ancient pontificale, still extant in Marlot's days (17th century).

The above is a summary of all that authentic history and trust- worthy tradition teach about the author to whom the common voice of the Middle Ages ascribed the Historia Caroli Magni. A short account of the work has been given elsewhere (RoLAND, LEGEND oF). But, popular as this production was during the Middle Ages, it was rather the crystallization of earlier Bolan! legends than the source of later ones. Potthast has enumerated about fifty codices without by any means, according to M. Gaston Paris, exhausting the list. The latter writer has made the Historia Karoli the subject of a special study (De Pseudo-T'urpino, Paris, 1865), which may be recommended as a model of brilliant though cautious scholarship. The great popularity of the pseudo-Turpin seems to date from the latter half of the 12th century ; and M. Paris enumer- ates at least five French translations belonging to the 13th, and one into Latin verse of about the same age. Mr Ward (Cat. of Romances, 549) has recently expressed a doubt as to whether the Turpin chronicle was completed at Vienne.

TURQUOISE, a blue or bluish green mineral, valued, when cut and polished, as an ornamental stone. The finest variety occurs in Persia, whence it originally reached western Europe by way of Turkey, and thus

came to be called by the Venetians, who imported it, turchesa, and by the French turquoise. It is chemically a hydrated phosphate of aluminium, associated with a variable pro- portion of hydrated phosphate of copper, to which it owes much of its colour. The green tints of certain varieties appear to be due to admixture with salts of iron. A fine blue Persian turquoise, analysed by Prof. A. H. Church, yielded—alumina 40°19, phosphorus pentoxide 32°86, water 19°34, cupric oxide 5:27, ferrous oxide 2°21, and manganous oxide 0°36. The most valued tint of the turquoise is a delicate blue, inclining slightly to green; in many speci- mens the green becomes more pronounced with age. Although the turquoise is practically opaque, sections may be ground so thin as to admit of examination by trans- mitted light. Its microscopic structure was first studied by Prof. Fischer of Freiburg (Baden), afterwards by H. Biicking of Strasburg, and recently by Clarke and Diller.

Thin sections are almost colourless. Between crossed Nicols they show either a fibrous texture or a finely-granular aggregate of doubly-refracting particles without definite crystalline outlines. The mineral has never been found crystallized, but occurs as veins, nodules, stalactitic masses, and incrustations. Large pieces are exceedingly rare. The specific gravity of turquoise is about 2°75, and its hardness below 6 ; it takes a fair polish and exhibits a feeble lustre. It is usually cut en cabochon or with a low convex surface, and in the East is frequently engraved with Persian and Arabic inscriptions, generally passages from the Koran,— the incised characters being in many cases gilt. Such objects are worn as amulets. The turquoise has always been associated with curious superstitions, the most com- mon being the notion that it changes colour with variations in the state of its owner’s health, or even in sympathy

with his affections.

Persia is the chief centre of the turquoise trade, where the same mines have been worked for at least eight centuries. The finest stones are found near Nishapur in Khorasan (see Persta, vol. xviii. p. 622). Tavernier, writing in the 17th century, states that the best turquoise, reserved for the sole use of the shah, was obtained from the mine which he describes as the Vieille

Roche, while inferior stones were got from the Nouvelle Roche. These terms still survive, all turquoise of fine colour being said in trade to be from the “old rock,” and that which is pale, or changes tint on exposure, is from the “new rock.” According toa recent report by Consul Benjamin at Teheran the best turquoise is found at Abu Riah, and all the Khorasan mines are farmed by a few prominent officials, who pay to the shah an annual rent of about £6500. Dr Tietze has lately described specimens of the matrix of the mineral brought to Vienna from Persia by General Schindler. These show that the turquoise occurs, not in clay-slate, as is often stated, but in a porphyritic trachyte or trachytic breccia, and in loose fragments in the neigh- bouring alluvium. The mineral is also found in Kerman in southern Persia, but the stone is of pale colour, tending to fade, and the mines which yield it are now nearly abandoned. In 1849 Major C. Macdonald found turquoise in Wady Maghara and Wady Sidreh, near SINAI (q.v.), where, according to Mr H. Bauerman, it lines the open joints of a ferruginous sandstone, and is also embedded in small ochreous nodules in the rock itself. The redder the rock the finer the colour of the associated turquoise. As the colour is liable to fade, the Arabian turquoise has not a good name among jewellers, and the workings were abandoned by Macdonald in 1865. In Wady Maghara there are relics of extensive mining operations, pre- sumably for turquoise, of so early a date that the rock was wrought by flint implements. The early inhabitants of Mexico made much use of this mineral for inlaying obsidian ornaments, and for mosaic work with iron- pyrites. It was probably one of the stones known as chalchihuitl In 1858 Prof. W. P. Blake called attention to the occurrence of turquoise at Cerillos, about 22 miles south- west of Santa Fé, in New Mexico, where mining operations for this mineral were carried on two centuries ago. The turquoise varies in colour from sky-blue to apple-green, and is found as nodules and small veins in a felspathic rock of microgranitic texture, probably of eruptive origin. The mines of Cerillos are no longer worked. A similar green mineral is found at Turquoise Mountain in Cochise county and at Mineral Park, Mohave county, Arizona. It also occurs to a small extent in southern Nevada, where it is found as blue grains disseminated through a sandstone. In Europe, the turquoise is found at Oelsnitz in Saxony and near Jordansmiihl in Silesia, occurring at the latter locality in clay-slate. Under the names of cadlais and callaina Pliny described a green mineral which, if not our turquoise, seems to have been very closely related to it. A bright

green mineral, wrought into beads, and found with stone hatchets in ancient graves at Men-er Hreeck (Rock of the Fairy) in Brittany, was described in 1864 by M. Damour, who, seeking to identify it with Pliny's cadlais, revived this name. Dana afterwards brought the word into harmony with our mineralogical nomenclature by writing it callainite. The mineral in question is a hydrated phosphate of aluminium, apparently identical with Breithaupt's variscite. By many mineralogists the true torquoise is called calaite (see vol. xvi. p. 405).

Turquoise is commonly imitated by enamels, but of late some ingenious counterfeits have been made with the same chemical composition as the natural stone. To increase the deception, pieces of ochreous matter are inserted at the back of the artificial turquoise, to imitate the natural matrix. In order to distinguish between the genuine stone and itsimitations, Pohl recommends that a splinter should be strongly heated in a platinum capsule, when the true turquoise is reduced to a brownish black powder or a friable mass with a decrepitating sound ; the false turquoise does not de- crepitate, but either fuses to a glass or is reduced to a frit.

For recent information on the turquoise, see ‘‘ Das Vorkomimen der Tiirkise bei Nischapur in Persien,” by Dr E. Tietze, in Verhandl. d. k, k. geolog. Reichsan- stalt, No. 6, 1884, p. 93; ‘‘Mikroskopische Untersuchung des Tiirkis,” by H. Biicking, in Zeitsch. f. Krystallog., vol. ii., 1878, p. 163 ; ‘Hine einfache und sichere Unterscheidungsweise der echten Ttirkise von deren Nachahinungen,” in N. Jahrb. f. Mineralogie, 1878, p. 864; ‘Turqois from New Mexico,” by F. W. Clarke and J. 8. Diller, in Americ. Journ. Science, Sept. 1886, p. 211; ‘* Re- vision of Mineral Phosphates, No. iv., Calaite,” by A. H. Church, in Chem. News, x. p. 290; and note in Journ, Soc. Arts, xxxii., 1884, p. 1084.

TURRETIN, or Turretini. Three theologians of this name figure in the history of Genevan theology.

1. Benorr Turretin (1588-1631), the son of Francesco Turretini, a native of Lucca, who settled in Geneva in 1579, was born in that town on 9th November 1588. He was ordained a pastor in Geneva in 1612, and became

professor of theology in 1618. In 1620 he represented the Genevan Church at the national synod of Alais, when the decrees of the synod of Dort were introduced into France ; and in 1621 he was sent on a successful mission to the states general of Holland, and to the authorities of the Hanseatic towns, with reference to the defence of Geneva against the threatened attacks of the duke of Savoy. He published in 1618-20 a defence of the Genevan translation of the Bible. Benoit Turretin died at Geneva on 4th March 1631.

2. FRANCOIS TURRETIN (1623-87), son of the preceding, was born at Geneva on 17th October 1623. After study- ing theology in Geneva, Holland, and France, he became a pastor in Geneva in 1647; after a brief pastorate at Leyden, he again returned to Geneva as professor of theology in 1653. He was one of the most influential supporters of the Yormula Consensus Helvetica, drawn up chiefly by Heidegger, in 1675, and of the particular type of Calvinistic theology which that symbol embodied. His Institutio Theologizx Hlenctice (3 vols. 4t0, Geneva, 1680-83) has passed through frequent editions, the last reprint having been made in Edinburgh in 1847. F. Turretin died at Geneva on 28th September 1687. He was also the author of volumes entitled De Satisfactione Christi Disputationes (Geneva, 1666) and De Necessaria Secesstone Nostra ab Ecclesia Romana (Geneva, 1687).

3. Juan ALPHONSE TurrRetIN (1671-1737), son of the preceding, was born at Geneva on 13th August 1671. He was educated at Geneva and in Holland, and after travelling in England and in France was received into the "'Vénérable Compagnie des Pasteurs" of Geneva in 1693. In 1697 he became professor of church history. During the next forty years of his life he enjoyed great influence in Geneva as the advocate of a more liberal theology than had prevailed under the preceding genera- tion, and it was largely through his instrumentality that the use of the Formula Consensus Helvetica as a symbol was discontinued in 1725. He also wrote and laboured for the promotion of union between the Reformed and Lutheran Churches, his most important work in this con- nexion being NVubes Testium pro Moderato et Pacifico de Rebus Theologicis Judicio, et Instituenda inter Protestantes Concordia (Geneva, 1719). Besides this he wrote Cogita- tiones et Dussertationes Theologicx, on the principles of natural and revealed religion (Geneva, 1737); and com- mentaries on

Thessalonians and Romans were published posthumously. He died at Geneva on Ist May 1737.

TURTLE. See Torroisz.

TUSCANY (Ital. Toscana), one of the sixteen comparti- menti of the kingdom of Italy, contains eight provinces— Arezzo, Florence, Grosseto, Leghorn, Lucca, Massa-Carrara, Pisa, and Siena—and has an area of 9287 square miles, with a population of 2,208,869 in 1881. In 1859, im- mediately before it united with the kingdom of Sardinia, the grand-duchy of Tuscany, exclusive of Massa-Carrara, which then belonged to Modena, but including the islands of Gorgona, Elba, Pianosa, Formica, Montecristo, Giglio, and Gianutra, as well as the duchy of Lucca (united to it

in 1847), had an area of 8625 square miles and a popula- tion of 1,806,940. See Irany, vol. xiii. pp. 489-490. ETRuRIA (q.v.) was finally annexed to Rome in 351 pB.c. (see Rome), and constituted the seventh of the eleven regions into which Italy was, for administrative purposes, divided by Augustus. Under Constantine it was united into one province with Umbria, an arrangement which subsisted until at least 400, as the Wotdtia speaks of a "‘ consularis Tuscie et Umbrie." In Ammianus Mar- cellinus there is implied a distinction between "Tuscia suburbicaria" and ‘‘Tuscia annonaria," the latter being that portion which lies to the north of the Arno. After the fall of the Western empire Tuscia, with other provinces of Italy, came successively under the sway of Herulians, Ostrogoths, and Greek and Lombard dukes. Under the last-named, ‘‘ Tuscia Langobardorum," comprising the districts of Viterbo, Corneto, and Bolsena, was distinguished from " Tuscia Regni," which lay more to the north. Under Charlemagne the name of Tuscia or Toscana became restricted to the latter only. One of the earliest of the Frankish marquises was Boniface, either first or second of that name, who about 828 fought with success against the Saracens in Africa. Adalbert I., who succeeded him, in 878 espoused the cause of Carloman as against his brother Louis ITI. of France, and suffered excommunication and imprisonment in consequence. Adalbert II. (the Rich), who married the ambitious Bertha, daughter of Lothair, king of Lorraine, took a prominent part in the politics of his day. A subsequent

marquis, Hugo (the Great), became also duke of Spoleto in 989. The male line of marquises ended with Boniface II. (or III.), who was murdered in 1052. His widow, Beatrice, in 1055 married Godfrey, duke of Lorraine, and governed the country till her death in 1076, when she was succeeded by Mariupa (q.v.), her only child by her first husband. Matilda died in 1114 without issue, bequeathing all her extensive possessions to the church. The consequent struggle between the popes, who claimed the inheritance, and the emperors, who maintained that the countess had iro right to dispose of imperial fiefs, enabled the prin- cipal cities of Tuscany gradually to assert their independence and

govern themselves under consuls and elders of their own selection.:

The most important of these Tuscan republics or self-governed com- munes were Florence, Pisa, Siena, Arezzo, Pistoia, and Lucca. Some account of the manner in which they were all gradually absorbed by Florence will be found under FroreNnce and Mzpict. The title of grand-duke of Tuscany was conferred on Cosmo de' Medici by Pius V. in 1567, and the emperor (Maximilian II.), after withholding his consent for some years, ultimately confirmed it to Cosmo's successor in 1576. In 1735, in view of the childlessness of Giovan Gastone, the last of the Medici, the succession of Francis, duke of Lorraine, afterwards emperor Francis I., was arranged for by treaty. In 1765 he was succeeded as grand-duke by his second son Leopold (see Lropoun II.), who, on becoming emperor in 1790, handed Tuscany over to his second son Ferdinand, third grand-duke of the name. The duchy was occupied by the French in 1799, ceded to Louis, prince of Parma, by the convention of Madrid in 1801, and annexed to the French empire in 1808. Ferdinand, however, was reinstated in 1814, and on his death in 1824 was succeeded by his son Leopold, second grand-duke of the name, who was deposed by the constituent assembly on 16th August 1860. See ITALy.

TUSCULUM, an ancient Latin city, situated in a com- manding position on one of the eastern ridges of the Alban Hills, near the site of the modern Fraseart (q.v.). It has a very beautiful and extensive view of the Campagna, with Rome lying fifteen miles! distant to the north-west, on the west the sea near Ostia, and the long range of the Sabine Hills on the north-east.

According to tradition, the city was founded by Telegonus, the son of Ulysses and Circe; hence Horace (Hpod., i. 30) speaks of it as “Circa meenia” and Ovid (/ast., iii. 91) as “Telegoni mcenia” (see also Prop., iii. 30, 4, and Sil. Ital., xii. 535). The legendary descent of one of the chief Tusculan families, the gens Mamilia, from Ulysses through Telegonus is com- memorated on some denarii struck by the Mamilian gens in the later years of the Roman republic; these have on the reverse a figure of Ulysses recognized by his dog Argo. When Tarquinius Superbus was expelled from Rome his cause was espoused by the chief of Tusculum, Octavius Mamilius, who took a leading part in the formation of the Latin League, composed of the thirty principal cities of Latium, banded together against Rome. Mamilius com- manded the Latin army at the battle of Lake Regillus, a

1 Dionysius (x. 20) states that Tusculum was only 100 stadia (about 123 miles) from Rome ; but the fifteenth milestone on the Via Latina was close to the walls of Tusculum.

piece of water which then lay immediately below the Colles Tusculani, but is now dried up. At this battle (497 3.c.) Mamilius was killed, and the predominance of Rome among the Latin cities was practically established. From that time Tusculum became an ally of Rome, and on that account frequently incurred the hostility of the other Latin cities. In 378 3.c., after an expression of complete submission to Rome, the people of Tusculum received the Roman fran- chise, and thenceforth the city continued to hold the rank of a municipium. Several of the chief Roman families were of Tusculan origin, e.g., the gentes Mamilia, Fulvia, Fonteia, Juventia, and Porcia; to the last-named the celebrated Catos belonged. During the imperial period little is re- corded about Tusculum ; but soon after the transference of the seat of empire to Constantinople it became a very important stronghold, and for some centuries its counts occupied a leading position in Rome and were specially influential in the selection of the popes. During the 12th century there were constant struggles between Rome and Tusculum, and towards the close of the century the Romans, supported

by the German emperor, gained the upper hand, and the walls of Tusculum, together with the greater part of the city, were destroyed.

Extensive remains still exist of the massive walls, which sur- rounded the city, and of its arx—a separate citadel—which stood on an abrupt rock, approached only on one side, that towards the city, with which it was connected by long walls. The walls are built of large blocks of the native ‘‘lapis Albanus” or peperino, some of them as muchas 5 feet long by 3 feet thick. They probably belong to the early republican period ; restorations in concrete faced with eee reticulatuni” of the 1st century B.c. can be traced in many places.

During the latter years of the republic and under the empire Tusculum was a favourite site for the country villas of wealthy Romans. That of Lucullus was very large and magnificent ; other handsome houses were built there by Julius Cesar, L. Crassus, Q. Metellus, Marcus Brutus, and others. A palace was erected fe Tiberius near Tusculum on the way to Rome, close to the Via

atina.

The most interesting associations of the city are those connected with Cicero, whose favourite residence and retreat for study and literary work was at Tusculum. It was here that he composed his celebrated Tusculan Disputations and other philosophical works. Much has been written on the position of his villa, but its true site still remains doubtful. Its grounds are known to have adjoined the more splendid villas of Lucullus and the consul Gabinius (see Cic., De Fin., iii. 2, and Pro Dom., 24). The most probable site is that now marked by the Villa Rufinella to the west of Tusculum, where the hill is divided into two ridges. The scholiast on Horace, Epod., i. 30, states that Cicero’s villa was ‘‘ad latera superiora,”’ the plural probably being used in allusion to the double ridge. The other theory, which places the site at Grotta Ferrata, some distance farther to the west, has little evidence to support it. Although Cicero (Pro Sestio, 43) speaks of his own house as being insignificant in size compared to that of his neighbour Gabinius, yet we gather from other notices in various parts of his works that it was a building of no mean size and pretension. It comprised two gymnasia (Div., i. 5), with covered porticus for exercise and philosophical discussion (Zusc. Disp., il. 3). One of these, which stood on higher ground,

was called “the Lyceum,” and contained a library (Div. ii. 3); the other, on a lower site, shaded by rows of trees, was called ‘‘the Academy.” The main building contained a covered porticus or cloister, with apsidal recesses (ewedr#) containing seats (see Ad Fam., vii. 23). It also had bath-rooms (4d Fam., xiv. 20), and contained a number of works of art, both pictures and statues in bronze and marble (Zp. ad Att., i. 1, 8,9, 10). The central atrium appears to have been small, as Cicero speaks of it as an atriolum (dd Quint. Fr., iii. 1). The cost of this and the other house which he built at Pompeii led to his being burdened with debt (Zp. ad Att., ii. 1). Nothing now exists which can be asserted to be part of Cicero’s villa with any degree of certainty. The so-called ‘‘ scuola di Cicerone,” near the line of the ancient wall of Tusculum, is the substructure of some building formed in the usual Roman way by a series of vaulted chambers, and is clearly later in date than the time of Cicero. Other remains of houses exist in and near the city, but nothing is known as to their history or ownership.

Ruins of two theatres still exist. One of them, which is not earlier than the beginning of the 1st century, between the city and the arx, is fairly perfect, and still possesses most of its ancient seats, divided into four cunei by three flights of steps. Only traces remain

of the other theatre, which abutted against the long walls that defended the road from the city to the arx. Remains of an amphi- theatre of no great size can be traced, dating probably from the 3d century. There is also a large piscina, near the first-mentioned theatre. In the vicinity of Tusculum a number of interesting tombs have been discovered at various times ; some, as for example that of the Furii, contained valuable inscriptions of the 4th and 3d centuries B.C.

The city was supplied with water by the Aqua Crabra, and near it were the springs which fed two of the Roman aqueducts—the Aqua Tepula and Aqua Virgo (Front., De Aq., 8).

For further information the reader is referred to Compagni, Memorie Storiche

dell’ Antico Tusculo; Canina, Descr. dell’ Antico Tusculo ; Gell, Topogr. of Rome and its Vicinity ; and Nibby, Dintorni di Roma, vol. ill.

TUSSER, THomas (c. 1527-1580), poet, was the son of William Tusser by Isabella, daughter of Thomas Smith of Rivenhall, Essex, where he was born about 1527. Not- withstanding strong reluctance on his part he was sent in his early years to a music school, and became chorister in the collegiate chapel of the castle of Wallingford. He was afterwards admitted into the choir of St Paul’s, and went thence to Eton, where he was under the tuition of Nicholas Udall. In 1543 he was elected to King’s College, Cam- bridge, and soon afterwards exchanged to Trinity Hall. On leaving the university he was for about ten years at court, probably in some musical capacity. He then settled as a farmer in Suffolk, near the river Stour, an employment which he seems to have regarded as combin- ing the chief essentials of human felicity. Subsequently he lived successively at Ipswich, West Dereham, Norwich, and London. ‘There he died in April 1580, and was buried in the church of St Mildred in the Poultry. His monument was destroyed in the fire, but the quaint epitaph is preserved in Stow’s Survey of London. A marble tablet, on which the epitaph is inscribed, has been erected to him in the church of Manningtree, Essex.

Tusser’s poems on husbandry have the charm of simplicity and directness, and their practical saws were apparently relished, for in his lifetime they went through a number of editions. They are 4 Hundreth Good Pointes of Husbandrie, 1557, 1561, 1562, 1564, and 1570; A Dialogue Wyuynge and Thryuynge, 1562; A Hundrethe Good Pointes of Husbandrie lately married unto a Hundrethe Good Pointes of Huswifry, 1570; Five Hundreth Pointes of Good Hus- bandrie united to as many of Good Wiferie, 1578, 1576, 1577, 1585, 1586, 1590, 1593, reprinted with memoir by William Mavor, 1812, by Auber, 1873, and by the English Dialect Society, 1879. His metrical autobiography, printed in the Appendix to Five Hundreth Pointes, 1573, was republished in 1846 along with his will, which would seem to refute the sarcasms which became current, that he had not been successful in practising his own maxims. One of these references is contained in a volume of epigrams by H. P., The More the Merrier, 1608. One of the epigrams entitled dd Tusserum, begins thus :—

“ Tusser, they tell me, when thou wert alive, Thou, teaching thrift, thyselfe could’st never thrive.”

Possibly Tusser obtained the reputation of being poor from his practice of thrift ; but in any case, if his will represents his worldly condition at the time of his death, hc was not in poverty in his later years.

TVER, a government of central Russia, on the upper Volga, bounded by Pskoff and Novgorod on the W. and N., Yarostavl and Vladimir on the E., and Moscow and Smo- lensk on the 8.; it has an area of 25,225 square miles. Lying on the southern slope of the Valdai plateau, and intersected by deep valleys, it has the aspect of a hilly region, but is in reality a plateau ranging from 800 to 1000 feet in height. Its highest parts are in the north-west, where the Volga, Western Dwina, and Msta rise in marshes and lakes. The plateau is chiefly built up of Carboniferous limestones, Lower and Upper, underlain by Devonian and Silurian deposits, which appear only in the denudations of the lower valleys. The whole is covered by a thick sheet of boulder-clay (the bottom-moraine of the Scandinavo-Russian ice-sheet) and subsequent lacustrine deposits. A number of dsar (see vol. x. p. 368) occur on the slopes of the plateau. Ochre, brick, and pottery clays, as also limestone for building, are obtained, and there are

chalybeate springs. The soil, which is clayey for the most part, is not fertile as a rule.

Nearly the whole of Tver is watered by the upper Volga (350 miles) and its tributaries, several of which (Vazuza, Dubna, Sestra, Tvertsa, and the tributaries of the Mologa) are navigable. The Vyshnevototsk system of canals connects the Volga (navigable some 60 miles from its source) with the Baltic, and the Tikhvin system connects the Mologa with Lake Zadoga. The Msta, which flows into Lake Ilmef, and its tributary the Tsna, water Tver in the north-west, and the Western Dwina rises in Ostashkoff. This network of rivers highly favours navigation : as many as 3000 boats yearly pass through the Vyshnevototsk system, and corn, linseed, spirits, flax, hemp, timber, metals, and manufactured ware to the annual value of £1,500,000 are shipped from, or brought to, the river ports of the

government. Lakes, ponds, and marshes are numerous in the west and north-west, Lake Seliger—the source of the Volga—and Lake Mstino being the most important. The forests—coniferous in the north and deciduous in the south—are rapidly disappearing, but still cover 890,000 acres. The climate is continental ; the average yearly temperature at Tver (41°°5 Fahr.) is the same as that of Orel and Tamboff (January 11°, July 67°). The population (1,646,683 in 1883, as against 1,567,300 in 1872) is unequally distributed, and in the districts of Kalyazin and Kashin attains a density not much less than that of the more highly favoured black-earth provinces of south east Russia (16 and 17 per square mile), Apart from some 100,000 Karelians and a few Poles and foreigners, the people are all Great Russians. Some traces of Finnish Ves and of Lithuanians are found in the north-east and south. he official returns give the number of Raskolniks as 25,000. Only 157,110 are urban; but agriculture is not the chief occupa- tion. While barley and oats are exported, rye is imported. The crops for 1883-1885 averaged 2,889,400 quarters of corn and 4,078,400 bushels of potatoes. Cattle-rearing does not prosper, and the in- crease shown by the returns for 1883 (351,630 horses, 583,670 cattle, and 373,780 sheep) as against those of 1872 is simply due to better registration. Cheese-making has recently been introduced on the co-operative principle (2168 cwts. of cheddar exported to Britain in 1881). The fisheries in the lakes and rivers are productive. The peasants are principally engaged in various manufactures. The total production of the larger manufactures in 1883 was valued at £2,237,250 (tanneries £244,460, cottons £803,270, distilleries £320,010, flour-mills £263,500), and that of the petty trades carried on in combination with agriculture (preparation of pitch, tar, and turpentine, boat-building, construction of cars, sledges, wheels, boxes, tubes, and wooden vessels, and cabinet-making) was estimated in 1884 at £3,000,000, giving occupation to 101,400 persons. Certain branches of the leather industry are important, Kimry and Ostash- koff sending to the market £650,000 worth of boots annually. The small workshops of Tver and the surrounding district work some 4500 ewts. of iron into nails every year, and the Ostashkoff smiths use some 7000 cwts. of iron annually in the manufacture of hatchets, scythes, sickles, and different agricultural implements. Weaving, lace-making, leather embroidery, stocking-making, felting, and the like are also important petty trades, several of these being organized on co-operative principles by the zemstvos. The railway from St Petersburg to Moscow crosses Tver, and

sends off two branches to Rzheff and to Rybinsk, all three lines being among the busiest in Russia. The river traffic also is considerable. The chief centres of trade, besides the city of Tver, are Byezhetsk, Rzheff, Kashin, Ostashkoff, Torshok, Krasnyi Kholm, and Vesiegonsk during its fair. The provincial assembly of Tver is one of the most prominent in Russia for its efforts in the cause of education and sanitary improvement. In 1883 there were 997 primary schools with 47,680 scholars (8500 girls), 17 gymnasia and progymnasia (1697 boys and 1268 girls), and two normal schools for teachers. The government is divided into twelve districts, the chief towns of which, with their a eae in 1884, are—TveER (see below), Byezhetsk (5890),

alyazin (5200), Kashin (5730), Kortcheva (2275), Ostashkoff (9900), Rzheff (26, 480), Staritsa (2700), Torshok (12,910), Vesiegonsk (3370), Vyshniy Vototchok (11,590), and Zubtsoff (3160).

TVER, capital of the above government, lies 102 miles by rail to the north-west of Moscow, on both banks of the Volga (here crossed by a floating bridge) at its junction with the Tvertsa. The low right bank is protected from inundations by a dam. Asa whole the town is but poorly built. The oldest church dates from 1564, and the cathedral from 1689. An imperial palace, the courts, and the post- office rank among its best buildings. A public garden occupies the site of the former fortress. The population was 39,100 in 1884. The manufactures, chiefly of cotton, employ 5900 workmen (5710 at the cotton mills), and a number of nail-making workshops employ some 800 men, while more than 1000 women are engaged in the domestic

manufactory of hosiery for export to Moscow and St Petersburg. The traffic of the town is considerable, Tver being an intermediate place for the trade of both capitals with the provinces of the upper Volga.

Tver dates its origin from 1180, when a fort was erected at the mouth of the Tvertsa to protect the Suzdal principality against Novgorod. In the 13th century it became the capital of an in- dependent principality, and remained so until the end of the 15th century. Mikhail Yaroslavovitch, prince of Tver,

was killed fighting against the Tatars, as also was Alexander Mikhailovitch, who boldly fought for the independence of Tver against Moscow. It long remained an open question whether Moscow or Tver would ultimately gain the supremacy in Great Russia, and it was only with the help of the Tatars that the princes of the former eventually succeeded in breaking down the independence of Tvcr. In 1486, when the city was almost entirely burned down by the Muscovites, the son of Ivan III. became prince of Tver; the final annexation to Moscow followed four years later. In 1570 Tver had to endure, for some reason now difficult to understand, the vengeance of Ivan the Terrible, who ordered the massacre of 90,000 inhabitants of the principality. In 1609-12 it was plundered both by the followers of the second false Demetrius and by the Poles.

TWEED, a river in the south of Scotland, has its rise in the south-west corner of Peeblesshire, not far from the Devil's Beef Tub in Dumfriesshire. The stream flowing from Tweed's Well, about 1500 feet above sea-level, is generally regarded as its source, although the honour is also claimed for other streams issuing from a higher eleva- tion. For the first 36 miles of its course it intersects the county of Peebles—frequently on this account called Tweeddale—in a north-easterly direction, passing between verdant hills separated by valleys watered by its numerous affluents. Having passed several picturesque keeps and castles, it reaches the town of Peebles, shortly before which it receives the Lyne Water from the north and the Manor Water from the south. The valley now widens; the scenery becomes softer and richer ; and the river, bending in a more easterly direction, passes Innerleithen, where it receives the Leithen from the north and the Quair from the south. It then crosses Selkirkshire in a south-easterly direction, and, having received the Ettrick from the south on the borders of Roxburghshire, flows northward past Abbotsford, forming for about 2 miles the boundary between the counties of Selkirk and Roxburgh. After receiving the Gala, the Tweed crosses the north-western corner of Roxburghshire past Melrose and its abbey, and, after being joined by the Leader from the north, winds past Dryburgh abbey round the south-western corner of Berwickshire.' The remainder of its course is in a north- easterly direction through Roxburghshire past Kelso, where it receives the Teviot from the south, and then between the counties of Berwick and Northumberland, past Cold- stream and Norham castle to the town of

Berwick, where it reaches the North Sea. It receives the Eden Water from the north at Edenmouth, the Leet Water from the north at Coldstream, and the Till from Northumberland between Coldstream and Norham castle. The last 2 miles of its course before reaching Berwick are in England. Though the latter part of its course is through a compara- tively level country, the scenery along the river is full of charm, owing to the picturesque variety of its finely wooded banks. The associations connected with the keeps and castles of the Tweed have supplied materials for several of Sir Walter Scott's poems and romances ; and its varied beauties have been sung by Hogg, Leyden, Thomson, and many others. The bed of the river is pebbly and sandy, and, notwithstanding discolorations from manufactures, the stream, from its clear and sparkling appearance, is still well entitled to the name of the "silver Tweed." The total area drained by it is about 1870 square miles, and its total length is 97 miles. Next to the Tay it is the largest river in Scotland. The Tweed has, however, no estuary, and its traffic is chiefly confined to Berwick. But for a short dis-

tance up the river some navigation is carried on by barges. The river is one of the best in Scotland for trout and salmon fishing.

See Sir Thomas Dick Lauder's Scottish Rivers and Prof. Veitch's River Tweed, 1884.

TWEEDS. See Wootten anp Worsrep MaNurac- TURES.

TWELVE TABLES. See Roman Law, vol. xx. p. 679 sg., and Rome, vol. xx. p, 737.

TWENTY-FOUR PARGANAS, the metropolitan dis- trict of the lieutenant-governorship of Bengal, India, takes its name from the territory originally ceded to the East India Company, which contained twenty-four parganas or sub-districts. The district lies between 21° 55' 20" and 22° 57' 32" N. lat. and 88° 6' 45" and 88° 20' 51" E. long. It has an area of 2124 square miles, and is bounded on the north by Nadiya, on the north-east by Jessore, on the south and south-east by the Sundarbans, and on the west by the river Hugli (Hooghly). The country consists for the most part of a vast alluvial plain

within the delta of the Ganges, and is everywhere watered by numerous rivers, all branches of the Hugli. In the northern portion the soil is very rich, but the southern or seaboard part con- sists of the network of swamps and inland channels known as the Sundarbans. The Hugli and six other streams are navigable by the largest boats throughout the year. The district is well supplied with canals, the most important being Tolly's Nala (10 miles long), which connects the Hugli with the Bidyédhari. The Twenty-Four Pargdnas was once famous for its sport, but owing to the extension of cultivation game is now scarce. 'Tigers are seldom met with ; leopards are more numerous; there are several varieties of deer. The district has many roads, and is traversed by the Eastern Bengal Railway and the Calcutta and South-Eastern State Railway.

In 1881 the population of the district, exclusive of Calcutta, numbered 1,869,859 (males 975,430, females 894,429), embracing 1,153,040 Hindus, 701,306 Mohammedans, and 13,976 Christians. The ten following municipalities had each a population of upwards of 10,000—South Suburban, 51,658 ; Agarpara, 30,317 ; Barangar, 29,982; Naihati, 21,533 ; Nawabganj, 17,702; Basurhat, 14,848 ; South Dum Dum, 14,108 ; Baduria, 12,981 ; Rajpore, 10,576; and Barasat, 10,533. The administrative headquarters of the district are at Alipur, a southern suburb of Calcutta. Rice forms the staple crop of the district ; other crops are pulses, oil seeds, sugar-cane, tobacco, &c. Its principal exports are rice, sugar, pdn leaf, fish, pottery, &c.; the imports comprise pulses of all kinds, oil-seeds, spices, turmeric, chillies, cloth, cotton, &c. The objects of the rural manufactures are sugar, cotton curtains, brass and iron work, horn sticks, and cotton and tasar silk cloth. The gross revenue of the district in 1885-86 amounted to £338,895, of which the land-tax contributed £155,181. The district was ceded to the East India Company by treaty by the nawab nazi of Bengal in 1757. Since

then several changes have been made in its boundaries, the latest in 1863.

TWICKENHAM, a town of Middlesex, England, is situated on the north bank of the Thames and on the London and South-Western Railway, 11} miles south-west of London by rail. It is a straggling and irregular town, but has many fine suburban villas, and the district is noted for its sylvan beauty.

Opposite the town there is an eyot in the river about 8 acres in extent, called Eel Pie Island, much resorted to by boating parties. The parish church of St Mary was rebuilt in red brick in very plain style after the fall of the old one in 1713, but the picturesque western tower of the 14th century still remains. It con- tains many interesting monuments, including one to Pope, who was buried in thenave. The principal public build- ings are the town-hall and assembly rooms (built in 1876, and containing the free library established in 1882), the economic museum, the royal naval female school for the daughters of naval and marine officers, the Montpellier lecture hall, the metropolitan and City of London police orphanage, the almshouses of the London Carpenters' Com-

pany, and a branch of the national refuge for the homeless and destitute. The population of the urban sanitary dis- trict (area 2415 acres) in 1871 was 10,533, and in 1881 it was 12,479.

Twiekenham at Domesday was ineluded in Isleworth. Anciently it was called Twittenham or Twicanham. The manor was given in 941 by King Edmund to the monks of Christ Church, Canter- bury, from whom it had been previously taken, but it was again alienated, for it was restored to the same monks by Edred in 948. In the reign of Henry VIII. it came into the possession of the erown, and by Charles I. was assigned to Henrietta Maria as part of her jointure. It was sold during the Protectorate, but after the Restoration the queen mother resumed possession of it. In 1670 it was settled for life on Catherine of Braganza, queen of Charles II. It still remains in possession of the crown, but since the death of Catherine has been let on leases. In the neighbour- hood are many residenees of literary or historical interest. Pope's villa, where he lived from 1717 till his death in 1744, has been removed. Among old mansions of interest still remaining are

Strawberry Hill, the residence of Horace Walpole, now much altered; Marble Hill, built by George III. for the countess of Suffolk, and subsequently resided in by the marquis of Wellesley ; Orleans House, built

in the reign of Queen Anne by Johnstone, occupied for some time by the duke of Orleans, and from 1879 to 1883 as a club house ; York House, said to have been the residence of James II. when duke of York, bestowed by Charles II. on Lord Clarendon when he married the duke of York's daughter, and in modern times resided in by the Comtc de Paris ; and Twickenham House, formerly the residence of Sir Jahn Hawkins, author of the History of Music, and the meeting place of the " Literary Club." Of the old manor house of Twickenham, to which Catherine of Aragon is said to have retired after her divorce from Henry VIIL., and which was subsequently the residence of Catherine of Braganza, queen of Charles II., the only remains are a ruin called the Aragon tower. Twickenham Park House, for some time the residence of Lord Chancellor Bacon, has been demolished.

TWILIGHT. The light of what is called the "sky" depends upon the scattering or reflexion of direct sunlight in the earth's atmosphere, mainly if not entirely due to those fine dust particles which (as we have recently learned) form the necessary nuclei for condensation of aqueous vapour. Were it not for these particles the sky would appear by day as it does in a clear winter night, and the stars would be always visible. Alpine climbers and aeronauts, when they have left the grosser strata of the atmosphere below them, find this state of things approxi- mated to; and even at the sea-level the blue of the sky is darker when the air contains but few motes. After the sun has set, its rays continue for a time to pass through parts of the atmosphere above the spectator's horizon, and the scattered light from these is called twilight. It is, of course, most brilliant in the quarter where the sun has set. Before sunrise we have essentially the same phenomenon, but it goes by the name of "dawn." The brilliancy of either depends upon several conditions, of which the chief is, of course, the degree by which the sun has sunk below the horizon. But the amount of dust in the air affects the phenomenon in two antagonistic ways: it diminishes the amount of sunlight which reaches the upper air after pass- ing close to the earth and it increases the fraction of this light which is scattered to form twilight. Hence no general law can be laid down as to the duration of twilight ; but it is usual to state (roughly) that it lasts until the sun is about 18° under the horizon. If we make this assumption, it is a simple matter of calculation to solve questions as to the duration of twilight at a given place at a given time of

year, the maximum duration of twilight at a given place, &c. In the older works on astronomy such questions were common enough, but they have now little beyond anti- quarian interest. The more complex phenomena of twi- light, such as the “ after-glow,” &c., probably depend upon the precipitation of moisture on the dust particles as the air becomes gradually colder. This will of course alter the amount of scattering; but it may also lead (by reflexion from strata of such particles) to an increase in the amount of light to be scattered.

and the large collieries in the neighbourhood.

‘March 1790.

TWI—T Y L

TYCHO BRAHE. See Braue.

TYLDESLEY wits SHAKERLEY, a town of Lan- cashire, England, is situated on a considerable eminence, 11 miles west-north-west of Manchester and 199 north-west of London (by the London and North-Western Railway). The church of St George, a handsome building in the Early Pointed style, erected in 1827, has lately undergone restoration. Public baths were built in 1876. A public cemetery was formed in 1878. The town is the growth of the 19th century and depends upon its cotton-mills It is governed by a local board of health of sixteen members. The population of the urban sanitary district (area 2490

acres) in 1871 was 6408 and in 1881 it was 9954.

At Domesday Tyldesley formed part of the manor of Warrington. One of its proprietors, Sir Thomas Tyldesley, was a distinguished Royalist. His son Edward in 1672 sold the manor to Ralph Astley, and from the Astleys it passed in 1728 to Thomas Johnson of Bolton. In 1823 it beeame the property of George Ormerod, author of the History of Cheshire.

TYLER, Joun (1790-1862), tenth president of the United States, was accustomed with pride, but with the support of conjecture rather than evidence, to claim re- lationship with Wat Tyler of the reign of Richard IL.

The earliest of his American ancestors was Henry Tyler, a reputed native of Shropshire, England, who in 1652 settled at Middle Plantation, Va., on the outskirts of what is now the city of Williamsburg. John Tyler was the son of Judge John Tyler, some time governor of Virginia, and was born at Greenway in that State, 29th In 1802 he entered the grammar school of William and Mary, where, though fond of fun and frolic and cultivating an inherited taste for the violin, he made good progress in his studies. After graduating in 1806 he entered on the study of law, and in 1809 was called to the bar, where his progress from the first was rapid. He became a member of the State legislature in December 1811. In 1813 he raised a company in defence of Rich- mond, in command of which he subsequently served with the fifty-second regiment at Williamsburg and Providence Forge. In December 1816 he was elected to the house of representatives at Washington, where he displayed much readiness and skill in debate as an uncompromising advocate of popular rights. In 1825 he was elected governor of Virginia by a large majority, and the follow- ing year was re-elected unanimously. In 1827 he was chosen a senator. He opposed Clay on the tariff question in 1832, delivering a speech against the protective duties which lasted three days; but he voted for Clay's Com- promise Bill of 1833. He was the only senator who voted against the Force Bill on 20th February of this year, a singularity of conduct which somewhat damaged his repu- tation in Virginia. Although opposed to the establish- ment of the United States Bank, he supported the resolu- tions in 1835 censuring President Jackson for the removal of the deposits, on the ground that the procedure was un- constitutional. In consequence of a vote of the Virginia legislature instructing him to vote for the expurgation of these resolutions from the senate journal he resigned, 21st February 1836. His action led the Whigs to bring him forward as a candidate for the vice-presidency, but he only received forty-seven votes. For some time after this he ceased to take an active part in politics ; removing in the end of the year from Gloucester to Williamsburg, where he had better opportunities for legal practice, he devoted his chief attention to his professional duties. At the Whig convention which met at Harrisburg, Penn- sylvania, 4th December 1839, he was nominated again for the vice-presidency on the Harrison ticket, and elected in November 1840. On the death of Harrison, soon after his inauguration in 1841, Tyler succeeded him. His ele-

vation to the presidency was thus accidental in a double sense, for he had been nominated for the vice-presidency to reconcile the extreme faction. His policy in office (see Unirep States) was opposed to the party who nominated him and was on Democratic lines. In 1845 he was suc- ceeded by Polk, and he spent the remainder of his life in retirement from active duties. He was nominated in 1861 for the lower house of the permanent congress, but died at Richmond on the 18th of the following January.

See L. G. Tyler, Life and Times of the Tylers, 2 vols., 1884.

TYNDALE, Witt1aM (c. 1484-1536), translator of the New Testament and Pentateuch (see ENGLISH BisBxg, vol. vill. pp. 384, 385), was born in Gloucestershire, possibly in the parish of Slimbridge, about the year 1484. Of his early education nothing is known; about his twentieth year he went to Oxford, where tradition has it that he was entered of Magdalen Hall. He afterwards resided at Cambridge. Ordained to the priesthood, probably towards the close of 1521, he entered the household of Sir John Walsh, Little Sodbury, Gloucestershire, in the capacity of chaplain and domestic tutor. Here he spent two years, and in the course of his private studies began to contemplate seriously the work of translating the New Testament into English. His sympathy with the “new learning,” which he had not concealed in conversation with the higher clergy of the neighbourhood at Sir John’s table, led to his being summoned before the chancellor of Worcester as a suspected heretic ; and “with the goodwill of his master” he left for London in the summer of 1523. There he preached a little at St Dunstan-in-the-West, and worked at his translation, living for some months in the house of Humphrey Monmouth, an alderman; but finding publication impossible in England he sailed for Hamburg in May 1524. After visiting Luther at Witten- berg, he settled in Cologne, where he made some progress with a quarto edition of his New Testament, when the interference of the authorities of the town compelled his flight to Worms. The octavo edition (see vol. viii. p. 384) was here completed in 1526. Where Tyndale resided in the interval between 1526 and 1530—the year of publica- tion of his translation of the Pentateuch—is not known ; his Parable of the Wicked Mammon (1527), Obedience of a Christian Man (1528), and Practice of

Prelates (1530), all bear to have been printed at ‘“‘ Marlborowe in the land of Hesse ” or ‘ Marborch.” From 1530 onwards he appears to have lived chiefly in Antwerp, but of his life there hardly anything is recorded, except that as a marked man he was continually the subject of plots and intrigues, and that at last he was arrested and thrown into prison in the castle of Vilvorde, some six miles from Brussels, in 1535. Having been found guilty of heresy, he was put to death by strangling, and his body afterwards burnt at the stake on October 6, 1536.

The orks of Tyndale were first published along with those of Frirx (q.v.) and Barnes, “three worthy Martyrs and principal Teachers of the Church of England,” by John Daye, in 1578 (folio). His Doctrinal Treatises and Introductions to Different Portions of the Holy Scripture were published by the Parker Society in 1848. For biography, see Demaus, William Tyndale (London, 1871) ; also the Introduction to Mombert’s critical reprint of Tyndale’s Pentateuch (New York, 1884), where a full bibliography is given. There seems no reason to doubt that the translation of Joshua, Judges, Samuel, Kings, and Chronicles in Matthew’s Bible is sub- stantially the work of Tyndale.

TYNE, a river in the north-east of England, is formed of two branches, the North Tyne, rising in the Cheviots on the borders of Roxburgh, and the South Tyne, rising at Tynehead Fell, at the south-eastern extremity of Cumber- land. The North Tyne flows south-eastwards by Belling- ham, a short distance below which it receives the Rede from the north, and 2 miles above Hexham it is joined by the South Tyne, which before the junction flows north-

ward to Haltwhistle, and then eastward, receiving the Allen from the right a short distance above Haydon Bridge. The united streams then have a course of about 30 miles eastwards to the sea at Tynemouth. Fora con- siderable part of its course the Tyne flows through a pleasant and richly cultivated country, but in its lower reaches the presence of coal pits has almost completely robbed the scenery of its natural charms, and the former sylvan retreats of monks and abbots are now occupied by blast furnaces and shipbuilding yards, and similar scenes of busy industry, which line both

banks of the river from Newcastle to the sea. The river is navigable to Blaydon for small craft, and to Newcastle, 8 miles from its mouth, for large vessels.

The coal trade of the Tyne is the most important in England, and for its general shipping trade the river ranks next in import- ance to the Thames and the Mersey. The principal ports are Newcastle and North and South Shields, but below Newcastle the river is everywhere studded with piers and jetties. About a seventh of the whole tonnage of vessels built in England is built

on the Tyne, the most important works being those of Jarrow. For boat-racing the Tyne vies in celebrity with the Thames.

TYNEMOUTH, a municipal and parliamentary borough of England, in Northumberland, includes the townships of Chirton, Cullercoates, North Shields, Preston, and Tyne- mouth. This last, the principal watering-place on this part of the coast, is picturesquely situated on a promontory on the north side of the Tyne at its mouth. It is connected with Newcastle, 8 miles to the west-south-west, by a branch of the North-Eastern Railway ; its distance from London is 273} miles by rail. The town has rapidly increased within recent years, and contains many well-built streets, squares, and villas. On the point of the promontory there is a small battery called the Spanish battery, and near it a monument has been erected to Lord Collingwood. Within the grounds to which the gateway of the old castle gives entrance are the ruins of the ancient priory of St Mary and St Oswin —the principal remains being those of the church. A pier, half a mile long, serves as a breakwater to the harbour. Among the principal public buildings are the assembly rooms and the aquarium (1872). The muni- cipal buildings of the borough of Tynemouth are situated in North Shields, where are also the custom house, a master niariners' home, a seamen's institute, and a sailors' home founded by the late duke of Northumberland. Shipbuilding is carried on, and there are rope and sail works. The fish trade is of considerable importance and employs several steam and sailing boats. The population of the municipal and parliamentary borough of Tynemouth (incorporated in 1849 ; area 4303 acres), divided into the three wards of

North Shields, Percy, and Tynemouth, was 38,941 in 1871, and 44,118 in 1881.

Tynemouth was a fortress of the Saxons, and was anciently known as Penbal Crag, ‘‘the head of the rampart on the rock.” From remains found in 1783 it is supposed to have been a Roman station. The first church was built of wood by Edwin, king of Northumbria, about 625, and was rebuilt in stone by his successor Oswald in 634. The body of Oswin, king of Deira, was brought hither for burial in 651, and on this account Tynemouth came to be in great repute as a place of burial both for royal and ecclesiastical persons. ‘The monastery was repeatedly plundered and burnt by the Danes, especially during the 9th century. After its destruction by Healfdeane in 876 it was rebuilt by Tostig, earl of Northumberland, who endowed it with considerable revenue; but, having been granted in 1074 to the monks of Jarrow, it became a cell of Durham. Malcolm III., king of the Scots, and his son Edward, who were slain in battle at Alnwick on 13th November 1093, were both in- terred in the monastery. In 1095 Earl Mowbray, having entered into a conspiracy against William Rufus, converted the monastery into a castle, which he strongly fortified. By William Rufus the priory was conferred on St Albans abbey, Hertfordshire. It was surrendered to Henry VIII. on 12th January 1539, and the site and remains were granted by Edward VI. in 1550 to the earl of Warwick, afterwards duke of Northumberland. In 1644 the castle was taken by the Scots under the earl of Leven. The town enjoyed various immunities at a very early period, which were

Predis- posing and ex- citing causes.

afterwards the subject of some dispute. Edward I. restored to it several free customs of which it had been deprived. Afterwards it received a confirmation of its various former charters by Edward II. and Richard II.

TYPE-FOUNDING. See Typocrapny.

TYPE-WRITING. See Writtnc MAcHINEs.

TYPHON, orTyPHoEts, son, according to Hesiod (Theog., 820 sg.), of the Earth and Tartarus, is described as a grisly monster with a hundred dragons' heads who was conquered and cast into Tartarus by Zeus. According to Iliad il. 282, he lies in the land of the Arimi (Cilicia). Other legends place his prison under tna or in other volcanic regions and make him the cause of eruptions. The myth, there- fore, as we have it, rests on a personification of volcanic forces. He is the father of dangerous winds (typhoons), and by later writers is identified with the Egyptian Set (see vol. vii. p. 717).

TYPHUS, TYPHOID, anp RELAPSING FEVERS. These are conveniently considered together, as they con- stitute the important class of continued fevers, having certain characters in common, although each is clearly dis- tinguishable from the others. The following is a general account of the more salient features of each.

Typuus Fever.

Typhus?! isa continued fever of highly contagious nature, lasting for about fourteen days and characterized mainly by great prostration of strength, severe nervous symptoms, and a peculiar eruption on the skin. It has received numerous other names, such as spotted, pestilential, putrid, jail, hospital fever, &c. It appears to have been known for many centuries as a destructive malady, frequently appearing in epidemic form, in all countries in Europe, under the con- ditions to be afterwards referred to. The best accounts of the disease are those given by English writers, who narrate its ravages in towns and describe many "black assizes," in which it was communicated by prisoners brought into court to the judges, jurymen, court-officials, &c., with fatal effect, producing oftentimes a widespread consternation. Typhus fever would seem to have been observed in almost all parts of the world; but, although not unknown in warm countries, it has most frequently prevailed in temperate or cold climates.

The causes concerned in its production include both the predisposing and the exciting. Of the former the most powerful of all are those influences which lower the health of a community, especially overcrowding and poverty. Hence this fever is most frequently found to affect the poor of large cities and towns, or to appear where large numbers of persons are living crowded together in unfavour- able hygienic conditions, as has often been

seen in prisons, workhouses, &c. Armies in the field are also liable to suffer from this disease ; for instance, during the Crimean War it caused an enormous mortality among the French troops. Some high authorities, including Dr Murchison, have held that such conditions as those referred to are capable of generating typhus fever by themselves, and the apparent occasional de novo origin of this disease has doubtless the support of many striking facts which would appear to favour this view (see PaTHoxoey, vol. xviii. p. 803). In the light, however, of recent researches into the relation of specific disease germs to the production of fevers and other infectious maladies, there is increasing difficulty in maintaining this position; and the direction of opinion is decidedly towards the view that, however much insani- tary conditions and overcrowding act as causes predispos- ing to the reception of the disease, the introduction into the system of a living organism or germ is necessary to the manifestation of the phenomena of the fever. Never- tbeloss no speciie Supa ae 7 ee ee 1 From rigos, smoke or mist, in allusion to the stupor of the disease.

in the case of typhus fever. This disease is now much less frequently encountered in medical practice than formerly, —a fact which must mainly be ascribed to the great attention which in recent times has been directed to improvement in the sanitation of towns, especially to the opening up of crowded localities so as to allow the free circulation through them of fresh air. In most large cities, however, limited epidemic outbursts of the disease occur from time to time, under the conditions of over- crowding and poverty, although the increased facilities possessed by local authorities for recognizing such out- breaks, and for the prompt isolation or removal of infected persons to hospitals, operate in general effectually to prevent any extensive spread of the fever. All ages are liable to typhus, but the young suffer less severely than the old. The disease appears to be communicated by the ex- halations given off from the bodies of those suffering from the fever, and those most closely in contact with the sick are most apt to suffer. This is shown by the frequency with which nurses and physicians take typhus from cases under their care. As in all infectious maladies, there is

often observed in typhus a marked proclivity to suffer in the case of individuals, and in such instances very slight exposure to the contagion may convey the disease. Typhus is highly contagious throughout its whole course and even in the early period of convalescence. The contagion, how- ever, is rendered less active by the access of fresh air; hence this fever rarely spreads in well-aired rooms or houses where cases of the disease are under treatment. As a rule one attack of typhus confers immunity from risk of others, but numerous exceptions have been recorded.

The course of typhus fever is characterized by certain well-marked stages. (1) The stage of incubation, or the period elapsing between the reception of the fever poison into the system and the manifestation of the special evidence of the disease, is believed to vary from a week to ten days. During this time, beyond feelings of languor, no particular symptoms are exhibited. (2) The invasion of the fever is in general well marked and severe, in the form of a distinct rigor, or of feelings of chilliness lasting for hours, and a sense of illness and prostration, together with headache of a distressing character and sleeplessness. Feverish symptoms soon appear and the temperature of the body rises to a considerable height (103°-105° Fahr.), at which it continues with but little daily variation until about the period of the crisis. It is, however, of import- ance to observe certain points connected with the tem- perature during the progress of this fever. Thus about the seventh day the acme of the fever heat has been reached, and a slight subsidence (1° or less) of the tem-

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Temperature chart of typhus fever.

perature takes place in favourable cases, and no further subsequent rise beyond this lowered level occurs. When it is otherwise, the case often proves a severe one. Again, when the fever has advanced towards the end of the second week, slight falls of temperature are often observed, prior to the

extensive descent which marks the attainment of the crisis. The pulse in typhus fever is rapid (100-120

Course of the fever,

T- ity.

FEVER. |

or more) and at first full, but later on feeble. Its condi- tion as indicating the strength of the heart's action is watched with anxiety. The tongue, at first coated with a white fur, soon becomes brown and dry, while sordes (dried mucus, &c.) accumulate upon the teeth; the appetite is gone and intense thirst prevails. The bowels are as a rule constipated, and the urine is diminished in amount and high-coloured. The physician on examination may make out distinct enlargement of the spleen. (3) The third stage is characterized by the appearance of the eruption which generally shows itself about the fourth or fifth day or later, and consists of dark red (mulberry coloured) spots or blotches varying in size from mere points to three or four lines in diameter, very slightly elevated above the skin, at first disappearing on pressure, but tending to become both darker in hue and more permanent. They appear chiefly on the abdomen, sides, back, and limbs, and occasionally on the face. Besides this, the character- istic typhus rash, there is usually observed a general faint mottling all over the surface. The typhus rash is rarely absent and is a very important diagnostic of the disease. In the more severe and fatal forms of the fever, the rash has all through a very dark colour, and slight subcutaneous hemorrhages (petechiz) are to be seen in abundance. After the appearance of the eruption the patient's condition seems to be easier, so far as regards the headache and discomfort which marked the outset of the symptoms ; but this is also to be ascribed to the tendency to pass into the typhous stupor which supervenes about this time, and becomes more marked throughout the course of the second week, The patient now lies on his back, with a dull dusky countenance, an apathetic or stupid' expression, and con- tracted pupils. All the febrile symptoms already mentioned are fully developed, and delirium, usually of a low muttering kind, but sometimes wild and maniacal (delirium ferox) is present both by night and day. The peculiar condition to which the term "coma vigil" is applied, in which the patient, though quite

unconscious, lies with eyes widely open, is regarded, especially if persisting for any length of time, as an unfavourable omen. Throughout the second week of the attack the symptoms continue unabated ; but there is in addition great prostration of strength, the pulse becoming very feeble, the breathing shallow and rapid, and often accompanied with bronchial sounds. (4) A crisis or favourable change takes place about the end of the second or beginning of the third week (on an average the 14th day), and is marked by a more or less abrupt fall of the temperature (vde chart) and of the pulse, together with slight perspiration, a discharge of loaded urine, the return of moisture to the tongue, and by a change in the patient's look, which clears up and shows signs of returning intelligence. Although the sense of weakness is extreme, convalescence is in general steady and comparatively rapid.

Typhus fever may, however, prove fatal during any stage of its progress and in the early convalescence, either from sudden failure of the heart's action —a condition which is specially apt to arise— from the supervention of some nervous symptoms, such as meningitis or of deepening coma, or from some other complication, such as bronchitis. Further, a fatal result sometimes takes place before the crisis from sheer exhaustion, particularly in the case of those whose physical or nervous energies have been lowered by hard work, inadequate nourishment and sleep, or intemperance, in all which conditions typhus fever is apt to assume an unusually serions form.

Occasionally troublesome sequela remain behind for a greater or less length of time as the effects of the fever. Among these may be mentioned mental weakness or irritability, occasionally some form of paralysis, an inflamed condition of the lymphatic vessels of one leg (the swelled leg of fever), prolonged weakness and ill health, &c. Gradual improvement, however, may be confidently anticipated and even ultimate recovery.

The mortality from typhus fever is estimated by Murchison and others as averaging about 18 per cent. of the cases, but it varies

much according to the severity of type (particularly in epidemics), the previous health and habits of the individual, and very specially the age,—the proportion of deaths being in striking relation to the advance of life. Thus, while in children under fifteen the death-rate is only 5 per cent., in persons over fifty it is about 46 per ceut.

The treatment of typhus fever includes the prophylactic measures Treat- of attention to the sanitation of the more densely populated por- ment.

tions of towns. The opening up of cross streets intersecting those which are close-built and narrow, whereby fresh air is freely admitted, has done much to banish typhus fever from districts where previously it was endemic. Further, the enforcement of the law regulating the number of persons accommodated in common lodging- houses, and the application of the powers now vested in local authorities for dealing with cases of overcrowding everywhere, and for isolation and treatment of the infected, have had a like salutary effect. Where typhus has broken out in a crowded dis- trict the prompt removal of the patients to a fever hospital and the thorough disinfection and cleansing of the infected houses are to be recommended. Where, on the other hand, a single case of acci- dentally caught typhus occurs in a member of a family inhabiting a well-aired house, the chance of it being communicated to others in the dwelling is but small; neverthcless every precaution in the way of isolation and disinfection should be taken.

The treatment of a typhus patient is conducted upon the same general principles as have been illustrated in other fevers (see SCARLET FEVER, SMALLPOX). Complete isolation should be main- tained throughout the illness, and the services of a day anda night nurse procured, who should keep a strict watch and preserve a record of the temperature and other observations, the times of feeding and the form of nourishment administered, as well as every other fact noticed, for the physician’s information. Due attention should be given to the ventilation and cleansing of the sick chamber. The main element in the treatment of this fever is good nursing, and especially the regular administration of nutriment, of which the best form is milk, although light plain soup may also be given. The food should be administered at stated intervals, not, as a rule, oftener than once

in one and a half or two hours, and it will fre- quently be necessary to rouse the patient from his stupor for this purpose. Sometimes it is impossible to administer food by the mouth, in which case recourse must be had to nutrient enemata. Alcoholic stimulants are not often required, except in the case of elderly and weakly persons who have become greatly exhausted by the attack and are threatening to collapse. The best indication for their use is that furnished by the condition of the circulation : when the pulse shows unsteadiness and undue rapidity, and the first sound of the heart is but indistinctly heard by the stethoscope, the prompt administration of stimulants (of which the best form is pure spirit) will often succeed in averting danger. Should their use appear to increase the restlessness or dclirium they should be discontinued and the diffusible (ammoniacal or ethereal) forms tricd instead.

Many other symptoms demand special treatment. The headache, which persists for days at the commencement and is with many a very distressing symptom, may be mitigated by removing the hair and applying cold to the head. The sleeplessness, with or without delirium, may be combated by quietness, by a moderately darkened room (although a distinction between day and night should be made as regards the amount of admitted light), and by soothing and gentle dealing on the part of the nurse. Opiate and sedative medicines in any form, although recommended by many high authorities, must be given with great caution, as their use is often attended with danger in this fever, where coma is apt to supervene. When resorted to, probably the safest form is a combination of the bromide of potassium or ammonium with a guarded amount of chloral. The writer has seen alarming effects follow the administra- tion of opium. Occasionally the deep stupor calls for remedies to rouse the patient, and these may be employed in the form of mustard or cantharides to the surface (calves of legs, nape of neck, over region of heart, &c.), of the cold affusion, or of enemata containing turpentine. The height of the tempcrature may be a serious symptom, and antipyretic remedies appear to have but a slight influ- ence over it as compared to that which they possess in typhoid fever, acute rheumatism, &c. The cold bath treatment, which has been recommended, cannot be carried out without serious risk to life in the necessary movement of the patient. It is a well-recognized rule that persons suffering from typhus fever ought not to be moved up in bed for any purpose after the first few days.

Cold sponging of the hands and feet and exposed parts, or cold to the head, may often considerably lower the temperature. Throughout the whole progress of a case the condition of the bladder requires special attention, owing to the patient's drowsiness, and the regular use of the catheter becomes, as a rule, necessary with the advance of the symptoms.

The complications and results of this fever fall to be dealt with according to the methods of treatment applicable to their character and extent.

Nature of typhoid.

Causes of

its ont- break.

TYPHOID oR ENTERIC FEVER.

Typhoid or enteric fever (évrepov, the intestine) is a con- tinued fever characterized mainly by its insidious onset, by a peculiar course of the temperature, by marked abdominal symptoms occurring in connexion with a specific lesion of the bowels, by an eruption upon the skin, by its uncertain duration, and by a liability to relapses.

This fever has received various names, such as gastric fever, abdominal typhus, infantile remittent fever, slow fever, nervous fever, &c. Dr Murchison, in reference to its supposed origin in putridity, uses the term " pythogenic fever," but this designation has not been generally adopted. Up till a comparatively recent period typhoid was not dis- tinguished from typhus fever. For, although it had been noticed that the course of the disease and its morbid ana- tomy were different from those of ordinary cases of typhus, it was believed that they merely represented a variety of that malady. The distinction between the two diseases appears to have been first accurately made in 1836 by Messrs Gerhard and Pennock of Philadelphia, and still more fully demonstrated by Dr A. P. Stewart of Glasgow (afterwards of London). Subsequently all doubt upon the subject was removed by the careful clinical and pathological observations made by Sir

William Jenner at the London fever hospital (1849-51). A clear distinction has been established between the two fevers, not only as regards their phenomena or morbid features, but equally as regards their origin. While typhus fever is a disease of overcrowding and poverty, typhoid may occur where such conditions are entirely excluded ; and the connexion of this malady with specific emanations given off from decomposing organic or feeculent matters, or with contamination of food or water by the products of the disease, is now almost universally admitted. Alike in sporadic cases and in extensive epidemic outbreaks the existence of insanitary conditions in house drainage, water supply, &c., can in the majority of instances be made out. The question whether such conditions alone will suffice to beget this fever—or, in other words, its de novo origin—has, as in the case of typhus, been much dis- cussed, and an affirmative opinion expressed by some high authorities. But the same remark must again be made as to the difficulties in the way of maintaining such a position in view of the evidence of the part played by microbes in infective processes.

That all insanitary conditions in respect of drainage of houses and localities furnish the most ready means for the introduction of the contagion of typhoid there is a general agreement, as there is equally that the most certain means of preventing its appearance or spread are those which provide a thoroughly trustworthy and secure drainage, a safe method of disposal of sewage, and a pure and abundant water supply. Typhoid fever is much less directly com- municable from the sick to the healthy than typhus. The infective agent appears to reside in the discharges from the bowels, in which, particularly when exposed and under- going decomposition, the contagium seems to multiply and to acquire increased potency. Thus in sewers, drains, &c., in association with putrefying matter, it may increase in- definitely, and by the emanations given off from such de- composing material accidentally escaping into houses, or by the contamination of drinking water in places where wells or cisterns are exposed to fecal or sewage pollution, the contagion is conveyed. Of the precise nature of the contagious principle we have as yet no full information,} but there appears to be strong reason for believing that a specific microbe or organism plays a part in the propagation of the disease. Still it is obvious that for its successful

1 A bacillus frequently noticed in certain tissues in cases of typhoid

fever has not yet been satisfactorily proved to be an organism character- istic of that disease, nor even to be constantly present.

implantation in and effect upon the system a peculiar con- dition of preparedness or receptivity to the morbific agent must be presupposed to exist in the individual, regarding which also our knowledge is of the vaguest. There is abundant evidence that one of the vehicles for the con- veyance of the contagion is food, especially milk, which may readily become contaminated with the products of the disease where an outbreak of the fever has occurred in a dairy.

Typhoid fever is most common among the young, the majority of the cases occurring between the ages of fifteen and twenty-five (Murchison). But children of any age may suffer, as may also, though more rarely, persons at or beyond middle life. It is of as frequent occurrence among the well-to-do as among the poor. The greater number of cases appcar to occur in autumn. In all countries this fever scems liable to prevail ; and, while some of its features may be modified by climate and locality, its main characters and its results are essentially the same everywhere.

The more important phenomena of typhoid fever will be better Patho. understood by a brief reference to the principal pathological changes logical which take place during the disease. These relate for the most part changes

to the intestines, in which the morbid processes are highly character- of istic, both as to their nature and their locality. be presently specified) are evidently the result of the action of the contagium on the system, and they begin to show themselves from the very commencement of the fever, passing through various stages during its continuance. The portion of the bowels in which they occur most abundantly is the lower part of the small intestine (ileum), where the ‘‘ solitary glands” and ‘‘ Peyer’s patches” on the mucous surface of the canal become affected by diseased action of a

definite and progressive character, which stands in distinct relation to the symptoms exhibited by the patient in the course of the fever. (1) These glands, which in health are comparatively indistinct, become in the commencement of the fever enlarged and prominent by infiltration due to inflammatory action in their substance, and consequent cell proliferation. This change usually affects a large extent of the ileum, but is more marked in the lowcr portion near the ileo-ceecal valve (see ANATOMY). It is generally held that this is the condition of the parts during the first eight or ten days of the fever. (2) These enlarged glands next undergo a process of slough- ing, the inflammatory products being cast off either in fragments or en masse. This usually takes place in the second week of the fever. (8) Ulcers are thus formed varying in size according to the gland masscs which have sloughed away. They may be few or many in number, and they exhibit certain characteristic appearances. ‘Thus they are frequently, but not always, oblong in shape, with their long axis in that of the bowel, and they have somewhat thin and ragged edges. They may extend through the thickness of the intestine to the peritoneal coat and in their progress erode blood-vessels or per- forate the bowel. This stage of ulceration exists from the second week onwards during the remaining period of the fever, and even into the stage of convalescence. (4) In most instances these ulcers heal by cicatrization, leaving, however, no contraction of the calibre of the bowel. This stage of healing evidently occupies a consider- able time, since the process does not advance at an equal rate in the case of all the ulcers, some of which have been later in forming than others. Even when convalescence has been apparently com- pleted, some unhealed ulcers may yet remain and prove, particularly in connexion with errors in diet, a cause of relapse of some of the symptoms, and even of still more serious or fatal consequences. The mesenteric glands external to, but in functional rclation with, the intestine, become enlarged during the progress of the fever, but usually subside after recovery.

Besides these changes, which are well recognized, others more or less important are often present. Among tliese may be mentioned one which the present writer has repeatedly observed in the severe and protracted forms of this fever, namely, marked atrophy, thin- ning, and softness of the coats of the intestines, even after the ulcers have healed,—a condition which may not improbably be the cause of that long-continued impairment of the

function of the bowels so often complained of by persons who have passed through an attack of typhoid fever. Other changes common to most fevers are also to be observed, such as softening of the muscular tissues generally, and particularly of the heart, and evidences of complica- tions affecting chest or other organs, which not unfrequently arise. The swelled leg of fever sometimes follows typhoid, as does also periosteal inflammation.

The symptoms characterizing the onset of typhoid fever are very Progress much less marked than those of most other fevers, and the disease of the in the majority of instances sets in somewhat insidiously. Indeed, disease.

it is no uncommon thing for patients with this fever to go about for a considerable time after its action has begun. The most marked of the early symptoms are headache, lassitude, and discomfort, to- gether with sleeplessness and feverishness, particularly at night ; this last symptom is that by which the discase is most readily de- tected in its early stages. The peculiar course of the temperature

The changes (to typhoid,

FEVER. |

is also one of the most important diagnostic evidences of this fever. During the first week it has a morning range of moderate febrile rise, but in the evening there is a marked ascent, with a fall again

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tremors and jerkings of the muscles (subsultus tendinwm), in drowsi- ness, and occasionally in “coma vigil.” – In severe cases the ex- haustion reaches an extreme degree, although even in such instances

towards morning, each morning and evening, however, showing respectively a higher point than that of the previous day, until about the eighth day, when in an average case the highest point is attained.

the condition is not to be regarded as hopeless. In favourable cases a change for the better may be anticipated between the twenty-first and twenty-eighth days, more usually the latter. It does not, how- ever, take place as in typhus by a well-marked crisis, but rather by what is termed a ‘‘lysis” or gradual subsidence of the febrile symptoms, especially noticeable in the daily decline of both morning and evening tempcrature, the lessening of diarrhoea, and im- rovement in pulse, tongue, &c. Convalescence proceeds slowly and is apt to be interrupted by relapses (due not unfrequently to errors in diet), which are sometimes as severe and prolonged as the original attack, and are attended with equal or even greater risks. Should such relapses repeat themselves, the case may be protracted for two or three months, but this is comparatively rare. Death in typhoid fever usually takes place from one or other of Causes of the following causes. (1) Exhaustion, in the second or third weeks, death in or later. The attending symptoms are increasing emaciation, weak- typhoid.

This varies according to the severity of the attack ;

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Temperature chart of typhoid fever,

but it is no unusual thing to register 104° or 105° Fahr. in the even- ing and 103° or 104° in the morning. During the second week the daily range of temperature is comparatively small, a slight morning remission being all that is observed. In the third week the same condition continues more or less; but frequently a slight tendency to lowering may be discerned, particularly in the morning tempera- ture, and the febrile action gradually dies down as a rule between the twenty-first and twenty-eighth days, although it is Hable to recur in the form of a relapse. Although the patient may, durin

the earlier days of the fever, be able to move about, he feels Meat} and uneasy ; and usually before the first week is over he has to take to bed, and soon the effects of the attack become more apparent. He is restless, hot, and uncomfortable, particularly as the day ad- vances, and his cheeks show a red flush, especially in the evening or after taking food. The aspect, however, is different from the oppressed stupid look which is present in typhus, and more resem- bles the appearance of hectic. The pulse in an ordinary case, al- though more rapid than normal, is not accelerated to an extent corresponding to the height of the temperature, and is, at least in the earlier stages of the fever, rarely above 100°. In severe and protracted cases, where there is evidence of extensive intestinal ulceration, the pulse becomes rapid and weak, with a dicrotic char- acter indicative of cardiac feebleness. The tongue has at first a thin whitish fur and is red at the tip and edges. It tends, however, _ to become dry, brown or glazed looking, and fissured transversely, while sordes may be present about the lips and teeth. There is much thirst and in some cases vomiting. Splenic and hepatic enlarge- ment may be made out. From an early period in the disease abdo- minal symptoms show themselves with greater or less distinctness and are frequently of highly diagnostic significance. The abdomen is somewhat distended or tumid, and pain accompanying some gurgling sounds may be elicited on light pressure about the lower part of the right side close to the groin,—the region corresponding to that portion of the intestine in which the morbid changes already referred to are progressing. Diarrhcea is a frequent but by no means constant symptom. When present it may be slight in amount, or, on the other hand, extremely profuse, and it corresponds as a rule to the severity of the intestinal ulceration. The discharges are highly characteristic, being of light yellow colour resembling pea soup in appearance. Should intestinal hemorrhage occur, as is not unfrequently the case during some stage of the fever, they may be dark brown, or composed entirely of blood. The urine is scanty and high-coloured. About the beginning, or during the course of the second week of the fever, an eruption frequently makes its appearance on theskin. It consists of isolated spots, oval or round in shape, of a pale pink or rose colour, and of about one to one and a half lines in diameter. They are seen chiefly upon the abdomen, chest, and back, and they come out in crops, which continue for four or five days and then fade away. At first they are slightly elevated, and disappear on pressure. In some cases they are very few in number, and their presence

is made out with difficulty ; but in others they are numerous and sometimes show themselves upon the limbs as well as upon the body. They do not appear to have any relation to the severity of the attack, and in a very consider- able proportion of cases (particularly in children) they are entirely absent. Besides this eruption there are not unfrequently numer- ous very faint bluish patches or blotches about half an inch in diameter, chiefly upon the body and thighs. When present the rose-coloured spots continue to come out in crops till nearly the end of the fever, and they may reappear should a relapse subse- quently occur. These various symptoms persist throughout the third week, usually, however, increasing in intensity. The patient becomes prostrate and emaciated ; the tongue is dry and brown, the pulse quickened and feeble, and the abdominal symptoms more marked ; while nervous disturbance is exhibited in delirium, in

ness of the pulse, and cadaveric aspect. Sometimes sinking is sudden, partaking of some of the characters of a collapse. (2) Hemorrhage from the intestines. The evidence of this is exhibited, not only in the evacuations, but in the sudden fall of tem perature and rise in pulse-rate, together with great pallor, faintness, and rapid sinking. Sometimes hemorrhage, to a dangerous and even fatal extent, takes place from the nose. (3) Perforation of an intestinal ulcer. This gives rise, as a rule, to sudden and intense abdominal pain, together with vomiting and signs of collapse, viz., a rapid flickering pulse, cold clammy skin, and the marked fall of tempera- ture. Symptoms of peritonitis (see Perrroniris) quickly supervenc and add to the patient's distress. Death usually takes place within 24 hours. Occasionally peritonitis, apart from perforation, is the cause of death. (4) Occasionally, but rarely, hyperpyrexia (excessive fever). (5) Complications, such as pulmonary or cercbral inflamma- tion, bedsores, &c.

Certain sequele are sometimes observed, the most important being the swelled leg, periostitis affecting long bones, general ill- health, and anemia, with digestive difficulties, often lasting for a long time, and sometimes issuing in phthisis. Occasionally, after severe cases, mental weakness is noticed, but it is usually of com- paratively short duration.

The mortality in typhoid fever varies with the character of the Mor- outbreak, the general health and surroundings of the individuals tality.

attacked, and other conditions. At one time it was regarded as, on an average, about the same as that of typhus; but under modern methods of treatment the chances of recovery are much greater, and the death-rate may be stated as about 12 per cent. or perhaps some- what less.

The treatment embraces those prophylactic measures which aim Treat- at preventing the escape of sewer gases into dwelling-houses by ment.

careful attention to the drainage and plumber-work, and also secure an abundant supply of pure water for domestic use (see HYGIENE, SEWERAGE, and VENTILATION). When an outbreak of the fever occurs in a family, all such matters should be specially inquired into, and the sources of milk supply carefully scrutinized. The discharges from the bowels of the typhoid patient should be at once disinfected with carbolic acid or other similar agent, and the greatest care taken as to their disposal, with the view of obviating any risk of contamination of drinking-water, &. The general management is conducted upon the same principles as are observed in the case of typhus, except that in typhoid fever very special care is neces- sary in regard to diet. Milk, the great value of which as a fever- food was first clearly set forth by Prof. Gairdner, is of eminent service in typhoid, but it must be administered with due regard to time and to the digestive powers of the patient. When given too frequently or in too great quantity it may, by its imperfect digestion, prove a source of irmtation to the bowels. Even when given with every care it may fail to agree, as is proved by the presence of un- digested curd in the evacuations. In such a case its admixture with lime water or with peptonizing agents may render its digestion less difficult, but sometimes its use must for a time be suspended. It is, however, rare that milk cannot be borne when carefully ad- ministered. Barley water or simple soups, such as chicken broth, beef-tea, &c., are occasionally useful either as substitutes for or adjuvants to milk. All through the fever the patient should be fed at regular periods—not, as a rule, oftener than once in one and a half or two hours—although in the intervals water or other fever- drink may be given from time to time. In convalescence the diet should still be largely milk and soft matters, such as custards, light puddings, meat jellies, boiled bread and milk, &c., but other solid foods, with the exception of fish, should be for a long time avoided. In changing the diet it is of importance to note its effect upon the temperature,

which may sometimes be considerably disturbed from this cause, even after the apparent subsidence of all febrile action. Stimulants, although unnecessary in a large proportion of cases, are occasionally called for when there is great exhaustion, and in prolonged attacks. Their effect, however, should be care-

fully watched. They are usually best administered in the form of pure spirit.

The more prominent symptoms which mark the course of typhoid fever frequeutly call for special treatment. Thus, when the fever continues long, with little break in its coursc, the employment of remedies to control its action (antipyretics) may often be resorted to with benefit. Such drugs as quinine, salicin, salicylic acid, and salicylate of soda, kairin, antipyrin, antifebrin, &c. (in ten to thirty grain doses of one or other), may frequently break in upon the con- tinuity of the fever, and by markedly lowering the temperature relieve for a time the body from a source of waste, and aid in tranquillizing the excited nervous system. The times for their administration are either one or two hours before the usual maximum temperature or during the period of remission. These remedies may, however, fail, or by inducing sickness or great prostration and depression of the circulation require to be discontinued. For a similar purpose the cold bath is recommended by many high authorities and is regularly employed in Germany. The method recommended by Liebermcister is this: ‘‘ When the temperature rises above 104° Fahr., the patient should be placed in a bath of about 94°, which is gradually cooled down by the addition of cold water to 68° Fahr., and remain immersed for twenty or thirty minutes, the limbs being all the while gently rubbed. He should then be put back into bed.” Another method is that of Dr Brand of Stettin: “ When the patient’s temperature attains 102° Fahr., he should be placed in a tepid bath of 70° and allowed to remain till a sense of coldness or shivering is produced, which usually occurs in from five to twenty minutes.” By such means no doubt the temperature can often be reduced 2° or 3° Fahr., but it is very apt to rise again and the bath must then be repeated. It is claimed by the advocates of this method of treatment that it has been suc- cessful in diminishing greatly the mortality of typhoid fever, but they hold at the same

time that its success in large measure depends upon its employment from an early stage in the disease. British physicians are much divided upon the point, many high authorities agreeing in its marked utility, while others no less eminent regard it as fraught with danger from the frequent movement of the patient from bed, the shock to the system, and the risk of hemor- rhage, pneumonia, or other complications, and as a plan of treat- ment difficult of being carried out in ordinary practice. Although employed in some fever hospitals and with apparent success, it has not yet commended itself for general adoption. Other methods of applying cold, while probably less effectual than the bath, are much more available, as, for example, the tepid or cold pack, the frequent sponging of portions of the body with cold water, or the applica- tion of icebags to the head. The present writer has resorted to these methods in many cases of typhoid fever, with the effect of wnarkedly lowering a high temperature. When diarrhea is ex- cessive it may be restrained by such remedies as chalk, bismuth, Dover's powder, &. Hemorrhage is dealt with by preparations of ergot, or by acetate of lead, gallic acid, or other styptics. In the event of perforation of the bowel opium is the only means avail- able to lessen the distress attending that fatal occurrence.

In the convalescent stage, and even after apparently complete recovery, the utmost care should be observed by the patient as to diet, all hard and indigestible substances being dangerous from their oo . to irritate or reopen unhealed ulcers, and bring on a relapse of the fever or cause a sudden perforation. Lastly, the general health demands careful attention for a length of time, in view of the remoter risks of chest and other diseases already alluded to.

RELAPSING FEVER.

This 1s a continued fever occasionally appearing as an epidemic in communities suffering from scarcity or famine. It is characterized mainly by its sudden invasion, with violent febrile symptoms, -which continue for about a week and end in a crisis, but are followed, after another week, by a return of the fever.

This disease has received many other names, the best known of which are famine fever, short fever, synocha, bilious relapsing fever, recurrent typhus,

and spirillum fever. As in the case of typhoid, relapsing fever was long believed to be simply a form of typhus. The distinction between them appears to have been first clearly established in 1826, in connexion with an epidemic in Ireland. Out- breaks of relapsing fever have occurred in all parts of the world at times and in places where famine has arisen ; but the disease has been most closely observed and studied in epidemics in Great Britain and Ireland, Germany, Poland, Russia, America, and India. It has frequently been found to prevail-along with an epidemic of typhus fever.

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Relapsing fever is highly contagious, and appears, like typhus, Causes of to be readily communicated by the exhalations from the body. With origina. respect to the nature of the contagion, certain important and inter- tion. esting observations have been made. In 1873 Obermeier discovered in the blood of persons suffering from relapsing fever minute organisms in the form of spiral filaments of the genus Spirochete (see vol. xxi. p. 399, fig. 1, n), measuring in length 35 to rey inch and in breadth g54¢oy to sodon inch, and possessed of rotatory or twisting movements. This organism has received the name of Spirillum obermeiert. It appears to be present in abundance dur- ing the height of the febrile symptoms, and is not seen during the interval until the relapse is impending, when it is again present as before. This observation has been confirmed by numerous investi- gators, and it has been found that inoculation with the blood containing these Spirilla produced the symptoms of relapsing fever in both men and animals, Comparatively little is as yet known of the life-history of these organisms, and the question whether they are to be regarded as the prime source of the disease or as mere accompaniments affords ground for difference of opinion (see PaTH- OLOGY, vol. xviii. p. 403); nevertheless their discovery and the con- ditions of their presence already mentioned are noteworthy facts in reference not only to the pathology of this fever but also to the general doctrine of infectivencss in disease-processes. The most con- stantly recognized factor in the origin and spread of relapsing fever is destitution ; but this cannot be regarded as more than a predis- posing cause favouring the reception and propagation of the morbific agent, since in many lands

widespread and destructive famines have prevailed without any outbreak of this fever. Instances, too, have been recorded where epidemics were distinctly associated with over- crowding rather than with privation. Relapsing fever is most commonly met with in the young. One attack does not appear to protect from others, but rather, according to some authorities, en- genders liability.

The extreme contagiousness of relapsing fever has occasionally Its con been shown by its spreading widely when introduced into a district, tagions- even among those who had not become predisposed by destitution ness. or other depressing conditions. The contagion, like that of typhus, appears to be most active in the immediate vicinity of the patient and to be greatly lessened by the access of fresh air. It is capable of being conveyed by clothing. The incubation of the disease is about one week. The symptoms of the fever then show themselves with great abruptness and violence by a rigor, accompanied with pains in the limbs and severe headache. The febrile phenomena are very marked, and the temperature quickly rises to a high point

TEMPERATURE FAHRENHEITS SCALE

Temperature chart of relapsing fever.

(105°-107° Fahr.), at which it continues with little variation, while the pulse is rapid (100-140), full, and strong. There is intense thirst, a dry brown tongue, bilious vomiting, tenderness over the

liver and spleen, and occasionally jaundice. Sometimes a peculiar bronzy appearance of the skin is noticed, but there is no character- istic rash as in typhus. There is much prostration of strength. After the continuance of these symptoms for a period of from five to seven days, the temperature suddenly falls to the normal point or below it, the pulse becomes correspondingly slow, and a profuse perspiration occurs, while the severe headache disappears and the appetite returns. Except for a scnse of weakness, the patient feels well and may even return to work, but in some cases there remains a condition of great debility, accompanied with rheumatic pains In the limbs. This state of freedom from fever continues for about a week, when there occurs a well-marked relapse with scarcely less

abruptness and severity than in the first attack, and the whole symptoms are of the same character, but they do not, as a rule, continue so long, and thcy terminate in a crisis in three or four days, after which convalescence proceeds satisfactorily. Second, third, and even fourth relapses, however, may occur 1n exceptional cases.

The mortality in relapsing fever is comparatively small, about 5 Mor- per cent. being the average death-rate in epidemics (Murchison). tality, The fatal cases occur mostly from the complications common to &e. continued fevers, The treatment is essentially the same as that for typhus fever (see above). (3, On Bs)

Harliest lefini- sions.

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Part I,—HIsTor1Icau.

YPOGRAPHY (writing by types) is the art of print- fi ing (cast-metal) movable types on paper, vellum, &c. It is quite distinct, not only from writing, but from xylo- graphy or wood-engraving, 7.e., the art of cutting figures, letters, or words on blocks of wood and taking impressions from such blocks, by means of ink or any other fluid

coloured substance, on paper or vellum.

Possibly the earliest attempt to describe the art of typography is that in the Donatus issued by Peter Schoeffer, perhaps before 1456, the colophon of which says that it was finished ‘‘ Arte nova imprimendi seu caracterizandi [from character = letter]... absque calami exaratione.” Fust and Schoeffer in the Mainz psalter of 1457 said that it was formed by an ‘‘adinventio artificiosa impri- mendi ac caracterizandi absque calami ulla exaratione.” The colo- phon of the Catholicon of 1460 is more precise, and says that the book was printed ‘‘non calanii, stili, aut penne suffragio, sed mira patronarum formarumque concordia, proporcione, ac modulo.” In 1462 Albrecht Pfister had “ gedrucket”’ the Four Histories. In the Liber Sextus

Decretaliwm, published in 1465, Fust and Schoeffer say that it was completed “non atramento [“atramento communi,” in the Justinianus of 1468 and 1472], plumali canna neque erea, sed artificiosa quadam adinventione imprimendi seu caracterizandi,” a phrase which they slightly varied in Cicero’s Offcia, issued in the same year: ‘‘non atramento, plumali canna neque erea, sed arte quadam perpnicra.” The edition of St. Jerome’s Epistles of 1470 is said to have been completed by an ‘‘ars impressoria,” the Decretum Gratiani of 1472 by an ‘‘ars quedam ingeniosa impri- mendi,” the Dyalogus of 1478 by an ‘‘ars magistra.”” We find further—“ ars sancta” or “divina,” “nova ars scribendi,” “novum exscribendi genus prope divinum,” “sculptoria archetyporum ars,” “ars mirifica formandi,” “ars excusoria,” “nova imprimendi ratio,” ‘ars pressure,” ‘‘chalcotypa ars,” ‘chalcographia” (1472 and later), ‘‘chalcographia excusoria impressoriaque,” ‘‘libraria im- pressio,” “empryntynge ” (Caxton, 1482), “prenterei” (Schoeffer, 1492), ‘‘truckery” (1505), ‘‘impression des livres” (1498), and ** prenten.”

The early printers called themselves, or were called by others, ‘‘librorum prothocaragmatici” (Gramm. Rhythm., 1468), “¢impres- sores librorum,” ‘‘exsculptor librorum” (Jenson, 1471), ‘chal- cographus” (1473; Hain, 13086), ‘‘magister artis impressoric,” ‘“boeckprinter” ; and during the 16th century we find them still frequently called ‘‘ chalcotypus” and ‘‘ chalcographus.”

The types were at first designated more by negative than positive expressions. In 1468 they were called ‘‘caragma,” later on ‘car- acter” or ‘‘character,” ‘‘archetipe note” (1478 ; Hain, 130386), ‘‘sculptoria archetyporum ars,” ‘‘chalcotypa ars,” ‘‘ forme,” ‘ar- tificiosissimee imprimendorum librorum forme.” We goon hear also of the process and material by which they were produced. The Grammatica of 1468, published by Schoeffer, says that it was “cast” (sum fusus libellus). In 1471 “nee formule” are spoken of ; and Bernardus Cenninus and his son say that they had printed the Virgil “expressis ante calibe caracteribus et deinde fusis literis” (with letters first cut into steel and then cast). In 1473 Friedrich Creusner at Nuremberg says that he had ‘‘ cut” (sculpsit) the work of Diogenes (Hain, 6192). Johan Zeiner of Ulm says in 1474 that he had perfected a book, not with the pen, but with letters of metal (stagneis caracteribus). In 1474 Joh. Ph. de Lignamine speaks of ‘‘metallice forme.”

In 1476 Husner of Strasburg represents the Nider as being printed with “letters cut of metal (litteris sculptis artificiali certe conatu ex wre).” Nicolas Jenson printed in 1480 with letters ‘‘cut and cast” (sculptis ac conflatis).

The word typographus does not seem to occur before 1488, when it was used in the preface of P. Stephanus Dulcinius Scale to the

” Astronomicon of Manilius, printed in that year at Milan by Antonius

Zarotus ;1 in 1498 Erasmus uses it in a letter (dated 13th Feb.) to Christianus, a Liibeck merchant ;2 and in 1517 Johan Schoeffer applies the word to himself in the colophon of the Aneas Sylvius published by him. But of the use of the word typographia no earlicr instance is known than 1520, in which year Gerardus Novio- magus (=Geldenhaurius) in his Lucubratiuncula de Batavorwm Insula (pref. to Nicol. Buscoducensis, dated 1520) says: ‘‘inventa Germanorum . . . bombarda videlicet, typographia, pyxis char- taque nautica ;” and Johan Schott, a printcr of Strasburg, in the Geogr. Ptolem. published by him, describes his grandfather, Johan Mentelin, as ‘primus typographie inventor.’ Gerardus, it may be added, borrowed the whole passage from Pet. Montanus (li. 1 Adag., published a. 1504), who has chalcographia instead of typo-

1 Maittaire, Annales Typogr., i. 508, note 1. 2 Opp., iii. col. 24.

graphia. Meerman indeed® speaks of a use of the word typographia (or at least of typographus) earlier than 1520, and refers to the preface of Bernardinus Veronensis in the edition of Tibullus, Catullus, and Propertius published at Venice in 1493 by Symon Bevilaqua, “at least, Meerman adds, “as it (the preface) is read in the Annal, Typogr. of Maittaire, 3. 560, 2d ed.” But on page 560 Maittaire quotes the first two lines of Bernardinus’s preface (till dicit) and then adds: ‘ Grecis characteribus destitutus, typographus necesse habuit hiatus in commentario hic illic relinquere,” which is evi- dently Maittaire’s own remark, not that of Bernardinus. The pre- sent writer at least has been unable to find such a passage in the Tibullus.

Although the art of writing and that of block-printing both differ widely from printing with movable metal types, yet this last process seems to have been such a gradual transition from block-printing, and block-printing in its turn to have been such a natural outcome of the many trials that were probably made to produce books in some more expeditious manner than could be done with hand- writing, that a cursory glance at these two processes will not seem out of place, all the less as a discussion on the origin and progress of typography could hardly be under- stood without knowing the state of the literary develop- ment at the time that printing appeared.

The art of printing, ¢.c., of impressing (by means of First certain forms and colours) figures, pictures, letters, words, attempts lines, whole pages, &c., on other objects, as also the art of a ua engraving, which is inseparably connected with printing, ® existed long before the 15th century. Not to go back to remoter essays, there is reason to suppose that medieval kings and princes (among others William the Conqueror) had their monograms cut on blocks of wood or metal in order to impress them on their charters. Such impressions from stamps are found instead of seals on charters of the 15th century. Manuscripts of the 12th century show Initials which, on account of their uniformity, are believed to have been impressed by means of stamps or dies. But the idea of multiplying representations from one engraved plate or block or other form was unknown to the ancients, whereas it is predominant in what we call the art of block- printing, and especially in that of typography, in which the same types can be used again and again.

Block-printing and printing with movable types seem to have East been practised in China and Japan long before they were known in Asiatic Europe. It is said that in the year 175 the text of the Chincse printing. classics was cut upon tablets, which were erected outside the uni- versity, and that impressions were taken of them, some of which are said to be still in existence. Printing from wooden blocks can be traced as far back as the 6th century, when the founder of the Suy dynasty is said to have had the remains of the classical books engraved on wood, though it was not until the 10th century that printed books became common. In Japan the earliest example of block-printing dates from the period 764-770, when the empress Shiyau-toku, in pursuance of a vow, had a million small wooden toy

pagodas made for distribution among the Buddhist temples and monasteries, each of which was to contain a dharani out of the Buddhist Scriptures entitled ‘“ Vimala nirbhasa Sitra,” printed on a slip of paper about 18 inches in length and 2 in width, which was rolled up and deposited in the body of the pagoda under the spire.

In a journal of the period, under the year 987, the expression “printed” book ” (swr2-hof) is found applied to a copy of the Bud- dhist canon brought back from China by a Buddhist priest. This, of course, must have been a Chinese edition; but the use of the term implies that printed books were already known in Japan. It is said that the Chinese printed with movable types (of clay) from the middle of the 11th century. The authorities of the British Museum exhibit as the earliest instance of Corean books printed with movable types a work printed in 1337. To the Coreans is attributed the invention of copper types in the beginning of the 15th century ; and an inspection of books bearing dates of that

3 Orig. Typogr., i. p. 82, note cx. 4 Passavant, Le Peintre-Graveur, i. 18, Leipsic, 1860-64; John Jackson, Wood-Engraving, London, 1839 ; Bucher, Gesch. der techn.

Kinste, p. 362 sq. = XIII. —* 86

MS. period.

Classes of writ- ing.

period seems to show that they used such types, even if they did not invent them.?

From such evidence as we have it would seem that Europe is not indebted to the Chinese or Japanese for the art of block-printing, nor for that of printing with movable types.

In Europe, as late as the second half of the 14th cen- tury, every book (including school and prayer books), and every public and private

document, proclamation, bull, letter, &c., was written by hand; all figures and pictures, even playing-cards and images of saints, were drawn with the pen or painted with a brush. In the 13th century there already existed a kind of book trade. The organi- zation of universities as well as that of large ecclesiastical establishments was at that time incomplete, especially in Italy, France, and Germany, without a staff of scribes and transcribers (scriptores), illuminators, lenders, sellers, and custodians of books (stationari librorum, librarit), and per- gamenarii, t.e., persons who prepared and sold the vellum or parchment required for books and documents. The books supplied were for the most part legal, theological, and educational, and are calculated to have amounted to above one hundred different works. As no book or docu- ment was approved unless it had some ornamented and illuminated initials or capital letters, there was no want of illuminators. The workmen scribes and transcribers were, perhaps without exception, caligraphers, and the illuminators for the most part artists. Beautifully written and richly illuminated manuscripts on vellum became objects of luxury which were eagerly bought and treasured up by princes and people of distinction. Burgundy of the 15th century, with its rich literature, its wealthy towns, its love for art, and its school of painting, was in this respect the centre of Europe, and the libraries of its dukes at Brussels, Bruges, Antwerp, Ghent, &c., contained more than three thousand beautifully illuminated MSS.

In speaking of the writing of the manuscripts of the 15th and two preceding centuries, it is essential to dis- tinguish, in each country, between at least four different classes of writing, and two of these must be again sub-divided each into two classes, All these different kinds of writing were, in the first instance, taken as models for cutting such portions of text as were intended to illustrate and explain the figures in block-books, and afterwards as models for the types used in the printing of books and documents.

(1) The book hand, that is, the ordinary writing of legal, theo- logical, and devotional books, was used by the official transcribers of the universities and churches. These men had received a more or less learned education, and consequently wrote or transcribed books with a certain pretence of understanding them and of being able to write with greater rapidity than the ordinary caligrapher. Hence their writing may be called (a) the current or

eursive book hand, of which a good many illustrations may be found in Wilh. Schum, Exempla Codicum Amplon. Erfurtensium. Quite distinct from this current writing, and much clearer and more distinct, is (6) the wpright or set book hand, which was employed by some writers who worked for universities and churches, and also by a good many who may be presumed to have worked in large cities aud com- mercial towns for schools and the people in general without uni- versity connexion. (2) In the church hand (Gothic or black letter) were produced transcripts of the Bible, missals, psalters, and other works intended for use in churches and private places of worship. This writing we may again subdivide into two classes,—(a) the orna- mental or caligraphic writing, found exclusively in books intended for use in churches or for the private use of wealthy and distin- guished persons, and (b) the ordinary wpright or set church hand, employed for less ornamental and less expensive books. (3) The letter hand may be said to be intermediate between the sct literary book hand and the set literary church hand, and to differ but little from either. It was employed in all public documents of the

nature of a letter. (4) The court or charter hand was used for charters, title-deeds, papal bulls, &c.

1 See Ern. Satow, ‘‘On the Early Hist. of Printing in Japan,” in Trans. Asiat. Soe. of Japan, x. 48 sq.; and Stan. Julien, “‘ Documents sur l’Art d’Imprimer,” &c., in Journ. Asiat., 4™* ser., ix. 505.

YEO Gh AP aa ¥

Dypold Liber (Lauber), a teacher and transcriber at Hagenau in 15th. Germany, is kuown to have carried on a busy trade in manuscripts century just about the time of the invention of printing. His prospectuses, books in handwriting of about the middle of the 15th century, announce written,

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that whatever books people wish to have, large or small, “ geistlich oder weltlich, hiibsch gemolt,” are all to be found at Dypold Lauber’s the scribe.

He had in stock Gesta Romanorum, mit den Viguren gemolt; poetical works (Parcival, Tristan, Freidank) ; romances of chivalry (Der Witfarn Ritter; Von eime Cletruwen Ritter der sin eigen Hertze gab umb einer schincen Frowen willen ; Der Ritter unter dem Zuber); Biblical and legeudary works (A Rimed Bible; A Psalter, Latin and German; Episteln und Evangelien dureh das Jor; Vita Christy ; Das gantze Passional, wintertetl und summerteil ; devotional books (Bellial ; Der Selen Trost; Der Rosenkrantz; Die zehn Gebot mit Gloscen; Small Bette-Biicher); and books for the people (Gute bewchric Artznien-Biicher ; Glemolte Loss-Biicher, 1.e., fortune-telling books ; Sehachtzabel gemolt). The lower educational books consisted for the most part of the Abccedaria, containing the alphabet, the Lord's prayer, the creed, and one or two prayers ; the Donatus, a short Latin grammar extracted from the work of Atlius Donatus, a Roman grammiarian of the 4th century, and distinctly mentioned in aschool ordinance of Bautzen of 1418 ; the Doetrinale, a Latin grammar in leonine verse, compiled by Alexander Gallus (or De Villa Dei), a minorite of Brittany of the 13th century ; the Sunmula Logica of Petrus Hispanus (afterwards Pope John XXI1.), used in the teaching of logic and dialectics ; and Dionysius Cato's Disticha de Moribus, and its supplement called Haeetus, with the Floretus of St Bernard, used in the teaching of morals. As helps to the clergy in their attempts to educate the lower classes, and as a means of assisting and promoting private devotion, there were picture books accompanied with an easy explanatory text, for the most part representations of the mystic relation between the Old and New Testaments (typology). Among these books the Biblia Pauperum? stands first. It represents pictorially the life and passion of Christ, and there exist MSS. of it as early as the 13th century, in some cases beautifully illuminated.? A richly illumi- nated MS. of it, executed in the Netherlands c. 1400, is in the British Museum (press-mark, King's, 5), and also fragments of one of the 14th century (press-mark, 31,303). A reniodelling and develop- meut of this work is the Spcewlum Humane Salvationis, a work in rhyme of the 14th century, which in forty-five chapters represents the Bible history interwoven with Mariolatry and legend. Of this work the Paris uational library and arsenal library each possesses a MS. composed in 1824, whereas the British Museum has nine MSS. (six being illuminated) of the 14th and 15th centuries, written in the Netherlands, Germany, France, and England, one (press-mark, 16,578) bearing the distinct date 1879 and another (press-

mark, Egerton, 878) that of 1486. A work of a similar nature is the Apocalypsis, of which at least two recensions with illustrations may be pointed out. One gives the text as we know it, with or without commentary, for which cf. Brit. Mus., 17,333 (French), 18,633 (French, but written in England), Reg. 2 D. xiii., and 22,498 (French),—all four early 14th century. Another is more a short history or biography of St John, but the illustrations follow those of the former work very closely ; ¢f. Brit. Mus., 19,896 (15th century, It is this last recension which agrees with the block- book to be mentioned hereafter. Other devotional works are the Ars Moriendi, the Antichrist, and other works which will be found mentioned among the block-books.

Block-Printing or Xylography.

When all this writing, transcribing, illuminating, &c., Block- had reached their period of greatest development, the art printing

of printing from wooden blocks (block-printing, xylography) on silk, cloth, &c., vellum, and paper made its appearance in Europe. It seems to have been practised, so far as we have evidence, on cloth, &c., and vellum as early as the 12th century,‘ and on paper as far back as the second half of the 14th century, while it was largely employed in the early part of the 15th in the production of (1) separate leaves (called briefs, from breve, scriptum), containing either a picture (print, prent, shortened from the Fr. emprint, empreinte, and already used by Chaucer, C. 7’, 6186, six- text, D. 604, printe, prente, preente, and in other early English documents ; also called in colloquial German Helge, Helglein, or Halge) or a piece of text, or both together ; ec A et

2 We find this title applied to at least three works,—(1) the well- known block-book, of which we speak below, (2) a treatise “in qua de vitiis et virtutibus agitur,” and (3) a work in rhyme by Alexander Gallus.

3 See Laib and Schwarz, Biblia Pauperum, Zurich, 1867.

4 Weigel, Anfange, i. 10.

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and of (2) whole block-books, sometimes consisting of half picture and half text, or wholly of text, or altogether of picture.’ It is, however, certain that about 1400 xylo-

graphy was known all over Germany, Flanders, and Holland.

In these blocks, as in wood-engraving now, the lines to be printed were in relief. The block, after the picture or the text had been engraved upon it, was first thoroughly wetted with a thin, watery, pale brown material, much resembling distemper; then a sheet of damp paper was laid upon it, and the back of the paper was care- fully rubbed with some kind of dabber or burnisher, usually ealled a frotton, till an impression from the ridges of the earved block had been transferred to the paper. In this fashion a sheet could only be printed on one side (anopisthographie) ; and in some copies of block-books we find the sides on which there is no printing pasted together so as to give the work the appearance of an ordinary book. There are only a few block-books whieh do not possess this char- acteristic, as the Legend of St Servatius in the royal library of Brussels, Das Zeitglécklein in the Bamberg library (cf. Falkenstein, p. 49), Das geistlich und weltlich Rom at Althorp and Gotha (cf. Falkenstein, p. 46) ; but these belong to the end of the 15th eentury, and therefore to a later period than the ordinary bloek-books. Con-

in that year, it may refer to that event. Another in the Weigel eollection representing the bearing of the eross, St Dorothea and St Alexis, has the date 1443, also written in by hand, though the woodcut is considered to belong to that period. These are the only known wood-engravings with dates anterior to the secoud half of the 15th century. But there exist a good many woodcuts which, from the style of the engraving, are presumed to be of an earlier date, and to have been printed partly in the fourteenth and partly in the first half of the 15th century. J.D. Passavant? enumerates twenty-seven, all of German origin and preserved in various libraries in Germany, while in the Collectio Weigeliana (vol. i.) no fewer than 154 are recorded, some of which are to be ascribed to the Netherlands. We know of

the existence of at least five engravings which may be aseribed to the Netherlands :—(1) representing the Virgin Mary, with Dutch inscriptions, in the museum at Berlin ; (2) representing the Virgin Mary spoken of above, in the library at Brussels ; (3) representing St Anthony and St Sebastian, in the Weigel colleetion ; (4) a St Hubert and St Eustatius, in the royal library at Brussels ; (5) representing the Child Jesus, in the library at Berlin ; (6) the Mass of St Gregory, with indulgenee, in the Weigel colleetion (ef. i. 195).

Of block-books of probable German origin the following are Bloek- known :— books of

(1) The Apocalypsis, or Historia 8. Johannis Evangelista: ejusque German Visiones Apocalyptice (Germ. Das Buch der haymlichen Offenba- origin.

sequently, if a man wanted to set up as a printer of briefs or books, he needed no apparatus but a set of wood-blocks and a rubber. Formerly it was the general opinion that playing-cards had

been the first products of xylography ; but the earliest that have been preserved to us are done by hand, while the printed ones date from the 15th eentury, therefore from a period in which woodcuts were already used for other purposes. It is believed that some of the wood engravings and block-books were printed in monasteries. In a necrology of the Franciscan monastery at Nordlingen, which . comes down to the beginning of the 15th century, this entry occurs : “VII. Id. Augusti, obiit Frater h. Luger, laycus, optimus incisor lignorum”; and on some of the engravings we find the arms of certain monasteries, whieh may, however, merely mean that they were printed for, not in, those monasteries. The registers of Ulm mention several wood-engravers (formsehneider),—in 1398 a eertain Ulrich ; in 1441 Heinrieh Peter von Erolzheim, Joerg, and another Heinrich ; in 1442 Ulrich and Lienhart; in 1447 Claus (Nicolas), Stoffel (Christopher), and Johann; in 1455 Wilhelm; in 1461 Meister Ulrich, &c. Ina register of taxes of Nérdlingen we find from 1428 to 1452 a certain Wilhelm Kegeler mentioned as bricf- triieker ; in 1453 his widow is called alt brieftriickerin; and in 1461 his brother Wilhelm is registered for the same craft. At Mainz there was a printer, Henne Cruse, in 1440. At Nuremberg we find in 1449 Hans, a formsehneider, while his son Junghans exercised the same industry

from 1472 to 1490. Hans von Pfedersheim printed at Frankfort in 1459, and Peter Schott at Strasburg in 1464.

The earliest dated woodeut that we know of is the St Christopher of 1423, preserved in the library of Lord Spencer at Althorp. The Mary engraving, which is preserved at Brussels and apparently . bears the date mceecxviii., is now declared to be of 1468, the date having been falsified. The next date after that of the St Christopher is 1487, found on a woodcut preserved in the imperial library at Vienna. It was discovered in 1779 in the monastery of St Blaise in the Black Forest, and represents the martyrdom of St Sebastian, with fourteen lines of text. The date, however, is said by others to refer to a concession of indulgences. A woodcut, preserved in the library at Vienna, which represents St Nicolas de Tolentino, has the date 1440, but written in by hand; as the saint was canonized

rungen Sanet Johans). Of this work six or seven editions are said to exist, each containing forty-eight (the 2d and 3d edition fifty) illus- trations, on as many anopisthographic leaves, whieh seem to have been divided into three quires of eight sheets each. The first edition alone is without signatures.

(2) Ars Moriendi. Of this work some authors think that there are early German editions, among others that spoken of below as the 2d Duteh edition. Certainly German is the edition of Hans Sporer of Nuremberg, 1478, in the public library at Zwickau, of another by Ludwig zu Ulm, in the Paris national library, and of that described in Collectio Weigel. (ii. 16), where also other, but opisthographic, editions are deseribed.

(3) drs Memorandi; thirty leaves, folio, printed on one side, fifteen leaves being letter-press and fifteen plates.

(4) Salve Regina, bears the name of its engraver, Lienhart czu Regenspurck. It is eomposed of sixteen leaves; two leaves (signature a) are wanting in ane only copy known of it, whieh was in the Weigel collection (ii. 108).

(5) Vita Christi ; thirty-two leaves, sm. 8vo. Paris library (Sotheby, ii. 148).

(6) The Len Commandments for Unlearned People (Die zehn Bott Sir die wngelernte Leut). Ten leaves are preserved in the library at Heidelberg

bound up with a manuscript (No. 488).3

(7) Lhe Passion of Our Lord; sixteen leaves, in the Weigel colleetion (Sotheby, ii. 141).

(8) Lhe Antichrist (Der Enndchrist) ; twenty-six leaves, small oH (eomey, ii, 88; Weigel, ii. 111). Copies, Lord Spencer and coll. Weig.

(9) The Fifteen Signs of the Last Judgment; twelve engravings, usually bound up with the engravings of Zhe Antichrist (Sotheby, ii. 42). Copy, Lord Speneer. There is also an edition published at Nuremberg in 1472 by Junghannss Priftmaler.

(10) Symbolum Apostoliewm ; small quarto, seven leaves printed on one side only, and containing twelve woodcuts with German inscriptions. The only copy of it known is preserved in the library of Munieh (Sotheby, ii. 148).

(11) Lhe Legend of St Meinrad ; forty-eight leaves. The only copy known is preserved in the Munich library (Sotheby, ii. 150).

(12) The Aecht Schalkheiten, of which eight leaves were in the Weigel collection (i. 112; Sotheby, ii. 154).

(18) The Fable of the Sick Lion ; twelve leaves, preserved in the library at Heidelberg (No. 488 ; see Sotheby, ii. 159, pl. Ixxxvi.).

(14) Defensoriwm Inviolate Virginitatis b. Marix# Virginis ; six- teen leaves fol. The unique copy is in the British Museum. On the first leaf are the initials of the printer F[riedrich] W[altheren] and the date 1470 (Sotheby, ii. p. 63).

(15) The same work, twenty-seven leaves, large folio, with the imprint “Johannes eysenhiit impressor Anno ab incarnaedis dfiice M* quadringentesimo septuagesimo j°” (¢f. Sotheby, ii. 72). Copy in the British Museum.

(16) Lhe Danee of Death (Dance Macabre; Der Doten Dantz) ; twenty-seven leaves (Sotheby, ii. 156).

(17) Die Kunst Ciromantia of Dr Johan Hartlieb (Sotheby, ii. 84).

(18) Der Beiehtspiegel or Confessionale ; eight engravings (Sotheby, ii. 145). Copy in the royal library at The Hague.

(19) The Apostles' Creed ; seven leaves, folio. fenbiittel.

(20) The Credo, in German ; twelve leaves, quarto. royal library at Munich.

Two copies in the

Copy at Wol-

Copy in the

1 We have also evidence that sometimes the picture or figures were printed from blocks, space being reserved for the text, to be added afterwards by hand (see Bernard, Origine, i. 102).

2 Le Peintre-Graveur, i. 27 sq. i 3 See Joh. Geffcken, Der Bildercatechismus des 15 Jahrh., Leipsic, 1855, quarto; Sotheby, ti. 160.

Of Nether- landish origin.

Nicholas V.'s in-

of 1454,

Propugnacula, sew Turris Sapientizx ; one sheet, plano, Brit. Mus. (Sotheby, ii 164).

Block-books of Nethcrlandish origin are :—

(1) Biblia Pauperum ; forty leaves (each bearing a signature ; @ to v, -a-to-v-). As many as seven editions have been distinguished by Sotheby (i. 43; see also Holtrop, Monwm. Typ., p. 8).

(2) Ars Moriendi ;1 twenty-four leaves, smal] folio, thirteen con- taining text, cleven plates (see Sotheby, L 69; Holtrop, p. 8).

(3) Canticum Canticorum, Historia sew Providentia B. Virginis Mariz ex Cantico Canticorum; sixteen leaves, in fol. (Sotheby, 1. 77; Holtrop, p. 6).

(4) Liber Regum, seu Historia Davidis; twenty leaves, (Sotheby, i. 120b). Some consider this to be a German work,

(5) Exercitium super Pater Noster, by Henricus de Pomerio; ten leaves, small folio (Sotheby, ii. 137; Holtrop, p. 10).?

(6) Temptationes Demonis Temptantis Hominem de Septem Peceatis Mortalibus; a single large folio leaf printed on one side. Two copies, one in British Museum, the other in the library at Wolfenbiittel.

(7) Vita Christi, or the Life and Passion of Christ ; thirty-six cuts, originally printed in a press on six anopisthographic leaves, 8vo. In the library at Erlangen (see Campbell, Annales, 746).

(8) Historia Sanctee Crucis; a fragment of one leaf (with signature g), preserved in the Weigel collection (ii. 92), which seems to be a proof-sheet only. :

(9) Alphabet in figures (Holtrop, p. 11; Sotheby, i. 122).®

(10) Pomerium Spirttuale, by Henricus de Pomerio or Henry Bogaert ; twelve leaves, having twelve woodcuts accompanied by MS. text, in the library at Brussels (Holtrop, fon. Typ., p. 9). It bears the date 1440 in two places; but some contend that this refers to the date when the book was written,* not when the engrav- ings were printed.

Besides the works of Sotheby, Holtrop, and Weigel, already quoted, consult W. M. Conway, The Woodcutters of the Netherlands in the 15th Century,

Cambridge, 1884; Heineken, ldée Générale, Leipsic, 1771; J. Ph. Berjeau, Facsimiles of the Biblia Pauperum, Canticum Canticorum, Speculum, London, 1859-1861; and Id., Catal. Illustré des Livres Xylogr., London, 1865.

folio

Early Printing at Mainz.

When we, for the moment, leave out of sight the question as to when, where, and by whom the art of printing with movable metal types was invented, and take our stand on well-authenticated dates in such printed documents as have been preserved to us, we find that the first printed date, 1454, occurs in two different editions of the same letters of indulgence issued in that year by Pope Nicholas V. in behalf of the kingdom of Cyprus.

These two editions are distinguished respectively as the 31-line The former, of which three different

for the word with which the document commences, and for the Christian name of the pope's legate ; (2) a smaller text or brief type, which was afterwards very closely imitated, if not actually used, at Eitville, in printing the 1472 edition of the Vocabularius ex quo and an edition of the Summa de Articulis Fidei of Thomas Aquinas; (3) a large initial V and two large initials M, which differ from each other. In the 30-line indulgence occur (1) a large church type, which is used as in the 31-line indulgence, and is usually re- garded as identical with that of the 42-line Bible ; (2) a smaller text or brief type, of which as yet no further trace has been found ; (3) a large initial U, and two large initials M, which differ from each other, the first being identical with the initial M of the second absolution of a 33-line indulgence printed by Peter Schoeffer in 1489 for ''Raymundus Peyraudi, archidiaconus Alnisiensis in

1 Heineken enumerates six editions, of which one has inscriptions in German. See also an article by Guichard, in Bull. dw Bibliophile, Paris, 1841.

2 See also W. M. Conway, Notes on the Exercitiwm super Pater Noster, 1887.

3 There is one copy in the British Museum and another in the library at Basel,

this last having the date 1464 engraved on the letter A, which is mutilated in the former. A similar alphabet prescrved at Dresden seems to be a copy made in Germany.

4 Mr W. M. Conway is of a different opinion; see Notes on Exercitium. Dumnortier testifies to having seen another copy unaccompanied by MS. (*‘ Notes sur l’Imprimerie,” in Bull. Acad. Roy. de Belg., vol. viii., 1841).

5 No inferences can be drawn from this priority, as it merely rests on the date of a sold copy that has come to light.

. we OG i A. Pon a

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ecclesia Xauton,” who issued it at the order of Pope Innocent VIIL., ‘pro tuicione orthodoxe fidei contra Turchos.” These two

different editions are usually regarded as having been printed at Mainz Mainz ; and, so long as there is no evidence to the contrary, we may printing,

assume that such was really the fact. But we must at the same time conclude that about November 1454 there were at least two rival printers at work there,—(1) the printer of the 31-line indulgence, whose name has not yet transpired, but who may have been Johan Gutenberg, perhaps subsidized by Johan Fust ; (2) the printer of the 30-line indulgence, who was no doubt Peter (Schoeffer) de Gernss- heym, on account of the connexion of this indulgence with that of 1489, which was unquestionably printed by him. Latterly four written copies of the same indulgence have been found, which re- spectively bear the dates,—Frankfort, 10th April 1454 (in the pos- session of Herr Lais, Wiesbaden); Frankfort, 11th April 1454 (Frankfort

archives) ; 11th July 1454 (place unknown ; Darmstadt archives) ; Liibeck, 6th October 1454, As their dates “precede by a few weeks only the earliest known printed date (15th November 1454), they mark, perhaps, the exact time when printing made its appearance at Mainz in an already advanccd state of perfection.

In following up the basis afforded by the above indulgences we Early may give a short chronological view of the early printing at Mainz, typesand so far as it is at present known, referring for niinute details to J. H. books at Hessels, Gutenberg: Was he the Inventor of Printing? 1882, p. Mainz,

150 sq.

Types 1 (large church type) and 2 (smaller brief type), used by an un- known printer, 1454.

(i.) 31-line indulgence; three different issues (A, B, C), with the printed year mnccccliiii., and one issue (D) withthe printed yearmeccelv. All printed on vellum. Of issues A and B no sold copies have yet come to light. Three unsold copies of each are preserved at (1) Bruns- wick, (2) Wolfenbiittel, and (3) Hanover (Culemann). Of issue C eight sold copies are known to exist in various libraries, with dates from Nov. 15 1454 to Apr. 80 1455. Also four unused copies have been dis- covered. Ofissue D ten sold copies with dates from Mar. 71455 to Apr. 80 1455 and four unused copies are known.

Lord Spencer’s library, in the Brit. Mus., at Jena, Leipsic, Antwerp, &e.6

Typrs 8 (large church type) and 4 (smaller brief type), used by Peter Schoeffer de Gernssheym, 1454-1455,

sold copies, with dates Apr. 11 and 29 1455, are in the Berlin library and the Brit. Mus. Of issue C two sold copies, with dates Feb. 22 and Apr. 24 1455, are at Hanover (Culemann) and Wolfenbiittel. An unsold copy is at Hanover (Cule- mann).

TYPE 8, continued (till about 1457); of type 4 no further trace is found. (ii.) Donatus of 24, 25, or 26 lines, 24

leaves; one leaf (the 8th or 9th ?) in the Mainz library. (iii.) Donatus of 32 lines, 14 (?) leaves, the 10th (?) in the Mainz library. (iv.) Donatus of 33 lines, two leaves

Type 1, continued ; for type 2 see below.

ii.) Manwng widder die Durke. An al- manac for Jan. 1455, in 4to, 5 leaves, 20 and 21 uneven lines, The only copy known was dis- covered at Augsburg, and is now in the Munich library.

(iii.) Conjunctiones et Oppositiones Solis et Lung.

(vili.) 36-line Bible.

Mainz, and is now in the Paris library.

(iv.) Der Cistanus (not Cislanus) zu

Dutsche, A broadside sheet, printed on one side, 36 lines, besides separate head-line. The Tross copy, mentioned in Suppl. to Brunet's Manuel (1878, s.v. " Cis- lanus "), was bought in 1870 for the Cambridge university library.

(v.) and (vi.) Donatus. Two different

editions of 14 (?) leaves each, 27 lines (B. Mus., C. 18.e 1, Nos. 2 and 5),

(vii.) Donatus of 30 lines, 12 (7) leaves ;

a fragment of the 8th (%) in the Mainz library.

2 vols. fol., 882 leaves, with 2 columns of 36 lines each on a page. Some _ biblio- graphers call this the Pfister Bible, assuming that Pfister printed it. The Paris library possesses a paper copy, and also a separate copy of the last leaf, which bears the MS. date 1461. Other copies exist in

in the Paris library.

(v.) Donatus of 35 lines, folio; printed,

according to the colophon, ‘‘ per Petrum de Gernssheym, in urbe Moguntina cum suis capitalibus.”

(vi.) 42-line Bible (also called Mazarine

Bible), printed before Aug. 15 1456, as the binder of the paper copy in the Paris library states that he finished its rubrication on that day. 2 vols. fol., 641 leaves of 2 columns of 42 lines each, ex- cept that in some copies the columns of pp. 1-9 contain 40 lines only, while the 10th page has 2 columns of 41 lines each, though the difference in the number of lines makes no difference in the space which they occupy.?

(vii.) 42-line Cantica ad Matutinas.

The first and only leaf known is in the Paris library. It is printed on vellum, and corresponds in every respect to the 42-line Bible, laa double columns, 42 lines, ve,

The above four types and the books printed with them (besides a few others printed by Albrecht Pfister at Bamberg) are the only ones that stand in close connexion with the question regarding the introduction, or the possible invention, of printing at Mainz. It has been pointed out above that one of the initial M’s of the 30-line indulgence of 1454 occurs again in an indulgence of 1489, printed by Schoeffer ; hence types 3 and 4 and the books printed with them must be ascribed to this printer, in spite of the fact that the capital P found in the indulgence does not seem to occur again in the 42- line Bible. No further trace of the brief type 4 has yet been found, and perhaps Schoeffer melted it down for his other types. As Schoeffer, in the colophon of the Donatus (v.) which bears his

6 See Hessels, Gutenberg, p. 160; and Bernard, Origine, ii, 31.

; ? For other copies, see Bernard, Origine, i. 164, 177-192; and Hessels, Guten- erg, 170.

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name alone, says that it was printed ‘‘cum suis capitalibus,” and as these capitals gradually disappear after 1459 and the type of the 42-line Bible is no longer found after 1456, we must presume that the seven incuuabula mentioned above were printed by Peter Schoeffer alone before he entered (in 1457) into partnership with Johan Fust.1 There is no such certainty as regards types 1 and 2 and the books printed with them. If the 31-line indulgence may be assumed to have been printed at Mainz, its printer was in all probability Johan Gutenberg, though it would seem from a lawsuit of 1455 (see p. 690 below) between him and Fust that in that year Gutenberg had not yet printed anything, and in 1454 (1455) Fust evidently called him to account for not having produced anything. Certain circum- stances point to Albrecht Pfister as the printer of the eight incuna- bula in the left-hand colunm. First, he undoubtedly printed with type 1 in that city as early as 1461, for on 14th February of that ycar he issued in that type an edition of Boner’s Edelstein (88 leaves, fol., with wood engravings), and printed with the samc type at least eight other works,” one of which was issued in 1462, the seven others without a date. Secondly, most of the copies of the 36-line Bible were at one time or another preserved in the libraries of Bavaria, and a great number of fragments have been discovered in monasteries in that country, even in a register of the abbey of St Michael at Bamberg of the year 1460. ‘Thirdly, a transfer of type from Gutenberg to Pfister is contrary to all analogy in the infancy of printing, when every printer started with a type of his own making. But, as there is no direct evidence as to who really possessed types 1 and 2 before 1460, we have not felt justified in assigning the 31-line indulgence and’ the other seven incunabula (including the 36-line Bible) to Pfister. It is alleged that, in consequence of the lawsuit between Gutenberg and Fust, the former was deprived of all tools, &c., which he had made, or is supposed to have made, with the money which the latter had advanced to him, and that afterwards a certain Dr Homery or Humery, a syndic of Mainz, lent him fresh money to enable him to establish another printing office. This allegation is made on the strength of a letter of obligation (of 26th February 1468), given by Dr Homery to Adolph, the archbishop of Mainz, by which he acknowledges to have received from the said arch- bishop ‘‘several forms, letters, instruments, implements, and other ae belonging to the work of printing, which Johan Gutenberg had left after his death, and which had belonged and still did be- loug to him (Dr Homery).” It is presumed that with these types, which we may call the

Mainz type No. 5, Gutenberg printed (i.) Joannes de Balbis, Catholicon, 1460, 378 leaves, folio, 2 columns of 66 lines each, copies of which exist in the Cambridge university library, three in the British Museum, two in the Paris library, in Lord Spencer's library, in the Wolfenbiittel and Mainz libraries, &c. ; (i1.) Mattheus de Cracovia, Tractatus Rationis, 22 leaves, 4to, 30 lines, three copies of which are in the British Museum, one at Althorp, one in the Cambridge library, two in the Paris library, &c. ; (iit and iv.) Thomas Aquinas, Summa de Articulis Fidet, two editions in 4to, the first of 13 leaves and 34 lines,—two copies of which are in the British Museum, one in Lord Spencer's, the Cambridge library, &c.—and the second of 12 leaves and 36 lines, —copies in the British Museum and the Paris library ; and (v.) in- dulgence of 1461 of 15 lines.

On 18th January 1465 Adolph II., archbishop of Mainz, ap- pointed ''Johan Gudenberg, on account of his grateful and willing service, his servant and courtier (dhiener und hoffgesind) for life, promising to supply him with clothing and each year 20 'malter' of corn and 2 'fuder' of wine." It has always been inferred from this that Gutenberg had quitted Mainz and gone to Eltville (Elfeld) to reside at the archbishop's court, and that, his dignity as courtier preventing him from printing himself, he passed the Catholicon types on to Henry Bechtermuncze at Eltville. But recent re- searches have shown that Gutenberg remained at Mainz till his death in 1468. We certainly find in 1467 the Catholicon type with some additions (already found in the indulgence of 1461) at Eltville near Mainz, in the hands of Henry and Nicholas Bechtermuncze and Wigandus Spyes de Orthenberg, who finished on 4th November of that year (vi.) Vocabularius ex quo (a Latin-German vocabulary) in 4to, 166 leaves, 35 lines, the only known copy of which is in the Paris library, and (vii.) Vocabularius ex quo, second edition, with colophon dated 5th June 1469, 4to, 165 leaves, 35 lines, copies of which exist in Lord Spencer's library, at Blenheim, and in the Paris library. Now it is asked how the Bechtermunczes could have been using the Catholicon type in 1467, if we assume that it was this type to which Homery refers in his letter of obligation as being in his possession. Some, therefore, conclude that the Catholi- con and the four other works in the same type were printed at Mainz by Henry Bechtermuncze, who may afterwards have trans- ferred his printing office to Eltville. In that case it is

difficult to see what type Homery could refer to, unless it were type 2, a close imitation of which, if not the actual type, was nsed by Nicholas

1 See for details, Hessels, Gutenberg, p. 166 sq. 2 See Hessels, Gutenberg, p. 161 sq.

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Bechtermuncze at Eltville in printing (12th March 1472) a third edition of the Vocabularius ex quo, 166 leaves, 35 lines, copies of which are preserved in the Paris and Hamburg libraries, and an edition of Thomas Aquinas, Swmma de Artieulis fidet, 12 leaves, 35 lines (Munich library).

It is necessary to point out that for nearly seventy years eight books—(1) Prognostication or Calendar; (2) Hermaun de Saldis, Speculum Sacerdotum ; (3) Traetatus de Celebratione Missarum; (4) a work in German treating of the necessity of councils; (5) Dialogus inter Hugonem Oathonem et Oliverium super Libertate Ecclesiastica ; (6) Sifridus de Arena, Determinatio Duarum Questionwm; (7) Id., Responsio ad Quatuor Questiones; (8) Ki lagspiegel, or New geteutscht Rechtbuch—have becn ascribed to Gutenberg on the strength (a) of the date 1460, whieh was said to be found in the Prognostieation in the Darnistadt library, and (2) of a so-called rubrication alleged to be in a copy of the Zractatus de Celebratione Missarum, in which “Johannes dictus a bono monte” and Johannes Numeister are represented as offering this work on 19th June 1463 to the Carthusians at Mainz. But the date in the Prognostication has been falsified from 1482 into 1460, aud the rubrication in the Traetatus is a forgery. The eight books are now eonsidercd to have been printed by Erhard Reuwich. :

When we set aside the above works, there is no further difficulty as regards the history of Mainz printing. Fust and Schoeffer worked together from 1457 to 1466, starting in August 1457 with an edition of the Psalicrium, printed in large missal types, which, as far as we know, is the first printed book which bears a date, besides the place where it was printed and the name of the printers. It was reprinted with the same types in 1459 (the second printcd book with date, place, and name of printer), in 1490, and in

1502 (the last work of Schoeffer, who had manufactured its types). In 1459 Fust and Schoeffer also published Gul. Durantus, Rationale Divin- orum Offictorwm, with the small type (usually called Durandus type) with which they continued to print long afterwards. In 1460 they published the Constitutiones of Pope Clement V., the text printed in a type (Clement type) about a third larger than the Durandus. This type was, however, in existence in 1459, as the colophon of the Durandus is printed with it.+

Spread of Typography.

Having explained the early printing of Mainz, in so far as it Spread bears upon the controversy (see below) as to where and by whom of typo- the art of printing was invented, we can follow its spread to other graphy.

countries. After Mainz it was first established in 1460 at Stras- burg, where the first printers were,—1. Johann Mentelin, who com- pleted a Latin Bible in that year, according to a rubrication ina copy at Freiburg in the Breisgau ; 2. Adolph Rusch de Inguilen, who is presumed to be the printer of the undated books with a singularly- shaped R,° e. 1464; 8. Henricus Eggestein, 1471; 4. George Husner; 5. Martin Flach, &c. In 1461 at Bamberg, where the first printer was Albrecht Pfister, who in that year published Boner's Edelstein, though it is still doubtful whether he did not print earlier (see above); 2. Joh. Sensenschmidt, c. 1480. 1465 at Subiaco ; first and only printers Conrad Sweynheym and Arnold Pannarts, who aleed in that year an edition of Cicero, De Oratore, and Lactantius, and removed to Rome in 1467. 1466 at Cologne, the printers being—1. Ulrich Zell, who published in that year Chrysostom, Super Psalmo Quinquagesimo Liber Primus, though it is presumed that he printed in 1463; 2. Arnold Ther Hoernen, 1470; 3. Johannes Koelhoff of Liibeck, 1470, who printed the Cologne Chroniele in 1499; 4. Nicolaus Gotz, 1474; 5. Goiswinns Gops, 1475; 6. Petrus de Olpe, 1476 (not 1470); 7. Conradus Winter of oe: 1476; 8. Joh. Guldenschaaf, 1477 ; 9. Henricus Quentel, 1479, &c.® 1467 at Eltville; first printers Nicolas and Henry Bechtermuncze and Wygandus Spyes de Orthenberg, who completed in that year a Vocabulartus ex quo. 1467 at Rome ; first printers Conrad Sweynheym and Arnold Pannarts from Subiaco, who published an edition of Cicero's Epistole ad Familiares, and Ulrich Hahn or Udalricus Gallus, who issued on 31st Deceinber 1467 Turrecremata's

Meditationes. 1468 at Augsburg; first printer Giinther Zainer or Zeyner. Same year at Basel; first printer Bert- hold Rot of Hanau. Same year at Marienthal; Brothers of the Common Life. 1469 at Venice ; printers,—1. Johannes of Spires ; 2. his brother Vindelinus of Spires ; 8. Christopher Valdarfer ; 4. Nicolas Jenson, &c. The further spread of typography is indicated by the following data:—1470 at Nuremberg (Johan Sensenschmidt, Friedr. Creusner, Anton Koberger, &c.), Berona or Beromiinster in Switzerland (Helyas Helye alias De Llouffen), Foligno (Emilianus de Orfinisand Johannes Numeister), Trevi(Johann Reynard), Savigliano

3 See Hessels, Gutenberg, pp. 107-114.

4 See further Bernard, Origine de I' Imprimerie, i. 216 sq.

5 M. Philippe, Origine de UImprimerie & Paris, p. 219, mentions two books printed in this type, which contain manuscript notes to the effect that they were purchased in 1464 and 1467, so that Inguilen should be placed before Eggestein.

6 Johan Veldener, who is said to have printed at Cologne, was never established there, but at Louvain (1473-77), Utrecht (1478-81), and Culenborg or Kuilenburg (1483-84); see Holtrop, Mon. Typ., pp. 42, 47, 109.

(Hans Glim), Paris (first printers the three partners Ulrich Gering, Michael Friburger, Martin Krantz); 1471 at Spires, Bologna, Ferrara, Florence, Milan, Naples, Pavia, Treviso, Savigliano (?) ; 1472 at Esslingen, Cremona, Mantua, Padua, Brescia, Parma, Monreale (Mondovi), Fivizzano, Verona, Icsi (2), St Ursino (?) ; 1473 at Lauingen, Ulm (perhaps as early as 1469), Merseburg, Alost, Utrecht, Lyons, Messina, Buda; 1474 at Louvain, Genoa, Como, Savona, Turin, Vicenza, Valencia (?); 1475 at Liibeck, Breslau, Blaubeuren, Burgdorf, Trent, Cracow (?), Modena, Reggio (in Calabria), Cagli, Caselle or Casale, Pieve (Piove) di Sacco, Perugia, Piacenza, Saragossa ; 1476 at Rostock, Bruges, Brussels, Angers, Toulouse, Polliano

(Pogliano) ; 1477 at Reichenstein, Deventer, Gouda, Delft, Westminster, Lucca, Ascoli, Palermo, Seville ; 1478 at Oxford, St Maartensdyk, Colle, Schussenried (in Wiirtemberg), Eichstadt, Geneva, Vienne, Trogen (2), Chablis, Cosenza, Prague, Barcelona ; 1479 at Erfurt, Wiirzburg, Nimegucn, Zwolle, Poitiers, Toscolano, Pinerolo, Novi, Lerida, Segorbe ; 1480 at. London, St Albans (or in 1479), Oudenarde, Hasselt, Reggio (in Modena), Salamanca, Toledo, Nonantola, Friuli (2), Caen; 1481 at Passau, Leipsic, Magdeburg, Treves, Urach, Casale di San Vaso, Saluzzo, Albi, Rougemont (?); 1482 at Reutlingen, Mcmmingen, Metz, Pisa, Aquila, Antwerp, Promentour, Zamora, Odense ; 1483 at Leyden, Kuilcnburg (Culenborg), Ghent, Chartres, Chalons-sur-Marne (?), Troyes, Gerona, Stockholm ; 1484 at Bois-le-Duc, Siena, Udine, Soncino, Winterberg, Klosterneuburg, Rennes, Loudéac ; 1485 at Heidelberg, Ratisbon, Pescia, Vercelli, Tréguier or Lantreguet, Salins, Burgos, Palma, Xeres; 1486 at Miinster, Stuttgart, Chia- vasco, Voghera, Casal Maggiore, Abbeville, Briinn, Schleswig ; 1487 at Ingolstadt, Gaeta, Rouen, Murcia ; 1488 at Stendal, Viterbo, Gradisca, Besancon, Constantinople ; 1489 at Hagenau, San Cucufat (near Barcelona), Coria, Pamplona, Tolosa, Lisbon ; 1490 at Orleans, Grenoble, Déle ; 1491 at. Hamburg, Nozzano, Goupillicres, Angou- léme, Dijon, Lantenac ; 1492 at Zinna, Valladolid, Leiria ; 1493 at Liineburg, Cagliari, Freiburg (in Breisgau), Urbino, Acqui ; 1494 at Oppenheim, Monterey, Braga ; 1495 at Freisingen, Freiberg, Seandiano, Forli, Limoges, Schoonhoven (monastery Den Hem), Wadstena, Cettinje ; 1496 at Offenburg, Provins, Granada; 1497 at Munich, Barco, Carmagnola, Avignon; 1498 at Tiibingen, Perigueux, Schiedam, Tarragona; 1499 at Montserrat, Madrid ; 1500 at Olmiitz, Pforzheim, Sursée, Perpignan, Valenciennes, Jacn. Printing was introduced into Scotland in 1505 by the establishment of Andrew Millar at Edinburgh,! and into Ireland, at Dublin, in 1551. As for non-European countries and towns, printing was established in Mexico in 1544, at Goa about 1550, at Tranquebar in 1569, Terceira in the Azores 1583, Lima 1585, Manila and Macao (China) 1590, in Hayti in the beginning of the 17th century, at Puebla in 1612, Cambridge (Mass.) 1638, Batavia 1668, Tiflis 1701, German- town 1735, Ceylon 1737, Halifax (Nova Scotia) 1766, Madras 1772, Calcutta 1778, Buenos Ayres 1789, Bombay 1792, in Egypt (at Alexandria, Cairo, and Gizeh) in 1798, at Sydney 1802, Cape Town 1806, Montevideo 1807, Sarepta 1808, Valparaiso 1810, Astrakhan 1815, in Sumatra and at Hobart Town and

Santiago (in Chili) in 1818, in Persia (at Teheran) in 1820, and at Chios about 1821.?

Till the moment (say 1477) that printing spread to almost all the chief towns of Germany, Italy, Switzerland, France, the Nether- lands, Spain, England, not a single printer carried away with him a set of types or a set of punclies or moulds from the master who had taught him, but, in setting up his printing office, each man cast a set of types for his own use, always imitating as closely as possible the handwriting of some particular manuscript which he or his patron desired to publish. When we compare Schocffer's 30-line indulgence of 1454 with a manuscript copy of the same indulgence dated 10th April 1454, now in the hands of a private collector at Wiesbaden, we sec that the types uscd in printing that document were specially cast for the purpose after the model of the handwriting employed for the written copies. We know also that the types of the 36-line and 42-line Bibles and those of the psalter of 1457 are the closest possible imitations of the ornamental church handwriting customary at the time of their production. Also, when we compare the 31-line indulgence of 1454 with the German block- book called the Hnadtchrist, and both in their turn with the German MSS. of that period (especially the manuscript portions in the printed copies of the indulgences), we see that the cutter of the text type of the indulgence, as well as the engraver of the block- book, formed his characters according to some German handwriting (book hand) of the period. This imitation extcnded, not only to the shape of the lctters, but likewise to all those combinations of letters (double p, double 7, double s, sé, tz, tu, re, cu, ct, st, de, co, ct, te, cc, or, ve, po, fa, he, be, &c.) and contractions (for pro, -wm, -em, ~~en, the~~, wer, -bus, -bis, sed, am, tur, qui, que, quod, secundum, &c.) which were then, and had been for many centuries, in use by scribes. In most, if not all cases, the MSS. which the printers

1 See Rob. Dickson, Introd. of Art of Print. into Scotl., Aberdeen, 1885.

2 On the introduction of printing in various towns, consult Henry Cotton, A Typog. Gazet., 8vo, Oxford, 1831 and (second series, 8vo, Oxford) 1866; (P. Deschamps) Dict. de Géogr. & UUsage du Libraire, 8vo, Paris, 1870; R. C.

Hawkins, Titles of the First Books from the Earliest Presses Established in Different Cities in Europe, 4to, New York, 1884.

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imitated were indigcnous to the place where they settled. Thus the first printers of Subiaco, though they were Germans and had most probably learned the art of casting types and printing at Mainz, clearly cut their types after the model of some Italian MS. which was free from any Gothic influence, but written in a pure Caroline minuscle hand, differing but slightly from the Caroline minuscles which the same printers adopted two years afterwards at Rome. The first Paris printers started in 1470 with a type cast in the most exact manner, on the model of the Caroline minuscle handwriting then in voguc at Paris. John de Westphalia, who introduced printing into Belgium, used from the beginning a type which he calls Venetian. Whcre therefore there is a great simi- larity, but no absolute identity, between the types of two printers (e.g., Schoeffer and Ulr. Zell), it should be attributed to the simi- larity of the handwritings which the printers followed rather than to any attempt on their part to imitate each other’s types. To this universal system (clearly discernible in the first twenty-five years of printing) of each printer setting up business with a new type cast by himself, there are, according to the conjecturcs of a good inany bibliographers, only two exceptions. One is Albrecht Pfister (see above); the other is the Bechtermunczes of Eltville (see above).

Another most important feature in the earliest books is that the Uneven. printers imitated, not only the handwriting, with all its contrac- ness of tions, combined letters, &c., but all the other peculiarities of the lines,

MSS. they copied. There is in the first place the unevenness of the lines, which very often serves as a guide to the approximate date of a book, especially when we deal with the works of the same printer, since each commenced with uneven lines, and gradually made them less uneven, and finally even. This unevenness was unavoidable in manuscripts as well as in block-books ; but in the carliest printed books it is regarded as evidence of the inability of the printers to space out their lines. If this theory be correct,

this inability was perhaps owing to the types being perforated and connected with each other by a thread, or to some other cause which has not yet been clearly ascertained. But it is not impos- sible that the unevenness was simply part and parcel of the system of imitating MSS., and that only gradually (about 1473 or 1474, but in some cases later) printers began to see that even lines looked better than uncven. This seems clear when we obscrve that the imitation of MSS. was carricd so far that somctimes things which deviated from the work of the scribe, but had accidentally been printed in, were afterwards erased and altered in conformity with the MS. The Paris library, for instance, posscsses two copies of the Liber Epistolarwm of Gasparinus Pergamensis (printed at Paris in 1470) in both of which the initial G of the first line and the initial M of the fourth line were printed in, and, whilst they have been allowed to remain in one of the copies, in the other they were regarded as a fault and replaced by a rubricated L and M.

In the second place the initials of books or the chapters of books Initials,

in MSS., and again in block-books and the earliest products of printing, were always, or at least in most cases (they are printed in the indulgences of 1454), omitted by the scribe and the printer, and afterwards filled in by the rubricator. As the latter artists were sometimes illiterate and very often filled up the gap by a wrong initial, we find in a good many MSS. as well as early printed books small letters written eithcr in the margin or in the blank left for the initial, to guide the rubricator. In most cases where these letters (which are now called initial directors) were written in the margin, they were placed as much as possible on the edges of the pages in order that they might be cut away by thc binder as unsightly ; but ina vast number of incunabula they have remained till the present day.? After a few years these initial directors were in a good many books printed in (in lower-case type) with the text. In all cascs, whether written or printed, they were meant to be covered by the illuminated initial ; but, as a matter of fact, the latter very seldom covers the initial director so completcly as to make it invisible, and in a good many cases the intended illu- niination was never carried into effect.

With respect to the hyphens, which were uscd in the 1454 Hyphens

indulgences and the 36-line and 42-line Bibles, always outside the printed margin, some of the earlicst printers did not cmploy them at the moment that they started their presses, and in the case of some printers the non-use or use of hyphens, and thcir position outside or inside the printed margin, serve as a guide to the dating of their products. After about 1472 they become more uniform in their shape and more generally used.

The use of signatures is confined in MSS. mostly to mark the Signa- quires, and in block-books to mark each shcet or page ; they do tures.

not occur in printed books before 1472 (at least in no carlier book with a date), when they appear in Joh. Nider's Preccptorrwm Divine Legis, published by Johan Koelhoff at Cologne.

Catchwords (eustodes) were used for the first time about 1469 by Catch-

Johannes of Spires, at Venice, in the first edition of Tacitus.

3 The university library of Basel possesses a collection of the earliest Paris books still bound in their original binding, in which these initial directors are written not only on the outer edges but on the inner sides of the pages, and so close to the back that they can only be seen by stretching the books wide open.

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whereas the judges speak of ''the work to the profit of both " (49),

and "their common use" (60). (B) In the earliest? book pub- From lished with a date (the Mainz psalter, issued 14th August 1457 by book Fust and Peter Schoeffer) it is said that it was perfected at Mainz colo- by an ''adinventio artificiosa imprimendi ae caracterizandi absque phons, calami ulla exaratione" (repeated and varied later ; see p. 681 above). &c.;

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Pagination or rather foliation was first used by Arn. Ther Hoernen, at Cologne in 1471, in Adrianus's Liber de Remediis Fortwitorum Caswum,

having each leaf (not page) numbered by figures placed in the end of the line on the middle of each right-hand page.

The practice among early printers of imitating and reproducing MSS. was not abandoned till many years after the first printed

book (1454) made its appearance ; and, looking at the books printed, say from 1454 to 1477, from our present standpoint of daily im- provement and alteration, the printing of that period may be said to have been almost wholly stagnant, without any improvement or modification. If some printers (for instance, Sweynheym aud Pannarts at Subiaco and Rome, and Nicolas Jenson at Venice) pro- duced handsomer books than others, this is to be attributed to the beauty of the MSS. imitated and the paper used rather than to any superior skill. Generally speaking, therefore, we shall not be very far wrong in saying that the workmanship of Ketelaer and De Leempt's first book, published at Utrecht ¢. 1473, and that of Caxton's first book issued at Westminster in 1477, exhibit the very same stage of the art of printing as the 1454 indulgences. If therefore any evidence were found that Ketelaer and De Leempt and Caxton had really printed their first books in 1454, there would be nothing in the workmanship of these books to prevent us from placing them in that year. And conversely, if the indulgences of 1454 had been issued without a date or without any names to in- dicate their approximate date, their workmanship would invariably induce bibliographers to ascribe them to circa 1470, if not somewhat later. Even after 1477 the alterations in the mode of printing books proceeded very slowly and almost imperceptibly. It came to be no longer a universal system for printers to begin business by cast- ing a type for themselves, but some received their types from one of their colleagues. And, though there were still many varieties of types, one sort began to make its appearance in two or thrce different places. The combinations of letters were the first to dis- appear; but the contractions remain in a good many books even of the 17th century.

Some theorics have been based on, and others have been con- sidered to be upset by, the supposition that the early printers always required as much type as printers of the present day, or at any rate so much as would enable then: to set up, not only a whole quire of 4 or 5 sheets (=8 or 10 leaves=16

or 20 pages), but even two quires (=40 pages), Consequently calculations have been madc that, for instance, the printer of the 42-line Bible required a fount of at least 120,000 characters. But, though the Speculum Humane Salvationis seems to have been printed by whole sheets (2 pages), there are numberless proofs that many early books were printed page by page, even when in small 4to. For instance, in some books it has been observed that portions of the types with which the text of the first, second, or third pages of a quire had been printed were used to ‘‘lock up” the types employed for the later pages of the same quire, as is evident from the blank impres- sions of such portions being found on these later pages. Again, in some books two, three, or four blank Icaves are found at the end, showing a niiscalculation of the printer. Moreover, the numerous itinerant printers of the 15th century, who established a press for a short time wherever they went, prove that the furniture of the earliest printing offices must have been of no great extent.

The Invention Controversy.

Now that we have traced the art of printing from the moment (1454) that it made its appearance in a perfect

” State at Mainz, and have followed its spread to all the chief . places of Europe till 1500, we must take notice of the

controversy which has been carried on for nearly four hundred years as to when, where, and by whom the art was invented. For this purpose we will gather up into a chronological sequence (a) a few of the most important expressions used by the earliest printers in their colophons, (6) whatever documentary evidence there may be on the subject, and © some accounts of the earliest authors on the subject. (The letters A, B, &c., are for the sake of

convenient reference.)

The earliest testimony (A) to which we may refer is the notarial instrument, dated 6th November 1455, of the lawsuit between Fust and Gutenberg, whereby the former sought to recover 2026 guilders from the latter in repayment of 1600 guilders (800 advanced in 1450 or 1449 and another 800 in 1452), with the interest thereon. Fust speaks here? of “ the work ” (line

24), and of “our common work” (line 60); Gutenberg speaks of “tools” in preparation, ‘“workmen’s wages, house-rent, vellum, paper, ink, &c.” (lines 37- 40), of “such work” (41), and of “the work of the books” (42) ;

1 See Bernard, Origine del’ Impr., i. 164, who was a printer himself and speaks ‘ DWe ones io fils: ae of the instrument as published by J. D. Koehler, Ehren-Rettung Johann Guttenderg’s, Leipsic, 1741.

(C) In 1460 the Catholicon was published at Mainz, without the name of the printer ; but the colophon, after stating that the book was printed at Mainz, which town God’s mercy had deigned to prefer above other nations of the earth, adds (D) that the book was printed and completed “ non calami, stili, aut penne suffragio, sed mira patronarum formarumque concordia, proporcione, et modulo.” This work is considered to have been printed by Gutenberg, and the mention of God’s mercy is regarded as an allusion to the in- vention of printing. The phrase is, however, also found in the Liber Sextus Decrctalium, in the Summa of Thomas Aquinas, and in the Clementine, published respectively on 17th December 1465, 6th March, and 8th October 1467, by Fust and Schoeffer. (EZ) On 17th January 1465 Adolph II., archbishop of Mainz, by a publie decree, appointed Gutenberg as his servant in reward for “his services,’”’ but he does not speak of him as the inventor of printing, noreven asa printer. (F) In the Grammatica Rhythmiea, published in 1466 by Fust and Schoeffer, the third line of the colophon runs: “Hine Nazareni sonet oda per ora Johannis,” which was formerly regarded as an allusion to Johann Fust or Johann Gutenberg, but which more probably refers to Johann Brunnen or Fons, the author of the grammar. (G) Ou 26th February 1468 Dr Homery wrote to the archbishop of Mainz the letter quoted above, from which it may be inferred that Gutenberg had been a printer, though not a word is said as to his being the inventor of printing. (H) In 1468 Schoeffer reprinted Fons’s Grammatica, and in the colophon it is said: ‘At Moguntina sum fusus in urbe libellus meque (the book) domus genuit unde caragma venit.” (I) Schoeffer published on 24th May 1468 the first edition of Justinian’ Imper. Institutionwm Juris Libri VI, cum Glossa. To this were added by way of colophon some verses commencing : ‘‘Scema tabernaculi, &c.,” in which it is said that (the ornament of the church) Jesus ‘hos dedit eximios sculpendi in arte magistros. . . Quos geuuit ambos urbs Moguntina Johannes, librorum

insignes prothocaragmaticos," which is regarded as an allusion to Johann Gutenberg and Johann Fust as first printers. (K) In the same year (1468) Johannes Andreas, bishop of Aleria, says, in the dedication of his edition of St Jerome's Epistles, published in that year (13th December) at Rome, to Pope Paul II., that 'Germany is to be honoured for ever as having been the inventress of the greatest utilities. Cardinal Cusa wished that the sacred art of printing, which then (under Cardinal Cusa, who died llth August 1464) seemed to have arisen in Germany, were brought to Rome." (L) In 1470 Guil. Fichet, in an octastichon inserted in the Paris edition of 1470 of the Letters of Gasparinus of Bergamo, exhorts Paris to take up the almost divine art of writing (printing) which Germany is acquainted with. In the same year Erhard Windsberg writes to the same effect in an epigram inserted in the Epistole Phalaridis published at Paris about 1470. (M) In 1471 Ludovy. Carbo speaks, in the dedication of the Letters of Pliny to Borso, duke of Modena, of the Germans having invented printing. Nicolaus Gupalatinus speaks (Venice, 1471) of a German being the inventor of printing, and Nicolaus Perottus of the art which had lately come from Germany. (N) On 21st May 1471 Nicolas Jenson published an edition of Quintilian, edited and revised by Ognibene de Lonigo (Omnibonus Leonicenus), who in the preface speaks of its printer as ''librarie artis mirabilis inventor, non ut scribantur calamo libri, sed veluti gemma imprimantur, ac prope sigillo, primus omnium ingeniose demonstravit." (O) About 1472 the first three printers of Paris published Gasparinus Perga- niensis's Orthographize Liber, to which is prefixed (in the copy of the university of Basel) a letter, dated 1st January, from Guil- laume Fichet, prior of the Sorbonne, to Robert Gagnin, in which he says that 'it 1s rumoured in Germany that not far from the city of Mainz a certain Johann Gutenberg (Johannes, cui cognomen Bone- montano) first of all invented the art of printing (impressoriam artem), by means of which books are made with letters of metal, not with a reed (as the ancients did), nor with the pen (as is done at present)." (P) On 14th July 1474 Joh. Philippus de Lignamine pub- lished at Rome Chronica Summorum Pontifieum Imperatorumque, in which we find, between two entries, relating one to 14th J uly 1459 and the other to Ist October 1459, an undated paragraph in which it is said that Jacobus with the surname of Gutenberg of Strasburg and a certain other one named Fustus, "imprimendarum litterarum in membranis cum metallicis formis periti, trecentas cartas quisque eorum per diem facere innotescunt

apud Moguntiam Germanie civitatem.” The same is said of Mentelin, and (under 1464) of Conrad Sweynheym, Arnold Pannarts, and Udalricus Gallus. (Q) On 23d May 1476 Peter Schoeffer issued the third edition of the Lnstitutiones of Justinian, with the same imprint as in the edition

3 The earliest is perhaps the Donatus issued by Peter Schoeffer, before 1456, the colophon of which says that it was finished : imprimendi seu caracterizandi . . . absque calami exaratione.”

possibly “ Arte nova

From docu- mentary evidence.

of 1468 (see testimony I), but with the addition that Mainz is the ‘“‘impressorie artis inventrix elimatrixque prima.” (R) In 1478 an edition of the Fascieulus Temporwm was issued at Cologne, in which it is stated under the year 1457 that the printers of books were multiplied on earth, deriving the origin of their art from Mainz. The earlier editions mercly stated that the printers of books were multiplied on earth. (S) In 1483 Matthias Palmerius of Pisa pub- lished at Venice the Chron. Euseb., in which under the year 1457 it is stated that students owe a great debt to Germany, whcre Johannes Guttenberg zum Jungen, knight of Mainz, invented the art of printing in 1440. (T) In the same year Jac. Phil. Foresta of Bergamo published Supplementum Chronicorum, in which he says under the year 1458 that the art of printing books was first dis- covered in Germany, according to some by Guthimberg of Strasburg, according to others by Faust (see P), according to others by Nicolas Jenson (see N). (V) On 6th March 1492 Peter Schoeffer published the Nicdersiehstsche Chronik of Conrad Botho, saying in, the colo- phon that it was ‘‘geprent … in… Mentz, die eyn anefangk is der prentery.” (X) At the end of 1494 two Heidelberg professors, Adam Wernher and Joh. Herbst, composed some Latin verses in honour of Johannes Gensfleisch (a family name by which Gutenberg was known, and which was turned into the Latin Ansicarus), whom they called “ primus librorum impressor” and_‘‘impressorie artis inventor primus.”! (Y) In 1499 Jacobus Wimpheling (born at Schlettstadt 1450, died 1528) published (at Mainz, by P. Friedberg) an Oratio in Memoriam Marsilti ab Inghen (d.

1896), in which he, on leaf 22a, praises Joannes Ansicarus in verse on account of his invention at Mainz. (Z) These verses are preceded by an epitaph on Johann Gensfleisch, "' artis impressorie inventor" and "repertor," written in Latin by Adam Gelthus, a relative of Gutenberg. (AA) In the same year Polydore Vergil (De Inventoribus Rerum, Venice, 1499, lib. ii. cap. 7) says that a certain Peter [Schoeffer ?], a German, invented in 1442 the art of printing at Mainz in Germany, as he had heard from the latter's countryman; this statement was re- peated in a Venice edition of 1503. In later editions '' Peter'' was altered to ''Joh. Gutenberg." (BB) In the same year Koelhoff, printer at Cologne, published Cronica van der hilliger Stat van Coellen, in which on fol. 312b it is said: (1) The art of printing was found first of all in Germany at Mainz about the year 1440; (2) from that time till 1450 the art and what belonged to it were investi- gated ; (3) and in 1450, when it was a golden year (jubilee), they began to print, and the first book that they printed was the Bible in Latin, in a large letter, resembling that with which at present missals are printed. (4) Although the art was found at Mainz in the manner in which it is generally employed now, yet the first pre- figuration was found in Holland from out the Donatuses which were printed there before that time, and from and out of them was taken the beginning of the aforesaid art, and it was found much more masterly and exact (subtilis) than that other manner was, and has become more and more artistic. (5) Omnibonus wrote in a preface to Quintilian, and in some other books too, that a Walloon from France, named Nicol. Jenson (see N), discovered this art ; but that is untrue, for there are those still alive who testify that books were printed at Venice before Nicol. Jenson came there, and began to cut and make letters. (6) But the first inventor of printing was a citizen of Mainz, named Junker Johan Gudenburch. (7) From Mainz the art was introduced first of all into Cologne, then into Strasburg, and afterwards into Venice. (8) The origin and progress of the art were told to the writer verbally by Ulrich Zell of Hanau, still printer at Cologne (anno 1499), through whom the said art came to Cologne. (CC) In 1501 Jacob Wimpheling (see Y), who stated in his Oratio Querulosa contra Invasorcs Sacerdotwm, Flam- inum, &ec., published at Delft ¢. 1495, that chalcography had been invented at Mainz, published a work (Germania, Strasburg, Joh. Priiss, 1501) in which he says (on p. 43) that the invention was made at Strasburg by Johann Gutenberg of Strasburg, and that it was perfected at Mainz. (DD) In 1503 Johann Schoeffer (the son

of Peter Schoeffer and the grandson of Johann Fust) published an edition of Hermes Trismegistus, in which he represents himself as one of the most distinguished citizens of Mainz, descended from the most fortunate race who invented the art of printing. (EE) In 1504 Ivo Wittig, who was a relative of Gutenberg, and a canon and the keeper of the seal of the St Victor cathedral near Mainz (of which Gutenberg had been a lay member), erected in the house “Zum Gutenberg” a memorial stone and an epitaph to Joh. Guten- berg of Mainz, ‘‘qui primus omnium litteras ere imprimendas invenit.” (FF) In 1505, in the German translation of Livy pub- lished by Johann Schoeffer (see KK), the dedication to the emperor Maximilian, which was probably written by Ivo Wittig (see EE), speaks of Johann Giittenbergk as inventor of printing (1450) and Johann Faust and Peter Schoeficr as improvers of the art. This work was reprinted six times (1514, 15238, 1533, 1551, 1553) with the same dedication; but in 1509 the Breviartwm Moguntinum says that it was printed at the expense and trouble of Johann

1 These verses were not published at the time, but in the 19th century by F. J. Mone, Quellensamml. der bad. Landesgesch., iii. 163, from the contemporary MS. of Adam Wernher, preserved in the archives of Carlsruhe.

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Schoeffer, whose grandfather (7.¢., Johann Fust) was the first in- ventor and author of the art of printing (see DD). (GG) In 1505 Jacob Wimpheling, in his Epithoma Germanorwm (Strasburg, 1505), asserts (on leaf xxxvili b. and xxxixa.) that in 1440 Johann Guten- berg of Strasburg invented there the art of printing. And in 1507, in his Catal. Episeoporum Argent. (Strasburg, 1507), he says that the art was invented, though in an imperfect manner, by a certain Strasburger, who afterwards went to Mainz and joined others work- ing and trying the same art, where it was, tnder the guidance of Johann Gensfieisch, perfected in the house ‘‘ boni montis ” (Guten- berg). This he repeated in 1515. (HH) About 1506 Johannes Trithemius wrote his Chronicon of Spanheim, published at Frank- fort in 1601, in which he says (p. 366) that the art of printing books was discovered afresh

at Mainz by Johan Gutenberg, who, after having spent all his property in accomplishing the new in- vention, perfected it by the advice and assistance of Johann Fust. The first propagator of the new art was, aftcr the inventor, Peter Schoeffer. (II) In 1515 Johann Schoeffer published Joh. Tri- themius's Compendium sive Breviartum Historie Franeorwm, and said in the colophon that the book was published at Mainz, the first inventress of the art of printing, by Johann Schoefler, grand- son of the late Johann Fust, the first author of the said art, who finally from his own genius commenced to excogitate and to investi- gate the art in 1450, and in 1452 perfected it and commenced printing, assisted by many necessary inventions of Peter Schoeffer von Gernsheim, his servant and adopted son. Johann Fust and Peter Schoeffer kept this art secret, binding all their servants and domestics by oath never to reveal it ; but in 1462 it was spread by the same domestics into divers countries. (KK) On 9th December 1518 the emperor Maximilian accorded to Johann Schoeffer the privilege of printing Livy (1518-1519), and says in it that ‘‘ he has learned and been advised on the faith of worthy testimonies that the ingenious invention of chalcograpliy was effected by the printer's grandfather.”” (LL) In 1519 Joh. Thurmayer Aventinus (1474-1534) wrote that ‘‘in 1450 Joannes Faustus, a German, a citizen of Mainz, invented a new kind of writing, called chaleography, and completed it in two years; it was kept secret by him and Peter Schoeffer, his son-in-law, but divulged in Germany ten years afterwards by Faust's servant, Johannes Guttenberger, a Strasburger.” (MM) In a pedi- grec of Lourens Janszoon Coster of Haarlem and his descendants, drawn up not later than 1520, it is asserted that in 1446 ‘‘he brought the first print into the world.” This document, of which the date 1446 seems to have been altered into 1440, is preserved in the Haarlem town library. (NN) In 1520 Johan Schott, a printer at Strasburg and grandson of Johan Mentelin, the first printer of that town, published an edition of Ptolemy, at the end of which he printed the arms of his grandfather with the following legend: ‘“Insigne Schottorum Familie ab Friderico Rom. Imp. III. Joan. Mentelio primo Typographie Inventori ac suis concessum : Anno Christi 1466.” Apart from the assertion that Mentelin was the inventor of printing, we may remark that the emperor Frederick III. raised Mentelin to the rank of a nobleman in 1466 and granted him new arms. (OO) About 1533 the Neapolitan Mariangelo Accorso, who had resided at the court of Charles V., wrote on an edition of Donatus (in the possession of Aldus Manutius, jun.) that “Joh. Faust of

Mainz first discovered the art of printing with metal types, which afterwards he made of lead; his son Peter Schoeffer added afterwards much to polish the said art. This Donatus and Confessionalia were printed first of all in 1450. Faust derived the suggestion from a Donatus printed before in Holland from an engraved block." 'This paragraph is found on p. 411 of the Biblioth. Apost. Vatieana of Angelo Roccha (Rome, 1591). Some consider its latter part to have been derived from the Cologne Chroniele (BB), and it seems probable that it was a mixture of some of the above testimonies. (PP) In 1536 Johan Schott (see NN) published Historicn Handt-Buchlein (Strasburg, 1536), in which (on leaf b! and b*) he says that "Hans Mentlin of Strasburg in- vented the art, which, through infidelity, was brought to Mainz." On the strength of this and other statements (CC, GG, NN) the bicentenary of the Strasburg invention was celebrated there in 1640. (QQ) In 1541 Joh. Arnold (Bergel or) Bergellanus, who had settled as press-reader at Mainz two years previously, published his Encomium Chalcographiz (Mainz, Fr. Behem, 1541, 4to), in which the lawsuit between Fust and Gutenberg (A) 1s alluded to for the first time. Bergel had read Tritheim's books (HH), in which the invention is ascribed to Johann Gutenberg with two coadjutors, Johann Faust and Peter Schoeffer, which he (Bergel) had heard confirmed in conversations with Mainz citizens ; he had also seen some old tools prepared for the work by the originators which were still in existence. Gutenberg invented it in 1450. (RR) About 1561 Jan Van Zuren (born at Haarlem in 1517) and Dirk Volkerts Coornhert (born at Amsterdam in 1522) established a printing office at Haarlem. Of the former it is alleged that he had compiled a work on the invention of printing, which is presumed to have been lost during the sicge of Haarlem in 1573, It was not publicly spoken of till 1628, when Peter Scriverius published his Laurecranz voor Laurens Coster. Scriverius had only found the

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title, preface, and introduction, in which Van Zuren contendcd that the first foundations of the art were laid at Haarlem, and that it afterwards accompanied a foreigner to Mainz. In this introduction he does not mention the name of the inventor, nor a date, but points in indefinite terms to the

house of the inventor as still existing. (SS) In the same year (1561) Van Zuren and Coornhert published an edition of the Oficia Ciceronis, in which the latter, in a de- dication to the magistracy of Haarlem, refers to the rumour that the art of printing books was invented first of all at Haarlem, and was brought to Mainz by an unfaithful servant and much improved there. He adds that very old and dignified persons had often told him, not only the family of the inventor, but also his name and sur- name, and had explained the first crude way of printing, and pointed out to him the house of the first printer. (TT) In 1566 Luigi Guicciar- dini, a Florentine nobleman who had visited the Netherlands and had resided many years at Antwerp, finished a description of the Netherlands (published in 1567), in which, alluding to Haarlem, he speaks of the invention there according to the assertions of the inhabitants, the evidence of some authors, and other remembrances g the inventor died before the perfection of his art; his servant went to Mainz, where he perfected the art, and hence the report that it was invented there. (VV) About 1568 (it is calculated) Hadrianus Junius wrote his Batavia, published at Leyden in 1588, with two prefaces, dated, the one from Leyden, 6th January 1575, the other from Delft ad annwm salutis 1575. On p. 253 he says that the opinion that the forms of the letters whcreby books are printed were first discovered at Mainz is very inveterate, but old and eminent inhabitants of Haarlem had assured him that they had heard from their ancestors that there lived at Haarlem, more than 128 years before, in a decent house then existing, near the market- place, opposite the royal palace, Lourens (son of) Jan, surnamed Coster, who, while walking in the wood near Haarlem, began to shape beechen bark first into figures of letters, by which, reversely impressed one by one on paper, he composed one or two lines to serve as an example for the children of his son-in-law. When this succeeded, he began to contemplate greater things, and first of all invented, assisted by his son-in-law Thomas (son of) Peter, a more glucy and substantial kind of ink (as the ordinary ink was found to blot), with which he printed whole tablets with pictures, with the letters added. Junius had seen books of this kind printed by Coster (the beginnings of his labours) on the rectos of the leaves only, not on both sides ; the book was written (in Dutch) by an anonymous author, and entitled Speculum Nostre Salutis, in which care was taken that the blank versos could be pasted together, so that the blank pages should not present any unsightliness. After- wards (Coster) changed the beechen characters into leaden, and the latter

again into tin ones. Very ancient wine-pots cast of the remains of these types were still to be seen in the house of Lourens, which was afterwards inhabited by his great-grandson Gerard (son of) Thomas, who had died an old man a few years before. When the new merchandise attracted purchasers everywhere, workmen were added to (Lourens's) HOHeliold, among whom was a certain John (whether, as was suspected, Faust, or another of the same name, Junius did not inquire), who was bound to the work of print- ing by oath. But, when he thought he knew the art of joining the letters and of casting the types, &c., he stole away, when every- body had gone to church, the whole apparatus of the types and the tools prepared by his master, and hastened to Amsterdam, thence to Cologne, until he arrived at Mainz, where he could remain in safety, and, having opened a work-office, issued within the space of one year, about 1442, the Doctrinale of Alexander Gallus and the Tracts of Petrus Hispanus, printed with the same types which Lourens had used at Haarlem. Junius recollects that Nicolaus Gale, his tutor, a man of firm memory and venerable old age, had told him that as a boy he had often heard a certain bookbinder Cornelis (a man of more than eighty years of age, who had been an under-workinan in the same office) narrating the story of the invention (as he had heard it from his master), the polishing and increase of the crude art, &c., and cursing those nights which he had passed, during some months, with the culprit in one bed. The burgomaster Quirinus Talesius admitted to Junius that he had formerly heard nearly the same from the mouth of the same book- binder. (XX) In 1628 Scriverius in his Lawrceranz (see RR) placed the date of the Haarlem invention as far back as 1428, and men- tioned as its inventor Lourens Janszoon, sheriff of Haarlem. He asserts that the art of printing appeared, "not in the manner as it is used now, with letters cast of lead and tin, but a book was eut leaf for leaf on wooden blocks," aud the Haarlem inventor was robbed in 1440 by Johan Gutenberg. Scriverius based the date 1428 upon a Hebrew Chronicle compiled by Joseph ben Meir {born 1496, d. c. 1575), and published in 1554 at Sabionetta by Comelius Adelkind, where, under the year of the Jewish era 5188 (= 1428), the author mentions a book (without giving the title) printed at Venice and seen by him. Scriverius, being convinced that this could only refer to a book printed at Haarlem, applied the entry to a xylographic Biblia Pauperum, of which he gave a description, together with several other block-books and early printed books.

(YY) In 1689 Boxhorn pushed the date of the Haarlem invention back to 1420, referring, as his authority, to the same Chronicle of

Rabbi Joseph. Since that time the date of the Haarlem invention

has been variously placed between 1420 and 1430.

Later testimonies are mere repetitions of earlier state- Other ments.! We need not say much about the story of Antonio claim- Cambruzzi, who asserted that Pamfilo Castaldi invented ts printing at Feltre, in Italy, in 1456, and that Fausto Comes- burgo, who lived in his house in order to learn the Italian language, learned the art from him and brought it to Mainz; this story, however, has found so much credence that in 1868 a statue was erected at Feltre in honour of Castaldi. Nor need we speak of Kuttenberg in Bohemia, where John Gutenberg is asserted to have been born and to have found the art of printing. We may also pass over Johann Fust, later on called Faust (testimonies P, T, DD, FF, II, KK, LL, OO), as we know from the Mainz law- suit of 1455 (A) that he had simply assisted Gutenberg with loans of money. We may also pass over Johann Mentelin of Strasburg (testimonies NN, PP), onlyremarking here that he had already printed a Bible in 1460, and that he is mentioned in Strasburg registers as a chrysographer or gold-writer from 1447 to 1450; but of his whereabouts between 1450 and 1460 there is no record. That he had gone, or had been called, after 1450 by Gutenberg to Mainz has been asserted but not proved, and there is no reason why he should not be one of the two Johannes alluded to as the prothocaragmatict of Mainz in the Justinian of 1468 (testimony I.). That Nicolas Jenson came to be regarded in certain circles and for a time as the inventor of printing is owing to testimony N being misunderstood. There re- main, therefore, to be considered the testimonies which bear on the rival claims of Haarlem and Mainz. The contro- versy between Germany and Holland was publicly started as early as 1499 by the Cologne Chronicle (testimony BB), that between the two towns mentioned not publicly before 1561 (testimony RR); while no rival inventor to Guten- berg was mentioned publicly and in print earlier than 1588 (testimony VV).

Let us first consider the claims of Germany and Mainz as centred Claims of in the person of Henne (=Hans or Johann) Gensfleisch, called Guten- Gutenberg or Gudenberg, the latter name derived from his mother, berg. whose maiden name was Elsa Wyrich, who lived in the *‘ Hof zum Gutenberg” at Mainz. He is supposed to have been born at that town about 1400. He is first mentioned in a Mainz document, dated 16th January 1430. In a document of 28th March 1430 he is spoken of as being ‘‘not in Mainz.” Documents from 14th March 1434 to 18th September 1444 prove him to have been at Strasburg during that time, and documents dated respectively 17th October 1448, 6th November 1455, 21st June 1457, 10th April 1461, show that he was in or near Mainz on those days. By a decree of 17th January 1465 the archbishop of that town rewarded him for “his services,” and in the bond of Dr Homery, dated 26th February 1468, he is spoken of as dead. There are, moreover, six forged documents (including some relics of an ancient press bearing the date 1441) respectively dated 24th March 1424, 1487, 3d July 1453, 20th July 1459, 19th June 1463, and an entry in an anniversarium which has been applied to Gutenberg, but does not concern him (see Hessels, Gutenberg).

In former years, when printing was believed to have been invented in 1440, the records of the Strasburg lawsuit of 1439, between Gutenberg and some Strasburg artisans about certain industrial undertakings (as the art of polishing stones, the manufacture of looking-glasses), were considered to prove the invention of printing at Strasburg, not, however, by Mentelin, as had been thought by some (testimonies NN, PP), but by Gutenberg. The records came to light about 1740, just when Schoepflin, the principal discoverer, had been commissioned to search for documents of this kind. Doubts may be suggested as to their genuineness, but they have all perished, partly during the revolution of 1798 and partly during the siege of Strasburg in 1870. However, nobody would now assert that printing was invented in 1439 or at Strasburg; and those who still believe that Gutenberg was the inventor of printing refer to them only as showing that he was a mechanic as early as 1489, and that he understood the art of pressing.”

1 Over a hundred of them have been collected by Ger. Meerman, Origines Typogr., ii. p. 58 sq. * See Hessels, Gutenberg, pp. 28, 185, &c.

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The first document that connects Gutenberg with the art of print- ing is the notarial instrument of 6th November 1455 (testimony A). But it says nothing of an invention or a new mode of print- ing. And yet the occasion was such as to make it almost imperative on Gutenberg to mention it, for he had spent 1600 guilders of Fust's money, apparently without printing anything,' and was on the point of being robbed by the latter and having taken away from him all that he had made and done to give effect to his idea or invention. In the next testimony (B), 7.¢., the earlicst Mainz books with printed dates (1457 to 1467), there is evidence that the new art of printing is not only not kept secret but fully appreciated. at Mainz, and its importance fully realized and advertised ; but, though they speak of a "nova ars imprimendi" and an ''adinventio imprimendi," there is not a syllable as to a Mainz invention or inventor. In testimonies C and D (the Catholicon of 1460) there is again not one word about an invention or an inventor, or about Mainz, Yet Gutenberg is supposed to have printed the Catholicon ; and it is incredible that he, who had been wronged and robbed by his two rivals (Fust and Schoeffer), should agree with them in explaining and proclaiming the new art, but never with one word assert his claim to the honour and profit of the invention, if he had made any, and should even omit his name, whereas he saw his two rivals never neglect to print their names in full on every book which they published. Those who believe that Gutenberg was the inventor of printing suggest that he kept silent, as otherwise his creditors would have seized his copies and his printing office. But this explanation cannot be accepted ; for the verbose colophon at the end of a gigantic folio book like the Catholicon, published at a time when there were perhaps not more than three printing offices in the world, was calculated to draw attention to its printer and his residence, not to conceal him. Testimony F (1466) is no longer regarded as having any reference to Gutenberg or the inven- tion of printing. H (1468) was formerly thought to mean: oe the book, am cast (7.¢., its types are cast) in the Mainz city, and the house whence the type came (=where the type was invented) produced me." But of late years it has been shown that the author of the book, Johann Fons, was Peter Schoeffer's press-corrector. And, as he no doubt resided in

Schoeffer’s house, the two lines evi- dently mean: ‘‘I ama little book cast in Mainz, and I was born (=written) in the same house whence the type comes ? (=where I ain printed).” Testimony I (also of 1468) speaks of two Johannes (Gutenberg and Fust) as the ‘‘prothocaragmatici librorum quos genuit urbs Moguntina.” But this certainly means, not that the first printers of books were born at Mainz, but that the two Johannes were the chief printers of books (born) produced at Mainz.

When we now place together the clear documentary testimonies (A to I) of the first fourteen years of printing (1454 to 1468) at Mainz, we see that they all come from Mainz itself. Everybody connected with the art speaks of it in the most public and un- reserved manner ; its importance is as fully realized and advertised during that period as it is in the present day ; the German nation is even congratulated on possessing it; there is never any secrecy about it; once (about 1456) it is even called a new art. But, in the midst of all this publicity, the art which Mainz and Germany pos- sess is never said to have been invented at Mainz, The supposed Mainz inventor (Gutenberg) even speaks himself on two occasions (in the lawsuit of 1455 and in the Catholicon of 1460), but never says that he had made an invention. The archbishop, too, speaks publicly of Gutenberg in 1465 (testimony E), and rewards him for services, but does not speak of him as the inventor of printing, nor even as aprinter. Nor does Dr Homery, in his letter to the archbishop (testimony G), in which he refers to Gutenberg’s print- ing apparatus, call him the inventor of printing.

In 1468 we enter on a new phase in the history of the invention. Even if we reject testimony I as being merely local, testimony K (1468) speaks of the art of printing as having arisen in Germany. This testimony, however, does not come from Germany, nor from Mainz, but from Italy, and is supposed to owe its inspiration to the two German printers who had established a printing office at Subiaco in 1465, and in 1467 at Rome, and who most likely learned their craft at Mainz. But, as the two printers are mentioned in the testimony, and as it does not speak of Gutenberg, nor of Mainz, it is far more likely that it was merely derived from the colophons of Fust and Schoeffer, or from something that Cardinal Cusa had heard during his embassies in Germany. To the Mainz colophons we must also ascribe (a) the two testimonies of 1470 (L) and (0) the three of 1471 (M), all five of

which come from France and Italy. At last, in 1472, we find in testimony O the invention of printing ascribed to Gutenberg of Mainz, but it is mentioned as a rumour, and comes from France. Guil. Fichet of Paris, who gives it, is

1 In tine 42 Gutenberg distinctly declares that ‘“‘he hoped that he was under no obligation to Fust to devote the first 800 guilders to the work of the books ;” and, as Fust, by advancing the second 800 guilders in 1452, had become Guten- berg’s partner, it seems clear-that the former claimed in 1454, when the trial is calculated to have commenced, his money and interest because Gutenberg

had as yet not printed anything. 2 Venit is the present not the perfect tense.

who commenced printing at Paris in 1470. But, as two of them had resided, immediately before they came to Paris, in the univer- sity of Basel, and are supposed to have learned their art there, the rumour is ascribed to ‘ Bertolff von Hanauwe,’ who appears in the lawsuit of 1455 as Gutenberg’s servant, and who was printing at Basel in 1468. Perhaps it came rather from information which Fichet obtained from the St Victor cathedral, near Mainz, as he speaks of the art having been invented not far from that town. Testimony P (1474) again comes from Italy, from Rome, and was perhaps derived from one of the German printers settled there at that time. It merely speaks of Gutenberg, Fust, and Mentclin as printers, but says not a word which even touches upon the invention of the art. In testimony Q (1476) we have definite mention of Mainz as the inventress of the art ; it is given as an addition to the Mainz colophon of 1468 (see I). In 1478 Mainz is again mentioned in a Cologne testimony ®, which gives evidence of research, as it is an amplification of an earlier one in which Mainz was not men- tioned. Germany, Gutenberg, and Mainz are again mentioned in the Venetian testimony S (1483), which gives for the first time 1440 as the date of the invention. In the same year we have two earlicr testimonies (P and N) worked into one (T), to the effect that printing was invented either by Gutenberg or by Fust or by Jenson, Testimony V (1492), which states that

printing com- menced at Mainz, is practically equivalent to Q. In 1494 and 1499 we have three German testimonies (X, Y, Z) as to Gutenberg being the inventor of printing; these, however, come, not from Mainz, but from Heidelberg. Zis given bya relative of Gutenberg, Adam Gelthus ; and, as the latter resided at Heidelberg, it is clear that he was the real source of the other two Heidelberg testimonies (X and Y). Two years later, when Wimpheling, the author of testimony Y, had left Heidelberg, he ascribed (CC) the invention of printing to Strasburg, though stating that Gutenberg was the inventor. Testimony AA is recorded above to show the great con- fusion that reigned in people's minds about the invention. We must add to these testimonies those of 1504 (EE) and 1505 (FF), which are owing to Ivo Wittig, a relative of Gutenberg, and a canon and the keeper of the seals of the St Victor cathedral, near Mainz, of which Gutenberg had been a lay member according to its liber fratcrnitatis. Thus in the period from 1468 to 1505 we have (1) several vague statements made in Italy and France as to the art of printing being known or practised or invented in Ger- many, statements which arose from the books and colophons pub- lished at Mainz; (2) one item of rumour in 1472 that Gutenber invented it near that town ; (8) two Mainz statements, of 1476 an 1492, and one Cologne statement, of 1478, that it was invented at Mainz ; (4) three German statements, of 1492, 1494, and 1499, that Gutenberg had invented it ; and (5) two Mainz statements, of 1504 and 1505, to the same effect. It is to be particularly noticed that the statements (2, 4, 5) which speak distinctly of Gutenberg being the inventor can be clearly traced to Gutenberg himself and two of his relatives.

Seeing then how slender the basis is for the tradition that Contra printing was invented by Gutenberg at Mainz, and that even this dictionol slender basis was not laid till fourteen years after the art had Guten- been fully established and proclaimed in that city, we cannot be berg's surprised to find the tradition promptly contradicted. This con- claims,

tradiction was made in 1499 (testimony BB) in a Chronicle pub- lished at Cologne. To facilitate the understanding of this testimony it is divided above into eight sections. The first (taken from Hart- mann Schedel's Chronicle, 1493), second, sixth, seventh, aud eighth are no doubt due to the compiler of the Chronicle, and must not be connected with the third, fourth,

and fifth, which, according to the compiler, are due to Ulrich Zell, a printer at Cologne, who had probably settled there about 1463, and had most likely learned his art at Mainz, as he called himself ‘“‘clericus Moguntinus.” As Zell’s testimony leaves to Gutenberg nothing but the honour of having perfected the art, various attempts have been made to ex- plain away this account. As long as no typographically printed Donatus had been found that could be fitted into Zell’s account, it was argued that he meant Donatuses printed from wooden blocks; and this argument is brought forward even at the present time. But a practical printer like Zell must have been able to express himself to that effect if he had really meant to say so; and, as block-printing was not less practised in Germany than in Holland, we could hardly assume that things printed in Holland would have inspired the German inventor rather than the same things printed in Germany. That testimony OO speaks of a Donatus printed from wooden blocks may be ascribed to the notion arising at that time (c. 1533) that block-printing had given rise to typography. It has also been asserted that Holland in the Chronicle means Flanders ; but the Chronicle is usually very correct in geographical matters. It has also been suggested that Zell most likely learned his art m Fust and Schoeffer’s office and invented the passage to injure the reputation of Gutenberg, who had been their enemy. Finally it has been said that Zell did not suggest or write the passage at all; but it is hard to see how this can be maintained in face of the com- piler’s own statement to that effect. Therefore, all these sugges-

tions failing to weaken Zell’s testimony, we must see how far it can be brought into harmony with other circumstances and the testi- monies MM, RR, 8S, TT, VV, XX, YY, which claim the honour of the invention for Haarlem in Holland. Testimonies RR and SS do not mention the name of the inventor. But the former is a mere introduction destined for a complete book that was lost during the siege of Haarlem in 1573 before it was printed ; we are, there- fore, not entitled to say that Van Zuren did not know the name. SS may have omitted the name, because the publication of Van Zuren’s work was in contemplation at the time that it was written. That Guicciardini (testimony TT) in 1566 did not mention the name of the reputed Haarlem inventor cannot be considered as an in- dication that it was

not known or had not. yet been “invented” when he wrote, as his accounts of the cities of the northern Netherlands are all very meagre and were for the most part derived from correspondence. In Junius’s account (VV), however, we find every particular that could be desired. He begins by re- ferring to the difficulty of vindicating the honour of the invention for Haarlem on account of the deep-rooted and general opinion that it took place at Mainz. He then mentions that Lourens (son of Jan) surnamed Coster resided at Haarlem “more than 128 years ago” and gives us to understand that in the year indicated by that phrase he invented the art of printing. As Junius’s book was not pub- lished till after his death, in 1588, and the two prefaces in it are dated 1575 (he died 16th June 1575), the number 128 is supposed to go back from the date when he actually wrote his account, which he is calculated to have done about 1568. Thus we get the year 1440 as the supposed date of the Haarlem invention, though, if we based our calculation upon the date of the preface, the year 1446 or 1447 would have to be assumed. But, as Junius adds that Coster’s types were stolen by one of his servants, who fled with them to Mainz, and establishing there a printing office printed within a year’s time, in 1442, two books, he must, if this latter date is correct, have meant 1440, By testimonies XX and YY we see that in the 17th century the date of the Haarlem invention was first put back as far as 1428, then to 1423; and since then it has usually been re- garded as 1423, especially after it was discovered that the Haarlem wood where Coster is said to have cut his wooden letters was destroyed during a siege in 1426,

The researches as regards the reputed Haarlem inventor have hitherto not been made ina manner adequate for scientific purposes. It would appear that by the pushing back of the date of the inven- tion, in spite of Junius, to 1420-1428, two inhabitants of Haarlem have been mixed up by the Dutch authors on the subject. (1) Lourens Janszoon, who never bore the surname Coster, and whose existence seems to be authenticated by documents from 1404 to 1439, was sheriff, and a wine merchant aud innkeeper, and is sup- posed to have died in 1439. About 1870, however, researches brought to light that there had been (2) a Lourens Janszoon Coster at Haarlem, duly authenticated by genuine official documents as a chandler and innkeeper, from 1486 to 1483, who went away from Haarlem in the latter year. The name of this man and some genea- logical particulars known of him fit into

the story of Junius, though there are certain particulars in Junius's account which cannot yet be properly explained.

Junius bases his account of the Haarlem invention on three books, a Dutch edition of the Speculum Humane Salvationis, the Doctrinale, and the Tracts of Petrus Hispanus (Pope John XXI1.). The first work, he said, was printed by Coster himself as a first specimen of his art, and it would seem from his words that he con- sidered the work to be printed with wooden types. The two Dutch editions of the Spcculwm, however, were printed, like the two Latin editions of the same work, with movable metal type, though in one of the Latin editions there are twenty leaves the text of which is

'printed apparently from wooden blocks. The Doctrinale and the Tracts of Hispanus were printed, Junius says, at Mainz by Coster's workman with the types which he had stolen from Coster. Of the Hispanus 7'racts no edition has yet come to light that would answer to Junius's description. But of the Doctrinale we have four edi- tions, all printed in the same type (i.) as the four editions of the Speculum, With these same types are printed no less than six editions of the short Latin grammar of Mlius Donatus; and editions of this school-book printed in Holland were, according to Zell in the Cologne Chronicle, the models for the printing at Mainz, which commenced about 1450. As there are no other editions of Donatus printed in Holland that could be placed before the year 1450, the claims of Haarlem and Holland are based on them; and we will, therefore, briefly describe the types and books which must be con- nected with the Specula, Doctrinalia, and Donatuscs just mentioned. In one of the editions of the Speculum in Dutch oecur two leaves printed in a different type (ii.) from the rest of the work. This type is in its turn so very much like another type with which a work of Laur. Valla (Facctiw Morales) is printed that we link it (iii.) on to the two just mentioned. Then again type iii. is, in some of its capitals, identical with a type (iv.) used for a work of Ludovicus de Roma, Singularia Juris, at the end of which, on the last leaf, commences another work, printed in a different type (v.).

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Type vi. is identical with type v., except in its capital P, which is larger. We have also works printed in two different types (vii., vill.) which both show such a great family likeness to each other and to types i. to vi. that it would not be advisable to separate them without evidence that they do not belong to the same office. With these eight types, which we cannot at present separate, forty- seven different books were printed, so far as we know at preseut. In type i.:—four editions (two in Latin,! two in Dutch) of the Speculum Humanx Salvationis, a work which consists of woodcuts with explanatory text underneath ; a Dutch version of The Scven Penitential Psalms; one Donatus of 27 lines; two editions of Donatus of 28 lines; a Liturgical Book in 16mo; three editions of Donatus of 30 lines ; one Donatus, in French, of 29 and 30 lines on a page; four editions of Doctrinalc of 32 lines; one Catonis Disticha of 21 lines, In type ii.:—two leaves only (49 and 60) of one of the Dutch editions of the Speculwm. In type iii.—Lauren- tius Valla, Facctiw# Morales, &. In type iv.:—four editions of Donatus of 24 lines ; Lud. (Pontanus) de Roma, Singularia Juris ; Lud. (Pontanus) de Roma (2), Treatise on Canonical Law (2). In type v.:—Pius II., Tractatus ct Epitaphia (printed at the end of the Singularia Juris) ; Guil. de Saliceto, De Salute Corporis ; one Donatus of 26 lines ; five editions of Donatus of 27 lines ; one Doc- trinale of 26 lines; one Doctrinale of 28 lines; one Doctrinalc of 29 lines; one Doctrinale of 32 lines; Catonis Disticha; Guil. de Saliceto, De Salute Corporis, together with Turrecremata, De Salute Animex; Pius II., Tractatus de Amore, &c.; Pindar of Thebes, Iliados Homerice Epitome, cum Preefatione Pit II.; another edition of the same work. In type vi.:—one Donatus of 26 lines; one Donatus of 27 lines. In type vii.:—one Donatus of 27 lines. In type viii.: —an Abccecdarium of two leaves and a Donatus of 31 lines.”

Type v. must have been in existence before 13th September 1474, as there is evidence that a copy of the Saliccto, printed in that type, was bought for the monastery of St James at Lille by its abbot Conrad du Moulin, who filled that office from the end of 1471 to 18th September 1474. As a work in this type (the Tracts and Epitaphs of Pius II.) is printed at the end of the Stagularia Juris in type iv., we may assume that this type existed a considerable time before type v. As the books printed in types iv. and v. show greater progress in style and workmanship than the books printed in types i. to iii., we must assign the latter to an earlier period than the former.

There is indeed positive evidence that type i. must have existed a considerable time before the end of 1473, as fragments of a Donatus printed in that type were used by a book- binder at Haarlem to strengthen the binding of an account-book of the cathedral church in that town for the year 1474. From these facts alone we may safely assume that none of the forty-seven books can be dated after 1474, or, if any, only a few in types v. and vii. On the other hand, four of the works in type v. cannot be dated before 1458, as they bear the name of Pius I]., who was not elected pope till that year. When we consider that there are twenty differ- ent editions of the Donatus printed in these types, and place an interval of about eighteen months between the successive editions, we get a period of some thirty years from about 1445 to 1474 for the issue of the twenty editions. That we reach the year 1445 by such a calculation is purely accidental ; but there is evidence that in 1446 and 1451 printed® Doctrinalia were bought at Bruges and Valenciennes by Jean Le Robert, the abbot of Cambray, according to two entries in his diary, preserved in the archives at Lille. And, as we know positively that there was no printing done at Mainz before 1454, nor anywhere else so early, we can only apply these entries to the Doctrinalia printed in Holland in the same types as the four editions of the Specudwm (on which Junius based the tra- dition of the Haarlem invention), and six editions of the Donatus, which we may fit into Zell's account. That the editions of the Speculum, of the Donatus, and of the Doctrinalc in type i. may be dated as early as 1445-1454 is clear when we compare them with the earliest products of Mainz printing, for which the Donatuses, according to the Cologne Chronicle, served as models. For instance, no difference in workmanship can be detected between the Donatuses printed in Holland and the three editions of Donatus in the 36-line Bible type and the four editions of the same in the 42-line Bible type, all seven presumably printed at Mainz and before 1456. Nor is the workmanship of the Spccwla (in type i.) or of the Pacetia Morales (in type iii.) different from or later than that of the Mainz Catholicon of 1460.

It has been pointed out above that the first products of the art of printing were not meant to be anything but faithful imitations of manuscript books, and that no material deviations from the general plan become observable till about 1473-1477. Nowhere is the plan of the MS. period more strictly adhered to than in the

1 Twenty leaves of one of the Latin editions are apparently printed from wooden bloeks, the text as well as the engravings. f

2 For a detailed list of these books, and further partieulars regarding them, see J. H. Hessels, Haarlem, the Birthplace of Printing, London, 1887, p. 25 sq.

8 The abbot speaks of Doctrinalia ‘‘gette” or ‘‘jettez en molle,” and the phrase is, as Bernard (Origine, i. 97 sg.) shows by eight examples from 1474—the year when printing is first offieially spoken of in Franee—to 1593, and down to the present day, applied to typographieally-printed books only.

Inven- tion at Haarlem by Coster.

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forty-seven books of which we are speaking. They are all without signatures, without initial directors, without hyphens, without catchwords, that is to say, without any of those characteristics which we see gradually, one after the other, come into almost general use from 1473 (if not earlier) to 1480. The four editions of the Speculum are all entirely printed_anopisthographically, the woodeuts at the top of the pages as well as the explanatory text (in type i.) underneath, which would hardly be the case ifeche books had been printed after 1471, when the printing of woodcuts, together with text in movable types, had already been known for eleven years. Their types have nothing in common with any of those used in the Netherlands after 1473, but remind us in every respect of the earlier period of the Dutch block-books and MSS. They are all, so far as we know, without any colophon (except such a word as explicit), which would, for a collection of forty-seven books, be incompatible with a period after 1471, but not with the earlier period of the block-books and MSS. Moreover, out of the forty-seven books no less than thirty-five are printed on vellum, which is incompatible with a period after 1471, when printing on paper had become universal, but not with the earlier period of the MSS.

There is, therefore, no reason whatever to discredit Zell's state- ment in the Cologne Chronicle of 1499, that the Donatuses printed in Holland were the models, the ‘‘ beginning” of the art of print- ing, at Mainz, nor that of Hadrianus Junius in his Batavia, that printing was invented at Haarlem by Lourens Janszoon Coster. The two statements were made independently of each other. That of Zell must be regarded as a direct contradiction of the vague rumours and statements about an invention of printing at Mainz in Germany by Gutenberg, which gradually crept into print in and after 1468 in Italy and France, and which found their way into Germany about 1476, after Mainz and Germany had given the greatest publicity to the existence of the art in their midst for more than twenty-two years, but had been silent about an invention and an inventor. And, though Zell accords to Mainz the honour of having improved the art and having made it more artistic, he denies it the honour of having invented or begun it, and this latter honour was never claimed by that town before 1476. Junius's account is the embodiment of a local tradition at Haarlem, the first written traces of which we have in a pedigree (testimony MM) of the family of the reputed Haarlem inventor, which must have ex- isted at least as early as 1520. His account has been indirectly confirmed by the finding of several fragments at Haarlem, all belong- ing to the groups of books mentioned above, but still more by the discovery of several fragments of the Donatuses printed in the Speculum type, all used as binder's waste by Cornelis, the book- binder, the very man whom Junius alleges to have been the servant of Coster. As the case stands at present, therefore, we have no choice but to say that the invention of printing with movable metal types took place at Haarlem about the year 1445 by Lourens Janszoon Coster.

Early Types and their Fabrication.

We must now take notice of two theories or traditions which have been current for a long time as to some in- tervening stage between the art of block-printing and the art of printing with movable cast types.! One theory or tradition would have it that the inventor of printing, after the idea of single, individual, movable types had arisen in his mind, practised his new invention for some consider- able time with wooden types, and that he came only

gradually to the idea of movable types cast of metal.

Junius gives us to understand that in his opinion the Dutch Speculum was printed with such wooden types. Of Johann Guten- berg it was asserted that he printed his first Bible with wooden types. The Mainz psalter, printed in 1457 by Joh. Fust and Peter Schoeffer, was alleged to have been printed with wooden types, in which case the 4th edition, published in 1502, and even the 5th edition of 1516, would be printed with wooden types, the same being used for them as for the editions of 1457 and 1459. Theod. Bibhander was the first to speak (in 1548) of such types and to de- scribe them: first they cut their letters, he says, on wood-blocks the size of an entire page; but, because the labour and cost of that way was so great, they devised movable wooden types, perforated and joined one to the other by a thread.? Bibliander does not say that he had ever seen such types himself, but Dan. Speckle or Specklin (died 1589), who ascribed the invention to Mentelin, asserts that he saw some of these wooden types at Strasburg.? Angelo

1 We do not allude to Tritheim's assertion that the Catholicon of 1460 was printed from wooden blocks; for this story, which he declares he had heard from Peter Schoeffer, if it were true, would belong to the history of block-printing. Nor need we speak of Bergellanus's verses (1541), in which he dis- tinctly alludes to carved blocks.

Pe ate! de Ratione Communit Omnium Linguarum et Literarum, Zurich, » p. 80.

3 Chron. Argent., MS., ed. Jo. Schilterus, p. 442.

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Roccha asserted in 1591 that he had seen at Venice types perforated and joined one to the other by a thread, but he does not say whether they were of wood or of metal.4 In 1710 Paulus Pater asserted that he had seen wooden types made of the trunk of a box-tree, and perforated in the centre to enable them to be joined together by a thread, originating from the office of Fust at Mainz.® Bodman, as late as 1781, saw the same types in a worm-

eaten con- dition at Mainz; and Fischer stated in 1802 that these relics were used as a sort of token of honour to be bestowed on worthy apprentices on the occasion of their finishing their term.

Besides those who believed in these wooden types from the fact that the letters (especially in the Speculum) vary among themselves in a manner which would not be the case had they been cast from a matrix in a mould, there were authors and practical printers who attempted to cut themselves or to have cut for them some such wooden types as were alleged to have been used by the early printers. Some of them came to the conclusion that such a process would be quite practicable ; others found by experiment that it would, in the case of small types, be wholly impossible. Up to the present time no book or document has come to light which can be asserted to have been printed with such single, movable, wooden types. But nearly all the experiments to which we have alluded were made with the idea that the inventor of printing, or the earliest printers, started, or had to start, with as large a supply of type as a modern printer. This idea is erroneous, asit is hardly any longer denied that, for a good many years after the first appearance of the art, printers printed their books (large or small) not by quires (qua- ternions or quinternions) but page by page.® Therefore, all con- siderations of the experimenters as to the impracticability of such wooden types, on account of the trouble and length of time required for the cutting of thousands of types, fall to the ground in face of the fact that the earliest printers required only a very small quantity of type, in spite of the peculiar forms (combined letters, letters with contractions, &c.) which were then in vogue.

The other theory would have it that between block- Sculpto. printing and printing with movable cast types there was fusi

an intermediate stage of printing with “ sculpto-fusi ” types, that is, types of which the shanks had been cast in a quadri- lateral mould, and the “faces,” 7.¢., the characters or letters, engraved by hand afterwards. This theory was suggested by some who could not believe in wooden types and yet wished to account for the marked irregularities in the types of the earliest printed books.

Gerardus Meerman, the chief champion of this theory, based it, not only on the words of Celtes (Amores, iii. 3), who in 1502 de- scribed Mainz as the city “que prima sculpsit solidos wre char- acteres,” but on the frequent recurrence of the word sew/ptus in the colophons of the early printers (for Jenson and Husner of Strasburg, see p. 681 above). Sensenschmid in 1475 said that the Codex Jus- tintanus was “cut” (dnsculptus), and that he had “cut” (sculpsit) the work of Lombardus, Jn Psalteriwm. Meerman also explained the account of the invention of printing by Trithemius’ as mean- ing that, after the rejection of the first wooden types, the inventors discovered a method of casting the bodies only of all the letters of the Latin alphabet from what they called matrices, on which they cut the face of each letter; and from the same kind of matrices a method was in time discovered of casting the complete letters of sufficient hardness for the pressure they had to bear, which letters they were before—that is, when the bodies only were cast—obliged to cut. In this way Meerman explained that the Speculwm was printed in sculpto-fusi types, although in the one page of which he gives a facsimile there are nearly 1700 separate types, of which 250 alone are e’s. Schoepflin claimed the same invention for Stras- burg, and believed that all the earliest books printed there were produced by this means, Both Meerman and Schoepflin agreed that engraved metal types (Jitere in wre sculpte) were in use for many years after the invention of the punch and matrix, mention- ing among others so printed the Mainz psalter, the Catholicon of 1460, the Egeestein Bible of 1468, and even the Praceptoriwm of Nider, printed at Strasburg in 1476. But the great difficulty con- nected with the process of first casting the shanks and afterwards engraving the faces of the types has become apparent to those who have made experiments ; and it seems more probable that the terms sculpere, exsculpere, insculpere are only a figurative allusion to the first process towards producing the types, namely, the cutting of the punch, which is artistically more important to the fabrication of types than the mechanical casting,—all the more as Schoeffer in 1468 makes his Grammatica Vetus Rhythmica say, ‘‘1 am cast at

4 De Bibliotheca Vaticana, Rome, 1591, p. 412.

5 De Germanie Miraculo, Leipsic, 1710, p. 10.

6 See, for instance, W. Blades, Life of Caxton, i. 39.

7 Annales Hirsaugienses, ii. 421: ‘ Post hee inventis successerunt subtiliora, inveneruntque modum fundendi formas omnium Latini alphabeti literarum, quas ipsi matrices nominabant, ex quibus rursum eeneos sive stanneos charac-

teres fundebant, ad omnem pressuram sufficientes, quos prius manibus sculpe- pant.” 8 Origines Typographice, The Hague, 1765, Append., p. 47.

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Mainz,” an expression which could hardly be anything but a figura- tive allusion to the casting of the types.

Granting that all the earlier works of typography pre- served to us are impressions of cast-metal types, there are still differences of opinion, especially among practical printers, as to the probable methods employed to cast them. It is considered unlikely that the inventor of printing passed all at once to the perfect typography of the punch, the matrix, and the mould. Bernard ! considered that the types of the Speculum were cast in sand, as that art was certainly known to the silversmiths and trinket-makers of the 15th century ; and he accounts for the varieties obgerv- able in the shapes of various letters on the ground that several models would probably be made of each letter, and that the types, when cast by this imperfect mode, would require some touching up or finishing by hand. He ex- hibits a specimen of a word cast for him by this process which not only proves the possibility of casting types in this manner but also shows the same kind of irregularities

as those observable in the types of the Speculum.

But here again it is argued that in types cast by this or any other primitive method there would be an absence of uniformity in what founders term “height to paper.”” Some types would stand higher than others, and the low ones, unless raised, would miss the ink and not appear in the impression. The comparative rarity of faults of this kind in the Speculwm leads one to le

that, if a process of sand-casting had been adopted, the difficulty of uneven heights had been surmounted either by locking up the forme face downwards, or by perforating the types either at the time of casting or afterwards, and holding them in their places by means of a thread or wire. To this cause Ottley attributed the numerous misprints in the Speculum, to correct which would have involved the unthread- ing of every line in which an error occurred. And, as a still more striking proof that the lines were put into the forme one by one, in a piece, he shows a curious printer's blunder at the end of one page, where the whole of the last reference-line is put in upside down, thus :—

Moe was hespot slapende enve niet puetenve, *yaqides ai sigauag A "turn" of this magnitude could hardly have occurred if the letters had been set in the forme type by type. Another suggested mode is that of casting in clay moulds, by a method very similar to that used in the sand process, and resulting in similar peculiarities and variations in the

types.

Ottley, who was the chief exponent of this theory, suggested that the types were made by pouring melted lead or other soft metal into moulds of earth or plaster, after the ordinary manner used from time immemorial in casting statues of bronze and other articles of metal. But the mould thus formed could hardly avail for a second casting, as it would be scarcely possible to extract the type after casting without breaking the clay, and, even if that could be done, the shrinking of the metal in cooling would be apt to warp the mould beyond the possibility of further use. Ottley there- fore suggests that the constant renewal of the moulds could be effected by using old types cast out of them, after being touched up by the graver, as models,—a process which he thinks will account for the varieties observable in the different letters, but which would really cause such a gradual deterioration and attenua- tion in the type, as the work of casting progressed, that in the end it would leave the face of the letter unrecognizable as that with which it began. It would therefore be more reasonable to suppose that one set of modcls would be used for the preparation of all the moulds necessary for the casting of a sufficient number of types to compose a page, and for the pcriodical renewal of the moulds all through the work, and that the

variations in the types would be due, not to the gradual paring of the faces of the models, but to the different skill and exactness with which the successive moulds would be taken. It is evident that the sand and clay methods of casting types above described must be slow. The time occupied after the first engraving of the models in forming, drying, and clear- ing the moulds, in casting, extracting, touching up, and possibly perforating the types required for one page, would exceed the time required by a practised xylographer for the cutting of a page of text upon a block. But he that has gone through the trouble of casting separate movable types has a clear gain over the wood- block printer in having a fount of movable types, which, even if the metal in which they were cast were only soft lead or pewter, might be used again and again in the production of any other page of text, while the wood-block can only produce the one page which

1 Origine de VImprimerie, i. 40.

it contains. Moreover, only one hand could labour on the xylo- graphic block; but many hands could be employed in the mould- ing and casting of types, however rude they might be. Bernard states that the artist who produced for him the few sand-cast types shown in his work assured him that a workman could easily pro- duce a thousand such letters a day. He also states that, though each letter required squaring after casting, there was no need to touch up the faces.

There remains yet another suggestion as to the method in which the types of the rude school may have been produced. This may be described as a system of what the founders of sixty years ago called polytype, which is a cast or facsimile copy of an engraved block, matter in type, &e.

Lambinet,? who is responsible for the suggestion, based upon a new translation of Trithemius’s narrative, explains that this process really means an early adoption of stereotype. He thinks that the first printers may have discovered a way of moulding a page of some work—an Abecedarium—in eooling metal, so as to get a matrix- plate impression of the whole page.

Upon this matrix they would pour a liquid metal, and by the aid of a roller or cylinder press the fused matter evenly, so as to make it penetrate into all the hollows and corners of the letters. This tablet of tin or lead, being easily lifted and detached from the matrix, would then appear as a surface of metal in which the letters of the alphabet stood out reversed and in relief. These letters could easily be detached and rendered mobile by a knife or other sharp instrument, and the operation could be repeated a hundred times a day. The metal faces so produced would be fixed on wooden shanks, type high, and the fount would then be complete. Lambinet's hypothesis was endorsed by Firmin- Didot, the renowned type-founder and printer of Lambinet's day. But it is impossible to suppose that the Mainz psalter of 1457, which these writers point to as a specimen of this mode of execution, is the impression, not of type at all, but of a collection of "casts" mounted on wood.

Whatever value there may be in the above theories with regard to the movable types of the first printer, certain it is that the shape and manufacture of the types used as early as c. 1470 do not seem to have differed materially from those of the present types.

This is evident (1) from the shape of the old types which were discovered in 1878 in the bed of the river Saéne, near Lyons, opposite the site of one of the 15th-century printing houses of that city, and which there is reason to believe belonged once to one of those presses, and were used by the early printers of Lyons ; (2) from a page in Joh. Nider's Lepra Moralis, printed by Conrad Homburch at Cologne in 1476, which shows the accidental impression of a type, pulled np from its place in the course of printing by the ink-ball, and laid at length upon the face of the forme, thus leaving its exact profile indented upon the page; (3) from an entirely similar page (fol. 4>) in Liber de Laudibus ac Festis Gloriosx Virginis, Cologne, c. 1468. From the small circle appearing in the two last-mentioncd types, itis presumed that the letters were pierced laterally by a circular hole, which did not penetrate the whole thickness of the letter, and served, like the nick of modern types, to enable the compositor to tell by touch which way to set the letter in his stick. The fact that in these two cases the letter was pulled up from the forme seems to show that the line could not have been threaded.

Vine. Fineschi, Wotizie Storiche sopra la Stamwperia di Ripoli (Florence, 1781, p. 49), gives an extract from the cost-book of the Ripoli press, about 1480, by which it appears that steel, brass, copper, tin, lead, and iron wire were all used in the manufacture of types at that period?

The history and nomenclature of the earliest types are practically a continuation of the history and nomenclature of the characters figured in the earliest block-books, wood- engravings,and MSS. For instance, Gothic type was first seen about the year 1445; but it should not be forgotten that the Gothic writing, of which that type was an imita- tion, was already known and used about the second half of the 12th century. Again, the pure Roman type, which appeared about 1464, is nothing but an imitation of what in palzography is called the Caroline minuscule, a hand- writing which was already fully developed towards the end of the 8th century. Consequently, details as to the history and development of the various types properly belong to

the study of PaLmocrapuy (¢.v.). 2 Origine de V Imprimerie, Paris, 1810, 2 vols. 8vo, i. 97

3 On the above theories and types consult T. B. Reed, Old English Letter Foundries, pp. 8-26.

Poly- type.

Shape of

earliest

type.

History of the earliest

types.

Gothie.

Bastard Italian or Roman.

Roman.

Burgun- dian.

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The broad outlines of the history of the earliest types are as follows :—

Gothic type, of the angular or pointed kind, was first used by the Haarlem printer of the Speculum, Donatus, &c. (see specimen No. 1, taken from the British Museum copy of the Speewlwn Humane Salvationis, mixed Latin edition), presumably ¢. 1445. An entirely similar but larger type (No. 2, taken from the British Museum copy of Ludovicus [Pontanus] de Roma, Singularia) was used, presumably by the same printer, ¢. 1465-1470. Gothic type appeared in Germany as a church type in 1454, in the 31-line indulgence, pre- sumably printed by Johan Gutenberg at Mainz (No. 8, from the Gottingen copy), and in the 30-line indulgence (No. 4, taken from the British Museum copy), printed by Peter Schoeffer at Mainz. Type No. 3 was also used about the same time for the 36-line Bible and type No. 4 for the 42-line Bible. Two much larger Gothic types appeared in the psalter of 1457, published by Fust and Schoeffer (see Bernard, Origine, pl. vii.). In Italy Gothic type appears in 1468 (No. 5, taken from the British Museum copy of Cicero, De Oratore published at Rome by Ulr. Hahn, 15th December 1468, in small Roman type, with imprint in Gothic), but in a more rounded form ; it is practically the ordinary Italian writing influ- enced by the Gothic. In France Gothic began to be used in 1478 ; in England it — first in Caxton’s type about the year 1480.! It was employed extensively in a great many of the earliest presses all over Europe, and continued to be used largely at all times, especially for Bibles, law books, royal proclamations, &c., and even to this day it is the national character of Germany. It is now usually called lettre de forme, black letter or English in English- speaking countries, lettre Flamand in Holland, and fractur in Germany.

Bastard Italian or bastard Roman was introduced in 1454 at Mainz in the 31-line (No. 6) and 80-line (No. 7) indulgence. It is also called lettre de somnve, some think from the Swimma of Thomas Aquinas, printed in the type of the Bible of 1462 by Fust and Schoeffer. Varieties of this kind of

type were, like the Gothic, much used by the earliest printers, as, for instance, the printer of the 1460 Catholicon, t.e., by Mentelin of Strasburg, e. 1460, and by Ulrich Zell at Cologne, ¢. 1466, &c. In England it appeared in the first three books printed (1478, 1479) at Oxford (No. 8, taken from the British Museum copy of Jerome's Haupositio in Simbolum Apostolorwm, wrongly dated 1468 for 1478).

Roman type, the Caroline minuscule of paleography, was first used in Germany about 1464, at Strasburg, by the printer whose fount of type is known by a peculiarly shaped R, and who on that account is usually called ''the R printer" (No. 9, taken from the British Museum copy of Durandus, Rationale, of which the Basel library possesses a copy which was bought in 1464).? In Italy it appears in 1465 at Subiaco (see Bernard, pl. xii., No. 19), at Rome in 1467 (op. eit., pl. xii., No. 20), but in all its purity at Venice in 1469, used by Johannes of Spires (op. eit., pl. xii., No. 23), and at Paris in 1470 (op. ezt., pl. xiii, No. 25). In England it was not used before 1518, when Richard Pynson printed Pace's Oratio in Pace Nuperrima (see facsimile in Reed's Type Foundries, p. 92).

Burgundian type, or gros batarde or seeretary, was first used about 1470-72 by Colard Mansion at Bruges (No. 10, taken from the British Museum copy of La Controversie de Noblesse, e. 1471-72). With a somewhat similar type (No. 11, taken from the British Museum copy of the Reewyell) William Caxton is presumed to have printed, likewise at Bruges, a set of five books, of which the Reewyell of the History of Troye, a translation of a work by Raoul le Feévre, is the best known and was probably printed ¢. 1471.3 To this same class belong the first type (No. 12, from the British Museum copy of the Dietes) used in England by William Caxton for the printing of Dietes and Sayings of the Philosophers (18th November 1477), and that used by the printer of St Albans (No. 13, taken from the Cambridge university library copy of Aug. Dactus, Elegancie). It

Defadli want PAtnocalat Ot prime mpto «= it furtit- DI

No. 1.—Speculum type, c. 1445 (2). No. 2.—Pontanus type, c. 1470 (%).

VY. Hereatur

Aptorz ei? ac Aiicte b? excel fib; crismib;

“ Nos. 3 and 6.—Mainz 31-line indulgence, 1454.

ifereatur « aplon. efg ac atide exceffiby crimini

Nos. 4 and 7,—Mainz 30-line indulgence, 1454.

(6) (7)

1 See Blades, Life of Caxton, pl. xvii. 2 See Jules Philippe, L’Imprimerie & Paris, p. 219. 3 Cf. Blades, Life of Caxton.

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thbri.g noBlelfe iad ajwicam. x Bonne

No. 5.—Cicero, De Oratore, 1468. No. 10.—Controversie de Noblesse, c. 1471-72.

Duis eft qui Remifimus de mevdius fe dif dinibo. Nae d dat affectum antonomafice

No. 8.—Jerome’s Expositio (1468), 1478, No. 9.—Durandus, c. 1464.

J lemeathcles. na of Qtalaleol Ale generacion and, fF Heth forie & Angythiemenp Cloes flow QUE

No. 11.—Recuyell of the Hist. of Troye, No. 12.—Dictes and Sayings, ec. 1471. 1477.

was an imitation of the manuscript hand ee of the English and Bur oka scribes fatue éabuno plebie: 8 rofiess nomiors

of the 15th century, and, after having 0 figured for a long time in several of the A a. early London and provincial presses, was 7U0 Wanmbale penu

about 1534 entirely superseded by the No. 18.—Aug. Dactus, Ele- English black letter. To this class of paren, 1478,

type belong also the later lettre de eivilité (c. 1570), the script (lettre coulée, lettre de finance, Dutch gesehreven schrift), set court, base secre-

tary, and running secretary types.

On the types before 1500, consult also the facsimiles in Holtrop's Mon. Typ. des Pays-Bas, The Hague, 1868; R. O. Hawkins, First Books and Printers of the Fifteenth Century, New York, 1884; William Blades, The Life of Caxton, London, 1861-63 ; Bernard, Origine de l' Imprimerie, Paris, 1858, vol. i., plates iii.~~xiii. ; Placidus Braun, Notitia de Libris ab Artis Typogr. Inventione usque ad Annum 14,79 Impressis, Augsburg, 1788; H. Noel Humphreys, Hist. of the Art of Print~~ ing, fol., London, 1867. The types after 1500 can best be learned from the catalogues of type-founders, among which those of Messrs Enschedé of Haarlem occupy a foremost place. Of others we may mention—Indice dei Caratteri nella Stampa Vaticana, 4to, Rome, 1628; Epreuves des Caractéeres qui se trouvent chez Claude Lameste, 4to, Paris, 1742; Eprewves des Car. de la Fonderie de Claude Mozet, 8vo, Nantes, 1754; Les Car. de ' Imprimerie par Fournier le Jeune, 8vo, Paris, 1764: Proefvan Letteren, Bloemen, &c., van Ploos van Amstel, 8vo, Amster- dain, 1767; Kpreuve de Car. de Jacques Francois Rosart, 8vo, Brussels, 1771; Schriften… bey J. H. Prentzler, 4to, Frankfort-on-Main, 1774; Epreuves des Car. de la Fond. de J. L. Joannis, 8vo, Paris, 1776; Epreuves des Car. de la Fond. de J. L. de Boubers, 8vo, Brussels, 1777 ; Proeve van Letteren welke gegooten worden door J. de Groot, 8vo, The Hague, 1787 ; Pantographie, by Edmund Fry, 8vo, London, 1799; and Manuale T'ypographico, by G. Bodoni, 4to, Parma, 1818.

Subsequent to 1500.

Though the Cologne Chronicle of 1499 denies to Mainz Printers

the honour of the invention of the art of printing, it was a

right in asserting that, after it had been brought there from Holland, it became much more masterly and exact, and more and more artistic. During

the first half century of printing a good many printers distinguished themselves by the beauty, excellence, and literary value of their productions. We may mention as such :—Johan Fust and Peter Schoeffer at Mainz; Johan Mentelin and Heinrich Eggestein at Strasburg; Ulrich Zell at Cologne ; Sweyn- heym and Pannarts at Subiaco and at Rome; Nicolas Jenson at Venice ; Anton Koberger at Nuremberg; Kete- laer and De Leempt at Utrecht; Johan Veldener at Louvain, Utrecht, and Kuilenburg; Gerard Leeu at Gouda; Johan of Westphalia at Louvain; and William Caxton (g.v.) at Westminster.

Very soon the demand for books increased, and with it came a reduction in their prices. This caused a decline in the execution of printing, which begins to be appreciable about 1480 in some localities, and may be said to have become general towards the end of the 15th century. At all times, however, we find some printers raise their art to a great height by the beauty of their types and the literary excellence of their'productions, Among the later printers we may mention the Aldi of Venice (1490 to 1597; see

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MANvTIUS, vol. xv. p. 512); G. B. Bodoni of Parma (1768- 1813 ; see vol. iii. p. 849) ; John Amerbach at Basel (1492- 1516); John Froben at Basel (1496-1527 ; see vol. ix. p. 791); John Baskerville at Birmingham (1750-1775 ; see vol. ili, p. 421); the house of Wechel, first at Paris (¢. 1530-1572), afterwards at Frankfort; Christopher Plantin at Antwerp (1554-1589), but continued long after under the firm Oficina Plantiniana (see vol. xix. p. 17 6); the Elzevirs, first at Leyden, afterwards at Amsterdam (1580-1680 ; 'see vol. viii. p. 156); Antoine Verard at. Paris (1485-1513) ; Josse Bade at Paris (1495-1535 ; see Bapivs, vol. iii. p. 228); and the Estiennes at Paris (1502-1598 ; see STEPHENS, vol. xxii. p. 534),

History of Modern Types.

The Italic type is said to be an imitation of the handwriting of Petrarch, and was introduced by Aldus Manutius of Venice for the purpose of printing his projected small editions of the classics, The cutting of it was entrusted to

Francesco da Bologna, an artist who is presumed to be identical with the painter Francesco Francia or Raibolini. The fount is a ‘‘lower case” only, the capitals being Roman in form. It contains a large number of tied letters, to imitate handwriting, but is quite free from contractions and liga- tures. It was first used in the Virgil of 1500. Aldus produced six different sizes between 1501 and 1558. It was counterfeited almost immediately in Italy, at Lyons, and elsewhere. Originally it was called Venetian or Aldine, but subsequently Italic type, except in Germany and Holland, where it is called “cursive.” The Watians also adopted the Latin name ‘‘characteres cursivi seu cancellarii.” In England it was first used by Wynkyn de Worde in Wakefield’s Oratio in 1524. The character was at first intended and used for the entire text of classical works. When it became more general, it was employed to distinguish portions of a book not properly belonging to the work, such as introductions, prefaces, indexes, notes, the text itself being in Roman. Later it was used in the text for quotations, and finally served the double part of emphasizing certain words in some works, and in others, chiefly translations of the Bible, of marking words not rightly forming a part of the text.

Greek type (minuscules) first occurs in Cicero, De Offctis printed at Mainz in 1465 by Fust and Schoeffer. The fount used is rude and imperfect, many of the letters being ordinary Latin. In the same year Sweynheym and Pannarts used a Sood Greek letter for some of the quotations in their edition of Lactanttus (sce, for in- stance, leaves lla, 19a, 36a, 139, 140) ; but the supply was evidently short at first, as some of the larger quotations in the first part of the book were left blank to be filled in by hand. The first

book wholly printed in Greek minuscules was the Grammar of:

Lascaris, by Paravisinus, at Milan in 1476, in types stated to have been eut and cast by Demetrius of Crete. The fount contains breathings, accents, and some ligatures. The headings to the ehapters are wholly in capitals. The Anthologia Greca of Las- caris was printed at Florence in 1494 wholly in Greek capitals (littere majusculz), and it is stated in the preface that they were designed after the genuine models of antiquity to be found in the inscriptions on medals, marbles, &c. But as late as 1493 Greek type was not common, for in that year the Veuice printer Symon Bevilaqua issued

Tibullus, Catullus, and Propertius with blanks left in the commentary for the Greek quotations. In England Greck letters appeared for the first time in 1519 in W. de Worde's edition of Whitenton's Grammatica, where a few words are in- troduced cut in wood. Cast types were used at Cambridge in Galen's De Tempcramentis, translated by Linaere, and printed by Siberch in 1521, who styles himself the first Greek printer in England; but the quotations in the Galen are very sparse, and Siberch is not known to have printed any entire book in Greek. The first printer who possessed Greek types in any quantity was Reginald Wolfe, who held a royal patent as printer in Greek, Latin, and Hebrew, and printed in 1548 two Homilies of Chryso- stom, edited by Sir John Chcke, the first Greek lecturer at Cambridge. In Edinburgh, in 1563, and as late as 1579, the space for Greek words was left blank in printing, to be filled in by hand. In 1632 Cambridge applied to Oxford for the loan of a Greek fount to print a Greek Testament, and the same university made an offer in 1700 for the purchase of a fount of the king's Greek at Paris, but withdrew on the French Academy insisting as a con- dition that every work printed should bear the imprint '' characteribus Grecis e typographeo regio Parisiensi." It should not be forgotten that the large number of ligatures in the Greek of that day made the production of a fount a serious business. The Oxford Augustin Greek comprised no fewer than 354 matrices, the

1 These paragraphs on the various types are for the most part taken from T. B. Reed's History of the Old English Letter Foundries, London, 1887, p. 50 sq.

great primer 456, and even one fount showed 776 different sorts. The Dutch founders effected a gradual reduction of the Greek typographical ligatures. Early in the 19th eentury a new fashion of Greek, for which Porson was sponsor and furnished the drawings, was introdueed, and has remained the prevailing form to this day,

The first Hebrew types are generally supposed tc have appeared Hebrew. in 1475 in Petrus Niger's Tractatus contra Perfidos Judzos (leaf 10), printed by

Conrad Fyner at Esslingen. De Rossi states that a Hebrew work in four folio volumes entitled Arba Turim of Rabbi Jacob ben Asher, was printed in 1475 at Pieve di Sacco in Austrian Italy, while in the same year, a few months earlier, Salomon Jarchi's . Comment. on the Pentateuch appeared at Reggio in Italy, printed in the Rabbinical character. Numerous other Hebrew works followed before 1488, in which year the first entire Hebrew Bible was printed, with points, at Soncino, by a family of German Jews. The first English book in which any quantity of Hebrew type was used was Dr Rhys's Cambro-Brytannicew Cymreceve Lingus Institu- tiones, printed by Thomas Orwin in 1592, though already in 1524 Greek characters, but cut in wood, were used by W. de Worde in Wakefield's Oratio. But the Hebrew fount made use of in Walton's Polyglott in 1657 was probably the first important fount cut and cast in England, though there were as yet no matrices there for Rabbinical Hebrew. In the beginning of the 18th century Amster- dam was the centre of the best Hebrew printing in Europe.

The first book printed in Arabie types is said to be a Diwrnale Arabie. Grecorum Arabum, printed at Fano in Italy in 1514.2 Two years later P. P. Porrus's Polyglott Psalter, comprising the Arabic version, was printed at Genoa ; and two years later a Koran in Arabic is said to have been printed at Venice. In 1505 an Arabic Vocabulary at Granada had the words printed in Gothic letters with the Arabic points placed over them; and in other presses where there were no Arabic types the language was expressed in Hebrew letters or cut in wood. De Guignes and othcrs mention a fount of Arabic used by Gromors in Paris in 1539-40 to print Postel's Grammar. In England some Arabic words were introduced in Wakefield's Oratio of 1524, but apparently cut in wood. In Minsheu's Ductor in Linguas, 1617, the Arabic words are printed in Italie chavacters. Laud's gift of Oriental MSS. to Oxford in 1635, and the appoint- ment of an Arabic lecturer, were the first real incentives to the cultivation of the language by English scholars. Previous to this it is stated that the Raphelengius Arabic press at Leyden had been purchased by the English Orientalist, William Bedwell; but, if it was brought to England, it does not appear to have been im- mediately made use of. The Arabic words in Thomas Greave's Oratio de Lingue Arabice Utilitate, printed at Oxford in 1639, were written in by hand.

Syriac type, probably cut in wood, first appeared in Postel's Syriac. Linguarum XII. Alphabeta, printed in Paris in 1538; but the charaeters are so rude-in form and execution as to be searcely legible. In 1555, however, Postel assisted in eutting the' punehes for the Syriac Peshito New Testament, printed at Vienna in 4to, the first portion of the Scriptures, and apparently the first book, printed in that language. In 1569-72 Plantin at Antwerp included the Syriac New Testament in his Polyglott, and reissued it in a separate form in 1574. In England Syriac was usually expressed in the earlier works in Hebrew characters. But in 1652, when the prospectus and pre- liminary specimen of Walton's Polyglott were issued, we find Syriac type in use.

Of the Armenian character the press of the Vatican possessed a Armen- good fount in 1591, when Angelo Roccha showed a specimen in ian. his Bibliotheca Apostolica Vaticana. A psalter is said to have been printed at Rome in 1565, and Rowe Mores mentions doubtfully a liturgy printed at Cracow in 1549. Armenian printing was practised in Paris in 1633 ; but the Armenian bishops, on applying to France for assistance in printing an Armenian Bible in 1662, were refused, and went to Rome, where, as early as 1636, the press of the Propa- ganda had published a specimen of its Armenian matrices. The patriareh, after fifteen months' residence in Rome, removed to Amsterdam, where he established an Armenian press, and printed the Bible in 1666, which was followed in 1668 by a separate edition of the New Testament. In 1669 the press was set up at Marseilles, where it continued for a time, and was ultimately removed to Con- stantinople. In England the first Armenian type was that presented by Dr Fell to Oxford in 1667. The alphabet given in the pro- legomena of Walton's Polyglott was cut in wood.

Of Ethiopic the earliest type appeared in Potken's Psalter and Ethiopic. Song of Solomon, printed at Rome in 1513. The work was reprinted at Cologne in 1518 in Potken's Polyglott Psalter. In 1548 the New Testament was printed at Rome by some Abyssinian priests. The press of the Propaganda issued a specimen of its fount in 1631, and again in Kireher's Prodromus Coptus in 1636. Erpenius at Leyden had an Ethiopie fount, whieh in 1626 was acquired by the Elzevirs. Usher attempted to procure the fount for England ; but, his attempt failing, punches were eut and matrices

prepared by the London founders for the London Polyglott, which showed the Psalms, Canticles, and New Testament in the Ethiopic version.

2 See Panzer, vii. 2.

Of Coptic the press of the Propaganda possessed a fount, and a specimen was issued in 1636, in which year also Kircher's Prodromus Coptus appeared from the same press. In England David Wilkins's edition of the New Testament was printed in 1716 from Coptic types cast with matrices which Dr Fell had presented to Oxford in 1667. The alphabets shown in the introduction and prolegomena to the London Polyglott of 1655 and 1657 were cut in wood.

Of Samaritan the press of the Propaganda had a fount in 1636, and the Paris Polyglott, completed in 1645, contained the entire Pentateuch in type the punches and matrices of which had been specially prepared under Le Jay's direction. The fount used for the London Polyglott in 1657 is admitted to have been an English production, and was probably cut under the supervision of Usher.

With Slavonic type a psalter was printed at Cracow as early as 1491, and reprinted in Montenegro in 1495. The only Slavonic fount in England was that given by Dr Fell to Oxford, and this, Mores states, was replaced in 1695 by a fount of the more modern Russian character, purchased probably at Amsterdam. The Oratio Donvinica of 1700 gives a specimen of this fount, but renders the Russian. Hieronymian version in copper-plate. Modern Slavonic, better

known as Russian, is said to have appeared first in portions of the Old Testament printed at Prague in 1517-19. Ten years later there was Russian type in Venice. A Russian press was established at Stockholm in 1625, and in 1696 there were matrices in Amsterdam, from which came the types used in Ludolph's Grammatica Russica, printed at Oxford in that year, and whence also, it is said, the types were procured which furnished the first St Petersburg press, estab- lished in 1711 by Peter the Great. Mores notes that in 1778 there was no Russian type in England, but that Cottrell was at that

time engaged in preparing a fount. It does not appear that this project was carried out, and the earliest Russian in England was cut by Dr Fry from alphabets in the Vocabularia, collected and published for the empress of Russia in 1786-89. This fount appeared in the Pantographia in 1799. Etruscan. A fount of the Etruscan character cut by William Caslon about 1733 for Swinton of Oxford was apparently the first produced. Fournier in 1766 showed an alphabet engraved in metal or wood. In 1771 the Propaganda published a specimen of their fount, and Bodoni of Parma in 1806 exhibited a third in his Oratio Dominica.

Runic types were first used at Stockholm in a Runic and Swedish Alphabetarium, printed in 1611. The fount, which was cast at the expense of the king, was afterwards acquired by the univer- sity. About the same time Runic type was used at Upsala and at Copenhagen. Voskens of Amsterdam had matrices about the end of that century, and it was from Holland that Francis Junius is supposed to have procured the matrices which in 1677 he pre- sented to Oxford. ‘This fount appears in the Oratio Dominica of 1700, and in Hickes’s Thesawrus, 1708-5, and it remained the only one in England.

Matrices of Gothic type were presented to Oxford by Francis Junius in 1677, and a fount of them was used for the Oratio Dominica of 1700 and in Hickes’s Thesaurus. A different fount was used for Chamberlayne’s Oratio Dominica, printed at Amsterdam in 1715. Caslon cut a fount which appeared in his first specimen in 1734, This and the Oxford fount were the only two in England in 1820.

Founts of Icelandic, Swedish, and Danish were included in Junius’s gift to Oxford in 1677, and were, perhaps, specially pre- pared in Holland. The first-named is shown in the Oratio Dominica of 1700 and in Hickes’s Thesaurus. Printing had been practised in Iceland since 1531, when a Breviary was printed at Hoolum, in types rudely cut, it is alleged, in wood. In 1574, however, metal types were provided, and several works produced. After a period of decline, printing was revived in 1778, and in 1810 Sir George M‘Kenzie reported that the Hoolum press possessed eight founts of type, of which two were Roman, and the remainder of the common

Icelandic character, which, like the Danish and Swedish, bears a close resemblance to the German.

For the Anglo-Saxon language the first type was cut by John Day in 1567, under the direction of Archbishop Parker, and appeared in Alfric's Paschal Homily in that year and in the /fredi Res Gestze of Asser Menevensis in 1574. Anglo-Saxon type was used by Browne in 1617, in Minsheu's Ductor in Linguas ; and Haviland, who printed the second edition of that work in 1626, had in 1623 made use of the character in Lisle's edition of Ailfric's Homily.

The first fount of Irish character was that presented by Queen Elizabeth to O'Kearney in 1571, and used to print the Catechism which appeared in that year in Dublin, from the press of Franckton. But the fount is only partially Irish, many of the letters being ordinary Roman or Italic. It was used in several works during the early years of the 17th century, and as late as 1652 in Godfrey Daniel's Christian Doctrine, printed in Dublin. The Irish seminaries abroad were better supplied with Irish type. A new type was cut by Moxon, and appeared in 1681 in Boyle's New Testament, printed by Robert Everingham.

The earliest specimen of music type occurs in Higden's Poly- chronicon, printed by De Worde at Westminster in 1495. The square notes appear to have been formed of ordinary quadrats, and

Coptic.

Samari- tan.

Slavonic.

Runic,

Gothic.

Scandi- navian.

Anglo- Saxon.

Trish.

Music.

i? Pr GR AY HY

Jiguratus). Before 1550 several European presses followed Petrucci’s

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the staff-lines of metal rules imperfectly joined. In Caxton’s edi- tion of the same work in 1482 the space had been left to be filled up by hand. The plain chant in the Mainz psalter of 1490, printed in two colours, was probably cut in wood. Hans Froschauer of Augsburg printed music from wooden blocks in 1473, and the notes in Burtius’s Opusculwm Musices, printed at Bologna in 1487, appear to have been produced in the same manner; while at Lyons the missal printed by Matthias Hus in 1485 had the staff only printed, : the notes being intended to be filled in by hand. About 1500 a

musical press was established at Venice by Ottavio Petrucci, at which were produced a series of mass-books with lozenge-shaped notes, each being cast complete with a staff-line. In 1513 he re- moved to Fossombrone, and obtained a patent from Leo X. for his invention of types for the sole printing of figurative song (cantus

example, and music type was used, among other places, at Augs- burg in 1506 and 1511, Parma in 1526, Lyons in 1532, and Nurem- berg in 1549. In 1525 Pierre Hautin cut punches of lozenge-shaped music at Paris. Round notes were used at Avignon in 1532, In England, after its first use, music-printing did not become general till 1550, when Grafton printed Marbecke’s Book of Common Prayer, ‘‘noted” in movable type, the four staff-lines being printed in red and the notes in black. There are only four different sorts of notes used,—three square and one lozenge. About 1660 the de- tached notes hitherto employed began to give place to the ‘‘new tyed note,” by which the heads of sets of quavers could be joined. But at the close of the 17th century music-printing from type be- came less common, on

account of the introduction of stamping and engraving plates for the purpose.

Printing for the blind (compare vol. iii. p. 826) was first intro- Printiz duced in 1784 by Valentin Haiiy, the founder of the asylum for for the blind children in Paris. He made use of a large script character, blind, from which impressions were taken on a prepared paper, the im- pressions being so deeply sunk as to leave thcir marks in strong relief and legible to the touch. Hatiy's pupils not only read in this way, but executed their own typography, and in 1786 printed an account of their institution and labours as a specimen of their press. The first school for the blind in England was opened in Liverpool in 1791, but printing in raised characters was not successfully ac- complished till 1827, when Gall of the Edinburgh asylum printed the Gospel of St John from angular types. Alston, the treasurer of the Glasgow asylum, introduced the ordinary Roman capitals in relief, and this system was subsequently improved upon by the addition of the lower-case letters by Dr Fry, the type-founder, whose specimen gained the prize of the Edinburgh Society of Arts in 1837. Several rival systems have competed in England for adoption, of which the most important are those of Lucas, Frere, Moon, Braille, Carton, and Alston; the last-named, as perfected by Dr Fry, seems likely to become the recognized method of print- ing for the blind in all European countries.

'As regards initials in the earliest printed books, see above, p. 686. Initi The trouble and cost involved in the use of the initial director early suggested the use of wood-cut initials, and Erhard Ratdolt of Venice, about 1475, is generally supposed to have been the first printer to introduce the litere# florcntes, called also Icttres towrneures, or typt tornatissimi, which eventually superseded the hand-painted initials, Caxton introduced one or two kinds in 1484. Among the earliest to be used are the so-called Lombardic initials or capitals. The more elaborate initials, such as those used in the Mainz indulgences and psalter, by Aldus at Venice, by Johann Schoeffer at Mainz in 1518, by Tory and the Estiennes at Paris, by Froben at Basel, and by the other great printers of their day, were known as lettres griscs. Besides these, the ordinary "two-line letters" or large plain capitals came into use; and these were generally cast, whilst the ornamental letters were for the most part engraved on wood or metal.

Type ornaments and flowers began, like the initials, with the Orna illuminators, and were afterwards cut on wood or metal. The first ments printed ornament or vignette is supposed to be the scutum or arms and of Fust and Schoeffer in their edition of the Bible of 1462. There flowers is no vignette in the Subiaco Lactantius of 1465 (as stated by Mr Reed, Letter Foundries, p. 82). In Holtrop's Monum. Typogr. des Pays-Bas may be seen borders used by some of the earliest printers of Holland (1475-1490) which would not look bad even in the present time. Caxton in 1490 used ornamental pieces to form the border for his Fifteen O's. At the same time the Paris printers engraved still more elaborate border pieces. At Venice entire frames were engraved in one piece, while Aldus as early as 1495 used tasteful head-pieces cut in artistic harmony with his lettres griscs. Early in the 16th century we observe detached ornaments and flourishes which have evidently been cast from a matrix.

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Part IT.—Practicat.

Printing has been defined to be the act, art, or practice of im- pressing letters, characters, or figures on paper, cloth, or other material, the definition being based on the etymology (Old Fr. empreindre, from Lat. imprimere). Technically the same definition might be applied to such arts as those of calico and oileloth print- ing, and even of moulding, embossing, coining, and stamping ; but in point of fact these are never understood when the word "printing" is employed. There is also printing without pressure, such as photographic printing. The use of a pigment or ink must be regarded as an indispensable element. The application of the term is therefore confined to the use of pressure and a pigment for literary and

pictorial purposes. As thus defined, printing includes three entirely different processes—not inaptly called the polygraphic arts—viz., chalcography or copperplate printing (compare ENGRAV- ING, vol. viii. p. 489 sg.), LirHogRrApPHy (g.v.) or chemical stone- printing, and typography or letterpress printing, The last-named is that to which the present article is confined.

The difference between the three methods lies essentially in the nature or conformation of the surface that is inked, and which afterwards gives a reproduction or image in reverse on the material to be impressed. In copperplate printing the whole of a flat sur- face is inked, and a portion of the ink sinks into an incision or trench, in which it still remains after the surface is cleansed. When pressure is brought to bear, this ink is transferred to the paper, giving an impression of a line. In lithographic printing the flat surface is protected except at certain places, where it is slightly coated with the ink, which practically leaves the stone ee level, but also marks a line when pressure is brought to bear.

n typography the printing surface is in relief. It alone receives ink, the remainder being protected by its lower level. Any kind of printing done from a relief surface belongs to letterpress print- ing, such as a woodcut, a casting in metal, india-rubber, celluloid, xylonite, &. (or “‘stereotype”), or a deposition by electricity (or ‘electrotype”’). The typographic method requires a surface that is more difficult to form than either of the other two. In litho- graphy the surface may be obtained by merely writing or drawing on the stone ; in copperplate printing the line may be immediately incised into or seratched on the plate ; but for letterpress printing the surface between the lines in relief has to be cut away. Hence the tediousness of wood-engraving, in which all the surface of the block has to be removed except those parts that are to be printed from and whieh form the black lines in the impression ; and the conformation of a type surface is similar.

Typography, however, has many compensating advantages. Im- pressions are taken with much greater facility. The inking appli- ance glides over the relief lines to be printed from, whereas it would cling to the entire surface of the stone or the metal ; hence mueh greater pressure would be required in these cases. The unprintable part of the stone in lithography has to be

damped, so as to re el the ink ; the same portion has to be inked and then cleaned off in copperplate printing ; but in letterpress printing the ink only that has to be transferred to the paper needs to be applied to the type. When the design has been drawn on the stone or scratched into the copper, the result does not admit of any further application beyond that at first contemplated. But in letterpress printing the surface may be of a composite character. It may be formed of single pieces representing the several letters, and these, when once formed, may be employed in endless combinations. Only by such means are eheap newspapers and books possible. Before the in- vention of typography (as in the East to the present day), the dif-

ferent pages of a book were printed from wooden blocks, cut after the manner of a wood-engraving. Blocks of this kind are of no use for printing after their first purpose has been fulfilled. They must necessarily be made very slowly and with much labour. Th forming a page of a book, on the other hand, by the typographic method there need (excluding necessary wear and tear) only be the cost of ‘‘composing” the types and of “‘distributing” them into their proper receptacles, from which they may be re-taken many times to form other compositions.

Types: their Material Characteristics,

Exclusive of such printing surfaces as wood-bloeks and casts, the Book- letters, marks, and signs with which letterpress printing is executed work are called types, a proportioned quantity of each of the letters of fount.

the alphabet in any one body or face forming a fount. A book- work fount contains single letters, diphthongs, ligatures (such as ff, fl), accented letters, figures, fractions, points, reference marks, dashes or metal rules (as), leaders (as …...), braces (——.), and signs (as & £). It also includes quadrats,—pieces of metal of various widths, which do not print, but are used to compensate for the shortness of occasional lines, as at the close of a paragraph— and spaces, which separate words and letters. There are thus about 226 separate characters in every ordinary English book-work fount.

The table used by type-founders to regulate the number of each Bill of The sorts are type.

of the several sorts in a fount is called a bill of type. supplied by English type-founders in certain definite proportions, depending upon the number of lower-case m’s. A bill of 3000 m’s usually contains the following :—

[Lower-case.

Figures, &c. Capitals, Small Caps. m 3,000 | , 4,500 | A 700 | A 450 a 9,000 | ; 800 | B 450 | B 270 b 2,000 | : 600 | C 500 | c 850 c 4,000]. 8,000 | D 550 | D 350 dy 2.35 06,000) |< 1,000 | E 750 | B 450 e … 14,000 | ? 300 | F 450 | F 800 fay) 18 0000T 200 | G 450 | G 270 g 2,000 | ’ 800 | H 450 | H 300 h 6,000 | (400 | I 900 | I 450 i 9,000 | [200 | J 300 | J 200 j 500 | * 250 | K 3800 | K 200 k 800 | + 100 | L 550 | L 800 1 5,000 | + 100 | M . 650 | M 300 n 8,000 | § 100 | N 550 | N 350) 8,000 | || 100 | O 550 | o 850 p 2,400 | 4 70 | P 500 | P 270 q 600 Q 200 | Q 120 r 7,000 | 1 700 | R 500 | R 330 8” cer “8000512 600 | S 600 | s 850 t _… 10,000: } 8 600 | T 800 | T 420 u … 4,500 | 4 500 | U 850 | U 240 v 1,500 | 5 500 | V 350 | Vv 200 w 2,500 | 6 500 | W 550 | w 270 x 500 | 7 500 | X 20GN FEA. x 120 y 2,500 | 8 500 | Y 850 | y 200 be 300 | 9 500 | Z 150 | z 120 & 300 | 0 700 | x, 100 | az 60 ff 400 | £ 200; i. 100 | @ 60 | fi 500

fl 300 | é 200;4 . 150 SPACES. ffl 200 | & 200}4 . 150 | Thick 20,000 ffi 800 | a 100 | # 150 | Middle 8,000 ee 200 | é 100 Thin 8,000 ce 100 4 50 | Hair 3,000 — 500 | All other 100 | % 50 | Em qds. 3,000 — 150 | accents 4 50 | En qds. 6,000 —— 100] each 2 50 | —~~ea. 20

80 | & @, ¥, Ib, 50 | § i 25

100 each é 50 | -—-“““ 25 ei ce 100 | a. 30 | 2 50 | ——+._ 25

Large quads, one-tenth of fount. Italic, one-tenth of Roman.

Such a fount would weigh about 750 tb if of piea size, 480 tb if long primer, 400 fb if bourgeois, 330 fb brevier, 280 Ib minion, 220 tb nonpareil, The numbers of the respective letters are based on the requirements of the English language ;! other languages of course require different proportions.

In Latin and French, for instance, q and u would be deficient, h in excess, and w needless. The number of the respective letters may be, and sometimes is, appor- tioned by weight ; for example, in one of the ‘‘ schemes” of founts

1 There is a tradition in one of the oldest English foundries that this scale originated in a laborious calculation of the comparative number of different letters used in setting up a lengthy debate in the House of Commons, it being supposed then that the purest English was spoken there. The scale is, however, frequently found defective in practice. It is a curious fact, for instance, that the matter of Charles Dickens’s works will empty the vowel boxes long before those of the consonants, and that Lord Macaulay’s statelier style will run with like persistency on consonants.

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Parts of a type.

Species of letter.

Speci- mens of

used by type-founders a fount of 125 tb Roman with, as its comple- ment, 10 Tb Italic, includes 8 oz. of E, M, C; 90z. of T; 8 tb ofe; 5 tb each of a, h, n, 0, t; and so on, down to 3 oz. of z. To estimate the quantity of type required for a page, the number of square inches it contains is measured and divided by 4, the quotient being the approximate weight of the matter in pounds. In small founts, however, 50 per cent. is added, and in large ones 30 to 40 per cent., to allow for the letters generally left in the cases, not being required in the job, and for sorts, &c. These figures, although useful, are only approximative, the proportion of the several ingredients of type-metal used by different founders for the various sizes of type greatly varying the calculation.

Each of the parts of a.type has a technical name. In the an- nexed diagram (fig. 1) of the capital letter M the darkest space a, a, a, a, is called the face ;

and only that part of the type touches the paper in printing. The face is divided into the stem, marked 1, which comprises the whole outline of the type M; the serifs, or the hori- zontal lines marked 2, which complete the outline 2 : of the letter; the beard, consisting of the bevel or sloping part marked 8, 6, and the shoulder or flat por- tion below b. The shank is the entire body of the letter, d, the front part (that shown) being known as the belly and the corresponding part behind as the back. The spaces at h and h are the counters, which regulate the distances apart of the stems in a line of type. The hollow groove extending across the shank at ¢, ¢ is the nick, which enables the work- man to recognize the direction of the type and to distinguish different founts of the same body. The absence of this simple expedient would retard the operation of composing types by fully one-half. The earliest type-founders did not know the use of the nick. In some letters, such as j and f, a part of the face overhangs the shank; this is called the kern. The groove g divides the bottom of the type ‘into two parts called the feet. An impression from that .part of a type on which it stands would be as ™. Types must be perfectly rectangular, the minutest deviation rendering them useless. Any roughness at the sides is called burr, and any injury to their faces a batter. Smoothness, sharpness of angle, and perfection of finish are also prime requirements. A line of types, when viewed along the back, presents the appearance of a solid bar of metal.

Types which have the face cast in the middle of the shank, as a, c, e, m, &c., and thus leave an open space above them corresponding to that below, caused by the beard, are known as short letters. Those whose stem extends to the top of the shank, as b, d, f, &., are called ascending letters. Those that have a stem extending over the shoulder, as g, p, &c., are called descending letters. ‘Those that are both ascending and descending, and extend over the whole of the shank, as Q and j, are long letters. Small letters and figures cast upon the upper part of the shank, as 1%, are called superiors ; those very low down on the shank are inferiors,as H,. Types that are very heavy and massive in appearance are called fat-faced ; those that are fine and delicate, lean-faced. A type whose face is not in proportion to the depth of the shank (¢.g., a small pica cast on a pica body) is a bastard type. .

Types are of various sizes, ranging from those used in printing pocket Bibles to those for large placards. The variation is con-

Fic. 1.—Finished type.

principal fined to the superficial dimensions of their ends, or bodies, as they

bodies,

are called. Each body has a distinctive name. The following are specimens of the principal bodies of ordinary types, and show the relation of the various bodies one to another—

Printing bh

Canon—17# lines to the foot.

Printing has b

Double great primer—25§ lines to the foot.

Printing has been

Double English—82 lines to the foot.

Printing has been defined to

Double Pica—41} lines to the foot.

Printing has been defined to be

Great primer—51} lines to the foot.

Printing has been defined to be the ac

English—64 lines to the foot.

Printing has been defined to be the act, art, or Pica—714 lines to the foot,

Printing has been defined to be the act, art, or prac Small pica—83 lines to the foot.

Printing has been defined to be the act, art, or practice of Long primer—89 lines to the foot.

Printing has been defined to be the act, art, or practice of i Bourgeois—1023 lines to the foot.

Printing has been defined to be the act, art, or practice of impress Brevier—111 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing Minion—122 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing lett Emerald—138 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing letters, Nonpareil—143 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing letters, charact Ruby—166 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing letters, characters, or fig Pearl—178 lines to the foot.

Printing bas been defined to be the act, art, or practice of impressing letters, characters,or figures on paper, cloth, Diamond—207 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing letters, characters, or figures on paper, cloth, or othe

Gem—222 lines to the foot.

Printing has been defined to be the act, art, or practice of impressing letters, characters, or figures on paper, cloth, or other

Brilliant—239 lines to the foot.

It is a confusing and inconvenient anomaly that the types made Size of by different English founders vary in size, although they bear the ty same

name, The above figures refer to the types of Messrs Miller and Richard, the royal type-founders for Scotland; but other eminent makers supply, for instance, long primer which is 893, 90, or 92 lines to the foot. This has been remedied in America by an agreement on the part of the founders to adopt one standard pica, to divide that pica into a certain number of equal parts, and to cast all their types as multiples of one of these parts. They divide the pica into twelve points, and the point is the unit upon which the system is based. There is also another practical advan- tage in this multiple system : each type bears a simple proportion to the others, and therefore can be used in exact combination. Thus pearl is 5, nonpareil 6, minion 7, brevier 8, bourgeois 9, long primer 10, small pica 11, and pica 12 points. In Germany, France, and other countries of the Continent a uniform system of points has been adopted, based on a scale of 183 ‘‘ Ciceros” (corpus 12) to 60 | centimetres. The types which most nearly correspond to those already mentioned are :—

Point Size in Point Size in Enis to Centi- Ems to Centi- Foot. metre. y Foot. metre SGI) oni ajsrosela tetas 162°15 °1879 BOrgigD) weecasi saverets 90°08 °3383 Nonpareille 6 …... 18512 “2256 Garmond 10 …..... 81:07 = *8759 Colonel Por sieteiaic oe 115°83 +2632 CICeVONTA he ts. aw oe 67°56 = 4511 Petit @cuusn mga 101°34 = *8008

The number of lines given to the foot in the above specimens of bodies is the theoretic and practically the only approximative standard. The height of types varies slightly with different founders, the mean being 33 in. The old Scotch height is about hy in. higher. Types lower than the ordinary dimension are said to be low to paper, and if surrounded by higher types will not give a perfect impression. Spaces and quadrats were formerly only three- fourths of an inch in height ; but, since electrotyping has become so common, they are almost invariably cut high, 7.e., up to the shoulder of the type. Six lines of pica and twelve lines of nonpareil each cover an inch in depth. It is, however, not possible to know the size of a type in a printed page by placing a rule measure upon it, as many books are not set solid: the lines are not close together, but leaded out with pieces of lead, to make them cover a larger space. A communication of great importance contributed to a newspaper may be set up in the same type as the leading

article; but if not leaded it will appear to the non-technical reader to be in a smaller character.

The width of pages or columns, in the technical language of the printing office, is expressed according to the number of ‘‘ems,”—

PRACTICAL, |

that is, of a pica m,—the square of the depth of pica. As the latter

is one-sixth of an inch, the em is the same width, and a page of

twenty-four ems wide is equal to one 4 inches wide. The columns of this Hncyclopedia are 19 ems wide.

According to the purpose for which they are used, types are divided into two classes—book type, including Roman and Italic, and job type, including a multitude of fanciful forms of letters, chiefly founded on the shape of the Roman and Italic letters, and intended to be more prominent, delicate, elegant, &c. It is imn- possible to enumerate all the varieties of the latter class, as addi- tions are being constantly made and once popular styles always going out of fashion. The leading varieties are the antiques, which are Roman letters with strokes of nearly uniform thickness, as M; sanserifs or grotesques, which have no serifs, as M; blacks, as fA; and scripts, which represent the modern cursive or Italian hand-

writing, as /, Black letter is now only a jobbing type in English-

speaking countries, although, as stated in the historical section of this article, it was the first character used in printing. It is still used in Germany, with certain modifications, as the principal text- letter for books and newspapers. A comparison of the numerous reproductions that have been issued of Caxton's works with any modern line of black letter will show how greatly the form and style have been altered within a period of four centuries. The present style of Roman type dates only from about the first quarter of the 18th century. Previously the approved shape was as follows : —

Printing has been defined to be the act, art, or

The use of this type was revived by Whittingham of the Chiswick Press abont 1843, and it has since become a favourite form, under the name of old style. Some of the punches cut by the first notable English type-founder, Williarn Caslon (1692-1766), have been pre- served and types are being constantly cast from them, Nearly all founders now produce modernized old style. For the recent revival of old style printing, see p. 710 below.

Large letters, such as are employed for large bills and posters, are made of wood, chiefly rock maple, sycamore, pine, and lime. These are cut up, planed to the required size, and then engraved, generally by special machinery, this being a business quite dis- tinct from that of letter-founding. The larger letters are designated as two line, three line, four line, &.,— meaning twice, thrice, or four times the depth of face of pica or great primer, &c,

Type metal is an alloy, of which lead is the principal ingredient ; but, owing to its softness, antimony and tin are added (see vol. ii. p. 129 and vol. xiv. p. 378). A patent type metal (Besley's) was invented in 1855 in which the mixture consisted of lead, regulus of antimony, tin, nickel, copper, and bismuth. Nearly all type is now made with some of these metals superadded. Ductility, hard- ness, and toughness are the prime requisites of a type metal.

The earliest printers made their own types, and the books printed from them can now be distinguished with almost as much certainty as handwriting can be identified. The modern printer has recourse to the type-founder, The first step in the making of type is cutting the letter on the end of a piece of fine steel, forming the punch (sce fig. 2), which is after- wards hardened. This is an operation requir-

ing great care and nicety (there being comparatively few

adepts at it), in order that the various sorts in a fount may be ex- actly uniform in width,

height, and general proportions to each other, A separate Fia. 2.—Punch. Fic. 3.—Drive. Fic. 4.—Matrix.

punch is required for

each character in every fount of type, and the making of them is the most expensive branch of type-founding. During the pro- cess of its manufacture the punch is frequently tested or measured by delicate gauges to insure its accuracy. When finished it is held over a light, the flame of which blackens the letter, and thus enables an impression, called a smoke proof, to be stamped on paper. When the letter is perfect, it is driven into a piece of polished copper, called the drive or strike (fig. 3). This passes to the justifier, who makes the width and depth of the faces uniform throughout the fount. They must then be made to line exactly with each other. When completed, the strike becomes the matrix (fig. 4), wherein the face of the type is made. This method of making a matrix has until now been in almost universal use in Great Britain. It is, however, a very slow and costly process. In America the great majority of matrices are made otherwise. If the design of the fount to be produced is original, it is often cut by hand or by an engraving-machine on the piece of metal which is to form the matrix. If, on the other hand, an existing fount has to be copied, the matrix is made by electro-deposition.

A perfectly good type is selected, and inserted in a mould specially made, called a fusible mould (fig. 5). Sufficient metal of a more fusible nature than the type is cast round it, and forms a shape similar to that of the ordinary mat- rix. This fusible cast is then placed in a box pro- tected by glass and gutta- percha, in order that the copper deposit may be kept square and to the proper dimensions. This arrangement also limits the deposition to the face. The box is immersed in the copper electrotyping solution, in which it may be left until the deposit of metal has increased to a thickness at which it

Fig. 5.—Mould. may be backed up with copper, or it is left until it reaches the

full thickness, which is about 35; of an inch. It is then fitted in line, set, position, and height. The minutest imperfection or blemish is reproduced by the deposition, and the type cast from such a matrix is a perfect counterpart of the original. A school of type-engravers has recently sprung up in the United States, cutting exclusively on metal and producing ornamentation and finish which the punch-cutters cannot rival. It is expected that in the course of time the electrotype matrix will nearly supersede that made in the old-fashioned way with the punch. In the ordinary method the mould in which the body of the type is formed is made of hardened steel in two parts; one part is fastened to the machine and is station- ary, while the other is movable so that it may be adjusted for the proper width of the letters, as one is wider than another. The com- bined matrix and mould are then adjusted to the type-casting machine, which manufactures types at the rate of from 25 to about 120 per minute, according to the body. The metal is kept fluid by a little furnace underneath and is injected into the mould by a pump, the spout of which is in front of the metal pot. The mould is movable, and at every revolution of the wheel it comes up to the spout, receives a charge of metal, and flies back with a fully formed type in its bosom ; when the upper half of the mould is lifted, a type is ejected. The spring in front holds the copper matrix in close proximity to the mould. The letter a, for instance, stamped in the matrix is directly opposite the aperture in the mould which meets the spout of the pump. When a due proportion of a’s are cast, another matrix with b stamped on it takes its place, and so on throughout the whole fount. The types, however, are not finished when they leave the machine.

There will be found attached to each a wedge-shaped jet (fig. 6), somewhat similar to that

on a bullet cast ina hand-mould. These are picked off by

boys at the rate of from 2000 to 6000 per hour,

which still adheres to the shoulder of the type is taken off

by the rubbers, who rub the sides on circular stones or on

files. The types afterwards go to the setters, who arrange

them in long lines ready for the dresser, and he slips them

into a long stick, turns them on their face, and, after duly

fastening them, cuts with a plane a groove in the bottom,

which forms the feet. (These processes are now frequently

performed by a machine, which produces types that do not

require rubbing or dressing.) The types are then dressed

and the picker takes them in hand, in order to pick out Fic. 6. each defective letter with the aid of a magnifying glass. ae They are finally made up into parcels of a convenient size, jet.

called type-founders' pages, weighing about 8 tb each.

Subjoined is a description of a machine for performing automa- Auto- tically the various operations of casting and finishing type which matic was invented about twenty years ago by Messrs J. R. Johnson and typecast- J.S. Atkinson. In this apparatus the metal is fused, injected into ing and the mould, the cast letter turned out, rubbed or planed, first on finishing one side and then on the other, the feet cut out and smoothed, the machine. dressed sides planed alternately, and the finished letter set up on a stick ready for use by the printer. The casting machine and the dressing machine

are in reality distinct, though mounted on a com- mon frame. The whole is driven by a steam-engine or other prime mover. The casting machine consists of a furnace covered by a shallow pot holding the fused metal. In this is a pump, and the mould is placed opposite its nozzle. The mould being adjusted and the matrix in its place, the molten metal is injected and then solidifies, forming a perfect type, but with jet attached. This letter is then thrust out, and the mould closes again for another jet of molten metal. All this is effected by one revolution of the axle of the machine. The letters pass through a channel one by one into the dressing machine. On arriving there they have each of their sides planed in succession by being held against cutters.

When one side is made true with respect to the set of the letter on

Type- case.

Com- posing.

700

its face, it is passed over a second cutter, which planes the second side absolutely parallel to the first. After this the type is carried in a line at right angles to its former course past a series of similar cutters, which plane out the foot, further smooth its surface, and plane each of the two dressed sides in sueccssion ; this completes the dressing or finishing of the types, which, continuing on their course, pass upon a composing stiek and are ready for the printer. The line of types presents the appearance of a solid bar of metal, so true, flat, and square are the surfaces of the several separate letters. This machine has been considerably improved by Mr P. M. Shanks. The new machine is of simpler construction and its parts are more compact. It does not produce better type, nor work quicker,—the speed in all type machines being regulated by the time required to cool the volume of metal, which, when on the machine, is assisted by having water percolating through the heated parts of the mould. The working of the new machine is more readily grasped by the manipulator, and there is considerable re- duction in its cost.
Type-Setting or Composing.

We may now describe the manipulation of the types in the print- ing office, and for the sake of conciseness reference must be made only to the operations connected with ordinary book-work. These differ in details from the methods in use in the other two depart- ments of the printing business, —news-work and job-work.

The types, received from the foundry in the packages called pages, are placed in shallow trays called cases. These contain compartments or boxes, each of which is appropriated to some par- ticular sort or character. ‘The cases when in use stand on frames or sloping desks. The case at the top is the wpper case, and that below the lower ease. The former contains ninety-eight cqual-sized boxes, pager princi- Yo UK;

ally to the capital /ZeUches //) etd small iaitial iG ME: Sai letters; the latter UL has fifty-three boxes of vari-

ous sizes, appropri. ated

Fic. 7.—Type-case.

to the lower-case sorts. The difference in the size of the boxes corresponds to the difference of quantity of letters in a fount, as already stated,—the lower-case e for instance having the largest box. The localization of the letters, &c., is a subject on which opinions differ, the object being to bring the letters most frequently required nearest to the hand of the compositor as he stands at work. As a man picks out from the boxes seldom less than 1500 letters per hour and distributes or replaces on the average about 5000 per hour, it is necessary that the most economical allocation of the boxes should be adopted. The system of allocating the various types is called the day of the case ; fig. 7 illustrates the plan used in the principal English book offices ; but there are many deviations.

The types when taken from the cases are arranged in lines or ‘* composed” in an instrument called a composing stick, made of iron, brass, or gun metal. ‘The’ slide in the middle is movable so as to accommodate varying lengths of lines. In the composing room the frames are arranged in rows, supporting the cases. The compositor fixes the ‘‘copy,” or document whieh he is to repeat in type, in a convenient place before his eye, and on some

part of the case that is seldom used. In his left hand he holds the com- posing stick, and with the thumb and first finger of the right hand lifts the letters from the boxes, and arranges them in the com- posing stick, every letter, point, or sign being picked out separately. In this operation he is much assisted by the use of a setting-rule, a thin brass or stcel plate which, being removed as successive lines are completed, keeps the type in place. “When so many words and parts of words as will nearly fill the line have been composed, it is made the exact length required by inserting or diminishing the space between the several words. This is called justifying the line and is effected by means of the spaces already mentioned. If the work is not “solid ’—that is, if the lines are not close together— the strips of metal called leads are used. They vary in thickness, but always form aliquot parts of pica body. A good compositor must possess intelligence and a reasonable amount of general know- ledge: he must be able to read his copy with readiness, and_ to understand its meaning, in order to punctuate it properly. He should be able to spell correctly, as some copy is almost undeciphcer- able in regard to separate letters, while other copy is incorrectly spelt. When the composing stick is filled, the type is lifted on to a galley, a shallow tray of wood or metal, two or three sides of which are flanged, for the purpose of supporting the type, when the

galley is slightly inelined. Stickful after stickful of type is placed

reetor of the press—deseribed below—begins.

on the galley until it is full. The matter is then fastened up, a proof taken at the proof press, and the work of the reader or eor- The proof, marked with the necessary corrections, is given back to the eompositor, in order that he may make the required alterations in the type.

The type, being duly corrected, is made up into pages of the Impos. required length (unless the author has desired to see proof in ing, slip). It is then imposed, that is, the pages are’ arranged in such a manner that, when printed and the sheet folded, they will fall in due numerical sequence. The

impression from any arrangement of pages will be the reverse of that in whieh they are laid down.

If an ordinary four-page newspaper supplement be opened and

A come out with the first page uppermost, it will be found that on

this side the order of pages is 4, 1; when turned the pages are 2,

3. The type pages must be ranged in the reverse way, as1, 4; 3, 2,

Thus the fourth page is placed alongside the first, because both

must be printed together on the outside ; the third page is to the

left, and the second to the right, because in books the odd page—the. verso —is always to the right. For a quarto a sheet of paper is folded twiee, that is once across its breadth and then once in a : perpendicular direction down the middle. It contains four leaves, ;

and if these are printed on both sides eight pages. The two sides , of a sheet are called the outer and inner formes respectively. A ‘ sheet of octavo is folded three times, making 8 leaves or 16 pages.

The size of a book depends, not only upon the number of times the

sheet has been folded, and described accordingly as 4to, 8vo, 12mo, &c., but upon the size of the sheets. The dimensions of the papers commonly used in book-printing are :—imperial, 22 × 30 inches ; super royal, 204×274; royal, 20×25; medium, 19×24; demy, 174 × 224; double crown, 20×80; double foolscap, 17 × 27 ; post, 15%x194. Hence to say that a book is a quarto merely gives no precise indication of its dimensions, as a quarto of one size of paper may be smaller than an octavo of another ; it is also necessary to know the size of the sheets of which it is composed. :

When a printed book is opened, it will be found that at the foot Signa- of certain pages there is usually a letter and at the foot of another tures a letter anda figure, as B, B 2; further on another letter and another letter and figure. On going through the book it will be seen that the letters are in

regular alphabetical order, and occur at regular intervals of eight, twelve, sixteen, &., pages. These designate the several shects of which the book is composed and are called signa- twres, so that a sheet may be designated B, and the pages of which it consists are thereby sufficiently indicated. (Occasionally, as in 7 the present work, numbers are used instead of letters.) These signatures assist the binder in folding, as they occupy a certain specified place in each shect ; hence to ascertain if the sheet has been folded properly it is only necessary to examine the position of the signature. The binder also is thus assisted in gathering or collating together the sheets of a volume in proper order. Signa- ture A is omitted, because it would be on the title or first page, and would be both unnecessary and unsightly. By old custom J, V, and W are discarded, I and J, U and V being originally used indis- q criminately by printers, while W was written UU or VV. When the alphabet is exhausted, a new one is commenced, distinguished by a figure precedent, as 2B, 2C, &c.

The pages of types are arranged in proper order on a flat table, Forme covered with stone or metal, called the imposing stone, and are then ready to be made into a forme, that is, in such a state that they can be securely fastened up and moved about. The forme is en- closed in an iron frame or chase, subdivided by a cross bar. The portions of the type are separated by furniture, which may be of metal or wood or both. It is of the same height as the chase, but lower than the type, and therefore does not print, but forms the margin of the printed pages. At the sides of the two sections of the formes are pieces of furniture of a tapering shape, called side- sticks, and at the top and bottom corresponding pieces, called foot- sticks. Small wedges, called guoins, are inserted and driven forward by a mallet and a shooting-stick, so that they gradually exert in- creasing pressure upon the type. Other mechanical means for locking up are also occasionally adopted. When sufficiently locked up, the whole is quite as firm and portable, however many thousands of pieces of metal it may consist of, as if it were a single plate.

In this rapid sketch we purposely omit mention of several opera- tions which, though important and indispensable, are only of interest to the workman.

For many years endeavours have been made to construct Type machines for type-setting which should obviate hand labour. setting Picking out the types separately from their boxes and arranging mac them singly in the composing stick is an irksome and monotonous operation, and one which it might be thought comparatively easy

to perform by automatic machinery. But of the many different composing machines that have been invented less than half a dozen have stood the test of practical experience. These have been con- fined to special classes of work, and it is open to doubt whether

the nimble fingers of a good compositor, aided by the brains which no machinery can supply, do not favourably compare on the

PRACTICAL, |

ground of economy with any possible mechanical arrangement. On the other hand, employers and makers of machines allege that owing to the opposition of the men machine type-setting has not had fair play. However that may be, it is undeniable that a composing machine is still rare in printing offices, and where employed it is only as an auxiliary to the ordinary labour of the men. It deserves to be mentioned that nearly the whole of the Times, with the single exccption of the advertisements, has for years past been set up by machinery, and that more than 10,000 pages of the present edition of the Encyclopedia Britannica have also been so set up. We have not space to describe with any minuteness the construction of ———— composing machines. In the Fraser machine (fig. 8), one of the simplest of its class, which has been made use of to the extent already mentioned in the present work, the types are contained in a series of grooved trays A, in the upper art of the machine, the trays ising previously been filled by complementary apparatus called the distributor. In these trays the types are kept in position, and pressed to- wards the front part of each tray, by slips of metal at- tached by eords to the box- wheels B; each of these con- tains a spring of suflicient strength to press the line of types steadily forward against the separators C, which are formed with an inverted shoulder, under which the front type in each line passes. The keys are connected by levers to the separators, and the depression of any key causes the corresponding separ- ator to descend, carrying with it the front

type of the line into the grooved face-plate, down which it slides into the com- posing stick G. Immediately the finger is lifted from the key the spiral spring D raises the separator to its original position, and the next type in the line takes the place of the one just released, and so in succession as fast as the keys can be pressed. Under the keys runs a rod connected by a crank motion with the pusher G, which, with every depression of a key, pushes forward the line of type in the composing stick, thus making room for the next letter. The matter is thus set in one continuous line, ready to be divided into lines of the required length either by the operator at the machine or by another hand working in conjunction. The speed of the machine varies from 6000 to 12,000 types per hour, but is regulated solely by the skill of the operator, as the machine will work as fast as the keys can be pressed. The composing machines now employed at the Z'imes office are an improved form of an apparatus invented by Charles Kastenbein, and introduced there in 1872. The oper- ator sits in front of four rows of keys one above the other, something like the manuals of an organ, but only about 3 feet wide. Each of the keys corresponds to a type or character. The types are kept in tin tubes placed vertically at the top of the machine. The de- pression of a key works a series of levers, and an iron finger pushes the undermost type from its tube, when it falls into a groove formed in a conducting plate, narrowing at the bottom to its apex. Iinme- diately below is a receptacle, and by the action of a treadle the type is pushed along a channel. Other letters follow, the matter being thus set up in a long line, on a groove of the width of an em quad, and running from left to right. The type when it first eomes into the groove is in an upright position, but in passing along it becomes twisted, so that the letters stand at an angle of about 45° when they reach the point at which they are justified. This groove eom- municates at its dexter extremity with the justifying galley,—a simple apparatus, something of the nature of a composing stick and

Fia. 8.—Fraser composing machine.

the adoption to setting up types of the Jacquard card of the power loom, which weaves automatically the most intricate patterns of cloth. The

apparatus consists of three parts,—two used for pre- paring the ‘‘card” or ribbon, which directs the third in the opera- tion of type composing. The perforator is like a small cottage pianoforte. When the keys are struck they produce a perforation, and the ribbon is made to move aside a little, so that a new surface may be presented for puncturing. The composer is a circular iron table, 4 feet in diameter, having round its periphery a number of boxes divided into sections, each of which holds one kind of type. On a slightly lower plane is a wheel carrying little brass tables, hinged at one end. When the machine is im motion, the types are pushed out on to the table, which passes with its freight round its course until it comes to the point of delivery, when the types are swept off. The rising of the table, and the drawing out of the types, are guided by the perforated paper. Hence the machine sets types without a human compositor. When once the ribbon is perforated, it may be used over again for subsequent editions of the same work, which may be in a different size of type. These machines are only in use.in the office of the inventor.

As has been already described under RevorTIne (vol. xx. p. 406), the parliamentary reports of some newspapers are set up entirely without copy, —by the ear, not by the eye. It has been found that by the aid of the machine the matter can be set up half as fast again as it eould be written out: the average speed of the compos- ing machine is 230 lincs per hour when the copy is dictated to the operator, whereas the most skilful workman setting at ease in the usual way can do but 50 lines per hour.

For many years it was a favourite idea with inventors, especially Logo- those who were not practical printers, that great economy might be types.

gained in eomposition by the use of word-characters or “ logotypes,” instead of single letters. The constant repetition of many words seemed to suggest that they might be cast in one piece. Combina- tions suitable for affixes and suffixes, as ad-, ac-, in-, -ing, ~~ment, &c., it was also suggested, should be used instead of the single component Ictters. The suggestion has, however, not been carried out, at least to any considerable extent. The chief practical objection to it is that it involves the use of cases with an inconveniently large num~~ ber of boxes. The more the variety of characters is multiplied the more “travel” of the compositor’s hand over the cases is

necessary for picking them up, and by so much is the speed of his work re-
tarded. Logotypes, too, are more liable to accident; when one letter is
damaged the combination is rendered useless.

The correction of the type is a subject that should be understood Correct- by
all who have to do with printing, as many mistakes are made ing type.

on the part of authors which a little technical knowledge would prevent. In
the course of setting any copy or MS. which may be given him the
compositor unavoidably picks up some wrong letters, or mistakes the words
in the copy before him, or fails to follow the style prescribed for the work.
These are called printer's errors. When the compositor has finished his task,
a first proof of the matter is taken, This proof is read through and compared
with the copy by the proof reader or corrector of the press and an assist- ant,
the copy-holder or reading boy. The proof is then sent back to the
compositor and the latter is required to correct all the inac- curacies
indicated therein—in fact, to attend to all the directions given by the reader
—and this has to be done at his own cost if he is working on piece—that is,
paid by results according to work done —or by the employer if he is
working ''on establishment wages " or paid by time. Another proof called a
revise is now taken ; this is carefully compared with the previous proof. If
the corrections have not all been made, the revise is marked accordingly,
and sent back to the compositor, who is required to remedy the imperfec-
tions. When the proof is deemed aceurate, or '' clean," it is sent, generally
along with the copy, to the author,—being now termed an author's proof.
Finally, in the printing office the matter is carefully re-read and compared
with the last author's proof by the press reader, who signs it and on his
responsibility the type is printed off.

The operation of distributing the types is the converse of that Distri- of
composing: it is de-composing the forme and returning the buting several
letters to their proper boxes in the case. Itis done, as already type.

galley combined. Then the type is divided into portions or lines of the
required length and justified in the galley, which is adjustable

to the width of the required length. As the long line approaches him, the
justifier with a small bodkin accelerates a portion large enough in his

judgment to fill the width of his column. When this is done he presses his foot on the treadle under him, and thereby causes the line to be pushed into the galley. The line is justified by spaces and quads, and enough type is then taken for another line. The Gonos depends on the operator, and varies from 6000 to 13,000 types per hour, the average being about 8000, with two operators,—a justifier and a compositor being also necessary. These machines are worked in the J%mes office at the rate of a column of solid minion an hour. The machine occupies a floor space of only about 4 feet wide by 2 deep.

Another machine at present in use is that of Mr Robert Hattersley of Manchester. It probably furnished the general scheme of others in use. One of the most ingenious machines of the kind is that of Mr Alexander Mackie of Warrington, its general principle being

mentioned, with remarkable rapidity. The forme is first washed over with an alkaline or other detergent to remove the ink from its surface, and then laid down on the imposing surface, unlocked, and damped ; this assists the cohesion of the type, after the chase, furniture, sidc sticks, &c., areremoved. The compositor then takes in his left hand, supported by a setting rule, a portion of type in lines, and with the right hand takes a word or so between the finger and thumb, letting each letter drop separately into Its proper box. There is hardly any operation which so strikes a spectator as dis- tributing, for a competent distributor literally showers the types into their receptacles. The types are held upside down, that is, with the nicks uppermost ; hence the letters of each word are read from left to right like ordinary matter when printed, but the words are of course dealt with in the inverse order.

Distributing machines of many different kinds have been invented.

Type-dis- They may be divided into two classes,—those worked entirely by tributing keys or notes, like the pianoforte, and those in which the distributing

machines.

Advan- tages of stereo-

typing.

Process of stereo- typing.

is to a certain extent done automatically. For the former class only the type in ordinary use in printing offices is required. For the latter the type requires to be specially prepared, each character having a distinctive nick or nicks upon it, which correspond with the particular channel of the machine it is intended to occupy, and by which it is guided to its special compartment. Kastenbein has produced a distributor which may be described as a composing machine reversed. The matter to be decomposed is placed at the top in its appropriate tray or fixed galley, the sides of which are adjustable to fit any measure, the back being so constructed that it may be advanced to keep the matter always up to the front. As the matter is pressed towards the front, the first letter of it is brought in contact with a steel pusher, behind it being an aperture com- municating with the channel of the guide plate. The matter is read by the operator ; and he touches the key corresponding to the letter that comes first. Thus the types are conveyed one by one to the guide plate or conductor. It has grooves furnished with little gates or switches, like the points of a railway, and these direct the types into their proper channels. The tubes into which the types are deposited are placed at the foot of each groove. Thus every time a key is depressed the switches move, the pusher sends the type to be distributed out of the line, it falls through the palin and, passing down the channels in the guide plate, reaches the proper tube. The speed

is to a certain extent depend- ent upon the skill of the operator, but averages be- tween 3500 and 4000 per hour. A good compositor can by hand alone distribute as many letters as this. But for <= the purposes of the composing “ machine, hand distributed types would have to be set up again, as the composing | — | machine is supplied not from ordinary cases but from tubes of type. In the Fraser dis- —— a

tributing machine (fig. 9) the Fic, 9.—Fraser distributing machine. page of matter to be distri- buted is placed on the upper part of the machine at H, whence by suitable apparatus it is moved line by line towards the separator

Tin front. The matter is there read by the operator, and as each letter comes in contact with the separator the corresponding key is pressed and the type is conveyed to the guide plate, where a series of switches guide it to its proper compartment in the tray of the composing machine.

Stereotyping, Electrotyping, de.

The method of reproducing and multiplying letter-press printing surfaces by taking casts of them, or stereotypes, has greatly con- duced to the progress of typography,—much more so, indeed, than might be realized by those who are unacquainted with the practical details of the art. Stereotyping (orepeds, fixed or solid ; Tvzos, type or forme) is the method of taking casts from a fixed or mov- atte forme; thus, printing from stereotypes is distinguished from typography, in which impressions are taken from movable types. It does not supersede type-founding, but supplements it, for a page of reading matter requires first of all to be set up letter by letter, and then the casts or plates are taken, each of which may be printed from with nearly as much perfection as from the original forme. Hence a printing surface may be reproduced to an almost infinite extent, and the means of production of impressions on the press or machine are increased in proportion to the number of casts taken. It ensures an accurate copy of an original text, whereas in repro- duction by resetting the movable types there is a liability to devia- tion. When only a cast is worked from, any accident may be re- paired by taking another cast, and the cost is slight compared with that of composing over again. A smaller quantity of type may be used in an office where this process is used ; a portion of a work may be set up, a cast taken, and the types returned to the cases. The plates are more easily stored than movable formes, and are not liable to the danger, as in the latter, of types falling out. Above all, the mould may be bent to any curve required, and a circular cast obtained, which may be fastened round the cylinder of a machine (see infra in regard to rotary printing).

The process of stereotyping, divested of merely technical details, is as follows. From a forme of matter, which may be wholly or in part composed of movable types, a matrix or mould is taken. The original is in rilievo ; the mould consequently is in intaglio. From this the stereo plate is cast, and it of course is again in rilievo. This in turn may likewise become an original,

and casts may be taken from a plate, or other casts from the same mould. The first books were printed from solid wooden blocks, each of which formed a page. Then came the era of typography, in which these pages

were composed, mosaic-like, of movable types. Now has succeeded the period of stereotyping, in which pages formed of single blocks —but of metal, not of wood—are used, The two essential parts are, therefore, the making of the matrix and of the cast, which is com- posed of an alloy something like that for type metal. The mould may be of plaster of Paris or papier-mache ; the latter being the simplest material, and that almost universally used, need alone be here referred to. The following account of the process, when carried out on the smallest possible scale, is sufficient perhaps to show the general principles of the art. The papier-maché for the mould, called flong, is made by uniting several sheets of paper with a paste made of wheaten flour, starch, and alum, to which whiting is added. These ingredients are often varied ; the general object in using them is to obtain a paste which will stand a high temperature without burning. A sheet of brown paper is laid down on a smooth surface and pasted over ; blotting paper is laid on that and pressed down, then pasted over, and a sheet of tissue paper added, which is also pasted, and another sheet of tissue paper placed on the top. This is well smoothed and pressed to give the incorporated material greater firmness and cohesion. Next, to prepare the forme for being moulded, it is surrounded with metal ‘‘ clumps” of the height of the type, placed close to the matter, and then oiled to prevent the flong sticking to it. The latter is then thoroughly damped, to render it quite plastic. The forme being on a level surface, the flong is laid upon it, and on that a piece of linen. ‘The surface is next well beaten all over with a long-handled brush, till the flong sinks into all the declivities of the forme and receives a deep impression of it. This is a process requiring experience and practice. The linen being removed, a piece of very stout paper is laid on the top, and also beaten down, so as to strengthen the flong, and the moulding is finished. The next point is to dry the mould.

In the most rudimentary method a combined drying and casting press is used. It consists of a flat iron surface, with a lid attached to one end by hinges. Over the surface is a cross-head fitted with a screw; pressure may be exerted on anything placed between, the arrangement being like that of a screw letter-copying press. The cross-head can be moved to one side when it is necessary for the lid to be lifted up. Underneath the press is a series of gas jets, by means of which the bed plate is heated. The press stands on supports, but is attached to them only by an axle, and it can be readily changed from the horizontal to the vertical position. The lid of the box is raised and the forme with the flong upon it placed on the centre of the iron surface. After being covered with a blanket, the lid is screwed down upon the whole, and, the gas being a ae the forme and mould are heated for a few minutes, after which the lid is raised, the steam evaporates, and the flong, which has now become the matrix, is thoroughly dry. In large stereotyp- ing foundries, after the flong has been well beaten upon the forme, until the impression of the types is plainly seen on the back, it is baked and dried (the forme still underneath) on a long thick iron slab, called a hot chamber, because it is heated from within by steam. The matrix is then removed from the forme, and any superfluous margin cut away or trimmed ; after this the matrix is dusted with powdered French chalk and is ready for being cast from.! A method has lately come into use for obviating the necessity of keeping the matrix on the type while it is being hardened by drying by heat, whereby the type is injured. The matrix is dried separately, being removed when moist from the forme, as soon as the impression is obtained. It is then placed on a bed of sand heated by gas. The forme is never heated, and there is a great saving of time, because the drying can be done in two minutes. The matrix is laid on the bed of the casting box face upwards, with gauges around it to de- termine the height or thickness of the cast. The lid is put down and screwed tightly, and the position of the press altered from the horizontal to the upright. The metal is then poured in and the press restored to its former position. The matrix is carefully raised aud the plate exposed. It has only to be “trimmed,” the super- fluous metal cut away, and the back planed, to be ready for mount- ing on a block of wood to make it type high.

In stereotyping for the Walter and similar presses the process Stereo The forme is laid on the table of the moulding typmg machine and the flong placed on it and thoroughly beaten in by fora

is as follows.

| q i

hand or passed through a moulding machine, which performs the Walter

same operation. and when nearly dried the matrix is removed from it and again dried. It is then placed in the casting box, which is curved to the circumference of the cylinder of the press. The box, being ona swivel, is set upright. The metal is now poured in from a ladle and the plate cast. It is allowed to stand a minute and then taken out, still hot, and placed upon a “finishing saddle” of the same circular form as the back of the plate, and secured by clamps and screws. An angular-shaped knife or chisel, fixed in a carri- age, is moved by a handle in a semicircular direction across the surface of the plate, in order to remove superfluous portions of metal and to form a bevel whereby the plate can be subsequently

1 These matrices can be preserved for several years, and the stereotyping pro- cess postponed until actually required.

The forme is next placed on a heating surface, press;

Ciluloid

PRACTICAL. |

clamped on the machine. If necessary the plate may be smoothed at the back by a specially-contrived planing machine. The plate is now ready for being placed on the printing machine. Each single operation can be performed with the utmost possible despatch. If the organization is sufficiently perfect, the time for making a plate, from the moment when the forme comes down from the machine-room to that wherein the perfect plate is set on the machine, need only be about eight minutes,

In newspaper establishments where stereotyping is thus adopted the pages are not all made up simultaneously: some are kept open till the last for the latest telegrams. The moment a page is com- pleted and locked up in its chase it is sent down to the foundry, and as many casts taken as there are

printing machines to be set going. One page follows another with rapidity, the first being placed in position on the machine, while the later ones are in the foundry. When all the plates are finished and fixed in their places, six, eight, or ten machines may be simultaneously printing at the rate of nearly 12,000 per hour each. The enormous increase in the circulation of the great daily newspapers would have been impossible but for the cxtraordinary facilities for rapid production provided by stereotyping. This process is also of special utility to the newspaper printer in the case of telegrams arriving late. In machines which printed from the type, late telegrams could only be inserted by a ‘‘stop-press”; that is, the printing was inter- rupted while the alteration was being made. But, when the papier-maché casts of the pages have been taken, the type itself is liberated and sent back to the composing room, so that, if later news arrives while the machines are running, the foreman printer alters the page, a fresh cast of it is taken, and a machine started without intcrrupting the production fora moment. The London evening papers have usually five editions, and for every edition fresh casts are made of one or more of the pages.

Quite recently the substance called celluloid has been introduced instead of the metal referred to previously. A mould is made of yellow oxide of lead and glycerin formed into a semi-fluid paste, which is applied to the surface of the type. The matrix is placed on a powerful press and a heated sheet of celluloid about 3, of an inch thick is laidon it. When pressure is applied, a perfect facsimile is obtained, and it is ready to be printed from when mounted in the usual way. Whereas a good electrotype from a wood block averages six hours in its production, a cast in celluloid can be got in less than an hour. These blocks are very tough and many thousands more of impressions can be printed from them than from stercotypes with- out their showing signs of wear. For small stamps india-rubber is used as a stereotyping material, and afterwards vulcanized. These stamps, being flexible, print on rough surfaces which would not take an impression from ordinary stereotypes. With a flexible surface, too, much less pressure is required.

Machines have been invented to do away with the use of types altogether. The principle is to punch the characters successively on some substance which will act like the flong and become a mould from which sterco plates

may be cast. In an apparatus recently introduced the flong is a prepared piece of millboard, which is placed in front of the steel punches. The latter are driven into the flong with lightning speed and great accuracy. By turning a handle all the Roman punches are changed to Italic; by anothcr a set of sanserif or other founts comes into play. For set- ting time-tables and logarithms the apparatus is said to save ninety per cent. over the ordinary system of hand-setting. The obstacle to the more general use of it is the difficulty of correcting errors. In another machine the punches are driven into a block of teak wood. They are cast to thicknesses which are the multiple of a “point”; hence by a simple calculation they may be spaced out to the exact number of points chosen for the length of the line, and every line leaves the machine justified. The block when com- plete is removed and a stereotype taken, which can be printed as in the ordinary method of typography.

For the reproduction of wood engravings electrotyping has nearly superseded stereotyping, as it produces much better copies. For obtaining plates of type matter it is also better than stereo- typing, as many thousands of impressions may be taken without reducing the sharpness of an electro, while ordinary stereotype would be almost worn out by printing a much smaller number. This arises from the superior hardness and toughness of copper, of which the surface of the electro is formed. Electrotyping, however, is costlier and slowcr.

The forme to be clectrotyped is placed upon a level plate, and surrounded with type-high clumps or metal furniture, and then floated with plaster of Paris, which prevents the mould of wax (to be afterwards made) from penetrating too far into the interstices of the spaces. The forme is next brushed with finely powdered blacklead or plumbago. The nioulding composition is made of melted wax, with the addition of a little blacklead. This is poured into a shallow metal moulding tray, to which two pieces of stout wire are soldered, in order that it may be afterwards suspended in the depositing trough. After the composition is cooled and set its surface is brushed with blacklead, and it is then ready for moulding.

The moulding press may be somcthing like a letter-copying press

or, in a large establishment, may consist of a powerful hydraulic or other press capable of exercising a pressure of many tons. The forme is placed exactly under the centre of the platen, with the moulding tray containing the wax, slightly warm, upon it. An impression is then taken, and the mould afterwards separated from the forme, The mould has next to go through the process of building, that is, heated wax is dropped upon such portions as should be more deeply sunk in the finished electrotype plate, namcly, the places where ‘‘whites” are to appear in the print. The mould, having been finished, has to be blackleaded, plumbago being a con- ductor of electricity, while wax is a non-conductor. The material is well brushed in, filling all the interstices of the forme ; and the entire surface of the mould must be properly covered, to ensure a perfect deposit of the copper. To facilitate this operation, a blackleading machine is used in large establishments. The forme is placed upon a carriage formed of transverse bars and is moved backwards and forwards by a handle and rounce to bring it under the blacklead brush. After the mould is blackleaded, the back of the moulding pan is coated with wax, to prevent the copper from being deposited upon it. The mould is now quickly immersed in one of the compartments of the battery. The process of depositing a copper solution upon the blackleaded surface of the mould is continued until a solid plate is formed, which, though it is scarcely thicker than a finger nail, being about 5 inch, forms, when pro- perly backed, the best and most enduring surface for letterpress printing that has been discovered.

The moulding tray containing the mould is hung on the brass rod of the depositing trough facing a plate of copper, and the con- nexion of the battery made: that is, the mould is attached to one pole of the battery and the plate of copper to the other. The copper, so to speak, is decomposed on the one hand and recomposed on the other: in other words, the current of electricity being com- plete, and the mould submerged in the sulphate of copper solution, the deposition of copper on the mould at once commences, Here it remains until the deposit is sufficient, the time usually occupied being from 8 to 12 hours, according to the state of the solution and the strength of the batteries. ‘The dynamo-electro machine, which is now employed in large houses, very materially reduces this period ; otherwise

Smee’s batteries are generally used. When the deposit, or, as it is called, the shell, formed on the wax mould is of proper thickness, it is disengaged from the wax,—the mould being placed with its back on an inclined board, and boiling water poured over the shell, which melts the surface of the wax, except a thin coating, the removal of which is effected by placing the mould and shell on a steam heating table. . Thus the wax mould is destroyed, and it is not possible to obtain more than one shell from a mould, whereas the stereotype process cnables almost an number of casts to be taken from the same matrix. The shell, being too thin and fragile to be printed from, is next backed, or filled up with metal of a somewhat softer kind than stereo metal. The shell, after being further cleaned, is lowered on to the top of a vessel of molten type metal ; and, when the solder previously used to unite the copper and the metal has fused, the latter is poured over it in a molten state until it is covered. The plate is washed, dried, and polished, the back roughly planed to a surface parallel to the front, the edges squared, and all imperfections made good. The thickness of a plate is usually a pica or 3th inch. It is mounted as an ordinary stereotype plate. Within the last few years the pro- cess has been greatly facilitated by the employment of specially contrived apparatus, and illustrations can be produced in three hours from the time the mould is made. Curved electros are pro- duced, as well as curved stereos, for use in rotary printing. Facing with nickel by the electroplating process is now largely adopted for hardening stereotypes and electrotypes and rendering them more durable, This process also prevents the deterioration of such plates by the action of the acids or other chemical reagents often present in printing inks, such as cyanide of potassium in red ink and nitric acid in some blue inks.

Polytyping is a method invented in France about the end of the Poly- 18th century, but now seldom practised in the United Kingdom. typing.

The apparatus somewhat resembles a pile-driver. It has two upright guides about six feet high, and a pulley at the top, which elevates by means of a rope a heavy plate, on which the matrix is placed in an inverted position. At the foot of the machine there is a sub- stantial iron bed, upon which the operator places some molten metal. He then pulls the rope until the matrix, with its weight attached, is elevated to the top of the machine, when it is suddenly allowed to fall. The result is similar to that made on a medal by

means of a die,—a perfect reproduction of the matrix in relief, which is mounted on a metal stand to type height. The results are excellent, as the plastic metal is forced into the finest lines of the matrix. Duplicates of a block can be thus produced more rapidly than by the ordinary stereotype process ; and another ad- vantage is that the intaglio parts are much deeper, —a point of some importance in printing. The matrix may be made from the block by the electrotyping process.

Process blocks.

Typo- etching.

Tone blocks.

Typo- graphic etching.

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Substitutes for Vood-Engraving.

Formerly the only available method of obtaining illustrations which could be printed on the letter-press in conjunction with type was that of wood-engraving. At the present time a number of comparatively new processes are in operation, in which the engrav- ing is done almost automatically by the adoption of chemical pro- cesses and the well-known principles of photography. Engravings of this kind are called in the trade process blocks, or sometimes ztnco- types, owing to the metal of which they are formed. There is space here for only the barest possible account of the processes.

In the first method, which is sometimes called typo-etehing, the drawing is made with ordinary lithographic ink on stone, or on paper and transferred to stone. It is then re-transferred to a plate of polished zinc by the ordinary lithographic process. Zine is employed on account of its cheapness and its ready solubility in the acids used for etching. It has properties similar to those of the lithographic stone in taking up the ink and the water. The transfer is made to adhere to the plate by being passed through a lithographic press ; the paper is then stripped off; and the whole of the ink is left on the plate, which is inked up as a litho stone with a view to render the

lines as solid and strong as possible to resist the acid. The covering of the lines is strengthened by dust- ing powdered asphalt or some other suitable material over the plate, which is warmed just sufficiently to incorporate the asphalt with the ink. The plate is next placed in a bath of acid (its back and other parts, where the acid is not required to act, being protected by varnish), in order that the unprotected parts, or those which are to form the whites of the finished picture, may be dissolved away. In order to prevent the acid eating not only straight down into the plate but on the sides of the furrows it forms, and thus undermining them, an ingenious device has been adopted. As soon as the etching has proceeded to a very slight depth, the plate is removed from the bath, washed, and heated. The ink and other protective medium are thus melted and run down the sides of the little furrows formed by the acids and thereby protect them from further action. Inking and dusting with resinous material are repeated, and etching resumed, until the depressions of the block have been brought to the proper depth. The etching is carried on in troughs to which a rocking motion is given, so that the acid flows to and fro in waves over the surface, and little bubbles of gas, &e., are carried away. Where large spaces of white occur, the metal is cleared away by a drill; after the block has been mounted type high, it is ready for the printer.

This process is only available for the production of “ line blocks,” #.e., those in which the original drawing is done in lines or dots, as for an ordinary woodcut. The highest achievement of process blocks has been the production of tone blocks, which may be made direct from oil-paintings, water-colours, photographs, draw- ings in chalk, wash, pencil, &c., or indeed from anything from which a photographic negative can be taken. The exact nature of the processes is a trade secret, but the rationale is given in Mr Truman Wood’s Modern Methods of Illustrating Books (London, 1887), to which we are indebted for the following details, The problem is to translate, as it were, the light and shade of the negative into solid outlines of black and white. The shades must be lines of various breadths or of various distances apart, or spots or grain of various degrees of fineness or closeness. In a surface- block any part that touches the paper prints, and any part that does not touch the paper does not leave any mark at all. The photographic image is continuous: there are no outlines in it, the picture being formed of graduated tints or shades, ranging from the white of the paper up to the

darkest colour that the process employed can give. To make a block for letter-press printing the graduated tints of the photograph have to be broken up into stipple or grain, and it must be a stipple closest in the shadows, gradually becoming more open through the range of the intermediate tones, and vanishing altogether in the highest lights. To describe the ingenious methods adopted to secure this end would involve an account of several photographic operations which would be out of place here. In one process, perfected by Meisenbach of Munich in 1882, grained negatives are produced by placing a transparent screen, on which a suitable grain is imprinted, in contact with the negative or the positive to be copied, and then photographing the two together. The negative is transferred to a plate of suitable material, which is graved or etched in the usual manner, to form a typographic block. Another device is to print from the original negative upon a piece of silk, the threads of which break up the picture into a regular grain. The positive on the silk is then photographed and a printing block made. These blocks require from their very low relief delicate and careful printing, but are made to give excellent results.

A process of typographic etching has been invented by Messrs Dawson, in which the design is drawn with an etching needle on a brass plate covered with a wax etching ground, in the same manner as for an ordinary etching. The metal is therefore bared at the lines, which are separated by ridges and spaces of wax. These spaces are

strengthened by the addition of melted wax, which runs up to the edges of the lines, but does not run over on to them as might be expected, filling them up. The supply is continued until the spaces between the lines, representing the whites of the finished print, have been raised to a height sufficient to give the necessary relief, when an electrotype is taken. This electrotype forms the printing surface. ;

Shanks’s process is a device for producing pictures simply by the Shanks’s use of mechanism, and is an application of the cidograph. The process plate to be drawn upon is moved under the drawing implement. which is a

rapidly revolving cutter, and the plate on its carrier is mounted on the end of a series of Icvers in the same way as the slide rest of a lathe, so as to have motion in two directions, one at right angles to the other, and consequently by a combination of the two to have motion in any direction in the same plane. If a plate of a suitable substance, such as hardened plaster of Paris, be mounted on the carrier, and the bracing point at the other end of the lever be moved over the lines of a drawing, the cutter will plough a little furrow, which will follow these lines. When the plate is finished, a stcreotype is takcn from it and forms the print- ing surface. The lines of the casts are remarkably strong owing to the conformation of the furrow of the mould, and they can be printed on fast rotary machines. The weather charts given in some newspapers are produced by this process. A block with the recurring outlines being made, plates are moulded from it, so that the details alone have to be separately cut upon future plates. Mr Shanks's method is remarkably simnple and expeditious, and the results are economical and trustworthy.

Press-Work and Presses,

The characteristic of printing, as already pointed out, is that the pigment—the ink—with which the printing surface of the type is coated is transferred to the paper or other material by pressure. The manner in which this pressure is exerted gives rise to two classes of machinery,—those in which the platen and the cylinder respectively are employed. After the paper is placed on the type, in the one case a flat plate of iron moves parallel to the forme and comes in contact with it, causing the impression on the paper, while in the other case a cylinder revolves over the surface, which travels in gearing with the cylinder.

Space does not permit of any sketch, howeyer slight, of the origin and progress of type-printing machinery. We can only refer to what may be regarded as representative appliances in present use. In America all kinds of apparatus for printing are called ‘‘ presses”; in England, however, an appliance of a more automatic character than the hand-press is usually called “a machine.” As the hand-press is now almost obsolete, this distinction will probably be abandoned, and the shorter and more expressive word ‘‘press” be applied to all. Venturing to adopt this suggestion, we may

say that of platen presses there are the hand-press, the treadle platen press, and the steam or other power- driven press,

Fig. 10 is a view of the Albion press. It is wholly of iron and Hand- steel. Although this press is nearly superseded, it is desirable press. to point out its component parts, as they indicate the gencral principles on which all typographic machinery is based. The flat plane on which the type is laid is called the bed of the press; the other flat plane which moves vertically and presses the paper on the type is the platen. These are the two essential parts of the press. The platen is perfectly smooth and level on its under surface, in order to give the whole of the type forme an equable pressure. It is mounted in a strong iron frame, with a cross- piece or head. The platen is propelled by a piston, which moves up and down. The power is gained by bringing an inclined bar of steel perpendicular to the direct line of pressure, and in doing so the piston is forced down. This steel bar is the chd7/, shaped like an elbow. At one end is a bar or handle which, on being pulled towards the operator, straightens the chill or brings it into the vertical position. At the sides are guide-plates fixed into the frame, to preserve the parallclism of the platen, for the slightest vibration or lateral movement would prevent a clear sharp im- pression being taken. ‘There are appropriate appliances, such as a helical spring, fixed on the head of the press, whereby the platen raises itself when the pressure is not required. In order to bring the forme readily under the platen, and to withdraw it so that it may be inked and the sheet to be printed placed in position, the table is mounted on a carriage, that runs on two rails by turning a handle connected with two endless bands. The paper is fixed to certain marks on the tympan, a kind of metal frame hinged on to the carriage, when it is in asloping position. This ensures the paper being printed in the exact place required, The tympan, over which calico or parchment is stretched, is double, and contains within it a pad of paper or a piece of blanket, to moderate the force of the impression of the platen. To it is hinged another metal frame, the frisket, which is covered with paper, cut to correspond with the shape of the type forme on the press. The ink is applied with a cylinder or roller, which revolves in an iron frame, and 1s

PRACTICAL. |

eovered about an inch thick with a composition of glue and treacle or of glycerin or other substance. The ink is spread out with a %, palette knife or similar appliance on a table

Viz? adjoining the press, and by repeatedly re- le volving the roller over it, it becomes coated AK with an extremely thin film of ink.

The roller is then moved over the surface of the forme on the press, until sufficient ink has been trans- ferred to it. This is called rolling, and is a very important part of ptess-work, for if inefficiently per- tormed there will be too much ink on

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sion, or even blotches, which _.. we called monks, or the __-_. print will be too pale or “~~*2= grey in places, such im*~~ *—= perfections being called [| —— friars. The sheet of* —= ff paper to be printed is = —— ~~ next laid on the tym- ~~” pan, to pins Serving as guides. The frisket is folded down on the tympan, which is in turn folded down on the forme with the right hand, while with the left the handle is turned and the press carriage brought under the platen. The bar is pulled by the right hand, the handle turned the reverse way with the left hand, the carriage brought out again, the tympan raised, the frisket opened, and the printed sheet removed, the tympan being ready to receive another white sheet. The frisket serves, among other things, to keep the edges and parts of the sheet not required to be printed from being discoloured by eontact with the ink or the gh of the forme, and to aid in steadying the sheet when the tympan is depressed and in the removal of the sheet when it is raised. Such is a bare outline of the method of printing at a hand-press,—one necessarily imperfect from a technical point of view, but sufficient to indicate the essentials of the operation.

Another press which has been much used is the Columbian,—a name given to it by its inventor, Clymer, an American. The power is gained by an ingenious combination of levers, Two of these are connected by a rod with the bar handle, which is in itself a lever. The platen is attached to the head by a strong iron bolt, the descent being made steady and regular by vertical guides. It is counterbalanced by a powerful lever or beam, having an adjust- able weight shaped like an eagle, which raises it automatically. In the bar handle is a screw stop by means of which the length of the lever rod can be adjusted and its pressure, or the pull, per- fectly regulated.

Nine distinct processes have thus to be gone through in order to print one side of a sheet of paper ata hand-press :—(1) inking the roller, (2) inking the forme, (3) laying the sheet on the tympan, (4) folding down the tympan, (5) running in the forme under the platen, (6) taking the impression by depressing the platen, and then immediately afterwards allowing it to raise itself by means of the counterpoise or spring, (7) running out the forme, (8) lifting the tympan and frisket, and (9) removing the sheet. The object of successive improvers of the printing press has been to render the apparatus more automatic, or to substitute for it a “machine” that will reduce these nine operations to the minimum. In modern machines this has been effected to the extent of rendering necessary only three of them—(1) laying on or “feeding” the sheets, (2) applying the motive power, (3) taking off or delivering the sheets ; and rotary machines both feed and deliver theinselves auto- matically. Nearly all eylinder machines have a delivery apparatus, and quite recently an appliance for the automatie feeding to them of single sheets of paper has been invented.

With respect to the platen press we notice first that which is capable of being driven by a rotating shaft or wheel. It should be observed that the adoption of the rotatory principle was essential to the acceleration of speed. This was recognized by the projector of the machine? press, William Nicholson, and by Frederick Koenig, who first brought the invention into use and constructed a practical

Fic. 10.—Albion press.

1 The best account of its invention is contained in a series of articles by Mr William Blades in the Printers’ Register, 1883-84, and Th. Goebel’s

Friedrich Koenig und die Erfindung der Schnellpresse (Stuttgart, 1883). This last has heen translated into French by Paul Schmidt, F. Koenig et Vinvention de la Presse Mécanique (Paris, 1885).

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press. The essential arrangements of every machine are four, their respective objects being (1) to feed in the paper, (2) to ink the forme, (3) to print the sheet, and (4) to deliver or take it off.

The treadle platen press is the simplest of machine presses capable Treadle power is not platen The type press,

of being worked by a wheel. When other motive available it is driven by a treadle, like that of a lathe. forme is usually secured by clamps on an almost vertical bed (fig. 11), and the platen rocks backwards and forwards, being thus brought in contact with the type ; Cae on the bed. Just before the impression is taken, the two surfaces are mo- mentarily parallel. The inking is effected by small composition rollers, ad- justed in a roller carrier swinging on a pivot. The rollers receive ink from a ‘fountain’ or duct of ink at the top of the machine, below which is an arrangement, such as a revolving disk, for dis- tributing the ink, The a constant motion of the 1G. 11.—Minerva press. rollers and of the revolving ink disk is equivalent to the manual movements of the operator who “rolls” at the hand-press, The rollers are carried by self-acting appliances over the face of the forme, and return to the ink table to be replenished with ink, after which the impression takes place. The sheet to be printed is placed in proper position on the platen, which is covered with paper or parchment, and is secured there during the move- ment of the platen by movable fingers called grippers. The platen on advancing brings the paper in contact with the type forme; after the printing it returns to its original position, when the sheet is removed and another sheet adjusted ready for being printed. The treadle platen press is only adapted for work on paper of small size, up to half sheet demy, but within this limit it is greatly superior to the hand-press. If sufficiently strong and well built, it gives a far more powerful impression, and it occupies about a sixth of the space. Its great merit, however, is its

superior speed. The hand-press, when worked by two men, one rolling the types and one pulling the handle of the press, produces only about 250 impressions per hour. The treadle press is worked by a boy, who has only to depress the treadle with his foot, and lay on and take off the sheets with his hands, and he can work at the rate of more than 1000 per hour. ‘The treadle press is also superior to the hand-press in the uniformity of its results, since the automatie inking ensures a greater regularity in the colour of the impressions than with the old hand-inking process. The ordinary or ‘‘double ” similar to the hand-press,

as double demy, and it had a perpendicular motion, being guided in grooves and worked by a connecting rod fixed to a cross beam and crank, which acquired its motion from the main shaft. In other respects the machine differed from the hand-press in having two type beds or coffins and two inking tables arranged at the ends of the carriage, which travelled backwards and forwards, being worked by a drum underneath. The paper to be printed was laid to marks on the frisket, and this was hinged on the tympan, which in turn was fastened to the end of the coffin by hinges or joints. The frisket and tympan were opened by running up bars at suitable positions. After a newly printed sheet was removed, another was placed on the frisket, which as the carriage moved ran down the bars and closed on the sheet, which then received its impression. This arrangement was dangerous to the boys who had to lay on the sheets.

Formerly it was thought that the very finest printing could not be done by a cylinder impressing a forme in the progress of its re- ciprocating motion, for that was liable to slur or blur the im- pression. Hence platen presses were employed for the best work. Of recent years engineers have brought the cylinder press to such perfection that there is not the slightest danger, under the super- intendence of a capable man, of any slur. Working quite as well as the platen press, the cylinder press is enormously quicker and more productive ; it requires less driving power ; and much better inking is obtained, which is all-important for fine woodcut print- ing. Accordingly, for even the best illustrated book-work, the platen power-press is now almost entirely superseded by the cylinder.

Cylinder machines are of two kinds,—(1) presses in which the type is on a flat plane and (2) those in which the type, or more eorrectly the impressing surface, is cylindrical. The first are called cylinder presses, the second—a development of the first—the rotary web presses.

The simplest kind of mechanical press is called the single-

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platen press was, in principle, very Double It was about 13 feet long. The platen, platen in the centre, was massive, as the machine printed sheets as large press.

Single- cylinder press.

Advan- tages of single- cylinder maehine over hand- presses.

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cylinder or one-sided machine, which has been recently brought to the highest state of perfection by Mr Samuel Bremner. It is generally used for commercial and fine book-work on one side of the paper. There are different varieties of cylinder machines, distinguished by trade-marks or the names of their makers; but the general principles, apart from details, are practically identical. There isa strong cast-iron frame, with bearings to carry the cylinder, which runs across the machine transversely, nearly in the centre. The cylinder revolves by gearing connected with a main’ shaft, which also

works the other moving

parts. This shaft is turned

by a wheel for hand or steam power. The table

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Frc. 12.—Extra-colour Bremner machine, with sheet-flyers.

carrying the type is also provided with a flat inking board of wood or iron, used for distributing the ink. It travels backwards and forwards, that is, with a reciprocating motion, At one end of the machine is the feeding-board, on which the pile of paper to be printed is placed. The layer-on places each sheet against metal marks, con- sisting of rectangular pieces of steel or brass mounted on a bar under- neath, which rises and falls according as the sheet is being laid to and taken away from them, When placed against these marks, en- suring correct “lay,” the sheet is seized by grippers or light metal claws fixed on a bar inside the cylinder. These clutch the sheet and carry it forward round the cylinder, which in its revolution brings it forcibly in contact with the type forme moving forward underneath, when the impression is effected. Immediately after the grippers release their hold, and the sheets are removed singly by an attendant called a taker-off, or by a mechanical automatic arrangement called a flyer, and deposited on the taking-off board. At the end of the machine farthest from the laying-on board is fixed a trough, which contains the ink ; it is fitted with the duct roller of cast-iron, which revolves by means of a band or ratchet- wheel and pawl. A flat bar or knife with a thin edge is set up against the metal roller lengthways by adjusting screws, which regulate the passage of the ink, and permit a thin film to pass the knife. A composition roller, called a vibrator, is fixed underneath, which takes off the ink that has already been deposited on the duct roller and leaves a ridge or strip of it on the iting slab. As the carriage returns, this strip of ink is distributed on the inking table by rollers placed diagonally across the machine. The diagonal position gives them a

waving motion ; hence they are called wavers. The inking of the forme is done by another set of rollers called inkers, placed near the impression cylinder. The inking rollers receive their ink from what is distributed on the table and coat the type while it is passing underneath them.

Thus the nine operations of the hand-press requisite to print one impression are greatly reduced. The bed carrying the type to and fro from the point of impression moves mechanically, superseding the running in and out of the carriage by the rounce and handle of the hand-press. The inking table, although independent, forms part of the type table, and some of the rollers distribute and others ink, this again being done mechanically and without a second operator. The platen and the tympan, as well as the levers by which the impression is given, are in effect combined in the cylinder, which rotates by gearing, the pressure being applied during the motion of the table itself. The laying-on of the sheet

upon the tympan and folding it down on the forme are superseded by the presentation of the paper to the grippers ; and the taking-off of the sheet after raising the tympan is superseded by removing it when released by the grippers and laying it on the adjacent table, — both immeasurably easier operations and done much more rapidly, Indeed both laying-on and taking-off may be done automatically, as is explained below. The result is that, while two men are re- quired to print a sheet of book-work on one side of the paper at the speed of 250 an hour at the hand-press, ma- chines of this class worked by one operator print about 1200

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ness of the cylin- YY, 7; Aer machine , tj over that of Yj Z/ the press. By Yj Vj Ze’ the latter, the Y yj largest sheet prac-

fj tically that could be double

square inches; single-cylinder machines are now made to print 7’ eight sheet double crown, the Mi ~superficies of whiclt is 4800 square f¢” inches, These sheets being afterwards cut up into double crown sheets, the pro- ductiveness of the machine to the press would be, per hour, about 8000 to 250.

As already mentioned, a self-acting feeding apparatus has been invented for supplying single sheets to cylinder machines. The pile of paper is laid on a feeding board or table, between gauges. A pneumatic tube takes up one sheet at a time; it is then run down tapes to a point at which india-rubber fingers bring it to the side lay of the machine, and it is printed with perfect accuracy of register. Once started, the machine works automatically, and the services of both layer-on and taker-off are dispensed with.

\per hour. Even –

We may now describe that class of machines by which the paper Perfee!-

is printed on both sides, or perfected, during one passage through ing

the machine. has two impression cylinders, having a continuous rotary motion towards each other. The frame is necessarily long, usually about 15 feet, and the width of the machine about 5 feet, these dimensions depending upon the size of the sheet to be printed. The table or carriage is double, containing two beds for the two formes of type, to impress the two sides of the paper, and two distributing tables for the ink. At each end is a complete roller apparatus, consisting of duct, duct roller, vibrator, and wavers. Close to the large cylinders on each side are the inking rollers. The table has a reciprocating motion, as in a single-cylinder machine. The dis- tinctive feature is the ingenious manner in which the sheets are oa ei first on one side and then on the other. This is effected

y carrying them over cylinders and drums by means of tapes. The pile of sheets stands on a high table placed at one end. The sheet is fed into the apparatus and led round an entry drum; thence it is carried round the large right-hand impressing cylinder, and underneath this, on the table, which is moving at the same speed as the cylinder, is the inner forme properly inked. The paper thus receives an impression on one side. It is next led up to the

right-hand drum, which it passes over, the printed side of the sheet being then downwards. Continuing, it is brought under the second or left-hand drum and on to the left-hand impression cylinder, which it passes with the printed side still downwards, or next to the cylinder, exposing the other side to the type of the outer forme on the table underneath. The drums have thus re- versed the position of the paper: the side which was outside when passing the first forme is inside when passing: the second forme, which accordingly prints the sheet on the opposite or blank side. The sheet is finally run out by the tapes and delivered in the space between the large eylinders, seized by a taking-off boy, and deposited

The Applegath and Cowper or ordinary machine presses,

PRACTICAL. |

on a table or taking-off board. This press is known as the drop- bar perfecting machine, owing to a peculiarity of the arrangement by which the paper is conveyed into the tapes. In front of the feeding table is a rod or bar of steel, along which are fitted several metal disks or bosses about half an inch thicker than the bar itself, These can be shifted, by means of small screws, to any position along the rod to suit the size of the sheet to be printed.

: the end, which works round a wheel attached \ to a cam with a dip. Every time the << pulley drops into the dip, the bar de- scends upon the paper, which is laid to marks at the front; and the) bar, possessing a rotary mo- tion from the tapes, runs) the sheet between a roller

To this bar is fixed a short arm, with a pulley at |

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and a small drum on to the inner forme cylinder, as already stated. Other kinds of machines are distinguished as the web, having a web or a series of broad tapes which lie on the laying-on board and are fastened to a small drum underneath it. The drum has a series of small cogs, and when it is

forced forward it moves the web or tapes in the same direction. The shcet, having been laid to a back mark on the tapes, is propelled between two revolving rollers and thus taken into the machine, LE

There are several distinct types of per- fecting presses in use, but we can only notice one or two. In the Anglo- French machine, which was in- vented in England but im- J proved in France, grippers are used instead of tapes and

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the intermediate drums for conveying the sheet from one cylinder to the other. The cylinders are on a level, but alternately rise and iall, allowing the sheet to clear the forme. Quite recently a single- eylinder perfecting press has been invented. The cylinder is double the usual size and has two printing surfaces and a double set of grippers. Two sheets are printed at each revolution, the first being the white paper and the second the partly printed shect which has immediately preceded it. The sheet is fed in as to an ordinary single side press, printed on one side, taken off, reversed, again gripped, and perfected, when it is automatically delivered on the table.

It has been mentioned that 250 sheets or a token per hour, printed on one side only, re- present the work of two men at the hand-press, Two youths at a perfecting machine will ()_ complete from 1200 to . 2000 copies per hour, _—*” €) equal to 4000im- _---

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| book – work, | Marinoni

lex single-cylinder machine,

one side only,—an increase of about sixteenfold. This, however, does not represent the whole of the superiority of these machines. Sheets much larger than double crown (20 × 80 inches) can hardly be worked at a press ; the machine perfects a sheet nearly double this size—50 × 40 or four royal, so that the proportionate product of the machine to the press is about as 82 to 1.

Perfecting machines are not so much used for book-work as formerly. The single-cylinder machine has been brought to such perfection, and is so superior in its inking arrangements, that printers prefer it. In America nearly all machines are one-sided. For newspapers of limited circulation, however, the perfectin machine is well adapted. Complete copies of a journal are aanducen as soon as the machine is started; extra copies can be worked off while news- agents are waiting ; and a number of sheets need not be printed off on one side to be completed when a sudden demand arises.

Fig. 13 shows a new form of French perfecting machine for printing

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Fia. 14.—Walter machine.

bined perfecting and duplex single-cylinder machine. The improve- ment in this machine over the perfecting two-cylinder machine de- seribed above consists in the alteration of some mechanical parts, so that the same machine can be used for printing sheets either on both sides or on one side only. It therefore serves the purpose of two single-cylinder machines or of one perfecting machine, the change from one to the other being very simple.

The rotary press differs essentially from the cylinder machine. In the former the printing surface and the impressing surface both rotate continuously, and the paper, —not cut up into single sheets, but carried between the two cylinders in a roll or web, like a ribbon,

—receives successively an impression on each side, after which it is cut up into sheets of the proper size and folded as it is run out, the sheets being deposited on a table ready for removal.

As representative of this class of machines we may take the Walter Walter press, whose mechanical arrangement is shown in fig. press.

14. The paper to be printed from, a continuous web about 8000 yards in length, is wound on a small roller at P. It is passed over a tension roller, and then over the damping cylinders W, W, and thoroughly wetted on both

sides. The damping cylinders are hollow, and contain sponges from which the water is distributed by centrifugal force, the outside of the cylinder being covered with

Printing from webs of paper.

Roller composi- tion.

blankets. The paper next passes on to the printing cylinders T, T’, on which the printing surface—not composed of movable types but of stereo plates—is fixed, and to the impression cylinders I, 7’. The printing cylinders contain each the plate in curvilinear shape, constituting the forme for one side of the paper. The web is led between the printing and the impression cylinders, as shown by the dotted line. After being printed on one side by JZ, it travels round J and receives an impression on the other side from 7’, thus being “‘perfected.” It then passes on to the cutting cylinders K, K, one of which has a serrated knife, which enters the paper, and on the application of tension divides the web, causing the peculiar saw-like edge seen in copies of journals printed on rotary machines. The paper is next carried in over tapes to the point where the completé severance takes place. Soon after they encounter a pendulous frame, which delivers them in two piles on to the tables x, , whence they are removed. There is an ink supply trough a, which is connected with the distributing rollers by a revolving metal roller 6. The distributing rollers of metal are marked f, g, h, 7, and the rollers which ink the forme, made of the ordinary composition, are marked k, k.

The average rate of speed of the Walter press is 12,000 per hour, the sheets being printed on both sides. In this apparatus every- thing is automatic: there is self-feeding and self-delivery, the web of paper at one end being transformed into properly printed single shects at the other. The machine requires only one man to super- intend its general working, including the replacing of the web when printed and the removal of the successive piles of sheets. In respect of speed, if the perfecting machine is to the hand-press as 32 to 1, the rotary will be to the hand-press as 96 to 1. The Walter press, requiring a space of only about 14 feet by 5, is not more remarkable for its speed and economy than for its simplicity of construction and its

compactness. And the same remark applies to several other machines, such as the Victory, the Hoe, and the Prestonian, which have since come into use. ‘Their general appear- ance is that of a collection of small cylinders or rollers, through which the paper seems to fly at railway speed, issuing forth in two descending torrents of sheets accurately cut into lengths. Without such machinery the prodigious issues of some of the morning journals would not be possible. One daily paper averages a circu- lation of more than a quarter of a million. This enormous number of sheets are printed in about four hours, owing to the type matter being stereotyped and placed on several presses.

Printing from webs of paper instead of single sheets will probably be adopted in the future for all newspapers and even books of large circulation. Hand-feeding is limited by the ability of the operator to lay the sheets on the feeding-board with the necessary accuracy. One chief obstacle to the more general adoption of rotary printing is the expense of stereotyping the type formes. Although a machine has been constructed in which movable types can be placed round the periphery of an impressing cylinder, it cannot compete with the Walter and other presses using stereo plates, The problem of printing directly from flat formes of ordinary types, as well as from stereotypes, with paper supplicd in the roll, is one that may be commended to engineers. The saving in stereotyping in many cases would be very considerable ; but, even where this is not an object, the readiness and ease with which the type could be manipulated would ensure for such an apparatus admission into offices where the large rotarics of the present day are inadmissible. It would also enable illustrated journals to be printed from the web. The pictures introduced into some of our daily journals are very rude when compared with those in periodicals printed on flat- bed machines. This is owing partly to the distortion that arises when the cast from a flat block is accommodated to a curved sur- face, partly to the fact that stereotyping does not give the fine and delicate reproduction that electrotyping supplies, and partly to the imperfect inking powers of the machines. Quite recently a plan has been patented whereby curved electrotypes of pictures can be fastened to blank or depressed portions of an ordinary curved stereo plate ; but the method is not always practicable. With a flat-bed machine the forme to be printed from might be of a com- posite kind,—partly movable types, partly stereotype, and partly electrotype. One

difficulty of constructing a web printing machine with a flat bed is that of turning the sheet so that it may be printed almost simultaneously on both sides. It would have to be reversed by the continued rotary movement of the cylinder. This, however, is quite within the limits of practicability, and experiments are now being madc to devise a machine with this feature.

For about three centuries after the invention of printing the formes were inked by leather balls. When machine presses were introduced, their earliest inventor tried to use cylinders covered with leather ; but the plan was most unsatisfactory, until a subse- quent inventor adopted a composition of glue and treacle, which was cast into cylinders having an inner ‘‘stock” of metal or wood. For about half a century this composition was used exclusively for both hand and machine presses. Since then glycerin has been in- trodueed for roller making. Hansard’s recipe, in use when the 8th edition of the present work was issued, was—glue 4 parts,

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treacle 12 parts, Paris white 1 part. Buta much better composi- tion is now formed of glue 10 parts, sugar 10 parts, and glycerin 12 parts. The glycerin has the property of always keeping the roller moist and soft, while the tendency of glue and treacle is to dry and harden.

Printing ink has peculiar qualities, It is required to change from Qualiti the soft adhesive state in which it is applied to the type to that of of prix a perfectly hard and dry substance after being transferred to the ing ink, paper. This change of condition must be under control, and when i air is excluded the ink should keep in good order any length of time. During its application to the type its solidification should be as slow as possible, and unaccompanied by the emission of any unpleasant or deleterious odour. It ought not to affect the rollers, and, having been applied to the paper, its action should be confined to a very slight penetration, just sufficient to prevent its detach- ment without injuring the surface of the paper. It must dry into a hard, inodorous, and unalterable solid. The ingredients of ink are burnt linseed or other oil, resin, and occasionally soap, with various colouring matters ; that for black ink is usually lamp black, but charcoal and

other cheaper materials are occasionally introduced. Ink is removed from types and blocks by detergents, such as potash and pearl ash ; benzine is also well adapted for the purpose.

Colour Printing. _ The apparatus previously described is intended for monochrome Printing printing, whatever be the shade of the ink. When two colours or in two more have to be printed in one composition, there must be a colons, separate type forme or separate engraving, and a separate printing, for each. Many attempts have been made to print several colow's simultaneously by dividing the trough or manipulating the rollers. All these have been more or less unsuccessful, with the exception of a press invented by Mr W. Conisbee, which prints from type formes in two colours. In construction it is somewhat similar to the ordinary single-cylinder machine, but is provided with two sets of inking apparatus, including ductor, wavers, and inkers, each of which acts totally independent of the rest. The cylinder is placed in the centre of the machine and makes two continuous revolutions, giving an impression for each colour. There are two type formes, each containing only the lines to be worked in one of the colours. These are in two beds adjoining one another, and, the circumference of the cylinder being equal to the length of one bed, one colour is printed by the first revolution and the other by the second. The sheet is thus printed twice without being released from the grippers, whereby perfect register is ensured. 'he speed is slow, averaging 300 to 400 complete iinpressions per hour.

The method by which the beautiful coloured supplements issued Chromo occasionally with illustrated newspapers are printed may be slightly typo- referred to. A copy of the artist's painting is first of all made, on graphy. a scale regulated by the size of the reproduction. This being sup- plied to the engraver, an outline or key block is made and proofs pulled. It is now necessary to determine the tones of colour to be used,—a process demanding great experience. The key block will, if printed first, afford a guide for the registration of the subse- quent printings ; sometimes, however, that is reserved for a later stage. The colours on which the subsequent printings are done must be of a transparent nature. The blocks are sometimes pro- duced by the typographic etching proccss, which gives a softness, delicacy, and variety unattainable by the graver. The blending of

the colours is the most delicate task the printer has to under- take. A large picture is often printed in ten or more workings, some of them in their turn intensifying and bringing previous colour workings into stronger relief, others giving shape and form to the picture. Almost to the end of the process, however, the picture will want vitality ; its outlines will be hard and bare, or vague and undefined, according to the sequence of the colours. Another working may give grey tones where wanted, and may increase the depth and transparency of various parts. A deep flesh working may have a marked effect on the development ; and, near the close of the series, if the entire colouring is found to be too warm, it may be corrected by over-printing very nearly the whole subject. Chromo-typography has undoubtedly made great strides during the past twenty years, its best results being shown in the coloured prints for illustrated journals. For the production of pictures for commercial and artistic purposes chromo-lithography Chromo- is generally resorted to ou account of its relative economy. In litho- lithography for typographic purposes the line has to be eut and the graphy. space on both sides removed so as to leave the line alone to be charged with the ink, or the white space has to be etched away with an acid. The printing of isolated points too is easily effected from a stone, whercas most minute labour is necessary to engrave them. Typographic etching has here, however, been of great assistance.

The differences of printing surface caused by the colours are met and overcome by the lithographic stone with great facility, even when the spaces are largest and most uneven ; it is quite the con- trary in regard to typography, whcrein the work has to be charged with ink to a greater extent according to its size, and the quantity

of ink requisite varies with the fineness of the strokes and of their distance apart. Owing to this we see in most letter-press poly- chromatic prints a deficiency of transparency, of half-tints, of depth of ground, and of general harmony. Even if it were possible to make chromo-typography as easy as clromo-lithography, there would still be the obstacle of its very much greater cost, owing to the expense of the engraving and of the casts from the key block. In chromo-lithography the designer can repeat the designs for

the different stones by a process that costs almost nothing. Also in the process of multiplying the blocks the deviation in the register of the successive colours is practically unavoidable. In lithography the surface to be printed is nearly level; hence the sheet is not shifted and twisted or stretched in places, as it is in typography, owing to the alternate closeness and absence of contact between the sheets and the raised and depressed surface of the block. Whatever success the letter-press metliod has attained of late is owing to the invention of electrotyping and process blocks, and to the improve- ment of machinery. For to print these pictures enormous strength and rigidity, and the most perfect arrangements for securing register, are absolutely essential.

Recent Changes.

We will now give a cursory glance at the changes that have been effected during the last twenty-five ycars in the processes and the products of the art of printing. That these have been of a most drastie kind may be gathered from a comparison of the appliances figured and described in the 8th or the previous edi- tions of the Lncyclopedia Britannica with those referred to above. The hand-press has been almost completely superseded by the machine press. Cylindrical impression has displaced platen impres- sion, and the finest book-work and woodcut work are done on a cylinder press. In book-work, indeed, other significant changes have taken place. Whereas formerly it was deemed essential that the paper should be damped before printing, in order to get a delicate and perfect impression, some of the finest books and periodicals are now printed on dry paper, highly calendered, even the illustrated journals and some of the evening papers being so worked. Then, it was thought: necessary for the safety of the type to interpose a thick soft blanket between it and the pressing surface, whether cylinder or platen; now, it is found equally safe, and far more conducive to a good impression, to make the packing as thin and hard as possible. Then, fine woodcuts were ‘‘brought up” by the use of many ‘‘overlays” and “underlays” to correct inequalities in the surface of the blocks and emphasize some of the parts; now, although the art of ‘‘making ready” has been brought to great

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and Baskerville. Yet as a matter of fact their best faces have been reproduced with perfect success by modern founders. From a mechanical point of view the impression given by the best machine presses to-day is undoubtedly superior to that of the hand-presses ofthe 17th and 18th centuries. If modern books suffer in any respect on comparison with those of former times, which are so highly prized by bibliophiles, it is owing to their want of general artistic ensemble, and not to any deficiency in mechanical execution. The: artistic taste of English printers has, however, been greatly raised during the last few years, and a very interesting movement is goin g on which must produce important results in the future. In 1880

Mr Andrew W. Ther of London organized the Printers' Specimen Printers' Exchange, a scheme intended to promote the technical education Speci- of the working printer. Each contributor to the exchange furnishes men Ex- periodically a certain fixed number of typographical specimens, all change.

alike, which are collated into sets, and again distributed to the members, each of whom gets a volume, consisting of one copy of the work of each of his fellow-contributors. By this plan they become acquainted with the progress made by their brethren, and good taste and good work are fostered and mutually encouraged. The eighth quarto volume, issued in 1887, contains nearly 400 fine specimens of typography by as many different hands. It forms also the best criterion of the character of the jobbing work done at the present day, not only in England but abroad, for the scheme is of an international character.

jobbing work. Much of this improvement is due to the superior material with which the printer is furnished, and especially to the great variety of ornamental types which have been introduced. The specimen books of the principal type-founders are splendid volumes, containing several thousand different faces. The best work of German printers is noteworthy for its studied neatness and attractiveness, tasteful and harmonious arrangement of colour and tint, a characteristic and conscientious attention to details of finish, exact register, and beauty of impression, American work excels in originality of design, brilliancy of colour, and perfect finish. English

printers are closely following the best points of each ot these schools of typography. There is a distinct leaning at present to the German style, but with little slavish imitation. The dis- tinctness of English typography is maintained, while the beautiful German combination borders, produced with such profusion of late, are judiciously utilized, often in conjunction with American type. In the arrangement of colours English printers prefer the quiet harmonious tints of the Germans to the bold striking contrasts of the Americans.

OL The results of the revival in Artistic artistie printing during the last decade are especially noticeable in printing.

perfection, the fewcr and thinner the overlays employed the better. And it may not be irrclevant to point out that the printing of wood- cuts has improved in the same degree as the engraving of them.

The vast extent of the operations of the printing fraternity Division at the present day is in remarkable contrast to those of the 15th of century, when the making of books was an art like the sculpture labour.

inting ;

Perhaps, however, the most remarkable change is that made in newspaper printing. The highcst achievement mentioned in the article "' Printing" in the 8th edition of this work was the six- cylinder Hoe machine, The makers of that apparatus subsequently contrived machines of eight and ten cylinders. But they have now becn wholly superseded by the rotary presses on the Walter principle. The hand feeding-in of single sheets is entirely done away with, and all newspapers of considerable circulation are printed from long reels of paper, uncut, as originally made at the paper-mill. The maxi- mui number of copies which a machine of this class would print with ten feeding attendants and four taking away attendants would be 8000 an hour. For folding the 8000 printed copies five folding machines and at least two attendants would be required to keep pace with the printing machines. Thus nineteen men were required to print and fold 8000 copies per hour with the best machines as late as 1870. With a rotary machine doing the same or a larger quantity of work only two men are required. The cost for print- ing and folding 1000 copies by the Hoe machine was estimated at Is.

4d., while with the rotary it is only about 2d. Hence the saving of wages to a newspaper issuing 200,000 copies a day on 313 working days would be nearly £3700 ina year. This, in connexion with im- provements in paper, or rather the discovery of cheaper materials, bringing the price of ‘‘ news” down to about 2d. per Ibh—one quarter of its price a very few years ago—accounts for much of th® enter- prise of modern journalism. For some time after the abolition of the paper duty there was a loss on the circulation of a large-sized penny journal; now there is a considerable gain. Lately rotary presses for small jobbing work have been constructed; and_ before long the rotary principle will probably be rendered available for illustrated periodicals and fine book-work, printed from webs or reels of paper instead of single sheets. Great improvements have

. also been made in type-founding, and the Roman and Italic founts

now used by English printcrs are equal to those of any country in the world. It is sometimes said that English éditions de luxe are not equal to those of the French, and that this is owing to the inferiority of the founders. This is, however, not quite true: some of the best French books are printed from English types or from types cut in the English manner. It is also the fashion to compare modern printed books with those of the Elzevirs

of statues or the designing of buildings. Now, printing isa manu- facture in which large capital and the greatest division of labour are essential. The old printers were almost entirely independent of other craftsmen. From the casting of the type to the mixing of the ink they did nearly everything for themselves. Gradually the different departments of the art were constituted separate and re- cognized trades. The type-founder was probably the first to seccde from the concern; then printers delegated to others the making of presses ; afterwards the ink and the rollers found separate and distinct manufacturers ; and there arose a class of persons who,

though belonging to other trades, made printing appliances a

specialty, such as printers’ smiths, printers’ joiners, and printers’ engineers. Subdivision again has taken place in regard to the. operations which chiefly appertain to printing. The same mau was formerly able to set up and print off the types, to fold the sheets perhaps, and even to make them up into

books. The opera- tive printer has now become either a pressman or a compositor.

If he is of the first denomination, he may be classed according as he works at press or machine. If he is a machinist, he may super- intend or be a “minder,” or he may be a layer-on or a taker-off of the sheets. Ifheisa minder, he may understand only book machines or only news machines; he may know all about platens and little about cylinders; or of cylinders he may know only one kind. En- tircly novel machines create a new class of artisans. There are men perfectly compctent to manage a Walter press who are ignorant how to work two-colour or fine book-work machines. In the eompositor’s department division of labour is carried out to a still minuter degree.

An old-fashioned printer would set up indiffcrently a placard, a title-page, ora book. At the present day we have jobbing hands,

book hands, and news hands, the word ‘‘hand”’ suggesting the factory-like nature of the business. There are jobbing hands who confine themselves to posters, and know little about general work even in this department. Book hands comprise those who set up the titles and those who set up the body of the work. Of these latter again, while one man composes, another, the “maker-up,” arranges the pages. Even the art of fitting up the furniture or “dressing the chase” is given to the ‘‘quoin-drawer overseer.” News hands include advertisement hands and general hands. Some men work by day, others altogether by night; some do general

Old style printing.

Depart- ments of a print-

ingestab- lishment,

book-work composition ; others set up head-lines ; others make up the galleys ; others ‘‘ prove” them.

Old Style Printing.

Within the last few years there has been an interesting revival of the old style of book printing, It owes its origin to Mr Whit- tingham of the Chiswick Press, who in 1848 was desirous of printing in appropriate type a work of fiction the diction of which was supposed to be that of the reign of Charles II. As the original “old face” matrices of the first Caslon had been preserved, a fount was cast from them, and on getting a proof with good ink, on good paper, from a modern press the impression was found to be far superior to specimens printed from the original fount. Sinee then the demand for old-faced characters has steadily inereased, and all founders now supply imitations of the old types. Comparing the old face and the modern characters, the latter are more regular in size, lining, setting, and eolour,—using these words in the technical sense of the founder; they have finer strokes and serifs, and produce in the page a more regular and sparkling general effect. At the same time it may be eonceded that legibility has been to a certain extent sacrifieed to beauty and general effect. About 1882 an eminent French printer made a number of experiments to ascertain what it is that constitutes legibility in type, and found that people read with less fatigue according as the letters—(a) are rounder, (0) are more equal in thickness, (c) have shorter upstrokes, (d) are dissimilar to each other, and © are well proportioned to their own body. Drawings of letters from old books were visible and legible at a distanee at which modern letters could not be distinguished. The revival has also brought about the re-introduction of antique head-pieces and tail-pieces, vignettes, and initial letters, which have been reproduced from old books by photography and typo- ctehing, For this kind of printing white paper has given place to toned, of a straw tint, which is often more agreeable to the eyes than the excessively bleached paper which was hitherto the fashion. Also hand-made instead of machine-made paper has to a large extent eome into vogue. Its characteristic is the “deekle edge”, which distinguishes it from the clean-cut edge of machine papers, and is highly prized by some bibliophiles. When extreme verisimili- tude is required, this kind of printing is done on the blank leaves of real old books, some of which have been ruthlessly destroyed for this modern craze. On the whole, however, the revival of old style printing has been beneficial: it las encouraged printers to study the more artistic attributes of the productions

of the great printers of the past, and has educated the public taste by presenting them with examples of the best kind of book-making.

Printing Establishment.

A large book-printing establishment contains many distinct de- partments, some of which have not been previously referred to and may here be summarily mentioned. The reading department, some- times called the closet, consists of a number of small apartments, each furnished with a desk, a couple of stools, and a shelf for books of referenee, and having for its occupants the reader and his reading-boy. here is also the warehouse, where all the printed and wiprinted sheets (or ‘‘white paper” as it is called, whatever its colour) are stored. Adjacent to this are folding, cutting, hot and cold pressing, drying, and other branches, each employing separate classes of artisans. Another department is the machine- room, where, arranged in long rows with an avenue between, are the various printing machines. The men in this part of the estab- lishment wear cotton vestments, covering all their other apparel, and caps, invariably made of paper, something like clerical birettas. The machine overseer has his box and keeps an account of the produce of each machine. Under him are the persons whose business it is to cut out overlays for the cut or illustrated formes. These men are in their way artists, for to them is attributable much of the beauty and perfeetion of working of each block that goes through their hands. They have by them three or four prints or ‘‘ pulls” of the block, and their tools eonsist of scissors, paste, a sharp knife or two, and perhaps a razor-like blade set in a wooden handle. Their work is to deepen the shadows, raise the lights, lower the edges, and perform a hundred other offices for a block. Standing sentry over each machine is the machine minder; under him are the takers-off and layers-on. The engine-room and boiler-house are close by, and higher up may be the hand-press-room,—provided these appliances are used. Here are the pressmen and their appren- tices. There is the storekeeper’s department, fitted up with shelves, racks, and drawers, for the orderly storage of type and materials. The plate-safe or plate-room is the repository of the stereo and electro plates, each plate being kept wrapped up in paper, with a distinctive index number marked thereon. There are also rooms for casting rollers, stereotyping rooms, drying rooms for paper, hydraulic press- ing rooms, sinks for washing formes, and lifts for conveying them

TYR. See Adstr, vol. i, p. 211.

TYRE, the ancient 4y, Greek T¥pos, the most famous | of Sur, with about 5000 inhabitants, built round the har-

from one department to another. There will possibly be several composing-rooms, sueh as the ’stab, where all the men are paid on established weekly wages, the piece room, where they are paid by results, and the apprentiees’ room. There may be rooms where particular jobs are done, especially if weckly periodicals are turned out, and the names of these designate the rooms. At the end of each room is the overseer. It is also a eommon practice for a Compos. number of men to form themselves into a kind of business partner- tors’ ship called a companionship or ’shtp. All the transactions of the partner. eompositor may be with his own clicker,—the workman who is ships, selected to keep the accounts of the partnership. From him the compositor receives his portion of copy and the necessary direc-

tions, and to him he gives the matter when it is eomposed. At

the end of the week he “‘ writes his bill,” delivers it to the clicker,

and from the latter receives at pay time the wages he has earned,

The clieker gets the matter proved or ‘‘ pulled” by the proof:- puller, who usually does nothing else but pull proofs. He will

then send the proof with the eopy to the overseer, and the overseer

sends it to the reading department to be corrected. The proof,

when corrected, is returned through the overseer (who retains the

copy) to the elicker, and he gives it to the compositor who set it

up. When the type is corrected a revise is pulled, whieh goes through the same hands to the overseer again ; and then it is de- spatched to the author, editor, or publisher. In a well-ordered eomposing-room strict silenee is enjoined upon the workmen, . Among the industrial pursuits there is none more monotonous and |

more exacting, none demanding more patience, sustained industry, and power of endurance than the compositor’s art. In a large newspaper office the quantity of types picked up in a few hours 1s marvellous. No better illustration of this could be given than the fact that several recent issues of the 7’imes have consisted of three sheets or twenty-four pages, each page comprising six columns. In one of these issues 84% of the 144 columns were filled with ad- vertisements, 2559 in number, set in extremely small type; the remaining 594 columns contained articles, reviews, letters, reports, and paragraphs. The total length of the column aggregate was 264 feet (62 more than the height of the London Monument). If the matter comprised in the paper, instead of being broken up into columns, had been set in one coutinuous line it would have reached one mile 950 yards. The number of separate types used in printing this issue was calculated at over two millions, and the quan of | in

printed matter was reekoned to be equivalent to that containe two octavo volumes of 480 pages each. The literary and mechanical staff of a first-rate London daily newspaper, excluding casual re- porters and unattached writers on various subjects, aggregates about 300 persons.

Bibliography.—On the practice of the art and its auxiliary processes, see South- ward, Dictionary of Typography (84 ed., London, 1875, 8vo ; with the Literary Almanack by William Blades), and Practical Printing: a Handbook of the Art ‘ of Typography (3d ed., London, 1887, 2 vols., 8vo). This last is the fullest work on the subject in the English language, embracing composition, press work, stereotyping, and electrotyping, and the warehouse department of a printing office. Gould’s Letterpress Printer (2d ed., Middlesborough, 1880, 12mo) has a short introduction by Southward, giving a sketeh of the origin and progress of the different typographical processes and appliances from the beginning. See also F. J. FE. Wilson, Typographic Printing Machines and Machine Printing (3. ed., London, 1883, 8vo); List of Technical Terms relating to Printing Machinery (London, 1882, $vo); Noble, Machine Printing (London, 1883, 8vo) and Principles and Practice of Colowr Printing (London, 1881, 8vo); and Wilson, Stereotyping and Electrotyping (London, 1880, $vo). This last contains a history of stereo- typing and electrotyping by Southward. The best works in French are— Lefevre, Guide Pratique du Compositeur et del Imprimeur (Paris, 1855-72, 8vo, two parts; includes machine work, stereotyping, and electrotyping); Claye, Manuel del Apprenti Compostteur (3d ed., 12mo, Paris, 1883); and Monet, Les Machines et Appareils Typographiques, swivi des Procédés d’Impression (Paris, 1879, 8v0). The best German work, and one which from its completeness supersedes all others, is Waldow’s Illustrierte Encyklopddie der graphischen Kiinste (Leipsic, 1884, lar. 8vo), containing 2798 articles and 581 illustrations, with a list of Ger- man books on typography, &c.

Periodicals.—No trade or interest in the world has, perhaps, so many repre: sentatives in the press as printing, The journals which record its progress and describe its products are wnrivalled in their excellent mechanical attri- butes, some equalling the highest class of book-work printing and using paper of the most luxurious description. Their literary character is usually worthy of their mechanical excellence, and they comprise an immense

collection of facts and speculations on the subjects involved. They also attract: a class of writers who in time become specialists and do the most valuable work in historical investigation. The Printers' Register (monthly), begun in 1863, the oldest of the English printing trade journals, contains several valuable contributions by Mr Williain Blades, the biograplier of Caxton, suel as "' Numismata Typo- graphiea," "Bibliotheca Typographica," 'Books and their Enemies," "The Inventor of the Steam Printing Press," and ''Early Type Specimen Books." The Paper and Printing Trades Journal (quarterly), begun in 1872, is printed in old style fashion, and reproduces in tone as well as in manner some of the best examples of the French and Italian schools in head and tail pieces, vignettes, and ornamental initials. In France appear L'Imprimerie (semi- monthly) and the Bulletin deV Imprimerie; in Germany, Archiv fur Buchadrucker- kunst (monthly) and Journal fiir Buchdruckerkunst; in Italy L' Arte della Stampa. The United States has the Inland Printer (Chieago) and the American Bookmaker (New York). The fullest list of such journals, past and present, is Louis Mohr's Die pertodische Fachpresse der Typographie (Strasburg, 1879). There is also an extended list, with historical annotations, in Bigmore an Wyman's Bibliography of Printing. (J. SO.)

of Phcenician cities, is now represented by the petty town

bour at the north end of a peninsula, which till the time of Alexander's siege was an island. The mole which he con- structed to reach the island city has been widened by de- posits of sand, so that the ancient island is now connected with the mainland by a tongue of land a quarter of a mile broad. The greatest length of the former island, from north to south, is about 2 of a mile and its area about 142 acres, a small surface for so important a town. The re- searches of 'Renan seem to have completely refuted the once popular idea that a great part of the original island has disappeared by natural convulsions, though he believes that the remains of a line of submerged wall at the south end indicate that about 15 acres more were once reclaimed from the sea and have been again lost. Confined to this narrow site—on which, moreover, place was found for the great temple of Melkarth with its courts and for all the necessities of a vast trade, for docks

and warehouses, and for the great purple factories which in the Roman time were the chief source of wealth and made the town an unpleasant place of residence (Strabo, xvi. 2, 23 ; Pliny, v. 76)—Tyre was very closely built ; Strabo tells us that the many-storied houses were loftier than those of Rome. In the Roman period the population overflowed its bounds and occupied a strip of the opposite mainland, including the ancient Paletyrus. Pliny gives to the whole city, con- tinental and insular, a compass of 19 Roman miles ; but this account must be received with caution. In Strabo's time the island was still the city, and Paletyrus on the mainland was 30 stadia off, while modern research indicates an extensive line of suburbs rather than one mainland city that can be definitely identified with Paletyrus. The ancient history of Tyre has been dealt with in tho article Pu@nicia ; the topography is still obscure owing to the paucity of Phoenician remains. The present harbour is certainly the Sidonian port, though it is not so large as it once was ; the other ancient harbour (the Egyptian port) has disappeared, and is supposed by Renan to have lain on the other side of the island, and to be now absorbed in the isthmus. The most important ruins are those of the cathedral, with its magnificent monolith columns of rose- coloured granite, now prostrate. The present building is assigned by De Vogué to the second half of the 12th century, but the columns must be older and may have be- longed to the 4th-century church of Paulinus (Euseb., ZH. #., x. 4). The water supply of ancient Tyre came from the powerful springs of Ras al-'Ain on the mainland, one hour south of the city, where there are still remarkable reservoirs, in connexion with which curious revivals of Adonis worship have been observed by Volney and other travellers, Tyre was still an important city and almost impregnable fortress under the Arab empire. From 1124 to 1291 it was a stronghold of the crusaders, and Saladin himself besieged it in vain. After the fall of Acre the Christians deserted the place, which was then destroyed by the Moslems. 'The present town has arisen since the Metawila occupied the district in 1766.

TYROL, a province of Austria, with the title of " county," lies between 10° 10' and 13° E, long. and 45° 40' and 47° 45' N. lat., and is conterminous on the north-west with the Austrian province of Vorarlberg, on the north with Bavaria, on the east with Salzburg and Carinthia, on the south-east and south-west with Italy, and on the west with Switzer- land, The last-named

country forms in the lower Engadine an angle penetrating deeply into Tyrol. The country is entirely mountainous, being traversed by the main chain of the Alps. It may be roughly divided into the valley systems of the Lech and the Inn to the north of the chain and of the Etsch or Adige (Vintschgau) and the upper Drave (Puster valley) to the south (see Aps). Its area is 10,316 square miles ; its population in 1880 was 805,176,

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inclusive of military, showing an increase of nearly 4 per cent. since 1869. Of these 432,062 spoke German, 360,975 Italian or some Romance dialect, and the re- mainder some form of Slavonic; 565,468 persons were able to read and write, 56,728 to read only, leaving about 223 per cent. of the total population, including children, wholly illiterate. Education is strictly compulsory ; but the schools are for the most part closed during the summer months, when all available hands are required in the fields and on the mountain pastures. Agriculture and forestry occupy about two-thirds of the entire population. Every householder owns a piece of cultivable land in the valley, while his goats, sheep, or cattle are driven with those of his neighbours to the mountain pastures (Alpen, Almen) which belong to the commune. Each commune has a president chosen by an elected committee of householders. The man selected cannot decline, but is bound to serve his term of office. The tenure of property is for the most part of the nature of absolute ownership. In 1880 100,393 persons of both sexes were returned as proprietors, 10,283 as tenants. The chief products are milk, butter, and cheese, Of grain-crops maize, which is largely grown in the Inn valley and Vintschgau, holds the first place. Wheat is grown in the lower valleys, barley and rye in the higher, the latter in favourable spots to a height of over 5000 feet. Potatoes are found above 6000 feet. In the Etsch valley, or district about Meran and Botzen, red and white wine of excellent quality is produced (in 1884 about 6,500,000 gallons). Of late years the cultivation of fruit has much developed, especially in south Tyrol. Silk is also produced (in 1885 1268 tons of cocoons). Game is still plentiful in the remoter valleys. In every district there are a certain number of licensed hunters, the prin- cipal game being red deer, chamois, hares, blackcock, ptarmigan, &c. Mining occupies about one-fifth of the population. At Hall near Innsbruck are important salt works, and at Brixlegg in the same valley copper and lead

are smelted. Iron is worked at Fulpmes in the Stubai valley and at Prad in the Vintschgau. “Zine is found at the head of the Passeir valley. In the Middle Ages gold and silver were found in sufficient quantities to make it worth while to extract them. About 4340 square miles of the country are covered with forest, chiefly pine, fir, and larch, which, however, is felled in a recklessly wasteful way. The capital of the county is IyysBrucx (q.0.).

The general average of comfort in Tyrol is high, and the cost of living is very moderate. The pcasant and his family are clothed in stuffs spun and woven at home, from the wool and flax produced in their own neighbourhood. The people are for the most part somewhat reserved in manner, but courteous and hospitable. ‘The savage fights which used to be a favourite pastime among the younger men are now almost, or quite, a thing of the past. In some valleys there is a good deal of musical talent ; and companies of Tyrolese singers, particularly from the Ziller valley, travel about all over Germany. The zither is a favourite instrument, especially in the southern valleys ; in the northern the guitar is more fre- quent. The religion is almost exclusively Roman Catholic ; but in Innsbruck there are some hundreds of Protestants. The priests belong chiefly to the peasant class, and receive their education at Brixen and the university of Innsbruck. This contains about 600 students in the various faculties and possesses a library of some 60,000 volumes. There is a diet, or landtag, with its seat at Inns- bruck, consisting of thirty-four representatives of the peasants, thirteen of the citizens, four of the prelates, ten of the nobles, three of the chambers of commerce at Innsbruck, Botzen, and Roveredo, and one of the university of Innsbruck. To the impcrial reichs- rath Tyrol sends cighteen members. Tyrol is garrisoned by troops recruited exclusively in Tyrol and Vorarlberg, and never, except in time of war, employed outside these provinces, Besides this there are the landwehr and the landsturm or militia,

History.—The country corresponding to modern Tyrol first ap- pears in history when the Rhetians were subdued by Drusus and Tiberius. This nation, by some held to have been cognate with the Etruscans, occupied the valleys from the source of the Rhine to that of the Drave. To the north of them were the Vindelici, and to the east the Norici; the former were apparently separated

of Ulster, is bounded N. and W. by Donegal, N.E. by Londonderry, E. by Lough Neagh and Armagh, and §, by Monaghan and Fermanagh. Its greatest length from

from thein by the ridges north of the Inn, the latter by the water- shed between the Etsch and the Drave. Pliny (. A, ili. 24) gives the names of all the tribes. After their subjection by Rome

these races became Romanized and shared the fortunes of the empire. Their position on and about the roads by which the central Alps are most easily crossed laid them especially open to inroads, and before the end of the 3d eentury the Alemanni had traversed the country. In the course of the next tliree centuries this people settled in the north-western valleys. But the peopling of the greater part of the province by Teutons was effected by the Baiu- varii, who were by the year 600 established throughout nearly the entire remainder of German Tyrol, some of the Romanized Rheetians probably being left, mixed with a few Alemannic stragglers, in the upper Vintschgau, while the Lombards pressed up from the southward and took possession of the district around Trent. The ‘Alemanni and Baiuvarii, governed immediately by their own dukes, owned a kind of allegiance to the kings of the Franks, and ulti- mately became in the time of Pippin and Charles incorporated in the Frankish monarchy. The country was then divided for ad- ministrative purposes into counties (comitatus, Grafschaften), under counts, whose rank, at first merely official, in course of time became, with their office, hereditary. The most powerful among them appear to have been those of the Vintschgau, where a fertile soil and a climate less rigorous than that of the northern valleys allowed more development of wealth. In the 12th century the eounts of Tirol begin to be conspicuous. This was a small district near Meran, taking its name from the ancient castle of Tirol, known in the later Roman time as Teriolis. These, in the course of the next century, acquired the lordship over nearly all the territory now contained in the province of Tyrol south of the main chain of the Alps, besides the advocacy (Sehirmvogtet) of the wealthy sees of Brixen and Trent. Meantime the valley of the Inn and those adjoining it had

come under the dominion of the counts of Andechs, a Bavarian family, who were also titular counts of Meran. The last of these died without issue in 1248. His wife's sister, Adelaide, married to Meinhard, eount of Gorz, was left in sole possession of nearly the whole of the province. Their son Meinhard II. (1257-1295) was connected with some of the most powerful houses in Germany ; and, being a man of great ability and equal un- scrupulousness, he succeeded in acquiring the few outlying portions of territory and castles still belonging to the smaller nobles, and thus consolidated Tyrol within the limits by which it has ever since been bounded. Carinthia and Styria also formed part of his domains; but their connexion with Tyrol has never been other than a personal one. Meinhard II. was succeeded in turn by his sons Otho and Henry. The latter (1810-1835), a weak and ex- travagant prince, scems to have done much towards organizing the government of the country. His elder daughter Margaret, known in Tyrolese history and legend as Die Maultasche, ‘‘ the Pocket-mouth," the heiress of his territories, took as her second husband (in 1342) Louis of Brandenburg. Their son Meinhard IIL, who succeeded to the county on his father's death in 1861, died in 1363. Margaret thereupon made over all her possessions to the house of Hapsburg, and since that time Tyrol has formed part of the hereditary dominions of the archdukes of Austria (see AUSTRIA). The fidelity of the ‘‘yrolese to their eounts has for many centuries been proverbial. The Brenner has more than once offered them a secure line of retreat and the mountains a rampart of defence. Maximilian I. (1498-1519) had an especial affection for Tyrol. He conferred on the province its present title of Die gefirstete Graf- schaft; he profited on more than one occasion by the refuge it afforded ; he spent much of his time within it; and at his death he directed that a sumptuous monument to himself should be erected in the Franciscans' church at Innsbruck. 'Tyrol has more than once been the scene of sharp fighting. In 1499 the men of Gran- biinden or the Grisons (see SWITZERLAND) invaded the country and defeated the Tyrolese in the neighbourhood of Mals. In 1708 Max Emmanuel, elector of Bavaria, penetrated the upper Inn valley, but was driven back. During the wars of the French Revolution French and Austrian armies met more than once within the limits of the province. By the treaty of Pressburg, 1805, the province was transferred to Bavaria. On the renewal of war between Boua- parte and Austria in 1809 the people rose and expelled the Bavari- ans, and afterwards, under the leadership of Andrew

Hofer, an innkeeper of the Passeir valley, repeatedly defeated the French, Bavarian, and Saxon forces. Innsbruck was more than once taken and retaken; and on 12th August Hofer, after defeating Marshal Lefebvre, was installed in the capital ascommandant. But the ill- success of the Austrian arms elsewhere prevented any support from being sent, and by the treaty of Schonbrunn in October the Tyrolese were again given up to their new rulers. Hofer, being captured through treachery, was shot at Mantua, 20th February 1810. On the fall of Bonaparte, Tyrol reverted to the house of Hapsburg.

See A. Jiiger, Die Verfassung Tirols, Innsbruck, 1881-85 ; Egger, Die Tiroler

und Vorarlberger, Innsbruck, 1872-79; Steub, Dret Sommer tn Tirol, Stuttgart, 1871 (2d ed.). (A. J.B.)

TYRONE, an inland county of Ireland, in the province

north to south is 46 miles and from east to west 60. The total area in 1881 was 806,658 acres or about 1260 square miles. The surface is for the most part hilly, rising into mountains towards the north and south, but eastwards towards Lough Neagh it declines into a level plain. Run- ning along the north-eastern boundary with Londonderry

are the ridges of the Sperrin Mountains (Sawell 2236 feet

and Meenard 2064 feet). Farther south there are a range of lower hills and Mullaghearn, to the north of Omagh (1890 feet). South of Clogher a range of hills (1265 feet) forms the boundary between Tyrone and Monaghan. On each side of the Mourne river near Omagh rise the two pictur- esque hills Bessy Bell and Mary Gray. The Foyle forms

a small portion of the western boundary of the county,

and receives the Mourne, which flows northward by Omagh and Newtown Stewart. The principal tributaries of the Mourne are the Derg, from Lough Derg, and the Owen- killew, flowing westward from Fir Mountain, The Black- water, which is navigable by boats to Moy, rises near Five- Mile

Town, and forms part of the south-eastern boundary of the county with Monaghan and Armagh, With the ex- ception of Lough Neagh, bounding the county on the east, the lakes are small, also few in number. Lough Fea is picturesquely situated in the north-west, and there are several small lakes near Newtown Stewart. The Ulster Canal runs along the southern boundary of the county from Lough Neagh to Caledon, The substratum of the northern mountains is mica slate interspersed with primary lme- stone. Yellow sandstone appears in the north-west, in the centre towards Omagh, and in the south-west, where it plunges into Fermanagh. The greater portion of the central area of the county is occupied by Old Red Sand- stone. The Tyrone coal-field (6 miles long by 1 to 2 broad) extends between Lough Neagh and Dungannon, all the measures being represented. ‘The coal-field is much broken by faults and has been worked chiefly near the surface, and generally in an unskilful manner ; the principal pits are near Dungannon and at Coal Island. The coal is bituminous. There are also indications of copper, iron, and lead.

Agriculture.—The hilly portions of the county are unsuitable for tillage ; but in the lower districts the soil is remarkably fertile, and agriculture is generally practised after improved methods, the county in this respect being in advance of most parts of Treland. The excellent pasturage of the hilly districts affords sustenance to a large number of young cattle. The total number of holdings in 1885 was 27,958, of which 16,469 or nearly two-thirds were each between 5 and 30 acres in extent (8865 between 5 and 15 and 8104 between 15 and 30). Only 48 were above 500 acres; 642 were be-tween 100 and 500 acres, 2378 between 50 and 100, 3937 between 30 and 50, 2578 between 1 and 5, and 1921 did not exceed 1 acre. There were 237,528 acres under crops, including meadow and clover (255,281 acres in 1876), 818,550 acres under grass, 1765 fallow, 9378 woods, 72,071 bog and marsh, 109,539 barren mountain land, and 30,112 water, roads, fences, &c. ‘The area under corn crops decreased between 1876 and 1885 from 115,788 acres to 105,348,— oats from 114,223 aeres to 104,040, and wheat from 1166 to 1018. The areas under the other corn crops are very small and fluctuate eonsiderably. The area under green crops between 1876 and 1885 decreased from 64,971 to 59,387 acres,—potatoes from 44,001 to 40,649, turnips from 17,157 to 15,531, mangel wurzel from 750 to 487, and other green crops from 38063 to 2670. Flax (28,901 acres in 1876) covered

16,864 acres in 1885. The area under meadow and clover in 1876 was 50,671, and in 1885 56,484, but there has been no increase since 1878. ‘The number of horses decreased be- tween 1876 and 1885 from 25,088 to 23,185, of mules from 71 to 49, of asses from 1124 to 921, of cattle from 176,841 to 168,072, of sheep from 45,274 to 44,434, and of pigs from 49,012 to 39,530. On the other hand, the number of goats increased from 7950 to 8984, and of poultry from 674,826 to 737,859.

According to the latest landowner’s Return (1876), the eounty was divided among 2787 proprietors owning 775,285 acres at a tot. annual value of £426,224, the average value per acre being nearly

Average number of emigrants annually was 3085.

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lis. Of the proprietors 1070 owned less than 1 acre each, the total The estimated extent The following possessed over 10,000 acres each—duke of Abercorn 47,615 acres, earl of Castlestuart

distributed amongst them being 272 acres, of waste land was 4000 acres.

32,615, earl of Caledon 29,236, commissioners of church tempor-

alities 28,002, Sir John M. Stewart 27,906, Arthur W. Cole Hamilton 16,683, representatives of Sir William M‘Mahon 16,326, Sir William

Verner 16, 043, earl of Belmore 14,359, Thomas Arthur Hope 13, 996,

Lord Dorchester 12,608, Michael Smith 10,968, Louisa Elizabeth

De Bille 10,455, and Thomas R. Browne 10,125. Communication.—Besides Lough Neagh and. the Ulster Canal,

Tyrone has the river Foyle, which is navigable for small craft to a point opposite St Johnstone, and thence by artificial cutting to S

trabane, and the Blackwater, which is navigable for boats to Moy. The Great Northern Railway intersects the county by Dungannon, Pomeroy, Omagh,

Newtown Stewart, and Strabane.

Manufactures.—The manufacture of linens and coarse woollens

(including blankets) is carried on. Brown earthenware, chemicals, whisky, soap, and candles are also made. There are a few breweries and distilleries, and several flour and meal mills. of enterprise the coal and iron might aid in the development of a considerable manufacturing industry.

Administration and Population.—The county comprises 8 haro- nies, 46 parishes, and 2164 townlands. Formerly it returned two

members to parliament, the borough of Dungannon also returning one; but in 1885 Dungannon was disfranchised and the county

arranged in four divisions—east, mid, north, and south—each returning one member. It is in the north-western circuit, and as- sizes are held at Omagh and quarter-sessions at Clogher, Dungan- non, Omagh, and Strabane. There are fourteen petty sessions districts within the county and portions of four others. is in the Belfast military district.

From 312,956 in 1841 the population had decreased by 1861 to 238,500, by 1871 to 215,766, and by 1881 to 197,719 (96,466 males and 101,253 females). In 1881 there were 109,793 Roman Catholics (119,937 in 1871), 44,256 Protestant Episcopalians (49,201 in 1871), 38,564 Presbyterians (42,156 in 1871), 3597 Methodists (3115 in 1871), and 1509 of other denominations (1857 in 1871). The nuinber of persons in the county who could read and write in 1881 was 98,764, who could read only 38,788, the remainder (60,172) being wholly illiterate. Twenty-two persons could speak Irish only and 9796 Irish and English. For the seven years ending 1885 the The population of the principal towns in 1881 was—Strabane 4196, Omagh (the county town) 4138, Dungannon 4084, and Cookstown 3870.

History and Antiquities.—Anciently Tyrone was included in the portion of Ulster made ‘‘sword-land” by the Scots. It became a principality of one of the sons of Niall of the Nine Hostages, and from his name—Eogain—was called Tir Hogain, gradually altered to Tyrone. From Eogain were descended the O’Neals or O’Neills and their numerous septs. The family

had their chief seat at Dun- gannon until the reign of Elizabeth, when it was burned by Hugh O'Neill to prevent it falling into the hands of Lord Mountjoy. The earldom of Tyrone had been conferred on Con Bacagh O'Neill by Henry VIII., but he was driven into the Pale by one of his sons Shan, who with the general consent of the people was then pro- claimed chief. From this time he maintained a contest with English authority, but his last remaining forces were completely defeated near the river Foyle in May 1567. During the insurrection of 1641 Charlemont Fort and Dungannon were captured by Sir Phelim O'Neill, and in 1645 the Parliamentary forces under General Munro were signally defeated by Owen Roe O'Neill at Benburb. At the Revolution the county was for a long time in the possession of the forces of James II. Dungannon was the scene of the famous volunteer convention in 1782. Raths are scattered over every dis- trict of the county. There is a large cromlech near Newtown Stewart, another at Tarnlaght near Coagh, and another a mile above Castlederg. At Kilmeillie near Dungannon are two circles of stones. The monastic remains are of comparatively little interest. There are still some ruins of the ancient castle of the O'Neills, near Benburb, and among other ruined old castles mention niay be made of those of Newtown Stewart, Dungannon, Strabane, and Ballygawley.

TYRTAUS, Greek elegiac poet, lived at Sparta about the middle of the 7th century B.c. According to the legend current in later times, he was a native of the Attic deme of Aphidnez, and was invited to Sparta, on the suggestion of the Delphic oracle, to assist the Spartans m the Second Messenian War. It is difficult, if not im- Possible, to determine the element of truth in this story. Herodotus at least either did not know, or disbelieved, the tradition, which meets us first in Plato (Laws, i. 629A), to the effect that, although Tyrtzus was by birth an

Athenian, he had the Spartan citizenship conferred upon

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him (see Herod., ix. 35). From Plato down to Pausanias we can trace the gradual growth and expansion of the legend. Ephorus is the first to call Tyrtzeus a lame poet ; by later generations he is represented as a lame school. master. Basing his inference on the ground that Tyrteeus speaks of himself as a citizen of Sparta (Fr. 2 v. 3), Strabo (viii. 4, 10) was inclined to reject the story of his Athenian origin, regarding the elegies in question as spurious. On the whole, perhaps, the conjecture of Busolt (Gr. Gesch., p. 166) comes nearest to the truth: the entire legend may well have been concocted during the 5th century in connexion with the expedition sent to the assistance of Sparta in her struggle with the revolted Helots at Ithome. It is possible, as Busolt suggests, that Tyrteeus was in reality a native of Aphidna in Laconia. However this may be, it is certain from the fragments of his poems that he flourished during the Second Messenian War (circ. 650 B.C.)—a period of remarkable musical and poetical activity at Sparta (see TERPANDER)—that he not only wrote poetry but took part in the actual service of the field, and that he endeavoured to compose the internal dissensions of Sparta. by inspiring the citizens with a patriotic love for their fatherland and its institutions.

We possess in all about twelve fragments of Tyrtzus's poetry, varying in length from one to forty-four lines. They are preserved by Strabo, Lycurgus, Stobzeus, and others. We may divide them into two varieties, accord- ing to the metre and dialect in which they are composed. The first class consists of elegies in the Ionic dialect, written partly in praise of the Spartan constitution and King Theopompus (Evvoyla), partly to stimulate the Spartan soldiers to deeds of heroism in the field ('Yrojcas —the title is, however, later than Tyrteus). The interest of the fragments preserved from the Kvvouia is mainly historical : they form our only trustworthy authority for the events of the First Messenian War (Fr. 5, 6, 7). The "Yzro6jxas possess considerable poetic merit, in spite of the occasional monotony of their versification. Addressed toa nation of warriors, they paint in vivid colours the beauty of bravery and the shame of cowardice; there are also lines in them which reveal the soldier as well as the poet, ¢.g., fr. 10, 31-32. One striking feature is the genuinely Greek feeling for plastic beauty, showing itself in the beautiful picture of the youthful form lying dead upon the battle-field (Fr. 10, 27-30, and 12, 23-34; see also Symonds's Greck Poets, i. p. 74). The popularity of these elegies in the Spartan army was

such that, according to Athenzeus (xiv. 630 F), it became the custom for the soldiers to sing them round the camp fires at night, the polemarch rewarding the best singer with a piece of flesh. Of the second class of Tyrtzeus's poems, marching songs, written in the anapestic measure and the Dorian dialect, the re- mains are too scanty to allow of our pronouncing a judg- ment on their poetic merit.

See Bergk, Poctw Lyrici Greci, vol. ii. pp. 8-22, Leipsic, 1882. Fragment 10 (reOvduevae yap Kaddv, &e.) has been translated into English verse by Campbell.

TYTLER. The surname of three Scottish writers, principally on historical subjects.

I, ALEXANDER Fraser Tyrnmr (1747-1813), Lord Woodhouselee, Scottish judge, was the eldest son of William Tytler (see below), and was born at Edinburgh on 15th October 1747. After passing through the High School, he was sent in 1763 to a school at Kensington taught by Dr Elphinston, the translator of Martial's Epigrams. He returned to Edinburgh in 1765, skilled in Latin versifica- tion, and with a competent knowledge of Italian, and a taste for drawing and natural history. He was called to the bar in 1770, His first work, a supplement to the Dictionary of Decisions, undertaken on the suggestion of

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Lord Kames, was published in 1778, and a continuation appeared in 1796. In 1780 Tytler was appointed con- joint professor of universal history in the university of Edinburgh, becoming sole professor in 1786. In 1782 he published Outlines of his course of lectures, afterwards extended and republished under the title of Elements of General History. The Elements has passed through many editions, and has been translated into several European languages as well as into Hindustani. The lectures them- selves were published in 1834 in Murray's Family Inbrary. In 1790 Tytler was appointed judge-advocate of Scotland, and while holding this office he wrote a Treatise on the Law of Courts-Martial. In 1801 he was raised to the

bench, taking his seat (1802) in the court of session as Lord Wood-houselee. He died at Edinburgh on 5th January 1813.

Besides the works already mentioned, he was the author of several papers in the Mirror, the Lounger, and the Transactions of the Royal Society of Edinburgh ; he also wrote Life and Writings of Dr John Gregory ; Essay on the Principles of Translation, 1790 ; a disserta- tion on Final Causes, prefixed to his edition of Derham's Physico- Theology, 1799; a political pamphlet entitled Jreland profiting by Example, 1799; an Essay on Laura and Petrarch ; and The Life and Writings of Henry Home, Lord Kames, 1807.

9. Patrick Fraser Tytiur (1791-1849), as the son of Lord Woodhouselee and grandson of William Tytler, may be said to have inherited a taste for literary and his- torical pursuits. He was born at Edinburgh on 30th August 1791, and was educated chiefly at the High School and university, being called to the bar in 1813. His earliest literary effort appears to have been a chapter or two contributed to Alison's Zravels in France (1815); and his first independent essays were papers in Blackwood's Magazine. Inheriting the family talent for music, and with a facility in throwing off humorous little poems and songs, he made several contributions to Thomson's Select Melodies of Scotland, 1824. In 1819 he published the Life of James Crichton of Cluny, commonly called the Admirable Crichton, a second edition appearing in 1823. This was followed by a Memoir of Sir Thomas Craig of Riccarton, 1823 ; an Essay on the Revival of Greek Lntera- ture in Italy, and a Life of John Wicklif, published anonymously, in 1826. The History of Scotland was un- dertaken at the suggestion of Sir Walter Scott, and occupied Tytler for nearly twenty years, in the course of which he removed to London for convenience of research. The first volume appeared in 1828, and the ninth and last in 1843. The original investigations on which the work was founded gave it an authority which no previous history of Scotland possessed, and the clear and graphic style made it inter- esting and popular. The last few years of his life were spent in physical prostration and mental depression, and he died at Great Malvern on 24th December 1849.

During the progress of his History a large amount of other work came from his pen, as the following list shows :—Lives of Scottish Worthics, for

Murray’s Family Library, 8 vols., 1831-33 ; Histori- cal View of the Progress of Discovery in America, 1832, and Life of Sir Walter Raleigh, 1838, for the Edinburgh Cabinet Library ; Life of Henry VILL, 1887 ; England under the Reigns of Edward Vi. and Mary, from original letters, 2 vols., 1839 ; article “ Scotland” in the seventh edition of the Encyclopxzdia Britannica (aftcrwards published separately as a school history) ; Motes on The Darnicy Jewel, 1843; on the Portraits of Mary Queen of Scots, 1845 (privately printed) ; and Memoirs of the War carried on in Scotland and Ireland, 1689-91, by General Mackay, edited in conjunction with Hog and Urquhart, and presented to the Bannatyne and Maitland Clubs in 1883.

3. Wintiam Tyrier (1711-1792), of Woodhouselee, writer on historical and antiquarian subjects, was the son of Alexander Tytler, writer in Edinburgh, and was born in that city on 12th October 1711. He was educated at the High School and the university, and, having adopted his father’s profession, was in 1744 admitted into the society of Writers to the Signet. While successfully practising as a lawyer, he found time to devote attention to historical

investigation. In 1759 he published an Inquiry, Eistori- cal and Critical, into the Evidence against Mary Queen of Scots, and an Examination of the Histories of Dr Robertson and Mr Hume with respect to that Evidence. This work, which warmly defended the character of the queen, met with great success. Four editions, the later ones con- siderably enlarged, were published in the author’s lifetime ; and it was translated into French. In 1783 he published the Poetical Remains of James the First, King of Scotland, to which he added a dissertation on the life and writings of the royal author. He wrote an essay on “Scottish Music,” which was appended to Arnot’s History of Edin- burgh. His “ Dissertation on the Marriage of Queen Mary | to the Earl of Bothwell” and “ Observations on the Vision, | a Poem,” appeared in the Z’ransactions of the Society of Antiquaries of Scotland (1791-92). A paper in the Lounger, on “ Defects of Modern Female Education,” and an Account of Fashionable Amusements in Edinburgh in the Seventeenth Century complete the list of his works. He died at Edin- burgh on 12th September 1792.

TYUMEN, a district town of West Siberia, in the government of Tobolsk, is situated at a point where the chief highway from Russia across the Urals touches the | first navigable river (the Tura) of Siberia. A railway passing through Ekaterinburg and the principal iron- .

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works on the eastern slopes of the middle Urals connects Tyumefi with Perm, the terminus of steamboat traffic on the Kama and Volga. The Tura being a tributary of the Tobol, which joins the Irtish, a tributary of the Ob, Tyumefi has regular steam communication with Omsk and Semipalatinsk by the Irtish (steamers penetrating as b far as Lake Zaisan in Dzungaria); with Tomsk, Barnaul, 7 and Biysk, in the Altai, by the Ob and the Tom ; with Irbit—the seat of the great Siberian fair—by the Tura and the Nitsa; and by the Tobol, the Irtish, and the Ob with the Arctic Ocean and the fisheries of the lower Ob. Tyumefi stands also at the western extremity of the Siberian highway which goes wa Omsk, Tomsk, and Krasnoyarsk to Irkutsk. In summer the Tura sometimes falls so low that steamers have to stop 90 miles off, pass- | engers and goods being taken thence to Tyumen in lighter vessels. The town is well built, and stands on both banks of the Tura, which is here spanned by a bridge. The portion on the low left bank is inhabited by the poorest class and is often inundated ; the best houses are on the high right bank. The streets are unpaved, but the houses (principally wooden) are for the most part inclosed by gardens. The people, who are famed throughout Siberia for their good looks, have always been renowned for their industrial skill. Woollen cloth, linen, belts, and especially boots and gloves, are manufactured to a large amount (70,000 pairs of boots and 300,000 pairs of gloves annually). Tyumeii carpets, although made in the simplest way and with the plainest tools, have a wide renown in Russia and Siberia, and recently have appeared in the markets of western Europe as of Oriental origin, All kinds of metal wares are made in small workshops. Sheepskins and various kinds of cloth are extensively manufactured, and the leather prepared at the tanneries (100 in number) is extensively sold all over Siberia, the Kirghiz steppe, and Bokhara. An establishment has recently been opened for the construction of barges, and a paper-mill, the

first im Siberia, was opened in 1886. The trade of Tyumen is ex- ceeded only by that of Irkutsk and of Tomsk. In addition to its primary schools Tyumefi has a “real” school. The population, which is of a fluctuating character in summer, is differently estimated at 13,000, 14,500, and 18,000. TZARSKOYE SELO. See TsaRSKOYE SELO. TZETZES, JoANNES, a voluminous Byzantine writer of the 12th century. See Grexce, vol. xi. p. 140 sg.

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U holds the twenty-first place in our alphabet. The

corresponding place in the Greek alphabets was occupied by Y (with some slight variations of form). The form in the Italian alphabets was generally V, These three are only modifications of one original; but they are independent symbols with us, though Y does not represent

any sound otherwise unrepresented. It will be most con- venient to describe the three forms once for all.

With T we reach the end of the original Phcenician The remaining symbols —no fewer than six with

alphabet. u’, four in the completed Latin alphabet—are accretions, either modifications of old symbols for greater exactness or old symbols themselves which had fallen out of their proper place and were added again. needed to represent the important vowel sound u. We have already seen that the Greeks employed the Phcenician symbols for the breaths which they did not want as symbols for the vowels which they did want.

for u. But vau was already employed for w, which was

a living sound in early Greek ; the form used was F (the

so-called digamma), the origin of our F. What then was the origin of the symbol for x ? find the two forms Y and V, e.., in inscriptions of Thera. Now the Moabite form of vau is Y, which resembles the Y more than F. It is difficult to see why the presumably oldest Phoenician form should appear, not in the sixth place of the Greek alphabet, but at the end, where it must have been an arbitrary addition; and, although the Y form could be derived from F (middle steps are found), it is not easy to get F from Y. We may suppose that the two symbols, F and Y, were obtained by the Greeks from independent Pheenician alphabets, the first being kept by those Greeks who required a symbol for w, and did not at first need any special sign to distinguish (which in the earliest Greek times known to us had the value of German ui) from 0; while the others took the form Y to express the modified «, and probably never really adopted the F, except as a numeral; it does not appear even in the very old Abu Simbel inscription written by the Ionian mercen- aries of Psammitichus. It is noteworthy that in that in- scription both the forms Y and V appear, whereas in those of Thera and Melos we have sometimes the one sometimes the other, but not both in the same inscription, and a study of the writing leads to the conclusion that the Y was felt to be the true (z.c., the older) form, but that V was used more frequently for the sake of simplicity.

At Rome the single form V denoted both the vowel x and also the consonantal w, F retained its place as sixth in the alphabet, but with the value of J, which was un- known to the Greeks; a peculiar form, C, in which the middle stroke has gone to the bottom, seems to have been affected by its neighbour E; this is found in Etruscan, Umbrian, and Samnite inscriptions ; it has, however, the value of w; while a curious symbol 8 appears at the end of the Etruscan alphabet, and is also used in the Eugubine tables, with the value of f; the origin of this is uncertain. It may be a rounded form of the second symbol in the digraph FH (i.e. FH) by which the sound F is indicated in a very old inscription (see Rhein. Mus., xlii. Beit this is so, the Latin alphabet has the first member of the digraph, the Etruscan has the second. Next, the symbol Y was added (together with Z) in the Ist century B.C. to Tepresent more exactly, in borrowed words, the sound of Greek upsilon.

The first new symbol was

Thus we should have expected that the Phoenician vau would have been used

In the earliest Greek we

Lastly, the form U was differentiated from V. It is the uncial form, and so belongs to the general transition from the pointed to the rounded character which conduced to greater convenience of writing. Examples of it may be seen in the article on PALHOGRAPHY ; see the specimen of Latin uncial of the 5th or 6th century (vol. xviii. p. 153), and the half-uncial of the Lindisfarne Gospels, about 700 A.D. (¢hid., p. 159). It was clearly a matter of convenience to have separate symbols to represent sounds so distinct as wand v; but the application of the two symbols seems to have been due to chance rather than design. The form V remained in use at the beginning of words, whereas w, which was the uncial and cursive form, naturally was used rather in the middle; by degrees the initial form was ap- propriated to consonants,—perhaps, as Dr Taylor suggests (Alphabet, ii. 189), because the consonant is commoner at the beginning of words, or for some other reason, while the medial form was connected with vowels.

The sound which U denotes is produced by “ rounding ” the lips to the furthest extent consistent with a clear vowel-sound, and by raising the back of the tongue higher than for any other rounded sound. It has two varieties (like all other vowels) according as the position of the tongue is more or less tense, producing thereby a narrower or a wider aperture for the voice to pass through ; whence the sounds are technically called “narrow” and “wide” respectively. The narrow sound is heard in English only when the vowel is long, as in “ book,” “ rule,” but in northern English (Scotch) “book” may be heard short, The wide sound is heard in “ full,” “good.” The digraph 00 is commonly used for the w sound, and attests the fact that the original sound of 6 has frequently passed into a, as in “ good,” “ food,” é&c., written ‘* gode,” “fode” in Middle English ; sometimes, however, the oo has come by analogy into words where is the original sound, as in “room,” M.E. “roum,” O.E. “ram.” Original has com- monly passed into the aw sound, spelt in English ow or ow, as in “how,” “house,” ‘ mouse,” “bower,” for O.E. alias”? “his,” “mis,” “bir.” According to Mr A. J. Ellis, words derived from the French had in Chaucer’s time the sound of

French uw; and Sir John Cheke's statement "cum duke, tuke, lute, rebuke, Sux, tux, Ave, peBv« dicimus, Grecum v sonaremus," seems strong for the same practice in the 16th century. In the 17th century the modern pro- nunciation of was 7u in "muse," "duke," " mute," " pure" had come in. Hence also we may explain the substitution of u for yin some genuine English words, as " busy " (orig. bysig). At the same time begins the corruption of u to the (so-called) 2 sound in "but," "shut," é&e.; this is not aw sound at all, but the neutral vowel as heard indiffer- ently in "but," "sun," "son," "blood"; it is often con- founded by writers with the true % heard in " pull" and in the northern pronunciation of "but," "shut." For the history of the German " modified" w (spelt «i, but origin- ally we) see under Y,

UBEDA, a town of Spain, head of an administrative subdivision in the province of Jaen, stands on a gentle Slope about 5 miles from the right bank of the Guadal- quivir, and about 22 miles to the east of the Menjibar station on the railway from Madrid to Cordova. Under the Moorish rule it was a place of considerable conse- quence, its population being said to have at one time numbered 70,000. Some portions of the old walls, with towers and gates, still remain, but none of the public buildings are of great age, the oldest church, that of San

Salvador, dating from 1540-56. The population within the municipal boundaries in 1877 was 18,149.

UDAIPUR [Ooprvrors], or MEwAr, a native state in Rajputana, India, with an area of 12,670 square miles. It extends from 23° 49' to 25° 58' N. lat., and from To 1 to 75° 52′ E. long, and is bounded on the N. by the British territory of Ajmere; on the E. by the native states of Bundi, Gwalior, Tonk, and Partabgarh ; on the 8, by Banswara, Dungarpur, and Mahi Kantha ; and on the W. by the Aravalli Mountains, separating it from Marwar and Sirohi. The greater part of the country is level plain. A section of the Aravalli Mountains extends over the south- western and southern portions, and is rich in minerals, but the mines have been long closed. The general inclination of the country is from south-west to north-east, the Banas and its numerous feeders flowing from the base of the Aravalli range. There are

many lakes and tanks in the state, the finest of which is the Dhebar or J aisamand, with an area of nearly 21 square miles; it is considered to be the largest sheet of artificial water in the world. There are only two metal roads in the state; the Nimach State Railway passes through the north-eastern part.

In 1881 the population, exclusive of 51,076 Bhils, was 1,448,144 (males 772,685, females 670,459); Hindus numbered 1,321,521, Mohammedans 43,322, Jains 78,171, and Christians 130. The only town with over 10,000 inhabitants is Udaipur, the eapital (38,214). This city is picturesquely situated on a lake 2000 feet above sea- level, and faces wooded hills. It contains the royal palace, which is a noble pile of granite and marble, built on the crest of a rocky ridge overlooking the lake, city, and valley. There are no manu- factures of any importance in the state, and the crops as a rule only suffice for local wants. The principal imports are salt, piece goods, groceries, metals, medicines, sugar, ivory, and tobacco ; and the exports are mostly confined to turmeric, gur, cotton, indigo, til, opium, and cattle. The total income of Udaipur in 1885-86 was £259,624. The state was taken under the protection of the British Government in 1817, and it pays an annual tribute of £20,000. The family of the raja of Udaipur ranks highest in dignity among the Rajput chiefs of India.

UDAL (Danish ode) is a kind of right still existing in Orkney and Shetland, and supposed to be a relic of the old allodial mode of landholding existing antecedently to the growth of feudalism in Scotland. The udal tenant holds without charter by uninterrupted possession on payment to the crown, the kirk, or a grantee from the crown of a tribute called scat (Danish shat), or without such payment, the latter right being more strictly the udal right. Udal lands descend to all the children equally. They are con- vertible into feus at the option of the udallers.

UDALL, Nicwotas (b. 1505-d. 15561), author of the earliest extant regular English comedy. Udall was a typ- ical man of the Renaissance in England, a schoolmaster by profession, a classical scholar, a translator of Terence and Erasmus, and a writer of pageants and interludes. He was high in favour at court, wrote verses for the city pageant exhibited at Anne Boleyn’s coronation in 1533, and was honoured by Mary in 1554 as one that had

“heretofore showed and mindeth hereafter to show his diligence in setting forth of dialogues and interludes before us for our regal disport and recreation.” The severity of his discipline at Eton, where he was headmaster, has been immortalized by the quaint lines of one of his pupils, Thomas Tusser. The exact history of the production of his comedy Ralph Royster Doyster is not known. A printed copy wanting the title-page came to light in 1818, and we know that it was licensed to be printed in 1566. Itisa distinct advance in construction on the Merry Interludes of John Heywood, but it is not a comedy in the strict

English sense, being, like the interludes, essentially farcical

; 1 The date of Udall’s death is sometimes erroneously given as 1564, in which year his play of Hzekias was performed at Cambridge before Queen Elizabeth. He was buried at St Margaret’s, Westminster, on 23d December 1556 (see memoir in Cooper’s edition of Royster Doyster).

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in motive, character, and incident. Although an imitation of the Latin comedy, it is far from being a servile imita- tion, and abounds in fresh fun and cleverness. It has been twice reprinted,—by the Shakespeare Society (with a memoir by Mr Cooper) and in Arber’s Reprints.

UDINE, a town of Italy, in the province of Udine, ina wide plain near the foot of the Carnic Alps, on the Roja, 84 miles by rail north-east from Venice and 49 miles north-west from Trieste. It is enclosed by an imposing wall of con- siderable antiquity, some 4 or 5 miles in circumference, and fortified with towers. In the centre, on an eminence, | stands the old castle, at one time the residence of the patriarchs of Aquileia, and now used as a prison. Grouped | around this is the old part of the town, with narrow crooked streets, some of which are lined with arcades. The cathedral, which is a Romanesque building with fine pillars, and an hexagonal tower bearing 14th-century sculp- tures, contains some interesting examples of native art (by Giovanni Martini da Udine and others). The church of S Maria della Purity has frescos by Tiepolo. On the principal square stands the town-hall,

built in 1457 in the Venetian-Gothic style, and skilfully restored since a fire in 1876 ; opposite is a clock tower resembling that of the Piazza di San Marco at Venice. The archiepiscopal palace and Museo Civico, as well as the municipal buildings, have some valuable paintings. Several of the palaces of the nobility have striking architectural features, and the town is adorned by many beautiful public walks. The leading industry of Udine is silk-spinning, but it also possesses manufactures of linen, cotton, hats, and paper, tanneries, and sugar refineries, and has a considerable trade. The population in 1881 was 23,254.

Udine is the Vedéaum of Pliny ; it was then a municipium, but quite an inconsiderable place compared with Forum Julii (Cividale) 11 miles to the east, or Aquileia 22 miles to south-south-east. In the Middle Ages it became a flourishing and populous city ; in 1238 the patriarch Berthold made it the capital of FRivL1 (9.2.), | and in 1420 it became Venetian.

UEBERWEG, Frizepricu (1826-1871), best known by | his History of Philosophy, was born on the 22d January) 1826 at Leichlingen, in Rhenish Prussia, where his father | was Lutheran pastor. His mother, left early a widow, devoted her scanty means to the education of her only son. Ueberweg passed through the gymnasium at Elber- feld, and studied at the universities of Gottingen and Berlin. In 1852 he qualified himself at Bonn as privat- docent in philosophy. His System of Logie, published in | 1857 (English translation 1871), and his essay On the . Authenticity and the Order of the Platonic Writings, crowned by the Imperial Academy of Vienna (published 1861), con- tributed to draw attention to him as at once a scholar and a thinker. In 1862 he was called to Konigsberg as extra-ordinary professor, and in 1867 he was advanced to the ordinary grade. He married in 1863, and on the 9th June 1871 he died prematurely.

The chief work of his later years was his compendious History of Philosophy, which is unmatched for fulness of information con)- bined with conciseness, accuracy, and impartiality of treatment. The first part appeared in 1862, An English translation, in two volumes, was published in 1872, and has gone through several editions. Ucberweg translated, in 1869, Berkeley’s Principles of Human Knowledge, with notes, for Kirchmann’s Philosophische Bibliothek. In philosophy Ueberweg was strongly opposed

to the subjectivistic tendency of the Kantian system, maintaining 1m particular the objectivity of space and time, which involved him 1m a somewhat violent controversy with several opponents. His own mode of thought he preferred to describe as an ideal realism, which refused to reduce reality to thought, but asserted a parallelism be- tween the forms of existence and the forms of knowledge. Beneke and Schleiermacher seem to have exercised most influence upot the development of his thought. A short memoir, by his friend F. A. Lange (author of the History of Materialism), gives some account of what may be called personal opinions in philosophy an theology, which did not find expression in Ueberweg's published writings.

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UFA, a government of south-eastern Russia, on the western slope of the Urals, has Vyatka and Perm on the N., Orenburg on the E. and §., Samara and Kazaji on the W., and comprises an area of 47,112 square miles. In virtue alike of its physical characters and of its population, which belongs chiefly to the Ural-Altaic stock, it forms an intermediate link between Europe and Asia, and it was only recently separated from the government of Orenburg, which is now limited to the eastern slopes of the Urals. Several craggy and densely wooded ridges, running from south-west to north-east parallel to the main chain of the southern Urals, occupy its eastern part. They are separ- ated by broad and long longitudinal valleys, and rise to altitudes of from 2500 to 3500 feet above the sea; their highest peaks—Iremel (5040 feet), Nurgush, Urenga, and Taganai (3950 feet)—are above the limits of tree-vegeta- tion, but in no case reach those of perpetual snow. The high longitudinal valleys of the Urals are the seat of an important mining industry. Southward Ufa extends over the slopes of the Obshchiy Syrt plateau, the angular space between the latter and the Urals being occupied by elevated plains (from 1000 to 1500 feet), deeply grooved by the river valleys and sometimes described as the " Ufa plateau." It slopes gently towards the depression of the Kama ; and its undulating surface, especially its broad valleys (500 to 600 feet above the sea), covered as they

are with a fertile soil, are being rapidly colonized by Russian settlers. Towards the Kama the fertility of the soil increases, and the black- earth regions of Menzelinsk and Birsk may be described as granaries for that part of Russia.

The geological structure of Ufa is very varied. The main ridge of the Urals consists of gneisses and various crystalline slates rest- lng upon granites and syenites ; next comes a broad strip of lime- stones and sandstones, the fossil fauna of which is intermediate in its lowest parts between the Upper Silurian and the Lower Devonian. These form the highest ridges of Ufa. Farther west the Devonian deposits are followed by Lower and Upper Carbon- iferous and “ Artinsk schists,” which, together with Permian de- posits, cover western Ufa. Quaternary deposits are extensively developed in all the valleys, most of which were occupied by lakes during the Lacustrine period. Ufa has not the mineral resources of Perm; only traces of gold have been found in its valleys, and silver ores arc absent; but its wealth in iron (Devonian) and copper (Permian) seems likely to have great mining importance in the future. The district of Ztatoust is celebrated for its granite, epidote, nephrite, and a variety of decorative stones and minerals. Coal is spread over a wide area, but only in Jayers too thin to make work- ing remunerative. Fire-clay, kaolin, and sandstone for making gtindstones are obtained to some extent; naphtha, sulphur, and saltpetre have been observed in several places.

Ufa belongs almost entirely to the drainage area of the Byetaya, a great tributary of the Kama, which rises in Orenburg, flows south and west till it pierces a mountain chain at Bugutchan, and then runs north and north-west, watering the high plains and receiving a number of important tributaries, among which the Sim, the Tanyp, and the Ufa are also navigable. The banks of the Byetaya are thickly peopled, and it is an important channel for trade ; but it sometimes reaches so low an ebb in summer that steamers cannot proceed beyond Birsk. The Kama flows for 120 miles along the western border of the government. Marshes lie along its course, so that its banks are but thinly inhabited. Forests cover nearly half the area, but the plains on the left of the Byetaya are comparatively thinly wooded. The climate of Ufa is very continental. The average temperature at Ufa is 37° F., and the winter is extremely cold (Janu- ary 5°°5 F., July 68° F.); at the Ztatoust observatory

(1340 feet) the average temperature is only 32°-2 (January 2°; July 61°‘8). Even In the hilly tracts of Ztatoust the annual rainfall is only 19 inches. The rivers are frozen 158 days at Ufa, and 202 about Ztatoust.

The population of Ufa is now rapidly increasing (1,798,260 in 1882, as against 1,291,020 in 1865). Only one-third of the whole is Russian, the remainder being chiefly Bashkirs (50 per cent., in- cluding Mescheriaks and Tepters), Tartars (8°4 per cent.), Tchere- misses, Tchuvashes, Mordvinians, and Votiaks. In the south the Bashkirs, Tartars, and other Ural-Altaians constitute two-thirds of the population. Among the Russians two distinct elements must be distinguished,—some 100,000 peasants, who formerly were mining serfs, and now support themselves chiefly by work in or for the mines, and nearly 620,000 agriculturists, for the most part more Tecent immigrants. The latter carry on agricultureon an extensive

scale, and export large quantities of corn. The Bashkirs are chiefly cattle-breeders, but of late they have been driven more and more to tillage, owing to the appropriation by speculators of their exten- sive pasture-lands. Bee-keeping is largely carried on, and hunting is still an important source of income to the Bashkirs. In the north-east the trade in timber and the manufacture of various wooden wares are largely engaged in by the peasantry. The mining industry is advancing, notwithstanding many obstacles (see vol. xxi, p. 85); the iron-works of Ztatoust especially have a wide reputation. Flour-mills, distilleries, and tanneries eome next in importance. The exports of corn, linseed, timber, wooden wares, metals, tallow, hides, and eattle are considerable, and trade is active, especially at the fairs of Menzelinsk, Ufa, and Ztatoust.

There are six administrative districts, the chief towns of which (with populations in 1884) are—Ufa (25,660), Belebei (4200), Birsk (8000), Menzelinsk (6100), Sterlitamak (8940), and Ztatoust (18,990). The loading places Tehetny and Berozovka on the Kama, and several iron and copper works (Satkinsk, Yurezafi, Katav-Ivanovsk, about 6000 inhabitants each) ought also to be mentioned.

UFA, capital of the above government, is situated at the confluence of the Ufa with the Byetaya, on high crags intersected by ravines, which are covered with gardens and orchards. The better part of the town contains a

few stone buildings connected with the administration, two cathe- drals, and a few churches; the remainder is a scattered aggregation of small wooden houses. There are two class- ical gymnasiums for boys and girls, a theological seminary, and several lower schools. The town has a few good hospi- tals. The manufactures are insignificant in Ufa itself, but there are several iron and copper works of importance within the district. Owing to the fertility of the neigh- bouring regions, and the position of the town at the junc- tion of two important rivers, the Ufa merchants carry ona brisk export trade. The population has rapidly increased of late, reaching 25,660 in 1884.

Ufa was founded in 1574, when a fort was built on the Byetaya, three other forts being erected about the same time at Birsk, Menzelinsk, and Berezovka, to connect Ufa with the Russian settle- ments on the Kama. The wooden krem] of Ufa, protected by wooden towers and an outer earthen wall, had to sustain the attacks of the revolted Bashkirs and Russian serfs in 1662 and at later dates; and in 1778 Tchika, one of the chiefs of the Pugatcheff revolt, besieged it for four months.

UGANDA, a country of eastern Central Africa, to the north-west of the Victoria Nyanza. It has an area of about 34,000 square miles, extending from 1° N. lat. to the Kitangule river, and from 31° E. long. to the Nile. The country bordering the lake and to the north-west is moun- tainous, the mountains being arranged in low parallel chains. The hills, covered with splendid timber and abun- dant underwood, rise to a height of 400 feet above their valleys, through which sluggish streams flow to the lake. Farther north the country becomes a plain, and the eastern portion of Uganda, between Rubaga and the Nile, consists of undulating country, varied by deep narrow valleys. The geological formation of the country is volcanic or metamor- phic ; two or three feet of rich black alluvial soil form the upper strata, covering a bed of red sandy clay, often 30 feet thick. In some places porcelain earth is found, as well as large masses of mica. Ironstone is present in con- siderable quantities, but as yet no other metals have been discovered. The climate is mild, and the temperature re- markably uniform throughout the year ; the thermometric range is from 50° to 90° F.; but the mean annual variation is only 20°. The annual rainfall is 50 inches, the greatest amount of rain occurring in March, April, May, and

Sep- tember, October, and November, when rain falls nearly every day, thunderstorms being frequent.

The population of Uganda is about five millions. The men are tall and well-built, and have good features and dark chocolate-coloured skin, with woolly hair. The women in their youth are good- looking. The country is divided into three provinces—Uddu in the south, Singo in the west, and Changwe in the east, to which must be added about 400 islands in the lake. The government of the country is feudal, the king being nominally supreme. Succession to the throne is hereditary, but the successor is usually a minor

chosen by three hereditary chiefs, who with the young king's mother carry on the government until he isof age. The reigning family in Uganda is descended from the Wahuma tribe; the late king Mtesa professed to trace back his descent to Kintu (or Ham), the founder of the dynasty. The country is ruled by the king, three hereditary chiefs, and a council of minor chiefs, —two hereditary chiefs and a certain proportion of the others being continually in residence at Rubaga, the capital of the country. The laws are strict, and the administration of justice is conducted in an orderly manner. There is no real taxation, but the people are compelled to render feudal service to all their superiors. The Waganda may be divided into four classes, the lowest class being the slave popu- lation, consisting of prisoners taken in war and their descendants ; next come the "bachopi" or peasants, who form the mass of the population; the third class are the " batongoli," or chiefs, who are recruited from the bachopi, but whose honours are not hereditary ; they receive their rank for distinguished bravery in the field or for services rendered to the state, and they are the governros of the villages. The highest class is that of the ''bakungu," a superior grade of chiefs, all belonging to the '' luchiko" or state council, and being governors of large districts of land. The three great hereditary chiefs belong to this class, and they are supreme governors of the three great districts into which Uganda is divided. The Waganda are very warlike; all adult males are compelled to serve in the army when required, and the military organization, having its head- quarters at the capital, ramifies throughout the whole land. Gazie is very plentiful : elephants, buffaloes, zebras, rhinoceroses, wild boars,

twelve species of antelopes, lions, leopards, jackals, foxes, hyenas, hares, chimpanzees, and several species of monkeys inhabit the forest. Snakes are numerous; hippopotami, crocodiles, and otters abound in the lake and in the Nile, as also many water-rats. The principal birds are parrots, guinea-fowl, owls, vultures, adju- tants, goatsuckers, kites, eagles, ducks, geese, storks, cranes, herons, gulls, scarlet flamingos, darters, the sacred and glossy ibis, and brilliantly coloured honey-birds. The principal insects are mos- quitos, fleas, locusts, white and driver ants, and butterflies of many species. The domestic animals are cows, goats, and a few sheep and dogs, The Waganda live chiefly npon a vegetable diet, the banana forming the staple food; it grows everywhere, and requires little or no cultivation. The sweet potato is the chief vegetable cultivated, but coffee, sugar-cane, cassava, maize, sesame, millet, tullabone, several species of beans, and two or three kinds of pump- kins are grown toa small extent. The principal fruits are the mpafu and a species of amomum. Strangers have introduced wheat, rice, guavas, papaws, pomegranates, tomatoes, onions, and radishes. Wine is made from the banana tree, and is a staple drink. Butter and cheese are also made. A good deal of manufacture is carried on, for the people are ingenious and clever workmen, and their work is tasteful, neat, and exact. Two kinds of pottery, a coarse and a fine variety, are manufactured in considerable quantities. The basket work is extremely good, and the metal work far superior to any seen among the neighbouring tribes. The manufacture of bark-cloths, in which most of the people are clothed, is very ex- tensively carried on, and their wood-work and boat-building are of very superior quality, Tanning, dyeing, and bead-work employ numbers of the people. There is not very much home trade in Uganda; it is limited to the barter of native manufactures. Several times a year caravans arrive from Zanzibar, bringing calico, guns, powder, files, knives, &c. The standard value of any article is reckoned by 100 cowries or an arm’s length of calico and beads ; hoes, salt, and fish are also employed as mediums of exchange. The language spoken in Uganda belongs to the great Bantu family, and is very rich in words. It has ten classes of nouns, the noun being the most important part of speech. Grammatical inflexions are formed by prefixes; the inflexions of verbs, adjectives, and pronouns vary according to the class of the governing noun. Adjectives agree with the substantive in number and case, and always follow the noun. There are personal, possessive, relative, demonstrative, and interrogative pronouns, and several forms of verbs. The

Waganda arc very good arithmeticians. The root of all multiples is ten; tallies are used as aids to the memory. The people are very musical ; their voices are clear and melodious, and of considerable range. They have a great variety of tunes,— orchestral, dance, and vocal music having distinct characteristics. Their musical instruments consist of harmonicons, rattles, drums, horns, whistles, flutes, and harps. The Waganda have no images or outward symbols of their gods; and they think that the world is ruled by spirits or demons, to whom Katonga, the great creator, has deputed his power. They worship Mukasa, the god of the lake ; Naduala, the god of small-pox ; Chiwuka and Nenda, the gods of war; and several of the former monarchs of Uganda, who are be- lieved to be demi-gods. A thunder spirit isalsoinvoked. The gods of war are supposed to inhabit certain trees, and offerings are made to them before entering the war-path; like offerings are also made to the god of the lake before commencing a voyage upon its waters.

The Waganda are courteous, cleanly, given to hospitality, but drunken, and to a certain extent indolent. Their standard of

morality, even judged by that of the surrounding tribes, is not high. Human life is little respected; they are untruthful and in- decent. Unless moved by passion, they are not cruel; passionate, they are not revengeful. Children are well treated, as are the aged men. On account of the extensive prevalence of polygamy, women occupy a somewhat low social grade.

Uganda was first visited by Speke and Grant in 1860, and the country has since been visited by numerous Europeans, chiefly missionaries. The Church Missionary Society and the Roman Catholics have mission stations in the country. In 1886 some forty of their converts were burnt at the stake, and in the same year Bishop Hannington was murdered on the borders of the country by the orders of King Mwanga.

See Speke’s Journal, Grant’s Walk across Africa, Stanley’s Through the Dark Continent, and Wilson and Felkin’s Uganda and the Egyptian Soudan. Also a monograph ‘On the Waganda Tribe,” by R. W. Felkin, in Proc. Roy.

Soc. Ed., vol. xiii., and an Outline Grammar of the Luganda Language, by C. T. Wilson.

UGLITCH, a district town of Russia, in the government of Yaroslavl, is situated on the upper Volga, principally on its right bank, 67 miles to the west of the capital of. the province. Its historical remains are mostly associated with the prince Dmitri (see vol. xxi. p. 93). The wooden house he occupied, a church of St Demetrius “on the Blood” erected at the spot where he was killed, and a kiosk on the site of the convent where his mother was forcibly conse- crated a nun,—all commemorate this chapter in the history of the rule of the boiars at Moscow at the beginning of the 17th century. An old cathedral, erected in the 13th cen- tury but subsequently restored, and containing the grave of Prince Roman, recalls a still earlier period of municipal independence. Uglitch has now become a commercial and industrial city with 11,930 inhabitants (1883), and has an important trade, being one of the chief loading places on the upper Volga. Its industries comprise the sewing of sacks for corn and flour (about one million every year) and the knitting of woollen socks; and it has a paper-mill, distilleries, copper works, and linen factories. Corn, paper, sausages (with which the name of Uglitch has long been associated), candles, &c., are shipped at the town.

Uglitch is one of the oldest towns of Russia; its local annals go as far as back as the 9th century. Until the 14th century it main- tained its independence as a separate principality, which extended over eastern Tver, and elected its own princes. In 1329 the sons of Prince Roman the Saint renounced their independence in favour of Moscow, and fifty years later the Uglitch princes finally sold their rights to the great prince of Moscow. The Tartars plundered the town during their invasions of 1237, 1293, and 1408, as also did the Lithuanians at a later date.

UGOLINO. See GuEeRARDESCA and PIsa.

UGRIANS. See FINLAND, vol. ix. p. 219.

UHLAND, Joann Lupwie(1787-1862), German poet, was born at Tiibingen, on April 26, 1787. He studied at the university of his native place, taking jurisprudence as his special subject, but also devoting much time to litera-

ture. Having graduated as a doctor of laws in 1810, he went for some months to Paris ; and from 1812 to 1814 he worked at his profession in Stuttgart, in the bureau of the minister of justice. He had begun his career as a poet in 1807 and 1808 by contributing ballads and lyrics to Seckendorf's Musenalmanach; and in 1812 and 1813 he wrote poems for the Poetischer Almanach and for the Deutscher Dichterwald. In 1815 he collected his poems in a volume entitled Gedichte, which almost immediately secured a wide circle of readers, and gives him his place in German literature. To every new edition he added some fresh poems ; and the sixtieth edition, published in 1879, included a number of pieces found among his papers. He wrote two dramatic works—Zrnst, Herzog von Schwaben and Ludwig der Baier—the former published in 1817, the latter in 1819. These, however, are unimportant in com- parison with his Gedichte. In some respects Uhland must be classed with the writers of the romantic school, for, like them, he found in the Middle Ages the subjects which appealed most strongly to his imagination. But his style has a precision, suppleness, and grace which sharply dis-

tinguish his most characteristic writings from those of the romantic poets. His best lyrics have the charm which belongs to the unaffected expression of delicate senti- ment; and in almost all his ballads he displays a remark-

able power of giving picturesque form to his conceptions of

character. He was a man of pure and noble impulse, and it was in presenting scenes which awaken love, or admira- tion, or pity that he did the fullest justice to his powers. Uhland's poetic sympathy with some characteristics of the

age of chivalry did not prevent him from sharing the best

aspirations of his own time. He wrote manly poems in

defence of freedom, and in the states assembly of Wiirtem-

berg he played a distinguished part as one of the most vigorous and consistent of the liberal members. In 1829 he was made a professor, at Tiibingen university, of German literature and the German language, but he resigned this appointment in 1833, when it was found to be incom- patible with his political duties. In 1848 he became a member of the Frankfort parliament, in which he sat as one of the most respected members of the liberal party.

Uhland was not only a poet and politician ; he was also an ardent student of the history of literature. In 1812 he published an interesting essay on Das altfranzisische Epos : and ten years afterwards this was followed by an admirable work on Walther von der Vogelweide. He was also the author of an elaborate study of Der Mythus von Thér nach nordischen Quellen (1836), and he formed a valuable col- lection of Alte hoch- und niederdeutsche Volkslieder, which appeared in 1844-45. He died on November 13, 1862. After his death his prose works were reprinted, with some additions, under the general title Uhland's Schriften zur Geschichte der Dichtung und Sage (1865-73), and an edition of his poems and dramas, in three volumes, was issued in 1863.

See Liebert, Ludwig Uhland, eine Skizze (1863); Mayer, Ludwig Uhland, seine Freunde und Zeitgenossen (1867); and Ludwig Uhiand's Leben, aus dessen Nachlass und aus eigener Erfahrung zusammengestellt von seiner Witwe (1874).

UJIJI, a town in eastern Central Africa, of considerable importance, also known by the name of KAVELE, is situated on the eastern shores of Lake Tanganyika, in 4° 55' §. lat. and 30° 5' E. long. It is the chief town on that lake, and is the centre of a brisk trade in ivory. Formerly it was a great slave-market. The town is of a straggling character, Arab houses of sun-dried bricks being mingled with native huts. The population, which fluctuates considerably, is very mixed, being composed of Arabs and the representa- tives of numerous Central African tribes, Ujiji has been visited by various European travellers, who have made it their headquarters, and it was here that Stanley found Livingstone, on October 28, 1871. Opinions vary as to the salubrity of its climate, but the balance of testimony appears to prove that during the greater part of the year it is very unhealthy.

UJJAIN, or Ooszty, a town in the native state of Gwalior, central India, situated on the right bank of the Sipra, in 23° 11’ 10” N. lat. and 75° 51′ 45” E. long., 1698 feet above sea-level. In ancient times Ujjain was the great and famous capital of Malwa, one of the seven sacred cities of the Hindus, and the spot which marked the first meridian of Hindu geographers. Though much decayed, it is still a large and populous city, with considerable commerce. ‘The modern city is surrounded on all sides by an almost uninterrupted belt of groves and gardens. Tn 1881 the population of the town numbered 32,932. Its trade consists chiefly in the export of opium and the mport of European goods, especially cotton fabrics.

_UKRAINE (“frontier ”), the name formerly given toa district of European Russia, now comprising the govern- ments of Kyarkorr, Kizrr, Poporra, and Potrava (q.v.).

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ULCER. See Surcery, vol. xxii. p. 683.

ULFILAS (311-381), the apostle of Christianity to the Gothic race, and, through his translation of the Scriptures into Gothic, the father of Teutonic literature, was born among the Goths of the trans-Danubian provinces in the year 311.1 There is a tradition that his ancestors were Christian captives from Sadagolthina in Cappadocia, who had been carried off to the lands beyond the Danube in the Gothic raid of 267; but the evidence on which this rests is inadequate. An authoritative record of the outlines of his hfe has only been discovered within the last fifty years, in a writing of Auxentius, his pupil and companion.

At an early age Ulfilas was sent, either as an envoy or as a hostage for his tribe, to Constantinople, pro- bably on the occasion of the treaty arranged in 332. During the preceding century Christianity had been planted sporadically among the Goths beyond the Danube, through the agency in part of Christian captives, many of whom belonged to the order of clergy, and in part of merchants and traders. Ulfilas may therefore have been a convert to Christianity when he reached Constantinople. But it was here probably that he came into contact with the Arian doctrines which gave the form to his later teaching, and here that he acquired that command over the

Greek and Latin tongues which equipped him for his labours as a translator. For some time before 341 he worked as a “lector” or reader of the Scriptures, probably among his own countrymen in Constantinople, or among those attached as faderati to the imperial armies in Asia Minor. From this work he was called to return as missionary bishop to his own country, being ordained by Eusebius of Nicomedia and “the bishops who were with him” in 341. This ordination of Ulfilas as missionary bishop by the chiefs of the semi-Arian party is at once an indication of their determination to extend their influence by active missionary enterprise and evidence that Ulfilas was now, if he had not been before, a declared adherent of the Arian or semi-Arian party. He was now thirty years of age, and his work as “bishop among the Goths” covered the re- maining forty years of his life. For seven of these years he wrought among the Visigoths beyond the Danube, till the success which attended his labours, and the growing numbers of his flock, drew down the persecution of the still pagan chief of the tribe. This “sacrilegus judex” has been identified with Athanaric, a later persecutor, probably without sufficient ground. The persecution was so severe that, to save his flock from extinction or dispersion, Ulfilas decided to withdraw both himself and his people from its range. With the consent of the emperor Constantius, he led them across the Danube, “a great body of the faith- ful,” and settled in Moesia at the foot of the range of Hemus, and near the site of the modern Tirnova (348). Here they developed into a peace-loving pastoral people.

The life of Ulfilas during the following thirty-three years is marked only by one recorded incident, his visit to Constantinople in 360, to attend the council convened by the Arian or Homoian party. His work and influence were not, however, confined to his own immediate flock, but radiated by means of his writings (homilies and treatises), and through the disciples he despatched as missionaries, among all the tribes of the Gothic stock beyond the Danube. By this time probably he had made some pro- gress with his version of the Scriptures, and copies of parts of it would begin to circulate. Thus the church beyond the Danube, which had not been extinguished on Ulfilas’s withdrawal, began to grow once more in numbers and importance, and once more had to undergo the fires of persecution. Catholic missionaries had not been wanting in the meanwhile, and in the indiscriminate persecution by

1 Krafft gives 318 as the date, Waitz 318.

Athanaric between 370 and 375 Catholics and Arians stood and fell side by side, The religious quarrel either accentuated, or was accentuated by, political differences, and the rival chiefs, Athanaric and Frithigern, appeared as champions of Paganism and Christianity respectively. Then followed the negotiations with the emperor Valens, the general adhesion of the Visigoths under Frithigern to Arian Christianity, the crossing of the Danube by himself and a host of his followers, and the troubles which culminated in the battle of Adrianople and the death of Valens (378). The part played by Ulfilas in these troub- lous times cannot be ascertained with certainty. It may have been he who, as a "presbyter Christiani ritus " conducted negotiations with Valens before the battle of Adri- anople ; but that he headed a previous embassy asking for leave for the Visigoths to settle on Roman soil, and that he then, for political motives, professed himself a convert to the Arian creed, favoured by the emperor, and drew with him the whole body of his countrymen,—these and other similar stories of the orthodox church historians appear to be without foundation. The death of Valens, followed by the succession and the early conversion to Catholicism of Theodosius, dealt a fatal blow to the Arian party within the empire. Ulfilas lived long enough to see what the end must be. Hardships as well as years must have com- bined to make him an old man, when in 381 he was sent for to Constantinople. 'The emperor had summoned him, for what purpose cannot be clearly ascertained. A split seems to have taken place among the Arians at Constan- tinople. Party riots were too familiar there, and a fierce dispute over a theological dogma, however abstruse, placed the peace of the city, if not the security of the palace, in jeopardy. Ulfilas was summoned to meet the innovators, and either by argument or by influence to induce them to surrender the opinion which caused the dispute. His pupil Auxentius describes how, "in the name of God," he set out upon his way, hoping to prevent the teaching of these new heretics from reaching 'the churches of Christ by Christ committed to his charge." No sooner had he reached Constantinople than he fell sick, "having pondered much about the council," and before he had put his hand to the task which had brought him

he died, probably in January 381. A few days later there died, also in Constantinople, his old enemy and persecutor, Athanaric.

The Arianism of Ulfilas was a fact of pregnant consequence for his people, and indirectly for the empire. It had been his lifelong faith, as we learn from the opening words of his own testament— ‘* Ego Ulfilas semper sic credidi.” If, as seems probable from the circumstances of his ordination, he was a Semi-Arian and a follower of Eusebius in 341, at a later period of his life he departed from this position, and vigorously opposed the teaching of his former leader. Ie appears to have joined the Homoian party, which took shape and acquired influence before the council of Constantinople in 360, where he adhered with the rest of the council to the creed of Ariminum, with the addendum that in future the terms tirdcracis and ovcta should be excluded from Christological definitions. Thus we learn from Auxentius that he condemned Homoousians and Homoiousians alike, adopting for himself the Homoian formula, ‘¢filium similem esse patri suo.” This Arian form of Christianity was imparted by Ulfilas and his disciples to most of the tribes of the Gothic stock, and persisted among them, in spite of the persecution, hatred, and political disasters it involved, for two centuries.

The other legacy bequeathed by Ulfilas was of less questionable value. His version of the Scriptures (see GorHic LANGUAGE, vol. x. p. 852) is his greatest monument as a way-breaker and a scholar. By it he became the first to raise a barbarian tongue to the dignity of a literary language; and the skill, knowledge, and adaptive ability it displays make it the crowning testimony of his powers as well as of his devotion to his work.

The personal qualities of the man may be inferred from his pupil’s description of him as ‘‘of most upright conversation, truly a con- fessor of Christ, a teacher of piety, and a preacher of truth,—a man whom I am not competent to praise according to his merit, yet altogether keep silent I dare not.”

Literature.—Waitz, Das Leben des Ulfilas, 1840; Krafft, Kirchengeschichte der Deutschen Volker, Abth. i., 1854; Id., article ‘‘Ulfilas,” in Herzog’s Realencykio-

piidie, vol. xvi., 1885; Id., De Fontibus Ulfilz Arianismt; Bessell. Das Leben des Ulfilas, 1860; C. A. Scott, Uifilas, Apostle of the Goths, 1885. See also ‘ Gothic Language” under GoTHs. (C. A. 8)

ULM, an ancient and important commercial town in

Wiirtemberg, and an imperial fortress of the first class, is situated on the left bank of the Danube, in a fertile plain at the foot of the Swabian Alps, 45 miles to the south-east of Stuttgart and 63 miles to the north-west of Munich. The town, quaintly built with narrow and confined streets, still preserves the dignified and old-fashioned appearance of an ancient imperial town, and contains many medieval buildings, both of historic and of artistic interest. Among these, besides numerous handsome private houses, are the town-house, of the 16th century, in the Transition style from late Gothic to Renaissance; the Kornhaus and market-buildings; the Ehingerhaus or N eubronnerhaus, now containing the industrial museum; the “new build- ing,” erected in 1603 on the site of a palace of Charle- magne; and the commandery of the Teutonic order, built in 1712-18 on the site of a habitation of the order dating from the 13th century. By far the most important and conspicuous building in Ulm, however, is the magnificent early Gothic cathedral, next to the cathedral of Cologne the largest church in Germany, and capable of containing

30,000 people. Begun in 1377, and carried on at inter- vals till the 16th century, the building was long left un-

finished ; but in 1844 the work of restoration and com- pletion was undertaken, and has steadily progressed ever since.

Ulm cathedral has double aisles and a pentagonal apsidal choir, but no transepts. Its length (outside measurement) is 464 feet, its breadth 159 feet ; the nave is 136 feet high and 474 wide; the aisles, which are covered with rich net-vaulting, are 68 feet in height. The massive and richly decorated square tower in the centre of the west fagade, for centuries terminated by a temporary spire, is now being completed according to the original plans, by the addition of an octagonal story and a tall open spire, which is to be carried up to the height of 534 feet, The towers of the choir have also been rebuilt in the course of the present restoration ; they are 282 feet high. The

interior, which is unusually well lighted, pro- duces an impression of much dignity from the great height of the nave, the absence of obtrusive decoration, and the massive manner in which the walls and piers are treated. It contains some fine stained glass, the largest organ im Germany (1856), and a number of interesting old paint- ings and carvings by Syrlin, Engelberger, and other masters of the Swabian school. The cathedral belongs to the Pro- testant Church. Trinity Church dates from 1617-21 ; and there are also a Roman Catholic church and a modern synagogue in the town. The Danube, joined by the Mller just above the town and by the Blau just below, becomes navigable at this point, so that Ulm occupies the import- ant commercial position of a terminal river-port. The trade, especially in wood and grain, has an upward tend- ency ; and the Ulm market for leather and cloth is also rising in importance. Ulm is famous for its vegetables (especially asparagus), barley, beer, pipe-bowls, and sweet cakes (Ulmer Ziickerbrot). Bleaching, brewing, and brass- founding are carried on, as well as a large miscellany of manufactures, including hats, metal goods, agricultural implements, tobacco and cigars, cement, paper, and chem- icals. The population in 1886 was 33,611.

The various routes which converge at Ulm have made it at all times a strategic point of great importance, and it has long been a fortress of the first rank. In 1844-59 the German Confederation carefully fortified it with walls, ramparts, and ditches, and in 1876 the new German empire added a very comprehensive outer girdle of detached forts, culminating in the powerful citadel of Wilhelms- burg. The defensive works embrace also the Bavarian town of Neu-Ulm (7823 inhabitants), on the opposite bank of the Danube, united with the older city by two stone bridges. Ulm is thus the basis of operations for the German army behind the Black Forest,

and can easily shelter a force of 100,000 men; its pcace garrison is 5600.

Ulm is mentioned as early as the year 854. It subsequently became a free imperial city, and the leading town in Swabia. In the 15th century it attained the summit of its prosperity, and ruled over a district of many square miles, with a population, rural and urban, of about 60,000. ‘Towards the end of the Middle Ages it frequently appears at the head of various Swabian leagues.

In 1530 it adopted the Augsburg Confession. In 1803 it passed to Bavaria, and in 1810 to Wiirtemberg. In 1805 General Mack, with 33,000 Austrians, capitulated to Napoleon at Ulm. Ulm is remarkable in the history of German literature as the spot where the ‘‘meisterstinger” lingered longest, preserving, without text and without notes, the traditional lore of their craft. In 1830 there were twelve ‘‘ meistersinger” alive at Ulm; but in 1839 the four survivors formally made over their insignia and guild property to a modern singing society, and closed the record of ‘‘ Meister- gesang” in Germany. ‘The last formal ineeting of the N uremberg “meister” took place in 1770.

ULPIANUS, Domirius, Roman jurist, was of Tyrian ancestry, but the time and place of his birth are unknown. He made his first appearance in public life as assessor in the auditorium of Papinian and member of the council of Septimius Severus ; under Caracalla he was master of the requests. Elagabalus deprived lim of his functions and banished him from Rome, but on the accession of Alex- ander (222) he was at once recalled and reinstated, and finally became the emperor’s chief adviser and prefectus pretorio. His curtailment of the privileges granted to the pretorian guard by Elagabalus provoked their enmity, and several times he only narrowly escaped their vengeance ; ultimately, in 228, he was murdered in the palace, in the course of a riot between the soldiers and the mob.

Ulpian’s period of literary activity extended from about 211 to 222 A.p. His works include 4d Sabinum, a commentary on the jus civile in over fifty books; Ad Edictum, a commentary on the Hdict, in eighty-three books; collections of Opinions, Responses, and Disputations ; books of Rules and Institutions; treatises on the functions of the different magistrates,—one of them, the De Officio Proconsulis Libri X., being a comprehensive exposition of the criminal law; monographs on various statutes, on testamentary trusts, and a variety of other works. His writings altogether have supplied to Justinian’s Digest about a third of its contents, and his commentary on the Edict alone about a fifth. As an author he is characterized by doctrinal exposition of a high order, judiciousness of criticism, and lucidity of arrangement, style, and language. Dontitii Ulpiani Fragmenta, consisting of twenty-nine titles, were first edited by Tilius (Paris, 1549). There are modern editions by Hugo (Berlin, 1834) and

Boécking (Bonn, 18386), the latter containing fragments of the first book of the Znstitutiones discovered by Endlicher at Vienna in 1835.

ULRICI, Hermann (1806-1884), one of the most active philosophical writers in Germany since Hegel's death, was born at Pforten, Prussia, on March 23, 1806. Educated for the law, he gave up his profession upon the death of his father in 1829, and after four years of further study, devoted to literature, philosophy, and science, qualified as a university lecturer. In 1834 he was called to a professorship at Halle, where he remained till his death on the 11th January 1884. His first works were in the domain of literary criticism. His treatise On Shake- speare's Dramatic Art (1839) has been translated into English. In 1841 he published a work Ueber Princip u. Methode der Hegelschen Philosophie, in which he subjected Hegel's system to a severe criticism. The critical attack was continued in the Grundprincip der Philosophie (1845-6), which at the same time expounds his own Speculative position; to this must be added as comple- mentary his System der Logik (1852). His later works, dealing with perennial problems of philosophy, have found a more extended circle of readers. Such are Glauben und Wissen (1858), Gott und die Natur (1862, 3d ed. 1875), Gott wnd der Mensch (2 vols., 1866-73, 2d ed. 1874). From 1847 onward Ulrici was associated with the younger Vichte in the editorship of the Zeuschrift fiir Philosophie.

His philosophical standpoint may be characterized as a reaction fom the pantheistic tendency of Hegel's idealistic rationalism

towards a more pronouncedly theistic position. The Hegelian identity of being and thought is also abandoned and the truth of realism acknowledged, an attempt being made to exhibit idealism and realism as respectively incomplete but mutually complementary systems. Ulrici's later works, while expressing the same views, are largely occupied in proving the existence of God and the soul from the basis of scientific conceptions, and in opposition to the materialistic current of thought then popular in Germany.

ULSTER. See Iretanp,

ULTRAMARINE, a magnificent blue pigment, which occurs in nature as a proximate component of Lapis La- ZULI. Lapis lazuli has long been known asa precious stone, and highly valued as such, and as early at least as the 11th century the art of extracting a blue pigment from it was practised. From the beginning of the 16th century this pigment began to be imported into Europe from " over the sea," as azurrum ultramarinum. To extract it, the stone, after having been powdered coarsely, is heated to redness and thrown into cold water to facilitate its con- version into a very fine powder, which is next treated with dilute acetic acid to remove the carbonate of lime which is present in almost all specimens. The insoluble blue residue is mixed up into a "dough" with a composition of resin, pitch, and linseed oil, and this dough is then kneaded under water, which is renewed as long as it runs off with a blue colour. The blue liquor, when allowed to stand, deposits a fine precipitate, which is collected, washed, dried, and sold as ultramarine. As the yield amounts to only 2 to 3 per cent. of the mineral used, it is not surprising to learn that the pigment used to be weighed up with gold. It was valued chiefly on account of its brilliancy of tone and its inertness in opposition to sunlight, oil, and slaked lime (in fresco-painting),

Lapis lazuli has the composition of a double silicate of lime and soda combined with sulphates and sulphides of the metals named. Of the many analyses made (compare Lavts LaZULI) we quote the following, carried out by Schultz in Rammelsberg's laboratory :— combined sulphur (not SO,), 3°16; combined sulphuric acid, SOs, 5°67; silica, 43°26; alumina, 20°22; oxide of iron, calculated as Fe,O3, 4°20; lime, 14°78; soda, 8°76.

In 1814 Tassacr observed the spontaneous formation of a blue compound, very similar to ultramarine, if not identical with it, ina soda-furnace at St Gobain, which caused the "Société pour |'En- couragement d' Industrie" to offer a prize for the artificial production of the precious colour. The problem was solved almost simultane- ously by Guimet and by Christian Gmelin, then professor of chem- istry in Tiibingen ; but while Guimet kept his process a secret (it has indeed never become kuown) Gmelin published his, and thus became the originator of an industry which flourishes to this day chieflyin Germany. There are very few ultramarine works in other countries, and none, as far as we know, in Great Britain. The raw materials used in the manufacture are—(1) iron-frce kaolin, or some other kind of

pure clay, which should contain its silica and alumina as nearly as possible in the proportion of 2Si0,: Al,O, demanded by the formula assigned to ideal kaolin (a deficit of silica, how- ever, it appears can be made up for by addition of the calculated weight of finely divided silica); (2) anhydrous sulphate of soda; (8) anhydrous carbonate of soda; (4) sulphur (in the state of powder) ; and (5) powdered charcoal or relatively ash-frec coal, or colophony in lumps. The numerous modes of manufacture may be viewed as modifications or combiuations of three processes.

(1) In the Nuremberg process the soda is used as sulphate, or partly as such and partly as carbonate. The following recipe gives an idea of the proportions in which the materials are used :—kaolin (calculated as anhydrous matter) 100 parts ; calcined sulphate of soda 88 to 100 (or 41 of sulphate and 41 of carbonate) ; charcoal uae powdered sulphur 13. These ingredients are mixcd most inti- matcly ; they are then rammed tight into fire-clay crucibles and kept at a nearly white heat for 7 to 10 hours, access of air being prevented as far as possible. The product obtained is a greyish or yellowish green mass, which is soaked in and washed with water 2 the porous residue is ground very fine in mills, again washed, dried, and again ground in the dry state and passed through sieves. The product at this stage has a green colour, and is sometimes sold as ‘‘green ultramarine,” although it has not a high standing amongst green pigments. For its conversion into blue ultramarine it is heated with sulphur in the presence of air to a relatively low tem- perature. Of the various apparatus used for this important stage of the manufacture, the easiest to describe is a large muffle, heated from the outside. On its floor the green ultramarine is spread out to a depth of 24 to 3 inches, and heated (with closed doors) to a

temperature at which sulphur powder when thrown in catches fire spontaneously. This temperature being maintained, a shovelful of sulphur is thrown in and allowed to burn off while the mass is being constantly agitated with iron rakers. Another dose of sul- phur is then added, and so on until a sample taken out is found to have come up to the highest attainable brilliancy and depth of blue. The product is then lixiviated with water,

which removes a deal of sulphate of soda formed in the process ; it is then ground up very fine, and finally subjected to elutriation to produce a graduated series of ultramarines of different degrees of fineness. In some works the process of sulphuration is divided into two or more periods, after each of which the product is washed, dried, and ground before being returned to the muffle to produce a higher degree of homogeneity.

(2) In the carbonate of soda process the soda is used solely, or at least principally, in the carbonate form. The following is one of many recipes :— kaolin (calculated as anhydrous matter) 100 ; car- bonate of soda 100; charcoal 12; sulphur 60. The mixture is heated in a reverberatory furnace to form in the first instance a white mass, which is so porous that it readily passes, by oxidation, into green and partly even into blue ultramarine. Green ultra- marine, saleable as such, cannot be produced in this manner. The half-blue product is finished by sulphuration pretty much as ex- plained above for the Nuremberg process. Well-made soda-ash ultramarine has a richer colour than tle Nuremberg variety.

(3) Siliea ultramarine is soda-ash ultramarine in whose prepara- tion a quantity of finely divided silica, equal to 5 to 10 per cent. of the weight of the kaolin, has been added. It is distinguished by a reddish tinge, which is the more fully developed the greater the proportion of added silica. It is more highly proof against the action of alum solution than non-siliceous ultramarine is.

Since 1873 the Nuremberg works have been producing four varieties of magnificently violet ultramarine. The mode of manu- facture has not transpired. Atthe Paris Exhibition in 1867 a mag- nificent block of ultramarine exhibited by the Kaiserslautern works attracted attention. In its manufacture the roasting (blueing) pro- cess is said to have been continued for three weeks.

Artificial, like natural, ultramarine has a magnificently blue eolour, which is not affected by light nor by contact with oil or lime as used in painting. Hydrochloric acid at once bleaches it with liberation of sulphuretted hydrogen gas and milk of sulphur. The natural pigment is proof against dilute acetic acid and solution of alum; the artificial pigment is even alum-proof only in a higher or lower relative sense. Hence there is room for

progress in one direction at least. The composition of the pigment is quite similar to that of lapis lazuli; but the constitution of both is still a chem- ical enigma. It is remarkable that even a small addition of zinc- white (oxide of zinc) to the reddish varieties especially causes a considerable diminution in the intensity of the colour, while dilu- tion with artificial precipitated sulphate of lime (“annalin ”) or sulphate of baryta (“blanc fix”) acts pretty much as one would expect. Ultramarine being very cheap (it sells at 7d. to 10d. per fb), it is largely used for wall painting, the printing of paper hangings and calico, &c., and also as a corrective for the yellowish tinge often present in things meant to be white, such as linen, paper, &c. Large quantities are used in the manufacture of paper, and especially for producing that kind of pale blue writing paper which is so popular in Great Britain. Only the very finest ultramarine can be used for paper tinging, because the least admixture of coarse particles becomes visible in the paper as dark spots or stains.

ULUGH BEG, Mirza MonamMMep BEN SHAH Rok (1394-1449), astronomer, grandson of Timur (q.v.), suc- ceeded his father as prince of Samarkand in 1447, after having for years taken part in the government, and was murdered in 1449 by his eldest son. He occupied himself with astronomical pursuits, and erected an observatory at Samarkand, from which were issued tables of the sun, moon, and planets, with an interesting introduction, which throws much light on the trigonometry and astronomical methods then in use (Prolégoménes des Tables Astronomi- ques d’Ouloug Beg, ed. by Sédillot, Paris, 1847, and trans- lated by the same, 1853). The serious errors which he found in the Arabian star catalogues (which were simply copied from Ptolemy, adding the effect of precession to the longitudes) induced him to redetermine the positions of 992 fixed stars, to which he added 27 stars from Al Sifi’s catalogue, which were too far south to be observed at Samarkand. This catalogue, the first original one since Ptolemy, was edited by Th. Hyde at Oxford in 1665 (Tabule Longitudinis et Latitudinis Stellarum Fixarum ex Observatione Ulugbeight), and in 1843 by Baily in vol. xiii. of the Memoirs of the Royal Astronomical Society.

ULVERSTON, a market-town in the north-west of Lan- cashire, England, is picturesquely situated near Morecambe Bay, on the borders of the Lake district, 9 miles north- east of Barrow-in-Furness, and 256 north-west of London. The town bears small evidence of its great antiquity. The principal streets branch from the market-place, and the houses built of stone are generally rough-cast and whitened. A rivulet flows through the town. The church of St Mary, founded in 1111, retains the south door of the original build- ing in the Transition style, but the greater portion of the structure is Perpendicular, of the time of Henry VIII. It consists of chancel, nave, aisles, south porch, and embattled western tower, and contains an altar-tomb with recum- bent figure of Walter Sandys of Conishead, dated 1588. After the destruction of Furness Abbey, Ulverston suc- ceeded Dalton as the most important town in Furness, but the rapid rise of Barrow within recent years has relegated it to quite a secondary place. Formerly it had a consider- able trade in linens, checks, and ginghams, but this has greatly fallen off. It possesses, however, large iron and steel works (North Lonsdale Iron and Steel Company), a large chemical work, an extensive paper manufactory, a bolt manufactory, breweries, tanyards, and wooden hoop manufactories. The population of the urban sanitary dis- trict (area 3120 acres) in 1871 was 7607, and in 1881 it was 10,008.

Early in the 12th century the lordship of Ulverston came into the possession of Stephen, earl of Boulogne, afterwards king of England, by whom it was presented to the monks of Furness Abbey as part of the endowment. In 1196 the ville of Ulverston was granted by the abbot of Furness to William de Lancaster, first baron of Kendal. In 1280 it obtained the charter of a market. The town became escheated to the abbot of Furness as chief lord in 1842, but this escheatment was suspended by Edward II. in favour of John de Coupland, who captured David II. of Scotland at the battle of Durham. After his death it reverted to the abbey. It is now in the possession of the family of Buccleuch.

ULWAR, an alternative form of ALWaR (q.v.).

ULYSSES. See OpyssEvs.

UMAN, a district town of Russia, in the south of the government of Kieff, is now a small industrial and trading town, with 15,400 inhabitants, many of

whom are Jews, who carry on an active trade in the export of corn, spirits, &e. It has a remarkable park (290 acres), planted in 1796 by the orders of Count Potocki, in connexion with which a gardening school is maintained.

Umait was founded towards the beginning of the 17th century as a fort against the raids of the Tartars. The Cossacks of the Ukraine, who kept it, revolted against their Polish rulers about 1665, and had to sustain a fierce siege. In 1674 it was plundered and most of its inhabitants murdered by the Ukrainians and Turks, during the wars for the hetmanship, In 1712 its last inhabitants were transferred by Peter I. to the left bank of the Dnieper. But by the end of the 18th century, when it again became the property of the Potockis, it was repeopled and became one of the busiest trading towns of Little Russia. In 1768, when the Cossacks re- volted anew against their Polish serf proprietors, they took Uman and murdered most of its inhabitants.

UMBALLA, an alternative form of AMBALA (¢.2.).

UMBER. See PIGMENTs.

UMBRELLA now means a portable protector from rain, while the name parasol is given to the generally sinaller, lighter, and more fanciful article carried by ladies asasun-shade. But primarily the umbrella (ombrella, Ital. dim. from Lat. umbra, shade) was a sun-shade alone,—its original home having been in hot brilliant climates. In Eastern countries from the earliest times the umbrella was one of the insignia of royalty and power. On the sculptured remains of ancient Nineveh and Egypt there are representations of kings and sometimes of lesser potentates going in procession with an umbrella carried over their heads; and throughout Asia the umbrella had, and still has, something of the same significance. The Mahratta princes of India had among their titles “lord of

—

the umbrella.” In 1855 the king of Burmah in addressing the governor-general of India termed himself “the monarch who reigns over the great

umbrella-wearing chiefs of the Eastern countries.” The baldachins erected over ecclesi- astical chairs, altars, aud portals, and the canopies of thrones and pulpits, &c., are in their origin closely related to umbrellas, and have the same symbolic significance. In each of the basilican churches of Rome there still hangs a large umbrella.

Among the Greeks and Romans the umbrella (cxids, oxddeov, umbraculum, umbella) was used by ladies, while the carrying of it by men was regarded as a sign of effeminacy. Probably in these southern climes it never went out of use, and we find from allusions by Montaigne that in his day its employment as a sun-shade was quite common in Italy. The umbrella was not unknown in England in the 17th century, and was already used as a rain protector. Michael Drayton, writing about the be- ginning of the 17th century, says, speaking of doves :—

“And, like umbrellas, with their feathers Shield you in all sorts of weathers.”

Although it was the practice to keep an umbrella in the coffee-houses early in the 18th century, its use cannot have been very familiar, for in 1752 Colonel Wolfe, writing from Paris, mentions the carrying of them there asa defence against both rain and sun, and wonders that they are not introduced into England. The traveller Jonas Hanway, who died in 1786, is credited with having been the first Englishman who habitually carried an umbrella. That practice he began thirty years before his death; at first he was singular, and his habit was derided, but he lived to see his example commonly followed.

The umbrella as at first used, based on its Eastern prototype, was a heavy ungainly article which did not hold well together, and no little ingenuity has been exercised to bring it into the elegant, compact, and strong form which is now quite common. The early umbrella had a long handle, with ribs of whalebone or cane, very rarely of metal, and stretchers of cane. The jointing of the ribs and stretchers to the stick and to each other was very rough and imperfect. The covering material consisted of oiled silk or cotton, heavy in substance, and liable to stick together in the folds. Gingham soon came to be substituted for the oiled cloth, and in 1848 William Sangster patented the use of alpaca as an umbrella covering material, One of the most notable

inventions for com- bining lightness, strength, and elasticity in the ribs of umbrellas was the “Paragon” rib patented by Samuel Fox in 1852. It is formed of a thin strip of steel rolled into a U or trough section, a form which gives great strength for the weight of metal. The use of such ribs, combined with the notched rings and runners which give a separate hinge and joint to each rib and stretcher, and with the thin but tough covering materials now in use, has principally contributed to the strength, lightness, and elegance which ordinary umbrellas now present. Umbrella silk is principally made at Lyons and Crefeld ; but much of it is so loaded in dyeing that it cuts readily at the folds. Textures of pure silk or of silk and alpaca mixed have better wear-resisting properties.

UMBRIA (OpBprxy, “OnBprxot, OtuBpo., UmBri). The early Greeks applied the name ‘Opp. to all central and northern Italy. Herodotus (iv. 49) speaks of it somewhat vaguely, as if it extended up to the Alps. The Umbrians probably extended across central Italy from sea to sea down as faras Latium. Pliny (iii. 13, 19) tells us that the Umbri were considered the most ancient nation of Italy (antiquissima gens Italie), by which he probably means, of the Italian stock. The Greek writers included under the name of Umbria the district known in later times as Picenum. Pseudo-Scylax makes Umbria march with Samnium, and describes Ancona as acity of Umbria. The Umbrians seem to have found the Siculi and Liburni in occupation of the land into which they advanced, the former holding the parts lying towards the interior, the latter people the district along the Adriatic. The Umbrians Were one of the chief peoples of that branch of the Indo- European family which had entered Italy from the north

| Picentes issued from the Sabine region.

and driven out and absorbed the older inhabitants. They were more closely connected with the Samnites and Oscans than with the Latin stock, as is shown by their language. Their possession of the fertile regions of upper Italy exposed them to the constant assaults of fresh bodies of invaders, pressing on over the Alps, and perhaps likewise from the seaboard. Their force was extended over a wide area, and thus too weak to withstand the attacks from various sides to which they were exposed. Thus their extensive

terri- tory was gradually reduced by the successive encroachments of other peoples. First came the Etruscans, who according to Herodotus (i. 94) were Lydians, who established them- selves in the land of the Umbrians. From which side of Italy they made their invasion, whether from the mouth of the Po or from the western coast of what later became Etruria, or whether from both, we have no means of de- termining. That the Umbrians did not yield without a struggle we cannot doubt. It was only after three hun- dred of their towns had been captured by the Etruscans that they succumbed. Nevertheless they still retained considerable influence in upper Italy, which, according to Strabo (v. 216), continued down to the time of the Roman conquest. For he says that there was a large Umbrian element in the Roman colonies in the region of the Po, as also some Etruscan. For, according to him, the Umbrians and Etruscans lived in a continual rivalry for the pre-eminence, so that if the one people made an expedition northwards, the other determined not to be outdone. So when the Etruscans had marched against the barbarians who dwelt near the Po, and had soon again been expelled owing to their effeminacy, the Umbrians in turn marched against the conquerors of the Etruscans. In consequence of this alternating struggle for these regions they planted many colonies, some Etruscan, others Uinbrian. Most of the colonies were Umbrian because the Umbrians lay closer to the disputed territory. Thus, even though they lost the sovereignty, the Umbrian race probably continued to form a considerable portion of the population of a wide extent of country. At all events, at the time of the Gaulish inroad the Etruscans seem to be in possession of the mouth of the Po. At this time, therefore, Umbria asa state con- sisted of the region bounded on the W. by the Tiber, on the 8. by the Sabines, on the E. by Picenum and the Adriatic, while on the N. it extended close up to the south-ern or Spinetic mouth of the Po. Scylax describes the Etruscans as extending from the Tyrrhenian Sea to the Adriatic, and represents them as in possession of the ancient Greek town of Spina. How much farther south the Etruscan sway had once reached we cannot determine, but that they had once held this region, as far as Ravenna at least, is rendered probable by the tradition that Ravenna had been founded by a colony of Thessalians who, not brooking the insulting treatment which they received from the Etruscans, gladly admitted some Umbrians, who thus became the possessors of the city. When the great Gaulish inroad took place at the beginning of the 4th cen- tury B.c. Etruscans and Umbrians alike suffered

severely. Some of the Celtic tribes crossed the Po and formed permanent settlements. The Ananes settled in the Apennines, the Boii between the former and the Adriatic; next came the Lingones; and finally the Senones occupied the seaboard of the Adriatic as far as the Rubicon. This region in Roman times was known as the Ager Gallicus (Polybius, ii. 16). But it was not only in the north and west that the Umbrians had been driven back. The early Greeks had included under the name of Umbria the dis- trict along the Adriatic, afterwards known as Picenum. This consisted of a fertile region, extending from beyond Ancona to the river Matrino. It is not improbable that the Tradition alleged

that the Picentes, led by the woodpecker (picus) of Mars, marched forth to occupy what is now the March of Ancona. But it was probably only aftera long struggle that this conquest was effected, for from another tradition we learn that the Sabines, after carrying on war against the Umbrians for a long time, at length vowed a sacred spring, and dedicated all the produce of the year to the gods. Then at length they became victorious (Strabo, v. 250). Thus, by the advance of the Gauls from the north and the Picentes from the south, the Umbrians were shut off from the seaboard, and confined to the district known as Umbria in historical times. of Italy, Umbria consisted of the region bounded by the Ager Gallicus on the N., by Etruria (the Tiber) on the W., by Picenum on the E., and by the Sabines on the S. The Umbrians kept a desperate hold of this district, which lies between the two arms of the Apennines. This position indicates of itself that they had been driven before stronger foes. Henceforward they play but an insignificant part in Italian history. This is explained by the physical formation of their country. It is an extremely mountain- ous region, with a few small plains between, which were noted for their fertility. Hence arose a number of small but thriving communities, none of which had the capacity of developing into a leading state such as Rome became for the Latins. Their want of seaports likewise excluded them from trade, the mouths of all the rivers which flowed from their country being in the hands of their enemies.

Of the Umbrians’ political and municipal organization little is known. In addition to the city (fofa) they seem to have had a larger territorial division

in the tribws (trifu, acc.) as we gather from Livy (xxxi. 2, per Umbriam quam tribum Sapiniam vocant ; of. xxxiii. 87) and from the Eugubine Tables (trifor Tarsinates, vi. B. 54). From the fertility of their land their communities were very prosperous. The olive and vine flourished in their valleys ; they grew spelt abundantly; and the boars of Umbria were famous. Ancient authors describe the Umbrians as leading effeminate lives, and as elosely resembling their Etrusean enemies in their habits (Theopompus, fragm. 142; Pseudo-Scymnus, 366-8). It is almost certain that each race influenced and modified the other to a large extent. Mommsen has pointed out that the names of many towns in Etruria are Umbrian, a fact which shows how persistent even after conquest was their influence in that region. On the other hand, we have conclusive proof of strong Etruscan influences in Umbria. For instance, they undoubtedly borrowed their alphabet and the art of writing from the Etruscans. Their writing runs from right to left. The alphabet consists of nineteen letters. It has no separate symbols for O, G, Q; the aspirates ¢ and x are wanting; on the other hand, it possesses forms for Z and V, and has likewise the Etruscan f(8), It also has a symbol d peculiar to itself for expressing the sound of palatal & when followed by either e or 7. It is also very probable that they borrowed the art of coining money from Etruria. Two towns are known to have issued coins, which consist entirely of bronze, and belong almost entirely to the series of #s grave. The most important is that of Tuder (Todi), which must have been a place of some note. It was a strong fortress on the left bank of the Tiber on the confines of Etruria. Iguvium (Gubbio), which struck coins after the standard of Tudcr, was a strong place likewise on the western or Etruscan side of the Apennines. The fact that it is only in towns on the side next Etruria that a coinage is found indicates that it was from the Etruscans they borrowed the art. The Umbrians counted their day from noon to noon. But whether they borrowed this likewise from the Etruscans we do not know (Pliny, ii. 77). In their measuring of land they employed the vorsus, a measure common to them and the Oscans (Frontinus, De Limit., p. 30), 34 of which went to the Roman jugerwm. When the Romans undertook the conquest of Italy, the most feeble resistance of all was offered to them by the Umbrians. In the great struggle between the Samnite confederacy and Rome Umbria played an insignificant part. It is probable that all through the Second Samnite War their sympathies were altogether on the side of their Samnite kinsmen, and that some assistance was afforded by individual communities. It is not

unlikely therefore that it was with a view to keep the Umbrians in check that the Romans planted a colony at Nequinum on the Nar, whose inhabitants were known as Nartes Interamnates, and who are included with the Etruscans, Iapydes, and Tadinates in the list of persons who were forbidden to be present at the sacred rites of Iguvium. At length in 308 z.c. the Umbrians made a vigorous effort to aid the Samnites, which, had

When Rome began the consolidating .

it taken place earlier in the war, might have had the most import- ant influence on the issue of the struggle. As it was, it came too late; the Etruscans had already laid down their arms. The Umbrians, who threatened to march on Rome, were intereepted by Rullianus with the Roman army from Samnium on the upper Tiber, a step which the Samnites now broken could not prevent ; aud this was sufficient to disperse the Umbrian levies. When the Third Samnite War broke out, the Umbrians took no active part in its operations ; but how their sympathies lay is evident from their affording a ready passage to the Samnite army under Gellius | Egnatius on its mareh to Ktruria, 296 B.c. When the battle of Sentinum (295) finally crushed the Samunites and Etruscans, Um- bria remained in the hands of the Romans. MHenceforward the process of Latinizing went on steadily, for by the 1st century B.c. we find them employing the Latin alphabet in copies of the ancient) sacerdotal ritual of Iguvium (sce EvcuBINE TaBLes). We know that the Oscan language only finally expired in the 1st century of our era, and there is no reason for believing that the Umbrian had disappeared much earlier. When the Romans conquered the Senones, 280 B.c., the Ager Gallicus was restored to Umbria, and both together formed under the eimpire the sixth region of Italy.

Strabo (v. 227) regards Ravenna as the boundary of Umbria. The Via Flaminia passed up through it from Ocriculum to Arim- inum, along which lay the important towns of Narnia (Narni) Carsule (Carsigliano), Mevania (Bevagna), Forum Flaminii, Nu- ceria, and Forum Sempronii. To the east lay Interamna (Terni), the probable birthplace of Tacitus, Spoletium (Spoleto), and the most important town of Camerinum on the side of the Apennines | towards Picenum, On the side towards Etruria lay Tuder (Todi),

Iguvium, which occupied a very advautageous position close to the } main pass through the Apenuines, Ameria (Amelia), and Hispellum | (Spello); on the Clitumnus (Clitunno) was Assisium (Assisi), the

birthplace of Propertius, whilst far to the north lay Sarsina, the |

birthplace of Plautus. For the pee of the country in the time of Augustus, see vol. xiii, Plate V.

See Bréal, Les Tables Eugubines, 1875; Biicheler, Umbrica, 1883; Kirchhoff, Griech. Alphabet, 4th cd., 1887 ; Head, Historia Numorum, 1887. (W. RI.)

UMMERAPOORA, another form of AMARAPURA (¢.0.).

UNAO, a British district in the Lucknow division of Oudh, India, under the jurisdiction of the lieutenant . governor of the North-Western Provinces. The area of | the district is 1768 square miles, and it is bounded on the N. by Hardoi, E. by Lucknow, 8. by Rai Bareli, and | W. by the Ganges. Unao is very flat, and has no features | of particular interest. Rich and fertile tracts, studded with groves, alternate with stretches of waste land and | plains of barren wsar, the whole being intersected with small streams, the water from which is extensively used | for irrigation. The Ganges is the only navigable river in the district. The temperature varies from about 75° to 103° in the hot weather, and from 46° to 79° in the cold season. The average annual rainfall is about 34 inches.

In 1881 the population was 899,069 (males 461,167, females 437,902); of these 880,342 were Hindus, 68,677 Mohammedans, and 49 Christians. Unao, the capital and administrative head- quarters, 9 miles north-east of Cawnpore, had 9509 inhabitants. The cultivated area of Unao amounted in 1885-86 to 598,131 acres, and 289,356 acres were returned as cultivable. The principal crops are rice, wheat, and other food grains, cotton, sugar-cane, and in- digo. The cultivation is mainly dependent on irrigation, The principal exports are grain of all kinds, gur, ghi, tobacco, and a little indigo and saltpetre; and the chief imports are piece goods, salt, iron, cotton, spices, &e. The gross revenue of the district in 1885-86 amounted to £188,088, the land yielding £144,914. During the mutiny of 1857-58 Unao

was the scene of several severe engagements between General Havelock's little army and the rebels. On the death of Raja Jasa Sinh, one of the leading rebels, and the capture of his two sons, the whole family estates were confiscated, and the villages either restored to their former owners or given to other landholders for their loyalty.

UNDULATORY THEORY. See Optics and WAVE THEORY.

UNGVAR, chief town of the county Ung, in the north- east of Hungary, stands on the river Ung. It is the seat of the bishop of Munkacs, and has a fine Greek cathedral, an episcopal seminary, a lyceum, a gymnasium, and also a teachers' college, a county hall, and an interesting ancient castle. The town and district produce good wine in large quantity, and abound in mineral springs. There is a good trade in timber and china clay. The population in 1886 was 13,460.

UNI—UNI

UNICORN, an animal with one horn. The name is applicable and has sometimes been applied to the rhinoceros, which is, for example, the Sumatran unicorn of Marco Polo. But the figure usually associated with the name is the well-known heraldic one of an animal with the form of a horse or ass, save that a long straight horn with spiral twistings, like the tusk of the narwhal, projects from its forehead. The belief in the existence of a one-horned animal of this kind goes back to Aristotle (Part. An., iii. p. 663), who names as one-horned "the oryx and the Indian ass." Later descriptions of the Indian unicorn, e.g, that of Ailian (Wat. An., xvi. 20), are plainly influenced to some extent by accounts of the rhinoceros, but the authority of Aristotle determined the general form ascribed to the animal. The twisted horn, of which A®lian already speaks, seems to have been got by referring to Aristotle's unicorn actual specimens taken from the narwhal; see Yule's Marco Polo, ii. 273. The ancient and medieval lore of the subject may be seen in Bochart, Hierozoicon, iii. 26. The familiar legend that the unicorn could be taken only by the aid of a virgin obtained currency through the Physiologus (see vol. xix. p. 7). The English Bible, following the Septuagint (jovdxepws), renders the Hebrew réém (ON) by "unicorn." But two horns are ascribed to the réém in Deut. xxxiii. 17, and the Hebrew word reappears in Arabic as the name of the larger ante- lopes, probably the

Antilope leucoryx, while in Assyrian the rimu appears to be the wild ox. There are recent fossil remains in the Lebanon both of Bos primigenius and Bison wrus, though both have been long extinct in Palestine.

UNITARIANISM. The term Unitarianism in its widest sense includes certain lines of the great religious and theo- logical movement or revolution of the Reformation in the 16th century, when this is regarded as the commencement of the process of the humanization of theology and ethics on the basis of the autonomy of the human mind. In another sense the term stands for a set of theological opinions, more or less variable, and yet in their general drift con- nected, some of them as old as Christianity, and one section of which only is. indicated by the term when used aS synonymous with Antitrinitarianism. But there is another meaning of the term, a still narrower one, and to Unitarianism in this sense this article must be confined. We must limit ourselves to a brief account of Unitarianism as it appears in ecclesiastical organizations in separation from the orthodox churches. This treatment of the sub- ject is of course incomplete, and would be misleading were the incompleteness not expressly announced. For a marked feature of the late history of the Unitarian churches is the growing tendency they exhibit of working out to their logical results some of the wider principles of the Reformation to which they ultimately owe their origin, rather than the design of formulating and propagating systems of theology. To not a few modern Unitarian leaders the bond which connects them with a specifically Unitarian organization is the spirit and tendency of the larger movement for which it happens to provide freer play than the orthodox churches, while they repudiate the im- putation of belonging to a dogmatic sect. Modern Uni- tarians have also, both in Europe and America, emphati- cally and successfully resisted the inclination of some of their number to lay down, though in the most general terms, a creed of Unitarianism. Indeed, in opposing this inclination, it might sometimes seem as if the only essen- tial article of Unitarianism were the maintenance of free inquiry in religion,—an impression, however, which a care- ful study of the history of Unitarian thought would remove. In the same way such a study would show that Unitarian churches are in agreement on many points of doctrine with early and recent theologians of all churches and sects.

This brief sketch of Unitarianism, as it has appeared in organized religious societies, takes us into but a few countries, and covers but a limited space of time. Poland, Transylvania, England, and America are the only countries in which Unitarian congregations have existed in any numbers or for any length of time. Elsewhere, either the law of the land has rendered their existence impossible, or they have been unnecessary in consequence of the substan- tial adoption by the existing churches of their principles and doctrines. The former was the case in Italy, Switzer- land, Germany, and England in the 16th and 17th centuries, the latter to a certain extent in England in the 18th cen- tury, still more in Germany in the 18th and 19th centuries, and in Holland in the present century, as also to a large extent in France in the Reformed Church.

Poland (1565-1658).—The Unitarians, under the names of Arians, Samosatenians, Pinczowians, were formed into aseparate church in 1565 by their exclusion as Antitrinitarians from the synods of the Trinitarian Protestants. Very early in the progress of the Reforma- tion in Poland individuals had arrived at heterodox opinions on baptism and the Trinity, very much under the influence of the heterodox Italian refugees in Switzerland, some of whom visited Poland (Lelio Sozzini, 1551 and 1558 ; Paul Alciati, 1561; G. V. Geutile, 1561; Biandrata, 1555). Gonesius and Gregory Pauli were the first to openly preach Antitrinitarian doctrine. After their separation from the orthodox, the Polish Unitarians developed divergent views as to the nature of Christ, as to the lawfulness of paying divine worship to Him, as to the subjects of baptism (infants or adults), and as to a relation of Christians to the state. On the first point some were Arians and others Humanitarians, while those who claimed divine worship for Christ were called Adorantes and those of the opposite view Nonadorantes, An epoch in the history of the party was made by the arrival of Fausto Sozzini at Cracow in 1579 (see Socinus). He succeeded in converting the great majority of the churches to his views and in silencing the dissentients. Henceforth the Polish Unitarians adopted the Socinian practice of paying worship to Christ, the Socinian view of the necessity of baptism and of the Christian’s duty towards the state. They rapidly became a numerous and powerfal body in Poland, distin- guished by the rank of their adherents, the ability and learning of their scholars, the excellence of their schools, and the superiority and wide circulation of their theological

literature. Racow, the theological centre of the Socinians, with its school and printing presses, obtained a world-wide fame. It was there that the Kacovian Catechism was published (1605 in the Polish language, 1608 in German, and 1609 in Latin). But before the death of Fausto Sozzini (1604) the situation of the Unitarians became more difficult, and in 1611 the Jesuits obtained their first open triumph over them. In the rapid course of the Catholic reaction, which was not resisted by the orthodox Protestants as long as the Socinian heretics only suffered, the church and school at Lublin, the most important place next to Racow, were first put down (1627), and Racow, with its church, school, and printing-press suffered the same fate in 1688. The final blow to the whole body followed in 1658, when all adherents of ‘‘the Arian and Anabaptist sect” were commanded to quit the kingdom within two years. A few renounced their faith, but the large majority fled into Transylvania, Prussia, Silesia, Holland, and England.

Transylvania (1568-1887).—Next to Poland Transylvania was the most important seat of Unitarianism. It was there the name was first used by the sect as its own designation, and it is thcre only that the sect lias had a continuous existence down to our own time, It is generally considered that the Italian refugee Biandrata was the founder of Transylvanian Unitarianism, but the present repre- sentatives of the body claim for it a nobler and domestic origin. Biandrata attended John Sigismund asa physician in 1568, and under his influence Unitarianism made rapid progress. In 1568 its professors, favoured by the king and many magnates, after separating from the orthodox church, constituted themselves a distinct body under the distinguished man Francis David, who is now regarded as the apostle of true Transylvanian Unitarianisin. Their principal centre was Klausenburg (Kolozsvar), where they had a large church, a college, aud a printing-press. But the same conflict between a more radical and a more conservative tendency which appeared amongst the Unitarians of Poland greatly disturbed the churches of Transylvania, particularly with regard to thie worship of Christ. On the side of the Adorantes was Biandrata, and on that of the Nonadorantes David. The party of David succumbed to force and fraud, and he himself died in prison a martyr to his convictions. Gradually the Socinian view prevailed, though in 1618 an old order to worship Christ required reinforcement. In the latter half of the 18th century the more

logical view of David entirely disappeared. Under the Austrian dynasty the Unitarians

were often exposed to great trials, until Joseph II. secured to them their rights and privileges. An official confession of faith of the year 1787 remains, with some modifications, essentially Socinian. But of late years the Transylvanian Unitarians have been in close relation with their co-rcligionists in England and America, some of the ministers having been educated at Manchester New College, and in consequence their theology is beconting essentially modern. The number of members was 32,000 in 1789, in 1847 40,000, dis- tributed in 104 parishes with 120 pastors. Their present number is 58,589 in 106 parishes, Their chicf centres are Kolozsvar, Thorda, and Keresztur, where they have excellent schools.

England (1778-1887).—For two and a half centuries previous to the rise of organized Unitarianism in England, opinions commonly called *by this name found numerous individual advocates and some martyrs. John Bidle (1615-62) published catechisms of Unitarian doctrine, translated Socinian works, and publicly discussed and preached an English form of Socinianism. But the severity of the law against Autitrinitarians, coupled with the gradual growth of free opinion in the Established Church and amongst the Presby- terian congregations, made the formation of separate Unitarian churches impossible, and, as was felt, less necessary for another hundred years. The adoption of a completely Humanitarian view of Christ’s person by a few solitary individuals (Lardner 17380, Priestley 1767, Lindsey 1778), assisted by the awakened earnest- ness of the time, led to their formation. Lindsey resigned a valu- able living in Yorkshire, and gathered the first professedly Uni- tarian church in London. Other clergymen followed his example, and amongst the Presbyterians several ministers, like Joseph Priestley, exchanged their Arian for Humanitarian views. This process went on with deep permanent effects in some of the Dissent- ing academies. In the year 1791 was formed the Unitarian Book Society for the distribution of literature, and several provincial asso- ciations originated about the sametime. In1806 the Unitarian Fund Society was established, with the object of promoting Unitarian Christianity by

direct mission work. In 1818 arose another society for protecting the civil rights of Unitarians. These various societies were consolidated in 1825 under the name of the British and Foreign Unitarian Association, which has now its headquarters in the building formerly used as Lindsey's chapel and residence in Essex Street, London. Early in this century nearly the whole of the old Presbyterian congregations, which, unlike those of the Baptists and Independents, had undogmatic trust-deeds, passed through the stages of Arminianism and various forms of Arianism into Socinianism in its peculiar English and mainly Priestleian form. The penal laws against Antitrinitarianism, which had long been obsolete, were repealcd in 1818, and in 1844 the right of Uni- tarians to the chapels which they held in succession from their Presbyterian forefathers was legally secured to them by the Dis- senters' Chapels Act without altering their undogmatic trust-deeds. Though these congregations, popularly known as Unitarian, on principle declined to restrict the progress of thought by imposing on either their ministers or members any dogmatic statements of belief, the generality of them adopted with some modifications the theological system of Priestley, which wasa combination of Locke's philosophy with the crudest rationalistic supernaturalism. With the rise of a more spiritual philosophy in Germany, which bore fruit in England and America before the close of the second decade of the century, the theology of English Unitarianism underwent a radical change, very much in the first instance under the influence of Dr Channing's writings. Without at all sacrificing its critical and rational bent, a decper emotional and spiritual element was introduced into it, which gradually, at the cost of some years of internal conflict, dispossessed the purely external and super- naturalistic Socinian and Priestleian legacy. English Unitarian theology was thereby brought into close sympathy with modern scientifie theology in Germany and elsewhere. This great and saving transformation was mainly due directly to James Martineau, J. J. Tayler, and J. H. Thom, aided by the writings of Channing and then of Theodore Parker. One consequence of the greater sub- stantial agreement of the present theology of the larger number of the Unitarian churches with the scientific theology of the century is that not a few representatives of these churches disclaim the name Unitarian as one tending to perpetuate divisions which have really no right to continued existence. The main reason for continued separation from the larger liberal churches, whether Established or Dissenting, earnestly urged by many

Unitarians of this class, is the use in those churches of theological formularies which modern theo- logy regards as of historic interest only. The number of congrega- tions in England and Wales generally described as Unitarian is about 300, nearly half of which date from between 1662 and 1750, and nearly all of which have undogmatic trust-deeds. Their consti- tution is purely congregational. For the education of their ministers they have Manchester New College, London (strictly undenomin- ational), the Unitarian Home Missionary Board, Manchester, and Carmarthen College, supported and managed by the Presbyterian Board in London, but practically Independent and Unitarian. The organs of the body are The Inquirer, The Christian Life, The Uni-

tarian Herald (weeklies), and The Christian Reformer (monthly). In Scotland there are 7 Unitarian congregations and 2 Universalist, the latter being, as in America, Unitarian in doctrine. In Ireland the number is about 40, being nearly all Presbyterian in constitu- tion. They are much stronger in the north than in the south of Ireland. In the north Antitrinitarian views began to spread about 1750; but the first congregation at Dublin traces its Unitarianism back to Thomas Emlyn, who wasimprisoned for his Arian opinions in 1702 at the instigation of orthodox Dissenters.

United States (1815-1887).—In the United States Unitarianism had no organized existence previous to 1815, and as in England at the present time the name has always covered great diffcrences of opinion within a common outline of belief or common drift of religious thought. Historical American Unitarianism represents ‘the liberal wing of the Congregational body.” Of tlic existing 370 churches 120 or more were originally the parish churches founded by the Puritan Congregationalists, which, like the Presbyterian congregations in England, passed gradually from Calvinism through Arminianism to Unitarianism, of which Harvard College became the spiritual centre. In 1812 there was but one church in America professedly Unitarian (that of King’s Chapel, Boston), though the ministers of Boston generally held Unitarian views. In 1815 Belsham’s account of the ‘‘State of the Unitarian Churches in America” (in his Life of Lindsey, London, 1812) led to a controversy, the issue of which was the distinct avowal of Unitarian

principles on the part of the liberal clergy of New England. Dr Channing came forward as the prophet and champion of American Unuitar- ianism, though the older he grew the more emphatically he re- pudiated sectarianism in every form. The Congregational body was thereby split into two sections, one of which styled themselves Unitarian Congregationalists. In 1825 the American Unitarian Association was formed, mainly for the diffusion of Unitarian literature and the support of poor congregations. At that time the Unitarian churches numbered about 122. Twenty years later they were some 280, while now they are about 870. The theological ‘ colleges of the body are the Divinity School of Harvard University, which is, like Manchester New College, undenominational, and the Theological School of Meadville. As in England so in America the theology of Unitarians has passed through marked changes, which have been attended by conflicts more or less acute. From 1815 to about 1836 a Biblical, semi-rationalistic seimi-super-

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naturalistic theology prevailed, in the heart of which Channing’s elevated ethical ideas were fermenting and slowly preparing a new birth. From 1836 forces such as Biblical criticism, Carlyle and Emerson’s ‘‘transcendentalism,” and Theodore Parker’s ‘absolute religion” opened the era of modern theology, bringing American Unitarianism into living touch with the philosophy and theology of Germany. An effort in 1865 to bring the right and left wings of the body into a closer confederation with a more pronounced profession of Christianity led to the formation of a Free Religious Association on the broad basis of the love of truth and goodness. In the Western States the same controversy as to the basis of reli- gious association has been raging for more than ten years. In May . 1886 a resolution was passed by the Western Unitarian Conference by a majority of more than three-fourths adopting a purely ethical and non-theological basis. This led to a split in the body, and the formation of a new Western Association on a distinctly Christian platform. The left wing of American Unitarians show greater sym- pathy with recent scientific speculation and less fear of pantheistic theories than is the case with English Unitarians. The organs of the body are The Unitarian Review (Boston), The Christian Register (Boston), and The Unitarian (Chicago).

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UNITAS FRATRUM. See Moravian BRETHREN.

UNITED BRETHREN IN CHRIST, a body of Pro- testant Christians in the United States of America, which in 1886 included 4332 organized churches (4078 in 1877), 185,103 members (143,881 in 1877), 1378 itinerant ministers, 890 local preachers, 3169 Sunday schools, with 98,547 teachers and 179,729 scholars. The total value of church property held by the denomination was $3,345,064; the sum raised for salaries, church building expenses, col-

leges, missions, and the like madea total of $842,700. The organization of the church is Episcopal (six bishops, two of them missionary), but its polity combines features of the Methodist, Congregational, and Presbyterian systems. The creed may be described as Arminian. The members are

prohibited from joining secret societies, and from using alcohol or engaging in its manufacture or sale. In con- nexion with the denomination are a theological institution (39 students), ten colleges, and nine academies or semin- aries of a higher grade, with 62 professors, 64 other teachers, and 2486 students. There are 49 annual conferences, 46 of them in the United States. Two missions in the Sherbro country in West Africa have 6 American missionaries, 9 churches, and 2631 members; in Germany there are 10 German missionaries, with 20 churches and 615 members.

The denomination originated in the labours of P. W. Otterbein (1726-1813), a native of Germany, who came as a missionary to Lancaster, Pa., in 1752, and settled at Baltimore in 1774. He became associated with Martin Boehm, a Mennonite preacher, and also co-operated with the Methodist preachers when they came to Pennsylvania. The first annual conference was held in 1800.

UNITED KINGDOM, Tues, or Great Brrrarmn anp TRELAND is the official title, adopted in 1801, now applied to England, Scotland, and Ireland (see Great Brrvatn). The total area is returned as 77,657,065 acres, or 121,339

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square miles,—England and Wales embracing 37,370,041 acres (whereof Wales 4,721,633), Scotland 19,467,077, and Ireland 20,819,947. The accompanying table gives the population of the counties according to the census of 1881, and their parliamentary representation as determined by the Redistribution Act of 1885. Inthe enumeration of the Scottish members of parliament, groups of burghs are included in the counties containing the burghs whence they are respectively named, while it is to be observed that Kinross county is united with Clackmannan, Nairn with Elgin, and Selkirk with Peebles. The addition of the nine university representatives (England, 5; Scotland, 2 ; Ireland, 2) brings the total membership of the House of Commons to 670.

For the Islands in the British Seas the figures are as follows :—Isle of Man-—141,263 acres, population 53,558 ; Channel Islands—48,322 acres, population 87,702.

UNITED PRESBYTERIAN CHURCH, Tux, in point

| of numbers the third of the Presbyterian organizations of

Scotland, was formed in 1847 by the union of the United Secession and Relief Churches (see below). The doctrinal standards are those of the other Presbyterian churches of Scotland, and the formula employed at the ordination of ministers is similar to that of the Established and Free Churches ; but adherence to the doctrinal standards is professed in view of the Declaratory Act of 1879, accord- ing to which signatories “are not required to approve of anything in the standards of the church which teaches or is supposed to teach compulsory or persecuting and intol- erant principles in religion,” and are allowed freedom of opinion on all points which, in the judgment of the church, do not enter into the substance of the faith. The denomina- tion in 1887 consisted of 32 presbyteries and 564 congrega- tions (518 in 1847), with a total membership of 182,063 (175,066 in 1878; 178,195 in 1883), thus representing about 14 per cent. of the population of Scotland. The number of baptisms in 1886 was 9894; there were 887 Sunday schools, with 11,994 teachers and 97,535 scholars, besides 788 advanced Bible classes, with 30,535 scholars. The total income

of the church in 1886 was £373,545 (average for ten years from 1877 to 1886, £375,660) ; of this total £237,300 was ordinary congregational income, and £136,245 missionary and benevolent income. The average stipend paid to each minister was £259, 16s. 10d. There is a divinity hall in Edinburgh with 4 professors and (session 1887-88) 114 students. The term of study is three years. The United Presbyterian Church has missions in Jamaica (a synod with four presbyteries), Trinidad, Kaffraria, Old Calabar, India, China, Japan, and Spain. The mission staff consists of 60 ordained Europeans, 22 ordained natives, 8 medical missionaries, 3 European evangelists, and 19 female missionaries. Under these are 502 native evangelists, teachers, and other helpers. In 1886 the membership of the native congregations was 13,214 (10,215 in 1881). In Jamaica there is a theological in- stitution. At the end of 1875 the denomination had 620 congregations, with 190,242 members, but in June 1876 98 of its congregations in England, with 20,207 members, were incorporated with the English Presbyterian Church. History.—(1) United Secession Church.—The general causes which led to the first great secession from the Church of Scotland as by law established in 1688 have already been briefly. indicated under PRESBYTERIANISM (see vol. xix. p. 685; compare also Scortanp, CHURCH oF, vol. xxi. p. 536 sg.). Its immediate occasion rose out of an Act of Assembly of 1732 which abolished the last remnant of popular election by enacting that, in cases where patrons might neglect or decline to exercise their right of presentation, the minister was to be chosen, not by the congregation, but only by the elders and Protestant

heritors. The Actitself had been passed by the Assembly, although the presbyteries to which it had been previously submitted as an overture had disapproved of it by a large majority ; and in accordance with a previous Act (1730), which had taken away even the right of complaint, the protests of the dissentient majority were refused. In the following October Ebenezer ErsKINE (g.v.), minister of Stirling, who happened to be moderator of the synod of Perth and Stirling, preached a synod sermon, in the course of which he took occasion to refer to the Act in question as in his opinion unscriptural and unconstitutional. Some of his expressions were objected to by members of synod because “ tending to disquiet the peace of the church

and impugning several Acts of Assembly and proceedings of church judicatories," and after long and keen debate it was resolved that he should be censured for them. This judgment, on appeal, was affirmed by the Assembly in May 1733, whereupon Erskine protested to the effect that he held himself still at liberty to teach the same truths and to testify against the same or similar evils on every proper occasion, This protest, in which he was joined by William Wilson, Alexander Moncrieff, and James Fisher, ministers at Perth, Abernethy, and Kinclaven respectively, was regarded by the Assembly as contumacious, and the commission of Assembly was ordered to procure its re- tractation or to proceed to higher censures. In November accordingly the protesting ministers were severed from 'their charges, their churches declared vacant, and all min- isters of the church prohibited from employing them in any ministerial function. They replied by protesting that they still adhered to the principles of the church, though now obliged to "make a secession from the prevailing party in ecclesiastical courts," maintaining their continued right to discharge all the duties of the ministerial and pastoral office "according to the word of God, the Con- fession of Faith, and the constitution of the church," and appealing to the "first free, faithful, and reforming General Assembly of the Church of Scotland." In De- cember 1733 they formally constituted themselves into a presbytery, but for some time their meetings were devoted almost entirely to prayer and religious conference. In 1734 they published their first '" testimony," with a state- ment of the grounds of their secession, which made pro- minent reference to the doctrinal laxity of previous General Assemblies. In 1736 they proceeded to exercise " judicial powers" as a church court, published a " judicial testi- mony," and began to organize churches in various parts of the country. Having been joined by four other min- isters, including the well-known Ralph Erskine, they appointed Mr Wilson professor of divinity. For these acts proceedings were again instituted against them in the Assembly, with the result that, having disowned the authority of that body in an "act of declinature," they were in 1740 all deposed and ordered to be ejected from their churches. Meanwhile the members of the '' Associate Presbytery " and its adherents steadily increased, until in 1745 there were forty-five congregations under its jurisdic- tion, and it was reconstituted into an "' Associate Synod." A violent controversy arose the same year respecting the religious clause of the oath taken by burgesses in Edin- burgh, Glasgow, and Perth ("I profess

and allow with my heart the true religion presently professed within this realm and authorized by the laws thereof”), and resulted in April 1747 in a “breach,” when two bodies were formed, each claiming to be the “‘ Associate Synod”; those who condemned the swearing of the burgess oath as sinful came to be popularly known as “ Antiburghers,” while the other party, who contended that abstinence from

1 The passing of the Act was certainly unconstitutional ; it was rescinded in 1734, ‘‘ because not made according to former Acts.”

it should not be made a term of communion, were desig- nated ‘“‘ Burghers.” The Antiburghers not only refused to hold further friendly conference with the others, but ultimately went so far as to pass sentences of deposition and the greater excommunication on the Erskines and other ministers who held the opposing view.

The Associate (Antiburgher) Synod held its first meeting in Edinburgh in the house of Adam Grp (¢.v.) on April 10, 1747. It grew with considerable rapidity, and in 1788 had ninety-four settled charges in Great Britain and nineteen in Ireland, besides a presbytery in America. For purposes of organization it was formed in that year into four provincial synods, and took the name of “The General Associate Synod.” The ‘new light ” controversies as to the province of the civil magistrate in matters of religion led to the publication of a revised testimony in the “ voluntary” sense in 1804, and in consequence M‘Crie, the historian of Knox, with three other brethren, withdrew to form the Constitutional Associate Presbytery.

The Associate (Burgher) Synod held its first meeting at Stirling on June 16, 1747. The number of congrega- tions under its charge rapidly increased, and within thirty years there were presbyteries in connexion with it in Jreland and North America, as well as throughout Scotland. In 1782 the American presbyteries took the designation of the Associate Reformed Church in America. About the year 1795 the “voluntary” controversy respecting the power of the civil magistrate in matters of religion arose within this synod also, and a large majority was found to have adopted “new light” views. This led in 1799 to the secession of the ‘“ Associate

Presbytery," which in 1805 took the designation of the Associate Synod or Original Burgher Synod.?

In 1820 the General Associate or Antiburgher Synod (to the number of 129 congregations®) united with the 154 congregations of the Associate or Burgher Synod. The body thus constituted, ‘‘The United Secession Church," had increased by 1847 to 400 congregations, the whole of which united in that year with the Relief Synod to form the United Presbyterian Church.

(2) Relief Church.—The Presbytery of Relief was con- stituted in 1761 by three ministers of the Church of Scotland, one of whom was Thomas GILLESPIE (q.v.), who had been deposed by the Assembly in 1752 for refusing to take part in the intrusion of unacceptable ministers. The number of congregations under its charge increased with considerable rapidity, and a Relief Synod was formed in 1773, which in 1847 had under its jurisdiction 136 congregations ; of these 118 united with the United Secession Church in that year. The Relief Church issued no distinctive ‘‘ testimonies," and a certain breadth of view was shown in the formal declaration of their terms of communion, first made in 1773, which allowed occasional communion with those of the Episcopal and Independent persuasion who are " visible saints." A Relief theological hall was instituted in 1824. .

See M‘Kerrow, History of the United Secession Chureh, 1841; Struthers, History of the Relief Church, 1848 ; Mackelvie, Annals and Statisties of the United Presbyterian Church, 1873.

UNITED PROVINCES. See Hotuanp.

2 The majority of this synod joined the Church of Scotland in 1839. The small minority which still retained the name joined the Original Seceders (see next note) in 1842, the resultant body assuming the designation of United Original Seceders. A small majority (twenty- seven ministers in all) of the Synod of United Original Seceders joined the Free Church in 1852. A synod of this name still exists, having under its jurisdiction four presbyteries, with twenty-nine charges (of which two are in Ireland).

3 A dissentient remnant (eight congregations) of the General Asso- ciate Synod united with the Constitutional Associate Presbytery in 1827, the resultant body being called the Associate Synod of Original Seceders.

DRITED STATES

PART I.—HISTORY AND CONSTITUTION.

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out under Christopher Newport. He found a fine river, Settle. which he named after the king, and on its banks, within ment of

I. COLONIZATION : 1607-1750.

plate, HOUGH the voyages of the Cabots (1497-98) along fie ae 5 VII. the coast of North America were the ground the present State of Virginia, he planted the settlement of re ‘arly _ which the English finally adopted as a basis for their claims | Jamestown’ (13th May 1607). Misgovernment, dissen- i“ on that continent, no very effective steps were taken to | Sion, mismanagement, and starvation were almost too much “xplora- reduce the continent to possession until after 1606. Martin | for the infant colony, and several times the colonists were jons. Frobisher (1576) failed in an attempt to explore Labrador. | ©” the point of giving it up and going home. Twelve Sir Humphrey Gilbert (1578) failed in a similar attempt | Ye@%8 were required to put Virginia on a sound footing. of Vir- on the continent ; and in a second effort (1583) he was By that time the liberal element in the London Company 8’nia; lost ina storm at sea on his return. In 1584 his half. | bad got control of it, and granted the colonists a repre- brother Raleigh

took up the work under commission from | Se2tative government. The year in which this house of Queen Elizabeth. He sent two small vessels under Amidas | burgesses met (1619) was the year in which African slaves and Barlow. They explored the south-central coast of | Were introduced into the colony from a Dutch vessel. what is now the United States, and returned with such 4. Separatists from the Church of England began the flattering reports that the courtly Raleigh at once named | ™ore northerly settlements. Driven from England, they the country Virginia, in honour of the queen, and sent out found refuge in Holland. Thence returning for the moment a colony. It was starved out in a year (1585). He sent to England, a company of 102 of them set sail for America another to the same place, Roanoke Island (1587), but it | 17 the “ Mayflower,” landing (December 21, 1620) at had disappeared when it was searched for three years after. Plymouth, in the south-eastern part of the present State of Ply- Gosnold (1602) found a shorter route across the Atlantic, of Massachusetts, The rigours of a new and cold country, mouth; and spent a winter on an island off the present coast of combined with poverty and the payment of interest at 45 Massachusetts ; but his men refused to stay longer. These | Per cent., made the early years of the Plymouth colony a are the official records of English explorations up to 1606; | esperate struggle for existence, but it survived. It had ’ but it is pretty certain that fishing and trading voyages, of | 2° special charter, but a licence from the Plymouth Com- which no record was kept, were more common than has | P@?Y- Other little towns were founded to the north of been supposed, and that they kept alive a knowledge of this settlement, and in 1629 these were all embraced in a the country. charter given by Charles I. to the Governor and Company ondon 2, In 1606 James I. formed two companies by a single of Massachusetts Bay. This was a Puritan venture, com- of Massa- ie charter. To one, the London Company, he granted the — of men of higher social grade than the Plymouth a bm. North-American coast between 34° and 38° N. lat.; to | Separatists, and was meant to furnish a refuge for those “*Y> who dreaded the ecclesiastical policy of the crown. The

Anies,

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the other, the Plymouth Company, whose membership was more in the west of England, he granted the coast between 41° and 45° N. lat. The intervening coast, between lat. 38° and 41°, or between the Rappahannock and Hudson rivers, was to be common to both, but neither was to plant a settlement within 100 miles of a previous settlement of the other. Each was to be governed by a council appointed by the king, and these councils were to appoint colonial councils of thirteen, with really absolute powers. Neither company did much in colonization: the London Company gave up its charter in 1624, and the Plymouth Company, after a complete change of constitu- tion in 1620, surrendered its charter in 1635. But the London Company at least began the work of colonization, and the Plymouth Company parcelled out its grant to actual colonists. Above all, the charter of the two com- panies had granted the principle to which the colonists always appealed as the foundation of English colonization in North America, as the condition on which immigrants had entered it, irrevocable unless by mutual consent of crown and subjects: ‘Also we do, for us, our heirs and successors, declare by these presents that all and every the persons, being our subjects, which shall go and inhabit within the said colony and plantation, and every their children and posterity, which shall happen to be born within any of the limits thereof, shall have and enjoy all liberties, franchises, and immunities of free denizens and natural subjects within any of our other dominions, to all intents and purposes as if they had been abiding and born within this our realm of England, or in any other of our dominions.”

3. The London Company was first in the field. A ship- load of the adventurers then swarming in London was sent

next year the company took the bold step of transferring its organization to America, so as to be out of the imme- diate notice of the crown and its agents. Eleven vessels took more than a thousand colonists over, and the real colony of Massachusetts was begun.

5. The charter of the London Company was surrendered to the crown, as has been said, in 1624; and the king thereafter disposed of the territory

which had been granted to it as he pleased. was carved out of it for Lord Baltimore. territory to the south of the present State of Virginia was

cut off from it and called Carolina, covering the present of Caro- In 1729 lina;

States of North and South Carolina and Georgia. Carolina was divided into North and South Carolina ; and in 1732 the last of the colonies, Georgia, was organized, of

Five distinct colonies were thus formed out of the original Georgia ;

London Company's grant.

6. When the Plymouth Company finally surrendered its charter in 1635, it had made one ineffectual attempt at colonization (1607) near the mouth of the Kennebec river, in Maine, and one complete colony, Massachusetts Bay, had arisen within its territory. Another colony, that of Plymouth, existed by licence. Massachusetts settlers, without even a licence, were pouring into the vacant

1 The former settlement of Jamestown is nowin James City county, Va., about 32 miles from the mouth of the James river. It was at first the capital of the colony, but began to decline when Williamsburgh was made the capital. Its death-blow was received when it was burned in 1676, during Bacon's rebellion. It was not rebuilt, and has now almost disappeared, " Nothing remains but the ruins of a church tower covered with ivy, and some old tombstones. The river encroaches year by year, and the ground occupied by the original huts

is already submerged." XXIII. — g2

In 1632 the new colony of Maryland of Mary- In 1663 the land;

territory to the south of Massachusetts, there to form the colonies of Connecticut and Rhode Island, afterwards chartered by the crown, 1662 and

1663. A few fishing villages to the north of Massachusetts, established under the grant of John Mason, were the nucleus of the colony of New Hampshire. The present States of Vermont and Maine were not yet organized. Out of the original Ply- mouth Company's grant were thus formed the colonies of Massachusetts, Connecticut, Rhode Island, and New Hampshire. The name New England was commonly applied to the whole territory from the beginning, having been first used by Captain John Smith in 1614.

7, Nine of the "old thirteen" colonies are thus ac- counted for. The remaining four fell in the territory between the two main grants, which was to be common to both companies, but was in fact never appropriated by either. The Spaniard had settled contentedly far to the south ; and the Frenchman, still bound by too many of the ancient ecclesiastical influences to contest supremacy with the Spaniard, had settled as far to the north as pos- sible, in Canada. England had been so far released from ecclesiastical influences by the spread of the Reformation as to be prepared to contest supremacy with Spaniard, Frenchman, or any one else ; but her lingering desires to avoid open conflict at any cheap rate had tended to fix her settlements on the very choicest part of the coast, in the middle latitudes,—a fact which was to colour the whole future history of the continent. The concurrent claims of the two English companies in the central zone seem to have deterred both of them from any attempt to interfere with the development of a colony there by the only other people of western Europe which was prepared to grasp at such an opportunity. The Dutch (1609) sent out Henry Hudson, an Englishman in their service, and he made the first close exploration of this central region. Dutch merchants thereupon set up a trading post at Manhadoes (the present city of New York), where a government under the Dutch West India Company was organized in 1621, when the Dutch states-general had granted the territory toit. The territory was named New Netherland, and the town at the mouth of the Hudson river New Amsterdam. Sweden sent a colony to Dela- ware Bay in 1638; but the attempt was never thoroughly backed, and in 1655 it was surrendered to the Dutch.

8. By the time of the Restoration in England, the northern and southern English colonies had developed so far that the existence of this alien

element between them had come to be arecognized annoyance and danger. From the Hudson river to Maine, from the Savannah river to Delaware Bay, all was English. Roads had been roughly marked out ; ships were sailing along the respective coasts as if at home; colonial governments were beginning to lean upon one another for support ; but between the two was a territory which might at any moment turn to hostility. There was an evidently growing disposition in New England to attempt the conquest of it unaided. When England and Holland found themselves at war (1664), the opportunity arrived for a blow at Holland's colonial possessions. An English army and fleet under Colonel Nichols touched at Boston, and, proceeding thence to New Amsterdam, took possession of the whole central territory. It had been granted by the king to his brother, the duke of York, and the province and city were now named New York in honour of the new proprietor. The duke, the same year, granted a part of his territory to Berkeley and

of Con- necticut and. Rhode Island ;

of New Hamp- shire.

The

Dutch settle- ments,

The colony of New York ;

fN aay. result. In 1681 the great parallelogram west of New

of Penn- Jersey was granted to Penn and called Pennsylvania. In sylvania; the following year Penn bought from the duke of York the little piece of territory which remained united to Penn-

Carteret, and the new colony of New Jersey was the >

STATES

sylvania until the revolution, then becoming the State of of Dele. Delaware. The central territory thus furnished four of Ware. the "old thirteen"

colonies, New England four, and the southern portion five.

9. If there was any governing idea in the organization The of the colonial governments, it was of the rudest kind ; ©lonial | and in fact each was allowed to be so largely modified by — circumstances that, with a general similarity, there was r the widest possible divergence. A general division of The the colonial governments is into charter, proprietary, and charter | royal governments. The charter governments were Mas- ogee sachusetts, Connecticut, and Rhode Island. In these the colonial governments had charters from the crown, giving the people, or freemen, the right to choose their own governors and other magistrates, to make their own laws, and to interpret and enforce them. Only Connecticut and Rhode Island kept their charters intact. The Massa- chusetts charter was cancelled by the crown judges (1684) under a quo warranto ; and in 1691 a new charter was granted. As it reserved to the crown the appointment of the governor, with an absolute veto on laws and after 1726 on the election of the speaker of the lower house, Massachusetts was thus taken out of the class of purely charter colonies and put into that of a semi-royal colony. | The proprietary colonies were New Hampshire, New York, The pr | New Jersey, Pennsylvania (including Delaware), Mary- prietary | land, Carolina, and Georgia. These were granted to pro- aise prietors, who, as inducements to settlers, granted govern- mental privileges almost as liberal as those of the charter colonies. Only Pennsylvania, Delaware, and Maryland remained proprietary colonies down to the revolution, and in these the governor had a charter right of veto on legis- lation. Virginia became a royal colony in 1620, and New Theryal) York as soon as its proprietor became king ; and other colonies. @ proprietors, becoming tired of continual quarrels with the | colonists, gradually surrendered their grants to the crown. New Hampshire, New York, New Jersey, North and South Carolina, and Georgia had thus become royal colonies before the revolution. In the royal colonies, commonly called provinces, the governors were appointed by the crown, and had an absolute veto on legislation, There were thus at last three proprietary, seven royal, one semi- royal, and two charter colonies. |

10, The two charter colonies were simple representative Reprs | democracies, having the power to legislate without even a practical appeal to the crown, and having no royal gover- > | nor or agent witbin their

borders. Their systems were the high-water mark to which the desires and claims of the other colonies gradually approached. Massachusetts and the proprietary colonies were very nearly on a level with them ; and the royal or proprietary governor's veto power was rather an annoyance than a fundamental differ- ence. But in all the colonies representative governments had forced their way, and had very early taken a bi- cameral shape. In the charter colonies and Massachusetts the lower house was chosen by the towns and the upper house from the people at large, and the two houses made up the "assembly." In Pennsylvania and Delaware there was but one house. In the royal colonies and in Mary- land the lower house alone was elected by the people ; the upper house, or council, was chosen by the crown through the governor; and the assent of all three elements was essential to legislation. In the final revolution the charter colonies did not change their governments at all; they already had what they wanted. The revolution was con- summated in the other colonies by the assumption of power by the lower or popular house, usually known as the "assembly," the governor or council, or both, being ousted.

rz. All these governmental organizations take a pro

[HISTORY,

Town and parish,

southern colonies.

1607-1750.] UNITED

minent place in American history, and had a strong influ- ence on the ultimate development of the United States ; and yet they touched the life of the people at compara- tively few points. A more marked and important distinc- tion is in the local organizations of the northern and All the southern colonies began as proprietary governments. Settlers went there as indi-

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never arrived at any distinct system ; at the best, their system was a conglomerate. Much the same result has been reached in the new Western States, organized under the care of the Federal Government, where the New Eng- land immigration has brought with it a demand for local self-government which has resulted in a compromise between the two systems of town units and county units.

14. Ecclesiastical divisions were at first as strong as Hcclesi-

viduals connected only with the colony. ‘T’o the individual : civil diversities. The New England colonies were Congre- @stical

“e aie: ae the colony was the great political factor ; his only other i

‘The town system.

*he ‘hiddle olonies,

connexion was with his parish, to which the colony allowed few political functions ; and, where political power touched him at all, it was through the colony. In time it became necessary to allow political powers to the parish or county, but they were really more judicial than political. ‘The southern county was a modified English shire, with the towns left out.” The whole tendency shows the character of the immigration in this part of the country, from Eng- lish districts outside of the influence of the towns.

12. In New England local organization was quite different. A good example is the town of Dorchester. Organized (March 20, 1630) in Plymouth, England, when its people were on the point of embarkation for America, it took the shape of a distinct town and church before they went on shipboard. Its civil and ecclesiastical organization were complete before they landed in Massachusetts Bay and came under the jurisdiction of a chartered company. Its people governed themselves, in their town government, in all but a few points, in which the colony asserted superi- ority. As the colony’s claims increased, the town’s dis- satisfaction increased. In 1635 the town migrated ina body, with its civil and ecclesiastical organization still intact, into the vacant territory of Connecticut, and there became the town of Windsor. Here, uniting with other towns, which had migrated in a similar fashion, it

formed the new Commonwealth of Connecticut, in which the local liberty of the towns was fully secured in the frame of government. Rhode Island was formed in the same way, by separate towns ; Vermont afterwards in the same way ; and the towns of the parent colony of Massachusetts learned to claim a larger liberty than had been possible at first. Thus, all through New England, the local town organizations came to monopolize almost all ordinary governmental powers; and the counties to which the towns belonged were judicial, not political, units, marking merely the jurisdiction of the sheriff. In the annual town meetings, and in special meetings from time to time, the freemen exercised without any formal grant the powers of self-taxation, of expenditure of taxation, of trial by jury, and of a complete local government. Further, the lower houses of their colonial legislatures were made up of gene- rally equal representations from the towns, while the upper houses were chosen from the colony at large. In this was the germ of the subsequent development of the United States senate, in which the States are equally represented, and of the house of representatives, representing the people numerically (§§ 104, 105, 109, 110).

13. The two opposite systems of the north and south found a field for conflict in the organization of the central territory after its acquisition (§ 8). The crown agents were strongly disposed to follow the more centralized system of the southern colonies, though Penn, having Organized counties and restricted his legislature to a single house, based it on the counties. In New York and New Jersey the Dutch system of “ patroonships” had left a simulacrum of local independence, and a stronger tendency in the same direction came in through immigration from New England. To encourage this immigration, the New Jersey proprietors gave town powers to many of them; and some of the New Jersey towns were merely trans- planted New England towns. But the middle colonies

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gational, and these churches were established and sup- ported by law, except in Rhode Island, where the Baptists were numerically superior. In the royal colonies generally there was a steady disposition to establish the Church of England, and it was more or less successful. In language there were striking dissimilarities, due to a most hetero- geneous immigration. It

was said that every language of Europe could be found in the colony of Pennsylvania. But, after all, this diversity had no indications of persist-

ence ; the immigration in each case had been too small to Immigra- Very little of the wonderful increase of tion.

support itself. American population between 1607 and 1750 was due to immigration ; most of it had come from natural increase. After the first outflow from Old to New England, in 1630-31, emigration was checked at first by the changing circumstances of the struggle between the people and the king, and, when the struggle was over, by the better-known difficulties of life in the colonies. Franklin, in 1751, when he estimated that there were “near a million English souls” in the colonies, thought that scarce eighty thousand had been brought over by sea. No matter how diverse the small immigration might have been on its arrival, there was a steady pressure on its descendants to turn them into Englishmen ; and it was very successful. When White- field, the revivalist, visited America about 1740, he found the population sufficiently homogeneous for his preaching to take effect, all the way from Georgia to New England. The same tendency shows itself in the complete freedom of intercolonial migration. Men went from one colony to another, or held estates, or took inheritances in different colonies, without the slightest notion that they were under any essentially diverse political conditions. The whole coast, from Nova Scotia to the Spanish possessions in Florida, was one in all essential circumstances ; and there was only the need of some sudden shock to crystallize it into a real political unity. Hardly anything in history is more impressive than this mustering of Englishmen on the Atlantic coast of North America, their organization of natural and simple governments, and their preparations for the final march of 38000 miles westward, unless it be the utter ignorance of the home Government and people that any such process was going on.

15. This ignorance had one singular effect in completing Demo- the difference between the new and the old country. An Cracy.

odd belief that European plants and animals degenerated in size and quality on transplantation to the western con- tinent was persistent at the time even among learned men in Europe, and Jefferson felt bound to take great pains to combat it so late as the end of the 18th century. That passage in

Thackeray's Virginians, where the head of the elder Virginian branch of the family returns to England, to be treated with contempt and indifference by the younger branch which had remained at home, indicates the state of mind among the influential classes in England which bent them against any admission of Americans to the honours or privileges of the English higher classes. A few titles were given; entails were maintained in the southern colonies; but there were no such systematic efforts as are necessary to maintain an aristocratic class. This may have been gratifying to the ruling class in England ; but it was in reality an unconsciously system-

Social con- ditions.

Educa- tion.

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atic effort to develop democracy in the English colonies in North America. In combination with the free represen- tative institutions which had taken root there, it was very successful, and, when the final struggle between the English ruling class and the colonists took shape, the former had singularly few friends or allies in the colonies. What the results might have been if efforts had been made to build up a titled class in the colonies, with entailed revenues and hereditary privileges in the upper houses of the colonial legislatures, is not easy to imagine ; but the prejudices of the privileged classes at home eliminated this factor from the problem. Every influence conduced to make the American commonwealths representative demo- cracies; and the reservation of crown influence in the functions of the governors or the appointment of the council was merely a dam which was sure to be broken down as development increased.

16. Social circumstances had all the features of life in a new country, aggravated by the difficulties of inter-com- munication at that time. In the southern and middle colonies there was a rude abundance, so that, however much the waut of luxuries might be felt, there was no lack of the necessaries of life. The growth of tobacco, indigo, and rice in the southern colonies was so large a source of wealth that luxury in that part of the

country had taken a more pronounced form than in the others. The southern planter, trained in English schools and universities and admitted to the English bar, was more like an English gentleman in a condition of temporary retirement than an American colonist. The settler of the middle colonies was the ordinary agriculturist. The hardships of colonial life were the special lot of the New England colonist. For some reason—perhaps because the forests retained the snow on the ground—the New England winters were more severe than they are now. The rudely built house, with its enormous chimney attracting draughts of outer air from every point, was a poor protection against the cold. Travel, difficult enough at the best, became impossible in winter, unless the snow rose so high as to blot out the roads and permit the traveller to drive his sledge across country. Medical and surgical attendance was scarce in summer, and hardly dreamed of in winter. The religious feeling of the people was against amusements of all kinds, except going to funerals, an occasional dinner, and the restricted enjoyments of courtship. It was a point of honour or of religious feeling to exclude luxury from church equipment : stoves were not known in Connecticut churches until the beginning of this century, and yet new- born infants were taken to church for baptism in the bitterest weather}

17. Wealth in the southern colonies was sufficient to give the better classes there an education of a very high order ; and they in turn, by virtue of their political and social leadership, imparted something of their acquisitions to those below them. In the middle colonies commercial pursuits and those interests which go to make men of affairs had something of the same influence on special classes. In New England education was more general, even though it had no such advantages for special classes as at the south. The first immigration into New England contained an unusually large proportion of English uni- versity men, particularly among the ministers. These

1 An extract from a New England diary of 1716 will give some notion of social circumstances at that comparatively late period. ‘‘Lord’s Day, Jany. 15. An extraordinary cold Storm of wind and Snow. Blows much as coming home at Noon and so holds on. Bread was frozen at the Lord’s table; Mr Pemberton administered. Came not out to afternoon exercise. Though ‘twas so cold, yet John Tuckerman was baptised. At six a-clock my ink freezes so

that I can hardly write by a good fire in my wive’s chamber. Yet was very comfortable at meeting. Laus Deo.”

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fixed the mould into which their descendants have been run, and New England’s influence in the United States has been due largely to them. The town system added to their influence. Owing to it the ebbing and flowing of population through New England was not blind or unor- ganized. Every little town was a skeleton battalion, to be filled up by subsequent increase and immigration ; and the ministers and other professional men made a multitude of successors for themselves, with all their own ideas. Con- sidering the execrable quality of school and college in- struction in New England, as elsewhere at the time, it is very remarkable that, as the original supply of university- bred leaders died off, there was a full crop of American- bred men quite prepared to take their places and carry on their work. Here were Harvard and Yale, the two lead- ing colleges of the country, which in 1760 had six :— Harvard College, in Massachusetts (founded in 1636); William and Mary College, in Virginia (1692); Yale College, in Connecticut (1700) ; Princeton College, in New Jersey (1746); Pennsylvania University (1749); and King’s, now Columbia, College, in New York (1754).

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18. Shipwrights had been sent to Virginia at an early Com- date ; but shipbuilding never made great head in the meme.

southern colonies, in spite of the fact that they had all the materials for it in abundance. At a later period ships were built, and it was not uncommon for planters to have their private docks on their own plantations, where their ships were freiglited for-Europe. But such building was individual : each planter built only for himself. The first vessel built by Europeans in this part of the continent was constructed by Adrian Block at New Amsterdam (1614). Many small vessels were built at the mouth of the Hudson river under Dutch and English domination, but New York’s commercial supremacy did not fairly begin until after the revolution. Perhaps the hardships of life in New England made its people prefer water to land ; at

any rate they took to shipbuilding early and carried it on diligently and successfully. Plymouth built a little vessel before the settlement was five years old, and Massachusetts another, the “ Blessing of the Bay” (1631). Before 1650 New England vessels had begun the general foreign trade, from port to port, which combined exportation with a foreign coasting trade and mercantile business, the form in which New England commercial enterprise was to show itself most strongly. Before 1724 English ship-carpenters complained of the competition of the Americans, and in 1760 the colonies were building new ships at the rate of about 20,000 tons a year, most of them being sold in England.

19. The earliest manufactures in the colonies were natur- Manu-

ally those of the simplest kind, the products of sawmills,

grist-mills, and tanneries, and home-made cloth. The saiting

search for ores, however, had been a prime cause of immi- gration with many of the settlers, and they turned almost at once to mining and metallurgy. Most of their efforts failed, in spite of “‘ premiums,” bounties, and monopolies for terms of years granted by the colonial legislatures. To this the production of iron was an exception. It was produced, from the beginning of the 18th century, m western Massachusetts and Connecticut, in eastern New York, in northern New Jersey, and in eastern Pennsyl- vania. All these districts were about on a level, until the adaptation of the furnaces to the use of anthracite coal drove the New England and New York districts, which had depended on wood as fuel, almost out of competition (§ 210). Until that time iron production was a leading New England industry. Not only were the various pro- ducts of iron exported largely ; the manufacture of nails, and of other articles which could be made by an industrious agricultural population in winter and stormy weather, was

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a “home industry” on which New Englanders depended for much of their support.

20. The colonial system of England differed in no respect from that of other European nations of the time : probably none of them could have conceived any other as possible. The colonies were to be depdts for the distri- bution of home products on a new soil; whenever they assumed any other functions they were to be checked, The attempts of the Americans to engage in commerce

maintenance of the connexion between the colonies and the mother country, after the interested classes in the colonies should become numerous and their interests large. Unluckily for the connexion, the arrival at this point was just the time when the attempt was first made to enforce the Acts with vigour (§ 38).

22. English imports from the North-American colonies The amounted to £395,000 in 1700, £574,000 in 1730, and American £761,000 in 1760; the exports to the colonies in the same ™2tket-

with other nations, their shipbuilding, and their growing manufactures were, in appearance, deductions from the general market of English producers, and the home Gov- ernment felt itself bound to interfere. Virginia claimed, by charter-right, the power to trade freely with foreign nations ; and Virginia was notoriously on the side of the Stuarts against the Parliament. In 1651 parliament passed the Navigation Act, forbidding the carrying of colonial produce to England unless in English or colonial vessels, with an English captain and crew. By the Act of 1661 the reach of the system was extended. Sugar, tobacco, indigo, and other “enumerated articles,” grown or manufactured in the colonies, were not to be shipped to any country but England. All that was necessary to make this part of the work complete was to add to the “enumerated articles,” from time to time, any which should become important colonial products. The cap-stone was placed on the

system in 1663, when the exportation of European products to the colonies was forbidden unless in vessels owned and loaded as in the preceding Acts and loaded in England. Virginia's commerce withered at once under the enforcement of the system. New England, allowed to evade the system by Cromwell for political reasons, continued to evade it thereafter by smuggling and bold seamanship. i

21. In 1699, on complaint of English manufacturers that the colonists were cutting them out of their foreign wool markets, parliament enacted that no wool or woollen manufactures should be shipped from any of the colonies, under penalty of forfeiture of ship and cargo. This was the first fruits of the appointment of the Board of Trade and Plantations three years before. From this time until the revolution, this body was never idle ; but, as its work was almost confined to schemes for checking or destroying the trade and manufactures of the plantations, it cannot be said to have done them any great service. It was con- tinually spurring on colonial governors to turn their people to the production of naval stores, or to any occupation which would divert them from manufactures ; and the governors, between fear of the legislatures which paid their salaries and of the Board which was watching them narrowly, had evidently no easy position. At intervals the Board heard the complaints of English manufacturers, and framed remedial bills for parliament. From 1718 the manufacture of iron was considered particularly obnoxious ; and, so late as 1766, Pitt himself asserted the right and duty of parliament to "bind the trade and confine the manufactures " of the colonies, and to do all but tax them without representation. In 1719 parliament passed its first prohibition of iron manufactures in the colonies ; and in 1750 it forbade under penalties the maintaining of iron- mills, slitting or rolling mills, plating-forges, and steel- furnaces in the colonies. At the same time, but as a favour to English manufacturers, it allowed the importa- tion of American bar-iron into England, as it was cheaper and better than the Swedish. Before this, in 1731, parlia- ment had forbidden the manufacture or exportation of hats in or from the colonies, and even their transportation from one colony toanother. All these Acts, and others of a kin- dred nature, were persistently evaded or defied; but the con- stant training in this direction was not a good one for the

years were £344,000, £537,000, and £2,612,000. In spite of parliamentary exactions and interferences, a great and entirely new market had been opened to English trade. The difference between the year 1606, when there was not an English settler on the North American continent, and 1760, when there were a million and a half with a great and growing commerce, is remarkable. It is still more remarkable when one considers that this population was already nearly one-fourth of that of England and Wales. Its growth, however, steadily increased the difficulties of maintaining the English system of control, which consisted mainly in the interference of the governors with legislation proposed by the assemblies. As the numbers and material interests of the subjects increased, the necessities for governmental interference increased with them, and yet the power of the subjects to coerce the governors increased as well. Only time was needed to bring the divergence to a point where change of policy must have disruption as its only alternative.

23. Merely material prosperity,

the colonies. In spite of attempts in almost every colony to establish some form of religious belief on a government foundation, religious freedom had really come to prevail to an extent very uncommon elsewhere at the time. Even in New England, where the theory of the state as an isolated opportunity for the practice of a particular form of worship had been held most strongly, persecution was directed chiefly against the Quakers, and that mainly on semi-political grounds, because of their determination to annoy congregations in their worship or to outrage some feeling of propriety. As soon as it came to be realized that the easiest method to deprive them of the power of annoyance was to ignore them, that method was adopted ; indeed, two of the New England colonies took hardly any other method from the beginning.

24. In political work the colonies had been very suc- Political They had built up thirteen distinct political freedom.

cessful. units, representative democracies so simple and natural in their political structure that time has hardly changed the essential nature of the American State governments. In so doing, the Americans were really laying the foundations of the future national structure, for there is hardly a suc-

cessful feature in the present national government which was not derived or directly copied from the original colonial growths ; while the absolutely new features, such as the electoral system (§ 119), introduced into the national system by way of experiment, have almost as generally proved failures, and have been diverted from their original purposes or have become obsolete,

Il, THE STRUGGLE FOR EXPANSION: 1750-63.

25. The English settlements along the Atlantic had covered the narrow strip of coast territory quite thoroughly before it was possible to think of expansion westward.

Since about 1605 Canada had been undisputedly in the The Their traders and missionaries had French in entered the present western United States ; Marquette and Canada

hands of the French.

Joliet (1673) and La Salle (1682) had explored the upper Mississippi river, and others, following their track, had explored most of the Mississippi valley and had built forts

the development of Religious wealth and comfort, was very far from the whole work of freedom.

Weak- ness of the French system.

Inter- colonial wars.

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in various parts of it. About 1700 the French opened ground at the mouth of the Mississippi; D'Iberville (1702) founded Mobile and the French Mississippi Com- pany (1718) founded the city of New Orleans. Consistent design, foiled at last only by failure of material, marks the proceedings of the French commanders in America for the next thirty years. New Orleans and Quebec were the extremities of a line of well-placed forts which were

to secure the whole Mississippi valley, and to confine the English settlements for ever to the strip of land along the coast bounded on the west by the Appalachian or Alleghany range of mountains, which is parallel to the coast and has but one important break in its barrier, the opening through which the Hudson river flows. The practical genius of the French plans is shown by the fact that so many of these old forts have since become the sites of great and flourishing western cities: Natchez, Vin- cennes, Peoria, Fort Wayne, Toledo, Detroit, Ogdensburgh, and Montreal either are built on or are so near to the old forts as to testify to the skill and foresight against which the English colonies had tocontend. To this whole territory, extending from the mouth of the Mississippi to that of the St Lawrence, covering even the western part of the present State of New York, the name of New France was given. The English possessions, extending in hardly any place more than a hundred miles from the ocean, except where the Dutch had long ago planted the outpost of Fort Orange, or Albany, on the upper Hudson, were generally restricted to the immediate neighbourhood of the coast, to which the early population had naturally clung as its base of supplies.

26. The French difficulties were even greater than those of the English. The French people had never had that love of emigration which had given the English colonies their first great impetus. Even where the French settled they showed more of a disposition to coalesce with the native population than to form a homogeneous people. The French were commonly far stronger with the Indians than were the English ; but, at the end of a hundred and fifty years, when the English colonists numbered a million and a quarter, all animated by the same political purposes, the population of all New France was only about 100,000, and it is doubtful whether there were 7500 in the whole Mississippi valley. The whole French system, wisely as it was designed, was subject to constant and fatal inter- ference from a corrupt court. Its own organization was hampered by attempts to introduce the feudal features of home social life. A way was thus opened to exactions from every agent of the court, to which the people sub- mitted with hereditary patience, but which were fatal to all healthy development. Perhaps worst of all was the natural and inevitable formation of the French line of claims. Trending westward from Quebec to meet the northward line of forts from New Orleans, it was bent at the junction of the two parts, about Detroit, and its most important part lay right athwart the path of

advancing English migration. The English wave was thus to strike the weaker French line in flank and at its weakest point, so that the final issue could not in any event have been doubtful. The French and Indian war probably only hastened the result.

27. There had been wars between the French and the English colonies since the accession of William and Mary, mostly accessory to wars between the mother countries. The colonies had taken part in the wars ended by the peace of Ryswick (1697), the peace of Utrecht (1713), and the peace of Aix-la-Chapelle (1748). ‘The alliance of the French and Indians made all these struggles wretched experiences for the English. The province of Canada became a prison-pen, where captives were held to ran-

som or adopted into savage tribes. Outlying settlements were broken up, or forced to expend a large part of their energy in watchful self-defence ; and it required all the persistence of the English colonies to continue their steady forward movement. Nevertheless they even undertook offensive operations. They captured Port Royal in 1690, but it was given up to the French in 1697, They cap- tured it again in 1710, and this time it was kept, with most of Acadia, which was now to be known as Nova Scotia, In 1745 the colonies took the strongest French fortress, Louisburgh, on Cape Breton Island, with very little assistance from the home Government. Their land ex- peditions against Montreal and Quebec were unsuccessful, the reason for failure being usually defective transport.

28. In the treaties which closed these wars, the interests The “as. of the colonies met with little consideration. The most iento.” notable instance of this was the 12th article of the treaty of Utrecht, by which an English company was secured the exclusive right to carry African slaves into American ports. Originally meant to obtain the Spanish trade in negroes, the company had influence enough to commit the crown to a steady support of the African slave-trade in its own colonies. Again and again the English legislatures in North America attempted to stop the slave-trade, and were pre- vented by the royal veto. ‘This will serve to explain a passage in Jefferson’s first draft of the American Declara- tion of Independence, as follows :—‘ He [the king] has waged cruel war against human nature

itself… ... Determined to keep open a market where men should be bought and sold, he has prostituted his negative for sup- pressing every legislative attempt to prohibit or to restrain this execrable commerce.”

29. All parties seem to have felt that the peace of Aix- la-Chapelle was but a truce at the best ; and the French court seems to have come at last to some comprehension of its extensive opportunities and duties in North America. With its tardy sympathy, its agents on the new continent began the erection of barriers against the great wave of English westward migration which was just appearing over the crest of the Alleghanies. It was too late, how- ever, for the English colonies were really able to sustain themselves against the French colonies and court together. Their surveyors (1747) had crossed the crests of the moun- tains, and had brought back appetizing accounts of the quality of the lands which lay beyond. The Ohio Com- The Ohio | pany (1749), formed partly of Virginian speculators and Company. | partly of Englishmen, had obtained a grant of 500,000 acres of land in the western part of Pennsylvania (then supposed to be a part of Virginia), with a monopoly of the Indian trade. As the grant was completely on the western side of the Alleghanies, and was the first English intrusion into the Ohio valley, it behoved the French to meet the step with prompt action. Their agents traversed the Ohio country, making treaties with the Indians and burying lead plates inscribed with the lilies of France and a state- ment of the French claims. The erection of the Ohio Company’s first fort (1752) brought on the crisis. The main line of French forts was too far away to be any check upon it. The French leaders therefore began to push a branch line eastward into the disputed territory. Their first work (1753) was put up at Presque Isle (now Erie), about 100 miles north of the Ohio Company’s fort. The citadel of the disputed territory had been begun on the spot where Pittsburgh now stands, where the Allegheny and Monon- gahela unite to form the Ohio river. Governor Dinwiddie, of Virginia, had obtained the right to erect the fort by treaty with the Indians. From Presque Isle the French began running a line of forts south, through the present “oil district ” of Pennsylvania, towards the headquarters of the English.

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30. Washington was then a land-surveyor, barely of age; but he was the agent whom Dinwiddie selected to carry an ultimatum to the French at Presque Isle. After a perilous winter passage through the wilderness, he found that the French had no intention of evacuating their posi- tions, and returned. Virginia at once (J anuary 1754) voted money and men to maintain the western claims of the colonies ; and Washington was sent with 400 provincial troops to secure the half-built fort at the head of the Ohio. The French were also pushing for that place. They won in the race, drove away the English workmen, and finished Fort Du Quesne, named after their governor. Washington, compelled to stop and fortify his position, won the first skirmish of the war with the French advanced guard, but was forced to surrender on terms (July 4, 1754). The usual incidents of a general Indian warfare followed for

1750-1763.]

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33. It is evident now that the French and Indian war was the prelude to the American revolution. It trained the officers and men for the final struggle. It released the colonies from the pressure of the French in Canada so suddenly that the consciousness of their own strength came at the same instant with the removal of the ancient barrier to it. It united the colonies for the first time ; few things are more significant of the development of the colonies than the outburst of plans for colonial union between 1748 and 1755, the most promising, though it finally failed, being that of Franklin (1754) at the Albany con- ference of Indian commissioners from the various colonies. The practical union of the colonies, however, was so evident that it might have been foreseen that they would now unite instinctively against any common enemy, even the mother country.

34. The war, too, while it obtained its main object in the The con-

| the rest of the year.

The 31. Both Governments began to ship regular troops to | view of the colonies—an unlimited western expansion,— dered French America, though there was no formal declaration of war brought the seeds of enmity between them and the crown, ‘tory. — until 1756. The year 1755 was marked by the surprise | The claims of the English on the continent, as has been

war, and defeat of Braddock, a gallant and opinionated British said, were based on the voyages of the Cabots. Under

-eace of France.

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officer who commanded an expedition against Fort Du Quesne, by the complete conquest of Nova Scotia, and by the defeat of the French, under their principal officer, Dieskau, at Lake George, in New York, by a force of pro- vincial troops under Sir William Johnson. In 1756 the greatest of French Canadian governors, Montcalm, arrived ; and the tide of war went steadily against the English. The officers sent out by the home Government were incom- petent, and they generally declined to draw on the colonists for advice. Montcalm found them an easy prey ; and his lines were steadily maintained at the point where they had been when Washington surrendered at Fort Necessity. Pitt’s entrance to the Newcastle ministry (June 1757) changed all this. For the first time the colonies found a man who showed a sympathy with them and a willingness to use them. Their legislatures were summoned into counsel as to the conduct of the war; and their alacrity in response was an augury of a change in its fortune. Incompetent officers were weeded out, with little regard to family or court influence. The whole force of the colonies was gathered up, and in 1758 was launched at the French. All western New York was cleared of the enemy at a blow; Fort Du Quesne was taken and renamed Fort Pitt ; Louisburgh, which had been restored to France at Aix-la-Chapelle, was again taken; and the only failure of the year was the dreadful butchery of the English in assaulting the walls of Ticonderoga. Louisburgh made an excellent point of attack against Quebec, and Montcalm was forced to draw off nearly all his troops elsewhere for the defence of his principal post. The year 1759 was therefore begun by the capture of Ticonderoga and almost all the French posts within

the present United States, and was crowned by Wolfe's capture of the towering walls of Quebec. In 1760, while George II. lay dying, the conquest of Canada was completed, and the dream of a great French empire in North America disappeared for ever.

32. The war continued through the first three years of |

George III., and the colonies took part in the capture of Havana after Spain had entered the struggle as an ally of The peace of Paris, which put an end to the war, restored Havana to Spain, in exchange for Florida, which now became English. France retired from North America, giving to Spain all her claims west of the Mississippi and that small portion east of the Mississippi which surrounds New Orleans, and to England the remainder of the continent east of the Mississippi. Spain retained for her territory the name of Louisiana, originally given by the French. The rest of the continent was now " the English colonies of North America,"

them the crown had granted in the charters of Massa- chusetts, Connecticut, Virginia, North and South Carolina, and Georgia a western extension at first to the Pacific Ocean and finally to the Mississippi. This was what the colonies had fought for; and yet at the end of the war (1763) a royal proclamation was issued forbidding present land sales west of the Alleghanies and practically reserving the conquered territory as a crown domain. In this, if in nothing else, lay the seeds of the coming revolution, as it afterwards almost disrupted the rising Union. The war had welded the thirteen colonies into one people, though they hardly dreamed of it yet; they had an underlying consciousness that this western territory belonged to the new people, not to the crown or to the separate colonies which had charter claims to it; and they would have resisted the claims of the crown as promptly as they after- wards resisted the claims of the individual colonies.

35. Finally, the war broke the feeling of dependence Effects of on the mother country. Poorly armed, equipped, and dis- the war.

ciplined, the colonial or " provincial " troops had certainly shown fighting qualities of no mean order. Colonists would not have been disposed, under any circumstances, to underrate the military qualities of their own men, but their self-glorification found a larger material because of the frequently

poor quality of the officers who were sent through family and court influence to represent Great Britain in the colonies. The bitter words in which Junius refers to British military organization in after years were certainly even more applicable in 1750; and the incom- petency of many of the British officers is almost incompre- hensible. Its effects were increased by an utter indiffer- ence to the advice of colonial leaders which, in a new and unknown country, was certain to place British soldiers again and again in positions where they appeared to great disadvantage alongside of their colonial allies or rivals. The provincial who had stood his ground, firing from behind trees and stumps, while the regulars ran past him in headlong retreat, came home with a sense of his own innate superiority which was sure to bring its results. Braddock's defeat was the prologue to Bunker Hill. The results were strengthened by the fact that most of the war was fought either in New England, the most democratic of the colonies, or by New England men. Their leaders had always been sought for by annual popular elections and re-elections, the promotion of approved men, and the retention of men of poorer quality in lower grades of office. To them the aristocratic influences which gave place and power to such men as Loudoun and "' Mrs Nabbycrombie " were simply ridiculous, and marked only an essential

English sympa- thies of the col- onists.

Change of Eng- lish policy.

difference between themselves and their English brethren which was to the disadvantage of the latter, even though it occasionally evolved a man like Howe or Pitt. Taking all the influences together, it is plain that the French and Indian war not only brought into being a tangible union of the colonies, but broke many of the cords which had held the colonies to the mother country.

Ill. THE STRUGGLE FOR UNION: 1763-75.

36. It is generally believed that the abandonment of North America by France was the result of profound policy, —that she foresaw that her

retirement would be followed by the independence of the English colonies, and that Great Britain's temporary aggrandizement would result in a more profound abasement. Vergennes and Choiseul both stated the case in just this way in 1763; and yet it may be doubted whether this was not rather an excuse for yielding to necessity than a political motive. At all events, it is certain that the peace, even with its release of the colonies from French pressure, was not enough to secure colonial union. For this it was necessary that the home Government should go on and release the colonists from their controlling feeling that they were rather Englishmen than Americans.

37. This feeling was not an easy one to eradicate, for it was based in blood, training, and sympathies of every nature. It would not have been easy to distinguish the American from the Englishman; it would, indeed, have been less easy than now, when the full effects of a great stream of immigration have begun to appear. American portraits of the time show typical English faces. Wherever life was relieved of the privations involved in colonial struggle, the person at once reverted to the type which was then the result of corresponding conditions in England. The traditions of American officers were English ; their methods were English ; even the attitude which they took towards the private soldiers of their armies was that which was characteristic of the English officer of the time. In the South the men who led and formed public opinion had almost all been trained in England and were ingrained with English sympathies and even prejudices. In the North the acute general intellect had long ago settled upon the " common rights of Englishmen" as the bulwark behind which they could best resist any attempt on their liberties. The pride of the colonists in their position as Englishmen found a medium of expression in enthusiasm for 'the young king"; and it would be hard to imagine a more loyal appendage of the crown than. its English colonies in North America in 1760.

38. Unfortunately, the peace of Paris did not result merely in freeing the colonies from dependence on the mother country ; it had the more important effect of free- ing the mother country from fear of France, and of thus encouraging it to open a controversy with the colonies which had not been ventured on before. Quebec had hardly fallen and given the home Government promise of success when the work was begun (1761). The Board of Trade began to revive those regulations of colonial trade which

had been practically obsolete in New England ; and its customs officers applied to the Massachusetts courts for “writs of assistance ” to enable them to enforce the regula- tions. Instant resistance was offered to the attempt to burden the colonies with these writs, which governed all men, were returnable nowhere, gave the officers absolute power, and opened every man’s house and property to their entrance. The argument of the crown advocates based the power of issuing such writs on parliament’s extension of the English revenue system to the colonies, backed by a statute of Charles II. permitting writs of assistance ; to refuse to grant the writs was therefore to impeach the

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power of parliament to legislate for the colonies. The counter-argument of James Otis was the key-note of the revolution. It declared in terms that no Act of Parliament could establish such a writ, that it would be a nullity even if it were expressed in the very terms which the customs officers claimed, and that “an Act of Parliament against the constitution was void.”

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39. Perhaps Otis meant by “ the constitution ” merely The the fundamental relations between the mother country and English theory of, to the final irreconcilable difference as to these relations. aie

the colonies, for this claim was the first step on the way

The English theory of the connexion had been completely put into shape by 1760, with very little objection from the colonists, whose attention had not yet been strongly drawn to the subject. It held that even the two charter colonies, and a fortiori still more such a royal province as New York, were merely corporations, erected by the king, but subject to all the English laws relating to such corpora- tions. The king was their visitor, to inquire into and correct their misbehaviours ; his courts, on guo warranto, could dissolve them ; and parliament had the same omni- potent power over them which it had over any other civil corporation,—to check, amend, punish, or dissolve them. These propositions must have seemed unquestionable to the English legal mind in 1763. Their weak point, the assumption that

parliament had power to control a cor- poration extra quatuor maria, had been covered by a new development of the English theory during the century. Parliament, originally a merely English body, had grown in its powers and claims until now the common use of the phrase “imperial parliament ” connoted claims to which the “four seas” were no longer a limitation, in law or fact. Parliament was to give the law to the whole empire. Hitherto this had been developed as a purely legal theory ; it was now first attempted to be put into practice when the enforcement of the Navigation Acts was begun in 1761. The first objections offered by the colonists were easily shown to be illogical and inconsistent with this legal theory of the relations between the home country and the colonies, but this only drove the colonists higher, step by step, in their objections,—from objections to taxation by parliament into objections to legislation by parliament, —until they had developed, about 1775, a theory of their own, logical enough in itself, but so inconsistent with the English theory that war was the consequence of their collision.

40. Passing over the intermediate steps, the form which the colonial theory finally took amounted to this. The introduction of the idea of an “ imperial parliament ” was itself a revolution, which could not bind the colonists, or change the conditions under which they had settled the new country. ‘Their relations, originally and properly, had been with the crown alone, and they had had nothing to do with parliament. The crown had seen fit to con- stitute new dominions for itself beyond the seas, with forms of government which were irrepealable compacts between it and the people whom it had thus induced to settle the new territory, and not mere civil corporations. It would follow, then, that the king was no longer king merely of Great ‘Britain and Ireland; he had at least thirteen kingdoms beyond seas, and a parliament in each of them. For the British parliament to interfere with the special concerns of Massachusetts was as flagrant a wrong as it would have been for the parliament of Massachusetts to interfere with the affairs of Great Britain ; and Massa- chusetts had a right to expect her king to protect her from such a wrong. The subject of Massachusetts knew the king only as king of Massachusetts, and the parliament of Great Britain not at all. It needed many years of suc cessful but suicidal logic on the part of their opponents to

The colonist theory.

1763-1775. | UNITED

force the Americans to this point ; they even continued to petition parliament until 1774; but after that time they were no further inconsistent, and held that the king was the only bond of union between the parts of the empire. When he wanted money from his American dominions, he was to get it, as he had always got it, by applying to the assembly of the colony, through the governor, for a grant. In the new seats of the race, as in the old, an Englishman was to be taxed only by his own representatives. In other words, each of the English colonies claimed, in its own field and for its own citizens, the exact principles of

“English liberty” which had been established in England

as the relations of the English subject to the crown. Each colony was to be governed by its own laws, just as in Jersey and Guernsey, in Scotland before the Union, or in Hanover in 1763, with appeal to the king in council, not to English courts or to the House of Lords. For the British parliament, or still more the British citizen, to talk of “our sovereignty ” over the colonies was a derogation from the king’s sovereignty, the only sovereignty which the colonies knew. ‘‘I am quite sick of ‘our sovereignty,’” wrote Franklin in 1769. The case of the colonies was evidently that of Ireland also; and Franklin notes the fact that several members of colonial assemblies had been admitted to the privileges of the Irish parliament, on the ground that they were members of ‘“ American parlia- ments,” ‘To this statement of their case the Americans adhered with progressive closeness from 1763 until the end. In their final Declaration of Independence it will be found that it is a declaration of their independence of the king only ; they do not then admit that the British parliament had ever had any authority over them; and that body is only mentioned in one place, in one of the counts of the indictment of the king, for having given his assent to certain “acts of pretended legislation,” passed by “a jurisdiction foreign to our constitutions and unacknow- ledged by our laws,” that is to say, by the British parlia- ment.

41. Two irreconcilable theories were thus presented.

0- Between them were two courses, either of which the

colonies were willing to accept. Under their theory there was no “imperial parliament.” They were willing to have one constituted, even if it were only a development of the British parliament through admission of colonial representatives ; but the time for this passed before the parties could debate it. On the other hand, the colonies were willing to abandon to the wealthier British parlia- ment, which sustained so much larger a proportion of the cost of the standing army and navy, the privilege of regulating external trade for the general good. So late as 1774 the Continental Congress, while maintaining the sole right of the colonial assemblies to levy internal taxation and make local laws, declared their willingness to yield to the British parliament the power to make such regulations of external trade as were bona fide meant to benefit trade, and not to raise a revenue from Americans without their Own consent. ‘This solution could have been only tem- porary at best, and war cut off any discussion of it.

42. The work of quiet revolution was begun in March 1763, in the closing hours of the Bute ministry, Charles Townshend being first lord of trade and administrator of the colonies. It was decided to make a point of having all the American judges and other officials hold office dur- ing the king’s pleasure, and to make their salaries inde- pendent of the colonial assemblies. The army estimates Were increased by an American standing force of twenty regiments, to be paid for by Great Britain for the first year, and thereafter out of a revenue to be raised in America by Act of Parliament. Bute’s purposes were Political,—the diminution of democracy in America. The

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Wilkes uproar drove lim out of power before he could develop his plans; but his successor, Grenville, followed them out for financial reasons, and in February 1765 the The Stamp Act “was passed through both Houses with less Stamp opposition than a turnpike bill.” ancl:

43. For the past two years the colonists had had other The Navi- things to think of. Under Grenville the Acts in restraint gation of colonial trade (S§ 20, 21), which had been allowed to L@¥s- become practically obsolete,

were put into force with unsparing rigour. The numbers of the customs officers were increased ; their duties were more plainly declared ; naval officers were encouraged to take the oaths of customs officers and share in the plunder of the commerce which had grown up between America and the West Indian Islands and other parts of the world. Search was con- stant; confiscation usually followed search ; and appeal was even more costly than confiscation. In the confusion arising from the efforts of American commerce to escape its new enemies, it was not wonderful that other ques- tions were allowed to go by default. But the mutterings of resistance were heard. The Massachusetts assembly protested against any schemes to create a standing army in America, to make officers independent of the assemblies, or to raise a revenue without consent of the assemblies, and appointed a committee to secure the united action of all the colonies. This was the first movement in the struggle for union. Its importance was hidden from the ministry by the official class in the colonies, whose mem- bers— the governors, judges, and other crown officials— continued to urge a persistence in the new policy, and to represent the Adamses, Otis, and the other colonial leaders as animated by a perverse desire to destroy the unity of the empire.

44. The revenue to be raised by the Stamp Act was to come from the sale of stamps and stamped paper for marriage licences, commercial transactions, suits at law, transfers of real estate, inheritances, publications, and some minor sources of revenue. With it was another startling provision,—a command to the colonial assemblies to furnish the royal troops in America with fuel, candles, vinegar, bedding, cooking utensils, and potables, and per- mission to billet the troops in inns, alehouses, barns, and vacant houses. The colonies were thus to be taxed with- out their consent ; the revenue derived therefrom was to be devoted to the support of a standing army; and that army was in turn to be used for the maintenance of the scheme of taxation. Yet no one in England seems to have dreamed of American resistance to it ; and Grenville was able to say in 1770 that he “did not foresee tlie opposition to the measure, and would have staked his life for obedience.”

45. The news of the passage of the Stamp Act caused Resist- all America to hum with the signs of resistance, but for- ance to cible resistance was at first

repudiated everywhere. It ee took the shape, really more significant, of declarations by “““ the colonial assemblies, the lower or popular houses of the legislatures. The Virginia assembly, under the lead of Patrick Henry and the younger members, took the first step (May 1765), by a declaration of colonial rights cover- ing the right of each colony to make its own laws and impose and expend its own taxation. The Massachusetts assembly followed with the formal proposal of an American. Congress, to be composed of representatives of all the colonies. South Carolina seconded the call; and the first step on the road to union was taken.

46. Outside of these formal steps there were signs of a less formal popular resistance. Even peaceable resistance was pro tanto a suspension of royal and parliamentary authority in the colonies; and it was probably inevitable

that the colonial assemblies should succeed to the power

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“Sons of Lib- erty.”

Stamp- Act Con- gress.

Repeal of the Stamp Act.

Town- shend’s Acts,

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during the interregnum before the organization of a real national power. But a temporary chaos was as inevitable ; and the form it took was the formation, particularly in the North, of popular organizations known as “Sons of Liberty,” the name being taken from a chance allusion in one of Barré’s speeches in the House of Commons. ‘These, backed frequently by the town organizations, forced the stamp officers to resign, and destroyed the stamps wherever they could be found. The Connecticut stamp-officer, as he rode into Hartford on his white horse to deposit his resig- nation, with a thousand armed farmers riding after him, said that he felt “like death on the pale horse, with all hell following him.” Newspapers and pamphlets rang

every possible change on Coke's dictum that " an Act of Parliament contrary to Magna Charta was void," and with warnings to stamp-officers that they would be considered enemies to the liberties of America if they attempted to carry out their duties. When the day broke on which the Act was to go into operation (November 1, 1765), America had neither stamps nor stamp-officers with which to fulfil its provisions.

47. The proposed Congress, commonly called the "Stamp- Act Congress," met at New York (October 7, 1765),— New Hampshire, Virginia, North Carolina, and Georgia being acquiescent but not represented. It petitioned the king, the House of Commons, and the House of Lords to recognize fully "the several governments formed in the said colonies, with full powers of legislation, agreeably to the principles of the English constitution." It also put forth a declaration of colonial rights, acknowledging allegiance to the crown, and claiming "all the inherent rights and privileges of natural-born subjects within the kingdom of Great Britain," including the right of petition, of trial by jury, of taxation by representatives, and of granting supplies to the crown, and protesting against the Stamp Act and the various Acts in restraint of trade. The action of this congress was thus purely declaratory ; there was no attempt to legislate; and the importance of the meeting was in its demonstration of the possibility of union and of one road to it.

48. In the meantime the Grenville ministry had fallen (July 1765), and the Rockingham ministry (March 1766) repealed the Stamp Act. The repeal was supported by Pitt, and Whigs who agreed with him, on the distinction that taxation by parliament without colonial representation was in violation of the essential principles of the British constitution, but that the power of parliament to legis- late in every other point for all parts of the empire must be maintained (§ 21). Nevertheless, the repeal was pre- ceded by a declaration of the power "of the king in parliament to bind the colonies and people of America in all cases whatsoever."

49. The colonists received the repeal with an outburst of rejoicing loyalty. They cared little for Pitt's distinction of powers, or even for the declaratory Act: it seemed to them merely the honours of war with which the ministry was to be allowed to retire. It really meant much more. The ruling interest

in the home Government, disordered for the moment by its sudden discovery of the strength and union of the colonies, had drawn back, but not for ever. All through the year an undercurrent of irritation against the colonies is evident; and, when (June 1767) Townshend, the chancellor of the exchequer, had wrested the lead from the other members of the Grafton ministry, he passed through both Houses the bill for taxing imports into the colonies, to go into effect on 20th November follow- ing. It laid duties on glass, paper, painters' colours, lead, and tea. As the proceeds were for the exchequer, they were to be distributed by the crown; and there was no secret that the design was to provide salaries for the crown

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servants in North America. About the same time other Acts established a board of customs at Boston, legalized the "writs of assistance," and suspended the New York assembly until it should obey the Billeting Act. Town- shend died soon after, leaving his system as a legacy to his successor, Lord North.

50. The New York assembly granted the necessary money, said nothing as to its use, and escaped further molestation. Beyond this the Acts accomplished nothing. Their advocates had urged that the colonies admitted the power of parliament to control external commerce, and that the new taxes were an exercise of such control. If they desired a purely technical triumph they had it, for their logic was sound, and the taxes remained on the statute-book. But, as the colonies ceased to import the taxed articles, by popular agreement and enforcement, the taxes amounted to little. The irritations caused by the enforcement of the Navigation Acts only increased in bitterness ; and the official class in the colonies, on whom must for ever rest the responsibility for nine-tenths of the difficulties which followed, lost no chance of representing every pamphlet, newspaper letter, or public meeting as incipient rebellion. A popular outburst in Boston (June 1768), following the seizure of John Hancock's sloop "Liberty," was thus used to give that town an unenvi- able reputation for disorder and violence. Colonial offi- cials everywhere openly or secretly urged the strongest measures ; and all the while the colonists, with the cautious tenacity of their race, were acting so guardedly that the British attorney-general was

compelled to say, “ Look into the papers and see how well these Americans are versed in the crown law; I doubt whether they have been guilty of an overt act of treason, but Iam sure they have come within a hair’s-breadth of it.”

st. The colonial officials, hoping for salaries inde- pendent of the assemblies, began to show a disposition to govern without those bodies. When the Massachusetts assembly refused by a large vote to withdraw its circular letter to the other assemblies urging united petition to the king alone, as an umpire between themselves and the British parliament, for redress of grievances, the assembly was prorogued, and did not reassemble for a year. Asa gentle hint of a possible mode of re-establishing popular government, delegates from the towns met in convention at Boston (September 1768), renewed the protests against the Acts of the ministry, and provided for the maintenance of public order. In the following December and January parliament passed a vote of censure on this proceeding, and advised that those who had taken part in it should be sent to England for trial on the charge of treason. ‘This They passed

Boston. Instead of a rebellious population they foun their most formidable opponents in minute law points, which were made to beset them at every turn, The Billeting Act required the ordinary barracks to be filled first: the council would assign no quarters in town until the barracks outside were filled. The assembly was not in session to authorize anything further, and the governor did not dare to summon it. The troops, who had marched into the town as into a captured place, with sixteen rounds of ammunition per man, were presently without a place in which to cook their dinners, urtil their commander hired houses out of the army chest. It was natural that

Non-in- ry portation — agree- ment,

he should denounce ‘this country, where every man studies law.” HExasperating and exasperated, the troops lived on in Boston until (March 1770) a street brawl between soldiers and citizens resulted in the death of

five of the latter and the injury of six more. Still the town kept its temper. The captain who had given the order to fire was seized by the civil authorities, subjected to the

under the new regulations were ordered home again by popular meetings in the American ports, and their captains generally obeyed. At Boston the governor refused to clear the vessels for Europe; and, after prolonged discussion, some fifty persons, disguised as Indians, went on board the vessels and threw the tea into the harbour in the presence of a great crowd of lookers-on (December 16, 17 73).

56. It was not possible that the term American should The new suddenly supplant that of Englishman ; but the successive national steps by which the change was accomplished are easily feeling. perceptible. Using one of the old English political phrases, the supporters of colonial privileges had begun about 1768 to adopt the name of “ American Whigs.” Its increas- ing substitution for that of Englishmen was significant. Within a few years the terms “ continental,” or “ the continent,” began to take on a new meaning, referring to a union of the colonies at which men hardly ventured to hint clearly. It meant a good deal, then, when men said

ordinary trial for murder, defended by John Adams and Quincy, two Massachusetts leaders, at the hazard of their own popularity, and acquitted for lack of evidence. But, while according a fair trial to the soldiers, the colonial leaders at last represented so plainly to the crown officials the imminence of an outbreak that the troops were re-) moved from the town to a fort in the harbour. he 53. The most significant point in the history of the plonial four years 1770-73 is the manner in which the ordinary ove colonial governments continued to go to pieces. When

a the assemblies met they would do nothing but denounce

colony was left without any government for which there was popular respect. This was about the state of affairs which the crown officials had desired ; but, now that it had come, they were not at all prompt in their use of it, Divorced from regular government, the people put out still stronger

efforts to enforce the non-importation agreements which had kept down the revenues from the tax laws of

very truly that “the whole continent ” applauded the ‘‘ Boston tea-party.” It was the first spoken word of the new national spirit. Nothing was less understood in Eng- land ; the outbreak left America in general, and Boston in particular, hardly a friend there. The burning of the revenue schooner “ Gaspee” in Narragansett Bay (June 1772) had seemed to the ministry almost an act of overt rebellion ; this was rebellion itself,

| the Acts of the ministry ; when they were prorogued the

1767. About 1773 a further development appeared. As soon as the assemblies met for their annual sessions, and

57- In March and April 1774, on receipt of full intelli- The “In- gence of the proceedings at Boston, the ministry passed a, tolerable

cts,”

before the governors could find excuse for proroguing them, they appointed “committees of correspondence,” to main- tain unity of action with the other colonies, Thus, even after prorogation, there was still in existence for the rest of the year a semi-official representation of the colony. This was nearly the last step on the way to colonial union,

54. The whites had already crossed the Alleghanies, In 1768 parties from North Carolina entered Tennessee ; and in 1769 Boone (p. 788) and a party of Virginians entered Kentucky. The settlement of Tennessee was hastened by difficulties with Tryon, the governor of North Carolina, Tryon was one of the worst of the crown officials ; and his government had been a scandal, even for those times. The people, denied justice and defrauded of legislative power, rose in hasty insurrection and were defeated, Tryon used his victory so savagely as to drive an increasing stream of settlers over the mountains into Tennessee. The centres of western settlement, however, were but few. There was one at Pittsburgh, another at Detroit, another near the Ulinois-Indiana boundary, another in Kentucky, another hear the present city of Nashville, Tennessee ; but none of these, except, perhaps, Detroit, was more

than a hunting or trading camp. Some efforts had been made to erect crown colonies, or to settle grants to companies, in the western territory, but they came to nothing. The settle- ments still clung to the coast.

55. In April 1770, encouraged by some symptoms of a failure of the non-importation agreements, the ministry had taken off all the taxes of 17 67, retaining only that upon tea—threepence per pound. The general popular agreement was still strong enough to prevent the importa- tion of this single luxury ; and it was found in 1772 that the tax produced but about £80 a year, at an expense of two or three hundred thousand for collection. Besides, the East India Company had been accumulating a stock of teas, in anticipation of an American market, of which the tea-tax had deprived it. In May 1773 the ministry took a fresh step: the tax was to be retained, but the Company was to be allowed a drawback of the entire duty, 780 that the colonists, while really paying the tax and Yielding the underlying principle, would get their tea cheaper than any other people. The first cargoes of tea

series of Acts which made open struggle only a question of time. The Boston Port Act shut up the town of Boston against all commerce until the destroyed tea was paid for and the town returned to loyalty. The Massachusetts Act changed the charter of that colony: the crown was now to appoint governor, council, and sheriffs; the sheriffs were to select juries ; and town meetings, unless by per- mission of the governor, were forbidden. Gage, the British commander-in-chief in the colonies, was made governor under the Act, and four regiments were given him as a support. Any magistrates, officers, or soldiers indicted under colonial laws were to be sent for trial to Nova Scotia or Great Britain. The billeting of soldiers in the town of Boston was legalized. The Quebec Act ex- tended the boundaries of the province of Canada over the whole territory lying north of the Ohio and east of the Mississippi. Here the ministry rested.

58. The news of these Acts of Parliament crystallized Union.

every element of union in the colonies. The attack on the charter of Massachusetts Bay was undoubtedly the most effective. The charters of Connecticut and Rhode Island were the freest of the colonies; but that of Massachusetts was certainly next to them. If Massachusetts was not safe against such an attack, no colony was safe. The nuinistry had forced an

issue on the very point on which the colonial and imperial theories were irreconcilable. The Boston Port Act furnished a grievance so concrete as to obviate the necessity of much argument on other points. The Quebec Act, with its attempt to cut off the northern colonies from the western expansion to which they all looked hopefully, was bad enough in itself, but it brought up with it the element of religious suspicion. For years the distinctively Puritan element had dreaded an attempt to establish the Church of England in the colonies 3 and the inclination of American Episcopalians to look to the home Government for relief against unjust local restric- tions had not helped to decrease the feeling. The Puritan element could see little real difference between Episcopacy and Catholicism ; and, when it was found that the Quebec Act practically established the Roman Catholic system in the new territory, the old dread revived to give the agita- tion a hidden but strong motive,

First Conti- nental Con- gress,

Its ulti- matum.

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59. The necessity of another Congress was universally felt. On the suggestion of Virginia and the call of Massachusetts, it met at Philadelphia (September 59, 1774). All the colonies but Georgia were represented ; and Georgia was so certainly in sympathy with the meet- ing that this is commonly known as the First Continental Congress, the first really national body in American history. Its action was still mainly deliberative. It adopted addresses to the king, and to the people of the colonies, of Quebec, and of Great Britain, and passed a declaration of colonial rights, summing up the various Acts of Parliament which were held to be in violation of these rights. But its tone was changed, though its lan- guage was still studiously controlled and dignified. It was significant that, for the first time, the two Houses of parliament were ignored in the matter of petitioning : it was at last seen to be an awkward concession even to memorialize parliament. The tone of a sovereign about to take his seat is perceptible in the letter of Congress to the colonies which had not yet sent delegates. And at least two steps were taken which, if not an assumption of sovereign powers, were evidently on the road to it. The first was the preparation of Articles of

Association, to be signed by the people everywhere, and to be enforced by committees of safety chosen by the people of cities and towns. These articles bound the signers to stop the importation of all goods from, and the exportation of all goods to, Great Britain and Ireland, the use of such goods, and the slave trade. The manner of the enforce- ment of the articles was evidently an incipient suspension of all authority proceeding from the mother country and the substitution of a general popular authority for it. The other step was a resolution, adopted October 8, as follows :—‘ That this Congress approve the opposition of the inhabitants of the Massachusetts Bay to the execution of the late Acts of Parliament ; and, if the same shall be attempted to be carried into execution by force, in such case all America ought to support them in their opposi- tion.” This was simply an ultimatum: in the opinion of Congress, the ministry could take no further step except that of attempting to enforce its Acts, and the colonies would resist such an attempt as an act of war. Before the next Congress met the conditions had been fulfilled. The agents of the ministry had applied force ; Massachu- setts had resisted by force ; and the new Congress found itself the representative of a nation at war, still acknowledg- ing the king, but resisting the operations of his armies. Having summoned a new Congress to meet at Philadelphia on the 10th of May following, and having cleared the way for its action, the First Continental Congress adjourned.

60. It is an unpleasant task to record the successive steps by which two peoples, so exactly similar to one another in every characteristic, so far removed from one another, and so ignorant of one another’s feelings, advanced alternately to a point where open collision was inevitable. From the standpoint of ‘no taxation without representa- tion,” which Pitt and his school of Whigs had approved, the colonists had now been driven by the suicidal logic of their opponents to the far more consistent position of “no legislation without representation,” which the Pitt school had never been willing to grant, and which was radically inconsistent with the British “imperial” theory. ither the previous legislation of parliament was to remain a dead letter, or it must be executed by force; and that meant war. Massachusetts was already on the brink of that event. Gage, the new governor, had refused to meet the assembly ; he had fortified himself in Boston, and was sending out spies as if into hostile territory. All regular

government was suspended or remanded to the towns ; and the people were organized into ‘‘ minute men,”

STATES

pledged to move at a minute’s notice. The first hostile movement of Gage would be the signal for the struggle. War, in fact, had come to be a possibility in the thoughts of every one. The new governor of Canada, Carleton, was sent out with instructions to levy the people and Indians of that province, in order that they might be marched against rebels in any province of North America. Governor Tryon’s defeat of the insurgent people of North Carolina at the Alemance (§ 54) furnished a tempting precedent to Governor Gage in Massachusetts. There was strong pressure upon him to induce him to followit. The king’s speech at the opening of parliament (November 29, 1774) spoke of the prevalent “resistance and disobedience to the law” in Massachusetts ; the ministry urged Gage to arrest the colonial leaders, even though hostilities should follow ; the two Houses of Parliament presented a joint address to the king, declaring Massachusetts to be in rebellion, and offering all the resources of the empire to suppress the rebellion ; and the king, in reply, announced his intention of acting as parliament wished.

61. The inevitable collision was narrowly escaped in February 1775. to search for powder; but the day was Sunday, and a conflict was prevented by the ministers. Another expe- dition (April 19) was more momentous. It set out for Concord, a little village some 20 miles from Boston, to seize a stock of powder which was reported to be gathered there. At daybreak the troops marched into the village of Lexington, on their road. They found some minute men who had been hastily summoned, for intelligence had been sent out from Boston that the expedition was coming. There was a hurried order from an officer that the militia should disperse, then a volley from his men and a few answering shots, and the first blood of the American revolution had been shed. The troops went on to Concord and destroyed the stores there. But by this time the whole country was up. Messengers

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and their mustering made the return to Boston more dangerous than the advance had been. When the troops began their return march the continuous fire from fences, trees, and barns along the route soon converted the retreat into arout. The opportune arrival of a rescuing party from Boston saved the whole force from surrender, but the pursuit was kept up until the expedition took refuge under the guns of the war-vessels at the water-side. The next morning the isthmus which connected the town of Boston with the mainland was blockaded ; the siege of Boston was formed ; and the revolution had begun.

62. The news of Lexington and Concord fights set the continent in a flame, but every feature of the outburst showed the still thoroughly English characteristics of the people. For nine long years they had been schooling themselves to patience ; and, as their impatience became more difficult to control, it was shown most strongly m their increasingly scrupulous care to insist upon the letter of the law. Even in the first open conflict the colonists were careful to base their case on their legal right to use “the king’s highway”; and Congress carefully collected and published depositions going to show that the troops had violated this right and had fired first. There was every thing in the affairs of Lexington and Concord to arouse an intense popular excitement : the mustering of undiscip- lined farmers against regular troops, the stern sense of duty which moved it, the presence and encouragement of the ministers, the sudden desolation of homes which had never known war before, were things which stirred every pulse in the colonies when they were told. But there was no need of waiting for such stories. When the dam burst, the force which had been stored up for nine years took

Gage sent a water expedition to Salem tonant

were riding in every direction, arousing the minute men He

Lexing.

Concord, |

Popular | govern- ments.

:

| |

Second Contin- ental

Congress,

ailure f the rst ‘ational _ystem,

1774-1775.] Uae T ED

everything away before it. The news was hurried by express along the roads to the southward; men left the plough in the furrow when they heard it, and rode off to Boston ; town committees of safety collected money and provisions and sent them to the same point; and before the end of the month the mainland around Boston harbour was occupied by a shifting mass of undisciplined half-armed soldiers, sufficient to keep the British troops cooped up within the peninsula on which the town was built.

63. The overturning of the royal governments in North America followed rapidly, as the news of the fights at Lexington and Concord spread abroad. In one colony after another the lower houses of the colonial legislatures, taking the name of “provincial congresses,” met and assumed the reins of government; the officers of militia and subordinate magistrates accepted commissions from them ; and the colonial officials, to whose advice so much of the course of events had been due, fled to England or to the nearest depdt of royal troops. On the day (May 10, 1775) when the stronghold of Ticonderoga, the key of the gateway to Canada, was taken by surprise by an American force under Allen (p. 787), giving the besiegers of Boston a welcome supply of weapons and ammunition, the Second Continental Congress met at Philadelphia. It came, under new circumstances, to redeem the pledge which its predecessor had given that all the colonies would support Massachusetts in resisting force by force. It was thus the representative of a united people, or of nothing. The struggle for union had been so far successful.

64. This fact of union has coloured the whole sub- sequent history of the country. The Articles of Associa- tion had really preceded it by a substitution of general popular government, however clumsy in form, for the previously recognized governments; in so far the authority of the various colonies was also suspended, and @ general national organization took their place. It was soon found that the colonial organizations had too much innate strength to be got rid of in this summary fashion ; they held their own, and, as soon as imminent danger had disappeared, they succeeded in tearing so much power from the Continental Congress as to endanger the uational existence itself. But, when the Second Conti- nental Congress met, it met (as Von Holst maintains) as a purely revolutionary body, limited by no law, and by nothing else but by its success in war and the support which it was to receive from the people, without regard to colony governments. With the energy and recklessness of a French revolutionary body it might have blotted out the distinctions between colonies, and established a centralized government, to be modified in time by circum- stances. In fact, it took no such direction. It began its course by recommendations to the new colonial govern- ments ; it relied on them for executive acts; and, as soon as the new colonies were fairly under way, they seized on the power of naming and recalling the delegates to the Congress. From that time the decadence of the Congress was rapid ; the national idea became dimmer; and the assertions of complete sovereignty by the political units became more pronounced. This failure of the Second Congress to appropriate the universal national powers Which were within its grasp is responsible for two opposite effects. On the one hand, it built up a basis for the future assertion of the notion of State sovereignty, necessarily including the right of secession. On the other, it maintained the peculiar feature of the American Union, its large State liberty, its dislike of centralization, and its feeling that the national power isa valuable but dangerous instrument of development. The effort to find a com- promise between the two forces makes up the record of

subsequent national politics, ending in the present asser- tion of the largest possible measure of State rights, but under the guarantee of the national power, not of the State’s own sovereignty.

65. The conversion of the former colonies into ‘ States” followed The State Since that time the States system,

hard upon the outbreak of war (§ 72). have really been the peculiar feature of the American system. The circumstances just mentioned put them into a position in which they held all real powers of government; and they are still the residuary legatees of all such powers as have not been taken from them by the national power or by thcir State constitutions, In 1775 they differed very materially in their organization, but there has becn a constant tendency to approach a general type, as States have adopted innovations which have proved successful in other States. All have now governors, legislatures of two houses, and State judiciaries. The governor, except in a few States, has a limited veto on legislation, and has a pardoning power. The State legislature is supreme in all subjects relating to the jurisdiction of the State, with two exceptions: the constitution of the United States imposes certain limitations on them (§ 116), and there is an evident tendeney in the later State constitutions to prohibit the legislatures from ‘‘special legislation,” and to provide that, in specified subjects, they shall pass only “general laws,” applicable to the whole State and all citizens alike. With these exceptions, it is difficult to imagine a more complete autonomy than is possesscd by the States of the American Union. The main restriction upon their action is in its results upon their welfare. They may even repudiate their debts, and there is no power which can make them pay; but, even in respect to this, the results upon the eredit of a repudiating State have been enough to check others in any action of the kind. They control the organization of the State into counties, towns, and cities; they touch the life and interests of the citizen in a far larger degree than does the Federal Govern. ment; and, in many points, such as that of taxation, their powers are co-ordinate with those of the Federal Governinent, so that the two departments of the Ameriean Governmental system operate on the same subjects. The admission of new States (§ 97) has raised the number of the original thirteen States to thirty-eight (in 1887), and the powers of the new States are exactly those of the old ones.

66. The “ force resolution ” of the First Congress (§ 59) shows that the national existence of the United States, in a purely political sense, dates from the fulfilment of the conditions of the force resolution—that is, from

the first shot fired at Lexington, From that instant the fact of union was consummated in the support given to Massachu- setts by the other commonwealths ; and George III. was king no longer of thirteen separate kingdoms, but of one, The fact that he did not recognize the union did not alter the fact of union ; that was to be decided by events. This success of the struggle for union gave the United States a date for the political, as distinguished from the legal, existence of the nation (April 19, 177 5).

IV. THE STRUGGLE FOR INDEPENDENCE: 1775-83.

67. The Second Congress adopted the “army” around Boston as “the American continental army”; rules and articles of war were formulated for it ; and Ward, Charles Lee (a British soldier of fortune), Schuyler (p. 790), and Putnam were named as major-generals, with eight brig- adiers, and Gates as adjutant-general. Union, though ac- complished, was still weak. Sectional interests, feelings, and prejudices were strong; and the efforts of the delegates to accommodate them had, as one result, the appearance of

Washington on the historical stage which he was to fill so Washing- completely. He had been of special service on the military ton,

committee of Congress; and the Massachusetts members ——the Adamses and others—saw in him the man whose appointment as commander-in-chief would be most accept- able to all the sections, and would “cement and secure the union of these colonies,” as John Adams wrote in a private letter. He was chosen unanimously and commis- sioned, and set out for Boston. But another collision, the battle of Bunker Hill, had taken place on the date of his commission (June 17).

68. In one of the irregular surgings of the colonial force Bunker around Boston, it took possession of Breed’s (now known Hill.

as Bunker) Hill, some 75 feet high, commanding Boston, and separated from it by a sheet of water. The British officers might have landed men so as to take the line of entrenchinents in the rear, or might have raked it from

’ end to end from the water. They chose to send 2500 men

Canada,

Paper currency.

Drift towards indepen- dence,

over in boats, and charge straight up the hill. The all- important question was whether the “ embattled farmers ” within the works would stand fire. Not a shot from the line of entrenchments returned the scattering fire of the advancing column until the latter was within a hundred feet ; then a sheet of flame ran along the line, and, when the smoke cleared away, the charging troops were retreat- ing down the hill. The officers moved the men again to the assault, with exactly the same result. At the third assault the ammunition of the farmers was exhausted ; but they retreated fighting stubbornly with gun-stocks, and even with stones. “ The success,” wrote Gage to the ministry, “ has cost us dear ; the trials we have had show the rebels are not the despicable rabble too many have supposed them to be.” He had lost 1100 out of 2500 men. A serious American loss was that of Warren, a Boston leader of high promise.

69. While Washington was endeavouring to form an army out of the heterogeneous matcrial around Boston, another American force was attempting to drive the British out of Canada. On the last day of the year 1775, in an assault on Quebec, one of the leaders, Montgomery (p. 790), was killed, and another, Benedict Arnold, was wounded. Shortly afterwards the American force was driven back into the northern part of New York, near the Canada line, where it held its ground. Congress began in June the issue of bills of credit, or “ continental currency,” as a substitute for taxation —a most unhappy stcp. The bills soon began to depreciate. Congress insisted on holding them to be legal tender; but it had not seized, as it might have done, the power of taxation, in order to provide for the redemption of the bills; and its recommendation to com- mittees of safety to treat as enemies of their country those who should refuse to receive the bills at their face value never accomplished its object. Successive emissions of paper enabled Congress to support the army for a few years, aud even to begin the organization of a navy. Privateers and public armed vessels had been sent

out by the several colonies; the first American fleet, of eight vessels, sailed in February 1776, but its cruise accom- plished little.

70, All this time Congress had been protesting its horror of the idea of independence; and the colonial congresses had instructed their delegates not to counten- ance any such project. The last petition to the king was adopted by Congress in July 1775, and sent to London by the hands of Richard Penn. It besought the king to consider the complaints of the colonists, and to obtain the repeal of the Acts which they had found intolerable. The news of the battle of Bunker Hill had preceded Penn ; the king refused to answer the petition; but by a pro- clamation (August 23, 1775) he announced the existence of open rebellion in the colonies, and called on all good subjects to give any information of those persons in Great Britain who were aiding and abetting the rebellion. This was but the first of a series of attacks on that strong sentiment in Great Britain which felt the cause of the colonies to be the old cause of English liberty. At the opening of the struggle this sentiment was intense : officers resigned their commissions rather than serve in America ; the great cities took open ground in favour of the colonies ; and some of the English middle classes wore mourning for the dead at Lexington. As the war increased in its intensity this sentiment necessarily decreased ; but, even while parlianient was supporting the war by votes of

more than two to one, the ministry was constantly ham- pered by the notorious consciousness that the real heart of England was not in it. Even when 25,000 men were voted at the king’s wish, provision had to be made to obtain them from Germany. Privilege and officialism were against the colonies; the popular heart and conscience were either ignorant or in favour of them.

71. Butin America everything spoke of war. Howe, who had succeeded Gage, passed a very bad winter. His men were often short of supplies ; their quarters were uncom- fortable; and their efforts to better their positicn were a severe infliction upon the inhabitants. Along the coast the commanders of British ships acted everywhere as if on the borders of an enemy’s country; Gloucester, Bristol, Falmouth, and other defenceless towns were

cannonaded ; and the flag of the king tended more and more to appear that of an enemy. On the first day of the new year the distinctive standard of the thirteen united colonies was raised at Washington's headquarters. It introduced the stripes of the present flag, but retained the crosses of St George and St Andrew ona blue ground in the corner, the whole implying the surviving acknowledgment of the royal power, with the appearance of a new nation. When inde- pendence had eliminated the royal element, the crosses were replaced (1777) by stars, as at present. Congress had been compelled to go so far in national action as to threaten reprisals for the threats of special punishment by the ministry. The first step towards the ultimate applica- tion for admission to the family of nations was really taken in November 1775, when Franklin, Jay, and three other delegates were appointed a committee to maintain inter- course with friends of the colonies " in Great Britain, Ire- land, and elsewhere"; the main importance of the appoint- ment was in the last two words. The end of the year left independence in the air, though hardly spoken of.

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72. Thomas Paine turned the scale (January 9, 1776) Paine,

by the publication of his pamphlet Common Sense. His argument was that independence was the only consistent line to pursue ; that " it must come to that some time or other"; that it would only be more difficult the more it was delayed ; and that independence was the surest road to union. Written in simple language, it was read every- where; and the open movement to independence dates from its publication. In the meantime events were urging Congress on. Washington in March seized and fortified Dorchester Heights, to the south of Boston and command- ing it. Before the British could move upon the works,

they had been made so strong that the garrison evacuated Evacua- the place (March 17, 1776), sailing away to Halifax on the ee For the moment the British had hardly an organ-*°*™

fleet. ized force within the thirteen colonies ; Charles Lee had just seized New York city and harbour ; and the ministry seemed not only hostile, but impotent. The spirit of Con- gress rose with success. It had already ordered

(November 25, 1775), on receipt of news of instructions to British war-vessels to attack American seaport towns “as in the case of actual rebellion,” that British war-vessels or trans- ports should be open to capture ; now (March 23, 1776) it declared all British vessels lawful prize. It then went on (April 6) to open all American ports to the vessels of all other nations than Great Britain, still forbidding the slave trade. It had even opened communication with the French court, which, using the name of a fictitious firm in Paris, was shipping money, arms, and supplies to the colonies. All these were acts of an independent power; and colony after colony, changing the colonial into State forms of government, was instructing its delegates to vote for independence. In May some of the colonies. had become too impatient to wait longer, for it was evident that the king had finally ranged himself against the new

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American nation. Virginia spoke in most emphatic tones ; and one of her delegates, Richard Henry Lee, moved a resolution in Congress for independence, seconded by John

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commander there, and driving him into Brooklyn (August Battle 27). The British hesitated to attack the American works of Long therc, so that Washington was able to draw off the defeated Island.

1775-1777.]

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Adams (June 7, 1776). A committee to draw up a declara- tion in conformity with the resolution was chosen, consist- ing of Thomas Jefferson of Virginia, John Adams, Franklin, Roger Sherman of Connecticut, and Robert R. Livingston of New York ; but the resolution was not adopted until July 2, as follows :—“ Resolved that these united colonies are and of right ought to be free and independent States ; that they are

absolved from all allegiance to the British crown; and that all political connexion between them and the state of Great Britain is and ought to be totally dissolved.”

force, and the British followed slowly to the New York side ofthe river. Through September and October Washington retreated northwards, fighting stubbornly, until he reached the strong defensive positions where the mountains begin to make a figure in the landscape north of New York city. Here he faced about, and prepared to give battle from behind fortifications. Again Howe hesitated, and then turned back to occupy New York.

76. Howe was cut off from the water-way to Canada by Washington’s fortification of the highlands, but his leu- tenant, Cornwallis, secured a lodgment by surprise on the

| Declara- 73. Jefferson had come from Virginia with the reputa- | other side of the Hudson, and thus drew Washington tion of tion of a very ready and able writer ; and the committee, | across the river to oppose him. Forced to retreat through Washing- Indepen- hy common consent, left the preparation of the first draft | New J ersey, pursued by the British, Washington at least ton’s lene, of the Declaration of Independence to him. He wrote it | used up the month of December in the retreat, But affairs 7°. almost at one heat ; and, though parts of it were rejected | were in a desperate plight. His army had been driven) or modified by Congress, the whole instrument, as it was | across the Delaware ; the British held all New Jersey, and adopted by that body (July 4, 1776), must stand as | were Only waiting for the river to freeze over to “catch Jefferson’s own work. John Adams was its champion on | Washington and end the war ”; Philadelphia was in a the floor of Congress, for Jefferson was not a public speaker, | panic, and Congress had taken refuge in Baltimore, leaving —and the coincidence of the deaths of these two men, just | Washington with almost dictatorial powers ; hosts of half- | fifty years afterwards (July 4, 1826), was a remarkable one. | hearted people were taking British protections and return- The language of the Declaration, like that of all the Ameri- ing to their allegiance ; and the time was one which “ tried can state-papers of the time, was strong and direct, Ignor- | men’s souls.” Washington’s soul was proof against all ing parliament, it took every act of oppression which had | tests; and in the

midst of his discouragements he had been aimed at the colonies as the act and deed of the king ; | already planned that which was to be the turning-point it concluded that “a prince whose character is thus marked | of the war. The advanced post of the British was one of by every act which may define a tyrant is unfit to be the Hessians, under Rahl, at Trenton, on the Delaware. Seiz- Battles of ruler of a free people ”; and it announced the independence | ing all the boats on the river, and choosing the night of Trenton of the United States in the terms of the resolution already | Christmas, on the probability that the Hessians would be stated. The date of its adoption is, by the decision of the drunk, he crossed the river, assaulted the town with the Supreme Court, the date of the legal existence of the | bayonet, and captured the garrison. Taking his prisoners United States in matters of municipal law. to Philadelphia, he recrossed the river on the last day of 74. Meanwhile clouds were gathering about the young | the year, and reoccupied Trenton. Cornwallis brought republic. A British expedition was beaten off from Charles. almost all his available forces towards that place ; and ton (June 28) ; but two days afterwards a stronger force, | Washington’s diminishing army was in greater danger under Howe, landed on Staten Island, just below New | than before. Leaving hiscamp-fires burning, he abandoned York city. The ministry, abandoning New England, had | his position by night, swept around the sleeping British and Attack decided to transfer the war to the middle colonies. Here forces, met, fought, and captured at Princeton (January 3, Prinee- m the was the originally alien element among the colonies (§7), | 1777) a detachment on its march to Trenton, and threat- “°™ * though the ministry was disappointed in it ; here was the | ened the British base of supplies at New Brunswick. It

commercial element, which had sometimes been willing to prefer profit to patriotism; above all, the Hudson gave a safe path for British frigates, so that the British forces might control at the same time the road into Canada and the moat which should cut off New England from the other colonies, Most of the reasons which made the open- ing of the Mississippi a severe blow to the Confederacy in 1863 applied to the capture of New York city and the operations in the Hudson river in 1776.

75. Washington had hurried to New York city as soon as Boston had surrendered, but his preparations were not far advanced when Howe

appeared (June 30). He and his brother, Admiral Lord Howe, the commander of the fleet, had high hopes of receiving the confidence of both parties to the struggle, by reason of their hereditary connexion with the crown and the liking of the colonies for their elder brother, killed at Ticonderoga ; and they brought conciliatory proposals and the consent of the Ministry to an unofficial exchange of prisoners. The country was now committed to independence, and in August Howe began offensive operations. Washington's force numbered 27,000, about four-fifths of them having never seen action ; and about one-third of his army had been placed on Long Island. Howe had 31,000 trained soldiers, largely Hessians; and he debarked 20,000 of them on Long Island, beating Putnam (p. 790), the American

was only a threat; but it served its purpose of drawing Cornwallis off from Philadelphia.

77. New Jersey is crossed from south-west to north- cast by a spur of the Alleghanies. Thus far opcrations had been confined to the flat country to the south ; Wash- ington now swept on to the northern or mountainous part, and the day after Princeton fixed his headquarters at Morristown, where they really remained almost all through the rest of the war. He was aided by the unwillingness of the British to attack entrenchments. His long line across New Jersey was everywhere strong; the British could now reach Philadelphia only by passing in front of his line and risking a flank attack ; and they at once drew in their outposts to New Brunswick. With the exception of the occupation of Newport by the British, and attacks on minor outlying places, as Danbury, there was a short breathing space.

78. Kalb, Kosciusko, Conway, and other foreign officers were already serving in the American army; Pulaski (p.790), Steuben (p. 790), and others were soon to come. Some of the minor foreign acquisitions of this sort were selfish, conceited, and troublesome; the most unselfish and devoted was the young Marquis de la Fayette, who came this year with a shipload of supplies as his gift to the republic.

Franklin made his appearance at the French court Franklin.

(Deceniber 7, 1776) as one of the American envoys, and

Bur- goyne’s expedi- tion,

Saratoga,

Treaty with France,

Capture of Phil- adelphia

Valley Forge,

soon took the lead in negotiations. Shrewd, sensible, far- sighted, and prompt, never missing or misusing an oppor- tunity, he soon succeeded in committing the French Government, in all but the name, as an ally of the United States; and, though his success with other European courts was small, he opened the way for the general commercial treaties which followed the war. His unoffi- cial influence was a more important factor in his work. Carefully maintaining the character of a plain American burgher, he seemed to the French the veritable man of nature for whom they had been longing. The pithy sense and homely wit which had given force to his Poor Richard’s Almanac had impressed even his unemotional countrymen strongly; his new audience took them as almost inspired. He, and his country with him, became the fashion ; and it became easier for the Government to cover its own supplies to the insurgents by an appearance of embarrassment in dealing with the enthusiasm of its subjects. The foreign aid, however, did the Americans areal harm. Congress, relying upon it, grew more and more into the character of a mere agent of the States for issuing paper and borrowing money ; and the taxing func- tion, which should have been forced upon it from the beginning, fell more positively into the hands of the States. As the national character of Congress dwindled, the State jealousies and ambitions of its delegates increased ; little cliques had their favourite officers,—Gates, Charles Lee, Conway, or some other soldier of fortune ; and Washing- ton, neglected and harassed by turns, must have found it difficult to face Howe with half his number of men, foil the various competitors for his own position, and maintain his invariably respectful tone towards Congress.

79. In July 1777 Burgoyne, with an army of British, Germans, and Indians, attempted the Hudson river route from the north, and forced his way nearly to Albany. The utter defeat of a detachment at Bennington (August 16) by the farmers of Vermont and New Hampshire under Stark, the atrocities of the Indians before they deserted Burgoyne's standard, and the end of the harvest brought abundant reinforcements to Gates, whom Congress had put in command. He gained the battle of Bemis Heights (Oct. 7), and ten days afterwards forced Burgoyne to surrender near Saratoga. The news of this success brought to Franklin (Feb. 6, 1778) the desire of his heart in a treaty of alliance, offensive and defensive, between the United States and France, and this was followed in the next month by war between Great Britain and France and an ineffectual proposal for reconciliation from Great Britain to the United States, covering colonial representa- tion in parliament and everything short of independence.

80. Meantime Howe had taken the water-route to Phil- adelphia, by way of the ocean and Chesapeake Bay, and had

' captured the city (September 25,1777) ; but Washington

had at least made his army capable of fighting two battles, those of Chad's Ford on the Brandywine (September 11) and Germantown in the outskirts of Philadelphia (October 4), both: stubbornly contested. Taking up winter-quarters at Valley. Forge, about 20 miles from Philadelphia, he watched Howe vigilantly, and struggled manfully with the responsibilities of supreme command, which the fugitive Congress had again left to him, with the misery and almost despair of his own men, and with the final intrigues of those who now wished to supersede him by the appointment of Gates. In June 1778 the news of the treaty with France, and of the departure of a French fleet and army for America, compelled Clinton, who had succeeded Howe, to set out for New York, in order to reunite his two main armies. Washington broke camp at once, followed him across New Jersey, and overtook the rear at Monmouth, or Freehold (June 29). An indecisive battle enabled the

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British to gain New York city; Washington formed his line Battle from Morristown around the north of the city, so as to be of Mon. able to interpose between Clinton and Philadelphia or New ™outh. England ; and these positions were maintained until the Yorktown campaign began in 1781. Beyond skirmishes, there were no more important events in the North, except some unsuccessful attempts to recover Newport with French assistance, the capture of Stony Point by Wayne (July 15, 1779), and the treason of the American commander of West Point, Benedict Arnold (p. 787), with the execu- tion of the British adjutant-general, Major John André, whom the Americans had captured within their lines while he was carrying on the negotiations (September 1780). 81. Midsummer 1778 marks the beginning of the end. 33,000 men, the high-water mark of the British army in the United States, had maintained a footing at but two places, New York city and Newport ; the ministry, in a war which had no real popular momentum, found German mercenaries an expensive resource; and the Germans were very apt to desert in America. An extraordinary number of leading men in England, while they would not hamper the nation in its struggle, made no scruple of expressing their practical neutrality or their high regard for various American leaders. France was now in the war, and Spain and Holland were soon to be the allies of France. The difficulties of supplying the British army were now aggravated by the presence of French fleets in American waters. English commerce had been decimated by American privateers; and Franklin was gathering vessels in France, in one of which (the “Richard”) Paul Jones was to fight with the “Serapis” one of the most — desperate naval battles on record (September 23, 1779). Perhaps hopeless of success in the northern and middle Attack States, the ministry decided to begin operations in theo the south, where it was believed that the slave population would be a fatal source of weakness to the Americans. 82. Late in 1778 a British expedition from New York captured Savannah, and rapidly took possession of the thinly populated State of Georgia. An attempt to retake Savannah in the following year cost the Americans the life of Pulaski. Evacuating Newport, and leaving only troops enough to hold New York city, Clinton sailed southward and captured Charleston (May 12, 1780). Capture Thence his forces swept over South Carolina until they had reduced it to a submission broken by continual out- a bursts of partisan warfare undcr Sumter (p. 790), Marion, and other leaders. This work finished, Clinton returned to New York,

leaving Cornwallis in command in the south. As soon as the summer heats had passed away Gates entered the State from the north with a militia army, and was badly beaten at Camden (August 16) by an inferior Camden British force. Even North Carolina now needed defence, and the work was assigned to Greene, one of the best of the American officers developed by the war. The com- mander of his light troops, Morgan, met his British rival, Tarleton, at the Cowpens (January 17), and inflicted Cowpens. upon the latter the first defeat he had met in the south. 4 This event brought Cornwallis up to the pursuit of the i victor. Morgan and Greene retreated all the way across North Carolina, followed by Cornwallis, and then, having raised fresh troops in Virginia, they turned and gave battle at Guilford Court House (March 15, 1781). Guilford | Greene was beaten, as was usually the case with him, but Court he inflicted so heavy a loss in return that Cornwallis retired to the coast at Wilmington to repair damages. Greene, energetic as well as cautious, passed on to the south, and gave battle to Rawdon, whom Cornwallis had -. left in command in South Carolina, at Hobkirk's HLill Moblin (April 25), and was beaten again. But Rawdon's loss a. was so severe that he drew in his lines toward Charleston.

[HISTORY.

House.

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86. In the winter of 1778-79 George Rogers Clark, a The Kentucky leader, acting under the authority of the State novth- of Virginia, had led a force of backwoodsmen into the ¥¢s* country north of the Ohio river, captured the British posts in it, and made the soil American up to the latitude of Detroit. The treaty of peace acknowledged the conquest, and even more than this. It settled the northern boundary of the United States, so far as the longitude of the Mississippi river, nearly as it now runs; the Mississippi as the western boundary down to 31° N. lat., thence east on that line to the present northern boundary of Florida, and east on that to the Atlantic. Great Britain restored the Floridas to Spain, so that the new nation had Great

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Eutaw Greene followed, and at Eutaw Springs (September 8)

Springs. fought the last pitched battle in the South. He was beaten again, but Rawdon again fell back, and thereafter did all that man could do in holding the two cities of Charleston and Savannah. Greene had won no battle, but he had saved the South.

83. Arnold, now a general in the British service (§ 80), had been sent, early in the year, to make a lodgment in Virginia. It seems to have been believed by the British authorities that the three southernmost States were then secure, and that Virginia could be carved out next. La

Fayette was sent to oppose Arnold, but the latter was soon relieved, and in June Cornwallis himself entered the State.

born:

wallisin He had not been willing to serve with Arnold. Directed | Britain as a neighbour on the north, and Spain on the Virgm to select a suitable position for a permanent post on the | south and west. Some disposition had been shown to | Chesapeake, he had chosen Yorktown, where, with the | exclude the Americans from the fishing ground off New-) troops already in Virginia, he fortified his army. The | foundland, but it was abandoned. ‘The United States by) general ground was that of M‘Clellan’s campaign of 1862 | the treaty entered the family of nations with recognized) ($ 285) and Grant’s of 1864-65 (§ 296). boundaries, and all the territory within these boundaries 84. Washington, reinforced by a lately arrived force of | could be recognized by other nations only as the property | 6000 excellent French troops (July 1780) under Rocham- | of the United States, But, so far as internal arrange- beau, was still watching Clinton at New York. The news | ments were concerned, a great question remained to be) that De Grasse’s French fleet, on its way to the American | settled. There were thirteen organized States, covering) coast, would enter the Chesapeake, where Cornwallis had | but a part of this territory ; a part of them claimed to be) left himself open to the chances of such an event, led | sole proprietors of the western territory outside of the Washington to conceive the campaign which captured | present State limits ; and it remained to be seen whether Cornwallis and ended the war. He began elaborate pre- | they would make

good their claim, or the other States parations for an attack on New York, so that Clinton | would compel them to divide, or the new national power actually called upon Cornwallis for aid. Moving down | would compel as clear an internal as an international the Hudson, he kept Clinton in ignorance of any move- | recognition of its claim (§ 89). ment to the south as long as possible, and then changed 87. The American army was now disbanded, its officers the line of march to one through New J ersey. The | receiving a grudging recognition of their claims and the allied armies passed through Philadelphia, were hurried privates hardly anything. Poverty was to blame for down the Chesapeake, and drove Cornwallis within his | much of this, and the popular suspicion of military power “ork entrenchments at Yorktown. De Grasse had arrived | for the rest. Washington’s influence was strong enough own. August 30, had defeated the British fleet, and was master | to keep the dissatisfied army from any open revolt, though

that step was seriously proposed. The organization of tlie hereditary order of the Cincinnati by the officers brought The Cin- about a more emphatic expression of public dislike, and cinnati. the hereditary feature was abandoned. But, wherever the officers and men went, they carried a personal disgust with the existing frame of government which could not but produce its effect in time. Their miseries had been largely due to it. The politicians who controlled the State legislatures had managed to seize the reins of government and reduce Congress, the only body with pretensions to a national character, to the position of a

of the Chesapeake waters. After three weeks’ siege Corn- wallis, having exhausted a soldier’s resources, surrendered

his army of 8000 men (October 19, 1781). 85. The country at large had really been at peace for along time. Everywhere, except in the immediate neigh- ‘ bourhood of the British forces, the people were work- | ing almost with forgetfulness that they had ever been English colonists; and, where the enemy had to be reckoned with, they were looked upon much as the early settlers looked on bears or Indians, as an unpleasant but inevitable item in the debit side of their accounts. Their

legislatures were making their laws ; their governors, or “presidents,” were the representatives whom their States acknowledged ; nothing but an American court had the power to touch a particle of the judicial interests of the American people; the American flag was recognized on the ocean; independence was a fact, and the ministry received from the English people so emphatic a call to acknowledge it that it yielded so far as to propose a defensive war. The House of Commons (March 4, 1782) voted to regard as enemies to the king and country all who should advise the further prosecution of the war ; the Rockingham ministry succeeded to power, to be followed shortly by the Shelburne ministry ; and Rodney’s victory over De Grasse gave the new ministries very much the same cover for an unsuccessful peace as Jackson’s victory at New Orleans afforded the United States in 1815 (§$ 181). Franklin, John Adams, and J ay, the American negotiators, concluded the preliminary treaty of peace, by which Great Britain acknowledged the independence of the United States (Nov. 30, 1782) ; hostilities ceased ; and the definitive treaty of peace was concluded (Sept. 3, 1783). A number of American loyalists (usually called Tories) accompanied the departing armies.

purely advisory body. The soldiery knew instinctively that the lack of power to feed them and clothe them, the payment of their scanty wages in paper worth two per cent. of its face value, were due to the impotence of Congress and the too great power of the States, that the nation presented the “awful spectacle,” as Hamilton called it, of “a nation without a national government”; and the commonest toast in the army was “ Here’s a hoop to the barrel,”—a stronger national government to bind the States together. The struggle for the establishment of this national government is the next step in the development of the United States, but to reach it naturally it will be necessary to go back into the midst of the struggle for independence.

V. THE STRUGGLE FOR NATIONAL GOVERNMENT :

1777-89,

88. The fact that the Continental Congress was really

a revolutionary body, not limited in its powers by any

fundamental law imposed by the underlying popular

sovereignty, but answering most closely to the British

parliament, has already been noted (§ 64). This state of

affairs was repugnant to all the instincts and prejudices XXIII. — 94

Articles of Con- federa- tion.

The western territory.

Tts rela- tions to the Union.

of the American people, and of the delegates who repre- sented them. Just at the time of the Declaration of Independence Congress set about preparing a “form of confederation,” which should express exactly the relative powers of the State and national Governments. Its work was finished November 15, 1777, and recommended to the States foradoption. Unluckily, before the work had been finished, the State legislatures had succeeded in establish-

ing their power to appoint and recall at pleasure the

delegates to Congress, so that Congress had come to be the mere creature of the State legislatures. The “ Articles of Confederation,” adopted in 1777, were thus calculated for the meridian of the State legislatures which were to pass upon them. The new government was to be merely ‘a firm league of friendship” between sovereign States, which were to retain every power not “expressly” delegated to Congress ; there was to be but one house of Congress, in which each State was to have an equal vote, with no national cxecutive or judiciary ; and Congress, while keep- ing the power to borrow money, was to have no power to levy taxes, or to provide in any way for payment of the money borrowed—only to make recommendations to the States or requisitions on the States, which they pledged their public faith to obey. The States were forbidden to make treaties, war, or peace, to grant titles of nobility, to keep vessels of war or soldiers, or to lay imposts which

should conflict with treaties already proposed to France or Spain. Important measures required the votes of nine of the thirteen States, and amendments the votes of all. Congress had hardly more than an advisory power at the best. It had no power to prevent or punish offences against its own laws, or even to perform effectively the duties enjoined upon it by the Articles of Confederation. It alone could declare war, but it had no power to compel the enlistment, arming, or support of an army. It alone could fix the needed amount of revenue, but the taxes could only be collected by the States at their own pleasure. It alone could decide disputes between the States, but it had no power to compel either disputant to respect or obey its decisions. It alone could make treaties with foreign nations, but it had no power to prevent individual States from violating them. Even commerce, foreign and domestic, was to be regulated entirely by the States, and it was not long before State selfishness began to show itself in the regulation of duties on imports. In everything the States were to be sovereign, and their crea- ture, the Federal Government, was to have only strength enough to bind the States into nominal unity, and only life enough to assure it of its own practical impotence.

89. Most of the States signed the Articles at once; New Jersey, Delaware, and Maryland held out against ratifying them for from two to four years. The secret of their resistance was in the claims to the western territory already mentioned (§§ 34, 86). The three recalcitrant States had always had fixed western boundaries, and had no legal claim to a share in the western territory; the Articles, while providing for the decision of disputes between individual States, were careful to provide also that “no State shall be deprived of territory for the benefit of the United States”; and this meant that those States whose charters carried them to the Pacific Ocean, while admitting the national authority to limit their claims by the Mississippi river, were to divide up the western territory among them. New Jersey and Delaware gave up the struggle in 1778 and 1779; but Maryland would not and did not yield until her claims were satisfied.

go. Dr H. B. Adams has shown that the whole question of real nationality for the United States was bound up in this western territory ; that even a “league government” could not continue long to govern a great and growing

territory like this without developing into a real national government, even without a change of strict law; and that the Maryland leaders were working under a complete consciousness of these facts. It is creditable, however, to the change which the struggle for union had wrought in the people that it was not until very late in this struggle that Virginia, the most omnivorous westcrn claimant, proposed to have the Articles go into effect without Mary- land, and still more creditable that her proposal hardly received notice from the other States. They were already conscious that the thirteen were really one.

g1. The solution of the difficulty was found in 1780. New The western boundary of the State of New York had York's always been very much in the air. Her main claim to "#™ her present extensive territory lay in the assertions that the western part had once belonged to the Six Nations of Indians, and that the Dutch, conquering the Six Nations, the English, conquering the Dutch, and New York, conquering the English, had succeeded to these rights. But the Six Nations had exercised an undefined suzer- ainty gver all the Indian tribes from Tennessee to Mich- ilimackinac, covering all the territory in dispute. New York proposed, if Congress would confirm her present western boundary, to transfer to Congress her western claims by conquest, superior to any mere charter claims ; and Congress approved the offer as " expressly calculated to accelerate the federal alliance." On March 1, 1781, the New York delegates formally completed the deed of transfer to the United States ; on the same day the Mary- land delegates signed the Articles ; and by this action of the last State the Articles of Confederation came into force as the first attempt to frame a national government.

92. The long struggle had given time for careful con- sideration of the Articles. Maryland's persistent criticism had prepared men to find defects in them. Conventions of New England States, pamphlets, and private corre- spondence had found flaws in the new plan of government ; but a public trial of it was a necessary preliminary to getting rid of it. The efforts of the individual States to maintain the war, the disposition of each State to magnify its own share in the result, the popular jealousy of a superior

power, transferred now from parliament to the central Government, and inflamed by the politicians who saw their quickest road to dignity in the State govern- ments, were enough to ensure the Articles some lease of life. A real national government had to be extorted through the “ grinding necessities of a reluctant people.”

93. Congress and its committees had already begun to declare that it was impossible to carry on a government efficiently under the Articles. Its expostulations were to be continued for several years before they were heard.

In the meantime it did not neglect the great subject which concerned the essence of nationality—the western territory. Virginia had made a first offer to cede her claims, but it was not accepted. A committee of Congress now made a report (1782) maintaining the validity of the rights which New York had transferred to Congress ; and in the next year Virginia made an acceptable offer. Her Tem deed was accepted (March 1, 1784); the other claimant tout States followed ; and Congress, which was not authorized a by the Articles to hold or govern territory, became the sovereign of a tract of some 430,000 square miles, nearly equal to the areas of France, Spain, and Portugal com- bined, covering all the country between the Atlantic tier of States and the Mississippi river, from the British possessions nearly to the Gulf of Mexico. ;

94. In this territory Congress had now on its hands the Peel same question of colonial government in which the British (ver: parliament had so signally failed. The manner in which vent Congress dealt with it has made the United States the

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country that it is. The leading feature of its plan was the erection, as rapidly as possible, of States, similar in powers to the original States. The power of Congress

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over the territories was to be theoretically absolute, but |

it was to be exerted in encouraging the development of thorough self-government, and in granting it as fast as the settlers should become capable of exercising it. Copied in succeeding Acts for the organization of Territories, and still controlling the spirit of such Acts, the Ordinance of 1787 (July 13, 1787) is the foundation of almost every- thing which makes the modern American system peculiar.

95. The preliminary plan of Congress was reported by a comn- mittee (April 23, 1784) of which Jefferson was chairman. It pro- vided for the erection of seventcen States, north and south of the Ohio, with some odd names, such as Sylvania, Assenisipia, Metro- potamia, Polypotaimia, and Pelisipia. These States were for ever to bea part of the United States, and to have republican govern- ments, and the Ordinance creating them was to be a compact between the Federal Government and each State, unalterable unless by mutual consent. ‘‘After the year 1800 there shall be neither slavery nor involuntary servitude in any of the said States, other than in the punishment of crimes wherecf the party shall have been duly convicted.” This provision, which represented Jefferson’s feeling on the subject, was lost for want of seven States in its favour.

96. The final plan of 1787 was reported by a committee of which Nathan Dane, of Massachusctts, was chairman. The prohibition of slavery was madc perpetual, and a fugitive slave clause was added (§ 124). The Ordinance ‘covered only the territory north of the Ohio, and provided for not less than three nor more than five States. Ohio, Indiana, Illinois, Michigan, and Wisconsin have been the resultant States. The inhabitants

were to be secured in the cqual division of real and personal property of intestates to the next of kin in equal degree. At first Congress was to appoint the governor, secretary, judges, and militia generals, and the governor aud judges were to make laws subject to the veto of Con- gress. When the population reached 5000 the inhabitants were to have an assembly of their own, to consist of the governor, a legislative council of five, selected by Congress from ten nomina- tions by the lower house, and a lower house of representatives of one delegate for every 500 inhabitants. This assembly was to choose a delegate to sit, but not to vote, in Congress, and was to inake laws uot repugnant to "the articles of fundamental com- pact," which were as follows:—the new States or Territories were to maintain freedom of worship, the benefits of the writ of habeas corpus, trial by jury, proportionate representation, bail, moderate fines and punishments, and the preservation of liberty, property, and private contracts; they were to encourage public education and keep faith with the Indians; they were to remain for ever a part of the United States; and they were not to interfere with the disposal of the soil by the United States, or to tax the lands of the United States, or to tax any citizen of the United States for the use of the Mississippi or St Lawrence rivers. These articles were to be unalterable unless by mutual consent of a State and the United States. The transformation of the Territory, with its quite limited government, into a State, with all the powers of an original State, was proinised by Congress as soon as the population should reach 60,000.

97. The constitution, which was adopted almost immediately afterwards, provided merely that " Congress shall have power to dispose of, and make all needful rules and regulations respecting, the territory or other property belonging to the United States," and that 'new States may be admitted by the Congress into the Union." Opinions have varied as to the force of the Ordinance of 1787. The Southern school of writers have naturally been inclined to consider it wltra vires and void; and they adduce the fact that the new Congress under the constitution thought it necessary to re-enact the Ordinance. The opposite school have inclincd to hold the Ordinance as still in force. Even as to the territorial provision of the constitution, opinions have varied. The Dred Scott decision held that it applicd only to the territory then in possession of the United States, and that territory

subscquently acquired, by con- quest or purchase, was not to be governed by Congress with absolute power, but subject to constitutional limitations.

98. In the interval of the settlement of the territorial question, the affairs of the “league of friendship” known as the United States had been going from bad to worse, culminating in 1786. The public debt amounted in 1783 to about $42,000,000, of which $8,000,000 was owed abroad—in Holland, France, and Spain. Congress had no power to levy taxes for the payment of interest or principal ; it could only make requisitions on the States.

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In the four years ending in 1786 requisitions had been made for $10,000,000, and the receipts from them had amounted to but one-fourth of what had been called for. Even the interest on the debt was falling into arrears, and the first instalment of the principal fell due in 1787. To pay this, and subsequent annual instalments of $1,000,000, was quite impossible. Robert Morris, the financier of the revolution, resigned in 1783, “rather than be the minister of injustice,” hoping thus to force upon the States the necessity of granting taxing powers to Congress. Wash- ington, on retiring from the command-in-chief, wrote a circular letter to the governors of all the States, urging the necessity of granting to Congress some power to provide a national revenue. Congress (April 18, 1783) appealed to the States for power to levy specific duties on certain enumerated articles, and 5 per cent. on others. It was believed that with these duties and the requisi- tions, which were now to be met by internal taxation, $2,500,000 per annum could be raised. Some of the States ratified the proposal; others ratified it with modifications ; others rejected it, or changed their votes ; and it never received the necessary ratification of all the States. The obedience to the requisitions grew more lax. Some of the States paid them ; others pleaded poverty, and allowed more or less of them to run into arrears ; others offered to pay in their own depreciated paper currency ; and others indignantly refused to pay in any currency until the delinquent States should pay all their obligations. In1786 a committee of Congress reported that any further reliance on requisitions would be “ dishonourable to the understand- ings of those who entertain such confidence.”

99. In the States the case was even worse. Some of them had been seduced into issuing paper currency in such profusion that they were almost bankrupt. Great Britain, in the treaty of peace, had recognized the independence of the individual States, naming them in order ; and her Government followed the same system in all its intercourse with its late colonies, Its restrictive system was maintained, and the States, vying with each other for commerce, could adopt no system of counteracting measures. Every possible burden was thus shifted to American commerce; and Congress could do nothing, for, though it asked for the power to regulate commerce for fifteen years, the States refused it. The decisions of the various State courts began to conflict, and there was no power to reconcile them or to prevent the conse- quences of the divergence. Several States, towards the end of this period, began to prepare or adopt systems of protection of domestic productions or manufactures, aimed at preventing competition by neighbouring States. The Tennessee settlers were in insurrection against the authority of North Carolina ; and the Kentucky settlers were appa- rently disposed to cut loose from Virginia, if not from the United States. Poverty, with the rigid execution of pro- cess for debt, drove the farmers of western Massachusetts into an insurrection which the State had much difficulty in suppressing; and Congress was so incompetent to aid Massachusetts that it was driven to the expedient of imagining an Indian war in that direction, in order to transfer troops thither. Congress itself was in danger of disappearance from the scene. The necessity for the votes of nine of the thirteen States for the passage of important measures made the absence of a State's dele- gation quite as effective as a negative vote. In order to save the expense of a delegation, the States began to neglect the election of them, unless they had some object to obtain by their attendance. It was necessary for Con- gress to make repeated and urgent appeals in order to obtain a quorum for the ratification of the treaty of peace with Great Britain. In 1784 Congress even broke up in

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disgust, and the French minister reported to his Govern- ment—‘ There is now in America no general government, —neither Congress, nor president, nor head of any one administrative department.” Everywhere there were symp- toms of a dissolution of the Union.

100. Congress was evidently incompetent to frame a new plan of national government; its members were too dependent on their States, and would be recalled if they took part in framing anything stronger than the Articles. The idea of a convention of the States, independent of Congress, was in the minds and mouths of many; Thomas Paine had suggested it as long ago as his Common Sense pamphlet: ‘Let a continental conference be held, to frame a continental charter, drawing the line of business and jurisdiction between members of Congress and mem- bers of assembly.” To a people as fond of law and the forms of law as the Americans there was a difficulty in the way. The Articles had provided that no change should be made in them but by the assent of every State legislature. If the work of such a convention was to be subject to this rule, its success would be no greater than that of Congress; if its plan was to be put into force on the ratification of less than the whole number of States, the step would be more or less revolutionary. In the end the latter course was taken, though not until every other expedient had failed; but the act of taking it showed the underlying consciousness that union, independence, and nationality were now inextricably complicated, and that the thirteen had become one in some senses.

ror. The country drifted into a convention by a round. about way. The navigation of Chesapeake Bay needed regulation; and the States of Maryland and Virginia, having plenary power in the matter, appointed delegates to arrange such rules. ‘The delegates met (1785) at Washing- ton’s house, Mount Vernon; and Maryland, in adopting their report, proposed a meeting of commissioners from all the States to frame commercial regulations for the whole. Virginia acceded at once, and named Annapolis, in Mary- land, as the place. The convention met (1786), but only five States were represented, and their delegates adjourned, after recommending another convention at Philadelphia in May 1787.

102. Congress had failed in its last resort—a proposal that the States should grant it the impost power alone ; New York’s veto had put an end to this last hope. Con- fessing its helplessness, Congress approved the call for a second convention; twelve of the States (all but Rhode Island) chose delegates ; and the convention met at Phil- adelphia (May 14, 1787), with an abler body of men than had been seen in Congress since the first two Continental Congresses. Among others, Virginia sent Washington, Madison, Edmund Randolph, George Mason (p. 789), and George Wythe; Pennsylvania Franklin, Robert and Gouverneur Morris, and James Wilson ; Massachusetts Rufus King, Gerry, and Strong; Connecticut William S. Johnson, Sherman, and Ellsworth ; New York Hamilton ; New Jersey Paterson; and South Carolina the two Pinck- neys (p. 790) and Rutledge! With hardly an exception

1 The following were some of the members of the convention not elsewhere noticed. OLIVER ELLSWORTH was born at Windsor, Conn., April 29, 1745, and died at his birthplace Nov. 96, 1807. He graduated at Princeton College in 1766, became a lawyer, and judge of the superior court of his State, and in 1796 was appointed chief- justice of the United States Supreme Court. He was sent on a mission to France in 1799, and resigned his place as chief-justice in 1800,—ELBRIDGE GERRY was born at Marblehead, Mass., July 17, 1744, and died at Washington, Nov. 23, 1814. He graduated at Harvard College in 1762, was a memher of the Continental Congress, 1776-1780 and 1783-1785, and of the Congress under the constitu- tion, 1789-1793. He was elected vice-president by the Democratic

party in 1812, and died in office. —Rurus Kina was born at Scar- borough, Mass. (now Maine), March 24, 1755, and died at Jamaica,

the fifty-five delegates were clear-headed, moderate men, with positive views of their own, and firm purpose, but with a willingness to compromise.

103. Washington was chosen to preside, and the con- vention began the formation of a new constitution, instead of proposing changes in the old one. Two parties were formed at once. The Virginia delegates offered a plan, proposing a Congress of two houses, having power to legislate on national subjects, and to compel the States to fulfil their obligations. This is often spoken of as a “ national plan,” but very improperly. It was a “ large State ” plan, proposed by those States which had or hoped for a large population. It meant to base representation in both houses on population, so that the large States could control both of them, and it left the appointment of the president or other executive and the Federal judges to Congress,—so that the whole administration of the new government would fall under large-State control. On be- half of the “small States” Paterson of New Jersey brought in another plan. It continued the old Confederation, with its single house and equal State vote, but added the power to regulate commerce and raise a revenue, and to compel the States to obey requisitions. The State representation was fortunate. New Hampshire’s delegates did not attend until after those of New York (then classed as a small State) had retired from the convention in anger at its evi- dent drift towards the “large-State” plan. The large States had a general majority of six to five, but the constant dropping off of one or more votes, on minor features, from their side to that of the small States prevented the hasty adoption of any radical measures. Nevertheless, the final collision could not be evaded ; the basis of the two plans was in the question of one or two houses, of equal or pro- portionate State votes, of large-State supremacy or of State equality. In July the large States began to show a disposi- tion to force their plan through, and the small States began to threaten a concerted withdrawal from the convention.

104. The Connecticut delegates, ance in the convention, had favoured a compromise. had been trained under the New England system, in which the assemblies were made up of two houses, one repre-

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N.Y., April 29, 1827. He graduated at Harvard College in 1777, and served as a Massachusetts member of the Continental Congress from 1784 to 1786. Removing to New York, he was elected United States senator from that State, serving in 1789-96, and was minister to Great Britain from 1796 to 1803. From 1804 to 1812 he was the Federalist candidate for the vice-presidency.—EDMUND RaNDOLPH was born in Virginia, Aug. 10, 1753, and died in Frederick county, Va., Sept. 12, 1813. THe became a lawyer, and, though the son of a leading royalist, entered the American revolutionary army as Washington's aide-de-camp. He served as governor of his State, and as attorney-general and secretary of state under Washington, re- signing in 1795 because of the discovery that he was in correspond- ence with the French minister.—JOHN RUTLEDGE was born at Charleston, 8.C., in 1789, and died July 23, 1800. He studied law at the Temple (London), served in the Continental Congress, 1774, was governor of his State from 1779 to 1782, and afterwards was chief justice —RoceR SHERMAN was born at Newton, Mass., April 19, 1721, and died at New Haven, Conn., July 23, 1793. He was a shoemaker, who, removing to New Milford, Comn., studied law, and served as judge of a State conrt from 1765 to 1789, as member of the house of representatives from 1789 to 1791, and as United States senator from 1791 to 1793.—Jamzs Witson was born near St Andrews, Scotland, about 1742, and died at Edenton, N.C., Aug. 28, 1798. Emigrating to the United States in 1766, he studied law, served in the Continental Congress (1775-78, 1782-83, and 1785- 87), and was one of the justices of the United States Supreme Court from 1789 until his death. Wilson's reputation as an able lawyer has been growing of late, and hardly auy member of the convention ranks higher than he for profound insight into the real nature of the govern- ment and constitution of the United States. —GEORGE WYTHE was born in Elizabeth county, Va., in 1726, and died at Richmond, Va., June 8, 1806. He was educated at William1 and Mary College, studied law, and was a member of the Virginia legislature

from 1758, and of the Continental Congress in 1775. He was chancellor of his State from 1778 until 1798.

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senting the people of the whole State, according to popula- tion, and the other giving an equal representation to the towns. They proposed that the new Congress should be made up of two houses, one representing the States in pro- portion to their population, the other giving an equal vote to each State. At a dead-lock, the convention referred the proposition to a committee, and it reported in favour of the Connecticut compromise. Connecticut had been voting in the large-State list, and the votes of her delegates could not be spared from their slender majority ; now another of the large States, North Carolina, came over to Con- necticut’s proposal, and it was adopted. Thus the first great struggle of the convention resulted in a compromise, which took shape in the peculiar feature of the constitu- tion, the senate.

105. The little States were still anxious, in every new question, to throw as much power as possible into the hands of their special representative, the senate ; and that body thus obtained its power to act as an executive council as a restraint on the president in appointments aid treaties. This was the only survival of the first alignment of parties; but new divisions arose on almost every proposal introduced. The election of the president was given

at various times to Congress and to electors chosen by the State legislatures ; and the final mode of choice, by electors chosen by the States, was settled only two weeks before the end of the convention, the office of vice-president coming in with it. The opponents and supporters of the slave trade compromised by agreeing not to prohibit it for twenty years. Another compromise included three-fifths of the slaves in enumerating popula- tion for representation. This was the provision which gave the slave-holders abnormal power as the number of slaves increased ; for a district in the "black belt" of the South, while three-fifths of its slaves were enumerated, really gave representation to its few whites only.

106. Any explanation of the system introduced by the constitu- tion must start with the historical fact that, while the national government was practically suspended, from 1776 until 1789, the only power to which political privileges had been given by the people was the States, and that the State legislatures were, when the convention met, politically omnipotent, with the exception of the few limitations imposed on them by the early State constitu- tions, which were not at all so searching or severe as those of more recent years. 'The general rule, then, is that the Federal Govern- ment has only the powers granted to it by the Federal constitution, while the State has all governmental powers not forbidden to it by the State or the Federal constitution. But the phrase defining the Federal Government's powers is no longer '' expressly granted," as in the Articles of Confederation, but merely '' granted," so that powers necessary to the execution of granted powers belong to the Federal Government, even though not directly named in the con- stitution. 'This question of the interpretation, or " construction," of the constitution is at the bottom of real national politics in the United States: the minimizing parties have sought to hold the Federal Government to a strict construction of granted powers, While their opponents have sought to widen those powers by a broad construction of them. The strict-construction parties, when they have come into power, have regularly adopted the practice of their opponents, so that construction has pretty steadily broadened ; the power to ''regulate commerce between the States" is now interpreted so as to include the power of Congress to regulate the fares and contracts of railways engaged in inter-State commerce (§ 327), which would have been deemcd preposterous in 1787.

107. Popular sovereignty, then, is the basis of the American system. But it does not, as does the English system, choose its legislative body and leave unlimitcd powers to it. It makes its “constitution” the permanent medium of its orders or prohibitions to all branches of the Federal Government and to inany branches of the State Governments: they must do what the constitution directs and leave undone what it forbids. The people, therefore, are continually laying their commands on their Governments; and they have instituted a system of Federal courts to ensure obedience to their commands. An English court must obey the Act of Parliament ; the American court is bound and sworn to obey the Constitution first, and the Act of Congress or of the State legisla- ture only so far as it is warranted by the constitution. But the American court does not deal directly with the Act in question ;

it deals with individuals who have a suit before it. One of these individuals relies on an Act of Congress or of a State legislature ; the Act thus comes before the court for examination ; and it sup- ports the Act or disregardsit as ‘‘ unconstitutional,” or in violation of the constitution, If the eourt is oneof high rank or reputation, or one to which a decision may be appcaled, as the United States Supreme Court, other courts follow the preccdent, and the law falls to the ground. The court does not come into direct conflict with the legislative body ; and, where a decision would be apt to pro- duce such a conflict, the practice has been for the court to regard the matter as a ‘‘ political question” and refuse to consider it.

108. The preamble states that “we, the people of the United The States,” establish aud ordain the constitution. vents have shown preamble. that it was the people of the whole United States that established the constitution, but the people of 1787 secm to have inclined to the belief that it was the people of each State for itself. This belief was never changed in the South; and in 1861 the people of that section believed that the ordinances of secession were merely a repeal of the enacting clause by the power which had passed it, the people of the State.

109. The original constitution was in seven articles. The first

related to the organization and powers of Congress, which consists of a senate and house of representatives, Representatives are to The be inhabitants of the State for which they are chosen, to be twenty- house of five years old at least, and are to serve two years. Each house of represen- represcntatives thus lasts for two years, and this period is usually tatives. known as ‘‘a Congress”; the fifticth Congress will expire March 4, 1889, having completed the first century of the constitution. Repre- sentatives are assigned to the States in proportion to population, and this fact forced the provision for a decennial ecnsus, the first appearance of such a provision in modern national history. The first census was taken in 1790. Apportionment of representatives from 1883 until 1893 is governed by the census of 1880; by Act of Congress the number 154,825 is the divisor into a State’s popula- tion which fixes the number of the State’s representatives, the whole number of representatives being 325, with eight delegates from the Territories, having seats and the right to debate but not to vote. The house elects its speaker and other officers, and has the power of impeachment.

110, The legislature of each State elects two senators, to serve The

for six years ; and no State can ever be deprived of its equal share senate. of representation except by its own consent. The senators are divided into three classes, the term of one class expiring every two years, Six years are therefore necessary to completely ehange the composition of the senate, and it is eonsidercd a continuous body. Senators are to be at least thirty years old, and must be inhabit- ants of the States from which they are chosen and citizens of the United States for at least nine years previous to their election. The vice-president presides over the senate, having no vote unless in case of an equal division. But the legislative provision (con- tinuing until 1887) that the death or disability of the president and vice-president devolved the office of president on the presiding officer pro tempore of the senate made that officer one of great possible importance, and the vice-president regularly retired just before the end of a session, so that a pro tempore officer might be selected (§ 117).

111. All officers of the United States are open to impeachment Impeach- by the house of representatives, the impeachment to be tried by ment. the

senate, and the penalty to be no more than removal and dis- qualification to serve further under the United States. When the president is tried, the chief justice of the Supreme Court presides,

112. The members of both houses are privileged from arrest and Both from being questioned elsewhcre for words spoken in debate. Each houses. house passes on the election of its own members; but an Act of Congress may control the Acts of the State legislature as to time, place, and manner of elections, except as to the place of choosing senators, in which the legislature remains supreme. Congress has exercised the power by passing a general election lay. The two houses cannot adjourn to another place, or for more than three days, nnless by common consent. Their members are paid by the United States, and must not be office-holders or receive any office ereated or increased in pay during their term of service in Con-

Tess. : 113. When a bill passes both houses it goes to the president, Veto If he signs it becomes law. If he holds it without signing for power, ten days (Sundays excepted) it becomes law, unless the final adjournment of Congress comes in the ten days. All bills passed in the last ten days of a Congress are therefore at the mercy of the president: he can prevent them from becoming laws by simply retaining them. If the president decides to veto a bill he returns it, with a statement of his objections, to the house in which it originated. It can then only become law by the vote of two-thirds of both houses,

114. The powers of Congress are fully stated. “lay and eollect taxes, duties, pay the debts and provide for welfare of the United States,”

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the original, but they are included in construction by all respect- able authorities, as essential to its meaning; any other construc- tion would give Congress absolute power over whatever it thought to be for “the common defence or general welfare.” Duties, &c., are to be uniform throughout the United States. Other powers are—to borrow money; to regulate foreign and

domestic commerce; to make rules for naturalization, and bankruptcy laws; to coin money, regulate the value of forcign coins, and fix the standard of weights and measures; to punish the counterfeiting of Federal securities and current coin; to establish post-offices and post-roais ; to establish patent and copyright systems; to establish courts inferior to the supreme court; to punish offences on the high scas or against international law; to declare war, graut letters of marque and reprisal, and make rules for captures; to raise and support armies, no appropriation to be for more than two years; to provide and maintain a navy; to make articles of war; to use the militia of the States in executing Federal laws, suppressing insurrections, and repelling invasions; to provide for organizing, arming, and disciplining this militia, leaving the States to appoint the officers and carry out the system ; to establish a national capital or Federal district (the District of Columbia, containing the city of Washington), and to exercise exclusive powers of legislation over it, and over sites for forts, dockyards, &c., bought by permission of the States; and, finally, ‘“‘to make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this constitution in the Government of the United States, or in any department or office thereof.” This last power has been the subject of most debate. It was urged that, unless an Act of Congress was strictly “ necessary ” for the execution of one of the granted powers, it was invalid. The Supreme Court has held that the Act need not be “ absolutely necessary,” or even ‘‘ very necessary,”—that it is enough if it is “necessary.” As the decision of the necessity is with the legis- lative body, the word opens a wide sweep for construction; but it has always furnished a barricade which the opponents of a bill have often found very strong. Powers 115. The real sovereignty which made the constitution shows forbidden itself in a double series of prohibitions—on the Federal Govern- tothe imentand on the States. The Federal Government shall not sus- Federal pend the privilege of tlie writ of habeas corpus except in case of Govern- rebellion or invasion, when the public safety requires it. Since ment; the Civil War the Supreme Court has decided that the writ itself can never be suspended while the courts are open, that the Federal Government may suspend the privilege of the writ as to classes of persons directly interested in the war, but that the writ,is still to issue and the court to decide whether the applicant comes within the excepted classes or not. Congress must not pass any bill of attainder or ex post facto law, tax exports, give

commercial prefer- ence to the ports of one State over those of another, lay direct taxes except in proportion to census population, or grant any title of nobility. Money is to be taken from the treasury only in con- sequence of appropriations made by law. And no person in the service of the United States may accept any gift or title from a foreign power without consent of Congress.

116. The States are absolutely forbidden to make treaties of any kind, to grant lettcrs of marque and reprisal, to coin money, to emit bills of credit, to make anything but silver a legal tender, to grant any title of nobility, to pass any bill of attainder, ex post Jacto law, or law impairing the obligation of contracts. It follows from the last clause that States cannot pass bankruptcy laws. The States are forbidden, except by consent of Congress, to lay any duties on imports or exports, except inspection charges, to be paid into the Federal treasury; to lay any tonnage duties; to keep troops (a word which does not cover militia) or ships in peace; to make any agreement with another State or with a foreign power; or to engage in war unless actually invaded.

117. The president is to be a native citizen, at least thirty-five years old, and at least fourteen years a resident within the United States. He is paid by the United States; and his salary is not to be increased or diminished by Congress during his term: the Act inust apply to the successors of the president who signs the Act. He is sworn to execute his office faithfully, and to “preserve, pro- tect, and defend the constitution of the United States.” In case of his death, resignation, or inability (by impeachment or otherwise) the vice-president succeeds him; and, in case of the inability of both, the members of the cabinet succeed in a prescribed order, according to the Presidential Succession Act of 1886. The president has the veto power already described, sends messages to Congress on the state of the Union or on special subjects, convenes either house or both on extraordinary occasions, reeeives foreign envoys, commissions officers of the United States, and oversees the execu- tion of the laws passed by Congress. He makes treaties; but uo treaty is valid unless passed by the senate by a two-thirds vote of those present. He appoints ministers and consuls, judges, and all other officers whose appointment Congress has not vested in other

officers; but presidential appointments must be confirmed by the senate, though the president may make temporary appointments

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during the recess of the senate, to hold until the end of their next session. He is commander-in-clief of the army and navy, and has power of pardon or reprieve for offences against Federal laws, except in case of impeachment. And he may call upon heads of departments for an opinion in writing on any subject relating to his departinent.

118, The last clause has evolved the ‘‘cabinct,” a term not The

known in the constitution. When Congress has by law organized eabinet, a department, its leading officer is called its secretary. here are now (1887) seven departinents,—those of state, of the treasury, of war, of the navy, of the post-office, of the interior, aud of justice; and departments of agriculture and of labour have been proposed, The secretaries are selected by the president and are confirmed by the senate, but are not responsible to any one but the president. Nor is he bound by their individual opinions, or even by an unanimous opinion from one of their periodical meetings. They are his advisers ouly.

119. The people have no direct voice in the choice of president The elec.

aud vice-president : they choose electors, each State having as toral many electors as it has senators and representatives together ; system, and the electors choose the president and vice-president, meeting at their State capitals for that purpose, and sending separate certificates of their choice of president and of vice-president to the presiding officer of the senate at Washington. ‘Ihe electors are to be chosen in such manner as the legislature of each State shall direct ; and this plenary power of the legislatures was the source of the unhappy disputed election of 1876-77. By Acts of Congress, the electors are to be chosen on the Tuesday after the first Mon- day of

November; they meet in thcir States and vote on the first Wednesday of December ; and Congress mects on the second Wednesday of February to witness the counting of the electoral votes. The electors are legally State officers ; and the action of their States in regard to them was evidently intended to be final. Until 1887 Congress refused to provide for necessary proof of the State's action, and claimed the power to provide from time to time for emergencies. Such emergencies were constantly occurring; and Congress, which was ineant to be merely a witness of the count by the presiding officer of the senate, had seized, before 1876, a general supervisory power over the electors and their votes. This illegitimate function of Congress broke down in 1876-77, for several Southern States sent different sets of certificates ; the two houses of Congress were controlled by opposite parties, and could agree on nothing ; and an extra-constitutional machine, the "electoral commission,' was improvised to tide over the difficulty. Now provision is made by the Electoral Count Act of 1887 for the State's certification of its votes ; and the certificate which comes in legal form is not to be rejected but by a vote of both houses, If there is no majority of electoral votes for any person for vice- president, the senate, by a majority of its members, chooses from the two names highest on the list. If there is no majority for president, the house of representatives chooses one from the three names highest on the list, each State having one vote.

120. The electors were meant to exercise a perfect freedom of Powers choice, and there are instances in early years of electors voting for of the personal friends of the opposite party. It was originally provided electors. that each elector was to name two persons, without specifying which was to be president or vice-president. When the votes were counted, the highest name on the list, if it had a majority of all the votes, obtained the presidency, and the next highest became vice-president. It has been said that the convention cut out the office of president according to the measure of George Washington, and there was no difficulty while he served : each elector cast one of his votcs for Washington, and he was chosen unanimously; the struggle was for the second office. When he went out of office im 1796 the parties began to name candidates in advance for the two offices; the electors began to feel bound to vote for their party candidates; and the individuality of the electors disappeared at ouce. In the election of

1800 the electors of the successful party voted together like a well-drilled army, and the result was that the two candidates of the successful party had an equal vote. The defeated party controlled the house of representatives, and their efforts to choose Burr president instead of Jefferson exasperated the nil Democrats and sealed the fate of the old system. An amendment The : to the constitution was adopted in 1804, changing the method of amend- the electors in voting, so that each should vote separately for the ment, two offices and thus prevent any tie vote from this cause. ;

121. The constitution provides for one Supreme Court, having ns , original jurisdiction in cases affecting foreign ministers and con- Fe Al suls, and those to which a State shall be a party, and appellate coum. jurisdiction from such subordinate courts as Congress should from time to time establish. Al] judges were to hold office during good behaviour (§ 237), and their salarics were not to be diminished during their continuance in office. Criminal trials were to be by jury, except in impeachments, and were to be held within the State in which the offence had been committed, or in places assigned by law for the trial of offences committed outside the jurisdiction of any State. The whole jurisdiction of Federal courts, covermg both

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the original and the appellate jurisdiction of the Supreme Court, was clearly stated. Iederal courts were to deal with all cases in law or equity arising under the constitution or the laws or treaties made under it; with all cases affecting public ministers and consnis, or admiralty or maritime law; with suits by or against the United States; and with suits by one State against another, by a State against citizens of another State, by a citizen of one State against a citizen of another, by a citizen of a State against citizens of his own State when the question was one of a grant of land from different States, by a State or its citizens against foreigners, or by a foreigner against an American. As the section first stood, it was open to the construction of giving the power to the citizen of one State to sue another State, and the Supreme Court so construed it in 1793-94. The States at once took the alarm ; and the 11th amendment, forbidding suit against a State under this section except by another State, was ratified in 1798.

122. As soon as the new Government was organized in 1789, a Judiciary Act was passed, organizing the whole system of inferior Federal courts. Subsequent development has not changed the essential nature of this first Act. The Supreme Court now consists

1787.]

of a chief justice and eight associate justices; there are nine circuit

courts, each consisting of a Supreme Court justice and a cireuit judge ; and fifty-six district courts, each with a district judge. Kach circuit comprises several States; and the Supreme Court justices, in addition to their circuit work, meet in bank annually at Washington. The districts cover each a State ora part of a State. Appeal lies from the district to the circuit court when the matter involved is of a value greater than $500, and from the circuit to the Supreme Court when $5000 or more is involved. There are also Territorial courts; but these are under the absolute power of Congress over the Territories, and are not covered by the constitutional provisions as to courts. Consular courts, held abroad, fall under the treaty power.

123. The Constitution's leading difference from the Confederation is that it gives the national Government power over individuals, The Federal courts are the principal agent in securing this essential power ; without them, the constitution might easily have been as dismal a failure as the Confederation. It has also been a most important agent in securing to the national Government its sup- remacy over the States, From this point of view the most im- portant provision of the constitution is the grant of jurisdiction to Federal courts in cases involving the construction of the constitu- tion or of laws or treaties made under it. The 25th section'of the Judiciary Act permitted any Supreme Court justice to grant a writ of error to a State court in a case in a Federal law or treaty had been denied, or in which a State law objected to as in violation of the Federal constitution had been maintained. In such cases, the defeated party had the right to carry the ‘‘ Federal question" to the Federal courts. It was not until 1816 that the Federal courts undertook to exercise this power; it raised a storm of opposition, but it was maintained, and has made the constitution what it professed to be—* the supreme law of the land." As a subsidiary feature in the judiciary system, treason was restricted to the act of levying war against the United States, or of adhering to their enemies, giving them aid and comfort ; the evidence of it to confession in open court, or to the testimony of two witnesses to an overt act ; and any forfeiture in the punishment to a life effect only. The States, however, have always asserted their power to punish for treason against them individually. It has never been fully maintained in practice; but the theory had its effect in the secession period.

124. The States were bound to give credit to the public records of other States, to accord citizenship to the citizens of other States, to return criminals fleeing from other States, aud to return "persons held to service or labour" under the laws of another State. This last was the "fugitive slave" provision of the constitution, which becanie so important after 1850 (§ 228).

125. The Federal Government was to guarantee a republican form of government to each of the States, and to protect each of them against invasion, or, on application of the legislature or governor, against domestic violence. The ‘‘ guarantee clause "' teally substituted State rights under the guarantee of the Federal Government for the notion of State sovereignty

under the guaran- tee of the State itself. A still Stronger case of this was in the 5th article of the constitution, stating the manner of amendment.

he convention of 1787, it must be borne in mind, was working under a system of government which provided expressly that it Was not to be altered in the least unless by consent of all the States. The constitution provided that it was to go into force, so far as the ratifying States were concerned, as soon as nine of the thirteen States should ratify it, and that any future ainendment, When passed by two-thirds of both houses and ratified by the legislatures or conventions of three-fourths of the States, should become a part of the constitution. By application of the legis- latures of two-thirds of the States, a new convention, like that Which framed the constitution, might take the place of the two houses of Congress in proposing amendments. A system under

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which a State submits its whole future destiny to an unliniited power of decision in three-fourths of its associate States can hardly be called one of State sovereignty.

126. The debts of the Confederation, and its engagements, were Supreme made binding on the new Government; the constitution, and law of laws and treaties to be made under it, were declared to be “the the land. supreme law of the land”; judges of State courts were to be bound thereby, ‘‘anything in the constitution or laws of any State to the contrary notwithstanding” ; all the legislative, execu- tive, and judicial officers of the United States and of cach and every State were to be bound by oath or affirmation to support the constitution of the United States; but religious tests were for- bidden.

127. Ten amendments were adopted so soon after the ratification The first

of the constitution that they may fairly be considered a part of ten the original instrument. They were due toa general desire that amend- a ‘bill of rights” of some kind should be added to it; but they ments, did not alter any of the articles of the constitution. They forbade any establishment of

religion by Congress, or any abridgment of freedom of worship, of the press, or of speech, or of the popular right to assemble and petition the Government for redress of grievances; the billeting of soldiers; unreasonable searches or seizures, or general warrants; trials for infamous crimes except through a grand jury's action; subjecting a person for the same offence to be twice put in jeopardy of life or limb ; compelling him to witness against himself in criminal cases ; the taking of life, liberty, or property without due process of law or without com- pensation for property; and the demand of excessive bail, or the imposition of excessive fines or of cruel or unusual punishments, They asserted the right of the people to keep and bear arms, to a jury trial from the vicinage in criminal cases or in cases involy- ing more than $20, to a copy of the indictment, to the testimony against the prisoner, to compulsory process on his behalf, and to counsel for him, And they stated expressly the general principle already given, that the Federal Government is restricted to granted powers, while those not mentioned are reserved "to the States respectively or to the people."

128. The omission of the word " thereof "

mentioned seems significant. The system of the United States reignty, is almost the only national system, in active and successful opera- tion, as to which the exact location of the sovereignty is still a mooted question. The contention of the Cathoun school—that the separate States were sovereign before and after the adoption of the constitution, that each State adopted it by its own power, main- tained it by its own power, aud could put an end to it by its own power, that the Union was purely voluntary, and that the whole people, or the people of all the other States, had no right to inaintain or enforce the Union against any State—has been ended by the Civil War. But that did not decide the location of the sovereignty. The prevalent opinion is still that first formulated by Madison :—that the States were sovereign before 1789; that they then gave up a part of their sovereignty to the Federal Government ; that the Union and the constitution were the work of the States, not of the whole people ; and that reserved powers are reserved to the people of the States, not to the whole people. The use of this bald phrase "reserved to the people," not to the people of the several States, in the 10th amendment, secms to argue an underlying consciousness, even in 1789, that the whole people of the United States was already a political power quite

distinct from the States, or the people of the States; and the tendency of later opinion is in thisdirection. It must be admitted that the whole people has never acted in asingle capacity ; but the restriction to State lines seems to be a self-imposed limitation by the national people, which it might remove, as in 1789, if an emergency should make it necessary. The Civil War amend- ments are considered below (§ 305-309).

129. By whatever sovercignty the constitution was framed and Details imposed, it was meant only as a scheme in outline, to be filled up of the afterwards, and from time to time, by legislation. The idea is system. most plainly carried out in the Federal justiciary: the constitution only directs that there shall be a Supreme Court, and marks out the general jurisdiction of all the courts, leaving Congress, under the restriction of the president's veto power, to build up the system of courts which shall best carry out the design of the constitution.

But the same idea is visible in every department, and it has carried the constitution safely through a century which has radi- cally altered every other civilized government. It has combined elasticity with the limitations necessary to make democratic government successful over a vast territory, having infinitely diverse interests, and needing, more than almost anything else, positive opportunities for sober second thought by the people. A sudden revolution of popular thought or fecling is enongh to change the house of representatives from top to bottom ; it must continue for several years before it can make a radical change in the senate, and for ycars longer before it can carry this change through the judiciary, which holds for life ; and all these changes must take place before the full effects upon the laws or constitution

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are aecomplished. But the minor ehanges which are essential to an accommodation with the growth and development of a great nation are reached in the meantime easily and naturally in the course of legislation, to which the skeleton outline of the con- stitution lends itself kindly. The members of the convention of 1787 showed their wisdom most plainly in not trying to do too much ; if they had done more they would have done far less.

130. The convention adjourned 17th September Si, having adopted the constitution. Its last step was a resolution that the constitution be sent to the Congress of the Confederation, with the recommendation that it be submitted to conventions elected by the people of each State for ratification or rejection; that, if nine States should ratify it, Congress should appoint days for the popular election of electors, for the choice of president and vice-president by the electors, and for the meeting of senators and representatives to be chosen under the new plan of government; and that then the new Congress and president should " without delay, proceed to execute this constitution." Congress, having received the report of the convention, resolved that it be sent to the several legisla- tures, to be submitted to conventions ; and this was all the approval the constitution ever received from Congress. Both Congress and the convention were careful not to open the dangerous question, How was a government which was not to be changed but by the legislatures of all the States to be entirely supplanted by a different system through the approval of conventions in three-fourths of them? They left such questions to be opened, if at all, in the less public forum of the legislatures.

131. Before the end of the year Delaware, Pennsy]- vania, and New Jersey had ratified ; and Georgia, Con- necticut, and Massachusetts followed during the first two months of 1788. Thus far the only strong opposition had been in Massachusetts, a "large State." In it the struggle began between Federalists and Antifederalists, between the friends and the opponents of the constitution, with its introduction of a strong Federal power; and it raged in the conventions, legislatures, newspapers, and pamphlets. The best

of the last was 7’he Federalist, written mainly by Hamilton, with the assistance of Madi- son and Jay, explaining the new constitution and defend- ing it. As it was written before the constitution went into force, it speaks much for the ability of its writers that it has passed into a standard text-book of American constitutional law.

132. The seventh and eighth States—Maryland and South Carolina—ratified in April and May 1788; and, while the conventions of Virginia and New York were still wrangling over the great question, the ninth State, New Hampshire, ratified, and the constitution passed out of theory into fact. This left the other States in an unpleasant position. The Antifederalists of the Virginia and New York conventions offered conditional ratifications of all sorts; but the Federalists stubbornly refused to con- sider them, and at last, by very slender majorities, these two States ratified. North Carolina refused to ratify the constitution, and Rhode Island refused even to consider it (§ 145). Congress named the first Wednesday of January 1789 as the day for the choice of electors, the first Wednesday in February for the choice of president and vice-president, and the first Wednesday in March for the inauguration of the new Government at New York city. The last date fell on the 4th of March, which has been the limit of each president’s term since that time.

133. When the votes of the electors were counted before Congress, it was found that Washington had been unan- imously elected president, and that John Adams, stand- ing next on the list, was vice-president. Long before the inauguration the Congress of the Confederation had expired of mere inanition ; its attendance simply ran down

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until (October 21, 1788) its record ceased, and the United States got on without any national Government for nearly six months. The struggle for nationality had been suc- cessful, and the old order faded out of existence.

134. The first census (1790) followed so closely upon the inauguration of the constitution that the country may fairly be said to have had a population of nearly four millions in 1789. Something over half a million of these

were slaves, of African birth or blood. Slavery of this Slavery sort had taken root in all the colonies, its original estab- in the

lishment being everywhere by custom, not by law. the custom had been sufficiently established statutes came in to regulate a relation already existing. Indented servants came only for a term of years, and then were free. Slaves were not voluntary immigrants: they had come as chattels, not as persons, and had no standing in law, and the law fastened their condition on their children. But it is not true, as the Dred Scott decision held long afterwards (§ 249), that the belief that slaves were chattels simply, things not persons, held good at the time of the adoption of the constitution. Times had changed some- what. The peculiar language of the constitution itself, describing slaves as “persons held to service or labour, under the laws of any State,” puts the general feeling exactly: they were persons from whom the laws of some of the States withheld personal rights for the time. In accordance with this feeling most of the Northern States

were on the high road towards abolition of slavery. Ver- Abolition mont had never allowed it. In Massachusetts it wasmthe

swept out by a summary court decision that it was irre- concilable with the new State constitution. Other States soon began systems of gradual abolition, which finally extinguished slavery north of Virginia, but so gradually that there were still 18 apprentices for life in New Jersey in 1860, the last remnants of the former slave system. In the new States north of the Ohio slavery was prohib- ited by the Ordinance of 1787 (§ 96), and the prohibition was maintained in spite of many attempts to get rid of it and introduce slavery.

135. The sentiment of thinking men in the South was exactly the same, or in some cases more bitter from their personal entanglement with the system. Jefferson’s lan- guage as to slavery is irreconcilable with the chattel notion ; no abolitionist agitator ever used warmer language than he as to the evils of slavery; and the expression, “our brethren,” used by him of the slaves, is conclusive. Washington, Mason, and other Southern men were as warm against slavery as Jefferson, and societies for the abolition of slavery were

very common in the South. No thinking man could face with equanimity the future pro- blem of holding a separate race of millions in slavery. Like most slave laws, the laws of the Southern States were harsh: rights were almost absolutely withheld from the slave, and punishments of the severest kind were legal ; but the execution of the system was milder than its legal possibilities might lead one to imagine. The country was as yet so completely agricultural, and agriculture felt so few of the effects of large production and foreign com- merce, that Southern slavery kept all the patriarchal features possible to such a system.

136. Indeed, the whole country was almost exclusively Agricul: agricultural, and, in spite of every effort to ENCOULALE vorce, manufactures by State bounties and colonial protection, anqmanv- they formed the meagrest element in the national produc: factures.

tion. Connecticut, which now teems with manufactures, was just beginning the production of tinware and clocks ; Rhode Island and Massachusetts were just beginning to work in cotton from models of jennies and Arkwright machinery surreptitiously obtained from England after several failures and in evasion of penal Acts of Parlia-

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ment ; and other States, beyond local manufactures of paper, glass, and iron, were almost entirely agricultural, or were engaged in industries directly dependent on agri- culture. Commerce was dependent on agriculture for exports; and manufactured imports were enough to drown out every other form of industry.

137. There were but four cities in the United States

having a population of more than 10,000,—Philadelphia

(42,000), New York (33,000), Boston (18,000), and Balti- more (13,000). The population of the city of New York and its dependencies is now more than half as large as that of the whole United States in 1789; the State of New York or of Pennsylvania has now more inhabitants than the United States in 1790; and the new States of Ohio and Illinois, which had hardly any white inhabitants in 1789, do not fall far behind. Imports have swollen from $23,000,000 to $650,000,000, exports from $20,000,000 to $700,000,000, since 1790. The revenues of the new Government in 1790 were $4,000,000; they have now grown to $300,000,000 or more. The expenditures of the Government, excluding interest on the public debt, were but $1,000,000 in 1790, where now they are $200,000,000 or upwards per annum. It is not easy for the modern American to realize the poverty and weakness of his country at the inauguration of the new system of government, however he may realize the simplicity of the daily life of its people. Even the few large cities were but larger col-

inodels ; history was annalistic, if anything; and the drama hardly existed. In two points the Americans were strong, and had done good work. Such men as Jonathan Edwards had excelled in various departments of theology, and American preaching had reached a high degree of quality and influence; and, in the line of politics, the American state-papers rank among the very best of their kind. Having a very clear perception of their political purposes, and having been restricted in study and reading to the great masters of pure and vigorous English, and particularly to the English translators of the Bible, the American leaders came to their work with an English style which could hardly have been improved. The writings of Franklin, Washington, the Adamses, Hamilton, J efferson, Madison, Jay, and others show the secret of their strength in every page. Much the same reasons, with the influ- ences of democracy, brought oratory, as represented by Patrick Henry, Fisher Ames, John Randolph, and others, to a point not very far below the mark afterwards reached by Daniel Webster. The effect of these facts on the sub- sequent development of the country is not often estimated at its full value. All through an immigration of every language

and dialect under heaven the English language has been protected in its supremacy by the necessity of going back to the “fathers of the republic” for the first, and often the complete, statement of principles in every great political struggle, social problem, or lawsuit.

140. The cession of the “north-west territory” by Limits of Virginia and New York had been followed up by similar settle- cessions by Massachusetts (1785), Connecticut (1786), and ™e2t

lections of the wooden houses, with few comforts, which composed the villages ; the only advantage of their in-

habitants over those of the villages was in the closer proximity to their neighbours; and but a little over 3 per cent. of the population had this advantage, against about 25 per cent. in 1880.

138. Outside the cities communication was slow. One stage a week was enough for the connexion between the great cities; and communication elsewhere depended on private conveyance. The great rivers by which the con- tinent is penetrated in every direction were with difficulty ascended by sailing vessels or boats ; and the real measure of communication was thus the daily speed of a man or a horse on roads bad beyond present conception. The western settlements were just beginning to make the question more serious. Enterprising land companies were the moving force which had impelled the passage of the Ordinance of 1787 ; and the first column of their settlers was pouring into Ohio and forming connexion with their predecessors in Kentucky and Tennessee. Marietta and Cincinnati (at first a Government fort, and named after the society of the Cincinnati) had been founded. But the intending settlers were obliged to make the journey down the Ohio river from Pittsburgh in bullet-proof flat-boats, for protection against the Indians, and the return trip depended on the use of oars. For more than twenty years these flat-boats were the chief means of river commerce in the west ; and, in the longer trips, as to New Orleans, the boats were generally broken up at the end and sold for lumber, the crew making the trip home on foot or on horseback. John Fitch and others were already experimenting on what was soon to be the steamboat (§ 167); but the statesman of 1789, looking at the task of keeping under one Govern- ment a country of such distances, with such difficulties of communication, may be

pardoned for having felt anxiety as to the future. To almost all thinking men of the time the constitution was an experiment, and the unity of the new nation a subject for very serious doubt.

139. The comparative isolation of the people every- where, the lack of books, the poverty of the schools and hewspapers, were all influences which worked strongly against any pronounced literary development, Poems, essays, and paintings were feeble imitations of European

South Carolina (1787). North Carolina did not cede Tennessee until late in 1789, nor Georgia her western claims until 1802. Settlement in all these regions was hardly advanced beyond what it had been at the outbreak of the revolution. The centres of western settlement, in Tennessee and Kentucky, had merely become more firmly established, and a new one, in Ohio, had just been begun. The whole western limits of settlement of the old thirteen States had moved much nearer their present boundaries – and the acquisition of the western title, with the liberal policy of organization and government which had been begun, was to have its first clear effects during the first decade of the new Government. Almost the only obstacle to its earlier success had been the doubts as to the attitude which the Spanish authorities, at New Orleans and Madrid,

would take towards the new settlements. They had already The Mis- asserted a claim that the Mississippi was an exclusively sissippi Spanish stream from its mouth up to the Yazoo, and that ™Y*-

no American boat should be allowed to sail on it. To the western settler the Alleghanies and bad roads were enough to cut him off from any other way to a market than down the Mississippi ; and it was not easy to restrain him from a forcible defiance of the Spanish claim. The Northern States were willing to allow the Spanish claim in return for a commercial treaty; the Southern States and the western settlers protested angrily; and once more the spectre of dissolution appeared, not to be laid again until the new Government had made a treaty with Spain in 1795, securing common navigation of the Mississippi.

141. All contemporary authorities agree that a marked Social change had come over the people since 1775, and few of condi-

them seem to think the change one for the better. Many attribute it to the looseness of manners and morals intro- duced by the French and British soldiers; others to the general effects of war ; a few, Tories all, to the demoraliz- ing effects of rebellion. The successful establishment of nationality would be enough to explain most of it ; and if we remember that the new nation had secured its title to a vast western territory, of unknown but rich capaci- ties, which it was now moving to reduce to possession by

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emigration, it would seem far more strange if the social conditions had not been somewhat disturbed.

VI. THE DEVELOPMENT OF DEMOCRACY: 1789-1801.

142. All the tendencies of political institutions in the United States had certainly been towards democracy ; but it cannot be‘ said that the leading men were hearty or unanimous in their agreement with this tendency. Not a few of them were pronounced republicans even before 1775, but the mass of them had no great objections to a monarchical form of government until the war-spirit had converted them. The Declaration of Independence had been directed rather against the king than against a king. Even after popular sovereignty had pronounced against a king, class spirit was for some time a fair substitute for aristocracy. The obstacles to communication, which com- pelled the mass of the people to live a very isolated exist- ence, gave abnormal prominence and influence to those who, by ability or wealth, could overcome these obstacles ; and common feeling made these a class, with many symptoms of strong class feelings. As often happens, democracy at least thought of a Cesar when it appre- hended class control. The discontented officers of the revolutionary armies offered to make Washington king, though he put the offer by without even considering it. The suggestion of a return to monarchy in some form, as a possible road out of the confusion of the Confederation, occurs in the correspondence of some of the leading men. And while the convention of 1787 was holding its secret sessions a rumour went out that it had decided to offer a crown to an

English prince. in the 143. The State constitutions were democratic, except States; for property or other restrictions on the right of suffrage,

or provisions carefully designed to keep the control of at

least one house of the State legislature ‘‘in the hands of inthe property.” The Federal constitution was so drawn that it constitu- would have lent itself kindly either to class control or to tion. democracy. The electoral system of choosing the president and vice-president was altogether anti-democratic, though democracy has conquered it: not an elector, since 1796, has disobeyed the purely moral claim of his party to con- trol his choice ($§ 119, 120). Since the senate was to be chosen by the State legislatures, ‘‘ property,” if it could retain its influence in those bodies, could control at least one house of Congress. The question whether the con- stitution was to have a democratic or an anti-democratic interpretation was to be settled in the next twelve years.

144. The States were a strong factor in the final settlement, from the fact that the constitution had left to them the control of the elective franchise : they were to make its conditions what each of them saw fit. Religious tests for the right of suffrage had been quite common in the colonies; property tests were almost uni- versal, The former disappeared shortly after the revolution ; the latter survived in some of the States far into the constitutional

Infiu- period. But the desire to attract immigration was always a strong ence of impelling force to induce States, especially frontier States, to make immigra- the acquisition of full citizenship and political rights as easy and

Demo- cracy in the United States ;

tion. rapid as possible. This force was not so strong at first as it was after the great stream of immigration began about 1848 (§ 286), but it was enough to tend constantly to the development of democracy ; and it could not but react on the national develop- ment. In later times, when State laws allow the immigrant to vote even before the period assigned by Federal laws allows him to become a naturalized citizen, there have been demands

for the modification of the ultra State democracy ; but no such danger was apprehended in the first decade. |

Organi: 145. The Antifederalists had been a political party, but

zation a party with but one principle. The absolute failure of

Oh that principle deprived the party of all cohesion ; and the

Govern. Federalists controlled the first two Congresses almost en-

ment, tirely. Their pronounced ability was shown in their organ-

izing measures, which stilt govern the American system very largely. The departments of state, of the treasury, of war,

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of justice, and of the post-office were rapidly and success- fully organized ; Acts were passed for the regulation of sea- men, commerce, tonnage duties, lighthouses, intercourse with the Indians, Territories, and the militia ; a national capital was selected ; a national bank was chartered ; the national debt was funded, and the State debts were assumed as part of it. The first four years of the new system showed that the States had now to deal with a very different power from the impotent Congress of the Confederation. The new power was even able to exert a pressure upon the two States which had not yet ratified the constitution, though, in accordance with the universal American prejudice, the pressure was made as gentle as possible. As a first step, the higher duties imposed on imports from foreign countries were expressly directed to apply to imports from North Carolina and Rhode Island. North Carolina having called a second convention, her case was left to the course of nature ; and the second convention ratified the consti-

tution (November 21, 1789). The Rhode Island legis- | lature wrote to ask that their State might not be con- sidered altogether foreigners, made their duties agree with . those of the new Government, and reserved the proceeds | for “continental” purposes. Still no further steps were | taken. A bill was therefore introduced, directing the president to suspend commercial

intercourse with Rhode | Island, and to demand from her her share of the con- | tinental debt. This was passed by the senate, and waited ‘ but two steps further to become law. Unofficial news- f\

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paper proposals to divide up the little State between her two nearest neighbours were stopped by her ratification | (May 29, 1790). All the ‘“‘old thirteen” were thus Compl — united under the constitution ; and yet, so strong is the tion of American prejudice for the autonomy of the States that a ysien. | these last two were allowed to enter in the full conviction

that they did so in the exercise of sovereign freedom of choice. Their entrance, however, was no more involuntary

than that of others. If there had been real freedom of choice, nine States would never have ratified : the votes of Pennsylvania, Massachusetts, New Hampshire, Virginia,

and New York were only secured by the pressure of powerful minorities in their own States, backed by the almost unanimous votes of the others.

146. Protection was begun in the first Tariff Act, whose Hamil- object, said its preamble, was the protection of domestic toa manufactures. The duties, however, ranged only from a 74 to 10 per cent., averaging about 84 per cent. The — system, too, had rather a political than an economic basis. Until 1789 the States had controlled the imposition of duties. The separate State feeling was a factor so strong that secession was a possibility which every statesman had to take into account. Hamilton’s object, in introducing the system, seems to have been to create a class of manu- facturers, running through all the States, but dependent for prosperity on the new Federal Government and its tariff. ‘This would be a force which would make strongly for national government, and against any attempt ab secession, or against the tendency to revert in practice to the old system of control by State legislatures, even though it based the national idea on a conscious tendency towards the development of classes. The same feeling seems to have been at the bottom of his establishment of a national bank, his

assumption of State debts, and most of the general scheme which his influence forced upon the Federal party. ,

147. In forming his cabinet, Washington had paid ae attention to the opposing elements which had united fem? the temporary purpose of ratifying the constitution. The national element was represented by Hamilton, secretary of the treasury, and Knox (p. 789), secretary of war; the par- ticularist element (using the term to indicate support of

Fu it was not familiar, nor of assured permanency.

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1789-1798.] VNITEYN

the States, not of a State) by Jefferson, secretary of state, and Edmund Randolph, attorney-general. It was not long before the drift of opinion in cabinet meetings showed an irreconcilable divergence, on almost every subject, between these two elements, and Hamilton and Jefferson became the representatives of the two opposite tendencies which have together made up the sum of public American history. At the end of 1792 matters were in train for the general recognition of the existence of two parties, whose struggles were to decide the course of the constitution's develop- ment. 'The occasion came in the opening of the following year, when the new nation was first brought into contact with the French Revolution.

148. The controlling tendency of Jeffcrson and his school was to the maintenance of individual rights at the highest possible point, as the Hamilton school was always ready to assert the national power to restrict individual rights for the general good. Other points of difference are rather symptomatic than essential. The Jefferson school supported the States, not out of love for the States, but out of a belief that the States were the best bulwarks for individual rights. When the French Revolution began its usual course in America by agitation for the " rights of man," it met a sympathetic audience in the Jefferson party and a cold and unsympathetic hearing from the Hamilton school of Federalists. The latter were far more interested in securing the full recognition of the power and rights of the nation than in securing the individual against imaginary dangers, as they thought them.

For ten years, therefore, the surface marks of distinction between the two parties were to be connected with the course of events in Europe ; but the essence of distinction was not in the surface marks.

149. The new Government was not yet four years old ; The only national Governments of which Americans had had previous experience were the British Government and the Confedera- tion: in the former they had had no share, and the latter had had no power. The only places in which they had had long-continued, full, and familiar experience of self- government were their State Governments: these were the only governmental forms which were then distinctly associated in their minds with the general notion of republican government. The governing principle of the Hamilton school, that the construction or interpretation of the terms of the constitution was to be such as to broaden the powers of the Federal Government, necessarily involved a corresponding trenching on the powers of the States ($106). It was natural, then, that the Jefferson school should look on every feature of the Hamilton programme as “anti-republican,” meaning, probably, at first no more than opposed to the State system, as hitherto known, though, with the growth of political bitterness, the term Soon came to imply something of monarchical and, more particularly, of English tendencies. The disposition of the Jefferson school to claim for themselves a certain peculiar title to the position of “ republicans” soon developed into the appearance of the first Republican party, about 1793.

150. Many of the Federalists were shrewd and active business men, who naturally took prompt advantage of the opportunities which the new system offered. The Republicans therefore believed and asserted that the whole Hamilton programme was dictated by selfish or class interest ; and they added this to the accusation of mon- archical tendencies. These charges, with the fundamental differences of mental constitution, exasperated by the passion which differences as to thie French Revolution Seemed to carry with them everywhere, made the political history of this decade a very unpleasant record. The Provision for establishing the national capital on the

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Potomac (1790) was declared to have been carried by a The corrupt bargain ; and accusations of corruption were re- national newed at every

opportunity. In 1793 a French agent, piel: Genet, appeared to claim the assistance of the United neal States for the French republic. Washington decided to ; issuc a proclamation of neutrality, the first act of the kind in American history. It was the first indication, also, of the policy which has made the course of every president, with the exception of Polk (§ 223), a determined leaning to peace, even when the other branches of the Government have been intent on war. The proclamation of 1793 brought about the first distinctly party feeling ; and The it was intensified by Washington's charge that popular Whisky opposition in western Pennsylvania (1794) to the new eal excise law had been fomented by the extreme French °° party. Their name, Deniocrat, was applied by the Federalists to the whole Republican party as a term of contempt, but it was not accepted by the party for some twenty years; then the compound title '" Democratic- Republican" became, as it still is, the official title of the party. There was no party opposition, however, to the Admis- re-election of Washington in 1792, or to the admission of of P Vermont (1791), Kentucky (1792), and Tennessee (1796) Kentnely as new States. sales. 151. The British Government had accredited no imin- nessee. ister to the United States, and it refused to make any commercial treaty or to give up the forts in the western territory of the United States, through which its agents still exercised a commanding influence over the Indians. In the course of its war with France, the neutral American vessels, without the protection of a national navy, fared badly. A treaty negotiated by Chief-Justice Jay (1794) Jay's settled these difficulties for the following ten years. But, treaty. as it engaged the United States against any intervention in the war on behalf of France, and as it granted some unfamiliar privileges to Great Britain, particularly that of extradition, the Republicans made it very unpopular, and the first personal attacks on Washington's popularity grew out of it. In spite of occasional Republican successes, the Federalists retained a general control of national affairs ; they elected John Adams president in 1796, though Election Jefferson was chosen vice-president with him; and the of 1796. national policy of the Federalists kept the country out of – entangling alliances with any of the European belligerents. To the Republicans, and to the French republic, this last point of policy was only a practical intervention against France and against the rights of man. 152. At the end of Washington's administration the French Directory, following up its successes in Germany and Italy and its exactions from conquered powers, broke off relations with the United

States, demanding the abro- gation of Jay’s treaty and a more pronounced sympathy with France. Adams sent three envoys to endeavour to The re-establish the former relations; they were met by official “X. Y. Z.” or unofficial demands for “ money, a great deal of money,” Mission. as a prerequisite to peace. They refused ; their letters home were published ; and the Federalists at last had the oppor- tunity of riding the whirlwind of an intense popular desire for war with France. Intercourse with France was sus- pended by Congress (1798); the treaties with France were declared at an end; American frigates were authorized to capture French vessels guilty of depredations on Ame- rican commerce, and the president was authorized to issue letters of marque and reprisal ; and an American army was formed, Washington being called from his retirement ‘ at Mount Vernon to command it. The war never went Quasi-war beyond a few sea-fights, in which the little American navy ae did itself credit, and Napoleon, seizing power the next “°° year, renewed the peace which should never have been broken. But the quasi-war had internal consequences to

the young republic which surpassed in interest all its foreign difficulties : it brought on the crisis which settled

the development of the United States towards democracy.

153. The reaction in Great Britain against the indefinite

“rights of man” had led parliament to pass an alien

law, a sedition law suspending the writ of habeas corpus,

and an Act giving wide and scarcely defined powers to magistrates for the dispersion of meetings to petition for

Error of redress of grievances. The Federalists were in control the Fede- of a Congress of limited powers ; but they were strongly ralists. tempted by sympathies and antipathies of every sort to form their programme on the model furnished from England. The measures which they actually passed were

based only on that construction of. the constitution which

is at the bottom of all American politics ; they only tended

to force the constitution into an anti-democratic direction.

But it was the fixed belief of their opponents that they

meant to go farther,—to forget the limitations imposed by

the ten-years'-old constitution, and to secure their own control by some wholesale measure of political persecution.

The 154. Three alien laws were passed. 'The first raised the Alienand number of years necessary for naturalization from five to Feuilen fourteen. The third permitted the arrest of subjects of "ws: any foreign power with which the United States should be at war. The second, which is usually known as the Alien Law, was limited to a term of two years; it permitted the president to arrest or order out of the country any alien whom he should consider dangerous to the country. As many of the Republican editors and local leaders were aliens, this law really put the whole Republican organization in the power of the president elected by their op- ponents. The Sedition Law made it a crime, punishable by fine and imprisonment, to publish or print any false, scandalous, and malicious writings against the Government of the United States, either house of Congress, or the president, with intent to defame them, or to bring them into contempt or disrepute, or to excite against them the hatred of the good people of the United States, or to stir up sedition or opposition to any lawful Act of Congress or of the president, or to aid the designs of any foreign power against the United States. In its first form the bill was even more loose and sweeping than this and

alarmed the opposition thoroughly.

155. Almost all the ability of the country was in the Federalist ranks; the Republicans had but two first-rate men—Jefferson and Madison. In the sudden issue thus forced between individual rights and national power, Jefferson and Madison could find but one bulwark for the individual—the power of the States; and their use of it gave their party a permanent list to

State sovereignty from which it did not recover for years. They objected to the Alien Law on the grounds that aliens were under the jurisdiction of the State, not of the Federal Government ; that the jurisdiction over them had not been transferred to the Federal Government by the constitution, and that the assumption of it by Congress was a violation of the constitution's reservation of powers to the States ; and, further, because the constitution reserved to every ‘‘ per- son,” not to every citizen, the right to a jury trial (§ 127). They objected to the Sedition Law on the grounds that the constitution had specified exactly the four crimes for whose punishinent Congress was to provide ; that criminal libel was not one of them ; and that amendment I. forbade

The Republi- can oppo- sition.

Congress to pass any law restricting freedom of speech.

or of the press. The Federalists asserted a common-law power in Federal judges to punish for libel, and pointed to a provision in the Sedition Law permitting the truth to be given in evidence, as an improvement on the common law, instead of a restriction on individual liberty.

156. The Republican objections might have been made

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in court, on the first trial. But the Republican leaders

had strong doubts of the impartiality of the Federal judges,

who were Federalists. They resolved to intrench the party

in the State legislatures. The Virginia legislature in Virging | 1798 passed a series of resolutions prepared by Madison, and Ken. | and the Kentucky legislature in the same year passed ae series prepared by Jefferson. Neglected or rejected by —. the other States, they were passed again by their legisla-

tures in 1799, and were for a long time the documentary

basis of the Democratic party (§ 320). The leading idea expressed in both was that the constitution was a ‘“ com- pact” between tlie States, and that the powers (the States) which had made the compact had reserved the power to restrain the creature of the compact, the Federal Government, whenever it undertook to assume powers not granted to it. Madison’s idea seems to have been that

the restraint was to be imposed by a second convention of

the States. Jefferson’s idea is more doubtful ; if it meant

that the restraint should be imposed by any State which should feel aggrieved, his scheme was merely Calhoun's

idea of nullification (§ 206); but there are some indica- tions that he agreed with Madison.

157. The first Congress of Adams's term of office ended in 1799. Its successor, elected in the heat of the war excitement, kept the Federalist policy up to its first pitch.

Out of Congress the execution of the objectionable laws Effects of had taken the shape of political persecution. Men were the law. arrested, tried, and punished for writings which the people

had been accustomed to consider quite within legitimate political methods. Some of the charges were petty, and some ridiculous. The Republican leaders made every trial

as public as possible, and gained votes constantly, so that

the Federalists began to be shy of the very powers which

they had sought. Every new election was a storm-signal

for the Federal party; and the danger was increased by

the appearance of schism in their own ranks.

158. Hamilton was now a private citizen of New York ; Fedemalis but he had the confidence of his party more largely than schism. its nominal head, the president, and he maintained close and confidential relations with the cabinet which Adams had taken unchanged from Washington. The Hamilton Hf faction saw no way of preserving and consolidating the ' newly acquired powers of the Federal Government but by keeping up and increasing the war feeling against France ; Adams had the instinctive leaning of an American pre- sident towards peace. Amid cries of wrath and despair from his party he accepted the first overtures of the new Napoleonic Government, sent envoys to negotiate a peace, and ordered them to depart

for France when they delayed too long. Then, discovering flat treachery in his cabinet, he dismissed it and blurted out a public expression of his feeling that Hamilton and his adherents were “a British faction.” Hamilton retorted with a circular letter to his party friends, denouncing the president ; the Republicans intercepted it and gave it a wider circulation than its author had intended ; and the Hamilton faction triedSo to arrange the electoral vote that Pinckney should be ot chosen president in 1800 and Adams should be shelved of 1°: into the vice-presidency. Even so, the Federal party barely missed success. As things turned out, the result depended on the electoral vote of New York ; and Aaron Burr (p. 788), who had introduced the drill and machinery of a modern American political party there, had made the State Republican and secured a majority for the Republican candidates. ‘There was an effort by the Federalists 10 disappoint the Republicans by making Burr president ; but Jefferson obtained that office, Burr becoming VI¢& president for four years (§ 120).

159. The “revolution of 1800” development of the United States.

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decided the future The new dominant

‘Revolu-

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- left the grass growing in the streets. – between the cities was still as bad as could be.

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party entered upon its career weighted with the theory of State sovereignty ; and a civil war was necessary before this dogma, put to use again in the service of slavery, could be banished from the American system. But the

democratic development never was checked. From that time the interpretation of the Federal constitution has gene- rally favoured individual rights at the expense of govern- mental power. As the Republicans obtained control of the States they altered the State constitutions so as to cut out all the arrangements that favoured property or class interests, and reduced political power to the dead level of manhood suffrage. In most of the States outside of New England this process was completed before 1815 : but New England tenacity was proof against the advanc- ing revolution until about 1820. For twenty years after its downfall of 1800 the Federal party maintained its hopeless struggle, and then it faded away into nothing, leaving as its permanent memorial the excellent organiza- tion of the Federal Government, which its successful rival hardly changed. Its two successors—the Whig and the second Republican party—have been broad-constructionist parties, like the Federal party, but they have admitted democracy as well; the Whig party adopted popular methods at least, and the Republican party grew into a theory of individual rights even higher than Jefferson's, —the emancipation of enslaved labour. –

160. The disputed election of 1800 was decided in the new capital city of Washington, to which the Government had just been removed. Its streets and parks existed only on paper. The Capitol had been begun; the White House was unfinished, and its audience room was used by Mrs Adams as a drying room for clothes ; and the Congressmen could hardly find lodgings. The inconveniences were only an exaggeration of the condition of other American cities. Their sanitary conditions were so bad that yellow fever from time to time reduced them almost to depopulation. Again and again, during this decade, the fever visited Philadelphia and New York, drove out the people, and The communication The traveller was subject to every danger or annoyance that bad roads, bad carriages, bad horses, bad inns, and bad police protection could combine to inflict upon him. But the rising spirit of migration seemed to urge the people to conquer these difficulties. The first attempts were made to introduce turnpike roads and canals ; and proposals were advanced for greater improvements. The war with natural obstacles had fairly begun, though it had little prospect of success until steam was brought into use as the ally of man.

161. About this time the term “the West” appears. It meant then the western part of New York State, the new territory north of the Ohio, and Kentucky and Tennessee. In settling land boundaries New York had transferred to Massachusetts, whose claims crossed her territory, the right to a large tract of land in central New York. The sale of this had carried population consider- ably west of the Hudson. After several American expedi- tions against the Ohio Indians had been defeated, another under General Anthony Wayne (1794) had compelled them to give up all the territory now in the State of Ohio. Set- tlement received a new impetus with increased security, and the new state of affairs added to the population of Ken- tucky, whose growth had been seriously checked by period- ical attacks from the Indians across the Ohio. Between 1790 and 1800 the population of Ohio had risen from almost nothing to 45,000, that of Tennessee from 36,000 to 106,000, and that of Kentucky from 74,000 to 221,000, —the last-named State now exceeding five of the “old thirteen ” in population. The difficulties of the western

emigrant, however, were still enormous. He obtained land of his own, fertile land and plenty of it, but little else. The produce of the soil had to be consumed at home, or near it; ready money was scarce and distant products scarcer ; and comforts, except the very rudest substitutes of home manufacture, were unobtainable. The new life bore most hardly upon women ; and, if the record of woman’s share in the work of American colonization could be fully made up, the price paid for the final success would seem very great.

162. The number of post-offices rose during these ten Post- years from 75 to 903, the miles of post-routes from 1900 ofiice.

to 21,000, and the revenue from $38,000 to $231,000. These figures seem small in comparison with the 55,000 post-offices, 375,000 miles of post-routes, and $45,000,000 of revenue of 1887, but the comparison with the figures of 1790 shows a development in which the new constitution, with its increased security, must have been a factor.

163. The power of Congress to regulate patents was Patents.

already bearing fruit. Until 1789 this power was in the hands of the States, and the privileges of the inventor were restricted to the territory of the patenting State. Now he had a vast and growing territory within which all the profits of the invention were his own, and that development began by which human invention has been urged to its highest point, as a factor in the struggle against natural forces. Twenty patents were issucd in 1793, and 22,000 ninety years afterwards ; but one of the inventions of 1793, Whitney's cotton gin, has affected the history of the United States more than most of its wars or treaties.

164. When the constitution was adopted it was not Cotton.

known that the cultivation of cotton could be made. pro- fitable in the Southern States. The "roller gin" could clean only a half dozen pounds a day by slave labour. In 1784 eight bags of cotton, landed in Liverpool from an American ship, were seized on the ground that so much cotton could not be the produce of the United States. Eli Whitney, a Connecticut school-teacher residing in Georgia, invented the saw-gin, by which the cotton was dragged through parallel wires with openings too narrow to allow the seeds to pass ; and one slave could now clean a thousand pounds a day. The exports of cotton leaped from 189,000 pounds in 1791 to 21,000,000 pounds in 1801, and doubled in three years more. The influence of this one Mvention, combined with the wonderful series of British inventions which had paved the way for it, can hardly be estimated in its commercial aspects. Its political influences were even wider, but more unhappy. The intro-

| duction of the commercial element into the slave system

of the South robbed it at once of the patriarchal features which had made it tolerable; but, at the same time, it developed in slave-holders a new disposition to uphold and defend a system of slave labour as a " positive good." The abolition societies of the South began to dwindle as soon as the results of Whitney's invention began to be manifest.

165. The development of a class whose profits were Slavery merely the extorted natural wages of the black labourer and demo- was certain ; and its

political power was as certain, though SY:

it never showed itself clearly until after 1830. And this class was to have a peculiarly distorting effect on the political history of the United States. Aristocratic in every sense but one, it was ultra-Democratic (in a purely party sense) in its devotion to State sovereignty, for the legal basis of the slave system was in the laws of the several States. In time, the aristocratic element got con- trol of the party which had originally looked to State rights as a bulwark of individual rights; and the party was finally committed to the employment of its original

Demo- cracy and nation- ality.

Louis- iana,

The steam- boat.

Centre of popu- lation,

The Oregon country,

Election of 1804,

doctrine for an entirely different purpose,—the suppression of the black labourer’s wages.

VII. DEMOCRACY AND NATIONALITY : 1801-29.

166. When Jefferson took office in 1801 he succeeded to a task larger than he imagined. His party, ignoring the natural forces which tied the States together even against their wills, insisted that the legal basis of the bond was in the power of any State to withdraw at will. This was no nationality ; and foreign nations naturally refused to take the American national coin at any higher valuation than that at which it was current inits own country. The urgent necessity was for a reconciliation between democracy and nationality ; and this was the work of this period. An underlying sense of all this has led Democratic leaders to call the war of 1812-15 the “second war

for independ- ence”; but the result was as much independence of past ideas as of Great Britain.

167. The first force in the new direction was the acquisition of Louisiana (§ 32) in 1803. Napoleon had acquired it from Spain, and, fearing an attack upon it by Great Britain, offered it to the United States for $15,000,000. Jefferson and his party were eager to accept the offer; but the constitution gave the Federal Government no power to buy and hold territory, and the party was based on a strict construction of the constitu- tion. Possession of power forced the strict-construction party to broaden its ideas, and Louisiana was bought, though Jefferson quieted his conscience by talking for a time of a futile proposal to amend the constitution so as to grant the necessary power. The acquisition of the western Mississippi basin more than doubled the area of the United States, and gave them control of all the great river-systems of central North America. The difficulties of using these rivers were removed almost immediately by Fulton’s utilization of steam in navigation (1807). Within four years steamboats were at work on Western waters ; and thereafter the increase of steam navigation and that of population stimulated one another. Population crossed the Mississippi ; constantly increasing eddies filled up the vacant places to the east of the great river; and all sections of the country advanced as they had never advanced before. The “centre of population” has been carefully ascertained by the census authorities for each decade, and it represents the westward movement of population very closely. During this period it advanced from about the middle of the State of Maryland to its extreme western limit; that is, the centre of population was in 1830 nearly at the place which had been the western limit of population in 1770.

168. Jefferson also laid the basis for a further acquisi- tion in the future by sending an expedition under Lewis and Clarke to explore the territory north of the then Spanish territory of California and west of the Rocky Mountains —the “Oregon country” as it was afterwards called (§§ 221, 224). The explorations of this party (1804), with Captain Gray’s discovery of the Columbia river (1792), made the best part of the claims of the United States to the country forty years later.

169. Jefferson was re-elected in 1804, serving until 1809; his party now controlled almost all the States outside of New England, and could elect almost any one whom it chose to the presidency. Imitating Washington in refusing a third term of office, Jefferson established the precedent, which has not since been violated, restricting a president to two terms, though the constitution contains no such restriction. The great success of his presidency had been the acquisition of Louisiana, which was a viola- tion of his party principles; but all his minor successes were, like this, recognitions of the national sovereignty

which he disliked so much. After a short and brilliant naval war the Barbary pirates were reduced to submission (1805). And the authority of the nation was asserted for the first time in internal affairs. The long-continued control of New Orleans by Spain, and the persistent intrigues of the Spanish authorities, looking towards a separation of the whole western country from the United States, had been ended by the annexation of Louisiana, and they will probably remain for ever hidden in the secret history of the early West. They had left behind a dan- gerous ignorance of Federal power and control, of which Burr took advantage (1807). Organizing an expedition in Kentucky and Tennessee, probably for the conquest of the Spanish colony of Mexico, he was arrested on the lower Mississippi and brought back to Virginia. He was ae- quitted ; but the incident opened up a vaster view of the national authority than democracy had yet been able to take. It had been said, forty years before, that Great Britain had long arms, but that 3000 miles was too far to extend them; it was something to know now that the arms of the Federal Government were long enough to reach from Washington city to the Mississippi.

170. All the success of Jefferson was confined to his first four years ; all his heavy failures were in his second term, in which he and his party as persistently refused to recognize or assert the inherent power of the nation in international affairs. The Jay treaty expired in 1804 by limitation, and American commerce was thereafter left to the course of events, without any restriction of treaty obligations, since Jefferson refused to accept the only treaty which the British Government was willing to make. All the

difficulties which followed may be summed up ina few words: the British Government was then the repre- sentative of the ancient system of restriction of commerce, and had a powerful navy to enforce its ideas; the Ame- rican Government was endeavouring to force into inter- national recognition the present system of neutral rights and unrestricted commerce, but its suspicious democracy refused to give it a navy sufficient to command respect for its ideas. Indeed, the American Government did not want the navy; it apparently expected to gain its objects with- out the exhibition of anything but moral force.

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171. Great Britain was now at war, from time to time, Neutral In time of commerce,

with almost every other nation of Europe. peace European nations followed generally the old restric- tive principle of allowing another nation, like the United States, no commercial access to their colonies; but, when they were at war with Great Britain, whose navy controlled the ocean, they were very willing to allow the neutral American merchantmen to carry away their surplus colonial produce. Great Britain had insisted for fifty years that the neutral nation, in such cases, was really intervening in the war as an ally of her enemy ; but she had so far modified her claim as to admit that “ tranship- ment,” or breaking bulk, in the United States was enough to qualify the commerce for recognition, no matter whither it was directed after transhipment. The neutral nation thus gained a double freight, and grew rich in the trafiie; the belligerent nations no longer had commerce afloat for British vessels to capture ; and the “frauds of the neutral flags” became a standing subject of complaint among British merchants and naval officers. About 1805 British prize courts began to disregard transhipment and to condemn American vessels which had made the voyage from a European colony to the mother country by way of the United States. This was really a restriction of American commerce to purely American productions, or to commerce with Great Britain direct, with the payment of duties in British ports.

172. The question of expatriation, too, furnished a good

Difficul- ties with — Great

Britain,

UNITED

xpatria- many burning grievances. Great Britain maintained the old German rule of perpetual allegiance, though she had modified it by allowing the right of emigration. The United States, founded by immigration, was anxious to establish what Great Britain was not disposed to grant,

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Law (1809) for the embargo ; it prohibited intercourse Non-in- with Great Britain and France and their dependencies, tercourse leaving other foreign commerce open; but Madison, 4:

Jefferson’s successor in 1808-09, assumed in the presi- Election dency a burden which was not enviable. New England of 1808.

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the right of the subject to divest himself of allegiance by naturalization under a foreign jurisdiction. Four facts thus tended to break off friendly relations—(1) Great Britain’s claim to allegiance over American naturalized subjects ; (2) her claim to the belligerent right of search of neutral vessels ; (3) her claim of right to impress for her vessels of war her subjects who

were seamen wherever found ; and (4) the difficulty of distinguishing native-born Americans from British subjects, even if the right to impress naturalized American subjects were granted. British naval officers even undertook to throw the onus proband, upon Aniericans—to consider all who spoke the English language as British subjects, unless they could produce proof that they were native-born Americans, The American sailor who lost his papers was thus open to impressment. The American Government in 1810 pub- lished the cases of such impressments since 1803, as numbering over 4000, about one-third of the cases result- Ing in the discharge of the impressed man ; but no one could say how many cases had never been brought to the atten- tion of a Government which never did anything more than remonstrate about them.

173. In May 1806 the British Government, by orders in council, declared a blockade of the whole continent of Europe from Brest to the Elbe, about 800 miles. In November, after the battle of Jena, N: apoleon answered by the “ Berlin decree,” in which he assumed to blockade the British Isles, thus beginning his “continental system.”

174. The Democratic party of the United States was almost exclusively agricultural, and had little knowledge of or sympathy with commercial interests ; it had little confidence in the American navy; it was pledged to the reduction of national expenses and the debt, and did not wish to take on its shoulders the responsibility for a navy ; and, as the section of country most affected by the orders in council, New England, was Federalist, and made up the active and irreconcilable opposition, a tinge of political feeling could not but colour the decisions of the dominant party. Various ridiculous proposals were considered as Substitutes for a necessarily naval war ; and perhaps the most ridiculous was adopted. Since the use of non-inter- course agreements as revolutionary weapons against Great Britain (§ 50), an overweening coufidence in such measures

ad sprung up, and one of them was now resorted to—the

” embargo (1807), forbidding foreign commerce altogether.

twas expected to starve Great Britain into a change of policy ; and its effects may be seen by comparing the $20,000,000 exports of 1790, $49,000,000

of 1807, and $9,000,000 of 1808. It does not seem to have struck those who passed the measure that the agricultural dis- tricts also might find the change unpleasant ; but that was the result, and their complaints reinforced those of New England, and closed Jefferson's second term in a cloud of recognized misfortune. The pressure had been slightly relieved by the substitution of the Non-intercourse

was in a ferment, and was even suspected of designs to resist the restrictive system by force (§ 180) ; and the administration did not feel secure enough in its position to face the future with confidence.

175. The Non-intercourse Law was to be abandoned as to either belligerent which should abandon its attacks on neutral commerce, and maintained against the other. In 1810 Napoleon officially informed the American Govern- ment that he had abandoned his system. He continued to enforce it in fact; but his official fiction served its purpose of limiting the non-intercourse for the future to Great Britain, and thus straining relations between that country and the United States still further. The elections of 1811-12 resulted everywhere in the defeat of "sub- mission men" and in the choice of new members who were determined to resort to war against Great Britain ; France had not been able to offer such concrete cases of injury as her enemy, and there was no general disposition to include her in the war. Clay, Calhoun, Crawford, and other new men seized the lead in the two houses of Congress, and forced Madison to agree to a declaration of war as a con- dition of his re-election in 1812. declaration of June 18, 1812. alists always called it "Mr Madison's war," dent was about the most unwilling participant in it.

176. The national democracy meant to attack Great Britain in Canada, partly to gratify its Western constitu- ency, who had been harassed by Indian attacks, asserted to have been instigated from Canada. Premonitions of

Success were drawn from the battle of Tippecanoe, in which Tippe- Harrison had defeated the north-western league of Indians canoe.

formed by Tecumseh (1811). Between the solidly settled Atlantic States and the Canadian frontier was a wide

stretch of unsettled or thinly settled country, which was Theatre Ohio had been ad- of the mitted as a State in 1802, and Louisiana was admitted ¥#

itself a formidable obstacle to war.

in 1812; but their admission had been due to the desire to grant them self-government rather than to their full development in population and resources. Cincinnati was a little settlement of 2500 inhabitants; the fringe of settled country ran not very far north of it 3 and all beyond was a wilderness of which little was known to the authorities. The case was much the same with western New York; the army which was to cross the Niagara river must journey almost all the way from Albany through a country far more thinly peopled than the far western Territories are in 1887. The difficulties of trans- port gave opportunities for peculation ; and a barrel of flour sometimes reached the frontier army with its cost multiplied seven or eight fold. When a navy was to be built on the lakes, the ropes, anchors, guns, and all material had to be carried overland for a distance about equal to the length of England ; and even then sailors had to be brought to man the navy, and the vessels were built of green timber: one vessel was launched nine weeks after ler timber was cut, It would have been far less costly, as events proved, to have entered at once upon a naval war ; but the crusade against Canada had been proclaimed all through Kentucky and the West, and their people were determined to wipe out their old scores before the conclusion of the war.

177. The war opened with disaster—Hull’s surrender Disasters of Detroit ; and disaster attended it for two years. Polit- by land.

ical appointments to positions in the regular army were numerous, and such officers were worse than useless, The men were not fitly trained or supplied. The war depart-

War was begun by the Election The New England Feder- of 1812. but the presi- War with

Chippewa and + Lundy’s Lane.

Washing- ton burnt.

State of the Navy.

Naval successes.

760 Unik ment showed no great knowledge, and poverty put its little knowledge out of service. Several futile attempts at in- vasion were followed by defeat or abortion, until the pol- itical officers were weeded out at the end of the year 1818, and Brown, Scott, Ripley, and others who had fought their way up were put in command. Then for the first time the men were drilled and brought into effective con- dition ; and two successful battles in 1814—Chippewa and Lundy's Lane—threw some glory on the end of the war. So weak were the preparations even for defence that a British expedition in 1814 met no effective resistance when it landed and burned Washington, It was defeated, however, in an attempt to take Baltimore.

178. The American navy at the outbreak of the war numbered half a dozen frigates and about the same number of smaller vessels. This was but a puny adver- sary for the thousand sail of the British navy, which had captured or shut up in port all the other navies of Europe. But the small number of American vessels, with the super- abundance of trained officers, gave them one great advan- tage: the training and discipline of the men, and the equipment of the vessels, had been brought to the very highest point. Captains who could command a vessel but for a short time, yielding her then to another officer wlio was to take his sea service in rotation, were all ambitious to make their mark during their term. 'The art of handling and fighting the old broadside sailing frigate " had been carried in the little American navy to a point which unvarying success and a tendency to fleet-combats had now made far less common among British captains!

179. The first year of the war saw five ship-duels, in all of which the American frigates either captured or sunk their adversaries. Four others followed in 1813, in two of which the British vessels came off victorious. The attention of the British Government had by that time been fully diverted to the North-American coast ; its blockading fleets made it very difficult for the larger American vessels to get to sea ; and there were but seven other ship-combats, in only one of which the American vessel was taken. Most of the work was done by three frigates, the 'Constitu- tion," the

‘‘ Essex,” and the “ United States.” There was fighting also on the Great Lakes between improvised fleets

1 The naval officers who came most prominently to notice in the war were Hull and Lawrence (see p. 789) and the following: -STEPHEN Decatur was born at Sinnepuxent, Md., Jan. 5, 1779, and died at Washington (shot in a duel), March 22, 1820. He distinguished himself in the first Algerine war, 1803-4, by his capture of the British frigate “ Macedonian,” while in command of the “ United States,” and in the brief war which brought about the final submission of the Algerines in 1815.—THomas MAcDoNOUGH was born in New- castle county, Del., Dec. 28, 1788, and died at sea, Nov. 16, 1825. He was commodore of the American fleet on Lake Champlain, in its victory over the British fleet.—OLiver HazarD PERRY was born at South Kingston, R.I., Aug. 23, 1785, and died on the island of Trinidad, Aug. 23, 1819. His great achievement was his victory over the British fleet, 1813, laconically announced in the despatcli: “We have met the enemy, and they are ours.” —Davip PORTER was born at Boston, Mass., Feb. 1, 1780. After service in a merchant- man, he entered the navy in 1798, served in the Algerine war and elsewhere, and in 1812 was in command of the “Essex.” His most brilliant service was his cruise in the Pacific in 1813-14, in which he swept that ocean of British whalers, and was finally captured in the neutral harbour of Valparaiso by two British vessels, after the most desperate naval combat of the war. He resigned in 1826, after a difficnlty with the navy department, and took command of the Mexican navy. He died near Constantinople, March 28, 1843, while serving as minister to Turkey. See D. D. Porter’s Memoir of David Porter (1876), and Irving’s Spanish Papers, vol. ii.i—Joun Ropaurs was born in Harford county, Md., in 1771. He entered the navy in 1798 as a lientenant, rose to a captaincy, commanded the Mediter- ranean fleet in 1805, and the frigate “ President” during the encounter with the “Little Belt” in 1811. He was in command of the fleet at New York in 1812, and hurried it to sea, lest his Government should forbid it to leave port. He commanded the fleet in another cruise the same year, but only individual captures were made. He died at Philadelphia, Aug. 1, 1838.

STATES

of small vessels. Perry captured the British fleet on Lake Victories | Erie (1813) and Macdonough the British fleet on Lake om the Champlain (1814). The former victory led to the end of ’% the war in the West. Harrison, the American commander

in that section, shipped his army across the lake in Perry’s fleet, and routed the British and Canadian army at the Thames.

180. The home dislike to the war had increased steadily Reeling with the evidence of incompetent management by the in New administration. The Federalists, who had always desired England a navy, pointed to the naval successes as the best proof of the folly with which the war lad been undertaken and managed. New England Federalists complained that the Federal Government utterly neglected the defence of their ia coast, and that Southern influence was far too strong in |

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national affairs. They showed at every opportunity a dis- position to adopt the furthest stretch of State sovereignty, as stated in the Kentucky resolutions; and every such development urged the national democracy unconsciously further on the road to nationality. When the New England States sent delegates to meet at Hartford and consider Hartfoni their grievances and the best remedies—a step perfectly conven. proper on the Democratic theory of a “voluntary Union ” 40 —treason was suspected, and a readiness to suppress it by force was plainly shown. The recommendations of the convention came to nothing ; but the attitude of the domi-

nant party towards it is one of the symptoms of the manner

in which the trials of actual war were steadily reconciling democracy and nationality. The object which Hamilton

had sought by high tariffs and the development of national classes had been attained by more natural and healthy means.

181. In April 1814 the first abdication of Napoleon took place, and Great Britain was able to give more attention to her American antagonist. The main attack was to be made on Louisiana, the weakest and most distant portion of the Union. A fleet and army were sent thither, and, after much delay, landed below the city.

The nearest settled country was Tennessee ; and between

it and New Orleans was a wilderness four hundred miles New long. Andrew Jackson had become the most prominent Orleans citizen of Tennessee, and he was ordered to the defence of New Orleans. His popularity and energy brought riflemen down the river and put them into position. ‘The British assault was marred by hopeless blunders, and the gallantry

of the men only made their slaughter and repulse more com- plete (January 8, 1815). Peace had been made at Ghent Peace fifteen days before the battle was fought, but the news of the battle and the peace reached Washington almost to gether, the former going far to make the latter tolerable. ;

182. Though the land war had gone almost uniformly Its tem: against the United States, and the American naval suc- cesses had been just enough to irritate the English mind, and though the British negotiators had nothing to dread and everything to demand, the treaty was quite satisfactory to the United States. It is true that it said not a word about the questions of impressment, search, and neutral rights, the grounds of the war; Great Britain did not abandon her position on any of them. But everybody knew that circumstances had changed. The new naval power whose frigates alone in the past twenty years had shown their ability to fight English frigates on equal terms was not likely to be troubled in future with the question of impressment ; and in fact, while not renouncing the right, the British Government no longer attempted 10 enforce it. The navy, it must be confessed, was the force which had at last given the United States a recognized and cordial acceptance in the family of nations; 1t had solved the problem of the reconciliation of democracy and nationality. From this time the dominant party shows al

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increasing disposition to exalt and maintain the national element of the American system.

183. The remainder of this period is one of the barren- est in American history. The opposition of the Federal party to the war completed the measure of its unpopular- ity, and it had only a perfunctory existence for a few years longer. There was but one real party, and the political struggles within it tended to take the shape of

1812-1825. |

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1818-19, but the iron duties were less satisfactory. In English manufacture the substitution of coke for charcoal in iron production led to continual decrease in price. As the price went down the specific duties were continually in- creasing the absolute amount of protection. Thus spared the necessity for improvements in production, the American manufacturers felt English competition more keenly as the years went by, and called for more protection.

187. Monroe succeeded Madison as president in 1817, “Era of and, re-elected with hardly any opposition in 1820, he good served until 1825. So complete was the supremacy of the feeling.

purely personal politics. Scandal, intrigue, and personal criticism became the most marked characteristics of Ame- rican politics until the dominant party broke at the end

of the period, and real party conflict was renewed. But the seeds of the final disruption are visible from the peace of 1814. The old-fashioned Republicans looked with intense suspicion on the new form of Republicanism generated by the war, a type which instinctively bent its energies toward the further development of national power. Clay was the natural leader of the new demo- cracy ; but John Quincy Adams and others of Federalist antecedents or leanings took to the new doctrines kindly ; and even Calhoun, Orawford (p. 788), and others of the Southern interest were

at first strongly inclined to support them. One of the first effects was the revival of protec- tion and of a national bank.

184. The charter of the national bank (§ 146) had expired in 1811, and the dominant party had refused to recharter it. The attempt to carry on the war by loans

Republican party that this is often called “the era of good feeling.” It came to an end when a successor to Monroe was to be elected ; the two sections of the dominant party then had their first opportunity for open struggle. During Monroe’s two terms of office the nationalizing party devel- oped the policy on which it proposed to manage national affairs. This was largely the product of the continually swelling western movement of population. The influence of the steamboat was felt more and more every year, and the want of a similar improvement in land transport was correspondingly evident. The attention drawn to western New York by the war had filled that part of the State with a new population. The Southern Indians had been com- pletely overthrown by Jackson during the war of 1812, and forced to cede their lands; all the territory west of

Georgia was thus opened up to settlement. The admission Admis.

of the new States of Indiana (1816), Mississippi (1817), sion of Illinois (1818), Alabama (1819), Maine (1820), and Mis- Indiana, souri (1821)—all but Maine the product and evidence of sippi, Western growth—were the immediate results of the de- Illinois, velopment consequent upon the war. All the territory Alabama, east of the Mississippi, except the northern part of the ee

north-west territory, was now formed into self-governing Missouri.

resulted in almost a bankruptcy and in a complete inability to act efficiently. As soon as peace gave time for con- sideration, a second bank was chartered for twenty years, with a capital of $35,000,000, four-fifths of, which might be in Government stock. It was to have the custody of the Government revenues, but the secretary of the treasury could divert the revenues to other custodians, giving his

reasons for such action to Congress. This clause, meant to cover cases in which the Bank of the United States had no branch at a place where money was needed, was after- wards put to use for a very different purpose (§ 204).

185. Protection was advocated again on national grounds, but not quite on those which had moved Hamil- ton (§ 146). The additional receipts were now to be expended for fortifications and other national defences, and for national roads and canals, the latter to be con- sidered solely as military measures, with an incidental benefit to the people. Business distress among the people gave additional force to the proposal. The war and block- ade had been an active form of protection, under which American manufactures had sprung up in great abundance. As soon as peace was made English manufacturers poured their products into the United States, and drove their American rivals out of business or reduced them to desperate straits. Their cries to Congress for relief had a double effect. They gave the spur to the nationalizing advocates of protection, and, as most of the manufacturers were in New England or New York, they developed in the citadel of Federalism a class which looked for help to a Republican Congress, and was therefore bound to oppose the Federal party. This was the main force which brought New England into the Republican fold before 1825. An in-

» Crease in the number of spindles from 80,000 in 1811 to

500,000 in 1815, and in cotton consumption from 500 bales in 1800 to 90,000 in 1815, the rise of manufactur- ing towns, and the rapid development of the mechanical tendencies of a people who had been hitherto almost exclusively agricultural, were influences which were to be reckoned with in the politics of a democratic country.

186. The tariff of 1816 imposed a duty of about 25 per cent. on imports of cotton and woollen goods, and specific duties on iron imports. The ad valorem duties carried most of the manufacturers through the financial crisis of

States; the State system had already crossed the Missis- sippi; and all that was needed for further development was the locomotive engine. The four millions of 1790 had grown into thirteen millions in 1830; and there was a steady increase of one-third in each decade.

188. The urgent demand of Western settlers for some road to a market led to a variety of schemes to facilitate intercourse between the East and the West, —the most successful being that completed in New York in 1825, the Erie Canal.

to the Atlantic coast. When the traveller has passed up the Hudson through that range he sees before him a vast champaign country extending westward to the Great Lakes, and perfectly adapted by nature for a canal. Such a canal, to turn Western traffic into the lake rivers and through the lakes, the canal, and the Hudson to New York city, was begun by the State through the influence of De Witt Clinton, was derisively called “Clinton’s big ditch” until its completion, and laid the foundations for the great com- mercial prosperity of New York State and city. Long before it was finished the evident certainty of its success had seduced other States into far less successful enterprises of the kind and had established as a nationalizing policy the combination of high tariffs and expenditures for internal

improvements which was long known as the “ American The – system.” The tariffs of duties on imports were to be carried ‘ Ameri- limit mn

as high as revenue results would approve; within this the duties were to be defined for purposes of protection ; and the superabundant revenues were to be expendcd for the improvement of roads, rivers, and harbours, and for every enterprise which would tend to aid the people in their efforts to subdue the continent. Protection was now to be for national benefit, not for the benefit of classes. Western farmers were to have manufacturing towns at their doors, as markets for the surplus which had hitherto XXIII. — 96

The Hudson river forms the great Erie natural breach in the barrier range which runs parallel Canal.

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been rotting on their farms; competition among manu- facturers was to keep down prices; migration to all the new advantages of the West was to be made easy at national expeuse ; and Henry Clay’s eloquence was to commend the whole policy to the people. The old Demo- cracy, particularly in the South, insisted that the whole scheme really had its basis in benefits

to classes, that its communistic features were not such as the constitution meant to cover by its grant of power to Congress to levy taxation for the general welfare, and that any such legisla- tion would be unconstitutional. The dissatisfaction in the

Tariffs of South rose higher when the tariffs were increased in 1824

1824 and

828.

The Monroe doctrine.

The colonial clause.

The north- west bound- ary.

and 1828. The proportion of customs revenue to dutiable imports rose to 37 per cent. in 1825 and to 44 per cent. in 1829; and the ratio to aggregate imports to 33 per cent. in 1825 and 37 per cent. in 1829. As yet, however, the Southern dissatisfaction showed itself only in resolu- tions of State legislatures.

189. In the sudden development of the new nation circumstances had conspired to give social forces an abnormally materialistic cast, and this had strongly in- fluenced the expression of the national life. Its literature and its art had amounted to little, for the American people were still engaged in the fiercest of warfare against natural difficulties, which absorbed all their energies.

190. In international relations the action of the Gov- ernment was strong, quiet, and self-respecting. Its first weighty action took place in 1823. It had become pretty evident that the Holy Alliance, in addition to its interven- tions in Europe to suppress popular risings, meant to aid Spain in bringing her revolted South-American colonies to obedience. Great Britain had been drifting steadily away from the Alliance, aud Canning, the new secretary, deter- mined to call in the weight of the trans-Atlantic power as a check upon it. A hint to the American minister was followed by a few pregnant

passages in President Monroe’s annual message in December. Stating the friendly rela- tions of the United States with the new South-American republics, he went on to say, “ We could not view an interposition for oppressing them (the South-American states), or controlling in any other manner their destiny by any European power, in any other light than as a manifestation of an unfriendly disposition towards the United States.” Ii both the United States and Great Britain were to take this ground the fate of a fleet sent by the Alliance across the Atlantic was not in much doubt, and the project was at once given up. The “ Monroe doctrine,” however, has remained the rule of foreign intercourse for all American parties. Added to the already established refusal of the United States to become en- tangled in any European wars or alliances, it has separated the two continents, to their common advantage.

rg. It was supposed at the time that Spain might transfer her colonial claims to some stronger power ; and Mr Monroe therefore went on to say that ‘the American continents should no longer be subjects for any new Euro- pean colonial settlement.” The meaning of this was well understood at the time; and, when its condition failed, the statement lost its force. It has been supposed that it bound the United States to resist any further establish- ment of European colonies in the Americas. Such a réle of universal arbiter has always been repudiated by the United States, —though its sympathies, more or less active, must always go with any American republic which falls into collision with any such colonizing scheme.

192. By a treaty with Russia (1825) that power gave up all claims on the Pacific coast south of the present limits of Alaska. The northern boundary of the United States had been settled by the treaty of 1783; and, after the acquisition of Louisiana, a convention with Great

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Britain settled the boundary on the line of 49° N. lat. as far west as the Rocky Mountains (1818). West of these mountains the so-called Oregon country (§ 168), on whose limits the two powers could not agree, was to be held in common possession for ten years. This common possession was prolonged by another convention (1827) indefinitely, with the privilege to

either power to terminate it on giving twelve months’ notice. This arrangement lasted until 1846 (§ 224).

193. Monroe’s terms of office came to an end in 1825, He had originally been an extreme Democrat, who could hardly speak of Washington with patience ; he had slowly changed into a very moderate Republican, whose tendencies were eagerly claimed by the few remaining Federalists as identical with their own. The nationalizing faction of the dominant party had scored almost all the successes of the administration, and the divergence between it and the opposing faction was steadily becoming more apparent. | All the candidates for the presidency in 1824—Andrew Blection — Jackson, a private citizen of Tennessee ; William H. Craw. of 182. | ford, Monroe’s secretary of the treasury ; Jolin Quincy Adams, lis secretary of state; and Henry Clay, the speaker of the house of representatives—claimed to be Republicans alike ; but the personal nature of the struggle was shown by the tendency of their supporters to call themselves ‘ Adams men” or “ Jackson men,” rather than by any real party title. Calhoun was supported by all parties for the vice-presidency, and was elected without difficulty. The choice of a president was more doubtful.

194. None of the four candidates had anything like a Party party organization behind him. Adams and Clay repre- diver sented the nationalizing element, as Crawford and Jackson 8™ did not; but there the likeness among them stopped. The strongest forces behind Adams were the new manu- facturing and commercial interests of the East ; belund Clay were the desires of the West for internal improve ments at public expense as a set-off to the benefits which the seaboard States had already received from the Govern- ment; and the two elements were soon to be united into the National Republican or Whig party. Crawford was the representative of the old Democratic party, with all its Southern influences and leanings. Jackson was the personification of the new democracy,—not very cultured, perhaps, but honest, and hating every shade of class con- trol instinctively. As he became better known the whole force of the new drift of things turned in his direction; ‘hurrah for Jackson” undoubtedly often represented tend- encies which the speaker would have found it hard to express otherwise. Crawford was taken out of the race, just after this election, by physical failure, and Adams by the revival of ancient quarrels with the Federalists of New

England ; and the future was to be with Clay or with Jackson. But in 1824 the question of success among the four was not an easy one to decide. The electors gave no one a majority ; and the house of representatives gave the presidency to Adams (§§ 119, 120).

195. Adams's election in 1824 was due to the fact that i ' Clay's friends in the house—unable to vote for him, as he an was the lowest in the electoral vote, and only three names tration were open to choice in the house—very naturally gave their votes to Adams. As Adams appointed Clay to the leading position in his cabinet, the defeated party at once raised the cry of " bargain and intrigue," one of the most effective in a democracy, and it was kept up throughout Adams's four years of office. Jackson had received the largest number of electoral votes, though not a majority ; and the hazy notion that he had been injured because of his devotion to the people increased his popularity. Though demagogues made use of it for selfish purposes, this feeling was an honest one, and Adams had nothing to oppose to it.

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ual Zave it up until slavery was ended.

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He tried vigorously to uphold the " American system," and succeeded in passing the tariff of 1828; he tried to maintain the influence of the United States on both the American continents ; but he remained as unpopular as his rival grew popular. In 1828 Adams was easily displaced

1824-1829.]

» by Jackson. Calhoun was re-elected vice-president.

196. Jackson's inauguration in 1829 closes this period, as it ends the time during which a disruption of the Union

by the peaceable withdrawal of any State was even pos-

sible. The party which had made State sovereignty its bulwark in 1798 was now in control of the Government again; but Jackson's proclamation in his first term, in which he warned South Carolina that "disunion by armed force is treason," aud that blood must flow if the laws were resisted, speaks a very different tone from the speculations of Jefferson on possible future divisions of the United States. Aud even the sudden attempt of South Carolina to exercise independent action (§ 206), which would have been looked upon as almost a right forty years before, shows that some interest dependent upon State sovereignty had taken alarm at the evident drift of events, and was anxious to lodge a claim to the right before it should slip from its fingers for ever. Nullification was but the first skirmish between the two hostile forces of slavery and democracy.

197. When the vast territory of Louisiana was acquired in 1803 the new owner found slavery already established there by custom recognized by French and Spanish law. Congress tacitly ratified existing law by taking no action ; slavery continued legal, and spread further through the territory ; and the State of Louisiana entered as a slave State in 1812. The next State to be carved out of the territory was Missouri, admitted in 1821.

_ the following arrangement, known as the Missouri com- _ Promise of 1820 :—Missouri was to enter as a slave State ;

slavery was for ever prohibited throughout the rest of the Louisiana purchase north of lat. 36° 30', the main southern boundary of Missouri; and, though nothing was said of the territory south of the compromise line, it was under- stood that any State formed out of it was to be a slave State, if it so wished (§ 249). Arkansas entered under this provision in 1836.

198. The question of slavery was thus set at rest for the present, though a few agitators were roused to more zealous Opposition to the essence of slavery itself. In the next decade these agitators succeeded only in the conversion of a few recruits, but these recruits were the ones who took up the work at the opening of the next period and never It is plain now, how- ever, that North and South had already drifted so far apart as to form two sections, and that, as things stood, their drift for the future could only be

further apart, in spite of the feeble tie furnished by the Missouri compromise. It became evident, during the next forty years, that the wants and desires of these two sections were so divergent that it was impossible for one Government to inake satis-

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factory laws for both. The moving cause was not removed in 1820; one of its effects was got out of the way for the time, but others were soon to take its place.

199. The vast flood of human beings which had been The pouring westward for years had now pretty well occupied settled the territory east of the Mississippi, while, on the west side 2″ of that stream, it still showed a disposition to hold to the river valleys. The settled area had increased from 240,000 square miles in 1790 to 633,000 square miles in 1830, with an average of 20-3 persons to the square mile. There was still a great deal of Indian territory in the Southern States of Georgia, Alabama, and Mississippi, and in Florida, for the southern Indians were among the finest of their race; they had become semi-civilized, and were formidable antagonists to the encroaching white race. The States interested had begun preparations for their forcible removal, in public defiance of the attempts of the Federal Government to protect the Indians (1827); but the re moval was not conipleted until 1835. In the N orth, Wis- consin and Michigan, with the northern halves of Illinois and Indiana, were still very thinly settled, but everything indicated early increase of population. The first lake The steamboat, the " Walk-in-the-Water," had appeared at De- steam- troit in 1818, and the opening of the Erie Canal added to oat: the number of such vessels. Lake Erie had seven in 1896 : and in 1830, while the only important lake town, Detroit, was hardly yet more than a frontier fort, a daily line of steamers was running to it from Buffalo, carrying the in- creasing stream of emigrants to the Western territory.

200. The land system of the United States had much 'the to do with the early development of the West. From the land first settlement, the universally recognized rule had been *Ystem. that of absolute individual

property in land, with itg corollary of. unrestricted competitive or “rack” rents : and this rule was accepted fully in the national land system, whose basis was reported by Jefferson, as chairman of a committee of the Confederation Congress (1785). The public lands were to be divided into hundreds of ten miles square, each containing one hundred mile-square plots. The hundred was called a “ township,” and was afterward reduced to six miles square, of thirty-six mile-square plots of 640 acres each. From time to time principal meridians aud east and west base lines have been run, and townships have been determined by their relations to these lines, The sections (plots) have been subdivided, but the transfer describes each parcel from the survey map, as in the case of “the south-west quarter of section 20, township 80, north, range | east of the third principal meridian.” The price fixed in 1790 as a minimum was $2 per acre; it has tended to decrease, and no effort has ever been made to gain a revenue from it. When the nation acquired its Western territory it secured its title to the soil, and always made it a fundamental condition of the admission of a new State that it should not tax United States lands. To com- pensate the new States for the freedom of unsold public lands from taxation, one township in each thirty-six was reserved to them for educational purposes ; and the excel- lent public school systems of the Western States have been founded on this provision. The cost of obtaining a quarter section (160 acres), under the still later homestead system of granting lands to actual settlers, has come to be only about $26; the interest on this, at 6 per cent., represents an annual rent of one cent per acre,—making this, says F. A. Walker, as nearly as possible the “no-rent land” of the econoinists.

201. The bulk of the early westward migration was of Immigra- home production ; the great immigration from Europe did tion. not begin until about 1847 (§ 236). The West as well as the East thus had its institutions fixed before being called upon to absorb an enormous foreign element.

New political methods,

The

new organi- zation of parties.

Bank of the United States.

The Whig party.

764 UNITED

VIII. INDUSTRIAL DEVELOPMENT AND

DIVERGENCE : 1829-50.

SECTIONAL

202. The eight years after 1829 have been called “ the reign of Andrew Jackson”; his popularity, his long struggle for the presidency, and his feeling of his official ownership of the subordinate offices gave to his administration at least an appearance of Cesarism. But it was a strictly constitu- tional Ceesarism ; the restraints of written law were never violated, though the methods adopted within the law were new to national politics. Since about 1800 State politics in New York and Pennsylvania had been noted for the systematic use of the offices and for the merciless manner in which the office-holder was compelled to work for the party which kept him in place. The presence of New York and Pennsylvania politicians in Jackson’s cabinet taught him to use the same system. Removals, except for cause, had been almost unknown before; but under Jackson men were removed almost exclusively for the purpose of in- stalling some more serviceable party tool; and a clean sweep was made in the civil service. Other parties adopted the system, and it has remained the rule ata change of admin- istration until comparatively recent years (§ 323).

203. The ‘system brought with it a semi-military re- organization of parties. Hitherto nominations for the more important offices had been made mainly by legislative caucuses; candidates for president and vice-president were nominated by caucuses of Congressmen, and candidates for the higher State offices by caucuses of the State legis- latures. Late in the preceding period “conventions ” of delegates from the members of the party in the State occur in New York and Pennsylvania; and in 1831-32 this became the rule for presidential nominations. It rapidly developed into systematic State, county, and city “conventions ” ; and the result was the appearance of that complete political machinery, the American political party, with its local organizations, and its delegates to county, State, and national conventions.

The Democratic machi- nery was the first to appear, in Jackson's second term (1833-37). Its workers were paid in offices, or hopes of office, so that it was said to be built on the " cohesive power of public plunder"; but its success was immediate and brilliant. The opposing party, the Whig party, had no chance of victory in 1836; and its complete overthrow drove its leaders into the organization of a similar machin- ery of their own, which scored its first success in 1840. Since that time these strange bodies, unknown to the law, have governed the country by turns ; and their enormous growth has steadily made the organization of a third piece of such machinery more difficult or hopeless.

204. The Bank of the United States had hardly been heard of in politics until the new Democratic organization came into hostile contact with it. A semi-official demand upon it for a political appointment was met by a refusal ; and the party managers called Jackson's attention to an institution which he could not but dislike the more he considered it. His first message spoke of it in unfriendly terms, and every succeeding message brought a more open attack. The old party of Adams and Clay had by this time taken the name of Whigs, probably from the notion that they were struggling against 'the reign of Andrew Jackson," and they adopted the cause of the bank with eagerness. The bank charter did not expire until 1836, but in 1832 Clay brought up a bill for a new charter. It was passed and vetoed (§ 113); and the Whigs went into the presidential election of that year on the veto. They were beaten; Jackson was re-elected ; and the bank party could never again get a majority in the house of repre- sentatives for the charter. The insistence of the president on the poit that the charter was a "monopoly" bore

| obtain a majority in the senate.

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weight with the people.

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But the president could not He determined to take a step which would give him an initiative, and which hig opponents could not induce both houses to

unite in over-

riding or punishing. Taking advantage of the provision Remoya) that the secretary of the treasury might order the public ofthe | funds to be deposited elsewhere than in the bank or itg “posits |

branches (§ 184), he directed the secretary to deposit all the public funds elsewhere. Thus deprived of its great source of dividends, the bank fell into difficulties, became a State bank after 1836, and then went into bankruptcy.

205. All the political conflicts of Jackson’s terms of office were close and bitter. Loose in his ideas before 1829, Jackson shows a steady tendency to adopt the strictest construction of the powers of the Federal Govern- ment, except in such official perquisites as the offices. He

grew into strong opposition to all traces of the “ American Oppo system,” and vetoed bills for internal improvements unspar- ton to ingly ; and his feeling of dislike to all forms of protection a is as evident, though he took more care not to make it too aot | There are many reasons for believing that his drift ten”

public. was the work of a strong school of leaders—Van Buren, Benton (p. 788), Livingston, Taney (p. 790), Woodbury (p. 790), Cass, Marcy (p. 789), and others—who developed the policy of the party, and controlled it until the great changes of parties about 1850 took their power from them. At all events, some persistent influence made the Demo- cratic party of 1830-50 the most consistent and successful party which had thus far appeared in the United States.

206. Calhoun and Jackson were of the same stock—Calhom | Scottish-Irish, —much alike in appearance and characteris-ad | tics, the former representing the trained and educated logic Jackson

of the race, the latter its instincts and passions. Jackson was led to break off his friendly relations with Calhoun in 1830, and he had been led to do so more easily because of the appearance of the doctrine of nullification, which was generally attributed, correctly enough, to the authorship of Calhoun. Asserting, as the Republican party of 1798 had done, the

sovereign powers of each State, Calhoun held that, as a means of avoiding secession and violent struggle upon every occasion of the passage of an Act of Congress which should seem unconstitutional to any State,

the State might properly suspend or “nullify” the opera- Null tion of the law within its jurisdiction, in order to protect eaten,

its citizens against oppression. Webster, of Massachusetts, and Hayne, of South Carolina, debated the question m the senate in 1830, and the supporters of each claimed a virtual victory for their leader. The passage of the Tariff Act of 1832, which organized and systematized the pro- tective system, forced the Calhoun party into action. A State convention in South Carolina declared the Tariff Act null and not law or binding on the people of the State, and made ready to enforce the declaration.

207. But the time was past when the power of a single State could withdraw it from the Union. The president issued a proclamation, warning the people of South Carolina against any attempt to carry out the ordinance of nullift cation ; he ordered a naval force to take possession of Charleston harbour to collect the duties under the Act; he called upon Congress for additional executive powers, and Congress passed what nullifiers called the “ bloody bill,” putting the land and naval forces at the disposal of the president for the collection of duties against ‘unlaw- ful combinations ;” and he is said to have announced, privately and profanely, his intention of making Calhoun the first victim of any open conflict. Affairs looked 80 threatening that an unofficial meeting of “leading nulli- fiers” agreed to suspend the operation of the ordinance until Congress should adjourn ; whence it derived the right to suspend has never been stated.

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Tariff of

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208. The president had already asked Congress to reduce the duties ; and many Democratic members of Con- gress, who had yielded to the popular clamour for Pro- tection, were very glad to use “ the crisis” as an excuse for now voting against it. A compromise Tariff Act, scaling down all duties over 20 per cent. by one-tenth of the surplus each year, so as to bring duties to a uniform rate of 20 per cent. in 1843, was introduced by Clay and be- came law. Calhoun and his followers claimed this as all that the nullification ordinance had aimed at; and the ordinance was formally repealed. But nullification had received its death-blow ; even those Southern leaders who maintained the right of secession refused to recognize the

right of a State to remain in the Union while nullifying

its laws; and, when protection was reintroduced by the tariff of 1842, nullification was hardly thought of.

209. All the internal conditions of the United States were completely altered by the introduction of railways. For twenty years past the Americans had been pushing in every direction which offered a hope of the means of recon- ciling vast territory with enormous population. Stephen- son’s invention of the locomotive came just in time, and Jackson’s two terms of office marked the outburst of modern American life. English engines were brought over in 1829; and served as models for a year or two; and then the lighter forms of locomotives, better suited to American conditions, were introduced. The miles of railroad were 23 in 1830, 1098 in 1835, nearly 2000 in 1840, and there- after they about doubled every five years until 1860.

210. A railway map of 1840 shows a fragmentary system, designed mainly to fill the gaps left by the means of communication in use in 1830. One or two short lines

run back into the country from Savannah and Charleston ;

another runs north along the coast from Wilmington to Baltimore ; several lines connect New York with Washing- ton and other points ; and short lines elsewhere mark the Openings which needed to be filled at once—a number in New England and the middle States, three in Ohio and Michigan, and three in Louisiana. Year after year new inventions came in to increase and aid this development.

- The anthracite coal of the middle States had been known

since 1790 (§ 19), but no means had been devised to put the refractory agent to work. It was now successfully applied to railroads (1836), and to the manufacture of iron (1837). Hitherto wood had been the best fuel for iron- making ; now the States which relied on wood were driven out of competition, and production was restricted to the States in which nature had placed coal alongside of iron. Steam navigation across the Atlantic was established in 1838. The telegraph came next, Morse's line being erected in 1844. The spread of the railway system brought with it, as a natural development, the rise of the American system of express companies, whose first phases of indi- vidual enterprise appeared in 1839. No similar period in American history is so extraordinary for material devel- Opment as the decade 1830-40. At its beginning the country was an overgrown type of colonial life ; at its end American life had been shifted to entirely new lines, which it has since followed. Modern American history had burst in with the explosiveness of an Arctic summer.

211. If the steamboat had aided Western development, the railway made it a freshet. Cities and States grew as if the oxygen of their surroundings had been suddenly increased. The steamboat influenced the railway, and the Tailway gave the steamboat new powers. Vacant places In the States east of the Mississippi were filling up; the long lines of emigrant waggons gave way to the new and better methods of transport; and new grades of land were made accessible. Chicago was but a frontier fort in 1832 ; within a half-dozen years it was a flourishing

town, with eight steamers connecting it with Buffalo, and dawning ideas of its future development of railway con- nexions. The maps change from

decade to decade, as map-

makers hasten to insert new cities which have sprung up.

Two new States, Arkansas and Michigan, were admitted Admis- (1836 and 1837).. The population of Ohio leaps from sion of 900,000 to 1,500,000, that of Michigan from 30,000 to “hee 212,000, and that of the country from 13,000,000 to Michigan. 17,000,000, between 1830 and 1840.

212. With the change of material surroundings and pos- Social sibilities came a steady amelioration of social conditions condi- and a development of social ideals. Such features of the %™* past as imprisonment for debt and the cruel indifference of old methods of dealing with crime began to disappear ; the time was past when a State could use an abandoned copper-mine as its State prison. The domestic use of gas and anthracite coal, the introduction of expensive aque- ducts for pure water, and the changing life of the people forced changes in the interior and exterior of American dwellings. Wood was still the common building material; imitations of Greek architecture still retained their vogue ; but the interiors were models of comfort in comparison with the houses even of 1810. In the “new” regions this was not yet the case, and here social restraints were still so few that society seemed to be reduced almost to its

primitive elements. Western steamers reeked with gamb-

ling, swindling, duelling, and every variety of vice. Public law was almost suspended in some regions ; and organized associations of counterfeiters and horse-thieves terrorized whole sections of country. But this state of affairs was altogether temporary, as well as limited in its area ; the older and more densely settled States had been well prepared for the change and had never lost command of the social forces, and the process of settling down went on, even in the newer States, with far more rapidity than could reason-ably have been expected. Those who took part in the movements of population in 1830-40 had been trained under the rigid forms of the previous American life; and these soon re-asserted themselves. The rebound was over before 1847, and the Western States were then as well pre- pared to receive and digest the great immigration which followed as the older States would have been in 1830,

213. A distinct American literature dates from this Litera- period. Most of the publications in the United States ture. were still cheap reprints of foreign works ; but native pro- ductions no longer followed foreign models with servility. Between 1830 and 1840 Whittier, Longfellow, Holmes,

Poe, Hawthorne, Emerson, Bancroft, and Prescott joined

the advance-guard of American writers—Bryant, Dana, Halleck, Drake, Irving, and Cooper; and even those writers who had already made their place in literature showed the influence of new conditions by their growing tendency to look less to foreign models and methods than before 1830. Populareducation was improved. The new States had from the first endeavoured to secure the best possible system of common schools. The attempt came naturally from the political instincts of the class from which the migration came; but the system which resulted

was to be of incalculable service during the years to come.

Their absolute democracy and their universal use of the Common English language have made the common schools most school successful machines for converting the raw material of system. immigration into American citizens. This supreme benefit

is the basis of the system and the reason for its existence

and development, but its incidental benefit of educating

the people has been beyond calculation. It was an odd News- symptom of the general change that American newspapers papers. took a new form during these ten years. The old “ blanket- sheet” newspaper, cumbrous to handle and slow in all its

ways, met its first rival in the type of newspaper which

appeared first in New York city, in the Sun, the Herald, and the Tribune (1833, 1835, and 1841). Swift and energetic in gathering news, and fearless,

sometimes reck-

STATES

216. The Democratic theory denied the power of Con- The gress to make anything but gold or silver legal tender, “specie There have been “ paper-money heresies” in the party ; “war”

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less, in stating it, they brought into American life, with very much that is evil, a great preponderance of good.

but there were none such among the new school of Demo- cratic leaders which came in in 1829; they were ‘‘ hard-

Land 214. The chaos into which a part of Amierican society | money men.” In 1836 Jackson’s secretary of the treasury sales. had been thrown had a marked effect on the financial | ordered land agents to take nothing in payment for lands institutions of the country, which went to pieces before it | except gold or silver. In the following spring the full fora time. It had not been meant to make the public | effects of the order became evident; they fell on the lands of the United States a source of revenue so much | administration of Van Buren, Jackson’s successor. Van as a source of development. ‘The sales had touched their | Buren had been Jackson’s secretary of state, the repre- high-water mark during the speculative year 1819, when | sentative man of the new Democratic school, and, in the receipts from them had amounted to $3,274,000 ; in other | opinion of the opposition, the evil genius of the Jackson years they seldom went above $2,000,000. When the rail- | administration ; and it seemed to the Whigs poetic justice road set the stream of migration moving faster than ever, | that he should bear the weight of his predecessor’s errors. and cities began to grow like mushrooms, it was natural | The “specie circular” turned the tide of paper back to the Epeal: that speculation in land should feel the effects. Sales | Hast, and, when it was presented for payment most of the

rose to $3,200,000 in 1831, to $4,000,000 in 1833, to $5,000,000 in 1834, to $15,000,000 in 1835, and to $25,000,000 in 1836. In 1835 the president

announced to Congress that the public debt was extinguished, and that some way of dealing with the surplus should be found. Calhoun's proposal, that after the year 1836 all revenue above $5,000,000 should be divided among the States as a loan, was adopted, though only one such loan was made. The States had already taken a hand in the general speculation by beginning works of public improvement. Foreign, particularly English, capital was abundant ; and States which had been accustomed to think a dozen times over a tax of a hundred thousand dollars now began to negotiate loans of millions of dollars and to appropriate the proceeds to the digging of canals and the construction of railroads. Their enterprises were badly conceived and badly managed, and only added to the confusion when the crash came. If the Federal Government and the States felt that they were rich, the imaginations of individuals ran riot. Every one wanted to buy; prices rose, and every one was growing rich on paper. The assessed value of real estate in New York city in 1832 was $104,000,000; in 1836 it had grown to $253,000,000. In Mobile the assessed value rose from $1,000,000 to $27,000,000. Fictitious values were the rule everywhere.

215. When Jackson (1833) ordered the Government revenues to be deposited elsewhere than in the Bank of the United States (§ 204), there was no Government agent to receive them. 'The secretary of the treasury selected banks at various points in which the revenue should be deposited by the collecting officers ; but these banks were organized under charters from their States, as were all banks except that of the United States. The theory of the dominant party denied the constitutional power of Congress to charter a bank, and the States had not yet learned how to deal with such institutions. Their grants of bank charters had been based on ignorance, intrigue, favouritism, or corruption, and the banks were utterly

Corpora- unregulated. The democratic feeling was that the privilege

tions.

of forming banking corporations should be open to all citizens, and it soon became so. Moreover it was not until after the crash that New York began the system of com- pelling such deposits as would really secure circulation, which was long afterward further developed into the pre- sent national bank system. In most of the States banks could be freely organized with or

without tangible capital, and their notes could be sent to the West for the purchase of Government lands, which needed to be held but a month or two to gain a handsome profit. “ Wild-cat banks” sprang up all over the country ; and the “pet banks,” as those chosen for the deposit of Government revenues were called by their rivals, went into speculation as eagerly as the banks which hardly pretended to have capital.

banks suspended specie payment with hardly a struggle, There was no longer a thought of buying; every one wanted to sell ; and prices ran down with a rapidity even more startling than that with which they had risen. Failures, to an extent and on a scale unprecedented in the United States, made up the “panic of 1837.” Many of the States had left their bonds in the hands of their agents, and, on the failure of the latter, found that the bonds had been hypothecated or disposed of, so that the States got no return from them except a debt which was to them enormous. Saddled suddenly with such a burden, and unable even to pay interest, many of the States “repudiated” their obligations; and repudiation was made successful by the fact that a State cannot be sued except by its own consent (§ 65). Even the Federal Government felt the strain, for its revenues were locked up in suspended banks. A little more than a year after Congress had authorized the distribution of its surplus revenues among the States Van Buren was forced to call it into special session to provide some relief for the Government itself.

217. Van Buren held manfully to the strictest con- struction of the powers of the Federal Government. insisted that the panic would best right itself without Government interference, and, after a four years’ struggle, he succeeded in making the “ sub-treasury scheme” law (1840). It cut off all connexion of the Government with banks, putting collecting and disbursing officers under bonds to hold money safely and to transfer it under orders from the treasury, and restricting payments to or by the United States to gold and silver. Its passage had been preceded by another commercial crisis (1839), more limited in its field, but more discouraging to the people. It is true that Jackson, in dealing with the finances, had ‘simply smashed things,” leaving his successor to repair damages ; but it is far from certain that this was not the best way available at the time. The wisest scheme of financial reform would have had small chance of success with the land-

jobbers in Congress ; and Van Buren’s firm- ness found the way out of the chaos.

218. Van Buren’s firmness was unpopular ; Whig party now adopted methods which were popular, somewhat demagogical. It nominated Harrison in 1840; it contrasted his homely frontier virtues with Van Buren’s “ostentatious indifference to the misfortunes of the people ” and with the supposed luxury of his life in the White House; and, after the first of the modern “ caDr paigns” of mass meetings and processions, Harrison was elected. He died soon after his inauguration (1841), and the vice-president, Tyler, became president. Tyler was of the extreme Calhoun school, which had shown some disposl- tion to grant to Van Buren a support which it had refused to Jackson ; and the Whigs had nominated Tyler to retain his faction with them. Now he was the nominal leader of

Panic of —

1837.

Repudia- tion.

He:

Sub- treasury scheme,

and the Election if of 1840.

1833-1848.] UNITED

the party, while his politics were opposite to theirs, and the real leader of the party, Clay, was ready to force a quarrel upon him. The quarrel took place; the Whig majority in Congress was not large enough to pass any measures over Tyler’s veto; and the first two years of his administration were passed in barren conflict with his party. The “sub-treasury” law was repealed (1841) ; Caniff of the tariff of 1842 introduced a modified protection ; and 842, there the Whigs were forced to stop. Their dissensions) made Democratic success comparatively easy, and Tyler . had the support of a Democratic house behind him during

the last two years of his term.

219. The success of the Democratic machinery, and the reflex of its temporary check in 1840, with the influences brought to bear on it by the returning Calhoun faction, were such as to take the control of the party out of the hands of the leaders who had formed it. They had had high regard for political principle, even though they were willing to use doubtful methods for its propagation ; these methods had now brought out new men, who looked mainly to success, and to close connexion with the con- trolling political element of the South as the easiest means of attaining success. When the Democratic con- vention of 1844 met it was expected to renominate Van Buren. A majority of the delegates had been sent there for that purpose, but many of them would have been glad to be prevented from doing so. They allowed a resolution to be passed making a two-thirds vote necessary for nomination ; Van Buren was unable to command so many votes; and, when his name was withdrawn, Polk was nominated. The Whigs nominated Clay. boli- 220. The beginning of the abolitionist movement in the United States, the establishment of the Liberator (1831) it ®2d of the American Anti-Slavery Society (1833), and the subsequent divisions in it, are given elsewhere (see Lincy. Grit., vol. x. pp. 86, 87). Up to that time “abolition ” had meant gradual abolition; it was a wish rather than a purpose. Garrison called for immediate abolition. The basis of the American system was in the reserved rights of the States, and slavery rested on their will, which was not likely to be changed. But the cry was kept up. The mission of the abolitionists was to force the people to think of the question ; and, in spite of riots, assaults, and per- secution of every kind, they fulfilled it manfully. It was inevitable that, as the Northern people were brought un- willingly to think of the question, they should look with hew eyes on many of its phases; while in the South many who might dislike slavery were disposed to resist the interferences with State rights which the new proposal involved. In truth, slavery was more and more out of harmony with the hew economic conditions which were rapidly taking com- plete control of the North and West, but had hardly been felt in the South. Thus the two sections, North and South, were more and more disposed to take opposite views of everything in which slavery was involved, and it had a faculty of involving itself in almost everything. The Status of slavery in the Territories had been settled in 1820 (§ 197); that of slavery in the States had

been settled by the constitution; but even in minor questions the intru- sive element had to be reckoned with. The abolitionists Sent their documents through the mails, and the South wished the Federal Government to interfere and stop the practice. The abolitionists persisted in petitioning Con- gress for the passage of various measures which Congress regarded as utterly unconstitutional ; and the disposition of Congress to deny or regulate the right of petition in such matters excited the indignation of Northern men who had no sympathy with abolition. But the first occasion on which the views of the two sections came into flat con- trast was on the question of the annexation of Texas,

PTrATES 167

221, ‘The United States had had a vague claim to Texas Texas, until 1819, when the claim was surrendered to Spain in part compensation for Florida. On the revolt of Mexico,

Texas became a part of that republic. It was colonized by Americans, mainly Southerners and slave-holders, and seceded from Mexico in 1835, defeating the Mexican armies and establishing its independence. Southern poli- ticians desired its annexation to the United States for many reasons. Its people were kindred to them ; its soil would widen the area of slavery ; and its territory, it was hoped, could be divided into several States, to reinforce the Southern column in the senate. People in the North were either indifferent or hostile to the proposal ; Van Buren had declared against it, and his action was the secret reason for his defeat in the Democratic convention. On the other hand, there were indications that the joint Oregon. occupation of the Oregon country (§ 192) could not last much longer. American immigration into it had begun, while the Hudson’s Bay Company, the English tenant of the soil, was the natural enemy of immigration. To carry the sentiment of both sections, the two points were coupled ; and the Democratic convention declared for the reannexation of Texas and the reoccupation of Oregon.

222. One of the cardinal methods of the political abolitionists was to nominate candidates of their own against a doubtful friend, even though this secured the election of an open enemy. Clay’s efforts to guard his Liberty condemnation of the Texas annexation project were just Party. enough to

push the Liberty party, the political aboli- tionists, into voting for candidates of their own in New York ; on a close vote their loss was enough to throw the electoral votes of that State to Polk, and its votes decided the result. Polk was elected (November 1844); and Texas Election was annexed to the United States in the following spring. of 1844. At the next meeting of Congress (1845) Texas was Admis- admitted as a State. sion of

223. West of Texas the northern prolongation of Te: Mexico ran right athwart the westward movement of American population; and, though the movement had not yet reached the barrier, the Polk administration desired further acquisitions from Mexico. The western boundary of Texas was undefined ; a strip of territory claimed by Texas was settled exclusively by Mexicans; but the Polk administration directed Taylor, the American commander in Texas, to cross the Nueces river and seize the disputed territory. Collisions with Mexican troops followed ; they were beaten in the battles of Palo Alto and Resaca de la Palma, and were chased across the Rio Grande. Taylor followed, took the city of Monterey, and established him- self far within northern Mexico,

224. On the news of the first bloodshed Congress War with declared war against Mexico, over the opposition of the Mexico. Whigs.

Slavery in the new terri- tory.

“Squatter

sove- reignty.”

Wilmot proviso.

Free Soil party.

Election of 1848.

Admis- sion of Cali-

fornia.

500,000 square miles to the area of the United States ; Texas itself made up some 375,000 square miles more. The settlement of the north-west boundary between Oregon and British Columbia (§ 221), giving its own share to each country (1846), with the Texas and Mexican cessions, gave the United States the complete territorial form retained until the annexation of Alaska in 1867.

225. In the new territory slavery had been forbidden under Mexican law; and its annexation brought up the question of its status under American law. He who re- members the historical fact that slavery had never been more than a custom, ultimately recognized and protected by State law, will not have much difficulty in deciding about the propriety of forcing such a custom by law upon any part of a territory. But, if slavery was to be ex- cluded from the new territory, the States which should ultimately be formed out of it would enter as free States, inclined to take an anti-slavery view of doubtful questions; and the influence of the South in the senate would be decreased. For the first time the South appears as a dis- tinct imperium in imperio in the territorial difficulties which began in 1848.

226. The first appearance of these difficulties brought out in the Democratic party a solution which was so closely in line with the prejudices of the party, and apparently so likely to meet all the wishes of the South, that it bade fair to carry the party through the crisis without the loss of its Southern vote. This was “squatter sovereignty,” the notion that it would be best for Congress to leave the people of each territory to settle the question of the exist- ence of slavery for themselves. cratic ground for the party would have been that which it at first seemed likely to take—the ‘ Wilmot proviso,” a condition proposed to be added to the Act authorizing acquisitions of territory, providing that slavery should be forbidden in all territory to be acquired under the Act. In the end apparent expediency carried the dominant party off to “squatter sovereignty,” and the Democratic adherents of the Wilmot proviso, with the Liberty party and the anti-slavery Whigs, united in 1848 under the name of the Free Soil party. The Whigs had no solution to offer ; their entire programme, from this time to their downfall as a party, consisted in a persistent effort to evade or ignore all difficulties connected with slavery.

227. Taylor, after the battle of Buena Vista, resigned and came home, considering himself ill-used by the ad- ministration. He refused to commit himself to any party ; and the Whigs were forced to accept hii as their candidate in 1848. The Democrats nominated Cass ; and the Free Soil party, or “ Free-Soilers,” nominated Van Buren. By the vote of the last-named party the Democratic candidate cost New York and the election, and Taylor was elected president. Taking office in 1849, he had on his shoulders the whole burden of the territorial difficulties, aggravated by the discovery of gold in California and the sudden rise of population there. Congress was so split into factions that it could for a long time agree upon nothing ; thieves and outlaws were too strong for the semi-military govern- ment of California ; and the people of that Territory, with the approval of the president, proceeded to form a con- stitution and apply for admission as a State. They had so framed their constitution as to forbid slavery; and this was really the application of the Wilmot proviso to the richest part of the new territory, and the South felt that it had been robbed of the cream of what it alone had fought cheerfully to obtain.

228. The admission of California was not secured until September 1850, just after Taylor’s sudden death, and then only by the addition of a bonus to Texas, the division of the rest of the Mexican cession into the Territories of

The broader and demo- .

STATES

Utah and New Mexico without mention of slavery, and the passage of a Fugitive Slave Law. The slave trade, but not slavery, was forbidden in the District of Columbia. The whole was generally known as the compromise of 1850, Compr. Two of its features need notice. As has been said, slavery mise of was not mentioned in the Act; and the status of slavery 180. in the Territories was thus left uncertain. Congress can veto any legislation of a Territorial legislature, but, in fact, the two houses of Congress were hardly ever able to unite on anything after 1850, and both these Territories

did establish slavery before 1860, without a Congressional veto. The advantage here was with the South. The other point, the Fugitive Slave Law, was a special demand a |

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of the South. The constitution contained clauses directing Slave that fugitive criminals and slaves should be delivered up, on requisition, by the State to which they had fled (§ 124).

In the case of criminals the delivery was directed to be made by the executive of the State to which they had fled ;

in the case of slaves no delivering authority was specified, \ and an Act of Congress in 1793 had imposed the duty on ! Federal judges or on local State magistrates. Some of the States had passed “personal liberty laws,” forbidding or Personal limiting the action of their magistrates in such cases ; and liberty the Act of 1850 transferred the decision of such cases to #™* United States commissioners, with the assistance of United States marshals. It imposed penalties on rescues, and denied a jury trial. All the ill-effects of the law were not

felt until a year or two of its operation had passed (§ 244).

229. The question of slavery had taken up so much time in Congress that its other legislation was compara- tively limited. The rates of postage were reduced to five and ten cents for distances less and greater than 300 miles (1845); and the naval school at Annapolis was established the same year. The military school at West Point had been established in 1794. When the Democratic party had obtained complete control of the government, it re-established the ‘sub-treasury,” or independent treasury (1846), which is still the basis of the treasury system. In ‘anf the same year, after an exhaustive report by Robert J. Uo Walker, Polk’s secretary of the treasury, the tariff of 1846 was passed ; it reduced duties, and cut out all forms of protection. With the exception of a slight additional re- duction of duties in 1857, this remained in force until 1861,

230. Five States were admitted during the last ten Adms years of this period,—Florida (1845), Texas (1845), lowa CA (1846), Wisconsin (1848), and California (1850). The early entrance of Iowa, Wisconsin, and Florida had been and Wis- due largely to Indian wars, —the Black Hawk war in Iowa consin and Wisconsin (1832), and the Seminole war in Florida (1835-

37), after each of which the defeated Indians were compelled to cede lands as the price of peace. The ex- tinction of Indian titles in northern Michigan brought about the discovery of the great copper fields of that region, whose existence had been suspected long before it

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could be proved. Elsewhere settlement followed the lines already marked out, except in the new possessions on the , Pacific coast, whose full possibilities were not yet known,

Railroads in the Eastern States were beginning to show ed something of a connected system; in the South they had be hardly changed since 1840; in the West they had only § been prolonged on their original lines. The telegraph, which was to make man master of even the longest and most complicated systems, was brought into use in 1844 ; but it is not until the census of 1860 that its effects are seen in the fully connected network of railroads which then covers the whole North and West (§ 273).

231. The sudden development of wealth in the country ae gave an impetus to the spirit of invention. Goodyear s “* method of vulcanizing rubber (1839) had come into usé M‘Cormick had made an invention whose results have

1845-1850. | UN PT ED

been hardly less than that of the locomotive in their im- portance to the United States. He had patented a reap- ing-machine in 1834, and this, further improved and supplemented by other inventions, had brought into play the whole system of agricultural machinery whose exist- ence was scarcely known elsewhere until the London “World’s Fair” of 1851 brought it into notice. It was agricultural machinery that made Western farms profitable and enabled the railroads to fill the West so rapidly (§ 278). A successful sewing-machine came in 1846; the power- loom and the surgical use of anzesthetics in the same year ; and the rotary press for printing in 1847.

232. All the conditions of life were changing so rapidly that it was natural that the minds of men should change with them or become unsettled. This was the era of new sects, of communities, of fantastic proposals of every kind, of transcendentalism in literature, religion, and politics. Not the most fantastic or benevolent, but certainly the most successful, of these was the sect of Mormons, or Latter-day Saints. They settled in the new Territory of Utah in 1847, calling their capital Salt Lake City, and spreading thence through the neighbouring Territories. There they have become a menace to the American sys- tem ; their numbers are so great that it is against American instincts to deprive them of self-government and keep them under a Congressional despotism ; while their poly- gamy and submission to their hierarchy make it impossible to erect them into a State which shall have complete con- trol of marriage and divorce.

233. The material development of the United States since 1830 had been extraordinary, but every year made it more evident that the South was not sharing in it. It is plain now that the fault was in the labour system of the South : her only labourers were slaves, and a slave who was fit for anything better than field labour was prima Jacie a dangerous man. The process of divergence had as yet gone only far enough to awaken intelligent men in the South to the fact of its existence, and to stir them to efforts as hopeless as they were earnest, to find some artificial Stimulus for Southern industries. In the next ten years the process was to show its effects on the national field, –

IX, TENDENCIES TO DISUNION: 1850-61,

234. The abolitionists had never ceased to din the iniquity of slavery into the ears of the American people. ‘Calhoun, Webster, and Clay, with nearly all the other political leaders of 1850, had united in deploring the wickedness of these fanatics, who were persistently stirring Up a question which was steadily widening the distance between the sections. They mistook the symptom for the disease. Slavery itself had put the South out of harmony with its surroundings, and still more out of harmony with the inevitable lines of the country’s development. Even in 1850, though they hardly yet knew it, the two sections had drifted so far apart that they were practically two different countries. 235. The case of the South was one of

arrested develop- .» Ment. The South remained very much as in 1790 ; while other parts of the country had developed, it had stood still. The remnants of colonial feeling, of class influence, which advancing democracy had wiped out elsewhere, retained all their force here, aggravated by the effects of an essentially aristocratic system of employment. The ruling class had to maintain a military control over the labouring class, and @ class influence over the poorer whites. It had even Secured in the constitution provision for its political power in the representation given to three-fifths of the slaves, The twenty additional members of the house of represen- _ ‘latives were not simply a gain to the South; they were still more a gain to the “black districts,” where whites

were few, and the slave-holder controlled the district. Slave-owners and slave-holders together, there were but 350,000 of them ; but they had common interests, the intelligence to see them, and the courage to contend for them. The first step of a rising man was to buy slaves ; and this was enough to enroll him in the dominant class. From it were drawn the representatives and senators in Congress, the governors, and all the holders of offices over which the “slave power,” as it came to be called, had control. Not only was the South inert; its ruling class, its ablest and best men, were united in defence of tendencies which were alien and hostile to those of the rest of the country.

236. Immigration into the United States was not an Immigra~ important factor in its development until about 1847, tion. The immigrants, so late as 1820, numbered but 8000 per annum ; their number did not touch 100,000 until 1842, and then it fell for a year or two almost to half that number, In 1847 it rose again to 235,000, in 1849 to 300,000, and in 1850 to 428,000; all told, more than two and a quarter million persons from abroad settled in the United States between 1847 and 1854. Taking the lowest estimates—$80 each for the actual amount of money brought in by immigrants, and $800 each for their in- dustrial value to the country,—the wealth-increasing in- fluence of such a stream of immigration may be calculated. Its political effects were even greater, and were all in the same direction. Leaving out the dregs of the immigra- tion, which settled down in the seaboard cities, its

best part was a powerful nationalizing force. It had not come to any particular State, but to the United States 3 it had none of the traditional prejudices in favour of a State, but a strong feeling for the whole country ; and the new feel- ings which it brought in must have had their weight not only on the gross mass of the people, but on the views of former leaders. And all the influences of this enormous immigration were confined to the North and West, whose divergence from the South thus received a new impetus. The immigration avoided slave soil as if by instinct. So late as 1880 the census reports that the Southern States, except Florida, Louisiana, and Texas, are “ practically with- out any foreign element”; but it was only in 1850-60 that this differentiating circumstance began to show itself plainly. And, as the sections began to differ further in aims and policy, the North began to gain heavily in ability to ensure its success,

237. Texas was the last slave State ever admitted ; and, The sec- as it refused to be divided, the South had no further tious in increase of numbers in the senate. Until 1850 the ad- Congress mission of a free State had been so promptly balanced by the admission of a slave State that the senators of the two sections had remained about equal in number ; in 1860 the free States had 36 senators and the slave States only 30. As the representation in the house had changed from 35 free State and 30 slave State members in 1790 to 147 free State and 90 slave State in 1860, and as the electors are the sum of the numbers of senators and representatives, it is evident that political power had passed away from the South in 1850. If at any time the free States should unite they could control the house of representatives and the senate, elect the president and vice-president, dictate the appointment of judges and other Federal officers, and make the laws what they pleased. If pressed to it, they could even control the interpretation of the laws by the Supreme Court. No Federal judge could be removed except by impeachment (§ 121), but an Act of Congress could at any time increase the number of judges to any extent, and the appointment of the additional judges could reverse the opinion of the court. All the interests of the South depended on the one question whether the free States would unite or not.

Ten- 238. In circumstances so critical a cautious quiescence | tive duty of protecting it. This, if it should become the

eo and avoidance of public attention was the only safe course | general Southern position, was certain to destroy the notion

eee for the “slave power,” but that course had become im- | of squatter sovereignty (§ 226), and thus to split the Demo- possible. The numbers interested had become too large | cratic party, which was alinost the last national ligament to be subject to complete discipline ; all could not be held | that now held the two fragments of the Union together, in cautious reserve ; and, when an advanced proposal came 242. The social disintegration was as rapid. Northern Social from any quarter of the slave-holding lines, the whole army | men travelling in the South were naturally looked upon ‘ivex. was shortly forced up to the advanced position. Every | with increasing suspicion, and were made to feel that they movement of the mass was necessarily aggressive ; and | were on a soil alien in sympathies. Some of the worst aggression meant final collision. If collision came, it must | phases of democracy were called into play in the South; be on some question of the rights of the States ; and on | and, in some sections, law openly yielded supremacy to such a question the whole South would move as one man. | popular passion in the cases of suspected abolitionists, Everything thus tended to disunion. Southern conventions, on all sorts of subjects, became

Sec- 239. The Protestant churches of the United States had | common ; and in these meetings, permeated by a dawning

tarian reflected in their organization the spirit of the political | sense of Southern nationality, hardly any proposition look-

divi- institutions under which they lived. Acting as purely vol- | ing to Southern independence of the North was met with

sioo- _untary associations, they had been organized into govern- | disfavour. In State elections a distinctly disunion element ments by delegates, much like the “conventions” which | appeared ; and, though it was defeated, the majority did had been evolved in the political parties (§ 203). The | not deny the right of secession, only its expediency. omnipresent slavery question

intruded into these bodies, 243. Calhoun, in his last and greatest speech, called Progms _ and split them. The Baptist Church was thus divided into | attention to the manner in which one tie after another was “tis a Northern and a Southern branch in 1845, and the equally | snapping. But he ignored the real peril of the situation ™™ powerful Methodist Church met the same fate the following | —its dangerous facts: that the South was steadily grow- year. Two of the four great Protestant bodies were thus no | ing weaker in comparison with the North, and more unable longer national ; it was only by the most careful manage- | to secure a wider area for the slave system ; that it was ment that the integrity of the Presbyterian Church was | therefore being steadily forced into demanding active Con- maintained until 1861, when it also yielded ; and only the | gressional protection for slavery in the Territories; that Episcopal and Roman Catholic Churches retained their | the North would never submit to this ; and that the South national character. If the process of disruption did not | must submit to the will of the majority or bring about a extend to other sects, it was because they were already | collision by attempting to secede. i mainly Northern or mainly Southern. 244. Anti-slavery feeling in the North was stimulated Fugitive °

Party 240. The political parties showed the same tendency. | by the manner in which the Fugitive Slave Law (§ 228) Slave

changes. Each began to shrivel up in one section or the other. The | was enforced immediately after 1850. The chase after ‘7 notion of “squatter sovereignty,” attractive at first to the | fugitive slaves was prosecuted in many cases with circum- Western democracy, and not repudiated by the South, | stances of revolting brutality, and features of the slave enabled the Democratic party to pass the crisis of 1850 | system which had been tacitly looked upon as fictitious without losing much of its Northern vote, while Southern | were brought home to the heart of the free States. The Whigs began to drift in, making the party continually more | added feeling showed its force when the Kansas-Nebraska Kansas pro-slavery. This could not continue long without begin- | Act was passed by Congress (1854). It organized the two a ning to decrease its Northern vote, but this effect did not | new Territories of Kansas and Nebraska. Both of them” * become plainly visible until after 1852. The efforts of the | were for ever free soil by the terms of the Missouri com- Whig party to ignore the great question

alienated its anti- | promise (§ 197). But the success of the notion of squatter slavery members in the North, while they did not satisfy | sovereignty in holding the Democratic party together while its Southern members. The Whig losses were not at first | destroying the Whig party had intoxicated Douglas and heavy, but, as the electoral vote of each State is deter- | other Northern Democrats ; and they now applied the doc mined by the barest plurality of the popular vote, they | trine to these Territories. They did not desire “to vote were enough to defeat the party almost everywhere in | slavery up or down,” but left the decision to the people of

Election the presidential election of 1852. The Whigs nominated | the two Territories.

of 1852. Scott and the Democrats Pierce; and Pierce carried all 245. This was the grossest political blunder in American but four of the thirty-one States, and was elected. This | history. The status of slavery had been settled, by the revelation of hopeless weakness was the downfall of the | constitution or by the compromises of 1820 and 1850, on Whig party ; it maintained its organization for four years | every square foot of American soil; right or wrong, the longer, but the life had gone out of it. The future was | settlement was made. The Kansas-Nebraska Act took a with the Free Soil party, though it had polled but few | great mass of territory out of the settlement and flung it votes in 1852. into the arena as a prize for which the sections were to

Changes 241. During the administration of Taylor (and Vice- | struggle; and the struggle always tended to force, as the

ae President Fillmore, who succeeded him) Clay, Webster, | only arbiter. The first result of the Act was to throw

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Calhoun, Polk, and Taylor were removed by death, and there was a steady drift of other political leaders out of public life. New men were pushing in everywhere, and in both sections they showed the prevailing tendency to dis- union. ‘The best of them were unprecedentedly radical. Sumner, Seward, and Chase came into the senate, bringing the first accession of

recognized force and ability to the anti-slavery feeling in that body. The new Southern men, such as Davis, and the Democratic recruits from the Southern Whig party, such as Stephens, were ready to take the ground on which Calhoun had always insisted— that Congress was bound not merely to the negative duty of not attacking slavery in the Territories, but to the posi-

parties into chaos, An American or “ Know-Nothing” ” ih party, a secret oath-bound organization, pledged to oppose the influence or power of foreign-born citizens, had been party.” formed to take the place of the defunct Whig party. It had been quite successful in State elections for a time, and was now beginning to have larger aspirations. It, like the Whig party, intended to ignore slavery, but, after a few years of life, the questions complicated with slavery entered its organization and divided it also. Even m 1854 many of its leaders in the North were forced to take position against the Kansas-Nebraska Act, while hosts of others joined in the opposition without any party organization. No American party ever rose so swiftly as

. this latter ; with no other party name than the awkward

title of “‘ Anti-Nebraska men,” it carried the Congressional elections of 1854 at the North, forced many of the former Know-Nothing leaders into union with it, and controlled the house of representatives of the Congress which met in 1855. The Democratic party, which had been practically the only party since 1852, had now to face the latest and strongest of its broad-constructionist opponents, one which with the nationalizing features of the Federal and Whig parties combined democratic feelings and methods, and, above all, had a democratic purpose at bottom. It acknowledged, at first, no purpose aimed at slavery, only an intention to exclude slavery from the Territories ; but, under such principles, it was the only party which was potentially an anti-slavery party, the only party to which the enslaved labourer of the South could look with the faintest hope of aid in reaching

the status of a man. The new party had grasped the function which belonged of right to its great opponent, and it seized with it its opponent's original title. The name Democrat had quite taken the place of that first used—Republican (§ 150), but the latter had never passed out of popular remembrance and liking at the North. The new party took quick and skilful advantage of this by assuming the old name, and early in 1856 the two great parties of the next thirty years— the Democratic and Republican parties—were drawn up against one another.

246. The foreign relations of the United States during Pierce's term of office were overshadowed by the domestic difficulties, but were of importance. In the Koszta case (1853) national protection had been afforded on foreign soil to a person who had only taken the preliminary steps to naturalization. Japan had been opened to American intercourse and commerce (1854). But the question of slavery was more and more thrusting itself even into for- eign relations. A great Southern republic, to be founded at first by the slave States, but to take in gradually the whole territory around the Gulf of Mexico and include the West Indies, was soon to be a pretty general ambition among slave-holders, and its first phases appeared during Pierce's administration. Efforts were begun to obtain Cuba from Spain; and the three leading American ministers abroad, meeting at Ostend, united in declaring the possession of Cuba to be essential to the well-being of the United States (1854). 'Filibustering " expeditions against Cuba or the smaller South American states, intended so to revolutionize them as to lay a basis for an application to be annexed to the United States, became common, and taxed the energies of the Federal Government for their prevention. All these, however, yielded in interest and importance to the affairs in Kansas.

247. Nebraska was then supposed to bea desert, and attention was directed almost exclusively to Kansas. No sooner had its organization left the matter of slavery to be decided by its "' people" than the anti-slavery people of the North and West felt it to be their duty to see that the "people" of the Territory should be anti-slavery in sympathy. Emigrant associations were formed, and these shipped men and families to Kansas, arming them for their protection in the new country. Southern newspapers called for similar measures in the South, but the call was less effective. Southern men without

slaves, settling a new State, were uncomfortably apt to prohibit slavery, as in California. Only slave-holders were trusty pro- Slavery men; and such were not likely to take slaves to Kansas, and risk their ownership on the result of the struggle. But for the people of Missonri, Kansas would have been free soil at once. Lying across the direct road to Kansas, the Missouri settlers blockaded the way of free- State settlers, crossed into Kansas, and voted profusely at

jurisdiction over its own affairs.

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the first Territorial election. Their votes chose a Terri- torial legislature which gave a complete code of slave laws

to the Territory. Passing to the north of Missouri the “free-State settlers” entered Kansas to find that their opponents had secured the first position. This bronght

out the fundamental difference between a Territory—under

the absolute control of Congress and only privileged in certain branches of legislation—and a State with complete Finding themselves cut

off from control of the former, the free-State settlers determined to attempt to substitute the latter. They organized a State government (1855), and applied for Free- admission by Congress. Such irregular erections of States State had been known before ; and, though they were confessedly a aa not binding until confirmed by Congress, the Democratic , party had always been tender with them, and prone to seek a compromise with them. A symptom of the process which had been making the Democratic party pro-slavery

was seen in the attitude which the Democratic adminis- tration now took towards the inchoate State of Kansas. Never thinking of compromise, it pounced on the new organization, scattered it, arrested its leaders, and ex- pressed a hesitating desire to try them for treason (1856). Nevertheless, the free-State settlers gave no further obed- ience to the Territorial government,

as the pro-slavery settlers refused to recognize the pseudo-State government,

and the struggle passed into a real civil war, the two powers mustering considerable armies, fighting battles, capturing towns, and paroling prisoners. The struggle was really over in 1857, and the South was beaten. It could not compete with the resources and enthusiasm of

the other section; its settlers were not unanimous, as their Opponents were ; and the anti-slavery settlers were in a great majority. There were, however, all sorts of obstacles

yet to be overcome before the new State of Kansas was recognized by Congress, after the withdrawal of the senators of the seceding States (1861).

248. In the heat of the Kansas struggle came the Election presidential election of 1856. The Democrats nominated of 1856. Buchanan, declaring, as usual, for the strictest limitation of the powers of the Federal Government on a number of points specified, and reaffirming the principle of the Kansas-Nebraska Act—the settlement of slavery by the people of the Territory. The remnant of the Whig party, including the Know-Nothings of the North and those Southern men who wished no further discussion of slavery, nominated the president who had gone out of office in 1853, Fillmore. The Republican party nominated Fre- mont; the bulk of its manifesto was taken up with pro- tests against attempts to introduce slavery into the Terri- tories ; but it showed its broad-construction tendencies by declaring for appropriations of public moneys for internal improvements. The Democrats were successful in electing Buchanan ; but the position of the party was quite different from the triumph with which it had come out of the elec- tion of 1852. It was no longer master of twenty-seven of the thirty-one States ; all New England and New York, all the North-West but Indiana and Illinois, all the free States but five, had gone against it; its candidate no longer had a majority of the popular vote, but was chosen by a majority of the electoral votes ; and it had before it a party with nearly as many popular votes as its own, the control of most of the strongest section of the Union, and an enthusiasm which was more dangerous still. For the first time in the history of the country a distinctly anti- slavery candidate had obtained an electoral vote, and had even come near obtaining the

presidency. Fillmore had carried but one State, Maryland ; Buchanan had carried the rest of the South, with a few States in the North, and Fremont the rest of the North and none of the South,

The Dred Scott decision.

Admis- sion of Minne- sota and Oregon.

John Brown's raid.

If things had gone so far that the two sections were to be constituted into opposing political parties, it was evident that the end was near.

249. Oddly enough, the constitutionality of the com- promise of 1820 (§ 197) had never happened to come before the Supreme Court for consideration. In 1856-57 it came up for the first time. One Dred Scott, a Missouri slave who had been taken to the Territory covered by the compromise, and had therefore sued for his freedom, was sold to a citizen of another State. Scott then transferred his suit from the State to the Federal courts, under the power given to them to try suits between citizens of different States, and the case came by appeal to the Supreme Court. Its decision was announced at the begin- ning of Buchanan's administration. It put Scott out of court on the ground that a slave, or the descendant of slaves, could not be a citizen of the United States or have any standing in Federal courts. The opinion of the chief- justice went on to attack the validity of the Missouri com- promise, for the reasons that one of the constitutional functions of Congress was the protection of property ; that slaves had been recognized as property by the constitution ; and that Congress was bound to protect, not to prohibit, slavery in the Territories. The mass of the Northern people held that slaves were looked on by the constitution, not as property, but as "persons held to service or labour" by State laws ; that the constitutional function of Con- gress was the protection of liberty as well as property ; and that Congress was thus bound to prohibit, not to pro- tect, slavery in the Territories. Another step in the road to disunion was thus taken, as the only peaceful interpreter of the constitution was pushed out of the way The North flouted the decision of

the Supreme Court, and the storm of angry dissent which it aroused did the disunionists good service at the South. From this time the leading news- papers in the South maintained that the radical Southern view first advanced by Calhoun, and but slowly accepted by other Southern leaders, as to the duty of Congress to protect slavery in the Territories, had been confirmed by the Supreme Court ; that the Northern Republicans had rejected it ; and that even the squatter sovereignty theory of Northern Democrats could no longer be submitted to by the South.

250. The population of the United States in 1860 was over 31,000,000, an increase of more than 8,000,000 in ten years. As the decennial increases of population became larger, so did the divergence of the sections in population, and still more in wealth and resources. Two more free States came in during this period—Minnesota (1858) and Oregon (1859),—and Kansas was clamouring loudly for the same privilege. The free and slave States, which had been almost equal in population in 1790, stood now as 19 to 12. And of the 12,000,000 in slave States, the 4,000,000 slaves and the 250,000 free blacks were not so much a factor of strength as a possible source of weak- ness and danger. No serious slave rising had ever taken place in the South ; but the sudden flaming out of John Brown's insurrection (1859), and the alarm which it car- ried through the South, were tokens of a danger which added a new horror to the chances of civil war. It was not wonderful that men, in the hope of finding some com- promise by which to avoid such a catastrophe, should be willing to give up everything but principle and even to trench sharply upon principle itself, nor that offers of com- promise should urge Southern leaders farther into the fatal belief that "the North would not fight."

251. Northern Democrats, under the lead of Douglas, had been forced already almost to the point of revolt by the determination of Southern senators to prevent the admission of Kansas as a free State, if not to secure her

admission as a slave State. When the Democratic con- Division vention of 1860 met at Charleston, the last strand of the of the last national political organization parted ; the Democratic Demo- party itself was split at last by

the slavery question, = The Southern delegates demanded a declaration in favour? of the duty of Congress to protect slavery in the Territories,

It was all that the Douglas Democrats could then do to maintain themselves in a few Northern States; such a declaration meant political suicide everywhere, and they voted it down. The convention divided into two bodies, The Southern body adjourned to Richmond, and the Northern and border State convention to Baltimore, Here the Northern delegates, by seating some delegates friendly to Douglas, provoked a further secession of border State delegates, who, in company with the Rich- mond body, nominated Breckinridge (p. 788) and Lane for president and vice-president. The remainder of the origi-

nal convention nominated Douglas and H. V. Johnson.

252. The remnant of the old Whig and Know-Nothing Constita. parties, now calling itself the Constitutional Union party, tional met at Baltimore and nominated Bell (p. 788) and Everett, Uniou The Republican convention met at Chicago. Its “plat- i: = form” of 1856 had been somewhat broad constructionist in al | its nature and leanings, but a strong Democratic element party, in the party had prevented it from going too far in this direction. The election of 1856 had shown that, with the votes of Pennsylvania and Illinois, the party would then have been successful, and the Democratic element was now ready to take almost anything which would secure the votes of these States. This state of affairs will go to explain the nomination of Lincoln, of Illinois, for president, with Hamlin, a former Democrat, for vice-president, and the declaration of the platform in favour of a protective tariff. The mass of the platform was still devoted to the necessity of excluding slavery from the Territories. To sum up: the Bell party wished to have no discussion The of slavery; the Douglas Democrats rested on squatter Pav sovereignty and the compromise of 1850, but would ac slavery cept the decision of the Supreme Court ; the Republicans in the demanded that Congress should legislate for the prohibition Tem of slavery in the Territories ; and the Southern Demoerats demanded that Congress should legislate for the protection of slavery in the Territories.

253. No candidate received a majority of the popular Bectio vote, Lincoln standing first and Douglas second. But of 18) Lincoln and Hamlin had a

clear majority of the electoral vote, and so were elected, Breckinridge and Lane coming next. It is worthy of mention that, up to the last hours of Lincoln's first term of office, Congress would always have contained a majority opposed to him but for the absence of the members from the seceding States. The interests of the South and even of slavery were thus safe enough under an anti-slavery president. But the drift of events was too plain. Nullification had come and gone, and the nation feared it no longer. Even secession by a single State was now almost out of the question; the letters of Southern governors in 1860, in consultation on the state of affairs, agree that no State would secede without assur- ances of support by others. If this crisis were allowed to slip by without action, even a sectional secession would soon be impossible. If secession were a right, it must be asserted now or never.

254. Some assurance of united action must have bee obtained, for South Carolina ventured into secession. The democratic revolution which, since 1829, had com- pelled the legislatures to give the choice of presidential electors (§ 119) to the people of the States had not affected South Carolina; her electors were still chosen by the legislature. That body, on the election day of November, 1860, having chosen the State's electors,

remained in session until the telegraph had brought assurances that Lincoln had secured a sufficient number of electors to ensure his election ; it then summoned a State convention and adjourned. The State convention, which is a legislative body chosen for a special purpose, met December 20, and unanimously passed an "ordinance of secession," repealing the Acts by which the State had ratified the constitution and its amendments (§ 108), and dissolving "the Union now subsisting between South Carolina and

other States, under the name of the United States of America." The convention took all steps neces- sary to make the State ready for war, and adjourned. Similar ordinances were passed by conventions in Missis- sippi (January 9, 1861), Florida (January 10), Alabama (January 11), Georgia (January 18), Louisiana (January 23), and Texas (February 1).

255. The opposition in the South did not deny the right

ment to secede, but the expediency of its exercise. SeCes-

was to elect delegates to the State conventions who would vote not tosecede. They were beaten, says A. H. Stephens, by the cry that the States "could make better terms out of the Union than in it." That is, the States were to withdraw individually, suspend the functions of the

Federal Government within their jurisdiction for the

time, consider maturely any proposals for guarantees for their rights in the Union, and return as soon as satis- factory guarantees should be given. A second point to

be noted is the difference between the notions of a State

convention prevalent in the North and in the South. The Northern State convention was generally considered as a preliminary body, whose action was not complete or valid until ratified by a popular vote. The Southern State convention was looked upon as the incarnation of the sovereignty of the State, and its action was not supposed to need a popular ratification. When the conventions of the seceding States had adopted the ordinances of secession, they proceeded to other business. Theyappointed delegates, who met at Montgomery, the capital of Alabama, February

Their effort

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257. The border States were in two tiers—North The Carolina, Tennessee, and Arkansas next to the seceding a States, and Delaware, Maryland,

Virginia, Kentucky, and °”** Missouri next to the free States. None of these were willing to secede. There was, however, one force which might draw them into secession. A State which did not wish to secede, but believed in State sovereignty and the abstract right of secession, would be inclined to take up arms to resist any attempt by the Federal Government to coerce a seceding State. In this way, in the following Spring, the original seven seceding States were reinforced by four of the border States (§ 267), making their final number eleven.

258. In the North and West surprisingly little atten- Feeling tion was given to the systematic course of procedure © the along the Gulf. The people of those sections were very Nom. busy; they had heard much of this talk before, and looked upon it as a kind of stage-thunder, the inevitable accompaniment of recent presidential elections ; and they expected the difficulty to be settled in some way. Re- publican politicians, with the exception of a few, were inclined to refrain from public declarations of intention. Some of them, such as Seward, showed a disposition to let the “erring sisters ” depart in peace, expecting to make the loss good by accessions from Canada.

nothing, except to admit Kansas as a free State and adopt Admis- the protective Morrill tariff (§ 276); even after its mem- oe of bers from the seceding States had withdrawn, those who #”-

4, formed a provisional constitution for the “Confederate States,” chose a provisional president and vice-president (Jefferson Davis and A. H. Stephens), and established

The permanent constitution, adopted in March, was copied from that of the United States, with variations meant to Maintain State sovereignty, to give the cabinet seats in Congress, to prevent the grant of bounties or any pro- tective features in the tariff or the maintenance of internal improvements at general expense, and to “recognize and protect” “the institution of negro slavery, as it now exists in the Confederate States.”

256. Under what claim of constitutional right all this was done passes comprehension. That a State convention should have the final power of decision on the question which it was summoned to consider is quite as

radical doctrine as has yet been heard of ; that a State conven- tion, summoned to consider the one question of secession, should go on, with no appeal to any further popular authority or mandate, to send delegates to meet those of other States and forma new national government, which could only exist by warring on the United States, is a novel feature in American constitutional law. It was revolution or nothing. Only in Texas, where the call of the State convention was so irregular that a popular vote could hardly be escaped, was any popular vote allowed. Elsewhere, the functions of the voter ceased when he voted for delegates to the State convention; he could only look on helplessly while that body went on to constitute him a citizen of a new nation of which he had not dreamed when he voted.

Wl. 9 . an army, treasury, and other executive departments. The | remained made no preparations for conflict, and, at their a president and vice-president were inaugurated February 18. | adjournment in March 1861, left the Federal Government 1861.

naked and helpless before its enemies.

259. The only sign of life in the body politic, the half-awakened word of warning from the democracy of the North and West, was its choice of governors of States. A remarkable group of men, soon to be known as the “war governors,’—Washburn of Maine, Fairbanks The of Vermont, Goodwin of New Hampshire, Andrew (p. 787) “ war of Massachusetts, Sprague of Rhode Island, Buckingham ce (p. 788) of Connecticut, Morgan (p. 790) of New York “°™™ Olden of New Jersey, Curtin of Pennsylvania, Dennison of Ohio, Morton (p. 790) of Indiana, Yates of Illinois, Blair of Michigan, Randall of Wisconsin, Kirkwood of Towa, and Ramsey of Minnesota,—held the executive powers of the Northern States in 1861-62. Someof these governors, such as Andrew and Buckingham, as they saw the struggle come nearer, went so far as to order the pur- chase of warlike material for their States on their private responsibility, and their action saved days of time. And at all times they were admirably prompt, methodical, clear- sighted, and intensely devoted to their one duty.

260. The little army of the United States had been almost put out of consideration ; wherever its detachments could be found in the South they were surrounded and forced to surrender and to be transferred to the North.

After secession, and in some of the States even before iit, the forts, arsenals, mints, custom-houses, ship-yards, and public property of the United States had been seized by

Seizure

property.

Position of the remain- ing forts.

Slavery and dis- union,

Embar- rassments of the Govern- ment.

Surrender of Fort Sumter. Rising

in the North,

authority of the State, and these were held until trans- ferred to the new Confederate States organization. In the first two months of 1861 the authority of the United States was paralysed in seven States, and in at least seven more its future authority seemed of very doubtful duration.

261. Only a few forts, of all the magnificent structures with which the nation had dotted the Southern coast, remained to it—the forts near Key West, Fortress Monroe at the mouth of Chesapeake Bay, Fort Pickens at Pen- sacola, and Fort Sumter in Charleston harbour. Both the last-named were beleaguered by hostile batteries, but the administration of President Buchanan, intent on main- taining the peace until the new administration should come in, instructed their commanding officers to refrain from any acts tending to open conflict. The Federal officers, therefore, were obliged to look idly on while every preparation was made for their destruction, and even while a vessel bearing supplies for Fort Sumter was driven back by the batteries between it and the sea.

262. The divergence between the two sections of the country had thus passed into disunion, and was soon to pass into open hostility. The legal

recognition of the custom of slavery, acting upon and reacted upon by every step in their economic development and every difference in their natural characteristics, surroundings, and institu- tions, had carried North and South further and faster apart, until the elements of a distinct nationality had appeared in the latter. Slavery had had somewhat the same effect on the South that democracy had had on the colonies. In the latter case the aristocracy of the mother country had made a very feeble struggle to maintain the unity of its empire. It remained to be seen, in the Amer- ican case, whether democracy would do better.

X, THE CIVIL WAR: 1861-65.

263. Secession had taken away many of the men who had for years managed the Federal Government, and who understood its workings. Lincoln's party was in power for the first time ; his officers were new to the routine of Fed- eral administration; and the circumstances with which they were called upon to deal were such as to daunt any spirit. The Government had become so nearly bankrupt in the closing days of Buchanan's administration that it had only escaped by paying double interest, and that by the special favour of the New York banks, which obtained in return the appointment of Dix as secretary of the treasury. The army had been almost broken up by captures of men and material and by resignations of competent and trusted officers. The navy had come to such a pass that, in February 1861, a house cominittee reported that only two vessels, one of twenty, the other of two guns, were avail- able for the defence of the entire Atlantic coast. And, to complicate all difficulties, a horde of clamorous office- seekers crowded Washington.

264. Before many weeks of Lincoln's administration had passed, the starting of an expedition to provision Fort Sumter brought on an attack by the batteries around the fort, and, after a bombardment of 36 hours, the fort sur- rendered (April 14, 1861). It is not necessary to rehearse the familiar story of the outburst of feeling which followed this event and the proclamation of President Lincoln call- ing for volunteers, the mustering of men, the eagerness of States, cities, and villages to hurry volunteers forward and to supply money to their own Government in its need. The 75,000

volunteers called for were supplied three or four times over, and those who were refused felt the refusal as a personal deprivation.

265. There had been some belief in the South that the North-West would take no part in the impending conflict,

STATES

and that its people could be persuaded to keep up friendly The relations with the new nationality until the final treaty of North. peace should establish all the fragments of the late Union We upon an international basis. In the spring months of 1861 Douglas, who had long been denounced as the tool

of the Southern slave-holders, was spending the closing days of life in expressing the determination of the North- West that it would never submit to have “a line of custom-houses” between it and the ocean. The batteries which Confederate authority was erecting on the banks of

the Mississippi were fuel to the flame. ar-off California, which had been considered neutral by all parties, pro- nounced as unequivocally for the national authority.

266. The shock of arms put an end to opposition in the “Folly. South as well. The peculiar isolation of life in the South ing the precluded the more ignorant voter from any comparisons tat.” of the power of his State with any other; to him it was alniost inconceivable that his State should own or have a superior. The better educated men, of wider experience, had been trained to think State sovereignty the founda tion of civil liberty, and, when their State spoke, they felt bound to “follow their State.” The president of the Confederate States issued his call for men, and it was also more than met. On both sides of the line armed men were hurrying to a meeting.

267. Lincoln’s call for troops met with an angry recep- tion wherever the doctrine of State sovereignty had a foot- ‘ hold. The governors of the border States (§ 257) gene- The boner rally returned it with a refusal to furnish any troops. Two Sits! States, North Carolina and Arkansas, seceded and joined the Confederate States. In two others, Virginia and Tennessee, the State

politicians formed “ military leagues” with the Confederacy, allowing Confederate troops to take possession of the States, and then submitted the question of secession to “popular vote.” The secession of these States was thus accomplished, and Riclimond became the Confederate capital. The same process was attempted in Missouri, but failed, and the State remained loyal. The politician class in Maryland and Kentucky took the extra-ordinary course of attempting to maintain neutrality ; but the growing power of the Federal Government soon enabled the people of the two States to resume control of their governments and give consistent support to the Union. Kentucky, however, had troops in the Confederate armies ; and one of her citizens, the late vice-president, John O. Breckinridge, left his place in the senate and became an officer in the Confederate service. Delaware cast her lot from the first with the Union.

268. The first blood of the war was shed in the streets Giml of Baltimore, when a mob attempted to stop Massachusetts troops on their way to Washington (April 19). For a time there was difficulty in getting troops through Mary- land because of the active hostility of a part of its people, but this was overcome, and the national capital was made secure. The Confederate lines had been pushed up to Manassas Junction, about 30 miles from Washington, When Congress, called into special session by the president | for July 4, came together, the outline of the Confederate States had been fixed. Their line of defence held the left bank of the Potomac from Fortress Monroe nearly to Washington ; thence, at a distance of some 30 miles from the river, to Harper’s Ferry ; thence through the mountams of western Virginia and the southern part of Kentucky, crossing the Mississippi a little below Cairo; thence through southern Missouri to the eastern border of Kansas; and thence south-west through the Indian Terr tory and along the northern boundary of Texas to the Rio Grande. The length of the line, including also the Atlantic and Gulf coasts, has been estimated at 11,000 miles. The territory within it comprised about 800,000

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square miles, with a population of over 9,000,000 and great natural resources. Its cotton was almost essential to the manufactories of the world; in exchange for it every munition of war could be procured; and it was hardly possible to blockade a coast over 3000 miles in

- length, on which the blockading force had but one

port of refuge, and that about the middle of the line. Nevertheless President Lincoln issued his proclamation announcing the blockade of the Southern coast, a procla- mation from President Davis appearing with it, offering letters of marque and reprisal against the commerce of the United States to private vessels. The news brought out proclamations of neutrality from Great Britain and France, and, according to subsequent decisions of the Supreme Court, made the struggle a civil war, though the minority held that this did not occur legally until the Act of Con- gress of July 13, 1861, authorizing the president, in case of insurrection, to shut up ports and suspend commercial intercourse with the inhabitants of the revolted district,

269. The president found himself compelled to assume powers never granted to the executive authority, trusting to the subsequent action of Congress to validate his action, He had to raise and support armies and navies; he even had to authorize seizures of necessary property, of rail- road and telegraph lines, arrests of suspected persons, and the suspension of the writ of habeas corpus in certain districts. Congress supported him, and proceeded in 1863 to give the president power to suspend the writ anywhere in the United States, which he proceeded to do (§ 115). The Supreme Court, after the war, decided that no branch of the Government had power .to suspend the writ in districts where the courts were open,—that the privilege of the writ might be suspended as to persons properly involved in the war, but that the writ was still to issue, the court deciding whether the person came within the classes to whom the suspension applied. ‘This decision, however, did not come until “arbitrary arrests,” as they were called, had been a feature of the entire war. A similar suspension of the writ took place in the Con- federate States.

270. When Congress met (July 4, 1861), the absence of Southern members had made it heavily Republican. It decided to consider no business but that connected with the war, authorized a loan and the raising of 500,000 volunteers, and made confiscation of property a penalty of rebellion. While it was in session the first serious

. battle of the war—Bull Run, or Manassas—took place

(July 21), and resulted in the defeat of the Federal army. Both armies were as yet so ill-trained that the victors gained nothing from their success. In the west the battle of Wilson's Creek, near Springfield, Mo, (August 10), was either a drawn battle or a Confederate victory; but here also the victors rather lost than gained ground after it. The captures of Fort Hatteras, N.C. (August 29), and Port Royal, S.C. (November 7), gave the blockading fleets two important harbours of refuge. The over-zealous action of a naval officer in taking the Confederate envoys Mason and Slidell out of a British mail-steamer sailing between two neutral ports almost brought about acollision between the United States and Great Britain in November, But the American precedents were all against the United States (§ 172), and the envoys were given up.

271. General M'Clellan (p. 789), in the early months of the war, had led a force of Western troops across the

'Ohio river, entered western Virginia, and beaten the

Confederate armies in several battles. After the battle of Bull Run he was called to Washington and put in command of all the armies on the retirement of Scott. His genius for organization, and the unbounded confidence of the people in him, enabled him to form the troops at

and near Washington into the first great army of the war ~—the army of the Potomac. It was held, however, too much in idleness to suit the eagerness of the people and the administration; and the dissatisfaction grew louder as the winter of 1861-62 passed away without any forward movement (§ 284).

272. If the army was idle, Congress was not. The broad-construction tendencies of the party showed them- selves more plainly as the war grew more serious; there Was an increasing disposition to cut every knot by legisla- tion, with less regard to the constitutionality of the legis- lation. A paper currency, commonly known as "' green- Paper backs," was adopted and made legal tender (February 25, currency. 1862). The first symptoms of a disposition to attack slavery appeared: slavery was prohibited in the District Slavery. of Columbia and the Territories; the army was forbidden to surrender escaped slaves to their owners; and slaves of insurgents were ordered to be confiscated. In addition to a Homestead Act, giving public lands to actual settlers at reduced rates (§ 200), Congress began a further develop- ment of the system of granting public lands to railway corporations.

273. The railway system of the United States was but Railways twenty years old in 1850 (§ 230), but it had begun to in 1850.

assume some consistency. 'The day of short and discon-

nected lines had passed, and the connexions which were to develop into railway systems had appeared. Consoli- dation of smaller companies had begun; the all-rail route across the State of New York was made up of more than a dozen original companies at its consolidation in 1853. The Erie Railway was formed in 1851; and another western route—the Pennsylvania —was formed in 1854. These were at least the germs of great trunk lines (§ 312). The cost of American railways has been only from one-half to one-fourth of the cost of European railways; but an invest- ment ina far western railway in 1850-60 was an extra- hazardous risk. Not only did social conditions make any form of business hazardous; the new railway often had to enter a territory bare of population, and there create its own towns, farms, and traffic. Whether it could do so was so doubtful as to make additional inducements to capital necessary. The means attempted by Congress in 1850, in the case of the Illinois Central Railroad, was to grant Land * public lands to the corporation, reserving to the United stants. States the alternate sections. The expectation was that the railway, for the purpose of building up traffic, would sell lands to actual settlers at low rates, and that the value of the reserved lands would thus be increased. At first grants were made to

the States for the benefit of the cor- porations ; the Act of 1862 made the grant directly to the corporation,

274. The vital military and political necessity of an The immediate railway connexion with the Pacific coast was Pacific hardly open to doubt in 1862; but the necessity hardly T#lways. justified the terms which were offered and taken. The Union Pacific Railroad was incorporated; the United States Government was to issue to it bonds, on the completion of each 40 miles, to the amount of $16,000 per mile, to bea first mortgage ; through Utah and N evada, the aid was to be doubled, and for some 300 miles of mountain building to be trebled; and, in addition to this, alternate sections of land were granted. The land-grant system, thus begun, was carried on in the cases of a large number of other roads, the largest single grants being those of 47,000,000 acres to the Northern Pacific (1864) and of 42,000,000 to the Atlantic and Pacific line (1866).

275. Specie payments had been suspended almost every- Prices in where towards the end of 1861; but the price of gold was Paper. but 102°5 at the beginning of 1862. About May its price in paper currency began to rise. It touched 170 during

Tariff and

internal revenue taxation.

Bonds,

Paper issues in the South.

Manufac- tures.

the next year, and 285 in 1864; but the real price prob- ably never went much above 250. As gold rose, specie disappeared. Other articles felt the influence in currency prices. Mr D. A. Wells, in 1866, estimated that prices and rents had risen 90 per cent. since 1861, while wages had not risen more than 60 per cent.

276. The duties on imports were driven higher than the Morrill tariff had ever contemplated (§ 258). The average rates, which had been 18 per cent. on dutiable articles and 12 per cent. on the aggregate in 1860-61, rose, before the end of the war, tc nearly 50 per cent. on dutiable articles and 35 per cent. on the aggregate. Domestic manu- factures sprang into new life under such hothouse en- couragement ; every one who had spare wealth converted it into manufacturing capital. The probability of such a result had been the means of getting votes for an increased tariff ; free-traders had voted for it as well as protection- ists. For the tariff was only a means of getting capital into positions in which taxation could be applied to it, and the “internal revenue” taxation was merciless beyond precedent. The annual increase of wealth from capital was then about $550,000,000 ; the internal revenue taxa- tion on it rose in 1866 to $310,000,000, or nearly 60 per cent. Even after the war the taxation was kept up un- flinchingly until the reduction of the national debt had brought it to a point where it was evidently at the mercy of time (§ 322).

277. The stress of all this upon the poor must have been great, but it was relieved in part by the bond-system on which the war was conducted (§ 322). While the armies and navies were shooting off large blocks of the crops of 1880 or 1890, work and wages were abundant for all who were competent for them. It is true, then, that the poor paid most of the cost of the war ; it is also true that the poor had shared in that anticipation of the future which had been forced on the country, and that, when the drafts on the future came to be redeemed, it was done mainly by taxation on luxuries. The destruction of a Northern railroad meant more work for Northern iron mills and their workmen. The destruction of a Southern road was an unmitigated injury ; it had to be made good at once, by paper issues; the South could make no drafts on the future, by bond issues, for the blockade had put cotton out of the game, and Southern bonds were hardly sale- able. Every expense had to be met by paper issues; each issue forced prices higher; every rise in prices called for an increased issue of paper, with increased effects for evil. A Rebel War-Clerk’s Diary gives the following as the prices in the Richmond market for May 1864 :— “ Boots, $200; coats, $350; pantaloons, $100; shoes, $125 ; flour, $275 per barrel; meal, $60 to $80 per bushel ; bacon, $9 per pound ; no beef in market ; chickens, $30 per pair; shad, $20; potatoes, $25 per bushel ; turnip greens, $4 per peck; white

beans, $4 per quart or $120 per bushel ; butter, $15 per pound ; lard same ; wood, $50 per cord.” How the rise in salaries and wages, always far slower than other prices, could meet such prices as these, one must be left to imagine. It can only be said that most of the burden was really sustained by the women of the South.

278. The complete lack of manufactures told heavily against the South from the beginning. As men were drawn from agriculture in the North and West, the in- creased demand for labour was shaded off into an increased demand for agricultural machinery (§ 231); every in- creased percentage of power in reaping-machines liberated so many men for service at the front. The reaping- machines of the South—the slaves—were incapable of any such improvement, and, besides, required the presence of a portion of the possible fighting-men at home to watch

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them. There is an evident significance in the exemption from military duty in the Confederate States of “one agriculturist on such farm, where there is no white male adult not liable to duty, employing 15 able-bodied slaves between ten and fifty years of age.” But, to the honour of the enslaved race, no insurrection took place.

279. The pressing need for men in the army made the o Confederate Congress utterly unable to withstand the rate growth of executive power. Its bills were prepared by 8 the cabinet, and the action of Congress was quite per-™%” functory. The suspension of the writ of habeas corpus, and the vast powers granted to President Davis, or assumed by him under the plea of military necessity, with the absence of a watchful and well-informed public opinion, made the Confederate Government by degrees almost a despotism. It was not until the closing months of the war that the expiring Confederate Congress mustered up courage enough to oppose the president’s will. The organ- ized and even radical opposition to the war in the North, the meddlesomeness of Congress and its ‘ committees on the conduct of the war,” were no doubt unpleasant to Lincoln ; but they carried the country through the crisis without the effects visible in the South.

280. Another act of Federal legislation—the National Nation Bank Act—should be mentioned here, as it was closely banking” connected with the sale of bonds (February 25, 1863), 5¥#™ The banks were to be organized, and, on depositing United States bonds at Washington, were to be permitted to issue notes up to 90 per cent. of the value of the bonds deposited. As the redemption of the notes is thus assured, they circu- late without question all over the United States. Bya subsequent Act the remaining State bank circulation was taxed out of existence. The national banks are still in operation; but the disappearance of United States bonds threatens their continuance.)

281. At the beginning of 1862 the lines of demarcation Admisin between the two powers had become plainly marked. Th western part of Virginia had separated itself from the a parent State, and was admittetl asa State (1863) under the name of West Virginia. It was certain that Delaware, Maryland, Kentucky, and Missouri had been saved to the Union, and that the battle was to be fought out in the territory to the south of them, In the west Grant (p. 788), commanding a part of Buell’s general forces, moved up the Tennessee river and broke the centre of the long Confederate line by the capture of Forts Henry and Fors Donelson (February 1862). The collapse of the Con- federate line opened the way for the occupation of almost all western Tennessee, including its capital, and the theatre of war was moved far forward to the southern boundary of the State, an advance of fully 200 miles into the heart of the Confederacy. It had been shown already that the successful officers were to be those from West Point ; but even they were getting their first experience in the handling of large masses of men. Grant and Sherman owed a part of that experience to the military genius of the Confederate commander, Albert 8. Johnston, whose sudden attack on their army at Pittsburgh Landing (April 6) brought Te the first great battle of the war. The Federal forces held Lanainé out stubbornly until the arrival of Buell’s advance guard relieved the pressure, and the Confederates were driven back to Corinth, with the heavy loss of their commander, who had been mortally wounded. Steady advances brought et the Union armies to Corinth, an important railroad centre, Corinth |

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in June; and the Mississippi was opened up as far as Memphis by these successes of the armies and by the hard fighting of the gunboats at Island Number Ten and other places. At the northern boundary of the State of Mississippi the Union advance stopped for the time, but what had been gained was held. ;

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282. At the same time the Mississippi was opened in part from below. A great naval expedition under Far- ragut and Porter, with a land force under Butler, sailing from Fort Monroe, came to the mouth of the Mississippi. Farragut ran past the forts above the mouth of the river, sank the ironclads which met him, and captured New ans. Orleans (April 25). The land forces then took possession

1861-1863.]

obstacles and Confederate vessels as far as Port Hudson

on bluffs too high for a naval attack.

283. The energy of the combatants had already brought ironclad vessels to the test which they had not yet met elsewhere, that of actual combat. Western ingenuity had produced a simple and excellent type of river ironclad by cutting down river steamers and plating them with railroad or other iron. The type needed for the rougher Eastern waters was different, and the Confederates converted the frigate “ Merrimac,” captured at Norfolk, into an ironclad

ni- of a more sea-going type. The battle between her and “ the “Monitor” (March 8), in Hampton Roads, was inde- » cisive; but the “ Merrimac” was driven back to N orfolk, the blockade and the cities of the Atlantic coast, which had seemed to be at its mercy, were saved, and the day of wooden war-vessels was seen to be over. Before the end of the following year there

were 75 ironclads in the United States navy ; the number of vessels had increased to 588, with 4443 guns and 35,000 men.

284. The hundred miles between Washington and Rich- mond are crossed by numberless streams, flowing south- east, and offering strong defensive positions, of which the Confederates had taken advantage. M‘Clellan (§ 271) therefore wished to move his army to Fort Monroe and attack Itichmond from that point, on the ground of Corn- wallis’s campaign of 1781. He believed that such a movement would force the Confederate armies away from Washington to meet him. The administration, believing that such a movement would only open the way for the enemy to capture Washington—a more valuable prize than Richmond—gave directions that a part of M‘Olellan’s force, under M‘Dowell, should take the overland route as far as Fredericksburgh, while the rest, under M‘Clellan, Were moving up the peninsula towards Richmond; and that, as the enemy withdrew to meet the latter, a junction of the two divisions should take place, so as to carry out MClellan’s plans without uncovering Washington. Buta month was spent in besieging Yorktown; when the attempt was made to form the junction with M‘Dowell it involved the separation of the two wings by the little river Chick- ahominy ; and in May the spring rains turned the little stream into a wide river, and the army was divided. Joseph E. Johnston, the Confederate commander, at once attacked the weaker wing at Seven Pines and Fair Oaks, but was beaten, and was himself wounded and com- pelled to leave the service fora time. This event gave his place to Robert E. Lee, whose only military service in the war up to this time had been a failure in western Virginia. He was now to begin, in conjunction with Thomas J. (“Stonewall”) Jackson, a series of brilliant campaigns.

285. From Staunton, 100 miles west of Richmond, the Shenandoah valley extends north-east to the Potomac, Whence there is an easy march of 75 miles south-east to Washington. Jackson struck the Union forces in the valley, drove them to the Potomac, and excited such alarm in Washington that M‘Dowell’s troops were hastily withdrawn from Fredericksburgh. Having thus spoiled M‘Clellan’s plan of junction, and taken some 40,000 men from him, Jackson hurried to Richmond. Lee met him on the north side of the Chickahominy, and the two armies

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of it and the forts, while the fleet cleared the river of

and Vicksburgh, where the Confederate works were situated

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attacked M‘Clellan’s right wing at Gaines’s Mill, and cut

the connexion between it and its base of supplies on the

York river (June 26). Unable to reunite his Wings and regain his base, M‘Clellan was forced to draw his right

wing south, and attempt to establish another base on the James river, Lee and Jackson followed hard on his retreat, and the ‘‘seven days’ battles” were the most The desperate of the war up to this time, the principal battles “seven being those of Savage’s Station (June 29), Glendale (June vce ‘ 30), and Malvern Hill (July 1). The last ended the series, ; for M‘Clellan had reached the James, and his army had

fixed itself in a position from which it could not be driven.

286. Pope had succeeded M‘Dowell, and Jackson at- Pope’s tacked and beat him on the battle ground of Bull Run cam- (August 29), driving his army towards Washington, P&8”- M‘Clellan was at once recalled to defend the capital. As he withdrew from the peninsula, Lee joined Jackson, and the whole Confederate army, passing to the north-west of Washington, began the first invasion of the North. As it passed through the mountains of north-western Maryland, the army of the Potomac, which had been brought up through Maryland in pursuit, reached its rear, and forced it to turn and fight the battle of Antietam, or Sharps- Antietam. burgh, September 17. Both sides claimed the victory, but Lee was compelled to recross the Potomac to his former position. M‘Clellan was blamed for the slowness of his pursuit and was removed, Burnside (p. 788) becom- ing his successor. The only

great event of his term of command was his attempt to storm the heights behind Fredericksburgh (December 13) and the terrible slaughter Freder- of his defeat. Hooker was then put in his place. The icks- year 1862 thus closed with the opposing armies in about “8b the same positions as at the beginning of the war.

287. At the beginning of the war the people and leaders of the North had not desired to interfere with slavery, but circumstances had been too strong for them. Lincoln had declared that he meant to save the Union as he best could,—by preserving slavery, by destroying it, or by destroying part and preserving part of it. Just after the battle of Antietam he issued his proclamation calling on The the revolted States to return to their allegiance before the Emanci- following January 1, otherwise their slaves would be ee declared freemen. No State returned, and the threatened cnet declaration was issued January 1, 1863. As president Lincoln could issue no such declaration 3 as commander-in-

chief of the armies and navies of the United States he

could issue directions only as to the territory within his lines ; but the Emancipation Proclamation applied only to territory outside of his lines. It has therefore been debated whether the proclamation was in reality of any force, It may fairly be taken as an announcement of the policy which was to guide the army, and as a declaration of freedom taking effect as the lines advanced, At all events, this was its exact effect. Its international import- ance was far greater. The locking up of the world’s source of cotton-supply had been a general calamity, and the Confederate Government and people had steadily expected that the English and French Governments, or at least one of them, would intervene in the war for the purpose of raising the blockade and releasing the Southern cotton: The conversion of the struggle into a crusade against slavery made intervention impossible for Govern- ments whose peoples had now a controlling influence on their policy and intelligence enough to understand the issue which had now been made.

288. Confederate agents in England were numerous and Confede. active. Taking advantage of every loophole inthe British rate Foreign Enlistment Act, they built and sent to sea the Privat- “Alabama” and “ Florida,” which

for a time almost drove °”* American commerce from the ocean. Whenever they were

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Mur- frees- boro’.

Vicks- burgh.

Port Hudson, Opening of the Missis- sippi.

Chicka- mauga.

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closely pursued by United States vessels they took refuge in neutral ports until a safe opportunity occurred to put to sea again. Another, the “Georgia,” was added in 1863. All three were destroyed in 1864,—the “ Florida” by a violation of Brazilian neutrality, the “ Georgia ” after an attempt to transfer her to neutral owners, and the “‘ Alabama ” after a brief sea-fight with the ‘‘ Kearsarge,” off Cherbourg (June 19). Confederate attempts to have iron- clads equipped in England and France were unsuccessful.

289. In the west (§ 281) Bragg (p. 788), now in com- mand of the Confederate forces, turned the right of the Union line in southern Tennessee, and began an invasion of Kentucky about the time when Lee was beginning his invasion of the North. Carrying off much booty, he retired into Tennessee. Towards the end of the year Rosecrans moved forward from Nashville to attack him. The armies met at Murfreesboro’, and fought a drawn battle during the last day of the year 1862 and the first two days of January 1863. The western armies were now in four parts,—that of Rosecrans near Murfreesboro’, that of Grant near Corinth, that of Schofield in Missouri and Arkansas, and that of Banks in Louisiana. The com- plete opening of the Mississippi being the great object, the burden of the work fell to Grant, who was nearest the river. Vicksburgh was the objective point, and Grant at first attempted to take it from the opposite or western bank of the river. Failing here, he moved south to a favourable

point for crossing, and used the river fleet to transfer his army to the eastern bank. He was now on the Vicksburgh side of the river. J. E. Johnston was north-east of him, at Jackson, with a weaker army ; the bulk of the Confederate forces was at or near Vicksburgh, under Pemberton. Johnston wanted no siege of Vicks- burgh ; Pemberton wanted no junction with Johnston, which might cost him the glory of defeating Grant ; and Grant solved their difficulty for them. Moving north-east he struck Johnston's army near Jackson, beat it, and drove it out of any possibility of junction. He then turned westward, fighting several sharp battles as he went, and late in May he had Pemberton shut up in Vicksburgh. His lines were maintained for six weeks, and then (July 4, 1863) the finest Confederate army in the west sur- rendered. Port Hudson surrendered to Banks five days later: the Mississippi was opened from end to end, and the Confederacy was cleft in twain. From this time com- munication between the two parts of the Confederate States became increasingly more difficult, and the transfer of supplies from the rich country west of the Mississippi was almost at an end. There was little further fighting to the west of the great river, except an intermittent guerilla warfare and the defeat of Banks's expedition against north- western Louisiana early in 1864. When the war ceased in the east, the isolated western half of the Confederacy fell with it.

290. While Grant was besieging Vicksburgh, Rose- crans had begun to move from the eastern end of the Union line in Tennessee against Bragg at Chattanooga. He drove Bragg through the place, and a dozen miles beyond it, into Georgia. Here the Confederate army took position behind Chickamauga creek, and inflicted a complete defeat upon the pursuing Union forces (September 19-20, 1863). Thomas covered the rear stubbornly, and secured a safe retreat into Chattanooga, but the posses- sion of the mountains around the place enabled Bragg to cut off almost all roads of further retreat and establish a siege of Chattanooga. Bragg was so confident of success that he detached a part of his army, under Longstreet, to besiege Knoxville, in eastern Tennessee. Grant was ordered to take command at Chattanooga, and went thither, taking Sherman and others of the officers who

had taken part in his Vicksburgh campaign. He soon opened new routes of communication to the rear, supplied and reinforced his army, and began to prepare for the storming of the mountains before him. His assaults on Lookout Mountain and Missionary Ridge (November 23- took: | 25) were among the most dramatic and successful of the Moun i” 1 war. Bragg was driven out of all his positions and back Mis | to Dalton, where Davis was compelled by the complaints Se 1 of his people to remove him, and appoint J. E. Johnston ~ his successor. Longstreet broke up the siege of Knox- ville, and made good his retreat across the mountains into Virginia to join Lee.

291. The army of the Potomac, under Hooker, kept its place near Fredericksburgh (§ 286) until May 1863. Hooker then began a movement across the Rapidan to- wards Richmond, and was defeated in the battle of Chancellorsville (May 2-3). The victorious army suffered Chane). | the severest of losses in the death of Jackson, but this did lowil not check Lee’s preparations for a second invasion of the North, which began the next month. As his army moved northwards, very nearly on the route which it had followed the year before, the army of the Potomac held a parallel course through Maryland and into Pennsylvania. The Confederate forces penetrated farther than in 1862; their advance came almost to Harrisburgh, and threw the neighbouring Northern cities into great alarm ; but the pursuing army, now under Meade (p. 790), met Lee at Gettysburgh (July 1-3) and defeated him. The Con- Getty federate army, assaulting its enemy in very strong posi- hugh — tions, suffered losses which were almost irreparable, and it was never again quite the same army as before Gettys- burgh. Some Northern critics were inclined to think that Lee’s former successes had really been due to Jackson’s genius, and that he had lost his power in losing Jackson. The campaign of 1864 was to prove the contrary. The customary retreat brought the two armies back to very neatly the same positions which they had occupied at the beginning of the war, the Rappahannock flowing between them. Here they remained until the following spring. __

292. The turning-point of the war was evidently in the The ar early days of July 1863, when the victories of Vicksburgh e and Gettysburgh came together. :

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The national Govern- 5 ment had at the beginning cut the Confederate States down to a much smaller area than might well have been ex- pected ; its armies had pushed the besieging lines far into the hostile territory, and had held the ground which they had gained; and the war itself had developed a class of generals who cared. less for the conquest of territory than for attacking and destroying the opposing armies. The great drafts on the future which the credit of the Federal Government enabled the North to make gave it also a startling appearance of prosperity ; so far from feeling the war, it was driving production of every kind to a higher pitch that ever before. The cities began to show greater evidences of wealth, and new rich men appeared, many of them being the “shoddy aristocracy,” who had acquired wealth by mis-serving the Government, but more being able men who had grasped the sudden opportunities offered by the changes of affairs.

293. The war had not merely developed improved weapons and munitions of war; it had also spurred the people on to a more careful attention to the welfare of the soldiers, the fighting men drawn from their own number, The Sanitary Commission, the Christian Commission, and other voluntary associations for the physical and moral care of soldiers received and disbursed very large sums. The national Government was paying an average amount of $2,000,000 per day for the prosecution of the wal and, in spite of the severest taxation, the debt grew to $500,000,000 in June 1862, to twice that amount a yeat

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later, to $1,700,000,000 in June 1864, and reached its maximum August 31, 1865,—$2,845,907,626. But this lavish expenditure was directed with energy and judg- ment. The blockading fleets were kept in perfect order and with every condition of success. The railroad and telegraph were brought into systematic use for the first time in modern warfare. Late in 1863 Stanton, the secretary of war, moved two corps of 23,000 men from Washington to Chattanooga, 1200 miles, in seven days. A year later he moved another corps, 15,000 strong, from Tennessee to Washington in eleven days, and within a month had collected vessels and transferred it to North Carolina. Towards the end of the war, when the capacity of the

railroad for war purposes had been fully learned, these sudden transfers of troops by the Federal Covern- ment almost neutralized the Confederate advantage of interior lines.

294. On the other hand, the Federal armies now held almost all the great Southern through lines of railroad, except the Georgia lines and those which supplied Lee from the South (§ 296). The want of the Southern people was merely growing in degree, not in kind. The yp: conscription, sweeping from the first, had become omni- | vorous ; towards the end of the war every man between

seventeen and fifty-five was legally liable to service, and in

practice the only limit was physical incapacity. In 1863

the Federal Government also was driven to conscription. . The first attempts to carry it out resulted in forcible

resistance in several places, the worst being the “draft riots” in New York (July), when the city was in the hands of the mob for several days. All the resistance was put down ; but exemptions and substitute purchases were so freely permitted that the draft in the North had little effect except as a stimulus to the States in filling their quotas of volunteers by voting bounties. md 295. Harly in 1864 Grant (§ 290) was made lieutenant- P general, with the command of all the armies. He went to Washington to meet Lee, leaving Sherman to face Johnston at Dalton. Events had thus brought the two ablest of the Confederate generals opposite the two men who were the best product of the war on the Northern side. It remained to be seen whether Lee, with his army of northern Virginia, could resist the methods by which Grant and Sherman had won almost all the great table-land which occupies the heart of the country east of the Mississippi. And it remained to be seen, also, whether the reputation which Grant had won at a distance from the political atmosphere of Washington would not wither in his new position. It was necessary for him to take the overland route to Richmond, or meet M‘Clellan’s fate. He did not hesitate. Early in May 1864, with about twice as many men (125,000) as Lee, he entered the “Wilderness” on the other side of the Rapidan. At the | same time he sent 30,000 men, under Butler, up the | James river; but this part of his plan

proved of com- , paratively little service. | 296. Two weeks’ hard fighting in the Wilderness and | at Spotsylvania Court House (May 5-18), and four days “more at North Anna (May 23-27), with flank move- ments as a means of forcing Lee out of positions too Strong to be taken from the front, brought the army of the Potomac to Cold Harbor, in the immediate defences of Richmond. One assault, bloodily repulsed, showed that there was no thoroughfare in this direction. Lee ad so diligently prepared that his position became stronger as he was driven into greater concentration; and Grant began to move along the eastern face of the line of Con- federate fortifications, striking at them as he passed them, but finding no weak spot. As he crossed the James river aud reached Petersburgh, he came at last into dangerous

proximity to the railroads which brought Lee’s supplies Peters- from the South—the Weldon Railroad, running directly burgh. south, the Danville Railroad, running south-west, and the Southside Railroad, running west. At this end of his line, therefore, Lee kept the best part.of his troops, and resisted with increasing stubbornness Grant’s efforts to carry his lines farther to the south-west or to reach the railroads. Resorting to the plan which had been so effective with M‘Clellan, he sent Early ona raid up the Shenandoah Valley, to threaten Washington (J uly). But Early was not Jackson, and he returned with no more success than the frightening of the authorities at Wash- ington. Grant put Sheridan in command in the valley, and he beat Marly at Cedar Creek (October), scattering his army for the remainder of the war. In August Grant succeeded in seizing a few miles of the Weldon Railroad ; but Lee brought his supplies in waggons round that portion held by Grant. Late in the year this was stopped by the destruction of some twenty miles of the road. Here Grant was himself stopped for the time. Lee had so taken advantage of every defensive position that Grant could not reach the nearer of the other two rail- roads without an advance of 15 miles, or the further one without a circuit of about 40 miles. The two armies remained locked until the following spring. Grant, how- ever, was operating still more successfully elsewhere through Sherman.

297. Sherman (§ 295) had moved on the same day as Grant (May 5). Jobnston's retreat was skilfully con-John- ducted ; every position was held to the last moment; and Ston's . it was not until the middle of July that Sherman had "t+: forced him back to his strongest lines of defence—those around Atlanta. 'The Confederate forces could not re- treat much beyond Atlanta, for the great central table- land here begins to fall into the plains which stretch to the Atlantic. Sherman had now been brought so far from his base that the two armies were much more nearly on an equality than in May; and Johnston was preparing for the decisive battle when Davis made Sher- man's way clear. A feature in Davis's conduct of the war had been his extraordinary tendency to favouritism.

He had been forced to take Johnston as commander in Georgia ; and the widespread alarm caused by Johnston's inexplicable persistence in retreating gave him the excuse he desired. He removed Johnston (July 17), naming Hood (p. 789), a "fighting general," as his successor. Before the end of the month Hood had made three furious attacks on Sherman and been beaten in all of them. Moving around Atlanta, as Grant was doing around Peters- Atlanta. burgh, Sherman cut the supplying railroads, and at last was able to telegraph to Washington (September 2), "Atlanta is ours, and fairly won."

298. Hood, by the direct command of Davis, then adopted a course which led to the downfall of the Confed- eracy in the following spring. Moving from between Sherman and the open country, he set out for Tennessee, expecting to draw Sherman after him. Sherman sent Thomas (p. 790) to Nashville, called out the resources of the North-West to support him, and left Hood to his march and his fate. Hood reached Nashville ; but in Nashville. the middle of December Thomas burst out upon him, routed his army, and pursued it so vigorously that it never again reunited. One of the two great armies of the Confederacy had disappeared; and Sherman, with one of the finest armies of the war, an army of 60,000 picked veteran troops, stood on the edge of the Georgia mountains, without an organized force between him and the back of Lee's army in Virginia.

299. In the meantime the presidential election of 1864 Election had taken place, resulting in the re-election of Lincoln, of 1864.

with Andrew Johnson as vice-president. The Demo- cratic convention had declared that, after four years of failure to restore the Union by war, during which the constitution had been violated in all its parts under the plea of military necessity, a cessation of hostilities ought to be obtained, and had nominated M‘Clellan (p. 789) and Pendleton. Farragut’s victory in Mobile Bay (August 5), by which he sealed up the last port, except Wilming- ton, of the blockade-runners, and the evidently staggering condition of the Confederate resistance in the east and the west, were the sharpest commentaries on the Demo- cratic platform ; and its candidates carried only three of

Admis- the twenty-five States which took part in the election. sion of The thirty-sixth State—Nevada—had been admitted in Nevada. 1864.

Sherman’s 300. Sherman began (November 16, 1864) the execu- march —_ tion of his own plan,—to ‘“‘send back his wounded, make cae a wreck of the railroad, and, with his effective army, move andthe through Georgia, smashing things to the sea.” He had

Carolinas. been drawing supplies from a point 500 miles distant, over a single railroad. He now destroyed the railroad and the telegraph, cut off his communication with the North, and moved towards the Atlantic coast. The sea was reached on December 12, and Savannah was taken on the 20th. He had threatened so many points, and kept the enemy in so much doubt as to his objects, that there had hardly been men enough in his front at any one time to make a skirmish line. On January 15, 1865, the army moved north from Savannah, through Columbia, to Fayetteville, N.C. The march had forced the evacuation of Charleston and the other coast cities, and their garri- sons had been put by Davis under command of Johnston as a last hope. Wilmington, which had been captured by a land and sea force on the day when Sherman left Savannah, was an opening for communication with Wash- ington; and it would have been possible for Sherman, with Wilmington as a base, to crush Johnston at once. All that he cared to do was to hold Johnston where he was while Grant should begin his final attack on Lee. 301. During the opening days of March 1865 Sheridan, with a body of cavalry, moved from the Shenandoah Valley along the James river to a

junction with Grant (§ 296). On the way he had ruined the canal and railroad communication directly west from Richmond, and had reduced Lee to dependence on the two railroads running south-west. Grant resumed his attempts to work his lines farther round to the south of Petersburgh; and, with each successful advance, Lee was compelled to lengthen his thin line of men. Sheridan was put in command on the extreme left; he pushed forward to Five Forks, de- stroyed the Southside Railroad (April 1), and held his ground. Giving Lee time to lengthen his line to meet this new danger, Grant gave the signal for a general advance the next day. It was successful everywhere ; Petersburgh was taken, and Richmond the next day ; Davis and the other political leaders fled to North Carolina; and Lee retreated westward, hoping to join Surrender Johnston. The pursuit was too hot, and he surrendered of Lee. (April 9). All the terms of surrender named by Grant were generous: no private property was to be surrendered ; the men were even to retain their horses, ‘‘ because they would need them for the spring ploughing and farm- work”; and both officers and men were to be dismissed on parole, not to be disturbed by the United States Government so long as they preserved their parole and did not violate the laws. It should be stated, also, to Grant’s honour that, when the politicians afterwards undertook to repudiate some of the terms of surrender, he personally intervened and used the power of his own name to force an exact fulfilment. Johnston surrendered on much the

Five Forks.

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same terms (April 26), after an unsuccessful effort at a $p broader settlement. All organized resistance had now o% Join ceased ; Union cavalry were ranging the South, picking up Ston, Government property or arresting leaders ; but it was not until May that the last detached parties of Confederates, particularly beyond the Mississippi, gave up the contest, 302. Just after Lee’s surrender President Lincoln died Deat by assassination (April 15), the theatrical crime of a half. lina, | crazed enthusiast. Even this event did not impel the American people to any vindictive use of their success for the punishment of individuals. In the heat of the war, in 1862, Congress had so changed the criminal law that the punishment of treason

and rebellion should no longer be death alone, but death or fine and imprisonment, Even this modified punishment was not inflicted. There was no hanging for treason ; some of the leaders were im- prisoned for a time, but were never brought to trial. The leader and president of the Confederate States is living (1887) quietly at his home in Mississippi; and the vice-president, before his death, had returned to the Congress of the United States as an efficient and respected member, 303. The armies of the Confederacy are supposed to __ have been at their strongest (700,000) at the beginning of The 1863 ; and it is doubtful whether they contained 200,000 ppasi men in March 1865. The dissatisfaction of the Southern “” people at the manner in which Davis had managed the war seems to have been profound; and it was only con- verted into hero-worship by the ill-advised action of the Federal Government in arresting and imprisoning him. Desertion had become so common in 1864, and the attempts of the Confederate Government to force the people into the ranks had become so arbitrary, that the bottom of the Confederacy, the democratic elements which had given it all the success it had ever obtained, had dropped out of it before Sherman moved northward from Savannah ; in some parts the people had really taken up arms against the conscripting officers. On the contrary, the numbers of the Federal armies increased steadily until March 1865, when they were a few hundreds over a million. As soon as organized resistance ceased, the disbanding of the men began; they were sent home at the rate of about 300,000 a month, about 50,000 being retained in service as a standing army. ‘The debt reached its maximum Coto August 31, 1865, amounting to $2,845,907,626.56. Some the – $800,000,000 of revenue had also been spent mainly on the war; States, cities, counties, and towns had spent their own taxation and accumulated their own debts for war purposes ; the payments for pensions will probably amount to $1,500,000,000 in the end; the expenses of the Con- federacy can never be known; the property destroyed by the Federal armies and by Confederate armies can hardly be estimated ; and the money value ($2,000,000,000) of the slaves in the South was wiped out by the war. Altogether, while the cost of the war cannot be exactly calculated, $8,000,000,000 is a moderate estimate.] 304. In return for such an expenditure, and the death ~~— | of probably 300,000 men on each side, the abiding gam” | was incalculable. The rich section, which had been kept back in the general development by a single institution, and had been a clog on the advance of the whole county, had been dragged up to a~~

~~level with the rest of the county. Free labour was soon to show itself far superior to slave labour in the South ; and the South was to reap the largest material gain from the destruction of the Civil War (§ 314). The persistent policy of paying the debt 1m~~ mediately resulted in the higher taxation falling on the richer North and West ; and the new wealth of the South will for ever escape the severe taxation which the other sections have been compelled to feel. As a result of the struggle the moral stigma of slavery was removed. 2

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power of the nation, never before asserted openly, had made a place for itself; and yet the continuing power of the States saved the national power from a development into centralized tyranny. And the new power of the nation, guaranteeing the restriction of government to a single nation in central North America, gave security against any introduction of international relations, inter- national armament, international wars, and continual war taxation into the territory occupied by the United States. An approach for four years to the international policy of Europe had given security against its future necessity. Finally, democracy in America had certainly shown its ability to maintain the unity of its empire,

1864-1868.]

XI, THE RECONSTRUCTED NATION: 1865-87,

305. The Federal Government had begun the war with an honest expression of its determination not to interfere with slavery ; the progress of the war had forced it into passing the 13th amendment in 1865, abolishing slavery in the United States for ever. In much the same way circum- stances were driving it into interference with what had always been regarded as the rights of the States. In the latter case the process was certain to find an obstacle in Lincoln’s successor, Johnson. He had been elected, like Tyler, to the comparatively unimportant office of vice- president in order to gain the votes of War Democrats ; and now the dominant party found itself with a president opposed to its fundamental views of the powers of the Federal

Government. The case was worse for Johnson, since the war had built up a new party. Until 1861 the Republican party had been a mixture of a strong Whig element and a weak Democratic element ; now it was a real party, and demanded complete loyalty from its leaders, not skilful compromises between its two elements. Just as in the cases of Seward, Sumner, Trumbull, and very many of its original leaders, the party was now ready to repudiate its leaders if they did not come up to its ideas.

306. The universal idea in 1861 had been that the States were to be forced to return with all their rights unimpaired. This original notion was seriously limited

‘ by the Emancipation Proclamation of 1862-63 3 as soon

as the president opened a door, by demanding a recogni- tion of the abolition of slavery as a condition precedent to

_ the return of a State, the way was just as open for the

_ he had a clear field before him, meet until December.

) had passed the

imposition of whatever conditions Congress as well should think essential to an abiding peace. But Congress was not called on to face the difficulty for some time. President Lincoln went on to reorganize civil government in Virginia, Tennessee, Arkansas, and Louisiana, by giving amnesty to such voters as would swear to support the Government of the United States and the abolition of slavery, and recognizing the State officers elected by such voters, When Johnson succeeded to the presidency in April 1865 for Congress was not to Before that time he had re- governments of the seceding States; they

13th amendment (§ 125); and they were ready to apply for readmission to Congress. Tennessee Was readmitted in 1866 by Congress; but the other seceding States were refused recognition for a time.

307. It was not possible that slave-owners should pass

organized the

_ at one step from the position of absolute masters to that

of political equality with their late slaves. Their State legislation assumed at once a very paternal character, Every means was taken, in the passage of contract and Vagrant laws, and enactments of that nature, to force the freedmen to work; and the legislation seemed to the Northern people a re-establishment of slavery under a hew name. Johnson had a very unhappy disposition for such a state of affairs; he had strong convictions, great

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stubbornness, and a hasty, almost reckless, habit of speech. Quarrel As soon as it became clear that Congress did not intend between to readmit the Southern States at once he began (February a 1866) to denounce Congress in public speeches as “NO president, Congress” so long as it consisted of representatives from

but part of the States. The quarrel grew rapidly more

bitter ; the Congressional elections of 1866 made it cer-

tain that the Republicans would have a two-thirds majority

in both houses through the rest of Johnson’s term of office ;

and the majority passed over the veto (§ 113) every bill

which Johnson vetoed. Thus were passed the Freedmen’s

Bureau Bill (1866) for the protection of the emancipated negroes, the Act for the admission of Nebraska, with equal Admis- suffrage for blacks and whites (1867), the Tenure of Office sion of Bill, making the assent of the senate necessary to removals, Nebraska, which had always been regarded as within the absolute

power of the president (1867), and the Reconstruction Acts

(1867). The increasing bitterness of the quarrel between

the president and the majority in Congress led to the im- Impeach-
peachment of the president in 1868 for removing Stanton, ment of the
secretary of war, without the assent of the senate s bat ia a on trial by the
senate a two-thirds majority for conviction °°” could not be obtained, and
Johnson served out his term.

308. The Reconstruction Acts divided the seceding States into military
districts, each under command of a general officer, who was to leave to the
State Governments then in existence such powers as he should not consider
to be used to deprive the negroes of their rights. The State Governments of
the seceding States were to be considered provisional only, until
conventions, elected without the exclusion of the negroes, but with the
exclusion of the leading Confederates, should form new or “ reconstructed”

State Governments, on a basis of manhood suffrage, and

their legislatures should ratify the 14th amendment to The 14th the
constitution (§ 125). This amendment, passed by amend- Congress in 1866,
was in five sections, but had three main ™t- divisions. (1) All persons born
or naturalized in the United States were declared citizens of the United
States

and of their States, and the States were forbidden to abridge the “ privileges
or immunities” of such citizens.

This was to override the Dred Scott decision (§ 249).

(2) The representation of the States in Congress was to

be reduced in proportion to the number of persons whom

they should exclude from the elective franchise. This

was to induce the States to adopt negro suffrage. On

the other hand, specified classes of Confederate office- holders were excluded from office until Congress should remove their disabilities. (3) The war debts of the Confederacy and the seceding States were declared void

for ever, and the war debt of the United States was guaranteed. Congress was given power to enforce all

these provisions by “ appropriate legislation.”

309. The presidential election of 1868 sealed the process Election of reconstruction. The Democrats opposed it, and nomin- of 1868. ated Seymour (p. 790) and Blair; the Republicans endorsed it, and nominated Grant (p. 788) and Colfax (p. 788). Virginia, Mississippi, and Texas were the only States of the late Confederacy which were excluded from this elec- tion ; all the rest had been reconstructed, and readmitted by Congress in June 1868; and the Republican candidates carried twenty-six of the thirty- four voting States, and were elected. The legislatures of the reconstructed States, representing mainly the negroes freed by the war, were devoted supporters of the new order of things ; and their ratifications secured the necessary three-fourths of the States to make the 14th amendment a part of the con- stitution (1868). Congress went on to propose a 15th The 15th amendment, forbidding the United States, or any State, 2mend- to limit or take away the right of suffrage by reason of “°™ race, colour, or previous condition of servitude. This was

Mexico.

Alaska. Treaty

of Wash-

ington.

The ©Vir- ginius” case,

The Chinese.

“ Dyna- miters.”

The

ratified by the necessary number of States, and became a part of the constitution (1870). Ratification of it was imposed as an additional condition on Virginia, Missis- sippi, and Texas, which had rejected the original terms of readmission. They accepted it, and were readmitted (1870). It was not until January 30, 1871, that all the States were once more represented in Congress.

310. The foreign affairs of the United States during this period took on a new appearance. The country’s promptness in disarming at the end of the war put it under no disadvantage in dealing with other nations ; power and pacific intentions were united in the act. The successful completion of the Atlantic cable (1866) gave a celerity and directness to diplomacy which was well suited to American methods. The tone of American complaint at the continued presence of French soldiers in Mexico grew more emphatic as the success of the war became assured; and, at the end of the war, significant movements of troops to the Mexican frontier led the French emperor to withdraw his support of Maximilian. Alaska was purchased from Russia in 1867. The treaty of Washington (1871) provided for the settlement by arbitration of the “Alabama” disputes, of the north- western boundary, and of the claims of Canada for damages for use of the shore by American fishermen. The capture by a Spanish man-of-war of the ‘“ Virginius,” a vessel claiming American nationality, and the execution of a part of her

crew (1873), threatened to interrupt friendly relations with Spain ; but the rupture was averted by proof that the vessel's papers were false. Chinese immigration had grown largely on the Pacific coast. There were riotous attacks on the Chinese by worthless white men ; and many others did not feel that they were a desirable political addition to the population of the United States. A treaty with China was obtained (1880), by which the limitation of Chinese immigration was allowed. So, also, the raising of money in the United States to assist the destruction of private and public buildings in England by some of the more desperate of the Irish people (1885) gave England reason for discontent. But the American Government had no power in the premises. The matter was under the exclusive jurisdiction of the State Governments ; and, as soon as these began to apply the common law to the case, the "dynamite subscriptions" disappeared. Further difficulties made their appearance as to the Canadian fisheries (1886-87). When American fishing-vessels bought ice or bait in Canadian ports, the

Canadian Canadian Government seized and condemned them, on the

fisheries.

Gold.

Silver.

Petrol. eum.

Coal.

Natural gas.

Manu- factures.

ground that such purchases were acts "preparatory to fishing in Canadian waters." Retaliatory measures were suggested, but no full retaliatory system has been adopted, nor has the dispute yet been settled (1887).

311. The prosperity of the United States knew no cessation. It had been found that gold was not confined to California. In 1858 it had been discovered in Color- ado, at Pike's Peak. It has since been found in most of the Pacific States and Territories. Silver, a metal hardly known hitherto in the United States, was discovered in Nevada (1858) ; and this metal also has been found to be widely scattered over the Pacific coast. Petroleum was found in north-western Pennsylvania (1859), and the enormous drain of this oil from the earth still continues without apparently affecting the reservoir. The coal-fields of the country began to be understood clearly. Taylor, in 1848, thought that the coal-area of the United States amounted to 133,000 square miles; it was estimated in 1883 at over 200,000 square miles. Natural gas has since come into use, and has made production of many kinds cleaner, more effective, and cheaper. Manufactures and every variety of production have increased with cumulative

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rapidity. In 1860 the largest flouring-mill in the United States was in Oswego, N.Y., the next two in Richmond, Va., and the fourth in New York city; and the capacity of the largest was only 300,000 barrels a year. In 1887 the flour production of Minneapolis, almost unknown in 1860, is 100,000 barrels a week or 5,000,000 barrels a year. The absolute free trade which prevails between the States has resulted in a constant shifting of centres of production, a natural arrival at the best conditions of pro- duction, and an increasing development. Mulhall, perhaps safer as a foreign authority, gives the total manufactures of the United States as £682,000,000 in 1870 and £888,000,000 in 1880, Great Britain coming next with £642,000,000 in 1870 and £758,000,000 in 1880. He

[nIstToRy,

estimates the accumulated wealth of Great Britain at Wealth,

£8,310,000,000 in 1870 and £8,960,000,000 in 1880, an increase of £650,000,000, and that of the United States at £6,320,000,000 in 1870 and £7,880,000,000 in 1880, an increase of £1,560,000,000. If he had followed the American census returns his value for 1880 would have been 25 per cent. larger. In 1870 the United States stood

_third in wealth ; in 1880 they had passed France in the

race, and stood at least second. The country whose popu- lation has been developed within 280 years does already one-third of the world's mining, one-fourth of its manu- facturing, and one-fifth of its agriculture; and at least one-sixth of the world's wealth is already concentrated in the strip of territory in central North America which is the home of the United States.

312. Of the 290,000 niles of railroad in the world, probably 135,000 are in the United States. Of the 600,000 miles of telegraph lines, more than a fourth are in the United States ; and the American telephone lines are probably still longer in the aggregate. The new

development of the American railways began in 1869, Railways

when Vanderbilt consolidated the Hudson River and New York Central Railroads and formed a trunk line to the west. It was undoubtedly hastened by the completion of the Central Pacific line in that year, and it has resulted in a universal tendency to consolidation of railways and the evolution of "systems," under combined managements (§ 273). The coincident introduction of Bessemer steel rails, the steady increase of weight carried by trains, and concentrated competition have reduced railway freight rates through the whole of this period. The average rates per ton per mile were 1:7 cents in New York in 1870 and 0°8 in 1880, 2:4 cents in Ohio in 1870 and 0°9 in 1880. The persistent effects of such a process on the industries of so large a country can hardly be described.

313. The extraordinary stimulus given to a new terri: el tory, if it has any basis for production, by the introduction ™

of a new railway, is also quite beyond description. Most ™ of the Western railways have had to build up their own traffic ; the railway has been built, and the sales of lands have afterward brought into existence the towns and even States which are to support it. Nebraska was described in the Government reports of 1854 as a desert country, hopelessly unfitted for agriculture, and the maps of the time put it down as a part of the "Great American Desert." It is now one of the leading agricultural States of the Union, with a population of a million ; and Dakota is waiting only for the

legal form of admission to become a State. The profits of railway construction, the oppo tunities for skilful management in the development of territory, and the spice of gambling which permeated the whole were great temptations to Americans to embark in the business. The miles of railway constructed pet annum, which had been from 1000 to 3000 (averagmg about 1500 miles) for the period 1859-68, rose to 4619 miles in 1869, to 6070 miles in 1870, and to 7379 miles

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1868-1876.] UNIT ese Dp

in 1871. Masses of labourers were brought into situations from which they could not easily escape ; and masses of capital were locked up in railways which were finally un- productive, and resulted only in total loss. The result

wncial was the financial crisis of 1873, from which the country

has hardly yet fully recovered.

314. For the first time in the history of the United States, the South has taken a normal part in all this development (§ 304), though it was not until about 1885 that Southern progress was fully understood by the rest of the country. Staggering under a load of poverty and discouragement which might have appalled any people, with the addition of social problems which no other country has solved with any great satisfaction, the Southern people began to feel for the first time the healthy atmosphere of free labour. The former slave is a free labourer, and the white man has gone to work; white labour produced 10 per cent. of the cotton crop of 1860 and 55 per cent. of that of 1886. The last eighteen slave- labour crops of cotton amounted to 51,000,000 bales ; the first eighteen free-labour crops amounted to 75,000,000 bales, And the latter figures are deceptive from the fact that, in their period, the South had turned a large percentage of its labour and capital into industries which had not been possible, only longed for, under

the slave system. Cotton- seeds were waste under slavery: 600,000 tons of them were crushed in 1886, giving an entirely new production of $12,000,000 per annum of cotton-seed oil. Southern railways, which had made but a meagre comparison with those of the North and West in 1860, began to assume something of the network appearance of the latter ; they too began to concentrate into “systems,” to reduce rates and improve service, and to develop new territory. Southern manufactures began to affect Northern markets : cotton-mills in the South began to reap the advantages of their immediate contiguity to their raw material, Pennsylvania ironmasters were startled as their product was undersold in the Philadelphia markets by Southern iron; and the great mineral fields of Tennessee and northern Georgia, Alabama, and Mississippi, over which Sherman’s and Hood’s men had so lately been tramping and fighting, were brought into notice and development. Wonderful as the general progress of the United States has been during this period, the share of the new South under free labour has been one of the most remarkable phases in it,

315. The population rose from 31,443,321 in 1860 to

~ $8,558,371 in 1870 and 50,155,783 in 1880. At the

normal rate of increase up to 1860—one-third for each ten years—the increase from 1860 to 1870 should have been about ten and a half millions, instead of seven millions. The difference represents the physical influences of the civil war. This influence was shown most plainly in the Southern States, notably in South Carolina and Alabama, Which had hardly any increase, and a real decrease in adult Males. It should also be noticed that natural checks on

the increase of population are plainly perceptible in the

Atlantic States in 1880, and were probably in operation, to a less extent, in 1860-70, though they were made in- distinguishable by the war. The increase in 1870-80 at the former normal rate should have been a little over a million more than it was. The tendency will be more evident in future, but it ought to be allowed for in

1860-70,

316. The material prosperity of the country brought its own disadvantages. The sudden development of wealth gave the country for the first time a distinct wealthy

fic) Class, not engaged in production of any kind, and very often having none of the characteristics of the people who

are the real strength of the country. The inevitable

extravagance of Government management, aggravated by

a period of civil war, when the people were disposed to

excuse almost any error of detail for which good motives could be shown, had its reflex influence on the people, as well as on the Governments of the nation, the States, and the cities. An era of legal tender paper currency (§ 272), legally unvarying in value, but showing its effects in the constant shiftings of price in every other thing, brought uncertainty as to every article, price, and transaction, The people had learned that “unhappy lesson —that there is an easier way to make a dollar than by working for it” ; and it was not long before speculation among the people called out its correlative of dishonesty among Government officials. Money was lavished on the navy ; in expendi- tures on that branch of the service the United States stood third or fourth among the nations, while the effec- tive results were discouraging, “ Rings” of politicians obtained control of the larger cities. The “Tweed ring ” in New York city was overthrown in 1872; but New York was not the only city of corruption : Philadelphia, Chicago, and almost every city large enough to have fat opportunities for fraud and to deprive universal suffrage of the general acquaintance of neighbours, each fell under control of its “ring,” and was plundered without mercy. Corruption even attacked the judiciary; for the first time American judges were found who were willing to prosti- tute their positions, and the members of the “ Erie ring ” were able to hold their ill-gotten railroads because they owned the necessary judges. A “ whisky ring” of distil-

- Rings,”

| lers and Government employees (1874) assumed national

proportions, and robbed the Government of a large per- centage of its internal taxation on spirits. The “star- ‘Star- routes,” in which the contracts for mail transportation routes.” were altered at the discretion of the contractor and the Government after the competition for the contracts had

been decided, gave rise to as great scandals through the connivance of Government agents with dishonest con- tractors. No one who lived in this period will wonder at

the pessimistic tone of the public speeches which marked

the hundredth year of the republic (187 6),

317. The republic had life and vigour in it, and its people showed no disposition to despair before the mass of corruption which confronted them. The newspapers attacked the star-route contractors, and drove the Govern- ment into an attack upon the ring, which broke it up.

The efforts of private individuals, backed by newspapers,

broke up the Tweed ring, banished or imprisoned its members, expelled the corrupt judges from the bench,

and carried destruction into the widespread whisky ring,

Local rings were attacked in city after city, were broken

up and revived again, but always found the struggle for existence more and more desperate. The people have shown themselves almost vindictive in driving out of public life any who have been proved dishonest : when

the ‘Credit Mobilier,” the construction company of the “ Credit Central Pacific Railroad, was shown to have bribed or Mobilier.” influenced members of Congress to vote for it, there is ground for believing that the punishment was distributed

more widely than justice demanded ; and it has come to

be recognized as a decided disadvantage for a public man

to be known as shrewd rather than honest.

318. The completion of reconstruction in 1870, and the The re- adoption of the 15th amendment (8 125), made negro con- suffrage the law of the land, even in the Southern States. in

. overn- The Southern whites were the tax-payers ; the NEZTOES ment, were the majority; and the negro legislatures proved hopelessly corrupt. In one or two States the whites recovered control of their States by hiring their negroes to remain at home on election day, or by threatening them with discharge for voting. Failing in this line of action

in other States, the whites fell into a steady tendency towards violence. A widespread secret society, the ‘“ Ku- “Ku- Klux-Klan,” beginning with the effort to overawe the Klux. negro population by whipping and arson, was rapidly Klan.” driven into political murders. The reconstructed Govern- ments resisted as best they could. They tried to use the force of the State against the offenders ; but the best part of the force of the State was the white element, which was most deeply involved in the resistance to the legal Govern- ment. On the application of the legislature of a State, or of the governor if the legislature cannot be summoned, the president may send Federal troops to suppress rebellion (§ 125). The reconstructed Governments called on Pre- sident Grant for such aid, and received it. But the whites were the stronger race, struggling for property, and know- ing well the letter of the law. They refused to resist the smallest atom of Federal authority: a large force of them, mainly old Confederates and excellent fighting men, who had seized the city of New Orleans and overturned the reconstructed Government (1874), retired quietly before a detachment of United States troops, and allowed the State Government to be restored. The little United States army in the South was kept busy. Wherever it appeared, resist- ance ceased at once, breaking out at the same time else- where. The whites had to gain but a single victory ; as soon as they secured a majority in a State legislature they so arranged the election laws and machinery that a negro majority was thenceforth impossible. The legislatures and

governors, with nearly all the local officers, were then Democrats ; calls for Federal troops ceased at once ; and the Republicans of the North, the dominant party of the nation, were reduced to the necessity of seeing their Southern vote disappear, without the ability to do any- thing to check the process. As the election of 1876 drew near, the reconstructed Governments of all the seceding States, except Florida, South Carolina, and Louisiana, had become Democratic. Civil 319. Congress, which was controlled by the Republicans, Rights had not been idle. The Civil Rights Act (1870) provided ae that fines and damages should be imposed for any attempt to violate or evade the 15th amendment or for con- spiracy to deprive the negroes of the right of suffrage. Election The Election Act (1870) exercised for the first time the Act. right to alter or amend State laws as to Federal elections which the constitution had given to Congress. This was strengthened by another Act in the following year. The Force Force Act (1871) went farther than the instincts of the Act. American people could follow Congress. It provided that any conspiracy or combination strong enough to deprive the negroes of the benefits of the 14th amendment should be evidence of a “denial by the State of the equal protection of the laws” to all its citizens; that the president should be empowered to use the army, navy, and militia to suppress such combinations; that, when any combination should appear in arms, the act should be a rebellion against the United States; and that, in such case, the president should have power to suspend the writ of habeas corpus in the rebellious territory (§ 305).

320. It was plain that the Southern whites meant to govern their States with little present regard to the last two amendments, and that it was impossible to defeat their purpose without cutting up the State system in the South by the roots. Even in 1872 a strong element of the Republican party thought that the party policy had gone too near the latter course. It held a convention of

Liberal its own, under the name of the Liberal Republican party, Re- and nominated Greeley and Brown. The Democratic party, anxious to save local government and State rights in the South, but completely discredited by its opposition to the war, accepted the Liberal Republican platform and

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nominations. Its action was in one sense a failure ; Greeley had been one of the bitterest and angriest criticg of the Democratic party, and so many of the Democrats refused to vote for him that his defeat was hardly ever doubtful. The Republicans renominated Grant, with Election | Henry Wilson for vice-president ; and they received the of 1g votes of 286 of the 349 electors, and were elected. Tho action of the Democratic party in adopting the Liberal Republican platform, and thus tacitly abandoning its oppo- sition to reconstruction, brought it back into the lines of political conflict and made it a viable party.

321. The election of 1876 was the first really contested Blection | election since 1860. The Democrats nominated Tilden of 18%, and Hendricks (p. 789) and the Republicans Hayes and Wheeler (p. 790). The platforms showed no distinct grounds of party struggle, except that of the ins and the outs. The election turned on the votes of the Southern States in which the reconstructed Governments still held their own or claimed to do so; and the extra-constitutional device of an electoral commission resulted in a decision in favour of Hayes and Wheeler. As a part of the result, some arrangement had been made for the settlement of the Southern difficulties, for Grant immediately withdrew the troops from Florida, South Carolina, and Louisiana, and the reconstructed Governments of those States surrendered without a struggle. All the Southern States were now Democratic ; the negroes had every right but that of voting ; and even this was permitted to a sufficient extent to throw a veil over the well-understood general state of affairs. Colorado, the thirty-eighth State (and the last, Admis. up to 1887), was admitted in 1876 and took part in this sao! election. Colorado,

322. The Hayes administration was a welcome period of calm. The main subject of public interest was mone tary, and much of it was due to the change of conditions during and since the war. In order to sell bonds during the war it had been necessary, not only to make the interest very high (in some cases 7°3 per cent.), but to sell them for the Government’s own depreciated paper. The Act of 1869, to restore the public credit, pledged the faith of the United States that the bonds should be paid in coin.

This had seemed very inequitable to some, but was acquiesced in. When the price of silver had fallen, in Demo | July 1876, to 47d., a ratio for gold and

silver of 20:1, ie) and it was found that an Act of 1873 had dropped the” ” silver dollar from the coinage, the people jumped to the conclusion that this was a trick of the bondholders to secure a further advantage in the payment of their bonds

in the more valuable metal only. It was useless to urge that for forty years before 1873 the silver dollar had been token money, and that its average coinage had been only about $150,000 a year; the current was too strong to be resisted, and Congress passed (1878) an Act to restore

the silver dollar to the coinage, to compel the coinage of

at least $2,000,000 in silver per month, and to make the silver dollar legal tender to any amount. The Act 1s still (1887) in force, in spite of the recommendations of successive presidents and secretaries of the treasury for

its repeal. The operation of refunding had been begun te under the Act of July 14, 1870, authorizing the issue of™

5, 44, and 4 per cent. bonds, to take the place of those at higher interest which should be payable. This first refund-

ing operation was completed in the year of the resumption

of specie payments (1879). The issues were $500,000,000

at 5 per cent., $185,000,000 at 44, and $710,345,950 at

4, reducing the annual interest charge from $81,639,684

to $61,738,838. One secret of the success of the Govern ment and its high credit was the persistence of the people

in urging the payment of the national debt. The work

was begun as soon as the war was ended ; before all the

» commissioners,

soldiers had been sent home $30,000,000 of the debt had been paid, and hardly a month has passed since with- out some reduction of the total amount. Between 1865 and 1880 the debt fell from $2,850,000,000 to about $2,000,000,000 ; and, as it decreased, the ability of the Government to borrow at lower interest increased. About $200,000,000 of 6 per cent. bonds fell due in 1881, and the secretary of the treasury (Windom) took the respon- sibility of allowing the holders of them to exchange them for 33 per cent. bonds, redeemable at the pleasure of the Government. ‘This privilege was extended to about $300,000,000 of other bonds, giving a saving of $10,000,000 interest. The 44 per cent. bonds of 1870-71 ($250,000,000) are not redeemable until 1891, and the 4 boads ($738,000,000) until 1907. Roughly stated, the whole debt, deducting cash in the treasury, is under $1,400,000,000, about $1,100,000,000 being interest- bearing, the remainder non-interest-bearing, paper currency of different kinds.

323. In 1880 the Republicans nominated Carfield

° (p. 788) and Arthur (p. 787), and the Democrats Hancock

(p. 789) and English. Again there was no great distinction between the party principles advocated. The Democrats, naturally a free-trade party, were not at all ready to fight a battle on that issue; and the Republicans, turning the contest to the point on which their opponents were divided, succeeded in electing their candidates. They were in- augurated in 1881; and the scramble for office which had marked each new administration since 1829 followed ($202). ‘The power of the senate to confirm the president’s nominations had brought about a practice by which the appointments in each State were left to the suggestion of the administration senators from that State. The senators from New York, feeling aggrieved at certain appointments in their State, and desiring the prestige of a re-election by their legislature, resigned. Unfortunately for them the legislature took them at their word, and began to ballot for their successors. Their efforts to be re-elected, the

caucuses and charges of treachery or corruption, and the

newspaper cohiments made up a disgraceful scene. In the midst of it a disappointed applicant for office shot the president (July 2), and he died two months later. Vice- President Arthur succeeded him (§ 117), and had an un-eventful administration. The death of President Garfield called general attention to the abominations of the system under which each party, while in office, had paid its party expenses by the use of minor offices for its adherents. The president's power of appointment could not be con-

, tolled; but the Pendleton Act (1883) permitted the _ president to make appointments to designated classes of

offices on the recommendation of a board of civil service President Arthur executed the law faith- fully, but its principle could hardly be considered estab-

lished until it had been put through the test of a Demo-

cratic administration; and this consideration undoubt-

| edly had its influence on the next election (1884). The

' Republicans nominated Blaine and Logan, and the Demo- erats Cleveland and Hendricks. A small majority for the Democratic candidates in the State of New York gave them its electoral votes and decided the election in their favour, They were inaugurated (1885), and for the first time in more than fifty years no general change of office- holders took place. 'The Pendleton Act was obeyed ; and its principle was applied to very many of the offices not legally covered by it. There have been, however, very many survivals of the old system of appointment, and each of them has been met by a general popular disapproval] Which is the best proof of the change of public sentiment. At least, both parties are committed to the principle of Civil service reform. 'There is a growing desire to increase

the number of offices to which it is to be applied; and the principle is making its way into the administration of States aud cities.

324. At home and abroad there is not a cloud on the political future of the United States in 1887. The economic conditions are not so flattering ; and there are indications that a new era of struggle is opening before the country, and that it must meet even greater difficulties in the immediate future. The seeds of these may perhaps be found in the way in which the institutions of the country have met the new economic conditions which caine in with the railway in 1830.

325. Corporations had existed in the United States Corpora.

before 1830, but the conditions, without the railway or tions in telegraph, were not such as to give them pronounced ad- es F vantages over the individual. All this was changed under Saree the new régime; the corporation soon began to show its superiority. In the United States at present there are many kinds of business in which, if the individual is not very highly endowed, it is better for him to take service with a corporation. Individual success is growing more rare ; and even the successful individual is usually suc- ceeded by a corporation of some sort. In the United States, as in England, the new era came into a country which had always been decided in its leanings to indi- vidual freedom; and the country could see no new de- parture in recognizing fully an individual freedom of incorporation (§ 215). Instead of the old system, under Freedom which each incorporation was a distinct legislative act, of Lap general provisions were rapidly adopted by the several aaa States, providing forms by which any group of persons could incorporate themselves for any purpose. ‘The first Act of the kind was passed in Connecticut in 1837, and the principle of the English Limited Liability Act of 1855 was taken directly from it. The change was first embodied in New York in its constitution of 1846, as follows:—* Cor- porations may be formed under general laws, but shall not be created by special Act, except for municipal purposes and in cases where, in the judgment of the legislature, the objects of the corporation cannot be attained under general laws.” The general laws were for @ long time merely directions to the corporators as to the form of the certificate and the place where it was to be deposited. The New York provision was only a development of the principle of a statute of 1811 applying to nianufacturing, but it is an instance of what was taking place all over the country.

326. The consequent freedom of corporations was also Dart- influenced by the law, as expounded by the Supreme Court mouth of the United States in the “ Dartmouth College case ” ae (1819), whose principle has always been the object of vigorous but unsuccessful criticism. The States are pro- hibited by the constitution from passing any laws which shall alter the obligation of contracts. This decision held that a charter was a contract between the State and the corporation created by it, and therefore unalterable except by consent of the corporation. The States were careful thereafter to insert in all charters a clause giving the State the right to alter the charter ; but the decision has tended to give judges a bias in favour of the corporations in all fairly doubtful cases. Corporations in the United States thus grew luxuriantly, guarded by the constitution, and very little trenched upon by the States.

327. American corporations have usually been well managed, and very much of the extraordinary develop- ment of the wealth of the United States has been due to them. But a corporation which holds $400,000,000 of Corporate property, owns niore than one State legislature, and has a power. heavy lien on several others, is not an easy creature to con-

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trol or limit. Wars of rates between rival corporations

= 95

Inter- State

Com-

merce Act.

Corpora- tions

as em- ployers,

Con- centra- tion of popula- tion,

Popular feeling towards corpora- tions.

claiming great stretches of territory as “their own,” into which other corporations must not intrude, are startling things to any people. The rise of a corporation, built upon the ruins of countless individual business concerns, and showing that it can reduce railway corporations to an obedience which they refuse to the State, is too suggestive of an wmperium im tmperio to be pleasant to a democracy. The States, to which the whole subject legitimately belongs, coufess their inability to deal with it by leaving Congress to pass the Inter-State Commerce Act (1887), intended to stop the encroachments of railway corporations on indi- vidual rights (§ 106); but the success of even this measure is still quite doubtful.

328. Still more unhappy have been some of the effects of the new régime on the relations between employers and employed. The substitution of a corporation for an indi- vidual as an employer could not but affect such relations unhappily, at least for a time ; but the freedom and power of the corporate employers straincd the relations farther than was at all necessary. The first clumsy attempts to control the corporations, by limiting the percentage of their profits, led to the artifice of “ watering,” or unneces- sarily increasing, their stock. In good years the nominal dividends were thus kept down to an apparently normal percentage. When bad years, or increasing competition, began to cut down the dividends, the managers were often forced to attack the wages, or increase the duties, of their employees. The “bad years” began to be more numerous and constant after the financial crisis of 1873 had set in ; and the first serious effects appeared in the “ railroad strikes of 1877.”

329. For many years past, the drift of population had been towards an urban life. Taking the town of 8000 inhabitants as the lower limit of urban population, we find that 3°3 per cent. of the population was to be classed as urban in 1790, and that the percentage had risen to 22°5 in 1880. If towns of 4000 inhabitants had been taken as the lower limit, the urban population in 1880 would have been 13,000,000, or more than 25 per cent. It may be thought that the policy of protection, of abnormal stimula- tion of manufactures, had something to do with this tend- ency ; but it is noteworthy that the increase during the generally free-trade period of 1840-

60, from 8:5 to 16:1, was the greatest of any twenty years, unless we take the period 1850-70, half free-trade and half protective, when the percentage rose from 12°5 to 20°9. Whatever may have been the cause, the tendency is indubitable, and its effects in increasing the facility of organization among the employees of corporations, whose fields of operation are generally urban, are as easily to be seen.

330. Some of the corporations were controlled by men who were believed, in some cases on the best of evidence, to have gained their control by the defects of American corporation law, particularly by the privilege of the majority of stock-holders to use the whole stock almost at their discretion, even for the wrecking of the road and its repurchase on terms ruinous to the minority's interests. Disrespect for " property rights " thus acquired was apt to extend to other corporate property, acquired legitimately : in the railroad strikes of 1877, there were cases in which citizens usually law-abiding watched with hardly-concealed satisfaction the destruction of such property as belonged to corporations. Further, the neutral position of the United States had brought about the transfer of consider- able English and other foreign capital to the United States to be invested, under corporate privileges, in cattle-ranges or other industries connected with Western agriculture. The American managers of these corporations, feeling little responsibility to any power except their foreign employers, permitted themselves to take liberties with individual

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settlers and their rights which arrayed a large part of the agricultural population of the West against corporate pro- perty. Finally, the differential rates made in private, even secret, contracts, by railway corporations all over the country, had gathered up passions of all sorts against the a corporate ‘‘ monopolies." The anchor of agricultural con- servatism, usually a safe reliance in the United States, had | ceased to be of service in this matter. An order, the il ‘“‘ Patrons of Husbandry," said to number 1,500,000 mem- Tits bers in 1874, had been formed with the avowed object of of Hus. checking the common corporate enemy ; and, though itg baudry," ’ prominence was short-lived, its influence reniained.,

331. The growing power of corporations, and that ataany

time when the democracy had just shown its strength most ecouomic | forcibly and to its own satisfaction ; the evident tendency of iene ; the corporations, especially in the protected industries and in transportation, to further combinations, such as “pools” and ‘‘ trusts”; the consequent partial disappearance of that compctition which had seemed to be a restriction on the , power of the corporations over the individual ; the power and disposition of corporations to cut wages down when- ‘ ever dividends made it necessary to do so; the half-under- stood, but heartily dreaded, weapon known as the “ black list,” by which combinations of employers, especially of corporations, drove employecs inclined to “agitation” out of employment; the general misgivings as to the wisdom or honesty of the State legislatures, in which the power over corporations was vested; the unhappy influences of the increase of urban population over the jury system ; the complicated systems of appeals which had grown up in American law, with their opportunities for delay or per- version of justice by wealthy and determined corporations; the altered character of American labour, which was now largely made up of a mass of immigration hardly yet fully digested, and more apt than American labour had once been to seek help in something else than individual effort, —all these influences made up a mass of explosives which became seriously dangerous after 1880. It was no longer so easy for the individual to defend himself against cor- porate ageression ; if it had been, the American working man was no longer so apt to trust to an individual de- fence; and labourers began to turn to combinations against corporations, though these combinations were even more prompt and successful in attacking individual employers than in attacking corporations.

332. The trade unions, which retained most of the con- Trale servative influences of their generally beneficiary nature, ™™ were not radical enough ; and a local Philadelphia society, the “Knights of Labour,” was developed into a national “Kuighi organization, following the usual American system of local * “assemblies,” with delegates to State and national conven tions, With but 52,000 members in 1883, it claimed 630,000 in October 1886, and 1,000,000 at the beginning of 1887. Its general object was the union of all classes and kinds of labour into one organization, so that, “an injury to one being the concern of all,” the oppression 0 even the humblest and weakest individual might be answered

by the sympathetic action of more important and, if necessary, of all classes of labour. The “ boycott, a an imported idea, was its most successful weapon: the firm Pe} or corporation which oppressed its employces was to be brought to terms by a refusal of all members of the national organization to buy its productions, or to deal with any one who bought or soldthem. Such ascheme was directly subversive of all social protection or security ; and yet It had gone on for nearly two years before it came plainly “a to public notice (January 1886). Boycotts increased in ail number ; local assemblies, intoxicated by their i pesttlts. success, went beyond the control of the well-intentone head of the order; the passive obedience on the part 0

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the members, which was a necessary feature of the system, evolved a class of local dictators, or “ rings,” which were irresponsible as well as tyrannical ; and the business of the country was very seriously threatened all through the years 1886 and 1887.

333. Law has begun to pronounce distinctly against both the black list and the boycott, as well as against the systems based upon them. There can be no doubt of the cruel tyranny which the new system of labour organization tends to erect not only over its enemies, the class of em- ployers and those working men who are not of the order, but over its own members. But the demonstration of the illegality and tyranny does not alter the conditions of the problem, of which it is but a single phase. How are the English common law, its statutory development, and its jury system, to exist when a great mass of the population is discontented, distrustful, and under the dominion of a secret public opinion, and when the way does not seem to be open for a removal of their discontents except by the serious curtailment of the

corporate system which has been so powerful an agent in American development and

wealth? The great American republic, then, seems to be entering upon a new era, in which it must meet and solve a new problem—the reconciliation of democracy with the modern conditions of production.

The works treating of the various phases of the history of the United States , arc so numerous that only the names of the leading authorities can be given: — _ The histories of the United States by Bancroft (to 1783), Pitkin (to 1797), Ramsay) (to 1814), Hildreth (to 1820), Bradford (to 1840), Tucker (to 1840), Spenser (to

1857), Bryant and Gay, Schouler, Von Holst, Higginson; M‘Master, History of the American People; Gilman, istory of the American People; Winsor, Narrative and Critical History ; Williams, Statesman’s Manual; H. H. Bancroft, History of the Pacific Coast; The American Commonwealth Series ; Force, Tracts relating to _ the Colonies, and American Archives; Poore, Federal and State Constitutions ; , Mlazard, Wistorical Collections; Neill, English Colonization in America; Dodge, | English Colonies in America; Doyle, English Colonies in America; Burke, English , Settlements in America; Holmes, Annals of America; Graham, History of the United States; Marshall, ZZistory of the Colonies; Palfrey, History of New England; Parkman’s Works; Gordon, Zistory of the Independence of the United States; Winsor, Reader’s Landbook of the Revolution; Carrington, Battles of the Revolution, Ludlow, War of American Independence; Frothingham, Rise of the Republic; Story, Commentaries; Chalmers, Annals of the Colonies, and Revolt of | the Colonies ; Scott, Constitutional Liberty in the Colontes ; Journals of Congress, L7h-89; Annals of Congress, 1789-182) ; Register of Debates in Congress, 1824-87 + | Congressional Globe, 1833-72; Congressional Record, 1872-87; American State , Papers (to 1815); Benton, Abridged Debates of Congress (to 1850); United States Statutes at Large; Revised Statutes of the United States ; Niles, Weekly Register, 1811-36; Tribune Almanac, 1838-87; Appleton, Annual Cyclopedia, 1861-86; Spofford, American Almanac, 1878-87 ; M‘Pherson, Political Manuals; Greeley, Political Text-Book, 1860; Cluskey, Political Cyclopedia, 1860; Hamilton, Republic of the United States; Renton, Thirty Years’ View ;

Young, American Statesman; Johnston istory of American Politics; Stanwood, History of Presidential Elections; Porter, Constitutional ITistory; Story, Commentaries on the Constitution; Kent, Commentaries on American Law; Wharton, Commen- taries; Duer, Constitutional Jurisprudence; Brownson, American Republic; Mulford, Zhe Nation; The Federalist ; Jameson, Constitutional Convention ; “Centz,” Republic of Republics; Tucker, Blackstone’s Commentaries; Curtis, Ifistory of the Constitution; Bancroft, History of the Constitution; Elliot, Debates; Cooley, Constitutional Limitations, Taxation, and Constitutional Law; Sedgwick, | Statutory and Constitutional Law; Bump, Notes of Constitutional Decisions; Wilson, Congressional Government ; Fiske, American Political Ideas 5 M‘Crary, Filection Laws; Rorer, Inter-State Law; Lamphere, American Government ; Counting the Electoral Vote, 1787-1876; M‘Knight, Zlectoral System; Dillon, Municipal Corporations ; Morse, Citizenship ; Lalor, Political Cyclopedia; Bur- net, Settlement of the North-West Territory, 1847; Flint, Geography and ITistory ofthe Mississippi Valley, 1828; Histories of the various States; Bishop, Z/éstory lof American Manufactures ; Seybert, Statistical Annals; Pitkin, Statistical View, es; De Bow, Jndustrial Record of the South and West, 1852; Eighty Years’ Progress of the United States, 1861; First Century of the Republic, 1876; Com~ pendium of the Census, for 1850, 1860, 1870, and 1880: Walker, Statistical Atlas, 1874; Scribner’s Statistical Atlas, 1884; Reports of the Bureau of Statistics, 1}1866-87 ; Lyman, Diplomacy of the United States; Trescot, Diplomacy of the Revolution, and Diplomatie Mistory, 1797-1801; Baker, Diplomatic History, 1861-65; Reports of the Secretary of the Treasury; Cooper, Z/istory of the Navy jXto 1853); Emmons, [story of the Navy (to 1853); Preble, History of the American Bian Roosevelt, Naval ITistory of the War of 1812; Boynton, J/istory of the if

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Lhe Presidents and Vice-Presidents of the United States.

Terms. Presidents. Vice-Presidents. 1789-93 | 1. George Washington, Va. 1. John Adams, Mass. 1793-97 George Washington. John Adams. 1797-1801} 2. John Adams, Mass. 2. Thomas Jefferson, Va. 1801-05 | 3, Thomas J efferson, Va. 3, Aaron Burr, N.Y. 1805-09 Thomas Jefferson. 4. George Clinton, N.Y. 1809-13 | 4. James Madison, Va. George Clinton (d. 1812). 1813-17 James Madison. 5. Elbridge Gerry, Mass. (d. 1814). 1817-21 | 5, James Monroe, Va. 6. Daniel D. Tompkins, N.Y. 1821-25 James Monroe, Daniel D, Tompkins. 1825-29 | 6. John Quincy Adams, Mass, 7. John Caldwell Calhoun, 8.C. 1829-33 | 7, Andrew Jackson, Tenn. John C, Calhcun, (res. 1832). 1833-37 Andrew Jackson. 8. Martin Van Buren, N.Y, - | 1837-41 | 8. Martin Van Buren, N.Y. 9. Richard Mentor Johnson, Ky. 1841-45 | 9. William Henry Harrison, O. | 10. John Tyler, Va. (d. 1841). 10. John Tyler. 1845-49 | 11. James Knox Polk, Tenn. 11. George Miffiln Dallas, Pa.

1849-53 | 12. Zachary Taylor, La. (d. 1850),) 12. Millard Fillmore, N.Y. 13. Millard Fillmore,

1853-57 | 14. Franklin Pierce, N.H. 13. William Rufus King, Ala. (d, 1853).

1857-61 | 15. James Buchanan, Pa. 14. John Cabell Breckinridge, Ky.

1861-65 | 16. Abraham Lincoln, 111. 15. Tlannibal Hamlin, Me.

1865-69 Abraham Lincoln (d. 1865). 16. Andrew Johnson, Tenn, 17. Andrew Johnson. 1869-73 | 18, Ulysses Simpson Grant, Tl. | 17. Schuyler Colfax, Ind. 1873~77 Ulysses 8. Grant. 18, Henry Wilson, Mass, (d. 1875). 1877-81 | 19. Rutherford Birchard Hayes, 0,] 19. William Almon Wheeler, N.Y. 1881-85 | 20. J: ae iss Garfield, O. } 20. Chester Alan Arthur, N.Y. 21. Chester Alan Arthur, 1885-89 | 22. Grover Cleveland, N.Y. 21. Thomas Andrews Hendricks, Ind. (d. 1885).

The following paragraphs contain a series of biographical notes on American public men, furnishing details of interest which could not without inconvenience have been incorporated in the foregoing continuous history.

ALLEN, ETHAN, was born in Roxbury, Conn,, Jan. 10, 1737. He removed about 1766 to Vermont, where he became a leader of the Vermonters, or “Green Mountain Boys,” in their struggle against New York. In 1775 he was the leader of the party which surprised Ticonderoga. He was captured in 1775, sent to England, and not exchanged until 1778. He died at Burlington, Vt., Feb. 12, 1789. He had published a number of somewhat eccentric pamphlets, either personal or attacks on Christianity. — See Spark’s American Biography, vol. i.

ANDREW, JOHN ALBION (1818-1867), governor of Massachusetts from 1861 to 1866, was born at Windham, Me., May 31, 1818. He became a graduate of Bowdoin College in 1837, and was admitted to the bar in Boston in 1840. He entered political life as a Whig, and the intensity of his anti-slavery convictions stood in his way until 1859, when he was sent to the State legislature. In 1860 he was elected governor. Foreseeing the coming struggle, he organized and equipped the militia of the State, and urged the other New England governors to do likewise. Lincoln’s call for troops was received at Boston, April 15; Andrew had volunteers in motion the next morning; on the afternoon of the 16th three regiments were ready; the Massachusetts Sixth left Boston on the 17th, fought its way through

Balti- more on the 19th, and reached Washington the same day. All through the war, Andrew's devotion to his duties was indefatigable, and it is to his influ- ence that Massachusetts owes her place of pre-eminence in that great struggle. He died suddenly of apoplexy, October 30, 1867. P. W. Chandler has written a memoir of Andrew, and A. 8. Brown a sketch of his official life.

ARNOLD, BENEDICT, was born at Norwich, Conn., Jan. 3, 1740. His dis- position was unruly in his boyhood. When the revolutionary war broke out, he entered the army, and soon became a coloncl. He was sent with a detachment through the Maine wilderness to assist Montgomery, and was severely wounded in the assault on Quebec in December, 1775. He was discontented because his promotion was slow, and still more because he had not sufficient opportunity for pecuniary advantage. Distinguishing himself at Bemis Heights and Stillwater, though then under arrest, he asked and obtained command of the post of West Point, the key to the Hudson river, He offered to betray this post to Clinton, but the negotiations were detected, and Clinton's agent, André, was captured and hanged as a spy, while Arnold escaped to the British lines. He was given a rank in the British army cor- responding to that which he had abandoned, and commanded two plunder- ing expeditions. It was not easy to induce other British officers to serve with him, and he went to England, where he seems not to have fared much better. He died in London, June 14,1801. His Life, in Spark's American Biography, gives the usual American estimate of him ; but a more apologetic biography, by a descendant, has recently been published.

ARTHUR, CHESTER ALAN (1830-1886), president from 1881 to 1885, was born in Fairfield, Vt., October 5, 1830, his father being a Baptist minister who had immigrated from Ireland. After graduating at Union College in 1848, he was a teacher for several years, and was admitted to the bar in New York in 1853. He rapidly obtained repute as a lawyer, particularly by his management of the cases of fugitive slaves; and, as quartermaster-general of the State of New York during the first two years of the civil war, charged with the duty of arming, equipping, and transporting the troops of the State, he obtained a reputation even higher. He became an active political leader in the Republican organization of New York city, and was appointed collector of the port by President Grant in 1871. Refusing to

abstain from active political work, he was removed in 1878 by President Hayes ; and in 1880, when, Garfield had been nominated by the Republican convention, Arthur was nominated for the vice-presidency, in order to propitiate the supporters of Grant. He was elected with Garfield in November and inaugurated in the following March, and became president when Garfield died (Sept. 19). He proved an exception to the rule that vice-presidents succeeding to the office of president have been failures. To him belongs the credit of a quiet, dignified, and successful administration of public affairs, and, above all, the inception of the reform of the civil service system. He carried out the Pendleton Act for that purpose with honest goodwill, and gave it an impetus which it is not likely ever to lose. He quieted the growing ill-feeling between his country and others as to South American affairs. The presence of British representatives at the hundredth anniversary of the surrender of a British army at Yorktown had a certain awkwardness, until the presideut's tact and good feeling relieved the pressure

by ordering that the eeremonies should close with a general salute to the British fiag, as a special mark of American respect for the queen. He fiuished his term with the high respect of all parties, and in the Republican convention of 1884 was the leading competitor for the nomination, which finally fell to Blaine. He died in New York city, November 18, 1886.

BELL, JOHN, was born near Nashville, Tenn., Feb. 15, 1797, and died near the same place, Sept. 10, 1869, He graduated at Nashville in 1814, became a lawyer, and served in the house of representatives, 1829-41, and in the senate, 1847-59, acting as seeretary of war from March to October 1841. He was nominated for the presidency in 1860, and was defeated.

BENTON, THOMAS HART (1782-1858), was born near Hillsborough, N.C., March 14, 1782. Removing to Tennessee in 1799, he studied law, was admitted to the bar, and entered the lifc of a frontier lawyer and politician. Andrew Jackson, then the leading flgure of Nashville, made him his aide-de- camp, and obtained for him the command of a Tennessee reginient, Quarrels and a street-fight in 1813, in which Jackson was nearly killed, made Tennessee an unpleasant residence for Benton, and, after two years of

service as lieutenant-colonel of a Uuited States regiment, he settled iu St Louis, Mo. From 1821 to 1851 he served as United States senator from Missouri. During all this period he was one of the most prominent members of the senate. He became a recognized leader of the Democratic party, and on the entrance of Jackson into national politics, he became one of his warmest supporters. Benton's knowledge of Spanish land-law made him an authority on all sub- jects into which that question entered; and his sympathy with the feelings of the Western settlers made him their mouth-piece on all such matters as the proposed annexation of Oregon. His pronounced aversion to all forms of paper currency procured him the popular name 'Old Bullion," in which he took great satisfaction. Benton was always a pronounced Union man, and, when the slavery struggle had gone far enough to make the thought of dis- union a political possibility, his supremacy in Missouri was over. Ife was defeated, after forty ballots, in the attempt to return to the senate for a new term in 1851. He served in the house of representatives, 1853-55, but was defeated in the next election as well as in the election for governor in 1856. He died at Washington, April 10, 1858. He has left two works of political value, Thirty Years in the United States Senate (2 vols.), and a most nseful Abridgment of the Debates in Congress from 1789 until 1850 (16 vols.).—See Roosevelt's Life of Benton, in the American Statesmen Series.

BooNE, DANIEL, born in Bucks county, Pa., Feb. 11, 1735, emigrated to North Carolina, penetrated the wilderness of Kentucky and began the settlement of that region, and died in Missouri, Sept. 20, 1820. Unlettered, but of strong native intelligence, simple houesty, courage, and coolness, he has become the type of his class.

BRAGG, BRAXTON (c. 1815-1876), American officer and general in the Con- federate service, was born in Warren County, N.C.,about1815. He graduated at West Point in 1837, served in Florida and elsewhere fcr several years, and so distinguished himself in the Mexican war, particularly at Buena Vista, as to reach the rank of lieuteuant-colonel by brevet. He resigned and retired to private life in 1856, but entered the Confederate service at the outbreak of the civil war with the rank of brigadier-general. He com- manded at Pensacola, but was transferred to the west in 1862, soon reaching the full grade of general in command of the department of

Mississippi. Just after Lee had begun his first attempt to invade the North in the east, Bragg began a similar attempt in the west. Passing to the east of the Union line in southern Teunessee, he moved northward into Kentucky, threatening Cincinnati, and remaining in Kentucky from Angust until October. The battle of Perryville (Oct. 8) forced hin to retreat into Tennessee, bnt he carried off enormous trains of captured property and booty. Returning late in the year towards Nashville, he met Rosecrans in the battle of Murfrees- boro or Stone River (Dec. 31, 1862-Jan. 2, 1863). It was very nearly a drawn battle, but Rosecrans held the ground, and slowly gained possession of the important point of Chattanooga during 1863. Following Bragg beyond it into Georgia, he was met and beaten in the battle of Chickamauga (Sept. 19-20, 1863), and Bragg, pursuing in his turn, formed the siege of Chat- tanooga, Grant replaced Rosecrans, and beat Bragg in the battles of Look- out Mountain and Missionary Ridge (Nov. 23-25, 1863), relieving the Union army. Bragg was then succeeded by Johnston, and took little further active part in the war. The Confederate president, Davis, retained Bragg at Rich- mond as military adviser. He died at Galveston, Texas, Sept. 27, 1876.

BRECKINRIDGE, JOHN CABELL (1821-1875), vice-president of the United States from 1857 to 1861, was born near Lexington, Ky., Jan. 21, 1821. He was admitted to the bar, served as major in the Mexican war, aud was a Democratic member of the house of representatives from 1851 to 1855. He was elected vice-president in 1856 by the Democrats. In 1860 he was nomin- ated for the presidency by the Southern wing of the Democratic party, but was defeated. Elected United States senator, he took his seat at the special session of July 4, 1861, left it (Aug. 6) to enter the Confederate army, and was expelled from the senate Dec. 4. He served at Murfreesboro and Chicka- mauga, and in the east, and in 1865 became the Confederate secretary of war. For a time he was in Europe, but returned in 1868, and died May 17, 1875.

BUCKINGHAM, WILLIAM ALFRED (1804-1875), governor of Connecticut, was born in Lebanon, Conn., May 28, 1804. In 1858 he was elected governor, and served until 1866. He refused further re-election, and retired to private life until 1869, when the Republicans of his State sent him to the United States senate, where he remained until 1875, the year of his

death. His energy and foresight, as the ‘‘war governor” of his State, did for Con- necticut what Andrew’s did for Massachusetts.

BURNSIDE, AMBROSE EVERETT (1824-1881), general in the Federal army, was born at Liberty, Ind., May 23, 1824. After graduating at West Point in 1847, he served in the Mexican war and on frontier duty until 1853, when he resigned. For five years he was engaged in the mannfacture of fire-arms in Rhode Island, and for the next three years in the management of the Illinois Central Railway Company. He entered the civil war as colonel of Rhode Island volunteers, was giveu eommand of the land forces operating on the North Carolina coast, at Roanoke Island and elsewhere, and as major-general commanded the ninth corps of the army of the Potomac in the Antietam campaign. His management of the left wing in the final battle has been severely criticized by M‘Clellan, on the ground of his slowness. When M‘Clellan was relieved of the eommand of the army in November 1862, Buruside was made his successor. He undertook to follow the direct road to Richmond, aeross the Rappahannoek and through Fredericks-burgh. Ile had hardly reached Falmouth, opposite Fredericksburgh, when Lee had begun his lines of defence ou the hills behind Fredericksburgh. Burnside’s army crossed the river Dec. 10-11, and Lee made the assault De-cember 13. Franklin on the left broke through the Confederate lines, but could not hold his ground; Suniner and Hooker led their men to the most dreadful slaughter of the war. On the night of the 15th of December the Union forces were withdrawn across the river, and Burnside resigned his command late in the following month, being sneceeded by Hooker, Burn-side served iu the west during the year 1863, and commanded the ninth corps under Grant during the final Virginia campaigns. Re-entering civil life, he served as governor of Rhode Island, 1866-69, and as United States senator, froni 1875 until his death in Rhode Island, September 13, 1881.

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BuRR, AARON (1756-1836), vice-president of the United States from 1g91 to 1805, was born at Newark, N.J., Feh. 6, 1756, being the son of Rey. Aaron Burr, president of Princeton College, and grandson of Rey. Jonathan Edwards. He graduated at Princeton in 1772, served as au officer in the revolutionary army, becoming lieutenant-eolonel, and in 1779 resigned and

studied law. He began practice in New York, where the leading lawyers were disfranchised or under a clond by reason of Toryism, and was successful almost at ouce, his leading competitor being Hamilton. He was a Re- publican United States senator, 1791-97, and introduced into the Republican party of his State that semi-military organization which now marks al} successful parties. Presidential electors were then generally chosen by State legislatures, and Burr's skilful management obtained a legislature in 1800 with a Republican majority. The Republican leaders at Washington at once named lim as the candidate to be voted for with Jefferson. All the Republican electors voted for the two, giving them a majority of the elec. toral votes, 73 each. But this, as the constitution then stood (§ 120), elected neither ; the house of representatives was to choose between them. The house had a Federalist majority, and was disposed to make Burr president in order to baulk Jefferson and his party. It was not until the 36th ballot that Jefferson was chosen, and Burr never recovered his party's confidence, He was not re-nominated in 1804; and in the same year he shot his great rival, Hamilton, in a duel near New York city. In 1807 he was tried foran expedition against Mexico, but was acquitted. For some years he lived abroad, but in 1812 he returned to New York city and resumed the practice of law. He died on Staten Island, N.Y., Sept. 14, 1836. Burt's great ability, his influence over young men and over women, the immorality of his private life, the misfortnues of his career and the stoical patience with which he bore them, have made him a remarkable figure in American history. He is buried at Prineeton, N.J.—See Parton's Life of Burr, Knapp's Life of Burr, Davis's Memoir of Burr, and Private Journal of Burr.

COLFAX, SCHUYLER, vice-president of the Uuited States from 1869 to 1873, was born in New York city, March 23, 1823. At the age of thirteen he removed to South Bend, Ind., studied law, became a newspaper editor, and entered political life as a Whig, afterwards a Republican. Defeated iu the Congressional election of 1851, he was successful at the next, and served in the house of representatives from 1855 to 1869. He was speaker of the house from 1863 to 1869. In 1868 he was nominated by the Republicans for the office of vice-president, and was elected, serving until 1873. He died Jan. 13, 1885. See Martin's Life of Colfax (1868).

CRAWFORD, WILLIAM HARRIS, American statesman, was born in Amherst county, Va., Feb. 24, 1772, but removed to Georgia while still a boy. He was admitted to the bar, served in the State legislature, 1803-7, in the United States senate, 1807-13, as minister to Frauce, 1813-15, as secretary of war, 1815-16, and as secretary of the treasury, 1816-25. He was one of the leading aspirants to the presidency in 1816, but. Monroe obtained the nomination by a small majority. As the end of Monroc's second term approached, it was thought that Crawford would certainly be his successor. In 1823 he was stricken with paralysis; but his friends endeavoured to concecal his condition, and pressed him for the caucus nomination in 1824. Ile obtained it, but it did him little service. Indeed, the struggle really put an end to the Congressional caucus as a uominating body. On his defeat he retired from natioual politics, serving as State judge in his own State from red uutil be died at Elberton, Ga., Sept. 15, 1834. See J. B. Cobb's Miscel-

anies, p. 131.

GARFIELD, JAMES ABRAM (1831-1881), president of the United States in 1881, was born at Orange, O., Nov. 19. 1831. His father died in 1833, leaving Garfield's mother to support four children, of whom the future president was the youngest. Ile learned the trade of a carpenter, earning some little additional money by working as a wood-chopper and as a driver on the canal. At the age of eighteen, he entered a village seminary, working at his trade and at odd jobs for hisown support. After preparing himself for college, he carried himself in like manner through Williams College, graduating in 1856. He then became a professor iu, and, after one year, presldent of, Hiram College, 0., where he remained until 1861. During this period he studied law, and was admitted to the bar. Ile had also become a recognized leader of the Republican party of the State, being elected to the State scnate for 1860-61. Entering the army as colonel of an Ohio regiment in 1861, he served in Kentucky and Tennessee, soon becoming brigadier-general and chief of staff to General Rosecrans. At Chickamauga he particularly distinguished himself, riding to Thomas's head-quarters after the retreat of the rest of the army, and taking part in the gallant stand made by 'the Rock of Chickamauga." For his services he was promoted to the rank of major-general. Ie resigned in December 1863, to take his seat in the house of representatives, to which he had been elected by his district in

northern Ohio. This seat he never really left. Ife was re-elected steadily for the remainder of his life, his last term closing with the date of his inauguration as president. Just before this last event in his career, he was elected United States senator by the legislature of Ohio, but never took his seat. From his entrance to Congress in 1863 he was one of the most prominent Republican members ; and in 1875, when the Republicans became for the first time since 1860 a minority in the lower House, he became their recognized leader there. In the Repnblican conventiou of 1880 he was ulti- mately nominated by 399 votes out of 756, and in November he was elected by an electoral vote of 214 to 155 for Hancock. He had always protested against the system which made the advice of administration senators the controlling faetor in appointments to office; and yet, from the moment 0 his inauguration, he found himself entangled in a conflict about appoint: ments with the senators from New York. In the midst of the newspaper excitemeut on this subject, a disappointed office-seeker shot the president In the Baltimore and Potomac railway station, July 2, 1881. After lingering through a Washington summer, he was removed (Sept. 6) to Long Branch, where he died on Sept. 19. 4 sted

GRANT, ULYSSES SIMPSON (1822-1885), lieutenant-general in the Unite States army and president of the United States from 1869 to 1877, was a at Point Pleasant, O., April 27, 1822. He had but a slight education in lus early youth, but graduated at West Point in 1843. Hc served in the Mexican war with credit, and in routine service until 1854, when he resigned, haviu® then the rank of captain. His attempts to engage in farming near St ae and in the leather trade at Galena, Ill., were not successful; and, when aid civil war broke out, he was the last man whom his brother officers WO ie have picked out as the coming hero of the war. With some difficulty obtained a commission as colonel of an Illinois regiment, but was soon hs vanced to the rank of brigadier-general, having his head-quarters at Be Ill. From this point he made incursions into the hostile territory, – a serious affair being at Belmont, Mo., Nov. 7, 1861, which was at best a ren battle. The Confederate line rau through southern Kentucky, an bie penetrated by the Tennessee river, of whosc mouth Grant had Done Estimating the opportunity correctly, he obtained permission, with mt “ difficulty, to attempt to secure eontrol of the whole Tcnnessee river. SS officer Foote, with seven gunboats and a number of transports,

Convey – Grant’s force up the river and captured Fort Henry, which comman a point where the Confederate line crossed the Tcnnessce river (Feb. 6,

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A distance of but seven miles separated the rifie-pits around this fort from those of Fort Donelson, which commanded the point where the Confederate line crossed the Cumberland river. Marching overlaud with about 15,000 men, Grant invested Fort Donelson, and began the first Federal siege of the war. Uhe surrender of the fort (Feb. 16) broke up the Confederate line and forced it back into southern Tennessee. Grant was more popular with the general public than with his superiors, and his experience with them was so unpleasant that he asked to be relieved. Matters were patched up, and he was allowed to push southward. Here the battle of Pittsburgh Landiug, in which Grant seems to have been taken by surprise, intensified the doubts his superiors had of his capacity, and he was for some time under a cloud, Halleck assuming command himself, and really rctiring Grant for some months, A fully counterbalancing result of the battle was the establish- inent of perfect sympatly between Grant and Sherman, who had shared its dangers and what odium had come out of it. Grant himself has written that, in the Mexican war, his scrvice “‘save no indication that he would ever be equal to the command of a brigade,” and that in 1861 he “had never looked at a copy of tactics since his graduation.” His training for supreme command was now completed, and it had qualified him for the defence of Corinth, to which all his subsequent successes may be directly traced. Left there almost in isolation, and exposed to the attacks of all the forecs which the Confederates chose to bring against him, his suc- cessful battles of Iuka (Sept. 19, 1862) and Corinth (Oct. 3-5) left him master of the route along the Mississippi. In January 1863 Grant and Sherman succeeded in taking

the west bank of the Mississippi to a point opposite Vicksburgh. Failing to reduce the city from this point, Grant crossed the river below Vicksburgh in April, and began the remarkable campaign which ended with the surrender of Pemberton. It showed that he had strategic ability as well as fighting power, and that he was able to discern the characteristics of his opponents and to calculate on their prob- able errors, and it gave him an official as well as a popular respect which he never lost. Followed by the victories of Lookout Mountain and Mis- sionary Ridge, it made him the acknowledged leader of the United States armies, and his appointment as licutenant-general and commander-in-chief was a foregone conclusion. When Grant assumed command in Virginia in March 1864, Lee's unaccustomed tendency to maintain a strict defensive showed his underlying consciousness that he had before him at last a man who was ready and willing to answer an attack by a counter-attack. Grant's military ability had now reached its highest developments: he handled his 120,000 men with as complete control as he had shown with his 15,000 at Donelson. It is not probable that anything but the vigour and intensity of Grant's operations could have met successfully the problem offered to any commander by Lee behind intrenchments arranged by himself and manned by the army of northern Virginia, or could have reduced that army to the condition which it presented in the winter of 1864-65. The end of the war and the death of President Lincoln left Grant the foremost man of the North and West, and it was really inevitable that he should be elected president in 1868. From the moment of Lee's surrender the people had shown a disposition to put upon his shoulders any work which called for prompt completion. The Republican leaders relied on him to hold all that had becn secured by the war until the Congressioual plan of reconstruction should be fully carried out, and he did the work as probably no other man could have done it. His public life is really the history of the country for the eight years after 1869, and its errors were largely the result of the intrusion of some of his best personal qualities into it. The rule in the civil service still was that of appointment by favour of the political leaders of the dominant party; Grant, bewildered by the constant aud tremend- ous pressure for appointments, undoubtedly selected some men who were no credit to his administration ; when the appointment had been made, his own bitter experience of unjust criticism led him to look with suspicion on any accusation against those whom he had appointed ; and his military habits of unquestioning

obedience gave him a tendency to expect the same thing from men in politics, and to regard independence as a sort of treason, disqualifying the man guilty of it for any useful criticism, His second term was therefore filled with scandals which are likely to overshadow the solid and enduring achievements of his first. Retiring to private life, he found needed rest in a tour of the world; he was, however, a candidate for the

| Republican nomination for the presidency in 1880, and engaged in business in which he had no experience, and in which he lost his all. Attacked by an incurable disease, he spent his last few months of life in the prepara- tion of his autobiography, knowing that its sale would be so large as to put his family out of reach of pecuniary distress. Ie died at Mount M‘Gregor, N.Y., July 23, 1885.

HANCOCK, WINFIELD Soot? (1824-1886), American officer, was born in Montgomery county, Pa., Feb. 14, 1824. He graduated at West Point in 1844, served with credit in Scott’s campaign in Mexico and on frontier duty until 1861, when he held the rank of captain. Having been appointed briga-

) dier-general of volunteers in 1861, he served in the army of the Potomac)) throughout its existence. For distinguished service on the peninsula and at } South Mountain and Antietam, he was given a division and the rank of major-general, and in 1863 he was placed in command of the second corps for his services at Fredericksburgh aud Chancellorsville. His crowning glory was won at Gettysburgh. Reynolds fell on the first day, and Hancock was sent forward by Meade to arrange the line until the commander could arrive. On the second and third days Hancock commanded the left centre, on Cemctery Ridge, where, just in the moment of victory, he was severely |} wounded, He received the thanks of Congress, and returned to the com- mand of his corps early in 1864, in time to take part in Grant’s campaigns of jthat year. He distinguished himself again and again at the Wilderuess, at Spotsylvania, and in the Cold Harbor and Petersburgh operations. At the jend of the war he commanded various departments, having been made a major-general in the regular army. From September 1867 to March 1868 he commanded the department of the Gulf, under the Reconstruction Acts; and certain orders issued by him, particularly those of Nov. 29 and Dec. 5, 1867, declaring that the military power was meant only to uphold, not to

control, the civil powcr, and declining to exercise arbitrary powers, were so satis- factory to the Democratic party that in 1880 it nominated him for the presi- jdency. He was defeated by Garfield, but retained his position as senior)niajor-general of the army, and the warm regard of the country. Ife died at Governor's Island, N.Y., Feb. 9, 1886. . : .) HENDRICKS, THOMAS ANDREWS (1819-1885), vice-president of the United States in 1885, was born in Muskingum county, O., Sept. 7, 1819. He re- jMoved with his father to Shelby county, Ind., in 1822, graduated at Hanover |College iu 1841, and was admitted to the bar in 1843. He was a member of the State legislature in 1848-49, a Democratic member of the house of Fepresentatives, 1851-55, and commissioner of the land office, 1855-59. He served as United States senator, 1863-69, and as governor of Indiana, 1873-77. In 1876 he was nominated for the office of vice-president by the Democrats, but was defcated. In 1876, 1880, and 1884 he was a prominent candidate for the nomination for the presidency ; and in 1884, when Cleve- jland was nominated, he consented to take the nomination for ithe vice- 'Presidency, and was elected. Te died at Indianapolis, Ind., Nov. 25, 1885.

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Hoop, Joun BELu (1831-1879), American officer in the Confederate ser- vice, was born at Owingsville, Ky., June 29, 1831. He graduated at West Point in 1853, and continued to serve in the United States army until 1861, when he entered the Confederate service.

He commanded a corps during Johnston's retreat before Sherman, in the early months of 1864; and, when Davis had decided_on removing J ohnston, Hood was appointed to the command of the army. He accepted reluctantly, and his position was not a pleasant one. He succeeded a general in whom the army had confidence; he was to reverse that general's policy, and he was to carry out a plan of campaign which had been prepared for him by the Confederate president. His obedieuce was paiufully accurate. He assumed the offensive as soon as he took command, fought several severe battles, and soon found himself under necessity of evacuating Atlanta (Sept. 2, 1864), Sherman had outflanked him; and the Confederate administration came to the desperate resolution of ordering him to move west and then

north into Tennessee. He was checked at Franklin, where he lost many of his best officers; and in the final battle of N: ashville (Dec. 15) his army was completely beaten, and almost lost its organization. The command of its remnants was transferred to General Richard Taylor, and Hood retired from active service. He died of yellow fever at New Orleans, Aug. 30, 1879.

HULL, Isaac (1775-1848), naval officer, was born at Derby, Conn., March 9, 1775. In 1798 he became lieutenant in the new navy created by Congress during the difficulties with France. He served with credit in the West Indies and Mediterranean, and, on the outbreak of war in 1812, was captain of the frigate ‘‘ Constitution.” By skilful seamanship he escaped the close pursuit of five British vessels, and on Aug. 19 he captured the British frigate “ Guerriere” off Newfoundland, after a conflict in which the ‘“Guerriere” was So severely cut up that Hull was forced to burn her, A gold medal was given him by Congress. He died at Philadelphia, Feb. 13, 1843.

KNox, Henry, major-general in the American revolutionary army, was born at Boston, July 25, 1750. Beginning life as a bookseller, he com- manded an independent company in Boston, and was made an engineer and artillery officer by Washington at the opening of the revolution. Under his charge the artillery arm of the service came to be of essential value. He was made sccretary of war in 1785, and Washington, on becoming president in 1789, gave him the same office under the new Government. He resigned in 1794, and retired to private life in Maine, He died at Thomaston, Me., Oct. 25, 1806.—See Drake’s Life of Knox (1874).

LAWRENCE, JAMES (1781-1813), captain in the United States navy, was born at Burlington, N.J., Oct. 1, 1781, and entered the navy asa midshipman in 1798. He commanded the “ Hornet” in the capture of the ‘‘ Peacock,” Feb.(24, 1818. Placed in command of the frigate ‘‘ Chesapeake,” he accepted the challenge of Captain Broke of the “Shannon” to a single battle, off Boston harbour. The “Chesapeake” was captured, and Lawrence, mortally wounded, died June 6, 1813.—See Irving’s Spanish Papers, vol. ii.

M‘CLELLAN, GEORGE BRINTON (1826-1885), general in the United States army, was born at Philadelphia, Dec. 3, 1826. He graduated at West Point in 1846, served in the Mexican war with such ability as to win the

brevet of captain, and attained full rank as captain in 1855. His services until 1857 were mainly scientific, with the exception of a military report on the organization of European armies in 1856, the result of a commission from the Government to follow the progress of the Crimean War, Iu 1857 he resigned aud entered the service of a Western railway, becoming its president. At the outbreak of the civil war he was eugaged by Ohio as major-general commanding her volunteers, and was soon given the samc rank inthe United States army by President Lincoln. It fell to M‘Clellan to cross into West Virginia and begin the campaign there, which he did during the early summer, the campaign ending with the surrendcr of the Confederate forces at Rich Mountain and the expulsion of the opposing armies from his department, on July 14, 1861. This sudden and brilliant success, followed almost immediately by the collapse of the Manassas campaign against Richmond, brought M‘Clellan into notice as the most likely leader to restore public confidence in the army of the Potomac. He was called to Washington, given command of the army, and, when Scott retired, was made commander of all the armies until March 1862, whew his command was reduced again to the army of the Potomac. The winter of 1861-62 was spent in organizing his new army, and in the spring he was at last almost forced, by public outcry and the impatience of the administra-tion, to attempt the task of wielding the weapon which he had created, Following what seems now the most feasible method of attack on Richmond, M‘Clellan appears to have begun with little confidence in the administration, and it was not long before the administration lost confidence in him. His campaign on the peninsula is historical; but the time involved should be taken carefully into account in estimating M‘Clellan’s abilities. It was on Sept. 2 that he was recalled and given command of ‘all the troops for the defeuce of the capital.” He found the armies iu almost complete confusion ; he organized and united them, marched them through Maryland to its northern border, attacked Lee’s rear so vigorously at South Mountain as to force him to turn and fight, and defeated him after a two days’ battle ; and all this work was done in fifteen days, Sept. 2-17. He was removed, how- ever, Nov. 7, 1862, for slowness in pursuing Lee, and Burnside became his successor. M‘Clellan was nominated for the presidency in 1864, and had much difficulty in reconciling the peace platform of his party with his own feelings. Defeated by Lincoln, he retired to private business as a civil engineer, in which he was very successful. He was elected governor of

New Jersey in 1877, serving 1878-81. He died at Orange Mountain, N.J., Oct. 29, 1885. The literature in attack and defence of his military reputation is voluminous ; for his own version of his career see M‘Clellan’s Own Story.

Marcy, WILLIAM LEARNED (1786-1857), was born at Sturbridge, Mass., Dec. 12, 1786, He graduated at Brown University in 1808, was admitted to the bar in 1810, and began practice at Troy, N.Y. He soon became a leading Democratic politician, and one of the “ Albany regency” which was supposed to control the action of the party in New York State. He was United States senator in 1881-32, and during his term he incidentally made usc of the phrase so frequently afterwards heard, ‘To the victor beloug the spoils.” He resigned to become governor of New York, 1833-39. Ie was secretary of war uuder Polk, 1845-49, and secretary of state under Pierce, 1853-57. As secretary of state he conducted with success the Koszta case in 1854, involving a collision with Austria on the subject of the right of expatria- tion. All his political leanings were to that branch of the Democratic party in New York which made the strength of the new Republican party in 1856, and he would have been its natural leader if he had followed his own convictious on the Kansas-Nebraska bill, He hesitated, and other men took his place. He died at Ballston Spa, N.Y., July 4, 1857,—See Jenkins’s Governors of New York. ;

MASON, GEORGE (1726-1792), member of the Federal convention of 1787, was born in Fairfax county, Va., in 1726. He served in the Virginia conven-

tion in 1775, and drafted its Declaration of Rights and Plan of Government. His most conspicuous service was in the Federal convention of 1787, of which he wasamember. Hetook part in most of the debates, and exerted a strong influence on the decision of almost every question before the convention. Some of his strongest utterances were on the subject of slavery, and his language on one occasion (Aug. 22) might have served as a model to an anti- slavery orator of later times. We was dissatisfied with the constitution, and opposed its ratification. He died Oct. 7, 1792.

MEADE, GHORGE GORDON (1815-1872), general in the United States army, was born in Cadiz, Spain, where his father was an agent of the United States navy, Dec. 30, 1815. He graduatcd at West Point in 1835, and, after serving but one year in the army, resigned to begin practice as a civil engineer. He was frequently employed by the Government, and re-entered its inilitary service in 1842. He served with distinction on the stafis of Taylor and Scott in the Mexican war, and in scientific work. At the outbreak of the civil war he was placed in command of a brigade of volunteers, soon rising to the command of a division, and joining his fortunes permanently to those of the army of the Potomac. He led his division through the seven days' battles, being severely wounded at Glendale, through the Antietam campaign, and at Fredericksburgh, where he particularly distinguished himself. At Chancellorsville he commanded the 5th corps; and when Hooker resigned the command of the army, and while the army itself was in hasty movement northward to check Lee's invasion of the North in 1863, Meade was appointed to the command. He accepted it with the greatest reluctance, and altogether from a sense of duty. He had inclined to fight on the line of Pipe Creek, to the south of Gettysburgh; but Reynolds fell into collision with Lee's advance at Gettysburgh, other corps hurried to support, and Gettysburgh became historical. When Grant assumed general command in 1864, Meade continued to command the army of the Potomac under him, and mutual good-feeling enabled them to maintain this delicate relation without friction, and with the best results. At the close of the war, being major-general in the regular army, he commanded the military division of the Atlantic until his death at Philadelphia, Nov. 6, 1872.

MONTGOMERY, RICHARD, was born near Raphoe, Ireland, Dec. 2, 17386, and died in the assault on Quebec, Dec. 31,1775. He served in the British army from 1754 to 1772, when he retired, emigrated to America, and settled in New York, marrying the daughter of R. R. Livingston. He was appointed a brigadier-general in the American army in 1775, and, for his services in Canada, was made a major-general the same year.

MORGAN, EDWIN DENNISON, governor of New York, was born at Wash- ington, Mass., Feb. 8, 1811. After a successful career as a merchant in Hartford, Conn., aud New York city, he served in the New York State senate, 1850-53, and was chairman of the Republican National Committee,

1856-64, Elected governor of New York in 1858, he served through the year 1862, supervising the raising and equipment of about 220,000 soldiers. Ie was United States senator, 1863-69. lle died Feb. 14, 1883.

MORTON, OLIVER PERRY (1823-1877), one of the leaders of the Republican party, was born in Wayne county, Ind., Aug. 4, 1823. He was admitted to the bar in 1847, and was elected a circuit judge in 1852. He had been a Democrat, but becamea Republican in 1855, and was the Republican candidate for the governorship in 1856. Ile was defeated, and in 1860 was nominated for the office of lieutenant-governor, with the understanding that the governorship candidatc was to be sent to the United States senate, if possible. This arrangement took effect, and Morton was left to fill the office of governor throughout the civil war. Ile was aetive and successful in raising troops for the support of the Federal Government, and bold, almost to recklessness, in his means of action. He knew, or at least believed, that his political opponents in the State were determined to support the Confederacy by refusing to supply any more troops to the Federal Government; and the mecting of a hostile legislature in 1863 brought matters toa head. The Re- publicans left the legislature, thus leaving their opponents without a quorum; the governor ordered money for war expenses to be borrowed on the credit of the State; the Democratic attorney-general and the State Supreme Court held that this was illegal, but the indomitable governor borrowed the moncy on his personal responsibility, and managed the State government without a legislature. The borrowed money was afterwards repaid by the State. In 1866 he was elected to the United States senate, and remained till his death, taking a prominent part in every debate, and exercising a strong influence on the party policy. He introduced the resolution for the repeal of the twenty-second joint rule, which had governed the count of the electoral votes since 1865, He died at Indianapolis, Nov. 1, 1877.

PINCKNEY, CHARLES (1758-1822), American statesman, was born at Charleston, 8.C., March 9, 1758. He was admitted to the bar in 1779, was a delegate to the Continental Congress, 1777-78 and 1784-87 ; a delegate to the Federal convention of 1787; governor of South Carolina, 1789-92 and 1796-98; United States senator (Democrat), 1797-1801; minister to Spain, 1803-5; governor of South Carolina, 1806-8; member of the State legisla-

ture, 1810-14; and member of the house of representatives, 1819-21. He died at Charleston, Feb. 25, 1822.

PINCKNEY, CIIARLES COTESWORTH (1746-1825), born at Charleston, 8.C., Feb. 25, 1746, and died at the same place, Aug. 16, 1825. He was educated at Oxford and the Middle Temple, served with distinction in the American revolutionary army, was one of the envoys to France in 1797, and was the Federalist candidate for the presidency in 1804 and 1808.

PULASKI, CASIMIR, Count, born in Lithuania, March 4, 1747, joined in the insurrection of 1769, escaped to Turkey in 1772, and was induced by Franklin to emigrate to America in 1777. He served in the battles of Brandywine and Germantown, receiving the rank of brigadier-general for his gallantry, and was placed in command of the cavalry. Forming a separate corps, known as Pulaski's legion, he went to the South, where he commanded the cavalry in the assault on Savannah. He was mortally wounded, and died Oct. 11, 1780.—See Spark's Life of Pulaski.

PUTNAM, ISRAEL, was born at Salem, Mass., Jan. 7, 1718, removing to Pomfret, Conn., in 1739, Courage, strong will, and knowledge of men rather than of books soon made him a leader among his neighbours ; and his shoot- ing of a wolf by torch-light in a cavern in which she had sought refuge has almost become a nursery story. In the French and Indian war he became one of the most renowned of the ''rangers" or partisan soldiers, who fought the Indians with their own weapons; and at the end of the war he had reached the rank of lieutenant-colonel of the Connecticut troops. At the outbreak of the revolutionary war, one of the four major-generals' commis- sions was given to Putnam. He was an active leader at Bunker Hill, commanded at New York, and in the battle of Long Island, and was put in eharge of the Iludson river defences in 1777, being the first to see the strategic importance of West Point. Ie died at Brooklyn, Conn., May 19, 1790.—See Lives by Cutler, Tumphreys, and Peabody.

SCHUYLER, Puitip, American gencral, was born at Albany, N.Y., Nov. 20, 1733. He was of an old and wealthy Dutch family, and in early manhood became a leader in the affairs of the colony of New York. He reached the rank of major in the French and Indian war, and at the beginning of the

revolutionary struggle was made one of the American major-generals. He took part in the expedition against Canada in 1775, but ill-health compelled

him to retire. He took the leading part in preparing to mect Burgoyne's expedition in 1778; but troops had to be called in from other States, and he was subjected to jealousies which thwarted him at every step. Nevertheless his arraugements were so complete that he had really checkmated Burgoyne before Congress superseded him in the command by the appointment of Gates who reaped all the glory which should have accrued to Schuyler, Retiring from the army, he served for three years in the Continental Congress, and in the United States senate, 1789-91 and 1797-98. He died at Albany, Nov, 18, 1804,—See his Life and Times, by Lossing.

SEYMOUR, HORATIO, governor of New York, was born at Pompey, N.Y, May 31,1810. Ile was admitted to the bar in 1832, but never practised law, having a large private property. He soon became a leader of the Democratic party of the State, serving three terms in the State legislature after 1842, one of them as speaker. He was elected governor in 1852. Tn 1862 he was nominated again, and his success alarmed the national administration with a fear that the great State of New York would now be lukewarm or unfriendly. He proved to be one of the best of the 'war govelnors," active, zealous, and prompt in raising and forwarding men and supporting the war, though he was accused of adopting temporizing mea- sures with the draft mob in New York city in July 1863, He was nomin- ated for the presidency in 1868, but was defeated by Grant, and then retired from public life. He died at Utica, N.Y., Feb. 17, 1886.—See Croly's Life of Seymour and M'Cabe's Life of Seymour (1868).

STEUBEN, FRIEDRICH WILHELM AUGUST IIEINRICH FERDINAND, BARON VON, was born at Magdeburg, Prussia, Nov. 15, 1730, Entering the army at fourteen, he rose to be adjutant-general and staff-officer to Frederick the Great. After his retirement from active service, Deane induced him to go to America, where he was made major-general and inspector-general, He rendered eminent service by giving the army its first systematic drill. In this department he was the most important accession which the American army received from Europe. THe settled as a

farmer on land in what is now Steuben county, N.Y., given him by the State, and died there Nov. 28, 1794. —See his Life by Kapp, Bowen's Life in Spark's American Biography, and Greene's German Element in the War of American Independence.

SUMTER, THOMAS, was born in Virginia in 1734, and died near Camden, S.C., June 1, 1882. He removed to South Carolina when a boy, and entered the American army as lientenant-colouel in 1776. When the British had apparently overrun the State he kept up the struggle, retreating, when hard pressed, to the swamps of the interior. IIe was made brigadier- general, and thanked by Congress. IIe was a representative for South Carolina from 1789 to 1793 and from 1797 to 1801, United States scnator from 1801 to 1810, and minister to Brazil from 1810 to 1811.

TANEY, ROGER BROOKE, chief justice, was born in Calvert county, Md., March 17,1777. He graduated at Dickinson Collegein 1795, and was admitted to the bar in Maryland in 1799. Like many other Federalists, he became a supporter of Jackson about 1824, and was called by him to the office of secretary of the treasury in 1888. The charter of the Bank of the United States contained a clause, allowing the secretary of the treasury to ordcr the revenues to be deposited in other places than the bank, giving his reasons therefor to Congress. This clause was meant to cover the case of places where there was no branch bank; Jackson wanted to useit to cover a refusal to deposit any of the revenues in any of the branch banks or in the mother bank. Tauey gave the necessary orders, and the bank was deprived of the further use of the revenues, The senate refused to confirm Taney in his position, but his real work in this office had been done. 'Tancy succeeded Marshall as chief justice of the Supreme Court. The leading incidents of his career were his opinion in the Dred Scott case,'and his attempt in 1861 to maintain the writ of habeas corpus against President Lincoln's suspension of it (the Merryman casc). His life has been written by Tyler, and is in Van Santvoord's Lives of the Chief Justices.

THOMAS, GEORGE HENRY (1816-1870), general in the United States army, was born in Southampton county, Va., July 31, 1816. He graduated at West Point in 1840, and served on frontier duty and in the Mexican war. Tlis fellow officers in the South unhesitatingly entered the Confederate

service in 1861; but he declared for the Federal cause. He was sent at first into his native State, and then to the West, where he soon rose to the command of a division in the army of the Cumberland, with the rank of major-general. His victory of Mill Spring (Jan. 19-20, 1862) was the first encouraging event in the war in the West. He led his division in the advance on Nashville, and in all the campaigns leading up to the occupation of Corinth, of which place he was given command. He was now really second in command of the army of the Ohio, and distinguished himself at the battles of Perryville and Murfreesboro, but his reputation was fully made at Chickamauga. When the right of the army had been routed and was in full retreat on Chattanooga, Thomas, who had sustained the brunt of the attack of the first day, held his ground all through the second day against the whole Coufederate army, retreated with persistent and stubborn fighting, covered the rest of the army and saved it from destruction, and gave so much time for fortification that Chattanooga was found by Bragg to be too strong for anything but a siege. From this time Thomas was in command of the army of the Cumberland, and held the eentre at the storming of Missionary Ridge and in the cam- paigns up to the capture of Atlanta. When Hood undertook to transfer the war to Tennessee, Sherman left Thomas to oppose him, Thomas gathered up all his forces at Nashville, and inflicted a eheck on the advancing Con- federates at Franklin (Nov. 30), but continued his preparations for a final battle near Nashville. His numbers were equal to those of Hood, but he persisted in refusing battle until he had prepared cavalry and imade every arrangement for pursuit. Public clamour against Thomas's delay had become so loud that Grant had started from Virginia to assume command himself when Thomas attacked ood (Dec. 15), routed him, and kept up so merciless a pursuit that the Confederate army was scattered almost beyond recovery. In 1869 he was transferred to the division of the Pacific, where he died at San Francisco, March 28, 1870. His uname has come more and more to be synonymous with all that Americans regard as best in the character of a military leader.—See Van Horne's History of the Army of the Cumberland,

WIEELER, WILLIAM ALMON, vice-president of the United States from 1877 to 1881, was born at Malone, N.Y., June 30, 1819. He was admitted Ms the bar in 1848, served several terms in the State legislature and as prey of the State constitutional convention of 1867, and was a member of the

house of representatives from 1861 to 1877. Ife was nominated for the BAS: presidency in 1876 by the Republicans, and was elected, after a contes before the electoral commission. He died at Malone, June 4, 1887. .

Woopsury, LEVI, was born at Francistown, N.H., Dec. 22, 1789, and pe admitted to the bar in New Hampshire in 1812. He became a leader i the Democratic party of his State, was appointed to the supreme one of the State in 1816, was elected governor in 1823, and speaker of the 8 es house of representatives in 1825, and served in the United States sena ‘ from 1825 to 1881. Te was secretary of the navy iu 1831, and page “a the treasury from 1834 to 1841. Again elected to the United State oa 1841, he served until 1845, when he was appointed an associate juste Me United States Supreme Court. He died at Portsmouth, N.H., Sept. 7, nies j See Demoeratie Review, vols. ii. and xii. (A. d.

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tT. jud- edge of the vast indentation made in the continent by the Gulf of sand Mexico marks the southern boundary between the meridians of

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PHYSICAL FEATURES. |

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PART IL—PHYSICAL GEOGRAPHY AND STATISTICS.

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PHYSICAL GEOGRAPHY AND GroLocy.

The area of the United States extends, throughout nearly its whole breadth, from the Atlantic to the Pacific. The northern

83° and 97°. From the edge of this gulf the boundary between the United States and Mexico is partly artificial. Its most essential feature is the Rio Grande, which separates the two countries from 31° 47’ N. lat. to its mouth. The boundary between the United States and Canada is to a large extent

natural; though artificial in the north-east (see map), it follows the St Lawrence and the Great Lakes from the 45th parallel to the point where the Rainy

_ Lake river enters Lake Superior, and thence passes up that river

to a point on the west side of the Lake of the Woods, whence it goes along the 49th parallel to the Georgia Gulf. The country, as thus limited, excluding Alaska, comprises an area, according to the most recent determinations of the Census Bureau, of 8,025,600 square miles. This total includes 55,600 square miles of water surface (coast waters, bays, gulfs, sounds, &e., 17,200; rivers and smaller streams, 14,500; lakes! and ponds, 23,900). The area of Alaska is given in the Census Report of 1880 as 531,409 square miles,—a rough approximation, differing greatly from that given in the 1886 Report of the commissioner of the General Land Office. The total area possessed by the United States is therefore, approxi- mately, 3,557,000 square imiles.

The longitude of the most easterly point is about 67° W.; that of the most westerly nearly 125°. The parallels of 29° and 49° N. roughly designate the position of the country in reference to lati- tude. The extreme southern end of Florida, however, extends as far south as 25° N., while the northern extremity of Maine only teaches toa little beyond 47° N., the large triangular area between the St Lawrence and the Great Lakes, belonging to Canada, being all south of the 49th parallel.

As compared with the western coast of Europe, ncither side of America possesses a deeply indented coast-line. On the Pacific side there is only one important bay (that of San Francisco) between San Diego and Puget Sound. “At San Francisco and San Diego there are commodious harbours, but within the limits of the United States there are no others on the Pacific coast, unless we except that furnished on the extreme north by Puget Sound, and that offered by the mouth of the Columbia river, the bar of which is somewhat for- midable except for steamers under the management of skilful pilots.

The eastern coast north of the 85th parallel is a considerably broken one. That of Maine may almost be described as a “ fiord coast,”” so numerous

are the indentations, which are, however, of moderate depths, but which are large enough to afford excellent and commodious harbours, of which that of Portland may be taken asthe type. There is an indentation of considerable size formed by the arm of Cape Cod projecting almost at right angles, and enclosing Massachusetts Bay, at the bottom of which lies the com- modious, but not specially accessible, harbour of Boston. The situation of the city of New York makes it by far the most import- ant centre of foreign and domestic commerce in the United States. This superiority is due in part to the excellence of its harbour, and in part to its being the terminus of the great natural line of com- munication between the East and the West, a position which wonld seem to belong by right to some point on or near the mouth of the St Lawrence, which is the outlet of the Great Lakes, but from which this river is shut out by its north-easterly trend, which carrics it into a region beyond that of successful cultivation and populous settlements, and where navigation is suspended during a considerable portion of the ycar by the freezing of the river.

Long Island, about 120 miles in length, and extending along the southern coast of Connecticut, is the only island of any con- siderable size on the whole Atlantic coast. Smaller ones—Martha's Vineyard, Nantucket, Block Island, and others—lic adjacent to Long Island on the cast, and form, as it were, its prolongation in that direction, while thcre are indentations of considerable depth on the coast of the mainland opposite these islands.

South of New York there are two indentations of importance— Delaware Bay and Chesapeake Bay,—the former being, as it were, the expanded mouth of the river of the same name, the other being in somewhat similar relations to two large rivers, the Susquchanna aud the Potomac. Philadelphia and Baltimore are the cities that command the advantages for commerce which these two bays offer.

The Gulf of Mexico is of large dimensions, and of great import- ance as affecting the accessibility of the interior, and still more as influencing the climate of the country. The peninsula of Florida, extending 5 degrees south of the mainland, and forming the eastern

oundary of the Gulf, is in a considerable part of its surface so low and swampy as to be practically uninhabitable. a ee

1 Under this head no portion of the Great Lakes is included.

The drainage areas of the country, as given by the United States Drainage census of 1880 are—Atlantic and Gulf, 2,178,210 sq. m.; Great areas,

Basin, 228,150; Pacific slope, 619,240. ‘The drainage into the Atlantic and Gulf is distributed as follows :—New England coast, 61,830 sq. m.; Middle Atlantic coast, 83,020; South Atlantic coast, 182,040 ; Great Lakes, 175,340; Gulf of Mexico, 1,725,980 (the Mississippi-Missouri basin being estimated at 1,240,039).

_ The explanation of this overwhelming preponderance of drainage into the Gulf of Mexico at once becomes evident when we notice the general relief of the country and the positions of the various watersheds, If the level of the occan were raised 1000 feet, a broad water-way across the American continent would be opened. There would be a great mass of land on the western side, which would comprehend nearly the whole of Mexico, and which, within the limnits of the United States, would have a breadth from east to west of from 1500 to 2000 miles. North of the United States boundary line the breadth of this mass of land would diminish rapidly in Width as higher latitudes were reached, but its dimensions would still be on a grand scale, although deeply intersected with inlets occupying the positions of the lower portions of the present streams of that region. A similar rise of 500 feet in the ocean would not divide the continent into two decidedly distinct and widely separ- ated parts, but would isolate New England from the land adjacent on the north and west, by opening a channel through the Hudson River and Lake Champlain depressions, would carry the Atlantic coast-line more than 100 miles inland of its present position, and would open a deep bay in what is now the Mississippi valley, the ramifying arms of which would extend north nearly to Chicago, to Cincinnati on the Ohio, to Burlington, Iowa, on the Mississippi, and nearly to Jefferson City, on the Missouri. A rise of sea-level of 2000 feet would not materially change, as to position and size, the great land-mass on the western side of the continent already spoken of. That area would be slightly narrowed on the east, and would have its western edge more deeply indented, with the addi- tion of groups of islands, so that its character would, south of the Columbia, be something like what it is at the present

time north of that river. On the eastern side of the continent, however, the most striking changes would be effected. All the present coherent land-mass east of the 97th meridian would have disappeared, and in place of it we should have various groups of islands, one of the most important of which would extend from the north line of Georgia north-east into Pennsylvania and New J ersey, where it would ter- minate in finger-like projections, forming north-easterly and south- westerly trending archipelagos, with various outliers in north-eastern New York, Vermont, and New Hampshire, the highest points of which would rise from 8000 to 4000 feet above the surrounding waters. The distance of these islands from the western mainland would be from 1000 to 1500 miles. Another group of islands north of the United States boundary would extend in a curving line parallel to and north of the St Lawrence and the Great Lakes.

The all-important fact in the topography of the North American General continent in general, and of the United States in particular, is the topo- existence of a central comparatively low and level region, declining graphy.

gently from a watershed in close proximity to the Great Lakes on the north towards the Gulf of Mexico on the south.

One may ascend the Mississippi to its junction with the Ohio, at Cairo—a distance of 1100 miles from the Gulf of Mexico,—and the elevation attained will be only about 300 feet, an average ascent of about 4 inches to the mile. A journey of almost 1000 miles farther, to Pittsburgh, at the junction of the Allegheny and Monon- gahela rivers, will only give a total rise of 700 fect above the sca- level. The head of the Mississippi is in a region entirely destitute of mountains, comprising an almost level area, covered in large part by lakes and swamps, and only about 1500 feet in elevation. In ascending the Mississippi to St Louis, a distance of 1250 miles, we have reached an elevation of about 400 feet, and at St Paul, 658 miles above the mouth of the Missouri, one of a little less than 700 feet. If we follow up the Missouri to the western line of the State of the same name, where the river flows from the north, we have the choice, if we wish to kcep on directly west, of following either of its great branches from that direction —the Platte and the Kansas. Up cither of these we may travel for fully 500 miles, rising so gradually that the difference of elevation from day to day is

hardly perceptible, the country preserving all the characteristics of a plain, although declining gently to the east.

We have, therefore, in the central region of the United States a nearly level area, which, roughly speaking, may be taken at 1250 miles square, which has a very gentle downward slope from east and west to the centre, and from very nearly its northern ex- tremity to the Gulf of Mexico, its southern boundary, while its northern edge, with a part of the adjacent region, is occupied by five great bodies of fresh water, communicating by short narrow river-like contractions of the water areas, and all together occupy-

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Break

of the Hudson and Mohawk.

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ing an area of about 92,000 square miles. This central valley is not entirely devoid of mountains; but these higher areas are so small in extent, as compared with the entire area of the great valley, as to be of extremely subordinate importance. Meanwhile we turn to a consideration of the higher regions east and west of the great valley.

Neither on the eastern nor on the western side of the eontinent are these of the nature of simple mountain chains. On the contrary, both eastern and western highlands are complicated in their oro- graphie structure, broken into portions, each having a character of its own, and generally—but not always—preserving a certain parallelism with each other, broken longitudinally or in the direc- tion of the prevailing trend of the elevated mass, and separated by valleys and tablelands of very varying dimensions. The western mass, which is much the larger, is also very much tlie more com- plicated of the two. It is not only made up of a great number of parts more or less distinctly separated from each other, but it even encloses a large area of plains, valleys, and mountain ranges which have no drainage to the sea. This greatly predominating complexity of the western elevated region is the result of complicated geologi- cal conditions, to which are

added climatic pcculiarities of a striking character. The eastern elevated side of the continent is now gene- rally called the Appalachian region, the western the Cordilleran.

The Appalachian Systen.

The Appalachian ranges all belong to an ancient system of uplift or disturbance, and have not been invaded by volcanic inaterials of recent date, presenting in both these respects a most marked contrast to the Cordilleran system. There are volcanic rocks along portions of the eastern slope of the Appalachians ; but these eruptive dikes and overflows are not of Tertiary and post-Tertiary but of Mesozoic age.

The name Appalachian is used as designating the entire complex of ranges, valleys, and tablelands in and upon whieh is situated the watershed from which on the north and east the streams descend to the Atlantic, either directly or through the Great Lakes, and on the west and south-west to the Gulf of Mexico, either as tributaries to the Mississippi or flowing directly to the Gulf. As thus defined, the Appalachian region, system, or complex of ranges extends from the promontory of Gaspé, in a mean direction of north-east and south-west, to Alabama, a distance of about 1300 miles, where it disappears under the much more recent geological formations which form a broad belt along the Gulf of Mexico and extend far up the Mississippi valley.}

While the Appalachian system, as a whole, is so nearly continu- ous, as a feature of the topography of the country, that it seems necessary to include it all under one general designation, yet dif- ferent portions are extremely unlike each other in some of those features which are generally looked upon as essential to the unity of a mountain system.

One very marked and important break at least in the system is that ocenpied by the Hudson river, and extending up the Mohawk valley to the west, to a eonnexion with the Great Lakes, and up the Champlain valley to the north, to a connexion with the St Lawrence river direct. A rise of 152 feet in the sea-level would isolate from the rest of the continent all of New England and that part of Canada lying to the south-east of the St Lawrence, as far as the extremity of Gaspé. A further rise of 278 feet would open a waterway

from the Atlantie to the Great Lakes, and leave the mass of the Adirondacks as an island lying adjacent to New England on the east and the Appalachian land-mass on the south. We seek in vain for any other break in the Appalachian system as complete as this, and, when we compare the portions of the system lying on each side of this line of division, we recognize the fact that there are essential points in which they differ from each other, and that these differences are greater than any pre- sented by the various portions of the system in its extension to the south-west of the Hudson river break. This north-eastern division of the Appalachians may therefore properly first have its more important topographical and geological features indicated.

Beginning with the division west of Lake Champlain and north

1 The first person to describe topographically the Appalachian system asa whole was Guyot, who, in 1861, published the results of scyeral years' work among these mountains, giving the heights of numerous points obtained by the aid of the barometer, accompanied by gencralizations in regard to the orography of the region, and a map (1: 6,000,000), which was first published in Petermann's Mitthetlungen (1860). The various geological surveys carried on by the States included in the Appalachian region have furnished a large mass of material both geographical and geological in regard to portions of the range; but, since this work has not, as a rule, been based on accurate topographical maps, most of it is rather of the nature of a reconnaissance than of a finished survey. The State of New Jerscy is, however, publishing a map based on an accurate triangula- tion, but on a small scale (1: 63,360). The first and second geological surveys of Pennsylvania have also done much to extend our knowledge of the topography of the most complicated and interesting portion of the whole Appalachian region, but as we go either south or north from this central region we find the data Icss and Iess eompletc, and in regard to the extreme south-western portion of the Appalachian range we are little if at all in advance of Guyot. What is most lacking at present is an accurate map of that portion of the system which lies to the south of the region embraced within the State of Pennsylvania.

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of the Mohawk valley—the Adirondack region or mountains, — Adiron-
we find, on cxamination, that this region is not only to a eertain dacks
extent isolated topographically from the rest of the Appalachian ranges, but
that it belongs to a geologically older system.2 The rocks are all eruptive in
the central portion of the mass, and chiefly gabbro and granitic or gneissoid
in character. On the exterior especially on the eastern edge, are deposits of
limestone, which are generally believed by geologists to be sedimentary
beds, highly metamorphosed, but which, in the opinion of the present writer

are more probably of the nature of chemical precipitates.

The drainage of this region is radial from a central point, but

the slope on the east is shorter than on any of the other sides, From
‘Tahawas or Mount Marcy (5344 feet) the drainage is to the north-east by
the Au Sable to Lake Champlain, by the : Raquette to the St Lawrence, and
by the branches forming the ‘| head waters of the Hudson to the south. The
dominating line of elevations runs nearly east and west, with high spurs and
narrow ridges on the north, of which Whiteface Mountain (4871 feet) is one
of the most conspicuous. The region is one of numerous lakes | and lake-
like expansions of the rivers, so that, with short portages, ‘? a large part of it
can be visited by boat or canoe. The lake region proper of the Adirondacks
lies at an elevation of from 1500 to 2000 feet:—Lake Silver, 1983 feet;
Placid, 1950; Saranac (Upper), 1606, (Lower), 1557 ; Smith’s, 1788 ;
Tupper’s, 1504 ; Long, 1584 ; Raquette, 1765; Sandford, 1685; Cranberry,
1570. here are indications of the Appalachian trend in the north-east south-
west direction of several of the larger lakes ; but many others trend nearly
north and south. The number of the lakes is the result of the impermeability
of the rock, the general uniformity in height of the region, and the broken
character of the surface, which is very irregularly covered by large masses
of rolled detritus. The work of water is everywhere distinctly visible, and
that of ice hardly perceptible.

The mountainous region east of the Hudson in New England New

is the portion of the system most irregular in topographical England
features. Two groups of elevations, however, are quite well topo- marked,
and have distinctive namcs—the Green and the White graphy. Mountains.

These are separated by the Connecticut river, which has a nearly north and south eourse parallel to the range of the Green Mountains. Nowhere in this latter range is there a continuous uplift forming a long ridge or crest, but there is a gentle swell of the surface on which here and there rise elongated groups of considerably higher summits. In the extreme south- western corner of Massachusetts rises Bald Peak (2624 feet), and in the north-western corner Graylock or Saddle Mountain (3505 feet). Still farther north, in Vermont, are the culminating points of the Green Mountain range :—Eqninox, 3872 feet ; Pico, 3935 ; Camel's Hump, 4077 ; Killington, 4221; and Mansfield, 4389 fect. As- cutney, a quite isolated point, near the Connecticut river, has an altitude of 3163 feet.

The Connecticut river makes a very complete separation, in all but the extreme northern portion of its course, between the Green Mountain system and the highlands to the east, which have no col- lective name, but are in a measure the continuation of the White Mountain range. In Massachusetts this swell of land—for more it can hardly be called—has an elevation of about 1000 feet, the valleys being rarely sunk more than 200 or 300 feet below the general level of the gently undulating higher lands. Occasionally there is a higher point, like Wachusett (2018 feet) or Monadnock (3169 feet). From Monadnock the region east of the Connecticut broadens very much, the coast-line trending rapidly eastward. The eountry becomes more and more mountainous, but still without continuous ranges. The mountains are grouped around various central points, of which the most important are Moosilauke or Moosehillock (4790 feet), Lafayette (5290), and Washington (6290 feet). The last-named is the highest point in the Appalachian system north of North Carolina, and rises nearly 500 feet above all the adjacent summits. :

Farther cast, in Maine, and in the neighbouring portions of Canada, the topography has been little worked out in detail. So far as known, in Maine the irregularity of the range is still greater than it is farther to the south-west. There is in this part of New England no coast-region, but a gradual rise from the seashore towards the interior for about 140 miles, to the divide between the waters running into the Atlantic directly and those tributary to the St Lawrence or forming the head of the St John. _ This divide, which has a general direction of pretty nearly east and west, is at an altt- tude of

about 1800 feet at the western edge of Maine, and declines to about 600 feet on its eastern boundary. The southern slope 18 a very gradual one to the sea, and though broken and rocky is a diversified by any marked ridges or long elevations. The high points rise sometimes nearly isolated, and sometimes 1n ee having little of the ridge character. Ktaadn (Katahdin) 1s we Having ‘tiie ol the ndge character, Se

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2 The Adirondack region—or Adirondack Wilderness, as it is often outa been more or less completely covered by a topographical survey ma – aa authority of the State of New York ; it was begun in 1872, but the final reswits, in the form of a map, have not yet been published.

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dominating peak (5215 feet), and it rises in such isolation as to look in the distance like a volcanic cone. That part of Maine lying south of the watcrshed is drained by streams running nearly south- ward. Like the Adirondack Wilderness, it is a district of numerous lakes, as might be expected, since it has no rapid descent in any direction, is underlain by impermeable rocks, and has a consider- able rainfall.

The general uniformity of character in the New England portion of the Appalachian system will be evident from what has been here stated. This region is marked by comparatively low swells of ground, on which rise groups of higher points, rather irregularly distributed, nowhere reaching the limit of perpetual snow, and nowhere presenting great obstacles to internal communication.

The geological structure of this north-eastern prolongation of the Appalachian system has been as yet only imperfectly made

. out, a circumstance due in part to the extreme searcity of fossil remains, and in part also to the fact that the various sedimentary beds have been so metamorphosed as to be distinguishable only with great difficulty from the

associated eruptive formations, while even the latter have frequently been themselves so much changed by chemical action, since their appearance at the surface, that it is only by the microscope that their real nature can be made out.

With the exception of a narrow belt of Mesozoic rocks in the Connecticut valley and a small basin of similar age in Woodbury and Southbury, Connecticut, and also with the exception of a very limited set of deposits of late Tertiary age on the eastern boundary of Lake Champlain and on the Atlantic coast, there are, so far as known, no rocks in New England more recent than the Paleozoic. Tertiary and Cretaceous formations are, however, found covering small areas on some of the islands adjacent to the coast. Along the western sides of Vermont and Massachusetts the rocks are clearly proved by their fossils to be of Lower Silurian age, and their structure has been made out in part. There are faults and synclinals,—limestones and chloritic and talcose slates being the predominating rocks. ‘The dips are chiefly to the eastward, and

_ the rocks are of more recent age as we go east from Lake Champlain,

_ on the east side of which is a large development of the Potsdam

_ sandstone. In and near the Connecticut valley, to the east of the

| region just noticed, fossils have been found (at Bernardston, Mass.)

i of late Upper Silurian age (Helderberg of the New York Survey). _ The stratigraphical relations of these rocks, however, remain

_ obscure. The same may be said of nearly or quite all of New

_ Hampshire, of eastern Massachusetts, and of a large part of Maine,

_ At one point in New Hampshire (Littleton) fossils have been

_ obtained of the same age as those discovered at Bernardston. In

_ northern Maine, traversing the State in a wide belt running north-

east and south-west, rocks occur of Upper Silurian and Lower

_ Devonian age, well characterized by fossils, a part of this belt

_ being clearly identical in age with the Oriskany sandstone of the

| New York Survey. The stratigraphical relations of these rocks are still obscure ; and south of this fossiliferous belt is a wide arca in which no fossils have yet been found. At one point in Massachusetts | (Braintree, near Boston) more than fifty years ago fossils of the lowest Silurian age (Priniordial) were found, and there are other

) indications that the rocks near the coast of New England, from

Cape Cod north, are very low down in the fossiliferous series ;

‘) but in Massachusetts, as well as in New Hampshire and Maine,

there is a wide arca between the Devonian and Upper Silurian

FEATURES. |

» which the stratigraphical relations are still very obscure.

To the west and south-west of the Hudson river, in New York, *| the intricacy and obscurity of the orographic structure and geological lage of the Appalachian system begin to be cleared up; but it is) not until we reach Pennsylvania that the characteristic features of this range are fully developed. (1) The first of these is, along its | south-eastern edge, as we cross the system from south-east to ‘4 north-west, at right angles to its trend, a series of elevations, at ‘ first comparatively unimportant and more or less detached from jeach other, but gradually, in going in a south-westerly direction, becoming more and more prominent and continuous, until, towards) the extreme southerly end of the system, it forms the most imposing connected mass of high plateaus and still higher ridges anywhere exhibited in tho Appalachian region. This south-easterly division Jof the system has no single distinguishing appellation. It is) called in Pennsylvania the South Mountains, in Virginia the Blue “Ridge; and in

North Carolina and Tennessee it has various names applied to its different portions. (2) The second important feature is the Appalachian region proper of the First Pennsylvania Survey, ‘a region of wave-like folds or corrugations, not so metamorphosed jbut that the geological sequence can be distinctly made out, in which orographic disturbances and a peculiar erosion have de- ‘veloped an interesting and intricate topography. (3) The third ‘Yegion, in crossing the chain from south-east to north-west, is ‘that of plateaus, bounded on the south-east by an escarpment to Which the name of Alleghany has been most frequently given, and iby which that portion of the system which lies in Pennsylvania is

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rocks of the Conncctcut valley and northern central Maine, of the geological age of which nothing is definitely known, and of

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still almost universally known. These are the three most prominent divisions of the system south-west of the Hudson, and between tho first and second there is a pretty well marked depression which is a very conspicuous feature of the topography in Virginia and Tennessee (in Pennsylvania the Kittatinny, in Virginia the Great V alley, and farther south the valley of East Tennessee). .

We next come to consider the region occupied by south-castern New

New York and northern New Jersey. The Green Mountains are Jersey generally considered as being prolonged south-westwardly in the and Hudson river highlands and the highland range of New Jersey. southern This latter range in New Jersey occupies a belt of country some- New what over 20 miles in width on the New York line, but narrows York. down to less than half that on the Delaware. It includes no long unbroken ridges, the one which comes nearest to having this character being the Green Pond range, about 12 miles long; nor are the subordinate ridges of which it is composed in a line with each other or with their axes parallel to the direction of the main range. The highest point is Rutherford’s Hill (1488 feet). The Kittatinny valley mentioned above is distinctly marked in New

Jersey, where it also bears the same name. It is bounded on the north-west by a range called the Shawangunk in New York, the Blue Mountains in New J ersey, and the Kittatinny in Pennsylvania, It lies on the extreme north-western edge of New Jersey, and forms an almost unbroken straight line for about 40 miles within this State, from the Delaware Water Gan to the New York line. The straightness of this ridge and its moat level crest, from 1200 to 1800 feet in height, mark it as belonging to the peculiar topographical belt of the Appalachian system which occupies central Pennsylvania, This belt is distinctly recognizable still farther east, in the vicinity of Catskill and east of the mountains of that name, where there is a miniature group of hills, called the Little Moun- tains, only a mile or two in width, and but a few hundred feet in height, which are made up of rocks of the same geological age as those in the central division of the Pennsylvania Appalachians, and with the same characteristic structure.

The plateau region occupies a large portion of the State of New New York. Its northern edge extends along the south side of the York Mohawk river, forming a distinctly marked escarpment (the plateau. Helderberg Mountains). Farther west, in central New York, only a few miles from the central depression through which pass the Erie Canal and the great lines of railroad connecting Albany with the west, are various heights rising 1000 feet above the surround- ing plateau, and from 1600 to 2000 feet above the sea (Fenner Hill, in Madison county, 1862 feet ; Ripley Hill, in Onondaga, 1968 ; Niles, in Cayuga, 1623; Milo Hill, in Yates, 1848; and East Hill, in Oswego, 2300). This plateau, with its extension to the south- west into Pennsylvania, forms the highlands in which rise the various branches of the Susquehanna, which traverses the entire Appalachian system, in a general direction from north-west to south-east,

In south-eastern New York there is a remarkable group of The mountains, very conspicuous from the Hudson, and appareutly Catskills, quite isolated as seen from the eastern side, but which, as ap- proached from the west, are recognized as being in intimate con- nexion with the plateau region of central New York. ‘This group is known as the Catskills, of which there are two divisions,—the northern, or Catskills proper, aud the southern. The Catskills proper are a massive plateau, enclosed between the Esopus and Catskill creeks—affluents of the Hudson running in a south- easterly

direction, nearly parallel with each other, and at a distance of about 25 miles apart. The mountain mass thus enclosed con- sists essentially of two border chains running parallel with the two streams, and from 10 to 15 miles apart. The highest point of the north-eastern border is the Black Dome, 4002 feet ; that of the south-eastern range, Hunter Mountain, 4038 feet. The southern group, lying south of the Esopus, the drainage of which on the west and sonth-west is into the Delaware river, includes Slide Mountain, the highest point of the entire Catskill group (4205 feet).

The Catskill range is, like the plateau region generally, of the Devonian and Lower Carboniferous formations, The upper 500 fect of the Slide Mountain is occupicd by a cap of the Carboniferous conglomerate, the equivalent of the millstone grit, and the nearest approach to the Coal-measures in any part of New York.

From New Jersey southward the Appalachian system is very Appa- easily separated into those divisions which have already been indi- Jachians cated. Its eastern border—the Atlantic slope—is an area of land in rising gradually from the sea towards the interior, to the foot of Pennsyl- the Appalachian ranges, broadening out as we follow it southward, vania and at the same time acquiring a greater elevation before the and mountains are reached. This gently rising area is hardly percept- south- ible in New England, but it occupies a considerable portion of the ward. Atlantic States from New Jersey south to Florida. Its altitude Atlantic at the eastern base of the mountains is, in Pennsylvania, only slope. from 100 to 800 feet, — Lancuster and Harrisburg, which are ou its western border, being respectively 350 and 320 feet. On James river, in Virginia, it is about 500 feet high (Lynchburg, 529 feet), but at the source of the Catawba it has risen to 1200 feet. This

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region of comparatively low elevation is geologically, and also to a eertain extent topographically, made up of two quite distinct portions. The part nearest the eoast is almost flat, or with the gentlest possible slope seaward, and unbroken by any elevations worthy of notice. Beyond this belt, to the

west and north-west, is another, itself almost a plain, but more undulating, rising more rapidly westward, so as to form almost a tableland at the base of the mountains, and itself diversified, in its western portion, by elevations whicli in places rise high enough to be called mountains. The belt nearest the shore consists of Tertiary and Cretaceous rocks having a very gentle dip seaward. These are first met with, as we proceed southward, on Raritan Bay, where the belt occupied by them is from 20 to 25 miles wide, but on reaching Philadelphia it is found to have acquired a breadth of more than 50. The stratified mass in New Jersey consists of a great number of alter- nations of sands, marls, and clays, from a third to half the width of the belt being occupied on the surface by the Cretaceous, and the more eastern portion being of Tertiary age. Trenton, near the western edge of this belt, is only 33 feet above the sea-level. These newer formations are of special interest on account of their fossils, and because of their great economic value. This level belt of uewer rocks maintains its width through Delaware and Virginia, and attains a width of more than 100 miles in North Carolina and Georgia. Between New Jersey and North Carolina it is deeply intersected by bays, the heads of which approximately mark a change from rocks of recent age to those much lower down in the series, which make up the western portion of the Atlantic slope. This change is also most distinctly marked by an interruption to the navigability of the rivers, and it also manifests itself in thie position of the eities of the Atlantic slope, most of which to the south of New York (Trenton, Philadelphia, Baltimore, Washington, Richmond, Petersburg, Raleigh, Columbia, Augusta, Milledgeville, and Montgomery) are not on the Atlantic itself, but on or very near this geological break. From Virginia southward the coast is very little indented, and most of the large towns are at a consider- able distance from it. In North Carolina the slope of the coast belt—here 100 miles wide —is hardly more than 1 or 2 feet to the mile. It is occupied by nearly horizontal strata of Tertiary, over- lain in considerable part by detrital accumulations of still later age, the whole consisting of loose sands, clays, marls, and gravels irregularly piled one above another. Nearly the same may be said of the continuation of this belt through Sonth Carolina and Georgia. In the former State Columbia (between 200 and 300 feet above the sea) marks its western border. In Georgia, at the gencral level of the country, nearly the whole belt is Tertiary ; but the underlying Cretaceous is revealed in various places where the rivers have cut deeper than usual. The heights

of the cities are as follows :— Augusta, 1380-180 feet ; Milledgeville, 810; Macon, 334 feet.

The second or upper belt of the Atlantic slope is in Iarge part made up of rocks which aro destitute of fossils, and in regard to which it has not yet been clearly made out whether they are really stratified beds older than the lowest Silurian (Azoic or Archeean of Dana), or whether they are highly altered rocks of Paleozoic age. Over most of its area it has very distinctly the character of a plain. In Pennsylvania it is highly cultivated and densely peopled, a ‘‘eountry of rolling hills and gently-sloping vales, with occasional rocky dells of no great depths, and nowhere more than 600 or 700 feet above the sea-level.” It is bordered on the north-west, for a portion of its extent, by a low range of elevations, knowu as the South Mountains, and generally eonsidered to be the northern prolongation of the Blue Ridgo of Virginia and the States farther south. The South Mountains enter Pennsylvania at the Delaware, forming a region of irregularly grouped ridges, which occupy a breadth of somewhat less than 10 miles, and which do not rise to an elevation of more than 400 to 500 fcet above the valleys. These hills are made up of massive varicties of gneiss, sandstones, — recognized by tho Pennsylvania Survey as being of Potsdam age,—and Lower Silurian limestones. The vallcys resting on this latter rock are covered with a highly fertile soil. In Virginia the upper belt of the Atlantie slope broadens out and becomes more and more complicated in its topography. In an official report! this region is divided into three portions, called the Middle, Pied- mont, and Blue Ridge divisions of the State. The Middle division is said to extend westward from the sea to the foot of the low broken ranges which, under the names of Kitoctin, or Kittoctan, Bull Run, Yew, Clark’s, South-West, Carter’s, Green, Findlay’s, Buffalo, Chandler’s, Smith’s, &c., Mountains and Hills, extend across the State south-west from Fairfax county on the Potomac to Pittsylvania county on the North Carolina line. These broken ranges, which preserve a general parallelism with the Appalachian ranges proper, and form, as it were, the outliers of this system, are designated by Major Hotchkiss the Atlantic Coast range. This middle country is described as a moderately undulating plain, from 25 to 100 miles wide, and rising from the south-eastern border, where it is from 150 to 200 feet above the sea, to an altitude of from 300

“1 Hotchkiss, Virginia, a Geographical and Political Summary, based on infor- mation obtained during the Geologieal Survey by Prof. W. B. Rogers in 1835-41.

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to 500 feet along its north-western edge. It is a succession of Jow north-east and south-west trending ridges, the valleys between them being sometimes narrow and deep, but the ridges themselves not very prominent. The rocks are inetamorphic slates and gneiss, with numerous eruptive masses in the form of dikes, and with many quartz veins, some of which contain considerable gold, although mining has not, on the whole, been successful. The Piedmont division forms a belt of from 20 to 30 miles in Width, and may properly be considered as being the foothill border of the Blue Ridge itself. There is a marked tendency to the formation of a continuous valley between the broken ridges already noticed as forming the so-called Coast range and the Blue Ridge proper. In this valley lie Culpeper (400-500 feet), Fairfax (382), Charlottes. ville (450), Lynchburg (650), and other towns. This foothill region is described as exceedingly intricate. The coast range is succeeded, in the west, by numberless valleys of all imaginable forms, which extend across to, and far into, the Blue Ridge, to which, in point of fact, they topographically belong. Portions of the Picdmont country, however, form quite extensive plains,

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The Blue Ridge with its belt of foot-hills—the Piedmont region The — forms a conspicuous feature of the topography of Virginia and the Blne The Potomac breaks through it at Harper’s Ridge,

States farther south. Ferry, at an elevation of 242 feet, the mountains adjacent rising about 1200 feet higher. The passes, locally known as ‘‘ gaps,” are numerous, and several of them are traversed by railroads, The James river intersects the Blue Ridge 706 fect above the sea. The elevation of this range is considerable, even in its northern portion, —Mount Marshall, near Front Royal and Manassas Gap, being about 3370 feet. The height as well as the breadth of the range increases rapidly as the southern line of Virginia is approached,— the Peaks of Otter, in Bedford county, near

Buford’s Gap, rising to 4000 feet, and Balsam Mountain, just at the North Carolina line, to 5700 feet. Here the Blue Ridge has already begun to expand into that wide and high platean, occupying the western portion of North Carolina, in which are found the highest points of the entire Appalachian system. This elevated region is formed bya broadening out and bifurcation of the Blue Ridge, which begins near Christiansburg (2012 feet), opposite the point where the New river changes its course from a direction parallel with that of the Appalachian ranges to one at right angles to this, and breaks through that part of the system which lies north-west of the Great Valley, flowing in that direction to the Ohio. This plateau rises in North Carolina to an average height of 2500 feet, while portions of it are over 3500. It is about 150 miles in length, with a width varying from 15 to 50 miles and averaging abont 30, and reaches its highest altitude (3500-4000 fect) at its narrowest part. The plateau is bordered by broken ranges; that on the sonthiaa still continues to be called Blue Ridge; the more or less continuous line of elevations in the south-west has various names—Unaka, Smoky, Bald, and Iron being among the number. Between these exterior ridges run various spurs, with many points over 6000 feet, the culminating one being the Black Dome (6707 fect). The northern portion of this high region is drained by the head waters of the New river, but the principal drainage of the most elevated part is to the north-west, from the plateau, through gaps in the western ridges, to the Tennessee.

The geology of the Blue Ridge division of the Appalachian system is obscure and difficult. Most of the rocks are highly crystalline, but whether of Palaeozoic or Azoic age is as yet undecided. These erystalline rocks are more or less intersected by ancient eruptive masses, the range andextentof which are uncertain. Flanking the Blue Ridge on the west side, and involved in the disturbances of the strata by which it has been built up, are sandstones and lime- stones which in Pennsylvania have been recognized as being of Lower Silurian age. These limestones seem to become more arell-aceous farther south, and also to become unfossiliferous. It may be assumed, however, that the range in general is made up of rocks not newer than Lower Silurian.

To the west and north-west of the Blue Ridge division of the The Appalachian system lies the Great Valley.

it from the mountain district lying adjacent to it on that side bya very regular natural wall. The entire length of the valley in that State is about 165 miles, and its width between 10 and 11 miles. Throughout its whole extent it presents a gently undulating surface, approximating to a level plain, with here and there a belt of low hills. In Virginia the Great Valley is a very important feature, having a length of a little over 300 miles, and a quite uniform width of about 20. The mountains on its north-west side (the Kittatinny) are known by a variety of names, their northern portion being designated on some maps as the Great North Mountains. ‘ small portion of this valley is also included within the limits : West Virginia. The drainage of the Great Valley is complicate : The north-eastern portion is the beautiful and fertile valley ee 1 140 miles in length) of the Shenandoah, drained by two par ie branches of that river,—a well-marked double range, 50 piiles A 3 length, dividing the Great Valley longitudinally. Through thi

Its north-western Great limit in Pennsylvania is the Kittatinny Monntain, which separates Valley.

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range the northern branch of the Shenandoah breaks, turning at right angles to its former course and uniting with the southern branch at Manassas Gap, below which, towards the Potomac, the valley is but slightly broken by hills. South of that portion of the Great Valley drained by the Shenandoah is a region about 50 miles in length, in which are the head waters of the James. The various branches of this river, coming from north-west and south, unite at the western base of the Blue Ridge, and there break through it. The remaining portion of the valley belongs partly to the Roanoke and partly to the New or Kanawha and to the Holston. The rise of the Great Valley to the south-west is very marked, the point where the Shenandoah enters the Potomac being only 240 feet above the sea, while the head of the New river is in a region ranging from 2500 to 3000 feet. According to the official report, “the aspect of this region is singularly pleasant. The great width of the valley, the singular colouring and wavy but bold outline of the Blue Ridge, the long uniform lines of the Kittatinny Moun- tains and the high knobs that rise up behind them in the distance, the detached ranges that often extend for many miles in this valley, like huge lines of fortifications—

all these for the outline, filled up with park-like forests, well-cultivated farms, well-built towns, and threaded by bright and abounding rivers, make this a charming and inviting region.” The next division of the Appalachians, which may be called the iniddle belt, is perhaps the most interesting and peculiar although – not the most persistent portion of the system. It is not until | Pennsylvania is reached that it becomes important. Its character of this division is thus indicated by H. D. Rogers in the report of the First Geological Survey of that State:— It is a complex chain of long, narrow, very level mountain ridges, separated by long, narrow, parallel valleys. These ridges sometimes end abruptly in swelling knobs and sometimes taper off in long slender points. Their slopes are singularly uniform, beiug in many cases unvaried by ravine or gully for many milcs; in other instances they are treuched at equal intervals with great regularity. Their crests are for the most part sharp, and they preserve an extraordinarily equable elevation, being only here and there interrupted by notches or gaps, which sometimes desccnd to the water-level, so as to give passage to the rivers. The whole range is the combined result of an clevation of the strata in long, slender, parallel ridges, wave- like in form, and of excessive erosion of them by water; and the present configuration of the surface is one which demonstrates that a remarkable, and as yct little understood, series of geological events has been concerned in their formation. The ridges, which are but remnants of the eroded strata, are variously arranged in | groups with long narrow crests, some of which preserve a remark- | able straightness for great distances, while others bend with a pro- » longed and regular swecp. In many instances two narrow contigu- } ous parallel mountain crests unite at their extremities, and enclose)) 2 narrow oval valley, which with its sharp mountain sides bears) not unfrequently a marked resemblance to a long slender sharp- pointed canoc.” The system of ranges thus described crosses north- | western Maryland, and is largely developed in Virginia, with char- acters in many respects resembling those which it displays farther horth. It is a region of long, narrow, parallel valleys, separatcd by narrow, straight, and quite elevated ridges, of which no one rises greatly above the others. The number of these diminishes as we proceed in a south-westerly direction, and the belt narrows in | proportion. The drainage on the extreme eastern border is into | the Great Valley. The interior valleys in the northern half of the) belt are traversed by streams flowing into the Potomae; the southern) half is mostly draincd by branches of New river, In

some cases the waters flow towards a central depression in the valley, and then break through the enclosing range. The rocks are Silurian, | Devonian, and Lower Carboniferous. In its north-eastern exten- sion this division includes the anthracite region of Pennsylvania. The ridges by which the Appalachian belt proper is traversed are | the result of a series of flexures of the strata, along numerous axes | of clevation and depression, not complicatcd in Pennsylvania by) extensive dislocations of the crust, or faults, eithcr longitudinal or transverse, but gradually becoming so as we proceed towards the south-west. It is a curious fact that, in following in a south- westerly direction the Appalachian belt proper, we find that it disappears or merges in the Great Valley, which in Tennessce occu- pies the entire space between the Blue Ridge and the Alleghany (plateau, there called the Cumberland tableland, and is fully 40 Mniles in width. The rocks which underlie the Great Valley are of ithe same geological age as those of which the Appalachian belt is) composed farther north, but more closely coinpressed together, and }complicated by great longitudinal faults, the whole area being a comparatively depressed one, and not broken by marked ridges. |The true Appalachian belt is therefore limited ‘to Pennsylvania, Virginia, and a very narrow space in Maryland, and here the system has its greatcst width and most intricate and interesting topo- | graphical features, but not its highest elevations, which occnr north and south of this portion, in regions of greater and more irregular | disturbance, complicated by metamorphic changes and irregular

STATAHS

intrusions of eruptive material on a grand scale

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, Making the task

of unravelling the geological structure extremely difficult.

The most western member of the Appalachian system

—is ; geology is most easily mad and, while its eastern border is an important topographical fe 1t mierges so gradually in the great central or Mi

plateau—is the one of which the

that any definition of its limits in that direction

The position and elevation of this plateau region in New York have been already indicated. Farther south this tableland occupies the western portion of Pennsylvania, nearly all West Virginia, a part of Kentucky and also of Tennessee, in which latter State it is called the Cumberland tableland, or the Cumberland Mountains, Since it here presents itsclf exceptionally with abrupt edges on the west, as well as on the east, but it is narrowed down to a width of not more than 30 or 40 miles in the northern portion of the State] The bold escarpment with Which the plateau faces the east in Pennsylvania is known as ny Virginia, but with A}lech much less distinctness, It is from this tableland that the waters Moun. crossing the cntire tains. the New river the ream heads on the € opposite direc-

and of much less in the southern. tle Alleghany Mountains, It is continued in of the Susquehanna descend to the Atlantic,

Appalachian system in its course, while with condition of things is reversed, since this st

eastern edge of the range and flows across it in th

tion from that of the Susquehanna,

Since the dip of the strata in southern New York and western occupy The Coal-measures

Pennsylvania is generally to the southward, 1 the surface as we proceed in that direction.

is quite impossible,

newer rocks

appear soon after the line of division of these two States is passed,

and it is largely with rocks of this age that the tableland is covered In fact the Appa- almost continuous mass of coal-bearing strata, extending from northern Pennsylvania to Alabama. A part of this field, however, notably in Ohio, reaches

through the whole of its southern extension. lachian coalfield, as it is called, presents an

far beyond the topographical limits of the Appalachian region.

The Appalachian tableland is, even in Pennsylvania, not entircly

destitute of marked topographical features, The axes which char- acterize the system farther east are not wanting, but the strata are

raised and depressed by gentle undulations, and not broken by

precipitous ridges. Much intricacy is given to

the topography, in

a small way, by the streams cutting down into the soft rocks, Before leaving the Appalachian region it will be desirable to add Mesozoic a few words on the belt of Mesozoic rocks occurring on the Atlantic belt of the

slope, which, although not forming a prominent to feature, are of much geological and paleontological interest. chians,

This belt consists chiefly of sandstones of reddish-brown colour, with which are associated shales, and occasionally, especially in the lower portion, coarser materials—conglomerates,—which are

sometimes well rounded by water, but in places in character. These rocks are first seen, on the

almost breccia-like north-east, in New

Brunswick, in Nova Scotia, and on Prince Edward Island. In New England they are limited to the valley of the Connecticut

river, with a small parallel area a little to the towns of Southbury and Woodbury, Connecticut

west of this in the . The Connecticut

valley Mesozoic area is about 150 miles in length, with a maximum breadth of about 14, The largest belt, however, is that extending from the west side of the Hudson river, along the south-eastern side of the South Mountains and Blue Ridge, through New Jersey, Pennsylvania, and Maryland, to about the centre of Virginia, having a maximum width of about 30 miles and a length of some- what over 300. There are other smaller areas of the same rock in Virginia and in North Carolina,—that of the last-named State

extending a short distance into South Carolina this sandstone is a considerable amount of ig

. Associated with neous rock, which

occurs in the form of dikes and overflows, which, as the sandstone has been worn away by erosive agencies, occasionally stand out

quite conspicuously, although nowhere reaching an elevation of

more than a few hundred feet. Some well-known and much visited localities, such as Mount Tom and Mount Holyoke in Massa-

chusetts, the Hanging Hills and East and West

Rocks in Connecti-

cut, and the Palisades in New York, are of this character. The fossils which the sandstones contain are not humerous, but are of niuch interest, and the geological age assigned to this formation by most paleontologists is the Triassic. In several localities, how-

ever, great numbers of footprints of animals

occur, which were

long considered to be those of birds, but are now known to belong —in considerable part, at least—to the Reptilia, some of which had certain features allying them to birds. The paucity of fossil

remains, other than footprints, found in these the working out of their true relations a mat

rocks has rendered ter of considerable

difficulty. The latest investigations of Prof. Fontaine show that the Mesozoic areas of Virginia are separable into two quite distinct groups, an older and a newer, the floras of the two being quite different. It is in the older Mesozoic of Virginia, and in the most easterly arca, near Richmond, that the coal occurs which was the first worked in the United States. The stratigraphical relations of the Mesozoic sandstones are difficult of comprehension, and have

been the occasion of much discussion,

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The Cordilleran System.

For convenient description, this system may be divided into the following six regions:—I. the Rocky Mountains; II. the Great Basin and the Basin ranges; III. the Northern or Columbian

lateau; IV. the Southern or Colorado plateau; V. the Sierra Re and Cascade ranges; VI. the Pacific Coast ranges.

I. The Rocky Mountains form the eastern border of the Cordil- leran region, —a border made up of many subordinate ranges. They may be divided into two parts—the north and south trending por- tion, and the north-west and south-east trending portion. Between these two subdivisions there is a marked orographic break, in the form of a high plateau region, over which the Union Pacific Rail- road passes at an clevation of about 8000 feet. On the north of this plateau are the Sweetwater and the much higher Wind River Mountains, which latter form the culminating region of the con- tinent, since in them head the three great river-systems of the country,—the Missouri, the Columbia, and the Colorado.

(A) The southern or north and south trending division is about 600 miles in length from north to south, and about 300 in breadth. Its eastern edge is extremely well marked, the ranges rising abruptly from a very gently sloping plateau. Looking at this division in the most general way, we find on its eastern edge a double range of mountains, quite distinctly marked in Colorado, or between the parallels of 36° and 41°, where they enclose a system of high plateau-like valleys, known as the North, Middle, South, and San Luis Parks, which have an elevation of from 6000 to 10,000 feet, the enclosing ranges rising 3000 to 4000 feet higher. These so- called parks are drained by the head waters of the Platte, Colorado, and Arkansas, with the exception of the San Luis Park or Valley, in which lies the upper course of the Rio Grande, whence it finds its way southward, through New Mexico, having a pretty well marked and lofty range on its eastern side, and more broken ones on the west, the two representing the Front and Park ranges of Colorado.

Tho Front or Colorado range proper, beginning as a junction at the south of the Medicine Bow range and the Laramie Hills, which are low inconspicuous ranges closing in the plateau above noticed as separating the two divisions of the Rocky Mountain system, is a broad, lofty mass, continuous from about 41° N. lat. as far as Pike’s Peak, about lat. 38° 45’, when it runs ont into the plain. The best known points in the Rocky Mountains—Long’s Peak (14,271 feet) and Pike’s Peak (14,147 feet)—are in this range; both are visible from the plains, and are conspicuous landmarks. Gray’s Peak (14,341 feet) is the highest point in this range; but, although on the continental divide, it is too far west to be visible from the

plains. This divide, which separates the Atlantic waters from those of the Pacific, follows the Front range as far as Gray's Peak, where it is deflected westward for 20 miles to the Sawatch range, which it follows for about 75 miles. In this deflexion the divide passes between Middle and South Parks, the lowest pass in this part being that called the Tennessee (10,418 feet), which leads from the head of the Arkansas to the Grand river branch of the Colorado.

The Sawatch range is one of the highest and best-marked chains in the Rocky Mountains. It lies west of the head of the Arkansas; and its dominating peaks, along the whole range, exceed 14,000 feet. 'Tle most northerly of these, the mountain of the Holy Cross (14,176 feet), was so named on account of the existence on its eastern flank of a large snow-field lying in two ravines which intersect each other at right angles, in the form of a cross, and which in summer is conspicuously visible from a great distance. The highest point is Mount Harvard (14,375 feet), and the passes range froin 12,000 to 13,000 fect. The continental divide follows the Sawatch range to its southern end, in lat. 38° 20', and then runs in a south-westerly direction for about 75 miles, over a high region without any distinctly marked range. Here it turns, and, running south-easterly, follows the crest of the San Juan range, which at many points rises above 13,000 feet. This range forms the western border of the San Luis Park, and, from its north- western end, in going either north, north-west, or west the explorer finds a very elevated and exceediugly broken country, which finally merges in the plateau or ''mesa" region of western Colorado. Uncompahgre Peak (14,285 feet), a magnificent isolated summit of volcanic materials, is the culminating point.

West of the Sawatch range is that of the Elk Mountains, a vol- canic mass of sharp pinnacles, the culminating point of which— Castle Peak—is over 14,000 feet. Between the Elk Mountains and the Uncompahgre rise the various branches which unite to form the Gunnison river.

The entire western portion of Colorado is a high plateau region of sedimentary rocks, of late geological age, cut deeply into by numerous streams, giving rise to cafions or ravines alternating with mesas or plateaus, the whole forming a labyrinthine succession of depressions and elevations.

The mesas are sometimes so nearly eroded away that the remaining portion of the flat surfacc is hardly wide enough for a bridle path, while at other times there is a broad area of nearly level surface, bordered on each side by tre- mendous precipices. The small valleys on the streams, where there

The Rocky Mts.

Southern division,

Colorado range.

Sawatch range,

San Juan range,

Elk Mts.

Plateau region,

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is an area of level land large enough to be a feature in the topo- graphy, are called “‘parks” or “holes.” The area occupied by these, in Colorado, west of the continental divide, is extremely small as compared with the whole area of the region.

When the ‘‘ Parks” are spoken of in describing the Rocky The Mountains, it is usually the more conspicuous ones—the North, Parks» Middle, South, and San Luis Parks—that are intended. The 7 North Park is a tolerably level area, about 40 miles by 20, and quite walled in by high ranges rising at points above 12,000 feet, This park is a favourite resort for hunters. In it rises the North Fork of the Platte. Middle Park, which is drained by the branches of Grand river (not to be confounded with the Rio Grande), is much moro broken by elevations than North Park. The continental divide surrounds it on every side excepting the west. There are but few points in this park under 7000 feet. South Park is about 40 miles in length and 15 to 20 in breadth; it is more nearly level than the North or the Middle Park, and has a higher elevation than either (about 10,000 feet at its northern end, and

declining gradually southward to about 8000). The San Luis Park, or Valley, is much larger than the more northern parks, and is closed in by high mountain ranges. On its north-eastern side it has as a boundary the Sangre de Cristo range, of which the culmin- Sangre ating point is Blanca Peak, the highest point in the Rocky de Mountains (14,4638 feet). The Sangre de Cristo range is almost a Cristo continuation of the Sawatch, having the saine trend and similar range, geological characters, the two being separated by the broad depres. sion known as Poncho Pass (about 9000 feet). The north-western portion of the San Luis Valley is closed in by the Garita Hills, which are a part of the great irregular volcanic mass continued north-westerly by the Uncompahgre and south-westerly by the San Juan range. The San Luis Valley is traversed by the Rio Grande, which enters it from the west, rising in the above- mentioned volcanic region. In the northern and wider portion of the valley the mountain streams sink or are lost by evaporation before reaching the Rio Grande, and most of this portion of the valley is sandy, and unfit for cultivation except where it can be artificially irrigated.

Proceeding westward from the San Juan range, in lat. 38°, we soon enter the plateau region which extends to the Colorado. This plateau region is bounded on the north-east by the volcanic masses of the San Juan, Uncompahgre, and Elk Mountains, at the western base of which spread the great tables or mesas of Cretaceons and Tertiary rocks, often capped by volcanic materials, and which thus already begin to exhibit the characteristic features of the plateau region. Here the principal branches of Grand river and of the Gunnison have their sources. The Grand itself rises in the Front range on the western slope of Long’s Peak, while the Gunnison heads near Mount Harvard, the two uniting near the western boundary of Colorado, near 39° N. lat.

Directly west of North Park, and separated from it by the mass Uintah of the Park range, and also by a broad belt of high mesa country, range, is the Uintah range, remarkable as having an east and west trend, and thus forming a sort of connecting link between the eastern edge of the Rocky Mountain system and its western border, of which the Wahsatch range is the most strongly marked division. Starting from the eastern side of the Wahsatch, where it inos- culates with it, it runs east for a distance of 150

miles, when it sinks and becomes lost in the Tertiary and Cretaceous mesas lying west of the Park range. It has the Bridger basin on the north—a continuation of the Laramie Plains,—the two together forming an important member of the orographic break between the north and south divisions of the Rocky Mountain system already indicated. The Bridger basin is underlain by rocks of Eocene age, and has an elevation of 6000 to 7000 feet, Fort Bridger itself being 6,753 feet above the sea. South of the Uintah range 1s the Uintah Valley, also underlain by Tertiary rocks, and forming the north-westernmost division of the Colorado plateau region.

The Uintah range itself is of very simple geological structure, being a low flattened anticlinal, complicated by one or more faults on the northern edge. The Tertiary and Cretaceous strata have been so much eroded away on the higher portion of the flattened arch that the chief rock exposed in the body of the range is the underlying Carboniferous. The highest points, as given by the Fortieth Parallel Survey, are Gilbcrt's Peak (18,687), Tokewanna (18,458), and Wilson's Peak (13,235 feet). The southern slope of this range is drained by the affluents of Green river, which unites with the Grand, about 175 miles farther south, to form the Colorado. Pentel

The Wahsatch range is one of the most conspicuous of the _ Rocky Mountain system, and, as it borders the Great Basin on its rang? eastern side, it may properly be considered as forming the western limit of the Rocky Mountain southern division of the Cordilleran system. This range has a nearly north and south trend, ate with a bold escarpment to a height of nearly 12,000 feet in t portion of the range just east of Salt Lake City, but al gradually towards the north and not being recognizable as ze 18- tinct range beyond Bear river. This streain rises on the nort ae slope of the Uintah range, in nearly the same latitude as that 0

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Salt Lake City, then flows northward for more than 100 miles, to lat, 42° 40', when it turns and follows an almost exactly opposite course, finding its way round the north end of the Wahsatch range and emptying into Great Salt Lake. In the loop thus made by Bear river is the Bear River range, in

which North Logan Peak rises to 10,004 feet, and others are of nearly equal altitude. ‘The whole of the Wahsatch region—the range of that name as well as the parallel ranges and spurs on the east—is one of difficult and complicated topography. It forms the connexion between the north and south divisions of the Rocky Mountains, and connects by spurs and irregular lines of elevation with the Wind River range, the range of the Tetons, and.the Snake River Mountains,

Although Bear river runs for more than a hundred miles in a northerly direction before crossing the Wahsatch range, the Weber river, which rises in the Uintah range, within three or four miles of the head of Bear river, runs with a pretty direct north-westerly eourse across that range, breaking through it where it is from 8000 to 9000 fect in elevation, and affording an easy route for the railroad from the Bridger and Green river basin to Salt Lake.

(B) The northern division of the Rocky Mountains has been much less fully explored than the southern. It also is made up of a large number of ranges, having a general though by no means uniform north-west south-east trend. Asa whole, this division is lower and less impressive from the grandeur of the masses than the southern ; and as we advance north-westerly we find more monotony in the scenery, more uniformity in the height of the rauges, and an almost entire absence of dominating peaks, Striking exceptions to this condition are offered by the Wind River range and the Yellow- stone geyser region.

The Northern Pacific Railroad, by which access is had from the east to this portion of the Cordilleras, strikes across the plains . from the western eud of Lake Superior, directly west to the Missouri, which it crosses in 101° W. long., at Bismarck, near the centre of Dakota. From this crossing it runs in almost a straight line to the Yellowstone river, which it follows for a distance of 340 miles. It then crosses to the Missouri at Gallatin, and follows that stream to near Helena, a distance of about 100 miles, From here the ascent of the main divide of the Rocky Mountains is made by way of Mullan’s Pass, the summit being crossed by a tunnel 3850 feet long, at an elevation of 5548 feet. Thence the line follows Hell-Gate river, the Missoula, and Clarke’s Fork, to Lake Pend d’Oreilles (2059 feet), which it

curves round on the north, and then strikes directly south-west to the junction of Snake river with the main Columbia.

The Rocky Mountains, in their north-western portion in Montana and Idaho, are more irregular in their development than they are farther south. There is, however, a similar tendency in both regions to the formation of those mountain-encircled valleys which are so generally known in this region as “ parks,” although not infrequently called ‘* prairies.” These parks are mostly destitute of timber, excepting the cotton-woods along the banks of the streams. The mountains are more or less covered with coniferous trees, not of great size, but sufficiently large for ordinary building purposes. As the ranges themselves are lower than in Colorado and in the southern division generally, so the high enclosed valleys are also proportionally lower. Portions of them have a soil suitable for cultivation; other portions are covered with bunch grass and well adapted for grazing. There is considerable uncertainty in the nomenclature of the various individual ranges. The namo Bitter Root is most frequently given to an important range, which ina portion of its course forms the main divide between the Missouri and the Columbia, but which, farther to the north-west, separates the waters tributary to the Snake from those which unite to form the Clarke’s Fork. The Lapwai and Ceur d’Altne ranges lie west and north-west of the Bitter Root Mountains, and unite the Rocky Mountains with the Blue Mountains, an important, but little-known group of ranges occupying a considerable portion of the region lying west of Snake river. Thereare also various groups of mountains, more or less isolated in position, and lying to the east of the main range of the Rocky Mountains in this portion of their extension. The Crazy Mountains form an isolated group immediately north of the Yellowstone river. They occupy an area about 40 miles long and 15 wide; the highest point is Crazy Peak (11,178 feet), and there are numerous others approaching 11,000 feet. The mass is formed by immense outbursts of volcanic rocks through horizontally lying strata eonsisting of sandstones and Shales of Cretaceous age. The Judith Mountains form another more or less isolated group farther north-east, in 109°-110° W. long. To the south-east, again, are the Big Horn Mountains, an extensive range forming an advance guard, as it were, of the main chain, between 43° and 46° N. lat. Still farther east, and in entire isolation from the main range, is the large and important group known as the Black Hills,

in 103° to 105° W. long., embracing a region which has lately become of considerable importance on account of its mineral wealth. This group covers an area of an irregularly oval shape, about 120 miles in length and from 40 to 50 in width; the average elevation is from 2000 to 3000 feet above

the surrounding country; but the highest point—Mount Harney —reaches 9700 feet. Deadwood, the principal mining settlement, has an elevation of 4630 feet. The geological structure of this Tange 1s comparatively simple, and typical of that of a very con- siderable portion of the Rocky Mountains, especially of the ranges of the northern division. The central or axial mass is of an oval form, about 70 miles in length by 40 broad, and is made up of crystalline rocks,—granitic, gneissoid, and schistose in character. The sedimentary rocks rest upon it unconformably, folded like a mantle around its base, and everywhere dipping from it, at a higher angle near the axial mass, and at a lesser one as we recede from it. The lowest fossiliferous rock is the Potsdam sandstone, from 200 to 300 feet in thickness. On this rests couformably a series of beds of Carboniferous age, 600 to 700 feet in thickness, and this group is succeeded by the series of deep-red sandy gyp- siferous strata, the “Red Beds” of the Rocky Mountain geologists, a very conspicuous feature of the geology through a large portion of this region, and the more so because often eroded into peculiar fantastic and picturesque forms. These beds are considered to be of Triassic age. In the Black Hills their total thickness varies from 300 to 400 feet. Above the Red Beds lies the Jurassic, which here has a quite uniform character, and is made up of grey or ash-coloured marls, marly limestones, and soft sandstones. ‘The thickness of this group in the central region of the Black Hills is about 200 feet, increasing to the north, and attaining in Belle Fourche Valley a maximum of 600 feet. In the Wind River range the Jurassic is more largely developed, and farther to the south and south-west, through the Rocky Mountains and in the ranges south of the Great Basin, it is still thicker. Above the Triassic and Jurassic, and conformable with them, are the various members of the Cretaceous series, so largely developed in this

region, varying in lithological character, the upper 600 feet composed of soft, easily eroded materials, and containing many characteristic Cretaceous fossils. The position of these various groups of strata, some quite hard and others very soft, wrapped coucentrically around the axial mass, and cut through by a radial drainage, has given rise to an interesting topography, easily understood from its simplicity, and little obscured by any covering of forest vegetation. A remarkable feature of the landscape, on the western bank of the Belle Fourche, is the Bear Lodge, or Devil's Tower, 'a great rectangular obelisk of trachyte, with a columnar structure, giving ita vertically striated appearance," rising 625 feet from its base, the summit being entirely inaccessible,

II. The Great Basin is the name now given to aregion embracing The an area of about 225,000 square miles, and having no drainage Creat to the sea. Its shape is roughly triangular, the apex of the triangle Basin, being near the mouth of the Colorado river, and its base extending in an irregular line, approximately east and west in direction, from near the north-eastern corner of California to a point on the northern slope of the Uintah range, where, as already mentioned, Bear river has its source. The length of the east side of the triangle thus designated is approximately 600 miles. From the northern side or base the drainage is into Snake river; on the south-eastern side rise various branches of the Colorado; and the south-western is very distinctly marked, for the greater part of its length, by the crest of the Sierra Nevada.

The Great Basin is an elevated plateau, traversed by numerous Its topo-ranges of mountains, having a general north and south trend, and graphy. a very considerable elevation above the intervening valleys, While there isa marked tendency in these ranges to isolation from each other, and to separation by deep and persistent valleys, there is still so much inosculation of one range with another, and so much irregularity in their development, that it is extremely difficult to define their number or to group them. Starting from the crest of the Sierra Nevada, at a point west of Pyramid Lake, and going in a direction a little north of east to Salt Lake, the traveller would cross about twenty mountain chains, mostly very distinctly marked, and separated by deep valleys of from 4 to 20 miles in width. The height of the plateau from which these chains rise is greatest in its central portion,

and it declines east and west and also towards the south, where considerable areas are actually below the level of the sea. The most important centres towards which the drainage con- verges are Salt Lake, about 4250 feet above the sea, and the sink of the Humboldt and Carson, very nearly at the same elevation. The head of the Humboldt river is near Cedar Pass (6263 feet), about 100 miles west of Salt Lake. This river therefore marks a distinct line of depression near the northern edge of the Great Basin, and in going south from this we rise iu the various valleys to heights of from 5000 to 7000 feet. The Humboldt Sink not only receives the surplus drainage of the northern portion of the Basin, but is on the same level, and after a wet season in aetual continuous con- nexion, with the Carson Sink, into which quite an extensive portion of the eastern slope of the Sierra Nevada is drained. Throughout the Great Basin the valleys between the ranges are themselves usually sinks, the lower portion being frequently occupied by bodies of water which vary in size according to the atmospheric precipita- tion of the preceding winter, and in many cases are hardly more

than saline incrustations resting upon a more or less muddy bottom. In general the valleys are nearly bare of vegetation in their lower portions; higher up they are covered with a growth of desert shrubs. There are, in occasional favoured localities, small sedge- grass meadows. There is a rapid falling off in elevation of the Basin region towards its south-western corner, and here portions are helow the sea-level, Death Valley, the sink of the Armagosa river, is one of these depressed regions, and along the line of the Southern Pacific Railroad is another depression, a little over 60 miles in length, the lowest portion of which is 263 feet below the level of the sea. Of the ranges traversing the Great Basin, with a trend approximately north and south, some are short and inconspicuous, while others maintain an almost unbroken crest for 100 miles or more. Their parallelism in certain portions of the Basin is very striking. The loftiest range is that called the East

Humboldt—or more frequently simply the Humboldt; this rises about the middle of the Basin, its southern end being in 115° 80’ W. long., and runs north-north-east for about 100 miles to near the head of the Hun- boldt river. At the north end of this range is Mount Bonpland (11,821 feet), the culminating point of the Basin ranges. The Pah-Ute range, about 150 miles west of the Humboldt, is another very persistent line of elevations, although rather irregular in trend, and not very high. The West Humboldt range is also a conspicu- ous one near the western side of the Basin; its culminating point is Star Peak (9925 feet). The mountain ranges of the Basin are characterized by the almost entire absenee of forest vegetation, trees being abundant only in their higher portions in the deeply hidden cafious. The rocks are everywhere exposed along the ridges and flanks. The valleys are deeply filled with detrital materials, which rise sometimes along the flanks of the ranges to a very considerable height, with a steep but gradually diminishing slope, indicating the former greater energy of erosive agencies.

The Great Basin is an interesting field for the geologist. The most important feature is the entire absence of the marine Creta- ceous and Tertiary formations, which play such an important part in the Rocky Mountain division. With the exception of the late freshwater Tertiary of the Humboldt river and some of the areas farther west, and of the post-Pliocene detrital accumulations of the valleys, there is nothing more recent than Jurassic, and very little of this, the most recent really important fossiliferous formation being the Alpine Trias. The stratigraphical relations of the forma- tions, especially with reference to the building-up of these ranges, are mostly simple, as in the Appalachian and Jura ranges, or even simpler still. Some ranges are simple monoclinals, others anti- clinals, and others again synclinals, or a combination of two or more of these forms of structure. They are rarely or never closely compressed and only moderately faulted. The striking peculiarities of Appalachian erosion, due in large part to the repetitions of hard and soft strata, are not to be found as important elements in the Great Basin topography. The Basin ranges differ, however, in a marked degree from those of the Appalachian and Jura in the almost constant presence, and sometimes overwhelming importance, of the volcanic masses throughout the whole region. In some instances these formations make up the whole range; or, at least, the whole interior skeleton of older rocks, if such exist, is concealed by them; in other cases the

eruptive matcrials have been poured forth along the base of the uplift, and there form great plateau- like masses; or they have issued from the summit of the range and spread themselves there in sheets, or flowed down the flanks of the central mass. In this respect the Basin ranges maintain a unity with the other portions of the Cordilleran system, throughout which the exhibition of the results of volcanic energy during the later geological periods is everywhere manifested on a scale perhaps unequalled elsewhere.

III. The Northern or Columbian plateau embraces the region en- elosed between the northern extension of the Rocky Mountains on the east and the Cascade range on the west. It is the basin of the Columbia river, which drains it by means of two principal branches, one of which retains the name Columbia to its source beyond the boundary of the United States, while the other, originally named the Lewis, is now almost universally known as the Snake river. The Columbia itself forks near the boundary line, the main river coming down from the north, and being joined by Clarke's Fork from the south-east. The Columbia and the Snake, after uniting, flow westward for about 100 iiles, before breaking through the Cascade range. This area is the portion of the United States of which we have the least topographical knowledge, and therefore only its more striking features can be indicated. The north- westerly trend of the northern division of the Rocky Mountains reduces the width of the Cordilleran system as we go north, since the Cascade range remains unchanged in its direction from the southern line of Oregon to the northern boundary of the country. The area between the two systems is more or less completely filled with mountains of which little is definitely known. Of these there are two principal groups, the Blue and Salmon River ranges, of which the former lies in the angle made by the Snake in its north- erly course before reaching the Columbia, while the latter forms an

intricate mass, extending from the westernmost ridge of the Rocky Mountain system westward towards the Snake.

The Columbia river riscs only 100 miles north of the boundary Columb; line, but runs nearly 200 miles farther in a north-westerly direction river . before turning to go south again in a course nearly parallel to that it had

before. The Okanagan joins it about 70 miles south of the boundary line and from here the course of the Columbia ig southerly, parallel with the Cascade range for about 160 iniles to the Great Bend, when the river takes a nearly westerly direc. tion, which it keeps until, after having passed through the range it reaches the Pacific. All the region lying north and west of the river and between that and the Cascade range is mountainous, ‘ The topography is very irregular, but there is a general tendeney to a north and south trend, which is still more marked in the region between the Columbia and Clarke’s Fork. Here the ranges on each side of the north-flowing Colville rise to from 5000 to 7000 feet in height.

South of the Columbia is a vast area, extending to the edge of The the Great Basin, and enclosed between the Rocky and Cascade Voleanic Mountains, of which the main feature is that a very large portion platean is deeply covered by volcanic formations, which here extend over a larger continuous area than anywhere else in the world, with the possible exception of the Deccan in India. This volcanic plateau- like region extends northward into British Columbia and south to near the line of the Central Pacifie Railroad in Nevada, from which its dark and frowning walls are visible; it extends up Snake river valley to the base of the Rocky Mountains, and south-west, through California, into the valley of the Sacramento. Along the Columbia river it unites with the great voleanic mass on which Hood, Adams, and St Helens are built up, and still farther north it merges in the eruptive accumulations which reach their greatest elevation and grandeur in Mount Rainier. These lava masses lie in nearly horizontal beds of varying thickness, interesting in their geological relations, but extremely monotonous from the scenographic point of view. They are often cut deeply into by the streams which in some places have sunk their beds below the general level of the country to the depth of more than 500 fect. ‘These are not infre- quently precipitated over the edges of the volcanic masses in cataracts, which sometimes are extremely picturesque. ‘The falls of the Pelouse river are striking, but those of the Snake river known as the Shoshone Falls are by far the finest, and among the waterfalls of the United States perhaps come next to Niagara in grandeur. On the volcanic plateau are occasional cones, occurring singly or in groups, but much the larger portion of the overflows seem to have taken place in the form of massive eruptions, by which wide areas were covered very uniformly with lava, and

on these nearly horizontal masses the cones have been built up during the dying out of the eruptive agencies. ‘he volcanic rocks cover an area, about the Columbia and its branches, east of the Cascade range, which may be safely estimated at fully 100,000 square miles,—perhaps at considerably more. A large portion of this area was once occupied by bodies of fresh water, the deposits from which, in the form of sands and clays, have been exposed by erosion in various places, and are found to be rich in remains of land and aquatic animals, mostly of late Tertiary age. A considerable number of lakes still oceupy portions of the surface, and an exten- sive group of these, some of which are of large size, although shal- low, occupies a corner of Oregon, and an adjacent part of California, east of the Cascade range. Much of the surfaee is dry and barren.

The valleys along the river courses are in many places well adapted for cultivation; but these fertile arcas are of comparatively small extent. The mountain ranges around the bases and over the lower portions of which the volcanic materials have been deposited appear to resemble, lithologically and geologically, the rocks of the Sierra Nevada. In the Owyhee Mountains there is a central core of granite, on whieh rest metamorphic slates and sandstones, forming a belt 20 miles wide on the south-western side of the range, and half as much on the other side. In the granitic axis are numerous veins of quartz, carrying free gold and ores of silver, With the exception of occasional hot springs, volcanic activity seems to be extinct, or at least to have been for some time dormaut. There seems to have been, about the close of the Tertiary epoch, a period of extraordinary volcanic activity throughout the Sierra Nevada and Cascade ranges, and over a vast extent of country to the east, It docs not appear, however, that there has been during the post- Tertiary times any eruption of fluid lava which would harden into solid rock on cooling. : ong

IV. Enclosed between the ranges of the Rocky Mountains on the e : . east and the Sierra Nevada on the west there are—as has been seell p — numerons high plateau-like districts, the beds of old fre region. lakes, some of which were of large dimensions. The strata deposite at the bottom of these lakes have been cut into by erosive agencies numerous places, so that the geological structure stands fully Te- vealed, while the wealth of organic

remains which they eoutain has niade these old lake-beds wonderfully attractive to paleontologists.

The drainage, desiccation, and subsequent erosion of these areas have giveu rise to a remarkable type of scenery, to which the name

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Mauvaises Terres was applied by the fur-hunters. These Bad Lands, which lie south and south-west of the Missouri and along its tributaries coming in from that direction, may be considered as the precursors and representatives of lands which, from the agricultural and business point of view, are bad enough, but which to the geologist and lover of the picturesque are in the highest degree good, and which are perhaps, on the whole, more striking than anything which the continent elsewhere exhibits. The essential features of their unique and striking type of scenery (of which the Grand Cafion of the Colorado is the grandest and most complete example) are these :—a heavy mass of stratified materials, several thousand feet in thickness, and covering many thousand square miles, has been cut into and eroded away, SO as to give rise to a labyrinthine series of gorges, or ‘ cations,” having a depth of from 1000 to 5000 feet, the walls of which are almost always extremely precipitous and in places perpendicular, and are by no ineans flat surfaces, but are worn and sculptured into forms almost always peculiar and striking, and often fantastic in the highest degree, And to a variety and complexity of form which seem to find a parallel nowhere on the earth is added the attraction of colour, the various groups of strata forming the cation walls presenting a gay adornment of tints of red, yellow, purple, brown, and grey, the depth and brilliancy of which surpass belief.

The region in which these wonderfully picturesque forms of landscape occur lies to the south and east of the Great Basin, between Great Salt Lake and the Colorado, to the west of the Green river branch of that river, extending west, with a gradual dis- appewance of its characteristic features, to near the border line of California. The Uintah Mountains may with convenience, although somewhat arbitrarily, be taken as the northern limit But, in point of fact, the characteristic type of scenery begins to be developed in Colorado, where the Book or Roan plateau, which rises to a height of 9000 feet, is deeply cut into by the White river in the north and the Grand river in the south.

The south-westernmost portion of the region, or that portion which includes the Grand Cafion and its branches, has a length from north-east to south-west of about 180 miles and a breadth in the opposite direction of about 125 miles. On the west it has as its boundary a grand escarpment which marks the change from ‘‘the calm repose of the strata with horizontal surfaces to the turmoil of flexed beds and jagged mountain crests” exhibited in the Sicrra and the adjacent ranges on the south-east, in the deserts of southern California. The transition from one type of geological structure to the other on that side is said to be so abrupt that one “might almost hurl a stone from one region to the other.” On the north the Grand Cafion receives the drainage of fonr distinct plateaus, the Sheavwits, Uinkaret, Kanab, and Kaibab, east of which lies a fifth (the Paria), which drains into Marble Cafion,—the prelude to the Grand Cation. ‘The Paria plateau differs from the others in that it lies at a lower level and is covered mainly by Triassic rocks, while the others present an almost unbroken expanse of Carbonifcrous strata. The southern boundary of the Grand Cafion district is a continuation of the western. The same great escarpment which overlooks the Sierra to the west stretches southward across the Colorado, preserving the same features for 80 or 40 miles. Slowly changing its course, it follows a south-eastcrly course through eastern Arizona, where its edge is known as the Mogollon Mountains. Passing this line to the south-west, the country descends at once from the horizontal platform into a lower country having apparently similar geological features to those presented in the Sierra country to the west. The following are some of the more interesting facts connected with the form and structure of the plateaus making up the Grand Cafion district on the north of the Colorado. The Sheavwits has on its

western side the so-called ‘‘ Great Wash,” a broad and deep valley to the north of the Colorado, The great escarpment of this plateau) isa fault or break, along the course of which the country to the | east has been raised several thousand feet. The Uinkaret plateau, which adjoins the Sheavwits on the east, is separated from it geo- logically by another great fault, the Hurricane Ledge, which marks | arise of the region to the east to the amount of 1600 or 1800 Teer, and which is prolonged far to the north. On this plateau are humerous cones and fiows of basaltic lava, some of which appear to be of very recent origin. Under some of these are beds of Permian age, lying over the Carboniferous, and preserved from crosion by the harder eruptive material with which they are capped. Another short fault separates the Uinkaret from the Kanab plateau on the east. The Kanab is the broadest of the four plateaus, and has a | grand side cafion cutting deeply into it, and running to the Color-) ado. The Kaibab plateau comes next on the east. Flat on the summit, and terminated by lofty battlements upon its eastern and Western sides, this is much higher than the other plateaus to the west, being from 7500 to 9300 feet above the sea-level. Its surface) is covered in part with forests, grassy parks intervening which in summer are gay with flowers of rare beauty and luxuriance. The | total length of this plateau is about 90 miles, and its maximum Width about 35. It is a block of ground raised by displacement

FEATURES. |

a labyrinth of cafions;”

great masses of strata by faulting.

STATES

between two great faults, tude is the Paria plateau,

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Farther east and at a much lower alti- “‘a terrace of Triassic strata scored with i d ‘ and farther north-east, again, is the Kaiparowits, which is nearly equal to the Kaibab both in size and

altitude; this is composed of strata of Lower and Middle Cretaceous age.

Still farther north is a succession of plateans, separated from each other by lines of dislocation, which, however, gradually close and become less conspicuous in this direction, the topographical features of the region being dependent chiefly for their existence on simple erosion, with the frequent occurrence of curious volcanic formations, and not so much on bodily uplift and depression of On the southern side of the Colorado is another vast expanse of plateau land, underlain by nearly horizontal strata, which, with one unimportant exception, are not deeply scored with cafons as is the region to the north, “ Low mesas, gently rolling, and usually clad with an ample growth of pine, pifion, and cedar, broad and shallow valleys, yellow with

sand or grey with sage, repeat themselves over the entire areca.

The altitude is greater than that of the platcaus north of the Colorado, except the Kaibab, being on an average not far from 7000 to 7500 feet. From such commanding points as give an

overlook of this region one lonely butte is always visible, and even conspicuous, miles south of the Kaibab division of the Grand Cafion, and is named the Red Butte.

by reason of its isolation. It stands about 20

It consists of Permian strata lying like a cameo upon the general platform of Carboniferous beds. The

nearest remnant of similar beds is many miles away. The butte

Owes its preservation to a mantle of basalt which came to the surface near the centre of its summit, . . . Fifty or sixty miles south of the river rise the San Francisco Mountains. They are all

volcanoes, and four of them are of large dimensions ; the largest—

San Francisco Mountain, nearly 13,000 feet high—might be classed among the largest volcanic piles of the west. Around these four masses are scattered many cones, and the lavas which emanate from them have sheeted over a large area." The length of the Grand Cafion of the Colorado, following the meanderings of the river along the middle of its water-surface, is about 220 miles, Where the cajion is narrowest it is five miles across from the edge of one wall to the edge of the other. The general depth is 2000 feet ; but in the centre is a portion 3000 feet deeper, having a width about eqnal to its depth. The Kaibab division, or that part which has the plateau of that name on the north, is the most stupendous portion of the Cafion, a thousand fect deeper than any other, and far more diversified and complex in its structure.

The peculiar interest of the topography of this region is due in part to the manner in which great blocks of strata have been raised or depressed between long faults, which have given rise to differences of level amounting to thousands of feet, and in part to the extraordinary amount of erosion which the region has undergone, first over its whole surface where not protected by overlying masses of harder volcanic material, and, later, in the channels of the streams, which channels have been gradually grow- ing narrower with the lapse of time, the streams diminishing in volume, until during the present epoch they have either shrunk to nothing or have become absolntely insignificant in comparison with what they were in later Tertiary times. In fact, we have in this region the best possible illustration of the progress and effect of that stupendous desiccation of the climate which has long been manifesting itself all over the world, and of which the results may easily be traced far back in geological history. The eontrast between the plateau region south and south-east of the Great Basin and that lying to the north—between the region of the Colorado and that of the Columbia—is a most striking one. In the north the volcanic outflows have filled the depressions in the corrugated and folded strata, covering over the whole of the lower portions of the region, from which the older mountain ranges project like islands from the great congealed sea of lava. The rivers could not subsequently cnt very deep into these overflows, because the material is so hard and the general level of the region solow. In the Colorado region, on the other hand, the strata have not been crumpled, folded, and metamorphosed, but raised en masse to a high elevation, and not hardened

so as effectually to resist erosion ; and, possessing just enough variety of lithological character to prevent uniformity of wearing away and give complexity to the resulting forms, they have, under the simple influence of eroding agencies, assumed the wonderful condition in which we now behold them. Here, too, volcanic agencies have been active; but the molten material has been poured out from orifices at a great elevation, and has built up cones, some of which are of nearly as grand dimensions as the mightiest of the Sierra Nevada and Cascade range ; but the valleys and lower regions have not been filled up by them, nor have there been in the southern plateau region any such enormous overflows as those which characterize the northern volcanic district.

V. The Sierra Nevada may without hesitation be called the most Sierra important and interesting member of the Cordilleran system, not Nevada. only as a long and elevated mountain chain,—on the whole the

most conspicuous within the limits of the United States, —but also for its minerals, its climate, its peculiar geological features, its remarkable forests, its scencry, and the eomparative density of the population along its western flank. Its importance and interest are still farther enhanced if (as on the whole seems a reasonable thing to do) we consider the Cascade range as being a continuation. The Sierra Nevada proper forms the western edge of the widest and highest portion of the Cordilleras, or that portion which lies east of the State of California. It is especially conspicuous from the western side, because on this side it falls nearly to the level of the sea, while on the other side it sinks only to the general plateau level. It does not, however, border the Pacifie directly, since there is, all along its course, a lower system of mountains, rising directly froin the coast—the so-called Coast ranges. With these the Sierra Nevada and the Cascade range are so inosculated in ccrtain portions of their extent that a topographical separation of them is impossible, but for a considerable distance both the Sierra and the Cascade range are distinctly separated from the Coast ranges by broad low valleys, the most extensive of these being the Great Valley of California (for which, as well as for the more important features of the Californian Sierra, the reader is referred to Ency. Brit., vol. iv. pp. 696-8), The Sierra

Nevada has been already shown to be made up of acore of eruptive granite flanked by rocks of Mesozoic age; the development of these Mesozoic rocks increases towards the north, and in the region lying along the western declivity of the chain, in the central portions of the State, forms the auriferous belt of the Sierra. The gold-produeing detrital deposits, formerly so extensively worked, are gravels of Tertiary age covered more or less completely by volcanic materials, which not nnfrequently attain a thickness of several hundred feet. As in other portions of the Cordilleran region, the presence of eruptive rocks of Tertiary and post-Tertiary age is a fact of great importance. ‘The volcanic materials in question are seen in places in large masses on almost the very highest portion of the Sierra, in its southern extension, in a region where there is very little of this material lower down on the flanks of the range, and where there are no slates and no mining or washing for gold of any importance. Just south of the Mount Whitney group, where the Sierra rapidly falls off in height between the two ranges of which the system is here comprised, there is a region—the valley of the Kern river—in which occur several volcanic cones, which have a very recent look, but which are not known to have been in eruption since the advent of the whites. This region, however, for several years in succession — from 1870 onwards, and perhaps from an earlier date—appears, on good evidence, to have been repeatedly and violently disturbed by earthquakes ; and this seems also to have been the portion of the Sierra which was most affected by the great earthquake of March 26, 1872. Midway in Owen’s Valley, on the east side of the Sierra, beginning about 380 miles north of Lone Pine, where this earth- quake was most disastrous in its effects, there is a region of volcanic cones and lava-flows, by which the river is crowded over against the Inyo range, at the foot of which it has only just room to flow. These cones are seemingly as perfect as they ever were; and the flows of basalt have spread themselves out over the sage-brush slope in a manner indicative of a very recent date for their out- breaking. Yet all seem now to be entirely dormant. Even solfataric action is almost (if not quite) exclusively manifested at the present time at or near the summits of the highest volcanic cones of the Sierra and the Cascade range. Farther north more and more volcanic materials cover the western flank of the range; and from abont 39° 30’ N. lat. much the larger portion of the older rocks is overlain and concealed by modern eruptive materials, through which the streams have worn channels, often of great depth, from the sides of which

access is given to the auriferous gravels occupying the bottoms of the channels of the old Tertiary but now buried river-systems. In Lassen's Peak, in 40° 30' N. lat., we have the first exhibition of the isolated volcanie cone rising high above the adjacent country, which makes so prominent a feature of the range farther north in California and through Oregon and Washington Territory. This volcanic mass is 10,537 feet in height, and there are abundant signs of recent volcanic activity on and near it. There are, in this vieinity, several localities where hot springs occur, and where the rock has been so softened by solfataric action as to have given rise to mud lakes, in which jets of hot water and mud are sometimes thrown to a height of scveral feet. One of these places, about 8 miles from the summit of the peak, is 5976 feet above the sea, and there is here a pool of hot water 600 feet long by 800 broad, in the midst of which miniature mud volcanoes are being constantly formed. There are no such striking indica- tions of dormant volcanic activity as are seen in the vicinity of Lassen's Peak anywhere to the southward along the crest and flanks of the Sierra. Neither is it known that there has been anything which could be properly called an eruption, whether of lava or ashes, since the region was first visited by the whites, either from Lassen's Peak or from the much grander volcano to which the name of Shasta is given. At Lassen's Peak a great change takes place in the character of the range, which is here broken through

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transverscly by a great fault, to the south of which we have the high ranges and deep cafions often cut down through the volcanic strata, and sunk deeply into the underlying metamorphic rocks while to the north is a great depression, comparatively level, and exclusively oceupicd by volcanic rocks, which stretch off to the north and north-east, in almost unbroken continuance, for many hundred miles, forming a portion of the northern plateau region already described. Seventy miles north-west of Lassen's Peak rises Mount Shasta (14,440 feet), standing in remarkable isolation on a base between 10,000 and 11,000 feet lower than its summit. There are indications of former volcanic activity near the summit, but they are not so marked as those on and near Lassen's Peak. There is a flat area about 400 feet below the summit, on one side of which are several orifices from which

steam and sulphurous gases were constantly escaping at the time of the present writer’s ascent of the mountain (1862).

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North of Mount Shasta the mountain mass now called the Cascade

Cascade range maintains characters similar to those which it has between Lassen’s Peak and Shasta for a distance of fully 500 miles, or until we have passed the northern boundary of the United States. The principal continuous ridge is comparatively low, and on it at irregular intervals rise great volcanic cones, differing con- sidcrably from each other in elevation, but all mueh higher than the surrounding plateau-like base on which they are built up. Unfortunately no portion of the Cascade range has as yet been topographically surveyed. From Mount Shasta northwards there are several prominent peaks, which are apparently volcanic, but which have not the conical form, while others exhibit this peculiar feature in a high degree of perfection. Mount Pitt (9718 fect) is a well-defined cone, about 75 miles north of Shasta. Mount Jefferson, about 150 miles still farther north, is of a similar character; and betwcen Pitt and Jefferson are various prominent peaks, especially the highly picturesque group of five sharp points, known as the Three Sisters, only three of them being visible from the Willamette Valley. All through this portion of the range evidences of comparatively recent volcanic action are present, in the form of regular craters and outflows of lava. Somewhat less than 100 miles north of Mount Jefferson is the grand break made in the Cascade range by the Columbia river, whieh has cut entirely through the volcanic mass, down almost to the level of the sea,— the Dalles, on the eastern side of the range, having an elevation of only about 100 feet. At the Dalles—so named on account of the great, broad, flat plates or sheets of lava which are there well exhibited on and near the river—is the beginning, in this direction, of the volcanic plateau of the Columbia, Near this point rise three of the best-defined volcanic cones of the range, two—Mount Adams and Mount St Helens—on the north side of the river, and one— Mount Hood—on the south. The last-named has been found by barometric measurement to be 11,225 feet; the other two seem to be of nearly equal height (about 10,500 feet). Mount Rainier (14,444 feet)—about 75 miles north of the Columbia river—is rivalled in

the whole of the Cascade range by Shasta only. The views of Rainier from Puget Sound are magnificent. It is much less accessible than Shasta, as it lies in the midst of a dense forest, far from roads; it is also very much more deeply covered with snow and ice. Still farther north than Rainier, and near the boundary line of the United States, is Mount Baker (10,755 fect), a prominent object in the grand panoramic view from Victona, Vancouver Island. While evidences of comparatively recent vol- canic action are so conspicuous all along the range from Lassen's Pcak north to Mount Baker, it is not easy to reconcile the con- flicting evidence with regard to the present condition of the eruptive agencies. 'The present writer, during several years of exploration, found no evidence whatever of any recent outflow of melted lava, such as would harden into a solid rock on cooling, in any part of the Sierra Nevada or the Cascade range. The eruptive rocks of these ranges are mainly andesites; but the last outflow of molten rock appears to have been basaltic m character. This is certainly true for the Sierra Nevada, and prob- ably so for the Cascade range. Under the basalt we find, in the buried sedimentary strata, abundant remains of vegetation, Pro- nounced by competent authority to be Pliocene in age, witha few species intermingled which have a decidedly Miocene character. The animal remains fonnd under the basaltic lava are all of extinct species, with the single exception of man, whose bones or handi- work have been repeatedly taken from strata occupymg this geological position. The age of the sedimentary beds under the basalt is therefore Tertiary, from the combined evidence of both plants and animals. There is no evidence that fragmental lava— ashes, cinders, and the like—has been emitted from any one 0 the voleanic cones of the Sierra Nevada since the region became known to the whites; but there is abundant evidence to this effect 4 regard to some of the high points in the Cascade range. hee Baker seems to have furnished the most unquestionable proof 0 activity in recent times. The first known eruption of this ve appears to have taken place in 1843. In at least thi instances Mount Baker has been seen in eruption by men 0 ius

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‘ questionable authority,—in 1854, 1858, and 1870. Smoke and steam are said to have been frequently seen rising from the summit of St Helens. It is not easy to reconcile the statements which have been made in regard to the activity of Mount Hood. Eruptions of this mountain have been reported as having taken place; but the present writer in 1867 made inquiries of persons having it in full view, without being able to procure satisfactory evidence of any activity similar to that of Baker and St Helens, at least within the preceding twenty or thirty years. There is no evidence of any similar activity of Mount Rainier; but, according to Stevens and Van Trump, who were the first to reach the summit of this mighty cone, jets of steam issue from the crater at the summit in sufficient quantity to keep a party warm.

VI. To the west of the Sierra Nevada and the Cascade range is another chain of mountains, which, although greatly inferior to these in some important respects, is still of very considerable interest—the Coast ranges of California and Oregon. They differ in being newer geologically, of less elevation, less extensively and regularly broken through by granitic axial masses, and less covered by voleanie overflows. The upheaval of the Sierra took place at the close of the Jurassic epoch, whereas that of the Coast ranges was the result of agencies operating during the later portion of the Tertiary, and continuing down to a very reeent date—namely, into the post-Pliocene. The greater part of these ranges south of the Bay of San Franciseo is of Miocene age, although even there extensive areas of Cretaceous rocks exist, and especially on the eastern side of this mountain belt, in the so-called Monte Diablo range. Farther north, beyond the bay, rocks of this age become more and more predominant, the areas of Tertiary being comparatively narrow and unimportant. A remarkable feature of

the geology of the Coast ranges is the extent to whieh these

newer formations have been metamorphosed, so that by some observers these altered rocks have been described as belonging to the very oldest part of the geological series, The prevalence of serpentines and obscure serpentinoid rocks in great masses in these altered portions is also a faet of much geologieal interest. These altered rocks, and especially such of them as have becn more or less silicified, are the home of the ore of quicksilver, mines of which

Metal have been opened and extensively worked at numerous

points both sonth and north of the Bay of San Francisco, Chromic

iron is also associated with these magnesian rocks, and ata few points is present in considerable quantity. Gold has been washed at humerous points in southern California, with some success,

_ An important member of the Miocene series south of the Bay of

San Francisco is the bituminous slate, which in plaecs is several

| thonsand feet in thickness, and often contains a large quantity

| of bituminous matter, which, at some localities, especially near

Santa Barbara and Los Angeles, has oozed out upon the surfaec and

given rise to areas of semi-liquid material, called ‘brea ” by the

Mexican Spanish, which has oceasionally hardened and formed

large deposits of asphalt. Many attempts have been made to bore

into these bituminous rocks for petroleum, but these efforts have | never been successful enough to furnish even the home market with

a supply of oil suitable for illuminating purposes. Coal is found

at numerous points in the Coast ranges, both in California and in

) Oregon, and of both Crctaccous and Mioeene age. The most im-

jPortant imines are those in Washington Territory, near Seattle :

jand there is also a valuable and quite extensive coal-field on Van- jcouver Island, near Nanaimo, also in the Cretaccous. The most important and best-developed portion of the Coast ranges is that

} opposite or to the west of the valleys of the San Joaquin and Sacra-

mento rivers. Both south and north of the extremities of these

valleys the masses of the Coast and Sierra mountains coalesce, or be- jcome topographically so united that any distinction other than geo- jlogical is impossible. This uniting of the two ranges whieh takes | place in northern California is continued through southern Oregon,

where the topography is quite as complicated and difficult as in | those parts of California where the two ranges come together.

‘But in the last-named State the structure of the Coast ranges has

been pretty well worked out by the California State Geological

Survey, although the maps unfortunately remain unpublished,

while in Oregon almost nothing has been done in this direction.

Where best developed—in California—the Coast ranges have a

jlength of fully 400 miles, anda breadth varying from 40 to 70

according to the varying position of the coast-line. The mass of

mountains covering this area is made up of numerous subranges, some of which are very distinct and well-marked, while others are much less so. These all along the north-west and south-east

trending portion of the coast, or from Point Conception (34° 15’

‘N. lat.) to Cape Mendocino, run nearly in the same direction as

that coast. Their altitude above the intervening valley, in the

Wicinity of the Bay of San Francisco, varies from a few hundred

‘to 3000 or 4000 feet. Prominent points near that bay are Monte

Diablo (3856 feet), Mount Hamilton (4440), Mount Helena (43438),

and Mount Bache (3790). As we go north and south from the region

of the Bay of San Francisco, we find the heights of the dominating peaks increasing. Mount Balley, about 150 miles north of San

Francisco, has an elevation of 6357 feet. About the same distance south of that city is San Carlos Peak (nearly 5000 feet). Portions of the range south of the Bay of San Francisco are of extremely recent date, as great masses of rock of Pliocene age, hundreds of feet in thickness, are seen to be turned up atahigh angle. The ranges along that portion of the coast whieh has an east and west trend, on Santa Barbara Channel, have themselves the same trend, and are high and precipitous. Of these the Santa Ifiez is the most conspicuous, having along its crest points nearly or quite 4000 feet high. The Santa Monica, another east and west trending range, farther cast and south, is remarkable as being made up of Miocene stratified rock, and having a ecntral well-defined linear axial mass of intrusive granite, driven through it like a wedge, by which the range has been raised toa high angle near the eruptive rock, where it 1s extensively shattered and metamorphosed, and from which, in each direction transverse to the chain, it gradually and rapidly recovers its normal character and nearly horizontal position. Farther south along the coast the ranges are much broken, and central dominating points rise to very considerable elevations. The San Bernardino and San Jacinto Mountains are two of these elevated central masses, each rising to about 11,000 feet. The precise relations of these high masses to the Coast ranges and Sierra cannot as yet be stated. The region of the Coast ranges in California 1s one of very unequal attractiveness. Portions are rough and for- bidding, being covered by a dense thorny undergrowth, locally known as ‘chaparral ” ; other portions are in the highest degree fertile and picturesque, and have a remarkably mild and uniform climate. The slopes and hills near the coast, or open to the west

winds, have a fairly sufficient rainfall. The interior ranges, especially the portions of them west of the San Joaquin valley,

are very dry, and over large areas so much go as to be unfit for cultivation.

Geology of the Mississippi Valley.

The area enclosed between the Appalachians and the Cordilleras, extending to upwards of 1,500,000 square miles, the drainage basin of the Great Lakes and St Lawrence on the north and of the grand Missouri-Mississippi river-system on the south, cannot here be discussed in detail from the topographical point of view. The gencral features do not present the diversity seen in the regions already considered. All that can be done here is to indicate the salient points of the geology.

The belt of Tertiary and Cretaceous rocks already mentioned ag forming the Atlantic slope extends, with very similar characters, curving broadly around the southern end of the Appalachians, and continuing along the Gulf and up the Mississippi valley, to about the junction of that river with the Ohio. About half of Alabama and Arkansas, all Mississippi and Louisiana, parts of Tennessee aud Kentueky, and a very small corner of Missouri are underlain by these newer formations. Nearly the whole of Texas is similarly situated with respect to its geology. In the northern central por- tion of the last-mentioned State the marly and gypsiferous red sandstones of Triassic age cover a large area, bordered on the south- east by a little-known coal-field, of Carboniferous age, with a very small pateh of Azoie or Archean rocks at its southern termination, almost exactly in the centre of the State. Tracing the geological formations northward from Texas into New Mexico and along the eastern flank of the Rocky Mountains, we find the belt of Cretaceous and Tertiary covering a very large area, extending as far east from the mountains as the eentre of Kansas, and covering nearly all Nebraska and Dakota, the north-western corner of Towa, and the western half of Minnesota. The Triassic belt mentioncd as ocenr- ring in Texas occupies a broad area in the Indian Territory and the southern eentral part of Kansas. It is also quite extensively ex- posed along the streams of New Mexico, forming the border of the Llano Estacado or Staked Plain. The Cretaceous and Tertiary rocks of the west have nowhere anything like the economical importance which they have in New Jersey; but from a

paleonto- logical point of view they are of interest, and, especially in the lower Mississippi valley, have been studied with care and in con- siderable detail by the State geologists. Included within this border of more recent rocks, and comprising the whole of the North- Eastern Central group of States (see below), as well as the western portion of the North-Western Central, and smaller portions of the South-Eastern and South-Western Central groups, isa region under- lain almost exclusively by Paleozoie rocks, covered with post- Tertiary and recent detrital formations, the intermediate members of the geological series being entirely wanting. These Paleozoie strata include very extensive and complete representations of both the Lower and Upper Silurian series, and also of the Carboniferous, including both the upper and lower members.of this division of tho Paleozoic. As we leave the Alleghany escarpment in going west- ward we find the disturbances of the strata becoming less and less marked, what flexures there are being exceedingly broad, so that over large areas the rocks seem to lie in an almost undisturbed horizontal position, The geographical distribution of the areas underlain by the Coal-measures in this region is indicated below

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(p. 812). Calcareous and calcareo-magnesian formations are espe- cially prominent over this great area of nearly undisturbed strata. As we proceed westwards from the Appalachian belt we find the purely detrital and siliceous rocks diminishing and the calcareous gaining in importance and thickness. Thus the millstone grit, which on its eastern edge is in places more than 1000 feet thick, is found in parts of the Mississippi valley to have diminished to a few feet, or even in places to have disappeared altogether. With this diminution of coarser detrital and siliceous material comes in a wealth of organic forms, and the rocks of the region in question have been most fruitful of material for the paleontologist. Towards the western and north-western portions of the Paleozoic area there oceur several marked breaks in the uniformity of the geological character of the region. These are due to the appearance at the sur- face of rocks older than the lowest Silurian

—rocks, indeed, which, up to the present time, in spite of forty ycars of diligent search, have not been found to exhibit any traces of life. For this reason these rocks, whieh unconformably underlie the Lower Silurian, and are in sucha position as to prove beyond a doubt that they assumed that position before the deposition of the lowcst known fossiliferous rocks, were called Azoic by Fostcr and Whitney, but are now more generally known as Archean, a name substituted by Dana. The Azoic areas of central Texas, northern Texas, and eentral Arkan- sas are comparatively small, and have been but little studied in detail, since, thus far, they have not been shown to be of much economical value. The Azoic area in south-eastern Missouri is also of small dimensions, but economically important, since iron ores, large in quantity and of great purity, occur here, at the well-known Iron Mountain, Pilot Knob, and other localities. Far more im- portant than those already mentioned, however, is the Azoic area of northern Wisconsin and north-western Minnesota, which is in direct counexion with the great Azoic district of so much import- ance in Canada as forming the mass of the Laurentian mountains, The region in Wisconsin forming the divide between the waters flowing into Lake Superior and those uniting with the Mississippi is one of Azoic rocks, and from this a long spur extends south-westerly through Minnesota and north-easterly to Lake Superior. It is in this region and in this formation that the iron mincs occur which are of so much importance to the country (see p. 814), the principal mines lying about 1500 feet above the sea or 900 feet above Lake Superior. To the north-west of this Azoic area, on the borders of the lake, is the very important copper region (p. 816). The coppcr-bearing range, which rises in places to an elevation of us much as 2000 feet above the sea-level, is made up of old volcanic masses interstratified with sandstones and conglomerates of Lower Silurian age. The so-called trappean range runs from the extremity of Keweenaw Point south-westerly along and near the shore of the lake, and finally disappears some distance beyond its western end ; but the portion of the range which is of importance for its copper mines is in Michigan and on or near Keweenaw Point. The detrital formations which cover most of the surface of the Paleozoic area, the boundaries of which have here been indicated, arc of varied eharacter. Over much of the country the principal detrital material present is that which has been left behind by the slow wasting away, under the influence of the rain and other atmospheric ageneies, of the calcareous rocks which there occur. This kind of material

forms the bulk of the soil in the higher portions of the region lying near the Ohio and its junction with the Mississippi, and north-west to Minnesota. The river-bottoms grow wider as we proceed in the direction of the drainage towards the Gulf of Mexico, but the thickuess of alluvial soil overlying the Tertiary and Cretaceous does not scem, in general, to be very great. The material liberated by the decomposition of the rock has been so fine that most of it has been easily carried away where the volume of water in the rivers was considerable. Coarser detritus occurs near the mountain ranges, especially those on the east, where strata made up in large part of pebbles or even boulders of quartzose or othcr indecomposable rocks form a considerable portion of the underlying formations. Animportant feature in the surface geology of the northern portion of the eentral area as well as of the extreme north-eastern portion of the United States, or that comprised within New England, New York, the northern part of Pennsylvania, and the region adjacent to and south of the Great Lakes, is the presence of a large amount of coarse detrital material in the form of boulders, gravcl, and sand, which has been, in large part, brought from the north, and which is mixed very unequally in different regions with the material resulting from the disaggregation, decomposition, and abrasion of the closely adjacent or underlying rocks. The origin and mode of distribution of this so-called “northern drift” has long been a fruitful subject of discussion among American geologists. By far the larger number of those who, in latcr years, have dis- cussed the problem have becn inclined to ascribe the origin of the drift almost entirely to glacial causes. It is assumed that the northern portion of the continent was, during the so-called “ glacial epoch,” covered deeply with ice, and that all, or nearly all, that we see at the present time upon the surface of the region thus covered is the result either of this icy envelope or of the floods

produced by its melting. The present writer believes the pheno. mena to be much more complicated and difficult of explanation than is generally supposed, but contents himself with simply stat. ing what is the current belief among American geologists.

POLITICAL AND NATURAL SUBDIVISIONS.

As politically organized at present the area included within the limits of the United States is divided into forty-nine subdivisions including Alaska. There are thirty-eight States, eight Territories, and three subdivisions, neither States nor Territories, cach of which stands in a peculiar relation to the general Government—namely the District of Columbia, the Indian Territory, and Alaska,

In the following table of the Statcs and Territories the names are followed by their customary abbreviations. The dates are those of admission into the Union as States; in thc case of the thirteen original States (printed in small capitals), they are the dates when those States ratified the constitution. The names of the Territories are printed in italics,

TABLE I,—

[PHYSICAL FEATURES,

| gS itori wa y 2 i) | 1 States and Territories. oe earns Junc 1, | June 1, so FRc kos} = é Gm | Bae Ae 1870, 1880. BR ess Alabama (Ala.).....s0+++./ 1819} 52,250] 996,992 | 1,262,505 | 266] 945 ANTZOU ON (AMT) «acco ce sseeseunees 113,020 9,658 40,440 | 318-7 04 Arkansas (APK.).....cc00 s0000 1836) 53,850) 484,471] 802,525] 65°6) 151 Califounial(Cal.)...0.s00ccers. 1850} 158,360 560,247 864,694) 54°38) 55 Colonadol(Cols instr 1875| 103,925! 89,864] 194,327) 387‘4| 149 Connecticut (Conn. or Ct.)| 1788 4,990 587,454 622,700] 15°8 | 1285 PD ANT AN OURNE Jononn: 887 compe. 149,100; 14,181] 185,177] 853°2] 09 DELAWARE (Del,),..... 000008 1787 2,050 125,015 146,608; 17:2) 748 District of Columbia (D.C.) 70 131,700 177,624 | 34-8)2960°4 Toone) (CES inpesnapeecbomnoceoe 1845] 58,680} 187,748 | 269,498] 43:5] 50 GEORGIA (Ga.) .vsseeeersseeeesee/ 1788] 59,475 | 1,184,109 | 1,542,180] 30°2| 261 BLUM OU CLO) seve siniicorernensantantente 84,800 14,999 32,610 | 117°4 04 DOV ccoptS) (AND) Ronenesageepeeanenon 1818 56,650 | 2,589,891 | 3,077,871] 21:1} 550 Indiana (Ind.)..... ...[1816| 86,350] 1,680,687 | 1,978,801! 17-7] 551 Indian Territory 64,690 a60 tae oe Pes Towa (Ia.).....+ 1846} 56,025 | 1,194,020 | 1,624,615 | 360] 293 Kansas (Kan.).... 1861 82,080 364,399 996,096 | 173‘3 | 12:2 Kentucky (Ky.)..... ‘1791| 40,400] 1,321,011 | 1,648,690] 24:8] 412 Louisiana (La.).....26. 1812) 48,720 726,915 939,946 | 29°3| 20:7 Maine (Me.)...cccessceeseeee)

1820) 38,040 626,915 648,986 | 3:5! 217 MARYLAND (M@,)..... ....., 1788] 12,210 780,894 934,943 | 19°7| 948 MaAssAcHousETTs (Mass.).....| 1788 8,315 | 1,457,351 | 1,783,085 | 22°83 | 2218 Michigan (Mich.).....«..|1887| 58,915 | 1,184,059 | 1,636,937! 38-2| 28% Minnesota (Minn.).....| 1858) 83,365 439,706 780,773 | 775| 98 Mississippi (Miss.)....., 1817} 46,810 827,922 | 1,131,597 | 36°6| 24-4 Missouri (Mo.)....0.s004- esee+-/ 1821} 69,415 | 1,721,295 | 2,168,380} 25°9| 815 Montana (MON.)...100.cceee0e 146,080] 20,595, 39,159 90-1) 03 Nebraska (Neb.) ....++...00+6++| 1867| 76,855 122,993 452,402 | 2678) a9 Nevada (NeV.)...-+.+ Gaowedeoc 1864} 110,700 42,491 62,266 | 46%5| 06 New HampsuireE (N. H.)....| 1788 9,305 318,300 346,991} 9°0| 385 NEW JERSEY (N. Jd.).-e0eese.|1787| 7,815 | 906,096 | 1,181,116 | 24-8 | 1517 New Mexico (N. M.).. 122,580 91,874 | 119,565| 301} 10 New York (N. Y.)....00 ..|1788} 49,170 | 4,882,759 | 5,082,871 | 15°9 | 1067 Nortu Carouina (N. C.)...1 1789} 52,250 | 1,071,361 | 1,899,750 , 80°6| 28°8 OHIGI.....006 ‘eeesss- (G9) MIGROBO 90,923 | 174,768| 92:2; 18 PENNSYLVANIA (Pa.)..+0+e+00ee|1787| 45,215 | 3,521,951 | 4,282,891 | 21:6) 952 Ruope Istanp (RK. I.).....] 1790 1,250| 217,353) 276,581| 27:2) 2649 Soutn Carouina (S. C.)...../1788} 80,570! 705,606} 995,577) 410] 330 Tennessee (TeENMN.).....01.000 1796| 42,050} 1,258,520 | 1,542,359) 22:5] 3860 TOX.”>MORASI -..~~esceerssesne ..| 1845} 265,780 818,579 | 1,591,749 | 94:4 61 (OaDE (AGES oecenooonce : 84,970} 86,786 | 143,968] 65:8) 17 Vermont (Vii)ussssecessseeees| 1791} 9,865] 330,551] 332,286] 0:5] 36:4 VIRGINUA (WiA.))0…~~—c0-ecccee 1788) 42,450] 1,225,163 | 1,512,565 | 28-4) 377 Washington (Wash.).....+. 69,180} 23,955} 75,116 | 2185) V4 West Virginia (W. Va.)..... 1862| 24,780] 442,014] 618,457} 39°90) 257 Wisconsin (Wi8.).....sseeeeees 1847| 56,040 | 1,054,670 | 1,815,497 | 24-7] 242 Wyoming (WY.).csseessscoees 97,890 9,118 20,789 | 127-9} 02 United States……..... 3,019,140 |38,558,371 |50,155,783 | 80°08 | 17°29 ALASKA. sceoersesccraensescecnsens 531,409 33,426

1 The total area (excluding Alaska) fs 3,025,600 square miles,—made up by the addition of unorganized territory (5740), Delaware Bay (620), and Raritan Bay, é&c. (100). The last column shows the population per square mile of the land surface, which amounts in all to 2,970,000 square miles.

As long as the population of the country was limited to the Atlantic and Gulf coasts there was no difficulty in classifying the divisions geographically; the Northern, Middle, Southern Atlantic, and Gulf States constituted a natural grouping. The almost wn- known and at that time not easily accessible region beyond them to the west was known as "'the West," and by this term unt more than a quarter of the present century had elapsed the valley of the Mississippi and its tributaries on the east was designated. It was not until about the middle of the century that a still farther " West" began to be taken into consideration.

Early in the history of the country the six north-eastern pees (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut) received the still current designation of England. And till after the Civil War there was the division 0 the States into Southern or Northern, according as slavery was oF was not permitted. e he

The suggestion was made by Mr Gannett, geographer 0 = census of 1880, ‘‘ to divide the country into three great divisions,

Plate xX. lo Temyra-

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the Atlantic region, the region of the Great Valley, and the Western or Cordilleran region.” The region of the Great Valley he calls the Central region, and this is again subdivided into two parts— the Northern Central and the Southern Central —by the Ohio river and the southern boundary of Missouri and Kansas. The Atlantic division is also subdivided, by a line following the south boundary of Pennsylvania and New Jersey, into the North Atlantic and South Atlantic divisions. The Western or Cordilleran division is limited on the east by the eastern boundaries of Montana, Wyoming, Colorado, and New Mexico. A farther subdivision will be found convenient at times, the Northern Central region being divided into two parts (the North-Eastern and the North-Western) by the

SUBDIVISIONS. |

STATES 803

Mississippi, and the Southern Central also into two parts (the South-Eastern and South-Western) by the same river. The Western or Cordilleran division may be naturally divided into the Roeky Mountain, the Plateau, and the Pacific Coast regions. Adopting the scheme thus suggested, we have the following grouping of all the States and Territories of the United States (Table IT.), the only differences between this scheme and that of Mr Gannett, besides those already indicated, being that the Atlantie States are divided into three subdivisions—the Northern, Middle, and Southern, —and that West Virginia is placed with the Central States because its drainage is

to the Ohio and in its physical characters it is allied to the North-Eastern Central group :1—

eee ae See

Area, Population. Division, Subdivision. States and Territories. Gross =i Land liom Area, $8 | Surface. | Number. 2 é Fie) E & Square | .& | Square we 1S 748 Miles. | 2% | Miles. oy |ag7 a : Northern Atlantic…... -.| New England States, New York, New Jersey, Pennsylvania, 168,765 5-6 162,065 | 14,507,407 | 28-9 89‘5 Atlantic…... Middle Atlantic…..... Delaware, Maryland, Virginia, District of Columbia…..... 57,400 19 52,005 2,771,740 Epis 53°3 Southern Atlantic…..... North Carolina, South Carolina, Georgia, Florida…....ce0e00. 200,975 6°6 191,970 4,207,000 84 21’°9 427,140 | 14:1 406,040 | 21,486,147 | 49-8 53°8 North-Eastern Central…) West Virginia, Ohio, Indiana, Illinois, Michigan, Wisconsin| 273,795 “) 269,195 | 11,825,125 | 93°5 43°9 enti North-Western Central…] Minnesota, Dakota, Iowa, Nebraska, Kansas, Missouri…... «| 616,840 | 1771 509,000 6,157,443 | 12°3 12°1 “’”””) | South-Eastern Central…) Kentucky, Tennessee, Alabama, DUISSISSID Dl sno sresvecnersoeaeeene 181,510 6 179,630 5,585,151 111 31:1 4 Es : Arkansas, Louisiana, Texas, Indian Territory (includin F . A Ey, South-Western Central { « unorganized ELMIROMVW es tavsevseseseeceeteccoecgeseacs i a8 re) | aes 480,585 8,412,362 o- oe 1,410,925 | 46°6 | 1,388,410 | 26,980,081 | 53-7 | 19-3 Rocky Mountain…..., Montana, Idaho, Wyoming, Colorado, New Mexico …..... 555,275 | 18:4 558,280 406,450 8 0-7 Cordilleran Plateau…... cnonenco6 core || WGA y NG@WAda WATIZONG ..1scercessscateesesccosssescessonscrres .| 308,690 | 10:2 304,850 246,669 oh) 0°8 Pacific Coast Washington Territory, Oregon, California…..... 323,570 | 10°7 317,420 | 1,114,578 2:2 3°5 1,187,585 | 39°3 | 1,175,550 1,767,697 85 15

CLIMATE.

From the Atlantic seaboard west to near the base of the Rocky Mountains the lines of equal mean temperature have a consider- able degree of regularity, running approximately east and west. When, on the other hand, we reach the borders of the Cordilleran region we find the isothermal lines suddenly deflected from their normal course, and in passing across the

mountain and plateau belt we find them irregular, often concentric over large areas and through great ranges of temperature, according as the altitude, width, and general trend of each separate range or system of ranges make their influence felt. Hence there are three distinct climatic divisions of the United States:—(1) the eastern region, from the Atlantic to the foot of the high plateaus at the base of the Roeky Mountains; (2) the plateau and mountain region of the Cordilleras; (3) a narrow strip on the Pacific coast, lying west of the Sierra Nevada and the Cascade range. These three divisions are of very unequal size and importanee. The first embraces about three-fifths of the entire country, and contains fully nineteen- twentieths of its population ; the second is also much larger than the third, containing not much less than a million square miles, but is very sparsely peopled. The third is more densely peopled than the second, but small in area, although its limits are not capable of being accurately defined. These three divisions will here be designated the Eastern, Cordilleran, and Pacific.

In the Eastern division the passage from one type of climate to another is gradual and uniform, though rapid. The difference in climate between the eastern and western coast of the Atlantic was long ago noticed and commented on. It was George Forster who first controverted the prevailing idea that the New World in general was colder than the Old, and recognized the analogy between the climates of the eastern coasts of the Atlantic and Pacific. Humboldt afterwards investigated the facts and pub- lished a tabular statement, which, as enlarged by Hann, is here presented (Table IIT.) :—

Mean Temperature of the A er ee enCes Latitude. Sronp Coldest |Warmest| Year. eat. | Month. | Month, Nain, Labrador……. 57 12 25°16 3°82 51°08 21° Aberdeen, Scotland…..... 57 12 46°76 37°22 57°74 . St John’s, Newfoundland…) 47 36 40°10 22°46 59°54 1355 Brest, France…....0.6.+. 48 24 53°60 | 42°44 64°76 Halifax, Nova Sco 44 42 43°34 22°64 64°40 7 BOTA CHIUX.....0…. 44 48 55°04 42°44 69°08 New York.. 40 42 51:08 | 28°94 75°56 10°6 Naples…..... 40 48 61°70 48°20 17-18 Norfolk, Virg 30 36 50 59°18 | 40°28 78°62 } 4-3 San Fernando, § 36 30 63°50 | 52°70 76°10

eoeeee ! |

From the above table it will be seen that the difference between the mean annual temperaturo of places in high latitudes on the opposite sides of the Atlantic is very large; and that it diminishes

as we go south. About lat. 30° the two sides of the Atlantic have nearly the same mean temperature, the difference in climate being very great, but chiefly dependent on differences in the amount of precipitation. Nearly the whole area of the United States is in- cluded between the annual isothermals of 44° and 68°—a difference of 24°, the corresponding difference of latitude being about 15°. The average change of temperature is, therefore, 1°°6 for each degree of latitude,—the most rapid change of temperature with the latitude known in any region of anything like cqual extent. The causes of the rapid increase of temperature in going south along the Atlantie seaboard are the position of the Gulf of Mexico, the high temperature of its waters, and the increasing predominanee of south-westerly winds. From these eircumstanees the southern portion of the Atlantic coast of the United States is decidedly warmer than the regions corresponding to it in latitude on the west side of the Pacific, while farther north places in the same latitude on the west sides of the two oceans have approximately the same temperature. This similarity of temperature on the corre- sponding sides of the Atlantic and Pacific is the result of causes now easily understood, the chief being the position of the mass of the land with reference to the dircetion of the prevailing winds. From the Atlantic coast to the eastern base of the Cordilleras the isothermal curves for the year are nearly parallel, and have a general east and west course, being only interrupted in this regularity and deflected to a certain moderate extent in passing across the Appalachian chain, which nowhere rises high enough to give a ehanee for permanent accumulation of snow. These curves, of course, are roughly parallel to the coast-line of the Gulf of Mexico, which over a breadth of fourteen degrees of longitude does not vary much from an east and west direction. The region over which a higher mean annual temperature than 68° F. prevails includes nearly the whole of Florida and _a narrow strip along the Gulf, which widens rapidly in Texas, where the trend of the coast-line suddenly becomes nearly north and south. The extreme south end of Florida, which just touches 35°, has a mean temperature of over 72°, the isothermal of 76° being nearly on that parallel. The isothermal of 64°, which meets the Atlantic eoast near the borders of North and South

Carolina, keeps nearly on the parallel of 34° as far west as about 100° W. long., where it is rapidly deflected southward, in con- formity with the direction of the other isothermals, by the gradually inereasing elevation of the country when the plateau region is en- countered. The isothermal of 60° is nearly parallel to that of 64°, except that it manifests the influence of the high southern extremity of the Appalachians, and is in consequence considerably deflected to the south between the meridians of 83° and 87°. The

1 The name Cordilleran is preferred for the Western division, because thereby any confusion is avoided which might arise from the fact that the people of the eastern States are still more or less inclined to call any portion of the region lying to their west by that name. No grouping in which all the States and Territories are included can be entirely satisfactory; but in that here suggested they are, while geographically connected, in most respects pretty closely allied to each other by their physical, climatic, and agricultural characters:

of the Cordil- Jeran

isothermal of 52° is, to the west of the Appalachians, nearly coincident in position with the Ohio river as far as Cincinnati, and thence follows an undulating course, with a nearly westerly general direction, through Indiana, Illinois, northern Missouri, and along the northern boundary of Kansas to the border of Colorado, where it is suddenly deflected and: runs with a nearly southerly course for a distance of fully 500 miles along the eastern base of the Rocky Mountains. Those portions of the country which lie between the isothermals of 44° and 52° are New England, with the exception of Maine and the northern part of New Hamp- shireand Vermont; New York, excluding the extreme north-eastern eorner (the Adirondack region); the Appalachian plateau region on the borders of New York and Pennsylvania; nearly all Ohio; two-thirds of Indiana and Illinois; nearly all Michigan and Iowa; southern Wisconsin; south-eastern Minnesota; nearly all Nebraska; and the southern half of Dakota. The isothermal of 40° passes through the centre of Maine, euts off the extreme northern end of New Hampshire and Vermont, then passes out of the United States, re-entering at

the west end of Lake Superior, passing through the centre of Minnesota, making a large loop to the south in eastern Dakota and then trending north-westwardly until it passes beyond the boundary line of the United States in 107° W. long,

Within the Cordilleran region, or west of the 105th meridian, the position of the isothermals is largely dependent on that of the mountain ranges, which rise high enough profoundly to influence

division ; the climate, though it is only at a few points, especially round the

of the Pacifie

summits of the lofty volcanic cones near the Paeific coast, that they reach the region of perpetual snow. This deficiency of lasting aceumulations of snow, however, is in very considerable part due to the smallness of the precipitation. Observations of temperature on the higher ranges are extremely deficient. On Mr Schott's temperature chart (Plate IX.) the isothermal of 44°, which, as already mentioned, east of the Cordilleran region nearly coincides with the northern boundary of the country, encloses within a great southerly-reaching loop the whole of the higher portion of the Rocky Mountains, extending as far south as the 34th parallel, or to about the position in latitude of the isothermal of 60° in the eastern division of the country. The crest of the Sierra Nevada, Cascade, and Blue Mountain ranges is also within the curve of 44°. The highest portion of the Rocky Mountains, as far south as 39° N. lat., is laid down as having a mean temperature lower than 36° F. The whole of the Great Basin and the Columbian plateau is indicated as having a considerably higher temperature than the dominating system of ranges which enclose it on the east and west. Con- siderable bodies of snow remain on the summits of the ranges during a large part of the year, at least as far south as 39° N. lat. In the plateau region of Arizona, Utah, and Nevada the decline of the ranges, the generally lessening elevation of the region, and the facility of access which the topographical conditions allow to the heated air from the south give a high temperature, and the isothermals form irregularly concentric loops extending from the head of the Gulf of California northwards. The isothermal of 52° reaches as far north as Virginia City, in lat. 39°, and that of 72° extends to Fort Mohave, in lat. 35°.

In strong contrast with the Eastern division, we find in the region bordering on the Pacific a very marked tendency to a parallelism of

division, the isothermals with the trend of the coast; consequently, a very

moderate change in the mean annual temperature may be met with over a large range of latitude. The character of the isothermals here is greatly modified by the position of the two parallel ranges, the Coast Mountains and the Sierra Nevada, which enclose valleys of great extent but of low altitude. In general the temperature of the Pacific coast-belt is much more uniform and higher than that of the Atlantic side of the United States. The isothermal of 60° runs nearly parallel with the coast, and not far distant from it, from the southern line of California north through nearly three degrees of latitude. The isothermal of 52° approaches San Francisco in lat. 37° 48’, and keeps near the coast to as far north as lat. 47°. A higher mean temperature than 48° prevails over the region adjacent to Puget Sound, at the northern boundary of the country, in lat. 49°, while the mean temperature of the northern part of Maine, between the parallels of 45° and 47°, is below 40°. Thus it may be said with truth that near the Pacific coast we have a difference of only 12° in mean temperature in a range of over sixteen degrees of latitude. And if we pass from the immediate vicinity of the coast in lat. 35° into the San Joaquin and Sacramento valleys, we may range over five degrees of latitude and keep in a region of which the mean temperature is not below 60° and nowhere much higher. The causes of this are the proximity of the great area of water from which the prevailing winds blow, the imodification which the temperature of this ocean undergocs near the American coast by the Asiatic coast current and the northern or Arctic coast current, and the position of the mountain ranges near the coast. Uniformity of climate along the edges of the land is still further aided by the peculiar nature of the eurrents along this coast. The influence of the warm Asiatic current—the Kuro-Siwo—is dis- tinctly felt in raising the temperature as far south as the northern

border of California, while farther south the cold Arctic current which apparently emerges from under the warm current, makeg its cooling

presenee felt along the coast nearly or quite as far as the southern boundary of the country.

The isothermals for the summer months (June, July, and August) Summer are much more irregular than those of the year, especially in the igo. Eastern division. The powerful heating influence of the Gulf of thermals Mexico, swept over in summer by southerly winds, makes itself extremely apparent in the summer isothermals, whieh bend to the north-west in a most remarkable manner, that of 72° reaching ag far as the centre of Dakota, or beyond lat. 45°. A mean summer temperature of 80° and upwards prevails over Florida, a consider. able portion of the Gulf States, and nearly all Texas. The belt adjacent to the Ohio, extending north as far as the Great Lakes, south along the Appalachian tableland into Tennessee and the north-western corner of Georgia, and west through lowa, Nebraska, and northern Kansas, lies between the summer isothermals of 68° and 76°. The summer isothermals along the Pacitic eoast are much less considerably changed in position and character from their mean annual character than they are on the Atlantic side, for reasons which have been already given, while the irregularity and com. plexity of the summer curves in the Cordilleran region generally would be very distinctly noticed if the data were at hand and could be exhibited with some detail, An extraordinarily high temperature prevails in summer in the southern portion of the a Great Basin and in the Arizona plateau region, the isothermal of 88° surrounding with its northerly-reaching loop a large area in the lower valley of the Colorado river and extending north as far as lat. 85°. The winter (December, January, February) isothermals Winter in the Eastern division have more of the regularity of the annual iso- curves than have those of the summer. The winter isothermal of thermals, 52° coincides very nearly with the mean annual curve of 68°, keeping near and closely parallel to the Gulf of Mexico. The winter isothermal of 32° runs from Cape Cod across Long Island to New York city, and across New Jersey, thence making a large loop to the south so as to surround the Appalachians, and, after ascending northerly again on the west side of that range to near the Ohio, passing through Indiana, Ilinois, Missouri, and Kansas, thence descending in a south-westerly direction and sweeping around the Rocky Mountains, and through the centre of the Great Basin in a very irregular course. On the

Pacific coast the form of / the winter curves closely resembles that of the yearly isothermal,

The winter curve of 52° very closely coincides with that of 60° for

the year, and the winter eurve of 40° runs from near San Francisco,

closely parallel to the coast and at a little distance from it, as far

as Cape Flattery, or through a distance of over ten degrees of i latitude.

The irregular, non-periodic fluctuations of the temperature are Irregular of great interest, and without knowing what these are one would fluctua- form a very false idea of the real character of the climate. It does tions of lot appear that these fluctuations greatly affect the general salubrity tempera- of the country, but they have a marked effect on the character of ture the vegetation, as well as on the methods of cultivation. The occasional occurrence of very low temperatures in low southerly latitudes where the mean winter temperature is quite high is one of the most striking phenomena in the climate. Savannah, as Hann remarks, has a mean winter tempcrature the same as that of | London and Cadiz, although this latter city lies 44° farther north. . But the vegetation of the two regions is essentially different, beeause frosts do not occur in that part of the Spanish peninsula.

Orange trees are liable to become entirely frozen everywhere in the ‘ United States except in southern Florida; this is not the case in

Spain. The cotton plant is a perennial in the south of Spain, while,

on the other hand, the stem and branches are killed every year by

frost in the United States, so that the fields have to be annually replanted.

The following table (IV.), from data arranged by Hann, gives an idea of the range of temperature in various parts of the country :—

ae Mean Monthly Range, Mean Yearly

Winter. | Summer, po

Choe) °) ° Cl Fort Sully 44 39 103°5 90°1 —25°2 108°7 Fort Snelling. 44 53 93-2 70°3 — 95 93°0 St Lonis…..... 88 37 90-3 73-2 — 58 99°7 New York 40 42 790 ale 0-7 93°0 Macon…..... 83 46 80:2 59°7 18°38 97-2 Charleston…. seal) eo a 734 52-3 94-1 927 New Orleans…....., 30 0 78°6 556 232 96°2

The region of lowest winter temperature is that along the eastern border of the Rocky Mountains in the northern portion of the country, where the temperature not unfrequently sinks so low as to freeze mercury. The lowest temperatures observed in this region, as given by Schott, are—at Fort Sanders, in Wyoming, – 50°; Fort Ellis, Montana, —53°. A temperature low enough to freeze mercury is occasionally observed in Wisconsin and Miehigan, and on the borders of Canada and New York. The hottest region

ind

j example, in July 1885 the thermometer at West Las | Colorado, rose on the 15th to 105°-2 \17th, to 96°-6

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is that along the lower portion of the Colorado and Gila rivers in Arizona and the adjacent part of California.

An excellent illustrative example of the suddenness and severity of the ‘‘cold waves” which occasionally pass over the country is afforded by the facts gathered by the Signal Service in regard to an occurrence of this kind in January 1886.

The barometer was high from the Rocky Mountain region to the Pacific coast on the 2d, and from that date to the 5th a slow north-easterly movement of this high area was observed; after the 5th there was an apparent increase of this high area from the region of the Saskatchewan valley and Manitoba, On the afternoon of the 6th the observers in Wyoming, Colorado, Nebraska, Kansas, and Missouri were warned of the approach of a “cold wave,” accompanicd by a “norther,” and of a probable fall of temperature of 20° to 25° in the next twenty- fonr hours, The centre of greatest barometric pressure remained north of Dakota from the 6th to

the 12th, but the cold wave had reached the Gulf coast and Florida before that date, causing in many places a lower temperature than has been observed in many years, and in some a lower one than had ever before been known. In Kansas many persons were frozen to death, and the loss of stock was very great; at Dodge City the wind blew with a velocity of 40 miles an hour, the thermometer averaging during the day 10° below zero. In Mahaska county, Iowa, from the 7th to the 11th twenty persons perished with the cold, and much. stock was lost. Similar reports came trom other parts of Towa. In Memphis, Tennessee, the thermometer fell to 8° below zero. In Nashville, from the 9th to the 10th, the cold was the severest on record, In New Orleans the cold wave struck the city at 3 a.m. on the 8th, and the thermometer stood at 15°°2 on tho morning of the 9th. At Indianola, Texas, the coldest weather experienced for several years occurred from tlie 8th to the 13th; on the 12th snow fell to the depth of 3 inches, At Galveston the cold was the greatest ever known, the mereury falling to 11°, being a fall of 54° in Jess than eighteen hours. A heavy snowstorm set in on the morning of the 12th, covering the ground to the depth of 6 inches, and causing much loss and suffering, At Mobile, Alabama, the minimum on the morning of the 9th was 11°, and at Montgomery, 5°-4. In Florida the cold was very severe ; ponds were frozcn over, and much fruit frozen on the trees, At Atlanta, Georgia, the mercury fell to 2°-4 below zero.

It appears from Prof. Loomis's working over of the records of the Signal Service that throughout the greater part of the United States there is oecasionally observed a difference of as much as 40° between the maximum and minimum of the same day, and that there are a few places where such ehanges are remarkably frequent. These places seem to be all west of the 95th meridian, and at or near the base of the Rocky Mountains. Thus, in 1874 there were thirty-eight stations at whieh a difference of 40° on the same day between the maximum and minimum temperature was observed. At Colorado Springs (5935 feet) this happened fifty-six times, at Denver (5135 fect) forty-five times, and at Cheyenne thirty-three times; at seventeen stations it happened only onee. At Denver, 15th January 1875, the thermometer fell 48° in one hour; and an observer "who is pronounced perfectly reliable" reported a fall in temperature at that place of 36° in five minutes, These changes of temperature felt at Denver were the

concomitants of a considerable storm, which came from the north-west, and whose centre passed about 250 miles east of that plaee.

The occasional occurrenee of ‘hot waves” which sweep over large areas of country, raising the temperature much above its normal height, is one of the most striking and most disagreeable features of the climate of the country, and especially of its northern and north-eastern portions. There is rarely a year in which one or more of these abnormal occurrences are not observed ; and, although

| they do not usually last more than two or threc days, they are

sometimes prolonged for a month or more, in a succession of heated periods with little or no interval between them. Thus, for Animas, ; at Albany, N.Y., on the ; at New London, Conn., on the 18th, to 92°°4; jin New York city, on the 21st, to 95°-9 ; in Baltimore, Md., on the 20th and 21st, to 98°3 and 98°‘7 ; at Dubuque, Iowa, on the 20th, outdoor work was suspended on account of the intense heat. Again, a little later, in Dayton, Washington Territory, on the 28th of the same month, the temperature rose to 102°°6 3 at Milwaukee, Wis., on the 28th, to 92°-8 ; at Fort Sully, Dakota, on the 29th, to 104°°5; at Yankton, Dakota, on the 30th, to 100°°7; at Dubuque, Iowa, on the 30th, to 97°1; at Des Moines, Iowa, on the 30th, to 100°1. All through the country many eases of sun- stroke oceurred, eighteen fatal cases having been recorded in Balti- more during the week ending with the 25th.

The prevailing winds, as in other regions lying in the latitude of the return trades, are westerly. The extreme southern part of the country is just on the border line where the influence of the \causes by which the trade-winds are originated cease to be felt. In the autumn, however, in the southern Atlantie States there is some ‘@pproach to the conditions of the trade-wind region. At that

yseason the winds in Florida and along the northern edge of the

| 11 summer is very great;

STATES

Gulf are deeidedly north-easterly as far as 33° south the Florida Keys and the northern certain extent, to the trade-wind region. Along the whole extent of the Atlantie coast region westerly winds predominate during the entire year, but they are ehiefly south-westerly in summer and north-westerly in winter. In the following ‘table (V.) the direction of the summer and winter winds is given in percentages of the total amount, for the distriets

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Middle Atlantic States—New York | |

to North-east VLC UTS on 8 }10) 6 |11/14/19/16)15] 9l19! 5 6 | 7 }14‘19/28 Sonth Atlantic States—South-east

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In the region between the Mississippi and the Appalachians, south- ward as far as the Cumberland range and north to Lakes Michigan and Huron, south-westerly and westerly winds prevail during both summer and winter.

There is an extensive region in the south- west of the United States, embracing an area equal to about one- third of the whole country, in which the winds of summer are chiefly southerly, varying between south-east and south-west, while in the winter they are mostly north and north-west. This region extends from the extreme south-east of California, through Arizona, New Mexico, southern Utah, Texas, Arkansas, eastern Colorado, eastern Wyoming, Kansas, and Nebraska, to Missouri. Farther north, in Wisconsin, Minnesota, and northern Miehigan, south winds prevail in the summer, but in winter there is no such marked predominance of northerly and north-westerly winds as in the region to the south-west. The influence of Lake Superior is clearly indicated in northern Wisconsin, where the prevailing winds in summer are from the lake and in winter from the land. On the Pacific coast the winds have a decidedly westerly character; but in the winter this preponderance is much less marked than in summer, On the coast of Washington Territory south-east is the prevailing direction, these winds being probably the south-west winds of the Pacific coast deflected by the mountains which le close upon the ocean. In the interior of Washington Territory south-west is the prevailing direction in both summer and winter, On the California coast the winds are very strong and steady from the north-west in the summer, but more to the south-west in winter. In summer the intensely heated plateau to the east draws the air from the Pacific, which blows with violence through every depression in the coast ranges towards the heated land-mass. There is no “ wind-gap” in the Coast ranges from the Columbia river to Santa Barbara so deeply and widely cut as that of the Golden Gate at San Francisco, At this point the cool winds from the sea find entrance to the Great Valley of the Sacramento and San Joaquin, and the mass of air thus set in motion spreads itself out fan-like after passing through the Gate, so that the prevailing winds in those valleys are in summer always from the Bay of San

Francisco towards the mountains. The hotter the weather in the interior the more violent is the wind at San Francisco, But this condition is limited to the daytime. At night the rapid cooling of the higher plateau ehecks or stops altogether the indraught of air, and an almost entire ealm prevails at San Franeisco, while the cool air flows in a gentle breeze down the slopes of the mountains,

in a reverse direction from that which it had during the daytime.

In the winter the westerly direction of the winds in this region is still greatly predominant, but the prevailing westerly current of air is not intensified in its motion as it is during the summer. Over the plateau and mountain region ineluded between the Sierra Nevada and the Rocky Mountains the surface winds are irregular, being governed by the topography of the eountry; but the upper eurrents are, in general, from the west. In the southern part of this region, in the valley of the Gila and the lower Colorado, there is a large area which is intensely heated in summer, and towards which the winds blow from the lower region to the south, and especially from the Gulf of California. Here the predominance of southerly winds but the mountain ranges to the west have so declined in height in this southern region that westerly winds are nearly or quite as common as northerly ones. Farther cast and north-east, as has been seen, the preponderance of northerly winds in winter is very great.

In reference to precipitation the territory of the United States Rainfall,

may be divided into two nearly equal portions by the meridian of 100°, the region to the east of that meridian being one of sufficient and pretty regularly distributed rainfall, while that to the west is irregularly and insufficiently supplied, with the exception of a narrow belt on the Pacific eoast, over a part of which the precipita- tion is irregular, but fairly sufficient, while another portion is very abundantly supplied with moisture.

Regions of less than 20 inches of precipitation must be essentially

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pastoral, or, where the amount falls considerably lower, unin- habitable or even deserts. For regions where the precipitation is between 20 and 25 inches cultivatiou of the soil may be on the whole possible, but will be liable to serious drawbacks, since the smaller the rainfall the greater the liability to a series of years when it will fall below the mean, with partial or total failure of the crops and consequent suffering. Of course, in regions favour- ably situated for artificial irrigation much may be accomplished in the way of making up for deficient precipitation. If in the light of these

preliminary remarks we consult Mr Schott's rainfall charts of the United States we find that the whole of the Eastern division of the country is well supplied with moisture. 'The isohyetal of 26 inches, which may be taken as approximately the dividing line between a sufficiently and an insufficiently watered area, crosses the northern boundary to the north-west of Lake Superior, runs south-westerly to the 97th meridian, which it strikes in about the latitude of St Paul (45°), and runs thence very nearly south, with a slight westerly inclination, so that when it reaches the northern border of Texas it has advanced westward as far as the 99th merid- ian, near which it remains through four degrees of latitude, to the parallel of 31°, when it again advances about four degrees to the westward, and then runs south-easterly to the Gulf of Mexico, near the mouth of the Rio Grande. As thus indicated, the isohyetal line of 26 inches leaves to the east, or in the moister region, a large part of Minnesota, the eastern edge of Nebraska, rather less than half of Kansas, most of the Indian Territory, and about half of Texas. The line of 20 inches crosses the northern boundary of the country at about the 97th meridian, and runs south with moderate undulations, gaining a little in westing, so that in the centre of Texas, on the 31st parallel, it is in about longitude 102°, Thence its course is south-easterly to the Gulf, in a course nearly parallel to the isohyetal of 26 inches, and at a very short dis- tance from it. The isohyetal curve of 32 inches, or that marking the western limit of abundant precipitation, is in general pretty nearly parallel to that of 26 inches, and not far distant from it, so that in general it may be said that we pass from a region where precipitation is abundant to one where it is decidedly insufficient in traversing a belt of country having an average width in longi- tude of about three degrees. The only important exception is that towards the north the distance between the isohyctal lines widens rapidly, that of 32 inches having an almost easterly course along the southern shore of Lake Superior and the northern of Huron. Moreover, there is in the lines of 26 and 32 inches a marked loop running to the south-east, so that alinost the whole of Minnesota is brought within the area over which the precipitation ranges between 20 and 82 inches, considerably the larger portion having over 26 inches. The position of the curve of 32 inches is such that asmall part of eastern Wisconsiu, a portion of eastern Michigan, and a small irregularly shaped belt in New York south of Lake Ontario lie in a region of Iess than that amount of rainfall.

The regions of largest precipitation are those bordering on the Gulf of Mexico and the Atlantic. Along the Gulf the rainfall between the meridians of 85° and 92° exceeds 56 inches in amount, and the curve of 56 inches extends northward so as to embrace a portion of Arkansas, Tennessee, Georgia, and South Carolina. There is no part of the Atlantic coast, except the extreme end of Florida, where the precipitation is as large as 56 inches, At various points the average is above 50, asin eastern North Carolina, the line of 44 inches running nearly parallel to the coast, and not far from it, as far south as lat. 37°, when it bends westwardly. The greater part of the Eastern division of the United States thus enjoys a sufficient but not over-abundant amount of precipitation, namely, that coming within the limits of 832 and 44 inches. Small areas in several of the States, however, have somewhat over 44 inches of rainfall. In the region of sufficieut and in places abuudant rainfall thus designated there is, on the whole, no such thing as a clearly-defined rainy season. Along the Atlantic sea-coast from Portland to Washington, through the Hudson river valley, Ver- mont, northern and western New York, in the Ohio valley from western Pennsylvania to Missouri, south to Arkansas and down the Mississippi to its mouth, the rainfall is pretty uniformly dis- tributed throughout the year. There are, however, local peculiarities in the distribution. Thus, in the Atlantic sea-coast region, as far south as Washington, there are three nearly equal maxima, about the middle of May, August, and December. In the region adjacent to the Hudson river valley through to western New York two maxiina are indicated, one early in July and one about the middle of October, while there is one principal minimum, early in February. In the Ohio river valley, west to Missouri, there is one principal maximum and one principal minimum, the former early in June, the latter early in February. In the lower Mississippi valley and in that of the Red River there is one principal maximum and one principal minimum, the former early in December, the latter about the iniddle of October; there is also a secondary maximum in July, and a sccondary minimum in June. In the Mississippi delta and along the Gulf coast eastward in Alabama and Mississippi there are two maxima, the principal one about the end of July, the

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secondary one early in December, while there are a principal minimum early in October and a secondary one towards the end of April. Along the upper Mississippi, in central Minnesota and part of Wisconsin, there is a decided tendency to a condition of summer precipitation and winter drought; there are two maxima a principal one about the end of Juue and asecondary one about the middle of September, and a principal minimum about the begin- ning of February. This is a similar condition of precipitation to that prevailing in the Hudson river valley and westward, except that in the upper Mississippi region the range is much larger, Again, on the Atlantic coast from Virginia south to Florida there is also a strongly-marked prevalence of summer rains, there bein

one maximum of very large range late in July or early in August, with two small adjacent minima about the middle of April and late in October, There are also subordinate maxima in March and December.

On the Pacific coast the increase in the amount of precipitation as we go northward is a very marked feature of the climate. Thus at San Diego the mean of the series from 1850 to 1874 is given at 9°31 inches; that of San Fraucisco, for nearly the same years, at 21°49; that of Astoria at 77°61. Along the coast of California, as well as in the interior of that State in the valley and on the western slope of the Sierra Nevada, there is an alinost entire absence of rain during the summer months, and a strongly marked maximum in December. Farther north, with the great increase in the total annual amount of precipitation already noted, there is also an increase in the rainfall of the summer, which amounts in the extreme north-western corner of Washington Territory to 10 or 12 inches during the three summer months. A large portion of the precipitation in the higher region of the Sierra Nevada is in the form of snow, of which the amount in different years appears to be very variable. Indeed the same thing may be said of pre-cipitation in general on the coast of California, The largest amount of rainfall at San Francisco during the years 1851 to 1874 is given by Mr Schott as 36:02 inches, the smallest 11°73. All through the Cordilleras, from the summit of the Sierra Nevada cast to the Rocky Mountains, the statistics of the precipitation are meagre, and have bceeu very irregularly taken. The amount in gencral is quite small. No doubt the precipitation on the higher portions of the Cordilleran mountaiu ranges is considerably

higher than it is in the valleys, as is indicated by the records kept by the Signal Service at the station on the suminit of Pike's Peak (14,184 feet), the average for 1874-80 being 31°65 inches. In the Cor- dilleran region generally the fact that the precipitation is larger on the mountain ranges than it is in the valleys, and that it is chiefly in the form of snow, is a matter of great importance. When the ranges are lofty and wide enough to collect and store away a large supply of snow, this by its melting furnishes water enough to irrigate the slopes and valleys, so that they can be cultivated; when, on the other hand, the ridges are low, they, as well as the valleys at their bases, are absolutely sterile.

[PHYSICAL FEATURES,

Those abnormal disturbances of the atmosphere which are accom- Storms.

panied by rain and wind may be classed under two heads, —ordinary storms, and those of destructive violence, or tornadoes. The former extend over wide areas, and are ordinarily attended by no evil results ; the latter are limited to comparatively narrow belts, and are often very destructive. The ordinary storms of the United States begin with the formation of areas of low barometer, which are first heard of in the far west or south-west, and move towards the east or north-east with a velocity averaging for the entire year, as shown by Loomis's investigation of the Signal Service Records for the years 1872-84, 28°4 miles per hour, the velocity being greatest in February and least in August, the former velocity 50 per cent. greater than the latter, and the velocity varying also very greatly for the same month in different years, the average velocity for the entire year being about two-thirds greater than it is in Europe. The direction in which these storm centres advance in the remote western stations—as, for instance, Bismarck, long. 100° 38"; Fort Sully, long. 100° 36'; Breckenridge, long. 96° 17'—is towards a point considerably south of east, but at the more easteru stations it 1s a little north of east. In general, probably about half the storms of the country advance from the extreme north-west in great curved lines beginning with a south-easterly direction, and passing out of the country in a direction a little north of east, or, in general, following a track nearly parallel in position to the Great Lakes and the St Lawrence. The remainder of the storms of the Atlantic coast region begin in the south-west and travel

north-east, or begin m the south and follow the coast-line pretty closely. In general the area of rainfall attendant on the advance of the centre of low barometer is in advance of the progress of that centre nearly in the direction of its average progress. The diameter of the rain area 38 variable, often much over 1000 miles. Iu the case of the great ram storms happening between the years 1878 and 1877, as investigated by Loomis, there were found to be, in many cases, quite a large number of independent rain centres prevailing simultaneously within the general rain area. In one case there were as many 4 eight of these, and there were only nine cases in which there Wa .

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not more than one area in which the rainfall exceeded half an inch. The average distance of the principal rain centres from the eentre of low pressure was about 400 miles.

The occurrence of tornadoes in the United States is a matter of importance on account of their frequency and their destructiveness, and much has been published in regard to them. A large amount of information will be found in a publication of the Signal Serviee, prepared by Mr J. P. Finley, and issued in 1882, These storms are not limited to any one month or season; but they are most frequent in snmmer, especially in the months of June, April, July, and May, aud least so in the months of December and January. Of 600 tabulated by Mr Finley, oecurring from 1794 to 1881, 112 were in June, 97 in April, 90 in July, 81 in May, and only 9 in December and 7 in January, They are most frequent in the after- noon, between noon and six o’clock; the hour in which the greatest number oecurred was that from 5 to 6 P.M. The course of more than half of the 600 (310) was from south-west to north-east, and only 38 moved in the opposite direction. Only 46 had a course directed from the castern side of the meridian towards the western. The width of the path of destruction varied from 40 to 10,000 feet, the average being 1085 feet. The velocity of progression of the storm-cloud, in 130 cases in which this item is given, varied from 12 to 60 miles per hour, the average being 30 miles. The time consumed by the tornado in passing any given point varied from 10 seconds to 30 minutes, the average of 50

occurrences being 6°52 minutes. The velocity of the wind within the cloud vortex was

CLIMATE. |

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| expected. The portions of the United States where altitude is fatal to the growth of forest vegetation are insignificant as com- pared with the area of the whole country. The Appalachian ranges—which originally were densely forested from extreme north- east to extreme south-west, and which still eontinue to be so over a considerable portion of their extent—only rise at a very few points high enough to cause the forests to disappear. This is the ease particularly with Mount Washington and the higher adjacent peaks, and with the summits of the most elevated part of the system in North Carolina. The Adirondacks are densely wooded, even almost to the highest summits. In the most elevated mountain-chains making up the Cordilleran system, want of moisture appears to co-operate with elevation in thinning out the forests on their flanks and causing them to disappear entirely on the highest ranges. The timber line on the most elevated peaks of Colorado reaches from 11,000 to about 11,500 feet, —the summits themselves rising from 2000 to 3000 feet higher. The Sicrra Nevada is bare of forests in its highest portions. The high region about Mount Whitney is, where not snow-eovered, nothing but an entirely bare mass of granite domes and needles, In the central part of the Sierra, in the vicinity of the Yosemite valley, forest vegetation is extremely scanty above 9000 feet, and the upper 3000 feet of the highest peaks is entirely bare of trees. If large areas of the United States are destitute of trees, and other regions but very poorly supplied, the chief cause of this is want of sufficient moisture.

variously estimated at from 70 to 800 miles an hour. The whirling motion of the cloud was invariably from right to left. Of 600 tornadoes investigated, 134 were reported as being ‘ unusually de-

In briefly indicating the nature and distribution of the forests of Appala- the United States, we may begin with the Appalaehian region, chian which here must be taken as embracing also the eountry to the forests,

structive.” Of these 64 oecurred within the States of Kansas, Illinois, Iowa, and Missouri, and this region, lying adjaeent to the Mississippi river, seems to be that in which the conditions are most favourable to the development of these phenomena. There are also two areas—one in Georgia and one in New York—where tornadoes are more frequent than they are elsewhere in the eastern States, Of the destructiveness of these tornadoes some idea inay be formed from the statement that in many of them)nildings and everything else projecting from the surface are levelled to the ground, frag- ments of the materials thus uptorn being carried often to great distances, In the tornado of April 18, 1880, the effeets of which Were felt along a path more than a hundred miles in length through I}linois and Missonri, in one town over whieh it passed, 65 persons were killed, over 200 wounded, and more than 200 buildings were demolished. The loss of property in two counties of Missouri was over a million dollars,

The series of destructive storms which took place on the 19th of February 1884 is probably the most remarkable occurrence of this kind which has taken place in the United States since the country was settled by the whites. The loss of property was not less than $3,000,000 to $4,000,000, while 800 persons lost their lives, and about 2500 were wounded. From 10,000 to 15,000 were rendered homeless, as many as 10,000 buildings having been destroyed. Great quantities of live stock also perished. A central area of barometric depression moved between 7 A.M. of the 18th and 7 A.M. of the 19th from Fort Keogh to the vicinity of Chicago ; at the same hour on the 20thit was about 150 miles north-west of Montreal. Onthe 19th, at 7 a.M., another extremely elongated area of barometric depression had been formed, extend- ing almost north and south across the whole United States, and having its eentre near Davenport, Iowa. Towards this centre the winds blew from north and south, the isotherms indicating very great contrasts of temperatnre between the areas of northerly and southerly winds, this condition of things being an invariable precursor of tornado development. The two centres of barometric disturbance were, as is commonly the case in occurrences of this kind, widely separated. At 3 p.m. of the 19th the centre of the north and south trending barometric depression was near Indian- apolis, the contrasts of temperature remaining extreme, and violent winds developing themselves at various points south of Indianapolis, especially along the Ohio river from Cairo to Louisville, in the vicinity of Nashville,

andin northern Alabama. At 11 p.m. of the same day the barometric trough had diminished somewhat in intensity, and the entire area of disturbance was | passing rapidly off to the north-eastward. Between 3 p.m. and | sundown the area devastated was chiefly in eastern Alabama and northern Georgia. Before 11 p.m. the destructive storms in North and South Carolina had reaehed their maximum violence; those in southern Virginia were most destruetive about midnight. The Signal Service charts for the day indicate about thirty distinet areas of violent tornadoes, most of them between the eastern border of Alabama and the southern boundary of Virginia.

VEGETATION.

No portion of the United States attains so high a latitude that the forest growth should be necessarily dwarfed by the cold, or dis- appear altogether. The northern boundary is, however, practic- ally nearly the limit beyond which valuable timber eaunot be

west and south-west, ineluding the valleys of the Mississippi and Missouri, as far west as the western boundary of the State of Missouri, or about the 95th meridian, to the east of which lies, coincident with the region of gencrally abundant and every- where sufficient rainfall, that portion of the United States which is almost everywhere densely forested, and the only portion whieh is so, with the exception of a comparatively narrow strip on the Pacific coast. Ineluded within this densely-forested region of thie Appalachian system and Mississippi valley there is quite a large area destitute of continuous forests,—the so-called “ prairie region ” (see below). The portion of the United States first settled by Europeans was, almost without exception, a densely-forested region, over which the aboriginal inhabitants roamed, withont having

interfered to any perceptible extent with the natural forest growth of the country. Their numbers were small, and their habitations were, almost without exeeption, either on or near the shores of the ocean and its bays and indentations, or along the river bottoms, in such places as were naturally grassed and not forested. This densely-forested region extends throughout the whole length of the Atlantic coast from Maine to Florida, west through the region of the Great Lakes to beyond Lake Superior, and to the south-west through Louisiana and for some distance into Texas. It differs from the

densely-forested region of the Paeific in that it is essenti- ally a region of deciduous or hardwood forests, while the latter is essentially one of coniferous trees; it differs from the forested region of the Rocky Mountains in that the latter is not only essentially a region of eoniferous trees, but one where the forests do not by any means occupy all the area, neither do they approach in density or economie importance those of the eastern division of the country. Again, the forests of the east embrace a great variety of species, which, as a rule, are very much intermingled, and do not, unless quite exceptionally, oecupy areas chiefly devoted to one species; while, on the other hand, the forests of the west— including both Rocky Mountain and Pacific coast divisions— exhibit a small number of species, considering the vast area em- braced in the region; and these species are, in quite a number of instances, extraordinarily limited in their range, although there are eases in which one or two species have almost exelusive posses- sion of very extensive regions. The eastern forested recion, while continuous from north-east to south, south-west, and west, is of course marked by changes in the species corresponding with the changes in temperature between the extreme north-east and the extreme south. These changes, however, are almost without exception gradually made, and we pass almost impereeptibly from a northern to a southern forest. This condition is, in a measure, the consequence of the breadth and high elevation of the Appa- lachian system in its southern extension, along which elevated belt the northern aspect of the arboreal vegetation is prolonged into a region almost semi-tropical.

The following hardwood trees may be mentioned as being the most prominent and important in the forests of the eastern division of the country. The sugar-maple (Acer saccharinum), called also the hard and rock maple, ranges as far south as northern Alabama, but is of the most economical importance in New England and the region of the Great Lakes, Ou the southern shore of Lake Superior, in the higher portions of the country, on and near the divide between the waters flowing into the lake and those which descend to the Mississippi, the forest, over large areas, is almost exclusively

made up of this species, the “ bird’s-eye” variety—formerly much prized for cabinet work—being there abundant. The other species of maple of less importance are the soft maple (A. dasycarpum), having a wide range, and attaining its greatest development in the valley of the lower Ohio, and the red maple (4. rubrum), also ranging from New Brunswick westward to the Lake of the Woods and south to Texas, and being largest and most abundant in the central portion of the Mississippi valley. The oaks range over the entire eastern forested region from Maine to Florida, and west nearly as far as arboreal vegetation extends. The number of species is large. The white oak (%. alba) ranges over nearly the whole forest region of the cast, reaching its greatest development along the western portiou of the Appalachian belt, and in the valley of the Ohio and its tributaries. The burr oak (Q. macrocarpa) has almost as wide a range as the white oak, extending farther west and north-west than any oak of the Atlantic forests ; it forms, with the scarlet oak (Q. coccinea), the principal growth of the “ oak- openings” in the prairie region. The red oak (Q. rubra) has also a wide range ; it extends farther to the north than any other species. The jack oak or black jack (Q. ntg7a) is a small trce of little value except for fuel, but widely disseminated in the west and south-west of the eastern forest region, and forming with the post oak (Q. obtustloba) the growth of the so-called ‘‘ cross timbers”’ of Texas. The live oak (. vircns) is an evergreen tree of considerable value, chiefly developed along the Gulf coast and through western ‘Yexas into the mountains of northern Mexico. The chestnut oak (Q. Prinus) ranges through the Appalachian region, from Lake Champlain to northern Alabama, and west to central Kentucky and Tennessee. Its bark is used in preference to that of the other North American oaksin tanning. The ash is represented by several species. ‘The white ash (Fraxinus americana) is of special value, and its range is very extensive, namely, east and west from Nova Scotia to Minnesota, and south-west to the extreme border of Texas. This species has its greatest development in the bottom lands of the lower Ohio valley. Towards the west and south-west it diminishes in size and importance, and is replaced to a considerable extent by the green ash (& viridis). The range of the red ash (F, pubescens) is nearly as large as that of the white ash, except that it docs not extend quite so far to the south-west. Its wood is less

valuable. The chestnut (Castanea vesea, var. americana) is an im- portant tree, with a wide range. The American chestnut is smaller and sweeter than the European. The species ranges from southern Maine west to Indiana, and south along the Appalachians to northern Alabama, attaining its greatest development along the flanks of the momntains in North Carolina. The birch is repre- sented in the eastern forest region by several species. The white, canoe, or paper birch (Betula papyracea) reaches a higher latitude than any other tree of the American deciduons forest. It ranges south to the mountainous region of northern Pennsylvania, and west to British Columbia. The yellow or grey birch (B. lutea) is one of the largest and most valuable trees of the New England forest, ranging south along the higher portion of the Appalachians to North Carolina, and west to southern Minnesota. There are in the region several species belonging to the two genera of the Jug- landacex, Juglans and Carya, which have a wide range, and are of importance both for their wood and for their fruit, and which also are among the most attractive ornaments of the forest. Prominent among these are the hickory (Carya alba), the butternut (Juglans cinerea), the black walnut (J. nigra), and the pecan (C. olivex- Jformis). The pecan does not occur to the north-west of Indiana, has its greatest development in the rich bottom lands of Arkansas, and is the largest and most important tree of western Texas. The butternut occurs in New England, but is by no means an abundant tree in that region; farther west, especially in the valley of the Ohio, it attains its maximum development. The black walnut is hardly known in New England, unless on its extreme western border ; but south-westward along the Appalachians and west to the Mississippi it is a tree of great value and importance. It attains its inaximum development on the western slope of the southern portion of the Appalachian range and thence to Arkansas. Hardly any other wood is cver used for gunstocks. The American elm (U. americana) has a wide range, extending from southern Newfoundland to Texas and west to central Nebraska. This species is especially the tree of the river bottoms, and specimens occur- ring isolated in natural meadows often attain great size. The rock or white elm (U. racemosa) is a tree hardly occurring in New England, but largely developed in the region of the Great Lakes, west to north-eastern Jowa, and south to central Kentucky. Its wood is considerably denser than that of U. americana. The beech (Fagus ferruginea) occurs through nearly the whole of the eastern forest region, ranging from Nova Scotia south and south-west to

Florida and Texas, and west to Missouri. The linden, lime, bass- wood, or white-wood (Zilia americana) is a tree of wide range, occurring more and more abundantly as we go west from New England through the region south of the Great Lakes into the Ohio valley, and found south along the Appalachians to Georgia. It has its maximum development towards the west and south-west

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in the rich bottom-lands. The tulip tree (Lirdodendron tulipifera) called also yellow poplar and white-wood, is one of the largest and most beautiful trees of the eastern forest region. It is rare in New England, but has its maximum development from New Jersey south along the slopes of the Appalachians to Tennessee and North Carolina, and west in the Ohio valley. The genus Magnolia ig represented by several species, two of which are of importance, especially for the great beauty of the tree and its flowers. These —M. glauca and A. grandifiora—like the other species of the magnolia, are pretty closely limited to the Atlantic coast and Gulf region, and the lower portion of the Mississippi valley. J. glauea, which has a variety of names, among which those of swect bay and white laurel are most common, is found over a small area on Cape Ann in Massachusetts, and in no other place in New England,— its range being from New Jersey southward, chiefly along the coast to Florida, and west to Arkansas and Texas. JL grandiflora, called the big laurel or the bull bay, an evergreen, and one of the finest trees of the region, is pretty closely limited to the southern and south-western coast, ranging from North Carolina south to Tampa Bay, westward to south-western Arkansas, and along the Texas coast to the valley of the Brazos. There are two trees known familiarly as the locust which are of considerable im- portance. One is the Lobinia Pseudacacia, commonly called cither simply the locust or the yellow locust ; the other is leditschia triacanthos, to which the popular names honcy locust, acacia, sweet locust, and black locust are given. The former occurs naturally in the Appalachians from Pennsylvania to Georgia, reaching its maximum development on the western slopes of the mountains of West Virginia, but has been introduced and cultivated over the whole region east of the Rocky Mountains, wherever trees can be made to grow. This tree, however, over an

extensive portion of the region where it was formerly cultivated has been exterminated by the attacks of the ‘‘locust borer” (Cyllene picta), The other locust, the three-thorned acacia, ranges from Pennsylvania, along the western flanks of the Appalachians, south as far as Florida, south-west through northern Alabama and Mississippi to Texas, and west from Pennsylvania through southern Michigan to eastern Kansas. It is the characteristic tree of the ‘‘ barrens” of middle Kentucky and Tennessee, and attains its maximum development in the lower Ohio bottom-lands. It is widely cultivated through- out the region east of the Appalachians for shade and ornament, and for hedges. There are certain trees and shrubs in the eastern forest region of little or no economical importance, but which, espe- cially when in flower, are highly ornamental. Of these only a few can be mentioned: the mountain ash (Pyrus americana), ranging over nearly the whole region, and much cultivated as an ornamental tree on account of the beauty of its fruit, of dark reddish or scarlet colour, and remaining long upon the branches ; the sumach (Rhus glabra), a handsome shrub, from 4 to 10 feet in height and very striking both for foliage and fruit, and a very characteristic feature of the New England landscape, as seen along the borders of the forests and by the sides of country roads; the mountain laurel (Kalmta latifolia), covering extensive areas of half-cleared forests in the hilly regions and very conspicuous at the flowering season, June and July, one of the most beautiful of all the character- istie native American shrubs; the dog-wood or cornel (Cornus alternifolia), a beautiful shrub, rising occasionally to sufficient height to be called a tree, ranging from the St Lawrence to Alabama, and in certain regions, especially in parts of New Jersey and Pennsylvania, very conspicuous at the time of its flowering, the landscape from a distance looking as if it had been snowed upon. The red-bud (Cercis canadensis), a small tree, is a con- spicuous feature of the forest in the extreme south-west, especially in southern Arkansas, the Indian Territory, and eastern Texas. Although the forest vegetation of the eastern region is essentially deciduous in character,

coniferous trees are widely spread over the whole country from Maine to the southern border of Georgia. — The genus Pinus is by far the inost widely distributed and most inter- esting of the conifers. First in value is the white pine (P. Strobus), a northern tree, having its maximum development in the region of the Great Lakes, ranging fron: Maine west to Lake Superior, and south-west along the Appalachians to Georgia, and attaining height greater than that of any other species in the eastern forest region, namely, somewhat less than half that of the tallest trees in the Pacific coast belt. The most important pineries of the eastern States are in Maine, where this species occurs scattered through the deciduous forests, and where the most easily accessible trees of large size have already been pretty well thinned out; Michigan and Wisconsin are the chief pine-producing States of the western and north-western region. Saginaw Bay, on Lake Huron, may perhaps be designated as the headquarters of the north- western pine lumber industry. The somewhat less valuable oo ern pine (P. palustris), called also hard, yellow, long-leaved, a Georgia pine, is, in contrast with the white pine, decidedly a south- ern species, ranging from southern Virginia south to Florida, an south-west through the Gulf States to the valley of the Red River in Louisiana and that of the Trinity in Texas. It occurs over CX

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ing the so-called “ pine barren ” zone of the southern Atlantic States, of especial importance in North and South Carolina and Georgia The wood of this tree is heavy, hard, and tough, almost all the tar, pitch, rosin, the United States. Another important pine, P. mitis, the yellow, short-leaved, or bull pine, ranges from Staten Island south to western Florida, through the Gulf

States and Tennessee to east- ern Texas, and west of the Mississippi into Kansas and Missouri, reaching its greatest development in western Louisiana, southern Arkansas, and eastern Texas. It is an important tree in the south- west, and west of the Mississippi, and among the yellow pines only inferior in value to P. palustris. Another important conifer, next to Pinus palustris the most characteristic tree of the south-eastern coast timber belt, is the cypress (Zaxodiwm distiehwm), which ranges | from Delaware south along the coast to Florida, and south-west to

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States, and also extending up the Mississippi to southern Illinois and Indiana, The cypress isa marked feature in the swamp country which extends along the coast from Virginia through North and South Carolina, of which the Great Dismal Swamp, on the borders of Virginia and North Carolina, may be taken as the type. These swamps are locally known through the region where they occur as ‘‘dismals ” or ‘‘pocosins.” The largest continuous area of swamp in North Carolina lies between Albemarle and Pamlico Sounds, covering an area of nearly 8000 square miles. The prevalent growth of the best swamp lands is the black gum (Nyssa sylvatica), tulip tree or poplar,” cypress, ash, and maple, the proportion of cypress increasing as the soil becomes more peaty. These so-called swamps —in large part at least—differ essentially from what is usually called a swamp, being considerably elevated above the adjacent streams; thcy are, in fact, immense accumulations of decaying vegetation, often peaty in character with more or less fine sand intermingled, and with a very considerable variety of forest vegetation. Portions of these swampy areas have been successfully drained and brought under cultivation ; other portions have resisted all attempts of the kind, although there has been a _ large amount of money expended in endeavouring to reclaim them. , Besides the pines, there are to be mentioned here the spruces, firs, larches, and cedars, which together form a marked zone of vegetation | decidedly northern in character, extending through the northern part of New England, through Canada to the Upper Lakes, and far } to the north and north-west, where it unites with the forest belt of | the Rocky Mountains, in almost the extreme northerly extension of this range within the United States. The northern forms of | coniferous trees also occur in the highest portion of the

Appalachians as far south as North Carolina, and are found along the most ele- vated ridges of the Rocky Mountain range, from the extreme north through to Arizona and New Mexico, and along the culminating portion of the Sierra Nevada nearly to the southern border of California. One of the most characteristic of these northern trees is the balsam fir (Abies balsamea), which ranges from Labrador | north-west to the base of the Rocky Mountains, occurring in central | Michigan, along the north shore of Lake Superior, and in the more elevated and damper portions of the Appalachians south to Virginia. } This is the tree which produces the "Canada balsam." There are two species of spruce which have about the same range as the | Species last mentioned, the black spruce (Picea nigra) and the white jspruce (P. alba). The hemlock (Abies canadensis) is another very) characteristic tree of the northern forests, where perhaps more than any other tree it sometimes occurs in "groves" or over areas of jconsiderable size to the almost entire exclusion of other species. It is met with along the higher Appalachian ranges, south as far as jAlabama ; and, although it is much more abundant at the north than at the south, the largest specimens of it are said to be found in \the high mountains of North Carolina. The bark of this tree is the principal material used in the northern States in tanning. The | larch (Larix americana), much more commonly called the tamarack i

or hackmatack, is another very characteristic northern species, jalthough, like most of the others, ranging to a considerable distance jsouth along the higher regions of the Appalachians. Swampy jareas, over which water stands during a considerable part of the summer, are often covered with a sparse growth of this species, to the almost entire exclusion of other trees. These swamps, which are

specially common in portions of the upper peninsula of Michigan, are usually known as tamarack swamps. The white cedar or arbor vite (Thuja occidentalis) is a very common specics in the north, and is much cultivated as a hedge and ornamental tree. Large swampy areas in the north, especially in the region south jof Lake Superior, are covered with a gnarled and tangled growth of this species, and are called by the English-speaking population "cedar swamps," and by the French voyagewrs *' savanes. " Tn the arthest north-westcrn regions of the United States, as, for instance, on

Isle Royale and the adjacent shore and islands of Lake Superior, the dwarfed and tangled growth of the characteristic northern conifers makes travelling difficult and vexatious. It is sometimes, ur long stretches, almost impossible to get over the ground except

tensive areas almost entirely unmingled with other species, oceupy-

and spirits of turpentine used in

Texas, forming extensive forests in the southern Atlantic and Gulf

by crawling on hands and knees. The white cedar (Chamecyparis spheroidea, more commonly known as Cupressus thyoides) is a trec pretty closely limited to the Atlantic and Gulf coast region, having its maximum development in the southern Atlantic States. It is one of the characteristic trees of the southern swampy belt.

we begin with the narrow, but in part densely Pacific coast. two regions are separated over several degrees of latitude by the intervening region of the Great Basin, where forests are extremely scantily distributed, there are many points of resemblance between them, especially in their northern extension, In the size and density of growth of some of the species, and in the grandcur of the forest scenery generally, portions of the Pacific coast belt surpass anything else that the country has to offer. This region of dense forest growth begins ou the western slope of the Sierra Nevada, at the southern extremity of the range, continuing north along that slope into Oregon and Washington Territory, where, in the region adjacent to Puget Sound, the forests are most remarkable for their density, as well as for the size and elevation of the individual trees. The most widely distributed and most valuable of the trees of this belt is the Douglas fir (Pseudotsuga Douglasii), which ranges from British Columbia south through the Coast mountains, and along the western slope of the Sierra Nevada to Arizona, and south-east along the Rocky Mountains through Montana, Wyoming, and Colorado, but not through the Great Basin. It often forms exten- sive forests, especially in the northern region, where it attains its maximuin development. Its wood is extensively used on the Pacific coast, the

headquarters from which it is supplied being the region adjacent to Puget Sound, where it grows to twice or three times the height it has in the Rocky Mountains, The yellow pine (Pinus ponderosa) ranges from British Columbia south along the Cascades and Sierra Nevada to Mexico, and occurs, irregularly distributed, along the Rocky Mountains from Montana, where it is quite abundant, to Arizona. For size and height this species, as well as the Douglas fir, is remarkable. Its wood is variable in character, but is largely used where a better quality cannot be obtained. The sugar pine (P. Lambertiana) occurs in abundance on the western flanks of the Cascades and the Sierra Nevada, and is especially well developed in the central portion of the latter. It is one of the most conspicuous of the species which make up the grand forests of that part of the Sierra which lies at an altitude of from 2000 to 7000 fect above the sea. The digger pine (P. Sabiniana) is the characteristic tree of the foot-hills of the Sierra Nevada. It is remarkable for the large size of its cones, the seeds of which were formerly an important article of food for the abori- gines. A characteristic tree of the Californian Coast ranges, similar in many respects to P. Sabiniana, and also having large and beautiful cones, with very long, sharp, recurved points, is P. Coultert, The wood of these two species is of little value except for fuel. Other Coast range pines of interest are—the Monterey pine (P. insignis), a trec peculiar to the sea coast, from Pescadero south to San Simeon Bay, and the Obispo pine (P. muricata), limited to the Coast ranges, from Mendocino south to San Luis Obispo. The pines of the high mountain region are—P. monticola, occurring in the Sierra Nevada at an altitude of from 7000 to 10,000 feet, and common in the northern part of the Rocky Mountains, as well as in the Cascade range, and in portions of the mountainous region of Idaho, where it is an important and valuable tree, and is sometimes called the white pine; P. flexilis, a tree occurring in limited numbers in the highest parts of the southern High Sierra of California, and here and there south along the higher portions of the Rocky Mountain ranges and also in the Great Basin, from Montana south to Arizona; P. albicaulis, by some considered a varicty of P. flexilis, by others a distinct species, and having a similar range with that species; P. Balfowriana, and . aristata, a variety of P. Balfouriana, found about Mount Shasta, at from 5000 to 8000 feet in altitude, and around the base of Mount Whitney, also occurring in the very highest portions of the Rocky Mountains, and in parts of the Great Basin south to Arizona ; P. Jeffreyi, by some considered a variety of P. ponderosa,

reaching its maximum development in the Sierra Nevada, and occurring throughout the whole length of that range at high clevations ; P. contorta and P. Murrayana (the latter often con- founded with the former, and by most botanists considered as a variety of it), a common species on the High Sierra at from 8000 to 9000 feet in altitude, extending into Oregon and through the Rocky Mountains south to northern Arizona. Two trees, limited in their occurrence to California, and of great interest on account of their size and beauty, belong to the genus Sequwota,—the red- wood (8. sempervirens) and the big tree (S. gigantea). The red- wood occurs quite close to the coast, in a narrow almost uninter- rupted belt, from a point in the Santa Lucia range about fifty miles south of Monterey to very near the north line of the State. North of Russian river this trce forms an almost unbroken forest, extremely grand in character, individual trees rising to nearly 300

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Passing to the consideration of the western or Cordilleran side, Forest forested, belt of the belt of In this connexion notice will be taken of the dis- the Paci- tribution of the forests of the Rocky Mountains ; for, although the fic coast.

feet in height. The big tree occurs on the western slope of the Sierra in somewhat isolated groves or patches always intermingled with other trees, and not forming forests by itself as the redwood does. Its range is from 36° to a little beyond 38° N. lat., there

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poorly-timbered region of the Rocky Mountains is an extensive Forest, area, including the northern and southern plateaus and the Great of th ‘ Basin, which practically is nearly destitute of trees. The coniferous on species occurring in the Rocky Mountains are found here and Basin,

being nine groves, the largest of which is about thirty miles north- north- east of Visalia, on the tributaries of King’s and Kaweah tivers. The groves

in Mariposa and Calaveras counties are those inost visited by tourists, and in the latter is the tallest of thesc trees, and the tallest tree on the American continent, so far as known (825 feet). Another conifer of much interest from its beauty and its very limited range is the Monterey cypress (Cup- ressus macrocarpa), a species occurring only on Cypress Point, near Monterey. The Port Orford cedar (Chamezxcyparis Law- soniana), a strictly Pacific Coast species, ranging from Coos Bay in Oregon into northern California, is a large and valuable tree, with an odoriferous, highly resinous wood. The white cedar of the Pacific coast (Liboccdrus decurrens, called by some botanists Thuja

there along the moister tracts of the higher ranges in the Great Basin, especially in its eastern and higher portion, but by far the larger part of the slopes and nearly all the valleys are treeless being chiefly occupied by the well-known “sage-brush” (Arte. misia tridentata), which covers many thousands of square miles especially in Nevada and Utah. ‘T’wo trees are, however, very characteristic of the Great Basin, especially of its western portion —the juniper (Juniperus occidentalis) and the pition or nut pine (Pinus monophylia). These two species, usually much dwarfed in size and scrubby in appearance, are almost the only trees of western and central Nevada, where they occur hidden away in the cations, Everywhere in a wide sweep adjacent to the mining districts all this vegetation has been completely cleared away.

giganica) is also a Pacific Coast species, ranging from the Santiam river in Oregon south through the Coast ranges as far as Mount San Bernardino, The Thuja gigantca proper, or red or canoe cedar, is another Pacific Coast range tree; but, unlike the two species last mentioned, it extends its range into the northern

An order of plants peculiarly American, and characterizing in a Vegeta. most marked manner the hot dry region adjacent to the lower tion of Colorado, is that of the Cactacew. The cactus ranges from the the extreme north of the plateau region to the extreme south, but its Southern most abundant and striking development takes place in southern Plateau,

Rocky Mountain region. It is a large tree, which has its maxi- nium development in the Coast ranges of Washington Territory and Oregon.

The deciduous trees of the Sierra Nevada and the Cascade range, as well as of the Pacific Coast ranges from California north to the boundary line, are of comparatively little importance. There are several species of oak, but of little value,—among them being the Coast live oak (Q. agrifolia), the largest and most generally dis- tributed oak in the south-western part of California; the black oak (Q. Kelloggii), ranging along the coast mountains of Oregon, and the most characteristic hardwood tree of the western slope of the Sierra ; and the chestnut oak (Q. denstflora), occurring in the Coast ranges from Oregon to central California. An evergreen tree, very characteristic of the coast ranges of Oregon and Cali- fornia, and very ornamental, is the California laurel (Umbellularia californica), of which the wood is hard and strong, and of a very pleasing light-brown mottled colour. The tree called the mad- rona or madrofio (Arbutus Mcnzicstt) occurs from British Columbia south through the Coast ranges to the Santa Lucia Mountains, and is a very characteristic tree of the region, with its red bark and beautiful glossy foliage. The wood is used in the manufacture of gunpowder, and the bark to some extent in tanning,

In the area included between the two heavily-timbered regions described above, or between the summit of the Sierra Nevada and Cascade range and the western border of the great eastern forest region, the paucity of rainfall corresponds to paucity or almost entire absence of forests over much the larger portion. “We may here distinguish, first, the Rocky Mountain region; then the Great Basin and the plateaus north and south of it; then the ‘‘Plains,” or the nearly level country lying east of the base of the Rocky Mountains; and, finally, the ‘‘ Prairie” region, or that portion of the scantily timbered area which for the most part lies enclosed within the eastern forested belt, and where other causes than the absence of moisture have operated to bring about the growth of a peculiar vegetation.

Nevada, southern California, and in general the region adjacent tothe Mexican boundary line. The so-called prickly pear (Opuntia) is the cactus family which has the widest range, being found from the upper Missouri through the Great Basin to Arizona. It has many species, that which ranges farthest nogth being O. missouri- ensis. The genera Mamillaria, Echinocactus, and Ccrcus are found in various localities in the Great Basin, as well as in southern California, in portions of which region, as well as in

lower Oali- fornia and Arizona, there are large areas where various kinds of cactus form almost the exclusive vegetation, often rising to such a height as to be properly called trees; the loftiest of all is the singularly striking Cereus gigantews. Mingled with them are yuccas (called the ‘‘Spanish bayonet”), mezquites (Algarobia glandulosa), and the creosote bush (Larrca mexicana), which are among the most abundant and characteristic plants of this region.

The vast area extending east from the base of the Rocky Mountains “The

to near the 95th meridian is the district universally known as “the Plains.”

Plains,” and one not at all to be confounded with the ‘ Prairies,” which are almost entirely included within a region of dense forests, and over which the partial absence of trees is due to a cause entirely different from that which has made the plains the home of the grasses and not of trees. The transition from the forested region of the east to the region of the plains is, almost without excep- tion, coincident with the diminution in the precipitation, whic as we proceed westward goes on rapidly, and, on the whole, pretty regularly. Thus Dakota, between 97° and 104° W. long,, is practically destitute of timber, except in its river bottoms and the small territory between the north and south forks of the Cheyenne, the region of the Black Hills. In Minnesota, which lies east of 97°, only the north-eastern portion, especially that adjacent to Lake Superior, is heavily timbered. The south-western corner of the State, embracing about one-third of its area, and the area west of the 96th meridian, are classed in the census report as having less than two cords of wood to the acre. Nebraska and Kansas, still farther south, are almost destitute of forests. In

Forests The Rocky Mountain belt is not destitute of forests, but these | Nebraska only a narrow strip along the Missouri, near the meti- of the are very irregularly scattered over the surface, and the species are | dian of 96°, is given as having from one to two cords of wood per Rocky few in number, chiefly belonging to coniferous genera, and of little | acre. The heavy forest growth of the Mississippi basin just reaches Moun- economic value. The species of conifers have been already men- | the extreme south-eastern corner of Kansas. North of this, and tains. tioned, and their range indicated

in speaking of the forests of the | along the eastern border of the State, there is a belt of from thirty

Sierra Nevada and Cascade range. Few forests in the Rocky Mountains at all compare in density or in the size of the individual trees with those of the Sierra and the Cascade range. What trees there are usually grow most densely in the moist places at the foot of the ranges, where the streams debouch from them, in the ravines and gorges, and on the lower slopes. By far the most common deciduous tree throughout this region is the aspen (Populus tremutoides), often called cottonwood and sometimes poplar, which most commonly springs up, forming dense thickets, throughout the Rocky Mountains, wherever the coniferous forest has becn burned off. It ranges from Newfoundland to Arizona, and is the most widely distributed of North American trees, and highly character- istic of northern and elevated regions. In various portions of the Rocky Mountains there are scattered oaks. The scrub oak (Q. undulata, var. Gambelii) occurs in some quantity on the mountains of southern New Mexico and Arizona, and is also found in Colo- rado and along the Wahsatch range. The black oak (Q. Emoryi), the white oak (Q. grisca), and a few other species are found here and there in the southern part of the Rocky Mountains, as also in Arizona, and ranging south into Mexico. The most denscly forested portions of the Rocky Mountains are the extreme north- ern in north-western Montana, the north-west corner of Wyo- ming, the higher part of Colorado, the eastern slope of the range in New Mexico, and the higher portions of Arizona. –

Enclosed between the deusely-forested Pacifie belt and the

to a hundred miles in width in which there is valuable timber on the borders of the streams. West of 97° W. long, the trees are confined to the immediate banks of the large streams, and are small and of little value. West of 99° we find the typical vegeta- tion of the plains, with only a few small stunted willows and cottonwoods scattered at wide intervals along the streams. The yearly isohyetal of 26 inches forms a limit beyond which arboreal vegetation is almost entirely absent, while in going east there 1s little of value until we reach the belt in which the rainfall is over 32 inches. The same may be said of the Indian Territory an Texas, the bending of the isohyetal curves to the west as we approac the Gulf of Mexico being,

however, as might be expected, accom- panied bya corresponding extension of the forest belt in that direc- tion. Thus, in Texas, the limit of what may be designated as the well-timbered region lies between 96° and 97°, while the line marking the entire disappearance of the forests may be placed somewhere between 99° and 100°, and pretty closely adjacent to the isohyetal of 26 inches. F icie

The French word * prairie," a meadow or grassy plain, Was aoa employed by Hennepin about 1680, in his excellent deseription regio". of the prairies of Illinois. The word has become current m the Mississippi valley, and still farther west. In the nt portion of the Rocky Mountains the sinall grassy areas adjacent to the streams and surrounded by mountains are called " Mie while farther south they are known as "parks," the still smate

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areas being frequently denominated "holes." In general, how- ever, the term prairie is used to designate tracts of land nearly or quite destitute of forests, or over which the trees are, as a general rule, limited to the '' bluffs"—the more or less precipitous slopes which separate the upland, or prairie proper, from the river bottom —which treeless areas occur in the midst of a well-forested country. Illinois is par excellence the Prairie State, and may be considered the centre of the prairie region, the adjacent States, on all sides, having more or less prairic and also areas of dense forest.

All through the prairie region the precipitation is abundant and pretty equally distributed through the year. The vicinity of Chicago, a typical prairie region, comes within the isohyetal of 44 inches and upwards, and the same is true of a part of the treeless region of Iowa. Large areas in the more southern States— Arkansas, Alabama, Mississippi, and Louisiana—are also prairies, portions of which are entirely destitute of forests, while others have small ''clumps"' of trees sparsely scattered over their surface. This is in a region of the largest rainfall, that of 56 inches and upwards. The cause of the absence of trees on the prairies is the physical character of the soil, and especially its exceeding fineness, which is prejudicial to the growth of anything but a superficial vegetation, the smallness of the particles of soil being am insuper- able barrier to the necessary access of air to the roots of a deeply- rooted vegetation. Wherever in the midst of the extraordinarily fine

soil of the prairies coarse or gravelly patches exist, there dense forests occur. ‘Ihe theory that fineness of soil is fatal to tree growth finds its most remarkable support in the fact that in south- castern Russia the limits of the “black earth” and the treeless region are almost exactly identical, and not at all in harmony with the position of the isolyetal lines. The black soil of Russia is an earth of exceeding fineness—so fine indeed that it is with the greatest difficulty that the air can penetrate it so as to oxidize the organic matter which it contains, —the essential cause (in the opinion of the present writer) of its dark colour. The peculiar mode of decay of the organic matter in such fine soils seems analogous to that by which vegetation has been turned into coal or lignite when so buried under detrital material as to greatly impede the access of the air. It is now easy to see why plains are likelicr than mountain slopes to be treeless, it being towards the plains that the finer particles of the material which is abraded from the higher regions are being constantly carried. The more distant the region from the mountains and the broader its area the more likely it is that a considerable portion of it will be covered with fine detritus, whether this be of subaerial origin or deposited at the bottom of the sca. The exceedingly fine soil of the typical prairie region consists, in large part, of the residual matcrial left after the removal, by percolation of the rain and other atmospheric agencies, of the calcareous portion of the undisturbed stratified deposits, chicfly of Paleozoic age, which underlie so large a portion of the Mississippi valley. he finer portions of the formations of more recent age in the Gulf States os also, over considerable areas, remained treeless. There are in various parts of the country beds of lakes which have disappeared in consequence of their very slow filling up with fine sediment, and these are not occupied by the forest, although surrounded by the densest arboreal growth.

The principal use of the forests of the United Statcs is for fuel ; and there is no part of the settled portion of the country where the consumption for this purpose is not of some importance. In the middle and northern Atlantic States coal is the chicf fuel in the cities and large towns, and the almost exclusive fuel of the larger cities on important lines of comniunication, but supple- mented, to a greater or less extent, by wood. But in the country, on the farms, and in the small towns wood is almost exclusively used, except on the coal-fields or in their immediate vicinity. In the coal-producing States of Illinois and Iowa, where forests are limited to certain areas, and in

Nebraska and Kansas, which have coal of inferior quality and where forests are still scarcer than they are in Illinois and Iowa, coal is the dominating fuel. The same is the case in certain parts of Missouri. In all the States south of Virginia and Kentucky wood is almost the exclusive fuel, except in a few of the very largest towns. Wood is also almost exclusively the material of which houses and barns are built over the whole United States, the exceptions being the larger cities (chiefly of brick, with some stone), the business portions of the towns of second rank, and occasional important buildings in towns of the third rank. The other uses of wood are obvious. The following figures given by the census of 1880 relate to the } manufacture of sawn lumber :—establishments, 25,708 ; capital, | $181,186,122; average hands employed, 147,956; feet of lumber } produced, 18,091,356,000; laths, 1,761,788,000; shingles, 5,555,046,000 ; staves, 1,248,226,000; sets headings, 146,523,000; | feet of bobbin and spool stock, 34,076,000 ; total value of specified products, $2380,685,061; value of other products, $2, 682, 668 ; | total value, $233,367,729. The consumption of wood for domestic | fuel is given in 1880 as amounting to 140,537,439 cords, with an estimated value of $306,950,040, and the total consumption of wood as fuel as 145,778,137 cords, valued at $321, 962,373.

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In 1619 the crection of ‘‘works” for smelting the ores of iron Histori- was begun at Falling Creek, near J amestown, Va., and iron appears cal to have becn made in 1620 ; but the enterprise was stopped by a sketch of In 1648 the busi- early ness of smelting and manufacturing iron was again begun at Lynn, mining.

general massacre of the settlers in that region.

Mass., where it was successfully carried on, at least up to 1671, furnishing most of the iron used in the colony. From the middle of the 17th century the smelting of this metal began to be of im- portance in the vicinity of Massachusetts Bay, and by the close of the century there had been a large number of iron-works established in that colony, which, for a century after its settlement, was the chief seat of the iron manufacturé in America, the bog ores, taken from the bottoms of the ponds, being chiefly employed. Early in the 18th century the industry began to extend itself over New England, and into New York and New J ersey, the German bloom- ery or forge being employed for reducing the ore directly to bar iron, and by the middle of that century it had taken a pretty firm hold in the Atlantic States. About 1789 there were fourteen fur- naces and thirty-four forges in operation in Pennsylvania, Before the separation of the colonies from the mother country took place the mannfacture of iron had been extended through all of them, with the possible exception of Georgia. As early as 1718 iron (both pig and bar) began to be sent to Great Britain, the only country to which the export was permitted, the annual amount betwcen 1730 and 1775 varying ordinarily between 2000 and 3000 tons, but im one year (1771) rising to between 7000 and 8000 tons.

So far as known, the first metal, other than iron, mined by the whites within the territory of the United States was eopper.? The first company began work about 1709, at Simsbury, Conn. The ore obtained there and in New Jersey seems to have been mostly shipped to England.

The first mining excitement of the United States dates back to the discovery of gold by the whites in the southern States, along the eastern border of the Appalachian range, in Virginia, and in North and South Carolina. “The existence of gold in that region had been long known to the aboriginal inhabitants, but no atten- tion was paid to this by the whites, until about the beginning of the present century, when nuggets were found, one of which weighed 28 1b, From 1824 the search for gold continued, and by 1829 the business had become important, and was attended with no little excitement. In 1838 and 1834 the amount annually obtained had risen to fully a million of dollars. A rapid devclop- ment of the lead mines of the West, both in Missouri and on the upper Mississippi in the region where Iowa, Wisconsin, and Illinois adjoin one another, took place during the first quarter of the

present century, and as early as 1826 or 1827 the amount of this metal obtained had risen to nearly 10,000 tons a year. By this time the make of iron had also become important, the production for 1828 being estimated at 130,000 tons.

In 1820 the first cargo of anthracite coal was shipped to Phil- adelphia. From 1880 the increase in the production was very rapid, and in 1841 the annual shipments from the Pennsylvania anthracite region had nearly reached 1,000,000 tons, the output of iron at that time being estimated at about 300,000 tons. The develop- ment of the coal and iron interests, and the increasing importance of the gold product of the Appalachian auriferous belt, and also of the lead product of the Mississippi valley, led to a more gcneral and decided interest in geology and mining; and about 1830 geo- logical surveys of several of the Atlantic States were begun, and more systematic explorations for the ores of the metals, as well as for coal, were carried on over all parts of the country then open to settlement. An important step was taken in 1844, when a cession of the region on the south shore of Lake Superior was obtaincd from the Chippeway Indians. Here explorations for copper im- mediately commenced, and for the first time in the United States the business of mining for the metals began to be developed on an extensive scale, with suitable appliances, and with financial success,

1 Throughout this article, by ‘“‘ton” is understood the ton of 2240 ib, unless the contrary is expressly stated.

2 This metal had also been extensively mined in the Lake Superior region long before the first visit of the English.

Mining indus- tries about

1850.

Coal.

An event of still greater importance took place almost immediately after the value of the copper region in question had been fully ascertained. This was the demonstration of the fact that gold existed in large quantities along the western slope of the Sierra

Nevada of California, a region which had just come into the |

possession of the United States. The discovery led to extraordinary excitement throughout the older States, and to an immigration from all parts of the world on an unprecedented scale. The pro- duction of this precious metal rose almost at once to figures far surpassing anything definitely known in history. In five years from the discovery of gold at Coloma on the American river, the yield from the auriferous belt of the Sierra Nevada had risen to an amount estimated at between sixty-five and seventy millions of dollars a year, or five times as much as the total production of this etal throughout the world at the beginning of the century. This rapid development led to a great mining excitement in the eastern States, asa result of which new veins and deposits of various metals were discovered, and many which had been previously worked to a limited extent and then abandoned were again taken up. This ex- citement was at its height in 1852 and 1858, but soon slackened as it began to be shown by the results of actual working that, while “indications ” of the valuable ores of the metals are very abundant in the Appalachian belt, the localities where these ores occur in sufficient abundance to be profitably worked are comparatively few.

The following details show the development of the mineral re- sources of the country at the middle of the present century. In

1850 the shipments of anthracite amounted to nearly 3,500,000 |

tons ; those of Cumberland or semi-bituininous coal were about 200,000 tons. The yearly production of pig iron had risen to between 500,000 and 600,000 tons. The annual yield of gold in the Appalachian belt had fallen off to about $500,000 in value, that of California had risen to $36,000,000, and was rapidly approach- ing the epoch of its culmination (1851-1853). No silver was ob- tained in the country, except what was separated from the native gold, that mined in California containing usually from 8 to 10 per

cent. of the less valuable metal. The ore of mercury had been dis- covered in California before the epoch of the gold excitement, and at New Almaden, about 100 miles south of San Francisco, was being extensively and successfully worked, the yield of this metal in the year 1850-51 being nearly 2,000,000 Ib. At this time the copper mines of Lake Superior were being successfully developed, and nearly 600 tons of metallic copper were produced in 1850. At many points in the Appalachian belt attempts had been made to work niines of copper and lead, but with no cousiderable success. About the middle of the century extensive works were erected at Newark for the manufacture of the oxide of zinc for paint ; about 1100 tons were produced in 1852, The extent and value of the deposits of zinc ore in the Saucon valley, Pennsylvania, had also just become known in 1850. The lead production of the Missouri mines had for some years been nearly stationary, or had declined slightly from its former importance; while that of the upper Mississippi region had, in the years just previous to 1850, risen to from 20,000 to 25,000 tons a year, but was gradually declining, having in 1850 sunk to a little less than 18,000 tons.

Coal.—Coal exists in the United States in large quantity in each of its important varieties,—hard coal, or anthracite ; soft or bi- tuminous coal ; and lignite, or brown coal. Semi-bituminous coal, which stands midway between hard and soft coal, is also an article of importance, being especially well adapted for blacksmiths' use, and also for ocean-going steamers. Geologically, the anthracite, semi-bituminous, and bituminous coals nearly all belong to the same formation, the Carboniferous par excellence. All the coal of the Appalachian region and Central Valley is of this geological age, excepting the small field near Richmond, Va., and two in North Carolina, the Deep River and Dan River fields, which are of Mesozoic age. That of Richmond was the first coal-field worked in the United States; but it is no longer of any importance. The North Carolina Mesozoic areas have never been developed to any extent. All the Cordilleran coal and that at the eastern base of the Roeky Mountains is either Tertiary or belongs to the very uppermost portion of the Cretaceous. Some of it is decidedly lignite, and is so called by the people who use it; but most of it, although of so receut geological age, is called coal, and, in point of fact, does not differ essentially from Paleozoic coal in external appearance. The area underlain by the Coal-measures in the United States is very large.

The areas of the various coal-fields are, in round numbers, as follows :— Rhode Island, 500 square miles ; Appalachian, 59,000 ; Central (Illinois, Indiana, Kentucky), 47,000; Western (Missouri, Towa, Kansas, Arkansas, Texas), 78,000; Michigan, 6700 ; total, 191,200. Of these fields the Appalachian is, and is likely long to remain, by far the most valuable. Those of Rhode Island and Michigan are practically of very little importance. Different portions of the fields are of very different value, as respects quality and quantity of coal, and portions of them do not contain coal-beds of sufficient thickness or of good enough quality to be worked with profit.

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The following table (V1.) shows the amount of coal produced in the several States and Territories (not including the local and colliery consumption), and the value at the mines in 1885 ;—

Tons, Value, Tons. Pennsylvania— $ 3 Anthracite….| 32,265,42] | 72,274,544 || Colorado…....| 1,210,769! 3,051,590 Bituminous ..| 23,214,285 | 24,700,000 || Wyoming…..... 720,828! 2,491 984 TMM OISieesersscere 11,456,493 |, New Mexico….. 271,442 918,606 ODIO, scseteessacccs 8,206,988 || Utah….....- 190,286 426,000 Maryland…..... 3,209,891 || California…..... 63,942 214,845 Missouri…..... 3,850,000 || Oregon…..... 44,643 195.000 West Virginia.. 3,369,062|| Washington.,...| 389,510 950,615 Indianga:....+....< 2hST 250)! MOXAS),.. cccseenee 133,928 300,000 TOW, dacsseeneseses 4,819,230 |} Arkansas…....| 183,928 225,000 Kentucky…..... 2,094,400 || Montana…..... 97,179 302,540 Tennessee;..... 1,100,000 || Dakota…..... 23,214 91,000 Virginia. . 666,792 || Idaho…..... 893 4,000 Kansas… 1,410,438 || Indian Terri- Michigan. 75,000 Os epecoonodendn 446,429 750,000 Alabama. .| 2,225,000} 2,990,000 — —— Georgia…..... 133,929 180,000 TOtalsiewccres 95,832,705 152,915,268 eee |

The amount consumed for local and colliery use would increase the total five or six per cent. Including all the coal thus consumed, the figures for the four years ending 1885 stand as follows, the value at the mine being added

for each year, except that for 1885 the value of the ‘‘commercial coal” only is given:— 1882, 92,219,454 tons, $146,632,581 ; 1883, 102,867,969 tons, $159,494,855 ; 1884, 106,906,295 tons, $148,768,578; 1885, 99,069,216 tons, $152,915, 268.

The Appalachian coal-field does not occupy any portion of the State of New York, but extends from near its southern boundary south-west into Georgia and Alabama:— Pennsylvania, 12,302 square miles; Maryland, 550; Ohio, 10,000; West Virginia, 16,000; Virginia, 1000; Kentucky, 8983; Tennessee, 5100; Georgia, 170 ; Alabama, 55380; total, 59,635 square miles.

Pennsylvania, to which State the anthracite of the country is practically limited, produces more than half the eoal raised in the United States, and about one-eighth of the total yield of the world, the increase during the past five years having been astonishingly rapid. Ohio stands next in importance among the States so situated as to have a portion of this field within their borders,—its yield, however, being only one-eighth of that of Pennsylvania, Mary- land produces about one-third as much as Ohio. The production of the remaining States over which the Appalachian field extends is small as compared with the extent of their areas underlain by coal. In Kentucky and Alabama, however, some progress has been made within the past few years. About three-quarters of the coal mined in the United States is from the Appalachian field. Next in importance to the Appalachian is the Central coal-field, from which Illinois draws its supplies of fuel. The yield of that State is somewhat less than a fifth of that of Pennsylvania, while Indiana produces about one-fifth as much as Illinois. The eoal of the Central field is decidedly inferior to that of the Appalachian, since it contains on the average considerably more ash and more water. The quality of the coal of the Western field is somewhat variable, but on the whole inferior to that of the Illinois field. The region over which it is spread is, however, not well supplied with forests ; and hence the amount annually raised is considerable (nearly 4,000,000 tons for Iowa and 2,500,000 for Missonri). The southern extension of this field through Arkansas and Texas has, as yet, been very little explored or developed. The coal-producing areas of the Cordilleran region are all of comparatively small size, and no one of them is capable of furnishing a large supply for any considerable number of years; but taken

together they are of great value, not only for local consumption, but for supplying the Mexican plateau. The Cordilleran coal (some call it lignite) is all newer than the Carboniferous ; and it is not known that there is any coal at all, either in the Roeky Mountains or farther west, m that portion of the geological series which is the paleontological equivalent of the true ‘‘Carboniferous.” A large part of the Cordilleran coal has a geologieal position close upon the line between the Cretaceous and Tertiary. By some paleontologists it is referred to the one, by some to the other. The quality of this newer coal is very variable: in some localities it is quite good, but 1m general it is decidedly inferior to the average coal of true Carboniferous age ; some portions are distinctly lignitic in character.

While the amount of coal in the United States is large, it is not by any means so much larger than that of England as it has been always inferred to be from the simple consideration of the compara- tive dimensions of the areas over which coal is known to exist the two countries. In the Central and Western fields the a of beds is small, and they are never of great thickness; norls! known how far the total area embraced within the limits usually assigned as that of these fields was really originally underlam continuously by coal-seams, or how much of these seams has Me. removed by erosion. It is only in regard to the anthracite fields that even an approximate statement of the total remaiming ava” able quantity of coal can be made, Mr P. W. Sheafer, a mmmg

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engineer of long experience in that region, has made a statement that the anthracite fields originally contained about 25,000,000, 000 tons of coal. Mr Ashburner, the assistant in charge of the State survey of the anthracite coal district, has stated that, up to 1st January 1883, the total production of that district had amounted to 509,333,695 tons. He also estimates that two-thirds of the coal actually attacked had been lost in the mining. Making allowance for increased consumption and other considerations, it would appear that 200 years must be taken as the maximum time during which the anthracite fields will hold out, while it is prob- able that they will be practically exhansted considerably earlier. As regards the quantity of available coal in any portion of the bituminons coal-fields of the country,

the only estimate we have is that of Prof. Lesley, who (February 1886) estimates the amount of available coal in the Pittsburgh seam at 5,000,000,000 tons, but confesses that any exact calculation is impossible. If the consumption remains at the figure at whieh it stood in 1884 (11,000,000 tons), this quantity will last about 450 years. Petrolewm.—The oil-produeing districts of present or past im- portance are nearly all in Pennsylvania; but there are small pro- ductive areas in the adjacent portions of New York. (1) The Allegany district, including the Richburg and several small outly- ing pools in Allegany county, New York, has a productive area of 31 square miles, and up to January 1885 produced 15,000,000 barrels. (2) The Bradford district, embracing the oil-pools in central and northern M‘Kean county, Pa., and southern Cattaraugus county, N.Y., has a productive area of 138 square miles, 121 of which are included in the Bradford field proper. The geological position of the oil-bearing strata is indicated by the fact that the uppermost oil-sand is, at Bradford, 1775 feet below the bottom of the lower member of the millstone grit, or Pottsville conglomerate, which in western Pennsylvania is one of the most persistent and best-recognized geological horizons, and is there known as the Olean conglomerate. This district had up to January 1885 pro- duced 109,000,000 barrels of oil. (3)The Warren district lies in eastern Warren and north-eastern Forest counties, Pa. ; it has an area of 35 square miles, and up to January 1885 had produced 12,000,000 barrels. The oils from different subdivisions of this district vary considerably in colour and gravity, although gener- ally spoken of as “amber oils.” They come from “sands” (sand rocks) of varying geological horizons, from 1100 to 1850 feet below the Olean conglomerate. (4) The Venango distriet—the scene of all the earlier oil developments—has an area of 65 square miles, and includes forty distinct and well-recognized oil-pools, the largest of which lies between Oil City on the south and Pleasantville on the north, and covers an area of 28 square miles. The production of this district up to January 1885 had been about 55,000,000 barrels. The oil of the Venango district comes from three principal sand beds, of which the uppermost one lics about 450 feet below the base of the Olean conglomerate. They arc all contained within an interval of 350 feet. The oils are generally green, but frequently black, and sometimes amber. The pebbles of the sand rocks are water-worn, sometimes as large as hazel-nuts, loosely cemented together and bedded in fine sand ; but the sands are not so regular or homogeneous as in the Bradford and

Allegany fields; conse- quently, the risk of obtaining unproductive holes and variable wells has always been greater in the Venango than in the Bradford and Allegany districts. (5) The Butler district includes the oil-pools in Butler and Clarion counties and in south-eastern Venango eounty. The area is 84 square miles, and up to January 1885 the production had been about 69,000,000 barrels. The oil here comes from the same group of sand rocks as in the Venango district. (6) The Beaver district includes the two principal oil-pools known as Slippery Rock and Sinith's Ferry, having an area of about 16 square miles, with a production of 1,000,000 barrels up to J anuary 1885, In both the oil-pools of the Beaver district heavy oil is obtained from the representative of the Pottsville conglomerate, and amber oi] from the Berea grit, a member of the Sub-Carbonifer- ous series. The geological position of all the other oil-fields is con- sidered by the geologists of the Pennsylvania Survey as Devonian. The total area of the productive oil areas is given by Messrs Carll and Ashburner at 369 square miles, and the general boundaries of the oil-regions of Pennsylvania are now regarded as established. That production is declining is shown by the following figures. In July 1888 the number of producing wells was 17,100, and the average daily product per well was 3°8 barrels ; in 1884 the corre- sponding figures were 21,844 and 3:0, and in 1885 they were 22,524 and 2°5. Since July 1882, when the maximum average daily pro- duction for any one month was realized (105,102 barrels), there has been an irregular but steady decline. In 1884 the shipments of petroleum were more than 1,000,000 barrels in excess of the pro- duction. At the end of August 1884 the stock of oil on hand had reached its maximum, 39,084,561 barrels; in September 1885 it had declined to 35,348,771 barrels. The price of petroleum had "1 'The substance of the following paragraph is mainly derived from a paper

read by Mr C. A. Ashburner, of the Pennsylvania Geological Survey, at a meet- ing of the American Institute of Mining Engineers in September 1885.

not, up to July 1885, been influenced by this condition of things crude oil being at that time worth 92% cents a barrel, 134 cents less than the average price for 1884, The extraordinary fluctuations in the price of petroleam during 1880 to 1886 are shown by the following figures :—in 1880 it ranged from 1242 to 70% cents per barre] for crude oi] ; in 1881 from 1004 to 72; in 1882 from 135 to 494 ; in 1883 from 125 to 842%; in 1884 from 115# to 51; in 1885 from 1118 to 68 ; in 1886 from 924 to 59%. These figures, however have but little reference to changed conditions of production. The fluctuations are simply the result of a colossal system of gambling, the magnitude of which may be inferred from the statement that the “clearances” on the ‘consolidated stock and petroleum ex- change” for 1886 amounted to about 2,275,000,000 barrels. The daily average exports of petroleum for that year are given at about 44,300 barrels. The tendency to lower prices in 1886 was due in part to the remarkable yield of the oil-wells at Baku, on the Caspian a in part to diseoveries, supposed to be of importance, in Ohio,

Natural Gas.—The use of natural gas for illumination, and even Natural for metallurgical purposes, has lately become a matter of importance. gas,

The existence of outflows or springs of gas in the region west of the Alleghany range has been long known, and the gas obtained from wells or bore-holes was used for illumination in Fredonia, N.Y., as early as 1821. One well after another was bored for this purpose at that place, until, in 1880, the supply had reached the amount of 110,000 cubic feet per month. The following figures, reported by T. P. Roberts, show the estimated value of the coal displaced by natural gas in the region where this source of heat and light was in use for the years mentioned :— 1882. Pittsburgh region, $75,000; elsewhere, $140,000; total, $215,000

1883, . 200,000; 275,000; ,, 475,000

1884, a0 1,100,000; of 360,000; ,, 1,460,000 Gas seems to be a general concomitant of the oil all through the petroleum region, but for a long time the outflow of gas from the oil-wells was looked upon as a nuisance. According to Mr Ash- burner,” the amount of gas at present flowing from the explored sands of Pennsylvania is probably two or three times greater than is required to meet all present demands. The same aut ority gives an

account of the development of the natural gas resources of Ohio. Their amount is not yet ascertained with any degree of certainty, but it seems likely to be large. All the gas comes from the Paleozoic strata, from the Upper Coal-measures down to the Trenton lime- stone,—the most prolific gas-bearing rocks being the Berea grit in the Sub-Carboniferous and the Trenton limestone of Lower Silurian age. Natural gas has been obtained in numerous localities in New York, but nowhere in considerable quantity except in the vicinity of the Allegany oil-district, in the county of that name. Portions

of West Virginia, especially the Kanawha valley, give promise of being regions of large production.

Iron and Stecl.—The following table (VII.) will convey an idea Iron. of the condition of the iron industry at the date of the last census, and of the progress made during the ten preceding years :—

No. of Amount of Weight of Establish- Capital ere 2 Products ments. invested. ee in Tons,

1870 1880

Increase per cent……..

808 1005

24°38

$121,772,074 230,971,884

89°68

$207,208,696 296,557,685

43°12

3,245,720 6,486,730

98°76

The ‘ weight of products,” as given above, includes the products of all the various processes or operations ; hence there is evidently a certain amount of duplication (rolled iron, for instance, being mainly produced from pig). The following table (VIII.) gives the production in each branch of the steel and iron industries :—

1870. 1880.

Pig iron and castings from furnace ….| 1,832,876 tons. 3,375,901 tons. All products of iron rolling mills…... 1,287,347 ,, 2,101,114 ,, Bessemer steel finished products …... 17,324 ,, 794,550 ,, Open-hearth steel finished products…. Ome §3,163 ,, Crucible steel finished products …... 25,061 ,, 62,784 ,, Blister and other steel …..... 2,040 ,, 4,424 ,, Products of forges and bloomeries …. DGI935) 4) 64,784 ,,

The distribution of the iron industry is extremely irregular. West of the Mississippi, with the exception of the angle between that river and the Missouri adjacent to St Louis, the amount of iron made is very small. The percentage of total production in 1880 was distributed as follows :— Pennsylvania, 50; Ohio, 13; New York, 8; Illinois, 6 ; New Jersey, 3; Wisconsin, W. Virginia, Michigan, and Massachusetts, each nearly 2; Missouri, Kentucky, and Maryland, between 1°5 and 2; Indiana and Tennessee, about 1; all the other States and Territories, an aggregate of about 4 per cent. New England now makes but little pig iron, and the South scarcely any rolled iron; the West has largely embarked in the manufacture of steel by the Bessemer process, while New York has not a single Bessemer establishment ; New York manufactures chiefly

2 Paper read before the American Institute of Mining Engineers, Oct. 1886.

from ore, and Pennsylvania from pig and scrap iron; Michigan is the leading producer of charcoal pig iron, and now makes no other kind; only five States make Bessemer steel; and two States, Penn- sylvania and New Jersey, produce nearly all the crucible steel.

The census year 1880 was one of exceptional prosperity for the iron and steel industries of the country. The production of pig iron and of Bessemer steel ingots and rails since 1880 is shown in the following table (IX.), from the statistics collected by the American Iron and Steel Association :—

1884. | 1885, 4,097,868 4,024,526]5,688,929 1,375,317 1,519,426|2.269,190

996,465 959.470)1,562/409

1886.

1881. 1882,

1883,

ISS fe NREFS| epanonoeneonaueneoo 4,144,253 4,623,323 4,595,510, Bessemer steel ingots../1,374,2 47 1,514,687 1,477,345 Bessemer steel] rails. ...|1,187,769 1,284,066)1,148,709

The total number of completed Bessemer steel works at the close of 1886 was 33, with 69 converters. Pennsylvania in that year made 59 per cent. of the ingots produced, Illinois 21, and other States 20. In the following table (X.) the amount of steel of all kinds produced is given (in tons) for the years stated :—

Bessemer {Open-Hearth| Crucible All other Total. Steel Ingots. | Steel Ingots, | Steel Ingots, Steel. 1870 37,500 ea9 31,250 70,089

1875 335, 283 8,080 35,179 11, 256 389,799

1880 | 1,074,261 | 100,850 64,664 7,558 NU Bye 1885 | 1,519,430 | 138,875 | 57,599 | 1,514 | 1,711,919 1886 | 2,269,190 | 218,973 (lel 2,366 2,562,502

By far the largest production of iron ore in the United States is from the rocks which lie below the Lower Silurian—the Azoic series of Foster and Whitney and the Archean of Dana. In this formation the ore occurs in immense quantity—in what may without exaggeration be called mountain

masses, which in many cases exhibit all the evidences of an eruptive origin, as in the case of the Iron Mountain of Missouri, or in some of the localities in the Marquette and Menomineo regions of Lake Superior. At the first-ineutioned locality the ore is intimately associated with an undoubted eruptive rock, with which it is intermingled in such a manner as to show that the two—ore and rovkk—inust have had one and the samo origin. A similar condition of things is revealed on Lake Superior, where the ore oceurs in repeated interlaminations between sheets of unquestionably eruptive material. The ores thus occurring are hematite or specular ore and magnetite, with some hydrated oxide, or limonite, the result of the action of water on the previously formed hematite. They are in general extraordinarily free from deleterious ingredients, especially phosphorus and sulphur, although usually containing a small amount of silica. The purity of these ores is a strong indication of their origin differing from that of ordinary sedimentary deposits. Many of the analyses of Lake Superior ore show the presence of only a few hundredths of one per cent. of phosphorus. The most important district in which these ores occur is the south shore of Lake Superior, and the most im- portant port of shipment is Marquette, a considerable amount being also shipped from Escanaba on Lake Michigan. From 1856 to 1886 the total shipments of iron ore from the region amounted to 31,030,160 tons. A district known as the Vermilion Lake iron district, in whieh the ore has similar characters, and where the quantity is believed to be very large, has been recently opened in Minnesota, on the north shore of Lake Superior. The Iron Mountain region, a little less than a hundred miles south of Saint Louis, although small, is of considerable importance. A very large portion of the Lake Superior ores goes to the Appalachian coal-field to be smelted ; and this was formerly the case with the Iron Moun- tain ore, but the latter is now used in nearer localities. There is a very important and apparently inexhaustible deposit in Lebanon county, Pennsylvania ; the ore is chiefly magnetite, and its mode of occurrence in close connexion with an eruptive rock is to the present writer strong, if not absolutely convincing, evidence of its igneous origin. There are important deposits of iron ore, on the eastern border of New York, especially in the Adirondacks, and along the Hudson River. The geological position in which a por- tion of these ores occurs is certainly the same as that of the ores of Lake Superior—namely, the Azoic. That is the character of the Adirondack ores, which have long been and still are extensively worked. The loealities

are chiefly in Clinton, Essex, and Franklin counties. Inthe last-named county are the very extensive Chateau- gay mines, The ores of this region are chiefly magnetite, but they often contain too much phosphorus to be used in the manufacture of steel. There are important oceurrences of magnetic ore near New York city and also near the Hudson river, in Orange, Roek- land, Putnam, and Columbia counties. Some of these ores are adapted to the manufacture of Bessemer stecl. The mode of occur- rence of the ores in southern New York and northern New Jersey is peculiar; they are not so distinctly eruptive as are the ores of Missouri and Lake Superior. One authority regards the New Jersey ores as unquestionably of sedimentary origin. This New Jersey

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district is not in a flourishing condition at present, since the ores as a rule, are not adapted to the manufacture of Bessemer steel. Similar ores oceur at many points, and often in large quantity, in the Azoie or erystalline belt of the Appalachian system, in the States lying farther south than New Jersey. In Mitchell county, North Carolina, is a deposit known as the Cranberry Bank, of which the quality is excellent, and the quantity is believed to be very great. Up to the present time, however, but little of this ore has been shipped. Next to the Azoic ores in importance, but decidedly in- ferior in quality, are those of the Clinton group, a member of the Upper Silurian series. The ore occurring in this geological position is known by various names, the most common ones being fossil or dyestone ore. It isa red hematite, not crystalline like the specular variety of the peroxide, but usually in a more or less granular or concretionary form, that of flattened grains resembling flax seed being a common mode of oceurrence, whence the name “ flax-seed ore.” This deposit occurs at many points along the outcrop of the Clinton group all the way around from Wisconsin, through Canada and New York, into Pennsylvania, and down the eastern slope of the Appalachian range to Georgia, and is said to be the most extensive deposit of iron ore in the world yet discovered. ‘The fossil ore, though large in quantity, contains too much phosphorus to be used for making steel in the ordinary method; but, being in places favourably situated with regard to fuel, and yielding as it doesa satisfactory quality of cast iron, it is quite extensively mined at various points. Next to the Clinton ore in importance

comes the brown hematite ore (limonite), which occurs in numerous localities, but of which the most extensive deposits are those occurring in the Lower Silurian limestones of the Appalachian system, and especially along the line of the Great Valley. Some of the ores are of excellent quality, notably those of Litchfield county, Connecticut, in the so-called Salisbury district. The iron made in charcoal furnaces in this region is considered as being of the highest value for articles in whieh strength and toughness are essential. Carbonate of iron, in the form of spathie iron, is of rare occurrence. The argillaceous carbonates (clay ironstone) are also of comparatively little import- ance, although used to some extent, especially as mixed with other ores, in western Pennsylvania and Ohio. ‘The coal-fields west of the Appalachians are very poorly supplied with iron ores. Black- band ore is also of somewhat rare and limited occurrence in the United States.

In spite of the abundance of iron ore in the United States and the existence of a heavy protective duty (75 cents per ton), a large quantity of ore is imported from abroad—chiefly from Spain, Elba, Algiers, and Cuba (1,039,433 tons valued at $1,912,437 in 1886). Almost all this was used in Pennsylvania, and chiefly in the manufacture of Bessemer pig iron and spiegeleisen. Up to 1884, at least, no pig iron suitable for the manufacture of Bessemer steel by any process now in use in the United States had ever been made south of the Potomae or south of Wheeling. Neither has iron suitable for crucible steel been made in the United States which can compete with that of Sweden.

The annexed table (XI.), published by Mr Swank, shows the pro- duction of iron ore in tons in the leading ore-producing districts for the years 1884, 1885, and 1886 :—

(STATISTICS,

1885, 1886,

3,258,174 304,396 379,776 688, 054 500,501 214,800

Lake Superior (Miehigan and Wisconsin)..... Vermilion Lake (Minnesota).

Missouri

Cornwall (Pennsylvania).

New Jerscy

2,231,064 225,484 169,162 508,964 330,000 143,278

9,455,924 24

Port Henry (New York)

Other Lake Champlain mines (New York)

Hudson River Ore and Iron Company (New Dov) Ea.capesenncos5

Tilly Foster (New York).

Forest of Dean (New York)

Salisbury region (Connecticut)...

Cranberry (North Carolina)

Tennessee Coal, Iron, and Railroad Com- pany’s Inman mines (Tennessee).....

235,799

90,000 35,964 20,370 25,000

3,998

55,000

70,757

Gold and Silver.—The washing of the high or Tertiary gravels Gold and by the hydraulic process and the working of mines in the solid rock silver

did not, on the whole, compensate for the diminished yield of the ordinary placer and river diggings, so that the produce of gold m California continued to fall off, and by 1860 had decreased to about half what it had been ten years before. Discoveries in other Cordilleran Territories, notably in Montana and Idaho, made up, however, in part for the deficiency of California, so that in 1860 the total amount of gold produced in the United States was estimated at not less than $45,000,000. In the latter part of the decade 1850-59 the Territories adjacent to California on the east, north, and south were overrun by thousands of miners from the Sierra Nevada gold-fields, and within a few years an extraordinary num- ber of discoveries were made, some of which proved to be of great

MINERALS. |

UNTPED

importanee.

of that name).

Lord, run from $304,752,171°54 to $306,181, 251°05.

ores contains about an equal amount in valne of silver and gold.

The mines on this lode thus added to the bullion stock of the world $100,000,000 more in eighteen years than the whole Freiberg

district in Saxony had furnished in a little over 700 years (1168-

1875).

in part and of a segregated vein in part. The gangue is quartz,

very irregularly distributed in bodies often of great size, and for

the most part nearly or quite barren of ore. The metalliferous portions of the lode, ‘‘bonanzas,” as they are here generally called, are usually of great size, but extremely irregular in their position. Their number has been about twenty, most of them lying near the surface ; but the last important one

discovered was struck at a little over 1000 feet below the surface. to Mr Church—about 700 feet in length, by 500 deep, and 90 wide ; the average yield $93‘55 per ton ; and the total value of the bullion obtained from it $104,007,653. The mines on this lode have been

worked to a greater depth than any mines in the world extending

over an equal amount of ground. Up to October 1886 work was still being carried on at several points below the depth of 3000 feet. The lower levels, below that of the Sutro tunnel, which intersects the lode at a point about 2000 feet below its outcrop, are now aban- doned. Weseines are still going on, however, above the great adit level, where there yet remain considerable bodies of low grade ore, which can perhaps be extracted with moderate profit, since more economical methods have been introduced both in Inining and milling, The yield of the Comstock lode at present, although small as compared with that of its prosperous years, is still much larger than that of all the mines in the Freiberg district of Saxony.

The success of the Comstock lode workings led to the active exploration of the whole adjacent region, with the result that a great number of localities were discovered where auriferous and argentiferous ores occur, and some of these have been extensively wrought and have produced largely. In very few, however, do the ore deposits bear the distinguishing characters of true or fissure veins. Special mention may be made of the Meadow Valley and Raymond and Ely mines in Lincoln county. The first-named mine is in Pioche, 273 miles south of Palisadé station on the Central Pacific Railroad ; the enclosing rock is quartzite of Lower Silurian age, the veins varying in width, but averaging from 2 to 2% feet, the ore being carbonate of lead near the surface with chloride of silver, passing into sulphurets, as usual, in going down. At the end of 1873 this mine was 1100 feet deep, and a large body of ore had been struck yielding $300 in value of silver per ton. The cul-

minating years of the prosperity of these mines were 1872 and 1878, |

and the yield of the Ely district for those years respectively was $5,321,007 and $3,735,596. The Eureka district in the central part of Nevada is of importance on aceount of the magnitude of its yield, and because mining

and smelting operations have been carried on uninterruptedly since 1869, thus affording great facilities for scientific investigations. Its ores are chiefly galena, accom- panied by the various oxidized combinations resulting from its de- eomposition. Similar orcs of zinc are also present, but in mueh smaller quantity. These ores are rich in gold and silver (average—15 per cent. lead, 0°079 silver, and 0:00248 gold). The rocks in which they occur are chiefly limestones, and of Lower Silurian age; the deposits are very irregular in form. Tn many of their features they closely resemble the so-called pipe-veins of the North of Eng- land lead mines. Much of the ore has beeome deeomposed, and has been subjected, since decomposition, to a rearrangement by water, analogous to stratification. The total yield of the Eureka district from 1869 to 1883 is stated at about $60,000,000 in value of gold and silver, and about 225,000 tons of lead. According to

j present indications, this district is approaching exliaustion.

The most powerful impulse to mining operations, and the immediate cause of a somewhat lengthy period of wild excite- ment and speculation was the discovery and successful opening of the Comstock lode in 1859, in the western part of what is now the State of Nevada, but was then part of the Territory of Utah, and known as the ‘‘ Washoe Country ” (from a small tribe of Indians The locality of the lode, where there soon grew up a large town called Virginia City, is about 20 miles cast of the boundary of California, and nearly due east of the northern end of Lake Tahoe. As early as August 1860 two mills were at work stamp- ing and amalgamating the ore from the lode ; mining had begun on a large scale; and many ingenious metallurgists were en- deavouring to ascertain experimentally how the somewhat com- plex metalliferous combinations there occurring could be best and most economically treated. So far as quantity of bullion produeed is concerned, these operations were eminently successful. The various estimates of the total yield of the lode from the time of its discovery to 30th June 1880, collected and published by Mr Eliot The total production to the end of 1886 may be estimated as having been not far from $320,000,000. The bullion obtained from the nilling of the

The lode is an ore channel of great dimensions, included within volcanic rocks of Tertiary age, which themselves have broken through pre-existing

strata of Triassie age. It exhibits some of the features of a fissure vein, combined with those of a contact deposit

Its dimensions were—according

oT £8 815

Utah has important mines resembling to a considerable extent those at Eureka. he Hornsilver mine at Frisco, in southern Utah, is a large contact deposit, 30 to 50 feet wide, between dolomitic limestone and an eruptive rock called rhyolite or trachyte. The ores are sulphate of lead with some carbonate, associated with heavy spar, which occurs chiefly near the wall of eruptive rock. This mine has paid $4,000,000 in dividends, but none since 1884, The Little Cottonwood district, at a height of over 10,000 feet in the Wahsatch range, shows a record of about 3500 *‘locations” made within an area 24 miles square. It includes the famous Emina mine, where a large body of ore oecurred occupying an egg- shaped cavity in the Carboniferous limestone, which yielded largely (over $2, 500,000) ; but it was soon worked out. ~The Flagstaff mine in the same cajion, a “ pipe-vein” or deposit occupying several regular cave-like openings in the limestone, seems also to have been nearly or quite worked out. One of the largest and most pro- ductive mines in the country, and the most important one in Utah, is the Ontario, in the Uintah district, Summit county. The vein seems to be, in the lower levels at least, a contact mass between walls of quartzite and highly deeomposed eruptive rock (called porphyry), and it varies in width from a few inches to 15 feet. It was discovered in 1872, has been worked by a company with $15,000,000 capital since 1877, and up to February 1887 had paid $8,075,000 in dividends. The Silver Reef district in Washington county is a region of remarkable interest, where sandstones of Triassic age have been broken through and invaded by eruptive masses (andesites and trachytes), and where the ore, according to Prof. Reyer, occurs in flat masses and impregnations between the strata, adjacent to the cruptive rock, and is especially largely developed in contact with the remains of plants with which the rock is filled. The ores are carbonate of copper with chloride of silver, passing into the sulphuret at depths. According to the same authority, these mines produced a few years ago over a million of dollars a year; but they have much fallen off of late. The census report of 1880 gives

the total product of the district up to Ist June 1880 at a little over $8,250,000,

The metalliferous deposits of Colorado are important from their magnitude and variety.! Of the actual precious metal production, by far the largest portion is derived from pyrites and galena and their decomposition products. The telluride ores of Boulder county and the auriferous pyrites of Gilpin county, with a few individual deposits in the southern portion of the State, constitute the source from which it is derived, With these exceptions its mineral deposits may be considered as essentially silver-bearing. The principal souree of silver is argentiferous galena and its decom- position products, while argentiferous grey copper or freibergite is, next to this, the most important silver-bearing mineral. The sulphides of silver also occur, and in some cases bismuth is found in sufficient quantity to constitute an ore. As yet, so far as known, no copper is extracted except as an adjunct in the reduction of silver-bearing copper ores. Placer deposits are generally confined to the valley bottoms among high mountain ridges ; their present yield is relatively inconsiderable. Before the silver ores of Lead- ville were discovered, mining in Colorado was principally confined

, to approximately vertical veins in the Archean rocks of the

Front range or in the eruptive rocks of the San Juan region ; but since the limestone deposits of the Mosquito range have proved so exceptionally rich attention has been more and more turned to the ores in sedimentary rocks, and many new districts have been discovered, but none to rival that of Leadville. The Leadville ores are flat sheets, of the kind often designated in the Cordilleran mining regions as ‘‘blanket deposits,” and appear to be contact deposits between the Carboniferous limestone and the overlying felsite, with additional or incidental ore accumulations in the lime. stone in irregular cavities. According to reports locally published the product of the Leadville ‘‘smelters” or smelting works in 1886 was—lead, 51,925,546 th; silver, 4,569,013 oz.; gold, 22,504 oz.; total value, $7,515,148. From the mode of occurrence of the Leadville deposits it seems probable that they will within a few years become practically exhausted. The area over which the blue limestone of Emmons (dolomite of Rolker) has been found in places productive is, however, very large, having been estimated at

225,000,000 square feet. The Montana deposits, which up to 1880 are reported to have yielded fully $50,000,000, seem now to have been pretty much worked out. The workings from which the ores are now chicfly obtained appear to be of the class of segregated veins, The ores consist largely of auriferous pyrites in a gangue of quartz, oxidized in their upper portions and there easily manipulated, but in depth passing into the more refractory sul- phurets. Unlike the ores described as occurring in Colorado and Utah, they are accompanied by copper rather than by lead, and they are also rather manganiferous than ferriferous. Much yet remains to be done before their nature and value can be fully understood ; and the same may be said of the adjacent Territory of Idaho, tle auriferous gravels of which resemble those of Montana, and have been next to those of California and Montana in inport- 1 See Census Report for 1880 (1885).

Mercury.

Tin.

Copper.

ance (total yield to date estimated at $30,000,000). The deep gravels of Boisé basin seem to be exceptional, and to resemble the deep or high gravels of California. A very large portion of the mines (other than placer) of Idaho appear to be of the fissure class, and to be enclosed in a country rock of granite, resembling in many respects the veins of the vicinity of Austin in Nevada. In Arizona, which ranks along with Idaho in the production of the precious metals, and is next to Michigan and Montana as a producer of copper, the mode of occurrence of the metalliferous deposits is com- plicated and varied, and is still very imperfectly known. They appear to be largely of the nature of contact deposits, dependent on the presence of some ancient or modern eruptive mass. The famous Tombstone district, in Pima county, has been a productive one, but seems at present to be declining.

TaBLE XII.—Gold and Silver Production of the Different States and Territories for 1885 (in Thousands of Dollars).

Gold. | Silver. | Total. Gold. | Silver.| Total. Alaska srsces+> 300 2 302 || North Carolina 152 3 155 AMI7OM A eercce sss. 880 | 3,800] 4,680 }) Oregon…..... 800 10 810 California…... 12,700 | 3,500 | 15,200 |) South Carolina 43 noe 43 Colorado…....| 4,200 | 15,800 | 20,000 || Utah…..... 180} 6,750] 6,930 Dakota…...00 3,200 100] 8,300 || Washington … 120 70 190 Georgia…..... 136 500 136 || Other States GEV semesneneon0 1,800 | 3,500| 5,300 || and Territories 90 5 95 Montana,,..... 3,300 | 10,060 | 13,860 _——— ee Nevada…....| 8,100 | 6,000} 9,100 Total…....] 31,801 | 51,600 | 83,401 New Mexico…| 800] 3,000} 3,800

The production of gold in the United States for each of the seven years 1880-86 inclusive is estimated (in nuillions of dollars) as— 36, 34.7, 32.5, 30, 30.8, 31.8, 35. Similarly the coining value of the silver produced during the same years is returned as—329.2, 43, 46.8, 46.2, 48.8, 51.6, 51. The commercial value of silver has, however, of late been considerably less than the coining value— 42, 42.5, and 39.4 in 1884-85-86.

All the quicksilver produced in the United States comes from California, although small quantities of the ores of this metal have been obtained at various points in Colorado, and also in New Mexico. A little mercury has also been produced in Oregon. The Californian mines are all in the Coast ranges, in rocks of Cretaceous age. Small veins of quartz containing a little cinnabar have been found in the Sierra Nevada; but this ore is not known to exist anywhere in that range in workable quantity. The mer- curial ores of the Coast ranges occur in very irregular deposits, in the form of strings and bunches, disseminated through a highly metamorphosed silicious rock. The first locality where this metal was successfully mined was New Almaden, about 100 miles south of San Francisco. Another locality—New Idria—about 100 miles still farther south, has also been productive, but in a less degree. Mercury ores have also been mined at several points north of San Francisco, in the neighbourhood of Clear Lake, where they occur, not only in metamorphic Cretaceous strata resembling those of New Almaden, but also in recent volcanic rocks, where gold has sometimes been found in intimate association with the cinna- bar. The New Almaden mine has been productive since 1850, but the yield has varied greatly from year to year, partly on account of the irregularity of the mode of occurrence, and partly on account of interference on the part of the United States based on a

question of title to the property. The most productive year was 1876, when the number of flasks (of 764 Tb) obtained was 47,194. The number produced in 1880 was 23,465, and in 1886 18,000. The total pro- duce of the Californian mines was 59,926 flasks in 1880, 60,851 in 1881, 52,732 in 1882, 46,725 in 1883, 31,913 in 1884, 32,073 in 1885, and 29,981 in 1886. No new discoveries of localities of im- portance have been made during the past few years, and the mines now worked in California are all in a depressed condition.

Tin has been discovered in numerous localities, and various attempts have been made to open mines—in Maine, New Hamp- shire, Virginia, Alabama —but hitherto the amount of the metal produced has been quite insignificant. The region from which most has been expected is the Black Hills of Dakota, about 20 miles south-west of Rapid City. The occurrence of the tin ore and the associated minerals at the mine to which the name of Etta has been given is very similar to that of the ores in the Erzgebirge. The cassiterite is disseminated through a granitic or granitoid rock in irregular bunches, strings, and even masses, associated with the usual minerals. There has not hitherto been any production of commercial importance from this source.

The present sources of copper are almost exclusively the Lake Superior region, and the Territories of Montana and Arizona. The mines of Lake Superior are the only important mines in the world in which the metal is exclusively obtained in the native state. The mode of occurrence of the copper varies, however, considerably in different portions of the mining district, which extends from Point Keweenaw along the southern shore of the lake to a little beyond the Ontonagon river. The most productive mines at pre- sent are those in the vicinity of Portage Lake, about half-way

between the eastern and western extremities of the cupriferous range. The rock in which the metal occurs is an old basalt, much metamorphosed from its original condition, and in the form uiow generally called melaphyre. This belt, commonly known in the region as the ‘‘ trap range,” is a volcanic material, interbedded in numerous alternating layers with sandstone and conglomerate, equivalent geologically to the Potsdam sandstone of the New

York Survey or the Primordial of Barrande. The metal occurs along nearly the whole extent of Keweenaw Point in veins crossing the formation, and having all the characters of true fissure veins, the gangue being a mixture of quartz and calcite with various zeolitic minerals. Copper in large masses has been found in various mines on Lake Superior, but in none of such great dimensions as at the Minnesota mine, near the Ontonagon river. The largest masg discovered here weighed about 500 tons. Its length was 46 feet, its breadth 184, and its maximum thickness 8§. While a consider- able amount of copper has been obtained on Lake Superior in large masses, and lumps too small to be shipped separately, and therefore put in barrels and called ‘‘ barrel-work,” much the larger portion occurs in small grains, scales, and strings, disseminated through the rock. For crushing rock of this character a new form of stamp known as the Ball stamp was invented, one head of which is cap- able of crushing from 220 to 250 tons of rock in twenty-four hours, The most interesting mine on Lake Superior, and indeed the largest and most important—not being an open-work—in the world, is that of the Calumet and Heela Company. The mode of occurrence of the copper, which is all in the metallic form, and like that of the other Lake Superior mines almost chemically pure, is peculiar, The cupriferous mass is a bed of eruptive material, interstratified with other masses of similar origin, but itself a conglomerate made up chiefly of more or less rounded pebbles of eruptive rock—rhyo- lite, trachyte, and basalt—cemented together by native copper. The Calumet and Hecla mines, which form one connected work, have been opened over a length of about 1# miles, and to a depth, on the inclination of the metalliferous bed, which is about 39°, of about 3300 feet. The number of men employed is about 2800, and the production for 1886 was 22,552 tons (the total amount since 1866 being 201,529 tons).

The copper mines of Montana are chiefly in the vicinity of Butte City. The really important operations seem to be pretty closely limited to an area only 23 miles long by 1 mile wide, within which are three important silver mines, as well as the copper mines which make the district so famous. There are two great classes of mineral occurrences, —cupriferous veins, carrying more or less silver, and silver veins, with a manganese gangue, which carry little or no copper. These two groups have certain features in common. They all occur in granite, and are all accompanied by zones of decomposed country rock, which run parallel to and usually form the walls

of all the large copper veins that have been opened to any great depths, and which are called porphyry dikes by the miners, but are really granite altered by the chemical changes which have accompanied the formation of the lode. They all pitch vertically or nearly so, and lack entirely the well-defined walls and the selvages which are characteristic of fissure veins. The cupriferous veins appear on the surface as wide bands of quartzose rock, much de- composed and stained with gossan. The surface ore always carries silver, is almost entirely in a free-milling condition, and generally in paying quantity. Nearly all the lodes at present worked for copper were at first worked for silver, and this condition continued until the water-line was reached, when the base ores—mainly the ordinary sulphuretted combinations of copper and of copper and iron, especially copper glance or vitreous copper and erubescite or variegated, peacock, and horseflesh ore—set in. The veins are of great size, being often thirty feet wide for several hundred feet in length. The average width of pay ore in the copper veins 1s stated to be not less than 7 feet ; the Anaconda—the widest of any yet opened—averages over 12 feet of profitable ore, and in many places widens to 30 or 40 feet for a great distance, showing no diminution in richness at the depth of 800 feet. In a part of these veins—as, for instance, the Anaconda and Liquidation—the ore 1s copper glance ina gangue of quartz and decomposed feldspathic rock ; while another type of veins, represented most perfectly by the Parrot vein, has nearly its entire metallic contents in the form of erubescite. This last-mentioned vein is also of great importance for its silver. The veins of the manganese-silver group lie al within a small area, but are of much interest and value. The gangue is quartz, heavily charged with its various oxidized com- binations of manganese, all more or less argentiferous, the ame of silver ranging from three or four to several hundred ounces 0 that metal per ton. In these manganese veins the transition from decomposed oxidized combinations to the hard silicate and carbonate of that metal at the water-line is as sudden and striking a8 ttt from oxidized to sulphurettcd ores in the previously-mentione class of veins. An exceptional occurrence in this district 1s that 0 the Gagnon mine, of which the gangue is chiefly quartz, and the ore argentiferous zinc blende. ; f

There has of late years been a falling off in the production ©

[STATISTICS,

copper in Arizona, but this appears to be due to unfavourable situation with reference to a market rather than to exhaustion. The Santa Rita mines, in New Mexico, near the Arizona line, were the first worked in that region, but are at present idle. The original workings were for metallic copper, occurring near the contact of a bed of limestone with an eruptive rock resembling felsite, the whole deposit being one of irregular character. Near the junction of the felsite and the limestone there is a series of parallel veins, in which the copper occurs in the form of carbonates and oxides. The Clifton district has been the scene of continuous mining opera- tions sinee 1872, and is at present the largest producer of copper in the south-west. Its cupriferous deposits have been divided into three classes,—those occurring in limestone, those associated with porphyry, and those in the granite. The ores of the first class are the red oxide in a gangue of compact hematite and the carbon- ates ina gangue of brown manganese ore. ‘The ores of the second and third class are oxides and oxysulphides, changing into copper glance at a trifling depth, and into yellow sulphurets in the deepest workings. The deposits are irregular, in some respects resembling contact deposits, and in others the metalliferous occurrenees in the North of England lead mines. They are called by many mining geologists “‘pockets”; but other authorities consider them true veins. The most productive mine of the district—the Longfellow —is described as being an almost vertical fissure in stratified lime- stone, at or near its junction with a dike of felsite.

MINERALS. |

TasiE XIII.—Copper Production of United States (in Tons) from 1882 to 1886.

1882, 1883, 1884, 1885, 1886,

Lake Superior……..... 25,438 | 26,653 | 30,961 | 32,209 | 35,593 Montana……..c0006..- 4,043 | 10,658 | 19,238 | 30,267 | 25.719 JASOVA010 pa 8,029 | 11,010 | 11,935 | 10,187 |} 6,989 Other localities……...] 2,957 | 8,258] 2,574] 1,488] 1,340 Total domestie copper | 40,467 | 51,574 | 64,708 | 74,051 | 69,641 From imported ores.. 446 7261

1,276] 2,271] 2,000 Total…..... | 40,918 | 52,300 | 65,984 | 76,322 | 71,641

Zinc has become within the past few years an important article of production. The ores are found in very numerous localities, usually in connexion with those of lead, both in the Appalachian range and throughout the comparatively undisturbed Paleozoie regions of the Mississippi valley. The Illinois zinc furnaces are at Peru, La Salle, and Collinsville ; those of Missouri mostly at Caron- delet near St Louis, but there is one at Rich Hill and one at Joplin. Those of Kansas are at Pittsburg, with the exception of one at Weir City. There is also a small establishment at White River in Arkansas. There are also zinc works at Bergen Point, N.J., and

at Bethlchem, Pa., and one small establishment in Tennessee. TaBLE XIV. —Total Zinc Production (in Tons) from 1881 to 1885.

1881. 1882. 1883, 1884.

a

00 eee

SATIS! s sc1 esc scsawoiewees 4,464! 6,576! 8,500} 7,017

IMSSSOUTI 5 ..0..0.00200 ..| 2,455] 2,282] 5,116] 4,670

Other States …..... 5,087 | 4,770] 7,018 re 30,145 | 38,423 | $4,413 | 36,327

The lead production was for many years, as already mentioned, limited to two districts near the Mississippi,j—one, the so-called ‘‘Upper Mines,” covering an area of 3000 to 4000 square miles included within the States of Wisconsin, Iowa, and Illinois; the other, the ‘‘ Lower Mines,” in south-eastern Missouri. The yield of the Upper Mines reached its culminating point about 1845; and in 1852 it had fallen off to about 15,000 tons. That of the Missouri

|) mines also fell off, so far as the south-eastern district was eoncerned,

but the loss was more than compensated by discoveries of ore in

) south-western Missouri, and later in the adjacent State of Kansas,) The production ofall these districts (the lead of which contains but a | trace of silver) for the years 1880-1884 is given by Mr E. A. Caswell | as follows : —24,700 tons in 1880, 27,470 in 1881, 25,900 in 1882,

19,300 in 1888, and 17,567 in 1884. A considerable portion of the

| recently renewed activity in the Missouri imines is duc to the in-

| creased utilization of the zinc ores associated with the galena. The numerous lead mines opened and worked in various States in the | Appalachian region, from Maine to North Carolina, have nearly | all proved unsuccessful. Yet, on the whole, the country has largely increased its product—a result due, chiefly, to the dis- j covery and successful working of various lead ores containing silver in sufficient quantity to pay for separation, in several of the Cordilleran States and Territories. The total yield was 87,340 tons

| in 1880, 104,540 in 1881, 118,650 in 1882, 128,515 in 1883, 124,908

sa) es 817

ie 115,546 in 1885, distributed in 1883-84 as follows (Table

1883. | 1884. 1883, | 1884,

PO Fee 2,100] 5,350

Wisse svassaent seers sy 1,350} 2,400 Colorado….....40+.4| 68,000 | 56,400 | California…..... 1500 1,420 Montana….....000006 4,500 6,250 || Mississippi Valley… 19,300 17,567 Tdah0….sseceecersereees| 5,350] 6,700 Wihpiniiinecscrss. sce 190 220

To the non-metallic mineral substauces mined or quarried in the United States, apart from coal and petroleum, which have been already considered, only very brief reference can here be made, The value of the lime and building-stone used in the country in 1885 was, for each of these articles, at

least as great as that of the petroleum. Coal alone constitutes nearly seven-tenths of the valuc of the non-metallic minerals mined, and coal, petroleum, building- stone, and lime together make up almost nineteen-twentieths of the same total. Other important articles are—salt (value $4,825,345 in 1885), cement ($3,492,500), phosphate-roek ($2,846,064), and limestone for flux in iron manufacture ($1,694,656).

The utilization of the brine springs of New York and Virginia Salt. was begun towards the end of the last century, and has become ex- tensively developed. To this development has been addcd that of similar saline resources in Ohio and Michigan. Previous to this, however, some salt had been made by the evaporation of sea-water at points along the coast, and especially in the neighbourhood of Massachusetts Bay ; and the ceusus of 1880 showed still six estab- lishments of this kind in existence, producing nearly 10,000 bushels of salt per annum. In California the evaporation of sea-water has attained some importance (884,443 bushels in 1880), the climatic conditions being much more favourable than along the northern Atlantic. A very small amount of salt was also made on the Florida coast. There are various lakes and partially or wholly dried-up beds of former lakes in the Cordilleran region, which are capable of furnishing a large quantity of salt, and some of these have bcen worked toa limited extent foruse in metallurgy. By far the larger portion of the salt manufactured in the United States comes from the evaporation of brine, obtained by boring. The produce of the four brine-producing States (in bushels of 56 Ib) is given as follows in the census report for 1880 :—Michigan, 12,425,885 ; New York, 8,748,203 ; West Virginia, 8,105,833; Ohio, 2,650,301; total, 26,929,722; total production of all the States, 29,800,298. The New York salt region is in the centre of the State, near Syracuse. The brine is obtained in a detrital deposit, varying in size from the coarsest gravel to the finest sand, which fills depressions in the Onondaga or Salina shales, to the depth in places of 300 or 400 feet. These shales are of Upper Silurian age. No rock-salt has been struck by boring ; but farther west, at various points in New York, Canada, and Michigan, the presenee of large bodies of salt has been proved by the aid of the diamond drill. As yet, howevcr, this source of supply has only been utilized to a limited extent. The salt of Michigan comes from several distinct geological horizons. The uppermost one is in the Coal-measures, the next lower in the Lower Carboniferous, and the

lowest in the Onondaga or Salina salt group, the salt-bearing formation of New York. ‘It is only in the last-named formation that rock-salt has been found in Michigan, namely, at Bay City, on Saginaw Bay, where, at a depth of 2085 feet, a bed of salt 115 feet in thiekness was bored through. In the Saginaw valley salt can be produced more cheaply than any- where else in the country; the business of salt-making is asso- eiated with that of sawing lumber, and the refuse of the saw-mills feeds the fires under the salt-pans.

The following table (XVI.) shows the value of the metallic pro- ducts of the United States for the years 1882, 1883, 1884, and 1885, as reported by the chief of the Division of Mining Statistics of the United States Geological Survey :—

Renton Se iyecrc $106, 336,429 | $91,910,200 $73,761,624 $64,712,400 AD er 46,800,000 46,200,000 48,800,000 51,600,000 Gold 32,500,000 | 30,000,000} 80,800,000} — 31,801,000 (GCiopo TO ein aconaanneo 16,038,091 18,064,807 18,106,162 18,292,999 MSCS asi over ates ator nce ars 12,624,550 12,322,719 10,537,042 10,469,431 ZAIN. rRO HIG Go oree 3,646, 620 3,311,106 3,422,707 3,539,856 NIGUONAA sa dpoonnad 1,487,042 1,253,632 936,327 979,189 INTOWO] . escicis aene oe 309,777 52,920 48,412 191,753 PANIOMMOMY). 6.0 en eas 12,000 AG ae ac JEPhoNthel AnaaeenoEs 600 600 450 187 Aluminium …..... a0 875 1,350 2,550 $219,755,109 | $203,116,859 | $186,414,074 | $181,589,365

The value of the iron is the spot value; that of the gold and silver the coining value; that of the copper, lead, and zinc the value at New York; and that of the mercury the value at San Francisco.

The total values of the mineral produets of the United States for the same years are returned on the same authority as amount: ing respectively to $235,461,580, $249,049,889, $226,800,674, and $246, 931,991. (J. D. W.) Sal, == 103

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POPULATION,

STATES

[sratistics,

only proportionally to the increase within, the figures for 1869 would have found Watson’s estimate wrong by several millions,

Growth The population of the English colonies in North America was at The ten years from 1860 to 1870 witnessed the introduction a of the no time definitely ascertained. In his History of the Constitution, | new force operating to bring down the rate of national increase, popula- Mr G,. T. Curtis presents a table showing the estimated numbers namely, the war of secession. The superintendent of the ninth tion, in the several States as that used by the “ Federal Convention” of census, 1870, presented a computation of the effects of this cause, — 1787. By this the aggregate population is put at 2,781,000. By first, through direct losses, by wounds or disease, either in actual the first census of the United States, however, taken in 1790, the service of the army or navy, or in a brief term following discharge; population was ascertained to be then 3,929,214. The second census, secondly, through the retardation of the rate of increase in the in 1800, showed a population of 5,308,483 ; and the third, that | gojoured element, due to the privations, exposures, and excesses oe 1810, showed another prodigious advance, the register reading | attendant upon emancipation; thirdly, through the check given to weer 7,239,881, An important prediction in the history of population immigration by the existence of war, the fear of conscription, and predic- ig that of Elkanah Watson, of New York, who in 1815 under- | tne apprehension abroad of results prejudicial to the national tions, took to project the population of the United States from 1820 to welfare. The aggregate effect of all these causes was estimated 1900. The following are his figures for the period 1820 to 1850 | ag a Joss to the population of 1870 of 1,765,000. Finally, the tem- (Table I.), in comparison with the actual results of the successive porary reduction of the birth-rate, consequent upon the withdrawal enumerations : — of perhaps one-fourth of the natural militia (males of 18 to 44 years) = ee tole eo during two-fifths of the decade, may. be estimated at perhaps three. =” oe 2 Se : quarters of a million. From these computations it woul appear

NVIGHHOMI:...ccccsssveee 9,625,734 12,833, 645 17,116,526 23,185,368 that, had the war of 1861-65 not broken out, the population of 1870 The census ……..... 9,633,822 12,866,020 17,069,453 23,191,876 would still, in spite of accessions from abroad and of the quickened WaueGitwetior….. — 8,088 | 32,375 47,073 ~6,508 fecundity of the newly arrived elements, have shown a large de- ficiency from the numbers estimated by Watson. No similar series of statistical predictions ever attained such a The tenth census put it beyond doubt that economic and soeial degree of verification, or commanded equal interest or admiration. | forces had been at work, reducing the rate of multiplication, The But qnite as remarkable as the fulfilments of the earlier estimates | a8certained population of 1880 was 50,155,783, against the estimated have been the failures in the later ones, as shown by the corre- | 56,450,241. Yet no war had intervened; the industries of the iA fi 0 to 1900 (Table 11.):— land had flourished ; the advance in accumulated wealth had been sponding figures for 1860 to 1900 (a) ei pean ; beyond all precedent ; immigration had increased to 2,944,695 for 1860, 1870, 1880, 1890. 1900, the decade. It is hazardous to speak of the future ; but the most s LO SI t…....| 81.758.804 | 49,908.499 | 5G ano 941 | 77 Deaonalinnaesaar| | reasonable computation which can at present be made qaaammme Ae a aaah Oo Bede 50185783 TAREE) OUR | omulation 310,503 |-3,770,061 |+6,294,458 The achievement of independence found the people of the United Geo- ; States owning the entire country between the Gulf and the Great graphical Condi- Watson’s estimates came so true during the earlier decades be- Lakes, excepting only Florida, as far to the west as the Mississippi; process tions of cause of the remarkable steadiness of the conditions then controlling | but the actual settlements were, with a few minor exceptions, con- of

increase. population. In 1790 there were about 600,000 white families in the United States. Speaking broadly, there were few very rich, and, except from the effects of intemperance or the premature death

fined to a narrow strip of territory along the Atlantic shore. The national depth of settlement, from the coast inland, varied greatly, ranging growth,

from what would be involved in the mere occupation of the shore See Plate Food was abundant.

of the breadwinner, there were few very poor. Both social traditions dnd the religious beliefs of the people en- couraged fecundity. The conntry enjoyed domestic tranquillity. All this while, too, the land was but partially settled. Mechanical labour was scarce, and even upon the farm it was difficult to com- mand hired service, almost the only farm labourers down to 1850, in the north, being young men who went out to work for a few years to get a little ready money to marry upon. The conditions recited are such as would allow population to expand withont re- striction. ‘Fhe change that was inevitable came between 1840 and 1850. That the veduction in the birth-rate coincided with a canse which was regarded as certain to qnicken the increase of population, namely, the introduction of a vast body of fresh peasant blood from Europe, affords another instance in proof that, even in this matter of population, moral are far more potent than physical causes.

The accessions between 1840 and 1850 from Ireland and Germany were enormous, the total immigration rising to 1,713,251 against 599,125 during the decade preceding, and against only 143,439 from 1820 to 1830. And these people came in condition to breed with unpreccdented rapidity, under the stimulus of an abundance, in regard to food, shelter, and clothing, such as the most fortunate of then had never known. Yet, in spite of these accessions, the population of the country realized a slightly smaller proportion of gain than when the foreign arrivals were almost insignificant.

The change which produced this falling off from the traditional rate of increase, namely, about 8 per cent. per annum, was that from the simplicity of the early times to comparative luxury, involving arise in the standard of living, the multiplication of artificial neces- sities, the extension of a paid domestic service, the introduction of women into factory labour. Fora time the retardation of the normal rate of increase among the native population was concealed from view by the extraordinary immigration. During the decade 1850 to 1860 the foreign arrivals rose to the enormous total of 2,579, 580, till it came about that almost one-seventh of the popula- tion of the country consisted of persons born abroad. And among this class no influence was yet exerted in restriction of population. Yet in spite of the arrival of 4,292,831 foreigners between 1840 and 1860, of whom 38,500,000 survived at the latter date, having had three (perhaps four) million children born to them on the soil, the census returns of 1860 showed

a falling off from Watson’s predic- tion of 310,508. At the time that prediction was made (1815) the arrivals at ports of the United States had averaged about 5000 perannum. Had the reinforcement from the outside been enhanced

for fishing purposes to a body of agricultural occupation extending VII. back to the base of the great Atlantic chain.

If we trace the western boundary of the body of continuous settlemeut at that time, we find, beginning at the north-east, sparse settlements extending along the entire seaboard to the New Hampshire line. The southern two-thirds of New Hampshire and nearly all Vermont were thinly covered by population. Reaching New York, the line of population treated off from the Hudson, north of the Mohawk, the westward tide flowing through a broad gap between the Adirondacks and the Catskills, which constitutes the northernmost of four main paths along which migration has historically taken place. Spreading over central New York, population had already covered the valley of the Mohawk and the region of the interior lakes. In Pennsylvania population had spread north-westward, occupying uot only the Atlantic plain but also, with sparse scttlements, the region traversed by the numerous parallel ridges of the eastern portion of the Appalachians. We omit, for the moment, consideration of the settlements around the junction of the Allegheny and the Monongahela rivers, represent: ing an overflow through the second of the four great channels of population,—that, namely, which crosses southern Pennsylvania, western Maryland, and northern Virginia, parallel to and along the course of the upper Potomac. Omitting then this, which we may term the Pittsburgh group, we find, in Virginia, that sparse settle- ments had in 1790 extended westward beyond the Blue Ridge, and into what is now West Virginia, on the western slope of the Alle-ghany Mountains, while another narrow tougue of population had penetrated south-westwards, down to the head of the Tennessee tiver, in the great Appalachian valley, having found out the third of the four main channels alluded to. In New Carolina settlement was still limited by the base of the Appalachians. Georgia was as yet, owing to the presence of Indian tribes, only occupied to the depth of about two counties along the Savannah river. The re- servations of the Red Men still prevented population from moving westward along the fourth of the great natural

paths alluded to,— namely, that around the southern end of the Appalachian chain.

In the preceding rapid survey of the new nation four groups have been omittcd,—the first, the Pittsburgh group, in south western Pennsylvania ; the second, the smallest, in West Me upon the Ohio and Kanawha rivers; the third, and by far ns largest, in northern Kentucky, upon the Ohio river, cae about 11,000 square miles; and the fourth upon the Cumberland river, in Tennessee. ‘The existence of these outlying groups ©

_ Detroit, and a small area in the

j the south. In Georgia the settlements have spread westward, across } the entire breadth of the

POPULATION. | UNGItED population in 1790 bore witness courage of the American pioneer,

what was then an almost unbroken wilderness,

Green Bay. The entire settled area at the first to have been 239,935 square miles, which, with an aggregate popu- lation of 3,929,214, would yield an average density of 16°4 persons to the square mile. The centre of population, as that phrase is commonly understood, rested east of Baltimore.

The census of 1800 showed a total settled arca computed at 305,708 square miles, including all outlying tracts. As the popu- lation had risen to 5,308,483, the average density of settlment had become 17°4. The centre of population had moved 41 miles west, along the 39th parallel of latitude.

The map of 1810 shows a vast change, owing to the acquisition of Louisiana from France ; the settled area was 407,945 square miles, which, with an ascertained population of 7,239,881, gave an average of 17°7 persons to the square mile. It is remarkable that the Ameri- can people, in nearly doubling their numbers between 1790 and 1810, only increased the average density of settlement from 16°4 to 17:7. At the latter date we find the hills of western New York now almost entirely covered with population,

which has spread along the southern shore of Lake Erie, well over into Ohio, effecting a

junction with the previously existing body of settlement about the forks of the Ohio. The occupation of that river has become com- plete from its source to its mouth, with the exception of small | gaps below the entrance of the Tennessee. The early Kentucky settlements have expanded in every direction, until almost the

extended southwards to the Tennessee, in what is now northern Alabama. In Georgia settlement is still held back by the presence of the Creek and Cherokee Indians, although a treaty with the _ former tribe in 1802 has opened up portions of the State, which have been eagerly occupied. In Ohio the movements of popula- tion northward from the river of that name and westward from Pennsylvania have carried forward the line of settlement, until it comprises two-thirds of the State. Michigan and Indiana, still Terri- tories, remain virgin soil, with the exception of a little strip around south- western part of Indiana, St | Louis has been transferred, by the purchase of Louisiana, from a

foreign jurisdiction to that of the United States, and has become an important centre of population, settlements having spread from it northward to above the mouth of the Missouri, and southward, along the Mississippi, to the mouth of the Ohio. ’ At the mouth of the Arkansas is found a similar body of population, Looking | still farther south, settlements are observed in the newly organized | Territory of Orleans, extending across the Mississippi to its left bank, and reaching up to the site of Vicksburg.

In 1820, at the fourth census, the population had become 9,633,822; the area of settlement had mache 588,717 square miles, yielding | an average density of 18°9. The effect of the westward movement

during the decade had been to move the centre of population 50 miles, still on the 39th parallel. } In 1830 the area of settlement was 632,717 square miles, yielding, | with an aggregate population of 12,866,020, an average density of

20°3. The centre of population had passed westward only 30 miles, the energies of the people having been given largely to filling up the already included arcas. The most noticeable changes are in

State, where they have struck against the barrier of the diminished Creek reservation. Stopped at this point, they have moved downwards into the south-west corner of the State, jand over the boundary line into Florida, recently acquired from Spain. No general advanee is to be noted in Mississippi, owing jto the continued presence of the Choctaw and Chickasaw nations. |The Alabama group has widened and deepened, until perhaps two- |thirds of the State is covered. In Mississippi the chief growth has been through a broad belt, up the river of the same name, reaching jto the present site of Kansas City. Population has progressed north- jward in Hlinois, until more than half the State is covered ; while jIndiana and Ohio have greatly reduced their vacant areas. | The settled area of 1840 was 807,292 square miles; the popu- Jiation was 17,069,458, the average density 21‘1. The centre of population had moved 55 miles, almost exactly due west. The jmost marked changes during the ten years had been in Georgia, jAlabama, and Mississippi, whence the Indian tribes—Cherokees, (Creeks, Chickasaws, and Choctaws—had been removed _to the indian Territory. Now, at last, we see population taking the southernmost of the four western routes of migration, —that round jthe lower end of the Appalachian chain. In northern Nlinois, the ac and Fox and Pottawatamie tribes having been removed to the (Indian Territory, their country has been promptly taken up; and jwe now find settlements carried over the whole extent of Indiana and Illinois, and northwards across Michigan and Wisconsin, as far ps the 43d parallel. Population has passed the Mississippi into

to the daring and even reckless

In addition there were in 1790 a score or more of small posts or incipient settlements, mainly of French origin, scattered over

Among these were Detroit, Vincennes, Kaskaskia, Prairie Du Chien, Machinac, and

census is computed |

entire State is covered, while that body of popnlation has been |

PPTATES

Towa Territory, and occupies a broad belt up and down that stream. In Missouri the settlements have spread northwards from the Mis- souri river nearly to the boundary of the State, and in the opposite direction until they cover most ‘of the southern portion, making connexion with the settlements in Arkansas. Population has largely increased in Florida; but the southern portion of the State remains unoccupied, owing to the hostility of the Seminole Indians,

Between 1840 and 1850 the limits of the United States had been 1850. greatly extended by the annexation of Texas and the territory ceeded by Mexico in the treaty of Guadalupe Hidalgo, these aequisitions embracing an area larger than the original area of the United States as defined by the treaty of 1783. The frontier of population now rests on the Missouri through a great north and south extent; and this date thus marks the natural division of the history of popula- tion in the United States into two parts. The map of 1850 does indeed show a few settlements on the uewly acquired Pacific coast, sparsely covering perhaps 30,000 square miles, with mining camps from a few weeks to a year old, comprising in all about 100,000 souls. But these small and distant groups may, in a survey like the present, be disregarded. In this great journcy of the English race to the Missouri we have scen the population increase from 3,929,214 to 28,191,876; the settled area has increased from 239,985 square miles to 979,249. The territory of the United States has grown, through purchase and war, from 827,844 to 2,980,961 square miles. The original thirteen States have become thirty. The centre of population has moved westward, during sixty years, over the space of 276 miles, notwithstanding the deepening of agricultural settlement in the older portions of the country and the growth of large commercial towns upon the seaboard, which have raised the average density to 23°7 persons to the square mile,

In 1860 the population of the Pacific coast settlements (about 1860. 100,000 in 1850) had risen to about 620,000, covering sparsely about 100,000 square miles. In the east the great fact observed is the extension of settlement, for the first time, beyond the line of the Missouri. The

movement up the slope of the great plains has begun. Into Kansas and N ebraska, especially the former, settlers are pouring rapidly, under the influence of the fierce struggle which is being waged to determine the political character of those Territories. Population has reached even beyond the 97th meridian. In the south Texas has filled up still more rapidly, its extreme settlements reaching to the 100th meridian. The small groups about St Paul, in Minnesota, have spread in all directions, after forming a broad band of union with the main body of population, down the line of the Mississippi. In Iowa population has crept steadly north-westward, along the course of the drainage, until the State is nearly covered. Following up the Missouri, settlers have crossed into the south-eastern corner of the present Ferritory of Dakota. In Wisconsin the settlements have moved at least one degree farther north. In the upper peninsula of Michigan the little settlements which appeared in 1850, in the upper region around Keweenaw Point, have extended and inereased in density as that mining region has developed in importance.

The hitherto unsettled regions in southern Missouri, north-eastern Arkansas, and north-western Mississippi have become sparsely covered. The entire occupied area of 1860 is 1,194,754 square miles ; the population is 31,443,321, and the average density 26°5. The centre has moved 81 miles westward since 1850. ;

The year 1870 found the nation undivided, with an aggregate 1870. population of 38,558,371, occupying 1,272,239 squate miles, the average density being 30°3. The new Cordilleran and Pacific coast settlements, beyond the 100th meridian, comprising about 1,000,000 souls, occupying abont 120,000 square miles, have arranged them- selves, rudely, in three longitudinal belts. The most eastern of these lies in central Colorado, New Mexico, and Wyoming, and along the eastern base of the Rocky Mountains. Population was first largely attracted thither in 1859 and 1860 by the discovery of mineral deposits, and has been retained there by the richness of the soil and the abundance of water for irrigation. The second belt is that of Utah, settled by the Mormons. This community differs radically in character from other Rocky Mountain settle- ments, being essentially agricultural, the mining industries having been discountenanced as tending to fill their “ Promised Land” with Gentile adventurers. The settlements here in 1870

extended from southern Idaho southward, through central Utah, into northern Arizona. With the exception of the two considerable towns of Ogden and Salt Lake, they consisted mainly of scattered hamlets and small villages, around whieh were grouped the farms of the several communities. The third belt is that in the Pacific States and Territories, extending from Washington Territory southward to southern California, and eastward to the systems of “Sinks,” so called, in western Nevada. This highly complicated body of popu- lation owes its existence to the mining industry. Beginning in 1849, it has grown through successive mineral discoveries, althongh more than one of its chief seats in earlier days have long since become deserted camps, more dreary even than before the white man came. Latterly the value of this region to the agriculturist has been recog- nized, and the occupations of the inhabitants are undergoing a

marked change. These three longitudinal belts comprised nine- tenths of the population of 1870 which was west of the gencral frontier line. The remainder were scattered about in the valleys and on the mountains of Montana, Idaho, and Arizona, in military posts, in isolated mining camps, and on cattle ranches.

In the east the traditional westward movement proceeded at less than its usual rate during 1860-70. Whereas the centre of popu- lation moved 81 miles in 1850-60, it accomplished a journey of only 42 iniles in the succeeding decade. In part this was due to the dis- couragement of pioneer enterprise by the state of war, portions of the frontier being involved in Indian hostilities, or becoming the scene of guerilla atrocities, all the way from Minnesota to Arizona; in part, to the absorption into the army of the restless portion of

From the latter table it appears that nearly one-fifth of the inhabitants of the country lived below 100 feet, z.¢., along the imme. diate seaboard and in the swampy alluvial regions of the south: more than two-fifths lived below

500 feet, more than three-fourths below 1000 fect, while 97 per cent. lived below 2000 feet. Within the area below 500 feet is included nearly all that part of the population which is engaged in manufacturing, in the foreign com. merce of the country, and in the culture of cotton, rice, and sugar, The interval between the 500 and the 1500 contours comprises the greater part of the prairie region and the grain-producing States of the north-west. The mean elevation of the surface of the United States is roughly computed at 2600 fect. The mean elevation of the actual population of 1880 is estimated at 700 feet. ‘

[STATISTICS,

At the date of the census of 1880 there were 6,679,943 persons Natiyit residing in the United States who had been born in foreign lands, of the y while at the samc time there were 9,593,106 born in the United popula.

the population which had been wont to lead the race in opening up newregions. In larger part, however, it was due to the prodigious growth, under the artificial encouragement afforded by war, of the

manufacturing industries of the east. Nevertheless, in southern Minnesota population had gonc to the boundary of the State, and had poured up the Big Sioux river in south-eastern Dakota; Iowa had become entirely occupied; through Kansas and Nebraska popu- lation had moved westward, following, in general, the courses of the larger streams and of the newly constructed Pacific railroads.

States who were living in other States than those of their birth, Generally speaking, the migrations of natives of the country have been, if not as usual directly along parallels of latitude, at least within the immediate zones of the individuals thus seeking new homes. Historically the statistics of the foreign elements are very incomplete. For only four censuses (1850-80) has the place

1880. The tenth census (1880) disclosed a population of 50,155,783. | of birth been returned in the enumeration of inhabitants. From The first thing which strikes one is the vast extent of territory | 1850 backwards to 1820 we have only tables compiled from the brought under occupation for the first

time. The settled area has | passenger lists of vessels bringing in emigrants, data notoriously risen sharply to 1,569,570 square miles, so that, with nearly twelve | imperfect. Prior to 1820 there are only scraps of evidence. The millions added to the population, the average density of settlement | following tables (V., VI.) show the arrivals at United States ports has only increased from 30‘3 to 32. The settlements in the Cordil- | from 1820 to 1850 by decades, and the total population and total leran regions and on the Pacific show enormous accessions of occu- | number of persons of foreign birth, with the proportions subsisting pied territory. In the east we note changes which are far greater in | between the two, at each of the four censuses taken since this class absolute importance, though less conspicuous in comparison with | of statistics began to be collected :— the extent of previously existing settlement. In Kansas and Ne- braska a broad tide has spread westward over the plains, annexing Total. G From 3 ite i Other vast tracts before unoccupied. At several points the pioneer line | |. _ —S aa aie a 3 pi has reached the boundary of the Humid Region, so that further 1820-30 151,000 8,000 82,000 61,000 extension must hereafter be governed by the supply of water in the 1830-40 ri 152,000 283,000 164,000 streams, Hence we already see the principal river marked by long rene pee? oo 100s ai ribbon-like bands of population. In Minnesota and east Dakota the building of railroads and the remarkable wheat-producing capa- Total Persons of | Per Cent. bilities of the region have caused a rapid ro gs of popula- Population. | Foreign Birth. of Foreign. tion. Besides the agricultural region of east Dak ota, we note the a 23,191,876 2,244,602 er formation of a body of settlement in the Black Hills, in the south- 1860 31,443,321 4,138,697 13°16 west corner, the result of important discoveries of gold deposits. 1870 38,558,371 5,567,229 14°44 In Wisconsin the unsettled area has rapidly decreased as railroad 1880 50,155,783 6,679,943 13°32 construction has advanced. In the upper peninsula of Michigan ; ae the copper and iron interests, and the railroads which subscrve them, The foreign-born have settled mainly between the 38th and 45th have peopled a large extent of territory. In the lower peninsula not degrees of latitude; more than two-thirds of them are found between only have settlements surrounded the head of the peninsula, but | the 39th and 43d degrees, ‘ there remains only a small body of unsettled lands in the interior, The following table (VII.) shows the proportion per 10,000 of the vast pine forests having been swept away by the activity of the | the natives of the foreign countries

named :— lumbering industry. In the south Texas has made great strides, into | Wee 1870, | 1880 through the extension of railroads and the development of the cattle — a | c a : and sheep interest. The unscttled area in the peninsula of Florida | | Born in England and Wales…..... 1,375 1,154 1,124 1,117 has decreased decidedly, while the vacant spaces heretofore seen ” A lagi ae 3,893 3,333 ae along the upper coast of Florida and Louisiana have disappeared. a es ate os an 4

5 : 5 ” EEN agonbeconongopaceooenn 2,601 3,083 8,037 2,944 The centre of population moved 58 miles westward between 1870 MEER e eres: 241 266 209 160 and 1880, making the total journcy 457 miles since 1790. nein eo, ee . pa bi . oe

. ’ OR : = a” weden and Norway…... 8 5 The following tables (I1J., IV.) show the distribution of popu All other foreigners…....ssssveeeees 446 563 724 | 1,114 lation by drainage basins and according to altitude :— Le et re

Popula- The occupations most affected by foreigners will appear from the

tion by — Aveaiin at lane following table (VIII.), in which the units represent thousands:—

drainage ae Square Miles, Total. |Per Sq. Mile. Manu- basins. xt… ee ey eS SS ae Engaged ; Personal : ing.

New England coast…...scssceceseeeee 61,830 3,788,334 61°2 Persons born in in all | In Agri- | or Pro- ne wee

Middle Atlantic coast …....ssceeese 83,020 9,240,897 111°3 Occupa- | culture, | fessional | ““jison, | and Mining

South Atlantic couSt…..cscssssceeee 132040 4,114,563 31°2 tions. Service. “| Industries.

GIGStRIAKeS es. cccostcsssessssscnetsss eset 175,340 5,684,147 32°4 — Sees anneeee a —

GUlEOT BICKICOR ensessssessesseessercess 1,725,980 25,884,117 14°9 United States……... 13,897 6,858 3,076 1,352 ge

Total Atlantic …scssssesssessees 2,178,210 | 48,717,293 224 ae ell ae ote ae a 984 Great 18} 1G 0\ppapconicioqsacoopocnsenanennc 228,150 227,107 1:0 Great Britain… ..... 467 104 80 5G 226 PACT C OCGA iiseratenecscissrseess tease 619,240 1,211,383 19 Sweden and Norway 206 92 53 16 & Touallnes deeammmnteny.oc\aster 3,025,600 | 50,155,788 16°6 pn Nes Se US B < In the following table (IX.) a few of the more important single

Popula- Heiwenent Per Cent, of | poration | Per Cent. of | | occupations are selected for a further comparison :—

tion ac- Ghneneeet in Population | Total Popula- es aan Population

eording Feet of the Group. | tion within C below each Sweden stich

2 : : ontour. ; ; ; Great Britis to alti- the Group. Contour, Germany. | Ircland. Britain. | 5y a America. a | a —_—— —— i orway. tude. 0-100 9,152,296 18°25 9,152,296 18°25 ———— ———— ee ae 100-500 10,776,284 21-48 19,928,580 39-73 Agricultural labourers,..... 48 24 15 23 21 500-1000 19,024,320 37°93 38,952,900 77°66 Farmers and planters…..... 233 108 83 68 51 1000-1500 7,904,780 15-76 46,857,680 93°42 Boot and shoe makers…..... 28 17 7 3 8 1500-2000 1,878,715 3°75 48,736,395 97°17 Textile operatives…..... 9 39 32 i 44 2000-3000 664,923 1:38 49,401,318 98°50 Domestic servants…....+000. 43 122 19 19 22 3000-4000 128,544 26 49,529,862 98°76 | In iron and steel works….. 9 17 10 1 2 4000-5000 167,236 “33. 49,697,098 99-09 Labouneties…....-..ceeasents 114 225 31 28 50 5000-6000 271,317 “54 49,968,415 99°63 MOORS osiec. acuestesasnenss settee 10 25 47 5 6000-8000 109,497 22 50,077,912 99°85 Railroad employés…....00.- 10 33 7) J 77,871 15 50,155,783 100 | Traders and dealers…..... 60 32 17 2 7

8000 and over

Cw ? ED

The question of the degrec to which forcign elements have con- tributed to the remarkable growth of population in the United States has formed the subject of much discussion. In 1870 an important step towards the obtaining of adequate statistical data for the solution of the problem was made by ascertaining, in addition to the number of persons born abroad, the number having a foreign- born father or mother, or both. From this count it appeared that, while there were (1) 5,567,229 persons resident in the United States who were born in other countries, there were (2) 10,521,283 who had a foreign father, (3) 10,105,627 who had a foreign mother, (4) 9,734,845 who had both parents foreign, and (5) 10,892,015 who had one or both parents foreign.! Another and important step was taken in 1880, when the eensus offiee obtained the means of determining the number of persons one or both of whose parents had been born in eacli speeified foreign country. From this enumeration it appeared that, while there were then in the United States (1) 6,679,943 persons who had themselves been born abroad, there were (2) 14,349,310 who had a foreign father, (8) 18,585,080 who had a foreign mother, (4) 18,011,646 who had both parents foreign, and (5) 14,922,744 who had one or both parents foreign, In addition to the above were found 33,252 persons, themselves born abroad, but of parents native to the United Statcs. This would make the total number of persons born abroad, and of per- sons of foreign parentage, 14,955,996. This aggregate was dis- tributed as follows among the chief nationalities (Table X.) :—

POPULATION. |

Persons having Irish fathers…….....ccccccccsesesescceeee . 4,529,523 ®) GOMMARE jo cssesecnssecences 4,883 842 Es BES A cveessschsesssovs 2,039,808 = Seandinavian fathers 635,405 es British Ameriean fathers 939,247

7 fathers born in other foreign eountries than those SRECIM ECM sectssncns cs: mies smietemeinnsese a aceecetee eye 1,321,485 ” native fathers and foreign motherS……..sccceecesseese,.,, 573,434 Foreign persons, having both parents native…..... 33,252 HOCH es cencsscsvess reese BSCOOOLDOUNCRaCADEOCDHAD 14,955,996 Persons having Wishimothers.s.i.:.....sccsscsssesssevensessesessesecssesesseeesecs 4,448,421 “6 GETING Re cia; svesisaviarssosvvssicaveert

qodoobadgonanonbosdenanoon 4,557,629 An ESM ao este nec velevoerdatisicciciiccccssscrcs 1,790,200 9 DCATMUVAVAOTIMOGNCHS....0css.00.sescecesseseesevavsoetessoceccecs, 631,309 “ British Ameriean mothers…..... Sodo0ospadHHOCHARedAOHEDHaN 931,408

Ae mothers born in foreign countries other than those BDECIN CU. sttesceeaiserrsisssesrenste nif 1,226,118 a native mothers and foreign fathe1 seco 1,887,664 Foreign persons, having both parents native ….c0.cccccscccccceecee, 83,252 MTobalteevsss««: Maresh reeaetnsuvavocivastaiveesuiect 14,955,996

Comparing these results with the total number of persons from each specified foreign country resident in the United States, we find that, for cvery 1000 persons living in the United States who were born in Ireland, there were in 1880 2442 who had an Irish father, 2387 who had an Irish mother; for every 1000 persons born in Germany there were 2483 who had a German father, 2306 who had a German mother ; for every 1000 persons born in Great Britain there were 2223 who had a British father, 1941 who had a British mother ; for every 1000 persons born in Sweden or Norway there were 1690 who had a Swedish or Norwegian father, 1671 who had a Swedish or Norwegian mother ; for every 1000 persons born in British America there were 1810 who had a British American father, 1292 who had a British American mother.

These ratios do not accurately represent the comparative fecundity of the foreign pone unless reference be had to the periods of time during which the scveral elements have respectively formed an important part of the population of the United States. The fact that for every 1000 persons born in Ireland there were in 1880 2442 persons (including of course the 1000 mentioned), who had an Irish father, while for every 1000 British Americans there were only 1310 who had a British American father, would seem to indicate that the Ivish are vastly more prolifie than the British Amcricans. The disproportion is, however, mainly due to the fact that the Irish residents have lived in the country for a very much longer period of time than the British Americans. Thus, of every 10,000 foreigners

} in the United States in 1850, 4285 were Irish, while only 658 were

British Americans. In 1880, out of every 10,000 foreigners, only 2776 were Irish, 1074 were British Americans. Again, it will have

} been noted that, in every case mentioned, there are more of persons

having a foreign father than of persons having a foreign mother. This is true regarding eaeh nationality, not only for the country, but for each State, and is due to the fact that immigration is pre- dominantly of males.

The first census (1790) showed the number of coloured persons to

i be 757,208, the coloured element thus constituting a larger propor- | tion of the population than ever after, i.¢., 19°3 per cent.

By 1800 the coloured element had increased absolutely to 1,002,087, being

| a gain per cent. of 32°32, but had declined relatively to 18°9 per

1 The reader will understand that these sums are not to be added together, as has been done in some statistical publications, yielding an aggrcgate somewhat

) larger than the entire population of the United States at the time. No.1 is

ineluded in No. 4, which is itself ineluded in both Nos. 2 and 3, whieh are in turn

|) included in No. 5, whieh is the ontside statement of that portion of the population } whose members were either themselves born abroad, or who had either a father } or mother born abroad.

cent, of the entire population. By 1810 it had reached 1,377,808, a gain of 37°05 per ccnt. upon its own numbers in 1790; it had also advanced towards its former share of the population, being 19 percent. of the whole. By 1820 the number had risen to 1,771,656, a gain of 28°58 per cent. in ten years ; the share of this element in the total population had sunk to 18°4 percent. By 1830 the number had increased to 2,328,642, a gain of 31°44

per cent.; the ratio to the total population had sunk to 18-2, By 1840 the total numbers had risen to 2,878,648, a gain of 23-4 per cent. (16°8 per cent. of the whole population). In 1850 the number was 3,638,808 (13°3 of whole population), a gain of 26°62 per cent. in ten years. Ou the threshold of the civil war in 1860 the number had risen to 4,441,830 (14°1 per cent. of whole population), being a gain of 22°06 per cent. in ten years. The enumeration of the eoloured population in 1870 was subsequently proved to have been partial and inaccurate in many parts of several Southern States. The number returned was only 4,880,009 (12°7 per cent. of total popula-tion), a gain of only 9°86 per cent. in ten years. In 1880 the number was 6,580,798 (13°1 of the whole), an increase of 34°85 per cent. over 1870.

The following table (XI.) summarizes the facts of gain per cent. within the eoloured population by ten-, twenty-, and thirty-year periods, from 1790 to 1880:—

Gormared Per Cent, Inerease per Cent, Population of Total * | Population. | 10 Years. | 20 Years, 30 Years, 1790 757,208 19°3 500 000 1800 1,002,037 18-9 32°32 et 200 1810 1,377,808 19 37°05 81:96 ee 1820 1,771,656 18-4 28°58 76°8 13397 1830 2,328,642 18-2 31°44 69°01 182°39 1840 2,873,648 16°8 23°4 62:2 108°56 185 3,638,808 13°3 26°62 56°26 10539 1860 4,441,830 14:1 22°06 54°57 90°74 1870 4,880,009 12:7 9°86 34°11 69°82

1880 6,580,793 13°1 34°85 48°15 80°85

The coloured people, all but an inconsiderable fraction, live

between the 29th and 40th degrees of latitude. In this respect, the foreign and the coloured elements are largely complementary. Only between the 38th and 40th parallels are both elements found in considerable numbers. In longitude the coloured are much more widely spread than are the foreigners. Again, the temperature and rainfall groups which contain one of these elements largely seldom embrace any eonsiderable portion of the other. Thus, it appears that, while more than 87 per cent. of the foreign-born live in regions having a mean annual temperature of 40° to 55° F., more than 98 per cent. of the coloured reside in regions having a mean annual temperature of 50° to 70°. In the region having a rainfall of about 60 inches

annually, the coloured form no less than 43 per cent. of the total, and in the next grade 36°5 per cent., while in the region having a rainfall of 50 to 55 inches more than half the in- habitants are coloured. Where the rainfall is less than 45 inches the eoloured population falls below the average, in some cases very far below. Not less than 85 per cent. of the coloured are found within regions between 40 and 60 inches. The foreign population, on the other hand, is chiefly grouped in regions between 30 and 50 inches, those regions containing nearly 85 per cent. of the foreign-born. Further, only 14°10 per cent. of the foreign popula- tion live in the regions raised 100 to 500 feet above the sea, while within those regions are found not less than 4495 per cent. of the coloured population.

The question of the future of the coloured race in the United States mainly depends on the answer to a prior question, whether the fact of the concentration in so great a degree of this element upon the lands at once very hot and very moist, which has actually taken place, is due to the superior attractions of cotton-planting in the past and even in the present, or represents also the special physiologieal aptitudes of the race. The enormous apparent increase in this element during 1870 to 1880 led some persons to project a line of ascent which would, in a few generations, cause the continent to be peopled almost entirely by members of the African race. Such predictions are as idle as were those of the speedy extinction of the coloured population after the disparaging but erroneous results of the census of 1870 were published. Inas- much as twenty-year periods have, from the beginning, shown a steady suecessive decline in the rate of increase among the coloured population (see Table XI.), it would seem that some positive reason should be shown for anticipating any higher rate for the future than that of 54°57 for 1840-60. Such a rate of increase among the eoloured people would steadily reduce the share of that element in the population of the country, bringing its numbers up to about ten millions in 1900 out of a not improbable population of eighty millions. Whether there is really room, economically speaking, for so large a coloured population, considering the limited area of the lands, already fairly well occupied, within which alone that race has any marked advantage over the whites by reason of their physiological adaptation to the climate, and considering the

Occupa- tions

of the people.

industrial advantages which the white race enjoy wherever the climate conditions are equally favourable, may be gravely doubted.

The growth of city populations during the ninety years embraced by the ten successive censuses of the United States has been little less remarkable than the inercase of population throughout the country as a whole. The following table (XII.) gives the aggregate for cities of 8000 inhabitants and upwards from 1790 to 1880 :—

Population of Population of Urban Population in

United States. Cities. each 100 of the Total. 1790 3,929,214 131,472 3°3

1800 5,308, 483 210,873 39 1810 7,239,881 356,920 4:9 1820 9,633, 822 475,135 49

1830 12,866,020 864,509 6°7 1840 17,069,453 1,453,994 8°5 1850 23,191,876 2,897,586 12°5

1860 31,443, 321 5,072,256 16‘1 1870 88,558,371 8,071,875 20-9

1880 50,155,783 11,318,547 22°5

In 1880 there were 286 cities with over 8000 inhabitants, and the following twenty exceeded 100,000:—New York, N.Y., 1,206,299 ; Philadelphia, Pa., 847,170 ; Brooklyn, N.Y., 566,668 ; Chicago, Ill., 503,185; Boston, Mass., 362,889; St Louis, Mo., 850,518 ; Baltimore, Md., 332,318 ; Cincinnati, O., 255,189 ; San Francisco, Cal., 233,959 ; New Orleans, La., 216,090; Cleveland, O., 160,146 ; Pittsburgh, Pa., 156,389; Buffalo, N.Y., 155,184; Washington, D.C., 147,293 ; Newark, N.J., 136,508 ; Louisville, Ky., 123,758 ; Jersey City, N.J., 120,722 ; Detroit, Mich., 116,340; Milwaukee, Wis., 115,587; Providence, R.I., 104,857.

The urban population of the United States is predominantly sustained by manufactures and mechanical industry rather than by commerce. Taking for the purposes of this analysis the fifty largest cities, we have an ageregate of 3,083,172 workers, of whom 32 per cent. are engaged in personal and professional services, 24 per cent. in trade and transportation, 48 per cent. in manufactures and mechanical industry, the remaining 1 per cent. being em- ployed in agriculture, as nurserymen, florists, market gardeners, &c. Of the total body of workers reported 77 per cent. are males, 23 females. Again, 34 per cent. are under 16 years of age, 3 per cent. are over 60, 984 per cent. are between 16 and 60.

The proportion of workers to population varies greatly in American cities, according to the industries pursued, according to the constituents of the population, according to age and sex, and according to certain social causes affecting the employment of women and young children.

The American census took no account of the occupations of the people till 1850, when the occupations of the free male inhabitants over 15 years of age were ascertained. In 1860 the statistics were made to include the gainful occupations of free women as well, but the exclusion of the entire slave population from the account, together with defects of classification due to the inherent difficulties of the work, make it impossible to institute satisfactory comparisons with statistics subsequently obtained. At the ninth and tenth cen- suses (1870 and 1880) special efforts directed to this end, aided by the great progress made of recent years in industrial organization and by the abolition of slavery, resulted in statistical accounts which afford a fair view of the occupations of the people at those dates.

The census of 1870 gave the number of people pursuing gainful occupations as 12,505,923, being 32°43 per cent. of the total popu- lation, 44°3 per cent. of the total population above ten years of age. 34°68 per cent. of the entire population, 47°31 per cent. of the population above ten years of age. This incrcase means a larger engagement of women and children in labour outside the family. The division of the grand total of 1880 among the four principal groups of occupations, with the further distinction of sex, appears in the following table (XIII.):—

Persons

Classes. Occupied. Males. Females.

AGTIGUIENTO, siete eat. Dinca cceedeetecetenesaxss 7,670,493 7,075,983 594,510 Personal and professional services…..... | 4,074,238 2,712,943 | 1,361,295 Trade and transportation …....sccc0sseeeee 1,810,256 1,750,892 59,364 Manufacturing, mechanical, and mining| 3,837,112 3,205,124 631,988 Ali occupations….....00006 17,392,099 | 14,744,942 | 2,647,157

le A A IN AE ee | il I a) Of these, 825,187 males and 293,169 females were from 10 to 15 years of age, 12,986,111 males and 2,288,115 females from 16 to 59, and 933,644 males and 70,873 females 60 and upwards.

It appears that 7,670,493 persons were in 1880 employed in agri- culture, constituting 44°1 per cent. of the whole number, against 47°3 in 1870, —a slight relative decline in this class during the de- cade. 4,225,945 persons reported themselves as farmers or planters. This agrees well with the number of farms and plantations returned on the agricultural schedule, 7.¢., 4,008,907. 3,323,876 persons report themselves as farm labourers, while about 120,000 are re- turned as apiarists, dairymen, florists, gardeners, nurserymen,

In 1880 the corresponding number was 17,892,099, being |

STATES

stock-drovers, turpentine farmers, &c. Agriculture still remains the predominant industry of the United States, employing nearly half the working population, and, since a greater number of persons are dependent upon the average farmer or farm labourer than upon the average factory operative or domestic servant, furnishing sub- sistence to considerably more than half the people.

The number of persons engaged in mechanical labour and in manufacturing and mining pursuits in 1880 was 8,837,112,—99 per cent. of the total, against 21°6 per cent. in 1870.

The number of persons engaged in trade and transportation wag in 1880 1,810,256, being 10°4 per cent. of the total. Between 1860 and 1870, with an increase in population of 22°8 per cent, the class engaged in trade and transportation gained 44 per cent., a result fairly attributable to the profits of middle-men, and the multiplication of stores, shops, and stands of every description, consequent upon the circulation of an irredeemable and fluctuating currency.

The last grand group of occupations to be mentioned is that characterized by the rendering of personal or professional services, This group in 1880 embraced 4,074,238 men, women, and children, or 23:4 of all connected with gainful avocations, against 214 per ceut. in 1870. The occupations within this group exhibit a wide range of character. We have at the one end the teacher, the Government official, the artist, the clergyman, the physician : at the other, the barber, the boot-black, the household drudge. The most important class of this group is that known as labourers, without further designation. This class, in the successive census

(STATISTICS,

‘reports, has always been large, doubtless too large for the facts of

the case, since it seems probable that no inconsiderable share of these labourers are connected with agriculture or trade or some branch of manufacturing industry with sufficient definiteness to

justify their being returned under one or other of those groups.

The number reported under this title in 1850 was 909,786; in 1860, 969,301 ; in 1870, 1,031,666 ; in 1880, 1,859,228,

The number of domestic servants in 1880 was 1,075,655, against 975,784 in 1870. It might have been expected that the general increase of luxury and refinement during the preceding decade must have caused a large proportional increase in domestic service. Yet we find the number of domestic servants to have increased but 10 per cent., while population has grown 30 per cent. The only fact indicated by the table of occupations which serves at all to account for this failure of domestic service to keep

pace with population is that the number of bakers has increased more than 50 per cent. during the decade, while the number of laundrymen and laundresses has grown from 60,906 to 121,942, showing that some part at least of the work formerly done in private houses is now done in shops, Yet we cannot fail to be struck with the fact that, while there was in 1870 1 servant to 7°76 families, 1880 found no more than 1 servant to 9°24 families.

The geographical distribution of domestic service throughout the United States is very irregular, the proportion between families and servants ranging from 2°5 families to 1 servant in the District of Columbia up to 24°8 families to 1 servant in Arkansas. The largest proportion of domestic servants is found in a group in the central Atlantic region,—Maryland, Delaware, Virginia, and the District of Columbia, where slavery formerly prevailed more as a social and political than as an industrial institution. Thus Maryland has 1 servant to 4°9 families, Delaware 1 to 5°83, Virginia 1 to 5°7.

In 1870 the number of families returned was 7,579,368, the Families number of persons to a family being 5°09; the number of dwell- and ings was 7,042,833, with 5°47 persons to a dwelling. In 1880 the dwellings. total number of families returned was 9,945,916, the number of persons to a family being 5°04; the number of dwellings was 8,955,812, with 5°6 persons to a dwelling. In 1880 the number of persons to a family ranged from 3°94 in Montana to 5°64 in West Virginia ; the number of persons to a dwelling ranged from 4°24 in Idaho to 6°68 in Rhode Island. Examination of the tables relating to the 100 largest cities in 1880 shows that the number of persons to a family ranges from 4:23 in Memphis to 599 in Denver. In general, the Southern cities rule low in this respect. The range as to the number of persons to a dwelling, among the cities of the United States, is much greater than in the case of persons to a family. Memphis has but 4°68 persons to a dwelling; New York has as many as 16°37. The othér instances of a low proportion are Lancaster, Pa., 5°02; Davenport, Jowa, 5°04 ; Camden, N.J., 5°05; Sacramento, 5°07. The other instances of a high proportion are Hoboken, 11°50; Holyoke, Mass., 10°52; Brooklyn and Cincinnati, 9°11; Manchester, N.H., 9°09; pile cester, 8:79 ; Fall River, 8°75; Jersey City, 8°59 ; Lawrence, 8 5; Boston, 826 ; Chicago, 8°24; Troy,

8°16; St Louis, 8°15. The other large cities show the following proportions :—Philadelphia, 5°79 ; New Orleans, 5°95 ; Baltimore, 6°54 ; San Francisco, a The remarkably low proportion, considering the population, whic obtains in Philadelphia is due to the admirable manner 1n W oe that city has been built up, largely under the system of groun rents, little known in other cities.

Ct

UNITED

AGRICULTURE.

AGRICULTURE. |

the American

their economic superiority has been most strikingly manifest. ten years from 1790, the mean

cleared of primeval forest ; improving the whole extent of previous towns and cities at a score of favoured points.

extended itself over 98,000 square miles of absolutely new territory,

of the older territory,

between 1840 and 1850, 215,000 square miles. sion, indeed, checked the westward flow of population, caused no refluence ;

and here and there by railroads, and dotted over with dwellings. That whieh has allowed this great work to be done

and fortunately has been,

secondly, the character of

the cultivators of the soil

tuted a peasantr

been the same i

the agricultural class.

ind of men, precisely out of the same homes,

mercial pursuits. Switzerland and Scotland have, in a degree,

other considerable

and manufactures,

factures in the United States,

far exceeded in the hurried “ in the housing of women, children, and live

ready reconnaissances which determined the

the capabilities of the soil; in the | exigencies of primitive agriculture.) that the chief manufacture of the United States, _ the manufacture of four million farms, # The people of the United States,

tinent containing an almost limitless | fertility, having at the start but little accumulated capital and

comprising 540,000,000 acres. finding themselves on a con-

the land in the earliest stages of occupation as practically of no | value, and to regard labour as of high value. In pursuance of this | view they have freely sacrificed the land, so far as was necessary, in order to save labour, systematically cropping the fields on the principle of obtaining the largest results with the least expendi- | ture, limiting improvements to what was demanded for immediate | uses, and caring little about returning to the soil an equivalent | for the properties taken from it in the harvests of successive) years. But, so far as the Northern Statcs are concerned, the |, cnoruious profits of this alleged wasteful cultivation have in the main been applied, not to personal consumption, but to permanent improvements,—not indeed

to improvements of the land, but to “what were still more needed in the situation, namely, improve- ‘Inents upon the land. The first-fruits of a virgin soil have been ,expended in forms which have vastly enhanced the productive | power of the country. The land, doubtless, as one factor of that productive power, became temporarily less efficient than it would have been under a conservative European treatment ; but the joint ‘product of the three factors—land, labour, and eapital—was for the time enormously increased. Under this regimen the fertility \ of the land of course in time necessarily declined, sooner or later according to the nature of the crops grown and to the degree of /Original strength in the soil. Resort was then had to new fields }farther west. The granary of the continent moved first to western |New York, thence into the Ohio valley, and then, again, to the banks of the Mississippi. The north and south line dividing the “Wheat product of the United States into two equal parts was in ‘1850 drawn along the 82d meridian. In 1860 that line was drawn

Agricuiture has been the chief and most characteristic work of people, that in which they have achieved the greatest results in proportion to the resources at command, that in which i In population of the period being 4,500,000, 65,000 square miles were for the first time brought within the limits of settlement, crossed with roads and bridges, covered with dwellings, both public and private, much of it also and this in addition to keeping up and settlements, and building In the next decade, the mean number of inhabitants being about 6,500,000, population

——an area eight times as large as Holland. Between‘1810 and 1820, besides increasing the density of population on almost every league besides increasing their manufacturing capital twofold, in spite of a three years’ war, the people of the United States advanced their frontier to occupy 101,000 square miles, the mean population being 8,250,000. Between 1820 and 1830 124,000 square miles were brought within the frontiers and made the seat of habita- tion and cultivation; between 1830 and 1840, 175,000 square miles ; The war of seces- though it but between 1870 and 1880 territory embrac- ing 297,000 square miles was reclaimed from the wilderness and the desert, was divided into farms, crossed everywhere by roads

so rapidly first, the popular tenure of the soil, and, At no time have north of the Potomac and Ohio consti- in the ordinary sense of that term. They have

generally with the same early training, as those who filled the learned professions or who were engaged in manufacturing or com-

approached the United States in this particular; but there is no country where as much mental activity and alertness has been applied to the cultivation of the soil as to trade

But even the causes which have been adduced would have failed to produce such effects but for the exceptional inventive ingenuity of the American, The mechanical genius which has entered into manu- the engineering skill which has guided the construction of the greatest works of the continent, have been improvements” of the pioneer farm ; stock and gathered | crops against the storms of the first few winters ; In the rough and “lay of the land” and preparation for the thousand

It is no exaggeration to say thus far, has been

extent of land of fair average

| urgent occasions for the economty of labour, have elected to regard

along the 85th, in 1870 along the 88th, in 1880 along the 89th. Meanwhile one portion of the inhabitants.of the earlier settlements joined in the movement across the face of the continent. As the grain centre passed on to the west they followed it, too restless by character and habit to find pleasure in the work of stable commun- ities. A second portion of the inhabitants became engaged in raising, upon limited areas, small crops, garden vegetables, and orchard fruits, and in producing butter, milk, poultry, and eggs, for the supply of the eities and manufacturing towns which had been built up out of the abundant profits of the primitive agricul- ture. Still another portion of the agricultural population gradually became occupied in the more carcful and intense culture of the cereal crops upon the better lands, the less eligible fields being allowed to spring up in brush and wood.

Deep ploughing and thorough drainage were resorted to; fertilizers were employed to bring up and to keep up the soil; and thus began the scrious sys- tematic agriculture of the older States. Something continued to be done in wheat, but not much. New York raised 18 million bushels in 1850; thirty years later she raised the same amount. Pennsylvania raised 154 million bushels in 1850 ; in 1880 she raised 194 million bushels. More is done in Indian corn (maize), that most prolific cereal, the backboue of American agriculture ; still more is done relatively in buckwheat, barley, and rye. Pennsyl- vania, though the tenth State in wheat production, stands first in rye, second in buckwheat, third in oats. New York is only thir- teenth in wheat, but first in buckwheat, second in barley, third in rye. We do not, however, reach the full significanee of the situation until we account for the fourth portion of the former agrieultural population, in noting how naturally and fortunately commereial and manufacturing cities spring up on the sites whieh have been pre- pared for them by the lavish expenditure of the enormous profits of a primitive agriculture upon permanently useful improvements of a constructive character. ‘These towns are the gifts of agriculture,

The agricultural returns for 1880 showed a total of 4,008,907 farms, comprising 536,081,835 acres, of which 284,771,042 were improved and 251,310,793 unimproved. The improved lands were made up of 223,067,144 acres of tilled lands, including fallow or grasses in rotation, and 61,703,898 acres of permanent meadows, pastures, and orchards. The unimproved land comprises 190,255,744 acres of woodland and forest. The unimproved land in farms was, in 1860, 59°9 per cent. of the total land in farms; in 1870, 58-7; in 1880, 46°9. It will be seen that the farms of 1880 comprise little more than one-third the total area of the country. The remainder consists of large fertile tracts, which will, in the near future, be embraced in farms; of extensive districts, along the frontier, occupied by the grazing interest; of water surfaces, rivers, lakes, ponds, and swamps; of barren tracts along the shore, and of the area of innumerable rugged hills and vast mountain chains ; and, lastly and chiefly, of the great arid plains beyond the 100th meridian,

The value of farms, including farm buildings, returned in 1880 was $10,197,096,776; the value of farming implements and machinery,

$406,520,055; of live stock on farms, $1,500, 384,707. The live stock on farms comprised horses, 10,357,488; mules and asses, 1,812,808; working oxen, 993,841; milch cows, 12,448,120; other cattle, 22,488,550; sheep, exclusive of spring lambs, 35,192,074; swine, 47,681,700. ‘The foregoing numbers relate only to live stoek upon farms. The report of the special agent appointed in 1880 to canvass the grazing interest, outside the limits of defined farms, estimated the number of ranch and range animals as follows :—cattle, 8,750,000; sheep, 7,000,000; swine,

2,091,000.

The acreage and yield of the cereal grains reported in 1880 (crop Cereals. of 1879) were as follows :—wheat, 35,480,333 acres, 459,483,137 bushels; Indian corn, 62,368,504 acres, 1,754,591, 676 bushels ; oats, 16,144,593 acres, 407,858,999 bushels; barley, 1,997,727 acres, 43,997,495 bushels; rye, 1,842,233 acres, 19,831,595 bushels ; buckwheat, 848,389 aeres, 11,817,327 bushels.

Of wheat fourteen States produced over 10,000,000 bushels each, six States over 30,000,000. The chief producing States, with their respective erops in round millions of bushels, were Illinois, 51; Indiana, 47; Ohio, 46; Michigan, 35; Minnesota, 34; Iowa, a1; California, 29. 303 million bushels were produecd in regions having a mean annual temperature of between 45° and 50° F., 51 millions between 40° and 45°, 59 millions between 55° and 60°. The general average yield per acre was 13 bushels. a

Of Indian corn twenty States produced over 20 million bushels

each, six over 100 millions. The chief producing States, with their respective crops in round millions of bushels, were Illinois, 326 ; Iowa, 275 ; Missouri, 202 ; Indiaua, 115 ; Ohio, 112 ; Kansas, 106. 1300 million bushels were produeed in regions having a mean annual temperature between 45° and 55°, 229 millions between 55° and 60°, 118 millions between 60° and 65°, The average yield per acre was 28 bushels.

Of oats ten States produced over 10 million bushels each ; five produced over 30 millions. The chief producing States, with their respective crops in round millions of bushels, were Illinois, 63;

Statisties of farms,

Hay.

Dairy

produce,

Hops,

Potatoes,

Wool,

Hemp and flax.

Cotton.

Rice.

Sugar.

Tobacco.

Other agri- cultural produce.

824 UHI THD

Iowa, 51 ; New York, 38 ; Pennsylvania, 34 ; Wisconsin, 33. The average yield per acre was 25 bushels. Of barley five States pro- duced over 2 million bushels, as follows :—California, 124 ; New York, 8; Wisconsin, 5 ; Iowa, 4 ; Minnesota, 8. The average yield per acre was 22 bushels. Of rye four States, namely, Pennsyl- vania, Illinois, New York, Wisconsin, produced between 34 and 2 million bushels each. The average yield per acre was 11 bushels. Of buckwheat 70 per cent. of the crop was produced by the two States of New York (4% millions) and Pennsylvania (34 millions). The average per acre was 14 bushels.

The harvested hay crop, as reported in 1880, amounted to 35,150,711 tons from 30,631,054 acres. Thirteen States show more than one nuillion acres mown, with a yield ranging from 0°8385 ton per acre in Missouri to 1°554 tons in Minnesota. As we pass southward, tlie importance of the grass crop diminishes until we reach large and populous States in which but ten or twenty thousand acres or less are mown.

The statistics of dairy products, taking those both of the home dairy and of the butter or cheese factory, as returned in 1880, show 806,672,071 Ib of butter made, 248,157,850 ib of cheese, 217,922,090 gallons of milk sold otherwise than to cheese and butter factories.

The production of hops is mainly in two States,—New York, which in 1880 cultivated 39,072 acres in this crop, nearly all in four counties, and Wisconsin, which cultivated 4489 acres. The total area in hops was 46,800 acres, with a yield of 26,546,378 tb.

The potato crop comprised 169,458,539 bushels of Irish, grown mainly in Northern States, and 33,388,693 bushels of sweet, grown mainly in the South, although the profitable cultivation of this crop extends as far north as New Jersey.

The statistics of the wool crop in a census of the United States are necessarily defective, requiring to be supplemented by informa- tion from the outside. This is due to the great amount of wool obtained from the pelts of slaughtered sheep, to the large number of animals upon ranches and ranges along the frontier, beyond the limits of defined farms, and, thirdly, to the fact that in some regions, notably California and Texas, two clips are made each year. The gross figures for 1880, after making allowance on these accounts, were 240,681,751 ib.

The production of hemp in the census year was but 5025 tons ; the products of the flax culture were stated at 7,170,951 bushels of seed, 421,098 tons of straw, 1,565,546 Ib of the fibre. It is in cotton, however, that the United States make their chief contribu- tion to the fibres of the commercial world. In 1879 5,755,359 bales were raised on 14,480,019 acres. The following table (XIV.) shows the distribution, geographically, of this most important crop :—

States. Acres, Bales. States. Acres. Bales. Alabama… .| 2,830,086 | 699,654 || Mississippi ….. 2,106,215 | 963,111 Arkansas . | 1,042,976 | 608,256 Missouri ….. 82,116 20,318 Florida …. | 245,595 54,997 North Carolina] 893,153 | 389,598 GOON RAs Sicscnsses 2,617,138 | 814,441 South Carolina | 1,364,249 | 522,548 Indian Territory 35,000 17,000 Tennessee …... 722,562 | 330,621 Krematteky. in… ccrs 2,667 1,367 TGRAS I cccsccenesss: 2,178,435 | 805,284 Louisiana…..... 864,787 | 508,569 Virginia ®..... 45,040 19,595

The other characteristic crops of the Southern States are rice, tobacco, and sugar. Of rice there was raised in 1879 110,181,378 tb, of which South Carolina produced upwards of 52 millions, Louisi- ana and Georgia producing, in about equal proportion, nearly all the remainder. The area cultivated for the sugar-cane was 227,776 acres, from which the crop was 178,872 hhds. of sugar and 16,578, 273 gallons of molasses. Of the sugar Louisiana produced 171,706 hhids.; Texas, 4951; Florida, 1273 ; Georgia, 601 ; South Carolina, 229; Alabama, 94; Mississippi, 18. In addition to the cane sugar of the far South, there were produced in the Middle and Northern States 12,792 Ib of sorghum sugar and 28,444,202 gallons of sor- ghum molasses ; while in the far North were produced 36,576,061 ib of maple sugar and 1,796,048 gallons of maple molasses. The chief sorghum-producing States are Missouri, Tennessee, Kentucky, Illinois, and Iowa. The chief maple-sugar States are Vermont, New York, Michigan, Ohio, Pennsylvania, and New Hampshire. The area sown in tobacco was 638,841 acres, the crop 472,661,157 tb. Fifteen States raised over 2 million pounds each; ten raised above 10 million each. The chief tobacco States were Kentucky, 171,120,784 tb; Virginia, 79,988,868; Pennsylvania, 36,943,272 ; Ohio, 34,735,235; Tennessee, 29,865,052; North Carolina, 26,986,213; Maryland, 26,082,147. The States next in order are Connecticut, Missouri, and Wisconsin.

In addition to the crops which have been mentioned, there were reported 102,272,135 barnyard fowls and 23,235,187 other fowls, producing 456,910,916 dozens of eggs; 25,748,208 tb of honey and 1,105,685 ib of wax ; $50,876,154 of orchard products, $21,761,250 of market-garden products, $95,774,735 of forest products; 29,480,106 Tb of broom corn ; 6,514,977 bushels of pease ; and 8,075,050 bushels of beans.

Since the census of 1880 the United States department of agriculture has published annually estimates of the successive

STATES [sratistics,

crops down to 1886. These estimates take the latest census figures for their basis, the percentages of increase or decrease being care. fully computed with reference to the statements of several thousands of local reporters. The following table (XV.) represents the estimated annual production of the cereal crops for the six or seven years quoted :—

Deer Area Planted, Crop, Average Yi Grain. in Acres. in Bushels. Enshioa ve

Indian corn (1880-86) .....| 68,435,634 1,639, 655,363 24

Wheat (1880-86) .....ce00 37,098,548 447,742,370 1211 Oats (1880-86).....cccessccees 19,940,322 533,012,913 26:7 Rye (1880-85) .....sssec00 00s 2,095,438 25,610,067 Joep Barley (1880-85).....c0.0se0s 2,300,021 50,829,950 PaneyL Buckwheat (1880—85)..... 858,313 11,089,007 12-9

2 Te a a

No statistics are available regarding the tenure of non-agricultural Tenure land ; but, of the 4,008,907 farms reported, 2,984,306 were culti- of farm vated by their owners, 322,857 by tenants for a fixed money rental, lands 702,244 by tenants paying a share of the produce as rent. Itthus appears that, of each 10,000 farms, 7444 were cultivated by owners, 804 were rented for fixed nioney payments, and 1752 were rented for a share of the produce.

The following table (XVI.) exhibits the distribution of the farms Size of of 1880 according to size, with the further distinction of the kind of farms tenure under which they were cultivated :— j

$e

i Rented for Rented for

ee >Y | Fixed Money | Shares of

‘ Rental. Produce,

2,601 875 876 85,456 22,904 26,529 122,411 41,522 90,816 460,486 97,399 223,689 804,522 69.663 158,625 1,416,618 84,645 194,720 66,447 3,956 5,569 25,765 1,393 1,420

|

MANUFACTURES.

Down to the revolution, the very beginnings of manufactures were prohibited in the American colonics by the policy of the mother country.

The history of American manufactures begins with the history of the United States. The natural resources of the country for the purposes of manufacture, whether in field, forest, or mine, were various and abundant in a high degree. The supply of coal was the marvel of the world, while the whole Atlantic coast was dotted over with immense water powers. Iron ores of the greatest variety, and often of high purity, were widely spread. The native woods were remarkable for their beauty, strength, and elasticity, A wealth of building stones, slates, and marbles underlay the sur- face, from New England to Tennessee and Alabama. Among fibres the soil had a high degree of adaptation to the production of those two which are the chief staples of textile manufacture. Indeed, in the cultivation of cotton this country has from the first been prac- tically beyond the competition of any other.

Yet during the first years after 1790, although nearly every branch of mill and factory industry had been undertaken, the United States at the best attained only respectable standing among the manufacturing nations of the second rank, As yet the Amer- ican people, as has been explained in a previous section, were em- ploying their thoughts and energies, their resources, their capital, in reaping the first-fruits of a virgin soil. While capital applied to the soil in England was yielding 3 per cent., intercst upon purely agricultural loans ranged from 8 to 15 per cent. in Indiana, Illinois, Wisconsin, and Iowa. While the English agricultural labourer was receiving from 9 to 18 shillings a week, the American farm hand was receiving from a dollar and a quarter to two dollars a day, according to the season of the year. At the same time hundreds of thousands of persons taking up farms in the new States, and paying such interest for capital and such wages for labour, saw their lands rise continuously in valuc through the growth of population and the intensification of settlement. Ina word, it has been the competition of the farm with the shop that from 1790 down to the present time has hindered the development of manufactures.

No attempt was made, either at the first or second census, to ob- tain the statistics of manufactures. In 1810 Congress provided for areport of all manufacturing establishments ; but it was found that this work had been so imperfectly done that no summary for the United States, or for any State, was possible. It is interesting to note that cotton cloth was set down at 80

cents a yard, pig iron at $66 a ton, bar iron at $151 a ton, while the average product of the grist mills was valued at 75 cents a bushel, and the average PI duct of the saw mill at $7.80 per 1000 feet. In 1820 and again » 1840 renewed attempts were made to obtain the statistics of manu factures, but the results were worthy of little consideration. –

In 1850, among extensive changes introduced into the a system, provision was made on an ample scale for statistics

ae ha Dp

manufactures ; and it is accordingly from that date that official information on this subject may be said to begin. The results then obtained were as follows (Table XVII.) :—

STATISTICS. |

Number of establishments ….....ceccccceceseees 123,025 Cayital employed ss.ccrcctc..os1cceessecsseeeeeeeeee $533, 245,351 Hands employed— INIA GS ie ecsessnecereeteceseenetontereereens 731,137 IN EMNAIE SMe es cose eee SRE SCHOD RUC COLE 2255922 TOfal ee eee 957,059 NWASOSIP AIAG rc ecisceverscccame eer cee $236,755,464 (BOSEOR MMECIIAIS!, «5.0:

These statistics were intended to include the production, not of factories merely, but of mechanic shops of every kind. It was found, however, that the returns did not generally embrace the products of artisans working singly at their trades. The mining industries were included in the returns of manufactures.

Between 1850 aud 1860 the capital employed had inercased to $1,009,855,715 ; the uumber of establishments was 140,433 ; the hands employed were—males 1,040,349, females 270,897, total 1,311,246 ; the wages paid were $378,878,966 ; the cost of mate- rials $1,031,605,092 ; the value of products $1, 885,861,676.

The decade 1860-70 was marked by a stupendous advance in mechanical enterprises. The totals are (Table XVIII.) :—

Number of establishments…….....ccccccssssecees 252,148 GUTLAnestrncscaticttes es yernernedevis crscvteseesnnete se $2,118, 208,769 Hands employed— INRIES IA DOVE IG! oc. ssvnsssessaeecce 1,615,595 Females above 16.,..... SgAgabogrenn 823,770 Children and youtlis…..... 114,628 TOGA Sse secsscs sees 2,053,996 WAIRIOSE DA Ui acce.s cssiesecsssssseuobeusscosasvsaasaales »» $775,584,343 COBUOMMAUCIIBIS!:..cccasscsssvicssocerarvinarevestecses $2,488, 427,242 VAIUG OF PNAGUCtS:...0506..cieserseess prncoononodoseage $4,232,325, 442

In addition to the foregoing statistics, it was ascertained that there were employed in manufactures 40,191 stcam engines, of 1,215,711 aggregate horse-power, and 51,018 water wheels, of 1,130,431 aggregate horse-power.

In preparation of the tenth census (1880) the provisions for the collection of statistics of manufactures were greatly extended and improved. The totals are as follows (Table XIX.) :—

Number of establislhments…....ccccscccesseceeee 253,852 CAP Ineyeceerssetetassecress sass +. $2,790, 272,606 Hands employed— Males above 16…... 2,025,335 Females above 16…. 531,639 Children and youths . 181,921 SOLEMN icacesedss+s —_— 2,738,895 Wit CORD e Cemerr scm restric erie tr eeiessedinsceise sens $947 953,795 COstHOMmat ella sive sscessscscccsceocssecesesescs ee $3, 396,823,549

Viale Of produchs…....ceerceorerrrssserrseess $5,969,979, 191 The geographical distribution of the manufactures of 1880 1s shown in the following table (XX.), the amounts being reduced to percentages :—

\ { Estab- | Capital | Mands | ,, | Area. lish- In- Em- mane Ria ments, } vested. | ployed. | “#!¢- NOKfhrAtantic …..../ 56 44°87 61:94 62°23 64°33 59°64 South Atlantie …..... | 9°4 10°16 5°89 7°59 4:99 5:26 Northern Central…....’ 25‘3 84°33 25°78 24°39 24°86 28°94 Southern Central…..... I 92023 55 3°75 3°85 HEE 3:47 Western (Cordilleran) .. 39°4 3°09 2°64 1:94 2°71 | 2°69

The first ten cities, in order of the number of persons employed in manufactures, were New York, 227,352; Philadelphia, 185,527, Chicago, 79,414 ; Boston, 59,213 ; Baltimore, 56,338 ; Cincinnati, 54,517; Brooklyn, 47,587; St Louis, 41,823; Pittsburgh, 36.930; San Francisco, 28,442.

RAILROADS.

The following figures show the construction of railroads in the United States, by decades :—1830-40, 2265 miles; 1840-50, 5046;

1850-60, 20,110; 1860-70, 16,090 ; 1870-80, 41,454 ; 1880-85,

44,002,—giving a total of 128,967 miles.

Poor’s Railroad Manual gives the cost of the railroads cou- structed down to 1885 as $7,037,627,350, including equipment ; capital stock, $3,817,697,832 ; bonded debt, $3,765,727,066 ; earnings for 1885—from passengers, $200,883,911; from freight, $519,690,992 ; from all sources, $765,310,419; net earnings, $266,488,998 ; interest paid on bonds, $179,681,323; dividends paid on stock, $77,672,105.

TELEGRAPHS.

The aggregate extent of telegraphic lines in the United States open for public business in 1887 excecded 170,000 miles, besides railway, Government, private, and telephone lines, of which the extent is not known. By far the greater part of this business in the United States is in the hauds of the Western Union Tele- graph Company, the main featurcs of whose operations, at certain successive dates, are shown in the following table (XXI.):—

{ory ry ‘ STioA a” ges 825 | Miles of | Milesof | No. of cor Mae Line, | Wire. | Offices, “Messages Sent,| “*°°epts. | oe | ee 1867 46,270 85,291 2,565 5,879,282 | $6,568,925

183 54,109 112,191 3,972 9,157,646 7,138,738 1875 72,833 179,496 6,565 17,158,710 9,564,575

1880 85,645 233,524 9,077 29,216,509 | 12,782,895 1885 147,500 462,283 14,184 42,096,583 | 17,706,834 1886 151,832 489,607 15,142 43,289,807 | 16,298,638 1887 156,814 524,641 15,658 47,394,530 | 17,191,910 The average toll per message was 36°3 cents in 1887. Since

the construction of this table, the purchase of the Baltimore and Ohio Railroad telegraph lines has brought the mileage of the Western Union to about 162,000, with over 580,000 miles of wire.

PosTAL SERVICE.

The following table (XXII.), from the latest annual report of the postmaster-general, exhibits the growth of the postal services :— C—O

Fiseal No. of Miles of Revenue of Expenditure

Years, Post-Offices. Post Routes. Department. | during the Year.

1790 75 – 1,875 $37,935 $32,140 1805 903 20,817 280,804 213,994 1810 2,300 36,406 551,684 495,969 1820 4,500 72,492 1,111,927 1,160,926 1830 8,450 115,176 1,850,583 1,932,708 1840 13,468 155,739 4,543,522 4,718,236 1850 18,417 178,672 5,499,985 5,212,953 1860 28,498 240,594 8,518,067 19,170,610 1870 28,492 931,232 19,772,221 23,998,838 1880 42,989 343,888 33,315,479 36,542,804 1885 51,252 365,251 42 560,843 50,046,235 1886 53,614 378,586 43,948,423 51,004,744

Forrign COMMERCE.

The full official statistics of the foreign commerce of the United States only begin with 1820. Prior to that date considerable statis- tical material relating to Teen

trade and navigation was collected by Dr Seybert. Domestic | Produets of | Per cent,

Table XXIII. exhibits the Merchan- | Domestic | of Agr. valme of exports of domes: dise. Agriculture.| Products. So oe mpd cae: countries during each tent 33 ,524, 0985, : year from 1830 to 1860, | 1819 | Wiese | 92.4007 | sa.

together with the part | isso | 316/242‘423 | 256,560,972 | 81-12 borne therein by the pro- | 1870 | 455,208,341 361,188,483 79°34 ducts of domestic agricul- | 1880 | 823,946,353 | 685,961,091 | 83-25

ture. The table shows strikingly the constancy with which the exports of agricultural pro- duce have maintained their share in the total exports during 60 years. The following table (X XIV.) shows the value of all imports into the United States at intervals of five years from 1835 to 1880 :—

Value of Imports. | Value of Imports,

1835 $149,895,742 1860 $362,160,254 1840 107,141,519 1865 248,555,652 1845 117,254,564 1870 462,377,587 1850 178,138, 318 1875 595,861,248

1855 261,468, 520 1880 | 760,989,046

In 1884, 1885, and 1886 respectively the total exports of merchandise amounted to $740,513,609, $742,189,755, and $679, 524,830, and the imports to $667,697,698, $577,527,329, and $635,436,136. The same years the exports of gold and silver amounted to $67,133,383, $42,231,525, and $72,463,410, and the imports to $37,426,262, $43,242,323, and $38,593, 656.

The following table (X XV.) gives the value, in round millions of dollars, of leading exports of domestic agriculture during each fifth year since 1860 : —

Provisions, a including attle, “taw.” | Stuffs, | ‘Tobueco, | Meats and | Sheep, and : a Dairy llogs. ‘ Products. 1860 192 24 16 17 1 |

1865 7 54 42 54 0 : 1870 227 72 21 31 1 1875 191 111 25 8&3 2 1880 212 288 16 132 15 1885 202 160 22 107 14

Table XXVI., p. 826, exhibits the value, in dollars, of the im- ports from, and exports to, each of the principal foreign countrics in 1886.

The following are the eleven principal exporting cities, with the value of the goods going out through them in 1886, and percentage of total United States exports:—New York, 314 millions of dollars (49°26 per cent.); New Orleans, 83 (12°15); Boston, 54 (7°96); Bal- timore, 36 (5°27); Philadelphia, 34 (4°97); San Francisco, 30 (4°45); Savannah, 20 (2:99); Charleston, 18 (2°6); Galveston, 17 (2°5);

XXITT. — 104

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TABLE XXVIJ.—Exports and Imports.

Exports Per from U.S. | cent. of to each Total Country. |Exports.
844,927,973 51°79 60,923,857 9°15

40,006,096 6-01

31,953,124 4°80 25,376,353 3°81 22,613,399 3°40

14,536,664 2-18

13,048,846 1°96

13,047,762 1:96

10,981,915 1°65

9,705,335 1-47 7,518,277 113

6,856, 077 1°03 6,480,738 ‘97 5,294, 798 ‘79 4,350,141 “65

4,331,770 “65

4,306,205 “65

4,044,384 61

| 8,125,130 47 | 8,115,899 “47

341,982 | “05

1,950,267 29 2,442,171 37 2,695,488 “40

1,110,545 ‘17

Foreign Country. Great Britain and Ireland ….. ses Germanys escseeseeres Saseheteensssensieces PMANGON scccssevessesicescccsvas

VGStUlLdGterascrscndscscccess stesso eres BelPiams:

fo) 2 TiN aesBende sa cepencoeeds DEBSCROSCACBNS British Possessions in Australasia

RISSTAIMNLULOPCsiccsscsrccesss-sseeeve (COTTE), “eransanon 2608000 me

United States of Colombia……..... British East Indies Argentine Republic ….00….0+0000… IROVDUNBAL, .. saacaseassesesexesres Hong Kong UAUBAT ee cceccecseres Hawaiian Islands… “ee ae DWAGZGLIAINGL....ssceccctsscrccsesoveacates Spanish Possessions Philippine Islands).....+... PAUISIUIMs cverescontscnsumemiesectsersiesces Centra] American States…..... eb WIETIOZAUICL OY cs scesesclcasanveceessscetaces UU AY sss: -.csceoene sadsdssecarssccetees

Per Imports

cent. of | into U.S. Total from each

Imports,| Country. 24°28 | 154,254,054 10°88 | 69,154,997 9°98 | 63,417,430 5°91 | 37,496,338 11°18 | 71,053,146 1°44 9,178,513 1°34 8,523,846 2°65 | 16,870,636

‘93 | 5,930,209

‘61 | 3,859,360 50 | 3,183,153 2-99 | 18,972,963 1°68 | 10,687,972 6°59 | 41,907,532 ‘47 | 3,008,921 271 | 17,247,825

‘79 | 5,022,346

22) 1,844,167

17 | 1,072,459

2°34 | 14,885,573 1°54 | 9,805,707 2:26 | 14,353,981

1°51} 9,566,912

6,603,058

‘98 | 5,915,413 ‘91 | 5,791,621 78. | 4,995,948

Norfolk, 12 (1°71); Huron, Mich., 8 (1°22 per cent.).

It thus

appears that, of the aggregate exports from the United States, all but 7°92 per cent. (about 54 millions of dollars) go out from these

eleven ports.

By far the greater part of the exports of New Orleans,

Savannah, Charleston, Galveston, and Norfolk consists of cotton. It is the shipment of this staple from Southern ports which in- creascs the number of important exporting cities.

On the other hand, all but 8°48 per cent. of the imports, amounting to 54 millions, were in 1886 received at seven ports as follows:— New York, 419 millions of dollars (65°9 per cent. of imports into United States); Boston, 58 (9°2); San Francisco, 37 (5°8); Phila- delphia, 37 (5°76); Baltimore, 12 (1°84); Chicago, 10 (1°6); New Orleans, 8 (1°28 per cent.).

The following table (XX VII.) exhibits the division of the imports of 1886 into two classes as free or dutiable, with the amount of duty collected on each of five principal groups of articles:—

Classes,

(A) Articles of food and live animals… (B) Articles in a erude condition which enter into the various pro- cesses of domestic LMGHISETYrwesssoeannens (C) Articles wholly oF partially manu- factured for use as materfals in the manufacturing and mechanical arts…. (D) Articles = manu- factured ready for consumption…..... (E) Articles of volun- tary use, luxuries,

Value,

Ad valo- rein rate Per cent.

Duty. on aire a ing Free of duty.} Dutiable. able. eye \Per cent.

$83,752,308 |$112,483,925 | $61,064,744 } 54-26 32°42 102,488,364 | 41,613,658 | 12,863,115 | 30°91 6°83 10,689,156 | 67,855,317 | 20,115,152 | 29°64 10°68 12,446,211 | 113,824,644 | 55,653,853 | 48°90 29°54 2,204,725 | 78,030,511 | 38,682,533 | 49°58 20°53 $211,530,759 |$418,778,055 |$188,379,397 | 45°55 |100-00

SHIPPING.

Shipbuilding was one of the earliest arts developed in the American colonies, and was prosecuted in the United States with the highest success until iron steamers began to drive out wooden sailing vessels. The following table (XX VIII.) exhibits the tonnage of the merchant marine of the country at ten-year intervals from

1790 to 1880:—

Total.

478,377

972,492 1,424.783 1,280,167 1,191,776 2,180,764 8,535,454 5,353,808 4,246,507

Date. Sailing Vessels, | Steamers.

1790 478,377

1800 972,492

1810 1,424,783

1820 1,280,167 a0

1830 1,127,304 64,472

1840 1.978425 202,339

1850 3,009,507 525,947

1860 4,485,931 867,987

1870 8.171,412 1,075.095 2,856,476 1,211,558

| 1880

4,068,034

st A2Tns

The decline in the American shipping interest since its maximum in 1860 is greater than would appear from the foregoing table, since the aggregate is kept up by the large lake, river, and coast fleets engaged in the coasting trade, which is by law confined to American vessels, The decline in registered tonnage, 4.¢., that engaged in ocean traffic, since 1860 is shown by the followin figures :—1860, 2,546,237 tons; 1865, 1,602,583 ; 1870, 1,516,800 ;

1875, 1,553,827; 1880, 1,352,810.

The decline above noted was due in the first instance to the war of 1861-65. About that time occurred the world-wide substitution of iron steamers for wooden sailing ves-_ ——-——_-—____

[sTATIstics,

sels or wooden steamers. In the new in- ane Foreign | dustry the American people have never oes. | achieved any marked success, while the | 18¢0 507 955 | law precludes the registering as Ameri- | 1865 | 167 437 can of vessels built abroad. Hence it is ee be ne that the American merchant marine | jg99/ 9209 1309 never recovered from the losses sustained | 1885 298 1108

between 1861 and 1865, and that the ————-—__ commerce of the country is carried on in an increasing proportion by foreign vessels. The latter fact is shown strikingly in the accompanying table (X XIX.) of exports and imports, in millions of dollars, carried in American and foreign vessels respectively.

In addition to the goods carried in vessels, about 57 million

dollars' worth were in 1885 carried in cars and other land vehicles,

BANKING AND CURRENCY.

Mention has already been made (see above p. 775, § 272) of the issue of legal tender paper money, by the national Government, in 1862, and (p. 776, § 280) of the establishment of the national banking system of 1868. Specie payments were resumed on January 1, 1879. The following statement (Table XXX.), pre- pared at the office of the United States treasurer, exhibits the classification of the circulating medium of the United States on June 30, 1887, stating separately the amount of each class which is in the United States treasury, in the national banks, and in

circulation:— In Circulation. Total.

In Treasury. In National

Banks,

Gold coin and $ $ 3 $

bullion…….! 277,979,653.61 | 98,187,439.47 | 278,403,241.92| 654,520,335 Gold certificates..} 30,261,380 54,274,940 86,950,497 121,486,817 Silver certificates 8,425,183 8,535,479 138,582,538 145,543,150 Silver dollars and d

bullion….,.....) 221,897,045.77 6,343,213 49,205,508.23 | 277,445,767 Subsidiary silver.| 26,963,9384.20| 2,813,138.80 45,770,726 75,647 709 National bank

NNOEEB). .+r00rrcesene 2,362.585 25,420,212 251,484,991 279,217,788 Legaltendernotes| 28,783,796.79| 74,482,342 243,414,877.21 | 346,681,016 Certificates of de-

posit, currency 310,000 8,770,000 ond 9,080,000 Fractional cur-

rericy, estimated 2,366 564,266 6,377,284 6,943,916 Compound inte-

ss NOtES….060- wes aa 192,880 192,880 One and two year

notes of 1868…) e 65,605 65,605 Old demand notes a 57,130 57,180 State bank circu-

IAGO, Sees cesstss 98,697 98,697

591,985,894.37 274,341,030,27 | 1,050,553,975.36 |1,916,880,900

It needs to be stated that, in order to obtain the uet circulating medium, the amounts given in the foregoing table should be reduced by the total amount of gold, silver, or currency certificates, inasmuch as the funds which these certificates represent are 1n- cluded in the aggregate. These deductions would leave the net amount $1,640,770,933. To obtain the amount actually in the hands of the people, it would also be necessary to deduct the quantities of the other elements held by the treasury and by the national banks. The following table (XXXI.) exhibits the coinage of the United States by successive periods from 1793 to

1887 :— i

SS

ee

Fiscal Years. Gold. Silver. | Minor. Tattle Average, 1793-1800 $101,429 $144,045 $7,939 i », 1801-1810 $25,074 856,917 15,125 aoe » 1811-1820 816,651 597,081 19,116 beard », 1821-1830 190,309 1,678,105 15,141 Wwe et » 1881-1840 | 1,875,649 2,730,996 34,282 pre » 1841-1850 | 8,923,982 2,236,813 38,068 Lae » 1851-1860 | 33,023,709 4,658,218 124,961 Le », 1861-1870 | 29,240,955 1,318,860 847,324 ae ae » 1871-1880 | 39,927,730 | 15,459,036 238,553 aE ri Actual, 1881 78,733,864 | 27,649,967 405,110 | 10 pete ” 1882 89,418,448 | 27,783,389 644,758 we Py 1883 35,936,928 | 28,835,470 1,428,307 6250922 – 1884 27,932,824 | 28,773,388 1,174,710 pa i ~ 1885 24,861,124 | 28,848,960 527,557 aoe A) F 1886 34,077,380 | 30,022,348 17,378 ee aeal me ms 1887 22,393,279 | 34,366,484 943,651 57.703, pal

Net fe D

The following table (XXXII.) exhibits the resources and lia- bilities of the national banks, expressed in millions of dollars, on dates near the 1st of October of the years 1878, 1882, and 1886 :—

Sm ic Sh ha

STATISTICS. |

Oct. 1, Oct. 3, Oct. 7, Resources and Liabilities. 1878. 1882, 1886.

2053 2269 2852

Banks. Banks, Banks, Resources, ILGHTS oneabatioootada ee HCeGULSH Hore oeactevierien 834-1 1243°2 14510 Bonds for Circulation…….....cscssecccsecc, 347°6 857°6 258°5 Other United States Bonds …..... 94°7 37°4 32°4 Other Stocks, Bonds, &C….csecescecccccsce, 36°9 66°2 81°8 Due from other Banks …….....600000006….., 138‘9 198-9 241°4 ARSAIPESIATC (rscsste, t.. cnet e 46°7 46°5 54:1 TLE Cler, code a stcaetierrcc ir sau tene 30°7 102°9 156°4

Legal Tender Notes ..,...sscceeeseccecscecccs., 64:4 63°2 62°8 National Bank Notes …..cccccccccesceesceeces., 16°9 20°7 22°7 Clearing House Exchanges ….....060…., 82:4 208°4 95°5 United States Certificates of Deposit…... Ouuy. 8:7 5°9 Due from the United States Treasury 16°5 17:2 14:0 Other Regoueester nes cceeee eens .oce. 24°9 28°9 37°4 Totals,..... 1767°3 2399°8 2513°9 Liabilities,

Capital Stock…..... Wie esusisenceenees 466-2 483°1 548-2 SUP MUN ccancsaosesssseseeses ene 116°9 132°0 157°2 Undivided Profits….....060.0..6 40°9 61:2 66°5 Cincilatlontersssssscosteesreere ek 301°9 315-0 228°7 Due toMDepowitorsie..,..cs:-/00esersc oe 668°4 1134°9 1189°8 Due to other Banks ….....ccccce0seeeeeeseeec,, 165-1 259°9 308°6 CONES GOLD UAB IER eorenoneenaesceasenucepiocetcee 7:9 1367 14:9 Totals….....) 2165°8 2399°8 2513°9

reports for 1886 (Table XXXIII.).

Resources, Loans on Real Estate

63°5

IRURAS LOCK va ceesecsaseoteseitee set cece 39°0 EUQHIBESEWTO Me araaenacysvesecessaccers ce 31:0 Other Investments ….....cscececees 79°0 PESIOMIB OS sicceacsarvstreiaiisieiecannyss cil Due from Baiiks,.....00cccecassee 43°7 WAS Heese stesceieasssececccheveeeceees 19°8

Total…... 1260°8 Totaly… 1260°8

I NTERIOR POLITICAL ORGANIZATION.

The United States is, as has been seen, divided into thirty-eight States, eight Territories, and the District of Columbia. Each State and Territory isin turn divided into more or fewer counties, except only in the case of Louisiana, where primary divisions of the State are called parishes, the functions and relations of the parish being, however, substantially the same as those of the counties of the surrounding States. The number of organized countics in 1880 was 2444. The number of unorganized eounties upon the frontier, laid

out upon the map but not yet sufficiently filled by population to justify the completion of their political organization, was 161. The number of organized counties in the several States has a wide range,—from 3 in Delaware, 5in Rhode Island, 8 in Connecticut, 10 in New Hampshire, to 114 in Missouri, 117 in Kentucky, 137 in Georgia, 160 in Texas, B = The political function of the county differs widely among the

several States. In general, it may be said that in the north-east, Where the counties are few, the county bears but a slight relation to the affairs of the people. It is the unit of real estate record. | Courts are, indeed, held at the county seat, but judges who have equal jurisdiction in other counties there administer laws which run equally over the entire State. The commissioners of the | county have authority over certain main roads, This said, all is said. The county means almost nothing to the citizen. It is the | so-called “town” (7.e., township) which in this region has the | power to deal directly with schools, which administers poor relief, } which builds and keeps in repair most of the roads and bridges, | Which has the charge of the public peace, which holds nearly all | the authority which, by the laws of the State, is vested anywhere for promoting the general welfare. These ‘‘small elemental republics,” as President Jefferson called them, absorb a large j part of the political interest of the people ; their names are the | objects of much affection and pride to their inhabitants; their

boundaries can only be changed by the legislature of the State, jand this is only done from important considerations of public eonvenience, and that too, generally, with their own consent.

On the other hand, in the South and extreme West, where the number of counties is very large, the county exercises or controls the exercise of nearly all the powers, excepting in the case of cities and incorporated towns, which by the laws of the State are eonceded to any political agency. The geographical subdivisions

er 21s 827

of the county become here of comparatively little, sometimes of very little, importance. In soine States their boundaries may be changed by county judges or county commissioners, for trivial, perhaps for purely temporary

reasons. In some States these sub- divisions of the county are little more than voting districts. In other States they are convenient units of political administration,

Midway, both geographically and politically, between the two groups which have been indicated, are many States, originally settled largely by emigrants from New England and New York, in which the political powers conceded by the constitution and laws of the several States are divided, not very unequally, between the county and the township. The county, as a whole, here takes charge of a very much larger range of publie interest than in the north-east. On the other hand, the township has much of the political power and dignity which belongs to the New England town. The aggregate number of such subdivisions of counties in all the States and Territories, so far as ascertained, is 26,682.

Law and usage differ very widely among the American States Tncorpo-

regarding the incorporation of cities, towns, and villages. In rated Massachusetts no town is incorporated of less than 10,000 towns inhabitants. In the West and South, villages of two and three and hundred inhabitants are sometimes incorporated. In some cases, cities. when a township acquires sufficient population it is made a city, embracing the entire area, including perhaps a large rural region. In other cases, only the closely occupied district is embraced within the municipal limits, and the township continues to maintain its political existence. In the latter class of cases it sometimes happens that the inhabitants of the borough or village are members of the township for certain purposes, though not for others ; at other times the township and the borough, or in- corporated village, become as distinct as if they were two town- ships or two boroughs. The number of incorporated cities in the United States is 969, of incorporated towns and villages 4,613, of boroughs 582. In two cases, New York and Philadelphia, a city makes up anentire county. In two cases, St Louis and Baltimore, a large city forms no part of a county. The District of Columbia has no county organization, while the eity of Washington, contained therein, has no municipal eharter.

TAXATION,

The taxing powers within the United States are as follows :—

A. The national Government, whose revenue powers are only limited by—(a) the provision of the constitution elich prohibits all duties on exports, and (b) the provision that all direct taxes must be levied in proportion to popnlation, —a provision which deprives direct taxes of nearly all their efficiency for revenue purposes ;

B. The several States, whose revenue powers are only limited by -—(a) restrictions in their respective constitutions, and (b) the gencral principle that those powers must not be exercised in such a way as to contravene laws of the United States, or to destroy sources of the national revenue, although a State may prohibit within its borders the sale of liquors, from which the United States treasury derives a considerable part of its reccipts.

C. Within each State, powers of taxation, to a determinate or to an indeterniinate extent, as the case may be, are by the consti- tution and laws of the State conferred, almost always for strictly defined purposes, (1) upon counties, (2) upon cities, boroughs, and incorporated villages, and (3) in nearly all the States, though in widely varying degrees, upon the primary geographical divisions of counties, such as the “town” of New England and the “ town- ship” of the Middle and Western States.

The revenues of the several States, and of the counties, cities, townships, &c.,are generally derived from direct taxes upon property, real and personal, although in some States licences and fees and taxes on franchises and incomes bear a not inconsiderable part. The revenues of the United States are, and have historically been, mainly derived from two species of indirect taxes, viz., customs duties on imports and excise duties on articles as produced or consumed within the country, notably liquors and tobacco. At three several periods, viz., 1800-02, 1814-17, and 1863-71, direct taxes have contributed considerable amounts to the national revenue. At times the proceeds of the sales of publie lands have formed an important element of the receipts of the general Govern- ment ; but in the main it has been the accepted policy to sell lands to actual settlers at rates so low as to be inconsistent with the object of revenue. Indeed, under the homestead law, large portions of the publie domain have been given away to settlers, while even larger amounts have been alienated in aid of schools, publie

improvements, &c. A detailed table, prepared by Prof. A. B. Hart, shows that up to 1884 192,584,116 acres had been sold, 162,230,099 had been granted to States and corporations for inter- nal improvements, and 325,901,100 had been granted (167, 483,506 to individuals and 158,417,594 to States) for other pur poses, — making a total of 680,715,315 acres.

At the tenth census (1880) an effort was made to obtain statisties covering the amounts raised, in one year, under all the taxing powers authorized and exercised in the United States. The diffi-

Reeeipts and ex- pendi- ture from

1791;

in 1886.

culty lay wholly in obtaining the facts relating to revenues collected by counties and by taxing agencies below the county. The aggregate results, as ascertained for 1879, were as follows (Table XXXIV.) :—

Receipts into the U.S. treasury (ordinary revenue)..... $272 ,322,137 Receipts into the State (or Territorial) treasnries…..... 52,019,955 Receipts into the county treasurics 69,606,571 Reccipts into the treasuries of cities, boroughs, or in- corporated villages, and of townships and other sub-divisions of counties…..... Jeabecthopooapoornencocncrmnsticos

Total…... $584,980, 614 The aggregate receipts into the United States treasury, beginning in 1791, have been (in millions of dollars) as follows:— from customs, 5642 ; from internal revenue, 3449; from direct taxes, 28; from public lands, 241; from bank dividends, 10; miscellaneous, 568; total, 9938. The net ordinary expenditures of the United States Government from 1791 to 1886 have been as follows (in millions of dollars):—war, 4563 ; navy, 1106; Indians, 230 ; pensions, 900 ; miscellaneous, 1938; total, 8737. The foregoing is exclusive of payments on accouut of the principal or interest of the public debt. The net ordinary receipts into the treasury for

1886 (the fiscal year ends June 30) were as follows :—from customs, $192,905,023 ; froin internal revenue, $116,805,937 ; from direct taxes, $108,240 ; from public lands, $5,630,999 ; miscellaneous, $20,989,528 ; total, $336,439,727. Of the receipts from internal revenue in 1886 $69,000,000 in round numbers were from spirits, $20,000,000 from fermented hquors, 28,000,000 from tobacco. The net ordinary ex- enditnres for 1886 were as follows :—war, $34,324,153; navy, 13,907,888 ; Indians, $6,099,158 ; pensions, $63,404,864 ; miis- cellaneons, 74,166,929 ; total, $191,902,992. The foregoing state- ment is exclusive of payments on account of principal or interest of the public debt.

191,031,951

Pusuic Dest.

The Goverument set out, in 1790, with a revolutionary debt of about 75 millions of dollars. This debt continued without important change until 1806, when a reduction began, continuing until 1812, when the debt was about 45 millions. The then ensuing war with England carried the debt up to 127 millions in 1816. This was reduced to 96 millions in 1819, to 84 millions in 1825, and to 24 millions in 1832, and in the three years following was extin- guished. The crisis of 1837, and the financial difficulties ensuing, created indebtedness, fluctuating in amount, which at the begin- ning of the war with Mexico was about 16 millions. At the con- clusion of peace the debt had risen to 63 millions, near which point it remained autil about 1852, from which time successive reductions brought it down to 28 millions in 1857. The financial crisis of that year cansed an increase, which continued until the imminence of the civil war, when it rose from 65 millions in 1860 to 91 millions in 1861, to 514 in 1862, to 1120 in 1863, to 1816 in 1864, to 2681 in June and its maximnm (2845 millions) in August 1865.

Of the outstanding principal of the debt in 1886, 158 millions bore interest at 3 per cent., 738 millions at 4 per cent., 250 millions at 44 per cent., making the interest-bearing debt 1146 millions. The debe bearing no interest amounted to 629 millions, making the aggregate 1775 millions. The cash in the treasury on the Ist of July of that year reached 493 millions,

leaving the total debt, less cash in the treasury, 1282 millions. The annual interest-charge was at this date 454 millions.

At the tenth census (1880) an effort was made to ascertain the indebtedness of all States, Territories, counties, cities, towns, townships, &c., with the following result (in millions of dollars) :— total funded debt, 1118; floating debt, 84; gross debt, 1202; sink- ing fund, 145; net debt, 1057, The total net debt was made up as follows (in millions of dollars):—debts of States and Territories, 234; debts of counties, 124; debts of townships, 32; debts of school districts, 17; debts of cities and towns, 649,

PENSIONS.

The number of pensioners on the rolls, June 30, 1887, with the amounts due the several classes, at existing rates per year, will be found in the following table (XXXV.) :—

f Number. | Amount. Wants IvehS¢ Lice onnenorarnocseeuccice|| 294,445 $36,063,345 ye BREN clay y Cusseta 85,010 13,313,455 Nav Nan yalidete os. scccssseetoc snes | 3,281 429,288 NAVY... .corcesvoovee \ Widows, ON… 1,973 405,288 5 MUL VAMONSephenesadscedsves’ess! 069 103,392 Waerormlele is s:2. Widows, &.s.-scsccscce 11/831 1,703,664 rere sas ISAO Bacenicoococonnacoscn 7,503 720,288 ‘Wea avatin BeaICS Myra ova, MC. cc ..-0 sco. “805 85,920

406,007 $52,824,640

Civit SERVICE.

It is impossible to make even an approximation to the number of persons in the civil service within the United States, including the officers of States, connties, cities, towns, &c. There is no com-

Sf 2°) ee

plete and exact statement available even as to those who are in the civil service of the national Government. An attempt has been made, for the present purpose, to reach an approximation to that number. This has beeu

done by counting the names on 1200 pages of the blue-book of 1885, under the several heads there mentioned. Such a process involves a liability to minor errors, in addition to whatever duplications or omissions may occur in the printed lists, The results are offered merely as an approximation to facts, Legislative branch, 427; executive branch, 114,852; judicial branch, 2876; total, 118,155. The executive branch includes— executive, 22; state department, 467; war department, 9050; navy department, 1637; interior departinent, 6115; treasury depart- ment, 14,505; post-office department, 79,110; department of agriculture, 203; national museum, 154; Fish Commission, 118: Government printing office, 2238; government of the District of Colnmbia, 1200; miscellancous, 33.

[STATISTICS,

ARMY.

The following table (XXXVI.) exhibits the personnel of the army on January 1, 1887 :—

Officers. Hood | Professors Cadets,

Genenalloficeshs.:cccsssssecnsooetessce 10 an wo Adjutant-general's department…. 17 cas F Inspector-general's department… 7 Judge-advocate -general's dept…. 8 Quartermaster's department…..... 61 Subsistence department….....e0. 26 58 Medical department….....sc0000 195 140 PAY GepATtMON t,o… sscscestcoevsrsere 48 500 ! Corps Of ENZINCELS,.....000.c0cccere 109 450 Ordnance departmenNt….....0006 59 400 | Sipmal COnPSiiiscssecsccssssessasseatsnees 17 470 FOStiChADIWINStecs.ccseecssecossreececes 30 pe | Ten regiments of cavalry….....06+ 432 7,970 | Five regiments of artillery. ..... 2380 2,650 : | Twenty-five regiments of infantry| 877 12.625 60 aa MalitaryqaCademyaeeserssssccesere: sna ano 7 344 Non-commissioned staff un-

attached to regiments…..... 800 | Enlisted men unattached to regi-

MIVEMUS Sv atonoasesevedscwostersanensee ses 265 Indian scouts……... m pan 200 eee tp General scrvicc clerks and mes- | |

SUMMONS Tcsaearesecerseresstessoactescents sve 70 i {

Total regular army…... 2176 25,640 or aa

Organized and equipped militia,

USB Bis. oss douse: ssseceneuevectessosancees 6535 75,175

Navy.

The following table (XXXVII.) exhibits the personnel of the navy on January 1, 1887 :—

Commissioned officers, line ….....008 750 Commissioned officers, staff — Mcdical department 163 Pay department 111 Engineers…..... 228 Other staff officer 64 CAGES. covssscsscecccntes 243 Non-commissioned officer: » =185 FnSted MENTANd DOVS)...s+s0necses:encscenesstoeeranenemm 8250 Marine Corps. Commissioncd officers .. SosEadondoceC 73 AUIMSUCUMIMEN yc ocesssescoseevscsscesedecssucacnstntsaeet teeta 1500

The following table (XXXVIIL) exhibits the number of vessels constituting the navy of the United States, according to class and condition, on January 1, 1887 :—

In In Building or Commission. Ordinary. Repairing. First-rate armoured ….....ss0ec0s 1 a 2 Second-rate unarmoured.,..... 10 ans Third-rate armoured …....0.. 000 il 2 5 Third-rate unarmoured…..... 17 Pc | 5 Fourth-rate armoured ,.....0.000« ae 1 oe Fourth-rate unarmoured …..... 4 a 1 TUS Ts sseiesev:vesrsascecccacaresassees ll ay ove SHINE) VESBEISisesccowcnsseeseresse ts 12 and | ee TO. cisccathaeee 56 | 14 | 13

‘Yen are unserviceable ; 3 of these are used as receiving ships, the others condemned and authorized to be sold.

EDUCATION.

The institution, control, and maintenance of public schools are in the hands of the several States, although the United States Government has made liberal grants of lands, in aid of ae instruction, to the States formed out of the public domain, ani also for the endowment of colleges of agriculture and the meehame arts, to all the States. ; f

The following table (XX XIX.) presents the leading a a the public school statistics at four dates between 1876 and 1886:

eit D> § fF APT HES

7 Aegere Daily TABLE XLI.—Religtous Denominations.

| . Number of Public School Enrolinent, 7 – ; a b Attendance. . EGCHEIR: Expenditure. Denomination. Ministers. Members. 1876 8,363,738 4,066,848 249,283 $84,005,333 i — = or Monks. 1880 9,781,521 5,805,342 282) 644 “80,032,838 Nee, ; ee eMREO | 3,286,168 1885 11,169,923 6,900,625 319,549 110,884,657 Pe me eile ou es ~ OC = oF 5 HODGCObDSSqnonaon . 2,208 ue Ta89, 207 Freee Xe 528,060 peeled Primitive Methodist…..... 38 2465 : 5 5 : Free Metliodist. ..... 25 2,08 _ The so-called public schools, although differing widely as to effi- Fs cuit Musicven pe 433 17737 ciency between new States and old States, between rich States and | | Congregationalist Methodist… 20,000 poor States, all conform closely to a traditional type, except so far | | PYotestant Methodist…....eee- 2,146 119,110 as differences arise according as schools are in sparsely or in densely Episcopal 18,979 3,112,520 settled districts through the opportunity for grading the pupils | | Union American M.Evsssecssscoss-ose. 91 3,500 which exists in the latter case. As regards, however, schools giving yet dew ML. By. seeeeseee 530 84,495 instruction higher than or other than that given in the ordinary | | 47j020 M-E. Zion Pe Bee public school, the greatest and most confusing differences exist as | | Methodist Episcopal South…cc,| 8.644 828,035 tu designation, organization, and schemes of instruction. Methodist Episcopal …....0000-0.| 11,042 1,698,336 The following table (XL.) presents the results of the compila- eee oe | tions of the statistics of schools of the various classes by the United | | six Principle.es.ces+ssecsosesesesseceeosee- 17 fe ellis 746 “ae | States Bureau of Education :— Seventh-Day ….. 103 8,576 ae Sk eee Anti-Mission ….. 622 41,660 Schools.| Teachers.} Pupils. Free-Will…....

1,294 74,851 = 2 ere Bc. | Reena | alec Fenie Baptistivesseccssss ccccndncotctnct ene 16,680 2,302,272 IBNOUIMAUSCHOOISPee ss cccvesc-cccsheconicsserecses ys ane 153 1394 40,325 Commercial und business colleges… é 239 1040 47,176 PRESBYTERIAN— 7,897 885,468 KAN GSTB ALTON SH .<....0.s.0000e-0nve tote Peal 407 945 | 21,640 Reformed..... ne 32 5,876 Institutions for secondary instruction. ... 1440 7566 | 151,050 United..... vl 647 81,226 INE PAMALOMYESCHOOISs....0.02026 essccatrsncsesensesssee reall 197 1434 21,031 Cumberland..... 6 1,366 98,068 | Institutions for superior instruction of women..... 204 2123 | 27,143 Presbyterian South.... 1,014 119,583 | Universities and COlleges....csscscescsssssssssseceecccevese 8345 4720 67,642 IPTESDYACILAM terserecescss essa caatavorceso cc / 4,853 580,720 | Schools of science ..... “anne i 90 974 16,532 | Schools of theology ....ssssccssseceeeees 142 803 6,344 Lutheran..... borrrenoortee 3,025 569,389 PSCHOOION lA sereteetce. cs ctteeicrmemcesca| 49 283 3,054 Christian (Disciples of Chris 2,658 556,941 | Schools of medicine, of dentistry, and of pharmacy} 175 2829 16,407 Congregational . 3,574 384,800 | Training schools fOr NUrses,.....ssseccccsesssvvcseseccevces 29 139 837 | Institutions for deaf and GUMD.....sccseceeesereseeses 61 596 7411 | EPIscoPaL— 3,215 | 336,669 Institutions for the Dlind.....0006 29 623 2,412 Reformed Episcopal....,.....see 66 10,451 | Schools for feebic-minded children... 16 636 2.942 Protestant Episcopal.....0....— 3,149 326,218 PPLRCLOTINSCHOOIB rece. sconeAOC emS ne tiGihanssaseenanssteestisr te st 2,178 155,579 D = eli was = Reformed, in United States……..... 755 154,008 United Evangelical…..... nobor 425 144,666 RELIGION. Evangelical Association….....00+- 1,343 99,710 The census has since 1850 attempted to obtain the number of Fe ioe ala 107 as 11,100 pines church edifices, with the aggregate number of sittings, belonging | | Seventh Day… 138 14,738 to each principal sect or denomination. The results have not been | | SCCONd..esssesesceceeeses 501 63,500 highly satisfactory, either as to accuracy or as to classification. At | | phe prethren (Dunkarrds) ..ccsssssseess 1,589 88,669 the census of 1880 the attempt to collect the statistics of churches | | Reformed. i rica… ‘ ‘ eformed, in Americu..,.... A 515 77,269 proved an almost total failure. It seems best, therefore, to AOU MOI || PHUICNSrerecccceseeeees 878 74,313 the present purpose, the . oe (Table XLI.) presented by the repre- se all ap ae an sentatives of the various denominations, as they have been

revised | | Gnurch of God (Winebrennarian).... 492 90.176 and digested by a competent authority, the Rev. Dr W. H. Dupuy, | | Unitarian.cccsciessssseeesseeenene 382 19,784 only adding the remark that no statement of this kind can be made eo Dee ia ; a4 mm . . EWISIl.covecccvecssercescceveesoes r 2 b to meet the views of all persons interested. The statement of Di New Jerusalem (Swedenborgian).... 92 5,538

Dupuy does not include the Roman Catholic Church, whose author- ities claim from six and a half to seven millions of adherents.

Abolition, 752, 763, 767,

769,

Acadia, 734.

Adams, Pres. John, 739,

741, 743, 745, 752, 755-6.

Adams, Pres. John Quin- cy, 761-2.

Adirondacks, 792.

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United States of America, especially in the New States, which has for its distinguishing tenet the of the final salvation of all souls from

Boston (notably in The Salvation 1784); Dr Joseph Huntington, of Coventry,

John Murray, Elhanan Winchester, Caleb Rich, specially, Hosea Ballou. 'the father of Universalism in America," (on a theory quite peculiar; Murray, a Methodist in England and Ireland, tinguished convert.

ance, he preached at Good Luck, New J ersey,

Gloucester, Massachusetts,

‘pducation,

ig‘discipulorum”), In the course of ihe latter part of the 14th century,

f teachers and scholars

i Diided as a place of instruction) instruction for all.2 udii” and “universitatis collegium” » be met with in official documents.

| It is necessary, however, to bear in mind, on the one hnd, that a university often had a vigorous virtual exist- &ce long before it obtained that legal recognition which en- Hled it, technically, to take rank as a “studium generale,” Ad, on the other hand, that hostels, halls, and colleges, Higether with complete courses in all the recognized Hanches of learning, were by no means necessarily in- Ived in the earliest conception of a university. The Hiversity, in its earliest stage of development, appears to jve been simply a scholastic guild,—a spontaneous com- pation, that is to say, of teachers or scholars, or of jth combined, and formed probably on the analogy of the des guilds, and the guilds of aliens in foreign cities, which, ithe course of the 13th and 14th centuries, are to be find springing up in most of the great European centres. je design of these organizations, in the first instance, was It is the design of the present article to exhibit the universities in Mir historical development, each being brought under notice, as far dpracticable, in the order of its original foundation. In the alpha-

Mical enumeration in the table at the end, the date of foundation

us Serves to indicate approximately the place where any university

igirst referred to.

Denifle, Die Universitdten des Mittelalters, i. 39.

UNI—UNI

UNIVERSALIST CHURCH, a religious body in the England doctrine sin through Christ. The pioneers of Universalism in America were Dr George De Benneville, who taught from 1741 principally in Pennsylvania; Dr

Charles Chauncy, of the First Church, of All Men, published in Conn. (whose Calvinism Improved was published after his death in 1796); and, very Murray is, however, regarded as In 1750 James Relly had avowed himself a Universalist, basing his belief who had preached as was Relly's most dis- In 1770 he came to America, and, under circumstances so strange that most Universalists regard them as providential, overcoming a deep reluct- and organ- ized a society, "The Independent Christian Church," at Hosea Ballou—a convert from

epoch-making, A Treatise on Atonement. The number of ministers increased, and societies were formed. These in due time became the constituents of larger organizations, tilla " New England convention" saw occasion, in 1803, to adopt a "profession of faith," which in three short articles avowed belief in the Bible ag making known in a Divine revelation the nature of God, the mission of Christ, the final holiness of all souls, and the necessity of good works. In 1866 a general convention, composed of delegates from the State conventions, was incorporated. It has jurisdic- tion throughout the United States and Canada. It has a " Murray fund" of about $135,000. Under the auspices of the Universalist Church are the "woman's centenary association," the ' Universalist historical society," several organized charities, four colleges, three theological schools, and five academies,—the total value of the schools, includ- ing endowments, being hardly less than 3 million dollars, It publishes eight periodicals. The Year Book for 1887 gives the following summary :—1 general convention; 22 State conventions; 945 parishes, 38,429 families; 696 churches, 35,550 members; 634 Sunday schools, 51,871 members; 789 church edifices; value above indebtedness,

$7,493,927 ; 673 clergymen in fellowship and 120 licensed lay preachers.

USBTVERSITIES:

HE mediaeval Latin term universitas (from which the

English word " university " is derived) was originally »mployed to denote any community or corporation re- garded under its collective aspect. When

used in its y- modern sense, as denoting a body devoted to learning and it required the addition of other words in order jo complete the definition,—the most frequent form of ex- pression being “universitas magistrorum et scholarium” (or time, probably towards the term began to be (ised by itself, with the exclusive meaning of a community whose corporate existence had peen recognized and sanctioned by civil or ecclesiastical juthority or by both. But the more ancient and custom- ry designation of the university in medizval times (re- was ‘‘studium generale ” br sometimes “ studium ” alone), a term implying a centre The expressions “ universitas are also occasionally

little more than that of securing mutual protection,—for the craftsman, in the pursuit of his special calling,—for the alien, as lacking the rights and privileges inherited by the citizen. And so the university, composed as it was to a great extent of students from foreign countries, was a combination formed for the protection of its members from the extortion of the townsmen and the other annoyances incident in medieval times to residence in a foreign state. It was a first stage of development in connexion with these primary organizations, when the chancellor of the cathedral, or some other authority, began, as we shall shortly see, to confer on their masters the right of teach- ing at any similar centre that either already existed or might afterwards be formed throughout Europe,—“‘facultas ubique docendi.” It was a still further development when it began to be recognized that, without a licence from either pope, emperor, or king, no “studium generale” could be formed possessing this right of conferring degrees, which originally meant nothing more than licences to teach.

In order, however, clearly to understand the conditions Chief under which the earliest universities came into existence, facts it is necessary to take account, not only of their organiza- i i

; : cl : – history of tion, but also of their studies, and to recognize the main learning influences which, from the 6th to the 12th century, served before to modify both the theory and the practice of education, the uni- In the former century, the schools of the Roman empire, V¢ersity which had down to that time kept alive the traditions of ° pagan education, had been almost entirely swept away by

the barbaric invasions. The latter century marks the

period when the institutions which supplied their place—

the episcopal schools attached to the cathedrals and the monastic schools—attained to their highest degree of influ-

ence and reputation. Between these and the schools of

the empire there existed an essential difference, in that the

theory of education by which they were pervaded was in complete contrast to the simply secular theory of the schools of paganism. The cathedral school taught only

what was supposed to be necessary for the education of

the priest; the monastic school tauglit only what was

supposed to be in harmony with the aims of the monk. But between the pagan system and the Christian system

by which it had been superseded there yet existed some-

Revival Under the rule of the Merovingian dynasty even these | tion of that island, that Salerno acquired its reputation, intime scanty traditions of learning declined throughout the | [t was by a band of these invaders that Bertharius, abbot e eon Frankish dominions; but in England the designs of | of Monte Cassino, and the author of certain medical reer Gregory the Great, as carried out by Thcodorus, Bede, | treatises, was massacred along with his monks in the year and Alcuin, resulted in a great revival of education and | 883. The Saracens were famed for their medical skill letters. The influence of this revival extended in the 8th | and, by tlieir translations of Galen and Hippocrates, did and 9th centuries to Frankland, where Charles the Great, | much to advance the study ; and, according to Jourdain,’ advised and aided by Alcuin, effected a memorable refor- | there were translations from the Arabic into Latin long mation, which included both the monastic and the cathe- | before the time of Constantine the African, but these dral schools;

while the school attached to the imperial | versions have perished. In the course of the 11th century, court, known as the Palace School, also became a famous | under the teaching of Constantine the African (d. 1087), centre of learned intercourse and instruction. the celebrity of Salerno became diffused all over Europe. Its con- But the activity thus generated, and the interest in | Ordericus Vitalis, who wrote in the first half of the 12th nexion Jearning which it served for a time to diffuse, well nigh | century, spcaks of it as then long famous. In 1231 it eee unl- died out amid the anarchy which characterizes the 10th | was constituted by the emperor Frederick II. the only ersity of : ; : cee ¢ Ba : Paris, century in Latin Christendom, and it is at least question- | school of medicine in the kingdom of Naples. doubtful, able whether any real connexion can be shown to have It was at a considerable interval after the rise of the Teaching existed between this earlier revival and that remarkable | school at Salerno, about the year 1113, that Irmerius com-% _ movement in which the university of Paris had its origin. | menced at Bologna his lectures on the civil law. This pees On the whole, however, a clearly traced, although imper- | instruction, again, was of a kind which the monastic and pologia, fectly continuous, succession of distinguished teachers has | cathedral schools could not supply, and it also met a new inclined the majority of those who have studied this ob- | and pressing want. The states of Lombardy were at this scure period to conclude that a certain tradition of learn- | time rising rapidly in population and in wealth ; and the ing, handed down from the famous school over which | greater complexity of their political relations, their increas- Alcuin presided at the great abbey of St Martin at Tours, | ing manufactures and commerce, called for a more definite continued to survive, and became the nucleus of the teach- | application of the principles embodied in the codes that General ing in which the university took its rise. Dut, in order | had been handed down by Theodosius and Justinian. But causes of adequately to explain the remarkable development and | the distinctly secular character of this new study, and its la novel character which that teaching assumed in the course | intimate connexion with the claims and prerogatives of the universi. Of the 12th and 13th centuries, it is necessary to take } Western emperor, aroused at first the susceptibilities of the ties. account of the operation of certain more general causes to | Roman see, and for a time Bologna and its civilians were which the origin of the great majority of the earlier uni- | regarded by the church with distrust and even with alarm. versities may in common

unhesitatingly be referred. These | These sentiments were not, however, of long duration. In causes are—(1) the introduction of new subjects of study, | the year 1151 the appearance of the Decretum of Gratian, Decrelum as embodied in a new or revived literature ; (2) the adop- | largely compiled from spurious documents, invested the ae tion of new methods of teaching which were rendered | studies of the canonist with fresh importance ; and canon necessary by the new studies ; (3) the growing tendency | numerous decrees of past and almost forgotten pontifis now law. to organization which accompanied the development and | claimed to take their stand side by side with the enact- consolidation of the European nationalities. ments contained in the Corpus Juris Civilis. They con- That the earlier universities took their rise to a great | stituted, in fact, the main basis of those new pretensions extent in endeavours to obtain and provide instruction of | asserted with so much success by the popedom in the a kind beyond the range of the monastic and cathedral | course of the 12th and 13th centuries. It was necessary, schools appears to be very generally admitted, and this | accordingly, that the Decretwm should be known and general fact has its value in assisting us to arrive at a | studied beyond the walls of the monastery or the episcopal conclusion with respect to the origin of the first European | palace, and that its pages should receive authoritative ex- Rise of university,—that of Salerno in Italy, which became | position at some common centre of instruction. Such a uni- known as a school of medicine as early as the 9th century. | centre was to be found in Bologna. The needs of the she The circumstances of its rise are extremely obscure, and | secular student and of the ecclesiastical student were thus

thing that was common to both: the latter, even in the narrow and meagre instruction which it imparted, could not altogether dispense with the ancient text-books, simply because there were no others in existence. Certain treatises of Aristotle, of Porphyry, of Martianus Capella, and of Boetius continued consequently to be used and studied; and in the slender outlines of pagan learning thus still kept in view, and in the exposition which they necessitated, we recognize the main cause which prevented the thought and literature of classic antiquity from falling altogether into oblivion.

whether it was monastic or secular in its origin has been much disputed. One writer! derives its origin from an independent tradition of classical learning which continued to exist in Italy down to the 10th century. Another writer? maintains that it had its commencement in the teaching at the famous Benedictine monastery of Monte Cassino, where the study of medicine was undoubtedly

pursued. But various facts may be urged in contraven-

1De Renzi, Storia Documentata della Scuola Medica di Salerno, ed. 1857, p. 145. 2 Puccinotti, Storia della Medicina, i. 317-326.

tion of such a theory. The school at Salerno, so far as its history can be traced, appears to have been entirely a secular community ; it was distinguished also by its catholic spirit, and, at a time when Jews were the object of religious persecution throughout Europe, members of this nationality were to be found both as teachers and learners at Salerno. Situated, moreover, as it was on the seq. coast, its communication with the neighbouring island of Sicily was easy and frequent ; and it would accordingly seem far more probable that it was owing to the new knowledge gained from the Saracens, after their occupa-

brought for a time into accord, and from the days of Irnerius down to the close of the 13th century we have satisfactory evidence that Bologna was generally recognized as the chief school both of the civil and the canon law. It has indeed been asserted that university degrees were instituted there as early as the pontificate of Bugentus III. (1145-53), but the statement rests on no 60% authority, and is in every way improbable. There 18, however, another tradition which is in better harmony

3 Sur 0_Age et U Origine des Traductions Latines, &¢., P.- 225. + Denifle, Die Universitdten, &c., i. 48.

with the known facts. When Barbarossa marched his forces into Italy on his memorable expedition of 1155,

ns and reasserted those imperial claims which had so long alr eo Jain dormant, the professors of the civil law and their are n scholars, but more especially the foreign students, gathered Hs ‘ts round the Western representative of the Roman Ceesars, Wat |

1, 22d besought his intervention in their favour in their ‘relations with the citizens of Bologna. A large proportion of the students were probably from Germany ; and it did not escape Frederick’s penetration that the civilian might prove an invaluable ally in the assertion of hig imperial pretensions. He received the suppliants graciously, and, finding that their grievances were real, especially against the landlords in whose houses they were domiciled, he granted the foreign students substantial protection, by conferring on them certain special immunities and privi- leges (November 1158).!_ These privileges were embodied in the celebrated Authentica, Habita, in the Corpus Juris Civilis of the empire (bk. iv. tit. 13), and were eventually extended so as to include all the other universities of Italy. In them we may discern the precedent for that state pro- tection of the university which, however essential at one time for the security and freedom of the teacher and the taught, has been far from proving an unmixed benefit, — the influence which the civil power has thus been able to exert being too often wielded for the suppression of that very liberty of thought and inquiry from which the earlier universities derived in no small measure their importance _ and their fame. But, though there was a flourishin _ is to be observed that Bologna did not possess a university so early as 1158. Its first university was not constituted until the close of the 12th century. The “universities ” ivl- at Bologna were, as Denifle has shown, really student guilds,

j* formed under influences quite distinct from the protecting

“clauses of the Authentica, and suggested, as already noted, by the precedent of those foreign guilds which, in the course of the 12th century, began to rise throughout western Europe. They had their origin in the absolute necessity, under which residents in a foreign city found | themselves, of obtaining by combination that protection | and those rights

which they could not claim as citizens. | These societies were modelled, Denifle considers, not on the trade guilds which rose in Bologna in the 13th century, | but on the Teutonic guilds which arose nearly a century | earlier in north-western Europe, being essentially ‘“ spon- | taneous confederations of aliens on a foreign soil.” Ori- ginally, they did not include the native student element. | The power resulting from this principle of combination, when superadded to the privileges conferred by Barbarossa, or 4 S2Ve to the students of Bologna a superiority of which tse {) they were not slow to avail themselves. Under the leader- amy Ship of their rector, they extorted from the citizens con- iHes.)) cessions which raised them from the condition of an op- | pressed to that of a specially privileged class. The same principle, when put in force against the professors, reduced |the latter to a position of humble deference to the very |body whom they were called upon to instruct, and im- jparted to the entire university that essentially democratic character by which it was afterwards distinguished. It is jnot surprising that such advantages should have led to an imitation and extension of the principle by which they jwere obtained. Denifle considers that the “ universities ” jat Bologna were at one time certainly more than four in

1 See Savigny, Gesch. d. rim. Rechts, iii. 152, 491-492. See also Giesebrecht, Gesch. d. Kaiserzeit (ed. 1880), v. 51-52. The story is preserved in a recently discovered metrical composition descriptive of jthe history of Frederick I.; see Sitzwngsberichte d. Bairisch. Akad. d. Wissenschaft, Phil.-Hist. Klasse, 1879, ii. 285. Its authenticity is

jcalled in question by Denifle, but it would seem to be quite in har- jmony with the known facts.

g school of study, it

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number, and we know that the Italian students alone were subdivided into two,—the Tuscans and the Lombards. In Other the centres formed by secession from the parent body a similar like subdivision took place. At Vercelli there Were four ‘oummumt: ‘‘ universitates,” composed respectively of Italians, Eng- a bs lish, Provengals, and Germans ; at Padua there were similar divisions into Italians, French (t.e., Lrancigens,

comprising both English and Normans), Provengals (in- cluding Spaniards and Catalans). When accordingly we learn from Odofred that in the time of the eminent jurist

Azo, who lectured at Bologna about 1200, the number of

the students there amounted to some ten thousand, of whom the majority were foreigners, it seems reasonable to conclude that the number of these confederations of students (“societates scholarium ”) at Bologna was yet greater.

It is certain that they were not formed simultaneously,

but, similarly to the free guilds, one after the other,—the

last in order being that of the Tuscans, which was com- posed of students from Tuscany, the Campagna, and Rome. Nor are we, again, to look upon them as in any

way the outcome of those democratic principles which found favour in Bologna, but rather as originating in the traditional home associations of the foreign students, fostered, however, by the peculiar conditions of their university life. As the Tuscan division (the one least in sympathy, in most respects, with Teutonic institutions)

was the last formed, so, Denifle conjectures, the German ‘university ” may have introduced the conception which

was successively adopted by the other nationalities,

In marked resemblance to the guilds, these confederations The were presided over by a common head,—the “rector schola- rector, rium,” an obvious imitation of the “rector societatum” or

“artium” of the guild, but to be carefully distinguished from the “rector scholarum,” or director of the studies, with whose function the former officer had, at this time, nothing incommon. Like the guilds, again, the

different nations were represented by their '"consiliarii," a deliberative assembly with whom the rector habitually took counsel.

While recognizing the essentially democratic character of Mature the constitution of these communities, it is to be remem- age of the bered that the students, unlike the majority at Paris and students. later universities, were mostly at this time of mature years. As the civil law and the canon law were at first the only branches of study, the class whom they attracted were often men already filling office in some department of the church or state, —archdeacons, the heads of schools, canons of cathedrals, and like functionaries forming a con- siderable element in the aggregate. It has been observed, indeed, that the permission accorded them by Frederick I. of choosing, in all cases of dispute, their own tribunal, thus constituting them, to a great extent, sui juris, seems to presuppose a certain maturity of judgment among those on whom this discretionary power was bestowed,

With the middle of the 13th century, these various con- Amalga- federations became blended, for the first time, into one or mation of other of the two great divisions alreadyreferred to,—those of aes the Ultramontani and the Citramontani, Johannesde Varanis aD being rector of the former and Pantaleon de Venetiis of the into two latter. Innocent IV., in according his sanction to the new divisions. statutes of the university in 1253, refers to them as drawn up by the "rectores et universitas scholarium Bononien- sium." With the commencement of the 16th century, the two corporations were combined under one rector.

About the year 1200 were formed the two faculties of Faculties medicine and philosophy (or the arts"), the former being instituted. érivium (t.e., grammar, logic, and rhetoric) and the quadrivium (t.e., arithmetic, geometry, music, and astronomy), as handed down from

the schools of the Roman empire. See J. B. Mullinger, Zistory of the University of Cambridge, i. 24-27. XXIII. — 105

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Account of the ulliver- sity by Anglicus,

The earliest colleges,

Origin of univer- sity of Paris.

Study of logic.

Teaching

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Abelard.

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somewhat the earlier. It was developed, as that of the civil law had been developed, by a succession of able teachers, among whom Thaddeus Alderottus was especially eminent. The faculty of arts, down to the 14th century, scarcely attained to equal eminence. The teaching of theology remained for a long time exclusively in the hands of the Dominicans ; and it was not until the year 1860 that Innocent VI. recognized the university as a “studium generale” in this branch,—in other words, as a place of theological education for all students, with the power of conferring degrees of universal validity.

In the year 1371 the cardinal legate, Anglicus, compiled, as chief director of ecclesiastical affairs in the city, an account of the university, which he presented to Urban V. The information it supplies is, however, defective, owing to the fact that only the professors who were in receipt of salaries from the municipality are mentioned. Of these there were twelve of civil law and six of canon law ; three of medicine, three of practical medicine, and one of sur- gery ; two of logic, and one each of astrology, rhetoric, and notarial practice. The professors of theology, who, as members of the religious orders, received no state remunera- tion, are unmentioned.

Colleges existed at Bologna at a very early date, but it is not until the 14th century that we find them possessing any organization. They were designed solely for neces- sitous students, not being natives of Bologna. A separate house, with a certain fund for the maintenance of a speci- fied number of

scholars, was all that was originally con- templated. Such was the character of that founded by Zoen, bishop of Avignon, in February 1256 (O.S.), the same month and year, it is to be noted, in which the Sor- bonne was founded in Paris. It was designed for the maintenance of eight scholars from the province of Avignon, under the supervision of three canons of the church, main- taining themselves in the university. Each scholar was to receive 24 Bolognese lire annually for five years. The college of Brescia was founded in 1326 by William of Brescia, archdeacon of Bologna, for poor foreign students without distinction as to nationality. The Spanish college, founded in 1364, for twenty-four Spanish scholars and two chaplains, is noted by Denifle as the one college founded in medieval times which still exists on the Continent.

Of the general fact that the carly universities rose in response to new wants the commencement of the uni- versity of Paris supplies us with a further illustration. The study of logic, which, prior to the 12th century, was founded exclusively on one or two meagre compends, received about the year 1100, on two occasions, a power- ful stimulus,—in the first instance, from the memorable controversy between Lanfranc and Berengar; in the second, from the no less famous controversy between Anselm and Roscellinus. intelligent apprehension of spiritual truth depended on a correct use of prescribed methods of argumentation. Dialectic was looked upon as “ the science of sciences” ; and, when, somewhere in the first decade of the 12th century, William of Champeaux opened in Paris a school for the more advanced study of dialectic as an art, his teaching was attended with marked success. Among his pupils was Abelard, in whose hands the study made-a yet more notable advance ; so that, by the middle of the cen- tury, we find John of Salisbury, on returning from the French capital to England, relating with astonishment, not unmingled with contempt, how all learned Paris had gone well nigh mad in its pursuit and practice of the new dialectic.

Abelard taught in the first instance at the cathedral school at Notre Dame, and subsequently at the schools on the Montagne Sainte-Geneviéve, of which he was the

A belief sprang up that an.

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founder, and where he imparted to logic its new develop. ment. But in 1147 the secular canons of Ste Genevidye gave place to canons regular from St Victor; and hence. forth the school on the former foundation was merely a school for the teaching of theology, and was attended only by the members of the house! The schools out of which the university arose were those attached to the cathedral on the [le de la Cité, and presided over by the chancellor, —a dignitary who must be carefully distinguished from the later chancellor of the university. For a long time the teachers lived in separate houses on the island, and it was only by degrees that they combined themselves into q society, and that special buildings were constructed for their class-work. But the flame which Abelard's teaching had kindled was not destined to expire. Among his

pupils was Peter Lombard, who was bishop of Paris in Lomban's 1159, and widely known to posterity as the compiler of Sendonces

the famous volume of the Sentences. The design of this work was to place before the student, in as strictly logical a form as practicable, the views (sententiz) of the fathers and all the great doctors of the church upon the chief and most difficult points in the Christian belief. Conceived with the purpose of allaying and preventing, it really stimulated, controversy. The logicians seized upon it asa great storehouse of indisputable major premises, on which they argued with renewed energy and with endless ingenuity of dialectical refinement; and upon this new compendium of theological doctrine, which became the text-book of the Middle Ages, the schoolmen, in their successive treatises super Sententias, expended a consider- able share of that subtlety and labour which still excite the astonishment of the student of metaphysical literature.

It is in these prominent features in the history of these Riso of

early universities—the development of new methods of = early uni: versitics,

instruction concurrently with the appearance of new material for their application—that we find the most probable solution of the question as to

how the university, as distinguished from the older cathedral or monastic schools, was first formed. Ina similar manner, it seems probable, the majority of the earlier universities of Italy— Reggio, Modena, Vicenza, Padua, and Vercelli—arose, for they had their origin independently alike of the civil and the papal authority. Instances, it is true, occur, which cannot be referred to this spontaneous mode of growth. The university of Naples, for example, was founded solely by the fiat of the emperor Frederick II. in the year 1224; and, if we may rely upon the documents cited by Denitle, Innocent IV. about the year 1245 founded in connexion with the curia a "'studium generale,"? which was attached to the papal court, and followed it when removed from Rome, very much as the Palace School of Charles the Great ac companied that monarch on his progresses.

As the university of Paris became the model, not only es Cea

sul tion of for the great majority of those of central Europe as well are. as for Oxford and Cambridge, some account of its early sity of Such an account Paris.

for the universities of France north of the Loire, but als

organization will here be indispensable. is rendered still further necessary by the fact that the recent and almost exhaustive researches of Denitle, the Dominican father, have led him to conclusions which on some important points run altogether counter to those sane tioned by the high authority of Savigny. i

The original university, as already stated, took 1ts rise entirely out of the movement carried on by teachers on the

1The view of Thurot (De U'Organisation de 0 Enseignement dans l Université de Paris, pp. 4-7) that the university arose out of a com bination of these several schools is rejected by Denifle (see Die Uni- versitdten, &e., i, 6538-694). z

2 Where the words studiwm generale are placed within quotation they oceur in the original charter of foundation of th versity referred to.

marks of e uni-

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ce, alike with the chancellor, the bishop, and the cathedral elo Chapter of Paris, by all of whom it was regarded as a tpt. centre of insubordination and doctrinal licence. Had it || |jnot been, indeed, for the papal aid, the university would bi |i probably not have survived the contest; but with that vd | powerful assistance it came to be regarded as the great n| |) Transalpine centre of orthodox theological teaching. 10 Successive pontifis, down to the great schism of 1378, if {|made it one of the foremost points of their policy to ij [jcultivate friendly and confidential relations with the hq jauthorities of the university of Paris, and systematically to | |jdiscourage the formation of theological faculties at other ir} fycentres. In 1231 Gregory IX., in the bull Parens Scien- 4 |tarum, gave full recognition to the right of the several { faculties to regulate and modify the constitution of the 1¢ entire university, —a formal sanction which, in Denifle's iy Opinion, rendered the bull in question the Magna Charta hq jjof the university. Sr:

n In comparing the relative antiquity of the universities ,, fpf Paris and Bologna, it is difficult to give an unqualified si| [Pecision. The university of masters at the former was a| |probably slightly anterior to the university of students at [phe latter; but there is good reason for believing that s, aris, in reducing its traditional customs to statutory form,

» (24) the new

. of the Seine and placing themselves under the jurisdiction of the abbot of the monastery of Ste Geneviéve ; and in

whose duty it should be to confer " licentia docendi" on those candidates who were desirous of opening schools in that district. But it was around the bestowal of this licence by the chancellor of Notre Dame, on the fle de la Cité, that the university of Paris grew up. It is in this licence that the whole significance of the master of arts degree is contained ; for what is technically known as admission to that degree was really nothing more nor less than receiving the chancellor's permission to "incept," and by " inception " was implied the master's formal entrance upon, and commencement

of, the functions of a duly licensed teacher, and his recognition as such by his brothers in the profes- | sion. The previous stage of his academic eareer, that of w bachelordom, had been one of apprenticeship for the mastership ; and his emancipation from this state was symbolized by placing the magisterial cap (biretta) upon his head, a ceremony which, in imitation of the old Roman ceremony of manumission, was performed by his former instructor, “under whom” he was said to incept. He then gave a formal inaugural lecture, and, after this proof of magisterial capacity, was welcomed into the society of his professional brethren with set speeches, and took his seat in his master’s chair.

This community of teachers of recognized fitness did not

ity in itself suffice to constitute a university, but some time “| between the years 1150 and 1170, the period when the

Sentences of Peter Lombard were given to the world, the university of Paris came formally into being. Its first written statutes were not, however, compiled until about the ycar 1208, and it was not until long after that date that it possessed a “rector.” Its earliest recognition as a legal corporation belongs to about the year 1211, when a brief of Innocent III. empowered it to elect a proctor to be its representative at the papal court. By this permis- | Sion it obtained the right to sue or to be sued ina court | of justice as a corporate body.

| This papal recognition was, however, very far from im- 3] plying the episcopal recognition, and the earlier history of community exhibits it as in continual conflict

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island, who taught by virtue of the licence conferred by HS the chancellor of the cathedral. the 13th century, it is true, we find masters withdrawing themselves from his authority by repairing to the left bank

In the second decade of

1255 this dignitary is to be found appointing a chancellor

largely availed itself of the precedents afforded by the already existing code of the Transalpine centre, while its rectorship, proctorships, and four " nations" are all clearly distinct adaptations of the corresponding divisions at Bologna. These nations, which included both professors The and scholars, were—(1) the French nation, composed, in ‘‘nations," addition to the native element, of Spaniards, Italians, and Greeks ; (2) the Picard nation, representing the students from the north-east and from the Netherlands 3 (2) the Norman nation ; (4) the English nation, comprising, besides students from the provinces under English rule, those from England, Ireland, Scotland, and Germany. These several nations first came into existence some time before the year 1219, and all belonged to the faculty of arts; but the fully developed university was divided into four faculties,—three " superior," viz., those of theo- logy, canon law, and medicine, and one " inferior," that of arts. The head of each faculty was the dean ; the head of each nation was the proctor. The rector, who in the first instance was head of the faculty of arts, by whom he was elected, was eventually head of the whole university. Hach of the nations and each of the superior faculties, while subject to the general authority which he represented, was, like a royal colony, in a great measure self-governed, and made statutes which were binding simply on its own members. Congregations of the faculty of arts were pre- sided over by the rector, who discharged the same function when general congregations of the whole academic com- munity were convened. In the former the votes on any question were taken by nations, in the latter by faculties and nations. Only "regents," that is, masters actually engaged in teaching, had any right to be present or to vote in congregations, Neither the entire university nor the separate faculties had thus, it will be seen, originally a common head, and it was not until the middle of the 14th century that the rector became the head of the collective university, by the incorporation under him, first, of the students of the canon law and of medicine (which took Place about the end of the 13th century), and, secondly, of the theologians, which took place about half a century later.

Apart from the broad differences in their organization, Parig and the very conception of learning, it will be observed, was Bologna different at Bologna from what it was at Paris. In the eee former it was entirely

professional,—designed, that is to °°” say, to prepare the student for a definite and practical career in after life; in the latter it was sought to provide a general mental training, and to attract the learner to studies which were speculative rather than practical. In the sequel, the less mercenary spirit in which Paris culti- vated knowledge added immensely to her influence and reputation, ‘The university became known as the great school where theology was studied in its most scientific spirit; and the decisions of its great doctors upon those abstruse questions which absorbed so much of the highest intellectual activity of the Middle Ages were regarded as almost final. The popes themselves, although averse from Papal _ theological controversies, deemed it expedient to cultivate Bal in friendly relations with a centre of such importance for the ie ie | purpose of securing their influence in a yet wider field. overs Down therefore to the time of the great schism (1378), sities, they at once conciliated the university of Paris and con- sulted what they deemed to be the interests of the Roman see, by discouraging the creation of faculties of theology elsewhere. The apparent exceptions to this policy are easily explained: the four faculties of theology which they sanctioned in Italy—-Pisa (1343), Florence (1349), Bologna (1362), and Padua (1363)—were designed to benefit the Italian monasteries, by saving the monks the expense and

| dangers of a long journey beyond the Alps; while that at

Founda- tion of univer- sities of Reggio and Modena,

Viceriza,

Padua,

Naples,

Toulouse (1229) took its rise under circumstances entirely exceptional, being designed asa bulwark against the heresy of the Albigenses. The popes, on the other hand, favoured the creation of new faculties of law, and especially of the canon law, as the latter represented the source from which Rome derived her most warmly contested powers and pre- rogatives. The

effects of this twofold policy were suffici- ently intelligible: the withholding of each charter which it was sought to obtain for a new school of theology only served to augment the numbers that flocked to Paris; the bestowal of each new charter for a faculty of law served in like manner to divert a certain proportionate number from Bologna. These facts enable us to understand how it is that, in the 13th and 14th centuries, we find, even in France, a larger number of universities created after the model of Bologna than after that of Paris.

In their earliest stage, however, the importance of these new institutions was but imperfectly discerned alike by the civil and the ecclesiastical power, and the first four uni- versities of Italy, after Bologna, rose into existence, like Bologna itself, without a charter from either pope or em- peror. Of these the first were those of Reggio and Modena, both of which are to be found mentioned as schools of civil law before the close of the 12th century. The latter, throughout the 13th century, appears to have been resorted to by teachers of sufficient eminence to form a flourishing school, composed of students not only from the city itself, but also froma considerable distance. Both of them would seem to have been formed independently of Bologna, but the university of Vicenza was probably the outcome of a migration of the students from the former city, which took place in the year 1204. In the course of the century Vicenza attained to considerable prosperity ; its students were divided into four nations, each with its own rector ; and in 1264 it included in its professoriate teachers, not only of the civil law, but also of medicine, grammar, and dialectic. The university of Padua was founded in 1222 as the direct result of the migration of a considerable number of students from Bologna. Some writers, indeed, have inferred that the ‘‘studium” in the latter city was transferred in its entirety, but the continued residence of a certain proportion in Bologna is proved by the fact that two years later we find them appealing to Honorius III. in a dispute with the civic authorities. In the year 1228 the students of Padua were compelled by circumstances to transfer their residence to Vercelli, and the latter city guaranteed them, besides other privileges, the night to rent no less than five hundred lodging-houses at a fixed rental for a period ofeight years. At first Padua was a school only of the civil and canon law; and during the oppressive tyranny of Ezzelin (1237-1260) the uni- versity maintained its existence with some difficulty. But in the latter part of the century it

incorporated the faculties of grammar, rhetoric, and medicine, and became known as one of the most flourishing schools of Italy, and a great centre of the Dominicans, at that time among the most active promoters of learning.

The university of Naples was founded by the emperor Frederick I. in the year 1225, as a school of theology, jurisprudence, the arts, and medicine,—his design being that his subjects in the kingdom of Naples should find in the capital adequate instruction in every branch of learn- ing, and “not be compelled in the pursuit of knowledge to have recourse to foreign nations or to beg in other lands.” In the year 1231, however, he decreed that the faculty of medicine should cease to exist, and that the study should be pursued nowhere in the kingdom but at Salerno. The university never attained to much eminence, and after the death of Frederick came for a time altogether to an end, but was restored in 1258 by King Manfred. In 1266 its

faculty of medicine was reconstituted, and from 1279-74 Thomas Aquinas was one of its teachers of theology. The commencement of the university of Vercelli belongs to Vercej about the year 1228 ; it probably included, like Naples, : all the faculties, but would seem to have been regarded

with little favour by the Roman see, and by the year 1379

had ceased to exist, although mention of colleges of law

and medicine is to be found after that date. The two universities of Piacenza and Pavia stand in close con- Piaceng nexion with each other. The former is noted by Denifle ag the earliest in Italy which was founded by virtue of a papal charter (6th February 1248), although the scheme remained for a long time inoperative. At length, in the

year 1398, the university was reconstituted by Giovanni Galeazzo Visconti, duke of Milan, who in the same year caused the university of Pavia to be transferred thither, Piacenza now became the scene of a sudden but short lived academic prosperity. We are told of no less than twenty-seven professors of the civil law,—among them the celebrated Baldus ; of twenty-two professors of medicine;

of professors of philosophy, astrology, grammar, and rhetoric; and of lecturers on Seneca and Dante. The faculty

of theology would appear, however, never to have been duly constituted, and but onelecturer in this faculty is mentioned.

With the death of Galeazzo in 1402, this precarious activity

came suddenly to an end; and in 1404 the university had ceased to exist. Its history is, indeed, unintelligible, un- | less taken in conjunction with that of Pavia. Even before Pavia, Irnerius taught at Bologna, Pavia had been widely known

as a seat of legal studies, and more especially of the Lom-

bard law, although the evidence is wanting which would

serve to establish a direct connexion between this early

school and the university which was founded there in

1361, by virtue of the charter granted by the emperor

Charles IV. The new “studium” included faculties of jurisprudence, philosophy, medicine, and the arts, and its students were formally taken under the imperial protec-

tion, and endowed with privileges identical with those

which had been granted to Paris, Bologna, Oxford, Orleans,

and Montpellier ; but its existence in Pavia was suddenly suspended by the removal, above noted, of its students to Piacenza. It shared again in the decline which overtook

the university of Piacenza after the death of Giovanni Galeazzo, and during the period from 1404 to 1412 it altogether ceased to exist. But in October 1412 the

lectures were recommenced, and the university entered

upon the most brilliant period of its existence. Its pro-

fessors throughout the 15th century were men of distin-

guished ability, attracted by munificent salaries such as

but few other universities could offer, while in the number

of students who resorted thither from other countries, and

more especially for the study of the civil law, Pavia had no

rival in Italy but Padua. Arezzo appears to have been Aremo, known as a centre of the same study so early as 1215, and

its earliest statutes are assigned to the year 1255. By

that time it had become a school of arts and medicine also ;

but for a considerable period after it was almost entirely deserted, and is almost unmentioned until the year 1938,

when it acquired new importance by the accession of

several eminent jurists from Bologna. In May 1355 it

received its charter as a studium generale from Charles iy,

After the year 1373 the school gradually dwindled, al-

though it did not become altogether extinct until ara

the year 1470. The university of Rome (which Is to be Rome, carefully distinguished from the school attached to –

curia) owed its foundation (1303) to Boniface VIIL, ‘.

was especially designed by that pontiff for the benefit 0

the poor foreign students sojourning in the capital. : originally included all the faculties; but in 1318 John XXII. decreed that it should possess the power of confer-

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ring degrees only in the canon and civil law. The uni- versity maintained its existence throughout the period of the residence of the popes at Avignon (see PoPEDoM), and

under the patronage of Leo X. could boast in 1514 of no

less than eighty professors. This imposing array would

seem, however, to be but a fallacious test of the prosperity of the academic community, the professors, owing to the imperfect manner in which they were protected in their privileges, were in the receipt of such insufficient fees that they were compelled to com- bine other employments with that of lecturing in order to support themselves. An appeal addressed to Leo X. in the year 1513 represents the number of students as so small as to be sometimes exceeded by that of the lecturers (“ut quandoque plures sint qui legant quam qui audiant ”), Scarcely any of the universities in Italy in the 14th

» century attracted a larger concourse than that of Perugia,

where the study chiefly cultivated was that of the civil law. The university received its charter as a studium generale from Clement V. in the year 1308, but had already in 1306 been formally recognized by the civic authorities, by whom it was commended to the special care and protection of the ‘podesta.” Incommon with the rest of the Italian universities, it suffered severely from the great plague of 1348-49; but in 1355 it received new privileges from the emperor, and in 1362 its first college, dedicated to Gregory the Great, was founded by the bishop of Perugia. The university of Treviso, which received its charter from Frederick the Fair in 1318, was of little celebrity and but short duration. It is doubtful, indeed, whether it

continued to exist after the city became subject to the republic of Venice in the year 1339; but in 1409 the Venetian senate issued a decree that no subjects of the republic should resort for study to any city in its dominions save that of Padua, and from this date the studium at Treviso must be held to have been no longer in existence. The circumstances of the rise of the university

#, of Florence are unknown, but the earliest evidence of } academic instruction belongs to the year 1320. | persion of the university of Bologna, in the March and April

The dis-

_ of the following year, afforded a favourable opportunity for

| the creation of a studium generale, but the necessary | measures were taken somewhat tardily, and in the mean-

time the greater number of the Bolognese students had | betaken themselves to Siena. The charter of foundation

) for Florence was accordingly not granted until 31st May

1349, when Clement VI. decreed that there should be in-

} stituted a studium generale in theology, jurisprudence,

medicine, and every other recognized faculty of learning,

the teachers to be professors who had obtained the degree

of doctor or master either at Bologna or Paris, or ‘some

other studium generale of celebrity.” On 2d January | 1364 the university also obtained the grant of imperial | privileges from Charles IV. On 14th February 1388 it j adopted a body of statutes which are still extant, and j afford an interesting study in connexion with the uni- | versity history of the period. The university now entered | upon that brilliant period in its history which was destined jto so summary an extinction. “It is almost touching,”

jsays Denifle, “to note how untiringly Florence exerted herself at this period to attract as teachers to her schools |the great masters of the sciences and learning.” In the jyear 1472, however, under the influence of Lorenzo de’ Medici, it was decided that Florence was not a convenient seat for a university, and its students were removed to Pisa. The commencement of the university of Siena belongs to about the year 1241, but its charter was first granted by the emperor Charles IV., at the petition of the citizens, in the year 1357. It was founded asa studium generale in jurisprudence, the arts, and medicine. The

for it is stated that many of

imperial charter was confirmed by Gregory XII. in 1408, and the various bulls relating to the university which he subsequently issued afford a good illustration of the con- ditions of academic life in these times. Residence on the part of the students appears to have been sometimes dis. pensed with. The bishop of Siena was nominated chan- cellor of the university, just as, says the bull, he had been appointed to that office by the imperial authority. The graduates were to be admitted to the same privileges as those of Bologna or Paris; and a faculty of theology was added to the curriculum of studies, The university of Ferrara owes its foundation to the house of Este, —Alberto, marquis of Este, having obtained from Boniface IX. in 1391 a charter couched in terms precisely similar to those of the charter for Pisa. In the first half of the 15th century the university was adorned by the presence of several distinguished humanists, but its fortunes were singularly chequered, and it would appear for a certain period to have been altogether extinct. It was, however, restored, and became in the latter part of the century one of the most celebrated of the universities of Italy. In the year 1474 its circle of studies comprised all the existing faculties, and it numbered no less than fifty-one profes- sors or lecturers. In later times Ferrara has been noted chiefly as a school of medicine.

Of the universities modelled on that of Paris, Oxford Oxford,

would appear to have been the earliest, and the manner of its development was probably similar. Certain schools, opened within the precincts of the

dissolved nunnery of St Frideswyde and of Oseney abbey, are supposed to have been the nucleus round which the university grew up. In the year 1133 one Robert Pullen, a theologian of considerable eminence (but whether an Englishman or a Breton is un- certain), arrived from Paris, and delivered lectures on the Bible. He was followed a few years later by Vacarius, a native of Lombardy, who as a student at Bologna had inherited the tradition of the teaching of Imerius. Al- though both the pope and King Stephen regarded the civil law at this time with considerable distrust, Vacarius maintained his ground, and the study became one of the recognized faculties at Oxford. Towards the close of the 12th century Giraldus Cambrensis describes the town as a place ‘‘ where the clergy in England chiefly flourished and excelled in clerkly lore.” In one respect, indced, Oxford was more favoured than even Paris, for the town auth- orities could not pretend to assert any right of interference with the university such as that to which the French monarch and the court frequently laid claim. In the 13th century mention first occurs of university “chests,” especi- ally the Frideswyde chest, which were benefactions de- signed as funds for the assistance of poor students. Halls, or places of licensed residence for students, also began to be established. In the year 1257, when the bishop of Lincoln, as diocesan, had trenched too closely on the liberties of the community, the deputies from Oxford, when preferring their appeal to the king at St Albans, could venture to speak of the university as ‘ schola secunda ecclesize,” or second only to Paris. Its numbers about this time were probably some three thousand; but it was essenti- ally a fluctuating body, and whenever plague or tumult led to a temporary dispersion a serious diminution in its numerical strength generally ensued for some time after. Against such vicissitudes the foundation of colleges proved the most effectual remedy. Of these the three earliest were University College, founded in 1249 by William of Durham ; Balliol College, founded about 1263 by John Balliol, the father of the king of Scotland of the same name ; and Merton College, founded in 1264. The last- named is especially notable as associated with a new con- ception of university education, namely, that of collegiate

Cam- bridge,

discipline for the secular clergy, instead of for any one of the religious orders, for whose sole benefit all similar foundations had hitherto been designed. The statutes given to the society by Walter de Merton are not less noteworthy, as characterized not only by breadth of con- ception, but also by a careful and discriminating attention to detail, which led to their adoption as the model for later colleges, not only at Oxford but at Cambridge. Of the service rendered by these foundations to the university at large we have significant proof in the fact that, although representing only a small numerical minority in the academic community at large, their members soon ob- tained a considerable preponderance in the administration of affairs.

The university of Cambridge, although it rose into existence somewhat later than Oxford, may reasonably be held to have had its origin in the same century. There was probably a certain amount of educational work carried on by the canons of the church of St Giles, which gradually developed into the instruction belonging to a regular studium. In the year 1112 the canons crossed the river and took up their residence in the new priory in Barnwell, and their work of instruction acquired addi- tional importance. Then, as early as the year 1224, the Franciscans established themselves in the town, and, some- what less than half a century later, were followed by the Dominicans. At both the English universities, as at Paris, the Mendicants and other religious orders were admitted to degrees, a privilege which, until the year 1337, was extended to them at no other university. Their interest in and influence at these three centres was con- sequently proportionably great. In the years 1231 and 1233 certain royal and papal letters afford satisfactory proof that by that time the university of Cambridge was already an organized body with a chancellor at its head; and in 1229 and 1231 its numbers were largely augmented by migrations from Paris and from Oxford. Cambridge, however, in its turn suffered from emigration ; while in the year 1261, and again in 1322, the records of the uni- versity were wantonly burnt by the townsmen. Through- out the 13th century, indeed, the university was still only a very slightly and imperfectly organized community. Its endowments were of the most slender kind; it had no systematic code for the government of its members; the supervision of the students was very imperfectly provided for. An important step in the direction of reform in this last respect was, however, made in the year 1276,

when an ordimance was passed requiring that every one who claimed to be recognized as a scholar should have a fixed master within fifteen days after his entry into the uni- versity. But the feature which most served to give per- manence and cohesion to the entire community was, as at Oxford, the institution of colleges. The earliest of these was Peterhouse, first founded as a separate institution by Hugh Balsham, bishop of Ely, in the year 1286, with a code which was little more than a transcript of that given by Walter de Merton to his scholars at Oxford. About forty years later was founded Michaelhouse, and at nearly the same time (1326) Edward II. instituted his foundation of “king’s scholars,” afterwards forming the community of King’s Hall. Both these societies in the 16th century were merged in Trinity College. To those sueceeded Pem- broke Hall (1347) and Gonville Hall (1348). All these colleges, although by no means conceived in a spirit of hostility to either the monastic or the Mendicant orders, were expressly designed for the benefit of the secular clergy. The foundation of Trinity Hall (1350) by Bishop Bateman, on the other hand, as a school of civil and canon law was probably designed to further ultramontane in- terests. That of Corpus Christi (1352), the outcome of

the liberality of a guild of Cambridge townsmen, was con. ceived with the combined object of providing a house of education for the clergy, and at the same time securing the regular performance of masses for the benefit of the souls of departed members of the guild. But both Trinity Hall and Corpus Christi College, as well as Clare Hall, founded in 1359, were to a great extent indebted for their origin to the ravages caused among the clergy by the great plague of 1349.

Turning to France, or rather to the territory included Mont within the boundaries of modern France, we find Mont- Pellier, pellier a recognized school of medical science as early ag the 12th century. William VIIL, lord of Montpellier, in the year 1181 proclaimed it a school of free resort, where any teacher of medical science, from whatever country, might give instruction. Before the end of the century it possessed also a faculty of jurisprudence, a branch of learn- | ing for which it afterwards became famed. The university } of medicine and that of law continued, however, to be totally | distinct bodies with different constitutions. Petrarch was sent by his father to Montpellier to study the civil law.

On 26th October 1289 Montpellier was raised by Nicholas ‘ IV. to the rank of a “studium generale,” a mark of favour which, in a region where papal influence was so potent, resulted in a considerable accession of prosperity. The university also now included a faculty of arts; and there is satisfactory evidence of the existence of a faculty of theology before the close of the 14th century, although not formally recognized by the pope before the year 1421. In the course of the same century several colleges for poor students were also founded. The university of Toulouse Toulous, is to be noted as the first founded in any country by virtue of a papal charter. It took its rise in the efforts of Rome for the suppression of the Albigensian heresy, and its foundation formed one of the articles of the conditions of peace imposed by Louis IX. on Count Raymond of Toulouse. In the year 1233 it first acquired its full | privileges as a “‘studium generale” by virtue of a charter given by Gregory IX. This pontiff watched over the uni- versity with especial solicitude, and through his exertions it soon became a noted centre of theological and especially of Dominican teaching. As aschool of arts, jurisprudence, and medicine, although faculties of each existed, it never attained to any reputation. The university of Orleans Orleans, had a virtual existence as a studium generale as early as the first half of the 13th century, but in the year 1305 Clement V. endowed it with new privileges, and gave its teachers permission to form themselves into a corporation. The schools of Orleans had an existence, it is said, as early as the 6th century, and subsequently supplied the nucleus for the foundation of a university at Blois; but of this university no records now exist.) Orleans, in its organiza- tion, was modelled mainly on Paris, but its studies were complementary rather than in rivalry to the older univer- sity. The absorbing character of the study of the civil law, and the mercenary spirit in which it was pursued, had led the authorities at Paris to refuse to recognize it as & faculty. The study found a home at Orleans, where 1t was cultivated with an energy which attracted numerous students. In January 1235 we find the bishop of Orleans soliciting the advice of Gregory IX. as to the expediency of countenancing a study which was prohibited in Pans. Gregory decided that the lectures might be continued ; but he ordered that no beneficed ecclesiastic should be allowed to devote himself to so eminently secular a branch of learning. Orleans subsequently incorporated a faculty of arts, but its reputation from this period was always that of a school of legal studies, and in the 14th century its reputation in this respect was surpassed by no other unt-

1 See Ch. Desmaze, L’ Université de Puris (1200-1875).

3] vers famed for its classical learning ;

jgno tthe legal faculties, and 190 scholars. ig

jversity in Europe. Prior to the 13th century it had been and Angers, which received jits charter at the same time, also once enjoyed a like reputation, which, in a similar manner, it exchanged for \that of a school for civilians and canonists. The roll of ‘the university forwarded in 1378 to Clement VII. con- tains the names of 8 professors utriusque juris, 2 of civil and 2 of canon law, 72 licentiates, 284 bachelors of both The university of Avignon was first recognized as a “studium generale” by Boniface VIII. in the year 1303, with power to grant degrees in jurisprudence, arts, and medicine. Its numbers declined somewhat during the residence of the popes, owing to the counter attractions of the “studium” at-

hf tached to the curia ; but after the return of the papal Tt! court to Rome it became one of the most frequented uni- “| [i versities in France, and possessed at one time no less than “lors,jseven colleges. The university of Cahors enjoyed the advantage of being regarded with especial favour by John J) § XXII. In June 1332 he conferred upon it privileges n| identical with those already granted to the university of i} #Toulouse. In the following October, again following the { precedent established at Toulouse, he appointed the schol- ‘| jasticus of the cathedral chancellor of the university. In vd | November of the same year a bull, couched in terms 0) almost identical with those of the Magna Charta of Paris, t} assimilated the constitution of Cahors to that of the oldest 4 |university. The two schools in France which, down to the close of the 14th century, most closely resembled Paris €| |were Orleans and Cahors. The civil immunities and pri- g | vileges of the latter university were not, however, acquired il] | until the year 1367, when Edward III. of England, in his ij capacity as duke of Aquitaine, not only exempted the 1 «scholars from the payment of all taxes and imposts, but i] © Jbestowed upon them the peculiar privilege known as prive- uj \Weguem fort. Cahors also received a licence for faculties of 1) theology and medicine, but, like Orleans, it was chiefly mobléknown asa school of jurisprudence, It was asa “studium a] generale” in the same three faculties that Grenoble, in the ‘| [year 1339, received its charter from

Benedict XII. The rq university never attained to much importance, and its al Annals are for the most part involved in obscurity. At ¢ {the commencement of the 16th century it had ceased alto- ie ether to exist, was reorganized by Francis of Bourbon in 2) 1542, and in 1565 was united to the university of Valence. dig: {Phe university of Perpignan, founded, according to Denifle, ly fin 1379 by Clement VII. (although tradition had pre- is] fWiously ascribed its origin to Pedro IV. of Aragon), and qs, [fhat of Orange, founded in 1365 by Charles IV., were uni- i] |Wersities only by name and constitution, their names rarely 4] |hppearing in contemporary chronicles, while their very td |pxistence becomes at times a matter for reasonable doubt.

opciagl To some of the earlier Spanish universities—such as

alencia, founded about the year 1214 by Alfonso VIII. ; Huesca, founded in 1354 by Pedro IV.; and Lerida, jounded in 1300 by James I[.—the same description is tpplicable ; and their insignificance is probably indicated by the fact that they entirely failed to attract foreign tudents. Valladolid, founded in 1346 by Pope Clement VI., attained, however, to some celebrity ; and the foreign eachers and students frequenting the university became so lumerous that in 1373 King Henry II. caused an enact- ent to be passed for securing to them the same privileges)s those already accorded to the native element. But the jotal number of the students in 1403 was only 116, and rrammar and logic, along with jurisprudence (which was he principal study), constituted the sole curriculum. Vhatever reputation, indeed, was enjoyed by Spain for jearly five centuries after the commencement of the uni- ersity era, centred mainly in Salamanca, to which Seville,

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in the south, stood in the relation of a kind of subsidiary Sala- school, having been founded in 1254 by Alfongo tlie ™c Wise, simply for the study of Latin and of the Semitic oe languages, especially Arabic. Salamanca was founded in 1243 by Ferdinand IIT. of Castile as a “studium generale” in the three faculties of jurisprudence, the arts, and medi- cine. – Ferdinand extended his special protection to the students, granting them numerous

privileges and im- munities. Under his son Alfonso (above named) the university acquired a further development, and eventually included all the faculties save that of theology. But the main stress of its activity, as was the case with all the earlier Spanish universities, excepting only Palencia and Seville, until the commencement of the 15th century, was laid on the civil and the canon law. But, notwithstanding the favour with which Salamanca was regarded alike by the kings of Castile and by the Roman see, the provision for the payment of its professors was at first so inadequate and precarious that in 1298 they by common consent suspended their lectures, in consequence of their scanty remuneration. A permanent remedy for this difficulty was thereupon provided, by the appropriation of a certain portion of the ecclesiastical revenues of the diocese for the purpose of augmenting the professors' salaries. The earliest of the numerous colleges founded at Salamanca was that of St Bartholomew, long noted for its ancient library and valuable collection of manuscripts, which now form part of the royal library in Madrid.

The one university possessed by Portugal had its seat Coimbra,

in medizeval times alternately in Lisbon and in Coimbra, until, in the year 1537, it was permanently attached to the latter city. Its formal foundation took place in 1309, when it received from King Diniz a charter, the provisions of which were mainly taken from those of the charter given to Salamanca. In 1772 the university was entircly reconstituted.

Of the German universities, Prague, which existed as a Prague, "'studium " in the 18th century, was the earliest, and was at first frequented mainly by students from Styria and Austria, countries at that time ruled by the king of Bohemia. On 26th January 1347, at the request of Charles IV., Pope Clement VI. promulgated a bull auth. orizing the foundation of a "studium generale" in all the faculties. In the following year Charles himself issued a charter for the foundation, This document, which, if ori- ginal in character, would have been of much interest, has but few distinctive features of its own, its provisions being throughout adapted from those contained in the charters given by Frederick IJ. for the university of Naples and by Conrad for Salerno,—almost the only important feature of difference being that Charles bestows on the students of Prague all the civil privileges and

immunities which were enjoyed by the teachers of Paris and Bologna. Charles had himself been a student in Paris, and the organization of his new foundation was modelled on that university, a like division into four “nations” (although with different names) constituting one of the most marked features of imitation. The numerous students—and none of the medizeval universities attracted in their earlier history a larger concourse—were drawn from a gradually widening area, which at length included, not only all parts of Ger- many, but also England, France, Lombardy, Hungary, and Poland. Contemporary writers, with the exaggeration characteristic of medisval credulity, even speak of thirty thousand students as present in the university at one time, —a statement for which Denifle proposes to substitute two thousand as a more probable estimate. It is certain, however, that Prague, prior to the foundation of Leipsic, was one of the most frequented centres of learning in Europe, and Paris suffered a considerable diminution in

Craeow,

Vienna,

Fiinf- kirchen,

Ofen,

her numbers owing to the counter attractions of the great studium of Slavonia.

The university of Cracow in Poland was founded in May 1364, by virtue of a charter given by King Casimir the Great, who bestowed on it the same privileges as those possessed by the universities of Bologna and Padua. In the following September Urban V., in consideration of the remoteness of the city from other centres of education, constituted it a “studium generale” in all the faculties save that of theology. It is, however, doubtful whether these designs were carried into actual realization, for it is certain that, for a long time after the death of Casimir, there was no university whatever. Its real commencement must accordingly be considered to belong to the year 1400,

when it was reconstituted, and the papal sanction was given for the incorporation of a faculty of theology. From this time its growth and prosperity were continuous; and with the year 1416 it had so far “acquired a European reputation as to venture upon forwarding an expression of its views in connexion with the deliberations of the council of Constance. Towards the close of the 15th century the university is said to have been in high repute as a school of both astronomical and humanistic studies.

The Avignonese popes appear to have regarded the establishment of new faculties of theology with especial jealousy; and when, in 1364, Duke Rudolph IV. founded the university of Vienna, with the design of constituting it a “studium generale” in all the faculties, Urban V. refused his assent to the foundation of a theological school. Owing to the sudden death of Duke Rudolph, the university languished for the next twenty years, but after the ac- cession of Duke Albert IIJ., who may be regarded as its real founder, it acquired additional privileges, and its prosperity became marked and continuous. Like Prague, Vienna was for a long time distinguished by the compara- tively little attention bestowed by its teachers on the study of the civil law.

No country in the 14th century was looked upon with greater disfavour at Rome than Hungary. It was stig- matized as the land of heresy and schism. When, accord- ingly, in 1367 King Louis applied to Urban V. for his sanction of the scheme of founding a university at Fiinf- kirchen, although theological learning was in special need of encouragement in those regions, Urban would not con- sent to the foundation of a faculty of theology; he even made it a condition of his sanction for a “studium generale ” that King Louis should first undertake to provide for the payment of the professors. We hear but little concerning the university after its foundation, and it is doubtful whether it survived for any length of time the close of the century, having been about that period absorbed in all probability in the university of Ofen. The foundation of this university is also involved in considerable obscurity, and its original charter is lost. We only know that it was granted by Boniface IX., at the request of King Sigis- mund, in the year 1389. In the first half of the 15th century it ceased for a long period to exist, but was revived, or rather founded afresh, by King Mathias Cor- vinus, an eminent patron of learning, in the last quarter of the century. “The extreme east of

civilized continental Europe in medieval times," observes Denifle, "can be compared, so far as university education is concerned, only with the extreme west and the extreme south. In Hun- gary, as in Portugal and in Naples, there was constant fluctuation, but the west and the south, although troubled by yet greater commotions than Hungary, bore better fruit. Among all the countries possessed of universities in medi- ceval times, Hungary occupies the lowest place—a state of affairs of which, however, the proximity of the Turk must be looked upon as a main cause."

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October 1385) from Urban VI. as a "studium generale" berg, in all the recognized faculties save that of the civil law,—

the form and substance of the document being almost iden-

tical with those of the charter granted to Vienna, granted at the request of the elector who conferred on the teachers and students, at the same time, the same civil privileges as those which belonged to the university of Paris. invested with the power of bestowing resident, the licences being conferred by the provost of the cathedral at Worms. the organizer and teacher, of the university was Marsilins of Inghen, to whose ability and energy Heidelberg was indebted for no little of its early reputation and success,

The university of Heidelberg received its charter (23d Heide.

\ It was palatine, Rupert i

In this case the functionary degrees was non-

But the real founder, as he was also

The omission of the civil law from the studies licensed in the original charter would seem to show that the pontif's compliance with the elector's request was merely formal, and Heidelberg, like Cologne, included the civil law among its faculties almost from its first creation. No mediayal university achieved a more rapid and permanent success, Regarded with favour alike by the civil and ecclesiastical potentates, its early annals were

singularly free from crises like those which characterize the history of many of the : medizval universities. The number of those admitted to degrees from the commencement of the first session (19th October 1386 to 16th December 1387) amounted to 579.1 Owing to the labours of the Dominicans, Cologne had Cologne, gained a reputation as a seat of learning long before the founding of its university; and it was through the ad- vocacy of some leading members of the Mendicant orders that, at the desire of the city council, its charter as a ‘‘studium generale ” (21st May 1388) was obtained from Urban VI. It was organized on the model of the uni- versity of Paris, as a school of theology and canon law, and “any other recognized faculty,”—the civil law being incorporated asa faculty soon after the promulgation of the charter. In common with the other early universities of Germany—Prague, Vienna, and Heidelberg—Cologne owed nothing to imperial patronage, while it would appear to have been, from the first, the object of special favour with Rome. This circumstance serves to account for its distinctly ultramontane sympathies in medieval times and even far into the 16th century. In a report transmitted to Gregory XITI. in 1577, the university expressly derives both its first origin and its privileges from the Holy See, and professes to owe no allegiance save to the Roman pontiff. Erfurt, no less noted as a centre of Franciscan Erfurt. than was Cologne of Dominican influence, received its charter (16th September 1379) from the anti-pope Clement VIL. as a ‘“‘studium generale” in all the faculties, Ten years later (4th May 1389) it was founded afresh by Urban VI., without any recognition of the act of his pretended predecessor. In the 15th century the number of its students was larger than that at any other German unl- versity—a fact attributable partly to the reputation it had acquired as a school of jurisprudence, and partly to the ardour with which the philosophic controversies of the time were debated in its midst. The collegiate system is to be noted as a feature common to all these early German universities ; and, in nearly all, the professors were partly remunerated by the appropra- tion of certain prebends, appertaining to some neighbouring church, to their maintenance. Pations Throughout the 15th century the relations of the Roman Hs a pontiffs to the universities continued much the pe popes to although the independent attitude assumed at the the unis councils of Constance and Basel by the deputies from the yersities

- The statistics of Hautz (Gesch. d. Univ, Heidelberg, i. Hee are corrected by Denifle (Die Entstehung der Universitdten, p. :

UM IVE R SLIT LES

universities, and especially by those from Paris, could not fail to excite their apprehensions. ‘Their bulls for each new foundation begin again to indicate a certain jealousy with respect to the appropriation of prebends by the founders. Where such appropriations are made, and more particularly in France, a formal sanction of the transfer generally finds a place in the bull authorizing the founda- tion ; while sometimes the founder or founders are them- selves enjoined to provide the endowments requisite for the establishment and support of the university. In this manner the control of the pontiff over each newly-created seat of learning assumed a more real character, from the fact that his assent was accompanied by conditions which rendered it no longer a mere formality. The imperial intervention, on the other hand, was rarely invoked in Germany,—Greifswald, Freiburg, and Tiibingen being the only instances in which the emperor’s confirmation of the foundation was solicited! But whatever influence the Roman see may have gained by increasing intervention was more than counteracted by those other tendencies which came into operation in the second half of the century. These were of a twofold character :—the first directly modi- fying the studies themselves, as the results of the discovery of printing and the new spirit awakened by the teach- ing of the humanists; the second affecting the external conditions, such as the multiplication of schools, and the growing demand for skilled physicians and learned civilians, —circumstances which afforded increased employment for the services of men of academic training. In northern Germany and in the Netherlands, the growing wealth and | prosperity of the different states especially favoured the ‘ formation of new centres of learning. In the flourishing , duchy of Brabant the university of Louvain (1426) was to a great extent controlled by the municipality; and their patronage, although ultimately attended with detrimental results, long enabled Louvain to outbid all the other uni- versities of Europe in the munificence with which she rewarded her professors. In the course of the next cen- tury the “Belgian Athens,” as she is styled by Lipsius, ranked second only to Paris in numbers and reputation. | In its numerous separate foundations and general organiza- | tion—it -

possessed no less than twenty-eight colleges—it | closely resembled the English universities; while its active) press afforded facilities to the author and the controversialist of which both Cambridge and Oxford were at that time) almost destitute. It embraced all the faculties, and no) degrees in Europe stood so high as guarantees of general | acquirements. Erasmus records it as a common saying, | that “no one could graduate at Louvain without know- ledge, manners, and age.” Sir William Hamilton speaks of the examination at Louvain for a degree in artsas “the best example upon record of the true mode of such ex- amination, and, until recent times, in fact, the only ex- ample in the history of universities worthy of consideration) at all.” He has translated from Vernuleus the order and | method of this examination.? In 1788 the faculties of | jurisprudence, medicine, and philosophy were removed to | Brussels, and in 1797 the French suspended the university altogether. When Belgium was formed into an indepen- | dent state in 1831, the university was refounded as a sRoman Catholic foundation. | The circumstances of the foundation of the university | of Leipsic are especially noteworthy, it having been the j result of the migration of almost the entire German j element from the university of Prague. This element comprised (1) Bavarians, (2) Saxons, (3) Poles (this last- named division being drawn from a wide area, which in- cluded Meissen, Lusatia, Silesia, and Prussia), and, being

1 Meiners, Gesch. d. hohen Schulen, i. 370. 2 Dissertations and Discussions, Append. iii.

represented by three votes in the assemblies of the uni- versity, while the Bohemians possessed but one, had ac- quired a preponderance in the direction of affairs which the latter could no longer submit to. Religious differ- ences, again, evoked mainly by the preaching of John Huss, further intensified the existing disagreements ; and eventually, in the year 1409, King Wenceslaus, at the prayer of his Bohemian subjects, issued a decree which: exactly reversed the previous distribution of votes, —three votes being assigned to the Bohemian nation and only one to all the rest. The Germans took deep umbrage, and seceded to Leipsic, where, a bull having been obtained from Alexander V. (9th September 1409), a new “ studium

generale” was founded by the landgrave of Thuringia and the margraves of Meissen. ‘The members were divided into four nations—composed of natives of Meissen, Saxony, Bavaria, and Poland. Two colleges were founded, a greater and a smaller, but designed, not for poor students, but for masters of arts,—twelve being admitted on the former and eight on the latter foundation. of northern Germany was that of Rostock, founded by the dukes John and Albert of Mecklenburg, the scheme receiving the sanction of Martin V. ina bull dated 13th February 1419 as that of a “studium generale ” in all the faculties excepting theology. ‘The faculty of theology was added in the year 1432. Two colleges were also founded, with the same design and on the same scale as at Leipsic.

No little illustration is afforded by the circumstances attending the foundation of the French universities of the struggle that was going on between the crown and the

Roman see. The earliest foundation in the 15th century Poitiers,

was that of Poitiers. It was instituted by Charles VIT. in 1431, almost immediately after his accession, with tlie special design of creating a centre of learning less favour- able to English interests than Paris had at that time shown herself to be. Eugenius IV. could not refuse his sanction to the scheme, but he endeavoured partially to defeat Charles’s design by conferring on the new “ studium generale ” only the same privileges as those possessed by Toulouse, and thus placing it at a disadvantage in com- parison with Paris. Charles rejoined by an extraordinary exercise of his own prerogative, conferring on Poitiers all the privileges collectively possessed by Paris, Toulouse, Montpellier, Angers, and Orleans, and at the same time placing the university under special royal protection. foundation of the university of Caen, in the diocese of Bayeux, was attended by conditions almost exactly the reverse of those which belonged to the foundation of that at Poitiers. It was founded under English auspices during the short period of the supremacy of the English arms in Normandy in the 15th century. Its charter (May 1437) was given by Eugenius IV., and the bishop of Bayeux was appointed its changellor. The university of Paris had by this time completely forfeited the favour of Eugenius by its attitude at the council of Basel, and Eugenius inserted in the charter for Caen a clause of an entirely

novel char- acter, requiring all those admitted to degrees to take an oath of fidelity to the see of Rome, and to bind themselves to attempt nothing prejudicial to her interests. ‘To this proviso the pragmatic sanction of Bourges was the reply given by Charles in the following year. On 18th May 1442 we find King Henry VI. writing to Eugenius, and dwelling with satisfaction on the rapid progress of the new university, to which, he says, students had flocked from all quarters, and were still daily arriving.* On 30th October 1452 its charter was given afresh by Charles in terms which left the original charter unrecognized ; both teachers and learners were made subject to the civil authorities of the city, while all privileges conferred in the former charter 3 Bekynton’s Correspondence, i. 128.

OID, == HOG

The first university Rostock,

The Caen,

Bordeaux, Valence, Nantes,

Bourges,

842

in cases of legal disputes were abolished. From this time the university of Caen was distinguished by its loyal spirit and firm resistance to ultramontane pretensions ; and, although swept away at the French Revolution, it was afterwards restored, owing to the sense of the services it had thus once rendered to the national cause.!_ No especi- ally notable circumstances characterize the foundation of the university of Bordeaux (1441) or that of Valence (1452), but that of Nantes, which received its charter from Pius II. in 1463, is distinguished by the fact that it did not receive the ratification of the king of France, and the conditions under which its earlier traditions were formed thus closely resemble those of Poitiers. It seems also to have been regarded with particular favour by Pius IL, a pontiff who was at once a ripe scholar and a writer upon education. He gave to Nantes a notable body of privi- leges, which not only represent an embodiment of all the various privileges granted to universities prior to that

date, but afterwards became, with their copious and somewhat tautological phraseology, the accepted model for the great majority of university charters, whether issued by the pope or by the emperor, or by the civil authority. The bishop of Nantes was appointed head of the university, and was charged with the special protection of its privileges against all interference from whatever quarter.2 The bull for the foundation of the university of Bourges was given in 1465 by Paul II. at the request of Louis XI. and his brother,

It confers on the community the same privileges as those

Greifs- wald,

Freiburg,

Basel,

enjoyed by the other universities of France. The royal sanction was given at the petition of the citizens; but, from reasons which do not appear, they deemed it neces- sary further to petition that their charter might also be registered and enrolled by the parlement of Paris.

In Germany, the first of the universities representing the new influences above referred to is that of Greifswald. A wealthy burgomaster, who had graduated as a master of arts at Rostock, was the chief mover; and, his proposal being cordially seconded by the city council, the duke of the province, and certain abbots of neighbouring monas- teries, the necessary bull was obtained from Calixtus ITI, (29th May 1456). The first session was commenced in October of the same year. Three colleges were at the same time founded,—two for masters of arts, as at Leipsic and Rostock, and a third for jurists. The chairs in the different faculties were distributed as follows : theology 3, jurisprudence 5, medicine 1, arts 4,—the number of jurists showing that the study of the civil law still obtained a certain preponderance. The university of Freiburg was founded by the archduke Albert, brother of the emperor Frederick II.,—the papal bull being given 20th April 1455, and the imperial ratification in the following year. The first session was opened in 1460, under the presidency of Matthew Hummel, a privy councillor, and the original numbers soon received considerable

additions by secessions from Vienna and from Heidelberg. The endowment was further augmented by an annual allowance from the city council, and by certain canonries and livings attached to neighbouring parishes. In the same year, and probably in a spirit of direct rivalry, was opened the university of Basel. The cathedral school in that ancient city, together with others attached to the monasteries, afforded a suffi- cient nucleus for a "studium," and Pius IL, who, as Aineas Sylvius, had been a resident in the city, was easily prevailed upon to grant the charter (12th November 1459). In the character of its endowments, and in the relative importance attached to the study of the civil law, Basel much resembled Greifswald, but its success throughout the 15th century was marred by the languid character of the

1 De la Rue, Essais Hist. sur la Ville de Caen, ii. 187-40. 2 Meiners, i. 368,

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support afforded it by the civic authorities. Before he had signed the bull for the foundation of the university of Basel, Pius IL, at the request of duke William of Bavaria had issued another bull for the foundation of a university at Ingolstadt (7th April 1459), 1472 that the work of teaching was actually commenced stadt, there. Some long-existing prebends, founded by former dukes of Bavaria, were appropriated to the endowment and the chairs in the different faculties were distributed ae follows :— theology 2, jurisprudence 3, medicine 1, arts 6, —arts in conjunction with theology thus obtaining the preponderance. As at Caen, twenty-two years before, an oath of fidelity to the Roman pontiff was imposed on every student admitted to a degree? That this proviso was not subsequently abolished, as at Caen, is a feature in the history of the university of Ingolstadt which was attended

by important results. Nowhere did the Reformation meet with more stubborn resistance, and it was at Ingolstadt that the Counter-Reformation was commenced, In 1556 the Jesuits made their first settlement in the university,

The next two universities took their rise in the archi. Treves,

episcopal seats of Treves and Mainz That at Treves received its charter as early as 1450; but the first academ. ical session did not commence until 1473. Here the ecclesiastical influences appear to have been unfavourable to the project. The archbishop demanded 2000 florins as the price of his sanction. The cathedral chapter threw difficulties in the way of the appropriation of certain livings and canonries to the university endowment ; and so obstinate was their resistance that in 1655 they succeeded in altogether rescinding the gift on payment of a very inadequate sum. It was not until 1722 that the assembly of deputies, by a formal grant, relieved the university

from the difficulties in which it had become involved. The Maing,

university of Mainz, on the other hand, was almost en- tirely indebted to the archbishop Diether for its founda- tion. It was at his petition that Sixtus IV. granted the charter, 23d November 1476 ; and Diether, being himself an enthusiastic humanist, thereupon circulated a letter, couched in elegant Latinity, addressed to students through- out his diocese, inviting them to repair to the new centre, and dilating on the advantages of academic studies and of learning. The rise of these two universities, however, neither of which attained to much distinction, represents little more than the incorporation of certain already exist- ing institutions into a homogeneous whole, the power of conferring degrees being superadded. But the university Tiibin- of Tiibingen, founded by charter of Sixtus IV. (9th 8% November 1476), represents an entirely new creation. Its real founder was Mathilda, the mother of Count Eber- hard of Witirtemberg, who appropriated five livings and eight prebends to the endowment. Of the chairs, 3 were for theology, 3 for the canon and 2 for the civil law, 2 for medicine, and 4 for arts. The general financial condition of this university in the year 1541-42, and the sources from whence its revenues were derived, have been illustrated by Hoffmann in a short paper which shows the fluctuating character of the resources of a university in those days,—liable to be affected, as they were, both by the seasons and the markets.4

Nearly contemporaneous with these foundations were ll those of Upsala (1477) and Copenhagen (1479), which, oa although lying without the

political boundaries of Germany, pagen, reflected her influence. The charter for Copenhagen was given by Sixtus IV. as early as 1475. The students

3 Paulsen, in speaking of this proviso as one “ die weder vorher noch nachher sonst vorkommt,” would consequently seem to be not quite accurate, See Die Griindung der deutschen Universititen, p. 277.

- Ockonomischer Zustand der Universitét Tiibingen gegen de Mitie des 16ten Jahrhunderts, 1845.

But it was not until Ingol.

| dictis fiat et constituatur. _ attracted to itself a larger share of the attention of Europe

1 scholastic era were overthrown. © founded in Gerniany prior to the Reformation was that of | Frankfort-on-the-Oder.

jllepburn, the prior of the monastery of St Andrews; and

college to the Blessed Virgin Mary of the Assumption, and

attracted to this new centre were mainly from within the radius of the university of Cologne, and its statutes werelittle more than a transcript of those of the latter foundation. The electorates of Wittenberg and Brandenburg were now the only two considerable German territories which did not possess a studium generale, and the university founded at Wittenberg by Maximilian I. (6th July 1502) is notable as the first established in Germany by virtue of an imperial as distinguished from a papal decree. Its charter is, however, drawn up with the traditional phrase- ology of the pontifical bulls, and is evidently not conceived in any spirit of antagonism to Rome. Wittenberg is con- stituted a “ studium generale” in all the four faculties, — the right to confer degrees in theology and canon law having been sanctioned by the papal legate some months before, 2d February 1502. The endowment of the uni- versity with church revenues duly received the papal sanction,—a bull of Alexander VI. authorizing the appro- priation of twelve canonries attached to the castle church,

_ as wellas of eleven prebends in outlying districts—wut sic

per omnem modum unum corpus ex studio et collegio pre- No university in Germany

at its commencement. And it was its distinguishing merit that it was the first academic centre north the Alps where the antiquated methods and barbarous Latinity of the The last university

The design, first conceived by the elector John of Brandenburg, was carried into execu-

tion by his son Joachim, at whose request Pope Julius IT. , issued a bull for the foundation, 15th March 1506. imperial charter, identical in its contents with the papal ‘ bull, followed on 26th October. , an endowment of canonries and livings similar to that of _ Wittenberg, and some houses in the city were assigned for

An

The university received

its use by the elector.

The first university in Scotland was that of St Andrews, jfounded in 1411 by Henry Wardlaw, bishop of that see, and modelled chiefly on the constitution of the university jof Paris. It acquired all its three colleges—St Salvator’s, |St Leonard’s, and St Mary’s—before the Reformation,— \the first having been founded in 1456 by Bishop James Kennedy ; the second in 1512 by the youthful archbishop Alexander Stuart (natural son of James IV.) and John

jthe third, also in 1512, by the Beatons, who in the year 1537 procured a bull from Pope Paul III. dedicating the

adding further endowments. The most ancient of the universities of Scotland, with its three colleges, was thus jreared in an atmosphere of medieval theology, and un- jdoubtedly designed as a bulwark against heresy

and pchism. But “by a strange irony of fate,” it has been fobserved, “two of these colleges became, almost from the first, the foremost agents in working the overthrow of that rhurch which they were founded to defend.” St Leonard’s fnore especially, like St John’s or Queens’ at Cambridge, became a noted centre of intellectual life and Reformation principles. That he “had drunk at St Leonard’s well” became a current expression for implying that a theologian had imbibed the doctrines of Protestantism. The univer- ity of Glasgow was founded as a “ studium generale” in 1453, and possessed two colleges. Prior to the Reforma- tion it acquired but little celebrity ; its discipline was lax, and the number of the students but small, while the in- struction was not only inefficient but irregularly given; no unds were provided for the maintenance of regular lectures n the higher faculties; and there was no adequate execu- tive power for the maintenance of discipline. The uni-

versity of Aberdeen, which was founded in 1494, at first Aberdeen. possessed only one college,—namely, King’s. Marischal College, founded in 1593 by George Keith, fifth Earl Marischal, was constituted by its founder independent of

the university in Old Aberdeen, being itself both a col-

lege and a university, with the power of conferring degrees. Bishop Elphinstone, the founder both of the university and

of King’s College (1505), had been educated at Glasgow,

and had subsequently both studied and taught at Paris

and at Orleans. To the wider experience which he had

thus gained we may probably attribute the fact that the constitution of the university of Aberdeen was free from

the glaring defects which then characterized that of the university of Glasgow.! But in all the medieval uni- versities of Germany, England, and Scotland, modelled as

they were on a common type, the absence of adequate discipline was, in a greater or legs degree, a common defect. In connexion with this feature we may note the coniparatively small percentage of matriculated students proceeding to the degrees of B.A. and M.A. when com-

pared with later times. Of this disparity the following Degrees table, exhibiting the relative numbers in the university of taken at Leipsic for every ten years from the year 1427 to 1552, Leipsic. probably affords a fair average illustration,—the remark-

able fluctuations probably depending quite as much upon

the comparative healthiness of the period (in respect of freedom from epidemic) and the abundance of the harvests

as upon any other cause :—

F ‘cent:

Years. ae Years. BA. | M.A ia

7 B.A’s. | M.A’s, 1427-1480 | 787 || 1429-1482 | 151 | 98 || 20-4 | 3°8 1437-1440 | 715 || 1489-1442 | 199] 50 || 27°3 | 6-9 1447-1450 | 808 || 1449-1452 | 274 | (50) || 33°99 |... 1457-1460 | 1,447 || 1459-1462 | 559 | 81 || 38°6 | 5:6 1467-1470 | 1,187 || 1469-1472 | 410} 61 || 36-0 | 5+4 1477-1480 | 1,163 || 1479-1482 | 458 | 49 || 39-4 | 4:9 1487-1490 | 1,858 || 1489-1492 | 714] 62 |i 88-4 | 3-4 1497-1500 | 1,288 || 1499-1502 | 497] 59 || 38:5 | 4:6 1507-1510 | 1,948 || 1509-1512 | 510] 65 || 261 | 3-4 1517-1520 | 1,445 || 1519-1522 | 247| 35 || 17-0 | 2-4 1527-1530 | 419 || 1529-1582 | 77 | 38 || 18-4 | 7-9 1537-1540 | 686 || 1589-1542 | 122] 97 [1173 | 3-9 1547-1550 | 1,818 || 1549-1552 | 200! 72 || 15-2] 5:5 14,969 4418 | 672 || 29°5 | 45

The German universities in these times seem to have General admitted for the most part their inferiority in learning to es of older and more favoured

centres ; and their consciousness aoe of the fact is shown by the efforts which they made to ypiver. attract instructors from Italy, and by the frequent resort sities. of the more ambitious students to schools like Paris, Bologna, Padua, and Pavia. That they took their rise in any spirit of systematic opposition to the Roman see (as Meiners and others have contended), or that their orga- nization was something external to and independent of the church, is sufficiently disproved by the foregoing evidence. Generally speaking, they were eminently conservative bodies, and the new learning of the humanists and the new methods of instruction that now began to demand attention were alike for a long period unable to gain ad- mission within academic circles. Reformers such as Hegius,

John Wessel, and Rudolphus Agricola carried on their work at places like Deventer remote from university in- fluences. That there was a considerable amount of mental activity going on in the universities themselves is not to be denied ; but it was mostly of that unprofitable kind which, while giving rise to endless controversy, turned upon questions in connexion with which the implied postulates and the terminology employed rendered all scientific investi-

1 Fastt Aberdonenses, Pref. p. xvi.

gation hopeless. At almost every university— Leipsic, Greifswald, and Prague (after 1209) being the principal exceptions—the so-called Realists and Nominalists repre- sented two great parties occupied with an internecine struggle. At Paris, owing to the overwhelming strength of the theologians, the Nominalists were indeed under a kind of ban; but at Heidelberg they had altogether ex- pelled their antagonists. It was much the same at Vienna and at Erfurt,—the latter, from the ready reception which it gave to new speculation, being styled by its enemies “novorum omuium portus.” At Basel, under the leadership of the eminent Johannes a Lapide, the Realists with diffi- culty maintained their ground. Freiburg, Tiibingen, and Ingolstadt, in the hope of diminishing controversy, arrived at a kind of compromise, each party having its own pro- fessor, and representing a distinct “nation.” At Mainz the

were scarcely less perceptible, as they found expression in connexion with the Counter-Reformation. In Germany the Thirty Years' War was attended by consequences which were felt long after the 17th century. In France the Revolution of 1789 resulted in the actual uprooting of the university system.

The influences of the New Learning, and the special character which it assumed as it made its way in Germany in connexion with the labours of scholars like Erasmus, John Reuchlin, Ulrich von Hutten, and Melanchthon, augured well for the future. It was free from the frivol- ities, the pedantry, the immoralities, and the scepticism which characterized so large a proportion of the correspond. ing culture in Italy. It gave promise of resulting at once in a critical and enlightened study of the masterpieces of classical antiquity, and in a reverent and yet rational inter-

pretation of the Scriptures and the fathers. The fierce Per- bigotry and the ceaseless controversies evoked by the pro- Bicious

authorities adopted a manual of logic which was essentially an embodiment of Nominalistic principles.

Abandon- In Italy, almost without exception, it was decided that | mulgation of Lutheran or Calvinistic doctrine dispelled, er : aie. these controversies were endless, and that their effects were | however, this hopeful prospect, and converted what might eats. studies Pernicious. It was resolved, accordingly, to expel logic, | otherwise have become the tranquil abodes of the Muses ism, in Italy, and allow its place to be filled by rhetoric. It was by | into gloomy fortresses of sectarianism. Of the manner in virtue of this decision, which was of a tacit rather than a | which it affected the highest culture, the observation of formal character, that the expounders of the new learning | Henke in his Life of Calixtus (i. 8), that for a century in the 15th century, men like Emmanuel Chrysoloras, | after the Reformation the history of Lutheran theology Guarino, Leonardo Bruni, Bessarion, Argyropulos, and | becomes almost identified with that of the German uni- Valla, carried into effect that important revolution in | versities, may serve as an illustration. academic studies which constitutes a new era in university

The first Protestant university was that of Marburg, Marbury, learning, and largely helped to pave the way for the Re- | founded by Philip the Magnanimous, landgrave of Hesse, formation.! This discouragement of the controversial | 30th May 1527. Expressly designed as a bulwark of spirit, continued as it was in relation to theological ques- | Lutheranism, it was mainly built up out of the confiscation tions after the Reformation, obtained for the Italian uni- | of the property of the religious orders in the Hessian versities a fortunate immunity from dissensions like those | capital. The house of the Dominicans, who had fled on which, as we shall shortly see, distracted the centres of | the first rumour of spoliation, was converted into lecture- High re- learning in Germany. The professorial body also attained | rooms for the faculty of jurisprudence. The church and putation to an almost unrivalled reputation. It was exceptionally | convent of the order known as the “ Kugelherrn” was — select, only those who were in receipt of salaries being | appropriated to the theological faculty. The friary of the — permitted, as a rule, to lecture; it was also famed for its | Barefooted Friars was shared between the faculties of ability, the institution of concurrent chairs proving an excel- | medicine and philosophy. The university, which was the lent stiniulus. These chairs were of two kinds —“‘ordinary” | object of the margrave’s peculiar care, rapidly rose to and “‘extraordinary,”—the former being the more liberally | celebrity ; it was resorted to by students from remote endowed and fewer in number. For each subject of im- | countries, even from Greece, and its professors were of portance there were thus always two and sometimes three | distinguished ability. How much, however, of this popu- rival chairs, and a powerful and continuous emulation | larity depended on its theological associations is to be seem was thus maintained among the teachers. ‘From the | in the fact that after the year 1605, when, by the decree integrity of their patrons, and the lofty standard by which | of Count Maurice, its formulary of faith was changed from they were judged,” says Sir W. Hamilton, “the call to a | Lutheran to Calvinistic, its numbers greatly declined. Paduan or Pisan chair was deemed the highest of all | This dictation of the temporal power now becomes one of literary honours. The status of professor was in Italy | the most notable features in academic history in Protestant elevated to a dignity which in other countries it has never | Germany. ‘The universities, having repudiated the papal reached ; and not a few of the most illustrious teachers in | authority, while that of the episcopal order was at an end, the Italian

seminaries were of the proudest nobility of the | now began to pay especial court to the temporal ruler, and land. While the universities of other countries had fallen | sought in every way to conciliate his goodwill, representing from Christian and cosmopolite to sectarian and local | with peculiar distinctness the theory,—cajus regio, ejus relt- schools, it is the peculiar glory of the Italian that, under | gio. This tendency was further strengthened by the fact the enlightened liberality of their patrons, they still con- | that their colleges, bursaries, and other similar foundations tinued to assert their European universality. Creed and | were no longer derived from or supported by ecclesiastical country were in them no bar,—the latter not even a reason | institutions, but were mainly dependent on the civil power. of preference. Foreigners of every nation are to be found The Lutheran university of Kénigsberg was founded 17th ainong their professors; and the most learned man in | August 1544 by Albert IIL, margrave of Brandenburg; Scotland (Dempster) sought in a Pisan chair that theatre | and the first duke of Prussia, and his wife Dorothea, 4 for his abilities which he could not find at home.”2 Danish princess. In this instance, the religious character Events The Reformation represents the great boundary line in | of the foundation not having been determined at the i ee the history of the medizval universities, and also, for a | mencement, the papal and the imperial sanction were Pe fy long time after, the main influence in the history of those | applied for, although not accorded. King Sigismund 0 inuni- new foundations which subsequently arose in Protestant | Poland, however, which kingdom exercised at that ie versity countries. Even in Catholic countries its secondary effects | protectorate over the Prussian duchy, ultimately gave the history, necessary charter (29th September 1561), at the same ume

1 For an excellent account of this movement, see Georg Voigt, Die Wiederbelebung des classischen Alterthwms, 2d ed. » 2 vols., 1880. * Hamilton, Discussions, 2d ed., p. 373.

ordaining that all students who graduated as masters ‘a the faculty of philosophy should rank as nobles of te

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Polish kingdom. When Prussia was raised to the rank of a kingdom (1701) the university was made a royal founda- tion, and the "'collegium Fridericianum," which was then erected, received corresponding privileges. In 1862 the university buildings were rebuilt, and the number of the students is now nearly one thousand.

The Lutheran university of Jena had its origin in a gymnasium founded by John Frederick the Magnanimous, elector of Saxony, during his imprisonment, for the express purpose of promoting Evangelical doctrines and repairing the loss of Wittenberg, where the Philippists had gained the ascendency. Its charter, which the emperor Charles V. refused to grant, and which was obtained with some difficulty from his brother, Ferdinand I., eventually en- abled the authorities to open the university, 2d February 1558. Distinguished for its vehement assertion of Luth- eran doctrine, its hostility to the teaching of Wittenberg was hardly less pronounced than that with which both centres regard Roman Catholicism. For a long time it was chiefly noted as a school of medicine, and in the 17th and 18th centuries it was in bad repute for the lawlessness of its students, among whom duelling prevailed to a scan- dalous extent. The beauty of its situation and the emin- ence of its professoriate have, however, generally attracted a considerable proportion of students from other countries, Its numbers in 1885 were 566.

The Lutheran university of Helmstidt, founded by Duke Julius (of the house of Brunswick-Wolfenbtittel), and designated after him in its official records as " Acade- mia Julia," received its charter, 8th May 1575, from the emperor Maximilian II. No university in the 16th cen- tury commenced under more favourable auspices. It was munificently endowed by the founder and by his son; and its " Convictorium," or college for poor students, expended in the course of thirty years no less than 100,000 thalers, an extraordinary expenditure for an institution of such a character in those days. Beautifully and conveniently situated in what had now become the well-peopled region between the Weser and the lower Elbe, and distinguished by its comparatively temperate maintenance of the Luth- eran tenets, it attracted a considerable concourse of _ students, especially from the upper classes, not a few being of princely rank. Throughout its history, until suppressed in 1809, Helmstidt enjoyed the special and powerful patronage of the dukes of Saxony.

The “Gymnasium Augidianum” of Nuremberg, founded in 1526, and removed in 1575 to Altdorf, represents the origin of the university of Altdorf. A charter was granted in 1578 by the emperor Rudolph IL, and the university was formally opened in 1580. It was at first, however, empowered only to grant degrees in arts ; but in 1623 the emperor Ferdinand II. added the permission to create) doctors of law and medicine, and also to confer crowns on poets ; and. in 1697 its faculties were completed by the | permission given by the emperor Leopold I. to create | doctors of theology. Like Louvain, Altdorf was nominally | ruled by the municipality, but in the latter university this | power of control remained practically inoperative, and the consequent freedom enjoyed by the community from evils like those which brought about the decline of Louvain is thus described by Hamilton :—“ The decline | of that great and wealthy seminary (Louvain) was mainly | determined by its vicious patronage, both as vested in the | university and in the town. Altdorf, on the other hand, | was about the poorest university in Germany, and long one of the most eminent. Its whole endowment never rose above £800 a year; and, till the period of its declension, the professors of Altdorf make at least as distinguished a figure in the history of philosophy as those of all the eight universities of the British empire together. On looking

closely into its constitution the anomaly is at once solved. The patrician senate of Nuremberg were too intelligent and patriotic to attempt the exercise of such a function. The nomination of professors, though formally ratified by the senate, was virtually made by a board of four curators; and what is worthy of remark, as long as curatorial patronage was a singularity in Germany, Altdorf maintained its rela- tive pre-eminence, losing it only when a similar mean was adopted in the more favoured universities of the empire.”!

The conversion of Marburg into a school of Calvinistic Giessen,

doctrine gave occasion to the foundation of the universities of Giessen and of Rinteln. Of these the former, founded by the margrave of Darmstadt, Louis V., as a kind of refuge for the Lutheran professors from Marburg, received its charter from the emperor Rudolph IL, 19th May 1607. When,

however, the margraves of Darmstadt acquired possession of Marburg in 1625, the university was trans- ferred thither; in 1650 it was moved back again to Giessen. The number of matriculated students at the com- mencement of the century was about 250; in 1887 it was 484, In common with the other universities of Germany, but with a facility which obtained for it a specially unenvi- able reputation, Giessen was for a long time wont to confer the degree of doctor in absentia in the different faculties without requiring adequate credentials. This practice, however, which drew forth an emphatic protest from the eminent historian Mommsen, has within the last few years

been entirely abandoned. ‘he university of Rinteln was Rintel.

founded 17th July 1621 by the emperor Ferdinand II. Almost immediately after its foundation it became the prey of contending parties in the Thirty Years’ War, and its early development was thus materially hindered. It never, however, attained to much distinction, and in 1819 it was

suppressed, The university of Strasburg was founded in Stras- 1621 on the basis of an already existing academy, to which burg.

the celebrated John Sturm stood, during the latter part of his life, in the relation of ‘rector perpetuus,” and of which we are told that in 1578 it included more than a thousand scholars, among whom were 200 of the nobility, 24 counts and barons, and three princes. It also attracted students from all parts of Europe, and especially from Portugal, Poland, Denmark, France, and England. The method of Sturin’s teaching became the basis of that of the Jesuits, and through them of the public school instruction in Eng- land. In 1621 Ferdinand II. conferred on this academy full privileges as a university; in the language of the charter, ‘‘in omnibus facultatibus, doctores, licentiatos, magistros, et baccalaureos, atque insuper poctas laureatos creandi et promovendi.”? In 1681 Strasburg became French, and remained so until 1870.

The university of Dorpat (now Russian) was founded Dorpat.

by Gustavus Adolphus in 1632, and reconstituted by the emperor Alexander I. in 1802. A special interest attaches to this university from the fact that it

has for a long time been the scene of the contending influences of Teutonism and Slavonianism, Situated in Livonia, which at the time of its foundation represented a kind of debateable land between Russia and Poland, its gradual monopoly by the former country has not been without resistance and pro- tests on the part of that Teutonic element which was at one time the more potent in its midst. The study of the Slavonic languages has here received considerable stimulus, and by a decree in May 1887 the use of the Russian lan- guage having been made obligatory in all places of instruc- tion through the Baltic provinces, Russian has now taken the place of German as the language of the lecture-room. Dorpat possesses a fine library of over 80,000 volumes, and is also noted for its admirable botanical collection. The

1 Discussions, &c., 2d ed., pp. 888-9. 2 Promulg. Acad, Privil., &c., Strasburg, 1628.

Prague.

Bam- berg.

Inns- bruck.

Breslau.

The Jesuits in the uni- versity.

Russian minister has also recently instituted a professor- ship of the comparative grammar of the Slavonic dialects (now filled by J. Baudouin de Courtenay). The general influence of the university has been rapidly extending during the last few years far beyond the Baltic provinces. The number of students, which in 1879 was 1106, in 1886 was 1751.1 A like contest between contending nation- alities has recently met with a final solution at Prague, where a Czech university has been established on an inde- pendent basis, the German university having commenced its separate career in the winter session of 1882-83. The German foundation retains its endowments, but the state subvention is divided between the two.

The repudiation on the part of the Protestant univer- sities of both papal and episcopal authority evoked a counter-demonstration among those centres which still adhered to Catholicism, while their theological intolerance gave rise to a great reaction, under the influence of which the medixval Catholic universities were reinvigorated and reorganized (although strictly on the traditional lines), while new and important centres were created. It was on the tide of this reaction, aided by their own skill and sagacity, that the Jesuits were borne to that commanding position which made them for a time the arbiters of educa- tion in Europe. The earliest university whose charter represented this reaction was that of Bamberg, founded by the prince-bishop Melchior Otto, after whom it was named ‘Academia Ottoniana.” It was opened Ist September 1648, and received both from the emperor Frederick III. and Pope Innocent X. all the civil and ecclesiastical privi- leges of a medixval foundation. At first, however, it com- prised only the faculties of arts and of thedlogy; to these was added in 1729 that of jurisprudence, and in 1764 that of medicine. In this latter faculty Dr Ignatius Dollinger (the father of the historian) was for a long time a distin- guished professor. The university of Innsbruck was founded in 1672 by the emperor Leopold I, from whom it received its name of “Academia Leopoldina.” In the following century, under the patronage of the empress Maria Theresa, it made considerable progress, and received from her its ancient library and bookshelves in 1745. In 1782 the university underwent a somewhat singular change, being reduced by the emperor Joseph II. from the status of a university to that of a lyceum, although retain- ing in the theological faculty the right of conferring de- grees. In 1791 it was restored to its privileges by the emperor Leopold II., and since that time the faculties of philosophy, law, and medicine have been represented in nearly equal proportions. In 1886 the number of profes- sors was 74, and of students 869. The foundation of the university of Breslau was contemplated as early as the year 1505, when Ladislaus, king of Hungary, gave his sanction to the project, but Pope Julius II., in the assumed interests of Cracow, withheld his assent. Nearly two centuries later, in 1702, under singularly altered conditions, the Jesuits prevailed upon the emperor Leopold I. to found a university without soliciting the papal sanction. When Frederick the Great conquered Silesia in 1741, he took both the university and the Jesuits in Breslau under his protection, and when in 1774 the order was suppressed by Clement XIV. he established them as priests in the Royal Scholastic

Institute, at the same time giving new statutes to the university. In 1811 the university was considerably augmented by the incorporation of that at Frankfort-on- the-Oder. At the present time it possesses both a Catholic and a Lutheran faculty. Its medical faculty is in high repute. The total number of students in 1887 was 1347.

In no country was the influence of the Jesuits on the

1 See Die deutsche Universitat Dorpat im Lichte der Geschichte,

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universities more marked than in France. The civil wars in that country during the thirty years which preceded the close of the 16th century told with disastrous effects upon

the condition of the university of Paris, and with the com. Condition

mencement of the 17th century its collegiate life seemed of the at an end, and its forty colleges stood absolutely deserted, ™%-

To this state of affairs the obstinate conservatism of the Pane of

academic authorities not a little contributed. The statutes by which the university was still governed were those which had been given by the cardinal D'Estouteville, the papal legate, in 1452, and remained entirely unmodified by the influences of the Renaissance. In 1579 the edict of Blois promulgated a scheme of organization for all the universities of the realm (at that time twenty-one in number),—a measure which, though productive of unity of teaching, did nothing towards the advancement of the studies themselves. The eminent lawyers of France, un- able to find chairs in Paris, distributed themselves among the chief towns of the provinces. The Jesuits did not fail to profit by this immobility and excessive conservatism on the part of the university, and during the second half of the 16th century and the whole of the 17th they had con- trived to gain almost a complete monopoly of both the higher and the lower education of provincial France,

Their schools arose at Toulouse and Bordeaux, at Auch, Colleges

Agen, Rhodez, Périgueux, Limoges, Le Puy, Aubenas, o the

) een Béziers, Tournon, in the colleges of Flanders and Lorraine, — 4 4 D

Douai and Pont-’-Mousson,—places beyond the jurisdic- tion of the parlement of Paris or even of the crown of France. Their banishment from Paris itself had been by the decree of the parlement alone, and had never been confirmed by the crown. “ Lyons,” says Pattison, “ loudly demanded a Jesuit college, and even the Huguenot Les- diguiéres, almost king in Dauphiné, was preparing to erect one at Grenoble. Amiens, Rheims, Rouen, Dijon, and Bourges were only waiting a favourable opportunity to introduce the Jesuits within their walls.”2 The university was rescued from the fate which secmed to threaten it only by the excellent statutes given by Richer in 1598, and by the discerning protection extended to it by Henry IV. The ‘college of Edinburgh” was founded by charter Edin- of James VI., dated 14th April 1582. This document bul contains no reference to a studium generale, nor is there ground for supposing that the foundation of a university was at that time contemplated. In marked contrast to the three older centres in Scotland, the college rose compara- tively untrammelled by the traditions of medizevalism, and its creation was not effected without some jealousy and opposition on the part of its predecessors. Its first course of instruction was commenced in the Kirk of Field, under the direction of Robert Rollock, who had been educated at St Andrews under Andrew Melville, the eminent Coven- anter. ‘He began to teach,” says Craufurd, “in the lower hall of the great lodging, there being a great con- course of students allured with the great worth of the man; but diverse of them being not ripe enough in the Latin tongue, were in November next put under the charge of Mr Duncan Narne,... who, upon Mr Rollock’s recom- mendation, was chosen second master of the college.”* In 1585 both Rollock and Nairne subscribed the National Cov- enant, and a like subscription was from that time required from all who were admitted to degrees in the college. Disastrous as were the effects of the Thirty Years’ War Results upon the external condition of the German universities, Thi resulting in not a few instances in the total dispersion of ye the students and the burning of the buildings and libraries, War. they were less detrimental and less

permanent than those which were discernible in the tone and temper of these

2 Life of Casaubon, p. 181. 3 Craufurd, List. of the Univ. of Edinburgh, pp. 19-28.

communities, A formal pedantry and unintelligent method

of study, combined with a passionate dogmatism in matters of religious belief, and a rude contempt for the amenities of | social intercourse, became the leading characteristics, and

lasted throughout the 17th century. But in the year 1693 the foundation of the university of Halle opened up a career to two very eminent men, whose influence, widely different as was its character, may be compared for its effects with that of Luther and Melanchthon, and served to modify the whole current of German philosophy and Ger- man theology. Halle has indeed been described as “the first real modern university.” It was really indebted for its origin to a spirit of rivalry between the conservatism of Saxony and the progressive tendencies of the house of Brandenburg, but the occasion of its rise was the removal of the ducal court from Halle to Magdeburg. The arch- bishopric of the latter city having passed into the posses- sion of Brandenburg in 1680 was changed into a dukedom, and the city itself was selected as the ducal residence. This change left unoccupied some commodious buildings in Halle, which it was decided to utilize for purposes of education. A ‘ Ritterschule” for the sons of the nobility was opened, and in the course of a few years it was decided to found a university. Saxony endeavoured to thwart the Scheme, urging the proximity of Leipsic ; but her opposi- tion was overruled by the emperor Leopold I., who granted (19th October 1693) the requisite charter, and in the following year the work of the university commenced. Frankfort-on-the-Oder had by this time become a centre of the Reformed party, and the primary object in founding a university in Halle was to create a centre for the ‘Lutheran party, but its character, under the influence of

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Mnencaits two most notable teachers, Christian Thomasius and A.

F| |)H. Francke, soon expanded beyond the limits of this con- iq”, ception to assume a highly original form. Thomasius and Mckaarancke had both been driven from Leipsic owing to the ay fisfavour with which their liberal and progressive tend- ey jencies were there regarded by the academic authorities, 0 nd on many points the two teachers were in agreement. y hey both regarded with contempt alike the scholastic 09 {philosophy and the scholastic theology; they both desired fo see the rule of the civil power superseding that of the | |pcclesiastical power in the seats of learning ; they were ! poth opposed to the ascendency of classical studies as ex- d jpounded by the humanists—Francke regarding the Greek R jtnd Roman pagan writers with the old traditional dislike, nj |ts immoral, while Thomasius looked upon them with con- 4 ©«Fempt, as antiquated and representing only a standpoint hI hich had been long left behind; both again agreed as to lq fhe desirability of including the elements of modern culture ie} (fn the education of the young. But here their agreement | jfeased. It was the aim of Thomasius, as far as possible, | Jo Secularize education, and to introduce among his country- q en French habits and French modes of thought; his own e tire was gay and fashionable, and he was in the habit i} (ff taking his seat in the professorial chair adorned with ¢ (fold chain and rings, and with his dagger by his side. c}_ [francke, who became the leader of the Pietists, regarded ij (Hl this with even greater aversion than he did the lifeless] + rthodoxy traditional in the universities, and was shocked 8 the worldly tone and disregard for sacred things which | fharacterized his brother professor. Both, however, com- iq panded a considerable following among the students. 1g ffhomasius was professor in the faculty of jurisprudence, g) «fvancke in that of theology. And it was a common pre- = fiction in those days with respect to a student who pro- ij ffesed to pursue his academic career at Halle, that he would i} [pfallibly become either an atheist or a Pietist. But the »] |prvices renderetl by Thomasius to learning were genuine la d lasting. He was the first to set the example, soon

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after followed by all the universities of Germany, of lectur- ing in the vernacular instead of in the customary Latin; and the discourse in which he

first departed from the traditional method was devoted to the consideration of how far the- German nation might with advantage imitate the French in matters of social life and intercourse. His more general views, as a disciple of the Cartesian philosophy and founder of the modern Rationalismus, exposed him to incessant attacks ; but by the establishment of a monthly journal (at that time an original idea) he obtained a channel for ex- pounding his views and refuting his antagonists which gave him a great advantage. On the influence of Francke, as the founder of that Pietistic school with which the re- putation of Halle afterwards became especially identified, it is unnecessary here to dilate.) J. C, Wolf, who followed Thomasius as an assertor of the new culture, was driven from Halle by the accusations of the Pietists, who declared that his teaching was fraught with atheistical principles. In 1740, however, he was recalled by Frederick IT., and reinstated in high office with every mark of consideration and respect. Throughout the whole of the 18th century Halle was the leader of academic thought and culture in Protestant Germany, although sharing that leadership,

after the middle of the century, with Gottingen. The uni- Gottin- versity of Gottingen (named after its founder " Georgia gen.

Augusta") was endowed with the amplest privileges as a university by George IL. of England, elector of Hanover, 7th December 1736. The imperial sanction of the scheme had been given three years before (13th January 1733), and the university was formally opened 17th September 1737. The king himself assumed the office of " rector magni- ficentissimus," and the liberality of the royal endowments (doubling those of Halle), and the not less liberal character of the spirit that pervaded its organization, soon raised it to a foremost place among the schools of Germany. Halle had just expelled Wolf; and Géttingen, modelled on the same lines as Halle, but rejecting its Pietism and dis- claiming its intolerance, appealed with remarkable success to the most enlightened feeling of the time. It included all the faculties, and two of its first professors—Mosheim, tlre eminent theologian, from Helmstidt, and Bohmer, the no less distinguished jurist, from Halle—together with Gesner, the man of letters, at once established its repu- tation. Much of its early success was also due to the supervision of its chief curator (there were two), —Baron Miinchausen, himself a man of considerable attainments, who by

his sagacious superintendence did much to pro- mote the general efficiency of the whole professoriate. Not least among its attractions was also its splendid library, located in an ancient monastery, and now containing over 200,000 volumes and 5000 MSS. In addition to its general influence as a distinguished seat of learning, Gottingen may claim to have been mainly instrumental in diffusing a more adequate conception of the importance of the study of history. Before the latter half of the 18th century the mode of treatment adopted by university lecturers was singularly wanting in breadth of view. Pro- fane history was held of but little account, excepting so far as it served to illustrate ecclesiastical and sacred history, while this, again, was invariably treated in the narrow spirit of the polemic, intent mainly on the defence of his own confession, according as he represented the Lutheran or the Reformed Church. The labours of the professors at Gottingen, especially Putter, Gatterer, Schlézer, and Spittler, combined with those of Mascov at Leipsic, did much towards promoting both a more catholic treatment and a wider scope. Not less beneficial was the example set at Gottingen of securing the appointment of its protes- sors by a less prejudiced and partial body than a university 1 See Paulsen, Gesch, des gelehrten Unterrichts, &c., pp. 348-358.

board is only too likely to become. ‘ ‘The great Miin- chausen,’ says an illustrious professor of that seminary, ‘allowed our university the right of presentation, of desig- nation, or of recommendation, as little as the right of free election; for he was taught by experience that, although

cal demeanour of their members towards the unassociated students gave rise to a general combination of the latter for the purposes of self-defence and organized resistance. At all the great German universities both these forms of aggo- ciation are to be found existing at the present day.

the faculties of universities may know the individuals best qualified to supply their vacant chairs, they are seldom or never disposed to propose for appointment the worthiest within their knowledge.’” The system of

patronage adopted at Gottingen was, in fact, identical with that which had already been instituted in the universities of the Nether-

The political storms which marked the close of the last Extin and the commencement of the present century gave the tion of death-blow to not a few of the ancient universities of Ger. Seman many. Mainz and Cologne ceased to exist ‘in 1799. Mer Bamberg, Dillingen, and Duisberg in 1804; Rinteln and oe Ilelmstadt in 1809 ; Salzburg in 1810; Erfurt in 1816, 1798.

Erlangen. lands by Douza (see infra, p. 850). The university of | Altdorf was united to Erlangen in 1807, Franktort-on. 1816. Erlangen, a Lutheran centre, was founded by Frederick, | the-Oder to Breslau in 1809, and Wittenberg to Halle in margrave of Baireuth. Its charter was granted by the | 1815. The university of Ingolstadt was first moved in emperor Charles VII., 21st February 1743, and the uni- | 1802 to Landshut, and from thence in 1826 to Munich, Munich, versity was formally constituted, 4th November. From | where it was united to the academy of sciences which was its special guardian, Alexander, the last margrave of Ans- | founded in the Bavarian capital in 1759. Of those of the bach, it was styled “Academia Alexandrina.” In 1791, | above centres which altogether ceased to exist but few, Ansbach and Baireuth having passed into the possession of | however, were much missed or regretted,—that at Mainz, Prussia, Erlangen became subject to the Prussian Govern- | which had numbered some six hundred students, being the ment. The number of the students, which at the com- | one notable exception. ‘The others had for the most part mencement of the century was under 300, was 880 in 1887, | fallen into a perfunctory and lifeless mode of teaching, and,

The On comparison with the great English universities, the | with wasted or diminished revenues and declining numbers,

eee universities of Germany must be pronounced inferior both | had long ceased worthily to represent the functions of a

man uni, 22 point of discipline and of moral control over the | university. Whatever loss may have attended their sup-

versities Students. The superiority of the former in these respects | pression has been far more than compensated by the com- is partly to be attributed to the more systematic care which | activity and influence of the three great German univer- pared. they took, from a very early date, for the supervision of | sities which have risen in the present century. Munich

each student, by requiring that within a certain specified time after his entry into the university he should be regis- tered as a pupil of some master of arts, who was respon- sible for his conduct, and represented him generally in his relations to the academic authorities. Marburg in its earliest statutes (those of 1529) endeavoured to establish a similar rule, but without success.2 The development of the collegiate system at Oxford and Cambridge materially assisted the carrying out of this discipline. Although again, as in the German universities, feuds were not unfre- quent, especially those between “north” and “south” (the natives of the northern and southern counties), the fact that in elections to fellowships and scholarships only a certain proportion were allowed to be taken from either of these divisions acted as a considerable check upon the possibility of any one college representing either element exclusively. In the German universities, on the other hand, the ancient division into nations, which died out with the 15th century, was revived under another form by the institution of national colleges, which largely served to foster the spirit of rivalry and contention. The denioral- ization induced by the Thirty Years’ War and the increase of duelling intensified these tendencies, which, together with the tyranny of the older over the younger students, known as “ Pennalismus,” were evils against which the authorities contended, but ineffectually, by various ordin- ances. The institution of ‘‘ Burschenthum,” having for its design the encouragement of good fellowship and social feel- ing irrespective of nationality, served only asa partial check upon these excesses, which again received fresh stimulus by the rival institution of ‘‘Landsmannschaften,” or societies of the same nationality. The latter proved singularly pro- vocative of duelling, while the arrogant and even tyranni-

‘ Hamilton, Discussions, p. 381.

2 “Volumns neminem in hanc nostram Academiam admitti, aut per rectorem in album recipi, qui non habeat privatium atque domesticum

prieceptorem, qui ejus discipulum agnoscat, ad cujus judicium quisque pro sua ingenii capacitate atque Marte lecturas et publicas et privatas audiat, a cujus latere aut raro aut nunquam discedat."' Koch expressly compares this provision with the discipline of Oxford and Cambridge, which, down to the commencement of the present century, was very much of the same character (Koch. Gesch. des academischen Pédago- giums in Marburg, p. 11).

has become a distinguished centre of study in all the faculties; and its numbers, allowing for the two great wars, have been continuously on the increase. The number of its professors in 1887 was over ninety, and that of its students at the commencement of the session 1886-87 3209.

The university of Berlin, known as the Royal Friedrich Berlin, Wilhelm university, was founded in 1809, immediately after the peace of Tilsit, when Prussia had been reduced to the level of a third-rate power. Under the guiding influence of Wilhelm von Humboldt, however, the prin- ciples which were adopted in connexion with the new seat of learning not only raised it to a foremost place among the universities of Europe, but also largely conduced to the regeneration of Germany.

The university of Bonn, founded in 1818, and known Bonn. as the Rhenish Friedrich Wilhelm university, has 88 pro- fessors and 1125 students. Equally distinguished as @ school of philosophy and a school of theology, it is notable for the manner in which it combines the opposed schools of theological doctrine,—that of the Evangelical (or Luth- eran) Church and that of the Roman Catholic Church here standing side by side, and both adorned by eminent names. This combination (which also exists at Tubingen and at Breslau) has been attended with complete guccess and (according to Dr Déllinger) with unmistakable advant- ages. When tried, however, a generation before, at Erfurt and at Heidelberg, its failure was not less conspicuous, and Erfurt was ruined by the experiment.

Owen hs fT Les

Dr Conrad, professor of political science at Halle, has recently made the statistics relating to the German uni- versities the subject of a careful investigation and analysis, which offer some interesting results. The total cost of the universities of the German empire is shown to be much smaller

than the total revenues of the English universities and colleges, although the number both of professors and students is much larger, and although 42 per cent. of the total expenditure is upon establishments, such as hospitals, museums, and so forth, But in Germany 72 per cent. of the cost of the universities is defrayed by the state, the students paying, in the shape of fees, only 9-3 per cent. To a great extent, however, the German universities are to be looked upon as professional schools, giving an education which directly fits a man to earn his bread as a clergyman, a lawyer, a judge, a physician, a schoolmaster, a chemist, an engineer, or an agriculturist. Notwith- standing the rapid growth in the numbers of the students, the growth of the professoriate has fully kept pace with it. In 1880 there were 1809 teachers at work in the German universities, more than half of whom (967) were full professors (‘ordinarii”),—the proportion of teachers to students being 1 to 11. This is a much higher propor- tion than that of Oxford and Cambridge, although in them there is a large staff of college lecturers, which is practic- ally more important than the university staff. It is higher again than the proportion of the Scottish universities, where there are only some 105 professors to between 5000 and 6000 students, a proportion of 1 to between 50 and 60 students. The increase in Germany has taken place partly by adding on fresh teachers for the old subjects, such as Latin and Greek, but still more by founding new chairs for new subjects, such as Oriental and Romance languages, geography, and archeology, and by subdividing departments which have been recently developed, such as those con- nected with political economy, political science, physiology, and biology. Owing to the great development of natural science, the faculty of philosophy has at some centres in- creased to such an extent as to equal in numbers all the other faculties put together. This inconvenience has been

differently met at different universities. In those of Switzerland, no further remedy has been devised than that of appointing separate syndicates or boards of management for the two main divisions,—the philosophico-historic and the mathematical and natural-scientific ; at Dorpat, Tiibin- gen, and Strasburg, on the other hand, these divisions have been represented by the formation of two distinct faculties; while Tiibingen, Munich, and Wiirzburg have created, in addition, a third faculty under which are grouped the several subjects of political economy, statis- tics, and finance.

The following table (taken from Conrad) exhibits the average of

Averages

the total number of matriculated students at the German universi- of

ties for every five years from 1831 to 1884; it brings the tendency to form large centres very forcibly before the view. The three largest centres—Berlin, Leipsic, Munich—even in the first quinquennium

students at Ger- man uni-

appear as absorbing no less than 85 per cent. of the students, and versities.

in the last as many as 42 per cent. At the same time, there has lately been a no less notable increase among the centres of second magnitude. A quarter of a century ago only two universities had

more than a thousand students ; at present there are nine.

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Greifswald… K6nigsberg.. IBOUMMI. sees eee Miinster…....

Wiirzburg…. Erlangen…...

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Strasburg …./

The following table, taken from Ascherson’s Deutscher Univer-

Table

sitdts-Kalender, 1887, supplies the most recent statistics respecting of pro-
both the teaching and the student bodies in the different faculties fessors

of the German-speaking universities on the Continent.

STUDENTS.

Privat- | ,, ‘ Theology. Juris- Universities, , Extra- docenten, | Teachers “___.| prudence, | Medicine, ee Total of Ordinary Honorary : of F Politieal | S z hilology, |atrieulated Prat ordinary Prof rs,.| Assistant it ,, Total. Bevan . Politica urgery: | Mathema. |Matriculate TOFESSOTS.! b-ofegsors.|£ 1O!CS8OFS-| Teachers, | Languages, ‘ Catholic.| Economy, |Pharmacy.| ~,! Students. 2 &e. gelical. Pra ties, &. &e. Forestry. GERMAN Exeme— 7 — _ { ICCTA DbS GSBperinrsocberonnd Mecaeacrs ae 75 83 7 124 if 296 794 aps 1282 1297 1984 5357 BOnM: 6560s Waneenasiariawer 57 31 a PT) 5 122 22 86 226 292 395 1121 BBreSlaWiscsssssssescascers 57 33 3 31 7 131 166 165 221) 362 433 1347 IBGIAMICOM ses csclersvasce 39 7 I 9 5 61 386 Are 11s 267 109 880 HV CMOUUG Noe sseccseertecies 36 15 1 24 4 80 400 116 147 428 305 996 Giessen….. Seseiuvsieere’s 38 9 ele 9 3 59 94 rein 125 138 127 484 GOfDINBEN..ccc.cecsc00e. 65 iy 2 21 6 121 289 a8 145 233 424 1041 Grcliswald.cssccs.ce.0s 41 23 one 13 5 82 306 cae 55 441 121 923 WOU Gerecasssemescecsscces 50 30 1 18 11 110 598 ee 115 315 499 1527 Heidelberg…... 43 28 6 20 2 106 ie a3 193 202 305 1723 saeeceesaes 35 24 8 15 5 87 126 awe 80 210 191 607 41 11 mae 20 6 78 55 tee 2) a aa ae IGGIUGSD OTR ..cs.ceseeoe 44 24 nfo 19 7 94 235 are 112 7] Léipate ie 67 38 12 58 5 180 672 see 738 781 1040 3231 Marburg…... 44 15 are Jere 6 82 189 one 74 271 366 894 MUUCH ccc ccverersescesa cous 75 15 5 65 5 165 ma 146 1136 1350 544 3176 MIUISLO TS asicscccacessssbels 22 10 1 4 3 40 eee 312 boc ere 163 475 NROSUMGHashercasucs ses stccneetcess 4g) 3 wae 5 2 39 87 B00 35 100

105 327 LLANE rea citacesainnesssossesss 59 20 1 HG) 3 102 89 add 195 233 331 848 SULIT ies cc vessunistscsersseses 52 16 tee ‘ 17 8 93 354 160 348 235 150 1247 WiMIZUIL Oise sce sccutnnanes sane 38 10 1 19 é 7a Age 179 218 935 179 1511 SWITZERLAND — : BARE leente asics ovetehce sss theneeeaee 37 13 es 29 4 83 95 o0e 43 131 85 354 Bern 41 6 4 36 a 87 44 8 164 446 96 oe Geneva.., 41 ves ane 29 ie 70 ? dis : . 3 ; Lausanne… 22 23 ; i 2 : re : i 4 v O aa lRaaecrr 25 3 ‘ ‘ : : i ee Air OKC: 38 13 nie ‘ 40 Or 41 56 241 143 481 rr ote) — Be 42 5 a 16 10 73 235 264 868 367 1734 AUSTRIA AND HuNGARY— | WZENMOWIGZ i se ceaiusssss-acotes 26 6 6 ey 41 60 123 ae 30 ae irc sssscsvciniane 50 17 43 4 114 86 489 548 70 1198 Tnnsbruck….. 41 11 1 19 wl 74 ae oe a ha ih 9 Cracow . sare) 89 14 i a a : aa é : : i 5 = ct 33 33 4 147 12 301 204 1911 2318 460 4893 XXL — qo7

and students.

Fluctua- tions of numbers.

Univer- sities of United Pro- vinces,

Leyden.

Franeker.

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850 UNIVERSTV Is

In 1878 a comparison of the numbers of the students in the different faculties in the Prussian universities with those for the year 1867 showed a remarkable diminution in the faculty of theology, amounting in Lutheran centres to more than one-half, and in Catholic centres to nearly three-fourths. In jurisprudence there was an increase of nearly two-fifths, in medicine a decline of a third, and in philosophy an increase of one-fourth. During the last few years, however, the faculties of theology have made some progress towards regaining their former numbers.

The universities of the United Provinces, like those of Protestant Germany, were founded by the state as schools for the maintenance of the principles of the Reformation and the education of the clergy, and afforded in the 16th and 17th centuries a grateful refuge to not a few of those Huguenot or Port-Royalist scholars whom persecution compelled to flee beyond the boundaries of France, as well as to the Puritan clergy who were driven from England. The earliest, that of Leyden, founded in 1575, commemo- rated the gallant and successful resistance of the citizens to the Spanish fleet under Requesens. Throughout the 17th century Leyden was distinguished by its learning, the ability of its professors, and the shelter it afforded to the more liberal thought associated at that period with Arminianism. Much of its early success was owing to the wise provisions and the influence of the celebrated James Douza :—‘ Douza’s principles,” says Hamilton, “ were those which ought to regulate the practice of all academical patrons; and they were those of his successors. He knew that at the rate learning was seen prized by the state in the academy would it be valued by the nation at large. .... He knew that professors wrought more even by example and influence than by teaching, that it was theirs to pitch high or low the standard of learning in a country, and that, as it proved easy or arduous to come up with them, they awoke either a restless endeavour after an even loftier attainment, or lulled into a self-satisfied conceit.” Douza was, for Leyden and the Dutch, what Miinchausen afterwards was for Géttingen and the German universities. “ But with this difference : Leyden was the model on which the younger universities of the republic were constructed ; Gottingen the model on which the older universities of the empire were reformed. Both Miin- chausen and Douza proposed a high ideal for the schools founded under their auspices ; and both, as first curators, laboured with paramount influence in realizing this ideal for the same long period of thirty-two years. Under their patronage Leyden and Gottingen took the highest place among the universities of Europe ; and both have only lost their relative supremacy by the application in other semin- aries of the same measures which had at first determined their superiority.” The appointment of the professors at Leyden was vested in three (afterwards five) curators, one of whom was selected from the body of the nobles, while the other two were appointed by the states of the pro- vince, —the office being held for nine years, and eventually for life. With these was associated the mayor of Leyden for the time being. The university of Franeker was founded in 1585

on a somewhat less liberal basis than Leyden, the professors being required to declare their assent to the rule of faith embodied in the Heidelberg Catechism and the confession of the “ Belgian Church.” Its four faculties were those of theology, jurisprudence, medicine, and “the three languages and the liberal arts.” } For a period of twelve years (circ. 1610-1622) the reputa- tion of the university was enhanced by the able teaching of William Ames (“Amesius”), a Puritan divine and moralist who had been driven by Bancroft from Cambridge and from England. His fame and ability are said to have

1 Statute et Leges, Franeker, 1647, p. 3.

attracted to Franeker students from Hungary, Poland, and Russia.

With like organization were founded—in 1600 the uni- Harder. versity of Harderwijk, in 1614 that of Groningen, and wijk, in 1634 that of Utrecht. The restoration of the House “tonin- of Orange, and establishment of the kingdom of the Sie h Netherlands (23d March 1815), was followed by important _ changes in connexion with the whole kingdom. The unj-

| versities of Franeker and Harderwijk were suppressed,

while their place was taken by the newly-founded centres

at Ghent (1816) and Liége (1816). A uniform constitu. Ghent, tion was given both to the Dutch and Belgian universities, Liege, It was also provided that there should be attached to each

a board of curators, consisting of five persons, “ distin- guished by their love of literature and science and by their rank in society.” These curators were to be nomin- ated by the king, and at least three of them chosen from

the province in which the university was situated, while

the other two were to be chosen from adjacent provinces, After the redivision of the kingdom in 1831, Ghent and Liége were constituted state universities, and each received

a subsidy from the Government (see Betcrum). The uni- Brussels. versity of Brussels, on the other hand, founded in 1834, is

an independent institution, supported by the liberal party; while the reconstituted university at Louvain represents

the party of Roman Catholicism, and is almost exclusively a theological school for the education of the Catholic clergy. The universities of Belgiuni are, however, somewhat hetero- geneous bodies, and present in their organization a singu-

lar combination of French and German institutions. Jn Amster- Holland, the foundation of the university of Amsterdam 4m. (1877) has more than repaired the loss of Franeker and Harderwijk, and the progress of this new centre during

the ten years of its existence has been remarkably rapid,

so that it bids fair to rival, if not to outstrip, both Utrecht

and Leyden. The higher education of women has made some progress in the Netherlands ; and in 1882-83 there were eighteen women studying at Amsterdam, eleven at Groningen, four at Leyden, and seven at Utrecht.

In Sweden the university of Lund, founded in 1668 and Univer. modelled on the same plan as its predecessor at Upsala, ie has adhered to its antiquated constitution with remarkable | 4 tenacity. At both these universities the medieval division Norway, into “nations” is still in force among the students, the Lund. number at Upsala being no less than thirteen. The pro- Ups fessoriate at both centres is much below the modern — requirements in point of numbers. The university of od Christiania in Norway, founded in 1811, and the Swedish ™”™ universities are strongly Lutheran in character ; and all alike are closely associated with the ecclesiastical institu- tions of the Scandinavian kingdoms. The same observa- tion applies to Copenhagen,—where, however, the labours of Rask and Madvig have done much to sustain the repu-__ tation of the university for learning. The university of Kiel Kiel (1665), on the other hand, has

come much more under Teutonic influences, and is now a distinguished centre of scientific teaching.

In France the fortunes of academic learning were even aa less happy than in Germany. The university of Paris was… distracted, throughout the 17th century, by theological trom the dissensions,—in the first instance owing to the struggi¢ 17th that ensued after the Jesuits had effected a footing at the century. Collége de Clermont, and subsequently by the strife occasioned by the teaching of the Jansenists. Its studies, discipline, and numbers alike suffered. Towards the close of the century a certain revival took place, and a succes sion of illustrious names—Pourchot, Rollin, Grenan, Coffin, Demontempuys, Crevier, Lebeau—appear 00 one roll of its teachers. But this improvement was soon inter- rupted by the controversies excited by the promulgation

of the bull Unigenitus in 1713, condemning the tenets of Quesnel, when Rollin himself, although a man of singu- larly pacific disposition, deemed it his duty to head the opposition to Clement XI. and the French episcopate. At last, in 1762, the parlement of Paris issued a decree (August 6) placing the colleges of the Jesuits at the dis- posal of the university, and this was immediately followed by another for the expulsion of the order from Paris. Concurrently with this measure the prospects of the uni- versity assumed a more favourable character, the curri- culum of its studies was extended, and both history and natural science began to be cultivated with a certain success. These better prospects were, however, soon ob- secured by the outbreak of the Revolution; and on the 15th September 1793 the universities and colleges

. throughout France, together with the faculties of theology,

medicine, jurisprudence, and arts, were abolished by a decree of the Convention. The Collége de France, when restored in 1831, was reconstituted mainly as a school of adult instruction, for the most part of a popular character, and entirely dissociated from the university. It now numbers thirty-nine chairs, among which is one of the Slavonic languages

and literature. The university of France (which succeeded to that of Paris) is at present

little more than an abstract term, signifying the whole of

the professional body under state control, and comprising various faculties at different centres—Paris, Montpellier, Nancy, &c., together with twenty-seven academical rector- ates. Each of these rectors presides over a local “ conseil d’enseignement,” in conjunction with which he elects the professors of lycées and the communal schoolmasters, whose formal appointment is then made by the minister of public instruction. There are ecclesiastics in some of the conseils d’enseignement, but the rectors are all laymen who have graduated in one of the faculties. The great schools have also in no small measure supplemented the work of the universities by their advance in the direction of scientific instruction. Among the number the “Ecole Pratique des Hautes Etudes” in Paris (31st July 1868) and the “ Ecole Polytechnique,” which traces its origin as far back as the year 1794, are especially distinguished. The course of instruction at the former is divided into five sections—(1) mathematics, (2) physics and chemistry, (3) natural history and physiology, (4) history and philology, (5) economic science. At the latter the instruction is conceived solely with regard to the application of scientific principles to all branches of the public service, but more especially the miilitary and mercantile. In 1875 the National Assembly passed an Act which enabled the Roman Catholic body to establish free universities of their own, and to confer degrees which should be of the same validity

qd as those of the state university. At Lille and Angers such

centres have been already organized. The university of Strasburg, which in the latter part of the last century had been distinguished by an intellectual activity which became associated with the names of Goethe, Herder, and others, was also swept away by the Revolution. It was, however, restored Ist May 1872, after the city had reverted to Ger- many, and was remodelled entirely on German principles. Since then its success has been marked and continuous. In Switzerland all the higher education is supported mainly by the German and Protestant cantons. The four universities of Basel, Bern, Zurich, and Geneva have an aggregate of some 1400 or 1500 students, and

all possess faculties of philosophy, jurisprudence, theology, and medi- cine. Basel is, however, the chief centre for theology, as

‘ is Bern for jurisprudence and Zurich for philosophy. At

Geneva the famous academy of the 16th and 17th cen- turies, long distinguished as a centre of Calvinistic teaching, is now represented by a university (first formed in 1876),

where the instruction is given (mainly in the French lan-

guage) by a staff of forty-one professors, and where there is a rising school of science. Switzerland almost takes the lead in connexion with female education on the Continent, and in 1882-83 there were 52 women at the university of Geneva, 36 at Bern, and 24 at Zurich.

In Spain the universities at present existing are those of Barcelona, Granada, Madrid (transferred in 1837 from Alcala), Oviedo, Salamanca, Santiago, Seville, Valencia, Valladolid, and Zaragoza. They are all, with the exception perhaps of Madrid, in a lamentably depressed condition, and mainly under the influence of French ideas and modelled on French examples. But in Portugal, Coimbra, which narrowly escaped suppression in the 16th century as a sus- pected centre of political disaffection, is now a flourishing school. Its instruction is given gratis ; but, as all members of the higher courts of judicature and administration in the realm are required to have graduated at the university, it is at the same time one of the most aristocratic schools in Europe. There are five faculties, viz., theology, jurispru- dence, medicine, mathematics, and philosophy. Of these, that of law is by far the most flourishing, the number of students in this faculty nearly equalling the aggregate of all the rest. There is a valuable library, largely composed of collections formerly belonging to suppressed convents. Asa school of theology Coimbra is distinctly anti-ultramontane, and the progressive spirit of the university is shown by the fact that the rector has been instructed by the govern- ment to devise a scheme for the admission of women.

In Italy the universities are numerically much in excess of the requirements of the population, there being no less

| than sixteen state universities and four free universities,

Very few of these possess theological faculties, and in no country are theological studies less valued. Education for the church is almost entirely given at the numerous “seminaries,” where it is of an almost entirely elementary character. In 1875 a laudable effort was made by Bonghi, the minister of education, to introduce reforms and to assimilate the universities in their organization and methods to the German type. His plans were, however, to a great extent reversed by his successor, Coppino.

Univer- sities of Spain and Portugal,

of Italy,

In Austria the universities, being modelled on the same of _ : ; ; re iall t rthy Austria- system as that of Prussia, present no especially noteworthy 4

features. Vienna is chiefly distinguished for its school of medicine, which enjoyed in the last century a reputation almost unrivalled m Europe. The other faculties were, however, suffered to languish, and throughout the first half of the present century the whole university was in an extremely depressed state. From this condition it was in a great measure restored by the exertions of Count Thun. The number of the matriculated students in 1887 was 4893, and that of the professors 138; among the latter the names of Zschokke, Maassen, Sickel, Jellinek, and Biidinger are some of the most widely known. versity of Olmtitz, founded in 1581, was formerly in pos- session of what is now the imperial library, and contained also a valuable collection of Slavonic works which were carried off by the Swedes and ultimately dispersed. It was suppressed in 1853, and is now represented only by a

Hungary.

Vienna.

The uni- Olmiitz.

theological faculty. The university of Graz, the capital of Graz.

Styria, was founded in 1586, and is now one of the most flourishing centres, containing some 1200 students. university of Salzburg, founded in 1623, was suppressed in

The Salzburg.

1810 ; that of Lemberg, founded in 1784 by the emperor Lemberg.

Joseph IT., was removed in 1805 to Cracow and united to that university. In 1816 it was opened on an inde- pendent basis. In the bombardment of the town in 1848 the university buildings were burnt down, and the site was changed to what was formerly a Jesuit convent. The fine library and natural history museum were at the same time

Czer- nowitz.

Budapest.

Klausen- burg.

Agram,

De- breczin.

Russian univer- sities. Helsing- fors.

Moscow.

Kieff.

Kazan.

Khar- koff.

St Peters- burg. Odessa.

almost entirely destroyed. The university at the present time numbers over a thousand students. The most recent foundation is that of Czernowitz, founded in 1875, and numbering about 300 students. The universities of the Hungarian kingdom are three in number :—Budapest, originally founded at Tyrnau in 1635, now possessing four faculties—theology, jurisprudence, medicine, and philo- sophy (number of professors in 1885 180, students 3117); Kolozsvar (Klausenburg), now the chief Magyar centre, founded in 1872 and also comprising four faculties, but where mathematics and natural science supply the place of theology (number of professors in 1877 64, students 391); Zagrab (Agram), the Slovack university, in Croatia, founded in 1869 but not opened until 1874, with three faculties, viz., jurisprudence, theology, and philosophy. The chief centre of Protestant education is the college at Debreczin, founded in 1531, which in past times was not unfrequently subsidized from England. It now numbers over 2000 students, and possesses a fine library.

Russia possesses, besides Dorpat (supra, p. 845), seven other universities. (1) Helsingfors, in Finland, was origin- ally established by Queen Christina in Abo (1640), and removed in 1826 to Heisingfors, where the original char- ter, signed by the celebrated Oxenstierna, is still preserved. It has four faculties, 38 professors, and 700 students. (2) Moscow is really the oldest Russian university, having been founded in 1755; it includes the faculties of history, physics, jurisprudence, and medicine; the professors are 69 in number, the students about 1660. (3) The uni- versity of St Vladimir at Kieff, originally founded at Vilna in 1803, was removed from thence to Kieff in 1833; the students number about 900, and the library contains 107,000 volumes. (4) Kazan (1804) includes the same faculties as Moscow ; the students are about 450 in num- ber, and it has a library containing 80,000 volumes. (5) Kharkoff (1804) numbers 600 students, and its library 95,000 volumes. (6) St Petersburg (1819) includes the four faculties of history, physics, jurisprudence, and Orien- tal languages, and numbers 1500 students. (7) Odessa, founded in 1865, represents the university of New

Russia. Generally speaking, the universities of Russia are not frequented by the aristocratic classes; they are largely subsidized by the Government, and the annual fees payable by students are less than £7 ahead. In 1863 the statutes of all the universities were remodelled ; and since that time there has been a tendency to impress upon them a more national character, as distinguished from mere imita- tion of those in Germany.

The university of Athens (founded 22d May 1837) is modelled on the university systems of northern Germany, on a plan originally devised by Professor Brandis. It includes four faculties, viz., theology, jurisprudence, medi- cine, and philosophy. The professors (ordinary and extra- ordinary) are upwards of 60 in number, the students about 1500. There is also a school of pharmacy, chemistry, and anatomy, and a library of 130,000 volumes, witli: 800 manuscripts.

The history of the two English universities during the 16th and following centuries has presented, for the most part, features which contrast strongly with those of the Continental seats of learning. Both suffered severely from confiscation of their lands and revenues during the period of the Reformation, but otherwise have generally enjoyed a remarkable immunity from the worst consequences of civil and political strife and actual warfare. Both long remained centres chiefly of theological teaching, but their intimate connexion at once with the state and with the Church of England, as “by law established,” and the modifications introduced into their constitutions, prevented their becoming arenas of fierce polemical contentions like

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those which distracted the Protestant universities of Germany.

The influence of the Renaissance, and the teaching of Influence Erasmus, who resided for some time at both universities, of the exercised a notable effect alike at Oxford and at Renais- Cambridge. The names of Colet, Grocyn, and Linacre illustrate this influence at the former centre ; those of Bishop Fisher, Sir John Cheke, and Sir Thomas Smith at the latter. The labours of Erasmus at Cambridge, ag the author of a new Latin version of the New Testament, with the design of placing in the hands of students a

text free from the errors of the Vulgate, were productive of important effects, and the university became a centre of The Reformation doctrine some years before the Writings of Reforma. Luther became known in England. The foundation of nes at Christ's College (1505) and St John's College (1511), yar through the influence of Fisher with the countess of ° Richmond, also materially aided the general progress of learning at Cambridge. The Royal Injunctions of 1535, embodying the views and designs of Thomas Cromwell, mark the downfall of the old scholastic methods of study at both universities; and the foundation of Trinity College, Cambridge, in 1546 (partly by an amalgamation of two older societies), represents the earliest conception of such an institution in England in complete inde. pendence of Roman Catholic traditions. Trinity (1554) and St John's (1555) at Oxford, on the other hand, founded during the reactionary reign of Mary, serve rather as examples of a transitional period.

In the reign of Elizabeth Cambridge became the centre Puritan of another great movement—that of the earlier Puritanism, 'm4 St John's and Queens' being the strongholds of the party bait led by Cartwright, Walter Travers, and others, Whitaker, the eminent master of St John's, although he sympathized to some extent with these views, strove to keep their expression within limits compatible with conformity to the Church of England. But the movement continued to gather strength; and Emmanuel College, founded in 1584, owed much of its early prosperity to the fact that it was a known school of Puritan doctrine. Most of the Puritans objected to the discipline enforced by the uni- versity and ordinary college statutes—especially the wear- ing of the cap and the surplice and the conferring of degrees in divinity. The Anglican party, headed by such Eliza- men as Whitgift and Bancroft, resorted in defence to eae repressive policy, of which subscription to the Acts of 6 1570, Supremacy and Uniformity, and the Elizabethan statutes of 1570 (investing the "caput" with larger powers, and thereby creating a more oligarchical form of government), were the most notable results. Oxford, although the Puritans were there headed by Leicester, the chancellor, devised at the same time a similar scheme, the rigid dis- cipline of which was further developed in the Laudianor Caroline statutes of 1636. It was under these respective ne codes—the Elizabethan statutes of 1570 and the Laudian ns statutes of 1636—that the two universities were governed until the introduction of the new codes of 1858.

During the Commonwealth the Puritan occupation and adminis tration, at either university, were accompanied by little injury to the colleges, and were far less prejudicial to learn- ing than the Royalist writers of the Restoration would lead us to suppose. William Dell, who was master of Caius College from 1649 to 1660, advocated the formation of schools of higher instruction in the large towns, a proposal which was then looked upon as one of but faintly masked hostility to the older centres. rhe Gatu-

During the 17th century Cambridge became the centre as of another movement, a reflex of the influence of _ the elyteist Cartesian philosophy, which attracted for a time consider movement, able attention. Its leaders, known as the Cambridge

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Platonists, among whom Henry More, Cudworth, and Whichcote were especially conspicuous, were men of high character and great learning, although too much under the influence of an ill-restrained enthusiasm and purely speculative doctrines. The spread of the Baconian philo- sophy, and the example of a succession of eminent scientific thinkers, among whom were Isaac Barrow, master of Trinity (1673-77), the two Lucasian profes. sors, Isaac Newton (prof. 1669-1702) and his successor William Whiston (prof. 1702-11), and Roger Cotes (Plumian prof. 1707-16), began to render the exact sciences more and more an object of study, and the insti- tution of the tripos examinations in the course of the first half of the 18th century established the reputation of Cambridge as a school of mathematical science. At Oxford, where no similar development took place, and where the statutable requirements with respect to study and exercises were suffered to fall into neglect, the de- generacy of the whole community as a school of academic culture is attested by evidence too emphatic to be gain- said. The nioral tone at both universities was at this time singularly low ; and the rise of Methodism, as associated with the names of the two Wesleys and Whitefield at Oxford and that of Berridge at Cambridge, operated with greater effect upon the nation at large than on either of the two centres where it had its origin. With the advance of the present century, however, a perceptible change took place, The labours of Simeon at Cambridge, in

connexion with the Evangelical party, and the far more celebrated movement known as Tractarianism, at Oxford, exercised considerable influence in developing a more thoughtful spirit at either university. At both centres, also, the range of studies was extended: written examinations took the place of the often merely formal viva voce ceremonies; at Cambridge classics were raised in 1824 to the dignity of a new tripos. The number of the students at both universities was largely augmented. Further schemes of improvement were put forward and discussed. And in 1850 it was decided by the Government to appoint com- missioners to inquire what additional reforms might advantageously be introduced. Their recommendations were not all carried into effect, but the main results were as follows :—‘ The professoriate was considerably increased, reorganized, and re-endowed, by means of contributions from colleges. The colleges were emancipated from their medieval statutes, were invested with new constitutions, and acquired new legislative powers. The fellowships were almost universally thrown open to merit, and the effect of this was not merely to provide ample rewards for the highest academical attainments, but to place the governing power within colleges in the hands of able men, likely to promote further improvements. The number and value of scholarships was largely augmented, and many, though not all, of the restrictions upon them were abolished. The great mass of vexatious and obsolete oaths was swept away; and, though candidates for the M.A. degree and persons elected to fellowships were still required to make the old subscriptions and declarations, it was enacted that no religious test should be imposed at matriculation or on taking a bachelor’s degree.”

In 1869 a statute was enacted at Cambridge admitting

| students as members of the university without making it | imperative that they should be entered at any hall or | college, but simply be resident either with their parents or | in duly licensed lodgings.

The entire abolition of tests followed next, After several rejections in parliament it was eventually carried as a Government measure, and passed the House of Lords in 1871.

In 1877 the reports of two new commissions were Reforms followed by further changes, the chief features of which of 1877. were the diversion of a certain proportion of the revenues of the colleges to the uses of the university, especially with a view to the encouragement of studies in natural science ; the enforcement of general and uniform regulations with respect to the salaries, selection, and duties of professors, lecturers, and examiners ; the abolition (with a few excep- tions) of all clerical restrictions on headships or fellow- ships ; and the limitation of fellowships to a uniform amount.

That these successive and fundamental changes have, on Increase the whole, been in unison with the national wishes and in requirements may fairly be inferred from the remarkable numbers. increase in numbers during the last quarter of a century, and especially at Cambridge, where the number of under graduates, which in 1862 was 1526, was in 1887 no less than 2979. In the academic year 1862-63 the number of matriculations was 448, and in 1886-87 1009.

Scarcely less influential, as a means of recovering for Local the two universities a truly national character, has been ¢xamina- the work which both have been carrying on and aiding ¥ons and by the institution of local examinations and of university epee! extension lectures. Of these two schemes, the former was lectures, initiated by both Oxford and Cambridge in the year 1858; the latter had its origin at Cambridge, having been sug- gested by the success attending a course of lectures to women delivered by Mr (now Professor) James Stuart, in 1867, in Liverpool, Manchester, Sheffield, and Leeds. By the former the standard of education throughout the country has been raised, both in public and in private schools. By the latter, instruction of the character and method which characterize university teaching has been brought within the reach of students of all classes and ages throughout the land.

So long ago as the year 1640 an endeavour had been Durham. made to bring about the foundation of a northern uni- versity for the benefit of the counties remote from Oxford and Cambridge. Manchester and York both petitioned to be made the seat of the new centre. Cromwell, however, rejected both petitions, and decided in favour of Durham.

Here he founded the university of Durham (1657), endow- ing it with the sequestered revenues of the dean and chapter of the cathedral, and entitling the society “The Mentor or Provost, Fellows, and Scholars of the College of Durham, of the foundation of Oliver, &ec.” This scheme was cancelled at the Restoration, and not revived until the present century; but on the 4th July 1832 a bill for the foundation of a university at Durham received the royal assent, the dean and chapter being thereby empowered to appropriate an estate at South Shields for the establish- ment and maintenance of a university for the advancement of learning. The foundation was to be directly connected with the cathedral church, the bishop of the diocese being appointed visitor, and the dean and chapter governors ; while the direct control was vested in a warden, a senate, and a convocation. A college, modelled on the plan of those at the older universities, and designated University Col- lege, Durham, was founded in 1837, Bishop Hatfield’s Hall in 1846, and Bishop Cosin’s Hall (which no longer exists) in 1851. The university includes all the faculties, and in 1865 there was added to the faculty of arts a school of physical science, including pure and applied mathematics, chemistry, geology, mining, engineering, &c. In 1871 the corporation of the university, in conjunction with some of the leading landed proprietors in the adjacent counties, gave further extension to this design by the foundation of a college of physical science at Newcastle-upon-Tyne, designed to teach scientific principles in their application to engineering, mining, manufactures, and agriculture.

Univer- sity of London,

King’s College.

Uni- versity College.

Victoria,

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Students who had passed the required examinations were made admissible as associates in physical science of the university. There is also a medical college which stands in similar relations to Durham, of which university

Cod- rington College, Barbados, and Fourah Bay College, Sierra Leone, are likewise affiliated colleges,

The university of London had its origin in a movement initiated in the year 1825 by Thomas Campbell, the poet, in conjunction with Henry (afterwards Lord) Brougham, Mr (afterwards Sir) Jsaac Lyon Goldsmid, Joseph Hume, and some influential Dissenters, most of them connected with the congregation of Dr Cox of Hackney. The scheme was originally suggested by the fact that Dissenters were practically excluded from the older universities ; but the conception, as it took shape, was distinctly non-theological. The first council, appointed December 1825, comprised names representative of nearly all the religious denomin- ations, including (besides those above mentioned) Zachary Macaulay, George Grote, James Mill, William Tooke, Lord Dudley and Ward, Dr Olinthus Gregory, Lord Lans-downe, Lord John Russell, and the duke of Norfolk. On llth February 1826 the deed of settlement was drawn up ; and in the course of the year seven acres, constituting the site of University College, were purchased, the found- ation stone of the new buildings being laid by the duke of Sussex 30th April 1827. The course of instruction was designed to include " languages, mathematics, physics, the mental and the moral sciences, together with the laws of England, history, and political economy, and the various branches of knowledge which are the objects of medical education." In October 1828 the college was opened as the university of London. But in the mean- time a certain section of the supporters of the movement, while satisfied as to the essential soundness of the primary design as a development of national education, entertained considerable scruples as to the propriety of altogether dis- sociating such an institution from the national church. This feeling found expression in the foundation and in-corporation of King's College (14th August 1829), opened Sth October 1831, and designed to combine with the original plan instruction in "the doctrines and duties of Christi- anity, as the same are inculcated by the United Church of England and Ireland." This new phase of the movement was so far successful that in 1836 it was deemed expedient to dissociate the university of London from University College as a " teaching body," and to limit its action simply to the institution of examinations and the conferring of degrees,—the college itself receiving a new charter, and being thenceforth designated as University College, London, while the rival

institution was also incorporated with the university, and was thenceforth known as King's College, London. In the charter now given to the uni- versity it was stated that the king 'deems it to be the duty of his royal office to hold forth to all classes and denominations of his faithful subjects, without any dis- tinction whatsoever, an encouragement for pursuing a regular and liberal course of education." The charters of the university of London and of University College, London, were signed on the same day, 28th November 1836. In 1869 both the colleges gave their adhesion to the move- ment for the higher education of women which had been initiated elsewhere, and in 1880 ladies were for the first time admitted to degrees.

The Victoria University took its origin in the institution known as the Owens College, Manchester,—so called after a wealthy citizen of that name to whom it owed its founda- tion. The college was founded 12th March 1851, for the purpose of affording to students who were unable, on the ground of expense, to resort to Oxford or Cambridge an education of an equally high class with that given at those

centres. The institution was, from the first, unsectarian in character. In July 1877 a memorial was presented to the privy council praying for the grant of a charter to the college, conferring on it the rank of a university, to be called the " university of Manchester." The localization implied in this title having met with opposition from the Yorkshire College at Leeds, it was resolved that the uni- versity should be called the "Victoria University." – Under this name the foundation received its charter 20th April 1880. " The characteristic features of the Victoria Uni- versity, as compared with other British universities, are these :—(a) it does not, like London, confer its degrees on candidates who have passed certain examinations only, but it also requires attendance on prescribed courses of academic study in a college of the university; (0) the constitution of the university contemplates its (ultimately) becoming a federation of colleges; but these colleges will not be situated, like those of Oxford and Cambridge, in one town, but wherever a college of adequate efficiency and stability shall have arisen. University College, Liverpool, and the Yorkshire College, Leeds, having fulfilled these requirements, have become affiliated with the university. The university, like the older bodies in England and Scot- land, is at once a teaching and an examining body, and there is an intimate rapport between

the teaching and the examining functions. To give it a general or national character, the governing body consists partly of persons nominated by the crown and partly of representatives of the governing and teaching bodies of the colleges and of the graduates of the university. External examiners are appointed, who conduct the examinations in conjunetion with examiners representing the teaching body. The grad- uates of the university meet its teachers in convocation to discuss the affairs of the university. Convocation will elect future chancellors, and a certain number of representatives on the court" (Thompson, The Owens College, &c., p. 548). Like the Johns Hopkins University in America, the Vic- toria University has instituted certain fellowships (styled the Berkeley fellowships) for the encouragement of research,

In Scotland the chief change to be noted in connexion Changes with the university of St Andrews is the appropriation in FG 1579 of the two colleges of St Salvator and St Leonard to 5¢ gy the faculty of philosophy, and that of St Mary to theology. Andrews, In 1747 an Act of Parliament was obtained for the union Glasgow, of the two former colleges into one. Glasgow, in the year <—- 1577, received a new charter, and its history from that date down to the Restoration was one of almost continuous progress. The restoration of Episcopacy, however, in volved the alienation of a considerable portion of its revenues, and the consequent suspension of several of its chairs. In 1864 the old university buildings were sold, and, a Government grant having been obtained, together with private subscriptions, the present new buildings were erected from the joint fund. The faculties now recognized at Glasgow are those of arts, theology, jurisprudence, and medicine. At Aberdeen an amalgamation, similar to that at St Andrews, took place, by virtne of the Universities Act of 1858, of the two universities of King's College and Marischal College. In conjunction with Glasgow, this unt versity returns a member to parliament. The peculiar a constitution of the college at Edinburgh, as defined by 1s sty of charter (the government being vested entirely in the lord py… provost, magistrates, and council, as patrons and guardians), purgh. involved the senate in frequent collisions with the towa council. The latter, being a strictly representative body, included elements with which the senate of the university sometimes found it difficult to work harmoniously, and 1s disposition to dictate was strongly resented by the dis- tinguished

metaphysician and professor Sir William Hamilton. On the other hand, the council sometimes

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exercised a beneficial discretion by appointing professors of ability whom the senate might have regarded as ineligible on the ground of their religious tenets. The Disruption of 1843 emancipated the lay professors from subscription to the Established Church of Scotland, and resulted in many of the important changes which were subsequently introduced in the Universities Act of 1858. On the 28th October 1859 the town council, notwithstanding that their powers were already terminated by the provisions of the Act, availed themselves of a technical right to appoint a principal,—their choice falling upon Sir David Brewster. The great landmark in the history of the Scottish as in that of the English universities is represented by the remodel- ling of the several constitutions of these bodies in the year 1858. The commissioners of 1858-62 left the university of Edinburgh in the possession of constitutional autonomy, with its studies and degrees regulated by ordinances. The students also received the rectorial franchise, but were not, as at Glasgow and Aberdeen, divided into nations, In arts the B.A. degree was abolished, the M.A. representing the only degree in this faculty, as at the other Scottish universities. The course of study was divided into three departments :—(1) classics; (2) mathematics, including natural philosophy ; (3) mental science and English liter- ature. In each department it was required that there should be an additional examiner besides the professor, so that the candidates should not be entirely examined by their own teachers. It was also provided that, instead of one examination for the degree at the end of a student’s course, examinations in each of the departments might be passed separately. In the twenty years beginning with 1863, 1400 M.A. degrees have been conferred, as against 250 in the twenty years preceding. In the faculty of medicine, the

original single degree of doctor of medicine gave place to

three classes—bachelor of medicine (M.B.), master in sur- gery (C.M.), and doctor of medicine (M.D.). In 1866 it was further laid down that theses should no longer be de- manded from candidates for the lower degrees of M.B. and C.M., and, on the other hand, that the degree of M.D. should not

be conferred on persons not showing any evidence of medical study after leaving the university, but that a thesis should be invariably required. Since the enactment of these ordinances the number of the medical students has increased from about 500 to over 1700. In the faculty of law the title of the degree was to be LL.B., and it was to be conferred only on those who had already graduated as M.A. But the minor degree, that of “bachelor of law” (B.L.), might be conferred if the candidate had attended one course of lectures in the faculty of arts, and passed a preliminary examination in (1) Latin, (2) Greek, French or German, and (3) any two of the three subjects—logic, moral philosophy, and mathematics. The chair of public law, which had fallen into abeyance in 1832, was recon- stituted, and the chair of universal civil history was con- verted into a professorship of history and constitutional law. ‘The degree of doctor of laws was left, as before, a purely honorary degree. Chairs of Sanskrit, engineering, geology, commercial and political economy, education, fine art, and the Celtic languages have also been founded. By the Representation of the People (Scotland) Act, 1868, the universities of Edinburgh and St Andrews were empowered to return jointly a member to the House of Commons.

A parliamentary return for the ten years ending 30th

Y March 1883 showed that the sums voted annually by

parliament or chargeable on the consolidated fund to the four universities had amounted during that period to £65,821 for Aberdeen, £85,906 for Edinburgh, £66,182 for Glasgow, and £38,111 for St Andrews. In addition to these sums Edinburgh had received £80,000 and Glas- gow £20,000 in the form of special grants in aid:

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Trinity College, Dublin, was founded in 1591, under the auspices of Sir John Perrot, the Irish viceroy. A royal charter nominated a provost and a minimum number of three fellows and three scholars as a body corporate, empowered to establish among themselves “ whatever laws of either of the universities of Cambridge or Oxford they may judge to be apt and suitable ; and especially that no other persons should teach or profess the liberal arts in Ireland without the queen’s special licence.” The first five provosts of

Trinity College were all Cambridge men, and under the influence of Archbishop Loftus, the first provost, and his successors, the foundation received a strongly Puritan bias. Prior to the year 1873 the pro- vostship, fellowships, and foundation scholarships could be held only by members of the Church of Ireland ; but all such restrictions were abolished by Act 36 Vict. c. 2iL, whereby the requirement of subscription to any article or formulary of faith was finally abrogated. As at present constituted, the ordinary government is in the hands of the provost and senior fellows in conjunction with the visitors and council,—the supreme authority being the crown, except so far as limited by Act of Parliament.

The first departure in Ireland from the exclusive system of education formerly represented by the foundation at Dublin, dates from the creation of the Queen's University, incorporated by royal charter 3d September 1850. By this charter the general legislation of the university, together with its government and administration, was vested in the university senate. In 1864 the charter of 1850 was superseded by a supplementary charter, and the university reconstituted "in order to render more complete and satisfactory the courses of education to be followed by students in the colleges "; and finally, in 1880, by virtue of the Act of Parliament known as the University Education (Ireland) Act, 1879, the Queen's University gave place to the Royal University of Ireland, which was practically a reconstitution of the former foundation, the dissolution of the Queen's University being decreed so soon as the newly constituted body should be in a position to confer degrees ; at the same time all graduates of the Queen's University were recognized as graduates of the new university with corresponding degrees, and all matriculated students of the former as entitled to the same status in the latter, The university confers degrees in arts (B.A., M.A, D.Litt.), science, engineering, music, medicine, surgery, obstetrics, and law. The preliminary pass examinations in arts are held at annually selected centres, —those chosen in 1885 being Dublin, Belfast, Carlow, Cork, Galway, Limerick, and Londonderry. All honour examinations and all exam- inations in other faculties are held in Dublin. The Queen's

Trinity College, Dublin,

Queen's Univer- sity.

Royal Univer- sity of Ireland.

Colleges

Colleges at Belfast, Cork, and Galway were founded in 4t Belfast,

December 1845, under an Act of Parliament “to enable Her Majesty to endow new colleges for the advancement of learning in Ireland,” and were subsequently incorporated as colleges of the university. Their professors were at the same time constituted professors in the university, and conducted the examinations. But in the reconstruction of 1880 the chief share in the conduct of the examinations and advising the senate with respect to them was vested in a board of fellows, elected by the senate in equal numbers from the non-denominational colleges and the purely Catholic institutions. The colleges retain, however, their independence, being in no way subject to the control of the university senate except in the regulations with respect to the requirements for degrees and other aca- demic distinctions. On the other hand, the obligation formerly imposed of a preliminary course of study at one or other of the colleges before admission to degrees was abolished at the foundation of the Royal University, the examinations being now open, like those of the university

Cork, and Galway.

Colleges in

St David’s,

Aberyst- with,

South Wales,

North Wales.

Calcutta. Bombay. Madras.

Punjab univer- sity.

Sydney.

of London, to all matriculated students on payment of certain fees.

There is at present no university of Wales, although the bestowal of a royal charter before long is confidently anticipated. The oldest college, that of St David's at Lampeter, possesses the right of conferring degrees. It was founded in 1822 for the purpose of educating clergy- men in the principles of the Established Church of England and Wales, mainly for the supply of the Welsh dioceses. The number of the professors in 1887 was 8, and the number of the students 120. The next college in order of foundation is Aberystwith. It was founded 9th October 1872, but possesses no charter, and is mainly supported by the Dissenting bodies. The staff of professors numbers 13, and the students number 150. The University College of South Wales and Monmouthshire at Cardiff was founded in 1883. The number of professors in 1887 was 9, lecturers 4, demonstrators 2 ; number of students 140, The University College of North Wales at Bangor received its charter 4th June 1885, its object being to " provide instruction in all the branches of a liberal education except theology." Its staff consists of a principal, 8 professors or lecturers, and 2 demonstrators; the number of the students is 127. There is also a hall of residence for women students. At each of these three last-named colleges students proceeding to degrees have to go through either a London, Edinburgh, Glasgow, or Dublin course of study, but at Edinburgh, Glasgow, and Dublin a certain proportion of the term of residence ordinarily required is remitted in their favour.

In India, the three older universities all date from 1857,—that of Calcutta having been incorporated January 24, Bombay July 18, Madras September 5, in that year. At these three universities the instruction is mainly in English. "A university in India is a body for examining candidates for degrees, and for conferring degrees. It has the power of prescribing text-books, standards of instruction, and rules of procedure, but is not an institution for teaching. Its governance and management are vested in a body of fellows, some of whom are ex officio, being the chief European functionaries of the state. The remainder are appointed by the Government, being generally chosen as representative men in respect of emincnt learning, scientific attainment, official position, social status, or personal

worth. Being a mixed body of Europeans and natives, they thus comprise all that is best and wisest in that division of the empire to which the university belongs, and fairly represent most of the phases of thought and philosophic tendencies observable in the country. The fellows in their corporate capacity form the senate. The affairs of the university are conducted by the syndicate, consisting of a limited number of members elected from among the fellows. The faculties comprise arts and philosophy, law, medicine, and civil engineering. A degree in natural and physical science has more recently been added" (Sir R. Temple, India in 1880, p. 145), The Punjab university was incorporated in 1883,—the Punjab University College, prior to that date, having conferred titles only and not degrees, The main object of this universityis the encouragement of the study of the Oriental languages and literature, and the rendering accessible to native students the results of European scientific teaching through the medium of their own vernacular. The Oriental faculty is here the oldest, and the degree of B.O.L. (bachelor of Oriental literature) is given as the result of its examinations. At the Oriental College the instruction is given wholly in the native languages. In 1887 the senate at Cambridge (mainly on the representations of Mr C. P. Ilbert, formerly vice-chancellor of the university of Calcutta) adopted resolutions whereby some forty-nine collegiate institutions already affiliated to the latter body were affiliated to the university of Cam- bridge, their students thus becoming entitled to the remission of one year in the ordinary statutable requirements with respect to residence at Cambridge. It is at these institutions, and the colleges of the first or second grade in the other presidencies, that the instruction is given.

In Australia, the university of Sydney was incorporated by an Act of the colonial legislature which received the royal assent 9th December 1851, and on 27th February 1858 a royal charter was granted conferring on graduates of the university the same rank, style, and precedence as are enjoyed by graduates of universitics within the United Kingdom. Sydney is also one of the institutions

associated with the university of London from which certificates of

having received a due conrse of instruction may be received with

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a view to adinission to degrees. There are four faculties, viz., arts, law, medicine, and science. The design of the university is to supply the means of a liberal education to all orders and dcnomina-tions, without any distinction whatever. An Act for the purpose of facilitating the erection of colleges in connexion with different religious bodies was, however, passed by the legislature during the session of 1884, and since that time colleges representing the) Episcopalian, Presbyterian, and Roman Catholic Churches have been founded. In 1885 the total number of students attendin lectures in the university was 206. The university of Melbourne, Mel-in the colony of Victoria, was incorporated and endowed by royal bourne, Act 22d January 1853. This Act was amended 7th June 1881, Here also no religious tests are imposed on admission to any degree or election to any office. The council is empowered, after due examination, to confer degrees in all the faculties (exceptin divinity) which can be couferred in any ulliversity within the British dominions. It is also authorized to affiliate colleges; and i Trinity College (Church of England) was accordingly founded in 1870 and Ormond College (Presbyterian) in 1879. ‘The founding of a university for Queensland is at the present time in contemplation.

The university of Adelaide in South Australia (founded mainly Adelaide, by the exertions and munificence of Sir Walter Watson Hughes) was incorporated by an Act of the colonial legislature in 1874, in which year it was further endowed by Sir Thomas Elder. In 188} letters patent were granted by the English crown whereby degrees conferred by the university were constituted of equal validity with those of any university of the United Kingdom. The faculties in the university are those of arts, medicine, law, science, and music, The number of matriculations since the foundation amounted in 1886 to 284, the number of undergraduates in that year being 90, The university of New Zealand, founded in 1870, and reconstituted New in 1874 and 1875, is empowered by royal charter to grant the Zealand. several degrees of bachelor and master of arts, and bachelor and doctor in law, medicine, and music. Women are admitted to degrees. To this the Auckland University College, Nelson College, Canterbury College, and the university of Otago stand in the relation of affiliated institutions. This last-named institution was Otago. founded in 1869 by an order of the provincial council, with the power of conferring degrees in arts, medicine, and law, and received as an endowment 100,000 acres of pastoral land. It was opened in 1871 with a staff of three professors, all in the faculty of arts, In

1872 the provincial council further subsidized it by a grant of a second 100,000 acres of land, and the university was now enabled j to make considerable additions to the staff of professors and lecturers, to establish a lectureship in law, and to lay the foundations of a medical school. In 1874 an agreement was made between the university of New Zealand and that of Otago, whereby the functions of the former were restricted to the examination of candidates for matriculation, for scholarships, and for degrees; while the latter bound itself to become affiliated to the university of New Zealand, to hold in abeyance its power of granting degrees, and to waive the claim which it had advanced to a royal charter. As the result of this arrangement, the university of Otago became possessed of 10,000 acres of land which had been set apart for university purposes in the former province of Southland, In 1877 a school of mines was established in connexion with the university, In Canada the M‘Gill College and University at Montreal was Montreal, founded by royal charter in 1821 (amended in 1852) on the foundation of the Honourable James M‘Gill, who died at Montreal 19th December 1813. A number of colleges and schools throughout the province stand in the relation of affiliated institutions, The university is Protestant but undenominational. It includes the

faculties of arts, applied sciences, medicine, and law. In 1885 the ‘ total number of students, including women, was 526. The unl- Toronto. versity of Toronto was originally established by royal charter in 1827, under the title of King’s College, with certain religious restrictions, resembling those at that time in force at the English Universities, but in 1834 these restrictions were abolished, and in 1849 the designation of the university was changed into that of the university of Toronto. In 1873 further amendments were made in the constitution of the university. The chancellor was made elective for a period of three years by convocation, which was at the same time reorganized so as to include all graduates m law, medicine, and surgery, all masters of arts, and bachclors of arts of three years standing, all doctors of science, and bachelors of science of threc years standing. The powers of the senate were also extended to all branches of literature, science, and the arts, to granting certificates of proficiency to women, and to affiliating colleges. The work of instruction is performed by University College, which is maintained out of the endowment of the provincial university, and governed by a council composed of the residents and the professors. Its several chairs include classical literature,

logic and rhetoric, mathematics and natural philosophy, chemistry

and experimental philosophy, history and English lita

mineralogy and geology, metaphysics and ethics, meteorology am

natural history, and lectureships on Oriental literature, German,

and French. Other universities and colleges with power to confer

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degrees are the Victoria University at Cobourg (1836), supported by the Methodist Church of Canada; Queen's University, Kingston (1841), representing the Presbyterian body; and the university of Trinity College, Toronto, founded in 1851 on the suppression of the faculty of divinity in King's College. Lennoxville is a centre for uni- versity instruction in conformity with Church of England principles. In Africa, an Act for the incorporation of the university of the Cape of Good Hope received the royal assent 26th June 1873, the council being empowered to grant degrees in arts, law, and medicine.

In the United States of America university education has received a great extension, without, however, exercising in Europe that reflex influence discernible in so many other relations. The report of the commissioners of education for 1883-84 gives a list of no less than 370 degree-giving universities or colleges ; but of these a large proportion are sectarian, others represent only a single faculty, and nearly nine-tenths have been founded within the last thirty- five years. Although a higher education has unquestion- ably been thus very widely diffused, the undue multiplica- tion of centres has, in some provinces, lowered the standard of attainment and led to a consequent depreciation in the value of university degrees. This tendency it was sought to counteract in the State of Ohio, some twenty-five years ago, by an organization of the different colleges. The in- struction given is, in most cases, almost gratuitous, the charge to each student being less than 30 dollars a year. This cheapening of a higher education is not, however, attended with quite the same results as in Germany (where lads with little aptitude for a professional career are thus attracted to the

professions), the rapidly increasing popula- tion and the wider scope for mechanical or agricultural pursuits probably exercising a beneficial counteracting influence. The distinguishing characteristics which belong to these numerous centres are described by the president of the Johns Hopkins University, in an address delivered at Harvard in 1886, as suggestive of four different classes of colleges,—(1) those which proceed from the original historic colleges, (2) those established in the name of the State, (3) those avowedly ecclesiastical, (4) those founded

by private benefactions. To the first class belong Harvard College and Yale College with their offshoots. Of these

two, the former was founded in 1638 at Cambridge, Mas-

sachusetts, by a former fellow of Emmanuel College at Cambridge in England, and represented the Puritan tenets for which the parent society was at that time noted ; the latter was founded in 1701 by the combined action of a few of the ministers of the State, a charter being given in the same year by the colonial legislature. It was for a long time chiefly supported by the Congregationalists, but 1s now unsectarian. The total number of students at Harvard in 1882 was 988, at Yale 692. The university of Pennsylvania was founded in 1751 by Thomas .Penn and Richard Penn, on the lines of a scheme drawn up by Benjamin Franklin, and was from the first placed on a basis comprising all denominations. It is distinguished by the liberality with which it has opened its courses of instruc- tion to the inhabitants of the city generally ; the degree of Ph.D. is conferred on all comers after due examina- tion. At Haverford and Lafayette Colleges, and also at the Lehigh university, “advanced degrees” are offered “only for higher study, prolonged beyond the collegiate course,” instead of being conferred as a matter of routine after a certain term of years. The Johns Hopkins Uni- versity, also an unsectarian body, was founded at Baltimore in 1867, and is already a school of established reputation, and especially resorted to by those designing to follow the profession of teachers. It is also distinguished by the possession of fellowships, to be held only by students in- tending to pursue some especial line of original research. Other steadily growing centres are Columbia College in New York, founded in 1754; the

Cornell University, also unsectarian, recently enriched by the acquisition of a con- siderable endowment ; Brown’s University in Providence ; and those of Princeton, Michigan, Virginia, and California. At Amherst College, where the number of students in 1882 was 339, the experiment has recently been made of par- tially dispensing with examinations during the course of

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Harvard College.

ale College.

Univer- sity of Pennsyl- vania.

Johns Hopkins Univer- sity.

Amherst College.

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study, where the students give evidence of having made satisfactory progress. Considerable modifications have also taken place in the courses of study, nearly all the colleges having now adopted the system of “ parallel

courses,” and the principle of selection between these. Female education has received in America an extension which it has attained in no other country, and one of the colleges (that of Wel- lesley) numbers several hundred students. Since the war of 1861 a greatly increased attention has been given throughout the universities to physical training and athletic exercises, and excellent gymnasia, constructed on German models, have been erected.

The accompanying table (p. 857), prepared by the council of education for the year 1883-84, shows the distribution of these centres in the different States, together with their numbers, revenues, libraries, and the estimated value of their endowments.

Authorities.—On the earlier history and organization of the medizyal univer- sities, the student should eonsult F. C. von Savigny, Gesch. d. rémischen Rechts im Mittelalter, 7 vols., 1826-51; for the university of Paris, Du Boulay, Historia Universitatis Parisiensis, 6 vols., Paris, 1665, Crevier, Hist, de I Université de Paris, 7 vols., Paris, 1761, and C. Jourdain, Hist. de l’Université de Paris au XVIIme et au XVI Time Siecle, Paris, 1862: of these the work of Du Boulay (Bu- lus) is one of great research and labour, but wanting in critical judgment, while that of Crevier is little more than a readable outline drawn from the former. The views of Du Boulay have been challenged on many Important points by P. H, Denifie in the first volume of his Die Universitdten des Mittelalters bis 1400 (1885), and more particularly on those relating to the organization of the early universi-

ties. The work of Meiners, Gesch. d. Entstehung u. Entwickelung der hohen Schui unsers Erdtheils, 4 vols. (1802-5), must be regarded as almost superseded oo seneral history, and the same may be said of Hnber’s work on the English universities, Die englischen Universitdten (Cassel, 1839-40), translated by Fw Newman, 3 vols. (1845). Much uscful criticism on both the English anq the Continental universities will be found in Sir W. Hamilton’s Discussions, &e, 1853 For the German universities, the works of Zarneke, Die deutschen Universitéten im Mittelalter (Leipsic, 1857), and

Paulsen, Gesch, d. gelehrten Unterrichts auf den deutschen Schulen und Universitdten (Leipsie, 1885), will be found the most trust- worthy,—the former for the medieval, the latter for the modern period. Tothese may be added two articles by Paulsen in vol. xlv. of Von Sybel's Mistorische Zeit-schrift :—(1) * Griindung " and (2) Organisation u. Lebensordnungen d. deutschen Universititen im Mittelalter"; Tholuck, Das akademische Leben des 17 Jahrhun. derts, 2 vols, (Halle, 1853-54); Von Raumer, Gesch. d. Padagogth, vol. iv. (4th ed. 1872); Dolch, Gesch. d. deutschen Studententhums (1858); Sybel, Die deutschen Universitdten (2d ed., 1874); and Dr J. Conrad, Zhe German Universities for the last Fifty Years, translated by Hutehinson, with preface by James Bryce, M.P. (Glasgow, 1885), For Oxford, there are the laborious colleetions by Anthony Wood,—History and Antiquities of the University and of the Colleges and Hails of Oxford, edited with continuation by Rev. J. Guteh, 5 vols, (1786-96), and Atheng and Fasti Oxonienses, edited by Dr P. Bliss, 4 vols. (1813-20); also the publications of the Oxford Historical Soclety; A Jistory of the Oniversity of Oxford from the Earliest Times to 1530,by H. C, Maxwell Lyte (1886); and Statutes ofthe University of Oxford compiled in 1636 under Authority of Archbishop Laud, ed. Griffiths (Oxford, 1888). For Cambridge, the researches of C. H. Cooper, sreatly surpassing those of Wood in thoroughness and impartiality, are comprised in three series. (1) Annals of Cambridge, 4 vols, (1842-52); (2) Athenx Cantabrigien ses, 1500-1609 2 vols. (1858-61); (8) Memorials of Cambridge, 3 vols. (new ed., 1884). The Archi. tectural Mistory of the University of Cambridge and of the Colleges, by the late Robert Willis, edited and continued by J. Willis Clark, 4 vols. (1886), is a work of admirable thoroughness and completeness. To these may be added Cambridge in the Seventeenth Century; Lives of Nicholas Ferrar and Matthew Robinson, by Prof. John E. B. Mayor, 2 vols. (1855, 1856); and Baker's J/istory of the College of St John the Evangelist, Cambridge, edited by Mayor, 2 vols, (1869); also J, B, Mullinger, History of the University of Cambridge from the Earltest Times to Accession of Charles J,, 2 vols. (1873-85). For both universities see the Documents issued by the Oxford and Cambridge Commissions of 1858; also the Wood, Hearne, Tanner, and Rawlinson MSS., and the Cottonian, Harleian, Lansdowne (espe-

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UNTERWALDEN is one of the Forest cantons of Switzerland, ranking as sixth in the Confederation. It is composed of two valleys through which run two streams both called the Aa, and which are called Obwald and Nidwald from their position with regard to the great forest of the Kernwald in which they are situated. In old documents the inhabitants are always described as “homines intramontani,” whether “ vallis superioris ” (Obwald) or “vallis inferioris ” (Nidwald). The total area of Obwald is 183-3 square miles, 154°2 of which are classed as productive (forests 37-6), while of the remainder 3°8 are covered by glaciers and 4°3 by lakes. The area of Nidwald is 112-1 square miles, 841 being productive (forests 27°7) ; of the

rest the cantonal bit of the Lake of Lucerne covers 12-8. The highest point in the canton is the Titlis (10,627 feet) in Obwald.

The census of 1880 returned the population of Obwald as 15,356, an increase of 941 on 1870, and that of Nidwald as 11,992, an increase of 291. In both the women have a small majority over the men. The native tongue of practically the whole population is German (15,254 in Obwald, 11,869 in Nidwald), and they are nearly all Roman Catholics (15,078 in Obwald, 11,901 in

Nidwald). Till 1814 the canton was in the diocese of Constance ; since that time it has (like Uri) formed legally part of no diocese, though it is provisionally administered by the bishop of Chur. The capital of Obwald is Sarnen (4039 inhabitants), Kerns (2500) being the only other place which is more than a village; that of Nidwald is Stanz (2210). The population is purely agricultural and pastoral. In Obwald the forests are remarkable, im Nidwald the fiery energy of the inhabitants. In educa- tional matters the standard is not very high, but is being gradually raised. At the head of the Nidwald valley (but legally in Obwald) stands the great Benedictine monastery of Engelberg, founded in 1121. There are no railways, but one is being made from Lucerne through Obwald over the Briinig Pass to Meyringen in Bern.

Historically Obwald was part of the Aargau, and Nidwald of the Ziirichgau. In both there were many great landowners (speci: ally the abbey of Murbach and the Hapsburgs) and few free men : while the fact that the Hapsburgs were counts of the Aargau an the Ziirichgau further delayed the development of political freedom. Both took part in the risings of 1245-47, and in 1248 Sarnen ye threatened by the pope with excommunication for opposing 1! hereditary lord, the count of Hapsburg. The alleged cruelties a mitted by the Hapsburgs do not, however, appear in history 0

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] official members being chosen every year, the ordinary every 4 or 3 j years respectively. The existing constitution of Obwald is that of | 1867 ; that of Nidwald is dated 1850, and was amended in 1877-78.

} lands” are still in the hands of the old guilds, and ‘‘ gemeinden ” j consist of natives, not merely residents, though in Obwald these

| contribute to the expenses of the new “political communes ” of | residents, while in Nidwald the latter have to raise special taxes.

| only half the share of those who are married.

jthe N. and E. by the Nile, on the W. by the Albert

ae =

Justinger’s Chronicle, 1420 (see TELL). On April 16, 1291, Rudolph the future emperor bought from Murbach all its estates in Unter- walden and thus ruled this district as the chief landowner, as count, and as emperor. On Ist August 1291 Nidwald formed the ‘ Eyer- lasting League” with Uri and Schwyz (this being the first known case in which its common seal is used), Obwald joining a little later on. In 1304 the two valleys were joined together under the same imperial bailiff, and in 1809 Henry VII. confirmed to them all the liberties granted by his predecessor—though none are known to have been granted. However, this placed Unterwalden on an equal political footing-with Uri and Schwyz; and as such it took part in Morgarten fight (also driving back an invasion over the Briinig Pass) and in the renewal of the Everlasting League at Brunnen (1315), as well as at Sempach (1386), and in driving back the Gugler or English freebooters (1875). For physical reasons, it was difficult for Unterwalden to enlarge its territories, Yet in 1368 it acquired Alpnach, and in 1378 Hergiswyl. So too Obwald shared with Uri in the conquest of the Val Leventina (1403), and in the purchase of Bellinzona (1419), as well as in the loss of both (1426). It was Nidwald that, with Schwyz and Uri, finally won (1500) and ruled (till 1798) Bellinzona, Riviera, and Val Blegno; while both shared in conquests of Aargau (1415), Thurgau (1460), and Locarno, &c. (1512), and in the temporary occupation of the Val d’Ossola (1410-14 to 1417-22). In the Burgundian war Unter- walden, like the other Forest cantons, long hung back through jealousy of Bern, but came to the rescue in time of need. In 1481 it was at Stanz that the Confederates nearly broke up the League for various reasons, and it was only by the intervention then of the holy hermit Nicholas von der Fliie (of Sachseln in Obwald) that peace was restored, and

the great federal agreement known as the compact of Stanz concluded. Like the other Forest cantons, Unterwalden clung to the old faith at the time of the Reformation, being a member of the ‘‘Christliche Vereinigung” (1529) and of the Golden League (1586).

In 1798 Unterwalden resisted the Helvetic republic, but, having formed part of the short-lived Tellgau, became a district of the eanton of the Waldstitten. Obwald submitted at an early date, but Nidwald, refusing to accept the oath of fidelity to the con- stitution mainly on religious grounds, rose in desperate revolt (September 1798), and was only put down by the arrival of 15,000 armed men and by the storming of Stanz. In 1803 its independ- ence as a canton was restored, but in 1815 Nidwald refused to accept the new constitution, and federal troops had to be employed to- put down its resistance, the punishment inflicted being the transfer to Obwald of the jurisdiction over the abbey lands of Engelberg (since 1421 ‘* protected ” by both valleys), which in 1798 had fallen to the lot of Nidwald. Since that time the history of Untcrwalden has been like that of the other Forest cantons. It was amember of the ‘‘ League of Sarnen”’ (1832), to oppose the re- forming wishes of other cantons, and of the ‘‘Sonderbund ” (1843) ; it was defcated in the war of 1847 ; and it voted against the acceptance of the federal constitution both in 1848 and in 1874, It forms at present two half cantons, each sending one representative to the federal ‘‘assembly of states.” In local matters the two valleys are independent. In each the supreme authority is the “landsgemeinde” (meeting on the last Sunday in April), composed of all male citizens of twenty (Obwald) or eighteen (Nid- wald) years of age, while the cantonal council, which drafts measures and sanctions the expenditure of sums below certain fixed small amounts, is composed in Obwald of 80 members (including the executive council) elected by the people for 4 years, and in Nidwald of 48 (besides the executive council) chosen in the same way for 6 years. The exccutive council is in both cases elected by the ‘* lands- emeinde”; in Obwald it consists of 3 officials and 4 ordinary mem- od and in Nidwald of 6 officials and 5 ordinary members, —the

It is very remarkable that in both valleys the old “common

In Engelberg (which still retains some independence) the poor are greatly favoured in the division of the common lands and their proceeds, and uninarried persons (or widowers and widows) receive

See J. Businger, Die Geschichten des Volkes von Unterwalden, 2 vols., 1827-28,

UNYORO, a kingdom of Central Africa, bounded on

Nyanza, and on the S.E. by the kingdom of Uganda. Its area is about 1600 square miles. The country is very fertile, well-watered, and thickly wooded; for the most part itis hilly in character, especially on the borders of | the Albert Lake and in the neighbourhood of Massindiand |

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Kiroto, where the mountains have an altitude of from 5000 to 6000 feet.. The population is about 1,500,000. The Wanyoro are of a dark reddish-brown colour, and are fully clothed, but are not so fine in physique, nor so high in intellectual development as their neighbours the Waganda, to whom, however, they appear to be very nearly related. The reigning family in Unyoro belongs to the Wahuma tribe, and is probably the oldest reigning Wahuma family in this part of Africa, The country is governed on the feudal system. Numerous tribes to the east and north of the Nile, and also on the western side of the Albert Nyanza, pay a small tribute to the Wanyoro. The latter possess large herds of cattle, and are very good herdsmen. The land, too, is cultivated to a considerable extent,—bananas, sweet potatoes, and dhurra being grown in large quantities. Coffee and tobacco are cultivated to a small extent. The people are very superstitious, and the numerous medicine men and women reap a rich harvest from their credulity. The Wanyoro huts are dome-shaped, small, and extremely filthy and full of vermin, although the people themselves are cleanly. Polygamy is universal, even the poorest man possessing two or three wives, Not- withstanding this, the people are fairly moral; but Unyoro is remarkable amongst Central African tribes for the exist- ence of a definite class of courtesans. The Wanyoro are moderately skilful workmen, and their iron-work, pottery, and wood-work are both neat and tasteful. The only article they export is salt,

which is obtained in considerable quantities at Kibiro on the shores of Lake Albert.

See Baker's Albert Nyanza, Felkin and Wilson's Uganda and the Egyptian Soudan, and various papers in Petermann's Mitthetl- wngen by Emin Pasha.

UPANISHADS. See Sansxnrit, vol. xxi. p. 280, and BRAHMANISM.

UPAS, a Javanese word meaning poison, and specially applied by the Malays and people of western Java to the poison derived from the gum of the anchar tree (Antiaris toxicaria), one of the Artocarpex, which was commonly used in Celebes to envenom the bamboo darts of the natives. The name of the upas tree has become famous from the mendacious account (professedly by one Foersch, who was a surgeon at Samarang in 1773) published in the London Magazine, December 1783, and popularized by Erasmus Darwin in " Loves of the Plants" (Botanic Garden, pt. ii.). The tree was said to destroy all animal life within a radius of 15 miles or more. The poison was fetched by condemned malefactors, of whom scarcely two out of twenty returned. All this is pure fable, and in good part not even traditional fable, but mere invention.

For a scientific account of the Antiauris, see Horsfield's Plantz Javaniee Lartores (1838-52) and Blume's Rwmphia (Brussels, 1836), and for the legend Yule, Anglo-Indian Glossary, p. 726 sq.

UPPER SIND FRONTIER, a district of British India, forming the northernmost portion of the province of Sind, in the Bombay presidency. It comprises an area of 2139 square miles, and lies between 27° 56' and 28° 27' N. lat. and between 68° and 69° 44' E. long. It is bounded on the N. and W. by the Derajat districts of the Punjab and the territory of Khelat, on the S. by Shikarpur district, and on the E. by the Indus. In the north-east the country is hilly; the remainder consists of a narrow strip of level plain, one half being covered with jungle and subject to inundation, from which it is protected by artificial embankments. The land is watered by canals from the Indus, of which the chief is the Begari (85 miles in length), navigable throughout by large boats, and the Desert Canal, which irrigates the country west of Kashmor,

The district contains several thriving timber plantations.

The wild animals comprise an occasional tiger and hyenas ;

wild hogs and jackals abound ; foxes are occasionally met

with ; and antelopes, hog-deer, and a species of sdémbhar deer are found in the dense jungle tracts adjoining the Indus. The climate is remarkable for its dryness and for its extraordinary variations of temperature. The average annual rainfall at Jacobabad is less than 5 inches. There are numerous roads of all descriptions, and the Frontier Military Railway from Sukkur wa Jacobabad to Sibi crosses the district.

The census of 1881 returned the population as 124,181 (males 70,166, females 54,015), —Hindus numbering 9894, Mohammedans 109,183, and Christians 230. The chief town is Jacobabad, with a population of 7365. In 1885-86 the cultivated area was esti- mated at 361,415 acres, of which 137,149 were cropped, and of these again 8163 were cropped more than once. The principal crops are wheat, joar, bajra, rice, barley, mustard-seed, and a little cotton and gram. Salt, lacquered work, leathern jars, embroidered shoes, woollen carpets, and saddle-bags are the principal manu- factures. The internal trade is principally in grain, the greater part of which is sent to the Punjab, and the transit trade from Central Asia into Sind crosses the district, bringing wool and woollen goods, fruits, carpets, and horses.

UPSALA, a city of Sweden, the seat of its oldest university and residence of the archbishop of Sweden, is situated on the small river Fyris, 42 miles north of Stock- holm. In spite of its position in a vast and fertile plain, Upsala was a rather insignificant little town till the open- ing of railway communication in 1866. The population, which in 1840 was only 5100, had at the end of 1885 increased to more than 20,000 (with students, scholars, and others, 23,000). The industries of the place are still unimportant, but its trade by sea (navigation being open for six or seven months of the year) and by rail is some- what livelier. Upsala owes its fame to its university, which was founded in 1477. In 1624 Gustavus Adolphus endowed it with 300

farms, the revenue of which formed its entire income for more than two hundred years. Parliament now contributes nearly the half of its whole revenue (393,300 crowns, or about £21,800, in 1885). The professors numbered 58 in 1887, with 61 “docents ” and assistant teachers, and there were 1928 students. The last-named are divided into 13 “nations” (based on the old ecclesiastical division of the country), almost every one of which possesses a house of its own, with a hall, reading- rooms, and library. About £7200 is distributed yearly in ‘‘stipendia” or scholarships. The new university house, above the cathedral, on the site of the former archbishop’s castle, is in the Renaissance style, and was built in 1879-87. It has a great hall capable of holding 2000 persons, eleven lecture-rooms, &. The vestibule, lighted from above by three large cupolas, and surrounded by open galleries, is particularly fine. The library building (called Carolina Rediviva, in remembrance of the Carolina which formerly existed near the cathedral) was erected in 1819-41, The library, which has a right to a copy of every book printed in Sweden, at present (1887) contains 250,000 volumes and 11,000 MSS., among which is the famous Codex Argenteus of Ulfilas’s translation of the Gospels. The “ Gustavianum,” built by order of Gustavus Adolphus for a university house, is now wholly occupied by the zoological institution. The botanical garden (which

formerly belonged to the castle) was presented by Gustavus IIT. to the university in 1787,—the former garden (in the northern part of the city), where Rudbeck and Linnaeus worked, and where the residence of the latter is still to be seen, having been found too small and inconvenient, The medical faculty possesses a hospital and anatomical, chemical, and pathologico-physiological institutions ; and about a mile from the town there is a magnificent lunatic asylum. The astronomical and meteorological institu. tions, as well as those of chemistry and physics, have also special buildings, all of recent date. The Royal Society of Sciences, established in 1710 by Eric Benzelius, the younger, occupies a house of its own, and has a valuable library. Of the buildings the cathedral, founded in the latter part of the 13th century and completed in 1435, is the most remarkable. The material is brick, but the proportions are uncommonly noble and harmonious ; the length is 390 feet, and the height inside 88. It has suffered

considerably from repeated fires, but since 1886 an extensive restoration has been going on. The castle, on the summit of a long ridge above the town, was founded in 1548 by Gustavus I., but not finished till a century later, when it was often used as a royal residence. It was destroyed by fire in 1702, and for more than forty years remained a ruin. At present only a small part of it is habitable, and that part is chiefly used by the provincial government, and as a residence of the governor. Apart from the cathedral and a few insignificant houses, there are no remains from the medizeval period, the city formerly having consisted almost entirely of wooden houses.

The name of Upsala originally belonged to a place nearly 2 miles to the north of the present city, which is still called Old Upsala, This Upsala, mentioned as early as the 9th century, was famous throughout Scandinavia for its splendid heathen temple, which, gleaming with gold, made it the centre of Svithiod, then divided into a great number of kingdoms ; three huge grave mounds or barrows still commemorate old times. In the same place the first cathedral of the bishops of Upsala was also erected (about 1100). On the destruction of this building by fire, the inconvenient situation caused the removal in 1273 of the archiepiscopal see to the present city, then called Ostra Aros,! but within a comparatively short time it came to be generally called Upsala. During the Middle Ages the cathedral and the see of the archbishop made Upsala a kind of ecclesiastical capital. There the kings were crowned, after the election had taken place at the Mora stones, 10 miles south-east of Upsala. As early as the 14th century, however, Stockholm became the proper residence of the king. To 1567 Erik XIV. murdered in the castle five of the most eminent men of the kingdom, three of them belonging to the family of Sture. In 1593 was held the great synod which marks the final victory of Protestantism in Sweden ; in the same year the university was restored by Charles IX. In the castle Christina, daughter of Gustavus Adolphus, resigned her crown to Charles X. in 1654. Tn 1702 nearly the whole city, with the castle and the cathedral, was burnt down. Among the teachers of the university who have carried its name beyond the boundaries of their own country, the following (besides Linnaeus) deserve to be mentioned -—Olof Rudbeck the elder, the author of the Atlantica (1630-1702) ; Torbern Bergman (1735-1784), the celebrated chemist ; and Erik Gustaf Geijer (1783-1847), the historian.

1The name first occurs in Snorro Sturluson in connexion with the events of the year 1018 ; it signifies ‘‘ the mouth of the eastern river.”’

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VOLUME XXIV

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BRITANNICA.

URAL-ALTAIC LANGUAGES

RAL-ALTAIC LANGUAGES. The Ural-Altaic, Finno-Tatar, or “Turanian” languages constitute one

of the primary linguistic families (see PHILoLocy, vol. xviii. p. 779) of the eastern hemisphere, occupying a vast domain, which extends with few interruptions from the Balkan Peninsula, Hungary, and Lapland eastwards to the Pacific Ocean, and from the Arctic Ocean southwards to China proper, Tibet, and the Mediterranean. It thus comprises nearly the whole of Asiatic and a considerable section of European Russia, the northern half of the Chinese empire, a large part of north Persia, by far the greater part of Asia Minor, and extensive tracts in European Turkey, Austria, and Scandinavia, with an area of not less than 10,000,000 square miles and a total population of over 40,000,000. Philologists recognize six well – marked branches, which, with their main subdivisions and four outlying doubtful or extinct members of the family, may be tabulated as under :— {2 wrak and Yeniset, White Sea to the Yenisei. { zen between lower Yenisei and Khatanga rivers. Kamasin, upper Yenisei. — Finland, parts of Norway, Lakes Onega and

Lad oga. Lapp, ese and Scandinavian Lapland. Esthonian and Livonian, south side of Gulf of Finland. Mordvinian and Tcheremissian, middle Volga. Permian, Votyak, and Siryenian, between the Vyatka

and Petchora rivers. { Ostiak, middle and upper Obi and its eastern affluents.

SAMOYEDIC.

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Uaric. Vogul, east slopes of the Ural Mountains.

Magyar, central and south-eastern Hungary.

Uigur or Hast Turki, including Uigur proper of Kashgar, Kulja, and Yarkand ; Jagatat of Bokhara, Ferghana, Khiva; Kara- -Kalpak, south-

eastern side of Aral Sea ; Turkoman (Turkmenian), west Turk- estan, nor th Persia, and Asia Minor.

Seljuk or West Turki or Osmanli, Asia Minor and the Balkan Peninsula ; Tchuvash, south-west of Kazan and about Simbirsk.

Kipchak (Kapchak): Coman, extinct, formerly current throughout the Kipchak empire from the Altai Mountains to the Black Sea; Kazan Tatar, middle Volga; Kirghiz, West Siberian steppes, lower Volga, the Pamir, and west slopes of the Altai, Thian – Shan, and Kuen-Lun Mountains ; Nogai with Kumuk, Bessarabia, Crimea, Volga delta, Daghestan, Terek valley.

Yakut, middle and lower Lena and northern slopes of the Sayan Mountains.

Tei {

Siberian Tatar: Teleut, Koibal, Soyot, Kotta, Bash-

a kir, Mescheryak, and “other corrupt Turki dialects caging spoken by Tatarized Finn populations from the

Altai to the Urals. Sharra or East Mongolian, Mongolia; Kalmuck, Vv. Dzungaria and lower Volga, thence to lower Don ; Moncotic. Buriat or Siberian Mongolian, east and west of Lake Baikal.-

VI Tungus proper, from the middle Yenisei to the TuNGust0 Pacific ; Lamut, westeru coast of the sea of Okhotsk ; : Manchu, Manchuria. VII. JAPANESE, Japan and Riu-Kiu (Lew-Chew) Islands ; doubtful. VIII. CornAN, Corea; doubtful.

IX. and X. Accap and Erruscan; both doubtful and extinct. In its morphology Ural-Altaic belongs to the agglutinat- ing order of speech, differing from other languages of this order chiefly in the exclusive use of suffixes attached to the unmodified root, and partly blended with it by the principle of progressive vowel harmony, in virtue of which the vowels of all the suffixes are assimilated to that of the root. Thus the typical formula is R+R+R+R, &e.,, where R is the root, always placed first, and R, R, R… the successive postfixed relational elements, whose vowels conform by certain

subtle laws of euphony to that of the root, which never changes. These suffixes differ also from the case and verbal endings of true inflecting languages (Aryan, Semitic) in their slighter fusion with the root, with which they are rather mechanically united (agglutin- ated) than chemically fused into a term in which root and relational element are no longer separable. Hence it is that the roots, which in Aryan are generally obscured, blurred, often even changed past the possibility of identi- fication, in Ural-Altaic are always in evidence, unaffected by the addition of any number of formative particles, and controlling the whole formation of the word. For ee the infinitive element mak of the Osmanli yazmak= write becomes mek in sev-mek=to love (vowel ae, and shifts its place in sev-cl-mek=to be loved (imperfect fusion with the root), while the root itself remains un- changed as to form and position in sev-csh-il-mek=to be impelled to love, or in any other possible combination with suffixed elements," The facility with which particles are in this way tacked on produces an exuberance, especially of verbal forms, which in Osmanli, Finnish, Magyar, Tungus, and Mordvinian may be said to run riot. This

is particularly the case when the numerous modal forms become further complicated by incorporating the direct pronominal object, as in the Magyar varjak=they await him, and the Mordvinian palasa=I embrace him. Thus arise endless verbal combinations, reckoned in Turki at nearly 30,000, and past counting in the Ugrian group.

Another marked peculiarity of the Ural-Altaic, at least as compared with the inflecting orders of speech, is weak subjectivity, the subject or agent being slightly, the object of the action strongly accentuated, so that "it was done by him" becomes "it was done with him, through him, or in his place" (apud eum). From this feature, which seems to be characteristic of all the branches, there follow some important consequences, such as a great pre-ponderance of locative forms in the declension,—the nomi- native, and often even the possessive, being expressed by no special suffix. Hence also the object normally precedes the subject, while the idea of possession (to have) is almost everywhere replaced by that of being (to be), so that, even

in the highly developed Osmanli, “I have no money” becomes ‘“‘money-to-me not-is” (Akchehim yok- dir). In fact the verb is not clearly differentiated from the noun, so that the conjugation is mainly participial, being effected by agglutinating pronominal, modal, tem- poral, negative, passive, causative, reciprocal, reflexive, and other suffixes to nominal roots or gerunds: I write = writing-to-me-is. Owing to this confusion of noun and verb, the same suffixes are readily attached indifferently to both, as in the Osmanli jén =soul, jén-ler = souls, and ydzdr = he will write, ydedr-ler = they will write. So also, by assimilation, the Yakut hotérdér katollér =the birds fly (from root £é¢= flying), where Aétél stands for kotor, and dor for lér, the Osmanli ler, or suffix of plurality.

But, notwithstanding this wealth of nominal or verbal forms, there is a great dearth of general relational elements, such as the relative pronoun, grammatical gender, degrees of comparison, conjunctions, and even postpositions. Byrne’s remark, made in reference to Tungus, that “there is a great scarcity of elements of relation, very few con- junctions, and no true postpositions, except those which are given in the declension of the noun,”! is mainly true of the whole family, in which nouns constantly do duty for formative suffixes. Thus nearly all the Ostiak post- positions are nouns which take the possessive suffix and govern other nouns in the genitive, precisely as in the Hindi: Gdmi-hitérdf (men) gaya =man-of-direction (in) I went=I went towards the man, where the so-called postposition ¢dérdf, being a feminine noun = direction, requires the preceding possessive particle to be also feminine (7 for ke),

As there are thus only two classes of words,—the roots, which always remain roots, and the suffixes, which always remain suffixes,—it follows that there can be no true com- position or word-building, but only derivation. Even the numerous Magyar nominal and adjectival compounds are not true compounds, but merely two words in juxta- position, unconnected by vowel harmony and liable to be separated in construction by intervening particles. Thus in aran-sinit = gold-colour = golden, the first part aran receives the particle of comparison, the second remaining unchanged, as if we were to say “gold-er-colour” for “more golden”; and ata/i=relative becomes ata-mfi-a =my relative, with intrusion of the pronominal m =my.

But, while these salient features are common, or nearly common, to all, it is not to be supposed that the various groups otherwise present any very close uniformity of structure or vocabulary. Excluding the doubtful members, the relationship between the several branches is far less intimate than between the various divisions of the Semitic

‘ Gen, Prin. of Struct. of Lang., i. p. 891, London, 1885.

and even of the Aryan family, so that, great as is, for instance, the gap between English and Sanskrit, that be- tween Lapp and Manchu is still greater.

After the labours of Castrén, Csink, Gabelentz, Schmidt, Boht- lingk, Zenker, Almqvist, Radloff, Munkaesi-Berat, and especialh Winkler, their genetic affinity can no longer be seriously doubted. But the order of their genetic descent from a presumed common organic Ural-Altaic language is a question presenting even greater difficulties than the analogous Aryan pe The reason is, not only because these groups are spread over a far wider range, but because the dispersion from a common centre took place at a time when the organic speech was still in a very low state of development. Hence the various groups, starting with little more than a common first germ, sufficient, however, to give a uniform direction to their subsequent evolution, have largely diverged from each other during their independent development since the remotest prehistoric times, Hehce also, while the Aryan as now known to us Tepresents a, descending line of evolution from the synthetic to the analytic state, the Ural-Altaic represents on the contrary an upward growth, ranging from the crudest syntactical arrangements in Manchu to a highly agglutinating but not true inflecting state in Finnish.? No doubt ateaeht also, like its congeners, had formerly possessive affixes and personal elements, lost er) through Chinese influ- ences ; but it can never have possessed the surprisingly rich and even superabundant relational forms so characteristic of Magyar, Finn, Osmanli, and other western branches. As regards the mutual relations of all the groups, little more can now be said than that they fall naturally into two main divisions—Mongolo-Turkic and Finno-Ugro-Samoyedo-Tungusic—according to the several methods of employing the auxiliary elements. Certainly Turkic lies much closer to Mongolic than it does to Samoyedic and Tungusic, while

Finno-Ugric seems to occupy an intermediate position between Turkic and Samoyedic, agreeing chiefly in its roots with the former, in its suffixes with the latter. Finno-Ugric must have separated much earlier, Mongolic much later, from the common connexion, and the latter, which has still more than half its roots and numer- ous forms in common with Turkic, appears on the whole to be the most typical member of the family. Hence many Turkic forms and words can be explained only by reference to Mongolic, which has at the same time numerous relations to Finno-Ugric and Samoyedic that have been lost in Turkic and Tungusic. It may therefore be concluded that the Finno-Ugric migrations to the north and west and the Tungusic to the east had been completed while the Turkic and Mongolic tribes were still dwelling side by side on the Altai steppes, the probable cradle of the Ural-Altaic peoples.

How profoundly the several groups differ one from the other even in their structure is evident from the fact that such assumed universal features as unchangeable roots and vowel harmony are subject to numerous exceptions, often spread over wide areas. Not only is assimilation of final consonants very common, as in the Osmanli bulun-mak for the Uigur bulul-mak, but the root vowel itself is frequently subject to wmlaut through the influence of suffixed vowels, as in the Aryan family. Thus in the Surgut dialect of Ostiak the long vowels of nominal stems become modified before the possessive suffix, @ and 2 to% and 6 to % (Castrén). It is still more remarkable to find that the eastern (Yenisei) Ostiak has even developed verbal forms analogous to the Teutonic strong conjugation, the presents tabag’, abbatag’an, and datpag’ becoming in the past tobaq’, abbatog‘an, and datpiyag’ respectively ; so also taig, torg, and targ, present, past, and imperative, are highly sug- gestive of Teutonic inflexion, but more probably are due to Tibetan influences, In the same dialects many nouns form their plurals either by modifying the root vowel, in combination with a suffixed element, or by modification alone, the suffix having disappeared, as in the English foot—feet, goose—geese. So also vowel harmony, highly developed in Finnish, Magyar, and Osmanli, and of which two distinct forms occur in Yakutic, scarcely exists at all in Tchere- missian, Votyak, and the Revel dialect of Esthonian, while in Mord- vinian and Siryenian, not the whole word, but the final vowels alone are harmonized. The unassimilated Uiguric dilur-tm answers to the Osmanli kilwr-um, while in

Manchu the concordance is neglected, especially when two consonants intervene between the root and the suffixed yowels. But too much weight should not be attached to the phenomenon of vowel harmony, which is of com- paratively recent origin, as shown in the oldest Magyar texts of the 12th century, which abound in such discordances as haldl-nek,

2 “ Meine Ansichten werden sich im Fortgange ergeben, so namentlich dass ich nicht entfernt die finnischen Sprachen fiir flexivische halten kann” (H. Winkler, Uralaliaische Volker, i. p. 54). Yet even true inflexion can scarcely be denied at least to some of the so-called Yenisei Ostiak dialects, such as Kotta and others still surviving about the middle Yenisei and on its affluents, the Agul and Kan (Castrén, Yen., Osijak., und Kott. Sprachlehre, 1858, Preface, pp. v-viii). These, how- ever, may be regarded as aberrant members of the family, and on the whole it is true that the Ural-Altaic system nowhere quite reaches the stage of true inflexion.

tiseta-seg, for the modern haldl-nak, tiszta-sag. It clearly did not exist in the organic Ural-Altaic speech, but was independently developed by the different branches on different lines after the dispersion, its origin being due to the natural tendency to merge root and suffix in one harmonious whole. The principle being thus of a purely psychological character, and necessarily an after- growth, it is not surprising to find no traces of it in the oldest and even in the later Accad texts, as seen by comparing the old tdi bar-mun-sib with the more recent t97 mun-sib-bar.

This progressive vocalic harmony has been compared to a sort of progressive wmlaut, in which the suffixed vowels are brought by assimilation into harmony with those of the root. All vowels are broadly divided into two categories, the guttural or hard and the palatal or weak, the principle requiring that, if the root vowel be hard, the suffixed must also be hard, and vice versa. But in some of the groups there is an intermediate class of ‘‘ neutral” vowels, which do not require to be harmonized, being indifferent to either category. In accordance with these general principles the vowels

in some of the leading members of the Altaic family are thus classified by L. Adam—1

Gutturals. | Palatals. | Neutrals.

HEME NDT NIWA etre araya seve cartes eleiees, dsrvielesters ti, 6, 4 e, i BEI GVCUMi ts aie eteveisials) oteiays lo-cisisyeres siaveis s1a.6ve Lien Oeme = e, i OTCVATIAN cscvcs scenes cece ss sea vs a,i Bo MilATEG, oA `honooos adecdsooboOGnoGd 6, a a, i, e os Ciguazimlll, cagpamdodos SoounmOnoGbAce oC U, 0, a,` ibi., @), Gy ol 5G VEO WGOIIAIY ierasteiereroc eenwnersere alesse U, 0, a ti, 6,4 i LW: pogtop res Onn a ano nOrOnoonpodh WG Oy usr O seal e, i PMIABCMU icici selec s eile eve ea siece creas bars 6, 0, & e 1B4,

A close analogy to this law is presented by the Irish rule of ‘broad to broad” and ‘‘slender to slender,” according to which under certain conditions a broad (a, 0, w) must be followed in the next syllable by a broad, and a slender (e, 7) bya slender. Obvious parallelisms are also such forms in Latin as annus, perennis, ars, iners, lego, diligo, where, however, the root vowel is modified by the affix, not the affix by the root. But such instances suffice to show that the harmonic principle is not peculiar to the Ural-Altaic, but only more systematically developed in that than in most other linguistic families.

This is not the place to discuss the vexed question of the relation of the Babylonian Accad and Sumirian, or of the Etruscan, with the Ural-Altaic linguistic stock. It must therefore suffice to state in a general way that, according to the latest views, both of those long extinct languages were really branches either of the Finno- Ugric or of the Turko-Mongolic division of that family. In reply to the objection that Sumirian was a prefix language, it is pointed out that Neo-Sumirian, extinct some 1600 years before the Christian era, had already become postfixing, so that the nin-gar of the oldest answers to the garra-bi of the later texts, from root gar=to make. Nevertheless the point is far from settled, as may be judged from the fact that such specialists as Dr Zimmern and Dr Hommel are still at issue on the fundamental question of the Ural-Altaic affinities of Accad and Sumirian. he position of Etruscan is much the same, the main outcome of recent controversy being that this primitive Italian language can scarcely

have been a member of the Aryan, whatever its relationship to the Finno-Ta- taric family.

Regarding the Japanese and Corean languages, it may be re- marked that Winkler agrees with Boller in unhesitatingly includ- ing the former, while doubtfully excluding the latter from this connexion. On the other hand, W. G. Aston (Journ. Roy. Asiat. Soc., August 1879) considers that both are as nearly related to one another as English and Sanskrit. The probability therefore is that Japanese and Corean are aberrant branches of the Ural-Altaic family, and that they separated at long intervals from the parent stock and at such remotc periods that their affinities can no longer be clearly traced.

Bibliography.—Besides the references given above, the chief general treatises on Ural-Altaic philology are—Kellgren, Die Grundztige der finnischen Sprachen mit Riicksicht auf die Ural-Altaischen Sprachstimme, Berlin, 1847; Castrén, Ueber die Ursitze des finnischen Volkes, Helsingfors, 1849 ; Id., Syrjaen. Gram., Samojed. Gram., and numerous other comparative grammars, dictionaries, and general treatises, chiefly on the Finno-Ugric and Samoyedic groups; W. Thomsen, Ueber den Hinfluss der germanischen Sprachen auf die Finnisch-Luppischen (Germ. trans. by Sievers, Halle, 1870—a classical work); Abel Rémusat, Recherches sur les Langues Tartares, Paris, 1820; L. Adam, Gram. de la Langue Mandchoue, Paris, 1872, and Gram. de la L. Tongouse, Paris, 1874; Bohtlingk, Die Sprache der Jakuten, St Petersburg, 1851; Radloff, Volksliteratur der ttirkischen Stdmme Sud-Sibiriens, St Petersburg, 1872, and ‘‘Remarks on the Codex Comanicus,” Bull. St Petersb. Acad. Sc., xxxi., No.1; Zenker, Gram. der tiirkischen-tatarischen Sprachen ; Schmidt, Mongol. Gram.; Gabelentz, Gram. Mandchoue, Altenburg, 1833; Csink, Hung. Gram., London, 1853; and Vambéry, Das Tirkenvolk, Leipsic, 1885, and Uigurische Sprach-Monumente u. das Kudatki Bilik, Inns- bruck, 1870. For further particulars relating to the affinities and characteristics of the various branches, and of their associated members, see the articles FINLAND (vol. ix. p. 219), Huncary (vol. xii. p. 374), Russa (vol. xxi. p. 79), Turks (vol. xxiii. p. 661), Moncoxs (vol. xvi. p. 750), and SIBERIA (vol. xxii. Pp. 8). (A. H. K.)

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- De C Harmonie des Voyelles dans les Langues Ouralo-Altaiques, Paris, 1874,

URAL MOUNTAINS. The girdle of mountains which extends from the Arctic Ocean southwards nearly to the Caspian Sea, and is now regarded as separating Europe from Asia, was anciently the subject of various myths. Even the Slavonians, who in the 11th century frequently visited the region of the Urals for trade with the Ugrians (which people at that time lived there), described them as mountains reaching to the sky, intersected by terrible pre- cipices, and as being inhabited by a population of cave-dwellers. Although crossed by a continuous stream of Russian colonizers from the 16th century onwards, the Ural Mountains still retained something of their mythical character in Western literature, and in the 18th century they received from geographers the high-sounding designa- tion of montes dicti angulus terre. The Russians describe them either as Kameii (stone) merely or by the appropriate name of Poyas (girdle), while the name of Urals (Uraty) —derived either from the Ostiak wrr (chain of mountains) or from the Turkish aral-tau or uwral-tau—has with them become a generic name for extensive mountain chains. (See plate IT. vol. xxi. and plate I. vol. xxii.).

Notwithstanding numerous scientific expeditions by which the exploration of various parts of the range began to be undertaken from the earlier portion of the 19th century, and notwithstanding partial accurate surveys and levellings and numerous geological researches made within the last thirty years, the real structure of the Urals, both oro- graphical and geological, remains still imperfectly known. Even on maps otherwise good they are still very often represented as an unbroken chain, at least 1200 miles in length, running north and south from the Arctic Ocean to the sources of the river Ural. But every fresh addition to our knowledge has made it increasingly apparent that their real structure is much more complicated; and in view of recent explorations it becomes plain that the Urals con- sist of a series of several separate upheavals, some having a north-western direction and some a north-eastern, which reach their maximum heights along a zone which lies nearly north and south. They have thus some resemblance to the

mountain-chains of Central Asia and Siberia, —which also have north-eastern and north-western directions, but are grouped in zones which, roughly speaking, lie west and east,—although in both cases chains running either along meridians or along parallels are, wherever they exist at all, only rare exceptions.

The composite nature of the Urals is best seen at the northern and southern extremities of the system, where the upheavals assume the character of distinct chains of mountains. The Pai-hoi Mountains are a ridge which, beginning at the head of Kara Bay, runs north-west, and is continued in the Island of Vaigatch and the southern island of Nova Zembla; and the Northern Urals, which join the Pai-hoi chain at the head of Kara Bay, run north- east and south-west as far south as 64° N. lat. In their middle portion the architecture of the Urals is complicated by the plateaus of middle Russia. The southern parts do not consist, as Humboldt supposed, of ramifications from main meridional chain, but of a series of parallel ranges running distinctly from north-east to south-west, as is plainly seen in the excellent maps recently published by the Russian Geological Committee.2 The structure of the separate parts of the Ural complexus is explained in some detail below.

I. The Pai-hoi or coast ridge (Samoyedic “ stony ridge”) is quite independent of the Urals proper, from which it is separated by a marshy tundra, some 80 miles wide. It hasa distinct north-north-

westerly and north-westerly trend along the shores of the Kara Sea ; and, although it is cut by the Ugrian Strait, there is no doubt

2 Carte Géologique Générale de la Russie d’ Europe, sheet 139; and “Description Orographique,” by A. Karpinsky and Th. Tchernycheff, in Mémoires du Comité Géologique, vol. iii. No. 2, 1886.

that it is continued in Vaigatch Island and Nova ZEMBLA (¢.2.). Its dome-shaped summits, which attain a height of about 1000 feet above the tundra (Vozaipai, 1312 feet), are completely bare of trees, and its stony crags are separated by broad marshy tundras. It is uninhabited. eeer.

II, The Obdorsk or Northern Urals, which begin within a few miles of the head of Kara Bay (Konstantinoff Kameii, in 68 380 N. lat., 1490 feet), and extend in a south-western direction as far as the 64th parallel, form a distinct ridge of mountains, stony and craggy, sloping steeply towards the south-east and gently to- wards the marshes of Russia, Its highest elevations are on the 66th and 67th parallels (8600 to 4870 feet). Sometimes the main chain has on the west two or three secondary ones, formed by the upheaval of sedimentary rocks, and it is towards the southern ex- tremity of one of those that the highest peaks of the Urals occur (Sablya, 5407 feet, in 64° 47’ N. lat., and Teplos-iz, 5540 feet, in 68° 55’). Dense coniferous forests, consisting chiefly of fir, pine, and larch, cover the slopes of the mountains and the narrow valleys ; but, as the less hospitable latitudes are spproached, every species except the larch gradually disappears and the upper limit of vegeta- tion (2400 feet in the south) rapidly descends till it reaches the very base of the mountains towards the Arctic Circle, and forest vegetation disappears altogether about 65° lat. (67° in the plains of Russia and Siberia), These inhospitable hill-tracts, rising from the wide tundras which stretch for hundreds of miles to the west and east of the Urals, are quite uninhabited, save for a few hunters, who visit them in the summer in pursuit of the reindeer which here seek refuge from the mosquitoes of the lowlands.

ILI. Although usually reckoned to the Northern Urals, the section between the 64th and 61st parallels has again a wholly distinct character. It is represented on the maps asa girdle of chains, 20 to 35 miles in width, running north and south, and separated by long valleys. From the broad plateaus, or parmas, which stretch to- wards the north-west, it might be conjectured, however, that the structure is more complicated ; and the recent researches by MM, Fedoroff and Ivanoff have, in fact, shown that what is described as the main chain (or, more correctly, the main water-parting) of the Urals is a succession of plateaus stretching in a north-westerly direction,’ with broad, flat, marshy valleys, and rising here and there into isolated dome-shaped flat summits, mostly under 3000 feet (Yang-tuny, 62° 43’ N. lat., 4166 feet). The whole region, except the mountain summits, is densely clothed with coniferous forests, birch appearing only occasionally in the south, and even the Scotch pine only in a few valleys. This part of the range is also uninhabited.

IV. The Middle Urals, between 61° and 55°30’ N. lat., and about 80 miles in breadth, are the best known, as they contain the richest iron, copper, and gold mines (Bogostovsk, Gorobia- godatsk, and Ekaterinburg Urals), The Deneshkin Kamei in the north (4288 feet) and the Tara-tash in the south (2800 feet) may be considered as marking the limits of this section. Here the oro- graphical structure is still more complicated, and the necessity of distinguishing the separate upheavals becomes still more apparent, In the north (61st to 60th parallel) there is a succession of chains with a distinct north-eastern trend ; and it still remains an open question whether, for two degrees farther south, the whole of the

ogostovsk Urals (5185 feet in the Konjakoff Kamei, and from 3000 to 4000 feet in several other summits) do not consist of chains having the same direction. Farther south a broad swelling, which crosses northern Russia from the Kanin peninsula in the north to the sources of the river Petchora in the south-east, joins the Urals, and is continued into Asia by the plateau of the Tura and Isset rivers. To the south of the Katchkanar (2891 feet), ¢.e., from the 58th to the 56th parallel, therefore, the Urals assume the ap- pearance of broad swellings from 1000 to 2000 feet in height, deeply ravined and with gentle slopes. These low and tieinel bree plateaus, the higher parts of which can be reached from Russia on a very gentle gradient, have been utilized for centuries as the chief highway to Siberia. They have none of the aspects of an alpine tract ; and the traveller to Siberia cannot but experience a feeling of disappointment as his horses, still Tunning at full speed, reach the marble column, inscribed “ Europe” on one side and “ Asia” on the other, which marks the water-parting (1180 feet) between the Russian and Siberian rivers. The eastern slope is steeper, but even there Ekaterinburg is only 350 feet below the water-parting. The valleys have a decidedly south-eastern direction, and such is also the course of the railway from Perm to Tyumefi, as soon as it reaches the Siberian slope. The plateau- like swellings of this division terminate farther south in a depression, about 70 miles broad, stretching from north-west to south-east, where the water- parting has a height of only a few hundred feet. The Middle Urals are still densely forested, notwithstanding the immense quantities of timber and fuel which are constantly being taken from them. The vegetation is much more varied than in the north (birch, oak, lime, and maple), a rich undergrowth of

bushes growing to- gether with the conifers, and the banks of the rivers being adorned

1 See map in the Izvestia of the Russ. Geogr, Soe., vol. xxii., 1886.

with the wild cherry (Prunus padus), poplar, willow, and alder. The valleys and lower slopes are covered with a thick sheet of rich humus and have become the site of large and wealthy villages. The mines also have given rise to a considerable population. The southern parts of the Middle Urals may be estimated to have a total agricultural and mining population of nearly 1,500,000.

V. The Southern Urals (from 55° 30’ to 51° N. lat.) are now well known both orographically and geologically ;? and it appears that, instead of consisting of three chains of mountains radiating from Mount Yurma, as was formerly supposed, they consist of a series of three parallel chains running north-east and south-west, and therefore constitute a quite independent part of the Ural com- plexus, The Ural-tau proper is a low sinuous chain extending due south-west and hardly exceeding 2200 to 2800 feet in height. Tt slopes gently towards the north-west and abruptly towards the south-east, where several short and low chains (Ilmefi, Irenty, &.) rise in the basins of the Mias and the Ui. In the west a chain separated from the Ural-tau by a longitudinal valley accompanics it throughout its entire length, This, although pierced by the rivers which rise in the longitudinal valley just mentioned (Ai, upper Byetaya), nevertheless rises to a much greater height than the Ural-tau. Its wild stony ridge has an altitude of 3375 feet in the Yurma, and 3950 feet in the Taganai; while the Urenga and Tremel Mountains exceed 3500 feet, and the peaks bearing these names reach 4018 and 5040 feet respectively. Farther west, another series of chains, parallel to the above, is described under various names (Zurat-kul, Zigatga, Nary); they reach nearly the same altitudes (Zigatga and Yaman-tau, 4880 and 5400 feet respect- ively). A number of other chains, also parallel and ranging from 2000 to 3000 feet, accompany them in the west. The whole system has thus the character of a swelling nearly 65 miles wide, inter- sected by a series of parallel chains, the results of as many foldings of the sedimentary rocks, which have undergone extensive denuda- tion. Some of the chains are exceedingly craggy, and most of them are covered with

masses of angular débris, sometimes concealed under thick sheets of marshy mosses. The gorges by which the rivers pierce the Devonian limestones on their way towards the lower terraces are most picturesque in the west, where the Urals assume an alpine character. The forests are no longer continuous ; the gentle slopes of the hilly tracts are dotted with woods, mostly of deciduous trees, while the hollows contain rich pasture grounds. The thick layers of sedimentary rock which are lifted en masse on the western slope cover a wide area farther to the west in the shape of a plateau Sig already assumes the features of a steppe (sce Ura). The whole region, formerly the abode of Bashkirs, is rapidly being colonized by Russians.

Farther south, between the 58d and_ 51st parallels, the Ural-tau, still composed of crystalline rocks (diorite, serpentine, granite), continues in the same direction, but is covered as we advance by horizontal Cretaceous deposits and, cxcept when deeply trenched by rivers, assumes the appearance of a plateau which hardly reaches 1500 feet. It is continued farther south-west (towards the Volga) under the name of Obschiy Syrt. A narrow longitudinal valley watered by the Sakmara (right-hand tributary of the Ural) separates the Ural-tau and the Guberlinsk Mountains (as the preceding tract is called) from the Irendyk chain, about 20 miles in width, which reaches 2300 feet in its higher parts. It is cut by the Ural river at Orsk and extends farther south-west towards the sources of the Tlek ; while in the east a wide granitic plateau, with only a few remainders of its former Devonian and Carboniferous covering, some 130 miles broad and nearly 1000 feet high, lies about the sources of the Siberian rivers, and is known by such local names as Kara- Edyr-tau, Djabik-Karagai, and the like.

VI. Asarule the Urals are not shown on maps to the south of the great bend of the Ural river, where quite independent ranges of hills, or flat swellings, are represented (Jaman-tau, Mugojar Hills). It appears, however, from recent exploration? that the Mugojar Hills may safely be regarded as a farther continuation of the upheavals which constitute the Urals. The Cretaceous plateau north of the Ural river is continued to the south of it; it again assumes a mountainous character in the Jaman-tau (50° N. lat.) and joins the Mugojar Hills, which consist of diorites and crystalline slates and reach their maximum in the Airuk Mountain (about 1000 feet). A range of

heights connects the Mugojar Hills with the Ust-Urt plateau (see TRANSCASPIAN REGION). It is hardly necessary to say that these plateaus and flat hills to the south of the river Ural have all the characters of the Ciscaspian and Transcaspian steppes.

Geology.—W hatever the variety of the orographically independent systems of mountains and plateaus embodied under the general name of Urals, a certain “ geotectonic” similarity may be observed in all of them. Denudation has been active on so grand a scale that entire strata of sedimentary deposits have been removed from their original positions and scattered in the form of débris to distances of more than 100 miles on both sides of the Urals, so as

2 Carte Géologique, sheet 139, ut sup. 3 P. Nazaroff, in Bull. de la Soc, des Naturalistes de Moscou, 1886, No. 4.

considerably to reduce their former height. But, if this agency be taken into account, the Urals seem to come under the category of what the Germans call asymmetric Faltengebirge, and thus exhibit a great resemblance to the western Alps. A broad strip of granites, syenites, diorites, and porphyries, with their subordinate gneisses and crystalline slates, belonging to the Laurentian and Huronian systems, constitutes the main axis of upheaval, and this axis is invariably situated in the eastern part of the mountain region. The asymmetry thus resulting is the more pronounced as the Azoic rocks are mostly covered directly by Tertiary and Quaternary deposits on their Siberian slope ; while towards the west they are covered with vast layers of Silurian, Devonian, Carboniferous, Permian, and Triassic rocks, which are manifoldly folded so as to constitute a series of chains parallel to the main axis and mostly lifted to much greater heights than the older Azoic rocks.

The crystalline rocks which must have constituted the primary ridges mostly appear in the shape of plateaus, water- and glacier- worn, with undulating surfaces; and the hills which rise above the plateaus are mostly dome-shaped and are seldom marked by the craggy characters which are met with in the limestone and sandstone mountains of the subsequent

formations. Masses of angular débris and great blocks cover both the plateaus and the mountains ; and only a very few traces of the sediments which may have partially covered the Azoic crystalline rocks are sporadically met with. But, as a rule, they have remained a continent since the Huronian epoch. As for the Primary and Secondary deposits of the western slope, they are represented by Silurian, Dercuian Carboniferous, Permio-Carboniferous, Permian, and Triassic deposits, attaining great thicknesses and following one another in succession so as to appear on the surface as strips lying parallel to the Urals. The strip occupied by the Silurian quartzites, limestones, and slates is narrow, even in its northern portion. Farther south it disappears, and the deposits which formerly were assigned to the Sifarian period are now considered to be mostly Devonian. These latter, mostly littoral in character and much resembling those of the Eifel and Belgium, occupy wide areas to the west of the main axis of the Urals. Their lower parts are much metamorphosed. The Car- boniferous deposits,—coal-bearing in the Middle and Southern Urals, —although appearing at the surface only as a narrow strip in the west Urals, occupy an extensive area, but are concealed by the largely developed Permian deposits, and that series of sediments which must be considered as intermediate between the Carboniferous and the Permian. These latter, described as ‘‘ Permo-Carbon ” by Russian and German geologists, are largely developed in the west Urals. Their fossils belong to a fauna intermediate between the Carboniferous and the Permian, which was formerly known as that of Artinsk ; but since two more series of the same intermediate character have been described the whole has been brought under the general name of Permio-Carboniferous deposits. The Permian de- posits cover a wide zone all along the western slope of the Urals from north to south, and are most important on account of their copper ores, salt-beds, and salt-springs. They are also covered with variegated marls which are almost quite destitute of fossil organ- isms, so that their age is not yet quite settled. Some Russian geologists continue to consider them as Permian, while the ma- jority of recent explorers assign them to the Triassic age.

The glaciation of the Urals is still a debated question. Even those geologists who now acknowledge that the Scandinavian ice- sheet covered middle Russia hesitate to admit the existence of an ice-cap covering the Middle and Southern Urals,—the want of polished and striated rocks being the chief

argument for the nega- tive. But, if the disintegrated state of the rocks which are best fitted to maintain glacial polishing and striation, their thick coverings of débris, and the action of lichens and mosses in obliterating the traces of glaciation be taken into account, as also the prevalence of erratic blocks, and the character of the deposits filling up the valleys, it must be regarded as most probable that the Urals, too, must soon be included within the limits of former glaciation (as has been already done by a few explorers, such as Polyakoff). The Lacustrine (Post-Glacial) deposits are widely spread all over the slopes of the Urals. Immense marshes, which have recently emerged, in the north, and numberless lakes in the south, which are but small in comparison with their size at a recent period, as also Lacustrine deposits in the valleys, all go to show that during the Lacustrine period the Urals were as much dotted with lakes as Finland is at the present time.

Climatic, Geo-Botanical, and Geo- Zoological Importance.—The importance of the Urals as a climatic and geo-botanical boundary can no longer be regarded as very great. Most European species of plants freely cross the Urals into Siberia, and several Siberian species travel across them into northern Russia. But, being a zone of hilly tracts extending from north to south in a meridional direction, the Ural Mountains necessarily exercise a powerful in- fluence in driving a colder northern climate, as well as a northern flora and fauna, farther towards the south along their axis. The harshness of the climate at the meteorological stations of Bogo- stovsk, Ziatoust, and Ekaterinburg is not owing merely to their

elevation a few hundred feet above sea-level. Even if reduced to sea-level, the average temperatures of the Ural meteorological stations are such as to produce a local deflexion of the isotherms towards the south. The same is true with regard to the limits of distribution of vegetable and animal species. It has been already stated that the northern limits of tree-vegetation descend to- wards more southern latitudes on the Northern Urals and in the vicinity of the chain. The same is true with regard to many other species of plants. In like manner several Arctic species of animals come much farther south than they might otherwise have done: the reindeer, for instance, is met with as far south as the 52d parallel. The Southern Urals introduce amidst the Ciscaspian steppes the forest vegetation, flora, and fauna of middle Russia.

In the distribution of the races of mankind the Urals have also played an important part. To the present day the Northern Urals are the abodes of Finnish stems (Samoyedes, Zyrians, Voguls, and Permians) who have been driven from their former homes by Slavonian colonization, while the steppes on the slopes of the Southern Urals have continued to be inhabited by the Turkish stems of the Bashkirs. The Middle Urals were also in the 9th century the abode of the Ugrians, and their land, Biarmia (now Perm), was well known to the Byzantine historians for its mineral wealth,—there being at that time a lively intercourse between the Ugrians and the Greeks. Compelled to abandon their abodes, they moved south on the Ural slopes towards the land of the Khazars, and through the prairies of south-eastern and southern Russia (the AeBedla of Constantine Porphyrogenitus) towards the Danube and to their present seat—Hungary,—leaving but a very few memorials in the Northern and Middle Urals.1_ At present the Urals, especially the Middle and the Southern, are being more and more colonized by Great Russian immigrants, while the Finnish stems are rapidly melting away.

Metallurgy and Mining.—The mineral wealth of the Urals was known to the Greeks in the 9th century, and afterwards to the Novgorodians, who penetrated there in the 11th century for trade with the Ugrians. When the colonies of Novgorod (Vyatka, Perm) fell under the rule of Moscow, the Russian czars soon understood the importance of the Ural mines, and Ivan III. sent out German engineers to explore that region. In 1558 the whole of the present government of Perm was given by the rulers of Moscow to the brothers Strogonoff, who began to establish salt-works and mines for iron and copper. Peter I. gave a new impulse to the mining industry by founding several iron-works, and from 1745, when gold was first discovered, the Russian colonization of the Urals took a new departure. The colonization was, however, of a double character, being partly free—chiefly by Nonconformists in search of religious freedom in the wildernesses of the Urals—and partly compulsory,—the Government sending peasant settlers who became serfs to the iron and copper works, and were bound to supply them with ores and wood for fuel. Until 1861 all work at the mines was done by serfs belonging either to private persons (the Strogonoffs, Demidoffs, and others) or to the crown. At present (1888) only a few works, maintained for supplying the army, belong to the crown.

Gold is found both in veins and in alluvial or diluvial deposits, and is extracted from both ; but the former yield only a moderate quantity annually (2180 to 2780 tb in 1882-84). The gold from the Ural mines constitutes nearly one-fifth of the total amount obtained throughout the Russian empire. Platinum is found either in connexion with gold dust or separately, the platinum mines of the Urals being the only ones worked in Russia. Osmium, iridium, and nickel are found at several places, but their industrial import- ance is small. Silver is also met with at several places, but only 2383 Ib were extracted during the years 1875 to 1884. The copper mines, chiefly in Perm, but partly also in Ufa, are very important, nearly two-thirds of the total amount of the metal mined in Russia being obtained from eight works in the Urals. The average amount of gold, platinum, and copper annually yielded by the Ural mines is given in the following table : —

Gold. |Platinum.| Copper. | Gold. | Platinum.| Copper.

Ib Ib ewts. ib tb 1860-64 | 11,296

Iron is widely diffused and is extracted in the governments of Perm, Ufa, and Orenburg, the chief works being in Perm. Of the 198 blast furnaces in the Russian empire 108 are in the Urals, and they supply nearly two-thirds of all the pig-iron produced in Russia. Oue-half of the iron and one-sixth of the steel obtained both from home and foreign pig-iron in the empire are prepared in the Urals; and, while the St Petersburg and Polish steel works, which prepare steel (chiefly for rails) from imported iron, show great fluctuations in their production, the Ural works have a steady

1 Comp. Moravia and the Madiars, by K. J. Groth; Zabyelin's History of

Russian Life and the polemics on the subject in Izvestia of the Russ. Geogr. Soc., xix., 1883,

increase. The average yearly production of iron in the Urals is best seen from the following :—

Pig-Iron. Tron. Steel.

ewts. ewts. ewts.

1875-80 6,623,000 3,406,000 259,600 1881-83 6,378,000 8,517,000 612,800 1884 6,740,000 3,874,000 763,340

| eee are | aah PER eo

Owing to the immense extent of forest, the coal mining industry is but of recent origin in the Urals. Only six pits were at work in Perm in 1884; and of recent years from 3,000,000 to 4,000,000 ewts. have been annually extracted (about 5 per cent. of the coal raised in the Russian empire). Finally, salt was raised in Perm, Orenburg, and Uralsk to the amount of 9,422,000 cwts. in 1884.

The precious (amethyst, topaz, emerald, tourmaline, &c.) and ornamental (malachite, carsovite, &c.) stones of the Urals are familiar in all European museums, and are féund in most beautiful varieties. The crown works at Ekaterinburg supply admirable works of art, while a numerous population at Ekaterinburg and in the neigh- pouring villages support themselves by searching for precious and ornamental stones and preparing them for export. Of the 830,750 workmen engaged in 1884 in mining and metallurgical industries throughout the Russian empire 183,914 were employed in the Urals, as well as nearly one-half of the motive power (steam- engines and water-wheels) used at the mining and metallurgical works of Russia, Poland, and Finland. The exports from the Urals are made chiefly by means of the rivers, which are navigable in their upper parts only during the spring. There is not as ae any railway connecting the Urals with Russia. The line of Siberian railway which now connects the iron-works of the eastcrn slope with the Kama at Perm has certainly increased the exports; but they are still so small in comparison with the expense of the line that the railway is worked at a loss, the deficiency being made good from the imperial budget, and the whole mining and metal- Turgical industry of the Urals is still maintained by means of high protective duties imposed on foreign metals and mctallic wares.

Several wealthy towns have grown up in the Ural valleys in con- nexion with mining industry and administration, HEKATERINBURG (q.v.) and Nignu-TacuHItsk (q.v.) both had more than 30,000 in- habitants in 1885, while ZLaTousrt (g.v.), Neviansk, Neiviusk, and Kyshtym in Perm, Votkinsk and Izhevsk in Vyatka, had from 21,000 to 12,500 inhabitants. The Revdinsk, Bogostovsk, Turinsk, Shaitanovsk, Gorobtagodat, Artinsk, Nijne-Saldinsk, Usolie, and Sysertsk mining towns in Perm, Katav-Ivanovsk, Kusinsk, and Satkinsk in Ufa, Byetoryetsk, Tirlansk, and Avzyano-Petrovsk have populations from 5000 to 10,000.

_ Bibliography.—1. The following general works may be mentioned as of chief importance :—Hermann, Versuch einer miner. Beschr. des Ural Eragebirges, 1789 ; Humboldt, Fragments, 1831; Hofmann and Helmersen, Geogn. Unters. des Siid- Uralgebirges, 1831 ; Kupffer, Voyage, 1833; L. von Buch, Beitr. zur Bestinvm. der Gebirgsform. in Russland, 1840; Eversmann, Orenburg Region (Russian), 1840 ; Schurowsky, Urals (Russian), 1841; Helmersen, Reise, 18413 Rose, Reise, 1842 ; Murchison, Geol. of Russia, 1845 (with Ozerskiy's Appendix to Russ. transla- tion); Keyserling and Krusenstern, Wiss. Beobachtwngen, 1846; Leonhardt, Geologie des Hur. Russland, 1848; Hofmann, Nordl. Ural, 1853-56; Meglitzky and Antipoff, Bergbaw im Ural, 1861; Ludwig, Ueberblick und Beobacht. in Russ- land, 1862; Moller, Geological Map of the Urals, 1869; Ruprecht, Verbr. der Pflanzen in nordl, Ural; Panaeff, Climatology of the Urals (Russian), 1882 ; Carte Géologique de la Russie d' Hwrope (139), 1886. For further bibliographical information see " Ural," " Perm," "Orenburg," &c., in the Geographical Dic- tionary (Russian) by P. Semenoff. 2. Monographs dealing with separate parts of the Urals occur in great numbers in the Gornyt Journal, the Verhandl. der Russ. Miner. Ges., the publications of the Russ. Geogr. Soc., the Ural, Kazan, and Moscow Societies of Naturalists, and in the Izvestia and Memoirs of the

Russ. Geological Coinmittee. See also the yearly Ind. by M. M those of the Kieff Society of Naturalists. a —o. CR

URALSK, a province of south-eastern Russia, lying to the north of the Caspian Sea, with an area of 141,174 square miles. It is bounded by Astrakhan on the west, Samara and Orenburg on the north, Turgai and the

Sea of Aral on the east, and the Transcaspian Region on the south. It is geographically situated mostly within the boundaries of Asia, 7.¢., to the east of the Ural river, and both its physical features and its inhabitants are, 'to a very large extent, Asiatic. Administratively, it belongs to the " Kirghiz provinces," or governor-generalship of the steppes. Apart from a narrow strip of land in the north where the slopes of the Obschiy Syrt, covered with a fertile black earth and stretches of forest, descend towards the Ural river, and the gentle slopes of the Mugojar Hills in the north-east, Uralsk consists of dry steppes and deserts, which fall with an imperceptible gradient towards the Caspian. Most of the province is below sea-level, the zero-altitude line running from Kamyshin on the Volga to the south of the town of Uralsk. consists for the most part of sandy clay, sands containing

The steppe-land.

shells of molluscs now living in the Caspian, salt clay, and shifting sands. It is also dotted with numerous salt lakes, partly remains of old lagoons of the Caspian. To the south-east Uralsk extends over the northern part of the Ust-Urt plateau. Red sandstones (Permian ?) and chalk are met with only in the north, the remainder of the province being covered with Post-Pliocene Caspian de- posits, which conceal the underlying rocks.

Uralsk is watered by the Ural, which rises in Orenburg at a height of 2100 feet above sea-level, but soon descends to the lowlands, where it flows south, west, and south, entering the Caspian after a course of 800 miles. Its chief tributaries, the Sakmara, the Or, and the Ilek, are in the north ; along its lower course the Great and Little Uzetis and many small streams on the left bank fail to join the main river, being lost in lakes before reaching it. The Emba, which has its course in the north of the Ust-Urt plateau, reaches the Caspian by a series of shallow lagoons, which were navi- gable in the 18th century.

The climate is influenced by the Central Asian steppes.

The character of the vegetation can be easily inferred from the above. The prairies and forest tracts of the north soon disappear, their place being taken by the vegetation of the south Russian steppes. This has, however, to struggle with the much poorer vegetation, Central Asian in character, of the

sandy regions to the west of the lower Ural, and the saliniferous vegetation of the clayey deserts of the Emba. The Ust-Urt has herbaceous steppes, where the want of irrigation and rain destroys all vegetation by the end of summer. Wide belts of rushes grow along the banks of the rivers and on the shores of the Caspian.

The population of the province, 525,380 in 1888, is made up of three different elements,—Ural Cossacks, who constitute about one-fifth, and numbered nearly 90,000 in 1879, some 15,000 Russian peasants, and Kirghiz. Of these 405,000 are still nomads. The Kirghiz are almost entirely dependent on cattle-breeding, and before the outbreak of the murrain of 1879 were reckoned to have 429,500 horses, 221,800 head of cattle, 1,411,000 sheep, and 175,000 camels. From that epidemic the Russians lost two-thirds of their horses and one-third of their other stock, whilst the Khirgiz lost more than three-fourths of both horses and cattle. The Ural Cossacks, descendauts of those independent communities of free settlers and Raskolniks who are so often mentioned in Russian history under the name of Yaik Cossacks, owing to their unwilling- ness to submit to the rule of the czars, are fine representatives of the Great Russian race, though not without some admixture of Tartar and Kalmuck blood. Their chief occupations are cattle- breeding and fishing, the latter a most important source of income. The rich fisheries in the Ural and the Caspian are the property of the community as a whole (the voisko), and are subdivided according to the needs and working powers of the separate villages.! They give employment to about 7000 Cossacks and 2000 hired labourers. There are also fisherics in the Emba. Walrus-hunting is also engaged in. Agriculture was first introduced between 1830 and 1840; but now more than 300,000 ewts. of wheat are exported annually. Nearly 130,000 cwts. of salt are obtained from the lakes every year. The manufactures of the province, which possesses a few steam flour-mills and a number of tanneries and tallow-melting works, are unimportant. 'Trade by barter is extensively carried on with the Kirghiz. Fish, corn, cattle, hides, tallow, and the like are exported, while manufactured wares are imported to the value of about £1,500,000 per annum. :

Uralsk is divided into four districts, the chief towns of which are— Uralsk (20,680 inhabitants in 1879), Kalmykoff (1510), Gurieff at the mouth of the

Ural (4880), and Temirsk, a small port, now the administrative centre of the district of Embinsk. Several villages have populations of from 2000 to 5000 each.

History.—In the first half of the 16th century Uralsk was occu- pied by the Nogai horde, a remnant of the Golden Horde, which retired there after the fall of Astrakhan and Kazan; the khans resided at Saraitchik on the Ural. At the same time the lower parts of the Ural were occupied by Russian runaway serfs and free Cossacks who did not recognize the authority of Moscow. They took Saraitchik in 1560 and formed an independent com- munity, like the sitch of the Zaporog Cossacks. The Moscow princes, recognizing the importance of these military settlements,

' See Haxthausen's Russia for a description of the Cossack com- munity ; comp. also the more recent works of Ryabinin and Khoroshkhin and many separate monographs in Russian periodicals ; also Baer's Kaspische Studien and Danilevsky on the fishing.

tried to win their allegiance by the grant of various privileges. But, when they attempted to bring them under the centralized rule of the empire and prosecuted them for nonconformity, the Cossacks revolted, first under Razin, and afterwards under Puga- tcheff. After the latter rising, the name of Ural was officially given to the Yaik river and the Yaik Cossacks. The disbanding of their artillery, the planting of Russian garrisons within the domains of the voisko, and the interference of Russian officials in their intcrior organization during the 19th century occasioned a series of smaller outbreaks, the latest of which, in 1874, against the new law of military service, resulted in the deportation of 2500 Cossacks, with their families, to Turkestan.

URALSK, capital of the above province, is situated on the upper Ural, at its confluence with the Tchagan, 1095 miles south-east from Moscow. The town is well built, with regular streets; among its prominent buildings are the theatre, the club, and two gymnasiums; and it is beautified by numerous gardens. The scientific society issues publica- tions of great value. There is

a very brisk trade in fish, cattle, hides, tallow, grain (exported), and in manufactured goods (imported). The population in 1879 was 20,680.

URANIUM, the name of a rather rare metallic element, already briefly referred to under CHEMIsTRyY (vol. v. p. 542). The credit of its discovery as an element must be assigned to Klaproth, who in 1789 isolated from pitch-blende a yellow oxide which, while obviously metallic, was foreign to all the known metals. He accordingly viewed it as the oxide of a new metal, which he named uranium, after the newly discovered planet of Herschel. From the yellow oxide he obtained, by reduction with charcoal at a high temperature, what he took to be metallic uranium. Ber- zelius about 1823 found that the yellow oxide, when treated with excess of sulphuric acid, united with it into a sulphate, not unlike the ferric salt Fe,O,.3SO, in its character. Hence he concluded that the uranium salt is Ur, 03.3803, where Ur,O., according to his analysis, re- presents 864 parts of yellow oxide, if Fe,0,=160 or O=16. Like Fe,0O,, the yellow oxide lost 48 parts of oxygen per Ur, O,= 864 parts as water, while Ur,=816 parts of metal remained.! These results were universally adopted until Péligot in 1840 discovered that Berzelius's (and Klaproth's) metal contains oxygen, and that his (Ur,) O, really is (Us04).O,=3U,0,, where U=120 is one atomic weight of real uranium. Péligot's results, though called in question by Berzelius, have been amply confirmed by all subsequent investigators; only now, on theoretical grounds, first set forth by Mendeljeff, we have come to double Péligot's atomic weight, so that through- out this article U signifies 240 parts of uranium, while UO, stands as the formula of the yellow oxide, and UO, as that of Berzelius's metal.

The only practically available raw material for the extraction of uranium is pitch-blende (Germ. and Fr. Uranpecherz), which occurs associated with lead and silver ores, chiefly in Joachimsthal and at Przibram in Bohemia, at Schneeberg in Saxony, and at Redruth in Cornwall, forming greenish or brownish black masses clustering together like grapes. Its hardness is 55. The specific gravity varies from 6°4 to 8, the mineral almost invariably presenting itself in intimate intermixture with a host of foreign metallic compounds, such as sulphides, arsenides, &c. Pure pitch-blende is U,0,, which ely good specimens forms some 80 per cent. or more of the whole,

In the chemical treatment of the ore, it is expedient to begin by removing at least part of the arsenic and sulphur of the admixtures by roasting, and then to wash away the light oxides with water or dissolve them away with hydrochloric acid. In one of the many processes proposed the purified ore is disintegrated with hot nitric acid, to produce nitrates, which are then converted into sulphates by evaporation with oil of vitriol. The sulphates are treated with water, which dissolves the uranium and other soluble salts, while silica, sulphate of lead, &., remain; these are removed by filtration. From the solution the arsenic, copper, &c., are precipitated by sulphuretted hydrogen as sulphides, which are filtered off. The filtrate contains the uranium as uranous and the iron as ferrous salt. These are oxidized by means of chlorine or some other oxidizing

+ We substitute for Berzelius's actual numbers the corresponding values calculated from our present constants. |

agent, and precipitated conjointly by excess of ammonia. The pre- cipitate, after having been collected and washed, is digested with a warm concentrated solution of carbonate of ammonia, which dissolves the uranium as a yellow solution of uranate of ammonia, while the hydrated oxide of iron, the alumina, &c., remain. These are filtered off hot, and the filtrate is allowed to cool, when crystals of the uranate separate out. The mother liquor includes generally more or less of nickel, cobalt, zinc, and other heavy metals, which, as Wohler showed, can be removed as insoluble sulphides by the addition of sulphide of ammonium; uranium, under the circum- stances, is not precipitated by sulphide of ammonium. The filtrate, on being boiled down, yields a second crop of uranate of ammonia. This uranate when ignited in a platinum crucible leaves a green oxide of the composition U,Og, 2.¢., artificial pitch-blende, which serves as a starting point for the preparation of uranium compounds. The green oxide, as a rule, requires to be further purified. One method for this purpose is to convert it into a solution of the nitrate UO,(NO;)., and from it to precipitate the metal as oxalate by the addition of oxalic acid (Péligot). The latter (UO,. C20.) ylelds a purer oxide, UO,, or, in the presence of air, U,O,, on ignition,

Metallic uranium, as shown by Péligot, can be obtained by the reduction of a mixture of dry chloride of potassium and dry uranous chloride, UCl,, with sodium at a red heat (for details see handbooks of chemistry). The metal, which is easily separated from the slag by treatment with water, remains as a dark heavy powder or in white compact globules, according to the temperature at which it was produced. According to Zimmermann, to whom we owe a recent investigation on the matter, pure compact uranium is | a white malleable metal, which is pretty hard, though "softer than steel." Its specific gravity has the high value 18°7; its specific heat is 0°02765, corresponding to U=240. The fusing point, from Zimmermann's statements on its preparation, seems to lie at bright redness. The compact metal when exposed to the air tarnishes only very slowly. The powdery metal when heated in air to 150° or 170° C. catches fire and burns brilliantly into U,0,. Dilute sulphuric acid attacks it but slowly ; hydrochloric acid, especially if strong, dissolves it readily, with the formation, more immediately, of a hyacinth-coloured solution of U,Clg, which, however, readily absorbs oxygen from the air, with the formation of a green solution of UCl, which in its turn gradually passes into one of yellow uranyl salt, UO,,.Cl,.

Uranous Compounds.—The oxide UO, (Berzelius's metal) is pre- pared by heating the green oxide U,0, in hydrogen. It dissolves in hot oil of vitriol; the mass, when treated with water, dissolves ; from the solution green crystals, U(SO,).+8H,0, are obtainable. The anhydrous chloride UCl, was prepared for the first time by Péligot by heating an intimate mixture of the green oxide and charcoal to redness in a current of dry chlorine; it is obtained as sublimate of black-green metallic-looking octahedra. The chloride is very hygroscopic. Uranous salts pass into uranic (uranyl) com- pounds under the same circumstances under which ferrous salts become ferric, only they do so far more readily.

Uranic Compounds.—By keeping the nitrate UO(NO,), at a temperature of 250° for a sufficient time the oxide UO, is obtained as a chamois-yellow solid, insoluble in water, but soluble in acids, with the formation of uranyl salts, UO,.Cl,, &c. The oxide, in other words, behaves to acids as if it were the monoxide of a radical (UO,) uranyl. The sulphate (UO,)SO,+8 or 3°5H,0O is de- posited from a syrupy solution in yellow crystals. The nitrate (UO,)(NO;).+6H,O forms large yellow crystals easily soluble in

water. This salt is used in photography, also in analysis as a characteristic precipitant for phosphoric acid. If a solution of a uranyl salt is mixed with one of ammonia, or potash, or soda, the uranium is precipitated in the form of a uranate, U,O,R.0, of the respective alkali. Uranate of soda, forming yellow crystals of the coinposition Na,U,O,+6H,0, is made industrially, being used for the production of yellow uranium glass in porcelain painting. The Joachimsthal works in 1875 produced 70 cwts. of this " oxide," representing a value of £8500.

Analysis,—A borax bead dissolves uranium oxides in the re- ducing flame with a green, in the oxidizing flame with a yellow, colour. Solutions of uranyl] salts (nitrate, &c.) behave to reagents as follows: sulphuretted hydrogen produces green uranous salt with precipitation of sulphur; sulphide of ammonium in neutral solutions gives a black precipitate of UO,S, which settles slowly and, while being washed in the filter, breaks up partially into hydrated UO, and sulphur ; ammonia gives a yellow precipitate of uranate of ammonia, characteristically soluble in hot carbonate of amnionia solution ; prussiate of potash gives a brown precipitate which in appearance is not unlike the precipitate produced by the same reagent in cupric salts. (W. D.)

URANUS (ie. Heaven) is in Greek mythology the husband of Gea (Earth) and father of Cronus (Saturn) and other deities. See MytHonocy, vol. xvii. p. 155, and SATURN.

8 Um BAN

URBAN, St, first pope of that name, was bishop of Rome from 222 to 230. He had been preceded by Calixtus and was followed by Pontianus, He is mentioned by Eusebius (H. £., vi. 23), and is named in an inscription in the cceme- terium Callisti, but of his life nothing is known. The Roman Breviary (25th May) speaks of his numerous con- verts, among whom were Valerianus, husband of St Cecilia, and his brother Tiburtius, and states that he suffered martyrdom, and was buried in the ccemeterium Pretextati.

URBAN IL. (Eudes or Odo), pope from 1088 to 1099, was born of knightly rank, at Lagery (near Chatillon-sur- Marne), and was educated for the church, He had already become archdeacon of Rheims when, under the

influence of St Bruno, his teacher, he resigned his preferment and entered the cloister at Cluny, where he rose to be prior. In 1078 Gregory VII. summoned him to Italy, and made him cardinal-bishop of Ostia. He was one of the most prominent and energetic supporters of Hildebrand- ism, especially as legate in Germany in 1084, and was among the few whom Gregory nominated as possible suc- cessors. Desiderius of Monte Casino (Victor III.) was chosen in the first instance to the difficult post, but at the next vacancy Odo was elected by acclamation (March 1088) at a small meeting of cardinals and other prelates held in Terracina. He frankly took up the policy of his great predecessor, but while pursuing it with equal determination showed greater flexibility and diplomatic finesse. At the outset he had to reckon with the presence of the powerful antipope Clement III. in Rome; but a series of well-attended synods held in Rome, Amalfi, Bene- vento, and Troia supported him in renewed declarations against simony, lay investiture, and clerical marriages, and a continued policy of opposition to Henry IV. In accordance with this last policy, the martiage of the countess Matilda with Guelph of Bavaria was promoted, Prince Conrad was helped in his rebellion against his father and crowned king of the Romans at Milan in 1093, and the empress (Adelaide or Praxedes) encouraged in her dis- graceful charges against her husband. In a protracted struggle also with Philip I. of France, whom he had ex-communicated, Urban II. finally proved victorious. But the most prominent feature in his pontificate, a feature indeed which marks an epoch in the history of Latin Christianity, is his connexion with the first crusade (see Crusapus, vol. vi. pp. 623-624), which united Christendom under the headship of the pope into one vast warlike confederacy (comp. Porrepom, vol. xix. p. 499). The crusading movement first took shape at Piacenza, where in March 1095 Urban received an embassy from the emperor Alexius I, asking help against the infidel, and where a great council met, attended by numerous Italian, Bur- gundian, and French bishops and by so vast a concourse of monks and laymen that the public meetings had to be held in the open air outside the city. The still more enthusiastic council of Clermont was held in November of the same year. Urban IL. died on 29th J uly 1099, four- teen days after the fall of Jerusalem, but before the tidings of that great event had reached Italy ; his successor was

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URBAN IIL. (Uberto Crivelli), pope from 1185 to 1187 was by birth a Milanese, and was made cardinal and arch. bishop of Milan by Lucius IIL, whom he succeeded (25th November 1185). He vigorously took up his predecessor's quarrels with the emperor Frederick L., including the standing dispute about the succession to the territories of the countess Matilda. Even after his elevation to the popedom he continued to hold the archbishopric of Milan, and in this capacity refused to crown as king of Italy Frederick's son Henry, who had married Constantia, -the heiress of the kingdom of Sicily. While Henry in the

south co-operated with the rebel senate of Rome, Fred- erick in the north blocked the passes of the Alps and cut off all communication between the pope, then living in Verona, and his German adherents. Urban now resolved on excommunicating Frederick, but the Veronese protested against such a proceeding being resorted to within their walls ; he accordingly withdrew to Ferrara, but died (19th October) before he could give effect to his intention. His successor was Gregory VIII.

URBAN IV. (Jacques Pantaléon), pope from 1261 to 1264, was the son of a cobbler in Troyes, studied theology and common law in Paris, became bishop of Verdun, was employed in various missions by Innocent IV., and was made patriarch of Jerusalem by Alexander IV. He was at Viterbo seeking help for the oppressed Christians in the East when the last-named pope died, and after a three months' vacancy he was chosen to succeed him (29th August 1261). As pope he endeavoured, but without success, to stir up a new crusade on behalf of his former diocese of Jerusalem. In domestic matters the chief prob- lems of his pontificate arose out of the competing claims for the crown of the Two Sicilies. Before the arrival of Charles of Anjou, the candidate whom he favoured, Urban died at Perugia on 2nd October 1264, His successor was Clement IV. The festival of Corpus Christi was instituted by Urban IV. in 1264.

URBAN V. (Guillaume de Grimoald), pope from 1362 to 1370, was a native of Grisac in Languedoc. He became a Benedictine and a doctor in canon law, teaching at Montpellier and Avignon. He held the office of abbot of St Victor in Marseilles ; and at Avignon, on his way back from Naples, whither he had been sent as papal legate, he was elected pope (28th October 1362)

in succession to Innocent VI. As pope he was a severe disciplinarian, discountenanced the pomp and luxury of the cardinals, introduced considerable reforms in the administration of justice, and liberally patronized learning. His pontificate witnessed one of the last flickers of crusading zeal in the expedition of Peter of Lusignan, king of Cyprus, who took Alexandria (11th October 1365), but soon afterwards abandoned it. The great feature of Urban V.'s reign was the effort to restore the papacy to Italy, and to suppress its powerful rivals for the temporal sovereignty there. In 1363 he excommunicated Bernabo Visconti, and ordered a crusade to be preached throughout Italy against him and his kindred, the robbers of the church's estate ; but in the following year he found it necessary to purchase peace by removing his ban and making other humiliating conces- sions. Continued troubles in Italy caused him to set out for Rome, which he reached on 16th October 1367 ; but, though he was greeted by the clergy and people with joy, and had the satisfaction of being attended by the emperor in St Peter's and of placing the crown upon the head of the empress, it soon became clear that by changing the seat of his government he had not increased its power. Unable any longer to resist the urgency of the French cardinals, he took ship again at Corneto on 5th September 1370, and, arriving at Avignon on the 24th of the same month, died on 19th December. He was succeeded by Gregory XI.

URBAN VI. (Bartolommeo Prignani), pope from 1378 to 1389, was a native of Naples, born in 1318. A devout monk and learned casuist, he became archbishop of Bari in 1377, and, on the death of Gregory XI. the Roman populace clamorously demanding an Italian pope, was unanimously chosen (8th April 1378) by the French car- dinals under this pressure to be his successor. The arro- gant and imperious temper of the new pope, intoxicated by his unexpected fortune, showed itself in ways so in- tolerable that five months afterwards the majority of the

cardinals met at Fondi, and, repudiating their previous action, proceeded to elect Robert of Geneva (20th Septem- ber), who assumed the title of Clement VII. Thus began the great schism which divided Christendom for nearly forty years (see Popepom, vol. xix. p. 502). The measures of Urban

were not without vigour, but at the same time were characterized by such a want of prudence and self- control as has given rise to the not improbable assertion that he actually was, at times at least, a lunatic. Clement VII. was, of course, excommunicated, and designated the Antichrist ; twenty-six new cardinals were created in a single day, and, by an arbitrary alienation of the estates and property of the church, funds were raised for open war. The castle of St Angelo was besieged and taken, and the antipope put to flight, while Charles of Durazzo was in- vested in the sovereignty of Naples, forfeited by Queen Joanna. In 1384, however, Charles began to resist the papal pretensions, and Urban was shut up in Nocera, from the walls of which he daily fulminated his anathemas against his besiegers; he afterwards succeeded in making his escape to Genoa, and, on the death of Charles, set himself at the head of his troops, apparently with the in- tention of seizing Naples for his nephew if not for himself. To raise funds he proclaimed a jubilee, though only thirty- three years had elapsed since that celebrated under Clement VL., but before the celebration he died at Rome of injuries caused by a fall from his mule, on 15th October 1389. His successor was Boniface IX.

URBAN VII. (Giovanni Battista Castagna), pope for twelve days in September 1590, was of Genoese origin, and was born in Rome in 1521. He was chosen successor of Sixtus V. on 15th September 1590, but died (27th September) before consecration. He was succeeded by Gregory XIV.

URBAN VIII. (Maffeo Barberini), pope from 1623 to 1644, belonged to a Florentine family which had been greatly enriched by commerce, and was born in 1568. Through the influence of an uncle, who had become apo- stolic protonotary, he, while still a young man, received various promotions from Sixtus V. and Gregory XIV. By Clement VIII. he was himself made protonotary and nuncio to the French court ; Paul V. also employed him in a similar capacity, afterwards raising him to the car- dinalate, and giving him the legation of Bologna, On 6th August 1623 he was chosen successor to Gregory XV. The period of his pontificate, covering as it did twenty- one years of the Thirty Years' War, was an eventful one, and the ultimate result of that great struggle was largely determined by Urban's policy, which was aimed less at the restoration of Catholicism in Europe than at such an ad- justment of the balance of parties as might best favour his own

independence and strength as a temporal power in Italy (see PopEpom, vol. xix. p. 506). In 1626 the duchy of Urbino was incorporated into the papal dominions, and in 1627, when the direct male line of the Gonzagas in Mantua became extinct, he favoured the succession of the duke of Nevers against the claims of the Hapsburgs, whose preponderance he dreaded. He was the last pope to extend the papal territory, and Castelfranco on the Man- tuan frontier was fortified by him. In Rome he greatly strengthened the castle of St Angelo, removing, for the purpose of making cannons, the massive tubular girders of bronze from the portico of the Pantheon ("quod non fecerunt barbari, fecerunt Barberini"), establishing also an arsenal in the Vatican, as well as a manufactory of arms at Tivoli, and fortifying the harbour of Civita Vecchia. It was during the pontificate of Urban that Galileo was summoned to Rome to make his great recanta- tion in 1633; on the other hand, the Poussins and Claude Lorraine were patronized by him, and it was he who

brought Athanasius Kircher to Rome, and who employed Bernini to build the Palazzo Barberini, the college of the Propaganda, the Fontana del Tritone, and other prominent structures in the city. He was the last to practise nepo- tism on a grand scale: various members of his house were enormously enriched by him, so that it seemed to contem- poraries as if he aimed at establishing a Barberini dynasty. He canonized many saints, among whom the most con- spicuous are Ignatius Loyola, Francis Xavier, Al. Gonzaga, and Filippo Neri. Urban VIII. was a clever writer of Latin verse, and a collection of Scriptural paraphrases as well as original hymns of his composition has been fre- quently reprinted. His death (29th July 1644) is said to have been hastened by chagrin at the result of a war he had undertaken against the duke of Parma, He was suc- ceeded by Innocent X.

URBANA, a city of the United States, the county seat of Champaign county, Ohio. It lies 95 miles nearly due north of Cincinnati, in the midst of a rich agricultural region. It has railroad communication by means of three lines, the New York, Lake Erie, and Western, the Pitts- burgh, Cincinnati, and St Louis, and the Indiana, Bloom- ington, and Western. It has some manufactures, particu- larly of agricultural tools, machines, and railway rolling stock, and is the site of a Swedenborgian or New Church college.

The population in 1880 was 6252, an increase of 46 per cent. since 1870. Urbana was laid out in 1808, when the county was organized.

URBINO, a medizval walled city of Italy, on the site of the Roman Urbinum Hortense, in the Marches of Ancona, stands in a commanding position on a spur of the Tuscan Apennines, near the valley of the Metaurus, about 20 miles from the Adriatic. It grew up, chiefly in the 14th century, around the stronghold of the Montefeltro family. Federigo da Montefeltro, lord of Urbino from 1444 to 1482, was one of the most successful condottieri chiefs of his time, and not only a man of great military and political ability, but also an enthusiastic patron of art and literature, on which he lavished immense sums of money. Federigo much strengthened his position, first by his own marriage with Battista, one of the powerful Sforza family, and secondly by marrying his daughter to Giovanni della Rovere, the favourite nephew of Pope Sixtus IV., who in return conferred upon Federigo the title of duke. Federigo's only son Guidubaldo, who succeeded his father, married in 1489 a very gifted lady, Elizabeth Gonzaga, of the ruling family in Mantua. In 1497 he was expelled from Urbino by Cesar Borgia, son of Alexander VI., but regained his dukedom in 1508, after Ceesar's death. Guidubaldo was the last duke of the Montefeltro line; at his death in 1508 he bequeathed his coronet to Francesco Maria della Rovere, nephew of Julius II., and for about a century Urbino was ruled by its second dynasty of the Della Rovere family. In 1626 the last descendant of Francesco, called Francesco Maria II., when old and childless abdicated in favour of Pope Urban VIII., after which time Urbino, with its subject towns of Pesaro, Fano, Fossombrone, Gubbio, Castel Durante, Cagli,and about 300 small villages, became part of the Papal States until the suppression of the temporal power in 1870.

During the reigns of Federigo and Guidubaldo, Urbino was one of the foremost centres of activity in art and litera- ture in Italy, and was known as the Italian Athens. In 1468 Federigo gave orders to a Dalmatian architect, Luciano da Laurana, to build him a magnificent fortified palace ; it was finished and enlarged by the Florentine Baccio Pintelli during Guidubaldo's reign. Rich friezes, sculptured architraves of doors and windows, and other decorations in marble, painting, and wood-work were exe- cuted by the sculptor Ambrogino di Milano, and by Fran-

cesco di Giorgio Martini of Siena (1439-1506), whom Vasari wrongly states to have been the principal architect of the palace. Federigo adorned his palace with fine series of paintings by Piero della Francesca, Melozzo da Forli, Paolo Uccello, and Raphael's father, Giovanni Santi; and, in addition to the crowd of able Italian artists whom he invited to his court, Flemish painters, such as Justus of Ghent, visited and worked in this hospitable city! The rich wood-work in the palace, decorated with tarsia, or wood mosaic, was executed by Gondolo Tedesco; the rooms were filled with magnificent furniture, costly gold and silver plate, and works of art of all kinds. Literature was no less encouraged under the patronage of Federigo: it was at his court that Piero della Francesca wrote his celebrated work on the science of perspective, Francesco di Giorgio his Trattato @Architettura (published by Saluzzo, Turin, 1841), and Giovanni Santi his poetical account of the chief artists of his time, among whom, probably from jealousy, he has omitted to mention either Justus of Ghent or Francesco di Giorgio, the latter a man of extraordi- narily versatile talents, who was much employed by the duke to design fortifications and military engines, to paint wall decorations, and to carve sculptured ornaments.? Though stripped of its art treasures and dismantled of its decorations, the ducal palace still exists in a good state of preservation : it is a very picturesque, massive building of irregular plan, suited to its uneven site, and stands up very nobly on the hill, dominating all the rest of the city.? The refined magnificence of Guidubaldo's court is elo- quently described by Baldassare CastTiGLIoNE (g.v.) in his Cortegiano. When Henry VII. of England conferred the order of the Garter on Guidubaldo, Count Castiglione was sent to England with a letter of thanks and with the small picture, now in the Louvre, of St George and the Dragon, painted by Raphael# in 1504, as a present to the English king. This painting was among Charles I.'s collection which was sold by order of the Commonwealth in 1649. Throughout the whole of the 16th century the state of Urbino was one of the chief centres for the production of majolica (see Porrery, vol. xix. p. 625 sq.), especially the towns of Gubbio and Castel Durante. Most of the finest pieces of Urbino ware were made specially for the dukes, who covered their

sideboards with the rich storied piatte di pompa, of which fine specimens have recently sold for from £2000 to £3000.5 Among the distinguished names which have been associated with Urbino are those of the Ferrarese painter and friend of Raphael, Timoteo della Vite, who spent most of his life there, and Bramante, the greatest architect of his age.® The Milanese sculptor, Ambrogino, who worked so much for Federigo, married a lady of Urbino, and was the progenitor of the Baroccio family, among whom were many able mathematicians and painters. Federigo Baroccio, Ambrogino's grandson, was a very popular painter, some of whose works still exist in the cathedral and elsewhere in Urbino. This city was

also the birthplace of Pope Clement XL, of several cardinals

1 The works of art from the palace of Urbino were scattered in the 17th century. Two paintings of the Sciences, part of a series executed for Federigo, are now in the National Gallery, London, where they are doubtfully attributed to Melozzo da Forli. Another by Justus of Ghent is in the royal collection at Windsor.

2 The very high esteem felt for Francesco's personal character and genius by the duke is shown in a letter which Federigo wrote to the commune of Siena; see Ricci, Storia d' Architettura, vol. ii. p. 538. His life is given by Vasari, part i.

3 See Arnold, Der herzogliche Palast von Urbino, Leipsic, 1857 ; and Baldi, Descrizione del Palazzo Ducale di Urbino, Rome, 1724.

4 For Raphael's birth in Urbino, and his subsequent connexion with that town, see RAPHAEL.

5 The Bargello at Florence and the South Kensington Museum possess the finest collections of Urbino ware.

§ Much information about Urbino and its crowd of artists is given by Pungileoni, Elogio Storico di Giov. Santi, Urbino, 1822.

of the Albano family, and of Bernardino Baldi, Fabretti,

and other able scholars. :

The modern city of Urbino, with a population of 5087 in 1880, is the seat of an archbishop, and still possesses a small university, but is not a thriving place. The cathedral, a building of no special interest, stands in the great piazza opposite the ducal palace, which is now used for municipal purposes and contains the city archives. In the sacristy there is a very beautiful miniature-like painting of the Scourging of Christ, by Piero della Francesca. One of the finest paintings by this artist is a large altar-piece of the Madonna enthroned between angels and saints, now in the Brera at Milan; it contains a very noble kneeling figure of Federigo in full armour, showing his strange profile disfigured by a bullet, which carried away part of the bridge of his nose. It was origin- ally a votive retable given by the duke to the monastic church of San Bernardino, about a mile outside the walls of Urbino, where Federigo and Guidubaldo were buried. The modest house where Raphael was born and spent his boyhood is still preserved. It is now the property of a society of artists, and so is safe from destruc- tion. Its rooms form a sort of museum of engravings and other records of Raphael's works, together with a picture of the Madonna by his father, Giovanni Santi, formerly thought to be by Raphael himself. The Institute of the Fine Arts in the Marches contains a small but interesting collection of pictures, including works by Giovanni Santi, Justus of Ghent, Timoteo della Vite, and other 15th-century artists. The picture of the Holy Communion by Justus is specially valuable from its containing fine portraits of the Montefeltro family and members of the ducal court. On the walls of the chapel of the guild or confraternity of San Giovanni are some valuable early frescos, painted by Lorenzo da San Severino and his brother, of the Florentine school, about 1416. An in- teresting collection of Roman inscriptions, arranged by the paleo- grapher Fabretti, is still preserved on the wpper walls of a court in the ducal palace. In the church of S. Spirito are two paintings by Luca Signorelli, the Crucifixion and the Day of Pentecost, origin- ally intended for a processional banner. The theatre, decorated by Girolamo Genga, is one of the earliest in Italy; in it was per- formed the first Italian comedy, the Calandria of Cardinal Bibbiena, the friend of Leo X. and Raphael. The magnificent library formed by the Montefeltro and Della Rovere dukes has been removed to Rome.

In addition to works quoted above, see Dennistoun, Memoirs of the Dukes of Urbino, London, 1851; Card. di San Clemente, Memorte concernenti la Citta di Urbino, Rome, 1724; and Sismondi, Histoire des Républiques Italiennes, Paris, 1807-8. An interesting view of Urbino, in the first half of the 16th century,

occurs among the pen drawings in the MSS. Arte del Vusajo, by the potter Piccolpasso, now in the South Kensington Museum. QV. H. }

UREA is known chiefly as a component of urine. Re- ferring to the article Nurririon (vol. xvii. pp. 682-685) for its physiological relations, we consider it here only as a chemical substance. Urea, CO(NH,),, was discovered by H. M. Rouelle in 1773; Fourcroy and Vauquelin in 1799 published the first exact investigation on it. In 1828 Wéhler showed that it can be obtained by the union in aqueous solutions of cyanic acid with ammonia, and thus for the first time effected what was then considered an impossibility, namely,'the artificial preparation of an organic compound from mineral matter. For the extrac- tion of urea from urine the latter is concentrated by evaporation (more or less, according to its original strength), and then, after cooling, mixed with a large excess of pure? nitric acid of 1°4 specific gravity. On standing in the cold most of the urea separates out as a crystalline nitrate, CO.N,H,.HNO,, which is collected over glass wool and washed with nitric acid. To convert it into urea, it is treated with water and carbonate of baryta, which acts upon the HNO, as if it were present as such, the urea be- ing liberated. The mixed solution of urea and the nitrate is evaporated to a small volume and allowed to stand, when the bulk of the barytic nitrate crystallizes out. The rest is removed by evaporating the mother liquor to dry- ness over a water-bath and extracting the urea with strong alcohol. To obtain fine crystals, the filtered alcoholic solu- tion is evaporated to dryness, the residual urea dissolved in a very little hot water, and the solution allowed to cool

7 This word points chiefly to the absence of nitrous acid, which, if

present, decomposes its equivalent of urea into nitrogen, water, and carbonic acid, thus :— CO(NH,),+2HO. NO=CO(OH), 2N2 2H,0.

Nitrous Carbonic Nitro- yw, Oise acid. acid. gen. eo

slowly, when part of the urea crystallizes out in long colour- less columns, not unlike those of nitrate of potash. Wohler's synthetical method for preparative purposes usually assumes the following form. Powdered prussiate of potash (see Prussic AciD) is dehydrated by heating, the anhydrous salt mixed with half its weight of anhydrous binoxide of manganese, and the mixture heated in a flat iron pan until the deflagration, which soon sets in, is completed. The residue now consists of oxides of iron and manganese and of cyanate of potash, NCO.K, formed from the cyanide of potassium of the prussiate by oxidation. The cyanate of potash is extracted by means of the least sufficient quantity of cold water (hot water decomposes the salt, with the formation of ammonia and carbonate of potash), and the solution is mixed at once with the calculated weight of sulphate of ammonia, 1(NH,),SO, for 2NCO.K. The two salts decompose each other into sulphate of potash and cyanate of ammonia ; the latter, however, passes spon- taneously and almost instantaneously into urea :— mee ; Sie CO(N He)>. anate O Seonie. Reve

The sulphate of potash is eliminated exactly as the nitrate of baryta

is in the urine method. That urea is not cyanate of ammonia itself

is proved, first by the fact that real cyanate of ammonia (pre-

arable by the union of anhydrous cyanic acid with ammonia gas) is a different substance, and secondly by its not yielding any ammonia when dissolved in cold caustic potash ley. Urea behaves to certain strong acids like a feeble basis, uniting (CON)H, parts)

with HNO, parts of nitric, }H2S0, of sulphuric, and $C,0,H, of

oxalic acid into crystalline salts. As shown by its formula, urea is the amide of carbonic acid: 7.¢., it is CO(OH):- 20H +2NH,, and consequently an anhydride of carbonate of ammonia, CO(O. NH,).. An aqueous solution of urea, when heated to 200° in a sealed-up tube, breaks up into carbonic acid and ammonia; and dry car- bonate of ammonia, when kept at a certain temperature, suffers partial conversion into urea and water.

Of the many methods for the quantitative determination of the urea in urine, the simplest is to treat a measured volume with excess of solution of hypobromite of soda (a solution of bromine in caustic soda ley) and to measure the volume of nitrogen evolved. By theory CON,H,+3NaBrO=3NaBr+CO,+2H20 (the CO, is absorbed by the excess of alkali); but in practice, according to Dupre, through unknown causes only 91 per cent. of the nitrogen is actually evolved, which must be remembered in the calculation of the result.

*URGA, a city of Mongolia and the administrative centre of the Northern and Eastern Khalkha tribes, is situated in 48° 20' N. lat. and 107° 30' E. long., on the Tola river. The Chinese and Mongolian towns which make up Hure, as the Mongols call Urga, stand on the high road from Peking to Kiachta (Kiakhta), about 700 miles from the Chinese capital and 165 from Kiachta, and are separated from each other by an interval of 2 or 3 miles. The Chinese town is the great trading quarter, and there the wealth of the district is collected. The houses in this part are more substantially built than in the Mongol town, and the streets have a well-to-do appearance. The population is estimated at about 5000, and the law which prohibits Chinamen from bringing their wives and families into the place tends to check increase. The population of the Mongol quarter is reckoned at about 10,000, though on the occasions of the religious festivals the numbers are much larger. Although trade is not altogether excluded, the raison d'étre of the town is that it is the residence of the metropolitan of the Khalkha tribes, who ranks third in degree of veneration among the dignitaries of the Lamaist Church. This "resplendently divine lama" resides in a sacred quarter on the western side of the town, and acts as the spiritual colleague of the Chinese lieutenant-general, who controls all mundane matters at Urga itself, and who is also especially charged with the control of the frontier town of Kiachta and the trade conducted there with the Russians. Until quite lately bricks of tea formed the only circulating medium for the retail trade at Urga, but Chinese brass cash are now beginning to pass current in the markets. The temples in the Mongol quarter are numerous and impos- ing in appearance, and in one is a gilt image of Maitreya Bodhisattva, 33 feet in height and weighing 125 tons, By the Chinese Urga is called K*ulun.*

Il

URI) one of the Forest Cantons of Switzerland, ranks as fourth in the Confederation. It comprises the upper

basin of the Reuss from its source to the Lake of Lucerne,

the southern arm of which is also within the canton. Its total area is 415°4 square miles ; of these 184°4 are classed as productive, 40°3 are covered with forests, 44°3 consist of glaciers, and 7°7 of the lake. The highest point in the canton is the Galenstock (11,802 feet). The population in 1880 amounted to 23,694 (men having a majority of 3000 over women), showing an increase of 7649, or 39°4 per cent., since 1870, owing to the St Gotthard Railway. German is the native tongue of 18,024 persons, Italian of 5313. The canton has always been very strongly Roman Catholic (23,149 in 1880). It was included up to 1814 in the diocese of Constance (except the valley of Urseren, which was in that of Chur), and since then has formed part of no diocese, but is provisionally administered by the bishop of Chur. In Uri the limits of the ecclesiastical parishes are the same as those of the civil communes. The capital is Altdorf (2901 inhabitants). Gdschenen (2990) and Wasen (2744) have increased since the opening of the St Gotthard Railway (1880), which runs through the greater part of the canton. The inhabitants are occupied in agricultural and pastoral pursuits, and are very saving and industrious. The main valley is fertile, but the side glens are very wild. Education is still very backward and largely in the hands of the priests; but an improvement was made in 1885, The main characteristics of the people are extreme conservatism and a passionate attachment to their religion.

Uri is first mentioned in history in 732 as the place to which Eto, abbot of Reichenau, was banished. For the early history of the canton, see SWITZERLAND, vol. xxii. pp. 783-787. In 1410 a perpetnal alliance was made with the upper valley of Urseren or Val Orsera, the latter being allowed its own headman and assembly, and courts under those of Uri, with which it was not fully incor- porated till 1808. In 1440 Uri alone won the Val Leventina for good, the title being confirmed by a treaty of 1466 with the duke of Milan and by the bloody fight of Giornico (1478). At the Reformation, Uri clung to the old faith (see SwITzERLAND, vol. xxii. pp. 790-

791). In 1798 on the formation of the Helvetic republic Uri lost all its Italian possessions. In September 1799 Suwaroff and the Russian army, having crossed the St Gotthard to Altdorf, were forced by the French to pass over into Schwyz, instead of sailing down the lake to Lucerne. In 1803 Uri became an independ- ent canton again, with Urseren, but without the Val Leventina. It tried hard to bring back the old state of things in 1814-15, and opposed all attempts at reform, joining the League of Sarnen in 1832 to maintain the pact of 1815, opposing the proposed revision of the pact, and being one of the members of the Sonderbund in 1843. Despite defeat in the war of 1847, Uri voted against the federal constitution of 1848, and by a crushing majority against that of 1874. The existing constitution of Uri is that framed in 1850 and amended in 1851, 1872, 1879, and 1881. The " landes- gemeinde," composed of all male citizens of twenty years of age, meets annually on 1st May, and is the supreme legislative assembly. There is a subordinate legislative assembly (landrath), consisting of the landammann or headman and his deputy, 4 of the members of the executive, and 70 elected members (1 for every 300 of the population), which drafts bills and passes laws provisionally in case of necessity. The executive consists of 9 members—the landam- mann, his deputy, and the treasurer, with 6 elected members. By an immemorial custom 7 men of 7 different families, bearing dif- ferent names, can cause an extraordinary meeting of the assembly of their "'gemeinde" to be summoned, or call on the landrath to

do the same in the case of the " landesgemeinde." See K. F. Lusser's Gesch. des Kantons Uri (1862).

URIC ACID, as explained fully in the article NUTRI- TION (vol. xvii. p. 683), is one of the penultimate products of the tissue waste in the human body. While the bulk of the nitrogen of the albuminoids passes off through the bladder as Urza (q.v.), a small portion of it stops at the uric acid stage. Human urine contains only a fraction of a per cent. of the acid, chiefly as soda salt ; abundance of "sen Esp As al A ES

1 The name is probably connected with the same obscure root as Urseren and Reuss, and is popularly derived from Urochs, " wild bull, a bull's head having been for ages borne on the cantonal shield.

uric acid is met with in the excrement of serpents and birds, with whom it is the principal nitrogenous product of tissue waste. For the preparation of uric acid (C,H,N,O3), GUANO (q.v.) is boiled repeatedly with a solution of borax in 120 parts of water. The filtered solution is acidified with hydrochloric acid, when impure uric acid separates out as a brown precipitate, which is washed with cold water. For its purification it is dissolved in hot dilute caustic potash or soda ley, the solution filtered, and the filtrate saturated with carbonic acid. An almost insoluble acid urate of alkali separates out, which is collected on a filter, washed, and decomposed by adding it in instalments to hot dilute hydrochloric acid. Uric acid separates out as a white precipitate, which is filtered off, washed, and dried, to be re-purified by a repetition of the alkali process or otherwise. Pure uric acid forms a snow-white micro- crystalline powder, devoid of smell or taste, soluble in 1800 parts of boiling and in 14,000 parts of cold water, but insoluble in alcohol and in ether. When heated it suffers complete decomposition.

For its detection in urine, the urine is mixed with excess of hydrochloric acid, and allowed to stand, when the uric acid separates out, generally coloured reddish by impurities. To identify the pre- cipitate, it is dissolved in a few drops of nitric acid on a watch-glass, and the solution cautiously evaporated to dryness. The residue, if exposed to ammonia gas as it comes off from the stopper of a liquor ammoniz bottle, assumes the intense purple colour of "murexide."'

Urates.—Uric acid dissolves in excess of caustic potash ley as dipotassic salt, C;H,K,N,03, soluble in 44 parts of cold water, with the formation of a strongly alkaline solution. On the saturation of the solution with carbonic acid one-half of the potash is elimi- nated as bicarbonate, and a neutral salt, C;H,KN,03, comes down as a precipitate, soluble in 800 parts of cold water. Soda and the alkaline earths behave similarly. But more interesting than its salts are the numerous derivatives obtainable from it, chiefly by the action of oxidizing agents. Most of these were discovered and investigated by Liebig and Wohler in a classical research published in 1838, From 1861 to 1863 Adolf Bayer supplemented their work by important new discoveries.

He showed that all those meta- morphoses of uric acid fallin naturally with the assumption that the molecule of uric acid consists of two urea rests— (NH)(CO)(NH)— united each by its two nitrogen affinities with a tricarbon group, (C,0), by carbon affinities of the latter. To give an example of the practical meaning of the theory, —if uric acid is oxidized cautiously with nitric acid, one of the urea rests by uniting with the 2H of an H,0 is split off as urea, while the rest unites with the oxygen of the H2O and other 0+ HO into alloxan, —

(HN) -(CO.C(OH),. CO)— (NH), = ee

the ureid of mesoxalic acid, HO-(CO.C(OH),.CO)-OH. On the application of more energetic oxidizing agents, that one urea rest still survives, but the tricarbon nucleus burns down into C,0,, the radical of oxalic acid, with formation of parabanic acid,

(HN) ~~(C,0,)~~(NH), a C0

the ureid of oxalic acid, HO(C,0,)OH.

URINE. See Urza and Uric Acip; also Nutrition, vol. xvii. pp. 682-684.

URMIA, or UrumtAu, a town of Persia, in the province of Azerbijan (Adarbaijan), lies 112 miles south-west of Tabriz and 10 from the west side of Lake Urmia, in the midst of an extremely fertile, highly cultivated, and densely peopled plain. Within the enclosures, consisting of a wall and deep ditch that can be flooded, there is a mixed Mohammedan and Christian population of from 25,000 to 30,000, while the surrounding district is studded with over 300 populous villages. Some of the streets are broader than is usual in Oriental towns and several are traversed by running water; but, beyond a busy bazaar and two or three old mosques, there is nothing of any interest. ‘The chief industries are weaving, dyeing, and especially tillage, abundant crops of rice, melons, cotton, and excellent tobacco being raised in the neighbourhood. Urmia has for many years been the centre of an American mission, which has had considerable success, especially amongst the so-called ‘“ Chaldean ” or Nestorian Christians. °

According to an old tradition, Urmia was the birthplace of Zoroaster.

The lake, which takes its name from the town, and which is also known as the Daria-cha, or " Little Sea," is a completely landlocked basin, filling a shallow depression at the east foot of the Kurdish Highlands, but still about 5000 feet above sea-level. It is 90 miles long north and south, 30 miles broad, and 250 round, with a total area of 1600 square miles, but a mean depth of not more than 10-or 12 feet (45 in the deepest part sounded by Monteith), so that the whole volume is at least six times less than that of the much smaller lake of Geneva. There are as many as fifty-six islands, grouped chiefly towards the south, the largest 5 miles by 2, the smallest mere rocks, and none permanently inhabited, although they are tilled or used for grazing horses and sheep in winter. Although fed by numerous streams, the lake is intensely saline, more so even than the Dead Sea, and is consequently inhabited by no fish or other aquatic fauna, except a peculiar species of small crustacean, which affords abundant food to numerous swans and other wild-fowl. The salt, which forms extensive incrustations some inches thick round about the shelving north-eastern and southern shores, appears to be de- rived from Tertiary beds (Dr E. Tietze), and the geological formation appears to resemble that of Lake Niris in southern Persia (Blanford). The whole lacustrine basin, including the farthest sources of its in- fluents, has an area of about 20,000 square miles, and the flooded part stood formerly at a much higher level than at present, as is shown by the watermarks on the encircling heights, and by the Shahi peninsula in the north-east, which at one time was certainly an island. In recent years the evaporation has on the whole balanced the inflow, although the lake is now said to be slightly rising, owing to the larger discharge from the Jaghatu and Tatau, which were formerly to a great extent absorbed in irrigating the southern Miandab plain. Near the Selmas river and at the village of Dihkergan in the south-east occur the famous " marble springs," yielding the pink, yellow, and white " marble of Tabriz," used for ornamenting many public buildings throughout western Asia. –

URQUHART, or Urcuarp,! Sir Tuomas (c. 1605- 1660), one of the most original and raciest translators from any foreign language into English, was the son of Sir Thomas Urquhart of Cromarty, the representative of a very ancient family, and of Christian, daughter of the fourth Lord

Elphinstone. His birth-year is uncertain, but it is guessed at 1605, and his birthplace was the old mansion-house of Cromarty. Not much is known of his youth, or indeed of any part of his life; but he was certainly well educated, travelled over Europe, succeeded to a con- siderable, though much embarrassed inheritance, and got together a remarkable library, which, however, fell into the hands of his creditors. All his later life was disturbed by pecuniary and political difficulties. He was an enthu- siastic Royalist ; and, so far as religious matters went, his principles may be judged from his favourite signature, "C. P.," for Christianus Presbyteromastix. He took part in the "Trot of Turriff" in 1639, and was rewarded by being knighted on 7th April 1641 by the king's own hand at Whitehall. He took occasion by this visit to London to see through the press his first work, a collection of Epi- grams of no great merit. Four years later, in 1645, he produced a tract called 7rissotetras, a treatise on logarithms, adjusted to a kind of memoria technica, like that of the scholastic logic. In 1649 he was proclaimed a rebel and traitor at the Cross of Edinburgh ; but this does not seem to have done him much harm, and, though he took part in the march to Worcester, and was there wounded and taken prisoner, his always embarrassed affairs do not seem to have been much worsened thereby. He published in rapid succession during 1652 and 1653 a series of tracts with quaint titles and quainter contents. Pantochrono- chanon (sic) is an almost unbelievable genealogy of the house of Urquhart up to Adam, with the names extem- porized for the earlier ages in a kind of gibberish, which seems to be after the pattern of the giants and heathens in the Amadis. Ecskubalauron, supposed to be a treatise on the virtues of a jewel found in the streets of Worcester, is in reality a rather elaborate treatise on the virtues of the Scottish character, as shown in the Admirable Crichton

1 So spelt on the title page of his first work.

and others. Finally, Logopandecteision handles the sub- ject of a universal language. These original works of Urquhart's, as far as intrinsic literary merits go, are not of much account; but they show perhaps better than any- thing else that singular mixture of patriotism, generosity, shrewdness, humour, with prejudice, almost insane family pride, crotchet, pedantry, and

apparent insensibility to some kinds of the ridiculous which was the dominant characteristic of a certain part of the Scottish nation, and which has furnished Sir Walter Scott with some of his most matchless studies and touches. The 7'ranslation of Rabelais, which Urquhart produced in 16538, is a very different work from the literary point of view, entering into and reproducing the author's spirit with wonderful success, and, though by no means technically faithful, far excelling in value all merely faithful versions. Next to nothing is known of Urquhart after its date ; it is said that he sought a refuge, like other cavaliers, on the Con- tinent, and died (1660) of a fit of laughing, brought on by joy at hearing of the Restoration.

His original Works, with such scanty particulars of his life as are known, and with reproductions of two original and curious frontis- pieces, which represent him as a handsome and dandified wearer of full cavalier costume, were published in a stately quarto volume by the Maitland Club (Edinburgh, 1834). The Rabelais has been repeatedly reprinted, and with Motteux's additions forms the sub- stance of Gargantua and Pantagruel in Bohn's Extra Series.

URSINUS, Zacwarras (1534-1583), German theo- logian, and one of the authors of the Hevdelberg Catechism (see vol. v. p. 219), was a native of Breslau, and became a disciple of Melanchthon at Wittenberg. He afterwards studied divinity at Geneva under Calvin and Hebrew at Paris under Mercier. In 1561 he was appointed professor in the Collegium Sapientis at Heidelberg, where in 1563 at the instance of the elector-palatine, Frederick III., he drew up the Catechism in cooperation with Kaspar Olevian. The death of the elector in 1577 led to the removal of Ursinus, who from 1578 till his death in 1583 occupied a professorial chair at Neustadt-an-der-Haardt. His Works were published in 1587-89, and a more complete edition by his son and two of his pupils, Pareus and Reuterus, in 1612.

URSULA, 81, and her companions, virgins and martyrs, are commemorated by the Roman Church on 21st October. The Breviary gives no legend; but in current works, such as Butler's Lives of the Saints, it is to the effect that " these holy martyrs seem . . . to have met a glorious death in defence of their virginity from the army of the Huns… . They came originally from Britain,

and Ursula was the conductor and encourager of the holy troop." The scene of the martyrdom is placed near the lower Rhine.

The date has been assigned by different writers to 238, c. 283, and c. 451. The story, however, is unknown both to Jerome and to Gregory of Tours—and this though the latter gives a somewhat detailed description of the Cologne church dedicated to that Theban legion with which the tradition of the martyred virgins was very early associated. The story of their fate is not entered under 21st October in the martyrology of Bede (0b. ¢. 735), of Ado (c. 858), of Usuard (ante 877), Notker Balbulus (896), or Hrabanus Maurus (845); but a 9th-century life of St Cunibert (ob. 663) associates a prominent incident in the life of this saint with the basilica of the sacred virgins at Cologne (Surius, vi. 275, ed. 1575). Not only does Archbishop Wichfrid attest a grant to the church of the sacred virgins outside the walls of Cologne (in 927), but he was a large donor in his own person. Still earlier a Cologne martyrology, written, as Binterim plausibly urges, between 889 and 891, has the following entry under 21st October: "xi. virg. Ursule Sencie Gregorie Pinose Marthe Saule Britule Satnine Rabacie Saturie Paladie." Much shorter entries are found in two of the old martyrologies printed in Migne (cxxxviii. 1207, 1275). A more definite allusion to the legend may be found (¢. 847) in Wandelbert's metrical martyrology (21st October) :

'¢ Tune numerosa simul Rheni per littora fulgent Christi virgineis erecta tropsa maniplis

Agrippinze urbi, quarum furor impius olim Millia mactavit ductricibus inclyta sanctis."

The full legend first makes its appearance in a festival discourse (sermo) for 21st October, written, as internal evidence seems to show, between 731 and 839. This sermo does not mention St Ursula, but makes Pinnosa or Vinnosa the leader of these spiritual "amazons," who, to avoid Maximian's persecution, left their island home of Britain, following their bridegroom Christ towards that East whence their faith had come a hundred years before. The con- current traditions of Britain, Batavia (where many chapels still preserved their memory), and Cologne are called in evidence to prove the same origin. The legend was already very old and the festival 'nobis

omni tempore celeberrima " ; but, as all written documents had disappeared since the burning of the early church erected over the sacred bones, the preacher could only appeal to the continuous and careful memory of the society to which he belonged (nostrates). Even in his time there were sceptics who pointed dubiously to the full-grown bones of " widows "' and of men among the so-called virgin relics. But to a priori reasoners who mocked at the notion of gather- ing so large a band of virgins in one place there was a triumphant answer ready: if Christ, while yet a man on earth, could summon 'twelve legions of angels" to his aid, surely we could allow that a meagre band of "'less than 12,000 virgins might follow the stain- less lamb" in heaven. The author of the sermo pointedly rejects the two theories that connected the holy virgius with the Theban band and brought them as pilgrims from the East to the West ; but he adds that even in his days there still existed an inscription in the church, showing how it had been restored from: its foundations by a certain "Clematius, vir consularis, ex partibus Orientis."

Two or threc centuries later the Passio XI. MM. SS. Virginum, based apparently on the revelations made to Helentrude, a nun of Heerse near Paderborn, gives a wonderful increase of detail, The narrative in its present form may date somewhere between 900 and 1100, while Helentrude apparently flourished before 1050. Ac- cording to her account, the son of a powerful pagan king demands in marriage Ursula, the beautiful daughter of Deonotus, a king "in partibus Britanni." Ursula is warned by a dream to demand a respite of three years, during which time her companions are to be 11,000 virgins collected from both kingdoms. After vigorous exercise in all kinds of manly sports to the admiration of the popu- lace, they are carried off by a sudden breeze in eleven triremes to Thiel in Guelderland on the Waal. Thence they sail up the Rhine by wit of Cologne to Basel, at which place they make fast their vessels and proceed on foot to Rome. Returning, they re-enter their ships at Basel, but are slaughtered by the Huns when they reach Cologne. Their relics are then collected and buried "sicnt hodie illic est cernere," in a spot where "to this day" no meaner sepulture is permitted. Then follows the usual allusion to Clematius ; the date is expressly fixed at 288; and the whole revelation is seem- ingly ascribed to St Cordula, one of the eleven thousand, who, after escaping death on the first day by hiding in one of the vessels, on the morrow gave

herself up to death of her own accord. Towards the beginning of the 12th century Sigebert of Gembloux (ob. 1112) gives a brief réswmé of the same story. He is the first to introduce the name of Attila, and dates the occurrence 453.

Passing over the visions and exhumations of the first half of the 12th century, we come to the singular revelations of St Elizabeth of Schénau. These revelations, delivered in Latin, German, or a mixed jargon of both languages, were turned into simple Latin by Elizabeth's brother Egbert, from whose words it would seem that in 1156 an old burial ground had lately been laid open near Cologne. The cemetery was naturally associated with the legend of St Ursula; and, this identification once accepted, it is not un- likely that, when more careful investigation revealed male skeletous and tombstones bearing the names of men, other and more definite epitaphs were invented to reconcile the old traditions with the facts of such a damaging discovery. Hence perhaps the barefaced imposture: "Cyriacus, papa Romanus, qui cum gaudio suscepit sanctas virgines et cum eis Coloniam reversus martyrium suscepit." One or two circumstantial forgeries of this kind would form the basis of a scheme for explaining not a few other problems of the case, such as the plain inscription " Jacobus," whom St Elizabeth promptly transformed into a supposititious British archbishop of Antioch, brother to the equally imaginary British Pope Cyriacus. For these epitaphs, with others of a humbler kind, were brought before St Elizabeth to be identified in her ecstatic converse with St Verena, her cousin St Ursula, and others. Elizabeth herself at times distrusted her own revelations: there was no Cyriac in the list of the popes; Antherus, who was said to be his successor (235-236), died more than two centuries before Attila, to whom common report assigned the massacre ; and it was hardly credible that James of Antioch could cut eleven thousand epitaphs in less than three days. Every doubt, however, was met by the invention of a new and still more improbable detail. According to St Verena, the virgins suffered when Maximus and " Africanus " were principes at Rome (? 387-388).

In 1183 the mantle of St Elizabeth fell upon Hermann Joseph, a Premonstratensian canon at Steinfeld. He had to solve a more difficult problem than St Elizabeth's ; for the skeletons of little

ee

Plate I,

Bound- aries,

14

children, ranging in age from two months to seven years, had now been found buried with the sacred virgins. But even such a diffi- culty Hermann explains away as readily as he does the fact of his having changed St Elizabeth's name for the royal bridegroom from /Stherius to Holofernes: the prince in question had two names, and the little children were brothers, sisters, or more distant relatives of the eleven thousand. Hermann's revelations are mainly taken up with an attempt to show the mutual relationship of nearly all the characters he introduces, The names are a most extraordi- nary mixture. Among British bishops we have Michael William, James, and Columbanus. Sovereign princes,—an Oliver, a Clovis, and a Pippin,—start out in every page, till the writer finds it neces- sary to apologize for the number of his kings and his own blunders. But, for all this, Hermann exposes his own doubts when he tells that often, as he was preparing to write, he heard a voice bidding him lay down the pen, "for whatever you write will be an unmixed lie." Hermann makes St Ursula a native of Brittany, and so approxi- mates to the version of the story given by Geofirey of Monmouth (Historia Britonum), according to whom Maximian, after fleeing from Rome, and acquiring Britain by marriage, proceeds to conquer Brittany and settle it with men from the island opposite. For these settlers he has to find British wives, and to this end collects 11,000 noble and 60,000 plebeian virgins, who are wrecked on their passage across, Certain of the vessels being driven upon "bar- barous islands," their passengers are slain by Guanius and Melga, 'kings of the Huns and Picts," whom Gratian had called in to his aid against Maximian, In this version St Ursula is a daughter of Dionotus, king of Cornwall. Hermann alludes more than once to the Historia Britonwm, and even to King Arthur.

The legend of St Ursula is perhaps the most curious instance of the development of an ecclesiastical myth. We know, however, too little about its earlier stages to justify any serious attempt at estimating what amount of historic truth underlies it, and it is doubtful whether many of the efforts in

this direction do not make a larger demand on human credulity than the legend itself. Even in the earliest form known to us this legend is probably the com-

lex growth of centuries, and any claim to the discovery of the Fost germ can hardly approve itself to the historic sense. These remarks apply especially to that venerable rationalization which evolves the whole legend from a misreading of Undecimilla into undecim millia, A more modern theory makes St Ursula the Christianized representative of the old Teutonic goddess Freya, who, in Thuringia, under the name of Horsel, welcomed the souls of dead maidens. Not a few singular coincidences seem to point in the same direction, especially the two virgins, " Martha and Sanla," whom Usuard states to have suffered " cum aliis pluribus" on 20th October, whence they were probably transferred to 21st October. It is curious to note that ae and many of the ear- liest martyrologies extant have on 21st October the entry " Dasius Zoticus, Gaius cwm duodecim militibus." Even in copies of Jerome this is transformed into millibus ; and it is perhaps not impossible that to this misreading we may indirectly owe the " thousands" in the Ursula legend. So far as is known to the present writer, the two entries are mutually exclusive in all the early martyr- ologies mentioned in this article, and in those printed in Migne, exxxvil, The earlier "Dasius" entry seems to disappear steadily, though slowly, as the Ursula legend works its way into current

martyrologies.

See Crombach, Vita et Martyriwm S. Ursula, Cologne, 1647, and the Bolland- ist Acta Sanctorum, 2lst October. The rationalization of the story is to be found in Oscar Schade's Die Sage von der heiligen Ursula, Hanover, 1854, of which there is a short résumé in Baring-Gould's Lives of the Saints. Schade's results seem to be now generally accepted. (T. A. A.)

URSULINES, a religious order founded at Brescia by Angela de Merici! in 1537, primarily for the education of girls. It was approved in 1544 by Paul IIL, and in 1572 Gregory XIIL., at the instance of Charles Borromeo, made enclosure obligatory and declared it a religious order under the rule of St Augustine. In the following century it was powerfully encouraged and supported by St Francis de Sales ; and towards the beginning of the 18th

century, the period of its greatest prosperity, the order embraced some 20 congregations, with 350 convents and from 15,000 to 20,000 nuns. It still has some importance and possesses about 36 convents in Germany and Austria alone.

URUGUAY. The republic of Uruguay, officially known as the ORIENTAL REPUBLIC oF THE Uruauay, and long locally called the Banpa OrtenTaL (meaning the land on the eastern side of the large river from which the country takes its modern name), is the smallest independent state in South America. It runs conterminous with the south- ern border of the empire of Brazil and lies between 30°

1 Born 1470, died 1540, canonized 1807.

and 35° §. lat. and 53° 25' and 57° 42' W. long. ; its area is 73,185 square miles, The country is in some sense a peninsula, having a seaboard on the Atlantic Ocean of 120 miles, a shore line to the south on the river Plate of 235 miles, and another of 270 miles along the Uruguay on the west. The boundaries separating it from Rio Grande do Sul, a province of Brazil, are Lake Mirim, the rivers Chuy, Yaguaron, and Cuareim, and a cuchilla or low range of hills called Santa Ana, The extent of the northern frontier from the Cuareim to the bar of the Chuy on the coast of the Atlantic is 450 miles. west to north-east by the river Negro and its affluent the Yi. The Uruguay (see Puate River, vol. xix. p. 187) is navigable all the year by steamers from the island of Martin Garcia at the mouth to Salto (200 miles). Above this place the navigation is interrupted by rapids. The ordinary volume of water in the Uruguay averages 11 millions of cubic feet per minute. The Negro, of which the principal port is the city of Mercedes, is the only important and to any practical extent navigable inland river. Others are navigable for short distances and by steamers of light draught. Besides the rivers mentioned, the chief streams are the Santa Lucia, which falls into the Plate a little west of Montevideo; the Queguay in Paysandi; and the Cebollati, rising in the sierras in Minas and flowing into Lake Mirim. These rivers as well as the Uruguay are fed by innumerable smaller streams or "arroyos," many of which have the importance and sometimes the names of rivers, such as the Arapey in Salto, the Dayman in Pay- sandu, the Yaguary (an affluent of the

Negro) in Tacua- rembé, the Arroyo Grande between the departments of Soriano and San José, and the San José (an affluent of

the Santa Lucia). None of the sierras or mountains in Moun- Uruguay exceed (or perhaps even attain) a height of tains.

2000 feet ; but, contrasting in their tawny colour with the grassy undulating plains, they loom up high and are often picturesque. They are ramifications of a range which, breaking away from the Andes in about 20° 8. lat., reaches the frontier of Uruguay in 32°. Here the chain divides, forming the Cuchilla de Haedo on the north and west and the Cuchilla Grande on the south and east. In the departments of Minas and Maldonado the second range takes the name of the Ghost Mountains. No accurate geological survey has yet been made, but it is known that the hills in the north are chiefly gneiss and granite and in other parts porphyry and sandstone. The hilly districts in the north and east contain minerals of many kinds, in- cluding gold, lead, copper, agate, amethyst, alabaster, and marble, The limestone, granite, and marble quarries have some commercial value ; but so far little progress has been made in the working of metallic veins. For the gold mines, see below.

The seat of government is the city of MonrEvipEo (q.v.) at the entrance of the river Plate. The harbour and roadstead of that port form the only good natural refuge for shipping for hundreds of miles south of Rio de Janeiro.

Uruguay has a healthy climate. Endemic diseases are unknown Climate.

and epidemics are rare. According to the tables of mortality for 1882, out of a total of 9640 deaths 45 were of persons over 100 years of age. In the interior, away from the sea and the shores of the great rivers, the temperature frequently rises in summer as high as 86° Fahr. and in winter falls as low as 35°°6 Fahr. In the dis- tricts bordering on the coast the thermometer seldom falls below 37°; and only for a few moments and at long intervals has it becn known to rise as high as 105°. The annual rainfall is stated to be more than twice that of Paris (19°68 inches). This arises not from the frequency of rain but from the greater quantity which falls in a given time. Observations made during the years 1842 to 1852 inclusive showed that there were in Montevideo in the summer season—November,

December, and January—70‘1 fine days, 14:1 cloudy, and 6°1 wet; in winter—May, June, and July—there were 54°83 fine, 27°1 cloudy, and 10°6 wet days.

Uruguay is intersected nearly from Rivers,

Flora.

Fauna.

Popula- tion.

UR UGuU AY

The pastoral wealth of Uruguay as of the neighbouring Argen- tine Republic is due to the fertilizing constituents of “pampa mud,” geologically associated with gigantic antediluvian animals, whose fossil remains are found abundantly in those regions. The country is rich in hard woods, suitable for cabinet work and certain building purposes. The principal trees are the alder, aloe, palm, poplar, acacia, willow, and eucalyptus (recently introduced). The “«montes,” by which are understood plantations as well as native thickets, produce amongst other woods the algarrobo, a poor imita- tion of oak ; the guayabo, a substitute for boxwood ; the quebracho, of which the red kind is compared to sandalwood; and the urunday, black and white, not unlike rosewood. Indigenous palms grow in the valleys of the Sierra José Ignacio, also to some extent in the departments of Minas, Maldonado, and Paysandu. The myrtle, rosemary, mimosa, and the scarlet-flowered ceibo are amongst the plants commonly seen. The valleys within the hill ranges are fragrant with aromatic shrubs. In the plains below the swards are gay with the scarlet and white verbena and other wild flowers of brilliant hues. The country abounds in medicinal plants. The sarsaparilla even colours the water of the Rio Negro and gives to it its name —the “black river.”

Amongst the wild animals the tiger or ounce—called in the Guarani language the “ja-gua” or “ big dog”—and the puma are found on the frontier of Brazil and on the wooded islets and banks of the larger rivers. The tapir, fox, deer, wild cat, wild dog, carpincho or water hog, and a few

small rodents nearly complete the list of quadrupeds. A little armadillo, the mulita, must be mentioned as the living representative of the antediluvian giants, the mylodon, mastodon, megatherium, &c. The ostrich—ZRhea americana—roams everywhere in the plains ; and there are a few specimens of the vulture tribe, a native crow (lean, tall, and ruffed), partridges, and quails. Parakeets are plentiful in the "montes," and the lagoons swarm with waterfowl of all descriptions. The most esteemed is the "pato real," a large duck. Of the birds of bright plumage the humming bird and the cardinal—the scarlet, the yellow, and the white—are the most attractive. The fish of the lagoons and streams are coarse, and some of them primitive in type ; but two or three kinds, found generally in the large rivers, are much prized. The varieties of fish on the sea coast are many and excellent ; 130 species are known. More than 2000 species of insects have been classified. The scorpion is rarely seen; but large and venomous spiders are common. The principal reptiles are a lizard, a tortoise, the "vivora de la cruz," a dangerous viper, so called from marks like a cross on its head, and the rattlesnake, this last in Maldonado and the stony lands of Las Minas.

At the commencement of the 19th century the population of Montevideo and the surrounding territory was estimated by Azara at 30,000, one-half of these being given to the city of Montevideo. This total seenis not to have included what remained of the in- digenous inhabitants in the north and west, though the Indian population of the Jesuit missions before these were destroyed, about the year 1767, was known to be very numerous. But the aborigines have now completely disappeared. They have been supplanted by half-breeds, from whom the class known as gauchos are mostly re- eruited. The gauchos are now being supplanted by European im- migrants and their progeny. In 1829, the epoch of the declaration of independence, the population is stated to have numbered 74,000, and in 1852, after the great war, 131,969. In 1860 the number had risen to 221,300 and in 1878 to 450,000. Comparatively recent esti- mates place it between 450,000 and 700,000, the latest official estimate being 551,768 ; but no formal census has yet been taken. In the eighteen departments of the state the proportion of foreigners is 25°41 per cent. of the population (in the department of Monte- video 42°29 per cent. and in the others 24°66 per cent.), consisting of 39,780 Spaniards, 36,303 Italians, 20,178 Brazilians, 15,546

Argentinians, 14,375 French (principally Basques), 2772 English, 2125 Germans, and 9148 of other nations. The density of the population in the metropolitan department is 365 inhabitants per square mile; in the whole republic it is 4°83, in the agricultural department of Cauelones 27°37, and in the remote departments of Tacuarembé and Rivera about 16. In respect of numbers the males have a slight preponderance over the females. Of the child- ren 20°23 per cent. are illegitimate, in the inetropolitan depart- ment 7°73 and in the rural departments 23°24. Illegitimate births have recently decreased, a fact which may be explained by the insti- tution of civil marriage and by the appointment of registrars in the remote country districts. Marriages take place at the rate of 6°8 per 1000. The death-rate is only 16°5 per 1000.

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Salto and Artigas. The principal inland town is San José. he chief ports, besides Montevideo, are Salto, Paysandu, Fray Bentos, Mercedes, Colonia, and Maldonado.

More than two centuries ago the Banda Oriental was looked upon Agricul- by the Spanish colonies on the opposite banks of the Plate and ture and Uruguay as a station for the breeding of live stock and the cutting industry.

of timber and firewood. And at this day, in spite of the thriving foreign trade of Montevideo, it still partakes largely of this char- acter. It boasts of 20,000,000 sheep—perhaps 14,000,000 would be nearer the mark—and 8,000,000 head of cattle. The country being in general pastoral, sheep and cattle grazing is the main occupation of the people; the sheep flourish best in the southern and western departments, whilst the principal cattle districts are towards the north and east. More than two-thirds of the public wealth, estimated variously between £80,000,000 and £120,000,000, consist of land, live stock, and rural properties. Ninety-six per cent. of the exports of the country consists of live stock and their produce—wool, hides, horns, hair, sheepskins, tallow, grease, bones, bone-ash, and jerked beef. More than half the fixed property and eommercial capital is in the hands of foreigners. At Fray Bentos, in the department of Rio Negro, is the Liebig factory of extract of meat; at Colonia there is a branch of the River Plate Frozen Meat Company. But, apart from these, and some breweries, flour-

mills, tanneries, establishments in Montevideo for the making of boots and shoes and clothing, and a few local industries, unnaturally fostered by high import duties, there are no manufactures to speak of. Agriculture is still in a promising infancy. Latterly it has made great strides ; yet the export of agricultural produce appears to be relatively insignificant. At intervals during the last twenty years agricultural settlements (colonies) have been established with great success in different departments, but principally in Colonia, where the settlers are mostly Italians and Swiss. These prosperous colonies have already in Colonia outgrown the space originally allotted ; but owing to the irregular and illegal appropriation of the public lands there is no more land to bestow on settlers, native or foreign, except at the exorbitant rates demanded by privatc owners and speculators,

At Cufiapirt in Tacuarembé gold was accidentally discovered in Minerals.

1842. The mines have been worked at intervals since 1867, but, partly owing to difficulties of communication, with indifferent suc- cess. But gold-mining seems to have lately assumed a more hope- ful aspect, ope to the employment of improved and economical machinery introduced by a French company. The metals of Uruguay are found in two quite distinct systems of hills. The Cufiapiru mines are in the Santa Ana range, the auriferous quartz being found in thin layers embedded in rocks of red porphyry. The formation of the system in general resembles that of the gold – producing regions in Brazil, California, and Australia. The Pan de Azucar (Sugar-Loaf Mountain), near the south coast of Maldonado, forms the extremity of a second system, which has its origin as far north as Pernambuco in Brazil ; as developed in Uruguay it is Huronian, limestone and slate being superposed on the gneiss and granite. The metals of this system are principally silver, lead, copper, and an argentiferous lead, which in earlier times the Spaniards mistook for silver. Two copper mines at the foot of the Pan de Azucar are now in active operation.

Since the beginning of the 19th century the value of the exports Com- and imports has increased twenty-fold, and with some relapses has merce.

more than doubled in the last twenty years. In 1881 the total value was £8,116,680, and in 1885 £10,750,747. The value of the exports is always a little in excess of that of the imports. Within the last ten years the number of

vessels entering the port of Montevideo has increased only about 10 per cent., whereas the total tonnage has increased 100 per cent., owing to the large ocean steamers which trade with the port or make it a place of call. A few ycars ago the imports from Great Britain amounted to about a third of the whole, and the exports to the same country to about one-fourth of the whole. But much of the produce from the river F.ate countries in general which formerly was shipped to England or to Antwerp now goes direct to France or to Hamburg and Bremen.

Telegraph lines, with a total length of 661 miles, exist in most Commu- Submarine cables communicate with Buenos nication.

of the departments. : Ayres and the ports of Brazil, and thence with Europe. The rail- ways are comprehended in three main systems, the central, north- western, and eastern; their combined length barely reaches 300 miles. There are no public roads in the country ; but communica- tion in the more inhabited parts is easily effected over the nearly level grassy plains.

The system of national education is gratuitous and compulsory. Educa- The number of school children is over 30,000, about 5-4 per cent. of tion. the total population. The teaching at the national schools is irre- spective of religious creed or denomination, In higher education much has yet to be accomplished. There is a school of arts and trades in the capital. The university of Montevideo, founded in 1838, numbers about 1300 students. The state religion 1s Roman Catholic ; but all sects enjoy complete toleration, unless a decided non-toleration of the Jesuits be regarded as an exception to the rule.

Adminis- The country is divided into eighteen departments, of which that trative of Montevideo is the smallest, although it contains one-fourth of divisions, the total population. Adjoining this is Canelones; and in a northerly direction are those of Florida, Durazno, Tacuarembo, and Rivera, the last-named bordering on Brazil. To the eastward on the Atlantic are Maldonado and Rocha, and north and west of these Minas, Treinta y Tres, and Cerro Largo. To the west, along the Plate and Uruguay, are San José, Colonia, Soriano, Rio Negro, and Paysandu ; and farther north towards the Brazilian frontier are

Govern- ment.

Army and navy.

Finance.

History.

The legislative power of the state rests with the general assembly, consisting of two chambers, one of senators (18) and one of repre- sentatives (51). The deputies of the lower house are elected annually and directly by the people, one deputy for every 3000 of the population, or any fraction not less than 2000. One senator is named for each department. The executive power is exercised by the president of the republic, who is elected by the general assembly. The judicial power is vested in a superior court, com- posed of two courts of appeal, which temporarily supply the place of a supreme court of justice, not yet created. ;

The permanent army on a peace footing consists of 3260 men. The national guard numbers about 20,000. On an emergency the Government could put into the field 30,000 men. The regular troops are well armed and accoutred after the European fashion. The navy consists of a few small steamers and gunboats.

The estimated revenue for 1886-87 was £2,775,362 (about two- thirds from custom dues, the rest from taxes on property and from stamps, trade licences, &c.). Of the estimated expenditure about two-fifths are devoted to the payment of the interest on the public debt, which in 1883 amounted to £11,127,000. On ist July 1886 the debt was officially stated to be £14,718, 089. :

The history of Uruguay dates from 1512, when Juan Diaz de Solis entered the Parand-guazti or "sealike" estuary of the Plate and landed about 70 miles east of the present city of Montevideo. Uruguay at that time was inhabited by Indians, of whom the dominant tribe was called Charrtas, a people described as physically strong and well-formed, and endowed with a

natural nobility of character. Their habits were simple, and they were disfigured neither by the worst crimes nor by the primitive superstitions of savages. They are said to have revealed no vestiges of religion. The Charrias are generally classified as a yellow-skinned race, of the same family as the Pampa Indians; but they are also repre- sented as tanned almost black by the sun and air, without any admixture of red or yellow in their complexions. Almost beard- less, and with thin eyebrows, they had on their heads thick, black, lustrous hair, which neither fell off nor turned grey until the possessors reached the age of eighty. They lived principally upon fish, venison, and honey. In the Guarani language "Charrua" means turbulent, and by their enemies the Charruas were accounted as such, and even ferocious, although admitted to be generous to their captives. They were a curiously taciturn and reticent race. Their weapons were the bow and arrow and stones.

Solis, on his second visit, 1515-16, was slain by the Charruas in Colonia. Eleven years later Ramon, the lieutenant of Sebastian Cabot, was defeated by the same tribe. In 1603 they destroyed ina pitched battle a veteran force of Spaniards under Saavedra. During the next fifty years three unsuccessful attempts were made by the Spaniards to subdue this courageous people. The real conquest of

ruguay was commenced under Philip III. by the Jesuit missions. It was gradually consummated by the military and commercial settlements of the Portuguese, and subsequently by the Spaniards, who established themselves formally in Montevideo under General Zavala in 1729, and finally demolished the rival Portuguese settle- ment in Colonia in 1777. From 1750 Montevideo enjoyed a pro- vincial government independent of that of Buenos Ayres. 'The American rebellion, the French Revolution, and the British invasions of Montevideo and Buenos Ayres (1806-7) under Generals Auchmuty and Whitelock all contributed to the final extinction of the Spanish power on the river Plate. During the war of independence Monte- video was taken in 1814 by the Buenos-Ayrean general Alvear. A long struggle for dominion in Uruguay between Brazil and the revolutionary Government of Buenos Ayres was concluded in 1828, through the mediation of Great Britain, Uruguay being declared a free and independent state. The republic was formally con- stituted in 1830. Subsequently Juan Manuel

Rosas, dictator of Buenos Ayres, interfered in the intestine quarrels of Uruguay ; and Montevideo was besieged by his forces, allied with the native par- tizans of General Oribe, for nine years (1842-51). From the era of its independence to about 1870 the history of Uruguay is a long record of foreign invasions and intrigues, financial ruin, and politi- cal folly and crime,

See Album de la Republica Oriental del Ur i and M. de Pena (isalevideo, 1882) ; aitnete. ees tor se ee years, official documents and reports published by the Government of ruguay; Bauza, La Dominacion Espafiola en el Uruguay (Montevideo, 1880); G. EB. Bor- doni, La Repubblica dell' Uruguay (Milan, 1885); M. G. and E. T. Mulhall Handbook of the River Plate (London, 1885); The Republic of Uruguay (London,

1883); an official and statistical pamphlet by Lomba:; Re i Palgrave (1885 and 1887). "ines aa u aie

URUMIAH. See Urmta.

USBEGS. See Boxuara, Kutva, Moneors, TurKe- STAN, and TURKS.

USHANT (Fr. Ouessant), the most westerly of the islands off the coast of France, 26 miles west-north-west from Brest, belongs administratively to the department of Finistere. It is about 44 miles in length, and almost

entirely granitic, with steep and rugged coasts, accessible only at a few points. The island affords pasturage to a few sheep and horses, and contains some small villages, the chief being St Michel. The inhabitants are princi- pally pilots and fishermen. The total population in 1886 was 2307.

USHER, James (1580-1656), prelate and scholar, was born in the parish of St Nicholas, Dublin, on 4th January 1580. He was the eldest son of Arnold Usher, one of the six clerks in Chancery, and descended from the house of Nevill, one of whose scions, accompanying John Planta- genet to Ireland in the capacity of usher in 1185, adopted his official title as a surname. James Usher was sent to a school in Dublin opened by two political agents of James VI. of Scotland, who adopted this manner of averting the suspicions of Elizabeth's Government from their real object, which was to secure a

party for James in Ireland in the event of the queen's death. In 1593 Usher matriculated as one of the first students at the newly-founded university of Dublin, whose charter had been obtained in 1592 by his uncle Henry Usher, arch- bishop of Armagh. He proved a diligent student, devoting much attention to controversial theology, graduated as M.A. in 1600, and became a fellow of Trinity College. On the death of his father in 1598 he resigned the family estate to his younger brother, reserving only a small rent-charge upon it for his own maintenance, and prepared to enter into holy orders. When he was but nineteen he accepted a challenge put forth by Henry Fitz-simons, a learned Jesuit, then a prisoner in Dublin, in- viting discussion of Bellarmine's arguments in defence of Roman Catholicism, and acquitted himself with much dis- tinction. In 1600 he was appointed proctor of his college and catechetical lecturer in the university, though still a layman, and was ordained deacon and priest on the same day, in 1601, while still under the canonical age, by his uncle the primate. In 1606 he became regius professor of divinity and also chancellor of St Patrick's cathedral, Dublin. He was a frequent visiter to England to purchase books for his college library, and upon similar errands, making on these occasions the acquaintance of the most eminent scholars in London, Oxford, and Cambridge, such as Camden, Selden, Sir Thomas Bodley, and Sir Robert Cotton. He took his degree of D.D. in 1612, and in the following year published his first printed work, though not his first literary composition,—Gravissime Questionis de Christianarum Ecclesiarum, in Occidentis presertim partibus, ab Apostolicis temporibus ad nostram usque xtatem, continua successione et statu, Historica Haplicatio, wherein he took up the history of the Western Church from the point where Jewel had left off in his Apology for the Church of England, and carried it on from the 6th till past the middle of the 13th century, but never completed it. In this same year he married Phoebe, daughter of Dr Luke Chaloner, a wealthy heiress. In 1615 he took part in an attempt of the Irish clergy to impose a Calvinistic confession, em- bodying the Lambeth Articles of 1595, upon the Irish Church, and was delated to King James in consequence. But on his next visit to England in 1619 he brought with him an attestation to his orthodoxy and high professional standing, signed by the lord deputy and the members of the privy council, which, together with his own demeanour in a private conference with the king, so influenced the latter that he nominated Usher to the vacant see of Meath, of which he was consecrated bishop in 1620. In

1622 he published a controversial Discourse of the Religion anciently Professed by the Irish and British, designed to show that they were in agreement with the Church of England and opposed to the Church of Rome on the points in debate between those churches, In 1623 he was made a privy

councillor for Ireland, and in the same year was summoned to England by the king that he might more readily carry on a work he had already begun upon the antiquity of the British churches. While he was detained on this business the archbishop of Armagh died in January 1624, and the king at once nominated Usher to the vacant primacy; but severe illness and other causes impeded his return to Ireland until August 1626.

For many years Archbishop Usher was actively em- ployed both in the government of his diocese and in the publication of several learned works, amongst which may be specified Hmmanuel (a treatise upon the Incarnation), published in 1638, and Britannicarum Ecelesiarum Anti- quitates, in 1639. In 1634 he took part in the convocation which drafted the code of canons that formed the basis of Irish ecclesiastical law till the disestablishment of the Irish Church in 1869, and defeated the attempt of Bram- hall, then bishop of Derry and later his own successor in Armagh, to conform the Irish Church exactly to the doctrinal standards of the English. He put the matter on the ground of preserving the independence of the Trish Church, but the real motive at work was to maintain the Calvinistic element introduced in 1615. In 1640 he paid another visit to England on one of his usual scholarly errands, meaning to return when it was accomplished. But the rebellion of 1641 broke out while he was still at Oxford, and he never saw his native country again. He published a collection of tracts at Oxford in that year, inclusive of a defence of Episcopacy and of the doctrine of non-resistance. One blot on his memory is that, being one of the five prelates whom Charles I. consulted whether he could conscientiously assent to the Act of attainder against the earl of Strafford after having pledged his word to him for his safety, Usher joined in the casuistical advice given by all except Juxon, who alone told the king that his pledged word could not be lawfully broken. All Usher's property in Ireland was lost to him through the

rebellion, except his books and some plate and furniture, but he was assigned the temporalities of the vacant see of Carlisle for his support. In 1643 he was offered a seat in the As- sembly of Divines at Westminster, but declined it publicly in terms which drew upon him the anger of the House of Commons, and an order for the confiscation of his library was averted only by the interposition of Selden. He quitted Oxford in 1645 and went into Wales, where he remained till 1646, when he returned to London, and was in 1647 elected preacher to the Society of Lincoln's Inn, an office he continued to hold till a little before his death. During his residence in Wales a hyper-Calvinistic work entitled A Body of Divinity; or the Sum and Substance of the Christian Religion, was published under his name by Downham ; and, though he repudiated the authorship in a letter to the editor, stating that the manuscript from which it was printed was merely a commonplace-book into which he had transcribed the opinions of Cartwright and other English divines, often disapproving of them and finding them dissonant from his own judgment, yet it has been persistently cited ever since as Usher's genuine work, and as lending his authority to positions which he had long abandoned, if he ever maintained them. In 1648 he had a conference with Charles I. in the Isle of Wight, assisting him in the abortive negotiations with Parliament on the question of Episcopacy. In 1650-54 he published the work which at the time and for more than a century after- wards was accounted his most important production, the Annales Veteris et Novi Testamentt, in which he propounded a scheme of Biblical chronology which held its ground until disproved by very recent advances in scholarship, and whose dates were inserted by some unknown authority in the margin of reference editions of the authorized ver-

sion. He was to some extent favoured by Cromwell after he became lord protector, who seems to have promised Usher a pension and a grant for twenty-one years of the lands belonging to the see of Armagh; but there is no proof that either was actually carried out. In 1655 Usher published his last work, De Graca LXX. Interpretum Ver- sione Syntagma. He died on 20th March 1656, in Lady Peterborough's house at Reigate in Surrey. His body was buried in Westminster abbey, in the chapel of St Erasmus. 'To one daughter who survived him he left his library, and she sold it to the officers

and soldiers of Cromwell's army in Ireland, who deposited it in Dublin castle, whence it was removed at the Restoration and given, according to Usher's original purpose, by direction of Charles II. to the library of Trinity College, of which it still forms a part.

Usher's works are very numerous, and were first collected by Elrington and Todd, Dublin, 1847, in 17 vols. (BR. By L.)

USKUP, Usxus, or Skopiiz, a town of European Turkey, capital of the sanjak of the same name and of the vilayet of Kossova, on the upper Vardar river, about 160 miles north-west of Saloniki. It occupies a pictur- esque and important strategic position near the southern foot of the Skhar-dagh (Scodrus), which connects the Balkan range in the east with the Bosnian and Albanian highlands in the west, and forms the water-parting be- tween the streams flowing north to the Danube and those going south to the Aigean. Here also converge the ethno- logical domains of the Albanians and Slavs (Servians, Bosnians, and Bulgarians), so that the population, estimated at 28,000, is of a somewhat mixed character. Uskup has some flourishing industries, such as leather and metal-work, weaving and dyeing, and is the centre of a rich agri- cultural district growing large quantities of fruits and cereals. It is the residence of the provincial governor, the seat of a Greek archbishop, and one of the chief stations on the main line of railway which runs from Saloniki up the Vardar valley to Bosnia. It communicates with the Simnitza valley and with Prisren by practicable roads running north and north-west over the encircling ranges.

Uskup retains in a slightly modified form the ancient name of Skupi (Skopi), a city of Peonia (north Macedonia), forming a northern outpost of Greek and Roman culture towards Dardania and Dacia Aureliani.

USURY. An ancient legal conception, it has been said, corresponds not to one but to several modern concep- tions; and the proposition is equally true when economic is substituted for legal. Until quite recent times the term "usury" covered a number of essentially different social phenomena. "Thou shalt not lend upon usury to thy brother, usury of money, usury of victuals, usury of any- thing that is lent upon usury. Unto a stranger thou mayest lend upon usury ; but unto thy brother thou shalt not lend upon usury, that the Lord thy God may bless thee" (Deut. xxiii. 19, 20). In this sentence we

find in- terest of all kinds blended together, and the natural economic tendencies directly counteracted by the moral and religious law. At the present day, "usury," if used in the old sense of the term, would embrace a multitude of modes of receiving interest upon capital to which not the slightest moral taint is attached. The man who does not in some shape or other lend his capital upon "usury " is, in the modern world, generally considered as lacking in his duty to himself or his family. The change in the moral attitude towards usury is perhaps best, ex- pressed by saying that in ancient times so much of the lend- ing at interest was associated with cruelty and hardship that all lending was branded as immoral (or all interest was usury in the moral sense), whilst at present so little lending

takes place, comparatively, except on commercial principles, XXIV. — 3

that all lending is regarded as free from an immoral taint. This change in the attitude of common-sense morality in respect to "anything that is lent upon usury" is one of the most peculiar and instructive features in the economic progress of society.

"Tt is worthy of remark," says Grote (History of Greece, vol. iii. p. 144), 'that the first borrowers must have been for the most part men driven to this neces- sity by the pressure of want and contracting debt as a desperate resource without any fair prospect of ability to pay; debt and famine run together in the mind of the poet Hesiod. The borrower is in this unhappy state rather a distressed man soliciting aid than a solvent man capable of making and fulfilling a contract ; and if he cannot find a friend to make a free gift to him in the former character he would not under the latter character obtain a loan from a stranger except by the promise of exorbitant interest and by the fullest eventual power over his person which he is in a position to grant." This remark, though suggested by the state of society in ancient Greece, is largely appli- cable throughout the world until the close of the early Middle Ages. Borrowers were not induced to borrow as a rule with the view of employing the capital so obtained at a greater profit, but they were compelled of necessity to borrow as a last resort. The conditions of ancient usury find a graphic illustration in the account of the building of the second temple at Jerusalem (Neh. v. 1-12). The reasons for borrowing

are famine and tribute. Some said, '"“We have mortgaged our lands, vineyards, and houses, that we might buy corn, because of the dearth ;” others said, 'We have borrowed money for the king's tribute, and that upon our lands and vineyards . . . and, lo, we bring into bondage our sons and our daughters to be servants, . neither is it in our power to redeem them, for other men have our lands and vineyards.” In ancient Greece we find similar examples of the evil effects of usury, and a law of bankruptcy resting on slavery. In Athens about the time of Solon's legislation (594 B.c.) the bulk of the population, who had originally been small proprietors or metayers, became gradually indebted to the rich to such an extent that they were practically slaves. Those who still kept their property nominally were in the position of Irish cottiers: they owed more than they could pay, and stone pillars erected on their land showed the amount of the debts and the names of the lenders. Usury had given all the power of the state toa small plutocracy. The remedy which Solon adopted was of a kind that we are accustomed to consider as purely modern. In the first place, it is true that according to ancient practice he proclaimed a general setsachtheia, or shaking off of burdens: he cancelled all the debts made on the security of the land or the person of the debtor. This measure alone would, however, have been of little service, had he not at the same time enacted that henceforth no loans could be made on the bodily security of the debtor, and the creditor was confined to a share of the property. The consequence of this simple but effective reform was that Athens was never again disturbed by the agitation of insolvent debtors. Solon left the rate of interest to be determined by free contract, and sometimes the rate was exceedingly high, but none of the evils so generally prevalent in antiquity were experienced.

When we turn to Rome, we find exactly the same diffi- culties arising, but they were never successfully met. As in Athens in early times, the mass of the people were yeomen, living on their own small estates, and in time they became hopelessly in debt. Accordingly the legislation of the XII. Tables, about 500 3B.c., was intended to strike at the evil by providing a maximum rate of interest. Un-

fortunately, however, no alteration was made in the law.

of debt, and the attempt to regulate the rate of interest

utterly failed. In the course of two or three centuries the small free farmers were utterly destroyed. By the pressure of war and taxes they were all driven into debt, and debt ended practically, if not technically, in slavery. It would be difficult to over-estimate the importance of the influence of usury on the social and economic history of the Roman republic. In the provinces the evils of the system reached a much greater height. In 84 B.c. the war tax imposed by Sulla on the province of Asia was at first advanced by Roman capitalists, and rose within fourteen years to six times its original amount. It is interesting to observe that the old law of debt was not really abolished until the dictatorship of Julius Cesar, who practically adopted the legislation of Solon more than five centuries before ; but it was too late then to save the middle class. About this time the rate of interest on first-class security in the city of Rome was only about 4 per cent., whilst in the provinces from 25 to 50 per cent. were rates often exacted. Justinian made the accumulation of arrears (anatocismus) illegal and fixed the rate at 6 per cent., except for mercantile loans, in which the rate received was 8 per cent. On the whole it was truly said of usury during the republic and early years of the empire: "Sed vetus urbi fenebre malum et seditionum discordiarumque creberrima causa." Even when it came to be authorized by Roman law under certain restrictions, it was still looked upon as a pernicious crime. 'Cicero mentions that Cato, being asked what he thought of usury, made no other answer to the question than by asking the person who spoke to him what he thought of murder."

It was only natural, considering the evils produced by usury in ancient Greece and Rome, that philosophers should have tried to give an a priori explanation of these abuses. The opinion of Aristotle on the barrenness of money be- came proverbial, and was quoted with approval throughout the Middle Ages. This condemnation by the moralists was enforced by the fathers of the church on the conversion of the empire to Christianity. They held usury up to detestation, and practically made no distinction between interest on equitable moderate terms and what we now term usurious exactions! The consequence of the con- demnation of usury by the church

was to throw all the dealing in money in the early Middle Ages into the hands of the Jews. A full account of the mode in which this traffic was conducted in England is given by Madox in chapter vil. of his History of the Exchequer (London, 1711). The Jews were considered as deriving all their privileges from the hand of the king, and every privilege was dearly bought. There can be no doubt that they were subjected to most arbitrary exactions. At the same time, however, their dealings were nominally under the supervision of the Jews' exchequer, and a number of regulations were enforced, partly with the view of protecting borrowers and partly that the king might know how much his Jews could afford to pay. It was probably mainly on account of this money- lending that the Jews were so heartily detested and liable to such gross ill-treatment by the people. A curious illustration of this popular animosity is found in the insertion of a clause in the charters granted by Henry III. to Newcastle and Derby, forbidding any Jew to reside in either place. Ultimately in 1290 the Jews were expelled in a body from the kingdom under circumstances of great barbarity, and were not allowed to return until the time of Cromwell. Before the expulsion of the Jews, however, in spite of canonical opposition, Christians had begun to take interest openly; and one of the most interesting ex- amples of the adaptation of the dogmas of the Church of

1 For a popular account of the reasons given in support of the

Canonical objections to usury, and of the modifications and exceptions admitted in some quarters, see W. Cunningham's Usury.

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Plate II,

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Rome to the social and economic environment is found in the growth of the recognized exceptions to usury. In this respect the canonical writers derived much assistance from the later Roman law. Without entering into technicalities, it may be said generally that an attempt was made to distinguish between usury, in the modern sense of unjust exaction, and interest on capital. Unfortunately, however, the modifications which were

really admitted were not openly and avowedly made by a direct change in the statutes, but for the most part they were effected (as so many early reforms) under the cover of ingenious legal fictions. One of the most curious and instructive results of this treatment has been well brought out by Walter Ross in the introduction to his Lectures on the Law of Scotland (1793). He shows, in a very remarkable manner and at considerable length, that "'to the devices fallen upon to defeat those laws (i.e., against usury) the greatest part of the deeds now in use both in England and Scotland owe their original forms" (vol. i. p. 4). One of the consequences of this indirect method of reforming the law was that in some cases the evil was much exaggerated. "The judges," says Ross, "could not award interest for the money; that would have been contrary to law, a moral evil, and an oppression of the debtor; but, upon the idea of damages and the failure of the debtor in per- formance, they unmercifully decreed for double the sum borrowed." He may well remark that imagination itself is incapable of conceiving a higher degree of inconsist- ency in the affairs of men (compare Blackstone, vol. iii. pp. 484, 435).

In the limits assigned to this article it is impossible to enter further into the history of the question, but an attempt may be made to summarize the principal results so far as they bear upon the old controversy, which has again been revived in some quarters, as to the proper relation of law to usury and interest. (1) The opinion of Bentham that the attempt directly to suppress usury (in the modern sense) will only increase the evil is abundantly verified. Mere prohibition under penalties will practically lead to an additional charge as security against risk. The evils must be partly met by the general principles applicable to all contracts (the fitness of the contracting parties, &c.) and partly by provisions for bankruptcy. Peculiar forms of the evil, such as mortgaging to excessive amounts in countries largely occupied by peasant proprietors, may be met by particular measures, as, for example, by forbidding the accumulation of arrears. (2) The attempt to control interest in the commercial sense is both useless and harm- ful. It is certain to be met by fictitious devices which at the best will cause needless inconvenience to the contract- ing parties ; restraints will be placed on the natural flow of capital, and industry will suffer. (3) In the progress of society borrowing for commercial purposes has gradually become of overwhelming importance compared with borrow- ing for

purposes of necessity, as in earlier times. By far the greater part of the interest now paid in the civilized world is, in the language of the English economists, only a fair reward for risk of loss and for management of capital, and a necessary stimulus to saving.

For information upon the modern legislation affecting the subject, see INTEREST and PLEDGE.

On the increasing share of the products of industry given to labour compared with capital, compare Leroy-Beaulieu's Réparti- tion des Richesses (1880), and E. Atkinson's Distribution of Products (1885) and Margin of Profits. (J. S. Nt.)

UTAH, a Territory of the United States, bounded on the N. by Idaho and Wyoming, on the E. by Colorado, on the S. by Arizona, and on the W. by Nevada. The eastern boundary coincides with 109° and the western with 114° W. long. The southern boundary is the 37th

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parallel of latitude ; the northern is on the 42d parallel between the meridians of 114° and 111°, while east of the latter meridian it follows the 41st parallel. The area of Utah is 84,970 square miles.

The surface is greatly diversified, containing high moun- Physical Near the features.

tains, broad arid valleys, and desert plateaus. middle of the northern boundary the Wahsatch Mountains enter the Territory, and they extend southward along its middle line, finally degenerating into plateaus whose eleva- tion diminishes southward. This is the principal moun- tain range of the Territory, and its position marks the highest land, from which, as a watershed, the streams flow off eastward and westward, the former to the Colorado of the West, the latter to sink in the Great Basin. East- ward from the Wahsatch, along the northern boundary of Utah, stretches a broad, massive range, known as the Uintah. These mountains are exceptional in that their trend is east and west, 7.e., nearly at right angles to the other uplifts of the Rocky Mountain system. South of this range and east of the

Wahsatch is a region of pla- teaus, horizontal or but slightly inclined, and receding step by step from the high mountains. In this region all the streams flow in cafions carved in the nearly horizontal sandstones and limestones, to depths ranging from a few hundreds to several thousands of feet. West of the Wah- satch stretches the Great Basin, a region having no outlet to the sea. Its surface presents an alternation of broad desert valleys and narrow abrupt mountain ranges, rising sharply from the valleys. The mean elevation of the Terri- tory is 6100 feet. The lowest portion is near the southern border, where it is less than 3000 feet above the sea; but, on the other hand, many mountain summits exceed 13,000 feet in height. Of the principal peaks may be mentioned Mount Nebo (11,680 feet) in the Wahsatch Range, and Gilberts Peak (13,987), La Motte (12,892), and Burro (12,834) in the Uintah Range. The principal stream of eastern Utah is the Colorado of the West. This is formed by the junction of Green river, which rises in the Wind River Mountains of Wyoming, and the Grand, whose sources are in the snow-fields upon Long's Peak in Colorado. The Green and the Colorado receive numerous branches from the Uintah and Wahsatch Ranges, among them the Uintah, Price, Fremont, San Rafael, and Virgin. With the exception of the first-named, all these streams have their courses far below the general surface, in the characteristic cafions of this strange region. In western Utah the climate is very arid, and, consequently, there are few living streams. The Great Basin, of which this region forms a part, consists of a large number of basins, differing greatly in magnitude. In each of these the waters from the surrounding mountains sink or collect in a lake, which, having no outlet, rises or falls with the excess of supply or evaporation. The largest of these basins is that of Great Salt Lake, which stretches along the western base of the Wahsatch Range. The lowest part of this valley is occupied by the lake, into which drain the rivers from the western slope of the mountains, the chief being the Bear, Weber, and Ogden, while the Provo, Spanish Fork, and American Fork contribute to it through Utah Lake and the river Jordan. In former geologic times Great Salt Lake had an extent vastly greater than at present, as is evidenced by the well-marked shore-lines upon the moun- tains around and within its basin. These shore lines have an altitude nearly 1000 feet higher than the present level of the lake. This higher stage, which has been named Lake Bonneville, was reduced to its present stage primarily by the formation of an outlet at the northern end of Cache valley, by which its waters flowed off through Snake

and Columbia rivers to the Pacific, and secondarily by the excess of evaporation over supply. Since the settlement

Geology.

Fauna and flora.

Popula- tion.

20

of the country, the surface of the lake rose, so that from an area of 1700 square miles in 1849 it had expanded in 1870 to about 2360. But in more recent years it has been slowly receding. Together with these general move- ments, slight oscillations with the changes of season are constantly going on. As Great Salt Lake has no outlet save evaporation, its water contains a large amount of saline matter in solution. The proportion varies inversely with the varying height of the water in the lake, ranging from 14°8 to 22°4 per cent. by weight. The only other bodies of water of considerable magnitude are Bear and Utah Lakes, both fresh and both tributary to Great Salt Lake. Besides the tributaries to Great Salt Lake, the only other stream of importance west of the Wahsatch is the Sevier, which, rising in the plateaus south of the Wahsatch, passes by a circuitous route into the deserts to the west, where it sinks. Formerly it flowed into Sevier Lake, whence its waters were evaporated, but the extensive use of the river for irrigation has caused the lake to disappear.

The Wahsatch Range is in general terms a great mono- clinal uplift, although in detail it is a complicated system of uplifts and faults. The general dip of the beds is to- wards the east, while the fractured edges face the Great Basin. The core of the range is composed of Archzan rocks, while sedimentary beds, as high as the Jurassic, are found upon its eastern flank. The Uintah Range is a broad anticlinal, surmounted by rocks of the Carboniferous age, with more recent formations lying upon its north and south flanks. The rocks of the plateau region are almost entirely sedimentary and lie horizontally, or nearly so. The ranges of the Great Basin are of diversified character, a large proportion of them being monoclinal uplifts, expos- ing the Archean rocks, with sedimentaries tilted

upon their slopes. The valleys have in all cases-a floor of Quaternary deposits, which effectually cover the rock formations that underlie them.

The animal and vegetable life presents variety corre- sponding with that of the topography. Upon the moun- tains and high plateaus are forests of Conifer, with groves of aspen skirting them at their lower limit. Here are found bears of different species, the mule deer, and occa- sionally the elk (wapiti) and the antelope. Upon the lower plateaus and in the desert valleys of the Great Basin life is not. abundant. Pifion pine and cedar, Artemisia, cacti, and yucca characterize the vegetation; while of animals there are few except the coyote, prairie dog, rattle- snake, and scorpion.

The settled portion of Utah lies mainly along the western base of the Wahsatch and in the valleys of that range, particularly in the northern part of the Territory. There are also considerable settlements near the southern bound- ary, in the valleys of the Virgin river. The population numbered 143,963 in 1880, showing an increase of 65:8 per cent. since 1870. The population is at present (1888) probably not far from 175,000. In 1850 the total was only 11,380; in 1860 it had risen to 40,273, and in 1870 to 86,786. Probably four-fifths of the population are adherents of the 'Church of Jesus Christ of Latter Day Saints" or Mormons, as they are popularly designated (see Mormonism). This proportion is steadily diminish- ing as the mining industries, the manufactures, and trans- portation increase, thus bringing in a constantly-increasing "Gentile" element. Of the aggregate population males are decidedly in excess of females: in 1880 there were 100 of the former to 93 of the latter, showing that poly- gamy was not generally practised. The proportion of foreign-born inhabitants is exceptionally large: in 1880 there were 44 foreign-born to 100 natives, 7.e., nearly one- third of the population were immigrants. Of this foreign

element there came from England, 19,654; Denmark, 7791; Sweden, 3750; Scotland, 3201; Wales, 2390; Ireland, 1321; Norway, 1214; Switzerland, 1040; Ger- many, 885. Thus England supplies nearly one-half and Denmark nearly one-fifth, while Germany and Ireland, which furnish the great bulk of the immigrants to the United States at large, are but feebly represented among the Mormons.

Utah is divided into twenty-four counties, enumerated, with their population in 1880, in the subjoined table.

County. Pop. County Pop. County. Pop. Beaver …..... SOLS a MANE ee snes « 8,085 || Sevier …..... 4,457 Box Elder ….| 6,761 |} Millard…..... 8,727 || Summit 4,921 @ache …. 2,562 |} Morgan …... 1,783 |) Tooele…..... 4,497 Davis … p27) leet Witte? on. wc. 1,651 || Uintah …... 799 Emery …..... btsi6}" ||| JRE gaanoons 15263) ||| Uitahy so… .... 17,978 Garfield] ..... Be Salt Lake ….| 31,977 || Wahsateh ….] 2,927 1 (O04 Saeeereprecr es 4,013 |} San Juan…... 204 || Washington ..| 4,235 UPD a sce evayetecaren 8,474 || San Pete …... 11,557 || Weber…..... 12,344

The principal cities, with their populations in 1880, are, —Salt Lake City, the capital of the Territory, 20,768 ; Ogden, in the Salt Lake valley, at the confluence of the Ogden and Weber rivers, 6069; Provo, in the valley of Utah Lake, 3432; and Logan, in Cache valley, 3396. There are numerous other smaller places, making a large aggregate of city and village population. This is a result of the policy of the Mormon Church, which has favoured the grouping of the farming population in villages.

As everywhere throughout the western United States, with the altitude above the sea there is a gradation of climate with respect to aridity. Upon the higher mountains there is sufficient rainfall for the needs of vegetation. But upon the low country the precipitation is slight, so that irrigation is almost universally practised by the agricul- turist. The annual rainfall at Salt Lake City, which is very favourably situated, being south-east of Great Salt Lake and at the immediate base of the Wahsatch Moun- tains, is about 30 inches. In all other habitable parts of the Territory it is less, being not greater than 10 inches in the southern and western portions. Temperature, also, has a wide range in different parts of the Territory. The mean annual temperature at Salt Lake City, which may serve as an average of the habitable parts of Utah, is about 45°, The range of temperature between summer and winter and between day and night is very great, and the changes of temperature are often startling in their magni- tude and abruptness.

The principal industries of Utah are agriculture and mining. Industry.

At Salt Lake City and Ogden some manufacturing is done, and in the remote parts of the Territory cattle and sheep raising is carried on toa limited extent. Agriculture is confined mainly to the Mormons, while mining enterprise is carried on almost ex- clusively by Gentiles. In 1880 the area of land in farms was 655,524 acres, or 1:2 per cent. of the total area of the Territory. A little over two-thirds of this was classed as improved, and nearly all the available water in the Territory was used to cultivate it. The average size of the farms was 69 acres, which was less than in any other State or Territory. The total value of the annual agri- cultural produce was valued at $3,337,410. The number of manu- facturing establishments was 640 and the value of the product $4,324,992. The principal mineral products are silver and lead, which are found associated in the same ores. The mines are situated almost entirely in the Wahsatch Range, east and south- east of Salt Lake City. During 1885 silver to the value of $6,750,000 and 28,000 tons of lead were mined. Of the latter metal Utah, next to Colorado, produces the largest quantity of any State or Territory of the Union. Utah is well supplied with railroads.

of these two lines being at Ogden. the Union Pacific runs northward to Montana and another south- ward to Salt Lake City and thence to the southern part of the Territory. The Denver and Rio Grande Western connects Salt Lake City with Pueblo, in Colorado. In addition to these, there are

1 Formed since the census of 1880 was taken.

The Union and Central Com- Pacific Railroads cross it near the northern boundary, the junction munica- From this place a branch of tion.

numerous short branches in the mountains, making a total length of 876 miles in operation at the close of 1885, Adminis- 'The executive is administered by a governor and a secretary, ap- tration. pointed by the president of the United States, and by a treasurer, nominated by the governor. There is a legislature, the members of which are chosen by the people. The judiciary consists of a chief justice and two associate justices, together with a United States district attorney and a marshal, all appointed by the pre- sident of the United States. The Territory has no debt. The taxable property was assessed in 1885 at $34,821,957. The rate of taxation

was $1°20 per $100. One-fourth of the sum raised is for the support of common schools. Recent While in some respects the influence of the Mormon Church Jegisla- upon its communicants is for good, in promoting industry, eco- tion. nomy, and sobriety, there are other features of it which are not only objectionable but dangerous. Polygamy is but an incident of the system, and the only objectionable one which can be success- fully combated. The all-powerful influence of the church in things temporal as well as in things spiritual is a dangerous feature, and one which can only be corrected by slow-moving social influences. For many years Congress has been trying to frame legislation which would destroy polygamy in Utah, but until recently the action of the courts was frustrated and the laws nullified by the power of the Mormon Church. ll elective offices were filled by Mormons. Juries were necessarily made up mainly of Mormons, whose obliga- tions to the church were superior to any Gentile oath. The Ed- munds Bill, passed in 1882, was the first efficient piece of legisla- tion. This measure declared all elective offices vacant, and consti- tuted a commission to oversee elections and appoint the judges and other officers of election. It disfranchised all polygamists. It annulled the action of the Territorial legislature in extending the ballot to women. It disqualified from service on juries all who accepted the dogmas of the Mormon Church regarding polygamy. Under the operation of this Act the leading polygamists have either been sent to jail or have gone into hiding. A bill of a still more drastic nature was passed by Congress in 1887. It annulled all Acts of the Territorial legislature designed in the remotest degree for the protection of polygamy. It provided that in trials for poly- gamy the wife may be a competent witness, that every marriage ceremony shall be made a matter of public record, and that all illegitimate children shall be disinherited. It annulled all Acts of the legislature incorporating and continuing the charters of the Mormon Church and of the Perpetual Emigration Fund Co., and confiscated their property, with the exception of the church build- ings and parsonages, devoting it to the support of common schools in the Territory. History. The area of Utah was acquired by the United States from Mexico in 1848, under the provisions of the treaty of Guadelupe Hidalgo. It was organized as a Territory in 1850, and at that time it com- prised all the country lying between the eastern boundary of Cali- fornia and the western border of the Great Plains. The subsequent creation of Nevada, Colorado, and Wyoming reduced it to its present limits. In 1847 the Mormons, under

*the leadership of Brigham Young, had commenced to make settlements in Salt Lake valley, and they: rapidly extended themselves over the fertile valleys of the Territory. Prior to the advent of railroads very few Gentiles settled in Utah ; but in recent years, as this once remote region has become easily accessible, the Gentile element has greatly increased. For further details of the history of the Territory, see (H. G**

Mormons,

UTICA (Irvxn), an ancient Pheenician colony in Africa near the mouth of the Bagradas (Majerda), about 20 miles north-west of Carthage. The site, which is still covered with ruins, including those of a vast amphitheatre, lies on a hill which is now 8 or 10 miles from the coast, but in ancient times a bay ran close up to the city, and the remains of quays can still be traced. Founded 1101 3.c. (see vol. xviii. p. 806), Utica was nearly three centuries older than Carthage. The two cities were generally allies ; but Utica, jealous of its neighbour, sometimes acted inde- pendently, and in the Third Punic War it made a separate peace with Rome, and reaped the fruits of the destruction of the greater Punic city, becoming the emporium of Roman trade and the capital of the province, till Carthage was re- built by Cesar in 44 8.c, It was here that the younger Cato killed himself, Utica received the Roman civitas from Augustus, was made a colony by Hadrian, and received the jus Italicum from Septimius Severus, The city was finally destroyed by the Arabs.

The name of Utica is probably Pheenician, and is generally taken to stand for NP'ny, the "old" city, perhaps as distinguished from Carthage, the 'new city." Olshausen, however, suggests the form

PAAY ('colony "). The ruins at Bu Shatir were identified with Utica by Shaw. For plansand a reconstruction, see Daux, Emporia Phéniciens, and atlas to Tissot, Géog. Prov. Rom. d' Afrique (1888).

UTICA, a city of Oneida county, New York, United States, about 180 miles north-north-west from New York City, is situated on the south bank of the Mohawk, about 400 feet above sea-level. The site of the city hasa gentle

slope towards the river. The surrounding country is thickly settled, the principal industries being the manu- facture of cotton, woollen, and iron goods, the production of butter and cheese, and the raising of hops. Utica is the chief market for cheese in the United States, The city is touched by five railroads, the New York Central and Hudson River ; New York, Ontario, and Western ; Rome, Watertown, and Ogdensburg ; Delaware, Lackawanna, and Western ; and New York, West Shore, and Buffalo; and by the Erie Canal. The city is irregularly built. Of the manufacturing industries, which are varied, the most im- portant is that of clothing, and next to it is that of boots and shoes. One of the State lunatic asylums is in Utica. The population of the city in 1880 was 33,914, an increase in ten years of less than 12 per cent., and in 1887 it was estimated at 40,000.

The first settlement at Utica was made near the middle of the 18th

century. In 1798 the village was incorporated, and it received a city charter in 1832.

UTILITARIANISM. See Eruics, vol. viii. pp. 605-7.

UTRECHT, a province of Holland, bounded north by North Holland and the Zuyder Zee, east by Guelderland, south by Guelderland and South Holland, and west by South Holland, has an area of 534 square miles and a population (1886) of 212,454. It belongs chiefly to the basin of the Rhine: the Neder Rijn, which skirts its southern border, after sending off the Kromme Rijn at Wijk, becomes the Lek, and the Kromme Rijn, in its turn, after sending off the Vecht at Utrecht to the Zuyder Zee, assumes the name of the Oude Rijn. The north- eastern portion of the province is drained by the Hem, which falls into the Zuyder Zee. In the west the province is flat and in many places below sea-level ; towards the east, where the Veluwe begins, it is more undulating, and at Zeist reaches a height of 164 feet. The more produc- tive region is in the west; towards the east the soil be- comes sandy and heath-clad. Nearly half (46°5 per cent.) of the total area is under grass; the chief agricultural pro- ducts are corn (buckwheat) and tobacco; bee-keeping is extensively carried on in the east, and there is a bee market at Veenendaal. The province is traversed by rail- ways to Amstertlam, Rotterdam, Leyden, and The Hague, Bois-le-duc, Arnheim, Zutphen, and Zwolle, all converging in Utrecht; it is also amply provided with navigable

water-ways. Of the total population 62 per cent. are re- tumed as Protestant, 37 per cent. as Roman Catholic, and las Jewish. Besides Urrecurt (see below), the capital, only one other town, Amersfoort, has a population exceed- ing 5000 (15,178 in 1887); but in density of population Utrecht ranks third among the provinces of Holland.

UTRECHT, capital of the above province, 22 miles by rail south-south-east from Amsterdam, 38 north-east from Rotterdam, and 35 nearly west from Arnheim, is situated at the point where the Kromme Rijn bifurcates into the Vecht and the Oude Rijn. The town is traversed by two canals or arms of the river, which are crossed by numerous bridges ; it is surrounded by strong forts and strategically covers Amsterdam, though its old ramparts were de- molished in 1830 and have given place to shady promen- ades. The streets are more regular, the squares more spacious, and the canals fewer than in most Dutch towns. Of its twenty churches the most important is the old cathedral of St Martin, a large Gothic building erected in 1254-67, on the site of the original structure founded by

St Willibrord about 720 and completed by Bishop Adelbold about 1015. Only the choir, transept, and western tower (338 feet) now remain, the nave having been blown down by a violent hurricane (1st August 1674) ; the interior (30 feet

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Plan of Utrecht.

wide and 115 feet in height) has been clumsily fitted up with pews and galleries for Protestant worship, so that the effect of its eighteen slender columns is almost entirely lost. On the south side are fine Gothic cloisters, adjoining which are the plain buildings of the university, founded in 1634 (with 41 professors and nearly 600 students) ; con- nected with the university are a valuable library (150,000 volumes), a museum of natural history, physical and chemical laboratories, a botanic garden, and an observa- tory. The town-hall (built in 1830) and the Museum Kunstliefde have small collections of pictures and other objects of art, and the

archiepiscopal museum, opened in 1872, also contains excellent examples of the sacred art of the Netherlands. Among other buildings of interest may be mentioned the royal mint, and the Paushuizen (“ pope’s house”), built by Adrian Floriszoon Boeyens, afterwards Pope Adrian VI., a native of Utrecht, in 1517. Utrecht has excellent schools and several literary and scientific societies, besides barracks, a large military hospital, and a veterinary school. The most important industrial estab- lishments are cigar-factories, manufactories of chemicals and earthenware, and brass-foundries. There is an active trade in the produce of the manufactures, and also in corn, cattle, butter, and cheese. To the east of the town is the Maliebaan or Mall, a triple avenue of trees about half a mile in length. The population of Utrecht in 1876 was 66,106, and in 1887 it was 79,166.

Utrecht (“Oude Trecht” or “old ford”), the Trajectum ad Rhe- num of the Itinerary of Antoninus, was known as Wiltaburg by the Frisians and Franks. Dagobert, king of the East Franks, built a chapel here in 630, and under St Willibrord Utrecht in 696 be- came an episcopal see. The bishops rose to great power during the Middle Ages, and the city was frequently an imperial residence. Conrad II. (1039) and Henry V. (1125) both died at Utrecht, and their hearts were buried in the crypt of the cathedral. The city was handed over to Charles V. by Bishop Henry in 1527. The first confederation of the Dutch provinces was formed in Utrecht in 1579. The celebrated peace of Utrecht between France and Great Britain, Savoy, Portugal, Prussia, and the states of Holland was concluded here on 11th April 1718. Utrecht has since 1728 been the headquarters of the JANSENISTs (q.v.).

UTRERA, a town of Spain, in the province of Seville,

18 miles to the south-south-east of that city, on the rail- way to Jerez and Cadiz, at the junction for Moron and Osuna, lies about 8 miles from the left bank of the Guadal- quivir, in a pleasant valley between two gentle undulations of the foot-hills of the southern sierra. It has no buildings of special interest ; the principal church, which is large and prominent, is Gothic in style and dates chiefly from the 15th century, but some of its most conspicuous features belong to the 17th. The place enjoys considerable pro-

sperity, due mainly to the fertility of the surrounding dis- trict, which produces large quantities of corn, and also fruit of various sorts, oil, and wine. The uncultivated " dehesas " skirting the Guadalquivir support large numbers of sheep and brood mares, and are famous throughout Spain for the bulls they send to the bull-ring. Many of the inhabitants are enterprising landowners or large farmers, and pursue highly enlightened methods of agriculture. An important fair is held at Utrera in September. The population with- in the municipal limits in 1877 was 15,093.

Utrera was of some importance during the Mohammedan period and has the remains of a Moorish castle. It was taken by St Ferdinand, but did not finally become subject to the sovereigns of Castile until the reign of Alphonso XI. (1340).

UXBRIDGE, an ancient borough and market town of Middlesex, England, is pleasantly situated on the Colne and Frayswater, on the Grand Junction Canal, and on a branch of the Great Western Railway, 154 miles west of London. The principal street is spacious and contains a number of good shops, but the streets leading off it are narrow and tortuous. The suburbs have of late greatly increased. The Colne is crossed by a brick bridge of five arches, The principal public buildings are the church of St Margaret in the Perpendicular style, consisting of nave, aisles, and low embattled tower, the town-hall (1836), and the cottage hospital. There are a large number of charities, On the banks of the Colne are several flour-mills. The town possesses several breweries and an iron-foundry. By the Grand Junction Canal, near which there are several saw-mills, a considerable trade is carried on in timber, slates, and coal. The town is governed bya local board of eighteen members. The population of the urban sanitary district (area 496 acres) was 7497 in 1871 and 7669 in

1881.

Uxbridge was one of the small boroughs originated by Alfred the Great. It is not mentioned in Domesday. For a long period it was of considerable importance as a frontier town, and latterly possessed a regular garrison. At Uxbridge negotiations were begun, on 80th January 1645, between the commissioners of Charles I. and the Parliament, but were broken off on 22d February. In 1647 the Parliamentary forces had for some time their

headquarters in the town. It remained a garrison town until 1689. It obtained the grant of a market from Henry II. Until the close of the 17th century it was governed by bailiffs.

UZ. The "land of Uz" (y4y pax) is best known as the scene of the story of Job. Job seems to be represented as living in the country east of Palestine and not far from Edom, to which his friend Eliphaz the Temanite belonged. In Lam. iv, 21 the Edomites appear as in possession of the land of Uz, while in Gen. xxxvi. 28 Uz is one of the pre-Edomite inhabitants of Seir. On the other hand, in Gen. x. 23 and xxii. 21 Uz (or Huz) is Aramean. Fin- ally in Jer, xxv. 20 "the kings of the land of Uz" appear in a clause, absent from the LXX., which seems to be a gloss on the preceding clause, and so to refer to Arabs. Medieval tradition places the home of Job in the Hauran (see Wetzstein in Delitzsch, Z ob), but it is doubtful whether all the Biblical references can apply to one district. The Septuagint forms from Uz the adjective Avoiris, which points to a pronunciation Aus = Arabic Aud, the name of a god whose worship was widely spread and might there- fore be readily borne by tribes or attached to districts in several regions.

23

V

is our twenty-second letter ; it represents the voiced V labio-dental to which F corresponds as the voiceless sound. It has been shown under U that these two symbols were originally one, and that their differentia- tion took place for convenience of writing only. But it was afterwards put to a good use, although not quite the natural one. It would have been better, while retaining wu for the vowel, to have used » for the corresponding labial consonant, which is actually denoted by w. The difference of u and w is simply that of vowel and con-

then had the w-sound there would have been no difficulty in producing the same sound in Teutonic words.

In the Roman system of numerals V stands for five. The reason is uncertain. The old view that it represents half ten (X), as D (500) represents half a thousand (M, originally ©), has no very high degree of probability. It is

perhaps as likely that L, IT., III., ITIL, denoted the uplifted fingers used in counting, and that V denoted the whole hand with the thumb on one side and the four fingers together on the other,

sonant: for ~ there is a sufficient opening of the lips to allow the voice to pass through without friction ; but for w the aperture is so much closed, by bringing together

*VACCINATION (from Lat. vacca, a cow), the name Rela- given in France to the Jennerian practice of cowpoxing, tions of shortly after the practice began in England C1G@8), "Wie *mell-*

pox, cow-

either the inner edges of the lips (as in England) or the outer edges (as in some parts of Germany), that there is an audible amount of friction as the voice passes. The organs employed are the lips only in each case, whereas for v the upper teeth and the lower lip are the factors of the sound.

The symbol v does not occur in the oldest of our texts : it is represented by f, as in "heofon," " ofer," "hlaford " (lord). The f generally is voiced when medial, but voice- less when initial. This absence of two symbols for the corresponding pairs of fricative consonants has been noted already in the use of d (or p) for both th and dh (see under T); salso did duty, as it often does still, for both s and z In Middle English « appears commonly for » The introduction of v into English writing is due to French scribes ; as a matter of fact almost all the words which begin with v are of French origin,

*It is tolerably certain that in Latin v represented the labial and not the labio-dental consonant. The arguments in favour of this view are singly not very important, but they are fairly numerous. The interchange of the w and vsounds, as in " genua" and "genva," "solvo" and *soluo," &c., is most easily explained on the hypothesis that »=w ; so are the loss of v, as in "audi(v)i," "ama(ve)ram," é&c., and the retention of o after » in words like "cervos" (whereas in other combinations o sank to a), because " cer-woos" would have been a more inconvenient combination than "cervoos." Again, the name of the letter should have been "ev," not "ve," like all other fricative sounds, "ef," "el," "es," dc.; but in explosives "be," "de," " pe,"*

“te,” with the vowel following. There is no reason why this should not have been the case if v were really our 2, a labio-dental ; but if it was w the name “ew” was prac- tically impossible, because the w would have been inaudible ; therefore it went over to the other class of names. To these arguments may be added others drawn from trans- literation. Mr A. J. Ellis (Z. £. P., ii. p. 518) agrees that Latin » cannot have been our labio-dental, but he thinks it probable that it was the South-German w, which differs from the North-German w (our 2, labio-dental) in the manner described above, with some other points of difference. His chief ground is that it is hard to imagine w producing v except through an intermediate labial of the North-German kind. There is something in this argu- ment. In any case the difference between these two w-sounds is slight compared with the difference between either of them and the labio-dental v. At what time the labial passed into the labio-dental of the Romance lan- guages is uncertain. We can fix limits of time before Which the change must have taken place: eg., it must have been before the time when the Romanized Gauls, trying to pronounce the Teutonic w in “ “werra,” “ward,” &c., produced “ guerra,” “guard,” &c. If their v had

procedure was based almost exactly on the earlier practice of inoculating the smallpox, the matter being inserted under the skin of the arm by a lancet point ; also the continuance of the same stock from arm to arm through a series of cases was an idea taken from some of the more adroit variolators. To replace smallpox inoculation by cowpox inoculation under certain specified circumstances was Jenner’s tentative project. The history of the intro- duction of cowpoxing, given in the article Jenner (vol. xlil. p. 623), is here supplemented from the point of view of historical criticism.

It is right to say that the views expressed in the present article diverge in many points from the opinions generally received among medical men, and must be re- garded not as the exposition of established and undisputed doctrine, but as the outcome of an independent and laborious research.

Jenner’s originality consisted in boldly designating cow- Jenner.

pox as variole vaccine or smallpox of the cow, and in tracing cowpox itself back to the grease of the horse’s hocks. The latter contention was at length set aside by practical men as a crude fancy; the former designation is just

as arbitrary and untenable. It was elaborately shown by Pearson in 1802, and has often been confirmed by subsequent writers, that the vesicle of inoculated cow- pox, even while it remains a vesicle, is quite unlike a single pustule of smallpox. But it is only for the vesicular stage of cowpox that there is even an allegation of likeness to variola ; the vesicle of natural or unmodified cowpox is only the stage of the disease before it becomes an ulcer, either inflammatory or indurated. Inoculated horse grease has the same vesicular stage ; and so also has the venereal pox when it is inoculated experimentally on the skin. These three very different infections have the same kind of vesicle, in every case unlike a smallpox pustule, and the same natural termination in a phagedenic or indurated sore.

Jenner's originality in starting vaccination in practice is for the most part misunderstood. When he published his Inquiry in June 1798, he had twice succeeded in raising vaccine vesicles by experiment,—the first time in 1796 with matter from a milker's accidental sore, and the second time in March 1798 with matter direct from the cow. The first experiment was not carried beyond one remove from the cow; the second was carried to the fifth remove, when the succession failed. A third ex- periment, in the summer of 1798, failed from the outset ; and his fourth and last experiment, in November-December 1798, led to nothing but extensive phagedenic ulceration in two cases out of six vaccinated.

1 See Ricord, Traité Complet, 1851, plate i. figs. 6 and 7 and ii. 7,

8, and 9; also H. Lee, Med. Chir. Trans., xliv. p. 2388, 2d plate, fig, 2,

Histori- cal sources of vac- cine lymph.

In this posture of affairs Woodville of the inoculation hospital, London, succeeded in January 1799 in starting a succession of arm-to-arm vaccinations from a London cow, which were exceptionally free from the ulcerative termination. From that source Jenner himself was sup- plied with lymph in February, while more than two hundred practitioners both at home and abroad were sup- plied some three weeks later. There was a quarrel with Woodville in due course, and an attempt to set up an authentic

Jennerian lymph independent of the London stock. But the merits of this claim (which otherwise rests on the vague evidence of Marshall) may be judged of by the fact that Ring's application to Jenner in Sep- tember 1799 for genuine lymph was answered by the latter with a supply of matter which was none other than Wood- ville's own stock, after six months' use in the country. Woodville's stock was used all over the world down to 1836. By that time there were numerous complaints that the lymph was degenerating, and a widespread feeling that it was necessary to 'go back to the cow." Apart from the numerous original cases of cowpox alleged to have been found in Wiirtemberg, the first new authentic source was the Passy cow of 1836. From the accidental vesicles on the milker's hand Bousquet, the director of vaccination in Paris, started a new stock, which partly superseded Woodville's lymph hitherto in use in France. In 1838 Estlin of Bristol, after several years' vain en- deavours, heard of original cowpox in Jenner's own parish of Berkeley (Gloucestershire), where the disease was so far forgotten that the milkers were for several days un- aware that the vesicles on their hands had been contracted from cows. Estlin's new geniture is one of the most fully recorded in the history of vaccination. In the same year, and the two following years (1838-41), Ceely of Aylesbury found some half-dozen distinct occurrences of cowpox in the dairy-farms of his district, and cultivated lymph from them. His account of the natural history of cowpox in the cow, and of the effects of primary lymph when inocu- lated on the human arm, is by far the most comprehensive and candid that has ever been given ; without it we should hardly have understood the real nature of cowpox. Bous- quet, Estlin, and Ceely are the chief writers who have authentically described the establishment of new stocks of cowpox lymph since Woodville's original report of 1799. There are numerous other references, less detailed, to original cowpox in the cow, and to vaccinations therefrom, in England, on the Continent, and in the United States ; some of these came to light in the inquiry of the Epidemio- logical Society in 1852. One of the best-known cases of comparatively recent times is the Beaugency cow of 1866, which has been the source of much of the calf-lymph of the Dutch, Belgian, and other vaccine "farms." Another French case occurred in the Gironde in November 1881, and is described in the Bulletin of the Academy of Medi- cine (p. 17, 1882). In England the editors of the Veter- inarian inserted a notice in the number for August 1879, making a request to their readers for lymph "from vesicles on the

teats of cows in cases of so-called natural cowpox." The only answer to it hitherto has been an intimation in June 1880 that there was a case of cowpox at Halstead in Essex, which was visited by Ceely and others and pro- nounced by the former to be of the nature of eczema. In 1876 the disease was found at a farm near Reykjavik in Iceland, where it had never been seen before; it was of the old type, producing sores on the milkers' hands, and causing much alarm by its unfamiliar character.!

1 Cowpox of the original ulcerating type still occurs, but is now hardly recognized as such. The inquiry into an outbreak of scarlet fever in December 1885, traced to a dairy at Hendon (Middlesex), elicited the fact that the inculpated cows, as well as seventy or eighty

The so-called calf lymph is as remote from the cow as Calf ordinary humanized lymph; it differs from the latter lymph. merely in the circumstance that the calf (on its shaven belly) becomes the vaccinifer, instead of the child, and that the cycle of the disease is very much abbreviated or contracted in the calf: the vesicles are distended with lymph about the fourth or fifth day, instead of the seventh or eighth, and are almost unattended by areolar redness and constitutional disturbance, the animal being able to support fifty to a hundred or more vesicles without the smallest inconvenience. On the child's arm the vesicles after calf-lymph are slower in development than in the

calf, and are attended by areola, &c.

Under the influence of theory, "vaccine" lymph has been got Anoma- from two sources that have absolutely nothing to do with cowpox ; lous and, oddly enough, the matter from these sources has been so sources managed as to produce correct vesicles on the child's arm. One of vac- soune is the grease of the horse's hocks and the other is smallpox cine. itself.

._ The grease of the horse was known to produce vesicles and sub- Grease sequent ulcers on the hands almost indistinguishable from those of of the accidental cowpox. There was also the tradition (which breaks horse. down when tested by facts) that accidental infection with the grease protected from smallpox. Jenner held that all " genuine" cowpox came from horse- grease ; and, after he had raised vaccine vesicles on the arms of children by

*matter from the cow's teats, he proceeded to try whether he could not raise the same kind of vesicle experi- mentally by matter once removed from the horse's hocks. The experiment succeeded, just as the accident had done. The vesicle (represented in plate 2 of the Znquiry) ulcerated, and the boy died of what is vaguely termed a "fever" in one place and a "con- tagious fever" in another. The same kind of inconsequent logic suggested the experiment of inoculating the matter of horse-grease upon the skin of the cow's teats, the object being to prove the identity of cowpox with the grease. That too succeeded in the hands of Loy of Whitby, Loy also inoculated children with the same matter, and raised vesicles on their arms, which were, of course, the same as the accidental vesicles (compared to the blister raised by a burn). Sacco of Milan actually used the equine matter on a large scale, instead of cowpox matter; and De Carro of Vienna '*equinated"" many persons in that city with lymph sent him by Sacco. Baron prints a memorandum of Jenner, dated 23d July 1818, relating to "equine virus which I have been using from arm to arm for these two months past, without observing the smallest deviation in the progress and appearance of the pustules from those produced by vaccine," and a second note, dated 17th May 1817, in which Jenner says he "took matter from Jane King (equine direct) for the National Vaccine Establishment. The pustules beautifully correct." This is not the place to enter upon the pathology of horse- grease; and, as a matter of fact, equination has not eh much practised on the whole. According to Jenner's own data, it was an occasional constitutional disease of the horse's hocks in wet seasons, which was communicable to the hands of men in the form of large whitish vesicles, ending in corroding and painful open sores (see the case reported to him by Fewster, op. cit., ed. 1800, p. 96).*

The other anomalous source of " vaccine" is human smallpox. Human Jenner having succeeded in passing off his doctrine that cowpox is small- smallpox of the cow, it occurred to some persons about forty years pox. after to prove the doctrine by experiment, the proof being to variolate the cow on the udder. This was accomplished in 1838, after much trouble, by Thiele in Kazan (Russia), who inoculated several thousands of persons with the variolous matter " passed through the system of the cow." Within a few months of that experiment, the same thing was attempted by Ceely of Aylesbury, who succeeded, after many failures, in raising a large variolous

pock, not ou the udder of the cow, but on the mucous membrane of the vulva. The first experiment with the matter of this pock was undesigned ; his assistant pricked his hand with the lancet which had just been dipped into the large pustule, and in due course had an attack of smallpox. Ceely persevered with his experiments (having meanwhile variolated another heifer at five places on the vulva), and in due time so "managed" his matter as to produce vesicles on the human arm (without general eruption on the skin), which were regarded at Cheltenham and other places as

at two other farms, were affected with what the dairymen called "cowpox"' (see Cameron, Trans. Epid. Soc., April 1886). A similar outbreak in November 1887, involving 160 cows and 7 milkers at four farms in Wiltshire, was clearly proved by Crookshank to be the his- torical cowpox of Jenner and Ceely, by the evidence of identity in the sores on the cows' teats and in the sores or vesicles on the milkers' hands or faces, and by the production of correct vaccine vesicles in calves inoculated with lymph from a vesicle on the face of a milker (Brit. Med. Journ., 17th December 1887 and 21st January 1888).

Natural history of cow- pox.

Its ori- gination,

YRCCILNATION

on the whole better than the cowpox vesicle of the period. But the real practical application of this idea was reserved for Badcock, a dispensing chemist at Brighton. It does not appear that any authentic or fully detailed account of Badcock's experiments has been published ;4 but he thus summarized the results some forty years later (Pall Mall Gazette, Jan, 23, 1880):—" By careful and repeated experiments I produced, by the inoculation of the cow with smallpox, a benign lymph of a non-infectious and highly protective character. My lymph has now been in use at Brighton for forty years, and is at the present time the principal stock of lymph employed there, being that exclusively used by the public vaccinators." At Boston, U.S., the same kind of lymph was raised and put in use in 1852. But at Attleborough, Mass., the same experiment had in 1836 led to disaster. Smallpox was inoculated on a cow's udder, and the product used to

vaccinate about fifty persons. The result was an epidemic of smallpox, a panic, and the suspension of business." On the face of it this method was simply variolating the cow (on a mucous membrane if the hairless or shaven skin failed) and inoculating the human subject with that curiously disguised smallpox matter. However, it was thought necessary to hold an experimental inquiry upon it, and in 1865 a commission of the Lyons Society of Medicine reported that, "in vaccinating according to the method of Thiele and Ceely, we are merely practis- ing the old inoculation, rendered uniformly benign, it may be, by the care taken to inoculate only the first product (U'accident primitif), but preserving for certain all its risks in respect to contagion." ? A negative result was come to by Klein in 1879, in an inquiry for the Local Government Board, wherein he had Ceely's cooperation. In 1879 the Irish Local Government Board prevented the use of similar variolous lymph by threatening to prosecute under the Act making the inoculation of smallpox penal. Notwithstanding the common sense of the case, and these experimental proofs, the official view taken by the medical department in 1857, that Thiele, Ceely, and Badcock had established the correctness of Jenner's doctrine of variole vaccine, is still held very tenaciously by the profession. It is too simple and attractive to be soon given up; but perhaps the best way to get rid of it is to state in plain terms what cowpox itself really is,

Although there is no difficulty in drawing up a complete natural history of cowpox, thanks to the laborious and exact studies of Ceely, yet the attention has been so much diverted to side issues that the facts to be stated in this section will come before most readers with the aspect of novelty. The other original authorities besides Ceely are Jenner himself, Pearson (who collected information by circular in the months following Jenner's Inquiry), Bous- quet (1836), Estlin (1838), and Crookshank (1888). The Wiirtemberg inquiry, published by Hering (Stuttgart, 1839), is made up of very indifferently authenticated or incomplete statements, which have not the same value as the rest, and are at variance with them on the most essential points.

Cowpox as an infective disease arises in cow-houses here and there, and at wide intervals of time, out of a common physiological or constitutional eruption of some particular cow, usually a heifer in her first milk, very often

in the spring season or at some other crisis of the year or of the animal's life-history. It never arises except in milch cows ; lt occurs nowhere in the cow but on the teats, or, by in- fection, on adjoining parts of the udder. All the characters by which we know it distinctively as cowpox are associated with the fact of milking, or with the inevitable traction on teats that are the subject of an otherwise unimportant eruption. The primary disorder, as Ceely describes it, is an eruption of a few pimples, the size of a vetch or larger, hard and solid at first, but at length slightly vesiculated on the summit. It is only rarely that a series of events ensues on this basis which constitute cowpox as we know it ; they ensue In some one animal out of many in the same byre, and years may elapse before the event happens again. The pumples on the teats are made to bleed by what Ceely calls "the merciless manipulations of the milkers " ; the blood forms crusts, which are dislodged every six hours; and indurated ulcers form on the sites of the original pimples. eee ee ee eee

; See Hodgson, Brit. Med. Journ., 26th November 1881. ; Bost. Med. and Surg. Journ., 1860, p. 77. Vaccine et Variole, Paris, 1865, p. 101.

25

The process being thus made inveterate owing to the in- Its in- cessant interference of the milker's hands, it becomes com- fective

municable to the other cows. The milkers can usually point out some one cow in which the disease began; and it spreads slowly through a byre, taking sometimes as long as three months to go.the round of all the animals. An animal already infected at one or more places on its teats may become infected at other places on the teats and body of the udder, either by the traction of milking or by the contact of parts when the cow is lying down.

The ulcers heal sometimes slowly, sometimes more quickly ; they may heal under crusts, or as open sores; induration and rounding of the edges are distinctive, along with much thickening of the base. The scars are also in- durated, rounded and elevated at the edges, and smooth or puckered on the surface; they are often as large as a walnut. It is not easy to see a vesicular stage of the disease even in the cows infected from the initial spontane- ous case; and Ceely had for the most part to be content with the coagulated

matter of crusts to vaccinate with. The process is, in fact, bound up from first to last in the most intimate and essential manner with the operation of milking. Cowpox "undisturbed by the milker's hands" has no existence in the originating cow ; it is the persistent irritation that makes it a pox. It is communicable, also, to the hands of the milkers themselves, and by their filthy hands to their faces. Jenner mentions a good many such cases ; Pearson has collected several ; and Ceely gives three

in very full detail. As in the inoculated venereal pox, the se a ° e

infection proceeds for a time under the skin, making bluish-white vesicle; it eats away the tissues round the margin, where the fluid makes the skin bulge out into the characteristic tumid ring. After the fourteenth day the vesicle will have become an eschar, the average size of a sixpenny piece, which comes away and leaves a sore. The open sore is a regular part of the infection in the milker's hand. Various regions of the face get infected by contact from the hands: Jenner mentions the case of "a poor girl who produced an ulceration on her lip by frequently holding her finger to her mouth to cool the raging of a cowpox sore by blowing upon it"; another of Jenner's cases had the sore on the wing of the nose; one of Ceely's cases had an ulcer on the teniple three-quarters of an inch long; in a case observed by Crookshank there was a very large vesicle and subsequent sore over the left cheek-bone. The local infection is accompanied by constitutional disturbance, more or less severe, including head- ache, pains in tite loins, vomiting, and sometimes delirium. The axillary glands become painful, usually about the fourth day, and remain hard for some time. Eruptions occurred, but there is very little said about them.

As might have been expected, the effects of experimental Human- e ac- ized cow-

infection with cowpox matter were the same as th

cidental. They are spoken of as the effects of " primary ®°™

lymph," that is to say, lymph direct from the cow's teats or from the milker's sore hand, or in the earlier removes from these sources. Jenner's experience of primary lymph was very much the same as Bousquet's, Estlin's, and

Ceely's forty years later. Woodville's, on the other hand, was exceptionally reassuring ; had it not been so, it 1s not likely that cowpoxing on the large scale would ever have survived the initial discouragements entailed by the use of primary lymph. The process on the child's arm was on the whole the same as on the milker's hand, allowing for the more deliberate mode of inoculation and for different texture of*

the skin. The vesicle grew to a great size up to the four- ee ee eee eee

4 But Addington (On the Inoculation of the Cowpox, ap 1801), who got his lymph from Woodville, was not equally fortunate ; of eleven cases at the beginning of his series five ended in ulceration ; after that the cases all ended in a "dry scab.

teenth day, and often became an ulcer, either excavated under the crust or absolutely open. Estlin did not entirely get rid of ulceration until after the twenty-ninth remove from the cow. The constitutional disturbance was often severe in infants: axillary tenderness and swelling were somewhat constant, and eruptions were especially frequent about the second to the fourth week, including macular roseola, lichen, and pemphigoid bulle. At each successive remove from the cow the cycle of the process became more contracted, and the constitutional disturbance, cxteris pari- bus, became less. Bousquet gives a plate which shows by parallel series of figures the differences between the vesicles of the old lymph (Woodville's, nearly forty years old) and the lymph from the Passy cow. The new lymph induced a process more protracted at every stage: the vesicle con- tinued to enlarge at the periphery for several days after the common vaccine vesicle of the period would have ceased to extend. It was not at its maximum until about the end of the second week, and it then became an eschar and a sore. Bousquet confesses that he first understood "les frayeurs de Jenner" when he saw the ulcerative and other effects of primary lymph. After a certain number of removes from the cow the cycle became so contracted that the vesicle was full at the eighth or ninth day; the abbreviation of its life-history enabled it to heal without ulcerating. It thus becomes the ordinary vaccine

vesicle as we know it, which heals under a scab, and leaves the peculiar punctated scar of subcrustaceous repair. The abbreviation or mitigation is effected by taking lymph from each successive vaccinifer at as early a period as it can be got, until the golden mean of safe vaccination, namely, maturity at the eighth day, is reached. That corresponds to Jenner's rule of taking the matter for vacci- nation before the areola appears ; if the vesicle be emptied after that period, the lymph from it is apt to cause ulcera- tion, or, as Ceely puts it, we have "all the inconveniences of primary lymph." It is thus clear that humanized cow- pox might be easily cultivated back to its original type ;

VACCINATION

no means of knowing whether the same has been the case among the population at large. In Table I. the column of deaths from erysipelas in general, among infants of the first year in England and Wales, is given side by side with the column of deaths from

Erysipelas after Vacci- nation.

Erysipelas after Vacci- | Erysipelas. nation.

Erysipelas.

a

0 5 0 0 5 2 2 3

if

*1 0 9 3 8 * 9*

e

erysipelas after vaccination. The post-vaccinal inflammation some- times takes the form of phlegmon; but there is no separate entry for that as a special sequel of vaccination. Many of the alleged deaths from erysipelas after vaccination have been the subject of coroner's inquests ; the verdict is often an open one, and even such cases as those near Gainsborough in

1876 and at Norwich in 1882 ~ were found to have been returned (all but one) by the certifying medical practitioners as due to erysipelas merely. It may be assumed that "after vaccination" is not certified unless the case has left no doubt in the minds of the jury or of the certifying medical attendant. The increase in the first column from 0 in 1855 to 32 in 1880 is probably in appearance only, and due to more correct diagnosis.

(2) It is only within the last few years that jaundice has been Jaundice, —

recognized as a post-vaccinal effect ; and at present there is only one accepted instance of it on the large scale. This was the epi- demic among re-vaccinated adults in a large shipyard at Bremen from October 1883 to April 1884. Owing to an alarm of smallpox, 1289 workmen were re-vaccinated between the 13th August and 1st September with the same humanized lymph preserved in glycerin ; of these 191 had jaundice at various intervals down to the month of April following. Circumstantial evidence (agreement and difference) clearly traced the epidemic to the vaccination.? In future an outlook will be kept for this effect of vaccination ; at Uae it has no intelligible theory. It may be noted that the ymph which caused the Bremen epidemic was mixed with glycerin.

(8) The eruptions that follow vaccination are proper to cowpox Skin infection. Although little is said about them in the accidental erup- infection of milkers, they were very common in the practice of tions. Estlin, Ceely, and others with primary lymph. The eruption is

and, as a matter of fact, it has sometimes been so culti- vated back by misadventure, with serious consequences to the vaccinated.

Risks of 'The risks of vaccination may be divided into the risks | 2 kind of exanthem, or "secondary" of the local infection, and vaccina- inherent in the cowpox infection and the risks contingent ey rcinanly apres Welorogheeccend Week: ane n ts em: cee ie =) monest forms is a patchy rose-rash, or macular roseola, not easily

to the puncture of the skin. Of the latter nothing special requires to be said; the former will be discussed under the five heads of (1) erysipelas, (2)

jaundice, (3) skin eruptions, (4) vaccinal ulcers, and (5) so-called vaccinal syphilis.

*(1) A slight degree of erysipelas was recognized by Jenner him- self, and even postulated by him, as part of the natural history of cowpox in man; and it is so recognized by the more unbiased writers of recent date.! The usual time for it corresponds to the appearance of the arcola (eighth or ninth day), that efflorescence round the pock being normally a slight erysipelas. It may start, however, from the puncture or scratch in the skin, after a day or two's interval; but that form of it (the "early erysipelas" of German writers) is much rarer than the erysipelas of the areola, or "' late erysipelas." Primary lymph, or lymph in the first removes, is most apt to excite an extensive and spreading areolar redness. In the ordinary course of vaccination remote from the cow the intensity of the superficial redness and deep infiltration would seem to de- pend mostly on the child's constitution, or on whatever concurrence of circumstances serves to recall the " inconveniences of primary lymph." The registrar-general's tables of mortality for England and Wales have contained an entry of "erysipelas after vaccina- tion" from 1855 down to 1881, when the entry was changed to '**cowpox and other effects of vaccination," the numbers at the same time nearly doubling. The fatal cases of erysipelas in infants under one year referred to vaccination are but a small fraction of the whole mortality from erysipelas at that age, a mortality which is far greater than at any other period of life. It is quite certain that in foundling hospitals, such as that of St Petersburg, the erysipelas of vaccination has been the starting-point of disastrous epidemics of erysipelas affecting the inmates generally. There is*

1 Bohn, Handbuch der Vaccination, Leipsic, 1875, p. 174.

distinguishable from the macular roseola of syphilis. Another form is lichen or dry papules, apt to scale ; it may also occur as a vesicular eruption, and in the form of pemphigoid bull or blebs. In one of Ceely's cases the eruption extended to the whole mucous membrane of the mouth aud throat. A peculiarity of the exanthem is that it may come and go several times before it finally disap- pears; and, like other skin eruptions, specific or non-specific, it may become inveterate. The widespread belief that much of the eczema of childhood dates from vaccination is not by any means to be

dismissed as a mere fancy. The skin-disorders that followed vaccination in the first years of the practice were declared by Birch and others to be new in type. At present the vaccinal eruption, especially on the scalp, is sometimes distinguished by the size and form of the crusts, and by scars remaining for a time.

(4) Ulceration of the vaccine vesicle, or of the site of it, is one Vaccinal It is a return to the native ulcers.

of the commoner forms of " bad arm." or untamed characters of cowpox on the cow's teats, or on the milker's hands or face, or in the child's arm after experimental inoculation with primary lymph. It crops out not unfrequently in everyday practice, and is probably dependent for the most part on the lateness at which the lymph was taken for vaccination, or on retardation of the process in the vaccinifer, or on emptying the latter's vesicles too much ; however, it may result from picking the scab or otherwise dislodging it. The ulceration usually proceeds to some depth in the form of a crater under the crust, and is attended with induration and rounding of the edges and induration of the base. According to Bohn (op. cit., p. 166), it may alarm practitioners by its resemblance to syphilis. In other cases the crust is wanting and the ulceration has the distinct type of phagedena. The de-

2 Cowpox and other effects of vaccination. 3 See Liirman, Berl. klin. Wochenschrift, 1885, p. 20. 4 Parrot, La Syphilis Héréditaire, 1886, p. 33.

struction of tissue in either case may be very extensive, going "down to the bone" and having as much as an inch or more of super- ficial area. Healing is frequently an affair of weeks, and may be aided by mercurial treatment. There are no statistics of this sequel of vaccination; but the frequency or infrequency of it may be learned in conversation with any intelligent chemist whose shop is resorted to by the poor, or with a medical practitioner of average experience. ; :

(5) It has been proved by many experiments, undesigned or

yphilis. otherwise, in Paris (1831 and 1839), Vienna (1854), and elsewhere,

that an infant with congenital syphilis develops correct vaccinal vesicles, provided its skin be clear of eruption and the lymph have been taken at the usual time ; also that the lymph taken from the correct vesicles of a syphilitic child produces correct vesicles in its turn, but does not produce syphilis in the vaccinated child. The congenital taint is, in fact, irrelevant to the course of cowpox in- fection. So far as experiment and casual experience can prove anything, that has been proved; the recent attempt to disprove it by an officer of the Local Government Board (Report for 1882, p- 46) is vitiated by fallacies, and has no value against the over- whelming testimony collected thirty or forty years ago. What, then, isthe meaning of the numerous outbreaks of syphilis in groups of children or adults vaccinated or re-vaccinated with lymph from one source ?

A careful examination of these cases shows that syphilis at the source of the vaccine matter was in all cases an after-thought, that

_ in most of the cases there was no evidence for it, and that in the

remaining cases the evidence was so far-fetched as to be unlikely (apart from the known & priori improbability), or that the traces of constitutional infection found in the vaccinifer were subsequent to vaccination, and therefore capable of being explained as an effect concurrent with the more obvious symptoms in those vaccinated therefrom. The effects, however, were very much the same as in the venereal pox. The vaccine vesicle either became an indurated or phagedenic sore, as described in the foregoing section on vaccinal ulcers, or the scar opened into an indurated sore after the usual sub- ernstaceous healing was complete, or became indurated without opening. The axillary and cervical glands were often indurated, In most of the epidemics there were a certain number of cases in which the effects were purely local, or confined to one only of the seats of puncture ; if these had not occurred along with others in a group, they would have been counted as ordinary vaccinal ulcers. But there were often secondary symptoms as well, including the roseolar, lichenous, or (rarely) pemphigoid eruption, and not unfrequently condylomata circa anwm et genitalia. In some epidemics (but not in all) there were, in a small minority of the cases, mucous patches on the tonsils, tongue, or lips, tending to ulcerate; and in some of the Italian outbreaks the infection spread among the mothers and

other members of the households in the form of specific sores of the nipples, with or without constitutional symptoms. Affections of the bones and viscera do not seem to have followed ; fatalities were not very common.

It will be hard to persuade medical authorities that these second- ary effects arc not the result exclusively of the venereal pox. The evidence, however, docs not allow us to assume any other specific infection than that of cowpox, which, as we know, has its proper secondary exanthem in the form of macular roseola, lichen, or pemphigus ; the eruption has even been known to affect the mouth and throat. The evidence from epidemics of vaccinal sore arms teaches us that condylomata, mucous patches of the tonsils, tongue, and lips, and even iritis, are also possible, although far from in- variable, among the "secondaries" of the primary vaccinal ulcer. The most general fact that comes out in these epidemics is that the lymph was taken late from the vaccinifer, or that the vesicles of the vaccinifer were drained dry to vaccinate a large number, or that the same vaccinifer was used for arm-to-arm inoculation on two successive days. It is not difficult to see how, in those cir- cumstances, the abbreviated cycle of humanized cowpox may be departed from and the native or untamed characters of cowpox infection reverted to. Cowpox, indeed, is parallel with the venereal

Torre de' Busi near Bergamo, 1862 mClis)s i >

on both sides in the Civil War), dE Cones: Coot Or ne troona of Health, Baton Rouge, 1884). Argenta near Ferrara, 1866 (Gamberini, in Gaz des Hépitaux, 1870, p. 505). Morbihan (neighbourhood of Vannes and Auray), 1866 (Depaul, Bull. de V Acad. de Méd., xxxii., 1866-67, p. 201; Bodelio, ibid. p. 1033). Cardaillac (Lot), 1866 (Bull. del' Acad. de Méd., 28th February 1867). Schleinitz (Styria), 1870 (Kochevar, Allgem. Wiener Med. Ztg., 1870, Nos. 21 and 24; abstract in Arch. fir Dermatologie und Syph., 1870). London (two series

1871 (Hutchinson, Med. Chir. Trans., liv., 1871). Switzerland, 1878 (Bull. de 2 Soc. dela Suisse Romande). Algiers, 1880-81 VJourn. @ Hygiene, 25th August 1881), Lyck (Hast Prussia), June 1878 (Pincus, Vierteljhschr. f. gericht. Med., 1879 Dp: 193), Aspri¢res (Aveyron), March 1885 (P. Brouardel, Rapport, Paris, 1886).

Attention was drawn to these cases because they occurred in groups varying in number from 10 to 100 or more, which made considerable stir, especially in country districts. It is unlikely that all cases have been reported. In the third Report of the clinical hospital of Manchester, Whitehead states the results of his inquiries on post-vaccinal illness in children. Setting aside most of the cases of illness vaguely alleged by the mothers to have been the con- sequence of vaccination, he admits as truly post-vaccinal 34 cases of syphilis or pseudo-syphilis ; of these he enumerates only 14 in his table of 63 cases of children's syphilis of all kinds, the other 20 cases being omitted, it would appear, not because there was any doubt of their being post-vaccinal, but because they were not of the perfect type of infantine syphilis. Such was the experience of a competent observer at asingle hospital during a period of 20 months. White- head's Report was published in 1859 ; but, when Hutchinson pub- lished his first series of London cases in 1871, the subject was con- sidered to be quite new. Here again it was the concurrence of some ten cases in a group that helped the reluctant assent of the profession. The first gronp of London cases had hardly begun to be talked of when one of Hutchinson's colleagues was led by two cases of skin disease at a hospital to follow up the traccs of another group, the very existence of which was unsuspected by the public vaccinator or general practitioners in whose district the eleven patients with vaccinal ulcers and occasional secondaries resided.

In the registrar-general's tables of mortality for England and Wales about one-half of the deaths from " cowpox and other effects of vaccination," or nearly thirty per annum, may be put down to effects of vaccination other than erysipelas ; but there is nothing to show that these were fatal cases of vaccinal ulcers with constitu- tional symptoms or marasmus. On the other hand, the table of deaths from syphilis shows an enormous and steady increase in the number of deaths of infants under the age of one. In the first year of compulsory vaccination (1854) the deaths suddenly increased by one-half, and the increase has gone on steadily since then (see Table II.) The interpretation of the fact is by no means easy or free

Infantine Death-Rate from Syphilis (England and Wales).

*Infants | aul Other Infants | an Other One Year. | "A8°S: One Year, | ASe**

1847 255 810 1868 1364 522 11852 880 . 243 1869 1361 498 11853 880 242 1870 1422 436 11854 591 873 1871 1317 425 1855 579 868 1872 1410 421 1856 579 300 1873 1376 467

1857 656 801 | 1874 1484 513 1858 684 322] 1875 1554 580

1859 778 811 1876 1580 554 1860 767 800 187 1550 524

1861 798 879 | 1878 1647 535 1862 867 878 j 1879 1493 536 1863 983 403 i 1880 1588 571

1864 1089 461 1881 1540 557 1865 1155 492 1882 1666 561 1866 1180 482 1883 1813 500 1867 1241 407 ‘ 1884 1733 547

from fallacies. There are doubtless other and better reasons for the increase besides vaccination ; and it is significant that the tables for Scotland show the mortality to be chiefly in the first three months of life, whereas the statutory limit for vaccination in that country is six months.

In the polemical writings of anti-vaccinists, such diseases Other as scrofula, tubercle, hooping-cough, diarrhoea, and other ate ? common causes of infantine mortality are alleged to have miter increased owing to vaccination. There is little or no ¢ion,

pox, both in the circumstances of its becoming an infective ulcera- tion {indurated or suppurating) and in its secondary or constitu- tional manifestations as an infection in man. But the “bad” lymph has hardly ever been used beyond the second remove ; and there the parallel fails.

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The following is a list of the so-called syphilitic epidemics after vaccination, including those that have been considered spurious, because they were either anomalous in type from the point of view of syphilitic infection or had no obvious causal connexion with that disease.

Udine, 1814 (see Viennois, in Syph. Vaccinale, p. 221). Cremona, 1821 (see Depaul, “‘ Projet de Rapport,” in Syph. Vace.). Grumello, 1841(ibid.).

Coblenz, 1849 (W egeler, in Preuss. Vereins-Ztg., 1850, No. 14; abstract in Schmidt's Jahro., Vol. Ixvii., 1852, p. 62). Upper Franconia (the Hiibner case), 1852 (Intelligenzbl. der Bayr, Aerate, 1854; Bohn, loc. cit.). Lupara (Italian prov. Molise), 1856 (see Depaul, Joc. cit.). Dispon near Pesth, 1855-57 (Oester. Zeitschr. fiir prakt. Heilk., 1862; Bohn, Joc. cit., p. 322). Rivalta (Piedmont), 1861 (Pacchiotti, Sisilide Trasmessa per Mezzo della Vaccinazione in Rivalta presso Acqui, Turin, 1862).

reason, in theory or in experience, to suspect that tuber- culous or scrofulous infection is ever communicated by vaccine lymph. As regards the above and other infantine maladies, vaccination may predispose the child to fall into them, in so far as it produces, or ought in theory to pro- duce, a considerable constitutional disturbance and pre- sumably a loss, for a brief period, of the natural power to

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1 The proportion assigned to the first year of life is calculated from the specimen table for 1852 (females only) and from the tables of London mortality.

Small- pox.

Influence of vacci- nation upon smallpox.

28

resist the various noxious influences by which the age of infancy, especially among the poor, is beset.

The value of cowpox as a protection against smallpox may now be judged of apart from the fanciful doctrine of variole vaccine by Which it was originally recommended. It has been put toa test extending over eighty years; and in some circumstances it has been possible to apply the logical methods of agreement and differ- ence with a good deal of cogency. The besetting fallacy of all vaccination logic is that of post hoc ergo propter hoc; and the only way to escape it is to hold intelligent views of the history, the natural history, and the epidemiology of smallpox. This will ne- cessitate a brief excursus.

Smallpox, which is really a tropical skin disease of the nature of lichen turned pustular, or of ecthyma, must be judged according to what we know of foreign pestilences in general. Perhaps we are safest to take a line through the behaviour of the plague. Plague in western Europe had the start of smallpox by a good many years, if we speak only of prevalence on the large scale. "Throughout the 16th century," says Hirsch, "the plague was a permanent form of disease on the continent of Europe. . . . During the first two- thirds of the 17th century we still meet with it over an equally wide area and equally often. But in the last thirty years of that century the plague was observed to be retreating gradually from the soil of Europe." It was not only in London after the fire of 1666 but also in Denmark and Sweden, in Italy, in Holland and Belgium, in Switzerland, in France, in

western Germany, and in Spain that the years 1660-1680 saw the last of plague ; it lingered only in the Levant, in Poland, and in other parts of north-eastern Europe, with occasional epidemic visits, such as those of Messina and Mar- seilles. Now it has left the Levant and Egypt, has abandoned even Mesopotamia and Arabia, and retreated to a few poor villages on the Perso-Armenian frontier. Or, take the example of leprosy, which owed its existence rather to the widespread or national con- currence of the same causes in various countries than to the travel- ling of an infection: Italy had it first and lost it first, and nearly every other country in Europe saw its rise, its general prevalence, its decline, and its extinction, the northern countries keeping it longest. Again, typhus fever was a standing disease so long as Europe was the theatre of protracted wars and all their consequences ; but, like other infections, typhus gradually declined and has almost disappeared since the conditions on which it depended ceased.

Leaving these parallels and coming to the facts of smallpox itself, it rose to prominence in western Europe in the 16th century, and in England in the 17th.1 From the early part of the 18th century a remission was noted; but the latter half of that century saw a considerable extension of the area of the disease, for which the practice of inoculation has been blamed. It isa mistake to suppose that smallpox has shown a tendency towards a universal infection ; for all its chances it has kept within moderate limits of age and place, and extended only by repeated provocation. Thus, Hirsch says of the western hemisphere, "A still more terrible source for America was the importation of Negro slaves, so much so that in after years, particularly in South America and the West Indies, not only the first appearances of smallpox, but every fresh outbreak of it, could be traced to importation from Africa,"—the African continent being then, as now and always, one of its principal native seats. In Europe it has been peculiarly a disease of infancy and of the most crowded parts of cities. It has had victims among the upper classes, just as cholera has had ; but, like that disease, its habitat is among the crowded poor; and it would have touched the well- to-do-classes less in former times if there had always been Byecous west-end quarters in cities or the modern "passion for clean linen," personal ablutions, and fresh air. Tenement houses and ill- ventilated courts or alleys have been the natural harbourage of smallpox ; in proportion as these have been demolished the

disease has disappeared or been circumscribed in its area. It is fallacious to estimate its prevalence now in ratio of the whole population ; for a just comparison of one period with another, we have to take into account, not the death-rate per million living, but the death-rate per million still living under the old-world conditions. From the earliest period of its history in Europe, the disease has had its seasons of quickening or revival, with long intervals of quiescence ; only in the most crowded parts of Western cities has it ever been endemic from year to year. These epidemic outbursts have varied much in intensity and in area, the conditions of variation being mostly unknown. In that respect, it need hardly be said, small- pox is like other epidemic diseases.

During the early years of the 19th century there was a marked remission of the epidemic outbursts of the disease in most parts of Europe. The amount of vaccination during those years was in-

1 The first known use of the term "' small pocks" is in Holinshed's Chronicle (1577), an epidemic of pestis in 1365 being so rendered, although it was prob- ably the ordinary bubo-plague of the period. The pox of Elizabethan writers was the French pox or great pox (syphilis), which overran Europe as an epi- demic in 1494. Its prominent character at its first appearance was the loath-

some affection of the skin (especially the face); hence when variola came on the scene it was called the lesser pox, or smallpox.

considerable ; in particular it hardly touched the poor. Thus, at the time of the Norwich epidemic of 1819, it was estimatcd (by Cross) that only one-fourth of the inhabitants were vaccinated, and these almost exclusively the well-to-do. At the same time the practice of inoculating smallpox, which was with good reason blamed for keeping the contagion generally diffused and active among the non-inoculated, began to be discontinued and soon ceased altogether. Undoubtedly there was a marked decline in smallpox during the first fifteen years of the century, but the as- sociated circumstances are as complex as the fact itself is simple. We have to bear in mind the old law of periodic exacerbation and dormancy, the cessation of a

practice (inoculation) which almost certainly interfered with the natural tendency of smallpox as a foreign pestilence to die out, and the unusual prevalence of typhus fever (on the Continent), and other displacing or substitutive factors in the death-rate. To what extent vaccination was a factor will have to be decided by the experience of a period when the practice was much more generally in vogue. For that purposc we may here restrict the inquiry to England and Wales, premising that the experience of other European countries where vaccination has been cqually practised is not different.

The following table (III.) begins with the year 1847; the re- gistration reports go back to 1838, but there is a break in the tables for five years near the beginning.

Deaths from Smallpox from 1847 to 1884, with the numbers among Children under five.

Children Children Total of All Other |] + Total of ~~ | All Other Year. All Ages. ae Ages. Year, All Ages. mee Ages.

1847 4227 3114 1113 1866 8029 1662 1367 1848 6903 4782 2121 1867 25138 1370 1148 1849 4644 8146 1498 1868 2052 1234 818 1850 4665 8265 1400 1869 1565 892 673 1851 6997 4869 2128 1870 2620 1245 1375

21852 7820 6076 22, 1871 | 23126 7770 15356

1853 3151 2164 987 1872 19094 5758 13336 1854 2808 1659 1149 1878 2364 587 1777 1855 2525 1323 1202 1874 2162 548 1619

1856 BAT 1299 978 1875 950 271 679

1857 3936 2835 1601 1876 2408 612 1796 1858 6460 3585 2875 1877 4278 1056 3222 1859 3848 2247 1601 1878 1856 472 1884 1860 2749 1544 1205 1879 536 130 406 1861 1320 723 597 1880 648 170 478 1862 1628 981 697 1881 3098 740 2358 1863 5964 8267 2697 1882 13817 275 1042

1864, 768i, 429), 8390 1883 957 226 731

1865 6411 8262 8149 1884 2234 508 1781

In the first years of the table the deaths from smallpox of children under five were to those of all other ages in the ratio of 3 to 1 or of 5 to 2 (at Norwich in 1819 there were 530 deaths, of which half were in infants under two, and all the rest save ten were in children under ten years) ; the disproportion lessened gradually, until about 1864 it was nearly 4 to 8; in 1870 the proportion was nearly equal; and from that time onward the preponderance leaves the age of infancy and childhood, so that in 1884 the deaths under five were three times fewer than those at all other ages. The great epidemic of 1871-72 brought out that remarkable change of incidence most decidedly. Taking the mortality of 1871 as an instance, the signi- ficance of the changed incidence on the periods of life is that the 7770 deaths under the age of five would, in pre-compulsion times, have had a complement of no more than 2500 deaths in the later periods of life, or that the actual mortality of 15,356 above the age of five would have had a complement of some 40,000 or 45,000 deaths below that age. (In British India in 1884 of 333,000 deaths 72 per cent. were of children under 12 in Bengal, and 64 per cent. in Madras.) Apart from the changed incidence of smallpox, Table III. shows merely the caprices of the disease as an epidemic. After every epidemic outburst the disease declines and sometimes looks as if it were about to die out altogether. The alarm attending cach severe epidemic has induced the legislature to make the vac- cination law more stringent and vaccinators to insert more of the virus, so that the periodic subsidence has corresponded to, and has seemed to be owing to, the better enforcement of the practice ; but there have always been alternating periods of quiescence and ex- acerbation, irrespective of any prophylactic. Moreover, smallpox being a foreign contagious skin disease lurking in congenial haunts, it would be quite according to precedent that it should one day cease absolutely in a community where sanitary progress had ad- vanced so far as to take the ground from under the feet of the pestilence ; such absolute cessation would have no more necessary connexion with almost universal vaccination than the alternating quiescence and recrudescence of epidemics have been connected with each new Act of Parliament. The epidemic of 1871-72 was one of the worst in the whole history of European smallpox ; and it may be that it was one of the last flickers of a slowly expiring flame. The universal practice of cowpoxing, however, is based upon the

2 The Italic numerals indicate the periodic maxima.

Va2CcinNnaAvYTiION

assumption that this contagious skin disease imported from the tropics is a thing that Europe must reckon with for an indefinite

an pestilence never stays unless it finds quarters suited to its existence, and that it may even take its departure capriciously, as in the case of the plague, after it has had a certain career, or on being displaced by some congener such as typhus. Vaccination is considered to have turned smallpox in great part aside from the early years of life and thrown it more than ever upon the later ages, While measles and other maladics proper to childhood have at the same time increased."

Itsutility Thus far as regards the utility of vaccination to the state; we to the in- have now to consider its utility to the individual. Do the vacci-*

dividual. nated escape in an epidemic? or, if they do not escape an attack of

Death- rates among vacci- nated

and un-

vacel- nated,

smallpox, do they escape death from it? In answer to the first question, apart from the familiar negative experience of everyone, we have the statistics of smallpox hospitals, which relate to the poorer class and probably do full justice to the fact of non-vaccina- tion, inasmuch as the unvaccinated residue is mostly to be found in those slums and tenements of the poor where smallpox (now as always) is apt to linger. At the Eastern Metropolitan Hospital (Homerton) from its opening early in 1871 to the end of 1878 there were 6533 admissions for smallpox, of which 4283 had vaccination marks, 793 had no marks although vaccinated, and 1477 were un- vaccinated, giving a proportion of 0°29 unvaccinated. In the epidemic hospitals of Liverpool, Glasgow, and Dublin the proportion was 0°25 during the same period. For some of the German states the proportion of

unvaccinated cases comes out a good deal less than one-fourth ; thus, in Bavaria in 1871 of 30,742 cases 29,429 were in vaccinated persons, or 95°7 per ccnt., and 1313 in the un- yaccinated, or 4°3 per cent. In some of the small local outbreaks of recent years the victims have been nearly all vaccinated (¢.g., at Bromley in 1881, a total of 43 cases, including sixteen confluent, all vaccinated).? In the army and navy, where vaccination and re-vaccination are absolutely without exception, the proportion is accordingly 0. It would thus appear that the rather excessive pro- portion of cases among the small residue of unvaccinated in the civil population must have other associated circumstances besides non-vaccination ; and these are not far to seek.

The next question is the death-rate among the vaccinated and unvaccinated respectively. The total death-rate from smallpox in modern times is almost the same as it was in the 18th century ; large ageregates collected by Jurin and others in pre-vaccination times show a mortality of 18°8 per cent., and corresponding aggregates in English and American hospitals, mostly since 1870, show a mortality of 18°5 per cent. It has, however, to be borne in mind that the division into discrete, confluent, and malignant smallpox is an old one; that a mild type was quite common in the 17th and 18th centuries, and was now and then characteristic of whole epidemics, just as in the case of scarlatina ; and that the vaccinated are at present liable to be attacked by the confluent and malignant disease as well as by the discrete. But are the vaccinated liable to the fatal forms of smallpox in the same proportion as the un- vaccinated? Itis only since 1879 that the registrar-general's tables for England and Wales have attempted to supply data bearing on this; and it will be seen from the following sstnects (Tables IV.- VII.) that the data are still far from being sufficient :—

Table IV.— Deaths from Smallpox, showing the Numbers of the Unvaecinated.

Total | Unvac- |Vacci-| Not Deaths. | cinated. nated.|stated.

*Total | Unvac-|Vacci-| Not *| Deaths. | cinated.|nated./stated.*

325 176 162 78 595 493

Year.

188 245 1378

231 282 1068

117 121 652

1317 957 2234

816 717

3098 1146

q | Total F 3 | Total cf g § in| Unvac-|Vacci-| Not a «| Unvac- |Vacci-| Not on cinated.|nated.|stated.|| = Be cinated.|nated.|stated.

i)

171 43 14 133 90

57 || 1882

1883 1884

887 821 1336

143 66 678 111 35 282 239

Total | Unvac-|Vacci-| Not Total | Unvac- Vacei- Not

Deaths. | cinated.|nated.|stated. Year. Deaths. | cinated. a ee stated. 319 144 14 161 1883 126 32 i 93 129 43 2 84 1884 254 118 | i

Year,

1881 1882

1 See Farr, Reg. Gen. Report for 1867, p. 213: ‘To operate on mortality, pro- tection against every one of the fatal zymotic diseases is required ; otherwise the suppression of one disease-element opens the way to another” (p. 219). He quotes Watt (1813) to show that the decrease of smallpox mortality among infants in Glasgow from 1783 to 1812 was balanced by a great increase in the infantine deaths from measles. See also Guy, Journ. Statist. Soc., 1882, p. 430.

; Majer, Vierteljahrschrift fiir gericht. Med. 5 Beall, BLY

Nicolson, Lancet, 27th August 1881.

On the other hand, the teaching of epidemiology is that a |

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Table (VII.),—Same for the Provinees(Metropolitan Deaths deducted),

Total – = Total | Unvac- |Vacci-| Not = 2. [10 ~~| Vacci~~ Deaths J S nvac-| Vacci Previnead cinated.‘nated./stated. i Deaths in cinated.| nated. istated.

Provinces.

1883 1884

108 146

These figures may be made to prove anything, according to the bias of the individual ; the column of “not stated”? commands the situation. The official figures for Bavaria in 1871 are more pre- cise: among the 29,429 cases of smallpox in vaccinated persons there were 3994 deaths, while among the 1313 unvaccinated cases there were 790 deaths; of the latter no fewer than 743 deaths were of infants in their first year. The mortality among both the vacci- nated and the unvaccinated is always excessive for infancy. Feeble health, as well as non-vaccination, is a factor in the very excessive smallpox mortality at that tender age.*

The returns from spccial smallpox hospitals make out a very small dcath-rate (6 per cent.) among the vaccinated and a very large death-rate (40 to

60 per cent.) among the unvaccinated. The result is doubtful gua vaccination, for the reason that in pre-vacci- nation times the death-rate (18°8 per cent.) was almost the samc as it is now in the vaccinated and unvaccinated together (18°5). At the Homerton Hospital from 1871 to 1878 there were admitted 793 cases in which "vaccination is stated to have been performed, but without any evidence of its performance"; the deaths in that important contingent were 216, or 27°2 per cent., but they are not permitted to swell the mortality among the "' vaccinated."° Again, the explanatory remarks of the medical officer for Birkenhead in 1877 reveal to us the rather surprising fact that his column of "unvaccinated" contained, not only cases that were admittedly not vaccinated, but also those that were " without the faintest mark"; of the 72 cases in that column no fewer than 58 died. His column of "unknown" contained 80 per cent. of patients who protested that they had been vaccinated (28 deaths in 220 cases or 12°7 per cent.). Those who passed muster as veritably vaccinated were 233, of whom 12 died (5:1 per cent.). With reference to this question of the marks, it has to be said that cowpox scars may be temporary, that their '"'goodness" or "badness" depends chiefly on the texture of the individual's skin and the thickness or thinness of the original crust, and that the aspect of the scar, or even its total absence some years or even months after, may be altogether misleading as to the size and correctness in other respects of the vaccine vesicle, and of the degree of constitutional disturbance that attended it. This was candidly recognized by Ceely,® and will not be seriously disputed by anyone who knows something of cowpox and of how it has been mitigated, and of the various ways in which the tissues of individuals may react to an inoculated infection. In confluent cases the marks on the arm would be less easily seen.

The following statistical table (VIII.) shows death from smallpox to be comparatively rare where the marks are many and " good."

Table VIII., showing the Number and Kind of Arm Marks in 379 Fatal Cases of Smallpox at Homerton Hospital, 1871-80 (Gayton).

Adiissions. | Deaths. Mortality per cent.

Vaccinal Marks. | Under 10 | Over 10| Under 10 | Over 10; Under 10 | Over 10 Years. Years. Years. Years. | Years. Years.

AVBOOd . 0 cece case 56 247 0 4 : oi 44 388 0 2 if 00 DIGOOM a eects eine 41 528 1 19 t 24 RE OOM efetelreverees 43 422 1 20 4imperfect …. 91 317 3 17 \ 3-0 8 imperfect …. 107 545 3 43 2imperfect ….| 142 930 17 92 \ 12°5 Daimpertect 7.1. 138 $20 18 129 in

The practice of re-vaccination was first recommended in England Re-vac- It cination.

by G. Gregory, and in Germany for the army by Heim (1829). has been more or less the law in Prussia since 1835 :7 " re-vaccina- tion of school pupils at the age of twelve is an integral part of the vaccination law." Notwithstanding the fact that Prussia was the best re-vaccinated country in Europe, its mortality from smallpox in the epidemic of 1871 was higher (69,889) than in any other northern state. The efficacy of re-vaccination is sometimes sought to be proved by the immunity of nurses in smallpox hospitals. fhe experiment of not re-vaccinating the nurses was tried at the small- pox hospital of the South Dublin Union in 1871-72 ; 29 out of the 36 attendants had not been re-vaccinated, and these all escaped smallpox as well as the other seven.® But nurses are not rarely chosen from among those who have had smallpox, and cases of smallpox in re-vaccinated nurses are not unknown.? The evidence as to re-vaccination on a large scale comes from the army. Accord- ing to a competent statistician (A. Vogt), the death-rate from small-

4 Majer, op. cit. 5 Parliamentary Return, 24th February 1880.

6 Trans. Prov. Med. and Surg. Assoc., viii., 1840. ;

7 Horn's Medicinal-Wesen in Preussen, ed. Eulenberg, Berlin, 1873-74, pp. 160 and 215. 8 Med. Press and Circ., 27th March 1872.

9 Sweeting, Rep. Fulham Hosp., 1881.

pox in the German army, iu which all recruits are re-vaccinated, was 60 per cent. more than among the civil population of the same age; it was ten times greater among the infantry than among the cavalry, and sixty times more

among the Hessians than among the Wiirtembergers. The Bavarian contingent, which was re-vaccinated without exception, had five times the death-rate from smallpox in the epidemic of 1870-71 that the Bavarian civil population of the ae ages had, although re-vaccination is not obligatory among the atter.

The susceptibility to cowpox infection diminishes with age ; among the pupils of twelve years in Prussian schools it fails in about one-fourth of the attempts, and at later periods of life the proportion of failures is still greater.

It is often alleged that the unvaccinated are so much inflammable material in the midst of the community, and that smallpox begins among them and gathers force so that it sweeps even the vaccinated before it. Inquiry into the facts has shown that at Cologne in 1870 the first unvaccinated person attacked by smallpox was the 174th in order of time, at Bonn the same year the 42d, and at Liegnitz in 1871 the 225th.

State-supported facilities for vaccination began in England in 1808 with the National Vaccine Establishment. In 1840 vaccination fees were made payable out of the rates. The first compulsory Act was passed in 1853, the guardians of the poor being intrusted with the carrying out of the law; in 1854 the public vaccinations under one year of age were 408,824, as against an average of 180,960 for several years before. In 1867 a new Act was passed, rather to re- move some technical difficulties than to enlarge the scope of the former Act ; and in 1871 the Act was passed which compelled the boards of guardians to appoint vaccination officers. The guardians also appoint a public vaccinator, who must be duly qualified to practise medicine, and whose duty it is to vaccinate (for a fee of one shilling and sixpence) any child resident within his district brought to him for that purpose, to examine the same a week after, to give a certificate, and to certify to the vaccination officer the fact of vaccination or of insusceptibility. The Local Government Board awards a considerable sum in premiums for totals of successful vaccination, at a higher scale of one shilling for each case, and a lower scale of sixpence. The vaccination officer sees that all infants are vaccinated, either publicly or privately, before they are three months old (in Scotland six months), unless there is

reason for post- poning the operation. He acts also as registrar of vaccinations. Parents refusing to obey the summons taken out by the vaccination officer are liable to a penalty of twenty shillings for each offence. In 1880 the president of the Local Government Board brought in a bill to repeal the part of the Act relating to cumulative penalties ; but the bill was withdrawn owing to protests from the medical pro- fession. In a number of populous unions of England a majority of the guardians are decided not to prosecute under the Vaccination Act; in other unions prosecutions are not unfrequent, the convic- tions having amounted in 1885 to upwards of two thousand, and having usually led to distraint of goods (rarely to imprisonment) in default of paying the fine. In England about two-thirds of all infants are vaccinated at the public expense.

Vaccination was made compulsory in Bavaria in 1807, and subse- quently in the following countries :—Denmark (1810), Sweden (1814), Wiirtemberg, Hesse, and other German states (1818), Prussia (1835), Roumania (1874), Hungary (1876), and Servia (1881). It is compulsory by cantonal law in ten out of the twenty-two Swiss cantons; an attempt to pass a federal compulsory law was defeated by a plebiscite in 1881.

In the following countries there is no compulsory law, but Govern- mental facilities and compulsion on various classes more or less directly under Governmental control, such as soldiers, state em- ployés, apprentices, school pupils, &c.:—France, Italy, Spain, Por- tugal, Belgium, Norway, Austria, Turkey.

In only a few States or cities of the American Union is there a vaccination statute; in Canada there is none. Vaccination has been compulsory in South Australia since 1872, in Victoria since 1874, and in Western Australia since 1878. In Tasmania a com- pulsory Act was passed in 1882. In New South Wales there is no compulsion, but free facilities for vaccination. Compulsion was adopted at Calcutta in 1880 and since then at eighty other towns of Bengal, at Madras in 1884, and at Bombay and elsewhere in the presidency a few years earlier.

Re-vaccination was made compulsory in Denmark in 1871 and in Roumania in 1874; in Holland it was enacted for all school pupils in 1872. The various laws and administrative orders which had been for many years

in force as to vaccination and re-vaccination in the several German states were consolidated in an imperial statute of 1874.

Authorities.—Jenner, Inquiry, London, 1798, and Further Observations, 1799 ; G. Pearson, Inquiry concerning the History of Cowpox, London, 1798 ; Woodville, Reports of a Series of Inoculations for the Variole Vaccine or Cowpox, London, 1799; Baron, Life of Edward Jewner, M.D., 2 vols., London, 1838; Bousquet, Sur le Cow-pox, découvert & Passy, Paris, 1836; Estlin, in Lond. Med. Gazette,

1838-39 ; Ceely, Trans. Prov. Med. and Surg. Assoc., viii. (1840) and x, (1842); Hering, Ueber Kuhpocken an Kiihen, Stuttgart, 1839; Viennois and others, in

Syphilis Vaccinale, Paris, 1865; Bohn, Handbuch der Vaccination, Leipsic, 1875 ; EB. C. Seaton, Handbook of Vaccination, London, 1868; Reports on Sanitary Measures in India, 1884-85; W. White, Story of a Great Delusion, London, 1885; M'Vail, Vaccination Vindicated, London, 1887; Lotz, Pocken und Vaccination, 2d ed., Basel, 1880; G. Fr. Kolb, Der heutige Stand der Impffrage, Leipsic, 1879 ; A. Vogt, Der alte u. d. neue Impfglaube, Bern, 1881; and Creighton, Natural History of Cowpox and Vaccinal Syphilis, London, 1887. (C. C.)

VAOZ (Germ. Waitzen), a market town in Hungary, on the left bank of the Danube, 20 miles north of Buda-Pesth. It gives its name toa Roman Catholic bishopric (established by Stephen, first king of Hungary, in 1000) and various schools, convents, and charities connected therewith, and has a state deaf and dumb institute and a central Government prison. The cathedral, a magnificent structure, is an imi- tation of St Peter's at Rome, with medizval relics and pictures. The majority of the inhabitants are engaged in agriculture and cattle-breeding ; but exportation of grapes from the neighbouring hilly district is also largely carried on. Vacz is a station on the Austrian-Hungarian railway system. The population, mostly Magyars by nationality, was 13,199 in 1880, and in 1887 was estimated to number nearly 17,000.

VAGA, Perino Dex (1500-1547), a painter of the Roman school, whose true name was PERINO (or PreRo) Buonac- corsi. He was born in Florence on 28th June 1500. His father ruined himself by gambling, and became a soldier in the invading army of Charles VIII. His mother dying when he was but two months old, he was suckled by a she-goat ; but shortly afterwards he was taken up by his father's second wife. Perino was first apprenticed to a druggist, but soon passed into the hands of a mediocre painter, Andrea da Ceri, and, when eleven years of age, of Ridolfo Ghirlandajo. Perino rapidly surpassed his fellow-pupils, applying himself especially to the study of Michelangelo's great cartoon. Another mediocre painter, Vaga from Toscanella, undertook to settle the boy in Rome, but first set him to work in Toscanella. Perino, when he at last reached Rome, was utterly poor, and with no clear prospect beyond journey-work for trading decorators. He, however, studied with great severity and spirit from Michelangelo and the antique, and was eventually entrusted with some of the subordinate work undertaken by Raphael in the Vatican. He assisted Gio- vanni da Udine in the stucco and arabesque decorations of the loggie of the Vatican, and executed some of those small but finely composed Scriptural subjects which go by the name of " Raphael's Bible"—Raphael himself furnish- ing the designs. Perino's examples are Abraham about to Sacrifice Isaac, Jacob Wrestling with the Angel, Joseph and his Brethren, the Hebrews Crossing the Jordan, the Fall and Capture of Jericho, Joshua Commanding the Sun to Stand Still, the Birth of Christ, His Baptism, and the Last Supper. Some of these are in bronze-tint, while others are in full colour. He also painted, after Raphael's drawings, the figures of the planets in the great hall of the Appartamenti Borgia. Perino exhibited very uncommon faculty in these works and was soon regarded as second only to Giulio Romano among the great painter's assist- ants. To Raphael himself he was always exceedingly respectful and attentive, and the master loved him almost as a son. He executed many other works about Rome, always displaying a certain mixture of the Florentine with the Roman style.

After Raphael's death in 1520 a troublous period ensued for Perino, with a plague which ravaged Rome in 1523, and again with the sack of that city in 1527. Then he accepted an invitation to Genoa, where he was employed in decorating the Doria palace, and rapidly founded a quasi-Roman school of art in the Ligurian city. He ornamented the palace in a style similar to that

of Giulio Romano in the Mantuan Palazzo del Té, and frescoed his- torical and mythological subjects in the apartments, fanci-

ful and graceful arabesque-work, sculptural and architec- tural details—in short, whatever came to hand. Among the principal works are the War between the Gods and Giants, Horatius Cocles Defending the Bridge, and the Fortitude of Mutius Scevola. The most important work of all, the Shipwreck of Aineas, is no longer extant. Perino was particularly good in the technique and colouring of fresco, and his stucco-work was no less highly prized than his pictures ; his Genoese paintings are, however, very in- ferior to those of Raphael in finish, as in other higher qualities, and his style in the nude tends rather towards Michelangelo. The Doria work is moreover extremely unequal. From Genoa Perino twice visited Pisa, and began some painting in the cathedral. Finally he returned to Rome, where Paul III. allowed him a regular salary till the painter's death. He retouched many of the works of Raphael, and laboured hard on his own account, under- taking all sorts of jobs, important or trivial. Working for any price, he made large gains, but fell into mechanical negligence. Perino was engaged in the general decoration of the Sala Reale, begun by Paul III., when his health, undermined by constant work and as constant irregulari- ties, gave way, and he fell down dead on 19th October 1547. He is buried in the Pantheon.

Perino, though his character and habits of life were not such as to inspire respect, seems to have been generally liked in a ccrtain way; he was, however, jealous of rivals, particularly of Titian when in Rome, and grudging in the instruction of his pupils. He produced some excellent portraits, and his smaller oil pictures com- bine with the manner of Raphael something of that of Andrea del Sarto. Many of his works were engraved, even in his own lifetime. Daniele da Volterra, Girolamo Sieiniutite da Sermoneta, Luzio

Romano, and Marcello Venusti (Mantovano) were among his prin- cipal assistants.

VAIR, GuittaumE pu (1556-1621), one of the fathers of French prose, and at the same time one of the most brilliant ornaments of the great school of French lawyers in the 16th and 17th centuries, was born at Paris on 7th March 1556. Du Vair was in orders, and, though during the greater part of his life he exercised only legal func- tions, he in 1617 accepted the see of Lisieux and died bishop thereof. His reputation, however, is that of a lawyer, a statesman, and a man of letters. He was fora considerable time a member (councillor) of the parlement of Paris, and it was in this capacity that he pronounced his most famous politico-legal discourse, an argument nominally for the Salic Law, but in reality directed against the alienation of the crown of France to the Spanish infanta, which was advocated by the extreme Leaguers. It was also during his tenure of the same post that he published (in 1595) a Traité de VEloquence Frangaise, which both advocates and exhibits a great improvement on the ordinary prose style of the day. In 1599 he be- came first president of the parlement of Provence (Aix), and in order not to give up this position he refused the see of Marseilles. In 1616 he received the highest pro- motion open to a French lawyer and became keeper of the seals. His death took place at Tonneins (Lot-et-Garonne) on 3d August 1621. Both as speaker and writer he holds a very high rank, and his character was equal to his abilities. Like other political lawyers of the time, Du Vair busied himself not a little in the study of philosophy (of a Christian stoical cast) and in that of classical an- tiquity, translating Cicero, Demosthenes, and Epictetus, and writing various treatises, on which Charron, a general plagiarist, is held to have drawn freely. Du Vair's works were published in folio at Paris in 1641.

_ VALAIS (Germ., Wallis), one of the Swiss cantons, rank- Ing as twentieth in the Confederation. Its name has been explained to mean the ' Welsh land," as the Teutons called all non-Teutonic lands ; but it is far more probably derived from "vallis," for Valais is simply the "Vallis Pcenina,"

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or valley of the Rhone, from its source to the gorge of St Maurice, together with some villages south of the Simplon Pass, and Monthey, Val d'Illiez, and Bouveret beyond St Maurice, on the left bank of the river. The total area of the canton is 2026°3 square miles, which is exceeded only by that of

Grisons (Graubiinden) and of Bern. Of this 930°4 square miles are classed as productive, forests cover- ing 243-2 and vineyards 9 ; of the remainder 375:1 square miles consist of snow and ice. The highest point of the canton is Monte Rosa (15,217 feet), and within its borders rises the Dom (14,942 feet), the loftiest peak entirely in Swiss territory. The population in 1880 was 100,216 (males predominating), an increase of 3329 since 1870. French is the native tongue of 67,214 and German of 31,962, the former dwelling (roughly speaking) west and the latter east of a line drawn north and south across the valley of the Rhone between Sierre and Leuk. The bulk (99,316) of the inhabitants are staunch Roman Catholics. The canton forms the diocese of Sion (founded in 4th cen- tury), which before 1513 was in the ecclesiastical province of Moutiers-en-Tarentaise (Savoy), and since then has been immediately dependent on the pope. In the canton there are three famous houses of Austin canons regular—St Maurice (founded as a Benedictine monastery, as distinct from the see, in 515 by Sigismund of Burgundy), the hos- pice on the Great St Bernard (first mentioned. in 1125), and that on the Simplon Pass (first mentioned in 1235). Ecclesiastical affairs are managed without any control or interference on the part of the state, though the cantonal legislative assembly selects as bishop one of four candi- dates nominated by the chapter of Sion. The only town of any size is the capital, Sion or Sitten (4871 inhabitants in 1880). 'The population are mainly engaged in agricul- tural pursuits, and great efforts have been made to improve matters lately, while the Rhone has been embanked to prevent disastrous floods. Much wine (¢g., Muscat and Vin du Glacier) and a vast quantity of grapes are exported. Education is compulsory and free, but very backward. A railway runs from Brieg to Bouveret. The mineral waters of Leukerbad and Saxon are well known, and in summer the canton is a favourite haunt of tourists.

The Vallis Poenina was won by the Romans after a great fight at Octodurus (Martigny) in 57 B.c., and was so thoroughly Roman- ized that the Celtic aboriginal inhabitants and the Teutonic Bur- gundian invaders (5th cent.) became Romance ~~*speaking peoples. According to a tradition which can be traced back to the middle of the 8th century, the "Theban legion' was martyred at St Maurice about 285. Valais formed part of the kingdom of Transjurane Burgundy (888), which fell to the empire in 1082, and later of the duchy of Burgundia Minor, which was held from the emperors by the*~~

~~house of Zaringen (extinct 1218). In 999 Rudolph III. of Burgundy gave all temporal rights and_privileges to the bishop of Sion, who was later styled “ prefect and count of the Valais,” and is still a prince of the Holy Roman empire; the pretended donation of Charlemagne is not genuine. The bishops had much to do in keeping back the Ziringen, and later the counts of Savoy. The latter, however, succeeded in winning most of the land west of Sion, while in the upper part of the valley there were many feudal lords (such as the lords of Raron and the counts of Visp). About the middle of the 13th century we find independent communities or “tithings” (“dizains ” or “zehnten”) growing up. In the same century the upper part of the valley was colonized by Germans from Hasli (Bern), who thoroughly Teutonized it, though many Romance local names still remain. In 1854 the liberties of the seven “tithings” (Sion, Sierre, Leuk, Raron, Visp, Brieg, and Conches) were confirmed by the emperor CharlesIV. A little later the influence of Savoy became predominant, and the count secured to his family the bishopric of Sion, of which he was already the suzerain. His progress was resisted by the tithings, which in 1388 utterly defeated the forces of the bishop, the count, and the nobles at Visp, this being a victory of the Teutonic over the Romance ele~~ ment in the land. From 1384 the Morge stream (a little below Sion) was recognized as the boundary between Savoyard or Lower Valais and episcopal or Upper Valais. For the connexion of the latter with the Val d’Ossola, see SWITZERLAND, vol. xxil. p. 785. By the election of Walther von Supersax of Conches as bishop in 1457 the Teutonic element finally won the supremacy. On the out-

break of the Burgundian War the bishop of Sion and the tithings made a treaty with Bern. In November of the same year (1475) they seized all Lower Valais up to Martigny, and in 1476 (March), after the victory of Granson, won St Maurice, Evian, Thonon, and Monthey. The last three districts were given up in 1477, but won again in 1536, though finally by the treaty of 1569 Monthey, Val d’‘Illiez, and Bouveret alone were permanently annexed to Valais. These conquered districts (or Lower Valais) were always ruled as subject lands by the bishop and tithings of Upper Valais. In 1533 a close alliance was made with the Catholic cantons; but by 1551 the Protestants had won so much ground that toleration was pro-

claimed by the local assembly. In 1586 Upper Valais became a member of the Golden League, and finally in 1603-4 the four tithings of Conches, Brieg, Visp, and Raron carried the day in favour of the old faith against those of Leuk, Sierre, and Sion. In 1790-91 Lower Valais rose in revolt ; but it was not finally freed till 1798, when the whole of Valais became part of the Rhodanic, and then one of the cantons of the Helvetic, Republic. Such prolonged and fierce re- sistance was, however, offered to French rule by the inhabitants that in 1802 Bonaparte declared Valais an independent republic, yet in 1810, for strategic reasons, he incorporated it with France as the ' department of the Simplon," and it was not freed till the Austrians came in 1813. In 1815 a local assembly was created, in which each of the seven tithings of Upper and each of the six of Lower Valais (though the latter had nearly double the population of the former) elected four members, the bishop being given four votes. In 1832 Valais joined the League of Sarnen to maintain the Federal Pact of 1815. In 1838-40 it was convulsed by a struggle between the Con- servative and Radical parties, the split into two half cantons being only prevented by the arrival of Federal troops. The constitution was revised in 1839 and 1844; the local assembly was to be elected according to population, and the bishop was given a seat instead of his four votes. In 1843 Valais was one of the Sonderbund, and in 1844 civil war raged, many Liberals being slain at the bridge of Trient (May 1844). The introduction of the Jesuits embittered matters,*

and Valais was the last canton to submit in the Sonderbund War |

(1847); it contented itself, however, with voting steadily against the acceptance of the Federal constitutions of 1848 and 1874. By the constitution of 1847 all ecclesiastical immunities were swept away, and the bishop lost his seat in the assembly. That constitu- tion was revised in 1852, and the present one is dated 1875. There is now a legislative assembly of 101 members, elected for four years by all male citizens of twenty years, in the proportion of one mem- ber to 1000 inhabitants, and an exccutive council of five members, holding office for four years, and chosen by the legislative assembly, though in a certain proportion to the different districts of the canton (two for the upper part, one for Sion, two for the lower part). The 'financial referendum" exists, by which when a capital expendi- ture of £2400, or au annual one of £800 for three years, is to be incurred, or it is

proposed to raise the property tax higher than 1% per cent., the proposal must be submitted to and approved by a popular vote.

ee Furrer, Gesch. von Wallis (3 vols., 1852-54); Gingins La Sarra, Développe-

ment de U' Indépendance du Haut Valais et Conquéte du Bas Valais (1844); and J. Gremaud, Documents Relatifs & U Histotre du Valais (1875 sq.). (W. A.B. C.)

VALDEPENAS, a town of Spain, in the province of Ciudad Real, on the railway line from Madrid to Cordova, is situated in the midst of a district thickly clothed with vineyards at the foot of the northern slope of the Sierra Morena. It is a straggling place and its only industry is that of wine-making (see Wiz). The population within the municipal boundaries in 1877 was 13,876.

VALDES, Juan De (c. 1500-1541), Spanish religious writer, born about 1500 at Cuenca in Castile, was the younger of twin sons of Fernando de Valdes, hereditary regidor of Cuenca. Juan has often been confounded with his twin-brother Alphonso, who was in the suite of Charles V. in 1520, acted as his Latin secretary from 1524, and died in 1532 at Vienna. It has been conjectured that Juan studied at the university of Alcala. We first meet him as the anonymous author of a politico-religious Didlogo de Mercurio y Caron, apparently written in 1528 and published then or soon after. As this Didlogo reflected strongly on the corruptions of the Roman Church, Valdes got into difficulties with the Spanish Inquisition, and left Spain for Naples in 1530. He removed in 1531 to Rome. On 12th January 1533 he writes from Bologna, where he was in attendance upon the pope, Clement VII.; his criticisms of papal policy had been condoned, inasmuch ag in his Didlogo he had defended the validity of the marriage of Catherine of Aragon to Henry VIII. But in the autumn

of 1533 he returned to Naples, and seems never to have left it again. His name has been Italianized into Valdesso and Val d'Esso. It has frequently been asserted that he was appointed by Charles V. as secretary to the

viceroy at Naples, Don Pedro de Toledo; but of this there is no evi- dence, and it seems a " harmonizing " conjecture, based on the confusion between Alphonso and Juan. Curione (writ- ing in 1544) calls him '"'cavalliere di Cesare," but there is no proof of his having ever held an official appointment. At his house on the Chiaja he was the centre of a very distinguished circle, literary and religious, and the influ- ence of his conversations and his writings, chiefly circulated in manuscript, stimulated the desire for a spiritual refor- mation of the church. The first-fruit of his cultured leisure at Naples was a philological treatise, Didlogo de la Lengua (written 1533) ; but, though his friends urged him to seek distinction by his humanistic studies, his bent was towards the spiritual problems of Biblical interpretation and the deep things of the devout life. Vermigli (Peter Martyr) and Marcantonio Flaminio were leading spirits in the coterie of Valdes, which included Vittoria Colonna and her sister-in-law Giulia Gonzaga. On Ochino, whom he furnished with themes for sermons, his influence was very great. Carnesecchi, who had known Valdes at Rome as "'a modest and wellbred courtier," found him at Naples in 1540 "wholly intent upon the study of Holy Scripture," portions of which he translated from the Hebrew and Greek into Spanish, with comments and suggestive pre- faces. To his teaching Carnesecchi ascribes his own com- plete adoption of the Evangelical doctrine of justification by faith, and at the same time his estrangement from the policy of the Lutheran schism. Valdes died at Naples in May 1541.

The death of Valdes scattered his band of associates. Ochino and Vermigli abandoned the hope of a regenerated Catholicism, and left Italy. By degrees some of Valdes's writings were translated into Italian and published. They exhibit great originality and penetration, combined with a delicate vein of semi-mystical spiritu- ality, and retain a large measure of that personal charm which is attributed to their author in all contemporary notices. Llorente finds traces in Valdes of the influence of Tauler's writings; any such influence must have been at second hand. Valdes was in re- lations with Fra Benedetto of Mantua, the anonymous author of Del Benefizio di Gest Cristo Crocefisso, which was revised by Flaminio (reprinted by Dr Babington, Cambridge, 1855). The suggestion that Valdes was unsound on the doctrine of the Trinity was first made in 1567 by the Transylvanian bishop, Francis David (see Socrnus, vol. xxii. p. 230); it has been adopted

by Sand (1684), Wallace (1850), and other anti-Trinitarian writcrs, and is counte- nanced by Bayle. Some colour has been given to this view by iso- lated expressions in his writings, and by the subsequent course of Ochino, whose orthodoxy seems, however, to have been unjustly suspected, from the speculative insight with which he presented objections, But Valdes, though he never treats of the Trinity, even when commenting upon Matt. xxviii. 19, reserving it in his Latte Spirituale as a topic for advanced Christians, explicitly affirms the consubstantiality of the Son, whom lie unites in doxologies with the Father and the Holy Spirit (Opusc., p. 145). His interest centred in matters of practical rather than of speculative theology: his great aim was the promotion of a healthy and personal piety.

The following is a list of his writings.

(1) Didlogo de Mercurio y Caron, 8vo (no date or place of print- ing; 1528?). An Italian translation, by Nicolo Franco, was printed at Venice without date, and reprinted at the same place in 1545. Both with the original and the translation is generally found a Did- logo on the sack of Rome in 1527, by Alphonso de Valdes, printed at the same time. Both are ascribed to Juan in the reprint Dos Didlogos of 1850. (2) Didlogo de la Lengua, written in 1533, first printed at Madrid, 1737, reprinted 1860 and 1873. (3) Qual Maniera si devrebbe tenere a informare … gli Figliuoli de Christiani delle Cose della Religione (no date or place of printing ; before 1545, as it was made use of by the Italian translator of Calvin's catechism, 1545). No Spanish originalis known. It was reproduced as Latte Spirituale, Basel, 1549, and Paris, 1550. A Latin version, by Pier- paolo Vergerio, was published in 1554 and again in 1557; it has been translated into German twice, into Polish, into English by J. T. Betts, 1882, and into Spanish by Ed. Boehmer, in Revista Cristiana, Madrid, February 1882 (also separately published). (4) Zrataditos, first published at Bonn, 1881, from a manuscript in the Palatine Library

at Vienna. An Italian translation, 1 Cinque Tratatelli Evangelict, was published at Rome, 1545, reprinted 1869. An English trans- lation, by J. T. Betts, is in XVII. Opuseules, 1882. (5) Alfabeto Christiano, Venice, 1545, an Italian translation of an unpublished and lost Spanish original. An English

version, by B. B. Wiffen, was published in 1861. (6) Qiento 7 Diez Congideragiones ; the ori- ginal is said to have been published, and all copies suppressed by the Spanish Inquisition ; thirty-nine of the Congideragiones werc published with the Jrataditos from a Vienna manuscript. An Italian translation, by Celio Secondo Curione, Le Cento et Dieci Divine Considerationi, was published at Basel, 1550, 8vo. A French translation, by Claude de Kerquifinen, was published at Lyons, 1563, 8vo, aud Paris, 1565, 8vo. The English translation by Nicholas Ferrar was published at Oxford, 1638, 4to, at the instance of George Herbert ; it was reprinted at Cambridge, 1646 ; a new translation, by J. T. Betts, was issued in 1865. A translation into Spanish from the Italian, by Luis Usdz i Rio, was published in 1855. (7) Seven Doetrinal Letters, printed with the Z'rataditos, from a Vienna manu- script, and translated by J. T. Betts in the XVII. Opuseules. (8) Comentario Breve .. . sobrela Epistola de San Pablo a los Romanos, Venice, 1556; translation and commentary, edited by Juan Perez de Pineda, reprinted 1856 ; English version, by J. T. Betts, 1883. (9) Comentario Breve . . . sobre la Primera Epistola de San Pablo a los Corintios, Venice, 1557 ; translation and commentary, edited, reprinted, and translated as No. 8. (10) El Hvangelio de San Mateo, translation and commentary, first published in 1881, from a Vienna manuscript ; English version, by J. T. Betts, 1883. (11) El Salterio, translation of the Psalms from Hebrew into Spanish, published with the Z'rataditos, from a Vienna manuscript. (12) At Vienna is an unpublished commentary in Spanish on Psalms i.-xli. (13) Sand mentions a commentary on St John's Gospel, which is not known to exist.

The notices of Valdes in Sand (Biblioth. Antitrinitar., 1684, p. 2), Bayle, and Wallace (Antitrin. Biog., 1850, ii. 8) are very inadequate. The revival of interest in him is due to M'Crie, Hist. Ref. in Italy, 1827, and Hist. Ref. in Spain, 1829. But the full knowledge of his life and teachings was first opened up by Benjamin B. Wiffen, whose Life of Valdes was prefixed in 1865 to the new translation of the Considerations. Since then important discoveries have been made in the Aulie Library, Vienna, by Dr Edward Boehmer ; compare his Span. Reformers of Two Centuries, 1874, and Lives of the Twin Brothers, J. and A. de Valdes, pre- fixed to Biblioth. Wiffeniana, 1882, also separately, with introd. by J. T. Betts. For an interesting sketch of Valdes, see Benrath's Bernardino Ochino, 1875. Respecting his

theological standpoint, compare Bonet-Maury, Early Sources of Eng. Unit. Christiantty, trans. by Hall, 1884. (A. GO

VALDO. See WALDo.

VALENCE, a town of France, chef-lieu of the depart- ment of Dréme and an episcopal see, is situated on the left bank of the Rhone, 65 miles south of Lyons on the railway to Marseilles. The river is here crossed by a fine suspension bridge. The cathedral of St Apollinaris (origin- ally of St Stephen) was rebuilt in the 11th century in the Auvergnesque variety of the Romanesque style, and consecrated in 1095 by Urban II. It was greatly injured in the Wars of Religion, but restored in 1604. The porch was rebuilt in 1861 ; above it rises a stone tower (187 feet). The church contains the monument of Pius VI. (bust by Canova), who died at Valence in 1799. A curious house (Les Tétes) of the 16th century has a sculptured front with heads of Homer, Hippocrates, Aristotle, Pythagoras, &c. The antique "little seminary" is occupied by a gallery of pictures, a museum of natural history, a library (25,000 volumes), and a collection of antiquities. Valence possesses a botanic garden, a champ de Mars, artillery barracks, and a departmental prison, worked on the solitary system. The chief industries are the spinning and weaving of silk, oil-pressing, distilling, metal-founding, and the manufacture of macaroni. A considerable trade is carried on in the pro- duct of this industry and in wine and agricultural produce. The population in 1881 was 21,941 (commune 25,402) and in 1886 22,453 (commune 24,761).

Valentia colonia Julia, Valentia Segalawunorum urbs, or eivitas Valentinorwm, was the capital of the Segalauni, and the seat of a celebrated school prior to the Roman conquest, a colony under Augustus, and an important town of Viennensis Prima under Valentinian. It was ravaged by the Alani and other barbarians, and fell successively under the power of the Burgundians, the Franks, the sovereigns of Arles, the emperors of Germany, the dukes of Valentinois, the counts of Toulouse, and its own bishops. The inhabitants rose unsuccessfully against these last in 1229, but obtained protection with the help of the dauphin in 1345. In 1450 they had their rights and privileges confirmed by Louis XI. and put on an equal footing

with those of the rest of Dauphiné. In the 16th century Protestantism spread freely under Bishop

Jean de Montluc, and Valence became the capital of the Protestants of the province in 1568. The town was fortified by Francis I. It had become the seat of a celebrated university in 1454; but the revocation of the Edict of Nantes struck a fatal blow at its industry, commerce, and population. Valence was the birthplace of General Championnet aud of President Bonjean (shot by the Commune of Paris in 1871); the family of Montalivet had its origin here. VALENCIA, a province of Spain, one of the three into which the former "kingdom " of Valencia is now divided, has an area of 4352 square miles and a population (1877) of 679,030, being thus, next to Barcelona, the most popu- lous province in the kingdom. It is bounded on the N. by Teruel and Castellon de la Plana, on the E. by the Mediterranean, on the S. by Alicante, and on the W. by Albacete and Cuenca. The surface is very much diversi- fied ; along the coast it is for the most part low and level, the fertile "vegas" of Valencia, Jativa, and Gandia in many places rising very little above sea-level ; to the west of these is a series of tablelands of a mean elevation of about 1000 feet, which in turn rise into the mountains that form the eastern boundary of the tableland of New Castile, and attain within the province a maximum eleva- tion of nearly 4000 feet. The principal rivers are the Guadalaviar or Turia and the Jucar. The former enters the province in the extreme north-west, flows south-east, and falls into the sea below the town of Valencia ; it receives numerous tributaries of little importance, and it dispenses fertility by numerous 'acequias," mostly of Moorish origin, throughout the whole of the lower part of its course. The Jucar is joined on the left at Cofrentes ("'Confluentes") by the Cabriel, a stream nearly as con- siderable as itself, and lower down by the Magro ; its chief right-hand tributary is the Albayda. Both the Jucar and the Albayda, like the Turia, supply an extensive irrigation. Almost every kind of geological formation from the Silurian to the Quaternary is represented in Valencia: the vegas are Quaternary ; nearly three-fourths of the entire pro- vince belong to the Cretaceous; large areas, especially to the west, in the district of Requena and Utiel, are of the Tertiary period ; in the north the Jurassic is prominent

; and Triassic is found along many of the river-valleys. The coast is skirted by considerable stretches of sand dune, and by a series of these the lagoon of Albufera (21,000 acres) is separated from the Mediterranean. The vegas enjoy an exceptionally fine, almost sub-tropical climate. In their low-lying portions rice is the favourite crop ; elsewhere wheat, maize, and all kinds of fruit are abundantly grown; the mulberry is cultivated for silk; and wine and oil are produced. Esparto grass is grown in the less fertile areas. The tablelands produce according to their elevation and exposure figs, almonds, olives, and vines. The pastures of the higher grounds sustain numer- ous sheep and goats; but cattle and horses are relatively few in Valencia. The hillsides are somewhat bare of

timber. The mineral resources of the province are little developed. The fishing industry on the coast is con- siderable. The manufactures include those of silk, glass,

pottery, and leather; there are also iron foundries, dis- tilleries, and soap manufactories. The coast railway from Tarragona to Encina passes through Valencia, whence another line has been carried along the Cuenca road as far as to Utiel (544 miles). The province is divided into twenty-one partidos judiciales and has 275 ayuntamientos. There are six "'cities"—Valencia (see below), Gandia (7604 inhabitants in 1877), Jativa (14,534), Requena (13,527), Sagunto (6287), and Alcira (16,146). VALENCIA, capital of the above province, is situated in the beautiful " huerta" of Valencia, on the right bank of the Guadalaviar or Turia, 3 miles above its mouth, and 304 miles by rail east-south-east from Madrid. Until 1871 it was enclosed by a wall, built in 1356 by Pedro IV.; two ay. — 5

picturesque gateways with machicolated towers still remain. | elegant Gothic hall (1482). The citadel, on the north- The river, reduced, except in time of flood, to a scanty | east of the town, was built by Charles Y. as a protection stream by the demands made upon it for purposes of irri- | against Barbarossa, the sea-rover ; in the south-west of the gation, is crossed by five bridges, of which the longest has | town is the former College of Saint Augustine, now used thirteen arches. The streets are for the most part narrow, | as a model prison, adjoining which is a large hospital.

crooked, and somewhat gloomy, but in the more modern | Outside the walls are a botanic garden, a large bull-ring, quarters there are some broad and handsome thoroughfares. | and various shady promenades, including the beautiful The cathedral (La Seo), begun in 1262, was afterwards "Glorieta," and, on the north side of the river, the alameda, (1459) lengthened in its original Gothic style, but in such | leading to the port of El Grao. The principal manufacture a way as to spoil its proportions, and in the 18th century | is silk, and the town is also celebrated for its coloured it was further injured by Pseudo-Classic additions. It | tiles or "azulejos." Linen and woollen fabrics, hats, possesses some fine examples of the sculpture and metal- | leather, paper, cigars, glass, and pottery are also manu- work of the 15th century, as well as of the Valencian school | factured, and there are foundries and printing-works. Corn, of painting. The campanile (El Miguelete), an isolated | rice, silk, saffron, oranges, raisins, almonds, figs, and other octagonal Gothic tower, 162 feet in height, commands an | fruits are extensively exported, and iron, hardware, timber,

uel

The port is at El Grao (Villanueva del Grao; population 4433 in 1877), 3 miles distant, where a commodious harbour with a mini- mum depth of 20 feet has been ~| constructed. The works were be- =] gun in 1792. The population of SJ Valencia in 1877 was 143,856,

Xj and in 1888 about 170,000 (esti-

— (136 B.c.). It sided with Sertorius (c. 77 B.c.), and was accordingly severely punished by Pompey, but must have \| recovered speedily, being mentioned by 3 Pliny (iii. 4) as a colony in the region of the Edetani, and spoken of by Mela as an important place. It was taken from the Goths by the Moors in 714, and from the Moors by the Cid (see vol. v. p. 774) in 1094, from whom it is soinetimes called Valencia del Cid. The Moors recovered. possession in 1101, but were compelled finally to relinquish it in 1238, when Jayme I. of Aragon (" El Conquistador") added it to his domi- nions. In the 16th and 17th ceuturics it became the seat of a considerable school of painting, of which Juanes (1506-79) may be regarded as the founder, and to which belonged also < rhage de Ribalta (1550-1628), Juan : e Ribalta (1597-1628), José Ribera is Fe oh, TERE (1588-1656), Pedro Orrente

(1560-1644), extensive view of the town and surrounding country. Near | and J. G. Espinosa (1600-1680). In the beginning of the 17th the cathedral is the episcopal palace ; its large and valuable ceutury Valencia and its surrounding district suffered greatly from

: – 1: og BOR the expulsion of the Moors, its most industrious and enterprisin library, oe ies ane “aa er at pe a ffeved greatly cultivators, In the War of Succession Valencia sided emphatio- during the French occupation in 2. Besides the cathe- | ally with the house of Austria, for which it was punished by being dral, Valencia has fourteen parish churches and numerous | deprived of many of its ancient privileges. In 1808 an abortive other ecclesiastical buildings, none of them of great archi- | attempt to capture it was.made by the French; they succeeded, tectural beauty or interest ; the church of St Nicholas (of however, in/ T1612, and hold Gua dune 203"

Moorish origin) has, however, good specimens of Juanes VALENCIA, a town in the United States of Venezuela, as well as frescos by Dinis Vidal; and Ribalta can be studied | capital of the state of Carabobo, situated amidst savannas in the chapel of the Colegio de Corpus or del Patriarcha. | and tropical plantations, 1800 feet above sea-level, in the The university buildings, dating from the 16th century, are | valley between the two chains of the Maritime Andes. It large but uninteresting ; the library (about 42,000 volumes) | is about 3 or 4 miles distant from the Lagoon of Tacarigua suffered severely in 1812, and, like the other appointments | or Lake of Valencia (about 45 miles in length and from of the university, falls considerably short of modern require- | 10 to 13 in width). The town is connected by cart-roads ments. ‘There is a collection of pictures (about 1000) in | with Cardcas and other places in the interior, as well as the city gallery, but only a few,—almost entirely of the local | with its port, Puerto Cabello. A railway across the school,—are of any importance. Among other public build- | northern chain of the Maritime Andes, with a total length ings may be mentioned the court-house, a Doric edifice, | of 334 miles, was nearly completed between Valencia and dating from the time of Ferdinand the Catholic, and having | its seaport in the end of 1887. The town is well built, curious frescos (1592) in its “chamber of deputies”; the | with straight streets cutting one another at right angles. custom-house (1758),

now a cigar manufactory, employing | The plaza or chief square, which is adorned with an early some 3500 women; and the silk exchange, a large and | Spanish church, commands a magnificent view of the

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Maritime Andes. There are several manufactories, among them a weaving factory and one for the making of machinery and agricultural implements. An iron aque- duct supplies the town with drinking water. Among the educational institutions are a college of science and a normal school. The climate is said to be healthy. The highest temperature is equal to 85° Fahr., the lowest 68°, the mean 76°°5. The population in 1883 was 36,145.

VALENCIENNES, a town of France and a first-class fortress, in the department of Nord, is 157 miles north- north-east of Paris on the railway to Brussels, at the point where the river Rhonelle joins the Scheldt. The latter here divides into two branches, one of which flows through the town, while the other, canalized, fills the trenches of the citadel and skirts the fortifications. Valenciennes is the centre of a rich coal-field, which has called into exist- ence numerous foundries, forges, rolling-mills, wire-works, and machine shops. There is also an extensive beetroot cultivation, with attendant sugar-works and distilleries. Cambrics and lawns are manufactured and calico-printing is carried on, though little of the famous lace is now made. There are a court of first instance, a chamber of

commerce, a conseil de prud'hommes, a chamber of agri- culture, and a sugar exchange. The town-hall, rebuilt after the old plan in 1867-68, and surmounted by a square campanile, contains examples of the three Watteaus, Van Dyck, Velazquez, Rubens (the Stoning of St Stephen), as well as numerous productions of the native school of fine arts (founded in 1782). There are also collections of medals and seals and a fine specimen of old Valenciennes tapestry. The library, formed at the Revolution from the libraries of the religious houses of Valenciennes, St Ainand, and the neighbourhood, contains 25,000 printed volumes and 980 MSS., the latter including valuable works in early Romance. Valenciennes also contains several interesting private collections, and has associations for the promotion of agriculture, science, art, music, &c. The church of Notre Dame du Cordon, of the 13th-century style, was consecrated in 1864. The church of St Géry has a grace- ful modern tower; but only a few pillars remain of the old building of 1225. The crooked and ill-paved streets contain some houses of the 15th and 16th centuries. Statues of Watteau and Froissart adorn the town. Of the six gates three have some architectural pretensions. The population in 1881 was 23,291 (commune 27,607) and in 1886 22,919 (commune 27,575).

Valenciennes, so named because founded or restored by the emperor Valentinian I., was a residence of Clovis, and it was hither that Charlemagne summoned his first assembly of states in 771. The Normans were repulsed from its fortifications in 881. Valen- ciennes by turns belonged to Hainault and was independent, till taken by Baldwin of Flanders in 1003. It cspoused the cause of Jean d'Avesnes in 1353, and was unsuccessfully besieged by the Flemings. In the 16th century Valenciennes becamc the strong- hold of Protestantism in Hainault, but was conqucred by the Spaniards, who committed all sorts of excesses. In 1656 the Spaniards under Condé made a suecessful defence against the French under Turcnne; but in 1677 Louis XIV. took the town after an eight days' siege, and Vauban constructed the citadel. Valeneicnnes has since always belonged to France. In 1798, after forty-three days' bombardment, the garrison, reduced to 3000 men, surrendered to the allied forces numbering some 140,000 or 150,000 men, with 400 eannon. In 1815 it defended itself succcssfully. Among the natives of Valenciennes may be mentioned Isabella of Hainault, wife of Philip Augustus of France, Baldwin IX. of Flanders (emperor of

Constantinople), Jeanne of Flanders, Henry VII. of Luxemburg (empcror of Germany), Froissart, the painters Watteau (3), Pater, and Abel de Pujol, the sculptors De Crauck, Durez, Saly, Carpeaux, and Lemaire, the soldiers Jacques de Lalaing and Charles dc Lannoy (viceroy of Naples), and the navigator Lemaire.

VALENS, empetor of the East from 364 to 378, owed his elevation in the thirty-sixth year of his age to his brother Valentinian, who chose him to be his associate in the empire, of which a formal division into East and West

was now once for all definitively arranged (see VALENTIN- tan I). Valens had been attached to Julian's bodyguard, but he was not much of a soldier, though his father, Gra- tian of Pannonia, had risen from the ranks to a high posi- tion. A revolt headed by Procopius in the second year of his reign, and backed up by the public opinion of Con- stantinople and the sympathy of the Gothic princes and chiefs on the Danube, seemed so alarming that he thought of negotiation; but in the following year the revolt collapsed at the prompt action of a loyal and able veteran officer. In the year 366 Valens at one stroke reduced the taxes of the empire by one-fourth, a very popular measure, though one of questionable policy in the face of the threaten- ing attitude of the Goths on the lower Danube. Before venturing on a campaign against them, Valens received baptism from Eudoxus, the bishop of Constantinople and the leader of the Arian party. After some small successes over the Goths, won by his generals, Valens concluded a peace with them, which lasted six years, on a general understanding that the Danube was to be the boundiry between Goths and Romans. On his return to Constanti- nople in 369-370 Valens began to persecute his orthodox and Catholic subjects. Yet he can hardly have been a hearty and willing persecutor, or he would not have suffered the orthodox Basil to remain bishop of Ceesarea in Cappa- docia, nor can he have been a thoroughgoing religious fanatic, or he would not have restrained many of his sub- jects from burying themselves in monasteries to escape the duties of citizens. Indeed he had not the strength of will or force of character to have been either the one or the other.

In the years 371 to 377 Valens was in Asia Minor, most of the time at the Syrian Antioch. The late war with Persia under the emperors Julian and Jovian had not been satisfactorily concluded: the question as to the possession or the protectorate of Armenia was still in suspense. Valens, though anxious to avoid an Eastern war, because of danger nearer home from the restlessness of the Goths, was compelled to take the field against Sapor, who had invaded and occupied Armenia. It seems that Valens! crossed the Euphrates in 373, and in Meso- potamia his troops drove back the king of Persia to the farther bank of the Tigris. But the Roman success was by no means decisive, and no definite understanding as to boundaries was come to with Persia. Valens returned to Antioch, where in the winter of 373 a young man of high rank, Theodorus by name, was made to believe by a pack of fortune-tellers and magicians that the emperor's suc- cessor would be a man whose name began with " Theod." Theodorus was put to death, with many others whose name began with the same fatal letters; and this led to a vindictive persecution throughout the province of Asia of all who professed or practised magic and necromancy. The age was a very superstitious and inquisitive one, and Valens certainly shared its weakness. Between 374 and 377 we read of grievous complaints of injustice and extor- tion perpetrated under legal forms, the result probably of the recent panic, and pointing to an increasing weakness and timidity at headquarters. Although preparations were made for following up the war with Persia and securing the frontier, a truce was patched up, rather to the disad- vantage of the empire, Armenia and the adjacent country being half conquered and annexed by Sapor. The armies of Rome, in fact, were wanted in another quarter. The Huns, of whom we now hear for the first time, were be- ginning in 376 to press the Goths from the north, and the latter asked leave of the emperor to cross the Danube into Roman territory. This they were allowed to do, on the condition that they came unarmed, and their children were

1 Ami. Marc., xxix. 1; the narrative is brief and not very clear.

transported to Asia as hostages. The conditions, how- ever, were not strictly enforced, and the whole affair was treacherously mismanaged by the imperial generals, who for their own profit forced the new settlers to buy

food at famine prices. Accordingly the enraged Goths, under their chief Frithigern, streamed across the Balkans into Thrace and the country round Adrianople, plundering, burning, and slaughtering as they went. They were driven back for a time, but returned in the spring of 378 in greater force, with Huns and Alans to fight with them against the empire; and again, after one or two repulses, they pene- trated to the neighbourhood of Adrianople. Valens, who had now returned to Constantinople, left the capital in May 378 with a strong and well-officered army. Without awaiting the arrival of his nephew Gratian, emperor of the West, who had just won a great victory over one of the barbarous tribes of Germany in Alsace, Valens attacked the enemy at once, although his troops had to go into action heated and fatigued by a long march on a sultry August day. The battle was decided mainly by the cavalry of the Alans and Sarmatians, the Roman infantry being outnumbered, outmanceuvred, and finally so hemmed in that the men could scarcely draw their swords. The slaughter went on for hours, till the imperial army was destroyed. Valens either perished on the field or, as some said, in a cottage fired by the enemy. From the battle of Adrianople the Goths permanently established themselves south of the Danube.

Ammianus Marcellinus, a contemporary writer, is our chief authority for the reigns of Valens and Valentinian. See also Gibbon's

sketch of the period in the 26th and 27th chapters of his Decline and Fall and Hodgkin's Italy and her Invaders.

VALENTINE, or VALENTINUS, the name of a consider- able number of saints,! three of whom may be particularized. 1. VALENTINUS, presbyter and martyr, according to the authorized Roman legend (see lesson for second nocturn, 14th February, in the diocese of Tortosa), was arrested and thrown into chains at the instance of the emperor Claudius (Gothicus), and handed over to Calphurnius, who employed

one Asterius to try to win him back to idolatry. Valentine

miraculously healed the blind daughter of Asterius, who accordingly believed and was baptized, with all his house. The saint after long imprisonment was beaten with clubs and finally beheaded on the Flaminian Way (14th Feb- ruary). 2. VALENTINUS of Interamna (Terni), bishop and

martyr, miraculously healed Cheremon, the deformed son of Craton, a Greek rhetorician living in Rome, who along with various other prominent persons was accordingly converted. This Valentine, who also is commemorated on 14th February, is invoked, especially in Italy and Germany (St Velten), in cases of epilepsy and cognate disorders. 3. VALENTINUS, who is spoken of as the apostle of Rheetia, and venerated in Passau as its first bishop, flourished during the first half of the fifth century.

For the peculiar observances that used to be connected with St Valentine's Eve and Day in England, Scotland, and also (it is said) in some parts of France, and to which allusion is so frequently made by English writers from Shakespeare onwards, such works as Brand's Popular Antiquities, Hone's Every-Day Book, or Chambers's Book of Days may be consulted. Their appropriateness to the spring season is, in a general way, perhaps, obvious enough ; and, as for the name, it has been suggested that there is at least a similarity in sound between Valentine and galentin (Fr. dim. from galant).

VALENTINIAN I., emperor of the West from 364 to 375. He had been an officer of the guard under Julian and Jovian, and had risen high in the imperial service. With a fine robust frame, he possessed great courage and great military capacity. He was chosen emperor in his forty-third year by the officers of the army at Nica in Bithynia early in 364, and shortly afterwards named his brother VALENS (¢.v.) colleague with him in the empire.

1 The Heiligenlexieon of Stadler-Ginal enumerates fifty-two.

The two brothers, after passing through the. chief cities of the neighbouring district, arranged the partition of the empire at Naissus (Nissa) in Upper Meesia. As emperor of the West, Valentinian took Italy, Illyricum, Spain, the Gauls, Britain, and Africa, leaving to Valens the eastern half of the Balkan Peninsula, Greece, Egypt, Syria, and Asia Minor as far as Persia. During the short reign of Valentinian there were wars in Africa, in Germany, and in Britain, and Rome came into collision with barbarian peoples of whom we now hear for the first time,—Burgundians, Saxons, Alemanni. The cmperor's chief work was guard- ing the frontiers and establishing military positions. Milan was at first his headquarters for settling the affairs of northern Italy ; next year (365) he was at Paris, and then at Rheims, to

direct the operations of his generals against the Alemanni. This people were driven back to the Ger- man bank of the Rhine, and checked for a while by a chain of military posts and fortresses, though at the close of 367 they swooped down on Moguntiacum (Mainz) and plundered the city. In that same year Valentinian was at Amiens, and there, before his assembled troops, he gave the title of Augustus to his son Gratian, eight years of age. The next three years he spent at Treves, organizing the defence of the Rhine frontier against the Alemanni and Saxons, and personally superintending the construction of numerous forts. Treves was, in fact, his headquarters dur- ing most of his reign. His general administration seems to have been thoroughly honest and able, in some respects beneficent. If he was hard and exacting in the matter of taxes, he spent them in the defence and improvement of his dominions, not in idle show or luxury. Though him- self a plain and almost illiterate soldier, he was a founder of schools, and he also provided medical attendance for the poor of Rome, by appointing a physician for each of the fourteen districts of the city. He was a Christian, an orthodox Catholic, and in his life perfectly pure; but he permitted absolute religious freedom to all his subjects. Against all abuses, both civil and ecclesiastical, he steadily set his face, even against the increasing wealth and worldli- ness of the clergy. Valentinian was in many ways a good and able ruler at a particularly difficult time. The great blot on his memory is his cruelty, which at times was frightful, and showed itself in its full fierceness in the punishment of persons accused of witchcraft, soothsaying, or magical practices. In 374 the Quadi, a German tribe in what is now Moravia and Hungary, resenting the erec- tion of Roman forts to the north of the Danube in what they considered to be their own territory, crossed the river and laid waste the province of Pannonia, Valentinian's native land. The emperor in the April of the following year entered Illyricum with a powerful army, and gave audience to an embassy from the Quadi at Bregetio on the Danube, somewhere near Pressburg. Their defence threw him into a paroxysm of rage, in which he suddenly fell down, apparently in a fit of apoplexy, and died in a few hours. His two sons, Gratian and Valentinian II, were jointly his successors.

VALENTINIAN IL., an infant of four years of age, with his half-brother Gratian, a lad of about seventeen, became the emperors of the West on the death of their father, Valentinian I.,in 375. They made Milan their home;

and the empire was nominally divided between them, Gratian taking the trans-Alpine provinces, whilst Italy, Ilyricum in part, and Africa were to be under the rule of Valen- tinian IT., or rather of his mother, Justina. Justina was an Arian, and the imperial court at Milan pitted itself against the Catholics, under the famous Ambrose, bishop of that city. But so great was his popularity that the court was decidedly worsted in the contest, and the em- peror's authority materially shaken. In 387 Maximus,

who had commanded a Roman army in Britain, and had in 383 (the year of Gratian's death) made himself master of the northern provinces, crossed the Alps into the valley of the Po and threatened Milan. The emperor and his mother fled to Thessalonica, to Theodosius, the emperor of the East and husband of Galla, Valentinian's sister. At their entreaty he marched into Italy with an army, de- cisively defeated Maximus, and set Valentinian once more on the throne (388). He also converted the lad to orthodox Catholicism. Four years later Valentinian was dead. A barbarian warrior, a Frank named Arbogast, who had fought for Gratian and Theodosius, so presumed on his services that Valentinian was provoked into giving him a letter of dismissal. But Arbogast tore the letter up before the emperor's face and openly defied him. Soon after- wards Valentinian was slain, no doubt by Arbogast's order, at Vienne in Gaul, while taking part in some athletic sports. Eugenius, a humble dependent of the barbarian, succeeded to the empire of the West, a disgrace noted by the poet Claudian (De Tertio Consulatu Honorii, |xvi.).

VALENTINIAN IIL, emperor of the West from 425 to 455, the son of Constantius and Placidia, daughter of the great Theodosius, was declared Czesar at Thessalonica under the auspices of Theodosius IT., and again the follow- ing year at Rome, in the seventh year of his age. His reign of thirty years was a period of great and terrible events associated with the names of Attila, Genseric, and Aetius, the "last of the Romans." This period is marked by the dismemberment of the Western empire, the con- quest of the province of Africa by the Vandals in 439, the final abandonment of Britain in 446, the loss of great portions of Spain and Gaul, in which the barbarians had established themselves, and the ravaging of Sicily and of

the western coasts of the Mediterranean by the fleets of Genseric. As a set-off against these calamities there was the great victory of Aetius over Attila in 451 in the neighbourhood of Chalons. (See Roms, vol. xx. p. 781.) The burden of taxation became more and more intolerable as the power of Rome decreased, although there were a partial remission of taxes in 450 and a cancelling of arrears in consequence of the general impoverishment of Rome's subjects. Ravenna was Valentinian's usual residence ; but he fled to Rome in 452 on the approach of Attila, who, after ravaging the north of Italy, died in the following year. In 454 Aetius, between whose son and a daughter of the emperor a marriage had been arranged, was treacherously murdered by Valentinian. Next year, however, the crime was avenged by the assassination of the emperor as he was looking on at some games in the Campus Martius. He was a contemptible creature, cowardly, self-indulgent, without spirit, and without ability. With Valentinian III. the family of Theodosius became extinct.

Our chief original sources for the reign of Valentinian ITI. are Jordanes, Prosper's Chronieles, written in the 6th century and end- ing with the year 455, and the poet Sidonius Apollinaris. See also

Gibbon's history of the period (Deeline and Fall, c. xxxili.-xxxv.) and Hodgkin's Jtaly and her Invaders (1880).

VALENTINUS AND VALENTINIANS. Valentinus was the most important Christian theologian before Origen. Clement and Origen both were his pupils. In his school all those problems were started which afterwards engrossed the Greek fathers, and a large proportion of the solutions given by him and his followers subsequently became, though in a modified form, accepted doctrines. The dog- matic of Origen lies at the foundation of the orthodox dogmatic of the church, and it in its turn had its prototype in that of the Valentinian school. Valentinus was the first man in Christendom who for other than merely apologetic purposes sought to fuse together the results of Greek philosophy with the substance of the Gospel, combined the exalted ethic of the Platonic and Neopythagorean schools

with the preaching of the evangelical pulpit, and treated the manifestation of Jesus as the keystone in the great structure of thought which Greek science had reared. His theology is, so to speak, the central pier of the bridge con- necting the Jewish with the Christian Alexandrians. He may perhaps be regarded as superior to Philo in sober- mindedness and in acuteness, and as having excelled Origen at once in delicacy of religious and moral perception and in vigour of language, though he was far behind him in learning and in extent of knowledge.! His success as a: teacher was brilliant. Tertullian tells us that among all the Christian "collegia" that of Valentinus was the most crowded,? and the numerous branches into which his scholars soon divided are evidence of the wealth of his influence. Even his enemies have praised his "ingenium et eloquium" (Adv. Valent., 4). Tertullian, Clement, Origen, Jerome, and Adamantius agree in testifying that he was a man of singular gifts. The few extant fragments of his writings fully confirm this: there is not one of them that is not marked by originality and depth. And his disciples, although they have partly deteriorated his teachings by undisciplined fancies and inappropriate mytho- logizing, have, every one of them, something particular and valuable to say. Their influence did not cease until in the catechetical school of Alexandria the church found teachers of her own who were at once scientific theologians and de- fenders of the church of orthodoxy.

Valentinus.—Of Valentinus himself almost nothing is known. That he was an Egyptian by birth and received his education in Alexandria is probable but not certain.? He came to Rome under Hyginus about 138, flourished under Pius (140-155), and was still there in the time of Anicetus (c. 155-166). This we learn from Irenus (iii. 4, 3), who lets us see that his main activity was in Rome. He further tells us that Polycarp during his sojourn in that city was the means of converting some Valentinians. Tertullian supplements (De Prescr., 30) Irenzeus with the information that Valentinus originally attached himself in Rome to the main body of the church, but "ob inquietam semper curiositatem qua fratres quoque vitiabat," after having been twice temporarily suspended from communion, he was ultimately cut off. This statement shows that the Roman Church did not, to begin with, possess the standards by which to try Valentinus. The sections of the Shepherd of Hermas which treat of the Gnostics represent them as still continuing to exist within the church, although their dangerous character was already

known. It was not, then, until the bishopric of Anicetus that the Roman Church suc- ceeded in ridding itself of the Valentinian collegia. It seems very doubtful whether there is any good foundation for Tertullian's further allegation (Adv. Valent., 4) that Valentinus was ambitious of obtaining the episcopate of Rome and that his failure in this caused him to break with the church. Hippolytus will have it (see Epiphanius and Philaster) that Valentinus afterwards went to Cyprus as a declared heretic. We are not in a position to control this statement ; but the words of Ireneeus would almost lead to the conclusion that he died in Rome. At any rate there is no reason to suppose that he was alive much later than 160. 'Tertullian, in spite of a disposition to bring him down to as recent a period as possible, does not seem to think of him as living in the time of Marcus Aurelius. But in the school of Valentinus it was asserted that their master had been a pupil of Theodas, a yv@pipos TlavAov ;4 in that case he must have been a very old man in 160.

1 Jerome nevertheless calls him "doctissimus" (Comm. in Osee, ii. 10).

2 Tert., Adv. Valent. ; cf. Origen, Hom., ii. 5, and Comm., xiv. p. 40, " robustissima secta."'

3 Epiph., Wer., 31; Mur. Fragm., fin.

4 Clem., Strom., vii. 17, 106.

Valentinus was the author of several epistles, three frag- ments of which have been preserved by Clement ;! one of these was addressed to a certain Agathopus. He also com- posed homilies (one entitled On Friends), of which we possess four fragments.? An expression of Tertullian's(Adv. Valent., 2) seems to imply that Valentinus was also the author of a treatise entitled Sophia. Perhaps this is the source from which Irenzus's systematic account of the Valentinian doctrine (i. 11, 1) was indirectly taken. Ter- tullian speaks of Psalms of Valentinus (De Car., xvii. 20) ; the author of the Muratorian Fragment seems also to refer to these; and in the Philosophumena of Hippolytus (vi. 37) a considerable fragment from them is given. The

“gospel” of Valentinus is spoken of below.

Sources, —All that we possess of Valentinus and his disciples are the fragments preserved by their opponents, the fathers of the chureh. We cannot therefore put implicit confidence in all that they tell us, or accept as of primary importance in the doctrine of the Valentinians all that they represent as such. The extant frag- ments of the writings of Valentinus himself, as well as of those of his scholars (Ptolemzus, Heracleon, Theodotus, and others), fortu- nately enable us to set their theology in a more worthy light than does the fantastic “system” which Ireneus has given. Of the four ancient treatises against the Valentinians known to Tertullian we possess but one, that of Irenzus, those of Justin, Miltiades, and Proculus being lost. The loss of Justin is most to be regretted, for he was a contemporary, and wrote his Syntagma probably in Rome at the time when Valentinus was actually labouring there. In Rome some sixty years later the author of the Muratorian Frag- ment also took notice of him. Proculus wrote a special polemie against him, while Miltiades wrote in the same sense in Asia Minor and Ireneus in Gaul about 180. Tertullian’s Adversus Valen- tinianos was composed in Carthage some twenty years later, and Clement engaged in a work of a similar nature alinost simultane- ously at Alexandria. Against the Marcionite Church the fathers were equally energetic, Marcion and Valentinus during the period between 150 and 280 passing for the most dangerous herctics. Our oldest and at the same time fullest source is the work of Irenzus, which rests upon a tract of Ptolemeus and probably makes use of the Syntagma® of Justin. In all probability he had read nothing of Valentinus himself. Tertullian’s Adversus Valentinianos is largely taken from Ireneus, but contains some things that are original and of very great value: he had either himself read some Valen- tinian works, or had at least obtained authentic information as to their contents. Our best sources for Valentinus himself are the Stromata and Eclogues of Clement of Alexandria, who had read much of Valentinus and something of Heracleon, and gives cxtracts from both. His Excerpta ca Theodoto are also invaluable. Hip- polytus in both his works against heretics has transcribed Irenwus ; yet in his Phélosophwmena he has followed a new source in describ- ing the Valentinian system. Origen made a careful study of Heracleon’s Commentary on John’s Gospel, and in his own Com- mentary he frequently refers to it both approvingly and

otherwise. The numerous fragments he has preserved have very great value for the historian. Lastly, Ireneus and Hippolytus have been tran- scribed by Epiphanius, who also has preserved various matters of importanee, particularly the letter of Ptolemeus to Flora.

Valentinians.—The school of Valentinus soon divided into two main branches, that of Italy and that of Asia Minor. Both in turn subdivided into various sections; but the Asiatic branch on the whole preserved most faithfully the teaching of the master. His influence spread even beyond the limits of the schools. Tatian, for example, in his later period indubitably derived much from Valen- tinus, and the fathers of the Alexandrian school were very largely indebted to him. Even in the time of Epiphanius Valentinians still existed in some districts of Egypt. The Italian branch had as heads of its schools Secundus, another master of uncertain name (Colarbasus? Epiphanius? see Iren., i. 11, 3), Ptolemeus, Herac- leon, Theotimus, and Alexander. Secundus modified the master's doetrine of the eons and introduced a dualism into it. The anony- mous scholar shows tokens of Pythagorean influence. But the most important, exceeding in the extent of their influence even the master himself, were Ptolemzus and Heracleon. The former made into hypostases the eons which Valentinus himsclf had regarded as impersonal powers of the one Godhead. He is the systematic and Biblical theologian par excellence of the Valentinian school, con- spicuous for a powerful if also undisciplined phantasy ; and in his letter to Flora he shows how thorough has been his study of the pa SO ES a ee as*

1 Strom., ii. 8, 36; ii, 20, 114; iii, 7, 59.

2 Strom., iv. 13, 91; iv., 18, 92; vi. 6,52; Hippol., Philos., vi. 42.

3 His use of this work, however, is not beyond all question, and it is impossible to tell the nature and amount of his indebtedness,

4 See Hippol., Philos., vi. 85; Tert., Adv. Valent., 4.

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Old Testament, and how penetrating, how carefully considered, and how pointed his criticism of it. Heracleon, mentioned also by Ireneeus, earned distinction by his Commentary (dmopyjpuara) on the Gospel according to John, for it is probably the first scientifie com- mentary that Christendom produced. Clement (Strom., iv. 9, 73) calls him the most eminent teacher of the Valentinian school. He appears to have shown much greater sobriety than Ptolemeus, whose speculations recall those of the later Neoplatonists in a most striking manner, just as we find Valentinianism generally to have anticipated, not only the later scientific theology of the Catholic Church, but also Neoplatonism. Of Theotimus all that we know is Tertullian's remark (Adv. Valent., 4): 'multum circa imagines legis operatus est." 'Tertullian is also our sole informant about Alexander (De Carne, 17-20). He seems to have busied himself specially with the Christological problem, and to have written under the title of SyJlogismi a treatise into which quotations from Valentinus's Psalms were introduced as authorities.

The names mentioned as those of leaders of the Asiatic school are Axionicus, Theodotus, and above all Bardesanes ; we also have some fragments of Valentinian writings belonging to the East, but of which the origin is otherwise unknown.> Axionicus at Antioch as was the master's most faithful disciple. Clement of Alexandria has preserved excerpts of a very inconsecutive character and in a very corrupt text from a systematic work, and some commentaries of Theodotus (Ex rv Oeodérov xal ris dvaroixis Kadoupévys didac- kadlas kara rovs Ovadevrivov xpébvous émirouat), These excerpts, which constitute one of the most important sources for Gnosticism generally, have not hitherto received the attention they deserve. Zahn (Horsehungen, iii, p. 128 sg.) has tried to make out that Theodotus is identical with Theodas, Valentinus's master. But from the excerpts it seems hardly probable that they should be the work of a man who must have written at latest under the emperor Trajan. Bardesanes, though originally influenced by Valentinus, ultimately took up peculiar and independent ground of his own, and through him Valentinus exercised a great influence npon the Syrian Church, which continued until the 4th century (see Syriac LITERATURE, vol. xxii. p. 827). In Asia Minor the Valentinian eollegia continued until past the middle of the 4th century (see Epp. Juliani). The church fathers bring into connexion with Valentinus the Magian Marcus, as to whose doctrine we are very adequately informed by

Irenzus, but it is questionable whether he can really be reckoned as one of the disciples of that master.

Teaching of Valentinus.—Valentinus made his appearance at a time when the Christian communities were still destitute of any fixed doctrinal system: they were still associations pledged to a holy life on the ground of their faith in the one spiritual God and in His Son Jesus Christ, closely held together by the bonds of brotherly love, and strictly separated from the world and from them that are without by the consciousness of having received the Holy Ghost. But an enormous volume of facts, of sayings, and of thoughts had by this time become current within the church, material drawn from the Old Testament, from the Gospel history, from the Pauline epistles, from other early Christian writings, and from the Hellenistic and apocalyptic literature of the Jews. How this material was to be arranged, how it was to be kept within bounds, and with what degree of authority it was to be invested were questions still unsettled. But one thing was certain—Paul had declared it, and every Christian apostle, prophet, and teacher had repeated it—that the Christian faith guaranteed knowledge supreme and complete, and led on from truth to truth. Another thing was sure—that all human wisdom was but folly in presence of this new "divine" wisdom, which was inclusive of all human knowledge. The means, moreover, by which every saying, every fact was to be turncd into a profound thought had for long been known and in use in the Christian communities, —that of allegory. But as yet there was no settled principle fixing the manner in which the allegorical method was to be applied, or determining what were the ruling thoughts of Scripture. The attitude of Christian teachers towards the Jewish wisdom was as indeterminate as it was towards Greek philosophy. The Pauline theology was intelligible only to a very few, and the Old Testament was as it were a veritable sphinx. It was understood to be a superhuman book, but it was also understood that much of its contents, if taken literally, was valueless. In what sense was it to be under- stood? How much of it was to be taken literally and how much spiritually? Was everything to be taken spiritually ? According to what principle was it on this assumption to be interpreted ? Was the whole of it the revealed word of the Most High, or were various authors to be recognized? Might it possibly be that part of it was divine, part heroical, part genial, part natural, part false, and part devilish? Or was it perhaps true that no part of the book proceeded from the Most High

God, that nothing was pneu- matic, but all psychical or carnal? And, if the Old Testament was

ee Oe eee 5 See Epiph., Her., iii. 5, 6; Method., Iepi avrefoveiov; Adamant., De recta in Deum fide. 6 Hippol., Philos., iv. 85; Adv. Valent., 4.

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to be allegorized, must not the narratives and the sayings of the Gospels be also treated in the same way? Was not allegory here also the pathway to the thought? If the opening chapters of Genesis and the histories of the patriarehs and of the people of Israel were a profound philosophical poem, why should not also the life of Jesus Christ be only the veil of a cosmie mystery? All these questions had within the period from 60 to 130 exercised, not indeed the great mass of believers, for these were uneducated, but thinking Christians; and the more the Christian preaching enlarged its scope, the more Christians came into contact with Syrian, Samaritan, Egyptian, and Greek wisdom, and the more they found themselves ealled upon to make eomparisons and to bring into clearness that which is peculiar to and distinetive of Christianity, it was inevitable that these questions should stir the minds of educated Christians all the more intensely. Upon the one basis of faith in Jesus Christ aceordingly there were about the year 130 a great variety of groups, differing from one another in doctrine, worship, organization, and the like,? but differing also in their attitude to Christianity at large, some keeping themselves aloof from it beeause they regarded it as wholly perverted, others being driven out from it, others again, while remaining within the main body, yet forming special schools, or "mystery" unions, and soon. In Syria, as also in other portions of the Roman empire, the gospel was associated with Semitie "cultus wisdom" and with the abstruse speculations of a physical science still in its ehildhood ; the entire Old Testament was rejeeted and an attitude of opposition assumed towards fellow-members in the great Christian union. These developments, however, could reekon on only a relatively small degree of encouragement within the Greco-Roman world. The barbaric elements they contained were too conspicuous, and on the other hand they were too far removed from Jewish-Christian tradi- tion and from Christian common sense. But the attractiveness must have been very great

when, on the basis of Christian tradition and the mysterious traditions of Oriental peoples, a system was set up with the aids of Greek philosophical science for a school of 'knowing ones' or " Gnostics," and a cultus organized for a eom- munity of the "initiated." This was what Basilides and Valentinus achieved. 'The importance of Valentinus lies in the faets, firstly, that he recognized the relationship (for sueh a relationship really existed) between the theogonie-eosmogonic myth-wisdom of western Asia and the Neopythagorean, Platonie, and Philonie philosophy ; secondly, that he touched all this rich and varied material which he had appropriated with the mmagie wand of the Platonic eoncep- tion of the universe, and thus transmuted the whole into entities of a purely spiritual character ; and thirdly, that he gave a decisive part to the appearance of Jesus Christ in that great drama which the history oF the higher and the lower cosmos presented to his mind. In all this he had no design of setting up a new "confes- sion," and still less any notion (as Mareion had) of utterly remodel- ling Christianity. He was prevented from eherishing any such ideas by his conviction that men were divided by the inalterable eonstitution of their natures into three elasses,—the " pneumatie," men of the spirit, genial natures, in whom sparks of the divinity are found ; the " psychical," moral men, who can if they choose be ethically good; and "hylie" or carnal, hopelessly chained to that whieh is perceived by the senses. The ordinary members of Christendom at large he held to be "psychical," and esteemed them as such. But he did not regard their Christianity as the Christianity, rather only as its exoterie form. Alongside of the exoteric there had all along, aceording to him, existed an esoteric. The apostles did not say out everything to everybody, but on the contrary communicated to the "spiritual ones" a secret doctrine into whieh only select persons might be initiated, and that not until after long and eareful probation. This secret teaching included a special dogmatic, a special ethie, and a special worship. But it was hot out of all connexion with the Christianity that was publiely taught. We ean observe in the history of the Valentinian schools the zeal with which they strove to adapt themselves to the Chris- tianity publicly professed, and to follow it in all its developments. The Valentinians always, so far as they possibly conld, accepted such things as the development of the canon (agitated for by them- selves) within the church at large, the building up of a tradition, the symbols framed, and the like ; to this Ireneus, Tertullian, and the Alexandrians all bear witness. In this they present the

strongest possible contrast to Marcion and his church, who from the outset took np an attitude of the utmost hostility to the main body of Christians. Hence they expressly even eontroverted Mareionitism, as the letter of Ptolemeus to Flora and the polemic of Bardesanes against the Mareionite Prepon show. If sueh was the unvarying attitude of Valcntinus's scholars, it is fair to attribute it also to Valentinus himself. In his day indeed the dogmatie, ethieal, and legal advanees of Christendom at large were still in their most rudimentary stage, but what there was of them must have been valued by him even then as the exoterie form of Christianity, to which he superadded his own Gnostie esoterie form. In this respect he was the forerunner of Clement and Origen, who likewise 1 See Harnack, Dogmengesch., i. p. 171 sq.

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distinguish Gnostic from common Christianity, and very probably learned the distinetion from Valentinus and his scholars. But his connexion with both was of a still more intimate eharaeter. They are related not only by virtue of the faet that they all regarded the gospel as the religion of the perfect Hellenically-eultured spiritual man, but also by the large-hearted disposition they cherished, and the settled purpose they manifested, to appropriate everything noble and great in the history of humanity, to rank it according to its proper value, and to find a place for it in the edifice of Christian philosophy. And it is very interesting to notice that they completely set aside the Greek and Roman mythologies, regard- ing them as worthless and devilish. The formal peeuliarity of the Valentinian Gnosis is that it placcs all moral and intelleetual ideas, possessions, and entities in a deseending seheme of genetic develop- ment. With Valentinus himself they figure as "motus et affectus " of the Godhead, the ultimate cause of all things, the alone Good ; by his scholars they are hypostatized. This descending develop- ment (self-revelation) of the Godhead takes plaee with a holy rhythm. At this point the Pythagorean speeulations about num- bers on the one hand and the aneient Semitie astrological wisdom on the other seemed important to Valentinus; but everything is made spiritual: even the old Semitie antithesis of " male" and "female" is adopted, but with an altered meaning.? The whole inner development of the primal eause (8v@os) into the pleroma, the cosinos of perfection, is designed to explain

how it was that this world of appearanee, of mixture, and of sin arose. Valentinus was a striet monotheist, but at the same time he diseerned in the present world the mingling of irreconeilable elements. The prob- lem then was how, while aeknowledging the absolute perfection, goodness, and causality of God, to reconeile with this the existence of the actual pneumatico-psychico-hylic world, and at the same time to show the possibility of redemption in the case of those who are capable of it. Valentinus solved this problem by assum- ing that the self-unfolding of the Godhead is at the same time to be thought of as a dissipation of energy. God alone is dyévvyros. The powers emanating from Him (voids, ddjOea, Adyos, fw, &vOpwiros =ideal man, éxxAnoia, and so on) are yervyrd. Henee, although duoovora with the Godhead, they have nevertheless a limitation attaching to them. They are eopies of the Godhead in a deseend- ing line ; but the copy is never of equal value with the pattern. The thirtieth and last zon, Sophia,' has the element of imperfection in the strongest degree. This belongs to it in the form of "passion" (7dG0s), the passionate desire after full knowledge of and fusion with the primal God. This passion for the pleroma, having sedueed the zon into overstepping its proper bounds, is accordingly sepa- rated from it and removed out of oneness with it; it thns falls into nothingness, the xévwua, but gives the impulse to the making of this world. This world is the outward shaping of nothingness, of appearance, through eonnexion with the fallen wisdom. It isa feeble eopy of the pleroma without any abiding hold, but it ineludes pneumatie portions, though these have fallen very low. It was fashioned by the demiurge, an intermediate being brought forth by the fallen wisdom. The demiurge is psychical, and thus has no feeling and no understanding for the pneumatie which adhered to the elements of the world he framed. But over against the sensuous powers included in this world, so far as it is derived from nothingness, the demiurge is the representative of order, righteous- ness, freedom for better things, and the men who have reeeived something of his spirit are those earnest moral natures who strive against their passions and aim at justitia civilis. Far above these stand the pneumatie ones, who, like their mother, have the strong passion of genius towards that which is highest, and in this posses- sion, in knowledge and in the desire for knowledge, are raised far above the antithesis of the hylie (the devil) and the psyehie (the demiurge). They earry within them an indestruetible and divine element which is unintelligible to their very maker, but they are

placed in a world which is foreign to them; they are as men im- prisoned and fettered. Here it is that the Christian idea of redemp- tion eomes in. Jesus Christ appears. The declarations about Him in the Valentinian school were exceedingly various. We can find traces in them of all the contemporary and later Christologies of the Christian Chureh, even of the Adoptian. What they all had in common was (1) the idea that Jesus Christ made manifest was an exceedingly eomplex Being, in whom two or three natures, or even a greater number, had to be distinguished (compare Origen's Christology) ; (2) the conviction that the highest element in the Redeemer was not one of the zons which had somehow parted with some of its potential energy, but was the perfect self-manifestation of the Good, the Supreme God Himself; (3) the conception that

2 The earliest opponents of the Valentinians distinguished them sharply from the "Gnostics." They rightly perceived that the Semitic and mytho- logical element was for the Valentinians merely the material, which they filled with the spirit of Hellenism. Some of the heads of schools, however, dealt with this material in a highly fantastic fashion, and accordingly the church fathers say with justice that "inolescentes doctrine Valentinianorum in silvas jam exoleverunt Gnosticorum" (Tert., Adv. Valent., 39). ms f

3 The number 30 comes from astronomy: at bottom the zons of Valentinus are 293, the number of days in the lunar month.

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the physical nature of Jesus Christ was no actual corporeity, but either something psychical or something pneumatical. This Jesus Christ then delivers all who are pneumatic in the world by com- municating knowledge. By full knowledge of God, of the world, and of themselves they are raised above the world, enter upon their undying divine life, and finally are brought by Christ into the pleroma. But psychical persons also are redeemed by Him. They who hitherto have been brought up according to the laws of the Old Testament, that is, of the demiurge, now receive the perfect law ; Jesus moreover by His death procured for them the forgive- ness of sins. They are now therefore in a position to lead a perfect moral life, and after death, if they have made a right use of their freedom, shall be brought to an abode of bliss. The Valentinian ethic shows a fine combination of

spiritual freedom with the element of asceticism. Their thesis, that primarily it is not the outward act but the intention that is important, was misunderstood by the fathers of the church as if they had given permission to pneu- matic persons to live in licence, to deny the faith under persecution, and the like. But there is no foundation for this. The fragments we possess from writings of Valentinus and his school show rather that they were second to no Christian body in moral earnestness. The Valentinians appear to have joined in the religious worship of the main body of the church so long as they were tolerated within it. But along with this they celebrated their own inysteries, in which only the initiated might take part.

In the foregoing sketch only the broad gencral outlines of the Valentinian theology have been indicated. In all the schools, and even with Valentinus himself, it was much richer and more com- plicated than has been indicated. But all was strictly wrought out, and even the apparently abstruse served always for the ex- pression of a weighty thought. Very manifold and various were in particular the doctrines about the fallen wisdom (Sophia) and about its relations to the world and the demiurge ; very various also were the views of Jesus and of Christ and of their relation to the pleroma of the zons. Finally their representations about "'Horos" differed widely. "As a harlot daily changes her attire," says Tertullian in his malicious way, "so do the Valentinians change their opinions." But none of these differences affected the oneness of the general view. That the history of redemption con- stitutes along with the history of nature and of the world one grand drama, that it is for scientific cosmology to explain how it is that the "mixtures" have come to pass, and that it is for scientific soteriology to show how the "separations" have been brought about, as to these inatters all were at one. Equally were they at one in their view of Christ as the absolute revelation of God, and in the persuasion that the creator of the world is identical with the God of the Old Testament, and is an "intermediate" Being. But the various Valentinian schools were above all united in their attitude towards

the Scriptures. They were Biblical theologians: that is to say, .

they started from the conviction that complete wisdom lay only in the words of Jesus Christ, or, in other words, in the Gospels. They accordingly sought

to base their systems throughout on the words of the Lord, applying to these the allegorical method. Ina secondary degree they availcd themselves also of the writings of the apostles. Their dogmatic claimed—as afterwards did that of Origen—to be evangelical and apostolic ; but, since they interpreted the New Testament after the same mcthod as that which Philo applied to the Old, it was as a rule Platonic thought that they introduced into the plain and simple words of Jesus, and thus the fathers of the church were not without justification in calling them "sectatores Platonis" (Tert., De Prescr., 30). As their method of exegesis supplied them with the means of everywhere finding the sense that suited them, it is highly improbable that they were at the trouble to prepare any new scriptures. The fathers do not as a rule charge them with either fabrication or falsification, but only with perversion of the Word through wrong interpretations. Nor did they dispute or reject the Roman creed; they simply, by a peculiar interpretation, put their own meaning upon it; yet at the same time they had alongside of it their own "regula fidei." It is hardly probable that they possessed an " evangelinm veritatis" of their own, but it is not impossible. They subjected the Old Testament to an admirable religious criticism. Ptolemeus distinguished in the law (1) what the demiurge had said, (2) what came from Moses, (3) what the later teachers of the law had added. Amongst those portions which were regarded as having proceeded from the demiurge himself, he again distinguished three groups :—(a) the Decalogue, which is of perpetual obligation, and which only required to be completed by Christ (in the sermon on the mount); (0) those commands which were given only for a season on account of the shortcomings of the people, and which were abolished by Christ ; (c) the ceremonial law, which had a typical meaning that was fulfilled by Christ. They denied that anything in the Old Testament came from the supreme God, the God of goodness and love. ;

From the fragments of Valentinus and of Heracleon and Theo- dotus the student can learn how these Valentinians anticipated the ecclesiastical speculations of subsequent centuries. The follow-

ing points may be mentioned in this connexion :——(1) the specula- tion as to dmooveros, duovos, érepovoros, ayevvyTos, and yevynrés, by which they

prepared the way for the Unitarian problem in its scientific shape ; (2) their speculation about ‘ Jesus” and “Christ” and about His various natures, by which they opened the way for later Christology ; (8) their scientific allegorical treatment of the New Testament Scriptures and their undertaking to found their whole system upon the sacred writings of Christianity, thus antici- pating Origen’s dogmatic ; (4) their distinction of the perficienda, abroganda, and implenda in the Old Testament, which paved the way for the doctrine of Ireneus and Tertullian in reference to the law ; (5) their doctrine of baptism ; (6) their doctrine of the Lord’s Supper ; (7) their doctrine of purification after death, in which they anticipated the later dogma of purgatory (Origen, Augustine, Gregory I.) ; (8) their twofold ethic (for psychical and for pneumatic persons ; see Clement and Origen, as also the monachism of the Catholic Church) ; (9) and finally the view destined later_to play so large a part within the church, that the soul of the Christian Gnostic is the bride of Christ.

Literature.—The fragments have been collected by Grabe (Spicilegiwm, ii, 430 sq.) and Hilgenfeld (Ztschr. f. wiss. Theol., 1880, p. 280; 1881, p. 214; 1883, p. 356). The system is set forth more or less in the works on Gnosticism by Neander, Matter, Baur, Lipsius, Hilgenfeld, Mansel, and Moller. See also Heinrici, Die Valent. Gnosis u. d. heil. Schrift (1871), and Rossel, Ges. Schriften (1847). (A. HA.)

VALENTINUS, pope for thirty or forty days in 827, in succession to Eugenius II. (824-827), was a Roman by birth, and, according to the Liber Pontificalis, was first made a deacon by Paschal I. (817-824). Nothing further is known of his history. His successor was Gregory IV.

(827-844).

VALERIAN, a genus of herbaceous perennial plants of the natural order Valerianacex. Two species—Valeri- ana officinalis, L. (see vol. iv. pl. VIIL), and V. diowca, L., —are indigenous in England, while a third, V. pyrenazca, L., is naturalized in some parts of Scotland and the west of England. The valerians have opposite leaves and small flowers, usually of a white or reddish tint, and arranged in terminal cymes. The limb of the calyx is remarkable for being at first inrolled and afterwards expanding in the form of pappus. The genus comprises about 150 species. In medicine the root of

V. officinalis is intended when valerian is mentioned. The plant grows throughout Europe from Spain to the Crimea, and from Iceland through northern Europe and Asia to the coasts of Manchuria. Several varieties of the plant are known, those growing in hilly situations being considered the most valuable for medicinal purposes. Valerian is cultivated in England (in several villages near Chesterfield in Derbyshire), but to a much greater extent in Prussian Saxony (in the neigh- bourhood of Cdélleda, north of Weimar), in Holland, and in the United States (Vermont, New Hampshire, and New York).

The dried root or rhizome consists of a short central erect portion, about the thickness of the little finger, surrounded by numerous rootlets about 75 of an inch in diameter, the whole being of a dull brown colour. When first taken from the ground it has no dis- tinctive smell ; but on drying it acquires a powerful odour of valeri- anicacid. This odour, now regarded as intolerable, was in the 16th century considered to be fragrant, the root being placed among clothes as a perfume (Turner, Herbal, part iii., 1568, p. 76), just as V. celtica and some Himalayan species of the genus are still used in the East (see SPIKENARD). By the poorer classes in the north of England it was esteemed of snch medicinal value that "no broth, pottage, or physical meat" was considered of any value without it (Gerard, Herball, 1636, p. 1078).

Valerian owes its medicinal properties to a volatile oil, which is contained in the dried root to the extent of one or, more rarely, two per cent., plants growing on dry or stony soil yielding the largest quantity. The oil is a complex body, consisting of a terpene, CypHyg 3 an alcohol, Cy)H,,0, isomeric with borneol, and compounds of the alcohol with formic, acetic, and valerianic acids; and an ether having the formula C,,H,,O. The valerianic acid occurring in the oil is not the normal acid, but iso-valerianic acid. The other con- stituents of the root are malic acid, resin, sugar, &c. Valerian is employed in medicine as a stimulant and antispasmodic in various forms of hysteria, and in chorea and hooping-cough ; it is also stated to possess anthelmintic properties. The red valerian of

cottage gardens is Centranthus ruber, also belonging to the Valert- ~

anacez ; but Greek valerian is Polemonium cerulewm, belonging to the natural order Polemoniaccw. Cats are nearly as fond of the

smell of this plant as of the true valerian, and will frequently roll on the plant and injure it.

VALERIANUS, Pusiius Licintus, Roman emperor from 253 to 260, was a man of ancient family and is first mentioned in the year 238 as princeps senatus. Some thirteen years later, when Decius restored the censorship and added to the office legislative and executive powers so extensive that it embraced the best part of the civil authority of the emperor, Valerian was chosen censor by the senate, to whom the appointment was committed. The death of Decius cut short this novel experiment in government, but Valerian retained the confidence of Gallus, who sent him to fetch troops to quell the rebellion of Aimilianus. The soldiers in Rheetia, however, proclaimed Valerian emperor ; and marching slowly towards Rome he found both his rivals dead. Valerian was already an elderly man—he is said to have been seventy years old at his death—and had scarcely the vigour to confront with success the enemies that threatened every frontier of the empire, but he applied himself to his heavy task with diligence and goodwill. Taking his son Gallienus as col- league, and leaving the wars in Europe to his direction, under which matters went from bad to worse and the whole West fell into disorder, Valerian chose for his own part the war in the East, where Antioch had fallen into the hands of a Persian vassal and Armenia was occupied by Shaptr, while in 258 the Goths ravaged Asia Minor. Valerian recovered Antioch, fought in Mesopotamia with mixed success, and finally was taken captive (see PERsIA, vol, xviii. p. 608). His ultimate fate is unknown.

VALERIUS, Pustius, surnamed Pusticona, the col- league of Brutus in the consulship in the first year of the Roman republic. According to the legend represented by Livy and Plutarch (see Romz), he was a member of one of the noblest Roman families, being son of Volusus, a de- scendant of a Sabine of that name who had settled in Rome along with King Tatius. He was one of those who witnessed the death of Lucretia, and joined in the oath to avenge her wrongs. He took a prominent part in the expulsion of the

Tarquins, and though not originally chosen as the colleague of Brutus he soon afterwards took the place of Tarquinius Collatinus. On the death of Brutus, which left him alone in the consulship, the people began to fear that he was aiming at kingly power. To calm their apprehensions, he discontinued the building of a house which he had begun on the top of the Velian Hill, overlooking the Forum, and also gave orders that the fasces should henceforward be lowered whenever he appeared before the people. He introduced various laws further to protect the liberties of the citizens, one of these enacting that whosoever should attempt to make himself a king might be slain by any man at any time, and another providing an appeal to the people on behalf of any citizen condemned by a magistrate. For these ser- vices the surname of Publicola or Poplicola was conferred on himself and on his descendants for ever. He was thrice re-elected to the consulship, and during his fourth term of office lie received the honour of a triumph for his victory over the Sabines. He died in the following year (503 B.c.), and was buried at the public expense, the matrons mourn- ing him for ten months.

VALERIUS FLACCUS. See Fraccus.

VALERIUS MAXIMUS, Latin writer, author of a collection of historical anecdotes, published his work in the reign of Tiberius. Prefixed to many MSS. of the collection is a life of the author, but it is a late and worthless compilation, and the only trustworthy in- formation concerning his career is drawn from a few passing allusions in the book itself. The family of Valerius was poor and undistinguished; for the great Valerii

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Maximi who are conspicuous in the annals of the early Roman republic cannot be traced lower than the Punic Wars. Valerius himself professes to have owed everything to Sextus Pompeius, who was descended from a_ paternal uncle of the great Pompey. This Pompeius was a kind of minor Meecenas, and the centre of a literary circle to which Ovid belonged; he was also the intimate of the most literary prince of the imperial family, Germanicus. He took Valerius with him when he went to Asia as proconsul, Although Valerius does not state that his profession was that of a teacher of rhetoric, the fact is betrayed by every page of his writings. In his

proeemium he plainly intimates that he is putting forth a kind of commonplace book of historical anecdotes for use in the schools of rhetoric, where the pupils were severely trained in the art of embellishing speeches by references to history. The title for the work in the MSS. is " Books of Memorable Deeds and Utterances." No ancient reader would have expected accuracy in such a book, and the indignation ex- pressed by many modern scholars at its glaring historical errors has been much misplaced. The stories are very loosely and irregularly arranged in nine books, each book being divided into sections, and each section bearing as its title the topic, most commonly some virtue or vice, or some merit or demerit, which the stories in the section are in- tended to illustrate. Most of the tales are from Roman history, but each section has an appendix consisting of extracts from the annals of other peoples, principally the Greeks. The exposition exhibits strongly the two cur- rents of feeling which are intermingled by almost every Roman writer of the empire,—the feeling that the Romarts of the writer's own day are degenerate creatures when confronted with their own republican predecessors, and the feeling that, however degenerate, the latter-day Romans still tower above the other peoples of the world, and in particular may take much comfort to themselves from their moral superiority to the Greeks.

The range of authorities from whom the collection is drawn is un- doubtedly narrow. It has even been maintained that Valerius used four authors only,—Cicero, Livy, Sallust, and Pompeius Trogus; there are, however, clear traces of others, as of Varro, Asinius Pollio, and Herodotus. By far the largest part of the material comes from Cicero and Livy, though each is only mentioned once by name. Valerius was neither a well-read nor an able man. His treat- ment of his material was careless and unintelligent in the extreme ; but for all that he did not miss his aim. Even though in one tale Tanaquil be made the wife of Ancus Martius, and in another Aischy- lus be mistaken for Pericles, though the Scipios and the Catos be mingled in confusion, though conflicting versions of the same occurrence be given, and the most startling anachronisms presented, yet the excerpts are none the less apt illustrations, from the rhetori- cian's point of view, of the circumstance or quality they were meant to illustrate. Scholars have long since ceased to corrupt the text of Valerius, as Pighius did, to save his character for historical accuracy, nor do they now, with Perizonius, distort his meaning for the pleasure of

adding to the list of his sins. What, then, are his claims to the attention of modern students? In the first place, the existing literary remains of the time in which he wrote are ex- tremely scanty, and mere scarcity confers value on many articles. which are in themselves poor. And cven on the historical side we owe something to Valerius. He often used sources now lost to us, and where he touches on his own time he affords us some glimpses of the much debatcd and very imperfectly recorded reign of Tiberius. His attitude towards the imperial household has often been mis- understood, and he has been represented as a mean flatterer of the same type with Martial. But, if the references to the imperial administration be carefully scanned, they will be seen to be extra- vagant neither in kind nor in number. Few will now grudge to Tiberius, when his whole action as a ruler is taken into account, such a title as "salutaris princeps," which seemed to a former generation a specimen of shameless adulation. The few allusions to Cwsar's murderers and to Augustus hardly pass beyond the conventional style of the writer's day. The only passage which can fairly be called fulsome is a rhetorical pean over the death of Sejanus. But it is asa chapter in the history of the Latin language that the work of Valerius chiefly deserves study. Without it our view of the transition of classical into silver Latin would be much more imper- fect than it is. Erasmus declared that Valerius is no more like

Cicero than a mule is like a man, which is only another way of saying that he had in excess the faults of his age. The entire life, thought, and literature of the first century and a half of the empire were steeped in the influences of rhetoric, enthroned in the seat of education. In Valerius are presented to us, ina rude and palpable form, all the rhetorical tendencies of the age, unsobered by the sanity of Quintilian and unrefined by the taste and subtlety of Tacitus. Here we have the loathing for direct and simple state- ment and the pursuit of novelty at any price. Every device which can put a gloss of newness on the language is eagerly adopted. The barrier between the diction of poetry aud that of prose is broken down ; the uses of words are strained ; monstrous metaphors are in- vented ; there are startling contrasts, dark innuendoes, and highly coloured epithets ; the most

unnatural variations are played upon the artificial scale of grammatical and rhetorical figures of speech. It is a most instructive lesson in the history of Latin to set side by side and compare minutely with each other a passage of Valerius and its counterpart in Cicero or Livy.

In the MSS, of Valerius a tenth book is given, which consists of the so-called 'liber de prenominibus," the work of some grammarian of a much later date. The collection of Valerius was much used for school purposes, and its popu- larity in the Middle Ages is attested by the large number of MSS. in which it has been preserved. Like other school books it was epitomated. One com- plete epitome, probably of the 4th or 5th century, bearing the name of Julius Paris, has come down to us; also a portion of another by Januarius Nepo- tianus. The best edition of Valerius with explanatory matter is that by C. Kempf (Berlin, 1854); the best text is that by C. Halm (Leipsic, 1865).

VALETTA, or Vatuetta. See Matra, vol. xv. pp. 340- 341. The population was 24,854 in 1881, and was esti- mated at 26,700 in 1888.

VALLA, Lorenzo (c. 1406-1457), one of the most salient personalities of the earlier Italian Renaissance, was born at Rome, of parents derived from Piacenza, possibly in the year 1406-07, or perhaps somewhat earlier. He was educated in the humanistic schools of Rome, according to the customs of that age, learning grammar from some humble dominie and afterwards attending the classes of eminent professors. Valla mentions Leonardo of Arezzo as his chief master in Latin and Giovanni Aurispa in Greek. He wished to establish himself as apostolic secre- tary in the Eternal City. But for some reason or other this office was refused him. At the age of twenty-four he went to Piacenza on family affairs, and from this city pro- ceeded to Pavia, where he obtained a professorship of elo- quence. Like all the scholars of that time, Valla wandered from university to university, accepting short engagements and airing his talents as a lecturer in many cities. It appears that he professed the New Learning in Milan and Genoa as well as Pavia. Somewhere, and at some uncer- tain date during this period, he came into relations with Alphonso of Aragon, who conquered the kingdom of Naples. Valla did not, however, follow this prince's for- tunes in the early days of their acquaintance. We find him once more in Rome in

1443 during the pontificate of Eugenius IV. At this period of his career Valla won the highest reputation by his dialogue De Voluptate and his treatise on the Elegances of the Latin Language. In the former work he contrasted the principles of the Stoics with the tenets of Epicurus, openly proclaiming his sym- pathy with those who claimed the right of free indulgence for man's natural and sensuous appetites. It was a re- markable utterance, since the paganism of the Renaissance here found, for the first time, deliberate expression in a work of scholarly and philosophical value. The Hlegantiz was no less original, though in a different sphere of thought. This work subjected the forms of Latin grammar, the rules of Latin style and rhetoric, to critical investigation. It placed the practice of composition upon a foundation of analysis and inductive reasoning. But there was a third essay composed by Valla during the pontificate of Hugenius which displayed the same originality and a like critical acumen. 'This bore the title of a Treatise on the Donation of Constantine; and in it Valla proved that the claims founded by the Roman see upon that supposed grant re- posed on forged documents and legendary fables. It was not published until 1440, when Valla had been already three years resident at Alphonso's court in Naples.

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There was every reason why the king of Naples should be interested in a man of Valla's stamp. He wished to attract scholars of the highest ability to his capital, and he was always on bad terms with the papacy. Valla com- bined the qualities of an elegant humanist, an acute critic, a freethinker, and a venomous pamphleteer who had committed himself to a destructive polemic against the temporalities of Rome. Accordingly the king made him his private secretary, encouraged him to open a school of rhetoric in Naples, and defended him against the attacks of friars and inquisitors. From Naples Valla continued his war of pamphlets against the church. He proved that the letter of Christ to Abgarus was a forgery, ridiculed the Latinity of the Vulgate, questioned the authenticity of the Apostles' Creed, and accused St Augustine of heresy. It is a singular note of that period in Italy that, on the death of Eugenius IV., his successor, Nicholas V., invited Valla to Rome, not to arraign him before the bar of the Inquisition, not to punish him for his insolent criticism, but in order to confer upon him the post of apostolic secretary, with substantial pecuniary appointments. This

entrance of Valla into the Roman curia has been justly called 'the triumph of humanism over orthodoxy and tradition." Nicholas had no other object than that of fixing one of the chief scholars of the age near his own person. He allowed Valla to open a school of eloquence in Rome, and he paid him munificently for translating Thucydides into Latin. Thus, for the sake of his erudition and stylistic talents, the supreme pontiff rewarded a man whose chief titles to fame are the stringent criticism with which he assailed the temporalities of the church, and the frank candour with which he defended a pagan theory of human conduct.

All the biographical notices of Valla are loaded with long accounts of his literary quarrels. Intolerant of rivalry, inordinately vain, and greedily self-seeking as the scholars of that epoch were, they indulged in the fiercest internecine warfare among themselves. The bulky folios of their works contain hundreds of invectives which may be ranked among the most obscene, the most wearisome, and the most disgraceful products of the human intellect. Valla won a regrettable celebrity by the uumber and the virulence of his enmities. Bartolomeo Fazio, Georgios Trapezuntios, and Poggio felt the stabbing sharpness of his pen. It must, however, be admitted that these antagonists gave back quite as good as they got. It is almost impossible to form a just estimate of Valla's private life and character through the dust-clouds of abuse and dirt which these con- troversies stirred up around his memory. He died at Naples in the year 1457. Posterity honours in him not so much the stylist and the scholar as the initiator of a bold critical method, applied to language, historical docu- ments, and ethical opinions.

The collected edition of Valla's Works is that of Basel, 1465. For detailed accounts of his life and work, consult Tiraboschi ; Voigt's Wiederbelebung des Alterthwms; and Symonds's Renaissance in Italy (vols. ii. and v.).

VALLADOLID, a province of Spain, one of the eight into which Old Castile is now divided, is bounded on the N. by Leon and Palencia, on the E. by Burgos, on the S. by Segovia, Avila, and Salamanca, and on the W. by Zamora. The area is 3043 square miles and the popula- tion in 1877 was 247,458. The province belongs entirely to the basin of the Douro, which traverses it from east to west, and within its limits receives the Pisuerga

(with the Esgueva) on the right, and the Duraton, Adaja (with the Eresma), and Zapardiel on the left. The country watered by these rivers is for the most part flat and exceedingly fertile, the only part that can be called in any sense hilly being in the north-west, where the low Montes de Torozos

occur. For the excellence and abundance of its grain crops Valladolid shares with La Mancha the title of granary of the peninsula. Besides the ordinary cereals and pulses, the province produces hemp, flax, various fruits, red and white wine, oil, and madder. The Montes de Torozos are well clad with oak and other timber. The pastures are extensive and large numbers of horses, mules, and sheep, as well as some cattle, are reared, while honey, wax, and silk are also produced. The woollen fabrics of Valladolid were once highly esteemed, but this industry has now greatly declined. Some trade is carried on, facilitated by the Canal of Castile, which connects Valladolid, on the Pisu- erga, with Alar del Rey, in Palencia, also on that river. The province is traversed by the national highways from Madrid to Santander, Leon, and Corufia, and the Calatayud and Salamanca roads may also be regarded as trunk lines. It is also traversed from north to south by the northern railway, which has a branch from Valladolid to Rioseco. There are 11 partidos judiciales and 237 ayuntamientos. The most important places besides Valladolid, the capital (see below), are Medina de Rioseco (4776 inhabitants in 1877) and Medina del Campo (5296).

VALLADOLID, capital of the above province, on the left bank of the Pisuerga, at its confluence with the Esgueva, which traverses the town by two channels, is situated (about 2250 feet above sea-level) 150 miles by rail to the north-west of Madrid. The site is in a small valley enclosed by steep and broken, though not very high, ground. The town, which was formerly surrounded by walls and entered by four principal gates, contains some fine streets and squares, especially the so-called Plaza Mayor, but on the whole it has a dull and deserted aspect, though of late years its industrial and commercial activity has somewhat revived. The granite cathedral, begun in 1585, would, if carried out according to the original design of Herrera, be a magnificent specimen of the Graeco-Roman style of that architect ; only the

nave, however, was ever completed, and the tower (one of four in the plan) fell in 1841. The interior is well proportioned, but bare. The tower and nave of the church of Sta Maria la Antigua date from about 1200. The church of San Pablo is later (1286) ; its chief feature of interest is a beautiful flam- boyant portal, and formerly it had exquisite cloisters. Adjoining is San Gregorio (15th century) with a fine Plateresque facade. San Benito, dating from the end of the 14th century, is an elegant Gothic building with a lofty roof finely groined. 'The college of Santa Cruz, a Classical building founded in 1479, now houses a collection of pictures and sculptures of little value, except for some ex- amples of Rubens and of the work of Berruguete. The university was founded in 1346; but the present Rococo building dates from the decadence of architecture in Spain. Among other public buildings of Valladolid may be men- tioned the royal palace, built in the beginning of the 17th century, and the court-house and town-hall; several ex-convents are now used as barracks. Along the banks of the rivers are several public walks adorned with trees and fountains. The principal industries are the manu- facture of linen, silk, and woollen fabrics, pottery, gold and silver work, leather, and paper. There is a considerable trade in the abundant agricultural produce of the vicinity. The population in 1877 was 52,206.

Valladolid is usually identified with the ancient Pintia of Ptolemy, described in the tinerary as a town of the Vaccei on the road from Asturica to Cesaraugusta. The present name is usually, but rather obseurely, explained as equivalent to Beled Walid, "the land of Walid." The town was recovered from the Moors in the 10th century, but is first named in a public document by Sancho II. of Leon in 1072. The cortes of Castile frequently met here in the following centuries, and in the beginning of the 15th century John

II. made it his principal residence. After the removal of the capital to Madrid by Philip II. in 1560 it began rapidly to decay.

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In December 1808 it was taken and sacked by the Freneh, and in the January following Bonaparte resided here for some days, and caused the destruction of many fine buildings and works of art. Columbus died (1506) and Philip II. was born (1527) at Valladolid.

VALLADOLID, a city of the state of Michoacan de Ocampo, in Mexico. See Morutia.

VALLADOLID, a town in the state of Yucatan, Mexico, lying towards the centre of the northern plateau, on the river Bolina, about 90 miles south-east of Merida, with which it is about to be connected by a railway. Valla-dolid, which with the suburban district has a population (1885) of 18,470, mostly Indians and half-castes, is situ- ated in the healthiest and best cultivated part of Yucatan, and is accordingly much frequented by invalids. The town is well built, with regular streets, and low but substantial houses, generally fronted by a garden plot and shady trees. Ainongst its buildings are seven fine churches, a large Jesuit college, a town-hall, a hospital, and a well- constructed aqueduct. But like everything else in Yucatan the place presents a general appearance of decay, although there is a considerable local cotton industry. Some miles to the east lie the remarkable ruins of Chichen-Itza, covering a space of nearly two miles in circumference. Amongst these remains are several sonatos, or tanks, from 65 to 200 feet in diameter and 50 to 110 feet deep, with steep rocky sides, in which water is still stored.

Valladolid is one of the oldest Spanish settlements in Yucatan, having been originally founded by Francesco de Montejo at a place called Chauachaa in 1543. But it was removed the next year to Zaqui, about 15 miles from the sea, with easy access to the port of El Cuyo, and soon after to its present position.

VALLE, Pierro DELLA (1586-1652), to whom we owe one of the best books of Eastern travel, came of a noble Roman family which had produced two cardinals, and was born, on 11th April 1586, in the family palace built by Cardinal Andrea. His early life was divided between the pursuits of literature and arms. He saw active service against the Moors of Barbary, but also became a member of the Roman Academy of the Umorist, and acquired some reputation as a versifier and rhetorician. To the latter quality we owe some tedious passages in his Z'ravels ; but that book gives also sufficient evidence of solid and useful learning in the classical authors, which served him well, particularly in the first part of his wanderings. The idea of travelling in the East was suggested by a disap- pointment in love, as an alternative to suicide, and was ripened to a fixed purpose by a visit to the learned Mario Schipano, professor of medicine in Naples, to whom the record of Pietro's travels was addressed in the form of very elaborate letters, based on a full diary. Before leaving Naples he took a vow of pilgrimage to the Holy Land, and, sailing from Venice on 8th June 1614, reached Con- stantinople, where he remained for more than a year, and acquired a good knowledge of Turkish and a little Arabic. On 25th September 1615 he sailed for Alexandria with a suite of nine persons, for he travelled always as a noble- man of distinction, and with every advantage due to his rank. From Alexandria he went on to Cairo, and, after an excursion to Mount Sinai, left Cairo for the Holy Land on 8th March 1616, in time to assist at the Easter cele- brations at Jerusalem. Having sedulously visited the holy sites, he journeyed by Damascus to Aleppo, and thence to Baghdad, where he married a Syrian Christian named Maani, a native of Mardin. He now desired to visit Persia; but, as that country was then at war with Turkey, he had to leave Baghdad by stealth (4th January 1617). Accom- panied by his wife, who was the courageous and constant companion of his Persian journeys until her death in con- sequence of a miscarriage (80th December 1621), he pro- ceeded by Hamadan to

Ispahan, and joined Shah Abbas in a campaign in northern Persia, in the summer of 1618.

Here he was well received at court and treated as the shah's guest. On his return to Ispahan he was occupied with political schemes hostile to the Turk, the alliance of Persia with the Cossacks and the king of Poland, and also with a project for the foundation of a Catholic colony in Persia ; at the same time he diligently continued his Oriental studies and observations. He now began to think of returning by India rather than adventure himself again in Turkey; but the state of his health, and the war between Persia and the Portuguese at Ormuz, created difficulties. In October 1621 he started from Ispahan, and, visiting Perse- polis and Shiraz, made his way to the coast ; but, after long delay and many troubles—his wife dying at Mina—he was forced to return to Shiraz, after the capture of Ormuz, and it was not till January 1623 that he found passage for Surat on the English ship '"' Whale." In India he remained till November 1624, his headquarters being Surat and Goa. He was at Muscat in January 1625, and at Bussorah in March. In May he started by the desert route for Aleppo, and, after a short stay there and a visit to Antioch, took ship at Alexandretta on a French vessel. Touching at Cyprus and doing quarantine at Malta, he reached Rome on 28th March 1626, and he was received with much honour, not only by literary circles, but by Pope Urban VIII., who appointed him a gentleman of his bedchamber. The rest of his life was uneventful; he married as second wife a Georgian orphan of noble family, Mariuccia (Tinatin de Ziba), whom his first wife had adopted as a child, and who had accompanied him in all his journeys. By her he had fourteen sons. He died at Rome on 21st April 1652.

In Pietro della Valle's lifetime there were printed (1) a Funeral Oration on his Wife Maani, whose remains he brought with him to Rome and buried there (1627); (2) an Account of Shah Abbas, printed at Venice in 1628, but not published ; (3) the first part of the letters describing his Travels (Turkey, 1650). The Travels in Persia (2 parts) were published by his sons in 1658, and the third part (India) in 1663. An English translation appeared in 1665 (fol.). Of the Italian text the edition of Brighton, 1843 (2 vols. 8vo), is more

esteemed than the other reprints. It contains a sketch of the author's life by Gio. P. Bellori (1622). Della Valle's story is often prolix, with a tendency to the rhetorical. He has no turn for incident, an absolute want of humour, and little real literary faculty of any kind ; but he is clear and exact, well informed, and very in- structive, so that his work still possesses high value.

VALLEJO, a city of Solano county, California, United States, is situated on the shore of San Pablo Bay, near the western end of the Straits of Carquinez. It has an ex- cellent harbour, and railroad communication by a branch of the Central Pacific Railroad. The city contains large flour-mills ; the population in 1880 was 5987. Vallejo, which takes its name from the Mexican general M. G. Vallejo, who took the country from the Indians in 1835, was in 1854 the capital of the State of California.

VALLOMBROSA, OrpeER oF. See Monacuism, vol. xvi. p. 708.

VALLS, a town of Spain, in the province of Tarragona, 11 miles to the north of that town, on a height near the Francoli. It is an old town and its walls and towers still remain. The usual Catalonian industries of wool and cotton spinning and weaving, as well as dyeing, distilling, paper-making, and tanning are carried on with considerable activity. The population within the municipal boundaries in 1877 was 13,250.

VALPARAISO, a city of Chili, the chief town of the province of the same name, and one of the principal com- mercial ports on the west coast of South America, is situated on a fine bay of the South Pacific Ocean, in 33° 0' 2" S, lat. and 71° 41' 15" W. long., 70 miles north-west of Santiago, with which there is communication by a cir- cuitous railway of 115 miles. The city lies at the south part of the bay, which is 2} miles wide, semicircular in

form, and well sheltered, except towards the north. There is good anchorage in the roadstead. There are two float- ing docks, capable of accommodating vessels of from 1400 to 3000 tons. The city is situated at the base of a range of barren hills, varying from 1000 to 1400 feet in height,

which have a narrow strip of low land between them and the sea; on this and on sites formed by cutting away the cliffs most of the houses are built. Further space is afforded by the deep dells or water- courses between the hills. These open towards the sea, and are on both sides covered with houses. Much of the fore- shore has been raised by earthquakes. The erection of an extensive embankment was begun in 1885. The older por- tion (Puerto) of the city, in which are the principal public and commercial buildings, is separated from the newer por- tion, called the Almendral, by a projecting point. The city is defended by a chain of forts, begun in 1866. The prin- cipal public buildings are the Government palace, the cus- tom house, the large bonded Government warehouses, the hospital, the city hall, and two theatres. The educational institutions include a theological seminary, a naval academy, and a lyceum; the last-named had 415 students in 1884 and 481 in 1885. The commercial enterprise of the city is largely dependent on the foreign merchants, especially Englishmen, Americans, and Germans. It is the com- mercial capital of Chili, and the principal residence of the foreign consuls. The principal industrial establishments are the Government railway shops, a large foundry and machine shops, coach-building and wheel-wright works, and a very large sugar refinery, the raw material for which is obtained from Peru. The population (97,737 in 1875) was 95,000 in 1885, of whom about a tenth were foreigners.

The number of vessels in the foreign trade that entered the port in 1885 was 587 of 582,066 tons, the number that cleared 348 of 373,551 tons. More than half of the tonnage was British,—Chilian, German, and French following in the order named. In the coasting trade the number of vessels that entered in 1885 was 781 of 434,486 tons, the number that cleared 1050 of 640,138 tons. About nine- tenths of the tonnage was British and Chilian, the latter having a

slight advantage. The following table shows the value of the import and export trade during five years, 1881 to 1885 :—

ice By “ful

Year. Imports. Exports. Total.

£& s. a £& a5 10. £& 8. d,

1881 7,487,545 8 2 7,891,783 0 0 15,329,328 8 2 1882 8,563,650 17 4 10,713,669 6 8 19,277,320 4 0 1883 9,673,618 13 6 11,441,571 7 4 21,115,190 0 10 1884 9,414,841 1 0 9,441,757 1 8 18,856,598 2 8 1885 6,620,326,18 2 8,324,446 17 8 14,944,773 15 10

The foreign trade is chiefly with Great Britain, France, Germany, and the United States, the value of the exports to these countries in 1885 being £1,356,583, £110,312, £262,065, and £15,424 respect- ively, and of the imports £1,787,310, £911,080, £900,066, and £318,629 respectively. The principal exports are metals (nitrate, bar copper, silver produce, copper and silver regulus, and gold and silver specie), wheat, barley, flour, wool, nuts, hay, beans, honey, iodine, coal, hides, and guano ; and the imports include iron, steel, wire, nails, machines and tools, sugar, rice, cashmeres, prints, shawls, wines, and beer.

Valparaiso was founded in 1536 by the Spanish officer Juan de Saavedra, who named it after his birthplace near Cuenca in Spain. In 1578 the city was captured by Drake, the exact date of his ap- pearance before it being 5th December ; and it was again taken by Hawkins's expedition in 1596. In 1600 it was sacked by the Dutch corsair, Van Noort. It was visited by severe earthquakes in 1730 and 1822, and by earthquake shocks in 1839 and 1873. It suffered from fire in November 1858; and on 31st March 1866 it was bom- barded by the Spanish fleet under Admiral Nunez, when a large part of the town was laid in ruins.

VAL—VAL

VALS, or Vats-Lis-Barns, a village of France, in the department of Ardéche, with a population of 2186 in 1886, is noted chiefly for its alkaline waters, which are similar to those of Vichy (see vol. xvi. p. 435). Within the com- mune, which in 1886 had a population of 3911, paper is manufactured to a small extent, and some silk is spun.

VALTELLINA, or VALTELLINE, the upper valley of the Adda, in the extreme north of Italy (province of Sondrio), derives its name from Teglio, the former capital, not far from Tirano (Val di Teglio, Val Teglina; Germ., Veltlin), and has a length, from Bormio to the Lake of Como, of about 68 miles. The chief town is Sondrio (4014 inhabit- ants in 1881), other

important places being Tirano (3119) and Morbegno (3240). Near Bormio (Germ., Worms) there are some frequented mineral springs (sulphur and lime), known in Pliny's time, and efficacious in diseases of the skin. There are several other baths in the side valleys, such as Santa Caterina (chalybeate), Masino, and Le Prese (sulphur). The highest points in the ranges enclosing the valley are the Piz Zupo (13,121 feet) in the Bernina group and the Konigsspitze (12,645 feet) in the Ortler district ; the Monte della Disgrazia (12,074 feet) is the highest peak comprised entirely within the water-basin of the valley. Three well-marked Alpine passes are traversed by good carriage-roads—the Stelvio Pass or Stilfserjoch (9046 feet, the highest carriage-road in Europe) from Bormio to Meran in the Adige valley, the Bernina Pass (7628 feet) from Tirano to Samaden in the Upper Engadine, and the Aprica Pass (4049 feet) from Tirano to the Val Camonica and the Lake of Iseo. The main valley is traversed from end to end by a magnificent carriage-road constructed by the Austrian Government in 1820-25. A railway from Colico, on the Lake of Como, to Sondrio (27 miles) was opened in 1884, and is being pushed on towards Tirano. The population is wholly Italian-speaking and Roman Catholic, the valley being in the diocese of Como. The shrine of the Madonna of Tirano (founded 1520) annually attracts a large number of pilgrims. The valley, particu- larly in its lower portion, is extremely fertile ; and of late years vigorous measures have been taken to prevent the damage caused by the frequent inundations of the Adda. Chestnuts, vines, mulberry trees, and fig trees abound; and there are many picturesquely-situated churches, castles, and villages. The chief articles exported are wine and honey. The wine is largely consumed in north Italy and Switzer- land, the best varieties being Grumello, Sassella, and Montagna. About 20,000 ib weight of honey is annually sent abroad. Politically the whole valley belongs to the kingdom of Italy, except the side valley of Poschiavo (Puschlav), which belongs to the Swiss canton of the Grisons (Graubiinden).

The political history of Valtellina is made up of the histories of three districts,—(1) the "free community" of Poschiavo (first mentioned as such in 1200-01); (2) the county of Bormio (first mentioned as a county in 1347); and (3) Valtellina proper, ex- tending from the defile of the Serra di Morignone on the east to the Lake of Como on the west. After the defcat of the Lombards (774) these three districts were given by Charlemagne to the

abbey of St Denis near Paris, which never seems to have exercised its rights. In 824 Lothair I., confirming an earlier donation made by Charlemagne, gave the churches of Poschiavo and Bormio to the bishop of Como. Bormio was in 1205 won by the men of Como, who in 1006 had reccived one-half of Valtellina from the emperor, and by 1114 they were masters of the entire valley. They retained Bormio till 1800, when it freed itself; but in 1336 it belonged to the bishop of Chur. In 1335 the Visconti, lords (later dukes) of Milan, became lords of Como, and therefore of Valtellina.

In 1350 they seized on Bormio and Poschiavo, the latter being won back by the bishop of Chur in 1394, and again lost to the

Milanese, including Poschiavo, Bormio, and Valtellina. Relying on this donation, the men of the Three Leagues of Rhetia (best known by the name of one, Graubiinden) invaded the valley in 1486-87, Poschiavo becoming in 1486 permanently a member (nota subject land) of the Gotteshausbund. This donation served too as the excuse for seizing, in 1512, on Bormio and Valtellina, which were harshly ruled as 'subject bailiwicks." Under the governor at Sondrio there were four " podestas" for the three divisions of Valtellina (Morbegno and Traona, Sondrio, and Tirano), besides one at Teglio and one at Bormio. Mastino Visconti's donation was solemnly confirmed in 1516 by the emperor Maximilian I. In 1530 the bishop of Chur was forced to sell to the Three Leagues for a small sum his title to these two districts. At the time of the Reformation Poschiavo became Protestant. The other two districts clung to the old faith and came under the influence of Carlo Bor- romeo, who, when founding in 1579 his "Collegium Helveticum " at Milan for Swiss students for the priesthood, reserved for Val- tellina six out of the forty-two places. Valtellina was extremely iniportant to the Hapsburgs as affording the direct route between their possessions of the Milanese and Tyrol. Hence a great struggle, into which religious questions and bribery largely entered, took place between Austria and Spain on one side and France and Venice on the other. In 1603 Fuentes, the Spanish governor of the Milanese, built a fortress (of which traces still remain) close to the Lake of Como and at the entrance to the valley, in order to

overawe it. The religious conflicts in Graubiinden led to reprisals in the "sub- ject land" of Valtellina. In 1620 (19th July—4th August) the Spanish and Romanist faction (headed by the Planta family) massacred a great number of Protestants in the valley, 350 to 600 according to different accounts (Veltliner Mord). For the next twenty years the valley was the scene of great strife, being held by the Spaniards (1620, 1621-23, 1629-31, 1637-39), by the French (1624-26, 1635-37), and by the pope (1623, 1627). At length George Jenatsch, a former pastor, who had been the active and unscrupulous leader of the Protestant party, became a Romanist (1635) in order to frec the land from the French by aid of the Spaniards (1637), who finally (1639) gave it back to its old masters on condition that the Protestants were excluded from the valley. In this way the local struggles of Valtellina came to be mixed up with the Thirty Years' War. In 1797 Bormio and Valtellina were annexed to the Cisalpine republic, in 1805 to the kingdom of Italy (of which Napoleon was king), and in 1815 (despite the remon- strances of the Rhetian leagues) to the kingdom of Loimbardo-Venetia, held by the emperor of Austria. In 1859 they became, like the rest of Lombardy, part of the kingdom of unitcd Italy. Poschiavo followed the fortunes of the "Gotteshausbund." It became (after 1798) part of the canton Rhetia of the Helvetic republic, and in 1803 of the canton of the Graubiinden or Grisons, which was then first received a full member of the Swiss Con- federation.

See G. Leonhardi, Das Veltlin and Das Poschiavinothal (1859); Romegialli, Storia della Valtellina (1834-39, 5 vols.); C. von Moor, Geschichte von Curratien 1870-74); P. C. von Planta, Die currdtischen Herrschaften in der Feudalzeit 1881); Coxe, Travels in Switzerland, &c. (4th ed., 1801; Letters 74-78); Henne-Am Rhyn, Geschichte des Schweizervolkes (1865); L. von Ranke, History of the Popes, bk. vii.; and H. Reinhardt, '"' Das Veltliner Mord," in Geschichis- freund (vol. xl., 1885).

VALUE. In most departments of economic theory it is convenient to use as the basis of the exposition the opinions of J. S. Mill, not only because he has embodied in his treatise in a remarkable manner nearly everything of importance from the theoretical standpoint in the work of his predecessors, but also because most of the recent advances in economic science have been made by way of criticism or development of his views. This

observation is especially true of the theory of value. In this subject Mill had digested the mass of previous learning with such effect that he commences his treatment with the remark : "Happily there is nothing in the laws of value which remains for the present or any future writer to clear up ; the theory of the subject is complete. The only difficulty to be overcome is that of so stating it as to solve by anticipation the chief perplexities which occur in applying it." Curiously enough this part of economic theory was the first to receive at the hands of Jevons and others serious modification, the nature and need for which can, however, only be properly understood after a preliminary examina- tion of the old orthodox position.

Visconti in 1435, As early as 1860 the men of Rhetia made in- cursions into Valtellina under the pretext that it had formed part of ancient Rhetia. This idea was confirmed in 1404, when, in return for kind treatment received during his exile, Mastino Vis- conti (son of Barnabo) gave to the bishop of Chur his share of the

As regards the question of definition, Mill starts with Value in the distinction somewhat loosely drawn by Adam Smith =, ca between value in use and value in exchange. When we cae. say that a thing possesses a certain value in use, we say 10

Price.

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more words than are necessary that it is useful: that is to say, value in use is an awkward phrase for utility. The conception of utility (see WEALTH) is the most fundamental in economics. It is held by Mill to mean the capacity to satisfy a desire or serve a purpose, and thus " useful," the corresponding adjective, is as fitly applied to ices as to steam-engines. But utility is obviously much wider than value, and Mill proceeds to say that by value in political economy we should always understand exchange value. This language seems familiar and definite, but on analysis it is clear that exchange implies two terms at least. If we say that a thing can be exchanged, we imply that it can be exchanged for something else, and when we speak of the exchange value of a thing we must directly or indirectly refer to the value of some other thing or things. In practice in modern

societies this other thing is standard money: an Englishman who talks of the exchange value of anything means the number of pounds sterling (or parts thereof) which it will fetch in the market or be appraised at by a fair arbitrator. On this view then the value of a thing is its price; but a very little experience in the theory or history of economics will show that it is often desirable, and sometimes necessary, to contrast value with price. "At the same time and place," says Adam Smith, "money is the exact measure of the real exchangeable value of all commodities. It is so, however, at the same time and place only." If, however, the exchange value of a thing is not its price, what is it? According to Mill, "The value of a thing is its general power of purchasing, the command which its possession gives over purchasable commodities in general." But what, we may well ask with Mill, is meant by command over commodities in general? Are we to understand the complete national inventory of wealth, or the total of things consumed in a given time by a nation? Obviously such conceptions are extremely vague and possibly unworkable. If, however, we make a selection on any representative principle, this selection will be more or less arbitrary. Mill is to some extent aware of these difficulties, although he never sub- jected them to a rigorous analysis; and he points to the obvious fact that a coat, for example, may exchange for less bread this year than last, but for more glass or iron, and so on through the whole range of commodities it may obtain more of some and less of others. But in this case are we to say that the value of the coat has risen or fallen ? On what principles are we to strike an average? The attempt to answer these questions in a satisfactory manner is at present engaging the attention of economists more than any other problem in the pure theory. Mill, how- ever, instead of attempting to solve the problem, frankly assumed that it is impossible to say except in one simple case. If, owing to some improvement in manufacture, the coat exchanges for less of all other things, we should certainly say that its value had fallen. This line of argu- ment leads to the position: "The idea of general exchange value originates in the fact that there really are causes which tend to alter the value of a thing in exchange for things generally, that is, for all things that are not them- selves acted upon by causes of similar tendency." There can be no doubt as to the truth of the latter part of this statement, especially if we substitute for one commodity groups of commodities. But it is doubtful if the idea of general exchange value arises from a consideration of the causes of value; and recent writers have

constantly emphas- ized the distinction between any change and the causes of the change. Following out the idea in the last sentence quoted, Mill goes on to say that any change in the value of one thing compared with things in general may be due either to causes affecting the one thing or the large group of all other things, and that in order to investigate the

VALU E

former it is convenient to assume that all commodities but the one in question remain invariable in their relative values. On this assumption any one of them may be taken as representing all the rest, and thus the money value of the thing will represent its general purchasing power. That is to say, if for the sake of simplicity we assume that the prices of all other things remain constant, but that one thing falls or rises in price, the fall or rise in price in this thing will indicate the extent of the change in its value compared with things in general, There can be no doubt that, in discussing any practical problem as to the changes in the relative value of any particular thing, it is desirable to take the changes in price as the basis, and much confusion and cumbrousness of expression would have been avoided in the theory of the subject if, to adapt a phrase of Cournot's, money had by Mill and others been used to oil the wheels of thought, just as in practice it is used to oil the wheels of trade.

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theory of value becomes essentially an examination of the sites for

causes which determine the values of particular commodi- ties relatively to a standard which is assumed to be fixed. Now in order that anything may possess value in this sense, that it may exchange for any portion of standard money or its representatives, it is evident on the first analysis that two conditions must be satisfied. First, the thing must have some utility ; and secondly, there must be some difficulty in its attainment. As regards utility, Mill apparently regards it simply as a kind of entrance examination which every commodity must pass to enter the list of valuables, whilst the place in the list is deter- mined by variations in the degree of the difficulty of attainment.

value,

Later writers, however (more particularly Finaland

Jevons), have given much more prominence to utility, total and have drawn a careful distinction between final and "lity.

total utility. This distinction is useful in throwing light on the advantages of, and motives for, exchanging com- modities. Suppose that on a desert island A possesses all the food, so many measures—(say) pecks—of corn, and B all the drinking water, so many measures—(say) pints. Then A, taking into account present and future needs, might ascribe to the possession of each portion of his stock so much utility. The utility of the first few pecks of corn might be regarded as practically infinite; but, if his stock were abundant, and a speedy rescue prabable, the utility ascribed to successive portions would be less and less. In the same way B might make an estimate of the utility of successive measures of the drinking water. Now, if we regard only otal utilities from the point of view of each, both are infinite. If an exchange were made of the total stocks of both men, the position of neither would be improved. But, if A sets aside (say) half his stock, then it may well happen that he could advantageously exchange the rest against part of B's drinking water. In precisely the same way B might set aside so much of his stock for his own consumption, and then the utility of the remain- ing portion would be much less than the utility he would gain if he obtained in exchange A's surplus. Thus, if the two men exchange their remainders, both will gain in utility ; in the case supposed they will make an enormous gain. For simplicity we have supposed each stock to be divided into two portions, but nothing has been said of the principles of the division. It is, however, clear that A can advantageously go on exchanging a measure of corn for a measure of water so long as by doing so he makes a gain of utility. Conversely B can advantageously offer water so long as he gains greater utility from the corn received in exchange. The utility of the last portion of corn retained by A (or of water by B) is the final utility of the stock retained, and similarly the utility of the last

By this method of abstraction the treatment of the Requi-

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*measure obtained in exchange may be called the final utility of*the stock purchased. A will have done his best if these utilities are just equal. For at this point, if he were to offer (at the same rate of exchange) more corn, it is clear that he would lose more utility than he would gain. Mutatis mutandis, the same reasoning applies to B; and thus the rate of exchange will be so adjusted as to bring about this equality of final utilities on both sides.) It follows that, if A gains on the last portion received just as much utility as he loses on the portion parted with, on all the other portions received he will have gained more than he lost. The total of these gains over successive portions has been called by Prof. Marshall consumer's rent.*

However useful this theory of final utility may be in throwing light on the fundamental nature of value, and on the advantages of exchange, it is obviously too abstract to be applied to the explanation of the relative values of the endless series of commodities and services which constitute a nation's stock of valuables at any time. For this pur- pose we must resort to the law of supply and demand, which requires a very careful statement owing to the ambiguities of popular language. Mill has succeeded in getting rid of most of these ambiguities, but he has hardly given due emphasis to the fundamental character of the law. He argues, after the brief consideration allotted to the element of utility, that the other preliminary condition necessary for value—difficulty of attainment—is not always the same kind of difficulty, and he arrives at three distinct laws of value, according to three forms or degrees of this difficulty. (1) In the first place the difficulty may consist in an absolute limitation of the supply, and in this case the corresponding law is said to be the law of supply and demand. Even on Mill's view the class of commodities which comes under this heading is both large and im- portant, for it includes not only the favourite examples of old pictures, china, &c., but also land, and especially building sites in large cities. Again, it is pointed out that, although comparatively few commodities may be absolutely limited, almost all commodities may be so locally and temporarily, which is really only another way of saying that the law of supply and demand governs all market values ; for it is obvious that the supply actually forthcoming or obtainable in a specified time in any market is limited,—a point which may be well illustrated by the extreme case of a "corner." Again, under certain circum- stances the supply may be artificially limited, as in the case of monopolies, a typical example being

the destruction by the Dutch of some of their spice, in order that the limited quantity might sell for a total higher price. Besides all these important instances of the operation of the law of supply and demand, Mill is compelled also to bring under the same law the wages of labour, the values of the staples of international trade, and some other peculiar cases of value. In fact, step by step he is almost forced to the conclusion, now generally accepted, that the law of supply and demand is the fundamental law of value, of which the other laws are only particular cases. At the outset, however, he appears to consider the two others as of co-ordinate importance. (2) When the diffi- culty of attainment consists not in the absolute limitation but simply in the fact that the article requires labour and capital to produce it, the normal or natural value is said to be determined by the cost of production. (3) In the last case taken by Mill it is supposed that an article can be increased in quantity, but only at an increasing cost, and in this case the corresponding law of value is the cost of production of that portion which is obtained under the most unfavourable circumstances. These three laws of

‘ F or a full account of the theory of which only the principles are here indicated, see J evons, Theory of Pol. Kcon., London, 1871.

value may now be examined critically and their mutual relations discussed, for the last two, if not properly of co- ordinate importance with the first, are at any rate wide generalizations,

In order to understand the law of supply and demand, it is best to take separately the general law of demand and the general law of supply, and then effect a combination. Demand must be defined as the quantity of any article demanded at some particular price, it being assumed of course that the bidder of the price can meet his engage- ments, or, as is sometimes said, that the demand is an effectual demand. It is quite clear that by demand we cannot simply mean desire to possess, because in a sense every one desires everything, and the less the means of payment so much greater in general is the desire. Again, it is obviously necessary to insert the qualifying clause “at some particular price,” because, as a rule, with a change in price a different quantity will be demanded. It is, indeed, this variation of quantity

demanded, according to variation in price, which gives rise to the statement of the general law of demand, namely: As the price of any article falls, other things remaining the same, the quantity demanded increases, and, conversely, as the price rises the quantity demanded decreases. A very good example of this law is found in the effects of the remission of taxes. The repeal of a tax leads to a fall in price and the fall in price is accompanied by increased consumption. Conversely, it has often been found that to increase the amount of a tax does not increase the revenue from it, because the demand for the article falls off. The precise connexion between the price and the quantity demanded differs in different cases, and, strictly speaking, is probably never the same for any two commodities. At the same time, however, com- modities may be placed in large classes according to the general character of the variation. The variation of quantity demanded according to price will ultimately rest on the principle of jinal utility explained above. A person with a limited amount of money to spend will hit the economic mark in the centre if the final utilities of his several purchases are equal. This is a rather technical way of saying that a prudent man will not spend a penny more on any particular thing if the penny spent upon some new object would give him a little greater satisfaction. Reverting to the variations of demand according to price, a contrast will at once be observed between necessaries and luxuries. However much the price rises, so long as people have the means they must consume a certain amount of necessaries, but, however much the price falls, the limit of consumption of bread, for example, must soon be reached. On the other hand, a great fall in price of many luxuries may cause an enormous increase in the demand, whilst a great rise may almost destroy the demand. A great deal of light might be thrown on many interesting problems in the progress of a nation and of its various component classes, if the laws of demand, or the statistics of consump- tion according to price, were obtainable.

Turning to the element of supply, this term in a similar way may be defined as the quantity offered for sale at some particular price, and the general law of supply may be stated thus: As the price rises, other things remaining the same, the quantity offered tends to increase, and, con- versely, as the price falls the quantity offered tends to diminish. Expressed in this manner, supply appears to be exactly analogous to demand, and the analogy seems to hold good even when we push the analysis up to the utility to the seller as

compared with the utility to its buyer. For, as the price rises, the seller will obtain greater utility, and will thus retain less for his own use or will be in- duced to produce more. On closer inspection, however, the law of supply is found to be not so simple as the law

Law of

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Law of

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Law of supply.

of demand. It would only be so if the seller had simply to compare the relative advantages of exchanging his com- modity and of retaining it for his own use, without any further reference to the conditions of, or the motives for, production. In most commodities, however, the determin- ing influence is not the comparative utility of consumption by the owner on the one hand or of the consumption of something else obtained by exchange on the other, but it is rather a comparison of the trouble of producing with the advantage of selling the article when produced. Of course, if we are considering finished products in any market the case is more simple; but even here the question of the relative advantages of present sale and reservation for a future market or distant place must be determined, and then the element of cost of production will again be brought back.

Before considering the relation of cost of production to supply, it will be convenient to combine the laws of supply and demand, taking the former in its simplest aspect, and to state the general law of supply and demand as govern- ing value. Excluding the simple case of the barter of two commodities on which the rate of exchange will be determined as explained above in reference to final utility, and meaning by demand the quantity demanded in a market at a certain price, and by supply the quantity there and then offered at a certain price, the general law

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case of a steamer which has a practical monopoly and is not controlled by Government. The owner will not send out the steamer at all unless the passengers and cargo pay the expenses; but, if there is a great demand, he will raise the price so as to secure a maximum profit. In general, however, any increase in the quantity of the article pro- duced (or the service rendered) will be accompanied by an increase in the necessary outlays, and this increase may be greater or less per unit. In these cases the caleu- lation of the maximum profit is a matter of great difficulty. Take, for example, the case of a railway which has a monopoly in a certain tract of country. The manager may aim at keeping down expenses and charging high rates, being contented with a moderate traffic; or he may lower his charges and incur additional expense to increase the gross income. It is worthy of remark that in many cases the monopolist has a choice of two methods which give practically equally good results, one starting with low and the other with high prices. But it is clear that the mass of the general public or the great body of consumers have an interest in low prices being adopted, whilst, on the other hand, the tendency is usually for the monopolist to charge higher prices than are really profitable in a maximum degree. The simplicity of the method of high prices is always attractive and often deceptive. Accord- ingly, even on these very general grounds, the interference

Equation may be stated thus: In any market the price of any article | of Government with monopolies may be defended as being en will be so adjusted that the quantity demanded will ex- | in the interests of the public and not against the interests and 2ctly equal the quantity offered at that price. The force | of the monopolists. The case of the parliamentary third-

by which the adjustment is made is, in general, competi-

class tickets furnishes an instructive example. At first

supply. ©. , ; as : tion. Thus, if the price were above the point indicated | the railways made their parliamentary trains as slow and by the law, there would be a lessened demand and the | inconvenient ‘as possible, whereas now there is hardly a competition of sellers would tend to lower the price. Con- | train which does not carry passengers at parliamentary versely, if

the price were lower the competition caused by | rates without compulsion. In a similar way many cases the increased demand would tend to raise it. The law as | of Governmental interference with landowners may be thus stated corresponds to what Mill calls the equation | justified, for very often there is a tacit combination on between demand and supply. He was induced to adopt | the part of a few great landowners to act on certain this phrase in place of the more popular expression, the | customs.! As a rule, however, in modern commercial Compet) | ratio of demand to supply, on the ground of its greater | countries monopolies are an exception. Any one, for ex- tion accuracy. And, if the term ratio is to be taken strictly, | ample, can prosecute any trade or manufacture if he can V2! no doubt Mill's criticism is perfectly just. At the same | provide the requisite skill, labour, and capital, and even time the equation must be stated very carefully to avoid | as regards land,—at any rate in the greater part of England falling into the truism suggested by Cairnes, namely, that | and Scotland,—there is from the point of view of cultiva- in any market the quantity bought at any price is equal | tion no real monopoly. But, when competition arises, to the quantity sold at that price. The point is that in | exceptional profit ceases, and thus a new principle for accordance with the general principles of supply and de- determining values comes into play. If the producer of mand the quantities offered and demanded vary with the any article is obtaining more than the usual rate of profit price. And, however inaccurate the literal use of the term | he at once provokes competition, and thus even the dread ratio may be, it has the advantage of suggesting a change | of this possible competition may keep down prices. This of price according to changes in demand and supply. is often expressed by saying that the potential supply affects ee ' It er be — at this point to consider the principles | prices almost as much as the actual supply. It thus be- ee eR Oly values are regulated. The simplest | comes obvious that, as regards freely produced commodities

case is when one individual possesses the whole stock and the cost of production is so small that it may be neglected. Take the case, for example, of some natural well having a unique character for the mineral waters it supplies. The monopolist will, in the first place, have to discover the law of demand for his article. If he fixes a very high price, he may only occasionally sell a pint to a king or a millionaire, whilst, if he fixes a very

low price, he may sell to every peasant and yet get a very poor return. He will in fact, have to work out a problem in mathematics, and

the production of which may be extended indefinitely at the same or at a decreasing cost, the value tends to con- form to the minimum cost of production, and that any other value is consequently unstable. It will be observed, how- ever, that cost of production only determines values by operating through the actual or potential supply, and thus that the law of demand and supply is fundamental. Once a thing is made, the actual cost of production has no influ- ence on its value, except as indicating the conditions of future possible supply.

must so adjust his price that the quantity sold multiplied by the price per unit will be a maximum. The same kind of difficulty is found in the case in which the expenses of production, although considerable, are practically fixed or only increase slightly in proportion to the quantity fur- nished. The minimum price will be given by the expenses of production, whilst the actual price will tend to be such F as to yield the maximum profit. Take, for example, the

*At this point it becomes necessary to analyse and explain Cost of the nature of cost of production. In the last resort it will produc: be found that nothing can be produced without labour, "™ and in a modern society capital must be added. Thus the component elements of production are labour and capital * The general theory of monopolies is admirably treated by the*

rench mathematician and economist Cournot, Revue Sommaire des Doctrines Economiques, Paris, 1877.

of pro- duction,

Wages and values,

VALUE

acting by natural forces upon raw material. But, since both the forces and the produce of nature require labour and capital for their exploitation, the elements that must be considered primary and fundamental in the case of

com- modities that can be indefinitely increased are labour and capital. Capital, again, is itself a product of labour, and it is also wealth set aside by the owner for future use instead of for present consumption. Accordingly, in order that a thing may be continuously produced, labour must obtain a sufficient reward for toil and capital a sufficient reward for "abstinence," or for preservation and accumu- lation of wealth. Thus the ultimate elements in the real cost of production are the toil and trouble and irksomeness of labour and of saving. But this toil and trouble will not be submitted to unless in any particular case the fair reward of industrial competition is forthcoming. However much pleasure a good workman may take in his work or a prudent man in his savings, in the industrial world as at present constituted both labour and capital will be attracted towards the point of highest reward (compare WAGES) ; and, accordingly, it is a necessary condition of the produc- tion of any article that the price obtained will yield the average rate of wages and profit obtainable for that species

Expenses of work. Now these rates of wages and profit can be

expressed in terms of money, and may be designated, following Prof. Marshall, the expenses of production as distinguished from the real cost. The real cost of produc- tion would on analysis consist of a confused unworkable mass of "efforts and abstinences," and the relation of these mental strains to their material rewards is the problem of wages and profits. But for the purpose of relative values it is not necessary to push the analysis so far, and thus, if we regard the capitalist as the producer, we may look on the elements of production as consisting of wages and profits. And this is quite in accordance with customary thought and language : every one who asks for the details of the cost of a thing expects to have a statement of the wages and profits directly involved, and of the material, which again directly involves wages and profits. So far, then, as freely produced commodities are concerned, the general law is that they tend to sell at such a priceas will yield on the average the ordinary rate of wages and profits which by industrial competition the occupation can command, It is at this point that the difficulty emerges as to the precise nature of the connexion between the prices of commodities and the money wages and profits of producers. Are we to consider that the former are deter- mined by the latter,

or the latter by the former? If, for example, commodity A sells for twice as much as com- modity B, are we to say that this is because wages are higher in the former case, or are the wages higher because the price is higher? The answer to this question is given in the theory of Wacxs (q.v.). It is sufficient to state here that, in discussing relative values, we may assume that industrial competition has established certain relative rates of wages and profits in various employments, and that any prices of articles which yielded more than these rates, whilst in other cases no corresponding rise took place, would be unstable. Thus, in discussing the normal values of freely produced commodities, we have to consider the quantity of labour and the rates of wages and the quantity of capital and the rate of profits, the normal rates of these wages and profits being given.

The use of the term "normal" requires some explanation. The word norma properly refers to the square used by masons and carpenters, &c., and thus a thing may be said to be in its normal position when no change will be made: that is to say, the normal position is the stable position, or it is the position to which the workman will try to adjust his work. And, similarly, by the use of normal as

applied to wages and profits, we mean the stable rate or the rate towards which they are attracted. It is thus quite possible that the normal rate may differ from the average rate or the rate obtained over a term of years, For it may easily happen that as regards wages, for example, a high rate for a short period may lead to such an increase in that kind of production that for a much longer period the rate will fall below the normal. The normal rate seems to refer to the actual conditions of industry, the rate which can be obtained for a given amount of exertion, taking the average of employments at the time, rather than to the particular rate obtained for some class of work over a period of years.

With these explanations the proposition holds good that the normal values of freely produced commodities tend to be equal to their cost, or rather expenses, of production, and any price which yields a greater or less return to labour and capital is unstable.

If all commodities were produced directly by the ex- Elements

penditure of labour, and in such a way that capital need not be considered, as in the simple natural state of society taken by Ricardo, then the only element to consider in value would be the quantity of labour. And in a society of a more developed character, in which wages are paid, if we consider that the rate of wages is uniform, and that profits may be disregarded in comparison with wages, the quantity of labour is the most important considera- tion, and a fall in the relative value of any article can only take place through some economy of labour. But, as we approach more nearly to the actual constitution of modern industrial societies, we find serious differences in the rates of wages in different employments, the use of fixed capital becomes of greater importance, and in some cases the lapse of time necessary for the completion of the commodity is considerable. Thus interest and profits, as well as the differential rates of wages, have to be taken into account just as much as the quantity of labour, and it is generally convenient to consider also the established differences in various returns to capital under different conditions (risk, irregularity, &c.). Indirectly, of course, since all capital in the ordinary sense is the result of labour, the quantity of labour is always of primary importance ; but, in considering the proximate causes of relative values, it is best to consider capital and labour as independent factors. It follows, then, that, in order to compare the relative values of two commodities, A and B, freely produced in a modern industrial society, we must take into account, first of all, the relative wages and rela- tive profits, and the relative amounts of labour and capital employed. If the producers of A are skilled workmen, and if the return to the capital is uncertain, whilst in the case of B the labour is unskilled and profit steady, then the value of A will be higher than that of B, supposing each produced by the same amount of capital and the same quantity of labour. Obviously, too, any change in the relative wages and profits will affect the relative values. If the commodities considered are not capable of division into similar parts (such as yards of cloth or silk), but must be considered in their entirety (e.g., ships and houses), then we must take into account also the different quantities of labour and capital required for their completion, as well as the relative rates of wages and profits. As regards changes of value in this case, it will be observed that, if the proportions are different in which labour and capital are employed in the production of two

commodities, then any change in the general rates of wages and profits will affect relative values. By making various suppositions as. to changes in the different elements of the expenses of production, a great many cases may be obtained, as is done, for example, by Mill (Pol. Zeon., bk. iii. ch. iv.). All the

cases enumerated and others may, however, be deduced from a general formula. Let #, represent the total ex-

ag ,penses of production of commodity A. Let @, be the

penses 0 produc- tion,

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quantity of fixed capital employed, and let 7, be the rate of wear and tear per annum, so that the loss is Q,/”. Let P, be the rate of profits per cent per annum which must be obtained on the whole capital. Let Q, be the number of labourers, and w, the rate of wages per annum. Let ¢, represent the time taken for production reckoned in years (¢, may be less than unity, thus ¢/@, would be weeks). Then the total expenses of production are

ee {a yt) + G-m(14+53)} Gs

This simply means that the commodity must return in the normal case profits on the fixed capital with repair of waste, and also the wages expended (the amount depend- ing on the number of labourers and the rate of wages), with profit on the circulating capital over all the time necessary to complete production. In some cases, it may be observed, it would be necessary to take ¢ differently for the fixed capital and the labour or circulating capital. Then, in a similar way £,, the expenses of production of B, may be expressed :

= Fouad zs) } £,= { (seh ts.) + Oa-or(d +ic8 tg.

Thus the relative values of A and B will be found by comparing the aggregate of these several elements ex- pressed on the right hand sides of the equations. It will now be evident on what a number of variable elements relative values must depend, even when we consider that the commodities can be indefinitely increased by the proper expenditure of capital and employment of labour. With the progress of invention and the develop- ment of industrial competition, constant changes are taking place in the various elements, and in the somewhat complicated formula given certain practical elements have been eliminated. Even if we suppose, for the sake of simplicity, that P, and P, are equal, as also w, and w, and t, and ¢,,—that is, if we suppose a uniform rate of wages and profits, and the same amount of time required,—still any change in these general rates will affect relative values, owing to the different proportions in which fixed and circulating capital may be employed in the two cases, Thus, for example, we arrive at Mill's statement: " All commodities in the production of which machinery bears a large part, especially if the machinery is very durable, are lowered in their relative value when profits fall." And it will be found on trial that by making various supposi- tions as to the identity of certain of the elements, or as to their disappearance, many other causes of changes in rela- tive values may be deduced. Two important practical conclusions of a general character may be drawn from this analysis. (1) Relative values are liable to constant dis- turbances, and accordingly, since relative prices tend to be adjusted to relative values, relative prices must be con- stantly changing. (2) It is extremely difficult to measure changes in the value of the monetary standard, or move- ments in the general level of prices, or variations in the purchasing power of money incomes.

These difficulties are further increased by the importance of the group of commodities which can only be increased (the arts of production remaining the same) at an increas- ing cost, and which are placed by Mill under a third law of value. The most important examples of this law are agricultural and mining produce. In order to make the principles on which this law depends clear and intelligible, it is necessary to proceed at first by the abstract method so well described by Cairnes (Logical Method of Pol. Econ., 2d ed., London, 1885). Assume then that there is an

isolated country and that its agricultural produce consists of corn. Then at any given stage of the growth of wealth and population the amount of corn may be increased (the art of agriculture remaining stationary) either by taking into cultivation inferior lands or else by cultivating with greater care and expense the lands already in cultivation. But in either case what is known as the law of diminishing return would come into play, and the additional supply could only be obtained at an additional cost. It may be assumed that at any stage of development the cultivation would be carried to such a point as to give just the ordinary return to capital on the last "dose" of capital expended. Further it cannot be carried, for no farmer will work at a continuous loss; and competition will insure that it is carried so far, for, if this last application of capital yields ordinary profit, the former "doses" must yield more, that is to say, rent as well as profit. It thus becomes manifest that, under the conditions supposed, the extent to which "the margin of cultivation " will extend depends upon the price of the produce, and in the normal case—The price must be equal to the expenses of production of that part which is produced under the most unfavourable circum- stances. This then is the third law of value, from which the economic theory of rent is an immediate deduction. For, if the last dose obtains just a sufficient return, the former doses must yield more, and the sum of these extra profits is rent. It thus appears, also, that rent depends upon price and not price upon rent.!

The pure theory of rent is arrived at by making certain Qualif hypotheses and abstractions, and accordingly it must not cations be applied to particular practical cases without further a Sy consideration, The theory certainly indicates the effect of of a very important causes, but requires in practice a certain amount of qualification. (1) The essence of the theory is that the return to each dose of capital applied can be separated, and that the application of capital will cease when the last dose yields only ordinary profits; and no doubt it is roughly true to say that a farmer will discover on trial at what point he should cease applying capital, and that this will depend upon the price of the produce. At the same time, however, it is quite possible that a farmer who owns the land which he tills may find it ad- vantageous to carry cultivation toa further pitch than if he only rented his land. For he will apply his own labour and capital at a less return on his own land. There can be little doubt that very many important improvements

made by landowners have yielded less than the ordinary rate of profit, just as peasant proprietors obtain a poor return by way of wages for their own labour. A land- owner cultivating his own land has the whole margin of economic rent to fall back upon, but a farmer has to pay his rent as a first charge. Thus it is possible, provided always that the land is cultivated in both cases with the same skill, that food would be cheaper if all the land were cultivated by the owner and not by tenants farming for a profit, and thus the fact that the American farmers pay no rent may account partially for the lower prices at which they sell their corn. (2) Again, the pure theory takes no account of the size of the portions into which the land is divided, nor of the kind of crops which are grown. But, when most of the land of a country is rented, both of these factors have to be considered, and it may be more convenient to the landowner to let the land with certain restrictions, which again indirectly operate on the price. (3) It has been well observed by Passy ? that the principal Se ee

1 An excellent account of the economic theory of rent, in which recent criticisms from different points of view (e.g., by P. Leroy-

Beaulieu, Henry George &c.) are examined, is Land and its Rent, b Francis A. Walker, London, 1884, i ual

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effect of various land laws is to increase or diminish the amount of the gross produce, which in Ricardian phrase- ology would mean to extend or contract the margin of cultivation. It thus appears that it is not always true to say that the payment of rent makes no real difference to the general public, and that it is simply a necessary method of equalizing farmers' profits. At the same time, however, with the necessary qualifications, there is no doubt that price determines rent and not rent price, especially when prices are affected by foreign competition. Recently in Great Britain a striking example has been afforded both of the abandonment of inferior lands (the contraction of the margin) and of a heavy fall in rent under the influence of falling prices.

The hypothetical history implied in Ricardo's theory as to the effects of the progress of society upon the value of agricultural produce also requires some criticism, such as that given by the historian of agriculture and prices, Thorold Rogers. The theory assumes that in the first place population increases, and thus there is a greater demand for food, and that therefore the margin of culti- vation extends and the price rises, and rent rises also. But, as Rogers observes, history shows that agricultural improvements of all kinds have first of all increased the amount of food, and thus allowed of an increase in popula- tion. It is worth noticing that in our own times an in- creasing population in rural districts (¢.g., the Highlands of Scotland and the west of Ireland) may indirectly tend to lower or destroy rents through minute subdivision. Ricardo's theory, however, accounts very well for the rise in the ground-rents of towns and cities, and it is there far more than in the rural districts that the unearned incre- ment is to be found.

The value of mining produce is determined generally in the same way as that of agricultural produce; but similar qualifications must be introduced. The theory is that both extensively and intensively the produce of mines is subject to the law of diminishing return, that the margin recedes as the price falls and extends as it rises, and that thus the price is determined by the most costly portion which it just pays to bring to market. And no doubt the main facts of the theory are correct; and recently the mines of Great Britain no less than its lands have illustrated the retrogression of the margin and the fall in rents. The principal point to observe is that mines are gradually quite exhausted.1_ In general the produce of mines is, like that of

land, consumed in a comparatively short time, and thus the value is subject to fluctuations according to the con- ditions of the annual demand and supply.

The peculiar durability of the precious metals, however, makes them in this respect differ widely from most mining produce. It is of course undeniable that (supposing coin- age free) the value of standard coins will be equal to the value of the same amount of bullion, and, conversely, that the bullion will be equal in value to the same amount of coins. The older economists argued that the precious metals had their value determined by their cost of pro-

'duction under the most unfavourable circumstances, and

then argued that in consequence the value of money (or coins) tended to be governed by the cost of production of bullion. If, however, it ig remembered that the annual production does not probably amount to two per cent. of the quantity in the hands of man, that cost of production can only operate through actual or potential supply, and that in the case of money the increase must be real to affect prices, it will be readily seen that the value of bullion is determined by the general level of prices (or

alta Marshall's Economics of Industry, London, 1879, bk. ii. chap.

depends upon the value of the bullion. At the same time, however, it is true that, if prices become very high, —in other words, if the value of money, and thus of bullion, becomes very low,—then a check is placed upon production from the mines, and, conversely, with falling prices or a rise in the value of the precious metals mining for them is extended and encouraged. But the difference in the annual supply due to this influence will be small under present or similar conditions, On the whole, this case of the precious metals furnishes perhaps the best example of the way in which the cost of production can only act through the law of supply and demand.

There is one other part of the general theory of value Law

which requires some notice.

needed to suit this case. sum of the values must be equal to the joint expenses of production, and the relative values inter se are deter- mined by demand and supply. Thus the Australian sheep-farmers will extend their sheep-farms so long as for wool and mutton together they obtain a fair profit, but the amount contributed by each portion will be determined by the relative demand. It is interesting to observe that in the progress of society the value of the meat has risen as compared with that of the hides and the wool. The same principle determines the kind of produce which will be raised from land, though the application is rather more difficult owing to rotation of crops, &c.

Much discussion has taken place recently on the question Theory whether a distinct theory of international values is required. of inter-

In the limits assigned to this article it is only possible to indicate the principal points in dispute. The 'orthodox " theory, as held by Ricardo, Mill, and Cairnes, has been attacked by Cournot, Prof. Sidgwick, and others, and has been re-stated with admirable clearness and much original power by Prof. Bastable.2 The best way to answer the question seems to be to make clear the assumptions on which the values of commodities produced within any "nation" are determined, and then to consider whether any change must be made when we bring in other nations. We are at once met with the difficulty, What is a " nation"? The orthodox answer' appears to be that within any nation (for which the term 'economic area" might per- haps be advantageously substituted) there is effective industrial and commercial competition. This appears to imply no more than is contained in the principle noticed above, that relative values tend to be equal to the normal expenses of production (commercial competition), and that the expenses tend to be proportioned to the real cost (industrial competition). The question then arises, Do

these conditions not exist in international trade? The Com- answer appears to be, first, that commercial competition parative certainly holds good; for as soon as a trade is estab- St

lished the commodities will sell at the same prices in both countries (allowance being made for cost of carriage). It would plainly be absurd to say that the value of Man- chester goods is determined by their expenses of produc- tion if they are consumed in England, but by something else if they are sent to India. If then there is any differ- ence between domestic and international values, it must arise owing to the absence of effective industrial competi- tion; that is to say, in the same country (or economic area) the real cost determines the expenses of production on account of the supposed perfect mobility of labour and capital, but between different economic areas these agents of production do not pass with sufficient readiness to secure a similar correspondence. It thus follows that a country may import articles which it could produce at less real 2 Theory of International Trade.

Recip- rocal de- mand.

Foreign ex- changes,

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cost, provided that it pays for these imports with exports which cost even less. A very striking example of this doctrine of comparative cost, as it is termed, is furnished by Victoria after the great gold discoveries. All kinds of produce were imported and paid for with gold, because there was less real cost involved in obtaining the gold to pay for imports than in making the articles. _Accord- ing to this theory every country will devote its labour and capital to its most productive uses; and, if by some new imports a domestic industry is checked or abolished, it is argued that the labour and capital will be devoted to increasing the exports so as to pay for the new imports. It must clearly be assumed as axiomatic that in the absence of loans, tributes, &c., imports can in the long run only be paid for by exports, and also that those articles will be ex- ported which can be produced at the least comparative real cost. This theory then may be held to explain in a satis- factory manner the origin and development of international trade; but the question of values is still undetermined. Consistently with exports paying for imports many differ- ent rates of exchange are possible, and the particular rate actually adopted is said to depend entirely on reciprocal demand. And in an extreme case, in which new countries trade solely in

articles of which each has a monopoly, this answer would seem to be correct; but, when we consider that under present conditions trading countries have many articles in common, and that a slight margin of profit suffices to expand or diminish an export trade, this answer seems too vague and unreal. The most probable solution seems to be that the rates of exchange will be so adjusted as to give to the exporters the ordinary rate of profits current in their respective countries. In general it is clear that the rate will be determined independently of the foreign trade, or at least that the foreign trade is only one factor to be considered. It is said, for example, that the annual value of the agricultural produce of the United Kingdom exceeds the total amount of the exports. If the rate of profit falls, a trade which before was impossible becomes possible. The opinion may be hazarded that the best way of explaining the general theory of international values would be to start with the foreign exchanges; but such an investigation is too technical and difficult for this place. (J. 8. N.)

VAMPIRE, a term, apparently of Servian origin (wampir), originally applied in eastern Europe to blood- sucking ghosts, but in modern usage transferred to one or more species of blood-sucking bats inhabiting South America.

In the first-mentioned meaning a vampire is usually supposed to be the soul of a dead man which quits the buried body by night to suck the blood of living persons. Hence, when the vampire's grave is opened, his corpse is found to be fresh and rosy from the blood which he has thus absorbed. To put a stop to his ravages, a stake is driven through the corpse, or the head cut off, or the heart torn out and the body burned, or boiling water and vinegar are poured on the grave. The persons who turn vampires are generally wizards, witches, suicides, and persons who have come to a violent end or have been cursed by their parents or by the church. But any one may become a vampire if an animal (especially a cat) leaps over his corpse or a bird flies over it. Sometimes the vampire is thought to be the soul of a living man which leaves his body in sleep, to go in the form of a straw or fluff of down and suck the blood of other sleepers. The belief in vampires chiefly prevails in Slavonic lands, as in Russia (especially White Russia and the Ukraine), Poland, and Servia, and among the Czechs of Bohemia and the other Slavonic races of Austria. It became specially

prevalent in Hungary be- tween the years 1730 and 1735, whence all Europe was

filled with reports of the exploits of vampires. Several treatises were written on the subject, among which may be mentioned Ranft's De Masticatione Mortuorum in Tumulis (1734) and Calmet's Dissertation on the Vampires of Hungary, translated into English in 1750. It is prob- able that this superstition gained much ground from the reports of those who had examined the bodies of persons who had been buried alive though believed to be dead, and was based on the twisted position of the corpse, the marks of blood on the shroud and on the face and hands,—results of the frenzied struggle in the coffin before life became extinct. The belief in vampirism has also taken root among the Albanians and modern Greeks, but here it may be due to Slavonic influence.

Two species of blood-sucking bats (the only species known)—Desmodus rufus and Diphylla ecaudata—repre- senting two genera (see Mammazia, vol. xv. p. 415), inhabit the tropical and part of the subtropical regions of the New World, and are restricted to South and Central America. They appear to be confined chiefly to the forest- clad parts, and their attacks on men and other warm- blooded animals were noticed by some of the earliest writers. Thus Peter Martyr (Anghiera), who wrote soon after the conquest of South America, says that in the Isthmus of Darien there were bats which sucked the blood of men and cattle when asleep to such a degree as to even kill them. Condamine, a writer of the 18th century, remarks that at Borja (Ecuador) and in other places they had entirely destroyed the cattle introduced by the mis- sionaries. Sir Robert Schomburgk relates that at Wicki, on the river Berbice, no fowls could be kept on account of the ravages of these creatures, which attacked their combs, causing them to appear white from loss of blood. The present writer, when in South and Central America, had many accounts given him as to the attacks of the vam- pires, and it was agreed upon by most of his informants that these bats when attacking horses showed a decided preference for those of a grey colour. It is interesting to speculate how far the vampire bats may have been instru- mental—when they were, perhaps, more abundant—in causing the

destruction of the horse, which had disappeared from America previous to the discovery of that continent.

Although these bats were known thus early to Europeans, the species to which they belonged were not determined until about fifty years ago, several of the large frugivorous species having been wrongly set down as blood-suckers, and named accordingly. Thus the name Vampyrus was suggested to Geoffroy and adopted by Spix, who also con- sidered that the long-tongued bats of the group Glosso- phage were addicted to blood, and accordingly described Glossophaga soricina as a very cruel blood-sucker (sangut- suga crudelissima), believing that the long brush-tipped tongue was used to increase the flow of blood. Vampyrus spectrum, L., a large bat inhabiting Brazil, of sufficiently forbidding aspect, which was long considered by naturalists to be thoroughly sanguivorous in its habits, and named accordingly by Geoffroy, has been shown by the observa- tions of modern travellers to be mainly frugivorous, and is considered by the inhabitants of the countries in which it is found to be perfectly harmless. Waterton believed Artibeus planirostris, a common bat in British Guiana, usually found in the roofs of houses, and now known to be frugivorous, to be the veritable vampire ; but neither he nor any of the naturalists that preceded him had suc- ceeded in detecting any bat in the act of drawing blood. It fell to the lot of Charles Darwin to determine one of the blood-sucking species at least, and the following is his account of the circumstances under which the discovery of the sanguivorous habits of Desmodus rufus was made :— "The vampire bat is often the cause of much trouble by

biting the horses on their withers. The injury is generally not so much owing to the loss of blood as to the in- flammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one was actually caught ona horse's back. We were bivouacking late one evening near Coquimbo, in Chili, when my servant, noticing that one of the horses was very restive, went to see what was the matter, and, fancying he

could detect something, suddenly put his hand on the beast's withers, and secured the vampire" (Naturalist's Voyage Round the World, p. 22).

Desmodus rufus, Weid, the common blood-sucking bat, is widely spread over the tropical and subtropical parts of Central and South America from Oaxaca to southern Brazil and Chili, It isa comparatively small bat, a little =~ 3 larger than the common noctule, the head and body about 3 inches in length, the forearm 24, with a remarkably long and strong thumb ; it is destitute of a tail, and has a Z very peculiar physiognomy, well re- 7 presented in fig. 1. The body is covered with rather short fur of a reddish brown colour but varying in shade, the extremities of the hairs sometimes ashy. The teeth are peculiar and characteristic, admirably adapted for the purposes for which they are employed. The upper front teeth (incisors), of which there are only two, are enor- a mously enlarged (see fig. 2), and in Wd shape obliquely triangular like small guillotines. The canines, though smaller than the incisors, are large and sharp ; but the back teeth, so w well developed in all – other bats, are very |. small and reduced in AN, number to two above AS. and three below, on ry each side, with later- ally compressed crowns pe parrogin rising but slightly Fia. 2.—-Teeth of D. rufus. above the level of the gum, their longitudinally disposed cutting edges (in the upper jaw) being continuous with the base of the canine and with each other. The lower front teeth (incisors) are small, bifid, in pairs, and are separated from the canines, with a space in front. The lower back tceth are narrow, like those in the upper jaw, but the anterior tooth is slightly larger than the others, and separated by a sinall space from the canines. Behind the lower incisors the jaw is deeply hollowed out to receive the extremities of the large upper incisors.

With this peculiar dentition there is associated as remarkable a departure from the general type in the form of the digestive ap-

aratus. The exceedingly narrow cesophagus opens at right angles into a narrow, intestine-like stomach, which almost immediately terminates on the right, without a distinct pylorus, in the duodenum, but on the left forms a greatly elongated caecum, bent and folded upon itself, which appears at first sight like part of the intestines. This, the cardiac extremity of the stomach, is, for a short distance to the left of the entrance of the esophagus,

still very narrow, but soon increases in size, till near its termination it attains a diameter

uite three times that of the short pyloric portion. The length of this cardiac diverticulum of the stomach appears to vary from 2 to 6 inches, the size in each specimen probably depending on the amount of food obtained by the animal before it was captured.

The only other known species of blood-sucking bat, Diphylla ecaudata, Spix, inhabits Brazil, and appears to be much less abun- dant than Desmodus rufus, from which it is distinguished by its slightly smaller size, by the absence of a groove in the front of the lower lip, by the non-development of the interfemoral membrane in the centre, and by the presence of a short calcaneum (absent in D. rufus), but more particularly by the presence of an additional rudimentary back tooth (? molar) above and below, and by the very peculiar form of the lower incisors, which are much expanded in the direction of the jaws and pectinated, forming a semicircular row touching each other, the outer incisors being wider than the inner ones, with six notches, the inner incisors with three each.

Thus constituted, these bats present, in this extraordinary differ- entiation of the manducatory and digestive apparatus, a departure from the type of other species of the family (Phyllostomide) to which they belong unparalleled in any of the other orders of Mammalia, standing apart from all other mammals as being fitted only for a diet of blood, and capable of sustaining life upon that alone.

Fia. 1.—Head of Desmodus rufus, Weid.

Travellers describe the wounds inflicted by the large sharp-edged in- cisors as being similar to those caused by a razor when shaving: a portion of the skin is shaved off and, a large number of severed capillary vessels being thus exposed, a constant flow of blood is maintained. From this source the blood is drawn through the ex- ceedingly narrow gullet—too narrow for anything solid to pass—into the intestine-like stomach, whence it is, probably, gradually drawn off during the slow process of digestion, while

the animal, sated with food, is hanging in a state of torpidity from the roof of its cave or from the inner sides of a hollow tree. (G. E. D.) VAN, a city of Asiatic Turkey, capital of a vilayet, is situated two miles to the east of the lake to which it gives its name, in 38° 30' N. lat. and 43° 18' E. long. It lies on the ill-defined borderland between Armenia and Kurd- istan, in an extremely fertile plain some 40 miles in circuit, which is described as one of the gardens of the East, whence the local saying: "Van in this world, heaven in the next." Its low flat-roofed houses are grouped irregularly at the southern base of a nummulitic limestone eminence, somewhat resembling a camel's back, which rises 100 feet sheer above the plain and is crowned by the so-called citadel, the fortifications of which are mostly in a dilapidated state. But it is naturally a position of great strength and of considerable strategic importance, standing at the junction of two military routes, which here diverge westwards through Mush and Kharput to Asia Minor and southwards to Mosul and Mesopotamia, besides commanding the approaches to the Persian frontier at Kotur and Bayezid. The town itself, which contains four mosques, two large churches, an Armenian bazaar, baths, and caravanserais, is enclosed within a double line of crenellated walls and ditches on the three sides not protected by the rock; and beyond these enclosures lies the suburban district of Baghlar, or the "'Gardens." The

| population, estimated at from 30,000 to 35,000, are Turks, _ except about 2000 Armenians and a few hundred Mo-

hammedan and Nestorian Kurds. Besides trade and agriculture, the inhabitants are engaged in a few indus- tries, such as the making of coarse cotton chintzes, a highly prized goat-hair waterproof moire antique, a thick woollen cloth called shayak, and an excellent soap, pre- pared from the saline efflorescences of Lakes Van and Erchek, which consist in about equal proportions of the

carbonate and sulphate of soda. ;

Armenian tradition derives the name of Van from an Armenian king who reigned a little before Alexander the Great, and speaks of an older city founded by Semiramis (Shemiramagerd). This is of course fable; but the Vannic inscriptions (vol. xiii. p. 116) show that the region was the seat of an

Armenian kingdom, whose native name was Biaina, as early as the 9th century B.c. In the isolated rock towering above the plain there are numerous galleries, flights of steps, crypts, and cuneiform rock inscriptions, one of which is trilingual, like that of Behistin, and like it relates the deeds of Xerxes, son of Darius. Others are in the Haikan or Old Armenian language ; while for others scattered over the district a solution has been sought by Prof. Sayce with doubtful success in the present language of Georgia.

The vilayet of Van, one of the finest but also one of the least developed regions of Asiatic Turkey, lies on the Persian frontier between Erzerum (north) and Baghdad (south). It has an area of 15,000 square miles, with a population

of over 1,000,000. Lake Van.

Lake Van, called Arsissa Palus by the ancients, and also Thos- pitis, from its Armenian name Tosp, is 80 miles long and 30 broad, with a total area of 1500 square miles. Although of smaller extent than Lake Urmia, it contains a much larger volume of water owing to its much greater depth, which is at least 80 feet near Van and still more along the south side. The lake stands about 5400 feet above sea-level on the south Armenian platcau, which is en- circled by the lofty ranges that bifurcate west and south from Ararat and culminate in the Sipan-Dagh (12,000 feet) on the north side of the lake. These mountains are clad with dense forests of beech, chestnut, ash, and walnut, while the broad fertile belt be- tween their base and the lake is planted with melon gardens and orchards of plums, peaches, apricots, figs, and pomegranates, festooned with a vine which yields a palatable wine.

5A. VAN—VAN

Lake Van, which is too brackish to be drinkable for man or beast, is inhabited by a species of blay or bleak, which abound especially about the mouths of the influents, and coine to the surface when the spring floods spread over the heavier saline layers. This lake is a completely land-locked basin, or at least has no visible ontlet. But the natives speak of underground channels through which it communicates south-westwards with the head-waters of the Tigris, attributing to the occasional obstruction of these

chanuels the great oscillations of level that have undoubtedly occurred in past and recent times. In the 17th century and again about 1840 the water rose from 10 to 12 feet, and is even now (1888) rising. Lake Erchek perhaps marks its extreme eastern limit in former times. Lake Van is also indirectly connected with the Euphrates through the little Lake of Nazik, which lies west of the Sipan-Dagh, on the water-parting between the lacustrian and fluvial basins, and which bya rare phenomenon sends emissaries to both. The narrow part of Lake Van, which runs for nearly 40 miles towards the north-east, and gives the lake somewhat the appearance of a frying- pan, is very shallow, aud was once, according to tradition, a fertile plain. The lake is not regularly navigated. Scattered along the south-east shore are a few picturesque islets, one of which, Aktamar, is the seat of an Armenian patriarch.

VANADIUM, a rare element discovered in 1830 by Sefstrém, when analysing a kind of iron obtained from the ores of Taberg in Sweden. Berzelius, in the course of an extensive investigation on vanadium, came to the conclu- sion that it is analogous to chromium, forming like it an acid trioxide, VanO,, in which "Van" signifies 134°41 parts of a radical analogous to the Cr=52 parts of chromium in chromic acid, CrO,. He succeeded in isolat- ing this radical, and, as it exhibited semi-metallic proper- ties, he had no doubt that it was the element vanadium itself. His results were universally adopted as correct until Roscoe (in 1867) found that Berzelius's vanadium is an oxide containing O,=32 parts of oxygen per Van, whence it followed that the presumed trioxide, VanO,, is really a pentoxide, V,O;, where V, = 2 × 51:2 = 2 atoms of the real element. Our present knowledge of vanadium is based chiefly upon his investigations. Of vanadium minerals, which are all very rare, we name two only,— mottramite, (Pb,Cu),(VO,).+ 2(Pb,Cu)(OH),, and vanadinite, 3Pb, (VO,).+PbCl,. This last is amorphous with apatite, which previous to Roscoe's discovery was difficult to explain. See Curmisrry, vol. v. p. 539.

Traces of vanadium arc found in certain iron ores and in many other minerals. Roscoe utilized a kind of sandstone from Alderley Edge and Mottram in Cheshire which contains a small admixture of mottramite. Another suitable material is the "Bohnerz" of Steinlade and Haverloh, essentially a hydrated ferric oxide. For the extraction of vanadium from this

latter mineral Wohler recom- mends the following method. The finely powdered mineral is mixed with one-third of its weight of nitre and the mixture kept at a dull red heat foran hour. The ignited mass is powdered and lixiviated with water, which extracts the potash salts of the oxides V,O,,CrO,, MoO;, As,O;,P20;, and SiO,. The filtered solution is almost neu- tralized with nitric acid, but not completely, or else some of the V,0; would be reduced by the nitrous acid to lower oxides; and the vanadic and most of the other acids named are precipitated as baryta salts by addition of chloride of barium. From the washed precipitate the acids are liberated by boiling dilute sulphuric acid, and the sulphate of baryta is filtered off. The solution is neutralized with ammonia, concentrated by evaporation, and, after cooling, kept in contact with a solid piece of sal-ammoniac more than sufficient to saturate the solution with this salt. Meta-vanadate of ammonia, V,0;(NH4).0, being characteristically insoluble in sal-ammoniac solution, separates out as a yellowish crystalline precipitate. This is collected, washed with sal-ammoniac solution and after that with alcohol, and purified by re-crystallization or otherwise. The pure salt when heated to dull redness leaves the pentoxide, V.O; (vanadic acid), as a red liquid, which freezes into a red-brown crystalline mass of sp. gr. 3°35 (J. J. Watts). It dissolves in about 1000 parts of water, forming a yellow solution which reddens litmus. The pentoxide, though capable of uniting with strong acids, ¢.g., with sulphuric into a salt, V.0,(SO,)3, behaves on the whole as an acid oxide analogous in its combining habits to phosphoric (see Puos- PHORUS, Vol. xviii. p. 818, and CuEmisTRy, vol. v. p- 540). Solu- tions of vanadates are easily recognized : on addition of mineral acid they assume the yellow colour characteristic of the pentoxide, and if the mixture is then kept in contact with zinc it passes through all shades of (intense) green till it ultimately assumes a lavender

1 Calculated from our present constants.

colour. The solution then contains a chloride corresponding to the oxide V,O, (Berzelius's metal). It absorbs atmospheric oxygen with an extraordinary degree of avidity, assuming, in the absence of free acid, a dark brown colour. An acidified vanadate solution, if shaken with peroxide of hydrogen and ether, furnishes a dark red reduction product, which passes into the ethereal layer. One part of vanadic acid in 40,000 parts of water

can thus be rendered distinctly visible (Werther). Ifa mixture of the pentoxide and charcoal is heated in dry chlorine, it is converted into an oxychloride, VOC], (tri- chloride of Berzelius), which distils over and may be purified by re-distillation over sodium. It is a canary-yellow mobile liquid, freezing below —15° C. and boiling at 126°:7 C., and its sp. gr. at 14°C, is 1:841. Water decomposes it with formation of hydrochloric acid and pentoxide V,O,;. If the vapour of this chloride is passed over red-hot charcoal in a current of chlorine, the tetrachloride VCl, is produced as a dark brown liquid, boiling at about 154°C. A mixture of the vapour of this chloride with hydrogen, when passed through a dull-red-hot tube, yields (more or less of 'sesqui-" chloride, V.Cl,, and) the dichloride VCl,, which, if pure, forms apple-green, niica-like, hexagonal plates. From this dichloride Roscoe for the first timc prepared the true metal by heating it to redness in hydrogen gas, a simple enough method in theory, but in practice one of the most difficult of operations, becanse the dichloride is very difficult to prepare and highly hygroscopic, and because the metal is extremely prone to take up oxygen. Even the purest product which Roscoe succeeded in obtaining contained an appreciable admixture of oxide. Vanadium is a light grey powder, which under the microscope appears crystalline and ex- hibits a silvery lustre, sp. gr. =5°5. Of its chemical properties the nost remarkable is that it combines directly with nitrogen gas, Ne, into a bronze-coloured nitride, VN.

Rare and expensive as vanadium is, it has found a practical application in the production of aniline black. The black is produced from aniline by the action of chloric acid, aided by the presence of some oxygen carrier. Sulphide of copper is usually employed ; but, as Lightfoot found, a mere trace of vanadic acid (or vanadate of ammonia) acts more energetically than any other available agent. According to Witz, 1 part of vanadic acid suffices for 67,000 parts of aniline salt. ;

VANBRUGH, Sir Jonn (1666 21-1726), dramatist and architect, was the son of a wealthy sugar-baker in Cheshire and grandson of a Protestant refugee of Ghent. From a passage in one of his letters to Tonson it might be sup- posed that he was born in the Bastille, though in what year is uncertain, probably in 1666. He was educated in France, but what he learnt there, whether architecture or merely that art of good-fellowship which he

found to be the true Aladdin's lamp of social life, is a question that will be variously answered by those who, like Sir Joshua Reynolds, admire Blenheim and Castle Howard, and those who, like the wits of Vanbrugh's time, scoff at them. This, however, is certain, that after his return from the Continent to England what he did was, not to pursue architecture, but to work, with a gusto and a success that are humor- ous and exhilarating, the " Aladdin's lamp" above men- tioned, His first step towards becoming a power in society was, of course, to enter the army. Perhaps, however, had he begun life in any other way his advance would have been just as rapid. For, strong as are social conditions, character is stronger still, and Vanbrugh's equipment—wit, tempered by good humour, a genuine feeling of comrade- ship, an exceedingly fine presence (according to Noble's description), and a winsome face (according to Kneller's portrait)—would, under any circumstances, have been ir- resistible. One of the points of difference between the dialogue in Vanbrugh's comedies and the dialogue in the comedies of Congreve is this: we feel that the characters in the Relapse and the Confederacy talk as Vanbrugh must

'have talked ; we feel that the characters in the Old Bachelor

and the Way of the World talk, not as Congreve talked, but as Congreve wrote. We feel that, while such dazzling sword-play as Congreve's would in society have chilled, even as it illumined the air, talk so hearty, good-humoured, frank, and daring as that we get in Vanbrugh's plays would have made the fortune of any man of fashion, made \t as certainly at a Roman supper party in the time of Augustus as at a London drinking-bout in the days of

Va & B UeG

Queen Anne. It is no wonder then that he was a favourite, no wonder that the two best haters of the time, Swift and Pope, tried in vain to hate the "man of wit and honour," Vanbrugh. During the martial period of his life, Van- brugh wrote the first sketches of the elapse and the Pro- voked Wife. These he showed to Sir Thomas Skipworth, one of the shareholders of Drury Lane, and with fortunate results.

In 1695 he was offered—whether through the court interest which he had secured or whether because he really had acquired a knowledge of architecture in France is not known—the post of secretary to the commission for en- dowing Greenwich Hospital. He accepted the post, and by way of fulfilling his functions as an architect turned his attention to the amours of " Lord Foppington." His Relapse or Virtue in Danger, a sequel to Colley Cibber's Love's Last Shift, was produced at Drury Lane in 1697. When a comic dramatist of the school of Wycherley con- fesses that the fine gentleman of his play, '" drinking his mistresses' health in Nantes brandy from six in the morn- ing to the time he waddled on upon the stage in the evening, had toasted himself up to such a pitch of vigour " that something too outrageous even for such an audience seemed imminent, we may assume that he has enjoyed a satisfactory first night. The success was so triumphant that Montague, afterwards Lord Halifax, asked at once for the Provoked Wife for the theatre in Lincoln's Inn Fields, and—Skipworth waiving, for the advantage of Vanbrugh, his own claim upon the play—it was produced at that theatre in the following year. All that could be said in answer to those who condemned it on account of its un- blushing libertinism was that Sir John Brute is sufficiently brutal to drive any woman into rebellion, and that since the glorious days of the Restoration a wife's rebellion and a wife's adultery were synonymous terms. The play was a complete triumph.

And now, having succeeded as a man of fashion, as an architectural commissioner, and as a comic dramatist of the school of Wycherley, Vanbrugh turned his attention to morals. Though sop—produced at Drury Lane in the same year as the Provoked Wife—was an adaptation of Boursault's dramatic sermon on the same subject, it was an improvement on the French play. As usual with Vanbrugh, who never did things by halves, he surpassed the Frenchman on that very point where the Frenchman had been pronounced unsurpassable. Just as in the Re- lapse, when he aspired to be merry, his merriment had en- tirely surpassed that of Cibber's play, of which his own was meant to be a sequel, and just as afterwards, when in Castle Howard and Blenheim he aspired to rival in mass- iveness the " thick rotundity of the earth," he laid on her a structure only a "few tons lighter than herself," so now, when he aspired to surpass the Frenchman in gravity, he achieved a kind of dulness compared with which the owl- like

dulness of Boursault was as the wit of Voltaire. Ina word, the humour of the piece lies in the fact that it was written by the author of the Melapse and the Provoked Wife. The play ran during a week only. Vanbrugh, accepting the failure with his usual good-temper, seems then to have turned his attention completely to archi- tecture ; for the adaptation in 1700 of the Pilgrim of Beaumont and Fletcher, and the production in 1702 of A False Friend, could hardly have engaged his serious efforts at all, so perfunctory are they and so inferior to all that he had done before.

Castle Howard in Yorkshire, which he had built for the earl of Carlisle, was a great success so far as pleasing his patron went, who as a reward gave him yet another open- ing in life by presenting him,—the most ignorant man perhaps in England of heraldry, judging from the fun he

niade of the appointment,—with the tabard of Clarencieux king-at-arms. But, if the dangerous moment in every man's life is when he has just scored a brilliant success, it is especially so with genial glowing natures like Vanbrugh's. It seems to have been the success of Castle Howard that caused him to entertain the rash project of building a theatre, from his own design, for the acting of his own plays. The joyous courage with which, having persuaded thirty people in the fashionable world to aid him in finding the money, and Congreve to aid him in finding the plays, he began to build in perfect unconsciousness of the danger before him is the only passage in his life which may be called pathetic, save of course his struggle with the "wicked woman of Marlborough." No doubt any archi- tect who builds a theatre is always in danger of letting his ideas run riot in the wide field of experiment, but he who builds a theatre for his own plays seems doomed by the malice aforethought of fate. The magnitude of Van- brugh's architectural ideas grew as the work went on, and with the ideas the structure grew till a theatre meant for the delicate bijouterie work of polite comedy seemed grow- ing to the proportions of the Roman Colosseum. Whether Congreve endeavoured to put a check upon his friend's architectural and authorial fervour does not appear. But it must be remembered that not only Vanbrugh's plays but his own were to be acted there, and that, although Congreve was a man of great sagacity, no man,

not even he who pretended to set his gentility above his genius, is sagacious when confronted by the surpassing excellence of his own poems and plays.

When at length the time came to test the acoustics of the pile, it was found to be sadly defective. What changes were made to rectify the errors of structure does not appear. The theatre was opened to the public with an Italian opera, which was followed by three of Moliére's comedies, and these by the Confederacy, Vanbrugh's masterpiece on the whole, though perhaps its finest scenes are not equal to the finest scenes in the Relapse.

Vanbrugh at last withdrew from the disastrous specula- tion ; Congreve had already withdrawn. But a man to whom fortune had been so kind as she had been to Van- brugh could hardly be depressed by any of her passing frowns. Queen Anne at once sent him abroad on an important state errand, and afterwards he was commis- sioned to build Blenheim. Upon the merits and demerits of this famous "hollowed quarry" there has been much conflict of opinion. As to the sarcasms by Swift, Walpole, Evans, and the rest, they are as nothing when set against Sir Joshua Reynolds's defence of Vanbrugh and his style. For in England the general sense for architecture seems to be even rarer than the general sense for poetry and painting. The truth is that Vanbrugh imported largely into architecture what in all the plastic arts should be allowed to fructify but sparsely, namely, literary ideas, and even these literary ideas of his seem to lack that fusion which we see in the works of the great masters. Hence, impressive as are the parts, they do not form an impressive whole. Blenheim, however, was a source of great sorrow to the kindly dramatist. Though Parliament had voted for the building of it, no provision had been made for the supplies. The queen while she lived paid them, and then Vanbrugh was left to the meanness of the duke of Marlborough and afterwards to the insolence of the "wicked woman," who did her best to embitter his life. Besides Castle Howard and Blenheim, he built many other country mansions, such as Grimsthorpe and Duncombe Hall in Yorkshire, Eastbury in Dorsetshire, Seaton-Delaval in Northumberland, King's Weston near Bristol, Oulton Hall in Cheshire, &c.

About the end of 1710 Vanbrugh married Henrietta

Maria, daughter of Colonel Yarborough of Haslington, and four years afterwards, at the accession of George I. he was knighted. He afterwards wrote again for the stage, and the unfinished fragment left at his death, which took place on 26th March 1726 at his house in Scotland Yard, London, shows that his powers remained to the last as fine as ever.

In order to find and fix Vanbrugh's place among English comic dramatists, an examination of the very basis of the comedy of repartee inaugurated by Etheredge would be necessary, and, of course, such an examination would be impossible here. It is chiefly as a humorist, however, that he demands attention. .

Given the humorous temperament—the temperament which impels a man to get his enjoyment by watching the harlequinade of life, and contrasting it with his own ideal standard of good sense, which the harlequinade seems to him to mock and challenge —given this temperament, then the quality of its humorous growths depends of course on the quality of the intellectual forces by means of which the temiperament gains expression. Hence it is very likely that in original endowment of humour, as distinguished from wit, Vanbrugh was superior to Congreve. And this is saying a great deal: for, while Congreve's wit has always been made much of, it has, since Maeaulay's time, been the fashion among critics to do less than justice to his humour,—a humour which, in such scenes as that in Love for Love whcre Sir Sampson Legend dis- courses upon the human appetites and functions, moves beyond the humour of convention and passes into natural humour. It is, however, in spontaneity, in a kind of lawless merrimeut, almost Aristophanic in its verve, that Vanbrugh's humour seems so deep and so fine, seems indeed to spring from a fountain deeper and finer and rarer than Congreve's. A comedy of wit, like every other drama, is a story told by action and dialogue, but to tell a story lucidly and rapidly by means of repartee is exceedingly difficult, not but that it is easy enough to producc repartee. But in comic dialogue the difficulty is to move rapidly and yet keep up the brilliant ball-throwing demanded in this form, and without lucidity and rapidity no drama, whether of repartee or of character, can live. Ktheredge, the father of the comedy of repartee, has at length had justice done to him by Mr Gosse. Not only could Etheredge tell a story by means of repartee alone: he could produce a tableau too ; so could

Congreve, and so also could Vanbrugh, but often—far too often—Vanbrugh's tableau is reached, not by fair means, as in the tableau of Congreve, but by a surrendering of probability, by a sacrifice of artistic fusion, by an inartistic mingling of comedy and farce, such as Congreve never indulges in. Jeremy Collier was perfectly right therefore in his strictures upon the farcical improbabilities of the Relapse. So farcical indeed are the tableaux in that play that the broader portions of it were (as Mr Swinburne discovered) adapted by Voltaire and acted at Sceaux as a farce. Had we space here to contrast the Relapse with the Way of the World, we should very likely come upon a distinction between comedy and faree such as has never yet been drawn. We should find that farce is not comedy with a broadened grin—Thalia with her girdle loose and run wild—as the critics seem to assume. We should find that the difference between the two is not one of degree at all, but rather one of kind, and that mere breadth of fun has nothing to do with the question. No doubt the fun of comedy may be as broad as that of farce, as is shown indeed by the celebrated Dogberry scenes in Much Ado about Nothing aud by the scene in Love for Love between Sir Sampson Legend and his son, alluded to above; but here, as in every other de- partment of art, all depends upon the quality of the imaginative belief that the artist seeks to arrest and seeure. Of comedy the breath of life is dramatic illusion. Of farce the breath of life is inock illusion. Comedy, whether broad or genteel, pretends that its mimicry is real. Farce, whether broad or genteel, makes no such pretence, but by a thousand tricks, which it keeps up between itself and the audience, says, " My acting is all sham, and you know it." Now, while Vanbrugh was apt too often to forget this the fundamental dilference between comedy and faree, Congreve never forgot it, Wycherley rarely. Not that there should be in any literary form any arbitrary laws. There is no arbitrary law de- claring that comedy shall not be mingled with farce, and yet the fact is that in vital drama they cannot be so mingled. The very laws of their existence are in conflict with each other, so much so that where one lives the other must die, as we see in the draina of our own day. The fact seems to be that probability of incident, logical sequence of cause and effect, are as necessary to comedy as they are to tragedy, while farce would stiflein such anair. Rather it would be poisoned by it, just as comedy is poisoned by what farce flourishes on, that is to say, inconsequence of reasoning — topsy-turvy logic. Born in the fairy country of topsy-turvy, the logic of farce would be

illogical if it were not upside-down. So with coincidence, with improbable accumulation of convenient events, — farce can no more exist without these than comedy can exist with

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them. Hence we affirm that Jeremy Collier's strictures on the farcical adulterations of the Relapse pierce more deeply into Van- brugh's art than do the criticisms of Leigh Hunt and Hazlitt. In other words, perhaps the same lack of fusion which mars Van- brugh's architectural ideas mars also his comedy. CI Wid)

VAN BUREN, Martin (1782-1862), eighth president of the United States, was the son of a small farmer, and was born 5th December 1782 at Kinderhook, Columbia, New York State, on the banks of the Hudson. He was educated at the village school, and, entering on the study of law at the age of fourteen, was called to the bar in 1803. Possess- ing in addition to his other abilities a peculiar power of winning personal trust and influence, his rise both in his profession and political reputation was rapid. In 1808 he was chosen surrogate of Columbia county, and in 1812 a member of the State legislature. From 1815 to 1819 he was attorney-general of the State, and during this period came to be recognized as the ruling spirit of the new Demo- cratic school known as the Albany regency. In 1821 he was chosen to the United States senate and the same year was elected a member of the convention for revising the State constitution, in which, though advocating an extension of the franchise, he opposed universal suffrage. In 1828 he was appointed governor of New York State. From March 1829 to April 1831 he was secretary of state in the administration of President Jackson, of whom he was the chief political adviser. During the recess he was appointed minister to England; but, on the ground that he had previously shown a too submissive attitude towards that country, and also a tendency to be influenced in his foreign predilections by home politics, the senate refused to ratify the appointment. In the following year he was, however, chosen vice-president of the United States, and in 1837 he succeeded Jackson as president. He entered upon office at the time of a severe commercial crisis (see UNITED Srates), and, although the methods he adopted to deal with it were in themselves admirable, the financial strain

which existed during his term of office weakened for a time the influence of his party. Besides the establishment of the independent treasury system, Van Buren's name isassociated with the pre-emption law giving settlers on public lands the preference in their purchase. On the expiry of his term of office he was again, in 1840, nominated for the presidency, but lost by a large majority. In 1844 a major- ity of the delegates to the Democratic convention were pledged to support him, but on account of his opposition to the annexation of Texas they allowed a motion to be introduced making a two-thirds vote necessary for nomina- tion. This he failed to obtain and his name was with- drawn. In 1848 he was nominated by the anti-slavery section of his party, but the split caused the defeat of both Democratic candidates. The remainder of his life was spent chiefly in retirement on his estate at Kinderhook. In 1853-55 he went on a European tour. He died at Kinderhook, 24th July 1862. His Inquiry into the Origin and Course of Political Parties in the United States was published by his sons in 1867.

See W. Allen Butler, Martin Van Buren, Lawyer, Statesman, and Man, New York, 1862.

VANCOUVER, George (c. 1758-1798), English navi- gator, was born about 1758. He entered the navy at the age of thirteen, and accompanied Cook in his second (1772-74) and third (1776-79) voyages of discovery. After serving for several years on the Jamaica station, Vancouver was appointed to command an expedition to the north-west coast of America, the object being to take over from the Spaniards their territory in that region, and to explore the coast from 30° N. lat. round to Cook's Inlet (or river as it was then called), with a view to the discovery of an eastward passage to the great lakes in the British dominions. The special point which he had to

ascertain was whether the Strait of Juan de Fuca really was a strait. Vancouver, accompanied by Lieutenant Broughton, left Falmouth on Ist April 1791, and, after spending some weeks at the Cape, made for the coast of Australia, where a very careful survey of the south-west coast was made, especially of King George's Sound, the value of which as a harbour Vancouver pointed out. He next made for Dusky Bay, New Zealand. After a short stay, he proceeded north-east, discovered the little island of Oparo

(27° 36’S. lat. and 144° 12’ W. long.) by the way, and on 30th December reached Tahiti, where he was again joined by Lieutenant Broughton, who meanwhile had discovered Chatham Island. After staying about three weeks at Tahiti and several weeks at the Sandwich Islands, Vancouver on 18th April 1792 sighted the west coast of North America (California, then known as New Albion) in 39° 27’ N. lat. Here he proceeded to examine the coast up to 52° 18’ N. lat. with minute care, surveying all inlets and navigating the passage through Juan de Fuca which separates the Island of Vancouver from the main- land. Most of February and March 1793 was spent again at the Sandwich Islands, with the natives of which Van- couver had much intercourse, and in the affairs of which he took much interest. In April he resumed his explora- tion of the coast, which he examined and surveyed as far north as 56° N. lat. Part of the autumn was spent in visiting the Spanish settlements in New California, and surveying the coast and coast region as far south as 35° N. lat. From January to the beginning of March Van- couver’s headquarters were again at the Sandwich Islands, the cession of which to Great Britain he accepted, though the cession seems never to have been officially ratified. Quitting the Sandwich Islands again about the middle of March 1784, Vancouver made direct for Cook’s Inlet by Tchernigoff Island and Kodiak Island. Cook’s Inlet was carefully explored and the fact established that it was not ariver. The coast eastwards and southwards was surveyed as far as the limit of the former voyages. After spending some time about Nootka and visiting some parts of the coast, Vancouver set out homewards in the middle of October 1794. Several points were examined and sur- veyed on the west coast of America on the way south- wards, including Cape St Lucas, the southern point of Lower California. After touching at Cocos Island and making a somewhat careful examination of the Galapagos Islands, Vancouver continued his voyage by way of Cape Horn, finally entering the mouth of the Shannon on 13th September 1795. He immediately set about the prepara- tion of the narrative of his voyage, but died at Petersham in Surrey, 10th May 1798, before he had quite completed his task. Under the care of his brother the narrative was published in 1798 (3 vols. 4to), with a folio volume of magnificent maps and plates.

Vancouver’s work on the west and north-west coast of America was of the highest character, and has formed the basis of all sub- Sequent surveys. His

zeal led him to take an active share in all operations, aud the hardships he thus suffered tended no doubt to

shorten his life. Hewasa man of great tact, humanity, generosity, and uprightness of character.

VANCOUVER ISLAND, which is included in the territory of British Columbia, lies in a north-west and south-east direction parallel with the coast. From Wash- ington Territory (U.S.) on the south it is separated by Juan de Fuca Strait, which leads into the Gulf of Georgia and Johnstone's Strait on the east of the island, Queen Charlotte Sound entering this last from the north-west. These channels vary from 5 to 80 miles in width. The island extends from 48° 20' to 51° N. lat. and from 123° to 128° 30' W. long. Its length is about 250 miles and its breadth varies from 10 to 70. The area is estimated at from 12,000 to 16,000 square miles; but the island has

never been completely surveyed. The coast-line generally is precipitous. The west coast is much broken by bays and fringed with numerous reefs and islands, which render navigation somewhat dangerous. Barclay Sound on the south-west, Nootka Sound behind Nootka Island on the west, and Quatseenough Sound on the north-west send branches into the heart of the island. The east coast is much less broken, though the channel separating it from the mainland is studded with islands. Vancouver generally is mountainous, with peaks rising from 6000 to 9000 feet. There are some level areas on the south-east coast, while in the interior a few narrow well-watered valleys are suitable for agriculture. Short streams run down both coasts, and the island is dotted with lakes,—Buttle and Dickson in the centre, Cowichan in the south, and Niin- kish in the north. The mountains, much broken, run generally along the length of the island, the highest peaks (estimated at 9000 feet) being south-east of Nootka Sound, while farther to the north are Victoria Peak (7484 feet) and Mount Alston (6500 feet). To the south of Buttle Lake, Mount Albert Edward rises to 6968 feet. The mountains in the south of the island are generally lower.

The island is essentially a mountain range composed of nietamorphic and trappean rocks, fringed by a belt of Carboniferous limestones and other

sedimentary deposits. Among the metamorphic and erupted rocks are gneiss and killas or clayslate, permeated by quartz veins, quartz and hornblende rocks, compact bituminous slate, highly crys- talline felspathic traps, and semi-crystalline concretionary limestone. Among the sedimentary rocks are sandstones and stratified limestones, fine and coarse grits, conglom- erates, and fossiliferous limestones, shales, &c., associated with seams of coal. The country is strewn with erratic boulders and other marks of Glacial action. So far as is known at present the chief mineral resource is coal, which is worked in large quantities at Nanaimo on the east coast, and in quality is reputed the best on the whole Pacific coast. While limited areas in the south-east of the island and in the inland valleys are well adapted to agriculture (about 300,000 acres in all), and while farming is carried on to some extent, the country is too mountainous ever to develop agriculture on any large scale. The mountains are, however, covered with forests, mainly the Douglas pine, yielding splendid supplies of timber. These forests, with its coal and its fisheries, may be regarded as the chief resources of the island. The climate of Vancouver, especially in the south, is wonderfully mild for the latitude, as mild as that of Great Britain, with drier summers. The mean temperature of December at Victoria, in the south of the island, is about 38° Fahr., while that of July is 53°. A rainfall of 35°87 inches in the year has been recorded at Esquimault. In the northern parts and in the west the climate gets much more severe, and there the rainfall is greater than on the south and east coasts. Cereals of all kinds, all fruits of the temperate zone, pulse, and vegetables flourish on the patches suited to agricul- ture, while cattle and sheep can be easily reared in small numbers. The population of the island in 1881 was 9991, of whom 5925 lived in the city of Victoria. In 1887 the population was estimated at 25,000 (19,000 whites and Chinese, and 6000 Indians).

The capital of the island is Victoria (qg.v.). Three and a half miles to the west of Victoria is the town of Esquimault at the head of Parry Bay. There has been a British Admiralty station here for many years, the harbour having an average depth of from 6 to 8 fathoms. There are Government offices, two churches, a public school, and various other buildings. The Canadian Government has constructed a dry dock, 450 feet long, 26 feet deep, and 65 feet wide at the entrance. The completion of the Canadian

Pacific Rail- way renders Esquimault of increasing importance. Seventy-three miles north of Victoria and counected with it by railway is the town

of Nanaimo, the centre of the coal mining industry ; the average output of coal in the five years ending 1887 was 250,000 tons per annum. 'The mines employ about 1100 men. There are a good harbour and wharves. The population in 1887 was estimated at 4000. There are smaller communities in the island, mainly in the south corner. Sixty miles north-west of Nanaimo is Comox, the chief centre of the lumber industry. On the mainland, opposite Nanaimo, on a peninsula to the south of Burrard's Inlet, a city named Vancouver has recently been formed (incorporated 1886) at the terminus of the Canadian Pacific Railway.

History.—Vancouver Island was discovered by Juan de Fuca in 1592. In 1778 Captain Cook roughly surveyed the coast, this work being extended by Captain Vancouver, who surveyed the Strait of Juan de Fuca and the Gulf of Georgia. The first settlement on the island was made by the Hudson's Bay Company on the site of Victoria in 1843. Six years later Vancouver Island was constituted a colony. Its union with British Columbia was effected in 1866.

VANDALS. The Vandals, one of the leading Teutonic nations that overthrew the Roman empire, were of the Low German stock and closely allied to the Goths. We first hear of them in the time of Pliny and Tacitus as occupy- ing a district nearly corresponding to Brandenburg and Pomerania. From thence, in the 2d century, they pressed southwards to the confines of Bohemia, where they gave their name to the mountains now called the Riesengebirge. After a century of hostile and desultory operations against the Roman empire, having been signally defeated by Aurelian (271), they made peace with Rome, one of the conditions being that they should supply 2000 /aderate to the imperial army. Sixty years later they sustained a great defeat from the Goths under their king Geberich, after which they humbly sought and obtained permission from Constantine to settle as Roman subjects within the province of Pannonia. Here they remained seventy

years, and during this period they probably made some advances in civilization and became Christians of the Arian type. In 406, when the empire under Honorius was falling into ruin, they crossed the Rhine and entered Gaul. Stilicho, the chief adviser of Honorius, who was a man of Vandal extraction, was accused by his enemies of having invited them into the empire, but this is probably a groundless calumny. Franks, in which they were defeated with the loss of 2000 men, and their king Godigisclus was slain. In 409 his son Gunderic led them across the Pyrenees. They appear to have settled in Spain in two detachments. One, the Asdingian Vandals, occupied Galicia, the other, the Sil- ingian, Andalusia. 'Twenty years of bloody and purpose- less warfare with the armies of the empire and with their fellow-barbarians, the Goths and the Suevi, followed. The Silingian Vandals were well-nigh exterminated, but their Asdingian brethren (with whom were now associated the remains of a Turanian people, the Alans, who had been utterly defeated by the Goths) marched across Spain and took possession of Andalusia.

In 428 or 429 the whole nation set sail for Africa, upon an invitation received by their king from Bonifacius, count of Africa, who had fallen into disgrace with the court of Ravenna. Gunderic was now dead and supreme power was in the hands of his bastard brother, who is generally known in history as Genseric, though the more correct form of his name is Gaiseric. This man, short of stature and with limping gait, but with a great natural capacity for war and dominion, reckless of human life and unrestrained by conscience or pity, was for fifty years the hero of the Vandal race and the terror of Constantinople and Rome. In the month of May 428 (?) he assembled all his people on the shore of Andalusia, and numbering the males among them from the graybeard down to the newborn infant found them to amount to 80,000 souls. The passage was effected in the ships of Bonifacius, who, however, soon re- turning to his old loyalty, besought his new allies to depart from Africa. They, of course, refused, and Bonifacius

In Gaul they fought a great battle with the.

turned against them, too late, however, to repair the mis- chief which he had caused. Notwithstanding his opposi- tion the progress of the Vandals was rapid, and by May 430 only three cities of Roman Africa—Carthage, Hippo,

and Cirta—remained untaken. The long siege of Hippo (May 430 to July 431), memorable for the last illness and death of St Augustine, which occurred during its progress, ended unsuccessfully for the Vandals. At length (30th January 435) peace was made between the emperor Valentinian III. and Genseric. The emperor was to retain Carth- age and the small but rich proconsular province in which it was situated, while Hippo and the other six provinces of Africa were abandoned to the Vandal. Genseric ob-

*served this treaty no longer than suited his purpose. On_*

the 19th of October 439, without any declaration of war, he suddenly attacked Carthage and took it. The Vandal occupation of this great city, the third among the cities of the Roman empire, lasted for ninety-four years. Gen- seric seems to have counted the years of his sovereignty from the date of its capture. Though most of the remain- ing years of Genseric's life were passed in war, plunder rather than territorial conquest seems to have been the object of his expeditions. He made, in fact, of Carthage a pirate's stronghold, from whence he issued forth, like the Barbary pirates of a later day, to attack, as he himself said, "the dwellings of the men with whom God is angry," leaving the question who those men might be to the decision of the elements. Almost alone among the Teutonic invaders of the empire he set himself to form a powerful fleet, and was probably for thirty years the leading mari- time power in the Mediterranean. Genseric's celebrated expedition against Rome (455), undertaken in response to the call of Eudoxia, widow of Valentinian, was only the greatest of his marauding exploits. He took the city without difficulty, and for fourteen days, in a calm and business-like manner, emptied it of all its movable wealth. The sacred vessels of the Jewish temple, brought to Rome by Titus, are said to have been among the spoils carried to Carthage by the conqueror. Eudoxia and her two daughters were also carried into captivity. One of the princesses, Eudocia, was married to Huneric, eldest son of Genseric ; her mother and sister, after long and tedious negotiations, were sent to Constantinople.

There does not seem to be in the story of the capture of Rome by the Vandals any justification for the charge of wilful and objectless destruction of public buildings which is implied in the word "vandalism." It is probable that this

charge grew out of the fierce persecution which was carried on by Genseric and his son against the Catholic Christians, and which is the darkest stain on their charac- ters. This persecution is described with great vividness, and no doubt with some exaggeration, by the nearly con- temporary Victor Vitensis. Churches were burned; bishops and priests were forced by cruel and revolting tortures to reveal the hiding-places of the sacred vessels; the rich provincials who were employed about the court, and who still adhered to the Catholic faith, were racked and beaten, and put to death. The bishops were almost universally banished, and the congregations were forbidden to elect their successors, so that the greater part of the churches of Africa remained '"' widowed" for a whole generation. In 475, at the very close of Genseric's life, by a treaty concluded with the Eastern emperor, the bishops were permitted to return. There was then a short lull in the persecution ; but on the death of Genseric (477) and the accession of Huneric (a bitter Arian, made more rancorous by the orthodoxy of his wife Eudocia) it broke out again with greater violence than ever, the ferocity of Huneric being more thoroughly stupid and brutal than the calcu- lating cruelty of his father.

VAN—VAWN

On the death of Huneric (484) he was succeeded by his cousin Gunthamund, Genseric having established seniority among his own descendants as the law of succession to his throne. Gunthamund (484-496) and his brother Thrasa- mund (496-523), though Arians, abated some of the rigour of the persecution, and maintained the external credit of the monarchy. Internally, however, it was rapidly declining, the once chaste and hardy Vandals being demoralized by the fervid climate of Africa and the sinful delights of their new capital, and falling ever lower into sloth, effeminacy, and vice. On the death of Thrasamund, Hilderic (523- 531), the son of Huneric and Eudocia, at length succeeded to the throne. He adhered to the creed of his mother rather than to-that of his father; and, in spite of a solemn oath sworn to his predecessor that he would not restore the Catholic churches to their owners, he at once pro- ceeded to do so and to recall the bishops. Hilderic, elderly, Catholic, and timid, was very unpopular with his subjects, and after a reign of eight years he was thrust into prison by his warlike cousin Gelimer (531-534).

The wrongs of Hilderic, a Catholic, and with the blood of Theodosius in his veins, afforded to Justinian a long- coveted pretext for overthrowing the Vandal dominion, the latent weakness of which was probably known to the statesmen of Constantinople. A great expedition under the command of Belisarius (in whose train was the his- torian Procopius) sailed from the Bosphorus in June 533, and after touching at Catana in Sicily finally reached Africa in the beginning of September. Gelimer, who was strangely ignorant of the plans of Justinian, had sent his brother Tzazo with some of his best troops to quell a re- bellion in Sardinia (that island as well as the Balearic Isles forming part of the Vandal dominions), and the land- ing of Belisarius was entirely unopposed. He marched rapidly towards Carthage and on the 13th of September was confronted by Gelimer at Ad Decimum, 10 miles from Carthage. The battle did not reflect any great credit either on Byzantine or Vandal generalship. It was in fact a series of blunders on both sides, but Belisarius made the fewest and victory remained with him. On the 14th of September 533 the imperial general entered Carthage and ate the feast prepared in Gelimer's palace for its lord. Belisarius, however, was too late to save the life of Hilderic, who had been slain by his rival's orders as soon as the news came of the landing of the imperial army. Still Gelimer with many of the Vandal warriors was at liberty. On the return of Tzazo from Sardinia a force was collected considerably larger than the imperial army, and Gelimer met Belisarius in battle at a place about twenty miles from Carthage, called Tricamarum (December 533). This battle was far more stubbornly contested than that of Ad Deci- mum, but it ended in the utter rout of the Vandals and the flight of Gelimer. He took refuge in a mountain fortress called Pappua on the Numidian frontier, and there, after enduring great hardships in the squalid dwellings of the Moors, surrendered to his pursuers in March 534. The well-known stories of his laughter when he was in- troduced to Belisarius, and his chant, '"'Vanitas vanitatum," when he walked before the triumphal car of his conqueror through the streets of Constantinople, probably point to an intellect disordered by his reverses and hardships. The Vandals who were carried captive to Constantinople were enlisted in five squadrons of cavalry and sent to serve against the Parthians under the title " Justiniani Vandali." Four hundred escaped to Africa and took part in a mutiny of the imperial troops which was with difficulty quelled by Belisarius (536). After this the Vandals disappear from history. The overthrow of their kingdom

undoubtedly rendered easier the spread of Saracen conquest along the northern shore of Africa in the following century. In this

as in many other fields Justinian sowed that Mohammed might reap.

Authorities.—Procopius, De Bello Vandatlico, a first-rate authority for contemporary events, must be used with caution for those which happened two or three generations before him. Consult especially i. 5 for the land settlement of Genseric, and also Victor Vitensis and Possidius (Vita Augustint) for the persecution of the Catholics. The chroniclers Idatius, Prosper, Victor Tunnunensis supply some facts. The Chronicon of Isidore adds little to our knowledge and is absurdly wrong in its chronology. Of modern treatises that of Papencordt (Gesch. d. Vandal. Herrschaft in Afrika) is the most complete. Consult also Dahn (Kénige der Germanen, part I.), Gibbon (chaps. xxxiii. aud xli.), and Hodgkin (Ltaly and her In- vaders, vols. ii. and iii.). (i)

VAN DER HELST. See Hetsr.

VANDEVELDE, Aprtan (1639-1672), animal and land- scape painter, a brother of William Vandevelde (see below), the marine painter, was born at Amsterdam in 1639. He was trained in the studio of Jan Wynants, the landscape painter, where he made the acquaintance of Philip Wouwer- man, who is believed to have aided him in his studies of animals, and to have exercised a powerful and beneficial influence upon his art. Having made exceptionally rapid progress, he was soon employed by his master to introduce figures into his landscape compositions, and he rendered a similar service to Hobbema, Ruysdael, Verboom, and other contemporary artists. His favourite subjects are scenes of open pasture land, with sheep, cattle, and goats, which he executed with adntirable dexterity, with much precision of touch and truth of draughtsmanship, and with clear silvery colouring. He painted a few small but ex- cellent winter scenes with skaters, and several religious subjects, such as the Descent from the Cross, for the Roman Catholic church in Amsterdam. In addition to his paintings, of which nearly two hundred have been cata- logued, he executed about twenty etchings, several of which appear from their dates to have been done

in his fourteenth year. They are simple but pleasing in tonality, and are distinguished by great directness of method, and by delicacy and certainty of touch. Adrian Vandevelde died at Amsterdam in January 1672.

VANDEVELDE, Witt1am (1633-1707), the younger, marine painter, a son of William Vandevelde, the elder, also a painter of sea-pieces, was born at Amsterdam im 1633. He was instructed by his father, and afterwards by Simon de Vlieger, a marine painter of repute at the time, and had achieved great celebrity by his art before he came to London. In 1674 he was engaged by Charles IL., at a salary of £100, to aid his father in "taking and making draughts of sea-fights," his part .of the work being to reproduce in colour the drawings of the elder Vandevelde. He was also patronized by the duke of York and by various members of the nobility. He died in London on 6th April 1707.

It seems probable that most of Vandevelde's finest works were executed before his residence in England, for they represent views off the coast of Holland, with Dutch shipping. His best produc- tions are delicate, spirited, and finished in handling, and correct in the drawing of the vessels and their rigging. The numerous figures are tellingly introduced, and the artist is successful in his renderings of sea, whether in calm or storm. His later productions are less carefully finished, and less pure and transparent in colour. Vandevelde was a most prolific artist : in addition to his paintings, of which Smith catalogues about three hundred and thirty, he executed an immense number of drawings, sketches, and studies, which are prized by collectors.

VAN DIEMEN'S LAND. See Tasmania.

VAN DYCK, Sir AntHony (1599-1641), painter, was born in Antwerp on 22d March 1599. Though the name of Van Dyck is frequently met with in the list of Antwerp painters, Anthony's pedigree cannot be traced beyond his grandparents, who were silk mercers of some standing. He was the seventh of twelve children of Francis Van Dyck, an Antwerp tradesman in good circumstances, and

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not, as has been asserted, a painter on glass at Bois-le-Duc. His mother, Maria Cupers, who died when he was scarcely eight years of age, seems to have attained a certain degree of excellence in art needlework. Of the boy's early educa- tion nothing is known. He was little over ten when he was apprenticed to Henry Van Balen, the painter of many delicate little pictures, also an occasional collaborator of Rubens, and the master of Snyders. From a document discovered some twenty years ago in the state paper office at Brussels, relating to a lawsuit between a picture dealer and an Antwerp churchman, which arose out of the sale, in 1660, of a series of Apostles' heads ascribed to Van Dyck, it appears that, as far back as 1615, Van Dyck had worked independently, with pupils of his own, and that his pictures were greatly valued by artists and amateurs.' Before he was nineteen (February 1618) Van Dyck became a full member of the Antwerp guild of painters; and some idea of his ability at the time may be gained from the excellent portraits of an old lady and gentleman, ascribed till quite recently to Rubens, in the Dresden gallery (Nos. 854 and 855). Dated 1618, they were originally entered as works of Van Dyck, and, as Prof. Woermann observes, are undoubtedly the same as those spoken of by Mols in his MS. annotations on Walpole's Anecdotes, now in the library at Brussels. But the same admiration cannot be accorded to the earliest religious composition known to have been painted by him—Christ Falling under the Cross, in St Paul's at Antwerp. This picture, of some ten life-size figures, still preserved in the place for which it was originally destined, distinctly proves that from the outset of his career Van Dyck's power of conception was vastly inferior to his refined taste as a portrait painter. At first sight it would seem also that with him, as with most other Flemish painters of the period, every concep- tion, whether sacred or profane, needed to be cast in the mould of Rubens. It would be too much, however, to assert that Van Dyck at this timie stood under the guid- ance of that master; their association indeed does not seem to have begun until 1619, and Bellori (1672), who got his information from Sir Kenelm Digby, Van Dyck's bosom friend, tells us that he was first employed in making drawings (probably also chiaroscuros) for the use of the great master's engravers, and that among works of the kind one of the first was the Battle of the Amazons (1619).

In 1620 we know that Van Dyck was working with Rubens, for on 20th March, in making arrangements with the Antwerp Jesuits for the decoration of their church, the great master is allowed to avail himself of his pupil's assistance, and obtains for him the promise of a picture. This proof of Van Dyck's personal reputation is fully con- firmed (17th July) by a correspondent of the earl of Arundel, who speaks of Van Dyck as a young man of one and twenty whose works are scarcely less esteemed than those of his master, and adds that, his relations being people of considerable wealth, he could hardly be expected to leave his home. Van Dyck was, however, thus persuaded, for on 28th November Sir Toby Mathew mentions the artist's departure to Sir Dudley Carleton, adding that he is in receipt of an annual pension of £100 from the king. There is evidence of Van Dyck's presence in London till the end of February 1621. He is first mentioned in the order-books of the Exchequer on the 17th of that month as receiving a reward of £100 "for special service by him performed for His Majesty," anid on the 28th, " Antonio van Dyck, gent., His Majesties servant, is allowed to travaile 8 months, he havinge obtayneid his Maties leave in that behalf, as was signified by the E. of Arundell." What Van Dyck did in London is not known. Among his

oes irate Raa cease eet es Tae ee OR 1 Prof. Woermann has identified several of the Apostles' heads here spoken of with some paintings in the gallery at Dresden.

numerous paintings still preserved in English houses one only is admitted as belonging to the period of this first visit, a full-length portrait of James I. in the royal collec- tion. That he was at the time a portrait painter of the rarest merit may easily be seen from his own likeness of himself when still quite young and beardless, in the National Gallery (London), in the Pinakothek at Munich, and in the private collections of the duke of Grafton and Sir Richard Wallace. In this last admirable specimen the young painter has represented himself in the character of Paris. Early paintings by Van Dyck are certainly not scarce in British galleries; and at Dulwich there is his admirable Samson and Delilah, wrongly ascribed to Rubens.

Van Dyck is supposed to have profited by his leave of absence to visit Paris and The Hague; but it is much niore probable that the eight months were

spent in Ant- werp, where Rubens was greatly in need of his assistance for the church of the Jesuits. After this Van Dyck most probably returned to London and remained there till the end of 1622, when his father died. The precise date of his departure for Italy—perhaps at the beginning and cer- tainly in the course of 1623—has not been ascertained. But he is known to have left with Rubens a considerable number of paintings, most of which have been identified in Madrid, Berlin, Dresden, &c., and show that study, as well as advice, had long since made the painter acquainted, through Rubens, with those principles of picturesque ex- pression which he was now about to see exemplified so splendidly in the works of the Venetian and Genoese schools. His previous acquaintance with many excellent examples of Titian, Tintoretto, and others in Rubens's own collection can alone account for the remarkably glowing tints of Van Dyck's earliest paintings. In fact, such works as the Martyrdom of St Peter (Brussels), the Crown- ing with Thorns (Berlin), the Betrayal of Christ (Madrid and Lord Methuen), St Martin Dividing his Cloak (Windsor Castle),—a magnificent production, generally ascribed to Rubens, but easily identified through Van Dyck's admir- able sketch at Dorchester House,—aincontestably prove that, in point of colouring, Venice at this moment stood higher in his predilection than Antwerp.

It is unnecessary to dwell on a number of tales con- nected with Van Dyck's early life, all of which have on closer examination proved to be apocryphal; but one story has been too frequently told to be altogether ignored. At the very outset of his Italian journey the inflammable youth was captivated by the beauty of a country girl, and for tle love of her painted the altar-piece still to be seen in the church at Saventhem near Brussels, in which he himself is supposed to be represented on a grey horse, given by Rubens to his pupil. It is now known, however, that the picture was commissioned by a gentleman living at Saventhem (to the charms of whose daughter Van Dyck in reality seems not to have been altogether insensible), and a closer study makes it almost certain that it was executed after, not before, his Italian journey. On a re- duced scale, and with the omission of two or three figures, the St Martin at Saventhem is a reproduction of the picture at Windsor Castle.

No master from beyond the Alps ever took up a higher position than Van Dyck among the most celebrated repre- sentatives of Italian art. Study, as a matter of course, had been one of his principal objects. No doubt can be entertained as to the great influence exerted by the works of Titian and Paul Veronese in the development of his genius ; still the individuality of the painter remains a striking feature of what may be termed his Italian works, especially portraits. Their peculiar character seems to originate even more in the stateliness of the personages

—S ©

Yan DYCK

he was fortunate enough to have as sitters than in any desire to follow individual predilection or prevailing fashion. As in later years Van Dyck gives us a striking picture of the higher classes in England, so at this stage he makes us acquainted with Italian beauty and style ; and at no other period is his talent more advantageously shown than in some of the glorious portraits he painted at Rome, at Florence, and above all at Genoa. At Rome he resided with Cardinal Guido Bentivoglio, who had been papal nuncio in Flanders from 1607 to 1617. For this patron were painted several works of very great import- ance, the most renowned being the prelate's own portrait, now in the Pitti Palace at Florence. Another work was a Crucifixion, representing Christ dying on the cross with uplifted eyes. Most probably the picture spoken of by Bellori ought to be identified with the admirable edition now in the gallery at Naples, catalogued as "Scuola di Van Dyck," unsurpassed by any of those at Antwerp, Paris, Vienna, Rome, or elsewhere. Besides these he painted religious subjects and portraits, several of which are reckoned among his finest examples, such as the portrait of Francis Duquesnoy, the famous sculptor, belonging to the king of the Belgians, and those of Sir Robert Shirley and his wife, in Persian attire, now at Petworth.

Bellori tells us of Van Dyck's prepossessing appearance, of his elegance and distinction, altogether so different from the habits of his compatriots in Rome, who formed a jovial '"oang," as they termed their association. Van Dyck seems to have kept out of their way, and incurred in consequence such annoyance as made his stay in Rome much shorter than it would otherwise

have been. In the company of Lady Arundel, who tried to persuade him to return to England, he travelled to Turin, and perhaps produced some of the paintings now in the royal gallery there, such as the spirited portrait of Thomas of Savoy on his splendid black charger. But he was eager to reach Genoa, where Rubens had worked with great success some twenty years before, and where his Antwerp friends, Luke and Cornelis de Wael, for many years resident in Italy, now were. Van Dyck remained their guest for several months, and their portraits, now in the Pinacoteca Capitolina at Rome (en- graved by W. Hollar from the monochrome at Cassel), may be supposed to have been one of his first Genoese pro- ductions. Though several of the palaces of the "superb " city no longer retain their treasures, and among the speci- mens of Van Dyck's genius still left too many have been greatly injured by cleaning and retouching, Genoa can still boast of a good number of his most attractive productions, portraits of the beautiful ladies and haughty cavaliers of the noble houses of Doria, Brignole Sale, Pallavicini, Balbi, Cattaneo, Spinola, Lommelini, and Grimaldi. It would scarcely be possible to speak too highly of such works as the portrait of the lady in white satin and the Durazzo children at the Durazzo Palace, the Balbi children at Panshanger, the Marchesa Balbi at Dorchester House, the equally beautiful portraits of the Lommelini and of the knight in black armour, buff jacket, and boots in the hational gallery at Edinburgh, or the Marchesa Brignole Sala at Warwick Castle. Van Dyck's "Genoese manner" 1S a current expression, and indeed his Genoese ~~*portraits are remarkable for their richness of tonality and what might be called royal splendour, perhaps never before at*~~ *tained in works of the kind. This we may suppose to have had its origin, not only in his recent study of Titian (Van Dyck having, it is said, first spent some time at Venice), but also in decorative necessities, —the size of the Palatial galleries and the rich hues of the Genoese velvets, on which these portraits were to find their place, obliging the painter to find a most uncommon strength of contrast. It must also be acknowledged that the beauty and distinc-*

tion of Van Dyck's models are greatly enhanced by a splendour of costume entirely different from the dulness then prevalent almost everywhere else. In Italy, more- over, he found the reality of those gorgeous backgrounds, —

flowing draperies, beautiful gardens, ornamental pillars, marble terraces and balustrades,—which elsewhere must be regarded as fictions merely. Here, finally, he was for the first time called upon to paint some of his grandest equestrian portraits, and the often-recurring grey steed with flowing mane (an admirable study of which belongs to Lord Brownlow) was first employed for the portrait of Antonio Giulio Brignole (still at Genoa) and for another picture which we may suppose to represent the same personage at Stafford House. As with Rubens, Titian seems to have been paramount in Van Dyck's regard. Copies in great number we know he possessed of the master's best works, and several little sketches in the British Museum bear proof of his devout study of the great Venetian. Some of Van Dyck's earlier paintings, religious and mythological,—the Tribute Money (Brignole Palace), Holy Family (Turin), Virgin and Saints (Louvre), Virgin (Grosvenor House), Martyrdom of St Lawrence (8S. Maria dell' Orto, Venice), Bacchanal (Lord Belper), engraved at Genoa as early as 1628, St Sebastian (Edinburgh),—are certainly Titianesque in the extreme. Still the master's individuality is not obliterated, and the gallery at Parma has a Virgin with the Infant Asleep which may be termed a marvel of realistic simplicity.

Van Dyck is said to have sailed from Genoa to Palermo and there to have painted several persons of rank, includ- ing the viceroy, Emmanuel Philibert of Savoy. While in Sicily he became acquainted with the painter Sofonisba Anguisciola (or Angussola), who was then over ninety years of age and blind ; and he was wont to say he had received more valuable information from a blind woman than from many a seeing man. No important works of Van Dyck are now to be found in Sicily. _Bellori tells us that a plague broke out and compelled him to leave abruptly, taking with him an unfinished picture of St Rosalia, destined for a confraternity of that name, and which was completed in Genoa. The composition was repeated in Antwerp for the Bachelors' Brotherhood, a picture now in Vienna. Van Dyck most probably re- mained in Genoa till 1627, and here in all likelihood he met and painted the sculptor George Petel, whose portrait is now in Munich, and who was frequently employed by Rubens ; the De Jodes, father and son, the celebrated en- gravers, who are represented together in a masterly por- trait in the Capitol at Rome, the companion picture to the brothers De Wael; and Nicholas Laniere, musician-in-chief to

Charles I., a painting spoken of in Van der Dort's cata- logue as "done beyond the seas." lLaniere was in Italy precisely at this time and it was through his portrait (now at Windsor Castle), Walpole assures us, that Van Dyck attracted the notice of Charles I.

Embarking for Marseilles) Van Dyck is said to have stopped at Aix with Peiresc, the famous scholar and friend of Rubens, and thence to have gone to Paris, where most probably he painted the beautiful portrait of Langlois the print-seller (belonging to Mr W. Garnett), a work still influ- enced by Italian reminiscences, and had the opportunity of meeting Callot, Simon Vouet, and Dupuy, the king's librarian,—all of whose portraits were engraved from his drawings in Antwerp. According to some authors, he also worked in Holland before returning to his native town ; but the supposition rests entirely on two portraits in the museum at The Hague, dated 1627 and 1628, and repre- senting a lady and gentleman, with the Sheffield arms. The lady is easily identified by a well-known print by Clouwet as Anne Wake. The Wake family resided in

Antwerp, and both portraits may have been painted there. There is no recorded proof of Van Dyck's return to Ant- werp before 6th March 1628. One of his sisters had died in a convent the year before, and he now made a will in favour of Susan and Isabella, two other sisters, also nuns. That Van Dyck was in Antwerp on 18th May is proved by a letter from Lord Carlisle to Buckingham (Sainsbury, CIII.), but it is stated in Bullart's Académie, published in 1682, that he returned again to London in 1629, without, however, attracting the king's attention. It is very likely that Lady Arundel's endeavours to get him back to Eng- land were now successful, and that the beautiful portrait of Lord Thomas, at Stafford House, belongs to this period.

Great as may have been the strength of Italian re- miniscence, from the moment Van Dyck again trod Flemish soil the influence of Rubens became predominant, and we can scarcely doubt that a competition speedily arose be- tween master and pupil. At this period churches and convents: were numerous and richly endowed; and the number of pictures, stained glass windows, and elaborate carvings in Belgian churches before the French conquest was enormous. Hardly fifty years had elapsed since these buildings had been stripped of their artistic treasures, and the devout were now eager once more to adorn them with productions of the greatest painters. Hence Van Dyck's share could be very copious without in any degree interfering with the vast undertakings assigned to Rubens. The latter

was also absent for many months in 1629 and 1630, so that Van Dyck was for a time the first master in the Netherlands. Among the earliest works after his return to Antwerp we find the Crucifixion, given to the Doniinican nuns, in accordance with the wish expressed by the painter's dying father, and now in the Antwerp museum. 'The figures are life-size, and at the foot of the cross, besides a weeping angel, are St Catherine of Siena and St Dominic. Neither in type nor in general effect does it suggest the master's immediately preceding works. As a new feature we observe a kind of elegance, not entirely free from mannerism, which is often conspicuous with Van Dyck even when the technical excellence com- mands our warmest admiration. Inspiration, as Waagen observes, was far more limited with Van Dyck than with Rubens. His truly delicate nature led him to restrain his conceptions within the bounds of an academic evenness, generally more pleasing to the uninitiated than the strength of expression which sometimes imparts a sort of violence to the works of Rubens. To Van Dyck's second—more justly speaking third—manner belong some of his best religious works. The Crucifixion in the cathedral at Mechlin is termed by Sir Joshua Reynolds one of the finest pictures in the world. Other Crucifixions are in St Michael's at Ghent (sketches in Lord Brownlow's collection and the Brussels museum) and in the church at Termonde. Still finer are the two works painted for the Antwerp Jesuits and now at Vienna,—the Blessed Herman Joseph Kneeling before the Virgin and St Rosalia Crowned by the Infant Saviour. To this period likewise belong the cele- brated Elevation of the Cross at Courtrai and the St Augustine in Ecstasy, in the church of the Jesuits at Antwerp ; the general effect of this last, it must be ac- knowledged with Reynolds, is inferior to the beautiful engraving by De Jode, and also to the earl of North- brook's magnificent sketch. At Dulwich we find the first idea of the composition, with many interesting differences. It may be a matter of individual preference to pronounce Van Dyck's Flemish portraits superior to those of an earlier period; but nobody can fail to admit that, tech- nically speaking, they indicate a further step towards per- fection. The darkness of the Genoese portraits has vanished ; broad daylight now freely illuminates the

model, and such works as the portraits of Cornelius Van der Geest (National Gallery, London) and Ambrogio Spinola (Rev. W. H. Wayne) are perhaps as close to material ex- cellence as any painting could be. The full-

length like- nesses of Philip Le Roy (1630) and his wife (1631) (at Manchester House) and of Mary Louisa of Tassis (Prince Liechtenstein, Vienna) are not only the finest examples of the master's talent, but deserve to rank among the most beautiful portraits ever painted. The Snyders at Castle Howard is regarded by Waagen as not inferior to the most celebrated Raphaels, Titians, or Holbeins; and of almost equal excellence are the Wife of Colin de Nole in the Munich gallery, the Lady and her Daughter at the Louvre, and the Lady in Black at Cassel.

Rapidly rising to honour and wealth, Van Dyck shared with Rubens the official title of court painter, and his numerous portraits of the Infanta in her monastic garb (Paris, Vienna, Turin, Parma, &c.) bear testimony to the great favour in which he stood with her. When Mary de' Medici, after her flight from France, took up her re- sidence in Brussels (1631), she honoured Van Dyck, as well as Rubens, with repeated visits, and several times called upon him to paint her likeness, as well as those of Gaston of Orleans and his wife Margaret of Lorraine, and several of the personages of their court. From Gerbier's letters we learn that Van Dyck at this time was con- templating another journey to England, and was very anxious to be commissioned by the infanta and the queen of France to take over their portraits as presents for the king and royal family. He soon travelled to The Hague to paint the prince and princess of Orange and their son. Quite at the beginning of 1632 Constantine Huygens, who was then living at The Hague, inscribes in his diary, "'Pingor a Van Dyckio." When, towards the end of March, Van Dyck sailed for England, he took all these portraits with him, as we learn from an account of the 8th of August 1632 (Carpenter's Pictorial Notices). Dutch authors speak of a visit paid by Van Dyck to Frans Hals at Haarlem, and of a portrait of the latter through which the Antwerp master was at once recognized by his Dutcli colleague. An engraving of a portrait of Hals after Van Dyck seems to confirm the story.

In undertaking this new journey to London, Van Dyck was assured of success, for Gerbier's letters show that the king had personally desired his presence. As early as March 1629 Endymion Porter, one of the gentlemen of the king's bedchamber, had been commissioned to order a picture from Van Dyck, Rinaldo and Armida, The composition is well known through De Balliu's first-rate engraving, and the canvas, now belonging to the duke of

Newcastle, may be looked upon as one of the master's finest creations. Rubens was in London at the time the picture arrived, and to him we may in a great measure attribute the realization of Van Dyck's plans and the ex- ceptional favours bestowed upon him almost from the day of his arrival in London. Besides the title of painter in ordinary, and the grant of an annual pension of £200, he received the honour of knighthood after a residence of less than three months at court (5th July 1632). Van Dyck rapidly achieved popularity among the higher classes, and, as Walpole says, his works are so frequent in England that to most Englishmen it is difficult to avoid thinking of him as their countryman.

His refined nature is strikingly illustrated in his ad- mirable interpretation of English beauty and style. And, if Van Dyck be compared to Mytens and Cornelius Janssen, the most distinguished painters employed by the English court immediately before him, few artists, whether in Eng- land or elsewhere, have more richly endowed their models with distinction of feature and elegance in bearing. To

him may be applied what Opie says of Titian, "that he combines resemblance with dignity, costume with taste, and art with simplicity." We are particularly struck with the thorough and immediate identification of his talent with local tastes and exigencies. Charles I. and Henrietta Maria, although pictured by several other painters, are known to posterity exclusively through Van Dyck, not from a greater closeness of resemblance to the original, but from a particular power of expression and bearing, which, once seen, it is impossible to forget. Lodged at the expense of the crown, with a summer residence at Eltham Palace, Van Dyck was frequently honoured with the visits of the king at his studio at Blackfriars. Portraits now followed each other with a rapidity scarcely credible to those unacquainted with the artist's method. In fact, his mode of living and his love of pleasure sufficiently explain his great need of money. During the first year of his _ presence in England he painted the king and queen a dozen times. The first of these noble portraits is the admirable full length of Charles I, with the queen and their two eldest children, at Windsor Castle. The style he adopted in England is generally termed his third manner ; we

might better say his fourth, as he already had a very particular style before he set out on his Italian journey. De Piles gives us some account of Van Dyck's methods at this period of his career. He began with a small sketch on grey paper with black and white chalks, or a mono- chrome in oils. This study was passed on to assistants in order to be copied on the required scale. When the clothes were sufficiently advanced by the pupils from those sent by the model, as well as the background and acces- sories, the master was enabled in a few sittings of an hour each to complete the work. Van Dyck excelled in paint- ing the hands ; he is said to have kept special models for this part of his work. It need hardly be said that a system of this kind, although employed by Rubens for his larger creations, was exceedingly ill adapted to portrait painting. In Van Dyck's later productions we too often detect marks of haste, as if the pencil were becoming a mere implement of trade.

Nearly the whole of 1634 and 1635 were spent by Van Dyck in the Netherlands.1 The archduchess died on 1st December 1633, and Van Dyck naturally wished to get his official title renewed by her successor, Ferdinand of Austria, brother of Philip IV. That Van Dyck's residence in Antwerp was only to be temporary is shown by the power given to his sister Susan for the administration of his affairs in Belgium (14th April 1634). On the arrival of the new governor Van Dyck was immediately called upon to paint his likeness, a picture now in the Madrid gallery, where the same personage is also represented by Rubens and Velazquez. Several other portraits of Fer- dinand, either in his cardinal's robes or in military dress, by Van Dyck, occur elsewhere. One on horseback was exhibited at the Grosvenor Gallery, London, in 1887 as the duke of Alva (the property of Mr S. Kynaston Main- waring). Van Dyck was greatly in demand at this time, and his prices were correspondingly high, as the Antwerp municipality found when they asked for a portrait of the late infanta to decorate one of the triumphal arches for the reception of the new governor. The most important of Van Dyck's works, at any rate as a portrait painter, belong to this period. The picture representing in life size the members of the Brussels corporation, which was destroyed by fire during the siege of 1695, is spoken of with intense admiration by several writers. Bullart, for instance, is very enthusiastic about its fine colour and life- like qualities. Among the religious paintings of undis-

‘ 1 Tt is not generally known that his brother, an Antwerp priest, had been called over by the queen to act as her chaplain.

puted excellence belonging to the same period are the Adoration of the Shepherds in the church at Termonde, and the Deposition, where the body of Christ rests upon the, lap of the Virgin, in the Antwerp museum. Among the portraits are the admirable full length of Scaglia, the king’s frequent agent in the Netherlands (at Dorchester House ; a replica in the museum at Antwerp), the eques- trian portrait of Albert of Arenberg (Arenberg Palace at Brussels), and a portrait of the same nobleman on foot, in the black velvet Spanish dress with golden chamberlain’s key (long said to be Rubens) at Althorpe, the full length of Helena Fourment, Rubens’s second wife (at St Peters- burg), the beautiful duchess of Havre, Mary Clara de Croy, signed and dated 1634 (Mr Ayscough Fawkes), and other members of the same family (at Munich), Thomas of Savoy (at Berlin), an admirable half length of a lady in black (in the Belvedere at Vienna), and above all the grandiose picture in which John of Nassau is represented at full length, with his wife and children (at Panshanger). Several portraits of Brussels and Antwerp magistrates must also be mentioned, the most important being John Van Mer- straeten, a Brussels lawyer (at Cassel).

After being chosen honorary president of the Antwerp guild of St Luke, Van Dyck returned to London before the end of 1635. In spite of the vast number of his later portraits, some of them deserve to be ranked among the most celebrated of his productions. The royal children in the gallery at Turin (1635), the portraits of Charles I. in the Louvre and in the National Gallery, London, the picture of the Pembroke family at Wilton House, Sir George and Sir Francis Villiers, and the earls of Bristol and Bedford, at Althorpe, as well as those of Francis Russell, fourth earl of Bedford, and Anne Carr, his consort, at Woburn Abbey (1636), all belong to the years immediately follow- ing the master’s return from the Netherlands.

He now married Lady Mary Ruthven, daughter of Sir Patrick Ruthven and grand-daughter of the earl of Gowrie. There are several portraits of her by her husband, the most important being in the Munich gallery, in which she is represented in white satin, playing on the violoncello. She is also said to

figure as the Virgin in a picture belonging to Lord Lyttelton. There is a capital engraving of her by Bolswert. In another picture, said to be Mary Ruthven (belonging to Mr J. C. Herford), an exceedingly handsome lady is represented as Herminia Putting on Clarinda's Armour. There can be no doubt as to the model having been Margaret Lemon, a celebrated beauty, whose portrait was engraved by W. Hollar and J. Morin and painted by Van Dyck at Hampton Court. "She was," says M. Law, in his excellent catalogue of this gallery, "the most beauti- ful and celebrated, though far from being the only mistress of Van Dyck. The great artist, in fact, loved beauty in every form, and found the seduction of female charms altogether irresistible. She lived with him at his house at Blackfriars." The precise date of Van Dyck's marriage has not been ascertained. It was probably towards the end of 1639. The union is said to have been promoted by the artist's friends in order to save him from the con- sequence of his pernicious way of living. Margaret Lemon resented the event most cruelly, and tried to maim Van Dyck's right hand.

Van Dyck found few occasions in England to paint any- thing but portraits. He seems to have been decidedly underrated by the king and queen as an imaginative painter. At the very time of his employment on the beautiful por- traits of Henrietta Maria, destined to serve as models for Bernini's bust, Gerbier was secretly negotiating with Jordaens, by order of Charles, for the decoration of the queen's apartments at Greenwich (1639). There exists at Belvoir Castle a sketch by Van Dyck representing a

procession of the knights of the Garter, a really grandiose composition, engraved by Cooper. We know from Bellori that Van Dyck had suggested through his friend Sir Kenelm Digby, for the banqueting room at Whitehall, a series of decorations illustrating the history of the order of the Garter, and that the king had been much pleased with the idea. The plan, however, failed through the ex- cessively high price asked by the painter, and perhaps also because the king had thought of having the work done in tapestry. Van Dyck's pension was five years in arrear, and, instead of £560, he received finally, besides his pen- sion, only £200.

When the news of Rubens's death reached London (June 1640) Van Dyck contemplated a return to his native country, and a letter from Ferdinand of Austria to Philip IV. speaks of his intended journey to Antwerp on St Luke's Day (18th October). Rubens had left unfinished a series of paintings commanded by the king of Spain, and from correspondence published by Professor Justi we learn that Van Dyck had been thought of to give them the finishing touch. But he absolutely refused to finish them, It was then agreed that he should paint an independent canvas destined to complete the series. Van Dyck was delighted with this order, and Ferdinand tells his brother that he returned to London in great haste "to make pre- parations for his change of residence ; possibly," adds the letter, "he may still change his mind, for he is stark mad." Whether Van Dyck found it possible to work during his short stay in the Netherlands is a matter of doubt. In the museum at The Hague are six medallion portraits of Constantine Huygens and his children, dated 1640. They have till lately been ascribed to Van Dyck, but are now said to be by Adrian Hannemann, a Dutchman, and one of his ablest assistants. In any case they are of small importance. Most authors suppose that Van Dyck's prin- cipal object in travelling to the Continent was to be en- trusted with the decoration of one of the galleries of the Louvre, There may be some truth in this, for Mariette speaks of a letter he saw, written by Claude Vignon, the French painter, in January 1641, asking Langlois for an introduction to Van Dyck, who was then in Paris. Unfor- tunately the great painter was thwarted in his aspirations. His health was beginning to fail. After his return to London he was frequently obliged to interrupt his work ; and a letter written (13th August) from Richmond by Lady Anne Roxburgh to Baron W. van Brederode at The Hague states that the portraits of the Princess Mary had been greatly delayed through Van Dyck's illness, and that the prince's (William II. of Orange) would be ready in eight days. "As Van Dyck intends leaving England in the course of ten or twelve days at latest," she adds, "he will take the paintings himself to the princess of Orange." These portraits, now in the museum at Amsterdam, are the last Van Dyck painted in England. They are considered to be inferior ; and the last edition of the catalogue terms them copies. But of works dated 1639 the portrait of Lady Pembroke, in the gallery at Darmstadt, is a really fine specimen ; and to the same year belongs a full-length por- trait of Arthur Goodwin at Chatsworth. The twin portrait of Thomas Carew and Thomas Killigrew, in the royal collec- tion, dated 1638, is certainly most delicate,

but very weak in tone and slight in handling. Van Dyck sailed in September, and probably spent some time with his Antwerp friends, In October he reached Paris, and succeeded in obtaining some important work, when, on 16th N ovember, he was compelled to resign his commissions on account of the state of his health. Scarcely three weeks later (9th December 1641) he died at his residence at Blackfriars. Van Dyck was buried in old St Paul's, where a Latin inscription was placed on his tomb by Charles I.

An elegy in Cowley's Miscellanies speaks, not only of the painter's talent, but of his amiable disposition. We may perhaps point to the coincidence that a Mrs Cowley is in Van Dyck's will (of 1st December) nanied guardian of his child, Justiniana Anna, born only eight days before her father's death. The painter had in the Nether- lands an illegitimate daughter, Maria Theresia, who was entrusted to his sister, and to whom he bequeathed £4000. The name of her mother is not known. Not long after her husband's death Lady Van Dyck became the second wife of Sir Richard Pryse of Gogerddan in Cardiganshire. She was dead in 1645. Justiniana Van Dyck, who was married when scarcely twelve years old to Sir John Stepney of Prendergast, was also something of an artist: she painted a Crucifixion, with four angels receiving Christ's blood in chalices. A similar subject had been painted by Van Dyck, as Bellori tells us, for the duke of Northumberland. After the Restoration a pension of £200 for life was granted to Justiniana Van Dyck, who died before 1690.

Van Dyck is one of the most brilliant figures in the history of art. That he should, in the same subjects chosen by Rubens, have attained the same degree of expression was scarcely possible. Rubens was exceptional precisely through the sweep and power of his ima- gination ; but Van Dyck, applying the same principles to portrait painting, was no less exceptional. Titian, Raphael, Rembrandt, Velazquez, and Frans Hals are not, on the whole, superior to him in this branch. They often delight us with their technical excel- lence or penetrating study of individuality, but their conception remains entirely different from that of Van Dyck. With him as with Rubens physiognomical interpretation is so intimately con- nected with

picturesque necessity that his portraits scarcely ever fail to leave an indelible impression on the mind. Burnet observes that with Van Dyck the union of the figure and the background seems to have been a principle, not only in respect of light and shade, but also of colour. Thus the shapes of his lights are ex- tended or doubled by means of a curtain in the background, &c. Hence Van Dyck, quite unlike the Dutch, is not what may be termed an intimate portraitist. In his eyes a prince, a warrior, a statesman, an artist belong to the world and to posterity, and in the realization of this idea he attains a degree of excellence seldom if ever attained before him. His works may be found lacking in solidity or displaying an unnecessary amount of motion in attitude, but these defects are easily compensated by a sense of proportion, an elegance in outline, a variety of conception united in his best works to the most able technic.

Properly speaking, Van Dyck cannot be said to have formed a school, He was followed to London by some of his earlier colla- borators, and there soon met a considerable number of others. Jan van Reyn, David Beek, Adrian Hannemann, Mathew Merian, John Bockhorst (Lang Jan), Remy van Leemput, and Peter Thys were foremost among foreigners, Henry Stone and William Dobson among Englishmen. 'To their assistance the master owed much; but they are also responsible for the vast number of constantly-recurring copies which go by his name. It often requires a very discriminating eye to distinguish some of these copies from the original paintings. Nevertheless after Van Dyck's death many of his coadjutors produced works of undeniable merit. No school more strikingly reflects the influence of Van Dyck than the British school. Stone and Dobson were, properly speaking, the most for- tunate of his continuators; and there is little doubt that such masters as Reynolds, Gainsborough, Lawrence, and Raeburn owe a large measure of their superiority to their study of his works.

Though Van Dyck's reputation greatly suffered through the numerous copies he allowed his pupils to take from his works, the case is otherwise with engraving: Vorsterman, Pontius, Peter de Jode, P. Balliu, and 8. Bolswert were seldom more fortunate than when under his guidance. De Jode's St Augustine, Bolswert's Ecce Homo and Crucifixion, Vorsterman's Deposition, and especially Pontius's Herman Joseph rank among the

masterpieces of the art of engraving. Wan Dyck was himself an incomparable etcher, and with the needle arrived at a degree of excellence scarcely inferior to that exhibited in his paintings. Such prints as the portraits of Vorsterman, John de Wael, Snyders, Josse de Momper, Adam van Noort, and above all his own effigy, bear witness to his prodigious knowledge of design. Pript collectors pay extravagant prices for a first proof taken from the plates engraved by Van Dyck himself, Mr Sackville Bale's copy of the portrait of Wawerius fetched £600. Van Dyck also employed some of the best engravers of his time for the production of a gallery of illustrious heads, men and women, of different countries. Whether all were taken from life is ques- tionable. Gustavus Adolphus and Wallenstein he can hardly have met. Du Breucq, the architect, he never knew. But all the sketches and drawings were done by himself, and are often met with in public and private galleries. The engravings are some- times very beautiful and in their first states very rare. Published successively by Martin van der Enden, Giles Héendrickx, and John Meyssens, the collection originally consisted of sixteen warriors and statesmen, twelve scholars, and fifty-two artists. Hendrickx raised the number to ninety-nine, and used asa frontispiece the

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portrait of Van Dyck, with the following inscription :—Icones principum, wirorum doctorum, etc., etc., numero centum ab Antonio Van Dyck pictore ad vivwm expresse etusg. sumtibus xrt incise, 1645. Seventeen editions were published, the last in 1759, with 124 plates. Many of the plates are now the property of the French Government, and belong to the Chalcographie Nationale in Paris. Literature.—See W. Hookham Carpenter, Pictorial Notices, consisting of a Memoir of Sir Anthony Van Dyck, with a descriptive catalogue of the etchings exe- cuted by him (London, 1844); John Smith, A Catalogue Raisonné of the Works of the most Eminent Dutch, Flemish, and French Painters, part iii. (London, 1841) ; J. Guiffrey, Antoine Vian Dyck, sa Vie et son Giuvre (Paris, 1882); A. Michiels, Ant. Van Dyck et ses Eléves (Paris, 1881); Ign. von Szwykowski, A. Van Dyck's Pildnisse bekannter Personen (Leipsic, 1858); Fr. Wibiral, L'Iconographie d'A. Van Dyck

d'apres les Recherches d. H. Weber (Leipsic, 1877); Carl Lemcke, A. Van Dyck (in Robert Dohme's Kunst und Kiinstler, vol. i., Leipsic, 1877); Alfr. Woltmann and K. Woermann, Gesch. der Malerei, vol. iii. (Leipsic, 1886); Max Rooses, Geschiedenis der Antwerpsche Schilderschool (Ghent, 1879); F. J. Van den Branden, Gesch, der Antw. Schilderschool (Antwerp, 1883); Percy Rendall Head, Van Dyck (London, 1887); F. G. Stephens, Catalogue of the Exhibition of the Works of Sir A. Van Dyck (London, 1887). (H. H.)

VANE, Sir Henry (1612-1662), the younger, was the son of Sir Henry Vane and Frances Darcy. His father, of an ancient family in Durham, was secretary of state and comptroller of the household under Charles]. Henry was born in 1612 at Hadlow in Kent; and after an education at Westminster, where he was noted for his high and reckless spirits, and at Magdalen, Oxford, where he neither matriculated nor took his degree, he was sent to France and Geneva. Here he no doubt acquired the strongly Puritan views for which he had been prepared by a re- markable change of mind when quite a boy. In spite of the personal efforts of Laud, who made the attempt at the king's request, he refused to give them up, and fell especially under the influence of Pym. In 1635 he emi- grated to Massachusetts, where he was elected governor in 1636, though only twenty-four years of age. After two years of office, during which he showed striking adminis- trative ability, he was defeated by Winthrop, the former governor, chiefly on account of the protection he had given to Mrs Hutchinson in the religious controversies which she raised.

Vane returned to England in August 1637. Being elected to the Short Parliament for Kingston-upon-Hull, he speedily became a leader of the Independents and a marked man. In order to secure him for the court he was made joint-treasurer of the navy with Sir W. Russell, and was knighted. In November 1640 he was again elected for Hull to the Long Parliament. Accidentally finding among his father's papers some notes of Strafford's advice to the king after the dissolution of the Short Parliament, in which Strafford justified the use of force, he handed them to Pym, and on 10th April 1641 was examined upon them by the House; this disclosure was largely instrumental in bringing about Strafford's down- fall. He carried up the impeachment of Laud from the Commons, was a strong supporter, when on the com- mittee of religion, of the "Root and Branch" bill, and in June

1641 put forward a scheme of church government by which commissioners, half lay and half cleric, were to assume ecclesiastical jurisdiction in each diocese. He was, in fact, foremost in all the doings of the Long Parliament. When war broke out he surrendered his oflice of treasurer of the navy, but was replaced in it by the Parliament. Hereupon he gave a rare example of dis- interestedness by relinquishing all the profits of the office, stated at £30,000 a year, stipulating only that. £1000 should be paid toa deputy. In August 1642 he was on the committee of defence. In 1643 he was the leading man among the commissioners sent to treat for a league with the Scots. Vane, who was bitterly opposed to the tyranny of the Presbyterian system, was successful in two mportant points. The aim of the Scots was chiefly the propagation of their discipline in England and Wales, and for this they wanted only a "covenant." The English desired a political "league." Vane succeeded in getting the bond termed the Solemn League and Covenant,

and further in substituting the expression "according to the word of God and the example of the best Reformed churches" for the latter phrase alone. In the Westminster Assembly, too, he joined Cromwell in insisting upon full religious liberty, and in opposing the view that the taking of the Covenant should be necessary for ordination. In 1644 he was charged by Essex with holding communica- tion with the court, but explained that he had done so in order to acquire information of the Royalist plans, and was fully acquitted by the House of Lords. He was on the committee of two kingdoms, and was engaged in the negotiations with Charles at Uxbridge in 1645. He was, with Cromwell, a prime mover in the Self-Denying Ordin- ance and the New Model, and it was he who suggested the filling up of the vacant seats in parliament. His views of government at this time and throughout his life may be best studied in an important paper, the People's Case Stated, written shortly before his death, 'The power which is directive, and states and ascertains the morality of the rule of obedience, is in the hand of God; but the original, from whence all just power arises, which is magistratical and coercitive, is from the will or free gift of the people, who may either keep the power in them- selves or give up their subjection and will in the hand of another." The king, then, having transgressed the condi- tion, and having

been conquered, the people were free to change their form of government and, if they pleased, resort toa republic. In 1646 Vane was one of the English com- missioners for the preservation of peace with Scotland, and in 1648 was appointed with others to negotiate with Charles at the Isle of Wight. Radical as were his views, he refused all participation in Pride's 'purge "—the point where he first broke with Cromwell—and remained in privacy at Raby Castle in Durham until after the king's death, a measure in which he took no part. In 1649, however, he returned to London and was placed on the council of state, though he refused to take the oath which expressed approbation of the king's execution. He was chairman of the committee appointed to consider the mode of election of future parliaments, and his proposals were brought forward in January 1650. He acknowledged the Commonwealth only so far as he found it "consonant to the principles which have given rise to the law and the monarchy itself in England," and he recognized in a parlia- ment, conforming in other respects to the ancient laws, the supreme authority of the state, whether there were a king at the head of it or not. He wished to reform the franchise on the property basis, to disfranchise some of the existing boroughs, and to give increased representation to the large towns ; the sitting members, however, were to retain their seats. In this he was opposed by Cromwell, who desired an entirely new parliament and the supremacy of the army representation; and Vane stands henceforward as the champion of the doctrine of pure parliamentary govern- ment. His most useful qualities were exhibited, however, when in March 1653 he became the head of the commission for managing the army and navy. It was by his exertions in organization that Blake was fitted out with the fleet with which Van Tromp was defeated and the supremacy of England at sea assured. It was at this time that Milton's sonnet was addressed to him. On 20th April Cromwell forcibly dissolved the Long Parliament, when Vane especi- ally received from the Protector studied insult. He was, however, almost at once invited to rejoin the Government. "He answered the invitation by a letter extracted from the Apocalypse wherein the reign of the saints is men- tioned, which faith he believes will now begin." In his retirement at Raby he now wrote the Retired Man's Medi- tations. In 1656 he proposed in A Healing Question a new form of government, insisting as before upon a Puritan

parliament supreme over the army. This he sent to Crom- well, and so alarmed was the Protector at the interest it excited that Vane was summoned on 12th August to the council in consequence. Refusing to give security not to disturb the public peace, he was on 9th September sent prisoner to Carisbrooke Castle, and there remained until 3lst December. He had previously, according to his opponents, excited the jealousy of the Government by 'going up and down among the Quakers, and endeavour- ing to withdraw them from their submission to the Govern- ment." After the death of Cromwell he stood for Kingston and Bristol successively, and was elected, but the court managers gave the certificate of election to the defeated candidates; finally, however, he was chosen for Whitchurch and took his seat on 27th January 1659, at the head of the small body of forty republicans. He was at once urgent in pressing that, before Richard Cromwell, for whom he had a great contempt, was acknowledged pro- tector, the limitations of his power, and the full security of parliament and subjects, should be settled. Upon Richard's abdication he joined the army leaders in reviv- ing the Rump; and, when the breach occurred between it and the army, he adhered to the latter, accepting a com- mission from them. He was one of the committee of safety and also of the council of state appointed in May ; he was, too, chairman of the army and navy commission, and soon afterwards of another special commission for the navy. In September he was made president of the council. He had, morever, in May, been appointed with Lambert and others to treat with the Dutch ambassador for freeing the commerce of the Baltic. When Monk arrived in London Vane was ordered to his seat in Lincolnshire, having been discharged from the parliament for espousing the cause of the army.

At the Restoration Vane was imprisoned in the Tower by the king's order. After several conferences between the Houses of Parliament it was agreed that he should be excepted from the indemnity bill, but that a petition should be sent to Charles asking that his life might be spared. The petition was granted. During the conferences he had been moved from prison to prison, and was finally placed ina castle in the Scilly Isles. In his captivity he wrote the People's Case Stated, with many other political and religious works of the highest eloquence and beauty. On 7th March 1662, the Convention

*Parliament being no longer in existence, he was taken to London, and on 2d June put upon his trial, which was conducted with a shameless absence of equity. He was refused the assistance of counsel and was not allowed to see the indictment before it was read. In his own behalf he spoke courageously and well, pleading the authority of the Long Parliament for his acts, and maintaining that the House of Commons, ** represent- ing the whole body of the people in case of a difference between the authority, royal and politic, possessed a just power to defend the right of the people, and to authorize the people of England and every one of them to defend them." Charles, however, was determined that he should die, and, in spite of his answer to the petition mentioned above, wrote himself to Clarendon declaring that Vane was "too dangerous a man to let live, if we can honestly put him out of the way." He was therefore sentenced on llth June to death. On the 14th he was taken out to execution, and died with the serenity and courage which had marked his life. (0. A.)*

VANILLA, a flavouring agent largely used in the manufacture of chocolate, in confectionery, and in per- fumery. It consists of the fermented and dried pods of several species of orchids belonging to the genus Vanilla.1 The great bulk of the commercial article is the produce of

1 Span. vainilla, dim. of vaina, a pod.

V. planifolia, Andrews, a native of eastern Mexico, but now largely cultivated in several tropical countries, especi- ally in Réunion, the Seychelles, and Java. The plant has a long fleshy stem and attaches itself by its aerial rootlets to trees, and appears to be little dependent on the soil for nourishment. The leaves are alternate, oval-lanceolate, and fleshy ; and the greenish white flowers form axillary

Vanilla plant. A. Flower, leaf, and aerial rootlets. B. Pod or fruit.

spikes, The fruit is a pod from 6 to 12 inches long, and when mature about half an inch in diameter. The wild plant yields a smaller and less aromatic fruit, distinguished in Mexico as Baynilla 'cimarona, the cultivated vanilla being known as B. corriente. Mexican vanilla is regarded as the best. It is

principally consumed in the United States, which import about 100,000 tb of it annually. Réunion produces about the same quantity, which is sent to Bordeaux, the chief centre of the trade in France, Its odour is said to differ from the Mexican variety in having a suggestion of tonqua bean. Guadaloupe produces about 5000 ib per annum, which is likewise shipped to Bordeaux. Mauritius exported 20,481 tb in 1877. The Seychelles have lately produced large quantities of exceedingly fine quality ; the produce of these islands goes chiefly to the London market. The Java vanilla, grown chiefly in Kra- wang and the Preanger Regencies, is shipped to Holland. The amount exported from the East Indian Archipelago to Holland in 1876 amounted to about 5000%. The best varieties of vanilla pods are of a dark chocolate brown or nearly black colour, and are covered with a crystalline efflorescence technically known as givre, the presence of which is taken as a criterion of quality. The peculiar fragrance of vanilla is due to vanillin, C;H,O,, which forms this efflorescence. Chemically speaking, it is the aldehyde of methyl-protocatechuic acid. It is not naturally present in the fleshy exterior of the pod, but is secreted by hair- like papille lining its three internal angles, and ultimately becomes diffused through the viscid oily liquid surround- ing the seeds. The amountof vanillin varies according to the kind: Mexican vanilla yields 1:69, Bourbon or Réunion 1°9 to 2°48, and Java 2°75 per cent. Besides vanillin, the pods contain vanillic acid (which is odourless), about 11 per cent. of fixed oil, 2°3 per cent. of soft resin, sugar, gum, and oxalate of lime.

Vanillin forms crystalline needles, fusible at 81° C., and soluble in alcohol and ether, hardly soluble in cold, but more so in boiling water. Like other aldehydes, it forms a compound with the alkaline bisulphites, and can by this means be extracted from bodies con- taining it. Vanillin has been found in Siam benzoin and in raw sugar, and has been prepared artificially from coniferin, a substance found in the sapwood of fir-trees, from asafcetida, and from a con- stituent of oil of cloves named eugenol. It is from the last-named

that vanillin is now prepared on a commercial scale, chiefly in Germany. Vanillin does not appear to have any physiological

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action on human beings when taken in small doses, as much as 10 to 15 grains having been administered without noxious results. On small animals, however, such as frogs, it appears to act as a eon- yulsive. It has been suggested as a stimulant of an excito-motor character in atonic dyspepsia. The poisonous effects that have on several occasions followed from eating ices flavoured with vanilla are not to be attributed to the vanilla, but probably to the presence of tyrotoxicon (Pharm. Journ. [8], xvii. p. 150), a poison found in milk which has undergone certain putrefactive changes, and producing choleraic effects, or perhaps to the presence of micro- scopic fungi in the vanilla, the plantations being liable to the attack of Bactertwm putredinis. Workmen handling the beans in the Bordeaux factories are subject to itching of the hands and face ; but this is caused by an Acarus which occupies the end of the pod. In some cases, however, symptoms of dizziness, weariness, and malaise, with muscular pains, have been felt, due probably to the absorption of the oily juice by the hands of the workmen. These symptoms have been attributed to the variety of vanilla known as yanillon, but it seems equally probable that they are due to idiosyncrasy.

The method of cultivation and preparation of vanilla for the market varies somewhat in different countries. In Mexico a clear- ing is made in the forest, where a few young trees, 12 or 15 feet apart, are left to serve as a support for the climbing stems of the vanilla plant. Close to each tree two cuttings, 3 to 5 feet in length, are inserted in the soil to the depth of about a foot, the upper part being tied to the tree. The cuttings become rooted in about a month, but do not bear fruit until the third year. They continue to bear for about thirty years. In Réunion, Mauritius, and the Seychelles the young plants are supported by a rude trellis made between the trunks of trees. Although the plants are probably fertilized by insects in their native country, in Réunion and else- where fertilization has to be promoted by hand. Only the finest flowers of each spike are fertilized, or the plants would die of ex- haustion. The pods are cut off separately as they ripen, since, if over-ripe, they are apt to split in drying, and if unripe the product will be of inferior colour and fragrance. The pods take a month to arrive at full size and six months longer to ripen. The exact time for collecting is judged by the crackling of the pod when pinched between the fingers. The

aroma of vanilla is developed by fermentation, and is said not to pre-exist in the ripe fruit.

In Mexico the pods, after they are gathered, are placed in heaps under a shed until they begin to shrivel, and are then submitted to a sweating process. They are next wrapped in a woollen cloth and exposed to the sun during the day, or heated in an oven to 140° Fahr. if the weather is cloudy, and then enclosed in air-tight boxes at night to sweat. In twenty-four to thirty-six hours, accord- ing to size, the pods have acquired a fine chcstnut-brown colour. They are then spread in the sun for about two months to dry, and are subsequently tied up into small packets of uniform length. In Réunion the pods are sorted into lengths and scalded in boiling water, the long pods being immersed ten seconds, those of a medium size fifteen seconds, and the short ones for fully one minute. They are next exposed to the sun between woollen blankets for about a week, until they assume the characteristic brown colour. They are then spread out under zinc-roofed sheds and turned frequently to ensure equal drying. When the beans can be twisted round the finger without cracking, the "smoothing process" is commenced. This consists in passing the beans between the fingers frequently, apparently to distribute equally the unctuous liquid which exudes as the fermentation proceeds, and to which the lustre and suppleness of the bean are due. When dry they are tied up in bundles of uniform length. These are divided' into three commercial Sorts, —(1) those which are nearly black and glossy and which soon become frosted ; (2) those which are lighter in colour, more or less Spotted with grey, and not so glossy ; (3) those which are gathered m an unripe condition and become little, if at all, frosted over with crystals. In Guiana, where an inferior quality is prepared, the beans are placed on ashes and left until they begin to shrivel ; they are then wiped, rubbed over with oil, and, the lower end of the pod having been tied, are hung up in the air to dry.

Other Vorieties.—In Brazil, Peru, and other parts of South America a broad and fleshy vanilla is prepared, which has an inferior odour. It is believed to be obtained from /. pompone, Schiede, which has been found to contain, besides from '4 to °7 per cent. of vanillin, another ingredient, benzaldehyde, by which the odour of vanilla is modified. This variety is often distinguished as vanillon mm commerce. It is destitute of givre. Rio vanilla is collected on

the banks of the Parahyba river in the province of Rio de Janeiro, Brazil, and is obtained from V. palmarum, Lindl. It has been, found to yield 1:03 per cent. of vanillin. It is of inferior Batty, but might be improved if more attention were paid to oe curing process. Guiana vanilla is a coarse variety obtained a EF; guranensis, Splitberger. The pods are short, thick, and Tequently split open, and of inferior fragrance. None of the South-

merican vanillas appear to be used in Great Britain for flavouring purposes, but solely for perfumery. (E. M. H.)

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VANINI, Lucinio (1585-1619), philosopher, was born at Taurisano, near Naples, in 1585. He studied philosophy and theology at Rome, and after his return to Naples applied himself to the physical studies which had come into vogue with the Renaissance. Though unmethodically cultivated and destitute of definite results, physical science power- fully affected men's imaginations in this transition period between the break-up of scholasticism and the rise of modern thought, and exercised an important influence upon philosophy. Giordano Bruno is perhaps the most striking instance of this, and Vanini in some respects re- sembles Bruno, though much his inferior both intellectu- ally and morally. Both represent the spirit of revolt against the old, the ferment and unrest of the 16th cen- tury. Vanini resembles Bruno, not only in his wandering life, but also in his anti-Christian bias, and in the tragic death which he suffered at the hands of the constituted authorities. From Naples Vanini proceeded to Padua, where he came under the influence of Pomponatius, whom he styles his divine master. Pomponatius belonged to the Alexandrist school of Aristotelians, and denied the im- mortality of the soul. Vanini speaks of Aristotle as " the god of philosophers, the dictator of human nature, and the sovereign pontiff of the sages," but gives the same naturalistic turn to the Aristotelian doctrine. At Padua, where he appears to have remained for several years, Vanini added law to his other acquirements, and he is at pains to print himself in his books as doctor utriusque juris. He wasalso ordained priest ; but, on leaving Padua, he led a roving life in France, Switzerland, and the Low Countries, supporting himself by giving lessons and using the opportunity, it would seem, for the dissemination of anti-religious views. He was obliged

to flee from Lyons to England in 1614, but was imprisoned in London for some reason for forty-nine days. Being set at liberty, he returned to Italy and made an attempt to teach in Genoa, but the same complaints being made against him drove him once more to France. Here he made a valiant effort to clear himself of suspicion by publishing a book against atheists,—Amphitheatrum diterne Providentie Divino- Magicum, necnon Astrologo-Catholicum, adversus Veteres Philosophos, Atheos, Epicureos, Peripateticos, et Stoicos (1615). It has been said that by the weakness of his answers he designedly gives his opponents the victory under pretence of refuting them; but, though the defini- tions of God are somewhat pantheistic, the book is suffi- ciently orthodox. Yet it cannot be taken as expounding his own views. Vanini expressly tells us so in his second (and only other published) work, and the tone of that work would be sufficient proof without this assurance. Though certified by two doctors of the Sorbonne, the second book undoubtedly preaches a pantheism nearly akin to atheism, and a sensualistic ethics strongly tinged with immorality. The title (De Admirandis Naturx Regine Dezxque Mortalium Arcanis) correctly indicates its general tenor. It was published at Paris in 1616, and was soon afterwards re-examined by the Sorbonne and condemned to the flames. This was the occasion of Vanini's leaving Paris, where he had been staying as chaplain to Marshal de Bassompierre, to whom the book is dedicated. He began to teach in Toulouse, but soon roused the clergy and magistrates against him. He was arrested in Novem- ber 1618, and after a prolonged trial was condemned, as an atheist, to have his tongue cut out, and to be strangled at the stake, his body to be afterwards burned to ashes. This savage sentence was executed on 9th February 1619. During his imprisonment, it is said, he professed the most orthodox Catholicism, but as soon as all hope was gone gave vent to his true feelings in ribald impieties. He appears to have met his fate with courage, mingled perhaps

with bravado. His moral character was loose and vicious, and his writings show him to have been a man of inordinate vanity. Though he possessed unquestionable gifts, neither originality nor profundity can be claimed for him as a thinker. His fate, however, has given him a species of fame.

The best modern account of Vanini is to be found in Cousin's Fragments de Philosophie Cartésienne. His works have been repub- lished by Rousselot.

VANLOO, Cuartes ANDREW (1705-1765), subject painter, a younger brother of John Baptist Vanloo (see below), was born at Nice on 15th February 1705. He received some instruction from his brother, and like him studied in Rome under Luti. Leaving Italy in 1723, he worked in Paris, where he gained the first prize for his- torical painting. After again visiting Italy in 1727, he was employed by the king of Sardinia, for whom he painted a series of subjects illustrative of Tasso. In 1734 he settled in Paris, and in 1735 became a member of the French Academy ; and he was decorated with the order of St Michael and appointed principal painter to the king. By his simplicity of style and correctness of design, the result of his study of the great Italian masters, he did much to purify the modern French school; but the con- temporary praise that was lavished upon his productions now appears undue and excessive. His Marriage of the Virgin is preserved in the Louvre. He died at Paris on 15th July 1765.

VANLOO, Joun Baptist (1684-1745), subject and por- trait painter, was born at Aix in Provence on 14th January 1684. He was instructed in art by his father. Having at an early age executed several pictures for the decoration of the church and public buildings at Aix, he was employed on similar work at Toulon, which he was obliged to leave during the siege of 1707. He was patron- ized by the prince of Carignan, who sent him to Rome, where he studied under Benedetto Luti. Here he was much employed on church pictures, and in particular executed a greatly praised Scourging of Christ for St Maria in Monticelli. At Turin he painted the duke of Savoy and several members of his court. Then, removing to Paris, where he was elected a member of the French Academy, he executed various altar-pieces and restored the works of Primaticcio at Fontainebleau. In 1737 he came to England, where he attracted attention by his por- trait of Colley Cibber and of Owen McSwiny, the theatrical manager ; the latter, like many other of Vanloo's works, was engraved in mezzotint by the younger Faber. He also painted Sir Robert Walpole, whose portrait by Vanloo in his robes as chancellor of the exchequer is in the National Portrait Gallery (London), and the Prince and Princess of Wales. He did not, however, practise long in England, for his health failing he retired to Paris in 1742, and after- wards

to Aix, where he died on 19th December 1745. His likenesses were striking and faithful, but seldom flattering, and his heads are forcible in colouring. The draperies and accessories in his pictures were usually painted by Van Achen, Eccardt, and Root.

VANNES (Breton Gwened), a town of France, chef-lieu of the department of Morbihan and an episcopal see, is situated on a little stream, 10 miles from the Gulf of Morbihan and 84 north-west of Nantes on the railway to Brest. The narrow, steep, and. crooked streets of the old town, which lie on a hill facing the south, are surrounded by fortifications of the 14th, 15th, and 17th centuries, pierced by four gates and flanked by nine towers and five bastions, connected by battlements. Some of the remains are Roman, and in the Constable's Tower Olivier de Clisson was confined in 1387. The modern suburbs, with public buildings, barracks, convents, squares, walks, and the port

surround the old town. The archeological museum con- tains one of the richest collections of prehistoric remains in Europe. There are also a museum of natural history and a library (10,000 volumes). The cathedral of St Peter overlooks the old town; burnt by the Normans in the 10th century, it was rebuilt in the 13th, 15th, and 18th centuries. It has no architectural interest, but contains the relics and tomb of St Vincent FrErRer (¢.v.). The curious round Chapelle du Pardon was built in 1557 in the Italian style. Some interesting old houses, including that of St Vincent Ferrer and that of the parlement of Brittany, the rich private collections of M. de Limur, the huge bar- racks, and three large hospitals should also be mentioned. In 1882 thirty-five vessels (3480 tons) entered and seventy- four (7225 tons) left the port of Vannes, which is access- ible to vessels of 150 tons; those of 800 tons can come to within 2 miles. The population in 1881 was 16,667 (commune 19,284), and had increased by 1886 to 18,127 (commune 20,036).

Vannes (Dariorigum), the capital of the Veneti, was at the head of the Armorican league against Julius Cesar, who in 56 B.c. overcame their fleet and opened up their country by six roads. St Paternus, the first bishop, was consecrated in 465. In the 5th century Vannes was ruled for a time by independent counts, but soon came under the yoke of the Franks. Nominoe,

the lieutenant of Louis the Pious in Brittany, assumed the title of king in 848, and one of his brothers was the founder of a line of counts who distinguished themselves against the Normans in the 9th and 10th centuries. Vannes be- came part of the duchy of Brittany under Geoffrey, who died in 1008, and the estates of Brittany met there for the first time after the death of Arthur of Brittany. In the course of the War of Suc- cession the town was besieged four times in 1342. Duke John IV. built here the castle of L' Hermine and made it his habitual residence. In 1487 the town was for a year in the hands of Charles VIII. of France. In 1532 Brittany was definitively united to France. The estates met at Vannes several times in the 17th and 18th centuries. During the Revolution this town was the scene of highly dramatic episodes, including the execution of some of the prisoners of Quiberon.

VANNUCCI. See Perucino.

VAPOUR. See Evaporation.

VAR, a department of France, formed in 1790 of part of Provence, but reduced in 1860 by the formation of the department of Alpes-Maritimes, so that the Var no longer flows through the department to which it gives its name. Situated between 42° 58' and 43° 55' N. lat. and 5° 39' and 6° 57' E. long., Var is bounded by the Mediterranean on the S., by Alpes-Maritimes on the E., by Basses-Alpes on the N., and by Bouches-du-Rhéne on the W. In the N.W. it touches the department of Vaucluse. The river Verdon on the N. and the Siagne on the N.E. are natural boundaries. The surface of the department is one of the most broken in France; the highest point is in the north- east, where a peak of the Alps rises to 5620 feet and is surrounded by others ranging from 4500 to 5000 feet. These calcareous hills are much fissured and very dry on the higher plateaus, but are rich in springs, which occasion a very beautiful verdure in the valleys. Towards the west rises the St Baume (3700 to 3800 feet), which is connected on the south with the hills above Toulon (2300 feet). The Maures (2550 feet), which extend between the coast from Hyéres to Fréjus, and the valley of the Argens form, geologically speaking, a sort of island in Provence, being composed of granite, gneiss, and schists. To the north of the Argens rises the independent Estérel Range (2020 feet), mostly composed of igneous rocks, with some

schists and porphyry. The principal river is the Argens (71 miles), which drains the larger portion of the depart- ment, traversing it from west to east, and falling into the sea a little south of Fréjus. Its minimum volume is 72,000 cubic feet, even in the driest weather and when most lavishly drawn on for irrigation. Nominally it is navigable for 11 miles, but in point of fact it is used only for floating timber. Draguignan, the chef-lieu of Var, is

situated on the Nartuby, the principal tributary of the Argens. Other streams are, in the north the Verdon, a tributary of the Durance, in the west the Huvaune and Arc, in the south the Gapeau, and in the east the Siagne. The coast-line, which is one of the most beautiful and picturesquely varied in France, runs from west to east between the Gulf of La Ciotat and Cape Comarat, then from south-west to north-east between the Gulfs of St Tropez and La Napoule. The shore is dotted from west to east with the sand-covered remains of the Phoczan city of Tauroentum ; the little ports of Bandol and St Nazaire ; the peninsula of Cape Sicié, 1180 feet high, with its projection Cape Cépet (see TouLon) ; the roads of Toulon ; the roads of Giens, the site of the Gallo-Roman town of Pomponiana ; the peninsula of Giens, formerly an island attached to the mainland by two long spits of sand, between which lies the lagoon of Les Pesquiers with its "salines"; the great anchorage of Hyéres, shut off from the Mediterranean on the south by the hilly and wooded islands of Porquerolles, Port-Cros, and Le Levant; the bold promontories of the Maures Mountains, dividing the coast into lovely bays; Cape Comarat (430 feet), with a lighthouse ; the deep Gulf of St Tropez, with perhaps the best anchorage in all Provence; the Gulf of Fréjus, where owing to the accumulated alluvial deposits of the Argens the site of the Roman port of Forum Julii is now occu- pied by the inland town of St Raphael; the porphyry headlands of the Estérel Range, with the roads of Agay between them; and Cape Roux (1486 feet). The climate is remarkably fine and mild on the coast, where there is complete shelter from the north wind, but is more severe in the mountains. Hyéres and St Raphael are favourite invalid resorts. The average temperature is 58° Fahr. at Toulon, 59° at Hyéres. The annual rainfall is 19 inches at Toulon and 24 in the valley of the Argens.

Of the total area of 1,489,488 acres 379,021 are arable, 529,660 under wood, 185,333 under vineyards, 14,857 are meadows and orchards, 49,606 pasture, and 142,466 uncultivated. The live stock includes 8460 horses (many of Arab blood), 13,230 mules, 5420 asses, 3015 cattle, 105,840 sheep (wool-clip in 1879, 234 tons 4 cwts., valued at £10,000), 19,900 pigs, and 14,815 goats. There were 14,380 beehives (42 tons 10 cwts. of honey and 28 tons 7 ewts. of wax in 1879). In 1884 366 tons 15 ewts. of silk cocoons were produced. The crops in 1884 were 1,485,000 bushels of wheat, 13,200 of meslin, 11,000 of rye, 30,250 of barley, 7150 of maize, 2640 of millet, 125,400 of oats, 4,840,000 of potatoes, 2512 tons of beetroot, and 103,000 tons of different kinds of fodder. The vines, reduced by 60 per cent. since 1875 by the phylloxera, yielded in 1884 over 7,000,000 gallons of wine (average of previous 10 years over 29,000,000 gallons). In 1879 olives occupicd 77,777 acres and yielded 1,384,856 bushels ; four-fifths of the crop was pressed for oil and yielded 5256 tons. Mulberries, strawberries, pears, peaches, plums, figs, almonds, oranges, pomegranates, lemons, jujubes, guavas, and Japanese medlars are grown; and the laurel, palm tree, date tree, eucalyptus, cactus, and sugar cane flourish, An export trade is carried on in flowers, and also in truffles, capers, and onions. The forests are planted with white and evergreen oaks, cork trees, maritime pines, and chestnuts. In the dense, and almost virgin, forest of St Baume are beeches, maples, limes, oaks, elms, yews, and pines, and the flora of the district is botanically most interesting. Var possesses mines of Iron, lead, aluminium, and coal (2846 tons of coal, 2075 tons of lignite in 1885). From 300 to 400 workmen are employed in the Production of salt and chemicals. Hyéres (population 13,170 in 1886) produces annually from 20,000 to 25,000 tons of salt. Marble, plaster, stone, chalk, clay, sandstone, and sand for glass are quarried or dug. There are 200 manufactories of pottery, earthen- ware, and tiles. Toulon (57,635), La Seyne (12,186), St Tropez (3622), and Bandol, where ships are built, are the chief industrial centres, There are silk, woollen (250 spindles, 6 looms), and cotton (350 spindles, 9 looms) mills, hat, cloth, and cork manufactories (1000 workmen), tan-yards, paper-mills (670 tons in 1879), print- ing establishments, tinned food manufactories, soap-works (172 tons), breweries, glass-works, oil-mills—in all 173 establishments. are tunny, anchovy, and sardine fisheries. The department

as 140 miles of railway, 164 of national roads, and 2448 of other Toads. About half the population of 288,577 (1881) were agricul- tural, 46,691 manufacturing, and 30,228 marine. In 1886 the total

population of the department numbered 283,689. Var is divided into 8 arrondissements (Draguignan, the chef-lieu, with 8562 in- habitants in 1886 ; Brignoles, with 4393 inhabitants ; aud TouLon (q.v.), 28 cantons, and 145 communes; it forms the diocese of Fréjus, and belongs to the jurisdiction of the Aix court of appeal and to the district of the Marseilles army corps.

VARASD (Germ. Warasdin), a royal free city of Hungary, in the county of Varasd, in Croatia, lies about 40 miles north-north-east of Zigraéb (Agram), on the river Drave. It was once used as a stronghold, but now only the castle remains fortified. Varasd possesses several churches of interest, a fine new county hall, two gym- nasia, and a real school. It has also tobacco and liqueur factories, and enjoys a brisk trade in wood and fruits, especially plums. The inhabitants numbered 13,701 in

1880.

VARENIUS, Bernuarpvs, or BERNHARD VAREN (1622- 1670), geographer, was born at Hitzacker on the Elbe, in the Liineburg district of Hanover. His early years were spent at Uelzen, where his father was court preacher to the duke of Brunswick. Varenius studied at the gym- nasium of Hanover and at Kénigsberg and Leyden uni- versities, where he devoted himself to medicine, taking his degree in 1649. He then settled at Amsterdam, in- tending to practise medicine. But the recent discoveries of Tasman, Schouten, and other Dutch navigators, and his friendship for Blauw and other geographers, roused in Varenius an interest in geography, and it was in this study that the principal achievements of his life were gained. He died in 1670.

In 1649 he published, through Elzevir, his Descriptio Regni Japoniz, an excellent see which may still be read with profit. In this was included a translation into Latin of Schouten's account of Siam and chapters on the

religions of various peoples. Next year appeared the work by which he is best known, his Geographia Generalis, in which he endeavonred to lay down the general principles of the subject on a wide scientific basis, accord- ing to the knowledge of his day. The work is divided into (1) absolute geography, (2) relative geography, and (3) comparative geography. The first investigates mathematical facts relating to the earth as a whole, its figure, dimensions, motions, their measure- ment, &c. The second part considers the earth as affected by the sun and stars, climates, seasons, the difference of apparent time at different places, variations in the length of the day, &c. The third part treats briefly of the actual divisions of the surface of the earth, their relative positions, globe and map construction, longitude, navigation, &c. Though the subject as treated by Varenius is erude and ill-defined, still, with the materials at his command, he dealt with it on the whole in a really philosophic and scientific spirit ; and it long held its position as the best treatise on scientific geography in existence. The work went through many editions. Sir Isaac Newton introduced several important improvements into the Cambridge edition of 1672; in 1712 Dr Jurin issued an edition with a valuable appendix ; in 1733 the whole work was translated into English by Dugdale; and in 1736 Dugdale's second edition was revised by Shaw. In 1755 a French translation of Shaw's edition appeared in Paris, There was also an Italian edition printed at Naples in 1716.

See a paper on Varenius by H. Blink in Tijdschr. van het Nederl. Aardrijks. Genootschap, ser. ii. pt. iti., 1587.

VARIABLE, Comptex. 1. The solution of a quad- ratic equation involves the extraction of the square root of a quantity which may be negative. In that case the solution is of the form a+ — 6%, which may be written a+b/-—1, or a+7, putting, with Gauss, for brevity, /-—1=i. Analysis was, therefore, at a very early stage compelled to contemplate the possibility that symbols of magnitude may represent combinations of dissimilar con- stituents; but it is only within the 19th century, mamly owing to the initiative of Cauchy and of Gauss, that the whole domain of analysis has been explored from this point of view. A quantity, a+b, consisting of a real part containing a units and an imaginary part containing b units, was called by Gauss a complex number,

and the conception of it includes those of each kind, the real and the purely imaginary as they are found from it by making

*—————— = St (t:*S*

in succession b=0 and a=0. Quantities thus expressed are subject to all the ordinary algebraic rules applicable to real quantities, and in addition to the relation 7?= —1. The occurrence of this symbol 7 in an identity thus singles out two distinct identities: for instance, if the product of ati and a'+12b' be A+7¢B, we have 4=aa'—6b' and B=ab' + ba'; and in this sense Cauchy, as lately as 1844, still maintained that every imaginary equation was only the symbolic representation of two equations between real quantities. If either or both of the real quantities be variable, the quantity is called a complex variable ; adopt- ing the usual notation, it is then written e+iy=2 In order that 2 may vanish, both « and y must do so, as it is not possible for the real part to cancel the imaginary. But either part becoming infinite renders z infinite, and a breach of continuity in the change of the variable z arises when either x or y is discontinuous ; but, as long as both change continuously, z is also a continuous complex variable.

2. As long as a variable is conceived to admit of real values only, the distances from a fixed point, measured along a right line, are sufficient to represent it. These may be taken positively or negatively, and in both direc- tions, through all magnitudes, from a vanishing amount to values large beyond conception, 7.¢., infinite. But, in- asmuch as a complex variable z=«+zy depends on two perfectly independent real variables, « and y, its geometri- cal realization demands a field of two dimensions. When this is assumed to be a plane, to each value z=x2+1y cor- responds a point P of the plane whose rectangular coor- dinates referred to an arbitrarily assumed pair of axes in the plane have the real values x and y. 'Thus to all real quantities in the old sense correspond the points of the axis of abscissze and to pure imaginaries those of the axis of ordinates. The coordinates of the point P may change quite independently, just as the variables # and y do. If the point P be given, the corre- ¥ sponding value of z is known, and also for a given value of z the corresponding point P is known. The continuous varia- tion of zis exhibited by the motion of Pon acurve. The

complex number may also be written in the following form, which is found as early as Kuler. Joining the point P to the origin O, the line OP =p is called the modulus, and the angle XOP= 6 which this line forms with the positive axis of «, or the prime axis, is called the argument (or amplitude) of the complex a + iy. Thus p= + "22+, cos 0=z2/p, sin 0=y/p, and z=x+iy =p(cos +7 sin 0)=pe®, This, again, shows that the variable vanishes only when x=0 and y=0, v.é., When p=0, since no real angle makes cos +7 sin 0=0. In this way the quantity is represented by rotating through the angle from the prime axis a line whose length is p. The value of the radical 22+ is always taken positively ; the difference of sign arises from a reversal of direction and is indicated by the angle in the factor ¢9, When P is given, p is unique and is determined by cos and sin : that is to say, it admits only of a certain value or of those which differ from it by integer multiples of 27. Thus two quantities are equal whose moduli are equal and their directions parallel. The modulus varies continuously with z, and so does the argument, except when z vanishes : that is, when the curve passes through the origin, the argument then undergoes generally a sudden change by 7.

3. Complex numbers form a system complete in them- selves, and any process of calculation on complex numbers always reproduces a complex number. Thus, as any such quantity is represented bya point approached from a given

**) x x Fig. 1.*

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point, the result of calculation also has a point or points to represent it. This is illustrated as follows.

The addition of the quantity z=x+7y to 2'=x'+iy' produces %=a2+a2'+t(y+y'); the point z has the coordinates x+2', y+y': that is, it is the extremity of the diagonal of the parallelogram ineluded by the lines Oz and Oz'. Y If a third quantity 2/=z"iy" were added on, the result would be represented by the diagonal of the parallelogram ineluded by Oz, and Oz'; and so on. Sub- traetion is the addition of a line with opposite sign. The modu- lus of the sum or difference of two quantities is found by as- 0 ' é x

suming p, cos 6, =p eos 6p' cos 0' Fig. 2. and p, sin 0,=p sin 6/' sin 6', whence p;?=p?+ p=k 2pp' cos (9-6). Thus the modulus of the sum is never greater than the sum of the moduli and the modulus of the differenee never less than their difference. The line zz, in fig. 2 is found by subtracting z from 2, and is thus seen to be equal to*

the parallel line Ov. The multiplication of z=pe? by 2 =pe" gives Z=z2'=pp'c9+ ; that is, we have to measure along a line inelined to the prime axis at an angle equal to the sum of the arguments a length representing the product of the moduli; in order to determine this, the unit of length must be introduced. If this be OU measured along the prime axis, Z is constructed by placing on Oz' a triangle z'O0Z similar and similarly placed to UOz. From this we can proceed at once to division ; as an example, when 2-2, Z'~~2 Z1~~% 2? ing 4, 2'), 2', is homothetie with that formed by z, #, 2".

In like manner we might proceed to powers of com- plex quantities with real exponents: eg., every complex number has distinct nth roots included in the form a/2= X/p. e6+2Kr)m ; then to powers with complex expon- ents; to logarithms of complex numbers: for example, every number has infinitely many logarithms to the base e, which differ by multiples of 277, in accordance with the formula log z=log p+i(@+ 2kr) ; and, finally, to powers with com- plex base and complex exponent. All these in turn lead again to complex numbers, and to such only.

4, In dealing with real numbers any definite range of values is represented by the points of a finite right line; but to realize a definite range of complex numbers we must have recourse in general to a "region" of two dimen- sions of the plane bounded by some curve. For instance, all complex numbers whose modulus is less than p and greater than p' occupy a region bounded by two concen- tric circles with radii p and p' round the origin. All those whose moduli are equal to p form a linear region, namely, the circumference of the circle round the origin with that radius. A region of two dimensions is called connected when we can pass from any point within it to any other point within it without crossing the boundary curve. A quantity is said to be unrestrictedly variable in a region when it can assume all numerical values in this region. It is said to be continuously variable

when all values which it assumes always belong to a finite connected region. Thus a variable is said to be unrestrictedly continuous for a certain value when it can take all the values which belong to a finite region, however small, which includes this value. The variable is restrictedly continuous for this value when the values it takes near this one form a region on whose boundary the value itself occurs, or it may be a region of one dimension. It is discontinuous for this value when the point is isolated, and does not belong to any region. When we know two definite values of a real variable, we know all the intermediate values which it must assume in passing from one to the other; but in the case of the complex variable there is an essential difference: it can pass continuously from one given value to another by infinitely numerous series of continuously consecutive values. In geometric terms, with the real variable we can only travel along the axis

the triangle formed by the three points represent-

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of «, with the complex we can travel along any path whatever leading from one point to the other.

5. When the values of one complex variable w=u+1 are determined by the values of another z= + zy, in such a way that for each value of z within a definite region one or more values can be assigned to w by performing a defi- nite set of mathematical operations on z, then w is said to be a function of the complex variable z. Functions are distinguished as one-valued and many-valued according to the number of values of w which belong to one value of z, as algebraic and transcendental according to the form in which the variables appear, and as zmplicit and explicit according as the relation is solved for wor not. The course of the function w will accordingly be illustrated by points in another plane or planes having the rectangular coordi- nates u and v, and its dependence on z will be geometri- cally a transformation from one plane to the other. A yery simple instance is when w= 1/z, where the transforma- tion is equivalent to geometric inversion. If the explicit function w=f(z) is to be unrestrictedly continuous in the region for which it has definite values, there must be a finite connected area, however small, around any admis- sible value of z, to which corresponds a connected region of w: that is, wand v must vary

continuously when w and y do so. Let z be increased by Az=—Axv+zAy and put w+ Aw=(ut Au) i(v Av) =f(2+ Az) ; then in whatever way Av and Ay may converge to zero we must have lim Aw =0 and limAv=0: in other words, w is continuous for a value z when this value can be included in a region such that for every value z+ Az within it the modulus of the difference mod(Aw) = mod[f(z + Az) — f(z)] = VAu? + Av? is less than any assignable small number.

6. We proceed to give somé elementary examples of functions.

Ex. 1. The power with positive integer exponent, w=" is a one- valued (monotrope) function which is continuous for the entire plane, since w=p"cos m0, v=p™sin m0 are continuous functions of p and which do not alter when the argument is increased by multiples of 27. When z becomes infinite so does w, and thus this value z is a singular one (pole) for the function, as contrasted with a regular one, which is such that a function has a finite value continuously changing with z.

Ex. 2. Any rational integer function of the nth degree in 2. S2)= My + az + age? + ... +2" is one-valued and continuous for the entire plane and has no singularity, except for z= o, for which it becomes infinite (pole).

Ex, 8. The power with a rational fractional inden.

w= sft =pP(cos(0-+2bn) isinZ(0 2k),

where & takes all integer values from 0 to g—1. Each value of & determines at each spot the value of a branch of the function, which is therefore a many-valued (polytrope) one. At the points z=0 and z= all branches have the same value. Thus, if p/g>0, at 2=0 the value of wis 0; atz=o its valueis o. These two points are called branch (eritical) points of the function. If we wish to contemplate the values of the function which belong to one branch, so as to have each branch by itself in general a continuous function, we employ the method of Cauchy: that is, we draw from the origin to the point infinity a curve which does not enclose any space, for Instance, the positive part of the axis ofz. Suppose we let p=1, q=2, then w=preX?t+2kr), where L=0 or 1. Taking £=0, the values of the independent variable and of the function along the prime axis for 9=0 are

z=p and w= p?; along the axis of y when §=7/2 they are z=pi and w=pet™ ; along the negative axis of « when 0=7 they are z= — p and w=pie?™'; along the negative axis of y, when §=37/2, z= — pi and w=pte?™; and along the prime axis, on completing a rotation, when 0=27, z=p and w= — ph. Hence, for any value of p, w is continuous all round the circle, but its ultimate value is different from its initial value.

Thus, as will happen in general with many-valued functions along their branching sections, the values be- longing to points alongside of the prime axis having posi- tive ordinates, however small, differ by finite amounts from those for the corresponding points, however near that line, having negative ordinates. The branch of the function

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so constructed is therefore discontinuous along the prime axis. Accordingly we conceive the plane cut through along this prime axis, and the branch of the function is easily seen to be continuous in the connected surface, which con- sists of the infinite plane so cut through. Riemann per- fected this method of Cauchy and enabled us to keep all the branches simultaneously in view, and thus regard the function as unique and continuous upon all admissible paths without restriction. His process is in the case of a q-valued function to let the variable z move upon qg different plane leaves.

*Thus, as above, when y=1, g=2, taking the case £=1, let us suppose z to move in a second plane; proceeding as before for the points of the primeaxis, we have now0=0,z=p, w=pte™' — ~ ph; and, when 0=2m,z=pand w=pte?™'=pt. Thus, though the rotation has brought w round continuously from the values for small positive ordinates to those for small negative ones, these last differ finitely from the first. Now these final values in the second plane are the same as the initial ones in the first plane ; moreover, the final values in the first leaf are the same as the initial ones in the second ; hence, if the second leaf be cut through os Soe all along the prime axis, as the oe first was, and if we conceive the —~—~————. * leaves to cross one another (as Fig. 3. indicated in profile in fig. 3) all along the cut, we have a connected two-leaved surface, called by Riemanna winding surface of the first order, to each point of which corresponds a definite value of the*

function w=2%, and to each continuous curve in it, whether in the same leaf or passing through both, correspond values of the function which vary continuously ; every closed curve which crosses the branching section either an even number of times or not at all leads finally back to the initial value. This conception can evidently be extended to surfaces with a greater number of leaves corresponding to functions admitting of a greater number of values.

7. In considering infinite series we must explain the con- ception of absolute convergence introduced by Cauchy: an infinite series of real quantities is absolutely convergent when the sum of its positive terms taken apart, and like- wise that of its negative terms taken by themselves, are each finite. When these are not separately finite, a series which converges for some value of the variable is semz-convergent. A complex series 2(u+7v) converges absolutely when the w series and the v series are both absolutely convergent. Hence it can be shown that the necessary and sufficient condition that a complex series may converge absolutely is that the series of the moduli of its terms converges. Such a series presents the same value if the sequence of its terms is rearranged according to any law whatever. Thus an infinite series of ascending powers of z the complex vari- able, dy+a,2+dg27+...4n2”...=f(z), with complex coefficients, 1s absolutely convergent for any value of z for which the series A)+A,p+ A,p?+...Anp”... formed by the moduli of its terms is convergent; and vice versa. In geometric language, if such a series be absolutely conver- gent for the point corresponding to any value of z, it is abso- lutely convergent for all other points equally distant from the origin of coordinates ; these are therefore situated on a circle. Itis also absolutely convergent at all points within this circle, and therefore the region of convergence of this series is always a circle round the origin. The radius of the circle of convergence of a series is the greatest value of p for which the series of moduli converges. It is found by the con-

— F ; , A dition that as increases indefinitely we must have aa <1 n

“.. As the terms of an infinite series of powers

A, : ; are one-valued, the series itself, so long as it converges, is a one-valued function of the complex variable, which does not become infinite

anywhere. It can also be proved that this function is continuous: that is, if z and z+ 6 be values of z for which it converges, then lim[,/(z + 8) — f(z)] =0, when S=0,

8. When a variable quantity depends upon two others in such a way that, if their values are given, its value is

or p<

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known, it is of course a function of them; but, inasmuch as for real values of « and y, when ~=x+iy) is given, we know both # and y, Cauchy considered any function 7'(2, 7) to be a function of z On the other hand, Riemann considered a function /'(x, y) to be one of z when it contains az and y only in the combination x+7y. In fact, if we have

6 6

df=— ay dy for any indefinitely small increments ae

dx and dy, inasmuch as this may be written Vor. 26r : 1/6f oF df= 5 & = a (dx—idy) + 5 (s-i = (da + idy) and if dF must always be zero as long as d(x+7y) vanishes, éF oF ; Sane then we must have 5 7 a 0. This, which is the con- dition that, when « and y are perfectly unrestricted (and so may each be complex), they may enter only in the com- bination «

; dF 1/6Ff .é6F xe U/OE aeons

in general = = 3 (+4 .) e7 210 4. 3 & —2 =) depends

not only on the value of z but also on the direction 0 of the ow

that is, for each point z, in case the function is monogeneous, there is a derived function with regard to the complex variable, independent of the direction in which this vari- able is supposed to change. If the relation do not hold, there isa different derived for each such direction. When we separate J' into its real and imaginary parts, we may write #=u-+i, and the preceding relation becomes

8 dv .fdv du du dv éu dv

e-ytilets) =0, NCO oy ee ae Sota Sy oy

Hence further a2 gan ° and satya 0:

9. A function of a complex variable which is continuous, one-valued, and has a derived function when the variable moves in a certain region of the plane is called by Cauchy synectic in this region, and by Briot and Bouquet! holo- morphe, to indicate that it is like an integer function, for which this property holds throughout the entire plane. Weierstrass styles it an analytic function. The property that dw/dz is independent of dy/dx furnishes a geometrical relation between the figure which w describes in its plane and that which z describes. In fact, let values w,, w,, ws; correspond to the values z,, 2, 2, then, if <3 — 7 = 1, as already observed, the triangle for the values w is similar and similarly placed to that for the values z; in that case Ws Ws — Wy

—w pS ae C " PUPS ded ae But, if we suppose 2, to close up to z,,

ag — % then w, closes up to w,, and, if z, close up to z,, w, closes up tow. In the limit the equality of these quotients for all directions of variation of z shows that the figure which w describes in its plane is in its infinitely small parts similar to that described by z, and two intersecting curves

SSS

1 The word monodrome is used by Cauchy and monotrope by Briot and Bouquet to indicate the case in which, supposing z has to move in a certain region, all the paths that.lead from an initial point % to any point z within the region lead to one and the same value of w; in other cases w will be polytrope. When w is holomorphe in a region except at a point 2, where it becomes infinite without 1/w ceasing to be holomorphe near this, this point is called a pole or an infinity of w. A rational fraction has the roots of its denominator as poles; and a function otherwise holomorphe having poles is called by these writers méromorphe. Some writers prefer the terms integer and fractional functions.

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in the plane of w cut at the same angle as the correspond- ing curves in the plane of z, provided always that d2/dz is neither zero nor infinity.

10. Let z+ be a complex value within the circle of con- vergence of the series f(z) =dy) . ay2 42 +...an2”..., then we have

Seth) =a) t+ ay(2 th) +a(2+rhPt+...tan(z+h+ ... Now, if we arrange this absolutely convergent series by powers of &, the coefficients are infinite series which can be proved to be the successive derived functions of f(z) ; thus, when a one-valued function f(z) can be expanded ina series of powers of z, the expansion can be made only in a single manner. We have therefore

A” (nr)

*AetM=sO+PFO*BP OF +I OF oo*

which is Taylor’s theorem for a function given by an in- finite series of powers of a complex variable.

11. We proceed to examine at how many points within a circle of convergence of radius # the function /(z) vanishes, 7.¢., has a root. In the first place it can be shown that, if R be finite, the function cannot vanish at infinitely many points in the circle without vanishing identically, that is, being zero everywhere in the circle. Hence we can only have a finite number of roots in any finite portion of the plane, and we may suppose noné of these to lie upon the boundary circle. If the function vanish at any point z,, then, when we take the expansion

a 2-2 z—2,)% Ae) =f +72) = fla) +e) + GH 7”) + be, we have f(z,)=0. We may also have f(z,)=0, f’(z,) =0, &c. Suppose that the first of these which does not vanish is f™(z,), or that the function f(z) vanishes for z= z, to the Z ih 2-2 order a, then oo Ne i JO(a) + eri FON + &e. Now let this quotient be rearranged according to powers of z, and suppose the function to vanish at 2, to the order 6, we can expand by powers of z—z, whence we Fe) | ;

Cae ae ultimately =¢(z),—a series not vanishing anywhere within the region. If j(z) were a ra- tional integer algebraic function, we should find ¢ (z) a constant, and we see thata+ B+...&c. =n: that is, such a function cannot have more than roots in the region of convergence, 7.¢., in the entire plane. Taking logarithms, we have log f(z) = alog(z— z,) + Blog(z—%) +... +log (2). Hence, taking for each logarithm on the right one of its innumerable values, let z move from any point A round the circumference of the boundary circle, keeping its interior on the left. Since z—z, vanishes only once within the circle, namely, for z=z, log(z—2,)=logp+70 will become logp+%(@+ 27) when z returns to A. Similarly log(z—2z,) will differ from its initial value by 2a; and so for the others. But, as ¢(z) does not vanish anywhere in the circle, log¢(z) will return to its original value at A. Hence, if there be v vanishing points or roots within the circle of convergence, the value of log f(z) changes by 2z7v, when z travels all round the circumference. Conversely, if the logarithm alter by 2c7v as z travels round the circle of convergence, the number of roots within the circle is v.

12. This theorem of Cauchy's at once leads to the fundamental theorem of algebra, that every equation of the nth degree f(z) =a) +az+ag?+ ... anz"=0 has n complex roots. For we can take the radius of the circle so great that the value of a,z"" far exceeds that of the other terms ; and, writing f(z) =an2(1/P), the modulus of P can be made as small as we please. Hence log f(z) = log(anz") + log(1+P). Now as we go round the circle log(1 + P) differs as little as we please from log(1) = + 2him, and so, whatever value we begin with, as the corresponding

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logarithm varies continuously, the value of log(1 +P) will not have changed by a multiple of 277 when we return to .the point we set out from, But, since the point z=0 is

within the circle, log(anz") = nlog(anz) changes its argu- ment by 2.27¢ in consequence of the circuit. Hence log f(z) changes by 27m: that is, in the circle of conver- gence whose radius is as large as may be required there are always » values for which the rational function Apt m2+a27+ ... +an2

vanishes. Some of these may be coincident ; but in all cases the total number of the orders of the different vanishings is n° 13. If two given points z and Z be joined by any curve of finite length, and if we take as many intermediate points as we please 2),2),...2n-1 upon the curve and form the sum FG 4-40) +14) (22-1) + F(a) (2-22) ++ +S (en -1(F—-2n-1)) then the complex limiting value to which this sum tends as n is increased indefinitely is called the definite integral of the function f(z), formed from z to Z along the path prescribed by the equation of the curve. Having first – examined, after the manner of the theorems regarding real _ integrals, under what conditions this sum has a determinate limiting value, we have next to take into account that a definite complex integral differs essentially from a real one in that the path along which the variable z may travel from one limit to the other is perfectly arbitrary. We have therefore to investigate this problem: When is the integral of a complex function a unique function of its superior limit independent of the path of integration? In order to answer this we must recall an important theorem concern- ing the reduction of a double integral of a function to simple integrals along the boundary curve, which is in fact a case of Green's theorem (see INFINITESIMAL CaALcu-Lus, vol. xiii, p. 58) when confined to two variables, 14. Suppose P and @ are two real functions of « and y which are everywhere within a certain boundary finite and continuous, the theorem is then that the double integral

8Q 6 ih (= – 5) aed taken over the entire region is equal to the simple integral | (Pdx+Qdy) taken along the entire

boundary of the region.

Taking the positive directions of the axes as usual, we define the positive direc- tion along the boundary to be that for which the bounded surface is on the left hand; then, if dy | we have to exclude any portion, ¢9., a circular Space altogether within the external boundary, so that the points within It are to be regarded as not included in the 're- gion, the positive direc- tion of the boundary is that indicated by the arrows in fig. 4. In all the simple integrals the inte- gration must be effected in the positive direction thus explained, 8Q

To integrate va J, exdy with respect to «, let us split

up the region into elements by parallels to the axis of «. Select any one and, reading from left to right, denote the values of Q where the element crosses the boundary at the entrances by Q,, Q., &c., and at the exits by

/ rey QV', Q"; &e.; then [xae- —-Q,+Q'- Q.+Q" — &e., and pe thus sued = [Quay + [ray + [Oxy + [O'dy—Ke

Fig. 4.

Now in each of these integrals y goes through all its values from the least to the greatest, therefore dy is always to be taken positively. But, denoting by dy,, dy,, &c., and by dy', dy", &c., the projections on the axis of y of the ares of the boundary cut by the element as above, when we take the positive direction of the boundary into account, we have dy= —dy,= —dy,=&e. =+dy'=+dy"=&c;

thus SS Se ddy = | Q,dy, + | Q'dy' + | Qody, + ke. = | Ody,

where this is taken along the entire boundary in the positive direction. In like manner, dividing the region into elements parallel to the axis of y, and denoting the values of Pat the entrances, proceeding from below up- wards, by P;, P,, &c., and at the exits by P, P', &., we

P have a; ae a – | P\ dx + | P'dz – | P,dx + &c., where

dx is positive. Hence, as before, taking account of the positive direction of the boundary, dx=+dz,= +dz,

5P = &e.= —dx'= —dx"=&c., and consequently wh > mi

=— | P, dx, – ' Pda! – | Pdx, — &e. = — | Pdx, taking the integral in the positive direction along the entire boundary. Accordingly, putting these both together, we have the tone! 1 sg 6 surface integra, L & i dxdy = | (Pdx + Qdy), taken positively along the entire boundary. 'This proposition may be extended to complex values: when P= 2" +7P" and Q =Q' +7Q"", as the proposition is already proved for real

8Q 6P ay a values, we can put wh & – =) dxdy = vA i – %) dudy

.718Q” 8 P” ‘e¥ = – A dxdy ; then, applying it to each of these,

8Q 6

Vite ca i) daedy =| (Pax + Q’dy) + if Prax + Q”dy) dx Oy

= | (Pdx+Qdy). We assumed that there were no branch-

points within the region, or other points at which P or Q are discontinuous. If there were such, we should have to surround them with actual closed lines, as small as we please, and thus exclude them, introducing these lines as parts of the boundary of the region.

15. We can now let P=f(z), Q=i(z). We see that, if J(2) be an analytic function of z without exception in any

simply connected region, | f(z)dz=0 when taken all round ply g

the boundary of that region. If we take any two paths from z) to Z in this region, since these paths from z through A to 4 and back through B to z include such a region, we have L(~AZBz) =0 or I(~AZ)+1(ZBz)=0. But, as the value of the integral 1(7Bz,)= — I(zBZ) along the same path, the last equation becomes J(z,4Z) =J(z,BZ), or the value with which the integral starting from z arrives at Z is inde- pendent of the path travelled under the conditions sup- posed : it is a function of the upper limit only. The path zBZ is said to be reconcilable with the path zAZ. If the region within which /(z) is an analytic function be

multiply connected, J J(2)dz vanishes when taken positively

all round the boundary. The integral has a definite value along each separate boundary curve. For instance, if within the region we take a closed curve which includes a simply connected region, as a in fig. 5, the integral along this curve vanishes, But for a curve which includes a region along with a boundary curve, as f in fig. 5, the in- tegral has the same value as it

has for this boundary curve. Whence, if a function f(z) which has to be integrated lose the character of an analytic function in isolated places,

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74 VARI these must be excluded by surrounding them by curves as near them as we please and taking these curves as part of the boundary ; it can then be integrated in the multiply con- nected region so found. The integral for the boundary of sucha place may vanish or not. If not, the integral function is many-valued and branches at this place. If it vanish, the integral remains one-valued, but the point may still be a singular one for the integral : that is, the integral may at it Fig. 5.

cease to be finite or to be an analytic function.

16. If we know the value of any function and those of all its derived functions at any one point, and if we know that it is an analytic function within a finite connected region,—that is, that it is unique, continuous, and has a determinate first derived,—then Taylor's series for it converges throughout a circle round this point, which is included within the region ; and for each point within the region the function can be developed in a similar series. In other words, every function which is analytic without exception in a connected region can be expanded around each point of the region in a series of ascending positive integer powers. The method in which we show this is due to Cauchy. Let f(z) be an analytic function with- out any exception in a simply connected region (including the boundary) ; then, if t=u+v be any point within the region, the quotient Ae) is likewise an analytic function within the region, only the point z=¢ is a singular one, Surrounding ¢ by a circle whose radius p is as small as we please, we obtain a region bounded by two curves in which the quotient is analytic without exception. Hence, inte- grating the quotient along both boundaries, the sum of both integrals vanishes. In regard to the small circle put z—¢t=pe; therefore we get dz=ipe"d@, and for it

| Oa, -7 | A(t + pe")d@. Now f is continuous near

- 0

z==t, Hence p can' be taken so small that for all values of 6 the difference of f(t) and S(t+ pe") may be less than 6, where the modulus of & is as small as we please. Hence

, far ; . [2 ;

a | S(t + pe®)d6 and 7 | "f(t)d0 = 2enf(t) differ by a quan-

0 0

tity whose modulus is less than that of 278: thus, what-

ever be the value of p, we have 7 | "At + pe)d6 = 2imfi(t). mG ; ° 1 z LO = 2onf(t) =(, or x (t) eee | Aa, when the integral is taken positively along the outer boundary, and so along any curve which includes the point ¢ This is what Cauchy called the residue of the quotient function relative to its infinite ¢ We thus see that, when the values of a function J(z) are given along'a closed curve, and the function is analytic without excep- tion within this curve, the value of J(2) can be found for each internal point by means of a definite integral.

It was assumed that /(z) has throughout a derived.

Hence we have

This can be exhibited as a definite integral. In fact flt+At)—f) 1 dz : ar eeu F(2) st GoD Aiye—d) ; whence, letting

. 1 2)dz . At converge to zero, '(t) = Gn ees , where the integral may be taken along any path round t, provided it remain within the original region. But it follows that through- out this 7"(¢) also is an analytic function, for, as before,

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ny 21 f fede n nm |_fed f (0-35 /E In like manner f¢ =F aan Thus for all points in the region the function has higher deriveds of all orders, and they are all analytic functions. 17. We can now develop the function /(¢) in a series of powers. Let us select a point a, otherwise arbitrary, such that the

largest possible circle which can be drawn round it without going outside the region may include the point ¢, for which the function is to be expanded. For every point on the circumference of this circle we have

1

mod(¢ —a)

gent series. Now, substituting this in the equation

oo | fa, and taking the circle as curve of inte- ; 1 § (#2 AG gration, we find I) =5 { | FO te (—a) J a) ee +(t-a)? aie ye + &e. \ , which by the equations already

G-

established may also be written /(¢)=/(a) + (¢- a)f'(a)

t—a)?_, t-—a)> ., oD (ay EOD rays… verges unconditionally for all values of ¢ within the circle round @ which does not go outside the original region. This is Taylor's series for a complex function, and this deduction of it shows definitely how far its convergence extends, namely, to all points ¢ which are less distant from a than the nearest point of discontinuity or of ramification. Thus a function whose value, as well as those of all its derived functions, is known for a point is analytic in the neighbourhood of this point only when a finite circle, how- ever small, can be assigned within which this series con- verges. The series arrived at will, in general, not converge for all values of ¢ within the original region in which F(a) was assumed to be analytic. But we can vary the centre a So as to arrive at a circle, and thereby at a development, which embraces any such required point. If ¢ be at a finite distance, however small, from the circle, draw any curve from a to ¢ which shall be always at a finite distance from the boundaries. Let the circle round a meet this curve in the point a' between a and ¢: then by means of the series we can calculate the function f and its deriveds for a point on the curve and within the circle as near as we please to a', and thus take this as the centre of a new development all whose coefficients are known. The new circle of convergence cuts the curve in a point a", which is certainly nearer to 4. The continuation of this process must ultimately lead

to a circle which includes the point é, since the radii cannot diminish below a finite assignable quantity, the path aa'a"...t being always at finite distance from the boundaries. By this process we can also carry on an analytic function that is defined by a series of powers beyond its circle of convergence into a region which does not contain any singular point. Each such series of powers defines the function for a determinate circular region of convergence, and is said to be an element of the function. Different elements of the function are got according to the centre chosen for the expansion, and even the same value of the argument belongs to different elements of the function; but for a unique function the different elements must lead to the same value for the Same argument. 'I'wo or more analytic functions, however defined within given regions, are to be regarded as belong- ing to the same function only when the elements of one function can be derived from those of the others.

18. We conclude with illustrating by a few applica-

This expansion con-

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tions to elliptic functions of a complex variable. Calling R(z)=(z—-a)(2-b)(2-e)(2-d), then (2) will be ex- pressed as a unique function by means of a two-leaved Riemann's surface. Its branches take the same valucs at each of the points a, b,c, d. Let the leaves be pierced through and joined transversely along the lines a to 6 and etod (fig. 6). Assume that in the upper leaf ./R(z) at the origin is + and inthe under Y, leafis—&. Every path which, when projected on the upper leaf, goes an odd number of times round an odd number of branch- points leads from one leaf into the other; on the other hand, a path which goes an even num- ber of times round an odd number of branch-points, or which goes round

x

Fig. 6, an even number of branch-points, ends in the leaf in which

it originally began. Now let us investigate what changes

dz —

——— z)d; W. de- TRO and to { RG) z when z scribes part of a vanishing circle round the branch- point a. First, let z=a+pe'®, then dz=iped0, R(z) =pel{a —b+ pe')(a—c + pe'®)(a — d+ pe) = pe#S. Hence EL >») =a yphedte i]*

JRO) apreto} Jé and / R(z). dz = ipiet#"dd VS. But, when p is evanescent, lim /.S= \/[(a—b)(a—c)(a — d)]=T7, and is therefore neither infinitely great nor evanes- cent; integrating therefore between 0) and 0,, we find

= 8 Las en lim Vp. nH ced and lim Via 'e6d0, Since these

6

vanish when p does, and the other factors are not infinite, d eos we see that, when | Rin and | V R(z)dz are taken along

paths surrounding indefinitely closely a single branch- point, both these integrals vanish.

If now we confine our attention to the integral of the first kind, let z go from the origin in the upper leaf along a straight line to near the point a; then the

in value accrue to |

, dz . : ; ' integral ee putting y=me in z=x2+iy=(1+u)z, Zz may be calculated as for a real variable, and it increases ae by | Srey Next let z go round a in a vanishing circle,

the integral gains nothing ; then let z return to the origin along the same line, it'proceeds now in the lower leaf; thus both R(z) and dz have signs opposite, but values equal to, what they had on the outward path. Thus on the whole by travelling this elementary contour (lacet, Schleife) from O to near a, round a, and back to O, the value of the in-

~~. a dz tegral is increased by A = 2 | . 0 J (2) have for the elementary contours or loops round 8, c, d the three incr | ‘oul | c~~

ements B=2/ ———, C= —+s—, and

D=2f —@ ov Lz) ov HH)

| oVR(z)

19. Now, if the loop round a be described twice in suc- Cession, the integral changes by A—A=O and g0 on.

But if, after a is once described, 6 is described once, the change is A—B. If then z go straight to any arbitrary

In like manner we

op

point for which the value of the rectilinear integral is w, the value along the entire path, or along any path recon- cilable with it, is d-—B+w. The two loops round a and 6 may be taken as often as we please before going by the straight course from O to z; thus A — B is a period of the integral, which is accordingly an infinitely many-valued function of z. As there are three independent differences of any four quantities, it would seem as if there should be three periods; but we can show that A—D arises from a combination of d- Band A-C. Im fact, describe round the origin a circle to include all the four points; then let 2 go straight from the origin to a point p on this circle, travel round it positively, and return from p to the origin. The integral has along this path the same value as along the four loops in succession, since between the two paths there is not any singular point and both have the same origin and goal. Thus the value of the integral along this path is 4-B+C-D. But, when z goes round the circle from p, the radical changes sign four times. If loops be described from p round a, 6, c, d, they are recon- cilable with the circumference of the circle. Hence the radical has the same sign when it returns to p as that it set out with; accordingly, since along Op and pO the radical has the same sign, the integrals J(Op) and J(pO) cancel, and the integral along the four loops in succession

has the same value as along the circle alone. To find this value, put z= pe' and it becomes

4 (tet ed 0

Md Sma ~ = But, as

LEDC e2)

the radical is unique along the circumference of the circle, the value of this integral is the same whatever be the value of p, provided it be large enough to include all the singular points. Hence we can let p increase indefinitely and then this has the limiting value zero. Consequently A-B+C-D=0, or A-D=A-C-(A-B); thus the third period is composed from the other two. Hence the periods reduce to. d- Band A-C. It can thus be shown that all values of the integral for all possible paths of inte- gration between O and z are included in the two formule mA —B)+n(A—C)+wandm(A- B)+n(A-C)+A-w.

20. If a new variable z' be introduced, homographically related to z by the equation a+ Bz + yz + dz' =0, it trans-

' dz. forms the integral | JRO into (ad — By) | JR.G The coefficients of £, (z') can be determined so that it may differ only by a constant multiplier from (1 — 2)(1 — £2z?), As & is given by a reciprocal quadratic equation, it is always possible to choose such a value that its modulus may be less than 1. In other words, it is possible by a homographic transformation to convert the quadrilateral a, 6, ¢, d into a parallelogram, the new origin being at the intersection of its diagonals (fig. 7). This leads to Jacobi's form of the integral when & is supposed real. The inte-

1 d: gras along the loops are bere d= 2 f a, 1/k dz as da 5 = 3) ES 7 nae C = 2 a ou. ie i V1 — 2)(1 — h2) I V (1 —2)(1 — #2?)

Pa ra –

I. V(1-2)(1 – 22) Hence A-C= .

A — B is the integral taken consecutively along the loops of a, 6; but for these paths we may substitute the following: proceed straight from O to a near a, then round a back to a, then straight from a to # near 8, next round 6 back to f, then again straight to a, and straight back to O. The integral takes the same value by this path as by the other, since there is no singular point between them and both paths have the same origin and

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goal. Now the radical changes sign as 2 goes round a, and again as it goes round 6; hence it returns to AC with the same sign. Thus Oa is travelled in the

two directions with the root having the same sign; hence J(Oa) and J(«O) cancel. By de- creasing indefinitely the radii of the circles, the circular integrals vanish ; and, as the root is negative along af and positive along fa, the value of A — B reduces to the negative double value of the in- tegral from a to f, that is, from a to 6 for vanishing radii; thus

j 1k .

acetal) aa grals required are now only between the limits 0, 1, and 1/k, so that. they do not cross any singular point. In case & is a positive proper fraction we have in Jacobi's notation A =2K, A—-C=4K, 4-B=2K'; therefore all

, a dz values of the elliptic integral | » VGA By ever be the path taken between the limits 0 and gz, are included in the two formule 4nK + 2mikK'+w and 4nK+ Imi K"+2K-—w. Hence the inverse function z=sinamw is doubly periodic for 4K and 22K', thus—

Fig. 7.

The rectilinear inte-

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VARIATION AND SELECTION

T is not proposed in the present article to trace the successive steps by which the general doctrine of the origin of species by descent with modification has come to gain acceptance among naturalists (see EvoLuTion). The present problem is concerned solely with the deter- minant factors of evolution, with searching out the mechanism of the evolutionary process, and of discerning if possible such order as may lie under the apparent flux of change. Yet a brief retrospect of the essential views of successive evolutionists is still necessary, but only in so far as these have been concerned, not simply with the empirical evidence for descent with modification, but with the deeper attempt to explain the rationale of this process, to show how it is that modifications come to arise, persist, and increase at all. In other words, just as there are these two essential aspects of the doctrine of evolution, which must on pain of immediate confusion be clearly kept apart, so it is necessary to distinguish between the corre- sponding sides of its historical development, and, passing beyond the simple hypothesis and evidences of descent, consider the attempts to explain the actual process of

modification.

Theories of Variation.

If we pass over the speculations of the earliest evolu- tionists—De Maillet, Maupertuis, Robinet, Bonnet, &¢.— as too vague for rapid summary, and note that Linnzus was not quite a consistent creationist, since he admitted that many species may be simply fertile hybrids, the his- tory of definite speculation as to the factors of variation may be fairly said to begin with Buffon, whose distinct though covert suggestion of the doctrine of descent with modification was supported by emphatic insistence upon the importance of external conditions. He endeavoured to show how "natures, instincts, and most inward quali- ties" are modified through bodily habits, how new functions seem to arise in response to new conditions, and how changes in climate, food, and other conditions of life bring about direct modifications in organisms exposed to them. Kant, on the other hand,

viewed the evolution of species as related essentially to the mechanical laws of the organ-

VAR—VAR

sin am(4nK + 2miK’ + w) =sinamw

sin am(2(2n + 1)K+ 2mK’ — w) =sinamw. This last shows that sinamw takes the same value for two different values of w within the same period. In fact, in the plane of w mea- sure a series of par- allels (see fig. 8) to the axis of ordinates at distances 4K, and to the prime axis at distances 2K’, then the plane will be di- vided into rect- —4 angles such that in each sinamw_ goes through all its values

2K.

Fig. 8.

and has equal values at corresponding points of differ- ent rectangles: thus, whatever it is at P for w=u+w, it is the same again at P,, P,, and P,; at Q, where w= 2K —u+i(2K’ —v), it has the same value; at /, where w=2K +u+iv, and at S, wherew=4K—u+i(2K’ —»), it

has the equal and opposite negative value. The value of sin am w vanishes at the points marked in fig. 8 by circles and is infinite at those denoted by crosses, (B. W.)

ism itself, although in his latest writings he allowed for the influence of geographical distribution, food, &c., noted the importance of selection in artificial breeding, and even hinted at the notion of struggle for existence, which was soon afterwards more clearly emphasized by Herder (Jdeen Herder! z, Phil. d. Geschichte, 1790) in a striking passage, which | may be briefly quoted in free translation: ‘All is in struggle, each one for himself. . . . Space is too small for 7 the number. . . . Each genus looks after itself as if it a were the only one. . . . In this way the whole was pre- served, . . . Thus were forces cradled, and limbs counted,

and tendencies determined, and the earth came to bear

what it could.”

Erasmus Darwin (Zoonomia, 1794) believed that the Brasm organism has the faculty of improving by its own inherent Darwm activity, that it has the power of attaining new parts attended with new propensities. Yet the strongest and | most active animals are those which propagate and hand | on improvements. Transformations, too, may be produced | in part by the exertions of the organism in consequence of its desires for food, security, and reproduction. Changed | conditions, such as climate, have an indirect influence in changing desires, and thus actions, and so finally struc- | ture; and they may also operate directly. Treviranus Trevir (1802-1831) assumed an indefinite variability of the organ- @0US. | ism, with considerable power of adaptation to surroundings, and even anticipated much recent speculation in his sug- gestion of a possible factor of modification in the union of sexual elements. The well-known theory of Lamarck Lamar (1801-1809) laid special emphasis on function and en- vironment ; for, though the sense of need in association with suitable environment calls out a succession of efforts, and so originates incipient structural modifications, it is | to increased functioning that the increase of these modifi- cations must be ascribed, while similarly disuse explains degeneration. Changed conditions produce new wants, a nutritive and reproductive ; hence changes in climate, or the like, change the organism by changing its habits. Rapid increase is checked by other organisms: the strongest and best-armed for attack devour the weaker, and the less

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perfect genera are kept down by the more perfect. The less definite view of Goethe included, besides recognition of the conservative or centripetal force of heredity, that of a progressive or centrifugal tendency to adaptation to environment. Oken (1809) similarly regarded all pro- gress from his primeval '" Urschleim" as having been in terms of its interaction with the external conditions of life. In 1813 Wells made his now well-known suggestion of the importance of natural selection in determining the varieties of the human species; and in 1831 Patrick Matthew published his much more developed, yet equally disregarded, statement of the same doctrine in its more general applications. In 1828-30 Geoffroy St-Hilaire, afterwards ably succeeded by his son Isidore, denied inde- finite variation, regarding function as of secondary im- portance, and laying special stress on the direct influence of the environment: for instance, it was not so much the effort to fly as the (supposed) diminished proportion of carbonic acid in the atmosphere which determined the evolution of birds from saurians. The veteran geographer Von Buch naturally inclined to emphasize the influence of geographical isolation (locality, climate, soil, food, é&c.), and laid stress on the restriction of the area of possible sexual union as bearing upon the origin of varieties. The embryologist Von Baer (1834) dwelt especially upon the organismal nature of variation, on the unfolding, as it were, of new structures ; and Schleiden (1838) and other naturalists more or less distinctly advanced similar opinions. In 1844 appeared the Vestiges of Creation, which in its later editions (1853) formulated an hypothesis of progress (1) by rhythmic impulse through grades of organization, (2) by

another impulse tending to modify organic structures in accordance with external circumstances. In 1852 Naudin argued for the formation of new species in nature in a similar way to that of varieties under cultivation, further attaching great importance to an assumed " prin- ciple of finality," apparently a kind of organismal fate. Herbert Spencer, whose weighty arguments for evolution date from 1852, laid special stress upon the modifying influences of environment, this involving changes of function, and so ultimately of structure. Finally, in 1853 Victor Carus argued fora progressive adaptation to chang- ing external conditions. An undefined hypothesis of in- ternal modifiability appears also to have floated before the mind of Owen.

In this succession of variational theories we recognize the repeated general insistence upon every separate factor in the problem,—organism, function, and environment,— the successive authors, in fact, almost falling into as many schools, Yet these are singularly unprogressive : the same hypothesis is stated again and again, but always fails to carry conviction; many employ the merest abstractional explanations, in terms of what is simply the old pre- physiological " vital force" (see BroLocy), or attempt to eut the knot by the more or less open introduction of a deus ex machina. Yiven the more definite and scientific theories of Erasmus Darwin, Lamarck, Geoffroy, and Spencer fail adequately to establish in a sufficient number of concrete cases the supposed potency of environment or function, much less of internal or volitional moods, in de- termining extensive changes; moreover, they are con- stantly confronted by cases in which any one set of changes seems to take place independently of the other. Hence, despite the deep and unanimous conviction of so many biological thinkers as to the origin of species by evolution, the essential problem remained unsolved. Fr, until some explanation, rational and concrete, detailed yet universal, of the origin of species should be reached, the cautious naturalist could not feel justified in accepting as a scientific certainty a doctrine which rested so largely upon unde-

monstrable grounds. Any really new attempt at estab- lishing the doctrine of evolution had thus, not simply to reorganize and strengthen the empirical

evidence, by marshalling beside the generalizations of morphological unity of type the facts of more strictly historic bearing,— distributional, paleontological, and embryological,— but also to meet this deeper theoretic want by showing not only that evolution has taken place but how. Hence the import-

ance and rapid acceptance of the Origin of Species (1859), Charles For it is evident from Darwin.

for which the time was fully ripe. the preceding historical outline that the view still fre- quently promulgated of the exclusive and, as it were, catastrophic importance of this work in the establishment of the doctrine of evolution must be replaced by a more uniformitarian and, so to speak, less creationist view. It should not seriously be supposed that the theory of descent which had been held in one form or another by the leading biological thinkers of that and the two preced- ing generations, with almost the individual exception of Cuvier, had been decisively abandoned by men of science, or that the public which had purchased ten editions of the Vestiges of Creation in as many years, and which took up the first edition of the Origin of Species on the day of publication, could be quite unprepared for the acceptance of the major thesis of both works. Yet that a lull had taken place is also unquestionable, for the failure of wave after wave of speculative effort had produced a widespread feeling of discouragement, and a tendency to concentration upon more concrete and smaller (for the most part Linnzan or Cuvierean) problems alone, since of these the solution was comparatively sure. The dramatic coincidence between Darwin's and Wallace's conclusions! soon helped to gain immediate attention to the new theory; and this was thoroughly developed and retained by the prompt appear- ance of the first and second editions of the Origin of Species. Without entering upon a review of this classic treatise, much less a retrospect of the controversy it pro- voked, it is evident that it was upon almost all sides so much stronger than preceding attempts, its central doctrine so lucid and obvious a statement of the everyday facts of life, its mode of presentation so temperate yet so forcible, its self-criticism so frank and unconcealed, that its marvellous success was owing far more to intrinsic merit than favour- able circumstances. The required re-statement of the evidence for the historic fact of evolution was at last learnedly and

forcibly done, and the salient difficulties in its way, like that of the imperfection of the geological record, admirably met ; yet this portion of the work sinks into comparative ineffectiveness beside the long-sought modal explanation of the process proffered in the theory of natural selection, which was soon seen to throw a new and searching light upon the smallest details of structure, function, and distribution,—in fact, to afford the instru- ment of a new and systematic interpretation of organic nature. Of this doctrine, then, a brief account is needed, and this may be best given by following as closely as pos- sible upon the lines of the magnum opus itself, although the full title of this—The Origin of Species by means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life—is its own best and briefest summary.

THEORY OF NATURAL SELECTION.

After mentioning that his first light upon the origin of Analysis species was derived from his early distributional studies, a Origin Darwin points out that "a naturalist, reflecting on the i iathe

mutual affinities of organic beings, on their embryological relations, their geographical distribution, geological succes- sion, and such other facts, might come to the conclusion that species had not been independently created, but had

1 Journ. and Proc. Linn. Soc., 1858.

Varia- tion under domesti- cation.

descended like varieties from other species. _Nevertheless, such a conclusion, even if well founded, would be unsatis- factory until it could be shown how the innumerable species inhabiting this world have been modified so as to acquire that perfection of structure and co-adaptation which justly excites our admiration." Again, "It is therefore of the highest importance to gain a clear insight into the means of modification and co-adaptation. At the commence- ment of my observations it seemed to me probable that a careful study of domesticated animals and cultivated plants

would offer the best chance of making out this obscure problem. Nor have I been disappointed: in this and all other perplexing cases I have invariably found that our knowledge, imperfect though it be, of variation under domestication affords the best and safest clue." Hence the first chapter is devoted to an account of those ex- tensive studies of variation under domestication which later formed the subject of a separate work.

A comparison between individuals of the same variety of culti- vated plants or animals shows a greater degree of variation than between individuals of any one species or variety in nature. This higher variability of domestic productions is to be ascribed to the less uniform conditions of their upbringing, perhaps in part also to excess of food. Exposure to new conditions must be continued for generations to set up any great variation ; but this, once set up, con- tinues indefinitely. Changed conditions may directly influence the whole organization or certain parts alone, or act indirectly through the reproductive system. With respect to the direct action, the nature of the organization seems more important than that of the conditions, The effect on offspring may be definite: ¢.g., size may depend upon the amount of food, colour upon quality of food, thick- ness of skin and hair upon climate, &c. But indefinite variability is a much commoner result of changed conditions, and has probably played a much more important part in the formation of our domestic races. The reproductive system is peculiarly sensitive to very slight external changes. Many plants and animals will not reproduce in domestication, even though individually vigorous ; others, though weak and sickly, breed freely. Hence we need not be surprised at the reproductive system acting irregularly and producing variations. But that variation is not exclusively associated with sexual repro- duction is demonstrated by the case of plants "sporting" through bud- variations. Such cases, moreover, prove the nature of the organism to be of more importance than the conditions.

Changed habits and use and disuse produce an inherited effect ; witness the lighter wing- and heavier leg-bones of the domestic duck, the enlarged udders of milch-cows, or the drooping (unpricked) ears of domestic mammals, Variations are often definitely correlated : short-beaked pigeons have small feet ; hairless dogs have imperfect teeth ; and blue-eyed white tom-cats are deaf. Hence selection of any one character will probably

modify others indirectly. Although the laws governing inheritance are mostly unknown, probably most, if not all, characters tend to be inherited. The popular statement that domestic varieties, when they run wild, revert to the primitive stock is unsupported by satisfactory evidence ; and, although rever- sions occasionally occur in domestication, there is no sign of any general tendency to the loss of acquired characters. Except in being less uniform than natural species, in often differing more widely in some single part, and in being fertile when crossed, there are no well-marked distinctions between our domestic raccs and the so-called true species of a genus. The many breeds of dogs and cattle may arise from more than one species ; but probably those of horses and fowls, and clearly those of rabbits, ducks, and pigeons, are cach descended from a single species. In this respect the brecds of pigeons are of peculiar importance, since not only carrier and tumbler, runt and barb, pouter and fantail, but at least a score of varieties might be chosen which differ so thoroughly, internally as well as externally, that an crnithologist, treating them as wild birds, would be compelled to grant them specific, and even distinct generic rank. Yet, since all these have indisputably arisen from the wild rock-dove (Columba livia), it is clear that naturalists who admit a unity to such domestic races, which professed breeders have often laughed to scorn, should in turn be cautious before de- riding the unity of wild ones.

How then have domestic races been' produced? By external con- ditions or habits alone? One of their most remarkable features is in exhibiting adaptation, not to their own good, but to man's use or fancy. We know that all the breeds were not produced as per- fect as we now see them, and the key is man's power of accumu- lative selection: nature gives successive variations ; man adds them up, making for himself useful breeds. Skilful breeders speak of the organization as plastic and under control, and have effected ex- tensive modifications within our own generation. Unconscious

selection, which results from every one trying to possess and breed the best individuals, is even more important. 'Tris accumulated change explains why we so often cannot recognize the wild parent stocks of our cultivated. plants, while its absence in countries in- habited by uncivilized man explains why these never yield plants worth immediate culture. Man's power of selection is facilitated by keeping large numbers, in which

variations are more likely to occur. Facility in preventing crosses is also of importance, as of pigeons as coutrasted with cats; some species are, however, less variable than others, e.g., the goose.

Individual differences arise even in the offspring of the same Varia. parents and tend to be inherited ; hence they afford material for tion natural selection to act on and accumulate, precisely as they would under for human selection. (Polymorphic genera—e.g., Rosa, Rubus, nature, | Hieraciwm, &c.—may perhaps owe their protean character to their variations being of no service or disservice, and consequently not being acted on by natural sclection.) In determining whether a form should be ranked as species or variety, the opinion of natural- ists of sound judgment and wide experience is the only guide, yct this lacks unanimity (see SpEcrEs) : for example, of the polymorphic genera of the British flora alone Bentham reckons 112 species but Babington 251. Wallace has shown that no certain criterion can possibly be given by which to define his convenient working cate- gories of Malayan Lepidoptera, &c., viz., variable forms, local forms, sub-species, and representative species. As De Candolle concluded from his monograph on oaks (in which he shows at least two-thirds of his 300 species to be provisional), "so long as a genus is imper- fectly known and its species founded upon a few specimens" they seem clearly limited ; but, "just as we come to know thein better, intermediate forms flow in and doubts as to specific limits augment." The terms variety and species are thus arbitrarily applied to inde- finable groups of more or less closely similar individuals, Common species that range wide and are much diffused are those which vary most. The species of the larger genera in each country vary more frequently than the species of the smaller genera. The species of large genera present strong analogies with varieties, which we can only understand if they originated as such.

The term "struggle for existence" is uscd in a wide sense, in- Struggl ; cluding dependence of one being upon another, and embracing for exis (which is more important), not ouly the life of the individual, but ence, |

success in leaving progeny. From the high (geometrical) rate of increase of all organic beings (slow breeders only requiring a few more years to people a whole district) struggle inevitably follows, either one individual with

another of the same species, or with the individuals of a distinct species, or with the physical conditions of life. Itis the doctrine of Malthus applied with manifold force to the entire animal and vegetable kingdoms, for in this case there can be no artificial increase of food and no prudential restraints from marriage. The checks to increase are most obscure. Eggs or young animals generally suffer most, and plants, mostly as seed- lings, both from germinating on ground already occupied and from animals. The amount of food, of course, gives the extreme limit of numbers, very frequently, however, the attacks of enemies, as of game by vermin. Climate plays an important part, and periodi- cal seasons of extreme cold have destroyed as many as four-fifths of the birds of an observed area. Epidemics, too, may occur. In many a species a large stock of individuals is often essential to its pager atten: Complex and unexpected checks and relations exist etween organic beings which have to struggle together ; witness the profound alteration of the flora and fauna of a heath when planted with Scotch fir, these again being wholly dependent upon the exclusion of cattle. But in several parts of the world insects determine the existence of cattle. Again, red clover depends for fertilization upon the humble-bees, these upon immunity from the attacks of field-mice, and thus indirectly upon the numbers of cats ; hence no bees, no clover, and the more cats, the more clover! The struggle will almost invariably be most severe between the indi- viduals of the same species, for they frequent the same districts, require the same food, and are exposed to the same dangers. In the case of varietics of the same species the struggle will generally be almost equally severe, and we sometimes see the contest soon de- cided (as in the case of varieties of wheat or sweet pea, of the mountain-sheep or medicinal leech). Similarly, the struggle be- tween species of the same genus will generally be more severe than between the species of distinct genera, ¢.g., the replacement of the black rat by the brown or of the large cockroach by the small. The structure of every being is related to that of all the others with which it competes, from which it escapes, or on which it preys ; witness alike the teeth and talons of the tiger, or the legs : and claws of the parasite clinging to his hair. The albumen of a : seedling favours its struggle with plants already growing around it. How will this struggle for existence act in regard to variation ? Natura. Can the principle of selection, so potent in the hands of man, apply selectio. under nature? Most efficiently ; for, when we bear in mind the constant occurrence of variation, with the strength of the

heredi- tary tendency, also how infinitely close and complex are the mutual relations of organic beings to each other and to their physical con-

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ditions of life, and consequently what infinitely varied diversities of structure might be of use to each being under changing condi- tions of life, can it be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations, useful in some way to each being in the great and complex battle of life, should occur in the course of many generations? And, if such do occur, cau we doubt (remembering that many more indi- viduals are born than can possibly survive) that individuals having any advantage, however slight, over others would have the best chance of surviving and procreating their kind? On the other hand, we may feel sure that any variation in the least degree in- jurious would be inevitably destroyed. This preservation of favour- able and this destruction of injurious variations are called natural selection, or, less mctaphorically, the survival of the fittest. The probable course of natural selection may be understood from the case of a country undergoing change of climate. The proportional numbers of its species will be changed ; some will probably become extinct ; and these changes would seriously affect the others. Im- migration of new forms might occur, with further serious disturb- ance, or, where this is impossible, we should have places in the economy of nature which might be better filled up. In such cases slight modifications which in any way favoured the individuals of any species, by adapting them better to thcir altered conditions, would tend to be preserved, and natural selection would have free scope for the work of improvement. Moreover, changed conditions increase variability. As man produces a great result, what may not natural selection effect? The former acts only for his own good, nature for that of the being itself; man on mere external characters, nature on the whole machinery of life ; man irregularly and imperfectly for a short time, nature by accumulation during whole geological periods. Natural selection

is daily and hourly scrutinizing, throughout the world, the slightest variations, reject- ing those that are bad, preserving and adding up all that are good, silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life. It may operate on char- acters which we are apt to consider of very trifling importance, and its accumulation of small variations may set up unexpected cor- relative changes. It may modify the egg, seed, or young as easily as the adult, the structure of young to parent and of parent to young, and in social animals it will adapt the structure of each for the benefit of all. The theory of natural selection is next illus- trated (1) by supposing the formation of swift varieties of wolves, much as greyhounds have been developed by man ; (2) by reference to the excretion of nectar by flowers, its use to insects, the action of these in carrying pollen, its advantage in intercrossing, and the resultant modification and adaptation of flower and insect to each other through the preservation of their advantageous variations. Circumstances favourable for the production of new forms through natural selection are great variability, large numbers of individuals, the complex effects of intercrossing, isolation in confined areas (yet probably still more extension over continental ones, especially if oscillating in level), and considerable lapse of time, although this by itself must not be supposed to do anything (as if the forms of life were undergoing change by some innate law), but merely to afford increased opportunity for variation and environmental change. Extinction, to which rare species are on the way, is caused by natural selection.

The divergence of character brought about by artificial selection in domestic breeds is efficiently paralleled in nature, since the more diversified the offspring of each species, the more they will seize on diverse places in the economy of nature, and so increase in numbers. The greatest amount of life can be supported by great diversification of structure. This divergence of character, with extinction of intermediate forms, explains the difficulties of tax- onomy, which arc then discussed in detail with the aid of a diagram.

1s, of course, takes the form of a genealogical tree, and suggests that of "the great tree of life, which fills with its dead and broken branches the

crust of the earth and covers the surface with its ever-branching and beautiful ramifications.”

The preceding summary of the classical statement of the doctrine of natural selection should be supplemented by teference not only to the original work, to the corrobora- tive labours of its author, and to the able independent treatise (Vatwral Selection) of Wallace, but to the enormous mass of exposition, argument, and illustration accumulated by subsequent writers, commencing with Hooker and Asa Gray, Huxley and Haeckel, but soon becoming too numer- ous even for mention. At the same time the history of the controversy which has arisen out of that statement should also be treated, in so far as it has kept within Cees cae Ss se

- u Tn the later editions of the Origin a brief account of sexual selec- tion is given at this point, vide infra, p. 82.

scientific bounds. The leading objections which have been brought against natural selection, together with the replies to them, should all be summarized, as, for instance, Fleem- ing Jenkin’s important criticism as to the swamping of individual variations by crossing,? Mivart’s vigorous and detailed polemic against natural selection as capable of accounting for the incipient stages of useful structures, &c.,? and so on. But this could not be done to the satis- faction of either party without far exceeding the present limits ; happily, however, two chapters of the Origin of Species (v. and vi.) are generally admitted to have at least made the attempt up to 1872, the date of the final edition, with great candour and fairness, The various constructive efforts to supplement the hypothesis of natural selection by introducing additional factors of evolutionary change should also be mentioned, headed of course by Darwin’s own accessory hypothesis of sexual selection.

We must not, however, leave natural selection without Huxley’s a fuller statement of its services and claims, and this may 2dvocacy-

most appropriately be taken from the recent and, as it were, judicial deliverance of their veteran advocate, Prof. Huxley. He first points out the*

grounds of his agnostic position (up to 1858) with respect to evolution as promul- gated by Lamarck, Chambers, and even Spencer : " Firstly, that up to that time the evidence in favour of transmuta- tion was wholly insufficient ; and, secondly, no suggestion respecting the causes of the transmutation assumed, which had been made, was in any way adequate to explain the phenomena." He then goes on to say—

*'"*The suggestion that new species may result from the selective action of external conditions upon the variations from their specific type which individuals present—and which we call "spontaneous" because we are ignorant of their causation—is as wholly unknown to the historian of scientific ideas as it was to biological specialists before 1858. But that suggestion is the central idca of the Origin of Species, and contains the quintessence of Darwinism… . That which we were looking for, and could not find, was an hypothesis respecting the origin of known organic forms which assumed the operation of no causes but such as could be proved to be actually at work. We wanted, not to pin our faith to that or any other speculation, but to get hold of clear and definite con- ceptions which could be brought face to face with facts and have their validity tested. The Origin provided us with the working hypothesis we sought. . . . The facts of variability, of struggle for existence, of adaptation to conditions were notorious enough, but none of us had suspected that the road to the heart of the species problem lay through them till Darwin and Wallace dispelled the darkness, and the beacon-fire of the Origin guided the be- nighted. . . . The only rational course for those who had no other object than the attainment of truth was to accept " Darwinism " as a working hypothesis and see what could be made of it. Either it would prove its capacity to clucidate the facts of organic life or it would break down under the strain. . . . Whatever may be the ultimate fate of the particular theory put forward by Darwin, I venture to affirm that, so far as my knowledge goes, all the ingenuity and all the learning of hostile critics have not enabled them to adduce a solitary fact of which it can be said, this is irreconcilable with the Darwinian theory."*

Darwin's own case for natural selection has also been Darwin's "The belief in natural selection must at Te4Sons.

tersely put.® present be grounded entirely on general considerations,— (1) on its being a vera causa, from the struggle for exist- ence and the certain geological fact that species do somehow change ; (2) from the analogy of change under domestication by man's selection; (3) and chiefly from this view connecting under an intelligible point of view a host of facts."

Applying to natural selection the accepted tests of a good theory—(1) power of explaining all phenomena and meeting all objections, (2) power of meeting new facts as they occur, (3) applicability as an instrument of research,

2 North British Review, 1867.

3 Genesis of Species, 1871. 7

4 Life of Darwin, vol. ii., "On the Reception of the Origin of Species." 5 Cf., however, op. cit., p. 129, note 4.

6 Letter to Bentham, 1863, in Life of Darwin, iii. p. 25.

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and (4) power of prediction,—it seems difficult for the most sceptical of critics to avoid ranking it very high, while to those who regard it as triumphantly surviving this assay the "law of parsimony " appears to preclude the necessity of seeking any further explanation of evolution.!

As no serious critic wholly denies the fact of a struggle for existence, nor even a certain preponderance among the survivors in any given area of those best fitted for the struggle, however much he may consider the importance

of these facts to have been overstrained in certain direc-

Uni- formi- tarian- ism in natural change.

tions, we are fairly entitled at the outset to regard natural selection, not only as provisionally superseding earlier attempts at solving the problems of geological and geo- graphical distribution, but as adequately,—it might almost seem finally,—explaining them (see BioLocy, DIsTRIBU- tion). This claim at any rate must be allowed even by those who deny the importance of natural selection as a substantial factor in evolution in the other sub-sciences of physiology and morphology, and this not simply because it was as experts in distribution that Darwin and Wallace themselves arrived at their hypothesis, nor because all subsequent workers in that field of science have adopted it, but because no valid objection, or even supplementary hypothesis, has ever, as regards this important department of science, been so much as proposed. 'The survival of the fittest, then, is unquestionably a vera causa, and one of no small importance in the study of nature (in fact, in undisputed possession of at least one entire field), as also in the study of social life, from which both Darwin and Wallace were directly inspired.2 The importance of breed- ing and artificial selection is also undisputed; nor can some small scope for natural selection in the formation of varieties of wild races be denied even by the most grudging of critics who may be versed in the facts of natural history at all. But this amounts to admitting that natural selec- tion, already the undisputed explanation of distributional changes, is at any rate a partial cause in structural and functional ones; while older explanations of these facts, even if not melting into merely abstractional ones, have not succeeded in gaining acceptance.

At this point comes in with ponderous weight the con- ception by which Lyell had for nearly thirty years been preparing the way for Darwin, that of uniformitarianism in natural change. For, although it was perhaps almost as much owing to the unfavourable opinion of Lyell as to the hostility of Cuvier that the doctrine of Lamarck had fallen into such disesteem, and although Lyell himself was accustomed "to keep the name of creation for a natural process which he imagined to be incomprehensible," he was, notwithstanding, as he claimed and as Huxley frankly allows, "strongly disposed to account for the origination of all past and present species of living things by natural causes," and his influence was, therefore, for Huxley, as no doubt for others, "perhaps more potent than any other in keeping alive a sort of pious conviction that evolution after all would turn out true." For, given the principle of Lyell's work,—'the principle that the

past must be ex- plained by the present, unless good cause be shown to the contrary, and the fact that, so far as our knowledge of the past history of life on our globe goes, no other cause can be shown,”—it is evident that “consistent uniformi- tarianism postulates evolution as much in the organic as in the inorganic world. The origin of a new species by

1 Romanes, Scientific Hvidence of Organic Evolution, 1886.

Through reading Malthus, On Population (see Origin, p. 3 sg.). It is worthy of notice also that Herder’s early suggestion (vide supra) was made in his Philosophy of History, Wells’s early statement with respect to the races of man, and Patrick Matthew’s in a treatise for practical purposes, while an early statement of the doctrine, hitherto

apparently overlooked, was made with respect to machines by James Watt (cf Catalogue of Industrial Exhibition, 1851).

other than ordinary agencies would be a vastly greater ‘catastrophe’ than any of those which Lyell successfully eliminated from geological speculation.”

Bearing in mind, then, the lesson of Lyell, that any efficient cause, even though slow or at first sight trifling, can be shown, if acting steadily for vast periods of time, to effect enormous results, the apparent difficulty of adding up varietal differences to specific ones, these to generic, and these again to still larger distinctions, becomes only the inevitable continuation of that summation of individual into varietal differences which no one can deny to be ’ happening around us. Thus the onus proband that species have not arisen in this way comes fairly to be thrown by the advocates of natural selection upon its adversaries. And, as these come individually to realize, through those concrete studies which necessarily underlie all active con- viction on one side or the other, the importance of the masses of concrete evidence which have been steadily accumulating, it is little wonder that their majority should not only have so rapidly dwindled, but actually have changed sides so generally as has been the case. Thus, to cite only a single case,—(1) we are now in actual possession of an unbroken and geologically successive series of fossil horses, perfectly gradated through some forty-five “species” back to a five-toed ancestor; (2) we can trace the con- tinued

evolution of the existing species in the bones, teeth, and finest peculiarities of the specimens around us, as well as the increasing differentiation of well-marked varieties through artificial selection ; (3) we can see that such con- tinuous improvement of skeleton, teeth, &c., as is now and has all along been in progress, must have been profitable

to the animals possessing them in the wild state, just as they now are in the tame (since implying better locomo- tion, digestion, &c.). Hence we soon come to feel a real

difficulty in understanding (1) how the continuous sum- . mation of small individual advantages through varietal characters into specific, and even generic ones, can be doubted, much less denied, and consequently (2) how the general applicability of the theory of natural selection to interpret the gradual process of historic change can any longer be called in question. At this point it is right to notice that several evolu- Varia- tionists have suggested or argued for the progress of tion — sire : : : : along variation along definite lines; but this return upon pre- 4.63. Darwinian standpoints has been energetically and, it must jines — be admitted, on the whole as yet successfully combated. Thus Asa Gray (1861-76) has argued for variation along j definite and useful lines. Néageli (1865) regarded the ac- | quisition of certain characters which appear to be of no service to plants as offering a difficulty to natural selection, and as affording a proof of some innate tendency in plants towards perfection, corresponding to what Kolliker entitles the "law of creation." Mivart (1871) has maintained that variations are definite, and frequently sudden and considerable. With such positions must also be noticed the continuous and increasing insistence of Spencer (1852-86) |

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upon environmental action and functional change, although spontaneous variation is not excluded nor considerable importance to natural selection denied. Butler in Eng- land, and Cope, Hyatt, and other " Neo-Lamarckians" in America, have more fully developed this reaction, for which experimental evidence has been especially sought in Germany by

Semper. And, while Darwin himself long continued an uncompromising opponent of all such heresies, a distinct, though partial, change of opinion was admitted by himself in later years, and has been fully insisted upon both by Mivart and Spencer. While in the Origin of Species up to 1869 variations are spoken of as "accidental" (no doubt only in that sense in which a scientific man may fairly use the word), and there is ample proof of Darwin's origin-

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ally even contemptuous attitude towards Lamarck, and of his substantial rejection of the comparative importance of function or environment in determining variations, these views are unquestionably modified in the well-known pero- ration to the Origin of Species. The further diminishing importance of natural selection is admitted in subsequent editions, as Spencer has pointed out, in the preface to the Descent of Man, and indeed elsewhere; while a recent pungent criticism ! cites evidence of a certain measure of ap- parently contradictory and indefinite fluctuation of opinion between increased insistence upon use and disuse on the one hand and upon spontaneous variability on the other. Since, however, Darwin never developed the grounds of this diminishing reliance upon natural selection, which still remains the central theme of his works, and that upon which their originality, as well as their importance to the theory of evolution, essentially depends (of course as dis- tinguished from their services in summing up the concrete

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tion of testing " whether, besides natural selection and the. direct action of external conditions, together with the correlative results of these two factors, there might not lie concealed in the organism some other transforming power," such as the " perfecting principle " of Nageli or the like. The results of these investigations have tended entirely to confirm the theory of natural selection in its classic form ; moreover, the same

naturalist has since ad- duced weighty arguments against the transmissibility of individual variations,® whether acquired by habit or im- pressed by environment, and thus proportionally weakened the arguments of Spencer and others in favour of the revival of the Lamarckian factors of change. Variation seems therefore to be driven in more and more upon the reproductive function, and thus an ultra-Darwinian in- sistence upon the obscure and as yet wholly indefinite factor of variation is strongly forced upon us, and natural selection seems more than ever to be our only possible clue.

evidence for the fact of evolution and their vast utility in diffusing it), too much weight must not be attached to such isolated expressions of opinion as those referred to above,

Armed, however, with this, we have a consistent means Darwin's of re- investigation of the whole organic world, in the course bio-

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the more so as these are nowhere borne out by any general change in the tenor of his works. In the absence of any theory of definite and progressive change, and in the presence of multitudinous variations under domestication and in nature which we can neither analyse, rationalize, nor hardly even classify, we are not only justified but logically compelled to regard variation as spontaneous or indefinite, z.¢., practically indeterminate in direction, and "therefore wnimportant, except as the groundwork for selection to act on." Conversely, variation must be in- definite, else the paramount importance of natural selec- tion must be proportionally impaired as this becomes de- finite (cf, Evotution, vol. viii. p. 751); for we cannot speak of selecting a course from one line of variation, nor even for that matter in the old sense of "variation" at all. Thus, "if it should hereafter be shown that variability is definite and determined in certain directions rather than others" (in short "fated" rather than '" spontaneous "), "the importance of natural selection would not be im- paired," since it would still have to be regarded as a vera causa in the history of species, yet the function ascribed to it would be practically reversed. It would exchange its former supremacy as the supposed determinant among the indefinite possibilities of structure and function for

that of simply accelerating, retarding, or terminating the process of otherwise determined change. It would furnish the brake rather than the steam or rails upon the journey of life ; or, in other words, instead of guiding the ramifica- tions of the tree of life, it would, in Mivart's phrase, do little more than apply the pruning knife to them.2 In fact, its functions would be restricted to those of the third

onomy and of comparative anatomy, acquire a new interest, and all existing lines of research receive a potent stimulus, but the marvellous variety of adaptation comes into in- telligibility and order,—a new teleology thus replacing the old. Of this profound change in the standpoint and interest of modern biology we can form an idea most simply, yet most representatively, by glancing at Darwin's own biological works. Before the Origin of Species we have the slow and laborious production of the substantial, yet conventional and comparatively arid, Zoology of the Beagle and Manual of the Cirripedia, while afterwards the well-known and fascinating new series of zoological and botanical discoveries and generalizations were poured out with remarkable rapidity. The many bold and ingenious applications of the theory of natural selection which we owe to Darwin and his school should here be reviewed seriatim ; but it is impossible to do more than mention some of them, ¢.g., the renascence and development of Sprengel's discovery of the relations of flowers to insects, the elaborate studies on Fertilization in Orchids, the Forms of Flowers, Insectivorous Plants, Climbing Plants, Movement in Plants, &c. Again, the interpretation of the problems presented by bee and ant society led him to grapple with the problems of mind and language, in the Descent of Man and the Hupression of the Emotions; and the systematic application of the conceptions of biological science to those of psychology, sociology, and ethics, which had been com- menced by Comte and continued by Spencer, rapidly passed from its comparative philosophic isolation into wide diffu- sion through the movement of literature and science.®

This passage from the inductive verification of the Applica- theory of natural selection to its deductive application as tion of 3 : : : . natural

an engine of research is conspicuously associated with the i area labours of Haeckel, whose Generelle Morphologie (1866) to bio- and other minor

works have a central historic place amid logical

the first fruit and seed of the new movement in German Science s

Fate, and would no longer, as at present, be supposed to in- clude those of the second. Under these circumstances it is unnecessary to appeal at length to the unanimity with which the later generation of Darwin's exponents (e.g., Lankester, Romanes, Allen, évc.) concur with all preceding

Ones in the necessary proposition, that 'natural selection trusts to the chapter of accidents in the matter of variation." The thesis thus summarized by Lankester thoroughly permeates the Variation of Animals and Plants under Domestication, as may be seen from the brief sum- mary of it given below (p. 82).2 Special reference must, however, be made to the important researches of Weis- mann, since these were devised with the deliberate inten-*

- Butler, Luck or Cunning, London, 1887, chap. xii. ; see also his Evolution, Old and New, London, 1879. 2 "On the Theory of Individuality," in Proc. Roy. Soc., 1886. ; See, however, chapter xxi. of Variation, &c., conclusion. Studies in the Theory of Descent, Eng. ed., London, 1882.

biology, which was henceforward almost completely Dar- winian ; and they have equally strong claims to be con- sidered as the starting-point of those logical and unflinch- ing attempts to view all problems in the light of natural selection which have since become more common. By transcending the limits of ordinary biological specialism independently of Darwin, and dispensing with his initial

- *The reservations with respect to mind and language made by evolutionists so contrasted in many respects as Wallace and Mivart should here be mentioned ; see Mivart's Lessons from Nature, also his ** Limit to Evolution," in Nineteenth Century, 1884.*

6 Die Continuitét d. Keimplasmas, Jena, 1885, and Die Bedeutung ad. sexuellen Fortpflanzung, Jena, 1886.

reservation as to the possible creation of primeval forms and with Wallace's final caveat as to the origin of man, a thoroughly '" monistic" view of biology and its kindred sciences is obtained. The systematic exclusion of the tra- ditional teleology and of that operation of the consciousness of the organism assumed by Lamarck (since indefinite struc- tural variations cannot be associated with, much less de- veloped by, definite psychical ones, and still less by any per- manent psychical bias or character) also necessarily follows ; and along with this goes the conception of the operation of an extra-organismal mind. The struggle for existence is the sole condition of human progress; and the conception of prevalent or predominant altruism, as systematized by past philosophy and tradition, is thus an alloy of senti- mental illusion with baser elements. The doctrine of natural selection is in this way fully developed into a substantially Neo-Lucretian philosophy, and, in justice to the logical clearness of the author to whom we especially owe this systematization, it must be admitted that those who grant his postulates, without endorsing his conclusions, have in all cases either refrained from continuing their development or fallen back upon the insertion of some caveat or deus ex machina at an arbitrary point.

To — In the same way we have this view of all things in

organle struggle applied to the explanation of the internal structure

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al and function of the organism itself. Once more to quote

function. Huxley,! 'It is a probable hypothesis that what the world is to organisms in general each organism is to the mole- cules of which it is composed. Multitudes of these, having diverse tendencies, are competing with one another for opportunity to exist and multiply, and the organism as a whole is as much the product of the molecules which are victorious as the fauna or flora of a country is the product of the victorious organic beings in it." This view has more recently been considerably developed by Roux,? and from its logical continuity with the major theory of which it is a corollary is gaining widened acceptance.

With regard to the destructive criticism of the old teleo- logy, which has been led by Haeckel, and aided or ac- quiesced in by other natural selectionists, it is important to note that the obvious proposition has also repeatedly been urged (¢.g., by Huxley and Weismann no less than by their critics, such as Von Hartmann and Lotze), that, just in proportion as our explanation of the origin of organic structures, functions, and adaptations becomes in- creasingly mechanical, so does an increasingly rigorous teleological view of this mechanism reappear. At most, therefore, we should have exchanged an external and mechanical view of teleology for an (at least relatively) internal and dynamical one.

Sexual The later hypotheses accessory to natural selection can here be selection. only very briefly outlined. Partly in course of his inquiries into the descent of man, partly also to account for many remarkable phenomena of sexual differentiation in animals (see Sex), Darwin was led to develop the hypothesis of sexual selection which he had already suggested in the Origin of Spccies. Not merely do indi- viduals struggle for existence, but the males struggle for the females ; thus the more vigorous tend to obtain mates, and so leave most progeny to repeat the struggle. Special weapons are used in the struggle, both offensive, like the cock's spurs or the stag's horns, and defensive, like the lion's mane; and advantageous variations of these tend to be accumulated. But, as the more beautiful or melodious males appear often to obtain the preference of the females, there is also ground for the conception that the esthetic advantages frequent in the male sex have similarly been acquired, the more so as we have common experience of how rapidly artificial selection can accumulate superioritics of plumage or song. After the opera- tion of sexual selection has been traced as far as possible through the animal kingdom, the doctrine is applied to man, with the con- clusion "that of all the causes which have led to the differences in

1 A frank and uncompromising application of this doctrine to the interpretatiou of nature and society will also be found in Huxley's 'Struggle for Existence," in Nineteenth Century, February 1888.

2 Der Kampf d. Theile im Organismus, Leipsic, 1876.

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extcrnal appearance between the races of man, and to a certain extent between man and the lower animals, sexual selection had been the most efficient." Acceptance of this hypothesis lias been much less general than of natural selection. Criticism has been busy, and this ranges from the serious yet partial dissent of Wallace to fundamental contrast, such as is involved in the theory of the nature and origin of sex suggested in the article Sex, which views the degree of development of the external characters of sex as essen- tially the outward expression of a proportional stage of the evolu. tion of constitutional " maleness" or "femaleness " (i.¢., katabolic and anabolic diathesis respectively). | Under the title of " physiological selection" G. J. Romanes has Physio' lately proposed "an additional suggestion as to the origin of species," logical" of which the more critical than constructive essence may be briefly selectic given in the author's own words: " As a theory of origin of species natural selection has in its way three cardinal difficultics,—(1) the difference between species and varieties in respect of mutual fertility, (2) the swamping effects of free intercrossing upon an individual variation, (3) the inutility to species of so large a proportion of specific distinctions. . . . Natural selection is not, properly speak- |

ing, a theory of the origin of species: it is a theory of the origin— or rather of the cumulative development—of adaptations. When- ever any variation in the highly variable reproductive system occurs, tending to sterility with the parent form, without entailing fertility with the varietal form, a physiological barrier must inter- pose, dividing the species into two parts, free to develop distinct : histories, without mutual intercrossing, or by independent varia- tion. By regarding mutually sterile species as records of variation | in reproductive systems, we are at work, so to speak, on the foun- dation of the matter." :

Laws oF VARIATION.

Even those who attach most importance to the doctrine Origin' of natural selection as affording a rationale of the process Vatia- _ of organic evolution will not seriously dispute that, even "°™ were this explanation completely extended to all the de- tails of plant and animal life, another and deeper explana- tion would still be necessary. That is, the theory of natural selection, being from the external standpoint only —that of the adaptation*

of the organism to survive the pressures of the environment—would all the more urgently stand in need of a complementary internal explanation, which should elucidate the physiological process of change through which the organism has actually been enabled to adapt itself. As a recent writer tersely expresses it, 'The survival of variations is a matter secondary to their origin, and it is becoming realized more and more that this is the point to be explained." How, in short, do we get the variations without which natural selection would have nothing on which to operate? Here we can no longer Darwi remain satisfied with the merely general conception of theory variation as essentially indefinite, with which we have be- come familiar as the postulate (p. 81) of the theory of natural selection, but must add to it a retrospect of the : theories of earlier authors such as has been already out- | lined,—(a) a summary and discussion of the extensive labours of Darwin upon the problems of variation from which this conception of indefiniteness was generalized, followed by (6) an account of subsequent progress. Un- fortunately the voluminousness of this literature makes such a task practically impossible: instead of the enormous wealth of concrete details accumulated with respect to the*

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Variation of Animals and Plants under Domestication, a reference to the volumes under that title must almost suffice. Some acquaintance with this work is, of course, necessary adequately to appreciate the force of its author's general con- ; clusions ; these may, however, be briefly outlined from the | chapter of the Origin of Species (chap. v.) devoted to the laws of variation, and from those (xxii.-xxvi.) of the larger work which contain an ample yet similar discussion.

'Our ignorance of the laws of variation is profound. Not in one case out of a hundred can we pretend to assign any reason

why this or that part has varied." Changed conditions generally Envir induce mere fluctuating variability in individuals, yet sometimes ment.

3 Journ. Linn. Soc., xix., 1886. For the criticisms of Wallace, Argyll, Meldola, Catchpool, and others, see Nature, vol. xxxiv. 4 Comp. Variation under Domestication, chap. xxi., conclusiou.

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direct and definite effects upon the mass. The facts and considera- tions for and against the belief that the conditions of existence act in a potent manner in causing definite modifications of structure are confronted in detail. In some few instances a marked effect has been rapidly produced, e.g., on European men in the United States, European dogs in India, horses in the Falkland Islands, oysters in the Mediterranean, &c. The chemical compounds of some plants and the state of their tissues are readily affected by changed conditions. The production of galls, &c., shows how great changes in structure and colour may result from chemical changes. We almost certainly know that organic beings in a statc of nature may be modified in various definite ways by the conditions to which they have been long exposed ; but it is difficult to distinguish be- tween the definite result of changed conditions and the accumula- tion through natural selection of indefinite variations which have proved serviceable. But, even granting the utmost weight to con- ditions, we can rarely see the precise relation between cause and effect. Moreover, many animals and plants of wide range and great diversity of experience yet remain uniform in character. Again, the degree to which domesticated birds, &c., have varied does not stand in any close relation to the amount of change to which they have been subjected. In fact, we may have similar modifications under different conditions, different modifications nnder similar change of conditions, or no modifications at all. Closely parallel varieties are often produced from distinct races or even species without ascertainable unity of conditions. Bird-varia- tions, too, seem conspicuously independent of circumstances.

All these considerations tend to force on our minds the conviction that what we call the external conditions of life are in many cases quite insignificant in comparison with the organization or constitution of the being which varies. No doubt each variation may have its efficient cause, but it is as hopeless to search for the cause of each as to say why a chill or a poison affects one man differently from another. With respect to acclimatization, although habit does something towards the success of the process, yet the appearance of constitu- tionally different individuals is a far more effective agent.

Increased use adds to the size of muscles, together with the blood-vessels, nerves, bony crests of origin, and even the whole bones ; it also increases glands and strengthens sense-organs. In- creased and intermittent pressure thickens the epidermis ; change of food modifies the coats of the stomach and alters the length of the intestine. Disuse weakens and diminishes all parts of the organization,—lungs and chest, wings and their associated bones, &e, Although in domestieated animals this never goes so far that a mere rudiment is left, it seems often to have occurred in nature, the effects of disuse being aided by economy of growth with inter- crossing. Changed habits may lead to use or disuse of organs, and consequently to their modification ; yet the effects of habit, use, and disuse have often been largely combincd with the natural selec- tion of innate variations and sometimes overmastered by it.

Correlated variation means that the whole organization is so tied together during its growth and development that, when slight variations in any part occur, and are accumulated through natural selection, other parts become modified, apparently irrespective of advantage in the change. Variations of strueture in the young often affect those of the mature animal ; the influence of hard parts, mechanical pressure, the relative position of parts, and the size of the whole body all have important influences. Homologous tissues may exhibit associated variations, e.g., hoofs, hair, and teeth. In most cases the correlation is, however, quite obscure, and may seem to be of no utility to the species, as with various monstrosities and diseases, Colour may be associated with other constitutional pecu- harities. Although correlation is of much importance, we may also falsely attribute to it structures which are simply due to in- heritance or natural selection, or its effects may be

inextricably commingled with those of increased use and of accumulation by natural selection, ¢.g., the gigantic horns of the Irish elk with the changes necessarily associated with the acquircment of them.

Homologous and multiple parts are peculiarly variable, and often tend to cohere. Rudimentary and lowly organized structures are variable. The law of compensation of Gocthe and Geoffroy, "that m order to spend on one side nature is forced to economize on the other," holds true to a certain extent with domestic production, but more doubtfully in nature.

Mechanical pressure and relative position of parts seem to be of Some importance in determining variations ; but such changes are often due to reversion to long-lost characters, which may frequently occur. A part extraordinarily developed in any speeies tends to be highly variable. Specific characters are more variable than generic characters. Distinct species present analogous variations ; but this may arise either from analogous constitution or from re- version. Secondary sexual characters are highly variable. ' What- ever the cause may be of each slight difference between the offspring and their parents—and a cause for each must exist—we have reason to believe that it is the steady accumulation of beneficial differences Which has given rise to all the more important modifications of structure in relation to the habits of each species."

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The preceding outline of Darwin's main positions (which are in harmony with his essential doctrine of indefinite variability) prepares us for the discussion of more recent research and opinion. But for our present concrete know- ledge of the influence of environment, use and disuse, in- cluding all such researches as those of Semper, or the peculiarly brilliant and luminous investigations of Poulton,? the recent valuable summary of Arthur Thomson? may conveniently be referred to. The corresponding theoretic argument for the definite causation of most variations by these agencies has been recently re-stated by Spencer,# along with his proposed limitation of natural selection. This should be taken along with the testimony of the American Neo-Lamarckian school, among which the learned and suggestive, though too undigested, essays of Cope are especially prominent. The views of Niageli, Mivart, and other advocates of

internal variation here present themselves anew, along with the criticisms and replies to them, as also Weismann's doctrine of variability as being ultimately germinal. But space precludes the survey of this voluminous and unfinished controversy, which, more- over, would not at present yield any general result, since neither the various inductive and deductive arguments, nor the organismal, functional, &c., and environmental explanations which these variously favour, have been as yet exhaustively stated, still less properly confronted, and least of all reconciled, by any author.

It may be more profitable to attempt, though necessarily in barest outline, a fresh re-examination of the entire field. This may be most appropriately introduced, and the initial conception of the present part of the discussion re-stated, by a passage from Weismann, whose substantial acceptance of the doctrine of natural selection has already been noticed (p. 81). "We certainly cannot remain at the purely em- pirical conception of variability and heredity as laid down by Darwin in his admirable work. If the theory of selec- tion is to furnish a method of mechanical explanation, it is essential that its factors should be formulated in a precise mechanical sense, But, as soon as we attempt to do this, it is seen that, in the first enthusiasm over the newly dis- covered principle of selection, the one factor of transform- ation contained in this principle has been unduly pushed into the background to make way for the other more ap- parent and better known factors. The first indispensable factor, and perhaps the most important in any case, in every transformation is the physical nature of the organism itself." Let us briefly summarize, therefore, the main results of a fresh survey of the leading variations presented by plants and animals, z.¢., no longer commencing with the analogy of human selection upon the smallest varietal and specific distinctions, and arguing on Lyell's principle for the cumu- lative origin of the characters of larger groups, but consider- ing these larger differences from the standpoint of general physiology, without any hypothesis at all.

The physiological principle invoked is simply that antithesis be- twecn reproductive functions and individual ones which has been familiar since the dawn of physiology, and which, when reduced to its physical terms, is obviously deducible from the principle of conservation of energy. Instead of the generally received doctrine, summarized above, that of indefinite variation, with progress by means of struggle for existence among

individuals, its systematic application furnishes a detailed re-interpretation of the forms pre- sented by plants and animals comparable to that afforded by the

received hypothesis, but with an essentially altered view of the process and factors of organic evolution as a whole. Briefly stated,

1 Animal Life, Int. Sei. Series, 1881.

2 Proc. Roy. Soc., 1884-88.

3 "A Synthetie Summary of the Influence of Environment," in Trans. Roy. Phys. Soc. Edin., 1887-88.

4 Factors of Organic Evolution, London, 1886 (reprinted from Nine- teenth Century).

5 The Origin of the Fittest, London and New York, 1887.

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the view of evolution thus reachcd is that of definite variation, with progress essentially through the subordination of individual struggle and development to species-maintaining ends. ; y Let us commence with the origin of the flower, which all botanists agree in regarding as a shortened

branch. The apparent explanation of natural selection (from two other alternatives, one lengthened, the other unshortened), although morphologically reasonable, is at once excluded by the physiological one of. inevitable shortening, since the expense of the reproductive functions necessarily checks the vegetative ones, and since we cannot speak of selection where the imaginable alternatives are physically impossible. Similarly, the shortening of the inflorescence from raceme to spike or flower- head, or its hollowing into a fig, with the corresponding reduction in the size of the flowers, receives the same explanation—growth of axis and of appendages checked by reproduction—superseding that current, viz., by mere convenient adaptation to fertilization by insects. The internal structure of the flower is similarly modified, as may be shown in detail n the aig ce from hyposyny through erizyny to epigyny (these being simply stages of the progressive ates of the Pera of the axis), in the reduction of the floral envelopes and stamens and the number of carpels and ovules, and even in the transition from perispermic to endospermic and finally exalbuminous seeds. But these are the most important of floral variations, and furnish the essentially distinguishing charactcrs of the natural orders; hence, when these are seen, instead of being indefinite, to be parallel and definite (z.¢., determined through the continuous checking of vegetation by reproduction along what is thus a single and definite groove of progressive change), the import- ance of natural selection changes wholly from that of selecting and accumulating supposed indefinite variations to that of retarding definite ones after the stage of maximum utility has been in- dependently reached. The same simple conception unlocks in- numerable problems of floral morphology, large and small alike : é.g., it interprets with equal ease the inevitable development of gymnosperm into angiosperm (by continuous subordination of the reproductive carpellary leaf) and the origin of refined minor adapta- tions, like the splitting fruit of the geranium or the cupped stigma of the pansy, not as achievements of natural selection from among fortuitous variations, but as naturally traceable to the checked vege- tation of their respective types of leaf organ, just as in the familiar case of the pinnately-lobed outer sepals of the rose bud. The origin of floral colour as primarily an inevitable consequence of the same principle of vegetative subordination through reproductive pre- ae a was long ago pointed out by Spencer, who unfortunately, 1owever, also accepted without scrutiny the orthodox hypothesis that this incipient floral colour would revert to the

ordinary green vegetation but for the accident of its attractiveness to insects, and consequently must have owed its accumulation simply to the repeated preservation of the offspring of the accidentally brightest coloured ; whereas we uow see that the arrest of vegetative greenness in the flower and the exclusive appearance of those colour- ing matters associated with the imperfect vegetation of spring and autumn are a continuous process of its subordination as a vegeta- tive, and its developinent as a reproductive, apparatus. Adapta- tion to insects thus takes a quite secondary place ; similarly with the leafy arrest and floral coloration of bracts; while a detailed examination of thorny plants practically excludes the hypothesis of mammalian selection altogether, and shows spines to arise as an expression of the diminishing vegetativeness—in fact the ebbing vitality—of a shoot or even of an entire species. Evergreens tend to arise in all orders among the forms of more vegetative habit, and in such forms the amount of flowering is usually diminished rela- tively to the deciduous members of the same group, whilst:such con- stitutional vegetativeness checks the progress of floral evolution. Hence it is that evergreens, and even orders in which they largely occur, are usually less differentiated than their deciduous congeners. The apparently indefinite variations presented by doiesticated plants, e.g., the cabbage tribe, are at once classified and interpreted as so many stages along the same course (from leafy kale, through Brussels sprouts with many leaf buds, to cabbage with apical flower bud, and finally to cauliflower). The importance of this line of evi- dence for the Darwinian view of variation and selection becomes still further reduced, although also broadly settled, when we note that, since the subordination of vegetative to reproductive pre- ponderance gave us the origin of ordinal characters, the converse improvement of individual characters at the expense of reproduc- tive ones (on which domestication usually insists and artificial selec- tion depends) can only give us minor ones, for the most part varietal or specific, if so much. The Lyellian analogy for the ultimate accumulation of varietal differences into ordinal characters has thus been misleading. The preceding transition of both organography aud physiology from empirical to rational carries with it a similar transition from empirical to rational taxonomy as well: the antagon- ism of vegetative and reproductive habit is seen to be also general and constitutional. Just as the liliaceous type ranges on one side towards the characteristically vegetative grass or reproductive orchid, so is it with the main variations of every natural alliance,

be this order, genus, or even species. Thus the Ranunculacex have their grassy and their orchid-like types in meadow-rue and larkspur, yet the species of these very genera show examples of the opposite swing of variation ; again, the two species or varieties of British oak (Q. pedunculata and Q. sessilifiora) are thus, so to speak, the incipient grass and orchid forms of their common ancestor (Y. Hobwr). What we call higher or lower species or orders are thus the leaders or the laggards along one or other of these two lines of variation, the repre- sentatives of some stage of the predominance on one side or other of that oscillating balance between vegetative and reproductive pro- cesses which have long been known as the essential functions of organic life.

The results of a similar survey of the animal world, despite the Working greater intricacy of the problem, are scarcely less definite or com.- of the prehensive, and at once lead to a deeper interpretation of the whole. law in Commencing with an ascending survey, we recognize such essential animal types of Protozoa as the rhizopods, gregarines, and infusors, not as world.

the empirically selected products of spontaneous variation among indefinite possibilities, but simply as the predominatingly ameeboid, encysted, and motile phases of the primeval cell-cycle (see MorPHo- LOGY), these three forms of which are fixed by the properties of proto- plasm itself (see Sx, vol. xxi. pp. 720-724), each particular phase being fixed by the constitutional bias (diathesis) of its type towards anabolism or katabolism (see PaystoLoGy, PRroropLasM). This rationale of variation in ultimate terms, 7.¢., both cellular and proto- plasmic, both morphological and physiological, may be continued through all fields, ¢.g.,embryological or pathological, for some diseases are coming to be interpreted as the progressive variation of some func- tion and organ which only disturbs the general balance in its progress towards a new and higher equilibrium.1 This conception of physio- logical as well as merely structural life-history rationalizes both animal and vegetable taxonomy. Thus the greatest of all steps in morphological progress, that from the Protozoa to the AMetazoa, is not due to the selection of the more individuated and highly adapted forms, but to the union of relatively unindividuated cells into an aggregate in

which each becomes diminishingly competitive and increasingly subordinated to the social whole. Passing to trifling variations, such as the internal deposition of spicules, we interpret these neither as mere accidents, nor as pure advantages for support or defence, but as arising like plant-crystals or gouty deposits as unremoved waste products, accumulating with local or constitu- tional passivity. How the inevitable constitutional preponderance of anabolism or katabolism excludes spontaneous variation and subordinates external selection in the formation of types would become clear could we pass in review the animal kingdom, and note how its various alliances all range from passive to iore active forms. We should compare the coral or sponge at one end of the scale with the similarly passive (and consequently also skeletal) tortoise and glyptodon at the other. We should read in their anabolic diathesis the secret of accumulating size and of inevitable extinction (nay, even unravel the apparent contradictions with re-spect to the influence of the enviroument, as being specially strong upon the passive types, which hence are far richer in species than the corresponding less readily influenced active forms).

Finally, the preponderating importance of the species-maintaining over the individual functions should again be noted in animals as in plants, since the conviction thus becomes inevitable that, in stat- ing the process of evolution essentially in terms of the survival of the fittest in competition, the centre of gravity of the subject has been misplaced. 'The constant primary insistence upon individual competition for food, and the very subordinate recognition of the importance of sexual and social co-operation for well-being, which are characteristic of the prevalent theory (witness their proportion in the preceding summary), are traceable at once to the confusion of putting the nutritive factors "in the first place" because they precede the reproductive in time ; whereas the organisin inevitably enters upon reproduction and so cedes the preponderance—'the first place" —to the other-regarding functions. That increase of reproductive sacrifice which at once makes the mammal and marks its essential stages of further progress (monotreme, marsupial, placental), that increase of parental care, that frequent appearance of sociality and co-operation which even in its rudest forms so surely secures the success of the species attaining it, be it mammal or bird, insect or even worm,—all these phenomena of survival of the truly fittest, through love, sacrifice, and co-operation—need far other promi- nence than

they could possibly receive on the hypothesis of the essential progress of the species through internecine struggle of its individuals at the margin of subsistence. Yet these cases are only the supreme outcomes of that continuous aud definite proccss of variation through individual subordination and species-maintaiu- ing preponderance which we have seen modelling even the vege- table world.

In short, while no more denying the existence of com- petition in nature than the fact of organic progress, we deny the assumed relation of these as cause and effect,

1 Cf. Sutton, General Pathology, London, 1886.

and propose an interpretation in essential respects directly converse, without denying the minor agency of use and dis- use, environment, &c. Hach of the greater steps of progress is definitely associated with an increased measure of sub- ordination of individual competition to reproductive or social ends, and of interspecific competition to co-operative adaptation. The ideal of evolution is thus an Eden ; and, although competition can never be wholly eliminated, and progress must thus be asymptotic, it is much for our pure natural history to see no longer struggle, but love, as "creation's final law." While ceasing to speak of inde- finite variation, we may of course still conveniently retain the rest of the established phraseology, and continue to speak of "natural selection " and of "survival of the fit- test," always provided that, in passing from the explana- tion of the distributional survival of individuals or species

in contest within a given area to the interpretation of the main line of their morphological and physiological progress, we make the transition from the self-regarding to the other-regarding (in ethical language, from the egoistic to the altruistic) sense of these terms which has above been outlined.}

It would be premature to enter upon the extended or deductive application of these considerations, since, pend- ing their acceptance, the preceding

statement of the received doctrine of natural selection from spontaneous variations, with all its logical consequences (pp. 81-82), remains valid. Conversely, it is of course obvious that their adoption would involve the extensive modification of the received doctrine, as well as the complementing of new constructive attempts by a re-examination of earlier views of both the process and the philosophy of evolution." (P. GE.)

VARIATIONS, Caucutus or. 1. It has been observed (Maxima AND Minima, vol. xv. p. 643) that the origin of the calculus of variations may be traced to John Ber- noulli's celebrated problem, published in 1696 in the Acta Eruditorum of Leipsic, under the following form, Datis in plano verticali duobus punctis A et B, assignare mobili M viam AMB per quam gravitate sua descendens, et moveri meipiens a puncto A, brevissimo tempore perveniat ad punctum B. This problem introduced considerations en- tirely different from those hitherto involved in the discus- sion of curves, for in its treatment it is necessary to conceive a curve as changing its form in a continuous manner, that is, as undergoing what is styled deformation. This change of form can be treated analytically as follows.

Suppose y=/(x) to represent the equation of a curve, and let us write Ce) IE) so oncncccsnes onsavenconacs (a), where a is an infinitesimal quantity, and ¥(x) any function of x subject only to the condition of being finite for all values of x within the limits of the problem. Then equation (1) represents a new curve indefinitely close to the curve y=/(x); and by varying the form of (x) we may regard (1) as representative of any continuous curve indefinitely near to the original curve.

2. Again a(x) is the difference of the y ordinates of the two curves for the same value of x; this indefinitely small difference is called the variation of y, and is denoted by dy. It may be regarded as the change in y arising solely from a change in the relation connecting y with x, while "itself remains unaltered. In general, if y be a function of any number of independent variables «,, Ly… Hn, then dy represents any indefinitely small change in y arising solely from a change in the form of the function, while i ts, &e., are unchanged. Thus the variable y may receive two essentially distinct kinds of increment,—one arising from a change in one or more of the variables, the other arising solely from a change in the relation which connects y with

these variables. The former increments are those contemplated and treated of in the ordinary calculus ; the latter are those principally considered in the calculus of variations.

_ We shall follow Strauch, Jellett, Moigno, and the prin- cipal modern writers on the subject, by restricting, in general, the symbol 6 to the latter species of increment. In many problems both kinds of increment have place simultaneously. Thus, if y=/(a,, 2», 23), and if Ay denote the total increment of y, we have

ay by + Fed diy + Hy eae est crane (2) and so on in all cases. dy ad

3. It is readily seen that San da? and in general

Mee 2s, The last equati hareaiee a equation may be written

SD" y= D"8Y ooeccccccccescceccccsaseneees (3),

where D stands for tle symbol of differentiation, ae

4. We shall adopt Newton's notation and write ¥ for d ? he :

a ¥ for = y™ for ra and proceed to consider the

variation of the general expression /=f(x, y, y, ¥,... y),

in which the form of the function f is given, while that of

y in terms of x is indeterminate. Here, considering w as

unchanged, we have

dV, av,

5V=-) dy + apt +++

dy dv_» av av oe dy Saale rt}

i

av n) PO é

Now let

then we have 5V = P5y + P,Diy+ P2D byt… +PrDoy…...0000 (4). 5. Next let us consider the variation of the definite eal . . integral U= | _ Vdx, where V does not contain either of the limits 2, and 2. Here, when the limits are unchanged,

x: we have dU = | ‘3 Vdx,and, when the limits undergo change,

%

Hi, H iy su=0[” vae= | “SV doe + Vidar, — Vollity svescecceees (5).

xO x 6. We shall here bring in a new symbol, called the sign of substitution, which was introduced by Sarrus.2 Thus, if / be any function of x, y, &c., the result of substituting x, for x in Y—the other variables being unchanged—is

represented by ” F in the form of notation adopted by Moigno and Lindeléf.4 “and i Pig represented by / ” Fe Employing this notation, (5) ‘ x

The difference between

Hh nie. ce he (6). xo x 7. We now proceed to transform the last equation, commencing with the case in which V is a function of x, y, and y solely.

x | Here 8U= | “(P3y +P, Ddy)dee + / Vae, x xg Hi ¢ : ay =) ‘(P= 92 Jaya + “Poy / Pdx x alae x0 ×0

Next let V be a function of a, y, y, and #, then

is written

*x xy su= | *(Pby + PyDby + P,D®8y)dee + Vda. xo x0*

1 Geddes, “On Variation in Plants,” “On the Origin of Thorns and Prickles,” and “On the Origin of Evergreens,”’ in Trans. Bot. Soc. Edin., 1886, 1887, 1888. ; ee

2 Geddes, “A Restatement of the Theory of Organic Evolution, Roy. Soc. Edin., 1888.

3 Recherches sur le Calcul des Variations, 1848.

4 Cale. des Var., 1861.

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Hence, observing that d (dP, aA Slade re

@ dP, dP, a we get su=| (2 ——=—+ ?) bydx +/ Vdx § is dx” dx ms

*we x +/ (1- Geet | * P,sy x9 dx Xo*

In general, if 7 be a function of x, y, J, J++. y™, we have .

= =dy — Py

=) dP»

ey Ean 5U=| (Poy+P,Diy+... + PnD”by)du+ / Vide. i x : ; Now let D; denote the differentiation of 5y, and D2 the differentia- tion of P,, Pz, &e.; we may write PmD™ by — (-1Y”8yD” Pm =(Dy” — (-1)“D2”)Pmdy =(D, DMD PO DD, +... Le ene

—1 ad =! aP, oH am—1 a” IE) a mV, OE’m rym Le £(=1)” yt I. at Lg Of at OU s2¢= 1) erg me at m ™m Xu P. ™m Henee / Pm D” sydx=(-1) mn by dae 2 Xo dx 4 #1 m—1 af, Mm yym—2 m—1 a” 7) See ee +(-1 a Ihe 4: i Pm D” dy — ~— D”by + f(r aie, me

x Applying this to the different terms in the value of 6U given above,

eree 2 Ole dae, ae i= er seem. eee a He lye ue bi Ait ae eee +(-1) dat aya ‘a p aP, a oe hal 1 Get a oy

y dP. od” P, \ ds / (7,- G... +(-1)” cit ae

oe ee + / ae / Vee Xo x0

Fete A ee (9). This result may be written vy na eu i (P)syda-+ i Vda XQ x %y + [Paya (LaU+ + (Pn)By- Pf oe(10) Xo . dP, dP dP, &P. , =e ee a ee fo = 2) eo ae where (P)= aa ae ya) =le ag + ies and

so on. 8. This expression consists of three parts,—(1) the de-

x finite integral | ‘(P)bydun, which depends on dy, the change XI)

in the form of the function y; (2) the expression ‘ Vda,

which depends solely on the change in the limiting values

of «; and (3) the quantity / – {(P)8y + (Pp)dy+...3, XL)

which depends on the variations of y, 9, &c., at the limits. It is often convenient to write (10) in the abbreviated

ou =L+ [Mayas ie ee (11). x9

9. The principal applications of the calculus of variations have reference to the determmation of the form of one or more unknown functions contained in a definite integral, in such a manner that the integral shall have a maximum or minimum value. For instance, to determine the form

form

oh of the function y which renders U= i "Vda a@ maximum or . . "0 : a minimum, we have as above 6U=Z + " MByde. Here, x

. . . 0

as in the differential calculus (see InrinrresimaL CAt- cuLus, § 64), for a maximum or minimum value of JU it is readily seen that we must have 5U=0; this leads to

Ly : L=0 and | Méydx=0. Now the latter integral cannot

x0 be zero for all indefinitely small values of Sy unless =0

for all values within the limits of integration. Hence we get the differential equation in y, mar, ory Ree Pao + g++ + (- FH (12).

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10. We here suppose that there is no restriction on éy, so that for any value of x the increments + dy and — dy are equally compatible with the conditions of the problem. The reasoning consequently will not apply if the conditions render this impossible. For instance, if a curve be re- stricted to lie within a given boundary, then for all points on the boundary the displacements must be inwards, and the opposite displacements are impossible. In this case! the curve satisfying a required maximum or minimum con- dition consists partly of portions of the boundary and partly of portions of a curve satisfying the equation J=0.

11. The equation J/=0 is in general a differential equation of the degree 2x ; aecordingly its solution usually contains 27 arbitrary con- stants. The values of these constants are to be determined by aid of the equations deduced from Z=0 in eombination with the given conditions at the limits. For example, if 7 be a funetion of x, y, .

and y solely, the solution of petits is in general of the form

dx y=f(x, , C). Now, suppose that the limiting points are re- strieted to the eurves ¥)=fo() and y,=/;(x,), then we get at the limits dyy+%dxy=fo'(x)da and dSy,y,dx,=/;'(a)dx, Henee, substituting in L=0 the values of dy) and dy, derived from these equations, we get, sinee dz and dz, are arbitrary, Vo(Pi)ol Zo (o) – Yo) =0 Vy + (PyiA() – 1) =0 We have therefore six equations for the determination of the six quantities x, Yo, 2, Yy 4, and ey. The integration of the equation Af'=0 is mueh simplified in particular cases. dP. (1) Let V be a funetion of x and y solely, then we have = =i),

P, =C > (2) If /be a function of y and y solely, P= 1, also x V)=Py4+- Py

therefore

= y+ yp. Hence, integrating, we get

V=Piy+e where ¢ is an arbitrary constant.

12. For example, let us consider Bernoulli's problem of the eurve of quickest descent under the aetion of gravity. Take the axis of x vertical and that of y horizontal, and suppose the particle to start from the point Xp, Yo with the velocity due to the height " ; then, if v be the velocity at any point, we have v?=2g(z+h-2), also ds se pda

t= —-=—_———_____—"———.. Here, neglecting a constant faetor, we ma y» A/ a w+) h—2% iil 8 , y a/T 4 gd j — write V={ —=2 = ; and by (14) we get Jo = eV 2+h—-2% aya — ay" alles V1+ 7 :

Now, writing @ for 1/c? and assuming «+h —2a=a sin®0, we find dy=tan 6dx=a(1—.e0s20)d0; therefore y=a(6 — sin 6 eos 0) + K, and we infer that the eurve is a cyeloid. (a) If we suppose the upper limit to be fixed and the

lower re- stricted to the curve y,=/;(,), we get from (18) 1+ tan 4f,'(x,)=0 accordingly the curve interseets the bounding eurve orthogonally. (8) Next let the upper limit be restrieted to the eurve y)=/o() ; then sinee V contains 2, we have an additional term in 6U arising from

vy the ehange in xp, viz., day i a a consequently the coefficient of

ago . ; qd V dx, in 6U is —— dat — {V+ (Py)o(fi' 0) – Yo) } » ayo 1 7 j . and we have / F ia Vor (PrydoCfo (20) — Yo) ce vveeeveveves Glo}

0

If we substitute for V its value, we get without diffieulty from this equation 1+ tan 6,f9'(%)=0. Comparing this with (16), we see that the tangents to the bounding eurves at the extremities of the trajectory are parallel (Moigno, op. cit., p. 230). cal 13. More generally, consider the curve for which U= () pds nat nt x9 = HA/1 + 9?dx is a maximum or a minimum, where p is a given XQ

funetion of zandy. Here pee +97, i and we get

dy Vi+# ip = y du dp d y eat Tide ae nae ys S| (——— IS i dy™1 = Vi agp de 7) +H ee =) ; hence, if p be the radius of curvature, we have Li pel: dp dp = cos ta ae we raee canara kitsch (18),

where a, 8 are the angles whieh the normal makes with the co-

1 For a full discussion of such cases, see Todhunter, On the Calculus of Variations, 1871 (Adams prize essay), Cambridge.

| | |

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ordinate axes respectively. Jellett remarks? that, if the proposed

integral had been : "< we should then have arrived at the equation

= (8 Bee cs st), and consequently have seen that the two pp dx dy

curves coutained under the cquation p?=f(x,y,%) are such that, if

pds a maximum or a minimuni, the other possesses

the same property with regard to | “

one reuders

14. Next, to find the curve such that the surface generated by its revolution round a given line shall be a minimum. Here,

X —_ neglecting a constant multiplier, we may write U= | yN1+ Pde ; Xo

aecordingly by (15) we have y=cV1+g. This gives ie = = . and hence Et? tog (y de Ses*

¢ or y=5(eerie c Sear) errr. (19),

which represents the common catenary.

15. We now proceed to generalize the results in § 11. If /be a function of 2, y, #,... y™, not containing y explicitly, we have by integration

—1

ae Pa _

de) SS roe osinc (20), Again, if V does not contain x explicitly, < (V)=9P+9P,+...+y@t)P,. Also, from the equa- as ; hence

. a’ P,, 7 dx

where ¢ is an arbitrary constant.

2

tion M=0 we see that P=—1-———2+ a=

d ed? gk mE, Be ~~8P, 495) + 0P,~~ oat. tY¥t MP,-(-1)

=(D,+ D,\yP,)+ (Dy – Dy\(gP2) + sD, ~(- 1) ae), where D, represents the differentiation of y, J, &c., and De that of

P,, P,, &c. Consequently, by integration Va=c+WP)) +H Pet… YP, coccccers (21), a differential equation of the order 2n-2 at the highest. Again, if

V contains neither x nor y explicitly, we may substitute c' for (P,), and consequently we have Vactc'y+y(Py) +... tYP, ceccccccsonee (22). 16. As an example, let us investigate the curve for which the area between the curve, its evolute, and the extreme radii of curva-

Sy 2) "/2\2 ture shall beaminimum. Here U= il pds= i} (1+ 9 a, Hence So Xo y . . b ' Oya) . = a Cy Coy Y (22), since #P,= — V,we have V= Cy + Co, OF p= ; ab Jo A/ + Sv JL OP

therefore " =¢, COs +¢, Sin ¢,where ¢ is the angle made by the

tangent with the axis of z. This leads to

(23)

whieh shows that the curve is a cycloid. Again, (1) if the extreme

dV

Let 4% 9 _aV , Cag a Be, a oni ay en 6U= Piles f (Poy + P,Doy+...+P,»Dsy)dx Xo Xo

Dy dt : Qoz+ Q Db2+...+ QmD"Sz)dx.

Proceeding as in § 7, we find

vy vy xy su= | (Payde+ | (Q)dzdax + Vde Xo Xo

%

' Calculus of Variations, p. 140.

oa + / {(Pydyt(P.)dg+... + P,,dy- DY x

+ [182+ (Q)85+ + OBO} ace (25), Xo

where (LP), (P,), ... have the same meaning as in § 7,and (Q), Q,),... are the corresponding functions for the variable z.

18. The determination of y and z where | Way is

. . . . : % .

maximum or a minimum leads, as in § 8, to the equations (P)=0, (Q)=0, along with the equation at the limits

vy x % / Vie + ” “(Py)By + ...P,Sy%-D} + iy {(Qy)82 + —. Qmnd2™-D} =, % Xo Xo

The mode of treatment is similar to that for a single de. pendent variable.

19. In the discussion of a curve which possesses a maximum or minimum property, if we limit the investiga- tion to all curves of a given length or which satisfy some other condition, we have a distinct class of problems, which originated in the isoperimetrical problems of James Ber- noulli. They were originally styled dsoperimetrical, but are now called problems of relative maxima and minima. Thus, let it be proposed to determine the form of y which renders

La Us | Vde a maximum or a minimum, and which also X

| satisfies the condition U’ = | V’dx = constant, where V and xo

V’ are given functions of x, y, y, &c. It is obvious that, if U is a maximum or a minimum, so also is V+ aU’, where a@ is any arbitrary constant. Accordingly the problem re- duces to the determination of the maximum or minimum

x: value of the integral | ‘(V+aV’)dx, regarding a as a con-

stant, whose value is to be determined by aid of the given value of U’.

20. Another class of problems closely allied to the pre- ceding is that in which the variables are connected by one or more equations of condition: for instance, when y, %, y, &e., 2, 2, &c., are connected by a relation W=0, we investi- gate the maximum or minimum values of

Ua] (VAN W det vecccccccccccescecees (26),

Xo where A is an indeterminate function of x We will illustrate these principles by examples.

21. To find the curve connecting two fixed points such that the surface generated by its revolution round a fixed line shall be given, and the volume of the generated solid shall bea maximum. 'Taking

wy the fixed line as the axis of z, we may write U= 1 (yr +ayV1+y")du. x0

ar ayy" Hence by (15) we have y?+ ayV1+ 7=c+—— VIi+y

a

or y+ Vise" aisiaitetatsletsteletetelslsiccicieaciciels (27):

If the curve meets the fixed axis we have c=0, and the curve is a circle whose centre lies on the axis.

The further integration of (27) depends on elliptic functions ; it can, however, be shown without difficulty, as was proved by De- launey, that the curve is that generated by the focus of an ellipse or hyperbola which rolls on a fixed right line.

22. Asan illustration of the method of § 20 we shall consider again the problem of § 13, taking the arc for independent variable. Let in @, =, then we have the relation #?+ y?—1=0; and we write

3 3)

v= | "ut ANGE +y°-1)} as= | Vas, where V=p+4X(e2+ 92-1). 50 So

Hence for a maximum or minimuin we have

dan ds dy aa) Pee ciNet (28) ; du _ du du_dnr therefore an ay ae or [t=)

x

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Again, the equation at the limits is

8] 5] / past / NPR O…....---2(80)3 so §

ORR. also at cach limit we have de=déx+ads, dy=dy+yds ; hence (30) 8] Ss] transforms into (w—A)ds + i Mada + ydy)=0, So 8p

Ss] . or cd(s, — So) / Naedart ydy)=0 ….0000-+- (31).

5

0 .

Now if the length of the curve be given, the first term in (31) vanishes ; whereas, if the length be not given, we must have c=0. Consequently in the isoperimetrical problem we have w= +¢, and in the general caseA=p. If we substitute « for \ in (28) we can readily deduce the results already given in § 13. 23. More generally, let » be a function of x, y, %, and y, then we have V=u+4Xa‘7+y2-1). Here we readily deduce v= dV x Le =C+e2 Fis 7] dy and the equation at the limits becomes

1/dV av 3, = ——d ——d)=0. cd(s, +] a = ay y

This shows, as before, that when the length of the curve is not given we have c=0.

24, The criterion for distinguishing between maximum and minimum solutions was investigated by Legendre, Lagrange, and other eminent mathematicians, for whose contributions to the solution of this problem, see Tod- hunter's History of the Calculus of Variations, The full analytical investigation was, however, first given by Jacobi, of whose results we here give a brief discussion.

In this investigation, as in ordinary problems of maxima and minima, it is necessary to take into consideration the squares and the higher powers of our indefinitely small variations. Thus, if

2

U=| Vdzx,the complete variation of Umay be written 65U+ 40 U+

xo &e., where 5U depends on the first powers of dy, 6y, &c., and &'U on their second powers, &c. Again, we will suppose that the limiting values of y and of its first 2 — 1 differential coefficients are fixed, then

%

*sU= ii '3Vde= a * Mbyden, and &°'U= i "aMoyde. The solutions of x ui*

x the problem, as already observed (§ 8), 'are given by the equation M=0. Also for a true maximum it is necessary that 6°U should be constantly negative, and for a minimum that it should be positive. If 6°U=0, or if it change its sign between the limits of integration, the result is in general neither a maximum nor a minimum. As

before, we suppose Va function oF fay WE Poo Y, and wa=p-2i, apd (i = (4-DE tla oa therefore oM= (= . DE+Ds ES .)av = ai Die moe (ett + ees")by (38).

When this is developed, we see that every term, disregarding sign,

2

is of the form D' as dy dy™ the corresponding term, and make /=m-+,r, we readily see that = ty 7m 7" av r dV ws – 1p {D araghs Yaa Hence 64 is reducible to the form 5M=(A)+DA,D+D'A,D'+... D"A,D" oy …(35), provided it can be shown that D'w(-1)'wD" is reducible to an operation of suchaform. Now thisis readily seen, for Du-uD=u, therefore D'u-DuD=Di and DuD-uD°=%D; consequently Dut+uD?=2DuD+iu. In like manner Du-uD = 2DUD + %i and the proposed result can be readily shown by induction. Hence we infer that we may write 6M in the form (35).*

25. We have in the next place to show that the symbolic oper- ator u(4y+DA\D+...D”A,D”)u may be written in the form By DBiD+...+D”B,D”. To establish this, it is sufficient to show that wD” A,D”w can be transformed into the shape in question. By Leibnitz’s theorem we have

D™ésy. Also, if we combine this with

D } D™ oy (34).

Du=ud + rap 43 a – apr ae

and UD = Du-rD a+ = =” pry aes

VARSATIONS

But these may be written

Du=udD” + Loe + LD ar aes!

uD Ss DUuHP LD eee. therefore uD”A,D’u=(D’u-D““L,+...) AUD +1, Da Hence by § 24 we readily see that uD”A,D”u is of the required form. Accordingly we may write wW(Ay+DA\D+...D” AnD \wo=(Byt DBD ... D”B,D”)v(36). If w=dy, we get from (35)

uo0M=(By+ DB\D+... + page) sheen. (the again, if v=1 in (36), we have w(Aypt+DA,D+... +D”AnD”)u= By

Hence, if w, be a solution of (4)+.D4A,D+...+D”4,D”)w=0, that

is, if it be a solution of 64/=0, the corresponding value of By is 0. Consequently we have from (36)

u,5M=D(B,DBD...+ pgp” ypu. If mars this becomes ; 5M=2,D(B, + DB,D+ ... D” BaD”) Daby……(89).

Again, the symbolic operator B,DB,D... 4D” By can be transformed into 2D(C,DC,D... +D”C,410" ee

and soon, Finally we get OM = 2, Da D vein Rye Dep Dinar ove PG VACY varseecee (40), Thus we obtain 2 “nl v= by%D2,D… Den D.. Deg De 6Yyd% wircece (41). Xo

If we integrate by parts, then, since the limiting values of y, y…

1

are fixed, we get 0° U=-— iP (Dz, 5y)(%Dey.. . %D2,6y)dx, and after x

ee : 0, nm successive integrations

: al é”U=(-1)” i Sql Denman. + DIROYOAL veaseeses (42).

9

® n ey Again, from (33) we see that 4,=(-1) ay

find without difficulty

; also from (40) we

Bi 1. nt) a ocseeseres tree (43). Hence we get finally TI Dee Demme eee OUNG vu= | ie ee 2) me Zn—12n—-2 + 0 Ry) e (44), ay es 9 ‘ ” where Q,, = ry From this it follows that the sign of 6°U de- iy 2 pends in general on that of Q,, or < (nB" Accordingly for a maxi- y

mum or minimum solution it is necessary that Q, should have the same sign for all values of « between the limits of integration, da being supposed always positive. The reader will find no difficulty in applying this criterion to any of the examples which we have hitherto given.

26. A new and complete discussion of the criteria for the discrimination of maximum and minimum solutions has been given by Mr Culverwell in Zrans. Roy. Soc., vol. elxxviii. (1887). Owing to want of space we can only make an allusion to this remarkable memoir, which contains an elementary investigation of the criteria for maxima and minima not only in the case of one but for any number of dependent variables, as also for multiple integrals.

27. We now proceed to the application of the calculus of variations to multiple integrals, commencing with the

double integral V= / – Vdxdy, where V is a function of xv Yo

: ; dz dz dz

*tr, Y; * P, % 7, 8, and ¢, in which P=’ tay ne da az Oe;*

s= cea Cage in accordance with the ordinary notation.

Yi 2: Let Vi=] Vay, then U= | ‘Vee; therefore by (6) we have Yo x

tal Oy su= | a7 de | V dee x9 xo

sil) pal 2 V1 ey afl = / / 5 Vdedy + / Voyde + i dx| Viay. Zo” Yo Zo’ Yo % Yo ay

Again 37 = Nbz+ Pop + Qdq + Ror + Sds+ Tot, where N=”,

———

Consequently, by subtraction,

dV dV dV

= i. , i (Noz+ Pip + Q6q + Ror + Sds+ T6t)dady…..... (45). Lov Yo

In the transformation of this expression we shall employ the fol- lowing formule, which are easily established,

Hig Y1 JE at / ‘ ‘“ a= i “ie | udy — ha is ee… 26y, Xo yl 1) Yo to Yo dx

w. vy 1 and / F i. ab daddy = / if 1021 AR ss SORA eg NO (47). aod yo LY a Yo

1 £¥1_ dé Hence we get | i, Po -daily Xo Yo we

Y. 1 /Y1 =- [? jis oe sedady + i “dee i “PBedy — | 7 Polecdy, aod Yo OX x Yo tg yo OF

“1 PV” déz 71 (“dQ (XA /Y1 also / : 0 ag – i a} GY saleberap Qaeda. Lov Yo dy ‘ Xo Yo dy – | wo Yo

0

TN doz Next, to transform i} R-, dedy, we have aod yo 0%”

0′

TV / asx 2 1 yi 2 \ (253+ 2 & anay= [| gel Bae aed aod Yo a x de aod yt dx

al Y1 oo vy Yl tes s Ds ae ay 2 (/ Rela t J yy ae tol yo Ue Axe | also / xy

y

YI aR doz GR Ly 41g dR les We + 2? day | saa ao?) aay

1 1dR 1 MdR dy = af — 62d. -| —— — dzedy. i yy UX Y ae de dx“*

Yo v1 ry 2 i ‘(2 Fhe) ay tw Yo daz dz’*

1 [1 / »ddz_ aR “1 M/dR. _ddz\dy = a R—— —- — 62 \d hs ep eee / a da de Jews [oP (ae # oe) das

Again, in transforming the latter integral it is necessary to observe that y, and y, are functions of x, and accordingly that in

: dbz ad dy dbz that integral we have dx de) – Pa a ; hence

1 (“A ddz dy % M1 /dy doz 1 1 dy d ‘. ge [2(#) — dl -[REL © (ae\a ff ae , zy! Vo we ao tol Yo dx da! te 1/41 d 1/“g og mio [0/8 oyayn ft] wld a ano eY ae qa Seay 1 7Yy -/ | ‘ep (BEY) ae Ol yy dz dx*

*a (4. dy dy/dR. dydR But ma Bat) = ay ,dy/dh dydR da\” dx as de * da dy*

TY i sz v1 (Yig2R 71 (¥1fodéz aR Re raed) =f il Seda i i (2G | ty yy dae y ! 2 yy tu? ela ao yo Ge da a Jee

v1 Yi a +f”) oo a se)) ode Xy

; hence we get

Yo ax? dx dx dy az 1/%1_ (dy \? déz 1 /Y._ dy +f”) n(SY) ay | / aos ee 48). ml yo \da]} dy x yo ae a ey ry 2 Next, to transform ‘i : i oe. Here ty) yo “ily

“a | “1 (ase aS dbz 71 (1d (_déz ght A 8) saya [29a ie yo\ daxdy dx dy y ay yo@@\ dy eae

4 ry dé 7 /Y iz

=/ seu f / po oe tod yy OY XZ! Yo dy dat

1 (Vi bs ry /Y

*also a (ie ay * tay andy = | OB sed aol yo \ de ay dudy tio) yo bt*

’ m”/ doe . dS henee b eee Gee ee by subtraction i; – iw ih S dey bz a = dudy

*PLY doz al Y1 (dS dézdy = S—— dy ~ -—O2 eee Mes hea : Ok dy y ae * dy dx ss –*

. wy y : Finally, to transform i 7 — mo) yy FY

APA se AT ds “1 v1 z lad a9 ap ay) ff al 7a) = ~ % Yo Y yay mod yol\ ty Xp! “Yo

WA/AT dee aT “a1 nay and is & ee =[/ —— 6edx, consequent] a) y\ ty dy” dy? : =a

dady, we have

ef? ute City, dy

V 2B bAsh 1 OW § 89

dV ,, av a i ie 4 ds: FT) i ie doz aT ee pe ge a2! ence 5 Ved pee 5. Vana ae 50). dp' Q dq' = dr' " ds at ane 'h: Yo Y aod yo ey? ay? " tol Yo dy dy (50)

y; Combining the preceding results, we get 5U=8 if ie dady

Xv Yo

*a ry 2 2 : =| '| (27 aE Daag ray * aya)Oeddy Yo*

*~ da dy ' dx * dxdy dy?*

ey Yi dy dy dRdy dR/dy\? dS av . +f) eee hae az ax a G2) Se

1 /¥1 P 2 sy + / (2(¢ ~ 8h 1) eae a! Yo dx dz dy

'1 /y¥ 7 Yi tt f, 'Voyde / : Péedy+ | ["(2-Z-) oF 0 XY Yo ov Yo a y

%! Yo

1 (Yi ay Y/Y ' 4 Rays | / s- nH)a: ee (51).

Xo/ Yo dee Xo" Yo ie! : 28. In many applications the limits of x and y are determined

from a single equation. Thus, suppose the integral U= || Vdady

to express the sum of the elements Vdzdy for all values of a and y which satisfy either g(x, y) >0 or $(z, y) <0, then the limits are given by the equation ¢(x, y)=0. In this case the preceding value of 6U becomes much simplified, for y, y, are determined from the equation' ¢=0; and the extreme values of z are found by eliminat- ing y between the equations ¢=0 and d¢/dy=0. But these are the conditions that ¢=0 should have equal roots in y; we consequently infer that, when either z=, or z=2, we have Yo=Y; Hence we

a Y: observe that i : ie ‘udy =0 and , : / ‘udy=0 for all values of 2, so

that the last four tert in the expr for 6U in (51) disappear in this case.

The methods and results of this and the preceding section can without difficulty be extended to triple and higher multiple integrals.

29. The method of application of the calculus of varia- tions to the determination of maximum or minimum values of multiple definite integrals proceeds on the same prin- ciples as those already considered in § 9 for single integrals.

We shall limit the discussion to a brief consideration of

the double integral U=

of «, y, z, p, and q solely, and the limits are determined, as in § 28, by an equation of the form ¢(x, y)=0. Such problems readily admit of geometrical interpretation.

Here (51) reduces to

y su= |” ‘(w-Z- 3) adady xo Yo dx dy

1 /W ¥ { (2 ~ Paes Vay | ae TE (52). Xo’ Yo dae

Consequently, as in the case of single integrals, for a maximum or minimum value of U we must have

ll Vdedy, in which V is a function

dP dQ_ . ee (53), y and / ‘{ (0-22) ba-+ Voy \ =0 ee: 4 (54), Yo ee

The former is in this case a partial differential equation of the second order, whose solution, whenever it can be obtained, consists of an equation between 2, y, z having two arbitrary functions. The form of these functions in each case is to be determined by aid of (54) combined with the given limiting conditions of the problem. Thus, let us suppose the

upper limit restricted to points in the U qd 1 ! dy 2 v1 / surface z=/,(x, y), and let p 7 dear then a/ = / g' Sy ;

¥1 v1, y and / (62+-q6y)= / Véy. This gives

Y) / {52+ (q—q')8y} =Onceceeceeeeeceeee (55). Substituting in (54), we get "{ 7+ (9-H ~~a)} <0 Petal (56). Again, along the limiting curve we have dz= pdx+qdy and dz=p'dx+q'dy ; hence we get oN ae Substituting in (56), we have along the limiting curve UEP Day — Q)=0 ...~~...ecncassees (57). 1 If the equation @=0 gives for y several values, Yo, Y1) Yo) Y3) Y4)—~» then

yy ¥3 we substitute fi Vdy= ii Vdy+ | Vdy+...,and each integral is to be treated as above. Yo 2

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90

A similar equation holds if the lower limit be restricted by another

surface. ; By aid of these equations the arbitrary functions involved in the solution of (53) are determinable. For example, to find the surface

such that ff pa shall be a minimum, dS being an element of the surface and yw a given function of the co-ordinates x, y, 2. Here

ae Hp Hg VapN 1 tpt, P= Vite Ni +p ge

; dP ad p d q tion Noes = =) leads to Hz So) t3(= =) = 1 du dp a

TaN 1+ pg? dz Pde Ydy J? hta = (cos 7 cos pGh + cosy) where 2 and F' are the principal radii of curvature of the surface at the point, and a, 8, y the angles which the normal to the surface makes with the co-ordinate axes, Again, if we suppose the surface limited by two fixed surfaces, the equation V+ P(p' —p)+ QO(q' – g)=9 reduces to Se yy/5 AOL = pene eoeencpoengcoeee (59). This shows that the surface intersects each of its bounding surfaces orthogonally. Asa particular case of (58) we infer that the surface of minimum area is in general such that its principal radii of

cur- yature at every point are equal and of opposite signs. A remark- able investigation of the equation of this surface was given by Bonnet in Liowville's Journal, 1860. Agaiu, in the surface of given area and of maximum volume we have V=z-aV1+7?+9°. The equation V— a e=0 readily leads in this case to z +5=0,

30. The principles and method of the calculus of varia- tions are largely employed in all branches of mathematics, both pure and applied. Want of space prevents our enter- ing into any account of such application. The reader will find the history of this calculus fully detailed in Todhunter's treatise, already mentioned. The most important recent work in English is Mr Carll's Calculus of Variations, New York and London, 1885. (3B. w.)

VARICOSE VEINS. See Sureery, vol. xxii. p. 684.

VARLEY, Cornetius (1781-1873), water-colour painter, a younger brother of John Varley (see below), was born at. Hackney, London, on 21st November 1781. He was educated by his uncle, a philosophical instrument maker, and under him acquired a knowledge of the natural sciences ; but about 1800 he joined his brother in a tour through Wales, and began the study of art. He was soon engaged in teaching drawing. From 1803 till 1859 he was an occasional exhibitor in the Royal Academy ; and he also contributed regularly to the displays of the Water-Colour Society, of which, in 1803, he was one of the founders, and of which he continued a member till 1821. His works, which are not numerous, consist mainly of carefully finished classical subjects, with architec- ture and figures. He published a series of etchings of Boats and other Craft on the River Thames, and during his life as an artist he continued deeply interested in scientific pursuits. For his improvements in the camera lucida, the camera obscura, and the microscope he received the Isis gold medal of the Society of Arts; and at the International Exhibition of 1851 he gained a medal for his invention of the graphic telescope. He died at Hamp- stead on 2nd October 1873.

VARLEY, Joun (1778-1842), water-colour painter, was born at Hackney, London, on 17th August 1778. His father, a man of scientific attainments and tutor in the family of Lord Stanhope, discouraged his leanings towards art, and placed him under a silversmith. But on his parent's

death Varley escaped from this uncongenial em- ployment, and, after working with a portrait painter, en- gaged himself at the age of sixteen to an architectural draughtsman, who took him on a provincial tour to sketch the principal buildings in the towns they visited. His spare hours were employed in sketching from nature, and in the evenings he was permitted, like Turner and Girtin,

Hence the equa-

or

VAR—VAR

to study in the house of Dr Munro. In 1798 he exhibited his first work, a View of Peterborough Cathedral, in the Royal Academy. In 1799 he visited North Wales, and in its wild mountain scenery found the subjects best suited to his brush. He returned to the same district in 1800, and again in 1802, and the impressions then received powerfully influenced the whole course of his art. In 1804 he became a foundation member of the Water-Colour Society, and contributed over forty works to its first ex- hibition. He had married in the previous year ; and, in order to provide for the wants of an increasing family, he was obliged to produce for the dealers much work of a slight and commonplace character. He also taught draw- ing, and some of his pupils, such as John Linnell and William Hunt, afterwards became celebrated. He was a firm believer in astrology, skilful in casting horoscopes ; and some curious instances were related of the truth of his predictions. It was at his house that his friend William Blake sketched his celebrated Visionary Heads. Varley died at London on 17th November 1842.

Varley's landscapes are graceful and solemn in feeling, and simple and broad in treatment, being worked with a full brush and pure fresh transparent tints, usually without any admixture of body- colour. Though his works are rather mannered and conventional, they are well considered and excellent in composition. Some of his earlier water-colours, including his Views of the Thames, were painted upon the spot, and possess greater individuality than his later productions, which are mainly compositions of mountain and lake scenery, produced without direct reference to nature.

Among his literary works are Zodiacal Physiology, 1828 ; Observations on Colour and Sketching from Nature, 1830; A Practical Treatise on Perspective, and Principles of Landscape Design for Young Artists.

VARNA, a fortified town and seaport of Bulgaria, in 43° 12' N. lat. and 27° 56' E. long., about midway between the Danube delta and the Bosphorus, lies on the north side of the Bay of Varna, at the opening of the Pravadi valley, 5 miles wide and skirted by hills on both sides. The town, which covers the slope of one of these hills, facing seawards, comprises Greek, Bulgarian, Turkish, Jewish, and Gipsy quarters, with a total population (1888) of 25,256 (8449 Bulgarians, 7569 Turks, 5423 Greeks). It has many finely built houses and shops. Its principal buildings are the gymnasium, a hospital, the barracks, and several churches and mosques. Amongst the industrial establishments are soap factories, breweries, distilleries, and tanneries. More than 3,740,000 gallons of wine are made annually within the department of Varna. The town is well supplied with good water, and is not unhealthy. Although open to the south and south-east, the bay affords safe anchorage, being sheltered from the north and north-east winds. Through the Pravadi it communicates with Lake Devno, which, if connected, as has been proposed, by a navigable canal with the bay, would form one of the best harbours in the Euxine. Varna is the chief outlet for the grain and agricultural produce of Bulgaria for Constantinople and the west of Europe, the export of grain in 1887 amounting in value to £244,210 (total exports, £349,030) and the total imports to £580,300. It lies 48 miles east of Shumla (Shumna), with which it is connected by the main Bulgarian railway, running thence to the Danube at Rustchuk,—these three fortresses forming with Silistria (on the Danube) the Bul- garian "quadrilateral." The old stone walls of Varna have been destroyed to make room for earth-fortifications.

Varna has been identified with the ancient Milesian colony of Odessus on the coast of Mesia Inferior. It figures largely in the history of more recent times, and close by was fought in 1444 the battle in which Amurath (Murad) II. slew the Hungarian King Ladislaus, and routed his forces commanded by the renowned John Hunyady. Varna was occupied in 1828 by the Russians, in 1854 by the allies, who here organized the invasion of

the Crimea, and in 1877 by the Egyptian troops summoned to the defence of Turkey against the Russians. The following year it was ceded to the principalit of Bulgaria. It has long been the seat of a Greek metropolitan an since 1870 of a Bulgarian bishop.

VAR—VAR

VARNHAGEN VON ENSE, Kart Avcust (1785- 1858), German biographer, was born at Diisseldorf on 21st February 1785. He went to Berlin to study medicine, but devoted his attention chiefly to philosophy and literature, which he afterwards studied more thoroughly at Hamburg, Halle, and Tiibingen. He began his literary career in 1804 as joint-editor with A. von Chamisso of a Musen- almanach. In 1809 he joined the Austrian army, and was wounded at the battle of Wagram. Soon afterwards he accompanied his superior officer, Prince Bentheim, to Paris, where he carried on his studies. In 1812 he joined the Prussian civil service at Berlin, but in the following year resumed his military career, this time as a captain in the Russian army. He accompanied Tettenborn to Hamburg and Paris, and his experiences were recorded in his Geschichte der Hamburger Ereignisse (1813) and his Geschichte der Kriegsziige Tettenborn's (1814). At Paris he entered the diplomatic service of Prussia, and in 1814 acted under Hardenberg at the congress of Vienna. He also accompanied Hardenberg to Paris in 1815. He was resident minister for some time at Carlsruhe, but was recalled in 1819, after which he lived chiefly at Berlin as a privy councillor of legation (Geheimer Legationsrath). He had no fixed official appointment, but was often employed in important political business.

In 1814 he married Rahel Antonie Friederike, originally called Levin, afterwards Robert. She was born in 1771 at Berlin, where she died in 1833. By birth she was a Jewess ; but before her marriage she made profession of Christianity. Although she never wrote anything for publication, she was a woman of remarkable intellectual qualities, and exercised a powerful influence on many men of high ability. Her husband, who was devotedly attached to her, found in her sympathy and encouragement one of the chief sources of his inspiration as a writer. After her death he published a selection from her papers, and after- wards

much of her correspondence was printed. Varn- hagen von Ense never fully recovered from the shock caused by her death. He himself died suddenly in Berlin on 10th October 1858.

He made some reputation as an imaginative and critical writer, but he is famous chiefly as a biographer. He possessed a remark- able power of grouping facts so as to bring out their essential significance, and his style is distinguished for its strength, grace, and purity. Among his principal works are Goethe in den Zeug- nissen der Mitlebenden (1824) ; Biographische Denkmale (five vols., 1824-30); and "Lives" of General von Seydlitz (1834), Sophia Charlotte, queen of Prussia (1837), Field-Marshal Schwerin (1841), Field- Marshal Keith (1844), and General Biilow von Dennewitz (1853). His Denkwiirdigkeiten wnd vermischte Schriften appeared in seven volumes in 1837-46. After his death were published two additional volumes of Denkwiirdigkeiten, some volumes of his corre- spondence with eminent men, his Tagebilcher (14 vols.), Blatter aus der preussischen Geschichte (5 vols.), and Biographische Portrits. His selected writings appeared in nineteen volumes in 1871-76.

VARNISH. A varnish is a fluid preparation which, when spread out in thin layers, dries either by evapora- tion or by chemical action into a hard, transparent, and glossy film. Varnishes are used to communicate lustre and brilliance to many different kinds of dressed surfaces, —metal-work, wood, paint, paper, leather, &c.,—and to protect such surfaces from the influence of air and damp. The chief requisites of a good varnish are that it forms a firmly-adherent layer on the surface over which it is spread, that it dries hard, yet with sufficient elasticity and tenacity not to crack with changes of temperature, that it forms a glossy durable surface, and that it dries quickly. The materials which almost exclusively form the permanent body of varnishes are the drying oils and resinous sub-Stances, the chief of which are the copals, lac, dammar, elemi, amber, sandarac, mastic, and rosin. For certain forms of varnish the drying oils themselves act as the solvent for the resins, but in other cases volatile solvents

all

are employed. The solvents chiefly used are methylated spirit, wood spirit, ether, benzin, and turpentine and other essential oils. Soluble colouring ingredients are also, in some cases, used in varnishes and lacquers, those principally available being gamboge, dragon's blood, aloes, cochineal, turmeric, and coal-tar dyes.

According to the solvents employed, the ordinary kinds of varnish are divided into three classes,—(1) spirit, (2) turpentine, and (3) oil varnishes. Spirit varnishes dry with great rapidity owing to the volatilization of the solvent spirit, leaving a coating of pure resin of great hardness and brilliance, but the film is deficient in tena- city, cracking and scaling readily on exposure. The resin lac, either as grain, shell, or bleached lac, is the basis of most spirit varnishes ; but sandarac is also largely used, and to these are added in varying proportions the softer resins,—elemi, Venice turpentine, Canada balsam, mastic, &c.,—which give elasticity and tenacity to the varnish. The solvent is almost exclusively methylated spirit. The resins are ground and mixed with powdered glass, which prevents the resinous particles from agglutinating, and thus facilitates the solvent action of the spirit. The solu- tion is effected by agitation in closed vessels with the aid of heat, and the varnish when strained off must be kept tightly closed from the air. Spirit varnishes are used principally for cabinet-work and turnery, stationery, gilding, and metal-work. Coloured spirit varnishes and lacquers are largely employed for metal-work, for imita- tion gilding and bronzing, for toys, &c. Turpentine is the solvent principally used for making dammar varnish, the solution being effected by powdering the resin and boiling it with a proportion of spirit of turpentine, after which more turpentine is added in the cold state to bring the preparation to a proper consistency. To increase the tenacity of such dammar varnish some proportion of boiled linseed oil or of oil copal varnish may be added. In place of oil of turpentine other essential oils may be used as solvents, and in practice oil of spike is largely utilized in preparing fine varnishes for oil paintings. Turpentine varnishes are also made in which the principal resinous bodies are sandarac and common rosin; and, moreover, turpentine is largely employed to reduce the consistency aud to improve the drying properties of copal varnishes. The basis or solvent of oil or fatty varnishes consists principally of linseed oil ; but the other drying oils—poppy and walnut, &c.—may also be used.

These oils, without the addition of resins, themselves form varnishes which on exposure in thin layers dry by a process of oxidation into tough glossy films; but the drying proceeds very slowly unless the oils are previously boiled with the red oxide of lead or otherwise treated to increase their power of absorb- ing oxygen (see LinsEED O1L, vol. xiv. p. 677). It is in the form of boiled oil or of oil prepared with driers that these oils are used in varnish-making. Oil varnishes thus differ from the other classes in the circumstance that the principal solvent is not volatile and dissipated on exposure, but in itself forms an essential and permanent ingredient in the preparation. The resin principally used in oil varnishes is copal, and its varieties differ very much in hardness, that is, in the temperature at which they melt and distil. Hard and semi-hard copals can only be made to mix with and dissolve in oils at the temperature at which they distil, which ranges from 230° to 360° C. The copal in varnish-making is melted and brought to the requisite temperature in a copper vessel. Simultaneously the oil is heated to the boiling-point in a separate copper vessel, and at the proper moment a measured quantity of the boiling oil is added to the liquefied resin. They are then boiled together till the mixture becomes perfectly clear, and by a series of alternate additions of oil and

resin at proper temperatures the solution is brought to the desired consistency. After the mixture of oil and resin has sufficiently cooled, oil of turpentine in certain propor- tion is added. The making of copal varnish is attended with great risk of burning, and special precautions have to be observed for the extinction of the fire that frequently bursts out in these highly-heated and most inflammable bodies. Copal varnish is also made by boiling together the requisite proportions of resin and oil under pressure in a closed vessel, and subsequently adding turpentine, or by dissolving the resin and turpentine at the high heat and adding the oil afterwards. Amber varnish is prepared by the same methods as those followed in preparing copal, but, the resin being still more refractory and insoluble, a higher heat is required. A peculiar varnish forms the basis of the celebrated Japanese lacquer. The substance is a resinous exudation, which is obtained by making in- cisions in the bark of the Japanese

urushi or lacquer-tree, Rhus vernicifera. The resinous juice on settling in vats separates into two layers, the upper and thinner of which, on mixture with a drying oil, forms a transparent varnish, having a rich yellow colour, which dries into coatings of remarkable tenacity, durability, and lustre (see JAPANNING, vol. xiii. p. 592).

VARRO, Marcus Trrentivus, Roman polymath and man of letters, lived from 116 to 27 B.c. When he was born, the Gracchan agitation had only just been laid to rest, and the year of his death saw the final and formal establish- ment of the empire. Into the changing life of that stirring time Varro entered deeply, and there was no current in thought, culture, literature, and even politics, with which he was not closely in contact. Few have ever so thoroughly combined the pursuit of scholarship and literature with experience of practical affairs. Dionysius of Halicarnassus well described him as the man of widest experience during his age. Nothing is known of Varro's ancestors but that they were natives of the Sabine country, where Varro himself was born in the town of Reate. Here he imbibed in his earlier years a good measure of the hardy simplicity and strong seriousness which the later Romans attributed to the men of the early republic,—characteristics which were supposed to linger in the Sabine land after they had fled from the rest of Italy. The chief teacher of Varro was L. /lius Stilo, the first systematic student, critic, and teacher of Latin philology and literature, and of the antiqui- ties of Rome and Italy. We know from Cicero that Varro also studied at Athens, especially under the philosopher Antiochus of Ascalon. It was the aim of this teacher to lead back the Academic school from the scepticism of Arcesilaus and Carneades to the tenets of the early Platon- ists, as he understood them. His opponents, however, declared that he identified Platonism with Stoic dogmatism, and that a very slight change in his views would have con- verted him into a Stoic of the Stoics. When Cicero wrote his Posterior Academics, he introduced Varro as an inter- locutor, and made him expound the views of Antiochus. The influence of Antiochus is most plainly to be traced in the extant remains of Varro's writings, and indirectly in works like the De Civitate Dei of Augustine, which owe much to Varro. In spite of controversial statements to the contrary, the differences between Antiocheanism and Stoicism were great and marked, and it is a serious, though a common, error to treat Varro as an adherent

of the Stoic school. The political career of Varro geenis to have been late and slow; but he arrived at the preetor- ship, after having been tribune of the people, questor, and curule edile. In politics and war he followed Pompey's lead ; but it is probable that he was discontented with the course on which his leader entered when the first triumvirate was formed, and he may thus have lost

his chance of rising to the consulate. He actually ridi- culed the coalition in a work entitled the Three-Headed Monster (Tptxdpavov in the Greek of Appian). He did not, however, refuse to join the commission of twenty by whom the great agrarian scheme of Cesar for the resettlement of Capua and Campania was carried into execution (59 B.c.). Despite the difference between them in politics, Varro and Cesar had literary tastes in common, and were friends in private life. Under Pompey Varro saw much active service: he was attached to Pompey as pro-queestor, probably during the war against Sertorius in Spain. We next find him, as legate, in command of a fleet which kept the seas between Delos and Sicily, while Pompey was suppressing the pirates, and he even won the "'naval crown," a coveted reward of personal prowess. A little later he was legate during the last Mithradatic war. In the conflict between Caesar and the Pompeian party Varro was more than once actively engaged. In his Civil War (ii. 17-20) Ceesar tells how Varro, when legate in Spain along with Afranius and Petreius, lost his two legions without striking a blow, because the whole region where he was quartered joined the enemy. Czsar curiously inti- mates that, though Varro did his best for Pompey from a sense of duty, his heart was really with the other leader. Nevertheless he proceeded to Epirus before the battle of Pharsalia, and awaited the result at Dyrrachium in the company of Cicero and Cato. Like Cicero, Varro received harsh treatment from Mark Antony after the Pompeian defeat. Some of his property was actually plundered, but restored at the bidding of Czsar, to whom Varro in grati- tude immediately dedicated one of his most important writings. The dictator employed the scholar in aiding him to collect and arrange great stores of Greek and Latin literature for the vast public library which he intended to found. We have glimpses of Varro at this time in the Letters of Cicero. The two, though alike in political inclinations and in their love for literature, were anti- pathetic in their natures,—the one soft in fibre, and vain, richly abundant in expression,

and subtly sensitive, the other somewhat harsh, severe, and retiring, solid in learn- ing, and no master of literary form. The impression of Varro's personality which Cicero gives is unattractive enough, but probably on the whole true. The formation of the second triumvirate again plunged Varro into danger. Antony took possession anew of the property he had been compelled to surrender, and inserted Varro's name on the list of the proscribed. His friends, however, afforded him protection. He was able to make peace with the triumvirs, but sacrificed his property and much of his beloved library. He was permitted to spend in quiet study and in writing the last fifteen years of his life. He is said to have died (27 B.c.) almost pen in hand.

Varro was not surpassed in the compass of his writings by any ancient, not even by any one of the later Greek philosophers, to some of whom tradition ascribes a fabulous number of separate works. In a passage quoted by Gellius, Varro himself, when over seventy years of age, estimated the number of " books" he had written at 490; but " book" here means, not merely such a work as was not subdivided into portions, but also a portion of a sub- divided work. For example, the Menippean Satires numbered 150, and are all counted separately in Varro's estimate. Jerome made or copied a catalogue of Varro's works which has come down to us in a mutilated form. From this and from other extant matcrials Ritschl has set down the number of the distinct literary works at 74 and the number of separate " books" at about 620. The later years of the author's life were therefore even more fruitful than the earlier. The complete catalogue may be roughly arranged under three heads,—(1) belles lettres, (2) history and antiquities, (3) technical treatises on philosophy, law, grammar, mathematics, philology, and other subjects.

The first of these three classes no doubt mainly belonged to Varro's earlier life. that was very elaborate, and little of a serious character. His genius tended naturally in the direction of burlesque and satite.

In poetry he seems to have attempted nothing»

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In belles lettres he showed himself throughout, both in matter and form, the pupil and admirer of Lucilius. He wrote satires in the style of his master, and he may be one of those to whom Horace alludes (Sat., i. 10, 47) as having "'tricd satire in vain." One poetical work probably consisted of short pieces in the style of the more satirical poems of Catullus. It is doubtful whether, as has often been supposed, Varro wrote a philosophical poem somewhat in the style of Lucretius ; if so, it should rather be classed with the prose technical treatises, One curious production was an essay in popular illustrated literature, which was almost unique in ancient times. Its title was Jmagines, and it consisted of 700 prose biographies of Greek and Roman celebrities, with a metrical elogiwm for each, accompanied in each case by a portrait. But the lighter works of Varro have perished almost to the last line, with the exception of numerous fragments of the Menippean Satires. The Menippus whom Varro imitated lived in the first half of the third century B.c., and was born a Pheenician slave. He became a Cynic philosopher, and is a figure familiar to readers of Lucian. He flouted life and all philosophies but the Cynic in light composi- tions, partly in prose and partly in verse. The fragments of Varro's imitations have been frequently collected and edited, most recently by Riese and by Biicheler. The glowing and picturesque account of these fragments given by Mommsen in his History of Rome is known to all students of Roman literature, but few readers could pass from Mommsen's picture to a careful study of the passages themselves without severe disappointment. That the remains exhibit variety and fertility, that there are in them numerous happy strokes of humour and satire, and many felicitous phrases and descriptions, is true, but the art is on the whole heavy, awkward, and forced, and the style rudely archaic and untasteful. The Latin is frequently as rough and uncouth as that of Lucilius. No doubt Varro contemned the Hellenizing innovations by which the hard and rude Latin of his youth was transformed into the polished literary language of the late republican and the Augustan age. The titles of the Aenippean Satires are very diverse. Sometimes personal names are chosen, and they range from the gods and demigods to the slaves, from Hercules to Marcipor. Frequently a popular proverb or catchword in Greek or Latin supplies the designation: thus we have as

titles "I've got You" ("Ex oe); "You don't Know what Evening is to Bring" (Nescis quid vesper serus vehat); " Kuow Thyself" (Tva@ ceavrév). Occasionally the heading indicates that the writer is flying at some social folly, asin "Old Men are Children for the Second Time" (Als watées of yepovres) and in the " Bachelor" (Celebs). In inany satires the philosophers were pounded, as in the " Burial of Menippus" and "Concerning the Sects" (Ilepi aiperéwv). Each composition seems to have been a genuine medley or "lanx-satura": any topic might be introduced which struck the author's fancy at the moment. There are many allusions to persons and events of the day, but political bitterness seems to have been commonly avoided. The whole tone of the writer is that of a "laudator temporis acti," who can but scoff at all that has come into fashion in his own day. From the numerous citations in later authors it is clear that the Menippean Satires were the most popular of Varro's writings. Not very unlike the Menippean Satires were the Libri Logistorici, or satirical and practical expositions, possibly in dialogue form, of some theme most commonly taken from philosophy on its ethical side. A few fragments in this style have come down to us anda number of titles. These are twofold: that is to say, a personal name is followed by words indicating the subject-matter, as Marius, de Fortuna, from which the contents may easily be guessed, and Sisenna, de Historia, most likely a dialogue in which the old annal- ist of the name was the chief speaker, and discoursed of the principles on which history should be written. Among the lighter and more popular works may be mentioned twenty-two books of Orations (probably never spoken), some funeral eulogies (Lawda- tiones), some " exhortations" (Swasiones), conceivably of a political character, and an account of the author's own life.

The second section of Varro's works, those on history and anti- quities, form to the present day the basis on which a large part of our knowledge of the earlier Roman history, and in particular of Roman constitutional history, ultimately rests. These writings Were used as a quarry by the compilers and dilettanti of latcr times, such as Pliny, Plutarch, Gellius, Festus, Macrobius, and by Christian champions like Tertullian, Arnobius, and Augustine, who did not disdain to seek in heathen literature the means of defending their faith, These men have saved for us a few remains from the great wreck made by time. Judging from what has been

casually preserved, if any considerable portion of Varro's labours as anti- quarian and historian were to be now discovered, scholars might find themselves compelled to reconstruct the earlier history of the Roman republic from its very foundations. Varro's greatest pre- decessor in this field of inquiry, the man who turned over the virgin soil, was Cato the Censor. His example, however, seems to have Temained unfruitful till the time of Varro's master, Lucius Alius Stilo Preconinus. From his age to the decay of Roman civilization there were never altogether wanting men devoted to the study of

their nation's past; but none ever pursued the task with the advan- tages of Varro's comprehensive learning, his indefatigable industry, and his reverent, yet discriminating regard for the men and the in- stitutions of the earlier ages. The greatest work of this class was that on Antiguities, divided into forty-one books. Of these the first twenty-five were entitled the Antiquities of Human Things (Antiquitates Rerum Humanarum), while the remaining sixteen were designated the Antiquities of Things Divine (Antiquitates Rerwm Divinarum). The book was the fruit of Varro's later years, in which he gathcred together the material laboriously amassed through the period of an ordinary lifetime. The second division of the work was dedicated to Cesar as supreme pontiff. The design was as far-reaching as that of the Natural History of Pliny. The general heads of the exposition in the secular portion of the book were four,—(1) " who the men are who act (qui agant), (2) the places in which they act (wdt), (3) the times at which they act (quando), (4) the results of their action (guid agant)." In the portion relating to divine affairs there were divisions parallel to these four, with a fifth, which dealt with the gods in whose honour action in divine affairs is taken. Our knowledge of this great book is to a large ex- tent derived from the works of the early Christian writers, and especi- ally from Augustine's De Civitate Dei. These lights of the church, as was natural, directed their attention mainly to the portion which treated of the religion of Rome. A glance at the authorities quoted in such a book as Preller's Rémische Mythologie will suffice to show how largely the imperfect indeed, but nevertheless invaluable, in- formation now attainable concerning the older and un-Hellenized forms of Roman and Italian religious rites depends on the citations by Christian authorities from the Antiquitates Rerum Divinarwm. It isa great

misfortune that no similar series of citations from the secular part of the Antiqwitates has come down to us. Most of the other historical aud antiquarian writings of Varro were special elaborations of topics which he could not treat with sufficient ful- ness and minuteness in the larger book. The treatise on the Genealogy of the Roman People dealt mainly with the relation of Roman chronology to the chronology of Greece and the East. Dates were assigned even to mythological occurrences, because Varro be- lieved in the theory of Euhemerus, that all the beings worshipped as gods had once lived as men. 'To Varro's researches are due the traditional dates assigned to the era of the kings and to that of the early republic. Minor writings of the same class were the De Vita Populi Romani, apparently a kind of history of Roman civilization ; the De Familiis Trojanis, an account of the familics who "came over" with Aneas ; the tia (Atria), an explanation of the origin of Roman customs, on which Plutarch drew largely in his Questiones Romanez ; a Tribuum Liber, used by Festus ; and the constitutional handbook written for the instruction of Pompey when he became consul. Nor must the labour expended by Varro in the study of literary history be forgotten. His activity in this direction, as in others, took a wide range. One of his greatest achievements was to fix the canon of the genuine plays of Plautus. The " Varronian plays" were the twenty which have come down to us, along with one which has been lost.

The third class of treatises, which we have called technical, was also numerous and very varied. Philosophy, grammar, the history and theory of language, rhetoric, law, arithmetic, astronomy, geometry, mensuration, agriculture, naval tactics, were all repre- sented. The only works of this kind which have come dowu to our days are the De Lingua Latina (in part) and the De Re Rustica. The former originally comprised twenty-five books, three of which (the three succeeding the first) are dedicated to a P. Septimius who had served with the author in Spain and the last twenty-one to Cicero. The whole work was divided into three main sections, the first dealing with the origin of Latin words, the second with their inflexions and other modifications, the third with syntax. The books still preserved (somewhat imperfectly) are those from the fifth to the tenth inclusive. The Latin style is harsh, rugged, and far from lucid. As Mommsen remarks, the clauses of the sentences are oftcn arranged on

the thread of the relative pronoun like thrushes onastring. Thearrangement of the subject-matter, while pretending to much precision, is often far from logical. The fifth, sixth, and seventh books give Varro's views on the etymology of Latin words. The principles he applies are those which he had learned from the philosophers of the Stoic school,—Chrysippus, Antipater, and others. The study of language as it existed in Varro's day was thoroughly dominated by Stoic influences. Varro's etymologies could be only a priori guesses, but he was well aware of their character, and very clearly states at the outset of the fifth book the hindrances that barred the way to sound knowledge. He was thoroughly alive to the importance of not arguing merely from the forms and meanings of words as they existed in his day, and was fully conscious that language and its mechanism should be studied historically. The books from the eighth to the tenth in- clusive are devoted to the inflexions of words and their other modifications. These Varro classes all under the head of "de- clinatio," which implies a swerving aside from a type. Thus Herculi from Hereules and manubria from manus are equally re-

garded as examples of declinatio. Varro adopts a compromise be- tween the two opposing schools of grammarians, those who held that nature intended the declinationes of all words of the same class to proceed uniformly (which uniformity was called analogia) and those who deemed that nature aimed at irregularity (anomalia). The matter is treated with considerable confusion of thought. But the facts incidentally cited concerning old Latin, and the state- ments of what had been written and thought about language by Varro's predecessors, are of extreme value to the student of Latin. The other extant prose work, the De Re Rustica, is in three books, each of which is in the form of a dialogue, the circumstances and in the main the interlocutors being different for each. The dramatic introductions and a few of thc interludes are bright and interesting, and the Latin style, though still awkward and unpolished, is far superior to that of the De Lingua Latina.

A complete collection of the remains of Varro is still a desideratum. The fragments of the different treatises have been partially collected in many

separate publications of recent date. The best editions of the De Lingua Latina are those by C. O. Miiller and by L. Spengel (re-cdited by his son in 1885). The most recent and best recension of the De Re Rustica is that of Keil (Leipsic, 1884). Of modern scholars Ritschl has deserved best of Varro. Several papers in his Opuscula treat of the nature of Varro's works which have not come down to us. GJ. 8. R.)

VARRO, Pusiius TERENTIUS, with the cognomen Aractnus, a Roman poet whose life extended from 82 to about 37 B.c. The name Atacinus, given to distinguish him from the more famous Varro of Reate, is drawn from Atax, the name of a small district or river in Narbonensian Gaul, near to which he was born. He was perhaps the first Roman born beyond the Alps who reached to eminence in literature. He seems to have taken at first Ennius and Lucilius as his models, and wrote an epic, entitled Bellum Sequanicum, eulogizing the exploits of Cesar in Gaul and Britain, and also Satires, of which Horace speaks slight- ingly. Jerome has preserved a statement that Varro began to study Greek literature with great avidity in his thirty- fifth year. The last ten years of his life were given up to the imitation of Greek poets of the Alexandrian school. Quintilian (indirectly confirming the judgment of Horace concerning the Satwres) says that Varro made his name as an interpres operts alieni—"'a translator of other men's works," for such is the force of the word interpres. Even in this capacity Quintilian bestows on him restricted praise as 'by no means to be despised." But Quintilian probably much undervalued the Roman imitators of the Alexandrians, Catullus included. From other evidence we may conclude that, though he had not sufficient power to excel in the historical epic or in the serious work of the Roman sativa, Varro yet possessed in considerable measure the lighter gifts which we admire in Catullus. His chief poem of the later period was the Argonautica, modelled, somewhat closely it would seem, on the epic of Apollonius Rhodius. The age was prolific of epics, both historical and mythological, and that of Varro seems to have held a high rank among them. Ovid asks what age will ever be unacquainted with the story of the first ship as told by Varro. In one of Ovid's lists of Roman poets Varro stands between Ennius and Lucretius, while in another he is linked with Virgil. Statius, in his poem on the birthday of Lucan, gives to the epic of Varro an equally distinguished place. Later he published erotic poems,

probably in the elegiac metre. These Propertius seems to have valued highly, for in a well-known passage he ranks the Leucadia celebrated by Varro along with the Lesbia of Catullus, the Quintilia of Calvus, the Lycoris of Gallus, and his own Cynthia. The other titles which have been preserved are the Cosmographia, or Chorographia, a poem on geography, imitated from the Greek of Alexander, an Ephesian, described by Cicero (Att., ii, 22) as a careless man and no good poet; and the Hphemeris, a poem on weather-signs, in hexameters, after Aratus. The Varro whom Quintilian (i. 4, 4) mentions in company with Lucretius as author of a poem on philosophy can hardly have been either Varro of Atax or Varro of Reate. The fragments of Varro Atacinus which remain, about fifty lines

in all, are put together by Riese at the end of his edition of the fragments of the greater Varro's Menippean Satires ; but there is not enough of them to enable us to form a judgment on his style.

VASA, Gustavus. See Gustavus I.

VASARHELY. See HopmMeEz6-VasaRHELy and Maros- VASARHELY.

VASARI, Groreto (1513-1574), a painter and architect, whose main distinction rests on his valuable history of Italian art,1 was born at Arezzo in 1513. At a very early age he became a pupil of Guglielmo da Marsiglia, a very skilful painter of stained glass. At the age of sixteen he went to Florence, where he studied under Michelangelo and Andrea del Sarto, aided by the patronage of the Medici princes. In 1529 he visited Rome and studied the works of Raphael and others of his school. The paintings of Vasari were much admired by the rapidly degenerating taste of the 16th century; but they possess the smallest amount of merit, being in the main feeble parodies of the powerful works of Michelangelo. Vasari was largely employed in Florence, Rome, Naples, Arezzo, and other places. Many of his pictures still exist, the most important being the wall and ceiling paintings in the great hall of the Palazzo Vecchio in Florence, and his frescos on the cupola of the cathedral, which, however, were not completed at the time of his death. As an

architect he was perhaps more successful: the loggia of

the Uffizi by the Arno, and the long passage connecting it with the Pitti Palace, are his chief works. Unhappily he did much to injure the fine medizeval churches of S. Maria Novella and Santa Croce, from both of which he removed the original rood-screen and loft, and remodelled the retro-choir in the degraded taste of his time. Vasari enjoyed a very high repute during his lifetime and amassed a considerable fortune. He built himself in 1547 a fine house in Arezzo, and spent much labour in decorating its walls and vaults with paintings. He was elected one of the municipal council or priori of his native town, and finally rose to the supreme office of gonfaloniere. He died at Florence on 27th June 1574.

Personally Vasari was a man of upright character, free from vanity, and always ready to appreciate the works of others: in spite of the narrow and meretricious taste of his time, he expresses a warm admiration of the works of such men as Cimabue and Giotto, which is very remark- able. As an art historian of his country he must always occupy the highest rank. His great work was first published in 1550, and afterwards partly rewritten and enlarged in 1568, bearing the title Delle Vite de' piu Ec- cellenti Prttori, Scultori, ed Architettort. It was dedicated to Cosimo de' Medici, and was printed at Florence by the Giunti; it is a small quarto illustrated with many good woodcut portraits. This editio princeps of the complete work is usually bound in three volumes, and also contains a very valuable treatise on the technical methods em- ployed in all branches of the arts, entitled Le Tre Arti del Disegno, cioé Architettura, Pittura, e Scoltura.

The best edition of Vasari's works is that published at Florence by Milanesi, 1878-82, which embodies the valuable notes in the earlier edition by Le Monnier. The Lives has been translated into French, German, and English (by Mrs Foster, London, 1850). They are written in a very pleasant style, interspersed with amusing stories, and are in the main trustworthy, except some of the bio-

graphies of early artists.2 With a few exceptions Vasari's Judgment is acute and unbiassed.

VASCO DA GAMA. See Gama, Vasco Da.

1 Vasari gives a sketch of his own biography at the end of his Vite, and adds further details about himself and his family in his lives of Lazzaro Vasari and Francesco Salviati. He was related to the painter Luca Signorelli.

; ? As in most other kindred subjects the tendency of modern criti- cism is to underestimate the historical accuracy of Vasari's work.

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Verse bAR SYSTEM

HE term vascular system designates all the arrange- ments in the body connected with the circulation of the blood. A description of the anatomy of the various organs as found in man is given under ANATOMY (vol. i. is 899 sq.), and an account of various modifications of the circulatory apparatus under the headings designating the great groups of the animal kingdom, such as Moxuusca, Crustacea, IcoTHYOLoGY, AMPHIBIA, REPTILES, BrrDs ; and reference may be made to the articles NurTRITIoN and Respiration for details as to the formation, physical and chemical properties, and functions of the blood. The present article is devoted to a consideration of the mechan- ism by which the circulation is carried on in the Mammalia and in man, a branch of physiology which has been more successfully investigated than any other department of the science. HistoricaL SKETCH,

Galen, following Erasistratus and Aristotle, clearly dis- tinguished arteries from veins, and was the first to over- throw the old theory of Erasistratus that the arteries con- tained air. According to him, the vein arose from the liver in two great trunks, the vena porta and vena cava. The first was formed by the union of all the abdominal veins, which absorbed the chyle prepared in the stomach and intestines, and carried it

to the liver, where it was con- verted into blood. The vena cava arose in the liver, divided into two branches, one ascending through the dia- phragm to the heart, furnishing the proper veins of this organ; there it received the vena azygos, and entered the right ventricle, along with a large trunk from the lungs, evidently the pulmonary artery. The vena azygos was the superior vena cava, the great vein which carries the venous blood from the head and upper extremities into the right auricle, The descending branch of the great trunk supposed to originate in the liver was the ziferior vena cava, below the junction of the hepatic vein. he arteries arose from the left side of the heart by two trunks, one having thin walls, the pulmonary veins, the other having thick walls, the aorta. The first was supposed to carry blood to the lungs, and the second to carry blood to the body. 'The heart consisted of two ventricles, communicating by pores in the septum; the lungs were parenchymatous organs communicating with the heart by the pulmonary veins. The blood-making organ, the liver, separates from the blood subtle vapours, the natural spirits, which, carried to the heart, mix with the air introduced by respiration, and thus form the wtal spirits; these, in turn carried to the brain, are elaborated into animal spirits, which are distributed to all parts of the body by the nerves.1 Such were the views of Galen, taught until early in the 16th century.

Jacobus Berengarius of Carpi (ob. 1527) investigated the structure of the valves of the heart. Andreas Vesale or Vesalius (1514-1564) contributed largely to anatomical knowledge, especially to the anatomy of the circulatory organs. He determined the position of the heart in the chest ; he studied its structure, pointing out the fibrous mings at the bases of the ventricles; he showed that its Wall consists of layers of fibres connected with the fibrous mings ; and he described these layers as being of three kinds,—straight or vertical, oblique, and circular or trans- verse. From the disposition of the fibres he reasoned as to the mechanism of the contraction and relaxation of the heart. He Supposed that the relaxation, or diastole, was ee Ws

1 See Burggraeve's Histoire de ? Anatomie, Paris, 1880, in which he

refers to many of the older authors, also to the articles GALEN and ANAToMyY,

accounted for principally by the longitudinal fibres con- tracting so as to draw the apex towards the base, and thus cause the sides to bulge out; whilst the contraction, or systole, was due to contraction of the transverse or oblique fibres. He showed that the pores of Galen, in the septum between the ventricles, did not exist, so that there could be no communication between the right and left sides of the heart, except by the pulmonary circulation. He also investigated minutely the internal structure of the heart, describing the valves, the columne carnex, and the muscult papillares. He described the mechanism of the valves with much accuracy. He had, however, no conception either of a systemic or of a pulmonary circulation. To him the heart was a reservoir from which the blood ebbed and flowed, and there were two kinds of blood, arterial and venous, having different circulations and serving dif- ferent purposes in the body. Vesalius was not only a great anatomist: he was a great teacher ; and his. pupils carried on the work in the spirit of their master. Promi- nent among them was Gabriel Fallopius (1523-1562), who studied the anastomoses of the blood-vessels, without the art of injection, which was invented by Frederick Ruysch (1638-1731) more than a century later. Another pupil

was Columbus (Matthieu Reald Columbo, 0d. 1559), first Colum- a prosector in the anatomical rooms of Vesalius and after- bus.

wards his successor in the chair of anatomy in Padua ; his name has been mentioned as that of one who anticipated Harvey in the discovery of the circulation of the blood. A study of his writings clearly shows that he had no true knowledge of the circulation, but only a glimpse of how the blood passed from the right to the left side of the heart. In his work there is evidently a sketch of the pulmonary circulation, although it is clear that he did not understand the mechanism of the valves, as Vesalius did. As regards the systemic circulation, there is the notion simply of an oscillation of the blood from the heart to the body and from the body to the heart. Further, he upholds the view of Galen, that all the veins

originate in the liver; and he even denies the muscular structure of the heart.2 In

1553 Michael Servetus (1511-1553), a pupil or junior Servetus.

fellow-student of Vesalius, in his Christianismi Restitutio, described accurately the pulmonary circulation.2 Servetus perceived the course of the circulation from the right to the left side of the heart through the lungs, and he also recognized that the change from venous into arterial blood took place in the lungs and not in the left ventricle. Not so much the recognition of the pulmonary circulation, as that had been made previously by Columbus, but the dis- covery of the respiratory changes in the lungs constitutes Servetus's claim to be a pioneer in physiological science.

Andrea Cesalpino (1519-1603), a great naturalist of this Cesal- period, also made important contributions towards the dis- Pm

covery of the circulation, and in Italy he is regarded as the real discoverer. Cesalpinus knew the pulmonary circulation. Further, he was the first to use the term

2 An interesting account of the views of the precursors of Harvey will be found in Willis's edition of the Works of Harvey, published by the Sydenham Society. Comp. also P. Flourens, Histoire de la Dé- couverte de la Circulation du Sang (Paris, 1854), and Prof. R. Owen, Experimental Physiology, its Benefits to Mankind, with an Address on Unveiling the Statue of W. Harvey, at Folkestone, 6th August 1881.

3 The passage is quoted under Anatomy, vol. i. p. 810 n.; comp. also Harvey. See Willis, Servetus and Calvin, London, 1877.

4 A learned and critical series of articles by Sampson Gamgee in the Lancet, in 1876, gives an excellent account of the controversy as to whether Cesalpinus or Harvey was the true discoverer of the circula- tion ; see also the Harveian oration for 1882 by George Johnston (Lancet, July 1882), and Prof. G. M. Humphry, Journ. Anat. and

1 Phys., October 1882.

Discov- ery of circula- tion of blood.

Harvey.

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“ circulation,” and he went far to demonstrate the systemic circulation. He experimentally proved that, when a vein is tied, it fills below and not above the ligature. The following passage from his Quzstiones Medicz (lib. v., cap.

4, fol. 125), quoted by Gamgee, shows his views :—

“The lungs, therefore, drawing the warm blood from the right ventricle of the heart through a vein like an artery, and returning it by anastomosis to the venal artery (pulmonary vei), which tends towards the left ventricle of the heart, and air, being in the meantime transmitted through the channels of the aspera arteria (trachea and bronchial tubes), which are extended near the venal artery, yet not communicating with the aperture as Galen thought, tempers with a touch only. This circulation of the blood (huic sanguinis cireulationt) from the right ventricle of the heart through the lungs into the left ventricle of the same exactly agrees with what appears from dissection. For there are two receptacles ending in the right ventricle and two in the left. But of the two only one intromits; the other lets out, the membranes (valves) being constituted accordingly.”

Still Cesalpinus clung to the old idea of there being an

efflux and reflux of blood to and from the heart, and he

had confused notions as to the veins conveying nutritive –

matter, whilst the arteries carried the vital spirits to the tissues. He does not even appear to have thought of the heart as a contractive and propulsive organ, and attributed the dilatation to “an effervescence of the spirit,” whilst the contraction,—or, as he termed it, the “collapse,”—was

due to the appropriation by the heart of nutritive matter. Whilst he imagined a communication between the termina- tion of the arteries and the commencement of the veins, he does not appear to have thought of a direct flow of blood from the one to the other. Thus he cannot be re- garded as the true discoverer of the circulation of the blood. More recently Ercolani has put forward claims on behalf of Carlo Ruini as being the true discoverer. Ruini published the first edition of his anatomical writings in 1598, the year William Harvey entered at Padua as a medical student. This claim has been carefully investi- gated by Ganigee, who has come to the conclusion that it cannot be maintained.!

The anatomy of the heart was examined, described, and figured by Bartolomeo Eustacheo (c. 1500-1574) and by Julius Cesar Aranzi or Arantius (c. 1530-1589), whose name is associated with the fibro-cartilaginous thickenings on the free edge of the semilunar valves (corpora Arantiz). Hieronymus Fabricius of Acquapendente (1537-1619), the immediate predecessor and teacher of Harvey, made the important step of describing the valves in the veins; but he thought they had a subsidiary office in connexion with the collateral circulation, supposing that they diverted the blood into branches near the valves ; thus he missed seeing the importance of the anatomical and experimental facts gathered by himself. At the time when Harvey arose the general notions as to the circulation may be briefly summed up as follows: the blood ebbed and flowed to and from the heart in the arteries and veins; from the right side at least a portion of it passed to the left side through the vessels in the lungs, where it was mixed with air; and, lastly, there were two kinds of blood,—the venous, formed originally in the liver, and thence passing to the heart, from which it went out to the periphery by the veins and returned by those to the heart, and the arterial,—contain- ing "spirits" produced by the mixing of the blood and the air in the lungs—sent out from the heart to the body and returning to the heart by the same vessels. The pulmonary circulation was understood so far, but its relation to the systemic circulation was unknown. The action of the heart, also, as a propulsive organ was not recognized. It was not until 1628 that Harvey announced his views to the world by publishing. his treatise De Motu Cordis et Sanguinis (see vol. xi. pp. 503-504). His conclusions are given in the following celebrated passage :—

1 Gamgee, “Third Historical Fragment,” in Lancet, 1876.

VASCUDTAT SY S71 fi

“ And nowI may be allowed to give in brief my view of the circu- lation of the blood, and to propose it for general adoption. Since all things, both argunient and ocular demonstration, show that the blood passes through the lungs and heart by the auricles and ventricles, and is sent for distribution to all parts of the body, where it makes its way into the veins aud pores of the flesh, and then flows by the veins from the circumference on every side to the centre, from lesser to the greater veins, and is by them finally discharged into the vena cava and right auricle of the heart, and this in such a quantity, or in such a flux and reflux, thither by the arteries, hither by the veins, as cannot possibly be supplied by the ingestor, and is much greater than can be required for mere purposes of nutrition, it is absolutely necessary to conclude that the blood in the animal body is impelled in a circle, and is in a state of ceaseless motion, that this is the act or function which the heart performs by means of its pulse, and that it is the sole and only end of the motion and contraction of the heart” (bk. x. ch. : xiv. p. 68).

Opposed by Caspar Hofmann of Nuremberg, Veslingius of Padua, and J. Riolanus the younger, this new theory was supported by Roger Drake, a young Englishman, who | chose it for the subject of a graduation, thesis at Leyden in 1637, by Rolfink of Jena, and especially by Descartes, and quickly gained the ascendant ; and its author had the satisfaction of seeing it confirmed by the discovery of the capillary circulation, and universally adopted. The cir-Capil- | culation in the capillaries between the arteries and the lary — veins was discovered by Marcellus Malpighi (1628-1694) i of Bologna in 1661. He saw it first in the lungs and the mesentery of a frog, and the discovery was announced in i the second of two letters, Hpistola de Pulmonibus, ad- | dressed to Borelli, and dated 1661.2 Malpighi actually showed the capillary circulation to the astonished eyes of | Harvey. Anthony van Leeuwenhoek (1632-1723) in 1673 repeated Malpighi’s observations, and studied the capillary circulation in a bat’s wing, the tail of a tadpole, and the tail of a fish,

William Molyneux studied the circulation | in the lungs of a water newt in 1683.3

The idea that the same blood was propelled through the Transfer body in a circuit suggested that life might be sustained by of blood) renewing the blood in the event of some of it being lost.

About 1660 Lower, a London physician (died 1691), suc-

ceeded in transferring the blood of one animal directly

from its blood-vessels into those of another animal. This

was first done by passing a "quill" or a "'small crooked | pipe of silver or brass" from the carotid artery of one dog to the jugular vein of another. This experiment was | repeated and modified by Sir Edmund King, Coxe, Gayant, | and Denys with such success as to warrant the operation being performed on man, and accordingly it was carried out by Lower and King on 23d November 1667, when | blood from the arteries of a sheep was directly introduced into the veins of a man. It would appear that the operation had previously been performed with success in Paris.

The doctrine of the circulation being accepted, physiolo- Force o! gists next directed their attention to the force of the heart, hee the pressure of the blood in the vessels, its velocity, and ee the phenomena of the pulse wave. Giovanni Alphonso Borelli (1608-1679) investigated the circulation during the Borelli, lifetime of Harvey. He early conceived the design of applying mathematical principles to the explanation of animal functions; and, although he fell into many errors, he must be regarded as the founder of animal mechanics. In his De Motu Animalium (1680-85) he stated his theory | of the circulation in eighty propositions, and in prop. lxxiiL, founding on a supposed relation between the bulk and the strength of muscular fibre ag found in the ventricles,

| erroneously concluded that the force of the heart was

equal to the pressure of a weight of 180,000 ib. He also

2 See his Opera Omnia, vol. i. p. 328. 3 Lowthorp, Abridgement of Trans. Roy. Soc., 5th ed., vol. iii. p. 230. : 4 Ibid., p. 231. 5 'Ibid., p. 226.

Keil. James Keill, a Scottish physician (1673-1719), who in his | underestimate of Keill (16 oz.), and when we know that Account of Animal Secretion, the Quantity of Blood in the | the estimate of Hales, as corroborated by recent investiga- Human Body, and Muscular Motion (1708) attempted to | tions by means of elaborate scientific appliances, is very estimate the velocity of blood in the aorta, and gave it | near the truth, we recognize the far higher service rendered at 52 feet per minute. Then, allowing for the resistance | to science by careful and judicious experiment than by of the vessels, he showed that the velocity diminishes to- speculations, however ingenious. With the exception of wards the smaller vessels, and arrived at the amazing con- | some calculations by Dan Bernoulli in 1748, there was no clusion that in the smallest vessels it travels at the rate of great contribution to hemadynamics till 1808, when two } inch in 278 days,—a good example of the extravagant | remarkable papers appeared from Thomas Young (1773- Thomas errors made by the mathematical physiologists of the 1829). In the first, entitled "Hydraulic Investigations," Young. period. Keill further described the hydraulic phenomena | which appeared in the Phil. Trans., he investigated the of the circulation in papers communicated to the Royal | friction and discharge of fluids running in pipes and the Society and collected in his Lssays on Several Parts of the velocity of rivers, the resistance occasioned by flexures in Animal Giconomy (1717). In these essays, by estimating pipes and rivers, the propagation of an impulse through the quantity of blood thrown out of the heart by each | an elastic tube, and some of the phenomena of pulsations. contraction, and the diameter of the aortic orifice, he cal- | This paper was preparatory to the second, "On the Func- culated the velocity of the blood. He stated (pp. 84, 87) | tions of the Heart and Arteries,"—the Croonian lecture for that the blood sent into the aorta with each contraction | 1808—in which he showed more clearly than had hitherto would form a cylinder 8 inches (2 ounces) in length and | been done (1) that the blood-pressure gradually diminishes be driven along with a velocity of 156 feet per minute. | from the heart to the periphery ; (2) that the velocity of Estimating then the resistances to be overcome in the | the blood becomes less as it passes from the greater to the vessels, he

found the force of the heart to be “little above | smaller vessels ; (3) that the resistance is chiefly in the 16 ounces,”—a remarkable difference from the computation | smaller vessels, and that the elasticity of the coats of the of Borelli, Keill’s method was ingenious, and is of his- great arteries comes into play in overcoming this resistance torical interest as being the first attempt to obtain quan- | in the interval between systoles; and (4) that the con- titative results ; but it failed to obtain true results, because | tractile coats do not act as propulsive agents, but assist in the data on which he based his calculations were inaccurate, regulating the distribution of blood.’

These calculations attracted the attention not only of the The next epoch of physiological investigation is charac- Use of anatomico-physiologists, such as Haller, but also of some | terized by the introduction of instruments for accurate istru- of the physicists of the time, notably of Jurin and D. measurement, and the graphic method of registering pheno- ™™- Bernoulli. Jurin (died 1750) gave the force of the left mena, now so largely used in science. In 1825 appeared ventricle at 9 tb 1 oz. and that of the right ventricle at 6 Ib | E. and W. Weber’s Wellenlehre, and in 1838 E. Weber’s Ad 3oz. He also stated with remarkable clearness, considering | Votat. Anatom. et Physiolog, i., both of which contain an that he reasoned on the subject as a physicist, without exposition of E, H. Weber’s schema of the circulation, a depending on experimental data gathered by himself, the | scheme which presents a true and consistent theory. In influence on the pulse induced by variations in the power | 1826 Poiseuille invented the hemadynamometer.> This of the heart or in the resistance to be overcome.) The | was adapted with a marker to a recording cylinder by experimental investigation of the problem was supplied | Ludwig in 1847, so as to form the instrument named by Hales.*

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recognized and figured the spiral arrangement of fibres in the ventricles. The question was further investigated by

by Stephen Hales (1677-17 61), rector of Teddington in Middlesex, who in 1708 devised the method of estimating the force of the heart by inserting a tube into a large artery and observing the height to which the blood was

impelled into it. Hales is the true founder of the modern experimental method in physiology. He observed in a horse that the blood rose in the vertical tube, which he had connected with the crural artery, to the height of 8 feet 3 inches perpendicular above the level of the left ventricle of the heart. But it did not attain its full height at once : it rushed up about half way in an instant, and afterwards gradually at each pulse 12, 8, 6, 4, 2, and sometimes 1 inch. When it was at its full height, it would vise and fall at and after each pulse 2, 3, or 4 inches 3 and sometimes it would fall 12 or 14 inches, and have there for a time the same vibrations up and down at and after each pulse as it had when it was at its full height, to Which it would rise again after forty or fifty pulses? He then estimated the capacity of the left ventricle by a method of employing waxen casts, and, after many such experi- ments and measurements in the horse, ox, sheep, fallow deer, and dog, he calculated that the force of the left Ventricle in man is about equal to that of a column of blood 74 feet high, weighing 514 ib, or, in other words, that the pressure the left ventricle has to overcome is

1 Jones, Abridgement of Phil. Trans., 34 ed. 1749, vol. v. p. 223. See also for an account of the criticisms of D. Bernoulli the elder and others, Haller's Zlementa Physiologiz, vol. i. p. 448, an Hales, Statical Essays, containing Hemastatics, &c., 1738, vol. ii.

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equal to the pressure of that weight. When we contrast the enormous estimate of Borelli (180,000 tb) with the

Volkmann the kymograph. Volkmann devised the hema- dromometer for measuring the velocity of the blood in 1850; for the same purpose Vierordt constructed the heematachometer in 1858 ; Chauveau and Lortet first used their heemadromograph in 1860; and lastly, Ludwig and Dogiel obtained the best results as regards velocity by the "stream-clock" in 1867. As regards the pulse, the first sphygmograph was constructed by Vierordt in 1856 ; and Marey's form, of which there are now many modifications, appeared in 1860. In 1861 Chauveau and Marey ob- tained tracings of the variations of pressure in the heart cavities (see p. 99 below) by an experiment which is of great historical importance. During

the past twenty-five years vast accumulations of facts have been made through the instruments of precision above alluded to, so that the con- ditions of the circulation, as a problem in hydrodynamics, have been thoroughly investigated. Since 1845, when the brothers Weber discovered the inhibitory action of the vagus, and 1858, when Claude Bernard formulated his researches showing the existence of a vaso-motor system of nerves, much knowledge has been acquired as to the relations of the nervous to the circulatory system. The Webers, John Reid, Claude Bernard, and Carl Ludwig may be regarded as masters in physiology equal in stand- ing to those whose researches have been more especially alluded to in this historical sketch. The Webers took the first step towards recognizing the great principle of

3 See Miscellaneous Works, ed. Peacock, 2 vols., London, 1855. 4 See Marey, La Méthode Graph. dans les Sc. Expér., Paris, 1878. ° Magendie's Journal, vol. viii. p. 272.

ah eed poet i to investigate The Action of the Heart. os sone Mehl heres Se . The form, position, and general arrangements of the heart are Physio-

the functions of — ¥R by his classical research on ths described under ANATOMY (vol. i. pp. 899-908), and it is only neces- logical eighth pair of cranial nerves ; Claude Bernard developed sary here to allude to certain points of physiological importance, —_ anatom; the fundamental conception of vaso-motor nerves ; and The substance of the heart is composed of a special variety of Museu):

Ludwig showed how this conception, whilst it certainly | muscular tissue, along with connective tissue, blood-vesscls, (aa phatics, nerves, and ganglia. The muscular fibres are of an ture.

made the hydraulic problems of the circulation infinitely more complicated than they were even to the scientific imagination of Thomas

Young, accounted for some of the phenomena and indicated at all events the solidarity of the arrangements in the living being. Further, Ludwig and his pupils used the evidence supplied by some of the phenomena of the circulation to explain even more ob- scure phenomena of the nervous system, and they taught pharmacologists how to study in a scientific manner the physiological action of drugs.

PuystoLocy, &C., OF CIRCULATION.

Vessels The blood is contained during life in a continuous system of more and or less elastic and contractile vessels. These are (1) the arteries, course of terminating in (2) the capillaries, from which originate (3) the veins, cireula- Whilst a special contractile organ, (4) the tion. heart, is placed at the commencement of the arteries and the termination of the veins (see fig. 1), The heart may be re- garded as a double organ, each half con- sisting of an auricle and a ventricle, the right half containing blood which has been returned from the body to be sent to the lungs, and the left half containing blood which has been returned from the lungs to be distributed to the body. There are thus, in a sense, two circulations,— the one pulmonary, from the right side of the heart, by the pulmonary artery to the lungs, through the capillaries of the lungs, "SNe and back to the left side of the heart by "eq the pulmonary veins, and the other sys-; +» #2 temic, from the left side of the heart, by '.': the aorta, and the arteries which ramify " from it, to the capillaries throughout the tissues, and from thence by the veins to the right side of the heart. Thus the course of the circulation may be traced (1) from right auricle to right ventricle, through the right auriculo-ventricular Fic. 1.—General course of pes ee by Loe tricuspid valve ; poche = —_ = rom right ventriele by the pulmona ipal vessels. H', right artery, through the cailbaries of the nee ete ole' B coer to the pulmonary veins, which open into left auricle ; P, pulmonary the left auricle ; (3) from left auricle to "tery, going to lungs; P', left ventricle, through the left auriculo- tae epg Maney eo ventricular opening, guarded by the mitral , trachea or wind-pipe: valve; (4) from the left ventricle through ?, #', bronchial tubes; a. a, the greater arteries, the medium-sized ar- Tht 4 left carotid arter- teries, and the arterioles into the capil- neck Hobetial pene ep a laries of the tissues and organs; and (5) subclavian), joining to form from thence by the veins, opening into*

escending or upper vena larger and larger trunks, so as ultimately fevatio' Depaul ates 5.2, i y 2 S patic vein; I, superior to constitute the superior and inferior mesenteric artery, going to vene cave, which open into the right mesentery and bowels; L, auricle, the point from which we started. pes penn dey: eels ged , Remembering that the walls of these tubes __V, inferior a cava, aplit: are all more or less elastic, imagine them _ ting into the twoiliac veins, to be distended with blood; there would % (AfterAllen Thomson.) then be a condition of permanent tension, which would be varied if pressure were applied to any part of the system. Such a varia- tion of pressure would produce a movement of the fluid in the direction of less pressure, aud, as the fluid cannot escape, there would be a circulation, which would be carried in the same direc- tion by mechanical arrangements of valves. In the living body the contractions of the heart force blood into the arterial system and increase the pressure in that part of the circulation ; the arteries empty part of their contents into the capillaries, which carry the blood to the veins, so as to tend to an equalization of pressure between the venous and arterial systems. If the pressure in both systems became equal, there would be no circulation ; but, as the veins pour a portion of the blood back again into the heart, this organ on being refilled again contracts, forcing more blood into the arterial system and again raising the pressure there; thus the possibility during life of an equalization of arterial and venous pressure is prevented. In describing more fully the mechanism by which this circulation is maintained we shall consider (1) the action of the heart, and (2) the action of the blood-vessels, arteries, capillaries, and veins,*

irregularly cubical form, faintly striated transversely, from 54> to sy inch in length by zéov to re#yy inch in breadth, destitute of sarcolemma, frequently having bands at the broad ends by which they anastomose, and showing an oval nucleus. A large mass of fibrous tissue and fibro-cartilage (which in some animals, as the ox, is bony) is found at the base of the heart, in the angle between the aortic and two auriculo-ventricular openings ; from it processes pass in various directions, and form the bases of the fibrous or tendinous rings of the auriculo-ventricular and arterial openings, and to these many if not all of the bands of muscular fibre are attached. These bands are arranged in layers. According to Pettigrew (1864), there are seven layers of fibres forming the wall of each ventricle,

—three external, one central, and three intcrnal,—and they are so arranged that the first or outer external layer is continuous with the seventh or inner internal layer, the second with the sixth, and the third with the fifth. Ludwig (1849) gives a simpler arrangement, — (1) an outer longitudinal layer extending from the base, where the fibres are attached to the tendinous structures around the orifices, and passing obliquely towards the apex to enter by a twist into the interior of the ventricle; (2) an inner longi- tudinal layer composed of the same aa of the outer layer, — Fig. 2. some of these becoming continu- pg 9 pi a in ous with the papillary muscles birds: myrea: inca oe na edwin (fig. 2) and others forming an ir- 4, fibre; P, papillary muscle. regular stratum of fibres, which sO Pinna ate! — ae. terminate in the fibrous rings at eee oe ee the base of the ventricle (fig. 3) ; and (3) an intermediate or trans- verse layer, the thickest of the three, formed of fibres passing with less and less obliquity until they are transverse. These arrangements are shown in figs. 4 and 5, and they account for the following physiological phenomena. (1) The auricles contract inde- pendently of the ven- tricles. So long as the rhythmic movement is normal, the auricular

contractions are equal Fic. 4,—View of fibres of sheep's heart dissected at

in number to the ventri- apex to aed ie re .. a par entering

" apex posteriorly at b; ¢, c, fibres entering apex

ana Reta eh anteriorly at d. (Pettigrew, Quain's Anatomy.)

2)

beats of the auricle for one of the ventricle, and at last only the auricles contract. The auricular portion of the right auricle is the last to cease beating; hence it is termed the wltimwm moriens. Sometimes also contractions of the vena cava and pulmonary veins may be noticed after the heart beats have onal, (2) The con- traction of the circular fibres around the orifices of the veins empties these vessels into the auricles ; and no doubt these fibres have also a sphincter-like action during the contraction of the cavities, pre- venting the regurgitation of blood, and thus doing away with the necessity for valves at these orifices. (8) The

double arrangement of fibres around the auricles produces, when the fibres contract, a uniform diminution of the auricular cavity. (4) The spiral arrange- ment of the fibres in the ventricular walls expels the blood with great force, as if it were propelled by wringing or twisting the walls of the cavity.

The valves of the heart are as follows (see ANATOMY, vol. i. p. Valves — 900, fig. 89). (1) The tricuspid guards the right auriculo-ventricular heart.

opening, and consists of three flaps, formed of fibrous tissue (con- taining many clastic fibres) covered with endocardium. These flaps are continuous at their base, forming an annular membrane sur- rounding the auricular opening, and they are kept in position by the chordx tendinew, which are attached to their ventricular sur- faces and free margins. (2) The bicuspid or mitral valve, at the left auriculo-ventricular orifice, consists of two pointed segments or cusps, having the same structure as those of the tricuspid valve. The auriculo-ventricular valves contain striated muscular fibres, radiating from the auricles into the segments of the valve. These probably shorten the valves towards their base and make a larger opening for the passage of the blood into the ventricles. A concentric layer of fibres, found near the base of the segments, has a sphincter-like

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action, approximating the base of the valves (Paladino). Some of the larger chorde tendinex contain striated muscle (Oehl), whilst a delicate muscular network e

exists in the valvule Thebesii (guarding the openings of small veins from the sub-

of the heart the anatomical limits of the organ may be exactly de- fined, and information obtained as to its actual size, as to any alterations in the relation of the lungs to the heart, and as to the presence or absence of fluid in the pericardium. The direct regis- tration of the movements of the

heart has been accomplished by the aid of various recording instruments.
!

The movements of the heart consist of a series of contractions Move-
which succeed each other with a certain rhythm. The period of ments of
contraction is called the systole, and that of relaxation the diastole. heart,
The two auricles contract and relax synchronously, and these move-

stance of the heart into the right auricle) and in the Eus- tachian valve (a
crescentic

fold of membrane in front of ff

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“Modes of oxamin- ingliving heart,

the opening of the inferior f

vena cava) (Landois). The aortic and pulmonary open-

ings are guarded by the sig- {

moid or semilunar valves,

ments are followed by a simultaneous contraction and relaxation of the
ventricles. Thus there is a systole and diastole of the auricles and a systole
and diastole of the ventricles. But in each half of the heart the

contractions and relaxations of the auricle and the contractions and relaxa- 2

each of which consists of three tions of the ventricle are suc- id ?

semicircular flaps, _each flap cessive. Finally, there is a Ae

“pene eee b ie es a ae — hs —

order to the wall of the ar- e heart is entirely in dia-

tery, whilst its free border stole. The whole series of

projects into the interior of movements, from the com-

the vessel. The segments con- mencement of one auricular

sist of fibrous tissue covered systole to the commencement

with endocardium. At the of the onc immediately follow-

middle of the free border there _ ing, is known as the cardiac Vor partial dissection of fibres ent

is a fibro-cartilaginous thick- Fic. 5.—View of

ening called the nodulus or corpus Arantii. From this nodulus numerous tendinous fibres radiate to the attached border of the valve, but along the margin of the valve the membrane is thin and desti- tute of such fibres. These thin parts are called the du- nulex. Opposite each semi- lunar flap there is a bulging of the wall of the vessel, the sinuses of Valsalva. In the aorta these are situated one anteriorly and two posteriorly (right and left). From the anterior arises the right coro- nary artery, and from the left posterior the left coronary artery, —these vessels being for the supply of blood to the substance of the heart (Quain).

in anterior wall of ventricles in a sheep’s heart, showing different degrees of obli- quity of fibres. At the base and apex the superficial fibres are displayed in the in- tervening space; more and more of the

bres have been removed from above downwards, reaching to a greater depth on the left than on the right side. al, al, superficial fibres of right ventricle; 61, 61, superficial fibres of left ventricle ; 2, superficial fibres removed so as to expose those underneath, which have the same direction as the superficial ones over the leftventricle, but a different.direction from those over the right ventricle; at 3 some of these have been removed, but the direc- tion is only slightly different; 4, trans- verse or annular fibres occupying middle of thickness of ventricular walls; 6, 7, internal fibres passing downwards to- wards apex to emerge at the whorl; ¢, c, anterior coronary or interventricular groove, over which the superficial fibres cross; in the remaining part of the groove some of the deep fibres turn back- wards into the septum ; d, pulmonary ar- tery; ¢, aorta, (Allen Thomson, Quain's Anatomy.)

According to Laennec, the size of the heart is about equal to the closed fist of the individual. Its mean weight is about 9 to 10 oz. John Reid's tables give the average weight in the adult male as 11 oz. and in the female as 9 oz. The proportion of the weight of the heart to that of the body is from 1 to 150 to 1 to 170 (Quain). W. Miiller gives the ratio of heart weight to body weight in the child, and until the body weighs 88 fb, as 176 oz. to 2°2 Ib; when the body weight is from 110 to 200 tb the ratio is '141 0z. to 2°2 bb ; and when the weight of the body reaches 220 tb the ratio is as "123 oz. to 2°2 Ib. The volume of the heart, according to Beneke, is as follows :—new-born infant, 1°34 cubic inches ; 15 years of age, 9°15 to 9°76 ; at 20 years, 15°25 ; up to the 50th year, 17°08 cubic inches ; after that there is aslight diminution. There is scarcely any differ- ence between the capacities of the two ventricles, although in the ordinary modes of death the right is always found more capacious than the left, probably because it is distended with blood ; the left ventricle after death is usually empty and more contracted. The wall of the left ventricle is much thicker than that of the right. The specific gravity of heart muscle is 1°069. _The thickness of the left ventricle in the middle is in man '44 inch and in woman '48 ; that of the right is '16 and '14 inch respectively. The circumfer- ence of the tricuspid orifice in man is 4°62 inches and in woman 4°33 ; of the mitral, 4°18 and 3°78 respectively. The circumference of the pulmonary artery is 2°94 inches ; of the aorta 2°77 ;

of the superior vena cava ‘702 to 1:05 inch ; of the inferior vena cava 1°05 to 1°4 ; and the diameter of the pulmonary veins, ‘53 to °62.

_ When the hand is applied to the side, a little to the left of the left nipple, and in the interval between the fifth and sixth ribs, a shock or impulse is felt. If the whole hand be placed flat over the region of the heart, one may notice the presence or absence of the heart- beat, also its situation and extent, and any alterations in its character. In some rare cases, where there is a congenital fissure of the sternum, the finger can be applied to various parts of the heart’s surface, with the integuments and pericardium intervening. This mode of examination may be termed palpation. Again, when the ear is applied, either directly, or indirectly by means of the stethoscope, over the position of the heart, sounds are heard the duration and rhythm of which are of physiological significance. This mode is known as auscultation. By percussing over the region

eyele or period of revolution of the heart. In fig. 6 the systole is represented by the x

curve above the horizontal “—_ eo Sa

lines and the diastole by the ; : curve below them. The auri- Fis. tie sieving movements

cular changes are traced on the upper line au and those of the ventricle on the lower line vent. The length of the lines represents the total duration of a cardiac revolution. The diagram shows that the auricular systole occupies one-fifth of the total time of a revolution of the heart and the ventricular systole two-fifths, that the auricular systole immediately precedes the ven- tricular systole, that the commencement of the ventricular systole coincides with the commencement of the auricular diastole, and that during two-fifths of the total period both auricles and ven- tricles are in a state of diastole. There are thus three periods,— (1) one of auricular systole, one-fifth ; (2) one of ventricular systole, two-fifths ; and (3) one of repose, two-fifths. The impulse of the apex against the wall of the chest, the moment of which is indi- cated by x, occurs at the middle of the time occupied by the ventricular systole.

In 1861 Chauveau and Marey obtained a direct record of the movements of the heart of a horse, determined the duration of the events happening in the heart, and measured the endocardiac pres- sure by an instrument termed a cardiac sound. When the sound was introduced into the right auricle and right ventricle,—the animal being anesthetized,—the tracings shown in fig. 7 were

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Fic. 7.—Tracings from the heart of a horse, by Chatveau and Marey. The upper tracing is from the right auricle, the middle from the right —e >, and the lowest from the apex of the heart. The horizontal lines represen

time, and the vertical amount of pressure. The vertical dotted lines mark

coincident points in the three movements. The breadth of one of the small squares represents one-tenth of a second.

obtained. From this diagram we learn the following facts. (1) The auricular contraction is less sudden than the ventricular, as is indicated by the line ab being more oblique than the line ¢' @'. (2) The auricular contraction lasts only for a very short time, as the curve almost immediately begins to descend, whereas the ventricle remains contracted for a considerable time, and then

1 See Marey, La Méthode Graphique, wt supra.

Sketch of

eardiae revolu- tion.

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slowly relaxes. (3) The time of the contraction of the auricle and that of its relaxation are about equal, but the time of the relaxation of the ventricle is nearly twice as long as that of its contraction ; the movements of the auricle are thus uniform and wave-like, whilst those of the ventricle

have more of a spasmodic character. (4) The auricular movement (ad, a'b', ab", g, 9', g') precedes the ventricular, and the latter coincides with the impulse of the apex against the wall of the chest, as is seen from the second vertical dotted line. (5) The contraction of the auricle, by forcing blood on- wards, affects the pressure for an instant in the ventricle, as is indi- cated by the little elevation immediately before the ventricular con- traction. (6) During the period of contraction of the ventricle there are oscillations of pressure affecting both the auricle and the ventricle ; these are indicated by the little waves d, ¢, f, a', é; oF gil e", and f" ; similar waves are seen ath, 7, h', 7', h", and 7". The letters %, e, k', e', and &", e" represcnt a third set of waves.

With these facts in view, we may now describe the phenomena which happen in a complete cardiac revolution. Suppose the blood to be pouring from the venz cave and the pulmonary veins into the two auricles. At that moment the auricles are passing into a state of complete diastole, and their cavity is increased by the funnel-shaped aperture at the auriculo-ventricular openings formed by the segments of the valves guarding these orifices. The dis- tension of the auricles is due partly to the pressure in the vene cave and pulmonary veins being less than in the interior of the auricles and partly to the aspirating action of the thorax during inspiration, sucking, as it were, the blood from the veins outside the chest to those inside the chest, and thus favouring the flow of blood to the heart. During this time both ventricles are filling with blood, the auriculo-ventricular orifices being open. When the distension of the auricles is complete (which happens before the distension of the ventricles, because the capacity of the auricles is much smaller than that of the ventricles), the auricular systole commences by the contraction and emptying of the auricular ap- pendix towards the general cavity of the auriele, and by the mouths of the veins becoming narrowed by contraction of the circular fibres in their coats. These rhythmic movements are propagated quickly over the auricular walls, causing them to contract simultaneously towards the auriculo-ventricular orifices. The contracting wall forces the blood chiefly in the direction of least resistance, that is, into the ventricle, which at the same time is only partially full of blood, and is passing into a state of complete relaxation. The pressure in the veins, aided by their rhythmic contraction at the commencement of the auricular systole, is sufficient to

prevent the blood from passing backwards, except to a very slight extent; but there is a momentary arrest of the flow in the large venous trunks. Thus the auricles act, not only as passive reservoirs for the blood in its passage from the veins to the auricles, but as rhythmic cavities tending to keep up a mean pressure in the veins, in diminishing by their extensibility the pressure which tends to increase during the ventricular systole, and in increasing the pressure by their contrac- tion at a time when the venous pressure would diminish, that is, towards the close of the ventricular diastole. Both auricles and ven- tricles exercise, during their diastole, a certain aspirating or sucking action, like that seen during the relaxation of a compressed india- rubber bag ; but this force is very feeble in the case of the heart.

The amount of blood discharged into the ventricles (already partially filled during the relaxation of the auricles) by the auricular systole is sufficient to fill their cavities, and consequently the ven- tricular systole immediately follows the contraction of the auricles. During the inflow of blood from auricles to ventricles the auriculo- ventricular valves are floated upwards into a more or less horizontal position, and the assumption of this position is further aided by the contraction of the longitudinal muscular fibres that pass from the auricles into the cusps of the valves. When the ventricular walls contract, the margins of the auriculo-ventricular valves are closely pressed together, and the cusps are kept from being folded backwards into the auricle by the simultaneous contraction of the musculi papillares pulling on the chord tendinex which are affixed to the ventricular aspect of the valves. The close apposition of the cusps is also increased, even along their margins, by the arrange- ment that the chorde tendinee of one papillary muscle always pass to the adjoining edges of twocusps. Thus the valves, tricuspid on the right side and mitral on the left, are tightly closed and the blood cannot regurgitate into the auricles. The blood, thus com- pressed, can only pass into the pulmonary artery from the right ventricle and into the aorta from the left. The positive pressure in the ventricles is at its maximum at the beginning of their con- traction ; during the contraction it diminishes ; and at the close of the systole (Marey), or in the diastole immediately thereafter (Goltz and Gaule), or even, according to Moens, shortly before the systole has reached its height, the pressure may even become negative. Moens

“explains this aspiration as being due to the formation of an empty space in the ventricle caused by the energetic expulsion of the blood through the aorta and pulmonary artery” (Landois and Stirling). As the blood passes from the ventricles into the pul- monary artery and aorta, the segments of the sigmoid valves are

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forced open and stretched across the dilatations or sinuses behind each cusp, without being actually pressed against the walls of the vessels ; and, as both the pulmonary artery and the aorta contained a certain amount of blood before, the pressure in these vessels is in- creased, and the walls of both yield to a considerable extent. As already stated, the ventricle continues in the contracted state for a brief space of time, and then it relaxes. Simultaneously with the commencement of relaxation, the auriculo-ventricular orifices open, thus permitting the passage of blood from the auricles; and at the same time the elastic walls of the aorta and pulmonary arteries recoil and force a portion of the blood backwards towards the cavities of the ventricles, in which, as they are passing into diastole, the pressure is much less than in the vessels. This blood, however, by filling the sinuses of Valsalva and the crescentic pouches of the sigmoid valves, closes these latter, and thus prevents any blood from passing into the ventricles. From the end of the ventricular con- traction to the moment when the auricles are again full, all the cavities of the heart are in a condition of dilatation and the cavities are filling with blood. This is the period of the pause, during which the heart may be supposed to be in a state of rest.

When one watches an actively beating heart exposed in an anes- thetized animal, the movements are so : tumultuous and rapid that the eye can- not follow them so as to convey to the mind a correct conception of the rapid changes in form. Owing to this our notions of such changes have been de- rived chiefly from an inspection of the heart after death. Recent ingenious in- vestigations by Ludwig and Hesse have shown that the post- mortem form is not the natural shape of the living heart Fra. 8.—

Projection of the base either in diastole or in systole, but such im systole and diastole; RV, as is shown, for example, in fig. 8. ~ seninicls,) 20, See

The apex beat or shock of the heart : is synchronous with. the systole, and is caused normally by the apex of the ventricle pressing more firmly against the chest wall, from which it is separated when the heart is at rest by the thin margin of the lung. At the time of ventricular systole, as already seen, the heart, instead of being an oblique cone having an elliptical base, as in rest, becomes more like a regular cone, having a circular base. When contraction occurs, the apex is carried from below and behind, upwards and forwards, and is forced into the intercostal space, and at the same time the ventricular portion twists on its long axis from left to right, so as to expose partially the left ventricle. It is the twisting motion that gives the shock or impulse, and it is caused chiefly by the contraction of the oblique fibres in the ventricles which lift up the apex; it is also assisted by the slightly spiral arrangement of the aorta and pulmonary artery. Some have supposed that the movement is partly due to the recoil of the ventricles after discharging their blood (like that of an exploded gun), causing the apex to go in the op- posite direction, downwards and outwards; others have held that the discharge of blood into the pulmonary artery and aorta causes an elongation of these vessels, whereby the apex is pushed down- wards and forwards. Both of these mechanisms, however, must have only a slight effect, as the cardiac impulse occurs even when from hemorrhage the pulsating heart is practically empty.

To obtain a tracing of the apex beat an instrument termed the cardiograph is employed, various forms of which are figured in Landois and Stirling's Human Physiology, vol. i. p. 89 sg. Figs.

b

Fig. 9.—Traeing of cardiae pulsations of a healthy man. (Marey.)

9 and 10 are examples of tracings obtained by this instrument. From the latter figure we learn the subjoined information. The time of the pause and the contraction of the auricle are represented by ab, and it is evident that the latter pheno- menon causes the apex of the heart to move towards

the intercostal space. The portion be corresponds to the contraction of the ventricles and is synchronous with the first sound. The curve then rapidly falls as the ventricles relax, and during| the descent there are two eleva-

tions, d and e, synchronous with the

Fig. 10.—Normal eurve from man. (Landois.)

second sound. As already stated, when the ventricles relax, the blood

in the aorta and pulmonary artery, driven backwards by the elastic recoil of the walls of these vessels, closes the semilunar valves.

Change in shape of heart. | |

Apex beat.

Cardio-

graphic tracings.

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VARCULAR SYSTEM

This shock is propagated to the apex of the ventricles and thus causes a vibration of the intercostal space. The elevation d is synchronous with the closure of the aortic valves and ¢ with that of the pulmonary valves ; it is also apparent that these valves are not closed at the same moment, but are

separated in time by ‘05 to ‘09 of a second,—an effect due, as already explained, to the greater blood pressure in the aorta than in the pulmonary artery. Finally, ef corresponds to the remaining part of the ventricular diastole.

‘atureot Much discussion has taken place as to whether the contraction

of the heart is to be regarded as a simple contraction, like the “twitch” of a muscle obtained by a single stimulation, or as a tetanic contraction, like cramp, such as is caused by the application of a number of stimuli in rapid succession. It is true that many of the phenomena of a cardiac contraction resemble those of a skeletal muscle: thus, fatigue diminishes the amplitude and in- creases the duration of the contraction ; and the effects of changes of temperature are similar. The period of latent stimulation of a cardiac muscle (one-third of a second) is much longer than that of skeletal muscle (one-hundredth of a second). The systolic contrac- tion, as regards duration, is more like a tetanic spasm than a twitch, being from eight to ten times longer. The electrical phenomena, on the other hand, resemble those of a twitch more than those of tetanus. Thus, when the heart is examined with a sensitive galvano- meter, and with the aid of the appliances described under PHYsIoLocy (vol. xix. p. 24 sq.), there is a “negative variation ” with each beat. The fact appears to be that, just as the heart muscle shows histo- logical characters intermediate between voluntary striated muscle and involuntary non-striated muscle, so it likewise shows physio- logical properties partaking of both.

The time occupied by cardiac movements has been measured by various observers by a study of tracings obtained from the impulse of the apex of the heart against the wall of the chest, as recorded by the cardiograph. If the velocity of the surface on which the tracing is obtained be known, and if a correct interpretation is given of the causes of the various parts of the curve, it is not difficult to determine approximately the time occupied by the phases of a cardiac revolution. Rollett gives the following results in fractions of a second as determined by Landois (Hermann, Handb. d. Physiol. vol. iv. p. 157).

Rate of Heart-Beat per Minute. Events in the Heart. SS ee Ee

55 | 55 | 74-2 | 109-7

brid ico Duration of Phases.

. From beginning of pause to end of auri-

cular contraction

. Contraction of ventricle

. Relaxation of ventricle to closure of semilunar valves

From close of pulmonary valves to be- ginning of pause

. Between Ist and 2d sounds….....

. Between 2d sound and next Ist sound..

- Time from 1 to 4 inclusive (complete

cardiac revolution)

. From closure of aortic valves to closure

of pulmonary valves

584 274

494 079

Dis 5

066

‘194 |

-090

“244 “303 “547

In the adult man cardiac pulsations occur at the rate of 65 to 75 per minute. There is a certain relation between the amount of

fcardiac blood in the circulation and the frequency of heart-beats. Thus,

in the animal series, as the beats of the heart increase in fre- quency the quantity of blood which passes per minute in one kilo- gramme (2°2 ib) of body weight also increases, as is shown in the following table by Vierordt :—

Quantity of Blood per Minute and | Number of Pulsations per Kilogramme of Body Weight. per Minute.

152 grammes

07

101

dupp; then the accent is on lupp (the first sound) when the stetho- scope is over the apex—thus, hipp dupp, lipp dupp—and on dupp (the second sound) when over the base—thus, lupp dupp, lupp dupp. 'There is a pause between the second sound and the next succeeding first sound, and a much shorter pause (almost in- appreciable) between the first and second sounds: thus—

At apex—lupp dw use), lupp du use), lipp dupp.

At ee dape cone ies cee hh neg aenb.

These relations are well seen in fig. 11. Dr Walshe states that, if the cardiac cycle be divided into tenths, the first sound will last four-tenths, the short pause one-tenth, the second sound two-tenths, and the long pause three-tenths. There has been considerable dif- ference of opinion as to the cause of the first sound. Some have supposed it to iar be due to vibrations of the , i auriculo-ventricular valves; |__|}}|/| i others believe that it is iy muscular, and due to the A contraction of the ven- oN i : |

tricles ; not a few have at- ’ hi mi | i tributed it to movements ‘yp E of the blood through the : aortic and pulmonary ori- fices; whilst yet others

have thought that it might F16. 11—Scheme of a cardiac cycle after Gaird-

: nerand Sharpey. The inner circle shows what be the result of a fusion of events occur in the heart, and the outer the these effects. It is cer- relation of the sounds and silences to these tainly not due to the shock

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AURICLE& VENTRICLE,

| ih a

events. ;

of the heart against the chest wall, as it has been heard after re- moval of the heart from the chest. The most likely view is that it is a muscular sound, varying in quality from the ordinary sound of a contracting muscle in accordance with the peculiar arrange- ment of the cardiac fibres, and that this sound is modified by the vibrations of the tense auriculo-ventricular valves. The fact that the sound has been heard from an excised heart still pulsating but empty of blood strongly supports this view ; and there is further the pathological evidence that in cases where the muscular walls have been much weakened by fatty changes (as in the advanced stages of typhus, fatty degeneration, &c.) the first sound may dis- appear. No doubt exists as to the cause of the second sound: it is produced by the sudden sharp closure of the sigmoid valves. As already mentioned, the aortic and pulmonary valves do not close absolutely simultaneously.

For practical purposes it is important to bear in mind what is happening in the heart whilst one listens to its sounds. With the first sound we have (1) contraction of the ventricles, (2) closure of the auriculo-ventricular valves, (3) rushing of the blood into the aortic and pulmonary artery, (4) impulse of the apex against the chest, and (5) filling of the auricles. With the second sound we have (1) closure of the semilunar valves from the elastic recoil of the aorta and pulmonary artery, (2) relaxation of the ventricular walls, (3) opening of the auriculo-ventricular valves so as to allow the passage of blood from auricle to ventricle, and (4) diminished pressure of apex against chest wall. With the long pause there are (1) gradual refilling of the ventricle from the auricle and (2) con- traction of the auricle so as to entirely fill the ventricle. The sound of the tricuspid valve is loudest at the junction of the lower right costal cartilage with the sternum, of the mitral at the apex beat, of the semilunar valves at the

aortic orifice in the direction of the aorta, where it is nearest to the surface, at the second right costal cartilage, and of the valves at the pulmonary orifice over the third left costal cartilage, to the left and external to the margin of the sternum.

For an account of the mechanical work performed by the heart, see NUTRITION, vol. xvii. pp. 685-686.

The heart is directly nourished by the blood flowing through its Nutri-cavities in some of the lower Vertebrates, as the frog; but in the tion of

'uantity hearts of larger animals, in which nutritional changes must be heart.

It has been determined, both by direct measurement and by cal-

1 heart,

{blood culation based on the velocity of the blood in the aorta and the

transverse section of the orifice of that vessel, that from a heart of average size each left ventricular systole ejects about 180 grammes (6°35 0z.). This is the figure usually given, but it must be regarded merely as approximative. The amount may vary even in the same individual according to the state of vigour of the muscular walls of the organ,

When the ear is applied over the cardiac region of the chest of a

» healthy man two sounds are heard, the one with greatest intensity

over the apex and the other over the base of the heart. The dull long sound heard over the apex has received several names, such as the first, the long, the inferior, and the systolic sound, whilst that over the base,—clearer, sharper, shorter, higher,—has been called the second, the short, the superior, the diastolic sound. Suppose the heart sounds to be expressed by the syllables Jupp

actively carried on, there is a special arrangement of vessels or cardiac circulation. The coronary arteries originate at the aortic orifice in the

region of the sinus of Valsalva, rather above the upper border of the semilunar valves, so that when the veutricle con- tracts the mouths of these arteries are not covered by the segments of the valves. The branches of the coronary arteries, after dividing and again dividing, penetrate the muscular substance and end in a rich plexus of capillaries, which carry arterial blood to the struc- ture of the heart. From these the radicles of the cardiac veins originate, and these veins carry the blood, now rendered venous, into the right auricle by the larger anterior cardiac veins and by numerous small veins constituting the foramina of Thebesius or the venxz minimex cordis. The coronary vein is dilated before enter- ing the auricle, forming the coronary sinus, and at the junction of the vein with the dilated portion there is a valve consisting of

one or two segments. Other veins enter the coronary sinus, each having a valve. These valves serve two purposes: (1) they inter- rupt the flow of blood during the contraction of the right auricle, preventing regurgitation and venous congestion of the wall of the heart, and (2), as the valves open towards the right auricle, they prevent the backward flow of blood during contraction of the ventricles and favour its onward flow, and thus the stream of blood is accelerated, as in the veins of a contracting muscle. The blood is sent through the cardiac circulation by the systole of the ventricle, and not, as was advocated by Briicke, during its diastole. Heart disease in advanced life, when the coronary arteries are often thickened and their calibre much diminished by sclerosis, may be shown by attacks of palpitation, weakness of the heart, altered rhythm, breathlessness, congestions, pulmonary cedema, hemor- rhage, and faintings,—all due to interference with the normal nutrition of the heart.

In an organ so active as the heart the lymphatic system is neces- sarily largely developed. These vessels, acting like drainage-tubes for carrying away waste products, are found in great numbers beneath both the pericardium and the endocardium, and through- out the muscular tissue. Amongst the muscular fibres there are numerous lacune or spaces lined by endothelial cells, which are the origins of the lymphatics. The lymph is carried into lymphatic glands between the aorta and the trachea, and

ultimately finds its way into the right innominate vein and the thoracic duct.

Persist – It has been known from early times that the heart will continue ence of to beat after its removal from the body. This is more especially cardiac the case with the hearts of cold-blooded animals. The frog's heart

Lymph- atics of heart.

move- may continue to pulsate for two and a half days, whilst that of a ment. rabbit will do so only for a period of from three to thirty minutes. The average duration of the beats of the warm-blooded heart is said to be eleven minutes. The right auricular appendix, which beats longest, has been observed to pulsate in the rabbit fifteen hours after death, in the mouse forty-six, and in the dog ninety- six hours. After the heart has ceased beating, it may again be caused to contract by direct stimulation or by heat. The injection of arterial blood into the coronary vessels will restore excitability in the Mammalian heart after it has ceased to beat (Ludwig). Cardio- If a wide glass tube filled with smoke be inserted into one nostril, pneu- while the other nostril and the mouth are closed, the smoke will matic be seen to move with each pulsation of the heart (Stirling). This move- phenomenon has been studied by Ceradini and Landois. It is ex- ment. plained by the fact that when the heart contracts it occupies less

space in the chest, and consequently, if the glottis be open, air will be drawn into the lungs. The reverse will happen during the diastole.

The heart and lungs being contained in an air-tight cavity, the chest or thorax, it is evident that the increase and decrease in the size of the chest during inspiration and expiration must affect the amount of pressure on the outer surface of the heart, and consc- quently its movements. When an inspiration is made by the descent of the diaphragm and the elevation of the ribs, the lungs expand ; there is then less pressure on the outer surface of the heart and the heart is in a state of distension in diastole. In consequence also of the removal of pressure during inspiration from the great veins entering the chest and reaching the right side of the heart, the flow of venous blood towards the heart is favoured. These effects are

more marked if after a deep expiration the glottis be closed, so as to prevent air entering the lungs, and if then the chest be dilated by a powerful inspiratory effort (J. Miiller). This causes

,a dilatation of the heart, and venous blood flows freely into the right side; this sends it on to the lungs, causing them to become engorged, whilst at the same time the dilated left side of the heart is unable to send out a sufficient amount of blood into the arterial system. The pulse in such conditions may disappear, and there is an intense feeling of distress. On the other hand, expiration in- creases the pressure on the outer surface of the heart and of the great veins ; only a small amount of blood flows into the right side – the heart is contracted ; the systole is small; and the pulse is re- duced in volume. This condition is intensified in what is termed Valsalva's experiment, in which after a deep inspiration the glottis is closed and a powerful expiratory effort is made. When this is done, the flow of venous blood into the heart is interrupted, the veins in the face and neck swell, and the blood is forced out of the compressed lungs into the left side of the heart, which throws it into the arterial circulation. The pulse and heart sounds disappear and there is the risk of syncope or fainting. Both these experi- ments, Miiller's and Valsalva's, are dangerous and should not be often repeated. They are extreme conditions of the normal state of things, in which inspiration favours the flow of blood into the heart and the dilatation of the heart, whilst expiration has the opposite effect ; and they also explain the mechanism by which air may be sucked into the veins from wounds in the neck or armpit. This is most likely to occur during inspiration, and when it does

Innerva- occur speedy death is the result. tion of In treating of the innervation of the heart we have to consider heart. (1) the influence of the great nerves connecting the heart with the

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central nervous organs, or what may be termed the eatrinsic nervous: mechanism, and (2) the nervous arrangements in the heart itself,

or the intrinsic nervous mechanism. (1) The extrinsic arrange- Ex- ments, consisting of the nerves given off by the cardiac plexuses trinsic, derived partly from the cerebro-spinal and partly from the sympa-

thetic system, have been investigated chiefly in the larger animals,

such as the tortoise, rabbit, and dog, and the general results have . been described under Puystonoey (vol. xix. p. 29 sg.). They may i be briefly summarized as follows: (a) there are fibres in the vagus ‘ nerve exercising a controlling or inhibitory action on the heart, and

these fibres originate in the medulla oblongata; (8) the sympathetic

nerve supplies accelerating fibres to the heart, and these fibres h originate in the cerebro-spinal system. (2) The intrinsic arrange- Intrins! — ments have been investigated more especially in the heart of the |

frog, a view of which is given in figs. 12 and 13. It will be seen

Fie. 12.—Heart of frog from the front. V, single ventricle; Ad, As, right and left auricles ; B, bulbus arteriosus; 1, carotid, 2, aorta, and 3, pulmonary artery ; C, carotid gland. (Ecker.)

Fic. 18.—Heart of frog from behind. sv, sinus venosus opened ; ci, inferior vena cava; csd, ess, right and left superior ven cave ; vp, pulmonary vein ; ‘ Ad and As, right and left auricles; Ap, communication between right and left auricle. (licker.)

that the frog’s heart possesses two auricles, communicating by a

foramen in the septum, and a single ventricle. The venous blood

from the body is poured in the first instance, not into the right auricle, but into a cavity called the sinus venosus, which comniuni- { cates with the right auricle. The left auricle receives the arterial

blood from the lungs by the pulmonary veins. Both auricles empty ;

into the common ventricle, which contains therefore a mixture of

arterial and venous blood, and when the ventricle contracts some

of this blood is again sent to the lungs, whilst the remainder passes

into a dilatation at the commencement of the arterial system, called

the bulbus arteriosus, and thence into the aorta.

After the heart of a decapitated frog has been removed from its Result: body, and so from the influence of the great nervous centres, rhythm- of ex- | ical movements may continue for some time independently of those peri- centres. If the apex of the heart be then cut off, it will remain ment. © motionless, whilst the larger part will still beat rhythmically. Successive slices may be removed from the larger portion without ; affecting rhythmical contraction, until a section is made through | the auriculo-ventricular groove, when the ventricular portion of the heart ceases to beat. If the motionless apex, or the separate por- tions rendered motionless by the above procedure, be mechanically irritated, a single contraction, not a series of rhythmic contractions, follows. When the ventricle is separated from the rest of the heart Experi by a ligature, or by concision at the level of the auriculo-ventricular ment 0 groove, the ventricle stops, but the auricles and the sinus go on Des- — beating. To continue the rhythmic movement of the ventricle, it cartes.)

i

is necessary to have attached to it a small portion of the auricular

part of the heart, especially the lower margin of the septum. It

would, therefore, appear that impulses pass from this auricular por- i tion into the ventricular and cause the latter to pulsate. If the Experi! sinus venosus be separated from the auricles by incision or ligature, ment 0 the veins and the sinus continue to beat, whilst the auricles and Stannit ventricles are arrested in diastole. Suppose another incision be

made through the auriculo-ventricular groove, the ventricle fre-

quently begins to beat, but the auricles remain in diastole. It is

also observed in these circumstances that the ventricle beats more slowly than under normal conditions. Although the rhythmical contractions of the heart are influenced by the nervous arrangements, | it cannot be said that ganglionic nerve cells and nerve fibres are a necessary part of the mechanism. It has been shown by Engel- mann that, if the ventricle of a frog's heart be cut into two or more strips in a zigzag manner, so that the parts still remain connected | with each other by muscular tissue, the strips still beat in a regular progressive mamner, provided one strip is caused to contract. g

The Action of the Blood- Vessels.)

It is evident that a general study of the flow of fluids through Flow tubes ought to precede that of the flow of the blood through the fluids © complicated system of tubes constituting the arteries, capillaries, throug. and veins. In this place, however, it is necessary to allude only tubes. — to those facts in hydraulics which have a special bearing on the phenomena of the circulation (comp. HypROMECHANICS, vol. xii. pp. 440 sg. and 459 sq.). When a stream of water is trans- mitted intermittently by the strokes of a pump through a long

General

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elastic tube, formed, say, of india-rubber, the fluid does not issue from the other end in a series of jets, which would be the case if the tube were rigid, but it flows continuously, because during the pause between the successive strokes the outflow still continues. Consequently a continuous flow is kept up in elastic tubes when the time between two strokes is shorter than the duration of the outflow after the first stroke. If the finger be placed on any part of such a tube, and more especially near the pump, an expansion and relaxation will be felt with each stroke. Further, if the right fore-finger be placed over the tube near the pump, and the left fore-finger over a more distant portion, a stronger impulse will be felt with the right than with the left finger. Thus a wave is transmitted along the tube,

diminishing in amplitude as the dis- tance from the pump increases. We must distinguish between the transmission of this wave (an oscillatory movement or change of form in the column of fluid) and the transmission of the current, that is, the translation of a mass of fluid along the tube. In elastic tubes the current is much slower than the transmission of the wave. The progress of the wave of oscillation may be traced graphically by an apparatus devised by Marey.1 E. H. Weber gives the velocity of waves in elastic tubes at 36°76 feet per second, and Donders states it at 86 to 424 feet. Increase of pressure in the tube appears to lessen the velocity of the wave. The specific gravity of the liquid also affects the velocity: thus the wave is propa- gated four times more slowly in mercury than in water.

The blood-vessels consist, as already stated, $

7%

structure of the arteries, the capillaries, and the x

of blood- veins.

vessels,

Fig. 14.—Capillaries of various size. a, capil- lary much magnified and acted on by nitrate of silver, to show that it is composed of flat- tened cells; 6,a smaller vessel showing the same; c,a small artery or vein showing trans- verse or longitudinal nuclei; d, ultimate

(a) The ultimate or most minute capillaries have the simplest type of structure (fig. 14), consisting of tubes formed of a single layer of transparent, thin, nucleated, endo- thelial cells, joined at their margins. A perfectly fresh capillary does not show the edges of the cells, owing to the uniform re- fractive property of the wall of the tube. The nuclei show an internuclear plexus of fibrils. The cement substance uniting the capillary 'from pia eclls is stained black by a } per cent. solu- maier of sheep's brain. tion of nitrate of silver. Here and there minute dots or slits may be scen, which have been supposed by some to be openings (stomata or stigmata). In the transparent parts of animals, such as the web of , the frog's foot, the mesentery and the lung of the frog, and the tail

coat attaius great thickness and strength. Asa general rule, the smaller arteries show a considerable development of the muscular coat, whilst in the larger it is the elastic coat that attains the pre- ponderance. In many of the larger arteries there are longitudinal muscular fibres at the boundary of the middle and inner coats, Whilst the circular fibres, on contracting, must narrow the calibre of the artery, the longitudinal may tend to keep the vessel open. In the external coat of the larger arteries minute vessels, vasa vasorum, exist for the nourishment of the tissue elements of the arterial wall.

(c) The veins have similar coats to those of an artery, with differ- ences in detail. The elastic layer is less developed in the internal coat ; the middle coat is much thinner and has less elastic tissue, but more connective tissue. Many veins have semilunar folds of the internal coat strengthened with fibrous tissue, forming valves. In some veins (iliac, femoral, umbilical) longitudinal muscular fibres are found in the inner part of the middle coat ; in the inferior vena cava, hepatic veins, and portal veins these longitudinal fibres are external to the circular coat ; in the superior vena cava and upper part of the inferior vena cava the circular coat is wanting ; and the veins of the pia mater, brain and spinal cord, retina, bones, and the venous sinuses of the dura mater and placenta have no muscular tissue (Schafer). Valves exist in the larger veins only, especially in those of the limbs ; they are not found in the veins of the viscera, of the cranium and vertebral canal, or of the bones, nor in the um- bilical vein.

(d) The arterioles and venules are the small vessels, simpler in structure than the larger above described, but containing the same elements, In the smallest veins the elastic layer has disappeared, and the muscular layer is also very thin. Sometimes the muscular layer is represented only by a single layer of contractile cells, and in such minute vessels the outer coat and elastic layer have also disappeared, so that the vessel is merely a tube composed of pave- ment cells with a few elongated fusiform muscular cells twisted around it. Even in the smallest vessels the following differences may be observed between arterioles and venules: "The veins are larger than the corresponding arteries ; they branch at less acute

angles ; their muscular cells are fewer, and their epithelium cells less elongated ; the elastic layer of the inner coat is always less marked, and sooner disappears" (Schiifer).

(ce) The cavernous spaces, as existing in erectile tissues (corpus cavernosum of the penis), consist of the anastomosis of large veins of unequal calibre. The walls and partitions have numerous per- forations ; threads of delicate tissue, covered with epithelium, pass through the cavities ; and the walls are strengthened by eonnective tissue. Similar structures connected with arteries form the carotid gland of the frog and the coccygeal gland of man.

of a fish, the blood may be seen (fig. 15) flowing through the capil- lary network from the arteries into the veins, The current is rapid in the small arteries, less rapid in the veins, and slow in the capillaries, ' It is also fastest in the centre of the vessel and slowest near the YY SS wall, The colourless corpuscles of s Py – blood may be seen to pass from \&# – e centre of the stream to the : : margins, to adhere to the inner 'wo of a fog's foot, as seen with surface of the blood-vessel, and oc- the microscope. The arrows in- casionally to pass through the coats dicate the course of the blood. of the more minute vessels, appear-

The physical properties of blood-vessels are cohesion and elas- Proper- ticity. The cohesion is great and the elasticity is small and perfect. ties of The walls of blood-vessels have the property of contractility, by blood- which alterations take place in the calibre of the vessel, and con- vessels. sequently in the amount of blood supplied to a part.

Arterial Circulation.—The arterial walls are both muscular and Arterial elastic, the muscular coat predominating in the smaller, whilst circula- the elastic coat is strong in the greater arteries. The chief function tion. of the elasticity of the greater vessels is to transmute the unequal movement of the blood in the large arteries, caused by the inter mittent action of the ventricle, into a uniform flow in the capil- laries. Thus, when the ventricle contracts, it propels a certain amount of blood into the elastic aorta, which expands in all direc- tions. On the commencement of the diastole of the ventricle the vis a tergo is removed ; the aorta owing to its elasticity recoils, so

(Schafer.)

ing in the surrounding tissues as migratory cells. Capillaries form networks (fig. 15), which vary much in the size and closeness of the Meshes, according to the degree of activity & of the tissue elements.

as to close, on the one hand, the semilunar valves and, on the other, to force part of its contents into the vessels farther onwards. These, in turn, as they already contain a quantity of blood, expand, recover by an elastic recoil, and transmit the movements with

(6) An artery has three coats,—an inner or elastic, a middle or museular, and an external or areolar (fig. 16). The inner coat Is formed of two layers,—one of pavement epithelium, sometimes called endothelium, and the other composed of fine elastic fibres interlacing, or of a fine membrane per- forated with holes of various sizes (fenes- trated membrane of Henle). In some vessels there is a thin layer of connective tissue between the epithelium and the

diminished intensity. Thus the blood is driven along the vesscls by the action (1) of the ventricular systole, and (2) of the elastic } | recoil of the walls of the vessels occurring during the intervals between the ventricular systole (see p. 104 below). By these actions a series of movements, consisting of expansions and contractions, gradually diminishing in amplitude, pass along the arterial system from the greater to the smaller vessels, the latter becoming, as already pointed out, less and less elastic. These expansions and relaxations of the arterial wall, passing along like a wave, con- stitute the pulse. The pulse therefore represents merely the trans- Pulse. : mission of an undulating movement of the blood, not its pro- elastic layer. The middle coat is formed Ss) gression in the vessels. The undulations of the pulse travel at of a layer of non-striated muscular fibres —SSe7, the rate of 3544 inches per second, about 80 times faster than the circularly disposed around the vessel, pio. 16,—An artery of inter- | Movement of the blood, which in the carotid artery of the horse mixed with numerous elastic fibres con- mediate size. a, a, open- | has been estimated to travel 11:8 inches per second. nected with the perforated membrane of ings of branches and posi- The pulse can be registered graphically by means of a SPHYGMO- Sphyg- the inner coat.

The outer coat consists of Sg Pe oe eee GRAPH (¢.v.). Vierordt constructed the first sphygmograph in mograph. Connective tissue, mixed also with elastic ing transverse nuclei; c,c, | 1855, substituting for a column of fluid a lever placed on the pulse,

which communicated with a system of levers and thus amplified

fibres. In the aorta there isa considerable coat of areolar tissue. : amount of sub-epithelial connective tissue (Schafer), and the elastic | the movement. Of those subsequently devised the best form is that of Marey, invented in 1861. It consists essentially of a long

1 Figured in M'Kendrick's Outlines of Physiology, pp. 338-339.

lever, which is moved near the fulerum by a screw acting on a small horizontal wheel, from whose axis there projects a long, light, wooden lever. The point of the screw rests on a flat disk of steel or ivory, at the end of an elastic spring, which presses the ivory disk or pad on the artery. The lever inscribes the movements on a blackened surface, usually a strip of paper smoked in the flame of a lamp burning turpentine, carried in front of the point of the lever by clock-work. In the instrument as modified by Mahomed, Byrom Bramwell, and others there is an arrangement for adjusting the amount of pressure made on the artery by the ivory pad, so that tracings may be taken at different times from the same artery with different or with the same pressures. The tracings are "fixed ' by passing them through shellac or photographic varnish. Sphyg- The following changes take place in an artery when it pulsates: mograph —(1) it dilates and at the same time lengthens to a small extent ; or pulse (2) the pressure of the blood increases in the artery, and a fecling tracing. .of hardness and resistance is experienced when the artery is com- pressed with the finger. These faets are illustrated in the sphygmo- graphic curve shown diagrammatically in fig. 17. The ascending line ad (line of ascent, up-stroke, or percussion stroke) corresponds to the distension of the ar- tery produeed by the systole of the left ventricle, and the descending line bcd to its elastic recoil ; the length of the line ad represents the total duration of the movement, which is divided into é a two portions by the

perpendicular line be. The Fie. 17.—Diagram of distance ae measures the duration of the disten- a sphygmographic sion of the artery and ed the time of its elastic 'RS: recoil, In a eontinuous tracing the durations of the individual pulsations are equal, and in inverse ratio to the number of pulsa- tions in a unit of time. In a normal pulse the distension and the ; elastic recoil of the vessel succeed each other without interruption, so that there is no period of repose in the artery. When, however, the pressure of blood in the artery falls below a certain point, these characters disappear or arc modified. Fig. 17 shows that the duration of the distension of the artery is only about one-third of that of its contraction. The rapidity and slowness of the pulse depend on the ratio of these periods. 'The pulse is quick when the duration of the arterial distension diminishes, and slow when it increases. The line ab becomes less oblique and more nearly ver- tical, in proportion as the time of the distension is short, quick, and nearly instantaneous. The rapidity of the pulse is increased by quick action of the heart, considerable power of yielding in the arterial walls, easy afflux of blood owing to dilatation of smaller vessels, and nearness to the heart. The term quwiekness has reference to a single pulse-beat, and frequency to the number of beats in a given time, say, one minute. The line bed is always more oblique than ab, and in careful tracings it presents several elevations or notches (see fig. 18). If we refer the _ different portions of the curve to their origin the re- sult is as fol- lows :—-(1) the ' up-stroke corre- Fy, 18.—Sphygmogram of radial artery; pressure 2.0z. Each sponds to the part of the curve between the base of one up-stroke and systole of the the base of the next corresponds to a beat of the heart, lee - wetitidie. 20 that this figure shows five heart-beats and part of a : » sixth; ab, the ascent; b, apex of up-stroke; 6 to h, the opening the aor- descent, with an elevation d, the first tidal or predicrotic tic valves, pour-

wave ; @, aortic notch ; f, a second elevation, the dicrotic ing the blood W8Ve3 92 slight curve, sometimes called the second tidal into the arter-

wave. (Landois and Stirling.) ies, and distending them; (2) the downstroke represents the time during which the blood is flowing out of the arteries at their peri- phery into the capillaries ; (8) the larger wave in the descent, 7.¢., the dicrotic, recoil, or aortic systolic wave, represents the time of the closure of the aortic valves; (4) the predicrotic, first tidal, or second

ventricular systolic wave occurs after the first systolic wave and during the ventricular contraction (Byrom Bramwell). In many

pulse-tracings there are still smaller secondary waves, due to elastic |

vibrations of the wall of the vessel. The three factors causing an arterial pulsation are (1) the more or less energetic contraction of the ventricle, (2) the quantity and pressure of the blood, and (3) the elastic and contractile properties of the arterial wall. If these factors be in any way modified there will be a corresponding modi- fication in the physical characters of the pulse. The character of a pulse-tracing is affected by the amount of pressure applied to the artery. With a light pressure the dicrotie wave is relatively less ; with a moderate pressure (34 to 7 oz.) it is well marked, whilst the curve is lower; and with greater pressure it-is again reduced.

Physio- With 72 to 104 oz. pressure small secondary waves appear before logical the dicrotic. char- The normal pulse-rate in man is about 72 per minute, in woman

acters of about 80 per minute; but in some individuals a state of health is pulse. consistent with a pulse-rate as rapid as 100 or as slow as 50 beats

per minute. The pulse-rate is influenced by the undermentioned factors. (1) Age: a newly-born child, 130 to 140 beats per minute ; 1 year, 120 to 180 ; 2 years, 105; 3 years, 100 ; 4 years, 97 ; 5 years, 94 to 90; 10 years, about 90; 10 to 15 years, 78; 15 to 50 years, 70 ; 60 years, 74; 80 years, 79 ; 80 to 90 years, over 80. (2) Length of body: Czarnecki, Volkmann, and Rameaux have shown that as the height increases the pulse slows. (8) Bodily states: active muscular exercise, increased blood-pressure, active digestion, pain, nervous excitement, extreme debility quicken the pulse. (4) Tem- perature: increase of temperature quickens the pulse. An increase of 1° above 98° Fahr. is assoeiated with an increase of 10 beats per minute: thus, at 98° Fahr. the pulse-rate will be 60 per minute ; at 99°, 70; at 100°, 80; at 101°, 90; at 102°, 100; at 103°, 110; at 104°, 120; at 105°, 180; and at 106°, 140 (Aitken). (5) Posture: the pulse is more

frequent when one stands than when one sits, and still slower when one lies down. (6) Sensory impressions: music is said by Dogiel to quicken the pulse. (7) Pressure: increased barometric pressure slows the pulse. (8) Diurnal rhythm: 3 to 6 A.M., 61 beats; 8 to 11.30 a.M., 74; towards 2 P.M., a decrease ; towards 3 (at dinner-time) another rise, which goes on until 6 to 8 P.M., when it may be 70; towards midnight, 54; a rise again to- wards 2 A.M., when it soon falls again, and afterwards rises, as before, towards 3 A.M. (Landois and Stirling).

Colin gives the following pulse-rates in various animals :—elephant, 25 to 28 beats per minute ; camel, 28 to 32; giraffe, 66; horse, 86 to 403; ox, 45 to 50; tapir, 44; ass, 46 to 50; pig, 70 to 80; lion, 40; lioness, 68; tiger, 74; sheep, 70 to 80; goat, 70 to 80; leopard, 60; wolf (female), 96; hyena, 55; dog, 90 to 100 ; cat, 120 to 140; rabbit, 120 to 150; mouse, 120; goose, 110; pigeon, 136; hen, 140; snake, 24; carp, 20; frog, 80; salamander, 77.

A pulse is said to be strong or weak according to the weight it is Strengt] able to raise. The strength is usually estimated by pressing the of pulse finger on the artery until the pulse-beat beyond the point of pressure ; disappears. The pulse is said to be hard or soft according to the Tension degree of resistance experienced. In feeling the pulse it is import- ant to notice whether the tension is great during the distension of the vessel, or whether it is hard during the intervals between the pulse-beats as well as during the beats themselves. On the other hand, it may be soft in these intervals in consequence of the semi- lunar valves at the aorta not closing perfectly (aortic ineompetence), thus allowing the blood partially to flow back into the ventricle. This softness and the feeling of sudden collapse of the arterial wall are the pulse characteristics of unfilled arteries. A pulse may be Volume large in volume, as where a large amount of blood is thrown into the aorta, owing to hypertrophy of the left ventricle, or it may be small and thready when a small quantity of blood passes into the aorta, either owing to a diminished total amount of blood, or from constriction of the aortic orifice (aortic stenosis), or from disease of the mitral valve allowing the blood to regurgitate into the left auriele, or when the ventricle contracts feebly. ;

The pulse becomes later and later in time as we recede from the Velocit, heart. Czermak estimated the delay as follows :—carotid pulse, of puls< after the cardiac beat, ‘087 second ; radial, ‘159 second ; posterior wave. tibial, ~~193 second. By placing delicate tambours or electromag~~ netic sphygmographs at different points of the circulation and re- cording the movements on a rapidly moving surface, E. H. Weber found the velocity of the pulse-wave to be 30°31 feet per second ; Garrod found it to be from 29°52 to 35°43 feet per second ; Crashey determined it at 27°89 feet per second; and Moens at 27:23. In the arteries of the upper limb it is stated to be 30°84 and in those of the lower limb 31°82 feet per second. The wave-length is ob- tained “ by multiplying the duration of the inflow of blood into the aorta= 08 to ‘09 second by the velocity of the pulse-wave.”

This would give the wave-length at 2°46 feet.

As already pointed out, inspiration favours the flow of blood into Influen the veins and retards the flow in the arteries, whilst expiration has of resp the reverse effect. The tension of the arteries during inspiration ration

is therefore less than in expiration, and this affects the form of the pulse. (1) “‘ The greater distension of the

pulse-curve, as is seen in fig. 19.

Fig. 19.—Sphygmographic tracing showing influence of respiration on pulse. J, during inspiration ; E, during expiration. (Riegel.)

arteries during expiration causes all the parts of the curve occurring during this phase to be higher ; (2) the line of ascent is heightened during expiration, because the expiratory thoracic movement helps to increase the force of the expiratory wave ; (3) owing to increase of the pressure the dicrotic wave must be less during expiration ; and (4) for the same reason the elastic elevations (secondary waves) are more distinct and oceur higher in the curve near its apex” (Landois and Stirling, op. cit.). ‘See also p. 102 above.

_ Non-striated muscle, as has been already stated, exists to a con- Contra: siderable amount in the walls of the smaller arteries, and the calibre tility

© of these vessels may consequently be changed by the activity of the artene: contractile coat. The contractility of vessels may appear under two

forms :—(1) as rhythmical contractions, such as have been seen in the vessels of a rabbit's ear or in a bat's wing, which are inde- pendent both of the pulse and of respiratory movements ; and (2) as persistent contractions, under the influence of the nervous system, whieh play an important part in the distribution of the blood. The amount of contraction of an artery will affect the pressure of the blood in its interior: it will accelerate or retard the rapidity of the blood current ; and it will regulate the supply of blood to the

by exposure to the air for one or two hours (see fig. 20). It consists of the adhesion to the wall of the vessel of the colourless corpuscles and their protrusion through the wall into the surrounding tissues. Hering is of opinion that it is due partly to the filtration of the colloidal matter of the cell under blood-pressure. Diapedesis is of importance as constituting a part of the inflammatory process. The colourless cells become pus corpuscles (Cohenheim) ; see Paru- OLOGY, vol. xviii. p. 865. (18) If a vascular membrane be

capillary area to which the vessel is distributed. By such arrange- | gently _ irritated ments, also, the distribution of blood to various organs is regulated, | whilst under the thus establishing what has been termed a balance of local circula- | microscope, the

tions. For example, if the vessels in one organ remain permanently contracted, whilst those in a neighbouring organ are dilated, more blood will pass to the latter than to the former, and some end of physiological importance may be served. Thus physiological correlations may be established between the cerebral and thyroid eirculations, the gastro-hepatic and the splenic circulations, and

capillaries become first slightly nar- rowed and then di- lated, crowded with corpuscles, whilst @% the blood – stream.”

the distribution of blood in the lower extremities as related to the | becomes __ slower. abdominal organs. By and by the ‘Arterial Ifa stethoscope be placed over a large artery, a murmur, sound, | stream oscillates sounds. or bruit will be heard, caused by the blood rushing through the | and then alto- ~~” vessel narrowed by the pressure of the instrument. The fluid escapes | gether stops. This into a wider portion of the vessel beyond the point of pressure, and | constitutes stastis, Fic. 20.— Small vessels of mesentery of frog, showing the sound is caused by the particles of fluid there being thrown into | a part of the in~~ Seaporeats Ls ne corpuscles. w, w, Serer rapid vibration, not by vibrations of the wall of the vessel. Such | flammatory pro- Woosh 0% pecgtlovatdoagtig to a pn sounds are favoured by a certain degree of elasticity in the walls of | cess, and is fol- corpuscles in various stages of extrusion ; 7, f, extruded the vessel, by diminished peripheral resistance allowing the blood | lowed by exudation corpuscles. (Landois and Stirling.) to flow away freely, and by a considerable difference of the pressure | of the plasma of the blood, along with colourless corpuscles, and 1 in the narrow and wide parts of the tube. They are always heard | more rarely coloured corpuscles. over an aneurism, when the arterial tube is dilated, and when The most important vital property of capillaries is, as already Vital pressure is applied to a large vessel. The placental souffle or bruit mentioned, contractility, by which their calibre may be modified. proper- heard during pregnancy is a sound of this kind, arising from pressure | The protoplasm forming their walls contracts when stimulated. ties of on the widely dilated uterine arteries. In cases of insufficient aortic | Some investigators have supposed the nuclei to be aetive agents in capil- valves a double blowing murmur may be heard, the first being | contraction ; but more probably the cell substance is the seat of larics. due to the rush of blood into the vessel caused by the ventricular change. Oxygen causes the nuclei to swell, whilst carbonic acid contraction, and the second by the flowing back of the blood into | has the opposite effect. Roy and Graham Brown attach mueh im- the heart during diastole. Comp. p. 106 below. portance to the active contractility of the capillaries as regulating

Japillary Capillary Circulation.—The circulation in the capillaries may be | the distribution of blood, now contracting, now relaxing, according

‘irewla- readily studied by placing under the microscope any transparent ion, membrane containing vessels, such as the web of a frog’s foot, the mesentery, lung, or tongue of a frog, the tail of a fish or a tadpole, the wing of a bat, the third eyelid of the pigeon or fowl, the liver of a frog or a newt, the mucous membrane of the inner surface of the human lip, or the conjunctiva of the eyeballs and eyelids. Under

to the needs of the tissues in their vicinity. Elasticity is also a characteristic of the capillary walls.

The arrangement of the capillaries in an organ or tissue is adapted Arrange- to its functional activity. Where there is great functional activity ment of there is a rich plexus of capillaries, and in the converse case the capil- converse is also true. Contrast, for example, the capillary supply laries.

favourable conditions the following phenomena may clearly be noticed. (1) The diameter of the finest capillaries is such as to per- mit the passage of corpuscles in single file only, and it may vary from 3000 10 ¢x,455 Of aninch. (2) The average length is about 2; of an mech. (3) The number varies according to the degree of activity of the tissue, being numerous where nutritive processes are active, as in the liver and muscles. (4) They form networks or anastomoses, the form and arrangement of which are determined by the tissue elements. (5) In the smaller arterioles and venules, and in the capillaries, the current is continuous and there is no pulse. Owing to the elasticity of the larger vessels the intermittent movement of the blood caused by each ventricular contraction is in the capillaries transformed into a continuous flow. (6) In some of the larger vessels the current is more rapid than in others of equal calibre: that is to say, it is more rapid in small arteries than in small veins. (7) The current appears to have a uniform velocity in all ultimate capillaries ofthe same size. (8) Sometimes a slight acceleration of the rapidity, even in the smallest vessels, may be observed to follow each cardiac beat. (9) In a vessel larger than an ultimate capillary, so large as to permit the passage of several coloured corpuscles abreast, these may be seen travelling with

great apparent velocity in the centre of the stream, whilst the colourless corpuscles move more slowly and with a rolling motion next the walls of the tube, in a layer of plasma talled Poiseuille's space. The coloured corpuscles also remain sepa- Yate from each other, and do not exhibit any tendency to adhere together or stick to the walls of the vessels, whereas the colourless corpuscles do both, more especially after the membrane has been ot for some time to the air, so as to excite the early stages of Intammation. Prof. D. J. Hamilton has shown that the nearer a Suspended body approaches the specific gravity of the liquid in which it is immersed the more it tends to keep in the centre of the stream, and he states that the reason why the coloured corpuscles keep the centre and the colourless the sides of the stream is that the specific gravity of the former is the same or slightly greater than the blood plasm, whilst that of the colourless corpuscles is less. (10) If the calibre of an ultimate capillary be marked at the beginning of an observation, and again some time afterwards, it will frequently be noticed that it has become narrower or wider, indicating that contractility is one of the properties of capillaries. (11) The velocity 18 greater in the pulmonary than in the systemic capillaries. (12)

he phenomenon known as diapedesis, or migration of the white blood corpuscles, first described by Waller in 1846, is readily seen m the mesentery of the frog after inflammation has been excited

in cartilage with that of muscle, or that of the grey matter of the nerve centres with that of the white matter (see Paysiouocy, vol. xix. p. 23 sqg.). But, in addition, the distribution of capillaries always corresponds to the intimate structural arrangements of the tissue or organ. So precisely is this the case that a good histologist is able to identify the organ from an injected preparation showing the vessels, although none of the ultimate histological elements of the organ or tissue are to be seen. In muscle, for example, the capillaries exist in the form of elongated meshes; in connective: tissue, such as is found beneath the skin, in an irregular network ; in the papille of the skin, in loops; and to form the glomeruli of the kidney in close reticulations (see NuTRITION, vol. xvii. p. 673, fig. 5).

The movement in the capillaries is due to the force of the heart, Attract- Some have supposed that ive in- it is supplemented by an attractive influence exerted by the tissues fluence (vis a fronte) ; and the statement is supported by the observation oftissues,

as modified by the vessels (vis a tergo).

that, when there is an increased demand for blood owing to active nutritional changes, there is an increase in the amount of blood flowing to the part, such as occurs, for example, in the mammary gland during lactation, and in the growth of the stag's horn. Sueh an attractive influence on the part of the tissues is quite conceivable as a force assisting in the inward flow of blood, acting along with capillarity ; but its amount is infinitesimally small in comparison with the force exerted by the heart. The force of the heart is sufficient to drive the blood through the capillaries into the veins.

When capillaries are examined in a transparent membrane of a Capillary Owing to the pulse,

living animal no pulse-like movement is visible. elasticity of the vessels the pulse-wave has been almost, if not quite, extinguished, and what might have remained of it is destroyed by the great resistance offered by the numerous capillaries. |: If these and the arterioles be widely dilated, a pulse may appear in the veins, as occurs when the vaso-dilator fibres of the chorda tym- pani nerve are stimulated, causing a pulse-like movement in the veins of the sub-maxillary gland (see PuystoLoey, vol. xix. p. 30). By increasing the extra-vascular pressure pulsations may occur in the capillaries (Roy and Graham Brown). 'The well-known throb- bing in the finger when eonstricted by an india-rubber band and the throbbing of inflammatory swellings are examples of pulsation in capillaries.

Venous Circulation.—The walls of the veins are thinner, less Venous They circula-

contain both elastic and contractile tissue, though to a smaller ex- tion.

elastic, and more distensible than the walls of the arteries.

XXIV. — 14

Oeea- sional pulse in veins.

Venous sounds.

Prime factors influen- cing cir- culation,

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tent than the arteries. Numerous anastomoses exist between veins and even between superficial and deep veins, so that if the flow of blood be obstructed in one direction it readily finds a passage in another. he circulation in the veins depends (1) on inequality of blood-pressure, the pressure being much less in the veins than in the arteries ; (2) on muscular action compressing the veins, and thus, in eonsequence of the valves found in many veins opening towards the heart, forcing on the blood in the direction of that organ ; (8) on the movements of respiration, —inspiration, as already seen, favouring the flow of blood in the great veins towards the heart ; and (4) on the suction-like action of the right auricle, and in the case of the lungs that of the left auricle, drawing the blood towards the heart. During venesection, muscular action increases the flow of blood from the divided vein; hence the use of the barber's pole, which was grasped by the patient during bleeding by the barber-surgeon of old. The flow of blood in veins is continu- ous, or nearly so; when, therefore, a vein is cut, it does not spurt" as an artery does, but it " wells out " in a stream.

There is normally no pulse in veins ; but sometimes a pulse may be observed in the veins of the neck, isochronous with the auricular systole, when there is an obstruction to the passage of blood from the right auricle into the right ventricle. Pulse-tracings (fig. 21) taken in these circumstances are very similar to those of the eardiae impulse. In this tracing the part a represents the right auricular contraction. During the systole of the right ventricle the tricuspid valve closes, and, if it be insufficient,—that is, if it does not close properly,—a positive wave is transmitted along the superior vena cava to the jugular (dc in the pulse-tracing). The closure of the pulmonary is indicated at e. During the

diastole of the right auricle and ventricle the blood flows to the heart and the curve descends, f. It has also been pointed out by Fricdreich that a pulse in the jugular vein does not necessarily mean insufficiency of the tri- cuspid valve but a weakened condition of the valve in the jugular vein itself, as the pulse will not be propagated into the jugular, even in cases of insuffi- ciency of the tricuspid valve, if the jugular valve be perfect. If there is great obstruction at the mitral orifice, a venous pulse may also be observed, which }, is associated with engorgement of the right auricle. || Sometimes a pulse in the veins occurs when there is . such rigidity from atheroma in the walls of the great Fic. 21.—Trac- vessels as to destroy the elastic influence of these ing of venous parts, and at the same time such a degree of dilata- eee ea pe tion of the arterioles and capillaries as to admit of the tricuspid the onward propulsion of the movement caused by valve. (Fried- the heart's contraction. Lastly, a pulse may occur Teh) when the blood-pressure rises and falls suddenly, as in insufficiency of the aortic valves, and when the arterioles are much dilated. Towards the close of life, when the heart is feeble and effusion may be taking place into the pericardium, a venous pulse may be observed.

If a stethoscope be placed at the root of the neck above the collar bones, and on the right side in particular, a whistling, rushing, or blowing sound will be heard. 'This is the bruit de diable, familiar to physicians. If heard without pressure being made by the stetho- scope it is abnormal, as it occurs in eonditions of anemia from almost any cause; but it may be heard in a healthy person when pressure is applied and when the head is turned to the opposite side. It is held to be due to the vibration of the blood in rushing from the contracted portion of the common jugular vein into the more dilated part of this vessel. During the auricular diastole and during inspiration it is more marked, as the blood then flows more rapidly in the veins towards the heart.

Phenomena of General Circulation.

Having described the structure and functions of the organs con- cerned in the circulation,—namely, heart, arteries, eapillaries, and veins,—we are ina position to consider the phenomena of the circula- tion asa whole. Consider the organs of the circulation as a closed system of tubes, over-

filled with blood ; when the tubes are in a state of rest, it is evident that, if the blood be uniformly diffused and under the same pressure, it will remain motionless and 1n equilibrium. When the pressure is changed at any point, as occurs when the left ventricle contracts and throws blood into the arterial system the blood will move from the part where the pressure is higher to where it is lower; in other words, there will be circulation as a consequence of the difference of pressure. When the heart stops beating, the blood continues to flow more and more slowly until the difference of pressure is equalized, and then there is no circulation. Each stroke of the heart throws as much blood into the arteries as flows into the heart from the veins; the orifices of the veins at the heart are more distensible than the beginnings of the arteries, and consequently the arterial pressure rises more rapidly than the venous pressure diminishes, and thus the beating of the heart raises the mean pressure throughout the arterial system. The circulation is therefore influenced by two factors,—(1) the

heart, as regards number, strength, and volume of beats; and (2) the amount of resistance in the arterioles. Modifications of these influences are the pressure and the velocity of the blood.

As the blood is cireulating through the vessels under

sion, the existence of which is shown by the jet of blood whieh spurts in

out on the puncture of an artery, and the amount of which is indi-vegsely,

cated by the height to which the jet is propelled. An instrument for measuring this pressure, termed a kymograph, has been devised by Ludwig. But this apparatus, owing to the inertia of the mass of mercury, —the medium used,—can only register mean_blood- pressure, and the more delicate variations escape notice. Fiek in 1864 attempted to register these smaller fluctuations by means of a curved spring-kymograph, consisting of a hollow spring, which is made to oscillate by variations of pressure communicated to the interior. Small portions of a tracing taken

with the mercurial manometric kymograph of Ludwig are shown in fig. 22. From this

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Fic. 22.—Mercurial kymographic tracing from carotid of dog, showing form of curve ona large scale. The figures on the left represent mm. of mercury. (Marey.)

it will be observed that there is (1) an increase and diminution of

blood-pressure with each eardiac beat, as is shown in the smaller

curves, and (2) an increase and diminution produced by respiratory movements, the increase occurring chicfly during inspiration and the decrease chiefly during expiration, as is indicated by the larger waves. It is evident also that all the smaller curves have the same general character, and that they reveal nothing as to varia- tion in pressure during individual beats. To show such variations,

Fick's kymograph must be used, when a tracing will be obtained

in which slight oscillations of pressure in the down-stroke of each

separate beat may be observed. By employing the different forms of kymograph the following conclusions have been arrived at.

(a) Arterial Presswre.—(1) The pressure diminishes from the heart Arterial to the capillaries. (2) It attains its maximum in the ventricle at pressure.

the moment of systole, and its minimum in the auricle at the moment of diastole, at which time also the pressure in the auricles and in the great veins may be negative, that is, below atmospheric pressure. (8) The mean blood-pressure in the large arteries of large mammals and of man is equal to that of a mercurial column 5°5 to 6°38 inches in height. (4) The blood-pressure in various animals has been ascertained to be as follows, the results being expressed in terms of a column of mercury of the

indicated number of inches in height. Carotid of horse, 6°34; carotid of dog, 5°89 (Poiseuille). Carotid of horse, 4°8 to 8°42; carotid of dog, 5°89 ; carotid of goat, 4°64 to 5°31; carotid of rabbit, 3°54; carotid of fowl, 3°46 to 6°73; aorta of frog, '86 to 1°14 ; gill artery of pike, 1°38 to 3°3 (Volkmann). Carotid of dog, 512 to 7°48 (Ludwig). Carotid of calf, 6°97; carotid of sheep, 6°65; carotid of goose, 6°38 ; carotid of stork, 6°34; brachial artery of pigeon, 6°57 ; carotid of cat, 5°9; brachial artery of man during operation, 4°33 to 4°72 (Faivre). Anterior tibial artery of boy, 3°93 to 6°83 (E. Albert). It no doubt varies even in animals of the same species. (5) The arterial pressure at any given point undergoes periodic variations, inereasing at the instant of ventricular systole and diminishing during diastole; they are most marked in the arteries near the heart. (6) These periodic variations may be observed in the intermittent spurting of an artery when it is punctured. (7) It is necessary to distinguish between the mean arterial pressure at any point of an artery and the mean pressure of the blood in the whole arterial system, which can only be obtained by taking the mean of the pressures in many different arteries at various distances from the heart. (8) The mean arterial pressure depends directly on the quantity of blood in the arterial system, and consequently on the total calibre of the system, so that any diminution of calibre, produced mechanically or by nervous influences, will increase the mean arterial pressure. (9) The mean arterial pressure increases with the energy of the beats of the heart. (10) The blood-pressure becomes greater with increased and acceler- ated action of the heart, sometimes with plethora, and after an increase in the amount of blood, such as occurs after a full meal or after transfusion of blood, whilst it becomes smaller during dimin- ished or enfeebled action of the heart, in anemia, and after heemor- rhage or excretions from the blood by the skin, kidneys, or bowels

/(Landois). (11) The pressure is affected by the degree of contrac-

tion or of dilatation of the blood-vessels, according as they are influenced by the nervous system. (12) The pressure is increased in cases of sclerosis or hardening of the arterial walls, in lead poisoning, after injection of ergotin (which contracts the small arterioles) or of digitalis (which acts on the heart), where there is granular or contracted kidney, and in cardiac

hypertrophy with dilatation. And (13) the pressure is diminished in fever, in chlorotic anemia, in phthisis, and by severe hemorrhage.

the influ- Blood- | ence of the action of the heart, it exerts a certain pressure or ten- pressure

Venous

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Capillary pressure. has not been directly measured.

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(0) Venous Pressure.—(1) In the veins ncar the heart the pressure

pressure, is only one twentieth to one-tenth of that of the corresponding

*arteries. (2) During auricular diastole the pressure in the veins near the heart may become negative (= —°0039 inch of mercury). (3) There are no periodic variations of pressure in the veins as in the arteries, except in the great venous trunks in the neck and near the heart, where there is a diminution of pressure during auricular diastole and an increase during auricular systole. (4) Great activity of the heart diminishes venous, while 1t increases arterial pressure. (5) The pressure increases in the veins according to their distance from the heart: thus, in the external facial vein of the sheep it is equal to a column of mercury '12 inch in height ; in the trachial to a column '16 inch high; in branches of the trachial, °35 inch; in the crural vein, *45 (H. Jacobson). (6)*

. Plethora increases venous pressure, whilst anemia diminishes it.

(7) Inspiration causes in the great veins near the heart an increase in pressure, whilst expiration diminishes it; but the respiratory movements 'do not affect the venous stream in peripheral veins" (Stirling). (7) Changes in the position of the limbs affect venous pressure hydrostatically : thus, elevation of the extremities favours the flow of blood towards the heart ; but, if the heart hangs down- wards, the face becomes turgid, as the outflow by the veins is retarded. (8) Gravity favours the emptying of descending and hinders the emptying of ascending veins, so that the pressure be- comes less in the former and greater in the latter. (9) As already stated, muscular movement by compressing the veins, aided by the mechanism of the valves, favours the flow of blood towards the heart, and thus increases the pressure in these vessels.

(c) Capillary Presswre.—For obvious reasons capillary pressure Von Kries has measured the amount of pressure necessary to occlude the capillarics in an area abounding in these vessels, such as the skin at the root of the nail on the terminal phalanx or on the ear in man, and on the mucous membrane of the gum in rabbits. He found the pressure in the capillaries of the hand, when the hand is raised, to be equal to '95 inch of mercury, when it hangs down, 2°13, in the ear "79, and in the gum 1:26. Roy and Graham Brown also measured the pressure necessary to close the capillaries in the web of the frog's foot, in the tongue and mesentery of the frog, and in the tail of newts and small fishes. It is evident that any condition favouring the afflux of blood to a capillary area will increase the pressure in the capil- laries, such as the dilatation of the small arterioles conveying blood to an area of capillaries, contraction of the venules carrying off the blood from it, or any increase of pressure in the arterioles or in the venules. The arrangement and position of the capil- lary network must affect the pressure : the pressure in the capillaries of the glomeruli of the kidney must, for in- stance, be greater than in those of the skin, as in the former position there is increased resistance owing to the

*double set of capillaries (see Nurnri- Seas ee ce TION, vol. xvii. p. 684). Finally, any *19- 29.—Viagram 8 ig 4 change in the es of Petra iba of pare a ancuae ey e er the wall of 'the capillary itself will laries; 4; veins;*

5, auricle; A to affect the pressure. C, line of presure in great. arter- _ The general facts regarding pressure {f° in" a seas ee in arteries, capillaries, and veins are veins. The dotted lines indicate eed by fig, 23, eyes desing beeper ae

arious attempts have been made 0 (4) ane Clasto'e (ah). oe

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by Volkmann, Vierordt, Ludwig and formasfaras theaurcle B, where Dogiel, Hering, and Chauveau and it is negative during auricular Lortet to measure the velocity of the diastole. (Beaunis.) circulation, and special instruments have been invented for that purpose, In 1850 Volkmann constructed the hemadromometer ; this was followed by the hematachometer of Vierordt in 1858 and by the hamadromograph of Chauveau and Lortet in 1867. These instruments are not now much used, having been superseded by the stromuhr (current-clock) or rheometer of Ludwig and Dogiel, which was invented in 1867. This instrument measures the amount of blood which passes through an artery in a given time. It con- sists of two glass bulbs of equal capacity communicating by a tube. One of the bulbs is filled with oil, which is expelled by the blood into the second (empty) bulb. The instrument is then reversed on its socket so that the bulb containing the blood is farthest from the heart, and the former process is repeated. From the time occupied in filling and refilling the velocity of the blood in the artery of supply can be calculated.

he following figures give, in inches per second, the velocities of the blood in different vessels. Carotid of dog, 8°07 to 14:06 ; Carotid of horse, 12°05; maxillary of horse, 9°13; metatarsal of horse, 2:2 (Volkmann). Mean velocity in carotid of dog, 10°28 ; Im carotid of dog at end of diastole, 8°46; at end of systole, 11°69 ;

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in crural artery of dog at end of diastole, 5°51; at end of systole, 9°41 (Vierordt). During systole in carotid of horse, 9°84; at time of dicrotic wave, 8°66; at end of diastole, 5°9 (Chauveau, Bertolus, Laroyenne). In carotid of rabbits, from 3°7 to 8-9; in carotid of dog, weighing 51-2 tb,

poisoned with morphia, from 13°74 to 28°86 ; in carotid of another dog, weighing 26°69 Ib, from 9°57 to 20°47; in carotid of dog, weighing 7°85 tb, in which the sympathetic nerve had been cut, from 8°03 to 18°35; and in carotid of another dog, weighing 6°97 Ib, poisoned with morphia, from 13°35 to 18-03 (Dogiel). The velocity in the capillaries cannot be directly mea- sured. E. H. Weber gives it at 032 inch per second in capillarics of mammals and °021 in those of the frog. Vierordt gives the velocity in man as '024 to '035 inch per second. Volkmann states that the flow of blood in mammalian capillaries is five hundred times slower than in the aorta. Donders asserts that the velocity of the current in the smaller arterioles is ten times faster than in the capillaries. When the current reaches the veins it is accelcrated in consequence of diminished resistance, but even in the larger venous trunks it is '5 to '75 times less than in the corresponding arteries. The following general conclusions may be drawn. (1) The velocity of the blood is in inverse ratio to the total calibre of the vessels: rapid in the aorta, it diminishes as we recede from it. (2) Each systole is followed by an increase in the velocity of the blood in the larger vessels. (3) In the smaller arteries, capillaries, and smaller veins the velocity is uniform and constant. (4) The velocity increases in the venous system as we approach the heart. (5) In the large arteries the movements of inspiration retard the velocity, whilst those of expiration increase it. (6) In the large veins the movement of respiration, and also the suction action of the auricle during diastole, cause a rhythmic increase and diminution of the velocity. The explanation of these variations in velocity is obvious. As the arteries pass outwards they give off branches, the united calibre of which is, with rare exceptions, greater than that of the parent vessel. Thus, as Kiiss expresses it, the arterial system may be regarded as a cone, the base of which ends in the capillaries, whilst the summit is at the aorta ; and the venous system is a second cone, the base being also at the capillaries and the apex at the right auricle, Vierordt states that the sectional area of the capillaries is to that of the aorta as 800 to 1; but, as the sectional area of the venous orifices at the heart is greater than that of the arterial orifices, the ratio of the sectional area of the capillaries to that of the veins at the heart has been stated as 400 tol. The increased sectional area retards the velocity, and the velocity of the blood-current in sections of the vessels at various points is inversely as their calibre. The velocity of the blood does not depend on the mean blood-

pressure, and, as was pointed out by Ludwig and Dogiel, the velocity in any section of a vessel depends on (1) the vis a tergo (i.e., action of the heart) and (2) the amount of resistance at the periphery.

It is important to distinguish between the rapidity of the blood Duration current and the time oceupied by a blood corpuscle in re a of circu- eft lation.

complete circuit through the heart and vessels, say, from the ventricle to the left ventricle again. Attempts have been made to measure the time, starting from the jugular vein. Hering injected into that vein a few drops of a 2 per cent. solution of ferro-cyanide of potassium, and then examined the blood of the opposite jngnlar every five seconds by testing with perchloride of iron,—the forma- tion of Prussian blue indicating the moment when the ferro-cyanide made its appearance in the blood of the jugular after having made a tour of the circulation. Vierordt modified the method by ex- amining the blood received from the jugular each half second. The duration of the circulation as thus determined for various animals is as follows,—horse, 31°5 seconds ; dog, 167; rabbit, 7°79 ; hedge- hog, 7°61; cat, 6°69; goose, 10°86; duck, 10°64; buzzard, 6°73 ; and common fowl, 5°17 seconds. Vierordt also made the discovery that in most animals the duration of the circulation is equal to the time in which the heart makes about twenty-seven beats. These facts are illustrated in the following table :—

7 Tat Pulse Beats | Number of Pulsations Animal. Weight of body, per Minute. | in the Circulation. 7°83 02, 320 23°7 46°28 ,, 240 26°8 82°13 ,, 189 23°8 50°59 ,, 220 28°5 20:28 tb 96 26°77 83°78 ,, 55 28°8 46°98 oz. 854 30°5 24-44 ,, 282 81°6 46-7 168 | 28°9 99°54 4, wt | 26°0 |

It may also be shown by another method that a volume of blood equal to that in the whole body passes through the heart in about thirty pulsations. Taking the quantity of blood in the body as pea Mrs of the total weight, a man weighing 140 Ib contains 112 tb, or 5292 grammes, of blood, which represent in capacity 5802 cubic centimetres. Each beat of the heart throws 172 cubic centi- metres into the aorta ; therefore the equivalent of the total quantity

Volume of organs.

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of blood in the body passes through the heart in about 30 pulsa- tions. Taking the pulse beat at 72 per minute, it follows that the duration of the circulation is about 26 seconds. ; It has been satisfactorily proved by Mosso, Von Basch, Dogiel, and Francois Franck that there is a slight change in the volume of any distensible organ with each beat of the heart. Mosso devised the plethysmograph,! an instrument by which the following results have been obtained. (1) The volume of an organ is not fixed, but varies according to the amount of blood contained in it. (2) Its volume changes with each cardiac pulsation, increasing when blood is forced into it and diminishing by the emptying of the capillaries

VYVABCULAR OYSTARM

mercurial column of 1°17 inches, in the cat to one of °69 inch, and in the rabbit °47 inch, or about three times less in the dog, four times less in the rabbit, and five times less in the cat than- the pressure in the aorta. Hering passed simultaneously a tube through the muscular walls of each ventricle of a calf, and the blood rose in the tube in the right ventricle 21 inches and in the left 33-4 inches (quoted by Landois and Stirling). Fick and Badoud found a pres- sure of 3°54 in the pulmonary artery of the dog, whilst the carotid pressure at the same time was 4°17 inches. The ratio of pulmonary to aortic pressure has been stated as 1 to 3 (Beutner and Marey) and as 2 to 5 (Goltz and Gaule).

into the veins. (3) Variations in the volume of one or more organs, say, by compression, or by the application of cold, or by the internal administration of substances which affect the calibre of blood- vessels, such as ergot, cause corresponding variations in the volume of other organs. (4) The pulsatile variations are very similar to the pulse-curve, and there are respiratory undulations correspond- ing to similar variations in blood-pressure tracings. (5) Movements

Next, it is important to note the peculiar physical conditions in Influenc| the chest during respiration. ‘As already shown (p. 102), the lungsofre- |

— are distended in consequence of the positive pressure on their inner spiratio:) | surfaces being greater than the negative pressure on their outer in pul- pleural surfaces. But when the lungs are distended by a full in- monary spiration they exert an elastic force (termed elastic recoil or "' elastic circula- traction') amounting to about 1°18 inches of mercury. Outside the tion,

of the limb cause diminution in volume, as was shown by Glisson in 1677, in consequence of acceleration of the venous current. (6) Mental exercise and sleep cause a diminution in the volume of the limb (Mosso). (7) So delicately attuned is the organism that music has been observed to cause a rise and fall in the tracings (Dogiel).

lungs, in the cavity of the chest, the surface of the heart and vessels is subjected to a pressure which is the difference between atmo- spheric pressure (29°92 inches) and the "elastic traction" (1°18 inches) or 28°74 inches. It is clear that the more the lungs are distended the greater is the elastic traction, and consequently the

Distribu- The blood is distributed throughout the body in varying propor- | less the pressure on the outer surface of the vessels. The thin- tion of tions, according to the requirement of any set of organs at a par- | walled pulmonary veins yield more during a deep inspiration, thus blood. ticular time. When any tissue or organ is active, there is a deter- | diminishing pressure, than the thicker-walled pulmonary artery,

mination of blood towards it, the amount being increased from 30 to 50 per cent.: thus, during digestion the mucous membrane of the stomach and intestinal organs is richly supplied with blood. Increased muscular velocity is always accompanied by increased vascularity ; but, whilst this is the rule, there are organs, such as the heart, the muscles of respiration, and nervous centres like those in the medulla oblongata, in which there is a condition of continuous activity, and in which there is a uniform vascularity. Seeing that the activity of certain organs varies at different times, it follows that, whilst some organs are congested, others are at rest. In the child there appears to be a different distribution of blood from what obtains in the adult. The heart of a child is relatively small up to puberty, while the vessels are relatively large; after puberty the reverse is the case.

Arterial pressure is less in the child than in the adult, whilst the pressure in the pulmonary circulation is larger in the child than in the adult (Beneke). Attempts have been made to estimate the distribution of blood after death. Ranke states that one-fourth of the total blood is in the muscles, one-fourth in the liver, one-fourth in the heart and vessels, and the remaining fourth in the rest of the organs.

Special Forms of Circulation.

whereby the flow of blood from the capillaries of the lung by the pulmonary veins to the left auricle is favoured. On the other hand, expiration by increasing the pressure tends to retard the flow of blood. Further, the velocity of the stream of blood is accelerated in the pulmonary vessels by inspiration and retarded by expiration. As regards the influence of the movements of the lung on the calibre of the pulmonary capillaries and smaller vessels, experi- ment has shown that the blood-vessels of the lungs containing air and distended are wider than those of collapsed lungs. Suppose an elastic bag having minute tubes in its walls to be dilated in a free space, the lumen of these tubes will be diminished ; but, if it be placed in a closed space, as in a wide glass bottle, and if the pres- sure on its outer surface be diminished by removing air from the space between the bag and the side of the bottle, the bag will dis- tend and the lumen of the tubes will be increased. Thus it is evident that inspiration, by increasing the calibre of the pulmonary vessels, draws blood towards the lungs, and the movements of the lungs become an effective force in carrying on the pulmonary circu- lation. The velocity of the blood is greater in the pulmonary than in the systemic capillaries, and greater in the pulmonary veins than in the pulmonary arteries. The great degree of distensi- bility of the pulmonary vessels allows of frequent adjustments

Cranial. The cranial circulation has been already described under PHysIo- | peing made, so that, within limits, as much blood in a given time Loey, vol. xix. pp. 42-48. : se will pass through the pulmonar 'as through the systemic circula- Hepatic. The peculiarity of the portal circulation is that the blood passes | tion," This adjustment, a may be Sidhe t Aurind. For

Pulmon- ary.

through two sets of capillaries. Arterial blood is conveyed to the stomach, spleen, pancreas, and intestines by branches of the abdo- minal aorta. These branches divide and subdivide, terminating in a capillary plexus in the various organs above enumerated. From this plexus the radicles of the various veins spring, and they unite with each other into larger and larger trunks, until by the conflu- ence of the mesenteric veins with the splenic vein the portal vein is formed. The portal vein conveys the blood to the liver, where it divides into smaller and smaller branches constituting a plexus in the lobules of the liver. From this plexus spring the roots of the hepatic vein, which conveys the blood from the liver to the inferior vena cava (see NUTRITION, vol. xvii. p. 678). There are thus in the portal circulation two sets of capillaries,—one in the abdominal viscera and the other in the liver. Ligature of the portal vein causes distension of all the abdominal vessels and a highly congested state of the abdominal viscera, whilst the blood- pressure quickly falls, and the animal dies. So distensible are the abdominal vessels that they can contain nearly all the blood in the body. Blood from such congested vessels has toxic properties (Schiff and Lautenbach). The ventricular systole may send a pulse down 'the valveless inferior vena cava and cause a pulse in the liver. The liver swells with each systole and relaxes with each diastole of the heart.

The pulmonary artery, carrying venous blood, divides and sub- divides, and the smallest branches end in a plexus of capillarics on the walls of the air-cells of the lung. From this plexus the radicles of the pulmonary veins originate ; and finally the four portal veins, two from each lung, carry the arterialized blood to the left auricle. Considering the apparently small extent of the pulmonary as com- pared with the systemic circulation, and the fact that the two ventricles, of about equal capacity, empty themselves simultane- ously, it is clear that the pulmonary circulation presents many points of interest. In the first place, the pressure in the pulmon- ary artery is considerably less than that of the aorta. In 1850 it was determined by Ludwig and Beutner to be in the dog equal to a.

1 Figured in M'Kendrick's Physiology, p. 365, fig. 99.

example, violent muscular exertion hurries the blood along the veins to the right side of the heart, and by the right ventricle the blood is discharged into the pulmonary circulation. If morc arrives than can be transmitted to the left auricle by the pulmonary veins in a given time, the pulmonary capillaries become engorged, breath- ing becomes quick and possibly irregular, the right side of the heart becomes engorged, signs of venous congestion appear in the

flushed face and turgid veins, and perhaps the pulmonary capillaries _

may rupture, causing hemorrhage from the lung. The weaker the muscular structure of the heart the more likely is this to occur. Hence the breathlessness in many cardiac affections, aggravated by muscular exertion, more especially in ascending a stair or hill.

In the mature feetus the fluid brought from the placenta by the Fetal.

umbilical vein is partly conveyed at once to the vena cava ascendens by means of the ductus venosus and partly flows through two trunks that unite with the portal vein, returning the blood from the intes- tines into the substance of the liver, thence to be carried back to the vena cava by the hepatic vein. Having thus been transmitted through the placenta and the liver, the blood that enters the vena cava is purely arterial in character ; but, being mixed in the vessels with the venous blood returned from the trunk and lower extremities, it loses this character in some degree by the time that it reaches the heart. In the right auricle, which it then enters, it would also be mixed with the venous blood brought down from the head and upper extremities by the descending vena cava were it not that a provision exists to impede (if it does not entirely prevent) any further admixture. This consists in the arrangement of the Eusta- chian valve, which directs the arterial current (that flows upwards through the ascending vena cava) into the left side of the heart, through the foramen ovale,—an opening in the septum between the auricles,—whilst it directs the venous current (that is being returned by the superior vena cava) into the right ventricle. When the ventricles contract, the arterial blood contained in the left is pro- pelled into the ascending aorta, and supplies the branches that proceed to the head and upper extremities before it

undergoes any further admixture, whilst the venous blood contained in the right

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yentricle is forced into the pulmonary artery, and thence through the ductus arteriosus—branching off from the pulmonary artery before it passes to the two lungs—into the deseending aorta, mingling with the arterial currents which that vessel previously conveyed, and thus supplying the trunk and lower extremities with a mixed fluid. A portion of this is eonveyed by the umbilieal arteries to the placenta, in whieh it undergoes the renovating influence of the maternal blood, and from whieh it is returned in a state of purity. In consequence of this arrangement the head and upper extremities are supplied with pure blood returning from the placenta, whilst the rest of the body receives blood whieh is partly venous. This is probably the explanation of the fact that the head and upper extremities are most developed, and from their weight oecupy the inferior position in the uterus. At birth the eourse of the eireula- tion undergoes ehanges. As soon as the lungs are distended by the first inspiration, a portion of the blood of the pulmonary artery is diverted into them and undergoes aeration ; and, as this portion increases with the full activity of the lungs, the ductus arteriosus gradually shrinks, and its eavity finally beeomes obliterated. At the same time the foramen ovale is elosed by a valvular fold, and thus the direet communieation between the two aurieles is cut off. When these changes have been aceomplished, the eireulation, which was before earried on upon the plan

of that of the higher reptiles, becomes that of the eomplete warm-blooded animal, all the blood which has been returned in a venous state to the right side of the heart being transmitted through the lungs before it ean reach the left side or be propelled from its arterial trunks (Allen Thomson). After birth the umbilical arteries shrink and close up and beeome the lateral ligaments of the bladder, while their upper parts remain as the superior vesical arteries. The umbilical vein becomes the ligamentum teres. The duetus venosus also shrinks and finally is closed. 'The foramen ovale is also closed, and the ductus arteriosus shrivels and becomes the ligamentum arteriosum.

The Innervation of Blood- Vessels.

This has already been described under PuysioLoey (vol. xix. . 30); but there are several points of interest that ean only be thoroughly understood after studying the general eonditions affect- ing, and the mode of measuring, the pressure of the blood. Stimu- lation of the pneumogastrie nerve in the neek slows the rate of the heart-beat, and, if the stimulation be strong, arrests the heart in a state of diastole. Suppose a kymograpli to be eonnected with the carotid in the neek of a rabbit deeply under the influence of chloral so as to be quite unconscious of pain ; if then one of the vagi in the neek be stimulated, the blood-pressure curve at once falls ; and on removing the stimulation it rises to its former height by a few leaps and bounds. Whilst this occurs in the arteries, the venous pressure rises in consequenee of the flow of blood into them from the arteries. But the pressure may be influeneed by another method. As was pointed out by Ludwig and Owsjannikow, a centre exists in the medulla oblongata (vaso-motor eentre) whence influences emanate that tend to keep the vessels in a more or less contracted condition. If this centre be injured, the smaller blood- vessels throughout the body dilate,—in short, they are paralysed,—and receive more blood, and consequently the pressure in the larger vessels at once falls. This vaso-motor centre in turn can be influ- enced by impressions reaching it from the periphery. This was clearly proved by Cyon in 1866, when he discovered the function of the depressor nerve, a small nerve (the superior cardiac) originat- ing in the rabbit from the superior laryngeal and from the pneumo- gastric nerve, but in many animals blended with the pneumogastric nerve. Stimulation of the distal

end of this nerve produces no effeet; but stimulation of the cephalic end eauses a great fall of blood pressure and a diminution in the frequeney of the pulse (see Puysiotocy, vol. xix. p. 29 and fig. 11). Similar depressor filaments exist in the trunk of the vagus below the origin of the Superior eardiac nerve (depressor of Cyon), in the nerves coming from the lungs, in the great auricular nerve, in the tibial, and in all probability in all sensory nerves. Further, it may be influenced by nerve fibres the stimulation of which excites the eentre, causing arise in pressure (pressor nerves). Such filaments have been experi- mentally demonstrated to exist in the superior and inferior laryngeal herves, in the trigeminus, and in the cervieal sympathetie. The vaso- motor centre is therefore under the influence of two antagonistie sets of impulses,—one stimulating it, eausing constriction of the smaller vessels and a rise of arterial pressure, the other inhibiting it, eausing dilatation of the smaller vessels together with a fall of pressure.

But this is not all, On cxamining a blood-pressure tracing it is

-xion of seen that the arterial pressure is influenced by the movements of

Tespiration, the larger waves corresponding to these movements. To aseertain precisely how much of the wave corresponds to inspira- tion and how much to expiration, suppose a blood pressure taken from the carotid artery, whilst at the same time arrangements are made for rceording simultaneously the variations of intra-thoracic pressure. It is then easily seen that, when expiration begins and the expiratory pressure rises the blood pressure rises, while when Mspiration begius both fall. Inspiration removes pressure from the

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outer surface of the vessels and thus allows the walls both of the great veins and of the aorta to distend; but the thin-walled veins yield to a greater extent than the thiek-walled aorta. Consequently during inspiration the blood tends to accumulate in the great veins aud in the right side of the heart and less eseapes by the aorta, and the blood

pressure in the aorta falls. On the other hand, during expiration the blood pressure rises, owing to the opposite set of conditions. Roughly speaking therefore, during inspiration blood pressure falls, whilst during expiration it rises. But a eareful ex- amination of the eurves shows that they do not exaetly coincide as to their maxima and minima. Thus the blood pressure rises before the rise of expiratory pressure ; or, in other words, during the first part of inspiration there is a fall of pressure and during the seeond part a rise. This cannot be explaincd by the mechanical movements of the ehest wall, but is caused, partially at all events, by the action of the vaso-motor eentre. During the latter portion of the inspiratory period impulses pass from this eentre, causing eonstriction of the smaller vessels, and eonsequently the rise of arterial pressure observed during this time. Again, an examination of a blood-pressure tracing shows that during the fall of the respira- tory curve the smaller curves are larger and fewer in number than during the rise of the eurve. After section of the vagi this differenee disappears, and it can only therefore be explained by stating that during the first portion of the time of inspiration, and during the fall of arterial pressure, the cardio-inhibitory eentre also acts, slowing the beat of the heart. Another important fact showing that the respiratory undulations cannot be aceounted for by the mechanical movements of the chest wall is that they appear in a blood-pressure traeing taken during artificial respiration. When a canula is inserted into the trachea and air is forced into the chest by a bellows, it is evident that the mechanical conditions are not those of ordinary respiration. When air is forced in, inflating the lungs to eorrespond to inspiration, the intra-thoracic pressure is inereased instead of diminished as in ordinary respiration, and when the air is sucked out to correspond to expiration the intra-thoracie pressure is diminished instead of being inereased as in ordinary expiration; and still the respiratory eurves remain. If artificial respiration be suddenly stopped, the blood pressure quickly rises ; but this does not oeeur to nearly the same extent if the spinal cord be divided. In other words, the rise of blood pressure when arti- fieial respiration is arrested is due to stimulation of the vaso-motor centre in the medulla by the cireulation througli it of blood too highly venous owing to stoppage of the cireulation, as is proved by the fact that, if the influence of the vaso-motor centre be re- moved, the rise of blood pressure does not take place. Finally, if during artificial respiration both

vagi be eut so as to remove the influence of the eardio-inhibitory eentre, and respiration be stopped, the pressure will rise as already deseribed, and in a short time a series of undulations will appear in the blood-pressure tracing known as the Traube-Hering eurves,—a rising and falling of blood pressure not due to the action of the heart, as they eontinue even when a pump is substituted for that organ, nor to the movements of respiration, but to a " waxing and waning" of the activity of the vaso-motor centre itself, contracting and dilating the blood- vessels and thus influencing the peripheral resistance. To sum up, the circulation is affeeted by the nervous system—(1) by the inhibi- tory aetion of the vagi in restraining the aetivity of the heart ; (2) by the aeeelerating action of fibres in the sympathetic, stimulating the activity of the heart ; (3) by the aetion of the intrinsie eardiac ganglia affecting the heart directly ; (4) by the action of the vaso- motor eentre (vaso-eonstrietor nerves) in the medulla, tending to keep up a greater or less degree of constriction of the vessels; (5) by the action of vaso-dilator nerves inhibiting the vessels, allowing them to dilate in a manner similar to the cardio-inhibitory action of fibres in the vagi; (6) by the influence on the vaso-motor centre of impulses coming from the periphery,—pressor fibres stimulating it, depressor fibres inhibiting it; (7) by the diffusion of impulses in the medulla from the respiratory centres ; (8) by the interaction of the vaso-motor, respiratory, and eardio-inhibitory eentres in the medulla ; and (9) by rhythmic changes in the vaso-motor centre itself. See PuysioLocy, vol. xix. p. 28 sq.

Bibliography.—A copious list of works relating to the anatomy of the organs of the cireulation will be found in Quain's Anatomy, edited by Allen Thomson, E. A. Schafer, and George D. Thane, 9th ed., vol. ii. p. 916; and on the physiology of the eireulation in Beaunis's Physiologie Humaine, 2d ed., 1885, and in Landois and Stirling's Text-Book of Human Physiology, 2d ed., vol. i. p. 557. To this last able work, to A. Rollett's elaborate essay, " Physiologie der Blutbewegung," in Hermann's Handbuch der Physiologie, and to Prof. Michael Foster's Text-Book of Physiology, 4th ed., the author is specially indebted in the preparation of this article. As to the action of drugs and poisons on the eireulation, reference is made to Lauder Brunton's Yeat-Book of Pharmacology, &c., 2d ed., 1886. For a brief account of the historical development of our

knowledge of the cireulation, sce abstracts of lectures by the present writer, delivered before the Royal Institution, in British Medical Journal for 1883. (J. G. M.)

VASILKOFF, a district town of Russia, in the govern- ment of Kieff, is situated 22 miles by rail to the south-west of that city. Its 16,600 inhabitants support themselves chiefly by agriculture and the transport of merchandise ; there is also some manufacture of tobacco and soap.

Vasilkoff was founded in the 10th century, but laid waste during the Mongolian invasion. In 1320 it was taken by the Lithuanians, and later on by the Poles, under whom it remained until 1686, when it was annexed to Russia.

VASTO, a fortified town of Italy, in the province of Chieti, stands high on an olive-clad slope, about a inile from the Adriatic and 131 miles south-east from Ancona. Tt is still surrounded by its medizeval walls, and commands fine views extending to the Tremiti Islands and Monte Gargano, The cathedral, with a Gothic facade, has no special interest ; the municipal buildings contain a collec- tion of Roman antiquities and inscriptions. There are manufactures of earthenware, woollen cloth, and silk ; but the inhabitants are chiefly employed in the culture of the olive and in fishing. The population in 1881 was 9761 (commune 13,883).

Vasto, the Histontwm of the ancient geographers, was a flourish- ing municipal town uuder the Roman empire, as is shown by the numerous remains of theatres, baths, and other public edifices. It was, and still is, subject to severe earth tremors.

VATICAN COUNCIL. The Vatican Council is the first and only plenary council of the Latin Church held since the close of the Council of Trent in 1563. But it bears very slight resemblance to that assembly in the cir- cumstances of its origin, objects, and proceedings. The Council of Trent was all but forced upon the Papacy by the demands of the principal Catholic states of Europe, and by the religious and political necessities of the time. It was convened for the purposes of endeavouring to secure the

return of the Lutherans, Calvinists, and other revolted bodies to the Roman Church, and of applying stringent measures of reform to amend the numerous practical abuses and scandals which had mainly caused the revolt. And, while it failed conspicuously in the former of these objects, it did achieve a certain degree of success in the latter, by a variety of disciplinary enactments covering a large range of subjects, and was followed, in point of fact, by a marked improvement in clerical morals and diligence. The Vatican Council, contrariwise, originated with the Papacy alone, and was neither demanded nor desired by Roman Catholic Christendom. Its object was confined to securing the triumph of the hyper-Ultramontane school within the Roman obedience by establishing papal auto- cracy as divine and infallible; and it made no attempt whatever beyond a sterile discussion, not published in its Acts, to deal with any of the abuses and scandals which had either survived the Tridentine reforms or had sprung up since. While the Council of Trent did much to repair the damage done to the personal authority of the popes by the incidents of the " great schism " and the character of the pontifis who sat during the close of the 15th and the beginning of the 16th century, it left several questions concerning the source and extent of papal authority un- decided, which proved a fruitful cause of debate between the Gallican and Ultramontane schools of theology, the former minimizing the papal claims as far as is compatible with acceptance of the tenet of the Petrine privilege, and viewing the Papacy as a constitutional monarchy under strict limitations, the latter holding it to be an autocracy resting on a divine charter, and incapable of restraint on the part of its subjects. But the French Revolution, by breaking up the old Gallican Church, led to the substitu. tion of a largely Ultramontane episcopate in France under the concordat between Pius VII. and Napoleon I., and thereby to the permanent declension of the moderate school, while, on the other hand, a variety of causes brought

the Jesuits, recalled into corporate existence by the same Pius VII. in 1814, after forty years' suppression, again into the same position of chief influence in the Latin Church which they had occupied in the heyday of the counter-Reformation. They have always held steadily to the military

ideas of their founder, and have therefore unceasingly striven to centralize and concentrate ecclesi- astical authority, to remove constitutional limitations upon its exercise, and to make it prompt, unfaltering, and trenchant in action. Clearly, if the Papacy could be con- verted into an absolute monarchy, this end would be attained at a single stroke, because the mere fiat of the supreme pontiff would thenceforward suffice as warrant for all ecclesiastical action, thus dispensing with cumbrous and dilatory machinery of every kind; and his delegated authority would enable any person wielding it to act with similar efficacy and despatch.

With the accession of Pius IX. to the papal chair in 1846 a favourable opportunity for carrying out this pro- gramme presented itself, for, weak in character and wholly unversed in theological learning, while strongly holding the very highest views of his own prerogatives and eagerly receptive of everything which tended to exalt them further, he was exactly the instrument suited for its execution. Two experiments, to test at once how far he was prepared to go, and how far Latin Christendom was prepared to submit in the matter of decrees on faith and morals issuing from himself singly, with no previous conciliar examina- tion or decision, were tried in 1854 by the promulgation of the tenet of the Immaculate Conception and in 1864 by that of the Syllabus of Errors, The former of these met with little resistance, the latter with none, and it was therefore judged safe to proceed with the bolder and more far-reaching scheme which they but foreshadowed. Its success appeared to be almost a foregone conclusion ; for, not only could a compact and docile Italian majority be as surely reckoned on as it was at Trent, but the far larger number of Roman Catholic bishops all over the world had been virtually appointed by Pius IX. during his long pontificate, and that exclusively from the Ultramontane school. Nevertheless there was still a minority important enough to make some caution desirable in the earlier stages of the preliminaries, and the proposal to hold an cecumeni- cal council was first laid privately before the congregation of rites by the pope himself in December 1864, con- temporaneously with the issue of the Syllabus, and im- mediately afterwards before all the cardinals then at Rome, who were desired to give their opinions as to the oppor- tuneness of convoking the council at all and as to the subjects it should discuss if convoked.

Nineteen cardinals approved the proposal; two opposed it; and one remained neutral. In March 1865 a congregation of direction was formed to take further steps towards the desired end, and private communications were made to various bishops and to the nuncios at the different courts, who were asked to send competent theologians to take part in the preliminary congregations. Some communications were also made privately in 1866 to bishops of the Oriental rite. The first directly public intimation of the approaching council was made in June 1867, through a circular letter of Cardinal Caterini to the 500 bishops present in Rome at the 18th centenary festival of the martyrdom of St Peter and St Paul, inviting their reply to a schedule of inquiries. In September 1868 an invitation to attend was despatched to the Oriental bishops not in communion with Rome, and also to "Protestants and non-Catholics." But, as it was intended that no Oriental prelate should be admitted to a seat in the council till he had first made profession of the Roman Catholic system in its entirety, and as Pro- testants were merely to be referred to " experienced men "

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to convince them of their errors, the insincere invitation niet with no acceptance whatever. The bull of convoca- tion was promulged on 29th June 1869, appointing 8th December 1869 as the day of meeting. A few days before this latter date, 27th November, Pius IX. issued the prief Afultiplices inter, prescribing the mode of conciliar procedure and effectually fettering the council from the outset, so that it had never even the shadow of freedom which ostensibly was allowed to the Tridentine synod. This brief consists of a preamble and ten chapters, containing, amongst much else, the following provisions. Any member desiring to bring forward a proposal had to deliver it privately in writing to a special committee named by the pope (of which there were six for various departments), and it should contain nothing foreign to the traditions of the Roman Church. Unless the committee passed it, no further action could be taken upon it. Strict secrecy as to the proceedings of the council, and even as to the opinions of particular members, was to be observed towards all outsiders. All new decrees and canons were to be discussed in preliminary congregations before the public sessions, drafts being

supplied some days previously, and those who desired to speak to the questions were obliged to give notice at least a day beforehand. Priority of speech was secured for these; if others desired to speak afterwards they had to obtain the permission of the presi- dents, all of whom were cardinals of the court party. If little or no debate arose, the draft decrees were to be officially formulated; if there were division of opinion, the question should be referred to the sub-committee (deputatio) corresponding to each congregation's subject of discussion, which should decide the matter if no further difficulty were raised. All the officers of the council were named directly by the pope, and in no case elected by the council itself, which was thus deprived of several conciliar rights held previously to be inherent and in- defeasible, and which had been exercised even at Trent.

The assemblage of the council was looked on with little favour by a large part of the Roman Catholic world, and in particular two German docunients attested the alarm it aroused. In April 1869 Prince Hohenlohe, Bavarian foreign minister, sent a circular letter to the European courts, warning them of the political dangers likely to ensue; and most of the German bishops, assembled at Fulda in September of that year, sent an address to the pope, anxiously deprecating the definition of papal infalli- bility which had been recommended in the Civilta Cattolica of 6th February 1869, to be made by the sum- Mary process of acclamation. This proposal drew forth two able books in opposition to the dogma,—one which appeared anonymously (Janus) in Germany, and Du Concile Général et de la Paix Religieuse, by Maret, bishop of Sura and dean of theology at the Sorbonne, published in France ; but they did not delay the measures being. taken for its declaration.

The council assembled punctually on the appointed day, 8th December 1869, and owing to the modern facilities of intercommunication it was by far the largest gathering of the kind in history, no fewer than 749 bishops, cardinals, abbots, and generals of orders being present,—a number aiterwards increased to 764,—and including nearly three- fourths of the whole Roman Catholic episcopate. Of these lt has been estimated that the minority opposed to the infallibility dogma amounted to at least 160, while in the Inajority were reckoned 53 bishops zn partibus, who, as having no

real dioceses, and being thus unable to attest the historical belief of their flocks, had properly no right of suffrage upon dogmatic questions in a council, such attestation being the one function dischargeable by bishops assembled in synod when considering articles of belief.

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To these are to be added about 125 bishops of sees too modern to have any ancient tradition to attest, such as those in North and South America, Australasia, and Oceania, who were thus for conciliar purposes on the same footing of incompetence to speak for any one save them- selves. And, besides these two large groups, there was a third, consisting of about 90 missionary bishops entirely under the control of the Propaganda, and thus not free agents, while their sees were in most cases of very recent origin, so that they also could allege only their personal opinion, having no ancient records to attest. By far the larger number in these groups were on the side of the court majority. The Italian bishops, numbering about 170, and the Spanish, 40 in number, were also infallibilists almost to a man, but included scarcely one theologian in their ranks. And no fewer than 300 of this majority were the personal guests of Pius [X., lodged, boarded, and maintained at his cost, and thus openly retained to do his bidding. The minority consisted chiefly of the German and Austrian bishops, a considerable section of Hungarian, French, and North-American prelates, and many of those Orientals of the Latin Church who occupied dioceses other than mere titular and paper ones. But this minority, though composed mainly of natives of the most highly educated and intellectual countries, and containing almost every bishop of note for ability and theological learning, was by no means so compact and united as were the bishops of the majority ; and there was not even full agree- ment amongst its members as to the grounds for opposing the new dogma, many going no further than its inoppor- tuneness, but not entertaining deeper objections to it. Thus, even apart from its numerical inferiority, the oppo- sition was at a disadvantage in face of the curialists, and lost not a few members to them during the progress of the council. Not only were the efforts to obtain freedom from the fetters of the brief dfultiplices inter vain, but no member of the opposition could secure a

place on any of the commissions or sub-committees, which consisted exclusively of infallibilists.

The matter of most importance in the first congrega- tion, which was held on 10th December 1869, was the publication of a bull, decreeing that, if the pope should die during the council, it should at once be prorogued and take no part in the election of a pontiff, which was to be restricted to the college of cardinals. The session which followed was little more than formal; but two steps towards bringing about the intended result were taken before the next time of assembling. The '"theo- logians" were forbidden to attend any meetings of the bishops, or even to meet among themselves to discuss any conciliar matters, being restricted each to private confer- ence with the particular bishop to whose person he was attached ; and various petitions for the definition of the new dogma were drawn up and signed, one being the result of a letter to the bishops of the council, issued by Archbishop Manning and the conductors of the Civilta Cattolica, and signed by some hundreds, another from the Italian prelates, a third from those of the Franciscan order, and a fourth from the Uniat Armenians, besides several of less note. The opposition issued a counter-memorial with 135 signatures ; but, as it is therein admitted that papal decrees ex cathedra on faith and morals are irreversible, even without the consent of the church being known in any way, and that true obedience to every decree of the see of Rome is due by all Christians, no weight could attach to it as a serious plea for rejecting, or even delaying, the definition. The second session (6th January 1870) was also formal only, so far as the direct transaction of business was concerned ; but by the adoption of a measure causing all the members present to recite the creed of Pius IV.,

containing a clause professing obedience to the pope (this clause being omitted by the pope himself), and then to renew the episcopal oath of feudal submission to the Papacy, powerful pressure was brought to bear upon the weaker of the opposition, who were thus reminded how far they had pledged themselves already, and how un- reasonable it therefore was to haggle about taking but one step in advance on the self-same road. The

time between the second and third sessions was mainly occupied in preparing the drafts (schemata) of constitutions on the faith and on the church, and also with discussions of sundry disciplinary measures (notably as regards clerical immorality) and the preparation of a new catechism ; but none of these last were proceeded with. By the pope's direct command the cardinal-presidents of the congrega- tions issued, on 20th February 1870, rules to check long debates, which drew yet tighter than before the cords that deprived the council of all freedom. Speakers were confined to touching upon such clauses only of any amendment as they had given previous notice of meaning to discuss, and were not allowed to take part otherwise in a debate, while the closure could be applied by the presidents at the demand of any ten members. This latter drastic measure drew out a protest from more than one hundred bishops, who urged that it was destructive of conciliar liberty (already much hampered by the noisy attempts of the infallibilists to stifle free discussion), and that the steps being taken disregarded the note of moral unanimity which should mark the decisions of a general council, thereby exposing the council itself to hostile criticism and even rejection. They pointed out several other serious faults in the new rules, but could obtain no modification of them. The constitution on the faith (usually cited now as Dei Filius), however,—a long and far from clearly worded document, — directed chiefly against modern rationalism, and enforced by 18 canons of anathema, was completed ; it passed the congregation without difficulty, was signed by all the 667 members present, and was published in the third session, 24th April 1870, with papal confirmation, or rather in the unprecedented form of a proclamation by the pope singly, "'the sacred council approving,"—an innovation which was intended to mark it as solely his act, and to settle in this summary manner the long-standing controversy as to the relative superiority of popes and councils. There were few, however, even of the opposition, who cared to contest such a point, and there was nothing of a contentious nature, as regards the two parties in the council, in the constitution itself, so that no debate was raised upon it.

The real struggle was yet to come, namely, over the constitution on the church, into which the new dogma was to be introduced. This constitution (now usually cited as Pastor diternus) asserted the following propositions

:—(1) that a proper primacy of jurisdiction over the whole church was conferred upon St Peter directly and singly, and not mediately through any delegation to him, as chief minister in the church, of a primacy held by the church corporately ; (2) that this Petrine primacy vests by divine institution aud right in the line of Roman pontiffs ; (3) that the pope's Jurisdiction is immediate in all churches—.¢., he is the universal ordinary, the actual bishop of every see (all other bishops being merely his curates and deputies), and is not a remote or merely appellate authority—so that in questions not of faith and morals alone, but of discipline and govern- ment also, all the faithful, of whatever rite or dignity. both pastors and laity, are bound, individually and collect. ively, to submit themselves thereto; (4) that it is unlaw- ful to appeal from the judgments of the Roman pontiffs to an cecumenical council, as though to a higher authority ; and (5) that the Roman pontiff, when he speaks ex cathedra, and defines a doctrine of faith or morals to be held by the

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universal church, is infallible, and such definitions are accordingly irreformable of themselves, and not from the consent of the church. This document was voted upon in the congregation of 13th July 1870, consisting of 671 members. Of these 451 voted in the affirmative; 88 voted against it; 62 voted placet juxta modum, meaning that they would accept it if it were seriously modified ; and 70 did not vote at all. By the canonical theory of councils such a division of opinion as this voided the decision of the majority, and made it null. For, while a bare majority in a council suffices to pass a mere disciplinary canon, being a variable matter, contrariwise, to enact a dogmatic decree requires practical unanimity, since nothing can be imposed as of faith for which the two attesting notes of universal prevalence and historical continuity cannot be adduced. And, as the dissent of any appreciable number of members denotes that they do not know it as the local tradition of their several dioceses, it thereby destroys the claim to these notes. Not only so; but in view of the character in which bishops appear at councils, as represent- ing their laity, it is clear that the size and population of their several dioceses have to be taken into account when estimating the weight attaching to their individual testi- mony as to the reception of any dogma within their juris- dictions. ‘Tried by this standard, the opposition was very much more important than its muster-roll seems to indicate, for it included the bishops from many of the most populous Roman Catholic dioceses, such as the archbishops of Paris, with 2,000,000 Catholics, Breslau with 1,700,000, Cologne with 1,400,000, Vienna with about the same number, and Cambrai with 1,300,000; whereas 62 bishops of the Papal States, for example, represented no more than 700,000 altogether, apart from the hundred and more titulars, who had no flocks at all. This matter may be summed up thus: every vote cast for the new dogma stood for 142,570 lay folks; but every vote cast against it stood for 492,520. Nor is this all: a council claiming to be cecumenical must speak with the consent of both East and West. But, even if the very large concession be made that the Uniat churches in communion with Rome are in truth the

lawful representatives of the ancient Oriental Church, the fact remains that the number and rank of the Orientals in the minority was such as to make the vote at best only a Latin one. The Melchite and Syrian patriarchs of Antioch, the Chaldee patriarch of Babylon, the Melchite archbishop of Tyre, the Maronite archbishops of Tyre and Sidon, of Beyrout, and of Aleppo, with several others, were in one or other of the three groups of dissentients, and thus nullified the Eastern suffrages in the majority. Immediately after this preliminary voting nearly all the bishops of the minority abruptly quitted Rome, after previously lodging a protest against the proceedings. Their flight was prompted by fears for their personal safety. They were given to under- stand that each of them would have two papers tendered to him for his signature in the ensuing session, one being a profession of adhesion to the infallibility dogma, the other a resignation of his diocese in case he refused such adhesion. And they had good reason to think that the pope, who had declared that he meant to be proclaimed infallible " without limitation " (senza condizone), and had shown open enmity to more than one of their nuniber, would employ direct coercion in the event of continued resistance, bringing his temporal power as sovereign of Rome to bear on the rebels within his territory. Accord- ingly, when the public session was held on 18th July 1870, while 535 bishops voted for the constitution Pastor 4Hternus, only two, those of Ajaccio and of Little Rock, remained to utter their "non-placet." The pope thereupon confirmed the decree, and the proceedings virtually ended.

By one of the most singular of historical coincidences,

on that very day Napoleon III. proclaimed war against Prussia, and entered on that great conflict amongst the immediate results of which were the overthrow of the temporal power of the Papacy and the occupation of Rome by the troops of the king of Italy in two months' time from the last meeting of the council. It was formally prorogued by Pius IX. on 20th October, and is thus technically still in existence; but the prorogation is a virtual dissolution.

The opposition collapsed everywhere after the promulgation of the decree, as even the German bishops, who had been the main- stay of the minority, consented to publish it in their dioceses. This led to the genesis of the Old

Catholic communion (see OLD CATHOLICS) as a refuge for such as were conscientiously unable to accept the new. dogma, but equally unwilling to join any of the Protestant societies. But submission to the dogma is not identical with belief in it, at any rate in the sense wherein Pius 1X. under- stood it and meant it to be received. The majority had, indeed, achieved their " triumph over history ": they had done what warn- ing voices had declared beforehand to be their purpose—annihilated the independence of the episcopate, abrogated the teaching and attesting functions of the dispersive church, and contracted the Roman Catholic creed into the single article of belief in the pope. But they had failed in three matters essential to the ultimate success of their plans. They had not even seemed to make any reply, save that of their snperior voting strength in the council, to the destructive criticism which had established the falsehood and novelty of the infallibility dogma ; they were not able to pass it so as to be canonically or theologically binding ; and they could not secure its unqualified acceptance in its original form. Instead of terminating all controversy, the new dogma (as might have been anticipated by any one familiar either with the laws of the human intellect or the facts of ecclesiastical history) at once became itself a topic of debate, receiving contradictory interpretations, partly due to its vague and clumsy wording, and partly the expression of competing opinions, ranging from the widest to the narrowest view of its scope and force. The "senza condizione"' of Pius IX. proved hopelessly unworkable, and it was soon found necessary to modify the decree so as to make it a not intolerable burden for intelligent consciences. Accordingly, Bishop Fessler of St Pélten, secretary- general of the council, published in 1871, with a brief of approbation from the pope, his treatise Die wahre und falsche Unfehlbarkeit der Pipste, soon reproduced in French and English, which provides that "juxta modum " limitation vainly sought from the tyrannical majority in the council itself. Ostensibly a reply to an anti-infalli- bilist work by the learned canonist Vou Schulte, it is in fact a studious minimizing of the incidence of the dogma, arguing that the occasions when the attribute of papal infallibility has been actually exercised and formulated in ex eathedra decrees have been, and must continue to be, of extremely rare occurrence, and further attenuating the dogma itself, so as to approach in some measure the old Gallican view of the pope's constitutional and limited authority as official spokesman of

the church. In England, where the evidence collected by Pitt in the 18th century, and by the earl of Liverpool in the 19th, when aiming at the abolition of the penal laws, on the opinions held by Roman Catholic theologians as to the prerogatives and attributes of the popes, made their general Tepudiation of papal infallibility familiarly known, the question was even more trenchantly dealt with. For Dr Newman, who had anxiously deprecated the coming definition, speaking of it in a letter to Bishop Ullathorne as a "' great calamity," wantonly forced on by "'an aggressive, insolent faction," explained the manner of his own belief and acceptance of it in a letter to the duke of Norfolk, and that in terms which to less subtle (and, it may be, more practical) intellects are indistinguishable from disbelief and rejection. Not only does he limit the attribute itself, and the occasions of its exercise, within much straiter bounds than those set by Fessler, but he specifies a number of cases wherein he would disobey a papal mandate, and, after saying that each such mandate must be decided on its own merits, adds: "I should look to see what theologians could do for me, what the bishops and clergy around me, what my confessor, what friends whom I revered 5 and if, after all, I could not take their view of the matter, then I must rule myself by my own judgment and my own conscience." That this deliverance is in effect a complete evacuation of the dogma will appear at once by supposing cognate language to be used in the civil sphere by the subject of an absolute temporal sovereign When defining the limits of his allegiance. But the subsequent eleva- tion of its author to the cardinalate proves that his view is regarded as fairly tenable in the Roman Church, and the infallibility dogma 1s thus, for the present at least, dismissed from the domain of practical action to that of speculative theory.

The bibliography of the Vatican Council is very copious, but the following Works will suffice for most students to consult :—Cecconi, Storia del Coneilio Vaticano, Rome, 1873; J. Friedrich, Geschichte des vatikanischen Konzils, Bonn,

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VATTEL, Emer ve (1714-1767), an eminent jurist, was the son of a Protestant minister, and was born at Couvet, in the principality of Neuchatel, on 25th August 1714. He studied at Basel and Geneva. During his early years his favourite pursuit was philosophy; and, having carefully examined the works of Leibnitz and Wolf, he published in 1741 a defence of Leibnitz's system against Crousaz. In the same year Vattel, who was born a subject of the king of Prussia, repaired to Berlin in the hope of obtaining some public employment from Frederick II., but was disappointed in his expectation. Two years later he proceeded to Dresden, where he experienced a very favour- able reception from Count Briihl, the minister of Saxony. In 1746 he obtained from the elector, Augustus IIIL., the title of councillor of embassy, accompanied with a pension, and was sent to Bern in the capacity of the elector's minister. His diplomatic functions did not occupy his whole time and much of his leisure was devoted to litera- ture and jurisprudence. Among other works he published Loisirs Philosophiques (1747) and Mélanges de Littérature, de Morale, et de Politique (1757). But his reputation chiefly rests on his Droit des Gens, ou Principes de la Loi Naturelle appliqués & la Conduite et aux Affaires des Nations et des Sowverains (Neuchatel, 1758). During the same year he was recalled from Switzerland, to be employed in the cabinet of Dresden, and was soon afterwards honoured with the title of privy councillor. His labours now became so intense as to exhaust his strength, and his health broke down. After a period of rest he returned to Dresden in 1766 ; but his renewed exertions soon produced a relapse, and

he made another excursion to Neuchatel, where he died on 20th December 1767. His last work was entitled Questions de Droit Naturel, ou Observations sur le Traité du Droit de la Nature, par Wolf (Bern, 1762).

Vattel's Droit des Gens, which is founded on the works of Wolf, had in its day a great success, in truth, greater than it deserved. His principal and only merit consists in his having rendered the ideas of that author accessible to the political and diplomatic

world. The Droit des Gens passed through many editions, and was translated into various languages (English in 1760).

VAUBAN, Sepastien Le PREstRE DE (1633-1707), marshal of France, was born in the neighbourhood of Saulieu in Burgundy (now in the department of Céte-d'Or) on 15th May 1633. At an early age he was left an orphan in very poor circumstances, and his boyhood and youth were spent among the peasantry of his native place, thus enabling him to gain that sympathetic insight into the condition of the agricultural classes which he afterwards showed in his economic writings. He owed his early education and his first instruction in the rudiments of mathematics and surveying to a friendly curé, who had taken an interest in him and discerned his abilities. At the age of seventeen he joined the Spanish troops under the prince of Condé, but after about a year's campaigning was taken prisoner by the French. He then became known to Mazarin, who treated him with kindness and enlisted him in the service of the king. In 1653 he first earned repute as an engineer by the share he had in the capture of Sainte-Menehould, and after further distinction at Stenay and Clermont he was given a lieutenancy and re- ceived in 1655 his commission as an "ingénieur du roi." Be- tween that year and the peace of 1659 he took part in numerous successful sieges—especially those of Gravelines, Ypres, and Oudenarde. After the cession of Dunkirk, Fort

Louis, and Mardyke in 1662 he had charge of the work of fortifying them as frontier towns. On the renewal of war in 1667 he saw much service in

Flanders, and gained special distinction in the siege of Lille, of which town he ultimately became governor, the king making him a lieutenant in the guards and bestowing on him a pension. The originality and success of his methods were now fully recognized, and in 1669 he drew up, at the instance of Louvois, his first exposi- tion of the theory of fortification (Mémoire pour Servir d Instruction dans la Conduite des Siéges), which was after- wards published at Leyden (1740). In 1673 Vauban ac- companied Louis XIV. on his Dutch campaign, and directed the more important sieges, afterwards superintending the demolition or reconstruction of the captured places. In the following year his principal achievement was the capture of Maestricht, and in 1677 he had the chief credit for the fall of Valenciennes and Cambrai. In the latter year he was appointed commissary-general of fortifications in succession to Clerville, and thus gained an opportunity, which in the following year he diligently used, for practically reconstruct- ing the entire land-defences of France. In the short war of 1683-84 he gained further distinction by the fall of Luxem- bourg, and during the campaign of 1691-92 the names of Mons and Namur were added to the long list of his successes. In 1686 Vauban had the courage to make a representation to the king in favour of the republication of the Edict of Nantes; and about 1697 he wrote his almost equally bold Projet Pune Dixme Royale, which, however, was not pub- lished until 1707 (see PotrricaL Economy, vol. xix. p. 359). In 1693 he was made a grand cross of the order of St Louis, and in 1703 marshal of France. The close of his life, which was saddened by the consciousness of waning influence and failing health, he devoted largely to the arrangement of the voluminous manuscripts (Jles Oisivetés) which contained his reflexions on such subjects as the art of war, administration and finance, agriculture, commerce, and the like. He died at Paris on 30th March 1707.

For Vauban's work as a military engineer, see FORTIFICATION (vol. ix. pp. 441-446). The Otsivetés long remained unpublished, and of the twelve manuscript volumes containing them several seem to have been hopelessly lost ; the fragmentary remains were published in three volumes at Paris in 1841-48. The Traité de l Attaque des Places, written in 1703, and that De la Défense des Places, written a few months before his death, were published together in 1787. Among the subjects in which Vauban

took a lively interest, and on which he wrote memoirs, may be mentioned the fortification of Paris, the inland navigation of France, its army organization, espe- cially in the artillery service, and the limits of ecclesiastical power

in temporal matters. The introduction of the socket-bayonet into the French army is usually ascribed to Vauban.

VAUCLUSE, a department of France, formed in 1793 out of the county of Venaissin (695 square miles), the principality of Orange (624 square miles), and a part of Provence (5154 square miles), lies between 43° 39' and 44° 26' N. lat. and 4° 38' and 5° 45' E. long., is bounded by Drome on the N., Basses-Alpes on the E., Bouches-du- Rhone (from which it is separated by the Durance) on the S., and Gard and Ardéche (from which it is separated by the Rhone) on the W. It has also an enclave, the canton of Valréas, in the department of Drdme. The western third of Vaucluse belongs to the Rhone valley, and con- sists of the rich and fertile plains of Orange, Carpentras, and Cavaillon, To the east, with a general west-south- west direction and parallel to one another, are the steep barren ranges of Ventoux, Vaucluse, and Lubéron, consist- ing of limestones and sandstones. The first-mentioned, which is the most northerly, has a maximum elevation of 6273 feet; the culminating peak, on which is a meteoro- logical observatory, is isolated and majestic. The Vaucluse chain does not rise above 4075 feet. The most southerly range, that of Lubéron (3691 feet), is rich in palzeonto- logical remains of extant mammals (the lion, gazelle, wild

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boar, &c.). The Rhone is joined on the left by the Aygues, the Sorgue (rising in Petrarch's celebrated fountain of Vaucluse, which has given its name to the department), and the impetuous Durance. The Sorgue has an import- ant tributary in the Ouvéze and the Durance in the Coulon (or Calavon). These and other streams feed numerous irrigation canals; their channels are sometimes quite dry in summer. The climate is that of the Mediter- ranean region. The valley of the Rhone suffers from the mistral

(see vol. ix. p. 507); but the other valleys are sheltered by the mountains, and produce the oleander, pomegranate, olive, jujube, fig, and other southern trees and shrubs. The mean annual temperature is 55° Fahr. at Orange and 58° at Avignon; the extremes of tempera- ture are 5° and 105° Fahr. Snow is rare. The south wind, which is frequent in summer, brings rain. The average annual rainfall is 29 inches in the hill region and 22 in

the plains.

Of the total area of 881,610 acres 679,737 are cultivated, —cereals occupying 232,250 acres, market and other gardens 41,085, meadows, pastures, and orchards 89,950, industrial vegetable products 18,998, summer fallows 58,489, vines 24,699, and woods and forests 197,049. The live stock in 1880 included 11,412 horses, 16,602 mules, 4410 asses, 2079 head of cattle, 46,406 pigs, 11,660 goats, and 165,040 shcep of native and 6983 of improved breed. There were 11,701 beehives (104 tons of honey and 28 tons of wax). Amongst wild animals the otter and beaver occur along the bank of the Rhone. The crops in 1884 were returned as follows —2,151,385 bushels of wheat, 7309 of meslin, 39,476 of rye, 60,208 of barley, 1677 of buckwheat, 17,162 of maize, 240,850 of millet, 445,920 of oats, 4,247,600 of potatoes, 21,680 tons of beetroot, and 197 tons of tobacco. In 1880 early vegetables were produced to the value of £384,940, and stone fruit to the value of £13,341. The olive crop amounted to 233,928 bushels (622 tons 17 cwts. of oil). In 1884 4,779,236 gallons of wine were obtained (average for preceding ten years 2,562,384 gallons). In the same year 766 tons of silk cocoons were produced. The phylloxera has reduced the area of the vine- yards from 79,000 to 13,000 or 14,000 acres; American vines are now being introduced. The culture of madder and the mulberry is diminishing, while the Chinese grass-cloth plant, beetroot, sorghum, and millet are grown in increasing quantities. The truffle markets of Carpentras and Apt are important. Lignite and coal (11,382 tons in 1882), iron, and sulphur are mined ; rich deposits of plaster, stone, clay, and ochre are worked ; and there is a large variety of mineral springs. The chief industrial establishments are manu- factories of madder dye, silk-mills (4295 workmen), silk-spinning factories (8365 spindles and 411 workmen), oil-mills, flour-mills, paper-mills (1047

workmen and 2700 tons of paper in 1880), wool-spinning factories (2645 spindles and 369 workmen), confec- tionery establishments, manufactories of pottery, earthenware, bricks, mosaics, tinned provisions, chemicals, candles, soap (2500 tons in 1880), and hats, breweries, puddling works, iron and copper foundries, cabinet workshops, blast furnaces, saw-mills, edge-tool workshops, and nursery gardens. Coarse cloth, carpets, blankets, and ready-made clothes are also produced. Vaucluse has 135 miles of railway, 97 of national roads, and 2380 of other roads. The population increased by 74,670 between 1801 and 1865, but from that date to 1886 it diminished by 24,304, owing to the decay of the madder and wine industries. In 1881 the department had 244,149 inhabitants, and in 1886 241,787. Vaucluse forms the archiepiscopal diocese of Avignon, has its court of appeal at Nimes, and belongs to the Marseilles army corps. It is divided into 4 arrondissements (Avignon, chef-lieu of the department, with 35,355 inhabitants in 1886; Apt, 4293; Carpentras, 8563; and Orange, 6904), 22 cantons, and 150 communes. Cavaillon (5164 inhabitants) is famous for its early vegetables and its fruit. Vaison (1988 inhabitants) is rich in Roman remains, and posscsses an interesting cathedral and a ruined castle of the counts of Toulouse.

VAUD (Germ. Waadt), a canton of Switzerland, ranking as nineteenth in the Confederation, takes its name either from the German Wald (a wood) or, more probably, from Walsch, the term applied by Teutonic to non-Teutonic tribes. It is of very irregular shape, as it owes its exist- ence solely to historical causes. Roughly speaking, it includes the whole north shore of the Lake of Geneva. It stretches on the south-east as far as St Maurice and takes in Chateau d'Oex, while to the north-west the Jura and the Lake of Neuchatel are its boundaries. The dis- trict of Avenches (entirely surrounded by the canton of

Freiburg) and a long narrow tongue running up to Payerne are also within its boundaries. The total area is 1244-3 square miles, larger than that of any other Swiss canton except Graubiinden (Grisons), Bern, and Valais. Of this total 1053°6 square miles are classed as productive, forests occupying 282 and vines 24°8 square miles. This is a larger extent under

vines than in any other canton save Tessin (Ticino), and more than one-fifth of the total wine- growing districts in the whole Confederation. Of the un- productive portion lakes occupy 164:1 and glaciers 4:3 square miles, while towns and buildings cover 57. The highest point is the Diablerets (10,667 feet) in the south- east comer. 'The population in 1880 amounted to 238,730 (an increase of 7030 since 1870), a larger number than in any other canton except Bern and Zurich. Of these 212,164 are French-speaking, 21,692 German-speaking (many persons from the German-speaking cantons coming thither to learn French), and 2518 Italian-speaking. In religion 219,427 are Protestants (Calvinists), divided be- tween the "national church" (19°20) and the "free church" (1:20). The capital is Lausanne (30,179 inhabitants, or with the surrounding districts 37,427), which since 1874 has been the seat of the federal tribunal. It is the largest town in the Confederation after Zurich, Basel, Geneva, and Bern. Other important places are Vevay (7820 in- habitants) and Yverdon (5968).

Agriculture is the main occupation of the people ; the land is much subdivided and very highly cultivated. The vineyards em- ploy 20,000 persons. About one-third of the wine produced is ex- ported, the best-known varieties being Yvorne (white) and Cortaillod (red). There is not much industry, except that of the watch- makers in the Jura; and the commerce is comparatively unim- portant. Many foreigners reside in the canton, particularly on the shores of the Lake of Geneva, from Lausanne to Villeneuve (as formerly Gibbon, Voltaire, and Rousseau). Montreux is a favourite winter residence, and its growth may be judged of from the fact that its inhabitants increascd from 3211 in 1849 to 4379 in 1860, 6659 in 1870, and 8017 in 1880, the increase being specially marked since the opening of the railway in 1861. The railways are 168 miles in length, besides a "ligne régionale" on the high road from Lausanne to Echallens, and the cable railways from Lausanne to Ouchy and from Territet to Glion. In educational matters the canton holds a high place. The academy of Lausanne dates from 1587 ; and there are a very large number of schools and educational establishments at Morges, Lausanne, Vevay, and elsewhere. Pesta- lozzi's celebrated institution flourished at Yverdon from 1805 to 1825. Among the remarkable historical spots in the canton are Avenches (the chief Roman settlement in Helvetia), Granson (scene of the

famous battle in 1476 against Charles the Bold), and the castle of Chillon (where Bonnivard, the prior of St Victor at Geneva, was imprisoned from 1531 to 1536 for defending the freedom of Geneva against the duke of Savoy).

History.—The early history of the main part of the territories comprised in the present canton is identical with that of south-west Switzerland generally. The Romans conquered (58 B.C.) the Celtic Helvetii, and so thoroughly colonized the land that it has remained a Romance-speaking district, despite conquests by the Burgundians (5th century) and Franks (532) and the incursions of the Saracens (10th century). It formed part of the empire of Charlemagne, and of the kingdom of Transjurane Burgundy (888-1032), the memory of "ood queen Bertha," wife of King Rudolph IL., being still held in high honour. On the extinction of the house of Zaringen (1218) the counts of Savoy gradually won the larger part of it, especially in the days of Peter II., "'le petit Charlemagne " (died 1268). The bishop of Lausanne (to which place the see had been transferred from Aventicum by Marius the Chronicler at the end of the 6th cen- tury), however, still maintained the temporal power given to him in 1011 by the king of Burgundy, and in 1270 became a prince of the empire, (We must be careful to distinguish between the present canton of Vaud and the old medieval Pays de Vaud: the districts forming the present canton very nearly correspond to the Pays Rom- and.) In the 15th century Bern began to acquire lands to the south from the dukes of Savoy, and it was out of those conquests that the canton was formed in 1798. In 1475 she seized Aigle, in 1475- (6 (in concert with Freiburg) Echallens and Granson as well as Orbe (the latter held of the duchy of Burgundy). Vaud had been Cccupied by Bern for a time (1475-76), but the final conquest did not take place till 1536, when both Savoyard Vaud and the bishopric of Lausanne were overrun and annexed by Bern (formally ceded in 1564), who added to them (1555) Chateau d'Oex, as her share of

the domains of the debt-laden count of Gruyéres in the division of the spoil she made with Freiburg. In 1565 the liberties of Vaud were, by a special treaty, placed under the guarantee of France. Bern in 1526 sent

Farel, a preacher from Dauphiné, to carry out the Reformation at Aigle, aud after 1536 the new religion was imposed by force of arms and the bishop's residence moved to Freiburg (permanently from 1663). Thus the whole land became Protestant, save the district of Echallens. Vaud was ruled very harshly by bailiffs from Bern. In 1588 a plot of some nobles to hand it over to Savoy was crushed, and in 1723 the enthusiastic idealist Davel lost his life in an attempt to raise it to the rank of a canton. Political feeling was therefore much excited by the out- break of the French Revolution, and a Vaudois, F. C. de la Harpe, an exile and a patriot, persuaded the Directory in Paris to marcli on Vaud in virtue of the rights conferred by the treaty of 1565. The French troops were received enthusiastically, and the 'Le- manic republic" was proclaimed (January 1798), succeeded by the short-lived Rhodanic republic, till in March 1798 the canton of Leman was formed as a district of the Helvetic republic. This corresponded precisely with the present canton minus Avenches and Payerne, which were restored to it in 1808. The new canton was thus made up of the Bernese conquests of 1475, 1475-76, 1536, and 1555. The constitutions of 1808 and 1815 favoured the towns and wealthy men, so that an agitation went on for a radical change, which was effected in the constitution of 1831. Originally acting as a mediator, Vaud finally joined the anti-Jesuit movement (especially after the Radicals came into power in 1845), opposed the Sonderbund, and accepted the new federal constitution of 1848, of which Druey of Vaud was one of the two drafters. From 1839 to 1846 the canton was distracted by religious struggles, owing to the attempt of the Radicals to turn the church into a simple depart- ment of state, a struggle which ended in the splitting off of the "free church." The cantonal feeling in Vaud is very strong, and was the main cause of the failure of the project of revising the federal constitution in 1872, though that of 1874 was accepted. In 1879 Vaud was one of the three cantons which voted (though in vain) against a grant in aid of the St Gotthard Railway. In 1882 the Radicals obtained a great majority, and in 1885 the con- stitution of 1861 was revised. The Government consists of a great council (one member to every 300 electors) for legislative and a council of state of 7 members (chosen by the great council) for executive purposes. 6000 citizens can compel consideration of any project by the legislature (" initiative," first in 1845), and the 7e- Jerendum exists in its "facultative" form, if demanded by 6000 citizens, and also in case of

expenditure of over a million francs. Capital punishment was abolished in 1874. The canton has lately been passing through serious financial difficulties. In 1862 the south-west frontier was slightly altered in consequence of a dispute with France as to the valley of Dappes.

See A. Verdeil, Histoire du Canton de Vaud (2d ed., 4 vols.), and L. Vulliemin, Le Canton du Vaud (3d ed., 1885).

VAUDOIS. See WaALDENSEs.

VAUGHAN, Henry (1621-1693), called " the Silurist," poet and mystic, was born into an ancient Welsh family settled at Skethiog-on-Usk, in the parish of Llansaintfraed, Brecknockshire, in 1621. From 1632 to 1638 he and his twin brother Thomas were privately educated by the rector of Llangattock, and then they proceeded to Jesus College, Oxford. At what time Henry left the university is not known ; but it was evidently after he had studied for some time in London and had been introduced into the society of men of letters that he printed his first volume, Poems, with the Tenth Satire of Juvenal Englished (1646). Of this publication he was afterwards, very needlessly, ashamed. Vaughan presently became a physician and returned to his native country, first for a while practising in the town of Brecon, and then settling down for the remainder of his life in Skethiog. From this place he sent forth his col- lection of sacred poems, Stlex Scintillans, in 1650, of which a second part appeared in 1655, and the secular poems of his Olor Iscanus, prepared for the press in 1647, and pub- lished without his consent by his brother Thomas in 1651. A mystical treatise in prose, The Mount of Olives, followed in 1652, and then two prose translations, Flores Solitudi- nis, 1654, and Hermetical Physick, 1655. The world took little notice of these performances. In 1678 an Oxford friend collected the miscellaneous verses of Vaughan's middle life in a volume entitled Thalia Rediviva. Henry Vaughan died at Skethiog on 23d April 1693, and lies buried in the churchyard of Llansaintfraed.

As a poet Vaughan comes latest in the so-called " metaphysical Hi school of the 17th century. He is the most remote of the disciples of Donne, and follows him mainly as he saw him reflected in George Herbert. He

analyses his experiences, amatory and sacred, with excessive ingenuity, striking out, every now and then, through his extreme intensity of feeling and his close though limited observation of nature, lines and phrases of marvellous felicity. He is of imagina- tion all compact, and is happiest when he abandons himself most completely to his vision. His verse is apt to seem crabbed and untunable in comparison with that of Crashaw, and even of Herbert at his best. "The Retreat," with its Wordsworthian intimations, "The World," mainly because of the magnificence of its opening lines, and "Beyond the Veil" are by far the most popular of Vaughan's poems and represent him at his best. His passion for the Usk, and his desire to immortalize that pastoral river, are pathetically prominent in his writings. His metrical ear was not fine, and he affected, almost more than Herbert himself, tortured and tuneless forms of self-invented stanza.

The earlier works of Henry Vaughan, in prose and verse, were collected in a very limited private edition in four volumes, in 1871, by Dr A. B. Grosart. The Rev. H. F. Lyte edited the sacred poems alone in 1847, up to which time Vaughan was praetically unknown as a poet.

VAUGHAN, Tuomas (1621-1665), "the Rosicrucian," was the twin brother of Henry VAUGHAN (see above). When Thomas left Oxford he went into the church and became rector of his native parish Llansaintfraed until his ejectment, when he settled at Oxford as an alchemist. He died at Albury on 27th February 1665, poisoned by the fumes of a cauldron, Under the pseudonym of Eugenius Philalethes, Thomas Vaughan produced eleven volumes defending and describing the tenets of the Rosi- crucians. The titles of these—among which are Zhe Jan- Mouse, 1650; The Second Wash, 1651; The Lame and Confession of the Fraternity of the Rosy Cross, 1652 ; Aula Lucis, 1652; and Huphrates, 1653—are not more extraordinary than their style. Henry More the Platonist engaged in controversy with Thomas Vaughan, deep calling unto deep in pamphlets.

VAUQUELIN, Louis Niconas (1763-1829), French analytical chemist, was born at Saint-André-d'Hébertot in Normandy on 16th May 1763. His parents, although very poor, sent him to school to fit him for the coveted

post of a gentleman's servant at the chateau. At the age of thirteen or fourteen Vauquelin went to Rouen as laboratory boy with an apothecary. He did not remain long there ; but his interest in chemistry was fairly aroused, and he began to make experiments and take notes. His master, finding him so engaged on one occasion, tore up his note-book and ordered him to keep to his menial work for the future. Vauquelin had spirit enough to resent this treatment: he borrowed six francs from a friend and walked to Paris to seek his fortune. Fora time his prospects were very dark: after getting and losing two situations he became ull, was sent to the public hospital, and when convalescent found himself once more without money or friends, At length, however, he met a humane apothecary, Cheradame, who took him in and treated him with kindness, Vauquelin at once resumed his studies, and devoted every spare minute to learning. Cheradame introduced him to Fourcroy, who had himself worked his way up from poverty, and from this time Vauquelin's fortune was made. Henceforward he devoted his attention to chemical analysis without in- termission or variety until his death, which occurred at his birthplace on 14th November 1829. At first his work appeared as that of his friend and patron, then in their joint names ; but in 1790 he commenced to publish on his own authority, and wrote perhaps more papers than any other chemist has ever done. "Hither together or success- ively Vauquelin held the offices of inspector of mines, professor at the School of Mines and at the Polytechnic School, assayer of gold and silver goods, professor of chemistry in the College of France, member of the Council of Industry and Commerce, commissioner on the pharmacy laws, examiner to the Polytechnic School, and, finally, was

successor to Fourcroy himself; at this last step all the

other candidates retired in his favour.

Vauquelin's life was uneventful ; his nature was quiet and retir- ing ; he never desired to mix with the world ; and even in the tur- moil of the Revolution his interest centred in the laboratory. He was emphatically one who lived for his work alone. He never married. He does not appear to have communicated with his parents after he became wealthy. The one

bright feature in the somewhat colourless character of his later life was the fact that he supported Fourcroy's aged sisters after his old friend died.

As an analyst Vauquelin came at the right time. The theory of chemistry was being built afresh on a basis of experiment; all substances, natural and artificial, were being classified by their com- position ; and it would be hard to mention any mineral or any plant or animal or product of life that Vauquelin did not examine. 'With Fourcroy he drove the piles on which the first theories in pure chemistry were founded ; with Haiiy he put mineralogy ona satisfactory footing ; but he himself was neither chemist nor mineral- ogist. Vauquelin's name is associated with 376 papers: published between 1790 and 18338, and, with the exception of one or two criti- cisms and claims for priority, these were all simple records of patient and laborious analytical operations. He propounded no theories, was guided by no generalizations, and was troubled by no problems save those of his methods. Given a substance, he did his best to find its composition, devising new processes where these seemed necessary, but this was all. Considering the amount of work he did, one is surprised that only two new elements are associated with his name. He detected glucina in beryl when analysing that mineral for Haiiy, and in a red lead ore from Siberia he discovered chromium, although, strange to say, eight years elapsed between his first examination of the ore and his separation of chromic acid. It is even more extraordinary that he never suspected the existence of alkaloids in the vegetable and animal juices he was continually analysing. Cuvier in his éloge argues from this that without the concurrence of a happy chance the greatest perseverance and the most admirable patience often miss the mark ; a more legitimate inference might be that work carried on " for work's ignoble sake" is fruitless in higher results, and that perseverance apart from a definite aim can accomplish little.

VAUVENARGUES, Luc p& Ciarrers, Marquis DE (1715-1747), a moralist and miscellaneous writer of con- siderable originality and power, was born at Aix in Provence on 6th August 1715. His family was poor though noble ; he was very badly educated; and his health was weak. He, however, entered the army early and served for more than ten years, taking part in the Italian campaign of 1736, and in the disastrous

expedition to Bohemia six years later in support of Frederick the Great's designs on Silesia, in which the French were abandoned by their ally. Vauven- argues suffered greatly from the hardships of Belle-Isle's winter retreat, and indeed never recovered from them. He was also much troubled by his poverty, and in a private letter written to a very intimate friend he discusses the possibility of obtaining a loan from a certain rich acquaint- ance by undertaking, first to get his son into his own regiment, or secondly to marry one of his daughters within a short time and with only a reasonable dowry. Nevertheless Vauvenargues was, according to the standard of that time, a most honourable man. Indeed he seems to have pushed honour to the point of naivety, if it be true that, weary of waiting for promotion, he addressed himself, not to any minister, or, more wisely still, to some favourite, but to the king himself. This unsophisticated proceeding had of course no result, and Vauvenargues threw up lis commission, hoping—but unsuccessfully— to obtain a post in the diplomatic service. His ill-luck pursued him: for, having joined his family in Provence, he fell ill with a bad form of smallpox, which still further weakened him. This was in 1744. He had, besides the correspondence above referred to with a certain M. de Saint Vincens, maintained one, still more interesting and likewise only recently known, with the celebrated and eccentric Marquis de Mirabeau, the author of L' Ami des Hommes, the father of the great Mirabeau. He had also, when in garrison at Nancy, begun an exchange of letters with Voltaire, who had a very high opinion of him, and this, with his natural inclinations, determined him to

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literature. He published in 1746 an Introduction a la Connaissance de V Esprit Humain, with certain Réflexions and Mdazximes appended. He died of lung disease at Paris on 28th May 1747.

The bulk of Vauvenargues's work is very small, but its interest is very considerable. In the Introduction, in the Réflexions, and in the minor fragments it consists, in fact, of detached and somc- what desultory thoughts, in the style wherein the 18th century so much delighted, on questions of moral philosophy and of literary criticism. Sainte-Beuve has

mildly said that as a literary critic Vauvenargues "shows inexperience." It would be truer to say that this part of his work has no value or interest beyond that of curiosity. He had no knowledge of any language but his own, and his literary criticism is limited to a repetition in crude form of the stock ideas of his time. Thus he exaggerates immensely the value of Racine and Boileau, but depreciates Corneille and even Moliére. It is almost sufficient to say that he blames Moliére for choosing "des sujets si bas," and shows an entire ignorance of all French litera- ture before the 17th century, and of all other literature whatsoever, except a certain second-hand acquaintance with the classics. As a writer he stands far highcr. His style is indeed, according to strict Academic judgment, somewhat incorrect, and when he attempts rhetorical flourishes (which is not often) they have usually the artificial and affected character—stilted or namby-pamby— which mars so much 18th-century work. His strength, however, is not really in any way that of a man of letters, but that of a moralist. Even here he is not superior to the weaknesses of his time. In his day the anti-religious or anti-Christian movement of thought was not fully declared, and he did not adopt the complete philosophe attitude ; in his letters, at any rate, he poses somewhat ostentatiously as "neutral" between the religious and the anti- religious schoo]. In some of his maxims about politics there is also traceable the hollow and confused jargon about tyrants and liberty which did so much to bring about, and to embitter when brought about, the struggles of the Revolution. It is in morals proper, in the discussion and application of general principles of conduct, that Vauvenargues shines. No century has ever excelled the 18th in moral theory, whatever may have been its deserts in respect of moral practice, and no 18th-century moralist has excelled Vauven- argues. He is not an exact psychologist, much less a rigorous metaphysician. He has no worked-out or workable theory of inoral obligation or of the moral sense. His terminology is merely popular and loose, and he hardly attempts the co-ordination of his ideas into any system. His real strength is in a department which the French have always cultivated with greater success than any other modern people,—the expression in more or less epigrammatic language of the results of acute observation of human conduct and motives. The chief distinction between Vauvenargues and his great predecessor La Rochefoucauld is that Vauvenargucs, unlike La Rochefoucauld, thinks nobly of man, and is altogether inclined rather to

the Stoic than to the Epicurean theory. He has indeed been called a modern Stoic, and, allowing for the vagueness of all such phrases, there is much to be said for the description.

An edition of the Works of Vauvenargues, slightly enlarged, appeared in the year of his death, and in part or in whole has been frequently reprinted, all editions, however, being superseded by that of M. Gilbert (2 vols., Paris, 1857), which contains the previ- ously unpublished correspondences above referred to and all other attamable matter, including some Dialogues of the Dead, some "characters" in imitation of Theophrastus and La Bruyére, and numerous short pieces of criticism and moralizing. Vauvenargues has been frequently written about, the comments best worth read- ing, besides those contained in Gilbert's edition, being four essays by Sainte-Beuve in Causertes du LInndi, vols. iii. and xiv.

VECELLIO. See Trrtan. _ VEDANTA. The Vedanta is the first and most impress- ive structure of Indian philosophy, the creed of intellectual Hindus, and the basis of the popular Hindu religions. Its earliest germs lie in the Mantra portion of the Veda. The Nasadiyasiikta (Rigveda, x. 129) propounds the genesis of the world from an inscrutable principle, darkness, neither existent nor non-existent, and from "one that breathed Without afflation, other than which there was nothing, beyond it nothing." The genesis of things from a universal soul is taught in the Purushasikta (Rigveda, x. 90). The unreality of the internal and external orders of things, and the sole reality of a supreme spirit, or impersonal self, are set forth in the Upanishads or later portions of the Veda. The teaching of these Upanishads explicated and system- atized, with little or no addition, constitutes the Vedanta. It has innumerable expositors among the Indian school-

men, of whom the most illustrious is Sankaracharya (see SANSKRIT LITERATURE, vol. xxi. p. 290), a philosopher of Kerala or Malabar, who lived, it is supposed, between 650 and 740.

The term “vedanta,” end of the Veda, is a synonym of “upanishad.” Upanishad is said by the Indian scholiasts to denote, in the first place, the knowledge of the imper- sonal self, the science of absolute being, paramdtmajndna, brahmavidyd, in the second place, any treatise imparting that knowledge. The doctrines of the Upanishads con- stitute the jnanakdnda, or gnostic portion of the Veda, as distinguished from the karmakédnda, or ritual portion, comprised in the Samhitas and Brahmanas. ‘They consti- tute also the pardvidya, or superior science, dealing with cessation from volition and action, and leading to extrica- tion from metempsychosis, as distinguished from the apardvidyd, or inferior science, of the Samhitas, Brah- manas, and Vedanhgas, which deals with action, and pro- longs metempsychosis, leading only to higher embodiments in this world or in the paradises of the deities. The Vedanta philosophy is also called Aupanishadi Mimansa, Brahmi Mimansa, Sariraki Mimansa. The Siitras or mnemonic formulas in which the system is developed are the Vedantasiitra, Brahmasiitra, and Sarirakasiitra. They are ascribed to Vyasa or Badarayana. The system is further styled the Uttaramimansa, as an investigation of the later portion of the Veda, as distinguished from the Pirvami- mans& of Jaimini, which is an investigation of the earlier portion of the Veda. The purport of the Parvamimansi is dharmajijndsd, inquiry into sacred prescription; the pur- port of the Uttaramimansa, or Vedanta, is brahmajijnasa, inquiry into the real nature of the soul.

There is, according to the Vedanta, but one substance or reality, ingenerable, immutable, incorruptible, eternal, and this is the supreme spirit, the impersonal self, the spiritual absolute, diman, paramaiman, brahman. The series of bodies and of environments through which the soul appears to pass in its werevowudrwors are illusive, unreal, the figments of a fictitious illusion, mayd, prakrit?, avyakta, avydkrita. The individual soul, jivatman, vijnanadtman, is personal only in fictitious semblance, only so long as it is impli- cated in the series of transmigratory states, and is in truth impersonal, one with the undifferenced self or Brahman. Its apparent and fictitious individuality, and its apparent action and suffering, are the individuality, the action, and the suffering of its illusory ad- juncts, the organism and the faculties. The unity of all souls in the one soul is the highest truth, or, properly speaking, the only truth.

On reaching and realizing this truth the individual soul returns to its isolation or state of pure indetermination. The duality of experience is fictitious and is surmounted by the true intuition, samyagjnana. On the side of this intuition there abides only "the existent, the intelligence, the beatitude."

Indian philosophy, and in particular its earliest form, the philo- sophy of the Upanishads, or Vedanta, is governed throughout by two needs. First, there is the need to give consistency and coher- ence to existing imagery, physical and hyperphysical, to work out a conception of the totality of things. Secondly, there is the need to put a stop to the miseries of metempsychosis. The idea of transmigration, foreign to the Indo-Aryans of the Vedic hymns, appears to have becn taken up by their successors from the lower races with which they intermingled, while retaining their supremacy among them. The Indo-Aryans of the Vedic hymns found life pleasurable and exciting. They prayed to the gods for their hundred years of it, and for an after-life with the whole body. This view of life was replaced by one of horror and aversion, pervading everything Indian with its gloom,—the expectation of care, bereavement, sickness, pain, and death, in body after body, and through eon after zon.

The effort to work out a coherent and complete idea by means of some principle of unity appears in the following passages.

In the Mundaka Upanishad: "Saunaka, the householder, ap- proached Angiras and said, 'Holy sir, by knowing what may all this universe be known?' Angiras replied, 'Two sciences are to be known which they that transmit the Veda propound, a superior and an inferior science. Of these the inferior is the Rigveda, &e. The superior is that by which that undecaying being is attained. That which none can see, none can handle, which is without kindred, without colour, which has neither eyes nor ears, neither hands nor feet, which is imperishable, infinitely diversified, everywhere pre- sent, wholly imperceptible,—that is the immutable, that it is that

sages behold as the source of all.'" In reference to this text the scholiast Anandagiri says, "If we know the principium, the wpa- dana, of things, we shall know all things, inasmuch as all things have pre-existed in and are identical with their causes. Sanka- racharya says: "In daily life things are known to ordinary people, if the unities are known under which those things are contained. For example, individual picces of gold are known under the nature of gold. Thus the question of the text is, what is the one cause or emanatory principle of the diversity of the universe, which known everything else is known ?"

Iu the Chhandogya Upanishad: " His father said to him, ' Sve-

taketu, thou art high-minded, wise in thy own conceit, and proud. —

Tell me, hast thou asked for that instruction by which the unheard is heard, the unthought thought, the unknown known?' He answered, 'How is that instruction given, sir?' His father said, 'Dear sou, as by one lump of clay all that is made of clay becomes known, being a modification of speech only, a change, a name, and the clay being the only reality ; as by one piece of iron all that is nade of iron becomes known, being a modification of speech only, a change, a name, and the iron being the only reality ; as by a pair of scissors all that is made of steel becomes known, being a modifica- tion of speech only, a change, a name, and the steel being the only reality :—such is the method of that instruction.' Svetaketu said, 'Sir, doubtless my teacher knew not that, for, had he known it, how could he have failed to tell me of it? Do thou therefore tell me of it.' His father said, 'Be it so, my dear son. youth, was this in the beginning, one only, without duality. Some indeed have said, non-existent only was this iu the beginning, one only, without duality. From that non-existent the existent pro- ceeded. But how could this be so? how could entity proceed out of non-entity ?'"

In the Svetasvatara Upanishad: " Those that proclaim Brahman say, What is the prineipium? Is it the impersonal self? From what have we proceeded into life? into what do we return? By what are we upheld as we pass through pleasures and pains? Is time the principium? Is the inherent property of things their principium'? Is chance? Are the elements? Or is the individual soul the origin of all things? Or is the sum of these the

principiwm ? Neither is any one of these, nor are all of these, the principium, for it is the impersonal self. It is not the individual self, for that is not independent, being subject to pleasures and to pains."

The most powerful incentive to speculation was the yearning to escape the miseries of transmigration. The soul has to pass through hunger and thirst, sorrow, bereavement, decrepitude, death, in body after body, through age after age. The individual soul has to look forward to continual suffering through a countless series of embodiments. The series is without beginning, and, until the individual learns his impersonal nature, without end. The series of transmigratory spheres is projected and retracted, projected and retracted, from before all time. Periods of evolution and of dis- solution follow each other from and to eternity. Any intervals of pleasure in the series of states through which the soul passes are fugitive and unsatisfying. Even the pleasures of the paradises of the deities are tainted with the fear of their expiry, and with the inequalities amongst the participants. They also are part of the darkness in which everything appears to be involved.

The transmigratory series, or samsdra, is said to consist of agents, actions, aud fruits of action. The fruits of action are the bodies and the environments allotted according to good or evil works. It is described as an unbroken succession of evils,—birth, death, bereavement, and other sorrows,—arising from transition from body to body. The individual soul floats down the stream, "like a gourd upon the waters," through embodiment after embodiment, "from a patch of grass to the first of the divinities," through forms, inorganic and organic, vegetable, animal, human, ultra- human, infernal, and celestial. Each later stage is determined by the good or evil actions of the individual in his earlier embodi- ments, by a blindly, a fatally operating law of retribution, adrishta. It is in conformity to this principle that the opifer adificatorque mundi deus, the Demiurgus, [svara, puts togethcr and rules the transmigratory series through the successive eons. It is this principle that clears the Demiurgus of the charge of cruelty and Injustice on account of the miseries and incqualities of life. In all that it does and suffers the soul is reaping the fruits of its own actions. Its actions proceed from preferences and aversions : its preferences and aversions proceed from

illusion, from its identifying itself with its per se unconscious senses, faculties, and organism. Merit, no less than demerit, prolongs the series, and must be shunned as sin by the aspirant to extrication.

The world, then, was pictured by the Indian sages as a series beginningless and endless, of bodies and environments, through which personal souls—that is, the one soul illusively viewing itself as many—pass. They pass through it for the fruition of their works, bhoga. The material of which it is built up at each period of evolution is the cosmical illusion, ajnana, avidyad, maya brakriti. This is the principle by which soul mistakes itself for not-self, identifies itself with fictitious adjuncts, upddhi, with the

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organs, the faculties, the organism. It is this illusion that gives rise to the unreal world of duality, generable, mutable, corruptible, avidyaparikalpitam dvaitam. It is illusion that projects the manifold of experience, ndndtvapratyupasthapika maya. As the flow of transmigratory experiences is a succession of pleasures, pains, and neutral states, the world-projecting illusion is defined to be pleasure, pain, and indolence in equilibrium, gunatrayasamya. Pleasure, pain, indifference, are the three primordia rerum, the factors of experience, the three strands of the rope that holds the soul in bondage. The world-projecting illusion is further spoken of as the power of the Demiurgus, his all-creative power, " the power of the divine spirit latent in its constituent primordia." Thus Sankaracharya in his Bhashya on the Vedantasiitra says: "Name and form (%.¢., all that is heard and seen), the fictitious products of illusion, and the body of the omniscient Demiurgus, — name and form, inexplicable as entity and as nonentity, the germs of the transmigratory series, —are called the illusion, the power, the productiveness (prakriti) of the Demiurgus." This illusion is 'neither existent nor non-existent, nor both in one, neither to be explained as entity or as nonentity, fictitiously proceeding from an to all eternity." It is the illusory adjunct, wpadhi, of Brahman. The internal and the external order of things are illusorily

superposed (adhyasta, adhydropita) upon the one and only real, the impersonal self, by an illusion that has imagined itself from all eternity.

To illustrate this in the figures of the Vedanta :—" As a spider extends and retracts his threads, as plants grow up upon the earth, as the hairs of the hcad and body spring from the living man, so the world arises from the imperishable." " As from the blazing fire its kindred sparks proceed in thousands, so the diverse creatures proceed from that imperishable principle and into it return." All that presents itself to the soul in life after life, in sphere after sphere, lies in fictitious semblance above the real, like the blueness seen in the sky, though in the sky it has no existence; like the waters of a mirage; like the bubbles on the surface of a river ; like the airy fabric of a day-dream ; like the visions of a dream ; like the silver seen, or seeming to be seen, on the shell of the pearl-oyster ; like the snake seen by the belated traveller in a piece of rope; like the gloom that surrounds the owl amidst the noontide glare. The soul is confined to the body as within a prison. Its doings and sufferings are as unreal as the apparent motion of the trees upon the bank to one sailing down the river. The experience of life after life is the phantasmagory of a waking dream. The unreality, the fictitious nature, of the things of experience is implied everywhere in the Upanishads, and explicated with a profusion of imagery, by the Indian schoolmen.

The contents of this transmigratory series are supplied from the popular religion, the earlier imagery being built up into the new conception. A place is found in it for the deities and their paradises; only these deities and their paradises, up to the Demiurgus himself, the Isvara, and the brahmaloka, the sphere of Brahma, are per se fictitious, unreal, illusory. A sojourn in these paradiscs is promised to the religionist ; assimilation to these deities is promised to those that worship them with knowledge as well as with rites. Every man, the Indian schoolmen say, shall be assimilated to the deity he worships. The highest reward of obedience to sacred prescription and of worship of the deities is continuance in the brahmatoka till the end of an exon, "relative immortality," dpekshikam nityatvam. The only real immortality is extrication from metempsychosis, reunion with the impersonal self, to be reached not by works but by knowledge. They that delight in works, in rites, and the spheres won by

works, wander in darkness, are like the blind led by the blind. Works and worship are, however, necessary to purify the intellect of the aspiraut to extrication. The process of purification may go on through several successive lines. Good works performed without a view to recompense, and as an offering to the Demiurgus, pro- duce that purity of the internal faculties which is requisite to the knowledge that terminates in liberation from metempsychosis. They are thus instrumental to emancipation. Good works are necessary, says Sankaracharya, to the rise of the spiritual intuition ; they are unnecessary when it has once arisen. The qualified aspirant to liberation, the adhikdrin, must renounce all works, the good as well as the evil, for they serve only to prolong the series of his embodiments. It is thus that the popular religion is – taken up and fitted into the Vedanta philosophy. Karmavidyd is preliminary to brahmavidya.

Maya, the inexplicable illusion, self-imagined, has been the unreal adjunct, upadhi, illusorily overspread upon Brahman from all eternity. Brahman in its first connexion with ignorance or illusion is the Demiurgus, I'vara, Paramegvara, the constructive and superintending deity of the Vedantins. Before describing the process of things at a period of evolution, the couception of Brahman, the impersonal self, must be unfolded in the terms of the Vedanta.

Brahman is the one and real that underlies the many and ap- parent. It is ingenerable, immutable, incorruptible. It is the

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ultimate residuum of abstraction, to be spoken of only under negative predicates, sarvanishedhavadhi. It transcends duality, the world of subject and object, jnatrijneyabhavatirikta. It is one only without internal and external differences. "There is nothing before it, nor after it, nor within it, nor without it." It is ever- lasting, objectless cognition, nityam nirvishayam jnanam. "Of the sight of the seer there is no intermission, for it is imperishable.' lt is no object of the understanding, and it cannot be expounded in language. '"' From it words turn back, with the thinking faculty, not reaching it." And this Brahman, this impersonal self, is I, aham brahmésmi.

The impersonal self, Brahman, is "existent, intelligence, beati- tude," sachchidananda :—existent, as imparting existence and manifestations to everything that is known and seems to be, sat- tasphaurtipradataya ; intelligence, as being self-luminous, as giving light to all things, making to appear all things that do appear, svaprakisaka, sarvavabhasaka ; beatitude, as exempt from all the miseries of metempsychosis, from evil, pain, and sorrow, a beati- tude in which there is no distinction between the bliss and the blissful subject, @nanda and dnandin, a beatitude like the repose of drcamless sleep. It is "ever pure, intelligent, and free," nitya- suddhabuddhamukta :—pure, as free from desire and aversion, and passionless, and as unaffected by illusory limitations, nirwpadhika ; intelligent, as irradiating all things, illuminating the otherwise dark or unconscious modifications of the sensories and intellects of personal spirits, and as illuminating the objects of those modifica- tions ; free, as unaffected by the experiences of those spirits, exempt from implication in the unreal. It is unmodifiable, and therefore neither knows, nor acts, uor suffers. All cognition, action, and passion belong to the unreal world of duality, and are the modifi- cations of the sensory and intellect of personal souls. These modi- fications would be dark, that is unconscious, but for the light of the underlying real self, in which they shine forth. In the absence of that real self the whole transmigratory order would be involved in blindness, tadabhave jagadandhyam prasajycta. It is the wit- ness,—that is, the inner light—of the cognitions of the intellects ofall personal souls, sarvabuddhipratyayasdkshin. It is "the light of lights beyond the darkness." "To it the sun gives no light, nor the moon and the stars, nor the lightning,—how then this fire? That, as it shines, all the world shines after. By the light of that all this world shines forth."

Brahman is said to abide especially within the heart, for it is there that the internal faculties are lodged, and it is by the light of Brahman that they are illumined. It is " the one spirit internal toall sentiencies," ekah sarvabhitantaratma. It is present to them all, as the one sun is mirrored upon many watery surfaces, as the ether one and indivisible in many water-jars. The personal sclf, the jivatman, is said to be resolved into the impersonal Brahman in three states,—in dreamless sleep, in a period of dissolution between two xons, and in emancipation. Dreamlcss sleep is called a "daily dissolution," dainandinah pralayah.

To Brahman alone belongs existence in the strict sense of the term, paramarthiki satta. It is; everything else appears to be. The things of daily life have a conventional existence, sufficient for acting upon, insufficient to the reason, vydvahariki satta. The silver seen upon the shell, the snake seen in the piece of rope, have an apparent existence, pratibhasiki satta. or the sage conven- tional existence is only apparent existence. At the foot of the scale of being stand things impossible or absurd, tuchcha, as the flowers of the sky, the horns of the hare.

Brahman is both the real and the operative cause of the world, the upadana and the nimitia. It is the real cause, inasmuch as the transmigratory series fictitiously overlies it. "Over this the sky, the earth, the welkin, are woven." "Illusion," says Sankar- acharya, "the ageregate of the powers ofall causes and effects, reposes upon Brahman, woven across and across it, as the potentiality of the banyan-tree reposes in the secd of the tree." "A fictitious object," says Anandagiri, "such as the snake seen in a piece of Tope, has a relatively real substratum in the piece of rope; the trausmigratory serics, unreal because phenomenal, has a real sub- Stance beneath it." Brahman is the operative cause of the world, inasmuch as the world-projecting illusion, inert of itself, becomes active by proximity to Brahman, as iron is set in motion by the loadstone, the iron being inert of itself, and the loadstone unmoved and unchanged.

A process of evolution is called a "differentiation under name and form," ndmaripavyakarana. Processes of evolution and of dissolution follow one another from eternity to eternity. Embodi- ments have proceeded from works, and works from embodiments, im a series without beginning, as plants proceed from seeds and seeds from plants. The series must proceed for each individual until he learns his real nature, and becomes re-immersed in the fontal umity. The one, the ultimate spiritual reality, is knowledge. The many is ignorance, the semblance of knowledge, fictitious Cognition, illusion. Ignorance is not mere privation of knowledge : it has a kind of being; it is a false identification of self with not- self, bhavaripam ajhanam, viparitajhanam ajhanam.

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A process of evolution is as follows :—

(1) Brahman overspread with illusion manifests itself as Ivara, the Demiurgus. The illusion of Isvara is one with the illusion of each and every sentiency, and of all sentiencies, or jivas. It is at once one and many. As one itis the causal body of the Demiurgus; as many it is the beatific cnvolucra of sentiencies, their dnandama- yakosha, The Demiurgus and the sentiencies are one. Their state is a state of dreamless sleep, a state of beatitude. Isvara, the Demiurgus, is the first figment of the cosmical illusion. The Demiurgus allots to transmigrating spirits their several bodies and spheres of fruition, in accordance with the law of retribution, and retracts them into himself at the dissolution of the eon. Know- ledge of the real nature of his soul frees a man from all fear of Isvara.

(2) Brahman overspread with illusion next manifests itself as Hiranyagarbha. As one it manifests itself as Hiranyagarbha ; as many it is the sentieucies or jivas in the state of dreaming sleep, tatjasa. Illusion has two powers,—that with which it envelops the soul, hiding from it its proper nature, the dvaranasgakti, and that with which it projects the seeming bodies and their seeming spheres, the vikshepasakti. The elements, as yet imperceptible, come into being. Out of these the tenuous involucra, the vestures of the spirit in its passage from body to body, are evolved. Out of the imperceptible elements the perceptible are afterwards evolved. The soul clothed upon with a tenuous involucrum, and passing with it from body to body, from sphere to sphere, is the individual soul, the jzvatman. Hiranyagarbha is spirit identifying itself with the as yet imperceptible elements, and with the tenuous involucra. It passes through them as a thread passes through the beads of a necklace, and is called the thread-soul, Sitratman.

(3) Brahman overspread with illusion finally manifests itself as Vaisvanara or Virat. As one it is Vaisvanara, as many it is the sentiencics or jivas in the waking state, visva. Vaigvanara is the Purusha of the Purushasiikta: "A thousand heads has Purusha, a thousand eyes, a thousand feet." Purusha is Brahman, illusorily identifying itself with the perceptible elements, and with the bodies of all transmigrating spirits. Every sentiency, every man, in the waking state, is Brahman illusively identified with this or that visible and tangible organism. The perceptible are evolved out of the imperceptible elements by the process of

quintuplication, punchikarana. Each of the later of the five elements has the pro- perty of the earlier elements in addition to itsown. Ether has the property of sound ; air the properties of sound and tangibility ; fire the properties of sound, tangibility, and colour; water the properties of sound, tangibility, colour, and taste; earth the pro- perties of sound, tangibility, colour, taste, and smell. Of these elements the bodies of transmigrating spirits, and their several spheres of fruition, are composed.

Such is the order of evolution. An evolution is conceived by the Vedantins as an instantaneous process, rapid as a flash of light.

There are, then, three orders of intelligence in three states of ex- perience —(1) the Demiurgus, and the individual soul in the state of dreamless sleep ; (2) Hiranyagarbha, and the individual soul in the state of dreaming sleep; (3) Vaiévanara, and the individual soul in the waking state.

There are for these three orders of bodies—(1) the causal body of the Demiurgus, and the wrapper of bliss; (2) the tenuous in- volucra of transmigrating spirits—(these are made up of three wrappers, laid above the wrapper of bliss, viz., the cognitional wrapper, or the intellect and the organs of sense; the sensorial wrapper, or the common sensory and the organs of action; the respiratory wrapper, or the five vital airs, and the organs of action) ;—(8) the gross involucra, the visible and tangible bodies of transmigrating spirits, or nutrimentitious wrapper. Invested in these five successive wrappers, one above the other, the impersonal self manifests itself in the shape of innumerable sentiencies, as beast, as man, as god. It is present in all, as the one sun reflects itself upon many pools, as the one ether spreads itself through many water-jars. It is at the same time, apart from these illusory adjuncts, untouched with mundane sorrows, as the sun looks down upon the impurities of the earth without defilement.

Out of these successive involucra the individual soul, to extricate itself from metempsychosis, has to extract itself "like the pith out of areed." It extracts itself by returning to its proper nature. And to learn and recover his proper nature, his real self, a mau must purify his intellect, perhaps through several lives, and must put himself under a spiritual preceptor to

whom the Vedantic doc- trine has descended through an unbroken line of authorized expou- ents. Brahman is to be known by traditional exponents, uot by the mere exercise of the intellect. “ Not he that has not ceased from evil, not he that rests not from sensations, not he that is not concentrated, not he whose faculties are not quiescent, can reach that self by the intuition.” ‘This spiritual reality is not to be reached by learning, by memory, by much spiritual study. But if he choose this reality it may be reached by him; to him the self unfolds its own essence.”

The aspiraut to extrication, the mumukshu, must renounce every-

thing in this and in future spheres of fruition. He must become a sannyasin. In the words of the Brihadaranyaka Upanishad : ‘«They that know the breath of the breath, the eye of the eye, the ear of the ear, the thought of the thought, they have seen this fontal spirit, primeval, existing from before all time. It is to be seen with the intellect only. In it there is nought that is manifold. From death to death he goes that looks on this as manifold. It is to be seen in one way only. It is unthinkable, imperishable, un- sullied, beyond illusion. Unborn, infinite, imperishable, is Self. Let the patient Brahman know that and learn wisdom. — Let him not learn many words, for that is a weariness of the voice. This indeed is the great, Unborn Self. This it is that holy mendicants yearn after in setting out upon their wandering life. Yearning after this it was that the ancient sages desired no offspring, saying, ‘What have we to do with children, we to whom this spiritual reality belongs in the real sphere? They arose, and forsook the desire of children, of wealth, and of worldly existence, and set out as holy mendicants.’” The tardy aspirant, mandadhikarin, who seeks for gradual emancipation, kramamukft, is enjoined to mutter and to ponder incessantly upon the mystic syllable Om. This is said to be the nearest image of Brahman, to be identical with all words, and with all things. “They make mistake who leave me out, Me, when they fly, I am the wings; I am the doubter and the doubt, And I the hymn the Brahman sings.”

The spiritual preceptor proceeds by the way of “ illusory super- position, and the sublation of that superposition,” adhyaropaipava- danydyena.

Wlusory superposition is the viewing of the unreal, the fictitious series of souls and their environments, upon the one and only real. The sublation of this superposition is the position of the impersonal self, Brahman, as the sole reality, and the recogni- tion of the falsity of the fictitious illusion and of all its figments. The doctrine of sublation is expounded as follows in Nrisinhasaras- vati's Subodhini: "Sublation is the annulment of the series pro- ceeding from illusion. The states in this series are illusory emana- tions, vivertia, of Brahman, and to annul them is to abide as pure, undifferenced spirit. The apparent snake of the familiar example, seen by the belated wayfarer, illusorily proceeds from, or is fic- titiously produced upon, the piece of rope, without any change of nature taking place in the rope itself. It is sublated when the piece of rope resumes its proper shape. A thing may retain its own nature, and become otherwise than it was, in two manners, viz., by modification, parinéma, and by illusory emanation, v1- vartta. Moditication is when a thing really quits its proper form and takes another shape. Milk, for example, quits its proper form to take the form of curds and whey. Illusory emanation is where a thing, without quitting its proper form, takes another and a fic- titious shape. The piece of rope takes the fictitious appearance of a snake without quitting its proper form: it remains a piece of rope. The transmigratory series is not allowed in the Vedanta to be a modification of Brahman. Brahman, if modified as the milk is modified, would be mutable, and therefore perishable. The doc- trine of illusory emanation is not exposed to this difficulty. The series superposed on Brahman being fictitious, Brahman remains unchanged. A fictitious thing, then, is said to be sublated when only the real thing abides upon which it was imposed. The trans- migratory series is sublated when only the pure intelligence re- mains upon which it was fictitiously outspread."

By eontinuous contemplation the aspirant refunds each entity into the entity from which it emanated, till he passes beyond illu- sion to the fontal unity of undifferenced spiritual existence. He follows the order of dissolution, the inverse of the order of evolution, till he arrives at Brahman. He thus realizes the import of the great text, the mahdvakya, "that art thou," tat tvam asi (Chhan- dogya Upanishad, sixth Prapathaka). Particular souls are one with the universal soul, the Demiurgus, and the universal soul is one with Brahman. This knowledge

is the last and highest of cog- nitions, the final modification of the aspirant's intellect as it melts away into the fontal unity. This is the phalitam brahma, "the resultant impersonal self." The phalitam brahma is a modification of the aspirant's sensorium, his antahkarana, and passes away, that the impersonal self, the supreme spirit, may alone remain. He to whose inner faculties this vision is present has the spiritual intuition. samyagdarsana, He is extricated but alive, jivanmukta, and remains in the body till those merits are exhausted which have led to his present life. Disengaged from metempsychosis, and still in the body, the perfected sage is said to be untouched by merit and demerit, unsoiled by sin, uninjured by anything he does or leaves undone. No evil, the scholiasts say, arises from this freedom, as the purificatory virtues of the aspirant cling to the accomplished scer,—his humility, his sincerity, his tenderness to all, remaining upon him like ornaments even after the rise of the spiritual intui. tion. Finally his body falls away, and his spirit is freed for ever. It abides in itself. It is undifferenced existence, undifferenced intelligence, undifferenced beatitude. This is the consummation of brahmavidya.

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The soul has found itself, has loosed itself, not that in verity it was ever lost or bound. From the highest point of view bondage and liberation, implication and extrication, are unreal. The Vedantins compare the individual spirit seeking to regain its im- personal nature to one searching for that which he unwittingly carries about with him, to a man trembling at his own shadow. The soul of the finished sage knows itself, and therefore is itself, In the words of the Mundaka Upanishad: " Burst are his heart's ties, broken his doubts, his merits spent, when he has seen the principle supreme at once and not supreme. In the golden, perfect involucrum is the unsullied Self, without parts, luminous, which they know that know the soul." " As all rivers flowing onwards disappear in the sea, quitting name and form, so the sage extricated from name and form enters into the self-luminous spirit beyond the last of things, beyond illusion." In the words of the Brihadar- anyaka: "He that knows it is no longer sullied by evil deeds, Repressing his scnses, quiescent, free from all desires, ready to suffer all things, his thoughts fixed, he sees within

himself the Self, the universal soul. Imperfection reaches him no more; he passes beyond imperfection. He burns up all his imperfection. He that knows Brahman becomes free from imperfection, free from uncertainty, insphered in Brahman. This same great, unborn, Self is undecaying, undying, imperishable, beyond all fear. Brah- man is beyond all fear. He that knows this becomes the spiritual reality beyond all fear," (A. E. G.)

VEDAS. See BRAHMANISM and SANSKRIT LITERATURE.

VEDDAUHS, or Weppaus, that is, " Hunters," a primi- tive people of Ceylon, probably representing the Yakkos of Sanskrit writers, who appear to have been the true aborigines and the sole inhabitants of the island prior to the Hindu conquest. During the Dutch occupation (1644- 1796) they were met in scattered groups as far north as Jaffna, but are now confined to the south-eastern district, about the wooded Bintenne, Badulla, and Nilgala Hills, and thence to the coast near Batticaloa. They constitute three distinct social groups—the coast people, who are settled and partly civilized, freely intermingling with their Singhalese neighbours ; the wild or rock people, who keep entirely aloof, living exclusively on the produce of the chase; and the willage people, semi-nomad agriculturists, intermediate in every respect between the other two. The Veddahs are thus in a state of transition from the lowest to a relatively high degree of culture; and their physical appearance gives evidence of their intermediate position between the aboriginal and the intruding races of Ceylon. Virchow! finds (1) that the Veddahs and Singhalese have much in common, which is probably due to the inter- mingling of the aborigines with the Hindu immigrants, as is also suggested by historic and anthropological considera- tions ; (2) that both differ very decidedly from the Tamils of north Ceylon and south India ; (3) that the Veddahs show certain analogies with the small dark pre-Dravidian element in this region, which De Quatrefages calls "'Ne- grito," and which Huxley groups with his ' Australoid" division of mankind. The true Veddahs of Bintenne are almost a dwarfish race, averaging about 5 feet (men, 5 feet 2 inches ; women, 4 feet 10 inches), with correspondingly low cranial capacity, narrow high skull like the Papuan (index 70), mesognathous jaw, slightly prominent cheek- bones, straight, but shaggy rather than lank, black hair, and features altogether more Hindu than Negroid,

although of somewhat darker complexion than the ordinary olive- brown Singhalese. They wander about in small family groups, which have not reached the tribal state, being absolutely destitute of any political or communal organi- zation whatsoever. Their dwellings are the caves of the rocks or the forest trees; they clothe themselves with foliage ; and they devour uncooked vermin, reptiles, and whatever other quarry they are able to capture with their rude weapons. It is stated that they can neither count, mark the succession of time, nor distinguish colours; but what is more certain is that they never laugh, in this respect differing from nearly all other races. They also

1 Ueber die Weddas von Ceylon und thre Bexiehungen zu den Nach- barsténmen, Berlin, 1882.

appear to be the only savage people who speak an Aryan language, for their present speech at least seems to be a degraded form of Singhalese, consisting mainly of Sanskrit intermingled with Dravidian elements. This circumstance

has given rise to the theory that the Veddahs are a de-

graded group of Hindu outcastes, whereas they call them-

selves the "sons of kings," and claim to belong to a superior

caste, a claim which, strange to say, appears to be admitted by their neighbours. Their religion has been described as a kind of demon- worship, consisting of rude dances and shouts raised to scare away the evil spirits, whom they con- found with their ancestors. But these "demons" and "spirits" are purely anthropomorphic beings ; of a super-

natural order as understood by more cultured peoples they

have no idea. Owing to an increasingly low birth-rate, the Veddahs are disappearing as a distinct ethnical group ;

even including the Rhodiyas of the western uplands they

numbered only 2284 in 1886 (Ferguson's Directory). But they should not be confounded with these Rhodiyas, who, although true outcastes, are nevertheless a much finer race, tall, well-proportioned, with regular features, and speak a language said to be radically distinct from all the Aryan and Dravidian dialects current in Ceylon. There is, how- ever, in Travancore, on the mainland, a low-caste "Veda" tribe, nearly black, with wavy or frizzly hair, and now speaking a Malayalim (Dravidian) dialect (Jagor), who probably approach nearer than the insular Veddahs to the aboriginal pre-Dravidian '"Negrito" element of southern India and Malaysia.

VEGA CARPIO, Lopr Fetrx pr (1562-1635), Spanish dramatist and poet, was born on 25th November 1562 at Madrid, in a house in the Platerias or jewellers' quarter adjoining the Puerta de Guadalajara. His father and mother, Felix de Vega and Francisca Hernandez, belonged to the lesser provincial nobility, and originally came from the valley of Carriedo in Asturias, where the hamlet of Vega still exists. How they came by the illustrious name of Carpio is not very clear; the family tradition which made them descendants of the famous Bernardo seems insufficiently supported. Lope himself frankly ridiculed the aristocratic pretensions of his parents; but this did not prevent him from invariably signing his comedies at full length as Lope de Vega Carpio. Lope began his studies in the imperial college, the principal establishment of the Jesuits in Madrid, where he was instructed in grammar and rhetoric. His precocity was extraordinary and his memory astounding. At five he read not only Spanish but Latin, and already showed such a passion for poetry that he would give up part of his meals to the older boys in exchange for their services in writing out verses to his dictation. It was not the way of the Jesuits to turn out pedants ; educators of the nobility, their single aim was to make their pupils accomplished men of the World, and accordingly Lope learned with them, besides the ordinary book-lessons, the accomplishments of singing and dancing and fencing. On leaving college —where he had been guilty of an escapade of some sort along with one of his companions—he was placed by his parents, who were far from wealthy, in the service of Don Gerénimo Manrique, bishop of Avila. Such

an arrangement did not at that time involve any sacrifice of dignity : it was almost the only resource open to a multitude of needy gentlemen, hidalgos, who, to avoid entering a trade, which would have compromised their position, found in the palaces of the higher aristocracy, first as pages and afterwards as secre- taries, the wherewithal to pasar la vida, as the phrase ran. Tn the service of Don Gerénimo, Lope appears to have begun the composition of his earlier dramas. But after a while he quitted the bishop's service to enter the university of Alcal4, where for four years he devoted himself to what

was then honoured with the name of philosophy, crammed his brain with names and citations from ancient writers, and acquired the habit of disputing in accordance with the formulz of the schools. It was then that he accumulated the materials for the pedantic dissertations with which the prefaces to his various works are encumbered, in which he so complacently displays everything that he has remembered of his university days. Leaving Alcal4 with the degree of bachelor in arts, Lope became secretary to the duke of Alva. Some time afterwards, about 1584, he married Isabel de Urbina, daughter of a herald-at-arms of Philip II. An incident such as he often afterwards reproduced in his plays soon arose to disturb the union. Some one who had spoken ill of Lope, and had in turn been severely lampooned by the poet, challenged him. In the encounter Lope wounded his opponent ; but he was unable to put himself right with the law and was compelled to take to flight. Perhaps he may have had upon his con- science some other peccadilloes which prejudiced him in the eyes of his judges, as seems to be hinted in Montal- ban's words, " This vexatious affair, and certain other bad turns of fortune, . . . compelled him to leave hig home, his country, and his wife." He retired to Valencia, where he met with an enthusiastic reception from a group of young poets, who were destined afterwards to range them- selves under the banner of the creator of the new comedy. After the lapse of two years Lope returned to Madrid 3 but in 1588 his wife died after giving birth toa daughter, who did not long survive her mother. The death of his wife and daughter were doubtless what now led him to

join the Invincible Armada, in which expedition he had

one of his brothers shot dead by his side. Once more at Madrid, he again entered service, becoming secretary, first to the marquis of Malpica and afterwards to the duke of Lemos. Meanwhile he married a second wife, Juana de Guardio, a Madrilefia, by whom he had two children (Carlos, who died in infancy, and Feliciana Felix) ; but she died, shortly after giving birth to the latter, in 1612. During this wife's lifetime the poet had by a mistress, Maria de Luxan, two other children,—Marcela del Carpio, who became a nun, and Lope Felix del Carpio y Luxan, who chose the profession of arms and perished at sea at the age of fifteen. Widowed a second time, Lope, like many other men of letters of the period, sought a refuge in the church. After a period of initiation, and after hav- ing been for some time affiliated to a tertiary order, he took priest's orders. At this juncture, that is to say, about 1614, he was in the very zenith of his glory. A veritable dictator and pope in the Spanish world of letters, he wielded over all the authors of his nation a sort of magisterial power similar to that which was exercised in France at a later period by Voltaire. At this distance of time we fail to see in Lope anything more than a great dramatic poet, the founder of the Spanish theatre; but to his contemporaries he was a great deal more. His epics, his pastorals, his odes, his sonnets, buried though they now are in oblivion, all placed him in the front rank of authorship. Such was his prestige that he dealt with his noble patrons almost on a footing of equality. The duke of Sesa in particular, his last Mzcenas, was also his per- sonal friend, and the tone of the letters addressed to him by the poet is that of a frank familiarity, modified only by some forms of deference,—a fact sufficiently striking to be worthy of notice at a time when talent, however great, in no way diminished differences of rank, and when the man of letters under the protection of a patron was neither more nor less than a kind of domestic in the house of a grand seigneur. Lope's fame, too, had travelled abroad : foreigners of distinction passing through Madrid made a point of visiting him; papal legates brought him the XXIV. — 16

compliments of their master; in 1627 Urban VIII, a: Barberini, sent him the diploma of doctor of theology in the Collegium Sapientiz and the cross of the order of St John of Jerusalem (whence the poet's titles of Doctor and Frey). Since Lope's correspondence with the duke of Sesa has made us acquainted with the closing period of his life, we may well ask whether his retirement within the church was the result of any genuine vocation, and up to what point his devotion was sincere. It Is difficult to avoid inquiring whether it may not have been due to a mere selfish desire for tranquillity, a desire to protect himself against any further reverse of fortune. This feel- ing may very well have had something to do with his decision ; still it would be unjust to regard Lope as nothing better than a mere hypocrite. Certainly he was far from being an ideal priest; we now know something of the nature of the services which he often rendered to the duke of Sesa, and we know how lightly he held one of his most sacred vows, maintaining for a long period illicit re- lations with Marta de Nevares Santoyo, a married woman, by whom he even had a daughter, who was baptized very publicly at San Sebastian in Madrid (26th August 1617), the son of the duke of Sesa acting as godfather. But, on the other hand, we must not forget his penitence, frequently expressed in touching terms, the sincerity of which ought to be above suspicion: 'Mal haya amor que se quiere oponer al cielo!" He has a claim also to our pity for having been at an advanced age the victim of foolish passion which his extreme mobility of character and his utter want of balance made him unable to resist: "Yo nac{i en dos extremos que son amar y aborrecer; no he tenido medio jamas." His last years were years of severe penance: Montalban tells us that every Friday the poet scourged himself so severely that the walls of his room were sprinkled with his blood. His death, on 27th August 1635, was followed by national mourning. The duke of Sesa, his executor, was chief mourner; the nobility and the church were represented by high digni- taries; the populace crowded the streets. After the funeral came a multitude of funeral orations and of pane- gyrics in prose and verse. Montalban has collected into a volume the tributes of posthumous admiration thus paid by Spanish authors; another collection was printed in Italy under the auspices of Marini.

In the intercourse of everyday life, in his relations with his con- temporaries, Lope was affable and kindly. He sometimes defended himself

when attacked, especially on the subject of his dramatic writings, but always in measured terms and without any pretence that his high position exempted him from criticism by his less successful rivals. Some severe and unjust criticisms on other writers, notably on Cervantes, are quoted against him; but it is only fair to remember that they occur in letters to his intimates and that it is not necessary to regard them as deliberate. It would be just as fair to set him down as an enemy of the secular clergy because in writing to the duke of Sesa he on one occasion expressed himself thus freely about the monks: " Los frailes son los hombres mas discretos del mundo: no van a la guerra, ni pagan millones gozan lo mejor, y danles dineros, . . . ellos hacen hijos y otros los crian, perdone lo descalzo." It would indeed be more just to reproach him with his universal and uniform indulgence, which he extends to all, great and small, good and bad, and 'with his mania for praising in hyperbolical and extravagant terms. He loved all the arts, particularly painting ; his little house in the Calle de Francos was full of pictures. He himself writes to a friend in 1619: " With some garden flowers, half-a-dozen pictures, and a few books, I live without envy, without desire, without fear, and without hope" (dedication of El Alcalde Mayor). But his 'most marked taste was for flowers. He had a small garden, which he himself tended with jealous care ; he sought out rare species and tried to acclimatize in Spain varieties of plants sent by his friends from abroad. In particular he was a tulip-fancier; hence his dedication of Lucinda Perseguida to Manuel Sueiro, a Spaniard resident in Flanders who had supplied him with fine specimens. Tending this garden became the great occupation of his old age ; he watered it with his own hands, and, according to Montalban the chill which led to his death was caught while he was thus engaged.

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One can easily detect in his writings the traces of this taste. It is not that he had in a higher degree than his contemporaries the feeling for nature, but the form, the colour, the perfume of flowers largely supply him with his figures and metaphors—his flowers of rhetoric, in short. It is to be regretted that this delicate taste of his, a taste very rare in Spain, where flowers and trees have never been greatly cared for, should have contributed rather to augment than to lessen the elaborateness,

pomposity, and affecta- tion of his style. But these faults were shared by all the writers of that age. In his comedies, for example, where he does not pique himself on a fine style and does not attempt to take the Latins or the Italians for his models, his language is, if not nervous and self-restrained, at least limpid and flowing, in this respect contrast- ing very favourably with the florid and laboured style of his epics and prose pastorals. Viewed broadly, and leaving out of account certain theories which in the long run greatly influenced his manner of writing, Lope belouged in literature to what may be called the school of good sense ; he made it his boast that he was a Spaniard pur sang, and steadfastly maintained that a writer's business is to write so as to make himself understood. When brought face to face with the coterie of the précieux and quintessenciés, the 'cultos," and "criticos," and "conceptistas," Lope takes the position of a defender of the language of ordinary life, the good old Castilian tongue. In the dispute which arose between the partisans of the two schools of "cultos" or "culteranos" and "llanos," the dramatist ranged himself on the side of the latter. In the matter of versification he refuses to admit that the long Italian verse has the advantage of the Castilian octosyllabic: "No pienso que cl verso largo Italiano haga ventaja al nuestro, que si en Espafia lo dizen es porque, no sabiendo hazer el suyo, se passan al estrangero como mas largo y licencioso. . . . Qué cosa iguala 4 una redondilla de Garci Sanchez 6 Don Diego de Mendoza?" (Preface to Isidro). Unfortunately the books that he read, his literary connexions, his fear of being unfavourably judged by the Italians, all exercised an influence upon his naturally robust spirit, and, like so many others, he caught the prevalent contagion of mannerism and of empty and pompous phraseology. In his studies at the imperial college and at Alcala Lope had never found his way up to the truest and highest sources of the beautiful; he had never attempted Greek, but had contented himself with Latin, which he chose to regard as the only ancient tongue which a man of letters needed to learn. To his natural son, Lope Felix del Carpio, when enter- ing upon his Latin studies, he wrote, "So you have begun to grapple with the rudiments? It is one of the things which cannot possibly be avoided ; but, for all that, if I could find some one to teach you your own language well, I should be quite satisfied, for I have seen too many of those who, having learned Latin, are ignorant of their native tongue and aflect to despise everything written in the vulgar idiom. What

presumption to forget that the Greeks did not write in Latin or the Latins in Greek! I con- fess I laugh whenever I see men giving themselves out for Latin poets who write in their own language like mere barbarians ; and I conclude that they cannot possibly have been born poets, for the true poet (there is not more than one, they say, in a generation) writes in his own language, and it is therein that he shows his excellence,—witness Petrarch in Italy, Rousard in France, and Garcilaso in Spain. Nevertheless I do not wish to discourage you from learning that queen of languages (Latin), the third in the world in point of antiquity. Try to know it as well as you can, my son, but by no means learn Greek, for I would not have you like those who strut and give themselves airs because they have acquired a smattering of it. Greek tends too much to vanity, and what is the use of learning a language which is known to so few ?" After thus warning his son against the dangers of Greek, Lope adds other counsels which reveal to us his feelings towards his own bygone days. " Have but few books, and those choose with care ; diligently observe the thoughts they contain, and do not let any- thing noteworthy pass without a mark on the margin. Should it be your misfortune to become a maker of verses (which God forbid !) try at least not to make that your chief occupation, nor let it divert you from more important matters, for therein you will spend your time to no profit. The less of verse you make the more you will be esteemed and appreciated. You need only take an example from me. Certainly you will never be able to render more services than I have done to so many patrons, and see to what my diligence — has brought me,—to the smallest of houses, a narrow bed, a poor table, and a patch of garden, the flowers of which dispel my cares and supply mie with ideas." Lope knew only Latin, but this he knew well. Yet, instead of filling himself with the spirit of antiquity, and purifying his taste by contact with its literary masters, he regarded their writings as nothing more than re- pertories of beautiful and out-of-the-way expressions. After the Latins Lope turned by preference to the Italians. Like every other Spanish man of letters of his time, he had been reared ou Italian literature: he knew intimately the works of its great poets of the Renaissance, especially Ariosto and Tasso, as well as Sau- nazaro, the last-named of whom he imitated on several occasions ;

yeached him from that quarter.

he kept a steady watch upon all that was published in Italy, eultivated carefully the eonnexions he had established with Italian writers of repute, and was always flattered by the eulogies which

His principal friend and eorre-

spondent in Italy was the Neapolitan poet, G. B. Marini, one of the worst corrupters of Italian literature (see vol. xiii. p. 511). He puts himself at Marini's feet, calls him antistes Musarwm and Ttaliez decos, sends him his portrait, and humbly begs his in- dulgence for a drama which he has been so bold as to dedicate to him (see dedication to Virtud, Pobreza, y Muger). Lope knew French also, and his works give evidence of an acquaintance with French poetry of the 16th and 17th centuries such as is rare in Spain ; he oceasionally quotes Ronsard and Malherbe, and shows solicitude as to French opinion about his dramatic writings. In a word, his literary culture was chiefly Latin-Italian ; and, if he defends the tradition of the nation, and the pure simplicity of the old Castilian against "los de la nueva poesia," that is to say, the innovators of the school of Gongora, and against the jargon of the "cultos," still he does not wish to be taken for an unin- formed person, for a mere casual litterateur devoid of classical training: he especially emphasizes the fact that he has passed through the university, and is continually accentuating the differ-

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ence between the

ingenios cientificos" (those who know Latin)

and "legos ignorantes" (ignorant laymen). With what a sense of superiority, for example, does he mention that Cervantes was not to his mind sufficiently "cientifico" (preface to Las Fortunas de Diana), the fact being that Cervantes had been neither at Alcala

nor at Salamanca !

For a rapid survey of the works of Lope, it is convenient to begin with those which the Spaniards include under the name of Obras Sueltas, the title of the large collection of the poet's non-dramatic works (Madrid, 21 vols. 4to, 1776-79). We shall enumerate the most important of these, as far as possible in the order of publication. The Arcadia (1598), a pastoral romance, composed at the instanee of the duke of Alva, and inspired by Sannazaro, Montemayor, and Cervantes, is one of the poet's feeblest

and most wearisome productions.

Isidro (1599), anarrative of the

hfe of Isidore, patron of Madrid, is ealled a Castilian poem on account of the rhythm in which it is composed,—quintillas of octo- syllabic verse. The Hermosura de Angélica (1602), in three books, isa sort of continuation of the Orlando Furioso, in octaves after the fashion of the original poem. Similar in form is La Dragontea, a fantastic history of the last expedition and the death of Sir Francis Drake, who was sueh a terror to the fleets and the coast of Spain that his name had become a synonym for that of the evil one. Finally the Rimas are a miscellany of short pieces. In 1604 was published the Peregrino en su Patria, a romance in prose and verse, similar in kind to the Zthiopica of Heliodorus; it is a mediocre work, but of great bibliographical interest, on account of its authentic lst of the comedies which Lope recognized as having been written by him up to that date, a list whieh he augmented by 114 new titles in the 1618 edition of the novel. The more Lope composed poetry the more he went to the Italian poets for inspiration, labouring to show that the mechanism of the Italian octave was as familiar to him as that of the national redondilla. Having imitated Ariosto, he proeeeded to imitate Tasso; but his Jerusalem Conquis- tada (1609) has preserved nothing of the art shown in its model, and isa dull and insipid performance. Little need be said about the Pastores de Belen (1612), a sort of pious pastoral, dedicated to his son Carlos, which forms a pendant to his secular Arcadia, or about the incidental pieces which he published in eonnexion with the solemnities of the beatification and canonization of St Isidore in 1620 and 1622. And it is cnough simply to mention La Filomena (1621), La Ciree (1624), and other poems published about the same date, as also

the four prose novels, Las Fortunas de Diana, El Des- dichado por la Honra, La Mas Prudente Venganza, and Guzman el Lravo. The great success of the Novelas Egemplares of Cervantes (1613) had stimulated Lope, who wished to measure himself with the author of Don Quixote on the field of the novel; and, as this literary form had been borrowed from the Italians, he expected to achieve a success as great as that which he supposed to be already his in the fields of pastoral romance and epic poetry. But in this Instanee at least the "cientifico" was eompletely defeated by the "lego": Lope's novels have none of the grace, naturalness, or interest whieh charaeterize those of his rival. The last important work which has to be mentioned before we leave the narrative poetry of Lope is the Lawrel de Apolo (1630). This piece deseribes the coronation of the poets of Spain on Helieon by Apollo. All of them—good, middling, and bad—share in the ceremonial, and 'mong the poets properly so called appear some other men of letters, certain important personages to whom Lope felt under obligations, Which eould not be more satisfactorily paid than in the current coin of verse which he had so readily at his eommand. This work 18 more meritorious as a bibliographical manual of Spanish poetry at that time than as genuine poetry. One other "obra suelta,"

ing a drama, is La Dorotea (1682).

closely akin to Lope's dramatic works, though not properly speak-

Lope describes it as an "action

in prose," but it is rather a "romance in dialogue"'; for, although divided into aets, the narrative has nothing dramatic about it ex- eept its outward form ; and on account of its size and the digres- sions with which it is encumbered it has never suceeeded in finding its way to the stage. It belongs to the class of whieh Celestina is the type, in so far as one of the principal characters, La Gerarda, is a go-between ; but Lope has amplified his model, idealized it, and purged away much of the grossness belonging to the mean sur- roundings of the eharacter of the original Celestina and common to the numerous works of the 16th and 17th centuries to which it gave rise. Of all Lope's productions Dorotea is undoubtedly that which shows most observation and study; the style also is unusually simple and easy. The attempt has sometimes been made to

dis- cover in the adventures of Fernando, one of its heroes, allusions to Lope's early youth ; but there is nothing conclusive in any of the supposed eoincidences between fact and fiction which Fauriel and others after him have sought to establish. Of all this mass of Obras Sueltas, filling more than twenty volumes, very little (leaving Dorotea out of aceount) holds its own in the impartial judgment of posterity. The long epic or narrative poems are quite unreadable, and almost the same must be said of the pastorals and novels. The lyrical element alone retains some vitality. From the Rimas and other eollections of detached pieees one eould compile a pleasing anthology of sonnets, epistles, elegies, and romances, to whieh it would be proper to add the Gatomaquia, a burlesque poem pub- lished along with other metrieal pieces in 1634 by Lope under the pseudonym of Tomé de Burguillos. But here the list would have to stop.

It is, however, to his dramatic writings that Lope owes his very considerable place in literary history. It is very curious to notice how he himself seizes every available oceasion for depreciating the work of the drama, treats the art of comedy-writing as one of the humblest of trades (de pane lwerando), and protests against the supposition that in writing for the stage his aim is glory and not money.! The reason is not far to seek. The Spanish drama, which, if not literally the creation of Lope, at least owes to him its defini- tive form—the three-aet eomedy—was totally regardless of the pre- eepts of the school, the pseudo-Aristotelianism of the doctors of the period. Lope accordingly, who stood in awe of the criticism of the " cientificos," felt bound to let them see that, from the point of view of literary art, he attaehed no value to the "'rustie fruits of his humble vega." In his Arte Nuevo de Hacer Comedias en Este Tienvpo, which was published in 1609 and is the Ars Poetica of the new school, Lope begins by showing that he knows as well as any onc the established rules of poetry, and then exeuses himself for his in- ability to follow them on the ground that the " vulgar" Spaniard eares nothing about them. " Let us then speak to him in the language of fools, since it is he who pays us." Under such condi- tions all that the dramatic poet can do is to plan ingenious plots, so as adroitly to sustain the interest and retard as long as possible the denouement, for nothing is more displeasing to the ordinary public than to be able to divine too soon the solution of the problem set

before them on the boards of the theatre. Such, with a few pieces of advice as to the choice of metres and the costuine of the actors, is the recipe for the new or free comedy, a barbarous kind- of literature, according to Lope, and outside the region of art, yet the only drama possible in Spain.? Another reason, more scrious still, which made it neeessary for him to speak deprecatingly of his dramatic works is the eircumstanee that the vast majority of them were written in haste and to order, precisely like so many feuilleton romances of Alexandre Dumas; they are for the most part comedias de repente, hurriedly conceived at the request of some grandee or of some impresario or manager. The poet does not hesitate to con- fess that "more than a hundred of my comedies have taken only twenty-four hours to pass from my brain to the boards of the theatre." Perez de Montalban, who has a great admiration for this kind of eleverness, tells how, at Toledo, on a certain oceasion, Lope eomposed fiftecn acts in fifteen days—that is to say, five entire comedies, which he read to his friends step by step. with the process of their composition. On another occasion, when pressed by a manager who wanted something for the carnival, Lope took Mon- talban asa eollaborateur ; the two friends parcelled out the eomedy between them, Lope undertaking the first act, Montalban the second, and the third, to save time, was divided between them. In two days they had finished the first two acts, and on the third Mon talban rose at two in the morning and at eleven he had finished. Then he went in search of Lope, who, when questioned as to his progress, replied: "I got up at five, finished the aet, break- fasted, wrote an epistle of fifty tercets, and have now finished watering the garden, and a rather tough business it has been. This is not art; it is handicraft, and one understands why Lope sometimes found it prudent to lay stress on the fact that his come- dies had been written for the ears of spectators, not for readers in ere ee ee ee ee

1 Algunos que piensan que las escribo por opinion ; desengafieles V. M. y digales que por dinero. A

2 Las comedias de Espana no guardanelarte . . . porque con aquel rigor de ninguna manera fueran oidas de los Espafioles.

their studies.1 Nevertheless, he did write some dramas in which the plan is more fully matured and the execution more carefully carried out; still, hurried composition and reckless production are after all among the most distinctive marks of his theatrical works. 'Towards the close of his career Lope somewhat modified the severe and disdainful judgments he had formerly passed upon his dramatic performanees; he seems to have had a presentiment that posterity, in spite of the grave defects of his work in that de- partment, would nevertheless place it much higher than the Jeru- salem Conquistada, La Dragontea, and other works of which he himself thought so much. In his Hgloga & Claudio, which is, so to say, his literary last will and testament, he claims to have becn a creator: "It is to ine that the art (of comedy) owes its beginnings, although I have departed from the strictness of Terence, and do not fora moment pretend to deny the part which belongs to the three or four great geniuses who have watched over the infancy of the drama. To whom are we indebted, Claudio, for so many de- lineations of love and jealousy, so many moving pieces of eloquence, such a copious supply of all the fignres which rhetoric has ever been able to invent? All that is produced to-day is nothing but imita- tion of what art created yesterday. The path,—it is I who have opened it up and made it practicable, and everybody now traverses it with ease. It was I who gave the example which is followed and copied on all hands." We may certainly credit Lope with creative power, with the instinct which enabled him to reprodnce the facts of history or those supplied by the imagination ina multi- tude of dramatic situations with an astonishing cleverness and flexi- bility of expression ; but unfortunately, instead of concentrating his talent upon the production of a limited number of works which he might have brought to perfection, he dissipated it, so to say, and scattered it to the winds.

The catalogue of Lope's comedies has been drawn up by himself; and, in spite of some discrepancies in his figures, it is established that up to 1604 he had composed, in round numbers, as many as 230. In 1609 the figure had risen to 500, in 1618 to 800, in 1620 to 900, im 1625 to 1070, and in 1632 to 1500. Ultimately Montalban in his general survey published in 1636 (Fama Posthuma) set down the total of Lope's dramatic productions at 1800 comedies and 400 autos sacramentales. Of this number there are nearly 608 comedies of which the text is extant, or which are at least

known to us by their titles (from the lists of the Peregrino) ; but the printed or MS. text of only 439 is actually accessible, besides some 40 autos and a few entremeses. Very many of these pieces were printed during Lope's lifetime, either in collections of varios autores or as separate issues by booksellers who bought from the actors in an underhand way the manuscripts of their réles or else caused the unpublished comedy to be written down from memory by persons whom they sent to attend the first representation. Such pieces therefore as do not figure in the collection published under Lope's own direction or under that of his friends cannot be regarded as perfectly authentic, and it would be unfair to hold their author responsible for all the faults and defects they exhibit. On the other hand, there exist in various libraries entire comedies in Lope's own handwriting which have never been printed.

The classification of this enormous mass of dramatic literature is a task of great difficulty, inasmuch as the terms usually employed, such as comedy, tragedy, and the like, do not apply here. There is not explicitness enough in the division current in Spain, which recognizes three categories :—(1) comedias de capa y espada, the subjects of which are drawn from everyday life and in which the persons appear as simple caballeros ; (2) comedias de ruido or de teatro, in which kings and princes are the leading characters and the action is accompanied with a greater display of dramatic maehin- ery ; (3) comedias divinas or de santos. Some other arrangement must be attempted. In the first place Lope's work belongs essenti- ally to the drama of intrigue; be the subject what it may, it is always the plot that determines everything else, not the delinea- tion of manners or of character. Lope in the whole range of his dramatic works has not a single piece comparable to La Verdad Sospechosa of Alarcon, the most finished example in Spanish litera- ture of the comedy of character ; and what is called the comedy of manners is no better represented : only El Rufian Castrucho, El Anzuelo de Fenisa, and one or two others can be named. It is from history, and particularly Spanish history, that he has borrowed more than from any other source. It would in fact be difficult to say what national and patriotic subjects, from the reign of the half fabulous King Pelayo down to the history of his own age, he has not put upon the stage. Sometimes he contents himself with serv- ing up old chronicles afresh or stringing together fragments of

old popular songs, as in El Bastardo Mudarra, with inventing here and there a few secondary characters when the original material is not sufficiently rich and complicated, as in Las Doneellas de Simancas Los Benavides, El Casamicnto en la Muerte, and many others or sometimes even with clothing with complete dramatic action one

1 No las escrivi.. . para que de los oydos del teatro se trasladaran a la censura de los aposentos.

single fact of history, as in one of his most famous plays, La Estrella de Sevilla, in Porfiar hasta Morir, in El Mejor Alcalde el Rey, and others. Even current events as they took place under his eyes furnished him with motives. In an age when people read but little, the theatre was a channel of information and a means of rousing patriotic sentiment. A victory of the Spanish arms in Flanders or the success of hardy adventurers in planting the royal banner of Castile in some virgin land in the West,— events like these promptly gave rise toa comedy. On the basis of any sort of report of battle or conquest Lope improvises a dramatic action, or at least a narrative in dialogue. Thus under the title of La Mayor Victoria de Ale- nania he describes a victory won in the Palatinate by Don Gonzalo de Cordoba, brother of the duke of Sesa, his patron. Such are the principal varieties of historical or heroic comedy. But it is to the class of capa y espada—also called novelesco, because the subjects are almost always love intrigues complicated with affairs of honour— that Lope's most cclebrated plays belong. In these he has most fully displayed his powers of imagination (the subjects being all invented) and his skill in elaborating a plot. Among the plays of this class which are those best known in Europe, and most frequently imitated and translated, may be specially mentioned Los Ramilletes de Madrid, La Boba para los Otros y Discreta para st, El Perro del Hortelane, La Viuda de Valencia, and El Maestro de Danzar. In some of them Lope has sought to set forth some moral maxim, and illustrate its abuse by a living example. Thus, on the theme that "' poverty is no crime," we have the play entitled Las Flores de Don Juan, in which he shows in the history of two brothers the triumph of virtuous poverty over opulent vice; at the same time he attacks

indirectly the institution of primogeniture, which often places in the hands of an unworthy person the honour and substance of a family when the younger members would be much better quali- fied for the trust. Such pieces are, however, rare in Lope's repertory ; in common with all other writers of his order in Spain, with the occasional exception of Alarcon, his sole aim is to amuse and stir his public, not troubling himself about its instruction. The strong point of such writers is and always will be their management of the plot. As has been said by Le Sage, a good judge: 'The Spaniards are our masters in the art of planning and skilfully work- ing outa plot ; they know howto set forth their subject with infinite art and in the most advantageous light." It is not necessary to dwell here upon the other varieties of comedy represented in Lope's works, that is, the comedias divinas, fiestas Qnythological dramas for the most part), entremeses, and autos. In none of them has he produced anything of the highest order, or even comparable to the better performances of his contemporaries and successors.

To sum up, Lope found a poorly organized draina, plays being composed sometimes in four acts, sometimes in three; and, though they were written in verse, the structure of the versification was left far too much to the caprice of the individual writer. The style of drama then in vogue he adopted, because the Spanish public liked it. The narrow framework it afforded he enlarged to an extra- ordinary degree, introducing everything that could possibly furnish material for dramatic situations,—the Bible, ancient mythology, the lives of the saints, ancient history, Spanish history, the legends of the Middle Ages, the writings of the Italian novelists, current events, Spanish life in the 17th century. Before him manners and the conditions of persons and characters had been barely sketched ; with fuller observation and more careful description he created real types, and gave to each social order the language and drapery appropriate to it. The old comedy was awkward and poor in its versification ; he introduced order into the use of all the forms of national poetry, from the old romance couplets to the rarest lyrical combinations borrowed from Italy. Hence he was justified in say- ing that those who should come after him had only to go on along the path which he had opened up. Calderon notably, whose merit has been much exaggerated, especially since the Germans took him under their protection, is merely a pupil and inferior to

his master ; at all events, his indebtedness to tle latter is enormous and has not as yet been adequately recognized.

Bibliography.—For the life of Lope, see Juan Perez de Montalban's Fama Posthuma (4to, Madrid, 1636; reprinted in Bibl. Rivadeneyra); La Barrera, Catdlogo del Téatro Antiguo Espanol; Von Schack, Geschichte der dramatischen Literatur und Kunst in Spanien, vol. ii.; and Ultimos Amores de Lope de Vega Carpio (8vo, Madrid, 1876), an extract by Francisco Asenjo Barbieri from an unpublished biography written by La_ Barrera in connexion with the poet's correspondence with the duke of Sesa. For Lope's literary theories and doctrine of dramatic art, reference may be made to Menéndez-Pelayo, Historia de las Ideas Estéticas en Espafia, and to A. Morel-Fatio, La Comédie Espagnole du XV Ime Siécle (8vo, Paris, 1885). The Obras Sueltas were published by Francisco Cerda Y Rico (1 vols. 4to, Madrid, 1776-79). For the bibliography of the comedies, see La Barrera. The selection of comedies published by Hartzen-

busch in four volumes in the Biblioteca Rivadeneyra is fairly good; but the same cannot be said of its choice of Obras Sueltas. (A. M.-F.)

VEGA, Garcttaso DE LA, See GAaRciLaso.

VEGETABLE KINGDOM2 There is one peculiar factor which enters into the problem of the classification

> The problem of classification being essentially the same in the

animal and vegetable kingdoms, the reader is referred to the general discussion of it in the article ANIMAL KINGDOM.

Yr? cETAaAeELai KINGDOM

of plants and materially adds to its complexity. It is the polymorphism of the individual: that is, the life-history is usually complex, the individual assuming different forms in various stages of its life-history. Thus, in the great majority of plants there is a well-marked alternation of generations, —an alternation, that is, of a sexual form, the gametophyte, with an

asexual form, the sporophyte (see REPRODUCTION, vol. xx. p. 423). And not only so, but in many cases one or other of these generations presents a number of different forms. Hence the true affinities of any individual cannot be regarded as satisfactorily ascer- tained unless its life-history is fully known ; and, since in most cases the various forms are perfectly separate, and often quite dissimilar, there is difficulty in obtaining all the information necessary for determining the true system- atic position of a plant,—a difficulty which has not yet been overcome in very many cases.

Comparatively little light is thrown on the affinities of existing plants by the information which has been accumu- lated with regard to the extinct fossil forms. In no case can the genealogy of an existing plant be traced as in the ease of the horse among animals (see ANIMAL KINGDoM).

The vegetable kingdom is usually divided into the four following sub- kingdoms:—I. Tuattopuyta; II. Bryo- puyTa; III. PreripopHyta; IV. PHANEROGAMIA (SPER- MAPHYTA).

All of these, except some Thallophyta, present a more or less clearly marked alternation of generations. In all cases the more conspicuous form is considered to be "the plant." Thus, in the Thallophyta generally the plant is the gametophyte, the sporophyte being comparatively in- conspicuous and in many cases merely an appendage on the gametophyte ; in the Bryophyta likewise the gameto- phyte is the plant, the sporopliyte being an appendage on the gametophyte. In the Ptertdophyta and in the Phan- erogamia the plant is the sporophyte, the gametophyte being comparatively inconspicuous. In the Pteridophyta the gametophyte is still an independent organism ; but in ascending from the lower to the higher forms it becomes more and more reduced. In the Phanerogamia the game- tophyte is still further reduced and becomes a mere appendage on the sporophyte.

Sus-Kinepom I. 'TTHALLOPHYTA.

This sub-kingdom includes the most lowly organized of plants. They are characterized by the total absence, or the imperfection, of that differentiation of the body into root, stem, and leaf which is so marked a

feature in the higher plants, and by the simplicity of their internal structure, especially by the absence of woody vascular tissue. In those Vhallophyta which present an alternation of generations the gametophyte is generally the more con- Spicuous, constituting the plant. The gametophyte is commonly capable of producing spores, not only sexually, but also asexually.

The sub-kingdom is naturally divided into two main classes, the ALGa& or SEA-WEEDS and the Funai, to which may be added, as a subsidiary group, the LicuEens. It is becoming usual to regard the Algw and Fungi as distinct sub-kingdoms ; but it is preferable, as they have so much im common, to continue to regard them as classes of the sub-kingdom Thallophyta.

Crass I. Atca,—There is so much variety in the form and structure of the Alge (see article ALG#) that no more precise definition of them can be given than that they are Thallophytes which contain chlorophyll (see PuysioLocy, vol. xix. p. 52). Though they characteristically live in water, this is by no means universally the case, for the natural habitat of many of them is damp soil. All Ale contain chlorophyll, but many of them contain other

colouring-matters in addition,—a feature which forms a convenient basis for classification. On this basis the Alge are classified into the four following sub-classes :—

I. Cyanophycee, containing a bluish colouring-matter, phyco-

cyanin, and having a blue-green colour. II. Chlorophycez, green Algz, containing no colouring-matter, except chlorophyll and its derivatives. III. Pheophycez, containing a yellow or brown colouring-matter, phycophxin, and having a brown colour. IV. Rhodophycex, containing a red colouring-matter, phyco- erythrin, and having a red or purple colour.

These four sub-classes are by no means co-extensive. The Cyanophyceex include only very simple forms; the Chlorophycez and the Pheophyceex

include a series of forms from the simplest to the most complex; the /hodo- phycee include only forms which, though their vegetative structure is frequently very simple, are comparatively highly developed as regards their reproductive organs.

Sub-Class I. Cyanophycex, or Blue-Green Algew.—The body may eonsist of a single, more or less nearly spherieal ccll, as in most of the Chroococcaceer (e.g., Glaocapsa), or it may be a inulti- cellular layer one cell thick (c.g., AMcrismopedia), or it may be filamentous, consisting of a single row of cells, as in Rivularia, Nostoc, Oscillaria. When the body is filamentous, it somctimes presents a distinction of base and apex, as in Lttévularia ; and it is frequently branched, the branching being either spurious (cg, Scytonema) or true (e.g., Sirosiphon). In most cases growth and eell-division go on in all the cells of the body, but in the Scyto- nemcex and Sirosiphonex only at the apices. A characteristic feature of the sub-class is the more or less bulky mucilaginous cell-wall which invests the eells and filaments.

Reproduction is mainly effected in a purely vegetative manner. In the unicellular forms each cell-division necessarily leads to the formation of new individuals. In the flattened forms (¢.g., Mcrismo- pedia), when the body reaches a certain limit of size, it simply breaks up into a number of separate portions. In the filamentous forms the body is marked out into segments by inert eells, termed heterocysts, which are quite different in appearance from the living cells of the filament. Eventually these segments, termed hormo- gonia, separate, and, escaping from the mucilaginous matrix, de- velop by growth and cell-division into new individuals. In many cases special reproductive cells, sporcs, are developed. Hach spore is formed from a single cell of the body, which surrounds itself with a thick firm wall ofits own. It is probable that ciliated spores, zoospores, are produced, but the existing observations on this point are inconclusive. There is no evidence of the existence of any form of sexual reproduction in this group.

The Cyanophycce are divided into a number of orders :—

Order 1. Chroococcaccer. Order 4. LRivulariacex.

», 2 Nostocacce. 1», 5. Scytonemex. 3 oO Oscillariacce. », 6. Strosiphonex (Stigonemce).

It is doubtful to what extent these orders really represent dis- tinct forms; for there is some cvidence that ccrtain Cyanophycce assume the different forms characteristic of several of these orders at various stages of their development and under various external conditions: in other words, some, at least, of the Cyanophycexw are polymorphic, and this necessarily renders their classification difficult.

The Cyanophycexw resemble the Schizomycetcs (Fungi) in many respects, as, for instance, in their general structure, in their simple vegetative reproduction and in their spore formation, in the pro- duction of a bulky mucilaginous matrix, and in their polymorphism. On these grounds they are frequently placed along with the Schizo- mycctes in a distinct class under the name Schizophyta. But this arrangement does not seem to secure any special advantage. It is simpler to regard the Cyanophycex and the Schizomycctcs as parallel groups, the one belonging to the Algz, the other to the Fungi.

Sub-Class II. Chlorophyces.—The body may consist of a single cell (e.g., Protococcoidex), or it may be multinucleate aud unseptate (e.g., Siphonex), or septate and therefore multicellular (¢.g., Char- accz). It presents all degrees of morphological differentiation : thus, it may be spherical (as in Hematococcus and in Volvox), or flattened (as in Ulva), or filamentous (as in Spirogyra, Ulothria, &c.), with a differentiation of root and shoot (as in @dogoniwm) ; or it may even present rudimentary differentiation into stem, leaf, and root, as in the Siphonce (e.g., Caulerpa) and Characew. The structure of the body is peculiar in the Hydrodictycxw, being com- posed of a number of originally separate cells; such a body is termed a cenobiwm.

Vegetative multiplication, though not universal, is not uncommon in this sub-class. Reproduction by means of asexually-produced spores is very general, and the spores are commonly ciliated zoo- spores. A sexual process has been observed in members of every order of this sub-class. It consists either in the fusion of similar sexual cells, when it is said to be isogamous ; or a large non-motile

female eell (oosphere) is fertilized by a small motile male cell (antherozoid), when it is said to be oogamous. The isogamous pro- cess usually takes place between free-swimming ciliated cells (plano- gametes) ; but in the group of the Conjugatx it takes plaee between gametes which are not set free into the water and are not ciliated (see REPRopucTION). In those Chlorophyeew in which both sexual and asexual spore-formation oceurs, there is generally a distinction of sexual and asexual forms, so that the life-history presents an alternation of generations. Thus, in Acetabularia the plant is the sporophyte, produciug asexually non-motile spores, whieh on ger- niination give rise to sexual reproductive cells or gametes. Hach of these spores represents a sexual form or gametophyte. Again, in Coleochzte the plant is the gametophytc, producing the sexual organs, the sporophyte being represented by a small flattened plate of cells, developed from the fertilized female cell or oospore, which never produees any sexual organs, but only spores.

The Chlorophyeex may be classified as follows :—

Order 1. Protoeoceoidex.—Unicclluiar plants ; the body frequently spherieal and unattached, but presenting in some forms a distinc- tion of base and apex, and then it is attached by the base. Re- produetion by vegetative division, or by zoospores, or by a sexual process, the sexual cells being similar planogametes. This order may be divided into two families,—the Protococeacex and the Palmellacex, the distinction being that in the latter the ccll- walls are swollen and mucilaginous, so that the cells are held together, whereas in the former the cells are free. Vegetative multiplication by division is universal in the Palmellaeex, but is eommonly wanting in the Protococeacex.

Order 2. Volvoeinex.—Unicellular or multicellular plants ; body free-swimming by means of cilia, either spherical or a flat plate.

a. Isogamous forms: Pandorina, Stephanosphera (spherical), Goniuwm (flattened).

b. Oogamous forms: Volvox, Hudorina, Chlamydomonas (uni- cellular).

Order 3. Hydrodietyex.—Multicellular plants ; body unattached, a net (Hydrodietyon) or a flat plate (Pediastrum), formed by the combination of originally separate cells (a cenobiwm). The sexual process is isogamous.

Order 4. Siphonex.—Unseptate multinucleate plants ; body vesi- cular and unbranched, or filamentous and branched, assuming most various forms, presenting distinction of base and apex, at- tached by base; sometimes (Caulerpa) presenting differentiation Into root, stem, and leaf. The sexual process is isogamous or oogamous.

a. Isogamous forms: Codiex, Dasyeladex, Caulerpcex, Botrydicex. b. Oogamous forms: Vauweheriacex.

Order 5. Confervoidex.—Septate multicellular plants (body uni- eellular in some Desmids) ; cells uni- or multi-nueleate ; body fila- mentous, branched or unbranched, sometimes presenting distinc- tion of root and shoot, and then attached by the root, or a flat plate or hollow tube of cells. The sexual process is isogamous or oogamous.

a. Isogamous forms— a. Gametes not free-swimming or ciliated: Conjugate.

(including Desmidic#, Mesoearpex, Zygnemex),

8. Gametes free-swimming and ciliated.

Body filamentous, unbranched : Ulothricacex,

Body filamentous, branched: Cladophorex, Cheto- phorex.

Body a flat or tubular layer of cells: Ulvacew,

b. Oogamous forms: body filamentous— a. Sexual organs undifferentiated: Sphwroplex. 8. Sexual organs differentiated.

Gdogontew ; body unbranched (exeept Bulbochezte) ; oogonium without trichogyne; sporophyte, a single cell (oospore).

Coleoechxtex ; body branched ; oogonium with tricho-

f gyne ; sporophyte multicellular.

Order 6. Charaecze.—Multicellular plants ; body presenting dif- ferentiation into leaf, stem, and root. There is no asexual produc- tion of spores ; the sexual process is oogamous, the sexual organs being highly differentiated.

The distinction of the genera, and to some extent also that of the orders, is rendered difficult in mally eases by polymorphism. Yor instanee, it has been ascertained that many plants which have been referred to the Protococcoidex are simply forms of some of the Confervoidex, Siphonew, &e. ; and similarly some of the Ulvaeex have Ulothricoid forms. Still, there can be no doubt that each of the above orders includes some autonomous forms.

With regard to the affinities and phylogeny of the orders of Chlorophyece, the Protoeecoidew must be taken as the starting-point from which the other orders have sprung, their evolution having taken place in various directions. Beginning with the simple spherical Protococeacex, the origin of the Volvoeines from these by eell-division can be readily traced through Chlamydomonas, the higher forms being simply motile multicellular Protococeaeex. Closely allied to the Volvoeinew are the Hydrodietyex, The Siphonex

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can be readily traced back to the simplest Protoeoceaeex through the attached Protoeoccacex, such as Charaeium. The Confervoidese are probably also derived from the Protocoeceacee ; and a certain relationship between some members of this order—the Cladophorex — and the Stphoneex is indicated by the multinucleate cells of the former. Thus, Valonia, which is septate, and therefore really be- longs to the Confervoidex, closely resembles some of the Siphonex in its general habit. The phylogeny of the Charaecx is obseure, but it is probable that they

have sprung from the Confervoidew, possibly from the Cladophorex. It is of interest to note that the large cells of the Charaeex become multinucleate.

Sub-Class III. Pheophycez.—The form of the body is very vari- ous ; it may eonsist of a single cell; when multicellular it may be filamentous and branched, or a flattened expansion, or cylindrical or vesicular, hollow or solid. It presents also various degrees of morphological differcntiation : in some forms it is quite undifferen- tiated ; in others it presents a differentiation of base and apex, and is then attached by the base ; in others it presents indications of differentiation into root, stem, and leaf. Vegetative multipli- cation is common only in the lowest forms ; in the higher it occurs in some cases, and is effected by the abstriction of modified members of the parent, termed gemmzx. The existence of a scxual process has been ascertained in several forms; but in many others further investigation is required to determine its presence or absenee. In those forms in which it occurs it may be either isogamous or oogam- ous ; the isogamous process may take place between free-swimming gametes, or between gametes which are not free-swimming or cili- ated. The life-history of the plants of this group is imperfectly known; but it has been ascertained that in some there is, and in others there is not, an alternation of generations.

The Pheophycex may be classified as follows :—

Order 1. Diatomacee.—Unicellular plants, cither free, or con- nected into filaments or masses by mucilage. Reproduction, vege- tative by division or by means of asexually-produced spores (avwxo- spores); or sexual isogamous by the fusion of non-ciliated gametes. The eell-wall is impregnated with siliea.

Order 2. Syngenetiex.—Body unicellular, the cells being held together by mucilage. Reproduetion by division and by asexually- produced spores. The order includes the two forms, Chromophyton and Hydrurus. The former is distinguished by being unattached and by the motility of its spores, which have a single long cilium. Hydrurus grows attached, and the spores are not motile.

Order 3. Pheosporex.—Multicellular plants; the body is fila- mentous and branched or flattened, always prescnting differentiation of base and apex, and in some cases more or less well-marked dif- ferentiation into root, stem, and leaf, usually attached by the base. Reproduction, vegetative by gemme or by means of asexually-pro- duced zoospores, or by a sexual proeess which is essentially iso- gamous, the gametes being ciliated, but in the higher forms tend- ing to become oogamous. The principal families of the Phwosporex are Hetoearpex, Sphacelariee, Mesogleacee, Desmarestiex, Seyto- siphonex, Cutleriacex, and Laminaricew. The filamentous type of structure obtains in the Letocarpex, Sphaeclariex, Mesogleacex, and Desnarestiex. The filaments may eonsist of single rows of cells (monosiphonous), as in most Hetoecarpex, or of several rows of cells (polysiphonous), as in the Mesogleacex ; or they may be polysiphon- ous with a more or less well-developed cortical layer, as in the Sphaeelartex, in whieh case there is also a large apical cell. The structure of the Desmarestice (e.g., Desmarestia and Arthrocladia) is similar to that of the Sphacelariew, but the growing point is not apical, as in the Sphacelaricx, but interealary, as in the Zeto- earpee. In some of these forms (¢g., Cladostephus among the Sphacelariex) there is an indication of the differentiation of the shoot into stem and leaf. The type of structure obtaining in the Scytosiphonex, Cutleriacee, and Laminariex is that of a flattened expansion of parenchymatous tissue, though in the Laminarice there is a certain degree of histological differentiation, as is indieated by the presence of elongated cells forming struetures resembling the sieve- tubes of the vascular plants. In some of the Seytosiphonex there is a large internal cavity, so that the body presents a cylindri- cal or vesicular form. Vegetative reproduction by gemmez is only known in the Sphaeelariex. Reproduction by means of ascxually- produced spores (zoospores) is known to oecur in the majority of the Pheosporex, but it has not yet been detected in some forms (e.g., Arthrocladia, Seytosiphon, Phyllitis, Colpomenia). The asexual organs are unilocular sporangia. The sexual organs (gamet- angia) are multiloeular. They have been found in all the families except the Laminariex, but not yct in all the genera (¢.g., Aspero- eoceus). The gametangia are all quite similar, except in the Cut- leriaeex and in Tilopteris (a genus allied to Desmarestia), in which also the gametes diffcr in appearance. A sexual process has only been observed in a few speeies of Hetocarpex and Seytostphonee (Eetoearpus silieulosus

and E. pusillus, Giraudia sphaeclarioides, Seytosiphon lomentarius), and in the Cutleriacezw. A full account of the sexual process in these forms is given in the artiele REPro- DUCTION, vol. xx. p. 425.

Order 4. Dietyotacez.—Body multicellular, thalloid, flattened,

ribbon-like, as in Dictyota, Phyeopteris, Dictyopteris, or broader and fan-shaped, as in Taonia, Padina, Zonaria; usually attached by the base, but by root-hairs developed on the under surface in Zonaria. Asexual reproduction by spores, formed four (etraspores) in each unilocular sporangium ; spores not motile. Though a sexual pro- cess has not been observed, there are apparently male and female organs,—antheridia and oogonia. 'The supposed male cells are set free and are not motile ; the supposed female cells are not set free. The sporangia and the sexual organs are borne on distinct indi- yiduals, and in some genera (¢.g., Dictyota, Taonia) the male and female organs are borne on distinct individuals.

Order 5. Fueaeexe.—Body multicellular ; generally differentiated into root and shoot ; shoot usually thalloid, cylindrical, or flattened, but differentiated into stem and leaves in Sargassum. No asexual production of spores. Sexual organs antheridia or oogonia. Male cells numerous, set free, ciliated ; female cells (oospheres) either onc (Pyenophyeus, Himanthalia, Cystoseira, Sargassum), two (Pelvetia), four (Ozothallia), or eight (Fucus) in an oogonium, set free, not motile.

The life-history of the Phxophycez is in most cases imperfectly known. In the Puecacex, since there is no asexual formation of spores, there is no alternation of generations, and there is no indi- cation of any other kind of polymorphism. In those forms in which the sexual and asexual organs are restricted to separate indi- viduals, as in Cladostephus (Sphacelariex), in the Cutleriacex, and in the Dictyotacex, there may be an alternation of generations. In the Cutleriacex it is, in fact, highly probable. In the one genus, Zanardinia, the two generations are similar, differing only in the nature of their reproductive organs. In Cutleria, the other genus, the two generations are dissimilar, the form known as Cut- leria being the gametophyte, whereas the sporophyte appears to be a form which has been regarded as a distinct genus, under the name of Aglaozonia. In some

genera of Dictyotacer (Taonia, Padina, Dietyoptcris) there is a further indication of polymorphism, in that the spore (whether tetraspore or oospore) produces on germination aspherical or cylindrical protonematoid body, from which spring the shoots of the characteristic form.

Since the life-history of the Phxophycex is so imperfectly known, the relations of the various orders cannot be accurately determined. The Diatomacex and the Syngenetice are apparently isolated groups. The families of the Phewosporex form a series leading from the simple isogamous Hetocarpex through the Cutleriacce to the oogamous Fucacew, There are also points of resemblance in the vegetative parts between some of the Scytosiphonex and the Laminaricz.

Sub-Class IV. Rhodophycez. —This sub-class includes the single order Floridex.

Order Floridex.—Multicellular plants; body flattened or fila- mentous ; when filamentous, either monosiphonous or polysiphon- ous, with or without a cortex; thalloid, or with indications of differentiation into stem and leaf. Asexual reproduction, by means of unciliated naked spores, which are usually tetraspores (wanting in Lemanea), produced in unilocular sporangia. Sexual reproduc- tion by means of male and female organs, termed antheridia and procarpia ; the procarpium is generally multicellular, but sometimes unicellular (Bangiacex, Nemalice), is always closed, and generally consists of two parts, the carpogonium or sporogenous portion and the trichogyne or receptive portion. The male cells are non-motile and have a cell-wall (spermatia); there is no differentiated female cellin the procarpium. After fertilization the carpogenous cell (or cells) divides to form the mother-cells of spores, and each mother- cell gives rise to a single naked spore (carpospore), which is not ciliated and is usually non-motile; in the Bangiacex the carpo- spores exhibit amceboid movements for atime. The group of sporo- genous cells formed from the fertilized carpogenous cell (or cells) is termed a cystoearp ; in many cases these cells become surrounded by an investment developed from the adjacent vegetative tissue. The structure of the cystocarp is very simple in the Bangiacex, consisting only of eight spore

mother-cells. The principal orders of the Floridex are Bangiacex, Lemancacex, Nemaliex, Ceranviacex, Corallinex, Rhodomelacex, Cryptonemiacex,, Rhodymeniacexr, Wran- geliaeex, Squamariacee, Spherococeacce.

With regard to the life-history of the Floridex, it is generally considered to present a well-marked alternation of generations, the plant being the gametophyte, the fructification (cystocarp) formed i consequence of fertilization being the sporophyte. Further poly- morphism has been detected in the genera Lemanca and Batracho- spermum. Here the carpospore does not at once give rise to the plant, but toa filamentous or flattened body, which in Batracho- spermum reproduces itself by spores, and' from which the parent form springs as lateral branches. This filamentous form appears to be identical with species of the genus Chantransia ; it is therefore known as the Chantvansia-form.

Mutual Affinities and Phylogeny of Sub-Classes of Algz. Comparison of the four sub-classes shows that, whereas the Chlovophycex and the Phxophycex present two fairly complete series of parallel forms, ranging fron unicellular undifferentiated to multi- cellular more or less highly differentiated organisms, the Cyano-

phycex consist only of comparatively simple forms in which sexual reproduction is unknown, and the Rhedophycex of comparatively complex forms in all of which a sexual process obtains. It has been suggested by Cohn, Berthold, and others that there is a close re- lation between the lowest Rhodophycex (Bangia) and the higher filamentous Cyanophycex (Scytonemex, Sirosiphonce), and that possibly the latter may have been derived from the former. On this view the Cyanophycex and the Rhodophycex, taken together, constitute a series which is on a level with those of the Chloro- phycez and of the Pheophycex. On comparing these three series together, it will be observed that they present a general correspond- ence, in that the main types of form are to be found in all. 'Thus, the Chroococeacex among the Cyanophycex, the

Palmellacex among the Chlorophycex, and the Syngenetice among the Phxophycee are corresponding groups; similarly, the Confervoidew among the Chlorophycee correspond to the Letocarpexr and other filament- ous Phxophycex, and to various forms of Rhodophycex, such as Bangia, Porphyra, Griffithsia, and Callithamnion; and Chara (Chlorophycex) resembles, at least in its vegetative structure, such forms as Cladostephus (Phxophycex) and Polysiphonia (Rhodophy- cew), There are, however, forms belonging to some of the sub- classes which have no representatives in othcrs. Thus the orders Siphonee,, Volvocincx, Hydrodietyce, belonging to the Chloro- phycez, are unrepresented in the other sub-classes, and this is true also of the Fucaeew and the Laminaricee among the Phwophycex. The Conjugate Chlorophycez also form a peculiar group, the only corresponding forms being the Diatomaece (Phxophycex), which present nany points of resemblance to the Desmidiex.

With regard to the phylogeny of the Algz, the possible derivation of the Rhodophycex from the Cyanophyccx has already been pointed out. Assuming this, there are three series of Algzx closely allied in their origin, in each of which evolution has proceeded on more or less divergent lines, thus leading to the devclopment of a number of corresponding forms in the three series. It is not impossible that the Chlorophyeex and the Phxophycex may also have sprung from the Cyanophycex, not, like the Rhodophyccex, from the higher forms, but from the lower. But, if the Cyanophycex be regarded, not as primitive, but as degenerate, forms—and for this view there are good grounds—then the simpler Chlorophycex are probably to be regarded as the forms from which the others have been derived.

Literature of Alge.—Special papers referred to :—Cohn, Bettrdge zur Phystologie der Phycochromaceen, 1867 ; Berthold, " Die Bangiaceen," in Fauna und Flora des Golfes von Neapel, 1882; Zopf, Zur Morphologie der Spalipflanzen, Leipsic, 1882; Hansgirg, Physiologische wnd Algologische Studien, Prague, 1887. Of general works consult—Harvey, Phycologia Britannica; Cooke, British Fresh- water Alg#, London, 1882; Thuret and Bornet, Notes Algologiques, i., ii., 1882-86, and Etudes Phycologiques, 1878; Falkenberg, " Algen," in Schenk's Handbuch der

Botanik, ii., Breslau, 1881-84; Hauck, “ Die Meeresalgen,” in Rabenhorst’s Kryptogamen-Flora, 2d ed., Leipsic, 1885; Goebel, Outlines of

Classificution and Special Morphology, Oxford, 1886. These works contain refer- ences to all the more important isolated papers on the Alga.

Crass IT. Funei1.—In view of the description of these plants given in the article Funeus (q.v.), it is unnecessary to define them here further than as Thallophytes which are devoid of chlorophyll.

The classification followed here differs in detail from that given in the previous article. It is as follows :— Sub-Class 1. Myxomycetes.

» Ll. Schizomycetes. », Ill. Phycomycetes. a. Zygomycctes. Order 1. Chytridiaccey. 9, 2. Mucorini. – 3, o Lutomophthorex. 4 » 4. Ustilaginer. „ LV. Ascomycetes. Order 1. Gymnoascex. Order 2. Pyrenomycetes. Order 3. Discomycetes. » ¥. Atcidiomycetes. Order 1. Uredinex. », VI. Basidiomycetes. Order 1. Tremellini. Order 2. Hymenomycetcs. Order 3. Gasteromycetes.

The chief points of difference between this classification and that given in the article Funcvus, besides the introduction of some addi- tional orders, are the division of the Phycomycetes into Zygomycetes and Oomyeetcs, the removal of the Ustilaginex from the Uredinex to the Phycomycetes, and the inclusion of the Erysiphex and Tuberacex in the Pyrenomyectes, this order being considered as containing all the Ascomyectes which have well-developed, but more or less con1- pletely closed, apothecia (perithecia),—in a word, all Ascomycetes which are neither Gymnoascex nor Discomycetes. The division of the Phycomycetes into Zygomycetes and Oomyeetes is necessary 1n order to distinguish those forms which are isogamous, and in which the sexual process is one of conjugation (see REPRODUCTION), from those which are oogamous, and in which the sexual process is one of fertilization, the former constituting the group Zygomycetes, the latter the group Oomycctcs. The change in position of the Usti-

b. Oomycetes. Order 1. Anceylistex. 2. Peronosporex. 3. Saprolegnicx.

aginez is made in accordance with the views of recent writers, such as De Bary and Brefeld, the Ustilaginex being regarded as sexually degenerate Zygomycctes. ;

A brief description of the newly introduced orders, namely, the

Chytridiacex, the Entomophthorex, the Ancylistex, and the Gymno-

ascex, may be given. The Chytridiacew are extremely simple Fungi, consisting in some forms of a single spherical cell and in others of a small mycelium. The Entomophthorex have a well- developed mycelium, which, unlike that of most Phycomycetes, is septate. The Ancylistex are merely the simplest forms of the Oomycetes. The Gymnoascex are characterized by the simple struc- ture of their fructification, the asci (or, in some cases, the single ascus) not being surrounded by an investment of sterile tissue. This group includes typical forms, such as Gymnoascus and Erem- ascus, as well as aberrant forms, such as Hxoascus, Saccharomyces, &c.

Mutual Affinities and Phylogeny of Sub-Classes of Fungi.

The Myxomycctes and the Schizomycctes are so peculiar that they cannot be connected in any way with the other sub-classes of Fungi. Beginning, then, with the Zygomycetes, there can be no doubt that the Chytridiacce are closely connected with the Jfucorint by such forms as Polyphagus and Zygochytrium, and with the Ancylistce among the Oomycetes. On the other hand, they are connected with the Ustilaginex (especially Protomyces) by Clado- chytrium. The Entomophthorex seem to be most nearly related to the Afucorint. The Ancylistex are closely related to the Perono- sporez (especially Pythium), and these again to the Saprolegniex. Coming now to the Ascomycetes, there is an obvious similarity be- tween the simpler Gymnoascex and the Mucorini. Thus in Hremascus the sexual organs are quite similar, and the sexual process is one of conjugation, as in the Mucorini ; but there is this difference, that the product of the sexual process in Hremascus is an ascus, whereas in the Aucorint it is a zygospore (see REPRODUCTION). Those Ascomycetes which, like Pyronema, have differentiated sexnal organs, show some resemblance to the Oomycetes. The Uredinex appear to be closely connected with the Ascomycetes on the one hand, the ecidium being homologous with the apothecium, and on the other hand with the Tremellint among the Basidiomycctes, through the Tremelloid Uredinex (Leptopucciniex), which have lost thcir ecidia, possessing only asexually-produced spores (teleutospores). The Hymenomycetes and the G'asteromycctes appear to form two parallel series starting from the J'remellini.

In attempting to express these relations in terms of phylogeny, the first question which arises is as to whcther or not the Chytri- diacexe ave to be taken as the primitive forms. It is possible to regard them, not as primitive forms, but as degraded Mucorini, their degradation being due to their aquatic habit; but there are no conclusive grounds for this assumption. Then there is the ques- tion as to the origin of the Ascomycetes. De Bary inclines to the opinion that they are derived from the Oomyectes (especially Perono- spora), on account of the similarity of the sexual organs of such Ascomycetes as Podosphzxra to those of the

Peronosporex. But how, on this view, is the development of Ascomycetes with similar sexual organs to be accounted for? It seems more reasonable to trace the Ascomycetes back through Eremascus to the Mucorini, and to as- sume that the differentiation of the sexual organs arose in the Ascomycetous series. The following scheme expresses the phylogeny of the Fungi as suggested in the foregoing remarks.

ee sc en | ee

| | (Zygochytrium) (Cladochytrium)

(Protomyces) Ustilaginer.

Mucorini | | Entomophthoree.

1

(Eremascus) Ascomycetes

(Ancylistex) Oomycetes,

| fEcidiomycetes (Tremelloid Uredinex)

Basidiomycetes Tremellini

| Hymenomycetes. Gasteronvycetes.

Affinities of Fungi with Alge.

With the exception of the Basidiomycetes, the sub-classes of Fungi present resemblances to various forms of Algez, as might be expected, for the Fungi must have sprung from the Algx. The Myzxomycetes resemble the Hydrodictyce, in that the body (plas- modium) is a coenobium, formed by the aggregation of originally separate cells. The similarity of the Schizomycetes to the Cyano- phycew has been alrcady mentioned (p. 125). The Phycomycetes resemble the Siphonex in their typically unseptate multinucleate structure; but the Aucorini approach the Conjugate Algx, and the Oomycctes the oogamous Siphonex, in the sexual process. The

simpler Chytridiacee closely resemble the Protococcacex in their general form, as also in the production of ciliated zoospores. The Ascomycetes, especially those in which male cells (spermatia) are formed, and probably also the czdiomycetes, resemble the Rhodo- phyceze in many important features. In both groups the female organ contains no distinctly differentiated female cell (oosphere) ; and the effect of fertilization is to cause the female organ to grow into a sporogenous fructification (apothecium, cystocarp), which con- stitutes the asexual generation or sporophyte in the life-history.

With regard to the derivation of the Fungi from the Alga, it appears that there are at least two distinct origins. The Schizomy- cetes doubtless arose from the Cyanophycex ; but, as pointed out above, the Schizomycctes cannot be regarded as having given rise to higher forms of Fungi. These sprang independently from the Algz ; and probably the Chytridiacex were derived from the Proto- coccacee ; and from the Chytridiacex the higher forms were developed as indicated in the above sketch of the phylogeny of the Fungi, the evolution of the Fungi proceeding along much the saine lines as that of the Algz, and thus giving rise to forms which have their representatives in the Alge, and terminating in the Basidiomycctes, which are altogether and peculiarly Fungal. The origin of the Chytridiacex, from the Protococcacez is suggested by the fact that many of the latter are "endophytic": that is, they inhabit the tissues of higher plants; and the Chytridiacex may be regarded as Protococcaceze which have become truly parasitic, and have conse- quently lost their chlorophyll.

Additional Literature to Fungi.cDe Bary and Woronin, Beitrége zur Mor- phologie und Physiologie der Pilze, 4th and 5th series, 1881-82; Brefeld, Un-

tersuchungen, parts v.-vii., 1883-88; De Bary, Comparative Morphology and Biology of the Fungi, Oxford, 1887.

SussipraRy Group, Licuzenses.—As pointed out in the article Funcus, a Lichen is a compound organism consist- ing of a Fungus and an Alga living symbiotically. In that article only those Lichens are considered in

which the Fungus belongs to the Ascomycetes; but Lichens are now known in which the Fungus belongs to the Basidiomycetes.

The Lichens may be classified as follows :—

Ascolichenes (Ascomycetous Lichens).

1. Discolichenes (Discomycetous Lichens),

2. Pyrenolichenes (Pyrenomycetous Lichens). Basidiolichenes (Basidiomycetous Lichens).

1. Hymenolichenes(Hymenomycetous Lichens).

2. Gastcrolichenes (Gasteromycetous Lichens). Literature.—Massee, 'On Gasterolichenes," in Phil. Trans., vol. clxxviil., 1S87.

Sup-Kinepom II. BRYOPHYTA (Muscinez).

The Bryophyta may be characterized as plants which pre- sent a definite alternation of generations, the plant being the gametophyte and the fructification or sporogonium the sporophyte. The sporophyte is not independent, but remains permanently attached to the gametophyte. The shoot of the gametophyte is sometimes thalloid ; but more frequently it is differentiated into stem and leaf. The shoot of the sporophyte is not differentiated into stem and leaf, though there is in some cases an indication of such differentiation. The gametophyte commonly reproduces its like by means of gemme ; the female organ is an arche- gonium. The Bryophyta are divided into two classes— the Hepatica or Liverworts and the Musci or Mossss. (For details see Musciyz2.)

Mutual Affinities and Phylogeny of Mosses and Liverworts.

In consequence of the well-marked alternation of generations in these classes, it is essential to trace their resemblances in both generations.

a. Gametophyte (plant).—-The higher Liverworts (foliose Junger- mannicx) resemble the Mosses in that the shoot is differentiated Into stem and leaf; but there is this general difference, that the shoot of these

Liverworts has dorsi-ventral symmetry, whereas that of the Mosses has radial symmetry. The connecting form is afforded by Haplomitrium, which alone among the foliose Liverworts has radial symmetry.

6. Sporophyte (sporogonium).—The main differences between the Sporogonium of the Liverworts and that of the Mosses are these: the structure of the sporogonium is simpler in the Liverworts than it is in the Mosses ; in the former it usually has no columella and produces elaters, whereas in the latter a columella is always present, and there are no elaters. In the Liverworts the sporogonium re- mains encloscd in the enlarged venter of the archegonium (calyptra) until the spores are ripe, but in most Mosses the developing sporo- gonium bursts the calyptra at an early stage. A connecting form is afforded by the sporogonium of Anthoceros (Liverwort), which has a columella and bears stomata like the sporogonia of the Mosses,

and in which the claters are rudimentary. Sphagnum and Archt- dium among Mosses resemble the Liverworts in that the sporo- goniuin is enelosed in the calyptra until near maturity.

Although there are so many points of resemblance between them, there is no evidenee to show that the Mosses and Liverworts form one continuous series. This might perhaps be assumed if the gametophyte alone were considered ; but it cannot when the sporo- phyte is taken into aceount as well. The more important features in the comparative morphology of the sporophyte are as follows. Taking first the Liverworts, in the Riccice proper (Riccia, Oxymitra) both the epibasal and hypobasal halves of the oospore (fertilized female eell) form sporogenous tissue. In the allied Corsiniex, the Marchantiex, and the Anthocerotez the epibasal half alone gives rise to sporogenous tissue, the hypobasal half forming an organ of absorption and attachment which is the true foot. In the Junger- manniex, likewise, the sporogenous tissue is developed entirely from the epibasal half of the oospore, which also gives rise to the seta or stalk of the sporogonium ; but the hypobasal half is aborted and gives rise to only a rudimentary foot ; in some foliose forms a Salse Joot is formed by a dilatation of the base of the seta. In the Mosses there is not in any family

such a simple sporophyte as that of the Rreciew among the Liverworts; but there are forms which present the same inorphological difference as that whieh in the Liverworts distinguishes the Aarchanticew and the Anthocerotex, on the one hand, from these Jungermanniez, on the other. Thus, among Mosses the Sphagnacex, Andrexacex, and Phascaccey have a true

foot, whereas in the Bryinezx there is a spurious foot at the base of

the seta, as in some Jungermannicz. Taking all the foregoing faets into account, it is clear that the Ricciex are the most prinui- tive of existing Afuscinez, and it is probably from them that the true Mosses, as well as the other Liverworts, have been derived.

The following phylogeny inay be suggested. As regards the Liverworts, there can be no doubt that the Marchantiex are to be traeed back through the Corsinvex to the Ricciex, and it is probable that, as Leitgeb points out, the frondose Jungermannice were de- rived from the Corsiniew through the Riellex. With regard to the Anthocerotez, Leitgeb seems to suggest that they may have been derived through Notothylas from the Jungermanniex ; but in opposi- tion to this must be set the difference between the two groups as regards the morphology of the foot. Probably the Anthocerotce arose independently from the Corsinice. The Mosses are to be traced back to the Anthocerotex, on account of the general similarity in the structure of the sporogonium. The genus Anthoccros shows its special relation to the Sphagnaccz in the development of the Sporogenous cells from the amphithecium, whereas the genus Noto- thylas resembles the other Mosses in that the sporogenous cells are developed from the endothecium. The following scheme will serve to illustrate these remarks.

Rieciex Corsiniex | Riellex. Anthocerotesxe Marchantiex. | | (Anthoceros) (Notothylas) A prance. Andrexacexe BR Phascaces? 2 (| Jungermanniex. us Bryinex.)

The phylogeny of the Auseincx can be traced with exccptional elearness in both generations. With regard to the gametophyte, it must be remembered (see MuscIneE#) that at its first develop- ment from the spore it is a protonema, which is either filamentous, as usually in Mosses,

or a flattened expansion, as generally in Liver- worts, the shoot which bears the sexual organs being a secondary development on the protonema. Both these forms of protonema bear a striking resemblance to various Confervoid Chlorophyccex, and there can be little doubt that it is from this group that the Muscinex have arisen. This view is supported by tlie close resent- blance of the simple sporophyte of Riccia among the Muscinex to that of Coleochzxte among the Confervoid Chlorophycex. There 1S, however, this difference, that in Riccia the cells resulting from the division of the oospore are differentiated into an external sterile layer, forming the wall of the capsule, and an internal mass of sporo- senous cells, whereas in Coleochawte all the cells are sporogenous,

Suz-Kinepom IIT. PTERIDOPHYTA (VASCULAR CRYPTOGAMS).

In these plants the gametophyte is a filamentous or tuberous, or more commonly a membranous, flattened pro- thallium, exhibiting no differentiation into stem and leaf.

he Sexual organs are antheridia and archegonia, as in the luscinee, The Sporophyte becomes quite independent of the gametophyte, constituting the plant. The shoot is

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always differentiated into stem and leaf, and the tissues are highly differentiated.

The sub-kingdom is divided into three classes, —FILictna, EQUISETIN2, LYCOPODINA.

Each of these classes includes two series of forms,—the homospor- ous, in which all the spores are alike, and the heterosporous, in which the spores are of two kinds, namely, large spores (macrospores) and small spores (microspores). On germination the spore of the homo- sporous forms gives rise to a well-developed prothallium, which be- comes quite free from the spore, and usually bears both antheridia (male) and archegonia (female). The spores of the heterosporous forms give rise on germination to comparatively ineonspicuous pro- thallia, which remain

connected with the spores, and bear either exclusively male or exclusively female organs. Thus, in the hetero- sporous forms the gametophytc is represented by a male and a female organism, the former being much the smaller. The male prothal- lium is always developed from a microspore, the female prothallium from a macrospore (see REPRODUCTION).

Cuass 1. Fitictna.—The Filicinz are characterized by having relatively large and few leaves. The spore-bearing or fertile leaves (sporophyils) are generally similar to the foliage leaves, and are not aggregated on special shoots, so as to form flowers. The embryo sporophyte has no suspensor; but it has generally (except in Sal- vinia) a primary root.

Series 4. Homosporous Filicinze.—This series consists of the sub-class Filices, which includes the Ferns. It seems to be eertain that all existing Ferns arc homosporous, and apparently all the known fossil forms are homosporous also, though it is not impossible that there may have been heterosporous Fidices. The orders of existing Ferns are arranged in two categories, according to the mode of development of the sporangia.

Lcptosporangiate Filices: the sporangium is developed from a

single epidermal cell :—

Order 1. Hymenophyllacce, Order 4. Gleichenicce. » 2 Cyatheacce. », 95. Scehizwacce. », % Polypodiacez. », 6. Osmundacee.

ELusporangiate Filices: the sporangiuin is developed from a group

of epiderma] cells :—

Order 1. Ophioglossacex. Order 2. Marattiacex. Scries B. Heterosporous Filicine.—As far as is known at

present, this series contains the sub-class Hydropteridex or Rhizo- carpx. In addition to the various peculiarities connected with their

heterospory, its members are characterized by the development of an investment round the clusters of sporangia (sori), the whole forming a

sporoearp. They are all Leptosporangiate.

The Hydropteridex are arranged in two orders, aecording to the structure of the sporocarp.

Order 1. Salviniacex : wall of sporocarp formed as a superficial outgrowth of the sporophyll ; each sporocarp contains a single sorus either of macrosporangia or of microsporangia (Salvinia, Azolla).

Order 2. Marsilcacex: the wall of the sporocarp is formed by a portion of the sporophyll ; each sporoearp contains several sori ; and eaeh sorus includes both macrosporangia and microsporangia (Marsilca, Pilularia).

It is possible that Jsoctes represents the heterosporous euspor- angiate Filices (see infra).

Crass 2. Equisr1iInz.—These plants are characterized by their rudimentary foliage leaves arranged in whorls at the nodes, and by their highly modified sporophylls, which are aggregated together at the ends of shoots, so as to form cone-like flowers. The embryo sporophyte has no suspensor, but a primary root.

Series A. Homosporous Equisetins.— All the existing forms belong to this series and constitute the order Liquisetacex ; they all belong to the genus Equisctum. The gametophyte isa green flattened prothallium, like that most commonly found in the Filices ; but it is much branched, and generally diccious.

Series B. Heterosporous Equisetinee.—There are no existing heterosporous Equisetinz ; it is probable that some fossil plants, such as Annularia and Asterophyllites, represent the extinct hetero- sporous forms.

Crass 3. Lycopopinz.—The Lycopodinz are gencrally charac- terized by their small and numerous foliage leaves, which are not arranged in whorls, though they are almost entirely wanting in Psilotum. The sporophylls are not highly modified, but they are frequently aggregated at the ends of shoots, so as to form cone-like flowers. So far as the

embryology of this class is known at present, the embryo sporophyte has a suspensor, but no primary root.

Serics 4. Homosporous Lycopodine.

Order 1. Lycopodiacex: the sporangia are borne on sporophylls (Lycopodium, Phylloglossum). ;

Order 2. Psilotacez : the sporangia are borne on the stem (Psilo- tum, Tmesipteris).

Serics B. Heterosporous Lycopodine.

Order 1. Selaginellacex (Selaginella). ‘

The existing heterosporous Lycopoding are usually eonsidered to consist of a family, termed the Ligulatx, which includes the two

genera Sclaginclla and Isoctes. This arrangement is not accepted here, for the reason that Selaginella and Isoetes have nothing in common beyond the ligule, and the fact that they are both hetero- sporous vascular cryptogams. It is in fact a question whether or not Tsoctes should be included in the Lycopodine at all; for it has few and large leaves, and the embryo sporophyte has no suspensor, but it has a primary root. This being the case, it 1s impossible to frame any definition of the group Lycopodinz which would apply to all the members, if Isoetes be included in it. In many features Tsoetes resembles the Filicinz, and especially the Zydropteridex. It may be suggested here that Jsoctes is a representative of the hetero- sporcus eusporangiate Filicinw. The only member of the Lyco- podine which Jsoetcs at all resembles is Phylloglossum.

Mutual Afinitics and Phylogeny of Pteridophyta.

Beyond the characteristics which they possess in common, and which have caused them to be collected into one class, there are no special

points of contact between the three sub-classes of the Ptert- dophyta. The classes have each its own well-marked habit ; and it therefore appears probable that they are to be regarded as equiva- lent branches of the Pteridophyta, springing from a common origin, in each of which a differentiation of homosporous and heterosporous forms has taken place. The relation of the homosporous to the heterosporous forms in each class is a point of interest. There is little or nothing to be said on this subject as regards the Zquiseting. But in the Filicine it appears probable that the simpler hetero- sporous forms have sprung from the simpler homosporous forms, that is, the Salviniacee from the Hymenophyllacez ; and in the Lycopodine that Selaginclla has sprung from Lycopodium. As- suming that Isoetcs belongs to the Lycopodinz, its nearest ally would appear to be Phylloglossum ; but this point must remain undecided until the whole life-history, especially the embryogeny, of Phyllo- glosswm is known, and its true systematic position thereby fixed.

Various attempts have been made to trace back the sporophyte of the Pteridophyta to that of the Muscince, the points of contact being the Hymenophyllacce on the one hand and Azthoceros on the other; but these attempts cannot be considered to have been suc- cessful. The differences between the known forms of sporophyte in the two classes are too great to be explained away on any hypo- thesis. The case is different with regard to the gametophyte; there are, in fact, many points of resemblance between the prothallium of the Ptcridophyta and the gametophyte of the Muscince. As Goebel and Bower have pointed out, the prothallium of some species of Trichomancs is a brauched filamentous structure, closely resembling Moss protonema; and in most ferns, as also in Hquisctum and Lycopodium, the prothallium is at first filamentous. The fila- meutous prothallium gives rise to one or more flattened expansions, on which the sexual organs, or at least the archegonia, are devcloped (archegoniophorcs). Thus there are indications in the gameto- phyte of many Pteridophyta of that distinction of protonema and sexual shoot which is so characteristic of the gametophyte of the Muscinex. But this remarkable correspondence in the gameto- phyte does not warrant the conclusion that the Pteridophyta have sprung from the Muscinew. It rather indicates that they are groups having a common origin in the Confervoid Chlorophyccex, but diverging from the first in the relation of

the sporophyte to the gametophyte, so that, whereas in the Muscince the sporophyte remains attached to the gametophyte throughout its whole exist- ence, in the Pteridophyta the sporophyte develops as an independ- ent organism. 'There can be little doubt that in the primitive Ptcridophyta the two generations resembled each other, and that, as evolution proceeded, they became more and more widely dissimilar, the gametophyte losing, the sporophyte gaining, in both morpho- logical and histological differentiation. An indication of this is still afforded by the general resemblance of the sporophyte of Phyllo- glossum to the gametophyte of Lycopodium cernuwm as described by Treub, and of the sporophyte of Lycopodium Philegmaria to its gametophyte (Treub). It will probably be found, when material 1s obtained for investigating it, that the sporophyte and the game- tophyte of Phylloglossum are very similar.

The phylogeny of the Pteridophyta, as suggested in the foregoing remarks, is indicated in the following table :—

(Chlorophycez)

Leptosporangiate

a = Filicine quisetinee omosporous Lycopoding sian lls (Hymenophyllacea) (ior caporous)

(Phylloglossum) — (Lycopodiwm)

: Hydro- (Heterosporous) Hetero- Eusporangiate pleridex sporous. Filicine (Hetero- — (Isoetes ?). Sclaginella. Homosporous sporous). | Heterosporous (Isoetes 2).

Literature of Pteridophyta.—Affinitiesand phylogeny:—Prantl, Untersuchungen zur Morphologie der Gefasskryptogamen, i,-ii., Leipsic, 1875-81; Goebel, Annales du Jardin Botanique de Buitenzorg, vii., 1887; Bower, "On some Normal and Abnormal Developments of the Oophyte of Trichomanes," in Annals of Botany, vol. i., 1888; Id., On the Morphology of Phylloglossum Drummondii, in Phil. Trans., part II., 1885; Treub, " Recherches sur les Lycopodiacées," in Ann. du Jardin Botanique de Buitenzorg, iii.-iv., 1884-86; Id., Annals of Botany, i., 1888: Kny, "Die

Entwickelung der Parkeriaceen," in Nova Actad. k. Leop. Akad., xxxvii., 1875. For general works, see Goebel, Outlines of Classification and Special Morphology, Oxford, 1887; Sadebeck, " Die Gefasskryptogamen," in Schenk's Handbuch der Botanik, i., 1879.

Sus-Kinapom IV. PHANEROGAMIA.

These plants are commonly known as "flowering plants"; but they are more correctly designated '"seed-bearing plants," or Spermaphyta, for the production of a seed is the one feature which distinguishes the members of this sub-kingdom from those of the other sub-kingdoms.

There is a definite alternation of generations in the life- history of these plants, but it is obscured by the extreme reduction which the gametophyte has undergone (see Repropuction). The sporophyte is the plant; a sus-pensor is formed in its embryogeny; and it is hetero- sporous. The sporophylls are aggregated on special shoots, frequently with other floral leaves (bracteoles, perianth leaves), to form flowers. The two kinds of sporangia are in all cases borne on distinct sporophylls. In the micro-sporangium there are numerous fertile sporogenous cells, each of which produces four microspores ; in the macro- sporangium there are generally but few sporogenous cells, of which only one is usually fertile, and this one produces a single macrospore without division. The microspores are set free from the sporangium producing them, whereas the macrospore is not. It is this last peculiarity which determines the formation of the seed.

In the above account of the asexual reproductive organs of the

Phanerogamia, the terms employed are those which are applied in the case of the heterosporous Pteridophyta ; the advantage gained by the use of these terms is that the true homologies of the repro- ductive organs in the two sub-kingdomsare keptin view. The rela- tion between these terms and those more commonly in use is as follows :—stamen=leaf bearing microsporangia (microsporophyl]) ; carpel=leaf bearing macrosporangia (macrosporophyll) ; pollen-sac =microsporangium ; anther=sorus of microsporangia ; ovule (nu- cellus)=macrosporangium ; pollen-grain= microspore ; embryo sac =macrospore. Stamens and carpels are

commonly borne by the same individual and in the same flower; but in many cases they are confined to distinct individuals (dieczous) or to distinct flowers (diclinous) on the same individual. _ Inasinuch as these plants are heterosporous, the sexual generation is represented by male and female gametophytes. The male gameto- phyte, formed by the germination of the microspore (pollen-grain), consists of two or sometimes three or four cells, one of which becomes the male organ (pollen tube=antheridium of other sub- kingdoms), while the rest have nothing to do with reproduction, but constitute the rudimentary vegetative portion of the prothal- lium. The female gametophyte, commonly known as the endo- sperm (=female prothallium), is formed in the interior of the macro- spore or embryo sac, and usually does not come at all into relation with the exterior. From certain cells of this endosperm one or more female organs are formed, which are equivalent to, and in some Phanerogams closely resemble, the archegonia of the Pteridophyta ; each of these female organs possesses, as its essential constituent, the female cell (oosphere, ovum).

The process of fertilization (see REPRODUCTION) depends upon the pollen-grains being brought near to the ovules, so that, when the pollen-grains germinate, the pollen tubes may be able, in the course of their growth, to come into close relation with the female cells which the ovules contain. In many cases the transference of the pollen-grains is effected by the wind ; the plants in which this is the case are characterized by their inconspicuous flowers, and are termed anemophilous. In other cases the transference is effected by means of insects; the plants in which this is the case are termed entomophilous, and are characterized by their conspicuous flowers, in which the perianth leaves are highly developed and brightly coloured, to attract the visits of insects,—an end which is further attained by the secretion of scented volatile oils and of sugary liquid (nectar). It is the conspicuous flowers of these ento- mophilous Phanerogumia which have earned for the whole group the designation of 'flowering plants," which, however, is by no means generally applicable.

The Phanerogamia are divided into two classes,—the GYMNOSPERM and the ANGIOsPERM.

VENohfasbEerk KINGDOM

Crass J. GymnosperM#.—The carpels are sometimes absent, and, when present, they do not form an ovary ; hence the ovules are naked. 'There is no stigma, conse- quently the pollen-grain comes into direct contact with the ovule. The whole of the female prothallium is formed in the embryo sac before fertilization. The female organ is in most cases a fully developed archegonium. The embryo is developed from a portion only of the fertilized female cell or oospore (meroblastic embryogeny) ; frequently several embryos are developed from one oospore (polyembryony). The flowers are dicecious or diclinous.

This elass consists of the following orders :—

Order 1. Cycadacex : characterized generally by the unbranched stem and by the large branched leaves. The order includes nine genera :—Cycas, Dioon, Ceratozamia, Zamia, Macrozamia, Encephal- artos, Stangeria, Bowenia, and Microcycas. The genus Cycas is peculiar, in that the carpels are not borne on special shoots, so as to form flowers, but on the main shoot, in the same way as the foliage leaves. The stamens of Cycas, as also both the stamens and carpels in the other genera, are highly modified sporophylls which are borne on special shoots forming cone-like flowers.

Order 2. Coniferw: characterized by the much-branehed stem and by the very numerous, small, unbranched leaves. The staminal flowers are generally cone-like. This order includes the Pines, Firs, Larehes, Yews, Cypresses, &e., arranged in the following families :—

Series A. Pinoides: the carpellary flowers are eones :— Fam. 1. Abietinex. Fam, 3. Cupressinex. «ok. Araucarien. » 4. Taxodince. Series B. Taxoidez: the carpellary flowers are not cones :— Fam. 1. Taxinex. Fam. 2. Podocarpex.

Order 8. Gnetacex: habit various; the flowers are not cones, and have a perianth. 'This order includes the three genera Ephedra, Gnetum, and Welwitschia. In Gnetum and Welwitschia the female organ (archegonium) is reduced to a single cell, the oosphere.

Mutual Afinitics and Phylogeny of Gymnosperme.

There is but little resemblance between the Cycadacex and the other two orders. Gingko or Salisburia, a remarkable genus whieh is usually placed in the Taxince, though it is in many respects peculiar, resembles the Cycadacex in the strueture of the arehe- gonium, in the fleshy character assumed by the outer portion of the seed-coat, and in the fact that the development of the embryo does not begin until after the seed has been shed. Probably the fossil plants known as the Cordaitacex may be regarded as a group inter- mediate between the Cycadacex and the Conifcre. The Conifcre and the Gnetacex are more closely allied, so much so in fact that the latter have been regarded by various writers as a family of the Conifere. The structure of the flowers in Ephedra is very similar to that in Taxus.

The connexion of the Gymnosperms with the Pleridophyta is un- doubted. The development of the microsporangium in the Gymno- sperms is the same as that of the sporangium of Lycopodium. The development of the macrosporangium presents in most cases the characteristic Phanerogamic features; but in certain cases (Ceratozamia longifolia, Cupressus sempervirens, Callitris quadri- valvis) there is a mass of sporogenous cells, as in the sporangia of the Pteridophyta, though only one of these cells is fertile, and it produces a single macrospore without division. In faet, there is a marked general resemblance in the development of the macrospor- angium between these species and Jsoetes. Another point of importanee is the fact that, although the female prothallium (endosperm) is under ordinary conditions entirely and permanently enelosed in the macrospore (embryo sac)—a feature which is charac- teristic of the Phanerogamia—yct in the Cycadaceex, if the first- formed archegonia are not fertilized, the prothallium resumes its growth and bursts the macrospore, coming to the surface of the ovule and turning green in consequence of exposure to light. Tak- ing into consideration their general habit and the peculiarities in the development of their sporangia, it appears that the Cycadacex find in the Eusporangiate Filices their nearest allies among the Pieridophyta. This suggestion presupposes the existence of hetero- Sporous Husporangiata, although all the known forms are homo- Sporous. But this difficulty will

be met, if, as suggested above, it turns out that Jsoetes really belongs to the Eusporangiate Filices. The Conifere resemble more nearly the Lycopodingw, such as Lyco- podium and Selaginella, in their general habit and in the cone-like form of their flowers. However, the position of the pollen-saes on the under surface of the peltate sporophyll is a feature which connects them with the Hguzsetine ; but, on the other hand, the ligular outgrowth on the upper surface of the macrosporophyll in Araucaria, which in the Abietinew becomes the large ovuliferous scale, is another point of resemblance to Selaginella and Jsoetes. In view of these resemblances to the Lycopodineg and the Equisetine,

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it is hardly possible to trace back the Coniferex to either of these groups: it is more probable that they sprang from forms of Pterido- phyta intermediate in character between the Lycopodinw and the Equisetine. The mutual relations and the phylogeny of the threc genera of Gnetacee cannot at present be determined with any de- gree of probability. The one point which affords any clue is the resemblance in general structure between the flowers of Gnetum and those of the Taxinew. The flower of Welwitschia, more than that of any other Gymnosperm, resembles that of an Angiosperm, especially in the fact that the staminal flower contains a rudi- mentary ovule.

Cuass II. AnciospERMa&.—The carpel or carpels form an ovary, in which the ovules are enclosed. A portion of the carpel forms a stigma, which receives the pollen-grains. The pollen-grains germinate on the stigma, and therefore do not come into direct relation with the ovules. A part only of the female prothallium (primary endosperm) is formed before fertilization, the remainder (secondary endo- sperm) after fertilization. The female organ is a reduced archegonium, consisting merely of the female cell (oosphere). The general occurrence of both macrosporophylls and micro- sporophylls in the same flower is a characteristic feature of this group, as is also the whorled arrangement of the floral leaves.

The Angiospermez are divided into two sub-classes,—the J/ono- cotyledons and the Dicotyledons, aceording to the number of the primary leaves or cotyledons of the embryo ; henee, in the former sub-elass the

first leaves are alternate, in the latter opposite. In the Monoeotyledons, with few exceptions, the growing-point of the embryonic stem is lateral; in the Dicotyledons it is always terminal. There are other distinguishing features, such as the parallel vena- tion of the leaves of Monoeotyledons and the retieulate venation in Dieotyledons ; but they are not sufficiently constant to be of much taxonomic value.

The Monocotyledons may be conveniently arranged in the following series :—

Series 1. Nudiflore: usually diclinous or dicecious; perianth wanting or rudimentary. This series includes the Spadiciflorz (Aroids, Palms, Natadex) and the Glumiflorx (Grasses, Sedges).

Series 2. Petaloidex: usually monoclinous ; perianth present, and usually well-developed and eoloured. This series ineludes the Lilies, Orehids, Irises, &e.

The Dicotyledons are usually classified as follows :—

Series 1. Monochlamydex: usually diclinous or dicecious ; perianth absent or simple.

Series 2. Polypetale: usually monoclinous; perianth usually con- sists of calyx and coloured corolla, the petals being free.

Series 83. Gamopetale: usually monoelinous; perianth usually consists of calyx and coloured corolla, the petals being coherent.

Phylogeny of the Angiosperme.

There can be no doubt that the Angiosperme have been derived from the Pteridophyta ; but it is a question whether they have had an independent origin from that group or whether they arc to be traced back to it through the Gymnosperms. In view of the wide gulf which separates the Angiosperms from even the highest Pécri- dophyta, and of the affinities of the Gymnosperms to the Ptert- dophyta on the one hand and to the

Angiosperms on the other, the latter suggestion would appear to be the more probable.

Although the Monoeotyledons and the Dieotyledons have so many features in common, it is probable that they have not had the same origin. The Gymnospermous forms to which the Dieoty- ledons are most nearly allied are the Coniferw, and Gnetum among the Gnetacex. The marked Angiospermous charaeters of Gnetwm, and its general similarity in habit to a Dicotyledonous plant, afford some ground for regarding this genus as the starting-point of the Dicotyledons. But morc probably the Dicotyledons are to be traced back to the Conifere, and the Gnetacex to be regarded as a lateral offshoot of the Coniferz, with an Angiospermous tendency, but not leading on to higher forms. The Gymnosperms which most re- semble the Monocotyledons are the Cycadacex ; and, ifit be assumed that the Angiosperms have sprung from the Gymnosperms, it is to this order of the latter class that the Monocotyledons are to be traced. The Monoeotyledons in which this resemblance is most conspicuous are those, such as the Aroids and Palms, which belong to the scrics Nudifiorz. j

Literature.—On the Phanerogamia, see Goebel, Outlines of Classification and Special Morphology, Oxford, 1887 ; Le Maout and Decaisne, Traité de Botanique (English ed. by Hooker, 1868); and Engler and Prantl, Die Pflanzenfamilien, Leipsic (in course of publication). r

On the phylogeny of plants, see Nigeli, Theorie d. Abstammungslehre, Munich, 1884; and Saporta and Marion, L' Evolution du Régne Végétal (Int. Sci. Serics, vols. xxxix. and lii.), Paris, 1881-85. Descriptions of the numerous natural orders will be found in the various text-books which treat of systematic botany, as well as in the above. (S. H. V.)

VEGETABLE MARROW. See Govurp and Hort1- CULTURE, Vol. xii. p. 283.

VEGETIUS, Fiavius Renartus, the compiler of a treatise on the art of war, dedicated to Valentinian II. (375-392). Nothing is known of his life

save that in MSS. he is called wr 2lustris and also comes. His sources, according to his own statement, were Cato, Cornelius Cel- sus, Frontinus, Paternus, and the imperial constitutions of Augustus, Trajan, and Hadrian. The book, which is a poor compilation, has to be used with great caution. The first edition appeared at Utrecht in 1473; the latest is that of Lang (Leipsic, 1869). The book has been often translated ; an English version through the French was published by Caxton in 1489.

VEGLIA (Slavonic, Ars), an island in the Gulf of Quarnero, Adriatic Sea, belonging to the Austrian district of Istria, is separated from the mainland by the narrow channel of Morlacca or Maltempo and from the island of Cherso on the south-west by that of Mezzo. It is 24 miles long and about 14 miles across at its widest part. The surface is mostly rugged and mountainous; but. the central, southern, and western districts are fertile, produc- ing wine, grain, oil, timber, and various kinds of fruit, besides pasturage for numerous live-stock. Silk, marble, and salt are also produced ; and fishing is carried on along the coast. In 1880 the island contained 18,089 inhabit- ants; the capital is Veglia, a town on the south-west side, with 1580 inhabitants and a good harbour.

VEHMIC COURTS. See Fenmic Courts,

VEIT. See Errvria, vol. viii. p. 634.

VELAZQUEZ, Dizco pz Sizva (1599-1660), the head of the Spanish school of painting and one of the mightiest painters the world has known, was born in Seville early in June 1599, the year in which Van Dyck also first saw the light at Antwerp. His European fame is of comparatively recent origin, dating from the first quarter of the 19th century. Tull then his pictures had lain immured in the palaces and museum of Madrid ; and from want of popular appreciation they had toa large extent escaped the rapacity of the French marshals during the Peninsular War. In 1828 Sir David Wilkie! wrote from Madrid that he felt himself in the presence of a new power in art as he looked at the works of Velazquez, and at the same time found a wonderful affinity between this master and the English school of portrait painters, being specially reminded of the firm square touch of Raeburn. He was struck by the sense of modernness of impression, of direct contact with nature, and of vital force which

pervaded all the work of Velazquez, in landscape as well as in portraiture. Time and criticism have now fully established his reputation as one of the most consummate of painters, and accordingly Mr Ruskin says of him that "everything Velazquez does may be taken as absolutely right by the student." At the present day his marvellous technique and strong individuality have given him a power in European art such as is exercised by no other of the old masters. Acquainted with all the Italian schools, the friend of the foremost painters of his day, he was strong enough to withstand every external influence and to work out for himself the development of his own nature and his own principles of art. A realist of the realists, he painted only what he saw; consequently his imagination seems limited. His religious conceptions are of the earth earthy, although some of his works, such as the Crucifixion and the Scourg- ing, are characterized by an intensity of pathos in which he ranks second to no painter. His men and women seem to breathe ; his horses are full of action and his dogs of life; so quick and close is his grasp of his subject. England was the first nation to recognize his extraordinary

1 See Cunningham's Life, vol. ii.

merit, and it owns by far the largest share of his works outside of Spain.? But Velazquez can only be seen in all his power in the gallery of the Prado at Madrid, where over sixty of his works are preserved, including historical, mythological, and religious subjects, as well as landscapes and portraits. It is hardly creditable to the patriotism of Seville, his native town, that no exaniple of his work is to be seen in the gallery of that city. Seville was then in the height of its prosperity, "the pearl of Spain," carrying on a great trade with the New World, and was also a vigorous centre of literature and art. For more thana hundred years it had fostered a native school of painting which ranked high in the Peninsula, and it reckoned among its citizens many whose names are prominent in Spanish literature.

Velazquez was the son of Rodriguez de Silva, a lawyer in Seville, descended from a noble Portuguese family, and was baptized on 6th June 1599. Following a common Spanish usage, he is known by his mother's name Velaz- quez. There has been considerable diversity of opinion as to his full name, but he was known to his contempo- raries as Diego de Silva Velazquez, and signed his name thus. He was educated, says Palomino, by his parents in the fear of God, and was intended for a learned profession, for which he received a good training in languages and philosophy. But the bent of the boy was towards art, and he was placed under the elder Herrera, a vigorous painter who disregarded the Italian influence of the early Seville school. From his works in Seville we can see that Herrera was a bold and effective painter ; but he was at the same time a man of unruly temper and his pupils could seldom stay long with him. Velazquez remained but one year, long enough, however, to influence his life. It was from Herrera that he learned to use long brushes, or, as Mr J. E. Hodgson, R.A., suggests, brushes with long bristles, by means of which his colours seem to be floated on the canvas by a light fluent touch, the envy and despair of his successors. From Herrera's studio Velazquez betook himself to a very different master, the learned and pedantic Pacheco, the author of a heavy book on painting, and, as we see by his works at Madrid, a dull commonplace painter. Jn this school he remained for five years, studying proportion and perspective, and seeing all that was best in the literary and artistic circles of Seville. Here also—and this may explain much—he fell in love with his master's daughter Juana, whom he married in 1618 with the hearty approval of Pacheco, who praises his hand and heart, claiming at the same time all the credit of having been his master. He must, however, have found Velazquez a wayward pupil; for, instead of looking to Raphael, according to orders, the young painter set himself to copy the commonest things about him,— earthenware jars of the country people, birds, fish, fruit, and flowers of the market-place. To paint well and thoroughly what he saw, to model with his brush, and to colour under the influence of light and shade were for him the vital purpose, the first lesson, in his art. It was with deliberate purpose that Velazquez painted these bodegones (tavern-pieces), as they were called ; for we are told that he said he would rather be the first painter of common things than the second in higher art. Carrying out this idea still further, Velazquez felt that to master the subtlety of the human face he must make

this a special study, and he accordingly engaged a peasant lad to be his servant and model, making innumerable studies in charcoal and chalk, and catching his every expression. We see this model in the laughing Peasant Boy of the

; On the 274 works attributed to Velazquez by Mr Curtis 121 are in the United Kingdom, while France has but 13, Austria-Hungary 12, Russia 7, and Germany about the same number.

YELAGOU EZ

Belvedere Gallery at Vienna. In such work as this, and in his studies by the wayside, Velazquez laid the founda- tion of his subsequent mastéry of expression, of penetra- tion into character, and of rendering the life of his sitter to the quick. He saw the world around him teeming with life and objects of interest to the painter, and he set him- self to render these. His manner is as national as that of Cervantes. He lived and died racy ofthe soil. The posi- tion and reputation of Velazquez were now assured at Seville. There his wife bore him two daughters,—all his family so far as is known. The younger died in infancy, while the elder, Francisca, in due time married Bautista del Mazo, a painter, whose large family is probably that which is represented in the important picture of later years in Vienna, the so-called Family of Velazquez. Mr Curtis, however, is inclined to believe that this picture is by Mazo. In the gallery at Madrid there is at least one portrait of this daughter, painted in these early days at Seville, as also a portrait of Juana his wife, holding a drawing-tablet on her knee. There was formerly in the possession of Lord Dudley another portrait of his wife by Velazquez, painted, perliaps, in the first year of their happy marriage. Of this early Seville manner we have an excellent example in E] Aguador (the Water-Carrier) at Apsley House (London). Firm almost to hardness, it displays close study of nature. One can see in it the youthful struggle to portray the effects of light stealing here and there over the prominent features of the face, groping after the effects which the painter was to master later on. The brushwork is bold and broad, and the out- lines firmly marked. As is usual with Velazquez at this time, the harmony of colours is red, brown, and yellow, reminding one of Ribera. For sacred subjects we may turn to the Adoration of the Magi at Madrid,

dated 1619, and the Adoration of the Shepherds in the London National Gallery, in both of which we have excellent ex- amples of his realism. The peasants offering their gifts of poultry are the hard-featured women of the market-place of Seville, pre-Raphaelite in their uncompromising truth- fulness. Thus also in the St John in the Desert we find his peasant boy transformed into the saint.

But Velazquez was now eager to see more of the world. Madrid, with its fine Titians, held out strong inducements. Accordingly in 1622, fortified with letters of introduction to Fonseca, who held a good position at court, he spent some months there, accompanied only by his servant. Here he painted the portrait of the poet Gongora, a com- mission from Pacheco, which now hangs in the gallery at Madrid. The impression which Velazquez made in the capital must have been very strong, for in the following year he was summoned to return by Olivares, the all- powerful minister of Philip IV., fifty ducats being allowed to defray his expenses. On this occasion he was accom- panied by his father-in-law. Next year (1624) he received from the king three hundred ducats to pay the cost of the removal of his family to Madrid, which became his home for the remainder of his life. Weak and worth- less as a king, Philip had inherited the art-loving propen- sities of his race, and was proud to be considered a poet and a painter. It is one of the best features of his char- acter that he remained for a period of thirty-six years the faithful and attached friend of Velazquez, whose merit he Soon recognized, declaring that no other painter should ever paint his portrait. By his equestrian portrait of the king, painted in 1623, Velazquez secured admission to the royal service with a salary of twenty ducats per month, besides medical attendance, lodgings, and payment for the pictures he might paint. The portrait was exhibited on the steps of San Felipe, and was received with enthusiasm, being vaunted by poets, ainong them Pacheco.

It has un- !

fortunately disappeared, having probably perished in one of the numerous fires which occurred in the royal palaces. The Prado, however, has two portraits (Nos. 1070 and 1071) which are most probably studies

for this picture. In them the harshness of the Seville period has disappeared and the tones are more delicate. The modelling is firm, recalling that of Antonio Moro, the Dutch portrait-painter of Philip IL, who exercised a considerable influence on the Spanish school. In the same year the prince of Wales (afterwards Charles I.) arrived at the court of Spain. We are told that he sat to Velazquez, but the picture has dis- appeared. It was during this period also that he painted the hunting- scenes of which examples are to be found in the collections of Sir Richard Wallace, Lord Clarendon, and others, and which served him in the production of the great Boar Hunt of the London National Gallery, painted, however, in the later years of his life,—a magnificent work in spite of some restorations. It was then too that he painted the groups of Court Gallants in their gay costumes, accompanied, as in the Boar Hunt, by their servants and dogs. The splendid Meeting of Artists (as it is absurdly named) in the Louvre was doubtless executed at a later time from studies taken in these early years, for it displays all the qualities of his finer work, space and air being thrown round the figures, which are touclied with great mastery and ease.

In 1628 Rubens visited Madrid on a diplomatic mission for nine months, and Velazquez was appointed by the king to be his guide among the art treasures of Spain. Rubens was then at the height of his fame, and had undertaken asa commission from Olivares the large pictures which now adorn the great hall in Grosvenor House (London). These months might have been a new turning-point in the career of a weaker man than Velazquez, for Rubens added to his brilliant style as a painter the manner of a fascinating courtier. Rubens had a high opinion of the talent of Velazquez, as is attested by Fuensalida, but he effected no change in the style of the strong Spaniard. He im- pressed him, however, with the desire to see Italy and the works of her mighty painters. In 1627 the king had given for competition among the painters of Spain the subject of the Expulsion of the Moors. Velazquez bore off the palm; but his picture was destroyed in a fire at the palace in 1734. Palomino, however, describes it. Philip ILI. points with his baton to a crowd of men and women driven off under charge of soldiers, while Spain, a majestic female, sits looking calmly on. The triumph of Velazquez was rewarded by his being appointed gentle- man usher. To this was shortly afterwards added a daily allowance

of twelve reals, the same amount as was allowed to the court barbers, and ninety ducats a year for dress, which was also paid to the dwarfs, buffoons, and players about the king's person—truly a curious estimate of talent at the court of Spain. As an extra payment he received (though it was not paid for five years) one hundred ducats for the picture of Bacchus, painted in 1629 (No. 485 of the Madrid gallery). The spirit and aim of this work are better understood from its Spanish name, Los Borrachos or Los Bebedores (the Topers), who are paying mock homage to a half-naked ivy-crowned young man seated on a wine barrel. It is like a story by Cervantes, and is brimful of jovial humour. One can easily see in this picture of national manners how Velazquez had reaped the benefit of his close study of peasant life. The painting is firm and solid, and the light and shade are more deftly handled than in former works. Altogether, this production

1 In 1847 Mr John Snare of Reading exhibited a picture which had come from the sale of Lord Fife in 1809, and which he maintained to be the long lost work. This led to much controversy ; but the claim was rejected by experts and the picture is said to be now in America,

may be taken as the most advanced example of the first style of Velazquez. It is usual to divide his artistic career by his two visits to Italy, his second style following the first visit and his third the second. Roughly speaking, this somewhat arbitrary division may be accepted, though

it will not always apply, for, as is usual in the case of

many great painters, his styles at times overlap each other. Velazquez rarely signed his pictures, and the royal archives only give the dates of his more important works. Internal evidence and history, as regards his portraits, supply to a certain extent the rest.

In 1629 Philip gave Velazquez permission to carry out his desire of visiting Italy, without loss of salary, making him besides a present of 400 ducats, to which Olivares added 200. He sailed from Barcelona in August in the company of the marquis De Spinola, the conqueror of Breda, then

on his way to take command of the Spanish troops at Milan. It was during this voyage that Velazquez must have heard the details of the surrender of Breda from the lips of the victor, and he must have sketched his fine head, known to us also by the portrait by Van Dyck. But the great picture was not painted till many years later, for Spinola had fallen into disfavour at court. In Venice Velazquez made copies of the Crucifixion and the Last Supper of Tintoretto, which he sent to the king, and in Rome he copied Michel- angelo and Raphael, lodging in the Villa Medici till fever compelled him to remove into the city. Here he painted the Forge of Vulcan (No. 1059 of the Madrid gallery), in which Apollo narrates to the astonished Vulcan, a village blacksmith, the news of the infidelity of Venus, while four Cyclops listen to the scandal. The mythological treatment is similar to that of the Bacchus: it is realistic and Spanish to the last degree, giving a picture of the interior of an Andalusian smithy, with Apollo thrown in to make the story tell. The conception is commonplace, yet the im- pression it produces is undoubted from the vividness of the representation and the power of expression. The model- ling of the half-naked figures is excellent. Altogether this picture is much superior to the other work painted at the same time, Joseph's Coat, which now hangs in the Escorial. This work has been much praised—overpraised in the opinion of the present writer—and this opinion is shared by Don Federico de Madrazo, the director of the Madrid museum, who looks on it as one of the weakest of the productions of Velazquez. Both these works are evidently painted from the same models. In looking at these two pictures what strikes one especially is that they betray no trace of the influence of the Italians, Velazquez remained true to himself. At Rome he also painted the two beautiful landscapes of the Gardens of the Medici, now in the Madrid museum, full of sparkle and charm. Landscape as a form of art never had attraction for the Spaniards ; but Velazquez here, and in the silvery land- scapes painted some years later at Aranjuez, shows how great a master he was in this branch of art. After a visit to Naples in 1631, where he worked with his country- man Ribera, and painted a charming portrait of the infanta Maria, sister of Philip, he returned early in the year to Madrid.

He then painted the first of many portraits of the young prince Don Baltasar Carlos, the heir to the throne, digni- fied and lordly even in his

childhood, caracolling in the dress of a field-marshal on his prancing steed. Sir Richard Wallace owns a fine example ; but the finest in the United Kingdom is the well-known picture at Grosvenor House a masterly example of the second manner of Velazquez. The colour is warm and bright, the workmanship solid and fused like enamel, while light and air pervade every corner. The scene is in the riding-school of the palace, the king and queen looking on from a baleony, while

Olivares is in attendance as master of the horse to the prince. Don Baltasar died in 1646 at the age of seventeen, so that judging by his age this picture must have been painted about 1641, two years before the fall of Olivares, This powerful minister was the early and constant patron of the painter. His impassive saturnine face is familiar to us from the many portraits painted by Velazquez, a face which, like his royal master's, seems never to have known a smile, and in which are written pride and disdain. Two must be named of surpassing excellence,—the full length belonging to Mr. Holford (exhibited at Burlington House in 1887), stately and dignified, in which he wears the green cross of Alcantara and holds a wand, the badge of his office as master of the horse ; the other the great equestrian portrait of the Madrid gallery (No. 487), in which he is flatteringly represented as a field-marshal in all his pomp during an action. It is difficult to overpraise the excel- lence of this work, either as regards its dramatic power or its masterly execution. In these portraits Velazquez has well repaid the debt of gratitude which he owed to his first patron, whom he stood by in his fall, thus expos- ing himself to the risk—and it was not a light one—of incurring the anger of the jealous Philip. The king, how- ever, showed no sign of malice towards his favoured painter. Faithful in few things, Philip kept true to Velazquez, whom he visited daily in his studio in the palace, and to whom he stood in many attitudes and costumes, as a huntsman with his dogs, as a warrior in command of his troops, and even on his knees at prayer, wearing ever the same dull uninterested look. His pale face and lack-lustre eye, his fair flowing hair and moustaches curled up to his eyes, and his heavy projecting Austrian lip are known in many a portrait and nowhere more supremely than in the wonderful canvas of the London National Gallery

(No. 745), where he seems to live and breathe. Few portraits in the whole range of art will compare with this work, in which the consummate handling of Velazquez is seen at its best, for it is in his late and most perfect manner.1 From one of the equestrian portraits of the king, painted in 1638, the sculptor Montafias modelled a statue which was cast in bronze by the Florentine sculptor Tacca, and which now stands in the Plaza del Oriente at Madrid, "a solid Velazquez," as it has been well named by Ford. This portrait exists no more ; but there is no lack of others, for Velazquez was in constant and close attendance on Philip, accompanying him in his journeys to Aragon in 1642 and 1644, and was doubtless present with him when he entered Lerida as a conqueror. It was then that he painted the great equestrian portrait (No. 1066 of the Madrid gallery) in which the king is represented as a great commander leading his troops,—a réle which Philip never played ex- cept in a theatrical pageant. All is full of animation except the stolid face of the king. It hangs as a pendant to the great Olivares portrait,—fit rivals of the neighbour- ing Charles V. by Titian, which doubtless fired Velazquez to excel himself, and both remarkable for their silvery tone, and their feeling of open air and harmony combined with brillianey. The light plays on the armour and scarf thrown to the wind, showing how completely Velazquez had mastered the effects he strove to reach in his early days. Of these two great works Sir Richard Wallace possesses small but excellent replicas.

_1 In this and in all his portraits Philip wears the golilla, a stiff linen collar projecting at right angles from the neck. It was invented by the king, who was so proud of it that he celebrated it by a festival, followed by a procession to church to thank God for the blessing (Madame D'Aulnoy, Voyage @ Espagne). The golilla was thus the height of fashion and appears in most of the male portraits of the period. ¢ Tn regard to the wonderful structure of Philip's moustaches, it is said that, to preserve their form, they were encased during the night in perfumed leather covers called bigoteras,

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But, besides the forty portraits of Philip which are known, we have portraits of other members of the royal family, of Philip's first wife,

Isabella of Bourbon, and her children, especially of her eldest son, Don Baltasar Carlos, of whom, besides those already mentioned, there is a beau- tiful full length in a private room at Buckingham Palace. Cavaliers, soldiers, churchmen, and poets of the court, as for example the Quevedo at Apsley House (Burlington House, 1887), sat to the painter and, even if forgotten by history, will live on his canvas. The admirable Pareja of Lord Radnor's collection (Burlington House, 1873) is said to have been taken by Philip for the living man. It has been remarked that the Spaniards have always been chary of committing to canvas the portraits of their beauti- ful women. Queens and infantas may be painted and ex- hibited, but ladies rarely. One wonders who the beautiful woman can be that adorns the gallery of Sir Richard Wal- lace, the splendid brunette so unlike the usual fair-haired female sitters to Velazquez. She belongs to this period of his work, to the ripeness of his middle period. Instinct with life, her bosom seems to heave and the blood to pul- sate through her veins. The touch is firm but free, showing the easy strength of the great master. Rarely has flesh been painted with such a glow, yet with such reserve. This picture was one of the ornaments of the Bethnal Green collection. But, if we have few ladies of the court of Philip, we have in great plenty his buffoons and dwarfs. Even these deformed creatures attract our sympathy as we look at their portraits by Velazquez, who, true to his nature, treats them gently and kindly, as in El] Primo (the Favourite), whose intelligent face and huge folio with ink bottle and pen by his side show him to be a wiser and better-educated man than many of the gallants of the court. El Bobo de Coria, El Niiio de Vallecas, and Pab- lillos, a buffoon evidently acting a part, all belong to this middle period. From these commissioned portraits of the menials of the court it is pleasant to turn to one of the greatest of historical works, the Surrender of Breda, often known as Las Lanzas, from the serried rank of lances breaking the sky, which is believed to have been painted about 1647. It represents the moment when the van- quished Justin of Nassau in front of his Dutch troops is submissively bending as he offers to his conqueror Spinola the keys of the town, which, with courteous grace, the victor refuses to accept, as he lays his hand gently on the shoulder of his defeated foe.1 Behind Spinola stand the Spanish troops bearing their lances aloft, while beyond is along stretch of the Low Country, dotted with fortifica- tions and giving the impression of vast space and distance. The

picture is full of light and air and is perhaps the finest example of the silvery bluish style of Velazquez. In con- ception it is as fine as in execution, and one looks in vain for a trace of "the malicious pencil" which Sir William Stirling-Maxwell discerned in the treatment of Justin and his gallant Dutchmen.

The greatest of the religious paintings by Velazquez belongs also to this middle period, the Christ on the Cross (Madrid gallery, No. 1055). Palomino says it was painted in 1638 for the convent of San Placido. It is a work of tremendous power and of great originality, the moment chosen being that immediately after death. The Saviour's head hangs on his breast and a mass of dark tangled hair conceals part of the face. The beautiful form is projected against a black and hopeless sky from which light has been blotted out. The figure stands absolutely alone without any accessory. The skull and serpent described by Sir William Stirling-Maxwell were added by some pious bungler

1 This gracious attitude is also employed by Velazquez in a picture

: an House (representing the reception of St Francis Borgia by oyola).

at a much later date. The picture was lengthened to suit its place in an oratory; but this addition has since been removed,

Velazquez's son-in-law Mazo had succeeded him as usher in 1634, and he himself had received steady promotion in

'the royal household, receiving a pension of 500 ducats in

1640, increased to 700 in 1648, for portraits painted and to be painted, and being appointed inspector of works in the palace in 1647. Philip now entrusted him with the carrying out of a design on which he had long set his heart, the founding of an academy of art in Spain. Rich in pictures, Spain was weak in statuary, and Velazquez was commissioned to proceed to Italy to make purchases. Ac- companied by his faithful slave Pareja, whom he taught to be a good painter, he sailed from Malaga in 1649,

land- ing at Genoa, and proceeding thence by Milan to Venice, buying Titians, Tintorettos, and Veroneses as he went. A curious conversation which he is said to have had with Salvator Rosa is reported by Boschini,? in which the Spaniard with perfect frankness confesses his want of appreciation of Raphael and his admiration of Titian, "first of all Italian men." It seems a possible story, for Velazquez bought according to his likings and painted in the spirit of his own ideals. At Modena he was received with much favour by the duke, and doubtless here he painted the two splendid portraits which now adorn the Dresden gallery, for these pictures came from the Modena sale of 1746. They presage the advent of the painter's third and latest manner, a noble example of which is the great portrait of Innocent X. in the Doria palace at Rome, to which city Velazquez now proceeded. There he was received with marked favour by the pope, who presented him with a medal and gold chain. Of this portrait, thought by Sir Joshua Reynolds to be the finest picture in Rome, Palomino says that Velazquez took a copy to Spain. There exist several in different galleries, some of them possibly studies for the original or replicas painted for Philip. One of the most remarkable is that in Apsley House, exhibited in Burlington House in 1887. The modelling of the stern impassive face comes near to per- fection, so delicate are the gradations in the full light ; all sharpness of outline has disappeared ; and the features seem moulded by the broad and masterly brushwork. When closely examined, the work seems coarse, yet at the proper distance it gives the very essence of living flesh. The handling is rapid but unerring. Velazquez had now reached the manera abreviada, as the Spaniards call this bolder style. This is but another way of saying that his early and laborious studies and his close observation of nature had given to him in due time, as to all great painters, the power of representing what he saw by simpler means and with more absolute truth. At Rome he painted also a portrait of his servant Pareja, probably the picture of Lord Radnor's collection, which procured his election into the Academy of St Luke. Philip was now wearying for his return ; accordingly, after a visit to Naples, where he saw his old friend Ribera, he returned to Spain by Barcelona in 1651, taking with him many pictures and 300 pieces of statuary, which he afterwards arranged and catalogued for the king. Undraped sculpture was, how- ever, abhorrent to the Spanish Church, and after Philip's death these works gradually disappeared.

Isabella of Bourbon had died in 1644, and the king had married Maria Anna of Austria, whom Velazquez now painted in many attitudes. He was specially chosen by the king to fill the high office of 'aposentador major," which imposed on him the duty of looking after the quarters occupied by the court whether at home or in their journeys —a responsible function, which was no sinecure and inter

2 See Stirling's Velazquez and his Works, p. 161.

fered with the exercise of his art.

highest examples of his style.) Inglés (the Englishman) with his dog, ZZsop, Menippus,

and the Sculptor, all in the Madrid gallery, show his surest To these may be added the charming

and freest manner. portraits of the royal children in the Louvre and Vienna, among the choicest of his works.

Menifias (the Maids of Honour) in the Madrid gallery, painted in 1656, where the little lady holds court, sur-

rounded by her ladies-in-waiting, her dwarfs, and her mas-

tiff, while Velazquez is seen standing at his easel. This is the finest portrait we have of the great painter, and, as etched by St Raymond, it forms the frontispiece of the book by Mr Curtis. It is a face of much dignity, power, and sweetness,—like his life, equable and serene, unruffled by care. Las Meniiias was the picture of which Luca Giordano said that it was the "theology of painting," an- other way of expressing the opinion of Sir Thomas Law- rence, that this work is the philosophy of art, so true is it in rendering the desired effect. The result is there, one knows not by what means, as if by a first intention without labour, absolutely right. The story is told that the king painted the red cross of Santiago on the breast of the painter, as it appears to-day on the canvas. Velazquez did not, however,

receive the honour till 1659, three years after the execution of this work. Even the powerful king of Spain could not make his favourite a belted knight with- out a commission to inquire into the purity of his lineage on both sides of the house! Fortunately the pedigree could bear scrutiny, as for generations the family was found free from all taint of heresy, from all trace of Jewish or Moorish blood, and from contamination by trade or commerce. The difficulty connected with the fact that he was a painter was got over by his being painter to the king and by the declaration that he did not sell his pictures. But for this royal appointment, which enabled him to escape the censorship of the Inquisition, we should never have had his splendid Venus and Cupid, belonging to Mr Morritt of Rokeby Hall (exhibited in Manchester in 1857), painted in his latest manner and worthy of comparison with Titian. There were in truth but two patrons of art in Spain,—the church and the art-loving king and court. Murillo was the artist favoured by the church, while Velazquez was patronized by the crown. One difference, however, deserves to be noted. Murillo, who toiled for a rich and powerful church, left scarcely sufficient means to pay for his burial, while Velazquez lived and died in the enjoyment of good salaries and pensions. Yet on occasions Philip gave commissions for religious pictures to Velazquez, —among others, and belonging to this later period, the Coronation of the Virgin (Madrid), splendid in colour—a harmony of red, blue, and grey—but deficient in religious feeling and dignity. It was painted for the oratory of the queen, doubtless Maria Anna, in the palace at Madrid. Another royal commission for the hermitage of Buen Retiro was the St Anthony the Abbot and St Pau] the Hermit, painted in 1659, the landscape of which excited the warm admiration of Sir David Wilkie. The last of his works which we shall name is Las Hilanderas or the Spinners (Madrid), painted about 1656, representing the interior of the royal tapestry works. The subject is no- thing, the treatment everything. Itis full of light, air, and inovement, splendid in colour, and marvellous in handling. This picture, Raphael Mengs said, seemed to have been painted not by the hand but by the pure force of will.

! The records of this commission have been found among the archives of the order of Santiago by M. Villaamil.

Yet far from indicat-

ing any decline, his works of this period are amongst the The dwarf Don Antonio el

It is one of these in- fantas, Margarita Maria, the eldest daughter of the new queen, that is the subject of the well-known picture Las

VEL—VEL

We see in it the full ripeness of the power of Velazquez, a concentration of all the art-knowledge he had gathered during his long artistic career of more than forty years, In no picture is he greater as a colourist. The scheme is simple,—a harmony of red, bluish green, grey, and black, which are varied and blended with consummate skill.

In 1660 a treaty of peace between France and Spain was to be consummated by the marriage of the infanta Maria Theresa with Louis XIV., and the ceremony was to take place in the Island of Pheasants, a small swampy island in the Bidassoa. Velazquez was charged with the decoration of the Spanish pavilion and with the whole scenic display. In the midst of the grandees of the first two courts in Christendom Velazquez attracted much attention by the nobility of his bearing and the splendour of his costume. On the 26th June he returned to Madrid, and on the 31st July he was stricken with fever. Feeling his end approaching, he signed his will, appointing as his sole executors his wife and his firm friend Fuensalida, keeper of the royal records. He died on the 6th of August 1660, passing away in the full possession of his great powers, and leaving no work behind him to show a trace of decay. He was buried in the Fuensalida vault of the church of San Juan, and within eight days his wife Juana was laid beside him. Unfortunately this church was de-stroyed by the French in 1811, so that his place of interment is now unknown, There was much difficulty in adjusting the tangled accounts outstanding between Velazquez and the treasury, and it was not till 1666, after the death of Philip, that they were finally settled.

Velazquez can hardly be said to have formed a school of painting. Apart from the circumstance that his occupations at court would have prevented

this, his genius was too personal for transmission by teaching. Yet his influence on those immediately connected with him was considerable. In 1642 he befriended young Murillo on his arrival in Madrid, received him into his house, and directed his studies for three years. His son-in-law Mazo painted in his manner, and doubtless many pictures by Mazo are attributed to the master. Carrefio, though never a pupil, was a favourite aud had the good sense to appreciate him and imitate him. His faithful slave Pareja studied his methods and produced work which by the favour of Velazquez procured his manumission from Philip. But the appreciation of the fine talent of Velazquez passed away quickly in Spain, as that country began to fall to pieces.

In addition to the standard works by Palomino, Cean Bermudez, and Pacheco, see the biographical notice by Don Pedro de Madrazo in his Catalogo del Museo del Prado (1872); Velazquez and his Works (1855) and Annals of Artists of Spain (1848), by W. Stirling (afterwards Sir W. Stirling-Maxwell); Ford's Handbook to Spain (1855) and his article in the English Cyclopedia; Velazquez and Murillo, by Charles B. Curtis (1883); the works of W. Burger (T. Thoré); Gesch. d. Malerei, by Woltmann and Woermann ; Sir Edmund Head's Handbook of Spanish Paint- ing (1848); Works of Velazquez (prints), by G. W. Reid (1872); Gaz. d. Beaux Arts, art. Velazquez", by Paul Lefort (second period 1879-82); and Justi, Diego Velazquez u. sein Jahrhundert, 2 vols. , Bonn, 1888. WJ. F. W.)

VELEIA, a town of Liguria, near the frontier of Gallia Cisalpina, on the Apennine slope, about 20 miles to the south of Placentia. The "oppidum Veleiatium " is vaguely mentioned by Pliny as belonging to Liguria, but its exact site remained unknown until 1760, when its remains began to be recovered from under a mass of debris, which showed that the city must have been overwhelmed by a landslip from the neighbouring mountain, Among the buildings that have been brought to light are a basilica, an amphi- theatre, and several temples. Interesting antiquities from Veleia, including the "tabula alimentaria" of Trajan (see vol. xiii. p. 132), are deposited in the museum at Parma. None of the coins hitherto discovered on the site are later than the time of Probus (276-282).

VELEZ-MALAGA, a town of Spain, in the province of Malaga, and 15 miles east-north-east from that town, is finely situated in a fertile valley at the foot of steep mountains (Sierra Tejada), within a mile of the mouth of the small river Velez. Formerly it was a place of con- siderable commercial importance, but its prosperity has much declined in recent years, and it suffered severely in the earthquakes of 1884. It is associated with many

romantic events in the history of the Moorish wars, to which period its old castle belongs. The vegetation of the neighbourhood is most luxuriant, including the aloe, palm, sugar-cane, prickly pear, orange, vine, olive, and sweet potato. The inhabitants are chiefly employed in the various industries connected with the cultivation and export of the products of these. There is also a tunny fishery. The population within the municipal boundaries in 1877 was 24,332.

VELIZH, or Wet1z, a district-town of Russia, in the government of Vitebsk, on the Dwina, 53 miles north-east of the city of Vitebsk. It has an active trade in corn and linseed, grown in the neighbouring provinces, and sent by river to Riga in exchange for fish, salt, tobacco, and groceries. The population (16,370 in 1885) has doubled since about 1860.

Velizh is supposed to have been originally founded by the Lithuanians, but it was deserted in the 16th century. In 1536 the

Russians erected here a wooden fort, which, however, was soon taken by the Poles (1580), and it remained in their possession until 1772.

VELLEIUS. See Patercuxus.

VELLETRI, a town of Italy, in the province of Rome, and 26 miles by rail to the south-east of that city, is picturesquely situated on a spur of Monte Artemisio on the southern edge of the Alban Hills and overlooking the Pontine marshes. The streets are steep, narrow, and irre- gular. In the

highest part of the town are the municipal offices, with an important ancient inscription relating to the restoration of the amphitheatre under Valentinian and Valens. Velletri is the seat of the bishop of Ostia ; the cathedral (1660) contains some good sculpture of the school of Sansovino. 'The neighbourhood produces a cele- brated wine, a chief source of wealth to the town. The population in 1881 numbered 13,532.

At the close of the Latin War (336 B.c.) the Volscian Velitre had its walls razed to the ground and its leading inhabitants banished beyond the Tiber, their lands being given to Roman settlers. It became a flourishing municipium, and was the native place of the Octavian family. In the neighbourhood of Velletri Don Carlos, younger son of Philip V. of Spain, in 1734 gained over the Austrians a decisive victory, which ultimately secured him as Charles III. the kingdom of the Two Sicilies.

VELLORE, a town and military cantonment of India, in North Arcot district of the Madras presidency, on the right bank of the river Palar in 12° 55' 17" N. lat. and 79° 10'17" E. long. It has a strongly-built fortress, which

was famous in the palmy days of the Carnatic, and which |

is overlooked by hills in the vicinity. In 1780 it with- Stood a siege for two years by Hyder Ali. After the fall of Seringapatam (1799) Vellore was selected as the resi- dence of the sons of Tippoo Sahib, and to their intrigues has been attributed the revolt of the sepoys at Vellore in 1806. Besides the fortress, the town contains a handsome Vishnuvite temple with some good carving. In 1881 the population was 37,491 (males 17,605, females 19,886). VELVET is a silken textile fabric having a short dense piled surface. It is the type of the numerous forms of piled fabric now made, the processes employed in the manufacture of which are noticed under WEAVING (¢.0.). In all probability the art of velvet-weaving originated in the far East ; and it is not till about the beginning of the I4th century that we find any mention of the textile. Pustian, however, which differs from velvet only in material, 18 spoken of in English ecclesiastical inventories as early as the beginning of the 13th century. The peculiar pro- perties of velvet, the splendid yet softened depth of dye- colour it exhibited, at once marked it out as a fit material for

ecclesiastical vestments, royal and state robes, and sumptuous hangings; and the most magnificent textures of medizval times were Italian velvets. These were in many ways most effectively treated for ornamentation, such as by varying the colour of the pile, by producing

pile of different lengths (pile upon pile, or double pile), and by brocading with plain silk, with uncut pile, or with a ground of gold tissue, &c. The earliest sources of Euro pean artistic velvets were Lucca, Genoa, Florence, and Venice, and to the present day Genoa continues to send out rich velvet textures. Somewhat later the art was taken up by Flemish weavers, and in the 16th century Bruges attained a reputation for velvets not inferior to that of the great Italian cities. The principal seats of the modern manufacture are Crefeld and Lyons; but, at the former centre especially, a large proportion of an inferior texture, having a silken pile on a cotton foundation and known as velveteen, is now made.

VENANTIUS. See Forrunarus.

VENDACE is the name of a British freshwater fish of the genus Coregonus, of which two other species are indi- genous in the fresh waters of the British Islands, viz., the gwyniad and the pollan. The vendace (C. vandesius) is restricted to some lochs in Dumfriesshire, Scotland ; it is, however, very similar to a species (C. albula) which inhabits some of the large and deep lakes of northern Europe. From its general resemblance to a dace the French name of the latter, vandoise, was transferred to it at the period when French was the language of the court and aristocracy of Scotland. So great is the local celebrity of the fish that a story has been invented ascribing to Mary Queen of Scots the merit of having introduced it into the Lochmaben lochs. It is considered a great delicacy, and on favourable days when the shoals rise to the surface, near the edges of the loch, great numbers may be taken. It spawns in November. In length it scarcely exceeds 8 inches.

Authentic accounts of the vendace have been published by Sir William Jardine, in Edinb. Journ. of Nat. and Geog. Science, iii. p.

4, 1830, and by Robert Knox, in rans. Roy. Soc. Edinb., xii. p.

503, 1834.

VENDEE, a maritime department of France, formed in 1790 out of Bas-Poitou, and taking its name from an un- important tributary of the Sévre Niortaise, lies between 46° 16’ and 47° 5’ N. lat. and 0° 32’ and 2° 10’ W. long., and is bounded by Loire-Inférieure and Maine-et-Loire on the N., by Deux-Sévres on the E., by Charente-Inférieure on the §., and by the Atlantic Ocean on the W. for 93 miles. The islands of Yeu (or Dieu) and Noirmoutier are included. The Sévre Nantaise on the N.E. and the Sévre Niortaise on the 8., besides other streams of minor import- ance, form natural boundaries. The department falls into three divisions—woodland, plain, and marsh. The highest point (945 feet) is situated in the woodland, which occu- pies the greater part of Vendée, on the water-parting between the Loire and the rivers of the coast. This region, which, geologically, is composed of granite, gneiss, mica-schist, schist, and lias, abounds in springs, and is fresh and verdant ; the landscape is characterized by open fields surrounded by trees, which supplied ambushes and retreats to the Vendéans in the civil war at the end of the 18th century. The plain of Vendée is bare and treeless, but fertile, though poor in springs; geologically it is com- posed of lias and oolite. The marshes, raised above the sea-level within historic times (four centuries ago), consist of two portions, the Breton marsh in the north and the Poitevin marsh in the south. The region includes salt marshes and cultivated areas artificially drained. Its area is constantly being increased by the alluvium of the rivers and the secular elevation of the coast. The department is drained by the Sevre Nantaise (tributary of the Loire) and the Boulogne (a feeder of Lake Grandlieu in Loire- Inférieure), both draining into the basin of the Loire ; and by the Vie, the Lay (with the Yon), and the Sévre Niortaise (with the Autise and the Vendée), which flow into the The climate is that of the Girondin region,

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mild and damp, the temperature rarely rising above (7 or falling below 18° Fahr.; 120 to 150 days of rain give an annual rainfall of 30 inches. The woodland is colder than the plain, and the marsh is damp and unhealthy.

Out of the total area of 1,656,531 acres arable land occupies 1,023,275 acres, grass 290,503, vines 37,467, wood 65,853, and moor, pasture, and uncultivated land 136,432. In 1881 the live stock included 29,790 horses, 4500 mules, 1950 asses, 471,775 cattle, 379,950 sheep (10,000 being of superior breed ; total wool-clip 395 tons), 55,000 pigs, and 1625 goats, There were 10,000 beehives (49 tons of honey and 10 tons of wax). The agricultural products in 1884 were returned as follows :—wheat 7,312,316 bushels, meslin 65,736, rye 218,720, barley 1,218,855, buckwheat 358,985, maize 33,000, millet 129,973, oats 2,815,436, potatoes 3,938,214, beetroot 324,601 tons, wine 15,569,312 gallons, colza seed 7790 tons, hemp seed 551 tons, linseed 991 tons, flax 1786 tons, and fodder 745,792 tons. The forests (oak, chestnut, pine, poplar, hornbeam, maple, ash, beech, and elm) yielded 3,180,000 cubic feet of wood, a third of which was applied to various industrial uses. Apples, pears, peaches, plums, cherries, and walnuts are the principal fruits grown. The salt marshes, 4572 acres in extent and employing 3500 work- men, yielded 2486 tons of salt in 1882. In 1884 18,409 tons of coal were mined. Iron, antimony, lead, "the Vendée diamond" (a kind of quartz), china clay, and slate are obtained ; and granite, gneiss, slate schist, limestone, cement, millstones, and clay are objects of industry. The celebrated beds of sea-shells near St Michel-en-l Herm—2300 feet long, 985 broad, and from 30 to 50 feet in depth—show to what an extent the coast has risen. The wool spinning and weaving industry occupies 12,570 spindles and 520 hand-looms ; cotton, 3100 spindles and 5 looms; linen, 388 spindles and 478 looms (80 being power looms). There are pot- teries, paper-mills, tan-yards, dye-works, a glass- work, manu- factories of hats, boots and shoes, and lampblack, flour-mills, dis- tilleries, tile-works, and shipbuilding-yards, and sardines and tinned foods are prepared,—in all 575 industrial

establishments. The sardine fishery occupies 800 boats and 2000 men, and there are extensive oyster-beds near Sables-d'Olonne. Corn, cattle, mules, fish, salt, wine, honey, wood, glass, and manure are exported ; wine, wood, building material, and coal are among the imports. The shipping places are Bouin and Beauvoir in the Breton marsh, and Noirmoutier, the island of Yeu, St Gilles-sur-Vie, Sables-d'Olonne, I'Aiguillon, and Lugon in the Poitevin marsh. In 1882 a total of 391 vessels (180,688 tons) entered and cleared from all these ports. Vendée has 212 miles of railway, 335 of national and 2966 of other roads, and 82 of navigable rivers and canals. In 1881 the popula- tion was 421,642, and in 1886 484,808,—an increase of 191,382 since 1801. The department forms the diocese of Lucon, has its court of appeal and academy at Poitiers, and is included in the dis- trict of the Nantes army corps. There are three arrondissements (La Roche-sur-Yon, the chef-lieu of the department, with 10,991 inhabitants in1886 ; Fontenay-le-Comte, 9282 ; and Sables-d'Olonne, 10,114), 30 cantons, and 300 communes. Lugon (6285 inhabitants) is connected with the sea by a canal, and has a cathedral of the 11th, 13th, 14th, 16th, and 18th centuries, with an elegant Gothic spire, a cloister of the 15th and 16th centuries, an episcopal palace, and a hospital, with portraits of the bishops of Lugon.

VENDOME, a town of France, chief-lieu of an arron- dissement in the department of Loir-et-Cher, is situated on the river Loir, 109 miles south-west of Paris by the rail- way to Tours, at the junction of the line from Blois to Le Mans. The abbey of the Trinity (12th to 15th cen- tury) has a fine portal in florid Gothic style. A graceful balustrade runs round the building at the spring of the roof, and two rows of flying buttresses, themselves resting on other elegant buttresses, support the nave. The high gallery of the triforium, the rich traceries of the windows, and the modern fonts are worthy of notice. Part of the building is in the Angevin style of the beginning of the 13th century. In the choir are some fine stalls and glass of the 15th and 16th centuries. The steeple, 262 feet high, which stands isolated in front of the church, belongs to the middle of the 12th century, and is one of the finest examples of Transition architecture. The lower part is rectangular and the upper octagonal, with a stone spire. It has been recently restored. The church of La Made- leine (15th century) is surmounted by a stone spire, an indifferent imitation of that of the

abbey. The fine tower of St Martin (16th century) is all that remains of the church of that name. The town-hall occupies the old gate of St George; its river front is composed of two

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large crenellated and machicolated towers, connected by a pavilion. The ancient hospital of St James afterwards became a college of the Oratorians, in which Mascaron was a professor, but is now a lyceum; the charming chapel, dating from the 15th century, in the most florid Gothic style, is still preserved. Parts of the chateau of the counts of Vendéme are as old as the 11th century. A public promenade leads to the curious vaults under the castle. Venddme is the seat of an archeological and scientific society, possesses a library of 15,000 volumes and 305 MSS., and a museum, mostly archeological, in front of which stands a statue of Ronsard. There are some interesting houses of the 15th and 16th centuries, and near the town are the remains of a Roman theatre. The population in 1881 was 7913 (commune 9420), the corresponding figures for 1886 being 7843 and 9325.

Vendéme (Vindocinum) appears originally to have been a Gallic oppidum, replaced later by a feudal castle, around which the modern town has arisen. Christianity was introduced by St Bien- heuré in the 5th century, and the abbey of the Trinity was founded in 1030. About the end of the 10th century Vendéme became an independent county, and was raised toa duchy in 1515. It long belonged to a branch of the Bourbon family. During the Wars of Religion the town was sacked by the Protestants, by members of the League, and was finally taken by Henry IV. Since then its industrial and commercial importance (tanneries and manufactories of woollen stuffs and gloves) has fallen off. Marshal de Rocham- beau was a native of Vendéme.

VENEERING is the art of attaching thin sheets or leaves of wood, ivory, &c., to the surface of wood or other material of a less costly or less ornamental description. It is thus in connexion with wood, ivory, &c., equivalent to plating in the working of metals. The art is largely practised

in cabinet-work. Veneers are either cut or sawn from solid blocks or planks. The ordinary veneer saw is a circular instrument of large diameter, made up of seg- ments of thin steel bolted on a strong circular iron frame, which gives the requisite stiffness and rigidity to the saw edge. The teeth of the saw are minute and finely set, so as to waste as little as possible of the valuable material as sawdust. With such a saw from 8 to 16 leaves per inch may be cut out of a block of wood and as many as 30 leaves of ivory, one-third of the solid being reduced to sawdust. Veneers are also made from certain straight- grained and pliant woods with cutting tools, either by the process of planing or of turning. For these methods of veneer-making, the wood to be operated on is first reduced to blocks of a size equal to the cutting edges by which they are to be made into veneer, and are then steamed in a closed chamber to soften the fibre. In the plane veneer- cutting machines the block of wood may be stationary and the cutter movable, or vice versa, and the cutting edge is applied obliquely to the block. Immediately in front of the cutter pressure is applied to the block to keep the shaving from splitting up. , With the planing machine from 100 to 150 veneer leaves can be cut from each inch of thickness. By the lathe-turning method continuous strips of veneer are obtained from circular blocks the width of the cutter, and it is possible to reduce the block till a core of about only 9 inches remains. In the cutting, as opposed to the sawing, of veneers there is no waste whatever of the solid material; but cut veneers are not so serviceable, and the most valu- able veneer woods, being hard, cross-fibred, and brittle, cannot be treated otherwise than by sawing. In veneer- ing, the surfaces to be united, after roughening, so as to give grip, are coated with thin glue applied very hot, and then tightly pressed together in a veneering press, with heated cauls or plates of zine applied to their surfaces, these cauls being contoured to the necessary outline when bent veneers are being planted. Should the veneer show any blistering after removal from the press, heat, damp, and local pressure are applied till veneer and wood are

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Plate IV.

VEN—VEN

solidly cemented together. The surface is afterwards smoothed, polished, and finished as in dealing with solid cabinet woods.

VENEREAL DISEASES. See PatHotoey, vol. xviii.

_ 404, and Sureery, vol. xxii. p. 20.

VENEZUELA,! a federal republic in South America, lying between about 57° and 73° 30’ W. long: and 1° 40’ and 12° 26’ N. lat. The republic claims that the area of its territory is 632,807 square miles; but the boundaries are not yet definitely fixed, and its area is consequently uncertain. In the south-west it claims large tracts extend- ing to the south of the equator, which are also claimed by Colombia and Ecuador; and in the east it claims from British Guiana the upper valley of the Essequibo, together with all the territory on the left bank of that river below the influx of the Rupununi. Of the total area claimed only about 439,000 square miles are actually under Vene- zuelan administration.

Physical Features.—A branch of the eastern chain of the Andes enters Venezuela in the west about 7° N. lat., and under the name of the Sierra Nevada de Merida proceeds north-eastwards towards Triste Gulf. This branch consists of parallel chains enclosing elevated valleys, in one of which lies the town of Merida at the height of 5400 feet, over- looked by the highest summit of the chain (Picacho de la Sierra, 15,000 feet). The sierra contains the water-parting between the basin of the Orinoco and those of the small rivers on the north-west. Hence it may be considered to terminate where the Rio Claro, the stream on which Bar- quisimeto stands, after rising on its western slopes flows eastwards into the basin of the Orinoco. Beyond the Claro begin two parallel ranges known as the Maritime Andes of Venezuela, which stretch east and west along the coast. The valley between these two ranges is the most densely peopled part of Venezuela. Within it lie the town of Valencia (1800 feet), the Lake of Valencia (1400 feet), and the town of Caracas (3000 feet). Above Caracas the highest peak of the system, Pico de la Silla, rises to 8740 feet. Behind the wide bay between Cape Codera and Cumana there is an interruption in the Maritime Andes ; but both ranges reappear between Cumana and the Gulf of Paria. West of the Maritime Andes low ranges (3500- 5000 feet) trend northwards from the end of the Sierra de Merida

towards the coast, on the east side of the Lake of Maracaibo, while the region on the west of that lake consists of lagoon-studded lowlands. East and south of the Sierra de Merida and the Maritime Andes the Venezuelan territory consists mainly of the basin of the Orinoco. This region is for the greater part of its extent thinly populated and little known. It consists of two portions,—a vast hilly or mountainous area, densely-wooded, in the south-east and south, and level plains in the north-west between the Orinoco and the Apure and the mountains. The latter is known as the llanos of the Orinoco, a region described by Humboldt as a vast "sea of grass," with islands of wood scattered here and there. Since the time of Humboldt, however, the aspect of these plains would seem to have changed very considerably. On the occasion of Appun's visit in 1850 trees seem still to have been comparatively rare; but a different aspect was presented when Dr P. Jonas visited the llanos in 1878. From the Galera, the southernmost range of hills north of the Orinoco basin, the traveller saw a vast plain thickly grown with low trees, among which the chaparro was chiefly represented. Few places were quite destitute of trees, and these of small extent. As far as Calabozo (about one-third of the dis-

' The name means "little Venice," and is a modification of the name of Venecia (Venice), originally bestowed by Alonzo de Ojeda in 1499 on an Indian village composed of pile-dwellings on the shores of the Gulf of Maracaibo, which was called by him the Gulf of Venecia.

lao tance between the hills and the Apure) it was now chaparros (evergreen oaks), now mimosas, which were the prevailing feature of the landscape, though other trees were not rare. But towards the south the open grass-covered spaces in- creased in number and area. To the south of Calabozo woods of considerable extent were seen. This change in the character of the landscape is due to the decline of horse and cattle rearing in the llanos, partly in consequence of political disturbances and partly of a murrain which broke out in 1843 among horses, mules, and asses, and in that and several subsequent years reduced their numbers by several thousands.

Geology.—Geologically the chief mountain ranges of Venezucla are all similar in structure. The nucleus of the Sierra Nevada de Merida is formed of plutonic or metamorphic rocks (granite, syenite, gneiss, crystalline schists, &c.), and this series is continued through- out the northern chain of the Maritime Andes. Stratified rocks belonging to the Cretaceous system are found on both sides of the plutonic nucleus of the former range, and are those chicfly seen in the southern chains of the Maritime Andes. Most of these deposits belong to the upper members of the Cretaceous system ; but the lower members come to the surface in considerable patclies west of the Sierra Nevada de Merida, and in the chains just referred to. Tertiary and Quaternary deposits (generally as conipact marl, sand, shingle, and conglomerate) are spread over nearly all the llanos, as well as round the Gulf of Maracaibo, and in the plains drained to the north by the Unare, between the two sections of the Maritime Andes. 'The hills and mountains east of the Orinoco, accord- ing to Humboldt, Schomburgk, and Codazzi, seem to be mainly composed of granite, syenite, and other crystalline rocks.

Climate.—The climate and vegetation are such as might be ex- pected from the tropical situation of the country. But Venezuela, as well as the rest of tropical South America east of the Andes, is directly exposed to the trade-winds. The temperature is thereby considerably moderated, and no such extremes of heat are to be met with as are experienced in the corresponding latitudes of northern Africa. The more populous parts of Venezuela are, how- ever, hotter than the maritime districts of Guiana, being less directly exposed to the Atlantic breezes. At La Guaira the mean temper- ature of the year is 85° Fahr.; at Caracas, only 10 miles distant but 3000 feet higher, it is 71°2 Fahr.; and the greatest extremes that have been observed at the latter station since 1868 are 83°°4 and 48° Fahr. At both stations the hottest periods are the middle of April and the end of August, when the sun is in the zenith. Everywhere there is a well-marked distinction between a dry and a rainy season, the latter occurring in the English summer months, when the sun is in the northern hemisphere and the force of the trade-wind on the north coast of South America is considerably slackened. At La Guaira the rainy season proper lasts only three months (May to August); but this season lasts longer in the mountains and in the llanos.

Fauna.—The fauna includes among the mammals the rodents and carnivores conimon to the rest of tropical South America. The manatee is met with nearly everywhere on the coast. In all the rivers are to be found caymans, electric eels, rays, and caribs, the last (Pygocentrus piraya, P. nigricans, P. niger, Miill.) consist- ing of several species of savage and voracious fishes armed with two rows of very sharp teeth. Among the venomous serpents arc the striped rattlesnake (Crotalus durissus), Lachesis mutus, an ally of the rattlesnakes, and a rather rare species of Cophias. Among the non-venomous sorts the commonest are the boa constrictor, the anaconda (Euneetes murinus), and the Coluber variabilis. Among birds is a singular form known from its note as the bell-bird (Chasmorhynehus caruneulatus). Coral banks abound on the coast ; like the waters which surround the roots of the mangroves, these teem with marine life, aud are peculiarly rich in beautifully coloured crustaceans. Swarms of locusts sometimes commit great ravages among the fields and plantations.

Flora.—The lower slopes of all the mountains are clad with the richest tropical vegetation. Amidst an endless variety of dicoty- ledonous foliage trees, interlaced by numerous twiners and climbers and adorned with epiphytic orchids, Tillandsiz, aroids, and Lor- anthacex, grow numerous palms and tree-ferns, up to the height of about 3500 feet. From among the forest trees may be singled out for mention the silk-cotton tree (Bombax Ceiba), the mango (Jfangi- fera indiea), the saman (Inga saman),—remarkable, like the last- mentioned, less for its height than for the extent and density of the shade which it casts,—the cow-tree (Brosimum Galaetodendron), and the Attalca speeiosa,—this last being one of the finest orna- ments of the palm tribe, a tree whose stem, 40 feet in height, carries erect on its crown leaves which also grow toa height of 40 feet, with a breadth of 8 feet. The mouths of the Orinoco and many parts of the coast are rendered unhealthy by mangrove swamps, which are no doubt partly to blame for the yearly recurrence of

yellow fever in many of the coast towns. From these swamps, however, La Guaira is free, and there the yellow fever is not a regular visitant. :

Vegetable Products.—The two chief crops grown for food are manioe and maize, the latter being generally ground coarse and baked into a kind of cakes called avepas, which are eaten hot like the Mexican tortillas. Among other vegetable products which take an important place in the Venezuelan dietary are all kinds of tropical fruits, including several kinds of melons and pumpkins, the sugar- cane (the sugar in a little refined condition, known as papelon, being a favourite article of food), the taro, sweet potatoes, various beans (including two species of Phascolus, which grow only high np in the mountains, but are highly prized everywhere), and a species

of hemlock (Coniwm moschatwm), which is eaten like celery. Of

plantation products grown for export by far the most important are coffee and cocoa, next after which come tobacco and cotton. The following table (I.) shows (in thousands of tb) the variations in the export of these products in several years since 1830-31 :—

=)

S S Year. | Coffee. |Cocoa. 3 2 Year. | Coffee. | Cocoa. Oo ° oa is) 1830-31 | 11,684 | 7304 | 103 98 || 1864-65 | 28,497) 8,386 1840-41 | 26,316 | 7770 | 1212 | 2038 || 1874-75} 72,263 10,725 781 || 1885-86 | 86,115 | 11,268

1850-51 | 38,432 |.8259 | 1539

This table clearly shows that coffee is rapidly taking a more and more important place as the leading staple of Venezucla. The only date at which the export of coffee shows a decline as compared with the previous date mentioned is 1864-65, when, it is clear, from a comparison of this column with that under cotton, that a consider- able arca must have been temporarily given up to the cultivation of cotton in consequence of the Civil War in the United States. As regards quantity, Venezuela held the fifth place among the coffee- exporting countries of the world on an average of the ten . years 1872-82." Both coffee and cocoa are grown under the shade of ery- thrinas, the scarlet racemes of which at the flowering season impart a brilliant aspect to the plantations. Besides the products above- mentioned, sugar and indigo at one time figured largely

among the exports of Venezuela; but both of them have now almost disappeared from the list of exports, the former in consequence of the decline in cultivation, the latter because of the increasing consumption of papelon among the inhabitants.

The following table (II.) shows, in thousands of acres, the extent of land under the principal crops in 1875, according to Codazzi, and in 1883 according to official estimates :—

1875. | 1883.

1875. | 1883. |

(Clit ee aCe eee 335°7 | 343-1 |} Manioc…..... 67°9 Shear-Cane. ns sosenenee SELON GO \iCoceas .. sas 60°8 Bananas ….....| 69°2| 92°4|| Tobacco ….. 15°6 Weectables:o2—.0.. yee Ee 97-1 || Various fruits …....) . PALO BWRIZE ecenc en aes Het) |) YANN CORIO ca onencosoueas ae | 14- 49

Live-Stock.—The number of live-stock was officially returned in 1888 as follows :—cattle 2,926,738 ; sheep and goats 3,490,563 : horses 291,603 ; mules 247,708 ; asscs 658,764 ; pigs 976,500.

Minerals, —The principal minerals of Venezuela are gold, copper, phosphates, and coal. The rich auriferous deposits on the banks of the Yuruari lie 100 miles south-west of the principal mouth of the Orinoco. At Aroa in the north-west, about 75 miles west of Puerto Cabello, are rich deposits of copper ore. Phosphates are obtained from the islands of Orchilla and Aves, which lie to the east of the Leeward Islands of the Dutch. A large deposit of bituminous coal, said to be of very good quality, exists about 6 miles south of Barce- lona, and a concession for a railway from this port to the coal- bed has been obtained from the Government. Another extensive deposit of bituminous coal has been found on the banks of the Utare, a small stream which empties itself into the sea about 40 miles east of La Guaira. Good petroleum is refined from deposits worked near Belijoque in the state of Los Andes. Both gold and copper ore are important exports, gold ranking in this respect next atter coffee. The total amount of gold exported from Ciudad Bolivar from 1866 to 31st

December 1886, so far as the export was controlled by the state, was 1,946,383 oz.; but it is estimated that within that time about half a million oz. were smuggled away. During the five years 1882-86 the average annual yield was about £740,000. The field from which this yield is derived is at present one of the most promising in the world, but the frontier disputes between Great Britain and Venezuela interfere with the investment of capital for the development of some portions of it to which both sovernments lay claim. Silver and tin are also met with, but neither has yet attained any commercial importance.

Industry.—Manufacturing industries are in general undeveloped. Artisans from Europe and North America are now settled in all the

- chief towns, and cotton weaving factories have been established.

1 Ranking after Brazil, Java, Ceylon, and Hayti.

VENEZUELA

The manufacturing industries most extensively making of shoes and hats. The latter industry is chiefly in the hands of Germans. A material called jipijapa is very largely used for the making of a kind of hats in imitation of Panama straw hats.

Commerce.—The total value of the imports amounted in the year 1885-86 to £2,498,135, and that of the exports to £3,292,171. The principal exports, besides the plantation products and minerals already mentioned, are hides and skins, coir, and animals; those of minor importance are starch, indigo, sugar, tonqua beans, cinchona, caoutchouc, divi-divi, cocoa-nuts, copaiba balsam, plants, and tim- ber. The principal imports are manufactured articles, drugs, and wine, the last from Spain. Petroleum is imported from the United States, though it is expected that the native supplies will soon meet the home demand. Foreign commerce is chiefly carried on with the United States, Germany, France, and England. There is also a coasting trade of considerable magnitude (value £2,382, 719 in 1883). The chief seaports are La Guaira (14,000 inhabitants) and Puerto Cabello (10,145), which has the finest natural harbour in Venezuela, enclosed by a ring of coral reefs ; the next in

import- ance are Maracaibo (31,921), Ciudad Bolivar (10,861), Carupano (12,389), Puerto Sucre, Puerto Guzman Blanco, La Vela (the port of Coro, opposite the island of Curacao), and Guiria (on the Gulf of Paria). Ciudad Bolivar is 236 miles up the river Orinoco, the navigation of which by any mouth has been free to all nations since the 25th of October 1886.

Communication.—The total length of railways open at the end of 1886 was 144 miles, and 263 miles were then in construction. The length of telegraph lines at the same date was 2595 miles. The railways already in existence or in construction are all short lines connecting the chief seaports with the nearest important in- land towns or seats of mineral production, or lines radiating to the more important towns round Caracas. The principal inland towns, besides CarAcas (q.v.), the capital (popnlation 70,509 in 1883), are Valencia (36,145), Barquisimeto (28,198), Merida (10,747), Cala- bozo, Barinas, Nutrias, and Maturin (14,748).

Population, Area, &e.—The republic is divided into eight states, eight federal territories, the federal district, and two national colonies, the names of which, with their arca in square miles and their population according to an official estimate for Ist January 1886, are given below :—

pursued are the

| Popula- |; tion.

States— Wundariy .<...c. 81,123 19,852 Carabobo 2,985 167,499 CAUTA ee eee 22,565 + Guzman Blanco) 33,890 515,418 Goajinatenc.-2e 3,608 36,500

Gi) Sees 9,297 | 245,489|) Colon …..... 166 137 Los Andes 14,720 317,195 Armisticio …. 7,151 a ATOR ares oe 25,212 245,457 IDE a ee 25,347 S0 INGO Gooaance 36,218 198,260 || Federal District 45 70,078 Bolivar …... 88,701 57,169 || Colonies—

Bermudez 32,248 285,377 Guzinan Blanco 214 1,599

Territories— Bolivarsc.o.: .. 9 Alto Orinoco) 119,780 38.340 La. a ‘Amazonas .. {| 119, , 594,197 {2,198,320

Armisticio, Alto Orinoco, Amazonas, Yuruari, and Delta inelude the disputed tracts of territory. The population of Caura in the preceding table is included in that of the state of Bolivar, the popu- lation of Armisticio and Delta in that of the states of Bolivar, Zamora, and Los Andes, and of the colony of Bolivar in that of the state of Guzman Blanco. The agricultural colonies are under the administration of a governor subordinated to the ministry of progress (del fomento). The pure white population is estimated at only 1 per cent. of the whole, the remainder of the inhabitants be- ing Negroes (originally slaves, now all free), Indians, and mixed races (inulattos and zambos).

Religion, Education, &c.—The Roman Catholic is the religion of the state, but liberty of worship is guaranteed by law. So far as legislative enactment goes, elementary education is now well pro- vided for ; but in the year ending 30th June 1886 the total number of common, municipal, and private schools was 1957, and the num- ber of pupils 99,466. There are also two universities (Cardcas and Merida), 19 federal colleges, and various other public and private institutions for higher education. The standing army consists of about 2800 men, but every male subject between eighteen and forty- five has to be enrolled in the national militia. The monetary system of Venezuela is that of the Latin convention, the franc being represented by the bolivar. The French metric system of weights and measures is likewise the legal system ; but the old weights, the libra =1-014 Ib avoir., the quintal =101-4 tb avoir., and the artoba = 25°35 tb, are also in use.

Finanee.—The revenue, which is chiefly derived from customs duties, amounted in 1885-86 to £1,098,644 and the expenditure to £1,239,400. The public debt, of which the external portion alone amounted in 1878 to nearly £11,000,000, including arrears of in- terest, was reduced in 1881 to a total of £4,000,000 by the issue of new bonds in place of all the old ones, both external and internal. At the end of 1886 the external debt amounted to £2,680,850, bearing interest at 4 per cent.

VE N—

Constitution.—The eonstitution is modelled to some extent on that of the United States. At the head of the executive is a pre- sident, who is assisted by eight ministers and a federal council. The legislative authority is vested in a congress of two houses, — a senate (24 members) and a chamber of deputies (52 members). The members of the chamber of deputies (one for every 35,000 in- habitants, and one more, for an excess of 15,000) are elected every four years directly by the electors of the states and the federal dis- trict, those of the senate by the legislative bodies of the different states (three for each). The congress elects the members of the federal council, in which there is one senator and one deputy for each of the political divisions of the republic, and one deputy for

the federal district. The federal council eleets the president. The | federal council and the president remain in office for two years. History.—The coast of Venezuela was the first part of the American mainland sighted by Columbus, who, during his third voyage in 1498, entered the Gulf of Paria and sailed along the coast of the delta of the Orinoco. In the following year a much greater extent of coast was traced out by Alonzo de Ojeda, who was accompanied by the more celebrated Amerigo Vespucci. In 1550 the territory was erected into the captain-generalcy of Caracas, and it remained under Spanish rule till the early part of the 19th century. During this period Negro slaves were introduced ; but less attention was given by the Spaniards to this region than to other parts of Spanish America, which were known to be rich in the precious metals.

In 1810 Venezuela rose against the Spanish yoke, and on 14th July in the following year the independence of the territory was proclaimed. A war ensued which lasted for upwards of ten years, and the principal events of which are described under BoLIVAR (q.v.), a native of Caracas and the leading spirit of the revolt. It was not till 30th March 1845 that the independence of the republic was recognized by Spain in the treaty of Madrid. At the date of. the battle of Carabobo (1821), by which the power of Spain in this part of the world was broken, Venezuela formed part of the federal state of Colombia, which embraced also the present Colombia and Ecuador ; but a meeting of Venezuelan notables on 26th November 1829 declared for the separation of their country from the eon-

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Pan | Hisrery.

LTHOUGH the numerous marshy islands of the la- goons extending along the north-western shores of the Adriatic between Altinum and Adria are known to have been largely used from the beginning of the 5th century by the inhabitants of Venetia (compare vol. xiii. p. 447)—one of the twenty-nine provinces into which Italy was divided by Constantine—as temporary retreats from successive barbarian invasions, the first permanent settlement on the site of the present city of Venice—the Rivo Alto (Rialto) and its numerous adjacent islets—cannot with certainty be traced further back than to the beginning of the 9th century. The physical conditions with which the earliest inhabitants had to deal were such as might seem singularly mpropitious to the growth of a large and prosperous city. Their untillable and salt-encrusted soil possessed no kind of mineral wealth; the thickets which here and there diversified the surface of the barren marshes produced no serviceable timber ; and even drinkable water was hardly obtainable ; yet it was here that the Venetians by their inventiveness, their energy, their industry, and their genius for commerce succeeded in establishing themselves on a firm soil and maintaining their independence, in making their neighbours their tributaries, in sending their fleets to distant shores, in controlling the destiny of empires, and consolidating a naval power that is unique in the his- tory of the world. cope The Venetian form of government—that of an aristo- mS. cratic republic—had its first beginnings at a very early period. Originally all power had been delegated to Ihagistrates known as tribuni maritimi or maritime tri- bunes ; but in 697, in order to give greater strength to the Supreme power and more unity to the popular representa- tion, a doge or duke was chosen, who had his residence in the little town of Heraclea. The first to bear this title

| Origin of the state.

Doge,

ap ee

federacy. Venezuela passed through the first years of its inde- pendent existence with more quietness than the other members of the confederacy. In 1846 there began a series of civil wars and revolutions, which continued, with but short periods of rest, down to the close of 1870. The chief rival parties in these internal dis- sensions were the Unionists and the Federalists ; the former aimed at securing a strong central Government, while the latter, who were ultimately victorious, desired to obtain a large measure of independence for separate states. It was during these troubles that the emancipation of the slaves took place, under a law of 24th March 1854. On 28th March 1864 a federal constitution was drawn up for the republic. Three years later, however, the civil war broke out again, and matters continued in an unsettled state, till in December 1870 Don Guzman Blanco, who had taken the leading part on the side of the Federalists, was declared provisional president. From that date Blanco acted as dictator till 20th February 1873, when he was elected constitutional president for four years, and it has been chiefly owing to his energy and ability that the confederacy has since proceeded on a course of orderly development. The two flourishing agrieultural colonies already mentioned were founded during his first tenure of office, in 1874. The chief event in recent years has been the re-division of the territory in 1881 into the states and territories whose names are given in the table above.

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the fauna and flora, see A. Ernst, Estudios sobre la Flora y Fauna de Venezuela, Caracas, 1877, 4to. There isa map of Venezuela by A. Codazzi in four sheets, with views and statistical tables, 1876; and a physical and political map accompanies the Statistical Annuary issued by the ministry of — (Caracas, 1887). G.)

ICH

was Paulucio Anafesto; the assembly by which he was elected consisted of the entire body of the inhabitants, not only of the towns on the mainland, which were constantly under fear of renewed barbarian devastations, but also those of the islets of the lagoons. Although all had equal electoral privileges, there were gradations of social rank, the citizens being divided into three classes—the maggiort, the mediocri, and the minori. The new arrangement lasted only forty years, when a general assembly resolved by ac- clamation on the abolition of the ducal power, for which was substituted that of the maestre della milizia, whose term of office was to last only for a year. The inconveni- ences of the new system, however, soon became apparent, and five years later (742) the assembly demanded the restoration of a single popular representative with life tenure, who again bore the title of doge: On this occasion the newly elected doge transferred his residence from Heraclea to Malamocco. The practical risks involved in the new experiment are obvious. In the succession of doges some were almost sure to show themselves unfit for the supreme power, others to disregard the authority of the auxiliary magistrates associated with them for purposes of control, and some even to aim at the establishment of an hereditary tyranny. Consequently the next sixty years witnessed a succession of bloody revolts, in the course of which three doges were put to death, one deposed and exiled, and several others condemned to lose their eyes. Nor was the incapacity or the ambition of individuals the sole cause of such revolutions: new circumstances as they arose sometimes compelled the doges by the very law of their existence to seek support outside the limits of the state, at one time from the Greek empire, whose frontier extended to their very doors, at another time from the Lombards, the latest invaders of Italy, who had permanently established themselves there and were daily acquiring new influence. Foreigners who, in connexion with the interests

War with Pippin.

Founda- tion of the city.

Early doges,

Suppres- sion of Adriatic pirates.

of commerce, had entered into close relations with the Venetians took advantage of these to stir up troubles, and sought to conciliate the doges with a view to the enlarge- ment of their trading privileges or the concession of mono- polies. Between 712 and 810 various struggles arose which called for the intervention in the lagoons of the generals of Pippin and his son Charlemagne. Doge Obe- lerio, a declared partisan of the Franks, allowed a war to break out between the Venetians and the Lombards, in the course of which Pippin seized Grado, the see of the patri- arch, burnt Caorle, Jesolo, and Heraclea, encamped in Albiola, and, forcing his way into the lagoon, threatened Malamocco itself (see map, p. 157 below). Peace was afterwards concluded, and the danger to which the last refuge of the fugitives from the mainland had been exposed led to their increased security. For, whether from the instinct of self-preservation or from a growing conscious- ness of the idea of fatherland, these fishermen became drawn together more closely than ever for purposes of common defence, and found theniselves possessed of a power hitherto unsuspected, so that they were able to com- pel their enemies to respect their independence and enter into commercial relations with them. The year 810 was one of the most important in the annals of Venice: it was then that the people finally abandoned the mainland in order to make the Rivo Alto with its surrounding islets the permanent seat of their government. The same year witnessed the beginnings of the basilica of St Mark. Angelo Partecipazio, who had proposed the migration to the Rialto, was chosen doge, and the town of Venice may be said to have been then founded.

From 811 to 1026 there was a succession of eighteen doges, of whom no fewer than fifteen were selected out of three leading families, political

power thus plainly tend- ing to become hereditary. It was no uncommon thing, however, for the people again to dismiss those whom they had thus placed in power. Murder, exile, cruel punish- ments, closed the career of more than one of the doges who had been called to the supreme authority by a unani- mous vote ; whole familics connected with rulers who had been deposed or put to death were compelled to quit the islands, and sought the help of the emperor Otho IL. That emperor was preparing an expedition against Venice at the very moment of his death ; and now once more the Venetians found safety in the very greatness of the danger which had threatened them, for the peril itself indicated to them the future at which they ought to aim if they would live and rule.

From the necessities of its geographical position the new state was bound to become a maritime power and to look to the East. Towards the end of the 10th century the doge Pietro Orseolo by a vigorous effort cleared the sea of pirates, who dwelt on the eastern coast of the Adri- atic and seriously harassed the Venetian commerce, and pursued them into the recesses of Quarnero and the islands of Istria. On 20th May 998, having advanced as far as Dalmatia, he came upon them in their apparently inac- cessible retreats, and inflicted upon thema great slaughter. Having thus given full security to trade, he constituted himself protector of the sea from Trieste to Albania, re- ceiving in consequence the title of duke of Dalmatia. Tt was to symbolize this dominion that Venice instituted the superb ceremonial of the espousals of the doge with the Adriatic, which was annually obsérved on Ascension Day.

Period of The republic began henceforward to undertake the bus}.

crusades.

ness of transporting to the East the successive armies of crusaders, to whom she lent on hire the fleets which were built in her arsenals; and these bold enterprises, at once religious, commercial, and military, procured for her in exchange important stations on the east of the Adriatic

VENICE

| and in the islands, as well as colonies and factories advan-

[HISTORY,

tageous for her commerce. The whole littoral from Trieste to Albania became in this way a sort of prolongation of the Venetian coast. The Byzantine emperors could hardly fail to become jealous of this great though pacific influence, and of the wealth thus created under their eyes and at their expense; and in the spring of 1171 Manuel I. ordered the sequestration of all Venetian goods and of all Venetians who had settled within the empire. Such a high-handed act at once called forth an outburst of enthu- siasm, and the doge, Vitale Michieli IL, sent out against Constantinople an imposing fleet to avenge the cause of the Venetian colonists. An outbreak of plague, however, on board the fleet compelled him to return to port; in so doing he brought the scourge to the town itself,—a dis- aster which led to his death at the hands of the infuriated populace. Even this catastrophe was not without its uses, for it led to the introduction of reforms fitted to give greater internal stability to the state.

Under Sebastiano Ziani, Michieli's successor, the con-Consti- |

stitution underwent a further modification.

The citizens, tution of

already divided into quarters (sestiert), nominated twelve 'estate

electors, who in their turn made choice of forty picked citizens in each of the divisions of the city. The 480 thus chosen constituted the great council, a body possessing at once deliberative and executive functions. Before this period certain intimate councillors, two of them perma- nent, had been summoned to act as advisers of the doge in matters of importance; but now their number was in- creased and they were requested (hence the name pregato) to assist the head of the state in all circumstances. The two permanent councillors of the doge, increased to six and conjoined with the supreme magistrates on whom the administration of justice had always devolved, formed the lesser council,

which afterwards came to be known as La Signoria. If we add, finally, to the powers already enu- merated the council of ten, which was instituted later, and also take into account the increasing body of secretaries and the magistracies which were gradually created as need arose, we shall have an adequate conception of the per- fected instrument of government by which the republic was controlled from the 13th century until its fall. While the political organization was thus rapidly developing, the change which was also passing over its democratic spirit must not be overlooked : the simple citizen gradually lost his privileges, and the increasing restrictions laid upon freedom ultimately made the government essentially aris- tocratic. Towards the end of the 13th century (1297) the important measure known as the "Shutting of the Great Council" (compare vol. xvii. p. 527), and subsequently the inscription in the Golden Book of the names of all branches of the noble houses, for ever shut against plebeians every avenue to power. For a long time before this the right of electing the doge had been restricted to certain care- fully-selected citizens,—a constitutional change of capital importance, which had caused much discontent and raised such a ferment in the mind of the masses that the first doge who was thus chosen, realizing the danger of the situation, refused to accept the dignity. The number of the electors was consequently increased and the election made subject to a number of ballots intended to safeguard the integrity of the vote; but it remained none the less true that to the people had been left nothing more than the illusory right of approving by acclamation in the basilica of St Mark each new doge after his election. The aristocracy, as it felt its growing force, proceeded to en- large its powers, and did not fail to guard them down to the fall of Venice by constantly increased restrictions. It was not long, it is true, before the danger attaching to so great a power separated from the living forces of the nation

was perceived, and there came to be instituted special kinds of magistrates, such as the "'correctors of the ducal engage- ment," whose function was to revise the charter to which he was to swear, and who

steadily exercised it in the way of restricting his freedom in such a manner that about the 16th century his lot was little better than that of a prisoner of state. Then there were the " examiners of the deceased doge," instituted in 1501,—posthumous judges whose ver- dicts on each departed doge on behalf of posterity still

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enamels, tapestries, silks, served as models to the deft artisans, who drew from them new inspiration and, re-dis- covering the secrets of the smith's and potter's and glass- blower's art, reproduced the artistic triumphs of their Oriental masters. Nor were letters neglected: rich and ancient manuscripts were brought from Greece ; a friendly asylum was offered to exiled men of genius and learning ; and freedom of thought and intellectual independence be- gan to be exercised.

If Venice in the course of its history was able at one Com- period or another to show its superiority in every field of mercial activity, if at the same time it was able to show enduring = am stability in its institutions and a wealth and political power tians.

further conspired to neutralize the dangers arising from . personal power.

eriodof The history of Venice was officially written by contem- _geatest porary chroniclers. The records they have left are of course

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exceedingly valuable; but, as they were subjected to a rigorous censorship, the element of criticism is quite ab- sent. Modern investigators, viewing the events from the outside, have been much more successful in forming a true judgment upon them and in tracing effects to

their actual causes. 'Those Venetians who, since the fall of their re- public, have endeavoured to investigate its annals in an independent spirit have come to the conclusion that it was between the 12th and the 15th century that the state reached its highest prosperity and power. In point of fact, the republic had at the beginning of the 13th century become so powerful that the Byzantine empire fell into its hands through the conquest of Constantinople by the doge Enrico Dandolo (1204). The Venetians even sought to raise a Latin empire upon its ruins, but the attempt was frustrated by the jealousy of the rival republic of Genoa, which re-established the Greeks in 1261. The period be- tween 1172, the date of the election of Sebastiano Ziani, and 1300, that of the election of Pietro Gradenigo, is one of the most brilliant in the history of Venice. The union that prevailed among all the citizens, the common effort of all classes, the military energy of the Government, the supple flexibility of its policy, had given them Constanti- nople ; and the peace which they made with Palzologus on his restoration to the Byzantine throne brought them many splendid advantages. It was in virtue of these successes and in the midst of the internal peace which they had secured that Pietro Gradenigo proposed the "Shutting of the Great Council," a measure the importance of which can be traced throughout the subsequent history of the state. Its effect was to exclude from political power all who had not been members of that assembly during the previous four years ; in a word, it constituted an heredi- tary legislature. Grave as the measure was, alternately accepted, rejected, modified, and never unopposed, it was finally carried. The new body enacted new laws and pro- vided adininistrative heads for the ten departments of government,—justice, legislation, worship, finance, com- merce, education, war, marine, public health, and city ad- ministration. The powerful and wealthy republic now found the honour of its alliance sought by emperors and popes ; the standard of St Mark was a familiar sight all over the Mediterranean ; and ultimately Venice entered the "European concert." Now, too, she began to show that devotion to architecture and the fine arts generally of which the basilica of St Mark's and the ducal palace are the most striking monuments.

Grown wealthy by commerce, and having acquired by the force of arms considerable territory on the east of the Adriatic, the Venetians now cast their eyes towards Asia. Their adventurous travellers had penetrated to

the central tegions of that continent, and Marco Polo on his return dazzled the populace by his wondrous tales and excited the cupidity of the merchants with visions of the riches of the East. New commercial enterprises were entered on; samples of Oriental industry with all their splendour of colour and delicacy of pattern were brought home: glass,

quite out of proportion to the smallness of its territory and the number of its subjects, it owed these in the first instance to its genius for commerce and to its maritime ascendency. This commercial genius led in the first place to the de- velopment of Venetian shipping, the growth of the arsenals, and large advances in the art of naval construction, and ultimately resulted in indisputable naval supremacy. The beginning of its fortune was in the salt trade, of which it had the monopoly throughout central Europe. Besides working the sources of salt which they had within their own territory, the Venetians rented those of their neigh- bours the Bolognese, and found access to the rock-salt deposits of Austria and Hungary; and in every instance where a treaty was made with a foreign power a clause was introduced reserving to Venice, whether as victor or as vanquished, the exclusive privilege of supplying this

commodity. The arsenal of Venice, which still exists, was The ar-

its palladium ; the high organization of this establishment, the technical skill of its workmen, the specially selected body of the "'arsenalotti," to whom the republic entrusted the duty of guarding the senate and great council, and its admirable discipline were for centuries the envy of other European powers. The enemies of the republic frequently made special efforts to destroy it by espionage and treach- ery. At the most critical period in its history, when it was engaged in its great struggle with the Turks towards the end of the 16th century, the arsenal regularly sent forth a fully equipped galley each morning for a hundred successive days. The power or decadence of the republic at each period may be measured by the extent of its build- ing-yards and by the number of its workmen and seamen. Where an ambassador had once seen an imposing force of 200 galleys all fully equipped for sea, another two centuries later saw only 20 ships of war, 16 galleys, and 2 galeasses. At the acme of its prosperity the arsenal employed 16,000 workmen ; buta little more than a century

afterwards, even at a time of war, that number had fallen to 2000, still further diminished in peace to 500.

senal.

The 14th century is remarkable for a series of con- Conspi-

spiracies, which the official historians have attributed to tacies of

but which no doubt had ee een ury.

mere turbulence and malignity, their main cause much deeper, in the position to which the masses had been brought by the political changes of preceding centuries. The conspiracy of Marino Bocconio in 1300, that of Bajamonte Tiepolo ten years later, a third in 1328, and finally that associated with the name of Marino Faliero (1355), without actually imperilling the existence of the state, compelled the great council to take measures against the recurrence of such movements, and

resulted in the creation of the "council of the ten," that Council

powerful and mysterious body the significance of which of ter.

still continues to exercise the ingenuity of the modern historian. Of these four conspiracies the first three were certainly aimed at the restoration of popular rights ; the fourth, on the other hand, arose out of an ambitious attempt to seize personal power. The legend of Marino Faliero is well known (see FaLiERo). It would be difficult

to describe exactly the functions of the council of the ten. Appointed merely provisionally in 1300 at the time of the conspiracy, to act as an inquisition, it was made a perma- nent body in 1335. Twenty years later the importance of the process against Marino Faliero led to an increase in the number of its members (/a zonta), and thencefor- ward the ten, under the presidency of the doge (Ww con- siglio), took cognizance of all matters, and their action extended over every department of government.

It isa mistake to suppose that the council was merely an exten- sion of the power of the aristocracy. It acted, on the contrary, as a check on the encroachments of the latter ; and, if it occasionally fell into culpable excesses, if some- times it employed what might be called "stage" machin- ery, allying itself with informers; rewarding traitors, sur- rounding its deliberations with an air of mystery only too favourable to private revenge and too threatening to public security, and in fact becoming at one time plainly the instrument of tyranny, nevertheless its constant watchful- ness over the interests of the state was not without advan- tages and compensations.

As invariably happens, the threatenings of danger from without gave pause to internal sedition and served to unite more closely together the aristocracy, the people, and the middle classes. The Genoese could but ill endure the supremacy of their rivals in the Adriatic. Leaving out of account a few years of truce, from 1298, the year of the defeat of the Venetians by their rivals at Curzola, to 1379, when after various changes of fortune the complete destruc- tion of their fleet by the Genoese at Pola allowed the latter to force a passage to the very heart of the lagoons, the struggle between the two maritime republics had gone on uninterruptedly. Never had Venice been nearer total destruction than after the disaster at Pola, but never also had the patriotism of her citizens expressed itself more clearly and unmistakably. The community of interest be- tween all classes was fully realized: old men, women, and children flew to arms ; all classes liberally contributed to the replenishment of the empty treasury; the precious things that had been brought from the East found their way into the melting pot, and even the altars were stripped. Doge Andrea Contarini, an old man of eighty, claimed the honour of leading an improvised fleet against the enemy, and Victor Pisani, a distinguished captain who had fallen under the suspicions of the ten, was brought up from his dungeon amid the acclamations of the whole people, who sacrificed every resentment to the ardour of their patriot- ism. Along with Carlo Zeno, just returned from the wars in the East, he gave spirit to the combatants, and drove the Genoese from Chioggia (on which they had seized). Venice was saved, and, grateful for the services rendered by certain families of the middle class who had ably assisted Pisani and

Zeno, the great council added to its numbers thirty new members selected from those who had most distinguished themselves in the struggle.

Con- The large extension of its territory on the mainland in yeaa ae the 14th century marks an important stage in the history a of Venice. From being essentially a naval power, the republic now began to be an important continental one 5 and henceforward down to the 17th century it threw its sword into the balance on every occasion on which Italy was made the battle-ground of Europe. The fall of the Lombard kingdom, the struggles of the Ghibellines and Guelphs, and the personal exploits of the condottieri al] urged Venice to take her part in the great movement, to widen her sphere of action, while fortifying herself against the dangers of her immediate neighbourhood, and to issue from her lagoons and establish herself as a state on terra Jirma. Venice made herself mistress of Vicenza, Feltre,

Contest with Genoa.

and Bassano in 1388 ; and with the help of Carmagnola, |

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Gattamelata, and afterwards Alviano and Colleoni, Padua and Verona were added in 1405, Udine and Friuli in 1420, Brescia in 1426, Bergamo in 1427, Crema in 1449, Rovigo in 1484, and Cremona in 1499, and podestas were set over each of these provinces.

Meanwhile a new danger was arising to Venice out of Danger| the Turkish advance in Europe. The republic was com- from il pelled to live continually, so to speak, on the qui vive, Tks. | perpetually on the defensive. Mohammed IL. became master of Constantinople in 1453; in the following year the Venetians attempted to exorcise the plague by means of a commercial treaty ; but not many years passed before hostilities broke out. The Turks were destined to become the hereditary and implacable enemies of the republic, and their attitude of hostility to cease only with the fall of the latter. And, except for one united effort

towards the end of the 16th century by Spain, Venice, and the pope, which resulted in the victory of Lepanto (1571), the banner of St Mark was almost invariably unsupported in its contest with the crescent. At Negropont (1470), Smyrna, and Scutari (1474) Erizzo, Mocenigo, and Loredano valiantly main- tained the honour of their flag; but after a struggle of several years the Venetian possessions in the archipelago were lost and the proud city was compelled to cede Scutari (1479), Negropont, and Modone. Nor was this all; the geographical discoveries of the Portuguese and the Span- | iards were about to inflict an irreparable blow on the mari- time supremacy of Venice. Although the bold feats of Columbus and Vasco da Gama deeply stirred her enthu- siasm, yet times had changed. New cares and new duties called her attention elsewhere; Venice could no longer concentrate all her energies upon her navy; having now become a territorial power, she had to watch her frontiers i on every side, threatened by troublesome neighbours, now | by the Malatestas, now by the Estes, the Bentivoglios, and ; the Borgias.

Having entered into treaty relations with Florence, Conti- | Milan, and the Vatican, she found herself continually in-2ental volved in ceaseless struggles, which demanded the presence struggl: of her mercenaries now in the plains of Lombardy, now in the Romagna, sometimes even in the kingdom of Naples. At the close of the 15th century, after a forty years' dispute over the fragments of the Lombard kingdom, which had fallen into the hands of the condottieri, the Italians saw the Alps twice crossed by the French and their country turned into a European battlefield. The efforts of the Venetians to extend their possessions on terra firma along |

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the Italian shore of the Adriatic and inwards towards Bergamo provoked the Italian captains who had founded hereditary dynasties to unite with the pope and the king I of France in opposing their further progress. Thus arose | ; the League of Cambrai, which brought the republic to the League — verge of extinction. Defeated at Gera D'Adda (Agnadello) Cambra in 1509, she was compelled to withdraw her armies, uot

only from the recently conquered territories, but also from , those in which she had been established for more than a 7 century, and she had

even to release her own subjects from { their oath of allegiance. She had passed through no such peril since the day of Chioggia in the struggle with Genoa, | for she was now face to face with three formidable enemies, —the king of France, the emperor Maximilian, and the pope,—not to speak of numerous petty powers, her Mantuan and Ferrarese neighbours, who hoped for a share in the spoil. At this juncture the senate displayed all its adroit suppleness and all its energy ; it recognized how necessary it was on such an occasion to show pliancy, to temporize, and be humble. A new league, formed against the very power which had initiated the first, proved the salvation of Venice: the king of France fell under the suspicion of his allies, who accordingly turned against him. The battle

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'attle of Venieri to be its admiral.

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of Ravenna in 1512 and that of Marignano in 1515 changed the whole aspect of affairs ; new combinations were formed ; and the treaty of Noyon restored to the republic all the continental territory she had lost.

Nevertheless the commonwealth was not allowed to rest, but was compelled henceforth to live constantly on the defensive, on the one hand against the Turks, who were a standing menace, and on the other, watching every move- ment and enterprise of the Italian princes, who would not suffer her to remain neutral in their incessant conflicts. Neither under Pius V. nor under Philip II. was the com- bined assistance of the pope and the Catholic king of much assistance to Venice against Islam. From the peace of Noyon (1516) to the year 1571, the date of the battle of Lepanto, the republic was never able for a single moment to lay down her arms, but was constantly driven to renewed efforts, which could not fail to exhaust her more and more. One by one she lost all her colonies: at one time it was Corfu, at another the islands of the Aigean, at another Nauplia and Malvasia. Her podestas, proveditori, and ambassadors in their several departments displayed an energy and a

patriotism to which there are few parallels in history: the names of Bragadin and of Marc Antonio Barbaro remain as abiding examples of disinterestedness and patriotic self-sacrifice. Born for the service of the state, her nobles were held bound to devote their energies to the republic from early manhood, and to give her the benefit of their strength and experience to their latest breath. About 1570 the Turks threatened the fleets of the Christian powers which ventured into the Adriatic ; and the pirates of the Barbary coasts boarded the Christian galleys and carried their crews into captivity, where they were held at heavy ransom. The Spaniards, whose sway then extended to the African coast of the Mediterranean, were determined to put an end to these incursions; the popes for their part were always ready to do battle with the infidel and to league themselves against the enemies of Christendom ; and Venice, who saw her colonial pos- sessions falling from her one by one, could not refuse an alliance which seemed to promise the possibility of strik- ing a grand blow by which her supremacy might be re- stored. On 13th May 1571 the treaty of alliance between the three powers was signed ; the league against the Otto- mans was to be perpetual, and its avowed object was to destroy their influence. Philip II. agreed to pay half the expenses of the expedition ; the republic supplied galleys to the pope ; Spain contributed her fleets and demanded in return the chief command of the expedition. The total naval force numbered no less than 300 vessels, while the troops embarked were reckoned at 50,000 foot soldiers and 5000 horse. Don John of Austria represented Spain in the command ; the papal forces were entrusted to Mare Antonio Colonna ; while the Venetian senate nominated Sebastian The result of the battle of

"panto. Lepanto, 7th October 1571 (see vol. xiii. p. 717), was ap-

parently the complete destruction of Turkey's naval forces, But the mutual jealousies of the allied powers served to counteract the effects of the victory, and the peace which followed, instead of being advantageous to the victors, turned out much to their prejudice. The action at Lepanto had taken place in the beginning of winter ; it was impos- sible, therefore, to undertake anything further before the

- Spring of the following year (1572), and each of the powers

believed its fleets secure in the ports where they had taken

vanced through the archipelago and devastated the Venetian colonies. The Spaniards at Messina awaited the decision of Philip IL. before they could set sail; the knights of Malta and the duke of Savoy, less hesitating, consented to join the Venetian galleys, and to go to meet the Moslems, whom they encountered at Cerigo. A battle of doubtful issue was about to be engaged in, when a message from Don John announced the co-operation of the Spanish fleet, but at Corfu, whither the Venetian admiral was requested to repair in order to concert a new plan of attack. The Venetians did not feel certain enough of success to warrant them in commencing hostilities without their ally, and, sailing for Corfu, they once more entrusted the supreme direction of affairs to Don John. But it is easy to under- stand how disastrous in their results such vacillation and hesitancy must necessarily be. It was not till the end of August that the allied forces, once more brought together to the nuniber of more than 250 vessels, set sail in search of the Turkish fleet. The latter, being lighter, gave way before the enemy, and, avoiding a pitched battle, did not give opportunity even for a skirmish or the capture of a stray prize. Meanwhile the winter was approaching ; navigation was becoming dangerous; the Spaniards were indisposed for action; and Don John, alleging the gravity of his responsibilities, returned to his anchorage at Messina. Thus a whole year had been lost, giving to the enemy daily opportunities of recuperation, Every day new differ- ences and mutual recriminations arose among the allies, and at length the idea of a peace with the Turks began to be broached in the councils of the republic. Such a pro- posal, however unlooked for, was suggested by considera- tions of the most practical kind, and by a just appreciation of the resources of the Ottoman empire; and the resulting negotiations, which were secretly conducted, led to a treaty being signed on 15th March 1573. By that treaty twenty years of peace were guaranteed to the republic; but it reversed the position of parties, and the vanquished of Lepanto now figured as victors. The Turks in fact were audaciously exacting, but their negotiations were ably con-

ducted and were completely successful. The one place which they had lost, Sopoto, was restored to them, and Venice also consented to the definitive cession of Cyprus, which had temporarily fallen into her hands before Lepanto. Nor was this all: it was not forgotten that Venice was tributary to the sultan ; her dues were doubled and a war indemnity of 300,000 ducats was stipulated for. On the other hand, the commercial privileges hitherto enjoyed by the republic were confirmed, and the freedom of the seas was guaranteed,

The epoch of Lepanto is, however, the most brilliant in Venetian history as regards the efflorescence of the arts and of literature ; it was at this time that the artistic glory of the city was seemingly most brilliant and most developed, and exercised the greatest attraction for strangers. More closely viewed, the 15th century had attained in Venicc and the subject cities of the mainland a higher degree of culture ; architecture, painting, sculpture, and the minor arts were inspired by a sentiment deeper, more sincere, more elevated both in form and in idea; but the artists who arose between the middle of the 15th and the closc of the 16th century had a natural disposition, with a touch of the sensual, better corresponding with the tastes of the people and with its artistic ideal, which aroused a greater enthusiasm and made their names more famous.

In literature and art Venice was the link between Italy Arts and and Greece. Its Eastern colonists learned the Greek ae tongue ; and the fall of the Greek empire brought to them “”~ its banished men of science and letters, who taught in their university and introduced to the Venetians the works of the ancients. Guarino of Verona opened to them Xeno-

tefuge, when, on the following May, the tidings reached Venice that the Turkish fleet which had been supposed annihilated was once more afloat. Don John had wintered at Messina; Colonna had returned to Civita Vecchia; while the Venetian fleet had cast anchor off Corfu. Before the Scattered allies could reunite sixty Turkish galleys ad-

Condi- tion at end of 16th century.

phon, Strabo, Lucian, Orpheus, Arrian, Dio, Procopius, Diodorus of Sicily, and Plato. At the same time they made Oriental architecture their own, impressing on it the stamp of their special needs and national genius. The Arabs gave them the manufacture of gunpowder and glass, and taught them decorative art; and from Persia they learned to weave costly tissues; while their plastic arts retained a reflexion of the sunny lands which, for geo- graphical reasons, were the source of their riches and the chief object of their preoccupation. 'The architecture, the painting, and the sculpture of Venice are separately treated (see below). Nor must it be forgotten that the city wel- comed from the first the art of printing, and stamped it with its own individuality. Venice, more than any other town, has the credit of having rescued from oblivion, by editions and translations, the masterpieces of Greek litera- ture. The work of the elder Aldus in this direction from 1495 to 1515 has been spoken of in the article ManuTiIUs (q.v.). The literary talent of Venice did not shine in works of imagination ; but on the utilitarian side it was really great and original. In Venice history was written to order, and so is open to suspicion. In poetry, if we may cite Pietro Bembo, Molza, Berni, Lodovico Dolce, Doni, Niccolo Franco, Rucellai, Sperone Speroni, and L. Aretino, whom lis contemporaries called 7 Divino, as all Venetians or refugees claiming the greater freedom of thought which Venice then afforded, we must yet admit the lack of a name of world-wide significance, a Dante or a Moliére. But the library of St Mark's shows the respect of the republic for letters; the building that housed the MS. collections bequeathed by Petrarch and Cardinal Bessarion is, perhaps, the most perfect model of 16th-century architecture ; and the librarian of the Marciana was, in virtue of his office, so high a personage that he had a title to be voted on by the senate and the great council for the ducal crown.

Such was Venice at the close of the 16th century, when some clearness of vision was still needed to foretell the approaching decay. She still had colonies, but their pre- servation became more difficult with the declining resources of the state. The customs were less productive, and the senate vainly sought to improve them by instituting at this period the "consuls of the merchants," the " provisors of commerce," the five "experts in

exchanges." Manners, too, were degenerating into indolence and luxury, and the courtesans of Venice were more famous than those of Rome. The proveditori alle pompe were designed to check the dilapidations of young patricians on the wealth their ancestors had gained by trade, and the like wastefulness of plain citizens, who consoled themselves for their exclusion from public charges and honours by squandering in idle profusion the money gained by trading commissions and illicit pursuits.

If the old senators who had known austerer times were privately exercised by the perils approaching the state, they were careful in public to conceal its weakness and dazzle strangers by the splendour of their pomps and receptions, and the Oriental gorgeousness of their palaces, churches, and processions, as was seen in the magnificent fétes given in 1574 to Henry III. on his way to assume the throne of France! They desired to make the king an ally as well as a guest, and some time later favourably entertained his proposal for a loan of 100,000 crowns of gold. In 1575 the city was visited by the plague, the almost inevitable consequence of such constant communi- cation with the East. Forty thousand Venetians fell, and the scourge passed on to the mainland, which it ravaged for four months. Next year the doge Mocenigo died, and the election fell to the old sea-lion Sebastian Venieri, the

1 The commemorative inscription can still be read on the threshold of the Hall of Giants.

hero of Lepanto, who already reckoned three '" most serene princes" in his family. He ruled but two years, and his last days were marred by the conflagration of the ducal palace. His successor was Nicolo da Ponte, a greybeard — of eighty-eight years, whose age showed that in the doge the Venetians sought rather the symbol than the reality) of authority. Yet he reigned for seven years, full of 4 peace and useful public works: the ducal palace rose from

its ruins; the procurazie or offices for the guardians of | noble orphans were completed ; Palladio fulfilled the vow

of the senate on the occasion of the late plague by erect-

ing the marble bridge of the Rialto to replace the old i wooden structure, and began the church of the Redeemer ; and Corfu and the Friulian frontier were fortified.

The peace of Italy had been mainly due to the religious wars of France; but the senate had wisely sought and if maintained the friendship of Henry III., and after his |

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death in 1589 had been sagacious enough to be the first of European powers to recognize Henry of Navarre, thus securing a vigorous ally against Spain, which had turned } against the republic since the battle of Lepanto. The | French alliance proved durable ; Henry IV. mediated be-

tween Venice and the duke of Savoy, and on his marriage | with Mary de' Medici his name was inscribed in the Book : of Gold. ' The doge Pasquale Cicogna, elected in 1585, was suc- Rivalr ceeded in 1595 by Marino Grimani, whose rule was marked betwee by grave dissensions between the senate and the Vatican. ., The house of Este came to an end in 1597, Pope Clement pope. F VIII. declaring Cesar d'Este, the nephew of Alphonso IL.,

duke of Ferrara, incapable of succeeding him. But Venice supported his claims and was ready to enforce them by

war, when he ceded Ferrara to the pope, contenting him-

self with the dukedom of Modena and Reggio. This solution brought the Vatican into a permanent rivalry with Venice,—a grave matter, since at the beginning of the century Cesar Borgia had seized the Romagna in the name of Alexander VI, and Julius II. had occupied Bologna, so that the Estates of the Church bordered on those of the republic. There were other causes of dis- sension also: Venice had never been on cordial terms with the Papacy; the recognition of Henry of Navarre had given umbrage at Rome ; and, though peace was made for a time, the quarrel recommenced, and in 1606 Paul V. launched an interdict at the republic. Venice affected the greatest formal respect for the holy see; the legate sat

by the side of the doge and took precedence of princes as well as ambassadors ; but under all the forms of respect the ex- travagant pretensions of the popes were constantly repelled with inflexible firmness and energy. The ambassadors of Venice at Rome were always chosen from the most ex- perienced and active men of affairs, and, though the pope had nearer relations with Venice than any other friendly sovereign, churchmen were constantly excluded from all political and civil posts in the republic. A man, it was held, could not serve two masters. Nay, in all discussions bearing on relations with Rome, whether in the senate or the great council, the usher's call "Fuori i Papalisti" ex- cluded from the deliberations, not only patricians whose ties of family or interest bound them to the sacred see, but all who even held what would now be called ultramontane opinions. The Venetian clergy made no contribution to public burdens ; the tithes required in time of war could be raised ouly by a special papal brief, and this privilege the senate claimed the right to suppress. To this Sixtus V. had consented ; but his successor was less complaisant. In face of the new pretensions of the Vatican the Venetians multiplied restrictive measures against the clergy, and the conflict grew hotter on both sides, till Paul V. laid the republic under the interdict,—a step that still struck terror

intonations. The hostile Spaniards were not without their share in this measure. But the supple Venetians made no appeal to temporal arms: they left the negotiation of the difficulty to theologians, and Paolo Sarpi made peace be- tween Rome and the senate.

possessions. At this crisis the senate called Francesco Moro- Morosini to the command of the fleet, a post in which he sini's covered himself with glory by his bold offensive operations he a in the Peloponnesus. For fourteen years the contest was cam-

bravely maintained on both sides, but the fortune of war paigns.

Scarcely was this trouble appeased when the Uskok pirates of the Adriatic coast and the Quarnero Islands recommenced their hostilities, and for ten years (1607-17) no merchant fleet could sail eastward without a convoy. The pirates were supported by Austria, which coveted Istria and Dalmatia, and the conflict was ended in 1617 by the Next

was against the Turks. The Venetians occupied the Morea and laid siege to Athens, Morosini bombarding the Parthe- non, which had been made a powder magazine. The cam- paigns, renewed every spring, were marked by a series of victories: Prevesa, Navarino, Modone, Argos, Lepanto, Corinth, all added glory to the name of Morosini 'il Pelo-

Conflict treaty of Madrid between Venice and that power. ponesiaco." He failed, however, in his attack on Negro- with year the Spanish conspiracy, originated by the Spanish | pont, after he had been raised (1688) to the dignity of Spall. ambassador, the marquis of Bedmar, broke out in the city | doge. Coraro, who followed him in the command of the itself, but was detected in time by the vigilance of the ten. | fleet, died suddenly ; and then Domenico Mocenigo, the new

The Spaniards meant to seize the arsenal by the help of | commander, formed the bold project of retaking Crete,

. some of the most influential senators. In 1622 Antonio | and was already before the port of Canea when the news Foscarini was disgraced because he was suspected of | of a Turkish attack on the Morea—really no more than a plotting with the Spanish ambassador ; the Catholic king | feeble diversion—induced him to raise the siege and lose

carried on his intrigues everywhere. But the republic on | his opportunity. The error cost him dear: he was removed

its part was not inactive and had stirred up against Spain | from his command, and the old doge Morosini again took

a formidable enemy, the duke of Savoy, to whom in one | the field in spite of his seventy-five years, but soon suc-

year (1617) it lent more than a million crowns of gold. | cumbed to fatigue (1694), when Sylvester Valieri succeeded

From 1627 to 1631 the two enemies were again face to | to the ducal throne. The war continued under the leader-

face in the war of the Mantuan succession ; but this time | ship of Antonio Zeno. Scio was taken and lost again; re-

it was the duke of Savoy who made a peace to which | verses followed on victories ; and the stern senate removed

Venice merely assented. the captain and the proveditori. But the peace of Carlowitz

Lossof Peace was unbroken from 1631 to 1645. But in the | (1699) between Austria and the Porte brought with it the

. Se latter year the Turks suddenly fell on the island of Crete; | end of the war between Venice and the sultan, and the

and for twenty-four years the whole forces of the republic, and every thought of the people and the nobles, were con- centrated on the preservation of this colony, which had been purchased from the marquis of Montferrat at the date of the fifth crusade, and in course of time had become a place of the first importance both as a trading station and a naval port. Surprised by the suddenness of the attack, the senate appealed to Europe for aid, and the Vatican, Florence, Naples, and the knights of Malta came to their succour ; but after an alliance of thirty-seven days all the helpers regained their ships and left the Venetians to con- front the enemy alone. The struggle was valiantly main- tained and cost Venice, between 1645 and 1669, no less than 4,392,000 ducats. The siege of Candia alone lasted twenty-two years, and for three successive years the combats were continual. At length, on 6th September 1669, the Turks were masters of the island. Europe had looked on impassively at a struggle which, disastrous as was the issue, bore the highest testimony to the valour and patriotism of the generals of the republic. Biagio Giuliani, Tommaso Morosini, Jacopo Riva, Alvisio and Lazaro Mocenigo,

Giuseppe Dolfin, and Lorenzo Marcello surpassed one another in exploits worthy of the heroes of antiquity. Between May and September 1667 thirty-two assaults were delivered and repulsed before Candia, and seventeen sorties were made by the besieged. The glory of such a resist- ance did not compensate for the disaster, which reduced the public treasure of Venice from 6,000,000 sequins to 500,000. (See also Greece, vol. xi. p. 121.)

The troubles excited all over Europe by the ambition of Louis XIV. gave an interval of rest and recovery to the re- public, which knew how to preserve its neutrality ; and the years from 1674 to 1684 were a period of profound peace. But the enmity of the Turk still counted on the visible weakness of his rival, and imposed on her humiliations which her isolation and the exhaustion of her finances com- pelled her to submit to. Venice was only saved by the diversion produced by the siege of Vienna and the inter- vention of John Sobieski; but even then their repulse in central Europe sent back the Turks more determined than ever to be done with Venice and strip her of her whole

Turks, whose humiliation dates from this epoch, were com- pelled, besides their concessions to Austria, Poland, and Russia, to recognize the authority of Venice in the Morea and in Dalmatia as far as the Bosnian frontier.

The first thirteen years of the 18th century, when almost The 18th all Europe was involved in the War of the Spanish Succes- ¢e2tury.

sion, were a time of repose for Venice, which remained neu- tral; but hardly was the peace of Utrecht concluded when the Turks resumed the offensive against the republic, which now had no allies. One after the other the islands and colonies ceded by the peace of Carlowitz were retaken ; the Morea again became Turkish ; Dalmatia was saved only by the interposition of Austria, which had need of the friendship of Venice to checkmate the projects of Philip of Spain against the Italian duchies. But soon the emperor found it necessary, in view of the struggle with Spain, to come to terms with the sultan; and his allies, the Venetians, were included in the peace of Passarowitz signed between Austria and Turkey on 21st July 1718. From this mo- ment Venice ceased to have any influence on

European politics: she had no more wars, if she still had enemies, signed no more treaties, and, in a word, had abdicated her place in Europe. Not even the dispute of 1731 as to the succession to the duchy of Parma, which brought France, Austria, Spain, and Savoy into conflict at her very doors, stirred her to action ; she was indeed no longer a useful ally. Her navy had fallen behind the times ; her commerce had been in decadence since the way to the East by the Cape of Good Hope was opened ; she could scarcely repulse the Barbary pirates from her shores ; and she had to treat with Algiers, Tunis, and Morocco to put an end to their inroads, daily repeated from 1760 to 1774. Yet, the Tunisians failing in their engagements, she decided on a war with them, which was closed by a fresh treaty.

The government meanwhile went on in the old form, Consti-

The successive doges were still tied by the restrictive laws which made them crowned prisoners ; but rivalries sprang up between the great powers of the state: the senate attacked the institution of the saviz, the ministers dele- gated to each branch of the administration, and in turn the magistrates known as the guarantie proposed to reform

Napole- onic period.

Farly state.

Bridges.

148 VENICE [are

the senate, while, lastly, the council of ten was threatened by the great council. In the midst of these reforms, which were calculated to make a great change in the institutions of Venice, the French Revolution broke out. Ludovico Manin had just become doge (1788), but was a mere cipher in the councils of the state. No heed was paid to the information supplied by the ambassadors of Venice at the court of France; nothing was foreseen, nothing decided on, for neither senate nor council understood the vast sweep of the new movement in Europe. Soon the Venetians were called on to recognize the French republic ; they refused, but did not join

the coalition against it. When Bonaparte was at the gates of Mantua, they at length decided to treat with him; but it was too late. Mantua capitulated on 2d February 1797; the Venetian envoys presented themselves before Bonaparte on 25th March; and on 18th April the Austrians signed the peace of Leoben, which left Venice without an ally at the feet of the victori- ous invaders of Italy. On 8th May the great council decided to offer no resistance to the French; the doge abdicated on the 12th ; and Napoleon entered the city on the 16th, and proclaimed the end of the republic. On 17th October following Bonaparte, by the treaty of Campo Formio, abandoned the territory of Venice to Austria. Venice was buffeted to and fro between France and Austria from 1798 to 1814, when the new coalition assigned her to Austria. Till 1866 Venice remained Austrian, save for a few hours in the insurrections of 1848-49 ; but her people never acknowledged the rights of those who had bought and sold them like a flock of sheep. The war between Austria and the allied Prussians and Italians in 1866 gave Venice her freedom, and the unity of Italy was at length accomplished under the sceptre of the house of Savoy (see ITALY, vol. xiii. p. 490), (er)

Part IJ.—Arr.

Architecture.

For some centuries Venice must have consisted mainly of a few groups of wooden huts scattered among the many small grassy islets that lay off the coast of Venetia. At first the main occupa- tions of the inhabitants were fishing and preparing salt by evapora- tion. But, as they grew richer, especially through the possession of large numbers of coasting vessels, in which they transported the merchandise or troops of foreign races at what were frequently very remunerative rates,! they became exposed to the inroads of Dal- matian pirates ; and strongly defended castle-like houses began to be built in stone or brick, with towers at the angles and battlements all along the walls. Though no example exists ‘of these early Venctian castles, a very interesting survival of their general form is still to be traced in the 11th and 12th century palaces, of which a considerable number are yet to be secn (see fig. 5 below). As the city increased in size and importance, great changes were made in the form of the islands on

which it stands and in the network of salt-water channels which divided the smaller islands from one another. In the 13th and 14th centuries many decrees of the great council provided for the deepening of existing canals, for filling up others, for draining marshes and forming dry ground by bring- ing shiploads of soil from neighbouring islands, and for driving piles to form securer ground for building. The shallow salt lagoons which surround the islands of Venice form a long band, 4 to 8 miles wide, once reaching to the Roman cities of Ravenna on the south and Aquileia on the north.2 These waters, averaging only 1 to 4 feet in depth, are separated from the deep sea by a series of long, sandy island bars. Those which form the natural breakwater to Venice are called Malamocco and Lido.

The early bridges of Venice were wooden structures ; even that over the Rialto was of no more durable material till the present bridge was builtin 1591. Many were mere planks nailed on boats. One of the earliest built in stone was that by the south-east angle of the ducal palace, called the Ponte della Paglia, which was founded in 1360. Its name ("the bridge of straw ") appears to be

1 There are many curious analogies between Venice in the early part of its career and the Phoenician city of Tyre in the Sth and 7th centuries B.c.. in the position of the two citics, their mercantile habits, their custom of acting as carriers for other races, and their both being in their habits of life and in their artistic productions links between the East and West.

2 Vitruvius (i. 4) speaks of the lagoon cities of Aquileia, Altinum, and Ra- venna as being healthy sites in spite of their position. Aquileia and Altinum which were wealthy cities, were both destroyed by Attila. '

due to the fact that it was built with money from the tax on straw,® large quantities of which were used to thatch the early houses of Venice. Till about the middle of the 19th century the Rialto was the only bridge across the Grand Canal.*

According to tradition, the first church built in Venice was §. Early Giacomo del Rialto (founded in 482).4 The legendary history of churche| the founding of some other early churches is given in the Chronicle | of

Andrea Dandolo, written ¢. 1350. In the 5th century St Magnus, bishop of Altinum, who included in his see the Rialto and adjacent islands, had the following series of visions. (1) St Peter appeared and bade him found a church on that island where he should find oxen. and sheep grazing ; and on the little island of Olivolo, at the extreme east of Venice, he accordingly built the church of S. Pietro di Castello, which from 1091 till 1807 was the cathedral church of the Venetian patriarch. (2) The church of S. Raffaello in dorso- duro was founded in obedience to the archangel, who bade St Magnus build a church at the place where he should see a large |

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flock of birds. (3) St Salvador was founded at the place where Christ told the bishop hé would see a red cloud rest. (4) S. Maria Formosa was erected at the command of the Virgin, at the place i where St Magnus saw a white cloud resting. (5) S. Giovanni in iW Bragola (or Bragora) and S. Zaccaria were built in obedience to the ;

Baptist, who told the bishop to raise churches to himself and his father. (6) The twelve apostles ordered a church to be built at i the place where Bishop Magnus should sce a flight of twelve im cranes. (7) S. Giustina, in the last vision, bade the bishop build |

a church in her honour at the place where he should see vines }

laden with grapes. Other early churches were those of S. Gemini- i ano and St Theodore, both on the island of Rialto (see below, "St : Mark's church"). j

Architectural Styles.—Owing to its isolated position on the verge Archite' of Italy, and its constant intercourse with the eastern shores and tural © islands of the Mediterranean, Venetian architecture was an inde- styles. — pendent development, though with many Oriental characteristics, having a character of its own quite unlike the styles employed in other Western countries. It was a very complex growth, in which the most diverse styles were absorbed and blended together ina very beautiful way. The various strands which, woven, as it were, together, combined to form

the magnificent web of Venetian archi- | tecture were chiefly these,—(1) the Byzantine, itself a most complex mixture of older styles, blended together and vivified with new life in the hands of the skilful builders and craftsmen of Justinian's time ; (2) the Moslem as developed in the gorgeous mosques and palaces of Persia, Syria, and Egypt; (3) the Gothic of northern Europe, and especially of France, with a secondary strain of Floren- tine influence, which, however, was more marked in the sculpture than in the architecture.

In the 11th and 12th centuries the Byzantine style was univer- Byzan- sally employed by the Venetians. The arches of this period are tine. semicircular, usually much stilted. The sculptured ornament is of very great beauty, and is applicd freely round arches, along string-courses, and in panels, with which the external facades were often thickly studded. According to the peculiar Venetian system of decoration, the walls were built in solid brick-work and then covered with thin slabs of rich and costly marbles. The columns, ; with their capitals and bases, were, as a rule, the only places where solid blocks were placed. This constant method of facing with thin slabs necessitated the use of special forms of mouldings and carv- ings, and thus, except in the solid capitals, no deep cutting could i be employed ; therefore the mouldings of this period consist of f small rolls, cavettos, or flutings contrived to enrich the surface with | the least amount of cutting into the thin marble. In the same way the sculptured bands are shallow in treatment, but full of the most vigorous grace, combined with the utmost spirit, in every line and curve, and rich, with an extreme delicacy, in all the details. Flowing scroll-work of semi-conventional foliage, mingled with ' grotesque animals, birds, or dragons, is most commonly uscd. As i purely decorative sculpture, nothing could surpass the beauty of i these early bands and panels. The round or arch-shaped or rect- angular sculptured panels, used to stud the facades like rows of jewels, are of peculiar beauty and interest. Many of the designs are derived from the far East, and appear to be of Sasanian origin ; favourite motives are eagles or dragons devouring hares or other animats, and peacocks treated in a conventionally decorative way, with their spreading tails forming a halo-like background to the body of the bird. Many of these panels are derived from the very ancient Assyrian subject of the sacred tree between two guardian beasts or birds; a

common variety of this has two peacocks face to face drinking from a eup placed on a tall, pillar-like object, which i recalls that on the lion-gate of Mycene. Many of these reliefs { closely resemble the sculptured screens and altars of the 6th cen- —— ee SO eee en ee eee

3 In the same way old London Bridge was paid for by the wool duty.

4 The word " Rialto" appears to have been applied, first to this deep channel

of salt water, and secondly to the large adjacent island, that on which St Mark's and the ducal palace are built.

5 See E. A. Freeman, Subject and Neighbour Lands of Venice.

§ See sections of mouldings illustrated by Mr Ruskin in Stones of Venice, MOL tik, jE, eS

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Moslem.

Early Renais- sance,

_ Classic.

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Founda- tions.

ART. |

tury in Ravenna, and are probably of the same date, though used to decorate buildings not earlier than the 12th century. The church of St Mark, especially, is a rich storehouse of these examples of early sculpture. Others of exactly similar style, which exist in the churches of Thessalonica and other Eastern cities, bear witness to the unity of early

Byzantine art and its wide geographical range until the downfall of the Eastern empire. One striking feature in Venetian architecture of all dates down to the 15th century is the constant use of the dentil moulding. This consists of a simple series of notchings, at once the easiest and the most effective way of enriching the thin facing-slabs when their edges were allowed to appear, as, for example, in those which lined the soffits of arches.

The influence of Moslem art is seen in the occasional use of the horse-shoe arch, in the very common ogee form which was almost universal in Venice from the 13th to the 15th century, and still more clearly in the fantastic rows of battlements, formed of thin pointed slabs of marble set on edge, which crowned the walls of nearly all the chief palaces of Venice in the 14th and the 15th century.

The 13th century was the time of transition from the round arched Byzantine style to the pointed arch with tracery, which in some cases was derived directly from the Gothic of northern countries. This is seen especially in the two great churches of the Dominican and Franciscan friars, SS. Giovanni e Paolo and 8S. Maria Gloriosa dei Frari. These two stately churches resemble those built by the friars in other places in Italy,1 and have little of the dis- tinctively Venetian character of the contemporary domestic build- ings. In the 14th and 15th centuries one peculiarity of Venetian

Gothic is the way in which tracery is used to fill rectangular and |

not arched openings. The result of this is that the tracery itself has to support the mass of wall above it, whereas in the Gothic of other countries the tracery is merely, as it were, a pierced screen filling in a constructional arch, which carries the whole weight of the superimposed wall and roof. Hence the Venetian tracery, of which that in the upper story of the ducal palace is a typical ex- ample, is much thicker and heavier in construction.

In the latter part of the 15th century Venetian architecture began to lose its distinctively local character, though very beautiful ex- "Spe of Early

Renaissance were built by the Lombardi family and other architects, largely under the influence of Fra Giocondo (see VERONA).

In the 16th century, under the later development of the Renais- sance, the Pseudo-Classic style was paramount in Venice, and Sanso- vino, Palladio, and others designed many costly buildings which had nothing specially Venetian in their style. This magnificent but dull and scholastic form of architecture reached its highest development in Venice, where it was later in degenerating into tasteless decadence than was generally the case elsewhere. Even in the 17th century good models of the Revived Classic style were built, especially by Longhena (see p. 155 below). After that the eee stion of architecture and sculpture took place with great rapidity.

The periods of these styles may be roughly tabulated thus :—(i.) Byzantine, 7th to end of 13th century ; (ii.) Gothic, middle of 13th toc. 1460; (iii.) Early Renaissance, c. 1450-1520 ; (iv.) Classic, ¢. 1520-1620 ; (v.) Extreme Decadence, c. 1600 downwards.

Materials and Methods of Construction.—In spite of its position on a number of small sandy islands in the lagoons, Venice was built upon firm and solid foundations, so that very few houses have suffered seriously from settlement. At a depth of 10 to 16 feet there is a firm bed of very stiff clay, and below this a bed of sand and gravel, and then a thin layer of peat. Recent borings for Artesian wells to a depth of about 1500 feet have shown a regular succession of these beds—clay, gravel, and peat—repeated again and again as far down as the borings have reached. The process implied in this geological formation seems still very slowly to be going on, and the present level of the square of St Mark has been raised artificially about 20 inches above the old brick paving shown in Gentile Bellini's picture of 1496. A good example of the old method of forming foundations is shown in that of the great cam- panile of St Mark, c. 900 (see fig. 1). Here the builders dug down. to the bed of stiff clay, and over the whole area of the footings of the tower drove in piles of white poplar, 10 to 11 inches in diameter, nearly touching one another. On the top of these a level platform was formed by two layers of oak trees (Quercus robur), each roughly squared, the upper layer being laid crosswise upon the lowcr one. The oak and poplar both grew along the shores close to

Venice ; in later times, when the Venetian territory was extended, the red larch (Pinus Larix) of Cadore and the Euganean Hills was largely used, as, for example, in the foundations of the ducal palace. In 1885 the foundations of the campanile were examined, and both the oak and the poplar were found to be perfectly sound." On the wooden platform massive footings are laid, consisting of five courses

1 Comp. 8S. Maria Novella and 8. Croce in Florence and 8. Maria sopra Minerva In Rome. 7

2 An interesting account of this and other foundations in Venice is given by Giacomo Boni in the Archivio Veneto, ser. ii., vol. xxix., pt. fi., 1885.

of large blocks of trachyte and other granitic or porphyritic rocks from the Euganean Hills. Above these are six courses of similar stone arranged in step-like offsets, forming a base or plinth to the

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CAMPANILE.

DUCAL PALACE.

A i

MODERN LEVEL

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Fig. 1.—Two methods of forming foundations, one with piles, the other with wider footings and no piles, as exemplified in the campanile and the ducal palace. A. 10-inch piles of white poplar, close driven into the stiff clay. B,B. Double layers of oak planks, the same in both. C. Rough footings of campanile, made of trachyte and other voleanic stones. D. Similar footings under pillars of ducal palace. E. Stylobate of three steps,

under lower loggia of palace, now hidden by raised level of modern pavement. F. One of the Istrian stone pillars of the palace. G. Paving of loggia, now flush with that outside.

tower ; owing to the raising of the pavement level only two and a half of these offsets are now visible. Another way of forming foundations, which was used in rather later times, was to omit the piles altogether and build footings with a wider spread. Fig. 1, which also shows the foundations of the ducal palace, dating from the 14th century, is a typical example of this second method, in which the oak platform is laid immediately on the stiff clay. The use of trachyte for foundations was soon superseded by that of Istrian limestone, a very beautiful cream-coloured stone, extremely fine and close in texture and capable of receiving a very high polish. Though not crystalline in grain, and, technically speaking, not a true marble, this Istrian stone has for most architectural purposes all the beauty of the finest white marble, and receives from age a beautiful golden-russet patina, very much like that assumed by Pentelic marble. From the 11th century onwards it was used very largely for plinths, angle quoins, string-courses, window tracery, and other decorative purposes. It occurs, for example, in all the magnificent series of arcades in the ducal palace. Its extreme fine- ness of grain allows it to be worked with an ivory-like delicacy and minuteness of detail.

Throughout the Middle Ages the main walling of Venetian build- Main ings was always of fine brick, usually a rich red in colour, made and walls.

fired in the kilns of Murano. In spite of its beautiful colour the brick-work was seldom left visible, the whole wall-surface being lined with thin slabs of marble in the more magnificent buildings, or else coated with stucco, on which diapers and other decorative patterns were painted.

Before 1405 the mortar used in Venice was made of the white Mortar.

lime from the Istrian limestone, which possessed no hydraulic qualities, and was consequently very perishable. But after that year, when the Venetians conquered Padua, they were able to get supplies of a strong

hydraulic dark lime from Albettone, which formed a very durable cement or mortar, able to resist salt water and the destructive sea air.

One of the chief glorics of Venice depends on its extensive use of Marbles.

the most beautiful and costly marbles and porphyries, which give a wealth of magnificent colour such as is to be seen in no other city in the world. In early times none of these seem to have been obtained direct from the quarries, but from older buildings, either of Roman or early Byzantine date. Immense quantities of rich marbles were brought from the ruined cities of Heraclea, Ravenna, Altinum, and especially Aquileia. Under the Roman empire Aquileia contained great numbers of magnificent buildings, deco- rated with marbles and porphyries from Greece, Numidia, Egypt, and Arabia. The gorgeous churches and palaces of the Byzantine emperors, enriched with rare marbles stolen from Greek and Roman buildings of classic times, were in their turn stripped of their costly columns and wall-linings by the victorious Venetians. Thus Venice became a magnificent storehouse in which were heaped the rich treasures accumulated throughout many previous centuries by various peoples. The principal varieties used in the palaces of Venice are—the red porphyry of Egypt and the green ee ee ee*

3 Early in the 15th century the Venetians began to work the rich quarries

of red marble near Verona; but with this exception the decorative marbles

seem to have been taken from older buildings elsewhere.

porphyry of Mount Taygetus, red and grey Egyptian granites, the beautiful lapis Atracius (verde antico), Oriental alabaster from Numidia and Arabia, the Phrygian pavonazzetto with its purple mottlings, cipollino from Carystus, and, in great quantities, the alabaster-like Proeonnesian marble with bluish and amber-coloured striations.! Till the 14th or 15th century the white marbles used in Veniee were from Greek quarries—Parian or Pentelic—being all (like the coloured marbles) stolen from older buildings, while in later times the native marble of Carrara was

imported. Large quantities of red Verona marble were used to form moulded frames round panels of white sculptured marble. The greater part of these costly marbles seems to have been imported in the form of columns, immense numbers of which were sawn up lengthways into long thin slabs for use as wall-facings. Other columns, usually those of the most precious marbles, were sawn across, and thus the roundels were produced which stud like jewels the facades of many of the palaces (see fig. 6). Thin slices sawn from the same column were reversed and placed side by side, so that the natural mottlings formed a regular sort of pattern. Very rich and complicated designs were produced by placing four slabs together to form one large pattern, repeating from one centre. The whole interior of St Mark's is decorated in this magnificent way, very large areas being covered with the same pattern reeurring againand again. Thus no attempt was made to disguise the fact that the marble was only a thin surface deeoration of no constructional importance. The fact that many slabs had been cut from one block was frankly acknowledged by the formation of these "eut and reversed " patterns, nor is there any attempt to conceal the bronze clamps which hold the slabs in their places.

Gold and The facades of the chief palaces of Venice down to the end of

colour decora- tion.

Frescos,

St Mark's,

the 15th century were wholly covered with these magnificently eoloured marbles. But that was not all; a still greater splendour of effeet was given by the lavish use of gold and colour, especially the costly ultramarine blue. Very frequently the whole of the sculpture, whether on capitals, archivolts, or frieze-like bands, was thickly covered with gold leaf, the flat grounds being coloured a deep ultramarine so as to throw the reliefs into brilliant prominence. The less magnificent palaces were decorated ina simpler way. The brick surfaces between the windows and other arches were covered with fine hard stucco, made, like that of the ancient Romans, of a mixture of lime and marble dust. The whole of this was then decorated with minute diapers or other geometrical ornament in two or

three earth colours, especially red, yellow, and brown ochres. Very few examples of this form of decoration still remain, owing to the corrosive action of the sea air. One notable example, dating from the 14th or 15th century, has a rich pattern formed by a series of adjacent quatrefoils, with half-figures of cherubs in the intermedi- ate spaces, covering the whole flat surface of the wall. A few faded patches are now all that is left.

With the early years of the 16th century and the later develop- ment of the Renaissance totally different methods of architectural decoration superseded the use of precious marbles and delicate repeated ornament in colour. The Pseudo-Classic buildings of Sansovino, Palladio, and their schools were either built of white stone or marble, quite unrelieved by colour, or else stuccoed facades were treated simply as a ground on which to paint large frescos with figure subjects, not designed with any sense of the true prin- eiples of architectural decoration. These frescos, which covered the otherwise unornamental facades of many of the 16th-century palaces, were often the work of the greatest painters, from Giorgione to Tintoretto; but the pictures, though no doubt beautiful in themselves, were obviously quite out of place on the facade of a house: the colossal groups dwarfed the building they were painted on, and were far inferior in decorative effect to the simpler patterns of earlier times. These, too, have mostly perished: on the fondaco? of the Germans, once covered with frescos painted jointly by Titian and Giorgione, only traces of two figures now remain. 'One of the best-preserved series of these exterior frescos is that inside the cloister of S. Stefano, painted by Pordenone, which has naturally suffered less than the very exposed facades on the Grand Canal.

Church of St Mark.—This church stands quite alone among the buildings of the world in respect of its unequalled richness of material and decoration, and also from the fact that it has been constructed with the spoils of countless other buildings, and there- fore forms a muscum of sculpture of the most varied kind, nearly every century from the 4th down to the latest Renaissance being represented in some carved panel or capital, if not more largely.

1 The splendid columns of St Mark' i / ini ; speaks Ste being of avalon Pie oe ee pe 45 we described by varions carly Byzantine writers.

According to Vitruvius (ii. 8),

the magnificent palaces of Croesus of Lydia and Mausolus of i were chiefly adorned with Proconnesian mie ee

2 The word fondaco, of Arab provenance, from the Greek Tavdoxetov applied to several of the largest Venetian palaces, denotes the mercantile head- quarters of a foreign trading nation. The fondachi of the Turks and of the Germans still exist, though much modernized. An analogous establishment was the hellenium of the trading Greeks at Naucratis in the Egyptian delta remains of which have recently been discovered by Mr Flinders Petrie (sec Pro- ceedings of the Egypt. Explor. Soc., 1886).

VENAW SE

During the early years of Venetian history the site of the present Site,

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church and square of St Mark was a large grassy field,with rows of trees, divided by a canal (which no longer exists), and containing two churehes. One of these, dedicated to St Theodore, the old patron saint of Venice, stood on the site of the present ehurch of St Mark. The other, that of S. Geminiano, was a little to the north- west of the great campanile. Fig. 3 (below) shows its position, and also the site on which it was rebuilt by Sebastiano Ziani (1178-79), when he pulled down the original church in order to extend the square westwards. In the 16th century it was again rebuilt by Cristoforo del Legname and Sansovino, and was destroyed in 1805 by Napoleon I., to make room for a new block to unite the two palaces of the procurators. The grassy campo where these churches stood was the property of the abbey of S. Zaccaria. At its eastern extremity a small palace was built for the doge about 810, when Venice first became the chief ducal place of residence under Angelo Partecipazio.

According to the chief early chronicles, the body of St Mark was Original secretly brought away from Alexandria and carried to Venice in chapel,

828, the church where he was buried having been pulled down by the Moslems in order to build with its materials a palace at ' Babylon," as old Cairo was then called. After the arrival of his relics, St Mark became the patron saint of Venice in place of St Theodore, and his bones were laid in the "confessio" of the small private chapel of the ducal palace. This chapel, however, soon lost its private character and became the chief church of Venice,*

though not the cathedral church of the patriarch. The small ducal Older chapel of St Mark was burnt in 976, together with the rest of the church.

palace, during the insurrection against Doge Candiano IV.: it was rebuilt on a larger scale by his successor, Pietro Orscolo, and the c A N A CS

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Fig. 2.—Plan of St Mark s; the black shows its older form, the shading its later development. 1. High altar, containing body of St Mark. 2. North apsidal chapel of St Peter. 3. South chapelofStClement. 4. 15th-century sacristy. 5. Rood-screen. 6. North ambo and patriarch's throne. 7. South ambo, 8. Altar of S. Maria dei Mascoli. 9. Altar of St Leonard. 10. Chapel of S. Isidore, added in 1353-55. 11. Chapel of St John the Evangelist. 12. Ante-room to treasury. 13. Treasury, formerly a tower of ducal palace. 14.

Baptistery. 15. Chapel of Cardinal Zeno. 16. Western atrium. 17. Northern atriuin. 18. North door. 19, Altar against a pier of the nave. 20. Porta della Carta. 21. Loggia of ducal palace. 22. Doge's ante-room. 23. Grand staircase of palace. 24. 16th-century part of ducal palace. 25. Canal, Rio del Palazzo.

following doges, the work being carried on for about a century. An inscription now lost recorded its completion in 1071, but it was not consecrated till 1085, in the reign of Vitale Faliero (1084- 1096), when it was dedicated ' to God, the glorious Virgin Annun-*

3 There is much analogy between the relationship of the church of St Mark to the ducal palace and that of the abbey church to the royal palace at West- minster: both were originally built in connexion with royal palaces and both Possessed special privileges as "royal peculiars."

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protector St Mark." The form of the church as then completed was quite different from its present aspect, both in extent of plan and in absence of rich decoration. Fig. 2 shows the size of the older church, which was

originally of the simple basilica form with three eastern apses and no transepts.! One very interest- ing relic of the old ducal palace still exists, namely, the lower part of one of its towers, with walls 11 feet thick ; this was made into the treasury of St Mark when the church was enlarged so as to include it in its plan, at the west corner of the south transept. Recent processes of " restoration" have sliown the external design of this early church, which was of plain red brick, undecorated by marble or mosaics, and only relieved by very simple blank arcading, with round arches, not unlike those on some early Norman build- ings in England.?

By degrees the church was enlarged: first of all transepts were added, then the baptistery on the south and the atrium extending along the west and north of the nave, about 1150-1200. Next chapels were added north and south of the two transepts : that of St Isidore was built and finished in 1354 by Andrea Dandolo. In the 15th century the sacristy at the east end was added, the altar of St Peter in the north apse being removed to make a passage to it; another way to the sacristy for the use of the clergy was cut through the massive wall of the main apse. During the long period from its dedication in 1085 till the overthrow of the Venetian re- public by Napoleon every doge's reign saw some addition to the rich decorations of the churcli—mosaics, sculpture, wall linings, or columns of precious marbles. By degrees the whole walls inside and outside were completely faced either with glass mosaics on gold grounds or with precious coloured marbles and porphyries, plain white marble being only used for sculpture, and then thickly covered with gold. It is impossible here to give an adequate notion of the splendour of the whole effect ; nothing short of the eloquence of Mr Ruskin can do justice to the subject. Unfortunately the whole wall surface of the interior is so stained and caked with dirt that much of the gorgeous effect of the marbles is lost.

The general scheme of decoration is the following. The whole of the domes and vaults, and the upper part of the walls down to the Icvel of the floor of the triforium, are completely covered with mosaics of brilliant glass tessere, the ground bcing in most cases of gold. Below this every inch of the surface of the walls and arches is covered with richly coloured marbles, porphyries, and alabaster, relieved by pure white marble, sculptured in panels, string courses, and the like. The various marbles are

arranged in broad upright bands, alternating so that one colour enhances the effect of that next to it. For example, the nave wall in the north aisle is faced thus,—(1) verde antico, (2) Proconnesian, (3) red broc- catello of Verona, (4) Proconnesian, (5) magnificent Oriental ala- baster, (6) Proconnesian, and (7) verde antico; below these is a narrow baud of red Verona marble, and then a plinth-moulding of Athenian white marble, which rests on the seat of panelled red marble that runs all round the interior of the nave and transepts. The large columns between the brick piers, six in the nave and eight in the transepts (see fig. 2), are monoliths of fine Proconnesian marble, veined with greyish blue and amber, and the great brick piers are faced with thin slabs of the same material. This facing and most of that throughout the church are made of ancient columns sawn into slices,

The eastern crypt or confessio extends under the whole of the choir behind the rood-screen, and has three apscs like the upper church. The body of St Mark was originally placed here, but is now within the high altar of the upper church. Below the nave is an older crypt, the existence of which has only recently been discovered ; it is not accessible, having been filled in with earth and rubbish at a very early period.

The choir, which is raised about 4 feet above the nave, is sepa- rated from it by a marble rood-screen, formed of ancient columns, bearing a straight architrave surmounted by fourteen statues, viz., St Mark, the Blessed Virgin Mary, and the twelve apostles. It extends across the aisles, forming a north apsidal chapel of St Peter and a southern one to St Clement. The rood-screen is signed

ciate, and to the

Se G. Jackson, in his work on Dalmatia and Istria (Oxford, 1887), vol. ili., gives an interesting account and valuable illustrations of the early churches at Parenzo, Grado, and Aquileia, which in their sculptured capitals, mosaics, and other details closely resembled the early portions of St Mark's. Large quantities of the sculpture and rich marbles used in Venice were brought from Grado, Aquileia, and other cities in the same district, the buildings of which were to a great extent the prototypes of those built in Venice before the 13th century. In later times the flood of

influence passed in the opposite direction, and during the 14th and 15th centuries an immense number of palaces and churches were built in the Venetian style, by architects from Venice, all along the eastern shores of the Adriatic. The result is that in these Istrian cities examples are to be seen of what appears to be the architecture of Venice during its whole course of development from the 12th to the 15th century.

_~ The exterior of the churcli of St Demetrius at Thessalonica is covered with simple brick arcading, very like that which still exists in many places behind the marble lining of St Mark's.

3 The first edition of the Stones of Venice, together with an unfinished series of folio plates, most of them exquisitely drawn by Mr Ruskin himself, was published in 1852; a carefully executed reprint of both was issued in 1886. This ed ee noblest monographs on any architectural subject that has ever

written.

as the work of the Venetians Jacobello and Pietro Paolo, sons of Antonio delle Masegne, 1394-97. The rood itself is of silver, dated 1394 and signed "Jacobus Magistri Marci Benato de Venetiis." The workmanship both of the silver crucifix and of the fourteen statues is of no great excellence. In front of the screen stand two very large ambones or pulpits, one of porphyry and the other of verde antico. In the northern ambo is a lofty patriarch's throne under a metal domed canopy, curiously like a pulpit in a Moslem mosque. There are fine marble baldacchini, supported on columns of precious marbles, over the high altar, two in the transepts, and one on the north side of the nave. No less than five hundred columns of porphyry and costly marbles are used to decorate the church, especially on the west front. Some of those inside the atrium have no constructional use, but are only set against the wall for the sake of their beauty and value.

A whole volume might be written on the sculptured capitals, Columns panels, screens, and other features of the church. A great part of and these are the spoils of other churches, especially from the East ; capitals.

much of the sculpture, as, ¢.g., the parapets along the triforium gallery, dates from the 6th century or even earlier. In the richly carved capitals every style from the 4th to the 12th century is represented, many of them being marvels of delicacy combined with extreme spirit of execution. Some of the larger caps are partially covered with a rich basket-work pattern completely under-cut with great technical skill ; others have vine or acanthus foliage treated with vigorous realism ; anda large number have the revived Byzan- tine treatment of the elassic Corinthian or Ionic capitals, with variations showing the richest power of invention and originality. In addition to the elaborate sculpture, some of the capitals are de- corated with inlaid patterns ; and many of the mouldings, such as the capping of the triforium screen, are also ornamented in the same way. This use of inlay is almost peculiar to St Mark's, as is also the method of enriching sculptured relicfs with backgrounds of brilliant gold and coloured glass mosaics, producing an effect of extraordinary magnificence.*

The extcrior is no less magnificent than the inside, the whole Exterior.

facades being covered with sculpture, mosaic, or slabs of rich marble. The west facade especially is a marvel of lavish expenditure both of labour and of costly material. The design consists of two main stages, the lower one being formed by the atrium, a 12th-century addition, in front of the older facade. Each stage is divided into five great arches, decorated with richly sculptured archivolts and with tympana filled in with mosaic pictures. Only one of the original mosaics now exists on this front ; all the rest have been destroyed and replaced by others of very inferior style in the 17th and 18th centuries. The one original mosaic is over the northern-most of the four doorways into the western atrium; its datc is about or soon after 1220. It is of great decorative beauty, and its subject—the translation into the church of the body of St Mark— is of great interest from its careful representation of the west fagade of the church as it was at the beginning of the 13th century. It shows the original form of the

upper part of the fagade before the addition in the 14th century of the large ogee gables with elaborate crockets, alternating with statucs, and intermediate pinnacled canopies placed between the five great arches of the upper story. It also shows the marble screen-work which once filled the great central west window, the whole of which is now missing, only the columns which supported it being left.° Similar filling-in still exists in some of the large side windows. The lower or atrium story is enriched with a wonderful collection of columns of precious marbles and porphyries arranged in two tiers. The sculptured archivolts, with foliage mixed with figures or subjects in relief, are of great beauty and variety. They are all carved in fine white Athenian marble, and were once gilt, as appears to have been the case with nearly all the sculptured ornaments of St Mark's. This extensive use of gold is clearly shown in Gentile Bellini's picture. The top of the atrium forms a wide upper gallery communicating with the interior at the triforium level. In the centre of this gallery stand the four colossal bronze horses, from some Graco- Roman triumphal quadriga, which were brought to Venice after the conquest of Constantinople by Enrico Dandolo in 1204.7

The roofs, including the five great external domes over the nave, choir, transepts, and crossing, are all covered with thick sheets of lead. Thc internal domes, like the rest of the vaults, are of brick, the external domes being of wood. The drums on which the outer domes rest are bound round with strong iron bands, which were 2 ee a ee eee

4 The church of St Demetrius at Thessalonica contains many sculptured panels and other decorations exactly similar in style to those of St Mark's ; and other churches in Thessalonica and Trebizond have mosaic pavilg and glass wall-mosaics closely resembling those in St Mark's. Even the plan of the Venetian basilica is Oriental in origin. ;

5 The most notable examples are over the doorways of the western atrium.

6 This tracery, or rather screen-work, was removed before 1496, when Gentile Bellini painted his picture of the Piazza and West Front of St Mark's. This very interesting picture shows the lost mosaics, the subjects of which appear to have been the same as those now existing.

7 These bronze horses were carried off to Paris, with many other art treasures, by Napoleon in 1797; they were restored to their place in 1815 by Francis of Austria, as is recorded in a large inscription on the arch below them.

Roofs.

Mosaics.

Pave- ment.

Retable or Pala d@'Oro.

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added by Jac. Sansovino in the 16th century. The round-headed windows in the drums were once filled in with pierced screen-work of marble, some examples of which still exist in the western atrium, —an interesting relic of the method of filling windows employed at a time when glass was but little used. '

The mosaics in the interior are among the finest and, from their variety of date, the most interesting series in the world ; those dating from the 12th and 13th centuries are of special beauty. The earliest appear to be those on the five great domes, probably executed before 1150. On the nave dome the subject is the Descent of the Holy Spirit: tongues of fire radiate upon colossal figures of the apostles, and below them, on the drum of the dome, isa second series of figures representing the various nations of the world who were converted through the inspired teaching of the apostles. On the dome over the crossing is the Ascension of Christ, with bands of large figures of the Apostles, and below them the Virtues. On the choir dome are a half figure of Christ and a series of the Prophets. In the main apse is Christ in Majesty. The transept domes have series of Saints and Doctors of the Church. All have explanatory inscriptions. The whole of the rest of the vaults and the upper portion of the walls are covered with mosaic pictures, of which a mere catalogue would occupy many pages. In the atrium the sub- jects are taken from the Old Testament; these date from ¢. 1200- 1300. In the baptistery? are the life of St John the Baptist

and scenes from the life of Christ; on the first dome (westwards) is Christ in Majesty over a series of baptismal scenes and the Greek Doctors ; on the second dome, Christ surrounded by Angels. On the barrel vault of the chapel of St Isidore is a very beautiful series of mosaics, with scenes from the saint's life and other subjects, exe- cuted in 1355, soon after the completion of the chapel. In the sacristy is a fine series of 15th-century mosaics, and in other parts of the church there are mosaics of still later date, some of them from cartoons by Tintoretto and other Venetian painters of the decadence. These later mosaics are not designed with any real sense of the special necessities of mosaic work, and are all very in- ferior in decorative effect to the simple Byzantine style from the 12th to the 14th century.

Most of the existing mosaics of the earlier periods have suffered very seriously from " restoration," a process which is still going on, with most fatal results to the interest and real value of the mosaics, The exterior marble facing and much of the sculpture have within recent years been completcly renewed in the most tasteless way,— the fine slabs of rich Oriental marbles having been largely replaced by cheap greyish Carrara marble of the worst quality, quite devoid of the fine colours and rich veinings of the original slabs. The same fate now threatens the magniticent mosaic pavement of St Mark's, the surface of which has sunk into a succession of wavy hollows, owing to the settlement of the vaulting of the crypt below on which the nave paving rests.2 The original part of the mosaic floor probably dates from about the middle of the 12th century. The nave pavement of the cathedral at Murano, which is exactly similar in style, materials, and workmanship, has an inscription dated 1140. The pavement of St Mark's consists partly of opus Alexandrinum of red and green porphyry mixed with some marble, and partly of tesselated work, made both of glass and of marble tessere. The two methods are obviously of the same date, as in some cases both processes are used in the same design. The opus Alexandrinum is very similar in style to that in some of the basilicas of Thessalonica, and also those in Rome, most of which are of about the same date, the 12th century. The designs executed in mosaic tesseree are of several different styles, some being taken from the mosaics of Roman classical times, while others, with large panels of peacocks on each side of a vase, eagles or lions devouring their prey, and

the like, are copied from Byzantine reliefs of much earlier date than the 12th century. The originals of many of these are to be seen in the sculptured roundels which stud the facades of Byzantine palaces in Venice. A great part of the pavement of St Mark's has been repaired and renewed at various times, from the 14th century down to the present time ; consequently a great variety of styles and materials occurs mixed with the original parts. The pave- ment in the north aisle was renewed in the most clumsy and spiritless fashion about twenty years ago, and it is much to be feared that a similar fate awaits the rest of these priceless mosaics,

One of the great glories of St Mark's is the most magnificent gold retable in the world, most sumptuously decorated with jewels and enamels, usually known as the Pala d'Oro, It was originally (according to the Venetian chronicles) ordered in Constantinople by Doge Pietro Orseolo I. in 976 ; and an inscription in enamelled letters added in 1345 records that it was brought to Venice and

2 There is no ground whatever for the notion that the wavy surface of the Its lines of depression simply follow loose filling-in of which allows more

3 It is interesting to note that a 6th or 7th century marble relief with the

; p facing of the t St Mark, has been copied exactly in one of the Inosaics of the south a. _

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again repaired and enlarged by Doge Pietro Ziani; and finally in 1345 Andrea Dandolo reset the enamels in new framework, and added some minute gold canopies and other decoration of Gothic style. In the 19th century it was thoroughly repaired and the stolen gems replaced by new ones, easily distinguishable from the original jewels by being cut in facets, not "en cabochon" after the old fashion. This marvellous retable is made up of an immense number of microscopically minute gold cloisonné enamel pictures, of the utmost splendour in colour and detail. The enamels are partly translucent, allowing the brilliant gold backing to

shine through the coloured enamel. The subjects are Christ in Majesty, figures of Archangels and Angels, and a very large number of single figures of Prophets and Saints, as well as many scenes from the life of Christ and of St Mark. No description can do justice to the splendour of effect produced by this gleaming mass of gold, jewels, and enamels; the delicacy of workmanship of the latter is only equalled by two Textus covers, also in gold cloisonné, now pre- served in the treasury of St Mark, which also possesses a magni- ficent collection of church plate of all sorts, such as large chalices and patens in crystal and agate, reliquaries, candlesticks, altar frontals, and other kinds of church furniture, all of the most precious materials and workmanship. Two silver frontals of the 14th century, now used for the high altar of St Mark, originally belonged to the cathedral of Venice, S. Pietro di Castello.

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was bounded on the west by the canal B, with the 6th-century church of 8.

Geminiano, C, on its west bank. The first enlargement of the square was

effected by Doge Sebastiano Ziani in 1176, when he filled up the canal and

rebuilt the church on a new site at D, thus nearly doubling the size of the

square. Lastly, the square was extended southwards in the 16th century,

when the new palace of the procurators, K, was built by Scamozzi. Gentile

Bellini's picture shows a line of houses along FF, reaching up to the great campanile, A. Napoleon I. in 1805-10 pulled down the church of 8. Gemi-niano and built a new block at the west end of the square, L. The dates of the various parts of the existing ducal palace are indicated on the plan ; the i rebuilding was carried on in the following order, P, Q) B.S; 1, Ui, Ve i Z is the treasury of St Mark, which was originally one of the towers belonging | {

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Fic. 3.—Square of St Mark and surrounding buildings. The original campo F ij to the old ducal palace; E, site of old houses; G, clock-tower; H, old palace of procurators; J, old library; M, two columns; N, Ponte della Paglia; O, Bridge of Sighs; W, Giants' Staircase; X, sacristy of St Mark; Y, Piazzetta.

The Ducal Palace.—The original doge's palace, probably a small Ducal strongly fortified castle, was built early in the 9th century, soon palace. after the transference of the seat of government from the island of Malamocco to that of Rialto. In the early troublous period of Early

Venetian history the ducal palace was frequently destroyed and re-
history. | built. It was burnt in 976, and again in 1106; by 1116 it had been rebuilt. At the end of the 12th century Sebastiano Ziani (1173-79) restored and enlarged it. Of his work the only fragments now in existence are some richly sculptured bands in relief, built in at intervals along the 14th-century Rio fagade, by the south- east angle of the palace (see P on fig. 3). The present magnificent palace was a slow growth extending over nearly three centuries, the older building of Ziani being gradually pulled down as room was required for the new work. :

The existing palace was begun in 1300-1 by Doge Pietro Gradenigo,
Present | who built the facade (P on fig. 3) along the Rio, in which are in-
palace. | serted the 12th-century friezes of Ziani. About 1309 the arcaded F facade along the sea front was begun at the south-east angle by the Ponte della Paglia (N on fig. 3), and the design which was then adopted was accurately followed along the whole external facade, the building of which occupied about acentury anda half. Towards the end of the 14th century the facade had been carried along the Piazzetta side as far as the tenth capital (counting from the south-

4 At the end of the 18th century the rich treasures of St Mark's were sacked

by the French, and much was then dispersed and lost, including many antique engraved gems and cameos from the Pala d'Oro.

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| Fagades.

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west angle), which is carved with baskets of different kinds of fruit (R on fig. 3). At this point the work seems to have remained sta- tionary for some years, and a considerable portion of Ziani's palace was still in existence; this was called the old palace to distinguish it from the 14th-century new palace. The Venetian council had decreed that a fine of 1000 gold ducats should be imnposed on any of its members who proposed that

the remaining part of the old palace should be rebuilt ; in spite of this, in 1422, Doge Tomaso Mocenigo did propose and carried a resolution that the new palace should be extended over the site of Ziani's building. The doge paid the fine, and it was spent as a contribution towards the re-building, which was begun in 1424; in a few years the remainder of the external facade was completed up to the north-west angle, by the church of St Mark (S on fig. 3). The magnificent gateway which unites the palace to the church, called the Porta della Carta! (T on fig. 8), was added in 1439-42 ; it was the work of the sculptor Bartolomeo Bon and his son. Soon after the great balconied windows, which break the regularity of both fronts of the palace, were inserted in the npper story. The internal block in the great court joining the Porta della Carta to the Rio front was built by Doge Cristoforo Moro about 1462. In 1479 a fire consumed part of the 14th-century buildings along the Rio, and this part was then rebuilt, mostly between 1480 and 1550. On the southern part of this block are the arms of Doge Agostino Barbarigo, 1482 (U on fig. 3).

ae two main facades, those towards the sea and the Piazzetta, consist of a repetition of the same design, that which was begun in the early years of the 14th century. The name of the architect who began the work and thus fixed the design of the whole is not certainly known, but it must have been a man of an earlier genera- tion than that of Filippo Calendario, who is often stated to have been the chief architect of the older portion. Calendario was an accomplice in the conspiracy of Marino Faliero and was executed together with the doge in 1855. It appears probable that a Vene- tian architect and sculptor named Pictro Baseggio was the chief master-builder in the first half of the 14th century.? The design of these facades is very striking, and uulike that of any other building in the world. It consists of two stories with open colonnades, form- ——— ing a long loggia on the ground and first floors, with seventeen arches on the sea front (see fig. 4) GREAT COUNCIL and eighteen on the other facade. HALL. Above this is a lofty third story, pierced with a few large windows, with pointed arches once filled with tracery, which is now lost. The columns of the middle story support heavy tracery of the char- acteristic Venetian form, which was copied with more or less modification in a very large num- ber of private palaces built in Venice during the 14th and 15th de cole centuries. The ground story has pig, 4 section through sea-front of

boldly moulded pointed arches, ducal palace (see P, Q in fig. 3). the spandrels of which were in- Lower loggia towards sea. B. Upper tended to be decorated with geo- Jsgla, towards sen… D. Loss metrical patterns in thin pieccs apartmentsofdoge. F. Offices. G. of marble inlay. Only two of Modern level of pavement which mete were, however, completed. hides the old stylobate of three The main walls are wholly of ie i daa dls brick ; but none was left visible. The whole surface of the upper story is faced with small blocks of fine Istrian and red Verona marbles, arranged so as to make a large diaper pattern, with, in the centre of each lozenge, a cross made of verde antico and other costly marbles. The colonnades, string-courses, and other decorative features are built in solid Istrian stone. Very beautiful sculpture, executed with an ivory-like minuteness of finish, is used to decorate the whole building with wonderful profusion. At cach of the three free angles is a large group immediately over the lower column. At the south-east angle is the Drunkenuess of Noah, at the south-west the Fall of Man, and at the north-west the Judgment of Solomon. Over each at a much higher level is a colossal figure of an archangel,—Raphael, Michael, and Gabriel. The sculpture of all the capitals, especially of those on the thirty- SIX lower columns, is very beautiful and elaborate, a great variety of subjects being introduced among the decorative foliage, such as the virtues, vices, months of the year, age of man, occupations, sclences, animals, nations of the world, and the like.2 On the whole the sculpture of the 14th-century part is finer than that of the later

: So named because public decrees and other papers were affixed to it. The edict for further rebuilding in 1422 names Baseggio as being the original designer of the 14th-century portion of the palace. _ 3° An excellent account of these sculptured capitals is given by Mr Ruskin In his Stones of Venice, vol. ii. A treatise on the same subject was written by Didron and Burges, L'I conographie du Palais Ducale, Paris, 1857, but the authors failed to recognize the true dates of the different parts of the palace.

part near St Mark's. In many cases the 15th-century sculptors have simply copied the older capitals. A strong Florentine influence is apparent

in all this sculpture, a great part of which was probably the work of Florentines. Unhappily within recent years about half the old capitals have been removed and replaced by copies, which in some cases are not even accurate reproductions of the originals. A very wholesale and needless "restoration"' is still in progress, not only of the sculpture, but also of the columus, arches, and traceries, which in many cases have been wholly renewed without any excuse whatever.*

The great internal court is surrounded with arcading of very Internal similar style ; even in the 16th-century portion the same main out- court. line has been followed, though the detail is different. From the interior of the court access is given to the upper loggia by a very beautiful staircase of early Renaissance style, built in the middle of the 15th century by the Venetian architect Antonio Ricci. Two colossal statues of Neptune and Mars at the top of these stairs were executed by Fran. Sansovino in 1554 —hence the name 'giants' staircase"; they are very clumsy and badly designed. Owing to a fire which gutted a great part of the palace in 1574, the in- ternal appearance of the rooms was completely changed, and the fine series of early Paduan and Venetian paintings which decorated the walls of the chief rooms was lost.> At present the magnificent council chambers for the different legislative bodies of the Venetian republic and the state apartments of the doges are richly decor- ated with gilt carving and panelling in the style of the Later Renais- sance. On the walls of the chief council chambers are a magnificent series of oil paintings by Tintoretto and other less able Venetians, — among them Tintoretto's masterpiece—Bacchus and Ariadne— and his enormons picture of Paradise, the largest oil painting in the world. All have suffered much from restoration. Some of the scenes of important Veuetian naval victories are of great historical interest, though of little merit as works of art.

In the 16th century the state prisons, which till then were on State the ground floor of the ducal palace, were removed to a new building prisons. on the opposite side of the narrow canal on the east of the Rio del Palazzo (see fig. 3). A bridge, usually known as the Bridge of Sighs, was built to connect the two buildings. This bridge and the new prisons ® were designed by a Venetian, who also built the Rialto bridge in 1588-91, and hence was nicknamed Antonio da Ponte.

Owing to the raising of the level of the Piazzetta and the Riva degli Schiavoni, the ducal palace has lost its stylobate, consisting of three steps, the level of the pavement outside being now the same as that of the lower loggia of the palace ; and thus a serious injury has been done to the architectural beauty of the facades (see figs. 1 and 4). As the columns of the lower story have no bases, a stylobate is specially needed. we

By the side of the sea in the Piazzetta, on to which the west Piazzetta facade of the ducal palace faces, stand two ancient columns of columns, Egyptian granite, one red and the other grey (see M, fig. 3). These great monoliths were brought as trophies to Venice by Doge Domenico Michieli in 1126, after his victories in Syria. In 1180 they were set up with their present fine capitals and bases by a Lombard engineer, Niccolo de' Barattieri. The grey column is surmounted by a fine bronze lion? of Byzantine style, cast in Venice for Doge Ziani about 1178; and in 13829 a inarble statue of St Theodore, standing upon a crocodile, was placed on the other column.$

The great campanile (see A, fig. 3) of St Mark in the square at the Campa- west of the church was founded about 900 by Doge Pietro Tribuno nile, and finished in 1181 or soon after. It is a very massive square tower of brick, 325 feet high by 42 square, on a stone base, simply decorated with slight pilasters. The ascent to the top is made bya series of inclined planes instead of stairs. The upper part, an open lantern with a pyramidal roof, was added in the 16th century ; on the apex is a fine colossal statue of an angel, formed of plates of gilt bronze on a wooden core,—a work of the end of the 15th century.

Other Churches.—The ancient cathedral church of S. Pietro di Cathe- Castello was wholly rebuilt during the latter part of the 16th ccn- dral tury, probably from designs by Palladio, It is a well-proportioned church. but uninteresting structure of the usual Pseudo-Classical Palladian style; it is now seldom used.

After St Mark's the two finest churches in Venice are those of Churches the Dominican and Franciscan friars, SS. Giovanni e Paolo and S. of SS. Maria Gloriosa dei Frari. Both are built on the same plan as that Giovanni of other important friars' churches, such as S, Maria Novella

and e Paolo S. Croce in Florence, with a large nave, aisles, transepts, and two and the

—— Frari.

4 According to Zanotti, the capital at the north-west angle was signed “ Duo Soci Florentini”’; but this inscription is not now visible.

5 Considerable remains of these paintings by Altichiero and other 15th-cen- tury masters still exist, though completely hidden by the later pictures on canvas. Meo

6 Many distinguished prisoners have suffered from violent heat in the piombt or roof cells, and from damp and cold in the pozzi or cellars, of these prisons.

7 This lion, carried off to Paris, together with the four bronze horses and other Venetian spoils, by Napoleon I., was sent back ina very fragmentary con- dition; the lion’s tail, the wings, and the book under its paws were added after its return to Venice in 1816. Originally the wings were much larger, and there was no book. 8 See Ruskin, St Mark’s Rest, chap. il.

or more chapels opening from the east of each transept. In the Venetian examples the choir and all the transept ehapels have apsidal terminations. Both churches are built of brick, with rich marble traceried windows, and simple vaulting throughout. The details of the interior are plain, but the scale is large and the general design very noble and effective, showing a strong infusion of northern Gothie influence, which is one of the characteristics of the friars’ churches throughout Italy. The Dominican church of SS. Giovanni e Paolo was used as the chief burial place of the doges and other chief members of the Venetian republic ;1 it was built about the middle of the 13th century. There is no foundation for Vasari’s statement that Niccola Pisano was the architect of this or of any other building in Venice, although the influence of the Pisano school of

sculpture was certainly very strong during the 14th cen- tury. The magnificent collection of tombs in this ehurch, of all dates from the 13th century downwards, is one of the finest in the world. Some of the recumbent effigies of the 14th century, and the reliefs and statuettes on the sarcophagi, are works of very great beauty, distinctly Florentine in character. The later monuments of the 16th and 17th centuries are in many cases very large, costly, and pretentious, of the worst possible taste, in striking contrast to the quiet simplicity of the 14th-century tombs. A remarkable feature in the Franciscan ehureh is its fine marble rood-screen of the 14th century, one of the very few which still exist in Italy; it is surmounted by two ambones or pulpits. The choir stalls, which extend rather more than one bay westwards of the erossing, are richly decorated with reliefs and tarsia work, executed in the later years of the 15th century. This church is the largest in Venice, even exceeding St Mark's in size ; it also contains a number of fine tombs, some of them with large equestrian statues of Venetian generals. The tomb of Doge Francesco Dandolo in this church, now mutilated and removed from its place, is a very noble example of 14th-century sculpture. The sacristy, on the south of the south transept, still possesses over its altar one of Giovanni Bellini's finest pictures, signed and dated 1485, representing the Madonna En- throned between Standing Figures of Saints, a picture of most ex- traordinary beauty and perfect preservation, in its original riehly carved retable-frame.? This church, though very similar in style, was built about half a century later than that of the Dominicans, and was not completed till after 1300.

Church The influence of the chief orders of friars in the style of ecclesi-

of 8.Stef- astical architecture is strongly shown in many other ehurehes, such

ano, &c. as that of S. Stefano, especially in the frequent use of the apse as a termination both for ehoirs and side ehapels. This church, built about 1360 by a monastery of Austin friars, has a rich west front, decorated with very delicate terra-cotta ornaments. 'The eastern apse extends over a small canal and is supported on a wide bridge- like arch. Of the same type are the church of 8. Gregorio and that of S. Maria della Carita, both now

desecrated. S. Gregorio has a very beautiful cloister, dated 1342, the columus of which support, not a series of arches, but flat wooden lintels. On the capital of each columu rests a moulded wooden corbel to diminish the bear- ing of the lintel ; this is a very characteristic Venetian mode of con- struction, used, not only for cloisters, but also for ground floors of houses, upper loggias, and other places, especially during the 14th and 15th centuries.4

8. Gia- One of the most interesting early ehurches is that of 8. Giacomo

como _—dall' Orio, built in the early part of the 13th ceutury, with a com-

dal!' plicated many-eolumned plan, the aisles being carried along the

Orio. transepts ag well as the nave. The roof isa very good example of the wooden coved type, of which the finest are at VERONA (q.v.). One of the columns in the south transept is a monolith of the precious verde antico, of wonderful size and beauty, probably brought from some Byzantine church.

8. Maria _ Venice contains some very beautiful ecclesiastical] architecture of

dei Mir- the Early Renaissance, about 1450 to 1500, with very delicate and acoli. refined detail, such as was designed by Fra Giocondo of Verona and various members of the Venetian Lombardo family. The most perfect example of this style is the little ehurch of §. Maria dei Miracoli, so called because it was built to contain a miraculous picture of the Madonna. Very rich and varied marbles were used in its construction, and it is lavishly decorated with seulpture of wonderful refinement and beauty of detail ; it was built in 1481-89 from the designs of Pietro Lombardo. The court of the guild of St John the Evangelist is another fine example of the same style LaterRe- In the 16th eentury and even later some very stately churches naissance of the Later Renaissance style were built in Venice by Jaeopo churches. Sansovino, Andrea Palladio, and their school. One of Sansovino's® best works, the church of S. Geminiano, was destroyed at the 1 Andrea Dandolo, whose tomb is in the baptistery, date

1355, was th $ bu Meda i St Mark's, which up to that time had been the usual — It was founded about 1234, but not i 3 Mr Ruskin, Shrine of the Slaves, p. eae on of fie ae heey

in the world, the second being another Madouna b Gian. Bellini i

of 8. Zaccaria in Venice. =pid iy pring gia 4 A fine loggia of this class exists in the ducal palace. o ening on

loggia of the Piazzetta facade. P ca Ait sane el ® For others of his works in Venice, see SANSOVINO.

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beginning of the 19th century in order to complete the west side of the square of St Mark (see fig. 3). The large church of S. Giorgio Maggiore, on an island opposite the ducal palace, was built by Palladio, and is a good example of the faults and merits of his style. S. Maria della Salute, built by Baldassare Longhena in 1632, as a thank-offering of the Venetian senate for the cessation of the great plague in 1630, is one of the most eonspicuons ehurches in Venice owing to its magnificent site near the mouth of the Grand Canal. Though dull and heavy in detail, it has a well-designed dome, and the general mass of the building is very skilfully arranged. Most of the 17th and 18th century churches in Venice are in the worst possible taste, and extravagantly pretentious in style. A large number still possess fine campauili,—lofty square brick towers, in general form not unlike the 12th-century campanili of Rome. These in Venice range from the 11th to the 16th century, those of the 14th century being specially beautiful.

Palaces.—In the beauty and interest of its domestic architecture Palaces, Venice ranks before any other city in the world. Fine examples of all dates from the 12th eentury downwards still exist, and many even of the earlier palaces are still externally in a very perfect state of preservation. The most

notable specimens of 12th-century 12thcen) Byzantine palaces are those of Loredano (now municipal offices), tury By Farsetti, and Da Mosto, all on the Grand Canal. The Jondaco of zantine © the Turks (now the Correr Museum) was once the finest of this date, palaces. but it has been ruined first by neglect and then by wholesale restora- tion. The general design of these Byzantine palaces appears to have been very similar in all cases; fig. 5 shows a typical example.

TOWER. ® e

TOWER. oe @ el CANAL. | CANAL. J.HM,

Fic. 5.—Typical facade and plan of a 12th-century Byzantine palace, with a tower at each end. No perfect example now exists, owing to the rebuilding of the upper stories with central part equal in height to the ends; but in many cases traces of this arrangement can be distinguished.7

The canal facade usually had a tower at each end, with a row of arches in the centre opening into a long vestibule or porch, behind which was a large hall. Along the first floor a long range of window arches extended from end to end, forming a continuous arcade ; in the fondaco of the Turks this upper range consisted of no less than twenty-six arches. Very beautiful sculpture was used to decorate all these arches, which were of stilted semicircular form, and also the capitals on which they rested. Mr Ruskin has shown how these round arehes developed into other forms, first a simple pointed ogee, and then a cusped ogee of several different varieties.

In the 13th eentury the introduction of window – tracery led Venetia gradually to the development of a special form of architecture, Gothic usually called Venetian Gothie, which was unrivalled for combined palaces. magnificence of material and design. The design of about the year 1300 adopted for the facade of the ducal palace had a very exten- sive and prolonged influence on the private palaces of Venice. A very large number of these, built in the 14th and first half of the 15th century, still exist and are among the most beautiful and well-preserved examples of medizval architecture which can any- where be seen. The climax of this magnificent style was towards the end of the 14th century, to which date

belongs the wonderful Ca' d'Oro or "golden house," as it is usually called, from the pro- fusion of gilding which once eovered its sculptures and mouldings.

6 A very beautiful fragment of an early palace in the Rio Foscari has been we Mlustrated by Mr Ruskin in his pivie ta Stones of Venice, 1886. Mr Ruskin has shown (in Stones of Venice, vol. ii.) that in these Byzantine palaces there are subtle variations in the width of the arches, forming a regular gradation of sizes, hardly perceptible without actual measurement,

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No words can describe the magnificence of this palace on the Grand Canal, its whole fagade faced with the most costly variegated Oriental marbles, once picked out with gold, vermilion, and ultra- marine, the walls pierced with elaborate traceried windows and enriched with bands and panels of delicate carving,—in combined richness of form and wealth of colour giving an effect of almost dazzling splendour.!

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Fic. 6.—Ca' d'Oro, as originally built.

Some of the 15th-century palaces of Early Renaissance or, as Mr Ruskin calls it, Giocondesque style are scarcely inferior in beauty to those of the Gothic period. Fra Giocondo, the Lombardi, and other architects of this era (1460-1510) still used with great skill and effect the rich Oriental marbles, which were wholly neglected by the architects of the Pseudo-Classic revival. On the Grand Canal the Corner-Spinelli, Trevisan, and Dario Palaces are specially beauti- ful examples of the style; the richest of all is, however, the small Guisetti Palace in the narrow Rio della Fava, faced with purple Phrygian pavonazzetto and other coloured marbles, and lavishly decorated with delicately sculptured pilasters, friezes, and corbels of the most exquisite design and workmanship. This architectural gem is now quite neglected, and used as a mere warehouse.

*Among the 16th-century palaces of later style are many of great size and magnificence, though designed in a somewhat dull and scholastic fashion. The influence of these Venetian buildings on * the 19th-century architecture of Europe generally has been very great. ,**

In most of the Venetian palaces of the Later Renaissance, such as the magnificent Grimani Palace by Sammichele, and in the library of St Mark by Sansovino, the main motive of the facade is taken from the arcading with entablature over engaged columns which was universally used for the theatres and amphitheatres of ancient Rome. In many cases the entire facade of the palace consisted of a series of columns, arches, and cornices, so that no plain wall surface was left at any part of the front, and the whole effect is too laboured and restless, and far less pleasing than the rather earlier examples of the same style, such as the Vendramini Palace on the Grand Canal and the Camerlenghi near the Rialto bridge, finished in 1525, in which some Gothic feeling still survives. One of the noblest palaces of the Later Renaissance is that of Pesaro, on the Grand Canal, built by Longhena, one of the chief Venetian architects of the 17th century, who in this case has followed the style of Sanso- vino or other architects of the previous century, using the Colosseum areade for the two upper stories. In general mass and in the pro- portions of the parts this palace is a work of great merit, far superior to the usually degraded style of the 17th century.

Other Public Buildings.—Much of the splendour of Venice in her days of greatest glory was due to the wealth and religious zeal of the various trade guilds or confraternities, called sewole by the Venetians. The members of each guild were united for both secu- lar and religious purposes ; their meeting places and chapels were often buildings of the greatest architectural magnificence, and were decorated with sculpture and painting by the chief artists of the

1 Signor Giacomo Boni. has given, in Proc. Inst. Brit. Arch. for February 188 i, 2 very interesting account of the decorations of this palace, and of the addition of its elaborate cornice (now destroyed) in 1424 by Bart. Bon, who ag paid 210 gold ducats for his work.

In London the facades of many of the principal public buildings have been copied with but little alteration from Venetian originals, as, ¢.g., the Army and Navy Club in Pall Mall froin Jac. Sansovino's Cornaro Palace (1532), with the omission of the middle story, and the Piccadilly School of Mines from the inner court of the doge's palace.

time. The scwola of St Mark, near the great Dominiean chureh, has a magnificent facade designed in 1485 by Pietro Lombardo. A beautiful series of pictures \ 4

by Vittore Carpaccio was painted for the Slavonian guild, and still exists in their chapel dedicated to St George and St Tryphonius. The scuola of St Rocco pos- sesses a wonderful collection of noble pictures by Tinto- retto, and the other chief guilds, such as those of St Ursula, Della Misericordia, Della Carita, and St John the Evangelist, possessed very beautiful and richly decorated buildings. st Tacha: Z

*One of the most import- ne a Arsenal, ant public buildings of Venice was the arsenal,? including large docks and yards for building ships (see p. 148, above). The en- trance gateway is an ela- t : * borate work, built in 1460 Fic. 7.—The library of St Mark's, begun in by the Lombardi; and in entail front of it stand four ancient marble lions, brought as trophies from the Pireus in 1687.4 The arsenal is still an important naval depét, and contains a museum of historically interesting objects.*

A stately series of public buildings surrounds the square of St Public Mark (see fig. 3). The north side is occupied by the old palace build- of the procurators, designed by Bart. Bon towards the end of the ings 15th century. Near it to the east stands an elaborate clock-tower round St built by Pietro Lombardo in 1496. On the south of the square Mark's is the newer palace of the procurators, designed in 1584 by Scamozzi, Square. now used as part of the royal palace. The west end is occupied by an extension of the public offiees built by Napoleon J. in 1805-10, partly over the site of the church of S. Geminiano. The adjoining Piazzetta is bounded on the east by the ducal palace and on the west by the magnificent library® of St Mark, built by Jacopo Sanso- vino in 1536. The mint oecupies part of the same block. The facade of the library is shown in fig. 7.

In front of the west facade of St Mark's are three large flagstaffs, originally used to display the gorgeous silk and gold banners of the subject kingdoms of the Morea, Cyprus, and Candia. Their elabo- rate bronze sockets were cast in 1505 by the Venetian sculptor, Alessandro Leopardi, who has inserted fine medallion portraits of the reigning doge Lorenzo Loredano.

The academy of fine arts, now in the Della Carita guild-house, Mu-

contaims a very large and valuable collection of pictures of the senms Venetian school. With one exception, Carlo Crivelli, all the chief and gal- Venetians are well represented here, and in many cases far better leries. than in any other collection in the world. Venetian art, in fact, can only be completely studied in Venice. The academy is very rich in elaborately carved retables of the early Venetian painters, works of great decorative splendour, though not equal in drawing or composition to the work of the 14th and early 15th century painters of Florence or Siena. The Vivarini family, the Bellini, with Carpaccio and others of the Bellini school, Cima da Conegliano, Titian, Tintoretto, and Paul Veronese arc all represented by a large number of their finest works. The Correr Museum, now moved from the Correr palace to the fondaco of the Turks, is the property of the city. It contains some fine Venetian pictures, and an inter- esting collection of early majolica and other medieval works of art. The Giovanelli Palace in the Rio S. Felice possesses a fine specimen of Giorgione, the rarest of Venctian masters: it is a noble woody landscape with two figures in the foreground. The portraits by Titian and Tintoretto in the same collection are very fine.

The churches of Venice are still marvellously rich in pictures by the chief Venetian painters of all dates. Almost every church con- tains some notable painting ; and some of them, such as S. Sebas- tiano, 8S. Giovanni in Bragora, and S. Giorgio Maggiore, possess a very great number of important works. Many private palaces con- tain fine collections of pictures ; but great numbers of these were sold to foreign purchasers during the 19th century.

Painting. For an account of Venetian painting the reader is referred to Painting. the separate articles on the various painters and to ScHOOLS

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3 Dante, Infer., xxi. 7-15, describes the various operations in the arsenal at Venice.

4 On the largest of these lions is cut a runie inscription recording a success- ful attack on the Pireus in the 11th century by a party of Norse warriors of the Varangian guard, under Harold Hardrada, who afterwards (in 1047) became king of Norway (see Arch. Journ., xvi. pp. 188-192). ;

5 This library contains about 65,000 volumes, with 5000 MSS., among which are some very valuable and artistically magnificent codices.

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Sculpture.

Till the 14th ceutury Venice continued to adhere to the old Byzantine style of sculpture! which, though often delicate in exe- cution and decorative in effect, slowly lost spirit and vigour, and from continually copying older forms gradually degenerated into a dull and mechanical formalism. Early in that century the influ- ence of Niccola Pisano and his school began to awaken a new artistic life among the archaistic sculptors of Venice ; but the progress of this renaissance was very slow, and in much of the Venetian sculp- ture the degenerate Byzantine formalism survived till nearly the close of the 14th eentury. Other works of the same period were executed with much of the grace and almost realistic beauty for which the eontemporary Florentines were so famous, and thus one may see in Venice, and in Venice only, two reliefs of the same date of which one is several centuries earlier in style than the other. This want of originality was probably partly caused by the immense quantity of older sculptured*

reliefs which was imported to adorn the walls of the churches. In the early part of the 14th century Florentine influence rapidly gained ground, and many sculptors from Florence came to work on the richly carved capitals of the ducal palace and other places, and espeeially produced a large number of very beautiful tombs with recumbent effigies. One very graceful type, the general motive of which was first used by Arnolfo del Cambio (see ORVIETO), was frequently repeated: at the head and foot of the effigy an angel is represented drawing a curtain so as to expose the figure of the dead man.3 The sarcophagus, on whieh the effigy lies, has reliefs of the Virgin and the Angel of the Annunciation, with the Crucifixion or some other sacred subject be- tween. In later times these subjects were usually replaced by allegorical figures of the virtues, and the simple curtain drawn by angels gradually became a large tent-like canopy, of rather clumsy and tasteless form. In most churches the sculptured decoration, apart from that on the tombs, was concentrated on the west facade, the tympanum of the central doorway being often filled with a very fine relief, such as that from the church of the guild Della Miseri- cordia, now in the South Kensington Museum.

In domestic architecture sculpture was but little used after the Byzantine period, the splendour of the facades depending mostly on their rich coloured marbles, and on moulded tracery and string- courses. Nevertheless, even as late as the 15th century it was not uncommon to insert 11th or 12th century pieces of sculpture in hew work ; many examples of this practice are still to be seen. The sculpture of the Early Renaissance is very abundant and extremely delicate and refined, especially that of the Giocondo and Lombardi schools; 8. Maria dei Miracoli contains some of the most beauti- ful examples.

Though not the work of a Venetian, Venice possesses what is perhaps the most magnificent equestrian statue in the world, the colossal bronze portrait of the Venetian commander-in-chief, Barto- lomeo Colleoni (figured in vol. xxi. p. 568, fig. 18),5 which stands in the square at the west end of SS. Giovanni e Paolo. It was modelled by the Florentine VERRoccHIO (q.v.), and was cast after his death by Alessandro Leopardi, who also designed the pedestal ; the whole was completed in 1495.

With the later development of the Renaissance, sculpture rapidly declined ; in domestic arehitecture it was but little used, except for the deep frieze under the top cornice, and with the Palladian school it became still rarer, and very mechanical in style. In the 17th century it was again used in the most lavish way as archi- tectural decoration, but was coarse in execution and violently awkward in outline. As Venice in her best days had produced some of the finest decorative sculpture in the world, so in her ex- treme decadence. an almost unequalled depth of degradation was reached, and this continued till the fall of the republic. The Venetian sculptor Canova was, on the whole, superior to his immediate predecessors, and was one of the leaders of the revival of classic sculpture which flourished during the first half of the 19th century.

Minor Arts.

During the early part of the medieval period the Venetians had no great skill in metal-work. Some of the bronze doors in the west fagade of St Mark's are importations from Byzantium. That on the right, whieh has rude figures of saints inlaid in silver, was brought to Venice in 1204; another with a Latin inscription appears to be native work of about the year 1112; both are very rude in design and execution. The open bronze grills of the west atrium doorways, whieh are signed as the work of a Venetian goldsmith Bertuccius, in 1800, show no increase of technical skill. Nor was the silver-work any better: the large silver rood in St Mark's is a

1 Some of the early doges are buried in seul tured sa i 5 6th centuries brought from elsewhere. 4 eee OnrERC ce

2 As, for example, the reliefs over the doorwa of the cloi Della Carita, both of the 14th century. J eer OTAU CREDA go The tomb of Andrea Dandolo in St Mark's (c. 1350) is one of the earliest in re this motive is used. : he 14th-century tomb of the Florentine ambassador Dueci i i is the first in Venice which has representations of the meee eres bert 5 See Vasari's Life of Verrocchio.

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very coarse piece of work. The silver altar frontals from the old cathedral, now in St Mark's, with sacred subjects and figures of saints repoussé in each panel, made in the 14th century, are no less rude in design and feeble in execution. As in the case of marble sculp- ture, Venice was chiefly dependent on foreign importations for its rich stores of treasures in the precious metals. In the latter part of the 15th century Venetian skill in bronze-work had greatly in- creased. Leopardi, who cast Verrocchio's statue of Colleoni, was a bronze-worker of great eminence ; and in the following century the bronze doors and the font eover® in St Mark's by Jacopo Sansovino are models of technical excellence, though showing some decadence of taste in their design. The great bronze lion on the west fagade of St Mark's, cast by Gaetano Ferrari in the first half of the 19th century, is a really fine work. A great deal of beauti- ful metal-work, especially in copper and bronze, such as large salvers, ewers, and the like, was made during the 15th and 16th centuries, partly by Moslem workmen and partly by native Vene- tians who adopted Oriental designs. A large colony of Moslem craftsmen seem to have settled in Venice, and had much influence on the designs used in many of the minor arts.

Moslem influence was especially strong in the case of woven Textiles

stuffs, for which Venice became very celebrated in the 15th century. Its damasks and other silk stuffs with patterns of extraordinary beauty surpassed in variety and splendour those of the other chief centres of silk weaving, such as Florence and Genoa. Fig. 7 in the article TEXTILES (vol. xxiii. p. 209) gives a beautiful example of 15th-century Venetian silk designed under Oriental influence, In addition to the native stuffs, an immense quantity of costly Oriental carpets, wall-hangings, and other textiles was imported into Venice, partly for its own use, and partly for export throughout western Europe. Thus in wealth of gorgeous stuffs and embroideries Venice surpassed all other cities, and on occasions of festivals or pageants the baleonies, the bridges, the boats, and even the facades of the houses were hung with rich Eastern carpets or patterned textiles in

gold and coloured silk. The glass manufactory of MuRANO (¢.1.), @lass-a smal] island about 14 miles to the north of Venice, was a great w.

source of revenue to the republic ; the glass-workers enjoyed special privileges and great pains were taken to preserve the secrets of the craft. Glass drinking cups and ornamental vessels, some decorated with enamel painting, and "silvered" mirrors were produced in great quantities from the 14th century downwards, and exported to other European countries, where they were sold for high prices. Much beautiful glass-work is still produced in Murano, but the workmen have lost all power of origina] design, and do little but copy the fornis invented in the 15th or 16th century. Like many other arts in Venice, that of glass-making appears to have been imported from Moslem countries, and the influence of Oriental design can be traced in much of the Venetian glass. The art of making stained glass windows was not practised by the Venetians ; almost the only fine glass in Venice is that in a south transept window in the Dominican church, which, though designed by able Venetian painters, is obviously the work of foreigners.

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6 This is usually attributed to Sansovino ; but, according to Moschini, a docu-

ment among the archives of St Mark's records that it was made by Desiderio of Florence and Tiziano of Padua.

orking) ;

number of 18th-century pictures by the Canaletti and by Guardi represent eanal views. The fine woodcut bird's-eye view of the city in 1497, engraved by Jacobo de' Barbari, is about to be published in facsimile with descriptive text by Giacomo Boni.

Part IJ].—Mopern City.

The modern city stands on 117 islands, separated by 150 canals (rio) and united by 380 bridges; all the main traffic passes along the canals. The usual range of tide-level is about 20 inches; but under exceptional circumstances there is a difference of nearly 6

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fect between lowest and highest water. The name "gondola" given to the passenger boats does not occur earlier than the 14th century. As shown in Carpaccio's and Gentile Bellini's pictures (¢. 1500), the goudola of that date was quite unlike the present boat with its heavy black cabin aud absence of any colouring: the older form had au awning of rich stuffs or gold embroideries, supported on a light arched framework open at both ends.1 The peculiar method of rowing with one oar at the stern is the same now as it was in the 15th century, and probably much earlier. Since 1880 "omnibus" steamers have been introduced on the Grand Canal, which has also

Map of the islands of Venice.

been disfigured in the 19th century by the addition of two hideous iron bridges, over one of which passes the railway that connects Venice with the mainland. Before the Venetian republic was sup- pressed by Napoleon I. the population amounted to nearly 200,000 ; in 1830 it had sunk to about 100,000; but since then it has in- ereased, and in 1881 amounted to 132,826 (commune 145,637). The city has grown rapidly in prosperity since its restoration to the kingdom of Italy, and it is now second only to Trieste among the seaports of the Adriatic. The climate is nild but some- what rainy, owing to the water-surrounded site. The principal

VENLO, a frontier town of Holland, in the province of Limburg, on the right bank of the Meuse (here crossed by a bridge), is an important railway junction ; Cologne lies 60 miles to the south-east and Maestricht 43 miles to the south-west. The population, which is somewhat closely packed, was 8494 in 1876 and 10,550 in 1887. None of the public buildings has any special interest attaching to it, The leading industries are distilling, brewing, tanning, spinning, needle-making, and tobacco manufacture. There is considerable trade by river with Rotterdam. Venlo was at one time a place of strength, but the fortifications were dismantled in 1868.

VENTILATION is the process of changing the air of rooms and other closed places so that a certain standard of purity may be preserved notwithstanding the vitiation which the air undergoes from the breath of inhabitants,

manufactures of the city remain what they were in the Middle Ages, namely, gold and silver work, glass, and velvet and silk, to which must now be added cotton, in all of which, as well as in grain, oils, wine and spirits, fruits, drugs, fish, and hides and leather an active trade is carried on. In 1886 the total value of the exports from Venice to foreign countries amounted to £7,239,479 and that of the imports to £8,788,012. During the same year there entered 2595 vessels of 714,642 tons (Italian 1565 vessels of 222,217 tons) and cleared 2597 of 724,740 tons (Italian 1565 vessels of 227,021 tons). (J. H. M.)

the products of combustion of illuminating agents, and other causes. In estimating the amount of air to be supplied, account must be taken of the standard of purity which is aimed at and of the rate at which vitiation occurs.

*Of the various impurities that are found in the air of Carbonic inhabited rooms carbonic acid forms the most ready index acid in The open air of London and other *"*

of the ventilation. large inland towns contains about four parts by volume of this gas in 10,000 of air. In the country and in towns near the sea two or three and a half parts in 10,000 is a more usual proportion. Authorities on ventilation usually take four parts in 10,000 as the standard for pure air, and use the excess over that quantity in estimating the adequacy of the air supply. But they differ as to the proportion

1 The use of black was made compulsory by a sumptuary edict ot the great council in the 16th century.

to which the carbonic acid may be allowed to rise in good Standard ventilation. It is generally admitted that the air in which of people dwell and sleep should not under any circumstances

Gas lights add to the vitiation of the air of rooms at a Vitiation rate which may be roughly estimated by treating one by burn- cubic foot of gas burnt per hour as nearly equivalent to 8 8.

purity.

be allowed to contain more than ten parts in 10,000. This has been accepted as the permissible proportion by Car- nelley, Haldane, and Anderson, after an extensive examin- ation of the air of middle and lower class dwellings.! De

one adult person, so far as the production of carbonic acid is concerned. Thus an ordinary burner, giving a light of about twenty candles and burning four cubic feet of gas per hour, uses the air of three or four men.

Chaumont, judging by the rough and unsatisfactory test The purity of the air of a room depends, of course, to Cubic afforded by the sense of smell, concluded that the air of a room ceased to be good when it contained eight volumes of

carbonic acid in 10,000 of air,? and recommends that six

the number of inmates. The influence of capacity is, ft00ms however, often overrated. Even when the allowance of .

Rate of con- sump- tion of air.

parts in 10,000 be taken as the maximum permissible in good ventilation. Parkes, in his Manual of Hygiene, quotes observations which point to an equally exacting standard as desirable.

The rate at which an adult respires carbonic acid varies widely with his condition of repose, being least in sleep, greater in waking rest, and very much greater in violent exercise. Asa basis on which to calculate the air necessary for proper ventilation we may take the production of carbonic acid by an adult as 0°6 cubic feet per hour.? Hence he will produce per hour, in 6000 cubic feet of air, a pollution amounting to one part of carbonic acid in 10,000 of air. If the excess of carbonic acid were to be

kept down to this figure (1 in 10,000), it would be necessary to supply 6000 cubic feet of fresh air per hour ; if the permissible excess be two parts in 10,000, half this supply of fresh air will suffice; and so on. We therefore have the following relation between (1) the quantity of air supplied per person per hour, (2) the excess of carbonic acid which results, and (3) the total quantity of carbonic acid present, on the assumption that the fresh air that is admitted contains four parts by volume in 10,000 :—

some extent, on the proportion of its cubic capacity to ota

space is very liberal, if no fresh air be supplied, the atmo- sphere of a room quickly falls below the standard of purity specified above ; on the other hand, the space per inmate may be almost indefinitely reduced if sufficient means are provided for systematic ventilation. Large rooms are good, chiefly because of their action as reservoirs of air in those cases (too common in practice) where no sufficient provision is made for continuous ventilation, and where the air is changed mainly by intermittent ventilation, such as occurs when doors or windows are opened. It must be borne in mind, too, that no room is hermetically sealed. In the absence of proper inlets and outlets casual ventilation goes on through every chink and cranny, and even by diffusion through the plaster of the walls. The ventilation given in this way is generally most inade- quate ; but a large room has at least the advantage over a small one that it offers more chances for the casual en- trance of fresh air, as well as a larger wall-surface through which diffusion may occur. It has also the advantage that a greater volume of air may more easily be passed through it than through a small room in a given time, without causing disagreeable draughts. A general idea

mf mate "| of the cubic capacity per inmate, allowed by law or by Air supplied per Carbonic Acid g 3 5 : : Adult per Hour, | (Parts by Volume in 10,000). custom 1n certain cases, is given in the table below :-— | Excess due to Total ER Me te 2. cole wedbsetass eck 1200 cubic feet (and upwards).] Cubic Feet. _ nee. ama Middle class hous@sg,. 1 itsi5 tec 1000 re : : 1000 6 10 eT ne ane Sar eet 600. 1200 5 9 Good secondary schools …..... 500° 1500 4 8 London board schools …..... 130 . 2000 8

fi Workhouse dormitories …..... 300 ig 8000 2 6 London lodging-houses …..... 240s; =. One-roomed houses 6&..... 212

Thus, to preserve the lowest standard of purity tolerated by sanitarians, ventilation must go on at the rate per person of 1000 cubic feet per hour, and 3000 cubic feet per hour are required to preserve the higher standard on which some authorities insist. Parkes advises a supply

of 2000 cubic feet of air per hour for persons in health |

and 3000 or 4000 cubic feet for sick persons, The English Barracks Improvement Commissioners 4 require that the supply be not less than 1200 cubic feet per man per hour. Pettenkofer recommends 2100 cubic feet, and Morin ® con-

To realize the need of provision for ventilation, it is only necessary to compare these figures with those already given for the rate of consumption of air. Taking the lowest permissible degree of purity (10 parts of carbonic acid in 10,000), we see that, if no fresh air were allowed to enter, the dweller in a middle-class house would make the atmosphere of his room unfit for breathing after occupying it for 1 hour, and that the sleeping rooms of the poor would fall below the standard in 13 minutes.

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siders that the following allowances are not too high :— The atmosphere of roonis is changed partly by diffusion, Ventila-

_ | but chiefly by actual currents of air. The experiments of tion by | i Ns ateoed en ee 2000 to 2400 cubic feet per hour.| | Pettenkofer have shown that air passes to a very sensible es | it ON coe etaaged aa ” ” extent through the substance of brick walls. In houses vcs Do. (unhealthy trades) | 3500 . » built of stone the movement of air through the walls must of air. BMI 6s li athe tee octeocn a 1700 id be insignificant ; but, as regards individual rooms, what es eee bie tc ra aad ¥s is chiefly important in this connexion is the percolation Schools (per child) .....| 400 to 500 through dry plaster, causing an exchange of atmosphere | Do. (per

adult) .....| 800 to 1000 – to occur between the inside of the room and the space

within the lining of the wall, which is generally in com- munication with other parts of the building and with the external air. In order that the atmosphere of a room should be changed by means of air currents, three things are necessary,—(1) an inlet or inlets for the air, (2) an outlet or outlets, and (3) a motive force to produce and maintain the current. One might think it needless to

1 Phil. Trans., 1887, vol. elxxviii, B, p. 61. In school-rooms well ventilated by mechanical means these authors found 13 parts of car- bonie acid in 10,000 of air, which they consider a limit permissible in rooms of that class, though not in dwelling-rooms.

2 Proc. Roy. Soc., 1875, vol. xxiii. Dp: Lei.

8 This estimate is based on the observations of Pettenkofer, Angus Smith, and Parkes.

4 Report, 1861.

5 See Etudes sur la Ventilation, Paris, 1863 ; also Proc, Inst. Mech. Eing., 1867, p. 68.

; 5 ee of 29 measurements by Carnelley, Haldane, and Anderson, oc. Cit.

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Mechani- quently overlooked.

YN TILA TAON

enumerate such obvious requirements were it not that, in providing appliances which are intended to act as venti- lators, one or other of the three essentials is not unfre- In systems which are distinguished

cal and py the general name of mechanical or artificial ventilation

natural : yentila-

- tion.

special provision is made for driving the air, by fans, or by furnaces, or by other contrivances to be described more fully below. In what is called natural ventilation no special appliance is used to give motive force, but the forces are made use of which are supplied by (1) the wind, 2) the elevated temperature of the room's atmosphere, and (3) the draught of fires used for heating. A careful distinction should be drawn between cases in which these motive forces are skilfully taken advantage of, by the use of proper inlets and outlets, to give the best result attain- able without special appliances for driving the air, and other cases, unfortunately too common in practice, where the ventilation is left to take care of itself. In a fair comparison of a mechanical with the natural system we should exclude examples in which the ventilation is hap- hazard, or in which as near an approach to no ventilation is reached as the conditions of modern architecture will permit.

"Chimney Domestic Ventilation.—The chief agent in domestic ventilation – draught. is the chimney ; when a bright fire is burning in an open grate, it

Other outlets,

rarely happens that any other outlet for foul air from a room need be provided. The column of hot air and burnt gases in the chimney is less heavy, because of its high temperature, than an equal column of air outside ; the pressure at the base is therefore less than the pressure at the same level outside. This supplies a motive force compelling air to enter at the bottom through the grate and through the opening over the grate, and causing a current to ascend. The motive force which the chimney supplies has not only to do work on the column of air within the chimney, in setting it in motion and in overcoming frictional resistance to its flow: it has also to set the air entering the room in motion and to overcome frictional resist- ance at the inlets. In many cases the latter part of the chimney's work is the more considerable of the two. From want of proper inlets air has to be dragged in at a high velocity and against much

resistance, under the doors, between the window sashes, and through a hundred other chinks and crevices for which we have to thank imperfeet carpentry and half-seasoned timber. Under these con- ditions the air enters in small streams or narrow sheets, ill-distri- buted and moving so fast as to form disagreeable draughts, the pressure in the room is kept so low that an opened door or window lets in a deluge of cold air, and the current up the chimney is much redueed. If the attempt is made to stop draughts by applying sand-bags and listing to the crevices at which air streams in, matters only become worse in other respects ; the true remedy of course lies in providing proper inlets! The discharge of air by an ordinary open fire and chimney varies widely, depending on the rate of com- bustion, the height and section and form of the chimney, and the freedom with which air is entering the room. About 10,000 cubic feet per hour is probably a fair average, about enough to keep the air fresh for half-a-dozen persons.?_ Even when no fire is burning the chimney plays an important part in ventilation : the air within an inhabited room being generally warmer than the air outside, it is only necessary that an up-current should be started in order that the ehimney should maintain it, and it will usually be found that a current is, in fact, passing up.®

When a room is occupied for any considerable length of time by more than about half-a-dozen persons, the chimney outlet should be supplemented by others, which usually take the form of gratings in the ceiling or cornices in communication with flues leading to the open air. Frequently these openings are protected from down- draught by light flap valves of oiled silk or sheet mica, opening outwards. To increase the efficiency of the ventilating action of the chimney, Dr Arnott advocated (in 1849) that an opening should

1 The absence of proper inlets for air in a house where several fires are burning involves a danger that is much more serious thau other effects of bad ventilation. When the air which is required to take the place of that discharged by the chimneys can only struggle in through small openings, the pressure within the house falls considerably below that of the outer air, the water traps under basins and closets are liable to be forced, and foul air is drawn in from every leak in soil-pipe or drain. The writer has found a house drawing what seemed to be its main supply of "fresh " air

from the public sewer, through a defective Joint between the soil-pipe and the (untrapped) house-drain.

- *Report of the Barracks Commissioners, 1861.*

: "< observations by De Chaumont, in Parkes's Hygiene, 6th ed., p.

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be made near the ceiling, into the chimney, guarded by a flap valve of this type, with the object of providing a direct exit for the foul warm air that gathers in the upper region of a room, especially when gas is burnt. To make Arnott's valve of much service it should be larger than the size usually supplied ; even then it has the drawback that, notwithstanding the protection given by the valve, enough back-flow may occur to blacken the wall and ceil- ing with soot near the opening. Ifa valve near the ceiling be pro- vided, it is probably better in most cases to lead its outlet shaft direct to the open air than to lead it into the chimney.

With regard to inlets, a first care must be to avoid such currents Inlets,

of cold air as will give the disagreeable and dangerous sensation of draught. At ordinary temperatures a current of outer air to which the body is exposed will be felt as a draught if its velocity excceds 2, or at most 3, feet per second. The current entering a room may, however, be allowed to move with a speed much greater than this without causing discomfort, provided its direction keeps it from striking directly on the persons of the inmates. To secure this, it should enter, not horizontally nor through gratings on the floor, but vertically through openings high enough to carry the entering stream into the upper atmosphere of the room, where it will mix as completely as possible with warm air before its presence can be felt. A favourite form of inlet — — =

is Sheringham's (see fig. 1). When opened it forms a wedge-shaped projection into the room, and admits air in an upward stream through the open top. It is usually placed near the ceiling ; but a lower place in the wall would be better. Other inlets are made by using hollow perforated blocks of earthenware, called air-bricks, built into the wall; these are

often shaped on the inner side like an inverted louvre-board or venetian blind, with slots that slope so as to give an upward in- clination to the entering stream.

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Fic. 1.—Sheringham air inlet.

In another and most valuable form of ventilator, the introduction Tobin of which is due to Mr Tobin of Leeds, the fresh air enters verti- tube.

eally upwards. The usual arrangement of Tobin's tube (shown in front elevation and section in fig. 2) :

is a short vertical shaft of metal plate or wood which leads up the wall froni the floor level to a height of 5 or 6 feet. Its lower end communicates with the outer air through an air- brick or built opening in the wall; from its upper end, which is freely open, the current of fresh air rises in a smooth stream, clinging, as it were, to the wall, and scarcely chang- ing its direction until it has passed far above the level of the opening. Various forms of section may be given to the tube: if placed in a corner it will be triangular or segmental; against a flat wall a shallow rect- angular form is most usual; a lining of wood forming a dado may even be made to serve as a Tobin tube b setting it out a little way from the wall. The tube is often furnished with a regulating valve ; but this isa doubtful advantage, as it tempts the inmates to stop the ventilation for no better reason than that the room is cold ; in exceptional circumstances, such as the presence of an invalid, the opening may be stopped or reduced by laying a board over it. Contrivances are occasionally added for cleansing the enter- ing air. A muslin or canvas bag hung in the tube, or a screen stretched diagonally across it, may be used to filter out dust; the same object is served in some degree by forcing the air, as it enters the tube at the bottom, to pass in close contact with the surface of water in a tray, by means of a deflecting plate. These complications have a double drawback : they require frequent attention to keep them in order and by putting resistance in the way of the stream they are apt to reduce the efficiency of the ventilation.4 The air entering by a Tobin tube may be warmed by a coil of hot pipes

within the tube or by a small gas-stove (provided of course with a flue to dis-

Fic. 2.—Tobin tube.

4 Wheu the air is not filtered, and when it has been warmed beforc eutering, the vertical direction of the stream is readily traced by dust which is deposited on the wall in a nearly upright column, spreading slightly fan-wise as it rises. With cold air the deposit of dust is comparatively slight. The difference is due to the fact noticed and ex- plained by Mr John Aitken, that air quickly deposits any suspended particles when it is brought into contact with a surface colder than itself, but retains them in suspension if the surface be warmer than the air (Trans. Roy. Soc. Edin., vol. xxxiii., 1884, p. 239), Another domestic illustration of the same fact is given by the greater dustiness of walls and furniture in a stove-heated room than in a room heated by an open fire.

Ventila- tion by window and door.

Arrange- ments in

barraeks ;

In public

buildings.

. in vertical streams.

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charge outside the products of combustion) ; or the tube may draw its supply, not directly from the outer atmosphere, but from a hot- air flue or from a room or corridor where the air has been already warmed. The opening should always be about the level of a man's head, but the tube need not extend down to the floor: all that is essential is that it should have sufficient length to let the air issue in a smooth vertical current without eddies (fig. 8). These inlets are at once so simple and effective

*that » no hesitation need be felt in introducing them freely » in the rooms of dwelling-houses. When no special provision is made for them in the walls, the advantage of a current entering vertically may still be in some ga a degree secured by help of certain makeshift contriv- *00 “uD ances. One of these, suggested by Dr Hinkes Bird, is to open one sash of the window a few inches and fill up the opening by a board ; air then enters in a zig-zag course through the space between the sashes. Another plan is to have a permanent vertical slot between the sashes by making the top of the lower sash stand outa little from the bottom of the upper one. Still another plan is to have a light frame of wood or metal or glass made to fit in front of the lower sash when the window is opened, forming virtually a Tobin’s tube in front of the window (see fig. 4, where a portion of the frame is broken away to show the position of the window sash). This last contrivance allows the fresh air as ready access as may be wished;*

Fig. 4.

Fia. 4.—Ventilating inlet fitted to window. Fic. 5.—Ventilating inlet at foot of door. of the current of air when the door is closed

The arrows indieate the direction

and, unlike the others, it is still effective when the blind is drawn down. A Tobin’s tube, however, is better placed against a dead wall than below a window, for the ascending current is liable to be broken by the window recess and by the down-draught which a window causes by its cooling action on the air of the room. The principle of giving entering currents an upward direction is turned to useful account in a simple contrivance (see fig. 5) for preventing the disagreeable cold draught which comes along the floor of a room from the chink beneath the door. The clearance under the door is made a little greater than usual, and a thin piece of wood is set on the inner side as close as possible to the floor and at a dis- tance of half an inch or so from the surface of the door ; the air then enters in a vertical stream.

As an example of the systematic ventilation of dwelling-rooms on a large scale, the following particulars may be quoted of arrange- ments that have been successfully used in English barracks for more than twenty

years. One or more outlet-shafts of wood are carried from the highest part of the room, discharging some feet above the roof under a louvre ; the number and size of these shafts are such as to give about 12 square inches of sectional area per head and the chimney gives about 6 square inches more per head. About half the air enters cold through air-bricks or Sheringham valves at a height of about 9 feet from the floor, and the other half is warmed by passing through flues behind the grate. The inlets taken to- gether give an area of about 11 square inches per head. A fairly — Seager "4 some 1200 cubic feet per head per hour is found

0 take place, and the proportion of carbonic acid ra 10 parts in 10,0001 ° pp aiahaeal

In the natural ventilation of churches, halls, and other large rooms we often find air admitted by gratings in the floor or near it. —an offensive plan, since it fouls the air, besides causing objection- able draughts, unless the temperature is very carefully reculated The inlets should consist, like Tobin's tubes, of upright flues rising toa height of about 6 feet above the floor, from which the air xivodd.

If the air is to be warmed before it enters the supply may be drawn from a chamber warmed by hot-water or steam pipes or by a stove, and the temperature of the room may be regulated by allowing part of the air to come from a hot chamber and part from outside, the two currents mixing in the shaft from which the inlets to the room draw their supply. Ifa basement or

1 De Chaumont, in Parkes's Hygiene, 6th ed., p. 171.

story below the room to be ventilated is available, a good plan is to carry the inlet tubes vertically down through it and warm the air in them, so that the height of the warm column assists the flow. Outlets usually consist of gratings or ee openings at or near the ceiling, preferably at a considerable distance from points vertically above the inlet tubes. One of the chief difficulties in natural ventilation is to guard them against down-draught through the action of the wind. Numberless forms of cowl have

been de- vised with this object, and often with the further intention of turning the wind to useful account by making it assist the up-current

of foul air. Some of these exhaust cowls are of the revolving class : Exhaust a hood or trumpet-shaped mouth, opening horizontally and sup- eowls,

ported about a vertical axis so as to be free to turn, is kept facin

away from the wind by means ofa large vane. To make the wind help the up-current, a horizontal conical tube is fixed within the cowl, pointing towards the wind and discharging through the trumpet-mouth of the cowl, where it exhausts by suction, on the principle of the jet-pump. Revolving cowls are liable to fail by sticking, and, apart from that, when the wind blows in shifting gusts they cannot respond quickly enough to its changes of direc- tion to prevent it from occasionally ppp WIND

blowing down. Fixed cowls are to be preferred ; they are designed in many forms, of which Mr Buchan's may be cited as a good example. Fig. 6 shows this ventilator in horizontal section: aa is the ver- tical exhaust flue through which the foul air rises; near the top this expands into a polygonal chamber, bbbb, with vertical sides, consisting partly of perforated sheet-metal plates ; outside of these are fixed vertical curved guide-plates, c,¢,c,c ; the wind, blowing between these

ree a

~ WIND and the polygonal chamber, sucks Fic. 6.—Sectional plan of Buchan's

air from the centre through the per- se nici cl

forated sides. Perhaps no form of cow] is entirely free from liability to down-draughts. The most complete safeguard is to place in the exhaust flue a set d of flap-valves open- ing only outwards. Fig. 7 shows the ar- rangement of exit- valvesemployed by Mr Buchan; the valves a, a, @ are flaps of oiled silk working on a wood- en grid 6), which is inclined enough to let them hang free of it when no current is passing ; beyond

them is a door closing-valve c, worked by hand by the cord d; and the whole is enclosed in a box, with glass sides ee, through which the action of the valves may be seen. When the outlets are guarded by valves of this type they may discharge through a plain box with louvred sides ; an exhaust cowl, however, may still be used with advantage to assist the ventilation under favourable conditions of the wind.?

The two things that supply motive force in automatic ventila- tion—the difference of temperature between inner and outer air and the wind—are so variable that even the best arrangements of inlets and outlets give a somewhat uncertain result. 'To secure a strictly uniform delivery of air, unaffected by changes of season or of weather, the influence of these irregular motive forces must be as far as possible minimized, and recourse must be had to an artificial method of driving the air.

Fic. 7.—Exit valves in exhaust flue.

Artificial or Mechanical Ventilation.—This finds application on Artificis ' the largest scale in the ventilation of collieries, by methods which ventila-

are fully described under Coat (vol. vi. pp. 70-71) and Mrntne (vol. tion.

xvi. p. 460). Motive force is supplied to the up-cast shaft either by a furnace at the base, which heats the rising column of air, or (in more modern practice) by a centrifugal fan, such as Guibal's, exhausting air from the top. The long galleries and workings through which the air has to be driven oppose so much resistance that the pressure required to move a sufficient volume of air is im-

mensely greater than is ever necessary or desirable in the artificial ventilation of buildings.

A broad distinction may be drawn between what are sometimes Ml In an

called vacuum and plenum methods of artificial ventilation.

the former, as in colliery ventilation, the motive force is applied at plenum

the outlets: air is drawn from the rooms, and the pressure of their method:

atmosphere is less than the pressure outside. In the latter the motive force is applied at the inlets: air is pushed in, and the pres- sure within the room is greater than outside. The plenum method has distinct advantages: it makes the air escape instead of coming

2 For an aecount of tests of various forms of ventilating cowls, see 8. 8. Hellyer, The Plumber and Sanitary Houses, 4th ed., 1887.

- Extrac- _ tion by hot-air . shaft,

Extrac- tion by fans,

Fans in

plenum Ventila- _ tion,

in as a cold draught at every crevice and casual opening to the outer air; it avoids drawing foul and mouldy air from sewers and basement ; and with it, more easily than with the other, one may

uard against the disturbing influence of wind. In the plenum method the air is driven by pumps or by fans; in the vacuum method pumps are rarely if ever used: suction is produced by fans or by heating the column of air in a long vertical shaft through which the discharge takes place. Water jets and steam jets have also been employed to impel the air.

Extraction by a hot-air shaft is a common mode of ventilating hospitals and other public buildings.' Heat is applied by a furnace or stove at the bottom of the shaft, or by coils of hot-water or steam Pipes which should not extend up the shaft farther than can be helped. In the lecture theatre of the Paris art conservatory, ventilated by Morin, where this means of extraction is employed, fresh air enters through the ceiling and foul air is drawn off through the floor from under the seats ; this reversal of the

natural direction of the current is of course only possible when a sufficient external motive force is applied. The House of Commons furnishes another example: there the air, after being warmed and moistened, or cooled by water spray, as the state of the atmosphere may require, is admitted through large gratings in the floor, which are covered by porous matting to prevent draughts ; outlets from the top of the House lead by flues to the Victoria tower, where a furnace maintains the current in an up-cast shaft.2 In theatres and other buildings lighted by clusters of gas jets or sun-lights at the ceiling the lights may be turned to account as effective ventilating agents by letting the foul air escape through shafts placed over them, which they heat at the base. What is known in America as the Ruttan or Smead system of ventilation, successfully applied in many schools there, employs a hot-air shaft to furnish motive power. In warm weather a stove at the base of the shaft is used to heat the column; in cold weather the exhaust air from the rooms is so much warmer than the atmosphere outside that the up-cast shaft acts without additional heating. This is in fact an example in which the classification of systems into natural and artificial breaks down. The supply of fresh air is warmed as it enters by passing through chambers containing tubular metal stoves ; the outlets are at or near the floor level. A curious feature in the arrangements is that the foul air, in passing to the up-cast shaft, is drawn through the privies, where it desiccates all discharges.

Extraction by fans presents no features requiring special remark. A favourite fan for the purpose is the Blackman propeller, the nearly flat form of which allows it to be readily placed in walls and partitions. One of these fans, 4 feet in diameter, when driven at a speed of about 330 revolutions per minute, is said to discharge 15,000 cubic feet of air per minute with an expenditure of one-horse- power. Though this is a good performance, it should be observed that for ventilating purposes, where air has to be driven in large volume with low velocity and under low pressure, fans, while they have the advantage of being less bulky, are less efficicnt than pumps, for they require that the air in passing through them should move much faster than in other parts of its course, and much of the energy of this motion is wasted in eddies. When fans are used to blow air into buildings, they should deliver into a chamber of considerable size, that the air may become nearly still before it passes into

the distributing flues. Loss of power may be avoided to some extent by receiving the air in a channel which gradually enlarges as it leaves the fan.

The plenum method, with fans to drive the air, is exemplified on a large scale in the ventilation of St George's Hall, Liverpool,' where there are four large fans in the basement, driven by a 10- horse-power steam-engine. The building is heated by passing the air through chambers containing coils of hot-water and steam pipes ; after the air is warmed it is moistened by injecting steam, and pro- vision is made for washing it by water-spray before it reaches the fans,

When fans are used, either with suction or with pressure, the amount of the current is not strictly independent of those variable motive forces which are the sole agents in natural ventilation ; the case is analogous to that of an electric circuit in which several sources of electromotive force are at work, assisting or opposing one another. The fan may be the main agent in circulating the air; but differences of temperature, and at times the action of the wind, may make large variations in the resultant effect. The case is different when pumps are used. A certain quantity of air is delivered at each stroke, and the only effect of these irregular forces 1s to make the power required to drive the pump sometimes greater and sometimes less, Provided there are no casual inlets and outlets, the amount of air supplied is known with certainty ; the ventila-

; For examples, see Morin, op. cit., or Proc. Inst. Mech. Eng., 1867, p. 61. The arrangements are similar to those introduced by Dr Reid in the temporary Houses of Parliament, and described in his Treatise on Ventilation and Warming; see also Tomlinson's Warming and Ventilation, p. 265. In ot ere pumps have been added, through which air may be forced into . building ; but the hot shaft is generally used. é See, for example, Morin's account of the ventilation of the Théatre Lyrique, aris. 4 Proc. Inst. Mech. Eng., 1863, p. 194.

tion under these conditions is sometimes described as positive. Positive Good recent examples of positive plenum ventilation are to be plenum found in Dundee University College and in a number of schools ventila-

in Dundee and Aberdeen, where the arrangements have been de- tion. signed by Mr W. Cunningham. Some of these are ordinary double-

acting reciprocating pumps, driven generally by water engines.

The pumps are rectangular wooden boxes, stiffened by iron ribs, and provided at top and bottom with inlet valves, consisting of a number

of short waterproof cloth flaps working against a vertical wooden

grid. The piston, which is also of wood, has a vertical travel; it

is held in place and worked by wire ropes above and below, which

lead over pulleys to the water motor ; and the piston is balanced by

a counterweight on the descending branch of the upper rope. A

piston 5 feet square, with a stroke of 5 feet, works at 20 Gece per

minute and delivers 150,000 cubic feet per hour.

*In other instances, where the volume of air is greater than could easily be dealt with by common pumps, Mr Cunningham uses re- volving pumps of the Root's blower type (shown in transverse vertical section through the revolving y "pistons" in fig. 8). At the Dundee College a battery of five] of these blowers, each discharg- ing over 150,000 cubic feet of § air per hour, is driven easily by a gas engine of two-horse-power. | The rooms are heated by having coils of Perkins's high a pressure hot – water pipes in the main dis- tributing flues. The inlets are flat upright tubes extending up the side walls to a height of nearly 6 * feet, and open at the top. Ample proof of the advantage that results from giving a vertical direction to the entering current is supplied by the success of Mr Cun- ningham's arrange- ments, where this form of inlet is ex- clusively adopted. Al- ternative outlets are generally provided in the end walls, one group near the ceil- ing, another a few i feet from the foot. Fic. 8.—Revolving pump for ventilation.*

They are fitted with

doors which allow one or other to be closed ; the high-level outlets are used in warm weather, when the fresh air that comes in is com- paratively cool ; the low-level ones are used in cold weather, when the fresh air, having been heated before it enters, would tend to rise and pass out too directly if the outlets near the ceiling were open. The outlet shafts communicate with a louvred tower or turrets on the roof. – Each room receives a volume of air equal to its cubic capacity in about 12 minutes, so that the atmosphere is completely changed five times in an hour. The inlets are propor- tioned to do this without allowing the velocity with which air enters to exceed 6 feet per second.

The " Zolus" water-spray ventilator of Kind and Mestern is an Water- example of a mechanical ventilator using a jet of water to impel the spray air. A nozzle at the top of a circular air-shaft delivers a conical venti- sheet of water, which impinges on the sides of the shaft a little way lator. below and carries down with it a considerable stream of air. This ventilator is used either to force air into rooms or to draw it out; in the former case a small gas-stove is often added to heat the supply.

For the ventilation of greenhouses and hot-houses, see vol. xi.

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The advantage of ample and systematic ventilation is Organic not to be measured only by the low proportion of carbonic matter acid it secures. Carbonic acid is not the only test of Fy… vitiation; it is not even the most dangerous impurity. organisms Another criterion of the foulness of close air is the amount in air. of oxidizable organic matter it contains; still another,—and a most valuable one,—is the number of micro-organisms, especially of bacteria. The micro-organisms may be de- termined by Hesse's method of slowly passing a given volume of the air to be examined through a tube coated inside with beef jelly; the germs are deposited on the nutrient jelly and each becomes in a few days the centre of a very visible colony. In outside air the number of micro-organisms, as tested in this way, varies greatly; it

is often less than 1 per litre (61 cubic inches) ; in well- ventilated rooms it ranges from 1 to 20; in close school- rooms as many as 600 per litre have been found. The elaborate researches of Carnelley, Haldane, and Anderson! on the air of dwellings and schools illustrate well the value of this test. One of the uses to which they have put 1t has been to compare schools known to be well ventilated (by mechanical means) with schools ventilated at hap- hazard or not ventilated at all. A large number of trials were made in each case; in the mechanically ventilated schoolrooms the average number of micro-organisms was 17 per litre, and in the others 152. Results of great in- terest were obtained by the experiment of stopping the me- chanical ventilators for a few hours or days. Tested by the proportion of carbonic acid, the air of course became very bad; tested by the number of micro-organisms, it remained comparatively pure, the number being, in fact, scarcely greater than when ventilation was going on, and far less than the average in "naturally ventilated " schools. This proves in a striking way the advantage of systematic ventilation. The bad effect of a foul stagnant atmosphere is cumulative. An habitually close room acts as a nursery of micro-organisms, which a casual flushing with fresh air will not remove ; an habitually well-ventilated room is kept in great measure clear of these dangerous inmates, and its atmosphere may be occasionally overtaxed without causing the number of them to be seriously increased. (J. A. E.)

VENTNOR, a watering-place in the south-east of the Isle of Wight, is finely situated in the Undercliff district, at the foot of St Boniface Down (784 feet), 12 miles south- south-west of Ryde and 10 south-south-east of Newport, with both of which there is communication by coach as well as by rail. The town is finely and picturesquely built on a succession of terraces sloping towards the sea, and from its sheltered situation, equable temperature, and com- paratively dry atmosphere is regarded as one of the best resorts in England for consumptive invalids. About fifty years ago it was only a small fishing hamlet; now it ex- tends along the shore for a distance of about 2 miles, in- cluding Bonchurch to the east. It possesses assembly rooms and a literary and scientific institution. An espla- nade was constructed in 1848, and a pier (645 feet in length) in 1872, which

was greatly improved in 1887. There are extensive recreation grounds. The churches are all modern and without special architectural features. The church of St Boniface at Bonchurch is perhaps the oldest in the island. Among the benevolent and charit- able institutions are the royal national hospital for con- sumptives (begun in 1869), the seaside home of the London city mission, the St Catherine's home for consumptives, and the convalescent home of the Royal Hants Hospital. An Act for establishing a market was passed in 1844, The town is governed by a board of eighteen members, established in 1858. The population of the urban sanitary district (area 215 acres) was 4841 in 1871 and 5504 in 1881; but there is a considerable population outside the district.

VENUE (from Lat. vicenetum) denotes in English law the place from which a jury must be brought for the trial of a case. The word occurs early in constitutional docu- ments, for it was for a long time one of the essentials of trial by jury that the jury should belong to the neighbour- hood in which the cause of action arose or the alleged crime was committed (see Jury). The phrase duodecim legales homines de viceneto or its equivalent is found in the Con- stitutions of Clarendon (1164), the Assize of the Forest (1184), and in Glanvill. In civil matters venue became after a time divided into local and transitory, the former where the cause of action could only have arisen in a

1 Phil. Trans., 1887, vol. clxxviii. B, p. 61.

particular county, such as trespass to land, the latter where it might have arisen in any county, such as debt. In the latter case the plaintiff might lay the venue where he pleased, subject to the power of the court or a judge to change it. The law on the subject is now only of anti- quarian interest (unless, perhaps, in certain actions on penal statutes), for it is enacted by the Rules of the Supreme Court, 1883 (Ord. xxxvi. r. 1), that there shall be no local venue for the trial of any action, except where otherwise provided by statute. The plaintiff may name his place of trial; where no place of trial is named the place is to be the county of Middlesex. The court ora judge has discretion to alter the place of trial. In criminal practice venue is still of importance, though not as much so as

formerly since the large powers of amendment of indictments given by recent legislation. 'The venue is named in the margin of an indictment in this form, " Middlesex to wit." By 14 and 15 Vict. c. 100 it is un- necessary to state any venue in the body of an indictment, and no indictment is to be held bad for want of a proper perfect venue.

Numerous Acts provide for, inter alia, the laying of the venue in the case of offences committed partly in one county and partly in another, or on the high seas, or abroad, and of special offences, such as those under the Post Office, Merchant Shipping, Slave Trade, and Foreign Enlistment Acts. The place of trial may be changed by the Queen's Bench Division, chiefly where it is rendered probable that a fair trial could not be had in the county of the venue.

In Scotch law venue is not used as a technical term; but there are statutory provisions for changing the place of trial in both civil and criminal cases.

In the United States venue may generally be changed by the courts ; but in some States it is provided by their constitutions that provision for change of venue is to be made by the legislature.

In other States the passing of local or special laws for change of venue is forbidden.

VENUS. See ApHRODITE.

VERA, Avcusro (1817-1885), the chief representative of Hegelianism in Italian philosophy, was born at Amelia in the province of Perugia on 4th May 1817. He com- pleted his education in Paris, and, after teaching classics for some years in Switzerland, was appointed professor of philosophy in connexion with the university of France. Attaching himself to Hegel's system with the enthusiasm of a disciple, Vera (who wrote fluently both in French and English as well as in Italian) became widely influen- tial in spreading a knowledge of the Hegelian doctrine. Without any marked originality, his writings are distin- guished by the lucidity of their exposition, and by their genuine philosophic spirit. Among his numerous works may be mentioned Introduction & la Philosophie

d'Hégel (1853, 2d ed. 1864); Probleme de la Certitude (1861); Mélanges Philosophiques (1862); Essais de Philosophie Hégélienne (1864); Strauss, ?Ancienne et la Nouvelle For (1873), an attack upon Strauss's last " confession," written from the standpoint of an orthodox Hegelian ; and a com- prehensive work in Italian, Jl Problema dell' Assoluto, be- longing to his later years. His English works are an Inquiry into Speculative and Experimental Science (1856), more recently an Introduction to Speculative Logic and Philosophy, and a translation of Bretschneider's History of Religion and of the Christian Church. Vera also trans- lated a number of Hegel's works into French, with intro- ductions and commentaries, including the Logic, the Philosophy of Nature, the Philosophy of Spirit, and the Philosophy of Religion. In 1860 Vera returned to Italy, where he was made professor of philosophy in the royal academy of Milan. In the following year he was trans- ferred to Naples as professor of philosophy in the university there. His Prolusioni alla Storia della Filosofia and Lezioni sulla Filosofia della Storia connect themselves with the work of his chair, which was specially devoted to the

history of philosophy and the philosophy of history. He held this post till his death, which took place at Naples in the autumn of 1885.

A Life of Vera, in two volumes, has been published by Signor Mariano, a friend and follower.

VERA CRUZ, a fortified town and seaport of Mexico, formerly capital of the state of Vera Cruz, is situated in 19° 11'50" N. lat. and 96° 20' W. long., at the south-west corner of the Gulf of Mexico, on a low and exposed seaboard, partly sandy partly marshy, where the true yellow fever is endemic, prevailing throughout the summer and occasion- ally breaking out even in winter.1 The town, which in 1884 had a population of 16,840, is distant 263 miles by rail from Mexico and 60 from Jalapa, the summer residence of the upper classes. It has few buildings of interest, except a superb cathedral decorated in the Moorish style. Most of the streets, which are laid out at right angles, are paved with cobble-

stones and have a kennel or open cutter in the middle. A characteristic feature of the place are the turkey-buzzards, who do the scavangering, and are consequently protected by law. The open roadstead, although partly protected by the neighbouring islets of Los Sacrificios and San Juan de Ulloa, is greatly exposed to the fierce "nortes" (northers), which sweep over the Gulf at intervals from October to March. A French company, which contracted with the Mexican Government to form a harbour by constructing a breakwater between the islands, has lately suspended operations. Vera Cruz is, however, the largest seaport in the republic. In 1886 over one-half of the exports of Mexico (£3,002,000 altogether) were shipped from this place (£1,625,000 to Great Britain). Of these exports £2,180,000 represented the precious metals, the other chief items being coffee (£207,000), hides and skins (£99,000), mineral ores (£84,000), tobacco (£68,000), broom root (£25,000), and sugar (£12,000). In the same year the imports amounted to £1,941,000 (£498,000 from Great Britain), and 487 vessels of 295,000 tons cleared from Vera Cruz. In 1887 the exports from Vera Cruz amounted to £1,047,000 (coffee £407,000 and minerals £208,000), and the imports to £2,159,000.

The present town of Villa Rica de Vera Cruz (" Rich City of the True Cross"), which lies several miles south of the original town founded by Cortes in 1520, was built by the viceroy Monterey at the end of the 16th century, and received the title and privileges of a city from Philip III. in 1615. :

The state of Vera Cruz has a seaboard of 450 miles on the Gulf of Mexico, with a mean breadth of 55 miles. Its area is 24,700 square miles, and its total population was 640,000 in 1887, nearly all native Mexicans.

VERATRUM. The Greek physicians were acquainted with a poisonous herb which they called white hellebore, and which has been supposed to represent the existing Veratrum. Be this as it may, in modern times the name has been applied to a genus of herbaceous plants closely al- lied in their structure to Colchicum, but differing greatly in general appearance. Veratrum is a tall-growing herb, having a fibrous root-stock, an erect stem, with numerous broad, plicated leaves, placed alternately, and terminal much-branched clusters of greenish or purplish polygam- ous

flowers. Each perfect flower consists of six regular segments, as many stamens, whose anthers open outwardly, and a three-celled superior ovary ; this last ripens into a three-celled, many-seeded capsule. The genus is included in the order Melanthacex, otherwise called Colchicacex, and comprises a small number of species, natives of the tem- perate regions of the northern hemisphere, generally growing in pastures or woods. Some, and presumably all, contain a violently poisonous alkaloid called veratrin ;

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but, given in small doses and under careful supervision, some of the preparations yielded by Veratrum are valu- able medicinal agents, their effect being to lower the pulse and the heat of the body. Sabadilla seeds also furnish a drug once in more frequent use than at present. V. album and V. viride are commonly grown in gardens as orna- mental perennials, but their poisonous qualities should be kept in mind, particularly as they bear a considerable re- semblance in foliage to the harmless Gentiana lutea.

VERBENA. The vervain genus gives its name to the natural order (Verbenacex) of which it isa member. The species are herbaceous or somewhat shrubby, erect or procumbent, with opposite or whorled leaves, generally deeply cut. The sessile flowers originate in the axils of bracts, and are aggregated into close spikes. Each flower has a tubular, ribbed calyx, a more or less irregular tubular two-lipped corolla, with two or four (didynamous) stamens springing from the centre of the corolla tube. The anthers are two-celled, with or without a gland-like appendage at the apex. The ovary is entire or four-lobed, and always four-celled, with a single ovule in each cell; the two styles are free at the apex only, being elsewhere undivided. The fruit consists of four hard nuts within the persistent calyx. There are about eighty species known, mostly natives of tropical and subtropical America. V. officinalis, according to Bentham, is also widely dispersed in the temperate and warmer regions of the eastern hemisphere. V. bonariensis occurs in Africa and in Asia, while V. supina is indigenous only in the Mediterranean and Canarian regions. The

vervein or vervain, V. officinalis, a common wild plant on limestone soils in England, was the object of much superstitious veneration on the part of our pagan ancestors, who attributed marvellous properties to it, pro- vided it were gathered in a particular manner and with much complex ceremonial, The plant is now but lightly esteemed, and its medicinal virtues, if it have any, are entirely ignored. The garden verbenas, once so popular for "bedding out," are derivatives from various South- American species, such as V. teucrioides, a native of southern Brazil, and V. chamedrifolia from Uruguay. The range of colours extends from pure white to rose- coloured, carmine, violet, and purple. Striped forms also are cultivated ; but of late years the cultivation of these beautiful flowers has been partially abandoned, owing to the prevalence of some-ill-understood disease, probably of fungous origin, which has debilitated the plants. The lemon-scented verbena of gardens, so much valued for the fragrance of its leaves, was once referred to this genus under the name V. triphylla, subsequently called Aloysza, but now referred by Bentham to the genus Lippia; it differs from Verbena amongst other matters in having two, not four, nuts to the fruit.

VERCELLI, a town of Italy, in the province of Novara, lies 14 miles to the south-west of that town, on the river Sesia (here crossed by a bridge), at its junction with the Canterana. The walls by which Vercelli was formerly surrounded have been demolished, and their place is now occupied by boulevards, from which a fine view of the Alps (especially the Monte Rosa group) is obtained. The streets are for the most part tortuous and narrow ; there is a large market-place (Piazza Cavour) with a statue of Cavour (1861). The cathedral is a large building dating from the 16th century ; its library contains a number of rare ancient MSS., especially the Codex Vercellensis, one of the most important MSS. of the old Latin version of the Gospels, written in the 4th century by Eusebius, bishop of Vercelli. The churches of St Andrew (a Romano- Gothic building dating from 1219-24), St Paul, St Catherine, and St Christopher possess valuable examples of the work of Gaudenzio Ferrari, one of the principal

ornaments of the Vercelli school of painting, which flour- ished in the 15th and 16th centuries, and to which belonged also Giovenoni, Defendente Ferrari, Lanini, and, one may almost add, Bazzi, who was a native of the town. Of the two hospitals of Vercelli one has a museum and bota- nical gardens ; the town also has a lyceum, a gymnasium, a technical school, and a seminary. The leading industry is silk-spinning; and there is an active trade in the products of the surrounding district (silk, hemp, flax, and rice). The population in 1881 was 20,165 (commune, 21,169).

Vercellx was originally the chief city of the Libici, and afterwards became a Roman municipium. In the neighbourhood (near Rotto on the Sesia) are the Raudii Campi where Hannibal won his first victory on Italian soil (218 B.c.), and where in 101 3.c. Marius and Catulus routed the Cimbri. From about 1228 till 1872 Vercelli was the seat of a university (see UNIVERSITIES).

VERD ISLANDS, Care. See Cape Verb Isnanps.

VERDUN, a town of France, chef-lieu of an arrondisse- ment in the department of Meuse, an episcopal see, and a first-class fortress, is situated on the Meuse, 174 miles east-north-east of Paris by the railway to Metz, at the junction of the line from Lérouville to Sedan by the Meuse. The enceinte is pierced by four gates; that to the north-east consists of two crenellated towers, and is an interesting specimen of the military architecture of the 15th century. On the left bank of the river is the citadel, on the site of the old abbey of St Vannes (10th century), the remaining buildings of which are used as barracks. On all sides the approaches to the place are guarded by an important line of defensive works, including five redoubts and six forts. From afar can be seen the square towers of the cathedral, the exterior of which still recalls the original building of the 11th century. It was burnt in 1047, and reconsecrated in 1147 by Pope Kugenius III. Some interesting buttresses of the 12th century and a crypt of the 11th are worthy of notice. The three naves of the interior have Gothic vaults, sepa- rated by modern arches. The town-hall (17th century) contains a library (22,500 volumes) and a museum of art, archeology, and natural history. One of the public squares

has a statue of General Chevert, a native of Verdun. The town is famous for its confectionery, sugar-plums, and liqueurs. In 1881 the population was 15,682 (commune 16,053), and in 1886 17,282 (commune 17,755).

Verdun (Verodunwm), an important town at the time of the Roman conquest, was made a part of Belgica Prima. It was de- stroyed during the period of the barbarian invasions, and did not recover till towards the end of the 5th century. Clovis seized the town in 502, and it afterwards belonged to the kingdom of Austrasia. In 848 the famous treaty was signed here by the sons of Louis the Pious (see FRANoR, vol. ix. p. 584, and GrRMANY, vol. x. p. 480). In the 10th century Verdun was definitively conquered by Germany aud put under the temporal authority of its bishops. In the 11th century the burghers of the now free and imperial town began a struggle with their bishops, which ended in their obtaining cer- tain rights in the 12th century. In 1553 Henry II. of France took possession of Verdun, which finally became French by the treaty of Westphalia. In 1792, after some hours of bombardment the citizens opened their gates to the Prussians,—a weakness which the Revolutionary Government punished by the execution of some young girls who had offered flowers to the king of Prussia. In 1870 the Prussians, unable to scize the town by a coup de main,

invested and bombarded it three different times, till j i in the beginning of November. sts

VERGILIUS. See Vira.

VERGNIAUD, Pierre Victurnien (1753-1793) French orator and Revolutionist, was born on 31st May 1753 at Limoges. He was the son of a merchant of that town, who lost the greater part of his means by specula- tion, The boy was early sent to the college of the Jesuits at Limoges, and soon achieved distinction. Turgot was then intendant of Limousin. In his presence young Vergniaud on one occasion recited some verses of his own composition. Turgot was struck with the talent they displayed, and by virtue of his patronage Vergniaud,

having gone to Paris, was admitted to the College of Plessis. It is impossible to read the speeches of Vergniaud without being convinced of the solidity of his education, and in particular of the wide range of his knowledge of the classics, and of his acquaintance—familiar and sympathetic—with ancient philosophy and history.

Duputy, president of the parlement of Bordeaux, with whom Vergniaud became acquainted, conceived the greatest admiration and affection for him and appointed him his secretary. Vergniaud was thereafter called to the bar (1782). The influence of Duputy gained for him the beginnings of a practice; but Vergniaud, though capable of extraordinary efforts, too often relapsed into reverie, and was indisposed for study and sustained exertion, even in a cause which he approved. This weakness appears equally in his political and in his professional life: he would refuse practice if his purse were moderately well filled ; he would sit for weeks in the assembly in listless- ness and silence, while the policy he had shaped was being gradually undermined, and then rise, brilliant as ever, but too late to avert the calamities which he foresaw. In 1789 Vergniaud was elected a member of the general council of the department of the Gironde. Being deeply stirred by the best ideas of the Revolutionary epoch, he found a more congenial sphere for the display of his great powers in his new position. About this period he was charged with the defence of a member of the national guard of Brives, which was accused of provoking disorders in the department of La Corréze. Abandoning all reserve, Vergniaud delivered one of the great orations of his life, depicting the misfortunes of the peasantry in language of such combined dignity, pathos, and power that his fame as an orator spread far and wide.

By the self-denying ordinance of the constituent assembly France was deprived of the whole talent and experience of its members in that new body—the legislative assembly— for which they were declared ineligible ; and the election of new men was proceeded with. Vergniaud was chosen a representative of the Gironde in August 1791, and he forth- with proceeded to Paris. The legislative assembly met on Ist October. For a time, according to his habit, he re- frained from speaking ; but on 25th October he ascended the tribune, and he had not spoken long before the whole assembly felt that a new power had arisen which might control

even the destinies of France. This judgment was re-echoed outside, and he was almost imniediately elected president of the assembly for the usual brief term. Be- tween the outbreak of the Revolution and his election to the legislative assembly the political views of Vergniaud had undergone a decided change. At first he had lauded a constitutional monarchy ; but the flight of Louis filled him with distrust of the sovereign, and his views in favour of a republic were rapidly developed. The sentiments and passions which his eloquence aroused were, however, watch- fully utilized by a more extreme party. It happened thus even with his first assembly speech, on the émigrés. His proposal was mainly that a treble annual contribution should be levied on their property ; but the assembly con- fiscated their goods and decreed their deaths. One great blot on his reputation is that step by step he was led on to palliate violence and crime, to the excesses of which his eyes were only opened by the massacres of September, and which ultimately overwhelmed the party of Girondists which he led. The disgrace to his name is indelible that on 19th March 1792, when the perpetrators of the mas- sacre of Avignon had been introduced to the assembly by Collot d'Herbois, Vergniaud spoke indulgently of their crimes and lent the authority of his voice to their amnesty. In language, sometimes turgid, but nearly always of pure and powerful eloquence, he worked at the theme of the

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VERGNIAUD

émigrés, as it developed into that of the counter-revolution ; and in his occasional appearances in the tribune, as well as in the project of an address to the French people which he presented to the assembly on 27th December 1791, he shook the heart of France, and, especially by his call to arms on 18th January, shaped the policy which culmi- nated in the declaration of war against the king of Bohemia and Hungary on 20th April. This policy in foreign affairs, which he pursued through the winter and spring of 1791-92, he combined with another,—that of fanning the suspicions of the people against the monarchy, which he identified with the counter-revolution, and of forcing on achange of ministry. On 10th

March Vergniaud delivered a powerful oration in which he denounced the intrigues of the court and uttered his famous apostrophe to the Tuileries: "In ancient times fear and terror have often issued from that famous palace, let them re-enter it to-day in the name of the law!" The speech overthrew De Lessart, whose accusation was decreed; and Roland, the nominee of the Girondists, entered the ministry. By the month of June the opposition of Vergniaud (whose voice still commanded the country) to the king rose to fever heat. On 29th May Vergniaud went so far as to support the disbanding of the king's guard. But he appears to have been unaware of the extent of the feelings of animo- sity which he had done much to arouse in the people, probably because he was wholly unconnected with the practices of the party of the Mountain as the instigators of actual violence. This party used Vergniaud, whose lofty and serene ideas they applauded and travestied in action. Then came the riot of the 20th of June and the invasion of the Tuileries. He rushed among the crowd, but was powerless to quell the tumult. _ Continuing for yet a little longer his course of feverous, almost frenzied, opposition to the throne, on 3rd July he electrified France by his bold denunciation of the king, not only as a hypo- crite and a despot, but as a base traitor to the constitution. His speeches breathe the very spirit of the storm, and they were perhaps the greatest single factor in the development of the events of the time. On the 10th of August the Tuileries was stormed, and the royal family took refuge in the assembly. Vergniaud presided. To the request of the king for protection he replied in dignified and respectful language. An extraordinary commission was appointed : Vergniaud wrote and read its recommendations that a national convention be formed, the king be provisionally suspended from office, a governor appointed for his son, and the royal family be consigned to the Luxembourg. Hardly had the great orator attained the object of his aim, the overthrow of Louis as a sovereign, when he became conscious of the awful forces by which he was Surrounded, and his eyes were opened to the infamy of their régime.

The terrible revelation silenced him for a time. But the massacres of September again unchained his eloquence. He denounced the massacres —their inception, their horror, and the future to which they pointed—in language so vivid and powerful that it raised for a time the spirits of the

Girondists, while on the other hand it aroused the fatal Opposition of Robespierre and of his followers within and without the convention.

__ The questions whether Louis XVI. was to be judged, and if so by whom, were the subject of protracted debate in the convention. They were of absorbing interest to Paris, to France, and to Europe ; and upon them the Girondist leader at last, on 31st December 1792, broke silence, delivering one of his greatest orations, probably one of the greatest combinations of sound reasoning, sagacity, and eloquence which has ever been displayed in the annals of French politics. He pronounced in favour of an appeal to

the people. He pictured the consequences of that temper of vengeance which animated the Parisian mob, and was fatally controlling the policy of the convention, and the prostra- tion which would ensue to France after even a successful struggle with a European coalition, which would spring up after the murder of the king. The great effort failed ; and four days afterwards something happened which still further endangered Vergniaud and his whole party. This was the discovery of a note signed by him along with Gaudet and Gensonné and presented to the king two or three weeks before the 10th of August. It contained nothing but sound and patriotic suggestions ; but it was greedily seized upon by the enemies of the Gironde as evidence of treason. On 16th January 1793 the vote began to be taken in the convention upon the punishment of the king. Vergniaud voted early, and voted for death. The action of the great Girondist was and will always remain inscrutable ; but it was followed by a similar verdict from nearly the whole party which he led. On the 17th Ver- gniaud presided at the convention and it fell to him, labouring under the most painful excitement, to announce the fatal result of the voting. Then for many weeks he sank, exhausted, into silence.

When the institution of a revolutionary tribunal was proposed by the Robespierrists, Vergniaud vehemently opposed the project, denouncing the tribunal as a more awful inquisition than that of Venice, and avowing that his party would all die rather than consent to it. Their death by stratagem had already been planned, and on 10th March they had to go

into hiding. On the 13th Vergniaud boldly exposed the conspiracy in the convention, taking occasion to discuss the profanation by the extremists of the name of liberty, and distinguishing between a true and spurious equality, employing with reference to the latter his famous simile of the bed of Procrustes, The antagonism caused by such an attitude had reached a significant point when on 10th April Robespierre himself laid his accusa- tion before the convention. He fastened especially upon Vergniaud's letter to the king and his support of the appeal to the people as a proof that he was a moderate in its then despised sense. Vergniaud made a brilliant extemporaneous reply, and the attack for the moment failed. But now, night after night, Vergniaud and his colleagues found themselves obliged to change their abode, to avoid assassination, a price being even put upon their heads. Still with unfaltering courage they continued their resistance to the dominant faction, till on the 2d of June 1793 things came toa head. The convention was surrounded with an armed mob, who clamoured for the "twenty-two." In the midst of this it was forced to continue its deliberations. The decree of accusation was voted, and the Girondists were proscribed.

Vergniaud was offered a safe retreat. He accepted it only for a day, and then returned to his own dwelling. He was kept under surveillance there for nearly a month, and in the early days of July was imprisoned in La Force. He carried poison with him, but never used it. His tender affection for his relatives abundantly appears from his correspondence, along with his profound attachment to the great ideas of the Revolution, and his noble love of country. On one of the walls of the Carmelite convent, to which for a short time the prisoners were removed, Vergniaud wrote in letters of blood—' Potius mori quam foedari." Early in October the convention brought forward its indictment of the twenty-two Girondists. They were sent for trial to the Revolutionary tribunal, before which they appeared on the 27th of October. The procedure was a travesty of justice. Conscious of innocence, but certain of death, Vergniaud preserved silence, and his example was largely followed by his companions. By the end of

the fourth day of trial it became evident that the demean- our of the prisoners was touching the hearts of the people and making them relent. Then suddenly came the order from the alarmed committee of safety to bring the pro- ceedings to an end. Gensonné demanded to be heard in defence of the prisoners. This was refused ; a verdict of guilty followed, and a sentence of death. Valazé stabbed himself to the heart and fell dead among his comrades.

They were conducted to the conciergerie, which they

entered singing the Marseillaise. Early on the following

morning, 3lst October 1793, they were conveyed to the

scaffold, again singing on the way the national chant, and keeping up the strain till one by one they were guillotined. Vergniaud was executed last. (tT. &)

VERKHNE-URALSK, a district-town of Orenburg, Russia, at the eastern base of the Ural Mountains and on the upper Ural river, 380 miles north-east of Orenburg, is rapidly becoming an important centre of trade with the Bashkirs and Kirghiz in honey, wax, wool, hides, horses, and sheep. The population (10,354 in 1882) has doubled within the last twenty-five years.

VERMIGLI, Prerro Marrire (1500-1562), commonly known as Perer Marryr, a Reforming theologian of the 16th century, came of a good Tuscan family, and was born at Florence on 8th September 1500. In 1516 he entered the house of the Augustinian canons regular at Fiesole, and from 1519 onwards studied at Padua, where he heard lectures on the Aristotelian philosophy and taught himself some Greek. In his twenty-sixth year he was sent out as a preacher, in which capacity he visited various Italian cities,—aniong them Bologna, where a Jewish physician gave him lessons in Hebrew. While prior of St Peter ad Aram in Naples he was introduced to Juan de Valdes's circle, and also became intimate with Bernardino Ochino. At Lucca, whither he had gone to be prior of San Frediano, the "evangelical " tone of his preaching attracted the atten- tion of the Inquisition, and he was compelled to quit Italy (1542).

After short halts at Zurich and Basel he settled in Strasburg as professor of Old Testament exegesis, and in 1547 he removed to England, mainly at Cranmer's in- stance. During the next six years he taught exegesis as a professor in Oxford, conducted public disputations, took part in the adjustment of the Book of Common Prayer, and was generally active in the theological discussions of the time. The accession of Queen Mary in 1558 obliged him to leave England, and he resumed his former duties at Strasburg. From 1555 till his death in the autumn of 1562 he taught in Zurich. He took a prominent part in the abortive conference of Poissy in 1561.

His Oxford lectures on 1st Corinthia i ich i 1551 and those on the Romans in 1558, ee ode meen Sensio doctrine veteris et apostolice de S. Eucharistiz sacramento, and also his Defensio ad R. Smythxi duos libellos de calibatu sacerdo- tum et votis monasticis. The Dialogus de utraque Christi natura dates from 1561 ; and after his death a number of his commentaries on books of the Old Testament were published by his friends. In 1575 Robert Masson, a French preacher in London, published a folio volume of loci communes from Martyr's writings, digested according to the method of Calvin's theological system. This is a work of

great value to students of the Reformation theology. A number

of oe letters by Martyr to prominent theologians are also extant.

— ea ae c,h' Leten der Vater Baprndor der njorvnen Sag ee Hea aa

VERMILION is a brilliant scarlet pigment composed of the sulphide of mercury, HgS. To a small extent it is obtained direct from pure and bright-coloured portions of the native ore CrnNABaR (¢.v.); but it is chiefly an artificial preparation. The process of manufacture, as conducted principally in-Holland, consists in making an intimate mixture of mercury with about one-sixth of its weight of sulphur, and these under the influence of a

gentle heat combine to form the black sulphide of mercury called zthiop's mineral. In successive portions pieces of this compound are thrown into tall earthen pots the lower parts of which are kept at a red heat, and the mass sublimes, depositing a coating of artificial cinnabar on the iron covers and over the upper part of the pots themselves. At the end of the subliming process, the pots are broken, the de- posit of cinnabar is scraped off, ground in a mill, levigated, and when dry it is ready for use as vermilion. The pig- ment is also prepared by the wet method (see Mercury, vol. xvi. p. 34), and it is said that Chinese vermilion owes its superiority to being made in this way. In addition to ' its brilliance, vermilion is a pigment of great intensity and 1 durability, remaining unaffected by acid fumes. Being costly, it is much subject to adulteration ; but the fraudu- | lent additions may easily be detected by volatilization,

which in the case of pure vermilion leaves no residue, i For antimony vermilion, see PicMENTS, vol. xix. p. 87.

VERMONT, one of the New England States of the Plate Vv. American Union, lies between 42° 44' and 45° 0' 43" N, | lat. and 71° 38' and 73° 25' W. long. It is bounded on the N. by the Canadian province of Quebec, on the E. by New Hampshire, from which it is separated by the Con- necticut river, on the S. by Massachusetts, and on the W. by New York, from which it is separated for more than 100 miles by Lake Champlain. The Canadian boundary is 90 miles long; but from this the width of Vermont con- ii tinually grows less towards the southern border, where it is 41 miles. The length is 158 miles. The boundary be- tween Vermont and New York passes through the western side of Lake Champlain, so that three-fourths of the lake and most of its islands belong to the former. The area of the State is 10,212 square miles. |

The surface is greatly diversified, so that the scenery is Physical everywhere attractive and often grand. The Green Moun- features. tains, following a south-westerly trend, divide the State into nearly equal portions. Near Canada there are two ranges, the western being the larger; but near the forty- fourth parallel they unite and continue through western New England as a single range. The highest mountain is Mansfield (4430 feet), and there are five others over 4000 feet and twelve

over 3500 feet. Except upon the loftiest summits, the whole range is densely covered with forests of spruce (Abies nigra), mingled with which are other ever- green and deciduous trees! Many of the streams flowing west unite to form five rivers which enter Lake Champlain. Eleven smaller rivers flow into the Connecticut, which drains about one-third of the area of Vermont. Three streams run north and enter Lake Memphremagog, about one-fifth of which is within the State, and two flow south to join the Hudson river. Mostof the larger streams pass through wide, fertile valleys. Small lakes and ponds are abundant.

The rocks of Vermont are largely metamorphic. Their Geology. age has long been disputed among geologists ; it appears t now, however, to be clearly established that most of them are Palzozoic, although there are a few small areas which he may prove to be Archean. Along Lake Champlain there are many outcrops of unaltered fossiliferous strata, which, from the Lower Cambrian through the Hudson River or Cincinnati formations, lie in a regular conformable series, and upon these rest Quaternary deposits. The strata have a northerly strike and a dip 5°-90° E. They form frequent headlands and cliffs upon the shore of Lake Champlain, where they can be most easily studied. The Cambrian beds, nowhere more than a few miles broad, extend from Canada southwards for about 90 miles, having a total thick- ness of probably not less than 10,000 feet. They consist of limestone, sandstone, shale, slate, quartzite, and conglo-

- *Hence the old French name Verd Mont.*

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Minerals,

VERMONT

merate. The limestone is often arenaceous and dolomitic, sometimes magnesian. 'There are great masses of reddish, silicious limestone, the Red Sandrock of geologists, which, often destitute of fossils, contains here and there species of Ptychoparia, Olenellus, Orthisina, Obolus, Salterella, &c. Included in these beds are thick layers of a beautifully mottled red

and white dolomite, the " Winooski marble," long used for architectural purposes. Similar fossils occur in the "Georgia shales" and elsewhere. Above the Cambrian are smmall patches of Calciferous and Quebec, then larger areas of Chazy, Trenton, Utica, and Hudson River. In the Chazy and Trenton there are extensive quarries upon Isle la Motte, and these formations are finely exhibited in many localities near the lake. The rocks are mostly limestones and shales of a black or dark grey colour, and frequently afford Silurian fossils in great abundance. Within a few miles of Lake Champlain the sedimentary rocks are replaced by schists, quartzites, and other meta- morphic rocks, which continue beyond the mountains to Connecticut river. In the southern part of Vermont there are Lower Helderberg strata, and in the northern, about Lake Memphremagog, Upper Helderberg. These occupy but limited areas and are unconformable with the under- lying rocks. Rev. A. Wing determined the age of the great marble beds of Rutland county to be mostly, if not wholly, of the Chazy epoch. He then extended his obser- vations to the rocks of the Green Mountain mass; and by means of the results thus gained, as well as by his own long-continued independent researches, Prof. J. D. Dana seems to have substantially settled the age of the rocks which compose the mountains as Lower Silurian, and shown that the uplift ending in the range took place after the close of the Hudson River and before the Helderberg period. In the Champlain valley the rocks are traversed by dykes of trap and porphyry, which in some instances have spread over the strata. In the Utica and Hudson River shales there is most beautiful veining: innumerable seams of white calcite, from the finest line to several inches in width, cross and recross the black strata in every direction. In a narrow strip from Canada to Bennington there are Tertiary beds, which are well seen at Brandon. In this formation there are great masses of lignite, containing fossil fruits, also bog iron, manganese, kaolin, and vari- ously and often brightly coloured clays. The entire sur- face of Vermont shows the effects of glaciation. Some of the Silurian ledges are striated and polished most beauti- fully. Drift, boulders, sands, clays occur everywhere ; every stream is bordered by terraces; remains of mam- moth, mastodon, beluga, are found in the drift deposits, as well as Aya, Saxicava, Mytilus, and other marine Mollusca. Sea-beaches over 2000 feet and terraces over 1000 feet above the present sea-level testify to movements of the surface. From the early Cambrian to the late

Quaternary epoch Lake Champlain was an arm of the sea, and for a portion of this time it was connected with the ocean at each end, so that a current flowed from what is now New York Bay to St Lawrence Gulf, converting New England into an island.

Ores of copper, silver, lead, gold, manganese, and iron occur; but, although numerous attempts at mining have been made, very lew have continued or ever been profitable. A large amount of copper Is obtained at the Ely mines, where the ore is chalco-pyrite ; and gold has been found in paying quantity in river gravel, and also in veins, and is still sought in one or two places. The chief mineral wealth of the State isin its quarries. No other State in the Union produces so great a variety or quantity of marble. The annual pro- duction is nearly 2,000,000 cubic feet, and is increasing. Roofing and other slate is obtained in very large quantities and of fine quality. Most excellent granite is quarried in increasing amount, and there are large beds of soap-stone, which are worked. Besides what may be called useful minerals, the State affords a large variety of species, ¢.g., rutile, actinolite, tale, serpentine, which are of interest to the mineralogist. The State has many mineral springs,

some of which have long been places of popular resort. Most of them are sulphurous, some chalybeate, carbonate, or alkaline.

The climate of Vermont, like that of New England generally, is subject to extremes and to sudden changes. In summer the tem- perature varies from 65° to 75° Fahr., sometimes rising to 90°; in winter it ranges from 18° to 50°, sometimes falling to — 10° or rarely —20°. At Burlington the mean annual temperature is 45°. The climate is milder in the Champlain valley than east of the Green Mountains. During the winter there is often much snow, which in the colder parts of the State covers the ground for three months. The average annual rainfall is 33 inches. ‘he air isclear and pure. Notwithstanding the changeable climate, the death-rate is low and the people robust.

Most of the large mammals formerly common,—the panther, wolf, lynx, beaver, otter, moose,—have either disappeared or are very rare ; others,

as the black bear, red deer, mink, and marten, are found only in certain localities. More common are the red fox, raccoon, skunk, porcupine, woodchuck, rabbit, squirrel, and other smaller species. Birds have changed less; but the wild turkey, golden eagle, raven, &c., have become very rare, and the white- headed eagle, large hawks, owls, herons, bitterns, and the like are far from common. The lakes are visited at certain seasons by great numbers of ducks, geese, and other water-fowl. Thrushes, blue- birds, titmicc, sparrows, swallows, warblers, vireos, blackbirds, crows, and woodpeckers are common, as well as many other small birds. In Lake Champlain and the large streams which flow into it are found sturgeon, garpike, muskalonge, bass, pike, pickerel, shad, as well as many smaller species. Trout abound in the moun- tain streams and in some of the ponds. Reptiles and batrachians are not numerous either in species or individuals.

The flora is of great beauty and of unusual botanical interest. Saxtfraga Atizoon, Poa laxa, Arenaria grenlandica, and other alpine plants are found on the higher mountains. Lathyrus mari- timus, Hudsonia tomentosa, and other maritime species recall the time when Lake Champlain was salt. A number of western species find their eastern limit in the Champlain valley, and a greater number of Canadian plants have ended their southward migrations in northern Vermont. Over 1300 species of phanerogams and higher cryptogams grow wild in the State. About 50 of these are found nowhere else in New England, and a few nowhere else in the United States. Ferns grow luxuriantly in many mountain forests and ravines, where 50 species may be collected, including such very rare forms as Asplenium viride, Pellxa gracilis, Woodsia glabella and hyperborea, Aspidium Braunii, &e. Orchids are also abund- ant. Ofthe 108 families found in the State the most numerous are the ranunculus, saxifrage, rose, composite, heath, lily, grass, and sedge. The once prevalent forests are now chiefly confined to the mountains. There are nearly 100 species of trees and large shrubs ; the forests and groves consist chiefly of 11 species of oak, 6 of maple, 17 of willow, 6 of birch, 8 of poplar, 3 of elm, 17 of conifers, besides beech, ash, walnut, butternut, &c. No single species forms so characteristic a feature of the landscape as the American elm, which with great variety of form, always elegant and beautiful, grows singly or in small groups in every

meadow and upon many uplands. The sugar maple is a common and conspicuous tree. (G. H. P.)

The population was estimated in 1777 at 30,000. The first cen- sus taken, in 1791, gave 85,425. The different enumerations from 1800 to 1880 inclusive have been as follows :-—154,465 ; 217,895;

235,966 ; 280,652 ; 291,948 ; 814,120 ; 315,098 ; 330,551; 332,286.

The very slight gain in the decades succeeding 1850 is accounted for by the large emigration from Vermont to the western portions of the country. Of the total population in 1880 291,327 were natives and 40,959 foreign-born. Of the latter class British America furnished the largest contingent, 24,620; Ireland 11,657 ; other parts of Great Britain 3773. The number of coloured was 1057; the excess of males over females 1488. The number gathered in towns of from 4000 to 12,000 inhabitants was 37,800. The largest towns are Rutland, 12,149 (in 1886 two new towns were formed from it); Burlington, 11,365; St Albans, 7193 ; Benning- ton, 6833; Brattleboro, 5880; St Johnsbury, 5800. Montpelier, the capital, has 3219. The average density of population is 36°4 per square mile. The insane numbered 1015 ; idiotic, 803 ; blind, 486 ; paupers, 1564; inmates of prisons and reformatories, 261. The births in 1885 were 6592, or 22°1 per 1000 of population, and the deaths 5858 (average age as reported, 41°95 years ; percentage of deaths to population, 1°61). The number of divorces in 1860 was 94, one to every 23 marriages ; in 1880 the number was 129 (one to 20 marriages); and in 1885 it was 94 (one to 28°7 marriages).

Agriculture is the chief occupation of the State.

Climate.

Fauna.

Flora.

Popula- tion.

The 35,522 Agricul-

farms make up a total of 4,882,588 acres, of which 3,286,461 are im- ture

proved land. The western portion of the State contains the finest tracts of arable land ; the climate as well as the soil of the Champlain valley is especially adapted to fruit-raising, the surface of the lake being but 90 feet above sea-level. The average size of farms in Vermont is 137 acres; the total estimated value of the farms in 1880 was $109,346,010, and of the total products in 1879 $22,082,656. Subjoined are the figures relating to the leading crops :—wheat,

Live Stock.

Fisheries,

Manu- factures,

Com- merce,

Rail-

ways.

Finance.

Religion.

Educa- tion.

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337,257 bushels, averaging 16°28 bushels per acre; oats, 3,742,282 bushels, averaging 37°6 bushels per acre; Indian corn, 2,014,271 ; potatoes, 4,438,172 bushels ; hay, 1,051,183 tons. The wool clip was 2,551,113 Ib ; and there were 217,033 cows, producing 25,245,826 Tb of butter (12,137,980 Ib in 1850) and 6,121,130 ib of cheese (8,720,834 in 1850). The value of orchard products amounted to $640,942. Of maple sugar Vermont produces more than any other State,—in 1880 11,261,077 tb, or 30°8 per cent. of the whole pro- duction of the United States, besides 128,091 gallons of molasses.

In 1880 the State possessed 75,215 horses, 288 mules and asses, 18, 868 working oxen and 167,204 other cattle (exclusive of milch cows), 489,870 sheep, and 76,384 pigs. Much attention is given to the raising of improved stock. The rearing of fine breeds of sheep for exportation is a lucrative business. :

Lake Champlain abounds in fish of various kinds. Great pains have been taken of late years to stock the numerous ponds and streams of the State with salmon, trout, carp, and bass. Both fish and game are protected by stringent laws, and to some extent by special police supervision. :

In 1880 there were 2874 manufacturing and mechanical establish- ments, the average number of operatives 17,540, and the value pro- duced in 1879 was $31,354,366. Eight firms manufactured cotton, 44 woollen goods, 227 flour and grist-mill products, 56 furniture, 77 leather, 95 tin-ware, copper-ware, &c., 35 agricultural tools, and 688 lumber. The State rates as nineteenth in value ($3,258,816) of lumber products, while Burlington ranks third in importance among the lumber markets of the United States. Eighteen marble quarries produced a value of $1,340,050; there are also granite and slate quarries,—61 quarries in all, with a total production in 1879 of $1,752,333.

Burlington is the only port of entry. The State has 9 steam vessels aggregating 2880 tons, 12 sailing vessels, and 14 unrigged vessels, the total tonnage being 4594. The imports for the year ending 31st December 1887 were $5,959,813 and the exports $1,483,564 ; the value of the pine, spruce, and hemlock lumber im- ported was $1,084,599. Most of this foreign trade is carried on with Canada.

Railroad construction was begun in 1846, and by December 1849 two lines were completed from the Connecticut river to Burlington. In 1853 the working mileage had risen to 493 miles, and in 1886 it was 946 miles, mainly of trunk lines. A State board of three commissioners, appointed by the governor and senate, exercises general supervision.

Bills of credit were issued as early as 1781, and were all faithfully redeemed, The first State bank was chartered in 1806, but closed an unsuccessful career in 1814. In 1818 banks were established at Windsor

and Burlington. In 1841 there were 17 incorporated banking institutions, with a capital of $1,735,000. In October 1887 there were 49 national banks, with an aggregate capital of $7,566,000, a surplus fund of $1,571,864, and $668,329 undivided profits. The circulation was $3,478,100, secured by bonds to the amount of $3,891,000. The loans and discounts amounted to $12,879,765, and the individual deposits to $6,627,090. In 1860 there were 12 institutions for savings, with deposits to the amount of $1,111,532. In June 1887 there were 28 savings banks and trust companies, with $15,587,051 to the credit of 53,810 depositors, and a surplus of $776,113. Deposits pay a state tax of xo percent. The State proper has no debt.

The Congregationalists have 197 churches, members, 22,035 pupils in Sunday schools, and 13,748 families belonging to the congregations. The Baptists have 105 churches 111 ministers, 8623 members, 8922 pupils in Sunday schools. The Methodists have 192 churches, 161 ministers, 16,067 members 18,830 children in Sunday schools. The Episcopalians report 36 ministers in charge of 52 parishes, with 3926 communicants ; num- ber of families, 1789. The Free Baptists and Christians together have 60 churches and 4000 members; the Adventists 35 churches with 1750 members. The Roman Catholics have 39 priests in chaser 79 churches and number about 25,000.

ands were set apart for the support of schools by the propri

of townships as early as 1761. Te pind pigpeIOn es os dates from 1782. 'The origina] educational system of the State contemplated primary schools in every township, a grammar or high school in each county, and one university, Towns were authorized to subdivide into districts of convenient size, each with power to choose its own officers, levy taxes, and maintain a school

In 1870 the towns were authorized' to substitute the town for the district system, but in 1886 only one in nine had made the exchange

In 1886 there were 2557 public schools of all grades, with 71,667 pupils, besides 7247 in private schools. In 1880 the number of persons above ten years unable to read was 12,993, or 4:9 per cent.

the population between 5 and 20 being 99,463. The total revenue for school purposes in 1886 was $621,370. This revenue is derived partly from funds held by the State, but chiefly from town and district taxes. Facilities for advanced instruction are offered by 39 public high schools and 25 incorporated academies, The State has 3 normal schools, founded in 1866, Since 1874 State supervision

186 ministers, 20,271

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is exercised through a superintendent elected by the general assem- bly. The State university at Burlington, chartered in 1791, was inaugurated in 1800 ; it provides instruction in arts, engineering, chemistry, agriculture, and medicine, with a teaching staff of 15 in the academic and 26 in the medical faculty ; in 1887 there were 189 students in medicine, 148 in arts and sciences, and in all depart- ments 487. The library contains 35,300 volumes. Middlebury College (Congregational), chartered in 1800, has a teaching staff of 9 with 63 students, and a library of 16,000 vols. Norwich univer- sity (Episcopalian) at Northfield is organized as a military school ; there are 10 instructors and 56 students. The State library contains 18,600 vols., the free public library of Burlington 18,000 vols., that of St Johnsbury 12,000, and that of Lunenburg (free but not public) 14,000. In all 75 libraries were reported in 1880, 42 having over 1000 vols. each.

The governor and chief executive officers are elected by direct Adminis. vote of the male citizens twenty-one years old and upwards who tration.

have resided within the State for one whole year preceding the election. The general assembly, or legislative body, is composed of a senate of 30 members apportioned among the 14 counties accord- ing to population, and a house of representatives consisting of one member from each organized township (244). The sessions of the legislature have been biennial since 1870. The State election occurs in September in the even years. The judiciary is elective through- out, the chief justice and 6 assistant justices of the supreme court being chosen by the senate and

house in joint assembly. The term of service is usually a long one, by virtue of repeated re-elcctions, The assistant judges of county courts are chosen by the freemen of the counties, and justices of the peace by the several towns The county courts hold two terms annually, a justice of the supreme court presiding. A general session of the supreme court is held at the capital in October or November. Probate courts are held in each county, six of the counties being divided each into two probate districts. The State is represented in the Federal Government by two senators and two representatives, aud has four votes in the electoral college. Since 1852 the policy of the State in regard to intoxicating liquors has been that of prohibition.

History.—Vermont first became known to Europeans in 1609, History.

when Champlain explored the lake since known by his name. During the next century the lake and its borders were a thorough- fare for various military expeditions in the Indian and colonial wars, and several points along the lake were occupied, mainly as military posts, by both French and English ; but the first perma- nent settlement was made in 1724 at Fort Dummer in the limits of Brattleboro. In 1760 therc were not more than 300 inhabitants, scattered along the Connecticut river within 50 miles of the south- ern border. Both New Hampshire and New York claimed juris- diction over the territory under royal grants (see vol. xvii. p. 398). By 1763 New Hampshire had chartered 138 townships west of the Connecticut, and between 1765 and 1776 New York had issued grants of land, covering in all 2,418,700 acres, often embracing the same territory as the New Hampshire charters. The claims of New York were always stoutly, and sometimes forcibly, resisted by the great majority of the settlers. In 1776 the Vermonters sought admission to the provincial Congress, but through the influeuce of New York were refused. In January 1777 they proclaimed their independence, framed a State constitution, and again applied for a place in the confederacy. Congress hesitated as before. In 1780 British generals made overtures to the little republic, but with no result beyond a diplomatic intercourse continued until 1783, so managed by the envoys of Vermont as to gain time and save the State from invasion. In 1782 they knocked at the doors of Con- gress again without avail. By July 1789 New York was willing to waive its

pretensions, and Vermont was admitted as the fourteenth State in March 1791. In May 1775 the "Green Mountain boys" under Ethan Allan and Seth Warner had captured Ticonderoga and Crown Point. The battle of Bennington in August 1777 was won by the combined forces of Vermont and New Hampshire. During the whole struggle the State, though unrecognized, contributed its full share of men and means. In the war of 1812-14 Vermont is credited with 5236 soldiers in regular service, exclusive of 2500 volunteers who were under arms at Plattsburgh in September 1814. In the Civil War of 1861-65 the State furnished more than its due quota of troops, 33,288 men from a total population (1860) of 315,098. The present organized force consists of but one regiment, with one battery, 565 men. The unorganized militia numbered 64,162 men in 1880.

The early history of the State may be found in Hiland Hall's and Thompson's Histories. Important documents are given in Vermont State Papers and in

Collections of the Vermont Historical Society. Its part in the war of 1861-65 is told in Benedict's Vermont in the Civil War. (J. E.G.)

VERNET, the name of three eminent French painters. I. Ciaups Josepa Verner (1714-17 89), who was born at Avignon on 14th August 1714, when only fourteen years of age aided his father, a skilful decorative painter,

in the most important parts of his work. But the panels

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of sedan chairs could not satisfy his ambition and he started for Rome. The sight of the sea at Marseilles and his voyage thence to Civita Vecchia made a deep im- pression on him, and immediately after his arrival he entered the studio of a marine painter, Bernardino Fergioni. Slowly but surely Claude Joseph made his way and attracted notice. With a certain conventionality in de- sign, proper to his day, he allied the results of

constant and honest observation of natural effects of atmosphere, which he rendered with unusual pictorial art. Perhaps no painter of landscapes or sea-pieces has ever made the human figure so completely a part of the scene depicted or so important a factor in his design. 'Others may know better," he said, with just pride, "'how to paint the sky, the earth, the ocean ; no one knows better than I how to paint a picture." For twenty years Vernet lived on in Rome, producing views of seaports, storms, calms, moon- lights, &c., when he was recalled (1753) to Paris, and executed, by royal command, the remarkable series of the seaports of France (Louvre) by which he is best known. On his return he became a member of the academy, but he had previously contributed to the exhibitions of 1746 and following years, and he continued to exhibit, with rare ex- ceptions, down to the date of his death, which took place in his lodgings in the Louvre on 3d December 1789. Amongst the very numerous engravers of his works may be specially cited Le Bas, Cochin, Basan, Duret, Flipart, and Le Veau in France, and in England Vivares.

II. Anrominr CHarLes Horace Verner (1758-1835), commonly called Carxz, the youngest child of the above- named, was born at Bordeaux in 1758, where his father was painting the view from the chateau of La Trompette (Louvre). He showed, at the age of five, an extraordinary passion for drawing horses, but went through the regular academical course as a pupil of Lépicié. Strangely enough, on arriving in Italy after carrying off the great prize (1782) he lost all ambition and interest in his profession, so that his father had to recall him to France to prevent his entering amonastery. In Paris Carle Vernet became himself again and distinguished himself at the exhibition of 1791 by his Triumph of Paulus milius, a work in which he broke with reigning traditions in classical subjects and drew the horse with the forms he had learnt from nature in stables and riding-schools. But the Revolution drew on and Carle Vernet's career for awhile seemed to end in the anguish of his sister's death on the scaffold. When he again began to produce, it was as the man of another era: his drawings of the Italian campaign brought him fresh laurels; his vast canvas, the Battle of Marengo, obtained great success ; and for his Morning of Austerlitz Napoleon bestowed on him the Legion of Honour. His hunting-pieces, races, land- scapes, and work as a lithographer (chiefly under the restoration) had also a great vogue. From Louis XVIII.

he received the order of St Michael. In 1827 he accom- panied his son Horace (see below) to Rome, and died in Paris on his return, 17th November 1835, having pro- duced but little during the last years of his life.

IM. Katie Jean Horace Verner (1789-1863), born in Paris, 30th June 1789, was one of the most characteristic, if not one of the ablest, of the military painters of France. He was just twenty when he exhibited the Taking of an Entrenched Camp—a work which showed no depth of observation, but was distinguished by a good deal of char- acter. His picture of his own studio (the rendezvous of the Liberals under the restoration), in which he represented him- self painting tranquilly, whilst boxing, fencing, drum and horn playing, &c., were going on, in the midst of a medley of visitors, horses, dogs, and models, is one of his best works, and, together with his Defence of the Barrier at Clichy (Louvre), won for him an immense popularity.

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Enjoying equal favour with the court and with the opposi- tion, he was most improperly appointed director of the school of France at Rome, from 1828 to 1835, and thither he carried the atmosphere of racket in which he habitually lived.1 After his return the whole of the Constantine room at Versailles was decorated by him in the short space of three years. This vast work shows Vernet at his best and at his worst: as a pioture it begins and ends nowhere and the composition is all to pieces; but it has good qualities of faithful and exact representation. He died at Paris on 17th January 1863. The twenty works which were exhibited after his death confirmed his reputation for extraordinary facility ; he had tried every sort of subject, showing affinity for all that was anecdotic rather than dramatic, failing most wherever most was demanded of him, and never reaching either beauty of colour or dignity of line. Vernet was in short a brilliant off-hand sketcher of all he saw, as he said himself, "from his window," and even in this work there was a good deal of affectation of the impromptu.

See Lagrange, Joseph Vernet et la Peinture au XVIII. Siécle ;

C. Blane, Hist. de U' Ecole Frangaise; and T. Sylvestre, Peintres Contemporains.

VERNIER, Prerre (c. 1580-1637), inventor of the instrument which bears his name, was born at Ornans (near Besangon) in Burgundy about 1580. He was for a con- siderable time commandant of the castle in his native town. In 1631 he published at Brussels a treatise entitled Con- struction, usage, et propriétés du quadrant nouveau de mathé- matiques, in which the instrument associated with his name is described (see NAVIGATION, vol. xvii. p. 256, and SURVEY- ING, vol, xxii. p. 718). He died at Ornans in 1637.

The instrument invented by Vernier is frequently called a nonius ; but this is incorrect, as the contrivance described by Pedro Nufiez in his work De crepusculis (1542) is a different one. Nuiiez drew on the plane of a quadrant 44 concentric arcs divided respectively into 89,88, . . . 46 equal parts; and, if the alidade did not coincide with one of the divisions on the principal arc, it would fall more or less accurately on a division line of one of the auxiliary arcs, from which the value of the measured angle could be made out. This instrument was, however, very difficult to make, and was but little used. Vernier proposed to attach toa quadrant divided into half degrees a movable sector of a length equal to 31 half degrees, but divided into 30 equal parts, whereby single minutes could be read off by seeing which division line of the "sector" coincided with a division line of the quadrant. This movable arc was in

m+1

other words divided into parts, and the divisions were gradu-

ated in the direction opposite to that of the graduation of the prin- i

n graduations going in the same direction. The idea had been mentioned by Christopher Clavius (1537-1612) in his Opera mathe- matica, 1612 (vol. ii. p. 5 and iii. p. 10), but he did not propose to attach permanently an arc divided in this way to the alidade ; Ls happy application of the principle at all cvents belongs to

ernier.

VERNON, Epwarp (1684-1757), English admiral, was born in Westminster, on 12th November 1684, and is said to have been descended from the ancient family of Vernon, long resident at Hanbury in Staffordshire. His father, James Vernon, secretary of state from 1697 to 1700, is best remembered by three volumes of his letters to the duke of Shrewsbury, which were published in 1841; and his mother was Mary, daughter of Sir John Buck of Lincolnshire. Edward, their second son, was sent to Westminster school, but his heart longed for the roving life of the sea, and his stay in that "seed-plot of learning" was but brief. Outside its walls he studied, with a view to his future profession, such branches of knowledge as geometry, geography, and the construction of military weapons. He entered the navy in 1701 and from that time until 1707 took part in many expeditions in the Mediterranean and the West Indies. He served with Sir George Rooke at the taking of Gibraltar in July 1704 ;

1 See a letter of Mendelssohn's cited by C. Blanc. XXIV. — 22

It is now usual to divide it into i parts, the two

cipal arc.

and on his return to England Queen Anne acknowledged his gallantry with the present of two hundred guineas. He next went to the West Indies as rear-admiral to Sir Charles Wager, a brave seaman, who afterwards rose to the highest position at the admiralty in the Whig ministry of Walpole, and was pitted against Vernon both in the House of Commons and at the polling-booth. In 1715, and again in 1726, Vernon assisted in the naval operations in the Baltic, supporting Sir John Norris in the first enter- prise, and on the latter serving under his old chief, Sir Charles Wager. During the long supremacy of Walpole little opportunity arose for distinction in warfare, and Vernon's energies found relief in politics, At the general election of 1722 he was returned for both Dunwich in Suf- folk and Penryn in Cornwall, but chose the latter constitu- ency. In the succeeding parliament of 1727 he was again chosen member for Penryn ; but he failed to retain his seat after the dissolution in 1734. At this period the English people regarded the Spaniards as their legitimate enemies, and the ill-feeling of the two countries was fanned both in poetry and in prose. The political antagonists of Walpole charged him with pusillanimity to Spain. With Pulteney and most of his associates this battle-ground was selected rather from expediency than from principle; but Vernon represented the natural instincts of the sea-captain, and with the sailor as with the soldier the motto was "No peace with Spain." In debate he spoke often, and fre- quently with effect, but his language always savoured of extravagance. He pledged himself in 1739 to capture Porto Bello with a squadron of but six ships, and the minister whom he had assailed with his invectives sent him, as vice-admiral of the blue and commander of the fleet in the West Indies, to the enterprise with the force which he had himself called sufficient. Vernon weighed

anchor from Spithead on 23d July 1739 and arrived off

Porto Bello on 20th November. Next day the combat began with a bombardment of an outlying fort which protected the mouth of the harbour, and on 22d November the castle and town surrendered with a loss on the English side of only seven men. The joy of the nation knew no bounds. Vernon's birthday was celebrated in 1740 in London with public illuminations, and 130 medals were struck in his honour. In February 1741 in a bye-election at Portsmouth Vernon was again sent to

parliament. At the general election in the following May he was returned for Ipswich, Rochester, and Penryn, and all but succeeded in winning Westminster.! A larger squadron was placed under Vernon's command at the close of 17 40, and with this force he resolved upon attacking Cartagena. After a fierce struggle the castle, which stood at the harbour's entrance, was gained ; but in the attack upon the city the troops and sailors failed to act in concert, and, with the numbers of his forces thinned by combat and by disease, the British admiral retired to Jamaica. The incidents of this disastrous attempt are described in Smollett's Roderick fandom, chap. xxxi., &c. A similar enterprise in July 1741 against Santiago in Cuba met with a similar reverse and Vernon attributed the defeat to the divided command of the British forces. He landed at Bristol, 6th January 1743, and on 24th January received the freedom of the city of London. When the country dreaded the march of Prince Charles to London, the fleet in the Downs was placed under the command of Vernon ; but his jealous disposition brooked no interference from the Admiralty, and on 1st January 1746 he struck his flag and handed over the command to another. His next act was to describe his grievances in a couple of angry pamphlets, revealing the communications of his official chiefs, and for this indis- cretion he was struck off the list of flag officers (11th 1 Grego's Parliamentary Elections, London, 1886, pp. 95-106,

April 1746). He continued to represent the borough of Ipswich until his death, but with this proceeding his public services practically ceased. He died suddenly at Nacton in Suffolk, 30th October 1757, and was buried in the church of the village.

Vernon's gallantry was unquestioned ; but his valour not infre- quently degenerated into foolhardiness, and he dwelt more often than is usual with British seamen on the merits of his own exploits. His politics were those of the Tory party, and his differences with the Whigs and with his colleagues in the services led to his pub- lishing several pamphlets on his

political conduct. A Memorial of Admiral Vernon from Contemporary Authorities was printed by W. F. Vernon for private circulation in 1861.

VERONA, an important city of northern Italy, in the province of Venetia, situated (45° 26’ 8” N. lat. and 10° 59’ 4” E. long.) in a loop made by the winding of the Adige (ancient Athess). It lies at the junction of the Adige valley railway and that from Mantua with the Milan, Vicenza, and Venice line, 25 miles north of Mantua and 30 south-south-west of Vicenza.

Modern City.—The basilica of 8. Zeno (an early bishop Church of Verona who became its patron saint), which standsofS.

outside the ancient city, is one of the most interesting 2" |

churches in Italy, but has been recently much injured by “restoration.” The church was remodelled in the 12th century, to which period most of the existing structure belongs, including the richly sculptured west front and the open “confessio” or crypt, which occupies the eastern half of the church, raising the choir high above the nave, —a plan adopted in §. Miniato near Florence, the cathe- dral of Parma, at Coire in Switzerland, and elsewhere. This arrangement was probably introduced by the northern invaders of Lombardy. The cloisters of S. Zeno, rebuilt in 1123, are an interesting example of brick and marble construction. Like many other churches in Verona, 8. Zeno is mainly built of mixed brick and stone in alternate bands: four or five courses of fine red brick lie between bands of hard cream-coloured limestone or marble,? form- ing broad stripes of red and white all over the wall. A similarly variegated effect in red and white is produced by building the arches of windows and doors with alternating voussoirs in brick and marble.? The cathedral, consecrated

in 1187 by Pope Urban IIL, stands at the northern ex-Cathe- |

tremity of the ancient city, by the bank of the Adige; dral. it is inferior in size and importance to 8. Zeno, but has

a fine 12th-century west front of equal interest, richly decorated with Lombardic sculpture. The rest of the exterior is built in bands of red and

white, with slightly projecting pilasters along the walls; it has a noble cloister, with two stories of arcading. Its baptistery, re- built early in the 12th century, is a quite separate build- ing, with nave and apse, forming a church dedicated to 8. Giovanni in Fonte. Pope Lucius IIL, who held a council

at Verona in 1184, is buried in the cathedral, under the pavement before the high altar. The Dominican church Church of S. Anastasia is a mine of wealth in early examples of ofS. painting and sculpture, and one of the finest buildings in re Italy of semi-Gothic style. It consists of a nave in six" bays, aisles, transepts, each with two eastern chapels, and

an apse, all vaulted with simple quadripartite brick groin- ing.t It dates from the latter part of the 13th century, and is specially remarkable for its very beautiful and com- plete scheme of coloured decoration, much of which is

2 The neighbourhood of Verona is especially rich in fine limestones and marbles of many different kinds, especially a close-grained cream-coloured marble and a rich mottled red marble, which are largely used, not only in Verona, but also in Venice and other cities of the province. The same quarry produces both kinds, and indeed the same block is sometimes half red and half white. ; ms See Street, Brick and Marble Arch. in Italy, London, 1855, p.

Sq. ; a This type of church was specially adopted by the Dominicans in Ye

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by Sanmichele, contains paintings by various Veronese Other masters. Though not built till after his death, the church churches, of S. Giorgio in Braida, on the other side of the river, was also designed by Sanmichele, and possesses many good pic- tures of the Veronese school. There are

several other fine churches in Verona, some of early date. One of the 14th century is dedicated to Thomas a Becket of Canterbury.

The strongly fortified castle built by the Della Scala Bridges lords in the 14th century stands on the line of the Roman 2nd wall, close by the river. A very picturesque battlemented ©!

Plan of Verona.

On the walls below are many fine frescos, ranging from c. 1300 to the 15th century, including Pisanello's beautiful painting of St George (mentioned below). This church also contains a large number of fine sculptured tombs of the 14th and 15th centuries, with noble effigies and reliefs of saints and sacred subjects. It is mainly built of red brick, with fine nave columns of red and white marble and an elaborate marble pavement inlaid in many different

bridge leads from it to the other shore, sloping down over three arches of different sizes, the largest next to the castle and the smallest at the other end. There are four other bridges across the Adige; one, the graceful Ponte di Pietra, was designed by Fra Giocondo. The 16th-century lines of fortification enclose a very much larger area than the Roman city, forming a great loop to the west, and also including a considerable space on the left bank of the river. In the latter part of the city, on a steep elevation, stands the castle of St Peter, originally founded by Theodoric, mostly rebuilt by Gian Galeazzo Visconti in 1393, and dismantled by the French in 1801. This and the other fortifications of Verona were rebuilt or repaired by the Austrians, but are no longer kept up as military defences. Verona, which is the chief military centre of the Italian province of Venetia, is now being surrounded with a circle of forts far outside the obsolete city walls.

The early palaces of Verona, before its conquest by Palaces,

Venice, were of very noble and simple design, mostly built of fine red brick, with an inner court, surrounded on the ground floor by open arches like a cloister, as, for example, the Palazzo della Ragione, an assize court, begun in the 12th century. The arches, round or more often

pointed in form, were decorated with moulded terra-cotta enrich- ments, and often with alternating voussoirs of marble. The Scaligeri Palace is a fine example, dating from the 14th century, with, in the cortile, an external staircase leading to an upper loggia, above the usual arcade on the ground floor. It has a very lofty campanile, surmounted by a graceful octagonal upper story. This palace is said to have been mainly built by Can Signorio (Della Scala) about 1370. After the conquest by Venice the domestic build- ings of Verona assumed quite a different type. They became feeble copies of Venetian palaces, in which one form of window, with an ogee arch, framed by the dentil moulding is almost always used. The monotony and utter lifelessness of this form of architecture are shown in the

\ patterns. Its general proportions are specially noble. meaningless way in which details, suited only to the Vene-

'hurch ~The church of S. Fermo Maggiore comes next in interest. tian methods of veneering walls with thin marble slabs, y _ With the exception of the crypt, which is older, the exist- | are copied in the solid marblesof Verona. From the skill

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ing edifice was rebuilt in the 14th century. Its plan is very unusual, consisting of a large nave without aisles, the span being between 45 and 50 feet; it also has two shallow transepts and an apsidal east end. The roof, which is especially magnificent, is the finest example of a class which as a rule is only found in Venetia :! the fram- Ing is concealed by coving or barrel-vaulting in wood, the surface of which is divided into small square panels, all painted and gilt, giving a very rich effect. In this case the 14th and 15th century painted decorations are well preserved. Delicate patterns cover all the framework of the panelling and fill the panels themselves ; at two stages, where there is a check in the line of the coving, rows of half-figures of saints are minutely painted on blue or gold grounds, forming a scheme of indescribably splendid de- coration. A simpler roof of the same class exists at S. Zeno ; it is trefoil-shaped in section, with a tie-beam join- ing the cusps. The church of S. Maria in Organo, rebuilt

- *Or in churches built by Venetian architects in Istria and other subject provinces.*

of Fra Giocondo (see below), Verona was for many years one of the chief centres in which the most refined and graceful forms of the early Renaissance were developed. The town-hall, with its light open loggia of semicircular arches on the ground floor, was designed by Fra Giocondo towards the end of the 15th century; its sculptured en- richments of pilasters and friezes are very graceful, though lacking the vigorous life of the earlier medizval sculptured ornamentation. Verona contains a number of handsome, though somewhat uninteresting, palaces designed by San-michele in the 16th century. The finest are those of the Bevilacqua,? Canossa, and Pompei families. The last of these is now the property of the city, and contains a gallery with some good pictures, especially of the Verona, Padua, and Venice schools. As in Venice, many of the 16th-cen-tury palaces in Verona had stuccoed facades, richly deco- rated with large fresco paintings, often by very able painters. One of these, the house of the painter Niccolo

2 The valuable collection of works of art once preserved in the Bevilacqua Palace has long since been dispersed.

Squares.

Popula- tion, in- dustry,

&

Roman remains,

Painting,

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Giolfino, still has its frescos in a good state of preservation, and gives a vivid notion of what must once have been the effect of these gorgeous pictured palaces. The episcopal palace contains the ancient and valuable chapter library, of about 12,000 volumes and over 500 MSS., among them

the palimpsest of the Jnstitutiones of Gaius which Niebuhr discovered. The Piazza delle Erbe (fruit market) and the Piazza dei Signori, both in the oldest part of the city, are very picturesque and beautiful, being surrounded by many fine medizeval buildings. In the former of these a copy of the lion of Venice has recently been erected.

Verona had a population of 67,080 in 1871, which by 1881 had increased to 68,741. In spite of its pleasant and healthy site, Verona is in winter liable to be cold and rainy, like other places which lie along the southern spurs of the Alps. The Adige, a rapid but shallow river, shrinks to an insignificant stream during the summer. Verona possesses some silk, linen, and woollen manufactures, and carries on a considerable trade in these goods and in grain, hides, flax, hemp, marble, drugs, &c. Amongst the public institutions of the place may be mentioned the public library (1802), the agricultural academy (1768), the botanical garden, various good schools and colleges (in- cluding a theological seminary, a lyceum, and gymnasia), and numerous hospitals and charitable organizations.

Roman Remains.—The most conspicuous of the existing Roman remains is the great amphitheatre, a building of the 2d or 3d cen- tury, which in general form closely resembled the Colosseum in Rome. Almost the whole of its external arcades, with three tiers of arches, have now disappeared ; it was partly thrown down by an earthquake in 1184, and subsequently used as a stone-quarry to supply building materials. Many of its blocks are still visible in the walls of various medieval buildings. The interior, with seats for about 20,000 people, has been frequently restored, till none of the old seats remain. Traces also exist of extensive baths and of a Roman theatre, the latter outside the most ancient line of walls, close to the left bank of the river. In 1885 portions of a number of fine mosaic pavements, dating from the 3d century, were discovered extending over a very large area under the cloister and other parts of the cathedral, about 5 feet below the present floor level. A large number of different patterns exist in a good state of preservation, elaborate in style, but, like all late Roman mosaics, rather coarsely executed with large tcsserez. The Museo Lapidario contains a fine collection of Roman and Etruscan inscriptions and sculpture, mostly collected and published by Scipione Maffei in the 18th century.

Artistic Importance.—In many respects the resemblance between Verona and Florence is very striking: in both cases we have a strongly fortified city built in a fertile valley, on the banks of a winding river, with suburbs on higher ground, rising close above the main city. In architectural magnificence and in wealth of sculpture and painting Verona almost rivalled the Tuscan city. and, like it, gave birth to a very large number of artists who dis- tinguished themselves in all branches of the fine arts.

Painting in Verona may be divided into four periods. (i.) The first period is characterized by wall paintings of purely native style closely resembling the early Christian pictures in the catacombs of Rome. Examples dating from the 10th to the 11th century have been discovered hidden by whitewash on the oldest parts of the nave walls of the church of S. Zeno. They are a very interestine survival of the almost classical Roman style of painting, and appear to be quite free from the generally prevalent Byzantine influence. (ii.) The Byzantine period seems to have lasted during the 12th and 13th centuries. (iii.) The Giottesque period begins contemporaneously with Altichiero da Zevio and Giacomo degli Avanzi, whose chief works were executed during the second half of the 14th century These two painters were among the ablest of Giotto's followers and adorned Verona and Padua with a number of very beautiful frescos rich in composition, delicate in colour, and remarkable for their highly finished modelling and detail. (iv.) To the fourth period belong several important painters. Pisanello or Vittore Pisano (g.v.), a very charming painter and the greatest medallist of Italy, was probably a pupil of Altichiero.! Most of his frescos in Verona have perished ; but one of great beauty still exists in a very perfect state in the church of S. Anastasia, high up over the arched open- ing into one of the eastern chapels of the south transept. The Scene represents St George and the Princess after the Conquest of the Dragon, with accessory figures, the sea, a mountainous land-

1 There is every reason to' doubt Vasari's statement that Pisanello was a pupil of Andrea del Castagno,

scape, and an elaborately painted city in the background. The only other existing fresco by Pisanello is an Annunciation in §, Fermo Maggiore. For Pisanello's pupils and other painters of sub- sequent date, see SCHOOLS OF PAINTING, vol. xxi. p. 448. Domenico del Riccio, usually nicknamed Brusasorci (1494-1567), was a pro- lific painter whose works are very numerous in Verona. Paolo Cagliari or Paul VERONESE (q.v.), though a native of Verona, belongs rather to the Venetian school.

Verona is specially rich in early examples of decorative sculpture, Sculp- (i.) The first period is that of northern or Lombardic influence, ture. exemplified in the very interesting series of reliefs which cover the western facades of the church of 8. Zeno and the cathedral, dating from the 12th century. These reliefs represent both sacred sub- jects and scenes of war and hunting, mixed with grotesque monsters, such as specially delighted the rude vigorous nature of the Lom- bards; they are all richly decorative in effect, though strange and unskilful in detail. Part of the western bronze doors? of S. Zeno are especially interesting as being among the earliest important examples in Italy of cast bronze reliefs. They represent scenes from the life of S. Zeno, are rudely modelled, and yet very dramatic and sculpturesque in style. Many of the 12th-century reliefs and sculptured capitals in S. Zeno are signed by the sculptor, but these merely constitute lists of names about whom nothing is known.

(ii.) In the 13th century the sculpture seems to have lost the Lom- bard vigour, without acquiring any qualities of superior grace or refinement. The font in the baptistery near the cathedral is au early example of this. Each side of the octagon is covered with a large relief of a Biblical subject, very dull in style and coarse in execution. The font itself is interesting for its early form, one common in the chief baptisteries of northern Italy: like an island in the centre of the great octagonal tank is a lobed marble recep- tacle, in which the officiating priest stood while he immersed the catechumens. A movable wooden bridge must have been used to enable the priest to cross the water in the surrounding tank. _(iii.) The next period is that of Florentine influence. his is exemplified in the magnificently sculptured tombs of the Della Scala lords, designed with steadily growing splendour, from the simple sarco- phagus of Martino I. down to the elaborate ercction over the tomb of the fratricide Can

Signorio, adorned with statuettes of the virtues, to the possession of which he could lay so little claim.4 The recumbent effigies and decorative details of these tombs are very beautiful, but the smaller figures of angels, saints, and virtues are rather clumsy in proportion. The latest tomb, that of Can Signorio, erected during his lifetime (c. 1870), is signed " Boninus de Campigliono Mediolanensis Dioscesis." This sculptor, though of Milanese origin, belongs really to the school of the Florentine Andrea Pisano. One characteristic of the 14th and 15th centuries in Verona was the custom, also followed in other Lombardic cities, of setting large equestrian statues over the tombs of powerful mili- tary leaders, in some cases above the recumbent effigy of the dead man, as if to represent him in full vigour of life as well as in death, That which crowns the canopy over the tomb of Can | Grande is a very noble, though somewhat quaint, work. (iv.) In i the 15th century the influence of Venice became paramount, though this was really only a further development of the Florentine i manner, Venice itself having been directly influenced in the 14th | century by many able sculptors from Florence. . |

The architecture of Verona, like its sculpture, passed through Architec Lombard, Florentine, and Venetian stages. (i.) The church of S. ture. Zeno and the cathedral, both of which were mainly rebuilt in the 12th century, are very noble examples of the Lombardic style, with few single-light windows, and with the walls decorated externally by series of pilasters and by alternating bands of red and white, in stone or brick. The arches of this period are semicircular and rest on round columns and capitals, richly carved with grotesque figures and foliage. Most of the external ornamentation is usually concentrated on the western front, which often hasa lofty arched porch on marble columns, resting on griffins or lions devouring their prey. (ii.) The Florentine period (c. 1250 to 1400) is repre- sented by the church of S, Anastasia, and by many more or less mutilated palaces, with fine courts surrounded by arcades in one or more stories. The arches are mostly pointed, and in other respects the influence of northern Gothic was morc direct in Verona than in Florence. Solidity of mass and simplicity of detail are among the characteristics of this period. (iii.) The Venetian period (c. 1400 to 1480) was one of little originality or vigour, the build- ings of this date being largely rather dull copies of those at Venice. (iv.) The early Renaissance developed into very

exceptional beauty in Verona, mainly through the genius of Fra Giocondo (1435-1514), eee eee

2 They are frequently stated to be of beaten bronze, but they are really castings, apparently by the cire perdue process.

- *Part of these doors are covered with bronze reliefs of scenes from the Bible, which are of still earlier date, and were probably brought to Verona from the Rhine provinces,*

Jey See an eloquent description by Ruskin, Stones of Venice, iii. p. sq.

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a native of Verona, who was at first a friar in the monastery of §. Maria in Organo. He rose to great celebrity as an architect, and designed many graceful and richly sculptured buildings in Venice, Rome, and even in France ; he used classical forms with great taste and skill, and with much of the freedom of the older medieval architects, and was specially remarkable for his rich and delicate sculptured decorations. The Roman gateway of Gallienus (nien- tioned below) supplied a special form of window, with a circular arch on pilasters, surmounted by a cornice; this was copied by Fra Giocondo, and has been used by countless architects down to the present day without any alteration whatever,1—a remarkable his- tory for a design: it was invented in the 3d century, revived in the 15th, and again copied in the 19th. Another of the leading architects of the next stage of the Renaissance was the Veronese Michele SANMICHELE (g.v.),a great military engineer, and designer of an immense number of magnificent palaces in Verona and other cities of Venetia. His buildings are stately and graceful in pro- portion, but show a tendency towards that dull scholastic classicism which in the hands of Palladio pnt an end to all real life in the art.

History.—Nothing is certainly known of the history of Verona until it became a Roman colony with the title of Augusta, together with the rest of Venetia (Tac., Hist., iii. 8, and Strabo, p. 213). Its fertile surroundings, its central position at the junction of several great roads, and the natural strength of its position, de- fended by a river along two-thirds of its circumference, all com- bined to make Verona one of the richest and most important cities in northern Italy, although its extent within the walls was not large. The existing remains of wall and gates are shown by in- scriptions on them to date from the 3d century ; the ancient fossa still exists as an open canal, so that the old part of the city is wholly surrounded by water. One very handsome gateway inside the Roman city, now called the Porta de' Borsari, was restored in 265 by Gallienus. There are, however, traces of a more ancient circuit wall and gates on the old line. The emperor Constantine, while advancing towards Rome from Gaul, besieged and took Verona (312) ; it was here, too, that Odoacer was defeated (489) by Theodoric the Goth, who built a palace at Verona and frequently resided there. Verona was the birthplace of Catullus.

In the Middle Ages Verona gradually grew in Size and import- ance. In early times it was one of the cliief residences of the Lombard kings ;? and, though, like other cities of northern Italy, it suffered much during the Guelf and Ghibelline struggles, it rose toa foremost position both from the political and the artistic point of view under its rulers of the Scaliger and Della Scala families. The first prominent member of the latter family and founder of his dynasty was Martino I., who ruled over the city from 1260 till his death in 1277. Verona had previously fallen under the power of a less able despot, Ezzelino da Romano, who died in 1259. Alberto della Scala (died in 1301) was succeeded by lis eldest son Bartolomeo, who was confirmed as ruler of Verona by the popular vote, and died in 1804. Alboino, the second son, succeeded his brother, and died in 1311, when the youngest son of Alberto, Can Grande, who since 1308 had been joint- lord of Verona with his brother, succeeded to the undivided power. Can Grande (Francesco della Scala, died in 1829) was the best and most illustrious of his line, and is specially famous as the hospitable patron of DANTE (g.v.). Other princes of this dynasty, which lasted for rather more than a century, were Giovanni (d. 1350), Martino II. (d. 1351), Can Grande II. (d. 1359), and Can Signorio (d. 1375). In 1889 Gian Galeazzo

Visconti, duke of Milan, became by conquest lord of Verona. Soon after his death the city fell by treacherous means into the hands of Francesco II. di Carrara, lord of Padua. In 1404-5, Verona, together with Padua, was finally conquered by Venice, and remained subject to the Venetians till the overthrow of the republic by Napoleon in 1797, who in the same year, after the treaty of Campo Formio, ceded it to the Austrians with the rest of Venetia ; and since that time its political history has been linked to that of Venice.

See the various works by Scipione Maffei (Verona Illustrata, 1728; Museum Veronense, 1749; and La Antica Condizion di Verona, 1719); also Panvinius, Antiquitates Veronx, Padua, 1668; Da Pertico, Descrizione di Verona, 1820; and

for soine of the older buildings Street, Brick and Marble Architecture, London, 1855. (J. H. M.)

_VERONESE, Paoto (1528-1588), the name ordinarily given to Paoto CaLtaRI, or CAaGLiaRt, the latest of the great cycle of painters of the Venetian school, was born in Verona in 1528 according to the best authorities (Zan- ett1 and others), or in 1532 according to Ridolfi. His father, Gabriele Caliari, a sculptor, began to train Paolo to his own profession, The boy, however, showed more propensity to painting, and was therefore transferred to

1 As, for example, in Sir Gilbert Scott's Government offices, White- hall, and many other recent buildings in London.

"~ Verona is the " Bern" of early German legendary history, and of the poems which celebrate the achievements of Charlemagne.

his uncle, the painter Antonio Badile. According to Vasari, he was the pupil of Giovanni Carotto, a painter proficient in architecture and perspective; this statement remains unconfirmed. Paolo, in his early years, applied himself to copying from the engravings of Albert Diirer and the drawings of Parmigiano ; and, having in a singular degree the gifts of

facility, retentiveness, and amenity, he made rapid progress. He did some work in Verona, but found there little outlet for his abilities, the field being pretty well occupied by Ligozzi, Brusasorci, Battista dal Moro, Paolo Farinato, Domenico Riccio, and other artists. Cardinal Ercole Gonzaga took him, when barely past twenty years of age, to Mantua, along with the three last- named painters, to execute in the cathedral a picture of the Temptation of St Anthony; here Caliari was considered to excel his competitors. Returning to Verona, he found himself exposed to some envy and ill-will. Hence he formed an artistic partnership with Battista Zelotti, and they painted together in the territories of Vicenza and Treviso. Finally Paolo went on to Venice. In this city

| his first pictures were executed in 1555 in the sacristy

and church of St Sebastian, an uncle of his being prior of the monastery. The subjects on the vaulting are taken from the history of Esther; and these excited so much admiration that thenceforward Caliari, aged about twenty- eight, ranked almost on a par with Tintoretto, aged about forty-five, or with Titian in his eightieth year, and his life became a series of triumphs. Besides the Esther subjects, these buildings contain his pictures of the Baptism of Christ, the Martyrdom of St Marcus and St Marcellinus, the Martyrdom of St Sebastian, &c. As regards this last-named work, there is a vague tradition that Caliari painted it at a time when he had taken refuge in the monastery, for some reason now unknown. He entered into a com- petition for painting the ceiling of the library of St Mark, and not only obtained the commission but executed it with so much power that his very rivals voted him the golden chain which had been tendered as an honorary distinction. At one time he returned to Verona, and painted the Banquet in the House of Simon the Pharisee, with Jesus and Mary Magdalene, for the refectory of St Mazzaro,—a picture now in Turin. In 1560, however, he was in Venice again, working partly in the St Sebastian buildings and partly in the ducal palace. He visited Rome in 1563, in the suite of Girolamo Grimani, the Venetian ambassador, and acquired enhanced elevation of style by studying the works of Raphael and Michelangelo, and especially the antique. Returning to Venice, he was overwhelmed with commissions, almost transcending the resources even of his own marvellous assiduity, fertility,

and promptitude,— qualities in which no painter perhaps has ever surpassed him. He was compelled to decline an invitation from Philip II. to go to Spain and assist in decorating the Escorial. One of his pictures of this period is the famous Venice, Queen of the Sea, in the ducal palace. He died in Venice on the 20th (or perhaps 19th) of April 1588, and was buried in the church of St Sebastian, a monument being set up to him there by his two sons, Gabriele and Carlo, and his brother, Benedetto, all of them painters. Beyond his magnificent performances as a painter, the known incidents in the life of Paul Veronese are (as will be perceived from the above account) very few. That he was prosperous is certain, and that he was happy is an almost necessary inference from the character of his pictures, on which the joy of living is ineffaceably stamped. He was honoured and loved, being kind, amiable, gener- ous, and an excellent father. His person is well known from the portraits left by himself and others: he was a dark man, rather good-looking than otherwise, somewhat bald in carly middle age, and with nothing to mark an exceptional energy or turn of char- acter. In his works the first quality which strikes one is the palatial

splendour—grand architecture, stately vistas, personages of easy and affable dignity in sumptuous costumes, the crowded assemblies,

the luxury of environment, the air and light, the graceful and abundant poise of action and of limb, the rhythmic movement, the sweet aud lordly variegation of tint. The pictorial inspiration is entirely that of the piercing and comprehensive eye and the magical hand—not of the mind; for Veronese yields none but negative results to the touchstone either of exalted and profound imagina- tion or of searching and constructive common-sense. The humau form and face are given with decorous comeliness, often with beauty. He constantly painted his figures and faces from the life, thns securing range and precision of character ; but of individual apposite expression there is next to none, and of reasoned realistic contact with the professed subject matter—whether in general disposition, in costume and accessory, or in attitude and effort of mind—there is frequently no trace at all. In fact, Paolo Veronese is pre-

eminently a paintcr working pictorially, and in no wise amenable to a literary or rationalizing standard: you can neither exhibit nor vindicate his scenic apparatus by any transcription into words. He enjoys a sight much as Ariosto enjoys a story, and displays it in form and colour with a zest like that of Ariosto for language and verse, As we have already indicated, he was supreme in represent-

ing, without hnddling or confusion, numerous figures in a luminous.

and diffused atmosphere, while in richness of draperies and trans-parency of shadows he surpassed all the other Venetians or Italians. In gifts of this kind Rubens alone could be pitted against him. In the moderation of art combined with its profusion he far excelled Rubens ; for, dazzling as is the first impression of a great work by Veronese, there is in it, in reality, as much of soberness and serenity as of exuberance. By variety and apposition he produces a most brilliant effect of colour ; and yet his hues are seldom bright. He hoards his primary tints and his high lights, like a rich miser who knows how to play the genial host on occasion. A colossal spon- taneity, to which a great result is only a small effort of faculty, is the chief and abiding impression derived from contemplating his works. He very rarely produced small pictures: the spacious was his clement.

Of all Veronese's paintings the one which has obtained the greatest world-wide celebrity is the vast Marriage at Cana, now in the Louvre. It contains about a liundred and twenty figures or heads—those in the foreground being larger than life. ' Several of them are portraits. Among the personages specified (some of them probably without sufficient reason) are the Marquis del Vasto, Queen Eleanor of France, Francis I., Queen Mary of England, Sul- tan Soleyman I., Vittoria Colonna, Charles V., Tiutoretto, Titian, the elder Bassano, Benedetto Caliari, and Paolo Veronese himself (the figure playing the viol). It is impossible to look at this picture without astonishment ; it enlarges one's conception of what pic- torial art means and can do. The only point of view from which it fails is that of the New Testament narrative ; for there is no more relation between the Galilean wedding and Veronese's court- banquet than between a true portrait of Lazarus and a true portrait of Dives. This

stupendous performance was executed for the re- fectory of the monastery of S. Giorgio Maggiore in Venice, the con- tract for it being signed in June 1562 and the picture completed in September 1563. Its price was 324 silver ducats (=£160), along with the artist's living-expenses and a tun of wine. There are five other great banquet-pictures by Caliari, only inferior in scale and excel- lence to this of Cana. One of them is also in the Louvre, a Feast in the House of Simon the Pharisee, painted towards 1570-75 for the refectory of the Servitesin Venice. A different version of the same theme is in the Brera Gallery of Milan. The Feast of Simon the Leper, 1570, was done for the refectory of the monks of St Sebastian, and the Feast of Levi (St Matthew), 1573, now in the Venetian academy, for the refectory of the monks of St John and St Paul. In each instance the price barely excceded the cost of the materials, so different were the conditions under which an artist even of the first celebrity, as Veronese then was, worked in Italy in the 16th century from the conditions prevailing at the present day. The Louvre contains ten other specimens of Veronese notably the Susanna and the Elders, and the Supper at Emmaus. In the London National Gallery are six examples. The most beautiful is St Helena's Vision of the Cross, founded upon an en- graving by Marcantonio after a drawing supposed to be the work of Raphael. Far more famous than this is the Family of Darius at the Feet of Alexander the Great after the Battle of Issus—the captives having mistaken Hephestion for Alexander. It was bought for £13,560, and has even been termed (very unreasonably) the most celebrated of all Veronese's works. The principal figures are portraits of the Pisani family. It is said that Caliari was ac- cidentally detained at the Pisani villa. at Este, and there painted this work, and, on quitting, told the family that he had left behind him an equivalent for his courteous entertainment. Another picture in the National Gallery, Europa and the Bull, is a study for the large painting in the imperial gallery of Vienna, and re- sembles one in the ducal palace of Venice.' The Venetian aca- demy contains fourteen works by Veronese. One of the finest—it is indeed a singular and choice masterpiece—is a comparatively small picture of the Battle of Lepanto, with Christ in heaven

pouring light upon the Christian fleet and darkness on the Turkish. In the Uffizi Gallery of Florence are two specimens of exceptional beauty—the Annunciation and Esther Presenting her- self to Ahasuerus ; for delicacy and charm this latter work yields to nothing that the master produced. In Verona St George and St Julian, in Brescia the Martyrdom of St Afra, and in Padua the Martyrdom of St Justina are works of leading renown. The draw- ings of Veronese are very fine, and he took pleasure at times in engraving on copper.

The brother and sons of Paolo already mentioned, and Battista Zelotti, were his principal assistants and followers. Benedetto Caliari, the brother, who was about ten years younger than Paolo, is reputed to have had a very large share in designing and execut- ing the architectural backgrounds which form so conspicuous a feature in Paolo's compositions. If this is not overstated, it must be allowed that a substantial share in Paolo's fame accrues to Benedetto ; for not only are the backgrounds admirably schemed and limned, but they govern to a large extcnt the invention and distribution of the groups. Of the two sons Carlo (or Carletto), the younger, is the better known. He was born in 1570, and was the favourite of his father, who sent hini to study under Bassano. He produced various noticeable works, and died young in 1596. Gabriele, born in 1568, attended, after Carlo's death, almost en- tirely to commercial affairs; his works in painting are rare. All three were occupied after the death of Paolo in finishing his pictures left uncompleted.

See Ridolfi, Le Meraviglie dell' Arte, &c.; Dal Pozzo, Vite de' Pittori Veronesi, &c.; Zanetti, Della Pittura Veneziana, &c.; and Lanzi. W. M. R

VERONICA,Sz. According to the Bollandists (4th F obo Veronica or Berenice was a pious woman of Jerusalem who, moved with pity as Jesus bore His cross to Golgotha, gave Him her kerchief that He might wipe the drops of agony from His brow. The Lord accepted the offering and after using it handed it back to her, bearing the image of His face miraculously impressed upon it. According to various forms of the legend, Veronica is identified with the niece of Herod the Great, with the woman whom Christ healed of an issue of blood (Mark v. 25 sq.; Matt. ix. 20 sq.), with a

woman who afterwards, along with fifty others, young men and maidens, suffered martyrdom at Antioch, and with the beloved of one Amator, who is described as "famulus S. Virginis Marie et Josephi, et Domini bajulus ac nutricius," who afterwards became an ascetic and died at Roquemadore (Rupes Amatoris) near Bordeaux. Current tradition in the Roman Church has it that Veronica was able to heal Tiberius of a grievous sickness with her napkin, and that the emperor, thus convinced of the divinity of Christ, forth- with sent Pilate into exile. This napkin (sudarium) was in the time of Pope John VII. (705) in the church of S. Maria Maggiore in Rome, but is now in St Peter's, though possession of it is indeed claimed also by Milan and Jaen (Spain). The Bollandist form of the story cannot be traced further back than to about the second quarter of the 15th century; but in a MS. of the 8th century, now in the Vatican, Veronica is said to have painted, or caused to be painted, the portrait of Christ after she had been healed by Him. In the 13th century we find the miraculous picture itself spoken of as 'figura Domini que Veronica dicitur," and this has suggested to archeologists the ques- tion whether the legend of the woman Veronica may not have arisen by confusion out of a totally distinct legend as to a vera icon (eikwv), such as that which, according to Greek tradition, Jesus sent with an autograph letter to Abgarus of Edessa. St Veronica is commemorated on Shrove Tuesday, but her festival is not of obligation.

See Karl Pearson's Die Fronica, ein Beitrag zur Geschichte des Christusbildes in Mittelalter (Strasburg, 1887), which contains a

discussion of the evolution of the story and much interesting matter

wnonE to the hymnological, liturgical, and artistic aspects of the subject.

_VERRES (c. 112-43 B.c.), whose name has been branded with everlasting infamy by the speeches of Cicero, was the bad son of a bad father. The elder Verres was an old hand at Jobbery and bribery, and some of his son's ill-gotten gains found their way into his pocket. He had some sort of connexion with the dictator Sulla, and it was through this probably that he rose to be a senator ; possibly, though

this is very doubtful, he may have belonged to some branch of the Cornelian family, or have been adopted into it. The younger Verres held his first important appointment about 82 B.c. as questor of the consul Carbo in Cisalpine Gaul. This implies that he was then of the democratic party of Marius; but he left it the same year, after having deserted and betrayed Carbo and embezzled the public moneys of which as questor he had the handling. As a reward for his treachery he got out of Sulla a slice of the landed property of some of the proscribed citizens of Beneventum, and Sulla probably screened him in the following year when he was threatened with an action by the treasury officials for his peculations under Carbo. Next year, 80 B.c., he was in Asia on the staff of

Dolabella, governor of Cilicia, where he again acted as.

questor. The governor and his subordinate plundered in concert, till in 78 s.c. Dolabella had to stand his trial at Rome, and was convicted, mainly on the evidence of Verres, who thus secured a pardon for himself. In 74 B.c. he was elected pretor, bribing heavily, it was said, and he had what was termed the city przetorship, which gave him all the powers of an English lord chancellor, with but in- adequate checks on their abuse. Verres, as a creature of Sulla's, in several of his judicial decisions turned them to political ends for the advantage of himself and his party. After his year of pretorship Verres went as governor to Sicily, the richest and most attractive of the Roman pro- vinces, with its treasures of Greek art, its Greek civiliza- tion, and its many noble and beautiful cities. Rome had recognized the claims of Sicily to a kindly and indulgent rule, and the people were for the most part comfortable and contented. But under Verres the island experienced more utter misery and desolation than it had felt amid the horrors of that long and fierce struggle, the First Punic War. The corn-growers, and the revenue collectors or "ublicans," were ruined by exorbitant imposts or by the iniquitous cancelling of contracts; temples and private houses were robbed of their works of art, which to the Sicilian Greek were even dearer than his money; and to all this were added insult and outrage. Men who had the Roman franchise, which was now beginning to be widely diffused, were among the victims of Verres: one was scourged publicly at Messana on an unproved charge. Verres returned to Rome in 70 B.c., with plunder which he boasted would enable

him to live in ease and luxury, even if he had to surrender two-thirds of it to bribe a Roman jury. The prosecution which he antici- pated was commenced the same year by the provincials of Sicily, and was at their request undertaken by Cicero. Verres entrusted his defence to the most eminent of Roman advocates, Hortensius, and he had the sympathy and support of several of the leading Roman nobles. The court before which he was to be tried was composed exclusively of senators, some of whom might be his personal friends. But the presiding judge, the city pretor Acilius Glabrio, was a thoroughly honest man, and his assessors were at least not accessible to bribery. Cicero took care that the evidence should be overwhelming, and he had a host of witnesses in readiness, not only from the il-used towns of Sicily, but from every part of the Greek world. The trial, one of the most memorable in antiquity, began early in the August of 70 B.c., after an unsuccessful attempt by the counsel for Verres to get it adjourned to the following year, when Hortensius would himself be consul and the presiding judge, Metellus, one of his political friends. Cicero opened the case with a comparatively brief speech (Actio Prima in Verrem), following it up with the examination of witnesses and documentary evidence, and convincing Hortensius that his client's cause was hopeless. Before the expiration of the nine days allowed

for the prosecution Verres was on his way to Marseilles ; there he lived in exile to the year 43 3.c., with abundant means of enjoying life in his own way. The story went (Pliny, V. H., xxxiv. 2) that his name was on the pro- scription list of Marcus Antonius, and that in fact he owed his death to the murderer of Cicero.

Verres may not have been quite so black as he is painted by Cicero, on whose speeches we depend entirely for our knowledge of the man, but there can hardly be a doubt that he stood pre-eminent among the worst specimens of Roman provincial governors. It is cruelly unjust to the memory of Warren Hastings to suggest a comparison between him and Verres, though between the two trials, between the charges made, and the general character and circumstances of the proceedings there are points of striking re- semblance. But there is a clearly marked difference. Verres

cared simply for himself; Hastings thought much of the greatness and glory of his country. For one thing indeed we have to thank Verres,—for the detailed description of Sicily and its Greek art treasures which we have in Cicero's famous Verrine orations.

VERROCCHIO, AnpreEa DEL (1435-1488), one of the most distinguished Florentine artists of the 15th century, equally famed as a goldsmith, sculptor, and painter, was born at Florence in 1435. He was the son of Michele di Francesco de' Cioni, and took his name from his master, the goldsmith Giuliano Verrocchi. Except through his works, little is known of his life. As a painter he occupies an important position from the fact that Leonardo da Vinci and Lorenzo di Credi worked for many years in his bottega as pupils and assistants. Only one existing painting can be attributed with absolute certainty to Verrocchio's hand, the celebrated Baptism of Christ, originally painted for the monks of Vallombrosa, and now in the academy of Flor- ence. The figures of Christ and the Baptist are executed with great vigour and refinement of touch, but are rather hard and angular in style. As Vasari says, Verrocchio "ebbe la maniera alquanto dura e crudetta." The two angels are of a much more graceful cast ; the face of one is of especial beauty, and Vasari is probably right in say- ing that this head was painted by the young Leonardo. Other pictures from Verrocchio's bottega probably exist, as, for example, two in the National Gallery of London wrongly attributed to Ant. Pollainolo—Tobias and the Angel (No. 781) and the very lovely Madonna and Angels (No. 296), both very brilliant and jewel-like in colour. One of the angel faces in the latter picture strongly recalls the expres- sion of Leonardo's heads, while the whole scheme of pure glowing colour closely resembles that employed by Di Credi in his graceful but slightly weak pictures of the Madonna and Child. This exquisite painting, one of the gems of the National Gallery, may possibly have been painted from Verrocchio's design by Lorenzo di Credi while he was under the immediate influence of his wonderful fellow-pupil Da Vinci}

In examining Verrocchio's work as a sculptor we are on surer ground. One of his earliest works was the beautiful marble medallion of the Madonna, over the tomb of Leonardo Bruni of Arezzo in the church of Santa Croce at Florence, executed some years after Bruni's death (1443).

In 1472 Verrocchio completed the fine tomb of Giovanni and Piero de' Medici, between the sacristy and the lady chapel of San Lorenzo at Florence. This con- sists of a great porphyry sarcophagus enriclied witli magnificent acanthus foliage in bronze. Above it is a graceful open bronze grill, made like a network of cord- age. In 1474 Verrocchio began the monument to Cardinal Forteguerra at the west end of Pistoia cathedral. The kneeling figure of the cardinal was never completed, and now lies in a room of La Sapienza, but the whole design is shown in what is probably Verrocchio's original clay sketch, now in the South Kensington Museum (see

1 See Crowe and Cavalcaselle, Painting in Italy, London, 1864, ii. p. 400 sq.

fig.). Though this work was designed by Verrocchio, the actual execution of it was entrusted to his assistant, the Florentine Lor- Z —~

enzetto. In 1476 Verrocchio model- led and cast the fine but too real- istic bronze statue of David, now in the Bargello (Flor- ff ence); and in the | following year he | completed one of the reliefs of the magnificent silver jf; altar-frontal of the Florentine baptis- | tery, that repre- | senting the Be- heading of St John. | Verrocchio's other works in the pre- cious metals are now lost, but Va- sari records that he

made many ela- SS _

borate pieces of Clay sketch for the monument of Cardinal plateand jewellery, Forteguerra, showing the kneeling portrait such as morses for of the cardinal, which is not in the actual copes, as well as monument ; a very poor modern figure oc-

i : cupies its place. a series of silver P P

statues of the Apostles for the pope's chapel in the Vatican. Between 1478 and 1483 he was occupied in making the bronze group of the Unbelief of St Thomas, which still stands in one of the external niches of Or San

Michele (Florence). He received 800 florins for these two figures, which are more remarkable for the excellence of their technique than for their sculpturesque beauty. The attitudes are rather rigid, and the faces hard in expression. Verrocchio's chief masterpiece was the colossal bronze equestrian statue of the Venetian general Bartolomeo Colleoni, which stands in the piazza of SS. Giovanni e Paolo at Venice. Verrocchio received the order for this statue in 1479, but had only completed gr

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the model when he died in 1488, In #! Ne cs A, | NY anes Cat spite of his request that the casting TNS " ae AW as 4 Bare should be entrusted to his pupil Lorenzo ; Bran rT] E | gel | \x? di Credi, the work was given to Ales- see A a nt

sandro Leopardi by the Venetian senate, P»_ and the statue was gilt and unveiled in |: 1496.1 There appears to be no doubt that the model was completed by Ver- |# rocchio himself, and that nothing more than its reproduction in bronze should be attributed to the much feebler hand oS of Leopardi, who, however, has set his |# own name alone on the belly-band of the js horse—ALEXANDER – LEOPARDVS V. | F. OPUS. This is perhaps the noblest equestrian statue in the world, being in some respects superior to the antique bronze of Marcus Aurelius in Rome and to that of Gattamelata at Padua by Donatello. The horse is designed with wonderful nobility and spirit, and the easy pose of the great general, combining perfect balance with absolute ease and security in the saddle, is a marvel of sculpturesque ability.2 Most remarkable skill is shown by the way in which Verrocchio has exaggerated

1 See Gay, Cart. Inéd., i. p. 367. ? See ScULPTURE, vol. xxi. p. 568, fig. 18.

the strongly marked features of the general, so that nothing of its powerful effect is lost by the lofty position of the head.? According to Vasari, Verrocchio was one of the first sculptors who made a practical use of casts from living and dead subjects. He is said also to have produced

plastic works in terra-cotta, wood, and in wax decorated with colour. Asa sculptor his chief pupil was Francesco di Simone, the son of that Simone whom Vasari wrongly calls a brother of Donatello. Another pupil was Agnolo di Polo (Paolo), who worked chiefly in terra-cotta.

Verrocchio died in Venice in 1488, and was buried in the church of St Ambrogio in Florence. (J. H. M.)

VERSAILLES, a town of France, chef-lieu of the department of Seine-et-Oise and an episcopal see, lies 11 miles west-south-west of Paris, with which it is con- nected by railways on both banks of the Seine and by a tramway. The town owes its existence to the palace (460 feet above the sea) built by Louis XIV. The fresh healthy air and the nearness of the town to Paris have attracted many residents, and the interest attaching to the place draws crowds of visitors. The population in 188] was 48,012; in 1886 it was 49,514 (commune 49,852), including about 10,000 military.

The three avenues of St Cloud, Paris, and Sceaux converge in'

the Place d'Armes. Between them stand the former stables of the palace, now occupied by the artillery and enginecrs. To the south lies the quarter of Satory, the oldest part of Versailles, with the cathedral of St Louis, and to the north the new quarter, with the church of Notre Dame. To the west a gilded iron gate and a stone balustrade shut off the great court of the palace from the Place d'Armes, On either side are allegorical groups, besides statues of the statesmen Suger, Sully, Richelieu, and Colbert, the soldiers Duguesclin, Bayard, Turennc, and Condé, the sailors Duquesne, Tourville, Duguay-Trouin, and Suffren, and the marshals Jourdan, Masséna, Lannes, and Mortier. At the highest point of the court there is an equestrian statue in bronze of Louis XIV., and to the right and left of this stretch the long wings of the palace, while behind it stand the central buildings one behind the other as far as the Marble Court. Here all the lines of construction meet, and here were the rooms of Lonis XIV. To the north the Chapel Court and to the south the Princes Court, with vaulted passages leading to the gardens, separate the side from the central buildings. On the latter is the inscription " A toutes les gloires de la France," which Louis Philippe justified by forming a collec- tion of five thousand works of art (valued at £1,000,000), com- memorating the great

events and persons of French history. The palace chapel (1696-1710), the roof of which can be seen from afar rising above the rest of the building, was the last work of Mansard.

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Y z Plan of Versailles,

Opposite the altar is the king’s gallery, which communicates with the rooms on the first floor of the palace. The ground-fioor of the north wing on the garden side contains eleven halls of historical pictures from Clovis to Louis XIV., and on the side of the interior courts a gallery of tombs, statues, busts of kings and celebrities of France for the same period. The Halls of the Crusades open off a el ee

? See Selvatico, Arch. e Scult. in Venezia, 1847; Cicognara, Fab- he piu Cospicue di Venezia, 1858; and Milanesi’s ed. of Vasari, iit Dp. sq.

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this gallery, and are decorated with the arms of crusaders, kings,

rinces, lords, and knights, and with those of the grand-masters and knights of the military religious orders. On the first floor of the north wing on the garden side are ten halls of pictures com- memorating historical events from 1795 to 1855; on the court side is the gallery of sculpture which contains the Joan of Arc of the Princess Marie of Orleans; aud there are seven halls chiefly devoted to French campaigns and generals in Africa, Italy, the Crimea, and Mexico, with some famous

war pictures by Horace Vernet. The second story has a portrait gallery. In the north wing is also the theatre built under Louis XV. by Gabriel, which was first used on the 16th of May 1770 on the marriage of the dauphin (afterwards Louis XVI.) and Marie Antoinette. Here, on 2d October 1789, the celebrated banquet was given to the Gardes du Corps, the toasts at which provoked the riots that drove the royal family from Versailles; and here the national assembly met from 10th March 1871 till the proclamation of the constitution in 1875, and the senate from 8th March 1876 till the return of the two chambers to Paris in 1879. The central build- ings of the palace project into the garden. On the ground floor are the halls of celebrated warriors (once the anteroom of Madame de Pompadour), marshals, constables, and admirals. The Great Dauphin (son of Louis XIV.), the duke and duchess of Berri, the dauphin (son of Louis XV.), Madame de Montespan, Madame de Pompadour, and the daughtcrs of Louis XV. all lived in this part of the palace. The gallery of Louis XIII., decorated with his- torical pictures of his and Louis XIV.'s time, leads to the halls surrounding the Marble Court. One of these contains many plans of battles, and at its door Louis XV. was wounded by Damiens in 1757. The lobbies of the ground floor are full of busts, statues, and tombs of kings and celebrated men. The famous state rooms are on the first floor. On the garden side, facing the north, are a series of seven halls,—among them that of Hercules, till 1710 the upper half of the old chapel, where the dukes of Chartres, Maine, and Burgundy were married, and Bossuet, Massillon, and Bourda- loue preached ; the Hall of Mercury, where the coffin of Louis XIV. stood for eight days after his death ; and the Hall of Apollo, or throne room. To the front of the palace, facing the west, are the Galleries of War and Peace, with allegorical pictures, and the Glass Gallery, built by Mansard in 1678 (240 feet long, 34 wide, and 48 high), having 34 arches, 17 of which are filled with windows looking on the gardens and 17 with large mirrors. The gallery is overloaded with ornament, and the pictures by Lebrun, the trophies and figures of children by Coysevox, and the inscrip- tions attributed to Boileau and Racine all glorify Louis XIV. This gallery was used by him as a throne room on state occasions. Here the king of Prussia was proclaimed emperor of Germany on 16th January 1871. Connected with the Gallery of Peace is the queen's room, occupied successively by Marie Thérese, Marie Lec- zinska, and Marie Antoinette, where the duchess of

Angouléme was born, the duchess of Burgundy died, and Marie Antoinette was almost assassinated on 6th October 1789. The Coronation Hall is so called from David's picture of Napoleon's coronation, which is regarded as the artist's masterpiece. This hall opens on the marble, or queen's, staircase. Behind the Glass Gallery on the side of the court are the rooms of Louis XIV. The Céil de Beuf, named from its oval window, was the anteroom where thie courtiers waited till the king rose. In it is a picture representing Louis XIV. and his family as Olympian deities ; and it leads to the bedroom in which Louis XIV. died, after using it from 1701, and which Louis XV. occupied from 1722 to 1738. To the north of the Marble Court are the "petits appartements" of Louis XV. and to the south those of Marie Antoinette. Among the former is the Porcelain Gallery, where every year under Louis XVI. the best work made at Sévres was displayed. On the second floor of the buildings surrounding the Stags Court Madame du Barry lived, and Lonis XVI. afterwards worked at lockmaking. Marie Thérése and Marie Leczinska had previously used the "petits apparte- ments" of Marie Antoinette, one of the rooms of which is orna- mented with woodwork of her time. In this part of the palace Madame de Maintenon and the duke of Burgundy had rooms, those of the latter being afterwards occupied by Cardinal de Fleury and the duke of Penthiévre. In the south wing of the palace, on the ground floor, are the Imperial Galleries (the first rooms of which were used by the duke and duchess of Bourbon under Louis XIV.) and the rooms occupied by the president of congress when the two legislative bodies meet together at Versailles. A sculpture gallery contains busts of celebrated scholars, artists, generals, and public men from the time of Louis XVI. onwards. In the south Wing is also the room where the chamber of deputies met from 1876 till 1879, and where the congress has since sat to revise the constitution of 1875 and to elect the president of the republic. The first floor is almost entirely occupied by the Battle Gallery (394 feet long and 43 wide), opened in 1836 on the site of rooms used by Monsieur the brother of Louis XIV. and the duke and duchess of Chartres. It is lighted from above, and the walls are hung With pictures of French victories. In the window openings are the

names of soldiers killed while fighting for France, with the names of the battles in which they fell, and there are more than eighty busts of princes, admirals, constables, marshals, and celebrated warriors who met a similar death. Another room is given up to the events of 1830 and the accession of Louis Philippe, and a gal- lery contains the statues and busts of kings and celebrities from Philip VI. to Louis XVI. In the rooms of the second story are portraits (mostly modern), sea-pieces, pictures of royal residences, and some historical pictures of the time of Louis Philippe.

The gardens of Versailles were planned by Le Notre. The best view is obtained from a balcony of the Glass Gallery. The ground falls away on every side from a terrace adorned with ornamental basins, statues, and bronze groups. Westwards from the palace extends a broad avenue, planted with large trees, and having along its centre the grass of the "Tapis Vert"; it is continued by the Grand Canal, 200 feet wide and 1 mile long. On the south two splendid staircases of 103 steps, 66 feet wide, lead past the Orangery to the Swiss Lake, 1312 feet long and 460 wide, beyond which is the wood of Satory. On the north an avenue, with twenty-two groups of three children, each group holding a marble basin, from which a jet of water rises, slopes gently down to the Basin of Neptune, remarkable for its fine sculptures and abundant water. The Orangery (built in 1685 by Mansard) is the finest piece of architecture at Versailles; the central gallery is 508 feet long and 42 wide, and each of the side gallcries is 375 feet long. There are twelve hundred orange-trees, one of which is said to be 465 years old, and three hundred other kinds of trees. The alleys of the parks are ornamented with statues, vases, and regularly-cut yews, and bordered by hedges surrounding the shrubberies. Be- tween the central terrace and the Tapis Vert is the Basin of Latona or the Frogs, with a white marble group of Latona with Apollo and Diana. Beyond the Tapis Vert is the large Basin of Apollo, who is represented in his chariot drawn by four horses ; there are three jets of water, one 60, the others 50 feet in height. The Grand Canal is still used for nautical displays ; under Louis XIV. it was covered with Venetian gondolas and other boats, and the evening entertainments usually ended with a display of fireworks. Around the Tapis Vert are numerous groves, the most remarkable being the Ballroom or Rockery, with a waterfall; the Queen's Shrubbery, the scene of the intrigue of the diamond necklace; that of the Colonnade,

with thirty-two marble columns and a group of Pluto carrying off Proserpine, by Girardon ; the King's Shrubbery, laid out in the English style by Louis Philippe ; the beautiful Grove of Apollo, with a group of that god and the nymphs, by Girardon ; and the Basin of Enceladus, with a jet of water 75 feet high. Among the chief attractions of Versailles are the fountains and waterworks made by Louis XIV. in imitation of those he had seen at Fouquet's chateau of Vaux. Owing to the scarcity of water at Versailles, the works at MARLY-LE-Rot (q.v.) were constructed in order to bring water from the Seine ; but part of the supply thus obtained was diverted to the newly-erected chateau of Marly. Vast sums of money were spent and many lives lost in an attempt to bring water from the Eure, but the work was stopped by the war of 1688. At last the waters of the plateau between Versailles and Rambouillet were collected and led by channels (total length 98 miles) to the gardens, the soil of which covers innumerable pipes, vaults, and aqueducts. The total volume of water annually brought to Versailles is about 175,000,000 cubic feet, of which two-fifths supply the town and the rest the park.

Beyond the present park, but within that of Louis XIV., are the two Trianons. The Grand Trianon was originally crected as a retreat for Louis XIV. in 1670, but in 1687 Mansard built a new palace on its site. Louis XV., after establishing a botanic garden, made Gabriel build in 1766 the small pavilion of the Petit Trianon, where the machinery is still shown by which his supper-table came up through the floor. It was a favourite residence of Marie Antoinette, who had a garden laid out in the English style, and lived an imaginary peasant-life. The Grand Trianon isa one-storied building with two wings, and has been occupied by Monsieur (Louis XIV.'s brother), by the Great Dauphin, the duke of Burgundy, the duchess of Orleans, Napoleon I., and Louis Philippe and his court. The duke and duchess of Orleaus lived in the Petit Trianon. The gardens of the Grand Trianon are in the same style as those of Versailles, and there is a museum with a curious collection of state carriages, old harness, &c.

Apart from the palace, there are no buildings of interest in Versailles, the church of Notre Dame, built by Mansard, the cathedral of St Louis, built by his grandson, the Protestant church, and the English chapel being in no way remarkable. The cele- brated tennis-court is now used as a

museum. The large and sumptuous palace of the prefecture was built during the second empire, and was a residence of the president of the republic from 1871 to 1879. The library consists of 60,000 volumes; and the military hospital formerly accommodated 2000 people in the service of the palace. There are a statue of General Hoche and one of Abbé de |' Epée in the town. A school of horticulture was founded in 1874, attached to an excellent garden, near the Swiss Lake.

XXIV. — 23

La- marck's and Cuvier's classifi- cations,

Essential vertebree.

struc- tures of Verte- brates.

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Versailles is the seat of a school of artillery and of a school for non-commissioned officers of the artillery and engineers. y History.—Louis XIII. often hunted in the woods of Versailles, and built a small pavilion at the corner of what is now the Rue de La Pompe and the avenue of St Cloud. In 1627 he entrusted Lemercier with the plan of a chateau, and in 1632 bought the land from Frangois de Gondi, first archbishop of Paris, for £2640.. In 1661 Levau made some additions, and in 1682 Louis XIV. took up his residence at Versailles, and gave Mansard orders to erect the great palace in which the original buildings disappeared. Fabulous sums were spent on the palace, gardens, and works of art, the accounts for which were destroyed by the king. Till his time the town was represented by a few houses to the south of the present Place d'Armes ; but land was given to the lords of the court and new houses sprang up, chiefly in the north quarter. Under Louis XY. the parish of St Louis was formed to the south for the increas- ing population, and new streets were built to the north on the meadows of Clagny, where in 1674 Mansard had built at Louis XIYV.'s orders a chateau for Madame de Montespan, which was now pulled down. Under Louis XVI. the town extended to the east and received a niunicipality ; in 1802 it gave its name to a bishopric. In 1783 the peace by which England recognized the independence of the United

States was signed at Versailles. The states-general met here on 5th May 1789, and on 20th June took the solemn oath by which they bound themselves never to separate

VERTEBRATA

ERTEBRATA, the name of a great branch or phylum V of the Animal Kingdom which comprises those ani- mals having bony "vertebre", or pieces of bone jointed so as to forma spinal column. The first recognition of the group is due to Lamarck (1797), who united the four highest classes of Linnzeus's system as "animaux 2 verté- bres," whilst distinguishing the rest of the animal world as "animaux sans vertébres." The same union of the four Linnean classes had been previously made by Batsch in 1788, who, however, proposed for the great division thus constituted the name " Knochenthiere." The significance of Lamarck's classification was materially altered, and the foundation laid of our present attempts to represent by our classifications the pedigree of the animal kingdom, when Cuvier propounded his doctrine of "types," and re- cognized the Vertebrata as one of four great types or plans of structure to be distinguished in the animal world (z).!

The Vertebrata of Lamarck and Cuvier included beasts, birds, reptiles, and fishes, and until recently the group was considered as one of the most sharply limited in the animal kingdom. The progress of anatomical studies very soon rendered it clear that all Vertebrata did not possess bony vertebre ; for, besides the commoner sharks and skates, with their purely cartilaginous skeletons, natu- ralists became acquainted with the structure of fishes, such as the sturgeons and the lampreys, which possess no verte- bree at all, but merely a continuous elastic rod (the noto- chord) in the place of the jointed spinal column. The muscles and their skeletal septa were seen in these fishes to be arranged ina series of segments attached to the sides of this continuous rod ; and hence the structural character of bony vertebree, as distinguishing the Vertebrata, gave place to the character of segmental arrangement of the muscles of the body-wall, such muscles being supported by a skeletal axis which might be itself unsegmented (notochord), or replaced by segmental cartilaginous or bony

The studies of embryologists furnished a sound foundation for this conception by demonstrating that in the embryos of Vertebrata with true vertebre these struc- tures are preceded by an unsegmented continuous noto- chord, The inquiry into the structural characteristics of Vertebrata led further to the recognition of several addi. tional points of structure, the combination of which was present only in the group which had been recognized by Lamarck on superficial grounds. It was found that all 1 These numerals refer to the bibliography at the end of the article.

till they had given France a constitution, and which led to the riots of 5th and 6th October. Napoleon, Louis XVIII, and Charles X. merely kept up Versailles, but Louis Philippe restored its ancient splendour at the cost of £1,000,000. In 1870 and 1871 the town was the headquarters of the German army besieging Paris, After the peace Versailles was the seat of the French national assembly while the commune was triumphant in Paris, and of the two chambers till 1879, being declared the official capital of France, Versailles was the birthplace of Hoche, Abbé de 1'Epée, Philip V. of Spain, Louis XV., Louis XV1., Louis XVIII., Charles X., Count de Maurepas, Prince de Polignac, Marshal Berthier (Prince of Wagram), Houdon the sculptor, Ducis the poet, Callet the mathematician, and Ferdinand de Lesseps. (G. ME.)

VERSECZ, a royal free town in the county of Temes, Hungary, 40 miles south of Temesvar. It is partly for- tified and is the seat of a Greek bishop. Amongst its principal institutions are a high college for girls, a gym- nasium, and a real school. Versecz is one of the principal wine-producing centres in the kingdom, its yearly export amounting to an average of five and a half million gallons, There is also a good trade in rice and silk. The popula- tion numbered 22,329 in 1880.

Vertebrata possess laterally-placed passages leading from the pharynx to the exterior, serving in the aquatic forms as the exits for water taken in by the mouth, and provided with vascular branchial processes, whilst in the embryos of the higher air-breathing classes they appear only as

temporary structures. It was further established that the great mass of nervous tissue lying dorsally above the spinal column, and known as the cerebro-spinal nerve- centre or brain and spinal cord, is in all cases a tube, and originates as part of the dorsal surface of the embryo, which becomes depressed in the form of a long groove and finally closed in by the adhesion of its opposite edges, thus forming a tube or canal. The three structures,—noto- chord, gill-slits, and tubular dorsal nerve-cord,—were more than twenty years ago recognized as characterizing, together with the metameric segmentation of the musculature of the body-wall, all Vertebrata at some one or other period of their existence.

*The establishment by Darwin of the doctrine of organic Question evolution in 1859 led naturalists consciously to make the . se attempt to determine the genetic affinities and the probable aan. . ancestry of the various groups of animals, and enabl Hi them to recognize in the classifications by "type", and other such conceptions of earlier systematists, the uncon- scious striving after genealogical representation of the relationships of organic beings. The question naturally — arose in regard to the Vertebrata, as in regard to other great divisions of the animal kingdom, What were the characters of the earliest forms, the ancestors of those now living? Then came the further questions as to whether any surviving Vertebrata closely resemble the ancestral form, and whether any animals are still in existence which retain the general characters of those primeval forms which were the common ancestors at once of Vertebrates and of other large and equally well-marked phyla or branches of the animal kingdom, such as the Molluscs, the Annulates, &c. This fascinating subject of inquiry received its most important impulse from the embryological investi- gations of the Russian naturalist Kowalewsky, and has been for nearly a quarter of a century the fertile source of speculation and its indispensable accompaniments, new observation and research. Kowalewsky published in 1866 Kowa- | an account of the embryology of the lowest and simplest Js! *) of then recognized Vertebrates, the lancelet (Amphioxus lanceolatus), in which he attempted to trace, cell for cell from the fertilized egg-cell, the origin of the characteristic*

YERTEEBERATA

Vertebrate organs of this animal (2).

This work alone | tadpole.

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No classification which pretended to set forth

would not have acquired historic importance, although it | the genetic aflinities of animals could henceforth separate KK

is the starting-point of what may be called strict cellular embryology, as compared with the less severely histological works of previous students. But it was accompanied by an account (3) of the development of Ascidia mamillata, one of the so-called Tunicate Molluscs, in which it was demonstrated by Kowalewsky, not only that this supposed Mollusc possesses when first hatched from its egg-envelope a notochord, pharyngeal gill-slits, and a tubular dorsal nerve-cord and brain, but that these three characteristic- ally Vertebrate features of organization originate from the same cell-layers of the embryo, and in essentially the same way as in Amphioxus, whilst the cell-layers themselves originate from the egg-cell in the two animals by precisely

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Fig. 1.—Early stages of Ascidia and Amphiovus. a, blastopore; b, neural Toove; ¢, neural folds; d, closed portion of neural tube; e, commencing oral invagination (stomodeum) of Ascidian tadpole; f, right and left cloacal Mvaginations of Ascidian tadpole; g, anterior opening of neural tube of Amphioxus, coincident with the later developed olfactory pit; h, wall of one – the scries of paired outgrowths of archenteron or ccelomic

pouches of ems 7, ectoderm; k, endoderm (of diblastula phase); 2, notochord,

eo from endoderm; m, cavity of gut; , cavity of nerve-tube; 0, wall af nerve-tube, formed by upgrowth and union of neural folds; p, mesoblast of tail of Ascidian tadpole, derived from endoderm; g, lumen of ccelomic pouches of Amphiorus, once continuous with m, but nipped off in the course of development.

A B, C, D. Four stages in development of Ascidia, surface views showing aw cuclosure of neural area. E, F, G. Three similar stages in develop- ae Amphiowus, AA. Vertical antero-posterior median section of A. BB. EE " section of B. DD. Similar section of a stage a little earlier than D. a nad section of E (Amphioxus).. GG. Similar section of embryo repre- a ing. H. Transverse section of diblastula stage of Amphioxus, with ti y open blastopore (earlier than Aor E). I. Transverse (right and left) oat about the middle of F, showing neural area. K. Transverse section or saree of G, showing nerve-tube, notochord, and coelomic pouches or "a astic somites g. L. Transverse section of a much further advanced o lg of Amphioxus, showing nerve-tube, notochord, and gut; the walls

tL coelomic pouches are now converted into muscular tissue and the pouch cavity (q) compressed. (All the figures after Kowalewsky, 77, 78.)

Similar movements of cell division and invagination (see figs. 1 and 2). Kowalewsky's discoveries established once for all that the Ascidian tadpole is identical in three very Special and distinct features of structure with the frog's

Ciki SLITS

Fic. 2.—Diagram illustrating relationship of tadpoles of Frog and Ascidian. The two upper figures represent surface views of the tadpoles ; the two lower ones show in place the chief Vertebrate organs, viz., notochord, gill-slits, nerve-tube, and myelonic eye. (From Lankester's Degeneration.)

the Ascidian from the Vertebrata, and with it the Ascidian brought the whole series of Z'unzcata.

The admission of Z'unicata as a group of Vertebrata was proposed by the present writer as long ago as 1877 (4); but it required the intermediate proposition by Balfour of a group Chordata, to comprise the two divisions Tunicata and Vertebrata, in order to render the final admission of Tunicata to their proper association with the Vertebrata of Cuvier palatable to systematists. As an objection to the simple inclusion of 7'unicata in the great phylum Verte- brata it has been urged that Z'unicata do not possess verte- bree,—a proposition which is equally true of Amphioxus and of some Fishes. Shifting the objection, some writers have maintained that the vertebration of the Vertebrata may be understood as having reference to the segmenta- tion of the muscles of the body-wall, which is exhibited by all Cuvier's Vertebrata without exception, inclusive of Amphioaus, though not by Tunicata. To this it may be replied that the Ascidian tadpole, and more clearly the free-swimming Tunicate Appendicularia (see fig. 9), do ex- hibit a segmentation of the muscles of the hinder part of the body-wall similar to and identical with that of Amphi- oxus, whilst no such strict application of a name in its original descriptive sense is desirable in systematic nomen- clature. All Gastropoda (it has been pointed out) are not gastropodous; all Arthropoda are not arthropodous ; and many Echinoderma are not echinodermous. It is, in the present writer's opinion, better to retain an historic and familiar name for the great branch of the animal pedigree to which it has become necessary to admit forms whose affinities therewith were at one time unsuspected rather than to sacrifice historical significance to a futile striving after etymological accuracy.

The admission of 7'unicata to association with Cuvier's Vertebrata has been followed by a further innovation. The remarkable marine worm Balanoglossus—originally described by Della Chiaje at the end of the 18th century— was shown in 1866 by Kowalewsky (5) to possess a series of pharyngeal gill-slits similar to those of T'unicata and Amphioxus. Later researches by Bateson (6) have de- monstrated that Balanoglossus develops in embryonic life a short notochord, whilst its nerve-cord is, in part at least, tubular, and similar in position and relations to the median

Admis- sion of Tunicata as Verte- brates.

Inclu- sion of alano- glossus in Verte. brate phylum.

epidermal tract by the infolding of which the nerve-tube of Tunicata and the other Vertebrata is formed. Hence it seems impossible to exclude Balanoglossus from a place in the phylum Vertebrata. The possession of pharyngeal gill-slits alone might not justify the association; but, when this is combined with the presence of the notochord, though rudimentary and with a special condition and position of the main nerve-centre, it becomes impossible to ignore Balanoglossus in our conception of the Vertebrate phylum. The recent discoveries of Harmer (7) with regard to Cephalo- discus will hereafter render it necessary to associate that form, and in all probability Rhabdopleura also, with Balano- glossus in the Vertebrate phylum. 'The further conse- quences of such an association in regard especially to the affinities of Polyzoa and of Gephyrea open up a large field of speculation and of consequent embryological and ana- tomical research.

Ances- The Cuvierian Vertebrata, Amphioxus, Tunicata, and

tral form Balanoglossus being thus indisputably connected by a re-
*ee *- markable combination of structural points, which admit of*
“no explanation consistent with the principles of evolutional
morphology except that of the genetic relationship of the
forms thus enumerated, we are at once confronted by those
questions as to the ancestral history of Vertebrata which
have been already mentioned above as stimulated by
Kowalewsky’s discoveries. Undoubtedly Amphioxus is
lower and simpler in structure than any Fish, Tunicata as
low as or lower than Amphioxus, and Balanoglossus, in
some respects, more archaic than either Amphioxus or the
Ascidian tadpole. The first tendency arising from the
discovery of the affinities of these simpler forms with the
Cuvierian Vertebrata was to see in them the representatives
of the ancestors of all Vertebrata. Amphioxus has been
pointed to by authorities in morphology as the living
presentation of our common Vertebrate ancestor ; a similar
position corresponding to an earlier stage of development
has been admitted by no less an authority than Darwin
for the Ascidian. It appears, nevertheless, that all such

simple solutions of the problem of Vertebrate ancestry are without warrant. They arise from a very common tendency of the mind, against which the naturalist has to guard himself,—a tendency which. finds expression in the very widespread notion that the existing anthropoid apes, and more especially the gorilla, must be looked upon as the ancestors of mankind, if once the doctrine of the descent of man from ape-like forefathers is admitted. A little reflexion suffices to show that any given living form, such as the gorilla, cannot possibly be the ancestral form from which man was derived, since ex hypothesi that ancestral form underwent modification and development, and in so doing ceased to exist. The same considerations apply to the question of the ancestry of Vertebrata. Probably no existing low form of Vertebrate closely represents the ancestral form by the modification of which higher forms have been developed. We have no justification for assuming that such low forms do more than present to us a collateral branch of the family, and that collateral branch must, in all probability, have experienced its own special

series of modifications of structure. Not only this, but

in we have no sufficient: ground for assuming that, even in

plicity of TeSPect of the simplicity of their structure, any given

struc. animal forms at present existing exhibit a mere survival

ture. of a corresponding degree of simplicity in their remote

ancestors. Such an assumption was almost universally

made, until a more correct view was pressed on the atten-

tion of naturalists by Dr Anton Dohrn, the founder of the

zoological station of Naples (8). So far from its being

the case that simplicity of organization necessarily implies

the continuous hereditary transmission of a low stage of

structural development from remote ancestors, there are

Argu-

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numerous Instances in which it is certain that the existing simplicity of structure is due to a process of degeneration, and that an existing form of simple structure is thus de- scended from ancestors of far higher complexity of organi- zation than itself. Such are various parasitic worms and Crustacea. The evidence in favour of the occurrence of progressive simplification of structure or degeneration, in place of progressive elaboration, depends (1) upon the com- parison of the adult structure of the degenerate organism with that of its nearest allies, by which it is often rendered clear that the ensemble of the organization of the simpler organism cannot be explained on the hypothesis that it represents an ancestral or archaic condition common to it and its more elaborate

congeners, and (2) on the direct evidence of individual development or life-history. The latter evidence is conclusive, when we find, as in the case of Cirrhipede Crustaceans and of Ascidian Tunicates, that the embryo on its way to the adult condition passes through stages of development presenting a higher degree of or- ganization than that ultimately reached, so that, as in the Cirrhipede larva and the Ascidian tadpole, the young form resembles allied organisms of a higher stage of develop- ment, and subsequently degenerates from the point of progressive elaboration to which it had attained, and be- comes greatly simplified in the final stage of its growth, Conclusive as such evidence is, there is no law of develop- ment which necessitates its preservation. If it be an advantage to the organism, the full force of heredity has play, and what are called the "recapitulative phases" of ancestral development are passed through by the indi- vidual in the course of development from the ego, But with remorseless thoroughness all such hereditary tenden- cies may be removed when such removal is an advantage to the organism, and the development from the ege may proceed directly to the adult degenerate form. Such is the case with many Z'unicata, the young of which never exhibit notochord and tadpole form ; indeed, were it not for the preservation of a few exceptional cases, like that of the Ascidian section of the group, we should have no direct evidence of the degeneration of Tunicata from tad- pole-like ancestry. The general result of the considerations which have Hypo-_ been urged with regard to degeneration is this, that it is thesis of prima facie as legitimate an hypothesis, that any existing – animal has developed by progressive simplification from more elaborate ancestors, as it is that such an animal has developed by a continuous and unbroken progress in elaboration from simpler ancestors; and we are specially called upon to apply the hypothesis of degeneration where the animal under consideration is likely from its mode of life to have undergone that process. Such modes of life, tending to degeneration, are parasitism, sessile or adherent habit, burrowing in the sea-bottom, and diffuse feeding. The animal which pursues living prey, and contends with other organisms for the dominion of the regions of earth and water that are flooded with light and richly supplied with oxygen gas, is the animal which represents the outcome of a longer or shorter period of progressive elaboration. It is worth while noting in parenthesis that in all cases the "whirligig of time" has

probably brought its revenges, and that the ancestry of a form evolved through a long period of progressive elaboration was at an antecedent period subject to simplification and degeneration, whilst in the past records of the present exemplars of the latter process there must certainly have been long stretches of continuous elaboration. | Applying these considerations to the construction of the Genea- | genealogical tree of Vertebrata, we find that the task is by logical i no means simplified. ~

10 0 We cannot with the earliest evolu-) tionists adopt a scale or ladder-like series, placing the :

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VERTEBRATA

simplest form on the lowest step; nor can we be satisfied with a treelike arrangement, in which the forms at the ends of the branches are always more elaborate than those nearer the trunk. Our genealogical tree will more strictly conform to that of a parvenu human family, if we take worldly prosperity in the latter case as corresponding to elaboration of structure in the former. The strict family genealogist will include in the successive ramifications of the tree the five sons of the founder of the family, one of whom remained an agricultural labourer, whilst two became brewers and two emigrated. The cousins in the next generation will be set forth in place, the sons of one brewer becoming paupers, whilst those of the other advance to the position of Government employés, and one to the peerage. Thus in successive branchings of py,pynorar the family history there may be alternate pro- sacs suits. gress and

degeneration. And so it must be rp Nasal Sec. — in the genealogical trees constructed by the r. zye.— naturalist: the fact that a branch is later in __

origin will not imply that it is higher in ela- jst post orat ad boration than those below it, and accordingly Fea Se Slit (we must not expect to draw our tree so as to? ~~ ~~} be able to trace all simpler forms to lower = off-sets of the tree. 4th

The structural features of those animals sth po. _ which must be admitted to the Vertebrate ~~gn po. phylum in consequence of possessing noto~~ chord, pharyngeal gill-slits, and dorsal nerve- plate, tubular or unrolled, are such as enable us very readily to group them in four great divisions, which appear to be equally distinct from one another. As to what may be the genetic relations to one another of these four groups we will inquire subsequently; for the present we term these groups "branches." They are as follows :—

Phylum VERTEBRATA. Branch a—Craniata (Cuvierian Vertebrata). b—Cephalochorda (Amphioxus). e—Urochorda (Tunicata). », d—Hemichorda (Balanoglossus).

The Vertebrata thus limited may be defined as Ccelomate Enterozoa (Metazoa) with well-developed ccelom. In all, with the exception of the more degenerate members of Urochorda, an elastic skeletal rod—the notochord—is de- veloped dorsally by an outgrowth of cells forming the wall of the primitive archenteron ; the notochord may or may not persist in adult life. Pharyngeal gill-slits, which may or may not persist in adult life, are developed in all Verte- brates. In all, except in certain Urochorda, the chief nerve- centre has the form of a dorsal, median, elongate tract, derived from the epiblast, which becomes sunk below the surface and invaginated so as to form a tube. In all there 1s a tendency to metameric repetition of parts, which may find its expression in a strongly-marked segmentation of the musculature of the body-wall and its skeleton, or may be recognizable only in a limited degree, as exhibited by the successive gill-slits or successive gonads.

We shall now examine the distinctive features of each of these large groups, and form an estimate of their rela- tions to one another, and of

their probable ancestry, this being the task to which we must limit ourselves in the brief space here afforded.

THE CRANIATA.

The Craniata are Vertebrata in which the tubular cerebro-spinal nerve-mass is swollen anteriorly to form a brain, consisting primarily of three successive vesicles, in connexion with the anterior of which the special nerves of the olfactory organs and of the eyes originate. The notochord, whilst extending posteriorly to the extremity of the body, does not reach quite so far forward anteriorly as the termina- tion of the nerve-tube.

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laterally so as to enclose and protect the brain (hence Craniata). Cartilage is developed in other parts of the body as a skeletal sub- stance, though it may be subsequently replaced in the cranium, as elsewhere, by bone. – The longitudinal muscles of the body-wall are divided by transverse fibrous septa into a series of segments, vary- ing in the adult from ten to one hundred or more in number. Cartilaginous neural arches, corresponding in number and position to the fibrous septa, and resting on the notochord, are developed so as to protect the nerve-cord. Cartilaginous bars also pass out- wards, with a direction at first horizontal and then ventral, from the sides of the notochord into the intermuscular fibrous scpta. Very generally, but not always, a tubular cartilaginous sheath forms round the notochord ; this sheath with rare exceptions be- comes segmented to form a series of vertebral bodies, which lie in the planes of the fibrous intersegmental septa, and, increasing in thickness by encroaching upon the substance of the notochord, finally obliterate it almost entirely.

SKELETAL VASCULAR ARCHES,

4. Pathetic of Eye. 5. Trigeminus.

Poeumogastric. 11. Spinal 3 Accessory. 12. Hypoglossal (Motor of Tongue).

Fre. 3.—Three diagrams showing characteristic disposition of gill-slits, skeletal arches, vascular arches, and furcal nerves in a primitive ideal Craniate. explanation :—pros., prosencephalon ; thal., thalamencephalon ; mes., mesencephalon ; met., met- encephalon ; aud., otocyst or auditory sac; tru. art., truncus arteriosus. (Original.)

The following abbreviations require

The pharyngeal slits follow closely upon the mouth, and in ex- isting Craniata never number more than eight pairs (see fig. 8). They are separated from one another and their apertures strengthened by a series of cartilaginous hoops, the first of which, that between the mouth and the first gill-slit, forms the primitive upper and lower jaw in all but the small and degenerate group Cyclostoma. The gill-slits when functional are generally protected by an opercular fold of the body-wall, which overhangs them and corresponds to the epipleural fold of Amphioxus, the collar of Balanoglossus, and doubtfully to the wall of the atrial chamber of Urochorda, The extension of this fold along the sides of the middle third of the body (between the pharyngeal region and the anus) acquired in ancestral Craniata the function of a continuous right and left lateral fin (see fig. 4). At the same time a continuous median fin, corre-

Fic. 4.—A. Hypothetical primitive Fish, with continuous lateral fins S, S (paired right and left), confluent with median azygos fin (An), the post-anal part of which is marked 8', whilst its dorsal part is marked D. 3B. Actual Fish, showing relation of isolated lateral and median fins to original hypothetical

fins of the upper figure. BrF, left pectoral fin (paired); BF, left pelvic fin (paired); AF, anal (post-anal) azygos fin; SF, caudal azygos fin; RF and

FF, anterior and posterior azygos dorsal fins; An, anus. (From Wiedersheim.)

sponding to the dorsal, caudal, and anal fins of existing Fishes, was developed. In both lateral and median fins a cartilaginous skeleton was developed, consisting of a basal longitudinal bar, supporting a number of rods like the teeth of a comb. The primitive form of fin skeleton is retained in the median fins of some sharks; the primitive lateral fin has in all cases either

entirely disappeared (Cyclostoma) (as has their anterior extension, the operculum, in many cases) or it has become, together with its skeletal elements, concentrated in two regions—forming the pectoral and the pelvic paired appendages or limbs, with their respective irdles.

‘ The cerebro-spinal nerve-centre and the disposition of the nerves issuing from it present a remarkable complexity, and at the same time uniformity, of strncture in all Craniata (see fig. 5). The fore- most of the three prim- sk. =

ary cerebral vesicles _- . A terior outgrowths, the prosencephala, to a “—~¢—-“-\————_3-——.

inedian dorsal out- growth, the OF VH Z ZHHC MH SD HE WT stalk of the at a i i

pineal eye (rudimentary in all exist- 7 ing Craniata), ELE and to a me- dian ventral outgrowth, which is met by an inva- gination

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of Fic. 5.—Diagrams of Craniate brain. A. Einbryonic eondition

tl id = of neural tube. “G, Cerebral portion; R, spinal cord; I, lee abies se Il, III, three primary cerebral vesicles. B. Longitudinal

of the oral section of adult brain, applicable to any and every Craniate

cavity form- Vertebrate. Bc, Floor of skull; Ch, notochord ; SD, roof of

i itu. Skull; NHI, nasal cavity ; VH, fore-brain, prosencephalon, _ oo or cerebrum ; Ol/, olfactory lobe; Cs, corpus striatum ; 4H, itary ors thalamencephalon, corresponding to primary anterior vesicle, further, to a from which the prosencephalon has grown out as well as Z, pair of latera] the epiphysis or pineal body; I, infundibulum, with attached

hypophysis or pituitary body H; Opt, optic nerve; Tho,

outgrowths, thalainus opticus ; HC, posterior commissure; MH, mesen- which be- cephalon (corpora quadrigemina or optic lobes or mid-brain); come the HH, cerebellum or metencephalon ; NH, medulla oblongata

i or epencephalon (the reference line touches the membranous _ and is roof of the so-called "fourth ventricle" of the brain); Co, optic nerves canal of the spinal cord or myelon. (From Wiedersheim.) and = retin

respectively. The modifications of the hindmost of the three prim- ary vesicles are also extremely definite and persistent throughout the group: its anterior dorsal surface enlarges and becomes the cerebellum (the metencephalon), whilst the cavity of its hinder part (the medulla oblongata or the epencephalon) becomes compara- tively wide, and is covered dorsally by a thin membrane only, in which nervous tissue does not take a part. The intermediate primary cerebral vesicle (the mesencephalon) does not give rise to outgrowths.

In all Craniata nerves are given off from the cerebro-spinal cord or tube with great regularity, one right and left in each success- ive myomere or segment of the body-wall. Each nerve has two roots, a dorsal (sensory) and a ventral (motor). A commissure between cach successive pair of deep or intestinal branches of the spinal nerves forms the so-called sympathetic nerve-cords, one on each side of the vertebral column. Nerves similar to the spinal nerves, but not identical with them, are given off from the brain, and perforate the eranial box right and left. In all Craniata there are ten pairs of nerves which originate thus, and in the higher forms two more pairs (elsewhere spinal) are included amongst those which thus perforate the cranium (spinal accessory and

hypoglossal). The order and character of the cranial nerves are the same in all Craniata. The first (olfactory) and the second (optic) are unlike spinal nerves in both distribution and origin. As we pass back- wards along the series, the cranial nerves are found to resemble more and more the ordinary spinal nerves. Hence it has been inferred that the cranial region consisted at one time of a number of distinct myomeres (as many as nine), which have become fused and modi- fied to form the typical craniate "head." The oculo-motor or 3d nerve indicates the first of these segments, the trochlear or 4th nerve the second, the abducens or 6th the third, the facial and auditory (7th and 8th) the fourth, the glosso-pharyngeal or 9th the fifth, and the vagus or 10th, with certain of its branches supposed to have been originally distinct nerves, the sixth, seventh, eighth and ninth. It is probable that in Craniata the metamerism of the gill-slits does not correspond to the metamerism of the body-wall. 'The mouth and each successive gill-slit are related to a bifurcate branch of a cranial nerve (furcal nerve) in lower Crantata (see fig. 3); these furcal nerves do not correspond, so far as we can at present judge, with cranial myomeres. F

The lateral pair of eyes (as opposed to the rudimentary pineal or parietal cye) present a striking uniformity of origin and structure throughout Craniata. Not only are they uniformly developed from three elements, viz., the retinal cup which grows out from the anterior of the primary cerebral vesicles, the epidermal lens which grows inwards from the surface of the skin, and the connective tissue between these two, but we find that the muscles attached to the eyeball are identical throughout the scries: that is, the superior,

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inferior, and internal rectus, and the inferior oblique muscles repre- sent the first cranial myomere, the superior oblique represent the second, and the external rectus represent the third cranial myomere.

The olfactory sacs are paired in all except Cyclostoma, in which they are represented by a single sac which may or may not be archaic in its azygos character. The auditory sacs are paired organs which develop as invaginations from the surface, —the orifice of invagination closing up,

—at the hinder part of the cranial region, They present a gradually increasing complexity of form as we pass from aquatic to terrestrial forms, but are identical in essential struc- ture throughout.

All Craniata, except some Fishes, possess a muscular process on the floor of the oral cavity which may carry teeth, or act as a lick- ing organ, or assist in suction. This is the tongue.

All Craniata, with degradational exceptions, possess an outgrowth, single or paired, of the post-pharyngeal region of the alimentary eanal, which is filled with gas. In many Fishes this becomes shut off from the gut ; in others it remains in communication with the gut by an open duct. In Fishes it functions as a hydrostatic appar- atus. In terrestrial Craniata it is subservient to the gas-exchange of the blood and becomes the lungs.

All Craniata have a large and compact liver ; and a pancreas is also uniformly present, except in Cyclostoma, some bony Fishes, and the lower Amphibia.

All Craniata have a thick-walled muscular heart, which appears first as an "atrium," receiving the great veins, attached to a "ventricle" by which the blood received from the atrium is pro- pelled through a number of arteries, right and left, corresponding in number to the pharyngeal gill-slits between which they pass. A preatrial chamber (the sinus) and an extra-ventricular chamber (the conus) are added to the primitive chambers; but the most important modifications arise in consequence of the development of pulmonary respiration and the gradual separation of the cavities of the heart by median septa into a double series, a right and a left. The plan of the great arteries in all Crandata is in origin the same, and is determined by the primitive existence of a branchial circula- tion in the gill-slits, which is obliterated in higher forms. Simi- larly the plan of the great veins is identical, the primitive posterior vertebral veins of lower Craniata, though persistent in higher members of the group, having their function gradually usurped by the excessive development of the renal vein, and of renal-portal and ultimately of iliac veins.

All Craniata have a lymphatic system or series of channels by which the exudation from the capillary blood-vessels is returned to the vascular

system. It includes in its space-system the ceelom and a variety of irregular and canalicular spaces in the connective tissues. Masses of spongy tissue (adenoid tissue, lymphatic glands) exist, through which the lymph filters, and there acquires corpus- cular elements as well as chemical elaboration. At various points in various Craniata pulsating or simple communications are estab- lished between the lymphatic system and the veins. A special aiid characteristic communication is established in the spleen, an organ which is found in all Craniata, either as a single mass or as scattered masses of spongy tissue in which blood-vessels and lymph- atics unite.

The renal organs of Craniata are primitively a series of nephridia corresponding in number to the myotomes of the mid-region of the body in which they exist. They are connected in the simplest Craniata by a right and a left archinephrie duct, which appear to be in origin lateral grooves of the epidermal surface. This primi- tive renal system has been modified in some lower forms (Cyclostoma and Teleostean Fishes) by the atrophy of its anterior portion. But in all other Craniata it acquires relations to the gonads or ovary and testes, so that an anterior portion of the archinephros and a corresponding longitudinal tract of the duct become separated to serve as oviduct, a middle portion to serve as sperm-duct, while a posterior portion retains exclusively or shares with the middle portion the function of urinary excretion. The male and female gonads are, with the rarest exceptions, developed in distinct indi- viduals, though the rudiments of the suppressed gonad may in some cases (Amphibia) be traceable in either sex.

The group of Craniate Vertebrata thus anatomically described, Sub- | whilst retaining the essential unity indicated, presents an immense divisions | The chief modifications are distinctly of Crant- traceable to and accounted for by mechanical and physiological ata

variety of modifications.

adaptation to a terrestrial and air-breathing life, as opposed to the earlier aquatic and branchial condition. The existing forms of Craniata have beet arrested at several points, in the progress towards the most extreme adaptation to terrestrial conditions, which is presented by those forms that

can not only breath air and live on dry ground but fly habitually in the air. The organs most obviously aifected by this progressive adaptation are the skin, the skeleton, especially of the limbs, the pharyngeal gills, and the air-bladder. This fact will appear most clearly in the subjoined classification of Craniata ; for space does not permit us to pursue further the history of these modifications.

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tral form of Crant- abil.

VERTEBRATA

Classification of CRanraTa.!

Grade A. CYCLOSTOMA. Class I. Myxinoidea. II. Petromyzontia. Grade B. GNATHOSTOMA. Grade a. Branchiata heterodactyla. Class I. Pisces. II. Dipnot. Grade b, Branchiata pentadactyla. Class. Amphibia. Grade c. Pentadactyla lipobranchia. Branch a. Monocondyla. Branch b. Amphicondyla. Class I. Reptilia. Class. Mammalia. If. Aves.

If we now briefly consider what must have been the common ancestral form from which these Craniata have proceeded, making use of such internal evidence as their structure affords, we find that we get no further back than such an animal as would fit the description given above, with the exception that we should be warranted in substituting in the ancestor a pair of continuous lateral fins, with comb-like cartilaginous skeleton, in place of the two pairs of fins, or their total defect, seen in living Craniata. We get no clear suggestion from the study of Craniata themselves as to the meaning of the curious shape of the brain and its outgrowths (though the pineal outgrowth has recently been explained as an eye), nor as to the original genesis of the notochord. We should, however, be justified in representing that region which now cor- responds to the hinder part of the skull and brain as more fully developed and segmented, so as to give a series of separate myotomes and perhaps separate nerves corresponding to the several furcal branches of the vagus ; and we may very well suppose that the num- ber of pharyngeal gill-slits was larger in the

ancestral than in any living form, though it seems improbable that in any true Craniate did each gill-slit correspond to a distinct muscular segment.

An attempt to go further than this has been made by Dr Anton

Dohrn by the method of hypothesis and subsequent corroborative inquiry into facts of minute structure and embryological history. Making use of the principle of degeneration, Dohrn started with the legitimate hypothesis that the branches of Vertebrata other than Craniata—viz., Cephalochorda, Urochorda, and (though at the time he commenced his work their structure was not fully under- stood) Hemichorda—were not to be regarded as permanent records of steps in the evolution of Craniata, but rather as greatly de- generate offshoots from the ancestors of that group, which could throw but little light on the character of their non-degenerate ancestors. A second fundamental assumption which led Dohrn to his position was that the segmentation of the Craniates' body-wall is a primitive and essential feature in their structure, and becomes more and more fully expressed instead of less developed the further we go back in their ancestry. Dolirn, in fact, assumes that what is called metameric segmentation is a phenomenon of structure which has occurred once only in the history of animal form, and that all segmented animals are genetically related and descended from a common segmented ancestor. Assuming this, he pointed to the existing Chetopod Worms as most nearly representing at the present day the common ancestor of segmented animals. They have, as he pointed out, a high organization, little inferior to that of the lowest Craniata; they possess a well-developed ccelom, blood-vessels with red blood, a segmental series of nephridia (modified in some as gonaducts), segmental branchiz, and lateral locomotive organs; not a few develop cartilage as a skeletal sup- iy and many show a concentration and fusion of segments to orm a complex head, which resembles, so far, that of Craniata. The ventral in place of the dorsal position of the nerve-cord led Dohrn to accept De Blainville's conception that the dorsal and ventral surfaces are reversed in Vertebrata, as compared with Annelids, Crustaceans, and Insects, so that the Vertebrate is com- – to an Insect walking with its ventral surface upward. This ed further to the notion that the mouth of the Chetopod or Annelid, which penetrates the nerve-cord, or rather passes between Its two

divaricated lateral constituents in those animals, has in Craniata disappeared, its place being taken by a new mouth de- rived from the modification of a pair of gill-slits. The remnant of the old mouth, which should, if the comparison instituted holds good, lie in Crantata somewhere on the dorsal surface of the cranial Tegion, was sought by Dohrn in some of the peculiar and hitherto unexplained median structures of the brain: at one time the fourth ventricle with its deficient roof was suggested as thus to be explained, whilst subsequently the curious median structures,—the pineal and pituitary bodies,—were called in as possibly thus significant.

Without pursuing further the elaboration of Dohrn's views, it must be at once noted that, whilst the legitimacy of the assumption of degeneration must be admitted, the second assumption, viz., that metameric segmentation is a character bringing all forms showing it into a special genetic continuity, cannot be accepted.

1 The classes here enumerated are described in separate articles, whilst Cyclostoma and Dipnoi are included in the article IcarHyoLoay.

The property of repeating units of structure, so as to build up a courplex of many similar parts united to form one individual, is a very general one in organic forms, and is exhibited in various con- ditions by both animals and plants. Its simplest expression is found in cell-structure and the binary division of cells. It shows itself as affecting larger masses of structure in the arborescent colonies of Calentera, in the radial or antimeric composition of Echinoderms and of Compound Ascidians, and in the linear or metameric segmentation of Worms, Arthropods, and Vertebrates. There is abundant evidence that this property is a general one, which may assert itself at any period in the history of a group of animals, and does not imply special unity of origin in forms which exhibit it. As pointed out in the article Hyprozoa, merogenesis —the name applicable to this phenomenon generally—may take an extreme and complete character, leading to the separation and independence of the units of structure produced ; in that case it may be termed eumerogenesis. Or the process may be very partial, occurring only during a period of

embryonic growth, and subse- quently ceasing, so that later growth obscures or obliterates it altogether (dysmerogenesis). There is no ground for assuming that either one of these extremes is fundamental or original. Any mechanical or nutritional condition may lead to merogenesis in an organism in which the tissues have a certain reproductive capacity, or have not acquired final differentiation ; and it will depend upon the balance of advantage, determined by natural selection, whether the segmentation (supposing the merogenesis to take the linear form) results in the separation of segment-buds, or in the formation of an annulate body, or leaves traces of its occurrence only in certain tissues and organs. The Cestoid Worms present within the range of a single group almost every grade of eumerogenesis and dysmero- genesis (Caryophyllzus, Ligula, Tenia). In the otherwise amero-~ genetic Mollusca, Chiton and the pearly Nautilus show dysmero- genesis in certain organs, whilst the Planarian Worms frequently exhibit eumerogenesis in their bud-segmentation (to be compared with that of the Annelid Ctenodrilus described by Zeppelin, g) and the elongated Nemertines only slight traces of dysmerogenesis.

If we deny Dohrn's assuinption with reference to segmentation, we are no longer led in the direction of the Annelids (Chetopods) in our search for the ancestry of the Craniate Vertebrata.

The fact that the notochord is the forerunner of the segmented vertebral column, and is itself never segmental, instead of being a difficulty, acquires directive significance. The fact that the nerve tube is dorsal, and not ventral, no longer requires the large assump- tion that animals have reversed their habitual carriage, but suggests that the Craniates' ancestor had a dorsal median nerve, which has increased in size and importance so as to become the nerve-tube of existing fornis. The explanation of the curious struc- ture of the brain will have to be found otherwise than in the assump- tion of a perforating pharynx,—an as- sumption which the recent discovery of the true nature of the pineal body has rendered untenable in the latest form advocated by its ingenious author, whose speculations, nevertheless, de- serve the fullest re- cognition as having stimulated inquiry and guided observa- tion.

Balfour (zo) in 1878 refused to a- dopt Dohrn's views, AMPHIOXUS and considered it ryq, 6.—Comparison of nervous systems of a Nemertine, probable that the aprimitive Craniate, and Amphiorus. m, Median dor- dorsal position of sal nerve, which becomes the myelon in the Craniate the nerve-cord in and Amphioxus, acquiring an anterior enlargement in

the former ; 1, lateral nerve (right and left), absent by

Vertebrata could be degeneration in Amphiorus; lg, ganglia of lateral

accounted for, with- nerve, forming a single large lobe on each side in

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oe ay Rae NAOR TS Orariaies Ftogte of vague verve of tho Oraniste, of a substitution of a pair of gill-slits for

dr, dorsal roots of nerves given off from myelon or median dorsal nerve; vr, ventral roots of these nerves,

the original mouth,

by assuming that ubrecht.)

here represented as separate nerves; 0, mouth. (After primitively the nerve-cord consisted of two lateral cords, as seen at the present time in the Nemertine Worms, and that these cords have coalesced dorsally in Vertebrata, just as it is clearly demon-

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roy

Char- acters of Cephalo- chorda.

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strable that two originally lateral cords have coalesced ventrally to form the Annelid's ventral nerve-chain.

The comparison of the Vertebrates' nervous system with that of the Nemertines had already been made by the present writer, as cited by Hubrecht (zz) in connexion with the latter's discovery of a complete sub-epidermal nerve-tunic in those worms. Hubrecht has more recently on two occasions (72 and 737) developed an in- teresting and important comparison of Nemertine and Vertebrate structure. He has in the first place suggested that the notochord of Vertebrata is nothing more than a modified survival of the pro- boscidean sheath of the Nemertines, whilst the oral invagination of the epidermis, in connexion with the hypophysis cerebri of the Vertebrate, may be a last remnant of the proboscis itself. More conclusively he has drawn attention to the median dorsal nerve of Nemertines as corresponding to the Vertebrate cerebro-spinal nerve- cord, whilst the great lateral nerve-cords of Nemertines, and the lateral ganglia in which they expand anteriorly, are compared to the lateral ganglia of the cephalic region of Craniate Vertebrata and the nerve of the lateral line (see fig. 6). The comparison is strengthened by the existence of a metameric series of transverse nerves in the Nemertine, which correspond in respect of their meta- merism and their connexion with a dorsal median trunk, with the spinal nerves of Craniata. Hubrecht is careful to insist that he does not regard the Nemertines as representing the direct ancestry of Vertebrata ; but he points out that from the primitive condition of an elongate animal, with a plexiform nerve-tunic, it is readily conceivable that a form was developed in which the nervous tissue was concentrated in three cords,~—a median dorsal and two lateral,— and from such a form we can derive the Craniates' condition by excessive development of the median tract and relatively small development of the lateral cords, whilst the Nemertines' condition would be attained by the converse process. The tubular condition of the cerebro-spinal nerve-cord of Vertebrata, it may here be re- marked, is now very generally regarded as being in its origin a purely developmental feature. It was primitively separated from the epidermis by delamination and in-sinking, and the mode of formation by invagination of a canal has been substituted in accord- ance with a general embryological law of growth, which is that bulky structures originating beneath a surface from the cells form- ing that surface take up their position in embryonic growth by in- vagination of the parent surface. The tubular form, having thus started, seems to have been utilized during one phase of Vertebrate evolution for the

respiration of the nervous tissue, by the introduc- tion through an anterior unclosed pore of a current of water, which escaped by the neuranal canal (as in larval Amphioxus).

There is a wide gap between any form presenting an approach to a Nemertine Worm and the most simple Craniate Vertcbrate which can be imagined still provided with the organization characteristic of all Craniata. To pass from such a Worm-like animal to a Craniate, we have to account for and introduce, amongst other new develop- ments, (1) a greatly increased metamerisin, showing itself in the segmentation of the muscles of the body-wall and in the repetition of the nephridia ; (2) the characteristic sense organs; (3) the lateral and median longitudinal folds or continuous fins; (4) the carti- laginous rods and bars of the skeleton ; (5) the gill-slits, even if " —— the notochord to be represented by the proboscidean sheath.

It remains to inquire whether the structure of the other Verte- brata throws light on this long hypothetical passage from the simple Worm phase to the elaborate Craniate, or suggests any other ahcecstry.

THE CEPHALOCHORDA.

_Cephalochorda are Vertebrata in which there is no anterior dilatation of the nerve-tube to form a brain (see fig. 6) and no specialized skeletal brain-case. The notochord extends from one extremity of the elongate body to the other as a tapering uncon- stricted rod, passing anteriorly some distance in front of the nerve-cord. The longitudinal muscles of the body-wall are divided by transverse fibrous septa into a series of segments (sixty-two in Amphioxus lanceolatus), the more anterior of which are in front of the mouth and not in any way fused to form a head or cranial structure. Dense connective tissue (differing but little from car- tilage) forms an unsegmented sheath to the notochord and an unbroken neural canal above it, in which the nerve-cord lies The same tissue forms a series of metamerically repeated fin rays, which support the base of a median fin extending along the entire dorsal surface. The fin is continued ventrally from the caudal ex- tremity as far forward as the anus, but without fin rays. Two lateral up-growths of the body-wall (the epipleura) extend one on either side from the head as far back as the anus. Each of

these is divided into three regions,—(1) an anterior, which forms the preoral hood ; (2) a median, which forms the wall of the great branchial chamber, the two folds meeting one another and coales- eing in the ventral mid-line, excepting where they leave a posterior median aperture, the atriopore ; and (3) the post-atrioporal preanal ventral fin (extending between atriopore and anus), which is formed by the complete coalescence of the two folds behind the atriopore.

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Fic. 7.—Amphioxus lanceolatus, Yarrell (Branchiostoma lubricum, Coste). (Original drawings.) (1) Lateral view of adult, to show general form, the myomeres, fin rays, and gonads. A, oral tentacles (28 to 32 in full-grown animals, 20 to 24 in half-grown specimens); B, preoral hood or preoral epi- pleur; C, plicated ventral surface of atrial chamber ; D1, Dl', 26, gonads, twenty-six pairs, coincident with myotomes 10 to 36; E, metapleur or lateral ridge on atrial epipleur; F, atriopore, coincident with myotome 36; Gl, G15, G34, double ventral fin rays, extending from myotomes 37 to 52, but hav- ing no numerical relation to them ; H, position of anus, between myotomes 51 and 52; I, notochord, projecting beyond myotomes; K', K27, K62, myo- tomes or muscular segments of body-wall, 62in number; L100, 1230, 1,253, dor- sal fin rays, about 250 in number, the hard substance of the ray being absent at the extreme ends of the body (these have no constant numerical relation to the myomeres); M, notochord as seen through the transparent myotomes, the thin double-lined spaces being the connective-tissue septa and the broader spaces the

muscular tissue of the myotomes ; N, position of brown funnel of left side (atrio-ccelomic canal) ; O, nerve-tube resting on notochord.

(2) Dissection of Amphioxus. By a horizontal incision on each side of the body a large ventral area has been separated and turned over, as it were on a hinge, to the animal's left side. The perforated pharyngeal region has then been detached from the adherent epipleura or opercular folds (wall of atrial or branchial chamber) by cutting the fluted pharyngo-pleural membrane d, and separated by. a vertical cut from the intestinal region. a, Edge of groove formed by adhesion of median dorsal surface of alimentary canal to sheath of notochord ; b, median dorsal surface of alimentary canal; ¢, left dorsal aorta; cc, single dorsal aorta, formed by union of the two anterior vessels ; ce', same vessel resting on intestine ; d, cut edge of pharyngo-pleural folds of atrial tunic, really the original outer body-wall before the downgrowth of epipleura ; d', atrial tunic (original body-wall) at non-perforate region, cut and turned back so as to expose peri-enteric ccelom and intestine 7; e', Up- standing folds of body-wall (pharyngo-pleural folds) on alternate bars of per- forate region of body; f, atrio-ccelomic canals or brown funnels (collar-pores of Balanoglossus) ; g, cavity of a gonad-sac; m, cut musculature of pody- wall; n, anus; 0, post-atrioporal extension of atrial chamber in form of 4

cecum; p, atriopore; g, hepatic cecum ; 7, intestine; s, celom; ¢, tte a cacsion tebween rae Ae canal and sheath of notochord ; 2, atrial chamber or branchial cavity; w, post-atrioporal portion of intestine; «, canals of metapleura exposed by cutting ; E, probe passing through atrio- pore into atrial or branchial chamber ; FF', probe passed from coelom, where it expands behind the atriopore, into narrower perienteric ccelom of pre-

joporal region. aya) Portion of (2) enlarged to show atrio-ccelomic canals ("' brown funnels"

of Lankester). Lettering as in (2). – hn)

(4) Section taken transversely through preoral region near termination of nerve-tube. a, Olfactory ciliated pit on animal's left side, its wall confluent with substance of nerve-tube ; 0, pigment spot (rudimentary eye) on anterior

termination of nerve-tube; c, first pair of nerves in section; d, fin ray; e,

myotome; f, notochord; g, space round myotome ? artifact or ccelom); h,

subchordal canal (? blood-vessel); 1, a symmetrical epipleura of preoral hood. The originally double character of this part of the ventral fin is indicated by the double series of metameric fin rays whieh support it. It is probable that these "epipleural" folds of Amphioxus correspond to the opercular folds and lateral fins of Craniata. No cartilaginous fin rays are developed in the atrio-pleural (opercular) region of the epipleura ; but a longitudinal unsegmented bar of cartilaginous consistency strengthens its side and bounds a lymph- holding canal (x in fig. 8).

The gill-slits in Amphioxus are very numerous (one hundred or more), and have no numerical relation to the metameres of the muscular body-wall, though the first few which appear in the embryo correspond at the time to successive myomeres, —a relation which they subsequently lose. The sides of the gill-slits are sup- ported by chitinous (?) bars, and each slit is divided into two equal portions by a longitudinal tongue or bar, which grows out from the dorsal margin of the slit soon after its first formation. The number of gill-slits increases continually throughout the life of Amphioxus by the formation of new ones at the posterior border of the pharynx, whilst the myomeres do not increase in number after early embryonic life.

The nerves given off from the dorsal nerve-cord of Amphioxus are of two kinds,—dorsal and ventral. The dorsal nerves correspond in number and position to the myomeres, right and left, except in the most anterior region of the body, where two larger pairs of dorsal nerves are given off from near the extremity of the nerve- cord, and pass forward, supplying the region which lies in front of the termination of the musculature. The ventral nerves are minute, and are given off numerously, right and left, from the nerve-tube throughout its length. The dorsal and ventral nerves of a single myomere appear to correspond, respectively, to the dorsal and ventral roots of a spinal nerve of a Craniate.

There is a single olfactory pit in Amphiowus, which rests upon the left side of the anterior termination of the nerve-cord (see fig. 7, 4). Within

the cavity of the nerve-cord at the same point a patch of brown pigment is present (eye-spot). There are no repre- sentatives of the lateral eyes of Craniata and no otocysts.

There is no representative of the Craniates' swim-bladder in Amphioxus. A single wide diverticulum of the alimentary canal represents the liver of Craniata ; the pancreas is unrepresented.

The vascular system is singularly incomplete: large trunks exist, but few branches and no heart, whilst the blood itself is colourless, and communicates (as in Craniata by the lymphatic ""hearts") with the ccelomic fluid at various points. A contractile ventral trunk runs along the lower face of the slit pharynx, and sends vessels right and left up the successive bars; these vessels unite above, asin Craniata, to form a double "' dorsal aorta," which posteriorly becomes a single vessel. A portal system of veins can be traced in connexion with the hepatic caecum.

No system of lymphatic vessels, nor lymphatic "glands," nor a spleen exist; but the ccelom, and certain other spaces in the connective tissue, contain coagulable lymph, and correspond to the lymph spaces of Oraniata.

There is no series of nephridia, nor a renal organ formed by the coalescence of nephridia, nor are gonaducts present. The "brown funnels," a pair of funnel-shaped tubes discovered by Lankester (74), place the ccelomic space of the opercular (epipleural) down- growths of the body-wall in communication with the space which these folds enclose. They appear to be identical with the "collar- pores" of Balanoglossus, and it is doubtful whether they represent nephridia,

Tn the larval Amphioxus there is developed from the left anterior coelomic pouch a glandular tube and a sense-organ, which are re-Presented in the adult by the structures marked / in fig. 8,B. Quite istinet from the foregoing is a nephridial tube lying on the left " ¢ behind the mouth of the larval Amphioxus. This tube is prob- – the Same thing as the subneural gland of Ascidians and as Be Poscidean gland and pore of Balanoglossus. All are probably a é nature of nephridia. In the adult Amphioxus the nephridial Se e ; In an atrophied condition, though large*

and active in a late Fai, Ve when the olfactory pit opens into the neural canal. matschek (75) describes this condition in " ausgebildete" but not In adult examples.*

& om gonads are distinct ovaries and testes ; they are developed ae inct male and female individuals in corresponding positions,

In that part of the ccelom which is carried downwards in the

; BIGHT Fic. 8.—Transverse sections of Amphioxus. (Original.) A. Section through re-

gion of atrio-ccelomic canals. B. Section in front of mouth; the right and left sides are transposed. a, Cavity surrounding fin ray; a', fin ray; }, muscular tissue of myotome; ¢, nerve-cord; d, notochord ; ¢, left aorta; 7 thickened ridges of epithelium of preoral chamber (Rader organ); g, coiled tube lying in a ceelomic space on right side of preoral hood, apparently an artery; h, cuticle of notochord ; i, connective-tissue sheath of notochord ; x, median ridge of skeletal canal of nerve-cord; 1, skeletal canal protecting nerve-cord ; m, inter-segmental skeletal septum of myotome ; n, subcutaneous skeletal connective tissue; 0, ditto of metapleur (this should be relatively thicker than it is); g, subcutaneous connective tissue of ventral surface of atrial wall (not a canal, as supposed by Stieda and others); 7, epiblastic epi- thelium ; s, gonad-sac containing ova; ¢, pharyngeal bar in section, one of the "tongue" bars alternating with the main bars and devoid of pharyngo- pleural fold and celom; w, so-called " dorsal" ceelom; x, lymphatic space or canal of metapleur; y, sub-pharyngeal vascular trunk; 2, blood-vessel (portal vein) on wall of hepatic cecum; aa, space of atrial or branchial chamber ; 6b, ventral groove of pharynx (anteriorly this takes the form ofa ridge); cc, hyperbranchial groove of pharynx; dd, lumen or space of hepatic cecum; eé, narrow celomic space surrounding hepatic cecum ; //, lining cell-layer of hepatic cecum ; gg, inner face of a pharyngeal bar clothed with hypoblast, the outer face covered with epiblast (represented black); hh, a

main pharyngeal bar with projecting pharyngeal fold (on which the reference line rests) in section, showing ccelomic space beneath the black epiblast ; 72, transverse ventral muscle of epipleura; kk, raphe or plane of fusion of two down-grown epipleura ; JJ, space and nucleated cells on dorsal face of noto- chord ; mm, similar space and cells on its ventral face.

descending right and left outgrowth (epipleura, opercula) of the body-wall, which encloses the atrial or branchial chamber. The gonads are twenty-six pairs in number, corresponding to the 10-36 myomeres. They are devoid of ducts, and discharge their pro- ducts by dehiscence into the atrial chamber, whence they pass to the exterior, either by the atriopore or by entering the pharynx through its slits, when they are ejected by the mouth.

In many respects Amphioxus, the only representative of Cephalo- chorda, bears evidence of being derived from a more highly organized

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ancestry. Its mode of life (burrowing in the sand in shallow water, whilst its general build is that of a swimming animal) and the nature of its food (diatoms, &e., carried into the pharynx by ciliary

chorda to currents) in themselves suggest such a history. The vascular Craniata system is elaborate in plan yet ineomplete in detail, suggesting an

and the Verte- brate aneestry.

atrophy of its finer branches, which is consistent with the small size of Amphioxus and the general principle that a complex vascular system can

only be developed in an animal which has attained to a certain bulk. The absence of well-developed sense organs and of "cephalization" in an animal which has attained to such elabora- tion of strueture as is shown by the pharynx and atrial ehamber, and whieh has such well-developed museles to the body-wall, is an inconsistency best explicable by degeneration ; so, too, the existence of the elaborata series of fin rays, which are ont of proportion to the mechanical requirements of so small a form.

Degenerate though Amphioxus must be, the ancestor from

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tive size. For the same reason no vaseular system develops in the Ascidian tadpole until it has ceased to be locomotive and has entered upon its later development ; but in the larger adult Urochorda a contractile heart and a well-developed vascular system are present.

No undeniable nephridia are present in Larvalia nor in the larval Ascidian, and no structure comparable to the collar pores of Balano- glossus or the atrio-ccelomic funnels of Amphioxus is known in them.

The subneural gland, however, a glandular tube opening anteriorly near the mouth of the pharynx, appears to be identieal with the preoral larval gland of Amphioxus and the proboscis pore and gland of Balanoglossus. It is probably to be regarded as a nephridium, and has been compared by Julin and Van Beneden to the pituitary body of Craniata, with which it corresponds in position and de- velopment.

The gonads of Larvalia are developed in irregular masses on the walls of the ceelom, ovaries and testes in the same individual.

As above indicated, there is a small seetion of Urochorda which Classi- retain in adult life the tadpole-like form and the essential Verte- fication brate organs which are exhibited by the larve only of other Uro- of Uy.) chorda, and by a few only of these. This necessitates a primary chorda.

whieh it started ou its retrogressive eourse was probably a long way behind any living Craniate. There is no reason to suppose that this aneestor had a cranium, or that the muscular segments

Char- acters of Uro- chorda.

and segmental nerves in its eephalic region were fused and welded. - Amphioxus has probably lost, as compared with that ancestor, lateral eyes and otoeysts, nephridia, and, above all, size. The epipleural folds which now form oral hood, branchial opercula, and eoaleseed ventral fin were probably originally less developed lateral ridges, protecting the gill-slits anteriorly and posteriorly, serving by their undulations to assist in locomotion, whilst the median fin and its rays were large and functional.

One of the most eurious features in the structure of Amphioxus is its asymmetry. The anus is on the animal's right side, the nasal pit upon its left ; the myomeres on the two sides of the noto- chord do not eoineide ; and the right and left dorsal spinal nerves do not arise vis-a-vis to one another. There is no eonclusive reason for regarding this as an ancestral feature, although the early larval form is as curiously asymmetrical asthe adult. Amphioxus habitu- ally rests upon the sand, lying upon one side of the body, and it is possible that the distortion is related to this habit, as in the case of the Plenroneetid Fishes.

However we may estimate Amphioxus, we are not led by it, though its muscular metamerism is so well marked, a single step in the direetion of the Annelids, neither are we led direetly, it is trne, in the direetion of Nemertina in eonnexion with those points, as to relationship of notochord with proboseis sheath and nerve-cord with median dorsal nerve, insisted on by Hubrecht. But it will be seen below that, by the agreement of Amphioxus with Balanoglossus in the strueture of the perforatious of the pharynx, in the possession of collar pores, and in the preoral glandular body, we do arrive at an important connexion with Nemertine-like forms.

THE UROCHORDA.

Urochorda are Vertebrata which, with the exception of the group Larvalia (Appendicularia, Fritillaria, Otkopleura), have receded very far indeed

from the eharaeteristic Vertebrate structure, show- ing neither notochord nor nerve-eord, and gill-slits only of the most highly modified and aberrant form ; some, however (certain Ascidians), pass through a larval eondition in which these struc- tures are present in the normal form. It is necessary for the pur- poses of the present article to eonfine our attention to Larvalia and to the larval forms whieh retain ancestral characters. (For a de- scription of the whole group, see the article Tunrcata.) In Uro- chorda thus signalized the notochord never reaches forward into the anterior part of the body, but is confined to the tail (hence U7ro- chorda). The longitudinal museles of the region traversed by the notochord show traces of metameric segmentation, whieh are prob- ably survivals of a more complete development of myomeres in ancestral forms (76). There is no trace in Larvalia of fin rays or other skeletal structure. Corresponding to the opercular folds and epipleura of Craniata and Cephalochorda are ridges of the body-wall, which protect the pharyngeal gill-slits, and may give rise, as in Cephalochorda, to an enelosed atrial chamber with atriopore. The gill-slits in these larval forms are few in number (one or two pairs), but in many of the aberrant Urochorda (by far the majority of the group) they beeome excessively numerous and complicated in strueture, and are supported by a chitinous (7) framework, as in Cephalochorda. It has been suggested that the fenestrated structure of the pharyngeal wall in Tunicata does not represent a series of gill-slits, but a single pair of slits subdivided. This suggestion is worthy of further consideration.

The eerebro-spinal nerve-eord is tubular and presents itself as a dilated cerebral vesicle in front of the notochord, and as a narrower part running along the whole length of the notoehord.

Sense organs are present—a single eye with pigment and lens a single otocyst, and an olfaetory pit (Zarvalia). The mouth is

division of the braneh into two grades. Grade A.—LARVALIA (Appendicularia, Fritillaria, Otkopleura), Grade B.—SACCATA. Class I. —Ascidiw (Simplices, Sociales, Composite, Pyroso- mitdea).

Class II.—Salpiformia (Salpiidea, Doltoltidea).

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Fic. 9.—Fritillaria (Appendicularia) furcata, one of the Urochorda. (Original drawings.) A. Lateral surface view, showing habitual carriage of "body" at right angles to "tail." B. Organs of body as seen by transparency. C. Lateral view of body with tail in morphological position, showing organs by transparency. D. Surface view of animal from below to show apertures. 4, Otocyst in connexion with brain ; }, olfactory pit; c, dorsal hood ; d, nerve- tube passing from enlarged brain to caudal region, where it forms one true ganglion and aseries of minor enlargements, corresponding to the rudimentary ""myotomes " or ''myomeres" of the tail; e, stomach; f, ovary ; g, testis; fh, notochord (urochord); 7, nerve-tube or myelon in tail; k, fifth myomere of ge ee m, heart; 7, gill-slit; 0, endostyle or hypobranchial groove;

, Mouth.

Urochorda are so extremely aberrant, and show so little more Relatic

than a transient developmental indication of the essential Verte- of Uro brate organs, that we cannot hope to get much positive information chorda from them on the subject of Vertebrate ancestry. Only the minute Verte- Appendicularіz (Larvalia) retain the Vertebrate structure through brate — f life, and they are obviously, on aecount of their minute size, ex- ancest! tremely degenerate. It is possible to make hypotheses as to the

dorsal in position in the Aseidian tadpole, but subterminal in Lar- valia. The pharynx is wide, and is followed by a narrow ceso- phagus, stomach, and intestine, which does not open ventrally but turns upwards to the anus. The Larvalia have a rudimentary heart and no vascular system,—a fact connected with their diminu-

har- ters of 'emi- wrda.

greater or less elaboration of the ancestors of Urochorda, and to maintain even that their ancestry had reached as high a condition as that shown by Craniata ; on the other hand, it does not seem likely that their point of divergence from the main ancestral line leading to Craniata was lower

than, or cven so low as, that at which Amphioxus branched off. The differentiation of trunk and tail by the limitation of the notochord anteriorly is a nearer ap- roach to Craniate structure than that shown by Amphioxus, whilst the definite development of a brain of eonsiderable relative size places Urochorda nearer to the Craniates than is Amphioxus. The metameric myomeres so strongly developed in this last are not absent in Urochorda, as is often maintained, but exist in a rudimentary form, indicating that they had once a fuller develop- ment. THe

HEMICHORDA.

Hemichorda comprise the single genus Balanoglossus—formerly classified by Gegenbaur as Enteropneusta, an independent phylum of the animal kingdom. They are Vertebrata of worm-like form,

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Fic. 10.—Balanoglossus, anatomy and development. A. Balanoglossus kowalewskii, Bateson; from the coast of Virginia, U.S.; natural size; a, proboscis; 6, collar; ¢, perforate region ; d, flattened digest-

(Modified from Bateson.)

ive region ; e, cylindrical hind region. B. Diagram of dorsal view, showing certain organs as though the body-wall were transparent. C. Diagram of a vertical antero-posterior section. D. Diagram of a dorsal view to show vessels and nerves by transparency. E. Diagram of a transverse section through the collar. F. Larva of B. kowalewskii; diagram of horizontal sec- tion. G. Vertical longitudinal section of an older larva of thesame. Letter- ing B-G:—a, proboscis; b, collar; f, nerve-tunic of proboscis; g, proboscis pore (ciliated orifice) ; h, notochord (limited to a small tract of modified tissue derived from preoral extension of alimentary canal); 7, dorsal nerve-plate ; k, collar-pore (right and left), opening to exterior from collar ccelom just be- heath the collar; 7, continuation of dorsal nerve-plate as a nerve-cord ; m, pharyngeal perforations (gill-slits) ; »', ccelom of proboscis (anterior azygos Primitive coelomic pouch); »2, collar coelom (right and left middle coelomic pouches of embryo); 3, body ecelom (right and left posterior coelomic pouches of embryo); 0, mouth; p, ventral nerve-tunic of body-wall; g, proboscis gland; r, strands connecting dorsal

nerve-plate with outer wall of collar; s, cavity of pharynx in front of perforate region ; ¢, dilated part (heart) of dorsal Vessel within proboscis-gland ; ¢', dorsal vessel ; u, blood-vessels of body-wall Im section ; w, paired nerves of collar region in transverse section; #, peri-

mal coelom, surrounding dorsal vessel in collar region ; y, digestive region of

t Gn embryo); z, mesoblast. H. Larva of another species of Balanoglossus,

Own as the Tornaria larva of Johann Miller, and resembling an Echinoderm larva. aa, preoral ciliated band of Tornaria ; bb, post-oral ditto ; ec, terminal ditto; dd, mouth; ee, apical plate and sense organ; ff, canal system and pore; 99, gut; hh, anus.

elongate and somewhat flattened from above downwards. In front of the mouth is a long cylindrical proboscis, and behind it a collar, the free margin of which is turned backwards, and corresponds to

the opercular epipleural folds of Cephalochorda and Craniata. This agreement is supported by the existence of a pair. of collar pores opening into the ecelom of the collar, as the " brown funnels" of Amphioxus open into the epipleural ccelom of that animal. A proboscis pore, opening on the left side into the preoral ccelom of the proboscis (paired in B. kupffert), is exactly representative of the similarly placed pore which in the young Amphioxus (according to Hatschek, 75) leads into the tubular organ derived from the left ceelomic chamber of the preoral lobe of that animal. The whole surface of the body is ciliated, as in Nemertines and Echinoderms, and asin no other Vertcbrates. Following the collar is a perforated region of the body,—gill-slits opening from the outer surface into the pharynx. In the young form there is for a time, as in Ap-pendicular iz and the Ascidian tadpole, only one pair of gill-slits, but they subsequently increase in number as the animal grows in length. They resemble in form and structure those of Amphi- oxus. The notochord (/ in

fig. 10) arises at the anterior end of the hypoblast in the young, and grows forward, forming a support for the base of the proboscis. It is limited to this very small region. The cerebro-spinal nerve-cord originates by a delamination of a solid cord of epiblast in the mid-dorsal line of the middle third of the body ; then by invagination of its two ends it extends as a tube both anteriorly and posteriorly. A general network of nerve-fibres (and cells?) exists beneath the epidermis all over the body. The blood-system is peculiar, consisting of an anterior heart and a dorsal and ventral vessel; these are united by a plexus of sub- eutaneous vessels. The musculature of the body-wall is not broken into suceessive myomeres; but, on the other hand, the gonads (ovaries or testes) are sac-like, and, as in Amphioxus, are repeated in a series throughout a great length of the body. In the pharyn- geal region the gonad sacs agree in number with the gill-slits, There are no nephridia (unless proboscis pore and collar pores arc to be so regarded); but the conneetive-tissue cells of the body-cavity are active as excreting agents, as in Echinoderms and in Urochorda, and a large glandular organ in the proboscis attached to the end of the notochord appears to have to do with this function. Not the least remarkable fact about Hemichorda is the nature of their larve. No other Vertebrata present larval forms which indicate the nature of the early ancestral history in what we may call pre-chordal times ; however interesting the Ascidian larva, or the young Amphioxus, and the embryo dog-fish, they do not take us out ofthe Vertebrate area. Some species of Balanoglossus (? B. minutus), however, pass through a banded ciliate larval condition, which was known as Tornaria, and was considered to be an Echinoderm larva allied to Bipinnaria, before its relation to Balanoglossus was discovered. It is not possible to view the Tornaria larva of Balano- glossus as otherwise than identical with Echinoderm larva, and it results that Balanoglossus and the Echinoderms have remote genetic affinities of a special kind.

No classification of Hemichorda is possible beyond an enumcra-. tion of the species :— . Balanoglossus clavigerus (Della Chiaje), Naples. . B. minutus Kowalewsky), Fs . B. kowalewskii (Al. Agassiz), east coast, United States. . B. brooksti (Bateson), . B. salmoneus (Giard), Brittany. . P. robinti (Giard), ve It seems that in Balanoglossus we at though no doubt specialized for its and possibly to some extent degenerate, extent

fallen from an ancestral emin- | dermis, the long Worm-like form, and ~ segmentation of the body-muscles lead Nemertines. The great pro- may well be compared to the larly placed in the Nemertines. The collar is the first commencement of a structure destined to as- sume great import- ance in Cephalo- chorda and Crant- ata, and perhaps pro- tective of a single gill- slit in Balanoglossus before the number of those aper- tures had been extended. Bor- towing, as we may, the nephridia from the Nemertines, and the lateral in addition to the dorsal nerve, we find that Balanoglossus gives the most hopeful hypothetical solution of the pedigree of Vertebrates. Space has not permitted us to go so fully into pros and : ; cons as the speculative nature of the subject requires; but we give the final conclusion to which our consideration of the structure of the four great branches of the Vertebrata leads in the form of the accompanying genealogical tree.

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Species of Hemi- chorda.

Relations of Hemi-

yet has not to any large chorda The eiliated epi- to Verte- the complete absence of brate

us to forms like the ancestry.

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VERTUE, Guorce (1684-1756), engraver and anti- quary, was born in St Martin’s-in-the-Fields, London, in 1684, At the age of thirteen he was apprenticed to an heraldic engraver, a Frenchman, who failed in three or four years. Vertue then studied drawing at home, and afterwards worked for seven years as an engraver under Michael Vandergucht. He was patronized by Sir Godfrey Kneller, and was one of the first members of the Academy of Painting which that artist instituted in 1711. His plate of Archbishop Tillotson, after Kneller, commissioned by Lord Somers, established his reputation as an engraver; and he was soon in an excellent practice, engraving por- traits after Dahl, Richardson, Jervas, and Gibson. In portraiture alone he executed over five hundred plates. In 1717 he was appointed engraver to the Society of Antiquaries, and his burin was employed upon many interesting statues, tombs, portraits and other subjects of an antiquarian nature. He died on the 24th of July 1756, and was buried in the cloisters of Westminster Abbey.

From the year 1713 Vertue had been indefatigable in his re- searches on all inatters connected with the history of British art, and had accumulated about forty volumes of memoranda on the subject. These were purchased by Horace Walpole, and form the basis of that author’s Anecedotes of Painting in England, where will be found an account of Vertue’s life and a catalogue of his en- gravings. Vertue’s own literary works include On Holbein and Gerard’s Pietwres (1740) ; Medals, Coins, Great Seals,

Impressions, Srom the Hlaboratc Works of Thomas Simon (1758) ; Catalogue and Description of King Charles the First's Capital Collection of Pictures, Limnings, Statues, &c. (1757) ; Catalogue of the Collection of Pietures belonging to King James II., to whieh is added a Catalogue of Pictures and Drawings in the Closet of Queen Caroline (1758) ; Catalogue of the Curious Collection of Pictures of George Villiers, Duke of Buckingham (1758) ; Deseription of the Works of that Ingenious Delineator and Engraver, W. Hollar (1745).

VERUS, M. Auretius. See AURELIUS,Vol. ili. pp. 86-87.

VERVIERS, a town of Belgium, in the province of Liége, is situated on the Vesdre, 154 miles by rail east by south from Liége and 19 miles south-west from Aix-la- Chapelle. It is divided into an upper and a lower town, but has no striking architectural features. The staple commodity is cloth, which is manufactured here and in the immediate environs to the value of £3,200,000 annually. Other manufactures are soap, chemicals, con-fectionery, and machinery; dyeing, tanning, and iron and copper founding are also carried on. The town is a modern one; its manufacturing prosperity, the beginning of which dates from the 18th century, is partly attributed to the waters of the Vesdre, which are said to be peculiarly well adapted to the purposes of the dyer. The population in 1876 was 37,828.

VESALIUS, Anpreas (1514-1564). See ANATOMY, vol. i. pp. 807-8 ; also VascuLar SysrEM, p. 95 above.

VESICAL DISEASES. The urinary bladder is the temporary reservoir of the renal secretion, and as such contains the urine for longer or shorter periods. In recent years diseases of the bladder have come more than formerly within the scope of operative surgery, owing especially to great advances in the methods of examining the inner wall of the bladder both by sight and touch,— sight in virtue of the endoscope, an instrument which Phen intro- duced into the bladder enables a visual examination of the interior to be made; and by touch, as surgeons do not now hesitate to make incisions into the bladder, either

Hubrecht, "Nerve-Tunic of Nemertines," in Quart. Jowrn. Micr. Sci., vol, xx., 1880; (72) and (73) Id., "Comparison of Nemertines and Vertebrates," in Quart. Journ. Micr, Sci., vol. xxiii., 1883, and vol. xxvii., 1887; (74) Lankester (E. Ray), "Brown Funnels of Amphiozus," in Quart. Journ. Micr. Sci., vol. xv. p. 257, 1875; (z5) Hatschek, "Subneural Gland of Amphioxvus and Olfactory Pit," in Zool. Anzeiger, p. 517, 1884; (76) Lankester (E. Ray), " Vertebration of the Tail of Appendicularia," in Quart. Journ. Micr. Science, vol. xxii., 1882; (77) Kowalewsky, " Later Researches on Ascidian Development," in Archiy Siir mikroskopische Anatomie, vol. Vii., 1871; (78) Id., "Later Researches on Amphioxus Development," in Archiv fiir mikroskopische Anatomie, vol. xiii.,

1876. (E. R.L.)

from the perineum or suprapubically, for purely diagnostic purposes, Further, more careful and improved chemical and microscopical examination of the urine enables the surgeon to judge better than formerly what the condition of the bladder is. Diseases of the bladder may be con- veniently divided into two groups,—(1) those which involve recognizable organic structural change, and (2) those which do not necessarily involve obvious organic structural change (Sir H. Thompson). The more import- ant diseases of the first class are inflammation or cystitis, calculi, and neoplastic growths ; but there are also others of less importance, such as hypertrophy, dilatation, and tuberculosis. The diseases of the second group in which no organic structural change can be recognized in the bladder-wall are numerous. In many cases, however, they can scarcely be considered as diseases of the bladder pure and simple, but rather as concomitants or results of other diseases. Moreover, in many cases they give rise sooner or later to diseases which are accompanied by structural changes. Thus "irritable bladder," although at first it may be independent of any such change, soon gives rise to inflammation of the bladder-wall, or cystitis; and many surgeons describe it from the beginning as simple cystitis, while cystitis as described in this article they call catarrhal cystitis. In this division, however, we may describe para- lysis, atony, incontinence of urine, stammering micturition, and retention of urine.

Cystitis. Inflammation of the bladder may be acute or chronic. Acute It is due in most cases to the presence of irritating matters in the cystiti

urine, produced by decomposition of the urine itself or by morbid admixture. The inflammation may result also from traumatic injury, from cold, or in cases of gonorrhea from extension of the inflammation along the urethra into the bladder (through continuity of tissue). Although frequently ushered in by rigors, the chief symptoms of acute inflammation are local: there is pain over the region of the bladder and frequent micturition. The desire to pass water is often incontrollable, even before more than one or two ounces of urine have been secreted. The urine is much changed in its character, being cloudy from the presence of epithelial scales, pus, mucus cells, and often blood. At this stage also it may be ammoniacal, though this usually comes on later, and is probably caused by septic decomposition of the urine due to the entrance or introduction of organisms into the bladder. The quantity of blood varies, but may be so large as to give the urine a distinct reddish tinge. As a rule, the mucous membrane at the neck of the bladder is the first part to become inflamed, but the whole of the mucous membrane may be affected ; resolution, however, usually

takes place before more than a portion has been attacked. Chronic Chronid cystitis is one of the most common affections of the bladder, and cystitis:

its causes are very various. It sometimes remains after an acute attack has passed off, but more commonly it results from long- continued irritation, such as may be produced by a urinary calculus in or by atony of the bladder. 'The symptoms are not so severe as in acute cystitis: the urine contains more mucus, but less pus and blood, and there is much less tendency to frequent micturition, the irritability of the bladder being greatly diminished. Frequently very large i are of mucus are secreted, and the condition is then termed "catarrh of the bladder." Chronic inflammation is not in itself dangerous ; but the patient, so long as it remains, is liable to an attack of acute cystitis, which, superadded to the pre-existing condition of the bladder, may be very serious. An increase in

the fibrous elements of the coats of the ae and hypertrophy of the muscular fibres are a common result of chronic cystitis.

The treatment in both varieties of the disease consists in giving Treat-

rest to the inflamed part and in alleviating the pain.

a quarter of an hour at a time ; and, if the pain be very severe, hot fomentations with tincture of opium should be applied to the peri- neum or hypogastrium, or a hot douche may be used per rectum.

Hot sitz- ment i) baths may be used two or three times daily for ten minutes or cystitis

| | {

— Caleuli.

WHESLEADIEDISEASES

Diluent drinks are given, and tincture of hyoscyamus may be prescribed, as it has a very soothing influence. It may be necessary to give morphia, but generally the pain can be allayed without its use., In chronic cystitis the treatment depends very much on the cause, which must if possible be removed. Thus, if the cystitis is due toa calculus in the bladder, the treatment is to remove the calculus (see below). Very often, however, special remedics are employed to relieve the inflammatory condition, and one of the best is washing out the bladdcr. This is a simple operation, based on the principle of siphon action with a head of water, and is carried out as follows. A catheter is introduced through the urethra into the bladder, and to it the stem of a T-shaped tube is fixed ; to each end of the horizontal part a picce of rubber tnbing is attached, one piece terminating in a vessel which contains an aseptic warm lotion and is placed at a higher level than the bladder, while the other is led into a receptacle placed lower than the bladder. Six or eight ounces of the lotion are allowed to flow into the bladder ; then the flow is checked, and the fluid passes out from the bladder through the other tube. Each tube should have a stop-cock, so that the surgcon can open or close it as he

desires. Occasionally pladder drainage is resorted to, and is carried out on the principle of siphon action.! Internal remedies have to be administered, one of the most valuable being benzoate of soda. The benzoate in its passage through the blood is changed into hippuric acid, and thus tends to render the urine less alkaline. Attention to the diet of the patient is of great importance in both acute and chronic cystitis ; it should be very light, easily digested, and nutritious. Diluents are often of much value, lessening the irritability of the bladder. All wines and stimulants should be avoided.

Caleuli.—Important information, as we have already said, is derived both by the surgeon and physician from a careful examina- tion of the urine, whether this be done chemically or microscopic- ally. Not infrequently on such examination crystals, varying in their chemical and physical characters, are found, and if these be in large amount distinct urinary deposits are got from the urine after it has been kept in a vessel fora time. The cause producing thesc crystals or their presence alone may give rise to disease, as, for instance, oxaluria, a condition in which, in addition to other symptoms, we find oxalate of lime crystals present in the urine. We have here to deal, however, with more than the mere presence of a few crystals disseminated in the urine, viz., with those con- ditions in which an amalgamation of crystals has occurred, giving rise to a concretion of such deposits into a mass, forming a cal- ctlus or stone. When such concretions are so small that they can be passed with the urine through the urethra they are known as gravel ; but when they are prevented by their size from passing along the urethra they are termed calewli, and the patient is said to suffer from stone or calculus. Calculus of the bladder constitutes a most formidable and important disease, and its treatment, either medical or surgical, has probably attracted more attention than that of almost any other disease. Urinary calculi occur in all parts of the world and affect both sexes. They are much more common, however, in some regions than in others. Thus, in India they are very common, while in Great Britain, although many persons suffcr from calculus in Norfolk and the north of Scotland, very few cases occur among people who live on the western side of the island. From the above facts many have attributed the formation of ealeuli to special climatic or geological influences, but it is probable that diet acts as a chief factor in their production. Calculi are

much rarer in females than in males, and this may perhaps be explained by the shortness and more vertical position of the urethra, so that the contents of the bladder can be more easily evacuated, and by the fact that the habits of the female with regard to diet are more regular than those of the male. The cause of the formation of a calculus may be (a) a tendency in the kidneys to precipitate salts to an abnormal degree, the urine being concentrated and small in amount, or (b) some abnormal state of the urine in the bladder, or (c) the presence of a foreign body in the bladder. Probably the last isthe most common causc ; for very frequently, when a section of

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sided. Some stones are hard ; others are soft. In size and weight they vary very much: we find them as small as a pea and as large as a child's head. The largest stone found in the bladder of a human being is in the Royal College of Surgeons' museum of Eng- land ; and in the Edinburgh university surgical museum there is a stone of very large size. The weight depends not only on the size but also on the composition, and varies from a few grains to the heaviest on record, which weighed 6 tb 8 oz.

Seven different kinds of calculi are described, but only three are Varieties Vesical calculi are classified according to their of cal- composition, and five different forms are very generally recognized ; culi.

very common.

but layers of different salts may be found in the same calculus. (1) The first class embraces wric acid and uratic calculi. Pure uric acid stones are small and hard, and usually vary in colour from a reddish orange to a brown tint. They are frequently rough, but may be smooth. Uratic stones are seldom pure. They frequently form the nucleus of calculi the outer layers of which are phosphatic. (2) Phosphatic and calcareous calculi consist chiefly of calcium phosphate ; stones formed purely of the carbonate of calcium are rare. Thestones of this group are white, soft, and friable, especially those composed of phosphate of lime. They frequently attain to a large size, and most commonly occur in persons whose general health has run down to a low ebb. (8) Oxalate of lime

calculi are excess- ively hard and densc, of a dark brown colour and tuberculated or spinous on their surface; hence they are often called mulberry calculi. This is a form which gives rise to great pain and irrita- tion, so that they are generally removed before they become very large. (4) Cystine and (5) xanthin calculi are rare.

When a stone is present in the bladder, whatever its nature, it Diagnos- acts similarly to any other foreign body, and usually gives rise to a ing for The patient complains of pain in the calculi.

series of definite symptoms. end of the penis at the completion of micturition. Rough or jolting movements give rise to pain in the region of the bladder. Occasionally there is a sudden stoppage of the flow of urinc, which is overcome by a change in position. He suffers from frequency of micturition, just as in any other irritable condition of the bladder. If, in addition to these symptoms, the patient states that at varying intervals he has passed " gravel," the surgeon is almost certain that a calculus is present ; but cven with all these symp- toms there is only one certain diagnostic sign of the presence of a stone, and that is to feel it. This is done by "sounding" the bladder with a sound,—an instrument resembling a bougie, but made of steel and with a shorter curve. It can be easily turned from side to side within the bladder, the whole of which must be systematically examined, and not only enables the surgeon to ascertain the presence of a stone but, when judiciously used, assists him in determining the size, mobility, situation, nnmber, and hard- ness of the calculi. This additional information is of the utmost importance in guiding the surgeon to the best method of treatment. In the child the stone can be occasionally felt by passing one finger into the rectum, laying the other hand above the pubes, and pressing ; the stone lies between the two hands. In other cases the size can be gauged with the lithotrite, by observing the distance to which the blades are separated when the stone is grasped.

The treatment of calculi by other means than operative surgery Treat- has been found to be of very little value. Attempts have been made ment.

to dissolve calculi by internal remedies or by the injection of chemical agents into the bladder; but, although many such methods have been

used, and have for a time in many cases been apparently successful, they have without exception been found in the long run to be practically worthless for removing calculi once actually formed. Further, the improvements in opera- tive means for the removal of calculi have advanced to such a degree that it is probably better fora patient, in our present state of know- ledge, to be treated by some one of them rather than undergo any attempt at their removal by other means. Nevertheless much can be done towards preventing the formation of calculi in those who have a tendency to their formation, by attention to diet and by the intcrnal administration of drugs.

Urinary calculi are removed by one of three methods, —(.) litho- Removal tomy or cutting for stone, (ii.) lithotrity or crushing the stone, of calculi and (iii.) litholapaxy, a modification of lithotrity, and the method by opera- now most commonly adopted. In about nine cases out of every tion. ten the stone may be crushed; but occasionally there are some circumstances which rendcr the operation of lithotomy preferable to lithotrity. Thus, where the urcthra is constricted, as in organic stricture or enlarged prostate, or where the stone is very large or extremely hard, it is right to cut for the stone instcad of making any attempt to crush it. Again, in children lithotomy is safer than lithotrity. ;

Lithotomy.—Cutting for stonc has been very long known and Litho- practised by surgeons; but up to the commencement of the 19th tomy. century it was performed only by a few men, who, bolder than their contemporaries, had specially worked at it and had attained celebrity as skilful lithotomists. Patients went very long distances to be operated on by them, and certain of the older surgcons, as Cheselden, performed a large number of operations with very suc-

a calculus is made, it is found that some form of foreign body has acted as the nucleus round which urinary deposits have become agglutinated. Such foreign bodies may exist in the bladder or may be introduced from without. Occasionally clots of blood have been found as the nucleus ; but one of the commonest is a small uric acid stone, which, having been formed in the kidney, has passed down the ureter into the bladder and there been surrounded by deposits of phosphate of lime, &c. Calculi vary

much in their physical characters and chemical constitution. Most frequently only a single stone is present ; but very large numbers have been Temoved from one bladder. The shape of the stone depends on whether it be movable or fixed, and whether there be only one or more in the bladder. A single stone is usually spherical or ovoid, but may be smooth or tuberculated or spinous, this last point being determined chiefly by the composition of the stone ; when there are a number of stones present they are usually facetcd or many-

fee aatiia cate hen aera eee ee 1 See "The Bladder Drainage," by Prof. Chiene, in Edin. Med. Journ., vol. XXVL, part i., 1880-81.

which go on favourably the patients are much sooner able to per- form their ordinary duties. Fatal terminations, however, do now and again occur, sometimes as a result of injury to the bladder-wall] setting up inflammation, which extends to the kidneys, sometimes from suppression of urine. Those cases in which there has been a fatal result most frequently have been complicated with old-stand- ing kidney disease.

cessful results. The operation is usually performed by an incision from the perineum ; but sometimes it is necessary to adopt the high or suprapubic incision. The former method is termed perineal lithotomy, and, as the incision most commonly made by the surgeon is a lateral one, it is ordinarily spoken of as lateral lithotomy. Lateral lithotomy consists of two distinct stages,—(i.) entting into the bladder and (ii.) removing the stone. The patient is placed on a table and brought under the influence ofan anesthetic. A grooved staff is passed along the urethra into the bladder to act as a guide for the knife, and the patient is then 'tied up in the lithotomy position." An assistant holds the staff in the middle line of the body and the surgeon makes an incision an inch and a half in length deeply into the perinenm, until the knife enters the groove of the staff, and then passes it along the groove, thus making an opening through the bladder-wall. 'The bladder having been thus cut into, a pair of lithotomy forceps is introduced by the perineal wound, and the stone is caught and removed by gently withdrawing the forceps by a rotatory movement. A lithotomy tube is now passed through the wound into the bladder and fixed in position ; the patient is untied and carried back to bed. The operation of litho- ton1y is not a difficult one to perform, nor is it in itself dangerous ; sometimes, however, there is a fatal termination, due commonly to one or other of the following causes—hxmorrhage (either primary or secondary), organic disease of the urinary organs, or blood poisoning. Hemorrhage may be the result of unskilful operating, the incision having been incorrectly made; or one of the larger vessels in this neighbourhood may have had an abnormal distribu- tion, so that, lying in the line of the incision, it was divided and gave rise to the bleeding which proved fatal. If the stone bea very large one, or the perineum very narrow, it is necessary to perform the suprapubic operation. Litho- Litholapaxy.—Lithotrity too can be best described if considered lapaxy. under two

headings,—(i.) the crushing of the stone and (ii.) the removal of the detritus. The two stages are now carried out at "fone sitting," instead of allowing an interval to elapse between them, as was formerly the practice, and the term litholapaxy is used to designate this method. The patient having been anesthetized, the urethra is dilated by the passage of large-sized bougies. Then a few ounces of a warm neutral aseptic fluid are injected into the bladder, and the crushing instrument, the lithotrite, is passed along the urethra into the bladder. The lithotrite has two blades, —a "male" and a "female,'—the latter fenestrated, the former solid with its surface notched ; these blades can be approximated both by a sliding and a screwing movement. The sliding movement is used to grasp the stone; but when the stone is fixed between the blades the screw action is used, as it enables great pressure to be applied evenly, gradually, and continuously. The lithotrite is made of very tough steel, so that even very hard stones may be crushed without any danger of the instrument breaking. It is passed into the bladder with its blades closed; they are then opened and an attempt made to grasp the stone. The stone having been fixed between the blades by the sliding movement, it is then crushed with the screw action, great care being taken not to catch the bladder-wall with the lithotrite. This danger is avoided by raising the point of the lithotrite immediately after grasping the stone and before crushing is begun. The stone breaks into two or more pieces, and these fragments must next be caught and crushed one by one, until they are all reduced to a very small size. If the stone be large and hard, half an hour or longer may be required to crush it sufficiently. When the surgeon fails to catch any more large portions of stone, the presumption is that it has been broken up into small enough pieces ; the lithotrite is then withdtawn and the second stage of the operation must be begun. This consists in removing the detritus by means of an aspirator, the best form of which is that invented and used by Sir Henry Thompson. It consists of an elastic bag connected with a trap. into which fragments of stone will fall and not pass out again on the instrument being used at later periods in the operation. A large catheter, with the eye very near the distal end of the short curve, is passed into the bladder; the aspirator, full of an aseptic fluid, is attached to the catheter, and a few ounces of the fluid are expressed from the aspirator into the bladder by squeezing the india-rubber bag. When the pressure is taken off the bag, it dilates and draws by suction the fluid out of the

bladder, and with it some of the detritus of the crushed stone, which falls into the trap, and is not expelled on the fluid being re-introduced into the bladder, This manceuvre is repeated again and again, until all the fragments and detritus of the stone have been removed. After the operation the patient somctimes suffers from pain and discomfort ; but these are not at all severe unless some fragments have been left in the bladder. If the pain be severe, it can very generally be relieved by hot fomentations or a sitz-bath. The patient must be kept in bed for some days after the operation, and in cases where the stone has been large and the bladder irritable the surgeon should insist on him remaining in bed for at least a week. Judging by statistics, the dangers of the operation, if it be gone about with care, are not nearly so great as those of lithotomy, and certainly in those cases

Neoplastic Growths,—The commonest neoplasms found in the Neo. bladder are vascular fibromata (often called villous cancers) and plastic | epitheliomata ; morc rarely malignant growths occur. The symptoms growths, ‘ produced by tumours vary; but they may cause obstruction to the | flow of urine and chronic cystitis, with more or less severe pain. f The most important signs are the passage of blood and the presence of tumour cells in the urine. Frequently, however, microscopical examination of the urine fails to discover the presence of tumour i cells, The passage of blood may be very intermittent and small in amount ; but this intermittent bleeding is one of the most character- istic signs of the existence of a tumour. When the presence of a tumour is suspected, the sound is passed and an attempt made to feel it. Sometimes it can be felt, but more often doubt remains as to whether a tumour does really exist or not. In such cases the endoscope may be had recourse to; but the information derived from its use is not always satisfactory, and a diagnostic incision must | then be made into the bladder to verify the diagnosis. When such | a diagnostic incision is made, the surgeon must be prepared to remove the tumour, should one be present and capable of removal. Usnally the diagnostic incision is perineal ; but, if the bladder is ! capacious, or if the perineum is deep and narrow, a more complete examination can be made by a suprapubic opening. The treat- ‘ ment of neoplasms is, as a rule, unsatisfactory. Ifthe growth be q pedunculated, it can be removed without great risk to the patient ; more commonly,

however, the tumour cannot be removed, and then | only palliative measures can be adopted, such as allaying the pain i and checking the hemorrhage. Great relief is often given by wash- } ing out the bladder; but this must be done with very great care, a soft flexible catheter being used, if it can be passed into the bladder, in preference to a rigid one.

Hypertrophy and Dilatation.—When there is long- continued Hyper- obstruction to the flow of urine, as in stricture of the urcthra, en- trophy larged prostate, &c., the bladder-wall becomes much thickened, the and dila- muscular fibres increasing both in size and number ; the interstitial tation. fibrous tissue is also inereased. The wall on its inner surface becomes rugose, and the condition is technically known as hypertrophy. | Hypertrophy may be accompanied by dilatation of the bladder,

a condition which the bladder may assume when from any cause the evacuation of its contents is interfered with for a length of time.

Paralysis of the bladder is a want of contractile power in the Paralysis muscular fibres of the bladder-wall. It may result from injuries of whereby the spinal cord is lacerated or pressed upon at or below bladder. the micturitory centre situated in the lumbar region, The result may be either retention or incontinence of urine; sometimes there is at first retention, which later on is followed by incontinence, while in other cases incontinence results in the first place and then reten- tion. Paralysis is also produced in certain nervous diseases, as in locomotor ataxia, and in various cerebral lesions, as in apoplexy.

Atony of the bladder differs from paralysis in being only a Atony of | paresis or partial paralysis. It is due to a want of tone in the bladder. | muscular fibres, and is most frequently the result of habitual over- distension of the bladder, such as may occur in cases of enlarge- ment of the prostate. The patient is unable to empty the bladder, and the condition of atony gets increasingly worse.

In both paralysis and atony the indication is to carefully prevent over- distension of the bladder by the urine being retained too long, and at the same time to treat by appropriate means the cause which has produced or is keeping up the condition.

Incontinence of wrine may occur in the adult or in the child, but Incon- is due to widely different causes in the two cases. In the child it tinence may be simply a bad habit, the child not having been properly of urine. | trained ; but more frequently there seems to be a want of control in the micturitory centre, so that the child passes its water un- wittingly, especially during the night. In adults it is not so much a condition of incontinence in the sense of water being passed against the will, but is rather due to a difficulty in retaining the urine in consequence generally of an over-full bladder,—the water which passes being the overfiow from a too full reservoir. It is usually cansed by an obstruction external to the bladder, e.9., enlarged prostate or stricture of the urethra. Occasionally the presence of a calculus may produce the condition. The treatment differs in the case of the child and of the adult. In the child an attempt must be made to improve the tone of the micturitory centre by the use of belladonna or strychnia internally and of a blister or faradism externally over the lumbar region, and every effort should be made to train the child to pass its water at stated times and regular intervals, In the adult the cause which produces the over- distension must be removed if possible ; but as a rule the patient

has to be provided with a catheter, which he can pass into his bladder and thus thoroughly empty it before it has filled to over-

3tam- mering micturi- tion.

- Reten- tion of urine.

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flowing. A soft flexible catheter should be given in preference to a rigid or semi-rigid one. The best form is the red-rubber catheter.

The condition termed by Sir James Paget stammering micturition is frequently seen in young men, morerarely in children and adults. This stammering of the nrinary apparatus is analogous to speech stammering, and occurs chiefly in those who are nervous and easily putout. It would seem to be due to incoordination of the sphincter and detrusor of the bladder, the former not relaxing synchronously with the contraction of

the detrusor, or vice versa, and is sometimes caused by external irritation, such as preputial adhesions. Occa- sionally not a drop of urine can be passed, or a little passes and then a sudden stoppage of the flow occurs, and the more the patient strains the worse lie becomes, until at last there is complete retention of urine. Very usually such errors in micturition can be cured by the removal of irritating causes, if they exist, and in these cases, as well as in those in which no such cause can be discovered, great care should be taken to avoid those difficulties which have given rise to the patient's worst failures. If at any time he should fail to perform the act of micturition, he ought not to strain, but should quietly wait for a little before making any further effort, after which he will often succeed. Regularity in the times of making water is also of much importance.

Retention of urine cannot be called a disease of the bladder, but may be the cause of, or result from, bladder disease. It may occur in paralysis of the bladder, or in conditions where the patient is suffering from an illness which blunts the nervous sensibility, ¢.g., typhoid fever. It is, however, much more commonly due to ob- struction in some part of the urinary passage anterior to the bladder, as in stricture of the urethra or enlargement of the prostate. The patient can usually tell when he last passed any urine; but, even when no such information can be obtained, there are signs which lead the surgeon to a correct diagnosis. Thus, the bladder if much distended can be felt as a rounded swelling above the pubes, and it may even have passed to the level of the umbilicus. Percussion of the hypogastrium gives a dull note. When retention of urine occurs and the bladder is over-distended, it is necessary to evacuate its contents as soon as possible. If there is no obstruction to the flow of urine, the retention being due merely to atony or paralysis of the bladder, a flexible soft catheter is passed into the bladder and the water drawn off. But, when there is an obstruction which cannot be overconie, aspiration of the bladder has to be resorted to, the needle of the aspirator being pushed through the abdominal wall into the bladder. The point of puncture in the abdominal wall is in the middle line just above the symphysis pubis. The bladder has been aspirated in this way very many times in the Same person without any evil result. But in all cases strict anti- septic precautions must be adopted. (J. C.)

VESOUL, a town of France, chef-lieu of the department of Haute-Sadne, is situated 147 miles south-east of Paris by the railway to Miilhausen, at the junction of branch lines to Gray and Besancon, on the river Durgeon, which here receives two tributaries. The isolated conical hill of La Motte (1483 feet), which shelters the town on the north, affords fine views of the Jura and the Vosges Mountains. On the summit is a votive chapel (1854). The chief features of Vesoul are the palace of justice, the church of St George with a fine altar, the promenade with a monu- ment to the gardes mobiles of the department who fell at Belfort in 1870 and 1871, a library of 20,000 volumes, and an archeological museum. The population in 1881 was 9431 (commune 9553), the corresponding figures for 1886 being 9602 and 9733.

Vesoul, which is first mentioned in the 10th century, was origin- ally a fief of the church of Besancon. It afterwards passed to the house of Burgundy, and was fortified. The castle was destroyed mm the 17th century. The town suffered much during the Wars of Religion and the Thirty Years' War. Vesoul belonged temporarily to France after the death of Charles the Bold, was returned to the empire when Charles VIII. broke off his marriage with the daughter of the emperor Maximilian, and again became part of France under Louis XIV. after the peace of Nimeguen.

VESPASIAN. Trrus Fravius VESPASIANUS, the tenth of the twelve Cexsars, was Roman emperor from 70 to 79 Im succession to Vitellius. He was born in the year 9, in the Sabine country near Reate. His father was a tax- collector and money-lender on a small scale ; his mother, however, was a lady of pretty good family, with a brother a senator. She encouraged her son to look up in the world. After having served with the army in Thrace and been a questor in Crete and Cyrene, Vespasian rose to be

edile and pretor, having meanwhile taken to wife the daughter of a Roman knight, Flavia Domitilla, by whom he had two sons, Titus and Domitian, both of whom suc- ceeded him. Having already served in Germany, in the years 43 and 44, in the reign of Claudius, he had the com- mand of a legion in Britain under Aulus Plautius, and saw much hard fighting, reducing to subjection the Isle of Wight and penetrating

very possibly into Devonshire and the neighbourhood of Exeter. He proved himself a thoroughly able soldier, while in his habits he was simple and frugal; in short, says Tacitus (Hist., ii. 5), "but for his avarice he was equal to the generals of old days." In 51 he was for a brief space consul; soon afterwards he went as governor to Africa, where, according to Tacitus (ii. 97), his rule was "infamous and odious," according to Suetonius (Vesp., 4), "upright and highly honourable," though he admits that there was a serious local disturbance in which the governor was pelted with turnips. On leaving Africa there was a story (Suet., Vesp., 4) that he got his livelihood as a dealer of sonie sort,! which, if true, shows that he did not turn his provincial governorship to profit. He went with Nero's suite to Greece, and in 67 was ap- pointed to conduct the war in Judea, which was threaten- ing general commotion throughout the East, owing to a widely spread notion in those parts that from Juda were to come the future rulers of the world. Vespasian, who had a strong vein of superstition, was made to believe that he was himself to fulfil this expectation, and all manner of omens and oracles and portents were applied to him. He also found encouragement in Mucianus, the governor of Syria; and he had a soldiery thoroughly devoted to him, although he was at the same time a strict disciplin- arian and reformer of abuses. Vespasian had, however, plenty of practical good sense, and he knew well how to strike down a foe. All eyes in the East were now upon him ; Mucianus and the Syrian legions were eager to back him up; and on Ist July 69, while he was at Ceesarea, he was proclaimed emperor, first by the army in Egypt, and then by his troops in Judea. The legions of the East at once swore to him the customary oath of allegiance. Nevertheless Vitellius had on his side the veteran legions of Gaul and Germany, Rome's best troops. But the feel- ing in Vespasian's favour quickly gathered strength, and the armies of Mcesia, Pannonia, and [lyricum soon declared for him, and made him in fact master of half of the Roman world. They entered Italy on the north-east under the leadership of Antonius Primus, defeated the army of Vitel- lius at Bedriacum, sacked Cremona, and advanced on Rome, which they entered after furious fighting and a frightful confusion, in which the Capitol was destroyed by fire. The new emperor received the tidings of his rival's defeat and death at Alexandria, whence he at once forwarded supplies of corn to Rome, which were urgently needed, along with an edict or a declaration of

policy, in which he gave assurance of an entire reversal of the laws of Nero, especially those relating to treason. While in Egypt he became more and more imbued with supersti- tion, consulting astrologers and allowing himself to be flattered into a belief that he possessed a divine power which could work miracles. Leaving the war in Judea to his son Titus, he arrived at Rome in 70, where he re- stored the Capitol, rebuilt a great part of the city, enforced discipline in the army, which under Vitellius had become utterly demoralized, and with the co-operation of the senate put the government and the finances on a sound footing. By his own example of simplicity of life, he put to shame the luxury and extravagance of the Roman nobles and initiated in many respects a marked improve- ment in the general tone of society. As censor he raised 1 Ad mangonicos questus descenderat.

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the character of the senate, removing unfit and unworthy members, and promoting good and able men, among them the excellent Julius Agricola. In 70 a formidable rising in Gaul, headed by Claudius Civilis, was suppressed ; the Jewish War was brought toa close by Titus's capture of Jerusalem, and in the following year, after the joint triumph of Vespasian and Titus, memorable as the first occasion on which a father and his son were thus associ- ated together, the temple of Janus was closed, and the Roman world had rest for the remaining nine years of Vespasian's reign. The peace of Vespasian passed into a proverbial phrase. In 78 Agricola went to Britain, and both extended and consolidated the Roman dominion in that province, pushing his arms into North Wales and the Isle of Anglesey. In the following year Vespasian died, in his 70th year.

The avarice with which both Tacitus (Hist., ii. 5) and Suetonius (Vesp., 16) stigmatize Vespasian seems really to have been an en- lightened economy, which, in the disordered state of the Roman finances, was an absolute necessity. Vespasian could be liberal to impoverished senators and knights, to cities and towns desolated by natural calamity, and especially to men of letters and of the pro- fessor class, several of whom he pensioned with salaries of as much as £800 a year. Quintilian is said to have been the first public teacher who cnjoyed this imperial favour.

Vespasian may be fairly credited with doing his best to improve and elevate the tone of the age by spreading those intellectual tastes with which personally he was not much in sympathy. Pliny's great work, the Natural His- tory, was written during Vespasian's reign, and dedicated to his son Titus, who almost shared the emperor's throne (sce Tirus). Some of the philosophers, pedants in reality, who talked idly of the good old times of the republic, and thus indirectly encouraged conspiracy, provoked him into reviving the obsolete penal laws against this class, but only one, Helvidius Priscus, was put to death, and he had affronted the emperor by studied insults. 'I will not kill a dog that barks at me" were words honestly expressing the temper of Vespasian. Much was spent on public works and the restoring and beautifying of Rome during his reigu, —a new forum, the splendid temple of Peace (symbolizing the sentiment of the age), the public baths, and the vast Colosseum being begun under Vaspasian.

To the last Vespasian was a plain, blunt soldier, with decided strength of character and ability, and with a steady purpose to establish good order and secure the prosperity and welfare of his subjects. In his habits he was punctual and regular, transacting his business early in the morning, and enjoying his siesta after a drive. He had not quite the distinguished bearing looked for in an emperor. He was free in his conversation, and his humour, of which he had a good deal, was apt to take the form of rather coarse jokes. He could jest, it was said, even in his last moments. "' Methinks I am becoming a god," he whispered to those around him. There is something very characteristic in the exclamation he is said to have uttered in his last illness, " An emperor ought to die standing." =

The Histories of Tacitus and the biography of Suetonius are our chief original

sources about Vespasian. Dean Merivale, in his H istory of the Romans under the Empire, gives a very complete account of him (chaps. 57, 59, 60).

VESPERS (officiwm vespertinum) in the Roman Catholic liturgy is that part of the daily office which follows none (nona) and precedes compline (completorium). In it the Pater Noster, Ave Maria, Deus in Adjutorium,

&c., are followed by five psalms and five antiphons, after which come the "little chapter," the hymn and the verse, which vary according to the season, the Magnificat and its antiphon, and the appropriate collect. In its general features the use of this office can be traced back to a very early date both in the Eastern and in the Western Church. Vespers may be said or sung at any time after midday, and In some circumstances even before it.

VESPUCCI, Americo (1451-1512), navigator, was born at Florence on 9th March 1451. His father, Nastugio Ves- pucci, was a notary, and his uncle, to whom he owed his education, was a scholarly Dominican and a friend of Savo- narola. As a student Amerigo showed a preference for natural philosophy, astronomy, and geography. He was placed as a clerk in the great commercial house of the Medici, then the ruling family in Florence. About 1490 he was sent by Lorenzo de' Medici to Spain, and in January 1492 he was at Cadiz, along with an associate,

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Donato Nicolini, probably as an agent of the Medici, Shortly after this he seems to have entered the service of a Florentine merchant, Juonato Berardi, established at Seville, who had fitted out the second expedition of Columbus in 1493. Berardi had also undertaken to fit out twelve ships for the king of Spain, and on his death in December 1495 Vespucci was commissioned to complete the contract. There is no proof that Vespucci accompanied Columbus on either his first or his second voyage, though there can be no doubt that the two Italians were known to each other. As Ferdinand had recalled the monopoly conceded to Columbus, the new passion for exploring became widespread and adventurers of all kinds were constantly leaving Spain for the West. On the authority of Vespucci himself, he sailed, possibly as astronomer, with one of these adventurous expeditions from Cadiz, on 10th May 1497. After touching at the Canaries, the four vessels are stated to have reached after twenty-seven days "a coast which we thought to be that of a continent"; from Vespucci's account this may have been Campeachy Bay. Thence they doubled Cape Sable and may even have reached Cape Hatteras. Finally,

after sailing about a hundred leagues to an archipelago, the chief island of which was called Iti, they made for Spain and reached Cadiz on 15th October 1498. Still following Vespucci's own statement, he on 16th May 1499 started on a second voyage in a fleet of three ships under Alonzo de Ojeda. They reached the coast of Brazil about Cape St Roque, sailed north to the mouth of the Amazons, round to the Gulf of Maracaibo, and on to San Domingo. The expedi- tion returned to Cadiz on 8th September 1500. Entering the service of Dom Manuel of Portugal, Vespucci took part in a new expedition to the "Land of Parrots" (Brazil), which left Lisbon on 10th May 1501. Cape St Roque was reached on 16th August; Rio Janeiro Bay was dis- covered and named on New Year's Day 1502; and in April the expedition appears to have got as far as South Georgia. It reached Lisbon again on 7th September 1502. Next year, on 10th June, Vespucci started from Lisbon on his fourth expedition, with six ships under Coelho, the object being to reach Malacca by sailing west. At the island of Fernando Noronha Vespucci's ship sepa- rated from the others and sailed to Bahia and then to Cape Frio, where he built a fort. He returned to Lisbon on 18th June 1504. In 1505 he went back-to Spain and re-entered the service of Ferdinand, settling in Seville. According to one account, Vespucci made two other voyages to the isthmus of Panama. In 1508 he was appointed piloto mayor. He died at Seville on 22d February 1512.

If his own account is trustworthy, Vespucci reached the main- land of America eighteen days before Cabot. to the expedition only in a subordinate capacity, and, had it not been that his name has become attached to the New World, it is probable he would scarcely have been heard of. It seems to be credible, however, that in a letter written soon after his return from his third voyage he referred to the newly discovered lands as the "New World." Vespucci's claim to have touched the American mainland before Cabot has been hotly disputed, and the controversial literature on the subject is voluminous. The facts, as accepted by those who admit his claims, or at least his good faith, are these. After his fourth voyage, that is after 1504, he wrote a diary called Le Quattre Giornale. No fragment of the original exists, and it is only known by allusion. He also wrote several letters to his former schoolfellow Soderini, the gonfalier or chief magistrate of Florence. One

of these only remains, and that not in the original, but ina Latin translation printed at the monastery of St Die in the Vosges on 25th April 1507. The statement is that a French translation of Vespucci's original had been given to King René, who was patron- izing the college at St Dié. Waldseemiiller (Hylacomylus) made use of this letter in his Cosmographi# Introductio, published at St Dié in 1507. Here it is that we have the first suggestion of a name for the New World in the words—' A fourth part of the world, which, since Amerigo found it, we may call Amerigé or America";

and again, " now a fourth part has been found by Amerigo Vespucci, and I do not see why we should be prevented from calling it

Yet he was attached —

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Amerigé or America." Since Humboldt discussed the subject in his Examen Critique de 0? Histoire de la Géographie du Nowveau Continent, vol. iv. (1837), the general weight of opinion has been that Vespucci did not make the 1497 voyage, and that he had no share in the first discovery of the American continent, but that there is not sufficient evidence to convict him of deliberate falsifica- tion. Varnhagen, however, in his Amerigo Vespucci (Lima, 1845) and many other writers on the subject maintain Vespucci's right to be regarded as a member of the expedition.

The whole question is very thoroughly discussed in vol. ii. of the Narrative and Critical History of America, edited by Justin Winsor (1886), where will be found ample references to all the authorities on the subject. See also Major's Prince Henry the Navigator (1868), and a recent re-examination of the evidence for the first voyage in "Alcune Considerazioni sul Primo Viaggio," by L. Hugues, in the Bolletino of the Italian Geographical Society, 1885.

VESTA (Greek Feoria), the goddess of fire and the domestic hearth. 'The cults of the Greek Hestia and the Latin Vesta, both of which involved the guardianship of an ever-burning sacred fire, are most probably derived from a very early custom, common to a great variety of races, and

practised during many different ages. Among people in a primitive state of development the production of fire is a slow and very laborious process; thus it became the custom for each village to maintain a constant fire for the general use of the community, in order to avoid the troublesome necessity of obtaining a spark by friction in case of the accidental extinction at one time of all the vill- age fires! This fire, the central hearth or Feoriéa of the vill- age (focus publicus), became a sacred symbol of home and family life, and by degrees grew into a religious cult of great sanctity and importance. The form of the primitive house in which the fire was preserved, probably a round hut made of wattled osiers daubed with clay, appears to have survived both in the circular prytaneum of the Greeks and in the Aides Vestze in Rome. 'To watch this fire would naturally be the duty of women, and especially of those who were not burdened with the cares of maternity, and hence may have arisen the Roman order of virgin priestesses, whose chief duty it was to tend the sacred fire. A survival of the prehistoric method of getting a spark appears to have existed in the rule which enacted that, if ever the sacred fire of Vesta did go out, the negligent vestal was to be punished by scourging (Livy, xxviii. 11), and the fire rekindled either by friction of dry sticks? or, in later times, by the sun's rays brought to a focus by a concave mirror (Plut., Vuma, 9). In the prytaneum, which existed in every Greek state, a different form of cult was developed, though the essential point, the sacred fire, was kept up, just asin the Latin worship of Vesta; and in both cases the fire was extinguished annually at the be- ginning of the new year, and solemnly rekindled by one of the primitive and hence sacred methods. In Rome this was done on the first day of March, the Latin New Year's Day (Ovid, Fast., iii. 137 -145). Both among Greek and early Latin races, at the founding of a new colony fire was solemnly sent from the prytaneum or Vesta temple of the mother colony to kindle a similar sacred fire in the new settlement. Thus we find that, according to tradition, the worship of Vesta in Rome was introduced from Alba Longa (Liv., i. 20, and Ov., Fast., iii. 46), which appears to eee ee eee eee

¥ Mr J. G, Frazer, in an interesting paper printed in the Journal of Philology (vol. xiv. pp. 145-172), on "the Worship of Vesta and its Connexion with the Greek Prytaneum,"' has given many examples of a Similar custom still Surviving among various savage races.

e An allusion to the earliest method of obtaining fire by rubbing two sticks together is probably contained in the myth of Prometheus, ao brought fire to mortals hidden in a hollow wand.

Fire obtained in this way, that is " pure elemental fire," was com- Monly thought to possess a special sanctity. Even throughout the Middle Ages in Catholic countries, at Easter, when the new year be- gan, the old pagan rite still survived. On Holy Saturday all lamps in each church were extinguished, and the Paschal candlestick was lighted by the help of flint and steel. From this sacred source the other lights in the church were kindled, and the various households in the parish took a flame to relight their fires and lamps, all of which had been carefully extinguished beforehand.

have been the oldest of the Latin colonies in Latium. This intimate connexion between the Greek prytaneum fire, sacred to Hestia, and that of Vesta in Rome has been ably worked out by Mr J. G. Frazer in the paper quoted above. 'The most generally received Latin legend attri- butes the founding of the Roman temple of Vesta to Numa, who transferred the centre of the cult from Alba, together with the four vestal virgins, its priestesses (Plut., Numa, 10). One of the later kings, either Tarquin I. or Servius Tullius, is said to have increased the number to six (Dion. Hal., iii. 67, and Plut., Wma, 10), and it is not till the last years of the pagan period that we hear of a seventh vestal having been added (see Ambrose, Epis., ed. Pareus, p. 477 ; also Plut., Rom. and Cam.).

The election (captio) of the vestal during the early period of Rome was in the hands of the king, and in those of the pontifex maximus under the republic and empire,' subject, however, to the following conditions (Aul. Gell., i. 12):—(1) the candidate was to be more than six and less than ten years of age; (2) she was to be patrima and matrima, 2.e., having both parents alive; (3) free from physical or mental defects; (4) daughter of a free- born resident in Italy. Certain details of the election were arranged subject to the provisions of the Lex Papia, now unknown. 'The selected child had her hair cut off, and was solemnly admitted by the pontifex maximus, who held her by the hand, and, addressing her by the name

amata, pronounced an ancient formula of initiation, which is given by A. Gellius in his interesting chapter on the subject (i. 12). In early times there were certain rules by which girls could be excused from serving as vestals, but the honour soon became so eagerly sought that these provisions were practically useless. Vows were taken by the vestal for a limited period of thirty years, after which she was free to return to private life and even to marry— a thing very rarely done (Aul. Gell., vi. 7). This period of thirty years was divided into three decades: during the first the vestal learnt her duties; during the second she practised them; and during the third she instructed the young vestals. The special dignity of chief of the vestals, or wrgo vestalis maxima, was reached in order of seniority. The inscriptions on the pedestals of statues of various vestales maxime show that a number of different grades of honour were passed through before reaching the maximatus or highest dignity.> The duties of the vestals, besides the chief one of tending the holy fire (Cic., De Leg., ii. 8), consisted in the daily bringing of water from the sacred spring of Egeria, near the Porta Capena, to be used for the ceremonial sweeping and sprinkling of the Aides Vestee.6 They also offered sacri- fices of salt cakes —muries and mola salsa—and poured on the altar of sacred fire libations of wine and oil, as is represented on the reverses of several first brasses and medallions of the empire (see fig. 1). The vestals were bound to offer daily prayers for the welfare of the Roman state, and more especially in times of danger or calamity (Cic., Pro Font., 21). They were also the guardians of the seven sacred objects on which the stability of the Roman power was supposed to depend :' the chief of these was the Palladium, a rude archaic statue of Pallas, which was said to have been brought by Aineas from the burning 4 From the time of Augustus the emperors themselves held the office of chief pontiff, and with it the privilege of electing the vestals.

> These inscriptions are printed in Middleton, Ancient Rome in 1885, pp. 200-6, and in Arch#xologia, vol. xlix. pp. 414-422.

6 The shrine of Vesta was not a templum in the strict Roman sense, as it was not consecrated by the augurs, its sanctity being far above the necessity of any such ceremony. Other natural springs might be used for the daily sprinkling, but it was forbidden to use water brought in a pipe or

other artificial conduit (Tac., Hist., iv. 53 ; see also Guhl and Koner, Vit. Gr. et Rom., p. 654).

7 See Cancellieri, Le Sette Cose Fatali di Roma Antica, Rome, 1812.

Troy. This sacred object was never shown to profane eyes, but it is represented on the reverse of a coin struck by Antoninus Pius in honour of his deified wife Faustina

Fia. 1.—First brass struck in honour of Diva Faustina by her husband Antoninus Pius, soon after her death. On the reverse is a vestal holding the Palladium and pouring a libation on the altar of the sacred fire.

(see fig. 1). Strict observance of the vow of chastity was

one of the chief obligations of the vestals, and its breach

was horribly punished by burial alive at a place near the

Porta Collina known as the Campus Sceleratus (see Livy,

viii. 15 and 89; Plin., Hp., iv. 11; and Suet., Dom., 8).

Cases of unchastity and its punishment were rare; and,

as the evidence against the vestal was usually that of slaves,

given under torture, it is probable that in many instances an innocent vestal suffered this cruel death. The case described by the younger Pliny (sup. cit.) is one of special pathos, as the vestal appears to have been condemned without any sufficient evidence, simply at the wish of the emperor Domitian. A fanciful reason for this fearful

punishment is given by Ovid, Fast., vi. 459-460.

The privileges of the vestals and their influential position were very remarkable. They were exempt from any patria potestas, except that of the pontifex maximus, their religious father; they could dispose by will of their property, and were in most respects not subject to the Roman laws ('legibus non tenetur," Servius, on Virg., 4n., xi. 204 ; of. Gaius, i. 1380, and Dion Cass., lvi. 10). This involved freedom from taxes, and the right to drive through the streets of Rome in carriages (plostrum and currus arcuatus). Some bronze plates have been found which were once attached to the carriages of vestals ; the inscription on one of them runs thus, Mlave Publicize v.v. maxime inmunis in jugo (see C. I. L., vi. 2146-2148 ; cf. also Pruden., Contr. Symm., ii. 1088). They were preceded by a lictor when appearing on state occasions, and enjoyed other semi-royal honours (Plut., Numa, 10, and Dion Cass., xlvii.19). At theatres and other places of amusement they enjoyed the best seats, except at some of the nude athletic contests, from which they were excluded ; they also took an import- ant part in all the grand religious and state ceremonies, such as when the pontifex maximus offered sacrifice on the occasion of a triumph before the temple of Capitoline Jupiter. They had power to pardon any criminal they met in the street on his way to execution, provided that the meeting were accidental. The vestals alone shared with the emperors the privilege of intramural burial (Serv., Ad din., xi. 206). During life they were richly dowered by the state (Suet., Aug., 31) and had public slaves appointed to serve them (see Tac., Hist., i. 43). They were also the guardians of the emperor's will, and of other important documents of state (Suet., J. Cxs., 83, and Aug., 101; Tac., Ann.,i.8; Plut., Anton.,58; and Appian, Civ.,v.73). Their influence in the appointment to many offices, both religious and secular, appears to have been very great. Many of the statues to the chief vestals which were found in the Atrium Vestz in 1883-84 have pedestals inscribed with a dedication recording that benefits had been conferred on the donor by the vestalis maxima. Lastly, they lived in a style of very great splendour: their house, the Atrium

~ 1 For a description of this, and also of the temple of Vesta and its

Vesta, which stood close by the Aides Vests, was very large and exceptionally magnificent both in decoration and material. The discovery already mentioned of a number of statues of vestales maximee has thrown new light on the dress of the vestals.2 With one or two exceptions the costume of these statues is much the same: they have a long sleeveless tunic =

*or stola, girdled by the zona immediate- ly below the breast. One only wears the diploidion over the upper part of her figure. The outer garment is an ample pallium, wrapped round the body ina great variety of folds, and in some cases brought over the head like a_ hood. All seem to have | long hair, showing | that the process of cutting off the hair | at initiation was not | repeated. One figure (see fig. 2) wears the suffibulum, a rectan- gular piece of white iy, cloth bordered by a | purple stripe, worn | over the head and **

Fic. 2.—Statue of a vestalis maxima wearing omg 2 npr hs the suffibulum ; time of Trajan.

According to Festus (ed. Miiller, p. 348), this sacred gar- ment was worn by the vestals only during the act of sacrificing (see also Varro, De Ling. Lat., vi. 21). This is probably the only existing statue on which this rare garment is represented. In all cases the head is closely bound by vitix, rope-like twists of woollen cloth, the ends of which usually fall in loops on each shoulder (see Ser- vius, Ad 4n., x. 538).

The Regza, or official fanum of the pontifex maximus, was adjacent to the vestal's house :—

- *Hic locus est Vestee, qui Pallada servat et ignem ; Hic fuit antiqui Regia parva Nume." 4*

When Augustus, after his election to the office of pontifex maximus in 12 B.c., moved his place of residence from the Regia to the Palatine, he built a new Aides Vestze near his palace, in the magnificent Area Apollinis. This appears to have been a copy of the older temple of Vesta. No traces of it now exist; but Pirro Ligorio, in the latter part of the 16th century, made some sketches of what then existed of this second temple, to

illustrate his great MS. on Roman antiquities, which is now preserved in the royal library at Turin (see Ovid, Fast., iv. 949-954, and Metam., xv. 864). The original course of the Sacra Via was supposed to have passed close to the temple of Vesta; but excavations made in 1886 have shown that this was not vicissitudes, see Rome, vol. xix. pp. 818-819; Middleton, Ancient Rome in 1885, pp. 181-206 ; and a paper by the same author in Arch@o- logia, vol. xlix. p. 391 Sq.

? These statues appear to have been the work of a privileged class of sculptors, who enjoyed the title of " fictores virginum vestalium,'—

an honour which is recorded in some of the dedicatory inscriptions on the pedestals,

*; * The form of the suffibulum as shown on this statue has a curious ainasladity, to the amice worn by the medizval clergy. Ov., Tris., iii. 29. For the history of the Regia and its existing*

— see Rome, vol. xix. p. 819, and Archeologia, vol. xlix. p. SY.

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the case, the supposed line of the road being really blocked by a very early structure. There is reason to believe that this formed part of the original Regia, which was rebuilt during the reign of Augustus in a more magnificent way by Domitius Calvinus, after his Spanish triumph.

The Vestalia, or chief festival in honour of Vesta, was held on 9th June (Ovid, Fast., vi. 249), after which the temple was closed for five days for a ceremonial cleansing.! In private houses the feast was celebrated by a meal of fish, bread, and herbs, eaten, not on the usual triclinium, but by

the domestic hearth, in front of the effigies of the Dii Penates (Ovid, Fast., vi. 309-310). The feast inaugu- rated by Augustus in honour of Vesta Palatina was held on 28th April, the anniversary of its consecration.

With regard to statues of the goddess, though the Greek Hestia was frequently represented in plastic art, yet among the Romans Vesta appears to have been rarely so treated. The Athenian prytaneum contained a statue of Hestia. But there was no effigy in the Roman temple of Vesta, although one is commonly shown on reverses of coins which have a representation of the temple, and it appears to have been commonly thought in Rome that a statue of Vesta did exist inside her shrine,—a mistake which Ovid corrects (Fast., vi. 297-300). No Roman statue now known can be certainly considered to represent Vesta, though a very beautiful standing figure of a female with veiled head (in the Torlonia collection) has, with some probability, had this name given to it.

The worship of Vesta appears to have died out slowly in the 4th century, after the adoption of Christianity as the state religion by Constantine. Zosimus (Hist. Vov., y. 38) tells an interesting story of a visit made to the Atrium Vest at the end of the 4th century by Serena, the wife of the Vandal Stilicho, who took a valuable necklace from one of the statues, in spite of the remon- strances of an aged woman, the last survivor of the vestal virgins. Soon after that time the building appears to have fallen into decay, its valuable marble linings and other ornaments having been stripped from its walls.

Literatwre.—For further information the reader is referred, in addition to the works quoted above, to Lipsius, De Vesta et Vestali- bus Syntagma, printed in Grevius, Thes. Ant. Rom., vol. v.; Cramer, Kleine Schriften, ed. by Ratjen, Leipsic, 1837, p. 89 sg.; Klausen, Aineas und die Penaten, ii. p. 624 sg.; Nardini, Roma Antica, ed. of 1818-20, ii. p. 185 sqg.; Brohm, De Jure Virginum Vestalium, Thorn, 1835; Preuner, Hestia-Vesta, Tiibingen, 1864; Jordan, Vesta und die Laren, Berlin, 1865, and more recent papers ; Maes, Vesta e Vestali, Rome, 1883; Lanciani, Z' Atrio di Vesta, Rome, 1884; and C. F. L., vi. p. 594, No. 2181 sq. (J. H. M.)

VESTMENTS, in ecclesiastical law, are the garments worn during the church service by the officiating clergy. In England and Scotland before

the Reformation the vestments in use were similar to those still worn by the Roman Catholic clergy,—probably modifications of the dress of Roman citizens in their origin (see Cosrumz)— and were either sacrificial, as the chasuble, or non-sacri- ficial, as the surplice. After the Reformation the question of vestments became of comparatively small importance in the Church of Scotland ; but in the Church of England it has in recent years been the cause of much controversy and litigation.

The "ornaments rubric" at the beginning of the Book of Com- mon Prayer, dating from 1662, provides "that such ornaments of the church and of the ministers thereof at all times of their minis- tration shall be retained and be in use as were in this Church of England by the authority of parliament in the second year of the reign of King Edward VI." 'The reference in this rubric is to the vestments enjoined by the first prayer book of Edward VI. (1549). The surplice (with the addition of the hood in cathedrals and colleges, and for preaching) was the priest's dress for the service other than the communion. In the communion the bishop was to Wear, besides a rochet, a surplice or alb, with a cope or vestment

' The solemn decade of the Vestalia began on 5th June and ended on the 15th, when the temple was closed.

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(also called a chasuble), and to have a pastoral staff borne by him- self or his chaplain. The officiating priest was to wear a white alb, plain, with a vestment or cope, the assisting ministers albs with tunicles. The second prayer book of Edward VI. (1552) enjoined the use of the surplice only. The Act of Uniformity of Elizabeth (1 Eliz. c. 2) provided for the use of the 1549 vestments, "until other order shall be therein taken by the authority of the queen's Majesty, &c." In 1564 the Advertisements of Elizabeth were issued, under which the legal vestments were fixed to be the cope worn by the principal minister, with gospeller and epistoler agreeably, in the ministration of the communion, but at ordinary services and at prayers (other than those during the ministration of the communion) said at the communion table the surplice only. Deans and prebendaries were to wear hoods. The point which the judicial committee of the privy council has been called upon more than once to decide is

whether the Advertisements of Elizabeth— coupled with the Injunctions of 1559 and subsequent visitations— were such taking of "other order" as to supersede the ornaments rubric. It has been held that they were, and the effect of the decisions has been to reduce the legal vestments to the surplice and hood for all ordinary purposes, with the addition of the cope for the administration of the communion on high feast days in cathedral and collegiate churches. The cope was also allowed by the canons of 1603-4. A bishop wears in addition arochet. The chasuble, alb, and tunicle had, as has been said, post-Reformation authority, but the girdle, amice, stole, maniple, dalmatic, and biretta were never legally recognized since that time. The stole, however, is frequently worn, by deacons generally arranged as a scarf over the left shoulder. Much information on the subject will be found in the first Report of the Royal Commission on Ritual, issued in 1867.

VESTRY. See Parisu, vol. xviii. p. 296.

VESUVIUS, the most celebrated volcano in the world, rises from the eastern margin of the Bay of Naples in Italy, in the midst of a region which has been densely populated by a civilized community for more than twenty centuries. Hence it has served as a type for the general

popular conception of a volcano, and its history has sup- plied a large part of the information on which geological theories of volcanic action have been based. The height of the mountain varies from time to time within limits of several hundred feet, according to the effects of successive eruptions, but averages somewhere about 4000 feet above

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Plan of Vesuvius, together with north-and-south profile.

the sea. Vesuvius consists of two distinct portions. On the northern side a lofty semicircular cliff, reaching a height of 3747 feet, half encircles the present active cone, and descends in long slopes towards the plains below. This precipice, known as Monte Somma, forms the wall of an ancient prehistoric crater of vastly greater size than that of the present volcano. The continuation of the same wall round its southern half has been in great measure obliter- ated by the operations of the modern vent, which has built a younger cone upon it, and is gradually fillmg up the hollow of the prehistoric crater. At the time of its greatest dimensions the volcano was perhaps twice as high as it is now. By a colossal eruption, of which no histori- cal record remains, the upper half of the cone was blown

away. It was around this truncated cone that the early Greek settlers founded their little colonies.

At the beginning of the Christian era, and for many previous centuries, no eruption had been known to take place from themountain, and the volcanic nature of thelocal- ity was perhaps not even suspected by the inhabitants who planted their vineyards along its fertile slopes, and built their numerous villages and towns around its base. The sagacious and observant geographer Strabo, however, de- tected the probable volcanic origin of the cone and drew attention to its cindery and evidently fire-eaten rocks. From his account and other references in classical authors we gather that in the first century of the Christian era, and probably for hundreds of years before that time, the sides of the mountain were richly cultivated, but towards the top the upward growth of vegetation had not concealed the loose ashes which still remained as evidence of the volcanic nature of the place. On this barren summit lay a wide flat depression, surrounded with rugged walls of rock, which were festooned with wild vines. The present crater-wall of Somma is doubtless a relic of that time. It was in this lofty rock-girt hollow that the gladiator Spartacus was besieged by the pretor Claudius Pulcher, and from which he escaped by twisting ropes of vine- branches and descending through an unguarded notch in the crater-rim.

After centuries of quiescence the volcanic energy began again to manifest itself in a succession of earthquakes, which spread alarm far and wide through Campania. For some sixteen years after 63 these convulsions continued, doing much damage to the surrounding towns. At Pompeii, for example, among other devastation, the temple of Isis was shaken into ruins, and, as an inscription records, it was rebuilt from the foundations by the munificence of a private citizen. This preliminary earthquake phase of volcanic excitement was succeeded by a catastrophe which stands out prominently as one of the great calamities of human history. On 24th August 79 the earthquakes, which had been growing more violent, culminated in a tremendous explosion of Vesuvius. A contemporary account of this event has been preserved in two letters of the younger Pliny to the historian Tacitus. From this narrative we can gather a tolerably clear conception of the general characteristics of the eruption :—abundant and increasingly violent earthquakes, followed by an extra- ordinary commotion that accompanied the outburst of the volcano, when chariots would not remain still even on level ground, when houses were shaken so as to threaten destruc- tion to their inhabitants, and when the unsteadiness of the land gave rise to great disturbance of the sea, which in its agitation retreated from the shores and left numerous marine animals uncovered ; the well-known pine-tree-shaped cloud of steam, dust, and stones towering above Vesuvius and spreading out far and wide over the surrounding country ; the constant flashes of lightning marking the highly electrical condition of the column of erupted material ; the showers of light cinders and ashes that fell at a distance from the mountain and the rain of hot pumice and pieces of black or glowing lava around the centre of eruption ; the total darkness for three days produced by the diffusion of the finer volcanic dust through the atmo- sphere ; the fiery glare that overspread the cloud-canopy as each explosion uncovered the glowing surface of the lava column in the chimney of the volcano; and the wide covering of ashes, which like a mantle of snow was found to have been spread over the surrounding country when the darkness cleared away and the catastrophe came to an end. This eruption was attended with great destruc- tion of life and property. Three towns are known to have been destroyed—Herculaneum at the western base of the

volcano, Pompeii on the south-east side, and Stabia, still farther south on the site of the modern Castellamare, The exhumation of Herculaneum and Pompeii in modern times has thrown much light upon the life of Roman citizens in the first century. There is no evidence that any lava was emitted during this eruption. – But the abundant steam given off by the volcano seems to have condensed into copious rain, which, mixing with the light volcanic dust, gave rise to torrents of pasty mud, that flowed down the slopes and overwhelmed houses and villages. Herculaneum is believed to have been destroyed by these " water lavas," and there is reason to suppose that similar materials filled the cellars and lower parts of Pompeii. Comparing the statements of Pliny with the facts still observable in the district, we perceive that this first recorded eruption of Vesuvius belongs to that phase of volcanic action known as the paroxysmal, when, after a longer or shorter period of comparative tranquillity, a voleano rapidly resumes its energy and the partially filled-up crater is cleared out by a succession of tremendous explosions. The great eruption of Krakatoa in the Sunda Strait in 1883 is a recent example of the same stage in the history of a volcano.

For nearly fifteen hundred years after the catastrophe of 79 Vesuvius remained in a condition of feeble activity. Occasional eruptions are mentioned, but none that was of importance, and their details are given with great vague- ness by the authors who allude to them. By the end of the 17th century the mountain had resumed much the same general aspect as it presented before the eruption described by Pliny. Its crater-walls, some 5 miles in circumference, were hung with trees and brushwood, and at their base stretched a wide grassy plain, on which cattle grazed and where the wild boar lurked in the thickets. The central tract was a lower plain, covered with loose ashes and marked by a few pools of hot and saline water. At length, after a series of earthquakes lasting for six months and gradually increasing in violence, the volcano burst into renewed paroxysmal activity on 16th December 1631. Vast clouds of dust and stones, blown out of the crater and funnel of the volcano, were hurled into the air and carried for hundreds of miles, the finer particles falling to the earth even in the Adriatic and at Constantinople. The clouds of steam condensed into copious torrents, which, mingling with the fine ashes, produced muddy streams that swept

far and wide over the plains, reaching even to the foot of the Apennines. Issuing from the flanks of the mountain, several streams of lava flowed down towards the west and south, and reached the sea at twelve or thirteen different points. Though the inhabitants had been warned by the earlier convulsions of the mountain, so swiftly did destruction come upon them that 18,000 are said to have lost their lives.

Since this great convulsion, which emptied the crater, Vesuvius has never again relapsed into a condition of total quiescence. At intervals, varying from a few weeks or months to a few years, it has broken out into eruption, sometimes emitting only steam, dust, and scorie, but fre- quently also streams of lava. The years 1766-67, 1779, 1794, and 1822 were marked by special activity, and the phenomena observed on each of these occasions have been fully described. .

The modern cone of the mountain has been built up by successive discharges of lava and fragmentary materials round a vent of eruption, which lies a little south of the centre of the prehistoric crater. The southern segment of the ancient cone, answering to the semicircular wall of Somma on the north side, has been almost concealed, but 1s still traceable among the younger accumulations. The numerous deep ravines that indented the sides of the pre-

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historic volcano, and which still form so marked a feature on the outer slopes of Somma, have on the south side served as channels to guide the currents of lava from the younger cone. But they are gradually being filled up there and will before long disappear under the sheets of molten rock that from time to time rush into them from above. On one of the ridges between these radiating valleys an obser- vatory for watching the progress of the volcano was estab- lished many years ago by the Neapolitan Government, and is still supported as a national institution. A continuous record of each phase in the volcanic changes has been taken, and some progress has been made in the study of the phenomena of Vesuvius, and in prognosticating the occurrence and probable intensity of

eruptions. A wire- rope railway (opened in the year 1880) carries visitors from the foot of the cone up to within 150 yards of the mouth of the crater.

See Volcanoes, by G. P. Scrope, 1872; Vesuvius, by John Phillips, 1869 ; Der Ausbruch des Vesuv im April 1872, by A. Heim,

1873; Vesuvio ela sua Storia and Pompei e la Regione Sotterrata dal Vesuvio nel' Anno 79, by Prof. Palmieri, Naples, 1879; Studien iiber

Vulkane und Erdbeben, by J. F. Schmidt, 1881; and " The Geology of Monte Somma and Vesuvius," by H. J. Johnstone-Lavis, 1884, in Quart. Journ. Geol. Soc., vol. xl. p. 85. See also GEOLOGY, vol. x. p. 240 sq. , (A. GE.) VESZPREM, the chief town of a county of the same name in Hungary, hes between Lake Balaton and thie forest of Bakony, about 65 miles south-west of Buda- Pesth. Veszprém is the seat of a Roman Catholic bishop, whose cathedral and palace, with the county hall and the gymnasium, form the chief features of the town. Veszprém is a station on the Western Railway system. Its four annual fairs are much frequented from all parts of the trans-Danubian district, and the trade in grain, wine, and home industries generally is considerable. The town is of very ancient origin, and was known to the Romans by the name of Cimbria. The queens of the Arpad dynasty used occasionally to reside here, and even now the queens of Hungary are crowned by the bishop of Veszprém. The place suffered much during the contentions between the Turks and the Hungarians and Austrians in the 16th and 17th centuries. The population numbered 14,800 in 1886.

VETERIAARY SCIENCE

HIS science comprises a knowledge of the conformation | Sarmatians in his professional capacity, and seems to have

and structure of all the domesticated animals, espe- cially the horse ; their physiology and special racial and individual characteristics ; their humane management and utilization ; their protection from, and medical and surgical treatment in, the diseases and injuries to which they are exposed ; their amelioration and improvement ; their relations to the human family with regard to communicable disorders; and the supply of food and other products, more particularly those derived from them for the use of mankind. HIsTory. There is evidence that the Egyptians practised veterin- ary medicine and surgery in very remote times; but it is

ac not until we turn to the Greeks that we obtain any very

definite information with regard to the state of veterinary as well as human medicine in antiquity. The writings of Hippocrates (460-356 B.c.) afford evidence of excellent investigations in comparative pathology. Diocles of Car- istus, who was nearly a contemporary, was one of the first to occupy himself with anatomy, which he studied in animals. Aristotle, too, wrote on physiology and com- parative anatomy, and on the maladies of animals, while many other Greek writers on veterinary medicine are cited or copied from by Varro, Columella, and Galen. And we must not overlook Mago of Carthage (200 B.c.), whose work in twenty-eight books was translated into Greek and was largely used by Varro and Columella.

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appear to have known much of veterinary medicine. Varro (116-28 B.C.) may be considered the first Roman writer who deals with animal medicine in a scientific spirit, m his De Re Rustica, in three books, which is largely derived from Greek writers. Celsus is supposed to have Written on animal medicine ; and Columella (1st century) 18 credited with having utilized those relating to veterinary Science in the sixth and seventh parts of his De Re Rustica, One of the best works of its class of ancient times: it treats, not only of medicine and surgery, but also of sani- tary measures for the suppression of contagious diseases. From the 3d century onwards veterinary science had a literature of its own and regular practitioners,

especially In the service of the Roman armies (mulomedici, veterin- ard), Perhaps the most renowned veterinarian of the

enjoyed a high and well-deserved reputation in his time. He was a keen observer; he distinguished and described a number of diseases which were badly defined by his predecessors, recognized the contagious nature of several maladies, and prescribed isolation for their suppression ; he also made interesting observations on accidents and diseases of horses' limbs, and waged war against certain absurd empirical practices then prevailing in the treatment of disease, indicating rational methods, some of which are still successfully employed in veterinary therapeutics, such as splints for fractures, sutures for wounds, cold water for the reduction of prolapsed vagina, hot baths for tetanus, &c. Not less eminent was Hierocles, the successor of Apsyrtus, whose writings he largely copied, but with improvements and valuable additions, especially in the hygiene and training of horses. Pelagonius again was a writer of empirical tendency, and his treatment of disease in general was most irrational. Publius Vegetius (not to be confounded with Flavius Vegetius Renatus, who wrote on the military art) was a popular author of the end of the 5th century, though less distinguished than Apsyrtus, to whom and to Pelagonius he was to a great extent indebted in the preparation of his Mulomedicina sive Ars Veterinarva. He appears to have been more of a horse-dealer than a veterinary practitioner, and knew next to nothing of anatomy, which seems to have been but little cultivated at that period. He was very superstitious and a believer in the influence of demons and sorcerers; nevertheless he gives some interesting observations derived from his travels. He had also a good idea of aerial infection, recognized the utility of disinfectants, and describes some operations not referred to by previous writers, such as removal of calculi from the bladder through the rectum, couching for cataract, the extirpation of certain glands, and several serious operations on the horse's foot. Though inferior to several works written by his predecessors, the Mulomedicina of Vegetius maintained its popularity through many centuries. Of most of the ancient veterin- ary writers we know little beyond what can be gathered from the citations and extracts in the two great collections of Hippiatrica and Geoponica compiled by order of Con- stantine Porphyrogenitus in the 10th century.

It is unnecessary to dwell here on the progress of the In

Roman empire was Apsyrtus of Bithynia, who in 322 | veterinary art during the Middle Ages. Towards the oa accompanied the expedition of Constantine against the | close of the medizval period the subject was much culti-

vated in the cavalry schools of Italy ; and Spain also had an organized system of good practitioners in the 15th century, who have left many books still extant. Ger- many was far behind, and literature on the subject did not exist until the end of the 15th century, when in 1492

was translated into several languages, and was borrowed from for more than a century by different writers. Sir W. Hope's Compleat Horseman (1696) is a translation from Solleysel by a pupil.

Modern Schools and Colleges.

there was published anonymously at Augsburg a Pferde- arzneibiichlein. In the following century the influence of the Italian writers was becoming manifest, and the works of Fugger and Fayser mark the commencement of a new era. JF ayser's treatises, Von der Gestiiterec and

The most important era in the history of modern veterinary Veterin. science commenced with the institution of veterinary schools, ary France was the first to take the great initiative step in this schools, direction. Buffon had recommended the formation of veterinary schools, but his recommendations were not attended to. Bourgelat, In an advocate at Lyons and a talented hippologist, through his influ- France.

Von der Zucht der Kriegs- und Birger-Pferde (1529-1597), are remarkable for originality and good sense. In Great Britain animal medicine was perhaps in a more advanced condition than in Germany, if we accept the evidence of the Ancient Laws and Institutes of Wales

(London, 1841) ; yet it was largely made up of the grossest superstitions.1 Among the Celts the healer of horse diseases and the shoer were held in high esteem, as among the more civilized nations of Europe, and the court farrier enjoyed special privileges.2 The earliest known works in English appeared anonymously towards the conimencement of the 16th cen- tury, namely, Propertees and Medcynes for a Horse and Mascal of Oxen, Horses, Sheepes, Hogges, Dogges. The word 'mascal " shows that the latter work was in its origin Italian. There is no doubt that in the 15th century the increasing taste for horses and horsemanship brought Italian riding-masters and farriers into England; and it is recorded that Henry VIII. brought over two of these men who had been trained by Grisone in the famous Neapolitan school. The knowledge so introduced became popularized, and assumed a concrete form in Blundeville's Foure Chiefest Offices belonging to Horsemanship (1566), which contains many references to horse diseases, and, though mainly a compilation, is yet enriched with original observations. In the 15th century the anatomy of the domesticated animals, formerly almost entirely neglected, began to receive attention. A work on comparative anatomy by Volcher Koyter was issued at Nuremberg in

ence with Bertin, prime minister under Louis XV., was the first to induce the Government to establish a veterinary school and school of equitation at Lyons, in 1761. This school he himself directed for only a few years, during which the great bencfits that had resulted from it justified an extension of its teaching to other parts of France. Bourgelat, therefore, founded (1766) at Alfort, near Paris, a second veterinary school, which soon became, and has re- mained to this day, one of the finest and most advanced veterinary schools in the world. At Lyons he was replaced by the Abbé Rozier, a learned agriculturist, who was killed at the siege of Lyons after a very successful period of school management, during which he had added largely to agricultural and physical knowledge by the publi- cation of his Journal de Physique and Cours d' Agriculture. Twenty years later the Alfort school added to its teaching staff several dis- tinguished professors whose names still adorn the anuals of science, such as Daubenton, who taught rural economy; Vic d'Azyr, who lectured on comparative anatomy ; Fourcroy, who undertook in- struction in chemistry ; and Gilbert, one of its most brilliant pupils, who had

veterinary medicine and surgery for his department. The last-named was also a distinguished agriculturist and published many important treatises on agricultural as well as veterinary sub- jects. The position he had acquired, added to his profound and varied knowledge, made him most useful to France during the period of the Revolution. It is chiefly to him that it is indebted for the celebrated Rambouillet flock of Merino sheep, for the conservation of the Tuileries and Versailles parks, and for the creation of the fine expcrimental agricultural establishment organized in the ancient domain of Sceaux. The Alfort school speedily became the nursery of veterinary science, and the source whence all similar institutions obtained their first teachers and their guidance. A third Govern- inent school was at a later period founded at Toulouse ; and these three schools have produced thousands of thoroughly educated veterinary surgeons and many professors of high scientific repute, among whom may be named Bouley, Chauveau, Colin, Toussaint, St Cyr, Goubaux, Arloing, and Galtier.

1573 ; about the same time a writer in Germany named Copho or Cophon published a book on the anatomy of the pig, in which were many original remarks on the lymphatic

Soon after the Alfort school was commenced a national school In Ga- for Austria was established at Vieuna by order of Maria Theresa ; many, and this, remodelled and reorganized by Joseph IJI., is now the &c.

vessels ; and Jehan Hervard in France produced in 1594 his rather incomplete Hippo-Ostéologie. But by far the most notable work, and one which maintained its popu- larity for a century and a half, was that of Carlo Ruini, a senator of Bologna, published in 1598 in that city, and

largest in the country. Prussia quickly followed suit; and soon Government veterinary schools were founded in almost every other European country, except Great Britain, mostly on a munificent scale. Probably all, but especially those of France and Germany, were established as much with a view to training veterinary surgeons for the army as for the requirements of civil life.

In 1790 St Bel (whose real name was Vial, St Bel being a village In the near Lyons, where was his paternal estate), after studying at the United Lyons school and teaching both at Alfort and Lyons, came to Eng- King- land and published proposals for founding a school in which to in- dom.

entitled Dell? Anatomia e dell' Infirmita del Cavallo, e suot Remedu. Passing through many editions, and trans- lated into French and German, this book was for the most

part original, and a remarkable one for the time in which it was composed, the anatomical portion being especially praiseworthy. English books of the 17th century exhibit a strong tendency towards the improvement of veterinary medicine and surgery, especially as regards the horse. This is even more notable in the writings of the 18th century, among which may be particularized Gibson's Larrier's New Guide (1719), Method of Dieting Horses (1721), and (best of all) his New Treatise on the Diseases of Horses, besides Braken's, Burdon's, Bridge's, and Bartlet's treatises. Veterinary anatomy was greatly ad- vanced by the Anatomy of an Horse (1683) of Snape, farrier to Charles II., illustrated with copperplates, and by the still more complete and original work of Stubbs, the Anatomy of the Horse (1766), which decidedly marked a new era in this line of study. Of foreign works it may suffice to mention that of Solleysel, Veritable Parfait Maréschal (1664), which passed through many editions,

Ea eee eee eee, 1 See Leechdoms, Wortcunning, and Starcraft of Early England, 3 vols. 8vo, London, 1864.

- *See Fleming, Horse-Shoes and Horse-Shoeing, London, 1869.*

struct pupils in veterinary medicine and surgery. The Agricultural Society of Odiham, which had been meditating sending two young men to the Alfort school, elected him an honorary member, aud delegated a committee to consult with him respecting his scheme. Some time afterwards this committee detached themselves from the Odiham Society and formed an institution styled the Veteriuary College of London, of which St Bel was appointed professor. The school was to be commenced and maintained by private subscrip- tion. In March 1792 arrangements

were made for building tem- porary stabling for fifty horses and a forge for shoeing at St Pancras. The college made rapid progress in public estimation, notwith- standing considerable pecuniary embarrassments. As soon as the building was ready for the reception of animal patients, pupils began to be enrolled ; and among the earliest were some who afterwards gained celebrity as veterinarians, as Bloxam, Blaine, R. Lawrence, Field, and Bracy Clark. On the death of St Bel in August 1793 there appears to have been some difficulty in procuring a suitable successor ; but at length, on the recommendation of John Hunter and Cline, two medical men were appointed, Coleman and Moorcroft, the latter then practising as a veterinary surgeon in London. The first taught anatomy and physiology, and Moorcroft, after visiting the French schools, directed the practical portion of the teaching. Unfortunately, neither of these teachers had much experience among animals, nor were they well acquainted with their diseases ; but Coleman had as a student, in conjunction with a fellow-student (afterwards Sir Astley Cooper), performed many experiments on

animals under the direction of Cline. Moorcroft, who remained only a short time at the college, afterwards went to India and during a journey in 1819 was murdered in Tibet.1 Coleman, by his scientific researches and energetic management, in a few years raised the college to a high standard of usefulness ; under his care the progress of the veterinary art was such as to qualify its practitioners to hold commiissions in the army; and he himself was appointed veterinary surgeon-general to the British cavalry. Owing to the lack of funds, the teaching at the college must have been very meagre, and, had it not been for the liberality of several medical men in throwing open the doors of their theatres to its pupils for instruction without fee or reward, their professional knowledge would have been sadly deficient. The board of examiners was for many years chiefly composed of eminent members of the medical profession. Coleman died in 1839, and with him disappeared much of the interest the medical profession of London took in the pro- gress of veterinary medicine. Yet the Royal Veterinary College (first styled "Royal" during the presidentship of the duke of Kent) continued to do good work in a

purely veterinary direction, and received such public financial support that it was soon able to dispense with the small annual grant given to it by the Government. In the early years of the institution the horse was the only animal to which much attention was giveu. But at the instigation of the Royal Agricultural Society of England, which gave £200 per annum for the purpose, an additional professor was appointed to investigate and teach the treatment of the diseases of cattle, sheep, and other animals; outbreaks of disease among these were also to be inquired into by the officers of the college. This help to the institution was withdrawn in 1875, but renewed in 1886. This veterinary school has been the parent of other schools in Great Britain, one of which, the first in Scotland, was founded by Prof. Dick, a student of Coleman's and a man of great persever- ance and ability. Commencing at Edinburgh in 1819-20 with only one student, in three years he gained the patronage of the Highland and Agricultural Society of Scotland, which placed a small sum of money at the disposal of a committee appointed by itself to take charge of a department of veterinary surgery it had formed. This patronage, and very much in the way of material assistance and encouragement, were continued to the time of Dick's death in 1866. During the long period in which he presided over the school, considerable progress was made in diffusing a sound knowledge of veterinary medicine in Scotland and beyond it. For many years his examining board, which gave certificates of pro- ficiency under the auspices of the Highland and Agricultural

Society, was composed of the most distinguished medical men in-

Scotland, such as Goodsir, Syme, Lizars, Ballingall, Simpson, and Knox. By his will Dick vested the college in the lord provost and town council of Edinburgh as trustees, and left a large portion of the fortune he had made to maintain it for the purposes for which it was founded. In recent years another veterinary school has been established in Edinburgh, and one in Glasgow, both of which are doing good service.

In 1844 the Royal College of Veterinary Surgeons (to be care- fully distinguished from the Royal Veterinary College) obtained its charter of incorporation. The functions of this body were, until a recent date, limited almost entirely to examining students taught in the veterinary schools,

and bestowing diplomas of membership on those who successfully passed the examinations conducted by the boards which sat in London and Edinburgh. Soon after the Royal College of Veterinary Surgeons obtained its charter of incor- poration a difference arose between it and Dick, which resulted in the latter seceding altogether from the union that had been estab- lished and forming an independent examining board, the Highland and Agricultural Society granting certificates of proficiency to those students who were deemed competent. This schism operated very injuriously on the progress of veterinary education and on profes- sional advancement, as the competition engendered was of a rather deteriorating nature. After the death of Dick the dualism in veterinary licensing was suppressed: the Highland Society ceased to give certificates and the only mode of admission to the profession was through the Royal College. Since then the subjects taught have been increased in number ; conformably with the requirements of ever-extending science, the period of study has been enlarged so as to be nearly as long as that imposed upon medical students; the teaching is more thorough and practical ; and the examinations are more frequent and searching. Candidates for admission to the Schools must also give evidence of having received a good general education. Also since the suppression of the dual system an Act of Parliament has been obtained protecting the title of the graduates of the Royal College of Veterinary Surgeons, and conferring other advantages, not the least of which is the power granted to the college to remove the names of unworthy members from its register. In some respects the Veterinary Surgeons Act is superior to the Medical Act, while it places the profession on the same level as other learned bodies, and prevents the public being imposed upon

1 See Moorcroft and Trebeck's Travels in Cashmere and Thibet.

by empirics and impostors. The college has instituted a higher degree, that of fellow, which cau only be obtained after the graduate has been five years in practice and by passing a severe examination. Fellows only can be members of council or members of the examin- ing boards. The graduates of the Royal College of Veterinary Surgeons who have been

registered since its foundation in 1844 probably number 4000. In the British army there is a smaller mortality among the animals employed, and less loss from con- tagious diseases than in any other in Europe; this result, as well as the high efficiency of the horses, is largely due to the zeal, intel- ligence, and natural aptitude of the veterinary officers for their special duties. In no other army are they so severely tested, physically and professionally,—more than one-half of their service being foreign; aud in India their skill has to be exercised on elephants, camels, bullocks, cattle, and sheep, in addition to horses. During war the strain on army veterinary surgeons is very heavy; and, while surgeons are protected in the field by the Geneva Red Cross, being considered as non-belligerents, veterinary officers arc regarded as combatants, and therefore run the risk of capture, imprisonment, or death at the hands of the enemy.

in India there are one or more veterinary schools in each presi- dency, in which natives are trained as veterinary surgeons. The need for this will be perceived when it is stated that the loss in India from preventible animal diseases alone amounts to at least £6,000,000 annually.

In the United States of America veterinary science has been an exotic of very slow growth. There are veterinary schools in New York, Minneapolis, and elsewhere, but these, like those in Great Britain, are private institutions. To the Cornell, Pennsylvania, and Harvard universities veterinary schools or chairs have beet attached with competent teachers. Events are at present rapidly compelling the people of the United States to realize the true value and importance of veterinary science. For many years the "lung plague"' has been gradually extending itself westward, and it is now causing heavy losses. Long exempted from the more serious of the contagious diseases of animals which have scourged Europe, the United States are now invaded by all of them except two—cattle plague and the foot-and-mouth disease ; and an exotic disorder of pigs, the swine plague or fever, is threatening to exterminate these animals.

The veterinary literature of this period affords striking evidence of the progress made by the science: excellent text-books, manuals, and treatises on every subject belonging to it are very numerous, and are published in every European language, while there is an abundance of periodical

literature. The education—general and technical—of practitioners of veterinary medicine has, of course, been improving to a corresponding extent. The matriculation test for admission to the best veterinary schools and the fixed period for instruction in them vary but little from those of the medical schools. In Germany the veterinary schools at Berlin and Hanover have been raised to the position of universities.

Objects of the Scrence.

One of the chief objects of the science is the treatment of disease in animals. Veterinary medicine has been far less exposed to the vagaries of theoretical doctrines and systems than human medicine. The explanation may perhaps be that the successful practice of this branch of medicine more clearly than in any other depends upon the careful observation of facts and the rational deductions to be made therefrom. No special doctrines seem, in later times at least, to have been adopted, and the dominating sentiment in regard to disease and its treat- ment has been a medical eclecticism, based on practical experience and anatomico-pathological investigation, rarely indeed on philosophical or abstract theories. In this way veterinary science has become pre-eminently a science of observation. At times indeed it has to some extent been influenced by the doctrines which have controlled the practice of human medicine—such as those of Broussais, Hahnemann, Brown, Rasori, Rademacher, and others— yet this has not been for long: experience of them when tested upon dumb unimaginative animals soon exposed their fallacies and compelled their discontinuance.

Of more moment than the cure of disease is its preven- tion, and this is now considered the most important object in connexion with veterinary science. More especially is this the case with those serious disorders which depend for their existence and extension upon the presence of an infecting agent, and whose ravages for so many centuries

In India.

In the United States,

Treat- ment of disease.

are written largely in the history of civilization. Every advance made in medicine affects the progress of veterinary science, and the recent remarkable discoveries, some of which have been initiated by members of the veterinary profession, or developed by them, must in the end create as great a revolution in veterinary practice as in the medicine of man. In "preventive medicine" the benefits to be derived from the application of the germ theory will be immense ; the sanitary police measures based on this know- ledge are easily framed, and, if carried rigorously into operation, must eventually lead to the extinction of these disastrous disorders.1 The medicine of the lower animals differs from that of man in no particular so much, perhaps, as in the application it makes of utilitarian principles. The life of man is sacred; but in the case of animals, when there are doubts as to complete restoration to health and soundness, monetary considerations generally decide against the adoption of remedial measures. This feature in the medicine of the domesticated animals brings very prominently before us the value of the old adage that "prevention is better than cure." In Great Britain the value of comparative pathology in the relations it bears to human medicine, to the public health and wealth, as well as to agriculture, has been strangely overlooked or ignored; and in consequence but little allowance has been made for the difficulties the practitioner of animal medicine has to contend with. The rare instances in which animals can be seen by the veterinary surgeon in the earliest stages of disease, and when this would prove most amenable to medical treatment; delay, gener- ally due to the inability of those who have the care of animals to perceive these early stages; the fact that animals cannot, except in a negative manner, tell their woes, describe their sensations, or indicate what and where they suffer; the absence of those comforts and conveni- ences of the sick room which cannot be called in to amelio- rate their condition ; the violence or stupor, as well as the structural arrangements and attitude of the sick creatures, which only too frequently render favourable positions for cure impossible ; the slender means generally afforded for carrying out recommendations, together with the often- times intractable nature of

these diseases; and the utili- tarian influences alluded to above,—all these considera- tions, in the great majority of instances, militate against the adoption of curative treatment, or at least greatly increase its difficulties.

For more than forty years most destructive plagues of animals have prevailed almost continuously in the British islands without any attempt, worthy of the name, having been made to check or extirpate them until within a very recent period. Two exotic bovine diseases alone (contagi- ous pleuro-pneumonia or lung plague and foot-and-mouth disease) are estimated to have caused the death, during the first thirty years of their prevalence in the United King- dom, of 5,549,780 cattle, roughly valued at £83,616,854 ; while the invasion of cattle plague in 1865-66 was calcu- lated to have caused a money loss of from £5,000,000 to £8,000,000. The depredations made in South Africa and Australia by the lung plague alone are quite appalling ; and in India the loss brought about by contagious diseases among animals has been stated at not less than £6,000,000 annually. The damage done by tuberculosis—a contagious tlisease of cattle, transmissible-to several kinds of animals, and possibly also to man, by means of the flesh and milk of diseased beasts—cannot be even guessed at; but it must be enormous, when we learn how widely the malady is diffused. But that terrible pest of all ages, the cattle plague, has in its two recent invasions of England been

1 Comp. Fleming, Veterinary Sanitury Science and Police, London,

1875.

promptly suppressed with comparatively trifling loss. The foot-and-mouth disease, which proved such a heavy inflic- tion to British agriculture from its introduction in 1838, has been completely extirpated. Glanders, which annually caused the destruction of large numbers of cavalry horses, | is now unknown in the army, and is rapidly disappearing from civilian stables. Rabies would soon be included in the category of extinct diseases if the indications of veterinary science were followed; and so with the other contagious maladies of animals. As for such diseases as | depend for their development upon germs derived from) the soil or herbage upon

which animals live, and which cannot be directly controlled by veterinary sanitary ’ measures, the system of protective inoculation with culti- vated virus introduced by Pasteur will probably bring about their extinction, or at any rate greatly nutigate their effects. Veterinary science can also offer much assistance in the Rela- study and prevention of the diseases to which mankind tions | are liable. Some grave maladies of the human species 2! Vt, : : : inary are certainly derived from animals, and others may yet be puma! added to the list. In the training of the physician great medi-. benefit would be derived from the study of disease in cine. | animals,—a fact which has been strangely overlooked in q England, as those can testify who understand how closely the health of man may depend upon the health of the creatures he has domesticated and derives subsistence from, and how much more advantageously morbid processes can be studied in animals than in our own species. Although as yet no chair of comparative pathology has been estab- lished in any British university, on the Continent such chairs are now looked upon as an almost indispensable item of every university. Bourgelat, towards the middle of the 18th century, in speaking of the veterinary schools he had been instrumental in forming, urged that “leurs portes soient sans cesse ouvertes 4 ceux qui, chargés par état de la conservation des hommes, auront acquis par le nom qu’ils se seront fait le droit d’interroger la nature, | chercher des analogies, et vérifier des idées dont la con- formation ne peut étre qu’utile 4 l’espéce humaine.” And the benefits to be mutually derived from this association of the two branches of medicine inspired Vicq d’Azyr to — elaborate his Vouveau Plan de la Constitution de la Médecine en France, which he presented to the National Assembly in 1790. His fundamental idea was to make veterinary \ teaching a preliminary (le premier degré) and, as it were, the principle of instruction in human medicine. His pro- posal went so far as to insist upon a veterinary school being annexed to every medical college established in France. This idea was reproduced in the Rapport sur [Instruction Publique which Talleyrand read before the National Assembly in 1790. In this project veterinary teaching was to form part of the National Institution at Paris. | The idea was to initiate students of medicine into aknow- | ledge of diseases by observing those of animals. suffering animal always appears exactly as it is and feels, ‘ without the intervention of

mind obscuring the symptom- atology, the symptonis being really and truly the rigorous expression of its diseased condition. From this point of

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The

view, the dumb animal, when it is ill, offers the same

difficulties in diagnosis as does the ailing infant or the

comatose adult. Of the other objects of veterinary science there is only

one to which allusion need here be made: that is the

perfectioning of the domestic animals in everything that

is likely to make them more valuable to man. This is in

an especial manner the province of this science, the know-

ledge of the anatomy, physiology, and other matters con-

nected with these animals by its students being essential

for such improvement.

Nursing.

. Food for a sick horse,

VETERINARY SCIENCE

DISEASES OF DOMESTIC ANIMALS.

Considerations of space forbid a eomplete or detailed description of all the diseases, medical and surgical, to which the domesticated animals are liable. 'This is to be found in the current veterinary text-books. Refcrence will be made here only to the more import- ant disorders of animals which

are of a communicable nature, and which were not included in the article MurnraIn (q.v.).

Diseases of the Horse.

Every horseman should know something of the injuries, lame- nesses, and diseases to which the horse is liable. Unfortunately not very much can be done in this direction by book instruction ; indeed, there is generally too much doctoring and too little nursing of-siek animals. Even in slight and favourable cases of illness re- covery is often retarded by too zealous and injudicious medication ; the objeet to be always kept in view in the treatment of animal patients is to place them in those conditions which allow nature to operate most freely in restoring health. This can best be rendered in the form of nursing, which sick animals greatly appreciate. However indifferent a horse may be to caressing or kind attention during health, when ill he certainly appreciates both, and when in pain will often apparently endeavour to attract notice and seek yelief from those with whom he is familiar. Fresh air and clean- liness, quiet and eomfort, should always be secured, if possible. The stable or loose box should be warm, without being close, and free from draughts. If the weather is cold, and especially if the horse is suffering from inflammation of the air-passages, it may be necessary to keep up the temperature by artificial means ; but great care should be taken that this does not render the air too dry to breathe. The surface of the body can be kept warm by rugs, and the legs by woollen bandages. Yet a sick horse is easily fatigued and annoyed by too mucli clothing, and therefore it is better to resort to artificial heating of the stable than to overload the body or impede moveinent by heavy wrappings. If blankets are used, it is well to place a cotton or linen sheet under them, should the horse have an irritable skin. For bedding, long straw should be employed as little as possible, sinee it hampers movement. Clean old litter, sawdust, or peat-moss litter is the best. If the hoofs arc strong, and the horse likely to be confined for some weeks, it affords relief to take off the shoes. Tying up should be avoided, if possible, unless it is urgently required, the horse being allowed to move about or lie down as he may prefer.

When a sick horse has lost his appetite, he should be tempted to eat by offering him such food as will be enticing to him. It should be given frequently and in small quantities, but should not be foreed on him ; food will often be taken if offered from the hand, when it will not be eaten out of the manger. Whether the animal be fed from a bueket or from a manger, any food that is left should be thrown away, and the receptacle well cleancd out after each meal, As a rule, during sickness a horse requires laxative food, in order to allay fever or inflammatory symptoms, while support-

biscuits, malt liquor, eorn, &c., are often prescribed with this object. Milk may be given skimined or unskimmed ; a little sugar may be mixed with it ; and one or two gallons may be given daily, according to circumstances. One or two eggs may be given beaten up with a little sugar and mixed with milk, three or four times a day, or more frequently ; or they may be boiled hard and powdered, and mixed in the milk. A quart of stout, alc, or porter may be given two or three times a day, or a half to one bottle of port wine daily. Scalded oats, with a little salt added, are very useful when convalescence is nearly completed. As a rule, a sick horse should have as much water as he likes to drink, though it may be necessary in certain cases to restrict the quantity, and to have the chill taken off; but it should never be warmer than 75° to 80°.

As little grooming as possible should be allowed when a horse is very weak ; it should be limited to sponging about the mouth, nostrils, eyes, and forehead with clean water, to which a little vinegar may be added. Rub the legs and ears with the hand, take off the clothing, and shake or change it once a day, and if agreeable rub over the body with a soft cloth. Exercise is of course not re- quired during sickness or injury, and the period at which it is allowed will depend upon circumstanees. Care must be taken that it is not ordered too early, or carried too far at first.

Administration of Medieine.—Much care is required in admin- How to istering medicines in the form of ball or bolus; and practice, as give a well as courage and tact, is needed in order to give it without ball.

danger to the administrator or the animal. The ball should be held between the fingers of the right hand, the tips of the first and fourth being brought together below the second and third, which are placed on the upper side of the ball; the right hand is thus made as small as possible, so as to admit of ready insertion into the mouth. The left hand grasps the horse's tongue, gently pulls it out, and places it on that part of the right side of the lower jaw which is bare of teeth. With the right hand the ball is placed at the root of the tongue. The momeut the right hand is withdrawn, the tongue should be released. This causes the ball to be carried still farther back. The operator then closes the mouth and watehes the left side of the neck, to note the passage of the ball down the gullet. Many horses keep a ball in the mouth a considerable time before they will allow it to go down. A mouthful of water or a handful of food will generally make them swallow it readily. If this does not succeed, the nostrils should be grasped by the hand and held a few moments.

To administer a drink or drench requires as much eare as giving How to a ball, in order to avoid choking the horse, though it is unattended give a with risk to the administrator. Au ordinary glass or stone bottle drink or

ing the strength. The following list comprises the usual laxative food employed :—green grass, green wheat, oats, and barley, Ineerne, earrots, parsnips, gruel, bran mash, linseed aud bran mash,

boiled barley, linseed tea, hay tea, and linseed oil. Green grass, Iueerne, and similar articles of food, if cut when in a wet state, should be dried before being given. Boiled grain should be cooked with very little water, so that it may be floury and comparatively dry when ready ; a little salt should be mixed with it. One gallon of good gruel may be made with a pound of meal and cold water, Which should be stirred till it boils, and afterwards permitted to simmer over a gentle fire till the fluid is quite thick. To make a bran mash, seald a stable bucket, throw out the water, put in three pounds of brau and one ounce of salt, add two and a half pints of boiling water, stir up well, cover over, and allow the mash to stand for fifteen or twenty minutes until it is well cooked. For a bran and linseed mash, boil slowly for two or three hours one pound of linseed, so as to have about a couple of quarts of thiek fluid, to Which two pounds of

bran and one ounce of salt may be added. The whole should be stirred up, covered over, and allowed to steam as before described. 'Ihe thicker the mash the more readily will the horse eat it. Linseed tea is made by boiling one pound of linseed m a couple of gallons of water until the grains are quite soft. It may be economically made by using less water to cook the linseed, and afterwards making up the quantity of water to about a gallon and a half. Hay tea. may be prepared by filling a buckct, after sealding it, with good sweet hay, pouring in as much boiling water as the bueket will hold, covering it over, and allowing it to stand until cold, when the fluid may be strained off and given to the horse. This forms a refreshing drink. Linseed oil, in quantities of from one quarter to half a pint daily, may be mixed with the food; it keeps the bowels in a lax condition, has a good effect on the skin oo alr-passages, and is useful as an artiele of diet. When debility las to be eombated, as in low fever or other weakening diseases, strengthening and other easily digested food must be administercd, though some of the foods already mentioned, such as boiled grain, 'answer this purpose to a certain extent. Milk, eggs, bread and

inay be used, provided there are no sharp points around the mouth ; drench.

but either the usual drenching horn or a tin vessel with a narrow mouth or spout is safer. It is necessary to raise the horse's head, so that the nose may be a little higher than the horizontal line. If the horse is restless, his head must be elevated by a loop of cord inserted into the mouth over the upper jaw, the prong of a stable fork being passed through it, and the handle held steady by an assistant. 'The drink must be given by a person standing on the right side (the assistant being in front or onthe left side of the horse), the side of the mouth being pulled out a little, to forma sack or funnel, into which the medicine is poured, a little at a time, allowing an interval now and again for the horse to swallow. If any of the fluid gets into the windpipe (which it is liable to do if the head is held too high), it will cause coughing, whereupon the head should be instantly lowered. Neither the tongue nor the nostrils should be interfered with. Powders may be given ina little mash or gruel, well stirred up.

If a wide surface is to be fomented (as the chest, abdonien, or Fomenta-
loins), a blanket or other large woollen cloth should be dipped in tions or
water as hot as the hand can comfortably bear it, noderately wrung
bathing.

out, and applied to the part, the heat and moisture being retained by covering it with a waterproof sheet or dry rug. When it has lost some of its heat, it should be removed, dipped in warm water, and again applied. In cases of acute inflammation, it may be neces- sary to have the water a little hotter ; and, to avoid the incon- venience of removing the blanket, or the danger of chill when it is removed, it may be secured round the body by skewers or twine, the hot water being poured on the outside of the top part of the blanket by any convenient vessel. To foment the feet, they should be placed in a bucket or tub (the latter with the bottom resting wholly on the ground) containing warm water ; a quantity of moss litter put in the tub or bueket prevents splashing and retains the

heat longer. . XXIV. — 26

Poultices.

Enemata or elysters.

Glanders.

Acute form.

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Poultices are used for allaying pain, promoting suppuration, softening horn or other tissues, and bringing on a healthy action in wounds. To be beneficial, they should be large and always kept moist. For applying poultices to the feet, a poultice-shoe, constructed as follows, may be used with advantage. 'Take a cir- cular piece of hard wood, a little longer and broader than a horse- shoe, and about one and a half inches thick. Get one surface of it rounded in a lathe, so that there may be a risc of about three- quarters of an inch in the centre, while the other surface remains flat. Round the circumference of the board nail leather, so as to form a

convenicnt boot for retaining the poultice, similar to the one in ordinary use, except that the part which comes on the ground is rounded. The fact of its being round will enable the horse to whose foot it is applied to ease the affected spot by throwing his weight on the toe, the heel, or on either quarter, as lie chooses. Poultices are usually made with bran, thongh this has the disad- vantage of drying very quickly, to remedy which it may be mixed with hnseed meal or a little linseed oil. Boiled carrots or turnips mashed make a good poultice, as docs linseed meal, when mixed with boiling water (with a little olive oil added) by stirring. A charcoal poultice is sometimes used when there is a bad smell to be got rid of. Itis made by mixing linseed meal with boiling water and stirring until a soft mass is produced ; with this some wood charcoal in powder is mixed, and when ready to be applied some more powder is sprinkled on the surface. It may be noted that, in lieu of these materials for poultices, what is known as spongio- piline can be usefully employed. A piece of sufficient size is steeped in hot water, applied to the part, covered with a large piece of oiled silk or waterproof stuff, and secured there. Even an ordinary sponge, steeped in hot water and covered with any watcrproof material, makes a good poulticing mediuin ; it is well adapted for the throat, near the head, as well as for the space between the branches of the lower jaw. g

Enemata or clysters are given in fevers, inflammation, constipa- tion, &c., to empty the posterior part of the bowels. They are adiministered by a large syringe capable of containing a quart or more of water, with a nozzle about twelve inches in length, with an ox's bladder tied to a pipe, or a large funnel with a long nozzle at aright angle; but the syringe is best. Water alone is usually applied for enemata; it should be about the temperature of the body, not less, but perhaps a degree or two more. To administer an enema, one of the horse's fore-feet should be held up, while the operator pushes the end of the nozzle, smeared with a little lard or oul, very gently and steadily for a few inches into the intestine, and then presses out the water. The amount injected will depend upon the size of the animal; two or three quarts would suffice for an ordinary-sized horse.

Epixootic and Contagious Diseases.—The epizootie diseases affect- ing the horse are not numerous, and may generally be considered as specific, or infectious and contagious, in their nature, cireum- stances of a

favourable kind leading to their extension by propaga- tion of the agent upon which their existence depends. This agent, in some of the maladies, has been proved to be a micro-organism, and there can be little doubt that it is so for all of them.

Glanders is one of the most serious diseases affecting horses, not only because it is incurable, but because it is very contagious. It is known in nearly every part of the world, except in Australasia. The virulent principle of glanders establishes itself most easily among horses kept in foul, badly-ventilated stables, or among such as are overworked, badly fed, or debilitated in any way. Glanders, however, has this in common with other contagious diseases, that it is never spontaneously developed, in the absence of the virulent agent. Carnivorous animals—as lions, tigers, dogs, and cats—have become infected through eating the flesh of glandered horses ; and goats, sheep, swine, and rabbits have been successfully inoculated with the virus. Men who attend on diseased horses are Hable to be infected, especially if they have any sores on the exposed parts of their bodies (see GLANDERS). Though infection through wounds is the readiest way of receiving the disease, the germ or bacillus may also obtain access through the lungs, stomach, and thin mucous membranes, such as that of the eyes, nose, and lips. Glanders is presented in two forms,—one affecting the mucous membranes of the body, more particularly those of the air-passages (glanders proper), and the other attacking the skin and the superficial lymphatic vessels (farcy). Both forms are due to the same virus, and both may be acute or chronic. The acute form is the more quae and virulent, and either destroys life quickly or becomes chronic.

The symptoms of acute glanders are marked by fever and its accompaniments—loss of appetite, hurried pulse and respiration, languor, and disinclination to move. Sometimes the legs or joints are swollen ; but the characteristic symptoms, the classical signs, are a yellow adhesive discharge from one or both nostrils ; there is also a peculiar enlarged nodulatcd condition of one or both lymphatie glands between the branches of the lower jaw, which, though they may be painful, very rarely suppurate ; and on the mucous mem- brane covering the septum of the nose are little yellow pimples or

pustules, running into deep ragged-edged ulcers. The discharge from the nostril adheres to its margin, because of its glutinous nature, and straw and other matters also stick to it, while the obstruction to the respiration causes the animal to snort frequently —a cause of danger to men and animals, as this nasal discharge is virulent. In addition, the lymphatic vessels of the face are often involved and appear as corded lines passing up the cheeks ; they are painful on pressure. In some cases there is a cough. As the disease progresses, the ulcers in the nostrils extend in size and depth and increase in number, often completely perforating the septum, and being sometimes covered with black crusts; the nasal discharge becomes more abundant and tenacious, streaked with blood, and foul smelling, and causes the animal the greatest diffi- eulty in breathing, so that it appears to be on the point of suffoca- tion. Death is due either to this cause or to exhaustion.

Chronic glanders gencrally presents the same symptoms ; but the Chronic

health and be able to perform a certain amount of work. In some cases the ulceration may not be perceptible, and only the peculiar knotty enlarged gland and slight discharge from one nostril be evident. There may be uncertainty in such cases as to whether the disease is glanders, owing to the absence of ulceration; and, to prove whether it is that diseasc, recourse has to be had to inocula- tion of another animal, generally a worthless horse or ass, the latter being the best, as it develops the characteristic symptoms more rapidly and certainly.

In farcy, instead of the symptoms being manifested in the interior Farey.

of the body or head, they show themselves on the skin, where the lymphatic vessels become inflamed and ulcerate. These vessels appear as prominent lines or "cords," hard and painful on manipn- lation, and along their course arise little tumours (the so-called "farcy buds"). These tumours ulcerate, forming sores, from which is discharged a thin glutinous pus. When the skin of the limbs is affected, these are much swollen and the animal moves with pain and difficulty. Rarely large abscesses containing thin pus form on the body. Farey may appear during

glanders or precede it, but it generally terminates in it, though the limbs and body may be eovered with ulcers before this occurs.

Medical treatment of glanders, chronic and acute, and of acute Treat- farcy should not be attempted, as the malady is incurable, while ment, the danger of infection being transmitted to other animals or men &e.

is always real and imminent. Horses which present suspicious symptoms, or those which have been in contact or have stood in the same stable with diseased horses, should be kept apart from others, and their harness, clothing, &c., left with them. Animals which are found to be affected should be immediately destroyed and buried with proper precautions, their harness, clothing, and the utensils employed with them being either destroyed also or thoroughly cleansed, while stables and places which they have fre- quented should be completely disinfected. Forage and litter used by glandered horses ought to be burned or buried.

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animal is not so seriously ill, and may indeed appear to be in good forni, j

The venereal or coitus disease is a malady which occurs in Arabia Coitus | and continental Europe, and has recently been carried trom France disease.

to the United States of America (Montana and Illinois). In sone of its features it resembles human syphilis, and it is propagated in the same manner. From one to ten days after coitus, or in the stallion not unfrequently after some weeks, there is irritation, swelling, and a livid redness of the external organs of generation (in stallions the penis may shrink), followed by unhealthy ulcers, which appear in successive crops, often at considerable intervals. {In mares these are near the clitoris, which is frequently erected, and the animals rub and switch the tail about, betraying uneasiness. In horses the eruption is on the penis and sheath. In the milder forms there is little constitutional disturbance, and the patients play recover in a period varying from two weeks to two months. In the severe forms the local swelling increases by intcrmittent steps. In the mare the vulva is the seat of a deep violet congestion and exteusive

ulceration ; pustules appear on the perineum, tail, and between the thighs ; the lips of the vulva are parted, exposing the irregular, nodular, puckered, ulcerated, and lardaceous – looking mucous membrane. Ifthe mare happens to be pregnant, abortion occurs, In all cases emaciation sets in; lameness of one or more limbs occurs; great debility is manifested, and this runs on to paralysis, when death ensues after a miserable existence of from four or five months to two yeats. In horses swelling of the sheath may be the only symptom fora long time, even for a year. Then there may follow dark patches of extravasated blood on or swellings of the penis; the testicles may become tumefied ; a dropsical en- gorgement extends forward beneath the abdomen and chest; the lymphatic glands in different parts of the body may be enlarged ; pustules and ulccrs appear on the skin; therc is a discharge from the eyes and nose ; emaciation becomes extreme ; a weak and vacillat- ing movement of the posterior limbs gradually increases, as in the mare, to paralysis; and after from three months to three years death puts an end to loathsomeness and great suffering. This malady appears to be spread only by the act of coition. Itisa purely con- tagious disorder, and cannot be generated by any known agency or

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| Influ- enza.

Typhoid, gastric, fluenza, and somctimes occurs at the same time in a locality. It

or bilious fever,

VETERINARY SCIENCE

cause. The indications for its suppression and extinction are there- fore obvious. They are (1) to prevent diseased animals coming into actual contact, especially per coitwm, with healthy ones, (2) to destroy the infected, and (3), as an additional precautionary measure, to thoroughly cleanse and disinfect the stables, clothing, utensils, and implements used for the sick horse.

Under influenza several diseases are sometimes included, and in different invasions it may (and doubtless does) assume varying forms. It may be said to bea specific fever of a low or asthenic type, associated with inflammation of the mucous membrane lining the air-passages, and also sometimes with that of other organs. At various times it has prevailed extensively over different parts of the world, more especially during the 18th and 19th centuries. Per- haps one of the most wide-spread outbreaks recorded was that of 1872, on the American continent. It usually radiates from the district in which it first appears. The symptoms have been enu- merated as follows:—sndden attack, marked by extreme debility and stupor, with increased body-temperature, quick weak pulse, rigors, and cold extremities. The head is pendent, the eyelids swollen and half closed, eyes lustreless, and tears often flowing down the face. There is great disinclination to move; the body sways on the animal attempting to walk; and the limb-joints crack. The appetite is lost and the mouth is hot and dry; the bowels are constipated and the urine scanty and high-coloured ; there is nearly always a deep, painful, and harassing cough ; on auscultation of the chest crepitation or harsh blowing sounds are audible; and the membrane lining the eyelids and nose assumes either a bright pink colour or a dull leaden hue. A white, yellowish, or greenish-coloured discharge flows from the nostrils. In a few days the fever and other symptoms subside, and convalescence rapidly sets in. In unfavourable cases the fever increases, as well as the prostration, the breathing becomes laboured, the cough more painful and deep, and auscultation and percussion indicate that the lungs are seriously involved, with perhaps the pleura or the heart. Clots sometimes form in the latter organ, and quickly bring about a fatal termina- tion. When the lungs do not suffer, the bowels may, and with this complication there are, in addition to the stupor and torpor, tension and tenderness of the abdominal walls when pressed upon, mani- festations of colic, great thirst, a coated tongue, yellowness of the membranes of nose and eyes, high-coloured urine, constipation, and dry feces covered with mucus. Sometimes rheumatic swelling and tenderness take place in the muscles and joints of the limbs, which may persist for a long time, often shifting from leg to leg, and involving the sheaths of tendons. At other times acute inflam- mation of the eyes supervenes, or even paralysis.

In this disease good nursing is the chief factor in the treatment.

Comfortable, clean, and airy stables or loose-boxes should be pro-

vided, and the warmth of the body and limbs maintained. Cold and damp, foul air and uncleanliness, are as inimical to health and as antagonistic to recovery as in the case of mankind. In influenza it has been generally found that the less medicine the sick animal receives the more likely it is to recover. Nevertheless it may be necessary to adopt such medical measures as the following. For constipation administer enemata of warm water or give a dose of linseed oil or aloes. For fever give mild febrifuge diuretics (as liquor of acetate of ammonia or spirit of nitrous ether), and, if there is cough or nervous excitement, anodynes (such as extract of bella- donna). When the fever subsides and the prostration is great, it may be necessary to give stimulants (carbonate of ammonia, nitrous ether, aromatic ammonia) and tonics, both vegetable (gentian, quassia, calumba) and mineral (iron, copper, arsenic). Some veter- inary surgeons administer large and frequent doses of quinine from the onset of the disease, and, it is asserted, with excellent effect. If the abdominal organs are chiefly involved, demulcents may supplement the above (linseed boiled to a jelly, to which salt is added, is the most convenient and best), and drugs to allay pain (as opium and hydrocyanic acid). Olive oil is a safe laxative in such cases. When nervous symptoms are manifested, it may be necessary to apply wet cloths and vinegar to the head and neck ; cven blisters to the neck have been recommended. Bromide of potassium has been beneficially employed. To combat inflammation of the throat, chest, or abdomen, counter-irritants may be resorted to, such as mustard, soap liniment, or the ordinary white liniment composed of equal parts of oil of turpentine, liquor ammonie, and olive oil. The food should be soft mashes and gruel of oatmeal, with carrots and green food, and small and frequent quantities of scalded oats in addition when convalescence is established.

Typhoid, gastric, or bilious fever is often confounded with in-

also appears independently in horses when shedding their coat in the autumn, in those kept in a hot, close, and impure atmo- sphere, and in those fed insufficiently or on badly-preserved, musty, or otherwise

improper food, or supplicd with water con- taining an excess of decomposing organic matter. Overwork or hardship predisposes to an attack. This fever seenis to become con- tagious under certain conditions, especially in badly-ventilated in- salubrious stables. Wholesome and well-aired stables are not indeed

always exempt ; but in them the disease is less serions and does not spread so rapidly. It is presumed that this fever is caused by some virulent principle. As "premonitory" indications of the malady, the horse appears dull and listless, and careless of food. Then signs of fever appear, in the form of staring coat, shivering, alternate heat and coldness of the surface, restlessness, a hot dry mouth, and elevation of the internal temperature of the body. 'The visible mucous membranes have a yellow tinge; constipation is present, and with it indications of colicky pain ; the abdomen is distended, tense, and sensitive on pressure ; feces are passed in the shape of a few hard, dark-coloured pellets covered with mucus; the urine is scanty, red in colour, and after standing a short time deposits a heavy sediment. Sometimes there is sore throat, with increased respiration and a nasal discharge. In mild attacks convalescence may occur in from a week to ten days. In serions cases the pulse is small, fecble, and quick; the mouth is very hot and dry, and exhibits yellow, brown, or greenish patches; the abdomen is more tender and the bowels very irritable, diarrhoea of a foetid character often ensuing. Prostration to an extreme degree is a very marked feature in these cases. The head is maintained in a pendent posi- tion ; the eyes become sunken ; the expression is haggard and list- less; while the stupor may be so advanced that pinching or pricking the skin will elicit no indication of sensibility. A fatal termination usually occurs in from ten to twenty days.

The diet must be carefully attended to, and should be soft and easily digested, such as mashes of bran, sliced carrots or turnips, boiled oats or barley, freshly cut grass, and oatmeal gruel. The stable should be kept clean and sweet, fresh air being an important factor in treatment ; the body of the patient must also be made comfortable by clothing. Quiet is necessary. Quinine has been found useful in large and repeated doses; and calomel has becn recommended. A daily dose of Glauber's salt may be given if there is constipation; and, if this is obstinate, enemata of warm water should be administered in addition. A drachm each of chlorate or nitrate of potash and muriate of ammonia may be given three or four times daily with the water drunk ; or in cases of great prostra- tion an

ounce of oil of turpentine, sulphuric ether, sweet spirits of nitre, or carhonate of ammonia may be given as well. If there is much tenderness of the abdomen, hot fomentations continued for a long time, or mustard poultices, or the application of extract of mustard should be resorted to. When convalescence sets in, three or four ounces of tincture of gentian or cinchona may be given twice daily, with muriate of iron and stimulants.

Strangles is a specific contagious and infectious fever peculiar to Strangles,

ungulates, and is more especially incidental to young animals. It is particularly characterized by the formation of abscesses in the lymphatic glands, chiefly those between the branches of the lower jaw (submaxillary). Various causes are ascribed for its production, such as change of young horses from field to stable, from grass to dry feeding, from idleness to hard work, irritation of teething, and change of locality and climate. It is asserted that repeated attacks will occur in the same horse under the influence of the last-named cause. But the chief, if not the sole, cause is infection, —the malady, in some of its features, closely resembling the ‘“‘mumps” of the human species. Languor and feverishness, diminution of appetite, cough, redness of the nasal membrane, with discharge from the eyes and nose, and thirst are among the earliest symptoms. Then there is difficulty in swallowing, coincident with the development of swelling between the branches of the lower jaw, which often causes the water in drinking to be returned through the nose and the masticated food to be dropped from the mouth. The swelling is hot and tender, diffused, and uniformly rounded and smooth ; at first it is hard, with soft, doughy margins; but later it becomes soft in the centre, where an abscess is forming, and soon “points . and bursts, giving exit to a quantity of pus. Relief is now experl- enced by the animal ; the symptoins subside ; and recovery takes place. In some cases the swelling is so great or occurs so close to the larynx that the breathing is interfered with, and even rendered so difficult that suffocation is threatened. In other cases the disease assumes an irregular form, and the swelling, instead of softening in the centre, remains hard for an indefinite time, or 1t may subside and abscesses form in various parts of the body, sometimes 1n vital organs, as the brains, lungs, liver, kidneys, &c., or in the

bronchial or mesenteric glands, where they generally produce serious conse- quences. Not unfrequently a pustular eruption accompanies the other symptoms. The malady may terminate in ten days or be protracted for months, often terminating fatally, especially when the animal is not well nursed and is kept in an unhealthy stable. Good nursing is the chief part of the treatment. The strength should be maintained by soft nutritious food, and the body kept warm and comfortable ; the stable or loose-box must have plenty of fresh air and be kept clean. The swelling may be fomented with warm water and poulticed. The poultice may be a little bag con- taining bran and linseed meal mixed with hot water, and applied warm to the tumefaction, being retained there by a square piece of calico, with holes for the ears and eyes, tied down the middle of the face and behind the ears. If the breathing 1s disturbed and

Horse pox.

Tuber- culosis.

Milk or parturi- ent fever.

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noisy, the animal may be made to inhale steam from hot water in a bucket or from bran mash. Ifthe breathing becomes very difficult, the windpipe must be opened and a tube inserted. Instead of the swelling being poulticed, a little blistering ointment is sometimes rubbed over it, which promotes suppuration. When the abscess points, it may be lanced, though it is generally better to allow it to open spontaneously. ,

It is very important to distinguish strangles from glanders ; the character of the nasal discharge, the absence of ulcers from the nostrils, and the diffused soft swelling between the branches of the lower jaw establish the distinction between them. oe <

Horsepox, which is somewhat rare, is almost, if not quite, identi- eal with eowpox, being undistinguishable when inoculated on men and cattle. It most frequently attacks the limbs, though it may appear on the face and other parts of the body. There is usually slight fever; then swelling, heat,

and tenderness are manifest in the part which is to be the seat of eruption, usually the heels ; firm nodules form, increasing to one-third or one-half an inch in dia- meter; the hair becomes erect; and the skin, if light-coloured, changes to an intense red. On the ninth to the twelfth day a limpid fluid oozes from the surface and mats the hairs together in yellowish seabs ; when one of these is removed, there is seen a red, raw depression, whereon the scab was fixed. In three or four days the crusts fall off, and the sores heal spontaneously. No medical treatment is needed, cleanliness being requisite to prevent the pocks becoming sloughs. If the inflammation runs high, a weak solution of carbolic acid may be employed.

Bibliography.—Among the numerous modern popular works in English which treat of diseases of the horse, the following may be mentioned :— Robertson, Equine Medieine (uondon, 1883); Williams, Prineiples and Practice of Vi eterinary Medieine (2d ed., London, 1874-79), and Principles and Practice of Veterinary Surgery (2d ed., London, 1872-76); Courtenay, Manual of Veterinary Medicine and Surgery (London, 1886); Fleming, Practical Horse-Keeper (London, 1886) ; Gresswell, Diseases and Disorders of the Horse (Leeds, 1886); Fitzwygram, Horses and Stables (London, 1869); and Law, The Farmer's Veterinary Adviser (London, 1879).

Diseases of Cattle.

The diseases of the bovine species are not so numerous as those of the horse, and some of the more serious have been already alluded to (see MurRAIN). We will notice a few which have not been included among these.

Tubereulosis is a most formidable and widespread disorder of cattle; it is assuming greater proportions every year in those countries in which it is prevalent, in consequence of no steps being taken to check or suppress it. It is infectious and con- tagious, can be conveyed to other specics of animals by ingestion of the flesh and milk, as well as of the tuberculous material, and by inocnlation of these, or inhalation of dried discharges from the lungs ; it ean also be transmitted from the affected animal to the foetus in utero. Its infectious properties and ready communica- bility to

other species render it a scrious danger to mankind, through consumption as food of the flesh and milk of tuberculous eows. 'The disease owes its origin to a bacillus. The structures chiefly involved are the lymphatic glands and tissues, —the charac- teristic tubercles or " grapes" varying in size from that of a millet seed to immense masses weighing many pounds ; they are found in all parts of the body, but generally in the chest and on its lining membrane, as well as in the abdominal cavity. The symptoins resemble somewhat the contagious pleuro-pneumonia of cattle in its chronic form (sec Murrary), though tubercles, sometimes in large numbers, are often found after death in the bodies of cattle which exhibited no sign of illness during life, and which when killed were in excellent condition. When the lungs are involved, there are a peculiar phthisical cough, low fever, wasting and de- bility, aud often enlarged throat glands, less frequently enlarged joints. If the animal is not killed, it perishes in a state of maras- mus, from the difficulty experienced in breathing, or the profuse foetid diarrhoea which ensucs. Medical treatment is of little if any avail. Preventive measures are of the utmost importance. Animals free from the tuberculous taint should alone be bred from, and those discovered to be affected should be at once completely ere: gated, and if convenient destroyed. The milk of tuberculous cows should not be given to any animal as food, not at least unless well boiled. Neither should the flesh be eaten unless well cooked throughout.

Milk or parturient fever is a specific malady which appears after parturition, due to the absorption of septie matter from the interior of the uterus or vagina, producing what is known as " blood-poison- ing" or septicemia. The symptois may be briefly summiarized as follows :—high fever, restlessness, intense injection of the visible mucous membranes, tympanitis, foetid breath, stupor, swollen limbs, sanguinolent and perhaps purulent discharges from the vagina, foul- smelling diarrhoea, coma, and death. In the early stage treatment is generally successful. The uterine cavity should be thoroughly cleaned out by injections of warm water, and any adherent portions of placenta removed by hand. Then a weak solution of Condy's fluid (permanganate of potash) must be injected. Cleanliness is all-important. Diffusible stimulants in large quantity should be

given, with doses of solution of sulphate of quinine, perchloride of iron, oil of turpentine, or carbolic acid.

There is now strong evidence that one form of abortion in cows Abor- is due to infection. Whenever a case of abortion occurs in a shed, tion,

either the cow should be at once removed from the others, if they are pregnant, and cleaning and disinfection immcdiately resorted to; or, better still, the pregnant cows should be quickly moved out of the shed, and every care taken to keep them away from the sick cow and the discharges from it—these and the aborted foetus being burned or otherwise completely destroyed.

Cowpox is a contagious disease of much less frequent occurrence Cowpox, |

now than formerly, probably owing to improved hygienic manhage- ment. In many localities the disease appears in all heifers which have recently calved on certain farms. 'There is usually a slight premonitory fever, which is generally overlooked ; this is succeeded by some diminution in the quantity of the milk, with some in- creased coagulability, and by the appearance of the eruption or "pox" on the udder and teats. In well-observed cases the udder is hot and tender on manipulation for a day or two previous to the development of small palc-red nodules about the size of peas ; these increase in dimensions to from three-fourths to one inch in diameter by the eighth or tenth day, when their contents have become fluid and they present a depressed centre. This fluid, at first clear and limpid, becomes yellowish white as it changes to pus, and soon dries up, leaving a hard, button-shaped black crust, which gradually becomes detached. On the teats, owing to the handling of the milker or to the cow lying on the hard ground or on straw, the vesicles are early ruptured and sores are formed, which often prove troublesome and may cause inflammation of the udder.

Actinomycosis, though affecting man (cf. vol. xviii. p. 270), horses, Actino- pigs, and other creatures, is far more common in the bovine

species. mycosis,

The fungus (Actinomyces) may be found in characteristic nodules in various parts of the body, but it usually invades the bones of the jaws, upper and lower, or the soft parts in the neighbourhood of these, as the tongue, cheeks, face, throat, and glands in its vicinity. About the head the disease appears to commence with slight sores on the gums or mucous membrane of the mouth or with ulcers alongside decaying teeth, and these extend slowly into the tissues. If the jaw is affected, a large rounded tumour grows from it, the dense outer bone becoming absorbed before the increas- ing soft growth within. Soon the whole becomes ulcerated and purulent discharges take place, in which are found the minute, hard, yellow granules which contain the fungus. When the tongue is affected, it becomes enlarged and rigid; hence the designation of " wooden tongue" given to it by the Germans. In the course of time the surface of the organ becomes ulcerated, and yellowish masses or nodules may be seen on the surface. Sometimes the entire face is involved, the lips and nostrils becoming swollen, hard, aud immovable, often rendering respiration difficult. Around the throat there are rounded dense swellings, implicating the glands. When the disease is well-defined and of slight extent, the parts involved may be removed by the knife, wholly or partially. If the latter only, then the remaining affected tissues should be dressed with tincture of iodine or iodized carbolic acid. Chromic acid has also been found useful.

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Diseases of Sheep.

The contagious diseases of the sheep are comparatively few, and two of the more serious have been deseribed under MuRRAIN.

The formidable disorder of sheep-pox is confined chiefly to the Sheep- It is extremely contagious and fatal, and in pox.

continent of Europe. these and some other characteristics resembles human smallpox. From three to twelve days after being exposed to infection the sheep appears dull and listless, and eats little if anything ; the temperature rises ; there are frequent tremblings ; tears flow from the eyes; and there isa nasal discharge. Red patches appear inside the limbs and under the abdomen; and on them, as well as on other parts where the skin is thin, dark red spots show themselves, which soon become papules, with a deep hard base. These are generally conical, and the apex quickly becomes white from the formation of pus. This eruption is characteristic and unmistakable ; and the vesicles or pustules may remain isolated (discrete pox) or coalesce into large patehes (confluent pox). The latter form of the disease 1s serious. In bad cases the eruption may develop on the eyes and in the respiratory and digestive passages. The course of the disease lasts about three weeks or a month, and the eruption passes through the same stages as that of cowpox. The mortality may extend from 10 per cent. in mild outbreaks to 90 or 95 per cent. In very virulent ones. Diseased animals should be sheltered, and fed on nourishing food, especially gruels of oatmeal, flour, or linsced ; acidulated water may be allowed. If there is sloughing of the skin

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Dis- temper.

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or extensive sores, oxide of zine ointment should be applied. But treatment should not be adopted unless there is general infection over a wide extent of country. All diseased animals should be destroyed, as well as those which have been in contact with them, and thorough disinfection resorted to.

Diseases of the Pig.

The pig may become affected with foot-and-mouth disease (see Mvurrain), and it also has its own particular variola. But the dis- ease special to it, and which causes enormous losses, is swine plague. This scourge, known in America as hog cholera, is a specific con- tagious fever, or fevers, for it is extremely probable that two diseases are included under this designation. It is generally very rapid in its course, death ensuing in a very few days ; and when the animal survives recovery is protracted. After a period of three or four days to a fortnight from exposure to infection, the animal exhibits signs of illness by dulness, weakness, shiverings, burying itself under the litter, disinclination to move, staggering gait, great thirst, hot dry snout, sunken eyes, loss of appetite, and_ greatly increased pulse, respiration, and temperature. Red and brown patches appear on the skin ; there is a hacking cough ; nausea is followed by vomiting; pressure on the abdomen causes extreme pain ; diarrhea ensues ; the hind limbs become paralysed ; stupor sets in; and the animal perishes. Treatment should not be at- tempted when there is danger of the infection extending to other pigs. If treatment be used, nursing ought to be the chief element ; sloppy food, in which small doses of carbolic acid and oil of turpen- tine have been mixed, should be given, and these should be followed by tonics when convalescence sets in. To suppress the disease, kill all affected pigs, and if necessary those which have been in contact with them ; burn or bury deeply the carcases and litter ; and disinfect everything likely to have been contaminated by tlie virus.

Diseases of the Dog.

The contagious diseases of the dog are likewise very few, but the one which attracts most attention is common and gencrally serious. This is what is popularly known as distemper. It is peculiar to the canine species, for there is no evidence that it can be conveyed to other animals, though the different families of Car- nivora appear each to be liable to a similar disease. Distemper is a specific fever which most frequently attacks young dogs, its effects being primarily developed in the respiratory passages, though the brain, spinal cord, and abdominal organs may subse- quently be involved. Highly bred and pet dogs suffer more severely than the commoner and hardier kinds. It is a most infectious disease, and there is much evidence to prove that it owes its ex- istence and prevalence solely to its virulence. One attack confers immunity from another. The symptoms are rigors, sneezing, dul- ness, loss of appetite, desire for warmth, and increased temperature, respiration, and pulse. The eyes are red, and the nose, at first dry and harsh, becomes smeared with the discharge which soon begins to flow from the nostrils. Suppuration also begins at the eyes ; vision is more or less impaired by the mucus and pus, and often the cornea becomes ulcerated, and even perforated. There is a cough, which in some cases is so violent as to induce vomiting. Debility rapidly ensues, and emaciation is soon apparent ; diarrhoea in the majority of cases sets in; the body cmits an unpleasant odour ; ulceration of the mouth is noticed ; the nostrils become obstructed by the discharge from them; convulsions generally come on ; signs of bronchitis, pneumonia, jaundice, or other complications manifest themselves ; and in some instances there is a pustular or vesicular eruption on the skin. In fatal cases the animal dics in a state of marasmus. Many which recover are affected with chorea for a long time afterwards. Here, again, good nursing is all-important. Comfort and cleanliness, with plenty of fresh air, must be ensured. Debility being the most serious feature of the disease, the strength should be maintained or restored until the fever has run its course. Light broth, beef tea, or bread and milk, or these alternately, may be allowed as diet. Preparations of quinine, given from the com- mencement of the attack in a little wine, such as sherry, have proved very beneficial. Often a mild laxative is required. Com- plications should be treated as they arise. The disease being ex- tremely infectious, precautions should be adopted with regard to other dogs.

The formidable affliction known as RABIEs (q.v.) has been treated of under that name.

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PRINCIPAL PARASITES OF DomEsTIc ANIMALS.

Perhaps the commonest worm infesting the horse is Ascaris megalocephala or common lumbricoid. The males are from 6 to 8 Inches long, females 7 to 17 inches. It is found in almost every part of the intestinal canal, but generally in the small intestines. The symptoms produced in the horse by this worm are colicky pains,

which occur intermittently, an unhealthy condition of the skin, and staring coat. Although the animal feeds well, it does not im- prove in condition, but is very " tucked up," and the visible mucous membranes are very pale. In some instances pouches are formed in the coats of the intestincs. There are many recipes for the expulsion of lumbricoid ; among the principal remedies is a mixture of emetic tartar, oil of turpentine, and linseed oil; others are san- tonine, sulphate of iron, male fern, &c. Strongylus armatus or palisade worm was at first supposed to consist of two varieties, but it has been proved that these are simply different stages of growth of one parasite. It is a moderate-sized Nematoid worm, having a straight body, with a globular and somewhat flattened head,—males 1 to 14 inches long, females 14 to 2 inches. It is found in the intestines, especially the double colon and cecum. The embryo is developed in the interior of the egg after its expulsion from the host, and is lodged in moist mud, where, according to Cobbold, it changes its first skin in about three weeks, after which it probably enters the body of an intermediate bearer, whence it is conveyed to the alimentary canal of the horse, its ultimate host, in food or water. From the stomach it bores its

way into the blood-vessels, where it again changes its skin and gives rise to aneurisms. After a time it recommences its wanderings, and passes into the large intestines, where it rapidly acquires scxual maturity. It is a duug- feeder. Sometimes it passes into other tissues of the body (kidney, liver, &c.), and occasionally produces fatal results. This parasite is most dangerous to its equine host when it is migrating from one organ to another. It is principally found at the root of the anterior mesenteric artery, but it also gives rise to ancurism in the celiac axis, the post-mesenteric and splenic arteries, and even the aorta. The common lunibricoid, the palisade worm, and the four- spined strongyle (S. tetracanthus) are principally productive of colic. The last-mentioned worm, of which the male and female are about the same size, 4 to 2 inch long, is found in the cecum, colon, and duodenum. It is a true blood-sucker, and its development is very similar to that of 8. armatus, except that, when in the intestines in the trichonemous stage, it pierces the inner coats, encapsules itself, and forms little pill-lhke masses, and then again enters the tissues of the intestines before becoming mature. The symptoms of its presence are loss of condition, more or less constant colicky pains, unhealthy coat, flabby muscles, abdominal distension, diarrhea, foetid and watery faeces, pale mucous membranes, great weakness, more or less frequent cough, and sometimes partial or complete paralysis, dne to the formation of a clot of blood causing thrombosis of one of the principal vessels of the posterior extremities, thus interfering with the circulation of blood in the part supplied by the particular vessel. The treatment by which the common lumbri- coid is expelled will suffice to expel these strongyles, but care must be exercised in administering oil of turpentine, as it very often irri- tates the wounds caused by S. tetracanthus in the coats of the intes- tines. Of course this treatment applies to the mature stage of these worms.

Oxyuris curvula or pin worm is fusiform in shape, with smooth gently curved body (males 14 to 19 inches, females 34 to 43 inches Tong). It is seated in the cecum and colon ; and, although not found in the rectum, it causes great irritation at the anus by the clusters of eggs which are deposited around that part in the form of yellowish crusts. This parasite is best treated by means of a cathartic, followed by sulphate of iron, also carbolic acid in 23 per cent. solution.

The Cestodes of the horse are very insignificant, both as regards their size and the symptoms they create, the two principal being Tzxnia perfoliata and 7'. plicata. The former is the more common, but is only from 1 to 5 inches in length ; it is found in the cecum and colon, and is distinguished from 7. plicata, not only by its length, but also by its rounder head. This last, which has a nearly square head, and is from 6 inches to 8 feet in length, occurs in the small intestines and stomach. Generally a horse may be proved to be infested with tape-worm by finding some of the proglottides in the feces. The best remedy for the removal of Tenia is extract of male fern, with oil of turpentine and linseed oil, given three days in succession. ;

Gastrus cqui or the common bot, though not a true helminth (see INSECTS, vol. xiii. p. 150), is classed with the parasites on account of its larval form living as a parasite. The bot-fly deposits its eggs on the hair of horses in such a position as to enable that animal, when licking itself, to take them into its mouth ; there the warmth and moisture of the tongue, combined with the pressure of licking, cause them to burst, and from each egg a small grub escapes, which sticks to the tongue, and then passes down into the stomach, where it fixes itself to the cuticular lining of the organ by a hook which it has on each side of its mouth. There it under-goes no change (except that of growth, being at this time about 1 inch long) for about nine months, when it detaches itself, passes into the food, and is discharged with the feces.

Of the parasites which infest cattle and sheep mention will only In cattle be made of Fasciola hepatica or common fluke, which gives rise to and the discase called rot, and is more frequently met with in sheep sheep.

In the pig.

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than in cattle. For a full description of its anatomy and develop- inent, see TREMATODA, Vol. xxili. p. 535.

Strongylus micrurus is the husk-producing worm of cattle. The common earthworm is the intermediate bearer. S. filaria, or the common lung

strongyle of sheep, is distinguished from S. mierwrus by having no papille on its head. The ialcs are 1 inch to 1 inch 2 lines long and the females nearly 3 inches. The development is unknown ; but Cobbold thought that in its larval form the creature infested snails, &c. The symptoms of its presence in the sheep are a dull expression, quickened breathing, feetid breath, foaming at the mouth and nostrils, violent and spasmodic cough, loss of appetite, aud emaciation. Of various specific remedies the most successful is a mixture of oil of turpentine, linseed oil, and sulphuric ether, administered two mornings in succession, followed by a third dose on the fourth morning. This causes coughing, and consequent freeing of the tubes of the larvee and mucus. Good results have been derived from inhalation of chlorine gas, &c., which acts in the same way. The intratracheal injection of oil of turpentine is said to be followed by favourable results. The system should be supported with as much good nourishing food as possible. S. rufescens, or gordian strongyle (males 5 to 6 inches long, females 6 to 7 inches), is very often associated with S. filaria.

The principal Cestode of ruminants is Tania expansa, which, when fully mature, is more frequently found in sheep than in cattle. Its body consists of about one thousand segments, cach more broad than long. It is the longest of all tape- worms, being (according to Cobbold) in sheep from 8 to 30 feet and in oxen from 40 to 100 feet in length. Its maximum width is ? inch ; it is found in the large and small intestines. Cobbold thought its larval form was devcloped in the louse of the ox. The symptoms are emacia- tion, with dysentery, and loss of appetite. Male fern ought to be given in doses according to the size of the animal. For a full account of the development of Cysticereus bovis, the beef measle, see TAPE-WORMS, vol. xxlil. pp. 50-52. C. ov's is supposed by Cobbold to be the larval form of his so-called 7". tenclla of the human subject. Another bladder worm, found only in the mesentery of the sheep, is C. tenuieollis, the larval form of 7. marginata of the dog. An- other important hydatid of ruminants is Cenurus cerebralis, which gives rise to gid ; 1t is generally found in the brain of sheep, cattle, goats, deer, &c., and also in the soft structures of rabbits. It is the larval form of 7. cenwrus of the dog. The symptoms of gid are these. The animal has a rotatory motion; it does not graze freely ; there is paralysis on the opposite side to the vesicle; the

head is elevated or depressed if the hydatid is situated in the centre ; and the animal is easily frightened. Medical treatment is of no avail ; but the hydatid may be removed by a surgical operation.

Frichocephalus afinis, the common whip-worm, somctimes gives rise to severe symptoms in ruminants, particularly in sheep. The males aud females are cach about 2 inches long.

The helminths of the pig, although not very detrimental to the animal itself, are nevertheless of great importance in respect to the Lntozoa of the human subject, being the intermediary bearers of some dangerous human parasites in their immature state. Allusion must be made to Zrichina spiralis (see PARAsirisM, vol. xviii. p. 270). The development of this parasite requires about three weeks after being taken into the stomach, where the capsule is digested ; it then passes into the intestines of the pig, principally the duo- denum, where it takes two days to become mature ; then after about a week the embryos leave the body of the female worm, and immedi- ately commence penetrating the walls of the intestines in order to pass Into some voluntary muscles. About fourteen days elapse from the time they begin their wandering. Each is generally enveloped in a capsule, but two or even four have been found in one capsule. The male is sth, the female 4th inch long, and the larve #,th to goth inch. They have been known to live in their capsules from eighteen months to two years.

Cysticereus cellulose is the larval form of Tenia solium of man (see TAPE-WorMS, vol. xxiii. p. 52). ‘ Measly pork” is caused by the presence in the tissues of the pig of this entozoon, which is bladder-like in form. It has also been discovered in the dog, ape bear, rat, and deer. Other important parasites of the pig are Stephanurus dentatus, or crown-tailed strongyle, and Echinorhyn- chus gigas. This latter is the only thorn-headed or acanthocepha- lous worm infesting the domesticated animals (Cobbold).

The commonest of all parasites infesting the dog is Ascaris mystax |

| parasites, are vomited.

(males 2 to 34 inches, females 3 to 8 inches long).

irregularity of bowels, short cough, and irritation at anus; in the cat, more particularly, large quantities of mucus, with numerous The treatment consists of the adininistra- tion of castor oil, with santonine, according to the size of the animal. Filaria immitis, another Nematode, infests the heart of the dog, and its larve circulate in the blood, giving rise to fits, which often end in death.

Tezxnia scrrata is a modcrate-sized Cestode, from 2 to 3 feet in length ; it is found in about 10 per cent. of all English dogs, most frequently in sporting dogs, especially greyhounds and _ harriers, owing to their eating the intestines of rabbits, &c., in which the larval form (Cystieereus pisiformis) of this parasite dwells. It takes two months to pass through the first stage and one month to pass through the second when it is artificially produced, but much longer when produced naturally (Cobbold). 7. cenwrus gives rise to gid in sheep, as previously stated. It is 18 to 24 inches long, and is principally seen in the small intestines. 7. marginata is the largest Cestode infesting the dog. It varies in length from 5 to 8 feet, and is found in the small intestines of about 30 per cent. of dogs in Great Britain ; its larval form, C. tenwicollis, is found in the mesentery, &c., of sheep. In the treatment of Cestodes extract of male fern has been found the most effectual remedy ; areca nut and a pill consisting of colocynth and jalap, varying according to the size, age, and condition of the dog, have also proved efficacious. Com- paratively small doses of any vermifuge have often been found to give rise to violent symptoms, and all vcrmifuges if taken in large doses produce death ; too much care cannot, therefore, be exercised in adininistering vermifuges to young animals.

Another order of parasites which cause numerous diseases of the Dernato- | skin in the domesticated animals may be classed under two heads, zoa, i

viz., animal parasites or Dermatozoa and vegetable parasites or Dermatophyta. The animal parasites are those which produce scab, itch, mange, &c., in all animals. This class may be again divided into three varieties, viz., Sareoptes, which burrow in the skin; Dermatodeetes, which bite the skin ; and Symbiotes, which simply pierce the epidermis

(Gerlach). All these parasites live on serous fluids, produced by the irritation which they excite. Either one or more of these varieties infest all our domesticated animals: all three varieties have been found on the horse and sheep, the last two on the ox, and one in the pig, dog, and cat respectively. The sarcoptic variety of the horse and dog is easily transmitted to man. To distinguish between the different varieties, it is only necessary to place a few fresh scales in the sun ; if Swreoptes are present, they will soon be found on the under surface, whereas Dermatodeetes are on the upper surface. Again, the Sareoptes are isolated, whereas the Symbiotes and Dermatodectes live in clusters or colonies, Thirdly, the Symbtotes do not burrow, but merely bite the skin, and principally invade the limbs. An effectual cure for those which infest the horse is a mixture of sulphur, hellebore, oil of turpentine, whale oil, and carbolic acid, applied for three successive days, then washed off and applied again. For the dog a very useful remedy is made from creosote, olive oil, solution of potassium, and sulphur, also train oil and spirits of tar. The first is an almost sure cure for cats. A good remedy for destroying lice may be compounded from staphysagria powder, soft soap, and hot water, applied warm to the skin.

Vegetable parasites are of two kinds, namely, Tinea tonsurans, Dermate- or the cominon ringworm, seen in most of our domesticated animals, phyta.

and Favus, or honeycomb ringworm. The latter is seldom seen. 7. tonsurans is due to a cryptogamic parasite, Z''ricophyton, and is lodged in the interior of the roots of the hairs, which after a time lose their elasticity and break off, leaving the fungi in the form of a greyish white bran-like incrustation. In this they differ from Favus, which is yellow and covers the epidermis. It may affect any part of the body, but occurs principally on the head, face, neck, and hindquarters ; it is very prevalent amongst young cattle. Ringworm is very contagious, and may be communicated from one animal to another, and from animals to man. It mostly attacks badly-fed and ill-cared-for animals. The affected parts should be well washed with soft soap and warm water, removing as much as possible of the bran-like scales, and then with Stockholm tar oint-

ment, and finally with either iodine (in tincture or ointment) or carbolic acid (in solution or ointment). (G. FL.)

VETO. By this expression (Lat. veto, "I forbid 2) is understood in public law the constitutional right of the competent authority, or in republics of the whole people in their primary assembly, to protest against a legislative or administrative act, and to prevent wholly, or for the time being, the validation or execution of the same.

It is generally stated that this right was called into existence in the Roman republic by the tribunicia potestas,

because by this authority decisions of the senate, and of the consuls and other magistrates, could be declared in- operative. Such a statement must, however, be qualified by reference to the facts that interdico, interdicimus were the expressions used, and, in general, that in ancient Rome every holder of a magistracy could check a negotiation set on foot by a colleague, his equal in rank, by his opposition and intervention. This was a consequence of the position

It is also found In the in the cat and larger canines. The symptoms are wasting, voracity, dog,

V ii

that each of the colleagues possessed the whole power of the magistracy, and this right of intervention must have come into existence with the introduction of colleagued authorities, z.¢., with the commencement of the republic. In the Roman magistracy a twofold power must be distin- uished,—the positive management of the affairs of the state entrusted to each individual and the power of re- straining the acts of magistrates of equal or inferior rank by his protest. As the tribuni plebis possessed this latter negative competence to a great extent, it is customary to attribute to them the origin of the veto.

In the former kingdom of Poland the precedent first set in 1652 wasestablished by law as a constant right, that in the imperial diet a single deputy by his protest '" Nie pozwalam," ze, "I do not permit it," could

invalidate the decision sanctioned by the other members. The king of France received the right of a suspensory veto at the commencement of the French Revolution, from the national assembly sitting at Versailles in 1789, with regard to the decrees of the latter, which was only to be valid for the time being against the decisions come to and during the following national assembly, but during the period of the third session it was to lose its power if the assembly per- sisted in its resolution. By this means it was endeavoured to diminish the odium of the measure; but, as is well known, the monarchy was soon afterwards entirely abo- lished. Similarly the Spanish constitution of 1812 pre- scribed that the king might twice refuse his sanction to bills laid twice before him by two sessions of the cortes, but if the third session repeated the same he could no longer exercise the power of veto. The same is the case in the Norwegian constitution of 1814.

In the present French republic the president has no veto, except against decisions of the general councillors (conseils générals du departements), just as the prefect pos- sesses the same power against decisions of the communal councillors. The king or queen of England has the right to withhold sanction from a bill passed by both houses of parliament. This royal prerogative has not been exercised since 1692 and may now be considered obsolete. The governor of an English colony has the power of veto against a bill passed by the legislative body of a colony, eg., Canada. In this case the bill is finally lost, just as a bill would be which had been rejected by the colonial council, or as a bill passed by the English houses of parlia- ment would be if the crown were to exert the preroga- tive of refusing the royal assent. The governor may, however, without refusing his assent, reserve the bill for the consideration of the crown. In that case the bill does not come into force until it has either actually or con- structively received the royal assent, which is in effect the assent of the English ministry, and therefore indirectly of the imperial parliament. Thus the colonial liberty of legislation is made legally reconcilable with imperial sove- rei¢nty, and conflicts between colonial and imperial laws are prevented.!

The constitution of the United States of North America contains in art. i., sect. 7, § 2, the following order :—

“ Every bill which shall have passed the House of Representatives and the Senate shall, before it becomes a law, be presented to the president of the United States; if he approve, he shall sign it ; if not, he shall return it with his objections to that house in which it shall have originated, who shall enter the objections at large on their journal and proceed to reconsider it. If, after such recon- sideration, two-thirds of that house shall agrec to pass the bill, it shall be sent, together with the objections, to the other house, by which it shall likewise be reconsidered, and, if approved by two-thirds of that house, it shall become a law. Every order, resolution,

or vote to which the concurrence of the Senate and House of Repre- sentatives may be necessary (except on a question of adjournment) ee ae

1A. V. Dicey, Lectures Introductory to the Study of the Law of the Constitution, p. 105 sg., 2d ed., London, 1886.

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shall be presented to the president of the United States, and, before the same shall take effect, shall be approved by him, or, being disapproved by him, shall be repassed by two-thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill.” ;

In most States of the Union the governors, in the same manner or to a modified extent, possess the right of pro- testing against the laws and decisions of the legislature. Here therefore we have again a suspensory veto which is frequently exercised. According to the official report for 1886, the president of the United States exercised his right of veto in that year 115 times against bills, resolutions, and orders of the most different kinds. Between 1840 and 1850 the Whigs agitated for the total abolition of the power of veto. Of late an agitation has begun in the opposite direction.”

According to the constitution of the German empire of 1871, the imperial legislation is executed by the federal council and imperial diet ; the emperor is not mentioned. In the federal council the simple majority of votes decides. But in the case of bills concerning the army, the navy, and

certain specially noted taxes, as well as in the case of decisions concerning the alteration of orders for the admini- stration, and arrangements for the execution of the laws of customs and taxes, the proposal of the federal council is only accepted if the Prussian votes are on the side of the majority in favour of the same (art. 7, sect. 3). Prussia presides in the federal council. The state of things is therefore in fact as follows: it is not the German em- peror, but the same monarch as king of Prussia, who has the right of veto against bills and decisions of the federal council, and therefore can prevent the passing of an im- perial law. The superior power of the presidential vote obtains, it is true, its due influence only in one legislative body, but in reality it has the same effect as the veto of the head of the empire.

The Swiss federal constitution grants the president of the Confederation no superior position at all; neither he nor the federal council possesses the power of veto against laws or decisions of the federal assembly. But in some cantons, viz. St Gall (1831), Basel (1832), and Lucerne (1841), the veto was introduced as a right of the people. The citizens had the power to submit to a plebiscite laws which had been debated and accepted by the cantonal council (the legislative authority), and to reject the same. If this plebiscite was not demanded within a certain short specified time, the law came into force. But, if the voting took place, and if the number of persons voting against the law exceeded by one vote half the number of persons entitled to vote in the canton, the law was rejected. The absent voters were considered as having voted in favour of the law. An attempt to introduce the veto in Zurich in 1847 failed. Thurgau and Schaffhausen accepted it later. Meanwhile another arrangement has quite driven it out of the field. For of late years the so-called "referendum," —properly speaking, direct legislation by the people,— has been introduced into most of the Swiss cantons. Formerly in all cantons—with the exception of the small mountainous districts of Uri, Schwyz, Unterwalden, Zug, Glarus, and Appenzell—it was not a pure democracy, but a representative constitution that prevailed: the great coun- cillors or cantonal councillors periodically chosen by the people were the possessors of the sovereign power, and after deliberating twice passed the bills definitively. Now they have only to discuss the bills, which are printed and sent to all voters with

an explanatory message ; then the people on a certain day vote for the acceptance or rejection

2 Riittimann, Das Nordamerikanische Bundes-Staatsrecht verglichen mit den politischen Einrichtungen der Schweiz, i. 244 and 245, Zurich, 1867; D. Webster, Works, ii. 337 and iii. 416, Boston, 1858.

paper, which is placed in an urn under official control. In some cantons important financial resolutions involving large state expenses are also submitted to the decision of the people. In the revised federal constitution of 1874, under certain suppositions which have no further interest for us at present, a facultative referendum (7.e., the possi- bility of demanding a plebiscite under exceptional circum- stances) has been introduced for federal laws. Since that period it has often been employed and has operated like a veto. It is evident that by the compulsory referendum in the cantons the mere veto is rendered superfluous.?

In examining the question as to what position the veto occupies in jurisprudence, we must separate quite different conceptions which are comprised under the same name.

1. The veto may be a mere right of intervention on the part of a magistrate against the order of another official, or against that of an authority of equal or inferior rank. This was the casein ancient Rome. To this class belong also those cases in which, in the present French republic, the president makes his ‘“‘no” valid against decisions of the general councillors, and the prefect does the same against decisions of the communal councillors. The use of the expression here is quite justifiable, and this veto is not confined to bills, but refers particularly to adminis- trative measures. It affords a guarantee against the abuse of an official position.

2. The veto may be a safety-valve against precipitate decisions, and so a preventive measure. This task is ful- filled by the suspensory veto of the president of the North American Union. Similarly, to this class belong the above- mentioned prescriptions of the Spanish and Norwegian

constitutions, and also the veto of the governor of an English colony against decisions of the legislature; for this protest is only intended to prevent a certain want of harmony between the general and the colonial legislation, by calling forth a renewed investigation. This veto is neither an interference with the competence of an authority, nor a division of the legislative power among different factors, but simply a guarantee against precipitancy in the case of a purely legislative measure. The wisdom of establishing this veto power by the constitution is thus manifest.

3. It is wrong to apply the term veto to what is merely the negative side of the sanctioning of the laws, in other words, an act of sovereignty. It would not be in accord- ance with the nature of a constitutional monarchy to de- clare the monarch's consent to a law unnecessary, or make it a compulsory duty; the legislative power is divided between him and the chambers. The sovereign must therefore be perfectly at liberty to say "yes" or "aie." im each single case according to his opinion. If he says the latter, we speak of it as his veto, but this—if he possesses an absolute and not merely a suspensory veto—is not an intervention and not a preventive measure, but the nega- tive side of the exercise of the legislative power, and there- fore an act of sovereignty. That this right belongs fully and entirely to the holder of sovereign power—however he may be called—is self-evident. One chamber can also by protest prevent a bill of the other from coming into force. The "placet of the temporal power for church affairs—when it occurs—also involves in this manner in itself the veto or non placet." Where in pure democracies the people in their assembly have the right of veto or referendum, the exercise of it is also a result of the sovereign rights of legislature.

The peculiar power of veto possessed by the (Prussian)

Y Avy. Orelli, Das Staatsrecht der schweizerischen Etdgenossensehaft, pp. 101 and 105, and Marquardsen, Handbuch des iffentlichen Rechts der Gegenwart in Monographien, vol. iv., Freiburg (in Breisgau),

1885.

VIA—VIA

president of the federal council of Germany lies on the boundary between (2) and (3). (A. v. 0.)

VIAREGGIO, a coast town of Italy, in the province of Lucca, 13 miles by rail north-north-west from Pisa, had in 1881 a population of 10,190 (commune 12,735). The principal industry is fishing, and the place is also a favourite sea-bathing resort.

VIATICUM. This word, which in classical Latinity means "provision for a journey" (Gr. Ta épdéia), is often used by early Christian writers to denote the sacrament of the Eucharist, and sometimes even is applied to baptism. Ultimately it came to be employed in a restricted sense to denote the last communion given to the dying. The 13th canon of the council of Nice is to the effect that "none, even of the lapsed, shall be deprived of the last and most necessary viaticum (éfod/ov)," and that the bishop, on examination, is to give the oblation to all who desire to partake of the Eucharist on the point of death. The same principle still rules the canon law, it being of course under- stood that penitential discipline, which in ordinary cir- cumstances would have been due for their offence, is to be undergone by lapsed persons who have thus received the viaticum, in the event of recovery. In extreme cases it is lawful to administer the viaticum to persons not fasting, The ritual to be observed in its administration does not differ from that laid down in the office for the communion of the sick, except in the words of the formula, which is "accipe, carissime frater (carissima soror), viaticum corporis nostri Jesu Christi, quod te custodiat ab hoste maligno, protegat te, et perducat te ad vitam eternam. Amen."

VIATKA. See VyatKa.

VIAU, or Viaup, THEOPHILE DE (1590-1626), more com- monly called both in his own time and since simply Tuko- PHILE, a poet of unfortunate life and of great but misused powers, was born at Clairac near Agen in 1590. He went to the capital in his twentieth year and ingratiated himself with at least one patron, the ill-fated duke of Montmorency, who was always constant to him. He also became acquainted with most of the literary men of the time, and in 1617 composed and produced with success the tragedy of Pyrame et Thisbé. This piece, written in the extravagant Spanish-Italian manner which was fashionable

in the in- terval between the Pléiade model and the innovations of Corneille, was later the subject of much ridicule, especially directed to the passage in which a sword, reddened with the blood of its master, is said to "' blush for its treason," no very unpardonable conceit in eyes less pedantic than Boileau's. Théophile's prosperity was not lasting. Only two years after the success of Pyrame he was accused of blasphemous and indecent writings, and was exiled to England. Re- turning in 1621 and joining the Roman Church (he had been a Huguenot), he served in two campaigns. But he was, rightly or wrongly, associated with the publication of the Parnasse Satirique, a collection of poems of the same character as those which had formerly got him into trouble, and in 1623 was tried, condemned in his absence to death, arrested, and imprisoned in the conciergerie. At length the sentence of death which hung over him was reduced to banishment, and the influence of Montmorency enabled him to hide himself in Paris till his death on 25th Sep- tember 1626.

For his singular persecution, which, even if the charges had been inuch better established than they are, would have been surprising enough in an age of unusually loose conduct and writing, the machi- nations of the Jesuits are sometimes held responsible. But if Théophile had bitter enemies he had warm friends. Six years after his death Georges de Scudéry edited his work with a Zombeaw (copy of obituary verses), and a challenge in the preface to any one who might be offended by the editor's eulogy of the poet. This was In 1632; the year before had appeared a tragedy entitled Pasi-

phaé, where the awkwardness of the subject is not redeemed by any merit of treatment ; but it is by no means certainly or even prob-

ably Théophile's, and is not included in his works, the standard modern edition of which is that of Alleaume in the Bibliotheque Elzévirienne (Paris, 2 vols., 1856). These works may surprise the reader who only knows Théophile's mishaps and ill-fame ; for, though varied enough, they contain in the certainly authentic part of them nothing discreditable. Besides Pyrame et Thisbé, the chief in point of bulk is a paraphrase, half verse half prose, after the odd fashion of the time, of the Phedo. There are

numerous French and Latin letters, a vigorous Apologie rebutting the accusations against him, a promising fragment of comic prose narrative, and a large col- lection of occasional verses, odes, elegies, stanzas, &c.' These latter, besides being very unequal, are distinguished by the faults of taste and the inelegance of language which marked the first quarter of the century. But there are occasionally bursts of real poetry ; and on the whole Théophile is the superior of all his contemporaries between Regnier and Corneille. In addition to Alleaume's edi- tion, a delightful article in Gautier's Grotesqgues should be con- sulted respecting him.

VIBORG, or Wrsore (Finnish, Vitpurz), capital of a province or lin of the same name in Finland, is situated at the head of the Bay of Viborg in the Gulf of Finland, at the mouth of the Saima Canal and on the railway which connects St Petersburg with Helsingfors. The Saima Canal (37 miles long), a fine engineering work, connects with the sea Lake Saima—the principal lake of Finland, 949 feet above sea-level—and a series of others, including Puruvesi, Orivesi, Héytiinen, and Kallavesi, all of which are navigated by steainers, as far north as Idensalmi in 63° 30' N. lat. Viborg is thus the seaport of Karelia and eastern Savolaks, with the towns of Vilmanstrand (1289 inhabitants in 1880), St Michel (1432), Nyslott (1424), Kuopio (6834), and Idensalmi, with their numerous saw- mills and iron-works. Viborg stands most picturesquely on the glaciated and dome-shaped granite hills surround- ing the bay, which is protected at its entrance by the naval station of Bjork6 and at its head by several forts. The castle of Viborg, built in 1293 by Marshal Torkel Knutson, was the first centre for the spread of Christianity in Karelia, and for establishing the power of Sweden; it is now used as a prison. Its lofty and elegant tower has fallen into decay. The court-house (1839), the town-house, the gymnasium (1641 ; with an excellent library), and the museum are among the principal buildings of the city. There are also a school of navigation and several primary schools, both public and private, a literary and an agricul- tural society, and several benevolent institutions. The population, 14,668 in 1880 and 15,800 in 1884, consists of three elements, — Finnish, Swedish, and Russian (see Frytanp). There is a strong Russian garrison. Several industrial establishments, including a foundry for the con- struction of steam-engines, an iron-work, and_ several candle-works, match-factories, and saw-mills, have risen of late at Viborg

and in its neighbourhood; but the place owes its chief importance to its export trade, in which timber is the chief item. The coasting trade is also considerable.

The environs are most picturesque and are visited by many tourists in the summer. The park of Monrepos (Old Viborg), in a bay dotted with dome-shaped islands, is specially attractive. The scenery of the Saima Canal and of the Finnish lakes with the grand as of Pungaharju ; the Imatra rapids, by which the Vuoksen dis- charges the water of Lake Saima into Lake Ladoga, with the castle of Kexholm at its mouth; Serdobol and Valamo monastery on Lake

Ladoga—all visited from Viborg—attract many tourists from St Petersburg and from other parts of Finland.

VICAR, in ecclesiastical law, is, in the words of Black- stone, "'a curate, deputy, or vicegerent of the appropriator, and therefore called wicarius or vicar." When a benefice had become appropriated before the dissolution of the religious houses to a spiritual corporation, usually with the authority of a licence from the Chancery, the vicar was the person appointed by the appropriators for the cure of souls in the parish. He was at first generally a member of the corporation. After the dissolution in the reign of Henry VIII. these appropriated benefices became —as Indeed they had been in the church in general up to

the Lateran council of 1179—vested in lay impropriators, ! but the legal position of the vicar remained the same. He was not a parson in the proper sense of the word (in fact parson and vicar are often distinguished in old statutes), and his stipend was at the discretion of the impropriator. Where he had the enjoyment of tithes, they were in most cases, apart from prescription, the small as distinguished from the great tithes, that is, such as the impropriator found it most difficult to collect. There was, however, no consistent rule in the matter: what were rectorial tithes in some parishes might be vicarial in others. The position of the vicar, at first so insecure and uncertain, was gradu- ally ameliorated by legislation. 15 Ric. IL. c. 6 provided for the sufficient endowment of the vicarage. 4 Hen.

IV. c. 12 repeated this provision, and in addition enacted that the vicar should be a secular priest, not removable at the caprice of the appropriators, and canonically instituted and inducted. Among numerous other Acts may be noticed 29 Car. II. c. 8, making perpetual temporary augmentations of vicarages, and 3 Geo. LV. c. 72, enabling them to be in certain cases converted into rectories. In Scotland vicarage teinds were the subject of many Acts of the Scottish parliament. Until they became a fixed burden on the land they were payable out of minor and accidental products, were established by usage, and lost by negative prescription. 27 and 28 Vic. c. 33 provided for the commutation of those vicarage teinds of fish which had not up to then been commuted.

Perpetual Curate.—W here a benefice was appropriated ad mensam monachorum or was from any other cause without thé services of a regular vicar, it did not fall within the statutes relating to vicars, and was served by a temporary curate, gencrally a regular ecclesi- astic belonging to the appropriating corporation. After the dis- solution the curate in charge became perpetual, inasmuch as he could not be removed exccpt by the bishop. By 2 and 3 Vict. c. 49 every church or chapel augmented by the governors of Queen Anne's Bounty and having a district is a perpetual curacy ; so, as a rule, are new churches built under the Church Building Acts. By 81 and 82 Vict. c. 117 the incumbent of every parish or new parish for ecclesiastical purposes, not being a rector, 1s to be styled the vicar, and his benefice is to be designated a vicarage. This Act only confers a more honourable name upon the perpctual curate ; it does not in any way alter his legal position.

Vicar-general is the deputy of the archbishop of Canterbury or York. In his court the bishops of the province are confirmed. How far he has any contentious jurisdiction appcars uncertain. In the confirmation of Dr Hampden as bishop of Hereford in 1848 the vicar-general of Canterbury refused to hear objections to the confirmation by the dean and chapter of Hereford, and the Court of Queen's Bench was equally divided as to whether such refusal was good in law. Vicar-choral is a clerk in orders who assists at cathedral services. See further ADVOWSON, BENEFICE, Panis, Parson, QUEEN ANNE'S Bounty, T1TUES.

VICENTE, Git (c. 1470-c. 1536), Portuguese dramatist, with an honourable position also in the history of Spanish literature, was born, most probably in Lisbon, about the year 1470. He wasof good family, and, after studying law at the then university of Lisbon, became attached to the royal court, in what capacity is unknown. In June 1502 he produced and took the leading part in the performance of his first piece, a kind of dramatic pastoral, after the manner of Juan de la Encina, on occasion of the birth of an heir to the throne (John IIL). So successful was this appearance that he soon became the recognized provider of such entertainments at court, during the reign both of Emmanuel and of John. Of his domestic history nothing is known, except that he married a lady named Branca Bezerra, by whom he had a sonand a daughter. His outward circumstances, especially in his later years, if some apparently personal allusions in his works are to be literally interpreted, do not seem to have been prosperous. Almost the only personal incident that has come down to us 1s his successful remonstrance with the clergy of Santarem in

1 Appropriation is the term for the possession of a benefice by a spiritual corporation, impropriation for its possession by a layman.

1531, for having taken the earthquakes of that year as a | botanic garden, and various hospitals. Some remains of

text from which to rouse orthodox fanaticism against the Jews or "Neo-Christians" ; the circumstances are related by Vicente in a letter to the king. The time and place of his death are alike uncertain; most probably it occurred at Evora not much later than 1536.

Vicente published various of his pieces during his lifetime, but the first collected edition of his works, edited by his son Luis, did not appear till 1562. It is in black letter folio, and only one copy, that in the Gottingen university library, is now known to exist. A second edition, "emended by

the Holy Office," appeared in 1585, of which also only a single copy is now extant (in Lisbon). The disfayour with which they were viewed by the Inquisition caused them to fall into unmerited neglect, and they do not appear to have been again reprinted till 1834, when they were carefully edited by Feio and Monteiro (Hamburg, 8 vols.). They number forty-two in all, of which seventeen are written wholly in Portuguese and ten wholly in Spanish, while in the remainder both languages are em- ployed. The principles determining his choice of language are not easy to discover, and indeed he seems to have used either indiffer- ently, perhaps in this accommodating himself to the aptitudes of particular actors. It may be observed, however, that, while in the 14th century it had been fashionable for all court poets in the western half of the peninsula to use Galician or Old Portuguese, the practice had changed in the days of John II. of Castile, when Castilian became the favourite speech. In writing chiefly in Portu- guese Vicente thus reverted to the older practice ; but, on the other hand, it is not surprising that he should have freely used Spanish at a court which stood in such intimate personal relations with that of Castile (of Emmanuel's three wives two were Castilian prin- cesses and the third was a sister of Charles V.), and where he had taken Encina as his avowed model. According to their form the works of Vicente are conveniently divided into—(1) obras de devocao or autos, (2) comedies and tragi-comedies, and (8) farces. The first class includes twelve autos or sacred pieces, intended for performance at Christmas, Epiphany, and other religious festivals. The plots are quaint and conceived entirely in the medieval spirit ; in their working out many touches of poetical feeling and also of sarcastic humour are introduced. There is a vein of pleasing romance in such compositions as his Dom Duardos and Amadis de Gaula, while the genuine mirthfulness of his farces (Inez Pereira and others), as well as their originality, well entitle him to be spoken of by his compatriots as their "father of comedy" and the national Plautus.

Some typical examples of Vicente's works may be read in Bohl von Faber's Teatro Espanol anterior & Lope de Vega (Hamburg, 1832) and in Ochoa's Tesoro del Teatro Espanol (Paris, 1838). An interesting essay, with analyses of many of the plays, occurs in vol. Ixxix. of the Quarterly Review (1846-47); see also mg Wolfs article "'Gil-Vicente" in Ersch and Gruber's Encykl. (sec. i. vol. lxvii.).

VICENZA, a town of Italy, capital of the province of Vicenza, lies at the northern base of the Monti Berici, on both sides of the Bacchiglione, immediately below its con- fluence with the Retrone, and 42 miles by rail to the west of Venice. It is surrounded by somewhat dilapidated walls, about 3 miles in circumference, and entered by six gates. Though many of the streets are narrow and irregu- lar, the town has a number of fine public buildings, many of them the work of Paxuanio (q.v.). Among these are the town-hall, otherwise known as the Basilica, one of the finest works of the Renaissance period, of which Palladio himself said that it might stand comparison with the similar work of antiquity. The prefecture and the Barbarano and Chieregati Palaces are also his work; in the last-named the civic museum is housed. The Olympic theatre is also noteworthy. The cathedral, which is Gothic, dating mainly from the 13th century, consists of a nave with eight chapels on each side; it contains examples of the Montagnas and of Lorenzo da Venezia. Several of the other churches contain noteworthy paintings: thus the Romano-Gothic church of San Lorenzo has Montagnas, S. Corona Montagnas and a G. Bellini, and 8. Stephano one of the most important works of Palma Vecchio. The principal square contains two columns, dating from the Venetian period, and a tall Gothic campanile. Of the Palladian villas in the neighbourhood La Rotonda or Villa Palladiana, 14 miles to the south-east, deserves special mention. Vicenza is the see of a bishop, and contains two

antiquity, including ruins of a theatre and an aqueduct, have been preserved. The most important manufacture is that of silk, which employs a large proportion of the inhabitants. Great numbers of mulberry trees are grown in the neighbourhood. Woollen and linen cloth, leather, earthenware, paper, and articles in gold and silver are also made in Vicenza, and a considerable trade in these articles, as well as in corn and wine, is carried on. The popula- tion of the town in 1881 was 24,331, or, including the suburbs, 27,694.

Vicenza is the Vicentia or Vicetta of the Romans, noticed by Strabo as one of the minor towns of Venetia. It continued to be a municipal town of some importance till the fall of the Western empire, and suffered severely in the invasion of Attila, by whom it was laid waste. It was for some time

during the Middle Ages an independent republic, but was subdued by the Venctians in 1405. Towards the end of the 15th century it became the seat of a school of painting, of which the principal representatives were, besides Bartolomeo Montagna, its founder, Giovanni Speranza and Bene: detto Montagna. Palladio (1518-80) was a native of Vicenza.

VICH, a town of Spain, in the province of Barcelona, 38 miles by rail to the north of that town, lies in a small side valley of the Ter, about 1500 feet above sea-level. It is irregularly built on a hill slope, and has narrow ill-paved streets; there are some quaint old houses in the Plaza Mayor. 'The cathedral, begun about 1040, belongs chiefly to the first half of the 14th century, but with some mis- chievous alterations of the 18th. The interior, with three naves and a transept, is elegant, and the Gothic cloisters (1340) are particularly fine. The industries include tanning and the weaving of linen and woollen fabrics ; and sausages are a speciality of the place. There are mines of copper and coal in the neighbourhood. The population within the municipal boundaries in 1877 was 12,478.

Vich, the Ausa of the ancient geographers, was the chief town of the Ausetani; in the Middle Ages it was called Ausona and Vicus Ausonensis, hence Vic de Osona, and simply Vich.

VICHY, a town of France, in the department of Allier, is situated on the right bank of the Allier, 227 miles by

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Plan of Vichy. : rail south-south-east from Paris and 6 south of St Ger-

gymnasia, a seminary, an academy, a public library, a | mains-de-Fossés, where the railway lines to Lyons and

VIC—

Nimes separate. The population in 1881 was 8322, and

in 1886 10,072.

Vichy owes its importance to its mineral waters, which were celebrated in the time of the Romans. Within the town or in its immediate vicinity there are 21 springs, 12 of which are state property (4 of these obtained by boring). The waters of those which are outside the town are brought in by means of aqueducts. The most celebrated and frequented are the Grande Grille, L'Hopital, the Célestins, and Lardy. The most copious of all, the Puits Carré, is reserved for the baths. All these, whether cold or hot (maximum temperature, 113° Fahr.), are largely charged with bicarbonate of soda (see MINERAL WATERS, vol. xvi. p. 435) ; some also are chalybeate and tonic. The waters, which are limpid, have an alkaline taste and emit a slight odour of sulphuretted hydrogen. They are re- commended in cases of stomachic and liver complaint, also for diabetes, gravel, and gout. The thermal establishment, begun in 1787, is capable of supplying 3500 baths a day. The company by which the state baths are farmed also manufactures pastilles, barley-sugar, and digestive choco- late, as well as salts for artificial baths. A considerable trade is carried on in the natural waters. In addition to the principal establishment, Vichy has a hospital bath, the hydropathic establishments of Lardy and Larbaud, and a large military hospital, founded in 1843. Cusset (5356 inhabitants in 1886), chief-lieu of the canton, about 1 mile distant, has similar mineral waters and a bathing establish- ment. Vichy possesses a casino and two public parks. The promenade commands a splendid view of the mountains of Auvergne. At Vichy, Cusset, and in the neighbourhood there are cotton cloth manufactures (tozles de Vichy).

VICKSBURG, a city of the United States and the county seat of Warren county, Mississippi, the largest and most important city in the State, stands on the bluffs, on the east bank of the Mississippi, nearly midway between Memphis and New Orleans. It is situated in the midst of the most fertile cotton region of the country, and is one of the principal inland shipping ports of that staple. Its means of communication, besides the river, embrace three important railroad systems. The city has some manu- facturing industries, particularly of lumber and cotton-seed oil and cake. The population in 1880 was 11,814, showing a slight decrease since 1870

; and in 1888 it was estimated at 18,000. Nearly one-half of the population were coloured.

Prior to the Civil War Vicksburg was an important river port, having in 1860 a population of 4591. Its growth had, however, been slow. During the war it became a very strong strategic point, as It controlled the navigation of the Mississippi, and a contest for its possession was waged for several months with heavy loss of life. Finally General Grant captured it in 1863, and with it the Con- federate army of General Pemberton, numbering 27,000 men. For a few years after the war the city gained rapidly in population and Importance.

VICO, Giovan Barrista (1668-1744), Italian jurist and philosopher, was the son of Antonio Vico, a small bookseller, and was born at Naples on 23rd June 1668. At the age of seven he had a serious fall and severely Injured his head, which produced in him "the melancholy and sour temper suited to men of talent." Afterwards he applied himself to the study of scholastic philosophy. At an early age he entered the university, and made such Yapid progress, especially in jurisprudence, that he is said A have won a suit for his father at the age of sixteen. Nevertheless he preferred the study of history, literature, juridical science, and philosophy. Being appointed teacher of Jurisprudence to the nephews of the bishop of Ischia, cB. Rocca, he accompanied them to the castle of Vatolla, near Cilento, in the province of Salerno. There he passed fine studious years, chiefly devoted to classical reading, Plato and Tacitus being his favourite authors, because

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"'the former described the ideal man and the latter man as he really is." On his return to Naples he found Car- tesianism in the ascendant, and this he disliked. Belong- ing to no particular school or literary sect, he languished in neglect and obscurity, until in 1697 he gained the pro- fessorship of rhetoric at the university, with a scanty stipend of 100 ducats. On this he supported not only himself but his rapidly increasing family; for he had married a poor and illiterate girl, who was only able to put her mark to the nuptial contract. Meanwhile his own studies were pursued with untiring zeal, and he began to write and publish his works.

Two modern authors exercised a weighty influence on his mind—Francis Bacon and Grotius. He was no follower of their ideas, indeed often opposed to them; but he derived from Bacon an increasing stimulus towards the investigation of certain great problems of history and philosophy, while Grotius proved valuable in his study of philosophic jurisprudence. In 1708 he published his De ratione studiorum, in 1710 De antiquissima Italorum sapientia, in 1720 De unwerse juris uno principio et fine uno, and in 1721 De constantia jurisprudentis. On the strength of these works he offered himself as a candidate for the university chair of juris- prudence then vacant, with a yearly stipend of 600 ducats. But he was rejected by the examiners, although all his competitors have remained unknown to fame. Without any sense of discouragement, he returned to his favourite studies, and in 1725 published the first edition of the work that forms the basis of his renown, Principu d'una Scienza Nuova. In 1730 he produced a second edition of the Scienza Nuova, so much altered in style and with so many substantial additions that it was practically a new work. In 1735 Charles III. of Naples marked his recog- nition of Vico's merits by appointing him historiographer- royal, with a yearly stipend of 100 ducats. But the philosopher derived little enjoyment from his new post. Attacked by a cruel malady, mind and memory failed. But during frequent intervals of lucidity he resumed his pen and made new corrections in his great work, of which a third edition appeared in 1744, prefaced by a letter of dedication to Cardinal Trojano Acquaviva. Vico expired on 20th January of the same year. Fate seemed bent on persecuting him to the last. A fierce quarrel arose over his burial between the brotherhood of St Stephen, to which he had belonged, and the university professors, who desired to escort his corpse to the grave. Finally the canons of the cathedral, together with the professors, buried the body in the church of the Gerolimini.

Vico has been generally described as a solitary soul, out of har- mony with the spirit of his time and often directly opposed to it. In fact, though living during the later years of the 17th and the early part of the 18th century, when Locke had already given to the world the germs of the ideas afterwards developed in the philosophy of the Encyclopedists, he followed an entirely opposite line of thought. The writer who was the first to declare that great men are the representatives and personifications of

their times would thus seem to have been the living contradiction of his own theory. Nevertheless a closer inquiry into the social conditions of Vico's time, and of the studies then flourishing, shows him to have been thoroughly in touch with them.

Owing to the historical past of Naples, and its social and economic condition at the end of the 17th century, the only study that really flourished there was that of law; and this soon penetrated from the courts to the university, and was raised to the level ofa science. A great school of jurisprudence was thus formed, including many men of vast learning and great ability, although little known to fame. This school stood apart, as it were, from the rest of the world ; the works of its representatives were inelegant, and often indeed exaggeratedly legal and scholastic in style. Accordingly they attracted little notice in upper Italy and were totally ignored beyond the Alps. But, while outside Naples scarcely anything was known of Marcello Marciano the younger, Domenico Aulisio, Duke Gaetano Argento, Niccolé Capasso, and many others, there were three men who rose to great eminence and attained to an honour- able rank in general literature both in Italy aud abroad. By an

exposition of the political history of the kingdom, based on a study of its laws and institutions and of the legal conflicts between the state and the court of Rome, Pietro Giannone was the first initiator of what has been since known as civil history. Giovan Vincenzo Gravina, the patron and preceptor of Metastasio, and also noted as a literary critic, wrote a history of Roman law, specially distin- guished for its accuracy and elegance. While Gravina studied the successive and varying forms of Roman law and sought to give them an historical explanation, Vico raised the problem toa higher plane, by tracing the origin of law in the human mind and ex- plaining the historical changes of the one by those of the other. Thus he made the original discovery of certain ideas which consti- tute the modern historic method, or rather the psychologico-historic method. This problem he proceeded to develop in various works, until in his Seienza Nuova he arrived at a more complete solution, which may be formulated as follows. If the principle of justice and law be one, eternal,

and immutable, why should there be so many different codes of legislation? These differences are not caused by difference of nationality only, but are to be noted in the history of the same people. 'The clearest, most precise, and most constant conception of law was undoubtedly that of the Romans ; nevertheless Roman jurisprudence underwent so many transforina- tions as apparently to constitute almost different codes. How was so strange a fact to be explained? This question is touched upon in his Orations or Inaugural Addresses (Oraziont 0 Prolusiont) and in his Minor Works (Scritti Minori). Finally he applied himself to its solution in his Universal Law (Diritto Universale), which is divided into two books. The first of these, De uno et wniversi juris principio et fine uno, was subdivided into two parts; so like- wise was the second, with the respective titles of De constantia philologiz and De eonstantia jurisprudentis.

The following is the general idea derived from these researches. Vico held God to be the ruler of the world of nations, but ruling, not as the providence of the Middle Ages by means of continued miracles, but as He rules nature, by means of natural laws. If, therefore, the physicist seeks to discover the laws of nature by study of natural phenomena, so the philosopher must seek the laws of historical change by the investigation of human events and of the human mind. According to Vico, law emanates from the con- science of mankind, in whom God has infused a sentiment of justice, and is therefore in close and continual relation with the human mind, and participates in its changes. This sentiment of justice is at first confused, uncertain, and almost instinctive, is, as it were, a divine and religious inspiration instilled by heaven into the primitive tribes of the earth. It is an unconscious, universal sen- timent, not the personal, conscious, and rational sentiment of the superior few. Hence the law to which it gives birth is enwrapped in religious forms which are likewise visible and palpable, inas- much as primitive man is incapable of abstract, philosophical ideas. This law is not the individual work of any philosophical legislator, for no man was, or could be, a philosopher at that time. It is first displayed in the shape of natural and necessary usages conse- crated by religion. The names of leading legislators, which we so often find recorded in the history of primitive peoples, are symbols and myths, merely serving to mark an historic period or epoch by some definite and personal denomination. For nations, or rather tribes, were

then distinguished by personal names only. The first obscure and confused conception of law gradually becomes clearer and better defined. Its visible and religious forms then give way to abstract formulx, which in their turn are slowly replaced by the rational manifestation of the philosophic principles of law that gains the victory in the final stage of development, designated by Vico as that of civil and human law. This is the period of indi- vidual and philosophic legislators. Thus Roman law has passed through three great periods,—the divine, the heroic, and the human, —which are likewise the three chief periods of the history of Rome with which it is intimately and intrinsically connected. Never- theless, on careful examination of these threc successive stages, it will easily be seen that, in spite of the apparent difference between them, all have a common foundation, source, and purpose. The human and civil philosophic law of the third period is assuredly very different in form from the primitive law; but in substance it is merely the abstract, scientific, and philosophic manifestation of the same sentiment of justice and the same principles which were vaguely felt in primitive times. Hence one development of law may be easily translated into another. Thus in the varied mani- festations of law Vico was able to discover a single and enduring principle (De universi juris uno prineipio et fine uno). On these grounds it has been sought to establish a close relation between Vico and Grotius. The latter clearly distinguished between a posi- tive law differing in different nations and a natural law based on a general and unchanging principle of human nature, and therefore obligatory upon all. But Vico was opposed to Grotius, especially as regards his conception of the origin of society, and therefore of law. Grotius holds that its origin was not divine, but human, and neither collective, spontaneous, nor unconscious, but personal, rational, and conscious. He belicved moreover that natural law

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and positive law moved on almost constant and immutable parallel lines. But Vico maintained that the one was continually progressing towards the other, positive law showing an increasing tendency to draw nearer to natural and rational law. Hence the conception that law is of necessity a spontaneous birth, not the creation of any individual legislator ; and

hence the idea that it necessarily proceeds by a natural and logical process of cvolution constituting its history. Vico may have derived from Grotius the idea of natural law; but his discovery of the historic evolution of law was first suggested to him by his study of Roman law. He saw that the his- tory of Roman jurisprudence was a continuous progress of the narrow, rigorous, primitive, and almost iron law of the XII. Tables towards the wider, more general, and more humane jus gentium. Having once derived this conception from Roman history, he was easily and indeed necessarily carried on to the next,—that the posi- tive law of all nations, throughout history, is a continual advance, keeping pace with the progress of civilization, towards the philo- sophie and natural law founded on the principles of human nature aud human reason.

As already stated, the Seienza Nwova appeared in three different editions. The divergences between the second and third are of too little moment to be recorded here. But the first and second edi- tions are almost distinct works. In the former the author sets forth the analytical process by which the laws he discovered were deduced from facts. In the second he not only enlarges his matter and gives multiplied applications of his idcas, but also follows the synthetic method, first expounding the laws he had discovered and then proving them by the facts to which they are applied. In this edition the fragmentary and jerky arrangement, the intricate style, and a peculiar and often purely conventional terminology seri- ously checked the diffusion of the work, which accordingly was little studied in Italy and remained almost unknown to the rest of Europe. Its fundamental idea consists in that which Vico, in his peculiar ter- minology, styles " poetical wisdom" (sapienza poetiea) and " occult wisdom " (sapienza riposta), and in the historical process by which the one is merged in the other. He frequently declares that this discovery was the result of the litcrary labours of his whole life.

Vico was the first thinker who asked, Why have we a science of nature, but no science of history? Because our glance can casily be turned outwards and survey the exterior world ; but it is far harder to turn the mind's eye inwards and contemplate the world of the spirit. All our errors in explaining the origin of human society arise from our obstinacy in believing that primitive man was entirely similar to ourselves, who are

civilized, 7.¢., developed by the results of a lengthy process of anterior historic evolution. We must learn to issue from ourselves, transport ourselves back to other times, and become children again in order to comprehend the infancy of the human race. As in children, imagination and the senscs prevailed in those men of the past. They had no abstract ideas; in their minds all was concrete, visible, aud tangible. All the phenomena, forces, and laws of nature, together with mental con- ceptions, were alike personified. To suppose that all mythical stories are fables invented by the philosophers is to write history backwards and confound the instinctive, impersonal, poctic wisdom of the carliest times with the civilized, rational, and abstract occult wisdom of our own day. But how can we explain the formation of this poetic wisdom, which, albeit the work of ignorant men, has so deep and intrinsic a philosophic value? The only possible reply is that already given when treating of the origin of law. Provi- dence has instilled into the heart of man a sentiment of justice and goodness, of beauty, and of truth, that is manifested differently at different times. The ideal truth within us, constituting the inner life that is studied by philosophers, becomes transmuted by the facts of history into assured reality. For Vico psychology and history were the two poles of the new world he discovered. After having extolled the work of God and proclaimed Him the source of all knowledge, he adds that a great truth is continually flashed on us and proved to us by history, namely, " that this world of nations is the work of man, and its explanation therefore only to be found in the mind of man." Thus poetical wisdom, appearing as a spontane- ous emanation of the human conscience, is almost the product of divine inspiration. From this, by the aid of civilization, rcason, and philosophy, there is gradually developed the civil, occult wisdom. The continual, slow, and laborious progress from the one to the other is that which really constitutes history, and man becomes civilized by rendering himself the conscious and independent possessor of all that in poetical wisdom remained impersonal, un- conscious, came as it were from without by divine aflatus.

Vico gives many applications of this fundamental idea. The religion of primitive peoples is no less mythical than thcir history, since they could only conccive of it by means of myths. On these lines he interprets the whole history of primitive Rome. One book of the second cdition of the

Scienza Nuova is devoted to " The Dis- covery of the True Homer." Why all the cities of Greece dispute the honour of being his birthplace is because the Iliad and the Odyssey are not the work of one, but of many popular pocts, and a true creation of the Greek people which is in every city of Greece.

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And because the primitive peoples are unconscious and self-ignorant Homer is represented as being blind. In all parts of history in which he was best versed Vico pursues a stricter and more scientific method, and arrives at safer conclusions. This is the casein Roman history, especially in such portions as related to the history of law. Here he sometimes attains, even in details, to divinations of the truth afterwards confirmed by new documents and later research. The aristocratic origin of Rome, the struggle between the patricians and the plebeians, the laws of the XII. Tables, not, as tradition would have it, imported from Greece (but the natural and spon- taneous product of ancient Roman customs), and many other similar theories were discovered by Vico, and expounded with his usual originality, though not always without his usual blunders and ex-aggerations.

Vico may be said to base his considerations on the history of two nations. 'The greater part of his ideas on poetical wisdom were derived from Greece. Nearly all the rest, more especially the trans- ition from poetical to occult wisdom, was derived from Rome. Having once formulated his idea, he made it more general in order to apply it to the history of all nations. From the savage state, through the terror that gives birth to religions, through the crea- tion of families by marriage, through burial rites and piety towards the dead, men approach civilization with the aid of poetic wisdom, and pass through three periods,—the divine, heroic, and human, — in which they have three forms of government, language, literature, jurisprudence, and civilization. The primary government is aristo- eratie. Patrician tyranny rouses the populace to revolt, and then

democratic equality is established under a republic. Democratic excesses cause the rise of an empire, which, becoming corrupt, de- elines into barbarism, and, again emerging from it, retraces the same course. This is the law of cycles, constituting that which is designated by Vico as the "eternal ideal history, or rather course of humanity, invariably followed by all nations." It must not be held to imply that one nation imitates the course pursued by another, nor that the points of resemblance between them are transmitted by tradition from one to the other, but merely that all are subject to one law, inasmuch as this is based on the human nature common to all alike. Thus, while on the one hand the various cyeles traced and retraced by all nations are similar and yet independent, on the other hand, being actually derived from Roman history, they become converted in the Scienza Nuova into a bed of Procrustes, to which the history of all nations has to be fitted by force. And wherever Vico's historical knowledge failed he was led into increased error by this artificial and arbitrary effort.

It has been justly observed by many that this continuous cyclical movement entirely excludes the progress of humanity towards a hetter future. It has been replied that these cycles are similar without being identical, and that, ifone might differ from another, the idea of progress was not necessarily excluded by the law of eyeles. Vico undoubtedly considered the poetic wisdom of the Middle Ages to be different from that of the Greeks and Romans,and Christianity to be very superior to the pagan religion. But he never investigated the question whether, since there is a law of progress- ive evolution in the history of different nations, separately examined, there may not likewise be another law ruling the general history

" of these nations, every one of which must have represented a new

period, as it were, in the history of humanity at large. Therefore,

-although the Scienza Nwova cannot be said absolutely to deny the

law of progress, it must be allowed that Vico not only failed to solve the problem but even shrank from attacking it.

He had no followers or admirers even in Naples, where the ideas of Tanucci, Filangieri, Genovesi, and Galiani prevailed, men who sometimes appear to be more French than Italian. When at last, with the German reaction initiated by Kant against the sense philosophy of the French, an entirely new philosophy arose, and many ideas started by Vico were revived on a more rigorous method, supported by more accurate research and with a wider and firmer grasp of knowledge, the name of the Neapolitan philosopher was forgotten, and no one recognized how much was owed to him. Nevertheless it may be asserted that between the close of the 17th and the early part of the 18th century, when the thought of the world was bent in a totally different direction, Vico was the first to discern and proclaim the course by which, in the present age, historical, moral, and political science was destined to make such great and assured progress.

See Cantoni, G. B. Vico, Studti Critici e Comparativi (Turin, 1867); Flint, Vico (Edinburgh and London, 1884). For editions of Vico's own works, see Opere, ed. Giuseppe Ferrari (Milan, 1834-35, 6 vols.), and Michelet, @uvres Choisies de Vico (Paris, 1835, 2 vols.). Mamiani, Rosmini, Gioberti, and many other Italian philosophers have treated at length of Vico in their works, The

most detailed account of him is Ferrari's essay, "La Mente de Vico," prefacing his edition of the Opere. (P. V.)

VICTOR L., St, bishop of Rome from about 190 to 202, succeeded Eleutherus and was followed by Zephyrinus. His name is chiefly associated with a display of intolerance towards the bishops of Asia Minor for the view they took in the Quartodeciman controversy (see Easter ; also PopE-

Dom, vol. xix. p. 489); he also excommunicated Theodotus of Byzantium on account of his doctrine as to the Person of Christ (see MoNARCHIANISM).

VICTOR IL, one of the series of German popes and the successor of Leo IX., was consecrated in St Peter's, Rome, on 13th April 1055. His father was a Swabian baron, Count Hartwig von Calw, and his own baptismal name was Gebhard. At the instance of Gebhard, bishop of Ratisbon, uncle of the emperor Henry III., he had been appointed while still a young man to the see of Hichstadt ; in this position his great talents soon enabled him to render important services to Henry, whose chief adviser he ultimately became. His nomination to the papacy by Henry at Mainz, in September 1054, was made at the instance of a Roman deputation headed by Hildebrand, whose policy doubtless was to detach from the imperial interest one of its ablest supporters. In June 1055 Victor met the eniperor at Florence, and held a council, which anew condemned clerical marriages, simony, and the aliena- tion of the estates of the church. In the following year he was summoned to Germany to the side of the emperor, and was with him when he died at Botfeld in the Harz on 5th October 1056. As guardian of Henry's infant son, and adviser of the empress Agnes, Victor now wielded enormous power, which he began to use with much tact for the maintenance of peace throughout the empire and for strengthening the papacy against the aggressions of the barons. He died shortly after his return to Italy, at Arezzo, on 28th July 1057. His successor was Stephen IX. (Frederick of Lorraine).

VICTOR IIL. pope from 24th May 1086 to 16th Sep- tember 1087, was the successor of Pope Gregory VII. Son of Landolfo V., prince of Benevento, he was born in 1027; in his thirtieth year he entered the cloister at Monte Cassino, changing his name of Dauferius into De- siderius. He soon became abbot of the monastery, and in 1059 Nicolas IJ. raised him to the cardinalate. He rendered many important services to Gregory VII., who accordingly on his deathbed indicated him to-the cardinals of south Italy as his worthiest successor. He was elected on 24th May 1086, but showed genuine reluctance to accept the embarrassing honour thus thrust upon him, and after his tardy consecration, which did not take place till 9th May 1087, he withdrew at once to Monte Cassino. The countess Matilda soon afterwards induced him to re- turn to Rome; but, owing to the presence of the antipope Clement III. (Guibert of Ravenna), who had powerful partisans, his stay there was short. In August he held at Benevento a synod of some importance, at which

Clement IIL. was excommunicated, lay-investiture forbidden, and a kind of crusade proclaimed against the Saracens in Africa. During the synod Victor fell ill, and betook himself to Monte Cassino, where he died on 16th September 1087. His successor was Urban II.

VICTOR IV. Two antipopes have claimed this name: —(1) Cardinal Gregorio Conti, who was chosen by a party in succession to the antipope Anacletus IT. in 11388, but through the influence of Bernard of Clairvaux was induced two months afterwards to make his submission to Innocent II.; and (2) Cardinal Octavianus, the Ghibelline antipope, elected in 1159, and countenanced by the emperor Freder- ick Barbarossa. He died at Lucca on 20th April 1164.

VICTOR, CLAUDE PERRIN (1764-1841), duke of Belluno, marshal of France, was born at La Marche (Vosges) on 7th December 1764. In 1781] he entered the army as a common soldier, and after ten years' service he received his discharge and settled at Valence. Soon afterwards he joined the local volunteers and in less than a year had risen to the command of a battalion. He greatly distin- guished himself on the Italian frontier, and for his bravery

at the siege of Toulon in 1793 he was raised to the rank of brigadier-general. He afterwards served for some time with the army of the eastern Pyrenees, and in the Italian campaign of 1795-97 he so acquitted himself at Mondovi, Roveredo, Porto Legnago, and many other places that he was promoted to be general of adivision. After the peace of Campo Formio he for some time commanded the forces in the department of La Vendée; but in 1798 he was again in Italy and in the battle of Marengo especially took a very important part. In 1803 he became commander-in- chief of the Batavian army,and after the peace of Amiens he acted for eighteen months as French plenipotentiary at Copenhagen. On the outbreak of hostilities with Prussia he joined the fifth army corps as chief of the general staff ; at the battle of Friedland he commanded the first corps in such a manner that Napoleon made him marshal of the empire on the field. After the peace of Tilsit he became governor of Prussia, and in 1808 he was created duke of Belluno. In the same year he was sent to Spain,

where he took a prominent part in military affairs, until his ap- pointment in 1812 to command the ninth army corps destined to operate in Russia. Here his most important service was in protecting the retreating army at the cross- ing of the Berezina. He took an active part in the wars of 1813-14, till in February of the latter year he had the misfortune to arrive too late at Montereau-sur-Yonne. The result was a scene of violent recrimination and his depriva- tion by the emperor, who transferred his command to Gérard. Thus wounded in his amour propre, Victor now transferred his allegiance to the Bourbon dynasty, and in December 1814 received from Louis XVIII. the command of the second military division. In 1815 he accompanied the king to Ghent, and on the second restoration he was made a peer of France and major-general of the royal guard, In 1821 he was appointed war minister and held this office for two years. After the revolution of 1830 he retired altogether into private life. His death took place at Paris on 3d March 1841.

VICTOR, Szexrus Avretius. A person of this name was made prefect of Pannonia by Julian about 360 (Amm. Marc., xxi. 10), and may be identical with the man who was consul along with Valentinian in 373 and with the prefect of the city of the same name who is mentioned in an inscription of the time of Theodosius. Four small historical works have been ascribed to him on more or less doubtful grounds—(1) Origo Gentis Romani, (2) De Viri- bus Illustribus Romex, (3) De Cexsaribus, (4) De Vita et Moribus Imperatorum Romanorum excerpta ex Libris Sex. Aur. Victoris. The four have generally been published together under the name Historia Romana, but the fourth piece is a réchauffé of the third ; and, though all are late, there is no sufficient reason to think that they are by one hand. The second was first printed at Naples about 1472, in 4to, under the name of Pliny (the younger), and the fourth at Strasburg in 1505. The first edition of all four was that of A. Schottus (8vo, Antwerp, 157 9). The De Cexsaribus, which goes from Augustus to Constantius, and claims to be by a man of mean origin who rose to distinction through letters, may be the work of the Sextus Aurelius Victor known to history.

VICTOR AMADEUS, the name of three dukes of Savoy. See Savoy.

VICTOR EMMANUEL (1820-1878), king of Italy, born at Turin on 14th March 1820, was the son of Charles Albert, prince of Carignano, who in 1831 became king of Sardinia. He was brought up with some severity and as a strict Catholic ; but it was not found possible to interest him in study or intellectual pursuits. In 1842 he was married to Adelaide, daughter of the Austrian grand-duke Rainer, his father at that time desiring to improve his

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relations with Austria. The young man took no part in politics, but showed from the first the characteristics of an energetic soldier. After the Austrian occupation of Ferrara in 1847 he was among those who pressed for an immediate declaration of war; and, when a year later hostilities broke out, he threw himself into the struggle heart and soul. At Goito, where he was wounded, his reckless bravery turned the tide of battle ; and in every encounter he was to be seen in the thickest of the fight. During the armistice that followed the defeat of Custozza (25th July) he was engaged in the reorganization of the Sardinian army. The abdication of his father on the evening of the battle of Novara (23d March 1849) made him king of a ruined state. From Radetzky he obtained some mitigation of the hard terms at first demanded by the conqueror, especially in the withdrawal of the Austrian claim that the Sardinian constitution should be abolished. It was the maintenance of this constitution, at a time when reaction swept away every other vestige of repre- sentative government in Italy, that gained for Victor Emmanuel the title of the honest king (re galantuomo) and won for him the confidence of the Italian nation, and ultimately the Italian crown. In the bitter days that followed Novara, the king, calumniated, misunderstood, and charged like his father with treachery, showed a noble forbearance and a self-mastery that could hardly have been expected from his passionate uncultured nature. Though in D'Azeglio and Balbo he had excellent friends and advisers, it was not till 1852 that the accession of CAVOUR (9.v.) to power gave him a man of great. political genius for his guide. From that time the career of Victor Emmanuel became what Cavour made it. While ecclesi- astical reforms, which brought upon the king and minister the execration of the church, laid the foundation for all future social and economical advance,

the alliance of Sar- dinia with England and France in the Crimean War secured for Italy the interest of the Western powers, which Austria by its inaction and its half-measures had forfeited. Meanwhile his mother, his wife, and his brother died within four weeks of each other; and the clericals exulted in this manifestation of an offended Providence. At the end of 1855, while the allied troops were still in the East, Victor Emmanuel visited Paris and London. In 1859 Cavour's object was attained and France united with Sar- dinia against Austria, the king, sorely against his will, giving his daughter Clotilda in marriage to Jerome Napoleon. Victor Emmanuel met Napoleon III. at Genoa on 13th May, and on the 30th fought at the head of a body of Sardinians and Zouaves at the battle of Palestro. After the victory of Magenta (4th June) the allied monarchs entered Milan, where Victor Emmanuel for the first time saw Garibaldi. In the crowning victory of 24th June, while the French were engaged at Solferino, the king with his Italians carried the village of San Martino. The peace of Villafranca left Venetia and the Quadrilateral to Austria. The extraordinary events of the next year united all Italy, with the exception of Rome and of what still remained to Austria, under the patriot king, who was now excommuni- cated by the pope (see Iraty, vol. xiii. p. 490). A scene of great violence had passed between the king and Cavour when the peace of Villafranca was accepted by the former ; but their old friendship was soon restored, and the death of Cavour in 1861 plunged Victor Emmanuel in the deepest grief. The Prussian alliance of 1866 incorporated Venetia with Italy. The personal desire of the king to assist Napoleon III. in the war of 1870 gave way before the wiser counsels of his ministers; and the entry of his troops into Rome after the disasters of the French army and the withdrawal of the French garrison completed Victor Emmanuel's task and the union of Italy. He lived

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for eight years more, reigning always as a constitutional king, and preserving amidst the splendours of a great court the simple tastes of his

early life. He died at Rome of a fever on 9th January 1878, and lies entombed in the

Pantheon.

evi. VICTORIA, a British colony occupying the south-eastern

corner of Australia; its western boundary is the 141st meridian ; on the east it runs out toa point at Cape Howe, in 150° E. long., being thus rudely triangular in shape; the river Murray constitutes nearly the whole of the northern boundary, its most northerly point being in 34° S. lat,; the southern boundary is the coast-line of the Southern Ocean and of Bass Strait; the most southerly point is Wilson's Promontory in 39° 8. lat. The greatest length east and west is about 480 miles; the greatest width, in the west, is about 250 miles. The area is offici- ally stated to be 87,884 square miles, –

The coast line may be estimated at about 800 miles, Tt begins at the 141st meridian with bold but not lofty sandstone cliffs, worn into deep caves and capped by grassy undulations, which extend inland to pleasant park-like lands. Capes Bridgewater and Nelson form a peninsula of forest lands, broken by patches of meadow. 'To the east of Cape Nelson lies the moderately sheltered inlet of Portland Bay, consisting of a sweep of sandy beach flanked by bold granite rocks, Then comesa long unbroken stretch of high cliffs, which owing to insetting currents have been the scene of many calamitous wrecks. Cape Otway is the termination of a wild mountain range that here abuts on the coast. Its brown cliffs rise vertically from the water; and the steep slopes above are covered with dense forests of exceedingly tall timber and tree ferns. Eastwards from this cape the line of cliffs gradually diminishes in height to about twenty to forty feet at the entrance to Port Phillip. Next comes Port Phillip Bay, a plan of which is given under MELBouRNE, vol. xv. p. 835, When the tide recedes from this bay through the narrow entrance it often encounters a strong current just outside ; the broken and somewhat dangerous sea thus caused is called "the Rip." East of Port Phillip Bay the shores consist for fifteen miles of a line of sandbanks; but at Cape Schanck they suddenly become high and bold. East of this comes Western Port, a deep inlet more than half occupied by French Island and Phillip Island. Its shores are flat

and uninteresting, in some parts swampy ; but all the land is owned and most of it occupied. The bay is shallow and of little use for navigation. The coast con- finues rocky round Cape Liptrap. Wilson's Promontory 1s a great rounded mass of granite hills, with wild and striking scenery, tree-fern gullies, and gigantic gum-trees, connected with the mainland by a narrow sandy isthmus. At its extremity lie a multitude of rocky islets, with steep granite edges. North of this cape, and opening to the east, lies Corner Inlet, which is dry at low water. The coast now continues low to the extremity of the colony. 'The slight bend northward forms a sort of bight called the Ninety Mile Beach, but it really exceeds that length. It is an unbroken line of sandy shore, backed by low sand hills, on which grows a sparse dwarf vegetation, Behind these hills come a succession of lakes, surrounded by excellent land, and beyond these rise the soft blue outlines of the Mountain masses of the interior. The shores on the ex-treme east are somewhat higher, and occasionally rise in bold points. They terminate in Cape Howe, off which lies Gabo Island, of small extent but containing an import- ant lighthouse and signalling station,

_ The western half of Victoria is level or slightly undulat- Ing, and as a rule tame in its scenery, exhibiting only thinly timbered grassy lands, with all the appearance of open parks, It is here that the merino sheep are de-

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pastured whose wool secures the highest price in the markets of Europe. The north-west corner of the colony, equally flat, is dry and sometimes sandy, and frequently bare of vegetation, though in one part some seven or eight millions of acres are covered with the dense brushwood known as "mallee scrub." This wide western plain is slightly broken in two places. In the south the wild ranges of Cape Otway are covered over a considerable area with richly luxurious but almost impassable forests, This district has been reserved as a state forest and its coast forms a favourite holiday resort, the scenery being very attractive. The middle of the plain is crossed by a thin line of mountains, known as the Australian Pyrenees, at the western extremity of which there are several irregu- larly placed transverse ranges, the chief being the Gram- pians, the Victoria

Range, and the Sierra Range. Their highest point is Mount Williams (3600 feet). The eastern half of the colony is wholly different. Though there is plenty of level land, it occurs in small patches, and chiefly in the south, in Gippsland, which extends from Corner Inlet to Cape Howe. But a great part of this eastern half is occupied with the complicated mass of ranges known collectively as the Australian Alps. The whole forms a plateau averaging from 1000 to 2000 feet high, with many smaller tablelands ranging from 38000 to 5000 feet in height. The highest peak, Bogong, is 6508 feet in altitude. The ranges are so densely covered with vege- tation that it is extremely difficult to penetrate them; only two tracks, impassable for vehicles, intersect them from north te south. But several thousand square miles of this country are still unexplored. About fifteen peaks over 5000 feet in height have been measured, but there are probably many more. Along the ranges grow the giant trees for which Victoria is famous, The narrow valleys and gullies contain exquisite scenery, the rocky streams being overshadowed by groves of graceful tree-ferns, from amid whose waving fronds rise the tall smooth stems of the white gums. Over ten millions of acres are thus covered with forest-clad mountains too wild for settle- ment, The Australian Alps are connected with the Pyrenees by a long ridge called the Dividing Range (1500 to 3000 feet high).

Victoria is fairly well watered, but its streams are Rivers.

generally too small to admit of navigation. This, how- ever, is not the case with the Murray River (9.v.). Echuca is the chief port of the river traffic, and about 250 vessels enter it every year, bringing down from 80,000 to 120,000 bales of wool from the interior. – In the lower portion of its course the stream occupies only a narrow winding channel in the midst of its old bed, which now seems like a fertile valley hemmed in on either hand by high cliffs of clay or red earth, or sometimes of beds of oyster shells of vast extent. The navigation of the Murray is greatly impeded by "snags," or trees that have stuck fast in the bed of the river and project a little above or below the surface. But the removal of these obstacles is constantly going on, and consequently the navigation is becoming easier. Of the total length of the Murray 670 miles flow conterminous with Victoria. The Murray re- ceives a number of tributaries from the

Victorian side The Mitta Mitta, which rises in the heart of the Australian Alps, is 150 miles long, The Ovens, rising among the same mountains, is slightly shorter. The Goulburn (340 miles) flows almost entirely through well-settled agricul- tural country, and is deep enough to be used in its lower part for navigation, The valley of this river is a fertile grain-producing district. The; Campaspe (150 miles) has too little volume of water to be of use for navigation ; its valley is also agricultural, and along its banks there lie a close succession of thriving townships. The Loddon (over

Lakes.

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200 miles) rises in the Pyrenees. The upper part flows through a plain, to the right agricultural and to the left auriferous, containing nearly forty thriving towns, includ- ing Sandhurst and Castlemaine. In the lower part of the valley the rainfall is small and droughts are frequent, but farmers are steadily pushing out into it, as the land 1s very fertile. Recent legislation has provided for the formation of irrigation trusts in these districts of rich soil but small rainfall. To the west of the Loddon is the Avoca river (140 miles). It is of slight volume, and though it flows to-wards the Murray it loses itself in marshes and salt lagoons before reaching that river.

The rivers which flow southwards into the ocean are numerous. The Snowy river rises in New South Wales and in Victoria flows entirely through wild and almost wholly unoccupied territory. The Tambo (120 miles long), which rises in the heart of the Australian Alps, crosses the Gippsland plains where the land is good, but only a small portion is occupied. The Mitchell river, rising also among the Australian Alps, is navigable to a limited ex- tent. Its lower valley is being rapidly occupied by thriv- ing hop plantations. The Latrobe is a deep clear stream flowing through level country. The Yarra rises in the "Black Spur" of the Australian Alps. Emerging in a deep valley from the ranges, it follows a sinuous course through the undulating plains called the 'Yarra Flats,"

which are wholly enclosed by hills, on whose slopes are some of the best vineyards of Australia; it finds its way out of the Flats between high and precipitous but well- wooded banks, and finally reaches Port Phillip Bay below Melbourne. Owing to its numerous windings its course through that city and its suburbs is at least thirty miles. Nearer to the sea its waterway, formerly available for vessels drawing 16 feet, has now been deepened so as to be available for vessels drawing 20 feet. The Barwon, farther west, is a river of considerable length but little volume, flowing chiefly through pastoral lands. .The Hop- kins and Glenelg (280 miles) both water the splendid pas- toral lands of the west, the lower course of the former passing through the fertile district of Warrnambool, well known throughout Australia as a potato-growing region.

In the west there are Lakes Corangamite and Colac, due north of Cape Otway. The former is intensely salt ; the latter is fresh, having an outlet for its waters. Lakes Tyrrel and Hindmarsh lie in the plains of the north-west. In summer they are dried up, and in winter are again formed by the waters of rivers that have no outlet. In the east are the Gippsland lakes, formed by the waters of the Latrobe, Mitchell, and Tambo being dammed back by the sandhills of the Ninety Mile Beach. They are connected with Bass Strait by a narrow and shifting channel through a shallow bar; the Government of Victoria has done a great deal of late years to deepen the entrance and make it safer. The upper lake is called Lake Wellington ; a narrow passage leads into Lake Victoria, which is joined to a wider expanse called Lake King. These are all fresh- water lakes, and are visited by tourists for the sake of their scenery, which, though monotonous, has a certain

impressiveness. The surrounding country is being rapj di settled and utilized. = y 1s being rapidly

Victoria enjoys an exceptionally fine climate. about one-half of the ie in ae year a sky, with a bracing and dry atmosphere, pleasantly warm but not relaxing. These days are mainly in the autumn and spring. Dur- ing the last twenty years there have been on an average 13] days annually on which rain has fallen more or less (chiefly in winter) but rainy days do not exceed thirty in the year.

y : Th yearly rainfall is about 26 inches. The disagreeable fiutees of the

Victorian climate is the occurrence of north winds i

; 1 s, Which bloy an average about sixty days in the year. In winter they are on and dry, and have a slightly depressing effect. But in summer they are hot and dry, and generally bring with them disagreeable

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clouds of dust. The winds themselves blow for periods of two or three days at a time, and if the summer has six or eight such periods it becomes relaxing and produces languor. These winds cease with extraordinary suddenness, being replaced in a minute or two by a cool and bracing breeze from the south. The temperature often falls 40° or 50° Fahr. in an hour. The maximum temperature occurs in February, averaging 105°°6 Fahr. in the shade. The mini- muin is in July, when the thermometer registers as low as 30°. The mean for the whole year is 57°°3.. The temperature never falls be- low freezing-point, except for au hour or two before sunrise in the coldest month. Snow has twice been known to fall in Melbourne for a few minutes, in 1849 and 1882. It is common enough, how- ever, on the plateau: Ballarat, which is over 1000 feet high, always has a few snow storms, and the roads to Omeo among the Australian Alps lie under several feet of snow in the winter. The general healthiness of the climate is shown by the fact that the average death-rate for the last five years has been only 14°37 per thousand of the population. The rainfall of the colony varics considerably. On the table-land it averages about 40 inches, at Melbourne 25-44 inches, along the Murray basin 20 inches, and in the " Wim- mera" or north-west corner not more than 15 inches.

Victoria rests throughout on a bed of coarse granite, which is Geology, —

exposed in many te by the denudation of the overlying strata. Above this lies a bed of Silurian rocks, which seems to have at one time extended over the whole areca, and still forms the surface of a great portion of the colony, especially in the north-east. Other Paleozoic strata are

represented by only one small patch of Devonian at Mount Tambo in the Australian Alps, and by small isolated beds of Carboniferous strata along the valley of the Mitchell river. The Mesozoic strata overlie the Silurian along the coast, being represented by beds of Upper New Red Sandstone of considerable thickness. These extend from Cape Otway as far east as Corner Inlet, and sections of them are prominent features where the coasts are rocky. The other Mesozoic strata are absent. Miocene beds occur in patches near Ballarat, near Warrnambool, and in some parts of Gippsland. These are unimportant, however, compared with the Pliocene formations, which cover a very large part of the colony, notably the great plains of the Wimmera and the Murray valley. They also occur in smaller areas over the Silurian rock, either as cappings of prominences, that were left as islands when the waves of Post-Tertiary seas washed away the rest of the beds or else as "leads," 4.e., the beds carved out of Silurian strata by rivers of Mesozoic periods, but filled in during Pliocene times by deposits of debris from the mountains. These have been protected by their sunken position when the great bulk of the Pliocene beds were washed away. It is from these old river beds that the alluvial gold of Victoria is got. This gold was evidently at one time contained in veins of auriferous quartz which were worn down and carried into the streams, There the heavy particles of gold gathered in the hollows, forming those collections ae to miners as pockets. In some parts of Victoria vast sheets of lava overlic the Pliocene beds. These are most prominent in the south-western corner. The district round Warrnambool possesses eighty-three extinct volcanoes, and there were probably many more whose craters have been completely denuded. The volcanoes were of no great height, but from them issued sheets of glowing lava, covering the plains for hundreds of square miles. At Ballarat the mining shafts descend through four beds of basalt divided from one another by deposits of clay. These

represent four distinct outflows of lava in comparatively recent geologic times.

During 1886 665,196 oz. of gold were obtained of the value of Minerals.

£2,660,780. The total yield from 1851 to 1886 was 54,393,182 oz. of the value of about £217,570,000. The number of miners is about 26,000, of

whom nearly 5000 are Chinese. These devote themselves in nearly equal proportions to alluvial mining and quartz mining. But little is now done in the way of merely surface alluvial digging. The shafts are carried down to ae beds of ancient rivers, where the layers of what are called 'wash dirt" vary in thickness from 1 to 1 feet, yielding from 4 to 3 oz. per cubic yard. Quartz mining is rapidly increasing in extent, though the total quantity of gold ob- tained is steadily decreasing and the expense of getting it is increas- ing, for the shafts are becoming of excessive depth. One at Stawell penetrates 2409 feet below the surface ; two others exceed 2000; and there are in all 17 shafts each over 1000 feet in depth. The average yield of this quartz has been of late about 10 dwts. to the ton. About one-third of the area of Victoria is supposed to be auri- ferous, but only 1300 square miles have as yet been worked. Be- sides gold, Victoria produces a little tin, copper, and antimony, and, in still smaller quantities, zinc, lead, cobalt, bismuth, and manga- nese. Iron ore is being smelted, but the industry has not yet reached a paying condition. Great efforts are being made to dis- cover coalfields or to open up those that are known to exist. The total value of the coal raised in the colony up to date (1888) is only

£17,000. A promising 5-foot seam is, however, now being worked in Gippsland.

The native trees belong chiefly to the Myrtacce, being largely Flor.

composed of Lucalypti or gum trees. There are several hundred

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species, the most notable being Lucalyptus amygdalina, a tree with tall white stem, smooth as a marble column, and without branches for 60 or 70 feet from the ground. It is singularly beautiful when seen. in groves, for these have all the appearance of lofty pillared cathedrals, These trees are among the tallest in the world, averag- ing in some districts about 300 feet. The longest ever measured was found prostrate on the Black Spur; it measured 470 feet in length ; it was 81 feet in girth near the root. Hucalyptus globulus or blue gum has broad green leaves, which yield the eucalyptus oil of the pharmacopeia. ucalyptus rostrata is extensively used in the colony as a timber, being popularly known as red gum or hard wood. It is quite unaffected by weather, and almost indestructible when used as piles for piers or wharves. Smaller species of euca- lyptus form the common "bush." Melaleucas, also of Myrtacea kind, are prominent objects along all the coasts, where they grow densely on the sandhills, forming "ti-tree" scrub. Hucalyptus dumosa is a species which grows only 6 to 12 feet high, but with a straight stem ; the trees grow so close together that it is difficult to penetrate the scrub formed by them. Eleven and a half million acres of the Wimmera district are covered with this "mallce scrub," asitis called. Recent legislation has made this land easy of acquisi- tion, and the whole of it has been taken up on pastoral leases. Five hundred thousand acres have recently been taken up as an irriga- tion colony on Californian principles and laid out in 40-acre farms and orchards. The Leguwminoszx are chiefly represented by acacias, of which the wattle is the commonest. The black wattle is of con- siderable value, its gum being marketable and its bark worth from £5 to £10 a ton for tanning purposes. The golden wattle is a beautiful tree, whose rich yellow blossoms fill the river-valleys in early spring with delicious scent. The Caswarinz or she-oaks are gloomy trees, of little use, but of frequent occurrence. Heaths, grass- trees, and magnificent ferns and fern-trees are also notable features in Victorian forests. But European and subtropical vegetation has been introduced into the colony to such an extent as to have largely altered the characters of the flora in many districts.

The indigenous animals belong almost wholly to the Marsupialia. Kaugaroos are tolerably abundant on the grassy plains, but the process of settlement is causing their extermination. A smaller species of almost identical appearance called the wallaby is still numerous in the forest

lands. Kangaroo rats, opossums, wombats, native bears, bandicoots, and native cats all belong to the same class, The wombat forms extensive burrows in some districts. The native bear is a frugivorous little animal, and very harmless. Bats are numerous, the largest species being the flying fox, very abundant in some districts. Eagles, hawks, turkeys, pigeons, ducks, quail, snipe, and plover are common; but the characteristic denizens of the forest are vast flocks of parrots, parakeets, and cockatoos, with sulphur-coloured or crimson crests. The laughing jackass (giant kingfisher) is heard in all the country parts, and Magpies are numerous everywhere. Snakes are numerous; but less than one-fourth of the species are venomous, and they are all very shy. The deaths from snake-bite do not average 2 per annum. A great change is rapidly taking place in the fauna of the country, owing to cultivation and acclimatization. Dingoes have hearly disappeared, and rabbits, which were introduced only a few years ago, now abound in such nuntbers as to be a positive muisance. Deer are also rapidly becoming numerous. Sparrows and swallows are as common as in England. The trout, which – also been acclimatized, is taking full possession of some of the streams.

Tn 1878 Victoria possessed nearly eleven millions of sheep. Vic- torian sheep give an exceptionally large yield of wool, and their fleeces obtain a higher price (on the average 6s. 2d.) than any other grown in Australia. The colony has one and a quarter millions of cattle, three hundred and eight thousand horses, and about a quarter of a million of pigs.

There were in 1887 about 38,000 farms in the colony, containing over 2,417,157 acres of land actually cultivated; in almost all farms there is much land that is not actually tilled. Every year, however, a larger and larger proportion is brought under the plough, In the year ending March 1887 the crops were as follows :—wheat, 12,100,036 bushels ; oats, 4,256,079 bushels ; barley, 827,852 bushels ; potatoes, 170,661 tons; and hay, 483,049 tons. The aver- age produce per acre of wheat crop was 114 bushels; the average per acre of oats, 23 bushels; of barley, 22 bushels; of potatoes, 34 tons. There are 10,300 acres of vineyards, producing 986,041 gallons of wine, and this industry is fast increasing. The hop plantations in 1887 yielded 5023 cwts. of hops. The following crops are being more or

less experimented with :—arrowroot, beetroot, flax, mangel wurzel, mustard, olives, poppies, oranges, and some other fruits.

nu the same year there were produced 12,008 ewts. of tobacco. Almost every fruit is grown more or less, but the banana and orange cannot be considered commercially successful. Apples, Pears, peaches, grapes, loquats, mulberries, plums, gooseberries, strawberries, melons, apricots, raspberries, cherries, currants, quinces, almonds, figs, walnuts, all grow well and are in common use. Bananas, pine-apples, oranges, and passion fruit are cheap, but

they come from the northern colonies. Tomatoes are plentiful and cheap, being easily grown in all parts of the colony.

The central half of Victoria is well supplied with a close network Com- of railways, whilst several long lines branch out into the less settled munica- districts east and west. A line parallel to the coast, joining Mel- tion. bourne to Bairnsdale, is sufficient for the Gippsland traffic. From Sale a number of short lines are being constructed for the con- venience of the surrounding district. To the west there isa line 270 miles long joining Melbourne to Portland, giving off short branches on both sides. Three lines are being steadily pushed forward to the north-west into the Wimmera district. In 1887 there was a total length of 1880 miles open for traffic, The average cost of the lines now in operation has been £11,748 per mile, but all the more recently constructed lines have not ex- ceeded £5000 per mile. The receipts for the year 1886-87 were £2, 453,078, and the working expenses £1,427,116. All the lines are on a uniform gauge of 5 feet 3 inches, and they all belong to the state, being managcd by a special board of three commissioners. Communication with Sydney, 573 miles distant, is effected by rail in 19 to 25 hours, and with Adelaide in about 20 hours.

The well-settled parts of the colony are excellently supplied with macadamized roads, which are constructed and repaired by shire councils, whose chief function it is to raise revenues, each from its own district, to support the roads in that district. The less settled districts have

tracks on which riding or driving is ex- cellent after fine weather, but not after much rain.

Victoria has 420 telegraph stations, connected by 4096 miles of line. Melbourne is connected with every town or borough in Australia, Tasmania, and New Zealand. It is also joined with London, the length of line being 13,695 miles. The shortest re- corded time for the transmission of a message along this line is 32 minutes ; the avcrage time is about three hours. There are about 1300 telephone wires in use in the colony, chiefly in Melbourne.

In 1886 the colony had 1429 post-offices, through which there passed 38,392,414 letters and post-cards, 17,482,490 newspapers, and 6,926,525 packets.

Victoria is fully committed to the system of " protection to native Trade, industry." In 1886 the value of its manufactures was £13,370,000, of which over £2,250,000 worth was exported. The number of establishments was 2770, and the number of hands employed 45,770. The total value of the exports for 1886 was £11,795,321, the chief items of which were wool, £5,028,061; gold, £4,309,535; live stock, £898,000; wheat, £408, 000 ; flour, £318,000; sugar (brought to Vic- toria to be refined), £266,779 ; tea (brought to Melbourne to be re- exported), £395,000 ; machinery, £184,135. The imports in 1886 amounted to £18,530,575 in value, of which £8,741,275 were from the United Kingdom, £6,567,403 from other British colonies, and £3,221,897 from foreign countries, the United States heading the list with over half a million, chiefly manufactured goods.

In 1886 2307 vessels entered at Victorian ports (chiefly Mel- Shipping. bourne) and 23824 cleared, the tonnages being 1,848,058 and 1,887,329 respectively. Of the vessels that entered 1684 and of those that cleared 1721 were colonial, their respective tonnages being 958,833 and 983,295. Of British vessels there entered 407 (648,026 tons) and cleared 382 (661,833 tons). There is no shipbuilding of importance carried on in Victoria, only 4 small vessels having been built in 1886, with a total tonnage of 420. But there is a brisk trade in repairs, there being several good yards, and the Govern- ment possesses at Williamstown a graving dock which admits vessels 500 feet long, the depth of water being 27 feet.

Eleven banks of issue in Victoria had in 1886 notes to the extent Banks, of £1,399,208in circulation ; their deposits bearing interest amounted to £23,999,791, not bearing interest (current accounts), £7,239,681. The total liabilities amounted to £33,085,989, the assets to £41,170,989, The average rate of annual dividends is 124. There are, besides, six banking companies which do not issue notes, and two distinct systems of savings banks. The ordinary savings banks had in 1886 15 branches with 111,031 depositors, who owned £2,322,959 of deposits. There were 264 branches of the post-office savings banks, with 78,328 depositors, owning £1,266,957. But perhaps the most popular institution for the investment of money among persons of moderate ineans is the building societies, of which 60 were returned in 1886, with 19,907 members, holding £2,910,792 as deposits. These societies act as banks, and members have their current accounts with them. The total sums deposited in banks and building societies in 1888 amounted to forty millions.

Victoria enjoys almost absolute autonomy. The practical govern- Adminis- ment of the country rests with the parliament, consisting of two tration. houses. The legislative council contains 42 members elected by 14 electoral provinces. Each member holds his seat for six years, a third of them retiring every two years but being eligible for re- election. To be eligible for election a candidate must be over thirty years of age and possessed of freehold property to the extent of £100 per annum. The electoral body consists of all citizens over twenty-one years of age, either possessing property of the yearly value of £10 or paying rates on property

of not less than £25 annual value, To these are added all graduates of universities and

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all members of the learned professions. Members of the legislative council receive no payment. They form a sort of court of revision of the work done in the lower house. The legislative assembly consists of 86 members elected by 55 electoral districts; they are paid at the rate of £300 a year. A general election must take place every three years. In all other respects it resembles very closely the British House of Commons. Every man of the full age of twenty-one years who has taken out his elector's right has a vote for the election of a member for the district in which he resides. All voting is by ballot. The governor is appointed by the sovereign of the British empire. He has the power of assent- ing to or rejecting bills sent up to him from parliament, exccpt eight classes, which he is bonnd to refer to the sovereign, who can disallow all bills by signifying disapproval of them within two years of their being passed by the legislature. The governor Is assisted by an executive conncil consisting of the ministers and ex- nlinisters of the crown. The cabinet consists of treasurer, chief secretary, miuister of pnblic instruction, commissioner of trade and customs, minister of mines, postmaster-general, minister of lands, minister of public works, minister of agriculture, solicitor-general, attorney-general, and minister of defence. The civil service of Victoria is under the control of three commissioners, who are ap- pointed for a term of three years by Government, but are then wholly independent. Their

business is to make all appointments, determine all promotions, and watch over the administration of the Civil Service Act. Their existence has effcctually abolished the evils of political patronage. ;

During the financial year 1885-86 the total receipts of the colony from all sources amounted to £6,945,099 and the expenditure to £6,513,539. On 30th June 1887 the public debt amounted to £33,119,164, more than twenty-three millions of which have been borrowed for tle construction of railways.

Victoria possesses a most efficiently organized system of state schools, where the education given is free, secular, and compulsory. The schools number 1826, with 4050 teachers, and 189,637 scholars. The average attendance is 119,488. The state awards each year for competition among boys and girls of the state schools eleven exhibitions of the yearly value of £35 each, tenable for six years, and two hundred of the value of £10 each for three years. The snecessful candidates of the former must go for two years to a college or grammar school and then enter the university of Melbourne ; those of the latter class attend the nearest grammar school. The Roman Catholic Church supports 180 primary schools with 18,000 scholars. Secondary edncation is quite unconnected with the state and wholly unsnpported by it; but the churches and private enterprise provide all that is needed. The Church of Eng- land has large grammar schools in Melbourne and Geelong. The Presbyterians have colleges in Melbourne, Geelong, and Ballarat, and a ladies' college in Melbourne. The Wesleyans have colleges for males and females respectively in Melbourne. The Catholics have also two institutions. Private grammar schools exist in all important towns. The university has four faculties—arts, law, engineering, and medicine—in which in 1886 the students num- bered respectively 166, 61,9, and 212. There are 14 professors and 10 lecturers. About one thousand candidates present themselves every year for matriculation, but only about 160 actually enter the university each year. A considerable number of ladies have matriculated and are pursuing their stndies in the university. In 1886 the number of persons who gradnated was 124 and the total from the beginning of the university (founded in 1853) has been 1169. The compulsory clause has not been in force more than ten years, and it has not yet produced its full result in

raising the general standard of education. At present 94 per cent. of the children between the ages of six and fifteen attend school, but nearly a fonrth of these fail to make up 40 days in the qnarter, Still of persons above fifteen years of age 96 per cent. can read and 92 per cent. can both read and write. These results would be even more favourable but for the presence of 13,000 Chinese in the colony nearly all of whom are returned as illiterate, neither reading nor writing English.

The population in 1886 was 1,003,048 (531, 452 males and 471,591 females), of whom about one-half were born in the colony and rather less than a third in the British Isles. The estimated population at the end of 1887 was 1,035,900. In religion a third are Episco- palians, a fourth Catholics, a sixth Presbyterians, and an eighth

There are now only about 780 of the aborigines left; but they never were humerous. When white men first settled in the colony, there probably were not 15,000; some estimates place them as low as 5000. Those who now remain live on stations maintained by the Government. They are allowed great freedom, with plenty of land to roam over, but each station is under the paternal care of a superintendent. Nevertheless they are steadily diminishing in num bers.

The eastern shore of Victoria was first explored by Surgeon Bass, who in January 1798 rounded Cape Howe from Sydney in a whale- boat. The western half was first examined in 1800-1 by Lieutenant

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Grant, when he discovered Port Phillip. In 1802 Flinders in charge of a British exploring expedition and Baudin at the head of one sent ont by Napoleon did exploring work in the same waters,

The colony was at first known as Port Phillip, settlement being confined to the shores of that inlet. The carliest attempt to colonize this part of Australia was made in 1803, when Collins was sent out with a number of convicts and landed on the sandy peninsula to the east of the entrance to the bay. Bnt, water being scarce, he went across to Tasmania. In 1835 John Bateman and John Pascoe Fawkner brought over from Tasmania

rival pastoral companies. Previous to this the brothers Henty had formed a whaling station at Portland, and had resided there for two years. But, as this was a purely private enterprise, aud not publicly known, the founding of the colony is rightly ascribed to Bateman and Fawkner. Before a year had passed about 200 persons had followed in their wake. At the end of 1839 there were 3000 persons on the banks of the Yarra ; in 1841 these had increased to 11,000, In 1842 the small community began to agitate for separation from New Sonth Wales, and in 1851, when its desires were realized, it numbered 97,000 persons. In this same year (1851) some of the Australian colonies received constitutions which rendered them self-governing, and among these the new colony of Victoria at- tained to the dignity of representative institutions. It was also in this year that the discovery of gold totally altered the character and prospects of Victoria. The discovery was first made in New South Wales in February 1851 by Edward Hargraves ; but a month or two elapsed before it became generally known. So great was the exodus to New South Wales that a committee of leading Melbourne citizens offered a reward for the first discovery of gold in Victoria. Numerous parties scoured the colony, with the result of finding gold at Clunes. Six weeks later the wonderful field of Ballarat was discovered, and attention was drawn to Victoria as a gold-producing country. In 1852 there were 70,000 arrivals in the colony, nearly all men. In 1853 there were 54,000, in 1854 there were 90,000, and so on, the population in 1861 being six times that of 1851. In 1854 the severity with which the licence-fee of thirty shillings a month was exacted from miners, whether successful or not, led to a serious riot. A number of the ringleaders were brought to trial, but the juries acquitted them. In 1860 the ill- fated expedition of Burke and Wills left Melbourne on its bold dash across the continent. In 1863 the colony was thrown into much excitement over a constitutional struggle generally known as the "deadlock." The democratic party wished to introduce the fiscal system of protection to native industry, but, after the bill had passed the lower house, the upper rejected it. It was then tacked to an Appropriation Bill, which the upper house resolntely refused to pass. For a year all supplies were stopped, and the business of the colony was carried on without funds. In 1866 a compromise was effected ; but then the struggle commenced anew. The English Government recalled the governor, Sir Charles Dar- ling, for siding with the democracy ; the lower house,

thinking him ill-used, placed on the estimates a grant of £20,000 for Lady Darling, which the upper house threw out. In 1868 Sir Charles received a lucrative position elsewhere, with £5000 from the colony as arrears of salary. The later history of the colony tells only of quiet, orderly, and unbroken prosperity. (A. SU.)

VICTORIA, capital of British Columbia and the princi- pal town of Vancouver Island, in the south-east corner of which it is finely situated (48° 25' 20" N. lat., 123° 22' 24" W. long.), on a small arm of the sea, its harbour, however, only admitting vessels drawing 18 feet. The city has some fine streets, handsome villas and public buildings, Govern- ment offices, and churches. There are several schools, public and private, a free library, a theatre, a mechanics' institute, and a public park. The water supply is good. The town, which is connected by cable with the mainland, is a favour- ite holiday resort for the Columbians. 'Till 1858 Victoria was a post of the Hudson Bay Company. The city was incorporated in 1862; and, according to the census of 1886, the population was 14,000, including Chinese and Indians, spread over an area of 4 square miles.

VICTORIA, a city of Brazil, capital of the province of Espirito Santo, 270 miles north-east from Rio de J aneiro, in 20° 18″ 8. lat. and 40° 20' W. long. Victoria, which has a white, Negro, and coloured population (1880) of 12,500, stands on the west side of an island at the head of the Bay of Espirito Santo, the entrance of which is defended by five forts, and also rendered difficult of access by several other islets and reefs rising little above high-water mark. The town is regularly laid out and well-built, with some good streets, two or three fine churches, a substantial governor's

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residence, and a few other conspicuous buildings. The surrounding district grows much rice, sugar, and manioc, which with other produce are here shipped, chiefly for the neighbouring coast towns.

Victoria, originally Espirito Santo, is onc of the oldest Portuguese settlements on the Brazilian coast, having been founded in 1535 by Vasco Fernando Continho at a little distance from its present site, on the south side and nearer to the entrance of the bay. It took the name of Victoria in 1558 to commemorate the crushing defeat inflicted by Fernando de Sa on the allied Indian tribes of the Aimores, Tapininguins, and Goitacazes in that year. The original site is still occupied by a group of houses and buildings commonly known as the Villa Velha or " Old Town," which is separated from Victoria by the Rio Santa Maria flowing to the south-west corner of the bay.

VIDA, Marco Girotamo (c. 1489-1566), one of the most eminent Latin poets and scholars of the age of Leo X., was born at Cremona shortly before the year 1490. He received the name of Marcantonio in baptism, but changed this to Marco Girolamo when he entered the order of the Canonici Regolari Lateranensi. During his early manhood he acquired considerable fame by the composition of two didactic poems in the Latin tongue, on the Game of Chess and on the Silkworm. This reputation induced him to seek the papal court in Rome, which was rapidly becoming the headquarters of polite learning, the place where students might expect advancement through their literary talents. Vida reached Rome in the last years of the pontificate of Julius IT. Leo X., on succeeding to the papal chair (1513), treated him with marked favour, be- stowed on him the priory of St Sylvester at Frascati, and bade him compose a heroic Latin poem on the life of Christ. Such was the origin of the Christiad, Vida's most cele- brated, if not his best, performance. It did not, however, see the light in Leo's lifetime. Between the years 1520 and 1527 Vida produced the second of his masterpieces in Latin hexameters, a didactic poem on the Art of Poetry. Clement VII. raised him to the rank of apostolic proto- notary, and in 1532 conferred on him the bishopric of Alba. It is probable that he took up his residence in this town soon after the death of Clement; and here he spent the greater portion of his remaining years. Vida attended the council of Trent, where he enjoyed the

society of Cardinals Cervini, Pole, and Del Monte, together with his friend the poet Flaminio. A record of their conversations may be studied in Vida's Latin dialogue De Republica. Among his other writings should be mentioned three eloquent ora- tions in defence of Cremona against Pavia, composed upon the occasion of some dispute as to precedency between ao two cities. Vida died at Alba on 27th September

566,

Vida's fame rests almost wholly on his Latin poems. These are more remarkable for their purity and grace of style than for quali- ties of imagination or powerful thinking. His contemporaries Were of opinion that Vida approached more nearly to the ancients M Majesty and gravity of diction than his rivals. Indeed, the Poetica cau still be read with both pleasure and instruction. Though we miss the poetic glow of Poliziano's and Pontano's Latin Compositions, and the exquisite workmanship of Flaminio's lyrics, there isin Vida so facile a command of the Latin language and metre that we might fancy ourselves listening to a writer of the Augustan age. The following lines will give a fair notion of his powers :—

Dii Rome indigetes, Trojz tuqve auctor, Apollo, Unde genus nostrum cceli se tollit ad astra,

Hance saltem anferri tandem prohibete Latinis: Artibus emineat semper studiisque Minerve Italia, et gentes doceat pulcherrima Roma; Quandoquidem armorum penitus fortuna recessit, Tanta Italos inter crevit discordia reges ;

Ipsi nos inter sevos destringimus enses,

Nec patriam pudet externis aperire tyrannis.

This pious prayer was not granted in the age which followed the council of Trent.

Berda's poems were collected and printed at Oxford in 1722, and an enlarged e ition appeared in 1731. For an account of his works, see

Symonds's Renais- Sance in Italy, vol. it.

VIEN, JoszpH Martz (1716-1809), French painter, was not only the master but the forerunner of David, and the

author of the classic movement which, inaugurated under Louis XVI, ran itself out under the first empire. He was born at Montpellier, 18th June 1716. Protected by Comte de Caylus, he entered at an early age the studio of Natoire, and obtained the great prize in 1745. He used his time at Rome in applying to the study of nature and the development of his own powers all that he gleaned from the masterpieces around him; but his tendencies were so foreign to the reigning taste that on his return to Paris he owed his admission to the academy for his picture Deedalus and Icarus (Louvre) solely to the indignant pro- tests of Boucher. When in 1776, at the height of his established reputation, he became director of the school of France at Rome, he took David with him amongst his pupils. After his return, five years later, his fortunes were wrecked by the Revolution ; but he undauntedly set to work, and at the age of eighty (1796) carried off the prize in an open Government competition. Bonaparte acknowledged his merit by making him a senator. He died at Paris on 27th March 1809, leaving behind him several brilliant pupils, amongst whom were Vincent, Regnault, Suvée, Ménageot, Taillasson, and others of high merit ; nor should the name of his wife, Marie Thérése Reboul (1728-1805), herself a member of the academy, be omitted from this list. Their son, Marie Joseph, born in 1761, also distinguished himself as a painter.

VIENNA (Germ. Ween), the capital and largest city of the Austrian-Hungarian empire, is situated on the right bank of the Danube, in 48° 13' N. lat. and 16° 23' E. long., at a height of about 550 feet above the level of the sea. It lies at the base of the last outlying spurs of the eastern Alps (the Wiener Wald), at the beginning of a plain which stretches eastwards to the Carpathians. The main channel of the Danube passes to the north of

Vienna; but an arm of the river, the Danube Canal, passes through the city, dividing it into two unequal parts. Into this

arm, on the east side of Vienna, flows the dirty and gener-

ally insignificant stream called the Wien, which gives its name to the city.! Vienna is the principal residence of the emperor, the see of an archbishop, the seat of the im- perial and Cisleithan (Austrian) ministries, the meeting- place of the Austrian diet, and also the meeting-place, alternately with Buda-Pesth, of the delegations (compare AvsTRIA). Vienna is now officially divided into the fol- lowing ten municipal districts,—the inner town (Innere Stadt) or old city of Vienna, Leopoldstadt, Landstrasse, Wieden, Margarethen, Mariahilf, Neubau, Josefstadt, Alser- grund, and Favoriten. The inner town, which lies almost exactly in the centre of the others, is, unlike the older parts of most European towns, still the most aristocratic quarter, containing the palaces of the emperor and of many of the nobility, the Government offices, many of the embassies and legations, the opera house, and the principal hotels. Leopoldstadt, which is the only district on the left bank of the Danube Canal, is the chief commercial quarter, and is inhabited to a great extent by Jews. Mariahilf, Neubau, and Margarethen are the chief seats of manufacturing industry. Landstrasse may be described as the district of officialism; there too are the British and German embassies. Alsergrund, with the enormous general hospital, the military hospital, and the municipal asylum for the insane, is the medical quarter. The inner city, or Vienna proper, was formerly separated from the other dis- tricts by a circle of fortifications, consisting of a rampart, fosse, and glacis. These, however, were removed in 1858- 1860, and the place of the glacis has been taken by a hand- some boulevard (Ring-Strasse), 2 miles in length and about 150 feet in average width. A series of external

1 Some authorities connect the name of Vienna with Vindobona (see p. 222 below).

works, consisting of a rampart and fosse, were constructed | centuries, but incorporating a few fragments of the original

in 1704 to surround the whole city at that time, including its suburbs; and these are still maintained as the boundary- line for the city imposts, and separate the above-named districts from the as yet unincorporated suburbs. This second girdle of fortifications is known as the Lines (Linien), and a second wide boulevard (Giirtel-Strasse) follows their course round the city.

Near the centre of the inner city, most of the streets in which are narrow and irregular, is the cathedral of St Stephen, the most important medieval building in Vienna, dating in its present form mainly from the 14th and 15th

12th-century edifice. Among its most striking features are the fine and lofty tower (450 feet), rebuilt in 1860-64 ; the extensive catacombs, in which the emperors were for- merly interred ; the sarcophagus (1513) of Frederick III. ; the tomb of Prince Eugene of Savoy; thirty-eight marble altars; and the fine groined ceiling. A little to the south-west of the cathcdral is the Hofburg, or imperial palace, a huge complex of buildings of various epochs and in various styles, enclosing several courtyards. The oldest part of the present edifice dates from the 13th century, and extensive additions are now being made according to

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Plan of the city of Vienna.

the plans of the architect Fischer von Erlach (1656-1723) In addition to private rooms and state apartments the Hofburg contains a library of 400,000 volumes and 20,000 MSS. ; the imperial treasury, a storehouse of objects of the greatest historical interest and intrinsic value; a cabinet of coins and antiquities ; and other important col- lections. In the old town are the two largest of the Hife extensive blocks of buildings belonging to the great abbe s of Austria, which are common throughout Vienna These are the Schottenhof (once belonging to the "Scot." or Irish Benedictines) and the Mélkerhof, adjoining the open space called the Freiung, each forming a little town of itself As in most Continental towns, the custom of living in flats 1s prevalent in Vienna, where few except the richer nobles occupy an entire house. Of late the so-called "Zins. palaste " ("tenement palaces") have been built on a large and magnificent scale, often profusely adorned without and within with painting and sculpture. Some of the finest of

these, a characteristic feature of Vienna architecture, are also to be seen in the old town. Other notable buildings within the line of the old fortifications are the Gothic Augustine church, containing a fine monument by Canova; the Capuchin church, with the burial vault of the Haps- burgs ; the church of Maria-Stiegen, an interesting Gothic building of the 14th century ; the handsome Greek church, by Hansen ; and the old rathhaus. At the corner of the Graben is the "Stock im Eisen," the stump of a tree, said to be the last survivor of a holy grove round which the original settlement of Vindomina sprang up (see p. 222 below). It is full of nails driven into it by travelling jJourneymen.

_ the number of its large and handsome modern build- ings Vienna can hold its own with any European capital. Most of these are found in or adjoining the Ring-Strasse, which certainly ranks as one of the most imposing achieve- ments of recent street architecture. Opposite the Hof-

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burg, the main body of which is separated from the Ring- Strasse by the Hofgarten and Volksgarten, rise the hand- some monument of the empress Maria Theresa and the imperial museums of art and natural history, two extensive Renaissance edifices with domes, matching each

other in every particular and grouping finely with the new part of the palace. Hans Makart's painted dome in the natural history museum is the largest pictorial canvas in the world. Adjoining the museums to the west is the palace of justice (1881), and this is closely followed by the houses of parlia- ment (1883), in which the Grecian style has been success- fully adapted to modern requirements. Beyond the houses of parliament stands the new rathhaus, an immense and lavishly-decorated Gothic building, erected in 1873-83. It was designed by Friedrich Schmidt, who may be de- scribed as the chief exponent of the modern Gothic tend- ency, as Hansen and Semper, the creators respectively of the parliament house and the museums, are the leaders of the Classical and Renaissance styles which are so strongly represented in Viennese architecture. The central tower and the tapering steeple of the rathhaus are surmounted by a colossal bronze figure of a knight. Opposite the rath- haus, on the inner side of the Ring, is the new court theatre, another specimen of Semper's Renaissance work. To the north stands the new building of the university, a Renaissance structure by Ferstel, rivalling the rathhaus in extent. Near the university, and separated from the Ring by a garden, stands the votive church in Alsergrund, erected to commemorate the emperor's escape from assas- sination in 1853, one of the most elaborate and successful of modern Gothic churches, in which the efforts of the architect (Ferstel) are supported by a profusion of sculp- ture and stained glass windows. The other important buildings of the Ring-Strasse include the magnificent opera house, the sumptuous interior of which vies with that of Paris, the Academy of Art, the industrial museum, and the exchange. On the north side the Ring-Strasse gives place to the spacious Franz Joseph's quay, flanking the Danube Canal. The municipal districts outside the Ring also contain numerous handsome modern buildings, Among the churches may be instanced those of Wieden (St Carlo Borromeo) and Lerchenfeld, the former an 18th- century imitation of St Peter's at Rome, the latter a plain but graceful building in an early medieval Italian style. The secular buildings include several large barracks and hospitals, various institutions connected with the univer- sity, the arsenal (with a collection of weapons), the Belve- dere (see below), and the polytechnic institute, market- halls, &c. In the outlying districts are numerous villas of great taste and elegance.

Vienna is the intellectual as well as the material capital of Austria,—emphatically so in regard to the German part of the empire. Its university, established in 1365, is now attended by nearly 6000 students, and the medical faculty enjoys a world-wide reputation. Besides an adequate supply of elementary and secondary schools, the other educational institutions include a large polytechnic, an agricultural academy, a military school, Roman Catholic and Protestant theological seminaries, a conservatorium of music, a training school for aspirants to a diplomatic career, 4 commercial college, and numerous technical and special Schools, Its scientific institutions are headed by the Academy of Science, The Academy of Art was founded m 1707, Few European capitals possess more valuable art collections than Vienna. The picture gallery in the Belvedere Palace, formerly the residence of Prince Eugene, 8 unsurpassed for its specimens of Rubens, Diirer, and the Venetian masters, The Lower Belvedere, at the other end of the garden, contains the famous Ambras collection of armour, curiosities, and antiquities. The private picture

galleries of Prince Liechtenstein, Count Harrach, and Count Czernin are of great extent and importance y and the collection of drawings and engravings known as the "Albertina," in the palace of the archduke Albert, is familiar to all connoisseurs. The collections of the various museums, &c., which are not unworthy of the handsome buildings in which they are exhibited, and the extensive military collections of the arsenal must also be mentioned.

In 1880 the population of Vienna proper, z.¢., the ten municipal districts, amounted to 705,402, a number which gave it the fourth place among the cities of Europe. In- cluding the suburbs, the total population rose to 1,082,812. The above figures are exclusive of the garrison of 20,700 men. The overwhelming majority of the inhabitants are Roman Catholics; the Jews number about 75,000, and the Protestants 26,500.

Owing to the peculiarities of its situation, the population of Vienna is of a very cosmopolitan and heterogeneous character. The German element is, of course, largely in the ascendant; but there are also large numbers of

Czechs, Hungarians, and Slavs. As a general rule the Viennese are gay, pleasure-loving, and genial, and they possess a bonhomie which differentiates them markedly from the inhabitants of the other great German eapital. The Viennese women are often distinguished by beauty and elegance ; and dress- ing as a fine art is cultivated here with almost as great success as in Paris, Asa rule the Viennese are passionately fond of daneing ; and the city of Strauss, Lanner, and Gungl provides the civilized terpsichorean world with waltzes and polkas. Opera, especially in its lighter form, flourishes, and the actors of Vienna maintain with success a traditional reputation of no mean order. The above description must not be understood to convey a negation of more solid qualities, especially industry, frugality, and sobriety. Its chief place in the history of art Vienna owes to its musicians, among whom are counted Haydn, Mozart, Beethoven, and Schubert. The Viennese school of painting is of modern origin ; but some of its members, for instance, Hans Makart, have acquired a European reputation.

The Prater, a vast expanse (2000 acres) of wood and park on the east side of the city, between the Danube and the Danube Canal, is greatly frequented by all elasses; and here all phases of Viennese life may be studied, from the fashionable eorso in the Haupt-Allee in May down tothe bois- terous and Derby- day-like jollity of a Sunday in the Wur- stel Prater or people's Prater. The great exhibition of 1873 was held in this park, and several of its buildings, in- cluding the large rotunda, have been left standing. Small- er parks are the Hof- garten, the Volks- garten, and the Town Park, all adjoining the Ring-Strasse. The environs of the city of Vienna contain many points of beauty and interest. Among the most popular resorts are the parks and gardens belonging to the imperial chateaux of Schénbrunn and Laxenburg.

The position of the eity on the chief European waterway running from west to east early marked out Vienna as one of the great com- mercial emporia of eastern Europe. The valley of the March, which river here joins the Danube, forms the natural line of communica- tion with the Oder and the Vistula. But the Austrian Government and the corporation of Vienna, by failing to keep the Danube in a proper state for navigation, have let slip the opportunity of making the city the great Danubian

metropolis which its geographical position entitles it to be. An extensive trade is nevertheless carried on from Vienna in grain, partly as a direct importation from Hun- gary and partly in transit between Russia and southern Germany. Other important articles are wine, cattle, colonial wares, and manu- faetured goods of the most varied description. Though not conspieu- ous among eities of its own rank as an industrial centre, Vienna nevertheless carries on a considerable number of manufactures ; and some of its products, such as its bent-wood furniture and meer- schaum pipes, are exported to all parts of Europe. In the number

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Environs of Vienna.

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and variety of its leather and other fancy goods it rivals Paris; and among manufaetures of a more solid character may be instanced machinery, ironwares, carriages, cotton and silk goods, &. The beer of Vienna is also famous. The municipal government of Vienna is entrusted to a gemeinderath of 120 elected members, with an executive and police magistracy. The annual income of this body amounts to about one and a half millions sterling. In the national parliament the city is represented by 10 members. The climate of Vienna is changeable, and rapid falls of tempera- ture are not uncommon. The range between January and June is about 40° Fahr. Violent storms often occur in spring and autumn ; and the heat of summer is accompanied by a plague of dust. Good water is brought by an aqueduct from the Schneeberg, 50 miles to the south-west. The annual death-rate is about twenty- six per thousand. ; ‘

History.—For several centuries Vienna filled an important réle as the most advanced bulwark of Western civilization and Christian- ity against the Turks, for during the whole of the Middle Ages Hungary practically retained its Asiatie character. The story of Vienna begins iu the earliest years of the Christian era, with the seizure of the Celtic settlement of Vindomina by the Romans, who changed its name to Vindobona, and established a fortified camp here to command the Danube and protect the northern frontier of the empire. The fortress grew in importance, and was

afterwards made a municipium ; and here Marcus Aurelius died in 180. On the decline of the Roman empire Vindobona became the prey of successive barbarian invaders. Attila and his Huns were among the temporary occupants of the place (5th century), and in the following century it came into the possession of the Avars, after which its name disappears from history until towards the close of the 8th century, when Charlemagne expelled the Avars and made the district between the Enns and the Wiener Wald the boundary of his empire. In the time of Otho II. (976) this " East Mark" (Ostmark, Oesterreich, Austria) was granted in fief to the Baben- bergers, and in the reign of Frederick Barbarossa (1156) it was ad- vanced to the rank of a duchy. There is no certain record that the site of Vindobona was occupied at the time of the formation of the Ostmark, though many considerations make it probable. It is not likely that the Avars, living in their "ring" encampments, de- stroyed the Roman municipium ; and Bees, the Hungarian name for Vienna to this day, is susceptible of a Slavonic interpretation only, and would seem to indicate that the site had been occupied in Slavonic times. The frequent mention of "Wiene" in the oldest extant version of the Nibelungenlied points in the same direction. Passing over a. doubtful mention of "Vwienni" in the annals of 1030, we find the "civitas" of Vienna mentioned ina document of 1130, and in 1156 it became the capital and residence of Duke Hein- rich Jasomirgott. In 1237 Vienna received a charter of freedom from Frederiek II., confirmed in 1247. In the time of the crusades Vienna increased so rapidly, in consequenee of the traffic that flowed through it, that in the days of Ottocar II. of Bohemia (1251-76), the suecessor of the Babenbergers, it had attained the dimensions of the present inner town. A new era of power and splendour begins in 1276, when it became the capital of the Haps- burg dynasty, after the defeat of Ottocar by Rudolph of Hapsburg. From this time on it has shared the fortunes of the house of Austria. In 1477 Vienna was besieged unsuccessfully by the Hungarians, and in 1485 it was taken by Matthew Corvinus. Of more import- ance were the two sieges by the Turks (1529 and 1683), when the city was saved on the first occasion by the gallant defence of Nicholas von Salm, and on the second by Riidiger von Starhem- berg, who held out until the arrival of the Poles and Germans under John Sobieski of Poland. The suburbs, however, were destroyed on both occasions. In 1805, and again in 1809, Vienna was for a short time occupied by the French. In 1814-15 it was the

meeting- place of the congress which settled the political affairs of Europe after the overthrow of Napoleon. In 1848 the city was for a time in the hands of the revolutionary party ; but it was bombarded by the imperial forces and compelled to surrender on 30th October of the same year, Vienna was not occupied by the Prussians in the war of 1866, but the invaders marched to within sight of its towers. Since then the most important event in its history has been the exhibition of 1873.

fi Se a Pc Bea 8h, etang am Topographie der Siadt Wien (1876); Victor Tissot, Vienne et la Vie V- iennoise (Paris, 1878). @. F. M.) VIENNE, a department of France, formed in 1790 out of Poitou (four-fifths of its present area), Touraine (one- seventh), and Berry, lies between 46° 3' and 47° 10' N. lat. and 0° 6' W. and 1° 12' E. long., and is bounded by Deux-Sevres on the W., Charente on the S., Haute-Vienne on the S.E., Indre on the E., Indre-et-Loire on the N.E. and N., and Maine-et-Loire on the N.W. The river Vienne, which gives its name to the department, with its tributaries

the Creuse (subtributary the Gartempe) on the east and the Clain on the west, flows from south to north, The general slope of the department is in the same direction, the highest point (764 feet) being in the south-east and the lowest (115 feet) at the junction of the Vienne and the Creuse. In the south the Charente, on the north- west the Dive, and in the west some streams belonging to the basin of the Sévre-Niortaise drain small portions of the department. The average temperature is 54° Fahr. The prevailing winds are from the south-west and west. The annual rainfall is 23 inches.

Of the total area of 1,722,478 acres arable land occupies 1,119,675, grass 76,899, vines 90,750, woods 193,322, and heath, pasture, and uncultivated land 146,971. In 1881 the live stock ineluded 22,637 horses, 7176 mules, 9679 asses, 63,052 cattle, 155,212 sheep of native and 47,970 of improved breed, 66,655 pigs, and 21,744 goats. There were also 11,047 beehives (32% tons of honey and as much of wax). The crops in 1884 were—wheat 4,557,146 bushels, meslin 245,641, rye 291,673, barley 1,063,647, oats 4,295,742, buckwheat 27,813, maize 51,529, potatoes 3,455,220, beetroot 54,941 tons, colza seed 668 tons, hemp 328 tons, flax 34 tons, hay 108,955

tons, clover 54,862, lucerne 98,282, sainfoin 53,350, other fodder 10,079 tons, wine 20,288,952 gallons (average for last ten years 21,384,880 gallons). Oak, ash, alder, and birch are the principal forest trees, and among the fruit-trecs are the chestnut, walnut, and almond. Iron and manganese occur, and there are numerous quarries of building and lithographic stones, lime, limestone, mill- stones, marl, and a sort of pebbles which are cut into " Chatel- lerault diamonds." There are sulphur and iron mineral springs. The most important industrial establishments are the national arnis manufactory and the cutlery works at Chatellerault; in other parts of the department are forges, blast furnaces, wool-spinning mills (580 spindles), hemp-spinning mills (4000 spindles, of which only 1500 are in use, and 28 looms), manufactories of serges and coarse cloth, vinegar, candles, leather, tiles, and pottery, paper-works, breweries, distilleries, rope-yards, lime-kilns, and numerous plaster and flour mills. Corn, wine, brandy, vegetables, fruit, chestnuts, fodder, cattle, cutlery, and dressed hides are exportcd ; butcher's meat, colonial produce, and coals are imported. The department has 233 miles of railway, 239 of national and 8704 of other roads, and 32 of waterway (the Vienne from Chatellerault, the Dive below Moncontour, and some miles of the Creuse being navigable). : The population in 1881 was 340,295 and in 1886 342,785, an increase of 101,795 since 1801. Vienne forms part of the diocese of Poitiers, has its eourt of appeal and acadenty at Poitiers, and belongs to the Tours army corps district. The chef-lieu is Poitiers (population 34,628 in 1886), and the department is divided for purposes of ad- ministration into 5 arrondissements (Poitiers ; Chatellerault, popu- lation of town 14,498 in 1886; Civray, 2464; Loudun, 4041; Montmorillon, 4155), 31 cantons, and 300 communes.

VIENNE, a town of France, chef-lieu of an arrondisse- ment in the department of Isére, historically and in- dustrially the first, and by population the second, city of Dauphiné, is situated on the left bank of the Rhone, at the point where it is jommed by the Gére, 19 miles S. of Lyons by the railway to Marseilles. On the north, east, and south the town is sheltered by low hills. Its site is an immense mass of ancient débris, which is constantly yielding interesting antiquities. Along the Gére are traces of the ramparts of the old Roman city; on Fort Pipet, to the east of the town, are the remains of a theatre and citadel and some vestiges of a pantheon

and an amphi- theatre ; and in the interior of the town are two arches of a theatre and the balustrade of a magnificent staircase. The ancient aqueducts, restored in 1822, still convey the waters of the Gere from a distance of 4 or 5 miles; and there are several pieces of Roman road to be seen in the neighbourhood. The Plan de l'Aiguille, a truncated quad- rangular pyramid 55 feet high, resting on a portico with four arches, used to be pointed out as the tomb of Pontius Pilate (who, according to tradition, died here), but it is now recognized as having been part of the spina of a large circus, the outlines of which have been traced. The temple of Augustus and Livia, a rectangular building of the Corinthian order, was rebuilt at the end of the 2d century, and in the 5th century was converted into a church. The "festival of reason" was celebrated in it at

the Revolution ; and it has only lately been restored, and the houses built against it cleared away. The museum in the town-hall is very rich in antiquities. The cathedral of St Maurice, exhibiting the finest Gothic architecture in Dauphiné, was begun at the end of the 12th century in the Transitional Burgundian style, on the ruins of a church which had been finished in 1107, and it was consecrated by Pope Innocent IV. in 1251. There is neither apse nor transept, and the building (315 feet long, 118 wide, and 89 high) is a singular mixture of the Romanesque and Gothic styles. The best part is the facade, finished in 1533, which rises majestically from a terrace overhanging the Rhone. Parts of the church of St André-le-Bas, which was used as a chapel by the dukes of Burgundy, are as old as the 9th century, and most of it was built in 1152. The church of St Peter, at present (1888) undergoing re- storation, is one of the oldest in France, dating from the 6th century; the porch is in the most primitive Roman- esque style; and the side walls, decorated with two rows of arches resting on marble columns (9th century), are unique in France. The steeple belongs to the 12th cen- tury, and the vaults were rebuilt by Soufflot in the 18th century. Among the many tombs is that of St Mamert. In the square fronting the town-hall is a statue of Ponsard the dramatist, who was born at Vienne. The Gére sup- plies the motive power to numerous factories. About one million yards of cloth are annually produced, and from 8000 to 9000 hides are dressed. The other industrial

establishments include a paper-mill, an iron and copper foundry (400 men), iron-works, foundries, lapidaries' workshops, glass-works, brick-works, and calcining and re- fining furnaces in connexion with the lead and zinc mines in the neighbourhood. Grain is an important article of commerce. A suspension bridge connects Vienne with the right bank of the Rhone, where the village of St Colombe occupies part of the site of the ancient town. Near St Romain-en-Gal is a tower built by Philip of Valois to defend the right, or French, bank, as distinguished from the left, which belonged to the empire. The population in 1881 was 22,740 (commune 26,060), and in 1886 23,011 (commune 25,480).

Vienne was originally the capital of the Allobroges, and was embellished and fortified by Julius Cesar, who made it a colony. Tiberius granted the citizens the Jus Italicum. The ramparts, pierced by five gates, enclosed a lower, middle, and upper town. Vienne was the residence of a pretor, had a senate, consuls, and a garrison of five legions, and was the seat of a celebrated school. A bridge of five arches connected it with the new town on the night bank. Postumus (see vol. xx. p. 776) was proclaimed Cesar here in 259, and Vienne became the capital of a provincial empire, which under himself and his successors, Victorinus aud Tetricus, lasted fourteen years. Christianity was introduced by St Crescens in the 2d century, and St Lupicin is named as the first archbishop. 'The archbishops of Vienne all through the Middle Ages disputed the title of primate of Gaul with those of Lyons. Vienne was conquered by the Burgundians in 438, and sacked by the Lombards in 558 and by the Saracens in 737. It was one of the residences of Boso, king of Burgundy and Provence (879), who died and was buried here. After the fall of the second kingdom of Burgundy, Vienne became the chef-lieu of a county, for which the nobility and clergy disputed, and which was finally seized by the Counts of Albon. In 1349 Humbert II. ceded Vienne with all Dauphiné to France. The town was sacked in 1562 by Baron des Adrets, was claimed by both Roman Catholics and Protestants, but declared for the League in 1590, and was compelled to surrender to the duke of Montmorency, who destroyed the citadel and ram- parts. The archbishopric was suppressed in 1790. Vienne was the birthplace of St Julian (3d century); and pope Calixtus II. (Guy of Burgundy ; 0d. 1124) was one of its archbishops.

VIENNE, Havre, a department of France, formed in 1790 out of Limousin (three-fifths), La Marche (one-fourth), Poitou, and Berry, and formerly known as Haut-Limousin, lies between 45° 26’ and 46° 23’ N. lat. and 0° 38’ and r o4’ E. long., and is bounded by the Indre on the N., Creuse on the E., Corréze on the S.E., Dordogne on the S.W.,

Charente on the W., and Vienne on the N.W. Haute- Vienne belongs to the central plateau of France, and drains partly to the Loire and partly to the Garonne, The highest point (2549 feet) is in the extreme south-east, and belongs to the treeless but well-watered plateau of Mille- vaches, formed of granite, gneiss, and mica. To the north- west of the Millevaches are the Ambazac (2300 feet) and Blond (1690 feet) Hills, both separating the valley of the Vienne from that of the Gartempe, a tributary of the Creuse. The Vienne traverses the department from east to west, passing Eymoutiers, St Léonard, Limoges, and St Junien, and receiving on the right the Maude and the Taurion. The Isle, which flows into the Dordogne, with its tributaries the Auvézére and the Dronne, and the Tar-doire and the Bandiat, tributaries of the Charente, all rise in the south of the department. The altitude and inland position of Haute-Vienne, its geological character, and the northern exposure of its valleys make the winters long and severe; but the climate is milder in the west and

north-west. The annual rainfall at Limoges is 36 inches.

Of the total area of 1,360,000 acres 439,215 are cultivated, 4263 are occupied by vineyards, 75,338 by chestnut trees, and 163,135 by dry underwood. The crops in 1884 were—wheat 1,242,271 bushels, meslin 34,298, rye 2,482,557, barley 13,300, oats 318,026, buckwheat 1,529,368, maize 65,579, potatoes 6,710,728, beetroot 189,000 tons, colza seed 1845 tons, hemp seed 1921, hemp 1200, linseed 93, flax 46, hay 387,192, clover 31,527, lucerne 3153, wine 111,480 gallons (average for preceding ten years 141,020 gallons). The live stock included 8371 horses ofa shapely and powerful breed, 684 mules, 4975 asses, 146,131 cattle, 507,443 sheep of native and 43,593 of improved breed, 104,263 pigs, and 9642 goats. There were 36,601 beehives (1044 tons of honey and 34% tons of wax). The department is on the whole unproductive. The chestnut is here

characteristic, as the apple in Normandy, and with the potato and turnip it forms the chief food of the people. The brooks are fringed by fine meadows, and the hills are covered with heath or forests of beech, hornbeam, oak, birch, and chestnut. he mineral wealth consists of iron, copper, tin, wolfram, antimony, serpentine, fine-grained granite, gneiss, garnets, emeralds, and a kind of por- phyry, which takes a fine polish. There are inexhaustible supplies of china clay, in which an export trade is carried on with Russia and America, 5800 workmen are employed in porcelain manufac- tories, 650 in paper and pasteboard mills (annual product, £100,000), 560 in wool and cotton spinning mills and manufactories of flannel, druggets, woollen cloaks, and carpets, 600 in shoe-making (annual product, £100,000), 600 in manufactories of sabots, 340 in glove manufactories, 376 in tan-yards, 325 in leather-dressing works, 130 in coach-building and wheelwrights' shops, 125 in cabinet work- shops, 325 in printing works, and 100 in distilleries (annual pro- duct, £480,000). In 1878 1153 tons of iron were produced, aud there are forges, foundries, copper-works, and manufactories of agricultural and other implements. Porcelain, china clay, woven goods, boots and shoes, sabots, gloves, leather, cattle, horses, wood, chestnuts, hemp, and paper are exported ; corn, wine, coal, raw materials, and various manufactured articles are imported. 'There are in Haute-Vienne 234 miles of railway, and 284 of national and 3191 of other roads. This department, with that of Corréze, forms the diocesc of Limoges ; it belongs to the district of the Limoges court of appeal and army corps, has its academy at Poitiers, and is divided for purposes of administration into 4 arrondissements (Limoges, population of town 63,707 in 1886; Bellac, 4015; Rochechouart, 1829; and St Yrieix, 3556), 27 cantons, and 203 communes. The population in 1881 was 349,332 and in 1886 363,182, an increase of 117,982 since 1801. Limoges is the chef- lieu. St Yrieix has an early Gothic church of the 12th century, kaolin mines, porcelain manufactories, and tan-yards. St Junien (5454) has an interesting bridge and houses of the 13th century, and numerous manufactories of gloves, paper, porcelain, sabots, and woven goods. St Léonard (3427), the birthplace of Gay-Lussac, possesses a remarkable church of the 11th and 12th centuries, tan- yards, paper-mills, and copper-works. At Chalus (1675) Richard Cceur de Lion died.

VIERZON, a town of France, in the department of Cher, 124 miles by rail to the south of Paris. The Cher and the Yévre unite at the foot of the hill on which lie the communes of Vierzon-Ville (population 10,514 in 1886) and Vierzon-Village (6995); Vierzon-Bourgneuf (1498) is on the left bank of the Cher. The three com. munes together have a population of 19,007. Vierzon has several large manufactories for the production of agri-

cultural machines, also foundries, porcelain and earthen- ware works, and glass-works, A very fine technical school has just been opened.

VIETA, or Vite, FRANcotIs, SEIGNEUR DE LA BIGOTIERE (1540-1603), more generally known as Franciscus VIETA, mathematician, was born in 1540 at Fontenay-le-Comte, in Poitou. According to F. Ritter's investigations,! Vieta was brought up as a Catholic, and died in the same creed ; but there can be no doubt that he belonged to the Hugue- nots for several years. On the completion of his studies in law at Poitiers Vieta began his career as an advocate in his native town. 'This he left about 1567, and some- what later we find him at Rennes as a councillor of the parlement of Brittany. The religious troubles drove him thence, and Rohan, the well-known chief of the Huguenots, took him under his special protection. He recommended him in 1580 as a "maitre des requétes" (master of requests) ; and Henry of Navarre, at the instance of Rohan, addressed two letters to Henry III. of France on 3d March and 26th April 1585, to obtain Vieta's restoration to his former office, but without result. After the accession of Henry of Navarre to the throne of France Vieta filled in 1589 the position of councillor of the parlement at Tours. He afterwards became a royal privy councillor, and re- mained so till his death, which took place suddenly at Paris in February 1603, but in what manner we do not know ; Anderson, the editor of his scientific remains, speaks only of a "praeceps et immaturum autoris fatum."

We know of one important service rendered by Vieta as a royal officer. While at Tours he discovered the key to a Spanish cipher, consisting of more than 500 characters, and thenceforward all the dispatches in that language which fell into the hands of the French could be easily read. His fame now rests, however, entirely upon his achievements in

mathematics. Being a man of wealth, he printed at his own expense the numerous papers which he wrote on various branches of this science, and communicated them to scholars in almost every country of Europe. An evidence of the good use he made of his means, as well as of the kindliness of his character, is furnished by the faet that he entertained as a guest for a whole month a scientific adversary, Adriaan van Roomen, and then paid the expenses of his journey home. Vieta's writings thus became very quickly known ; but, when Franciscus van Schooten issued a general edition of his works in 1646, he failed to make a eomplete collection, although probably nothing of very great value has perished.

_ The form of Vieta's writings is what we may call their weak side. He indulged freely in flourishes ; and in devising technical terms derived from the Greek he seems to have aimed at making them as unintelligible as possible. None of them, in point of fact, has held its ground, and even his proposal to denote unknown quantities by the vowels A, E, I, 0, U, Y, —the consonants IBS ©; ice, being reserved for general known quantities, has not been taken up. In this denotation he followed, perhaps, some older contemporaries, as Ramus, who designated the points in geometrical figures by vowels, making use of consonants, R, s, T, &c., only when those were exhausted. Vieta is wont to be called the father of modern algebra. This does not mean, what is often alleged, that nobody before him had ever thought of choosing symbols different from numerals, such as the letters of the alphabet, to denote the quan- tities of arithmetic, but that he made a general custom of what until his time had been only an exceptional attempt. All that is wanting in his writings, especially in his Lsagoge in artem analyticam (1591), in order to make them look like a modern school algebra, is merely the sign of equality,—a want which is the more striking because Robert Recorde had made use of our present symbol for this purpose since 1557 and Xylander had employed vertical parallel lines since 157 oe On the other hand, Vieta was well skilled in most modern artifices, aiming at a simplification of equations by the sub- stitution of new quantities having a certain connexion with the primitive unknown quantities. Another of his works, Recensio canonica effectionum geometricarum, bears a stamp not less modern being what we now call an algebraic geometry,—in other words, a collection of precepts how to construct algebraic expressions with the

use of rule and compass only. While these writings were generally intelligible, and therefore of the greatest didactic import- ance, the principle of homogencity, first enunciated by Vieta, was so far in advance of his times that most readers seem to have passed it over without adverting to its value. That principle had been made use of by the Greek authors of the elassic age; but of later

1 Bolletino Boncompagni, vol. i. p. 227, note 1, Rome, 1868.

mathematicians only Hero, Diophantus, &c., ventured to regard lines and surfaces as mere numbers that could be joined to give a new number, their sum. It may be that the study of sueh sums, which he found in the works of Diophantus, prompted him to lay it down as a principle that quantities occurring in an equation ought to be homogeneous, all of them lines, or surfaces, or solids, or supersolids,—an equation between niere numbers being inad- missible. During the three centuries that have elapsed between Vieta's days and our own several changes of opinion have taken place on this subject, till the principle has at last proved so far victori- ous that modern mathematicians like to make homogeneous sucli equations as are not so from the beginning, in order to get values of asymmetrical shape. Vieta himself, of course, did not see so far as that ; nevertheless the merit cannot be denied him of having indirectly suggested the thought. Nor are his writings lacking in actual inventions. He conceived methods for the general resolution of equations of the second, third, and fourth degrees different from those of Ferro and Ferrari, with which, however, it is difficult to believe him to have been unacquainted. He devised an approxi- mate numerical solution of equations of the second and third degrees, wherein Leonardo of Pisa must have preceded him, but by a method every vestigc of which is completely lost. He knew the connexion existing between the positive roots of an equation (which, by the way, were alonc thought of as roots) and the coefficients of the different powers of the unknown quantity. He found out the formula for deriving the sine of a multiple angle, knowing that of the simple angle with due regard to the periodicity of sines. This formula must have been known to Vieta in 1593. In that year Adriaan van

Roomen gave out as a problem to all mathema- ticians an equation of the 45th degree, which, being recognized by Vieta as depending on the equation between sin ¢ and sin £ was resolved by him at once, all the twenty-three positive roots of which the said equation was capable being given at the same time. Such was the first encounter of the two scholars. A second took place when Vieta pointed to Apollonius's problem of taction as not yet being mastered, and Adriaan van Roomen gave a solution by the hyperbola. Vieta, however, did not accept it, as there existed a solution by means of the rule and the compass only, which he published himself in his Apollonius Gallus (1600). In this paper

ieta made use of the centre of similitude of two circles. Lastly, he gave an infinite product for the number 7 (see SQUARING THE CIRCLE, vol. xxii. p. 434).

Vieta's collected works were issued under the title of Opera Mathematica by F. van Schooten at Leyden in 1646. CM. CA

VIGEVANO, a town of Italy, in the province of Pavia, on the right bank of the Ticino, 24 miles south-west from Milan and about the same distance north-west from Pavia. It is a medieval walled town, with an arcaded market- place, a cathedral, and a castle of the Sforza family, dating from the 14th century and adorned with a loggia by Bramante. It is a place of some importance in the silk trade, and also produces excellent macaroni. The popu- lation in 1881 was 14,794 (commune, 20,096).

VIGIL, in its ecclesiastical sense, means the day preceding a festival, In the liturgy of the Roman Catholic Church there are special offices for the vigils of the greater feasts, and the vigil is regarded as more or less of a fast day. In the early church there was a widespread practice of celebrating festivals, of martyrs especially, by actual vigils (vgilie or pernoctationes, mavvuxides) in the churches; but this led to such serious evils that the custom had to be discouraged, and now sur- vives, if at all, only in rare, unauthorized, and considerably disguised forms. In some of the stricter religious orders the daily office is recited at various hours of the night as well as during the day; but, if these nocturnal services are spoken of as vigils, it is only in the popular meaning of that word.

VIGILANTIUS, presbyter, celebrated as the author of a work, no longer extant, against superstitious practices, which called forth one of the most violent and scurrilous of Jerome's polemical treatises, was born about 370 at Calagurris in Aquitania (the modern Saint Bertrand de Comminges in the department of Haute-Garonne), where his father kept a "statio" or inn on the great Roman road from Aquitania to Spain. While still a youth his talent became known to Sulpicius Severus, who had estates in that neighbourhood, and in 395 Sulpicius, who probably

baptized him, sent him with letters to Paulinus of Nola, where he met with a friendly reception. On his return to

Severus in Gaul he was ordained ; and, having soon after-

wards inherited means through the death of his father, he set out for Palestine, where he was received with great respect by Jerome at Bethlehem. The stay of Vigilantius lasted for some time ; but, as was almost inevitable, he was dragged into the dispute then raging about Origen, in which he did not see fit wholly to adopt Jerome's attitude. On his return to the West he was the bearer of a letter from Jerome to Paulinus, and at various places where he stopped on the way he appears to have expressed himself about Jerome in a manner that when reported gave great

offence to that father, and provoked him to write a reply

(Zp. 61). Vigilantius now settled for some time in Gaul, and is said by one authority (Gennadius) to have after- wards held a charge in the diocese of Barcelona, About 403, some years after his return from the East, Vigilantius wrote his celebrated work against superstitious practices, in which he argued against relic worship, as also against the vigils in the basilicas of the martyrs, then so common,

the sending of alms to Jerusalem, and the attribution of

special virtue to the unmarried state, especially in the case of the clergy. All that is known of this work is through Jerome's treatise Contra Vigilantium, or, as that con- troversialist would seem to prefer saying,

‘Contra Dormi- tantium.” Notwithstanding Jerome’s exceedingly un- favourable opinion, there is no reason to believe that the tract of Vigilantius was exceptionally illiterate, or that the views it advocated were different from those now held on the subjects with which it deals by most educated men outside the Roman Catholic Church, or even by many within its pale. Soon, however, the great influence of Jerome in the Western Church caused its leaders to espouse all his quarrels, and Vigilantius gradually came to be ranked in popular opinion among heretics. The year of his death is unknown.

VIGILIUS, pope from 537 to 555, succeeded Silverius and was followed by Pelagius I. He was ordained by order of Belisarius while SmLvERIUS (q.v.) was still alive ; his elevation was due to Theodora, who, by an appeal at once to his ambition and, it is said, to his covetousness, had induced him to promise to disallow the council of Chalcedon, in connexion with the “three chapters” con- troversy (see vol. xiii, p. 796). When, however, the time came for the fulfilment of his bargain, Vigilius de- clined to give his assent to the condemnation of that council involved in the imperial edict against the three chapters, and for this act of disobedience he was per- emptorily summoned to Constantinople, which he reached in 547. Shortly after his arrival there he issued a docu- ment known to history as his Judicatum (548), in which he condemned indeed the three chapters, but expressly disavowed any intentions thereby to disparage the council of Chalcedon. After a good deal of trimming (for he desired to stand well with his own clergy, who were strongly orthodox, as well as with the court) he prepared another document, the Constitutum ad I mperatorem, which Was laid before the so-called fifth “ cecumenical ” council in 593, and led to his condemnation by the heterodox majority of that body, some say, even to his banishment. Ulti- mately, however, he was induced to assent to and confirm the decrees of the council, and was allowed after an enforced absence of seven years to set out for Rome. He died, however, before he reached his destination, most probably in the beginning of 555.

VIGNA, Prerro pE LA, or PeTRus DE VINEA (c. 1190- 1249), the emperor Frederick II.’s minister, was born at Capua probably about 1190.

From his own letters he Would seem to have been of obscure parentage, though one

of his correspondents refers to his nobilitas. He was per- haps educated at Bologna; but he certainly studied in a strange city and not at his own expense, though it is not till after his death that we find the story which makes him beg his bread in the streets. His name does not appear affixed to any judicial act before J uly 1225, at which time he was judex magne curiz ; and this continued to be his official title till April 1247, when his style was changed for that of protonotary and logothete. In 1232 he was at Rome on a mission to Gregory IX. , and in 1234-35 he was in England negotiating the marriage of his master with Henry IIT.'s sister Isabella, after which time he seems to have kept up a friendly communication with the king, and on one occasion even begs to be reckoned "as a son and citizen of the realm." In March 1239 he was with Frederick II. at Padua when the news came of the em- peror's excommunication, with reference to which he was ordered to address the people. In 1247 he was at the very height of his power and regarded as the emperor's alter ego. But from this height of prosperity Peter suddenly fell very early in 1249, and all kinds of stories have been invented to explain an event that puzzled his contemporaries as well as succeeding ages. He was thrown into prison and blinded, after which he was led about from place to place as a public example, "the master-councillor of the emperor, who was lord of his law and betrayed him to the pope." His death must have taken place about April 1249. There seems to be some truth in the tale that makes him die a suicide's death at Pisa. It is among the suicides that Dante meets his shade in hell.

Pietro. de la Vigna's writings consist of (1) Letters and (2) a Latin poem on the twelve months of the ycar. A Latin satire dirccted against the Dominicans and Franciscans is also perhaps his. Besides these, many poems in the common speech are attributed to him. It is difficult to pronounce a definite opilion on his relation to the new religion or new church which it was perhaps the ambition of Frederick's most

enthusiastic adherents to inaugurate. The Letters were first printed at Basel in 1566. Sce Huillard-Bréholles, Vie et Correspondance de P. de la Vigne, Paris, 1864.

VIGNOLA. See Baroccnio.

VIGNY, Aurrep px (1799-1863), a French poet of exceptionally refined and original faculty, which was kept from voluminous production by a fastidiousness perhaps verging on affectation, was born at Loches (Indre-et-Loire) on 27th March 1799. Sainte-Beuve, in the rather iL natured essay which he devoted to Vigny after his death, expresses a doubt whether the title of count which the poet bore was very well authenticated, and hints that no very ancient proofs of the nobility of the family were forthcoming ; but it is certain that in the 18th century persons of the name occupied positions which were not open to any but men of noble birth. For generations the ancestors of Alfred de Vigny had been soldiers, and he himself joined the army at the age of sixteen. But the Revolutionary and Napoleonic wars were over, and after twelve years of life in barracks he retired, preserving, however, a very high estimate of the duties and career of the soldier. While still serving he had made his mark by the publication in 1822 of a volume of poems, and in 1826 by another, together with the famous prose romance of Cing-Mars. Sainte-Beuve asserts that the poet antedated some of his most remarkable work. This may or may not be the case; he certainly did not and could not antedate the publication, and it so happens that some of his most celebrated books—Floa, Dolorida, M oise,—appeared before the work of younger members of the Romantic school whose productions strongly resemble these poems. It is quite certain that the other Alfred—Alfred de Musset— felt the influence of his elder namesake, and an impartial critic might discern no insignificant marks of the same effect in the work of Hugo himself. Even Lamartine, XXIV. — 29

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considerably Vigny's elder and his predecessor in poetry, seems rather to have been guided by Vigny than Vigny by him. No one can read Dolorida

or Le Cor without seeing that the author had little to learn from any of his French contemporaries and much to teach them. At the same time Vigny, either from indolence, or from fastidious- ness, or from being a "barren rascal," or from fear of losing the high position which he had gained, hardly attempted anything more in poetry proper during the more than thirty years of his life, and his entire poems, including posthumous fragments, form but one very small pocket volume. Cngq-Mars, which at least equalled the poems in popularity, will hardly stand the judgment of posterity so well. It had in its favour the support of the Royalist party, the immense vogue of the novels of Walter Scott, on which it was evidently modelled, the advantages of an exquisite style, and the taste of the day for the romance as opposed to the novel of analysis. It therefore gained a great name both in France and abroad. But any one who has-read it critically must acknowledge it to be disappointing. The action is said to be dramatic; if it be so, it can only be said that this proves very con- clusively that the action of drama and the action of the novel are two quite different things. To the reader who knows Scott or Dumas the story is singularly uninterest- ing (far less interesting than as told in history); the characters want life; and the book generally stagnates. Alfred de Vigny's admirable French and the quasi-poetical beauty of detached passages alone save it from positive dulness. Its author, though always as a kind of outsider (the phrase constantly applied to him in French literary essays and histories being that he shut himself up in a "tour Wivoire"), attached himself more or less to the Romantic movement of 1830 and the years immediately preceding and following it, and was stimulated by this movement both to drama and to novel-writing. In the year before the revolution of July he produced at the Théatre Francais a translation or rather paraphrase of Othello, and an original piece, Maréchale d'Ancre. In 1832 he published the curious book Stello, and in 1835 he brought out his drama of Chatterton, which shocked French taste even after five years of Romantic education, by the hero's suicide, but had a considerable success. The same year saw the publication of Servitude et Grandeur Militaires, a singular collection of sketches rather than a connected work, in which Vigny's military experience, his idea of the soldier's duties, and his rather poetical views of history were all worked in. The subjects of Chatterton and Othello naturally suggest a certain familiarity with English, and in fact Alfred de Vigny knew English well, lived in England

for some time, and married an English- woman. His father-in-law was, according to French gossip, SO conspicuous an example of insular eccentricity that he never could remember his son-in-law's name or anything about him, except that he was a poet, by which fact and the kindness of casual Frenchmen who went through the list of the chief living poets of their country he was some- times able to discover his daughter's husband's designation. In 1842 Alfred de Vigny was elected to the Academy. whose meetings he frequented with an assiduity rather Surprising In a man of such retired habits and (still accord- ing to Sainte-Beuve) rather troublesome to his colleagues But he produced nothing save a few scraps ; and beyond the work already enumerated, little has to be added except his Journal d'un Poéte and the poems called Les Destinées edited, with a few fragments, by M. Louis Ratisbonne im. mediately after his death. Among his dramatic work however, should be mentioned Quitte pour la Peur and an adaptation of the Merchant of Venice called Shylock. Les Destinées excited no great admiration in France, but they

and for the most part, as has been said, spent in retirement.

deal less.

VIG—VIL

contain some exceedingly beautiful poetry of an austere kind, such as the magnificent speech of Nature in "La Maison du Berger" and the remarkable poem entitled

"Ta Colére de Samson." Vigny died at Paris on 17th

September 1863.

The later life of Alfred de Vigny was almost wholly uneventful, His

reputation, however, is perfectly secure. It may, and probably

will, rest only on his small volume of poems, though it will not be lessened, as far as qualified literary criticism is concerned, should

the reader proceed to the rest of the work. The whole of his non- dramatic verse does not amount to 5000 lines; it may be a good But the range of subject is comparatively wide, and ex- traordinary felicity of execution, not merely in language, but in thought, is evident throughout. Vigny, as may be seen in the speech of Nature referred to above, had the secret,—very uncommon

with French poets,—of attaining solemnity without grandiosity,

by means of an almost classical precision and gravity of form, The defect of volubility, of never leaving off, which mars to some extent his great contemporary Hugo, is never present in him, and he is equally free from the looscness and disorders of form which are sometimes blemishes in Musset, and from the effeminacy of Lamartine, while once more his nobility of thought and plentiful- ness of matter save him from the reproach which has been thought to rest on the technically perfect work of Théophile Gautier. The dramatic work is, perhaps, less likely to interest English than French readers, the local colour of Chatterton being entirely false, the sentiment conventional in the extreme, and the real pathos of the story exchanged for a commonplace devotion on the poet's part to his host's wife. In the same way, the finest passages of Othello simply disappear in Vigny's version. In his remaining works the defect of skill in managing the plot and characters of prose fiction, which has been noticed in Cing-Mars, reappears, together (in the case of the Journal d'un Poéte and elsewhere) with signs of the fastidious and slightly affected temper which was Vigny's chief fault asaman. In his poems proper none of these faults appear, and he is seen wholly at his best. It should be said that of his post- humous work not a little had previously appeared piecemeal in the Revue des Deux Mondes, to which he was an occasional contributor. The prettiest of the complete editions of his works (of which there are several) is to be found in what is called the Petite Bibliotheque Charpentier. (G. SA.)

VIGO, a town of Spain, in the province of Pontevedra, 486 miles by rail north-west from Madrid,is picturesquely situated on the side of a hill (Castelo) which slopes down to the southern shore of the Ria de Vigo. The Ria is the most southerly of the great fjords by which the western coast of

Galicia is so deeply indented ; Bayona at its mouth is 13 miles from the town of Vigo and Puente Sampayo at its head a somewhat shorter distance. Some of the former walls still remain, and there are two old castles on the hill behind the town; the older streets retain their narrow, steep, and tortuous aspect. There are some fisheries at Vigo ; but the manufactures of the place are Insignificant. Its activity is enttrely due to its magnificent anchorage ; it is a regular port of call for several inter- national lines of steamers, and has a very important trade ; the chief imports are cotton and woollen fabrics, sugar, hides, &c., while cattle, sardines, grain, and eggs are ex- ported. The population within the municipal limits in 1877 was 13,416.

Vigo, the ancient Oda (Ptolemy) or Vicus Spacorum, has in modern times been more than once attacked by the English,—by Drake in 1585 and 1589, and by Cobham in 1719. The Plate fleet was destroyed by the duke of Ormond and admirals Rooke and Stanhope in Vigo Bay on 22d October 1702.

_ VILKOMIR, or WILKOMIERZ, a district-town of Russia, in the government of Kovno, 44 miles north-east of the capital of the province, is one of the oldest cities in that part of western Russia. Founded as early as 1025, it suffered much from the attacks of the Teutonic Knights, . as well as from internal wars. It flourished in the 16th century under " Magdeburg law," but soon came upon ad- verse times again during the wars between Poland, Russia, and Sweden. It was annexed to Russia in 1796. Tie Position on the principal highway from St Petersburg to Kovno gave it some trade in flax, but this is now declining. Its population increased from 7300 in 1860 to 16,240 in

1885. Vilkomir has a fine church dating from the 14th

century.

VILLA DE CONTAS, a town of Brazil, in the province of Bahia, 230 miles south-west from the city of Bahia, on the Brumado (Contas-Pequeno), a head-stream of the Rio de Contas (Jussiape), which rises on

the east slope of the neighbouring Serra das Almas, and flows thence to the coast at Barra do Rio Contas. This town, which has a mixed population (1880) of 10,200 whites, Negroes, half- castes, and Indians, lies in a fertile district producing much cotton, sugar, and tobacco. It was founded in 1715 by some enterprising "' Paulistas," who were attracted to the district by the auriferous sands washed down by the head- streams of the Jussiape. It received the title of a town in 1724, and soon afterwards most of the inhabitants re- moved to the present more convenient site five miles lower down the Brumado, on the high road between Bahia and Goyaz. Villa de Contas is the capital of the department of the same name, which was detached in 1833 from the old: department of Jacobina.}

VILLA DO RIO PARDO, a town of Brazil, in the province of Rio Grande do Sul, on the left bank of the Jacuhy at its confluence with the Pardo, about 80 miles due west from Porto Alegre, in 30° S. lat. and 52° W. long. The Jacuhy, chief affluent of the coast lagoon Dos Patos, is navigable by small steamers to this place, which is one of the most flourishing towns in the province, with a total population (1880) of 11,500, including 6000 whites, 4500 Negroes and coloured, and about 1000 civilized Indians. It had its origin in a fort built by the Portuguese at this point in 1751, but was not raised to the rank of a town till1809. There is a large parish church founded in 1769, besides several other churches and three schools, but no note- worthy buildings. The district is fertile and well-watered, and grows an excellent flax, which supplies a number of local hand-looms. A considerable export trade is carried on by the river craft, which here ship maté (Paraguay tea), jerked meat, linen, and other products for the coast towns.

VILLANI, Giovanni (c. 1275-1348), Italian chronicler, was the son of Villano di Stoldo, and was born at Florence in the second half of the 13th century; the precise year is unknown. He was of good burgher extraction, and, following the traditions of his family, applied himself to commerce. During the early years of the 14th century he travelled in Italy, France, and the Netherlands, seeing Men and things with the sagacity alike of the man of business and of the historian. Before leaving Florence, or rather in the interval between one journey and another, he had at least taken some part in that troubled period of civil contentions which Dino

Compagni has described, and which swept Dante Alighieri into banishment. In 1301 Villani saw Charles of Valois ruining his country under the false name of peacemaker, and was witness of all the misery which immediately followed.2, Somewhat later he left Italy, and in September 1304 he visited Flanders. It is not well ascertained when he returned to his native city. He was certainly living there shortly after the emperor Henry VII. had come to Italy in 1312, and prob- ably he had been there for some time before. While still continuing to occupy himself with commerce, he now began to take a prominent part in public affairs. In 1316 and 1317 he was one of the priors, and shared in the crafty tactics whereby Pisa and Lucca were induced to conclude @ peace with Florence, to which they were previously

averse.® In 1317 he also had charge of the mint, and a sli (: Ritter, and with him nearly all other geographers, wrongly make

this place still the capital of Jacobina, although Millet de Saint-Adolphe (ii, Pp. 404) distinctly makes the statement given in the text. : See Villani, Chronicle, bk. viii. ch. 37, 38. Chron., bk. ix. ch. 80.

during his administration of this office he collected its earlier records and had a register made of all the coins struck in Florence up to his day. In 1321 he was again chosen prior; and, the Florentines having just then under- taken the rebuilding of the city walls, he and some other citizens were deputed to look after the work. They were afterwards accused of having diverted the public money to private ends; but Villani clearly established his innocence. He was next sent with the army against Castruccio Castracane, lord of Lucca, and was present at its defeat at Altopascio. In 1328 a terrible famine visited many provinces of Italy, including Tuscany, and Villani was appointed to guard Florence from the worst effects of that distressing period. He has left a record of what was done in a chapter of his Chronicle, which still remains a monument of the economic wisdom in which the medieval Florentines were often so greatly in advance of their age. In 1339, some time after the death of Castruccio, some rich Florentine merchants, and among them Villani, treated for the acquisition of Lucca by Florence for 80,000 florins,*

offering to supply the larger part of that sum out of their own private means; but the negotiations fell through, owing to the discords and jealousies then existing in the Govern- ment (Chron., x. 143). The following year Villani super- intended the making of Andrea Pisano's bronze doors of the baptistery (see vol. xix. p. 122). In the same year he watched over the raising of the campanile of the Badia, erected by Cardinal Giovanni Orsini (Chron., x. 177). In 1341 the acquisition of Lucca was again under treaty, this time with Martino della Scala, for 250,000 florins. Villani was sent with others as a hostage to Ferrara, where he remained for some months (xi. 130, 133, 135). He was present in Florence during the unhappy period that elapsed between the entry of the duke of Athens and his expulsion by the Florentines (xii. 1, 2, 8, 15,16). Involved through no fault of his own in the failure of the commercial com- pany of the Bonaccorsi, which in its turn had been drawn into the failure of the company of the Bardi (1345), Villani towards the end of his life suffered much privation and for some time was kept in prison.2 In 1348 he fell a victim to the plague described by Boccaccio.

The idea of writing the Chroniele was suggested to Villani under the following circumstances. "In the year of Christ 1300 Pope Boniface VIII. made in hononr of Christ's nativity a special and great indulgence. And I, finding myself in that blessed pilgrim- age in the holy city of Rome, seeing her great and ancient remains, and reading the histories and great deeds of the Romans as written by Virgil, Sallust, Lucan, Livy, Valerius, Paulus Orosins, and other masters of history who wrote the exploits and decds, both great and small, of the Romans and also of strangers in the whole world… considering that our city of Florence, the daughter and offspring of Rome, is on the increase and destincd to do great things, as Rome is in her decline, it appeared to me fitting to set down in this volume and new chronicle all the facts and beginnings of the city of Florence, in as far as it has been possible to me to collect and discover them, and to follow the doings of the Florentincs at length . . . and so in the year 1300, on my return from Rome, I began to compile this book, in honour of God and of the blessed John, and in praise of our city of Florence."® Villani's work, written in Italian, makes its appearance, so to say, unexpectedly in the historical literature of Italy, just as the history of Florence, the moment it emerges from the humble and uncertain origin assigned to it by legend,

rises suddenly into a rich and powerful life of thought and action. Nothing but scanty and partly legendary records had preceded Villani's work, which rests in part on them. The Gesta Florentinorum of Sanzanome, starting from these vague origins, begins to be more definite about 1125, at the time of the union of Fiesole with Florence. The Chronica de Origine Civitatis seems to be a compilation, made by various hands and at various times, in which the different legends regarding the city's origin have been gradually collected. The Annales Florentint Primt (1110-1173) and the Annales Florentini Seeundi (1107-1247),

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5 On Villani's imprisonment, see Massai's biography of Villani, mentioned below.

§ Chron., bk. viii. ch. 36.

together with a list of the consuls and podestas from 1197 to 1267, and another chronicle, formerly attributed, but apparently without good reason, to Brunetto Latini, complete the series of ancient Florentine records. To these must, however, be added a certain quantity of facts which were to be found in various manu- scripts, being used and quoted by the old Florentine and Tuscan writers under the general name of Gesta Florentinorum. Another work which used to be reckoned among the sources of Villani is the Chronicle of the Malespini; but very grave doubts are now entertained as to its authenticity, and many hold that at best it is merely a remodelling, posterior to Villani's time, of old records unknown to us, from which several chroniclers may have drawn, either without citing them at all or only doing so in a vague manner. The Cronaca Fiorentina of Villani goes back to Biblical times and comes down to 1846. The wide universality of the narrative, especially in the times near Villani's own, while it bears witness to the author's extensive travels and to the compre- hensiveness of his mind, makes one also feel that the book was inspired within the walls of the universal city. Whereas Dino Compagni's Chronicle is confined within definite limits of time and place, this of Villani is a general chronicle extending over the whole of

Europe. Dino Compagni feels and lives in the facts of his history ; Villani looks at them and relates them calmly and fairly, with a serenity which makes him seem an outsider, even when he is mixed up in them and is himself their originator. While very important for Italian history in the 14th century, this work is the cornerstone of the early medieval history of Florence. Of contemporary events Villani has a very exact knowledge. Having been a sharer in the public affairs, and in the intellectual and economic life, of his native city, at a time when in both it had no rival in Europe, he depicts what he saw with the vividness natural to a clear mind accustomed to business and to the observa- tion of mankind. He was Guelph, but without passion ; and his book is much more taken up with an inquiry into what is useful and true than with party considerations. He is really a chronicler, not an historian, and has but little method in his narrative, often reporting the things which occurred long ago and far off just as he heard them and without criticism. Every now and then he falls into some inaccuracy ; but such defects as he has are largely com- pensated for by his valuable qualities. He was for half a century eyewitness of his history, and provides abundant information on the constitution of Florence, its customs, industries, commerce, and arts ; and among the chroniclers throughout Europe he is perhaps unequalled for the value of the statistical data he has preserved. As a writer Villani is clear and acute ; and, though his prose has not the force and colouring of Compagni, it has the advantage of greater simplicity, so that taking his work as a whole he may be regarded as the greatest chronicler who has written in Italian. The many difficulties connected with the publication of this most important text have hitherto prevented the preparation of a perfect edition. The Italian Historical Institute, lately founded, has, however, undertaken to reprint on a wider scheme the great collec- tion of Muratori.

Villani's Chronicle was continued by two other writers of the same name. (1) Matrzo Vituani, his brother, of whom nothing is known save that he was twice married, and that he died of the plague in 1363, continued it down to the year of his death. Matteo's work, though inferior to Giovanni's, is nevertheless very valuable. A more prolix writer than his brother and a less acute observer, Matteo is well informed in his facts, and for the years of which he writes is one of the most important sources

of Italian history. (2) Frurppo VILLANI, the son of Matteo flourished in the end of the 14th and the beginning of the 15th century. In his continuation, though showing greater literary ability, he is very inferior as an historian to his predecessors. His most valuable work was a collection of lives of illustrious Florentines. Twice, in 1401 and 1404, he was chosen to explain in public the Die a ae in the Florentine "studio." The year of his death is unknown.

On Giovanni Villani, as well as on Matteo and Filippo, the followin

may be consulted i—Argelati, Bibl. Mediol. (1745); U. Tenheh iy A a of Italy (1883) ; Bellarmin-Labbé, Script. eccl. (1728); Brunet, Manuel (1864) ; Classict Ital. (1802); Fabricius, Bibl. Med. Z», (1735); Gamba, Testi Ital. (1828); Gervinus, Hist. Schrift. (1833); Giovanni e Mira (Ant. di), in Giorn. di Scienze. Xxxi; Graesse, Trésor (1867) ; Hartwig (Otto), 'Giovanni Villani und die Leg: genda di Messer Gianni di Procida," in Sybel, Histor. Zeitschr. (1871); Id

Quellen und Forschungen zur altesten Geschichte der Stadt Florenz (1870); V. Le Clerc, in ist. Litt. France (1862); Lorenz, Deutsch. Geschichtsquellen (1870); Massai (Pietro), in Uom. Ill. Toscani (1771); Melzi, Anon. Ital. (1852); Michaud, Bibl. des Crotsades (1829) ; Milanesi (Gaet.), "' Documenti riguardanti G. Villani e il Palazzo degli Alessi in Siena," in Arch. Stor. Ital. (1856); Moreni, Bibi. Toscana (1805); Muratori, Rer. Ital. Script. ; Negri, Scritt. Fiorent. (1722); Rev. de Paris (1832); and Tiraboschi, Stor. Lett. Ital. (1807). Uz. B.) ;

VILLARS, Cravpr Lovrs HEctTor, 1734), French general, was born at Moulins on 8th May 1653. After spending some time at the college of Juilly he became a page of the grand éeurie, and then entered the army as a volunteer. He first saw service in Holland

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under Louis XIV. and later under Condé, Turenne, and Luxembourg in Germany, where in 1674 he obtained the command of a troop of horse.

Hostilities being brought to a close by the peace of Nimeguen in 1678, he was sent as ambassador to the courts of Vienna and Munich, in which capacity he greatly distinguished himself. In 1702 he received the command of an army in order to succour the elector of Bavaria, who had espoused the cause of France in the War of Succession. On 14th October he routed at Friedlingen Louis of Baden, the Austrian com- mander. In the beginning of the following year he captured Kehl and effected a junction with the army of the elector. He then conceived the daring project of marching on Vienna. The united forces defeated the Austrians under Count Styrum at Hochstidt, but his skilfully-conceived project, which had every prospect of success owing to the scattered state of the Austrian forces, had to be abandoned on account of the pusillanimous con- duct of the elector. Villars was next sent to subdue the Camisards, the Protestants of the Cevennes, a task which he completed by a judicious combination of military skill and clemency. In 1705 the north-eastern frontier, which was threatened by Marlborough, was defended by Villars with such skill and ability that Marlborough was com- pletely baffled in his attempts to penetrate into France, and even compelled to retreat. Villars took advantage of this opportunity to march into Alsace, where he captured several towns along with great quantities of war materials belonging to Marlborough and Prince Eugene. These advantages were, however, counterbalanced by Villeroy's defeat at Ramillies. After two short campaigns in 1707-8 Villars was sent (in 1709) to Flanders to oppose Marl- borough and Prince Eugene. He was, however, defeated at Malplaquet and severely wounded. The weak state of his health, the consequence of his wound, prevented him during the next two years from engaging in active service. In 1712 Villars, at the head of an army raised with great difficulty by the French, defeated the Austrians under Albemarle in a brilliant action at Denain, compelled Prince Eugene to raise the siege of Landrecies, and took several fortresses and towns. This brilliant campaign raised again the almost desperate fortunes of France and led to the treaty of Utrecht (1713) and the peace of Rastadt (1714). For many years after this Villars exerted great influence at court, until he was finally supplanted by Fleury. In 1733 the war with Austria again broke out, and in the following year Villars, although over eighty years of age, was sent to take command in Italy. But after some suc- cesses he demanded his recall, either in consequence of his increasing infirmities

or of disgust at the conduct of his ally, the king of Sardinia; he died on his way back to France, at Turin, on 17th June 1734. VILLEFRANCHE DE ROUERGUE, a town of France, chef-lieu of an arrondissement in the department of Aveyron, is situated 390 miles south of Paris by the railway to Toulouse, on the right bank of the Aveyron. One of the three bridges that cross the river belongs to the 13th century, and the narrow, winding streets are full of gabled houses of the 13th and 14th centuries. The church of Notre Dame (1260-1581) has a nave and two fine rose windows of the 14th and 15th centuries. The steeple is represented by an unfinished square tower (190 feet). In the interior the stone pulpit, the rich woodwork of the choir, and tapestry of the 16th century are worthy of notice. Some parts of the Carthusian monastery, now used as a hospital, belong to the 15th and 16th centuries. The little cloister is a masterpicce of the best period of Gothic ; the fine pulpit of the refectory and the Gothic architecture of some of the rooms have been preserved. Rich quarries of phosphates are worked near Villefranche.

The population in 1881 was 8433 (commune 10,366), and in 1886 8092 (commune 9836).

Villefranche, founded about 1252, owes its name to the numerous immunities granted by Alphonse of Poitiers, count of Toulouse. In 1348 it was so flourishing that sumptuary laws were passed. The town fell into the hands of the Black Prince, but was the first place in Guienne to rise against the English. Charles V. granted it new privileges, which were taken away by Louis XI. In 1588 the inhabitants repulsed the League, and afterwards murdered a governor sent by Henry IV. The town was ravaged by the plague in 1463, 1558, and 1628. A revolt excited by the exactions of the intendants was cruelly repressed in 1648. Villefranche was the birthplace of Marshal de Belle-Isle.

VILLEFRANCHE-SUR-SAONE, a commercial and manufacturing town of France, chef-lieu of an arrondisse- ment in the department of Rhone, is situated on the Morgon, near its junction with the Sadne,. 18 miles by rail nearly north of Lyons. The chief industrial establishments are factories of coarse woven goods, cotton, fustian, " molle- tons," prints,

and blankets, tan-yards, puddling-works, spinning-mills, distilleries, foundries, and a saw-mill. The wines of Beaujolais, hemp, cloth, linen, cottons, drapery goods, and cattle are the principal articles of trade. An old Renaissance house is used as the town-hall. The church of Notre Dame des Marais, begun at the end of the 14th and finished in the 16th century, has a tower and spire (rebuilt in 1862), standing to the right of the fagade (15th century), in which are carved wooden doors. Villefranche is the seat of the primary normal school of the department. The popu- lation, 12,032 (commune 13,074) in 1881, was 12,157 (commune 12,518) in 1886.

The town grew up near a tower from which the lords of Beaujeu enforced their rights of toll on the Burgundy and Lyons road. The name arose out of privileges granted by Guichard I. of Beaujeu, which were confirmed and extended by his successors. Under the dukes of Burgundy Villefranche was the capital of Beaujolais, and retained some of its privileges when united to France. Baron des Adrets sacked the town and demolished the ramparts in 1562. A well-known academy was founded here in 1695.

VILLEHARDOUIN, Grorrroy DE (c. 1160-c. 1213), the first vernacular historian of France, and perhaps of modern Europe, who possesses literary merit is rather supposed than known to have been born at the chdteau from which he took his name, near Troyes in Champagne, about the year 1160. Not merely his literary and histori- cal importance, but almost all that is known about him comes from his chronicle of the fifth crusade, or Conquéte de Constantinople. Nothing is positively known of his ancestry, for the supposition (originating with Du Cange) that a certain William, marshal of Champagne between 1163 and 1179, was his father appears to be erroneous. Villehardouin himself, however, undoubtedly held this dignity, and certain minute and perhaps not very trust- worthy indications, chiefly of an heraldic character, have led his most recent biographers to lay it down that he was not born earlier than 1150 or later than 1164. He Introduces himself to us with a certain abruptness, merely Specifying his own name as one of a list of knights of Champagne who with their count, Thibault, took the cross at a tournament held at Escry-sur-Aisne at Advent 1199, the crusade in

contemplation having been started by the preaching of Fulk de Neuilly, who was com- missioned thereto by Pope Innocent III. The next year S1x deputies, two appointed by each of the three allied counts of Flanders, Champagne, and Blois, were despatched to Venice to negotiate for ships. Of these deputies Ville-

ardouin was one and Quesnes de Béthune, the poet, another. They concluded a bargain with the seigniory for transport and provisions at a fixed price. Villehardouin had hardly returned when Thibault fell sick and died ; but this did not prevent, though it somewhat delayed, the enterprise of the crusaders. The management of that enterprise, however, was a difficult one, and cost

Villehardouin another embassy into Italy to prevent if possible some of his fellow-pilgrims from breaking the treaty with the Venetians by embarking at other ports and employing other convoy. He was only in part suc- cessful, and there was great difficulty in raising the charter- money among those who had actually assembled (in 1202) at Venice, the sum collected falling far short of the stipu- lated amount. It is necessary to remember this when the somewhat erratic and irregular character of the operations which followed is judged. The defence that the crusaders were bound to pay their passage-money to the Holy Land in one form or other to the Venetians is perhaps a weak one in any case for the attack on two Christian cities, Zara and Constantinople; it becomes weaker still when it is found that the expedition never went or attempted to go to the Holy Land at all. But the desire to discharge obligations incurred is no doubt respectable in itself, and Villehardouin, as one of the actual negotiators of the bargain, must have felt it with peculiar strength.

The crusaders set sail at last, and Zara, which the Venetians coveted, was taken without much trouble. The question then arose whither the host should go next. Villehardouin does not tell us of any direct part taken by himself in the debates on the question of interfering or not in the disputed succession to the empire of the East,— debates in which the chief ecclesiastics present strongly protested against the diversion of the enterprise from its proper goal. It is quite clear, however, that the marshal

of Champagne, who was one of the leaders and inner counsellors of the expedition throughout, sympathized with the majority, and it is fair to point out that the tempta- tion of chivalrous adventure was probably as great as that of gain. He narrates spiritedly enough the dissensions and discussions in the winter camp of Zara and at Corfu, but is evidently much more at ease when the voyage was again resumed, and, after a fair passage round Grecce, the crusaders at last saw before them the great city of Con- stantinople which they had it in mind to attack. When the assault was decided upon, Villehardouin himself was in the fifth "battle," the leader of which was Mathieu de Montmorency. But, though his account of the siege is full of personal touches, and contains one reference to the number of witnesses whose testimony he took for a certain wonderful fact, he does not tell us anything of his own prowess, After the flight of the usurper Alexius, and when Isaac, whose claims the crusaders were defending, had been taken by the Greeks from prison and placed on the throne, Villehardouin, with Montmorency and two Venetians, formed the embassy sent to arrange terms. He was again similarly distinguished when it became necessary to remonstrate with Alexius, the blind man's son and virtual successor, on the non-keeping of the terms. Indeed Villehardouin's talents as a diplomatist seem to have been held in very high esteem, for later, when the Latin empire had become a fact, he was charged with the delicate business of mediating between the emperor Bald- win and Boniface, marquis of Montferrat, in which task he had at least partial success. He was also appointed mar- shal of " Romanie"—a term very vaguely used, but appa- rently signifying the mainland of the Balkan Peninsula, while his nephew and namesake, afterwards prince of Achaia, took a great part in the Latin conquest of Pelopon- nesus. Villehardouin himself before long received an im- portant command against the Bulgarians. He was left to maintain the siege of Adrianople when Baldwin advanced to attack the relieving force, and with Dandolo had much to do in saving the defeated crusaders from utter destruc- tion, and conducting the retreat, in which he commanded the rear.guard, and brought his troops in safety to the sea at Rodosto, and thence to the capital. As he occupied

the post of honour in this disaster, so he had that (the command of the vanguard) in the expedition which the regent Henry made shortly afterwards to revenge his brother Baldwin's defeat and capture. And, when Henry had succeeded to the crown on the announcement of Bald- win's death, it was Villehardouin who fetched home his bride Agnes of Montferrat, and shortly afterwards com- manded under him in a naval battle with the ships of Theodore Lascaris at the fortress of Cibotus. In the settlement of the Latin empire after the truce with Lascaris Villehardouin received the fief of Messinople (supposed to be Mosynopolis, a little inland from the modern Gulf of Lagos, and not far from the ancient Abdera) from Boniface of Montferrat, with the record of whose death the chronicle

abruptly closes.

In the foregoing account only those particulars which bear directly on Villehardouin himself have been detailed; but the chronicle is as far as possible from being an autobiography, and the displays of the writer's personality, numerous as they are, are quite involuntary, and consist merely in his way of handling the subject, not in the rcfcrences, as brief as his functions as chronicler will admit, to his own proceedings. The chronicle of Villehardouin is justly held to be the very best presentation we possess of the spirit of chivalry, not the designedly exalted and poetized chivalry of the romances, not the self-conscious and deliberate chivalry of the 14th century, but the unsophisticated mode of thinking and acting which brought about the crusades, stimulated the vast literary development of the 12th and 13th centuries, and sent knights-errant, principally though not wholly of French blood, to establish principalities and kingdoms throughout Europe and the nearer East. On the whole, no doubt, it is the more masculine and practical side of this enthusiastic state of mind which Ville- hardouin shows. No woman makes any but the briefest appear- ance in his pages, though in reference to this it must of course be remembered that he was certainly a man past middle life when the events occurred, and perhaps a man approaching old age when he set them down. Despite the strong and graphic touches here and there, exhibiting the impression which the beauty of sea and land, the splendour of Constantinople, the magnitude of the effete but still imposing Greek

power made on him, there is not only an entire absence of dilation on such subjects as a modern would have dilated on (that was to be expected), but an absence likewise of the elaborate and painful description of detail in which contempor- ary trowveres would have indulged. It is curious, for instance, to compare the scanty references to the material marvels of Constan- tinople which Villehardouin saw in their glory, which perished by sack and fire under his very eyes, and which live chiefiy in the melancholy pages of his Greek contemporary Nicetas, with the claborate descriptions of the scarcely greater wonders of fabulous courts at Constantinople itself, at Babylon, and clsewhere to be found in his other contemporaries, the later ehanson de geste writers and the carlier embroiderers of the Arthurian romances and romans daventures. And this latter contrast is all the more striking that Villehardouin agrees with, and not impossibly borrows from, these very writers in many points of style and phraseology. The brief chapters of his work have becn justly compared to the laisses or tirades of a chanson in what may be called the vignetting of the subject of each, in the absence of any attempt to run on the narra- tive in the precise forms, and in poetical rather than prosaic word- order of the sentences. Undoubtedly this half-poetic style (ani- mated as it is and redeemed from any charge of bastardy by the freshness and vigour which pervade it) adds not a little to the charm of the book. Its succession of word pictures, conventional and yet vigorous as the illuminations of a medizval manuscript and in their very conveutionality free from all thought of literary prescntation, must charm all readers. The sober lists of names with whieh it opens ; the account of the embassy, so business-like in its estimates of costs and terms, and suddenly breaking into a fervent description of how the six deputies, "prostrating them- selves on the earth and wecping warm tears, begged the doge and people of Venice to have pity on Jerusalem ;" the story immediately following how the young count Thibault of Champagne, raising himself from a sickbed in his joy at the successful return of his ambassadors, "leva sus et chevauclia, et laz! com grant domages, car onques puls ne chevaucha que cele foiz," compose a most striking overture. Then the history relapses into the business vein and tells of the debates which took place as to the best means of carrying out the vow after the count's decease, the rendezvous, too ill kept at Venice, the plausible suggestion of the Venetians that the balance due to them should be made up by a joint

attack on their enemy the king of Hungary. Villehardouin does not in the least conceal the fact that the pope (“l’apostoilles de Rome,” as he calls him in the very phrase of the chansons) was very angry with this;

VILLA RD OUTWN

for his own part he seems to think of little or nothing but the reparation due to the republic, which had loyally kept its bargain and been defrauded of the price, of the infamy of breaking company on the part of members of a joint association, and perhaps of the unknightliness of not taking up an adventure whenever it presents itsclf. For here again the restoration of the disinherited prince of Constantinople supplicd an excuse quite as plausible as the liquida- tion of the debt to Venice. A famous passage and one short enough to quote is that describing the old blind doge Dandolo, who had ‘Grant ochoison de remanoir (reason for staying at home), car viels hom ere, et si avoit les yaulx en la teste biaus et n’en veoit gote (goutte),”’ and yet was the foremost in fight.

It would be out of place to attempt any further analysis of the Conquéte here. But it is not impertinent, and is at the same time an excuse for what has been already said, to repeat that Villehar- douin’s book, brief as it is, is in reality one of the capital books of literature, not merely for its merit, but because it is the most authentic and the most striking embodiment in contemporary literature of the sentiments which detcrmined the action of a great and important period of history. There are but very few books which hold this position, and Villehardouin’s is one of them. If every other contemporary record of the crusades perished, we should still be able by aid of this to understand and realize what the mental attitude of crusaders, of Teutonic knights, and the rest was, and without this we should lack the earliest, the most undoubtedly genuine, and the most characteristic of all such records. The very inconsistency with which Villehardouin is chargeable, the absence of compunction with which he relates the changing of a sacred rcligious pilgrimage into something by no means unlike a mcre filibustering raid on the great scale, add a charm to the book. For, religious as it is, it is entirely free from the very slightest touch of hypocrisy or indeed of self-consciousness of any kind. The famous description of the crusades, gesta Dei per Francos, was evidently

to Villehardouin a plain matter-of-fact description, and it no more occurred to him to doubt the divine favour being extended to the expeditions against Alexius or Theodore than to doubt that it was shown to expeditions against Saracens and Turks.

- The person of Villehardouin reappears for us once, but once only, in the chronicle of his continuator, Henri de Valenciennes. There is a great gap in style, though none in subject, between the really poetical prose of the first historian of the fifth crusade and the Latin empire and the awkward mannerism (so awkward that it has been taken to represent a "'disrhymed" verse chronicle) of his follower. But the much greater length at which Ville- hardouin appears on this one occasion shows us the restraint which he must have exercised in the passages which deal with himself in his own work. He again led the vanguard in the emperor Henry's expedition against Burilas the Bulgarian, and he is represented by the Valenciennes scribe as encouraging his sovereign to the attack in a long speech. Then he disappears altogether, with the exception of some brief and chiefly diplomatic mentions. Du Cange discovered and quoted a deed of donation by him dated 1207, by which certain properties were devised to the churches of Notre Dame de Foissy and Notre Dame de Troyes, with the reservation of life interests to his daughters Alix and Damerones, and his sisters Emmeline and Haye, all of whom appear to have embraced a monastic life. A letter addressed from the East to Blanche of Champagne is cited, and a papal record of 1212 styles him still "mar- shal of Romania." The next year this title passed to his son Erard ; and 1213 is accordingly given as the date of his death, which, as there is no record or hint of his having returned to France, may be supposed to have happened at Messinople, where also he must have written the Conquéte.

The book appears to have been known in the ages immediately succeeding his own ; and, though there is no contemporary manu- script In existence, there are some half dozen which appear to date from the end of the 13th or the course of the 14th century, while one at least appears to be a copy made from his own work in that spirit of unintelligent faithfulness which is much more valuable to posterity than more intelligent editing. The first printed edi- tion of the book, by a certain Blaise de Vigenére,

dates from 1585, is dedicated to the seigniory of Venice (Villehardouin, it should be said, has been accused of a rather unfair predilection for the Vene- tians), and speaks of either a part or the whole of the memoirs as

having been printed twelve years earlier. Of this earlier copy nothing seems to be known. A better edition, founded on a Nether-

landish MS., appeared at Lyons in 1601. But both these were completely antiquated by the great edition of Du Cange in 1657, wherein that learned writer employed all his knowledge, never since equalled, of the subject, but added a translation, or rather paraphrase, into modern French which is scarcely worthy either of himself or hisauthor. Dom Brial gave a new edition from different MS. sources in 1823, and the book figures with different degrees of dependence on Du Cange and Brial in the collections of Petitot, Buchon, and Michaud and Poujoulat. All these, however, have been superseded for the modern student by the editions of M. Natalis de Wailly (1872 and 1874), in which the text is critically edited from all the available MSS. and a new translation added. The charm of Ville-hardouin can escape no reader ; but few readers will fail to derive some additional pleasure from the two essays which Sainte-Beuve devoted to him thirty years ago, and which may be found reprinted in the ninth volume of the Causeries du Lund. (G. SA.) VILLEINAGE. See CopyHotp and Siavery. VILLEMAIN, Aset Francois (1790-1867), historian of French literature, was born at Paris on 11th June 1790. He was educated at the lycée Louis-le-Grand, and was only twenty when he was appointed to an assistant- mastership at the lycée Charlemagne. This appointment was shortly exchanged for a post at the Ecole Normale. He early devoted himself to the composition of the Academic prize essays which have founded the fortune of so many French men of letters, and in 1812 he gained the prize with an éloge on Montaigne, which was followed by other successful attempts. Huis second successful essay, On Criti- cism, had the honour of being read by the author before the Academy and the allied sovereigns who were then (April 1814) in Paris. Under the restoration he was appointed, first, assistant professor of modern history and then professor of French eloquence at the Sorbonne. Here he began and

continued for about ten years a series of literary lectures which had an extraordinary effect on his younger contemporaries. The secret indeed of Villemain's great popularity and immense influence is only to be understood by exact observation of the time at which he came. He had no very extraordinary gift of style, nor was he a very original thinker. But he had the great advantage of coming just before the Romantic movement, of having a wide and catholic love of literature, and, at the same time, of not being an extremist. All, or almost all, the clever young men of the brilliant generation of 1830 passed under his influence ; and, while he enchanted those of Romantic tendency by his constant reference to, and his frank apprecia- tion of, the beauties of English, German, Italian, and Spanish poetry, he had not the least inclination to decry the classics —either the classics proper of Greece and Rome or the so- called classics of France. In 1819 he published a book on Cromwell, remarkable for a Frenchman of his day, and two years later he was elected to the Academy. The time was more favourable than any previous time had been to literary men with political inclinations, and Villemain was appointed by the restoration Government "chef de l'im- primerie et de la librairie," a post involving a kind of irregular censorship of the press, and afterwards to the oflice of master of requests. Like others, however, Villemain became more and more Liberal, and before the revolution of July he had been deprived of his office and had been elected deputy for Evreux. This secured his fortune under Louis Philippe's reign, and, though he did not long sit in the lower chamber, he received a peerage in 1832. He Was a very important member of the council of public instruction, and was twice minister of that department, while at the same time with his elevation to the upper chamber he was made secretary of the Academy. This combination made him during the whole of the July monarchy one of the chief dispensers of literary patronage In France ; and, though he never drew on himself the Personal ill-will which his friend and colleague Cousin attracted, it was almost inevitable that he should displease many for every one that he gratified. Villemain's literary

position had moreover been somewhat left behind by the course of events, and in politics he was something of a doctrinaire. For more than the last

twenty years of his life he took no open part in public affairs, though his liter- ary activity continued to be considerable, the books which he published being in part workings-up of his brilliant Sorbonne courses. Although he still retained a great name and an important Academic position, his later years are supposed to have been somewhat saddened by the differ- ence of his employments and consideration, as compared with those of his middle age. Villemain, in fact, was a man who had at one time, chiefly by accident and coinci- dence, acquired a position to which he was not quite equal. Some reflexions on him in the "Notes et Pensées" to be found in Sainte-Beuve's Causeries du Lundi, vol. xi., are, as is too often the case in that collection when it refers to contemporaries, harsh. But it is certain that he had little originality of thought or definiteness of literary theory, that he was rather a clever exponent of ideas which happened to be popular than a convinced reasoner, and that he had an undue admiration of success. His death took place at Paris on 8th May 1867.

Villemain's chief work is his Cours de la Littérature Francaise, in 6 volumes, printed soon after he ceased lecturing, and reprinted long afterwards in 1864. It is a very discursive book, containing literary judgments on all sorts of subjects, and illustrating very well the fashion in which Villemain satisfied and stimulated a generation which had just become aware that literature was not limited to the productions of the men of the grand siécle. Alinost all his later works, which are numerous, consist of collections of Academic éloges, lectures, and literary and historical essays. As, however, he began with a substantive historical work so did he end with one, the posthumous History of Gregory VII., on which he had been known to be engaged for many years, and the long delay of which had been the cause of not a few sarcasms. Although a book of merit, it will hardly supplant Villemain's early Academic lectures as his title to remembrance and fame—such fame as is due to a teacher who succeeds in stirring up the literary faculties of men more highly gifted than himself.

VILLENA, a town of Spain, in the province of Alicante, is situated 37 miles by rail to the north-west of that town, on the right bank of the little river Vinalapo. It has narrow winding streets, and is crowned by a

picturesque- looking old castle. The slopes of the surrounding hills are clothed with vines, and there are also some extensive salt lagoons, The annual fair of Villena (29th Sept.—5th Oct.), dealing in the produce of the neighbourhood, is still of considerable importance. The industries (soap-making, weaving, distilling) are not extensive. The population within the municipal boundaries in 1877 was 11,424.

VILLENEUVE-SUR-LOT, a town of France, chef-lieu of an arrondissement in the department of Lot-et-Garonne, is built on both sides of the river Lot, 22 miles north of Agen by a line which branches at Penne from the Agen and Périgueux Railway. Large portions of the 13th-century ramparts, altered and surmounted by machicola- tions in the 15th century, still remain, and high square towers rise above the gates to the north-east and south- west. The principal arch of the bridge (13th century) has a span of 118 feet and is 59 feet in height, and was built in the reign of Louis XIII. Arcades of the 13th century surround a square. Important markets of cattle, horses, wines, and Agen plums (£120,000 worth exported annually) are held. Boots and shoes, sausages, tinned foods, and buttons are made, and there are marble works and large mills. The population in 1881 was 9520 (com- mune 14,560) and in 1886 9780 (commune 14,693). Of these 1102 were prisoners at Eysses.

Villeneuve originated in a fortress built in 1264 as a refuge for the inhabitants of Pujols, whose town had been destroyed in the Albigensian War. The English held it from 1279 to 1337, and again in the 15th century. Less than a mile from Villeneuve the former abbey of Eysses, founded about the 7th century, stands on the site of the Roman town of Excisum. It is now used as a

central prison, and accommodates about 1200 prisoners. On the left bank of the Lot, 2 miles south of Villeneuve, are the 138th- century walls of Pujols.

VILLIERS, Gzorce. See BuckincHam, DUKE oF. ©

VILLON, Francis (1431-14611), whose real surname 1s a matter of much dispute, so that he is also called Corbueil, Corbier, De Montcorbier, and Des Loges, though in litera- ture Villon is the sole term used, was born in 1431, and, as it seems, certainly at Paris. The mixture of the real and the ironical in the singular poems called Testaments, which form his chief, if not his only certain, work, make it very unsafe to speak positively as to such details of his life as depend upon them. Yet the Testaments, with some extant documents, are the only trustworthy information that we have, the legends and anecdotes which are told respecting him being for the most part of the most dubious, if not the most certainly apocryphal, character. It appears that he was born of poor folk, that his father died in his youth, but that his mother was alive when her son was thirty years old. The very name Villon was stated, and that by no mean authority, the president Claude Fauchet, to be merely a common and not a proper noun, signifying "cheat" or "rascal"; but this seems to be a mistake. It is, however, certain that Villon was a person of loose life, and that he continued, long after there was any excuse for it in his years, the reckless way of living common among the wilder youth of the university of Paris. He appears to have derived his surname from a friend and benefactor named Guillaume de Villon, an ecclesiastic and a person of some property and position. The poet, either by his assistance or in some other way, became a student, and took the degree of bachelor in 1450 and that of master in 1452. Between this year and 1455 nothing positive is known of him, except that nothing was known against him.

On 4th June 1455 the first important incident of his life that is known occurred. Being in the company of a priest named Giles and a girl named Isabeau, he met a certain Breton, a master of arts, who was also in the company of a priest, Philippe Chermoye or Sermoise or Sermaise. A scuffle ensued ; daggers were drawn; and Sermaise, who is accused of having attacked Villon and drawn the first blood, not only received a dagger thrust in return, but a blow from a stone which struck him down. Sermaise died of his wounds. Villon fled,and was sentenced to banish- ment,—a sentence which was remitted in January 1456, the formal pardon being extant strangely enough in two different documents, in one of which the culprit is de- scribed as " Francois des Loges, autrement dit Villon," in the other as " Francois de Montcorbier." 'That he is also said

to have described himself to the barber-surgeon who dressed his own wounds as Michael Piton is less surprising, -and hardly needs an addition to the list of his aliases. It should, however, be said that the documents relative to this affair confirm the date of his birth, by representing him as twenty-six years old or thereabouts. A year later he was again in trouble. In his first broil "la femme sabeau" is only generally named, and it is impossible to say whether she had anything to do with the quarrel. In the second, Catherine de Vaucelles, of whom we hear not a little in the poems, is the declared cause of a scuftle in which Villon was so severely beaten that to escape ridicule he fled to Angers, where he had an uncle who was a monk. It was before leaving Paris that he composed what is now known as the Petit Testament, of which we shall speak presently, with the rest of his poems, and which, it should be said, shows little or no such mark of profound bitter- ness and regret for wasted life as its in every sense greater successor the Grand Testament. Indeed Villon's serious troubles were only beginning, for hitherto he had been rather injured than guilty. He left Paris for Angers in

the very early spring of 1456-57, and shortly afterwards (in March) the chapel of the College of Navarre was broken open and five hundred gold crowns stolen. The inquiries get on foot discovered a gang of student robbers, one of whom, Guy Tabarie, turned king's evidence and accused Villon, who was then absent, of being the ringleader, and of having gone to Angers, partly at least, to arrange for similar burglaries there. Other crimes were confessed by the accomplice, and Villon was arrested, put to the torture, and condemned to be hanged,—a penalty which was actu- ally inflicted later on two of his gang, and which he com- memorated by anticipation in one of the most famous and remarkable of his poems, the sombre " Ballade des Pendus." He escaped Montfaucon, however, by appealing from the bishop's court, where as a clerk he had been tried, to the parlement of Paris, by which body his sentence was com- muted to banishment—that is, of course, banishment from the capital. Where he went and what he did for the next four years we do not know. It is certain that at one time, and probable that at more times than one, he was in corre- spondence with Charles d'Orléans, and it is likely that he resided,

at any rate for some period, at that prince's court at Blois. He had also something to do with another prince of the blood, Jean of Bourbon, and traces are found of him in Poitou, in Dauphiné, &c. But at his next certain appear- ance he is again in trouble. He tells us that he had spent the summer of 1461 in the bishop's prison (bishops were fatal to Villon) of Meung. His crime is not known; but his enemy, or at least judge, was Thibault d'Aussigny, who held the see of Orleans. Villon owed his release to a general jail delivery at the accession of Louis XI., and became a free man again on 2d October.

It was now that he wrote the Grand Testament, and this, the work which has immortalized him, is the last certain fact which is known of his life. If one could judge from a vague kind of internal evidence, it would seem likely that it is really a testament, and that the poet died soon after- wards. Although he was only thirty at the date of this composition (which is unmistakable, because given in the book itself), there seems to be no kind of aspiration towards a new life, nor even any hankering after the old. Nothing appears to be left him but regret ; his very spirit has been worn out by excesses or sufferings or both. But, however this may be, he disappears from history. Rabelais indeed tells two stories about him which have almost necessarily been dated later. One is a countryside anecdote of a trick supposed to have been played by the poet in his old age at Saint Maixent in Poitou, whither he had retired. The other, a coarse but pointed jest at the expense of England, is told as having been addressed by Villon to King Edward V. during an exile in that country. Now, even if King Edward V. were not evidently out of the question, a pass- age of the story refers to the well-known scholar and man of science, Thomas Linacre, as court physician to the king, and makes Villon mention him, whereas Linacre was only a young scholar, not merely at the time of Edward V.'s supposed murder, but at the extreme date (1489) which can be assigned to Villon's life. For in this year the first edition of the poet's work appeared, obviously not published by himself, and with no sign in it of his having lived later than the date (1461) of the Grand Testament. It would be easy to dismiss these Rabelaisian mentions of Villon as mere humorous inventions, if it were not that the author of Pantagruel was born quite soon enough to have actually seen Villon if he had lived to anything that could be called old age, that he almost certainly must have known men

who had known Villon, and that the poet undoubtedly spent much time in Rabelais's own country on the banks of the lower Loire.

The obscurity, the unhappiness, and the evil repute of Villon's

life would not be in themselves a reason for the minute investiga- tion to which the events of that life have been subjected, and the result of whieh has been summed up here. But his poetical work, scauty as the eertainly genuine part of it is, is of such extraordinary interest, and marks such an epoch in the history of Europcan liter- ature, that he has been at all times an interesting figure, and, like all very interesting figures, has been often praised for qualities quite other than those whieh he really possessed. Boileau's famous verses, in whieh Villon is extolled for having first known how to smooth out the confused art of the old romaneers, are indeed a prodigy of blundering or ignoranee or both. As far as art, or the technical part of poetry goes, Villon made not the slightest advance on his predecessors, nor stood in any way in front of such contemporaries ' as his patron Charles d'Orléans. His two Testaments (so called by the applieation to them of a regular elass-name of medieval poetry) consist of eight-line stanzas of eight-syllabled verses, varied in the ease of the Grand Testament by the insertion of ballades and rondeaux of very great beauty and interest, but not formally differ- ent in any way from poems of the same kind for more than a century past. What really distinguishes Villon is the intenser quality of his poetical feeling and expression, and what is perhaps arrogantly called the modern character of his subjects and thought. Medieval poetry, with rare exceptions, and, with exceptions not quite so rare, classical poetry, are distinguished by their lack of what is now called the personal note. In Villon this note sounds, struck with singular force and skill. Again, the simple joy of living whieh distinguishes both periods—the medieval, despite a common opinion, scarcely Jess than the ancient—has disappeared. Even the riot and rollicking of his earlier days are mentioned with far less relish of remembrance than sense of their vanity. This sense of vanity, indeed, not of the merely religious, but of the purely mundane and even half pagan kind, is Villon's most prominent eharacteristic. It tinges his narrative,

despite its burlesque bequests, all through ; it is the very keynote of his most famous and beautiful piece, the "Ballade des Dames du Temps Jadis," with its refrain " Mais ot sont les neiges d'antan?" aswell as of his most daring piece of realism, the other ballade of "La Grosse Margot," with its burden of hope- less entanglement in shameless vice. It is nowhere more clearly sounded than in the piece which ranks with these two at the head of his work, the " Regrets de la Belle Heaulmiére," in which a woman, once young and beautiful, now old and withered, laments her lost charms. So it is almost throughout his poems, including the grim "Ballade des Pendus," and hardly excluding the very beautiful " Ballade pour sa Mére," with its description of sincere and humble piety. It is in the profound melancholy which the dominance of this note has thrown over Villon's work, and in the suitableness of that melancholy to the temper of all generations since, that his charm and power have consisted, though it is difficult to conceive any time at which his poetical merit could be ignored.

His certainly genuine poems cousist of the two Testaments with their eodicil (the latter containing the " Ballade des Pendus," or more properly " Epitaphe en Forme de Ballade," and some other pieces of a similarly grim humour), a few miscellaneous poems, chiefly ballades, and an extraordinary colleetion (called Le Jargon) of poems Mm argot, the greater part of which is now totally unintelligible, if, which may perhaps be doubted, it ever was otherwise. Besides these, certain poems of no inconsiderable interest are usually printed with Villon's works, though they are certainly, or almost certainly, not his. The chief are "Les Repues Franehes," a curious series of verse stories of eheating tavern-keepers, &c., having some resemblance to those told of George Peele, but of a broader and eoarser humour. These are beyond doubt, if not the poet's work, nearly eontemporary with him, and may have some foundation in faet. Another of these spurious pieces is the extremely amusing monologue of the "' Frane Archier de Bagnolet," in which one of the newly constituted archers or regularly trained and paid soldiery, who were extremely unpopular in France, is made to expose his own poltroonery. The third most important piece of this kind is the 'Dialogue de Mallepaye et de Baillevent," a dramatic conversation between two penniless spendthrifts, which is not without merit. These poems, however,

were never attributed to Villon or printed with his works till far into the 16th eentury.

It has been said that the first dated edition of Villon is of 1489, though some have held one or more than one undated copy to be still earlier. Between the first, whenever it was, and 1542 there Were no less than twenty seven editions, the most famous being that of Clément Marot in 1533, one of whose most honourable distinc- tions is the care he took of his poetieal predeeessors. The Pléiade Movement and the classieizing of the grand siécle put Villon rather out of favour, and he was not again reprinted till early in the 18th century, when he attracted the attention of students of old French like Duchat, La Monnoye, and Prosper Marchand. The first critical edition in the modern sense—that is to say, an edition founded on MSS. (of which there are in Villon's case several, chiefly at Paris and Stockholm)—was that of the Abbé Prompsault in 1832, The next and on the whole the most important was that of the bibliophile Jacob (P. Lacroix) in the Bibliothéque Elzevirienne

(Paris, 1854). Sinee then Villon has been frequently reprinted, very great interest having been shown in him; but not mueh has been done to the text till the recent and uncompleted labours of a Dutch scholar, Dr Bijvanck, who is oeeupied especially on the Stock- holm MS. On the other hand, from the literary and biographical view, Villon has been exhaustively studied of late, especially by MM. Canipaux, Vitu, and Longnon, the researehes of the last-named (Paris, 1877) having probably ascertained everything that there is to know. In England, too, attempts have been made to translate his work, especially by the late D. G. Rossetti, by Mr Swinburne, and by Mr Andrew Lang, while a complete translation has been pro- duced by Mr John Payne. (G, SA.)

VILNA, or Witno, a Lithuanian government of west Russia, has the Polish province of Suwatki on the W., Kovno and Vitebsk on the N. and E., and Minsk and Grodno on the E. and §. Its area is 16,421 square miles. Vilna lies on the broad marshy swelling, dotted with lakes, which separates Potanp (g.v.) from East Prussia and stretches east-north-east towards the Valdai Plateau. Its highest parts are a little more than 1000

feet above sea-level. On its western and eastern boundaries Vilna is deeply trenched by the valleys of the Niemen and the Dwina. Devonian limestones crop out in the north- east. Elsewhere they are concealed by the marine and freshwater limestones and sandstones of the Eocene period, which cover nearly the whole of Vilna; and these in their turn are overlain by thick layers of boulder clay, sands, and lacustrine deposits. The soil is for the most part clayey or sandy, fertile loam appearing only in the depres- sion watered by the Vilia. Numerous lakes and marshes, partly covered with forests, and scarcely passable except when frozen, as well as wet meadow-land, occupy a large area in the central parts of Vilna. The Niemen, which flows along the southern and western borders for more than 200 miles, is the chief artery of trade for the govern- ment, and its importance in this respect is enhanced by its tributary the Vilia, which flows west for more than 200 miles through the central parts of Vilna, receiving many affluents on its course. Among the tributaries of the Niemen is the Berezina, which acquired renown during Napoleon's retreat in 1812; it flows in a marshy valley in the south-east. The Dwina for 50 miles of its course separates Vilna from Vitebsk. The combined traffic on the Niemen and the Dwina was valued at nearly £200,000 in 1883. The climate of the government is only slightly tempered by its proximity to the Baltic Sea (January 21°°8 Fahr. ; July 64°°5); the average temperature at the town of Vilna is only 43°°5. But in winter the thermometer descends very low, the minimum observed during the last sixty years being —30°. The flora and fauna are inter- mediate between those of Poland and middle Russia. The population of Vilna, which amounted to 1,223,260 in 1883, consists chiefly of Lithuanians (35 per cent.) in the west and north and White Russians (45 per cent.) in the south and east. Jews make up 11 per cent. of the popula- tion ; and the Poles, who constitute the landed aristocracy and the artisan classes of the towns, reach 7 per cent. A few Great Russians and Tatars, descendants of Crimean prisoners, must be added to the above. Roman Catholicism is the prevailing creed among the Lithuanians and Poles ; and the White Russians belong for the most part to the Greek and Nonconformist Churches.

In spite of the unfertile soil, sufficient cereals are grown for the needs of the population and to supply the distilleries. 'The average crops of 1882-

1885 were 1,010,000 quarters of rye, 44,000 of wheat, 790,000 of various kinds of grain, and 9,840,000 bushels of potatoes. Apart from finer breeds kept by a few landowncrs, tle cattle of the peasautry belong to inferior varieties. In 1883 there were 203,620 horses, 303,100 horned eattle, 277,800 sheep, and 238,800 pigs. More than one-third of the area is eovered with forests, whence a considerable quantity of timber is exported, partly to Germany, for shipbuilding. A variety of petty trades are carried on in the villages of the forest region,—sledges, cars, wheels, and wooden ware being made by the peasants. Tar,

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itch, and potash are exported. The manufaetures have only boean to ee of late. In 1884 there were 300 establishments employing 3020 men, and giving an annual output valued at £885,100 (as against £200,000 in 1860). An aetive trade in timber, eorn, and flax (exported) and in manufaetured goods (imported) is earried on. Vilna is divided into seven districts, the ehief towns of which (with their populations In 1883) are—\ ilna (see below), Vileika (3905), Disna (8030), Lidy or Lida (7940), Oshmiany (4470), Svieneiany (8510), and Troki (2440).

VILNA, or Winno, capital of the above government, is situated 436 miles to the south-west of St Petersburg, at the junction of the Vilia with the Vileika, and at the intersection of two great railway lines, one from St Peters- burg to Warsaw, the other from Libau to the mouth of the Don. It is an old town, rich in historical associa- tions. Its imperial palace, and the cathedral of St Stanislaus, containing the silver sarcophagus of St Casimir, are fine buildings. The (Greek) cathedral of the Holy Virgin contains the remains of Prince Olgerd (bap- tized in 1377) and his family. The museum of antiquities has valuable historical collections of the region. The ancient castle of the Jagellones is now a mass of ruins. The old university, founded in 1576, was restored by Alexander I., but has been closed since 1832 for political reasons; the only departments which remain in activity are the astronomical observatory and a medical academy. The scientific societies of Vilna, especially the medical and archeological, are well known. In spite of the war of 1812, and the Polish

risings of 1831 and 1863, the popu- lation has of late increased rapidly. In 1883 it numbered 93,760. The inhabitants are chiefly Roman Catholics in religion and Poles by nationality. The Jews are steadily increasing in numbers and now make more than one-third of the population. The town has an important trade in timber (with Prussia), as also in corn.

History.—The territory of Vilna has certainly been oceupied by the Lithuanians sinee the 10th eentury, and probably mueh earlier; their chief fortified town, Vilna, is first mentioned in 1128. A temple to the god Perkunas stood on one of its hills till 1387, when it was destroyed by Jagello, after his baptism. After 1323, when Gedimin abandoned Troki, Vilna became the capital of Lithuania. The formerly independent prineipalities of Minsk and Lidy, as well as the territory of Disna, which belonged to the Polotsk prineipality, were annexed by the Lithuanian princes, and from that time Vilna, whieh was fortified by a stone wall, became the ehief city of the Lithuanian empire. It was united with Poland when its prinee Casimir was elected (1444) to the Polish throne. In 1519 1t had a printing-offiee, and fifty years later the Jesuits founded there a eollege, whieh became later on a university. But the plague of 1588, a fire in 1610, and still more the wars between Russia and Poland, which began in the 17th century, eheeked its further growth. The Russians took Vilna in 1655, and in the following year it was ceded to Russia. The Swedes eaptured it in 1702 and in 1706. The Russians again took possession of it in 1788; and it was finally annexed to Russia in 1795, after the partition of Poland. Its Polish inhabitants took an aetive part in the risings of 1831 and 1863, for which they were severely punished by the Russian Government.

VINCENNES, a town of France, in the department of Seine, 4 miles east of Paris, with which it is connected by a railway and two tramways. The castle, formerly a royal residence, was begun by Louis VII. in 1164, and rebuilt by Philip Augustus, Philip of Valois, and Charles y. Catherine de' Medici added two pavilions, finished in 1614, which Louis XTV. connected by two covered galleries, one of which has been destroyed and the other hidden by casemates. Napoleon altered the castle into a vast maga- zine of war materials. Louis XVIII. added an armoury ; and under Louis Philippe numerous casemates and a new fort on the east side were

constructed. The population of Vincennes, 20,530 in 1881, was 22,237 in 1886.

The old eastle is a rectangle of 1258 feet by 735. The enclosing wall was originally flanked by nine towers, which were cut down to its level between 1808 and 1811, and now serve as bastions, Vincennes 1s at onee a barraeks, a fortress, an arsenal, and a school of artillery and is the seene of most new artillery experiments in France, The donjon is a square tower 170 feet high, with walls 10 feet thick.

The chapel, begun by Charles V. in 1379, eoutinued by Charles VI. and Francis I., and finished by Henry II. in 1552, has been recently restored, In the sacristy is the monument ereeted in 1816 to the memory of the duke of Enghien, who was shot in the castle moat in 1804. Vineennes possesses a military hospital with 642 beds, and a statue of General Daumesnil, erected in 1878. The wood of Vineennes contains various military establishments, an experimental farm, and the redoubts of Gravelle and La Faisanderie. In the latter is the normal sehool of military gymnasties. The wood, whieh now belongs to Paris, was laid out during the second empire in imitation of the Bois de Boulogne. In the Lake of Gravelle the waters of the Marne are colleeted in a reservoir, holding up- wards of 700,000 eubie feet. The Marne flows 130 feet below. On the south border of the wood near Charenton is the asylum of Vineennes (500 beds), founded in 1855 for the benefit of conva- Ieseents from the hospitals.

VINCENNES, a city of the United States, the county seat of Knox county, Indiana, is situated on the east bank of the Wabash, which is navigable to this point. It is the centre of a fertile agricultural district, with extensive under- lying coal deposits, and is an important railroad centre, where seven railroads intersect. These railroads have their workshops here, in which they employ a large number of men. Besides this there are flour-mills, a woollen mill, furniture and cigar factories, and machine-shops. The population in 1880 was 7680, an increase since 1870 of 42 per cent. Vincennes is the seat of a university, char- tered in 1804.

The site of the city was settled in 1702. In 1768 the British beeame its possessors, and it remained a British fort until captured

by Colonel G. R. Clarke in 1779. From 1800 to 1813 it was the capital of Indiana Territory.

VINCENT, or Vincentius, St, deacon and martyr, according to the Roman Srevary, was born of noble parents at Huesca (Osca) in Spain, and was educated by Valerius, bishop of Zaragoza, who in due time ordained him to the diaconate. Under the persecution of Diocletian he was arrested and taken to Valencia. Having stood firm in his profession before Dacianus, the governor, he was subjected to excruciating tortures and thrown into prison, where angels visited him, lighting up his dungeon with celestial light, relieving his pains, loosing his bonds, and mingling their voices with his in psalms of praise. His warders, having seen these wonders through the chinks of the wall, forthwith became Christians. He was afterwards brought out and laid upon a soft mattress that he might regain sufficient strength for new torments ; but, while Dacianus was vainly meditating punishment, the saint gently breathed his last, as a crowd of bystanders kissed his feet and treasured up his blood in napkins. The tyrant exposed the body to wild beasts, but a raven miraculously descended and protected it; it was then thrown into the sea, but could not be hid, and finally received decent burial. The date assigned to his martyr- dom is 304; he is commemorated on 22d January, chiefly in Spain and the patriarchate of Lisbon. Prudentius (403) devotes a hymn to the details of his martyrdom ; Paulinus calls him the glory and ornament of Spain; and in more than one of his discourses St Augustine has cele- brated his praise.

VINCENT, Gxorce (1796-18311), English landscape and marine painter, was born at Norwich in June 1796. He studied art under "Old" Crome, and at the age of fifteen began to contribute to the Norwich exhibition. From 1814 till 1823 he exhibited occasionally at the Royal Academy, and also in the Water-Colour Exhibition and the British Institution. In 1819 he removed from Norwich to London, and he was a contributor to the Suf- folk Street gallery from its foundation in 1824 till 1830. He possessed great artistic abilities; but unfortunately he fell into dissipation, and his

works became slight and hastily executed. Finally he dropped out of sight, and he is believed to have died about 1831. His most im- portant work, a View of Greenwich Hospital, was shown in

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the International Exhibition of 1862. His London from the Surrey Side of Waterloo Bridge is also a fine work,

VINCENT oF BeEavvais, or VINCENTIUS BELLOVA- cENsis (c. 1190-c. 1264), the encyclopzedist of the Middle Ages, was probably a native of Beauvais.1 The exact dates of his birth and death are unknown. A tolerably old tradi- tion, preserved by Louis a Valleoleti (c. 1413), gives the latter as 1264;? but Tholomeeus de Luca, Vincent's younger contemporary (0d. 1321), seems to reckon him as living during the pontificate of Gregory X. (1272-1276). If we assume 1264 as the year of his death, the immense volume of his works forbids us to think he could have been born much later than 1190. Very little is known of his career. A plausible conjecture makes him enter the house of the Dominicans at Paris between 1215 and 1220, from which place a second conjecture carries him to the Dominican monastery founded at Beauvais in 1228-29. There is no evidence to show that the Vincent who was sub-prior of this foundation in 1246 is the encyclopedist ; nor indeed is it likely that a man of such abnormally studious habits could have found time to attend to the daily business routine of a monastic establishment. It is certain, however, that he at one time held the post of "reader" at the monas- tery of Royaumont (Jfons Regalis), not far from Paris, on the Oise, founded by St Louis between 1228 and 1235. St Louis read the books that he compiled, and supplied the funds for procuring copies of such authors as he re- quired for his compilations. Queen Margaret, her son Philip, and her son-in-law Theobald V. of Champagne and Navarre are also named among those who urged him to the composition of his "little works," especially the De Institutione Principum. Though Vincent may well have been summoned to Royaumont even before 1240, there is no actual proof that he lived there before the return of Louis IX. and his wife from the Holy Land, early in the summer of 1254. But it is evident that he must have written his work De Eruditione Filiorum Regalium (where he styles

himself as '" Vincentius Belvacensis, de ordine predicatorum, qualiscumque lector in monasterio de Regali Monte") after this date and yet before January 1260, the approximate date of his T'ractatus Consolatorius. When he wrote the latter work he must have left Royaumont, as he speaks of returning from the funeral of Prince Louis (15th January 1260) "ad nostram domum," a phrase which can hardly be explained otherwise than as referring to his own Dominican house, whether at Beauvais or elsewhere.

The Majus Speculum, the great compendium of all the knowledge of the Middle Ages, as it left the pen of Vincent, seems to have consisted of three parts only, viz., the Speculum Naturale, Doc- trinwle, and Historiale. Such, at least, is Bchard's conclusion, derived from an examination of the earliest extant MSS. All the printed editions, however, consist of four parts, the additional one being entitled Speculum Morale. This has been clearly shown to be the production of a later hand, and is ascribed by Eckard to the Period between 1310 and 1325. In arrangement and style it is quite different from the other three paris, and indeed it is mainly 4 compilation from Thomas Aquinas, Stephen de Bourbon, and two or three other contemporary writers.

The Speculum Naturale tills a bulky folio volume of 848 closely- pnnted double-columned pages. It is divided into thirty-two books and 3718 chapters. It is a vast summary of all the natural history known to western Europe towards the middle of the 13th century. It is, as it were, the great temple of medieval science, Whose floor and walls are inlaid with an enormous mosaic of skil- fully-arranged passages from Latin, Greek, Arabic, and even Hebrew authors. To each « juotation, as he borrows it, Vincent prefixes the name of the book aud author from whom it is taken, distinguishing,

ert, his own remarks by the word "actor." The Speculum eae 18 so constructed that the various subjects are dealt with ' He is sometimes styled Vincentius Burgundus ; but, according to M. Daunon, this appellation cannot be traced back further than the first half of the 15th century. aa Apparently confirmed by the few enigmatical lines preserved by Echard from his epitaph—

f " Pertulit iste necem post annos mille ducentos,

Sexaginta decem sex habe, sex mihi retentos."

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according to the order of their creation ; it is in fact a gigantic commentary on Genesis i. Thus bk. i. opens with an account of the Trinity and its relation to creation; then follows a similar scries of chapters about angels, their attributes, powers, orders, &c., down to such minute points as their methods of communicating thought, on which matter the author decides, in his own person, that they have a kind of intelligible speech, and that with angels to think and to speak are not the same process. The whole book, in fact, deals with such things as were with God "'in the beginning." Bk. ii. treats of our own world, of light, colour, the four elements, Lucifer, and his fallen angels, thus corresponding in the main with the sensible world and the work of the first day. Bks. iii. and iv. deal with the phenomena of the heavens and of time, which is measured by the motions of the heavenly bodies, with the sky and all its wonders, fire, rain, thunder, dew, winds, &c. Bks. v.~~xiv. treat of the sea and the dry land: they discourse of the seas, the ocean, and the great rivers, agricultural operations, metals, precions stones, plants, herbs, with their seeds, grains, and juices, trees wild and cultivated, their fruits and their saps. Under each species, where possible, Vincent gives a chapter on its use in medicine, and he adopts for the most part an alphabetical arrangement. In bk. vi. c. 7 he incident~~ ally discusses what would become of a stone if it were dropped down a hole, pierced right through the earth, and, curiously enough, de- cides that it would stay in the centre. Bk. xv. deals with as- tronomy—the moon, stars, and the zodiac, the sun, the planets, the seasons, and the calendar. Bks, xvi. and xvii. treat of fowls and fishes, mainly in alphabetical order and with reference to their medical qualities. Bks. xviii.~~xxii. deal in a similar way with domesticated and wild animals, including the dog, serpents, bees, and insects; they also include a general treatise on animal physi~~ ology spread over bks. xxi.-xxii. Bks. xxiii.~~xxviii. discuss the psy~~ chology, physiology, and anatomy of man, the five senses and their organs, sleep, dreams, ecstasy, memory, reason, &c. The remain- ing four books seem more or less supplementary ; the last (xxxii.)

is a summary of geography and history down to the year 1250, when the book seems to have been given to the world, perhaps along with the Speculum Historiale and possibly an earlier form of the Speculum Doctrinatle.

The Speculum Doctrinale, in seventeen books and 2374 chapters, is a summary of all the scholastic knowledge of the age and does not confine itself to natural history. Itis intended to be a practical manual for the student and the official alike; and, to fulfil this object, it treats of the mechanic arts of life as well as the subtlcties of the scholar, the duties of the prince, and the tactics of the general. The first book, after defining philosophy, &c., gives a long Latin vocabulary of some 6000 or 7000 words. Grainmar, logic, rhetoric, and poetry are discussed in bks. ii. and iii., the latter including several well-known fables, such as the Lion and the Mouse. Bk. iv. treats of the virtues, each of which has two chapters of quota- tions allotted to it, one in prose and the other in verse. Jk. v. is of a somewhat similar nature. With bk. vi. we enter on the practi- cal part of the work ; it deals with the ars wconomica, and gives directions for building, gardening, sowing, reaping, rearing cattle, and tending vineyards; it includes also a kind of agricultural almanac for each month in the year. Bks. vii.-ix. have reference to the ars politica: they contain rules for the education of a prince and a summary of the forms, terms, and statutes of canonical, civil, and criminal law. Bk. xi. is devoted to the artes ncchanicz, namely, those of weavers, smiths, armourers, merchants, hunters, and even the general and the sailor. Bks. xii.~~xiv. deal with medicine both in practice and in theory: they contain practical tules for the preservation of health according to the four seasons of the year, and treat of various diseases from fever to gout. Bk. xv. deals with physics and may be regarded as a suminary of thi Speculum Naturale. Bk. xvi. is given up to mathematics, under which head are included music, geometry, astronomy, astrology, weights and measures, and metaphysics. It is noteworthy that in this book Vincent shows a knowledge of the Arabic numerals, though he does not call them by this name. With him the unit is termed "digitus"; when multiplied by ten it becomes the "articulus"; while the combination of the articulus and the digitus is the "numerus compositus." In this chapter (xvi. 9), which is super~~ scribed "actor," he clearly explains how the value of a number increases tenfold

with every place it is moved to the left. He is even acquainted with the later invention of the "cifra" or cipher. The last book (xvii.) treats of theology or (as we should now say) mythology, and winds up with an account of the Holy Scriptures and of the fathers, from Ignatius and Dionysius the Areopagite to Jerome and Gregory the Great, and cven of later writcrs from Isidore and Bede, through Alcuin, Lanfranc, and Anselm, down to Bernard of Clairvaux and the brethren of St Victor.

As the fifteenth book of the Speculum Doctrinale is a summary of the Speculum Naturale, so the Speculum Historiale may be re- garded as the expansion of the last book of the same work. It con- sists of thirty-one books divided into 3793 chapters. The first book opens with the mysteries of God and the angels, and then passes on to the works of the six days and the creation of man. It includes

dissertations on the various vices and virtues, the different arts and sciences, and carries down the history of the world to the sojourn in Egypt. The next eleven books (ii.~~xii.) conduct us through sacred and secular history down to the triumph of Christianity under Constantine. The story of Barlaam and Josaphat occupies a great part of bk. xv.; and bk. xvi. gives an account of Daniel's nine kingdoms, in which account Vincent differs from his professed authority, Sigebert of Gembloux, by reckoning England as the fourth instead of the fifth. In the chapters devoted to the origines of Britain he relies on the Brutus legend, but cannot carry his cata~~ logue of British or English kings further than 735, where he honestly confesses that his authorities fail him. Seven more books bring us to the rise of Mohammed (xxiii.) and the days of Charle- magne (xxiv.). Vincent's Charlemagne is a curious medley of the great emperor of history and the champion of romance. He is at once the gigantic eater of Turpin, the huge warrior eight feet high, who could lift the armed knight standing on his open hand to a

level with his head, the crusading conqueror of Jerusalem in days:

before the crusades, and yet with all this the temperate drinker and admirer of St Augustine, as his character had filtered down through

various channels from the historical pages of Eginhard. Bk. xxv. includes the first crusade, and in the course of bk. xxix., which contains an account of the Tartars, the author enters on what is almost contemporary history, winding up in bk. xxxi. with a short narrative of the crusade of St Louis in 1250. One remarkable

feature of the Speculum Historiale is Vincent's constant habit of

devoting several chapters to sclections from the writings of each great author, whether secular or profane, as he mentions him in the course of his work. The extracts from Cicero and Ovid, Origen and St John, Chrysostom, Augustine, and J erome, are but specimens of a useful custom which reaches its culminating point in bk. XXvill., which is devoted entirely to the writings of St Bernard. One main fault of the Speculum Historiale is the unduly large space devoted to miracles. Four of the medixval historians from whom he quotes most frequently are Sigebert of Gembloux, Hugh of Fleury, Helinand of Froidmont, and William of Malmesbury, whom he uses for Continental as well as for English history.

Vincent has thus hardly any claim to be reckoned as an original writer. But it is difficult to speak too highly of his immense in- dustry in collecting, classifying, and arranging these three huge volumes of 80 books and 9885 chapters. The undertaking to com- bine all human knowledge into a single whole was in itself a colossal one and could only have been born in a mind of no mean order. Indeed more than six centuries passed before the idea was again resuscitated ; and even then it required a group of brilliant French- men to do what the old Dominican had carried out unaided. The number of writers quoted by Vincent is almost incredible: in the Speculum Naturale alone no less than 350 distinct works are cited, and to these must be added at least 100 more for the other two Specula. His reading ranges from Arabian philosophers and natural- ists to Aristotle, Eusebius, Cicero, Seneca, Julius Ceesar (whom he calls Julius Celsus), and even the J ew Peter Alphonso. But Hebrew, Arabic, and Greek he seems to have known solely through one or other of the popular Latin versions.

nd printed, will be found in the istotre chard. The Tractatus Consolatorius pro

writer of this article has bee able to consult d in ini all the information which E Falco Gana ge

so-called first edition of the

ascribed to Mentelin and long celebrated as the earliest work printed burg, has lately been challenged as being only an earlier edition of vices

three genuine Specula (c. 1468-70), with which has been bound up the Speculum

Morale first printed by Mentelin (c. 1473-76), (T. A. A.)

VINCENT oF Lerins, St, an ecclesiastical writer of the Western Church, of whose personal history hardly any- thing is known, except that he was a native of Gaul, pos- sibly brother of St Loup, bishop of Troyes, that he became a monk and priest in the monastery of Lerinum (island of St Honorat opposite Cannes), and that he died in or about 450. From himself we further learn that only after long and sad experience of worldly turmoil did he betake him. self to the haven of a religious life. In 434, three years after the council of Ephesus, he wrote the Commonitorium adversus profanas omnium hereticorum novitates, in which the famous threefold test of orthodoxy is laid down and applied,—" quod ubique, quod semper, quod ab omnibus creditum est." Itis not altogether improbable that Vincent of Lerins was also the author of the Semipelagian treatise against Augustinianism which is dealt with by Prosper of Aquitania in lis Pro Augustini doctrina responstones ad capitula objectionum Vincentianarum.

VIN—VIN

The Commonitorium has becn edited by Baluze (Paris, 1663, 1669, and 1684), and by Kliipfel (Vienna, 1809). It also occurs in vol, 1. of Migne's Patrol. curs. compl. (1846).

VINCENT DE PAUL, Sr (1576-1660), founder of the "Congregation of Priests of the Mission," usually known as LazaRItTES (9.v.), was born on

24th April 1576 at Pouy near Dax (Landes), where his father owned a small farm. It was originally intended to train him for the ordinary pastoral life of the peasants of the Landes, but he soon showed other aptitudes, and after passing through the school at Dax he studied at Toulouse, and was ordained to the priesthood in 1600. Some time afterwards, while on board a felucca off Marseilles, he had the misfortune to be captured by Barbary pirates, who took him to Tunis and sold him asa slave. His third master, who happened to be a renegade Italian, he succeeded in converting, and both managed to make their escape, landing at Aigues-Mortes near Marseilles in June 1607. After short stays at Avignon and Rome, Vincent found his way to Paris, where he became favourably known to Monsieur (afterwards cardinal) de Bérulle, who was then engaged in founding the con- gregation of the French Oratory. At Bérulle's instance he became curate of Clichy near Paris (1611); but this charge he soon exchanged for the post of tutor to the count of Joigny at Folleville, in the diocese of Amiens, where he first developed the idea of those "missions" with which his name is associated. In 1617 he accepted the curacy of Chatillon-lés-Dombes (or sur-Chalaronne), and it was here that he received from the countess of Joigny the means by which he was enabled to found his first "con- frérie." The subsequent history of the priests of the mis- sion will be found in the article Lazarirxs, Among the works of benevolence with which his name is more imme- diately and personally associated are the establishment of a hospital for galley slaves at Marseilles, the institution of two establishments for foundlings at Paris, and the organization of the "Filles de la Charité." He died at Paris on 27th September 1660, and was buried in the church of St Lazare. He was beatified by Benedict XIII. in 1729 and canonized by Clement XII. in 1737, his festival (duplex) being observed on 19th July.

VINCENT FERRER, Sr (1355-1419), a great Spanish Dominican preacher, was born of respectable parentage at Valencia on 23d January 1355. In February 1374 he took the Dominican habit, and after spending some years in teaching, and in completing his theological studies, he was licensed to preach. He graduated as doctor of theo- logy at Lerida in 1374, and his sermons in the cathedral of Valencia from 1385 onwards soon became famous. Cardinal Peter de Luna took him with him to Paris

in 1391; and on his own election to the pontificate as anti- pope Benedict XIII. made Ferrer his confessor and master of the sacred palace. Finding, however, the ecclesiastical atmosphere of Avignon an uncongenial one, he in 1397 resumed his work as a preacher, and Spain, France, Italy, Germany, and Great Britain and Ireland were successively visited by him; and in every case numerous conversions were the result of his eloquence, which is described as having been singularly powerful and moving. In 1412 he was delegated by his native city to take part in the election of a successor to the vacant crown of Aragon ; and in 1416 he received a special invitation to attend the council of Constance, which, however, he does not appear to have accepted. He died at Vannes on 5th April 1419, and was canonized by Calixtus III. in 1455, his festival (duplex) being observed on 5th April.

VINCI. See Leonarpo DA VINCI,

VINDELICIA, or the country of the Vindelici, is a name of the Roman province which was also called Rheetia Secunda. See Rumrra.

VINE. Of the grape vines (Vitis) V. vinifera is the species best known and longest cultivated ; but out of ten species that grow wild in the United States four (V.

rotundifolia, V. Labrusca, V. xstivalis, and V. cordifolia),

according to Engelmann, are cultivated and have given origin to numerous derivatives used for wine-making pur- ~~poses. Some of the American varieties have been intro~~ duced into France and other countries infested with Phyllo- wera, to serve as stocks on which to graft the better kinds of European vines, because their roots, though per- haps equally subject to the attacks of the insects, do not suffer so much injury from them as the European species. American vines should not, however, be introduced for grafting or other purposes into a vine-growing country hitherto free from Phylloxera, but only into those in which the insect has already spread.

Although the genus Vitis comprises, according to Ben- tham and Hooker, more than two hundred species, mostly natives of tropical or subtropical

regions, yet less than half-a-dozen species have any economic value, while the great interest centres in four or five only. Vines have woody climb-

?ing stems, with alternate, palm- ately-lobed, or in some

Vine,

(ii.) Fruit ; reduced. (iii.) Foliage, tendril, and inflorescence ; reduced.

cases (Ampelopsis, Cissus) compound (digitate), leaves, pro-

(i.) Flower after fall of petals ; magnified.

vided at the base with small stipules. Opposite some of these leaves springs a tendril, the nature of which is obvi- ous from the numerous transitional states it offers between the ordinary form of tendril and the inflorescence. The flowers are small, green, and fragrant, and are arranged in dense clusters, Each hasasmall calyx in the form of a shallow rim, sometimes four-lobed or five-lobed, or toothed. Within this is an equal number of petals, which in the true vines cohere by their tips and form a cap or hood, Which is pushed off when the stamens are ripe. In other species (and as a malformation in the vine itself) the petals are free and spreading. Four or five free stamens, placed Opposite the petals, spring from a fleshy ring or disk sur- rounding the ovary, each bearing a two-celled anther. The ovary is surmounted by a sessile stigma and is more or less completely two-celled, with two erect ovules in each cell. This ripens into the berry and seed. Planchon, in his monograph of the Ampelidex (1887), divides the genus Vitis into numerous genera of equal rank. He retains, however, the grape vines under their original name. The cultivated vine has usually hermaphrodite flowers ; but, as it occurs in a wild state, or as an escape from cultivation, the flowers manifest a tendency towards unisexuality : that is, one plant bears flowers with stamens only, or only

the rudiments of the pistil, while on another plant the flowers are bisexual. Exclusively female flowers without stamens do not appear to have been observed. Seedling plants from the cultivated vines often produce unisexual flowers, thus reverting to the feral type. Perhaps the ex- planation of the fact that some of the cultivated varieties are, as gardeners say, "bad setters,"—7.e., do not ripen their fruit owing to imperfect fertilization,—is to be sought in this natural tendency to dicecism.

The conformation of the vine stem has elicited a vast amount of explanatory comment. The most generally accepted explanation is the "'sympodial" one. According to this, the shoot of the vine is a "sympode," consisting of a number of "podia" placed one over the other in longitudinal series. Each podium consists of a portion of the stem bearing one or more leaves, each with an axil- lary bud or buds, and terminating in a tendril or an inflor- escence. In V. Labrusca there is a tendril opposite to each leaf, so that the podium bears only a single leaf. In other species there is a definite arrangement of the leaves, some with and others without tendrils opposite to them, the numerical order remaining constant or nearly so. These arrangements have doubtless some reference to climatic phenomena, continuity of growth being arrested by cold and promoted by warmth. In any case it is obvious that these facts might be turned to practical ends in cultiva- tion. A vine, for instance, that produces bunches of grapes at each joint is preferable to one in which there are several barren joints, asa larger quantity can be grown within a smaller area. The practice of pruning or "stop- ping," as explained under HorTicULtvRE (vol. xii. p. 277), is consciously or unconsciously regulated by the mode of growth. The tendril or inflorescence, according to the views above explained, though in reality terminal, is bent to one side; hence it appears to be lateral and opposite to the leaf. While the tendril is thus diverted from its orginal direct course, the axillary bud of the leaf opposite the tendril begins a new podium, by lengthening into a shoot which assumes the direction the tendril had prior to its deflexion. This new podium, now in a direct line with its predecessor, produces leaves and ends in its turn in a tendril or inflorescence. A third podium succeeds the second, and soon. Other authorities explain the forma- tion of the tendril and its anomalous position opposite to a leaf by supposing

that the end of the stem bifurcates during growth, one division forming the shoot, the other the tendril or inflorescence. It is not possible within the limits at our command to specify the facts and arguments by which these theories are respectively supported. Prac- tically the tendrils assist the plant in its native state to scramble over rocks or trees. As in the case of similar formations generally, they are endowed with a sensitive- ness to touch which enables them to grasp and coil them- selves round any suitable object which comes in their way, and thus to support the plant. The tendrils of the Virginian creeper (Vitis or Ampelopsis hederacea; the Parthenocissus quinquefolia of Planchon) are branched, each branch terminating in a little sucker-like expansion by means of which it adheres firmly to walls or rocks. This is especially noticeable in the Japanese species now so commonly grown against walls under the name of Ampelopsis Veitchit (the Parthenocissus tricuspidata of Planchon). The extremities of these tendrils turn away . from the light, and by this means they are enabled to enter crevices, inside which they expand and fix themselves, just as the lewis or key, used by stone-masons, is fixed into blocks of stone. The anomalous position of the stamens in front of the petals is explained by the abortion or non-development of an outer row of stamens, indica- tions of which are sometimes seen on the hypogynous disk

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encircling the ovary. The seeds or grape stones are some- what club-shaped, with a narrow neck-like portion beneath, which expands into a rounded and thickened portion above. On the inner or central side of the seed is a ridge bounded on either side by a shallow groove. This ridge indicates the point of union of the "raphe" or seed-stalk with the seed; it serves to distinguish the varieties of V. vinifera from those of other species. In the true vines the neck of the seed is much longer than in the American vines, and the ridge or '"'chalaza" occupies the upper half of the seed, not the middle portion, as in the American kinds. In endeavouring to trace the filiation and affinities of the vine, the characters afforded by the seed are spe- cially valuable, because they have not been wittingly inter- fered with by human agency. Characters derived from the size, colour, or flavour of the berry are of less value for

historical or genealogical purposes than those which are the outcome of purely natural conditions.

The native country of the European vine is considered to be the region south of the Caspian. From this pre-

sumed centre it has spread eastwards into Central Asia'

and westwards to both sides of the Mediterranean, Central Europe, and as far north as Belgium (Planchon). Regel has propounded the notion that the cultivated vine origin- ated as a hybrid between V. vulpina and V. Labrusca, both North-American species ; but he offers little evidence in support of his opinion, which has not received the assent of botanists generally. It is interesting to note that grape stones have been found with mummies in Egyptian tombs of not later age than 3000 years. The seeds, according to Engelmann, have the characteristics of those of V. winifera, but show some very slight variations from the type of seed now prevalent. Among the Greeks in the time of Honier wine was in general use. The cul- tivation of the vine must also have been introduced into Italy at a very early period. In Virgil's time the varieties in cultivation seem to have been exceedingly numerous ; and the varied methods of training and culture now in use in Italy are in many cases identical with those described by Columella and other Roman writers (comp. HortTICULTURE, vol. xli. pp. 223, 277). Grape stones have been found among the remains of Swiss and Italian lake dwellings of the Bronze period, and others in tufaceous volcanic deposits near Montpellier, not long before the historic era.

The vine requires a high summer temperature and a prolonged period in which to ripen its fruit. Where these are forthcoming, it can be profitably cultivated, even though the winter temperature be very low. Tchihatchef mentions that at Erivan in Russian Armenia the mean winter temperature is 7°] C. and falls in January to — 30° C., and at Bokhara the mean temperature of J anuary is 4° C. and the minimum — 22° C., and yet at both places the vine is grown with success. In the Alps it is profit- ably cultivated up to an altitude of 1870 feet, and in the north of Piedmont as high as 3180 feet. At the present time the limit of profitable cultivation in Europe passes from Brittany, lat. 47° 30', to beyond the Rhine by Liége

and through Thuringia to Silesia in lat. 51° 55' (Grise- bach). In former centuries vines were cultivated to the north of this region, as, for instance, in Holland, in Bel- gium largely, and in England, where they might still be grown. Indeed experiments have lately been made in this direction near Cardiff in South Wales. The yield is satisfactory and the wine made, the variety known as Gamay noir, is described as being like still champagne In the Middle Ages, owing to various causes, the better wines of France and Germany could not be obtained in England except at prohibitive prices; but, when this state of things ceased and foreign wine could be imported the English consumers would no longer tolerate the in-

ferior productions of their own vineyards. It is also prob- able that the English mixed sugar or honey with the wine and thus supplied artificially that sweetness which the English sun denied. It is a curious fact that at the present day much or even most of the wine of finest quality is made at or near to the northern limits of possible cultivation with profit. This circumstance is probably explained by the greater care and attention bestowed both on the cultivation of the vine and on the manufacture of the wine in northern countries than in those where the climate is more propitious. The relative inferiority of the wines made at the Cape of Good Hope and in Australia is partly due to variations of climate, the vine not yet having adapted itself to the new conditions, and partly to the deficient skill of the manufacturers. That such inferi- ority may be expected to disappear is suggested by the success of vine-culture in Madeira and the Canary Islands,

The development of other species of Vitis, such as the curious succulent species of the Soudan and other parts of equatorial Africa, or the numerous kinds in India and Cochin China, is of course possible under suitable con- ditions; but it is obvious that an extremely long period must elapse before they can successfully compete with the product of many centuries.

For currants and raisins, both produced by varieties of the grape-vine, see the respective articles.

Apart from their economic value, vines are often culti- vated for purely ornamental purposes, owing to the elegance of their foliage, the rich coloration they assume, the shade they afford, and their hardihood. (M. T. M.)

DisEASES OF VINES.

The organic diseases which affect the vine may be divided into two categories, those caused by insects and those caused by para- sitic fungi.

Diseases Caused by Inseets.—Kaltenbach in 1874 enumerated Insect thirty-two species of insects which injure the vine ; and since then enemies.

others have been added to the list. We here deal only with the most important. Amongst those which attack the leaves and young buds a small beetle, Anomala vitis, one of the Searabzxida, does great harm in some parts of southern Europe by devouring the soft tissue of the leaves. A genus of weevils, Otiorhynchus, contains several species which are injurious to the vine, chiefly by the adult beetle devouring the buds. 0. raweus, hirticornis, picipes, nigritus, ligustiet, and suleatus are all reported from various places as doing much damage ; the larva of the last-mentioned species attacks the roots of the vine, causing the shoots to be small and ultimately bringing about the death of the plant. Fortunately the members of this genus have no wings, so that the damage they cause is to a great extent localized. The same kind of injury is caused by a small Chrysomeleous beetle, Eumolpus vitis. The larvee of several Lepidoptera attack the vine in the same way, destroying the young buds. Amongst these Nania typiea, Agrotis tritict, and A. pronuba may be mentioned. The larva of Tortriz pilleriana in the early spring weaves the young vine leaves to- gether, and, enclosed in this nest, devours the soft tissue at leisure. The imago emerges from the chrysalis in July and shortly after lays its eggs upon the upper surface of the vine leaf. After a few weeks the caterpillars emerge and continue their work of destruction. Lethrus cephalotes, one of the Searabeide, is very injurious in vineyards which have a dry sandy soil. The beetles live in pairs in holes in the ground ; during the summer the beetle bites off the small young shoots and drags them away to its hole, where it is believed they serve as food for the larve. In this way very

serious damage is caused to the vine plants. Rhynchites betuleti, a weevil, also does much damage to the young shoots and leaves. The grapes are attacked by the caterpillar of a moth, Conchylis ambiguella, which lays its egg in the young fruit; and in a similar way the larva of Graptolitha (Conehylis) botrana attacks the flowers and fruit. The larva of the cockchafer, Melolontha vulgaris, also does much damage by biting through and devouring the roots. Cocews vitis is a small scale insect of reddish brown colour, with irregular black spots in the female, which lives in the bark of old or neglected vines and weakens the tree.

By far the most destructive of all insect pests which attack the Phyllo-cultivated vine is Phylloxera vastatriz. This much-dreaded insect vera.

belongs to the family Aphide# or plant lice of the order Hemiptera. The genus contains several species which live upon oak trees. Their proper home is in North America ; but they have been found

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in English vineries since 1863. The symptoms of the disease first appeared in France about the same time, in the neighbourhood of Tarascou. From the department of Gard the infection spread south to the sea, and east, west, and north, till the south-eastern corncr of France was thoroughly infected. Another centre of infection arose a few years later near Bordeaux in Gironde, whence the disease spread till the whole of the southern half of France was more or less severely attacked. The parasite was first discovered in France in the year 1868. The Phyllowera has spread to Corsica; it has appeared here and there amongst the vineyards of the Rhine and Switzerland ; it is found in Spain and Portugal, Austria, Hungary, Italy, and Greece ; and in 1885 its presence was discovered in Australia (Victoria), at the Cape of Good Hope, and in Algeria. Hence it is no exaggeration to say that with very few exceptions its distribution is co-extensive with that of the cultivated grape- vine.

The symptoms of the disease, by means of which an infected spot may be readily recognized, are these. The vines are stunted and bear few leaves, and those small ones. When the disease reaches an advanced stage, the

leaves are dis- coloured, yellow or reddish, with their edges turned back, and_ withered. The grapes are arrested in their

rowth and their skin is wrinkled. f the roots are examined, numerous fusiform swellings are found upon the smaller rootlets. These are at first yellowish in colour and fleshy ; but as they grow older they become rotten and assume a brown or black colour. Ifthe roots on which these swellings occur be examined with a lens, a number of minute insects of a yellowish brown colour are ob- served; these are the root-forms (radicola) of Phyllowera (fig. 1); they

Fig. 1. Fig. 2. Fig. 1.—Root-inhabiting form (radicola) of Phylloxera, with proboscis inserted into tissue of root of vine. Fic. 2.—Phylloxera. Winged female which lives on leaves and buds of vine, and lays parthogenetically eggs of two kinds, one developing into a wingless female, the other into a male.

are about ‘8 mm. long, of an oval outline, and with a swollen body. No distinction between head, thorax, and abdomen can be observed. The Y head bears small red eyes and a pair of three- jointed antenne, the first two joints being short and thick, the third more elon- gated, with the end cut off ob- liguely and slightly hollowed out. Underneath, between the legs, lies the rostrum, Which reaches back to the abdo- men. The insect

Fig. 4. is fixed by this Fic. 3.—a, Male produced from small egg ¢, laid by winged

Fig. 3.

female (fig. 2); b, large egg; c, small egg. ia. 4.—Wingless female produced from large egg (fig. 8, 0), laid by winged female (fig. 2).

rostrum, which is mserted into the root of the vine for the purpose of sucking the sap. The abdomen consists of seven Segments, and these as well as the anterior segments bear four rows of small tubercles on their dorsal surface. These root-dwelling insects are females, which lay parthenogenctic eggs. The insect is fixed by its proboscis, but moves its abdomen about and lays thirty to forty yellow eggs in small clusters. After

the lapse of six, eight, or twelve days, according to the temperature, the larve hatch out of the eggs. These are light yellow in colour and in appearance resemble their mother, but with relatively larger appendages. They move actively

about for a few days and then, having selected a convenient place ou the young roots, insert their proboscis and become stationary. They moult five times, becoming with each change of skin darker in colour ; in about three weeks they become adult and capable of laying parthenogenetic eggs. In this way the insect inereases with appalling rapidity: it has been caleulated that a single mother whieh dies after laying her eggs in March would have over 25,000,000 descendants by October. If, however, the insect were content with this method of reproduction, the disease could be isolated by surrounding the infeeted patches with a deep ditch full of some such substance as coal-tar, which would prevent the insects spreading on to the roots of healthy vines. The fertility of the parthenogenetically-produced insects would also diminish after a certain number of generations had been produced.

As the summer wears on a second form of insect appears amongst the root-dwellers, though hatched from the same eggs as the form described above. These are the nymphs, destined to acquire wings ; their body is more slender in outline, and at first they bear well- marked tubercles. After several moults the rudiments of two pairs of wings appear, and then the insect creeps up to the surface of the earth, and on to the vine. Here it undergoes its fifth and last moult, and appears as a winged female, capable of reproducing parthenogenetically. The winged form has a slender body with distinct head (fig. 2). The eyes are well developed, with numerous facets; the antenne have three joints, the terminal one shaped like that of the root-dwellers. The wings are transparent, with few nervures, and are well adapted for flight. The anterior pair reach far beyond the end of the abdomen; the posterior are narrower and not so long. These winged forms are about 1 mm. long. They fly about from July till October, living upon the sap of the vine, which is sucked up by the rostrum from the leaves or buds. They lay their parthenogenetically-

produced eggs in the angles of the veins of the leaves, in the buds, or, if the season is already far advanced, in the bark. In very damp or cold weather the insect remaius in the ground near the surface, and deposits its eggs there. The eggs are very few in number and of two sizes, small and large (fig. 4, andc). From the larger a female (fig. 8) is hatched in eight or ten days, and simultaneously, for the first time in the life-history of the Phylloxera, a male (fig. 4) appears from the smaller egg. Neither male nor female has wings; the rostrum is replaced by a functionless tubercle; and there is no alimentary canal. The female is larger than the male and differs from it and the other forms in the last joint of the antenne. The life of these sexual forms lasts but a few days, and is entirely taken up with reproduc- tion. The female is fertilized by the male and three or four days later lays a single egg—the winter egg—and then dies. This egg is laid in the crevices of the bark of the vine, and asit is protectively coloured it is almost impossible to find it. Here the winter eggs remain undeveloped during the cold months; but in the following spring, as a rule in the month of April, they give birth to a female insect without wings, which resembles the root-dwelling forms, but has pointed antennz. These forms are termed the stock-mothers ; they creep into the buds of the vine, and, as these develop into the young leaves, insert their proboscis into the upper side. By this means a gall is produced on the under side of the leaf. The gall is cup-shaped, and its outer surface is crumpled and covered with smal] warts and hairs. The opening upon the upper surface of the leaf is protected by similar structures. Within this gall the stock- mother lives and surrounds herself with numerous parthenogenetic- ally-produced eggs,—sometimes as many as two hundred in a single gall; these eggs give birth after six or eight days to a numerous progeny (gallicola), some of which form new galls and multiply in the leaves, whilst others descend to the roots and become the root-dwelling forms already described. The galls and the gall-producing form are much commoner in America than in the Old World.

Scheme of the Various Forms of Phylloxera vastatrix. A. sachin forms, ?

| | Root-infesting forms, 2d generation, ? bi forms, 9

Root-infesting "— 3d generation, ?

Male. &e.

Wingless female.

Winter egg. Stock-mother. |

Gall-producing ? a Q

ditto. A.

The natural enemies of the Phyllowera are few in number : they include some mites,—Hoplophora arctata, Th yroglyphus phylloxere, —and the millepede Polyxenus lagurus, which devours the subter- ranean forms. Innumerable artifices have been proposed to com- bat the terrible discase caused by this minute insect, but none of them seem to be completely successful. Asa rule the means sug-

Oidium.

Perono- spora witicola.

An- thrac- nose,

gested are to render the soil uninhabitable for the root forms by injecting certain chemical poisons. Since the importance of the winter egg in the life-history of the insect was demonstrated by Balbiani, attempts have been made to destroy these eggs by rubbing the branches with a chain-armour glove, or some such contrivance for removing the outer layers of the bark, which should be burnt. Again, certain varieties of American vines, which have the reputa- tion of being Phylloxera proof, have been grafted on European stocks; but this has proved to be only a doubtful success as regards the Phylloxera, whilst the wine made from such vines has un- doubtedly deteriorated. The treatment which has been most suc- cessful is periodically to submerge the vineyard for a period of not less than forty days. Where this plan has been tried, it has been most successful ; unfortunately the majority of vineyards are planted on hill-

sides and other places where this method of treat- ment is impracticable. The root-dwelling forms do not thrive in a sandy soil ; hence vines grown in a district where such soil is found usually escape the disease. ; a Fungoid Discases.—The most destructive form of fungoid disease which attacks the vine is caused by a Pyrenomycetous fungus, Oidium (Erysiphc) Tuckeri. The disease was first noticed in

England in 1845; in 1848 it appeared at Versailles; by 1851 it.

had spread through all the wine-producing countries of Europe, being especially virulent in the lands bordering on the Mediter- ranean; and in the foHowing year it made its appearance in Madeira. There is little doubt that, like the Phylloxera, the Oidiwim is in its origin American. The disease is characterized by the appearance of a white mycelium on the young leaves ; this spreads quickly and attacks the older leaves and branches, and ultimately reaches the grapes. At first these are marked only by small brown spots ; but the spots spread and fuse together, the skin of the grape is destroyed, and the flesh decays, the seed only remaining apparently untouched. The disease spreads by the mycelium growing over the epidermis of the plant. The hyphe composing the mycelium are provided with haustoria, which project into the cells of the affected part. Some of the hyphe which project from the leaf bear conidia, which are constricted off one at a time, and it is by their means that the fungus spreads. The perithecia have not yet been discovered in Europe. But it is not impossible that this stage of the life-history of Ovdiwm exists in the United States in the form of Uncinula spiralis, which causes a widely spread disease amongst the American vines. The Oidiwm is in its turn attacked by a fungus of the same tribe, Cicinnobolus Cesatii, De By, which lives parasitically within the hyphe of its host, and at times even succeeds in destroying it. The means which have proved most efficacious, both as a remedy and a preventative of this disease, is to scatter flower of sulphur over the vines, before the morning dew has evaporated. Another method is to boil one part of lime with three parts of sulphur, and to sprinkle the mixture over the affected plants.

Another fungus which attacks vines, especially those of America, is Peronospora viticola. The mycelium spreads through the green parts of

the plant, attacking the leaves, twigs, and unripe grapes. On the upper side of the leaf, where it is first visible, it forms pale green irregular spots, which become darker in colour. On the under side of the leaf these patches are white and are composed of the spore-bearing hyphe. The leaf ultimately becomes dried up and brittle. The grapes which are attacked cease to grow, turn brown or white, and ultimately dry up and fall off. This disease has been successfully treated with' a spray of copper sulphate and lime, or sulphate of iron ; solutions of these salts prevent the conidia from germinating.

*Anthracnose is the name usually given to a disease which was formerly known as "charbon," *< pech," or "brenner." This disease is caused by the parasitism of Sphaceloma ampclinum, one of the Pyrenomycetous fungi. The fungus assails all the green*

'parts of the vine, and injures the leaves and young shoots as much

as it does the grape itself. The first sign of its presence is the ap- pearance of a minute spot, which is greyish in the centre, with a brown border. This spot increases in size ; in the stalks it assumes an oval shape, with its long axis parallel to the stalk, whilst in the leaves and grapes it is more or less circular in outline. The centre of the spots on the grapes becomes darker as the disease ad- vances, and a red line appears dividing the dark brown border into an outer and an inner rim and giving a very characteristic appear- ance to the diseased plant. The berries do not shrivel up as those do that are affected by the black rot. The mycelium of Sphace- loma grows just beneath the cuticle of the vine, through which it soon bursts, giving rise to a number of minute hyphe, "which bear conidia. These are minute, oval, colourless spores, which serve to spread the disease over the vineyard and from place to place. The complete life-history of this form is at present unknown ; and in- formation as to where the fungus passes the winter, and in what form, would probably afford some useful indications as to the method that should be adopted to combat the disease. Anthracnose has been known in Europe for many years, but has only been ob- served in America since 1881, whither it was probably imported from the Old World. As a preventative to its attacks a solution

(50 per cent.) of iron sulphate has been found very useful, as well as care in planting on well-drained soil that does not lie too low, the disease seldom appearing in dry, well-cxposed vineyards.

The black rot, like the Oidiwm and P. viticola, is American in its Black origin. It has been known and observed there since 1848, but ap- rot. peared for the first time in France in 1885. The disease is caused by a fungus, Physalospora Bidwellii, Sacc. (Phoma uvicola), one of the Pyrenomycctes, and by some authorities it has been considered to be a further stage in the life-history of Sphaceloma. The fungus confines its attacks to the grapes, the leaves and stems being rarely if ever affected. The grapes arc not assailed until nearly full-grown, when a brownish spot appears, which spreads over the whole grape.

The latter at first retains its plumpness, but on the appearance of little black pustules, which first occur on the part first affected,

the grape begins to shrivel. This continues until the grape is \ reduced toa black hard mass, with the folds of skin pressed closely { against the seed. The disease does not spread from grape to grape, so that as a rule only a certain number of grapes in a bunch are destroyed. The hyphx of the mycelium of this fungus are sep- tate, with numerous short branches. The pustules on the surface are due to fructifications, pycnidia, and spermagonia. The presence of conidia has also been recently demonstrated. The fungus passcs the winter in the withered grapes which fall to the ground ; hence every care should be taken to collect these and burn them. The use of the solutions mentioned above may also be recommended as a preventative.

Among the other fungi which infest the vinc may be mentioned Other _ Phyllosticta viticola and Ph. Labruscw, which, when the attack is fungi. severe, cause the destruction of the leaves, the only part they assail. These, like the foregoing, are members of the Pyrenonvycetes. To the same class belongs also Cercospora vitis (Cladosporium viticolum), which has club-shaped spores of a green-brown colour. This also attacks the leaves ; but, unless the season is extremely unfavour- able, it does little harm.

A very disastrous root-disease of the vine is due to the ravages of the fungus Dematophora necatriz, which forms subterranean strings of mycelium—so-called rhizomorphs—the fructification of which is as yet not known ; it forms conidia and sclerotia, however, and presents certain analogies to the Discomycctcs. The diseased roots have been confounded with those attacked by Phylloxcra.

The only mode of combating the malady seems to be to uproot the plants and burn them. Isolation of the diseased areas by means of

trenches has also been practised. This fungus has extended its } ravages considerably in southern France and Switzerland within the last ten years, (A. E. §.)

VINEA. See Viena.

VINEGAR is a dilute form of acetic acid, having a flavour that varies according to the source from which it is obtained. Vinegar has been known from the earliest historical period, and its power of acting on and dissolving mineral substances rendered it an important agent in the hands of the alchemists. They were, however, unac- quainted with pure acetic acid; the most concentrated solution they possessed, called spiritus veneris, was obtained by distillation from cupric acetate (verdigris). The nature of acetous fermentation, and the rationale of the processes by which vinegar is prepared, are explained under Ferr- MENTATION (vol. ix. p. 98); and the acetic acid obtained by the destructive distillation of wood is dealt with under Tar (vol. xxiii. p. 57). Here we have to do only with the various kinds of vinegar used for table, medicinal, and other household purposes. Malt, wine, and beetroot vinegars are made by the slow process, whilst for the quick method dilute brandy or other spirit is most largely employed.

Malt vinegar is the preparation commonly manufactured in the United Kingdom, the high alcoholic duties there excluding the use of spirits in the industry. A fermented wort is prepared, as in brewing, which is run into casks laid on their side, bung-hole upwards, till they are three-fourths filled. These casks have a hole bored in each end near the top, aud between the three holes a con- stant circulation of air is secured over

the surface of the liquid. The casks are disposed in low-roofed vaults, artificially heated, in which free circulation of air is kept up ; but sometimes the process 18 carried on in the open air in what is termed a vinegar field. | According to the temperature (which should be about 70° Fahr.) and other conditions, the acetification of the wort may occupy from i weeks to months. From the casks the vinegar is transferred to large tuns provided with false bottoms, over which a thick layer of stalks and skins of grapes and raisins, &c., termed rapes, is strewn. Through this the vinegar is filtered from one tun into another,

Al

had considerable affinities with this last, and hig work, having the singular advantage of being in some sort foreign criticism, without undergoing the disadvantage which attaches in French eyes to all criticism of French affairs written in a foreign language, has had a great in- fluence on France. Vinet died on 15th May 1847 at

whereby it is cleared from mucilaginous matter and the last traces of alcohol arc thoroughly oxidized. J/ine vinegar is made in France and other vine-cultivating countries from wine lees and inferior wines. The finest vinegar is yielded by white wines, the product being purer, pleasanter, and generally stronger than ordinary malt vinegar. Vinegar is also largely prepared from beet- root, from the juice of other saccharine vegetables and fruits, and from sugar; and indecd all sources of alcohol may be regarded as possible materials for making viuegar. Quick method vinegar is made, principally in Germany, from dilute spirit (about one of proof spirit to six of water), to which are added small proportions of sugar, honey, or malt extract. The standard liquor used by dif- ferent manufacturers varies considerably. The process is also used to some extent in England for converting fermented and clarified malt wort into vinegar. Commercial viuegar varies much in strength. What is termed "proof" vinegar contains 4°6 per cent of real acetic acid ; and, as it requires twenty-four grains of anhy- drous carbonate of soda to neutralize each fluid ounce, it is also known as No, 24. In the same way weaker qualities are known as No. 22, No. 20, &c., these figures

indicating the grains of car- bonate of soda which neutralize a fluid ounce.

Vinegar is extensively consumed in the preparation of pickles and sauces, and as a table condiment, especially with salad vege- tables and fish. For many culinary purposes it is flavoured with aromatic herbs and spices. Aromatic vinegar, made from glacial acetic acid and perfumes, possesses a refreshing stimulating pun- gency, as is familiarly known by its use in vinaigrettes. Marseilles vinegar, or thieves' vinegar, is an aromatic preparation used as a prophylactic and masker of evil odours. Vinegar is also a men- struum for several medicinal agents; and in a concentrated con- dition it is a valuable rubefacient and external stimulant.

VINET, Atexanpre RopoipuHe (1797-1847), a French critic, though not a Frenchman, was born near Lausanne on 17th June 1797. He was educated for and duly entered the ministry of the Protestant Church, the date of his ordi- nation being 1819. He had, however, already acquired an important position as teacher of the French language and literature in the gymnasium at Basel, and during the whole of his life he was more of a critic than of a theologian, though he exercised some influence in the latter capacity, headed a secession from the national church in Vaud, was for a time professor of theology at Lausanne, and advo- cated an extreme toleration in the matter of religious formulas, together with the separation of church and state. As a theologian Vinet would already have been long for- gotten, despite some sermons and treatises which had a certain vogue in his native country, and, being in part translated into English, exercised some influence on English- speaking adherents of Calvinism. His performances as a literary critic, which for the most part represent his aca- demic lectures, are, however, of greater importance. By procuring for Sainte-Beuve an invitation to lecture at Lausanne on Port-Royal, he was the cause of one of the capital works of recent French literary history. But he had less indirect titles to fame in the same department than this, Like all other French writers of repute in Switzerland, he has been accused by French-born censors of that mysterious patavinity which is supposed to attach to Swiss French, and which has been illustrated in such a remarkable fashion by Rousseau, Benjamin Constant, Joseph and Xavier de Maistre, Tépffer, and others. But the persons thus branded were

probably content to write French as well as Livy wrote Latin. Vinet's Chrestomathie Francaise (1829), his Etudes sur la Littérature Francaise au XTX Siecle and his Histoire de la Littérature Fran- guise au XVIII Siecle, together with his Etudes sur Pascal, Etudes sur les Moralistes des XVI ef XVIJeme Stécles, Histoire de la Prédication pendant les kéformes, and other books gave evidence of a wide knowledge of litera- ture, a sober and acute literary judgment, and a very con- siderable faculty of appreciation. On the whole, he belongs to the academic school of critics rather than to the romantic- impressionist school, or to that rarer and better school than either which adjusts its theories to the work which is brought before it, and condemns nothing so long as it is 00d work according to the writer's own standard. He

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Clarens (Vaud). A considerable part of his works was not

printed till after his death.

VINNITSA, a district-town of Russia, in the govern-

ment of Podolia, is situated on the Bug, 137 miles to the

north-east of Kamenets-Podolsk, and 29 by rail from the Zhmerinka junction on the railway from Odessa to Lem- berg. It was founded in the 14th century, but nothing now reniains of its two stone forts. Its old Jesuit college is now a gymnasium. Owing to the great fertility of the neighbourhood, there are a number of distilleries ; and the Vinnitsa merchants, mostly Jews, carry on trade in corn and spirits. The population in 1884 was 18,580.

VIOL. See Vioxrn.

VIOLET. The violets comprise a genus of at least one hundred, some say two hundred species, found principally in temperate regions of the northern hemisphere ; a few also occur in mountainous districts of South America, while the genus is not wholly without representatives in Australia. The species are mostly low-growing herbs with alternate leaves

provided with large leafy stipules. The flowers are solitary, or rarely in pairs, at the end of slender axillary flower stalks. The flowers themselves are very irregular in form, with five sepals prolonged at the base, and five petals, the lowest one larger than the others and pro- vided with a spur. The five anthers are remarkable for the petal-like processes which extend beyond the anther cells and form a sort of cone around the style. The ovary is superior, one-celled, with three parietal placentas and numerous ovules. It is surmounted by a single style, which terminates in a dilated or hook-like stigma. The fruit is a capsule bursting loculicidally, i.e., through the centre of each of the three valves. The irregular con- struction of the flower is evidently connected with fertili- zation by insect agency. To reach the honey in the spur of the flower (of the pansy), says Miiller, the insect must thrust its proboscis into the flower close under the globular head of the stigma. This lies in the anterior part of a groove fringed with hairs on the inferior petal. The anthers shed their pollen into this groove, either of them- selves or when the pistil is shaken by the insertion of the bee's proboscis. The proboscis, passing down this groove to the spur, becomes dusted with pollen; as it is drawn back, it presses up the lip-like valve (of the stigma) so that no pollen can enter the stigmatic chamber; but as it enters the next flower it leaves some pollen on the upper surface of the valve, and thus cross-fertilization is effected. It is curious, however, that in the common violet, V. odorata and other species "cleistogamic" flowers occur of a greenish colour, so that they offer no attractions to insect visiters and their form is correspondingly regular. In such flowers self-fertilization is compulsory and very effectual, as seeds in profusion are produced.

Several species of Viola are native to Great Britaiu. V. odorata is highly prized for its fragrance, and in cultivation numerous varieties have originated. The garden pansies or heartseases are derivatives from V. tricolor, a cornfield weed, V. altatca, and V. grandifiora. They are reputed to have been first raised about 1810 by Lady Mary Bennet, with the assistance of her gardener, Mr Richardson, the term pansy or pensée having been long attributed to V. tricoler, The variety and richness of colouring in these flowers are very remarkable. " Bedding violas," which differ from pansies in some slight technical details, have been raised by crossing V. lutea with V. calcarata. The violas are credited with powerful

emetic and diuretic properties, on which account they have been admitted into some of the pharmacopceias; but they are now

very little used. XXIV. — 31

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Descrip- | VIOLIN, a stringed instrument employed in orchestral tion of and chamber music. The body is a resonant box, composed the in- of belly, back, and six ribs, all shaped out of thin wood oa to various curves, the belly and back being scooped out of solid slabs, and the ribs planed and bent. The whole 1s glued together upon six internal blocks. Pine is used for the belly, maple for the other parts. The external surface is covered with a fine hard varnish of a brown, red, orange, or yellow colour, which renders the box more resonant. To this box is glued a solid neck or handle, slightly in- clined to the plane of the box, and along the whole instru- ment four gut strings are stretched by means of as many pegs and a tailpiece. They are tuned in fifths, thus— and set in vibration with a bow, strung with —= horsehair well rubbed with rosin, which is held = in the right hand, the scale being completed by stopping the strings with the fingers of the left hand, in which the instrument is held, on an ebony finger-board glued to the handle, and projecting over the body of the fiddle. The movable bridge, across which the strings are strained, forms the spring or mechanical centre of the violin, and answers to the reed in wood wind-instruments. It has two feet, of which the treble or right-hand one rests firmly on that part of the belly which is supported by a sound-post resting on the back, thus forming a rigid centre of vibration, while the bass or left-hand foot, resting on the freely-vibrating part of the belly, communicates to it, and through it to the air in the box, the vibrations which the bow excites in the strings. The belly is strengthened, and its vibration regulated and increased, by a longitudinal bar glued inside it exactly under the bass foot of the bridge. Two incisions in the belly, called sound-holes, from their letting out the sound, also facilitate and modify the vibration. The middle pair of ribs on each side have an inward curvature, to afford the bow better access to the strings. The superficial area of the belly is divided by the bridge into two approximately equal parts, for an obvious acoustical reason ;1 but the

upper half is longer and narrower than the lower, which is relatively short and broad. 'This device gives greater length to the vibrating portion of the strings, and hence greater compass to the instrument. It also brings the bowing place on the strings

nearer to the player. Descent The violin, as the name imports, is a modified form of of violin. the viol, an instrument constructed on exactly similar principles, though different in every detail. It dates from the middle of the 16th century; the viol was perfected somewhat earlier. During two centuries the two instru- ments were in use contemporaneously ; but the violii class gradually drove the viols from the field, on the principle which governs the general history of musical instruments. of the "survival of the loudest." The primitive viol is ' modified form of the lute; and the lute is an adaptation of the small lyre of classical antiquity, the name of which (jidicula) survives in both groups of the common names for bowed instruments (fidicula, fidula, fideille, vielle, fidel vedel, fiedel, fiddle ; in the Romance group, vidula, viula, viola, violino, violone, violoncello). The fidicula or lyre consisted of a resonant box, having a yoke (jugum or transtullum) instead of a neck, and one string for each note. Obviously, by substituting for the jugum a handle or neck, and thus enabling the fingers of the left hand to stop the strings at will, the number of strings and the tension on the box could be diminished, the scale of notes increased, and the task of the right hand facilitated. By this improvement the class of instruments denominated lyre developed into the lute class ; and by other improve- ments upon the original basis it developed into the harp.

u In order that the vibrational impulse may be given as nearly as possible at the centre of the mass of air in the resonant box,

Lyre.

y PeOadnl N

The origin of the peculiar mechanism which, when added to the lute, produced the viol, viz., the movable bridge, Viol, sound-post, and bow, is obvious. The bow is a develop- | ment of the plectrum employed for sounding the lyre. The bridge was borrowed from the Greek xavwv, or

monochord. Movable bridges (traywyets, subductaria, ponticulr) were employed to divide the monochord so as to produce the intervals of the various scales.2 The sole use of this in- strument being to train the ear of singers, it may well be supposed that musicians would endeavour to render the tone continuous, the better to support the voice ; and this could be readily done by substituting for the plectrum a common military bow, with the string well rubbed Thebo with rosin,?—a substance largely used by the Greeks and | | Italians. This supposition is confirmed by the fact that | the marine trumpet, the most primitive of bowed instru- ments, is simply a bowed monochord. Although we can point to no pictorial representation of the bow as applied to musical instruments earlier than the 10th or 11th cen- tury, it is reasonable to conclude that the bridge and bow were adapted to the monochord and fidicula during the later empire. A substitute for the bow was afterwards | found in the rosined wheel and handle, doubtless first | applied to the monochord, afterwards perfected in the large j medizval organistrum, and still employed in the smaller vielle or hurdy-gurdy. The bow, however, held and still j holds its ground as the most convenient means of pro- ducing continuous tone from stringed instruments. The substitution of a hank of horse-hair for the single bow-string dates from very early times.

Except the marine trumpet or bowed monochord, we find in Europe no trace of any large bowed instruments | before the appearance of the viol in the 15th century. The geige, crowd, rebec, and fidel, as the small bowed in- Geige, | struments of the Middle Ages were variously called, were ctow', small enough to be rested on the shoulder during perform- 4°. ance, and were usually rather smaller than the modern gaq. | violin. It is not easy to assign each of these names to | any particular form of instrument. They all had in com- mon a resonant box, either circular, oval, or semi-pear- shaped, a handle with a finger-board, a tail-piece, a bridge, and from two to four strings tuned to fourths or fifths. The pegs were set vertically to the handle above the finger- i board, as in the modern guitar. The bow, which was short and clumsy, had a considerable curvature, and the | string a high tension. None of these instruments can have had a deeper compass than a boy's voice. The use of the | fidel in the hands of the troubadours, to accompany the | adult male voice, explains

the attempts which we trace in | the 13th century to lengthen the oval form of the instru-

ment. A contrary curvature, as in the guitar, was then given to the sides of the resonant box, to enable the bow to reach the strings of the enlarged instrument. This may be denominated the troubadour's fiddle.

The invention next to be described formed the turning- Side- point in the history of bowed instruments. In order to ee keep in place the ribs of the troubadour's fiddle, with 4 their troublesome contrary flexures, side-blocks inside the blocks. | instrument were probably used. By cutting these blocks | with an angle towards the outside, dividing each side rib into three smaller ones, and giving the middle one on each side a contrary curve so as to meet the upper and ee Eee ee ee eee

: Meibomius, Auctores Musice Antique, Amsterdam, 1652, p. 89. ; Rosin, manufactured as now from turpentine, was generally used in Italy and Greece in the preparation of wine (Pliny, V.12., xiv. 20, 25), as an ingredient in medicine, and as a cosmetic (Scribonius Largus, Compos., 187 sg.). Violin rosin is called in French colophane and in German colophonium, from the town of Colophon ; and Colo- phonian rosin is described by Pliny as "pree ceteris fulva, si teratur

alba fit, gravior odore," Good violin rosin answers exactly to this description.

Yronrin

lower ribs at an angle on the block, the resonant box was greatly strengthened, its construction became easier, and it became possible to make instruments of indefinitely larger size. Corner-blocks thus converted the fidel into the viol. Single corner-blocks (contrary flexures being still given to the upper ribs) were sometimes used, and often occur later on; but double corner-blocks came at once into general use, and resulted in the construction of the viol in several sizes. The medizval fiddle appears originally to have had a perfectly flat belly like the lute. It must early have been discovered that a belly scooped out to a slight curve offered greater resistance to the pres- sure of the strings transmitted by the bridge. Bellies

thus scooped out probably came into general use with the in- vention of corner-blocks. The back continued to be, and in the viol family has always been, a piece of flat joinery. Theoretically, no doubt, this is right ; for a scooped-out back is false in construction, as there is nothing for the arch of the back to carry. But, as a back thus modelled and forming a duplicate of the belly, as in the violin, produces a much more powerful tone, this consideration has come to be disregarded.

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sponding voice, and being from the purely musical point of view superfluous. It appeared, however, concurrently with the bass, as soon as the invention of corner-blocks made it possible to construct bowed instruments of a size only limited by the possibility of playing them. As the discant viol is determined in size by the proportions of the bent arm, the tenor viol by the height above the knee of a sitting player, the bass by a relative height when the instrument is held between the knees, instead of supported on them, so the double bass is determined in size by the height of the standing figure, the bottom of the resonant box resting on the ground. In this respect it corresponds with the marine trumpet, which afforded an obvious hint for its construction. Originally it was made for six strings, the tuning being as follows :—

Double Bass In imitation probably of the largest register

Viol of pipes on the improved organs which were –2Z=– then being built, the double bass viol was used "= as sub-bass. For this purpose the three

=

highest strings were probably soon found to be useless, and they must have been very liable to break 3 and, as the pressure of useless strings impairs the resonance of

q

The viol The viol is an instrument, or rather family of instru- | the instrument, they seem to have been gradually dropped. family. iments, of merit and interest, though now superseded by | The three lowest strings are the same as those used for the violin, with the exception of the double bass, which | the modern double bass. still survives as a practical instrument. The following The earliest use of the viols was to double the parts of Develop- are the points in which the viol differs from the violin:- — | vocal concerted music ; they were next employed in ae . The Vi reqs special compositions for the viol trio written in the same "¢ Yio! he Viol has— The Violin has— M h ate fe pees 9 1. A flat back of joiner's work. | 1. A scooped-out back, modelled Compass. | any such works im the form o a like the belly. or "fancies," and preludes with suites in dance form, by 2. Shoulders with a contrary /2. Square shoulders, and a top | the masters of the end of the 16th and 17th centuries, mea in une a al ane like the bottom. exist in manuscript ; a set by Orlando Gibbons, which are 3. iMich Blige iounted < a 3. A low bridge with feet only, | $004 specimens, has been published by the English Musical 4. C-shaped, sometimes "flaming | 4. f-shaped sound-holes. Antiquarian Society. Later, the viols, especially the bass, sword," sound-holes. were employed as solo instruments, the methods of com- 5. A thin broad handle. 5. A thick narrow handle. position and execution being based on those of the lute. 4 ee oo nes, toned bye Hous gieipenimiedigy Nts.) aS lates aunistonieeit fact equally adapted for the bass a Eitan cities ee + Sontateotiers: viol, and vice versa. In the 17th century, when the violin 8. Deep ribs. 8. Shallow ribs. was coming into general use, constructive innovations be- 9. A soft penetrating tone. 9. A ringing brilliant tone. gan which resulted in the abandonment of the trio of pure In the matter of 4 and 7 a few viols, made after the six-stringed viols. Instruments which show these innova- violin had been perfected, and chiefly Italian, follow the | tions are the quinton, the lyre, and the viola d'amore. violin, The modern double bass also follows the violin in | The first-mentioned is of a type intermediate between the these points and in 5. The viol was made in three main | viol and the violin. In the case of the discant and tenor kinds,—discant, tenor, and bass,—answering to the cantus, | viol the lowest string, which was probably found to be of medius, and bassus of vocal music. Each of these three | little use, was abandoned, and the pressure on the bass kinds admitted of some variation in dimensions, especially | side of the belly

thus considerably lightened. The five the bass, of which three distinct sizes ultimately came to | strings were then spread out, as it were, to the compass be made—(1) the largest, called the concert bass viol ; | of the six, so as to retain the fundamental principle of the (2) the division or solo bass viol, usually known by its | outer strings being two octaves apart. This was effected Italian name of viola da gamba; and (3) the lyra or tabla- | by tuning the lower half of the instrument in fifths like ture bass viol. The normal tuning of the viols, as laid | the violin and the upper half in fourths. This innovation down in the earliest books, was adapted from the lute to | altered the tuning of the treble and tenor viols, thus— the bass viol, and repeated in higher intervals in the rest. | One half of the instrument was a ee Diseant Viol. Tenor Viol, Viclada Gamba. The fundamental idea, | therefore a viol, the other half 1 mons 'Tenor Quinton, ; '_ Gass Viol.) ag in the lute, was that | a violin, the middle string form- . ——sS—— —— a= — the outermost strings | ing the division. The tenor ——— = = o~- =s— should be two octaves | viol thus improved was called – = apart—hence the in- | in France the quinte, and the ———— —<—_£_—_- = S — tervals of fourths with | treble corresponding to it the = ———- SS a third in the middle. | quinton. From the numerous specimens which survive it Discant The highest, or discant viol, is obviously not a treble but | must have been a popular instrument, as it is undoubtedly "io an alto instrument, the three viols answering to the three | a substantially excellent one. The relief in the bass, and Inale voices. As a treble instrument, not only for street | the additional pressure caused by the higher tuning in the and dance music, but in orchestras, the rebec or geige did | treble, gave it greater brilliancy, without destroying the duty until the invention of the violin, and long afterwards. | pure, ready, and sympathetic tone which characterizes the The discant viol first became a real treble instrument in viol. While the tendency in the case of the discant and __ the hands of the French makers, who converted it into | tenor was to lighten and brighten them, the reverse process ouble the quinton. The double bass, the largest of the viols, is | took place in that of the bass. The richer and more sonor-

 not a legitimate member of the family, having no corre-

ous tones of the viola da gamba were extended downwards

Sympa- thetic strings.

The violin.

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by the addition of a string tuned to double bass A, thus— Seven-stringed Marais, a French virtuoso, is usually credited

Gocv. with this improvement ; and this extended com-

-: pass is recognized in the classical viola da gamba eZ. writings of Sebastian Bach and De Caix

= WHervelois. The result, however, was not uni- versally satisfactory, for Abel used the six-stringed instru- ment; and the seven strings never came into general use in England, where the viola da gamba was more generally employed and survived longer than elsewhere.

The want of positive power, which is the weakness of the viol and ultimately drove it from the field, must have been early noticed on a comparison of its delicate tones with the harsher notes of the rebec. Hardly had the viol appeared, when makers cast about for means of augmenting its tone. One way of doing this was by additional strings in unisons, fifths, and octaves, a device which had been already employed in the small fiddles of the Middle Ages, and is identical in principle with the augmentation of diapason tone on the organ by means of other registers. The double or treble strung viol, in various sizes, was known as the lyre (Italian, accordo) ; but this multiplica- tion of strings proceeds on a false principle, for each ad- ditional string diminishes the resonance of the box, and at the same time hardens the tone and increases the task of the player. More ingenious and successful was the in- vention of sympathetic metal strings, usually steel, laid under the finger-board, as close as possible to the belly, and speaking by consonance with the notes produced on the bowed strings. From this resonance by sympathy the viol thus strung acquired the general name of wola damore. The original viola da gamba when so strung came to be called the viola bastarda; the seven-

stringed bass, with an elaborately perfected sympathetic apparatus, was well known in the 18th century by the name of the bordone or

baritone, and was a favourite instrument with musical epi- cures. Instruments made on this principle are found in all sizes; even kits are met with having sympathetic strings (sordino d'amore). Violins with sympathetic strings (usually five) are more rare; the viola d'amore chiefly used was of tenor size and compass. Originally tuned as to its bowed strings like the pure tenor viol, an additional string was given it, and the so-called "harp-way" tuning adopted, thus— viola d'Amore, Violad'Amore, The sympathetic strings were at- "it tuning. sharp tuning. tached to ivory pegs driven in- == —s— to the bottom block, passed a «2— through the mi ms a bridge, or over a low bridge o ——= ~—je— their near as possible —— = to the fstees of the belly, under the fingerboard, and were strained to pitch either by means of additional pegs, or, better, by wrest-pins driven into the sides of the peg box and tuned by a key. Originally Six, seven, or eight sympathetic strings were used which were tuned to the diatonic scale of the piece in per- formance. Later, a chromatic set of twelve strings was employed ; and instruments are met with having a double set (24) of chromatic strings, two for each semitone in the scale. With thirty-one strings to be kept in perfect tune the task of the player must have been arduous indeed : and it is not strange that instruments so elaborate and troublesome were abandoned. Ina moist climate like that of Great Britain it is practically impossible to keep a viola d'amore in playing order, the steel strings being in most of their length covered by the fingerboard and out of reach, while the slightest. rust impairs the resonance, and much rust renders the instrument completely useless, The improvements which were to develop an ultimate bowed Instrument for permanent musical use proceeded in the opposite direction to the lyre and viola d'amore: they

Y¥ieLiIwn

consisted in increasing yet more the resonance of the box, by making it lighter and more symmetrical and by string- ing it more lightly, instead of more heavily. This was really falling back on primitive principles, for the hints were certainly derived from old extant specimens of the crowd and

the geige. Existing pictures prove that the oval and the circular geige were made with nearly flat backs and bellies of correlative pattern ; and it was natural to seek to reproduce their more powerful tone in the viol by giving it shallower ribs and a back modelled like the belly, and by assimilating the top of the instrument, where the handle is added, to the bottom. This change at once transformed the box of the viol into that of the violin, and the transformation was completed by rejecting the lute tuning with its many strings and tuning the instru- ment by fifths, as the geige and rebec had always been tuned. The tenor viol was apparently the first instrument in which the change was made, about the middle of the 16th century, and it was so successful that it was quickly applied to the treble and bass instruments.

The question so often mooted, Who invented the violin ? may therefore be dismissed. The instrument was produced by applying to the viol certain principles borrowed from its smaller predecessors. It would be equally correct to say that it was produced by applying to the geige other princi- ples borrowed from the viol. Tradition indicates one of the Tieffenbriickers, a German family whose members for more than a century were famous lute-makers in Venetia and Lombardy, as the inventor. The earliest instrument of the violin type known to the present writer is a tenor made by Fr. Linaroli of Bergamo, at Venice, in 1563; and the earliest makers whose authentic works have descended to us in considerable numbers are Gaspar da Sald and Maggini, both of Brescia.

An important distinction should be mentioned which High —

divides violins into two classes, known respectively as the eon } {

“high” and the “flat” model. On this subject much has been said and written ; but it has not been discussed scien- tifically, nor has the prevalence of one model over the other at different times and in different places been accounted for. It is understood that, while the flat model, which has now practically driven the high model from the field, yields a tone that is more powerful and travels further, the high model yields a tone which comes out more readily, and is softer and more flute-like, although less capable of light and shade. The high model is less convenient for the player, because when the instrument is rested on the

clavicle the strings are at a greater altitude in relation to the right arm, which accordingly requires to be raised. Hence the high model has become less popular as the art of violin- playing has developed, and is undoubtedly less suitable to the elaborate system now in use. These remarks apply to instruments of pronounced high model; for the distinction is in fact a matter of degree, and is purely mechanical in origin. The flattest models rise about twelve millimetres above the ribs, while the highest do not exceed twenty, and many of the best violins have an elevation between these limits. The object of the rise being to give Just such a degree of resistance to the pressure of the bridge as will set the enclosed air in due vibration, and this de- gree being approximately the same in all violins, the amount of elevation must obviously be relative to the strength and elasticity of the fibres of the belly. The more regular the shape of the box,—that is, the flatter the model, —the more perfect and the more completely blended will be the undulations of the mass of air within, and the more uniformly sonorous and musical the tone ; but owing to the pressure of the strings only strong and elastic wood can be used for this model. Wood of stiff and brittle fibre-must be worked to a higher arch, or if used for the

Sea a ee — er os

violins, |

A eS a Se

avira

pete

Early Italian makers.

German, English, and _ French

makers,

V¥1lOLIN

flat model must be left too thick for perfect vibration. Hence we might expect ta find the flat and the high model employed respectively where different qualities of wood are available, with a corresponding result in the tone. Fine elastic pine is chiefly found on the southern slopes of the Alps; and thereabouts the best viols and violins have always been made. The famous violin-makers carried on their trade at Brescia, Cremona, Mantua, Milan, and Venice, while the Piedmontese Alps and the Apennines furnished material for some makers in Piedmont and at Bologna. High-modelled violins, and flatter instruments of thicker wood and inferior sonority, were chiefly made in Tyrol, Germany, France, and England, where the available mate- rial was less tenacious and elastic.

The early Italian school is chiefly represented by the Brescian makers, Gaspar da Sald, Giovanni Paolo Maggini, Giovita Rodiani, and the two Zanettos (1580-1630). It is, however, misleading to denominate it the Brescian school, for its characteristics are shared by the earliest makers of Cremona and Venice. To eyes familiar with the geometrical curves of the later Cremona school most of the violins of these makers, like the early violins of England and Ger- may, have a rude and uncouth appearance. The height of the model varies; the pattern is attenuated; the f-holes share the general rudeness of design, and are set high in the pattern. Andreas Amati of Cremona, the eldest maker of that name, effected some improvements on this primitive model; but the violin owes most to is sous, Antonio and Geronimo, who were partners. Nicholas, son of Geronimo, and Antonio Stradivari, the pupil of Nicholas, each did something to perfect the model ;. but the substantial im- provements which converted the Brescian violin into the modern instrument were the work of Antonio and Geronimo. These im- provements, which were, in fact, of an artistic rather than a scien- tific nature, consisted in modelling the instrument in all its outlines and surfaces to regular curves. Painting and inlaying had long been employed in the decoration of stringed instruments; but the brothers Amati were the first who applied to the violin the funda- mental law of decorative art, that the decorative and constructive elements should be blended in their inception : in other words, the construction should be itself decorative and the decoration itself constructive. The nature of the instrument suggested the applica- tion of this law, for all extraneous additions to the varnished wood of

which it consists tend todamp the tone. Nicholas Amati (1596- 1684) made some slight improvements in the Cremona model, and Antonio Stradivari (1649-1737) finally settled the typical Cremona pattern, which has been generally followed; for the majority of violins since made, whcther by good or bad makers, are copies of Stradivari. Besides the last-named, the following makers worked generally on the Amati model,—Cappa, Gobetti, the Grancino family, Andreas Guarnieri, and his son Giuseppe, the Ruggieri family, and Serafin of Venice. Balestrieri, the Bergonzi family, Alessandro Gagliano, the earlier members of the Guadagnini family, Montagnana, and Panormo were pupils or followers of Stradivari. Landolfi, Storioni, and Carlo Giuseppe Testore, a pupil of Giovanni Grancino, leaned to the model of Giuseppe Guarnieri del Gest. Some resemblances, especially in the matter of the varnish, are traceable between the works of makers who lived contemporaneously in the same town, ¢.g., in Naples, Milan, and Venice.

The Amati method was adapted to the higher model by Jacob Stainer of Absam, near Hall in Tyrol, whose well-known pattern Was chiefly followed by the makers of England, Tyrol, and Germany, down to the middle of the 18th century. It thenceforward fell into disuse, owing to the superior musical qualities of the Cremona violin and to improved means of communication, which enabled the violin- makers of other countries to procure wood sufficiently soft and tenacious to be worked to the flat modcl. The school of Stainer is Tepresented amongst many others by Albani, Hornsteiner, the Klotz family (who made large numbers of instruments excellent in their kind), Schorn of Salzburg, and Withalm of Nuremberg. The English makers may be divided into three successive groups :—1. an antique English school, having a character of its own (Rayman, Urquhart, Pamphilon, Barak Norman, Duke of Oxford, fac),)) 2 Pa, imitators of Stainer, at the head of whom stands Peter Wamsley (Smith, Barrett, Cross, Hill, Aireton, Norris, &c.); 3. a later school Who leaned to the Cremona model (Banks, Duke of Holborn, Betts, the Forsters, Gilkes, Carter, Fendt, Parker, Harris, Matthew Hardie of Edinburgh, &c.). The early French makers have little merit or interest (Bocquay, Gavinies, Pierray, Guersan, &c.); but the later copyists of the Cremona models (Lupot, Aldric, Chanot the elder, Nicholas, Pique,

Silvestre, Vuillaume, &c.) produced admir- able instruments, some of which rank next in merit to the first-rate makers of Cremona.

_ The tenor violin, in compass a fifth lower than the treble

Violin, appears to have preceded the latter; and -from

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Basso da

Tenor Violin. Violoncello. Conca €Xisting specimens we —=— ~~ ———— 1 2 ——— know that the bass vio- = Se SS lin, now termed the

— > violoncello, with a tun-

G—=— ing an octave below the tenor, appeared very ———— _ shortly afterwards. A double bass violin, tuned a fourth below the violoncello and usually known as the basso da camera, completed the set of instruments in violin shape ; but from the difficulty attending its manipulation it never came into general use. The celebrated double bass player, Dragonetti, occasionally used the basso da camera, and an English player named Hancock, who dis- pensed with the highest or E string, is still remembered for his performances on this unusual instrument.

The tenor and violoncello are made on the same general model and principles as the violin, but with certain modi- fications. Both are relatively to their pitch made smaller than the violin, because, if they were so constructed as to have the same relation to the pitch and tension of the strings as the violin, they would not only have an over- powering tone but would be unmanageable from their size. This relatively diminished size, both in the dimen- sions of the instrument and in the thickness of the wood and strings, gives to the tenor and violoncello a graver and more sympathetic tone. To some extent this reduced size is compensated by giving them a greater proportional height in the ribs and bridge ; the increase is hardly per- ceptible in the tenor, but is very noticeable in the violon- cello. Correlative to this general diminution in the size of the instrument and the tension of the strings as the bass register is entered,

there is a progressive diminu- tion in the size and tension of the strings of each instrument, the treble string having in all cases the greatest tension and being thickest in proportion, though actually the thinnest. This is partly due to the fact that the ear demands greater brilliancy and force in the higher register ; but it has also a mechanical reason. The treble foot of the bridge is fixed, while the bass foot vibrates freely ; additional stability is given to the rigid side and additional freedom to the bass side by lightening the tension in each string progressively towards the bass. This can be verified by the simple experiment of stringing up a violin with the strings reversed, but without altering the sound-post and bass-bar. Still further to lighten the tension on the bass side, the lowest string of the violin and the two lowest of the tenor and violoncello are spe- cially made of thin gut and covered with fine metal wire. Such strings yield a grave tone with comparatively little tension.

It is obvious that, if the lowest string, or the two lowest strings, are elevated in pitch, the tension will be greater, and the violin will produce a more powerful tone; if the bass string is lowered, the contrary will take place. By adapting the music to this altered tuning (scordatura) some novel effects are produced. The follow-

ing are the principal scordatwre which have been occasionally employed by various players,

] —= = — = = = _————— —s— = Tartini, Biber. Biber Nardini. Barbella, Castrucci. Campagnoli. (Scotch Reels.) | —— = —ho—— —— ae = a z- ss bs = Lolli. De Bériot, De Bériot. Paganini. Baillot. Prume, Mazas, &c.

The violoncello is less amenable to the scordatura than the violin ; the only classical instance is the tuning employed by Bach _—— in his fifth sonata, which consists in lowering the first

—— string by a tone. ane… =: It is commonly said that an old violin is better than

Bach. anewone, Other things being equal, and supposing

Tenor violin and violon- cello.

Scorda- tura.

“Good” the older to be in fair preservation, this is true ;

violins.

Violin bow.

Strings.

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it is also true that of old violins the best, as a rule, have survived. Good violins, however, have been continuously made, and are still being made, though since the middle of the 18th century the cheapness of the “trade” fiddle, made by the hundred by divided labour, has much circumscribed the business of the higher-class workman. The best workmen of different countries differ little in merit ; but it_ is seldom that any maker out of Italy is successful in varnishing his work so as to impart to it the superior resonance which characterizes the best Italian violins. he varnish, originally merely orna- mental and preservative, has become an essential part of the work, from its intimate connexion with the tone. The secret of making varnish is not lost, as is sometimes stated ; the difficulty consists in applying and drying it with reference to the climate where the operation takes place. In moist climates, oil varnish, which is the best, dries too slowly ; hence the use of spirit varnish, which is more manageable, but has not the effect of permeating the superficial tissues of the wood so as to increase and perpetuate its elasticity. Many well-made modern violins, notably those of some French makers, have proved failures, because they have, under a mistaken belief, been made out of old and dry wood. After a few years pine begins to lose its elasticity; the old makers used wood that was only just sufficiently seasoned, and they preserved its elasticity by applying their varnish at once. eee ;

It is also commonly said that a flat violin is preferable to a high- modelled one. This must be accepted with some modification. Instruments which

are excessively flat should be avoided, for reasons above stated. A moderate height, rather less than the medium, is most favourable to vibration ; what is really essential is that the sound-holes should be in horizontal planes, not in planes inclined at a considerable angle to the transverse section of the instrument. Such sound-holes, as may be proved at once by the ear, have the property of immediately letting out the vibrations of the small mass of air which lies directly under the bridge, and thus rob the great mass of air in the body of the fiddle of the impulse necessary to set it properly in vibration ; hence the tone, though quickly yielded and not feeble to the ear of the player, is found at a short distance to be deficient in force and flexibility. The violins most in request are the larger specimeus of the Amati family, of Stradivari and his best pupils, and of the two cousins Giuseppe Guarnieri,—the instruments of Giuseppe called "del Gest," from his use of the sacred monogram on his tickets, being by some players preferred to those of Stradivari. For old instruments of the best class purchasers must be prepared to pay from £200 to £600, according to their quality and state of preservation. Second-class old Italian instruments, and first-rate specimens of the best school of French copyists, can usually be bought for smaller sums down to £20. The chief seats of the wholesale violin manufacture are Mirecourt in France and Markneukirchen in Saxony.

The violin bow, which is made of Brazil wood, was reduced to its present admirable shape about 1780 by Francois Tourte of Paris (1747-1835), whose bows are still esteemed above all others. A fair Tourte bow is generally worth £10; but a fine one has been sold for £30 ; and one of his best violoncello bows, which are rarities, was recently sold in Paris for £44. Bows, however, which leave little to be desired are made in great numbers by English, French, and German makers. A good bow is of more importance to a player than a good violin ; something may be done with an indiffer- ent instrument, but no one can play with a bad bow.

The best strings have always been made in Italy ; the climate of northern Europe is unsuitable for the manufacture. Good strings are essential to the player, and they should be frequently changed, as they only retain their shape at the place where the bow touches them, and their elasticity, for a limited period.

For further informatio i ringed i : referred to Vidal, Les i ius ees ang eS Pagrenaye ae mann, Gesch. der Bogen-Instrumente (Brunswick, 1882); and the various articles in Grove's Dictionary of Music and Musicians. The best handbook of violin- makers is Hart's Violin (London, 1875-80). The process of violin-making is well described in HE, H. Allen's Violin-Making as it was and ts (London, 1885). A smaller work, which can be recommended, is Maugin's Manuel du Luthier (Paris, 1869). The art of playing the violin has been practically treated at length by Campagnoli, Baillot, Spohr, Ferdinand David, Alard, and many other professors of the various schools; but the only attempt to explain it system- atically with reference to sound scientific theory is contained in an unpre- tending brochure by Karl Courvoisier (Die Violin-Technik, Cologne, 1878),

which it is impossible to praise too highly. See also Musical Inst: is- toric, Rare, and Unique, by A. J. Hipkins (Edinburgh, 1887). Ea pty

VIOLLET-LE-DUC, Evcknse Emmanver (1814-187 9) French architect and writer on archeology, was born at Paris on 27th January 1814. He was a pupil of Achille Leclére, and in 1836-37 spent a year studying Greek and Noman architecture in Sicily and Rome. His chief interest was, however, in the art of the Gothic period, and, like Sir Gilbert Scott in England, he was employed to "restore" some of the chief medieval buildings of France, his earliest works being the abbey church of Vézelay, various churches

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at Poissy, St Michel at Carcassonne, the church of Semur in Cdte-d'Or, and the fine Gothic town-halls of Saint- Antonin and Narbonne, all carried out between 1840 and 1850. From 1845 to 1856 he was occupied on the restoration of Notre Dame in Paris in conjunction with Lassus,! and also with that of the abbey of St Denis. In 1849 he began the restoration of the fortifications of Car- cassonne and of Amiens cathedral; and in later years he re- stored Laon cathedral, the chateau of Pierrefonds, and many other important buildings. He was an intimate friend of Napoleon IIL, and during the siege of Paris (1871) gave

valuable help as an engineer to the beleaguered army.? He held many important offices, both artistic and political, and was for many years inspector-general of the ancient buildings throughout a large part of France. His last work was the general scheme for the Paris exhibition buildings in 1878. He died on 17th September 1879.

As a designer Viollet-le-Duc occupied only a secondary place ; but as a writer on medieval architecture and the kindred arts he takes the highest rank. His two great dictionaries arc the standard works in their class, and are most beautifully illustrated with very skilful drawings by his own hand. Viollet-le-Duc was a man of the most varied and brilliant abilities, endowed with a power of work which has seldom been equalled. He was at once an artist, a man of science, a learned archeologist, and a scholar. His map showing the rock contours aud the glaciers of Mont Blanc is a model of its kind, which combines great artistic beauty with the accuracy of the most skilful engineer. His strong poetical fancy enabled him to reconstruct the life and buildings of the Middle Ages in the most vivid way. His principal literary works were the Dictionnaire de V Architecture Francaise du XI. aw XVI. Siecle, 1853-69 ; Dictionnaire du Mobilier Francais, 1854-75; L' Architec- ture Militaire au Moyen Age, 1854; Habitations Modcrnes, 1874- 1877 ; Histoire d'une Maison, 1873 ; Histoire dwne Forteresse, 1874 ; Histoire de V Habitation Humaine, 1875 ; Le Massif de Mont-Blanc, 1876; LD' Art Russe, 1877; Histoire dun Heétel-de-Ville et dune Cathédrale, 1878 ; La Décoration appliquée aux Edifices, 1879 ; as well as many minor works dealing with separate buildings.

VIOLONCELLO. See Vio1in.

VIOTTI, Giovanni Battista (1753-1824), violinist and musical composer, was born at Fontanetto in Pied- mont, on 23d March 1753. He learned the rudiments of music from his father, a veterinary surgeon and an amateur horn-player; and in 1764 Giovannini taught him the violin for a year. Two years later he was placed by the Marchesa di Voghera under the violinist Pugnani at Turin. In 1780 Viotti, having already made himself a name, travelled through Germany and Poland to Russia, where the empress Catherine honoured him with marks of extra- ordinary favour.

He next appeared in London, in com- pany with Pugnani, and at once achieved a brilliant and lasting reputation. In 1782 he was equally successful in Paris. Two years later he was appointed leader of Prince de Soubise's private orchestra; and in 1788 he undertook the direction of the opera, raising the performances, with Cherubini's assistance, to a very high level. Viotti also joined with Feydeau-de-Brou in constructing the famous Feydeau theatre. In 1790 the Revolution compelled him to fly to England ; but a charge of Revolutionary espionage drove him for a time to Hamburg, whence, however, he returned in 1795, From that time he resided almost uninterruptedly in London until 1818, when he once more settled in Paris, resumed the direction of the opera, and retired in 1822 with a pension. He died in London on 10th March 1824.

Viotti's playing was distinguished by an extreme purity of style, a magnificent tone, and an endless variety of poetical and ima- ginative expression. He was undoubtedly the best violinist of the age, and the best composer for his instrument. Among his works are 29 violin concertos, a series of symphonies concertantes for two violins, 45 duos, 18 trios, and 21 quartetts, and a great number of sonatas, notturnos, and other instrumental works. His school was worthily perpetuated by his pupil Rode.

1 He published in 1867-69 a fine work showing his not very success- ful coloured decoration applied to the chapels of Notre Dame.

" See his Mémoire sur la Défense de Paris, 1871.

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VIPER. The vipers constitute a family (Viperidz) of Old-World, poisonous, viviparous snakes, which have a single movable poison fang on either side of the upper jaw, without any excavation or pit between the eye and the nostril,—thus differing from the Crotalide. They have a post-frontal and a maxillary bone, which latter is swollen and upright, articulating with the pre-frontal by a ginglymus, and short—not reaching the premaxilla. Vipers are mostly more or less thick-bodied and _ short-

tailed, the head being entirely covered above with small scales, except in a single species. The nose is often re- curved, and some scales of the head are elongated so as to form "horns" in several species, The main points in the anatomy! of the group have been already described in the article Reprites, and their zoological relations stated in the article SNAKES.

There is much diversity of opinion as to the classifica- tion of the vipers, and, as Dr Alexander Strauch appears to be the author who has worked out the group with the greatest care and completeness, his classification is here provisionally adopted.

The Viperide thus consist of three genera, which are

distinguished as follows :—

(1) Two rows of sub-caudal scales….....0. { Pe face s.)

(2) One row of sub-caudal scales—

a. Gular scales smooth, body rounded or Echis depressed, tail simple ….....0-. (1 species.)

b. Gular scales strongly keeled, body com- f Atheris pressed, tail prehensile…..... { (3 species.)

The common viper (V. berus) is easily distinguished from the harmless ring-snake by the black and white (or yellow) band behind the head, which is generally con- spicuous in the latter animal. It is also distinguishable (apart from individual varieties) from the snake Coronella, rare in England, by having a dark V-shaped mark on its head and a dark zig-zag line down the back. It is this viper which has the top of the head covered by shields (which may be regular or irregular in outline) instead of small scales only. It is one of the most widely distributed of snakes, being found from northern Spain eastwards to the island of Saghalin, and from the northern boundary of Persia to beyond the Arctic Circle in Scandinavia, though it is not found in Ireland. It inhabits all sorts of situations, though it prefers a dry soil, and it may be met with at an elevation of 9000 feet above the sea. It seeks its prey at night, and

penetrating the burrows of mice will eat their nestlings. Its bite is sometimes fatal to large dogs, and occasionally to weakly children. It brings forth in April and May from five to fourteen young, which are hatched as they are born.

The other European vipers are V. aspis, V. ammodytes, and V. latastii.2 V-. aspis is very like the common viper, save as to the seales on the head and the fact that its snout is somewhat turned up. It inhabits France, Switzerland, and Italy. V. ammodytes 1s asomewhat larger species, with a singular pointed process extend- ing upwards from the snout end. It is found in Egypt, Syria, Asia Minor, Turkey, Greece, southern Austria, and Italy. V, latastii is a species intermediate between V. aspis and V. ammo-dytes. It inhabits Spain, Portugal, Morocco, and Algiers. Thus, of the four European vipers, two are also found in Africa and one in both Africa and Asia. There are three exclusively Indian Vipers,—V. xanthina, V. persica, and V. russcllii. V. xanthina 1s an animal about 24 feet long. As in all the other non-European Vipers, the body scales are strongly keeled. It is found in Asia Minor, Syria, and Persia. V. persica is, as its name implies, a Persian animal. The scales above each eye are so modified as to form a horn. V. russellii is hornless, but very large: it is said to attain a length of more than 6 feet. It is widely distributed, inhabiting India, Burmah, Siam, Ccylon, Sumatra, and Java,

1 For a description of the poison fang, see vol, xx. p. 457; and for a figure of the skull, see vol. xx. p. 452. In collections wherein very many specimens are preserved it is

Possible to find transitional forms between all the four European species,

Two vipers are common to Asia and Africa. Oue of these, V. mauritanica, extends from Algiers to Persia. It maybe nearly 5 feet long. The other species, V. cerastes, is a much smaller snake, never being much more than 20 inches in length. It is remark- able for two long pointed horns (which stand up over either eye), and is widely distributed in North Africa and Arabia. All the other species of the genus Vipera are exclusively African, and only one is found north of the Sahara, Thisis V. avizenne. It

has no horns, and only attains a length of about 16 inches. JV. superciliaris is also a small snake, but it has a large rugose supra- orbital plate. It comes from Mozambique. The puff-adder (V. arictans) is a large thick snake, which may be 4 feet long. Itisa very deadly animal, and is widely distributed over southern and central Africa, extending to both the east and west coast of that continent. It is withont horns. V. nasicornis is a beautifully

¢ eX Fig. 1.— Vipera nasicornis. coloured, large, and bulky snake, which may be upwards of 6 feet long. Two horns project obliquely forwards from just in front of either nostril. It inhabits southern Africa. It is a very venonious animal. V. rhinoceros is another large snake, which comes from both the east and west coasts. It has a pair of horns upstanding between its nostrils, each clothed with but a single shield. cornuta has scaly prominences, which are hardly " horns," and which consist each of a group of four or five large upright distinct scales placed above one of the eyes. It is a small snake, hardly ever more than 20 inches long. It inhabits western, southern, and eastern Africa. V. caudalis is a still smaller snake, which has a single scale extending upwards over either eye. It comes from southern Africa, as also does V. schneidert, which is like the last species, save that it has nothing at all representing horns. V/. inornata is also hornless, though it has the supraorbital region somewhat elevated. It is a very small snake, only about 15 inches long. It is a South-African species, as also are V. atropos and V. atropoides, which are both hornless and are about 2 feet long.

The genus chis consists of but one species (Z. carinata), which has been noticed and figured in the article SNAKES (see vol. xxii. p. 198). It is a viper-like snake, which

3 On one occasion one of these snakes, after giving birth to twenty- one young (which bit and killed mice within five minutes of being born), became very ill-tempered, and when two adult males were placed in her cage she bit one with such violence as to break off one of her fangs, which she left, about three-quarters of an inch in length, sticking in his back. He, however, appeared not to suffer the slightest inconvenience, and was never the worse for it (see Proc. Zool. Soc., 1871, p. 638).

inhabits desert lands or dry plains, and extends from India through Abyssinia and North Africa to Senegal.

Fie. 2.—Atheris burtoni. (Length 12 inches.)

The genus Atherts is made up of several more or less problematical species of snakes, all of which present a great contrast to the other Viperide, in that they have long, slender, and laterally compressed bodies with prehensile

tails—being altogether adapted for arboreal life. Never- theless the head is decidedly viperine, sharply marked off from the neck, broad behind, and heart-shaped when looked at from above. 'These animals are assisted in climbing, not only by their prehensile tails, but also the strongly keeled scales beneath the lower jaw. All the so-called species are inhabitants of tropical Africa,—A. burtoni, A. sqguamigera, and A. chloroechis being found on the west coast. 'Two new species have been lately discovered, .A. anisolepis and A. cxviceps,—both from the Congo.

'The genus Acanthophis is sometimes classed with the vipers, but is here excluded on account of its large, truly colubrine head shields. See Snaxags, vol. xxii. p. 198.

The Viperidx are geographically distributed as follows :—

Palearctic Region.1—V. berus, V. aspis, V. ammodytes, V. latastii, V. xanthina, V. persica, V. mauritanica, V. cerastes, V.

avizenns, EL. carinata. Ethiopian Region.—V. superciliaris, V. arietans, V. nasicornis,

V. rhinoceros, V. cornuta, V. caudalis, .V. schneideri, V. inornata V. atropos, V. atropoides, A. burtoni, A. sqyuanvigera, A. chioroechis. Indian Region.—V. russellii, E. carinata. (ST G. M.)

VIRGIL (P. Vercitius Maro) enjoyed in ancient times an unquestioned supremacy arnong Roman poets. His pre-eminence in poetry was as distinctly recognized as that of Cicero in prose ; and among the Romans, as among all nations who have possessed a great poetical and a great prose literature, the superior power of poetry over that of

+ This region includes Europe, Africa north of the Sahara, and Asia north of the Himalayas.

any other mode of artistic expression to embody and per- # petuate the true ideal of the national imagination and the deepest vein of national sentiment, was fully recognized. The veneration in which his name was held during the long interval between the overthrow of Western civilization and the revival of letters affords testimony of the depth of the impression which he made on the heart and imagin- ation of the ancient world. The traditional belief in his pre-eminence has been on the whole sustained, though not with absolute unanimity, in modern times. By the scholars and men of letters of the 16th, 17th, and 18th centuries it was never seriously questioned. Only during the first half of the present century has his right to be ranked among the great poets of the world been disputed by eminent German and English critics. The. German mind has always been more in sympathy with the art and genius of Greece than of Rome and Italy ; and during the first half of the present century, when English criticism first came under German influence, there was a strong reaction from the habitual deference paid to those writers who had moulded literary taste in the previous century. The estimation of Virgil, as the most consummate repre- sentative of Latin culture, suffered most from this reaction. In the present day the effect of this reaction shows itself only in a juster estimate of Virgil's relative position among the poets of the world. It is no longer a question whether he or Homer was best entitled to hold that " sceptre" among the great poets of antiquity which Lucretius awards to the older poet. It may still be a matter of individual opinion whether Lucretius himself was not a more powerful and original poetical force, whether he does not speak more directly to the heart and imagination of our own time. But it can hardly be questioned, on a survey

of Roman literature, as a continuous expression of the national mind, from the age of Nevius to the age of Claudian, that the position of Virgil is central and com- manding, while that of Lucretius is in a great measure isolated. If we could imagine the place of Virgil in Roman literature vacant, it would be much the same as if we imagined the place of Dante vacant in modern Italian, and that of Goethe in German literature. The serious efforts of the early Roman literature—the efforts of the older epic and tragic poetry—found their fulfilment in him. The revelation of the power and life of Nature, first made to Lucretius, was able to charm the Roman mind, only after it had passed into the mind of Virgil, and been brought nearer to the heart of Romans and Italians by association with the industry most congenial to them. And not only does Virgil absorb and supersede much of what went before him; he anticipates and supersedes much of what came after him. When we have read the Aineid, we add scarcely anything to our sense of the capacities of the Italian genius and of the Latin language by studying the artificial epics of the empire. It is enough to read any ten lines of them along with any ten lines of Virgil to feel how absolute is his superiority. Virgil is the only complete representative of the deepest sentiment and highest mood of his countrymen and of his time. In his pastoral and didactic poems he gives a living voice to the whole charm of Italy, in the dnetd to the whole glory of Rome. He was in the maturity of his powers at the most critical epoch of the national life, one of the most critical epochs in the history of the world. Keeping aloof from the trivial daily life of his con- temporaries, he was moved more profoundly than any of them by the deeper currents of emotion in the sphere of government, religion, morals, and human feeling which were then changing the world; and in uttering the enthusiasm of the hour, and all the new sensibilities that were stirring in his own heart and imagination, he had, in

the words of Sainte-Beuve, 'divined at a decisive hour of the world what the future would love." He was also by universal acknowledgment the greatest literary artist whom Rome produced. It was an essential condition of Roman more than of any other great literature that it was based ou culture and education. Not only the knowledge but the inspiration of

Greek poetry—'spiritus Graie camene "—was the condition of Roman success in poetry. Virgil had not only more learning and culture, but had a more catholic sympathy with the whole range of Greek poetry, from Homer and Hesiod to Theocritus and the Alexandrians, than any one else at any period of Roman literature. Greek studies were in his time pursued with greater ardour, completeness, and thoroughness than at any previous period. The effort of the preceding generation to attain to beauty of form and finish of artistic execution found in him, at the most susceptible period of his life, a ready recipient of its influence. The rude dialect of Latium had been moulded into a powerful and harmonious organ of literary expression by the emotional ardour and vigorous understanding of a long series of orators ; the rough and unhewn structure of the Latin hexameter, first shaped by Ennius to meet the wants of his own spirit and of his high argument, had been smoothed and polished by the congenial labour of Lucretius, and still more perfected by the finer ear and more careful industry of Catullus and his circle; but neither had yet attained their final develop- ment. It was left for Virgil to bring both diction and rhythm to as high a pitch of artistic perfection as has been attained in any literature.

The great work which he accomplished was the result of the steady devotion of his genius, undistracted by pleasure or business, to his appointed task. For the first half of his life he prepared himself to be the great poet of his time

and country with a high ambition and unresting industry,

equalled only by the ambition and industry with which Cicero prepared himself to be the greatest orator and the most accomplished exponent of philosophy among his con- temporaries and countrymen. The second half of his career was a religious consecration of all his powers of heart, mind, and spirit to his high office. He was born on the 19th of October in the year 70 B.c., in a farm on the banks of the Mincio, in the district of Andes, not far from the town of Mantua. He thus belonged to a genera- tion about thirty years younger than that to which Lucretius belonged, and about fifteen years younger than that of Catullus: but both these poets were dead before the younger poet was old enough or sufficiently

known to have come into personal contact with them. But the literary tnpulse which gave birth to their poetry was felt in all its force in his early youth, and especially in the district north of the Po, in which a race of more imaginative suscepti- bility than the people of Latium, who had been the first to receive the discipline and feel the enthusiasm of Greek studies, formed part of the Latin-speaking population.! It was favourable to his development as a national poet that he was born and educated during the interval of com- parative calm between the first and second civil wars, and that he belonged to a generation which, as the result of the social war, first enjoyed the sense of an Italian nationality. Yet it was only after Virgil had grown to manhood that the province to which he belonged obtained the full rights of Roman citizenship. It is remarkable that the two poets whiose imagination seems to have been most powerfully possessed by the spell of Rome,—Ennius and Virgil,—were born outside the pale of Roman citizenship, though be-

4 Cf. Cic., Pro Archia, iti. 5—" Erat Italia tune plena Grecarum artium ac disciplinarum, stndiaque hac et in Latio vehementius tum colebantur quam nunc iisdem in oppidis, et hic Rome propter tran-

quillitatem reipublice non neglegebantur."

longing to races who had acknowledged the sovereignty without deeply or permanently resenting the hostility of Rome.

The scenery familiar to his childhood, which he recalls with affection both in the Hclogues and the G'eorgics, was that of the green banks and slow windings of the Mincio and the rich pastures in its neighbourhood. Like his. friend and contemporary Horace, and unlike the poets of the preceding generation, who were members either of the aristocracy or of the class closely associated with it, he sprung from the class of yeomen, whose state he pronounces the happiest allotted to man and most conducive to virtue and piety. Virgil, as well as Horace, was fortunate in having a father who, though probably uneducated himself, discerned his genius and spared no pains in nourishing it with the highest and richest culture then obtainable in the world. At the age of twelve he was taken for his educa- tion to Cremona, an old Latin colony, and from an expres- sion in one of the minor poems attributed to him, about the authenticity of

which there cannot be any reasonable doubt, it may be inferred that his father accompanied him thither as Horace's father accompanied him to Rome for the same purpose. He assumed the toga virilis on his sixteenth birthday, the day, according to Donatus, on which Lucretius died ; and shortly afterwards he removed to Milan, where he continued engaged in study till he went to Rome two years later. The time of his renioval to Rome must have nearly coincided with the publication of the poem of Lucretius and of the collected poems of Catullus, the first really artistic poems produced in the Latin language. A powerful stimulus must have been given to a youth of genius from a northern province by his arrival in the metropolis of the world at such a crisis in the national literature. The impression produced on_ his imagination on his first coming to Rome may be recalled to memory in the lines he puts into the mouth of Tityrus in the first eclogue,

"'Urbem quam dicunt Romam Melibeee putavi," &c.

After studying under a rhetorician, who was, probably about the same time, the teacher of the future emperor, he proceeded to the study of philosophy under Siron the Epicurean, who, in common with other teachers of that sect, appears to have had the gift of inspiring enthusiasm for his subject and affection for himself. One of the minor poems written about this time in the scazon metre, which had recently been brought to the highest possible perfection by Catullus, tells of his delight at the immediate prospect of entering on the study of philosophy, and of the first stirring of that enthusiasm for philosophical investigation which haunted him through the whole of his life, but never obtained complete realization. At the end of the poem, the real master-passion of his life, the charin of the Muses—'" dulces ante omnia Muse "—reasserts itself.

Our next knowledge of him is derived from allusions to his circuinstances and state of feeling contained in the Lclogues, and belongs to a period nine or ten years later. Of what happened to him in the interval, during which the first civil war took place and Julius Cesar was assassin- ated, we have no indication from ancient testimony or from his own writings. We might conjecture that this was a time of studious leisure passed in his father's house in the country, as the life of Milton was passed after

leaving Cambridge. In 42 s.c., the year of the battle of Philippi, when he was in his 28th year, we find him lead- ing such a life, “ cultivating his woodland Muse,” and enjoying the protection of Asinius Pollio, the governor of the district north of the Po. In the following year the famous confiscations of land for the benefit of the soldiers of the triumvirs took place. Of the impression produced

on Virgil by these confiscations, and of the effect they had on his fortunes, we have a vivid record in the poem which stands first in his collected works. Mantua, in consequence of its vicinity to Cremona, which had been faithful to the cause of the republic, was involved in this calamity; and Virgil's father was driven from the farm which he had acquired by the thrift and industry of his early years. By the influence of his powerful friends, and by personal application to the young Octavianus, already practically master of the Western world, Virgil obtained the resti- tution of his land; but, on attempting to resume posses- sion of it, he was exposed to imminent personal danger, and had to swim across the river to escape from the violence of the soldier to whom it had been allotted. Immediately afterwards he took his father and family with him to the small country house of his old teacher Siron

(" Villula que Sironis eras, et pauper agelle," &c., Catal., x.), which may have become his own by gift or inheritance. Soon afterwards we hear of him living in Rome, enjoying, in addition to the patronage of Pollio, the favour of Mecenas, intimate with Varius, who was at first regarded as the rising poet of the new era, and soon afterwards with Horace, who had just returned from his unfortunate adventure with the army of Brutus. His friendship with Gallus, for whom he indicates a warmer affection and more enthusiastic admiration than for any one else, was formed before his second residence in Rome, in the Cisalpine province, with which Gallus also was connected both by birth and office. The pastoral poems, or " eclogues," as they are usually called, though that name is never given to them by himself, commenced in his native district, were finished and published in Rome, probably in 37 B.c. Soon afterwards he withdrew from habitual residence in Rome, and lived chiefly in Campania, either at Naples or in a country house in the neighbourhood of Nola. He resided also for some time in Sicily; and there is in the fourth Georgic distinct evidence of his familiarity with the neighbourhood of Tarentum. He was one of the companions of Horace in the famous journey to Brundisium ; and it seems not unlikely that, sometime before 23 B.c., he made the

voyage to Athens which forms the subject of the third ode of the first book of the Odes of Horace.

The seven years from 37 to 30 B.c. were devoted to the composition of the Georgics. In the following year he read the poem to Augustus, on his return from Asia. The remaining years of his life were spent on the com- position of the neid. In the course of its composition, in 23 B.c., the year of the death of the young Marcellus, he read three books, the 2nd, 4th, and 6th, to the emperor and the members of the imperial family. In 19 B.c., after the dneid was finished but not finally corrected, he set out for Athens, intending to pass three years in Greece and Asia, and to devote that time to perfecting the workman- ship of the poem. At Athens he met Augustus and was persuaded by him to return with him to Italy. While visiting Megara under a burning sun, he was seized with illness, and, as he continued his voyage without interrup- tion, he grew rapidly worse, and died on the 21st of September, in his fifty-first year, a few days after landing at Brundisium. In his last illness he called for the cases containing his manuscripts, with the intention of burning the Aine. He had previously left directions in his will that his literary executors, Varius and Tucea, should publish nothing of his which had not already been given to the world by himself. This pathetic desire that the work to which he had given so much care, and of which such great expectations were formed, should not survive him has been used as an argument to prove his own

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dissatisfaction with the poem. A passage from a letter of his to Augustus is also quoted, in which he speaks as if he felt that the undertaking of the work had been a mistake. Virgil does not indeed show that sanguine confidence in the result of his labours which Horace expresses on the completion of the three books of lyrical poetry to which he devoted the best years of his life ; but the lines (Zn., ix. 444, &c.),

“ Fortunati ambo si quid mea carmina possunt,” &c., though with less self-assertion, imply a similar assurance that his work would endure as long as the Roman state and empire. The dissatisfaction with his work, increased by the depression of his last illness and the fatigue of the long

tension of mind, heart, and imagination upon it, may more probably be ascribed to his passionate craving for a perfection of workmanship which death prevented him from attaining than to any sense either of the unworthiness of his subject or of his own inadequacy to do justice toit. The commands of Augustus fortunately intervened to prevent the loss of some of the noblest poetry of antiquity and of the most enduring monunient of the greatness and glory of Rome.

He was buried at Naples, where his tomb was long regarded with religious veneration, and visited as a temple. That veneration was a survival of the feeling with which he was regarded in his lifetime, and is greater than what we find attaching to the actual memory of any other ancient poet, though the mystery connected with the personality of Homer excited a greater curiosity. Horace is our most direct witness of the affection which he in- spired among his contemporaries. The qualities by which he gained their love were, according to his testimony, "'candor,"—that sincerity of nature and goodness of heart which, along with "fides" or loyalty, the Romans valued most among the qualities which attach men to one another ; and " pietas,'"—the deep affection for kindred, friends, and country, combined with a reverent spirit, which they prized above all personal qualities. The statement of his biographer, that he was known in Naples by the name " Parthenias," is a testimony to the exceptional purity of his life in an age of licence. These direct testimonies are confirmed by the indirect testimony of his works. Scarcely any poet in any age seems to deserve so high a rank among those whom he himself characterizes as "'pii vates et Phoebo digna locuti." The seclusion of his life and his devotion to his art touched the imagination of his countrymen as the finer qualities of his nature touched the heart of his friends. It had been, from the time of Cicero,! the ambition of the men of finest culture and most original genius in Rome to produce a national literature which might rival that of Greece ; and the feeling that at last a poem was about to appear which would equal or surpass the greatest among all the works of Greek genius found a voice in the lines of Propertius—

"Cedite Romani scriptores, cedite Graii; Nescio quid majus nascitur Iliade."

The feeling which his countrymen and contemporaries entertained towards him seems justified by the personal impression which he produces on modern readers,—an impression of sanctity, as of one who habitually lived in a higher and serener sphere than that of this world. The reverential love inspired by him is something distinct from the affection felt for Horace as a familiar friend, a wise

1 Cf. Tusc. Disp., ii. 2: ' Quamobrem hortor omnes qui facere id possunt, ut hujus quoque generis landem jam languenti Grecie eripiant," &c. These words apply specially to philosophical literature, but other passages in the same and in other works imply that Cicero thought that the Romans had equal aptitudes for other departments of literature ; and the practice of the Augustan poets in each appro- priating to himself a special province of Greek literary art seems to indicate the same ambition.*

counsellor, and genial companion, sharing the ordinary interests and pleasures of life, liable to the same weak- nesses and endeared by the same social charm as those who are best liked in the intercourse of our own day.

Virgil's fame as a poet rests on the three acknowledged works of his early and mature manhood—the pastoral poems or Eclogues, the Georgics, and the neid—all written in that hexameter verse which he received from his immediate predecessors, still lacking something in variety and smoothness of cadence, and which he left to the world, in the words of a poet, who, if any one, is entitled to speak with authority on such a subject,

"The noblest metre ever moulded by the lips of man." But other poems were attributed to him in ancient times, and have been incorporated with his acknowledged works. These are (1) a collection of short poems, under the name "Catalepton," most of them in the style of the short poems of Catullus, and composed in various forms of the iambic metre (chiefly the scazon), and in elegiacs; and (2) some longer poems, the Culex, Ciris, Copa, Moretum, to which sometimes the ina and Dire are added, all with one exception written in hexameters. As the younger Pliny mentions Virgil among the men of grave character by whose authority he justifies

his own occasional indulgence in the composition of slight, playful, and somewhat indecorous verses, it is quite possible that two or three pieces of that kind found in the Catalepton may have been written by Virgil when fresh from the first reading of Catullus. The fifth, written in the couplet most used in the Epodes of Horace, and the most bitter in tone and coarsest in expression, it is im- possible to attribute to him. But there are others among them of which there is no reason to question the authenticity, and which are interesting as an immediate expression of the poet's personal feelings at various periods of his life. Of the longer poems attri- buted to him in ancient times it is clear from internal evidence that the Ciris and Dirx, though belonging to the Augustan age, are not his. The tna has been shown to have been written in the age of Nero. The Moretwm and the Copa are interesting as graphic and sharply defined pictures from common or homely life. But they have nothing in common with the idealizing art of Virgil, and the tone and sentiment of the Copa especially are quite alien from the tone and sentiment of his acknowledged work. But there has been more controversy about the authenticity of the Culex, The ambitious saying, not to apply to it a harsher epithet, attri- buted by his biographer to Lucan, 'et quantum mihi restat ad Culicem," shows that in his time it was believed that Virgil had written a poem of that name. Martial (xiv. 185) writes of a Culex as the undoubted work of Virgil. He believes in it as unhesitatingly as he does in the 'Passer Catulli," and speaks as if it were only the patronage of Meecenas that enabled Virgil to rise to higher themes. Virgil's biographer speaks of the poem as having been written by him at the age of sixteen, though the saying of Lucan seems to imply that he supposed it to have been written when he was ten years older. The poem has no trace of the charm and variety of Virgil's style and rhythm, and is even less like the style and metre of the Eclogues than of his tater poems. On the other hand, there is a techuical correctness and regularity In the metre which was not possible until after the art of V. irgil had made the knack of writing hexameters as attainable by all educated men as the art of Pope made the writing of the heroic couplet; and the writing of such verse seems to have become a regular part of a liberal education. It is to be remembered that in the same soil and under the same air under which the genius of Virgil and Horace expanded to such stately proportions, there was a great undergrowth of minor poets who are the frequent butts of

Horace's good-natured satire. Descriptions of nature to which they were trained by the reading of Lucretius and Virgil, and mythological commonplace, were apparently the chief materials of their verse exercises. The descriptions in the Culex show the care- ful study both of Lucretius and of the Eelogues and Georgics, and, though too diffuse and diluted, are not without a real perception of, and feeling for, Italian nature. But it is very difficult to believe that the poem was ever edited by or acknowledged by Virgil in his life- time, _ Nothing is more alien to his character than such immature ambition, It is difficult also to believe that it is a crude effort of his boyhood, accidentally preserved, and given to the world after his death by an authorized editor. It seems more probable that it is the composition of some young and enthusiastic admirer of Virgil, who, some time after his death, aud, perhaps, after the death of his immediate contemporaries, succeeded in palming off his own imitative concoction as an early composition of the great master. The dedication to the 'revered Octavius," if the person addressed is the " young Augustus," and not the poet and historian mentioned by Horace, and the lines— " Posterius graviore sono tibi musa loquetur Nostra, dabunt cum maturos mihi tempora fructus "»—

seem like not very ingenious artifices to secure acceptance for the Poem, and to represent Virgil as already in boyhood closely con- nected with the future emperor, and conscious of his own genius and

of the great future that awaited both himself and the young friend whom he addresses as "sancte puer."

The pastoral poems or Eelogwes—a word denoting short selected Eelogues.

pieces—were composed between the years 42 and 37 B. c., when Virgil was between the age of twenty-eight and thirty-three. By his invocation to the "Sicelides Muse" and ' Arethusa," by the names " Daphnis"' and " Menalcas," " Thyrsis" and "Corydon," &e., which he gives to his shepherds, by his mention of " Arcadians" and of "Kurotas," and by many other indications, he avows the purpose of eliciting from the strong Latin language the melody which the "Sicilian shepherd" drew out of the 'Doric reed," of peopling the familiar plains and river-banks of his native*

land with the picturesqne figures of the old Greek pastoral, and of express- ing that tender feeling for the beauty of Italian scenes which Theocritus had expressed for the beauty of Sicily. The position of Virgil indicated in the Helogues was not unlike that indicated in the idylls of Theocritus,—that of a youth of genius with all the refinement of a rich culture, but with rustic tastes and habits, living his life among other young poets of his native province, cultivating his art by friendly rivalry with them, and nourishing his genius by communion with the spirit of nature as revealed in the scenes around him and in the melodies of older poets. It was as natural under these circumstances that he should aspire to be the Italian Theocritus as that Horace, with his more social and versatile temperament, and with the more adventurous experience of his youth, should aspire to be the Roman Alceus.

The earliest poems in the series were the second, third, and fifth; and these, along with the seventh, are the most purely Theocritean in character. The first and ninth, which probably were next in order, are much more Italian in sentiment, are much more an ex- pression of the y- oet's own feelings, and have a much more direct reference both to his own circumstances and the circumstances of the time. The first is a true poetical reflex of the distress and confusion which arose out of the new distribution of lands, and blends the poet's own deep love of his home, and of the sights and sounds familar to him from childhood, with his Italian suscepti- bility to the beauty of nature. The ninthis immediately connected in subject with the first. It contains the lines which seem accur- ately to describe the site of Virgil's farm, at the point where the range of hills which accompany the river for some distance from the foot of the Lago di Garda sinks into the plain about 14 or 15 niles above Mantua—

'Qua se subducere colles Incipiunt mollique jugum demittere clivo."

The sixth is addressed to Varus, who succeeded Pollio as governor of the Cisalpine district. Its theme is the creation of the world (according to the Epicurean cosmogony), and the oldest tales of mythology.! The fourth and eighth are both closely associated with the name of Virgil's earliest protector, Pollio. The fourth celebrates the consulship of his patron in 40 B.c., and perhaps also the birth of his son, though it was disputed in

antiquity, and still is disputed, who was meant by the child whose birth was to be coincident with the advent of the uew era, and who, after filling the other great offices of state, was to " rule with his father's virtues the world at peace." The main purpose of the poem, however, is to express, in connexion with pastoral associations, the longing of the world for a new era of peace and happiness, of which the treaty of Brundisium seemed to hold out some definite hopes. There is no trace in this poem of Theocritean influence. The rhythm recalls the stately monotonous movement of the longest poem of Catullus, not the vivacity of the idyllic rhythm. The ideas are derived partly from Greek representations of the Golden Age, and partly, it is sup- posed, from the later Sibylline prophecies, circulated after the burning in the time of Sulla of the old Sibylline books, and pos- sibly tinged with Jewish ideas. Some of the phraseology of the poem led toa belief in the early Christian church that Virgil had been an unconscious instrument of inspired prophecy. The date of the eighth is fixed by a reference to the campaign of Pollio against the Dalmatians in 39 B.c. It is founded on the dapyareurpla of Theocritus, but brings before us, with Italian associations, two love tales of homely Italian life. The tenth reproduces the Daphnis of Theocritus, and is a dirge over the unhappy love of Gallus and Lycoris. As in the other poems, the second and eighth, of which love is the burden, it is to the romantic and fantastic melancholy which the passion assumes in certain natures that Virgil gives a voice. Nothing can be more unreal than the association of such a feeling with an ordinary Jiaison like that of Gallus, the adventurous and ambitious soldier, and Cytheris, the notorious actress and discarded mistress of Antony. But there is no representation in ancient poctry of an_ ideal and chivalrous passion so tender and true as that of the Gallus of Virgil.

There is no important work in Latin literature, with the excep- tion of the comedy of Terence, so imitative as the Helogues. But they are not, like the comedies of Terence, purely exotic as well as imitative. They are rather composite, partly Greek and partly "1 In the Georgics also Virgil attempts to combine science with the poetic fancies which filled its place in older times.

eorgics,

Italian, and, as a vehicle for the expression of feeling, hold an undefined place between the objectivity of the Greek idyll and the subjectivity of the Latin elegy. For the most part, they express the sentiment inspired by the beauty of the world, and the kindred sentiment inspired by the charm of human relationships. Virgil's susceptibility to the beauty of nature was fostered by the sympa- thetic study of Theocritus, but it was also native to himself. The originality of his representation appears in the truth with which it suggests the eharm of Italy—the fresh and tender life of an Italian spring, the grace and delicate hues of the wild flowers, and the quiet beauty of the green pastures and the rich orchards of his native district. The representative character of the poems is en- hanced by the fidelity and grace with which he has expressed the Italian peasant's love of his home and of all things associated with it. But, whatever detraction may have to be made from the originality of the substance and form of these poems, the supreme charm of the medium of diction and rhythm through which the poet's feeling has found utterance is universally recognized. The power of varied harmony is as conspicuous in Virgil's earliest poems as in the maturer and more elaborate workmanship of the Georgics and 4fneid. The Italian language, without sacrifice of the fulness, strength, and majesty of its tones, acquired a more tender grace and more liquid flow, which reappeared long after in the poets of modern Italy, from the gift—the " molle atque facetum "— whieh the Muses of country life bestowed on Virgil.

But these Muses had a more serious and dignified function to fulfil than that of glorifying the picturesque pastime, the "dolco far niente," the "otia dia," of rural life. The Italian imagina- tion formed an ideal of the happiness of a country life nobler than that of passive susceptibility to the sights and sounds of the out- ward world. In the idyllic picture in which Horace enumerates the various delights of the countryman's condition (Zpode 2), while tho pleasures to eye and ear are not wanting, more stress is laid on the labours by which man co-operates with nature, and on the joy with which he contemplates the results of his toil. It was the aim of the more serious Roman writers to invest objects which minister to practical utility with the glory and charm of poetry. Suctonius tells us that

Augustus valued nothing so much in litera- ture as "preeepta et exempla publice vel privatim salubria."' It is stated that Macenas, acting on the principle of employing the poets of the timo in favour of the conservative and restorative poliey of the new government, directed the genius of Virgil to the subject of the Georgics. From a moral, social, and national point of view, no object could be of more consequence in the eyes ofa statesman whose master inherited the policy of the popular leaders than the revival of the great form of national industry, associated with the older and happier memories of Rome, which had fallen into abeyance owing to the long unscttlement of the revolutionary era as well as to other causes. Virgil's previous life and associations made it natural for him to identify himself with this object, while his genius and artistic accomplishment fitted him to enlist the imagination of his countrymen in favour of so great a practieal reform. It would be a most inadequate and false view of his purpose to suppose that, like the Alexandrian poets or the didaetic poets of modern times, he desired merely to maké useful information and practical precepts more attractive by the aid of poetical rhythm and diction. His aim was rather under the form of practical instruction to describe with realistic fidelity, and at the same time to surround with an atmosphere of idealizing oetry, the annual round of labour in which the Italian yeoman's life was passed ; to bring out the intimate relation with the manifold aspects and processes of nature into which man was brought in the course of that life, and to suggest the delight to heart and imagination which he drew from it; to contrast the simplicity, security, and sanctity of such a life with the luxury and lawless passions of the great world; and to associate the ideal of a life of rustic labour with the varied beauties of Italy and the historic glories of Rome. Thus a speculative and religious, an ethical and patriotic, niotive enlarges and supersedes the apparent motive of conveying instruc- tion. This larger conception of the dignity of his subject separates the didactie poem of Virgil from all other didactic, as distinct from philosophic, poems. He has produced in the Georgics a new type of didaetic, asin the Zneid he has produced a new type of epic, poetry

The subject which is unfolded in the four opening lines— ;

- *Quid faciat letas segetes, quo sidere terram Vertere, Maecenas, ulmisque adjungere vites Conveniat ; que cura boum, qui cultus habendo Sit pecori, apibus quanta experientia parcis ”— is treated in four books, varying in length from 514 to 566 lines. The first treats of the tillage of the fields, of the constellations. the rise and setting of which form the farmer’s calendar, and of the signs of the weather, on which the success of his labours largely depends. The second treats of the cultivation of trees, and especially of the vine and olive, two great staples of the national wealth and industry of Italy ; the third of the rearing of herds and flocks and the breeding of horses; the fourth of the tending of bees. The treatment of these homely subjects is relieved by*

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various episodes, introduced at various places, but mainly at the end of the different books, which serve to bring out the intimate connexion of his theme with his national and ethical purpose.

As he had found in Theocritus a model for the form in which his idler fancies were expressed, he turned to an older page in Greek literature for the outline of the form in which his graver interest in rural affairs was to find its outlet; and, though the /Vorks and Days of Hesiod could not supply an adequate mould for the systematic treatment of all the processes of rural industry, and still less for the treatment of the larger ideas to which this systematic treatment of the subject is subsidiary, yet that Virgil considered him as his prototype is shown by the line which concludes one of the cardinal episodes of the poem—

- *Ascreeumque cano Romana per oppida carmen.”*

By the use which he makes of his quaint phraseology Virgil attracts attention to the relation which he wishes to establish between himsclf and Hesiod; and in the religious spirit with which they cach regard man’s labours and condition in the world there is a real affinity between the primitive Beotian bard and the refined artist of the Augustan age. Virgil accepts also the guidance of other models of the decadence of Greek literature, the Alexandrian poets who treated the science of their day—

astronomy, natural history, and geography—in the metre and diction of epic poetry. But, in avail- ing himself of the work of the Alexandrians, Virgil is like a great master making use of mechanical assistants. From the compari- son of passages in the Gcorgics with passages in those authors which suggested them, we learn to appreciate the immeasurable superiority of the poetical language of Rome at the maturity of its development over the exotic diction produced in the decay of Greek creative imaginatiou. But a more powerful influence on the form, ideas, sentiment, and diction of the Gcorgics was exercised by the great philosophical poem of Lucretius, of which Virgil had probably been a diligent student since the time of its first appear- ance, and with which, in the phrase of the English editor of the older poet, his mind was "saturated" when he was engaged in the composition of the Gcorgics. In Virgil we find the spirit of Hesiod in conflict with the spirit of Lucretius. He is at once attracted and repelled by the genius and attitude of the philosophic poct. He is possessed by his imaginative conception of nature, as a living all-pervading power ; he shares with him the Italian love of the beauty of the world, and the pathetic sympathy with animal as well as human life. He recognizes with enthusiasm his contem- plative elevation above the petty interests and passions of life. But he is repelled by his apparent separation from the ordinary beliefs and pleasures, the hopes and fears, of his fellow men. Virgil is in thorough sympathy with the best restorative tendencies—religious, social, and national—of his time; Lucretius was driven into isolation by the anarchic and dissolving forces of his.

So far as any speculative idea underlying the details of the Georgics can be detected, it is one of which the source can be traced to Lucretius—the idea of the struggle of human force with the forces of nature. In Virgil this idea is modified by Italian piety and by the Italian delight in the results of labour. In the general plan of the poem, and the systematic arrangement of his materials, Virgil follows the guidance of Lucretius rather than of any Greek model. The dedication and personal appeals to Maecenas are parallel to those addressed to Memmius. The distinction between a poem addressed to national and one addressed to philosophical sympathies is marked by the prominence assigned in the one poem to Cesar as the supreme personality of the age, in the other to Epicurus as

the supreme master in the realms. of mind. The invocation to the "Di agrestes," to the old gods of mythology and art, to the living Cesar as the latest power added to the pagan Pantheon, is both a parallel and a contrast to the invoeation to the all-pervading prineiple of life, personified as "'Alma Venus." In the systematic treatment of his materials, and the interspersion of episodes dealing with the deeper poetical and human interest of the subject, Virgil adheres to the practice of the older poet. He makes use of his connecting links and formulas, such as "principio," "quod superest," "his animadversis," "nune age," &c. Virgil indeed uses these more sparingly, so as to make the logical mechanism of the poem less rigid, while he still keeps up the liveliness of a personal address. He shows his artistic superiority by passing lightly over details which it is impossible to invest with beauty. All his topies admit of being vitalized by attributing the vivacity of human relationships and sensibility to natural processes, and by association with the joy which the ideal farmer feels in the results of his energy. Much of the argument of Lucretius, on the other hand, is as remote from the geuial presence of nature as from human associations. Virgil makes a much larger use thau Lucretius of ornament borrowed from older poetry, art, seience, and mythology. There is uniformity of chastened excellence in the diction and versi- fication of the Gorgics, contrasting with the imaginative force of isolated expressions and the majesty of isolated lines and passages in Lucretius. The "vivida vis" of imagination is more apparent in the older poet; the artistic perfection of Virgil is even more conspicuous in the Geargics than in the Eclogues or the Avneid.

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Tho principal episodes of the poem, in which the true dignity and human interest of the subject aro brought out, occur in the first and second books. Other shorter episodes interspersed through the different books add{variety to the didactic disquisition. These episodes, as is the case still more with the episodes of Lucretius, are not detached or isolated ornaments, but give a higher unity to the poem, and are the main ground of its perma- nent hold upon tho world. There is indeed one marked

exception to thisrule. The long episode with which the whole poem ends, — the tale of the shepherd Aristens, with which is connected the more poetical fable of Orpheus and Eurydice, has only the slightest connexion with the general ideas and sentiment of the

oem. Itis altogether at variance with the truthful realism and the Italian feeling which prevade it. If we suppose that Virgil originally thought it necessary to relieve the interest and keep the attention of his readers by appealing to their taste for those mythological tales, which iu an earlier part of the poem he had decried as "omnia jam volgata," it would be difficult to acquit even so great an artist of some forgetfulness of tho requirement of unity of impression in a work of art, cspecially in such a " templum de marmore"' as the Georgics. But we are distinctly told that the conelnding episode, from the middle-till the end of the fourth book, had contained the praises of Gallus, the friend of Virgil's youth, who, about the time when Virgil was finishing the pocm, had gained distinction in the war against Cleopatra, and had in consequence been made the first governor of tho new province of Egypt. It is difficult to see how such a statement could have been invented if it were not true. Such a conclusion might well have been in keeping with the main purpose of the poem. As the first book ends with a dirge over the national fortunes before the outbreak of the war with Antony and Cleopatra, the last book might well havo ended with a hymn of triumph over the successful end of that war, in which the hero of Virgil's youthful enthusiasm played so distinguished a part. After the fall of Gallus, owing to his ambitious failure in his Egyptian administration, and his death in 26 B.c., the poet, according to the story, in obedience to the command of the emperor, substituted for this encomium the beautiful but ir- relevant fable of Orpheus and Eurydice, in which he first dis- played the narrative skill, the pathos, and the magical power of making the mystery of the unseen world present to the imagin- ation, which characterize the neid.

The cardinal episodes of the poem, as it now stands, aro the passages in bk. i. from line 464 to the end, and in bk. ii. from 136 to 176 and from 475 to 542. The first, introduced in connexion with the signs of the weather, recounts the omens which accom- panied the death of Julius Cesar, and shows how the misery of Italy and the neglected state of the fields, for

which the poem secks to find a remedy, are the punishment for the great sin of the previous generation. In the second of these passages tho true key- note of the poem is struck in the invocation to Italy—

‘ Salve, magna parens frugum, Saturnia tellus, Magna virum.,*

The thought of the varied beauties of the land, of the abundance and variety of its products, of its ancient cities and mighty works of man, its brave and hardy races, the great men and great families who had fought for her and saved her in old times, and of him, the greatest among her sons, who was then defending Rome against her enemies in the farthest East, inspires the poet, and gives dignity to the trivial details which seem sometimes to clog his high ambition. But a still higher and more catholic interest is given to the subject in the greatest of the episodes,—the most perfect passage in all Latin poetry,—that from line 458, “O fortu- natos nimium,” to the end. The subject is there glorified by its connexion not only with the national wellbeing but with the highest life and purest happiness of man. Aun ideal is held up to the imagination in which the old realistic delight in the labours of the field blends with the new delight in tho beauty of nature, and 1s associated with that purity and happiness of family life which was an Italian ideal, and with the poetry of thosc religious beliefs and observances which imparted a sense of security, a constantly pring charm, and a bond of social sympathy to the old rustic ife,

The Georgics is not only the most perfect in art, but is tho most native in sentiment and conception of all the works of the ancient Italian genius. It is essentially Italian in idea, in detail, in religious and ethical feeling, in colouring and sentiment, in its Solid and massive composition. Though tho form was borrowed from the Greek, yet we have to remember that it was only by becoming a province of Roman art that the didactic poem acquired dignity and the capacity of treating a great theme. Even where

€ borrows from Greek originals, Virgil, like a conqueror, makes the Greek mind tributary to his national design. The Georgies, the poem of the land, is as essentially Italian as the Odyssey, the poem of tho sea, is essentially Greek. Nature is presented to us as she is revealed in the soft and rich Inxnrianco of Italian land- Scape, not in the clearly defincd forms of

Greek scenery. The ethical and religious ideal upheld is an Italian one. As a work of

art, while showing in the largest degree the receptivity of the Greek feeling for form and symmetry which was the primary con- dition of all Roman success in literature, the poem shows equally the Italian susceptibility to the beauty of the outward world, the dignity and sobriety of the Italian imagination, the firm and enduring structure of all Roman workmanship.

The work which yet remained for Virgil to accomplish was the dneid.

*addition of a great Roman epic to literature. This had been the earliest effort of the national imagination, when it first departed from the mere imitative reproduction of Greek originals. The work which had given the truest expression to the genius of Rome before the time of Virgil had been the Annales of Ennius. This work had becn supplemented by various historical poems but had never been superseded. It satisfied the national imagination as an expression of the national life in its vigorous prime, but it could not satisfy the newly developed sense of art; and the expansion of the national life since the days of Ennius, and the changed con- ditions into which it passed after tho battle of Actium, demanded a new and ampler expression. It had been, as wo learn both from his biographer and from himself— ** Cum canerem reges et preelia"—*

Virgil's earliest ambition to write an heroic poem founded on the traditions of Alba Longa; and he had been repeatedly urged by Augustus to celebrate his exploits. The problem before him was to compose a work of art on a large scale, which should represent a great action of the heroic age, and should at the same time embody the most vital ideas and sentiment of the hour,—which in substance should glorify Rome and the present ruler of Rome, while in form it should follow closely the great models of epic poetry and repro- duce all their sources of interest. It was his ambition to be the Ifomer as he had been the Theocritus and Hesiod of his country.

Various objects had thus to bo combined in a work of art on the model of the Greek epic :—the revival of interest in the heroic fore- time; the

satisfaction of the national and imperial sentiment; the expression of the enthusiasm and of the deeper eurreuts of emotion of the age; the personal celebration of Augustus. A new type of epic poetry had to be created, as a new type of didactic poetry had been realized in the Georgics. It was desirable to select a single heroic action which should belong to the cycle of legendary events celebrated in the Homeric poems, and which should be associated with the whole fortunes of Rome and with the supreme interests of the hour. The only subject which in any way satisfied theso apparently irreconcilable conditions was that of the wanderings of /éncas and of his final settlement in Latium. The story, though not of Roman origin but of a composite growth, had been familiar to the Romans from the beginning of their literature, and had been recognized by official acts of senate and people as associated with the national fortunes. The subject enabled Virgil to tell over again and to give novelty to the tale of the fall of Troy, and to tell a tale of sca-adventure similar to that of the wanderings of Odysseus. But the special applicability of his subject to his purposes was determined by the claim which tho Julii, a patrician family of Alban origin, made to descent from Iulus, the supposed son of /fneas and founder of Alba Longa. The personal, as distinct from the national and artistic, motives of the poem could be satisfied by this subject alone.

The dneid is thus at once the epic of the national life under its new conditions and an imitative epic of human actions, manners, and character. The true keynoto of the poem is struck in the line with which the proem closes—

"« Tantz molis erat Romanam condere gentem."

The idea which underlies the whole action of the poem is that of the great part played by Romo in the history of the world, that part being from of old determined by divine decree, and carried out through the virtuo of her sons. The idea of universal empire is thus the dominant idea of the poem. With this idea that of the unbroken continuity of the national life is intimately associated. The reverence for antiquity, for old customs and the traditions of the past, was a large element in the national sentiment, and has a prominent place in tho 4¥neid. So too has the fecling of local attachment and of the power of local association over the imagina- tion.

This feeling is specially appealed to in the eighth book, which has been called the most purely Roman in the poem. The pocm is also characteristically Roman in the religious belief and observ- ances which it embodics. Behind all tho conventional and artistic machinery of the old Olympic gods there is the Roman apprehen- sion of a great inscrutable power, manifesting itself by arbitrary signs, exacting jealously certain observances, alienated for a tiie by neglect, and again appeased by compliance with its will, working out its own secret purposes through the agency of Roman arms and Roman counsels.

The word by which Virgil recognizes this power is Fatum (or Fata in the plural). The hero of the Wneid 1s an instrnment in their hands, and the living emperor is regarded as fulfilling the same.function in the actual world. The predominauce of this idea gives coherence to the aetion, and establishes its relation to the whole national life. The poem is thus a religious as well as a

national epic, and this explains the large part played in the develop- ment of the aetion by special revelation, omens, prophecies, cere- monial usages, and prayer. But, while the predominant religions idea of the poem is that of a divine purpose carried out regardlessly of human fecling, in other parts of the poem, and especially in that passage of the sixth book in which Virgil tries to formulate his deepest convictions on individual destiny, the agency of fate seems to yield to that of a spiritual dispensation, awarding to men their portions according to their actions. ‘ :

The idealization of Augustus is no expression of servile adulation. It is through the prominence assigned to him that the pocm is truly representative of the critical epoch in human affairs at which it was written. The cardinal fact of that epoch was the substitution of personal rule for the rule of the old commonwealth over the Roman world. Virgil shows the imaginative significance of that fact by revealing the emperor as chosen from of old in the counsels of the supreme ruler of the world to fnlfil the national destiny, as the descendant of gods and of heroes of old poetic renown, as one, moreover, who, in the actual work done by him, as

victor in a great decisive battle between the forces of the Western and the Eastern world, as the organizer of empire and restorer of peacc, order, aud religion, had rendered better service to mankind than any one of the herocs who in an older time had been raised for their great deeds to the company of the gods.

Virgil's true and yet idealizing interpretation of the imperial idea of Rome, in its national, religious, and personal significance, is the basis of the monumental greatness of the d/neid as a represent- ative poem. It is on this representative character and on the excellence of its artistic execution that the claim of the neid to rank as one of the great poems of the world mainly rests. The inferiority of the poem to the J/iad and the Odyssey as a direct representation of human life is so unquestionable that we are in greater danger of underrating than of overrating the real though secondary interest which the poem possesses as an imitative epic of human action, manners, aud character. What are the main sources of human interest in the poem can only be briefly indicated. In the first place, the action is chosen not only as suited to embody the idea of Rome and the dominant sentiment of a great and critical epoch in human affairs, but as having a peculiar nobleness and dignity of its own. It brings before us the spectacle, but restored by the light of a romantic imagination cast upon dim traditions, of the destruction of the city of greatest name in poetry or legend, the supposed seat of a prehistoric empire, of the foundation of the imperial city of the Western seas, in which Rome had encountered her most powerful and dangerous antagonist in the whole course of her long struggle for supremacy, and that of the first rude settle- ment on the hills of Rome itself. The scenes through which the action 'is carried are familiar, yet full of great memories and associ- ations, —Troy and its neighbourhood, the seas and islands of Greece, the coasts of Epirus, familiar to all travellers between Italy and the East, Sicily, the site of Carthage, Campania, Latium, the Tiber, and all the country within sight of Rome. The personages of the action are prominent in poetry and legend, or by their ethnical names stir the sentiment of national enthusiasm,—neas and Anehises, Dido, Acestes, Evander, Turnus. The spheres of activity in which they are engaged are war and sea-adventure, the themes of the oldest and greatest of epie poems. The passion of love, which had played a great part in Attic tragedy

and in the epic and elegiac poets of Alexandria, is a powerful addition to the older sources of interest which Virgil derives from the Homeric poems. The Zncid, like the Alexandrian epic, revives, by a conventional compromise be- tween the present and the remote past, some image of the old romance of Greeee; it creates the romance of 'that Italy for which Camilla the virgin, Euryalus, and Turnus and Nisus died of wounds." It might be said of the manner of life represented in the dineid, that it is no more true to any actual condition of human society than that represented in the Eclogues. But may not the same be said of all idealizing restoration of a remote past in an age of advanced civilization? The life represented in the Gdipus Tyrannus or in King Lear is not the life of the Periclean nor of the Elizabethan age, nor is it conceivable as the real life of a prehistoric age. The truth of such a representation is to be Judged, not by its relation to any actual state of things ever realized in the world, but by its relation to an ideal of the imagination a the ideal conception of how man, endowed with the gifts and graces of a civilized time, but who had not yet lost the youthful buoyancy of a more primitive age, might play his part under circumstances which would afford scope for the passions and activities of a vigorous personality, and for the refined emotions and subtle reflexion of an era of high intellectual and moral cultivation. The verdict of most readers of the 4neid will be that Virgil does not satisfy this condi- tion, as it is satisfied by Sophocles and Shakespeare. Yet there is a considerable attraction in the compromise which Virgil has pro- duced between the life which he knew by experience and that which he saw in the past of his imagination. There isa courtesy dignity, and consideration for the feelings of others in t

lity, ¢ he ma of his chief personages, such as might be exhibited by the abla

_by her "false friend."

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and most commanding natures in an age of chivalry and in an age of culture. The charm of primitive simplicity is present in some passages of the £neid, the spell of luxurious pomp in others. The actual delight of voyaging past beautiful islands, familiar to travellers in the Augustan age,

is enhanced by the suggestion of the adventurous spirit which sent the first explorers abroad in. search of unknown settlements. Where Virgil is least real, and least successfully ideal, and where consequently he is most purely imitative, is in the battle-scenes of the later books. They afford scope, however, to his patriotic desire to do justice to the martial energy of the Italian raees; and some of them have a peculiar beauty from the pathos with which the death of some of the more interesting personages of his story is deseribed.

But the adverse eriticisms of the #neid are chiefly based on Virgil's supposed failure in the crucial test of a great poem of action, the creation of character. And his chief failure is pro- nounced to be in the protagonist of the poem, the " pious Aineas." Is this charge truc? Is Aineas a worthy and interesting hero of a great poem of action? Not, certainly, according to the ideals realized in Aehilles and Odysseus, nor according to the modern ideal of gallant and adventurous heroism. A blameless character, patiently enduring much suffering, cannot arouse the same personal interest as a more energetic and impulsive character, relying on his own resources, and stirred by ordinary human passions. It is well said of Aineas by a French critic—"Sa vertu doit étre une haute et froide impersonalité, qui fasse de lui non un homme mais un instrument des dieux." Virgil wishes to hold up in Aneas an ideal of pious obedience, steadfast endurance, persistent purpose, — a religious ideal belonging to the ages of faith combined with the humane and self-sacrificing qualities belonging to an era of moral enlightenment. The virtues of the natural man—chivalry and daring courage—he represents in Turnus. His own sympathy is with his religious ideal rather than with that which better satisfies modern sentiment, nursed on the traditions of chivalrous romance. Yet that there was in his own imagination, more than in that of any other Roman writer, a ehord responsive to the chivalrons emotion of a later time is seen in the love and pathos which he has thrown into his delineations of Pallas, Lausus, and Camilla. But, with all his sympathies with the "Itala virtus "—the martial virtues of the old Italian racc and the martial prowess of Rome,— he felt that the deepest need of his time was not military glory, but peace, reconciliation, the restoration of law, order, and piety.

Among the personages of the Zed the only one which entitles Virgil to rank among great creators is Dido, an ideal of a true queen and a true woman. She is the sole creation which Roman poetry has added to the great gallery of men and women filled by the imaginative art of different times and peoples. There are the out- lines of a great creation in Mezentius; but Dido alone is a life-like and completed picture. On the episode of which she is the heroine the most passionate human interest is concentrated. It has been objected that Virgil does not really sympathize with his own ereation, that he gives his approval to the cold desertion of her Whether he sympathizes with his own creation or not, he is entirely possessed by it. If he does not eon- demn his hero, he sees in the desertion and death of Dido a great tragie issue in which a noble and generous nature is sacrificed to the larger purpose of the gods. But that Virgil really sympathized with the ereation of his imagination appears, not only in the sym- pathy which she still inspires, but in the part which he assigns to her in that shadowy realm in which he conceives that the "world's great wrongs" are at last righted—

*'*Conjunx ubi pristinus illi Respondet curis, equatque Sychzus amorem."*

Even those who have been insensible to the representative and to the hnman interest of the @Zneid have generally recognized the artistic excellence of the poem. This is conspicuous both in the conception of the action and the arrangement of its successive stages and in the workmanship of details. In variety of interest and finish of execution the first eight books are superior to the last four. Each of the former has a large and distinct sphere of interest, and they each eontribute to the impression of the work as a whole. In the first book we have the interest of the storm, of the prophecy of Jove, and of the building of Carthage ; in the second the spectacle of the destruetion of Troy; in the third the voyage among the islands and coasts of the Mediterranean; in the fourth the tragedy of Dido; in the fifth the rest in the Sicilian bay, at the foot of Mount Eryx; in the sixth the revelation of the spiritual world of Virgil's imagination, and of the souls of those who built up the greatness of Rome in their pre-existent state, in their shadowy dwelling-place ; in the seventh the arrival of the Trojans at the mouth of the Tiber and the gathering of the Italian clans; in the eighth the first sight of the hills of Rome, and the

prophetic representation of the great crises in Roman history, leading up to the greatest of them all, the crowning victory of Actium. Among these books we may infer that Virgil assigned the palm to the second, the fourth, and the sixth, as he selected them to read to Augustus and the members of the imperial family. The interest flags in the last

four; nor is it possible to feel that culminating sympathy with the final eombat between Turnus and Aineas that we feel with the combat between Hector and Achilles. Yet a personal interest is awakened in the adventures and fate of Pallas, Lausus, and Camilla. Virgil may himself have become weary of the succession of battle- seenes—"eadem horrida bella,"—which the requirements of epic poetry rather than the impulses of his own genius or the taste of his readers called upon him to pourtray; and this may partly account for the sense of discouragement which he is supposed to have felt at the end of his labours. There is not only a less varied interest, there is greater inequality of workmanship in the later books, owing to the fact that they had not received their author's final revisal. Yet in them there are many lines and passages of great power, pathos, and beauty. Virgil brought the two great instruments of varied and continuous harmony and of a rich, chastened, and noble style to the highest perfection of which the Latin tongue was eapable. The rhythm and style of the neid is more unequal than the rhythm and style of the Georgics, but is a larger and more varied instrument. The note of his supremacy among all the poetic artists of his country is that subtle fusion of the music and the meaning of language which touches the deepest and most sccret springsofemotion. He touches especially the emotions of reverence and of a yearning for a higher spiritual life, and the sense of noble- ness in human affairs, in great institutions, and great natures; the sense of the sanctity of human affections, of the imaginative spell exercised by the past, of the mystery of the unseen world. This is the seeret of the power which his words have had over some of the deepest and greatest natures both in the ages of faith and in more positive times. No words more subtly and truly express the magic of his style than those in which Dr Newman characterizes 'his single words and phrases, his pathetic half-lines, giving

utterance as the voice of nature herself to that pain and weariness, yet hope of better things, which is the experience of her children in every age.

"The most important of the recent editions of Virgil are those of Heyne and the revised edition by Wagner, that of Forbiger, of Kitbeck, of E. Benoist, and of Conington. Among recent works bearing on the literary criticism of Virgil arc Sainte-Beuve's Etude sur Virgile, M. G. Boissier's La Religion Romaine d' Auguste aur Antonins, Comparctti's Virgilio nel Medio Evo, Vergil und die epische Kunst, by Theodor Pliiss, various works by Prof. Nettleship, and Prof. Sellar's Roman Poets of the Augustan Age. Thc best critical estimate of the genius and art of Virgil in English is that of Mr F. Myers. Among recent translations of the Aineid are those of Conington, Mr W. Morris, and Lord Justice Bowen in verse, and of Conington and Mr J. W. Mackail in prose. CWeevsS:)

VIRGIL, PotyporeE (c. 1470-1555), author of the /is- toma Anglica, otherwise known as P. V. CasTELLENSIS, was a kinsman of Cardinal Hadrian Castellensis, a native of Castro in Etruria. His father's name is said to have been George Virgil; his great-grandfather, Anthony Virgil, "a man well skilled in medicine and astrology," had pro- fessed philosophy at Paris, as did Polydore's own brother and protégé, John Matthew Virgil, at Pavia, in 1517. A third brother was a London merchant in 1511. Polydore is said to have been educated at Bologna, and was probably in the service of Guido Ubaldo, duke of Urbino, before 1498, as in the dedication of his first work, Liber Proverbiorum (April 1498), he styles himself this prince's client. Polydore's second book, De Inventoribus Rerum, is dedicated to Guido's tutor, Ludovicus Odaxius, from Urbino, in August 1499. After being chamberlain to Alexander VI. he came to England in 1501 as deputy col- lector of Peter's pence for the cardinal. As Hadrian's proxy, he was enthroned bishop of Bath and Wells in October 1504. It was at Henry VII.'s instance that he commenced his Historia Anglica—a work which, though seemingly begun as early as 1505, was not completed till August 1533, the date of its dedication to Henry VIII, nor pub- lished till 1534. In May 1514 he and his patron the cardinal are found supporting Wolsey's claims to the cardinalship, but he had lost the great minister's favour before the year was out. A rash letter, reflecting severely on Henry VIII. and Wolsey, was intercepted early in 1515, after

which Polydore was cast into prison and supplanted in his collectorship (March and April). He was not without some powerful supporters, as both Catherine de' Medici and Leo X. wrote to the king on his behalf. From his prison he sent an abject and almost blasphemous letter to the offended minister, begging that the fast approaching Christmas—a time which witnessed the restitution of a World—might see his pardon also. He was set at liberty

before Christmas 1515, though he never regained his col- lectorship. In 1525 he published the first edition of Gildas, dedicating the work to Tunstall, bishop of London. Next year appeared his Liber de Prodigiis, dedicated from London (July) to Francesco Maria, duke of Urbino. Somewhere about 1538 he left England, and remained in Italy for some time. Il-health, he tells us, forbade him on his return to continue his custom of making daily notes on contemporary events. About the end of 1551 he went honie to Urbino, where he appears to have died in 1555. He had been naturalized in October 1510, and had held several clerical appointments in England. In 1508 he was appointed archdeacon of Wells, and in 1513 prebendary of Oxgate in St Paul's Cathedral, both of which offices he held after his return to Urbino.

The first edition of the Historia Anglica (twenty-six books) was printed at Basel in 1534; the twenty-seventh book, dealing with the reign of Henry VIII. down to the birth of Edward VI. (October 1536), was added to the third edition of 1555. Polydore claims to have been very careful in collecting materials for this work, and takes credit for using foreign historians as well as English ; for which reason, he remarks, the English, Scotch, and French will find several things reported in his pages far differently from the way in which they are told in current national story. In his searcli after information he applied to James IV. of Scotland for a list of the Scottish kings and their annals; but not even his friendship for Gavin Douglas could induce him to give credit to the historical notions of this accomplished bishop, who traced the pedigree of the Scots down from the banished son of an Athenian king and Scotta the daughter of the Egyptian tyrant of the Israelites. A similar scepticism made him donbt the

veracity of Geoffrey of Monmouth, and thus called forth Leland's Defensio Gallofridi and Assertio Incomparabilis Arturti. This doubting instinct led to his being accused of many offences against learning, such as that of burning cartloads of MSS. lest his errors should be discovered, of purloining books from libraries and shipping them off by the vesselful to Rome. As a matter of fact, it is of course mainly from the time of Henry VI., where our contemporary records begin to fail so sadly, that Polydore's work is useful. He must have been personally acquainted with many men whose memories could carry them back to the be- ginning of the Wars of the Roses. Dr Brewcr speaks somewhat harshly of him as an authority for the reign of Henry VIII., and indeed his spite against Wolsey is evident; but it is impossible to read his social and geographical accounts of England and Scotland without gratitude for a writer who has preserved so many interest- ing details. Polydore's Adagia (Venice, April 1498) was the first collection of Latin proverbs ever printed; it preceded Erasmus's by two years, and the slight misunderstanding that arose for the moment out of rival claims gave place to a sincere friendship. A second series of Biblical proverbs (553 in number) was dedicated to Wolsey's follower Richard Pace, and is preceded by an interesting letter (June 1519), whieh gives the names of many of Polydore's English friends, from More and Archbishop Warham to Linacre and Tunstall. The De Jnventoribus, treating of the origin of all things whether ecclesiastical or lay (Paris, 1499), originally consisted of only seven books, but was increased to eight in 1521. It was exceedingly popular, and was early translated into French (1521), German (1537), English (1546), and Spanish (1551). All editions, however, except those following the text sanctioned by Gregory XIII. in 1576, are on the Index Expurgatorins. The De Prodigtis also achieved a great popularity, and was soon translated into Italian (1548), English (1546), and Spanish (1550). This treatise takes the form of a Latin dialogue between Polydore and his Cambridge friend Robert Ridley. It takes place in the open air, at Polydore's country house near London. Polydore's duty is to state the problems and supply the historical illustrations; his friend's to explain, rationalize, and depreciate as best he can. Here, as in the Historia Anglica, it is plain that the writer plumes himself specially on the excellence of his Latin, which in Sir Henry Ellis's opinion is purer than that of any of his contemporaries.

VIRGINAL. See Pranororrs, vol. xix. pp. 67, 68.

VIRGINIA, one of the original thirteen States of the Plate North American Union, extends from 36° 31’ to 39° 27’ VIL

N. lat., and from 75° 13’ to 83° 37’ W. long. It is rudely triangular in form,—its southern boundary, the base of the triangle, a nearly east to west line, being 440 miles long, the north-western 565, the northern and north-eastern 230, and the eastern 125 miles. On the S. it is bounded by North Carolina and Tennessee, on the W. and N.W. by Kentucky and West Virginia, on the N. and N.E. by

Physical features.

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Maryland, and on the E. by the Virginian Sea of the Atlantic Ocean. Its greatest length from east to west 1s 476 miles, its greatest breadth from north to south 192 wiles. It is subdivided into 100 counties. The area is variously stated at about 44,500 and 42,450 square miles ; the latter extent is that given at the census of 1880. Of the 1,512,565 inhabitants of Virginia (1,059,034 of them over ten years of age) in 1880, 494,240 were engaged in gainful occupations,—254,099, or over 50 per cent., in agriculture, 30,418 in trade and transportation, and 63,059 in manufactures and mining and mechanical industries; but now (in 1888) a very much larger proportion of the industrial population is engaged in mining, manufacturing, trade, and transportation, in consequence of the opening of mines, the erection of blast-furnaces, coke ovens, and various manufacturing establishments since 1880.

Physical Features.—Speaking broadly, Virginia may be divided into a lowland and a highland country. Its south-eastern part—over 23,000 square miles, or more than half of the whole—has the aspect of a broadly undulating plain, that, with but few marked variations of relief, rises from the sea-level to from 400 to 800 feet above it. The north-western portion is a region composed of approximately parallel mountain ranges, running entirely across the State from north-east to south-west, separated by nearly parallel valleys,—the whole presenting all the varieties of relief

peculiar to the Appalachian country between the levels of 800 and 5700 feet. To speak more accurately, the State is naturally divided into seven grand divisions or belts, each with marked characteristics of relief and geological structure, and each succeeding the other, somewhat as a more or less ascending stairway, from the sea to the north-west.

1. Tidewater Virginia is the marine plain, of Quaternary and Tertiary structure, 10,850 square miles in area, that extends westward, for nearly 100 miles, from the Atlantic border to 'The Ridge," the granitic escarpment which by its rise determines the tidal limit in the great rivers of the State. This Tidewater plain, rectangular in form, is divided by Chesapeake Bay and the great estuaries of the Potomac, the Rappahannock, the York, and the James rivers, into five large peninsulas, which are subdivided by arms of the bay and tidal branches of the rivers into hundreds of smaller peninsulas, thus giving to the region great wealth of tidal shore outline—fully 2000 miles—so that nearly every square mile of its surface can be reached by tide-borne vessels. The nearly level surface of its north to south trending peninsulas, those of the eastern marine plain, the Quaternary ones, averages about 12 feet above sea-level ; their low-lying semi-insular position and their warm finely comminuted soils make these the highly favoured great market-garden or "trucking" portions of Tidewater. The north-west to south-east trending penin- sulas, those of the western marine plain, the Tertiary ones, have more broken surfaces that vary in altitude from sea- level to about 100 feet, and are disposed in flat watershed ridges and slopes, terraces, and swamps, all deeply trenched by the secondary drainage.

2. Midland Virginia is the triangular area (12,470 square nuiles) which, 25 miles wide along the Potomac and 100 wide along the North Carolina line, extends from the Tidewater escarpment westward to the eastern base of the Atlantic coast range, the broken eastern range of the Appalachian Mountains. The elevation here varies from 100 to 200 feet above sea-level in the east to from 700 to 800 in the west ; once a gently eastwardly sloping plain, mostly underlaid by steeply dipping granitic and other Archean rocks—with included areas of Jura-Trias— striking north-east to south-west, the rivers have deeply

trenched into this, and so given it a greatly broken and _ the sea on the east ;

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varied relief through a moderate range of altitude; it abounds in stream-valleys. This, with Piedmont and the Blue Ridge, was the first dry land, the oldest portion of Virginia.

3. Piedmont Virginia is the area (6680 square miles) of greatly diversified country, some 250 miles in length and 20 to 30 miles in width, that stretches between the Blue Ridge and the Coast Range mountains, including all of the latter and the eastward spurs and slopes of the former; its valleys, coves, and plains vary in altitude from 300 to 700 feet in the north-east to from 500 to 1000 in the south-west, while its included and bordering mountains range through all gradations from above 4000 feet down to the levels of its valleys. It is cliarmingly varied and picturesque, and adapted to a great variety of productions.

4, Blue Ridge Virginia is the Virginian portion (300 miles in length) of the great mountain chain of that name, with its numerous tablelands— especially the Floyd-Carroll- Grayson plateau (1230 square miles) in the south-west, having an altitude of from 916 to 5700 feet. It is, for most of its length, a chain of two ranges: the eastern, the chief, in which numerous rivers have their origin, is a grand mountain mass, carved from the Archean and eruptive rocks, forming the most striking feature of thousands of square miles of Virginia landscape ; the western is mainly composed of short ridges, formed from the easterly out- crops of the Palzeozoic rocks, flanking the western slopes of the main range.

5. The Valley of Virginia is the Virginian portion (300 miles) of the length of the great limestone or Appa- lachian valley of the Atlantic highlands, one that, made up of numerous subordinate valleys, extends with unbroken continuity from Canada to Alabama, and has for its whole length, with varying local names, the Blue Ridge on its eastern and the Kittatinny or Great North Mountain on its western border. In Virginia this is a plateau-valley,— embracing 7550 square miles,—its greatly varied tillable surface ranging in altitude from about 500 to over 2500

feet and averaging fully 1000. Carved from the lime- stones and limy shales and slates of the Cambrian group into an almost endless variety of valley and upland forms, the higher ones in gracefully rounded outline, all blending into one or more broad valleys, and bounded by grand mountain chains, this is indisputably one of the most desirable regions in the United States.

6. Appalachia (4500 square miles), a region of alter- nating "rich" and " poor" valleys (according as they are carved from the lime-abounding or from the slaty sandstone rocks of the Silurian or the Devonian groups), is Virginia's portion of the Appalachian Mountains region proper, the one that lies between the Great Valley on the east and the great Carboniferous escarpment of the Trans-Appalachia plateau. Its general features are repetitions of long, parallel, straight, and level-crested mountain ranges—many of them over 4000 feet—succeeding one another in echelon, with narrow, trough-like valleys,—ranging from 800 to 2700 feet,—but these are diversified by the occa- sional dying out of some mountain ranges and the conse- quent widening of valleys, and by the widening of ranges into plateaus or their opening into double crests or lovely mountain " coves" and "gardens." It is a noted grazing and timber region.

7. Trans-Appalachia (mainly the 1200 square miles in Buchanan, Dickenson, and Wise counties) is the Virginian portion of the tableland that extends westward from the great Carboniferous escarpment or Alleghany " backbone." It is eroded from the Carboniferous rocks, and so is the great coal-bearing portion of the State.

Climate.—The State lies in the middle Jatitudes. its great mountain chains guard it on the

It is open to Climate. |

VIRGINIA

north and west ; and it has aeeordingly as nearly a climate of means as any of the Atlantic-bordering States ean have. Its position and physical strueture also give great variety to its climate: that of its bordering sea islands and large peninsulas is insular; that of its great Tidewater and

Midland plains is warm temperate ; that of Piedmont and the Great Valley is typically mild temperate; and that of the Blue Ridge plateau and of the high valleys and table- lands of Appalaehia is more uniformly eool temperate than in higher latitudes. Its elimatie range, in the average latitude of 38° N., is from the sea-eoast to 500 miles inland, and from the sea-level to 5700 feet, a range that is equivalent to 19° of latitude, and that gives to Virginia all the adaptations for production embraced between 36° 30' and 59° N. lat. This wide range finds expression in the market-gardens and temperate fruits and trees and the extensive sweet potato, cotton, and peanut fields of Tidewater ; in the large plantations of tobaceo, hard-grained winter wheat, and the dented- seed (the large variety) Indian eorn, and in great forests of pitch- pines, oaks, &e., in Midland and Piedmont, and in the lower 'portions of the Valley and Appalachia; in the productive vineyards and orchards of Piedmont and the adjacent slopes of the Blue Ridge ; in the perennial pasture-lands—the native homes of the rich blue

s—of the higher levels of Piedmont, of the crests and plateaus of the eastern Blue Ridge, of the Great Valley, and of the extensive limestone valleys and ridges of Appalachia; in the large eereal erops and dairy produets of the Valley; in the big eattle farms and ranges of Appalachia, the Blue Ridge, and the more elevated parts of the Valley ; in the flax, buekwheat, Irish potato, cabbage, and other north-country erops that flourish in the Blue Ridge, the higher parts of the Valley, and Appalachia ; and in the north-land balsams and other cold climate trees and vegetation that clothe the higher levels of the Blue Ridge and of Appalachia.

The mean annual temperature zones of Virginia are—60° to 65° in eastern Tidewater ; 55° to 60° in western Tidewater, and most of Midland ; 50° to 55° in the higher parts of Midland, in most of Piedmont, and in the lower parts of the Valley and Appalachia ; 45° to 50° in north-east Piedmont, in most of the Valley, and in the lower valleys of Appalachia ; and 40° to 45° on the Blue Ridge, on and near the high levels of the Valley, and in most of Appa- lachia. The average for the State is near 66°, ranging from 48° in the highlands to 64° in the lowlands—from the mean adapted to grass to that suitable for cotton. The changes of temperature

are great, but not so sudden or so extreme as they are in the regions to the north-east and north-west.

The prevailing winds are from the south quadrants, generally shifting between south and west; next in frequency are those be- tween north and west; high winds are rare, except along the coast. The rainfall is abundant and well distributed throughout the seasons in every part, there being two sourees of supply, one from the Gulf by the south-west and one from the Atlantic by the south-east winds ; the average annual precipitation is from 32 to 44 inches, except in a belt extending north-west from the mouth of Chesapeake Bay towards Staunton, in whieh it is from 44 to 56 inches; there is a gradual decrease in the rainfall from the coast westward. The snowfall is generally light, some winters insignifieant ; and the snow soon melts, save in the elevated regions.

Virginia is noted for the clearness of its skies, the purity of its air, and its freedom from great storms. Its climate is moist without being damp, and so mild as to invite to living much in the open air ; its winters are short, its periods of seedtime and harvest

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long ; and its healthfulness is attested by the vigour and longevity of its people.

Geology.—The subjoined table of the geological formations found in Virginia, correlated with those of Pennsylvania and New York, and with the general groups and systems of the American geological seale, follows, in the main, the late Prof. William B. Rogers :—

Subdivisions or Formations in Virginia.

Geology.

General Groups. Systoms.

20. MNS SUREE II W VS Eo cise s vSence sanick oraneucmeertes Quaternary. 19¢, Piiocene (Upper Tertiary) .....00ee0° Cainozoic. 19d, Miocene (Middle Tertiary).....s0ssesccscores Tertiary 19a. Eocene (Lower Tertiary).....:..0000ssessescoos 18 and 17. Jurasso-Cretaceous (Upper Mesozoic)..... : 7 17 and 16. Jurasso-Triassic (Lower Mesozoic)..... 5 Mesozoie. Mesozoic. 140 (xiii.). Middle Coal group…..... Upper Car- l4a (xii.). Lower Coal group…..... f bonifcrous.! 136 (xi.). Greenbrier shales and lime- | Middle Car- : stones (Carb. limestone). f boniferous. Carboniferous 13a@(x.), Montgomery grits and coal-) Lower Car- measures (Vespertine)... f boniferous. 12 (ix.), Catskill red sandstone (Upper Devonian) lldanda f Chemung and Portage shales (Middle (viii.). DievOnlaidl) \ccacct-aresssx: ats

Co eee

Primary)

Note.—The first or Arabic numbers and the letters of the above are the numberings of the formations and their subdivisions now generally recognized and used in North America; the Roman numbers in brackets are the equivalent formations as numbered and used by the Rogers Brothers in the Pennsylvania and Virginia reports,

As the aeeompanying geological map shows, Midland, Piedmont, and the Blue Ridge grand divisions, over 20,000 square miles, or about half the land area of the State, are underlain by the Archean or old Primary and metamorphic rocks ; within this Archean area are a dozen or more patches, large and small, of the Jura-Trias (forma- tions 16, 17, and 18) or Mesozoic rocks, some of them with valuable coal-beds, that in later times were deposited in depressions, lake-like basins, in the Archean rocks, The Cambrian (Lower Silurian) areas, the Virginia formations i., ii., and iii., inelude all the Great Valley (limestone) and numerous

limestone valleys of Appalachia, some of them, like that of Clinch river, quite large—in all some 10,000 square miles of surface—having within them detached mountain ranges of more recent forma- tions. The Silurian (Upper Silurian) areas, those where the Virginia formations iv., V., Vi., and vii. outcrop, are

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Geological Map of Virginia.

mountain ranges, detached once in the Great Valley, and ranges and chains of them in Appalachia, for these formations, made up

largely of massive sand-rocks, are mountain-builders. The Devo- nian areas, Virginia formations viii. and ix., are principally those of the slaty or poor" valleys of Appalachia, No. viii. being a formation from which stream-valleys are liberally earved, though 1x., chiefly sand-rocks, often holds it up to included or bordering ridges. The Lower and the Middle Carboniferous roeks, Virginia formations x. and xi., outcrop in long and narrow belts or strips of Greenbrier shales and limestones (xi.), and adjacent narrow and

long mountain ranges of Montgomery grits and coal-measures (x.), in south-west portions of the Valley and of Appalachia, and in small mountain areas elsewhere in Appalachia. The Upper Car- boniferous, Virginia formations xii. and xiii., the Lower (xii.) and tho Middlo (xiii.) Coal groups, underlie all the thousand squaro miles of Trans-Appalachia, where the semi-bituminous eoking coals of the Lower Coal group are exposed, above water-level, in their best conditions of purity (high in carbon, low in volatile matter,

1 Formations xiv., xv., and xvi., the Upper Coal group, are not known in the

present limits of Virginia. XXIV. — 33

Minerals.

and very low in ash, sulphur, and phosphorus) for ee purposes, and in beds of remarkable thickness, and where the bi i ininous coals of the Middle Coal group also have a maximum 0 development combined with remarkable purity of composition, adapting them to gas and domestic uses. | Tertiary rocks (19a, 0, ¢) underlie all Tidewater (the new Virginia of geology, though the old one of colonial history),—the Lower or Eocene outeropping, approximately, in a line a little west of ie W. long., the Middle or Miocene between that and a little east of 76° 30' W., and the Upper or Pliocene in the remaining east part, except whicre covered by recent or Quaternary (20) deposits.

Minerals.—The varied and abundant mineral resources of the State are as yet but imperfectly developed. Her medicinal mineral springs are numerous, and many of them well known. Tidewater abounds in fertilizing marls, and in choice brick-clays, sands, and shell-limestones for building. Lime-burning, from oyster shells, isan important industry. Midland abounds in superior granites, which are extensively quarried near Richmond and Petersburg ; in the best of slates for roofing and other purposcs, especially in Albemarle and Buckingham counties ; in Jura-'l'rias brownstones and sand- stones; in trap for Belgian blocks ; in soapstones (steatites), lime- stones, and in brick-, plastic-, and fire-elays. Thick beds of excellent bituminous coal and of natural coke are found in the Jura-Trias of Chesterfield and adjacent counties, which have long been mined, ochre beds are worked in Chesterfield county ; thick beds of magnetic, specular, and limonite iron-ores, and of gold, silver, and copper-bearing rocks, traverse its whole length from north-east to south-west. Its gold belt, from 15 to 20 miles wide, rich in free, quartz, and pyritous-rock gold, traverses the whole western tier of Midland counties, for more than 200 miles, from the Potomac to the Dan ; in this belt, in Louisa county, at the Arminius copper mines, veins of white pyrites, 42 feet, bearing 46 per cent. of sulphur and considerable yellow copper, have becn opened and reduction works erected for a 800 tons daily output ; 12,000 tons of pyrites were shipped in 1886. Manganese, mica, plumbago, titanium, cyanite, garnets, emeralds, quartz, and othcr Archean and Jura-Trias minerals are found at many points. The minerals and metals now

exploited are gold, iron and copper pyrites, manganese, hematites, magnetites, and limonitcs, mica, slates, granites, brown- stones, and trap-rock. Piedmont has extensive beds of magnetic, specular, and limonite iron ore throughout its length; chromic iron ore is found in the north-east ; copper ores abound especially along the west border in spurs of Blue Ridge; manganese deposits have been worked at various points; the same Archean and Jura-Trias building stones and minerals are found here as in Midland, the marbles of Bedford and Loudoun counties of fine quality. Iron ores, Inanganese, slates, and marbles are now exploited. The Blue Ridge abounds in copper and iron ores for its whole length in Virginia ; these as well as pyritous silver, copper, and iron ores, are especially abundant in the Floyd-Carroll-Grayson or south-west plateau, where also aurifcrous quartz is milled; tin mines have been opened in Rockbridge county ; the great Potsdam or primordial iron belt, with its vast deposits of ore, flanks the western base of the Blue Ridge in Virginia for nearly 300 miles, and from the rich deposits of manganese in the same belt two-thirds of the manganese output of the United States in 1886 was mined; glass-sand of the best quality and fire and other clays are abundant, and so are build- Ing sandstones in the western Blue Ridge. Mining operations are now extensively conducted in iron and manganese ores. The Great Valley is all underlain by limestones suitable for ornamental, build- ing, and agricultural purposes ; its cement (hydraulic) and archi-tectural, fuxing, and agricultural limes are noted for their purity ; extensive beds of iron-ore are found among its hills ; marbles, barytes, brick- and fire-clays, and travertine marls are abundant : there are large deposits of lead and zinc ores, especially in the south- west, in Pulaski and Wythe counties, where they accompany the great iron-ore deposits of the Cripple Creek region ; from the Vesper- tine (No, x.) beds of the Lower Carboniferous, in Montgomery and Pulaski counties, from 15,000 to 20,000 tous of semi-anthracite coal are annually mined; ochres are mined in Page and Augusta counties ; iron, manganese, zinc, and lead ores are now mined on quite an extensive scale, and lime-burning is an important industry Appalachian Virginia abounds in very remarkable beds of limonite iron ores, found (often, under large areas, in a more or less stratified condition) in the Hudson river (iii.), Clinton (v.), and Oriskany (vii.) formations of Cambrian and Silurian age ; there are also deposits a magnetic hematites in Craig and Giles counties ; limestones of the Valley

(ii.), Trenton (iii.), and Lower Helderberg (vi.) formations underlying the "rich " valleys and ridges, abound, and furnish the best of materials for building, lime-burning, and blast-furnace fluxing purposes, as well as for beautiful encrinal and other fancy marbles ; in its Vespertine (x.) areas are numerous patches of anthracite and semi-anthracite coals, worked and workable for local use: in the Appalachian portions of Smyth and Washington counties are larce deposits of rock-salt and gypsum ; travertine marls, caves abounding in nitrous carths, and chalybeate, sulphur, alum, hot, warm, and other mineral springs are common; sandstones and slates for

-and sweet chalybeate.

Vig iNPSe

building purposes are plentiful. The iron-ores of Alleghany county

and those of the Appalachian portions of Rockbridge and Botetourt

counties are extensively mined for local blast-furnaces ; marbles and

gypsum are quarried ; considerable salt is manufactured, and semi-

anthracite coal in Pulaski for use in local zine furnaces. Trans-

Appalachia is Virginia's 1000 square miles of the Great Coal Basin

of the Ohio, or the Trans-Appalachian Coal Basin (the one usually,

but improperly, called the Great Appalachian Coal Basin) ; this is

all underlain by thick and casily accessible beds of the best of semi—bituminous and bituminous coals, those of the Lower (xii.) and of the Middle (xiii.) Coal groups of the Carboniferous. Only the semi-

bituminous coking, steam, and domestic coal of this region is now mined for exportation at Pocahontas, Tazewell county, from which 639,751 tons (93,550 of them converted into coke) were shipped in

1886, the traffic having begun with the shipment of 105,805 tons in 1883. From the Flat-top coalfield, including the Pocahontas and some adjacent mincs in West Virginia, 1,314,700 tons of coal were mined in 1887, part of which was made into about 145,000 tons of coke, equal in quality to any made in the United States.

This fuel is remarkably high in fixed carbon and low in ash and sulphur, and therefore admirably adapted for metallurgical purposes,

Twenty mineral springs of Virginia, used medicinally, were reported to the United States Geological Survey in 1886 (Tidewater 1, Mid- land 4, Blue Ridge 2, Valley 5, Appalachia 8); they were reported as chalybeate, alum, white sulphwr, red sulphur, blue sulphur,

warm sulphur, cold sulphur, hot sulphur, lithia, healing, ague,

These and many others not reported are visited as health resorts, and many of them ship to market large quantities of their waters.

Virginia produced—of coal 300,000 tons in 1884, 1,000,000 in 1886, and about 1,250,000 in 1887; of coke 25,340 tons in 1884, about 122,352 tons in 1886; of pig iron, 29,934 tons in 1880, 152,907 in 1883, 156,250 in 1886, and 156,698 in 1887; of rolled iron 40,581 tons, and of cut nails 212,552 kegs of 100 Ib in 1886; of manganesc 3661 tons in 1880 and 20,567 tons in 1886 ; of pyrites 12,000 tons in 1886 ; of ochre 1750 tons in 1886 ; of salt, gypsum, lead, zinc, granite, slates, lime, limestone for blast-furnace flux, cement, brownstone, mineral waters, and iron-ore for export large quantities were produced in 1886, and still larger in 1887, when the mining industries of this State were in a healthy condition of development.

Vegetation.—The variety of vegetation in Virginia is very great, Vegeta- | the range being from a profitable growth of semi-tropical cotton to tion.

semi-arctic pines and balsams. From one-half to two-thirds of the State is now covered by forests of native evergreen and deciduous trees. Hard and soft woods, in nearly equal proportions, form the original forests of Tidewater and Midland,—the plain regions; hard woods predominate in

the high country divisions; the park-like hardwood forests of the Great Valley have grown up since its occupation by white men.

The census report of 1880, in its natural divisions of North American forests, assigns the east maritime plain of Tidewater to the coast-pine division; the north-east portions of Blue Ridge, Valley, and Appalachia to the northern-pine division ; and the rest of the State to that of deciduous trees, The principal timber trees, found in varying abundance in all parts, are white, Spanish, black, chestnut, red, post, and swamp oaks; tulip-peplar and cucumber ; white (or shell), bark, and pignut hickories ; yellow or pitch pine ; red or Virginia cedar; beeeh, elm, black and white walnuts, sycamore, mulberry, locust, sassafras, and gum; sugar, red, and white maples; black, red, and yellow birches; wild cherry, per- simmon, dogwood, ironwood ; white, red, black, and water ashes ; chestnut, and willows. Cypress, juniper, long-leaved pine, holly, sweet gum, and some live oaks are confined mainly to Tidewater and east Midland; white pinc, hemlock, black spruce, rock chestnut oak, and balsams to the mountain regions; the oaks of the Valley are of rare excellence, and the tulip-poplars and oaks of Trans-Appalachia and its borders are of remarkable size; sumachs, millions of pounds of the leaves of which are gathered for their tannin, arc everywhere plentiful. From the sugar-maple consider-able quantities of sugar are made in the Valley and the Appalachias ; the forests of Tidewater, easily reached by vessels, furnish large quantities of fuel and lumber to seaboard markets ; railways reach the other timber regions of the State ; lumbering, charcoal-making, the cutting of railway sleepers, and the collection of tan-bark are Important industrics. Wild fruits and nuts, gooseberries, black- berries, whortleberries, cranberries, strawberries, haws, service- berries, persimmons, plums, crab and thorn apples, cherries, various wild grapes, chestnuts, chinquapins, black and white walnuts, hickory nuts, hazel and becch nuts, acorns, &c., are nearly all found in all parts. Medicinal roots (ginseng, sarsaparilla, snake-root, mandrake, &.) are gathered in large quantities in the Appalachias ; oil from sassafras roots is made in quantities in Midland and Picdmont. All the cultivated fruits of temperate climates flourish ; apples, pears, peaches, grapes, plums, cherries, currants, and other small fruits are everywhere plentifully grown ; the peach, pear, and apple orchards of Midlaud, Piedmont, Blue Ridge, and the Valley

Animals.

VIRGINIA

are noted ; the vineyards of Midland, Piedmont, and Blue Ridge are becoming well known for both grapes and wines in variety; in Tidewater and eastern Midland figs, apricots, nectarines, and other warm-country fruits flourish, and the scuppernong grapes and wines of Tidewater are also worthy of mention. The flora of Virginia includes nearly every species of plant found in the United States east of the Mississippi, excepting only the extreme south, The cleared lands of the State, about two-sevenths of the whole, are devoted to orchards, vineyards, meadows, and pastures, to market and other gardens, and to erops of maize (Indian eorn), wheat, oats, rye, buckwheat, barley, pease, beans, peanuts, round (Irish) and long (sweet) potatoes, turnips, cabbage, clover, flax, hemp, cotton, tobacco, &e. Cereal and root crops are abundantly grown in all parts, as also are tobacco, hay, clover and grass seeds, flax and flaxseed, hops, hemp, and cotton. Nearly half the State, part of Piedmont, and all Blue Ridge, the Valley, and the Appalachias is a natural grass eountry—half of it the habitat of the famous blue grass—-and well adapted to grazing and dairy-farm- ing; the spceial crops of Tidewater are those of inarket-gardens, early vegetables, and round and sweet potatoes in the east, and of peanuts and cotton in the west ; tobacco is a specialty of south- west Midland and Piedmont.

Fauna.-~Tho buffalo and elk, common when white men first settled here, are now extinet ; deer, red and grey foxes, rabbits, hares, ground-hogs or woodchucks, red, grey, and ground squirrels, opossums, polecats, muskrats, martens, minks, weasels, bats, rats, and mice are found everywhere ; otters and beavers, once numerous in all parts, are again becoming common in south Midland and elsewhere ; blaek bears frequent the Appalachian and borders of the adjacent Valley divisions ; wild-cats, eatamounts, and the small wolves are occasionally met in unfrequented portions of the moun- tain regions. Of game or food birds, partridges (quails), pigeons, wood doves, grouse (pheasants), larks, thrushes, snipe, wild turkeys, and several kinds of wild ducks are found in nearly all parts; the coasts, the inland bays, the great estuary rivers, and

the marshes of Tidewater fairly swarm, especially during the colder months, with eanvas-back, mallard, creek, redhead, bald-face, teal, and other wild ducks, and with wild geese, swans, snipe, and other water and water-side fowl; gulls and other sea birds frequent the coast. Song-birds, including mocking-birds, orioles, bobolinks, robins, eatbirds, bluebirds, wrens, tanagers, sparrows, &c., abound ; the English sparrow is domiciled in all the cities and towns ; hum- ming-birds are plentiful. The common birds of prey, eagles, hawks, owls, a vulture (the turkey-buzzard) ; the wading birds (herons, grass snipes, fly-up-the-creeks, &c.) and the various swimming birds are abundant. The common reptiles include land and water tortoises, or turtles and terrapins (some highly prized for food), and harmless snakes, useful in the destruction of vermin, frogs, toads, salamanders, &c.; the poisonous rattlesnakes, copperheads, and moccasins are sometimes encountered, but are not numerous; the comparatively harmless blaek snakes are more common. Of edible saltwater fishes, more than thirty kinds are taken in quantities in Chesapeake Bay waters, including sturgeon, rock-fish, trout, chub, sheepshead, spot, sunfish, bluefish, shad, herring, anchovy, Spanish mackerel, eod, bonito, drum, menhaden, bass, sea-eels, and hog-fish ; while dozens of kinds not used for food are known. The freshwater fishes are perch, pickerel, cat-fish, chub, bass, sueker, fall-fish, salmon, hog-fish, red-horse, red-eye, carp, inullet,.sun-fish, eels, and trout in the mountain streams. Of the abounding crustaceans, edible crabs and lobsters are caught in great numbers in the marine waters, and millions of bushels of oysters, clams, and other shell-fish are annually sent to market.

Government. —The government is entrusted to three departments, each with distinct and separate powers. (1) The legislative authority is vested in a general assembly, composed of a house of delegates of 100 and a senate of 40 members which meets biennially at Richmond ; the members of the house of delegates are elected for two years, those of the senate for four, —half the latter being elected biennially. (2) The executive authority is vested in a §overnor, elected by the people for four years. A lieutenant-governor is elected at the same time, who is president of the senate, and should a vacaney occur during the term of office becomes governor. The other executive officers are a secretary of the com- monwealth, a

treasurer, first and second auditors of public accounts, a superintendent of public printing, a superintendent of tho peni- tentiary, a railroad commissioner, a commissioner of agriculture, a registrar of the land office, and a superintendent of public instruc- tion. (8) The judicial authority is vested—(a) in justices of peace, three in each of the magisterial districts into which the eounties are subdivided ; (b) in judges of county courts ; (c) in judges of the Seventeen circuit courts into which the State is divided, and judges of city eourts; and (d) in a supreme court of appeals of five judges. The right of appeal, with specified limitations, is provided for from each of the above courts to the other, in the order named ; the Supreme court has only appellate jurisdiction save in cases of habeas corpus, mandamus, and prohibition. The justices of the peace, a supervisor, a constable, and an overseer of the poor are elected by

the voters of each magisterial district to serve two years; the general assembly elects the eounty judges for terms of six years,

the circuit judges for terms of eight years, and the judges of the supreme court of appeals for terms of twelve years. An attorney- general for the State is elected at and for the same time as the governor. In the Congress of the United States, Virginia has two senators and ten representatives. Aliens ean acquire and hold any property in Virginia on the same footing as citizens.

Population.—The population of Virginia before the separation Popula-

of West Virginia in 1862 is shown by the following table :— tion.

In- | Persons|| In- | Persons

| Census. | Population.| crease per Census. | Population.) crease per

per cent.) sq. m. percent.) sq. m 1790 747,610 op iit} | 1,211,405 13°7 18°7

| 1800 880,200 alr ety? Seon 1,239,797 2°3 1971 1810 974,600 } 10-7 15-0 | 1,421,661 | 14-6 21°9 1820 | 1,065,116 9-2 16-4 | 1,596,318 12°2 24°6

In 1870 the population of Virginia was 1,225,168, and that of West Virginia 442,014. In 1880, while West Virginia had 618,457 inhabitants (39-9 per cent. increase), Virginia had 1,512,565 (745, 589 inales, 766,976 females), ————_—_____

—an increase of 23°4 per | White. Colonred. = with 37 L PCTSODS | ri dowater …ce-ceseese— 201,578 213,691 o the square mile. MITC. cscs sc0se—sse 198,140 245,151 Theaccompanying table | Piedmont…….+. 148,138 103,620 – shows the distribution of 12 | as Be sk » . BVO ceceasayeses: 5 s4t7 the population in 1880 The Appalachias…... 96,345 9,059 according to the grand divisions. Thero were Virginia…….| 880,858 631,616

in addition 6 Chinese and : 85 Indians. The number of foreign-born, 14,696, does not amount to 1 per cent. of the population.

The original stock of the whites was mainly English, Scottish, and Huguenot Freneh in Tidewater, Midland, and Piedmont, and Scottish (largely Scoto-Ivish from migrating by way of Ireland), German, and English in the remainder of the State—in proportions in the order named.

Virginia has six cities with over 10,000 inhabitants. In 1880 Cities. Richmond, the State capital, had 63,600, Norfolk 21,966, Peters- burg 21,656, Lynchburg 15,959, Alexandria 13,659, and Portsmouth 11,390,—Danville eoming next with 7526.

Education.—The public school system of the State, organized Eduea- in 1870, provides (1) primary and (2) intermediate instruction tion. in the common branches of education, including preparation for college, by graded primary and high schools—the latter eonfined to cities, towns, and large villages—free to all between the ages of five and twenty-one inclusive ; (3) advanced instruction and train- ing in scientific and professional studies, by a military institute, an agricultural and mechanical eollege, inale and female normal schools, and an institution for the deaf-mutes and the blind—all for whites, and by a normal and agricultural institute and normal college for coloured pupils,—tuition free to a selected number from all parts of the State; and (4) higher instruction, in the eom- plete academic, scientific, technical, and

professional schools of the university of Virginia, its academic department tuition free to all young men of Virginia, over eighteen years of age, under restrictions in regard to culture. The State schools eonfer no honorary degrees. Equal provision, but in entirely separate schools, is made by law for white and coloured.

The public free school system is in charge of a board of education.

In 1887 the school population, those between five and twenty- one, numbered 610,271 (345,022 white and 265,249 coloured) ; 7140 schools (5047 white and 2093 coloured) were open, including 458 graded schools ; 7161 teachers (2416 white males, 2889 white females, 1023 eoloured males, and 833 eoloured females) were eniployed ; 325,184 pupils (209,638 white and 115,546 coloured) were cnrolled, and 184,520 (121,571 white and 62,949 coloured) were in average daily attendance. The school districts owned 4365 schoolhouses, and their school property was valued at $1,907,775 ; the expense of the free school system in 1887 was $1,381,690, besides $153,600 spent on permanent improvements. The State makes liberal grants to the military institute, the agri- cultural and mechanical college, the normal and agricultural insti- tute, the three normal schools, and the university.

Private and corporate schools embrace academies and high schools for boys, preparatory for college or university; female eolleges, mainly under denominational control; and the well-known colleges of St John's in Tidewater; Hampden-Sidney, Randolph-Macon, Richmond, and Virginia Medical in Midland ; and Roanoke, Emory and Henry, and Washington and Lee University in the Valley. The eollege of William and Mary (founded in 1693), suspended by reason of losses during the eivil war, is now a normal school.

Prisons.~~—One penitentiary, at Richmond, provides for all con~~ Crime. victed of serious crimes in Virginia; during 1885-86 it received 337 convicts (80 white, 257 coloured) ; its expenses were $98,978, and the labour of the conviets yielded $78,000. Each county

Lunacy.

Pauper- isin.

Deaf- mutes and

blind.

Agri- eulture.

Manu- factures.

260

has a jail for persons committed for petty offences or awaiting trial. : Lunacy, &c.—There are four first-class lunatic asylums, —at Williamsburg, Staunton, and Marion, and (for coloured patients) at Petersburg. In 1885-86 there were 1479 patients in the eae three asylums, for which it eontributed $345,077. The census 0 1880 returned 2411 insane,—1171 males, 1240 females, 1719. white, and 692 coloured. Pauperism is not common in Virginia; in 1870 there were only 3890 paupers, supported by public charity at a cost of $303,081; in 1880 the total number was 3138, 2117 of these being in almshouses, of whom 1027 were coloured. Deaf-mutes and blind are well cared for in a noble institution at Staunton, which trained during 1885-86 78 deaf-mutes and 44 blind, with an annual grant of $35,000. The disabled Confederate soldiers of Virginia are aided by the State ($83,040 in 1885-86). also, near Richmond, a soldiers' home. : , Agriculturc. —More than 50 per eent. of the labonring population was in 1880 engaged in agriculture. According to that year's census the land area was 25,680,000 acres, 19,835,785 of which (0°772 of the whole) were embraced in 118,517 farms, although only 8,510,113 acres of snch area (only two-sevenths of the whole) were under cultivation (leaving 57°1 per cent. of land in farms unimproved), yet the number of farms increased 60°5 per eent. and the acreage in farms 9°3 per cent. from 1870. Seventh-tenths of its farms were cultivated by owners ; over half of the remainder were rented for a share of the crop, and the other part for a fixed money rental. The average size of farms was 167 acres; but there were 53,101 containing from 100 to 500 acres, 5561 with from 500 to 1000 acres, and 1568 containing over 1000 acres each,—so that more than half the farms contained from 100 to over

1000 acres each, or a probable average of 300 acres each, large farms being the rule. The farms and their improvements were valued at $216,028,107, their farming implements at $5,495,114, the live stock at $25,953,315 ; for improvements $1,697,180 and for manures $2,137,283 were spent, and the value of their products was estimated at $45,726,221. The live stock comprised 218,838 horses, 33,598 mules and asses, 54,709 working oxen, 243,061 milch cows, 388,414 other cattle, 497,289 sheep, and 956,451 swine. The wool clip was 1,836,673 Ib; 1,224,469 gallons of milk were sold; 11,470,923 tb of butter and 85,535 of cheese were made; 859 acres of barley yielded 14,223 bushels; 16,463 of buckwheat 136,004 ; 1,768,127 of Indian corn 29,119,761 ; 563,443 of oats 5,333,181; 48,746 of rye 324,431; 901,177 acres of wheat yielded 7,826,174 bushels ; 45,040 acres of cotton 19,595 bales ; the flax crop was 4526 bushels of seed, 16,430 tons of straw, and 66,264 ib of fibre; the sorghum crop was 148 fb of sugar and 564,558 gallons of molasses; from the sugar maple were made 85,693 Ib of sugar and 7518 gallons of molasses ; of hay 286,823 tons were grown on 336,289 acres; 17,806 bushels of elover seed and 41,722 bushels of grass seed were raised ; there were 1,987,010 barn-yard and 660,147 other fowls, and 8,950,629 dozen eggs were produced during the year ; 1,090,451 tb of honey and 53,200 of beeswax were made; on 140,791 acres wero grown 79,988,868 ib of tobacco ; 2,016,766 bushels of Irish potatoes were raised, and on 23,755 acres 1,901,521 bushels of sweet ones ; orchard products were valued at $1,609,663, and market-garden products at $837,609 ; 2,177,770 cords of wood, valued at $3,053,149, were eut; the wool elip was valued $1,836,673; 12 acres of hops yielded 1599 ib and 127,976 Ib of broom eorn were grown; the crop of pease was 77,758 bushels, and that of beans 45,411. Of the 8,510,113 acres of improved land, 1,152,083 were in permanent meadows, pastures orchards, and vineyards, and 7,358,030 were under tillage ; of the 11,325,672 acres unimproved in farms, 9,126,601 were in woodland and forest, and 2,199,071 in old fields, &c. Virginia was one of the twenty States that produced over 20,000,000 bushels of Indian corn' each, ranking thirteenth; it stood second to Kentucky in acreage and quantity of tobaeco grown. The United States com. missioner of agriculture estimates that in 1884 Virginia had 4,071,401 acres in crops, produeing 44,000,000 bushels of cereals 2,061,000 bushels of potatoes, 99,763 ib of tobacco, 366,389 tons of hay, and 18,500 bales of cotton, valued at $39,050,052 ; and had

on its farms 2,127,023 domestic animals, worth $39 608 536. Manufactures.—Though Virginia has great natural advanta es for becoming a leading manufacturing State, in 1870 less than 12 ot cent. of its population was engaged in manufacturing industries In 1880, however, its 5710 establishments had invested $26 968,990, employed 40,184 persons (28,779 men), paid $7,425,261 for w es and $32,883,933 for materials, and produced to' the Wate of $51,780, 992,—a gain of nearly 60 per-cent. in ten years. It is estimated 1 that the value of the products in 1885 was $75 000 000 —a gain of over 44 per cent. in five years. The sales of "products of the manufacturing establishments of Richmond city alone amounted in 1887 to $27,887,340. The pig-iron output in 1887 was worth over $3,000,000. – The more important nianufactures are those of iron, tobacco, leather, coke, cotton, manures paper agricultural implements and machinery, builders' materials. 1 United States Internal Commerce Report for 1886.

There is | | the head of Chesapeake Bay is connceted with Delaware Bay. At

VIRGUNTS

vehicles, lumber, lime, tanning extracts, railway cars and loco- motives, flour and mill products, spelter, salt, distilled spirits, canned fruits, vegetables, &c.

Communication.—The navigable tidal bays, creeks, rivers, Commu- harbours, and roads of Tidewater Virginia furnish more than a nication,

thousand miles of channels for commerce; Richmond, at the head of the tidal waters of the James, 117 miles from Chesapeake Bay, is reached by ocean ships drawing 15 feet of water ; West Point, at York Head, 41 miles from the bay, has 18 feet of depth ; Elizabeth river gives to the fine harbour of Norfolk a channel 25 feet deep ; while Hampton Roads, with its 400 square miles of area, is the largest as well as the most central and commodious landlocked harbour on the Atlantic coast of the United States. Ship eanals connect the great waterways of Virginia with those of North Carolina and beyond to the southward ; and, similarly, northward

the beginning of 1888 there were 35 railway companies working 2540 miles of road, all of standard 4 fect 9 inches gauge, except some 256 miles of narrow-gauge short lines. The Virginia rail- ways earned $13,825,909 in 1885 at an outlay of $8,999,853, the work done being equivalent to 971,477,375 inile-tons. Virginia early took part in the construction of railways, investing many millions in the stocks of the various lines now reaching nearly every part of the State; beginning about 1830, it had 147 miles of railway in 1840, 884 in 1850, 1350 in 1860, 1449 in 1870, 1893 in 1880, 2430 in 1885, and 2540, with some 200 niles more in course of construction, at the beginning of 1888. Eight great through railway lines connect its trade and manufacturing centres with those of other States.

Finance.—For the year ending Scptember 30, 1886, the assessed
Finance.

value of the real estate of Virginia was $257,607,935, and of personal property $83,152,971, or $840,760,906 of taxable valuation; the taxes were $1,029,936 on real estate, $336,366 on personal property, $39,112 on ineomes, $316,293 capitation, $141,755 from railways on a valuation of $34,614,427, $299,343 from liquor and $400,325 from other licences, The receipts of the State were $2,773,487, and its expenses of all kinds $2,755,036; of these $657,610 went to the support of the free public schools and $1,064,097 to the support of the State Government. The rate of taxation is low, and on a low property valuation. The State debt at January 1, 1885, was $28,961,829.

Militia. —In 1880 the natural militia (inale persons from eighteen
Militia.

to forty-four years of age inclusive) was 264,033 (102,426 of them coloured) in a male population of 745,589. The organized militia foree is small. In 1885-86 there were 51 equipped volunteer com-

anies of active militia under the orders of the State,—mainly in its cities and larger towns,—43 of infantry (18 of them coloured), 5 of artillery, and 3 cavalry,—mustering in all 2904 men. The Virginia military fund is about $11,000 a year.

History.—The mound-builders of the Mississippi valley had out- History.

posts, as evidenced by remains of their carth-works, in the mountain passes of Appalachia. At the time of the arrival of the whites the Powhatans held most of Tidewater, the Mannahoacks the north- east and the Monacans the south-west of Midtind and Piedmont ; the Cherokees held the Tennessee basin parts of the Valley and Appalachia, and Algonkin tribes—Shawnees, Delawares, &c.—the rest of those divisions. Many of the place names are still Indian. Cabot probably entered Chesapeake Bay in 1498; when Raleigh's ships, In 1584, brought to England glowing accounts of the Albe- marle Sound region, the whole country was named Virginia in honour of Elizabeth, the virgin queen. The first permanent English settlement in America was made at Jamestown, Virginia, May 13, 1607, by one hundred settlers sent from England by Sir Thomas Gates and Company, who had obtained in April 1606 a charter from James I. to plant two colonics in Virginia,—a southern somewhere between 34° and 41°, and a northern between 38° and 45° N. lat., but at places not less than 100 miles apart. In 1609 the London Company superseded Gates's, which had merely held its settlement and given to the world the romantic adventures of Captain John Smirx (g.v.). King James gave the London Com- pany, by charter, a sea-front of 400 miles,—200 north and 200 south from Point Comfort,—all islands within 100 miles of the coast, and all the country back from this 400 miles of frontage " throughout from sea to sea," and to its eolonists all the rights of natural-born Englishmen ; under this charter Virginia had jurisdic- tion over her imperial colonial territory, and under it holds the fragment of that colony now called Virginia. The colony of the London Company grew and prospered, and in 1619 Governor Yardley organized at James City, the capital, a few miles inland from Jamestown, the first legislative body that met in North America ; in 1621 the London Company granted the colony a liberal constitution, the general form of which Virginia has always pre- served. In August 1619 a Dutch man-of-war sold at Jamestown twenty African negroes, and introduced negro slavery. In 1624 James I. arbitrarily deprived the London Company of its charter, and Virginia became a royal colony, which was, till the revolu- tion, a favourite and generally a loyal royal province governed

by the constitution of 1621, the king appointing the governor and council and the people electing the members of the house of burgesses. In 1698 the capital was transferred to Williams- burg, where, under royal patronage, William and Mary College had been established in 1693. The colony soon occupied most of Tidewater and its Midland border; in 1716 Governor Spotswood crossed the Blue Ridge, and was, so far as known, the first white man to enter the Great Valley, which was soon thereafter occu- pied by large unmbers of Scottish and some German and English settlers. Indian wars followed as settlers moved westward, but in 1744 Virginia purchased from the Indians the right to make settlements to the Ohio, and built a fort where Pittsburgh now stands ; the French captured this in 1754, and the long French and Indian war followed, until the 1763 treaty of Paris ended it and made the Mississippi the western boundary of Virginia. During that war, in 1755, Braddock was defeated; and in 1758 Fort Duquesne, which under the French had taken the place of Pitts- burgh, was captured and renamed Fort Pitt. In 17738 the general

assembly of Virginia resolved for an "inter-colonial committee of

correspondence," and was dissolved by Lord Dunmore, the royal governor. In May 1774 it again met and protested against the

closing of the port of Boston; Dunmore again dissolved it, but the burgesses, the members elected by the people, reassembled and passed resolutions denouncing British taxation and recommending to the other colonies an annual congress of delegates,—leading in this as it had in recommending committees of correspondence. Virginia took a leading part in the subsequent war of independence, but the various steps of her policy necd not be detailed here (see UNITED STATES, and compare also JEFFERSON and WASHINGTON).

The great territory of Virginia, reaching from the Atlantic to the Mississippi, and now divided into five large States, made the other Statcs of the Union apprehensive of her future domination. In 1781, to promote harmony, she offered to cede to the general Government all her territory beyond the Ohio, and in 1784 she made the cession, only stipulating that the territory thus volun- tarily given np should, when peopled, be divided into new States, in which slavery should be for ever prohibited, and that the remainder of her territory—that from the Atlantic to the Ohio—should remain inviolably hers. In 1787 the convention of the States, at Philadelphia, presided over by Washington, adopted the present constitution of the United States, and this Virginia, in convention, ratified in 1788. In the war of 1812-14 with England Virginia bore a conspicnons part, as also in that of 1846-47 with Mexico. The civil war of 1861-65 was more disastrous in its consequences to Virginia than to any other State of the Union; from first to last its territory was overrun, hundreds ~~of battles and minor engagements took place within its borders, and all the destruction incident to gigantic military operations fell upon it ; tens of thousands of its best men were killed in battle; its terri~~ tory was dismembered, and a third part of it cut off, while more than three hundred million dollars' worth of property was destroyed in what remained.

For some time after 1865 Virginia was under Federal military control as " District No. 1"; but on December 8, 1867, a conven- tion, elected by the people, under an Act of the United States Congress, met and framed a new constitution, prohibiting slavery and accepting the results of the war; this was ratified by a popular vote, July 6, 1869, at which time members of a general assembly and State officers were also elected. The chosen governor was Inaugurated Scptember 21, 1869; the general assembly met October 5, 1869, and ratified the fourtcenth and fifteenth amend- ments to the constitution of the United States ; and on J. anuary 26, 1870, Virginia was readmitted to representation in Congress, and released from military control. (J. H.)*

VIRGINIA CITY, the county seat of Storey county, Nevada, U.S., and the largest and most important city of the State, is situated upon the steep rugged eastern slope of Mount Davidson, about 6300 feet above sea-level.

A branch line connects it with the Central Pacific Railroad at Reno. Virginia City is built over the great Comstock lode, the mineral vein which has yielded probably more of the precious metals than any other single deposit in the World (see vol. xxiii. p, 815). With the varying fortunes of this lode the prosperity of Virginia City is intimately connected. It was founded in 1859, and in 1860 its inhabitants numbered 2345. In 1861 it received a city charter. It continued to increase until towards the end of that decade, when the falling off in the receipts from the mines caused a partial exodus from the town, and the census of 1870 showed only 7048 inhabitants. The dis- covery of the "great bonanza" in 1875 produced a return of prosperity, but this was but transient, and before the

next census the city was again on the wane. In 1880 the census showed 10,917 inhabitants,—nearly half of foreign birth, and about 5 per cent. Chinese. Since the last census the population has, in all probability, not increased. The city is laid out rather irregularly, conforming to some extent to the surface of the mountain side. Some streets have been graded, at great expense, as it involved much rock cutting.

VIRGIN ISLANDS, a group of small West India Islands (see West Iypiss), about one hundred in number, for the most part uninhabited, extending eastward from Porto Rico, and lying between 17° and 18° 50' N. lat., and 64° 10' and 65° 30' W. long. Their total area may be estimated at about 465 square miles, and their popu- lation at 67,000. For the most part they are rocky or sandy and barren, but the cultivable portions yield sugar, maize, coffee, cotton, indigo, and tobacco. Guinea grass grows abundantly on the hillsides, and the rich natural grass affords excellent pasturage ; the forests include many useful trees, among which are mahogany and fustic. Fish are very plentiful on the coasts. The westerly portion of the group belongs to Spain, the central to Denmark, and the easterly to Great Britain. The chief of the Spanish islands are Culebra or Snake Island, and Bieques or Crab Island ; they have in all an area of about 150 square miles, with a population of 2600. The Danish Virgin Islands, which include St Tuomas (q.v.), St Croix (¢.v.), and St John, have a total of about 240 square miles, with about 34,000 inhabitants. The

principal of the British portion of the group are Tortola, Anegada, and Virgen Gorda or Spanish Town, and Jost van Dyke (total area 57 square miles, and population 5287 in 1881, of whom more than one- half are in Tortola). They are subject to a lieutenant- governor, under the governor-in-chief of the Leeward Islands, and are governed by an administrative council of six elective and three non-elective members, presided over by the governor for the time being. In 1886 the revenue and expenditure were respectively £1448 and £1676. The customs revenue was £823, and there was no public debt. Inthe same year 1710 vessels entered, of 10,764 tons burden (exclusive of coasting trade), and 1779 vessels cleared, of 8444 tons; the total value of the imports was £3603, and of the exports £4103.

The Virgin Islands were discovered by Columbns on his second voyage, in 1494, and named Las Virgenes, in honour of St Ursula and her companions. In 1666 the English established themselves on Tortola, which has ever since remained in their possession. In the 17th century the Virgin Islands were favourite resorts of the Buccaneers (g.v.). The Danish islands of St Thomas and St Johu were taken by the British in 1801, but restored the following year. In 1807 they surrendered to the British, and continued in their hands till 1815, when they were again restored. The constitution of the British Virgin Islands was amended in 1854.

VISCONTI. See Minay, vol. xvi. p. 293.

VISCOUNT (Latin vice-comes), a titled rank of nobility, the fourth in the order of the British peerage, and con- sequently intervening between the dignities of earl and baron. The first English viscount, as that term now is used and understood, was Jolin, Baron Beaumont, K.G., who, by letters patent dated 12th February 1440, by Henry VI. was created Viscount Beaumont. The title vice-comes, however, existed in England certainly as early as the Domesday survey; aud in those early times it was borne by a county officer, who was deputy to the comes or earl, in accordance with the feudal system, which knew no titles independent of offices. The vice-comes, whose title from the first may fairly be translated "viscount," and who acted in the absence of the earl, may be considered to have been identical with the functionary known by the English term '"'shire-reeve"

or "sheriff," or, as we now should say, "high-sheriff." During the reigns of the Anglo-Norman monarchs this office of wice-comes was

commonly hereditary; after a while it was granted for several successive years to the same personage at the king's pleasure ; and, finally, the modern practice obtained of appointing a new high-sheriff every year. A viscount is " Right Honourable," and is styled "' My Lord. His wife, also " Right Honourable," is a "' Viscountess," and is styled "My Lady." All their sons and daughters are Honourable." The coronet first granted by James I. has on the golden circlet a row of fourteen small pearls set in contact, of which number in representations nine are shown. The scarlet parliamentary robe of a viscount has two and a half doublings of ermine. VISHNU. See Branmanism, vol. iv. p. 207. VISTULA. See Potann, vol. xix. p. 307. VITALIANUS, bishop of Rome from 657 to 672, succeeded Eugenius I. and was followed by Adeodatus. In the monothelite controversy then raging he acted with cautious reserve, refraining at least from express condem- nation of the 7Z'ypus of Constans IT. (see vol. xvi. p. 758). The chief episode in his uneventful pontificate was the visit of Constans to Rome; the pope received him "almost with religious honours," a deference which he requited by stripping all the brazen ornaments of the city—even to the tiles of the Pantheon—-and sending them to Constantinople. Archbishop Theodore was sent to Canterbury by Vitalian. VITEBSK, a government of western Russia, with Livonia and Pskoff on the N., Smolensk on the E, Moghileff, Minsk, and Vilna on the §., and Courland on the W., has an area of 17,440 square miles. Except on its south-eastern and northern borders, where there are low hills, deeply eroded by the rivers, its surface is mostly flat, or slightly undulating, and more than a million of acres are occupied by immense marshes, with as many as 2500 small lakes. The Devonian limestones and red sand- stones of which it is built up are covered with thick layers of Glacial and Lacustrine deposits,—the Glacial boulder- clay, with immense numbers of boulders, covering extensive areas. The rest consists of Lacustrine clays or sands. The soilis thus for the most part unproductive.

The Diina, or West Dwina, rises not far from the north-eastern angle of the government, and flows through it, or along its southern boundary, for 530 miles. From its junction with the Kasplya, é.c., for more than 450 miles, it is navigable; and, through a tributary, the Ulla, it is connected with the Dnieper by the Berezina Canal. The Mezha and Kasplya, tributaries of the Diina, are navigable in spring. The climate is relatively mild, the average yearly temperature at Vitebsk being 40° F. (January, 16°-4; July, 64°°3), '

The population, 1,204,950 in 1884, is chiefly White Russian (61 per eent.) and Lettish (21 per cent.); Jews come next (10 per eent.). The Poles make only about 2°3 per cent. of the population, and there are moreover about 10,000 Germans in the north-west, The Great Russians number only a few thousands. Nearly two- thirds of the inhabitants are Orthodox or Raskolnik, the remainder being Catholics, Jews, or Lutherans.

Agriculture is the chief industry, but the yearly produce rarely suffices for the wants of the population, and corn has to be imported from Smolensk. Rye, oats, and potatoes are the chief crops, occupy- ing abouta third of thearca. Flax is an important crop for export. Cattle-breeding is only moderately prosperous. Manufactures in 1884 oecupied only some 3000 persons, and their aggregate pro- duetion reached only about £788,700 (as against £84,000 in 1860); the most important branches are represented by distillcries, flour. mills, and tanneries. As arule, the White Russian population of the villages is very poor, and great numbers of the peasants are compelled every year to leave their homes in search of work. Of domestic trades, the manufacture of wooden wares, as Well as some boat-building and flax-combing, may be mentioned. The principal exports are flax, linseed, timber, and . hides. There is a brisk water-traffic on the Diina by boats to Riga, Vitebsk loading-places contributing 1,128,500 ewts. (483,000 roubles value) loaded and 630,000 ewts. diseharged in 1883.

Vitebsk is divided into twelve districts, the chief towns of which with populations in 1885, are Vitebsk (54,680), Drissa (3490), Diina- burg, a fortress on the Diina (69,030), Gorodok (5620), Lepel (6000), Lutsin

(5460), Nevel (7310), Polotsk (19,130), Ryezhitsa (10,150), Sebezh (3820), Surazh (5085), and Velizh (16,370).

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VITEBSK, capital of the above government, stands on both banks of the Diina, on the railway from Smolensk to Riga, 345 miles west of Moscow. It is an old town, with decaying mansions of the old nobility, and dirty Jewish quarters, half of its 54,680 inhabitants being Jews. Its manufactures are insignificant, and the poorer classes support themselves by gardening, boat-building, and the flax trade, while the merchants carry on an active business with Riga in corn, flax, hemp, tobacco, sugar, and timber.

Vitebsk (Dbesk, Vitbesk, and Vitepcsk) is mentioned for the first time in 1021, when it made part of the Polotsk principality. Eighty years later it became the chief town of a separate princi- pality, and so continued until 1320, when, after having taken an active part in the internal wars of the Russian princes, it came under the dominion of the Lithuanians. In the 16th century it fell to Poland. Under the privileges given to the city by the Polish sovereigns it flourished, but it soon began to suffer from the wars between Russia and Poland, during which it was thriee taken by the Russians and burned. Russia annexed it finally in 1772,

VITELLIUS, Avtus, the ninth of the twelve Cxsars, and Roman emperor during the greater part of 69 a.D., was the son of Lucius Vitellius, who had been consul and governor of Syria under Tiberius, and distinguished for his gross and ridiculous flattery under Caius (Caligula) and Claudius, which the senate, who gave him a public funeral, recognized by a statue with the inscription " Pietatis immobilis erga principem." He was one of the intimate companions of Tiberius at Capree; he had driven chariots in the circus with Caius, had played dice with Claudius, had induced the young Nero to sing at a public entertainment, and had been a censor once and a consul three times. He had been governor of Africa, and had there, according to Suetonius (Vitellius, 5), acquitted him- self creditably. Under Galba, to the general astonishment, he was chosen to command the army of Lower Germany, and here he made himself popular with his subalterns and with the soldiers by an outrageous prodigality and an excessive good

nature, which soon proved quite fatal to order and discipline. Far from being an ambitious or scheming man, he was lazy and self-indulgent, fond of eating and drinking, and he was in fact drifted into empire by the promptings of Cecina and Valens, commanders of two legions on the Rhine. Through these two men a military revolution was speedily accomplished, and early in 69 Vitellius was pro- claimed emperor at Cologne, or, to speak more accurately, emperor of the armies of Upper and Lower Germany. In fact, he was never acknowledged as emperor by the entire Roman world, though at Rome the senate accepted him and decreed to him the usual imperial honours. But after all he was only emperor in name. It was noted as a bad omen that he received the title of supreme pontiff on the anniversary of the day of Allia, 390 3.c., on which Rome was all but utterly overthrown by the Gauls. His advance into Italy at the head of a licentious and ruffianly soldiery was as horrible and calamitous as civil war could possibly be; there was fighting and bloodshed within 7 miles of Rome, and amid riot and massacre and gladiatorial shows and extravagant feasting and a waste of seven millions of money (Tacitus, Zist., ii. 95) the capital of the empire was a scene of horror and infamy such as had never been witnessed in the most savage revolutions of past days. As soon as it was known that the armies of the East, Dalmatia, and Illyricum had declared for Vespasian, Vitellius, finding himself deserted by many of his adherents, was for resigning the title of emperor ; so crestfallen was he, so dull and lethargic, that, to quote Tacitus (ist. aa 63), "had not others remembered he had been an emperor, he would have forgotten it himself." On the entrance into Rome of Vespasian's troops he was dragged out of some miserable hiding-place, and, with his hands tied behind him, insulted unpitied, driven to the fatal Gemonian

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stairs, and there struck down amid a shower of fierce eager blows. " Yet I was once your emperor," were the last, and, as far as we know, the noblest words of Vitellius. He perished thus miserably in his 57th year.

The Histories of Tacitus and the biography of Suetonius give us in full detail the story of Vitellius. In Merivale's History of the Komans under the Empire (chaps. 56, 57) the period is fully and vividly described.

VITERBO, a city of Italy, capital of a circondario in the province of Rome, lies 1200 feet above sea-level, on the Arcione, at the north-western base of Monte Cimino (3450 feet), on the high road between Florence and Rome, 42 miles north-north-west of the latter city ; a branch line (242 miles) connects it with the Attigliano station on the railway. It is picturesquely surrounded by luxuriant gardens, and enclosed by walls and towers, which date partly from the Lombard period. The streets are paved with large lava blocks, and the town has many handsome edifices, and some elegant fountains; among the latter may be mentioned the Fontana della Rocca by Vignola (1566). The cathedral, a fine basilica, with 13th-century restora- tions, contains the tombs of Popes Alexander IV., Clement IV., and John XXI. In 1271 it was the scene of the murder, on the steps of the high altar, during public worship, of Henry, son of Richard of Cornwall, by Guy de Montfort (see Dante, Jnf., xii. 118). In the sacristy is a Madonna with saints by Lorenzo di Viterbo. The old episcopal palace is a Gothic building of the 13th century, in which numerous conclaves have been held. The church of St Rosa exhibits the embalmed body of that saint, a native of Viterbo, who died in her eighteenth year, after working various miracles and having distin- guished herself by her invectives against Frederick II. (1251). St Francesco contains the tomb of Pope Adrian V., and has an important work by Sebastiano del Piombo; the Gothic cloisters of St Maria della Verita are strikingly beautiful. The town-hall contains some Etrurian sarco- phagi and a few good paintings. The inhabitants of Viterbo (15,279 in 1881) are chiefly dependent on agri- culture ; hemp is a specialty of the district, and tobacco and various grains are largely grown, as well as the olive and vine. There are in the vicinity numerous mineral springs; the warm sulphur spring of Bulicame, about 2 miles off, is alluded to by Dante (Inf, xiv. noe

Viterbo has sometimes, but very doubtfully, been identified with the Fanum Voltumnz, where the general assembly of the Etruscans used to be held. It was fortified by the Lombards, and in the Middle Ages became a

favourite papal residence. Popes Urban IV. (1261), Gregory X. (1271), John XXI. (1276), Nieholas III. (1277), and Martin IV. (1281) were elected here, and it was at Viterbo

that Alexander IV. (1261), Clement IV. (1268), Adrian V. (1276), and John XXI. (1277) died.

VITORIA, a town of Spain, capital of the Basque province of Alava, stands at a height of about 1750 feet above sea-level, on a small hill commanding the plain of Alava, 234 miles by rail north-north-east of Madrid. The oldest part of the town, the Campillo or Villa-Suso, occupies the top of the hill; some of the walls and towers by which it was formally defended still remain, but it is now almost deserted, and chiefly occupied by gardens. Below it is " Vitoria Antigua," with narrow tortuous lanes : on the lower level ground is the modern town, with wide Streets, an arcaded market place, and shady promenades. The cathedral of St Mary in the Campillo dates its founda- tion from 1181, and has some good Gothic arches, but has been considerably spoiled by late additions ; the church of San Miguel also dates from the 12th century, but does not possess any features of special interest. Vitoria, from its favourable position, is an important centre of trade in wine, wool, horses, mules, and hardware ; the chief industries are paper-making, carriage-building, cabinet-making, tanning,

and the manufacture of earthernware. The population within the municipal boundaries in 1877 was 25,039. Though an obscure village seems to have occupied the site from an early period, the existence of Vitoria as a town dates from 1181, when Sancho the Wise of Navarre granted a "'fuero" similar to that of Logrofo, and fortified the place. A decisive victory was here gained by the Anglo-Spanish army under Wellington over the French under Joseph Bonaparte and Jourdan on June 21, 1813. VITRE, a town of France, chef-lieu of an arrondissement in the department of Ille-et-Vilaine, stands on a hill rising from the left bank of the Vilaine, 24 miles east of Rennes by the railway to Paris. The town has preserved as many features of the Middle Ages as any in France, and viewed from the north its feudal aspect is striking. The streets are formed of confused masses of wooden houses, full of

projections and curves, covered with coarse slate over- grown with moss and lichen, and are bordered by covered galleries on a level with the ground, out of which dark shops open. Most of the curious houses, ornamented with statuettes and sculptures, are older than the first half of the 17th century. Only one vault remains of the original castle, founded towards the end of the 11th century; the rest was rebuilt in the 14th and 15th centuries (the best period of Breton military architecture in Brittany), and all has been recently restored. It is now occupied by a prison, a museum of natural history and painting, and the town library (6000 volumes). In the court is the former collegiate church, some of it older than the 12th century. The church of Notre Dame, formerly a priory of the abbey of St Mélaine of Rennes, dates from the 15th and 16th centuries. An outside stone pulpit is a fine example of 16th-century sculpture. Parts of the ramparts are still standing, and other parts are built into the houses of the town. There is a well-wooded botanical garden, and the remains of a castle destroyed at the Revolution. The chief articles of trade are cloth, hosiery, and thick clothing made of goats' skins. The chateau of Les Rochers, celebrated through Madame de Sévigné, stands 3 miles from the town. The population in 1886 was 8957 (commune 10,447). Vitré was formerly a Breton barony, and belonged in the 10th century to the younger branch of the counts of Rennes. In 1295 it passed to Guy IX. baron of Laval, ou his marriage with the heiress, and afterwards successively belonged to the familics of Rieux, Coligny, and La Trémoille. The town was seized by Charles VIII. in 1488. Protestantism spread under the rule of the houses of Rieux and Coligny; Vitré became a Huguenot stronghold ; and a Protestant church was established, which was not suppressed till the revocation of the edict of Nantcs in 1685. Mercceur, the head of the members of the League in Brittany, besieged the town in vain for five months in 1589, and was forced to withdraw by the army under the Prince de Dombes. 'he estates of Brittany, over which the barons of Vitré and of Léon alternately presided, met here several times, and Madame de Sévigné gives interesting details of such an occasion. Vitré was the birth- place of Pierre Landais, the favourite minister of Francis II., duke of Brittany (hanged in 1485), of his nephew Cardinal Guibé, and of Bertrand d'Argentré, jurist and the historian of Brittany. VITRIFIED FORTS is the name given to certain rude stone enclosures whose walls bear traces of having been subjected to the action

of fire. They are generally situated on elevated hills, which occupy strong and easily defended positions. Their form is irregular, and seems to have been determined rather by the contour of the flat summits which they enclose than by any definite architectural plan. The walls vary in size, some being comparatively small, while a few are upwards of 12 feet high, and are so broad that they present the appearance of huge embank- ments. Weak and exposed parts in the defence are strengthened by double or triple walls, and occasionally vast lines of ramparts, composed of large blocks of unlewn and unvitrified stones, are drawn around the fortified hills at some distance from the vitrified centre. No lime or cement has been found in any of these structures, but all of them present the peculiarity of being more or less con-

solidated by the fusion of the rocks of which they are built. This fusion, which has been caused by the application of intense heat, is not equally complete and regular in the various forts, or even in the walls of the same fort. In some cases the stones are only partially melted and calcined ; in others their adjoining edges are fused so that they are firmly cemented together ; in many instances pieces of rock are enveloped in a glassy enamel-like coating which binds them into a uniform whole; and at times, though rarely, the entire length of the wall presents one solid mass of vitreous substance.

Since John Williams—one of the earliest of British geologists, and author of The Mineral Kingdom—first de- scribed, in 1777, these singular ruins, about fifty examples have been discovered in different parts of Scotland. The most remarkable are Dun Mac Uisneachain, the ancient Beregonium, north of Oban; Tap o' Noth, in Aberdeen- shire; Craig Phadraic and Dun Dhardhail, in Inver- ness; Knockfarrail, near Strathpeffer; Dun Creich, in Sutherland; Findhaven, near Aberlemno; Barryhill, in Perthshire ; Laws, near Dundee; Dun Gall and Burnt Island, in Buteshire; Anwoth, in Kirkcudbright; and Cow- denknowes, in Berwickshire. Dun Mac Uisneachain is the largest in area, being 250 yards long by 50 yards broad. The strongest and most cyclopean is the Tap o' Noth: here the walls are about 8 feet high, and between 20 and 30 feet

thick. In Dun Mac Uisneachain, Barryhill, and Laws the remains of small rectangular huts or dwellings have been found.

For a long time it was supposed that these forts were limited in their range to Scotland; but they are now known to exist in Londonderry and Cavan, in Ireland ; in Upper Lusatia, Bohemia, Silesia, Saxony, and Thuringia ; in the provinces on the upper banks of the Rhine, especi- ally in the neighbourhood of the Nahe; in the Ucker Lake, in Brandenburg, where the walls are formed of burnt and smelted bricks ; and in several places in France, such as Chateauvieux, Peran, La Courbe, Saint Suzanne, Puy de Gaudy, and Thauron. They have not been found in England or Wales ; and Worsaae, Herbst, Rygh, Hilde- brand, and Stephens assert that they do not exist in Denmark or in Scandinavia.

All the examples yet described present a general simi- larity in form and structure. In some of the Continental forts the vitrified walls are supported by masses of unvitrified stone built up on each side. Thisyin ll probability, constituted an essential feature in the Scottish forts. Except on the hypothesis of buttresses of a similar kind, it is impossible to explain the vast quantities of loose stones which are found both inside and outside many of the vitrified walls.

The method by which the fusion of such extensive fortifications was produced has always excited much interest and conjecture. Williams, when he first directed attention to the subject, maintained that the builders of the forts, whoever they were, found out, either during the process of smelting bog-ore, or whilst offering sacrifices, the power of fire in vitrifying stone, and that they im- proved upon this discovery by using it for the purpose of cementing and strengthening their strongholds. This view has been keenly controverted, and other theories have been suggested. It has been held that the vitrified sum- mits were not forts at all, but the craters of extinct vol- canoes (West, Pennant, and Cordiner), an hypothesis long since abandoned as unscientific ; that the vitrified summits are not so much vitrified forts as vitrified sites, and that the vitrescence was produced by beacon fires lighted during times of invasion, or by bonfires kindled on hill tops in religious celebrations (Sir George

Mackenzie, Dr §. Hibbert, and Principal Daniel Wilson); and, lastly, that if

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they were forts they must have originally been built of wood and stone, and that their present vitrified appearance is not due to design, but to their being set on fire by a besieging enemy (A. Fraser Tytler, Forbes Leslie, Von Cohausen, and Dr Joseph Anderson). The theory of Williams —which has, with modifications, been accepted by all the principal British and Continental authorities, such as MacCulloch, Hugh Miller, Virchow, Schaaffhausen, Thuot, and Montaiglon—is likely to hold the field. It is supported by the following facts :—

(1) The idea of strengthening walls by means of fire is not singular, or confined to a distinct race or area, as is proved by the burnt-earth enclosure of Aztalan, in Wisconsin, and the vitrified stone monuments of the Mississippi valley. (2) Many of the Primary rocks, particularly the schists, gneisses, and traps, which contain large quantitics of potash and soda, can be readily fused in the open air by ineans of wood fires, —the alkali of the wood serving in some measure as a flux. (3) The walls are chiefly vitrified at the weakest points, the naturally inaccessible parts being un- vitrified. (4) When the forts have been placed on materials prac- tically infusible, as on the quartzose conglomerates of the Old Red Sandstone, as at Craig Phadraic, and on the limestones of Dun Mac Uisneachain, pieces of fusible rocks have been seleeted and carried from a considerable distance to the top. (5) The vitrified walls of the Scottish forts are invariably formed of small stones whieh could be casily acted upon by fire, whereas the outer ram- parts, which are not vitrified, are built of large blocks. (6) Many of the Continental forts are so constructed that the fire must have been applied internally, and at the time when the structure was being erected. (7) Daubrée, in an analysis which he made on vitrified materials taken from four French forts, and which he sub- mitted to the Academy of Paris in February 1881, found the presence of natron in such great abundance that he inferred that sca-salt was used to facilitate the original fusion. (8) In Scandi- navia, where there are

hundreds of ordinary forts, and where for centuries a system of signal fires was enforced by law, no trace of vitrifaction has yet been detected.

A great antiquity has been assigned to vitrified forts, but without sufficient proof. Articles of bronze and iron have been found in the Scottish forts, while in Puy de Gaudy a Roman tile has been discovered soldered to a piece of vitrified rock. In a few of the German forts Prof. Virchow found some of the short logs of oak used as fuel in vitrifying the walls, and he concluded from the evenness of their cut surfaces that iron and not stone implements must have been used. These results indicate that these structures are the products of a high civilization, and were possibly in use as late as the early centuries of our era. It has been suggested that they were built as temporary refuges against the invasions of the Norsemen in Europe. There is much in the situation and character of the forts which favours this supposition. This is especially the case with reference to the Scottish forts. Here the vitrified summits are invariably so selected that they not only command what were, as we learn from the sagas, the favourite landing places of the vikings, but are the best natural defences against attacks made from the direction of the sea-coast. In Saxony and Lusatia the forts are known as Schwedenburgen, and in the Highlands of Scotland as the fortresses of the /ecune—designations which also seem to point to an origin dating back to the times of the vikings.

It may be interesting, as throwing light on the influence of high temperature on rocks, to notice some of the forms exhibited by the fused substances. Schistose gneiss is resolved into a kind of green glass ; mica is converted into a grey glassy stone of great hardness; quartz is reduced to the condition of pumice; trap rock becomes glazed like bottle glass; sandstone is transformed into a compact quartzite; and the felspar of granite is changed into coarse porcelain. Some of the materials have assumed, probably during the process of cooling, the prismatic structure, with four or six sides; while others, owing to the iron peroxide being reduced, have become distinctly magnetic.

The following are some of the more important treatises and references :— Williams, An Account of some Remarkable Ancient Ruins; A. Fraser Tytler, Edin. Phil. Trans., vol. ii.; Sir George Mackenzie, Observations on Vitrified Forts; Hibbert, Arch. Scot., vol, iv.; MacCulloch, Highlands and Western Islands, vol. i.; Miller, Rambles of a Geologist, chap. ix.; Wilson, Archexology, and Prehistoric Annals, vol. ii.; J. H. Burton, History of Scotland, vol. i; R. Angus Smith, Loch Etive and the Sons of Uisneach; Anderson, Scotland in Pagan Times; C. MacLagan, The Hill Forts of Ancient Scotland; Thomas Aitken, TZrans. Inverness Scientifie Soe, vol. i.; Charles Proctor, Chemical Analysis of Vitrified Stones from Tap o' Noth and Dunideer (Huntly Field Club); various papers in published Proecedings of Soc. Antig. Scot. and Proceedings of Royal Irish Academy; Leonhard, Archiv fiir Mineralogie, vol. i.; Virchow, Ztschr. fiir Ethnologie, vols. iii. and iv.; Schaaffhausen, Verhandlungen der deutsch. anthrop. Gesellschaft (1881); Kohl, Verhand. d. deutsch. anthrop. Gesell-schaft (1883); Thuot, La Forteressc vitrifice du Puy de Gaudy, ke. ; De Nadaillac, Les Premicrs Hommes, vol. i.; Mémoires de la Soc. Antig. de France, vol. xxxviii.; and Hildebrand, De férhistoriska folken 1 Europa (Stockholm, 1880). (R. MU.)

VITRIOL, a name formerly and sometimes still given to sulphuric acid and to certain sulphates (see SuLPHUR, vol. xxii. p. 636). Oil of vitriol is concentrated sulphuric acid. Blue vitriol is sulphate of copper; green

vitriol, sulphate of iron (copperas, ferrous sulphate); and white vitriol, sulphate of zinc.

VITRUVIUS,! a Roman architect and-engineer, whose full name was Marovus Vitruvius Potxio, the author of a very celebrated work on architecture. Nothing is known about his personal history, except what can be gathered from incidental remarks in his own writings. Owing to the discovery of a number of inscriptions relating to the Gens Vitruvia at Formiz in Campania (Mola di Gaeta), it has been suggested that he was a native of that city, and he has been less reasonably connected with Verona on the strength of an existing arch of the 3d century, which is inscribed with the name of a later architect of the same family name—'"' Lucius Vitruvius Cerdo, a freedman of Lucius." From Vitruvius himself we learn that he was appointed, in the reign of Augustus, together with three others, a superintendent of balistx and other military engines, a post which, he says, he owed to the friendly influence of the emperor's sister, probably Octavia (De Architectura, i. pref.). In another passage (v. 1) he describes a basilica and adjacent xdes Augusti, of which he was the architect. From viii. 3 it has been supposed that he had served in Africa in the time of Julius Cesar, probably as a military engineer, but the words will hardly bear this interpretation. He speaks of himself as being low in stature, and at the time of his writing bowed down by age and ill-health (ii. pref.). He appears to have enjoyed no great reputation as an architect, and, with philosophic contentment, records that he possessed but little fortune. Though a great student of Greek philosophy and science, he was unpractised in literature, and his style is very involved and obscure. To a great extent the theoretical and historical parts of his work are compiled from earlier Greek authors, of whom he gives a list at i. 1 and viii. 3. The practical portions, on the contrary, are evidently the result of his own professional experience, and are written with much sagacity, and in a far clearer style than the more pedantic chapters, in which he gives the somewhat fanciful theories of the Greeks. Some sections of the latter, especially those on the connexion between music and architecture, the scale of harmonic proportions, and the Greek use of bronze vases to reverberate and strengthen the actors' voices in the theatre, are now almost wholly unintelligible.

The De Architectura is divided into ten books, each with @ preface, in which occur most of the personal facts about himself. It is dedicated to Augustus, and that fact is

1 The references in this article follow the divisions into books and chapters adopted in the more recent German editions,

really all that is known with regard to the date at which Vitruvius lived, though many attempts have been made to gather more minute indications from the internal evidence of his writings : for example, the omission of any mention of the Pantheon in Rome has been taken as an argument to show that he wrote before it was built in 27 z.c. This, however, and other arguments of the same kind are obviously of but little weight. Vitruvius's name is men- tioned by Frontinus in his work on the aqueducts of Rome; and most of what Pliny says (7.N., xxxv. and XXXVi.) about methods of wall-painting, the preparation of the stucco surface, and other practical details in building is taken almost word for word from Vitruvius, especially from vi. 1, though without any acknowledgment of the source. From the early Renaissance down to a comparativel 5 recent time the influence of Vitruvius's treatise has been remarkably great. Throughout the period of the classical revival Vitruvius was the chief authority studied by all architects, and in every point his precepts were accepted as final. In some cases a failure to understand his meaning led to curious results ; for example, the mediaeval custom, not uncommon in England, of placing rows of earthenware

jars.under the floor of the stalls in church choirs appears

to have been an attempt to follow out Vitruvius's remarks about the advantages of placing bronze vases round the auditorium of theatres. Bramante, Michelangelo, Palladio, Vignola, and earlier architects were careful students of Vitruvius's work, which through them has largely influenced the architecture of almost all European countries down to the present century, a very remarkable instance of the success and influence of a book being actively redeveloped a very long time—about fifteen centuries—after its author's lifetime. There is no reason to suppose that

the book was either popular or influential among the ancient Romans, and yet in more modern times its influence has been un- bounded. Its archzeological value is very great, as without it we should find it very difficult to understand the uses of the various parts of such houses as those at Pompeii, and many interesting details with regard both to construction and design would have remained unintelligible.

Bk. i, opens with a dedication to Augustus. ©. 1 is on the science of architecture generally, and the many different branches of knowledge with which the trained architect ought to be acquainted, viz., grammar, music, painting, sculpture, medicine, geometry, mathematics, and optics; c. 2 is on the general ee of architectural design ; c. 3 on the considerations which

etermine a design, such as strength, utility, beauty, and tho like ; c. 4 on the nature of different sorts of ground for sites; c. 5 on walls of fortification ; c. 6 on aspects towards the north, south, and other points ; c. 7 on the proper situations of temples dedicated to the various deities. Bk. ii. relates to materials (preface about Dinocrates, architect to Alexander the Great). C. 1 is on the earliest dwellings of man; c. 2 on systems of Thales, Heraclitus, Democritus, &c.; c. 8 on bricks; c. 4 on sand; c. 5 on lime; c. 6 on pozzolana ; c. 7 on kinds of stone for building; c. 8 on methods of constructing walls in stone, brick, concrete, and marble, and on the materials for stucco ; c. 9 on timber, time for felling it, season- ing, &c.; and c. 10 on the fir trees of the Apennines, Bk. iii., on styles, has a preface on ancient Greek writers. C. 1 ison symmetry and proportion ; c. 2 on various forms of Greek temples, ¢.g., in antis, prostyle, peripteral, dipteral, hypathral ;? c. 3 on inter- columniation— pycnostyle, systyle, eustyle, &c.; c. 4 on founda- tions, steps, and stylobates ; c. 5 on the Ionic ordcr, its form and details. Bk. iv., on styles and orders, has a preface to Augustus on the scope of the work. The subjects of its nine chapters are— (1) the Corinthian, Ionic, and Doric orders; (2) the ornaments of capitals, &c.; (3) the Doric order ; (4) proportions of the cella and pronaos ; (5) sites of temples; (6) doorways of temples and their architraves ; (7) the Etruscan or Tuscan order of temples; (8) circu- lar temples ; (9) altars. Bk. v., on public buildings, has

a preface on the theories of Pythagoras, &c. Its twelve chapters treat (1) of fora and basilice, with a description of his own basilica at Fanum ;

2 The excavations made in 1887 have shown that Vitruvius was right in describing the great temple of Olympian Zeus at Athens as being octastyle. The previously almost universal opinion that it was decastyle had led to the needless theory that the passage containing this statement was corrupt.

(2) of the adjuncts of a forum (rarium, prison, and curia); (3) of theatres, their site and construction ; (4) of laws of harmonics ; (5) of the arrangement of tuned bronze vases in theatres for acoustic purposes ; (6) of Roman theatres; (7) of Greek theatres ; (8) of the selection of sites of theatres according to acoustic principles ; (8) of porticus and covered walks ; (9) of baths, their floors, hypocausts, the construction and use of various parts ; (11) of paleestre, xysti, and other Greek buildings for the exercise of athletes ; (12) of har- bours and quays. Bk. vi. is on sites and planning, and the preface treats of various Greek authors. C. 1 is on selection of sites ; c. 2 on the planning of buildings to suit different sites ; c. 3 on private houses, their construction and styles, the names of the different apartments ; c. 4 on the aspects suited for the various rooms ; c. 5 on the various sorts of buildings fitted for special positions; c. 6 on farms and country houses; c. 7 on Greek houses and the names of various parts ; c. 8 on construction of houses in wood, stone, brick, orconcrete. Bk. vii., mostly on methods of decoration, has a preface (as usual) on the opinions of ancient Greek writers, with lists of Greek sculptors, architects, and writers on architecture, and of Roman architects. C. 1 has for its subject pavements and roads, their construction, mosaic floors; c. 2 is on white stucco for walls (opus albarium) ; c. 3 on concrete vaults, gypsum mouldings, stucco prepared for painting; c. 4 on building of hollow walls to keep out the damp, wall decoration by various processes; c. 5 on methods and styles of wall painting, the debased taste of his time ; c. 6 on fine stueeo made of pounded marble,—three coats to receive wall paintings; c. 7 on colours used for mural decoration ; c. 8 on red lead

(miniwm) and mercury, and how to use the latter to extract the gold from worn-out pieces of stuff or embroidery; c. 9 on the preparation of red lead and the method of encaustic painting with hot wax, finished by friction ; ec. 10-14 on artificial colours— black, blue, purple ; c.10 white lead and ostrum, 7.c., murex purple, and imitations of murex dye. Bk. viii. is on hydraulic engineer- ing, and the preface on theories of the ancients. OC. 1 treats of the finding of good water, its quality according to the soil it runs through ; c. 2 of rain-water and rivers—rivers in various countries ; e. 8 of hot springs, mineral waters, with an account of the chief medicinal springs of the world; c. 4 of selection of water by observation and experiment ; c. 5 of instruments for levelling used by aqueduct engineers; c. 6 of construction of aqueducts, pipes of lead, clay, &c., cisterns, fountains, poisoning from lead pipes, hydraulic cement, settling tanks, and other valuable matter on the subject of water-supply. Bk. ix. is on astronomy. The preface treats of Greek sciences, geometry, the discovery of specific gravity by Archimedes, and other valuable discoveries of the Greeks, and of Romans of his time who have vied with the Greeks—Lucretius in his poem De Rerum Natura, Cicero in rhetoric, and Varro in philo- logy, as shown by his De Lingua Latina. The subjects of the eight chapters are (1) the signs of the zodiac and the seven planets; (2) the phases of the moon ; (8) the passage of the sun through the zodiac ; (4) and (5) various constellations; (6) the relation of astrological influences to nature; (7) the mathematical divisions of the gnomon; (8) various kinds of sun-dials and thcir inven- tors. Jk. x. ison machinery, with a preface coneerning a law at ancient Ephesus compelling an architect to complete any public building he had undertaken ; this, he says, would be useful among the Romans of his time.?_ The chapters are—(1) on various machines, such as sealing-ladders, windmills, &c.; (2) on windlasses, axles, pulleys, and cranes for moving heavy weights, such as those used by Chersiphron in building the great temple of Diana at Ephesus, and on the discovery by a shepherd of a quarry of marble required to build the same temple ; (3) on dynamics ; (4) on machines for drawing water ; (5) on wheels for irrigation worked by a river ; (6) on raising water by a revolving spiral tube ; (7) on the machine of Ctesibius for raising water to a height; (8) on a very complicated water engine, the description of which is not intelligible, though Vitruvius remarks that he has tried to make the matter clear : (9) on machines with wheels to register the distance

travelled, either by land or water ; (10) on the construction of seorpiones for hurling stones ; (11) and (12) on baliste# and catapults ; (13) on battering- rams, and other machines for the attack of a fortress: (14) on shields (éestudines) to enable soldiers to fill up the enemy's ditches ; (15) on other kinds of testudines ; (16) on machines for defence, and examples of their use in ancient times. : The first MS. of the De Architectur i i codex on vellum preserved in the Pein eet ce . the first printed edition is that issued in Rome by George Herolt about 1485-86 but without indication of place or date; it is a small folio with thirty-four lines to the page, and has neither signatures, catchwords, nor numbering of the leaves, 1t was edited by J. Sulpicius, and with it is printed Frontinus De Agueductibus : this second work occurs as an addition in many early editions of Vitruvius of which a very large number were printed at various places in Italy within a tew

ycars after the publication of the editio princeps.? On the whole the best editi of Vitruvius's text is that edited by Schneider, Leipsic, 1807, 3 vols. 8vo, with ook

1 Vitruvius names Cieero and Lueretius as " post nostram memoriam nascentes." 2 The architect being at that time also the eontraetor.

3 One of the earliest commentators on Vitruvius was the monk-arehi- teet Fra Gioeondo, a man of extraordinary talent (see VERONA).

notes, but no plates. An immense number of translations have also been pub- lished in most European languages—the first Italian translation at Como in 1521; French, at Paris in 1547; German, at Nuremberg in 1548; and the first English translation in London in 1692. The best English translation is that of Gwilt, 1826, improved edition, 1860. That of Wilkins (1812) is merely a fragment of some of the books, but it is copiously illustrated with engraved plates.

The name of Vitruvius has been given to several liandsome works on modern architecture, such as Campbell, Vitruvius Britannicus, London, 1715-71, a series of illustrations of the chief buildings of the 18th century

in England, including many works of the brothers Adam ; one of these brothers, William Adam, pro- duced a similar work illustrating the buildings which he had designed for Scotland, of which he was a native, under the title of Vitruvius Scoticus, Edin- burgh, 1790. Thurah, Ze Vitruve Danots, Copenhagen, 1746-49, is a similar collection of modern buildings in Denmark.

The biographies of Vitruvius as usually published are very untrustworthy, and contain many statements which rest upon no authority whatever. (J. TE. M.)

VITTORIA, an inland town of Sicily, in the Italian province of Syracuse, about 18 miles by road east-south- east from Terranova, stands in the midst of a rich vine and olive district, which also produces silk, rice, and honey. The population in 1881 was 21,755. Itis quite a modern town,— founded towards the beginning of the 17th century. The principal church (San Giovanni) dates from 1854.

VITUS, Sz, according to the Roman Breviary, while still a very young boy, had been baptized without the knowledge of his father, who, on learning this, spared no effort to bring about his return to paganism. After other severe measures had been tried in vain he was delivered to Valerian to be scourged, but even this had no effect, and he was handed back to his father. Admonished by an angel, Vitus, accompanied by Modestus and Crescentia, by whom he had been brought up, now took refuge abroad, where his fame for sanctity became so great that he was summoned by Diocletian to heal his child, who was grievously vexed with a devil. Successful in this he was urged by the un- grateful emperor to worship the pagan deities, and on his refusal was cast into prison. Along with Modestus and Crescentia he was sentenced to be plunged into a cauldron of molten lead, resin, and pitch, but here their experience was that of the three Hebrew children. Next they were cast before the lion, but the wild beast fawned upon them and licked their feet. Finally they were torn limb from limb. The three are commemorated on June 15. The more extended legend of St Vitus relates that, on one occasion when he had been shut up in a dungeon, his father look- ing through a chink in the door beheld him dancing with seven beautiful angels ; so dazzled was he by the sight that

he became blind, and recovered only through the interces- sion of his son. St Vitus is accordingly the patron saint of dancers and actors, and is invoked against the disease known as Sr Vitus's Danczx (q.v.). He is the patron of Saxony, Bohemia, and Sicily, and throughout Germany ranks as one of the fourteen " Nothhelfer" of the church.

VIVARINI, the surname of a family of painters of Murano (Venice), who produced a great quantity of work in Venice and its neighbourhood in the 15th century, leading on to that phase of the school which is represented by Carpaccio and the Bellinis.

ANTONIO VivaRINI was probably the earliest of this family. He came from the school of Andrea da Murano, and his works show the influence of Gentile da Fabriano. The earliest known date of a picture of his, an altar-piece in the Venetian academy, is 1440; the latest, in the Lateran museum, 1464. He worked in company with a certain " Joannes de Alemania." By some writers Joannes has been regarded as himself a Vivarini, but this appears improbable: no trace of him exists of a date later than 1447. After 1447 Antonio painted either alone or in combination with his younger brother Bartolommeo. The works of Antonio are well drawn for their epoch, with a certain noticeable degree of softness, and with good flesh and other tints. Three of his principal paintings are the Virgin Enthroned with the Four Doctors of the Church, the Coronation of the Virgin, and Sts Peter and Jerome. The first two (in which Joannes co-operated) are in the Venetian academy, the third in the London National Gallery.

BaRTOLOMMEO VIVARINI is known to have worked from 1450 to 1499. He learned oil-painting from Antonello da Messina, and is said to have produced, in 1473, the first oil picture done in Venice. This is in the church of Sts John and Paul,—a large altar-piece in nine divisions, representing Augustine and other saints. Most of his works, liowever, including one in the National Gallery, are in tempera. His outline is always hard, and his colour good ; the figures have much dignified and devout expres- sion. As ""vivarino" means in Italian a goldfinch, he some- times drew a goldfinch as the signature of his pictures.

Luici or ALvisE VIVARINI painted in 1490 and on to 1505. It has sometimes been supposed that, besides the Luigi who was the latest of this pictorial family, there had also been another Luigi who was the earliest, this supposition being founded on the fact that one picture is signed with the name, along with the date 1414. There is good ground, however, for considering this date to be a forgery of a later time. The works of Luigi show an advance on those of his predecessors, his best work being one which he executed for the Scuola di S. Girolamo in Venice, representing the saint caressing his lion, and some monks decamping in terror. The architecture and per- spective in this work are superior. Other works by Luigi are in Treviso and in Milan.

VIVES, Juan Luts (or Lupovicus) (1492-1540), a well- known scholar of the third and fourth decades of the 16th century, was born at Valencia, in Spain, in March 1492. He studied at Paris and Louvain, ultimately becoming professor of humanity at the latter university. At the instance of his friend Erasmus he prepared an edition of Augustine's De Civitate Dei, which was published in 1522 with a dedication to Henry VIII. of England. Soon after- wards he was invited to England and appointed tutor to the Princess Mary, for whose benefit he wrote De Ratione Studii Puerilis Epistole Due. While in England he resided a good deal at Oxford, where he was made doctor of laws and lectured on philosophy. Having openly declared himself against the king's divorce, he lost the royal favour and was thrown into prison, where he re- mained for six months. On his release he went to Spain and afterwards to the Low Countries, finally settling in Bruges, where he married and devoted himself to the com- position of his numerous works, which were chiefly directed against the scholastic philosophy and the preponderant authority of Aristotle. He died on May 6, 1540.

A complete edition of his works was published at Basel in 1555 (2 vols. fol.), and another at Valencia in 1782.

VIZAGAPATAM, a British district of India, in Madras presidency, lying between 17° 14' 30" and 18° 58' N. lat. and 82° 19' and 83° 59' E. long., with an area of 3477 square miles. Including the Jaipur and Vizianagram zamindaries, which are under British administration, the area is 17,380

square miles. Vizagapatam is bounded on the N. by Ganjam district, on the E. by Ganjam and the sea, on the S. by the sea and Godavari district, and on the W. by the Central Provinces. It is a beautiful, picturesque, and hilly country, forming part of the large extent of shore known as the Orissa coast, but for the most part it is unhealthy. The surface of the country is generally undu- lating, rising towards the interior, and crossed by streams, Which are dry except during the rainy season. The main portion is occupied by the Eastern Ghats. The slopes of these mountains are clothed with luxuriant vegetation, amid which rise many tall forest trees, while the bamboo grows profusely in the valleys. The drainage on the east 1s carried by numerous streams direct to the sea, and that to the west flows into the Godavari through the Indravati or through the Sabari and Sillar rivers. To the west of the range is situated the greater portion of the extensive

zamindari of Jéipur, which is for the most part very hilly and jungly. The north and north-west of the district ig also mountainous. In the extreme north a remarkable mass of hills, called the Nimgiris, rise to a height of 4972 feet, and these are separated by valleys of not more than 1200 feet from the neighbouring ranges of Ghats. The plain along the Bay of Bengal is exceedingly rich and fertile. It is described as a vast sheet of cultivation, green with rice fields and gardens of sugar-cane and tobacco. There are great varieties of climate in the dis- trict. Along the coast the air is soft and relaxing, the prevailing winds being south-easterly. The average annual rainfall at Vizagapatam exceeds 40 inches.

The census of 1881 returned the population of the district, exclusive of the agency tracts, at 1,790,468 (males 897,116, femalcs 893,352). Including the Jaipur and Vizianagram dependencies, the total population of the district was 2,485,141 (males 1,254,850, females 1,230,291), of whom 2,460,474 were Hindus, 20, 403 Mohammedans, and 3410 Christians. There arc five towns with populations of more than 10,000, viz.:—Vi1ZAGAPATAM and Viz1A- NAGRAM (9.v.); Anakapalle, 13,341; Bobbili, 14,943; and Salur, 11,856. The chief crops are rice, which is the staple product of the country, and sugar. The cultivation of indigo is also successfully carried on. Thc actual area under cultivation in 1885-86 amounted to 168,559 acres, besides 10,833 acres of forests.

The gross revenue of the district in 1885-86 was £201,699, of which the land yielded £139,200. There are few industries, the principal being cotton cloths and the beautiful fancy wares of Vizagapatam towns. On the dis- solution of the Mughal empire Vizagapatam occupied a portion of the territory known as the Northern Circars, which were ceded to the East India Company by treaty in 1768. On the introduction of the per- manent settlement in 1802 it was formed into a separate collectorate, and since then scveral changes have bcen made in its administration.

VIZAGAPATAM, a municipal and seaport town, the administrative headquarters of the above district, with a population in 1881 of 30,291. It lies on a small bay, the south extremity of which is bounded by a promon- tory known as the Dolphin's Nose, and its northern extremity by the suburb of Waltair. The town or fort, as it is called, is separated from the Dolphin's Nose by a small river, which forms a bar where it enters the sea, but is passable for vessels of 300 tons during spring tides. Vizagapatam is the residence of a Roman Catholic vicar apostolic. It contains some good streets, has a hand- some hall, library, and reading- room, an excellent hospital and dispensary, and maintains a great many schools. The principal exports are grain and sugar, and the principal industries of the town are elk horn and ivory knick- knacks and gold and silver filigree work.

VIZIADRUG, or Guerta, a port in Ratnagiri district, Bombay presidency, India, about 30 miles south of Ratnagiri town and 170 miles south of Bombay city, in 16° 33' 40" N. lat. and 73° 22'10" E. long. It is one of the best harbours on the western coast of India, being without any bar, and may be entered in all weathers ; even to large ships it affords safe shelter during the south- west monsoon. The chief interest of the place centres in its fort, which is one of the strongest Mohammedan fortresses in the Concan, and rises grandly about 100 feet above the river.

About 1698 the pirate chief Angria made Viziadrug the capital of a territory stretching for about 150 miles along the coast, and from 30 to 60 miles inland. The fort surrendcred to the English fleet in 1756, and was given over to the peshwd4. In May 1818 an unsuccessful attempt was made to take Viziadrug, but, the whole of the district of Ratnagiri having

now passed into the hands of the British, the fortress surrendered in June.

VIZIANAGRAM, one of the most ancient and extensive estates or zamindaries in India, included in the Vizaga- patam district of the Madras presidency, with an area of about 3000 square miles, and a population (1881) of 844,168. The chief town, Vizianagram, had in 1881 a population of 22,577.

The zamindari first came under the charge of the English authorities in 1817, with a very heavy debt, but it was restored to

the raja five years afterwards clear of all incumbrances. It again came under their charge in 1827, during a minority, but on the r4ja's coming of age it was again restored with a surplus.

VIZIER (Arabic Waztr), literally the " burden bearer i of the sovereign. The office of vizier, which spread from the Arabs to the Persians, Turks, Mongols, and other Oriental peoples, arose under the first Abbasid caliphs, and took shape under their great ministers the Barmecides (see vol. xvi. p. 591). The vizier stood between sovereign and subjects, representing the former in all matters touch- ing the latter. This withdrawal of the head of the state from direct contact with his people was unknown to the Omayyads, and was certainly an imitation of Persian usage ; it has even been plausibly conjectured that the name is but the Arabic adaptation of a Persian title. It appears, however, in the Koran (xx. 30, xxv. 37), where Aaron is called the waztr of Moses, and these passages are appealed to by Arabic writers as giving divine sanction to the institution. The title of wazir was often given to ministers of a special department, such as the treasury or the police, but the wazir (the grand vizier, as Europeans say) bore the whole burden of the state, and, although his position was absolutely uncertain, depending on the mere will of the sovereign, his power was unlimited. His place was one of dizzy grandeur but of extreme difficulty. He was expected to be able to answer all questions, realize every wish of the caliph, keep the coffers of the state full, and yet find time to cultivate the personal favour of the sovereign by

the display of social gifts. Such were the Barmecide viziers, the brilliant type of which all subse- quent Oriental ministers are more or less imperfect copies. Ultimately under the caliph Radi the grand vizier gave way toa mayor of the palace called the amir al-omard, but the old office and title were continued at the courts of the princes who rose on the decline of the caliphate. In Spain, where the chamberlain (Adjib) was the greatest officer of state, the title of waztr was given to governors of towns, and in this sense the word was the parent of the Spanish alguazil.

VIZZINT, an inland town of Sicily, in the Italian province of Catania, 39 miles E.N.E. of Terranova and 34 miles W.N.W. of Syracuse, is a prosperous country place of 13,966 inhabitants (1881). It has several churches (S. Gregorio, Minori Osservanti, S. Maria de' Greci), with pictures of some artistic or antiquarian interest.

VLACHS. Vlach, otherwise written Wallack, is a general name for all the members of the Latin-speaking race inhabiting eastern Europe. The name is in its origin identical with our "Welsh," " Welshman," and represents a Slavonic adaptation of a generic term applied by the Teutonic races at the time of the migration of peoples to all Roman provincials. It thus finds its analogies in the German name for Italy—Welschland (Walischland), in the Walloons of the Low Countries, the " Wallgau" of Tyrol, &c. An early instance of its application to the Roman population of the Eastern empire is found in the Zraveller's Song, where in a passage which in all probability connects itself with the early trade-route between the Baltic staple of Wollin and Byzantium, the gleeman speaks of Czsar's realm as Walaric = "Welshry." In verse 140 he speaks of the " Rum-walas," and it is to be observed that "Rum " is one of the words by which the Vlachs of eastern Europe still know themselves.

The Slavs, at least in their principal extent, first knew the Roman empire through a Teutonic medium, and adopted their terms Vlach, Voloch, from the Ostro-Gothic equivalent of the Anglo-Saxon "Wealh." The name is thus of foreign origin, the native Vlachs continuing to this day to call

See Lagarde, Armenische Studien, p. 147, and Noldeke's trans- lation of Tabari, pp. 58 n, 444 n.

themselves " Raument," Romeni, or even Lomani; and it is from the native pronunciation of the Roman name that we have the equivalent expression Kowman, a word which must by no means be confined to that part of the Vlach race inhabiting the present kingdom ef Roumania. This Vilach or Rouman race constitutes a distinct division of the Latin family of peoples, widely disseminated throughout eastern Europe, both north and south of the Danube. North of the Danube the Roumans inhabit, besides Walachia and Moldavia, Bessarabia and the adjoining South-Russian districts, a large part of Transylvania and the Hungarian Banat, and extend sporadically from the Bug to the Adriatic. South of the Danube the central glens of Pindus form the principal nucleus of Rouman habitation, but there is besides a considerable colony in the Epirote district of Musakja, in Aitolia and Acarnania, in various districts of Albania, Thessaly, Macedonia, and the Bulgarian principality. In Servia this element is preponderant in the Timok valley, while in Istria it is represented by the Cici, at present largely Slavonized, as are now entirely the kindred Morlachs of Dalmatia.

The centre of gravity of the Vlach or Rouman race is at present unquestionably north of the Danube, and corre- sponds roughly to the limits of Trajan's Dacian province. From this circumstance the popular idea has arisen that the race itself represents the descendants of the Romanized population of Trajan's Dacia, which was assumed to have maintained anunbrokenexistencein Walachia, Transylvania, &ec., beneath the dominion of a succession of invaders. The Vlachs of Pindus, &c., on this hypothesis, were to be regarded as later immigrants from the lands north of the Danube. In 1871 Roesler published, in a collective form, a series of essays, in which he absolutely denied the claim of the Roumanian and Transylvanian Vlachs to be regarded as Dacian autochthones. He laid stress on the statements of Vopiscus and others as implying the total withdrawal of the Roman provincials from Trajan's Dacia by Aurelian, and on the non-mention by historians of a Latin popula- tion in the Jands on the left bank of the lower Danube, during their successive occupation by Goths, Huns, Gepide, Avars, Slavs, Bulgars, and other barbarian races. He found the first trace of a Rouman

settlement north of the Danube in a Transylvanian diploma of 1222. Roesler's thesis has been generally regarded as an entirely new de- parture in critical ethnography. As a matter of fact, his conclusions had to a great extent been already anticipated by Sulzer in his Geschichte des Transalpinischen Daciens, published at Vienna in 1781, and at a still earlier date by the Dalmatian historian Lucius of Traii in his work De Regno Dalmatiz et Croatix, 1666.

The theory of the later immigration of the Roumans into their present abodes north of the Danube, as stated in its most extreme form by Roesler, commanded wide accept- ance, and in Hungary it was politically utilized as a plea for refusing parity of treatment to a race of com- paratively recent intruders. In Roumania itself Roesler's views were resented as an attack on Rouman nationality. Outside Roumania they found a determined opponent in Dr Jung, of Innsbruck, who in his Anfénge der Roméinen upheld the continuity of the Roman provincial stock in Trajan's Dacia, disputing from historic analogies the total withdrawal of the provincials by Aurelian; and the reaction against Roesler was carried still further by T. Lad. Pit (Ueber die Abstammung der Rumiinen, 1880) and Prof. A. D. Xenopol of Jassy (Les Rowmains au Moyen Age, 1885).

On the whole,—as often in controversies,—it may be said that the truth lies between the two extremes. 'Roesler 1s no doubt so far right that at the time of the migration of peoples, and indeed throughout the early Middle Ages, the bulk of the Rouman people lay south of the Danube.

2 jb Et eit.

Pié's view that the population of the Roman provinces of Meesia, &c., were Hellenized rather than Romanized, and that it is to Trajan's Dacia alone that we must look for the Roman source of the Vlach race, conflicts with what we know of the Latinizing of the Balkan lands from inscrip- tions, martyrologies, Procopius's list of Justinian's Illyrian fortresses, and other sources. This Roman element south of the Danube had further received a great increase at the expense of Trajan's colonial foundation to the north when Aurelian established his New Dacia on the Mcesian side of the river. On the other hand, the analogy supplied by the withdrawal of the Roman provincials from Riparian Noricum tells against the

assumption that the official withdrawal of the Roman colonists of Trajan's Dacia by Aurelian entailed the entire evacuation of the Carpathian regions by their Latin-speaking inhabitants. As on the upper Danube the continuity of the Roman population is attested by the Vier Komanisci of early medizeval diplomas and by other traces of a Romanic race still represented by the Ladines of Tyrol, so it is reasonable to suppose a Latin-speaking population continued to exist in the formerly thickly colonized area embracing the present Transylvania and Little Walachia, with adjoining Carpathian regions. Even as late as Justinian's time, the official con- nexion with the old Dacian province was not wholly lost, as is shown by the erection or restoration of certain tétes- de-pont and castella on the left bank of the lower Danube.

We may therefore assume that the Latin race of eastern Europe never wholly lost touch of its former trans- Danubian strongholds. It was, however, on any showing greatly diminished there. The open country, the broad plains of what is now the Roumanian kingdom, and the Banat of Hungary were in barbarian occupation. The centre of gravity of the Roman or Romance element of llyricum had now shifted south of the Danube. By the 6th century a large part of Thrace, Macedonia, and even of Epirus, had become Latin-speaking.

What had occurred in Trajan's Dacia in the 3d century Was consummated in the 6th and 7th throughout the greater part of the South-Illyrian provinces, and the Slavonic and Avar conquests severed the official connexion with eastern Rome. The overthrow of civic life and break-down of provincial organization was complete. The Roman element was uprooted from its fixed seats, and swept hither and thither by the barbarian flood. Nomadism became an essential of independent existence. On the other hand, large masses of homeless provincials were dragged off as captives in the train of their barbarian Conquerors, to be distributed in servile colonies. They were thus in many cases transported by barbarian chiefs—Slav, Avar, and Bulgarian—to trans-Danubian and Pannonian regions. In the Acts of St Demetrius of Thessalonica we actually find an account of such a Roman colony, which, having been carried away from South-Illyrian cities by the Avar khagan, and settled by him in the Sirmian district beyond the Save, revolted after seventy years of

captivity, nade their way once more across the Balkan passes, and finally settled as an independent community in the country Inland from Salonica. Others, no doubt, thus transported northwards never returned. It is certain that the earliest Hungarian historians who describe the Magyar invasion of the 9th century speak of the old inhabitants of the country as Romans, and of the country they occupied as Pascua Romanorum; and the Russian Nestor, writing about 1100, makes the same invaders fight against Slavs and Vlachs (Volochi) in the Carpathian Mountains. So far from the first mention of the Vlachs north of the Danube occurring only in 1222, as Roesler asserts, it appears from & passage of Nicetas of Chonz that they were to be found already in 1164 as far afield as the borders of Galicia.

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It is nevertheless true that throughout the early Middle Ages the bulk of the Rouman population lay south of the Danube. It was in the Balkan lands that the Rouman race and language took their characteristic mould. It is here that this new Illyrian Romance first rises into historic prominence. Already in the 6th century, as we learn from the place names, such as Sceptecasas, Burgualtu, Clisura, &c., given by Procopius, the Rouman language was assuming, so far as its Latin elements were concerned, its typical form. In the somewhat later campaigns of Commentiolus (587) and Priscus, against the Avars and Slovenes, we find the Latin-speaking soldiery of the Eastern emperor making use of such Romance expressions as " torna, frate!" (turn, brother !), or "sculca" (out of bed) applied to a watch (cf. Rouman "a se culca" = Italian " coricarsi" + ex-(s-) privative). Next we find this warlike Rouman population largely incorporated in the Bulgarian kingdom, and, if we are to judge from the names Paganus and Sabinus, already supplying it with rulers in the 8th century. The blending and close contact during this period of the surviving Latin population with the Slovene settlers of the peninsula impregnated the language with its large Slavonic ingredient; and the considerable Albanian element in Rouman, as well as the still greater element of Rouman in Albanian, is alone sufficient to show that the two languages took their charac- teristic shapes in a contiguous area. The fact that these peculiarities are common to the Roumans north of the

Danube, whose language differs dialectically from that of their southern brothers, shows that it was this southern branch that throughout the early periods of Rouman his- tory was exercising a dominating influence. Migrations, violent transplantation, the intercourse which was kept up between the most outlying members of the race, in its very origin nomadic, at a later period actual colonization en masse and the political influence of the Bulgaro-Vlachian empire, no doubt contributed to propagate these southern linguistic acquisitions throughout that northern area to which the Rouman race was destined almost imperceptibly to shift its centre of gravity.

Byzantium, which had ceased to be Roman, and become Romaic, renewed its acquaintance with the descendants of the Latin provincials of Illyricum through a Slavonic medium, and applied to them the name of " Vlach," which the Slav himself had borrowed from the Goth. The first mention of Vlachs in a Byzantine source is about the year 976, when Cedrenus (ii. 439) relates the murder of the Bulgarian czar Samuel's brother 'by certain Vlach way- farers," at a spot called the Fair Oaks, between Castoria and Prespa. rom this period onwards the Rouman inhabit- ants of the Balkan peninsula are constantly mentioned by this name, and we find a series of political organizations and territorial divisions connected with the name of " Vlachia." Within the limits of the present article it is impossible to give more than a short synopsis of the most important of these, while for a history of the later Rouman princi- palities of Walachia and Moldavia the reader is referred to the article RouMANIA.

1. The Bulgaro-Vilach Empire.—After the overthrow of the older Bulgarian czardom by Basil Bulgaroktonos, the Vlach population of Thrace, Hemus, and the Mesian lands passed once more under Byzantine dominion; and in 1185 a heavy tax, levied in kind on the cattle of these warlike mountain shepherds, stirred the Vlachs to revolt against the emperor Isaac Angelus, and under the leader- ship of two brothers, Peter and Asen, to found a new Bulgaro- Vlachian empire, which ended with Kaliman iI. in 1257. The dominions of these half-Slavonic half-Rouman emperors extended north of the Danube over a great deal of what is now Roumania, and it was during this period that the Vlach population north

of the river seems to have been most largely reinforced. The French traveller Rubruquis speaks of all the country between Don and Danube'as " Asen's land" or " Blakia."

2. Great Walachia (MeydaAn BAaxta).—It is from Anna Com- nena, in the second half of the 11th century, that we first hear of

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a Vlach settlement, the nucleus of which was the mountainous region of Thessaly. Benjamin of Tudela, in the succeeding century, gives an interesting account of this Great Walachia, which was then completely independent. It embraced the southern and central ranges of Pindus, and extended over part of Macedonia, thus including the region in which the Roman scttlers mentioned in the Acts of St Demetrius had fixed their abode. After the Latin conquest of Constantinople Great Walachia was included in the en- larged despotate of Epirus, but it soon reappears as an independent principality under its old name, which, after passing under the yoke of the Serb emperor Dushan, was finally conquered by the Turks in 1393. Many of their old privileges were still accorded to the in- habitants, and their taxes were limited to an annual tribute to the sultana Valide. Since this period the Megalovlachites have been largely Hellenized, but they are still represented by the flourishing Tzintzar settlements of Pindus, and traces are at present perceptible among them of a national Rouman reaction.

3. Little Walachia (Mixpa BAaxla) was a name applied by Byzantine writers to the Rouman settlemeuts of /tolia and Acarnania, and with it may be included " Upper Walachia" or AvéBaaxa. Its inhabitants are still represented by the Tzintzars of the Aspropotamo and the Karaguni (Black Capes) of Acarnania.

4. The Morlachs (Mavrovlacht) of the West.—These are already mentioned as Nigri Latint by the Presbyter of Dioclea (circ. 1150) in the old Dalmatian littoral and the mountains of what is now Montenegro, Herzegovina, and North Albania. Other colonies extended through a great part of the old Servian interior, where is a region still called Stara Vlaska or "Old Walachia." The great commercial staple of the east

*Adriatic shores, the republic of Ragusa, seems in its origin to have been a Rouman settlement, and many Vlach traces survived in its later dialect. Philippus de Diversis, who described the city as it existed in 1440, says that '*the various officers of the republic do not make use either of Slav or Italian, with which they converse with strangers, but a certain other dialect only partially intelligible to us Latins," and cites words with strong Rouman affinities. In the mountains above Ragusa a number of Vlach tribes are mentioned in the archives of that city, and the original relationship of the Ragusans and the nomadic Alpine representatives of the Roman provincials, who preserved a traditional knowledge of the old lines of communication throughout the peninsula, explains the extraordinary development of the Ragusan commerce. In the 14th century the Mavrovlachi or Morlachs extended themselves towards the Croatian borders, and a large part of maritime Croatia and northern Dalmatia began to be known as " Morlacchia." A " Major Vlachia"' was formed about the triple frontier of Bosnia, Croatia, and Dalmatia, and a 'Little Walachia" as far north as Posega, The Morlachs have now become Slavonized.*

5. Ctct of Istria.—The extreme Rouman offshoot to the north- west is still represented by the Cici of the Val d'Arsa and adjoining Istrian districts. They represent a 15th-century Morlach colony from the Isle of Veglia, and had formerly a wider extension to Trieste and the counties of Gradisca and Gorizia. The Cici are at present rapidly losing their native tongue, which is the last re- maining representative of the old Morlach, and forms a connecting link between the Daco-Roman (or Roumanian) and tho Macedo- Roman (or Tzintzar) dialects,

6. Roumans of Transylvania and Hungary.—As already stated, a large part of the Hungarian plains were, at the coming of the Magyars in the 9th century, known as Pascua Romanorum. At a later period privileged Rouman communities existed at Fogaras where was a Silva Vlachorum, at Marmaros, Deva, Hatzeg Hun- yad, and Lugos, and in the Banat were seven Rouman districts Two of the greatest figures in Hungarian history —John Corvinus of Hunyad, and his son King Matthias—were due to this element Oppressed by the dominant race, which had deprived them of their ancient privileges, the Roumans of Transylvania and the Banat rose

in 1785 under Horia, Closca, and Crischanu. This Rouman "Jacquerie " was suppressed, but Joseph II. declared the peasants free. Since that date the Rouman element in this part of the old Dacian region has largely increased in numbers though it has hitherto failed to secure its political rights, The contiguous dis- trict of the Bukovina, a part of Moldavia annexed to the Haps- burg dominions in 1775, remains under the Austrian Government.

The present numerical strength of the Roumani : mately be given as follows:— eer AAR PEO –

Southern or Tzintzar branch in Pindus, &c….225,000

Roumans of Tirnok district… ..0…..ccccceccce.., 150,000 RSSISMM AF iy sees = 408 asc aedsecccseces,ch 4,500,000 MGPPANIS UIA MOAN pons oo enesevec. cs .oeces 3,500,000 In Bessarabia and South Russia…..... vessess44e600,000

|W | ee SOD0N0cAROCOSO NEES cone eee 8,975,000

In features the Vlachs especially of the Carpathian yall – sent decidedly Roman characteristics, and it z not Bugiciacilt to find types which occur in North Italy and amongst Spaniards aud

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Provengals, They are usually short and dark. Those of Pindus have sharper-cut features and soine Slovene traits in their physio- gnomy. 'The race has a great natural capacity for trade and manu- facture. The Vlachs excel as builders and artisans, but notably as workers in nietal; their financial enterprise is also remarkable, and some of the principal banking establishments in Vienna are due to members of this race. An extraordinary cxample of their successful enterprise in the Balkan peninsula is supplied by the history of Moschopolis on the Epirote side of Pindus, which was founded by a Vlach colony in the 16th century, and whicli not only became a populous commercial staple but a centre of literary culture. Moschopolis possessed a large public library, flourishing schools, and a printing press, from which issued both Greek and Rouman

books of a religious and scholastic nature. Joannina, since completely Hellenized, was also of Rouman origin. Metzovo (Minciu) is another flourishing Rouman colony in the same region, and, though Moschopolis has fallen a victim to the ravages of the wild Arnauts, a local successor has sprung up in the rising town of Gjurtza, The Roumans make good soldiers, as was seen at Plevna. In their customs and folk-lore both Latin and Slavonic traditions assert themselves as in their language. Of their Roman traditions the Trajan saga, the celebration of the Rosalia and Kalende, the belief in the "striga" (witch), the names of the inonths and days of the week, may be taken as typical examples. Some Roman words connected with the Christian religion, like biserica (basilica) =a church, botez=baptizo, duminica=Sunday, preot (presbyter) = priest, point to a continuous tradition of the Illyrian church, though most of their ecclesiastical terms, like their liturgy and alphabet, were derived from the old Slovene. In most that con- cerns political organization the Slavonic element is also pre- ponderant, though there are words like imparat—imperator, and domn=dominus, which point to the old stock. Many words re- lating to kinship are also Latin, some like vitrig (vitricus) =father- in-law being alone preserved by this branch of the Romance family. Although of the actual vocabulary only about one-fifth is Latin, and two-fifths, or about double the amount, Slavonic (see Cihac, Diction- naire d Etymologie Daco-Romaine), the greater proportion of the words in common use is still Latin. Many words, however, of common and indispensable use, those even connected with ideas nearest to the heart, as for instance the Rouman iubesc=to love, and maic&=a mother, are themselves of Slavonic origin. Alike in the dwellings, customs, and costumes of the Vlach race we en- counter at every turn the dominating influence of the Slav peoples by whom they were surrounded. Thisexternal influence, however, has not by any means affected the strong pride of Roman origin which is the heirlooni of all members of the Rouman race. Hel- lenization itself, hitherto successful among the southern Roumans, has received a check in the Pindus region, while north of the Danube the Rouman race is continually gaining at the expense of its neigh- bours.

VEADIKAVKAZ, a fortified town of Russia, in the province of Terek, is advantageously and picturesquely situated at the northern base of the

Great Caucasus chain, on a raised plain, 2230 feet above the sea-level, where the gorge of the Terek emerges from the mountain tracts. It is the present terminus of the railway from RosrorrF (¢.v.), which is intended ultimately to cross the main ridge. The fortress, formerly but a small redoubt, erected in 1784 at the northern entrance of the pass by which the Caucasus used to be crossed, now stands higher up, and is connected by a bridge with the town proper. Vtadikavkaz is now the capital of the province. It is tidily built, and its popula- tion since it became an entrepét for trade between Russia and Caucasus has rapidly grown (32,340 in 1883). The transport of merchandise is the principal occupation of the place, 400,000 cwts. of goods annually arriving by rail to be forwarded to Tiflis, while 160,000 cwts. are sent from Viadikavkaz northwards.

VLADIMIR, a government of middle Russia, bounded by Moscow and Tver on the W., Yarostav and Kostroma on the N., Nijniy Novgorod on the E., Tamboff and Ryazafi on the S., has an area of 18,864 square miles. It extends over the eastern parts of the central plateau of middle Russia, which has an average elevation of from 800 to 950 feet above the sea, and is grooved by river valleys to a depth ranging from 300 to 450 feet below the

general level, so that the country has a hilly appearance on the banks of the chief rivers. The lacustrine depres- sion of the middle Volga and Oka extends into the eastern parts of the government. The Upper Carboniferous lime- stones, of which it is mostly built up, are covered with Permian sandstones towards the east, and patches of Jurassic clays —denuded remnants of formerly extensive deposits—are scattered over its surface. Cretaceous de- posits are supposed to make their appearance in the south. The whole is covered with a thick sheet of boulder clay, considered as the bottom-moraine of the North-European ice-sheet, and overlaid, in its turn, in the depressions, by extensive Lacustrine clays and sands. The soil is thus for the most part unfertile, save in the district of Yurieff, where are found patches of black earth, which..of late have occasioned a good deal of discussion among Russian geologists. Iron-ore is widely diffused, and china clay and gypsum are met with in several

places. Peat is of common occurrence. As for coal, it is certain that the coal-bearing Lower Carboniferous strata of the Moscow basin would be encountered by boring to a certain depth ; no such explorations, however, have yet been made, as forests still cover extensive tracts in the south-east, and the numerous manufactures of Vladimir suffer from no lack of fuel. The climate resembles that of Moscow, but is a little colder, and still more continental ; the average yearly temperature at Vladimir is 38° F. (January, 16°; July, 66°°5).

The Oka flows through the government for 85 miles, and is navigable throughout. Of its tributaries, the Klyasma is navigable to Kovrotf, and even to Vladimir in summer; and timber is floated on the Teza, Small lakes are numerous; that of Plescheyevo or Pereyastav] (5 miles in length) has historical associations, Peter I. having here acquired in his boyhood his first experiences in navi- gation. Marshes cover more than half a million acres.

The population (1,359,330 in 1883) is thoroughly Great Russian; the Finnish tribes, Muroma and Merya, which formerly inhabited the region, have been absorbed by the Slavonians, as also have the Karelians who are supposed to have formerly inhabited the terri- tory ; the descendants of the few hundred Karelian families, which were settled by Peter I. on the shores of Lake Pereyastavl, still, however, maintain their language. Agriculture is carried on every- where, but is in a prosperous state only on the left bank of the Klyasma, and corn is imported. The culture of flax, both for local manufactures and for export—especially about Melenki—is important ; so also are that of hemp and gardening. Natural pas- tures being by no means deficient, the number of cattle is greater than might be expected in a province so backward in agriculture, The average crops of the ycars 1883-85 were—rye, 1,400,300 quarters; oats, 1,097,000; wheat, 36,400; barley, 63,000; other grains, 250,800; and potatoes, 52,300. In 1883 there were 323,000 cattle, 210,050 horses, and 330,050 sheep.

A distinctive feature of Vladimir is the great variety of petty trades carried on in its villages by peasants who still continue to cultivate their allotments and thus combine manufacture with agriculture. Nearly every village has its own specialty, and, while i some of them almost all the male

population leave their homes and go in numerous artels (see vol. xxi. p. 84) all over Russia as carpenters, masons, iron-roof makers, or as ofent (pedlars or travel- ling merchants), other villages have their specialties in some branch of manufactured produce. Nearl y 30,000 carpenters leave Vladimir every year. Whole villages are engaged in painting sacred pictures or ikons, and there are weekly fairs, where no fewer than 130 cart-loads of planks for such works are bought every week during winter. Although the ikons are sold at a shilling the hundred, the

seregate trade is valued at £150,000 a year; and the Vladimir (or rather Suzdal) pictures spread all over Russia and the Balkan peninsula, In other villages some 1200 men are employed in making sickles, knives, or locks. Wooden vessels, boxes, and baskets, lapti (shoes made of lime-tree bark which are worn in Great Russia, and are produced by the million), wheels and sledges, sieves, combs, woollen stockings and gloves, sheepskins and sheepskin gloves for peasants, felt, all kinds of toys, earthenware, and finally all kinds of Woven fabrics, are so many specialties of separate villages. In 1884 102,500 persons were directly engaged in petty trades, in which indeed Vladimir occupies the first rank in Russia, the annual pro- duction (63,000,000 roubles) being one-third of the total for the whole country, Moscow coming next with 37,300,000 roubles. he manufactures of Vladimir are equally important: out of the aggregato production of the fifty governments of European

Russia (1,329,602,000 roubles in 1884), Vladimir was returned for 88,827,000 roubles, exclusive of numerous minor manufactures not included in the census. In the number of workmen employed in manufactures (102,900) Vladimir is second only to Moscow, and in its production it is second only to Moscow and St Petersburg. The chief industrial establishments are cotton and linen factories, glass, chemical, and iron works, distillerics, and tanneries,

Vladimir is divided into fourteen districts, the chief towns of which (with populations in 1884) are VLADIMIR (q.v.), 18,420 ; Alexandroff, 6915; Ivanovo-Voznesensk, 14,060 ; Kovroff, 8050; Melenki, 6470; Murom (q.v.), 18,680; Pereyastavl Zalyesskiy, 7470; Pokroff, 2700; Suuya (q.v.),

21,480 ; Sudogda, 1880; Suzdal, 6770; Vyazniki, 6015; and Yuriecff Polskiy, 5400. Kirzhatch (3285), Voznesensk (6000), and Gavritovsk (1780) have also muni- cipal institutions, Ivanovo, Gusevsk, Khotui, and several others, though mere villages, are more important than some district towns,

VLADIMIR, capital of the above government, is known in history as Vladimir-on-the-Klyasma, to distinguish it from Vladimir in Volhynia. It is picturesquely situated on the Klyasma and Lybed, 114 miles by rail to the east of Moscow. The Lybed divides it into two parts. Extensive cherry gardens occupy the surrounding slopes, each with its small watch-tower, having cords drawn in all directions to be shaken by the watcher when birds alight. The krem] stands on a hill and contains two very old cathedrals—the Uspenskiy (1150), where all princes of Vladimir have been buried, and the Dmitrievskiy, restored in 1834 in its old style. Several churches date from the 12th century, The "Golden Gate"—a triumphal gate sur- mounted by a church—was built by Andrei Bogolubskiy in 1158. On the whole Vladimir is a decaying place ; its population has only risen to 18,420 in 1884 from 13,865 in 1859. The manufactures are for the most part insignificant, and trade has not the importance it has in some of the district towns.

Vladimir was founded in the 12th century. It first comes into notice in 1151, when Andrei Bogolubskiy secretly left Vyshgorod —the domain of his father in the principality of Kieff—and migrated to the newly settled land of Suzdal, where he became (1157) grand- prince of the principalities of Vladimir, Suzdal, and Rostoff. During the next century Vladimir became the chief town of the Russian settlements in the basin of the Oka, and till 1328 it disputed the superiority with the new mg pond of Moscow (g.v.). In the 14th century it began to fall to decay; and, like Pskoff, it is now one of the less important provincial cities of Russia.

VEADIVOSTOK, the chief naval station of Russia on the Pacific, is situated in 43° 7' N. lat. and 131° 55' E. long., on the Gulf of Peter the Great in the Sea of Japan. This gulf, which has a length of nearly 50 miles, and a width at its entrance of 112 miles, is divided into two large bays—Amur and Usuri—by the hilly peninsula of Muraviofi-Amurskiy,

continued in a group of islands, of which the Kozakevitch or Russkiy (Johanga-tun) is the largest. A narrow strait, which has received the high- sounding name of the Eastern Bosphorus, separates this from the peninsula, and Viadivostok occupies the northern shore of one of its horn-like expansions, which the Russians have called the Golden Horn (Zolotot Rog). The depth of the Eastern Bosphorus ranges from 13 to 20 fathoms, and that of the Golden Horn from 5 to 13, the latter thus affording a spacious harbour, ez —one of the finest, indeed, in the world. The hills are covered with forests of oak, lime, birch, maple, cork, wal- nut, acacia, ash, aspen, pop- ks=-ty lar, elm, apple, pear, and wild cherry, with a rich under- growth of the most varied shrubs. Excellent timber is supplied by oak and cedar forests not far off. The climate, however, is severe, if compared with that of corresponding latitudes in Europe. Though standing in almost the same parallel as Marseilles, Vtadivostok has an average annual temperature of only

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Environs of Vtadivostok.

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38°°5 F., and, although the gulf itself never freezes, a thin ice-crust forms along the shores in December, keeping ships ice-bound for from thirty to forty-five days. ;

The settlement of Vtadivostok, though founded only in 1861, had in 1886 12,500 inhabitants, chiefly military ; and for hundreds of miles inland the sole population con- sists of the small military posts by which communication is maintained up the Suifun to Lake Khangka and the Cossack settlements on the Usuri. Vtadivostok is con- nected with headquarters by telegraph.

Since the transference of the navy workshops from Nikolaievsk the place has gained in importance. It has a pro-gymnasium for boys (60 pupils), a club, and a newspaper. The imports of both Russian aed foreign goods

during the last five years have reached an average of from 24 to 8 millions of roubles; but the exports are insignificant. Some 3000 or 4000 Coreans find employment in the Gulf of Peter the Great in gathering the edible seaweed Laminaria saccharina, of which about 70,000 cwts. (£45,000) are sent to China annually. The discovery of gold in the neighbouring alluvial deposits brought togctler some hundreds of Chinese, but the Russian Government compelled them to withdraw. The amonnt of gold is, however, not believed to be remunerative.

The Gulf of Peter the Great was discovered in 1852 by the French corvette "Capricieuse," and named the Golfc d'Anville. Two years later Count Putyatin, on board the frigate ' Pallada," de- scribed the south-western part of the gulf and the Bay of Possiet. In 1855 an English squadron mapped. its middle portion as far as Lefu (Askold) Island, and gave it the name of Victoria Bay. The whole gulf was mapped in 1859 by the Russian ships " America" and "Stryelok," and two years later a Russian post, which after- wards received the namc of Vtadivostok, was established.*

VOGELWEIDE. See WALTER VON DER VOGELWEIDE.

VOGHERA (Vicus Iriz), a town of Italy, in the pro- vince of Pavia, and 19 miles by rail to the south-south- west of that city, on the Staffora, formerly the Iria (a tributary of the Po), here crossed by a fine bridge. The fortifications erected by the Visconti in the Middle Ages have given place to a series of shady promenades. The large church of San Lorenzo dates its foundation from the 11th century, but was remodelled in the baroco style about the beginning of the 17th. fertile and produces much silk, in which, as well as in corn and wine, an active trade is carried on. The popula- tion in 1881 was 10,785.

VOGLER, Grore Josepy (1749-1814), usually known

as Abbé Vogler, organist and composer, was born at |

Wiirzburg, June 15, 1749. His father, a violin maker, while educating him for the church, took every opportunity of encouraging his musical talent, which was so marked that at ten years old he could not only play the

organ well, but had also acquired a fair command of the violin and some other instruments without instruction. In 1769 he prosecuted his higher studies at Bamberg, remov- ing thence in 1771 to Mannheim. Here he composed a ballet for the elector Karl Theodor, who, charmed with his talent, sent him to Bologna, to study under the Padre Martini. Unsatisfied with the method of that learned

theorist, he studied for five months under Valotti, at.

Padua, and afterwards proceeded to Rome, where he was ordained priest in 1773, admitted to the famous academy of Arcadia, made a knight of the Golden Spur, and appointed protonotary and chamberlain to the pope.

On his return to Mannheim in 1775 Vogler was appointed court chaplain and second " maestro di cappella." He now established his first great music school, to which Winter, Ritter, Kraus, Danzi, and Knecht came for in- struction. His pupils were devoted to him, but he made innumerable enemies, for the principles upon which he taught were confessedly opposed to those of all other teachers whatsoever. fingering for the harpsichord, a new form of construction for the organ, and a new system of musical theory founded upon that of Valotti. Mozart condemned the fingering as "miserable." The proposed change in the construction of

The neighbourhood is '

He had invented a new system of |

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the organ consisted in simplifying the mechanism, intro- ducing free-reeds in place of ordinary reed-stops, and substituting unisonous stops for the great " mixtures" then in vogue! The theoretical system, though pro- fessedly based upon Valotti's principles, was to a great extent empirical, and, like the scheme for revolutioniz- ing the organ, has long been forgotten. Nevertheless, a certain substratum of truth seems to have underlain all his new heresies; and, by virtue of this, in spite of a rage for reform amounting almost to madness, Vogler un- doubtedly exercised a

powerful influence over the progress of musical science, and numbered among his disciples some of the greatest geniuses of the period.

In 1778 the elector removed his court to Munich. Vogler followed him thither in 1780, but, dissatisfied with the reception accorded to his dramatic compositions, soon quitted his post, and travelled for some years in Spain, Greece, Armenia, remote districts of Asia and Africa, and even Greenland, in search of uncorrupted forms of national melody. In 1786 he was appointed " kapellmeister" to the king of Sweden, founded his second music school at Stockholm, and attained extraordinary celebrity by his performances on an instrument called the "orchestrion,"—a species of organ invented by himself. In 1790 he brought this instrument to London, and per- formed upon it with great effect at the Pantheon, for the concert-room of which he also constructed an organ upon his own principles. Gerber alleges that organ pedals were unknown in England until Vogler introduced them, during his residence in London. This assertion is dis- proved by a MS. Concerto, by Handel, now in the Royal Library at Buckingham Palace, dated February 17, 1740, and containing an obbligato pedal part; nevertheless, it is certain that the abbé's pedal-playing excited great attention. His most popular pieces were a fugue on themes from the "Hallelujah Chorus," composed after a visit to the Handel festival at Westminster Abbey, and A Musical Picture for the Organ, by Knecht, containing the imitation of a storm.

From London Vogler proceeded to Rotterdam and the chief towns on the Rhine. At Esslingen he was presented with the "wine of honour" reserved for the use of sovereigns. At Frankfort he attended the coronation of the emperor Leopold II. He then visited Stockholm, and after a long residence there, interrupted by endless wanderings, once more established himself in Germany, where his compositions, both sacred and dramatic, received at last the full credit that was due to them. To trace his journeys from end to end of Europe would be impossible. We hear of him at Berlin in 1800, at Vienna in 1804, and at Munich in 1806. But while at Frankfort in 1807 he received an invitation from Louis I., grand-duke of Hesse- Darmstadt, offering him the appointment ofkapellmeister," with the order of merit, the title of privy councillor, a salary of 3000 florins, a house, a table supplied from the

| duke's own kitchen, and other privileges, which determined _ him to bring his wanderings at last to a close.

At Darmstadt he opened his third and most famous music school, the chief ornaments of which were Gins- bacher, Weber, and Meyerbeer. Giinsbacher had been his pupil at Vienna. Weber had studied under him in 1803, and once more sought his old master's help in 1810, though rather in the way of advice than instruction. Meyerbeer had been first introduced to him by means of a fugue which he criticized very severely, though he saw in it so much talent that he invited the composer to become his pupil. The three young students were inseparable,

_ | An organ built on the ' unisonous system" stood for many years in Wornum's Music Hall, Store Street, London.

VOI—VOTI

One of Vogler's latest exploits was a journey to Frankfort in 1810, to witness the production of Weber's Sylvana. He continued hard at work, genial and pleasant to the last, and died suddenly of apoplexy at Darmstadt, May 6,

1814.

Opinions are strangely divided as to the reality of Vogler's voca- tion. Some have pronounced him a genius, others a charlatan. Mozart was strongly prejudiced against him. hat he was a bril- liant and accomplished performer no one denies. It is certain that he was an excellent, if an eccentric, teacher. But his theories were visionary, and of his numberless compositions not one has survived to the present day.

VOICE is produced by the vibrations of the vocal cords, two ligaments or bands of fibrous elastic tissue situated in the larynx. It is to be distinguished from speech, which is the production of sounds intended to express ideas. Many of the lower animals have voice, but none have the power of speech in the sense in which man possesses that faculty. There may be speech with- out voice, as in whispering, whilst in singing a scale of musical tones we have voice without speech. Regarding speech, see

PHonETIcs and Sprecu-Sounps; also the articles on the various letters of the alphabet.

1, Physiological Anatomy.—The organ of voice, the laryne, is situated in man in the upper and fore part of the neck, where it forms a well-known prominence in the middle line. It opens below into the trachea or windpipe, and above into the cavity of the pharynx, and it consists of a framework of cartilages, connected by elastic mem- branes or ligaments, two of which constitute the true vocal cords. 'These cartilages are movable on each other by the action of various muscles, which thus regulate the position and the tension of the vocal cords. The trachea conveys the blast of air from the lungs during expiration, and the whole apparatus may be compared to an acoustical con- trivance in which the lungs represent the wind chest and the trachea the tube passing from the wind chest to the sounding body contained in the larynx. Suppose two tight bands of any elastic membrane, such as thin sheet india-rubber, stretched over the end of a wide glass tube 80 as to leave a narrow chink between the free borders of the membrane, and that a powerful blast of air is driven through the tube by a bellows. The pressure would so distend the margins of the membrane as to open the aper- ture and allow the air to escape; this would cause a fall of pressure, and the edges of the membrane would spring back by their elasticity to their former position ; again the pressure would increase, and again the edges of the membrane would be distended; and those actions would be so quickly repeated as to cause the edges of the mem- brane to vibrate with sufficient rapidity to produce a musical tone, the pitch of which would depend on the number of vibrations executed in a second of time. The condensation and rarefaction of the air thus produced are the chief cause of the tone, as Von Helmholtz has pointed out, and in this way the larynx resembles the syren in its mode of producing tone (see Acoustics). It is evident also that the intensity or loudness of the tone would be determined by the amplitude of the vibrations of the margins of the membrane, and that its pitch would be affected by any arrangements effecting an increase or de- crease of the tension of the margins of the membrane, The pitch might also be raised by the strength of the current of air, because the great amplitude of the vibra- tions would increase the mean tension of the elastic mem- brane. With tones of medium pitch, the pressure of the air in

the trachea is equal to that of a column of mercury of 160 mm. ; with high pitch, 920 mm. ; and with notes of very high pitch, 945 mm. ; whilst in whispering it may fall as low as that represented by 30 mm. of water. Such 18 a general conception of the mechanism of voice.

“ments, or true vocal cords.

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The cartilages form the framework of the larynx. They consist of three single pieces (the thyroid, the cricoid, and the cartilage of the epiglottis) and of three pairs (two arytenoids, two cornicula laryngis or cartilages of Santorini, and two cuneiform cartilages

or cartilages of Wrisberg), see figs. 1 and 2, The epiglottis, the

Fig. 1.

Fig. 1.—Cartilages and ligaments of the larynx seen from the front; half natural size. 1, epiglottis; 2, hyoid bone; 3, small cornu of hyoid bone; 4, middle thyro-hyoid ligament; 5, great cornu of hyoid bone; 6, small nodules of cartilage (cartilago triticea); 7, the lateral thyro-hyoid ligament; 8, left lamina or wing of thyroid cartilage ; 9, cricoid cartilage; 10, lower cornu of thyroid cartilage; 11, part of cricoid united to the thyroid by the middle crico- thyroid ligament ; 12, second ring of trachea. (From Krause.)

Fic. 2.—Cartilages and ligament of larynx seen from behind ; half natural size. 1, epiglottis ; 2, lesser cornu of hyoid bone; 3, greater cornu of hyoid ; 4, lateral thyro-hyoid ligament ; 5, cartilago triticea; 6, upper cornu of thyroid ; 7, thyro-epiglottic ligament; 8, cartilages of Santorini; 9, arytenoid carti- lages; 10, left lamina of thyroid; 11, muscular process of arytenoid cartilage ; 12, inferior cornu of thyroid ; 18, first ring of trachea; 14, posterior mem- branous wall of trachea ; 15, lamina of cricoid cartilage. (From Krause.)

Fig. 2.

cornicula laryngis, the cuneiform cartilages, and the apices of the arytenoids are composed of yellow or elastic fibro-cartilage, whilst the cartilage of all the others is of the hyaline variety, resembling that of the costal or rib cartilages. These carti- lages are bound together by ligaments, some of which are seen in figs. 1 and 2, whilst the remainder are represented in fig. 3. The ligaments specially concerned in the production of voico are the inferior thyro-arytenoid liga- These are composed of fine elastic fibres attaclied behind to the anterior projection of the base of the arytenoid cartilages, processus vocalis, 3 in fig. 8, and in front to the middle of the angle be- tween the wings or lamine of the thyroid cartilage. They are practi- ~ cally continuous with the lateral crico- ? thyroid ligaments, 6 in fig. 3.

The cavity of the larynx is divided into an upper and lower portion by the narrow aperture of the glottis or i —. <¥? 4 ibe ayes, chink between the edges of the rae ligne footton: twosthindenataral vocal cords, the rima glottidis. Im- gize, 1, epiglottis; 2, arytenoid mediately above the true vocal cords, cartilage ; 8, processus vocalis between these and the false vocal of rere fee Bests cords, there is on each side a recess or feodent ser tetera pg Hed pouch termed the ventricle of Mor- roid ligament; 7, posterior crico- gagni, aud opening from each ventricle nape mer a i. 1 lee geil there is a still smaller recess, the joyrC eryien' me Coe laryngeal pouch, which passes for the tilage; 10, superior thyro-ary- space of half an inch between the tenoid ligament, or false vocal superior vocal cords inside and the aoe ie middie tnro-leord thyroid cartilage outside, reaching as ligaments 13, hyo-epiglottic liga- high as the upper border of that car- ment; 14, body of hyoid bone; tilage at the side of the epiglottis. 15, smaller cornu of hyoid bone. The ventricles no donbt permit a free (#7°™ Krause.) vibration of the true vocal cords (Quain), The upper aperture of the glottis is triangular, wide in front and narrow behind ; and, when seen from above by means of the laryngoscope, it presents the view represented in fig. 4. The aperture is bounded in front by the epiglottis, e¢, behind by the summits of the arytenoid carti- lages, ar, and on the sides by two folds of mucous membrane, the aryteno-epiglottic folds, a. The rounded elevations corresponding to the cornicula laryngis and cuneiform cartilages, c, and also the cushion of the epiglottis, ¢, are readily seen in the laryngoscopic picture. The glottis, 0,is seen in the form of a long

narrow fissure, bounded by the true vocal cords, ti, whilst above them we have the false vocal cords, ts, and between the true and false cords the open- ing of the ventricle, v. The rima glottidis, between the true vocal cords, in the adult male measures about 23 millimetres, or nearly XXIV. — 35

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an inch, from before backwards, and from 6 to 12 millimetres across its widest part, according to the degree of dilatation. In females and in males before puberty the antero-posterior diameter is about 17 millimetres and its transverse diameter about 4 millimetres. The vocal cords of the adult male are in length about 15 millimetres, and of the adult female about 11 milli- metres. The larynx is lined with a layer of epithelium, which is closely adherent to underlying structures, more especially over the true vocal cords. The cells of the epithe- + lium, in the greater portion of " tongue: ¢, epighottis; ye, pharyngo- the larynx, are of the columnar epiglottie fold; g, pharyngo ~~*laryngeal ciliated variety, and by the vi*~~ *groove; ae, aryteno-epiglottic fold; ¢, bratory action of the cilia mucus Wileboee om see aa ents: ol 3 is driven upwards, but over the inter- arytenoid fold ; 0, glottis; v, ven. true vocal cords the epithelium tricle; #, inferior or true vocal cord; issquamous. Patches of squa- 4s, superior or false vocal cord. (From mous epithelium are also found Mandl.)*

in the ciliated tract above the glottis, on the under surface of the epiglottis, on the inner surface of the arytenoid cartilages, and on the free border of the upper or false cords. Numerous mucous glands exist in the lining membrane of the larynx, more especially in the epiglottis. In each laryngeal pouch there are sixty to seventy such glands, surrounded by fat.

We are now in a position to understand the action of the muscles of the larynx by which the vocal – cords, forming the rima glottidis, can be tightened or relaxed, and by which they can be approximated or separated. Besides certain extrinsic muscles—sterno-hyoid, omo-hyoid, sterno-thyroid, and thyro-hyoid— which move the larynx as a whole, there are intrinsic muscles which move the cartilages on each other. Some of these are scen in fig. 5. These muscles are (a) the crico-thy- roid, (5) the posterior crico-arytenoid, (c) the lateral crico-arytenoid, (d) the thyro-

*arytenoid, (e) the aryten- oid, and (/) the aryteno-epiglot- tidean. Their actions will be readily understood with the aid of the dia- grams in fig. 6. (1) The crico-thyroid is a short thick triangular muscle, its fibres passing from the cricoid F1¢. 5.—Muscles of the left side of cartilage obliquely upwards and out- *h¢ larynx, seen from within ; two- wards to be inserted into the lower atectte ghana gg Mg Nag Se a*

4 ! gament, seen in profile ; border of the thyroid cartilage and 2, epiglottis; 8, aryteno-epiglot- : os uke bette of its lower horn. Dian ea. a

en the muscle contracts, the cri- ee sa oe coid and thyroid cartilages are ap- a mar tee aks Coe proximated. In this action, how- ever, it is not the thyroid that is

r 4,—Laryngoscopic view of the glottis.

terior crico-arytenoid ; 8, lateral crico-arytenoid ; 9, lower cornu depressed on the cricoid, as is gener- 16, Beco et rie ee ally stated, but, the thyroid being of crico-thyroid muscle ; 11, left fixed in position by the action of the lamina of thyroid cartilage' cut extrinsic muscles, the anterior border — Nye Tt et of the _cricoid is drawn upwards, thyro-arytenoid » 14, thito-api whilst its posterior border, in con- glottic; '15, superior thyro-ary- sequence of a revolution around the enoid ee eee axis uniting the articulations be- "Sent (from Krause.)

tween the lower cornua of the cricoid and the thyroid, is de- pressed, carrying the arytenoid cartilages along with it. Thus the vocal cords are stretched. (2) The thyro-arytenoid has been divided by anatomists into two parts—one, the internal, lying close to the true vocal cord, and the other, external, immediately within the ala of the thyroid cartilage. Many of the fibres of the anterior portion pass from the thyroid cartilage with a slight curve (concavity inwards) to the processus vocalis at the base of the arytenoid cartilage. They are thus parallel with the true vocal cord, and when they contract the arytenoids are drawn forwards, carrying with them the posterior part of the cricoid and relaxing the vocal cords. Thus the thyro-arytenoids are the antagonists of the crico-thyroids. Ludwig 'has pointed out that certain fibres (portio-ary-vocalis) arise from the side of the cord itself and pass obliquely back to the processus vocalis, These

will tighten the parts of the cord in front and relax the parts behind their points of attachment. Some of the fibres of the outer portion run obliquely upwards from the side of the crico-thyroid membrane pass through the antero-posterior fibres of the inner portion of the

muscle, and finally end in the tissue of the false cord. These fibres have been supposed to render the edge of the cord more prominent. Other fibres inserted into the processus vocalis will rotate slightly the arytenoid outwards, whilst a few passing up into the aryteno- epiglottidean folds may assist in depressing the epiglottis (Quain).

Fie, 6.—Diagrams explaining the action of the muscles of the larynx. The dotted lines show the positions taken by the cartilages and the true vocal cords by the action of the muscle, and the arrows show the general direction in which the muscular fibres act. A, Action of crico-thyroid: 1, cricoid cartilage ; 2, arytenoid cartilage; 8, thyroid cartilage ; 4, true vocal cord; 5, thyroid cartilage, new position; 6, true vocal cord, new position. B, Action of arytenoid: 1, section of thyroid; 2, arytenoid; 8, posterior border of epiglottis ; 4, true vocal cord; 5, direction of muscular fibres; 6, arytenoid, new position; 7, true vocal cord, new position. ©, Action of lateral crico-arytenoid; same description as for A and B; 8, posterior border of epiglottis, new position; 9, arytenoid in new position. D, Action of posterior crico-arytenoid ; same description. (From Beaunis and Bouchard.)

(3) The posterior and lateral crico-arytenoid muscles have antagon- istic actions; and may be considered together. The posterior arise from the posterior surface of the cricoid cartilage, and passing up- wards and outwards are attached to the outer angle of the base of the arytenoid. On the other hand, the lateral arise from the upper border of the cricoid as far back as the articular surface for the arytenoid, pass backwards and upwards, and are also in- serted into the outer angle of the base of the arytenoid before the attachment of the posterior crico-arytenoid. Imagine the pyra- midal form of the arytenoid cartilages. To the inner angle of the triangular base are attached, as already described, the true vocal cords ; and to the outer angle the two muscles in question. The . posterior crico-

arytenoids draw the outer angles backwards and in- wards, thus rotating the inner angles, or processus vocalis, outwards, and, when the two muscles act, widening the rima glottidis, This action is opposed by the lateral crico-thyroids, which draw the outer angle forwards and outwards, rotate the inner angles inwards, and thus approximate the cords. (4) The arytenotds pass from the one arytenoid cartilage to the other, and in action these cartilages will be approximated and slightly depressed. (5) The aryteno-epi- glottidean muscles arise near the outer angles of the arytenoid; their fibres pass obliquely upwards, decussate, and are inserted partly into the outer and upper border of the opposite cartilage, partly into the aryteno-epiglottic fold, and partly join the fibres of the thyro-arytenoids. In action they assist in bringing the arytenoids to- gether, whilst they also draw down the epiglottis, and constrict the upper aperture of the larynx. The vocal cords will be also relaxed by the elasticity of the parts.

2. General Physiological Characters.—As already stated, the cntensity or loudness of voice depends on the amplitude of the movement of the vocal cords. Pitch depends on the number of vibrations per second ; and the length, size, and degree of tension of the cords will determine the number of vibrations. The more tense the cords the higher the pitch, and the greater the length of the cords the lower will be the pitch, The range of the human voice is about three octaves, that is from fa, (87 vibrations per second) to sol, (768 vibrations). In men, by the development of the larynx, the cords become more elongated than in women, in the ratio of 3 to 2, so that the male voice is of lower pitch and is usually stronger. At the age of puberty

the larynx grows rapidly, and the voice of a boy " breaks"

in consequence of the lengthening of the cords, generally falling an octave in pitch. A similar change, but very much less in amount, occurs at the same period in the female. At puberty in the female there is an increase of about one-third in the size of the glottis, but it is nearly doubled in the male,-and the adult male larynx is about one-third greater than that of the female. In advanced life the upper notes of the register

are gradually weakened and ultimately disappear, whilst the character of the voice also changes, owing to loss of elasticity caused by ossifica- tion, which first begins about middle life in the thyroid cartilage, then appears in the cricoid, and much later in the arytenoid. Eunuchs retain the voices of childhood ; and by careful training it is possible in normal persons to arrest the development of the larynx so that an adult male can still sing the soprano parts sometimes used in cathedral choirs. The ranges of the different varieties of voice are shown in the following diagram, where the dotted lines give the range of certain remarkable voices, and the figures represent vibrations per second.

dog 2048. Upper note of Luerezia Ajugari.

las fag' 1805. Upper note of Nilson in 10 Flauto Magioo. reg 1152. Ajugari trilled on thismote, do, 1024 ope Oe Pts

~ ;

a4 : gol, __768 : fay F do, _512 si : ae sol. : fag, 341, : ree (288

5 :

*Dog 256. Mid C in [piano : : si 240. | Sop:rano: al, 192. | Mezizo-soprano, : iB Pe me ZOn8OpI secs mig 160. Contralto. * – do, _128. er 2c! ae FS re, ees – 106 Dies i eee i ——_— | oe Farinelli, 8i octaves. fa, _ 87. Bass. : = miy re, doy 64*

81-7

la-) s0l—} ne mi-, Gaspard Forster, 3 octaves.

Seal do-; 32. Beginning of musical tone.

There is thus a range for ordinary voices of nearly two octaves, and certain rare voices may have a range of three and a half octaves. A basso named Gaspard Forster passed from fa_, to la,; the younger of the sisters Sessi had a contralto voice from do, to fa,; the voice of Catalani ranged three and a half octaves; a eunuch singer, Fari- nelli, passed from la, to

re, ; Nilson, in Jd auto Magico, can take fa,; and Mozart states that he heard in Parma in 1770 a singer, Lucrezia Ajugari, range from sol, to dog, which she gave purely, whilst she could execute trills on te;. 'The latter is the most highly pitched voice referred to in musical literature, an octave and a half above the highest ordinary soprano. The range of these voices is shown in dotted lines in the accompanying diagram, and the number of vibrations per second is also noted, taking the middle C of the piano as 256 vibrations per second. Tt will be observed that the lowest note of Gaspard Forster's voice is not much above the pitch at which the perception of musical tone begins, and that from this note to the upper note of Lucrezia Ajugari there is a range of nearly Six octaves, whilst the extreme range of ordinary voices, from the lowest bass to the highest soprano, is a little over

three octaves. It is also interesting to observe in connexion with this that the range of the human ear for the percep- tion of musical tone is from do_, to doy, or from about 32 to 33,768 vibrations per second,—eleven octaves.

The quality of the human voice depends on the same laws that determine the quality, clang-tint, or timbre of the tones produced by any musical instrument. Musical tones are formed by the vibrations of the true vocal cords. These tones may be either pure or mixed, and in both cases they are strengthened by the resonance of the air in the air-passages and in the pharyngeal and oral cavities. If mixed—that is, if the tone is compounded of a number of partials—one or more of these will be strengthened by the cavities above the cords acting as a resonator ; and so strongly may these partials be thus reinforced that the fundamental one may be obscured, and a certain quality or timbre will be communicated to the ear. Further, Von Helmholtz has shown that special forms of the oral cavity reinforce in particular certain partials, and thus give a character to vowel tones,—indeed to such an extent that each vowel tone may be said to have a fixed pitch. This may be proved by putting the mouth in a certain form, keeping the lips open, and bringing various tuning forks sounding feebly in front of the opening. Whena fork is found to which the resonant cavity of the mouth corresponds, then the tone of the fork is intensified, and by thus altering the form and capacity of the oral cavity its pitch in various

conditions may be determined. Thus, according to Von Helmholtz, the pitch corresponding to the vowels may be expressed :—

WOWOW 6.0 2s0.2.0 oe G Al a ot SU ou

Tee aetna na cone fag sidg sidDy sols sids reg dos sols

or or or or or rey fag fag fag fag No. of vibrations..170 470 940 1536 1920 2304 1024 1536 or or or or or

576 341 170 341 170

Koenig has fixed the pitch of the vowels differently, thus :— WOMGL. occas… 4 ao 0 # mes Tiss eee aoe See sidg sibs siby sids side No. of vibrations ..235 470 940 1880 3760 Donders has given a third result, differing from each of the above; and there is little doubt that much will depend on the quality of tone peculiar to different nationalities. By means of Koenig's manometric flames with revolving mirror the varying quality of tone may be illustrated: with a pure tone, the teeth in the flame-picture are equal, like the serrations of a saw, whilst usually the tone is mixed with partials, which show themselves by the unequal serra- tions. It is thus certain that quality of voice depends, not merely on the size, degree of elasticity, and general mobility of the vocal cords, but also on the form of the resonating cavities above, and there can be no doubt that very slight differences in these may produce striking results.

3. Condition of the Larynx in the Various Registers.—In singing, one can readily observe that the tone may appear to come chiefly from the chest, from the throat, or from the head, or it may show the peculiar quality of tone termed falsetto. Authorities differ much in the nomenclature applied to these varieties of the voice. Thus the old Italian music masters spoke of the voce di petto, voce di gola, and voce di testa. Madam Seiler describes five conditions, namely, the first series of tones of the chest register, the second series of tones of the chest register, the first series of tones of the falsetto register, the second series of tones of the falsetto register, and the head register. French writers usually refer to two registers only, the chest and the head; whilst Behnke gives three registers for male voices (lower thick, upper thick, and upper thin), and five for the voices of women and

children (lower thick, upper thick, lower thin, upper thin, and small).1 These

1 See Voice, Song, and Speech, by Lennox Browne and Emil Behnke, 1888, p. 171.

distinctions are of more importance practically than as implying any marked physiological differences in the mechanism of the larynx during the production of the tones in the different registers. By means of the laryn- goscope it is possible to see the condition of the rima glottidis and the cords in passing through all the range

of the voice.

In 1807 Bozzini first showed that it was possible to see into the dark eavities of the body by illumining them with a mirror, and in 1829 Babington first saw the glottis in this way. In 1854 Garcia investigated his own larynx and that of other singers, and three years later Tiirek and especially Czermak perfeeted the construction of the laryngoseope. In 1883 Lennox Browne and Emil Behnke obtained photographs of the glottis in the living man. The laryn- goscope is a small mirror, about the diameter of a shilling, fixed to the end of a long handle at an angle of 125° to 130°. This mirror is gently pushed towards the baek of the throat, and if sufficient light be thrown into the mouth from a lamp, and if the eye of the observer be in the proper position, by angling the small mirror it is not difficult to get a view of the glottis. The light from the lamp is reflected by the mirror down on the glottis, from this it is reflected baek to the mirror, and then by the muror it is finally reflected to the eye of the observer. Usually the observer has in front of his eye a mirror by which a powerful beam of light ean be thrown from a lamp into the mouth and throat. In the eentre of the mirror there is a small hole through which the eye of the observer sees the image in the small mirror at the back of the throat. By placing a second plane mirror in front of the face, an observer ean easily study the mechanism of his own larynx.!

Suppose the picture of the larynx to be examined in the small mirror at the back of the throat, an image will be seen as in fig. 4. During calm breathing, the glottis is lance-shaped, between the yellowish white cords. A deep inspiration causes the glottis to open widely and in favourable circumstances one may look into the trachea. When a sound is to be made, the vocal cords are brought close together, either along their whole length, as in fig. 7,

or only along the ligamentous portion, the space between

Fig. 7.

Fia. 7.—Arrangement of glottis 8; false cord; ri, true vocal cord ; ar, arytenoid cartilages. Fia. 8.—Closure of the ligamentous portion of glottis. cord ; ri, true vocal cord; cartilages ; tenoid fold.

previous to emission of asound. }, epiglottis; (From Mandl.)

¢c, cuneiform medlenln wl ue cee etn tad ian in "(From Mandl.) ' ' r png iad the arytenoids being still open, as in fig. 8. Then when the sound begins the glottis opens (fig. 4), the form of the opening influencing the kind of voice, whilst the degree of tension of the cords will determine the pitch.

During inspiration the edges of the true vocal cords may occasionally be close together, as in sobbing, and it has been pointed out by various observers that during inspiration the false cords are easily separated, even when they touch, and during expiration, owing to dilatation of the ventricles, they come together and may readily close. Thus, from the plane of the cords, the true cords are most easily closed during inspiration and the false cords during expiration. Wyllie clearly showed in 1865 that the false vocal cords play the chief part in closure of the glottis during expiration (#din. Med. Jour., 1866). Lauder Brunton and Cash have confirmed Wyllie's results, and have shown further that the function of the false cords is to close the glottis and thus fix the thorax for muscular effort; and they adduce many facts from comparative

1 A cheap and efficient form of auto-laryngoscope was constructed

by the late Dr David Foulis, and may be had from Mes Ww Hilliard & Son, 65 Renfield Street, Glasgow. ‘alin

b, epiglottis ; rs, false |

VOICE

anatomy in favour of this view, these cords being strongly developed in those animals whose habits render fixation serviceable, whilst, on the other hand, they are absent or weakly developed in animals where fixation is of little or no service (Jour. Anat. and Physiol., vol. xvii.).

During the production of the chest voice, the space between the arytenoid cartilages is open, and between the vocal cords there is an ellipsoidal opening which gradually closes as the pitch of the sound rises (see figs. 9, 10, 11).

Fig. Fig. 10.

Fic. 9.—Chest voice, deep tone. 0, epiglottis; or, glottis; rs, false vocal cord ; ri, true vocal cord ; rap, ary-epiglottidean fold; ar, arytenoid carti-lages. (From Mandl.)

Fic. 10.—Chest voice, medium tone. orl, ligamentous portion of glottis; ore, portion of glottis between arytenoids; remaining description as in fig. 7. (From Mandl.)

During head voice, the opening between the arytenoids is completely closed ; the portion between the vocal cords is

o

| ia. Fic. 11.—Chest voice, high tone; description same as for figs. 7 and 8. Mandl.) Fig. 12.—Head voice, deep tones. glottidean folds; ae, ary-epiglottic folds; rs, false cords ; ri, true vocal cords; g, pharyngo-laryngeal groove; ar, arytenoid cartilages ; c, cuneiform carti-

(From

1, tongue; e, epiglottis ; pe, pharyngo-epl-

lages ; 0, glottis; r, inter-arytenoid folds. (From Mandl.)

open, but in place of being alinost a narrow straight slit as in chest voice, it is wide open so as to allow an escape of more air (see fig. 12). The condition of the cords during falsetto is, according to Miiller, one in which the cords can only vibrate at their margins, and especially in the middle, in consequence of the false cords pressing downwards upon them. O6ertel, on the other hand, states that in falsetto the cords vibrate throughout their length, "but that they form nodal lines parallel to the free borders of the loops or bellies of vibration" (Beaunis). Probably in these circumstances the membranes become much thinner. Oertel also found that during the falsetto voice the epiglottis became erect, the apices of the arytenoids were directed backwards, and the whole larynx became narrower but longer from before backwards. Behnke says that, in the production of the 'small register," the mechanism "consists in the formation of an oval orifice in the front part of the glottis which contracts the more the higher the voice ascends, the vocal ligaments being, in the hinder part, pressed together so tightly that scarcely any trace of a slit remains" (Lennox Brown and Behnke, op. cit.). Illing- worth is of opinion that falsetto (and even the ordinary voice) is produced in the "same way as the mouth is used in whistling" (see Edin. Med. Jour., 1876). This view may be true to some extent as regards falsetto, but it will not hold good for the ordinary voice.

The crico-thyroid muscle is supplied by the superior laryngeal branch of the pneumogastric nerve, and all the other muscles by the inferior or recurrent laryngeal branch

The superior laryngeal is also the Stirling has found ganglionic cells in the course of this nerve. Paralysis of the motor fibres causes aphonia, or loss of voice. If one cord is paralysed the voice may be lost or become falsetto in tone. Sometimes the cords may move in breathing or during coughing, but be motionless during an attempt at the pro- duction of voice. Rarely, incomplete unilateral paralysis of the recurrent nerve, or

the existence of a tumour on each cord, thus making them unequal in length, may cause a double tone, or diphthongia (Tiirck). Hoarseness is caused by roughness or swelling of the cords.

On the history of. the theories of voice production, see Longet's Traité de Physiologie, 1869, vol. ii. p. 733, and Gavarret's Phonation et Audition, 1877, p. 41. An excellent bibliography is given in Beaunis's Physiologie Humaine, 1881, vol. ii. p. 946; also in Quain's Anatomy, 1882, vol. ii. p. 538. (J. G. M.)

VOIRON, a manufacturing town of France, in the de- partment of Isére, stands on the banks of the Morge (a tributary of the Istre) and on the lower slopes of a moun- tain nearly 2500 feet high, 15 miles north-north-west of Grenoble on the Lyons railway. Some 30 or 35 factories, employing from 4000 to 5000 persons, are engaged in the production of a kind of cloth that takes its name from the town (toiles de Voiron), and the industry is carried on in the neighbourhood also, every inhabitant having his loom. Table linen, silk stuffs (2000 looms), and liqueurs are also made, and there are paper-mills, bleachworks, foundries, edge-tool factories, and building sheds. The monks of La Grande Chartreuse have stores at Voiron in connexion with the railway. A fine modern church was built from 1864 to 1873 in the style of the 13th century. The chief attraction of the town lies in the fine views it possesses of the mountains of Grenoble and the valley of the Isére. The population in 1886 was 8575.

VOITURE, Vincenr (1598-1648), the best writer of vers de société that France has yet produced, and one of the most influential preceptors of classical French prose, was born at Amiens in 1598. His father was a well-to-do wine merchant, who had connexions with the court, and itis one of the charges brought against Voiture that he was unnecessarily ashamed of his origin. At any rate he soon obtained a position in society, being appointed by Gaston d'Orléans to various offices in his household, Voiture had been well educated, and had profited both by his education and by the school friendships which it enabled him to make. He was early introduced to the Hétel de Rambouillet, and travelled in the suite of Monsieur, or on missions, a good deal both in and out of France, on one occasion extending his journeyings as far as Ceuta, whence he wrote a

letter of elaborate gallantry to Mademoiselle Paulet. Although a follower of Gaston, he made friends with Richelieu, and was one of the earliest Academicians. He also received appointments and pen- sions from Louis XIII. and Anne of Austria, and became altogether a very prosperous person. During his lifetime he, like most of the literary men of his time who were not either dramatists or serious scholars, published nothing in book form, but his verses and his prose letters were the delight of the coteries, and were copied, handed about, and admired more perhaps than the work of any contemporary. This coterie success has, it would seem, done them more harm than good in the eyes of posterity. When the long and rather wearisome history of the quarrel between the Uranistes and the Jobelins (partisans of the respective Merits of a sonnet of Voiture addressed to a certain Uranie and of another composed by his younger rival Benserade On the subject of Job) is mentioned, the modern reader is apt to suppose that the interest of the affair is merely one of antiquarian gossip. Yet it is difficult to think of any living writer who could surpass, or of any writer living during the last two centuries who could have surpassed, the

of the same nerve. sensory nerve of the larynx,

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mixture of gallantry and sincerity in the Uranie sonnet, Another famous piece of his of the same kind, "La Belle Matineuse," is less exquisite, but still very admirable, and, generally speaking, Voiture deserves the praise given to him at the head of this article. His prose letters, if less interesting to the present generation, are full of lively wit, and are historically even more important. He ranks with Jean de Balzac as the chief director of the reform in French prose which accompanied that of Malherbe, and preceded that of Corneille, in French verse. Nor is there

any one to whom more than to Voiture (who was for many years almost an arbiter elegantiarum in literary matters)

the escape of French prose from the over-legislation which had such injurious effect on French verse can be ascribed. The fault of the century —a tendency to elaborate and "metaphysical " turns of phrase—affected

him to a certain extent, but in a mild form ; and, on the whole, he was the Frenchman of letters of the old school who has been least

favourably treated by the resurrection of taste for that old school which the present century has seen. It may seem absurd, but is probably just, to ascribe this absence of

enthusiasm in part to the fact that the most unjust censures of the extreme classical school passed harmless by him. Boileau had no abuse for him, and the 18th century read him with pleasure. The militant spirit of Romanticism had therefore nothing to avenge. Voiture lived a careless and Epicurean life for just fifty years,

and died at the outbreak of the Fronde, which killed the society to which he was accustomed, on the 26th of May

1648. His works were first published two years later, and

a characteristic and rather absurd literary quarrel, which

made a great noise at the time, broke out, on the subject of his literary merits, between his friend Costar and a certain Sieur de Griac. The standard modern edition of Voiture is that of Ubicini, 2 vols., Paris, 1855.

VOLCANOES. — See Gronoey, vol. x. pp. 240-254.

VOLE (Germ. Wiihimaus, Fr. Campagnol). This word, little known as it is to the majority of English people, is the proper name for a genus containing three of the com- monest of our English mammals, namely, the water, bank, and field voles,—animals generally called " water-rat," "red field-mouse," and "short-tailed field-mouse " respect- ively. The scientific name for the group is Arvicola, a genus which, with the lemmings and two or three other genera, forms the subfamily Arvicoline of the great Rodent family Muridx, whose proper place in the general system is shown under Mammatta (vol. xv. p. 419).

The voles, as a whole, are distinguished by their squat and heavy shape, their slower and less graceful move- ments, very small eyes, blunt snout,

inconspicuous ears, andshortenedlimbs and tail, in all of which points they are markedly con- trasted with the true rats and mice of the genus Mus, the only animals with which they can be confounded. But by far the : : most important characteristic of the voles lies in their molar teeth, which have been said to form "the perfection of Rodent dentition" from their wonderful specialization and adaptation to the purpose of grinding vegetable substances, These teeth, three in number on each side of each jaw, are rootless, that is to say, they go on grow- ing during the whole life of the animal at the same rate

Molars of Water-Vole (Arvicola amphibius); top view.

that they are worn down by use, just as is the case with the incisors, whose rootless condition is a characteristic of the whole Rodent order. Each tooth consists of a variable number of prismatic pillars formed externally of enamel and internally of the softer dentine, their section, as produced naturally by wear, being as is shown in the woodcut, a figure which may be compared with that given of the true murine dentition under Movs (vol. xvii. p. 5). The general prismatic appearance of the teeth, how- ever, is only due to the bending in at regular distances of the external enamel walls of the tooth, to such an extent that the enamel touches that at the opposite side of the tooth and thus shuts off a greater or less number of dentinal spaces, triangular in section. Owing to the manner of growth of the teeth their general pattern of spaces and angles is but little affected by age and wear, remaining practically the same throughout the life of the animal. On this account the variations in the pattern have been very generally used asa means of characterizing the different genera, subgenera, and species of the group, although their value for this purpose has of late been questioned, and a new classification proposed, entirely ignoring the tooth- characters, and based more upon external peculiarities. Without entering into the characters of the different sub-groups of the voles, it may suffice to say that each of the three species found in Great Britain belongs to a dis- tinct subgenus of Arvicola, and therefore the three together give a fair idea of the extent to which the

subgenera differ from one another. These three species are the following :—

1. The common Water-Vole (Arvicola amphibius) is as large as the house-rat, with which it is so often confused, but possesses of course the bluff-headed appearance and short tail characteristic of the voles. Its fur is long, soft, and thick, of a uniform grizzled brown all over, except when, as is not uncommon, it is wholly black. Its tail is about half the length of its head and body, and its hind feet are unusually long and powerful, although not webbed, and have five rounded pads on their lower surfaces. Its molar teeth (see woodcut) present the following number of prismatic spaces:—in the upper jaw the first, or anterior, has 5, the second 4, and the third 4, of which the last is very irregular in shape, and is sometimes itself divided into two, making 5 in all; in the lower jaw the first has 7 spaces, of which the 3 anterior are generally not fully separated from one another, the second has 5, and the third 8. These numbers for the different teeth are taken as the characters of the subgenus Paludicola of Dr Blasius, by whom this method of subdividing the group was first introduced. The water-vole is one of the commonest English mamunals, and is perhaps the most often actually seen of all, owing to its diurnal instead of nocturnal habits. It frequents rivers and streams, burrowing deeply into their banks, and in this way often causing considerable damage. Its food consists almost wholly of water- weeds, rushes, and other vegetable substances, but, like so many other rodents, it will also eat animal food on occasion, in the shape of insects, mice, or young birds. The female has during the warm season of the year three or four litters, each of from two to seven young. The range of the water-rat extends over the whole of Europe and North Asia, from England to China, but is not found in Ireland, where, curiously, no species of Arvicola is indigenous.

2, The next British species, representing the subgenus Agricola of Dr Blasius, is the common Field-Vole, or short-tailed field-mouse (Arvicola agrestis), about the size of a house-mouse, but with a short stumpy body, and a tail only about one-third the lensth of the head and body combined. Its hind feet have six pads on their inferior surfaces. Its colour is dull grizzled brown above, and greyish-white below. Its molar teeth have respectively 5, 5, and 6 prismatic spaces above, and 9, 5, and 3 below. The

field-vole is one of the commonest of our smaller mammals, and frequents fields, woods, and gardens in enormous numbers, often doing very considerable damage in the latter owing to its fondness for garden produce of all kinds. It is spread over the whole of Great Britain from the Hebrides southwards. Abroad its range extends from 'Finland to North Italy and from France and Spain to Russia.

3. The Bank-Vole (Arvicola glareolus) is of much the size and general appearance of the common field-vole, but may be dis- tinguished by its more or less rusty or rufous-coloured back, its larger ears, and its comparatively longer tail, which attains to about half the length of the head and body. Its molar teeth present characters so different from those of all other voles as to have causcd it to be often looked upon as belonging to an entirely distinct genus, for which the name of Lvotomys is used.

Their chief distinction lies in the fact that, unlike those of all other voles, their pulp-cavities close up in adult life, and they form distinct roots, more resembling those of the ordinary rats and mice. The enamel spaces of these teeth number respec- tively 5, 4, and 5 above, and 7, 3, and 3 below. The habits of this specics are in every way similar to those of the field-vole. Its range in Great Britain cxtends northwards to Morayshire, beyond which it has not yet been observed. Abroad it is found all along the north temperate zone from France to China, and is replaced in North America by a closely allied animal known as Arvicola gappert. It is probable, however, that both these forms, A. gappert and A. glarcolus, are only southern cliinatic offshoots of a still more northern species, the Arvicola rutilus of northern Europe, Siberia, and Arctic America.

The foreign species of vole number about 40, of which about 10 are European, 20 Asiatic, and 10 North American, none being found either in Africa, India (except in the extreme north), Australia, or South America. The group is therefore one peculiarly characteristic of the temperate parts of the northern hemisphere. (0.2)

VOLGA, Tue, the chief river of European Russia, rises See vol. – in the Valdai plateau of Tver in north-western Russia, xxi. and after a winding

course of 2325 miles (1040 in a Plate Il.

straight line) falls into the Caspian at Astrakhan. It is by far the largest river of Europe, those next in length, the Danube and the Ural, being only 1735 and 1478 miles respectively, while the Rhine (825 miles) is shorter even than two of the chief tributaries of the Volga,—the Oka and the Kama. Its drainage area, which includes the whole of middle and eastern as well as part of south- eastern Russia, amounts to 563,300 square miles, thus exceeding the aggregate superficies of Germany, France, and the United Kingdom. A hundred tributaries of the Volga are navigable for an aggregate length of 14,600 miles, a distance greater than the aggregate length of all the railways of England and Wales. The drainage area embraces twenty-one provinces of the Russian empire, or, in other words, nearly the whole of Great Russia proper, and has a population of nearly 40,000,000. The most populous regions of Great Russia are situated within the Volga basin, and cities like Moscow, Nijni-Novgorod, Saratoff, Simbirsk, and Kazaii, as well as many others, are indebted for their growth and present importance to their situation on the Volga or its tributaries. But the real "basin" of the Volga is not limited to its drainage area. By a system of canals which connects the upper Volga with the Neva, the commercial mouth of the Volga has been transferred, so to speak, from the Caspian to the Baltic, thus making St Petersburg, the capital and chief seaport of Russia, the chief port of the Volga basin as well. Other less important canals connect it with the Diina and the White Sea (Riga and Archangel) ; while a railway only 40 miles in length joins the Volga with the Don and the Sea of Azoff, and three great trunk lines bring its lower parts into connexion with the Baltic and western Europe. Traffic on the river and its tributaries is carried on by more than 760 steamers, 20,000 barges and boats, and 50,000 rafts; upwards of 4,000,000 tons of various goods, valued at 500,000,000 roubles (in weight one-half and in value three-fourths of the total merchandise on Russian rivers) are carried. If in addition some 50,000 rafts of timber not included in the preceding statistics are reck- oned, the timber floated in the basin of the Volga exceeds by nearly a million tons the total weight of merchandise carried on the 13,000 miles of Russian railways.

The Volga rises in the extensive marshes covering the western

parts of the Valdai plateau, where the Diina also has its origin. Small streamlets languidly circulate from marsh to marsh, so that

*1 See '*The Volga as a Means of Communication," by Prof. Boguslavskiy, St Petersburg, 1887 (Russian), being vol. ix. of the Sbornik of the Institute of Roads and Communieations. The above length of the Volga is taken from this work, based on recent surveys, and is therefore more aecurate than the length given by M. Strelbitzky (1978 miles) and Gen. Tillo (2108 miles).*

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it is very difficult to say which of these ought to be regarded as the real source. Lake Seliger was formerly so considered; but at present that distinction is given to a small spring trickling into a wooden trough from beneath a small chapel in the midst of an extensive marsh to the south of Seliger (57° 10' N. lat.). The honour has also been claimed of late, not without plausibility, for the Runa rivulet.! Recent exact surveys have shown those marshes to be no more than 665 feet above sea-level. The stream first traverses several small lakes, all having the same level, and, after its junction with the Runa, enters Lake Volgo. A dam recently erected a few miles below that lake, with a storage of 350 million cubic yards of water, makes it possible to raise the level of the Volga as far as the Sheksna, thus rendering it navigable, even at low water, from its 65th mile onwards. Unlike most other great rivers, the Volga has thus no "upper course" among thc mountains. From the Valdai plateau, however, its descent is rapid, until at Tver its level is only 420 feet. Before reaching this point it has received numerous small tributaries, so as to be already 300 yards in breadth, with a volume of more than 4000 cubic fect per sccond, and a minimum depth at low water of 19 inches. The T'vertsa is connected by the Vyshniy-Vototchok Canal with the Tsna, a tribu- tary to the Msta and Volkhoff, which flows to Lake Ladoga,—the first of the three systems of canals which, as already remarked, have removed the commercial mouth of the Volga to the Baltic. From Tver the Volga is

regularly navigated, although not without some difficulties on account of the shallows and sandbanks, It flows north-east along a broad vallcy to join the Motoga and the Sheksna, two important tributaries connected by the Tikhvinsk and Mariinsk Canals with the tributaries of Lake Ladoga. Of these two systems the latter is much the more important, and the town of Rybinsk, at the mouth of the Sheksna, has therefore become the chief port of the upper Volga.

From its junction with the Sheksna the Volga flows with a very gentle descent towards the south-east, past Yarostavl and Kostroma, along a broad valley hollowed to a depth of some 150 and 200 feet in the Permian and Jurassic deposits. In fact, its course is through a succession of depressions formerly filled with wide lakes, and connected by links. When the Volga assumes a due south-east direction it is already a large river (8250 cubic feet per second, rising occasionally in high flood to as much as 178,360 cubic feet) ; of its numerous tributaries, the Unzha (365 miles, 330 navigable), from the north, is the most important.

The next great tributary is the Oka, which comes from the south- west after having traversed, on its course of 920 nniles, all the Great Russian provinces of central Russia. It rises in Orel among hills which also send tributaries to the Dnieper and the Don, and receives on the left the Upa, the Jizdra, the Ugra (300 miles), navigable up to Kozelsk, the Moskva, on which steamers ply up to Moscow, the Klyazma (395 miles), on whose banks arose the Middle Russian principality of Suzdal, and on the right the navigable Tsna (255 miles) and Moksha, Every one of these tributaries is connected with some important event in the history of Great Russia, and the drainage area of the Oka is a territory of 97,800 square miles. It has been maintained of late that, of the two rivers which unite at Nijni-Novgorod, the Oka, not the V olga, is the chief ; and the fact is that both in length (818 miles) and in drainage area above the junction (89,500 square miles), as wellas in the aggregate length of its tributaries, the Volga is the inferior. But, on the other hand, the Volga contributes on the whole the largest volume of water, although in flood the Oka here also has the advantage.

At its junction with the Oka the Volga enters the broad lacus- trine depression (see Russta) which must have communicated with the Caspian during the Post-Pliocene period by means of at least a broad strait. Its level at low water is only 190 feet above that of the ocean. Immediately below the junction its breadth ranges from 350 to 1750 yards, and even at the lowest water (in 1873) it had a minimum depth of 5} feet. The valley, which is nearly 7 miles wide, but at several places is narrowed to less than 2 miles, shows evident traces of having originated from a succession of elongated lakes, the shores of which bear numerous traces of the dwellings of prehistoric man from the Stone Age. There are many islands which change thcir appearance and position after each mundation. On the right it is joined by the Sura, which drains a large area and brings a volume of from 2700 to 22,000 cubic feet of water per second, the Vetluga (465 miles long, of which 865 are navigable), from the forest-tracts of Yarostavl, and many smaller tributaries; then it turns south-east and descends to another lacustrine depression, where it receives the Kama below Kazaii, 300 miles below its junction with the Oka, and only 110 feet above the sea. Remains of molluscs still extant in the Caspian occur extensively throughout this depression and up the lower

ama,

The Kama, which brings to the Volga a contribution ranging from 52,500 to 144,400 cubic feet and occasionally reaching even 515,000 cubic feet per second, might again be considered as the

1 Ragozin, The Volga, St Petersburg, 1881, 3 vols, (Russian), summarized in Roskoschny's Die Wolga und thre Zuflisse, Leipsic, 1887.

more important of the tworivers. It rises in Vyatka, takes a wide sweep towards the north and east, and then flows south and south- west to join the Volga after a course of no less than 1120 miles, A great number of important rivers join it:—the Wishera, coming from the depth of the forest region; the Kosva, so important for the export of metallic wares from the Ural works; the T'chusovaya (430 miles), which receives the Sylva and connects the Ekaterinburg mining district with central Russia; and finally the Byetaya (800 miles), which, together with the Ufa, its tributary, waters the fertile lands of the Bashkirs, rapidly being settled now by the Russians, A territory larger than France is thus brought into connexion with the great artery of Russian industrial life.

Along the next 788 miles of its course the Volga—now from 580 to 2600 yards wide—flows south-south-west, with but one great bend at Samara. At this point, where it pierces a range of limestone hills, the course of the river is very pictnresque, fringed as it is by high cliffs which rise about 1000 feet above the lcvel of the water (which is only 54 fect above the sea at Samara). Along the whole of the Samara bend the Volga is accompanied on its right bank by high cliffs, which it is constantly undermining, while wide lowland areas extend on the left or eastern bank, and are intersected by several old beds of the Volga. At SARATOFF (q.v.) the cliffs are being undermined so rapidly that a broad beach now separates the chief channel of the river from the city. Very few streams of any importance join the Volga in this part of its course. Still, at Ekaterinenstadt, a few miles above Saratoff, the volume per second for the two years 1884 and 1885 appears to have becn as much as 384,000 cubic feet. In flood 1,427,000 cubic feet per second has been recorded (Boguslavskiy). In the lower portion of this section the Volga has already passed below sea-leve (58 feet below at Tsaritsyn),

At Tsaritsyn the Volga reaches its extreme south-western limit, where it is separatcd from the Don by an isthmus of only 40 miles in width. The

isthmus is too high to be crossed by means of a canal, but a railway at Duboffka brings the Volga into some sort of connexiou with the Don and the Sea of Azoff. At Tsaritsyn the river takes a sharp turn in a south-easterly direction towards the Caspian; it enters the Caspian steppes, and some 50 miles below Tsaritsyn sends off a branch—the Akhtuba—which accom- panies it for 830 miles before falling into the Caspian. Here the Volga receives no tributaries; its right bank is skirted by low hills, but on the left it spreads freely, joining the Akhtuba by many branches when its waters are high, and flooding the country for from 15 to 35 miles, The width of the main branch ranges from 520 to 3500 yards, and the depth exceeds 80 fect. The delta proper begins 40 miles above 'Aetvalchan, and the branches subdivide so as to reach the sea by as many as 200 separate mouths. Below Astrakhan navigation is difficult, and on the sand-bars at the mouth the maximum depth is only 12 feet in calm weather,—a depth increased or diminished by a few feet according to the force and direction of the wiud.

The figures given above, showing as they do how immensely different in volume is the river at different periods, help to indicato the greatness of the changes which are constantly going on in tho channel and on its banks. Not only does its level occasionally rise in flood as much as 50 feet and cover its low-lying banks for a distance ranging from 5 to 15 miles; even the level of the Caspian is considerably affected by the sudden influx of water brought by the Volga. The amount of suspended matter brought down is of course correspondingly great; and, were it not for the action of the wind in driving back masses of water at the mouth of the Volga and thus filling up lakes where the mud is deposited, the bar at Astrakhan would soon become so silted up as completely to pre- vent navigation. All along its course the Volga wastes its banks with great rapidity; towns and loading ports have constantly to be shifted farther back. The shoals and shallows are continually changing, and maps of the river made for a scries of consecutive years are of the greatest interest to the physical geographer. ;

The question as to the gradual desiccation of the Volga, and its causes, has often been discussed, and in 1838 a committee which included Karl Baer among its members was appointed by the academy of sciences to

investigate the subject ; no positive result has, however, been arrived at, principally on account of the want of regular measurements of the volume of the Volga and its tributaries, —measurements which began to be made on scientific principles only in 1880. Still, it may be regarded as established that during the last thirty years new shallows have appeared in the upper Volga, and the old ones have increased in size ; while if we go back two or three centuries it is indisputable that rivers of the Volga basin which were easily navigable then are now hardly accessible to the smallest craft. The desiccation of the rivers of Russia has been often attributed to the steady destruction of its forests. But it is obvious that there are other general causes at work much more important,—causes to which the larger phenomena of the gencral desiccation of all rivers of the northern hemisphere in the deserts of Siberia and Turkestan, as well as in Russia, must be attributed. The gradual elevation of the whole of northern Russia and Siberia,

and the consequent draining of the marshes (sce N OVGOROD), is one of them; the drying-up of lakes all over the northern hemisphere, a proeess which is going on so rapidly (see Tomsk), in eonsequence of the deepening of the outflows of lakes and the cessation of supply to tho lakes which remained after the glaciation of the northern hemisphere, is another ; and both causes are amply sufficient to explain the known phenomena throughout the historical period. The desiccation of the Russian rivers is only one instanee of the general desiceation of the northern parts of the Old World, of which so many instances have been given under Russta, TURKESTAN, TRANSCASPIAN REGION, and SIBERIA.

Fisherics. —The network of shallow and still Zémans or "cut- offs" in the delta of the Volga and the shallow waters of the northern Caspian, sweetened as these arc by the water of the Volga, the Ural, the Kura, and the Terek, is exceedingly favourable to the breeding of fish, and as a whole constitutes one of the richest fishing grounds of the world. As soon as the ice breaks up in the delta innumerable shoals of roaeli (Leucisews rutilus) and trout (Luciotrutta lewcichthys) rush up the river. They are

followed by the great sturgeon (Acipenser huso), the pike, tho bream, and the

ike perch (Lewcioperca sandra). Later on appears the Caspian

erring (Clupea caspia), which formerly was neglected, but has now become more important than the various species of sturgeon; the sturgeon (A. stellatus) and "'wels" (Silurus glanis, see vol. Xxil p- 67) follow, and finally the sturgeon Acipenser gilldenstddtit, so mueh valued for its caviare. In search of a gravelly spawning- ground the sturgeons go up the river as far as Sarepta (250 miles). The lamprey, now extensively piekled, the sterlet (4. ruthenus), the tench, the gudgeon, and other river species also appear in immense numbers. No less than 15,000 men, partly from central Russia, are engaged in the fisheries of the lower Volga and its delta, while on the waters of the northern Caspian there are as many as 3000 fishing-boats, giving employment to something like 50,000 persons. From the end of June onwards immense trawl-nets, some- times a mile in length, and occasionally taking at one haul as many as 40,000 bream, 150,000 roaeh, and 200,000 herrings, are continually at work, and it is estimated that 3,600,000 cwts. of various fish, of the value of 15,000,000 roubles, are taken annually in the four fishing districts of the Volga, Ural, Terek, and Kura, Seal-hunting is also carried on off the Volga, and every year about 40,000 of the Phoca witulina are killed to the north of the Man- ghishlak peninsula, Fishing is cxtensively carried on along the entire course of the Volga and its tributaries, as also in ine alee of its upper basin.

Ice-Covering.—In winter the numberless tributaries and sub- tributaries of the Volga become so many highways for sledges. The iee lasts from 90 to 160 days aeeording to the climatic condi- tions, and breaks up earlier in its upper course than in some parts lower down. The average date of the break-up is April 11th at Tver, and 14 days later about Kostroma, from whieh point a regular aceeleration is observed (April 16th at Kazaf, April 7th at Tsaritsyn, and Mareh 17th at Astrakhan). Similarly, the average dates of freezing are November 23d at Tver, November 20th about Kostroma, December 7th at Kazafi, 20th at Tsaritsyn, and 17th at Astrakhan. Thus the river is open for an average of 226 days at

Ostashkoff and Tver, 215 days at Kostroma, and 209 at Kineshima; from Nijni-Novgorod, where the average is 224 days, there is a regular increase (235 days at Kazafi, 241 at Samara, 257 at Tsaritsyn, and 275 at Astrakhan), There are, however, great fluctuations, the navigation in some years having lasted only 182 days in the upper course, 169 at Kostroma, and 243 at Tsaritsyn; while within the last eighty years maxima of 260 days in the upper course and 288 in the lower course have been observed. The tributaries are navigable for periods ranging from 180 to 246 days.

Trafic.\—The chief Volga traffic is up river, the amount of merchandise which reaches Astrakhan being nearly fifteen times less than that reaching St Petersburg by the Volga canals. The details of this traffic are highly characteristic of the prescnt economic life of Russia. Ten million cwts. of fish, salt, and naphtha are despatched from Astrakhan; this contingent is soon swelled to 12 millions at Tsaritsyn by the salt bronght by rail from the Baskuntchak salt-lakes. From Tsaritsyn 7 million cwts. of fish salt, and naphtha are despatehed by the first of the three railways whieh traverse Russia from south-east to north-west and connect the lower Volga with the Baltic. Considerable amounts of corn are added to this total on its way towards the north-west: and while salt, fish, and naphtha are discharged for use at various points in middle Russia, the flow of corn continues to swell – portions of it are sent to Moscow from Gryazi and Orel, but the remainder goes north-west, so as to reach Riga to the amount of 9,300,000 cwts., chiefly of corn and flax.

By the Volga itself only 5,100,000 ewts., chiefly of fish, salt, and naphtha, leave Tsaritsyn, but before this ascending traffic reaches Saratoff it has increased to 6,300,000 ewts., chiefly by the addition of corn from the Saratoff steppes. There the current of merchan-

! See Sbornik of the Ministry of Roads and Communications, vols. xi. and xiL,

1885 and 1887: Graphical Maps of the Movement of Goods in 1882 and 1883.

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dise divides again; 8 million cwts. of corn, fish, &c., leave the Volga to be carried north-westwards towards Tamboff, while the remainder is carried on farther north, up tho Volga, recciving on the way considerable additions of corn from the fertile tracts of Samara and the steppes of Orenburg, which are connected with Samara by rail. At Samara the flow again divides, and part of it is sent again north-west, via Penza, to Ryazhsk; there the three north-western currents which leave the Volga respectively at Tsaritsyn, Saratoff, and Samara reunite after having taken in eorn from the fertile regions of Tamboff and Ryazafi, so that nearly 20 million ewts. of eorn and other produce leave Ryazhsk to be carried on to Moscow. But the flow of corn ascending the Volga does not diminish, and Samara sends farther north no less than 14 million ewts., chiefly corn. At Kazai the volume of traffic is 16,200,000 ewts. (13 million ewts. of corn). Here a new mass, consisting of 11 million ewts. of corn, 34 of various metals, 4 of salt, and 64 of miscellaneous merchandise, all shipped down the Kama, joins the former, so that the total amount of merchandise forwarded from Kazaii up the Volga reaehes 35 million cwts. The Sura, the Oka, and the Vetluga add their corn, timber, and mannfaetured goods, and the volume reaching Nijni-Novgorod amounts to 38 million ewts. Here the stream divides once more: while manufactured goods brought in to the Nijni-Novgorod fair are dispersed from it all over Russia, nearly 10 million ecwts. of various merchandise (4 million of corn) are sent by rail to Moscow, but the great bulk (28 million cwts.) continues to move up the river, receiving on the way more timber from the Unzha, and sending some corn north- wards to Vologda and Archangel.

When the traffic reaches Rybinsk, we find that it consists of 20 million ewts. of corn and flax, and 54 million of metals, metallic and manufactured goods, hides, leather, and so on. At Rybinsk it again subdivides into three branches; one (6,300,000 ewts., chiefly of eorn) is diseharged and sent by rail to St Petersburg; another (2,800,000 cwts.) continues up the Volga to enter the Vyshniy Vototchok and Tikhvinsk canal-systems; and the third and largest (16 million ewts., almost entirely corn and flax) moves along the Mariinsk system towards Lake Ladoga and St Petersburg. Masses of timber and wood for fuel are added to it from the forest tracts of the lake district, the Syas and the Volkhoff bringing together nearly 17 million cwts., chiefly wood, so that finally

14,000,000 ewts. of corn and flax, 31,300,000 of timber and wood, 16,000,000 of building materials, and 4,000,000 of miscellaneous goods reach St Petersburg, which thus is the real seaport of the Volga basin.

The goods traffic down the river is much less important in weight, but relatively greater in value. Its prominent feature is the amount of wood sent to supply the provinees of Samara, Saratoff, and Astrakhan, as well as the lower Don, which now have very few or no forests. But the 84 million ewts. of wood and timber whieh reach Samara on boats are but a trifle in eomparison with what is floated in the shape of rafts, The down traffic in manufaetured goods is still more important. The great bulk of those exported from St Petersburg is sent to Moscow by rail, and thence distri- buted by rail over central Russia; but part of it is sent by rail to Rybinsk, and thence shipped down the Volga. Moseow sends its goods for the same purpose, partly to Yarostavl, and partly to Nijni- Novgorod (by rail), as also does Vladimir. Nijni-Novgorod distributes the merchandise all over eastern Russia, sends it up the Kama to Siberia, and ships nearly 2 million cwts. down the Volga. This quantity is increased by the additions brought by rail to Samara, Saratoff, and T'saritsyn.

According to official returns the aggregate amount of goods loaded in the basin of the Volga amounts to nearly 4 million tons, valued at 150 million roubles (2 million tons, 100 millions worth, on the Volga proper); trustworthy authorities, however, consider the real value of goods loaded in the basin of the Volga to be not less than 500 million roubles, exclusive of nearly 34 million tons of timber and fuel.

Formerly tens of thousands of " burtaki" were employed in dragging boats up the Volga and its tributaries, but this method of traction has disappeared unless from a few of the tributaries. Horse-power is still extensively resorted to along the three eanal systems. The first large steamers of the Ameriean type were built in 1872. Steamers are now very common; in 1885 as many as 766 were already in use on the Volga and its tributaries, and of these only one-eighth were not built within the Volga basin itself. One-third of them used naphtha as fuel. Of barges and other light vessels an immense variety of types are now in use; during 1885 no fewer than 20,610 vessels were afloat, and during the last thirteen years

the annual average of vessels built on the Volga and its tributaries has been 5080 (4,180,000 roubles). Large numbers of them are broken up after a single voyage.

History.—The Volga was not improbably known to the early Greeks, though it is not mentioned by any of tho writers previous to Ptolemy, who all confounded the Caspian with a gulf of the Arctic Ocean. According to Ptolemy, the Rha is a tributary of an in- terior sea, formed from the confluence of two great rivers, the sources of which are separated by twenty degrees of longitude; but

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it is scarcely possible to judge from his statements how far the Slavonians had by that time succeeded in penetrating into the basin of the Volga. The Arabian geographers also throw but little light on the condition of the Volga (which they knew under the names of Itil, Etil, or Atel) during the great migrations of the 3d century, or subsequently under the invasion of the Huns, the growth of the great Khazar empire in the southern steppes, and of that of Bulgaria on the middle Volga. But we know that in the 9th century the Volga basin was occupied by Finnish stems in the north, and by Khazars and various Turkish stems in the south. The Slavonians, driven perhaps to the west, had only the Volkhoff and the Dnieper, while the Mohammedan Bulgarian empire, at the confluence of the Volga with the Kama, was so strong that for some time it was an open question whether Islam or Christianity was to gain the upper hand among the Slavonian idolaters. But, while the Russians were driven from the Black Sea by the Khazars, and later on by a tido of Ugrian migration from the north-east to the south-west (see p. 5 supra), a stream of Slayonians slowly moved towards the north-east, down the Oka, into the bordcrland between the Finnish and Turkish stems, After two centuries of struggle the Russians succecded in coloniz- ing the fertilo valleys of the Oka

basin; in the 12th century they built a series of fortified towns on the Oka and Klyazma, and finally they reached the mouth of the Oka, there founding (in 1222) a new Novgorod—the Novgorod of the Lowlands, now Nijni-Novgorod. The great lacustrine depression of the middle Volga was thus reached. Under the protection of the forts in the north-east, of the forests of Ryazafi in the south, and of the marshes of Novgorod and Tver in the north, the Great-Russian nationality freely developed in the fertile valleys of the Oka, absorbing the feeble Finnish tribes which formerly peopled them; and when the Tartar-Mongolian invasion came it encountered in the Oka basin a dense agricultural population with many fortified and wealthy towns,—a population which the Mongols found they could conquer, indeed, but were unable to drive before them as they had done with so many of the Turkish stems. This invasion only checked but did not stop the further advance of the Russians down the Volga; nay, it partly facilitated it, because it weakened the Bulgarian empire, and, by keeping up on the lower Volga a continual flow and ebb of nomads, prevented the development there of any settled population which might ultimately have op- posed the further advance of the Russians towards the Caspian. Two centuries elapsed before the Russians covered the 300 miles which separate the mouths of the Oka and the Kama, and took possession of Kazafi. But in the meantime a flow of Novgorodian colonization had moved eastward, in the upper portions of the left- bank tributaries of the Volga, and had reached the Urals, thus opening the way to Siberia.

With the capture of Kazat the Russians found the lower Volga open to their boats, and eight years afterwards they were already masters of the mouth of the river at Astrakhan. The Tartars and Turks of the steppes between the Dnieper and the Volga were thus encircled; the Little Russians endeavoured to take possession of the lower Dnieper, and the Great Russians already had a firm foot- ing on the lower Volga. The possession of the latter opened a free passage to the Don, up the little river Kamyshinka (now dried up but then navigable), which gave easy means of crossing the narrow isthmus between the Don and the Volga. Thus the lower Don was colonized. But two centuries more elapsed before the Russians opened for themselves a free passage to the Black Sea and became masters of the Sea of Azoff and the Crimea; the Volga, however, was their route. During these two centuries they fortified the lower river,

settled it, and penetrated also farther eastward into the steppes, towards the upper Ural and thence to the upper parts of the Tobol and the other great Siberian rivers. They penetrated also into the northern parts of the Caucasus isthmus, while another stream of armed colonization moved up the Kama and its numerous tributaries; finding the sources of these close to those of the Ob and Tobol, they crossed the low watersheds of the Urals and spread over northern Siberia, always following the river courses and tak- ing advantage of the portages for penetrating from one basin into the next. The entire growth of Russia towards the east went on from the Volga and its tributaries, and the long line of water com- munication (nearly 1000 miles) which flows from the upper Kama (60° N. lat.) to Astrakhan (46°

became the basis for all further advance of Russia into Asia. Bibliography.—Semenoft's Geographical and Statistical Dictionary, 6 vols., 1863-1885, contains a full bibliography of the Volga and tributaries up to date. See also Baer's Kasptsche Studien, 1837 sq.; Haxthausen's Studien tiber Russland; Baer and Helmersen's Beitrdge; Spiski naselennykh myest of Volga Provinces; V. Ragozin's Volga, 8 vols., 1880-81, with atlas (Russian) ; N. Bogo- luboff, The Volga from Tver to Astrakhan (Russian), 1876; S. Monastyrskiy, Iilustrated Handbook of the Volga (Russian), Kazah, 1884; Niegorodskiy Sbornik (Russian); Reclus's Géographie Universelle, vol. v.; Roskoschny, Die Wolga und thre Zufliisse, Leipsic, 1887, vol. i. (history, ethnography, hydrography, and biography, with rich bibliographical information); N. Boguslavskiy, The Volga as a Means of Communication (Russian), 1887. with detailed profile and maps ; M. Bogdanolf, Birds and Mammals of the Black-Earth Region of the Volga, 1869: Id., " Fauna ot Volga," in Mem. Kazan Natur., 1872; Peretyatkovitch,

4'), between Europe and Asia, and | extends as far south as Astrabad on the Caspian (36° 51' N. lat.), |

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Volga Region in the 15th and 16th Centuries, 1877; Klopoff, Results of Explora- tion of Volga Corn Trade,1887. For geology, see the publications of the Geological Committeeand Mineral Society (maps of Yarostavl and

lower Volga), and Memoirs of Astrakhan Statistical Committee for fishing. (EAI)

VOLHYNIA, a government of south-western Russia, bounded by the Polish provinces of Lublin and Siedlce on the W., Grodno and Minsk on the N., Kieff on the E., and Podolia and Galicia (Austria) on the S,, has an area of 27,731 square miles. A broad and flat spur of the Carpathians —the Avratynsk plateau—which enters from the west and spreads eastward towards the Dnieper, occupies its southern portion, reaching a maximum elevation of 1200 feet; another branch of the Carpathians in the west of the government ranges between 700 and 900 feet at its highest points. Both are deeply grooved in some places, and the crags give a hilly aspect to the districts where they occur. The remainder of the government, which is quite flat, with an imperceptible slope towards the marshes of Pinsk, is known as the Polyesie (see Minsk). It is covered by impassable marshes (sometimes as much as 400 square miles in extent), sparsely interspersed with forests and traversed by languid streams, with low, almost inaccessible banks, here and there diversified by sandy dunes. The drainage of the Polyesie is, however, being vigorously carried on, and large tracts of meadow land have already been reclaimed by extensive operations recently undertaken by Government. Among the marshes are many small lakes. Volhynia is copiously watered by a number of comparatively unimportant rivers which rise in the Avratynsk Hills and flow northwards towards the Dnieper; the Pripet with the Turia, the Styr, the Goryii, the Slutch, and other smaller tributaries of the Dnieper are navigable by small boats, and considerable quantities of timber and firewood are floated. By the western Bug, which separates Volhynia from Poland, timber is floated and corn and various goods shipped to Prussia.

The geological formation of Volhynia is very simple. The Avratynsk Hills, consisting of granite and various crystalline rocks, are covered with the Chalk, above which in turn are Tertiary sand- stones, sands, and clays containing lignite. The whole is covered by Glacial deposits and Lacustrine clays, reaching a great thickness in the north. Kaolin, pottery clay, and iron ore are the chief mineral] products ; amber also is occasionally found in the Tertiary sands. The climate of Volhynia, notwithstanding the influence of its marshes, is much milder than that of

central Russia within the same latitudes. The vegetation on the southern slopes of the Avratynsk Hills begins to show something of a West-European character ; oaks, maples, and limes prevail, while on the northern slope there arc immense forests of Scotch fir. The forests cover more than one-third of the entire area, and it is reckoned that 2,500,000 acres yield timber for building purposes.

The population of Volhynia in 1884 was 2,096,475, of whom nearly four-fifths were Little Russians (from 70 to 91 per cent. in various districts); there were 30,000 White Russians and somo 10,000 Great Russians. Next in importance to the Russiaus come the Jews, who numbered about 12 per cent. of the population. The Poles are variously estimated at from 120,000 to 170,000, but are certainly under 7 per cent. of the total population. The Germans number about 30,000. Agriculture cannot be said to flourish except on the Avratynsk plateau and its slopes, but is still the chief occupation, and more than one-third of the arca is under crops. The fertile soil of the south produces a surplusage of corn, which is cither used in distilleries or exported; the average crops from 1883 to 1885 were 1,606,000 quarters of rye, 550,000 of wheat, 1,145,000 of oats, 394,000 of barley, and 1,032,000 of potatoes. Hay is exported, but cattle-breeding has been almost stationary since 1850. In 1883 there were 506,500 horses, 655,050 cattle, and 571,500 sheep. Wool is exported. Beet is largely grown for sugar (38,000 acres, producing 4,800,000 cwts., having been under this crop in 1885). The culture of tobacco is rapidly extending (7000 tobacco plantations yielding about 8000 cwts. of tobacco in 1885). In the Polyesie the principal occupations are connected with the export of timber and firewood, the preparation of pitch, tar, potash, and various wooden wares, and boat-building. Tho wild boar, bear, fox, and hare are hunted. ,

The manufactures in 1884 yielded 18,884,000 roubles, as against only 2,856,000 in 1860. The goods principally produced are sugar, spirits, woollen cloth, paper, china, and metal wares. Wool, corn,

hides, and tallow are partly manufactured within the government, and partly exported to Riga and Poland. Volhynia is traversed by a railway from Kieff via Berditcheff to Brest-Lifovsk, with branches to Lublin and to Lemberg. The traffic by this line is eonsiderable, and the Radziviloff custom-house, on the Austrian frontier, is one of the most important in Russia.

Volhynia is divided into twelve districts, the chief towns of which are ZHITOMIR (q.v.), which had 54,830 inhabitants in 1884, Dubno (7255), Kovel (18,980), Kremenets (10,560), Lutsk (13,770), Novgrad Volhynskiy (18,590), Ostrog (16,520), Ovrutch (6480), Radziviloff (7350), Rovno (7300), Staro-Konstantinoff (17,980), and Zastavl (10,120).

Volhynia has been inhabited by Slavonians from a remote antiquity. In Nestor's Annals its people are mentioned under the name of Dulebs, and later in the 12th century they were known as Velhynians and Buzhans (dwellers on the Bug). From the 9th century the towns of Volhynia—Vladimir, Ovruteh, Lutsk, and Dubno—were ruled by descendants of Rurik, and the land of Volhynia remained independent until the 14th century, when it fell under Lithuania. In 1659 it was annexed to Poland, and so remained until 1795, when it was taken possession of by Russia.

VOLNEY, Constantin Francois CHASSEB@UF, CoMTE DE (1757-1820), was born at Craon, on February 3, 1757, of a good but not noble family, and educated first at the neighbouring provincial towns of Ancenis and Angers, then at Paris. According to the common and curious habit of the time and country he was at first surnamed Boisgirais, but afterwards assumed the name of Volney. When he was about four and twenty he acquired some reputation by an essay on the chronology of Herodotus, and was introduced into literary and philosophical society. He then did what was at the time not common, common as it has become since. Having inherited a sum of money, he visited the East and spent some four years in Eyypt and Syria, writing the history of his travels when he returned, and publishing it in 1787. He had not merely travelled but had learnt Arabic, and had studied the politics as well as the topography of the countries he visited. Of the former study he gave evidence the year before the Revolu- tion by some Considerations on the war between

Russia and Turkey. He was a member both of the States- General and of the Constituante, and distinguished himself as an ardent reformer. In 1791 appeared the book Les Ruines, by which he is known toa great many people who have never read it. Itis a kind of essay on the philosophy of history written from the philosophe point of view, and of course containing some direct and much oblique manifestation of philosophe antipathy to religion. It is probable, however, that those who, after the lapse of a century, read it under the impression of the strong denunciations of it by some orthodox writers of its own and immediately succeeding times will be not a little surprised. The book, of which the full title is Les Ruines, ou Méditation sur les Révolutions des Empires, purports to contain the discourses of a traveller among the ruins of Palmyra with a very 18th-century genius. Volney was a good deal more than a mere author. He tried to put his politico-economic theories into practice in Corsica, where in 1792 he bought an estate and made an attempt to cultivate colonial produce. He was thrown into prison during the Jacobin triumph, but escaped the guillotine. He was some time professor of history at the newly-founded Ecole Normale, lectured there, and published his lectures. Then he undertook a journey to the United States, the result of which took form in a book (chiefly geographical) published in 1803. Next year he republished and much enlarged his early essay on Herodotus. He was not a partisan of Napoleon, but, being a moderate man, a savant and a Liberal, was impressed into service by the emperor, who made him a count and put him into the senate, of which he was one of the least servile members. The restoration in the same way recruited him against his will, and he became a peer of France. He was a member of

the Institute and latterly of the Academy proper, and, besides his historical, political, and (as the 18th century understood philosophy) philosophical studies, was a philo- logist of some power. He died at Paris on April 25, 1820, and his complete works appeared soon afterwards in 8 volumes.

Volncy has been called the last of the philosophes, and so, if date and cminence together be considered, he was. It may, as in many such cases, be doubted whether his identification with a powerful but one-sided movement was more of service than of disservice to him. No doubt it stimulated his work, but it also cramped and distorted it,—the curious and not wholly intelligible attitude of the whole school towards Christianity showing itself distinctly in him as a prejudicing and narrowing force. He was, however, an accurate observer, a thinker of acuteness and originality if not of great width or depth, and master of his pen in no ordinary degrce. His style suffers from the general defects of 18th-century French prose, in being thin, colourless, and devoid of flavour despite its clearness and brilliancy. But it serves him as a most excellent vehicle both of description and of argument.

VOLO, a town and seaport of Greece, on the east coast of Thessaly, at the head of the gulf to which it gives its name. Volo lies just below the mouth of the little river Orchestus, near the west foot of Mount Pelion, on the southern verge of an undulating and extremely fertile plain, which stretches thence northwards beyond Larissa, and which is skirted on the east by the chain above which tower Pelion, Ossa, and Olympus. The town, which has a mixed population (1884) of 4000, comprises three distinct quarters :—the kastro, enclosed by walls and inhabited chiefly by Turks ; the scala, or port, centre of the trade and shipping ; and the squalid Greeco-Jewisli suburb, which stretches from near the kastro to the coast. Volo, which is regularly visited by the Austrian, French, and Greek steamers plying weekly between the Pirzeus and Constanti- nople, is the only outlet for the produce of northern Greece. The exports (tobacco, hides and skins, fruits, olive oil, raw silk and cocoons, &c.) were valued in 1886 at £31,000, while the imports (cereals, cotton goods, petroleum, sugar, hardware, &c.) amounted to £259,000.

The castle of Volo stands on or close tothe site of Pagase, whence the gulf took the name of Sinus Pagaseeus or Pagasicus, and which was one of the oldest places of whieh mention occurs in the legendary history of Greece. From this port the Argonautic expedi- tion was said to have sailed, and it was already a fiourishing place under the tyrant Jason, who from the neighbouring Phere ruled over all Thessaly. Two miles farther

south stand the ruins of Demetrias, founded (290 B.c.) by Demetrius Poliorcetes, and for some time a favourite residence of the Maccdonian kings. On the opposite side of the little inlet at the head of the gulf rises the hill of Episcopi, on which stood the aneient city of Ioleus. Here Dr Lolling discovered in 1883 some underground sepulchral chambers resembling those of Mycenee and Orchomenus.

VOLOGDA, a government of north-eastern Russia, having Archangel on the N., Tobolsk on the E., Perm, Vyatka, Kostroma, and Yarostavl on the S., Novgorod and Olonetz on the W. 'This immense government, which comprises an area of 155,500 square miles, stretches in a north-easterly direction for 800 miles, from Novgorod to the Urals, including the broad depression drained by the Sukhona from the 8.W. and the Vytchegda from the N.E., head-waters of the Dwina. From the basin of the Volga it is separated by a flat, swampy, and wooded swelling, where the heads of tributaries belonging to both Arctic and Caspian drainage-areas are closely intermingled. The eastern boundary of Vologda follows the main water- parting of the Urals, which has but few points over 3000 feet ; wide parmas, or woody plateaus, fill up the space between the main Urals and the southern spurs of the Timansk Mountains, in the upper basin of the Petchora, and it is above the parmas—especially over those which are nearest to the Urals proper—that the highest summits of the Urals rise in the form of dome-shaped mountains (Tellpdss, 5540 feet above sea-level ; Hoste-pidr, 4955 feet ;

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Idjed-kashem, 4225 feet). The Timansk Mountains are a swampy plateau, where the rivers flowing either to the Dwina or to the Petchora take their rise in common marshes ; so that on the Mytva portage boats have to be dragged only a distance of three miles through marshy forests to be transported from one system to the other.

Permian sandstones and cupriferous slates cover most of the territory ; only a few patches of Jurassic clays overlie them ; while in the east, in the Ural parmas, coal-bearing Carboniferous, Devonian, and Silurian slates

and limestones appear, covering the erystalline slates of the main ridge. Vast layers of boulder clay and Lacus- trine deposits cover the whole. Rock-salt and salt springs, iron ore, millstones, and grindstones are the chief mineral produets ; but mining is in its infancy.

Vologda is profusely watered; as many as 4800 rivers and streams have been counted on its maps. The Sukhona, which rises in the south-west and flows north-east past Vologda, Totma, and Velikiy Ustyug, is navigable for 375 miles, After its junction with the Yug (390 miles long), which comes from the south, it bceomes the Dwina, which flows north-west, and receives the Vytehegda, another great river, 740 miles long and navigable for 570 miles, which, how- ever, waters a nearly uninhabited region. The Luza, a tributary of the Yug, is also navigated for more than 250 miles. The Petchora, which flows through eastern Vologda, is an artery for the export of eorn and the import of fish in the Petchora region, otherwise difficult of aecess. The Pinega, the Mezei, and the Vaga, all belonging to the Arctie basin, rise in northern Vologda. In the south-west the Sukhona is connected by means of Lake Kuben- skoye and the canal of Alexander of Wiirtemberg with the upper Volga. Numberless smaller lakes oceur, and marshes cover a con- siderable part of the surface.

The climate is severe, the average yearly temperature being 36° F. at Vologda (Jan., 10°-7; July, 63°°5) and 32°°5 at Ust- Sysolsk (Jan., 4°-8; July, 61°-7).

The flora and the physical aspects present a great variety of characters as the traveller moves north-east down tho Sukhona and up the Vytchegda, towards the parmas of the Petchora. In the south-west the forests are cleared, and the dry slopes of the hills are covered with fields and ineadows; the population is relatively dense, and nearly one-quarter of the area is under erops. 'There is a surplus of grain, which is uscd for distilleries; and apples are extensively cultivated. The flora ismiddle-Russian. Farther to the north-east the climate grows more severe ; but still, until the Dwina is reached, corn suceceds well, and there is no lack of excellent nmieadows on the river-terraces. Flax is cultivated for export ; but only 4 per cent. of the area is tilled, the remainder being covered with thick fir forests, with oceasional woods of deciduous trecs (birch,

aspen, elder). At about the 46th degree of east longitude the larch appears and soon supersedes the fir. Several plants unknown in western Russia make their appcarance (Silene tartarica, Anthyllus vulneraria, Euphorbia palustris, Filago arvensis, Lycopo- dium complanatum, Sanguisorba officinalis) Tho Veratrum is especially characteristic : it sometimes encroaches on the meadows to such an extent as to compcl their abandonment. The region of the upper Mezeii (the Udora) again" has a distinctive character. The winter is so protracted, and the snowfall so copions, that the Zyrians are sometimes compelled to clear away the snow from their barley-fields. But the summer is so hot (a mean of 54° for the three summer months) that barley ripens within forty days after beingsown, The Timansk plateaus are a marked boundary for the middle-Russian flora. Those to the east of them are uninhabitable ; even on the banks of the rivers the climate is so severe, especially on aceount of the icy northern winds, that rye and barley are mostly grown only in orchards. The whole is covered with quite impenetrable forests, growing on a soil permeated with water, Mosquitocs swarm in the forests; birds are rare. The Siberian cedar begins, and the lime-tree disappears. Fir, cedar, pine, and larch chiefly compose the forests, with birch and aspen on their outskirts. "Hunting is the chief oceupation of the Zyrian inhabitants.

The population (1,172, 250 in 1883 as against 960,850 in 1861), Consists chiefly of Great Russians (88 per cent.), aud Zyrians (12 Per cent. ; only 7 per cent. according to Rittich). The Zyrians —4 Finnish stem akin to the Permians—constitute the bulk of the population on the Ural slopes. They formerly inhabited the Kama and Vyatka basins, and call themselves Komi-yurt, or Komi-yas, and m the 14th century the Russians hardly distinguished them from the Permians; but they were compelled to migrate northwards into the basins of the Dwina and Petchora, and even across the Urals, by the religious fanaticism of the earlier Christian missionaries. A portion of them now live in Archangel (about 15,000), and their agstegate numbers are estimated at from 100,000 to 120,000, but the figures are very uncertain, as they arc often hardly distinguishable from the Russians, whose religion and habits they have assumed.

They differ widely fromm the western Finns in having dark eyes and hair; their honesty is proverbial, as also is their industry. They grow corn amidst the forests, after having patiently cleared them, and rear eattle, but are pre-eminently hunters. Their "artels," guided by a primitive compass, penetrate hundreds of miles into the virgin forests, and bring in vast quantities of squirrel furs and feathered game ; they fell timber for export, and gather cedar-nuts, but in doing so are rapidly destroying the cedar-tree.

The chief oceupation of the Russians is agriculture, and the average erops of 1883 to 1885 were rye, 785,000 quarters ; barley, 926,000 ; oats, 925,000; other grains, 197,000; and potatoes, 107,000 quarters. In 1883 they had 229,500 horses, 520,200 cattle, and 392,900 sheep. They also fell timber, prepare tar, pitch, and potash, and manufacture wooden utensils. In the south-west they pursue a variety of domestic trades (spinning, weaving, sewing of plain eloth, &c.). The manufacturing industry is represented by a few ironworks, distilleries, paper-mills, and a variety of small manufactures ; their aggregate production was only £274,500 in 1884. Salt was raised in 1881-84 to the average amount of 65,000 cwts. Flax, linen cloth, linseed, butter, tar, pitch, timber, and furs are the main items of export, the chief centres for trade being Vologda, Verkhovajsk, and Ustyug.

Vologda is divided into ten distriets, the chicf towns (with populations in 1881) being VoLoepa (17,025), Gryazovets (2225), Kadnikoff (1520), Nikolsk (1880), Solvytchegodsk (1820), Totma (3380), Ustyug Velikiy (7980), Ust-Sysolsk (4100), Velsk (1410), and Yarensk (1250). (RaPAn IK)

VOLOGDA, capital of the above government, is situated in its south-western corner, 302 miles to the north-east of Moscow, with which it is connected by rail via Yarostavl. It is an old town, having many relics of the past in its churches, including one which dates from the 12th cen- tury, and the cathedral founded in 1565. The educa- tional institutions are in a better state than in many other provincial towns. Vologda, though a place of only 17,025 inhabitants in 1881, is a considerable commercial centre,—fiax, linseed, oats, hemp, butter, and eggs being bought to a

large amount in the neighbouring districts and in Vyatka, and exported both to St Petersburg and Archangel.

Vologda existed as a place of commeree as early as the 12th cen- tury. It was a colony of Novgorod, and, owing to its advantageous position and the enterprise of the Novgorod merchants, it grcw to be a populous city. It carried on a brisk trade in flax, tallow, and furs, which were sent in from Ustyug Vclikiy,—another important colony of Novgorod; while the Byelo-ozero merchants brought to Vologda and Ustyug corn, leather, and various manufactured goods to be bartered against furs, or to be shipped to Klotmogory, at the mouth of the Dwina. In 1273 it was plundered by the prince of Tver in alliance with the Tartars, but soon recovered. Moscow dis- puted its possession with Novgorod until the 15th century; the Moscow princes intrigued to find support amidst the poorer inhabi-tants against the rieher Novgorod merchants, and four succcs- sive times Vologda had to fight against its metropolis. It was definitely annexed to Moscow in 1447. When Archangel was founded, and opened for foreign trade in 1553, Vologda became the chief depot for goods exported through that channel. They were brought on sledges from Moscow, Yarostavl, and Kostroma; and special yams, or post stations, were maintained to connect Vologda with Moscow. Many foreigners lived at Vologda; Fletcher, the British envoy, stayed there, and the first Russian envoy to Britain came originally from Vologda. Polish bands plundered it in 1613, and the plaguc of 1648 devastated it; but it maintained its com- mereial importance until the foundation of St Petersburg, when Russian foreign trade took another channel.

VOLSCI. See Iraty, vol. xiii. p. 445, and Roms, vol. xx. p. 739-741.

VOLSK, or Votssk, a district town of Russia, in the government of Saratoff, and 90 miles to the north-east of that town, on the right bank of the Volga, was a century ago but a small village (Matykovo); recently, however it has grown to be one of the important towns on the lower Volga, and its population has rapidly increased from 23,500 in 1860 to 36,315 in 1885. It is built in a narrow valley between chalk cliffs, and has a large cathedral and a market; it is surrounded by gardens, the produce of

which is exported to Nijni-Novgorod— gardening being also a distinctive feature of the wealthy and populous neighbouring villages.

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VOLTA, Atzssanpro (1745-1827), was born at Como on February 18, 1745. In 1774 he was appointed pro- fessor of physics in the gymnasium of Como, and in 1777 he left his native town for the first time to travel through Switzerland, where he formed an intimate friendship with De Saussure. In 1779 a chair of physics was founded in Pavia, and Volta was chosen to occupy it. In 1782 he undertook a journey through France, Germany, Holland, and England, and became acquainted with nearly all the scientific celebrities of that day. In 1791 he received the Copley medal of the Royal Society. In 1801 Napoleon called him to Paris, to show his experiments on contact electricity, and a medal was struck in his honour. He was made a senator of the kingdom of Lombardy. In 1815 the emperor of Austria made him director of the philosophical faculty of Padua. In 1819 he retired, and settled down again in his native town. He died on March

5, 1827.

The first published paper of Volta (De Vi Attractiwa Ignis Electrici) dates from 1769; it contains no new facts, but deserves our attention as showing us the knowledge with which Volta set out on his journey of discoveries, and the theoretical speculations which seem to have given him the first impulse to experimental work. Franklin, who was then justly considered the great authority on these matters, had endeavoured to explain electrical phenomena by the mutual repulsion of the particles of an electrical substance and the attraction between that electrical substance and ordinary mattcr. Volta tried to simplify the theory by assuming an action only between the electrical substance and matter, and he tells us that he cxplained his views in a letter to the Abbé Nollet when he was nineteen years old. The way in which he endeavoured to account for the phenomena of attraction and repulsion and the phenomena of the Leyden jar have no interest for us to-day, but that part of his paper in which he showed the application of his theory to the generation of electricity is of historical importance, for in it we can trace the germ of many future

discoveries. He imagines all bodics in the natural state to contain electricity in such propor- tion that they are in clectrical equilibrium. He believes stint his experimental results obtained by rubbing metals with each other show this. But when bodies are brought into close contact, as, for instance, in friction, adopting the views of Boscovich, according to which attraction and repulsion alternate at small distances, he con- siders that the attractions of electricity and matter 1aay alter and a new electrical equilibrium will establish itself. He asks the question whether during the progress of chemical action, such as solution, mixture of fluids, combustion, in which the particles of matter change their position, there is no disturbance of electrical equi- librium. He expresses his conviction that this is the case, and explains the experimental difficulties which prevent a proof, but expresses a hope that he will succeed in obtaining signs of electrical action during chemical operations. He shows how atmospheric electricity might be accounted for in accordance with these views.

The principal point of interest in his second paper (Novus ac Simplicissimus Electricorum Tentaminum Apparatus) is the attempt to explain electrical insulation by a repulsion between the insulating matter and electricity. The influence of Boscovich in this attempt to explain everything by forces and centres of force is here apparent. Theory thus seems to have given Volta the first impulse to his electrical inquiries; but as he went on with his experimental work the firm establishment of facts took the first place in his mind, and after the first two papers we find hardly anything speculative in his writings.

On June 10, 1775, Volta announced the construction of the electrophorus in a letter to Priestley, asking him, as the historian of electricity, how far the discovery was new.. The remainder of the year seems to have been taken up with improvements in the mechanical construction of the apparatus. A letter to De Saussure in 1778 treats of the electrostatic capacity of conductors. Although we now know that Cavendish had treated the same subject in a much more complete way, the researches of Cavendish have only recently been published, and Volta's experiments are a grcat advance on anything that had been published at the time. The construc- tion of the condenser, and its applications to the study of

electrical phenomena, were first published in the Philosophical Transactions (1782). By means of the delicate apparatus at his disposal he re- turned to the ideas announced in his first paper, and tried to discover signs of electricity during the processes of evaporation and ebulli- tion, aud during changes of temperature ; after repeated failure he at last believed himself to have succeeded in obtaining electrical effects during the evaporation of water. The first successful experi- ments were made in Paris in the presence of Lavoisier and Laplace.

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We know now thut evaporation by itself does not cause a difference in electric potential, and that Volta's effect was due to friction of the vapour generated against the sides of the vessel ; but this has only been established quite recently.

The results on electrical effects due to evaporation led Volta to the closer investigation of the phenomena of atmospheric electricity, a subject which seems always to have had a special attraction for him. Between 1788 and 1790 he wrote nine letters on Meteorologia Elettrica addressed to Lichtenberg. The first two letters treat of electrical measurements. For the pith ball electroscope he substi- tutes the straw electrometer, in which the angle of divergence of two clectrified straws is measured. Different electrometers of various sensitiveness are carefully graduated and compared with each other. Nor is this all: Volta has never as yet received the credit of havin constructed the first absolute electrometer, and for having conte his other instruments with it, so that it would be possible now to refer all his measurements to absolute units. His electrometer consisted of a balance, one pane of which was a flat round disk. Below this disk was placed a larger parallel plate, conducted away to earth, and stops were arranged so that the disk could not approach the plate nearer than 2 inches. In the unelectrified state the balance was in a state of equilibrium. When the disk is electrified it is attracted towards the plate but kept at its proper distance by the stops; weights are then added in the other plate of the balance until the disk is torn away from the stops.

The remaining letters addressed to Lichtenberg contain obser- vations on atmospheric electricity and on the action of points and flames in

discharging electncity. The reader cannot help fecling low very little more we now know about these matters than Volta did.

It was probably in 1790 that Galvani first madc the observa- tions which have rendcred him celebrated. He was struck by the muscular contractions of a frog which had recently been killed and skinned, and was lying on a table ncar an electrical machine, which was accidentally set to work. In order to see whethcr he could obtain similar contraction from atmospheric electricity, he sus- pended the thigh of a frog by means of a hook from an iron railing, and found the contraction whenever the muscle touched the railing. He tricd to account for the observation by assuming that the nerves and muscles of the animal body formed a kind of Leyden jar, which was discharged whenever an external circuit brought them into electrical contact. Voltaat first agreed to this explanation, but his own experiments soon led him to change his opinion. It is very instructive to read the various letters and essays in which Volta describes his observations and his reasoning which gradually led him up to the construction of the electrical pile. His whole ex- perimental training as well as the speculations of his early youth seemed to force him on in the right path, and in this work, as indeed in his whole carecr, nonc of thc discoveries seems due to chance. The muscle of the frog soon appeared to him to be nothing but a very delicate electrometer, and he made use of it as such. The conductors he divided into two classes. Conductors of the first kind, to which carbon and the metals belong, he showed to become elcctrified by contact, but in such a way that equilibrium is estab- lished in each circuit, so that no current of electricity can be produced by any arrangement containing conductors of this class only. Conductors of the second kind are what we should now call electrolytes. An electric current is produccd whenever a circuit is arranged between two conductors of the first kind and one of the second kind. It is impossible here to enter into the history of this now celebrated contact theory, but, although opinions may differ on the interpretation of some of the experiments, there is not much in Volta's writings on this subject which could be called incorrect even at the present day. Volta's electric pile was first described in a letter to Sir J. Banks, then president of the Royal Society. The letter is dated March 20, 1800, and it was read before the Society on June 26 of the same ycar. The pile consisted of a

number of disks of tin and an equal number of disks of silver or copper. The zinc and tin plates are in contact, and each pair is separated by some porous mattcr which is kept moist. He describes a number of experimental results obtained with this pile, and finally shows that all the effects produced are the same as those which can be obtaincd from electrical machines, and that therefore "galvanism " and "electricity" are identical. Volta lived to see the remarkable development of his science at the hands of Sir Humphry Davy, Oersted, and Ampére, but he was no mathematician, and the subject grew beyond his powers. He recognized this with that frank honesty which is apparent in all his writings, and during the last twenty-five years of his life he published nothing on electrical subjects.

A complete history of Volta's writings ought to take in much which must be omitted here. His investigations on gas analysis, and his very interesting paper on the expansion of gases by heat, deserve, however, to be mentioned. He showed the causes which had led different experimenters to such inconsistent results, and

established independently what is now known as the law of Charles. (ATS?)

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VOLTAIRE, Francois Marte ARovET DE (1694-1778), whose real name was Francois Marre Anover simply, was born on the 21st of November 1694 at Paris, and was baptized the next day. His father was Francois Arouet, a notary; his mother was Marie Marguerite Daumart (sometimes, but less correctly, spelt D'Aumard, apparently because her family was noble). Both father and mother were of Poitevin extraction, but the Arouets had been for two generations established in Paris, the grandfather being a prosperous tradesman, and the father, as has been said, a still more prosperous notary. The Arouet family are heard of in Poitou as far back as the early 16th century, and appear to have always belonged to the yeoman-tradesman class. Their special home was the town of St Loup. Voltaire was the fifth child of his parents—twin boys (of whom one survived), a girl, Marguerite Catherine, and another boy who died young, having preceded him. Not very much is known of the mother,

who died when Voltaire himself was but seven years old. She seenis, however, to have had delicate health, and she pretty certainly was the chief cause of Voltaire's early introduction to good society, the Abbé de Chateauneuf (his sponsor in more ways than one) having been her friend. The father appears to have been somewhat peremptory in temper, but neither inhospitable nor tyrannical. Marguerite Arouet, of whom her younger brother was very fond, married early; the elder brother Armand was a strong Jansenist, and there never was any kind of sympathy between him and Frangois.

Voltaire appears to have received no very regular education till he was ten years old; but the Abbé de Chateauneuf instructed him pretty early in belles lettres and deism, and he showed when quite a child the unsur- passed faculty for facile verse-making which always distin- guished him, and to which the literary tastes and models of the time lent themselves with especial readiness. But at the age just mentioned he was sent to the Collége Louis-le-Grand, which was under the management of the Jesuits. This was in 1704. He remained there till 1711. It was his whim, as part of his general liberalism, to depreciate the education he received ; but it seems to have been a very sound and good education, which beyond all doubt formed the basis of his extraordinarily wide, though never extraordinarily accurate, collection of knowledge subsequently, and (a more important thing still) disciplined and exercised his literary faculty and judgment. Nor can there be much doubt that the great attention bestowed on acting—the Jesuits kept up the Renaissance practice of turning schools into theatres for the performance of plays both in Latin and in the vernacular—had much to do with Voltaire's lifelong devotion to the stage. It must have been in his very earliest school years that the cele- brated presentation of him by his godfather to Ninon de Lenclos took place, for Ninon died in 1705. She left him two thousand livres " to buy books with." Voltaire's School experience appears to have been much more like that of English schoolboys than like the dreary imprison- ment of which in later days Frenchmen have generally complained. He worked fairly, played fairly, lived com- fortably, made good and lasting friends. Some curious traits are recorded of this life—one being that in the terrible famine year of Malplaquet a hundred francs a year were added to the usual boarding expenses, and yet the boys had to eat pain bis.

His troubles began when, in August 1711, at the age of 17, he came home, and the usual battle began between @ son who desired no profession but literature and a father Who, in those days not quite unreasonably, refused to con- sider literature a profession at all. Fora time Voltaire submitted, and read law at least nominally, doing quite other things besides or instead of that study. The Abbé

de Chateauneuf died before his godson left school, but he had already introduced him to the famous coterie of the Temple, of which the grand prior Venddme was the head, and the poets Chaulieu and La Fare the chief literary stars, and which chiefly existed for purposes of sometimes elegant and sometimes by no means elegant dissipation. It does not appear that Voltaire got into any great scrapes, and the anecdotes recorded of this wild oats time of his are harmless enough. But his father naturally prognosti- cated little good to him from such society, and tried to break him off from it, by sending him first to Caen and then in the suite of the Marquis de Chateauneuf, the abbé's brother, to the Hague. Here, however, he got into what, in the paternal eyes at least, was a far worse scrape than staying out at night or wasting his substance on the purchase of coaches and horses. He meta certain Olympe Dunoyer (" Pimpette"), a girl apparently of respectable character and not bad connexions, but a Protestant, penniless, and daughter of a literary lady whose literary reputation was not spotless. The mother discouraged the affair, and, though Voltaire, with an early display of his afterwards famous cunning, tried to avail himself of the mania for proselytizing which then distinguished France, his father would not hear of the match, and stopped the whole affair by procuring a lettre de cachet, which, however, he did not use. Voltaire, who had been sent home, sub- mitted, and for a time pretended to work in a Parisian lawyer's office. But he again manifested a faculty for get- ting into trouble,—this time in the still more dangerous way of writing libellous poems,—so that his father was glad to send him to stay for nearly a year (1714-1715) with Louis de Caumartin, Marquis de St Ange, in the country. Here he was still supposed to study law, but as usual really devoted himself in part to literary essays, in part to storing up that immense treasure of gossiping history which was afterwards one of

his most unique pos- sessions. Almost exactly at the time of the death of Louis XTV. he returned to Paris, to fall once more into literary and Templar society, and to make the tragedy of Cdipe, which he had already written, privately known. He was now introduced to a less questionable and even more distinguished coterie than Vendéme's, to the famous "court of Sceaux," the circle of the beautiful and am- bitious Duchesse du Maine. It seems, though it is not certainly known, that Voltaire lent himself to the duchess's frantic hatred of the regent Orleans, and helped to com- pose lampoons on that prince. At any rate, in May 1716 he was exiled, first to Tulle, then to Sully. He was allowed to return, but again fell under suspicion of having been concerned in the composition of two violent libels,— one in Latin and one in French,—called from their first words the Puero Regnante and the J'ai vu, was inveigled by a spy named Beauregard into a real or burlesque con- fession, and on May 16, 1717, was arrested and sent to the Bastille. He remained there for eleven months, recast Gidipe, began the Henriade, and determined to alter his name. ver after his exit from the Bastille in April 1718 he was known as Arouet de Voltaire, or simply Voltaire, though legally he never abandoned his patronymic. The origin of the famous name has been much debated, and attempts have been made to show that it actually existed in the Daumart pedigree or in some territorial designation. The balance of opinion has, however, always inclined to the hypothesis of an anagram on the name " Arouet le jeune," or " Arouet 1. j.," « being changed to v and j to ¢ according to the ordinary rules of the game. If it be so, the much despised art of the anagrammatist has the triumph of pro- ducing one of the dozen or score most famous names in literary history.

A further "exile" at Chatenay and elsewhere succeeded

the imprisonment, and though Voltaire was admitted to an audience by the regent and treated graciously it is clear that he was not trusted, and the inconveniences he had suffered for a time induced even his incorrigibly mischievous nature to keep quiet. Mdipe was acted at the Théatre Frangais on 18th November of the year of release, and was very well received, a not dissimilar rivalry between parties to that which not

long before had helped Addison's Cato assisting its success. It had a run of forty-five nights, was acted at court, and brought the author not a little money in profits and presents, besides a gold medal from the regent. Voltaire seems to have begun with these gains his long and (among authors) almost unique series of successful financial speculations. But adversity had by no means done with him. In the spring of next year the production of Lagrange-Chancel's libels, entitled the Philippiques, again brought suspicion on him. He was informally exiled, and spent much time with Marshal Villars, again increasing his store of "reminis- cences." He returned to Paris in the winter, and his second play, A7témire, was produced in February 1720. It was a failure, and though it was recast with some success Voltaire never published it as a whole, and used parts of it up in other work. He again spent much of his time with Villars, listening to the marshal's stories and making harmless love to the duchess. In December 1721 his father died, leaving him property (rather more than four thousand livres a year), which was soon increased by a pension of half the amount from the regent. In return for this, or in hopes of more, he offered himself as a spy— or at anyrate as a secret diplomatist —to Dubois. He had, however, an awkward brush with a fellow-servant in this honourable kind of work, for, meeting his old enemy Beauregard in one of the minister's rooms and making an offensive remark, he was waylaid by Beauregard some time after in a less privileged place and soundly beaten. This unpleasant proceeding was only a preliminary to Voltaire's second and most important experience of ' Black Will with a cudgel," to use Rochester's phrase as to the proper mode of dealing with troublesome men of letters. His visiting espionage, as unkind critics put it —his secret diplomatic mission, as he would have liked to have it put himself— began in the summer of 1722, and he set out for it en bonne fortune,—in company, that is to say, with a certain Madame de Rupelmonde, to whom he as usual made love, though it may perhaps be platonic love only (for Voltaire was not fortunate in this way), taught deism, and served as an amusing travelling companion. He stayed at Cam- bray for some time, where European diplomatists – were still in full session, journeyed to Brussels, where he met and quarrelled with Jean Baptiste Rousseau, went on to the Hague, and then returned. It does not seem that he did anything diplomatically important, but from that day to this French Governments have had an amiable weakness for paying the

travelling expenses of men of letters who feel inclined to see the world. The Henriade had got on considerably during the journey, and, according to his life- long habit, the poet, with the help of his friend Thiériot and others, had been " working the oracle " of puffery after a fashion not particularly creditable, but perhaps recom- mended by a knowledge of mankind. During the late autumn and winter of 1722-23 he abode chiefly in Paris, taking a kind of lodging in the town house of M. de Bernicres, a nobleman of Rouen, and endeavouring to procure a "privilege." for his poem. In this he was dis- appointed, but he had the work printed at Rouen never- theless, and spent the summer of 1723 revising it. In November he caught smallpox and was very seriously ill, so that the book was not given to the world till the spring of 1724 (and then of course, as it had no privilege, appeared

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privately). Almost at the same time, March 4, his third tragedy, Mariamne, appeared, at first with great success, but before the curtain fell complete damnation fell on it, The regent had died shortly before, not to Voltaire's advantage ; for though that rather hardly treated person had little reason to love the poet he had been a generous patron to him. Voltaire had made, however, a useful friend in another grand sergneur, as profligate and nearly as intelligent, the duke of Richelieu, and with him he passed 1724 and the next year chiefly, recasting Mfariammne (which was now successful), writing the comedy of L'Indis- cret, and courting the queen, the ministers, the favourites, and everybody who seemed worth courting. The end of 1725 brought a disastrous close to this period of his life. He was insulted in one way or another by the Chevalier de Rohan, replied with his usual sharpness of tongue, and shortly afterwards, when dining at the Hotel Sully, was called out and bastinadoed by the chevalier's hirelings, Rohan himself looking on. Nobody would take his part, and at last he challenged Rohan, who accepted the chal- lenge, but on the morning appointed for the duel Voltaire was arrested and sent for the second time to the Bastille. This was nearly three months after the outrage. Voltaire had been ostentatiously taking lessons in fencing mean-

while, and it requires some effort to sympathize with him in all the circumstances. He was only kept in confine ment a fortnight, and was then packed off to England in accordance with his own request. In the then state of social matters in France this was probably the best end of the matter, and nobody comes out of it so badly as the duke of Sully, who, by the code of gentlemen of all ages, was clearly bound to take the part of the guest who had been trepanned from his own table, and did not take it. But here also Voltaire took the best means of putting him- self in the wrong and his enemies in the right by cutting Maximilien de Béthune's name out of the Henriade.

No conipetent judges have ever mistaken the importance of Voltaire's visit to England, and the influence it exercised on his future career. In the first place, the ridiculous and discreditable incident of the beating had time to blow over ; in the second (as a previous experience of J. B. Rousseau's, which a good man of business like Voltaire was not likely to forget, had shown), England was a very favourable place for Frenchmen of note to pick up guineas ; in the third, and most important of all, his contact with a people then far more different in every conceivable way from their neighbours than any two peoples of Europe are different now, acted as a sovereign tonic and stimulant on his intellect and literary faculty. Before the English visit Voltaire had been an elegant trifler, an adept in the forms of literature popular in French society, a sort of superior Dorat or Bouffiers of earlier growth. He returned from that visit one of the foremost literary men in Europe, with views, if not profound or accurate, yet wide and acute on all les grands syjets, and with a solid stock of money to make him independent of those great men of his own country who had taught him how dearly their patronage was to be purchased. The visit lasted about three years, from 1726 to 1729; and, as if to make the visitor's luck certain, George I. died and George II. succeeded soon after his arrival. The new king was not fond of " boetry," but Queen Caroline was, and the international jealousy (which, though there was no actual war, was never stronger than then) was pleased at the thought of welcoming a distin- guished exile from French illiberality. The Walpoles, Bubb Dodington, Bolingbroke especially, Sir Everard Falkener, a merchant and a diplomatist, Young, Congreve, Sarah Marlborough, Pope, were among his English friends. Heat least tried to appreciate

Shakespeare, and at least attained to the length of now copying and now reviling him. He

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was much struck (and it would appear not unfrequently hoaxed) by English manners, was deeply penetrated by English toleration for personal freethought and eccen- tricity, and (though the amount is very variously stated) certainly gained some thousands of pounds from an auth- orized English edition of the Henriade dedicated to the queen. But he visited Paris now and then, without per- mission (at other times he obtained permission to go with- out visiting it), and his mind, like the mind of every exiled Frenchman, was always set thereon. He at last gained full licence to return in the spring of 1729.

He was full of literary projects, and immediately after his return he is said to have increased his fortune im- mensely by a lucky lottery speculation. The /enriade was at last licensed in France; Brutus, a play which he had printed in England, was accepted for performance, but kept back for a time by the author ; and he began the celebrated poem of the Pucelle, the amusement and the torment of great part of his life. But he had great difficulties with two of his chief works which were ready to appear, and did after a fashion appear in 1731,—to wit, Charles XJ. and the Lettres sur les Anglais. With both he took all imaginable pains to avoid offending the censorship; for Voltaire had, more than any other man who ever lived, the ability and the willingness to stoop to conquer. At the end of 1730 Brutus did actually get acted with not incon- siderable but gradually decreasing success. Then in the spring of the next year he went to Rouen to get Charles XII, surreptitiously printed, which he accomplished. In all this nomadic life of his, which had now reached more than "the middle of the way," he had never had a house of his own, nor had he now, though for a rather unusually long time he was half-guest half-boarder with the Comtesse de Fontaine-Martel. In 1732 another tragedy, Eriphile, appeared with the same kind of halting success which had distinguished the appearance of its elder sisters since Gidipe. But at last, on August 13, 1732, he produced Zaire, the best (with MJérope) of all his plays, and one of the ten or twelve best plays of the whole French classical school. Its

motive was borrowed to some extent from Othello, but that matters little. In the following winter the death of his hostess turned him out of a comfortable abode. He still, however, did not set up housekeeping, but took lodgings with an agent of his, one Demoulin, in an out-of-the-way part of Paris, and was, for some time at least, as much occupied with contracts, speculation, and all sorts of means of gaining money as with literature.

It was in the middle of this period, however, in 17 DD, that two important books, the Lettres Phailosophiques sur les Anglais and the Temple du Govt appeared. Both were likely to make bad blood, for the latter was, under the mask of easy verse, a satire on contemporary French literature, especially on J. B. Rousseau, and the former was, in the guise of a criticism or rather panegyric of English ways, an attack on everything established in the church and state of France. It was published with certain " re- marks " on Pascal, more offensive to orthodoxy than itself, and no mercy was shown to it. The book was condemned (June 10, 1734), the copies seized and burnt, a warrant issued against the author, and his dwelling searched. He himself, as usual henceforward, took care to be out of the way of danger, and was safe in the independent duchy of Lorraine with Madame du Chatelet, not having taken, but very shortly about to take, up his abode with that "respectable Emily " at her famous chateau of Cirey.

If the English visit may be regarded as having finished Voltaire's education, the Cirey residence may be justly said to be the first stage of his literary manhood. He had Written important and characteristic work before; but he had always been in a kind of literary Wanderjahre. He

now obtained a settled home for many years, and, taught by his numerous brushes with the authorities, he began and successfully carried out that system of keeping out of personal harm's way, and of at once denying any awkward responsibility, which made him for nearly half a century at once the chief and the most prosperous of European heretics in regard to all established ideas. He was in no great or immediate danger on this particular occasion, especially as he was perfectly ready to deny his

authorship, and he travelled about for some time, visiting the camp at Philippsburg, where some not very important fighting, notable only for being the last campaign of Eugene, was going on. It was not till the summer of 1734 that Cirey, a half-dismantled country house on the borders of Champagne and Lorraine, was fitted up with Voltaire's money and be- came the headquarters of himself, of his hostess, and now and then of her accommodating husband. Many pictures of the life here, some of them not a little malicious, survive. It was not entirely a bed of roses, for the "respectable Emily's" temper was violent, and after a time. she sought lovers who were not so muchi des cérébrauax as Voltaire. But it provided him with a safe and comfortable retreat and with something of the same kind of convenience for literary work which matrimony provides for more commonplace or more scrupulous men of letters. In March 1735 the ban was formally taken off him, and he was at liberty to return to Paris, a liberty of which he availed himself but sparingly now and ever afterwards, finding himself better away from the capital. At Cirey lhe wrote indefatigably and did not neglect business. The principal literary results of his early years here were the play of Alzire (1736) and a long treatise on the Newtonian system which he and Madame du Chatelet—an expert mathematician—wrote together. But as usual Voltaire's extraordinary literary industry was rather shown in a vast amount of fugitive writings than in substantive works, though for the whole space of his Cirey residence he was engaged in writing, adding to, and altering the Pucelle. In the very first days of his sojourn he had thus written a pamphlet with the imposing title of "Treatise on Metaphysics." Of metaphysics 'proper Voltaire neither now nor at any other time understood anything, and the subject, like every other, merely served him as a pretext for laughing at religion with the usual reservation of a tolerably affirmative deism. In March 1736 one of the least creditable events of his life, yet still not wholly discreditable, happened. An avowal of the English Letters was got out of him privately and then used publicly as an engine of extortion. In the same year he received his first letter from Frederick of Prussia, then crown prince only. He was soon again in trouble, this time for the poem of the Mondain, and he at once crossed the frontier and then niade for Brussels. He spent about three months in the Low Countries, and in March 1737 returned to Cirey, and continued writing, making experi- ments in physics (he had at this time a large

laboratory), and busying himself not a little with iron-founding, the chief industry of the district. The best known accounts of Cirey life, those of Madame de Grafigny, date from the winter of 1738-39 ; they are, as has been said, somewhat spiteful but very amusing, depicting the constant quarrels between Madame du Chiatelet and Voltaire, his intense suffering under criticism, his constant dread of the sur- reptitious publication of the Pucelle (which nevertheless he could not keep his hands from writing or his tongue from reciting to his visitors), and so forth. The chief and most galling of his critics at this time was the Abbé Desfontaines, and the chief of Desfontaines's attacks was entitled La Voltairomanie, in reply to a libel of Voltaire's called Le Préservatif. Both combatants had, according to the absurd habit of the time, to disown their works, Desfontaines's

disavowal being formal and procured by the exertion of all Voltaire's own influence both at home and abroad. For he had as little notion of tolerance towards others as of dignity in himself. In April 1739 a journey was made to Brussels, to Paris, and then again to Brussels, which was the headquarters for a considerable time owing to some law affairs of the Du Chatelets. Frederick, now king of Prussia, made not a few efforts to get Voltaire away from Madame du Chatelet, but unsuccessfully, and the king earned the lady's cordial hatred by persistently refusing or omitting to invite her. At last, in September 1740, master and pupil met for the first time at Cleves, an interview followed three months later by a longer visit at Remusberg. Brussels was again the headquarters in 1741, by which time Voltaire had finished the best and the second or third best of his plays, Mérope and Mahomet. Mahomet was played first in the year and at the place just. mentioned ; it did not appear in Paris till August next year, and JMdérope not till 1743. This last was and de- served to be the most successful of its author's whole theatre. It was in this same year that he received the singular diplomatic mission to Frederick which nobody seems to have taken seriously, and after his return the oscillation between Brussels, Cirey, and Paris was resumed, in a manner rather difficult to record in a short biography. During these years Voltaire's production of miscellanies was as constant as usual, but his time allotted to serious work was chiefly given to history and much of the Hssaz sur les Moeurs

and the Siecle de Lows XIV. was now com- posed. He also returned, not too well-advisedly, to the business of courtiership, which he had given up since the death of the regent. He was much employed, owing to Richeliew's influence, in the fétes of the dauphin's marriage, and was rewarded on New Year's day 1745 by the appoint- ment to the post of historiographer-royal, once jointly held by Racine and Boileau. The situation itself and its ac- companying privileges were what Voltaire chiefly aimed at, but there was a salary of two thousand livres attached, and he had the year before come in for three times as much by the death of his brother. In the same year he wrote a poem on Fontenoy, he received medals from the pope, and dedicated J/ahomet to him, and he wrote court divertissements and other things to admiration. But he was not a thoroughly skilful courtier, and one of the best known of Voltairiana is the contempt or at least silence with which Louis XV.—a sensualist but no fool—received the maladroit and almost insolent inquiry Trajan est- u content ? addressed in his hearing to Richelieu at the close of a piece in which the emperor had appeared with a transparent reference to the king. All this assentation had at least one effect. He who had been for years ad- mittedly the first writer in France had been repeatedly passed over in elections to the Academy. He was at last elected in the spring of 1746, and received on May 9. Then the tide began to turn. His favour at court had naturally exasperated his enemies ; it had not secured him any real friends, and even a gentlemanship of the chamber was no solid benefit, except from the money point of view. He did not indeed hold it very long, but was permitted to sell it for a large sum, retaining the rank and privileges. He had various proofs of the instability of his hold on the king during 1747 and in 1748. He once lay in hiding for two months at Sceaux, and afterwards for a time lived chiefly at Lunéville, where Madame du Chatelet had estab- lished herself at the court of King Stanislaus, where she carried on her flirtations with Saint Lambert, and where, in September 1749, she died, not in, but about four days after, childbirth. .

The death of Madame du Chatelet is another turning point in the history of Voltaire. He was now not a young

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man—indeed he was fifty-five—but he had nearly thirty years more to live, and he had learnt much during what may be called his Cirey cohabitation. On the one hand, he had discovered that it was undesirable that a man should not have a household ; on the other, he had dis- covered that it was still more undesirable that a man should put himself under illegitimate petticoat government. For some time, however, after Madame du Chatelet's death he was in a state of pitiable unsettlement. At first, after removing his goods from Cirey, he hired the greater part of the Chatelet town house and then the whole. He had some idea of settling down in Paris, and might perhaps have done so if mischief had not been the very breath of his nostrils. He could not bring himself to testify in any open and dangerous manner for what he thought to be the truth; he could not bring himself to refrain from attack- ing, by every artifice and covert enginery, what he thought to be falsehood. He went on writing tales like Zadig. He engaged in a foolish and undignified struggle with Crébillon pére (not jils), a dramatist who, in part of one play, Rhadamiste et Zénobie, has struck a note of tragedy in the grand Cornelian strain, which Voltaire could never hope to echo, and who, in most of his other efforts, was and is mainly futile. He used the most extraordinary efforts to make himself more popular than he was, but he could not help being uncomfortable in a city where the court all but threatened, and where the city did more than all but laugh.

All this time Frederick of Prussia had been continuing his invitations, and the "respectable Emily " was no longer in the way. It does not appear that, at any rate at first, Frederick made any real difficulty as to money. Indeed he behaved on the whole very generously. Voltaire left Paris on the 15th June 1751, and reached Berlin on the 10th July.

This Berlin visit might itself be treated, without undue extension, at the length of the present article; but its circumstances may be presumed to be already more or less familiar to most English readers from the two great essays of Macaulay and Carlyle as well as from the /rederick of the latter. It is desirable, if not altogether necessary, to say that these two masters of English were not perhaps the best qualified to relate the story. Both were unjust to Voltaire, and Macaulay was unjust to Frederick as well. It is quite certain that at first the king behaved altogether like a king to his

guest. He pressed him to remain; he gave him (the words are Voltaire's own) one of his orders, twenty thousand francs a year, and four thousand ad- ditional for his niece, Madame Denis, in case she would come and keep house for her uncle. But Voltaire's con- duct was from the first Voltairian. He sent a letter, in which Madame Denis pleaded with him to return, to Frederick—an odd way of ingratiating his niece with that monarch. He insisted on the consent of his own king, which was given without delay and on very liberal terms, —Louis XV., if gossip is to be trusted, pointing out with considerable shrewdness that it was not his fault if Voltaire would put himself constantly in hot water, and still less his fault that there were so few men of letters in Prussia that it suited the king of Prussia to ask them to dinner, and so many in France that it was quite impossible for the king of France to do so. Frenchmen, always touchy on such a point, regarded Voltaire as something of a deserter ; and he was not long before he bitterly repented his deser- tion, though his residence in Prussia actually lasted for nearly three years. It was quite impossible that Voltaire and Frederick should get on together for long. Voltaire was not humble enough to be a mere butt, as many of Frederick's led poets were ; he was not enough of a gentle- man to hold his own place with dignity and discretion ; he

was constantly jealous both of his equals in age and re- putation, such as Maupertuis, and of his juniors and in- feriors, such as Baculard D'Arnaud. He was greedy, restless, and in a way Bohemian. Frederick, though his love of teasing for teasing's sake has been exaggerated by Macaulay, was anything but amiable in disposition, was a martinet of the first water, had a sharp though one-sided idea of justice, and had not the slightest intention of allowing Voltaire to insult or to tyrannize over his other guests and servants. If he is to be blamed in this parti- cular matter, the blame must be chiefly confined to his imprudence in inviting Voltaire at the beginning and to the brutality of his conduct at the end. Within Voltaire there was always a mischievous and ill-behaved child; and he was never more mischievous, more ill-behaved, and more childish than in these years. But, knowing as we do what he was, there is much excuse for him. He tried to get D'Arnaud exiled and succeeded. He got into a quite unnecessary quarrel with Lessing, the most distinguished, or at least the most gifted, German author of the day. He had not been in the country six

months before he engaged in a discreditable, and in Prussia directly illegal, piece of financial gambling with Hirsch, the Dresden Jew. He had the extreme unwisdom and meanness to quarrel with this agent of his about money, and was at least accused of something like downright forgery—that is to say, of altering a paper signed by Hirsch after he had signed it. The king's very well justified disgust at this affair (which came to an open scandal before the tribunals) was so great that he was on the point of ordering Voltaire out of Prussia, and Darget the secretary had no small trouble in arranging the affair (February 1751). Then it was Voltaire's turn to be disgusted with an occupation he had undertaken himself—the occupation of '" buckwash- ing" the king's French verses. However, he succeeded in finishing and printing the Svécle de Lowis XIV., while the Dictionnaire Philosophique is said to have been devised and begun at Potsdam. Lut Voltaire's restless temper was brewing up for another storm. In the early autumn of 1751 La Mettrie, one of the king's parasites, and a man of much more talent than is generally allowed, horrified Voltaire by telling him that the king had in con- versation applied to him, Voltaire, a proverb about " suck- ing the orange and flinging away its skin ;" and about the same time the dispute with Maupertuis, which had more than anything else to do with his exclusion from Prussia, came to a head. No one qiite knows how it began, though it is probably enough to say that Maupertuis and Voltaire had been of old quasi-rivals in the favour of the "divine Emilie," that as president of the Berlin Academy Maupertuis was in a manner Voltaire's literary superior, that he was a man of rough and boorish manners, and that he is said at least to have refused his aid in the Hirsch affair. He also seems to have had something at least to do with a tedious and complicated squabble arising from the work of a certain La Beaumelle, a literary hack of the time, not without ability, who chose to visit Berlin and court Voltaire. The final rupture was provoked by Maupertuis himself, though indirectly, by a dispute into which he got with one Kénig. The king took his pre- sident's part; Voltaire (unluckily for him, but with suffi- cient adroitness to make no open breach) took K6nig's. But Maupertuis must needs write his Letters, and there- upon (1752) appeared one of Voltaire's most famous, though perhaps not one of his most read works, the Diatribe du Doctewr Akakia. Even Voltaire did not venture to publish this lampoon on a great official of a prince so touchy as the king of Prussia without some

permission, and if all tales are true he obtained this by another piece of some- thing like forgery—getting the king to endorse a totally

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different pamphlet on its last leaf, and affixing that last leaf to Akakia. Of this Frederick was not aware; but he did get some wind of the Diatribe itself, sent for the author, heard it read to his own great amusement, and either actually burned the MS. or believed that it was burnt. In a few days printed copies appeared. Now Frederick did not like disobedience, but he still less liked being made a fool of, and he put Voltaire under arrest. But again the affair blew over, which is at least a proof that the king was not wanting in long-suffering. He believed that the edition of Akakia confiscated in Prussia was the only one. Alas! Voltaire, according to his usual fashion, had sent copies away; others had been printed abroad; and the thing was irrecoverable. Of course it could not be proved that he had ordered the printing, and all Frederick could do was to have the pamphlet burnt by the hangman. Things were now drawing to a crisis. One day Voltaire sent his orders, &c., back; the next Frederick returned them, but Voltaire had quite made up his mind to fly. A kind of reconciliation occurred in March, aud after some days of good-fellowship Voltaire at last obtained the long-sought leave of absence and left Potsdam on the 26th of the month (1753). It was nearly thrce months afterwards that the famous, ludicrous, and brutal arrest was made at Frankfort, on the persons of him- self and his niece, who had met him meanwhile. There was some faint excuse for Frederick’s wrath. In the first place, after a plea of business in Paris, of the necessity of the waters of Plombiéres, and so forth, it was a little in- congruous that the poet should linger at Leipsic. In the second place, in direct disregard of a promise given to Frederick, a supplement to Akakia appeared, more offen- sive than the main text, and was followed by a paper war of letters with Maupertuis. But the king cooked his spleen and bided his time. From Leipsic, after a month’s stay, Voltaire moved to Gotha, and seemed once more in no hurry to go on, his excuse being the compilation of Annals of the Empire, asked of him by the duchess of Saxe-Weimar. Once more, on May 25, he moved on to

Frankfort, and here the blow fell. Frankfort, nominally a free city, but with a Prussian resident who did very much what he pleased, was not like Gotha and Leipsic. An excuse was provided in the fact that the poet had a copy of some unpublished poems of Frederick's, and as soon as Voltaire arrived the thing was done, at first with courtesy enough. The resident, Freytag, was not a very wise person (though he probably did not, as Voltaire would have it, spell " podsie" " poéshie"); constant references to Frederick were necessary; and the affair was prolonged so that Madame Denis had time to join her uncle. At last Voltaire did the unwisest thing he could have done by trying to steal away. He was followed, arrested, his niece seized separately, and sent to join him in custody; and the two, with the secretary Collini, were kept close prisoners at an inn called the Goat. This situation lasted some time (a time, indeed, since the " ceuvre de poéshie " was at once recovered, rather unintelligible except on the score of Freytag's folly), and was at last put an end to by the city authorities, who probably felt that they were not playing a very creditable part. Voltaire left Frankfort on July (th, travelled safely to Mainz, and thence to Mannheim, Strasburg, and Colmar. The last-named place he reached (after a leisurely journey and many honours at the little courts just mentioned) at the beginning of October, and here he proposed to stay the winter, finish his Annals of the Empire, and look about him.

Voltaire's second stage was now over, and he was about to try what an Englishman would have tried long before —complete independence of hosts and patrons, mistresses and friends. Even now, however, in his sixtieth year, it

required some more external pressure to induce him to take this apparently obvious step. He had been, in the first blush of his Frankfort disaster, refused, or at least not granted, permission even to enter France proper,—a rebuff probably due in about equal parts to a wish not to displease or disoblige Frederick, and a wish to punish Voltaire himself for selecting Prussia as a home. At Colmar he was not safe, especially when in January 1754 a pirated edition of the Essai sur les Meurs, written long

before, appeared. Permission to establish himself in France was now absolutely refused ; and even Madame de Pompadour was powerless, if indeed she cared greatly to exert her power. Nor did an extremely offensive per- formance of Voltaire's—the solemn partaking of the eucharist at Colmar after due confession—at all mollify his enemies. His exclusion from France, however, was chiefly metaphorical, and really meant exclusion from Paris and its neighbourhood. In the summer he went to Plombiéres, and after returning to Colmar for some time journeyed in the beginning of winter to Lyons, and after a month there went, as it may almost be said, " home "— to a home which he had never yet visited, but which was, with slight changes of actual domicile, but with no change of neighbourhood, to shelter him for the rest of his life. His first resting-place, Geneva, was reached in the middle of December ; but Voltaire had no purpose of re- maining in the city, and almost immediately bought a country house just outside the gates, to which he gave the name of Les Délices. This, the first house of his own which he can be said to have possessed, is still standing, though now absorbed in the suburbs. It was pretty, with fine views ; but it had advantages of a non-zsthetic kind for its owner, of which he made no secret. He was here practically at the meeting-point of four distinct jurisdic- tions—Geneva, the canton Vaud, Sardinia, and France, while other cantons were within easy reach. Before finally settling in Ferney he bought other houses dotted about these territories, so as never to be without a refuge close at hand in case of sudden storms. At Les Délices he set up a considerable establishment, which his great wealth (obtained chiefly by speculation in the manner already more than once hinted at) made him able easily to afford. He kept open house for visitors; he had printers close at hand in Geneva ; he fitted up a private theatre in which he could enjoy what was perhaps the greatest pleasure of his whole life—acting in a play of his own, stage-managed by himself. His residence at Geneva brought him into correspondence (at first quite amicable) with the most famous of her citizens, J. J. Rousseau. His Orphelin de la Chine, performed at Paris in 1755, was very well received and the earthquake at Lisbon, which appalled other people,

gave Voltaire an excellent opportunity for ridiculing the |

beliefs of the orthodox, first in verse (1756) and later in the (from a literary point of view) unsurpassable tale of Candide (1759). All was, however, not yet quite smooth with him. Geneva hada law expressly forbidding theatrical performances in any circumstances whatever. Voltaire, as has been said, had infringed this law already as far as private performances went, and he had thought of building a regular theatre, not indeed at Geneva but at Lausanne. In July 1755 a very polite and,,as far as Voltaire was concerned, indirect resolution of the consistory declared that in consequence of these proceedings of the Sieur de Voltaire the pastors should notify their flocks to abstain and that the chief syndic should be informed of the con. sistory's perfect confidence that the edicts would be carried out. Voltaire obeyed this hint as far as Les Délices was concerned, and consoled himself by having the performances in his Lausanne house. But he never was the man to take opposition to his wishes either quietly or without retalia-

tion. He undoubtedly instigated D'Alembert to include a censure of the prohibition in his Lncyclopédie article on "Geneva," a proceeding which provoked fRousseau's celebrated Lettre & D' Alembert sur les Spectacles. As for himself, even still restless, he looked about for a place where he could combine the social liberty of France with the political liberty of Geneva, and he found one. At the end of 1758 he bought the considerable property of Ferney, on the shore of the lake, about four miles from Geneva, and on French soil. At Les Délices (which he sold in 1765) he had become a householder on no small scale ; at Ferney (which he increased by other purchases and leases) he became a complete country gentleman. He set about establishing himself handsomely in his new abode, and though he did not absolutely abandon his other houses he was henceforward known to all Europe as squire of Ferney, hardly less than as author of the Henriade and the Pucelle, of Charles XFI. and Akakia.

From this time forward many of the most celebrated men of Europe visited him there, and large parts of his usual biographies are composed of extracts from their accounts of Ferney. His new occupations by no means quenched his literary activity, but on the contrary stimu- lated it.

He did not make himself a slave to his visitors, but appeared only occasionally and reserved much time for work and for his immense correspondence, which had for a long time once more included Frederick, the two getting on very well when they were not in contact. Above all, he now, being comparatively secure in position, engaged much more strongly in public controversies, and, without wholly abandoning, resorted less to, his old labyrinthine tricks of disavowal, garbled publication, and private libel. The suppression of the Encyclopédie, to which he had been a considerable contributor, and whose conductors were his intimate friends, drew from him a shower of lampoons directed now at "Vinfame" (see infra) generally, now at literary victims, such as Le Franc de Pompignan (who had written one piece of verse so much better than anything serious of Voltaire's that he could not be forgiven), or Palissot (who had boldly gibbeted most of the phalosophes in his play of that name, but had not included Voltaire), now at Fréron, an excellent critic and a dangerous writer, who had attacked Voltaire from the conservative side, and at whom the patriarch of Ferney, as he now began to be called, levelled in return the very inferior farce-lampoon of L' Kcossaise, of the first night of which Fréron himself did an admirably humorous criticism.

How he built a church and got into trouble in so doing at Ferney, how he put " Deo erexit Voltaire" on it (1760- 61) and obtained a relic from the pope for his new build- ing, how he entertained a grand-niece of Corneille, and for her benefit wrote his well-known "commentary" on that poet, are matters of interest, but to be passed over briefly. Here, too, he began that series of interferences on behalf of the oppressed and the ill-treated which, whatever mixture of motives may have prompted it, is certainly an honour to his memory. Volumes and almost libraries have been written on the Calas affair, and it is impossible here to give any account of it or of the only less famous cases of Sirven (very similar to that of Calas, though no life was actually lost), Espinasse (who had been sentenced to the galleys for harbouring a Protestant minister), Lally (the son of the unjustly treated but not blameless Irish-French commander in India), D'Etalonde (the companion of La Barre), Montbailli, and others.

In 1768 he entered, it would seem out of pure wanton- ness, into an indecent controversy with the bishop of the diocese (who, like an honest man, was not particularly well satisfied with his occasional conformity); he had differences with the superior landlord of part of his estate,

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the president De Brosses ; and he engaged in a long and tedious return match with the republic of Geneva, in which the scoring was alternate and rather bewildering, Geneva playing at one time an insult to Voltaire's friend and patron Catherine of Russia, and Voltaire replying at another by setting up a rival colony of watchmakers at Ferney. The match went on the whole in favour of Voltaire, for during its course a theatre was authorized in the city, and he himself, a kind of exile from it, was applied to to mediate between different classes of the community. But the general events of this Ferney life are somewhat of that happy kind which are no events—the distractions and employments of a man who has nothing serious to occupy himself about.

In this way things went on for many years, and Voltaire, who had been an old man when he established himself at Ferney, became a very old one almost without noticing it. Louis XVI. excited even in his aged breast the hope of re- entering Paris, but he did not at once receive any en- couragement, despite the reforming ministry of Turgot. A much more solid gain to his happiness was the adop- tion, or practical adoption, in 1776 of Reine Philiberte de Varicourt, a young girl of noble but poor family, whom Voltaire rescued from the convent, installed in his house as an adopted daughter, and married to the Marquis de Villette. Her pet name was "Belle et Bonne," and nobody had more to do with the happiness of the last years of the "patriarch" than she had. It is doubtful whether his last and fatal visit to Paris was due to his own wish or to the instigation of his niece, Madame Denis ; but it is fair to say that this lady —a woman of disagreeable temper, especially to her inferiors—appears to have been rather hardly treated by Voltaire's earlier, and sometimes by his later, biographers. The suggestion which has been made that the success of Beaumarchais piqued him has nothing impossible init. At any rate he had, at the end of 1777 and the beginning of 1778, been carefully

finishing a new tragedy—Jréne—for production in the capital; he started on the 5th of February, and five days later arrived at the city which he had not seen for eight and twenty years.

Abundant as is the information respecting the whole, or almost the whole, of his life, it is nowhere more abundant than in respect to these last months. He was received with immense rejoicings, not indeed directly by the court, but by the Academy, by society, and by all the more im- portant foreign visitors. About a fortnight after his arrival age and fatigue made him seriously ill, and a con- fessor was sent for. But he recovered, scoffed at himself as usual, and prepared more eagerly than ever for the first performance of Iréne, on March 16. At the end of the month he was able to go out and attend a performance of it, which has often been described, and was a kind of apotheosis. He was crowned with laurel in his box, amid the plaudits of the audience, and did not for the moment Seem to be the worse for it, enjoying several other triumphs, during one of which he had, in full Academic séance, to embrace Franklin after the French manner. He even began or proceeded with another tragedy, —A gathocle, — and attended several Academic meetings. But such pro- ceedings in the case of a man of eighty-four were impossible. To keep himself up he exceeded even his usual excess in coffee, and about the middle of May he became very ill. For about a fortnight he was alternately better and worse ; but on May 30 the priests were once more sent for,—to wit, his nephew the Abbé Mignot, the Abbé Gaultier, who had officiated on the former occasion, and the parish priest, the curé of St Sulpice. He was, however, ina state of half Insensibility, and petnlantly motioned them away. The

legends set afloat about his dying in a state of terror and despair are certainly false; but it must be regarded as singular and unfortunate that he who had more than once gone out of his way to conform ostentatiously and with his tongue in his cheek should have neglected or missed this last opportunity. The result was a difficulty as to burial which was compromised by hurried interment at the abbey of Scelliéres in Champagne, anticipating the inter- dict of the bishop of the diocese by an

hour or two. On July 10, 1791, the body was transferred to the Pantheon, but it was not to rest there, and during the Hundred Days it was once more, it is said, disentombed, and stowed away in a piece of waste ground. His heart, taken from the body when it was embalmed, and given to Madame Denis and by her to Madame de Villette, was preserved ina silver case, and when it was proposed (in 1864) to restore it to the other remains the sarcophagus at Sainte Genevidve (the Pantheon) was opened and found to be empty.

In person Voltaire was not engaging, even as a young man. His extraordinary thinness is commemorated, among other things, by the very poor but well-known epigram at- tributed to Young, and identifying him at once with "Satan, Death, and Sin." In old age he was a mere skeleton, with a long nose and eyes of preternatural brilliancy peering out of his wig. He never seems to have been addicted to any manly sport, and took little exercise, He was sober enough (for his day and society) in eating and drinking generally ; but drank coffee, as his contem- porary, counterpart, and enemy, Jolnson, drank tea, in a hardened and inveterate manner. It may be presumed with some certainty that his attentions to women were for the most part platonic ; indeed, both on the good and the bad side of him, he was all brain. He appears to have had no great sense of natural beauty, in which point he resembled his generation (though one remarkable story is told of his being deeply affected by Alpine scenery); and, except in his passion for the stage, he does not seem to have cared much for any of the arts. Conversation and literature were, again as in Jolinson's case, the sole gods of his idolatry, As for his moral character, the wholly intellectual cast of mind just referred to makes it difficult to judge that. His beliefs or absence of beliefs emanci- pated him from conventional scruples ; and it must be ad- mitted that he is not a good subject for those who main- tain that a nice morality may exist independently of religion. He was good-natured when not crossed, generous to dependants who made themselves useful to him, and indefatigable in defending the cause of those who were oppressed by the systems with which he was at war. But he was inordinately vain, and totally unscrupulous in gaining money, in attacking an enemy, or in protecting himself when he was threatened with danger. In these three cases he stuck at no lie, found no weapons too foul to use, and regarded

no gain as too dirty to pouch. His peculiar fashion of attacking the popular beliefs of his time has also failed to secure the approval of some who have very little sympathy with those beliefs, of not a few even who go so far as to approve of ridicule and indeed of mere ribaldry being used to wean those who hold things sacred from their belief in them. The only excuse made for the alternate cringing and insult, the alternate abuse and lying, which marked his course in this matter, has been the very weak plea that a nian cannot fight with a system, —a plea which is sufficiently answered by the retort that a great many men have so fought and have won. But this comes so closely to the discussion of Voltaire's works aud intellectual character that it may be dismissed for the present with only one more remark, by no means new, but it would seem constantly requiring repetition. Voltaire's works, and especially his private letters, constantly contain

the word " Vinfame " and the expression in full or abbrevi- ated "'écrasez l'infame." This has been misunderstood in many ways,—the mistake going so far as in some cases to suppose that Voltaire meant Christ by this opprobrious expression. No careful and competent student of his works, whatever that student's sympathies, has ever failed to correct this gross misapprehension. ' L'infame" is not God ; it isnot Christ; itis not Christianity; it is not even Catholicism. Its briefest equivalent may be given as "' persecuting and privileged orthodoxy" in general, and, more particularly, it is the particular system which Voltaire saw around him, of which he had felt the effects in his own exiles and the confiscations of his books, and of which le saw the still worse effects in the hideous sufferings of Calas and La Barre, and in the less hideous but still severe miseries of persons perfectly guiltless, even accord- ing to their tormentors, such as the families of Calas and Sirven.

Vast and various as the work of Voltaire is, no article such as the present could be even approximately complete without some attempt to give an outline of its general contents and character- istics, for its vastness and variety are of the essence of its writer's peculiar quality. The divisions of it have long been recognized, and may be treated in order.

The first of these divisions in order, not the least in bulk, and, though not the first in merit, inferior to none in the amount of congenial labour spent on it, is the theatre of Voltaire. Between fifty and sixty different pieces (including a few which exist only in fragments or sketches) are included in his writings, and they cover the entire stretch of his literary life. It is at first sight remarkablo that Voltaire, whose comic power was undoubtedly far in excess of his tragic, should have written many tragedies of no small excel- lenec in their way but only one fair second-class comedy, Nanine. His other efforts in this latter direction are quite inferior, being cither slight and almost insignificant in scope, or, as in the case of the somewhat famous Heossaise, deriving all their interest from being personal libels. His tragedies, on the other hand, though they can never fully satisfy those who have bcen accustomed to the stronger meat of romantic drama, are works of extraordinary merit in their own way. Although Voltaire had neither the perfect versification of Racine nor the noble poetry of Corneille, he sur- passed the latter certainly, and the former in the opinion of some not incompetent judges, in playing the difficult and artificial game of the French tragedy. Zaire, among those where love is admitted as a principal motive, and Mérope, among those where this motive is excluded and kept in subordination, yield to no plays of their class in such sustaining of interest as is possible on the model, in adaptation of that model to stage effect, and in uniform, if never very transporting or extraordinary, literary merit. Voltaire was an enthusiastic lover of the stage; he was intimately acquainted with its laws; he knew that the public opinion of his time reserved its highest prizes for a capable and successful dramatist ; and he was determined to win those prizes. He therefore set all his wonderful cleverness to the task, going so far as to adopt a little even of that romantic disobedicnce to the strict classical theory which he condemned, and no doubt sincerely, in Shakespeare. The a is that his work in its kind is unlikely ever to be sur- passed,

It is very different with his poems proper, of which there arc two long ones, the enriade and the Pucelle, besides smaller pieces of which it is enough to say that a bare catalogue of them fills fourteen royal octavo columns. The valuc of these is very unequal. The Henriade has by universal consent been relegated to the posi- tion of a school reading book, and perhaps does not hold even that very securely. Constructed and

written in almost slavish imitation of Virgil, employing for medium a very unsuitable vehicle—the alexandrine couplet (as reformed and rendered monotonous for dramatic purposes)—and animated neither by enthusiasm for the subject nor by real understanding thereof, it could not but be an unsatisfactory performance to posterity. The Pucclle, if morally inferior, is from a literary point of view of fay more value. It is desultory to a degree ; it is a base libel on religion and history ; it differs from its model Ariosto in being, not, as Ariosto is. a inixture ofromance and burlesque, butasometinics tedious tissue of burlesque pure and simple; and it is exposed to the objection—often and justly urged—that much of its fun depends simply on the fact that there were and are many pcople who believe enough in Christianity to make its jokes give pain to them, and to make their disgust at such jokes piquant to others. Nevertheless, with all the Pucelle's faults, it is amusing—less so indeed than its author's prose tales but still amusing. The minor poems are as much above the Pucelle as the Pucelle is above the Henriade. 1tis true that therc is nothing,

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or hardly anything, that properly deserves the name of poetry in them—no passion, no sense of the beauty of nature, only a narrow 'criticism of life," only a conventional and restricted choice of langnage, a cramped and monotonous prosody, and none of that indefinite suggestion which has been rightly said to be of the poctic essence. But there is immense wit, a wonderful command of such mitre and language as the taste of the time allowed to the poet, occasionally a singular if somewhat artificial grace, and a curious felicity of diction and manner on occasions proper to the poet's genius.

~The third division of Voltaire's works in a rational order (though it is usually placed later in the editions) consists of his prose romances or tales. These productions—incomparably the most remarkable and most absolutely good fruit of his genius—were usually, if not always, composed as pamphlets, with a purpose of polemic in religion, politics, or what not. Thus Candide attacks religious and philosophical optimism, L'Homme aux Quarante Eeus certain social and political ways of the time, Zadig

and others the received forms of moral and metaphysical orthodoxy, while some aro ere lampoons on the Bible, the unfailing source of Voltaire's wit. But (as always happens in the case of literary work where the form exactly suits the author's genius) the purpose in all the best of them disappears almost entirely. It is in these works inore than in any others that the peculiar quality of Voltaire—ironie style without exaggeration—appears. That he learned it partly from St Evremond, still more from Anthony Hamilton, partly even from his own enemy Le Sage, is perfectly true, but he gave it perfection and completion. There is no room to analyse it ioe but, if one especial peculiarity can be singled out, it is the extreme restraint and simplicity of the verbal treatment. Voltaire never dwells too long on his point, stays to laugh at what he has said, elucidates or comments on his own jokes, guffaws over them, or exagzerates their form. The famous "pour encourager les antres" (that the shooting of Byng did " encourage tho others" very much is not to the point) is a typical example, and indeed the whole of Candide shows the style at its perfection.

The fourth division of Voltaire's work, as we shall rank it here, his historical work, is the bulkiest of all except his correspond- ence, and some parts of it are or have been among the most read, but it is far from being the best, or even among the best. The universally known small treatises on Charles XII. and Peter the Great are indeed models of clear narrative and ingenious if some- what superficial grasp and arrangement in little of considerable subjects. The so-called Siéele de Louis XIV. and Stécle de Louis XV. (the latter inferior to the former but still valuable) contain a great miscellany of interesting matter, treated by a man of great acuteness and unsurpassed power of writing, who had also had access to much important private information. But even in these books defects are present, which appear much more strongly in the singular olla podrida entitled Essai sur les Meurs, in the Annales de ' Empire, and in the minor historical works of which thcre are many. These defects are an almost total absence of any coinpre- hension of what has since been ealled the philosophy of history, the constant presence of gross prejudice, frequent inaccuracy of detail, and, above all, a complete incapacity to look at anything except from the narrow standpoint of a half pessimist and half self- satisied philosophe of the 18th century. Attempts have been made to

argue that Voltaire's admitted want of catholicity and apprecia- tion was merely the fault of his time; but, while this would be an insufficient plea if granted, it is not the fact. Montesqnieu, to name no other of his contemporaries, had if not a perfect yet a distinct scnse of the necessity of dealing with other times and other manners so as to take to some extent the point of view of the actors; Voltaire had none. And, though he was very far from being an idle man, he cannot be said to have been extraordinarily anxious to secure accuracy of fact.

His work in physies concerns us less than any other here; it is, however, not inconsiderable in bulk, and is said by experts to give proof of aptitude.

To his own age Voltaire was pre-eminently a poet and a philosopher; the unkindness of succeeding ages has somctimes questioned whether he had any title to either name and especially to the latter. His largest philosophical work, at least so-called, is the curious medley entitled Dictionnaire Philosophique, which is compounded of the articles contributed by him to the great Eneyclopédie and of several minor pieces. No one of Voltaire's works shows his anti-religious or at least anti-ecelesiastical animus more strongly. The various title-words of the several articles are ofteu the merest stalking horses, under cover of which to shoot at the Bible or the church, the target being now and then shifted to

_the political institutions of the writer's country, his personal foes,

&c., and the whole being largely seasoned with that acute, rather superficial, common-sense, but also commonplace, ethical and social criticism which the 18th century called philosophy. The book ranks perhaps second only to the novels as showing the character, literary and personal, of Voltaire; and despite its form it is nearly as readable. The minor philosophical works are of no very different

character. In the brief Traité de Metaphysique the author makes his grand effort, but scarcely succeeds in doing more than show that he had no real conception of what metaplysic is. His Philo- sophe Ignorant is a clever skit on the contradictions of philosophers, his Lettres de Memmius

a fair instance of his habit of taking oblique shots at one thing under cover of another and while apparently aiming at a third. And all the minor works commonly called philosophical, though they are voluminous enough, come to little more than the same result.

In general criticism and miscellancous writing Voltaire is not inferior to himself in any of his other functions. Almost all his more substantive works, whether in verse or prose, are preceded by prefaces of one sort or another, which are models of his own light pungent cawserie; and in a vast variety of nondescript pamphlets and writings he shows himself a perfect journalist. In literary criticism pure aud simple his principal work is the Commentaire sur Corneitle, though he wrote a good deal more of the same kind— sometimes (as in his Life and notices of Molitre) independently, sometimes as part of his Stécles. Nowhere, perhaps, except when he is dealing with religion are Voltaire's defects felt more than here. His great acquaintance with stage matters often enabled him to make valuable technical criticism in that department, and his unrivalled acuteness of course served him in literary as in other matters. But he was quite unacquainted with the history of his own language and literature, and more here than anywhere else he showed the extraordinarily limited and conventional spirit which accompanied the revolt of the French 18th century against limits and conventions in theological, ethical, and political inatters.

There remains only the huge division of Voltaire's correspondence, which fills some three thousand pages, double-columned, large, and closely printed, in the compactest editions, which is constantly being augmented by fresh discoveries, and which, according to M. Georges Bengesco, the best living authority, has never been fully or correctly printed, even in some of the parts longest known. In this great mass Voltaire's personality is of course best shown, and perhaps his literary qualities not worst. His immense energy and versatility, his adroit and unhesitating flattery when he chose to flatter, his ruthless sarcasm when he chose to be sarcastic, his rather unscrupulous business faculty, his more than rather un-serupulous resolve to double and twist in any fashion so as to escape his enemies,—all] these things appear throughout the whole mass of letters.

After giving an account of Voltaire's personal character, and a sketch of tho characteristics of tho different sections of his work, his intellectual and literary position in history can be briefly summed up, though the summary is not one to be lightly under- taken. Most judgments of him have been unduly coloured by sympathy with or dislike of what may be briefly called his polemical side. When sympathy and dislike are both carefully discarded or allowed for, he remains certainly one of the most astonishing, if not exactly one of the most admirable, figures of letters. That he never, as Carlyle complains, gave utterance to one great thought is strictly true. That his characteristic is for the most part an almost superhuman cleverness rather than posi- tive genius is also true. But that he was merely a mocker, which Carlyle and others have also said, is not strictly true or fair. In politics proper he seems indeed to have had few or no constructive ideas, and to have been entirely ignorant or quite reckless of the fact that his attacks were destroying a state of things for which as a whole he neither had nor apparently wished to have any substi- tute. In religion he protested stoutly, and no doubt sincerely, that his own attitude was not purely negative ; but here also he seems to have failed altogether to distinguish between pruning and cutting down. Both here and elsewhere his great fault was an inveterate superficiality. But this superficiality was acconipanied by such wonderful acuteness within a certain range, by such an absolutely unsurpassed literary aptitude and sense of style in all the lighter and some of the graver modes of literature, by such untiring energy and versatility in enterprise, that he has no parallel among ready writers anywhere, Not the most elaborate work of Voltaire is of much value for matter; but not the very slightest Work of Voltaire is devoid of value as form. In literary craftsman- ship, at once versatile and accomplished, he has no superior and scarcely a rival.

The bibliography of Voltaire is a very large subject, and it has for years been the special occupation of a Roumanian diplomatist of much erudition and judg- ment, M. Georges Bengeseo, the first volume of whose work was published at Paris in 1882. The latest, and on the whole the best, edition of the works is that completed not long ago by M. Louis Moland in 52 voluines (Paris, Garnier); the handiest and most compact is that issued in 13 volumes royal octavo some fifty years ago by Furne, and kept in print by the house of Didot. Of the earlier editions, though their

bulk is an objection, several are interesting and valuable. Especially may be noticed the so-ealled edition of Kell, in which Voltaire himself, ind later Beaumarchais, were concerned (70 vols., 1785-89); those of Dalibon and Baudouin, each in 97 vols. (from which "the hundred volumes of Voltaire" have become a not infrequent figure of speech); and the excellent edition of Beuchot (1829) in 72 volumes, Editions of separate or selected works are innumerable,

and so are books upon Voltaire, There is no really good detailed life of him, with complete examination of his work, in any language as yet, though the works

Containing materials for such are numerous, and (especially in the case of M. Desnoiresterres) sometimes excellent. In English the essays of Carlyle and Mr John Morley are both in their way inyaluable, and to a great extent correct one another. The principal detailed life in our language is that of an American writer, Mr James Parton, which gives the facts with very considerable detail and fair accuracy, but with no power of criticism. Fresh correspondence of Voltaire is constantly being discovered, sometimes showing that his published works have been considerably garbled, so that an edition definitive from such manuscripts as exist, and containing all the variants of his own constantly altered issues, is likely to be a inatter long delayed. (G. SA.)

VOLTERRA, a town of Italy, in the province of Pisa, 51 miles by rail east-south-east from Leghorn, and 35 by road west-north-west from Siena, stands on a commanding olive-clad eminence about 1600 feet above sea-level, and is surrounded by the massive remains of its ancient walls, some 44 miles in circuit. The most important relic of its Etrurian period is the Porta dell' Arco, an archway of dark grey stone, about 20 feet in height, the corbels of which are adorned with almost obliterated heads, probably representing the guardian deities of the city. Volterra possesses several public buildings of interest, dating from the period of its republican independence in the 13th century. The Palazzo dei Priori, or Palazzo Pubblico (1208-57), is a handsome building, unfortunately some- what modernized in its windows and mouldings ; it con- tains a very valuable

collection of Etruscan antiquities, especially cinerary urns. The cathedral, consecrated in 1120, but enlarged and adorned by Niccolo Pisano in 1254, has a fine pulpit of that period, and on the high altar are sculptures by Mino da Fiesole; in the transept is a remark- ably fine Annunciation by Luca Signorelli. The baptistery also, supposed to date in part from the 7th century, largely belongs to the 13th; the font is by Andrea di Sansovino, and the ciborium by Mino da Fiesole. The citadel, now a house of correction, consists of two portions, the Rocca Vecchia, built in 1343 by Walter de Brienne, duke of Athens, and the Rocca Nuova, built by the Florentines (1472). The inhabitants are chiefly employed in the manufacture of vases and other ornaments from alabaster, of good quality, found in the vicinity of Volterra and near Leghorn. The population in 1881 was 5347 (commune

14,063).

Volaterre (Etrurian Velathri) appears to have been one of the twelve confederate cities of Etruria (see Ernunta, vol. xili. p. 686). It received a military colony under the triumvirate, but is included by Pliny among the municipal towns of Etruria. It was destroyed in the 10th century, and rebuilt under the Othos. In the 12th and 18th centuries it enjoyed free institutions; in the 14th it fell under the power of Florence. Persius the satirist and Daniele da Volterra (see RiccIARELLI) were both natives of the town.

VOLUNTEERS. Although it would be difficult to assign a period when the principle of volunteer organiza- tion for national defence was first adopted in England, it is certain that societies to promote this object existed in various parts of the country in the reign of Henry VIII, who in fact granted a charter in 1537 to the " Fraternity or Guylde of Saint George: Maisters and Rulars of the said Science of Artillary as aforesaid rehearsed for long- bowes Cros-bowes and Hand-Gonnes." This ancient vol- unteer corps is now the Honourable Artillery Company of London, whose muster-rolls have borne the names of many distinguished personages, including John Milton. Al- though the Honourable Artillery Company has always been a distinct volunteer association, it was at one time (notably during the wars of the Commonwealth) a centre of instruc-

tion for the City trained bands, whose officers indeed were required by statute to be members also of tle company. It is an interesting fact in connexion with tliis company that there exists at Boston, U.S., a volunteer corps bear- ing the name of the "Antient and Honorable Artillery Company of Massachusetts." This legacy of the pilgrim- fathers was formed in 1638 after its London prototype, and its Puritan origin is still recognized in the ' election sermon" whicli celebrates the anniversary of its formation.

It was not, however, until 1779 that volunteer organiza-

tion became an integral part in national defence. In that

year, Ireland being threatened with invasion by France | é 'hension has to be first communicated to parliament, or if

and Spain, a levy of 40,000 Protestants was made by the gentry in the north. The energy and patriotism thus promptly manifested no doubt averted the impending danger, but not without unexpected results, for the volun- teers then enrolled availed themselves of the opportunity to assert claims on their own account for the extension of civil liberty. The close of the 18th and the early part of the present century saw in Great Britain itself a more com- plete development of the national instinct for self-defence, when the aggressive wars of France, following upon the Revolution of 1789, threatened the safety of the United Kingdom. Between 1794 and 1804 successive Acts of Parliament were passed providing for the administration and discipline of the volunteer force, which, in 1805, when invasion by the first Napoleon was imminent, amounted to 429,165 men (70,000 of whom were Irish). When peace, however, was restored, this force was disbanded, with the exception of the yeomanry or volunteer cavalry, which continues to this day.

After an interval of nearly half a century the warlike attitude of France, under Napoleon III., caused the British once more to arm for the protection of their country. This long interval, however, had been used differently by the respective nations. England, from a questionable

economy, had allowed both army and navy to decline in strength and efficiency; France on the other hand, by the energetic development of her military and naval power, and the early application of steam to ships of war, brought the pos- sibilities of the invasion of England in 1846 within measur- able distance, while a feeling of hostility was fostered and inflamed by her political writers. England at this time was awakened to the gravity of the situation by the publi- cation of a well-known letter from the duke of Wellington, then commander-in-chief, to Sir John Burgoyne, followed by a well-timed pamphlet by General Sir Charles Napier, entitled The Defence of England by Volunteer Corps and Militia. This characteristic sketch of the true principles of defence for a free people became seven years later the basis of the volunteer organization.

In 1857 the French press became more and more menacing. The United States had dismissed the resident British minister, and in consequence reinforcements had to be sent to Canada and New Brunswick. The war going on in China required an army and employed a fleet. The Indian Mutiny taxed the resources of England to the uttermost, while at home (save the actual garrisons) an unsatisfactory reserve of barely 36,000 militia was all that could be counted on. This threatening condition of affairs tended to aggravate, if not to produce, a serious commercial panic. It was then that the volunteer movement began, and by a popular impulse.

A circular letter, dated 12th May 1859, from the secretary for war to the lord-lieutenants of counties in Great Britain, authorized the formation of volunteer corps. The statute under which the general enrolment took place was the same that had governed the organization of the volunteer force in the beginning of the century.? The main provisions of that Act, however, were found inapplicable to the altered conditions under which invasion was now possible (through the application of steam); they failed also to meet the new system entertained of main- taining the volunteer force on a permanent footing in peace. A new Act was therefore passed, the most important provision of which® was that apprehended invasion should constitute a sufficient reason for the sovereign to call out the volunteers for service, in lieu of the old condition

: Life and Letters of Field-Marshal Sir John Burgoyne. 2 44 Geo, III. cap. 54. 3 Volunteer Act, 1863, s. 17.

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which required the actual appearance of the enemy upon the coast. To carry this provision into effect, the appre-

parliament is not sitting declared by the queen in council and notified by proclamation. The volunteers are there- upon bound to serve in Great Britain until released by a proclamation declaring the occasion to have passed. When so called out, they receive pay on the army scale.

The force thus brought into existence is composed of corps of light horse, artillery, engineers, mounted rifles, and rifle volunteers. There exist also in connexion with the Admiralty special volunteer corps for the defence of the coast-line, called '" Royal Naval Artillery Volunteers." The term "corps" possesses no tactical signification. Any body of persons, great or small, whose offer of service the queen has accepted constitutes a "corps." The property belonging to the corps is vested in the command- ing officer, and is administered by a committee of officers under the rules of the corps. These rules are in the first instance agreed on at a general meeting of officers and men, and, having received the queen's approval, become legal, and may be enforced by a magistrate's order. The commanding officer has power to dismiss a man from the corps, and a volunteer not on actual service may ter- minate his engagement on giving fourteen days' notice.

Volunteers, when assembled under arms, whether for actual service or for exercise, are under the command of the commander-in-chief or of general or other field- officers of the regular army appointed to command them, who must be senior in rank to every officer of the volun- teers present. But it isa fundamental law that volunteers are to be led by their own officers. For the purposes of training, a permanent staff of adjutants and sergeant-in- structors is provided from the regular army.

The formation of corps constituted as described was so rapid that in the course of a few months in 1859-60 a force of 119,000 volunteers was

created. For adminis- trative purposes, and for instruction, small corps were erouped in their several counties into 'administrative battalions." This provisional arrangement has since been abolished (a questionable measure), and the small " corps," deprived of much of the status necessary as nuclei of battalions in time of war, are converted into constituent parts or companies of what had been their administrative battalions. These latter are now not only constituted "corps" in the meaning of the Act, but are called ' con- solidated corps," though their constituent parts are widely scattered. Though this arrangement is convenient during peace, confusion would probably result under pressure of apprehended invasion.

On the 7th March 1860 the queen held a levee in London, at which 2500 officers of volunteers were pre- sented. On the 23d June a royal review was held in Hyde Park, when 21,900 volunteers marched past; and at Edinburgh on the 7th August another royal review took place, at which 22,000 volunteers from the northern corps were under arms.

Public confidence was thus restored, but yet more remained to be done. An end had to be put to the ever- recurring panics that paralysed from time to time the commercial system of the country. The Government, which in the beginning had tolerated rather than en- couraged the movement, now followed the lead of public opinion, and decided on maintaining the volunteer force as a part of the regular defensive system of the country. The personnel of the volunteer corps (with a few essential exceptions) thereupon underwent a change. The wealthy and professional classes, who had at first joined the ranks in anticipation of war, cared no longer to bear arms.

| Their places were taken by the artisan class, which added

materially to the number and permanence of the force. But, as contributions and subscriptions now flagged, it becanie evident that public grants would have to be voted for its maintenance. A Royal Commission was therefore appointed in 1862 to inquire into the requirements of the volunteers, as well as to determine the conditions on

which the public grant should be given, and a scale of ordinary and special capitation allowances, subject to regu- lation, was fixed on that commission's recommendation.

It was not to be expected that this so-called mushroom army should escape a certain amount of professional ridi- cule, which the inefficiency of the old volunteers associated with the name. Nor was this tendency unmixed with apprehension in certain quarters that the public grants voted for the force might in some way affect the interests of the regular army. But a generous appreciation and sympathy took the place of adverse criticism, as the earnestness of the volunteers and their devoted loyalty became apparent. Nor were they unsuccessful in their own efforts to keep pace with modern military training, and even to introduce improvements. Lord Elcho, a prominent leader of the volunteer movement, revived in the National Rifle Association the ancient English pastime of practising at the butts. The queen herself fired the first shot (a bull's-eye) at Wimbledon in 1860, and thus inaugurated those great national meetings where many thousands compete annually for prizes, the aggregate value of which has now reached £14,680, with 126,463 entries.

Colonel Harcourt followed Lord Elcho in establishing the National Artillery Association, whose meetings are held annually at the School of Gunnery at Shoeburyness. The volunteers in this arm of the force are more than 40,000 strong, and belong chiefly to the mechanic class. Their aptitude to learn the use of the great modern ordnance which their presence at the School of Gunnery encourages, and their steady discipline when in garrison, have impressed the officers of the Royal Artillery with their value as a reserve for manning the coast defences, as well as for the equipment of field batteries. Special provision has now been made for the latter, on the condition that the batteries are fully horsed by the volunteers, and that three com- plete detachments of men per gun are maintained in training.

The regular attendance of detachments of colonial vol- unteers at these great annual national competitions has exercised for some years past a silent and beneficial influence, by fostering the military sympathy of the

colonies with the mother country as regards the interests of imperial defence. This feeling found practical expres- sion in the expedition to the Soudan in 1885.

A novel and peculiarly national arm was also introduced in 1860 by Colonel Bower, then master of the Hambledon hounds at Droxford, who trained members of the hunt as @ corps of mounted riflemen to occupy ground from point to point across country.

When the number of hunting men in Great Britain is considered, all of whom would be ready to turn out, thus equipped, to harrass the flank of an invader, beyond reach even of his cavalry, some estimate may be formed of the value of this contribution to the plan of defence.

The late Lord Ranelagh, another leader of mark among volunteers, initiated the great Easter volunteer field-days at Brighton and elsewhere. His views, at first opposed, are now officially acted on, and the annual Easter assem- blies have developed into manoeuvres, interesting as well as instructive to all engaged. The Easter holidays afford also opportunity to artillery volunteers to go into garrison in forts, as at Sheerness and other coast works, where means of practising are available. Facilities in camp instruction are also extended to volunteers in summer, an arrangement

which enables the small scattered corps to unite for drill. As many as 100,000 volunteers were in camp in 1887.

Perhaps the most important organization of all, alike for the service of the army and the auxiliary forces, is that known as the "Engineer and Railway Transport Corps," formed by the patriotic exertions of the late Charles Manby, civil engineer, and a lieutenant-colonel in the corps. The term "corps" presents in this case a council of officers composed of the following elements :—(1) eminent civil engineers ; (2) the general managers of the main lines of railway ; (3) the chief employers of labour. These officers have the rank of lieutenant-colonel. There are also other officers of the same classes, subordinate to the above, and not belonging

to the council. The functions of the corps include (a) the arrangement and the carrying into effect of any sudden and general concentration of troops to Oppose invasion, and (0) the rapid execution of works upon the railways and lines of defence by the means at the disposal of the great contractors directed by the civil engineers. The ready labour power of this useful corps is estimated at from 12,000 to 20,000 navvies, with tools, barrows, and commissariat complete. It has already performed important service in tabulating, and printing at great private cost, complete time-tables and special reports for six general concentrations against possible invasion. A special return was also prepared by the corps (the first of its kind) of the entire rolling stock of all the railways in Great Britain. This important work—which is corrected and republished annually—shows where the requisite numbers of carriages of every description can be obtained for the composition of troop trains.

The opinion of military judges has been that the main weakness of the whole volunteer system rests with the officers. But this judgment has undoubtedly been modified of late years by the eagerness displayed by the officers of all ranks to become capable leaders of their men. While advantage is taken of the facilities provided by the Government—such as schools of instruction, temporary attachment to regular and militia regiments, and half- yearly examinations in tactics—officers of volunteers are making progress among themselves by initiating societies in various parts of the country for the study and discussion of military subjects, war games, dc. Individually, some officers have already taken a prominent position as students in the art of war. One of these, Colonel Macdonaid, C.B., commanding the Edinburgh Rifle Volunteers, has originated important improvements in the system of infantry drill, and his modifications have been approved in principle by the adjutant-general. An ambulance service has been organized, and a scheme for battalion transport brought out.

The foregoing organization has not exhausted the re- sources of volunteer national defence. Science and com- mercial wealth combined are now creating an outer line,— the former for the defence of the Humber, Tees, Tyne, Mersey, &c., by means of volunteer marine mining corps, and the latter by the institution of the Naval Volunteer Defence

Association, having for its object the protection of merchant ships, by fitting out in British ports a number of merchant vessels to scrve in time of war as a cordon around the coasts of the kingdom, within which the ship- ping may pass in security.

There is yet another weak point, of equal importance, in the personal equipment of the volunteers, which, as a rule, is deficient for field service. But now that the jurisdiction has been transferred from the lord- lieutenants of counties to the crown, the whole subject of equipment for the field is entrusted to direct and responsible military authority.

The still graver question arises as to the issue of war- like stores in general in the time of national danger. Notwithstanding that such stores are already partially in

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possession of the services, the issue to the levée en masse (or augmentation of the volunteer forcc) alone will be a matter of extreme difficulty for one arsenal to manage. This difficulty will be best understood by the following statement. The volunteer force in Great Britain at the beginning of the century numbered 359,165. Since then, however, the population has nearly doubled. Therefore, supposing all other conditions to be equal, the number that would now come forward to defend the country would be about 700,000, or 481,800 more than the present peace footing of the volunteer force. One arsenal is not sufficient to sustain the strain that would then be put upon it. Strategically considered also, the situation of that at Woolwich is not such as to justify the accumulation there of all the warlike material the nation would have to depend on. A central arsenal, if not a northern one as well, appears to be a national necessity.

The existence of the volunteer force averts conscription for the country's defence, and it forms, as the first Lord Brougham characterized it, a "national insurance." The cost to the country is trifling compared with the magni- tude of the issues, being in 1885 £767,400 for 218,000 'efficient " volunteers entitled to the public grant, that is £3, 8s. 6d. per volunteer, or barely 6d. per head of the population to be defended. The

value of the volunteer force is not, however, to be estimated by the numbers actually enrolled. It is in fact, in its present form, a great training school of citizen soldiers, through which thousands pass annually into a reserve ready to join in case of need. And every year of its valuable service con- firms the wisdom of Sir Charles Napicr's last words of advice to his countrymen, viz., ' Militia and volunteers are the proper forces to prepare for danger in time of

eace." (M. MM.)

VOLUSENUS, FLoreEntivs (that is, FLoRENcE WILSON or WoLsEy, though in an English letter he writes himself VOLUZENE), a Scottish humanist of the first half of the 16th century, whose elegant Latinity, but still more the thoughtful beauty of his Christian philosophy, claims for him a high place among the scholars of his age. That he was born near Elgin, and studied philosophy at Aberdcen, as is stated in the notice of his life published in 1619 by Thomas Wilson in Adamsoni Poemata Sacra, may be only an inference (though probably a just one) from a passage in the dialogue De Tranquillitate Animi, more than half of which consists of a description of the abode of tran- quillity, based on a dream that, as we arc told, came to the author, when he had been a student of philosophy for four years, after a conversation on the pleasant banks of the Lossie with John Ogilvy, afterwards rector of Cruden. Proceeding to Paris, he became tutor to a nephew (or really a bastard son) of Cardinal Wolsey, and this connexion led to repeated visits to England, where he was well seen by the king, and formed, with men like John Fisher, Stephen Gardiner, and Thomas Cromwell, connexions that were not dissolved by Wolsey's fall, for he was in England as late as 1534. In Paris he knew George Buchanan, who afterwards wrote a graceful epitaph on his friend's death and found patrons in the cardinals Jean de Lorraine (to whom he dedicated in 1531 a Latin exposition of Psalm xv.) and Jean du Bellay. With the latter he started in 1534 for Italy, but, being detained by sore sickness at Avignon, found a new patron in the bishop of the diocese the learned and pious Sadolet, who procured for him the mastership of the school at Carpentras, with a salary of seventy crowns. Volusenus felt himself a little out of place in a grammar school, all his tastes leaning to philo- sophy, and it would seem that from Carpentras he made repeated

visits to Lyons (where Gesner saw him, still a young man, in 1540), probably also to Italy, where he

made many friends, perhaps even to Spain, for Alciat tells us that he had acquired French, Italian, and Spanish "par frequentation des nations."

The authorities for the life of Wilson are well brought together by Irving in the Lives of Scottish Writers (1839) ; with the exeep- tion of two letters in the Bannatyne Miscellany, vol. i., the most important of them had already been eollected in Wishart's edition of the De Tranquitlitate (8vo, Edin., 1751). Irving, however, overlooked Wilson's earliest works, #7. Vol. ad tllustr. Dom, Card. Lotharingorum Ps. xv. Enarratio (4to, Paris, 1531) and £7. Vol. Brit- anni tn Psalmumn nobis 50 Hebrexis vero lad… Stephanum Winto- niensem Episcopum Enar. (4to, Paris, 15382). These show that lis linguistic studies embraced Hebrew as well Greek and Latin. Wilson's reputation, however, rests on the beautiful dialogue already eited, and first printed by Gryphius at Lyons in 1548. From in- ternal evidenee it appears to have becn composed about that time, but the subject had exercised the writer for many years. The dialogue shows us Christian humanism at its best, not yet breaking with the church and somewhat afraid of authority, but open to new light, tolerant and yet believing. Volusenus is a great admirer of Erasmus, but censures in hima lack of purity in his Latin and a certain want of philosophy. Latinity and philosophieal training are his own distinguishing points, but his philosophy is Christian and Biblieal rather than elassical or seholastic. To analyse his argument would here be out of place; the title of the dialogue itself shows that he takes a freak and independent view of the chief good of Christian ethics, and it is sufficient to observe that from this point of view he ultimately reaches a doetrine as to the witness of the Spirit and the assurance of grace which breaks with the traditional Christianity of his time and contains ethical motives akin to, though not identieal with, those of the German Reformation. The verses which oecur in several parts of the dialogue, and the poem which concludes it, give Wilson a place among Scottish poets, but not nearly so high as that which he oecupies among philosophical writers on Christianity.

VONDEL, Joost van per (1587-1679), Dutch poet. See HonnanD, vol. xii. p. 94.

VORAGINE, Jacosus DE (¢. 1230-1298), archbishop of Genoa, is said to have been born at the little village of Varaggio, near Savona, about the year 1230. He entered the order of St Dominic in 1244, and is said to have preached with great success in many parts of Italy, as well as to have taught in the schools of his own fraternity. From the office of prior in 1267 he was raised to be provincial of all Lombardy. This post he held till 1286, when he was removed at the meeting of the order in Paris. He also represented his own province at the councils of Lucca (1288) and Ferrara (1290). On the last occasion he was one of the four delegates charged with signifying Nicholas IV.'s desire for the deposition of Munio de Zamora, who had been master of the order from 1285, and was deprived of his office by a papal bull dated April 12, 1291. In 1288 Nicholas empowered him to absolve the people of Genoa for their offence in aiding the Sicilians against Charles IJ. Early in 1292 the same pope, himself a Franciscan, summoned James to Rome, intending to con- secrate him archbishop of Genoa with his own hands. James reached Rome on Palm Sunday (March 30), but only to find his patron ill of a deadly sickness, from which he died on Good Friday (April 4). The cardinals, how- ever, "proptcr bonorem Communis Janue," determined to carry out this consecration on the Sunday after Easter, and thus, to quote his own words, '"'he returned with joy to his own city, and was reverently received by the people." If we may trust Echard, he was a model bishop, and especially distinguished himself by his efforts to appease the civil discords of Genoa. His death seems to have taken place in June 1298. He was buried in the Dominican church at Genoa. A story, mentioned by Kchard as unworthy of credit, makes Boniface VIII., on the first day of Lent, cast the ashes in the archbishop's eyes instead of on his head, with the words, " Remember

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that thou art a Ghibelline, and with thy fellow Ghibellines wilt return to naught."

Jacobus de Voragine has left us a list of his own works. Speak- ing of himself in his Chronicon Januense, he says, “ While he was in his order, and after he had been made archbishop, he wrote many works. For he compiled the legends of the saints (Legendz Sanctorum) in one volume, adding many things from the Historia Tripartita et Scholastica, and from the chronicles of many writers.” The other writings he claims are two. volumes of “ Sermons con- cerning all the Saints”! whose yearly feasts the church celebrates. Of these volumes, he adds, onc is very diffuse, but the other short and concise. Then follow Sermones de Omnibus Evangeliis Domi- nicalibus for every Sunday in the year; Sermones de Omnibus Evangeliis, i.¢., a book of discourses on all the Gospels, from Ash Wednesday to the Tuesday after Easter ; and a treatise called “Marialis, qui totus est de B. Maria compositus,” consisting of about 160 discourses on the attributes, titles, &c., of the Virgin Mary. In the same work the archbishop claims to have written his Chronicon Janwense in the second year of his pontificate (1293), but it extends to 1296 or 1297. To this list Echard adds several other works, such as a defence of the Dominicans, printed at Venice in 1504, and a Summa Virtutum et Vitiorum Guillelmi Peraldi, a Dominican who died about 1250. James is also said to have translated the Old and New Testaments into his own tongue. ‘“‘But,” adds Echard, “if he did so, the version lics so closely hid that there is no recollection of it.”

His two chief works are the Chronicon Januense and the Golden Legend or Lombardica Hystoria. The former is partly printed in Muratori (Scriptores Rer. Ital., ix. 6). It is divided into twelve parts. The first four deal with the mythical history of Genoa from the time of its founder, Janus the first king of Italy, and its enlarger, a second Janus, “citizen of Troy,” till its conversion to Christianity “about twenty-five years ‘after the passion of Christ.” Part v. professes to treat of the beginning, the growth, and the perfection of the city; but of the first period the writer candidly confesses he knows nothing except by hearsay. The second period includes the Genoese crusading exploits in the East, and extends to their victory over the Pisans (c. 1180), while the third reaches down to the days of the author’s archbishopric. The sixth part deals with the constitution of the city, the seventh and eighth with the duties of rulers and citizens, the ninth with those of domestic life. The tenth gives the ecclesiastical history

of Genoa from the time of its first known bishop, St Valentine, "whom we believe to have lived about 530 A.D.," till 1188, when the city was raised to archiepiscopal rank. The eleventh contains the lives of all the bishops in om and includes the chief events during their pontificates ; while the twelfth deals in the same way with the aes not forgetting the writer himself."

The Golden Legend, one of the most popular religious works of the Middle Ages, is a collection of the legendary lives of the greater saints of the medieval church. The preface divides the ecclesias- tical year into four periods corresponding to the various epochs of the world's history, a time of deviation, of renovation, of recon- ciliation, and of pilgrimage. The book itself, however, falls into five scctions:—(a) from Advent to Christmas (cc. 1-5); (6) from Christmas to Septuagesima (6-30); (c) from Septuagesima to Easter (81-58); (d) from Easter Day to the octave of Pentecost (54-76); (¢) from the octave of Pentecost to Advent (77-180). The saints' lives are full of puerile legend, and in not a few cases contain accounts of 13th-century miracles wrought at special places, par- ticularly with reference to the Dominicans. The author is very particular in giving the derivation of proper names, and indeed generally supplies a copious choice of alternatives. He is nearly always careful to assign a yearly date to the saints he treats of, but seldom, if ever, mentions their feast days. As he reaches the great seasons of the year he inserts treatises dealing with their signi- ficancc and interpretation. Thesc we have for Advent, Christmas, Good Friday, Easter, Whitsunday, &. The last chapter but one (181) "De Sancto Pelagio Papa," contains a kind of history of the world from the middle of the 6th century; while the last (182) is a somewhat allegorical disquisition, "' De Dedicatione Ecclesix."

The Golden Legend was translated into French by Jean Belet de Vigny in the 14th century. It was also one of the earliest books to issue from the press. A Latin edition is assigned to about 1469; and a dated one was published at Lyons in 1473. Many other Latin editions were printed before the end of the century. A French translation by Master John Bataillier is dated 1476; Jean de Vigny's appearcd at Paris, 1488; an Italian one by Nic. Manerbi (? Venice, 1475); a Bohemian one at Pilsen,

1475-9, and at Prague, 1495; Caxton's English versions, 1483, 1487, and 1493; and a German onc in 1489. Seycral 15th-century editions

of the Sermons are also known, and the AMariale was printed at Venice in 1497 and at Paris in 1503.

VORARLBERG, the most western division of the Austrian-Hungarian monarchy, is bounded on the N.

*' Printed without name or plaee, 1484, * The adjective "golden" has been transferred from this to other works of the author.*

by Bavaria, on the W. by the Lake of Constance, Liechtenstein, and Switzerland, on the §. by Switzer- land, and on the E. by Tyrol. Though united for administrative purposes with Tyrol, it enjoys a con- stitution of its own, and ranks as a separate member of the empire. It is emphatically an Alpine region, being traversed by various spurs of the Rhetian Alps (Arlberg, Bregenzer Wald, &c.), attaining a height of 6000 to 9000 feet, and even possessing a few small glaciers. The name is derived from the Arlberg Pass (z.e., Adlerberg, or Eagle's Mountain, 5895 ft.), separating it from Tyrol and forming the means of communication between Innsbruck and the Lake of Constance. The pass is now traversed by a railway, the tunnel under the Arlberg itself (opened Oct. 1884), being 64 miles in length. Vorarlberg is watered by numerous small streams, most of them flowing into the Rhine, which is in contact with the west side of the crown- land for a distance of about 20 miles. About one-third of the surface (almost exactly 1000 square miles in extent) is occupied by pasture, upwards of one-sixth by forests, one-seventh by meadows, and only one-twentieth by arable land. In correspondence with these figures, we find that the chief employments of the inhabitants are cattle-rearing, dairy-farming, and forestry.

In 1881 the district contained 61,115 cattle, and cheese is produced in large quantities. Grain is cultivated in the valley- bottoms, but not more than enough is raised to cover the home consumption ; potatoes, fruit, and wine are also produced. The manufacturing industry is also by no means unimportant, occupy- ing nearly 30 per cent. of the population. The chief branch is the spinning and weaving of cotton, which is carried

on with special vigour in the neighbourhood of the towns and larger villages. A characteristic industry is the construction of wooden chalets, which are exported to Switzerland by water. Many of the men spend the summer in Switzerland as masons and labourers, returning to their homes in winter. In 1881 the population numbered 107,373, nearly all of Teutonic stock and the Roman Catholic faith. The chief towns, none of which are large, are Bregenz (4786 inhabit- ants), the capital, and the port of Austria on the Lake of Constance, Bludenz (8150 inhabitants), Feldkirch (3600), and Dornbirn. Vorarlberg belongs to the see of Brixen, the prince- bishop of which is represented by a vicar-general at Feldkirch. The provincial diet consists of twenty-one members, including the vicar-general. The crownland sends two representatives to the imperial parliament.

Vorarlberg is formed out of the old duchies and countships of Bregenz, Feldkirch, Bludenz, Sonnenberg, and Hohenems, all of which had come into the possession of the house of Austria by the 14th century, chiefly by purchase. Prior to 1782 it was counted part of Hither Austria, but since then it has been administratively united with Tyrol. The peace of Pressburg (1805) assigned it to Bavaria, along with northern Tyrol, but it was restored to its old allegiance in 1814.

VORONEZH, a government of southern Russia, is bounded by Tamboff on the N., Saratoff and the Don Cossacks on the E., Kharkoff on the §., and Kursk and Orel on the W., and has an area of 25,448 square miles. It occupies the southern slopes of the Middle-Russian plateau, and its average elevation is from 450 to 700 feet above sea-level. The surface is hilly, and broken by ravines in the west (where two ranges of chalk hills separated by a broad valley run north and south), but flat and low to the east of the Don. Devonian sandstones crop out in the north, but farther south these are covered with chalk. Glacial clays with northern erratics spread as far south as Voronezh, and extensive areas are covered with Lacustrine clays and sands. The soil is very fertile, owing to the large prevalence of the black earth; it becomes, however, sandy towards the east. Voronezh lies on the border between the forest and meadow-region of Middle Russia and the southern steppes; the forests rapidly disappear

as one advances south, and those which in the time of Peter the Great still covered the upper parts of the tributaries of the Don, and were used for

| shipbuilding, are now almost entirely destroyed. Less

than one-tenth of the entire area is under wood, and both timber and firewood have to be imported.

The Don traverses Voronezh from north to south-east, watering it for more than 400 miles; it is an important channel for the export of corn, tallow, and other raw pro- duce, as well as for the import of wood, floated from the north. Its tributary the Voronezh is also navigated, and another large tributary, the Vorona, flows through the eastern part of the government. Many other small streams flowing into the Don intersect the territory, but the influence of the dry steppes begins to make itself felt ; there are no lakes, and marshes persist only in the valleys. The climate is therefore continental, and, although the mean temperature at Voronezh is 42°-7 F., that of January is as low as 8°‘3 and that of July as high as 74°:2.

The population is steadily increasing, and reached 2,532,840 in 1883 as against 1,974,400 in 1860. It is Little Russian in the south-west (from 35 to 40 per cent., according to different estimates), and Great Russian elsewhere. There are also a few German colonies with some 3500 inhabitants, and a few Poles (2000).

Agriculture is the chief oecupation, and corn is exported to a eonsiderable amount. The average crops from 1883 to 1885 reached 3,467,800 quarters of rye, 901,600 of wheat, 958,000 of oats, 1,680,000 of various grains, and 960,100 of potatoes. 17,000 acres were under beet (176,000 cwts. in 1885); tobacco is also largely cultivated, and the crop of 1885 yielded 1,723,000 tb. The sun- flower has also been mueh cultivated of late for oil. ‘The Voronezh horses enjoy a high reputation in Russia, as also do its cattle, and cattle-breeding has advanced during the last thirty years. In

1883 there were 535,500 horses, 649,100 cattle, and 1,348,100 sheep. Bees are kept in many villages, and honey is gathered to the annual amount of more than 10,000 cwts. Market-gardening and fishing are also of importance. The manufactures arc of recent growth; the production reached £2,066,000 in 1884, the chief produets being spirits, oil, sugar, woollens, and tallow. Wheat

and other grains, flonr, flax, tallow and hides, wool, and cattle are the chief items of export.

Voronezh is divided into twelve districts, the chief towns of whieh are Voronczh (56,185 inhabitants in 1885), Biryutch (4435), Bobroff (3660), Bogutehary (4230), Korotoyak (1840), Nijne-Dyevitsk (2635), Novokhopersk (8015), Ostrogozhsk (8610), Pavlovsk (8390), Valuiki (4425), Zadonsk, with a great monastery (9940), and Zem- lyausk (3870). These are mostly mere administrative centres; and several villages, such as Buturlinovka (21,7 00), Katatch (13,000), and Vorontsovka (12,000), have larger populations and more comnierce.

VORONEZH, capital of the above government, is situated on a high bank of the river of the same name, 365 miles by rail to the south of Moscow. It is almost entirely built of wood, and only recently began to re- acquire importance as an entrepdt on the railway which connects Moscow with the Sea of Azoff. It has a military school of cadets, gymnasiums for boys and girls, and a number of schools for elementary education, Its theatre, now rebuilt, has a name in the history of the Russian stage, and the town was also the birthplace of two peasant poets, to whom we owe some of the finest ex- amples of Russian poetry—Koltsoff and Nikitin, A memorial to the former has been erected on a public pro- menade. A few factories for cleansing wool and for the preparation of tallow and oil, as well as some distilleries have arisen of late. The population of the town in- creased from 39,800 in 1860 to 56,185 in 1885. It is now an important entrepdt for corn, flax, tallow, hides sugar, wood, and coal from the Don ; the railway traffic amounts to 24 million ewts., and that of the Razdelnaya Junction, close by, is nearly thrice that amount.

Voronezh was founded in 1586, as a fort against T a site which had been occupied from the 11th centu town, but had been deserted during the 14th

and 15th centuries Four years afterwards it was burned by the Tartars, but again re- built, and soon became an important trading place. Its "wooden fort was rebuilt in 1672. Peter I. recognized its importance, and in 1694 erected on an island of the river a wharf, where a flotilla of sixty-six boats (2546 guns and 17,000 men) was built, under the direction of Dutch shipbuilders, for the eonquest of Azoff, It thus became the basis of further advances towards the Black Sea. The

town was almost completely destroyed by fire in 1703, 1748, and 1773, but was always rebuilt and has steadily developed. ,

artar raids, on ry by a Khazar

VOR—VOS

VORTEX MOTION. See Hypromecuanics, vol. xii. p-. 450 sq.

VOSGES, a mountain range of central Europe, stretching along the west side of the Rhine valley in a north-north- east direction, from Basel to Mainz, for a distance of 150 miles. Since 1871 the southern portion, from the Ballon d'Alsace to Mont Donon, has been the political boundary between France and Germany. 'There is a remarkable similarity between the Vosges and the corresponding range of the Black Forest on the other side of the Rhine: both lie within the same degrees of latitude and have the same geological formation; both are characterized by fine forests on their lower slopes, above which are open pasturages and rounded summits of a uniform altitude; both have a steep fall to the Rhine and a gradual descent on the other side. The Vosges in their southern portion are mainly of granite, with some porphyritic masses, and of a kind of red sand- stone (occasionally 1640 feet in thickness) which on the western versant bears the name of " grés Vosgien."

Orographically the range is divided from south to north into four sections :—the Grandes Vosges (62 miles), extending from Belfort to the valley of the Bruche ; the Central Vosges (31 miles), between the Bruche and the Col de Saverne ; the Lower Vosges (30 miles), between the Col de Saverne and the source of the Lauter; and the Hardt (25 miles). The rounded summits of the Grandes Vosges are called "ballons." The departments of

Vosges and Haute Saéne are divided from Alsace and the territory of Belfort by the Ballon d'Alsace or St Maurice (4100 feet). Thence north-wards the average height of the range is 3000 feet, the highest point of all, the Ballon de Guebwiller (Gebweiler) or Soultz, rising on the east to a height of 4680 feet. 'The Col de Saales, between the Grandes Vosges and the central seetion, is 1900 feet high ; the latter is both lower and narrower than the Grandes Vosges, the Mont Donon aud other chief heights not exceeding 3300 feet. The railway from Paris to Strasburg and the Rhine and Marne Canal traverse the Col de Saverne (1085 feet). No railway crosses the Vosges between Saverne and Belfort, but there are very good carriage roads over the passes of Bussang (2410 feet) from Remiire- mont to Thann, the Schlucht (3746 feet) from Gérardmer to Munster, the Bon Homme (3100 feet) from St Dié to Colmar, and from St Dié to St Marie-aux-Mines (2625 fect). The Lower Vosges are a sandstone plateau ranging from 1000 to 1850 feet high, and are crossed by the railway fron1 Hagenau to Sarreguemines, defended by the fort of Bitche. 'The Hardt, a sterile region, covered with heath and low brushwood, has for its highest point the Donners- berg (Mont Tonnerre), 2264 feet high; it is traversed through deep ravines by the railways from Denx-Ponts to Landau, and from Kaiserslautern to Spires and Worms. Meteorologically, the differ- ence between the eastern and western versants of the range is very marked, the annual rainfall being much higher and the mean temperature being much lower in the latter than in the former. On the eastern slope the vine ripens to a height of 1300 feet; on the other hand, its only rivers are the Ill and other shorter streams, which afford water-power rather by their rapid fall than by their abundance. The Moselle, Meurthe, and Sarre all risc ou the Lorraine side. Moraines, boulders, and polished rocks testify the existence of the glaciers which formerly covered the Vosges. The lakes, surrounded by pines, beeches, and maples, the green meadows where hundreds of cows with tinkling bells peacefully graze, and the fine views of the Rhine valley, Black Forest, and snow-covered Swiss mountains combine to make the district charmingly pictur-esque. The lower heights and buttresses of the main chain on the Alsatian side are covered with numerous castles, generally in ruins, in connexion with which curious legends and interesting historical incidents are told. At several points on the main ridge, especially at St Odile above Ribcauvillé (Rappoltsweiler), are the remains of a wall of unmortared

stone with tenons of wood, 6 to 7 feet thick and 4 to 5 feet high, called the pagan wall (Mur Payen). It was certainly used for local defence in the Middle Ages, and archeolo- gists are divided as to whether it was built for this purpose by the Romans, or before their arrival.

VOSGES, a frontier department of eastern France, was formed in 1790, for the most part of territory previously belonging to Lorraine, with fragments of Franche-Comté, Champagne, and Alsace. The portion belonging to Alsace was ceded to Germany in 1871. Lying between 47° 48' and 48° 32' N. lat., and 5° 22' and 7° 10' E. long., the department is bounded by Alsace-Lorraine on the E. and by the departments of Meurthe-ct-Moselle on the N. , Meuse on the N.W., Haute-Marne on the W. ,and Haute-Sadne on

the 8. The Vosges Mountains form a natural boundary on the E. The highest point is the Hohneck (4482 feet) near the Schlucht. The south of the department is traversed by the Monts Faucilles (2000 feet), which form part of the European watershed, separating the basins of the Rhine and the Rhone. The Moselle and the Meuse, tributaries of the Rhine, have the largest drainage areas in the department ; a small district in the north-west

belongs to the basin of the Seine (Ornain and Marne),

the rest to that of the Rhone. The Moselle rises in the Col de Bussang, and in a N.W. course of 75 miles receives the Moselotte and Vologne on the right; the Mortagne and the Meurthe on the right and the Madon on the left bank also belong to Vosges, though they join the Moselle outside the department. The source of the Sadne is on the south-east slope of the Monts Faucilles, and the Canal de l''list follows the course of the Coney, a tributary of the left bank. The height above the sea, the northward exposure of the valleys, and the impervious subsoil com- bine to make the climate severe ; the average temperature at Epinal (1070 feet) is 49°F. The annual rainfall is 24 inches at Kpinal, 31 at St Dié, and more in the mountains.

Of a total area of 1,452,181 acres, arable land occupies 608,201 eres, grass 199,839, wood 361,526, heath, pasture, and uncultivated land 81,486, and vineyards 12,054. The live stock in 1881 included 31,811 horses (of a small but strong breed), 857 asses and mules, 143,827 cattle, 45,634 sheep, 81,488 pigs, 19,615 goats, more than 17,000 dogs, 500,000 head of poultry; 17,952 beehives yielded 43 tons 7 cwts. of honey and 18 tons 11 cwts. of wax. 872 tons of chcese were made at Gérardmer. The crops in 1884 were—wheat 1,911,470 bushels, meslin 494, 483, rye 710,627, barley 108,262, oats 3,225,755, buckwheat 63,409, potatoes 17,787,404, dry vege- tables 45,974, fodder beetroot 25,060 tons, tobacco 33 tons, hops 79 tons, hemp seed 138 tons, hemp 99 tons, linseed 39 tons, flax 22 tons, hemp, flax, and poppy oils 94 tons, colza seed 206 tons, fodder 457,388 tons, wine 2,869,000 gallons (average of preceding ten years 3,964,441). The department stands first in France for the extent and importance of the woods under forest rule, though only third for the actual area of forest land. The state owns one- third of the forests, private individuals one-fifth, and the communes the rest. Oaks, beeches, hornbeams, birches, aspens, and maples thrive on the plains, beeches and oaks on the higher grounds, and firs, beeches, and pines on the mountains. The annual valuc of timber produced is £280,000, and 9,000,000 fir planks, besides other kiuds, are annually cut in 300 sawmills. Traces of gold are found, and the department contains silver and lead mines, copper ore, iron ore (4530 tons of iron annually), zinc, manganese, cobalt, and antimony. In 1884, 681 tons of coal were mined, and in 1882 1595 tons of peat were dug; 1336 persons are employed in 482 quarries of marble, sandstone, granite, and building and lithographic stones. The department is rich in hot, cold, sulphate, sodic, calcium, iron, bicarbonate, and gascous mineral springs. Those at Plombiéres were known to the Romans, 37,000 hands arc employed In the manufacture of pig and cast iron (for all which wood is the chicf fuel) and wares of iron and steel. The cotton industry (135,000 looms and 423,724 spindles) has been largcly developed since 1871; canvas and linen are woven at Gérardmer (3000 looms). The manufacture of cloth employs 500 workmen, of lace 1000, embroidery by the hand and loom 40,000 workwomen, silk spin- ning 1000 spindles. Wool is spun and hosiery manufactured. Coopers' work (over 300 tons) is exported, as are also sabots. At

pinal several hundred workmen are engaged in the manufacture of images; and musical instruments are made at Mirecourt. 1000 workmen are employed in glass-works, and 1987 in paper-mills (10,000 tons of paper and cardboard). The department contains in all 409 industrial establishments; 200,000 tons of coal are Imported. There are 281 miles of railway, 177 of national roads, and 3096 of other roads. The Eastern Canal connects the Saéne with the Moselle and Meuse. The population in 1881 was 408,862, of whom 189,176 were engaged in agriculture and 181,253 in manu- factures ; the population in 1886 was 413,707. The department forms the diocese of St Dié, has its court of appeal and academy at Nancy, belongs to the district of the corps d'armée of Chalons- sur-Marne, and is divided for administrative purposes into 5 arron- dissements (Epinal, Mirecourt, Neufchatcau, Remiremont, St Dié), 29 cantons, and 530 communes. The chef-lieu is Epinal.

VOSS, Jonann Hernricu (1751-1826), German poet, archeologist, and translator, was born at Sommersdorf in Mecklenburg on the 20th February 1751. In the same year his father, a farmer, removed from Sommersdorf to

Penzlin. From 1766 to 1769 Voss attended school at Neubrandenburg. In the latter year, in consequence of misfortunes which had overtaken his father, he was obliged to accept a tutorship in the family of a private gentleman near Penzlin. He went to Gottingen in 1772, in response to the invitation of Boie, whose attention he had attracted by poems contributed to the Gottingen Musenalmanach. At Gottingen he studied with enthusiasm ancient and modern literature, and became one of the leading members of the famous " Dichterbund." In 1775 Boie made over to him the editing of the Afwsenalmanach, which he con- tinued to issue for many years. He married Boie's sister, Ernestine, in 1777, and in the following year he accepted the position of rector at Ottendorf in Hanover. As the climate of Ottendorf did not suit his health, he resigned this office in 1782, and went as rector to Eutin, where he remained until 1802. He then lived for some time in Jena, but in 1805 he accepted a call toa professorship at Heidelberg. He died at Heidelberg on March 29, 1826.

Voss was a man of a remarkably independent aud vigorous character, and he achieved distinction in several kinds of literary activity. In 1785-95 he published in two volumes a collection of original poems, to which he afterwards made many additions, The best of these works is his idyllic poem " Luise," in which he sought, with much success, to apply the style and methods of classical poetry to the expression of modern German thought and sentiment. In his Mythologische Briefe (2 vols., 1794), in which he attacked the ideas of Heyne, in his Antisymbolik (2 vols., 1824-26), written in opposition to Creuzer, and in other writings he made im- portant contributions to the study of mythology. He was also prominent as an advocate of the right of free judgment in religion, and at the time when some members of the Romantic school were being converted to the Roman Church he produced a strong im- pression by a powerful article, in Sophronizon, on his friend Friedrich von Stolberg's repudiation of Protestantism. It is, however, to his work as a translator that Voss chiefly owes his place in German literature. All his renderings of the works of ancient writers indi cate not only sound scholarship but a thorough mastery of the laws of German diction and rhythm. The most famous of his translations are those of Homer, which were published together, in 4 volumes, in 1793. Of these the onc generally preferred is the translation

of the Odyssey, as originally issued in 1781. He also translated Hesiod, Theocritus, Bion and Moschus, Virgil, Horace, Tibullus, Propertius, and other classical pocts, and he prepared a critical edition of Tibullus. In 1818-29 was published, in 9 volumes, a translation of Shakespeare's plays, which he com- pleted with the help of his sons Heinrich and Abraham, both of whom were scholars and writers of considerable ability.

See Paulus, Lebens- u. Todeskunden tiber J. H. Voss (1826), and Herbst, J. 77. Voss (2 vols., 1872-76).

VOSSIUS, Gzrarpus Jonannes (1577-1649), classical scholar and theologian, was born near Heidelberg in 1577. His father Johannes Vos, a native of the Netherlands, had fled as a Protestant from the persecutions in his own country into the Palatinate, and became pastor in the village near Heidelberg where Gerard was born ; butyas he was a Calvinist, the strict Lutherans of the Palatinate caused him once more to become a wanderer. In 1578 he settled at Leyden as student of theology in the university, and finally as pastor at Dort, where he died in 1586, leaving Gerard an orphan. Here the boy received his education, until he entered the theological college and then the university of Leyden. He there became the lifelong bosom friend of Hugo Grotius, and pursued with great zest the study of the classics, Hebrew, ecclesiastical history, and theology. In 1600 he was made rector of the high school at Dort, where he devoted himself to philology and historical theology. From 1614 to 1619 he filled the office of director of the theological college at Leyden. The moderation of his theological views and his abstention from controversy brought him under the suspicion of heresy, in consequence of which he escaped expulsion from his office only by resignation (1619). The year before he had published his valuable work the Historia Pelagiana, which his enemies considered favoured the views of the Arminians or Remonstrants. But in the year 1622 he

received the appointment of professor of rhetoric and chronology, and subsequently of Greek, in the university. In 1624 the university of Cambridge offered him a professorship, which he declined. Two years afterwards another unsuccessful effort was made to induce him to settle

in England, but he accepted from Archbishop Laud a prebend in Canterbury cathedral of the value of £100 per annum, without residence, coming over to England to be installed in 1629, when he was made LL.D. at Oxford. In 1632 he left Leyden to take the post of professor of history in the newly founded Atheneum at Amsterdam, which he held till his death, March 17, 1649.

He was one of the great scholars of tle world, and his character added lustre to his learning. His works, of which a complete edition appeared at Amsterdam, 1695-1701, in 6 vols. fol., are philological, historical, and theological. He made invalnable con- tributions to the correct study of Latin grammar and of the Greek and Latin historians. He wasamongst the first to treat theo1ogical dogmas and the heathen religions from the historical point of view. His principal works are Historia Pclagiana (1618) ; Htymologicum Lingue Lating (1662); Commentariorum Rhetoricorum Libri VII. (1606); De Historicis Greeis Libri LIT, (1624); De Historicis Latinis Libri II. (1627); De Theologia Gentili (1642); Dissertationcs Tres co Symbolis, Apostolico, Athanasiano, ct Constantinopolitano

See Nicéron, Mémotres pour servir aU Histoire des Hommes Iilustres, vol. xiii., Paris, 1730; Herzog's Realencyklopddie, art, " Vossius."

VOSSIUS, Isaac (1618-1689), son of the preceding, was born at Leyden in 1618, and was carefully educated by his father. After three years spent on a learned tour through England, France, and Italy, which he used in making the acquaintance of the first scholars and the great libraries of those countries, and from which he brought back many valuable MSS., he accepted in 1648 an invitation to the court of the brilliant Queen Christina of Sweden, whom he taught Greek. He declined the offer of the chair of history at Amsterdam vacated by his father's death, and continued for some years in Sweden, with occasional visits to Holland. In 1658 he finally left Sweden. His father's merits and his own learning pro- cured him favour with Louis XIV. of France and in England. In 1670 he came to reside in England, was made LL.D. of Oxford, and in spite of notorious looseness of morals and levity of character received a canonry

at Windsor from Charles IT. in 1673, residing in the castle, where he died in February 1689.

His learning was great, and he rendered valuable services in eonnexion with ancient history, antiquities, chronology, and geography, though they were marred by the admixture of great levity and want of judgment. To him is owing the first Greek text of the six shorter epistles of Ignatius (1646). He pnblished valuable editions of the geographer Scylax (1639), of Justin (1640), of Pomponius Mela (1648), and of Catullus (1684). In his various dissertations on chronology he maintained the greater accuraey of the system of the Septnagint in comparison with that of the Hebrew text, and generally asserted the greater genuineness of the Greek translation as compared with the Massoretic text. He in- herited his father's valuable library, which, to the great sorrow of Evelyn, went after his death back to Holland.

Comp. Nicéron's Mémoires, vol. xiii.

VOTKINSK, an iron-work in the Urals, in the Russian government of Vyatka, 47 miles north of Sarapul, and 8 iniles from the Kama, was founded in 1756. Its popula. tion reached 15,480 in 1885. Together with the Kamsk iron-work, Votkinsk was till lately one of the chief Govern. ment establishments for the construction of steamers for the Caspian flotilla, as well as of locomotives for the Siberian railway, and it has long been renowned for its excellent tarantasses and other smaller iron-wares, as well as for its knitted goods. No large orders having been received from the Government, a number of workmen recently united into an "artel" or co-operative society for the manufacture of agricultural machinery, already known throughout Russia for its excellence and cheapness,

VOUET, Simon (1590-1649), French painter, born at Paris, January 9, 1590, passed many years in Italy, where

he married, and established himself at Rome, enjoying there a high reputation as a portrait painter. Louis XIII. recalled him to France, lodged him in the Louvre with the title of First Painter to the Crown, and

gave him a considerable salary. All royal work for the palaces of the Louvre and the Luxembourg was placed in his hands; the king became his pupil; he formed a large school, and renewed the traditions of that of Fontainebleau. Amongst his scholars was the famous Lebrun (who raised on the foundations laid by his master the tyranny by which he dominated the whole artistic world during the reign of Louis XIV.), Lebrun's rival Errard, Louis Lerambert, the two Testelins, Poerson, and Dorigny. Vouet was an exceedingly skilful painter, especially in decoration, and executed important works of this class for Cardinal Richelieu (Rueil and Palais Royal) and other great nobles. His better easel pictures bear a curious resemblance to those of Sassoferrato, but, being much in demand, he fell into mannerisms, and of the enormous quantity of work produced by himself or with the aid of his pupils little has survived worth study. Almost everything he did was engraved by his sons-in-law Tortebat and Dorigny.

VOW, a solemn undertaking to do something which is held to be acceptable to the Deity. In the antique re ligions mere prayer, without some material expression of homage, was not held to be a complete or normal act oi worship (cf. SacriricE). Supplications, therefore, were generally presented to the Deity in connexion with a sacrifice, or, if the moment of need was one at which a ritual offering could not well be presented, the prayer for help was naturally accompanied by a promise to present a gift at a future time. Thus prayer together with a vow is a sort of imperfect act of worship, which has to be com- pleted by the discharge of the vow at the sanctuary. So in Greek the same word edy7 is equally applicable to the prayer which opened a service of sacrifice and to a vow taken at the commencement of an enterprise or in other time of need. So too the Latin votwm means both "vow" and " desire." In the Old Testament, in like manner, it is generally a sacrifice or gift at the sanctuary which is promised in vows, and the word "vow" (néder) means also '"a votive sacrifice," as distinguished from obligatory sacrifices (piacular offer- ings and stated festal sacrifices; 1 Sam. i. 21).

The vows of which we read in the Old Testament and in classical authors are generally conditional on the fulfil- ment of the petition with which they are coupled. Such vows are made on occasions of special need, or difficulty (Ps. Ixvi. 13 sq.; Pliny, H. W., viii. 21 [57], "tum preecipuus

votorum locus est cum spei nullus est”), as before a peril- ous enterprise (Gen. xxviil. 20; Judg. xi. 30). The pay- ment offered may be a victim for the altar, or any other gift which the ritual of the religion acknowledges as acceptable. But, as vows are generally made on extra- ordinary occasions, the thing promised will often be excep- tional in kind or magnitude. The vow of Jephthah (Judg. xi.) is a case in point, and also illustrates by an extreme example the principle that a vow once taken must be ful- filled at any cost. This principle was so far modified in later times, in Israel, that exceptional vows were by law redeemed at a valuation (Lev. xxvii.). Hannah’s vow, de- voting her unborn son to the service of the sanctuary (1 Sam. i. 11), would have fallen under this law. Moreover, the law provided that the vow of an unmarried daughter or of a wife might be disallowed by the father or husband respectively (Numb. xxx.). On the other hand, a widow or a divorced woman was free to make what vow she pleascd. These provisions are important evidence of the legal posi- tion of woman in Hebrew society, and also, ea silentio, as implying that Hebrew sons (at least after infancy) were not subject to patria potestas of the Roman kind,

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Of ordinary vows a common type in antiquity was a promise made in peril by sea, sickness, or other straits, to suspend in a temple a picture or other symbol of the danger against which the Divine aid was implored. This usage passed into Christianity and survives in Catholic countries, where votive pictures and models of eyes, hands, &c., cured in answer to prayer, are still seen in churches. At the council of Lestines (743 a.p.) the use of such models was condemned as a pagan practice.

In point of obligation, vows were analogous to oaths (Numb. xxx. 2); their sanction was not human but Divine (Deut. xxiii. 21). Thus slackness or fraud in the fulfil- ment of vows is the mark of an age of declining faith (Mal. i. 14 ; Harith, Moall., 1. 69 Arnold ; Lucian, Jupiter Trag., ¢. 15; of. Eccles. v. 4). Among the Arabs the speedy fulfilment of vows was

favoured by a rule of ab- stinence from certain enjoyments and conveniences (ithraém), which custom imposed till the vow was fulfilled. This appears to have been the ancient practice of other Semitic nations also; among the Hebrews it survives in the Nazarite vow (see Nazanrre), and probably also in the esi or issdér (interdict), which is mentioned along with vows in Numb. xxx., and is described in verse 13 as "an oath of abstinence to afflict the soul,"—words which seem to show that fasting is specially contemplated. As there is no as- cetic tendency in Hebrew religion, in which fasting and similar observances have not positive religious value, but are only expressions of penitent supplication, it seems reason- able tointerpret the oath of abstinence by the aid of the examples in Psalm cxxxii. 2 sg., Acts xxiii. 12 (cf. also 1 Sam. xiv. 24 sg.), and to understand it, like the Arabian thrdm, as an obligation of abstinence till a positive vow was fulfilled. The detail in the Psalm, "I will not enter my house or rest in my bed till," &c., has its parallel in Arabia and in Syrian heathenism (Sir. ii. 185—-where to enter the house from behind is an evasion of the rule ; Lucian, Dea Syr., § 55; cf. Wellhausen, Skizzen, iii. 117). It is to be observed that in Arabia, where there was little or no development of obligatory ritual sacrifices, offerings were usually votive, and vows were often simple and not conditional promises; so too in Deut. xxiii. 23, Lev. vii. HG vows are closely associated with free-will offerings. A purpose of sacrifice formed at a distance from a sanctuary naturally found expression in a vow. Occasions of sacri- fice are not frequent in nomad life and it may be conjec- tured that the earliest vows were simply deferred sacrifices, without the element of bargaining with the Divinity which is prominent in later times. The simple vow presupposes that the sanctuary or the customary day of sacrifice is re- mote; the conditional vow, on the other hand, may often be made at the sanctuary itself, where the Godhead is nearest to man (Gen. xxviii. 20; 1 Sam. i. 11; Zviad, vii. 93).

In Christian times vows to present a material gift (vota realia) have been less important than vows to adopt a certain course of life (vota personalia), a change which naturally followed from the modification of the idea of sacrifice in Christianity (see Sacrirtce). The personal vows recognized by the Catholic church are of various kinds, covering all manner of actions religiously meritorious (e.9-, pilgrimage or crusading);

but the most promitient have been vows of abstinence (fasting, chastity), to which the growth of asceticism gave a positive value. Most important of all is the monastic vow of poverty, chastity, and obedience (see Monacnism). The presupposition of all such vows is that there is a higher life of godliness, which cannot be attained to by Christians at large, and which all are not bound to attempt, although there is merit in consecrating oneself to it. From this point of view it came about in process of time that vows of self-consecration were viewed as neces- sarily perpetual. To fall back from a purpose of higher life

was not at all the same thing as never to have formed such a purpose. Hence, ¢.g., the vow of chastity, which Cyprian still regards as terminable by marriage in the case of virgins who have not strength to persevere in continence, was de- clared to be of perpetual obligation as early as the council of Ancyra (314 a.p.). On the other hand, the church was careful to guard against the rash assumption of vows, by requiring certain formalities in the act, and by the in- stitution of the noviciate, as a period of probation. The power of the pope to dispense from vows, which appears in the Decretals, was of later growth. Protestantism, deny- ing the superior merit of the ascetic life, rejects all per- petual vows, and indeed shows little favour to vows of any kind. (W. RS.

VRANCX, Sepastian, born about 1572, was a painter of the Antwerp school, of very moderate ability. Most of his pictures represent scenes of war, such as the sack of towns, cavalry combats, and the like. Though occasionally vigorous in drawing, his paintings are dull and heavy in tone. The date of his death is uncertain.

VULCAN, the old Roman fire-god, answering to the Greek HEPHzsTUS (¢.v.), with whom he was confounded by the ancients. The etymology of the name is uncertain: it has been proposed to derive it from the root var, "warm"; uwlka in Sanscrit is a firebrand. How closely Vulcan was identified with the fire, regarded as a person, appears from the stories of the birth of Cxculus and Servius Tullius, both of whom were called sons of Vulcan, and were supposed to have been conceived by virgins who had been impregnated by sparks of fire from the hearth. At Rome his temple was in the Campus Martius outside the city walls. But there was also a

place sacred to him in the comitium. It was not a temple, but only a raised area, called the Volcanal. It was said to have been founded by Romulus, and a lotus tree in it was thought to be as old as the city. Statues of persons who or whose statues had been struck by lightning were sometimes set up in the Volcanal. There was a festival of Vulcan called the Volcanalia on August 23d, in which the people threw animals into the fire instead of themselves. On the 7th of June there was a fishermen's festival, with games, held under the superintendence of the "praetor urbanus," and the fish were brought to the Volcanal and sacrificed to the god instead of human victims. Another festival of Vulcan was the Tubilustria, or purification of trumpets, on May 23d, Vulcan being regarded as the father of trumpets. At Ostia there was a festival of Vulcan (Volcanalia) pre- sided over by a "preetor sacris Voleani faciundis," and at Ostia there were also a temple and a pontifex of Vulcan. At Rome there was a "flamen" of Vulcan, who sacrificed to Maia, wife of Vulcan, on the Ist of May. According to others the name of Vulcan's wife was Majesta.

VULCANO. See Lipart Istanps, vol. xiv. p. 682.

VULGATE. See Brete, vol. iii. p. 647.

VULTURE, the name of certain birds whose best- known characteristic is that of feeding upon carcases, and these birds, owing to this obscene habit, are in many hot countries regarded with favour as useful scavengers. The genus Vultur, as instituted by Linnzeus, is now restricted by ornithologists to a single species, V. monachus, of which more presently, the other species included therein by him, or thereto referred by succeeding systematists, being else- where relegated (cf. LAMMERGEYER); but the most im- portant taxonomic change that has been introduced is that by Prof. Huxley (Proc. Zool. Society, 1867, pp. 462-464), who pointed out the complete structural difference between the Vultures of the New World and those of the Old, regarding the former as constituting a distinct Family, Cathartide (which, however, would be more properly named Sarcorkamphidz), while he united the latter with

the ordinary diurnal Birds-of-Prey as Gypaetide. This arrangement seems to overlook the signification of some considerable distinctions, and to the present writer it would appear more reasonable to recognize the existence of a Family Vulturide, confined to the true Vultures of the Ancient Continent, equal in rank to the Falconide, while fully admitting the claim made on behalf of the New-World forms for the same standing.

The American Vulture may be said to include four genera :—(1) Sarcorhamphus, the gigantic Condor, the male distinguished by a large ficshy comb and wattles; (2) Gypagus, the King-Vulture, with its gaudily-coloured head and nasal caruncle; (3) Catharista, containing the so-called Turkey-Buzzard of English-speaking Americans with its allies; and (4) Pseudogryphus, the great Californian Vulture—of very limited range on the western slopes of North America, and threatened with speedy extinction through the use of poison. Though all these birds are structurally so different from the true Vultures of the Old World, in habits the Vulturide and Sarcorhamphide are much alike, and of several of the latter—

King-Vulture (@ypagus papa).

particularly of the Condor and the Turkey-Buzzard—we possess rather elaborate accounts by excellent observers, as Darwin, Alex- ander Wilson, and Mr Gosse—whose works are readily accessible. The true Vultures of the Old World, Vudturide in the restricted sense, are generally divided into five or six genera, of which Neophron has been not unjustifiably separated as forming a dis- tinct Subfamily, Meophronine,—its members, of comparatively small size, differing both in structure and habit considerably from the rest. One of them is the so-called Egyptian Vulture or Pharaoh's Hen, WN. percnopterus, a bird whose delicacy of build and appearance contrast forcibly with its choice of the most filthy kind of food. It is a well-known species in some parts of India,} and thence westward to Africa, where it has an extensive range. It also occurs on the northern shores of the Mediterrancan, and on three occasions has strayed to such a distance from its usual haunts as to have twice suffered capture in England, and once even in Norway. Of the genera composing the other Subfamily, Valturing Space 1s wanting to say much. Gyps numbers seven

or eight local species and races, on more than one of which the English name Griffon has been fastened. The best known is @. Julvus, which by some authors is accounted "British," from an example having been taken in Ireland, though under circumstances which suggest its appear- ance so far from its nearest home in Spain to be due to man's inter- vention. The species, however, has a wider distribution on the European continent (especially towards the north-east) than the Egyptian Vulture, and in Africa nearly reaches the Equator, extend- ing also in Asia to the Himalaya; but both in the Ethiopian and Indian Regions its range inosculates with that of several allied forms or species. Pseudogyps with two forms—one Indian, the

1 Tn the eastern part of the Indian peninsula it is replaced by a smaller race or (according to some authorities) species, NV. gingianus, which has a yellow instead of a black bill.

other African—differs from Gyps by having 12 instead of 14 rectrices. Of the genera Otogyps and Lophogyps nothing here need be said; and then we have Vultur, with, as mentioned before, its sole representative, V. monachus, commonly known as the Cinercous Vulture, a bird which is found from the Straits of Gibraltar to the sea-coast of China.? Almost all these birds inhabit rocky cliffs, on the ledges of which they build their nests,

The question whether Vultures in their search for food are guided by sight of the object or by its scent has long excited much interest, and the advocates of either opinion have warmly contended in its behalf. Without denying to them the olfactory faculty, it seems to be now gene- rally admitted, notwithstanding the assertions to the con- trary of Waterton and a few more, that the sense of sight is in almost every case sufficient to account for the observed facts. It is known that, directly a camel or other beast of burden drops dead, as the caravan to which it belonged is making its way across the desert, Vultures of one sort or another appear, often in considerable numbers, though none had before been observed by the ordinary traveller, and speedily devour the carcase over which they are gathered together. The mode in which communication is effected between

the birds, which are soaring at an immense height, seems at first inexplicable, but Canon Tristram has suggested (Zdis, 1859, p. 280) the following simple solution of the supposed mystery :—

‘The Griffon who first descries his quarry descends from his elevation at once, Another, sweeping the horizon at a still greater distance, observes his neighbour’s movements and follows his course. A third, still further removed, follows the flight of the second ; he is traced by another ; and soa perpctual succession is kept up so long as a morsel of flesh remains over which to consort. I can conceive no other mode of accounting for the number of Vultures which in the course of a few hours will gather over a carcase, when previously the horizon might have been scanned in vain for more than one, or at the most two, in sight.”

The Canon goes on to suppose that in this way may be explained the enormous congregation of Vultures in the Crimea during the siege of Sevastopol, where they had before been scarce:—‘“the habit of watching the movements of their neighbours” may “have collected the whole race from the Caucasus and Asia Minor ”—he might have added the Balkans —“to enjoy so unwonted an abundance.” Doubt may be entertained whether the last supposition be correct, but. none as to the accuracy of the first. (A. N.)

VYATKA, or ViaTKA, a government of north-eastern Russia, with Vologda on the N., Perm on the E., Ufa and Kazafi on the §., and Nijni Novgorod and Kostroma on the W., has an area of 59,124 square miles. It has on its northern boundary the flat water-parting which separates the basins of the Northern Dwina and Volga, and its surface is an undulating plateau of from 800 to 1400 feet above sea- level, deeply grooved by rivers and assuming a hilly aspect on their banks, broken up as they are by ravines. Permian sandstones, marls, and limestones cover it; over these is boulder clay, with extensive forests and marshes. The Kama rises in the north-east, and, after making a wide sweep through Perm, flows along its south-eastern boundary, while the whole of the government is watered by the Vyatka and its numerous tributaries. Both the Kama and the Vyatka are navigable, as also are several of their tributaries; the Izha and Votka, which flow into the latter, have important iron-works on their banks. As

many as 1,700,000 ewts. of corn, iron, hides, leather, tallow, timber, and wooden wares were loaded in 1883 at the landing- places of Vyatka, while the traffic on the Kama is still more important. There are no railways, but the province is traversed by the great highway to Siberia, and two other roads by which goods from the south are transported to

? The geographical range of the various species of Vultures has been

exhaustively treated by Mr Sharpe (Journ. Linn. Society, Zoology, xl. pp. 1-26, pls. i.-ix.).

loading-places on the Vytchegda and the Yug to be shipped farther north to Archangel. Lakes are numerous, and vast marshes are met with everywhere, especially in the north; three-quarters of the area are under forests. The climate is very severe, the average yearly temperature being 36° F. at Vyatka (January, 8°-2; July, 67°:0), and 35° at Slobodskoi (January, 3°°5 ; July, 65°:3).

The population (2,859,000 in 1883, as against 2,170,221 in 1861), though sparse on the average, is somewhat dense in the better-situated valleys. The bulk consists of Great Russians (81 per cent.), but there are also considerable remains of the aboriginal Votiaks (250,000), Tcheremisses (about 150,000), Tartars, Tepters, Permians, and even Bashkirs. Mohammedans number about 100,000, and pagans (Tcheremisses and Votiaks) about 11,000. The Votiaks (Otiaks), a Finnish stem of the Permian group, call themselves Ot, Ut, or Ud, and the Tartars call them Ar, so that it is supposed that they may be akin to the Ars of the Yenisei. They are middle-sized, with fair hair and eyes, oftcn red-haired; and the general structuro of the face and skull is Finnish. By their dialect they belong to tho same branch as the Permians. Thcy are excel- lent agriculturists, very laborious, and excel in bee-keeping.

The soil is fertile, especially in the valleys of the south ; rye, barley, oats, buckwheat, and to some extent wheat are grown. The crops of 1885 were —rye, 4,006,000 quarters ; oats, 3,957,000;

barley, 734,000 ; wheat, 98,000; potatoes, 231,000 quarters. Corn

is exported to the Kama or to the north, as also are flax and hemp. There is no want of natural meadows in the south, and cattle- rearing prospers. The Vyatka horses, a fine breed, though rather small, are well known throughout Russia. There were in 1883 706,600 horses, 925,100 cattle, and 1,446,400 sheep. Attempts are being made to introduce finer breeds of cows and sheep.

Industries are developing steadily, there having been in 1884 684 establishments, which employed 9700 workmen, and showed a yearly return of £1,510,000. They include distilleries (£885,606), iron-works, chemical works, tanneries, soap and glass works, and cotton and paper mills. VOoTKINsK (9.v.) has a considerable ycarly production of agricultural machinery and steam-engincs. The crown manufactory of guns at Izhevsk works up yearly 10,000 cwts. of stecl. Domestic trades give occupation to more than 40,000 persons, and their returns in 1884 reached £706,800. The manu- facture of wooden vessels, window frames, doors, furniture, sledges, and carts supplies a considerable export trade to the steppe pro- vinces of the lower Volga. Domestic weaving produces, it is esti- mated, about 5,400,000 yards of linen every year. Many peasants have nevertheless to leave their homes in search of work, either as "burlaki" for shipping and dragging boats or as porters ; hunting and bird-catching still have some importance in the forest tracts.

Trade is considerable,—iron, copper, tar, pitch, glass, leather, paper, timbcr, and wooden wares, as also corn, hides, flax, linseed, honey, and other raw produce being exported to Nijni Novgorod, Orenburg, and Siberia ; while groceries and various manufactured goods are imported.

Vyatka is one of those few governments of Russia where the semsivo, consisting to a great extent of representatives of the peasantry, has succeeded in creating a series of educational institu- tions without incurring the displeasure of the Government. It distinguishes itself very favourably byits schools, libraries, surgeons, and hospitals in villages, and by its elaborate house-to-house statis. tical descriptions of several districts, and statistical publications. There were in 1884 641 primary and 22 secondary schools.

Vyatka is divided into eleven districts—those of VYATKA (24,480 inhabitants in 1885) ; Elabuga (9750) ; Gtazoff (1945) ; Kotelnitch (4490) ; Matmyzh (3400) ; Nolinsk (3990) ; Ortoff (3880); Sarapul (12,370); Stobodskoi (9225); Urzhum (5100) ; Yaransk (2855). VorkiInsk (9.v.) has 15,480 inhabitants, and Izhevsk has 21,500.

VYATKA, capital of the above government, is situated on the Vyatka river, 653 miles to the north-east of Moscow. It is built mostly of wood, on the steep hills which rise above the river, as well as on their slopes and at their base. Its old walls have been demolished, and its old churches built anew. Two public gardens, a small public library, and the usual educational institutions of a Russian provincial town are all that it can boast of. Its manu- factures are insignificant, but its trade in corn, leather, tallow, candles, soap, wax, paper, and furs (exported), and in all kinds of manufactured and grocery wares (imported), is important. The population in 1885 was 24,480.

Vyatka was foundcd in 1181 by the Novgorodians, under the name of Khtynoff, for the purpose of maintaining their dominion among the Votiaks, Tcheremisses, and Tartars. The squirrel and beaver furs, especially the latter (beaver being then common in the region), and the Vyatka horscs, as also wax and honcy, were the

chief attractions for trade ; and, notwithstanding the dangers then

encountered on the route to Vyatka and Perm, via Vologda, the

Novgorod merchants and wkshuiniki (plundering merchants) will-

ingly visited Vyatka and settled there. The town soon grew around

the fort, and had to be enclosed within new walls. In 1391 it was plundered by the Tartars, and again in 1477. The power of Nov- gorod was decaying, and the Moscow princes, always pursuing the same policy of intrigue, and showing themselves ready to take up the cause of the poorer classes against the richer merchants, made advantageous use of internal struggles, and annexed Khtynoff to Moscow in 1489. It received the name of Vyatka in 1780.

VYAZMA, a district town of Russia, in the govern- ment of Smolensk, and 109 miles by rail to the north-east of that town, was a populous place as early as the llth century, and carried on a lively trade with Narva on the Gulf of Finland. In the 15th century it fell under the dominion of the Lithuanian princes, but was too close to Moscow to remain in their hands, and was retaken by the Russians by the end of the century. The Poles took it again, however, during the outbreak of 1611, and kept it till the peace of 1634. At present it is an important centre for the trade of Smolensk ; corn, hemp, linseed and hemp seed, tallow, and hides are exported to St Petersburg and Riga, while fish, metals, and manufactured goods are supplied to the neighbouring region chiefly by the Vyazma merchants. The population was 13,000 in 1882.

VYERNYT, formerly Atmary, capital of the Russian Central-Asian province of Semiryetchensk, is situated on a plateau at the base of the Trans-Ili Alatau, in 43° 16' N. lat., 47 miles to the south of the Ili river. It was founded in 1854 as a small blockhouse, but from the advantages of its situation—the fertility of the surround- ing country, the ample water-supply from the Atma- tinka river, and of timber and firewood from the valleys of the Alatau—it rapidly increased ; in 1884 the popula- tion numbered 17,545, nearly 3000 of them military. Around the central blocks are several suburbs of wooden and brick houses ; the streets are broad and planted with trees. Most of the houses are surrounded by thick growths of poplar and elm as well as by fruit-gardens, and the streets and squares are refreshed by channels of running water. 'The Little Russian, Kirghiz, and Tarantchi villages which surround the town, and have excellent orchards, amply supply Vyernyi with all necessaries. The Tarantchis proved specially helpful to the young settlement on account of their laborious habits and their acquaintance with the agriculture of the steppes. Situated as it is on the site of the old Atmaty, at the crossing of two roads—froin Kuldja to Tashkend, and from Semipalatinsk to Kashgar —Vyernyi carries on an active trade in wheat, rice, corn, tea, oil, and tobacco. The dislocation of the rocks on the northern slope of the Alatau Mountains is the cause of severe earthquakes, the last of which, on June 9, 1887, destroyed or damaged nearly a thousand stone houses in Vyernyi and its neighbourhood, killing 326 persons. Slighter shocks were felt up till February 1888.

VYSHNIY VOLOTCHOK, a district town of Russia, in the government of Tver, 82 miles by rail to the north-west of that city, owes its importance to its situation in the centre of the Vyshne-Vototsk navigation system, which connects the upper Volga with the Neva. The portage (votok) of less than 17 miles between the Tvertsa, a tribu- tary of the Volga, and the Tsna, which flows into the Msta and the Volkhoff (Lake Ladoga), had long been used for transporting boats from the one basin to the other, and the canal, which was afterwards dug, soon became one of the most important links of connexion between the Volga and the Neva; now, however, the boats prefer the Mariinsk system, and the prosperity of Vyshniy Vototchok is declining. The inhabitants (11,590 in 1884) support themselves chiefly by shipping, and partly by the cotton industry. The trade is still considerable.

W

W is simply double v, so far as the form goes ; but its value, like its name, is double w, and it dates back to a time when ~ and wv had not been fully differentiated, one into a vowel, the other into a consonant (see under U). The oldest form of the letter was wu, sometimes w only; eg., uulfheard, uilfrith, in the Leber Vitx, 9th cen- tury. Later, a peculiar symbol appears, p, called '" wen"; this belonged to the runic alphabet, which the Latin super- seded: it undoubtedly represented the w-sound. It died out about 1300, probably through the influence of French copyists. As early as the 11th century we find wz, later w. The sound denoted by W is a voiced labial, formed by rounding the lips so much that the voice cannot escape without friction. In the nature of the case no hard and fast line can be drawn between it and the vowel « (any more than between 7 and y): it is impossible to say exactly at what point the open position of the lips for « ceases and sufficient closure for a definite consonant begins. We may perhaps mark out three noticeable sounds :—(1) the clear vowel uw; (2) a consonant u, equivalent to a "glide" in the diphthongs "eu," "ou," d&c., 2.¢., a2 sound which is held not long enough to be a vowel as forming a syllable by itself, yet without sufficient friction to make a consonant; (3) the consonant w. The difference between (2) and (3) may be illustrated by the initial sounds of French " oui" and English "' we"; the ow in "oui" is

a consonant u; it does not make a syllable distinct from the following 7, and so it is not a vowel ; yet it is quite distinguishable from the w in "we." It is probable, from some slight indications, principally in Sanskrit, that both (2) and (3) were sounds of the Indo-European language. But. it could hardly be supposed that they would be kept rigorously distinct in the derived languages ; they lie too near together. It has been already pointed out (see article U) that the

representatives of the sound w varied much in the different ,

languages. In Greek we find F and sometimes v (as in evade, &c.); in Latin there was no symbol to distinguish it from the vowel wu. The English varieties are mentioned above. .

For the history of this sound in connexion with the velar & of the original speech see article Q. This sound died out in most of the derived languages, but left traces in Greek—(1) in the symbol koppa, (2) in the phonetic change called " labialism," by which the slight labial of the original sound developed and eventually changed the guttural explosive into a labial, eg., k'ow became zo. Similarly in Italy the Latin gu of "qui," "'quantus," &e., preserved the original symbol and sound, whereas the Oscan and Umbrian agreed with the Greek in labializing.

In English the w-sound has commonly held its own. It has survived in writing, even in the alinost impossible com- bination wr, as in " wrath," "write," " wreck," " wretch," but the sound is lost. In several Old English words the combination cw was exchanged for qu, as was natural under French influence, ¢g., quoth (O.E. cweed), quell (O.E. ewellan), queen (O.E. cwén),

The digraph wh denotes the voiceless sound correspond- ing to the voiced w. In the great majority of cases where it occurs it represents original k",.as in who, what (original base k"a) ; these were originally written hw4, hweet ; so also "while" was "hwil," "wheeze" was "hws" (Lat. ques- tus). In similar combinations with J and r the & has been lost, as in "loud," formerly " hhid " (kAvrés), raven (hrefn), ring (hring); and in hw the & seems to have robbed the w of its voice (a result denoted by the writing wh), and then fallen off here also as an independent sound.

WACE, whom most modern writers without any autho- rity call Ropert, but who simply calls himself " Maistre Wace," was a clerk ("clerc lisant") and trouvére of the 12th century, who was born in Jersey, studied at Caen, and received from Henry II. a prebend at Bayeux with other gifts. Nothing is known certainly of the dates of his birth or death ; but the one is conjecturally put at about 1120 and the other at about 1180. He seems to have been much about the reigning house of Normandy and England: he boasts of the kindness of Henry to him (he knew, he says, three Henrys, the third being Prince Henry, the eldest son of Henry II.), and is said by Layamon to have dedicated his Brut to Eleanor of Aquitaine. This shadowy personality is partly compensated by a consider- able literary work. Wace has left two long romances, the ftoman de Brut and the Roman de Rou, both of which are interesting monuments of Norman French, while the latter is a document of some importance for English his- tory, the writer informing us that he got some direct information from his father, who no doubt was not his only source. The Roman de Brut, the longer of the two, is in octosyllabic couplets of a facile and somewhat undis- tinguished kind. It has generally been regarded as a mere versifying of Geoffrey of Monmouth, a point which turns to some extent of course on the vexed question of Geoffrey's own originals. The Roman de Rou, a chronicle of the Norman dukes, is much more interesting and much more vigorously written. The greater part of it is also in octosyllables, but there is a large insertion of assonanced alexandrines in something like the form of the chansons de geste. Wace is not in mere poetical value a very good example of the trouvéres, but his subjects give him interest, especially for Englishmen.

The first and hitherto the only edition of the Brut is that of Le Roux de Lincy (1838); the Row, after being edited by Pluguet in 1827, has been recently(1877) re-edited by Dr Hugo Andresen.

WACO, a city and the county seat of M'Lennan county, Texas, U.S., is situated on the west bank of the Brazos river, at the mouth of the Bosque, in an agricultural and pastoral region. It contains Waco university (Baptist) and a female college. The population in 1880 was 7295, more than one-third being negroes.

WADAI. See Sovupay, vol. xxii. p. 279.

WADDING, Luxe (1588-1657), ecclesiastical historian, born at Waterford in 1588, emigrated with his parents to Spain in early youth, and from Spain passed to Portugal, to study at the Irish College in Lisbon. While still a student, he entered the order of Cordeliers, or Friars Minim, in 1604, taking the name Michael Angelo of St Romulus, and his early reputation for learning soon ob- tained for him a professorship of theology at Salamanca. Philip III. of Spain was anxious to procure the formal definition of the Immaculate Conception B. V. M., which had been left open by the council of Trent, and sent Diego de Torres, bishop of Cartagena, as ambassador to the pope for that purpose. Torres, being himself a Cordelier, made choice of Wadding to accompany him on his embassy, and the young divine created so favourable an impression at Rome that another chair of theology was bestowed upon him there, and he was made vice-commissary and procurator- general-of his order. He made Rome his headquarters for the remainder of his life, dying there as principal of the Trish College of St Isidore in 1657.

His earliest publication was an account of the embassy in which he had taken part, MpeoBela, sive Legatio Philippi III. et IV.,

Hispaniarum Regum, ad Summos Pontifices Paulum V., Gregorium XV., et Urbanum VIIL., pro definienda Controversia Immaculate

i

Conceptionis Beate Mariex Virginis (Louvain, 1624, fol.). He

contributed, many ycars later, a work to this question himself, Immaculaiz Conceptionis Beatz Marie Opusculum (Rome, 1655, 8vo), now of extreme rarity. He was also author of a treatise on

the Hebrew language and other occasional writings, but his literary reputation rests chicfly upou the important works he published in

connexion with the Franciscan order. The principal of these arc Annales Ordinis Minorum, 8 vols. folio (Lyons and Rome, 1628- 1654), a book of high repute, recast and enlarged by Fonseca, 19 vols, folio (Rome, 1731-1745), and since continued by Michelcsi, 1794, and Melchiori de Ccretto, 1844 ; Scriptores Ordinis Minorum (Rome, 1650), to which is subjoined a reprint of a Syllabus FF, Minorum, a list of the English Franciscans who were put to death in Tudor days, which had become extremely rare, because most of the original impression was sent to England during the legateship of Cardinal Pole, and was seized and destroyed by order of Queen Elizabeth, because of its reflexions upon the character of Henry

VIll.; an edition of the Concordantix Bibliorum Hebraice of

Calasio, 4 vols. folio (Romc, 1621); Opera Omnia Joannis Duns Scoti, 12 vols. in 11, folio (Lyons, 1639); Sti Francisei Assisiatis Opuscula (Antwerp, 1623); and Sti Antonti Paduani Concordantiz Morales (Rome, 1624).

WAFERS, as articles of stationery, consist of thin, brittle, adhesive disks, used for securing papers together, and for forming a basis for impressed official seals. Wafers are made of a thin paste of very fine flour, baked between "wafer irons" over a charcoal fire till the thin stratum of paste becomes dry and brittle, and the flour starch is partly transformed into glutinous adhesive dextrin. The cake is cut into round disks with suitable steel punches. Bright non-poisonous colouring matter is added to the paste for making coloured wafers. Wafers of gelatin are also made.

WAGER. The law of wagers may be divided for purposes of convenience into two great classes, dealing respectively with procedure and with substantive law. In both classes the legal importance of the wager has tended to diminish.

Procedure.—Determination of cases, civil and criminal, by means of wager or analogous forms of procedure is a characteristic feature of archaic law. The legis actio sacramenti at Rome—at first a real, then a fictitious wager—the wager of battle and of law in England, of the highest antiquity in their origin, survived up to a com- paratively late period in the history of both legal systems. The form of the wager survived

long after its reason had been forgotten. The general prevalence of the wager form of proceeding is perhaps to be attributed to the early conception of a judge asa mere referee who decided the dispute submitted to him, not as an executive officer of the state, but as an arbitrator casually called in (see Maine, Ancient Law, c. x.). Wager of battle in England was a mode of trial which was allowed in certain cases, viz., on a writ of right (see Writ), and on appeals of treason and felony (see Apprat). A full account of the judicial combat will be found under Durr and ORDEAL. Wager of law (vadiatio legis) was a right of a defendant in actions of simple contract debt and of detinue. It super- seded the ordeal (itself called Jew in the Assize of Clarendon and other ancient constitutional records). The mode of proceeding in a wager of law was an interesting relic of that system of compurgation—traced by Blackstone to the

osaic law, Ex. xxii. 10—which was employed in many legal systems, especially the Scandinavian, and had probably an appreciable effect on the development of the English Jury (g.v.). It also has some points of re- semblance, perhaps some historical connexion, with the sponsio and the decisory oath of Roman law, and the reference to oath of Scots law (see OatH). The use of the oath instead of the real or feigned combat—real in English law, feigned in Roman law—no doubt represents an advance in legal development. 'The technical term sacra- mentum is the bond of union between the two stages of law. In the wager of law the defendant, with eleven

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compurgators, appeared in court, and he swore that he did not owe the debt or (in detinue) that he did not de- tain the plaintifi's chattel ; while the compurgators swore that they believed that he spoke the truth. It was an eminently unsatisfactory way of arriving at the merits of a claim, and it is therefore not surprising to find that the policy of the law was in favour of its restriction rather than of its extension. Thus it was not permitted where the defendant was not a person of good character, where the king sued, where the defendant was the executor or administrator of the person alleged to have owed the debt, or In any actions other than

those named, even though the cause of action were the same. No wager of law was allowed in assumpsit, even though the cause of action were a simple debt. This led to the general adoption of as- sumpsit—proceeding originally upon a fictitious averment of a promise by the defendant—as a means of recover- ing debts. Where a penalty was created by statute, it became a common form to insert a proviso that no wager of law was to be allowed in an action for the penalty. Wager of law was finally abolished by 3 and 4 Will IV. c. 42. Another form of the judicial wager in use up to 1845 was the feigned issue by which questions arising in the course of Chancery proceedings were sent for trial by jury in a common law court. The plaintiff averred the laying of a wager of £5 with the defendant that a certain event was as he alleged ; the defendant admitted the wager, but disputed the allegation ; on this issue was

joined. 8 and 9 Vict. c. 109 enabled such questions to be

referred by the Chancery to the common law courts in a direct manner. Substantive Law,—A wager may be defined as"a promise to pay money or transfer property upon the determination or ascertainment of an uncertain event" (Anson, Law of Contract, p. 171). At common law wagers were legally enforceable, subject to certain rules dictated by considera- tions of public policy, eg., that they did not lead to immorality or breach of the peace, or expose a third person to ridicule. Actions or wagers were not favoured by the

judges ; and, though a judge could not refuse to try such

an action, he could, and often did, postpone it until after the decision of more important cases. Parliament gradu- ally intervened to confine the common law within narrower limits, both in commercial and non-commercial wagers, and both by general and temporary enactments. An example of the latter was 7 Anne c. 16, avoiding all wagers and securities relating to the then war with France, The earliest general enactment was 16 Car, IL. c. 7, pro- hibiting the recovery of a sum exceeding £100 lost in games or pastimes, or betting on the sides or hands of the players, and avoiding securities for money so lost. 9 Anne c. 19 avoided securities for such wagers for any amount, even in the hands of bona fide holders for value without notice, and enabled the loser of £10 or upwards to sue for

the money he had lost within three months. The hardship of the Act, as it affects securities in the hands of bona fide holders, was remedied by 5 and 6 Will. IV. c. 41, which enacted that such securities should be taken to be held for illegal consideration. Finally, 8 and 9 Vict. c. 109, § 18, enacted "that all contracts or agreements, whether by parole or in writing, by way of gaming or wagering shall be null and void; and that no suit shall be brought or maintained in any court of law or equity for recovering any sum of money or valuable thing alleged to be won upon any wager, or which shall have been deposited in the hands of any person to abide the event on which any wager shall have been made; provided always that this enactment shall not be deemed to apply to any sub-scription, or contribution, or agreement to subscribe or contribute, for or towards any plate, prize, or sum of XXIV. — 39

Defini- tion.

money to be awarded to the winner or winners of any lawful game, sport, pastime, or exercise."

What is a lawful game depends upon numerous statutes from 38 Hen. VIII. c. 9 downwards, among which may be classed the Lottery Acts (see Lorrrrims). A curions exception is made in some of the statutes in favour of unlawful games if they are played in a royal palace. The mere making of a wager is not now illegal, as it was under the earlier statutes ; it is simply unenforceable. The winner has no legal remedy against the loser or the stake- holder. The loser can recover his stake where it still remains in the stakeholder's hands or has been paid over to the winner aftcr notice from the loser to the stakeholder not to pay it over. He cannot recover where it has been paid over to the winner without notice. The agentin a wagering contract may have legal rights against his principal, though the principal has none against the other party. Agreements between buyers and scllers of stocks and shares to pay or receive differences only (sometimes known as "'time-bargains") are within 8 and 9 Vict. c. 109, but a broker employed to speculate on the understanding that only differences should be paid by his principal may recover indemnity against the principal. Employment of an agent to bet in his own

name may imply an authority to pay the bet if lost, an authority that may become irrevocable after payment to the winner. Though wagers themselves are now void and not illegal, securities for wagers, by the combined effect of 5 and 6 Will. IV. c. 41 and 8 and 9 Vict. c. 109, are still either illegal (as a bet on the result of a game) or void (as a bet on the result of something other than a game, such as a contested clection). This difference is important as affecting the question of burden of proof in actions on securities originally given for wagering purposes. Where the consideration is illegal, the plaintiff must show affirmatively that he gave value, but the mere absence of consideration throws on him no such duty. In commercial matters the most important examples are wagering policies of insurance, that is, policies made by persons having no insurable interest, and made void by statute (sec INSURANCE). Sir John Barnard's Act, 7 Geo II. c. 8 (called "An Act to prevent the infamous practice of stock-jobbing "), prohibited contracts for liberty to accept or refuse any public stocks or securities, and wagers relating to the stocks.

In Scotland the courts refuse to try actions on wagers, as being sponstones ludicre#, unbecoming the dignity of the courts. 9 Anne c. 19 and 5 and 6 Will. IV. c. 41 extend to Scotland, but the weight of judicial opinion is that 8 and 9 Vict. c. 109 does not. In the United Statcs the loser may, by the legislation of some States, recover his money if he sue within a limited time, as he might have done in,England under 9 Anne c. 19.

WAGES. Wages, although one of the most common and familiar terms in economic science, is at the same time one of the most difficult to define accurately. The natural definition is that wages is the "reward for labour," but then we are at once confronted with the difficulty so well stated by Adam Smith :—" The greater part of people understand better what is meant by a quantity of a particular commodity than by a quantity of labour ; the one is a plain palpable object, the other an abstract notion, which, though it can be made sufficiently intelligible, 1s not altogether so natural and obvious." If we regard wages as the reward for a quantity of labour, it is clear that to make the meaning precise we must give a precise meaning to this abstract notion of Adam Smith. From the point of view of the labourer the quantity of labour refers not so much to the work accomplished (e.g., raising so many foot-pounds) as to " all the feelings of

a disagree- able kind, all the bodily inconvenience or mental annoyance connected with the employment of one's thoughts or muscles or both in a particular occupation " (J. 8. Mill). But this analysis seems only to make the task of definition more difficult, for the class of labourers, in this wide sense of the term labour, would include the capitalist who racks his brains in making plans just as much as the navvy who digs with the sweat of his brow. Thus " profits," in the ordinary sense of the term, instead of being contrasted would to a large extent be classified with wages, and in fact the wages of superintendence or of management is one of the recognized elements in the classical analysis of profits. It is, however, only when we refer to the list of " occupations " in any civilized country that we can really form an adequate idea of the variety of classes to which

the term labour, as defined by Mill, may be extended. In the General Report of the census (1881) in England and Wales (published 1883) an analysis is given of the "un- occupied class." After deducting children and young persons under fifteen, persons over sixty-five years of age, who for the most part had been engaged in work of some kind previously, and those between the ages of fifteen and twenty, who might be considered as training for work, there remained 4,641,190 between the ages of twenty and sixty- five without specified occupation. But of these 4,458,908 were " women, of whom by far the greater part were married and engaged in the management of domestic life," and thus the number of males in the working period of life (20-65) of the " unoccupied " class was reduced to 182,282. Thus practically nearly the whole of the efficient male population of the country was engaged in some form of " labour " and in receipt of some form of " wages."

It may be granted that in certain economic inquiries it is extremely useful to bring out the points of resemblance between " workers" at the various stages of the social scale, and it is especially serviceable in showing that the op- position between "employer" and the "employed," and the " classes " and the "' masses," is often exaggerated. At the same time, however, the differences, if not m kind at any rate in degree, are so great that if the analogy is carried very far it becomes misleading. Accordingly it seems natural to adopt as the preliminary definition of "wages"? something equivalent to that of Prof. Walker in his work on the Wages

Question (the best book on the subject as a whole), viz., "the reward of those who are employed in production with a view to the profit of their employers and are paid at stipulated rates." Even as thus restricted the " working or wage-earning classes " represent probably two-thirds of the population of the United King- dom. It may be observed that by extending the meaning of production, as is now done by most economists, to include all kinds of labour, and by substituting benefit for profit, this definition will include all grades of wages.

Having thus limited the class of those who earn Nominal

"wages," the next point is to consider the way in which and real the wages ought to be measured. The most obvious V8 method is to take as the rate of teme-wages the amount of money earned in a certain time, and as the rate of task- wages the amount of money obtained for a given amount of work of a given quality; and in many inquiries this rough mode of measurement is sufficient. But the intro- duction of money as the measure at once makes it necessary to assume that for purposes of comparison the value of the money to the wage-earners may be considered constant. This supposition, however, does not hold good even between different places in the same country at the same time, and still less with variations in time as well as place. To the labourers, however, the amdunt of money they obtain is only a means to an end, and accordingly economists have drawn a sharp distinction between nominal and real wages. " Labour, like commodities," says Adam Smith, 'may be said to have a real anda nominal price. Its real price may be said to consist in the quantity of the necessaries and conveniences of life which are given for it; its nominal price in the quantity of money. The labourer is rich or poor, is well or ill rewarded, in proportion to the real not to the nominal price of his labour."

Prof. Walker (op. cit., p. 12 sg.) has given a full Vario analysis of the principal elements which ought to be a taken into account in estimating the real wages of labour. a They may be classified as follows. (1) Variations in ~ the purchasing power of money may be due in the first place to causes affecting the general level of prices in a country. Such, for

instance, is a debasement of the coinage, of which a good example is furnished in English

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history in the reigns of Henry VIII. and Edward VI. Prof. Thorold Rogers has ascribed much of the degra- dation of labour which ensued to this fact; and Lord Macaulay has given a graphic account of the evils suffered by the labouring classes prior to the recoinage of 1696. The issues of inconvertible paper notes in excess have frequently caused a disturbance of real wages, and it is generally asserted that in this case wages as a rule do not rise so quickly as commodities. A general rise in prices due to great discoveries of the precious metals would, if nominal wages remained the same, of course cause a fall in real wages. There are, however, good grounds for suppos- ing that the stimulus given to trade in this case would raise wages at least in proportion ; and certainly the great gold discoveries in Australia and California raised wages in England, as is shown in Tooke's History of Prices, vol. v. p. 284. Similarly it is possible that a general fall in prices, owing to a relative scarcity of the precious metals, may lower the prices of commodities before it lowers the price of labour, in which case there is a rise in real wages. In the controversy as to the possible advantages of bi- metallism this is one of the points most frequently dis- cussed. It is impossible to say a priori whether a rise or fall in general prices, or a change in the value of money, will raise or lower real wages, since the result is effected principally by indirect influences. But, apart from these general movements in prices, we must, in order to find the real value of nominal wages, consider variations in local prices, and in making this estimate we must notice the principal items in the expenditure of the labourers. Much attention has been given recently by statisticians to this subject, with the view of finding a good " index number" for real wages. (2) Varieties in the form of payment require careful attention. Sometimes the payment is only partly in money, especially in agriculture in some places. In many parts of Scotland the labourers receive meal, peats, potatoes, &c. (3) Opportunities for extra earnings are sometimes of much importance, especially if we take as the

wage-earning unit the family and not the individual. At the end of last century Arthur Young, in his celebrated tours, often calls attention to this fact. At the present time, in Northumberland and other counties a "hind" (2.e., agricultural labourer) is more valued if he has a large working family, and the family earnings are relatively large. (4) Regularity of employment is always, especially in modern times, one of the most important points to be considered. Apart from such obvious causes of fluctuation as the nature of the employment, e.g.,in the case of fisher-men, guides, &c., there are various social and industrial causes (for a particular and able investigation of which the reader may consult Prof. Foxwell's essay on the subject). Under the system of production on a large scale for foreign markets, with widely-extended division of labour, it seems impossible to adjust accurately the supply to the demand, and there are in consequence constant fluctuations in the employment of labour. A striking example, happily rare, is furnished by the cotton famine during the American civil war. (5) In forming a scientific conception of real wages we ought to take into account the longer or the shorter duration of the power to labour: thé man whose employment is healthy and who lives more comfortably and longer at the same nominal rate of wages may be held to obtain a higher real wage than his less fortunate com- petitor. It is worth noting, in this respect, that in nearly every special industry there is a liability to some special form of disease: ¢.g., lace-workers often suffer from diseases of the eyes, miners from diseases of the lungs, &e. (For further illustration the reader may consult the excellent works of Mr Bevan on Industrial Classes and Industrial Statistics.) Thus, in attempting to estimate real wages, we

have to consider all the various discomforts involved in the " quantity of labour " as well as all the conveniences which the nominal wages will purchase and all the supple- ments in kind.

In a systematic treatment of the wages question it General

would be natural to examine next the causes which ae determine the general rate of wages im any country at any sy coun. time. This is a problem to which economists have try at given much attention, and is one of great complexity. any time. It is difficult, when we consider the

immense variety of " occupations " in any civilized country and the constant changes which are taking place, even to form an adequate conception of the general rate of wages. At the census in 1881 in the United Kingdom, the commissioners found it necessary to make a small dictionary of the words by which different classes of workers described their callings, and without a special dictionary it would be impossible to classify such as the following : "' blabber," " doctor-maker," "fluker," "egger," "lurer," "toother," é&c., &c. There are thousands of occupations of various kinds, and at first sight it may seem impossible to determine, in a manner sufficiently accurate for any useful purpose, an average or general rate of wages, especially if we attempt to take real and not merely nominal wages. At the same time, how- ever, in estimating the progress of the working-classes, or in comparing their relative positions in different countries, it is necessary to use this conception of a general rate of wages in a practical manner. The difficulties presented are of the same kind as those met with in the determina- tion of the value of money or the general level of prices, and may be overcome to some extent by thesame methods. An "index number" may be formed by taking various kinds of labour as fair samples, and the nominal wages thus obtained may be corrected by a consideration of the elements in the real wages to which they correspond. Care must be taken, however, that the quantity and quality of labour taken at different times and places are the same, just as in the case of commodities similar precautions are necessary. Practically, for example, errors are constantly made by taking the rate of wages for a short time (say an hour), and then, without regard to regularity of employ- ment, constructing the annual rate on this basis; and again, insufficient attention is paid to Adam Smith's pithy caution that " there may be more labour in an hour's hard work than in two hours' easy business." But, however difficult it may be to obtain an accurate measure of the general rate of wages for practical purposes, there can be no doubt as to the value and necessity of the conception in the theory of political economy. For, as soon as it is assumed that industrial competition is the principal economic force in the distribution of the wealth of a com- munity, and this is in reality the fundamental assumption of modern economic science, a distinction must be drawn between the most general causes which affect all wages and the particular causes which lead to differences of wages in different employments. In other words, the actual rate of wages obtained*

in any particular occupation depends partly on causes affecting that group compared with others, and partly on the general conditions which determine the relations between labour, capital, and production over the whole area in which the industrial competition is effective.

Thus the theory of the wages question consists of two Wages-

A : , fund parts, or gives the answers to two questions :—(1) What on are the causes which determine the general rate of wages } a (2) Why are wages in some occupations and at some times and places above or below this general rate ?

With regard to the first question, Adam Smith, as in almost every important economic theory, gives an answer which combines two views which were subsequently

Analysis of the theory.

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differentiated into antagonism. "'The produce of labour constitutes the natural recompense or wages of labour," is the opening sentence of his chapter on wages. But then he goes on to say that 'this original state of things, in which the labourer enjoyed the whole produce of his own labour, could not last beyond the first introduction of the appropriation of land and the accumulation of stock." And he thus arrives at the conclusion that " the demand for those who live by wages, it is evident, cannot increase but in proportion to the increase of the funds which are destined to the payment of wages." This is the germ of the celebrated wages-fund theory which was carried to an extreme by J. S. Mill and others; and, although Mill abandoned the theory some time before his death, he was unable to eradicate it from his systematic treatise and to reduce it to its proper dimensions. It is important to observe that in the hands of Mill this theory was by no means, as was afterwards maintained by Prof. Cairnes, a mere statement of the problem to be solved. According to Cairnes (Leading Principles of Political Economy, bk. ii.), the wages-fund theory, as given in Mill's Princoples (bk. ii. ch. xi. §1), embraces the following statements :—(1) the wages-fund is a general term used to

express the aggregate of all wages at any given time in possession of the labour- ing population ; (2) the average wage depends on the proportion of this fund to the number of people ; (3) the amount of the fund is determined by the amount of general wealth applied to the direct purchase of labour. These propositions Cairnes easily reduces to mere verbal statements, and he then states that the real difficulty is to determine the causes which govern the demand and supply of labour. But the most superficial glance, as well as the most careful survey, will convince the reader of Mill's chapters on wages that he regarded the theory not as the statement but as the solution of the problem. For he applies it directly to the explanation of movements in wages, to the criticism of popular remedies for low wages, and to the discovery of what he considers to be legiti- mate and possible remedies. In fact, it was principally on account of the application of the theory to concrete facts that it aroused so much opposition, which would have been impossible if it had been a mere statement of the problem.

The wages-fund theory as a real attempt to solve the wages question may be resolved into three propositions, which are very different from the verbal truisms of Cairnes. (1) In any country at any time there is a determinate amount of capital unconditionally destined for the pay- ment of labour. This is the wages-fund. (2) There is also a determinate number of labourers who must work independently of the rate of wages,—that is, whether the rate is high or low. (3) The wages-fund is distributed amongst the labourers solely by means of competition, masters competing with one another for labour, and labourers with one another for work, and thus the average rate of wages depends on the proportion between wage- capital and population. It follows then, according to this view, that wages can only rise either owing to an increase of capital or a diminution of population, and this accounts for the exaggerated importance attached by Mill to the Malthusian theory of population. It also follows from the theory that any restraint of competition in one direction can only cause a rise of wages by a corresponding fall in another quarter, and in this form it was the argument most frequently urged against the action of trade unions. It is worth noting, as showing the vital connexion of the theory with Muiull's principles, that it is practically the foundation of his propositions on capital in his first book, and is also the basis of the

exposition in his fourth book of the effects of the progress of society on the condition of the working-classes.

WACGCHS

It has often been remarked that, in economics as in other sciences, what eventually assumes the form of the development of or supplement to an old theory at first appears as if in direct antagonism to it, and there is reason to think that the criticism of the wages-fund theory was carried to an extreme, and that the essential elements of truth which it contains were overlooked. In many respects the theory may be regarded as a good first approximation to the complete solution of the problem. The causes which it emphasizes too exclusively are after all vere cause, and must always be taken into account. There can be no doubt, for example, that under certain conditions a rapid Increase in the labouring population may cause wages to fall, just as a rapid decline may make them rise. The most striking example of a great improve- ment in the condition of the labouring classes in English economic history is found immediately after the occurrence of the Black Death in the middle of the 14th century. The sudden and extensive thinning of the ranks of labour was manifestly the principal cause of the great improve- ment in the condition of the survivors.

Again, as regards the amount of capital competing for Apparent labour, the reality of the cause admits of no dispute, at any truth of

rate in any modern society. The force of this element is perhaps best seen by taking a particular case and oon that the general wages-fund of the country is divided into a number of smaller wages-funds. Take, for example, the wages of domestic servants when the payment of wages is made simply for the service rendered. We may fairly assume that the richer classes of the community practically put aside so much of their revenue for the payment of the wages of their servants. The aggregate of these sums is the domestic wages-fund. Now, if owing to any cause the amount available for this purpose falls off, whilst the number of those seeking that class of employment remains the same, the natural result would be a fall in wages. It may of course happen in this as in other cases that the result is not so much a direct fall in the rate of wages as a

diminution of employment—but even in this case, if people employ fewer servants, they must do more work. Again, if we were to seek for the reason why the wages of governesses are so low, the essence of the answer would be found in the excessive supply of that kind of labour compared with the funds destined for its support. And similarly through the whole range of employments in which the labour is employed in perishable services and not in material products, the wages-fund theory brings into pro- minence the principal causes governing the rate of wages, namely, the number of people competing, the amount of the fund competed for, and the effectiveness of the com- petition. This view also is in harmony with the general principles of demand and supply. If we regard labour as a commodity and wages as the price paid for it, then we may say that the price will be so adjusted that the quantity demanded will be made equal to the quantity offered at that price,—the agency by which the equation is reached being competition.

But when we turn to other facts for the verification Apparent of the theory we easily discover apparent if not real ae of

contradictions. The case of Ireland after the potato famine affords an instance of a rapidly declining popu- lation without any corresponding rise in wages, whilst in new countries we often find a very rapid increase of population accompanied by an increase in wages. In a similar manner we find that the capital of a country may increase rapidly without wages rising in pro- portion—as, for example, seems to have been the case in England after the great mechanical improvements at the end of last century up to the repeal of the Corn Laws— whilst in new countries where wages are the highest there

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are generally complaints of the scarcity of capital. But perhaps the most striking conflict of the theory with facts is found in the periodical inflations and depressions of trade. After a commercial crisis, when the shock is over and the necessary liquidation has taken place, we generally find that there is a period during which there is a glut of capital and yet wages are low. The abundance of capital is shown by the low rate of interest and the difficulty of obtaining remunerative investments.

Accordingly this apparent failure of the theory, at least partially, makes it necessary to examine the propositions into which it was resolved more carefully, in order to discover, in the classical economic phraseology, the " disturbing causes." As re- gards the first of these propositions—that there is always a certain amount of capital destined for the employment of labour—it is plain that this destination is not really unconditional. In a modern society whether or not a capitalist will supply capital to labour depends on the rate of profit expected, and this again depends proximately on the course of prices. But the theory as stated can only consider profits and prices as acting in an indirect round- about manner upon wages. If profits are high then more

combine to create a practical monopoly. Again, the end may be attained by leaving the control to Government, or by obeying the unwritten rules of long-established custom. But these methods of satisfying the economic instincts are opposed to competition in the usual sense of the term, and certainly as used in reference to labour. 'Thus on the negative side competition implies that the economic interests of the persons concerned are attained neither by combination, nor by law, nor by custom. Again, it is also assumed, in making competition the principal distributing force of the national income, that every person knows what his real interests are, and that there is perfect mobility of labour both from employment to employment and from place to place. Without these assumptions the wages-fund would not be evenly distributed according to the quantity of labour. It is, however, obvious that, even in the present industrial system, competition is modified considerably by these disturbing agencies ; and in fact the tendency seems to be more and more for combinations of masters on one side and of men on the other to take the place of the competition of individuals.

The attempted verification of the wages-fund theory leads Wages tosomany important modifications that it is not surprising paid +3 to find that in recent times the tendency has been to reject /™0™ the

: : d it altogether. And thus we arrive at the development of Toon

capital can be accumulated and there is a larger wages- fund, and if prices are high there may be some stimulus to trade but the effect on real wages is considered to be

very small. In fact Mill writes it down as a popular delusion that high prices make high wages. And if the high prices are due purely to currency causes the criticism is in the main correct, and in some cases, aS was shown above, high prices may mean low real wages. If, how- ever, we turn to the great classes of employments in which the labour is embodied in a material product, we find on examination that wages vary with prices in a real and not merely in an illusory sense. Suppose, for example, that, owing to a great increase in the foreign demand for our produce, a rise in prices takes place, there will be a corresponding rise in nominal wages, and in all probability a rise in real wages. Such was undoubtedly the case in Great Britain on the conclusion of the Franco- German war.

On the other hand, if prices fall and profits are low, there will so far be a tendency to contract the employment of labour. At the same time, however, to some extent the capital is applied unconditionally,—in other words, with- out obtaining what is considered adequate remuneration, or even at a positive loss. The existence of a certain amount of fixed capital practically implies the constant employment of a certain amount of labour.

Nor is the second proposition perfectly true, namely, that there is always a certain amount of labourers who must work independently of the rate of wages. For the returns of pauperism and other statistics show that there is alwaysa proportion of "floating" labour sometimes em- ployed and sometimes not. Again, although, as Adam Smith says, man is of all luggage the most difficult to be transported, still labour as well as capital may be attracted to foreign fields. The constant succession of strikes resorted to in order to prevent a fall in wages shows that in practice the labourers do not at once accept the " natural " market rate. Still, on the whole, this second proposition is a much more adequate expression of the truth than the first ; for labour cannot afford to lie idle or to emigrate so easily as capital.

The third proposition, that the wages-fund is distributed solely by competition is also found to conflict with facts. Competition may be held to imply in its positive meaning that every individual strives to attain his own economic interests regardless of the interests of others. But in some cases this end may be attained most effectively by means of combination, as, for example, when a number of people

Adam Smith's introductory statement, namely, that the pro- duce of labour constitutes the natural recompense or wages of labour. The most important omission of the wages- fund theory is that it fails to take account of the quantity produced and of the price obtained for the product. If we bring in these elements, we find that there are several other causes to be considered besides capital, popula- tion, and competition. There are, for example, the various factors in the efficiency of labour and capital, in the organiz- ation of industry, and in the general condition of trade. To some extent these elements may be introduced into the old theory, but in reality the point of view is quite different. This is made abundantly clear by considering Mill's treatment of the remedies for low wages. His main con- tention is that population must be rigidly restrained in order that the average rate of wages may bekept up. But, as several American economists have pointed out, in new countries especially every increase in the number of labourers may be accompanied by a more than proportionate increase in the produce and thus in the wages of labour. Again, the older view was that capital must be first accumulated in order afterwards to be divided up into wages, as if apparently agriculture was the normal type of industry, and the workers must have a store to live on until the new crop was grown and secured. But the " produce" theory of wages considers that wages are paid continuously out of a continuous product, although in some cases they may be advanced out of capital or accumulated stores. According to this view wages are paid out of the annual produce of the land, capital, and labour, and not out of the savings of previous years. 'There is a danger, however, of pushing this theory to an untenable extreme, and over- looking altogether the function of capital in determining wages ; and the true solution seems to be found in a com- bination of the "produce" theory with the ''fund" theory.

An industrial society may be regarded, in the first place, as a great productive machine turning out avast variety of products for the consumption of the members of the society. The distribution of these products, so far as it is not modified by other social and moral conditions, depends upon the principle of 'reciprocal demand." In a pre- liminary rough classification we may make three groups— the owners of land and natural agents, the owners of capital or reserved products and instruments, and the owners of labour. To obtain the produce requisite even

Relative wages.

Natural the policy of Europe. causes of

differ- ence.

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for the necessary wants of the community a combination of these three groups must take place, and the relative reward obtained by each will vary in general according to the demands of the others for itsservices. Thus, if capital, both fixed and circulating, is scanty, whilst labour and land are both abundant, the reward of capital will be high rela- tively to rent and wages. This is well illustrated in the high rate of profits obtained in early societies. According to this view of the question the aggregate amount paid in wages depends partly on the general productiveness of all the productive agents and partly on the relative power of the labourers as compared with the owners of land and capital (the amount taken by Government and individuals for taxes, charity, &c., being omitted). Under a system of perfect industrial competition the general rate of wages would be so adjusted that the demand for labour would be just equal to the supply at that rate.

Tf all labour and capital were perfectly uniform it would not be necessary to carry the analysis further, but as a matter of fact, instead of two great groups of labourers and capitalists, we have a multitude of subdivisions all under the influence of reciprocal demand. Every sub- group tries to obtain as much as possible of the general product, which is practically

always measured in money. The determination of relative wages depends on the con- stitution of these groups and their relations to one another. Under any given social conditions there must be differ- ences of wages in different employments, which may be regarded as permanent until some change occurs in the conditions ; in other words, certain differences of wages are stable or normal, whilst others depend simply on temporary fluctuations in demand and supply. A celebrated chapter in the Wealth of Nations (bk. i. ch. x.) is still the best basis for the investigation of these normal differences,— which, as stated above, is the second principal problem of the wages question. First of all, a broad distinction may be drawn between the natural and artificial causes of dif- ference, or, in Adam Smith's phraseology, between those due to the nature of the employments and those due to In the former division we have (1) the agreeableness or disagreeableness of the employ- ment, illustrated by two classical examples—' honour makes a great part of the reward of all honourable pro- fessions," and " the most detestable of all employments — that of public executioner—is, in proportion to the work done, better paid than any common trade whatever." There is, however, much truth in Mill's criticism, that in many cases the worst paid of all employments are at the same time the most disagreeable, simply because those engaged in them have practically no other choice. (2) The easiness and cheapness or the reverse of learning the business. This factor operates in two ways. A difficult business implies to some extent peculiar natural qualifica- tions, and it also involves the command of a certain amount of capital to subsist on during the process of learning, and thus in both respects the natural supply of labour is limited. (3) The constancy or inconstancy in the employment,—a point already noticed under real wages. (4) The great or small trust reposed in the workmen, an important consideration in all the higher grades of labour, e.g., bankers, lawyers, doctors, &c. (5) The chance of success or the reverse. Here it is to be observed that, owing to the hopefulness of human nature and its in- fluence on the gambling spirit, the chance of success is generally over-estimated, and therefore that the wages in employments where the chance of success is really small are lower than they ought to be. The most striking in- stance is furnished by the labour in gold mines, diamond fields, and the like, and the same cause also operates in many of the professions.

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All these causes of differences of wages in different employments may be explained by showing the way in which they operate on the demand and supply of labour in the particular group. If the " net advantages," to adopt Prof. Marshall's phraseology, of any group are relatively high, then labour will be directly attracted to that group, and the children born init will be brought up to the same occupation, and thus in both ways the supply of labour will be increased. But the "net advantages" embrace the conditions just enumerated. Again, if the other members of the community require certain forms of labour to a greater extent, there is an increase in the demand and a rise in their price.

Tn addition to these so-called natural causes of difference, Artificial there are those arising from law, custom, or other so-called causes of artificial causes. They may be classified under four head- q

ings. (1) Certain causes artificially restrain industrial competition by limiting the number of any particular group. Up to the close of last century, and in many instances to a much later date, the regulations of guilds and corporations limited the numbers in each trade (cf. Brentano, Guilds and Trade Unions). This they did by making a long apprenticeship compulsory on those wishing to learn the craft, by restricting the number of apprentices to be taken by any master, by exacting certain qualifications as to birth or wealth, by imposing heavy entrance fees, either in money or in the shape of a useless but expensive masterpiece. Some of these regulations were originally passed in the interests of the general public and of those employed in the craft, but in the course of time their effect was, as is stated by Adam Smith, simply to unduly restrain competition. The history of the craft- guilds is full of instructive examples of the principles governing wages. No doubt the regulations tended to raise wages above the natural rate, but as a natural con-sequence industry migrated to places where the oppressive regulations did not exist. In the time of the Tudors the decay of many towns during a period of rapid national progress was largely due to those "fraternities in evil," as Bacon called the guilds. At present one of the best examples of the survival of this species of artificial restriction is the limitation of the

number of teachers qualifying for degrees in certain universities. (2) In some employments, however, law and custom tend unduly to increase the amount of competition. This was to a great extent the case in the church and the scholastic professions owing to the large amount of charitable edu- cation. Adam Smith points out that even in his day a curate was "passing rich on forty pounds a year," whilst many only obtained £20,—below the wages earned by a journeyman shoemaker. In the same way state-aided education of a commercial and technical kind may result in lowering the rates (relatively) of the educated business classes. It is said that one reason why the Germans replace Englishmen in many branches is that, having obtained their education at a low rate, there are more of them qualified, and consequently they accept lower wages. The customary idea that the position of a clerk is more genteel than that of an artisan accounts largely for the excessive competition in the former class, especially now that education is practically universal. (3) In some cases law and custom may impede or promote the circulation of labour. At the time Adam Smith wrote the laws of settlement were still in full operation. "There is nota man of forty who has not felt most cruelly oppressed by this ill-contrived law of settlement." Differences in wages in different parts of the same country and in different occupations are still largely due to impediments in the way of the movement of labour, which might be removed or lessened by the Government making provisions for

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migration or emigration. (4) On many occasions in the past the law often directly interfered to regulate wages. The Statute of Labourers, passed immediately after the Black Death, was an attempt in this direction, but it appears to have failed, according to the investigations of Prof. Thorold Rogers. The same writer, however, ascribes to the celebrated Statute of

Apprentices (5th of Elizabeth) the degradation of the English labourer for nearly three centuries (Agriculture and Prices, vol. v.). This, he asserts, was due to the wages being fixed by the justices of the peace. It is, however, worth noting that Brentano, who is equally sympathetic with the claims of labour, asserts that so long as this statute was actually enforced, or the customs founded upon it were observed, the condition of the labourers was prosperous, and that the degradation only began when the statute fell into disuse (Origin of Guilds and Trade Unions).

It is impossible in the limits of this article to discuss this particular case, but something must be said as to the power of the state to regulate wages. As far as any direct regulation is concerned, it seems to be only possible within narrow limits. The state might of course insti- tute certain complex sliding-scales for different classes of labour and make them compulsory, but this would rather be an official declaration of the natural market rate than a direct regulation. Any rate which the state of trade and prices would not bear could not be enforced: masters could not be compelled to work at a loss or to keep their capital employed when it might be more advantageously transferred to another place or occupation. Thus the legal rate could not exceed to any considerable extent the market rate. Nor, on the other hand, could a lower rate in general be enforced, especially when the labourers have the right of combination and possess powerful organizations. And even apart from this the competition of capitalists for labour would tend to raise wages above the legal rate, and evasion would be extremely easy.

The best illustration of the failure to raise the rate of wages directly by authority is found in the English poor law system between 1796 and 1834. "In the former year (1796) the decisively fatal step of legalizing out- relief to the able-bodied, and in aid of wages, was taken," and "in February 1834 was published perhaps the most remarkable and startling document to be found in the whole range of English, perhaps indeed of all social, history" (Fowle's Poor Law). The essence of the system was in the justices determining a natural rate of wages, regard being paid to the price of necessaries and the size of the labourer's family, and an amount was given from the rates sufficient to make up the wages received to this natural level. The method of administration was certainly bad, but the

best administration possible could only have kept the system in existence a few years longer. In one parish the poor-rate had swallowed up the whole value of the land, which was going out of cultivation, a fact which has an obvious bearing on land nationalization as a remedy for low wages. The labourers became careless, inefficient, and improvident. Those who were in regular receipt of relief were often better off (in money) than independent labourers. But the most important con- sequence was that the real wages obtained were, in spite of the relief, lower than otherwise they would have been, and a striking proof was given that wages are paid out of the produce of labour. The Report of the Poor Law Commissioners (1834) states emphatically (p. 48) that "the severest sufferers are those for whose benefit the system is supposed to have been introduced and to be perpetuated, the labourers and their families." The inde- pendent labourers suffered directly through the unfair competition of the pauper labour, but, as one of the sub-

reporters stated, in every district the general condition of the independent labourer was strikingly distinguishable from that of the pauper and superior to it, though the independent labourers were commonly maintained upon less money.

But, although the direct intervention of the state, with the view of raising the nominal rates of wages, is, according to theory and experience, worse than useless, still, when we consider real wages in the evident sense of the term, there seems to be an almost indefinite scope for state interference.

The effect of the Factory Acts and similar legislation has Factory been undoubtedly to raise the real wages of the working- !egisla-

classes as a whole, although at first the same arguments were used in opposition to these proposals as in the case of direct relief from the poor-rates. But there is a vital difference in the two cases, because in the former the tendency is to increase whilst in the latter it is to diminish the energy and self-reliance of the workers. An excellent summary of the results of this species of industrial legisla- tion is given by Mr John Morley (Life of Cobden, vol. i. p. 303) :—

‘ We have to-day a complete, minute, and voluminous code for the protection of labour: buildings must be kept pure of effluvia ; dangerous machinery must be fixed; ehildren and young persons must not clean it while in motion; their hours are not only limited but fixed; eontinuous employment must not exeeed a given number of hours, varying with the trade but prescribed by the law in given cases; a statutable number of holidays is imposed; the ehildren must go to school, and the employer must have every week a eertifieate to that effeet; if an aceident happens notice must be sent to the proper authorities; speeial provisions are made for bakehouses, for lace-making, for eollieries, and for a whole seliedulo of other special callings; for the due enforcement and vigilant supervision of this immense host of minute prescriptions there is an immense host of inspectors, eertifying surgeons, and other authorities whose business it is to ‘speed and post o’er land and ocean’ on sullen guardianship of every kind of labour, from that of the woman who plaits straw at her cottage door to the miner who descends into the bowels of the earth and the seaman who conveys the fruits and materials of universal industry to and fro between the remotest parts of the globe.”*

The analysis previously given of real wages shows that logically all these improvements in the conditions of labour, by diminishing the ‘“ quantity of labour ” involved in work, are equivalent to a real rise in wages. Experience has also shown that the state may advantageously interfere in regulating the methods of paying wages. A curious poem, written about the time of Edward IV., on England’s commercial policy (Political Songs and Poems, Rolls Series, vol. ii. p. 282), shows that even in the 15th century the “truck” system was in full operation, to the disadvantage of the labourers. The cloth-makers, in par- ticular, compelled the workers to take half of their wages in merchandise which they estimated at higher than its real value. The writer proposes that the “wyrk folk be paid in good moné,” and that a sufficient ordinance be passed for the purpose, and a law to this effect was enacted in the 4th year of Edward IV. At the present day the Truck Act (1st and 2d William IV.) is in full operation, and has quite recently been extended. Again, the legis- lation directed against the adulteration of all kinds of goods, which also finds its prototypes in the Middle Ages is in its effects equivalent to a rise in real wages.”

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The power of trade unions in regulating wages is in Trade most respects analogous in principle to that of legislation unions

just noticed. Nominal wages can only be affected within – comparatively narrow limits, depending on the condition of trade and the state of prices, whilst in many cases a rise In the rate in some trades or places can only be accomplished by a corresponding depression elsewhere. At the same een le i

1 For a general criticism of the Allowance System, ¢f. Mill's Principles, bk. ii. ch. xi. § 3.

2 On this subject compare Jevons, The State in Relation to Labour.

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time, however, it can hardly be questioned that through the unions nominal wages have on the whole risen at the expense of profits,—that is to say, that combinations of labourers can make better bargains than individuals. But the debatable margin which may make either extra profits or extra wages is itself small (cf. Atkinson on the Distribution of Products), and at present the principal direct effect of trade unions is to make wages fluctuate with prices, a rise at one time being compensated by a fall at another. The unions can, however, look after the interests of their members in many ways which improve their general condition or raise the real rate of wages, and when nominal wages have attained a natural maximum, and some method of arbitration or sliding-scale is in force, this indirect action seems the principal function of trade unions. The

effects of industrial partnership (cf Sedley Taylor's Profit Sharing) and of productive co-operation (cf: Holyoake's History of Co-operation) are at present small in amount (compared with the total industry of any country) though excellent in kind, and there seem to be no signs of the decay of the entrepreneur system.

The industrial revolution which took place about the end of last century, involving radical changes in pro- duction, destroyed the old relations between capital and labour, and perhaps the most interesting part of the history of wages is that covered by the present century. For fifty years after the introduction of production on a large scale, the condition of the working-classes was on the whole deplorable, but during the last fifty years great progress has been made. The principal results may be summed up under the effects of machinery on wages,— taking both words in their widest sense. Machinery affects the condition of the working-classes in many ways. The most obvious mode is the direct substitution of machinery for labour. It is clear that any sudden and extensive adoption of labour-saving machinery may, by throwing the labourers out of employment, lower the rate of wages, and it is easy to understand how riots arose repeatedly owing to this cause. But asa rule the effect of labour-saving machinery in diminishing employment has been greatly exaggerated, because two important practical considerations have been overlooked. In the first place, any radical change made in the methods of production will be only gradually and continuously adopted throughout the industrial world; and in the second place these radical changes, these discontinuous leaps, tend to give place to advances by small cncrements

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loom weaver, from fifteen to twenty, assisted by a girl of

'twelve, attending to four looms, could weave eighteen

pieces. This is only one example, for, as Porter remarks, it would fill many large volumes to describe the numerous inventions which during the present century imparted facility to manufacturing processes, and in every case we find a continuity in the improvements. This twofold

progressive character of invention operates in favour of the labourer,—in the first place, because in most cases the increased cheapness of the commodity consequent on the use of machinery causes a corresponding extension of the market and the amount produced, and thus there may be no actual diminution of employment even temporarily ; and secondly, if the improvement takes place slowly, there is time for the absorption of the redundant labour in other employments. It is quite clear that on balance the great increase in population in this century has been largely caused, or rather rendered possible, by the increased use of labour-saving machinery. The way in which the working-classes were at first injured by the adoption of machinery was not so much by a diminution in the number of hands required as by a change in the nature of the employment. Skilled labour of a certain kind lost its peculiar value, and children and women were able to do work formerly only done by men. But the principal evils resulted from the wretched conditions under which, before the factory legislation, the work was performed ; and there is good reason to believe that a deterioration of the type of labourer, both moral and physical, was effected. It is, however, a mistake to suppose that on the whole the use of machinery tends to dispense with skill.

On the contrary, everything goes to prove that under the Progress present system of production on a large scale there is on of the the whole far more skill required than formerly,—a fact Wo"kms

which has been well brought out by Mr Giffen in his essay on the progress of the working-classes (Hssays on Finance, vol. ii. p. 365). The two lowest classes of labour, which constituted each about one-third of the whole manual-labour class of the United Kingdom fifty years ago, now constitute only one-eighth each, and the remaining highest-paid class, which was only one-third fifty years ago, is now three-fourths of the whole. Taking this fact into consideration, it is easy to understand the estimate that the money wages of labour have on the whole risen 100 per cent. during this period. There seems every reason to believe that this rise in real wages will continue with every extension of the power of man over nature.

of imvention. We have an instance of a great radical – change in the steam-engine. Watt's patent for "a method of lessening" the consumption of steam and fuel in fire-

For, taking the most general view of the subject, the more Tendeney there is produced or acquired in exchange from other of profits

countries, so much more is there to consume. But this t fall and wages

engines was published on January 5, 17 69, and it may be said that the movement of substituting steam as a motive power is not yet over. Every day we hear of steam being extended to some new employment and to some out-of- the-way district. The history of the power-loom again shows that the adoption of an invention ig comparatively slow. In 1813 there were not more than 2400 power- looms at work in England. In 1820 they increased to 14,150. In 1853 there were 100,000, but the curious thing is that during this time the number of hand-looms had actually increased to some extent (Porter's Progress of the Nation, p. 186). The power-loom also illustrates the gradual continuous growth of improvements. This is clearly shown by Porter.

very improvement in the production and acquisition of wealth facilitates the creation of new capital, and increases the rate of accumulation, and thus there is a greater intensity in the demand of capital for labour, and the rate of profits falls whilst the rate of wages rises.1_ (3. s, Nt.)

Law RELATING To WAGES.

The legislature has often dealt with wages in a manner whieh modern politieal economy would not endorse. The amount was fixed by the Statute of Labourers in 1349, and by many sueceeding statutes (see LazBour). The poliey of these Acts is now obsolete, although the British parliament has never gone as far as the con- stitution of Louisiana, and expressly provided that no law is to fix the price of manual labour. To conspire to effeet an alteration in wages is now no longer an offence. It was formerly punished very sevcrely both at eommon law and under the provisions of various statutes, espeeially 2 and 8 Edw. VI. e. 15. Existing

legislation on the subject of wages deals with the mode of their payment and reeovery, and their protection from attachment and from the

1 For further information on this branch of the subject eompare Atkinson, Distribution of Products and The Margin of Profits; Leroy-Beaulieu, Repartition des Richesses; Nicholson, Effects of

| Machinery on Wages; and Marshall, Economics of Industry.

bankruptcy laws. They must (except in the case of farm servants) be paid in money, and the payment must not be made in a public house (see PAYMENT). The recovery of wages by SEAMEN (q.v.) is the subject of special legislation. In other cases statutory authority is given to county courts and courts of summary jurisdiction to deal with claims for wages. Sce especially the Employers and Workmen Act, 1875. The County Courts Acts enable an infant to sue in a county court for wages not exceeding £50 as though he were of age. Wages are asa rule privileged debts (see PRIVILEGE). By 33 and 34 Vict. c. 30 the wages of a servant, labourer, or work- man cannot be attached by order of a court of record or inferior court. In Scotland wages arc exempt from arrestment on process under the Small Debt Acts and in any case up to 20s. a week by 8 and 9 Vict. c. 39 and 33 and 34 Vict. « 63. The English Bankruptcy Act, 1883, gives priority in the distribution of a bankrupt's estate to wages of clerks, servants, labourers, and workmen up to the extent of £50. The Scottish Bankruptcy Act, 1856 (as amended in 1875), is in similar terms.

WAGNER, RupoteH (1805-1864), anatomist and physiologist, was born in June 1805 at Baireuth, where his father was a professor in the gymnasium. He began the study of medicine at Erlangen in 1820, and finished his curriculum in 1826 at Wiirzburg, where he had attached himself mostly to Schénlein in medicine and to Heusinger in comparative anatomy. Aided by a public stipendium, he spent a year or more studying in the Jardin des Plantes, under the friendly eye of Cuvier, and in making zoological discoveries at Cagliari and other places on the Mediterranean. On his return he set up in medical practice at Augsburg, whither his father had been transferred ; but in a few months he found an opening

for an academical career, on being appointed prosector at Erlangen. In 1832 he became full professor of zoology and comparative anatomy there, and held that office until 1840, when he was called to succeed Blumenbach at Gottingen. At the Hanoverian university he remained till his death in 1864, being much occupied with ad- ministrative work as pro-rector for a number of years, and for nearly the whole of his residence troubled by ill- health (hereditary phthisis). In 1860 he gave over the physiological part of his teaching to a new chair, retaining the zoological, with which his career had begun. While at Frankfurt, on his way to examine the Neanderthal skull at Bonn, he was struck with paralysis, and died at Géot- tingen a few months later (May 1864) in his 59th year.

Wagner's activity as a writer and worker was enormous, and his range extensive, most of his hard work having been done at Erlangen while his health was good. His graduation thesis was on the ambitious subject of "the historical development of cpi- demic and contagious diseases all over the world, with the laws of their diffusion," which showed the influence of Schénlein. His first treatise was Dic Naturgeschichte des Menschen (in 2 vols., Kempten, 1831). Frequent journeys to the Meditcrranean, the Adriatic, and the North Sea gave him abundant materials for re- search on invertebrate anatomy and physiology, which he com- municated first to the Munich academy of sciences, and republished in his Bettrége zur vergleichenden Physiologie des Blutes (Leipsic, 1832-33, with additions in 1888). In 1834-35 he brought out a text-book on the subject of his chair (Lehrbuch der verglcichenden Anatomie, Vcipsic), which recommended itself to students by its clear and concise style. A new edition of it appeared in 1843 under the title of Lchrbuch der Zootomie, of which only the vertebrate section was corrected by himself. The precision of his earlier work is evidenced by his Micrometric Measurements of the Elementary Parts of Man and Animats (Leipsic, 1834). His zoological labours may be said to conclude with the atlas Iconcs Zootomice (Leipsic, 1841). In 1835 he communicated to the Munich academy of sciences his researches on the physiology of generation and develop- ment, iucluding the famous discovery of the germinal vesicle of the human ovum. These were republished under the title Pro- dromus Historie Gencrationis Hominis atque Anmalium (Leipsic, 1836). Asin zoology, his original researches in physiology were followed by a students' text-book,

Lehrbuch der speciellen Physio- togie (Leipsic, 1838), which soon reached a third edition, and was translated into French and English. This was supplemented by an atlas, Lconcs Physiologicw (Leipsic, 1839). To the same period belongs a very interesting but now little known work on medicine proper, of a historical and synthetic scope, Grundriss der Eneyklo- pidie unit Methodologie der medicinischen Wissenschaften nach geschichtlicher Ansicht (Erlangen, 1838), which was translated into

*Danish. About the same time he worked along with Will at a translation of Prichard's Natural History of Man, and editcd various writings of Sommering, with a biography of that anatomist (1844), which he himself fancied most of all his writings. In 1848, after his removal to Gottingen, he began his great Handwérterbuch der Physiologie, mit Ricksicht auf physiologische Pathologie, and brought out the fifth (supplementary) volume in 1852; the only contribu- tions of his own in it were on the sympathetic nerve, nerve-ganglia, aud nerve-endings, and he modestly disclaims all merit except as being the organizer. While resident in Italy for his health from 1845 to 1847, he occupied himself with researches on the electrical organ of the torpedo and on nervous organization generally; these he published in 1853-54 (Newrologische Untersuchungcn, Gottingen), and therewith his physiological period may be said to end. His next period was stormy and controversial. He cntered the lists boldly against the materialism of "Stoff und Kraft," and avowed himself a Christian believer, whereupon he lost the countenance of a number of his old friends and pupils, and was unfeelingly told that he was suffering from an "atrophy of the brain." His quarrel with the materialists began with his oration at the Got- tingen meeting of the Naturforscher-Versammlung in 1854 on '*Menschenschopfung und Seelensubstanz." 'This was followed by a series of '* Physiological Letters" in the Allgcmeinc Zeitung, by an essay on "Glauben und Wissen," and by the most important piece of this series, " Der Kampf um die Seele" (Gttingen, 1857). Having come to the consideration of these philosophical problems late in life, he was at some disadvantage; but he endeavoured to join as he best could in the current of contemporary German thought. He had an exact knowledge of classical German writings, more especially of*

Goethe's, and of the literature connected with him. In what may be called his fourth and last period, Wagner became anthropologist and archeologist, occupied himself with the cabinet of skulls in the Gottingen museum collected by Blumenbach and with the excavation of prehistoric remains, corresponded actively with the anthropological societies of Paris and London, and organized, in co-operation with the veteran Von Baer, a success- ful congress of anthropologists at Gottingen in 1861. His last writings were memoirs on the convolutions of the human brain, on the weight of brains, and on the brains of idiots (1860-62).

See memoir by his eldest son in the Géttinger gelehrte Anzetgen, " Nachrichten" for 1864,

WAGNER, Witnetm Ricuarp (1813-1883), dramatic composer and reformer of the musical drama, was born at Leipsic on May 22, 1813. In 1822 he was sent to the Kreuzschule at Dresden, where he did so well that, four years later, he translated the first 12 books of the Odyssey for amusement. In 1828 he was removed to the Nicolai- schule at Leipsic, where he was less successful. His first music-master was Gottlieb Miiller, who thought him self- willed and eccentric ; and his first important composition was an "Overture in Bb," performed at the Leipsic theatre in 1830. In that year he matriculated at the university, and took lessons in composition from Theodor Weinlig, cantor at the Thomasschule. His '" First Sym- phony" was performed at the Gewandhaus concerts in

'1833, and in the following year he was appointed con-

ductor of the opera at Magdeburg. The post was an unprofitable one, and Wagner's life at this period was very unsettled. He had composed an opera called Die Feen, adapted from Gozzi's La Donna Serpente, and another,

'Das Lnebesverbot, founded on Shakespeare's Measure for

Measure, but these were never performed, and for some considerable time the young composer found it difficult to obtain a hearing.

In 1836 Wagner married Fraulein Wilhelmina Planer, an actress at the theatre at Kinigsberg. He had accepted an engagement there as conductor, but, the lessee becoming bankrupt, the scheme was abandoned in favour of a better appointment at Riga. Accepting this, he remained actively employed until 1839, when he made his first visit to Paris, taking with him an unfinished opera, for which he had himself prepared a libretto, upon the lines of Lord Lytton's novel Rienzi. The venture proved a most unfortunate one. Wagner was unsuccessful in all his attempts to achieve popularity, and Rienzi, destined for the Grand Opera, was relentlessly rejected. He completed it, however, and in 1842 it was produced at the court theatre in Dresden, where, with Madame Schroeder Devrient and Herr Tichatschek

in the principal parts, it achieved an immense success, and undoubtedly laid the foundation of the great composer's fame.

Though, in completing Rienzi, Wagner had put forth all the strength he then possessed, that work was far from representing his preconceived ideal. This he now en- deavoured to embody in Der Fliegende Lolldnder, for which, as before, he composed both the libretto and the music. In this fine work we find the first sign of his determination to sacrifice all considerations of traditional form and symmetrical construction to the dramatic exigencies of the story. It is true, this great principle was but very faintly announced in the new work, and in an evidently tentative form ; but the success of the experi- ment was incontestable, though it took some time to convince the world of the fact. The piece was warnily received at Dresden, January 2, 1843 ; but its success was by no means equal to that of Rienzi. Spohr, however, promptly discovered its merits, and produced it at Cassel some months later, with very favourable results.

Wagner was now fairly launched upon his arduous career. On February 2, 1843, he was formally installed as hofkapellmeister at the Dresden theatre, and he cele- brated the event by at once beginning the composition of a new opera. For the subject of this he selected the legend

of Tannhiauser, collecting his materials from the ancient "'Tannhiuser-Lied,"! the Volksbuch, Tieck's poetical Erzihlung, Hoffmann's story of Der Sdngerkrieg, and the medizval poem on Der Wartburgkrieg. 'This last-named legend introduces the incidental poem of " Loherangrin," and led to the study of Wolfram von Eschenbach's Parzival und Titurel, with strange effect upon Wagner's subsequent inspirations. But for the present he confined himself to the subject in hand; and on October 19, 1845, he produced his Zannhiiuser, with Madame Schroeder Devrient, Fréiulein Johanna Wagner,? Herr Tichatschek, and Herr Mitterwurzer in the principal parts. Notwith- standing this powerful cast, the success of the new work was not brilliant, for it carried still farther the principles embodied in Der Pliegende Holltnder, and these principles were not yet understood either by the public or the critics. But Wagner boldly fought for them, and would probably have gained the victory much sooner than he did had he not taken a fatally prominent part in the political agitations of 1849, after which his position in Dresden became un- tenable. In fact, after the flight of the king, and the subsequent suppression of the riots by troops sent from Berlin, a formal act of accusation was drawn up against him, and he had barely time to escape to Weimar, where Liszt was at that moment engaged in preparing Tannhduser for performance at the court theatre, before the storm burst upon him with a violence that seriously alarmed both his friends and himself.

Without the loss of a moment Liszt procured a passport, and escorted his guest as far as Eisenach. Wagner pro- ceeded in all haste to Paris, and thence to Zurich, where, with few interruptions, he lived in strict retirement until the autumn of 1859. And it was during this period that most of his literary productions—including Oper und Drama, Ueber das Dirigiren, Das Judenthum in der Musik, and other like works—were given to the world.

We have spoken of Wagner's incidental study of the legends of "' Loherangrin" and " Parzival" during the time that he was preparing the libretto of Tannhduser. After the production of that opera he again recurred to the subject, chose Lohengrin as the title for his next opera, and elaborated the conception with his usual minute and affectionate care, carrying out his new principles somewhat

1 Preserved in Uhland's Alte hoch- wu. mieder-deutsche Volkslieder. 2 The composer's nicce.

farther than he had hitherto ventured to do. He had com- pleted the work before he fled from Dresden, but could not get it produced. Hoping against hope, he took the score with him to Paris, and, as he himself tells us, " when ill, miserable, and despairing, I sat brooding over my fate, my eye fell on the score of my Lohengrin, which I had totally forgotten. Suddenly I felt something like compassion that the music should never sound from off the death-pale paper. 'Two words I wrote to Liszt; his answer was tlie news that preparations were being made for the performance of the work, on the grandest scale that the limited means of Weimar would permit. Everything that care and acces- sories could do was done to make the design of the piece understood. Liszt saw what was wanted at once, and did it. Success was his reward; and with this success he now approaches me, saying, ' Behold we have come thus far ; now create us a new work, that we may go farther '."

Lohengrin was, in fact, produced at Weimar, under Liszt's direction, on August 28, 1850. It was a severe trial to Wagner not to be permitted to hear his own work, but he knew that all that could be done for it was done, and he responded to Liszt's appeal for a new creation by meditating upon his famous tetralogy, Der Ring des Nibelungen, the four divisions of which—Das Lheingold, Die Walkiire, Siegfried, and Gétterdimmerung—though each as long as an ordinary opera, are In reality but parts of one colossal whole. At this time, also, he first began to lay out the plan of Tristan und Isolde, and to think over the possibilities of Parsifal.

It is in theso later works, andin Die Meistersinger von Niirnberg, the first sketch for which had been made at Dresden in 1845, that the genius of Wagner reaches its culminating point; and it is in these only that his great plan for the reformation of the musical drama is fully and honestly carried out. In order to understand this plan, we must first inquire what kind of reformation was needed. What were the abuses that demanded redress? What were the causes that had led to the decline of the opera from a higher state of perfection than that which it exhibited in the

middle of the 19th century—if, indeed, it ever did exhibit a higher state of perfection than that? What, in short, had been the history of the musical drama during the two centuries and a half that had elapsed between its first invention and its arrival at the condition in which Wagner found it when he first began to compose for the stage? The story is a very simple one, and may be told in a very few words; but it was not without an immensity of deep thought and earnest consideration that Wagner was able to grapple with the gigantic practical difficulties with which the case was sur- rounded.

Tho possibility of constructing a musical drama on reasonable principles was first seriously discussed during the closing years of the 16th century, at certain réunions of literary and artistic dilettanti, who were accustomed to meet periodically at the palazzo of Giovanni Bardi, Conte di Vernio, in Florence. The principal members of the little society were Ottavio Rinuccini the poet, Vincenzo Galilei the father of the great astronomer, Giulio Caccini, Jacopo Peri, Pietro Strozzi, and the Conte di Vernio himself. All these earnest savants were deeply embued with the principles of the Renaissance, and regarded the traditions of classical antiquity with a reverence which led them to hold the greatest creations of modern art in undisguised contempt. The music of Palestrina and the great composers of the contrapuntal schools they utterly de- spised ; and their one idea was to revive the system of declamation peculiar to Greek tragedy, and by means of that to produce a form of drama which could be consistently sung throughout as the trilogies of Aschylus and Sophocles were sung by the Greeks. So far their aim was identical with Wagner's. The difference lay in the means by which this aim was to be attained. Wagner himself tells us that, while occupied upon Lohengrin, he looked upon his work as "an experiment towards determining whether or not opera was possible." And in other places he speaks of the question whether or not the modern spirit can produce a theatro that shall stand in relation to modern cultnre as the theatre of Athens stood in relation to the culture of ancient Greece. He believed that this might be accomplished by reforming the opera from the stand- point of Beethoven's music. The friends of the Conte di Vernio had hoped to accomplish it by restoring the actual music of the Greek drama. But this was impossible. For Greek music was based upon a system of tonality which, even in the time of Galilei, had been obsolcte for

centurics. The Greek scales and ours differ so widely in their radical construetion that no vocalist accustomed

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to the one could by any possibility sing the other. Even Peri and Vincenzo Galilei must have known this. But, pretending to ignore the fact, they made a compromise, and endeavoured to imitate what they fondly conceived to be the Greek method of recitative, in the tonality of the modern scales; aud in this way they struck, not upon the form of which they were in search—for that was irretrievably lost—but a new one, which rapidly developed itself into the kind of music now called recitative. This recitative —the most valuable artistic invention of the 17th century —they used as the basis of their musical drama; and, after the lapse of two centuries and a half, Wagner determined that this, and none other, must be the basis of his. Enriching it with all the beautiful accessories that had been amassed by composer after composer during its long period of progressive development, and notably with other very important accessories of his own invention, he built his drama upon it as completely as the first dramatic music was built upon it by the frequenters of the Palazzo Bardi. And in this great fact lies the secret of his gigantic reform. :

The first Italian opera ever publicly performed was Jacopo Peri's Euridice, composed to a libretto writteu by Ottavio Rinuccini, and produced at Florenco in 1600, in honour of the marriage of Henry IV. of France with Maria de' Medici. This most interesting work, a rare printed copy of whieh is preserved in the British Museum, is entirely in recitative; and the music is so constructed throughout as to aid in the true dramatic expression of the words, at the expense of all attempt at what is now called melody. The operas of Monteverde, Cesti, Cavalli, and all the earlier composers of the 17th century were conceived upon the same principle. But Alessandro Scarlatti (1659-1725), aiming at higher musical per- fection, and willing to sacrifice no small amount of dramatic truth to its exigencies, introduced certain constructive forms—notably that called the "da capo"—which, while adding to the symmetrical beauty of the aria, tended eventually entirely to destroy its dramatic force and its logical

consistency as an exponent of the situation presented upon the stage. Later composers carried this abuse very much farther. Handcl's strong dramatic instinct kept him above the errors of his time; but his contemporaries simned more and more dceply until, for the sake of obtaining popularity, they were ready to fill their operas with unmeaning passages, introduced solely for the purpose of showing off the skill of the favourite vocalists of the period. And so the abuse proceeded from worse to worse until, under Porpora (1686-1766) and Hasse (1699-1783), the opera at Naples and Dresden became a mere concert sung upon the stage without any trace of dramatic propriety whatever. ©

And now arose a reformer whose work will be remembered as long as the musical drama continues to exist. Christoph Willibald Gluck (1714-1785), disgusted with his own want of success while writing in the vicious style of the period, determined to reform it upon true dramatic principles; and in the preface to his Alceste (1767) he set forth those principles with a clearness which cannot possibly be misunderstood. The history of his great reform has already been narrated in detail (see Guuck). A careful comparison of the argument laid down in the preface to Alceste with that set forth in Wagner's Oper wnd Drama will prove the aim of the two reformers to have been absolutely identical. That a less perfect identity should have existed with regard to the means they used for the attainment of their common end was naturally to be expected. At the outset of their career both Gluck and Wagner freely employed all the resources at their command, adding to them afterwards as circumstances permitted. But between the produc- tion of Gluck's latest and Wagner's first masterpiece art had made enormous strides; the advantage, therefore, in this respect was immeasurably on Wagner's side.

In France Gluck's principles were carried out more or less con- scientiously by Méhul, Cherubini, and Spontini. In Germany they bore still richer fruit. Glorified by the genius of Mozart and Beethoven, and accepted without reserve by Weber, Spohr, Marschner, and the most enlightened of their followers in the German romantic school, they were professed, if not fully carried out, bycomposers of every degree. But in Italy they produced no effect whatever. Though Rossini sometimes invested his situa- tions with a certain amount of dramatic colouring, he

never attempted anything farther than this; while Mercadante, Bellini, Donizetti, and their imitators regarded melody, pure and simple, as the highest, if not the only really important, attribute of art. Under their rule the opera once more descended to the level of a concert on the stage. The effect of their example upon the lower class of German composers was fatal, and ended in the production of a form of Singspiel, lacking all the freshness of the Italian Cantilena, and noticeable only for its intolerable vapidity. Not- withstanding the attempts of Halévy and Meyerbeer to perpetuate in France the traditions of a purer epoch, the musical drama sank, under Auber and his imitators, to the level of a string of dance tunes. Tho 19th century had witnessed the birth of abuses as flagrant as those against which Gluck had protested in the 18th. It was Wagner's turn now to effect the desired reform, and he effected it as completely as his predecessor had done—but not in

the same way. Gluck had begun by propounding a theory, and eatried on the good work by eonsistently putting it into practiec. Wagner theorized also; but for his ultimate triumph he was indebted to the power of his own creative genius—to his ceaseless endeavour to realize the preconceived ideal which neither theory nor desire for reform could ever tempt him to forget. "The nature of the subject," he says, "could not induce me, in sketching my scenes, to consider in advance their adaptability to any particular musical form, the kind of musical treatment being, in every ease, suggested by the scenes themselves. J never contemplated on prineiple, and as a deliberate reformer, the destruction of the aria, the duet, or any other operatic form; but the disuse of these forms followed naturally from the character of my subjects." Surely no frame of mind could be more free from prejudice than this.

While exercising this unrestrained freedom of thought and action, Wagner found one particular form more useful to him than any other. Mozart in Don Giovanni, and Weber in Der Frei- schiitz, Ewryanthe, and Oberon, had availed themselves of certain characteristic musical phrases as exponcnts of emotional or scenic complications of peculiar interest, and had emphasized their mean- ing by repeating them at every

recurrence of the dramatic situation, In modern musical terminology a musical phrase of this kind is now called a "leading theme" (" Leitmotif"). Wagner has em- ployed this expedient more freely than any other composer, and in a way peculiarly his own. Not only has he introduced in his later works a leading theme for every one of the dramatis personx, and for every prominent feature in the scenery or action of the play, but in many cases he even indicates the changing moods and passions of his principal characters by distinct phrases, which he coinbines together with a power of part-writing truly marvellous, interweaving them—as in "Siegfried's Trauermarsch," in the Gotterdimmerung—in such sort as to present the whole story of a life and mission in the music of a single scene. Short-sighted critics have dwelt too much upon the technical ingenuity displayed in scenes of tliis description, and too little upon the expression thrown into them by the power of Wagner's genius. A diligent student may acquire sufficient mastery over the art of part-writing to enable him to interweave his themes with any amount of mechanical perfection, yet without a trace of the beauty displayed by Sebastian Bach in the involutions of his counter-subjects, or by Wagner in labyrinthine combinations used, not for the sake of vaunting his scholarship, but as his most potent engines of dramatic expression. The plaintive wail of the "Trauermarsch " appeals to hearers who know nothing at all of its ingenious construction, and tells its tale to them beyond all possibility of misunderstanding. It is at this point that genius steps in ; and the power of Waguer's genius is irresistible.

It was during the period of his exile that Wagner matured his plans and brought his style to its culminating point of perfection ; but it was not until some considerable time after his return that any of the works he then medi- tated were placed upon the stage. In 1855 he accepted an invitation to London, where he conducted the concerts of the Philharmonic Society with great success. In 1857 he completed the libretto of Tristan und Isolde at Venice, taking as the basis of his scheme the Celtic legend modified by Gottfried of Strasburg's mediaeval treatment of the sub- ject (see Gorrrrrep and Romance). But the music was not completed till 1859. In that year Wagner visited Paris for the third time; and after much negotiation, in which he was nobly supported by the Prince and Princess Metternich, Tannhiiuser was accepted at the Grand

Opéra. Magnificent preparations were made for its production. It was rehearsed 164 times, 14 times with the full orchestra; and the scenery, dresses, and stage accessories generally were placed entirely under the composer's direction. More than £8000 was ex- pended upon the venture; and the work was performed for the first time in the French language on March 13, 1861. But, for political reasons, a powerful clique determined to suppress both the piece and its composer. A scandalous riot was inaugurated by the members of the Parisian Jockey Club, who interrupted the performance with howls and dog- whistles ; and so great was the disturbance that after the third representation the opera was withdrawn to reappear no more. Wagner was broken-hearted. But the Princess Met- ternich continued to befriend him, and in 1861 he received through her intercession a pardon for his political offences, with permission to settle in any part of Germany except Saxony. Even this restriction was removed in 1862.

Wagner now settled fora time in Vienna, where Tristan und Isolde was accepted, but abandoned after 57 rehearsals, through the incompetence of the tenor, Herr Ander. Lohengrin was, however, produced on May 15, 1861, when Wagner heard it for the first time. His circumstances were now extremely straitened ; but better times were at hand. In 1863 he published the libretto of Der Ring des Nibelungen. King Louis II. of Bavaria was much struck with it, and in 1864 sent a private secretary to Wagner, who was then at Stuttgart, with an invitation to come to Munich and carry on his work there. The invitation was accepted with joy by the then almost despairing composer. The king gave him an annual grant of 1200 gulden (£120), considerably enlarging it before the end of the year, and placing a comfortable house in the outskirts of the city at his disposal. The master celebrated his good fortune by composing a " Huldigungsmarsch." In the autumn he was formally commissioned to proceed with the tetralogy, and to furnish proposals for the building of a theatre and the foundation of a Bavarian music school. All seemed to promise well, but no sooner did his position

seem assured than a miserable court intrigue was formed.

against him. His political misdemeanours at Dresden were quoted to his discredit and made the excuse for bitter persecutions, and, notwithstanding King Louis's un- diminished favour, the opposition was too strong to be resisted, and Wagner was obliged to retire to Triebschen, near Lucerne, where he spent the next six years in uninter- rupted study.

Der Fliegende Holländer was performed at Munich in 1864; and on June 10, 1865, Z'ristan und Isolde was pro- duced for the first time, with Herr and Frau Schnorr in the principal parts. Die Meistersinger von Niirnberg, first sketched in 1845, was completed in 1867, and first per- formed at Munich under the direction of Herr von Biilow, June 21, 1868. The story, though an original one, is founded on an episode in the life of Hans Sachs, the poet- cordwainer of Nuremberg ; and Wagner has combined its incidents with infinite ingenuity and humour. The success of the opera was very great; but the production of the tetralogy was still impracticable. The scheme for the new theatre, which was to have been designed by the architect Semper, having been abandoned, there was no opera-house in Germany fit for the production of a work designed on so colossal a scale. A project was therefore started for the erection of a suitable building at Baireuth. Wagner laid the first stone of this in 1872, and the edifice was completed, after almost insuperable difficulties, in 1876.

After this Wagner resided permanently at Baireuth, ina house named Wahnfried, in the garden of which he him- self built the tomb in which his remains now rest. His first wife, Wilhelmina (née Planer), having died in 1866, he was united in 1870 to Liszt's daughter Cosima, who had previously been the wife of Herr von Biilow. Meantime Der Ring des Nibelungen was rapidly approaching com- pletion, and on August 13, 1876, the introductory portion, Das Kheingold, was performed at Baireuth for the first time, followed on the 14th by Die Walkiire, on the 16th by Siegfried, and on the 17th by Gétterddmmerung. The success of the work, the story of which is founded on the famous Nibelungenlied, was very great; and the per- formance, directed by Herr Hans Richter, excited extra- ordinary attention, but the expenses attendant upon its production were enormous, and burdened the management with a debt of £7500. A portion of this was raised by performances at the Albert Hall, in

London, at which the composer himself was present, in 1877. The remainder was met by the profits upon performances of the tetralogy — or, as Wagner himself called it, the " Biihnenfestspiel"— at Munich.

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Wagner's next, last, and perhaps greatest work was Parsifal, based upon the legend of the Holy Grail, as set forth, not in the legend of the Mort d' Arthur, which fixes the home of the sacred vessel at Glastonbury, but in the poems of Chrestien de Troyes and Wolfram von Eschen- bach, written in the 12th and 13th centuries, and other less-known works (see the article Romance, in which the subject is treated in its various aspects). The libretto was complete before his visit to London in 1877. The music was begun in the following year, and completed at Palermo, January 13, 1882. The first sixteen per- formances took place at Baireuth, in July and August 1882, under Wagner's own directing, and fully realized the expectations that had been formed of them. There can indeed be no doubt that this last work, called by Wagner a " Bithnenweihfestspiel," in allusion to its mystically religious character, forms a fitting crown to his already brilliant reputation. Unhappily, the exertion of directing so many consecutive performances seems to have been too much for the veteran master's already failing strength, for towards the close of 1882 his health began to decline rapidly. He spent the autumn at Venice, in the Palazzo Vendramini, on the Grand Canal, and was well enough on Christmas Eve to conduct his own first symphony (composed in 1833), at a private performance given at the Liceo Marcello. But late in the afternoon of February 13, 1883, he was seized with a sudden attack of faintness, and on that evening he calmly breathed his last.

Wagner was buried at Wahnfried, in the tomb he had himself prepared, on February 18, and a few days after- wards King Louis rode to Baireuth alone, and at dead of night, to pay his last tribute of respect to the master he had so generously befriended.

In private life Wagner was beloved and respected by all who knew him, though in his public character he made himsclf in- numerable enemies, and provoked an inmmense amount of hatred— it must be confessed, not wholly undeserved—by the violent and intemperate character of his writings. Though Mcyerbeer had been extremely kind to hin in Paris, he spoke of him in Oper wnd Drama with the grossest disrespect. His utterly groundless pre- judice against Liszt was ultimately conquered by that great master's beautiful forbearance alone. But these things will be forgotten, while the brightness of his genius will remain the lasting heritage of art. In person he was rathcr below the middle height, erect in carriage, with commanding aspect and remarkable quickness of speech and gesture. 'That his manners were to some extent uncon- ventional there can be no doubt, but those who knew him best deny that there was even the semblance of truth in the absurd stories that were circulated with regard to his extraordinary eccentricities.

Besides the great dramatic works we have mentioned, Wagner composed the choral music for Weber's funeral (Dresden, 1844), Das Liebesmahl der Apostel (Dresden, 1847), Hine Faustovertire (Paris, 1839), Katsermarsch (1871), Siegfried Idyl (1871), and a not very numerous collection of smaller pieces. His literary works, published at Leipsic in 1871, fill nine thick volumes. (W. S. RB.)

WAGTAIL (Wagsterd and Wagstyrt, 15th century, fide Th. Wright, Vol. Vocabularies, ii. pp. 221, 253; Uuagtale, Turner, 1544, p. 53), the little bird that delights us equally by its neat coloration, its slender form, its nimble actions, and its sprightly notes. Since it is so generally dispersed, especially in summer, throughout the British Islands, it seems to need no further description.

The Pied Wagtail of authors, it is the Motacilla luqubris of modern ornithology, or Af. yarrelli of some writers, and has for its very near ally —if indeed it be not considcred mercly a local race or subspecies of—the Jf. alba of Linneus, which has a wide range in Europe, Asia, and Africa, visiting England almost yearly, and chiefly differing from the ordinary British form in its lighter- coloured tints, —the cock especially having a clear grey instead of a black back. Eleven other more or less nearly-allied

species are recognized by Mr Sharpe (Cat. B. Brit. Musewm, x. pp. 456-496), who has laboriously treated the complicated synonymy of this group of birds. Eight of these are natives of Asia, several of them wintering in India, and one, M. ocularis, even occasionally reach- ing the west coast of North America, while the rest are con- fined to Africa. No colours but black, grey, or white enter into the plumage of any of the foregoing ; but in the species peculiar to

Madagascar, M. flaviveniris, as well as in that which it much re- sembles, the so-called Grey Wagtail of Britain, 42. melanope (AL. boarula or sulphurea of some authors), a great part of the lower surface is yellow. The species last mentioned is one of the most graceful of birds, and though having a very wide range in the world at large is curiously local in its distribution in Britain, being almost wholly confined in the breeding-season to the neighbourhood of rocky streams in the west and north, and a line drawn from the Start Point, slightly curving to round the Derbyshire hills, and ending at the mouth of the Tecs, will, it is believed, mark off its breeding-range in England. Then there is a section which by some systematists has beeu raised to the rank of a genus, Budytes, con- taining the Wagtails in which yellow takes a still more prominent part in their coloration. Of these, 8 species, besides several sub- species, are recognized by Mr Sharpe (ut supra, pp. 503-532). One of these is the common Yellow Wagtail of England, Jf. radi (by some mistakenly called Jf, campestris), which, though very gene- rally distributed throughout the country, is much less numerous than the Pied Wagtail, and more addicted to wet meadows; but, just as Jf. lugubris is regarded by some as a local form of the more widely-ranging M. alba, so does Mf, raii hold the same relation to M. flava, the Blue-headed Wagtail, which has a very extensive distribution in the Old World, and even crosses the Pacific to Alaska, presenting also a great number of varieties or races (most of which are treated by Mr Sharpe as real species) differing from each other chiefly, if not solely, in the colour of the head, a character which in this section can hardly be deemed specific, while their geographical range intersects and inosculatcs in a most puzzling manner. Much credit is due to the author just named for the enormous trouble he has taken, after study of a vast

series of speci- mens, to clear up the questions herein involved ; but it will probably be long before ornithologists can agree on many of the disputed points, and it is certain that the last word has by no means been spoken concerning them.

The genus Motacilla (an exact rendering of the English " Wagtail," the Dutch Kwikstaart, the Italian Codatremola and other similar words), which, as originally founded by Linnzus, centained nearly all the "soft-billed" birds of early English ornithologists, was restricted by various authors in succession, following the example set by Scopoli in 1769, until none but the Wagtails remained in it. Most of the rest are now commonly classed as Sylvidzx (cf. WarBLER), while the Wagtails with the Prrrts (¢.v.) constitute the Family Motacillde. (A. N.)

WAHABEES, or WanHdsis. See ArAbta, vol. ii. p.

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WAINEWRIGHT, THomas Grirrirus (1794-c. 1852), journalist and subject-painter, was born at Chiswick in October 1794. He was educated by his distant relative Dr Charles Burney, and served as an orderly officer in the guards, and as cornet ina yeomanry regiment. In 1819 he entered on a literary life, and began to write for The Interary Pocket-Book, Blackwood's Magazine, and The Foreign Quarterly Review. He is, however, most definitely identified with Zhe London Magazine, to which, from 1820 to 1823, he contributed some smart but most flippant art and other criticisms, under the signatures of "James Weathercock," "Mr Bonmot," and "Herr Vinkbooms." He was a friend of Charles Lamb,—who thought well of his literary productions, and in a letter to Bernard Barton, styles him the 'kind, light-hearted Wainewright," —and of the other brilliant contributors to the journal. He also practised as an artist, designing illustrations to Chamber- layne's poems, and from 1821 to 1825 exhibiting in the Royal Academy figure pictures, including a Romance from Undine, Paris in the Chamber of Helen, and the Milk Maid's Song. Owing to his extravagant habits, Waine- wright's affairs became deeply involved ; and in 1830 he insured the life of his sister-in-law in various offices for a sum of £18,000. The lady died in the December of the same year, and payment of tlle amount was declined by the companies on the

ground of their having been misrepre- sentation when the insurance was effected. Wainewright now retired to France, but here he was seized by the authorities as a suspected person, and imprisoned for six months. On his being examined there was found upon

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his person a quantity of strychnine, a poison by means of which it was afterwards found he had destroyed, not only his sister-in-law, but also his uncle, his mother-in-law, and a Norfolkshire friend. He returned to London in 1837, but was at once arrested on a charge of forging, thirteen years before, a transfer of stock, and was sentenced to transportation for life. He died of apoplexy in Hobart Town hospital, about the year 1852.

The Essays and Criticisms of Waincwright were published in 1880, with an account of his life, by W. Carew Hazlitt ; and the history

of his crimes suggested to Dickens his story of “ Hunted Down,” and to Bulwer Lytton his novel of Lweretia.

WAITZ, Guore (1813-1886), one of the most distin- guished of modern German historians, was born at Flens- burg, in the duchy of Schleswig, on October 9, 1813. He was educated at the Flensburg gymnasium and the uni- versities of Kiel and Berlin. His strong bent to historical studies and the influence of Ranke early diverted him from his original purpose of studying law, and while still a student he began that series of researches in German medieval history which was to be the occupation of his life. On graduating at Berlin in August 1836, Waitz went to Hanover to assist Pertz in the great national work of publishing the Monumenta German Lirstorica ; and the energy and learning he displayed in that position won him a summons to the chair of history at Kiel in 1842. The young professor soon began to take an interest in politics, and in 1846 entered the provincial diet as representative of his university. His leanings were strongly German, so that he became somewhat obnoxious to the Danish Govern- ment, a fact which made an invitation in 1847 to become professor of history at Géttingen peculiarly acceptable. The political

events of 1848-49, however, delayed his appearance in his new chair. When the German party in the northern duchies rose against the Danish Government, Waitz hastened to place himself at the service of the pro- visional Government. He was sent to Berlin to represent the interests of the duchies there, and during his absence he was elected by Kiel as a delegate to the assembly at Frankfort. Waitz was an adherent of the party who were eager to bring about a union of the German states under a German emperor ; and when the king of Prussia declined the imperial crown the professor withdrew from the assembly in disappointment, and ended his active share in public life. In the autumn of 1849 Waitz began his lectures at Géttingen. His style of speaking was dry and uninteresting ; but the matter of his lectures was so practical and his teaching so sound that students were attracted in crowds to his lecture-room, and the reputation of the Géttingen historical school spread far and wide. At the same time Waitz's pen was not idle, and his industry is to be traced in the list of his works and in the Pro- ceedings of the different historical societies to which he belonged, In 1875 Waitz removed to Berlin to succeed Pertz as principal editor of the Monumenta Germaniz Historica. In spite of advancing years the new editor threw himself into the work with all his former vigour, and took journeys to England, France, and Italy to collate works preserved in these countries. He died at Berlin on He was twice married,—in 1842 to a daughter of Schelling the philosopher, and in 1858 toa daughter of General Von Hartmann.

Waitz is often spoken of as the chief disciple of Ranke, though perhaps in general characteristics and mental attitude he has more affinity with Pertz or Dahlmann. Ife is an industrious and painstaking historian, who, with- out troubling himself about the graces of style, has collected and published an immense quantity of valuable and care- fully sifted material. His special domain was medizeval German history, and he rarely travelled beyond it.

Waitz's chief works are—Deutsehe Verfassungs-Geschichte, 8 vols., Kiel, 1844-78 ; 2d ed., 2 vols. only, 1865-70; Sehlcswig-Holsteins Gesehichtc, 2 vols., Gottingen, 1851-54 (the 3d vol. was never pub- lished); Liibeek

unter Jiirgen Wullenwever und die Ewropiiische Politik, 3 vols., Berlin 1855-56; and Grundziige der Politik, Kiel, 1862. Among his smaller works, which, however, indieate the line of his researches, are the following :—Jahrbiicher des deutsehen Retehs unter Heinrich [., Berlin, 1887, 3d ed., 1885; Ucber das Leben und die Lehre des Uljila, Hanover, 1840; Das alte Reeht der Salischen Franken, Kiel, 1846; and Deutsehe Kaiser von Karl dem Grossen bis Maximilian, Berlin, 1872. In eonjunction with other scholars Waitz took a leading part in the publication of the Forsehungen zur deutschen Geschichte, Munich, 1862 sq., and in the Nordalbingisehe Studien, published in the proceedings of the Sehleswig-Holstein Historical Society, Kiel, 1844-51. It is im- possible here to do more than refer to his numerous and valuable eontributions to the Afonwmenta, and to his numerous papers and criticisms published in periodicals and the proceedings of historical societies. A Bibliographisehe Ucbersicht tiber Waitz's Werke was published by E. Steindorff at Gottingen in 1886.

Obituary notices of Waitz are to be found In the Historische Zeitschrift, new series, vol. xx.; in tho publications for 1886 of tho Berlin Aeademie,der Wissen- sehaften, the Gottingen Gesellschaft der Wissensehaften, and the Hansische Gesehiehtsverein; in the Histortsches Jahrbuch der Gérres Gesellschaft, vol, viiis and in the Revue Historique, vol. xxxi.

WAKEFIELD, a municipal and parliamentary borough and market-town of England, in the West Riding of York- shire, of which division it is the shire-town, is pleasantly situated on the Calder, and on the Lancashire and Yorkshire, Great Northern, and North-Eastern Railway lines, 9 miles south of Leeds and 1754 miles from London. It has water communication (via Goole) with Hull by the Calder, which also communicates with the Lancashire canals. The streets are spacious; and, if the town has a somewhat old-fashioned appearance, and is less regularly built than several of the other large towns in Yorkshire, it enjoys the advantage of an atmosphere less polluted by smoke. The Calder is crossed by a fine bridge of eight arches, on which stands the chantry of St Mary, a beautiful Gothic structure, 30 feet long by 24 feet wide, endowed by Edward IV. in memory of his father Richard, duke of York, killed at the battle of

Wakefield in 1460; it was restored in 1847 at a cost of £3000. The parish church of All Saints, conse- crated by Archbishop William de Melton in 1329, but almost wholly rebuilt in the 15th century, is a beautiful building, partly Early English and partly Perpendicular, consisting of chancel, nave, and tower surmounted by a fine spire rebuilt in 1860-61, the total height being 247 feet. The whole building was restored in 1857-86 from designs of the late Sir Gilbert Scott, at a cost of about £30,000. The other churches are without special interest. The Elizabethan grammar school founded in 1592 was rebuilt in 1829; it is now regulated by a scheme formed by the charity commissioners. Among the principal public buildings of Wakefield are the corn exchange, erected in 1837, enlarged in 1862, and including a public concert- room; the town-hall, in the French Renaissance style, opened in 1880 at a cost of £80,000 ; the large prison for the West Riding of Yorkshire; the West Riding sessions house ; the borough police station (1879); the office of probate (1863); the mechanics' institution, with large library ; the church institute and library; the fine art institution ; and the public baths. The benevolent insti- tutions include the Clayton ~~hospital, built on the pavilion system, opened in 1879 at a cost of £25,000, and the West Riding pauper lunatic asylum, with accommodation for upwards of 1400 patients. Formerly Wakefield was the great emporium of the cloth manufacture in Yorkshire, but it has within the present century been superseded in this respect by Leeds. Foreign weavers of cloth were estab~~ lished at Wakefield by Henry VII.; and Leland, writing in the time of Henry VIII, states that its "whole profit stand- eth by coarse drapery." During the 18th century it became noted for the manufacture of worsted yarn and woollen stuffs. Although its manufacturing importance is now

small in comparison with that of several other Yorkshire towns, it possesses large mills for spinning worsted and carpet yarns, cocoa fibre, and China grass. It has also rag-crushing mills, chemical works, soap-works, and iron- works ; and there are a large number of collieries in the neighbourhood. Wakefield is the chief agricultural town in the West Riding, and has one of the largest corn-markets in the north of England.

It possesses large agricultural implement and machine works, corn and flour mills, malt- works, and breweries.

Wakefield is supposed by some to oceupy the site of a Roman station. In Bones the name oecurs as Wackofield. Originally it consisted of three hamlets—Northgate, Kirkgate, and Westgate. The manor of Wakefield soon after the Conquest was granted to William, third earl of Warren. It formed an extensive baronial liberty extending westwards to the borders of Laneashire and Cheshire. On the death without male issue (30th June 1347) of John, eighth earl'of Warren, it reverted to the erown, and by Edward Il]. it was given to his fifth son, Edward de Langley, whom he ereated earl of Cambridge, and who in the reign of Richard II. was created duke of York. After the battle of Wakefield in 1460 it re- mained in the possession of the erown till the reign of Charles I., who granted it to Henry, earl of Holland. It became the marriage portion of the earl's daughter when she married Sir Gervaise Clifton of Clifton in the eounty of Nottingham. About 1663 Sir Gervaise Clifton sold it to Sir Christopher Clapham, whose heirs in the year 1760 sold it to the duke of Leeds, and it still remains in the possession of that family. Near Wakefield Queen Margaret inflieted a memorable defeat on Riehard, duke of York (31st Decem- ber 1460). The town has possessed a corn-market sinee the time of the Saxons, It obtained a charter for a cattle-market 1st Mareh 1765. It was incorporated by Charles I. in 1626, and was governed by a constable, until it obtained a new charter under the Municipal Act, 11th Mareh 1848. Sinee 1832 it has returned a member of parliament. Under an Improvement Act obtained in 1877, the corporation were empowered to purchase the waterworks belonging to a company which had been formed in 1835. In 1880 an Aet was granted for obtaining a supply from Rishworth Moors, near Halifax, and the works were completed in 1888 at a eost of about £500,000.

WAKEFIELD, Epwarp Gibson (1796-1862), colonial statesman, was born in London, March 20, 1796, of an originally Quaker family. His father, Edward Wakefield, author of Ireland, Statistical and Political, was a surveyor and land agent in extensive practice; his grandmother, Priscilla Wakefield, was a popular author for the young, and one of the first introducers of savings banks. Wakefield was fora short time at

Westminster School, and was brought up to his father's profession, which he relinquished on occasion of his elopement at the age of 20 with Miss Pattle, the orphan daughter of an Indian civil servant. The young lady's relatives ultimately became reconciled to the match, and procured him an appointment as attaché to the British legation at Turin. He resigned this post in 1820, upon the death of his wife, to whom he was fondly attached, and, though making some efforts to connect himself with journalism, spent the years immediately succeeding in idle- ness, residing for the most part in Paris. In 1826 he ap- peared before the public as the hero of a most extraordinary adventure, the abduction of Miss Ellen Turner, daughter of .William Turner, of Shrigley Park, Cheshire. Miss Turner was decoyed from school by means of a forged letter, and made to believe that she could only save her father from ruin by marrying Wakefield, whom she accordingly

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accompanied to Gretna Green, This time the family refused to condone his proceedings ; he was tried with his confederates at Lancaster assizes, March 1827, convicted, and sentenced to three years' imprisonment in Newgate. The marriage, which had not been consummated, was dissolved by a special Act of Parliament. A disgrace which would have blasted the career of most men made Wake- field a practical statesman and a benefactor to his country. Meditating, it is probable, emigration upon his release, he turned his attention while in prison to colonial subjects, and acutely detected the main causes of the slow progress of the Australian colonies in the enormous size of the landed estates, the reckless manner in which land was given away, the absence of all systematic effort at colonization, and the consequent discouragement of immigration and dearth of labour. He proposed to remedy this state of things by the sale of land in small quantities at a sufficient price, and the employment of the proceeds as a fund for promot- ing immigration. 'These views were expressed with extra- ordinary vigour and incisiveness in his Letter from Sydney (1829), published while he was still in prison, but composed with such graphic power that it has been continually quoted as if written on the spot. After his release Wakefield seemed disposed for a while to turn his attention to social questions at home, and produced a tract on the

Punishment of Death, with a terribly graphic picture of the condemned sermon in Newgate, and another on incendiarism in the rural districts, with an equally powerful exhibition of the degraded condition of the agricultural labourer. He soon, however, became entirely engrossed with colonial affairs, and, having impressed Stuart Mill, Colonel Torrens, and other leading economists with the value of his ideas, became a leading though not a conspicuous manager of the South Australian Company, by which the colony of South Australia was ultimately founded. In 1833 he published anonymously Hngland and America, a work primarily in- tended to develop his own colonial theory, which is done in the appendix entitled "'The Art of Colonization." The body of the work, however, is fruitful in seminal ideas, though some statements may be rash, and some conclusions extravagant. It contains the distinct proposal that the transport of letters should be wholly gratuitous—the pre- cursor of subsequent reform—and the prophecy that, under given circumstances, 'the Americans would raise cheaper corn than has ever been raised." In 1836 Wakefield pub- lished the first volume of an edition of Adam Smith, which he did not complete. In 1837 the New Zealand Associa- tion was established, and he became its managing director. Scarcely, however, was this great undertaking fairly com- ienced when he accepted the post of private secretary to Lord Durham on the latter's appointment as special com- missioner to Canada. The Durham Report, the charter of constitutional government in the colonies, though drawn up by Charles Buller, embodied the ideas of Wakefield, and the latter was the means of its being given prematurely to the public through the Z%mes, to prevent its being tampered with by the Government. He acted in the same spirit a few months later, when (about July, 1839), under- standing that the authorities intended to prevent the despatch of emigrants to New Zealand, he hurried them off on his own responsibility, thus compelling the Govern- ment to annex the country just in time to anticipate a similar step on the part of France. For several years Wakefield continued to direct the New Zealand Company, fighting its battles with the colonial office and the missionary interest, and secretly inspiring and guiding many parlia- mentary committees on colonial subjects, especially on the abolition of transportation, The company was by no means a financial success, and many of its proceedings were wholly unscrupulous and indefensible ; its great object, however,

was attained, and New Zealand became the Britain of the south. In 1846 Wakefield, exhausted with labour, was struck down by apoplexy, and spent more than a year in complete retirement, writing during his gradual recovery his Art of Colonization. The management of the company had meanwhile passed into the hands of others, whose sole object was to settle accounts with the Government, and wind up the undertaking. Wakefield seceded, and joined Lord Lyttelton and Mr Godley in establishing the Canterbury settlement as a Church of England colony. A portion of his correspondence on this subject has been published by his son, and is perhaps the most adequate memorial extant of the vigour and sagacity of his intellect. As usual with him, however, he failed to retain the confidence of his coadjutors to the end. In 1853, after the grant of a constitution to New Zealand, he took up his residence in the colony, and immediately began to act a leading part in colonial politics. In 1854 he appeared in the first New Zealand parliament as extra-official adviser of the acting governor, a position which excited great jealousy, and as the mover of a resolution demanding the appointment of a responsible ministry. It was carried unanimously, but difficulties, which will be found detailed in Swainson's Vew Zealand and its Colonization (ch. 12), prevented its being made effective until after the mover's retirement from political life. In December 1854, after a fatiguing address to a public meeting, followed by prolonged exposure to a south-east gale, his constitution entirely broke down. He spent the rest of his life in retirement, dying at Wellington on 16th May 1862.

Wakefield was a man of large views and lofty aims, and in private life displayed the warmth of heart which commonly accompanies these qualities. His main defect was unscrupulousness: he hesitated at nothing necessary to accomplish an object, and the conviction of his untrustworthiness gradually alienated his associates, and left him politically powerless. Excluded from parliament by the fatal error of his youth, he was compelled to resort to in- direct means of working out his plans by influencing public men. But for a tendency to paradox, his intellectual powers were of the highest order, and as a master of nervous idiomatic English he is second to Cobbett alone. After every deduction it remains

true that no contem- porary showed equal genius as a colonial statesman, or in this department rendered equal service to his country.

For an impartial examination of the Wakefield system, sec Leroy-Beaulieu, De la Colonisation chez les Peuples Modernes (8d ed., pp. 562-575 and 696-700). (R. G.

WAKEFIELD, Gitzert (1756-1801), classical scholar, theologian, and politician, was born at Nottingham, February 22, 1756, and was the son of the Rev. George Wakefield, rector of St Nicholas. After being educated at. various private schools, he proceeded at the age of sixteen to Jesus College, Cambridge, where he cultivated his classical studies diligently, but imbibed a thorough distaste for logic and mathematics. He became, however, fellow of his college in 1776, and in 1778 was ordained by the bishop of Peterborough, in a frame of mind which led him afterwards to declare that he regarded his subscription to the Articles as the most disingenuous action of his life. He held, however, curacies for a short time at Stockport and Liverpool, but in 1779, the year of his marriage, quitted the church, and accepted the post of classical tutor at the Nonconformist academy at Warrington. The institution was already on the decline, and Wakefield's pugnacious temper was not likely to contribute to restore it. 'It survived my arrival, he says, "four years." During this short period he published translations of Matthew and the first epistle to the Thessalonians, and treatises on inspiration and baptism,

the latter of which was entirely written in nine days. He apologizes for this precipitancy as the result of 'a con- stitutional ardour which will not suffer me to dwell long on the same subject." However inevitable, this was the source of most of his failures and mistakes. After the dissolution of the academy, he resided successively at Brameote in Nottinghamshire, at Richmond, and at Nottingham, taking pupils and persevering in his theo-logical and classical studies, which were considerably retarded by ill health. His most important production at this time was the Silva Critica, "illustrating the Scriptures by light borrowed from the philology of Greece and Rome." Three parts of this work were printed at the

Cambridge university press, but, the authorities declining to proceed further with it, the author was obliged to com- plete it himself. In 1790 he was appointed professor of classics at the newly-founded Unitarian college at Hackney. Here he speedily became uncomfortable ; his proposals for reform in the course of instruction were unacceptable to his colleagues, and his dislike to the religious services, which he carried to the length of objecting to all social worship, occasioned his resignation in June 1791. The publication of his views on public worship deprived him of all his private pupils, and his time was henceforth devoted to authorship and the education of his children. His next important work was a new translation of the New Testa- ment, retaining as much of the language of the Authorized Version as he deemed consistent with accuracy. This soon reached a second edition. He commenced an edition of Pope, which he was prevented from completing by the competition of Warton, but the notes were published separately. His edition of Lucretius, a work of high pre- tensions and little solid performance, appeared in 1796. It gained for the editor a very exaggerated reputation, but Wakefield suffered himself to be allured from the paths of literature into those of political and religious controversy. After assailing with equal acerbity writers so diverse in their principles as Wilberforce and Thomas Paine, he in January 1798 "employed a few hours" in drawing up a reply to Bishop Watson's Address to the People of Great Britain. These few hours procured him two years' imprisonment in Dorchester jail. He was convicted in February 1799 of having published a seditious libel, an offence which he had assuredly no intention of committing, and his eloquent defence was naturally thrown away upon the same jurymen who had already convicted the printer. The sympathy excited for him, however, led to a subscription, amounting to no less than £5000, and forming a sufficient provision for his family upon his death, which occurred September 9, 1801, shortly after his liberation, from an attack of typhus fever. He had occupied himself while in prison with the preparation of classical lectures and an English- Greek lexicon, and had corresponded on classical subjects with Charles James Fox. 'The letters were subsequently published.

Wakefield was one of the most honest of nen, but also one of the most precipitate, narrow-minded, and _pre- sumptuous. His extreme ardour

and his consciousness of integrity produced an uncharitableness verging on offensive- ness, little in harmony with the many magnanimous and amiable features of his character. Rashness, opinionative- ness, and contentiousness grievously marred in him the character of patriot and scholar, though they could not destroy his claim to be numbered among both.

The priucipal authority for his life is the second edition of his Memoirs, in two volumes (London, 1804). The first volume is autobiographical ; the second, compiled by the editors, Rutt and Wainwright, includes several estimates of his character and per- formances from various sources, the most remarkable being one by Draarr:

WAKIDI. See Tapart.

WAK—WAL

WALACHIA. See Roumania and VLAoHs.

WALAFRID! STRABO (or Strrasus, «¢., " squint- eyed") was born in Germany (808-9), but the exact place is unknown. His taste for literature early displayed itself, and by the age of eighteen he had already achieved a reputation among the learned men of hisage. He was educated at the monastery of Reichenau, near Constance, where he had for his teachers Tatto and Wettin, to whose visions he devotes one of his poems. Later on in life (c. 826-829) he passed to Fulda, where he studied for some time under Hrabanus Maurus before returning to Reichenau, of which monastery he was made abbot in 838. There is a story, based, however, on no good evidence, that Walafrid devoted himself so closely to letters as to neglect the duties of his office, owing to which he was expelled from his house; but, from his own verses, it seems, that the real cause of his flight to Spires was that, notwithstanding the fact that he had been tutor to Charles the Bald, he espoused the side of his elder brother Lothair on the death of Louis the Pious in 840. He was, however, restored to his monastery in 842, and died August 16, 849, on an embassy to his former pupil. His epitaph was written by Hrabanus Maurus, whose elegiacs praise him for being the faithful guardian of his monastery.

Walafrid Strabo's works may be divided into three classes, — theological, historical, and poetical.

1. The first class includes the Glossa Ordinaria,? a large com- mentary on the Bibleand part of the Apocrypha. This is of course to a great extent a compilation from St Jerome, St Augustine, St Isidore, Bede, Hrabanus Maurus, &c. Under the same heading come the exposition of the first twenty Psalms, published by Pez (Anecdota, Nova, iv.), and an epitome of Hrabanus Maurus's com- mentary on Levitieus. An Haxpositio Quatuor Evangeltorum is also ascribed to Walafrid. The treatise De Rebus Eeelesiastieis, dedicated to Regenbert the librarian, gives not only explanations and direc- tions for the erection and embellishment of churches, but also instructions as regards such questions as the method of taking the holy communion and the payment of tithes. Walafrid approves of the use of images and 'pictures in churches, "quia pictura est quedam literatura illiterata." He had himself seen "simple folk and idiots," whom words could hardly bring to a realization of what they were told, so touched by representations of our Lord's passion that the tears ran down their faces. Last among Wala- frid's theological treatises must be mentioned the De Subversione Jerusalem Traetatus.

2. Walafrid's chief historical works are—(a) the Vita Saneti Galli, which, though written nearly two centuries after this saint's death, is still the primary authority for his life, and (6) a much shorter life of St Othmar, abbot of St Gall (d. 759). Both these lives were based ou previous ones written by Abbot Gotzbert of St Gall (from 816-837).

3. Walafrid's poetical works include a short life of St Blaithmaic, a high-born monk of Iona, murdered by the Danes in the first half of the 9th century; a life of St Mammes; and a Liber de Vistonibus Wettini. This last poem, like the two preceding ones written in hexameters, was composcd at the command of " Father" Adalgisus, and based upon the prose narrative of Heto, abbot of Reichenau from: 806 to 822. It is dedicated to Wettin's brother Grimald. At the time he sent it to Grimald Walafrid had, as he himself tells us, hardly passed his eighteenth year, and he begs his corre- spondent to revise his verses, because, "as it is not lawful for a monk to hide anything from his abbot," he fears he may be beaten with deserved

stripes. In this curious vision Wettin saw Charles the Great suffering purgatorial tortures because of his incontinence. The name of the ruler alluded to is not indeed introdueed into the actual text, but " Carolus Imperator" form the initial letters of the passage dealing with this subject. Many of Walafrid's other poems are, or include, short addresses to kings and queens (Lothair, Charles, Louis, Pippin, Judith, &c.) and to friends (Einhard, Grimald, Hrabanus Maurus, Tatto, Ebbo, archbishop of Rheims, Drogo, bishop of Metz, &c.). His most famous poem is the Horiulus, dedicated to Grimald. It is an account of a little garden that he used to tend with his own hands, and is largely made up of

1 In the oldest MSS. this is always spelt " Walahfrid."

2 This commentary was the one in general use during the Middle Ages, when it went by the name of Glossa simply.

3 Walafrid also edited Thetinar's Life of Louis the Pious, prefixing a preface and making a few additions, and divided Einhard's Vita Caroli into chapters, adding an introduction.

descriptions of the various herbs he grows there and their medicinal and other uses. Sage holds the place of honour; then comes rue, the antidote of poisons; and so on through melons, fennel, lilies, poppies, and many other plants, to wind up with the rose, " which in virtue and scent surpasses all other herbs, and may rightly be called the flower of flowers." The curious poein De Imagine Tetrict takes the form of a dialogue.

WALCH, the name of a family of scholars.

I. Jonann Grore Watcu (1693-1775) was born at Meiningen, and studied at Leipsic and Jena under Olearius and Buddeus. From 1716 he was professor at Jena of philosophy, rhetoric, and poetry successively, and after- wards (from 1724) of theology. He married the only daughter of Buddeeus, and in his learned and theological career followed in the footsteps of his father-in-law. His theological position was that of a very

moderate ortho- doxy, which had been influenced greatly 'by the philosophy and controversies of the Deistic period. His university lectures and published works ranged over the wide fields of ecclesiastical history in its various branches, particularly the literature and the controversies of the church, dog- matics, ethics, and pastoral theology.

Of his works the most valuable were Bibliotheca Theologica (1757-64); Bibliotheca Patristica (1770, new ed. 1834); his edition of Luther's works in 24 vols. (1740-52); Historische und theologische Einleitung in dic religidsen Streitigkeiten ausserhalb der Luthcrischen Kirche, 5 vols. (1734-36); and the companion work to this, Streitig- keiten der Evangel. Luth. Kirche (1730-39). His life, with a com- plete list of his writings, which amounted to 287, Leben und Charakter des Kirchenraths J. G. Walch, was published by his son C.W.F. Walch (Jena, 1777). Comp. Gass, Protestantische Dogmaitk, iii, p. 205 sq.

II. Jonann Ernst Immanven Watcu (1725-1778), son of the above, born at Jena in 1725, became professor of philosophy in the university in 1750, and of rhetoric and poetry in 1759. He died in 1778. He was distinguished for his philological, antiquarian, and mineralogical acquire- ments.

See Lebensgeschichts Johann Ernst Im. Walch, Jena, 1780, and Meusel's Lexicon verstorbener deutscher Schriftstcller, vol. xiv.

III. Curistian WitHetm Franz Watcu (1726-1784), younger brother of J. E. I. Walch, was born at Jena December 25, 1726. He was educated at Jena under his father's direction, and as early as 1745-1747 lectured in the university in branches of exegesis, philosophy, and history. He then travelled with his brother J. E. I. Walch for a year through the Continent, making the acquaintance of the learned men of each country. On his return he was made professor of theology in Jena, but in 1753 he accepted an invitation to Gottingen, where he spent his life as pro- fessor of theology. He lectured on dogmatics, church history, ethics, polemics, natural theology, symbolics, the epistles of Paul, Christian antiquities, historical theological literature, ecclesiastical law, and the fathers. His per- manent place amongst learned theologians rests on his works on ecclesiastical history. He here holds the third place in the important trio Semler, Mosheim, Walch. Semler was much his superior in originality

and boldness, and Mosheim in clearness, method, and elegance. But to his wide, deep, and accurate learning, to his conscientious and impartial examination of the facts and the authorities at first hand, and to "his exact quotation of the sources and works illustrating them and careful discussion of the most minute details " all succeeding historians are deeply indebted. His method is critical and pragmatic, ' pursuing everywhere the exact facts and the supposed causes of the outward changes of history," leaving wholly out of sight the deeper moving principles and ideas which influence its course. He speaks of history as consisting of "the accidental changes of accidental matters." But, although he thus failed to reach the modern standard of an historian, the results of his industry and research remain as permanent historical materials.

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His principal work was his Entwurf ciner volistandigen Historie der Ketzcreien, Spaltungen, und Religionsstreitigkeiten, bis auf die Reformation, 11 vols., Leipsic, 1762-85. It was a great advance in theological liberality that he defined a heretic on the onc hand as a Christian and on the other as one in fundamental error. He thus claimed for the heretic a place in the church, while he declined to treat as heretical such differences as divided great sections of Christians. Of his other valuable works may be men- tioned Eniwurf einer volistindigen MMistorie der Rémischen Piipste (1756, 2d ed. 1758), Entwurf einer vollstindigen Historie der Kirchenversammlungen (1759), Bibliotheca Symbolica Vetus (1770), Kritische Untersuchung vom Gebrauch der heiligen Schrift unter den alten Christen (1779), occasioned by the controversy between Lessing and Goeze, and to which Lessing began an elaborate reply just before his death.

On C. W. F. Walch as historian see Baur, Hpochen der kirchlichen Geschichtschreibung (1852), p. 145 sq., and Dogmengeschichte, p. 38 sq. (1867, 8d ed.); Gass, Geschichte der Protestantischen Dogmatik, iii. p. 267 sq.; Meusel, Lexicon verstorbener deutscher Schriftsteller, vol. Xiv.

IV. Cart Friepricu Watcu (1734-1799), brother of the last-named, was professor of jurisprudence at Jena, and the author of several valuable

legal works. He died at Jena i 1799. His son Georg Ludwig (1785-1838) was for a time professor in the Kloster gymnasium of Berlin and afterwards in the university of Greifswald. He edited valuable editions of Tacitus's Agricola and Germania.

WALCHEREN. See ZEALAND.

WALDECK-PYRMONT, a small principality in the north-west of Germany, is the eighteenth factor of the German empire in point of area, and the twenty-fourth in point of population. It consists of two separate portions lying about 30 miles apart, viz., the county (grafschaft) of Waldeck, embedded in Prussian territory between the provinces of Westphalia and Hesse-Nassau, and the principality (fiirstenthum) of Pyrmont, farther to the north, between Lippe, Brunswick, and Hanover. Waldeck, with 48,580 inhabitants, comprises an area of 407 square miles, covered for the most part with hills, which culminate in the Hegekopf (2807 feet). The centre is occupied by the plateau of Corbach. The chief rivers are the Eder and Diemel, both of which eventually find their way into the Weser. Pyrmont, only 26 square miles in extent, with 8123 inhabitants, is also mountainous. The Emmer, also belonging to the Weser system, is its chief stream. The united area is thus 433 square miles, or about half the size of Cambridgeshire in England, and the united population in 1885 was 56,703. Agriculture and cattle-rearing are the main resources of the inhabitants in both parts of the principality, but the soil is nowhere very fertile. Only 554 per cent. of the area is occupied by arable land and pasture; forests, one-tenth of which are coniferous, occupy 36 per cent. Rye isthe principal crop; but oats, potatoes, and flax are also grown in considerable quantities. In 1883 the principality contained 5956 horses, 20,249 cattle, 66,704 sheep, 17,735 pigs, and 7332 goats. Iron, slate, and building-stone are worked at various points, and, along with horses, cattle, sheep, pigs, wool, and timber, form the chief exports. A few insignificant manufactures (cigars, liqueurs, earthenware, linen, knitted stockings) are carried on in some of the little towns, but both trade and manufactures are much retarded by the almost com- plete isolation of the country from railways. Wildungen in the extreme south of Waldeck is the terminus of a branch line, and a narrow part of Pyrmont is intersected by an unimportant line.

The capital and the residence of the prince is Arolsen (2442 inhabitants) in Waldeck ; twelve smaller " towns g and about one hundred villages are also situated in the county. The only town in Pyrmont is Bad Pyrmont, with about 1500 inhabitants, at one time a highly fashionable watering-place on account of its chalybeate and saline springs. The annual number of visitors 1s still estimated at 13,000. Wildungen is also a spa of some repute. The

inhabitants to the north of the Eder are of Saxon stock, to the south of Franconian,—a difference which is distinctly marked in dialect, costumes, and manners. Nearly all are Protestants. In 1880, when the population was 56,522, there were 53,995 Protestants, 1576 Roman Catholics, 854 Jews, and 97 others.

Waldeck-Pyrmout has one vote in the federal council and one in the imperial diet. The constitution, dating from 1852, is a reactionary modification of one carried in 1849, which in its turn had been a considerable advance upon one granted in 1816. The single chamber consists of fifteen members (three of whom represent Pyrmont), elected indirectly for three years. In the event of the male line of the present ruling family becoming extinct the female line succeeds in Waldeck, but Pyrmont falls to Prussia. In terms of a treaty concluded in 1868 for ten years and renewed in 1878 for a similar period, the finances and entire government of Waldeck-Pyrmont are managed by Prussia, the little country having found itself unable to support unassisted the military and other burdens involved by its share in the North-German Confederation. The government is conducted in the name of the prince by a Prussian "landes-director," while the state-officials are 'Prussian subjects," and take the oath of allegiance to the king of Prussia. The prince of Waldeck reserves his whole rights as head of the church, and also the right of granting pardons, and in certain circumstances may exercise a veto on proposals to alter or enact laws. Educa- tion, the administration of justice, and similar matters are thus all conducted on the Prussian model; a previous con- vention had already handed over military affairs to Prussia.

The budget for 1886 showed a revenue of £52,530 and an expenditure of £48,680. The public debt was £117,550, paying interest at 4 per cent. The prince issupported by the income derived from crown-lands.

The princes of Waldeck-Pyrmont are descendants of the counts of Schwalenbcrg, the earliest of whom known to history was Wittekind, who died in 1187. His grandson seems to have becn the first count of Waldeck. For many centuries the original pos- sessions of the Schwalenbergs were divided among several collateral lines of counts (Waldeck, Landau, Wildungen, Eisenberg); and about 1428 Hesse obtained a right of superiority over Waldeck, in return for its protection during those troublous times. This right gave rise to important claims on the part of Hesse, which were not finally sct aside until 1847, when the German diet decided that the right had come to an end with the extinction of the empire. In 1685 a pactum primogeniture was made between the two surviv- ing lines, which took effect in 1692, when the Eisenberg branch be- came extinct with the death of George Frederick, who had served with distinction as an imperial field-marshal, and had received the title of prince. Pyrmont had also originally belonged to a branch of the Schwalenberg family ; but it had successively been held by the counts of Lippe (from 1557) and Glcichen (from 1584), before it finally fell back to Waldeck in 1625. From 1692 the lands have remained undivided under the Wildungen line, with the ex- ception of a brief period (1805-1812) when Waldeck and Pyrmont were held by two brothers. Frederick Anthony Ulrich, who suc- ceeded in 1706, was made prince by the emperor Charles VI. In 1807 Waldeck was a member of the Confederation of the Rhine ; and in 1814 it entered the German Confederation. Its first consti- tution was granted in 1816 by Prince George Henry (1813-1845). George Victor, the present prince (1888), succeeded in 1845 at the age of 14, and assumed the government in 1852. The most im- portant incident in the recent history of the principality is the conclusion of the above-mentioned treaty with Prussia, with whom it sided in the war against Austria.

WALDENBURG, an active industrial town in Prussian Silesia, is situated on the Polsnitz, 39 miles south-west of Breslau. It contains a handsome modern town-house and two churches. Among the chief industrial

establishments are a large porcelain and stoneware factory, extensive fire-clay works, glass-works, and a china-painting establish- ment; and there are numerous flax-spinneries and linen- factories in the neighbourhood. Adjoining the town on the south is the village of Oberwaldenburg, with a chateau. Waldenburg lies in the centre of the extensive and pro-

ductive coal-district of the Waldenburger Gebirge, a branch of the Sudetic chain. The town, which received municipal rights in the 16th century, had a population of 12,999 in 1885; in 1816 the population was 1768. There are villages of the same name in Saxony and Wiirtemberg.

WALDENSES, THE, a name given to the members of an heretical sect which arose in tle south of France about 1170. The history of the sects of the Middle Ages is obscure, because the earliest accounts of them come from those who were concerned in their suppression, and were therefore eager to lay upon each of them the worst enormities which could be attributed to any. In later times the apologists of each sect reversed the process, and cleared that in which they were interested at the expense of others. In early times these sectaries produced little literature of their own ; when they produced a literature at the beginning of the 15th century they attempted to claim for it a much earlier origin. Hence there is confusion on every side; it is difficult to distinguish between various sects and to determine their exact opinions or the circum- stances under which they came into being. The polemical conception which has done much to perpetuate this con- fusion is that of the historical continuity of Protestantism from the earliest times. According to this view the church was pure and uncorrupt till the time of Constantine, when Pope Sylvester gained the first temporal possession for the papacy, and so began the system of a rich, powerful, and worldly church, with Rome for its capital. Against this secularized church a body of witnesses silently protested ; they were always persecuted but always survived, till in the 13th century a desperate attempt was made by Innocent ITI. to root them out from their stronghold in southern France. Persecution gave new vitality to their doctrines, which passed on to Wycliffe and Huss, and through these leaders produced the Reformation‘in Germany and England.

This view rests upon a series of suppositions, and is entirely unhistorical. So far as can be discovered the heretical sects of the Middle Ages rested upon a system of Manicheism which was imported into Europe from the East (see Manicuazism). The Manichzan system of dualism, with its severe asceticism, and its individualism, which early passed into antinomianism, was attractive to many minds in the awakening of the 11th century. Its presence in Europe can first be traced in Bulgaria soon after its conversion in 862,! where the struggle between the Eastern and Western churches for the new converts opened a way for the more hardy speculations of a system which had never entirely disappeared, and found a home amongst the Paulicians in Armenia. The name of Cathari, taken by the adherents of this new teaching, sufficiently shows the Oriental origin of their opinions, which spread from Bulgaria amongst the Slavs, and followed the routes of commerce into central Europe. 'The earliest record of their presence there is the condemnation of ten canons of Orleans as Manichees in 1022, and soon after this we find complaints of the prevalence of heresy in northern Italy and in Germany. 'The strongholds of these heretical opinions were the great towns, the centres of civilization, because there the growing sentiment of municipal independence, and the rise of a burgher class through commerce, created a spirit of criticism which was dissatisfied with the worldly lives of the clergy and their undue influence in affairs.

The system of Catharism recognized two classes of adherents, credentes and perfecti. The perfectt only were admitted to its esoteric doctrines and to its superstitious practices. 'To the ordinary men it seemed to be a reform- ing agency, insisting on a high moral standard, and up- holding the words of Scripture against the traditions of an

1 Schmidt, Histoire des Cathares, i. 7.

overgrown and worldly church. Its popular aim and its rationalistic method made men overlook its real contents, which were not put clearly before them. It may be said generally that Catharism formed the abiding background of medizval heresy. Its dualistic system and its anti- social principles were known only to a few, but its anti- ecclesiastical

organization formed a permanent nucleus round which gathered a great deal of political and ecclesi- astical discontent. When this discontent took any in- dependent form of expression, zeal, which was not always accompanied by discretion, brought the movement into collision with the ecclesiastical authorities, by whom it was condemned as heretical. When once it was in conflict with authority it was driven to strengthen its basis by a more pronounced hostility against the system of the church, and generally ended by borrowing something from Catharism. The result was that in the beginning of the 13th century there was a tendency to class all bodies of heretics together: partly their opinions had coalesced ; partly they were assumed to be identical.

Most of these sects were stamped out before the period of the Middle Ages came to a close. The Waldenses, under their more modern name of the Vaudois, have sur- vived to the present day in the valleys of Piedmont, and have been regarded as at once the most ancient and the most evangelical of the medizeval sects. It is, however, by no means easy to determine their original tenets, as in the 13th and 14th centuries they were a body of obscure and unlettered peasants, hiding themselves in a corner, while in the 16th century they were absorbed into the general movement of the Reformation. As regards their antiquity, the attempts to claim for them an earlier origin than the end of the 12th century can no longer be sus- tained. They rested upon the supposed antiquity of a body of Waldensian literature, which modern criticism has shown to have been tampered with. The most important of these documents, a poem in Provengal, "La Nobla Leyczon," contains two lines which claimed for it the date of 1100 :—

Ben ha mil e cent anez compli entierament

Que fo scripta Vora, car sen al derier temp. But it was pointed out! that in the oldest MS. existing in the Cambridge university library the figure 4 had been imperfectly erased before the word "cent," a discovery which harmonized with the results of a criticism of the contents of the poem itself. This discovery did away with the ingenious attempts to account for the name of Waldenses from some other source than from the historical founder of the sect, Peter Waldo or Valdez. To get rid of Waldo, whose date was known, the name Waldenses or Vallenses was derived from

Vallis, because they dwelt in the valleys, or from a supposed Provengal word Vaudes, which meant a sorcerer.

Putting these views aside as unsubstantial, we will con- sider the relation of the Waldenses as they appear in actual history with the sects which preceded them. Already in the 9th century there were several protests against the rigidity and want of spirituality of a purely sacerdotal church. Thus Berengar of Tours (999-1088) upheld the symbolic character of the Eucharist and the superiority of the Bible over tradition. The Paterines in Milan (1045) raised a protest against simony and other abuses of the clergy, and Pope Gregory VII. did not hesitate to enlist their Puritanism on the side of the papacy and make them his allies in imposing clerical celibacy. In 1110 an apos- tate monk in Zeeland, Tanchelm, carried their views still further, and asserted that the sacraments were only valid

through the merits and sanctity of the ministers. In

1 Bradshaw, in Transactions of Cambridge Antiquarian Society, 1842. The text edited by Montet, 4to, 1887.

France, at Embrun, Peter de Bruys founded a sect known as Petrobrusians, who denied infant baptism, the need of consecrated churches, transubstantiation, and masses for the dead. VIL. had carried the church.

It was at this time (1170) that a rich merchant of Lyons, Peter Waldo, sold his goods and gave them to the poor; then he went forth as a preacher of voluntary poverty. His followers, the Waldenses, or poor men of Lyons, were moved by a religious feeling which could find no satisfaction within the actual system of the church, as they saw it before them. Like St Francis, Waldo adopted a life of poverty that he might be free to preach, but with this difference that the Waldenses preached the doctrine of Christ while the Franciscans preached the person of Christ, Waldo reformed teaching while Francis kindled love ; hence the one awakened antagonisms which the

‘other escaped. For Waldo had a translation of the New

Testament made into Provengal, and his preachers not only stirred up men to more holy lives but explained the Scriptures at their will. Such an interference with the ecclesiastical authorities led to difficulties. Pope Alexander III., who had approved of the poverty of the Waldensians, prohibited them from preaching without the permission of the bishops (1179). Waldo answered that he must obey God rather than man. The result of this disobedience was excommunication by Lucius III. in 1184. Thus a reforming movement became heresy through disobedience to authority, and after being condemned embarked on a course of polemical investigation how to justify its own position. Some were readmitted into the Catholic Church, and one, Durandus de Osca (1210), attempted to found an order of Pauperes Catholici, which was the forerunner of the order of St Dominic. Many were swept away in the crusade against the ALBIGENSES (¢.v.). Others made an appeal to Innocent IIL, protesting their orthodoxy. Their appeal was not successful, for they were formally condemned by the Lateran council of 1215.

The earliest definite account given of the Waldensian opinion is that of the inquisitor Sacconi about 1250.? He divides them into two classes, those north of the Alps and those of Lombardy. The first class hold (1) that oaths are forbidden by the gospel, (2) that capital punish- ment is not allowed to the civil power, (3) that any lay- man may consecrate the sacrament of the altar, and (4) that the Roman Church is not the church of Christ. The Lombard sect went farther in (3) and (4), holding that no one in mortal sin could consecrate the sacrament, and that the Roman Church was the scarlet woman of the Apocalypse, whose precepts ought not to be obeyed, especially those appointing fast-days. This account sufficiently shows the difference of the Waldenses from the Cathari: they were opposed to asceticism, and had no official priesthood ; at the same time their objection to oaths and to capital punishment are closely related to the principles “of the Cathari. Their other opinions were forced upon them by their conflict with the authority of the church. When forbidden to preach without the permission of the bishop, they were driven to assert the right of all to preach, with- out distinction of age or sex. This led to the

further step of setting up personal merit rather than ecclesiastical ordination as the ground of the priestly office. From this

2 D'Argentré, Collectio Judiciorum de Novis Erroribus, i. 50, &c.

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followed again the conclusion that obedience was not due to an unworthy priest, and that his ministrations were invalid.

These opinions were subversive of the system of the medizeval church, and were naturally viewed with great disfavour by its officials ; but it cannot fairly be said that they have much in common with the opinions of the Reformers of the 16th century. The medizval church set forth Christ as present in the orderly community of the faithful; Protestantism aimed at setting the individual in immediate communion with Christ, without the mechanical intervention of the officers of the community; the Wal- denses merely set forward a new criterion of the orderly arrangement of the church, according to which each mem- ber was to sit in judgment on the works of the ministers, and consequently on the validity of their ministerial acts. It was a rude way of expressing a desire for a more spiritual community. The earliest known document pro- ceeding from the Waldensians is an account of a confer- ence held at Bergamo in 1218 between the Ultramontane and the Lombard divisions, in which the Lombards showed a greater opposition to the recognized priesthood than ead their northern brethren.}

As these opinions became more pronounced persecution became more severe, and the breach between the Waldenses and the church widened. The Waldenses withdrew alto- gether from the ministrations of the church, and chose ministers for themselves whose merits were recognized by the body of the faithful. Election took the place of ordination, but even here the Lombards showed their difference from the Ultramontanes, and recognized only two orders, like the Cathari, while the northern body kept the old three orders of bishops, priests, and deacons. Gradually the separation from the church became more complete: the sacraments were regarded as merely sym- bolical; the priests became helpers of the faithful

; ceremonies disappeared ; and a new religious society arose equally unlike the medieval church and the Protestantism of the 16th century.

The spread of these heretical sects led toresolute attempts at their suppression. The crusade against the Albigensians could destroy prosperous cities and hand over lands from a heedless lord to one who was obedient to the church ; but it could not get rid of heresy. The revival of preach- ing, which was the work of the order of St Dominic, did more to combat heresy, especially where its persuasions were enforced by law. The work of inquisition into cases of heresy proceeded slowly in the hands of the bishops, who were too busy with other matters to find much time for sitting in judgment on theological points about which they were imperfectly informed. The greatest blow struck against heresy was the transference of the duty of i inquiry into heresy from the bishops to Dominican inquisitors. The secular power, which shared in the proceeds of the confiscation of those who were found guilty of heresy, was ready to help in carrying out the judgments of the spiritual courts. Everywhere, and especially in the district round Toulouse, heretics were keenly prosecuted, and before the continued zeal of persecution the Waldenses slowly disappeared from the chief centres of population and took refuge in the retired valleys of the Alps. There, in the recesses of Piedmont, where the streams of the Pelice, the Angrogne, the Clusone, and others cleave the sides of the Alps into valleys which converge at Susa, a settlement of the Waldensians was made who gave their name to these valleys of the Vaudois. In the more accessible regions north and south heresy was exposed to a steady process of persecution, and tended to assume shifting forms. Among the valleys it was less easily reached, and retained its old organization and its old con-

1 Preger, Bettrige sur Geschichte der Waldesier.

tents. Little settlements of heretics dispersed throughout Italy and Provence looked to the valleys as a place of refuge, and tacitly regarded them as the centre of their faith. At times attempts were made to suppress the sect of the Vaudois, but the nature of the country which they inhabited, their obscurity, and their isolation made the difficulties of their

suppression greater than the advantages to be gained from it. However, in 1487 Innocent VIII. issued a bull for their extermination, and Alberto de' Capitanei, archdeacon of Cremona, put himself at the head of a crusade against them. Attacked in Dauphiné and Piedmont at the same time, the Vaudois were hard pressed ; but luckily their enemies were encircled by a fog when marching upon their chief refuge in the valley of the Angrogne, and were repulsed with great loss. After this Charles II., duke of Piedmont, interfered to save his territories from further confusion, and promised the Vaudois peace. They were, however, sorely reduced by the onslaught which had been made upon them, and lost their ancient spirit of independence. When the Lutheran movement began they were ready to sympathize with it, and ultimately to adapt their old beliefs to those of the rising Protestantism. Already there were scattered bodies of Waldenses in Germany who had influenced, and afterwards joined, the Hussites and the Bohemian Brethren.

The last step in the development of the Waldensian body was taken in 1530, when two deputies of the Vaudois in Dauphiné and Provence, Georges Morel and Pierre Masson, were sent to confer with the German and Swiss Reformers. A letter addressed to Gicolompadius? gives an account of their practices and beliefs at that time, and shows us a simple and unlettered community, which was the survival of an attempt to form an esoteric reli- gious society within the medieval church. It would appear that its members received the sacraments of baptism and the holy communion from the regular priesthood, at all events sometimes, but maintained a discipline of their own and held services for their own edification. Their ministers were called barba, a Provengal word meaning guide. They were chosen from among labouring men, who at the age of twenty-five might ask the body of ministers to be admitted as candidates. If their character was approved they were taught during the winter months, when work was slack, for a space of three or four years; after that they were sent for two years to serve as menial assistants at a nunnery for women, which curiously enough existed in a recess of the valleys. Then they were admitted to office, after receiving the communion, by the imposition of hands of all ministers present. They went out to preach two by two, and the junior was bound absolutely to obey the senior. Clerical celibacy was their rule, but they admit that it created

grave disorders. The ministers received food and clothing from the contributions of the people, but also worked with their hands; the result of this was that they were very ignorant, and also were grasping after bequests from the dying. The affairs of the church were managed by a general synod held every year. The duties of the barbas were to visit all within their district once a year, hear their confessions, advise and admonish them; in all services the two ministers sat side by side, and one spoke after the other. In point of doctrine they acknow- ledged the seven sacraments, but gave them a symbolical meaning ; they prayed to the Virgin and saints, and admitted auricular confession, but they denied purgatory and the sacrifice of the mass, and did not observe fasts or festivals. After giving this account of themselves they ask for information about several points in a way which shows the exigencies of a rude and isolated society, and finally they say that they have been much disturbed by the

2 Scultetus, Annales, ii. 294, &c.

Lutheran teaching about freewill and predestination, for they had held that men did good works through natural virtue stimulated by God's grace, and they thought of predestination in no other way than as a part of God's foreknowledge.

(Ecolampadius gave them further instruction, especially emphasizing the wrongfulness of their outward submission to the ordinances of the church: "God," he said, "is a jealous God, and does not permit his elect to put themselves under the yoke of Antichrist." The result of this intercourse was an alliance between the Vaudois and the Swiss and German Reformers. A synod was held in 1532 at Chanforans in the valley of the Angrogne, where a new confession of faith was adopted, which recognized the doctrine of election, assimilated the practices of the Vaudois to those of the Swiss congregations, renounced for the future all recognition of the Roman communion, and established their own worship no longer as secret meetings of a faithful few but as public assemblies for the glory of God.

Thus the Vaudois ceased to be relics of the past, and became absorbed in the general movement of Protestantism. This was not, however, a source of quiet or security. In France and Italy alike they were marked out as special objects of persecution, and the Vaudois Church has many records of martyrdom. The most severe trial to which the Vaudois of Piedmont were subjected occurred in 1655. The Congregation de Propaganda Iide established, in 1650, a local council in Turin, which exercised a powerful influence on Duke Charles Emmanuel II., who ordered that the Vaudois should be reduced within the limits of their ancient territory. Fanaticism took advantage of this order; and an army, composed partly of French troops of Louis XIV., partly of Irish soldiers who had fled before Cromwell, entered the Vaudois valleys and spread destruc- tion on every side. They treated the people with horrible barbarity, so that the conscience of Europe was aroused, and England under Cromwell called on the Protestant powers to join in remonstrance to the duke of Savoy and the French king. The pen of Milton was employed for this purpose, and his famous sonnet is but the condensation of his state papers. Sir Samuel Morland was sent on a special mission to Turin, and to him were confided by the Vaudois leaders copies of their religious books, which he brought back to England, and ultimately gave to the university library at Cambridge. Large sums of money were contributed in England and elsewhere, and were sent to the suffering Vaudois.

By this demonstration of opinion peace was made for a time between the Vaudois and their persecutors; but it was a treacherous peace, and left the Vaudois with a hostile garrison established among them. Their worship was prohibited, and their chief pastor, Leger, was obliged to flee, and in his exile at Leyden wrote his Histoire Générale des Eglises Vaudoises (1684). The revocation of the edict of Nantes in 1685 began a new period of persecution, which aimed at entire extermination. This was found so difficult that the remnant of the Vaudois, to the number of 2600, were at last allowed to withdraw to Geneva. But the love of their native valleys was strong among the exiles, and in 1689 one of their pastors, Henri Arnaud, led a band of 800 men to the reconquest of their country. His first attempts against the French were suc- cessful; and the rupture between Victor Amadeus, duke of Savoy, and Louis XIV. brought a sudden change of fortune to the Vaudois, They were recognized once

more as citizens of Savoy, and in the war against France which broke out in 1696 the Vaudois regiment did good service for its duke. The peace of Utrecht saw the greater part of the French territory occupied by the Vaudois annexed to Savoy, and,

though there were frequent threatenings of persecution, the idea of toleration slowly prevailed in the policy of the house of Savoy. The Vaudois, who had undergone all these vicissitudes, were naturally reduced to poverty, and their ministers were partially maintained by a subsidy from England, which was granted by Queen Anne. The 18th century, however, was a time of religious decadence even among the Alpine valleys, and the outbreak of the French Revolution saw the Vaudois made subjects of Trance. This led to a loss of the English subsidy, and they applied to Napoleon for an equivalent. This was granted, and their church was organized by the state. On the restora- tion of the house of Savoy in 1816 English influence was used on behalf of the Vaudois, who received a limited toleration. From that time onwards the Vaudois became the objects of much interest in Protestant countries. Large sums of money were collected to build hospitals and churches among their valleys, and they were looked upon as the possible centre of a Protestant church in Italy. Especially from England did they receive sympathy and help. An English clergyman, Dr Gilly, visited the valleys in 1823, and by his writings on the Vaudois Church attracted considerable attention, so that he was enabled to build a college at La Torre. Moreover, Dr Gilly's book (A Visit to the Valleys of Piedmont), chanc- ing to fall into the hands of an officer who had lost his leg at Waterloo, Colonel Beckwith, suggested an object for the energies of one who was loth at the age of twenty- six to sink into enforced idleness. Beckwith visited the valleys, and was painfully struck by the squalor and ignorance of a people who had so glorious a past. He settled among them, and for thirty-five years devoted himself to promote their welfare. He married a Vaudois peasant girl, lived amongst the people, and established no fewer than 120 schools. Moreover he brought back the Italian language which had been displaced by the French in the services of the Vaudois Church, and in 1849 built a church for them in Turin. He lived in La Torre till his death in 1862, and the

name of the English benefactor is still revered by the simple folk of the valleys whom he did so much to civilize.

According to the: latest official returns the Waldensian Church had, in 1886-87, 43 churches and 38 mission stations throughout Italy. The ordained pastors num- bered 37, evangelists 6, and male and female teachers 56, the total number of salaried agents being 124. The church had 4005 members, and the day schools were attended by 2206 scholars, the Sunday schools by 2482. The total income, about three-fourths of it contributions from the United Kingdom and other Protestant countries of northern Europe, amounted to upwards of £10,000.

The literature on the subject of the Waldensian and other sects is copious. For their rise the most important authorities are to be found in Moneta, Adversus Catharos ct Waldenses ; D'Argentré, Collectio Judiciorum de Novis Erroribus ; Alanus, Adversus Here- ticos ; D'Achery, Spicileyia, vol. i.; Gretser, Opera, vol. x. ; Lim- borch, Historia Inquisitionis, at the end of whichis the Liber Sententiarum of the Inquisition of Toulouse from 1307-1322. Of modern books may be mentioned Schmidt, Histoire des Cathares ; Hahn, Geschichte der new-manichdischen Ketzer ; Dieckhoff, Die Valdensier in Mittelalter; Preger, Bettrige zur Geschichte der Waldesier ; Canti, Gli Erctichi in Halia ; Comba, Storia della Riforma in Italia, and Histoire des Vaudois d'italie ; Tocco, L'Ercsia nel Medio Evo; Montet, Historie litterarte des Vaudois ; Lea, History of the Inquisition of the Middle Ages. Amongst books dealing with the more modern history of the Vaudois specially are Leger, Histoire des 0 Lglises Vaudoises ; Arnaud, Histoire de la Rentrée des Vaudois: Perrin, Histoire des Vaudois ; Monastier, Histoire de ?Eglise Vaudoise ; Musten, L'israel des Alpes ; Gilly, Excursion to the Valleys of Piedmont, and Researches on the Waldensians ; Todd, The Waldensian Manuscripts ; Melia, The Origin, Persceution, and Doctrines of the Waldensians. (M.C.)

WALDO, Vaxpo, or VALDEZ, PETER. See p. 323 supra. WALES. See ENGLAND.

WALKER, a town of Northumberland, England, on the north bank of the river Tyne, 2 miles east of Newcastle- on-Tyne, with which it is connected by railway. Christ Church, in the Perpendicular style, erected in 1848, con- sists of chancel, nave, aisles, and tower with beautiful illuminated clock erected in 1887. The windows of the church are all monumental stained glass. There is a large colliery, in which at one time was a salt spring, which was used in the mdnufacture of soda, begun by permission of the Government in 1795, by a company who may be re- garded as the first producers of mineral alkali and soda in England. Along the banks of the Tyne there are large iron and chemical works, coal staiths, ship- and boat-building establishments, and brick and tile works. The corporation of Newcastle-on-Tyne are lords of the manor. The town is formed of what were formerly the villages of Walker, Low Walker, and Walker Quay. It is governed by a local board of health of twelve members. The population of the urban sanitary district (area 1200 acres) in 1871 was 8888, and in 1881 it was 9527.

WALKER, Freperick (1840-1875), subject painter, was born in Marylebone, London, on May 24,1840. While very young he began to draw from the antique in the British Museum, and at the age of sixteen he was placed in the office of Baker, an architect. The occupation proved uncongenial ; at the end of eighteen months he resumed his work from the Elgin marbles at the Museum, attending art classes ; and in March 1858 he was admitted a student of the Royal Academy. He soon turned his attention to designing for the wood-engravers, and served an apprentice- ship of three years with J. W. Whyinper. His earliest book-illustrations appeared in 1860 in Once a Week, a periodical to which he contributed largely, as also to the Cornhill Magazine, where his admirable designs to the works of Thackeray and those of his daughter appeared. These woodcuts are among the most spirited and artistic works of their class, and entitle Walker to rank with Millais at the very head of the draughtsmen of our time who have dealt with scenes of contemporary life. In the intervals of work asa book-illustrator he practised painting in water-colours, his subjects being frequently more con- sidered and refined repetitions in colour of his black-and- white designs. Among the more notable of his productions in water-colour are Spring, a Fishmonger's Shop, the Ferry, and Philip in Church, which gained a

medal in the Paris International Exhibition of 1867. He was elected an associate of the Society of Painters in Water Colours in 1864, and a full member in 1866 ; and in 1871 he became an associate of the Royal Academy. His first oil picture, the Lost Path, was exhibited in the Royal Academy in 1863, where it was followed in 1867 by the Bathers, one of the artist's finest works, in 1868 by the Vagrants, now in the National Gallery, in 1869 by the Old Gate, and in 1870 by the Plough, a powerful and impressive render- ing of ruddy evening light, of which the landscape was studied in Somerset. In 1871 he exhibited his tragic life-sized figure of a Female Prisoner at the Bar, a subject which now exists only in a finished oil study, for the painter afterwards effaced the head, with which he was dissatisfied, and was prevented by death from again completing the picture. The last of his fully successful works was the Harbour of Refuge, shown in 1872, for the Right of Way, exhibited in 1875, bears evident signs of the artist's failing strength. In the end of 1873 he made a journey to Algiers for his health, but, returning in the bitter English spring, he was again prostrated ; and on June 5, 1875, he died of consumption at St Fillan's, Perthshire.

The works of Frederick Walker are thoroughly original and in-

dividual, both in the technique of their colour and execution and in their view of nature and humanity. His colour, especially in his

watcr-colours, is pure, powerful, and full of delicate gradations; he had an admirable sense of design, and the figures of his peasants at their daily toil show a grace and swecping largeness of line which recalls the antique ; while the sentiment of his subjects is unfail- ingly refined and poetic.

WALKER, Sears Coox (1805-1853), astronomer, was born at Wilmington, Massachusetts, U.S., on March 28, 1805. He kept a school at Philadelphia till 1845, when he was appointed assistant at the Washington observatory. Shortly afterwards he took charge of the astronomical department of the United States Coast Survey, where he was among the first to make use of the electric telegraph

‘for the purpose of determining the difference of longitude

between two stations, and he introduced the method of registering transit observations electrically by means of a chronograph. Healso investigated the orbit of the newly discovered planet Neptune. He died at Cincinnati on January 30, 1853.

WALLACE, Str Witi1am, the most popular national hero of Scotland, is believed to have been the second son of Sir Malcolm Wallace of Elderslie and Auchinbothie, in Renfrewshire. The date of his birth is not certainly ascertained, but is usually given as 1270. The only authority for the events of his early life is the metrical history of Blind Harry. That authority cannot be implicitly relied on, though we need not conclude that the minstrel invented the stories he relates. He lived about two centuries later than Wallace, during which a considerable body of legend had probably gathered round the name, and these popular ‘‘gestis” he incorporates in his narrative. At the same time he professes to follow as his “autour” an account that had been written in Latin by John Blair, the personal friend and chaplain of Wallace himself. As Blair’s account has perished, we cannot tell how far the minstrel has faithfully followed his authority, but some comparatively recent discoveries have confirmed the truth of portions of the narrative which had pre- viously been doubted. At best, however, his authority must be regarded with suspicion, except when it is con- firmed by other and more trustworthy evidence.

Only for a period of less than two years in his life— from the beginning of the insurrection in 1297 to the battle of Falkirk—does Wallace come before us in the clearest historical light. With the exception of one or two glimpses of him that we obtain from authentic historical documents, the recorded events of his later as of his earlier life rest on no more certain authority than that of Blind Harry.

In his boyhood, according to the usual accounts, he resided for some time at Dunipace, in Stirlingshire, with an uncle, who is styled “parson” of the place. By this uncle he was partially educated, and from him he imbibed an enthusiastic love of liberty. His education was continued at Dundee, where he made the acquaintance of John Blair. On account of an incident that happened at Dundee—his slaughter of a young Englishman

named Selby, for an insult offered to him—he is said to have been outlawed, and so driven into rebellion against the English. Betaking himself to the wilds of the country, he gradually gathered round him a body of desperate men whom he led in various attacks upon the English. In consequence of the success of these early enterprises his following largely increased, several of the more patriotic nobles—including the steward of Scotland, Sir Andrew Moray, Sir John de Graham, Douglas the Hardy, Wishart, bishop of Glasgow, and others—having joined him. His insurrection now became more open and pronounced, and his enterprises of greater import- ance. An attack was made upon the English justiciar, Ormsby, who was holding his court at Scone. The justiciar himself escaped, but many of his followers

were captured or slain. The burning of the Barns of Ayr, the quarters of English soldiers, in revenge for the treacherous slaughter of his uncle, Sir Ronald Crawford, and other Scottish noblemen, followed. The success of these exploits induced the English king to take measures for staying the insurrection. A large army, under the command of Sir Henry Percy and Sir Robert Clifford, was sent against the insurgents, and came up with them at Irvine. Dissensions broke out among the Scottish leaders, and all Wallace's titled friends left him and made submission to Edward, except the ever faithful Sir Andrew Moray. The treaty of Irvine, by which these Scottish nobles agreed to acknowledge Edward as their sovereign lord, is printed in Rymer's Medera. It is dated 9th July 1297, and is the first public document in which the name of Sir William Wallace occurs. Wallace retired to the north, and although deserted by the barons was soon at the head of a large army. The vigour and success of his operations was such that in a short time he succeeded in recovering almost all the fortresses held by the English to the north of the Forth. He had begun the siege of Dundee when he received information that an English army, led by the earl of Surrey and Cressing- ham the treasurer, was on its march northward. Leaving the citizens of Dundee to continue the siege of the castle, he made a rapid march to Stirling. Encamping in the neighbourhood of the Abbey Craig—on which now stands the national monument to his memory—he watched the passage of the Forth.

After an unsuccessful attempt to bring Wallace to terms, the English commander, on the morning of 11th September 1297, began to cross the bridge. When about one-half of his army had crossed, and while they were still in disorder, they were attacked with such fury by Wallace, that almost all—Cressingham among the number—were slain, or driven into the river and drowned. Those on the south side of the river were seized with panic and fled tumultuously, having first set fire to the bridge. The Scots, however, crossed by a ford, and con- tinued the pursuit of the enemy as far as Berwick. Sir Andrew Moray fell in this battle. The results of it were important. The English were everywhere driven from Scotland. To increase the alarm of the English, as well as to relieve the famine which then prevailed, Wallace organized a great raid into the north of England, in the course of which he devastated the country to the gates of Newcastle. On his return he was elected guardian of the kingdom. In this office he set himself to reorganize the army and to regulate the affairs of the country. His measures were marked by much wisdom and vigour, and for a short time succeeded in securing order, even in the face of the jealousy and opposition of the nobles. Edward was in Flanders when the news of this successful revolt reached him. He hastened home, and at the head of a great army entered Scotland in July 1298. Wallace was obliged to adopt the only plan of campaign which could give any hope of success. He slowly retired before the English monarch, driving off all supplies and wasting the country. The nobles as usual for the most part deserted his standard. Those that remained thwarted his councils by their jealousies. His plan, however, came very near being successful. Edward, compelled by famine, had already given orders for a retreat when he received information of Wallace's position and intentions. The army, then at Kirkliston, was immediately set in motion, and next morning (July 22, 1298) Wallace was brought to battle in the vicinity of Falkirk. After an obstinate fight the Scots were overpowered and defeated with great loss. Among the slain was Sir John de Graham, the bosom friend of Wallace, whose death, as Blind Harry tells, threw the hero into a frenzy of rage and grief. The

account of his distress is one of the finest and most touching passages in the poem. With the remains of his army Wallace found refuge for the night in the Torwood —known to him from his boyish life at Dunipace. He then retreated to the north, burning the town and castle of Stirling on his way. He resigned the office of guardian, and betook himself again to a wandering life and a desultory and predatory warfare against the English. At this point his history again becomes obscure. He is known to have paid a visit to France, with the purpose of obtaining aid for his country from tbe French king. This visit is narrated with many untrustworthy details by Blind Harry; but the fact is established by other and indisputable evidence. When in the winter of 1303-4 Edward received the submission of the Scottish nobles, Wallace was expressly excepted from all terms. And after the capture of Stirling Castle and Sir William Oliphant, and the submission of Sir Simon Fraser, he was left alone, but resolute as ever in refusing allegiance to the English king. A price was set upon his head, and the English governors and captains in Scotland had orders to use every means for his capture. On the 5th August 1305 he was taken—as is generally alleged, through treachery—at Robroyston, near Glasgow, by Sir John Menteith, carried to the castle of Dumbarton, and thence conveyed in fetters and strongly guarded to London. He reached London on the 22d August, and next day was taken to Westminster Hall, where he was impeached as a traitor by Sir Peter Mallorie, the king's justice. To the accusation Wallace made the simple reply that he could not be a traitor to the king of England, for he never was his subject, and never swore fealty to him. He was found guilty and condemned to death. The sentence was executed the same day with circumstances of unusual cruelty.

The cause of national independence was not lost with the life of Wallace. Notwithstanding the cruclty and indignity amid which it terminated, that life was not a failure. It has been an inspiration to his countrymen ever since. The popular ideas regarding his stature, strength, bodily prowess, and undaunted courage are con- firmed by the writcrs nearest his own time—Wyntoun and Fordun, And indeed no man could in that age have secured the personal ascendency which he did without the possession of these qualities. The little we know of his statesmanship during the short period he was in power gives proof of political wisdom. His patriotism was conspicuous and disinterested. He was well skilled in the modes of

warfare that suited the country and the times. That he failed in freeing his country from the yoke of England was due chiefly to the jealousy with which he was regarded by the men of rank and power. But he had a nobler success in inspiring his countrymen with a spirit which made their ultimate conquest impossible. (A. F. H.)

WALLACE, Witt1am (1768-1843), mathematician, was born on September 23, 1768, at Dysart, in Fife- shire, where he received his school education. In 1784 his family removed to Edinburgh, where he himself was set to learn the trade of a bookbinder; but his taste for mathematics had already developed itself, and he made such use of his leisure hours that before the completion of his apprenticeship he had made considerable acquirements in geometry, algebra, and astronomy. He was further assisted in his studies by Professors Robison and Playfair, to whom his abilities had become known. After various changes of situation, dictated mainly by a desire to gain time for study, he became assistant teacher of mathematics in the academy of Perth in 1794, and this post he ex- changed in 1803 for a mathematical mastership in the Royal Military College at Great Marlow (afterwards at Sandhurst). In 1819 he was chosen to succeed Playfair in the chair of mathematics at Edinburgh, and in 1838, when compelled by ill-health to retire, he received a Government pension for life. He died in Edinburgh, after a lingering illness, on April 28, 1843. ;

In his earlier years Wallace was an occasional contributor to Leybourne's Mathematical Repository and to the Gentlemans

Mathematical Companion. Between 1801 and 1810 he contributed the articles " Algebra," "Conic Sections," "Trigonometry," and several others in mathematical and physical science to the fourth edition of the Encyclopedia Britannica, and some of these were re- tained in subsequent cditions from the fifth to the cighth inclusive. He was also the author of the principal mathematical articles in the Edinburgh Encyclopedia, edited by Brewster (1808-80). Sub- joined is a list of his more important papers contributed to the Transactions of the Royal Society of Edinburgh :—" Geometrical

Porisms, with Examples of their Applications to the Solution of

Problems" (1796); "A ncw Method of expressing the Coefficients in the Development of the Formula which represents the Mutual Perturbation of two Planets" (1802); " New Serics for the Quadra- ture of the Conic Sections, and the Computation of Logarithms "

(1808); 'Investigation of Formule for finding the Logarithms of

Trigonometrical Quantities from one another" (1823); " Account of the Invention of the Pantograph, and a Description of the Lidograph," the latter being an instrument of his own invention (1881); " Analogous Properties of Elliptic and Hyperbolic Sectors iH (1839); and "Solution of a Functional Equation, with its Applica- tion to the Parallclogram of Forces and the Curve of Equilibration." In 1836 he contributed '"'Two Elementary Solutions of Kepler's Problem by the Angular Calculus" to the Royal Astronomical Society; and for the Cambridge Philosophical Society he wrote a paper on "Geometrical Theorems and Formule, particularly ap- plicable to some Geodetical Problems."

WALLASEY, a town of Cheshire, England, on rising ground near a branch of the Mersey called Wallasey Pool, which bounds it on the S.E., while to the N.W. is the Trish Sea. It is about 2 miles north-west of Birkenhead, of which part of it is practically a suburb, and Wallasey Pool is now occupied by the Great Float, forming an immense dock of about 150 acres. The church of St Hilary, rebuilt in the 18th century, with the exception of the tower bearing date 1536, having been gutted by fire in 1857, the whole, except the tower, was rebuilt in the Early English style. The free grammar school, built and endowed by Major Henry Meols in 1656-57, was re-estab- lished under a scheme of the charity commissioners, and reopened in 1876. On the shore of the Irish Sea is Leasowe Castle, once known as Mock-Beggar Hall, and supposed to have been erected by the earls of Derby in the reign of Elizabeth, in order to witness the races. On the sides of Wallasey Pool are remains of a submarine forest bed, in which various animal skeletons have been found. The population of the urban sanitary district (which includes Liscard and Poulton, with Seacomb, the total area being 3408 acres) in 1871 was 14,944, and in 1881 it was 21,192.

At the Conquest Wallasey formed part of the possessions of Robert de Rhuddlan, and on his decease became part of the fee of Halton. In the reign of Elizabeth it had a small port, to which there belonged three barques and fourteen men. In 1668 the manor was possessed by the earl of Derby, but various parts afterwards became alienated. For a considerable time the horse races held on what was then a common had considerable reputation, but they werc discontinued in 1760. At these races the duke of Monmouth, son of Charles IJ., once rode his own horse and won the plate.

WALLA WALLA, a city and the county seat of Walla Walla county, Washington Territory, United States, is situated in a valley on Mill Creek, a tributary of the Walla Walla, in a fertile agricultural region, devoted mainly to the growth of wheat, fruit, and vegetables. The population, which in 1880 was 3588, was estimated at 5000 in 1888.

WALLENSTEIN (properly Wa.psTEIn), ADALBERT Evusrsius von (1583-1634), duke of Friedland, Sagan, and Mecklenburg, was born on the hereditary estate of his family, Hermanic, in Bohemia, on 15th September 1583. His parents were Protestants, and in early youth he attended the school of the Brothers of the Common Life at Koschumberg. After the death of his parents he was sent by his uncle, Slawata, to the Jesuit college at Olmiitz, where he joined the Roman Catholic Church. In 1599 he went to the university of Altdorf, which he had to leave in consequence of some boyish follies. Afterwards he studied

at Bologna and Padua, and, according to the custom of the young nobles of the time, visited many places in southern and western Europe. While in Padua, he gave much atten- tion to astrology, and during the rest of his life he seems never to have wavered in the conviction that he might trust to the stars for indications as to his destiny.

For some time Wallenstein served in the army of the emperor Rudolph II. in Hungary. In 1606 he returned to Bohemia, and soon afterwards he married a rich widow, Lucretia Nikossie von Landeck, whose lands in Moravia he inherited after her death in 1614. Supporting the arch- duke

Ferdinand in his war with Venice, he became favour- ably known at court, and his influence was increased by his marriage with Isabella Katharina, daughter of Count Harrach, a confidential adviser of the emperor Matthias.

In the disturbances which broke out in Bohemia in 1618 —disturbances which proved to be the beginning of the Thirty Years' War—advances were made to Wallenstein by the revolutionary party ; but he preferred to associate himself with the imperial cause, for which he repeatedly fought with marked success. In 1620 he was made quartermaster-general of the army of the League, com- manded by Tilly. Wallenstein was not present at the battle of the Weissenberg (1620), but soon afterwards he did brilliant service as second in command of the army which opposed Bethlen Gabor in Moravia.

The battle of the Weissenberg placed Bohemia absolutely at the mercy of the emperor Ferdinand; and Wallenstein, who was a man of insatiable ambition, knew how to turn the prevailing confusion to his own advantage. Through no very honourable means he secured the inheritance of the great estates belonging to his mother's family, and the emperor sold to him on easy terms vast tracts of confiscated lands. His possessions he was allowed to form into a territory called Friedland, and he was raised in 1622 to the rank of an imperial count and palsgrave, in 1623 to that of a prince. In 1625 he was made duke of Fried- land. Inthe government of his principality he displayed much vigour and foresight. He not only placed the ad- ministration of justice on a firm basis, but by many wise measures developed agriculture and mining and manufac- turing industries.

The early successes of the emperor Ferdinand in the Thirty Years' War were due chiefly to the army of the League, which he could only indirectly control. When he was threatened with a coalition of the Protestant powers, with Christian IV. of Denmark as his most active enemy, he was anxious to have an army of his own, which should be more devoted than that of the League to the interests of his dynasty. He had not, however, the means of secur- ing the fulfilment of his wish. In these circumstances Wallenstein saw that he might have an opportunity of playing a great part

in the events of the age ; and accord- ingly, early in 1626, he offered to raise an army for the imperial service. After some negotiations the offer was accepted, the understanding being that the troops were to be maintained at the cost of the countries they might occupy. Wallenstein had always been a popular com- mander, and great numbers of recruits flocked to his standard, so that he soon found himself at the head of an army of 30,000 men. With this force he marched north- wards for the purpose of co-operating with Tilly against Christian IV. and Mansfeld. No engagement was fought in 1625; but on April 25, 1626, Wallenstein defeated Mansfeld at the bridge of Dessau, and later in the year Christian IV. was defeated by Tilly at Lutter. Wallenstein pursued Mansfeld into Hungary, where the Protestant general effected a junction with Bethlen Gabor. Before the end of the year Mansfeld died, and Bethlen Gabor came to terms with the emperor.

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Having established peace in Hungary, Wallenstein pro- ceeded, in 1627, to clear Silesia of some remnants of Mansfeld's army ; and at this time he bought from the emperor the duchy of Sagan, his outlay in the conduct of the war being taken into account in the conclusion of the bargain. He then joined Tilly in the struggle with Christian TV., and afterwards took possession of the duchy of Mecklenburg, which was granted to him in reward for his services, the hereditary dukes being displaced on the ground that they had helped the Danish king. He failed to capture Stralsund, which he besieged for several months in 1628. This was his first important reverse, and it caused him bitter disappointment, for he had hoped that by obtain- ing free access to the Baltic he might be able to make the emperor as supreme at sea as he seemed to be on land. It was a part of Wallenstein's scheme that he should ob- tain possession of the Hanseatic towns, and through them destroy the naval power of the Scandinavian kingdom, the Netherlands, and England. This plan completely broke down when he was compelled to withdraw his troops from the brave city which he had sworn to take even if it were bound with chains to heaven. Notwithstanding this check, the imperial cause prospered; and early in 1629 Christian IV. was obliged to accept terms of peace. About the same time Ferdinand issued the famous edict of

restitution, which excited deep resentment in every Protestant state in the realm.

Meanwhile Wallenstein had made for himself a host of enemies among the princes of the empire. They regarded him as an upstart, and complained of the incessant exactions of his army. Moreover, it was by no means clear what he intended to do with the great force he had gathered around him. He was sometimes heard to speak ominously of the arrogance of the princes, and it appeared probable that he might try to bring them, Catholics and Protestants alike, into rigid subjection to the crown. Again and again, there- fore, the emperor was advised to dismiss him from his command. Ferdinand was very unwilling to part with one who had served him so well; but the demand was pressed so urgently by the electors in 1630 that he had no alter- native, and in September of that year envoys were sent to Wallenstein to announce his removal. Had the emperor declined to take this course, the princes would probably have combined against him; and the result would have been a civil war even more serious than that which had already brought so many disasters upon the country. This was perfectly understood by Wallenstein, who therefore accepted the emperor's decision calmly, and retired to Gitschin, the capital of his duchy of Friedland.

Some months before the dismissal of Wallenstein, Gustavus Adolphus had landed in Germany, and it soon became obvious that he was by far the most formidable of the enemies with whom the emperor had yet had to con- tend. 'Tully was defeated at Breitenfeld and in the battle of the Lech, where he received a mortal wound; and Gustavus advanced to Munich, while Bohemia was occupied by his allies the Saxons. After the battle of Breitenfeld the emperor entreated Wallenstein to come once more to his aid. Wallenstein at first declined; he had, indeed, been secretly negotiating with Gustavus Adolphus, in the hope that he might thus be able to maintain his hold over his great possessions. In the end, however, he accepted the offers made to him by Ferdinand, and in the spring of 1632 he took the field with an army of more than 40,000 men. This army was placed absolutely under his control, so that he assumed the position of an independent prince rather than of an ordinary subject.

His first aim was to drive the Saxons from Bohemia, —an object which he accomplished without serious diffi- culty. Then he advanced against Gustavus Adolphus, who

attacked him near Nuremberg on the 3d of September, but was driven back. On the 16th of November 1632 a decisive battle was fought at Liitzen, in Saxony. In this battle the imperialists were routed, but Gustavus Adolphus was killed.

To the dismay of Ferdinand, Wallenstein made no use of the opportunity provided for him by the death of the Swedish king, but withdrew to winter quarters in Bohemia. In the campaign of 1633 much astonishment was caused by his apparent unwillingness to attack the enemy. The truth was that he was preparing to desert the emperor. That he sincerely desired to secure for Germany the benefits of peace is probable enough, but it is certain that he was also resolved to make for himself a position of command- ing importance. He entered into negotiations with Saxony, Brandenburg, Sweden, and France; and one of his condi- tions was that the possession of the kingdom of Bohemia should be guaranteed to him. He had vast and somewhat vague schemes for the reorganization of the entire constitu- tional system of the empire, and he himself was to have supreme authority in determining the political destinies of his country.

Irritated by the distrust excited by his proposals, and anxious to make his power felt, he at last assumed the offensive, and in October he defeated the Swedes at Steinau. Soon afterwards he entered Lusatia and took Gorlitz and Bautzen, and despatched a troop of cavalry as far as Berlin. He then resumed the negotiations, and pressed for a full and final acceptance of his plans. In December he retired with his army to Bohemia, fixing lis headquarters at Pilsen.

It had soon been suspected in Vienna that Wallenstein was playing a double part, and the emperor, encouraged by the Spaniards at his court, anxiously sought for means of getting rid of him. Wallenstein was well aware of the designs formed against him, but displayed little energy in his attempts to thwart them. This was due in part, no doubt, to ill health, in

part to the fact that he trusted to the assurances of his astrologer, Seni, with whom he often conferred. He also felt confident that when the time came for his army to decide between him and the emperor the decision would be in his own favour.

His principal officers assembled around him at a banquet on the 12th January 1634, when he submitted to them a declaration to the effect that they would remain true to him. This declaration they signed. More than a month later a second paper was signed ; but on this occasion the officers' expression of loyalty to their general was associated with an equally emphatic expression of loyalty to their emperor. By this time Wallenstein had learned that he had too easily allowed himself to be lulled into a sense of security, and that he needed to act warily. On the 24th of January the emperor had signed a secret patent remov- ing him from his command and requiring the army to obey Count Gallas; and imperial agents had been labouring to undermine Wallenstein's influence. Another patent charging Wallenstein and two of his officers with high treason, and naming the generals who were to assume the supreme command of the army, was signed on the 18th February, and published in Prague.

When Wallenstein heard of the publication of this patent, he realized the full extent of his danger, and on the 23d February, accompanied by several of his most intimate friends, and guarded by about 1000 men, he went from Pilsen to Eger, hoping to obtain the protection of the Protestant general Bernard of Weimar. After the arrival of the party at Eger, Colonel Gordon, the commandant, and Colonels Butler and Leslie agreed to rid the emperor of his enemy. Qn the evening of the 25th February

-Wallenstein's supporters Ilo, Kinsky, Terzky, and Neumann

were received at a banquet by the three colonels, and murdered by several dragoons. Butler, accompanied by Captain Devereux and a number of soldiers, then hurried to the house where Wallenstein was staying, and broke into his room. He had just taken a bath, and was standing in his

shirt ready to go to bed. He was instantly killed by a thrust of Devereux's partisan. The body was taken to the citadel, and laid beside those of his murdered comrades. Wallenstein was buried at Gitschin, but in 1732 the remains were removed to the castle chapel of Minchen- atz.

© Xs direct orders for the murder of Wallenstein had been issued, but it was well understood that tidings of his death would be welcome at court. The murderers were handsomely rewarded for what they had done, and their deed was commended as a necessary act of justice.

Wallenstein was tall, thin, and pale, with reddish hair, and eyes of remarkable brilliancy. He was of a proud and imperious temper, and was seldom seen to laugh. He worked hard, and invariably acted on the motto that if speech is silvern silence is golden. In times of supreme difficulty he listened carefully to the advice of his counsellors, but the final decision was always his own, and he rarely revealed his thoughts until the moment for action arrived. Few generals have surpassed him in the power of quickly organiz- ing great masses of men and of inspiring them with confidence and enthusiasm ; and as a statesman he was distinguished for the boldness of his conceptions and the liberality of his sentiments. All his good qualities were, however, marred by a furious lust for power, in the gratification of which he allowed no scruples to stand in his way.

See Forster, Albrecht von Wallenstein (1834) ; Barthold, Geschichte des grossen deutschen Kriegs (1842-43) ; Aretin, Wallenstein (1846) ; Helbig, Wallenstein und Arnim, 1632-3) (1850), and Kaiser Ferdinand und der Herzog von Friedland, 1633-34, (1853); Hurter, Zur Geschichte Wallensteins (1855); Fiedler, Zur Geschichte Wallensteins (1860); L. von Ranke, Geschichte Wallensteins (3d ed., 1872); Gindely, Geschichte des dreissigjdhrigen Kriegs (1869). SI.)

WALLER, Epmunp (1605-1687), enjoyed in the latter half of his long life a high reputation as a poet, which has been partly fixed by the compliments of Dryden and Pope. Waller is a singular and piquant figure in the history of the 17th century; his relations with Charles I., with the Long Parliament, with Cromwell, with Charles II, his position as a poet, as a courtier, as a privileged water- drinker among the bibulous Restoration wits, form a com- bination that has no parallel. paralleled,

but the run of incidents is unique. He was born at Coleshill, in Hertfordshire, March 3, 1605, and came of distinguished ancestry, landed gentry, with estates in Kent and other counties, and prominent places in the public service from the reign of Henry V. downwards. He inherited a position of difficulty in view of the civil strife that began when he reached manhood; his mother was herself an ardent Royalist, but was connected by blood with Hampden and by marriage with Cromwell. His father died when he was eleven years old. He entered parliament at sixteen, and sat also in the first and in the third parliaments of Charles]. He was thus, as Clarendon put it, nursed in parliament, and this early experience helped him to make a figure afterwards ; but he took no active part at the time, the chief use that he made of his advantages as a courtier and a youth of fashion being to marry a wealthy city heiress. With this addition to the handsome fortune left him by his father, he retired to his estate at Beaconsfield and studied literature. This was about 1632.

When he first began to write verses is a doubtful and disputed point. Clarendon says that he began at an age when most men leave off, and if we put this at thirty there is no published or even probable evidence to the contrary; but, on the other hand, it is argued that he began at the age of eighteen, in 1623, this being the date of the subject of his first poem,—Prince Charles's escape from a storm at St Andero. This earliest date must be increased by at least two years, the whole point of the poem

The character might be,

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being Charles's marriage with his queen Henrietta, which took place in 1625. The exact date of his beginning acquires some interest from Johnson's dictum that he wrote as smoothly at eighteen as at eighty, "'smoothness" being his established merit; and the difficulty of determining the date arises from his not having "gathered his sticks into a faggot" and published till 1645. The incidents that furnished him with themes for his peculiar artificial and decorative treatment occurred long before,—for example, the duke of Buckingham's death in 1628, the taking of Salle in 1632, the repair of St Paul's in 1633, the death of the earl of Carlisle in 1636, his courtship of Lady Dorothy Sidney —

“Saccharissa ’”—between the death of his first wife in 1634 and Saccharissa’s marriage to another in 1639. But that the poems, as we now have them, were written immediately after the incidents glorified in his verse is an uncertain assumption, considering his elaborating habits, the strongly Royalist tone of his verses on public events, and the express statement of Clarendon, who was likely to have known if copies had been circulated in the society of the court long before they appeared in print. If they were at least retouched by him between the ages of thirty and forty, the wonder of his uniformity of manner from first to last—which, after all, has been somewhat exaggerated —is considerably lessened.

In the struggle between king and parliament, Waller tried at first to mediate, holding the king’s demands un- constitutional, but endeavouring through his advisers to induce him to modify them. He made such a mark as a speaker in the Short Parliament that at the opening of the Long Parliament he was chosen by the Commons to conduct the impeachment of Judge Crawley for his ship- money decision. Thereafter, as the struggle became fiercer, with a view apparently to prevent parliament from pro- ceeding to extremities, he engaged in what was known as Waller’s plot. The object of the plot seems to have been to restrain the extreme Parliamentarians by some public declaration of moderate opinion, but it was complicated with another plot, the object of which was to assist the king with armed force. All Waller’s relations, except his mother, were anti-Royalist, and it is said that his complicity was discovered by domestic treachery. He behaved with the most abject meanness when arrested by order of Pym on May 31, 1643, saved himself by at once turning informer and making disclosures that were at least unreserved, and was let off eventually with a fine of £10,000 and banish- ment. It was from his exile in Paris, in 1645, that he directed his first publication of poems. He lived there in high repute as a wit and a munificent host till 1654, when Cromwell, at the intercession of his anti-Royalist relatives, allowed him to return to England, and try to mend his impaired estate. He celebrated the Protector’s greatness in a lofty panegyric, and Cromwell is said to have relished his pleasant qualities as a companion. It deserves to be noted, as evidence of a real admiration, that he wrote also a lament “ Upon the Death of the Lord Protector,” when the sincerity of his panegyric was less open to question. The poem contains two famous lines of bathos—

Under the tropic is our language spoke

And part of Flanders hath received our yoke. But otherwise it does not fall beneath the poet's steady level.

Upon the Restoration Waller hastened to express his joy, mingled with trembling, "' Upon His Majesty's Happy Return," and found little difficulty in making his peace. He met the king's complaint that his congratulation was inferior to his panegyric on the Protector with the famous retort, " Poets, Sire, succeed better in fiction than in truth." He was soon on such terms with Charles that he applied for the provostship of Eton; the king

agreed, but Clarendon refused, on the ground that he was a layman, and the refusal was sustained by the council. He thus failed in his only application for substantial evidence of the king's favour, but in every other respect the changed state of things made his old age happy and glorious. He entered parliament again, and became, Burnet says, "the delight of the House, and, though old, said the liveliest things of any of them." His witty sayings were circulated through the town, and, as Johnson suspects, good things were fathered on him,—a tribute to his reputation. Although a water-drinker, he was a boon companion with the roystering wits, Dorset saying that "no man in England should sit in his company without drinking, except Ned Waller." Further, surviving all his early contemporaries, he found himself in higher reputa- tion than ever asa poet. His poems now went through several editions, each increased by new productions, though the bulk was never large. He wrote in his formed eulo- gistic fashion on topics of the day, on St James's Park, on Somerset House, the victory over the Dutch, the queen's birthday, the beauties, and other celebrities of the time. He fitted The Maid's Tragedy with a happier ending in rhymed couplets, assisted Dorset and Godolphin in the translation of the Pompey of Corneille, and wound up his career becomingly with Divine Poems, continuing to write to the last. He died in 1687, at the age of eighty-two, and at the height of his poetic reputation. Rymer of the Feedera, the savage critic of Shakespeare, wrote the epitaph for his tomb at Beaconsfield, in which it is recorded that "inter poetas sui

temporis facile princeps, lauream, quam nieruit adolescens, octogenarius haud abdicavit." Fenton, Pope's coadjutor in the translation of the Odyssey, edited and commented on his poems after his death, justifying the pains bestowed by coniparing him to Petrarch and Malherbe.

There can be no doubt that as a panegyrical poet, ready to over- lay any subject, entirely irrespective of its intrinsic worth, with a cleverly woven and tastefully coloured garment of words and images, Waller deserved all the admiration he received, and would be hard to beat in our literature. Fenton showed true discern- ment in urging that his excellence lay in commendation, whether or not he was right in adding that any ill-natured person could be a satirist. And complimentary poetry was so much in fashion when poets were courted and munificently rewarded by politicians that Waller's fame from the Restoration till the time of Walpole, who dispensed with the aid of complimentary poets, is easy to understand. But Mr Gosse's recent contention that Waller must be regarded as the founder of the classical school, and that his influence changed the course of our literature for a century, must pass as a hurried cxaggeration. He was so eminently successful that he influenced minor poets at the close of his life and for a generation afterwards, but his range of subjects as well as his art was extremely limited, and much larger and wider influences were at work. He is an cxample of one of the tendencies, but it is absurd to represent him as a commanding influence, except in a very humble field. He influenced pane- gyvical writing, and, inasmuch as this fell in with and influenced the tendency "to dress nature to advantage," "to raise sentiments above the vulgar pitch" with the borrowed riches of genuinely impassioned poetry, it might be argued that Waller's influence extended beyond his own uarrow circle of aims. But his effect on Dryden or on Pope was infinitesimal. Even on the form of the favourite "classical" couplet Waller's single example cannot be held to have told in any considerable degree. It was already an established form for complimentary verse when he began to write. "Waller was smooth," it is true, but Pope at once qualifies the complimeut with a reference to his want of variety. And Pope is also strictly correct in confining Waller's metrical improve- ments to his post-Restoration verse. When we place Wallcr's later couplets side by side with his earlier, say The Triple Combat or The Divine Poems, with His Majcsty's Escape, or

The Countess of Carlisle in Mourning, or The Death of Lady Rich, we become aware ofa marked change in his metrical scheme, notwithstanding the current opinion to the contrary. It is only in his later couplets that he aims, under French influence, as Pope justly implies, at making each distich complete in itself, varying this only with a stave of four, generally with a break in the third line. His earlier couplets are less monotonous, and were obviously modelled on the Hero and Leander of Marlowe and Chapman. To that noble poem,

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indeed, whieh was not known in the days when Waller's rhythm was so admired, he owed a large part of his panegyrical stock-in- trade, as anybody familiar with it can trace, not merely in his "classical " allusions, but also in his diction and his earlier metre. As regards smoothness and balance, there are no couplets in the edition of 1645 that could not be paralleled from the verses of his eontemporaries, George Sandys and Cowley. (W. M.) WALLIS, Joun (1616-1703), an eminent English mathematician, logician, and grammarian, was born on the 23d November 1616 at Ashford, in Kent, of which parish his father was then incumbent. Having been previously instructed in Latin, Greek, and Hebrew, he was in 1632 sent to Emmanuel College, Cambridge, and afterwards was chosen fellow of Queen's College. Having been admitted to holy orders, he left the university in 1641 to act as chaplain to Sir William Darley, and in the follow- ing year accepted a similar appointment from the widow of Sir Horatio Vere. It was about this period that he displayed surprising talents in deciphering the intercepted letters and papers of the Royalists. His adherence to the Parliamentary party was in 1643 rewarded by the living of St Gabriel, Fenchurch Street, London. In 1644 he was appointed one of the scribes or secretaries of the Assembly of Divines at Westminster. During the same year he married Susanna Glyde, and thus vacated his fellowship ; but the death of his mother had left him in possession of a handsome fortune. In 1645 he attended those scientific meetings which led to the establishment of the Royal Society. When the Independents obtained the superiority, Wallis adhered to the Solemn League and Covenant. The living of St Gabriel he exchanged for that of St Martin, Ironmonger Lane ; and, as rector of that parish, he in

1648 subscribed the Remonstrance against putting Charles I. to death. Notwithstanding this act of opposition, he was in June 1649 appointed Savilian professor of geometry at Oxford. In 1654 he there took the degree of D.D., and four years later suc- ceeded Dr Langbaine as keeper of the archives. After the Restoration he was named one of the king's chaplains in ordinary. While complying with the terms of the Act of Uniformity, Wallis seems always to have retained moderate and rational notions of ecclesiastical polity. He died at Oxford on the 28th of October 1703, in the eighty-seventh

year of his age.

The works of Wallis are numerous, and relate to a multiplicity of subjects. His Institutio Loyicw, published in 1687, was very popular, and in his Grammatica Lingua Anglicane we find indiea- tions of an acute and philosophic intellect. The mathematical works are published some of them in a small 4to volume, Oxford, 1657, and a complete collection in three thick folio volumes, Oxford, 1695-93-99. The third volume includes, however, some theological treatiscs, and the first part of it is occupied with editions of treatises on harmonics and other works of Greek geometers, some of them first editions from the MSS., and in general with Latin versions and notes (Ptolemy, Porphyrius, Briennius, Archimedes, Eutocius, Aristarchus, aud Pappus). The second and third volumes include also two collections of letters to and from Brouucker, Frenicle, Leibnitz, Newton, Oldenburg, Schooten, and others; and there is a tract on trigonometry by Caswell. Excluding all these, the mathie- matical works contained in the first and second volumes occupy about 1800 pages. The titles in the order adopted, but with date of publication, are as follows:—" Oratio Inauguralis," on_his appointment (1649) as Savilian professor, 1657; '«Mathesis Uni- versalis, seu Opus Arithmeticum Philologice et Mathematice Tradi- tum, Arithmeticam Numerosam et Speciosam Aliaque Contincns, 1657; "Adversus Meibomium, de Proportionibus Dialogus,' 1657 ; 'De Sectionibus Conicis Nova Methodo Expositis," 1655 ; "Arithmetica Infinitorum, sive Nova Mcthodus Inquirendi in Curvilineorum Quadraturam Aliaque Difficiliora Matheseos Prob- lemata," 1655; "Eclipsis Solaris Observatio Oxonil Habita 2d. Aug. 1654," 1655; "Tractatus Duo, prior de Cyeloide,

posterior de Cissoide et de Curvarum tum Linearum Edéévoe. tum Superficierum TlAarvope," 1659; " Mechanica, sive de Motu Traetatus Geometricus," three parts, 1669-70-71; "De Algebra Tractatus Historieus et Practicus, ejusdem originem et progressus varios ostendens," English, 1685; " De Combinationibus Alternationibus et Partibus Aliquotis Tractatus," English, 1685 ; "De Sectionibus Angularibus Tractatus," English, 1685 ; 'De Angulo Contactus

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et Semicirculi Tractatus," 1656; "Hjusdem Tractatus Defensio," 1685; "De Postulato Quinto, et Quinta Definitione, Lib. VI. Euclidis, Disceptatio Geometrica," ?1663; "Cuno-Cuneus, seu Corpus partim Conum partim Cuneum Representans Geometrice Consideratum," English, 1685; "De Gravitate et Gravitatione Disquisitio Geometrica," 1662 (English, 1674); "De Aistu Maris Hypothesis Nova," 1666-69.

The Arithmetica Infinitorum relates chiefly to the quadrature of curves by the so-called method of indivisibles established by Cavalleri, 1629, and cultivated in the interval by him, Fermat, Deseartes, and Roberval. The method is substantially that of the integral calculus; thus, ¢.g., for the curve y=2" to find the area from z=0 to z—1, the base is divided into m equal parts, and the area is obtained as— 4 (1242? . .. £2), = 1 ,0(n-+1) (20-+1),

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which, taking 7 indcfinitcly large, is=4. The case of the general parabola y=a™ (2 a positive integer or fraction), where the area is

, had been previously solved. Wallis made the important

m+ 1 remark that the reciprocal of such a power of x could be regarded

; : il as a power with a negative exponent (a-e" , and he was thus ay

enabled to extend the theorem to certain hyperbolic curves, but the case m a negative value larger than 1 presented a difficulty which he did not

succeed in overcoming. It should be noticed that Wallis, although not using the notation xin the case of a positive or negative fractional valuc, nor indeed in the case of a negative integer value of m, deals continually with such powers, and speaks of the positive or negative integer or fractional value of mas the index of the power. The area of a curve, y=sum of a finite number of terms Az", was at once obtained from that for the case of a single term; and Wallis, after thus establishing the several

results which would now be written he —2'da=1, Ke — x?) dar = b Jy (@ ~~— 2° Pda= gy ae — x82 =+1,4, &c., proposed to himself to interpolate from these the value of ih '(ee — x)tdx, which is the expression for the area (=4z) of a semicirele, diameter=1; making a slight transformation, the actual problem was to find the value of O (~~=), the term halfway between 1 and 2, in the series of*

terms 1, 2, 6, 20, 70,... ; and he thus obtained the remarkable

: 2.4. 45676 8), Ce. « ; , expression T™=9" 3 5 5 7 7 gs together with a succession of

superior and inferior limits for the number x. In the same work Wallis obtained the expression which wonld

\2 now be written ds=dz Ae 1+ (4) for the length of the clement ae

of a curve, thus reducing the problem of rectification to that of quadrature. An application of this formula to an algebraical eurve was first made a few years later by W. Neil; the investiga- tion is reproduced in the " Tractatus de Cissoide, &c." (1659, as above), and Wallis adds the remark that the curve thus rectified is in fact the scmicubical parabola.

The Afathesis Universalis is a more elementary work intended for learners. It eoutains copions disscrtations on fundamental points of algebra, arithmetic, and geometry, and critical remarks.

The De Algebra Tractaius contains (chapters 66-69) the idea of the interpretation of imaginary quantities in geometry. This is given

somewhat as follows: the distance represented by the square root of a negative quantity cannot be measured in the line backwards or forwards, but ean be measured in the same plane above the line, or (as appears elsewhere) at right angles to the line either in the plane, or in the plane at right angles thereto. Con- sidered as a history of algebra, this work is strongly objected to by Montuela on the ground of its unfairness as against the carly Italian algebraists and also Vieta and Descartes, and in favour of Harriot ; but De Morgan, while admitting this, attributes to it eonsiderable merit.

The two treatiscs on the cycloid and on the cissoid, &c., and the Meehanviea contain many results which were then new and valuable. The latter work contains elaborate investigations in regard to the centre of gravity, and it is remarkable also for the employment of the principle of virtual velocities. The cuno-cuneus is a highly interesting surface; it is a ruled quartic surface, the equation of which may be written c?y?=(c— z) (a? — x).*

Among the letters in volume iii., we have one to the editor of the Leipsic Acts, giving the decipherment of two letters in secret characters. he ciphers are different, but on the same prineiple: the characters in each are either single digits or combinations of two or three digits, standing some of them for letters, others for syllables or words,—the number of distinct characters which had to be deciphered being thus very considerable.

For the prolonged conflict between Hobbes and Wallis, see Horses, vol. xii. pp. 86-38. (A. CA.)

WAL—W AL

WALLON, or Wattoon, the collective name of the inhabitants of the south-eastern division of Belgium, who are distinguished from the rest of the population chiefly by their Romance speech and darker complexion. The Wallon domain comprises the four provinces of Hainault, Namur, Liége, and Luxemburg, besides about one-third of Brabant. It forms a nearly regular right-angled triangle, with apex at Maestricht within the Dutch frontier, and base stretching along the French frontier in a south-

easterly direction, from the neighbourhood of Lille to Longwy at the south-west corner of German Luxemburg. It coincides almost exactly with the section of the Meuse basin com- prised within Belgian territory, and has a total area of 6000 square miles, or about one-half of the kingdom, with a population (1886) of 2,780,000, or considerably less than half of the entire Belgian population. But from the following figures it is evident that the Romance is steadily gaining on the Flemish (Teutonic) section and will soon be in a majority. In 1830 the Wallon population numbered 1,360,000 as against 1,860,000 Flemish; in 1866 the corresponding figures were 2,040,000 and 2,406,000; and in 1886 they were 2,780,000 and 3,060,000.

This north-eastern extremity of ancient Gaul, originally inhabited by the Aduatici, Eburones, Tungri, and other Belgic nations, was reduced by Cesar (51 3B.c.), and early brought within the sphere of Roman culture. Hence the Latin langnage was already too firmly established to be supplanted by the Teutonic when the country was occupied in the 5th century by the Franks previous to their conquest of the more central provinces. But about the same time Roman institutions and speech were entirely supplanted in the more open low-lying districts of western Belgium by the same Franks penetrating from the east, and by the roving Saxon and Frisian tribes arriving by sea on the Litus Saxoniewm. Since that time the two elements have remained, without much further change, in close proximity, or separated only by intervening strips of ' marches" or border-lands formed by the uncleared forest formerly known as the Silva Carbonaria.*

The Wallons, allowing for inevitable intermingling, especially towards the German frontier, are thus Romanized Gauls, lineal representatives of the ancient Belge, in a much truer sense than their Flemish neighbours, althongh accepting from them this name of " Wallon," that is, Welsh or Forevgn, just as the Saxon intruders in Britain imposed the same designation on its primitive inhabit- auts. Their Gallic descent is shown specially in their much darker complexion, as clearly established by the anthropological statistics collected by Dr Beddoe.? In other respects the Wallons contrast favourably with the Tcutonic-speaking populations of Belgium. They are physically a stronger race, more bony, angular, and

taller, and also more long-lived and exempt from disease, as shown by the much lower death-rate in the province of Namur (18 per 1000) than in West Flanders (25 per 1000). The cause of this superiority has been attributed by some writers to a greater inherent vitality of the Wallons, but by others with more probability to their greater general comfort, and particularly to the more salubrious climate of their elevated and more hilly territory. In medisval times the Flemings were certainly far superior in wealth, culture, and public spirit. But the great centres of industry have since been shifted from Bruges and Ghent (Flanders) to Liége and Namur, and the Wallons now take the lead in all these respects,—in fact, in every- thing except music, painting, and the fine arts generally.

The Wallon language is a very marked dialect of the Langue d'Oil (Northern French), betraying strong affinities to the neigh- bouring idioms of Picardy and Lorraine, but still distinct from both. Being little cultivated, and possessing no literary standard, it has developed several varieties, the chief of which are—(1) the Liégeois, current throughout the districts bordering on Rhenish Prussia, and largely affected by German influences ; (2) the Namurois of the central districts and the Ardennes, with several local patois ; (8) the Hennuyer of Hainault and the western districts, so named from the town of Hennuyéres, where it is spoken with the greatest purity. But since French has been accepted as the written standard and the official language of the whole kingdom Wallon is gradually receding from the large towns and assuming more and more the character of a purely rural patois. It possesses no literary remains of any consequence, and its earliest extant monument appears to be the " Declaration des Provost, Juret, Eskievin de Valenchienes"' of the year 1256.

1 In Namur, a eentral point of the Wallon domain, the proportion of dark eyes is 47 and of dark hair 57°5 per cent. as compared with 24 and 20 respeetively in Mechlin, a corresponding eentral point in the Flemish domain.

WAL—-WAL

WALLSEND, a town of Northumberland, England, on the north bank of the Tyne and on the Newcastle and Tynemouth Railway, 4 miles east-

north-east of Newcastle. The church of St Peter, erected in 1809 ata cost of £5000, has a tower surmounted by a spire. There are still some remains of the old church of the 11th century in the Transition Norman style. The church of St Luke was erected in 1886 at a cost of £4000. At an early period Wallsend was famous for its coals, but the name has now a general application to coal that does not go through a sieve with meshes 8ths of an inch in size. The colliery, which was opened in 1807, has frequently been the scene of dreadful accidents. There are also ship and boat building yards, engineering works, lead and copper smelting works, cement works, and brick and tile works. The ecclesiastical commissioners are lords of the manor. The town is governed by a local board of twelve members. The population of the urban sanitary district (area 1202 acres) in 1871 was 4169, and in 1881 it was 6351.

Wallsend derives its modern name from its position at the extremity of Hapnian's Watt (g.v.); originally it was the Roman station Segedunuwm. It had a quay, of which remains have been discovered, and possessed a magazine of corn and other provisions for the supply of the stations in the interior,

WALNUT (Juglans), a genus of seven or eight species, natives of the temperate regions of the northern hemi- sphere, some even extending into Mexico and the West Indies. They are all trees, usually of large size, with alter- nate, stalked, unequally pinnate leaves, and abounding in an aromatic resinous juice. The scars left by the fallen leaves are unusually large and prominent. The buds are not unlike those of the ash; and it frequently happens that in the axils of the leaves, instead of one, several buds may be formed. The utility of this is seen in seasons when the shoot produced from the first bud is killed by frost; then one of the supplementary buds starts into growth, and thus replaces the injured shoot. The flowers are unisexual and moncecious, the numerous males borne in thick catkins proceeding from the side of last year's shoot. The female. flowers are solitary or few in number, and borne on short terminal spikes of the present season's growth. In the male flower the receptacle is " concrescent " cr inseparate from the bract in whose axil it originates. The receptacle is, in consequence, extended more or less horizontally, so that the flowers appear to be placed on the upper surface

of horizontally-spreading stalks. The perianth consists of five or six oblong greenish lobes, within which is found a tuft, consisting of a large number of stamens, each of which has a very short filament and an oblong two-lobed anther bursting longitudinally, and surmounted by an oblong lobe, which is the projecting end of the connective. There is usually no trace of ovary in the male flowers, though by exception one may occasion- ally be formed.

The female flower consists of a cup-like receptacle, inseparate from the ovary, and bearing at its upper part a bract and two bracteoles, uplifted with the receptacle. Vrom the margin of this latter organ springs a perianth of four short lobes. The one-celled ovary is immersed within the receptacular tube, and is surmounted by a short style with two short ribbon-like stigmatic branches. The solitary ovule springs erect from the base of the ovarian cavity. The fruit is a kind of drupe, the fleshy husk of which is the dilated receptacular tube, while the two-valved stone represents the two carpels. The solitary seed has no perisperm or albumen, but has two large and curiously crumpled cotyledons concealing the plumule, the leaves of which, even at this early stage, show traces of pinne.

The species best known is J. regia, the Common Walnut, a native of the mountains of Greece, of Armenia,

of Afghanistan and the north-west Himalayas, and also found in Japan. Traces of the former existence of this or of a very closely-allied species are found in the Post- Tertiary deposits of Provence and elsewhere, proving the former much wider extension of the species. At the pre- sent day the tree is largely cultivated in most temperate countries for the sake of its timber or for its edible nuts. The timber is specially valued for cabinet work and for gun- stocks, the beauty of its markings rendering it desirable for the first-named purpose, while its strength and elasticity fit it for the second. The leaves and husk of the fruit are resinous and astringent, and are sometimes used medicinally as well as for dyeing purposes. It is stated that sugar is prepared from the sap in a similar manner to that obtained from the maple Acer saccharinum in Canada.

The young fruits are used for pickling. When ripe the seeds are much esteemed as a delicacy, while in France much oil of fine quality is extracted from them by pressure. There are several varieties in cultivation, varying in the degree of hardihood, time of ripening, thickness of shell, size, and other particulars. In the climate of Great Britain a late variety is preferable, as securing the young shoots against injury from frost, to which otherwise they are very subject. The kernel of the large-fruited variety is of very indifferent quality, but its large shells are made use of by the French as trinket-cases.

Among the American species J. nigra, the Black Walnut, is especially noteworthy as a very handsome tree, whose timber is of great value for furniture purposes, but which is now becoming scarce. In Britain it forms a magnificent tree. The White Walnut, J. cinerea, is a smaller tree; its leaves are used medicinally.

Closely allied to the walnuts and sometimes confounded with them are the hickories (see HicKory). See also vol. xii. p. 278.

WALPOLE, Tlorace (1717-1797), who was born on 24th September 1717, was accepted and recognized throughout his life as the youngest of the six children of Sir Robert Walpole by Catherine Shorter, but by some of the scandal-mongers of a later age, Carr, Lord Hervey, the half-brother of the peer who wrote the Memoirs of the Court of George the Second, has been called his father. This parentage has been assigned to him partly through the circumstance that the first wife of Sir Robert Walpole lived for some time estranged from her husband and on terms of friendship with Carr, Lord Hervey, not the least clever or unprincipled member of a family notorious for ability and for laxity of morals, and partly through the antagonism of the qualities shown by Horace Walpole to those of the prime minister, and through their affinity with the talents of the Herveys. If this rumour be correct, no such suspicion ever entered into the mind of Horace Walpole. To his mother he erected a monument, with an inscription couched in terms of sincere affection, in the chapel of Henry VII. in Westminster Abbey, and from the beginning to the end of his life his sarcasms never spared the Newcastles and the Hardwickes, who had shown, as he thouglit, lukewarmness in support of his father's ministry.

About 1728 he was sent to Eton, and in 1735 matriculated at King's College, Cambridge. Two years (1739-41) were spent in the recognized grand tour of France and Italy, in company with Gray the poet, whose acquaintance had been made amid the classic groves of Eton and Cambridge. They stopped a few weeks in Paris, and lingered for three months under the shadow of the magnificent portals of the cathedral of Rheims, on the pretence of learning the French language. Henry Seymour Conway, whose mother was a sister of Lady Walpole, shared their society in the French city, and retained Horace Walpole's warm friendship during life. The other two members of this little circle next proceeded to Florence, where Walpole rested for more than a year in the villa of Horace Mann, the British envoy-extraordinary for forty-six

years to the court of Tuscany. Mann's family had long been on terms of the closest intimacy with his guests, as Robert Mann was concerned in the contract for which Sir Robert Walpole was expelled from the House of Commons in 1712, and the envoy continued the correspondent of Walpole until 1786, for as they never met again their friendship remained unbroken. At Reggio Walpole and Gray parted in resentment. The latter was shy in manners and absorbed in literature, while his more opulent com- panion lived in society, and only dabbled in antiquities for pleasure's sake. Walpole in after years took the blame of these differences on himself, and it is gene- rally believed that the quarrel arose from his laying too much stress on his superiority in position. In 1744 the two friends were nominally reconciled, but the breach was not cemented.

During Walpole's absence he was returned to parliament in 1741 for the Cornish borough of Callington, over which his elder brother, through his marriage with the heiress of the Rolles, exercised supreme influence. He represented three constituencies in succession, Callington 1741-54, the family borough of Castle Rising from 1754 to 1757, and the more important constituency of King's Lynn, for which his father had long sat in parliament, from the latter date until 1768, In that year he retired, probably because his success in political life had not equalled his expectations, but he continued until the end of his days to follow and to

chronicle the acts and the speeches of both Houses of Parliament. Through his father's influence he had ob- tained three lucrative sinecures producing at least £5000 a year, and for many years (1745-84) he enjoyed a share, estimated at about £1500 a year, of a second family per- quisite, the collectorship of customs. The possession of these ample endowments and of a leasehold house in Arlington Street, which was left to him by his father, enabled him, a bachelor all his days, to gratify every expensive luxury and every costly taste. He purchased in 1747 the charmingly situated villa of Strawberry Hill, near Twickenham, on the banks of the Thames, and six years later began a series of alterations in the Gothic style, not completed for nearly a quarter of a century later, under which the original cottage became transformed into a building without parallel in Europe. Some years after this purchase he established a printing-press there for the gratification of his literary tastes, and many of the first editions of his own works were struck off within its walls. At this press were produced in 1753 the clever, if eccentric, designs of Richard Bentley (the youngest child of the great doctor, and for some time a protegé of Horace Walpole) for the poems of Gray; and among the reprints of Straw-berry Hill were the Lafe of Lord Herbert of Cherbury, Memoirs of Grammont, Hentzner's Journey into England, and Lord Whitworth's Account of Russia. The rooms of this whimsical edifice were crowded with curiosities of every description, and the house and its contents were shown, by tickets to admit four persons, between 12 and 3 from May to October, but only one party was admitted on each day, and the owner, although enamoured of notoriety, simulated discontent at this limited intrusion into his privacy. His nephew, the reckless third earl, died in 1791, and Horace succeeded to the peerage, but he never took his place in the House of Lords, and sometimes signed his name as "the uncle of the late earl of Orford." All his life long he was the victim of the gout, but he lived to extreme old age, and died unmarried, in Berkeley Square, London, March 2, 1797, when his body was buried privately at Houghton. The ancient estate of the family descended to the earl of Cholmondeley, whose ancestor had married Horace Walpole's younger sister. All Walpole's printed books and manuscripts were left to Robert Berry

WALPOLE

and his two daughters, Mary and Agnes ; their friendship had been very dear to the declining days of Walpole, who, it has even been said, wished to marry Mary Berry. By his will each of the ladies obtained a pecuniary legacy of £4000, and for their lives the house and garden, formerly the abode of Kitty Clive, which adjoined Strawberry Hill. Strawberry Hill went to Mrs Anne Damer, daughter of his lifelong friend General Conway, for her life, but it was entailed on the countess dowager of Waldegrave and her heirs. Walpole died worth £91,000 in the three per cents, and gave the whole of it away, the chief legacy being £10,000 for his niece the duchess of Gloucester. The collections of Strawberry Hill, which he had spent nearly fifty years in amassing, were dispersed under thie hammer of George Robins in 1842. They are described in a catalogue of that date, and in a series of articles in the Gentleman's Magazme for that year.

The pen was ever in Horace Walpole's hands, and his entire compositions would fill many volumes. His two works of imagination, the romance of the Castle of Otranto and the tragedy of the Mysterious Mother, are now all but forgotten. The former, which purported to be a story translated by William Marshal, gent., from the original Italian of Onuphrio Muralto, canon of the church of St Nicholas at Otranto, was often reprinted in England, and was translated into both French and Italian. By Sir Walter Scott it was lauded to the skies for its power in raising the passions of fear and pity ; from Hazlitt it met with intense condemnation. 'The Mysterious Mother, a tragedy too horrible for representation on any stage, was never intended for performance in public, and only fifty copies of it were printed at Strawberry Hill. By Byron, who, like Horace Walpole, affected extreme liberalism, and like hiin never forgot that he was born within the purple, this tragedy was pronounced "of the highest order." Several of Walpole's antiquarian works merit high praise. The volume of Historic Doubts on the Life and Reign of King Richard the Third, one of the earliest attempts to rehabilitate a character previously stamped with infamy, showed acuteness and rescarch. These doubts provoked several answers, which are criticized in a supplement edited by Dr Hawtrey for the Philobiblon Society. A fare of more lasting reputation, which has retained its vitality for more than a century, is entitled Anecdotes of Painting in England, with some Account

of the Principal Artists; collected by George Vertue, and now digested and published from his original manuscripts by Horace Walpole (4 vols., 1762-71). Its value to art students and to admirers of biographical literature demanded its frequent reproduction, and it had the good fortune to be re-edited with additions by the Rev. James Dallaway in five volumes (1826-28), and then again was revised and edited Aye R.N. Wornum in 1849. A cognate volume, also based on the inaterials of Vertue, is entitled the Catalogue of Engravers Born and Resident in England, which, like its more famous predecessor, often passed through the press. On the Catalogue of Royal and Noble Authors of England Walpole, whose professed liberalism only stopped short of the principles of republicanism, spent many hours of toilsome research, The best edition is that which appeared in five volumes, in 1806, under the competent editorship of Thomas Park, who carefully verified and diligently augmented the labours of the original author. As a senator himself, or as a private person following at a distance the combats at St Stephen's, Walpole recorded in a diary the chief incidents in English politics. For twenty-seven years he studied, a silent spectator for the most part, the characters of the chief personages who trod the stage of politics, and when he quitted the scene he retained the acquaintance of many of the chief actors. If he was sometimes prejudiced, he rarely distorted the acts of those whom he disliked; and_ his prejudices, which lie on the surface, were mainly against those whom he considered the traitors of his father. These diaries extend from 1750 to 1783, and cover a period of momentous im- portance in the annals of the national history. The Memoirs of the Last Ten Veurs of the Reign of George II. was edited by Lord Holland; its successor, Memoirs of the Reign of King George III. , was published under the editorial care of Sir Denis Le Marchant, who poured into his annotations a vast store of information; the last volumes of the series, Jowrnal of the Reign af George ILI. from 1771 to 1783, were edited and illustrated by Doran; and to these works should be added the Reminiscences, which Walpole wrote in 1788 for the gratification of the Misses Berry. These labours would in them- selves have rendered the name of Horace Walpole famous for all time, but his delightful Letters are the crowning glory of his life. His correspondents were numerous and widespread, but the chief of them were Cole the clerical antiquary of Milton, Robert Jephson, an obscure play-writer in mele Mason the poet,

Lord Hertford during his embassy in Paris, the countess of Ossory, Lord Har-

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court, George Montagu, one of his earliest friends, Conway, and Sir Horace Mann. With most of these friends he quarrelled, but the friendship of the last two, in the former casc through genuine liking, and in the latter through his fortunate absence from England, was never interrupted. The Letters were published at different dates, but the standard collection is that by Peter Cunningham (9 vols., 1857-59), and to it should be added the vol- umes of the letters addressed to Walpole by his old friend Madame du Deffand (1810, 4 vols.), and the publication of Dr Doran, Mann and Manners at the Court of Florence, which is founded on the epistles sent in return to Walpole by the envoy-extraordinary. A handsome little volume, Horace Walpole and his World, con- sisting of select passages from his letters, extracted and strung together in a simple narrative by Mr L. B. Seeley, was issued in 1884. Walpole has been called "the best letter-writer in the English language"; and few indeed are the names, possibly none save Swift and Cowper, which can compare with his. In these compositions his very foibles are penned for our amusement, and his love of trifles—for, in the words of another Horace, he was ever "nescio quid meditans nugarum et totus in illis"—minister to our instruction. To these friends he conimunicated every fashionable scandal, every social event, and the details ofevery political struggle in English life. The politicians and the courtiers of his day were more akin to his character than were the chief authors of his age, and the weakness of his intellectual perceptions stands out most prominently in his estimates of such writers as Johnson aud Goldsmith, Gibbon and Hume. On many occasions he displayed great liberality of disposition; and he bitterly deplored for the rest of his days his neglect of the unhappy Chatterton.

Abundant information about Horace Walpole will be found in the Memoirs of him and of his contemporaries cdited by Eliot Warburton, Jesse's George Selwyn and his Contemporaries, and the extracts from the journals and correspondence of Miss Berry; and it would be

unpardonable to omit mention of Macaulay's sketch of Walpole's life and character. (W. P. C.)

WALPOLE, Str Ropert, Eart or Orrorp (1676- 1745), prime minister of England from 1721 to 1742, was the third but eldest surviving son of Robert Walpole, M.P., of Houghton in Norfolk,! by Mary, only daughter and heiress of Sir Jeffery Burwell, of Rougham, in Suffolk. The father, a jolly old squire who revelled in outdoor sport and the pleasures of the table, transmitted to his son the chief traits in his own character. The future statesman was born at Houghton on 26th August 1676, and was sent to Eton and to King's College, Cambridge, where he was admitted as scholar on 22d April 1696. At this time he was destined, as a younger son, for the church, but his two elder brothers died young and he became the heir to an estate producing about £2000 a year, whereupon in May 1698 he resigned his fellowship, and was soon afterwards withdrawn by his father from the university. His education lasted sufficiently long, however, to enable him to gratify the tastes of the county members in parliament with the usual quotations from Horace, though in classical attainments he was excelled by Pulteney, Carteret, and many others of his contem- poraries in politics, On his father's decease the electors of the family borough of Castle Rising returned him in January 1701 to the House of Commons as their repre- sentative, but after two short-lived parliaments he sought the suffrages of the more important constituency of King's Lynn (1702), and was elected as its member at every subsequent dissolution until he left the Lower House. From the first he took a keen interest in the business of the House, and not many months passed away before his shrewdness in counsel and his zeal for the interests of the Whigs were generally recognized. In March 1705, accord- ing to the statement of Archdeacon Coxe, he was appointed one of the council to Prince George of Denmark, the inactive husband of Queen Anne, and then lord high admiral of England. Complaints against the administra- tion of the navy were then loud and frequent (Burton's Queen Anne, ii. 22-31), and the responsibilities of his new position tested his capacity for public life. His abilities proved equal to the occasion, and justified his advancement,

1 The head of a family whose ancestors and descendants are recorded

in an elaborate pedigree published in the Proceedings of the Norfolk and Norwich Archeol. Soc., i. 363-79.

3395

in succession to his life-long rival Henry St John, to the more important position of secretary-at-war (February 1708), an office of recent creation but in time of war of great responsibility, which brought him into immediate contact with the duke of Marlborough and the queen. With this post he held for a short time (1710) the treasurership of the navy, and by the discharge of his official duties and by his skill in debate became admitted to the inmost councils of the ministry. He could not succeed, however, in diverting Godolphin from the great error of that statesman's career, the impeachment of Sacheverell, and when the committee was appointed for elaborating the articles of impeachment Walpole was called upon to act as one of the managers for the House of Commons. On the wreck of the Whig party which ensued upon this fatal mistake, Walpole shared in the general misfortune, but neither cajolery nor menace could induce him to retain office, and he took his place with his friends in opposition. His energies now shone forth with irre- sistible vigour ; both in debate and in the pamphlet press he took up the cause of the ejected ministry, and in revenge for his zeal his political opponents brought against him an accusation of personal corruption. On these charges, now universally acknowledged to have proceeded from party animosity, he was in the spring of 1712 expelled from the House and committed to the Tower. His prison cell now became the rendezvous of the Whigs among the aristocracy, while the populace heard his praises commemorated in the ballads of the streets. The ignominy which the Tories had endeavoured to inflict upon him was turned into augmented reputation. At the dissolution of 1713 the faithful electors of King's Lynn again placed their trust in him, and during this parliament, the last summoned by Queen Anne, he took the leading part in defence of Steele against the attacks of the Tories.

With the accession of George, the Whigs regained their supremacy, and for nearly half a century they retained the control of English politics. The prizes fell to the victors, and Walpole obtained the lucrative if

unimportant post of paymaster-general of the forces in the administration which was formed under the nominal rule of Lord Halifax, but of which Stanhope and Townshend were the guiding spirits. A committee of secrecy was appointed to inquire into the acts of the late ministry, and especially into the peace of Utrecht, and to Walpole was entrusted the place ofchairman. Most of his colleagues in office were members of the House of Lords, and the lead in the Commons quickly became the reward of his talents and assiduity. Halifax died, and after a short interval Walpole was exalted into the conspicuous position of first lord of the treasury and chancellor of the exchequer (11th October 1715). Jealousies, however, prevailed among the Whigs, and the German favourites of the new monarch quickly showed their discontent with the heads of the ministry. Townshend was forced into resigning his secretaryship of state for the dignified exile of viceroy of Ireland, but he never crossed the sea to Dublin, and the support which Sunderland and Stanhope, the new advisers of the king, received from him and from Walpole was so grudging that Townshend was dismissed from the lord-lieutenancy (April 1717), and Walpole on the next morning withdrew from the ministry. They plunged into opposition with unflag- ging energy, and in resisting the measure by which it was proposed to limit the royal prerogative in the creation of peerages Walpole exerted all his powers. This display of ability brought about a partial reconciliation of the two parties among the Whigs. To Townshend was given the presidency of the council, and Walpole once again assumed the paymastership of the forces (June 1720). On the financial crash which followed the failure of the South

Sea scheme, the public voice insisted that he should assume a more prominent place in public life. At this crisis in England's fortunes Stanhope and Craggs were seized by death, Aislabie, the chancellor of the exchequer, was committed to the Tower, and Sunderland, though acquitted of corruption, was compelled to resign the lead. Walpole, as first lord of the treasury and chancellor of the exchequer (April1721), became with Townshend responsible for the country's government (though for some years they had to contend with the influence of Carteret), and during the rest of the reign of George I. they remained at the head of the

ministry. The hopes of the Jacobites, which revived with these financial troubles, soon drooped in dis- appointment. Atterbury, their boldest leader, was exiled ; Bolingbroke, in dismay at their feebleness, sued for pardon, and was permitted to return to his own country. The troubles which broke out in Ireland over Wood's patent for a copper coinage were allayed through the tact of Carteret, who had been banished as its lord lieutenant by his triumphant rivals. The Continent was still troubled with wars and rumours of wars, but a treaty between England, Prussia, and France was successfully effected at Hanover in 1725. England was kept free from warfare, and in the general prosperity which ensued Walpole basked in the royal favour. His eldest son was raised to the peerage as Baron Walpole (10th June 1723), and he himself became a knight of the Bath in 1725, and was rewarded with the Garter in 1726. Next year the first King George died, and Walpole's enemies fondly believed that he would be driven from office, but their expectations were doomed to disappointment. The confidence which the old king had reposed in him was renewed by his successor, and in the person of Queen Caroline, the discreet ruler of her royal spouse, the second George, the Whig minister found a faithful and life-long friend. For three years he shared power with Townshend, but the jealous Walpole brooked no rival near the throne, and his brother-in-law withdrew from official life to the groves of Norfolk in May 1780. Before and after that event the administration was based on two principles, sound finance at home and freedom from the intrigues and wars which raged abroad. On the Continent congresses and treaties were matters of annual arrangement, and if the work of the plenipotentiaries soon faded it was through their labours that England enjoyed many years of peace. Walpole's influence received a serious blow in 1733. The enormous frauds on the excise duties forced themselves on his attention, and he proposed some arrangements by which the income resulting to the national exchequer from the duties on wine and tobacco might be largely increased. His opponents fastened on these proposals with irresistible force, and so serious an agitation stirred the country that the ministerial measure was dropped amid general rejoicing. Several of his most active antagonists were dismissed from office or deprived of their regiments, but their spirit remained unquenched, and when Walpole met a new House of Commons in 1734 his supporters were far less numerous. The Gin Act of 1736, by which the tax on that drink was raised to au

excessive amount, led to disorders in the suburbs of London; and the imprisonment of two notorious smugglers in the Tolbooth at Edinburgh resulted in those Porteous riots which have been rendered famous in the Heart of Midlothian. These events weakened his influence with large classes in England and Scotland, but his parliamentary supremacy remained unimpaired, and was illustrated in 1737 by his defeat of Sir John Barnard's plan for the reduction of the interest on the national debt, and by his passing of the Playhouse Act, under which the London theatres are still regulated. That year, however, heralded his fall from power. His constant friend Queen Caroline

died, and the prince of Wales, long discontented with his parents and their minister, flung himself into active opposition. Many of the boroughs within the limits of the duchy of Cornwall were obedient to the prince's will, and he quickly attracted to his cause a considerable number of adherents, of whom Pitt and the Grenvilles were the most influential. The leading orators of England thundered against Walpole in the senate, and the press resounded with the taunts of the poet and pamphleteer, illustrious and obscure, who found abundant food for their invectives in the troubles with Spain over its exclusive pretensions to the continent of America and its claim to the right of searching English vessels. The minister long resisted the pressure of the opposition for war, but at the close of 1739 he abandoned his efforts to stem the current, and with a divided cabinet was forced, as the king would not allow him to resign, into hostility with Spain. The Tory minority had seceded from parliament, but at the commencement of the session, in November 1739, they returned to their places with redoubled energigs. The campaign was prosecuted with vigour, but the successes of the troops brought little strength to Walpole's declining popularity, and when parliament was dissolved in April 1741 his influence with his fellow-countrymen had faded away. His enemies were active in opposition, while some of his colleagues were lukewarm in support. In the new House of Commons political parties were almost evenly balanced. Their strength was tried immediately on the opening of parliament. The Bossiney election went against him by six votes; a member of the opposition was elected as chairman of committees by a

majority of four; and the ministry was twice defeated over tlie Westminster election. The voting on the return for Chippenham was accepted as a decisive test of parties, and, as Walpole was beaten on a preliminary point in connexion with the return, he resolved upon resigning his places. On the 9th of February 1742 he was created earl of Orford, and two days later he ceased to be prime minister. A committee of inquiry into the conduct of his ministry for the previous ten years was ultimately granted, but its deliberations ended in nought, and Walpole was allowed to spend the rest of his days in retirement at Houghton. There he died 18th March 1745, and in its parish church he was buried on March 25. With the permanent places, valued at £15,000 per annum, which he had secured for his family, and with his accumulations in office, he had rebuilt the mansion at great expense, and formed a gallery of pictures within its walls at a cost of £40,000, but the collection was sold by his grandson for a much larger sum in 1779 to the empress of Russia, and the estate and house of Houghton, a vast and gloomy edifice described in the Art Journal for March 1887, passed to Lord Cholmondeley, the third earl having married the premier's younger daughter. Walpole was twice married,—in 1700 to Catherine, eldest daughter of John Shorter, who died in 1737, having had issue three sons and two daughters, and in 1738 to Maria, daughter of Thomas Skerret, a lady often mentioned in the letters of Lady Mary Wortley Montague.

Civil wars at home and the protracted struggle with France on the Continent had produced in Englishmen an intense desire for peace, and, in their remembrance of the constant disputcs undcr the previous two sovereigns over the succession to the throne, the

_great majority of them cheerfully consented to the rule of the

electors of Hanover. Walpole knew the disposition of his country- men, and he gratified their tastes by consistently acting both in ecclesiastical and civil affairs on the principle gwieta non movere. He had profited by the lesson of the ill-fated prosecution of Sacheverell, and while he was prime minister the Church of England slept in peace without fear of danger from her enemies. The followers of dissent ranged themsclves behind his banner, but they were fed by promises rather than by actual concessions, and the wisest among them were contented with permission to worship un-

disturbed. His aim ever was to maintain peace abroad and quiet at home, and the chief blot on his ministerial career is that through love of office he allowed himself to be drawn into the war with Spain. In business matters he was methodical; his judgment was sound in financial affairs; and his speeches were marked by clear- ness of expression. Pope, who loved him not, has borne witness to his merits "in the happier hours of social pleasure," but neither in private nor in public life were his manners refined or his estimates of men and women exalted. "All these men have their price" was his estimate of members of the House of Commons, and although he gathered together at Houghton many of the master- pieces of painting he was not a lover either of art or of letters. All the eminent writers of the day were opposed to his rule, and at his fall his jealous spirit had driven into opposition every politician of repute. Great as his faults were, his character was suited to the temperament of the period within which he lived, and during his tenure of office his country advanced in prosperity by leaps and by bounds.

His life is written by Archdeacon Coxe in three ponderous folios, and has more recently been described in one volume by Mr Ewald. (W. P. C.)

WALPURGIS, Warpurea, or Warpurca,! §1, was born in Sussex about the end of the 7th or the beginning of the 8th centnry, and was educated at Winburn, Dorset, where, efter taking the veil, she remained for twenty-

seven years. She then at the instance of her uncle, St Boniface, and her brother, St Wilibald, set out along with some other nuns to found religious houses in Germany. Her first settlement was at Bischofsheim in the diocese of Mainz, and two years later (754) she became abbess of the Benedictine nunnery at Heidenheim, within her brother Wilibald's diocese of Eichstaédt in Bavarfa, where also another brother, Winebald, had at the same time been made head of a monastery. On the death of Winebald in 760 she succeeded him in his charge also, retaining the superintendence of both houses until her death on February 25, 779. Her relics were translated to Eichstadt, where she was laid in a hollow rock, from which exuded a kind of bituminous oil afterwards known as Walpurgis oil, and regarded as of miraculous efficacy against disease. The cave became a place of pilgrimage, and a fine church was built over the spot. She is commemorated at various times, but principally on May 1, her day taking the place of an earlier heathen festival, which was characterized by various rites marking the commencement of summer. In art she is represented with a crozier, and bearing in her hand a flask of balsam.

WALRUS, or Morsz.? In the article Mammatta (vol. xv. p. 442) it was shown that the existing members of the Pinniped division of the order Carnivora are divided into three very distinct groups, the true seals (Phocidz), the sea-bears or eared seals (Otariidx), and the T'richechidz, containing the walrus alone, in some respects intermediate between the other two, but also possessing, especially in its greatly modified dentition, peculiar characters of its own.

Trichechus is the almost universally accepted generic name by which the walrus is known to zoologists, but lately some confusion has been introduced into literature by the revival of the nearly obsolete terms Rosmarus by some authors and Odobenus by others. 7. rosmarus is the name of the species met with in the Arctic seas; that of the North Pacific, if distinct, is 7. obesus. The follow- ing description will apply equally to both. A full-grown male walrus measures from ten to eleven feet from the nose to the end of the very short tail, and is a heavy, bulky animal, especially thick about the shoulders. The head is rounded, the eyes rather small, and there are no external ears. The muzzle is short and broad,

with, on each side, a group of very stiff, bristly whiskers, which become stouter and shorter in old animals. The tail

1 French forms of the name are Gualbourg, Falbourg, Vaubourg, and Avougourg.

2 The former word is a modification of the Scandinavian vallross or hvalros ("whale-horse"), the latter an adaptation of the Russian name for the animal.

scarcely projects beyond the skin. The fore-limbs are free only from the elbow ; the hand is broad, flat, and webbed, the five fingers being of nearly equal length, the first slightly the longest. Each finger has a small, flattened nail, situated on the dorsal surface at a considerable distance from the end. The hind-limbs are enclosed in the skin of the body almost to the heel. The free portion, when expanded, is fan-shaped, the two outer toes (first and fifth) being the longest, especially the latter. Cutaneous flaps project considerably beyond the bones of the toes. The nails of the first and fifth toes are minute and flattened ; those of the second, third, and fourth elongated, sub-compressed, and pointed. The soles of both fore and

hind feet are bare, rough, and warty. The surface of the skin generally is covered with short, adpressed hair of a light, yellowish-brown colour, which, on the under parts of, the body and base of the flippers, passes into dark reddish- browu or chestnut. In old animals the hair becomes more scanty, sometimes almost entirely disappearing, and the skin shows ample evidence of the rough life and pugnacious habits of the animal in the innumerable scars with which it is usually covered. It is everywhere more or less wrinkled, especially over the shoulders, where it is thrown into deep and heavy folds.

One of the most striking external characteristics of the walrus is the pair of tusks which descend almost directly downwards from the upper jaw,

sometimes attaining a length, in old animals, of 20 inches, or even more. In the female they are as long or sometimes longer than in the male, but less massive. In the young of the first year they are not visible. These tusks correspond to the upper canine teeth of other mammals. All the other teeth, including the lower canines, are much alike—small, simple, and one- rooted, and with crowns, rounded at first, but wearing to a flat or concave surface. The complete dentition appears to be 7 3, c 4, pm 4,m $=, total 34. Many of these teeth are, however, lost early, or remain through life in a rudimentary state concealed beneath the gum. The teeth which are usually functionally developed are 73, ¢ q, pm 2=5, total 18. The tusks are formidable weapons of defence, but their principal use seems to be scraping and digging among the sand and shingle for the molluscs and crustaceans on which the walrus feeds. They are said also

‘to aid in climbing up the slippery rocks and ledges of ice

on which so much of the animal’s life is passed. Although this function of the tusks is affirmed by numerous authors, some of whom appear to have had opportunities of actual observation, it is explicitly denied by Malmgren. _ Walruses are more or less gregarious in their habits, being met with generally in companies or herds of various sizes. They are only found near the coast or on large masses of floating ice, and

ERI) = 43

rarely far out in the open sea; and, though often moving from one part of their feeding ground to another, they have no regular seasonal migrations. Their young are born between the months of April and June, usually but one at a time, never more than two. Their strong affection for their young, and their sympathy for each other in times of danger, have been particularly noticed by all who have had the opportunity of observing them in their native haunts, When one of their number is wounded, the whole herd usually join in a concerted and intelligent defence. Although harmless and inoffensive when not molested, they exhibit considerable fierceness when attacked, using their great tusks with tremendous effect either on human enemies who come into too close

quarters or on polar bears, the only other adversary they can meet with in their own natural territory. Their voice is a loud roaring, and can be heard at a great distance ; it is described by Dr Kane as "something between the mooing of a cow and the deepest baying of a mastiff, very round and full, with its bark or detached notes repeated rather quickly seven or nine times in succession,"

The principal food of the walrus consists of bivalved molluscs, epoca, Mya truncata and Samicava rugosa, two species very abundant in the Arctic regions, which it digs up from the mud and sand in which they lie buried at the bottom of the sea by means of its tusks. It crushes and removes the shells by the aid of its grinding teeth and tongue, and swallows only the soft part of the animal. It also feeds on other molluscs, sand-worms, star- fishes, and shrimps. Portions of various kinds of alge or sea-wecds have been found in its stomach, but whether swallowed intention- ally or not is still doubtful.

The commercial products of the walrus are its oil, hide (used to manufacture harness and sole-leather and twisted into tiller ropes), and tusks, The ivory of the latter is, however, inferior in quality to that of the elephant. Its flesh forms an important article of food to the Eskimo and Tchuktchis. Of the coast tribes of the last-named people the walrus forms the chief means of support. "The flesh supplies them with food, the ivory tusks are made into implements used in the chase and for other domestic purposes, as well as affording a valuable article of barter, and the skin furnishes the material for covering their summer habitations, harness for their dog-teams, and lines for their fishing gear " (Scammon).

Geographically the walrus is confined to the northern circum- polar regions of the globe, extending apparently as far north as ex- plorers have penetrated, but its southern range has been much re- stricted of late in consequence of the persecutions of man. On the Atlantic coast of America it was met with in the 16th century as low as the southern coast of Nova Scotia and in the last century was common in the Gulf of St Lawrence and on the shores of Labrador. Jt still inhabits the coast round Hudson's Bay, Davis Straits, and Greenland, where, however, its numbers are daily decreasing. It is not found on the Arctic coast of America between the

97th and 158th meridians. In Europe, occasional stragglers have reached the British Isles, and it was formerly abundant on the coasts of Finmark. Itis rare in Iceland, but Spitzbergen, Nova Zembla, and the western part of the north coast of Siberia are still constant places of resort, in all of which a regular war of extermination is carried on. The North Pacific, including both sides of Behring's Strait, northern Kamchatka, Alaska, and the Pribyloff Islands are also the haunts of numerous walruses, which are isolated from those of the North Atlantic by the long stretches of coast, both of Siberia and North America, in which they do not occur. The Pacific walrus appears to be as large as, if not larger than, that of the Atlantic ; its tusks are longer and more slender, and curved inwards; the whiskers are smaller, and the niuzzle relatively deeper and broader. These and certain other minor diffcrences have in- duced some naturalists to consider it specifically distinct under the name of Trichechus obesus. Its habits appear to be quite similar to those of the Atlantic form. Though formerly found in immense herds, it is rapidly becoming scarce, as the methods of destruction used by the American whalers, who have systematically entered upon its pursuit, are far more certain and deadly than those of the native Tchuktchis, to whom, as mentioned before, the walrus long afforded the principal means of subsistence.

Fossil remains of walruses and closely allied animals have been found in the United States, and in England, Belgium, and France, in deposits of Quaternary and late Tertiary age,

An exhaustive account of this animal, with references to all the authors who have written upon it, will be found in Allen's History of North American Pinni- peds, 1880, (W. H., F.)

WALSALL, a municipal and parliamentary borough and market-town of Staffordshire, England, is situated chiefly on an eminence above a rivulet tributary to the Tame, on various canals and branch railway lines, 8 miles north- north-west of Birmingham and 123 north-west of London. The principal street is spacious and regular, and, although the side streets are generally crooked and mean, the suburbs are for the most part built with regularity and neatness.

The parish church of St Matthew, occupying a prominent position on an eminence, is a handsome modern building in the Transition style. The other five parish churches are also all modern. The schools include the grammar school, founded in 1554 for the education of boys, natives of Walsall, in the classics, the blue coat and national infant schools, and several board schools. The public library, established in 1859, enlarged in 1872, contains about 12,000 volumes; the scientific and art institution was established in 1854, and the literary institute in 1883. Among the principal public buildings are the town-hall in the Italian style, erected in 1866 ; the guild hall (1773), the theatre (formed out of the old agricultural hall in 1881), the drill hall (1866), the temperance hall (1866), the county court-house (1869), and the post-office (1879). The charitable institutions include the corporation alms- houses (1825); Harper's almshouses for six women, founded in the reign of James I. and rebuilt in 1793; the Henry Boy's almshouse, opened in 1887; the memorial cottages at Caldmore, erected in 1868 by private benefaction of two townspeople, for twelve poor couples or widows ; the Walsall cottage hospital (1863); the epidemic hospital (1872); and a number of minor charities. In the vicinity of the town are extensive coal-mines and limestone quarries. Ironstone is also obtained, and brick clay is dug. The town possesses iron and brass foundries, corn mills, and tanneries. One of the staple industries is the manufacture of the various kinds of ironmongery required in the construction of harness and carriages. Locks and keys, bolts, pulleys, and other hardware goods are also largely manufactured. The town is governed by a mayor, six aldermen, and eighteen councillors. The area of the municipal borough was extended in 1877 to 6929 acres; the population in 1871 was 46,447 (estimate of that in the extended area 49,018), and in 1881 it was 58,795. The population of the parliamentary borough (area 7478 acres) in 1871 was 49,018, and in 1881 it was 59,402.

In the early part of the 10th century Walsall was fortified by Ethelfleda, daughter of Alfred the Great and countess of Mercia. At the time of the Conquest it was retained by William as a royal demesne for about twenty years, until it was bestowed on Robert, son of Asculpus, who had accompanied the Conqueror to England. Subsequently it was owned by Richard Neville, earl of Warwick, the king-maker, and it was held

successively by Henry VII. and Henry VIII. By the latter it was granted to John Dudley, duke of Northumberland, on whose attainder-and execution in the reign of Mary it was forfeited and came into the possession of the Wilbrahams, from whom it passed by marriage to the Bridgmans. It is spoken of by Camden as "none of the meanest of market towns." Queen Elizabeth visited Walsall in the 28th year of her reign, and made a grant of lands to the town. Walsall was the residence of Henrietta Maria for a short time in 1643, It is a borough by prescription, but received charters from Edward III. and Henry IV., confirming the privileges and immunities con- ferred on it by previous sovereigns. Its oldest charter is that bestowed in the 3d of Charles I., which was confirmed in the 13th of Charles II. It is now governed under the Municipal Act of 1835. It was constituted a parliamentary borough by the Reform Act of 1882, and returns one member to parliament,

WALSH, Witrtam (1663-1709), is included among Johnson's Most Eminent English Poets, but is justly said to be "known more by his familiarity with greater men than by anything done or written by himself." It was he who gave Pope in his boyhood the advice to study correct- ness, The value of his counsel is acknowledged in the Essay on Criticism (1. 729). He was a native of Wor- cestershire, represented his native county in several parlia- ments, and was gentleman of the horse to Queen Anne.

WALSINGHAM, Sir Franects (c. 1536-1590), secre- tary of state under Elizabeth, was descended from an old Norfolk family, and was the third and youngest son of William Walsingham of Scadbury, Chislehurst, Kent, where he was born about 1536. After a good private education he entered King's College, Cambridge, but did

not take a degree. He remained abroad during the reign of Mary, and the knowledge of foreign languages he thus acquired is said to have commended him to the notice of Cecil, Lord Burghley. In the parliament which met in January 1558-59 he was returned for Banbury, and in that which met in January 1562-63 for both Banbury and Lyme Regis; he decided to sit for the latter place. Nothing further is known of his political

history, till in 1568 he wrote to Cecil a letter on the Darnley murder, which shows that he enjoyed the confidence of Cecil and the regent Murray, and was fully convinced of Queen Mary's guilt. In the following year Ridolfi, the papal agent, was confined, under suspicion of conspiracy, in Walsingham's house. In August 1570 Walsingham was selected as special ambassador to France in connexion with the negotiations for the toleration of the Huguenots, and in December took up his residence as permanent ambassador at Paris. On the 19th April 1572 he was successful in obtaining the signature of a treaty of peace between England and France, but the beneficial results of his skilful diplomacy in connexion with the negotiations for the Anjou and Alengon marriages were neutralized by the uncertain and changeable moods of Elizabeth, and finally frustrated by the massacre of St Bartholomew. He took his leave of the king of France on 23d May 1573, and on 20th December of the same year he was made secretary of state. On Ist December 1577 he was knighted, and on 22d April of the following year made chancellor of the order of the garter. In June following, along with Lord Cobham, he was sent to the Netherlands to assist in arranging a pacification of the States, but the extra- ordinary vacillation of Elizabeth rendered his mission a total failure. In July 1581 he was again sent on an embassy to Paris, but his instructions were of a kind both so dishonourable and so foolish that he said he wished rather the queen had sent him to the Tower. In such circumstances he could only endeavour to temper and qualify the policy of Elizabeth in such a manner as to prevent a fatal breach in the relations between the two countries, and in this he was successful. His embassy to Scotland in 1583 to endeavour to persuade James to dismiss the earl of Arran was also, as he prognosticated, a failure. He therefore recommended that the purpose of Elizabeth should be effected by fostering a conspiracy among the Scottish nobles, but the project was not carried out for some time afterwards. In 1584 Walsingham was appointed custos rotulorum of Hants and recorder of Colchester, and in 1585 high steward of Winchester. On 23d November 1586 he was returned member for Surrey, and again on 29th October 1587.

From the first Walsingham, equally with Cecil, Lord Burghley, was strongly hostile to Queen Mary of Scotland. By constant watchfulness and

the skilful use of spies he succeeded in discovering the inmost secrets of her policy and plans. He permitted the Babington conspiracy to develop until letters passed between Babington and Mary which, if they are to be accepted as genuine, proved that the scheme for the assassination of Elizabeth had Mary's fullapproval. Mary and her friends declared that Walsing- ham had counterfeited her ciphers; but that Babington sent her letters informing her of the assassination scheme is beyond denial. Mary's friends, without any proof but her own asseveration, affirm that the letters never reached her, and that Mary's letters in reply, the authenticity of which Babington to the last never doubted, were forged by the agents of Walsingham. 'The asseveration of Mary is, however, robbed of all value by the fact that, in addition to denying the authenticity of the letters, she denied all knowledge of the Babington conspiracy ; for Mendoza, the Spanish ambassador, while the plot was in progress, wrote

to Philip II. that Mary had informed him she was fully acquainted with it. The accusation against Walsingham, that he was an accomplice in bringing Mary to the block on false and forged evidence, cannot therefore be entertained, although there cannot be any doubt that he regarded her execution as a happy deliverance from a position of great political embarrassment. He was one of the commissioners on her trial, and on Mary hinting that the incriminating letters had been written by him, called God to witness that he "had done nothing unbecoming an honest man."

By becoming surety for the debts of Sir Philip Sidney, Walsingham, on account of a flaw in the power of attorney left by Sidney, found himself on Sidney's death un- expectedly involved in pecuniary ruin. But, although one of the ablest and wisest of Elizabeth's councillors, his honesty had frequently ruffled her self-esteem, and she witnessed his embarrassments without deigning to lend him the smallest help. He died at his house in Seething Lane, London, 6th April 1590, in circumstances of so great poverty that his friends buried him in St Paul's at night to save the expense of a public funeral. Walsingham was a Puritan in his religious principles, but was unable to obtain for the Puritans the

consideration from Elizabeth he desired. He established in 1586 a divinity lectureship at Oxford ; he was a general patron of learning ; and he encouraged Sir R. Hakluyt and other navigators in their voyages of discovery. By Spenser he is described as

"The Great Mecenas of this age As well to all that civil acts professe As those that are inspired with martial rage."

A large number of Walsingham's letters and state documents are in the library of the British Museum and State Paper Office. An account of his embassies to France with letters and despatches is contained in the Compleat Ambassador, edited by Sir Dudley Digges, 1655; the "Heads of a Conference between James VI. and Sir Frances Walsingham, September 1853," is published in vol. i. of the Banna- tyne Miscellany ; and his " Journal from December 1570 to Apri] 1583 " is published in vol. vi. of the Camden Miscellany (1871). The Arcana Aulica, or Walsingham's Prudential Maxims for the Statesmanand the Courtier, London, 1655, said to have been translated from the Spanish, was probably translated by another Walsingham than Sir Francis. In Sir Robert Cotton's Cottont Posthuma is a short article en- titled "Sir Francis Walsingham's Anatomizing of Honesty, Ambition, and Fortitude."

WALTHAM, a city in Middlesex county, Massachusetts, United States, like the other so-called cities and towns of New England is in effect a township, containing several bodies of urban population, together with rural districts. It is situated about 9 miles west-north-west from Boston, being in facta suburb of that city, in a country of rounded hills of glacial gravel. Besides the large village of Waltham, there are comprised in the city five others, viz., Bleachery, Chemistry, New Church, Prospectville, and Robert's Crossing. These have absorbed nearly all the population of the city, the rural inhabitants being com- paratively few in number. The population, by the State census of 1885, was 14,609, about one-fourth being of foreign birth. Waltham is known all over the world for its machine-made watches, of which over 1400 are turned out daily. It has also a cotton-mill, a bleachery, and watch-tool manufactories.

The present area of Waltham was settled in 1630 by Puritans. In 1783 the town was incorporated, and in 1884 it received a city charter.

WALTHAM ABBEY, or Watrsam Hoty Cross, a inarket-town of Essex, England, on the borders of Hertford- shire and Middlesex, is situated on the Lea, near the great northern road, and on the Cambridge branch of the Great Eastern Railway, 13 miles north of Liverpool Street station, London. The town lies in a hollow, with streets for the most part crooked and narrow, and although many additions have lately been made it still retains much of the characteristic appearance of an old country town. Of the former magnificent abbey church the only portion of importance now remaining is the nave, forming the present parish church, the two easternmost bays of the nave being converted into the chancel. It is a very fine specimen of

Norman, and in the opinion of Mr Freeman forms part of the original building of Harold, although others assign its date to the time of Henry I. Only the western supports of the ancient tower now remain. A tower corresponding with the present size of the church was erected in 1556 and restored in 1798. On the south side of the church is a lady chapel of about the end of the reign of Edward II. or beginning of that of Edward III., containing some good decorated work. Bishop Hall became curate of Waltham in 1612, and Thomas Fuller was curate from 1648 to 1658. At Waltham Cross on the great northern road, about a mile west of Waltham, is the beautiful cross erected (1291-94) by Edward I. at one of the resting-places of the corpse of Queen Eleanor on its way to burial in Westminster Abbey. It is of Caen stone and is supposed to have been designed by Pietro Cavalini, a Roman sculptor. It is hexagonal in plan, and consists of three stages, de- creasing towards the top, which is finished by a crocketed spirelet and cross. The lower stage is divided into com- partments enclosing the arms of England, Castile and Leon, and Ponthieu. It underwent restoration in 1833, and a scheme for the same object was started in 1885. The old Elizabeth market-house that formerly stood in the market-square of Waltham was taken down in 1852. The town is the seat of a county court for Epping division of Essex, and possesses a court-house erected in 1849. The royal gunpowder factory is in the immediate vicinity; and the town possesses gun-cotton and percussion-cap factories, flour-mills, malt kilns, and breweries. Watercresses are largely grown in

the neighbourhood, and there are exten- sive market-gardens and nurseries, including Paul's famous rose nursery. The area of the urban sanitary district of Waltham Holy Cross, which is identical with the parish of Waltham Abbey and is in the civil county of Essex and registration county of Middlesex, is 11,017 acres. the popu- lation being 5197 in 1871 and 5368 in 1881.

Waltham appears first in history as the hunting seat of the Danish thane Tovi or Tofi, the royal standard-bearer at whose wedding feast Hardicanute died. The great forest on the edge of which it was built was long known as the forest of Waltham, but the only portion of it now remaining is called Epping forest. A wonderful cross which had been found in Tovi's land at Montacute, Somerset, was brought to Waltham, and Tovi built a church for its reception, which was named the Church of the Holy Cross. When the estate after being confiscated to the crown came into the possession of Harold, he pulled down Tovi's church and built a new one of great magnificence, which was consecrated in 1060. He also founded a great secular college, which, though nsually referred to as an abbey, did not, as is pointed out by Mr Freeman, become a religious house till the reign of Henry II. Shortly before the fatal battle of Hastings, Harold made a pilgrimage to Waltham, bringing with him many gifts. His body, which was first buried under a cairn at Hastings, was subsequently brought to Waltham and buried in the place of honour by the high altar. The tomb was destroyed about 1540. The site and property of the abbey were given by Henry VIII. to Sir Anthony Denny, whose grandson, Sir Edward Denny, was created by James I. baron of Waltham, and by Charles I. earl of Norwich. The town obtained a grant of a market from Henry III.

See " Architecture und Early History of Waltham Abbey Church," by E. A. Freeman, and other papers in vol. ii. of Zransactions of the Essex Archzological

Society; Thomas Fuller's History of Waltham Abbey; Stubbs's Foundation of Waltham Abbey; and Freeman's Norman Conquest.

WALTHAMSTOW, a town of Essex, England, now practically a suburb of London, is situated a short dis- tance east of the river Lea, on a branch

of the Great Eastern Railway, 6 miles north of Liverpool Street station. The original village grouped round the church is of com- p3ratively small dimensions, but a large number of houses and villas have been built along the high road, from which diverge a number of streets and "ends." The church of St Mary existed at a very early period, but the present building, chiefly of brick, was erected in 1535 by Sir George Monoux, lord mayor of London, and has under- gone frequent alteration and improvement. Besides other old brasses it contains in the north aisle the effigies in

brass of Sir George Monoux and Anne his wife. Among the other public buildings are the town hall, erected in 1876 at a cost of £4500, the literary institute, founded in 1882, and the working men's club and institute. There are a number of educational institutions, including a school of art connected with the science and art department of South Kensington, the Monoux grammar school, the Forest school, founded in 1834 in connexion with King's College, and the home for orphan boys. The benevolent and charitable institutions include the public dispensary (1873), the Leyton and Walthamstow hospital home for children (1877), Sir George Monoux's almshouses for thirteen poor men (1527), the Collard almshouses for ten married couples (1851), and the Squire almshouses for widows of decayed tradesmen. In the vicinity are the reservoirs of the East London Waterworks Company. On the banks of the Lea there are flour-mills and an oil-mill. The popu- lation of the urban sanitary district (area 4374 acres) in 1871 was 10,692, and in 1881 it was 21,715.

In Domesday the name occurs as Welamestun. In the reign of Edward the Confessor it belonged to Waltheof, son of Siward, earl of Northumberland, who married Judith, niece of the Conqueror, who betrayed him to his death in 1075. The estate subsequently passed to Guy de Beauchamp, earl of Warwick, and on the attainder of Karl Thomas in 1396 reverted to the crown. Afterwards it came into the possession of Edmund Beaufort, duke of Somerset; from the Somerscts it passed to Sir George Rodney, and subsequently it came to the Maynard family. It is

supposed to have been the birthplace of George Gascoigne the poet (d. 1577). Sir William Patten, commissioner of the navy, the friend of Pepys, had his seat at Walthamstow, and was frequently visited there by Pepys.

WALTHER, Bernuarp (1430-1504), astronomer, was born at Nuremberg in 1430. He was a man of large means, which he devoted to scientific pursuits. When REGIoMonTANUS (q.v.) settled at Nuremberg in 1471, Walther built for their common use an observatory and a printing office, from which numerous calendars and ephemerides were issued, which became of great importance for the voyages of discovery. At this, the first German observatory, clocks driven by weights were first used in astronomical observations in 1484. The observations, con- tinued until Walther's death in May 1504, were published by Schoner in 1544, and by Snell in 1618, as an appendix to his edition of Landgrave William's observations.

WALTHER VON DER VOGELWEIDE (¢. 1170- c. 1230), the most illustrious of the German minnesinger, was born in Tyrol between 1165 and 1170. He belonged to a noble family, but had no hereditary possessions. At an early age he seems to have given evidence of an apti- tude for poetry, and his genius was developed under the influence of the older poet Reinmar, whom he soon far surpassed. His earliest patron was the young and brilliant Duke Frederick of Austria, at whose court in Vienna he spent several years. After Duke Frederick's death Walther betook himself to King Philip, at whose coronation in Mainz, on the 8th September 1198, he was present. King Philip appreciated his genius, but nothing is definitely known as to their relations to one another, or as to the causes which brought their connexion to an end. After a short stay at the court of Duke Leonhard of Carinthia Walther went to Eisenach, where poets were always welcomed by the landgrave Hermann. Here he remained until 1211, when the landgrave, in deference to the pope, joined some other princes in an attempt to secure the crown for the prince afterwards known as Frederick II. Walther, who disapproved of this policy, soon after- wards entered the service of the emperor Otho; but, the emperor having proved unfriendly towards him, he associ- ated himself with the cause of Frederick, who greatly pleased him by granting him a

small fief near Wiirzburg, thereby gratifying a wish the poet had often expressed. He might now have led a settled life, but he had so long

been accustomed to go from court to court that it was apparently hard for him to live without the excitement of travel and adventure. In 1217 he was at the court of Duke Leopold of Austria, after whose departure for the Holy Land he appears to have been received first by the duke's uncle, Henry of Medlik, then by Berthold of Andechs, the patriarch of Aquileia. On the return of Duke Leopold Walther again spent some time with him; but in 1220 he joined the retinue of the imperial vicar Engelbert of Cologne and Frederick II.'s son, Henry, to whom he seems to have acted as tutor. In 1224 Walther retired to Wiirzburg, where, although living in privacy, he watched closely the course of public affairs. He may have taken part in the crusade of 1228, but he certainly did not reach Palestine. He died about 1230 at Wiirzburg, where, under a tree in the Laurence garden of the new minster, a stone was long pointed out as that which, according to tradition, marked his grave. A new monu- ment to him was erected at Wirzburg in 1848, and a statue of him was unveiled at Innsbruck in 1877.

Walther von der Vogelweide was a poet not only of exquisite sensibility, but of a frank, independent, and manly character. He lived in a troubled age, when church and state were often in deadly conflict. In this struggle, in which he took keen interest, his sympathy was wholly with the imperial cause, and he did much to influence opinion by the vigour with which he attacked the extravagant pretensions of the papacy. While defending the rights of secular rulers, he did not forget their duties, and many of his verses—considering the period to which they belong—display a remarkably clear and generous conception of the principles of humanity and freedom. In writing of love, the favourite subject of the minnesinger, he had all the brightness, freshness, and gaiety of the best of his contemporaries, and he excelled them in his deli- cate appreciation of the noblest womanly qualities. His love of nature, especially in the season of spring, was an essential element of his intellectual and emotional life, and gives an enduring charm to the poems in which it is incidentally or

indircetly expressed. He was a master of all the forms of verse used in Middle High German, and the perfection of his rhythm and diction, combined with the depth and wide range of his idcas, secures for him an enduring place in the front rank of the lyrical poets of his country.

A critical edition of his poems was issued by Lachmann in 1827, and there have been later editions by Wackernagel, Rieger, and Pfeiffer. There are renderings into modern German by Simrock, Koch, and Wciske. An admirable biography of the poet was written by Uhland (1822). Biographical and critical studies have also been written by Reuss, Rieger, Menzel, and Bése.

WALTON, or WALTON-LE-DALE, a township of Lanca- shire, is situated on the south bank of the Ribble, 14 miles south-east of Preston. The township includes the town of Walton-le-Dale, the villages of Bumber Bridge and Higher Walton, and several hamlets. The Ribble is crossed by a stone bridge of three arches erected in 1782, connecting Walton-le-Dale with Preston. The church of St Leonard, situated on an eminence to the east of the town, was originally erected in the 11th century. The earliest portions of the present building are the chancel and tower, in the Perpendicular style, the nave having been rebuilt in 1798, while the transepts were erected in 1816. The nave was re-pewed in 1855 and the chancel restored in 1864. There are a number of interesting old brasses and monuments. A working men's institute was built in 1881. Cotton-spinning is carried on, and there are market-gardens in the vicinity. The population of the urban sanitary district (area 4683 acres) was 8187 in 1871 and 9286 in 1881.

Walton occupies the site of a Roman station, probably that of Cocctum. The manor was granted by Henry de Lacy about 1130 to Robert Banastre. It afterwards passed by marriage to the Langtons, and about 1592 to the Hoghtons of Hoghton. Walton was the principal scene of the great battle of Preston, fought on the 17th August 1648 between Cromwell and the duke of Hamilton. In 1701 the duke of Norfolk, the earl of Derwentwater, and other Jacobites incorporated the town by the style of the "mayor and corporation of the ancient borough of Walton." In 1715 the pass- age of

the Ribble was bravely defended against the Jacobites by Parson Woods and his parishioners.

WALTON, or Watron-on-THE-HiLL, a township of Lancashire, England, now practically a suburb of Liver-

pool, 3 miles north-east of the central station. It con- sists largely of villas and the better class residences, but a considerable portion of the Parish Church district is occupied by labourers and artisans. The parish church, dedicated to St Mary, was originally founded in 1326, but has all been rebuilt within recent times, the nave in 1742, the chancel in 1810, and the embattled western tower in 1831-32. There are also situated within the township the West Derby union workhouse, erected in 1868 at a cost of £10,000; the borough prison, 1855, £180,000 (which, however, is by a special Act of Parlia- ment included within the borough of Liverpool); and the county police station, 1885, £8000. One of the attrac- tions of Walton is Stanley Park, 100 acres in extent, opened in 1870 at a cost of £200,000. In the neigh- bourhood are also the Liverpool parochial cemetery, the Anfield Park cemetery, and the Kirkdale cemetery. The population of the urban sanitary district (area 1907 acres) in 1871 was 6449, and in 1881 it was 18,536.

The parish of Walton originally included Liverpool, which was separated from the mother church in 1699. At Domesday it was held by a Saxon named Winestan, and subsequently it was for some centuries in the possession of a family who took from it their name. The earl of Sefton is now lord of the manor.

WALTON, Brian (1600-1661), bishop of Chester, and editor of the great London Polyglott Bible, was born at Seymour, in the district of Cleveland, Yorkshire, in 1600. He went to Cambridge as a sizar of Magdalene College in 1616, migrated to Peterhouse in 1618, was bachelor in 1619, and master of arts in 1623, After holding a school master- ship and two curacies he was in 1626 made rector of St Martin's Orgar in London (1626), where he took a leading part in the contest between the London clergy and the citizens about the city tithes, and compiled a treatise on the

subject, which is printed in Brewster's Collectanea, 1752. His conduct in this matter displayed his ability, but his zeal for the exaction of ecclesiastical dues was remembered to his hurt in 1641 in the articles brought against him in parliament, which appear to have led to the sequestration of his very considerable preferments.1 He was also charged with Popish practices, but on frivolous grounds, and with aspersing the members of parliament for the city. Up to this time he was perhaps more an active ecclesiastic than an eager student. In 1642 he was ordered into custody as a delinquent ; thereafter he took refuge at Oxford, and ultimately returned to London to the house of Dr Fuller, dean of Ely, whose daughter Jane was luis second wife. In this retirement he planned and executed his great work, a Polyglott Bible which should be completer, cheaper, and provided with a better critical apparatus than any previous work of the kind (see Pory- GLoTT). The proposals for the Polyglott appeared in 1652, and the book itself came out in six great folios in 1657, having been printing for five years. England had at this time a band of Biblical and Oriental scholars of unusual distinction, and Walton could reckon among his active helpers Usher, Lightfoot, and Pococke, Castle, Wheelock, and Patrick Young, Hyde, Thomas Greaves, and others of less note. The great undertaking was supported by liberal subscriptions, and Walton's political opinions did not de- prive him of the help of the Commonwealth ; the paper used was freed from duty, and the interest of Cromwell in the work was acknowledged in the original preface, part of which was afterwards cancelled to make way for more loyal expressions towards that restored monarchy under which Oriental studies in England immediately began to languish. To Walton himself, however, the Reformation

1 He was from January 1635-36 rector of Sandon, in Essex, where his first wife, Anne Claxton, is buried. He appears to have also been

a prebendary of St Paul's, and for a very short time he had held the rectory of St Giles in the Fields.

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brought no disappointment. He was consecrated bishop of Chester in December 1660. In the following spring he was one of the commissioners

at the Savoy Conference, but took little part in the business. In the autumn of 1661 he paid a short visit to his diocese, and returning to

London he fell sick and died on 29th November.

However much Walton was indebted to his helpers, the Polyglott Bible is a great monument of industry and of capacity for directing a vast undertaking, and the Prolegomena (separately reprinted by Dathe, 1777, and Wrangham, 1825) show judgment as well as learn- iug. The same qualities appear in Walton's Considerator Considered (1659), a reply to Dr John Owen's Considerations, who thought that the accumulation of material for the revision of the received text tended to atheisni. Among Walton's works must also be mentioned an Jntroduetio ad Lectionem Linguarum Orientalium

(1654, 2d ed. 1655), meant to prepare the way for the Polyglott. See Henry J. Todd, Memoirs of the Life and Writings of Walton, London, 1821, in 2 vols., of which the second contains a reprint of Walton's answer to Owen.

WALTON, Izaax (1593-1683), author of Zhe Compleat Angler, hooked a much bigger fish than he angled for when he offered his quaint treatise to the public. There is hardly a name in our literature, even of the first rank, whose immortality is more secure, or whose personality is the subject of a more devoted cult. Not only is he the sacer vates of a considerable sect in the religion of recrea- tion, but multitudes who have never put a worm on a hook—even on a fly-hook—have been caught and securely held by his picture of the delights of the gentle craft and his easy leisurely transcript of his own simple, peaceable, lovable, and amusing character.

A succession of devotees have supplemented by patient inquiry what he tells us of himself. He was born at Stafford in August 1593; 'the register of his baptism gives his father's name as Jervis, and nothing more is known of his parentage. He settled in London as a shopkeeper, and at first had one of the small shops, seven and a half feet by five, in the upper story of Gresham's Royal Burse or Exchange in Cornhill. In 1624 he had a shop in Fleet Street opposite the Temple, and was described as a linen-draper. In 1632 he bought a lease of a house and shop in Chancery Lane, and was described as a "sempster" or milliner.! His first wife, married in

December 1626, was Rachel Floud, a great-great-niece of Archbishop Cranmer." She died in 1640. He married again soon after, his second wife being also of distinguished clerical connexion, Anne Ken—the pastoral "Kenna" of The Angler's Wish —sister of Thomas Ken, afterwards bishop of Bath and Wells. When the civil war broke out, he retired from business. He had bought some land near his birthplace, Stafford, and he went to live there, but, according to Wood, spent most of his time "in the families of the eminent clergymen of England, of whom he was much beloved." His second wife died in 1662, and was buried in Worcester cathedral church, where there is a monument to her memory. One of his daughters married Dr Hawkins, a prebendary of Winchester, in whose house he died in December 1683, at the age of ninety. The last forty years of his long life seem to have been spent in ideal leisure and occupation, the old man travelling here and there, visiting his "eminent clergymen" and other brethren of the angle, compiling the biographies of con- genial spirits, and collecting here a little and there a little for the enlargement of his famous treatise.

The first edition of The Compleat Angler was published in 1653, but the peaccful angler continued to add to its completeness in his leisurely way for a quarter of a century. There wasa second edition in 1656, a third in 1661 (identical with that of 1664), a fourth in 1668, and a fifth in 1676. In this last edition the thirteen chapters of the original have grown to twenty-one, and a second part was added by his loving friend and brother angler

Charles Cotton, who took up "'Venator" where Walton had left him and completed his instruction in fly-fishing and the making of flies. 1 There was more millinery in men's elothes in those days; henee

his location near the fashionable Temple. 2 See Notes and Queries, Nov. 15, 1878.

WAL—-WAN

Walton did not profess to be au expert with the fly; the fly-fishing in his first edition was contributed by Mr Thomas Barker, a retired cook and humorist, who produced a treatise of lis own in 1659; but in the use of the live worm, the grasshopper, and the frog "Piscator" himself could speak

as a master. ‘The famous passage about the frog—often misquoted about the worm— “use him as though you loved him, that is, harm him as little as you may possibly, that he may live the longer ”—appears in the original edition. The additions made as the work grew were not merely to the didactic part; happy quotations, new turns of phrase, songs, poems, and anecdotes were introduced as if the leisurely author, who wrote it as a recreation, had kept it constaritly in his mind and talked it over point by point with his numerous brethren. There were originally ouly two interlocutors in the opening scene, ‘ Pisca- tor’ and “Viator”; but in the second edition, as if in answer to an objection that “ Piscator” had it too much in his own way iu praise of angling, he introduced the falconer, “ Auceps,” changed “Viator” into “ Venator,” and made the new companions each dilate on the joys of his favourite sport.

Although The Compleat Angler was not Walton’s first literary work, his leisurely labours as a biographer seem to have grown out of his devotion to angling. It was probably as an angler that he made the acquaintance of Sir Henry Wotton, but it is clear that Walton, whatever lis education and breeding may have been, must have had more than a love of fishing and a humorous temper to recommend him to the friendship of the accomplished ambas- sador. At any rate, Wotton, who had intcnded to write the life of John Donne, left the task to Walton, who had lamented his pastor’s death in an Elegy in 1638, and now completed and pub- lished the life, much to the satisfaction of the most learned critics, in 1640. Sir Henry Wotton dying in 1639, Walton undertook his life also; it was finished in 1642, and published in 1651. His life of Hooker was published in 1662, George Herbert in 1670, and Bishop Sanderson in 1678. All these subjects were endeared to the biographer by a certain gentleness of disposition and cheerful picty ; three of them at least, Donne, Wotton, and Herbert, were anglers. Their lives were evidently written with loving pains, in the same leisurely fashion as his Angler, and like it are of value less as exact knowledge than as harmonious and complete pictures of character. Walton also rendered affectionate service to the memory of his friends Sir John Skeffington and John Chalkhill, editing with prefatory uotices Skeffington’s Hero of Lorenzo in 1652, and Chalkhill’s Thealma and Clearchus a few months before his owu death in 1683. Two political letters, published in 1680, under the title Love and*

Truth, though conciliatory enough in temper to be Walton's, are ascribed to him on somewhat doubtful authority (see Zouch's Lives, vol. ii. p. 387, ed. 1817).

There are biographies of Walton himself by Sir John Hawkins (prefixed to an edition of the Ang/er, 1760), Dr Zouch (appended to an edition of the Lives, 1796), and Sir Harris Nicolas (prefixed to an edition of the Angler, 1836). There are notices also, with additional scraps of fact, annexed to two great American editions, Bethune's (1847, particularly splendid) and Dowling's (1857). A fac- simile of the original edition of the Angler was issued by Bagster in 1810, another by Elliot Stock in 1876. (W. M.)

WAN-CHOW-FU, a prefectural city in the Chinese province of Ché-keang, and one of the ports opened by treaty to foreign trade, is situated (28° 1' N. lat. and 120° 31' E. long.) on the south bank of the river Gow, about 20 miles from the sea. The site is said to have been chosen by Kwo P'oh (276-324 a.p.), a celebrated antiquary who recognized in the adjacent mountain peaks a correspondence with the stars in the constellation of the Great Bear, from which circumstance the town was first known as the Tow, or Great Bear, city. Subsequently, however, the appearance in its vicinity of a white deer carrying a flower in its mouth was deemed to be so favour- able an omen as to more than justify the change of its name to Luh, or Deer, city. Its present name, which signifies the " mild district," and which is correctly descriptive of the climate, though not of the inhabitants, was given to it during the last dynasty (1368-1644). The walls, which were built in the 10th century, are about 6 miles in circumference, 35 feet in height, and 12 feet broad at the top. The gates, seven in number, were put up in 1598. Wan-chow is about 1563 miles by road from Peking and 600 from Hankow. The country in the neighbourhood of the town is hilly and pretty, while opposite the north-west

3 The existenee of Chalkhill was ealled in question by S. W. Singer in 1820, and the pastoral supposed to be Walton's own. There can be little doubt that the poet is the same person whose tomb is in Win- chester

eathedral, and that Walton was simply mistaken in describing him as "an aequaintant and friend of Edmund Spenser."

Modern changes in the art of war,

An army an organism, not a machine,

WAN—WAR

gate " Conquest Island" forms a picturesque object. The island is, however, more beautiful than healthy. The port, which was opened to foreign trade in 1876, has not justi- fied the great expectations which were formed of its prob- able success as a commercial centre.

In 1886 the imports (excluding treasure) were valued at £118,710, and the exports at £25,751; 44 vessels entered, of which one only was British, and 45 cleared. A noticeable feature in the year's return is the falling off in the quantity of opium imported,—only 25 piculs, 62 per cent. less than the average of the previous three years. The principal item of import is cotton goods, which showed an increase of 12 per cent. over the same average. Kerosene oil, matches, window-glass, sugar, dates, and old iron are among the chief goods imported; while among the exports kittysols or umbrellas, timber, oranges, and tea figure prontinently.

WANDERING JEW. See Jew, Wanperinc.

WANSTEAD, a village of Essex, England, now really a London suburb, is situated on a branch of the Great Eastern Railway (Snaresbrook station), 8 miles by rail north-east of Liverpool Street station. It possesses the

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usual characteristics of the better-class eastern suburbs of London. Wanstead Park, 184 acres in extent, was opened in 1882. A feature of Wanstead is Eagle Pond or Lake, 10} acres in extent. At Lake House Hood wrote Tylney Hall. The population of the urban sanitary district (area about 1072 acres) is estimated to have been 4311 in 1871; in 1881 it was 5362.

Wanstead is supposed to have been a Roman station. It belonged to the monks of St Peter's, Westminster, and afterwards to the bishop of London, of whom it was held at Domesday by Ralph Fitz Brien. In the reign of Henry VIII. it came into the posses- sion of the crown, and in 1549 it was bestowed by Edward VI. on Lord Rich, whose son sold it in 1577 to Robert, earl of Leicester. The original manor house was rebuilt by Lord Chancellor Rich, who was here visited by Queen Elizabeth in 1561, and for her enter- tainment Sir Philip Sidney wrote a dramatic interlude which was played before the queen at Wanstead garden, and is printcd at the end of the Arcadia. Sir Richard Child, afterwards earl of Tylney, built the splendid mansion of Wanstead House in 1715 (demolished in 1822), in which the prince of Condé and others of the Bourbon family resided during the reign of the first Napoleon.

WAR

HATEVER definition of the word "army" (see Army) be adopted, the fact that it is a body of men organized for the effective employment of arms is the essence of it. Hence the nature of the most effective organization and employment of armies in active warfare at any given period has always turned upon the nature of the arms in use at the time. The laboratory and work- shops of science in recent years have in fact produced and forced on a change in the nature of fighting, of a kind which it is safe to say never entered the mind of any one of the inventors whose skill made it necessary. And yet the change is of such a kind that, though due to the development of very material things, as, for instance, the greater rapidity of fire, the greater range of weapons, and the like, it is much more remarkable in its effect on the spirit of armies and the nature of fighting discipline than in almost any other aspect.

In all periods of war, under all conditions of arms, the moral forces which affect armies have been the great determining factors of victory and defeat. From a date much earlier than the day when Cesar, defeated at Dyr- rachium, gained the empire of the world by so acting as to restore the morale of his army before the great contest at Pharsalia, it has been on this nice feeling of the moral pulse of armies that the skill of great commanders has chiefly depended. In that respect there is nothing new in

the modern conditions of war. But the sequence by which the development of arms has changed the moral pivot of military power in our own times is so remarkable that it deserves to receive a somewhat careful historical statement at the outset of this article. Unless it is under- stood the lessons of modern fighting cannot be learnt ; for there has not yet occurred a modern war in which the principles of modern fighting, as they are now universally understood among the most thoughtful soldiers of all nations, have been deliberately applied to action, after those principles have been realized and worked out in practice during peace time. And yet it is among the first of these principles that for success in our days careful peace practice, adapted to the actual conditions of fighting, must precede the entry on a campaign. When letters from the seat of war in 1866 brought home to Europe the effect which the breech-loader was producing in deter- mining the contest, the first impression was that of simple consternation. It was supposed that Prussia, by the possession of that weapon alone, had made herself mistress of Europe. Gradually it came to be known that the secret

of Prussian power lay, not in her breech-loader alone, but at least as much in her perfect organization. In 1870 her scarcely less startling successes tended for a time to produce an effect almost as blinding upon the eyes of those who watched them. There was a dis- position to assume that whatever had been done in the war by the Prussians was, by the deliberate choice and determination of the best and most successful soldiers in Europe, shown to be the best thing that could be done under the circumstances. The exhaustive statement of facts contained in the Prussian official narrative and in the regi- mental histories, and the evidence of eye-witnesses innumer- able, have, however, gradually made it evident that, valuable as the experiences of the 1870 campaign unquestionably are for soldiers of all nations, the Prussian successes were certainly not due to the carrying out of what are now regarded by the best Prussian officers themselves as the principles of action which ought to determine practice in future wars. But during the course of the war itself the Prussian army, prepared by the soundest peace training to adapt itself to whatever conditions it met with, was continually and progressively modifying its practice under the experience of conditions which it had been impossible fully to anticipate.

It is upon the surface of the facts that the extreme loss of life suddenly oc asioned at particular points by the effectiveness of the fire of the new weapons, both of artillery and infantry, compelled the gradual abandonment of close formations of men, massed together in dense columns or even in closed lines, and the gradual adoption of what are known as "skirmishing" or open order formations. In other words, when the French fire fell upon the solid columns of the advancing Prussians, the column in- stinctively scattered. The officers and non-commissioned officers were often lost in very large proportion, and during the actual course of the fighting, without any preconceived idea on the subject, a method of attack was adopted which proceeded by successive swarms of dispersed men taking advantage of such shelter as the ground permitted. The noise of the rapid breech-loader, and the crash of an artil- lery able to fire much mere frequently than in former campaigns, and, moreover, accumulated in much greater masses than had ever been the case before, made words of command inaudible at a distance. Hence it came to pass that small parties of men, once launched into an infantry fight, were virtually beyond all control on the part of superior officers. All that these could do to influence

Subordi- nation of drill to organiza- tion.

the action was to determine the direction and object of the first attack of each fraction, and then to furnish it with fresh supports at the proper moment, sending them forward in such a way as to cause their blows to be delivered in the most telling direction.

Here then was the great change which had come about, produced, as has been said, by the efficiency of the new weapons, but rendered possible by those changes in the characteristics of the men of whom armies are composed, which had arisen from altogether different circumstances, such as the high educational standard of the Prussian nation, and the introduction into the ranks of highly culti- vated classes. The army, at all events in battle, was and could be no longer a mere mechanical weapon in the hands of its commander. [If this latter could not infuse into it a spirit of hearty willing co-operation and intelligent subor- dination, chaos

and chaos only must ensue. For the very essence of the old forms of fighting in battle, as they had been inherited from the time of Frederick the Great, and, though modified by Napoleon, had yet in this respect re- mained the same, was that battle movements were led up to and prepared for by an elaborate system of drill, so ar- ranged that by the issue of predetermined words of com- mand the officer leading at least a division of an army could decide precisely the formation it was to assume and the movements it was to make in battle. Now, though no doubt many of the prelininary movements could still be accomplished in accordance with the old drill, yet, for at least the very mile and a half over which the issue had actually to be fought out, drill had vanished, as far at all events as the infantry were concerned. All effective move- ments and co-operation depended on perfect organization, and on a training which made every officer and every man know almost instinctively what to do and what decisions to form as each emergency arose. The Germans had in the largest sense perfected their organization, not merely in its form, itself a matter of no small importance, but in its pre- paredness for battle action. This had been done chiefly by keeping and training together much larger units of command than had ever been organically worked together before. By "organic working" we specifically mean such work as leads each nan to know by long habit what the part assigned to him is, and how to contribute his share in bringing about the result desired by his general. In the article ARmy will be found an exhaustive statement of the successive forms which army organization has assumed at different periods of history. With regard to these forms, representing as they do the condition of an army in a state of rest, suffice it to say that the ancient proverb about new wine and old bottles applies perfectly. It would not have been possible for the Germans to have secured a complete correspondence of working, a unity amid great diversity, without having devised a form of organization which assigned to every man an adequate share of work and of responsibility, by bringing a limited number of men at each step under the authority of one, those so placed in authority being themselves at the next stage, in limited number, also under one man's authority. But the very idea of organization implies more than this mere perfection of form. It implies also, as animating the whole body, a spirit developed by careful training, a mutual reliance on the certainty of the adherence of all to known principles of action.

The essential change, then, which appears to have come over inodern war may be stated thus. Under the condi- tions of the past, the general in command of an army relied upon its perfection in drill and in formal manceuvres for enabling him to direct it with success against the weak points of an adversary. Now he must depend instead upon the perfection of its organization and of a training

adapted to make each man ready when required to apply sound principles in every emergency, and, above all, as soon as possible voluntarily to place himself under authority again so as to secure unity of action. To summarize this statement in a single sentence, and employing the word organization in the larger sense explained above, the change consists in the substitution of organization for drill as a means of battle-action. In other words, a living organism must take the place of a mechanical instrument.

It will be seen at once that the perfection aimed at, involving as it does not merely a mechanical learning, by rote and drill-sergeant, of required changes of position, is of a much higher order both for the individual man and for the whole body than was the case under the old con- ditions. On the other hand, it is not possible that the practical performance should so nearly approach the ideal as happened formerly. Hence, great as was the excellence of the Prussian army in 1870 as a whole, yet the more thoroughly that campaign is studied the more manifest will be the mistakes in point of details committed by subordinate actors. It is in the nature of things im- possible that this should ever be otherwise under the con- ditions of war which are now established. When the choice of action in detail is left to so many hands the possibilities of error are multiplied indefinitely.

It is clear from what has been said that a change Applica- of the most complete character has come over the very tion of past principle by which armies are held together. It is by (°RUN

a: 3 o strategy no means surprising, therefore, that a few soldiers should ang tactics. have arrived at the conclusion that, because of the import- ance of this change, all past experience of fighting has ceased to be of any importance to him who would under- stand the principles of war as they

exist to-day. On the other hand, others of far higher authority have declared it to be certain that change has only affected that branch of the art of war which is called tactics, and that the other branch, or strategy, is in no way affected. We are not able to subscribe absolutely to either of these state- ments. But before stating our views it will be convenient to define the terms employed. By strategy we under- stand "the art of rightly directing the masses of troops towards the object of the campaign." Of modern tactics no better definition perhaps has ever been given than that of Sir Edward Hamley. After defining the limits of either subject thus—'" the theatre of war is the province of strategy, the field of battle is the province of tactics," } he describes the manceuvres of a modern battle-field as "the quick orderly change of highly trained and flexible masses of men from one kind of formation to another, or their transference from point to point of a battle-field for purposes which become suddenly feasible in the changing course of action."

It is necessary, in discussing the application of past experience to modern war, to make intelligible the dis- tinction between these two fields of experience, because undoubtedly the changes wrought by time affect the two great parts of the art of war in very different ways and in a very different degree. But in fact there are many parts of the study of tactics which are not strictly included within its province when that is limited to the field of battle. The distinction between the two provinces having been understood as a general idea, it will be seen at once how it has happened that in the varied incidents of warfare it has become necessary to apply the terms " tactics " and "strategy " toother matters. For no army can determine for itself or know beforehand absolutely what will be a field or a day of battle. Hence it is necessary throughout almost the entire course of a campaign to take those pre- cautions and to take into account those considerations

1 Operations of War, 4th ed., pt. ili. ch. i.; pt. vi. ch. i.

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The art

of war as a study.

which apply properly to the period of actual combat. Thus, though an enemy may in fact be many marches dis- tant, it is necessary to provide against his possible attack, by having some troops always on the alert whilst others are marching with all the ease and security which the pro- tection of these procures for them. It is necessary also in a similar manner to have protection for the repose of an army, and to detail troops for this purpose. All the questions, then, which concern the fixing of "advanced guards" and "rear guards," which protect the front and rear of an advancing army, and the " outposts," which protect an army at rest, are usually included in the study of tactics, though in many instances they may have nothing to do with a battle-field. But again, though the campaign —the large field of war which concerns the marches and movements of armies striving against one another to obtain positions of vantage for the actual combat—is the province of strategy, yet it may well happen that on the actual battle-field itis necessary to take account, not only of those circumstances which will help to secure victory in the fight, but of the effect which victory or defeat will have upon the campaign. All these considerations we necessarily regard as " strategical," even though they occupy our minds ona battle-field.

For it must be emphatically asserted that there does not exist, never has existed, and never, except by pedants, of whom the most careful students of war are more im- patient than other soldiers, has there ever been supposed to exist,an "art of war" which was something other than the methodic study of military history. Those who have most assisted in making the study sufficiently methodic to enable it to be of practical profit in their own profession to soldiers for future use, or to historical students in watching the play of mind between great commanders, have been invariably the most emphatic in denouncing all attempts to formulate a systematic series of "rules of war." Among generals, Mack, the unfortunate Austrian who surrendered at Ulm to Napoleon, and in our own time Count Palikao, who had made himself the laughing- stock of the English staff during the advance on Peking, and who was afterwards responsible for bringing about the catastrophe of Sedan, have been the great sticklers for the "rules of war." At least once Count Palikao, in

China, came without his sword to look on at the success of operations which he had denounced as " contrary to every maxim of war." On the other hand, Sir Edward Hamley, who has done more than any other Englishman to make known to English officers the value of a methodical treatment of the study of campaigns, has most vigorously denounced such talk as this.

"Nothing is more common," he writes ''than to find in writings on military matters reference to the 'rules of war,' and assertions such as that some general 'violated every principle of war,' or that some other general owed his success to 'knowing when to dispense with the rules of war.' It would be difficult to say what thésc rules are, or in what code they are embodied; and an inquirer, who is somewhat puzzled, perhaps, to understand how the highest proficiency can be displayed in a science by defiance of its principles, had better resolve to base his own conclusions upon

fact and reason alone, when he will probably discover that such criticisms have only very vague ideas for their foundation."

Jomini, a very eminent authority in his day, though not a little disposed to somewhat exact definition, and perhaps sometimes to over-pedantic statement, has with very little difference expressed the same view. Clausewitz, probably the most profound of all military students, has even more emphatically declared that the theory of the art of war is valuable, just in so far as it assists to guide a man through the vast labyrinth of military experience, and to prepare his mind to be ready to act for itself under the emergencies of actual war; but, he adds, "it must renounce all preten- sion to accompany him on to the field of battle." Both he

and Jomini agree in asserting that it must have become with him an instinct, almost absorbed into his blood, to be of any value to him. '"' The wise teacher," says Clausewitz, "restricts himself to the work of directing and assisting the mental development of his pupil, and does not try to keep him in leading-strings throughout his career." Thus from all countries those who have come to be accepted as authorities on the study

of war, the very men who, if any, ought to be tempted to magnify their office, have cried aloud against the abuse of such study. It is not from them, but from non-military writers like Macaulay, that the notion of some formal code of the rules of war has been derived. Macaulay's expression about Peterborough winning battles by violating the rules of war cannot be characterized otherwise than as worthless rhetoric, not only unsupported, but absolutely contradicted by fact. So thoroughly reasoned and so entirely worked out on a principle were Peterborough's campaigns that they have in our own day served to guide one of the most brilliant of English soldiers in the conduct of one of his most successful wars. The campaigns by which Colonel Gordon saved China were largely assisted in their conception by his careful study of Peterborough's generalship in Spain.

On the other hand, it is not from writers on war, but from the greatest generals, that the most emphatic state- ments have come as to the paramount importance to a soldier of the careful study of past campaigns. The class- ical instance of the most authoritative dictum on this sub- ject is surrounded by circumstances of dramatic interest. Napoleon in 1813, sitting after dinner surrounded by his marshals, between the first and the second battle of Dres- den, was drawn to speak on this subject by Marmont, the one who, in Napoleon's own judgment and that of others, had himself the most complete knowledge of war as an art. Marmont, observing how difficult it was, during the con- tinued strain of war itself, to improve in its practice, maintaining that rather in peace than in war could war be best studied, said to Napoleon that he thought that Napoleon's own first campaign in Italy was the most brilliant in its conception of any that he had ever fought; so that sixteen years of high command had hardly made his knowledge of war.as an art more perfect. Napoleon at once admitted the truth of this, and in reply said, '"' Yes; Turenne was the only one of us all who constantly improved in the management of his campaigns as he advanced in years." This reply is especially remarkable, because Napoleon was not only the greatest captain of his own age, but he was by far the most careful student that the world has known of the great generals of all ages. It is an unanswerable assertion that only by study of the past experience of war has any great soldier ever prepared him- self for commanding armies.

It must, however, be always a question how far the circumstances of our own time have so changed as to limit the period within which it is worth while to devote very careful study to the wars of the past. On the one hand, the greater number of officers in any army will never find time exhaustively to study all the great campaigns which would be of value if they had really so known them as to acquire the experience, as far as may be, of the various actors in them, and it is therefore of special importance that the most modern experiences at least should be completely known to them. On the other hand, even after all the campaigns which have taken place since breech-loaders and rifle-guns have become the determining factors of battles have been carefully studied, it can hardly be claimed for them that they present a picture approximately complete of all the possibilities of modern war. To any one who tells us that nothing applicable to the wars of the future is now to be learnt from the campaigns of Napoleon, or even from

the events of the Peninsular War, we are prepared to reply by adducing, either from almost any one of Napoleon's most important campaigns or from the Peninsula, specific lessons, for the most part experiences of human nature, and illustrations of the mistakes which men are liable to make, which have in no wise been diminished in value by the changes which have come over the face of war.

As an instance in point, reference may here be made to a recently published study of the campaign of Fredericks- burg during the civil war in America. It deals in a sound and useful manner with both strategy and tactics, and yet it is based entirely on conclusions drawn from a period of war prior to the introduction of the breech- loader. We are disposed to put it forward as a very powerful illustration of the kind of lessons which a careful student may draw from one condition of tactics and apply to another. What is most interesting in the work is perhaps the way in which those lessons are made to apply with exceptional force to the peculiar and special condi- tions involved in breech-loader fighting. It seems impos- sible for any one who has appreciated its excellence not

other source which came to be known as its " base of supply." It began to be the object of generals to manceuvre in such a way as to interfere with the lines by which their opponents were receiving their supplies and to protect their own. In many respects, no doubt, even the Roman armies in the time of Hannibal acted on strategical principles that are applicable in our own time. Yet the change in the conditions under which armies began to live in the field was so great from the moment when, in order to facilitate and hasten their movements, they began to be thus supplied from a particular "base," and along these "lines of com- munication," that the art of handling them in campaigns changed almost as completely as tactics ever changed. New combinations became possible. Skill was turned into a new direction. In other words, strategy, like tactics, changes when its implements or weapons change. If now it be asked whether since the days of N apoleon and Wellington the implements of strategy have not changed almost as completely as those of tactics, it must be answered that the change has been even more complete.

Since 1815 the face of Europe has been more altered Changes in than it had been in five previous centuries. It is now the general covered with a network of railways and telegraphs. The ©ontitions

to perceive that in a similar manner, with the like wise appreciation of those things which are permanent and those

Changes in

things which change, sound deductions may be drawn from even the tactical experiences of the Napoleonic era. N ay, the statement of the most brilliant and successful general in the British army of to-day appears to be indisputable, that a perusal of the words of even Cesar himself will suggest to any thoughtful soldier, who knows something also of modern war, reflexions that he may afterwards recall with advantage as applicable to modern campaigns. That tactics have been first and most directly affected

commerce of the world and its means of intercommunica- tion have developed in a manner that has everywhere revolutionized the conditions of life. The advance of science has operated in a thousand forms upon the circum- stances under which armies exist in the field. The condi- tions of sea transport and of sea warfare are even more completely changed than those of land. Further, it must be remembered that battle-action is itself one of the deter- mining factors of strategy. If, in their general character,

ae by the changes which have recently taken place in the | the nature of battles and the circumstances under which a ee conditions of modern war it is impossible to doubt. The | battles have to be fought change very materially, that in

nature of tactics has been always of a kind more tending to admit of rapid change, and more frequently suggesting to a commander of originality new developments. Napoleon indeed declared that tactics should be changed every ten years. Strategy has always, on the other hand, been as- sumed to possess a more permanent character, All im- portant changes in armament immediately affect tactics. No one now disputes the general character of the tactical changes which have been produced by the introduction of the breech-loader and the development of artillery. In- deed, when we come to describe the broad features of modern tactics, we shall be dealing with matters as to which, except as to a few specific points, it may be said that practically the military world of Europe is agreed ; but we confess that we are not prepared to accept the assumption that tactics only have been changed, and that he who would be ready for future war on the grand scale must not also look for some change in the general char- acter of strategy.

Sir E. Hamley, in his Operations of War, has graphically described how it was that armies lived in the days of Edward III. ; how they depended absolutely upon the food and supplies which they found in the country through which they moved; and how, when they had exhausted that country, and were opposed by an enemy holding a strong position, which they could not venture to assail, they were obliged to fall back simply because they had no arrangements for obtaining supplies regularly from their own land. Now the great strategic movements of armies have

depended always upon this question of food and of warlike supplies in the first instance. It will therefore be evident at once that the character of strategy changed from the moment when a system was devised by which along a regular chain of posts, or "line of communications," an army received its supplies of food, warlike implements, and reinforcements, from either its own country or some

itself involves a further change in the combinations which are open for manceuvres in the field of which the ultimate object is to lead up to battle. Once more, the size of the armies which will enter into the next great campaign in Europe will be so vastly different from those which fought out the great wars of the past that their manoeuvring in campaigns must necessarily be very different from anything that Napoleon undertook. Now, even during the later wars of Napoleon, Jomini was obliged to admit that many of the experiences of the past must be materially modified as armies increased in size. One of the most familiar forms in which Napoleon exercised his strategic skill lay in defeating with his own entire army a fraction of the forces opposed to him, before it could be reinforced by the remainder of the enemy. Thus the element of time essen- tially entered into the question. Even during the great campaign of 1813, when Napoleon, holding a central posi- tion on the Elbe, endeavoured to strike from thence against the masses of the allies formed in a great circle round him at Berlin, in Silesia, and in Bohemia, experience showed that it was by no means easy to crush with sufficient rapidity armies of 120,000 men so as to pre- vent them from being supported in time by others. As the allies gradually closed in on him, and the distances between their different forces diminished, this became continually more and more apparent. In fact, it became clear, if it had been doubtful beforehand, that the ques- tion was altogether a matter of proportion between time, distance, and the resisting power of the several armies concerned. On the other hand, in 1814, when the nature of the country invaded caused a reduction in the size of the armies moving forward separately, Napoleon was able as of old to strike his blows right and left with telling effect.

Now, if it were possible for an army of our day, supplied with all the implements with which modern science has

of war,

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provided it, to meet any army cf equal members, equipped as Napoleon's armies were equipped, the difference in power of the modern army would be such that it would almost be able to deal with its enemy as civilized armies provided with firearms were at first able to deal with savages possessed only of bows and arrows. The artillery of the days of Napoleon would not be able to act at all, for our modern infantry can fire with effect at a distance greater than could Napoleon's big guns. Our artillery would be able to destroy Napoleon's army before either his artillery or infantry could act against us. Thus an army of 50,000 men of our own time must be reckoned as possessing at least the resisting power of 100,000 of the days of Napoleon. It is obvious therefore that the re- lationship between time, distance, and the resisting power of armies has been greatly affected by the change in the character of weapons, and that calculations as to what a superior army can do in a given time to break up the force of an army opposing it, and to be free to deal with an- other army, are greatly modified.

There is another element which has largely to be taken into account in our modern battles. The expenditure of ammunition is, from the rapidity of fire, enormous. Even in the days of Napoleon it was extremely difficult, as his own words after the battle of Ligny show, for a victorious army rapidly to turn upon a second force which had not been engaged, because of the time required for filling up the empty ammunition waggons and the men's cartouches. These difficulties under our conditions of warfare are therefore immeasurably increased.

Again, in order that an army may nowadays be isolated in the way in which Napoleon in 1805 cut off the army of Mack in Ulm and utterly destroyed it, many conditions have to be secured which were not needed then. The telegraph is a formidable enemy to such an operation. The newspapers are a still greater. When MacMahon in 1870 attempted his disastrous march to the relief of Bazaine in Metz, to the success of which secrecy was es- sential, his movements first became known to the Prussian headquarters through French and English journals. Thus the

rapid intercommunication between town and town, capital and capital, which is now extended in all directions over Europe to an extent that makes it extremely difficult to completely prevent news of all kinds from leaking out, is an element that cannot be neglected in any strategical calculations. The change in this respect is strikingly shown by the fact that seven weeks elapsed before the news of Trafalgar reached Naples. Furthermore, distant parts of an army may, under certain conditions, be in point of time much more closely connected than they formerly were because of the facilities afforded by railways and telegraphs. There are a variety of other elements less important individually than as all contributing to the same result, which must not be ignored,—the facilities afforded for the supply of armies by compressed food and compressed forage, the enormously extended area which caters for the feeding of the European populations and the organization of the commerce of the world rendering all which that area yields rapidly available, and, lastly, the continually improving methods of machine transport by road, bicycles, tricycles, &c., making it possible to effect rapid movements without forage at all.

Furthermore, not only have we to deal with new material conditions, but, as already observed, the armies which have to be led under these new circumstances have themselves been profoundly changed, not only in their armament but in the very spirit, discipline, and organization by which they are held together. What is true of the private, of the sergeant, of the captain, in his relations with superiors, is even truer of the leader of the brigade, of the division,

of the army-corps, of the co-operating army. The whole method of the Prussian discipline and organization, as it showed itself in 1870, implied an intelligent independence of action in all ranks that most seriously affected the strategical operations. In fact, in that campaign two very noteworthy points may be observed. From the first battle at Weissenburg up to and including Gravelotte, the peculiar feature of the war was that the German successes at each action— Weissenburg, Worth, Spicheren, Colombey-Nouilly, Mars-la-Tour—were much more important in their

strateg- ical than in their tactical aspect,—much more important, that is to say, in their general influence on the campaign than in the severity of the losses in men and material inflicted on the enemy. The losses in battle were in fact greater on the side of the victors than on that of the van- quished. Yet, secondly, each of these actions, up to but not including Gravelotte, was brought on by the determination of subordinate leaders, and was not designed beforehand either by the king's headquarters or by the headquarters of any one of the three armies. It cannot of course be denied that there was an element of danger in this way of managing a campaign. But the general who attempts to carry out a modern campaign without having realized the nature of this strictly strategical experience is reckoning without his host. Armies now occupy, even when in numbers similar to those of the past, distances vastly greater than was the case in former times. One of two things must happen: either a general must attempt to pre- scribe the action of his subordinate leaders with a rigidity which nowadays will continually prevent them from carry- ing out what would be his wishes could he be on the spot to advise them; or he will find that he has, as best he may, to make his strategical movements fit into events which have not been previously designed by himself. The Prussian headquarters, realizing fully the dangers involved

'In the plan which they, in fact yielding to necessity,

accepted, found no fault with the generals who had in- itiated battles which had proved successful, fearing to do more injury to the spirit of the army than would be com- pensated by any other advantage. Nevertheless the notes of warning thrown out in the official history of the war are clear and unmistakable. Tous it appears that this condi- tion of things is an element in modern war to be foreseen and prepared for, that it represents, not an accident of the 1870 campaign, but an almost inevitable consequence of the present condition of armies. It was their high spirit, their high training, their knowledge of war, which made the German leaders so hard to keep within the leash when they saw the prey before them, and realized that it was a matter of moments whether it could be seized or not. There is nothing like this campaign, in the peculiar mode in which its strategical aspects developed, in all the past history of war.

It would appear, therefore, that it tends to mislead a man who is anxious to consider what combinations are open toa general in the field in our day, to assure him that strategy has undergone no change since the days of Napoleon. No doubta soldier who had never considered how or why Napoleon triumphed over his opponents, and when and why he failed, would have very little chance of solving aright the problems of a modern campaign. The handling of armies is, before all things, in the infinite variety of its elements, a dealing with human nature, under certain peculiar conditions, a play of mind against mind, and only by a study of the masters of the game can some of its experiences be gathered. If the changed conditions under which a modern war now takes place have been realized, then all study of the martial experiences of the past will in its own degree have value. We doubt extremely if any man can fairly appreciate the character of the campaign of

Changes since time of Napoleon.

Merit not necessarily to be esti- mated by success.

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1866, or the campaign of 1870, who knows nothing of the campaigns of Napoleon. To take, for instance, the earlier of the two, the Prussian strategy in it has been the subject of much dispute ; and those who think that questions of war can be settled by quoting maxims of Napoleon, or of other great generals, find no difficulty in picking out sayings of his that would condemn without excuse the scheme of the Prussian campaign. Certainly we should ourselves be sorry to suggest that it is the one satisfactory model for future guidance under analogous circumstances. To us it seems that its value, as a sample of what may be done in war, depends ona careful comparison of the handling of the Prussian armies, under the conditions in which they had to act, with the mode in which Napoleon and other great generals acted under their own conditions. The point in which the Prussians offended against the received maxims of Napoleon lay in their attempting to pass the Bohemian mountains In two separate armies,—one from Silesia, one from Saxony and Prussia. The Prussian headquarters remained at Berlin in telegraphic connexion with both armies up to the moment when the junction of the two had been so

far effected that they were able to communicate with each other. Now Napoleon in many letters, more especially those addressed to his brother Joseph in Spain, has condemned the attempt to arrange complicated schemes for the co-operation of armies acting from different bases of supply. His reason is that such complicated schemes are rarely worked out as they are intended to be. For our own part we do not believe that the warning from the ast experience on which Napoleon's views were based has ceased to be of practical importance. We think that it ought to be present to the minds of all who are working out the plan of a campaign, and that the simpler, the less complicated, the less dependent on the successful combina- tion of a number of different elements the plan is the more likely is it to be successful. But we think also that the actual circumstances of each case as a whole must be taken into account, and that in the instance of the campaign under consideration the Prussian headquarters were fully justified in the method they adopted. Such an operation indeed would not have been safe or wise in the days of Napoleon (see below); but for the moment our contention is that the nodifications of the art of war which are necessitated by modern conditions extend to all its branches, and that criticism of modern campaigns which is based upon maxims derived from the past, without taking account of those new circumstances, is unsound and untrue. Few things are more unsafe in war than to judge by isolated cases of success alone, as to the soundness of the principles and the capacity of the leaders concerned in bringing about the successful result. 'The importance of military success is, in Britain more especially, apt to be measured much more by the national interest and national excitement which the result occasions than by any careful estimate of the difficulties actually overcome and the capacity for future command exhibited by the triumphant leader. To take illustrations sufficiently distant from our own days :— scarcely any victory, naval or military, has ever excited wilder enthusiasm in England than the capture of Porto Bello by Vernon in 1725; scarcely any disaster, the most disgraceful that ever occurred, caused greater horror and alarm in England than the return of Moore's expedition from Corunna in January 1809. Yet, as subsequent events showed, Vernon was by no means a very able admiral ; and, on the other hand, as all who have really studied the Corunna campaign well know, few have been ever conducted with more conspicuous ability or would

have justified a higher confidence in the general. It is thus of the greatest importance that statesmen at least should not be carried away by the sort of hasty criticism which

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deals in glib phrases, and avoids reasoned examination of facts. The maxims of Napoleon may be as easily kiln- dried and deprived of life as those of Frederick had been by the Prussian army of Jena, which was so sure of defeating the upstart aspirant to military supremacy.

To sum up, then, what has been said on the art of war. There is no royal road to the knowledge of the art of handling armies any more than to that of any other branch of human activity. All that the best summary on that subject can profess to do for a reader is to assist him in undertaking a methodic study for himself of the principles which have guided great commanders, of the experiences of those who have fought in great battles and great campaigns, in endeavouring to put himself in their place so as to see with their eyes, hear with their ears, and realize the passions which influenced them, and the circumstances under which their decisions had to be formed.

It is not to be forgotten that even a commonplace critic may find it easy, when all the facts are fairly laid before him, to judge what ought to have been done in a given emergency. 'La critique est facile, Part est difficile," was the motto which Muffling, the very able representative of the Prussian army at Wellington's headquarters in 1815, chose for the title-page of his studies of war. The historical student has at least one advantage which is always and absolutely denied to the general. He may never, for many reasons, have an altogether correct and a completely true picture of all the circumstances which occurred on a given day, but he has a far more complete one than could possibly be before the general at the moment when he formed his decisions. Still more, he has far better materials for judgment than any of the minor actors who had themselves to decide what they ought to do, within the limitations of the orders they received, on most incomplete knowledge of what others were doing at distant parts of the field, of the positions and designs of the enemy, and of many other facts which may now be known with certainty by any one who

will read what happened. He who would prepare himself in any measure for criticizing aright must put himself in the place of the soldier who has to choose,—must realize the condi- tions of personal danger, of noise, of passion, of incom- plete and constantly misleading information, of disorder, confusion, panic, excitement, under which decisions are to be formed that must be calm and cool though they involve the lives of thousands of men, the fate of nations, and the course of history, and yet must be given then and there, for the lost moment will not return. Then he will perhaps perceive that after all the question whether he would himself have given the right decision, no matter what his previous training may have been, will be more a question of character than of knowledge. Nevertheless he is much more likely to decide aright if he has in his mind some large knowledge of the accumulated experience of the past than if, without anything to guide him, he judges by a so-called "common sense" which has already led him to ignore the earnest advice of those who have been themselves most successful in war. He is still more likely to decide aright, if, after he has acquired some general knowledge of the experience of the past, his judgment has been exercised by considering under assigned conditions what course he would actually choose to adopt. This is the method of peace preparation for war in which the Prussian officers of our day have been most carefully trained. In all their current works on the study of war they insist on the importance of this formation of the judgment and this training of choice as a matter of the utmost importance. All their most important military educational works take the form of "studies" or problems. The use of the war game and the training given by peace-

Conditions of histori- cal study.

Supplies.

Trans-

WAKE

manceuvres, as well as all regimental instruction, are adapted to the same end. STRATEGY.

The character of all military operations, whether those of strategy or tactics, is mainly determined by the nature of the armies engaged in them. An army as it exists in the field owes its constitution largely to those military institutions which have been fully described for each of the armies of our time under ARMy. But an army in the field differs considerably in each case from that which has been described as "the machine in a state of rest." This will be obvious at once if we consider the first question which attracts the attention of a commander about to lead anarmy in war. He has to choose the line of operations along which his army will act. The considerations which determine his choice are mainly connected with the neces- sity he is under of providing at all times for the supply of his army with food, forage, and ammunition, whilst he directs it against the point at which he is to strike.

In order that, for actual fighting purposes and during war, "that vast and complicated machine," an army, may so act "that the whole aggregate force of its numerous parts may be exerted in any direction and on any point required," the necessities of the individual soldier must be so provided for as not to hamper its working. A body of even thirty thousand men occupies a very considerable space, and requires an amount of food that completely disturbs the ordinary peace arrangements of most places at which it arrives in the course of its movements. Hence, apart from the large means of transport, such as a great fleet or ample railway communication, which may be sometimes used to carry a whole army to a given destina- tion, an army requires what is known as "transport" for an altogether different purpose. The food and ammunition must be distributed to the several battalions of soldiers composing the army from the points at which it has been collected, and within the battalions it will often be neces- sary to distribute it by transport to the men. Similarly for the conveyance of the sick and wounded of an army transport is required. In former days the arrangements which were made to provide an army with what was needed in this way were clumsy in the extreme. It will be remembered that during the Peninsular War the Duke of Wellington was necessarily so much occupied with this question of food and supply that he used humorously to say that he did not know that he was much of a general, but he prided himself upon being a first-rate commissariat officer. As long as all armies depended upon the services of country carts

and undisciplined drivers it was always possible to carry on war by these means, An army which, like the British in the Peninsula, fought continuously in the same country for six years, gained an enormous advantage by the gradual training and discipline of its transport drivers and commissariat employés. But now that the great nations of the continent of Europe have adopted a system by which all the population is available for military service, the result is that from the moment of declaration of war a modern army enters upon a eampaign with the whole of its "transport," using the term in the sense we have employed, as definitely a part of the disciplined army as its infantry, its cavalry, or artillery are. It is scarcely possible to exaggerate the importance of this change in facilitating the operations of an army in the field. The British army stands at a very great disadvantage in this respect, from the fact that the population outside the fighting ranks is

1 We are indebted to the Volunteer Tactical Society of Manchester for by far the best essay we have seen in any language on the history and use of the war game—that by Captain Spenser Wilkinson—and for the beginning of a series of translations of exercises in strategy and tactics by some of the ablest German soldiers of the day.

not, like that of Germany or France, ready to take up its place in the departments which cater for supply and transport. This modern perfecting of the efficiency of the interior transport of an army is a new strategical weapon in the hands of a general, to be reckoned among those spoken of in the earlier part of this article. Whether with the British army in an imperfect degree, or in a Con- tinental army more completely, this transport must be understood to be as much a part of a modern army as any of its "arms." When, during a campaign, an infantry battalion is moved by train, it, unless for a very especial emergency, requires to have with it the waggons and carts which form what is called its "regimental transport." Other transport is required to carry the more general stores needed for a brigade, a division, or an army-corps. Thus each unit of an army, if it is to remain in a condition of fighting efficiency, requires to have with it a great number of horses and carts. It is impossible to realize

the nature of the problems involved in the movements of armies unless this condition is kept in mind. For instance, when the British were moving to Ismailia in 1882, it was no uncommon assumption of the critics who at home watched the operations as they went on that within a day or two at the outside the small force, not exceeding about 10,000 men, which at first moved thither from Alexandria, had effected its landing. Had it been a body of 10,000 travellers landing from a variety of ships, to be provided for by the civil arrangements of the country after they had landed, that might not have been an exaggerated estimate of what was possible. But in fact the great ships were carrying not only 10,000 travellers,? but great quantities of stores of all kinds, of ammunition, of railway rolling- stock, of engineer equipment, of waggons and of horses. The landing of these and their passage up a narrow causeway was necessarily a very elaborate and slow operation. The whole scheme of the campaign had to take account of the time which such work would take, and, in fact, as a conse- quence of it, more than half the force to be ultimately employed was left either at Alexandria or at sea, and only arrived at Ismailia many days afterwards, when the landing of the first part had advanced considerably.

The same difficulty in rapidly transferring an army, chiefly because of its attendant departments, affects all strategical movements by railway. The embarking of troops on a railway, and their disembarking from the carriages, 1s an operation of such slowness that for com- paratively short journeys it is actually quicker for troops to march than to move by railway. The miscalculations and mistakes which were made so recently as 1870 by the French army, from failure to understand these facts, led often to the most disastrous consequences. In one instance Gambetta, insisting on sending troops by railway whicli Aurelle de Palladines had wished to march, hampered thie operations of that veteran by the delay which was thus im- posed upon certain portions of thearmy. There is, in fact, between the distance to be moved over and the number of troops to be moved by a line of railway a proportion which determines whether it is a more rapid operation to march or to travel by railway. In a pamphlet published shortly after the war the French emperor attributed his disasters to the general ignorance of his army as to the conditions involved in railway transport.

An army in the field, however, in addition to having Contin- transport present with it for distribution, needs to be uity of

able to replenish its supplies; and, though in fertile countries like France the feeding of the army may be greatly assisted by requisitions or by opening markets, it is impossible to depend for existence on these alone.

2 The entire army employed in Egypt was about 30,000 strong. Only the force which first landed at Ismailia is here spoken of.

Line of commu- nications.

Fresh supplies of ammunition at least must be continually received from a secure source, and the means must be available for feeding the army in case the resources of the country fail. Nowadays, and in most countries, the main line of supply is carried along lines of railway ; but, as these are always liable to be destroyed by a retreating enemy, transport, independent of that which is required merely for distribution, must be provided in the form of waggons, carts, or pack animals sufficient to supply, for at least some days, the entire army.

The source from which an army is supplied is usually spoken of as its "base" or its "base of supply." The direction in which, looking forward, a general proposes to advance, and along which it will be necessary to arrange for supply, is spoken of as his "line of operations." The direction along which the army, having already advanced to some distance from its base, is supplied, is spoken of as its "line of communications." Now, as the line of com- munications may come to be of great length as an army advances, and as the army needs to have its fighting strength available in the front when it is engaged with the enemy, it is clear that the long lines of road or rail- way along which the food and ammunition are moving forward, while parties of sick and wounded men are going backward, become weak points in its condition, which must be jealously guarded, but are difficult adequately to protect throughout their length, without detracting too much from the force in the front. In modern war the effort of the general is directed to maintaining in its full efficiency "the vast and

complicated machine" which he handles, and to breaking up and destroying the efficiency of that to which he is opposed. This is the central fact to be kept in mind. Generals and soldiers, long accus- tomed to look at war from this point of view, frequently embody their whole conception of strategy in a phrase which to a reader, taking it in its simple form, is apt to seem like a mere truism—that the great principle of strategy is to concentrate the largest possible force at the right moment at the decisive point. So stated, strategy may seem to have nothing exceptional in its nature, and to in- volve no study of the nature of the great organizations of men with which it is concerned. But, in fact, this study and this knowledge are presupposed by those who thus explain their art. It is because armies are not mere gatherings of armed men, but have a vitality of their own, that some very heavy blows may be struck against them without affecting a vital point, whilst a more skilfully directed stroke may destroy their whole future power of action. An army then, as it stands in the field, is of this character, that, while the fighting force directly opposed to the enemy is an organism which depends for its vitality upon the trained spirit of order, discipline, and enthusiasm or devotion which holds it together, and on the trained capacity for mutual and effective fighting co-operation which makes it act like one man, it has also, reaching far behind it, a long and weak tail, on the safety of which its very existence depends.

Now, if by employing a large portion, or the whole of |

his own force, against a smaller portion of the enemy's, a general can break up and defeat it, the advantage gained depends on the fact that he has broken up the organic unity of this portion. Even if, as may easily happen, he has lost more men than the enemy during the effort, that very little affects the importance of the result on the future of the campaign. The strength of armies cannot be measured by counting heads within the theatre of war. It depends upon the organized force that the general is able to use and to direct. During the earlier battles of the 1870 campaign, for instance, the Germans lost very many more men than the French, but at Weissenburg they broke

up the organic efficiency of a French division of about 8000 men. At Worth they broke up the organic efficiency of 40,000 men at least. After Worth the French army which had fought there had for the time being ceased to be an effective fighting body at all. Throughout the campaign it never recovered efficiency. The German forces, on the other hand, though they had lost more fight- ing men than the French, had actually increased their own effective power. Their organic unity was retained, and the spirit which inspired it had been incalculably raised by victory. But if a general can in any way interfere with the source from which an enemy is obtaining his supplies of food, ammunition, and fresh men, he can diminish his fighting power as effectually as if he broke up the organic unity in battle. A body of men who are starving can as little be held in the bonds of organization as a body of men who are dispersed. Hence the slightest movement which threatens that long and weak tail already described obliges the general whose line of communications is threatened to take steps for its protection.

At first sight it is not very obvious, since each army pos- sesses lightly movable troops—cavalry, mounted infantry, and the like—why these should not be able to pass round the front of the opposing army, and get at the unguarded parts of the roads and railways along which the supplies are moving. To some extent, during the American civil war, this was actually done by the great leaders of horse- men on either side,—Sheridan and Longstreet. In all probability a similar attempt will be made in future wars by the great bodies of Russian Cossacks, and perhaps by the cavalry of Germany, France, and Austria. But what facilitated the raids of the American cavalry of either army was the fact that they were moving in a country where all the people spoke the same language as themselves, and where they were sure to find sympathizers to supply them with needed information. Under ordinary circumstances the difficulty is that each army faces the other without any approach to complete knowledge of the distribution of the troops opposed to it. The part of the – enemy's line of communication which is nearest to you is also the part nearest to the main body of that enemy's own army. In order to get at some parts of his communications which would be out of reach of support

from the main army, it would be necessary to send the assailing light troops to points several marches in rear. This involves a long détour, an elaborately prepared march, and the risk that the enemy may become aware of what is designed. In fact, to use the forcible illustration which Clausewitz has employed to explain the situation in which the leader of such a raid finds himself, he is like a man entering a dark room full of assailants, never knowing when or whence a blow may be struck against him.

The situation is altogether changed if, instead of the two armies fronting one another directly, one of the two is able to make its movements in such a way that, while it securely covers its own line of communications, its direct march forward threatens to strike the line of communica- tions of the enemy. 'Then the light troops can at once strike the most exposed parts in all security. Under those circumstances the army whose communications are threatened is obliged immediately, for fear of losing its means of existence, to turn to face its opponents. The advantage so gained by the army which has obliged its enemy to conform to its movement is very great. or the choice of position can no longer be made by the assailed army solely with the view to gaining success in battle. It may be obliged to fight in a position tactically dis- advantageous, and if it is defeated the defeat is almost certain to be fatal: for it will be driven away from the means of replenishing supplies. On the other hand, the

Aims of strategy.

STRATEGY. |

army to which it is opposed, if obliged by ill-success in action to retreat, falls securely back upon fresh supplies, and suffers only in proportion to the extent of its actual defeat on the battle-field.

Thus the aims of strategy directed against the actual condition of the armies of our time are twofold,—first, to break up the organic force of the opposing army by dealing in concentrated force with fractions of the enemy, and secondly, to threaten, and if possible to destroy, the enemy's connexion with the sources from which he draws his supplies. Failing either of these opportunities, a superior army may nevertheless endeavour

to force on a decisive action in order to make its superiority tell. In other words, in that case the aim of strategy becomes that of securing a decided tactical advantage. It might be supposed, since these facts are known to all men who are at all likely to be placed in the command of armies in the field, that opportunities would rarely occur for delivering blows of the kind described. In fact, the difficulties in the arrangements for the movement of armies are so great, and

if it is not able to advance and to act offensively when the Opportunity is presented to it. It has been convenient to illustrate these points from the most recent campaign in Europe, but they had been already deduced and were fully understood long before that campaign had been entered on. They illustrate the way in which the experience of the past indicates what will happen in future war. The arrival of Osman Pasha at Plevna was a complete surprise to the Russians. Its disastrous effect for them was largely due to this cause. Apparently the same thing is true of the arrival of the Van forces at Bayazid. Yet, at the time, the existence of the Turkish forces both at Van and Plevna was known in London. The want of information at the Russian headquarters appears therefore to suggest the most extraordinary negligence on the part of the Russian staff. In any case, the vital effect upon a campaign of being able to procure the best information in any way obtainable can hardly be exaggerated. Cavalry being the arm employed to spread round an army in all directions, to gain information and to conceal the movements of the

the difficulties in obtaining information of what is going on in a theatre of war are so serious, that such chances are presented in almost every campaign. Thus in the 1870 campaign the Germans, after first breaking up compara-

army, is on this account often justly called the strategical – arm. In whatever way strategy is employed surprise and Secrecy

concealinent are essential to its success. On this account a lal

tively small fractions of the French army at Weissenburg, Worth, and Spicheren, succeeded in separating one great mass of the French army under Bazaine from the other under MacMahon, and in separately crushing them. In the 1877-78 campaign the Russian army in Asia Minor advanced westwards past Kars against Erzeroum, driving Mouktar Pasha back before it ; but the arrival of a fresh hostile force from the neighbourhood of Van in the south, which, marching northwards upon Bayazid, struck directly upon the line of communications of the Russian army, produced an immediate collapse of the whole movement. The Russian army was obliged to fall back at once. Similarly, in Europe the Russian forces advancing from Tirnova had pushed their advance across the Balkans towards Adrianople, when the arrival of Osman Pasha's army, moving from Widdin upon Plevna at right angles to their line of communications, caused the whole movement to collapse, and obliged the Russians to turn their attention to the force which thus threatened them.

it will continually happen, in selecting a line of operations . or a scheme of campaign, that the most important point of all is to carry out just what an enemy does not expect. Very often successful campaigns, the method of which has been subsequently much criticized, have owed their suc- cess to the fact that, from a nice calculation of time and distance, the successful general has seen that he could carry through an operation dangerous in itself but sure not to be the one expected by his opponent. For the same reason, in all the most brilliant and successful efforts of strategic skill, steps have been taken beforehand to carry out the preliminary movements of an army in such a way as to leave an enemy up to the last moment uncertain in what direction the blow would be struck. Usually also some special effort has been made to induce the enemy to believe that he would be attacked in some very different direction from that intended.

One of the means by which this has been most successfully accomplished is the selection of the point of

Relations This movement of Osman Pasha's illustrates very | concentration prior to the opening of a campaign. The % stra- happily several points in the relation between strategy and | inotives and causes for this '" concentration" require, how- a ee tactics. In the first place,

Osman's move was obviously | ever, some explanation. It is much more easy to feed and

trated.

in its general character, in what we call its strategical aspect, an offensive one directed against the most vital point of the Russian field of campaign, the bridge by which they had passed the Danube at Sistova. The threatening character of the position he took up obliged the Russians in some way to dispose of his force. Very unwisely they engaged in a series of ill-prepared and ill- directed attacks upon him. The result was so completely to shatter their forces that, had Osman advanced, alter his final success, against Sistova, the small Russian remnant between him and the Danube must have been driven into the river, and in all probability all the Russian -forces which had crossed it would have been destroyed. But, as he remained obstinately within his field fortress at Plevna, the Russians in their turn gradually succeeded in cutting off his communications, and in obliging him to surrender that which they could not take. Thus it is clear how a site for an army may be so chosen as, from its strategical character, to induce if not to compel an enemy to attack it. It is also clear that an army fighting in a well-chosen and well-fortified position, acting on the defensive, may inflict serious defeat upon forces superior to it in numbers. Finally, it is clear that such an army will, in the long run, lose all the advantages of its success,

supply an army which is distributed over a considerable area than one which is closely concentrated for the purposes of action. Furthermore, armies when moving along roads occupy a very great length. The head of the column is more or Jess distant from the rear in proportion to the number of troops, waggons, and animals that march by the same road. Hence it follows that the more roads an army can employ in its march the more easy will it be for its several parts to reach a required point at the same moment. Therefore, for facility of supply and for facility of movement, as long as an army is out of reach of an enemy, a considerable dispersion is advisable. But it is vitally necessary to an army entering on a campaign to be able to get all its parts together before there is any possibility of an enemy's attacking it. Otherwise it would be in the position

of exposing some of its fragments to the danger of being separately attacked by superior forces of the enemy, and having their efficiency destroyed before they could be supported. Hence a concentration out of reach of an enemy's concentrated army is the pre- liminary necessity of every campaign.

Though it is nearly always to the advantage of a body of troops which comes in contact with a hostile force inferior to it in fighting power to fight with it and

Detention of a large force by a smallone.

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destroy its organic unity, yet a small force may for a time succeed in delaying the movements of one very superior to it. The fighting power of an army depends upon the number of weapons that it is able to bring to bear upon its enemy. Now, as for rapid movement that does not fatigue the men an army is ordinarily obliged to march along roads, it follows that the number of weapons avail- able for fighting in front of the line of march is very small. Hence, though a general may have under his com- mand a very large body of troops, representing a very great amount of power when that power is developed, yet as long as he is simply marching forward he cannot imme- diately use that power at the point which the head of his column has reached. In order to do so he must bring those men who are far away from the front up to a position in which they can use their arms. Such an operation often takes a very long time. The time becomes much longer if, instead of marching on a road through open country or between hedge-rows, he has great mountain precipices on either side of him, so that he cannot easily get his men out of the path in which they are. Or again, if he finds that it is necessary for him to develop the power of his army in order to force his way across a bridge over a river, it may be necessary for him in the first instance to extend his artillery and infantry along the side of the stream nearest him in order to use his weapons; and then, when he wants to resume his march, he may have to bring them back again to the bridge. These are instances of the

delay which is imposed upon armies which have to force their way through ‘ defiles.”

Now, if a small force is employed in delaying a larger one, which it does not intend seriously to engage, its object almost always is to induce the larger one thus to “deploy ” its force from the march to a position for fighting, purposing itself to escape before the enemy seriously attacks it. It may seem at first that, as the small force has itself necessarily to pass from the march formation to the fighting position and to return again to the march, there is no gain of time. But, in fact, if the successive positions be judiciously chosen for the small force, it is extremely difficult for the general commanding the superior army to know what number of enemies he has before him. If, not wishing to delay the movement of his army, he deploys too small a force, the defender may use his whole power to inflict a crushing defeat upon this before it can be supported. If, on the other hand, he deploys a force sufficient to destroy the body opposed to him, this must involve a long delay, and very probably he will find, when he moves to attack, that the defensive force is already gone, or has left only some light troops to make a show up to the last. By such means again and again in war a small force employed in well-chosen ground has been able to hamper the movements of a superior body and to gain time for other operations. The different applications of this detaining power of small bodies are so numerous that hardly any problems either of strategy or tactics are intelligible unless its nature is understood. The essence of it lies in the smaller body not allowing itself to become so engaged as to have its organic unity destroyed by defeat.

The simplest application of this detaining power of small bodies occurs in this way. Suppose, as often happens, that two allied armies, or two parts of the same army, are moving to unite against an enemy. It may happen that by skilful dispositions or the chance of war the general engaged against them is able to interpose between them whilst they are still several marches apart from one another. Suppose now that in a country favourable to such an operation he employs a small portion of his own force to delay the march of oue of his opponents, whilst he

throws the bulk of his forces against the other. In attempting to defeat this body before it can receive support he holds a position of very great advantage. This is the situation which is commonly described by saying that the general in question is acting on "interior lines" against the two armies opposed to him. But it is vitally important to his success in this matter that he shall succeed in defeating one of his opponents whilst the other is still some marches off, otherwise their union against him on the field of battle may, from the very fact of their striking his position from different directions, prove even more disastrous to him than if he had allowed them to unite before he attacked them. Thus when Napoleon, during the Waterloo campaign, had broken in at Charleroi upon the intended point of concentration of the allied armies, he, with Ney opposing Wellington at Quatre-Bras long before the English army was concentrated, and himself able to act with the bulk of his forces against Bliicher at Ligny before the Prussian army was fully con- centrated, was acting in the most perfect way upon interior lines. But, when at Waterloo, whilst he was still engaged with Wellington in his front, Bliicher broke in upon his flank, though the bulk of the French army was still between its opponents, that was a position of disaster. During the 1866 campaign the Prussians crossed the Bohemian mountains in two separate armies,—one from Silesia under the crown prince, one from Saxony and Prussia under Prince Frederick Charles. Had the army under the Austrian commander Benedek been concentrated in Bohemia, so that, whilst one part of his forces detained either the crown prince or Prince Frederick Charles, the main body had been thrown against the other, the general would have gained all the advantages of interior lines. But, when on the field of Sadowa, whilst Benedek was still fiercely engaged against the army of Frederick Charles in front, the crown prince broke upon his flank, though the Austrian army was still in one sense between the two Prussian armies, it was so only in a sense disastrous for it. This event, in which an army attempting to take advantage of the separation of two opponents is crushed between them on the field of battle, is described by German soldiers by the phrase that such an army is taken "tactically between them" ("in der taktischen Mitte ").

The operation of acting on interior lines was the favourite form of Napoleon's strategy. He would have condemned unhesitatingly the attempt to carry out any plan of campaign which involved such a combination as the Prussians attempted in 1866. But in his day armies were not connected by telegraph. In speaking of the con- centration of armies prior to a campaign as necessarily made out of reach of a concentrated enemy there is this reservation to be noted. If two armies acting against a third can so nicely time their union as to strike against the enemy on the field of battle avithin a few hours of one another, they gain all the advantage of getting their enemy "tactically between them." The difficulties, however, of this nice adjustment of time are so great that no prudent commander would deliberately beforehand arrange his general concentration in this way on the field of battle. Nevertheless, the fact that it is sufficient for the armies to have effected their junction so nearly as to be within reach of mutual support on a field of battle consider- ably enlarges the area within which their union can be accomplished. Thus at the beginning of the 1866 campaign the Prussians had fixed the point of junction of their two armies at Gitchin ; but, though it would have been possible for them to have joined their forces on June 30, they did not carry out this actual meeting. They were content with the fact that the two armies were by June 30 in close supporting distance of one another.

Depéts of sup- plies.

STRATEGY. |

They only actually met on the field of battle of Sadowa. The effect of the selection of a point of concentration, as tending to leave an enemy uncertain as to the direction which a general purposes afterwards to take, can hardly be better illustrated than by Napoleon's concentration in the Waterloo campaign. By gathering his army at Philippe- ville, Beaumont, and Solre, he threatened Mons more directly than he threatened Charleroi, and thereby tended to prevent his enemies from concentrating against the point of his intended attack.

There is a peculiarity in the strategical aspect of British campaigns beyond sea against savage tribes which requires a short explanation.

Usually the difficulty lies in trans- porting from the base towards the front a sufficient quantity of provisions without eating them up on the road. Since the animals and men employed in transporting food and ammunition must themselves be fed, it is evident that if we send supplies for a day's journey forward the balance available for feeding the troops will be the amount the transport can carry, less two days' food for themselves, that is one day forward and one day in coming back. Similarly, for a journey of eight days to the front sixteen days' food for the carrying animals and men will have to be deducted. In fact, more than this will be required, because when the journey is extended beyond a certain limit there must be occasional rest days. It is clear that if, as was the case in Abyssinia, in Ashantee, in the movement on Sikukuni's country, and, though with different transport, on the Nile and in Egypt, a march of many days beyond all supplies of food not carried by the transport has to be made, a point will be reached at which the animals begin toeat up all the food they carry. This can only be met by the system of depéting. That is to say, an accumula- tion of large supplies of food is made as far forward on the road as possible, and then from that point it is again pushed forward by one relay of transport whilst others fill it up from behind. But here again another point arises. If the whole army to be employed on the expedition were pushed forward to the front where the supplies are being accumulated, these supplies would be eaten up as fast as they arrived. The fewer the troops in the front the more rapid will be the accumulation. Hence the great secret of a rapid advance in this case is to keep in front only as many troops as are necessary, when well entrenched, to guard the accumulation of supplies. The more completely all others are kept back fron the front the sooner will the expedition achieve the object for which it is employed. These are incidents which repeat themselves on every English expedition, while at the same time complaints are continually being made of the generals during the course of the campaign for the delay involved in their doing the very thing which hastens achievement.

Tactics,

In speaking of the changes which have affected strategy, we declared our belief that the weapons of strategy have changed since the Napoleonic era

even more completely than those of tactics. It now becomes necessary to define the limits of what this statement implies. We have shown how, even in questions of strategy, the spirit of subordination and the nature and kind of co-operation which a minor leader has to give to his commander-in-chief have been affected by the changes in the size of armies, the scope of operations, and the. developed facilities of conimunication and supply. This change, however, of the spirit of organization is, in so far as re-gards strategy, a comparatively secondary matter. Among the few men engaged in the actual command of armies and army corps, it is almost an affair of personal arrange- ment and of mutual understanding how far the sub-

ordinate acts independently, and how far he merely carries out the precise directions of his superior. "Where men are so well known to one another as were, for instance, the leaders of armies and army corps of the Germans during the campaign of 1870, the generals of such great bodies as these could judge from personal knowledge of the characters of those under whom they were acting what degree of latitude to allow themselves in the interpretation of orders. We see the evidence of this everywhere. This personal confidence, this mutual knowledge of one another amoung the higher leaders of arnties, has become an essential instrument of modern war. The general who has men under him whom he does not know and cannot trust suffers now in a degree in which he never suffered before.

But when we come to compare the effect of modern changes on the spirit of strategy, in these matters of discipline, with its effect on tactics, there is no proportion between the two.

Discipline is the very life-blood of an army, and it is on the field of battle, that is, within the province of tactics, that it shows its potency. To interfere in any way with this spirit, as it determines the power of the commander over his men in the presence of the enemy and under the stress of battle, to introduce the least malignant influence into it, is to blood-poison the

army. Therefore, as no army can nowadays hope, in presence of a modern enemy armed with the weapons of to-day, to carry out a system of manceuvres in which discipline can be main- tained with the old facility, and under conditions so favourable to it as those of the past, we must approach the subject with a caution proportioned to its vital importance. Curiously enough it is from an English scientific author, from Mr Darwin, that one of the ablest of recent German writers on war has borrowed the penetrating phrase which sums up the essential element, common to the discipline of the past with that of the present, which it is vital to us not to shake or to impair. The engrained habit of mutual confidence among all ranks of a regiment is the factor in its strength which attracted Mr Darwin's attention as the cause of its incalculable superiority in power over an armed mob. Baron von der Goltz accepts the statement as true, without reserve. When, however, we come to consider what has enabled armies to acquire this engrained habit, we are met by some very curious experiences. In the first place, the instinctive habit of obedience to a word of command, as coming from one who has the right and the duty to give that command, has to be carried into the very limbs of aman. When cultivated men of mature years entered the ranks of the British volunteers during the early stages of the movement, some very amusing protests appeared in print as to the dreary monotony of the mechanical contortions which represent the early phases of recruit drill. A certain pity or sympathy was expressed for the poor soldiers who had to spend their lives in such uninteresting tasks. It would hardly be too much to say that the complaints of these very superior persons showed a want of philosophic acute- ness, which is entirely absent from the minds of the most zealous volunteers of our day. No one understands better than these the fact that in the dull mechanical routine of those incidents of recruit drill is laid the foundation of all military power. The zealous barrister, who at thirty-five always found himself turning by mistake to the right when he was ordered to turn to the left, who found it impossible to supple his limbs in the required "extension motions," was unconsciously illustrat- ing the weakness of the most zealous untrained armed man. With the best of wishes his body was so little under the command of his own mind and will that he could not, much as he wished it, place it at once under

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Importance of mechani-

eal drill.

Further training now necessary.

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the command of anyone else. Much less could he cut out that disturbing element himself so far as to obey in- stinctively, and without a certain element of resisting individuality, the command he received.

Now the capacity to act together under the orders of one man can never be dispensed with under any of the condi- tions of modern war. The instinctive obedience of a rank of soldiers to the order to turn 'Right about," when that order sends them back into the ground where shells are bursting and where bullets are raining, has been a power in fighting too great for us ever willingly to throw it away. Some humorous illustrations of its effect on soldiers, and of the victory-winning power which an even apparently unintelligent submission to this authority of instinct has given, more especially to English soldiers, are mentioned in the article Army (vol. ii. p. 589). In proportion as men understand war they value this effect, and would be unwilling even to diminish at a given moment actual loss of life if that diminution were secured by any sacrifice of this power. An old English battalion trained to the absolute perfection of such mechanical obedience was a splendid fighting instrument. No train- ing, however perfect, to take advantage of ground, to seek cover, to glide on to the weak points of an enemy, will compensate, even in these days, a deficiency in that habit of utter self-abnegation, of entire subordination to the one purpose of united action under assigned orders. But, under the modern conditions of war, the loss inflicted within a given time by the terrible weapons now in the hands of all armies is so great that the very formations under which ona parade ground the armies of the past prepared to move in actual fighting under the orders of their commanders are mechanically as much as morally dissolved. Not even can the voice of the captain or the subaltern be heard, much less that of the lieutenant-

colonel, above the din of breech-loaders and of shrapnel shells. It is not therefore with a light heart, not willingly, not as thinking that a dispersed order of fight is something in itself more powerful or more advantageous than a rigid formation in which ordered and orderly movement is easy, in which force can be concentrated, in which the habits of

discipline can be more certainly maintained, but of dire.

necessity, that the most experienced soldiers of our day have come to the absolute conviction that only by preparing armies for fighting in dispersed order can discipline be maintained at all. The great problem of modern tactics, in so far as it concerns actual fighting, which regulates everything else, is how to maintain the old unity under the new conditions which make it so difficult. Infantry.

This much at least we know, that from the moment that infantry are actually involved in a modern breech- loader fight all manceuvring has ceased to be possible. The natural and the necessary deduction from this is that the only influence which can be exercised upon such a fight by any but very subordinate leaders is to throw into it fresh bodies of men who till then have been retained in close formations. Now the experience of the 1870 battles showed clearly that the effect of fresh bodies thus thrown into a fight is very great indeed. Moreover, that experience showed further that the direction in which the fresh force is thrown into a contest already engaged between two bodies of infantry is vitally important in determining how great the effect of the blow so delivered will be. The tendency of any great fight is to break up into a series of partially independent actions. Therefore it almost always happens that in each of these there are on both sides certain weak points, which present oppor- tunities to a skilful assailant. These arise either from cir-

cumstances of ground or from the inevitable disconnexion produced by isolated action of particular bodies of troops. Skill now consists in taking advantage of these oppor- tunities, in anticipating the conditions under

which they are likely to occur, in preparing to escape from similar dangers, and in pressing home a success, Here then is the way in which the organization spoken of above as the means of battle action makes itself felt. It is impossible now for the commander-in-chief of a great army to be ready at each part of a battle for one of these emergencies. Scarcely can the commander of a division of 10,000 men, or even the commander of 3000, meet all the local incidents that occur. At each stage of the hierarchy there is needed a man who, in proportion to the extent of the opportunity or the danger, is ready to seize or to meet it.

But among the means of doing this which the practical experience of the Prussians taught them is one which tends more and more to be forgotten as the experiences of the great campaign are lost in the distance of the past. As the phases of any battle now succeed one another a time comes when the fight sways forward, and many men are left behind out of the immediate region of the combat. Often these stragglers are more numerous than the men engaged in the actual shooting line. They may be in a wood or for some other reason out of the reach of the enemy's projectiles, or they may at all events not be severely exposed to them. What is wanted is to take advantage of this wasted power and to throw it into the fight. This can only be done effectively by getting the men into closed bodies, and so bringing them again under orders and discipline. This was what the Germans—or,

to speak more accurately, the Prussians, who in all these

respects were head and shoulders over all their German compatriots—habitually did.

The study then of the mode of preparing infantry for the fights of the future does not in these inner circumstances of battle consist in training them for some particular forms of attack nearly so much at least as in the following points :—

1, In aecustoming the men, as soon as from any cause they find themselves thrown out of the actual fighting line and out of the stress of fire, to place themselves instinctively and as quickly as possible under the orders of some officer who can get them into order, and either lead them on or await the moment wheu the services of a formed body of men will become invaluable;

2. In aceustoming officers to seek all opportunities for re-forming dispersed men at the earliest possible moment ;

3. In maintaining such close order as is possible as long as it can be maintained without risking overwhelming loss of life and dire confusion, —hence therefore the breaking up into such small organized bodies as, by taking advantage of ground or other means, inay be able to preserve unity of action longer than would be possible with greater masses ;

4. In keeping up, by the action of the higher ranks of the military hierarchy, the fighting connexion between these bodies, by the judicious employment of fresh force or of reserves that have been made up out of men that have been already engaged ;

5. In providing for the continual replenishment of ammunition elose to the fighting line of at least all those who are not actually engaged in it, and the continually thrusting into the fighting line of men well supplied with ammunition to push forward the line, so that those who have exhausted their ammunition may be resupplied without having to fall back ; and

6. Above all, in practice and training during peace in a mode of action which cannot be simply learnt on a parade-ground by help of drill-sergeant and words of command taught by rote.

We have taken first this question of the change which has taken place in infantry fighting, because it is on the forms of infantry fight that the changes in armament have produced their greatest effect, because the main sub- stance of an army always consists of infantry, and because the changes which have occurred in the use of the other arms, artillery and

cavalry, have been determined by the changes in infantry tactics and arms niore than by any other cause, though the development of artillery armament has also affected them.

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Control drill.

TACTICS. }

Now the danger which faces any British army under present conditions in preparing for modern battle lies in the fact that a long peace following upon the great wars of the end of the last and the beginning of the present century has tended to stereotype forms which were origin- ally based upon the battle-experience of the past. There is a dread of change where change is required, because officers and men have come to look upon the great tradi- tions of the past as sacred. In England men wish to follow in the footsteps of the soldiers who acquired an experience under Wellington such as no men since then have had. It isin its essence a sound and healthy feeling. But there is the greatest danger lest names should be put for facts, lest in the very act of servilely copying forms we should ignore altogether the principle which determined the action of our forefathers. They started from the ex- periences and necessities of the battle-field as these existed in their own day. They based their forms upon those necessities. If we would really imitate them we must in this do as they did. We cannot take their forms based on the battles of their own time, and then work forward from these forms to what we shall do on the battle-field now. We must frankly face the fact that, the character of battles having changed, we must work back from the con- ditions of our present battle-fields to the peace-forms which will prepare our soldiers for them.

Terms under such circumstances become confused. Men talk about the practice of forms in which their life is spent as 'practical work." They look upon all experience gathered from the fields where shells actually burst and where infantry firearms are used to kill as "theoretical." The truth is exactly the opposite. Such merit as the older drill at present has is due to certain theoretical con- siderations which were at one time soundly deduced from practice in the past. The only practical work is that which tends to prepare men, not for the inspection of some general ona parade ground, but for actual war. An army is doing " practical" work in the preparation for its real duty, that of winning battles. It is employed on mis- chievous theoretical work, on false theory, whenever it is doing anything else.

Now this one thing is certain, that, whereas the great fighting formation of the past for British infantry was the line, that formation can be used no longer in actual fighting against troops armed with modern weapons, unless excep- tionally in purely defensive positions, where its trained cohesion is of little importance, because cohesion is in any case easy. All rigid drill is at present based on the assumption that wheels of parts of this line are necessary in order to enable the troops to keep together shoulder to shoulder. What is required is not this, but that we shall obtain by complete organization down to the lowest units a command of fire and a command of groups. Of all the incidents of a modern fight that of which it is the hardest to give any conception to a man who has not seen infantry possessed of the enormous facilities for firing which are supplied by modern arms is the intense absorption in the mere fact of firing, which almost like a catalepsy takes possession of the man who is using his weapon against an enemy, or, as may often happen in close country, against nothing at all. Many of the rifles that were picked up on Majuba Hill were found, at the last moment when the Boers were closing, sighted to 800 yards. It is noted as a quite remarkable instance of presence of mind on the part of a Prussian sergeant during the attack on St Privat, that he personally took care that the men reduced their sights to the proper range as they advanced. Now this illustrates perfectly the kind of trained habit which we need by our modern drill to induce in men in action. We want to educate men so that they do not fire under the conditions

of a catalepsy. Now experience has shown that this can only be done by having men who are not themselves firing trained to look after those who are firing, so that the fire may be regulated, effective, and deliberate. The men themselves must be trained to fire only under orders, and not under the influence of a tendency to fire merely to relieve their feelings. We cannot put better what is in- volved in these necessities than in the following words of Colonel J. H. A. Macdonald of the Queen's Edinburgh Rifle Volunteer Brigade :—

- *How is this to be done? How but by so regularly, consistently, and persistently putting the soldier through the action of firing by orders that it shall be a second nature to fire his rifle only under control of his superior, and not otherwise. What is wanted is the conviction in the mind of every instruetor, from the highest to the lowest, that his men should never leave a parade without having gained something in fire diseipline,—that is, that fire control drill be one of the main points in view as a necessary part of the work to be performed on every occasion when men are being drilled, exercised, or inspeeted, from the moment that they know the rifle exereises until the day when they leave the service. Let some of the time whieh formerly was spent in a perpetual form drill to produee a military machine that had a steadiness in formation which nothing eonld shake be now spent in produeing by a per- petual control drill a firing organism which shall have a steadiness in the use of fire which nothing can shake. The troops that shall be found most in the hands of the commander in the matter of fire will, ceteris paribus, be invincible."*

But in order that we may secure this end it is essential that the organization be carried down to the smallest groups within a company, and our drill must be adapted to deliver such groups as methodically and regularly as possible within the zone of fighting.

It does not appear that any adequate experiments have as yet been made to determine the means by which this can best be done. Experiments

during peace time are in no sense wholly satisfactory. In order that they may be worked out properly they require to be watched at every stage by men who have closely studied the experiences of modern war, and know what has been done by other armies, who have learned from those experiences not slavishly to copy what was done by men who were them-selves experimenting under the dread conditions of actual warfare, but to extract from them sound lessons for future guidance. To quote again from Colonel Macdonald.

'¢ Would it not be wise to do what is done in other departments of military science, and give some faeility for practical and exhaus- tive experiment? In all other departments practical experiment goes merrily and expensively on. Thousands of pounds are spent on a gun which penetrates another inch or two of armour. New and thicker plates are rolled. A new 'Big Will' is built, and again crashes through the armour with its first shot, and perhaps blows off its own muzzle with the second. Treasure-devouring sea monsters are built superseding one another at short intervals. Torpedoes, torpedo boats, and machine guns are subjected to erncial experiments. But from the nature of the material with which experiment has to be conducted in the case of the most important land fighting machine — the infantry—the cireumstances are exactly reversed. Experiment would cost nothing ;_ but, while inventors can experiment in armour metal, gun bnilding, and rifling and explosives, before offering appliances to the Government, there ean be no practical experiment with the only material out of which the infantry machine of war is made without order from authority. It is only by leave of the state, through its officers, that any proposals to improve the working ean be tested, and—as is the case in all inventions—not only tested, but developed and improved by experiment. Almost all suecessful invention is the result of alternate thought and experiment. There is also the further difficulty that the proposers of tactical improvements are not independent men, but servants of the owners of the material. They cannot consistently with discipline proceed as other inventors are able to do. They eannot canvass higher officials, or exert extraneous influence. They may not use the soldiers who happen to be under their control as material for experiment. ;

" Further, even if it be permitted to them to exhibit these ideas

| experimentally, the material with which they must do so is not

dead material, plastic and absolutely passive. They have to test

1Common Sense on Parade, or Drill without Stays (p. 118), by Colonel the Right Hon. J. H. A. Macdonald, C.B., M.P., 1886.

their invention with materials which have been turned into a machine already on a different system, and have therefore a way of working which unconsciously at first militates against the dis- play to the best advantage of the new idea."

These conclusions appear unanswerable. Though, for the reasons which are implied in the very sentences we have quoted, we are not as yet prepared absolutely to advocate any specific system, it appears to us that the method of working which has been suggested by Col. Macdonald promises such valuable results that it ought at least to be fairly tried on a large scale. It has received the warmest possible support from the best infantry sol- diers of the English army—from Lord Wolseley, from Sir Donald Stewart, and many more. It has been approved in principle by many others, who have not had the oppor- tunity of examining its practice. It has been successfully tried and experimented upon so far as peace-trials go, both at home and in the colonies, and has been greatly appreci- ated by those who have tried it. It consists in a method of permanently arranging a company in four ranks, so that from these the successive bodies of firing line supports and reserves may be successively sent forward. It has several important recommendations. It limits the front of a captain's command. By forming groups of eight men of those who stand side by side in the fours it carries organi- zation down to the lowest point, while it tends to bind together, by the principle of comradeship, the supports who successively arrive to the men who are in front. By making this comradeship apply to those who form the two adjacent groups of four of the company when in line, it ought certainly to facilitate the re-formation of the com- pany. At present if one man is lost in the front rank of a company, the whole have to be numbered again in order to enable it to form in a column of fours at all. On Col.

Macdonald's system each group of eight being fixed, the company can be fitted together by the gathering of these groups in any order, so long as all are in their proper places within their own group of eight.

In any case, going back once more to the experience of the past, we are now at a time in these matters very like that which preceded the Peninsular War. The drill which was employed in the Peninsula was in all essentials worked out by Sir John Moore in a series of experiments conducted at the camp of Shorncliffe. No more important results were ever obtained by peace-training for war than those which were deduced from these experimental exercises, If we really reverence the great soldiers of the Peninsula, this is the way in which we shall honour them. We shall not do what they did not. We shall not accept from the traditions of the past forms which are not adapted to actual warfare. We shall not write drill books in the study or the bureau, and force field movements into conformity with them. We shall employ for the work of our great camps of exercise generals who have made an exhaustive study of the present conditions of warfare, and staff-officers who can assist them in their work. We shall experimentally try "those suggestions which have upon them any reasonably good stamp of approval by military men of skill." We shall really and crucially investigate them, "with oppor- tunity afforded to proposers to meet difficulties that may be suggested." "Those proposals which can be defended from serious theoretical objections should be submitted to a few months' experiment in selected regiments, and reported on as to their practical working in the essential points of

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The Russians at. one time adopted and abandoned a system of working by groups of four. So far as we are able to perceive, Colonel Macdonald's system is not open to the objection which led the Russians to abandon their method of fours. They found that, when they had formed their groups under a "father" who became the leader, the men were so much attached to one another that as soon as one was wounded all remained with him, so that every time the enemy wounded one man four were put hors de combat. It is clear, on the one hand, that this is an objection that

would not present itself in mere peace practice at all, so that the necessity for criticism applied at the time from actual experience of fighting shows itself forcibly. On the other hand, it by no means follows that the difficulty would not be overcome by such a closer association of groups as Colonel Macdonald's system ap- pears to promise, and by a trained habit of trusting that the wounded will be properly cared for by the men assigned for that purpose, and a knowledge that the business of all those who are able to continue the fight is to ensure the safety of the wounded by securing victory.

It will be obvious from what we have already said that we do not believe that any army in Europe has as yet solved the question of the most effective mode of deliver- ing infantry within the area of modern fight, and that nevertheless we believe that data now exist from which, with proper experiments, a method might be adopted which would at least give to that army which adopted it incal- culable advantages in the earlier battles of a modern war. The one point that must be thoroughly realized is that the firearm of the present day has become the determining weapon, for the development of the efficiency of which all tactics must prepare the way.

That brings us to another matter of vital importance. As long as the shock tactics of the past were possible, the neat drills of the parade ground were the essence of sol- diering, and therefore, when a few rifle regiments at first, and afterwards the army generally, had liberty to prac- tise shooting, that was looked upon as an accidental and exceptional thing unconnected with the real business of the soldier, and therefore with his everyday life. This unfortunate divorce between the work at the butts and on the manceuvre-ground, once established in the habits of an army, cannot for many years be cured. It exists still. Yet every mancuvre in which careless aiming, careless expenditure of ammunition, and wrongly adjusted sights are permitted is a direct injury to the fighting efficiency of the force which manceuvres. Nothing else can compensate for the evil so done. Good shooting, and movements tending to give to good shooting and good weapons the greatest possible advantage, are next to a healthy morale the essence of modern fight.

Nevertheless, it is the training of the spirit of an army, the bringing home to all ranks of the objects now to be aimed at, that is the difficulty in all these matters. The very strength and power of discipline in its formation and engraining of habits is that which makes an army so hard to deal with when habits have to be changed.

In the present condition of the tactical question it has seemed to us essential to devote so much space and pains to the enforcing of these points that we can only lightly touch on several questions that have been most eagerly discussed in relation to infantry tactics.

The question of long-range fire against reserved fire is Long-range mainly a question between material and moral effect. It and re- seems no doubt a strange thing, when we have enormously °°"¥¢¢ fe. increased the range of modern weapons, that we should throw away that advantage, and allow an enemy without firing a shot at him to pass over a large area of ground where we could inflict loss on him. Undoubtedly, in so

simplicity and uniformity of manceuvre, adaptability to circumstances arising, maintenance of order, retention of unity of commands, rapid recovery of exact tactical form, and fire control. Then let authority take what is best, it may be adopting here one detail and there another."

1 Colonel Macdonald, as aboye, p. 127.

far as we can train picked shots to fire at long ranges, so as to disturb the movements of columns, and to interfere with artillery, it is well worth our while to do so. But with the utmost training that we can give them the mass of men in the ranks of an army never will become good shots at long ranges. Almost all fire, therefore, at long ranges becomes unaimed fire, and an enemy can to a great extent avoid exposing himself on the ground where the fortuitous rain of bullets is falling. Meantime the mere fact of firing having begun puts the troops who are firing almost beyond the reach of orders. Their own excite- ment and the noise together make it most difficult to give them any directions. Sights that have been fixed for the long range are not changed to the short. The fact that, despite all their

efforts, the enemy continues to ad- vance demoralizes them, and despite his losses encourages him. 'These are considerations which are not taken into account in the arguments of those who base their con- clusions merely on the amount of loss which may be in- flicted at very long ranges. Yet, at all events up to 1877, they had in actual fighting proved supreme. It may be the case that a very highly trained army, using long-range volley firing under effective control, might produce such loss upon an enemy approaching that it would make his actual attack upon a position impossible. What is certain is that, up to 1877, there had been no experience in war which proved that such long-ranged fire was as effective as fire carefully reserved for the ranges within which infantry can use their arm with the greatest effect.

Such at all events was the experience of the 1870 cam- paign, and it confirmed the experience of previous wars in certain respects which, as will have been seen from the above account, depend rather on the condition of men's minds than on the efficiency of weapons. Both, however, in the German army and im the French an immense im- pression was produced by the incidents of the attack on Plevna. There is no doubt that there the certainly un- aimed fire of the Turks produced an enormous effect. Skobeleff, when he had at last succeeded in reaching the 'Green Hill" in one of his own most brilliant efforts, found that there were no troops behind the slender line of skirmishers whom he had actually with him. All his reserves had melted away under the storm of bullets. If this experience could be accepted as representing a normal phase of a modern battle, the conclusion would be inevit- able that so long as there are ample supplies of ammuni- tion the effect of long-range fire may be so great as to be decisive. It would be madness altogether to reject such an experience. Where analogous conditions occur no doubt a better regulated long-range fire is too important an element of power to be ignored. But it is necessary to realize what the conditions were. In the first place, the whole attack was one that never ought to have been made. It never would have been made had not the com- manding archduke overriden the advice of all the best soldiers he had, and in mere obstinacy and ignorance dashed his men against a position that ought never to have been so assailed. It was an attempt of a field army against what had almost become a fortress. The Russians were unsupported by any

adequate artillery for its reduc- tion. The ground was unusually open and exposed to the full range of the Turkish fire. The Russians showed here just the same incapacity for taking advantage of ground, so far as the smaller groups were concerned, which they had shown in the Crimea. They huddled together in great masses, more unwieldy than any regular column, but just as much exposed to unaimed fire. There was therefore nothing to show that a properly conducted skirmishing attack might not have found means of reaching the posi- tion which Skobeleff actually secured.

Nevertheless, when all these allowances have been made, and while it seems as important as ever to realize what advantages the sudden effect of reserved fire may secure, the fact remains that under certain very possible condi- tions of fighting an extensive employment of long-range fire may be advisable, and it is therefore right that every army should prepare for such an event.

For instance, in an attack on the forts @arrét with which the French have covered their frontier, it is ex- tremely probable that the Germans, being close to their own magazines, and therefore able to employ a practically unlimited amount of ammunition, will overwhelm these places with long-range infantry as well as with artillery fire. There is no doubt that their infantry has been practised in firing volleys at very long range, and for such purposes it would be certainly comparatively easy to ensure the delivery of actual volleys. It may even be the case that m defensive positions, where the extent of ground open to view is considerable, long-range infantry fire regu- lated by volleys may be attempted. We cannot, however, see how it would be possible to attempt this during an attack unless one special body of troops be assigned for the work of long-range fire, in order to occupy the atten- tion of the enemy while other forces advance to the attack. On the one hand, the discipline of the French army was so loose during the campaign of 1870 that it is quite possible that long-range fire might be much better brought under control than it was by them ; on the other, it is emphatically necessary to assert that the difficulties involved in a free employment of long-range fire are not

merely those of an adequate supply of ammunition, but that those considerations to which we have drawn atten- tion must be taken into account. If an army is sufficiently well in hand for the choice between long-range fire and reserved fire to be in the option of the general who com- mands, then undoubtedly cases will arise when each may be used with advantage. Certainly it would not be a wise or safe thing for an army to enter the field without having ever practised the regulated fire by volleys at long range against an army which had practised it. It is clear that the tendency in that case would be for the unpractised to indulge in much unregulated long-range firing. With an army trained to both methods of action, the general who realizes the risks and advantages of either will be able to exercise a sounder choice than the man who has become an inveterate pleader for either system, and cannot there- fore adapt himself to the cases that arise.

The general question of volley firing as against indivi- Volley

dual shooting is independent of the special use of volleys for very long-range shooting to which we have above re- ferred. It may obviously be possible to ensure the regular delivery of volleys at very long ranges, such as the French are now practising, 3000 yards or more, without its being possible to do so in anything that can properly be called an engaged fight. The effect produced by a well-delivered volley is out of all proportion great as compared with the effect of isolated shots. Moreover, it is a curious fact that apparently men aim better when they fire together than when they fire each by himself one after another. It is constantly found at the butts that the greatest number of shots has been delivered by the " best volley," that is, the one in which all the arms go off most like one. But it is a matter of great doubt whether in war it is practically possible under most circumstances to deliver a volley at all. Captain May, the author of the "tactical retro- spect" on the 1866 campaign, denied that any volleys had been fired in that campaign. The cases of its employment in the 1870 campaign, which are sufficiently established not to fall under such criticism as he applied to the nomi- nal volleys of 1866, are not very numerous. We may

leave the question with the remark that the moral effect produced by a volley is too great for the attempt to use it ever to be willingly thrown away, but that it would be now rash to take for granted that on service the best troops can be depended on to deliver during close fighting accurate volleys, unless it be in small parties. The possi- bility of even the fire of groups is disputed by Von der Goltz. It is obvious that, if he be correct in this respect, all attempt at regulating fire in action is " An effort only and a noble aim, Still to be sought for, never to be won."*

We incline to think that all war experience tends to this conclusion, and it is a reservation which we must therefore append to our cordial agreement with the passages we have quoted from Colonel Macdonald.

Cavalry.

Of all tactical facts, the one which needs most study for practical purposes is the relation of the size of men, on foot, mounted, 'in mass, and in different formations, to the undulations and features of ground. There is nothing which the untrained eye so little realizes as the extent to which concealment and cover for men, even for mounted men, exists on the apparently most level plain. This fact, which is important for both the other arms, is for cavalry vital to its present use. Nothing is more certain than that under the present condition of arms cavalry cannot successfully assail in front either artillery or infantry in any formation in which the artillery or infantry are able to use their arms and can observe the approach of cavalry over long distances.

On the other hand, cavalry striking by sudden surprise on the flank of unprepared infantry or artillery, engaged with other enemies, may produce an effect, great to an extent of which as yet we have no adequate example in modern war. That is the conclusion drawn from their own experiences of the 1870 campaign by the most experi- enced leaders who were employed in it. Count Von Moltke in 1882, and Prince Kraft of Hohenlohe-Ingelfingen in his letters on cavalry published in 1887, have alike pro- nounced decisively on the subject, and it would be easy to show that the whole weight of the best military opinion in all countries except Russia is on the same side.

The practical possibility on most fields of battle of cavalry being thus employed depends on two facts,—on the one hand the extent to which almost all ground presents opportunities to a skilful leader for moving his men unobserved from point to point of a great battle-field, and on the other that absorption in the intense excitement of a modern fight which prevents men from observing what is taking place anywhere beyond the immediate range of their own employment.

It follows from this that the utmost possible skill in the handling of cavalry as a mounted arm will be required if cavalry is to take advantage of such chances as modern fight will present to it. Now, in all periods since the invention of firearms, there has been a tendency, as improvement in weapons has taken place, to attempt to put cavalry on a level in point of firearms with the infantry with which it has had to contend. Invariably, when that rare development of armies, a great cavalry leader, has arisen, he has swept away all attempts of the kind, and has employed his cavalry with their proper weapon, the 'arme blanche," sword or lance.

The reason of this is easy to explain, and the explana- tion is one that shows that the principle is as applicable to the present condition of warfare as to any preceding one. The effective action of cavalry as cavalry depends on ruse, on surprise, on skilful manceuvring, and on the impetuous power and moral effect of the man and horse,

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glued to one another as though they together formed the old ideal of the arm, the centaur. Now, the dash and vigour with which an actual cavalry charge takes place depends on the moral condition of that part of the centaur in whose hands it is the great purpose and effect of high training to place the guiding of the composite animal. Never has it been possible to train a great body of fighting men in two opposite directions at once. Balanced judg- ment, and an appreciation of the powers and uses of each part of the force he has to employ, are the duties of a general, But if a body of infantry, dispersed in scattered groups, or isolated men, are to

repel successfully a body of charging cavalry, they must have acquired sufficient sang-froid to calmly fire at the great and overwhelming avalanche which they see moving down on them. To that end they must have acquired confidence in their weapon, the firearm, and must have learnt to believe that its power is so great that it gives them plenty of time to bring down the mighty-looking horseman before he closes with them. Similarly, if cavalry is successfully to be led by skilful manceuvring into a fight where firearms are creating the most horrible appearance of danger, they must have ac- quired a confidence in the skill of their leaders, in their own power of combined action, and in the effects of their sudden appearance, which will carry them on though leaders fall, and though death and destruction seem to await them. In other words, they must have learnt to despise the firearm when pitted against their own skill in evading its danger and in delivering home their blows. All attempts, therefore, to train cavalry not to employ their skill in manceuvring as the weapon to which they trust, but, on the contrary, to be always ready to jump off their horses and begin firing, tends directly to weaken and destroy the very spirit and quality on which the efficiency of true cavalry depends.

Now, the great leaders to whom we have referred believe absolutely in the possibility of true cavalry properly trained being able to play its part on the field of battle. Prince Kraft's 7th letter on this subject is so admirable in its analysis of past experience that all who would under- stand the subject should study it in its integrity. His conclusion is—' From all that I have stated in this long letter I draw the conclusion that cavalry will, in the future, also be able to play a decisive part in battle if they can be led in such a manner that they can break out round a flank, and can thus, up to the last moment, take advantage of the fire effect of their own line of battle. But to do so will sometimes require from the cavalry that they shall be able to advance as much as four miles, at a rapid pace, before they deliver their charge."!

There is, however, another necessity of modern warfare Mounted which is altogether distinct from the question of supplying ™fantry.

firearms to cavalry in order to make up to them for the increased power of infantry. Powerful as modern infantry is, it is very slow in its movements.

It is very difficult for a general to have it at the very place where he wants it. Hence the idea of mounting infantry and of sending them forward either on horseback or in carts, or where there are numerous roads on bicycles and tricycles, is one that is of the greatest importance. The so-called cavalry of the American civil war were all of this character. Most of them had been accustomed to rifle-shooting from their child- hood and could ride. They had had no opportunity what- ever of acquiring the manceuvring facilities of European cavalry. Probably European cavalry would have been altogether unsuited to the country in which they had to work, The essential condition of the efficiency of mounted

1 Translation in Royal Artillery Institution Proceedings, April

1888, p. 40. See also Die Kavallerie- Division als Schlachtenkérper,

1884.

infantry, which these men in fact were, is that, while they can ride well enough to get over such ground as is required, they waste no time in learning manceuvres which they could not master, but look altogether to fighting with firearms and on foot whenever collision becomes neces- sary. The Boers represented an almost ideal body of this kind. British wars have supplied most valuable bodies of mounted infantry, who have been always picked men, picked shots, and excellent infantry. Asa general prin- ciple, it issafe to say that they ought to be under infantry and not under cavalry officers, as to their immediate com- mand,—though very often indeed they will be a most valuable auxiliary for any cavalry commander, who will in that case of course have the whole body under his orders. In so far as their presence tends to save cavalry from the disastrous necessity which occasionally befalls them of having to employ their men in fighting on foot, their presence with cavalry is always valuable. But, as the time when all their best training is required is when they are actually fighting on foot, it is far better that they should then find themselves under the orders of an officer whose training tends to make him accustomed to handling men on foot, rather than to one all whose

experience ought to have accustomed him to handle men on horseback, and to hate making them jump off their horses.

The difficulty in enforcing these principles lies in the fact that it is only the experience of war on a large scale which brings home to cavalry officers the disastrous con- sequences of injuring their own power by continually try- ing to take up the réle of mounted infantry. They find themselves at peace manceuvres continually put hors de combat, because they have come under the fire of infantry. They can very often get into positions where, if they were infantry and in large numbers, their effect would be most telling. Their rapidity of movement enables them to do this. A narrow deduction from a very incomplete know- ledge of the experiences of cavalry charges during the 1870 campaign led to the conclusion that cavalry could not be employed on a modern battle-field in their proper work. That conclusion is utterly rejected by all those authorities who have had the best means of analysing the experiences on which it was based; yet it remains a tradition which unfortunately affects the minds of many cavalry officers as well as those of many other officers in the army.

It is safe to say, in conclusion on this matter, that the two forces of cavalry and mounted infantry are each of the greatest value, provided they each adhere to their own proper function. As soon as mounted infantry begins to attempt manoeuvres on horseback it necessarily becomes a very inferior cavalry. As soon as cavalry takes to dis- mounting, its equipment, its training, and usually its arms are sure to make it into a very inefficient body. Every year adds to the necessity of high shooting training for infantry, and of every hour of their work being connected with the efficient use of their arm. Every hour devoted by cavalry to shooting which subtracts anything from training in their own proper work, or which leads them to compete with the other arm in that way, weakens them. By no process can they compete with infantry if they measure themselves with them under the conditions favour- able to infantry fighting. Nothing is more fallacious than the notion that because during the latter part of the 1870 campaign the German cavalry often fought on foot the Germans therefore consider that the proper employment of the arm.

Prince Kraft emphatically says—‘ The circumstances of the latter campaigns of this war were so abnormal that no rules for the employment of the arms can be deduced from them.” ‘No cavalry could perform the duty” the German

cavalry here did, of saving their own infantry by acting on the wings against the French infantry, “except in the case where they were engaged with an enemy whose hastily collected and undrilled masses had not the full value of regular troops.”

We may also mention as an illustration of at least the views of the German leaders that during some manceuvres in 1879 a regiment of lancers by sudden surprise charged from behind some rising ground at four battalions of infantry, who did not see the cavalry till these were on their flank at a distance of 200 yards already in full charge. Scarcely a shot was fired before the cavalry were among the infantry. The emperor and Count Von Moltke were present, and the decision was that three battalions were hors de combat. Now, when it is remembered that a cavalry regiment numbers about 400 men and three battalions about 3000, the difference between the effect produced under such circumstances by a body of cavalry and an equivalent body of mounted infantry, who could not have dismounted at most more than 300 men, who would certainly have been destroyed, is too great not to be realized. In this case an instance occurred of what Prince Kraft mentions as a possibility continually illustrated by the experiences of the 1870 campaign. The colonel commanding the lancers, having moved personally to a well- chosen spot, had been quietly observing the movements of the infantry, himself unseen up to the moment when by a signal he gave the order for his regiment to advance at a gallop, and then charge.

Artillery.

Here the first point it is necessary to insist on is that the tendency to a divorce between firing practice and drill manceuvre has been inherited by the artillery from the past as it has been by the infantry. Napoleon's formation for the battle of Austerlitz placed his artillery guns between his infantry brigades and on their flank. The artillery advanced nearly in line with the infantry and rather in advance of it. As long as it was possible for artillery thus to move up to close quarters with the infantry, exact accuracy of fire training was of little importance. The distance was so short that the round shot were bound to produce their effect. But, when the range of both infantry and artillery fire were greatly extended, a change took place which required a change of habitin the artillery, for which the long training of the past had as little prepared them as had been the case with the infantry. The horse artillery, and at a much later date the field batteries, had acquired a mobility which enabled them very rapidly to take up assigned positions. But the habit of thinking that drill movements, irrespective of accuracy of fire, were the busi- ness on which a soldier's mind should be set continued to operate long after all idea of moving artillery cheek by jowl with infantry or cavalry had been abandoned. The practice grounds of artillery for actual shell fire are neces- sarily much fewer and more difficult to select than the ranges for infantry. Hence what we have said of the tendency in infantry manceuvres to separate the effective fire of the ranges and the butts from drill and manceuvres applies with tenfold force to the artillery. Moreover, in the case of the artillery this tendency has been aggravated by a certain fear among generals and their staff officers of interfering in the detail work of a special arm. As long as a battery is seen to manceuvre rapidly, to take up an assigned and telling position, and to fire off a puff of smoke, the superintending general is apt to think that he may assume that all has been done that ought to have been done. ;

Unfortunately, it may happen that the battery which thus appears to have acted in the very smartest possible

way may have all the time been learning to do just what will injure it for war service. Nothing is more note- worthy throughout the 1870 campaign

than the extraordi- nary superiority of the German artillery over the French. There were no doubt certain technical reasons for this ; but by far the most important reasons were these :—(1) the German batteries had been trained habitually so to co- operate that a French battery almost always found itself opposed to a German brigade of six batteries when it came to fighting; and (2) at all their manceuvres the Germans had been training for war, while the French artillery had not. The German artillery had never fired off a gun which had not been properly laid at an assigned object, with the range determined, the nature of the projectile declared, and the fuse to burst the shell so far fixed that, had it been necessary actually to fire in earnest, every man would have gone through an almost exactly similar ex- perience. The French, on the other hand, had piqued themselves on their dashing battery manceuvres, and had been content to fire off a blank cartridge as rapidly as possible, no matter how the gun was laid, or what would have happened about the shell.

The same two schools at this moment exist among British artillery officers. The unfortunate tendency at pre- sent is for the officer commanding a battery who tells his subalterns, " Never mind how you fire; get off a puff of smoke, just to show where you are," to seem much smarter than the man who insists upon every gun being properly laid at an assigned object, and on having every possible condition fulfilled as it would be in war. The general who at a mile's distance sees the two puffs of smoke can- not tell the difference, though, if he rode into the battery which has so promptly puffed off its smoke, he would prob- ably find that one gun was inclined high in air and the next shooting into the ground ten paces in front of the muzzle. It is not too much to say that this latter battery has been in every respect acquiring inefficiency by the day's work. It will be slow when it comes to action, be- cause the men have never been trained to be as quick as the circumstances of action permit, have acquired no prac- tice in rapidity under those conditions. It will have ac- quired no practice in actual shooting except its few annual shots on the practice ground, which are sure with it to have been regarded as a most inconvenient interruption to the show drill and show manceuvres on which it has been employed throughout the year. This is the point of artillery tactics without which everything else is utterly valueless. As

Prince Kraft of Hohenlohe-Ingelfingen puts it, "The artillery must in the first place Att, in the second place Ait, and in the third place Ait."

It depends far more in England upon generals com- manding districts and divisions and on their staffs than upon artillery officers whether this result is attained or not. It is almost impossible for the most zealous artillery officer to keep up the confidence and spirits of his battery and to keep their work to the proper level if on every occasion they find that, because he insists on work being properly done, some other battery which is amusing itself with sham firing gets all the credit of superior smartness. The matter is therefore vital to the efficiency of this arm of the service. The infantry and cavalry will find in action that they rely on the support of a broken reed if the artillery generally has not brought the most efficient technical and practice-ground work into the closest relation with field manceuvring. Given that this has been done in the sense here described, Prince Kraft's next condition may be briefly stated, because its importance will be easily understood. 'It must next be in a condition to come into position at the right moment, and, with this object it must practise itself in getting over distances of many miles, and

even forced marches of a day or so, at rapid pace. If," he adds,! "it can satisfy these claims, it will give us every- thing which is needed as to its fitness for employment in battle."

So far we have spoken of conditions in which the tacti- cal necessities of modern artillery are very similar to those of modern infantry. In the next point the contrast is as sharp as the analogy was close in the former instance. Infantry, as we have seen, once committed to a fight, is be- yond the control of all officers not actually leading them at the time. Artillery under all but the rarest circum- stances can be almost as easily moved from one point to another of a battle-field out of action in which it is fiercely engaged as if it were not employed in firing atall. There- fore the rule is now accepted in all armies that every gun that can be employed should as soon as possible be brought to bear onthe enemy. The shorter

time artillery is limbered up and the longer it is employed in action the more effec- tive is its work. With a very large army Prince Kraft, whose authority on such a subject is probably the highest we have, makes a rather hesitating exception in this sense that ordinarily the commander-in-chief of a very large army will have whole army corps designed for a particular work, usually for striking at the decisive point of a field of battle. With these their own artillery will naturally move. But so far as artillery is available on any part of a field of action, even including that of divisions and army corps kept back from the actual fight, as long as these are stationary, every possible gun will be pushed forward. The altogether overwhelming effect of a concentrated and massed artillery fire is so enormous that whatever tends to increase the number of guns employed tends to give that superiority over the enemy's artillery which it is one of a general's first objects to secure.

Ordinarily a battle will now begin by artillery opening fire at a range which is fixed by the necessity of the attack- ing artillery not exposing itself during the time that it is coming up to the enemy's effective fire with shrapnel shell. 'This is reckoned at about 3800 yards. From that point the artillery, as soon as it has been able sufficiently to occupy the fire of the enemy to make further advance possible, pushes in to a distance of from 2200 yards to 2700 yards. Infantry in the meantime will have been pushed on sufficiently to protect the ground thus to be occupied by the artillery from direct attacks from the enemy. At this point an artillery duel is practically the certain beginning of the regular battle. The artillery will fire at any of the other arms as soon as it is able to bring any effective fire to bear on them. It is no easy matter for infantry to attack other infantry until the artillery has prepared the way for them by a heavy fire. But the artillery will hardly ever be able to do this until it has established such an ascendency over the enemy's artillery that the latter is either silenced or at least tem porarily withdrawn.

No matter how great the mass of artillery that is gathered together, Prince Kraft, basing his conclusions upon the soundest reasoning, condemns altogether the independent fire of individual guns within a battery, and, unless exceptionally for the purpose of ascertaining a range, all salvoes of artillery by batteries or otherwise. Nothing is gained in point of the

number of shell that can be thrown in a given time by firing battery salvoes in- stead of firing steadily gun by gun from the flank of a battery. After a salvo an interval of from 36 to 48 seconds at least is required before another can be fired,

1 We quote from his correspondent's summary of his views, and from the translation given by Major Walford, R.A. These words occur in the 17th letter, Royal Artillery Institution Proceedings, August 1887, p. 187.

Massed artillery fire.

Regulation

battery re,

Supply of ammuni-

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while with very rapid firing from the flank an interval of from 6 to 8 seconds allows a shell to traverse a range of from 2500 to 3000 yards, so that the effect of each shell can be seen.1 The effect of this is to enable the officer commanding the battery to have his fire under control, and to induce much more careful firing by each gun. Indeed, if a German battery is seen to be firing, not from the flank but irregularly, it may be taken for granted that it is being mastered by the hostile fire, and is out of hand. The duty of each commanding officer of a battery is to be continually watching over the replenishment of his

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culty. The employment of artillery in great masses, never in isolated batteries, is, so far as that arm is concerned, its most important law. So much so is this the case that, even when as many as eighty-four guns were collected together at Worth, the Germans found it answer best to turn all of them at once upon a single French battery, and then upon another, and

so on. Wherever possible, some at least of the guns will take up an enfilading position ; that is, they will fire from flank to flank of the troops they assail, in preference to firing directly at them. It is always advantageous to the fire of artillery to have great depth

tion. ammunition, and therefore as long as possible to draw | rather than great extent to fire at, because range is much upon his waggons for ammunition, keeping the ammunition | more difficult to fix correctly than direction. in his limbers as a last reserve. If this cannot be done, Prince Kraft regards it as doubtful whether artillery the limbers must be filled up as rapidly as possible. If, | can be employed in crossing its fire, the right of a long line however, by misfortune all ammunition is exhausted, the | of guns firing at an enemy's right and the left at the left, artillery must not retire, but must, for the sake of the | which would give to each a certain advantage in the direc- moral effect, remain without firing rather than produce the | tion of their fire. But itis clear that, if the whole of a encouragement to the enemy and discouragement to their | long line of guns be employed, as at Worth, first against own troops of withdrawing without express orders. one object and then against another, many of the batteries

Summary. We shall complete this sketch of the duties of artillery | will not be firing directly to their front, but at an angle,

in action by quoting the following summary from Prince

sometimes a very sharp one, to their own front.

In any case the earlier stages of a modern battle are Normal

Kraft of Hohenlohe-Ingelfingen :— sure to begin with a heavy fire of artillery, following either Course of

On the Offensive.—(a) Artillery, after it has silenced the enemy's

artillery, must not as a rule approach nearer than from 1600 to 1700 a modern

yards to infantry of the enemy which is as yet intact and is not engaged with other troops. () If the enemy's infantry is held in check by another force of artillery, or by infantry, it is not only advisable, but it is the duty of artillery to advance to a range of from 1100 to 1200 yards. (c) At the most decisive moment of the action artillery must not shun the very closest range. (d) As soon as the main attack has proved successful, the artillery must hasten up to secure the captured position by its fire; at such a moment, its proper place, in most cases, is in the line of skirmishers.

On the Defensive.—(a) The normal post for artillery in a defen- sive position (though this may be modified by the character of the ground) is 500 yards in rear of the foremost infantry position, pro- vided always that'the latter lcaves the field of fire of the artillery open. (6) Artillery must never abandon its position, even if the encmy come up to the muzzles of the guns, unless the officer com- manding the troops has given orders for a general retreat. But this does not imply that artillery, acting on the defensive, are for- bidden, if the assailant begins to get the advantage in the artillery duel, to cease firing for a time, and to withdraw their guns under cover, with the object of suddenly coming into action again at the most critical moment. (c) If the order to retreat is given, the only possible moment at which it can be commenced is either when the enemy has not yet advanced to the attack, or when he is preparing a sccond attack after having been repulsed in the first.

Horse Artillery ina Cavalry Action.—(a) Asa rule horse artillery should go in at once to a decisive range for the artillery duel, since the considerations which compel artillery when engaged with infantry to fight at longer ranges lose their force in this case, owing to the speed at which cavalry can move. From this posi- tion it will silence the enemy's artillery, and immediately after- wards, or as soon as it can see them, it will turn its fire on the enemy's cavalry. (%) During the charge of its own cavalry it will fire on that of the enemy, or, if that be not possible, on his artillery. If it has nothing to fire at, it will remain in position with loaded guns (common shell and not shrapnel should be used), in order, in case of the failure of the charge, to give support to its retiring cavalry, and to show them where they are to rally. (c) The horse artillery requires a special escort on that flank of its position

. only on which the cavalry fight is not taking place, and even therc

it requires it merely for the purpose of scouting ; a section will therefore be sufficient. (d) If the charge succeeds, the horse artillery must gallop up to the spot-where it took place, in order to secure its possession with their fire, and to assist in the pursuit.

The Combined Action of the Three Arms.

So far we have spoken of what may properly be called the minor tactics of the three arms, though that name is often applied in quite a different sense. There can be little doubt that it is in that portion of tactics that the complexity and difficulty of the present stage of the question lie. As

regards the larger handling of armies, the tendency of recent'

wars has been rather to simplification than to increased diffi-

1 See the prince's 15th letter, Royal Artillery Institution Proceed- ings, p. 171.

on some slight affairs of outposts or on the cavalry having ascertained the position of the enemy at least approxi- mately. Then may perhaps follow, what we have already suggested as one of the alternatives, a carefully regulated long-range fire of infantry; then probably a gradual development of the infantry of the assailing army in front of the position to be attacked and certain tentative move- ments designed to feel the strength of an enemy's position. Then, as soon as the point to be carried at any cost has been determined on, every effort will be made to distract the enemy's attention from this, to occupy him at other points, and by engaging him all along the line to prevent him from reinforcing the point which it is essential tocarry. At present the attempt will be, when possible, almost certainly to attack a flank. But, as the necessity of this becomes thoroughly realized as it now is on both sides, and a tendency arises towards continual extension of the space occupied in order to meet outflanking movements, it is almost certain that on one side or other the extension will exceed the limits of defensive power, and that then blows will be struck with the object of breaking the too extended line. All the

cavalry not employed in mere reconnoitring duties, or for keeping up the connexion between different parts of the army, will ordinarily be kept under the con- trol of the commander-in-chief until he is able to define the part of the battle in which it can be most effectually used. Then, when he has so far decided its direction, he will be obliged to leave all details to the cavalry leader, who will choose his own time and opportunity for delivering his blow. The local defensive power conferred by the present arms will be used on both sides. The assailant will endeavour by employing it at unimportant parts of his line to gain the advantage of the superiority of force neces- sary for striking at the decisive point. The defendant will naturally employ it to the full. Both on one side and the other, however, the effort will be to keep strong forces of all arms for the decisive period of the action.

So far as Continental warfare is concerned, the enormous development of modern armies makes it very uncertain how far elaborate strokes of tactical skill can ever again be delivered in the way they were by Napoleon,—for instance, at Austerlitz and Dresden. The experience of recent wars supplies us at all events with nothing of the kind. The enormous masses and the enormous extent of ground to be covered almost force a general into the

it to his subordinates to work out the development with such local skill as the circumstances permit. Nevertheless, it would be rash to say that, as incidents of a great campaign, many battles may not be fought, the effect of which on the conduct of the general operations will be very decisive, where comparatively small numbers are engaged. For the conduct of these at least there are many lessons to be gathered from the tactical experiences of earlier wars. Choice of In the taking up of positions it may be assumed gene- position. ally that the conditions to be sought are freedom for manceuvre, free scope for fire both of artillery and infantry, and, as a rule, for that end gentle glacis slopes like those of St Privat and Gravelotte, rather than precipitous heights like that of the Red Hill at Spicheren. There is nothing as to which war experience and popular

assumptions differ more than as to the relative strength of different positions. Asa rule, steep heights give a great deal of cover from fire. Their lower slopes can only be seen from the edge, and that edge cannot be held because it is completely exposed to the enemy's fire from many points below. It is better to have a difficult climb than to be shot by a bullet. It has constantly happened that positions have fallen because the defenders have trusted to physical difficulties of access rather than to the effect of ground upon the use of arms for their defence. Whatever tends to oblige an enemy to debouch on a narrow front against a wide front of fire is most valuable to the defence ; but it is upon considerations like these of the use of arms that the strength of a position must be determined. Similarly, whatever tends to facilitate communication between one part and another of your own troops, and to cause an enemy to separate his, adds greatly to the strength of your position. The element of time also has here, as in the province of strategy, to be always taken into account. Where ground tends to make movements slow and difficult, there it will be safe to economize men by employing small forces, in order to gain time for decisive blows in other directions. Whatever in an enemy's rear will prevent his safe retreat, and therefore either locally or throughout a position will make successful attack decisive, is greatly in favour of the army which, whether at first on the defen- sive or offensive, can attack an enemy in such a position. The application of these principles is almost infinite in its variety. It is impossible here to do more than indicate their general character. Provision The proposition has been advanced that it would be best against to meet the effort of an assailant to outflank a position by outflanking employing detached bodies to manceuvre outside the posi- move- : . . . eee tion, so that when an assailant has committed himself to an outflanking movement, and has moved up his enveloping troops, the detached bodycould fall upon these unexpectedly from their rear. Twice during the 1870 campaign the Germans designed a movement of this kind. In neither case was there an opportunity for putting it to the test. Such a movement successfully executed could hardly fail to have great results. On the other hand, a well-handled cavalry, searching all the country round prior to an action, might not improbably discover the isolated corps placed for the purpose, and in that case it ought not to be difficult for the assailant to keep it apart from the main army and to destroy it. _

_A proposal of a somewhat kindred kind, but involving a different principle, was made by Sir E. Hamley asa de- duction from the 1870 campaign, and was applied in practice by the Russians in Asia in 1877. He suggested that the defensive strength of comparatively small bodies was now so great that a general would be tempted to detach, or to connect with his main body only by a tele- graphic wire, a body of troops, who, passing round an enemy to be attacked, should take up a strong position in

his rear, and should thus become the anvil on which the main assailing army should act as hammier, grinding the enemy between them to powder. This was actually done by the Russians, who in October 1877 destroyed Moukhtar Pasha's army by this very means.

Both these forms of operation—the detached force to the flank and the detached force to the rear—partake of the nature of the attempt of Napoleon to destroy the allied armies, after the battle of Dresden in 1813, by pre- viously detaching Vandamme to intercept their retreat. As a matter of fact, that manceuvre was one of the most disastrous that Napoleon ever attempted, but the disaster was probably due to a failure of Napoleon's own wonted activity arising from illness. The telegraph might then have made a very great difference in the result of the operation. In any case, these suggestions indicate pos- sibilities of action, due to the present condition of arms and of science, which may have much wider application in the hands of skilful commanders. Everything will depend on their execution, and on the skill with which they are met. It may at least be asserted that, with the possibilities of such manceuvres being employed against him, it will ordinarily be extremely rash for a general to commit himself to the actual turning movement by which he wheels up a portion of his army to attack an exposed flank, without having searched the ground with his cavalry far beyond the point which he proposes to assail. This was actually done by the German cavalry under express orders from headquarters, prior to and during the great turning movement at the battle of Gravelotte.

Marches. —The principles regulating the marches of armies which
Marches.

pee battles are determined by the conditions of a modern attle itself. Asa rule nowadays the cavalry of an army will be certainly pushed far forward in advance of the main body. There- fore, with the exception of small parties of horsemen employed as orderlies, for keeping up the connexion between one part of an army and another, and to aid the infantry in the immediate work of local security, the marching body will in ordinary country consist of artillery and infantry. The tendency for every action to begin by artillery fire continually leads more and more to the pushing forward of that arm to the front of the column, only sufficient infantry being placed before it on the road to give pro- tection in case of sudden attack, and to furnish the necessary troops for the defence of the guns at the beginning of an action. The exact order of march will thercfore necessarily vary with the character of the country through which the army moves. In very mountainous districts, in which collision with an enemy may occur at any moment, it may be neccssary to push forward infantry instead of cavalry. In all cases where mountain defiles have to be passed, detached infantry must gain possession of the heights before the main body enters the defile.

Since the great object of all marches is to deliver the army in fighting order on the battle-field, it is necessary that the force should not be disperscd too widely on the march, but it is quite as necessary with large bodies of troops that the march should not be made upon too few roads. An army corps with its attendant waggons occupies in depth about 25 miles on a single road. As under most circumstances a day's march is about 18 or 14 miles, it is clear that, if an army corps were moving in the ordinary road formation on a single road, the rear of the column would scarcely be able to arrive on the same day that the head of the column was first involved in action. Nor is it always possible to place the whole of the fighting force in front and to leave the whole mass of waggons in rear. Ambulances and surgeons at least, as well as ammunition columns, are required at the very moment of battle. Therefore it is advisable to employ as many roads as possible that are within con- venient reach of one another. The difference between the lengths of march that have been- done by troops under favourable and un- favourable conditions is so great that it is impossible to fix any specific length as the march that can under all circumstances be relied on. Good spirits, good roads, high training,

and favourable weather on the one hand, and depression, deep mud, storms, and want of marching condition on the other, are elements that must be taken into account in all such matters. Of the difficulties which a large number of troops marching on a single road encounter a striking illustration is afforded by an incident of the 1866 cam- paign. According to the Austrian official account, the men marched eight abreast in order to diminish the length of road occupied. Yet, though this unusually wide marching front was taken up by

Advanced and rear guards,

Outposts.

Reconnais- sance and intelli- gence,

TACTICS. |

the infantry, and corresponding formations were as far as possible taken by the other arms, the length of the longest column, accord- ing to Von der Goltz, was, when actually on the road, from front to rear 674 miles in length. – In this case about three corps were march- ing together. Hence it is always desirable when possible to allow one road at least to each division. Another striking illustration both of the size of modern armies and of the length occupied by troops on a road is given by Von der Goltz. He calculates that, if the present German army were placed on one road, it would reach from Mainz to the Russian frontier, the whole distance being denscly packed with men, guns, and waggons. Again, he shows that either the present French or German army extended in battle array would occupy the entire length of the common frontier of the countries.

Advaneed and Rear Guards.—The questions involved in the proper use and employment of advanced and rear guards would occupy more space than we can possibly afford for them. In general terms it may be said that, with both advanced and rear guards, artillery (perhaps with machine and quick-firing guns), cavalry, and mounted infantry will play the principal parts. It is tolerably certain, though opinion is much divided on the subject, that the enormous advanced guards employed by the Germans during the 1870 campaign, in which the advanced guard of an army corps

sometimes consisted of about half the whole force, would be for most campaigns a mistake. The tendency of very large advanced guards is, as that campaign showed, to bring on actions prematurcly. Artillery or mounted corps can be easily drawn out of a premature action. Infantry cannot be so withdrawn. Ifthe advanced guard is large enough to give time to tho marching body to form upon suitable ground before it is attacked, it possesses all the strength that is necessary.

The task of a rear guard retiring before a victorious enemy, and covering the retreat of a beaten army, is one of the most delicate of operations. It depends for its proper execution on the full employment of those means for gaining time by forcing an enemy to deploy on unfavourable ground which have been described under the general heading.

Outposts.—The subject of outposts is also one which, for its full explanation, would require a volume to itself. The general prin- ciple on which their use is based is that a slender cordon of men shall so surround an army when at rest that no enemy can approach its quarters unobserved, and that this cordon shall be supported by piquets from which the actual sentries for the cordon are taken, and these again by stronger but less numerous bodies, serving to connect together the different parts, so that, if the enemy attempts to drive in the outposts at any point, he meets with a continually increasing resistance. In this broad indication of the method, the principle is equally applicable to cavalry and to infantry outposts. In general, however, the security of a modern army, when not in actual contact with an enemy preparatory to battle, depends chiefly on the early information gained by cavalry pushed far out beyond the rest of the army. The cavalry will be at a distance of at least one or two days' march in advance and on the flanks scouring the country in all directions.

It is practically certain that during the earlier stages of a campaign the collisions that will occur will be between bodies of cavalry pushed forward from both sides, supported by horse artillery and by such infantry as can be rapidly transported to the front. The circumstances of the collision of the main armies must depend in the first instance upon what happens in these encounters, in which cavalry will be the most important arm. Both

sides will endeavour to use their cavalry to obtain all the information they can and to prevent the enemy from obtaining information of their own movements. At the same time, in the case of two great neighbouring powers like France and Germany, it is probable that attempts will be made by the cavalry on both sides to interfere with the mobilization of the armies across the frontier. These efforts promise to result in contests on a scale and of a kind such as we have never yet seen, and of the nature of which it is difficult to judge from any past experience of war. It seems certain, how- ever, that the body which will gain victory in these encounters will be the most highly trained and numerous cavalry, supported by its sister arm the horse artillery. But the value of a body of mounted infantry, and perhaps a strong force of cyclists, pushed forward to support the cavalry, can hardly be doubted when it is remembered how often defiles will have to be seized, bridges held, and important stations permanently secured. No doubt, when such infantry is not available, cavalry will at times have to be employed on foot for these purposes. So long as such employment is looked on as exceptional and a necessity to be regretted, it need do no harm. In any case no rules must prevent the securing of the actual object for the time being.

Reconnaissanee and Intelligence.—The vital necessity of obtain- ing all possible information of what an enemy is doing makes the reconnaissances continually carried out by cavalry all round an army, and the occasional special reconnaissances conducted by single officers and small parties or strong bodies employed for the purpose, some of the most important operations of war. It is, however,

difficult in brief space to lay down rules for their guidance, because the essence of tho value of such work depends on officers being trained in all parts of the art of war so as to know what to look for and what to report. The principles of such reconnaissance are determined by tho general principles of both strategy and tactics, and are not in themselves independent. Nevertheless, it is very important that it should be realized, by men who are sending in reports from some one point of a Jarge circle,

that information in itself apparently unimportant may be of the greatest value when it is collated with other facts either already known or simultane- ously gathered from other quarters. Thus, for instance, a news- paper advertisement, or a reference to a particular man or officer as not being with his regiment, may give negative evidence of the position of that regiment which may become of great importance. The sifting, therefore, of information should be chiefly left to the department at headquarters which has charge of that work. Spies and deserters will supply evidence the value of which usually depends on the power of the department to check their assertions by a number of minute facts already known. Any information about the enemy or the country which may assist to that end should be carefully gathered and reported. Numerous forms and rules have been drawn up to supply hints as to the kind of informa- tion about roads, rivers, railways, villages, &c., which should be gathered. Lord Wolseley's Pocket-Book and Colonel Harrison's Handbook are the best for these purposes.

Literature—The following books may be recommended as the most recent and most valuable on matters of military'art. (1) On tactics, to which modern military literature has been chiefly devoted, see Prince Kraft of Hohenlohe-Ingelfingen's Letters on cavalry, infantry, and artillery, especially those on the last-named. These are being now translated in the Proceedings of the Royal Artillery Institu- tion. (2) On cavalry tactics two anonymous works by the same writer appeared in Germany in 1884: Die Kavallerte-Division als Schlachtenkérper, and Ueberjdie Bewaffinung, Ausbildung, und Verwendung der Reiteret. The former has been translated into French in the Revue de,Cavalerie of successive months of 1885-86, and we have no hesitation in saying that it is a book that ought to be known to every officer of every arm of the service, but more especially to every cavalry officer. See also Das Volk in Waffen ("The Nation in Arms,"), by Baron von dcr Goltz, which has been completely translated into French under the title of La Nation armée—organisation militaire et grande tactique modernes (1884); parts of it have been translated by Sir Lumley Graham in the Journal of the United Service Institution, No. 138, vol. xxxi. (1887). (8) On infantry tactics the books are legion. They should be read in conjunction with the actual history of the battles on which their conclusions are based, and if possible with a

study of them on the ground on which they were fought. Perhapsthe most important are Von Scherff's Studien zu neuen Infanterie-Takitk (1873), translated by Sir Lumley Graham, New Tactics of Infantry, 1875; Verdy du Vernois's Studien uber Feld- dienst (1886), and his Studien uber Truppen-Fuhrung (1873-75), and the numerous strategical and tactical studies recently published in Germany,—many by Von Gizycki, and in some cases translated as we have noted above by Captain Spenscr Wilkinson, and published by the Manchester Tactical Society. We should also recommend a perusal of Col. the Right Hon. J. H. A. Macdonald's Common Sense on Parade (1886), from which we have given several extracts. (4) On strategy Prince Kraft's ' strategical letters'' have already been alluded to. Sir Edward Hamley's Operations of War (4th ed., 1878) remains without a rival in the English language on questions of strategy. We cannot think that Clausewitz's great book, On War, translated by Col. J. J. Graham, 1873, has:ceased to be of value. Mekler's Taktik, which represents the course for the German war school, has not as yet been translated; it is a most important work. No soldier can read Major Adams's Great Campaigns without advantage. But on these matters we must conclude by expressing our conviction that an exhaustive study of at least a single campaign carried out pretty nearly on the principles laid down, for the pur- poses of the study of general history, by Dr Arnold, in his Lectures on History, but with just such modifications as apply to war study. is almost indispensable to a soldier who would derive much value from those books which examine the whole field of war, and that that cultivation of the judgment of which we have spoken must follow, if any real use is to be made of either one orthe other. (J. F, M*.)*

NAVAL STRATEGY AND TACTICS.

The introduction of steam, armour, the torpedo, and other modern changes must necessarily have produced modifications in naval strategy and tactics since the days of the last great naval war. In the course of the last eighty years wars on land, both in Europe and elsewhere, have been frequent, and soldiers have thus been enabled to keep pace with modern inventions, and to accommodate their strategy and tactics to the ever-changing conditions of the problem. But since 1805, when Great Britain, by her crowning victory of Trafalgar, placed herself in un- disputed

command of the seas, and, having rendered her- self superior to all possible combinations against her, was thus enabled to found unmolested her unrivalled colonial empire, the world has seen no naval war of sufficient magnitude to enable seamen to lay down maxims of strategy and tactics founded on actual experience. it does not follow, however, that we must necessarily give up the problems as insoluble; we are entitled to reason by analogy. The lessons of history, if not followed too slavishly, will act as a useful guide; and when we have made due allowance for the superseding of sail by steam power, and the consequent limits to the mobility of all

fighting ships dependent on their supply of coal, when we have taken into consideration the cutting of the Suez Canal and the possibility of another through Panama, and when we have given due weight to the possession by various nations of certain strategic points on the surface of the globe where coal may be obtained, we shall be able to construct some not altogether imaginary theories of future naval strategy, and shall probably find that the problem, at least as between Great Britain and her maritime rivals, bears a striking family resemblance to that which presented itself in the past. The geographical factors are not greatly altered. Some new naval powers have sprung into existence, and must be taken account of, whilst some of those which figured conspicuously in the beginning of the century have dwindled into insignificance; but the relative interests of the two great maritime rivals, Great Britain and France, are practically unchanged.

to form accurate schemes of combination, and thus the most carefully planned expeditions and enterprises were often frustrated and rendered abortive almost at the moment of consummation by a foul wind or storm. All this is now changed ; the present development of steam- power renders fleets practically independent of wind, and even storms can only slightly affect them. The limit to their range of operations dependent on

their coal supply, with the question of the possibility of replenishing, adds another element of certainty to the data upon which we can form accurate calculations as to the power and mobility of fleets. It has become possible, therefore, to say that naval strategy is no longer the inexact and haphazard busi- ness, depending largely on chance, which it was of old, but an accurate and most interesting science, worthy of the close attention and practical study of the most skilled experts. The two principal objects of the naval strategy of Great

Strategy. Strategy.—The great continental powers of Europe, in | Britain —the command of the narrow seas around her consequence of their land frontiers, have to depend mainly | coasts, and the protection of her mercantile marine—are on their armies to defend their position, and maintain | to a certain extent different, though not actually inde- their independence, and they have all been constrained to | pendent of each other. Thus she might, by providing an adopt a system of forced military service, and to support | overwhelming fleet of iron-clads, and neglecting to build a great standing armies, with prodigious reserves, and vast | sufficiency of fast cruisers, retain undisputed command stores of war material constantly at hand. For them the | of the narrow seas, and yet have her commerce swept off problems with which we are now dealing are questions of | the ocean by an enemy provided with numerous fast, minor importance, and must be held entirely subordinate | far-ranging cruisers; and on the other hand, it would be to their military requirements. Italy is probably the only | useless for her to provide vast numbers of vessels of the one of them which has reason to fear invasion by sea, or | latter class to protect her commerce all over the world, if descents and raids upon her extended coast line; and she | by neglecting her iron-clads she lost command of the has lately been making gigantic efforts to supply herself | narrow seas, and saw her merchant ships captured in sight with a powerful war navy, though she is still far behind | of their ports. It is obvious, therefore, that her only France, the only power from whom she has any cause to | safety depends upon an ample supply of both.

Strategic apprehend attack. To Great Britain alone of the great The naval strategy of the last war may be briefly but Blockadeof

problemsof powers of Europe are the problems of naval strategy of | comprehensively described as a blockade of the enemy's e"emy's

a ante paramount importance. Upon a thorough knowledge and | ports. The question which now exercises the minds of Pt fo ion just appreciation of them, with a sufficient provision of | seamen is whether blockade is at present possible, and if Britain, physical force to secure their successful development in her | so under what conditions; and the conclusion which seems

own interests, depends the existence of the British empire.

The two primary factors which must decide the future naval strategy of Great Britain are the command of the English Channel and the protection of her mercantile marine. Upon the former depends her own safety from invasion, or from partial but disastrous raids upon her open commercial cities and coast towns; and upon the latter depends the no less vital consideration of the uninterrupted supply of food and of raw material for manufacture.

Her naval supremacy in the Mediterranean is of vast importance, for upon it will depend the freedom of her principal route to India and Australia, and also the eventual retention of Malta, Gibraltar, and Cyprus, and of that priceless possession vaguely termed naval prestige, upon which alone she can found a claim to be classed amongst the great powers of Europe. But, notwithstanding the importance to Great Britain of being able to hold her own in the Mediterranean, either with or without allies, in the event of a war with France, or with France and Russia combined, it cannot be considered as vital to the exist- ence of the empire; and it is possible to conceive circum- stances in which she might be driven from that sea, or for strategic reasons be induced temporarily to withdraw her ships, and yet, if she could keep open her alternative trade route by the Cape of Good Hope, and protect her food supplies from America, she might secure time to develop her unrivalled maritime resources, and eventually, notwithstanding the enormous temporary loss of prestige, regain her wonted supremacy on all seas.

The naval strategy of the past was necessarily a some- what inexact and haphazard business. The fact that fleets had to depend entirely for locomotion upon the fickle and uncertain power of wind rendered it impossible

to have been arrived at by the ablest naval strategists of the present day appears to be that a close blockade, carried on under the old system, is, for various reasons, no longer possible. What is now practicable is observation, or watching by a chain of look-out vessels in connexion with a superior fleet, in such a way that the squadron in port would be masked (to use a military term), or in other words, that they would be unable to leave the port with- out the extreme probability of being obliged to meet and engage with a superior force. The distance at which the masking fleet should remain from the blockaded port, and the question whether they should be kept under weigh, or at anchor at some suitable anchorage, are points of detail which come more under the head of tactics, and must be decided in each individual case in accordance with local circumstances, and with such considerations as the prospect of the blockading fleet being or not being subjected to the attacks of torpedo boats and coast de- fenders, which, although not strictly speaking sea-going vessels, are yet capable of exercising potent energies within a certain zone of their port, by selecting the most suitable time and weather for their operations. Such considera- tions render it obvious that the blockading ships must greatly exceed the sea-going force in the port blockaded, as they render themselves liable to all sorts of subsidiary but very effective attacks from comparatively insignificant forces, which, in consequence of their own distance from their base of operations, they would be unable to reply to in a similar manner. If the blockading force is to be kept constantly under weigh, its numbers must be still further increased, as in that case a certain proportion of the ships, variously estimated at from one-sixth to one- third, must be continually absent from their station for

Swift cruisers.

Changes In naval tactics.

AND TACTICS. }

the purpose of replenishing their coal supply, and of making those repairs to machinery which are incidental to steam ships kept constantly under weigh.

The effective blockade of an enemy's ports would of itself provide for the protection of commerce, for if no hostile ships could escape there would be nothing to prey upon the commerce. Such experience, however, as was gained during the American civil war, supported by numerous peace trials and general nautical experience on the subject, tends to show that a perfectly effectual blockade is impossible, as against steamers: some vessels of high speed will certainly find means of escaping on dark nights or during thick weather, so that it becomes necessary for a rich commercial nation, whose merchant ships cover every sea, to make arrangements for providing at least two cruisers of superior speed and greater coal endurance, to look after every one of the hostile raiders which may escape the blockade and endeavour to adopt the tactics of the famous " Alabama." Some half-dozen Confederate cruisers of feeble power and insignificant speed succeeded in driving the merchant flag of the United States off the ocean, and deprived that country of the large share of the carrying trade of the world which it then possessed. A similar disaster to Great Britain in her present unique position would, it is almost superfluous to point out, have far wider consequences. +

Some high political authorities have given it as their opinion that no fleet of fast cruisers which it would be possible to provide would suffice for the protection of Great Britain's commerce in case of war with a maritime power. This may or may not be the case, but it is a view not generally shared by the highest naval authorities, who take into consideration the possession by Great Britain of the principal coaling stations of the world.

A novel but apparently not unpractical proposition has been made by one of the ablest and most thoughtful admirals of the British navy, with a view to prevent the wholesale transfer of the mercantile marine to a neutral flag on the outbreak of war with a maritime power. It is to the effect that the national exchequer should guarantee to make good all war losses, provided owners conformed to a few simple but not too harassing regulations as to routes and times of sailing, to be laid down by the

Admiralty from time to time. It is quite possible that the call on the national purse might be enormous, perhaps a hundred millions sterling during the first six months of the war; but no mulct it would be reasonable to conceive would equal the amount of the indirect national loss which would accrue from the wholesale transfer of the carrying trade of the country to a foreign flag.

The subject is worthy of the attentive consideration of all those who essay to deal with the great questions of naval strategy, as the protection of the mercantile marine of the country from either direct or indirect destruction is one of the principal factors in the problem.

Lactics.—If naval strategy has been modified by the recent inventions and alterations in warlike materials and the motive power of ships, it is certain that the same causes have had a still greater effect upon all preconceived notions of naval tactics.

Weather gauge will no longer be sought for as an advantage. In fact in all cases of attack by surprise, such as an assault by torpedo boats, or other light craft, for the purpose of harassing a fleet, the attacking force would certainly approach from the leeward, by which tactics the smoke from every gun fired by the fleet would act as a screen to hide their movements, and protect them from machine gun fire; for not even the beams of the electric light can penetrate smoke.

A large amount of speculative writing has lately been

indulged in, by both English and French writers, as to the naval tactics of the future. We hear of "ramming tactics," "the end-on attack," "the melée," and various other somewhat vague phrases, used to express the views of theorists as to the probable tactics of a future naval battle ; and, whilst the torpedoist tells us that his weapon (meaning the locomotive torpedo) will certainly decide an action, and forbid ships to approach near enough for ramming, the artillerist laughs to scorn the inaccuracy and

limited range of torpedoes moving in such a dense medium as water, and maintains that his weapon, of far greater accuracy, almost equal destructive power, and immensely greater range, will as of old decide the battle.

It is probable that all three weapons, ram, gun, and torpedo, will play a part in future naval battles, though many thoughtful and practical seamen seem to be coming to the conclusion that the ram will not be deliberately used, except perhaps to give the coup de grace toa ship with her engines already disabled; and this even would appear to be a wanton destruction of a ship which might become a valuable prize, and an inhuman sacrifice of lives no longer capable of exercising any material influence on the battle.

It seems to be thought that ramming when it takes Ram- place in action will be as often accidental as deliberate ; ming.

and indeed the present high speed and great size and weight of iron-clads would probably forbid practical sea- men from adopting that mode of attack. Two ships of from ten to thirteen thousand tons, meeting end-on ata speed of 28 knots an hour (assuming the speed of each to be 14 knots), would certainly produce mutual destruction, with loss of the lives of almost all on board, and it seems difficult to believe that any two men who still retained calm judgment and reason would deliberately adopt such a suicidal method of fighting, if indeed it be possible to steer two large ships at high speed with such accuracy as to cause a direct collision, —a point which many practical seamen doubt.

On the other hand, a ship striking another on the broadside, or at any angle approaching a right angle, would probably cause the destruction of the latter, with but trifling injury to herself, supposing her bows to be properly constructed for ramming; but, in order to place a ship in a situation to strike such a blow (both ships proceeding at speed), she would herself have to assume a very critical position ; that is to say, she would have to expose her broadside, or in other words, she would have to place herself almost as much across the assumed path of her adversary as the adversary was across hers; in which position the miscalculation of a few seconds in time, a knot or two in speed, or even a small touch of the helm

of either ship at the last moment, would turn the would- be rammer into the victim. It is probable therefore that, if ramming takes place in action, it will be more frequently by accident than design.

Much has been made by the advocates of ramming tactics of the incident of the battle at Lissa, where the Austrian wooden ship 'Ferdinand Max" rammed and sank the Italian iron-clad '" Re d'Italia"; but it has been stated on high authority that the brave Tegethoff himself has disclaimed any preconceived design in the matter, further than that he suddenly observed through the smoke a grey object in front of him, which he took to be an enemy, that he ordered his ship's engines to be put "full speed a-head" and his ship to be steered for the object, and that he then found he had rammed and sunk the "ave datalia.""

In some instances modern ships have been designed and built with a view to carrying out some special plan of tactics. Thus in the British navy several ships have been

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built for the " end-on attack," as it is called, a somewhat vague term for expressing the desire of some officers to fight their ships end-on to the enemy,—tactics, however, which can only be consistently carried out if the enemy consents to run away ; otherwise it is evident that, if both ships continue to advance towards each other, they will meet, and if they do not strike and sink each other, they must pass from the "end-on" to the " broadside-on," then " stern-on," and then, unless they mutually agree to run away from each other, they must pass through the "broadside-on " position again before they resume the "end-on" or bow attack.

It would seen therefore to be wise not to construct the ordinary battle ships for any particular method of attack, whilst the whole subject is in such an untried and specula- tive condition, and so much necessarily depends on the tactics of the enemy, but rather to make ships as strong all over, both offensively and defensively, as it is possible to do upon a given displacement and at a certain cost.

The principal tactical formations for modern fleets are— single column in line ahead; two and three columns in line ahead ; the same in line abreast ; quarter line or line

WARANGAL, or WoruneUL, an ancient town in the Nizam's Dominions, or Hyderabad state, situated 86 miles north-east of Hyderabad city, in 17° 58' N. lat. and 79° 40° E. long., and containing in 1881 a population of 3347. It was the ancient capital of the Hindu kingdom of Telingana, founded by the Narapati Andhras, of which now little remains to denote its former grandeur except the four gateways of the temple of Siva. These are still in a state of tolerable preservation.

WARASDIN. See Varasp.

WARBLER, in ornithology, the name bestowed in 1773 by Pennant (Genera of Birds, p. 35) on the birds removed, in 1769, by Scopoli from the Linnean genus Motacilla (cf. WactaiL) to one founded and called by him Sylvia,—the last being a word employed by several of the older writers in an indefinite way,—that is to say, on all the species of AMotacilla which were not Wagtails. "Warbler" has long been used by English technical writers as the equivalent of Sylvia, and consequently generally applied to all members of the Family Sylviide thereon raised, which has since been so much subdivided as to include a vast number of genera, while species almost innumerable have from time to time been referred to it.

Until recently ornithologists had come to agree pretty well as to which forms should be considered to belong to the Family Sylviidzx, —the "American Warblers" (Mniotiltidx), to be presently con- sidered, being therefrom segregated ; but some writers, seeing the difficulty of separating the remainder from the Turdidz (ef. TuRvsH), tried to get over it by proposing to erect an intermediate Family for the WHEATEAR (q.v.) and some similar forms, under the name Saxicolide. In truth the difficulty was thereby doubled, for, if it was before hard to distinguish between Sylviide and Turdidex, it has since become harder to distinguish on the one hand between Sylviidx and Saxicolide, and on the other between Saxicolide and Turdide. The confusion thus caused is chiefly due to the adoption in a more or less modified form of the views put forth by

Sundevall in 1872, and revised by him in 1874 (cf, ORNI- THOLOGY, vol. xviii. p. 38). For him, however, it is to be said that

he at least proceeded in a fashion that had long been recognized, :

and gave reasons, whether good or bad, for the system he pro- pounded; but his imitators have omitted so obvious a requirement, and leave to any one who would use their results the task of dis- covering how they have been reached. Hence it has been suggested that some of the alterations introduced since Sundevall's time have been purely arbitrary, if indeed they did not proceed from considerations of personal convenience, or occasionally even through mischance. Still the greatest allowance must be made for those who attempt to reduce to order such a multitudinous assemblage of forms—forms which present an almost endless

1 For this reference, not before precisely given, the writer is in- debted to the Rev. G. M'Arthur.

of bearing ; indented line ; and the group formation. In the last-named, a group of three ships becomes the tactical unit instead of the single ship ; there is a leader with a ship on each quarter at different angles and different distances ; and in this, and also in the indented line formation, the object is to keep the broadsides of the ships open or clear of consorts ; but, in consequence of the more recent battle ships not being built specially with a view to broadside fire, these somewhat complicated formations are not generally popular.

Science_and the ingenuity of inventors are day by day adding fresh weapons of more terribly destructive energy to the already prodigious list of war material, and the attack may be said to keep always well ahead of the defence, so that it becomes more difficult to lay down fixed rules for tactics than for strategy. Much will depend upon the personal genius, nerve, and happy in- spirations of the individual admirals and captains who first find themselves engaged in a modern naval battle ; and national

instincts, and practical experience in handling steam ships at high speed, will count for much towards the issue. (6. @P.&)

*variety of small differentiating characters, pointing in numerous directions—while the essential structure of all is apparently so similar that at present there is no hope of assistance from the anatomist or the morphologist. But the affinity, seeming or real, to the Turdidx does uot offer the only difficulty. The resemblance which some other forms, often placed with the Sylviide, bear to the Timeliide *—the Crateropodid# of some systematists—is equally if not more puzzling. It is admitted by many systematists that the Timeltide form a group that has been made a "refuge for the destitute," a group into which genera and species that were trouble- some to classify have been thrust ; and, as a natural consequence, the limits of such a "Family" or group have scarcely been plausibly defined.? It appears that the so-called Timeliidw lead off to other groups, as the Lantidez (cf. SHRIKE) and what not, and their existence as a separate " Family" can hardly be taken for a certainty. Again, a small group of birds, almost wholly peculiar to the Australian region, have been sometimes separated as A/alurida, and of these more must be said presently. Lastly, there are certain genera that, though formerly included without hesitation among the Sylviidx, have lately been designated " Fly-catchers," on grounds, however, that have not been explained.*

To deal with this theme in satisfactory detail would require far more space than can here be allowed, for the failures of later systematists would have to be shewn by a series of minute criticisms of a kind that would be only acceptable to specialists, and hardly understood by others than experts. All things then considered, it would seem to be best for our present purpose to regard the "Warblers "—without pledging our faith to the recognition of a "Family" Sylviide—from the point of view which obtained before the more recent and perplexing (because ill-defined) opinions were introduced, and that aspect is afforded by the scheme furnished by Canon Tristram to Mr Wallace, and by him adopted in his Geographical Distribution of Animals (ii. pp. 257-260); but our limits will only allow us to touch upona few of the most prominent membcrs in addition to those which have already been or will form the subject of

separate articles. In this sense then the first that may be mentioned arc those forming a group of more or less aquatic habit, usually called Calamoherpingw but more correctly Acrocepha- ling, the commonest of which in England is the well-known Sedge- bird or Sedge-Warbler, Acrocephalus schenobenus, whose chattering song resounds in summer-time from almost every wet ditch in most parts of Britain. As is the case with so many of its allies, the skulking habits of the bird cause it to be far more often heard than seen; but, with a little patience, it may be generally observed flitting about the uppermost twigs of the bushes it frequents, and its mottled back and the yellowish-white streak over its eye serve to distinguish it from its ally the Reed-Wren or Reed-Warbler, 4. streperus, which is clad in a wholly mouse-coloured suit. But this last can also be recognized by its different song, and comparatively

seldom does it stray from the reed-beds which arc its favourite

2 These are exotic birds, having no recognized English name, Those of " Babblers," ' Bush-Babblers," and '" Babbling-Thrushes " have been applied to them by some writers, who consider them to be sufficiently characterized by their short, rounded, and incurved wings.*

3 Cf. Mr Sharpe's meritorious efforts, Cut. B. Brit. Museum, vols. vi, and vii,

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haunts. In them generally it builds one of the most beautiful of nests, made of the seed-branches of the reed and long grass, wound horizontally round and round so as to include in its substance the living stems of three or four reeds, between which it is suspended at a convenient height above the water, and the structure isso deep that the eggs do not roll out when its props are shaken by the wind. Of very similar habits is the Reed-Thrush or Great Reed- Warbler, A. arundinaccus, a loud-voiced species, abundant on the Continent but very rarely straying to England. Much interest also attaches to the species known as Savi's Warbler, A. luscinioides, which was only recognized as a constant inhabitant of the Fen- district of England a few years before its haunts were destroyed by drainage. The last example known to have been obtained in this country

was killed in 1856. The nest of this species is peculiar, placed on the ground and formed of the blades of a species of Glyceria so skilfully entwined as to be a very permanent structure, and it is a curious fact that its nests were well known to the sedge: cutters of the district which it most frequented, as those of a bird with which they were unacquainted, long before the builder was recognized by naturalists. In coloration the bird somewhat re- sembles a Nightingale (whence its specific name), and its song differs from that of any of those before mentioned, being a long smooth trill, pitched higher but possessing more tone than that of the Grass- hopper- Warbler, 4. nxzvius—the Salicaria locustella of many authors —which is a widely-distributed species throughout the British Isles, not only limited to marshy sites, but affecting also dry soils, in- habiting indifferently many kinds of places where there is tangled and thick herbage, heather, or brushwood. In those parts of England where it was formerly most abundant it was known as the Reeler or Reel-bird, from its song resembling the whirring noise of the reel at one time used by the spinners of wool. The precise determination of this bird—the Grasshopper Lark, as it was long called in books, though its notes if once heard can never be mistaken for those of a grasshopper or cricket, and it has no affinity to the Larks—as an English species is due to the discernment of Gilbert White in 1768. Inits habits itis one of the most retiring of birds, keeping in the closest shelter, so that it may be within a very short distance of an eager naturalist without his being able to see it, —the olive-colour, streaked with dark brown, of its upper plumage helping to make it invisible. The nest is very artfully concealed in the thickest herbage, The foreign forms of Aquatic Warblers are far too numerous to be here mentioned.

In the scheme already mentioned, a Subfamily Drymecing, with 15 genera and nearly 200 species, is recognized. That such a natural group may exist is quite likely, but about its composition and limits much doubt cannot fail to be entertained. If its existence be acknowledged, the remarkable genera Orthotomus with about 12 and Cisticola with some 30 species may be fairly admitted as belonging to it. The former ineludes the Tailor-birds of the Indian region of which all have heard or read, for their habit of sewing together the leaves of plants so as to form a cone in which to build their nests has often been described and the fabric figured.

Jerdon (B. India, ii. p. 166) writes of the common Indian Tailor-bird, O. longicauda, that it " makes its nest of cotton, wool, and various other soft materials," and " draws together one leaf or more, gene- rally two leaves, on each side of the nest, and stitches them together with cotton, either woven by itself, or cotton thread picked up; and, after passing the thread through the leaf, it makes a knot at the end to fix it." Cuistécola, of which one species inhabits the south of Europe, follows the same trade on stems of grass, confining them by stitches above the nest, which assumes a globular form.

In the same group Drymecing is placed by some authors the Australian genus Malurus, to which belong the birds known as 'Superb Warblers," and they are not inaptly so named, since in beauty they surpass any others of their presumed allies. Part of the plumage of the cocks in breeding-dress is generally some shade of intense blue, and is so glossy as to resemble enamel, while black, white, chestnut, or scarlet, as well as green and lilac, are also present in one species or another, so as to heighten the effect. But, as already stated, there are systematists who would raise this genus, which contains some 15 species, to the rank of a distinct Family, though on what grounds it is hard to say.

Of the other Subfamilies, Saxicoline, Sylvtins, and Phylloscopinz, will be conveniently treated under WHEATEAR, WHITETHROAT, and [Willow-] WREN (gq.v.), while the Ruticilling have been already mentioned under NIGHTINGALE, REDBREAST, and REDsTART, and the Accentoring under [Hedge-] SpaRRow.

The birds known as " American Warblers," forming what has now for a long while been almost universally recognized as a distinct Family, Mniotiltide, remain for consideration. They possess but nine instead of ten primaries, and are peculiar to the New World. More than 130 species have been described, and these have been grouped in 20 genera or more, of which members of all but three are at least summer-visitants to North America, AS a whole they are much more brightly coloured than the Sylviidw (Malurus, if it belongs to them, always excepted); for, though the particular genus Mniotilta (from which, as the fortune of nomenclature will

have it, the Family takes its right name)! is one of the most abnormal—its colours being plain black and white, and its habits rather resembling those of a TREE-CREEPER (q.v.)—in other groups chestnut, bluish-grey, and green appear, the last varying from an olive to a saffron tint, and in some groups the yellow predominates to an extent that has gained for its wearers, belonging to the genus Dendreca, the name ot #*Golden" Warblers. In the genus Seto- phaga, the members of which deserve to be called " Fly-catching"' Warblers, the plumage of the males at least presents yellow, orange, scarlet, or crimson. Dr Coues (Key N.-Am. Birds, ed. 2, p. 288), following on the whole the arrangement of Baird, Brewer, and Ridgway (N.~~Anv. Birds, i. p. 178), separates the whole Family (for which he arbitrarily retains the name Sylvicolidx) into three Sub~~ families, Sylvicolinw (= Mniotilting), Icteriine, and Sctophagine, grouping the genera Mniotilta, Parula, and Peucedromus as " Creep- ing Warblers"; Geothlypis, Oporornis, and Siurus as " Ground. Warblers"; Protonoteria, Helminthotherus, and Helininthophila as "Worm-eating Warblers"; Setophaga, Cardellina, and Mytodioctcs as "Fly-catching Warblers"; Jcteria, which perhaps may not belong to the Family, standing alone; and Dendraca as '* Wood- Warblers."

The Afniotiltide contain forms exhibiting quite as many diversc modes of life as do the Sylviidw. Some are exclusively aquatic in their predilections, others affect dry soils, brushwood, forests, and soon. Almost all the genera are essentially migratory, but a large proportion of the species of Dendraca, Setophaga, and cspecially Basileuterus, seem never to leave their Neotropical home; while the genera Leucopeza, Tcretristis, and Microligia, comprising in all but 5 species, are peculiar to the Antilles. The rest are for the most part natives of North America, where a few attain a very high latitude,? penetrating in summer even beyond the Arctic Circle, and thence migrate southward at the end of summer or in the fall of the year, some reaching Peru and Brazil, but a few, as, for instance, Parula pitiayumi and Geothlypis vclata seem to be resident in the country last named,

To return, in conclusion, to the Sylviidz, or true Warblers, it is to be hoped that before long some com- petent ornithologist will take on himself the task, necessary if toilsome and perhaps ungrateful, of revising the work that has lately been done upon them and upon the Turdide, and, setting aside all preconceived notions except that of aiming at the truth, without prejudice fix the limits of the two Families, if Families they be, and at the same time adjust the relations of the hitherto very indefinite group Zrmeliide. aN.)

WARBURTON, Extot BartHotomew Grores (1810- 1852), traveller and novelist, born in 1810 near Tullamore, Ireland, made a hit with his first book, The Crescent and the Cross. It was a book of Eastern travel, in Turkey, Syria, Palestine, and Egypt, and fairly divided public attention with Mr Kinglake's Zothen, which appeared in the same year, 1844, Interest was centred in the East at the time, and Warburton had popular sympathy with him in his eloquent advocacy of the annexation of Egypt; but, apart from this harmony with the tastes of the time, the traveller had so many adventures, told them with such spirit, de- scribed what he saw with such picturesque vigour, and sketched character with such animation and generosity, that the success of the book on its merits was perfectly legitimate. Warburton was an Irishman, with an Irish- man's rhetoric and spirit of adventure, who, after an educa- tion at Cambridge, was called to the Irish bar, tried to settle down on his paternal estate, but very soon abandoned the management of his tenants for a life of nobler excitement. His first success as an author tempted him to try again, but he had unhappily a short career, and did not again equal Zhe Crescent and the Cross. His most substantial work was a Memoir of Prince Rupert, published in 1849, enriched with original documents, and written with eloquent partiality for the subject. This was followed in 1850 by a novel, Reginald Hastings, the scenes of which

1 By some writers the Family is called Sylvicolid%, a practice which contravenes the ordinary usage of nomenclaturists, since the name Sylvicola in ornithology is preoccupied by its employment in con- chology.

2 Seven species have been recorded as wandering to Greenland, and

one, Dendreca virens, is said to have occurred in Europe (Nau- mannia, 1858, p. 425).

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were laid in the same period of civil war. It was much more commonplace than his travels, and showed no power of construction or felicity in the creation of character. He produced another historical novel, Darien, or The Merchant Prince (1851). The knowledge therein shown of the inhabitants of the isthmus led to his selection by the Atlantic and Pacific Company to explore the country and negotiate a treaty with the Indian tribes. He sailed on this mission in the "Amazon," which perished by fire with nearly all on board on the 4th of January 1852.

His Life of the Earl of Peterborough was published posthumously in 1853. To the Memoirs of Horace Walpole (1851), nominally edited by him, he contributed, as he avowed in the preface, only his advice to the anonymous author and the countenance of his name.

WARBURTON, Witiiam (1698-1779), bishop of Gloucester, was the son of the town-clerk of Newark, where he was born on December 24, 1698. He was educated at Oakham and Newark grammar schools, but, being intended for his father's profession, does not seem to have addicted himself especially to the classics, or to have manifested extraordinary proficiency in any study. He lost his father while a boy, and in 1714 he was articled to Mr Kirke, attorney at Great Markham, in Nottinghamshire, and after serving his time with him returned to Newark with the intention of practising as a solicitor. Whether he ever did seems uncertain, but a very short time afterwards he is found studying Latin and Greek under the master of Newark school, who frequently sat up till late at night with his pupil. In 1723 he was ordained deacon by the archbishop of York, and on March 1, 1727, received priest's orders from the bishop of London. He had occupied the interval in various literary labours, the most important being the notes he contributed to Theobald's edition of Shakespeare, and an anonymous pamphlet on a question which had arisen concerning the jurisdiction of the Court of Chancery. Warburton had undertaken to answer another anonymous pamphlet, which proved to be the composition of no less a person than Mr Yorke, afterwards Lord

Chancellor Hardwicke, and the impression which he made upon his antagonist was evinced by the pains the latter took with his reply. He now re- ceived from Sir Robert Sutter the small living of Griesley, in Nottinghamshire, exchanged next year for that of Brant Broughton, in Lincolnshire, and was made an honorary M.A. of Cambridge. Here for eighteen years he spent his time in intense study, the first result of which was his celebrated treatise on the alliance between church and state, published in 1736. The work was probably intended, and certainly admirably adapted, to afford the ministry of the day an excuse for omitting to redeem their promise to the Dissenters of freeing them from the bondage of the Test and Corporation Acts. To this end the test is represented as the only possible means of reconciling the principle of a religious establishment with that of a free toleration, a piece of logic which, now that religious tests are no longer held a qualification for civil office, would excite most opposition where it originally gained most favour. It fully answered its tenrporary purpose, and equally subserved the author's real end by gaining him credit at court. It would appear that he only missed immediate preferment by the death of Queen Caroline. His next performance, the famous Divine Legation of Moses Demonstrated on the Principles of a Religious Deist, the first part of which was published in 1738, will long preserve his name as the author of the most daring and ingenious of theological paradoxes. The deists had made the absence of any inculcation of the doctrine of a future life an objection to the divine authority of the Mosaic writings. Warburton boldly admits the fact and turns it against the adversary No human legislator, he contends,

would have omitted such a sanction of morality; ergo, the legislation was divine. It may be doubted whether the argument ever convinced any one; and its cogency was not assisted by the multitude of minor paradoxes with which it was interwoven, such as the identification of the scenery of the sixth book of the dmeid with the exhibitions of the Eleusinian mysteries. But the author's extraordinary power, learning, and originality were acknowledged on all hands, though he excited censure and suspicion by a circumstance highly honourable to him, his tenderness to the alleged

heresies of Conyers Middleton. The second volume of the work appeared in 1741.

Warburton's next undertaking, though still theological, brought him into the field of general literature. Either in quest of another paradox, or actually unable to recognize the Spinozistic tendency of Pope's Lssay on Man, he entered upon its defence against Crousaz, in a series of articles contributed to The Republic of Letters. Whether Pope had really understood the tendency of his own work has always been a question, but there is no question that he was glad of an apologist, or that Warburton's jeu d'esprit (for him it was hardly more) in the long run did more for his fortunes than all his erudition. It occasioned a sincere friendship between him and Pope, whom he persuaded to add a fourth book to the Dunciad, and substitute Cibber for Theobald as the hero of the poem. Pope bequeathed him the copyright and the editorship of his works, and contributed even more to his advancement by introducing him to Murray, afterwards Lord Mansfield, who obtained for him the preachership of Lincoln's Inn, and to Ralph Allen, who, says Johnson, "gave him his niece and his estate, and, by consequence, a bishopric." The marriage took place in 1745, and from that time Warburton resided principally at his father-in-law's estate at Prior Park, in Gloucestershire, which he inherited on Allen's death in 1764. In 1747 appeared his edition of Shakespeare, into which, as he expressed it, Pope's previous edition was melted down. He had previously entrusted notes and emendations on Shakespeare to Sir Thomas Hanmer, whose unauthorized use of them led to a warm controversy. Warburton was further kept busy by the attacks on his Divine Legation from all quarters, by a dispute with Bolingbroke respecting Pope's behaviour in the affair of Bolingbroke's Patriot King, and (1750) bya work of more importance in vindication of the alleged miraculous inter- ruption of the rebuilding of the temple of Jerusalem undertaken by Julian. Here again Warburton shows his habitual intrepidity as a controversialist, and places himself upon ground where few at the present day would care to follow him. His defence of revelation was con- tinued in his View of Bolingbroke's Posthumous Writings (1754), universally allowed to be a most masterly per- formance. Warburton's manner of dealing with opponents would be in our day considered both insolent and rancorous, but it did him no disservice in his

own. In 1757 he was made dean of Bristol, and in 1760 bishop of Gloucester.

Mr Abbey characterizes Warburton as an inactive bishop, and the partial Hurd can say no more than that "he per- formed the duties of his office with regularity, but further than this he could not prevail with himself to go." Nor did he ever seek to shine in parliament. He continued, however, active with his pen, so long as the infirmities of age allowed, collecting and publishing his sermons, reprint- ing his principal works with large additions, toiling to complete the Divine Legation, the last book of which appeared after his death, and writing (1762) a vigorous attack on Methodism under the title of The Doctrine of Grace. Of this work his friend and biographer Hurd says, with curious infelicity, "the sect will find a sort of

immortality in this discourse." The reverse has proved true, yet the book ranks among the author's most powerful productions. He also engaged in a keen controversy with Bishop Lowth on the book of Job, which even his admir- ing biographer wishes forgotten. His last important act was to found, in 1768, the Warburtonian lecture, "to prove the truth of revealed religion from the completion of the _ prophecies in the Old and New Testament which relate to the Christian church, especially to the apostacy of Papal Rome." 'On the right determination of the prophecies relating to Antichrist," he said, "one might rest the whole truth of the Christian religion,"—another opinion which finds little support in the 19th century. The principal authority for his latter years is his correspondence with his friend Bishop Hurd, an important contribution to the literary history of the period. After the death of his only son in 1776 he fell into a lethargic languor, which was terminated by death on June 7, 1779.

Warburton was undoubtedly a great man, but his intellect, marred by wilfulness and the passion for paradox, has effected no result in any degrce adequate to its power. He disdained to per- suade unless he could at the same time astonish, and in endeavour- ing to amaze he has failed to convince. None of the propositions with which his name is chiefly connected have found acceptance with posterity, and while abundantly

demonstrating lis own learn- ing he has failed to make any considerable addition to the stock of human knowledge, or to leave any signal mark on the history of opinion. He was rather a gladiator than a warrior, an exhibitor of brilliant fence leading to no definite end. Though always faith- ful to his convictions, he argued for victory rather than truth, and wasted upon advocacy powers which would have produced great results if they had been employed in serious and dispassionate investigation. His rude and arrogant style of controversy deserved and received severe reprehension ; it was at all events free from pettiness and malignity ; and his faults were in general those of an aspiring and magnanimous nature. He was a warm and constant friend, and gave many proofs of gratitude to his bencfactors. As an editor and -critic he displayed much force of mind, but his standard of research was not high, and his literary taste was that of the 18th century. (R. G.)

WARD. See Inrant.

WARD, Epwarp Marruew (1816-1879), history and genre painter, was born at Pimlico, London, in 1816. Among his early boyish efforts in art was a series of clever illustrations to the Rejected Addresses of his uncles Horace and James Smith, which was followed soon afterwards by designs to some of the papers of Washington Irving. In 1830 he gained the silver palette of the Society of Arts ; and in 1835, aided by Wilkie and Chantrey, he entered the schools of the Royal Academy, having in the previous year contributed to its exhibition his portrait of Mr O. Smith, the comedian, in his character of Don Quixote. In 1836 he went to Rome, where in 1838 he gained a silver medal from the Academy of St Luke for his Cimabue and Giotto, which in the following year was exhibited at the Royal Academy. The young artist now turned his thoughts to fresco-painting, which he studied under Cornelius at Munich. in 1843 he forwarded his Boadicea Animating the Britons previous to the Last Battle against the Romans to the competition for the decoration of the Houses of Parliament,—-a work upon which he was after- wards engaged, having in 1853 been directed by the fine art commissioners to execute eight subjects in the corridor of the House of Commons. The success of his Dr Johnson in Lord Chesterfield's Ante-Room—now in the National Gallery, along with the Disgrace of Lord Clarendon (the smaller picture) (1846), the South Sea

Bubble (1847), and James II. receiving the News of the Landing of the Prince of Orange (1850)—secured his election as an associate of the Royal Academy in 1847, and in 1855 he gained full academic honours. Among the more important of his other works may be named Charlotte Corday Led to Execution (1852), the Last Sleep of Argyll (1854), the Emperor of the French Receiving the Order

of the Garter (1859), painted for the queen, the Ante- chamber at Whitehall during the Dying Moments of Charles II. (1861), Dr Johnson's First Interview with John Wilkes (1865), and the Royal Family of France in the Temple, painted in 1851, and usually considered the artist's masterpiece. For several years before his death Ward suffered from ill-health and mental depression, which led to temporary aberration of intellect. He died at Windsor, on January 15, 1879.

Ward's pictures have been extremely popular, and the engrav- ings which reproduce so many of them have had a wide circulation. His works are gencrally interesting in subject; they tell their story with point and clearness, are correct and learned in costume, and full of observation.and character. In purely technical qualities, in lighting, tone, colour, and draughtsmanslup, they are more fre- quently open to exception.

WARD, James (1769-1859), animal painter and engraver, was born in Thames Street, London, on October 23, 1769. At the age of twelve he was bound apprentice with J. Raphael Smith, but he received little attention and learnt nothing from this engraver. He was after- wards instructed for over seven years by his elder brother, William Ward, and he engraved many admirable plates, among which his Mrs Billington, after Reynolds, occupies a very high place. He presented a complete set of his engravings, in their various states, numbering three hundred impressions, to the British Museum. While still a youth he made the acquaintance of George Morland, who afterwards married his sister; and the example of this artist's works induced him to attempt painting. His early productions were rustic subjects in the manner of Morland, which were frequently sold as the work of the more celebrated painter. His Bull-Bait, an animated composi- tion, introducing many figures, attracted much attention in the

Royal Academy of 1797. A commission from Sir John Sinclair, president of the new agricultural society, to paint an Alderney cow led to much similar work, and turned Ward's attention to animal-painting, a department in which he achieved his highest artistic successes, his renderings of cattle being unrivalled in the English school, and worthy to rank with the pictures of the great animal- painters of Holland: His Landscape with Cattle, acquired for the National Gallery at a cost of £1500, was painted in 1820-22 at the suggestion of West, in emulation of the Bull of Paul Potter at The Hague. His Boa Serpent Seizing a Horse was executed in 1822, and his admirable Grey Horse, shown in the Old Masters' Exhibition of 1879, dates from 1828. Ward also produced portraits, and many landscapes like the Gordale Scar and the Harlech Castle in the National Gallery. Sometimes he turned aside into the less fruitful paths of allegory, as in his unsuccessful Pool of Bethesda (1818), and Triumph of the Duke of Wellington (1818). He was a frequent contributor to the Royal Academy and the British Institution, and in 1841 he collected one hundred and forty examples of his art, and exhibited them in lis house in Newman Street. He was elected an Associate of the Royal Academy in 1807, and a full member in 1811, and died at Cheshunt on the 23rd of November, 1859.

Ward compiled an autobiography, of which an abstract was published in the Art Journal in 1849.

WARD, Wituiam (1766-1826), mezzotint-engraver, an elder brother of James Ward (see above), was born in London in 1766. He was the most distinguished pupil of J. Raphael Smith, and executed a great part of many of the plates which bear the name of that excellent engraver. In 1795 he began to exhibit in the Royal Academy, of which in 1814 he was elected an associate engraver. He also held the appointment of mezzotint-engraver to the prince regent and the duke of York. He executed six plates after Reynolds, engraved many of the

works of his brother-in-law, George Morland, and his mezzotints after Andrew Geddes, which include the full- lengths of Sir David Wilkie and of Patrick Brydone, are of great merit. His engravings are full of artistic spirit, and show fine feeling for colour; and they are excellently tender and expressive in their rendering of flesh. He died suddenly at Mornington Place, on December 1, 1826.

WARDHA, or Wurpa, a British district in the chief commissionership of the Central Provinces of India, with an area of 2401 square miles. It lies between 20° 18' and 21° 21' N. lat. and 78° 4' 30" and 79°15' E. long, and forms a triangle with its apex towards the north-west, the base resting on Chanda district ; on the east it is bounded by Nagpur, and on the west the Wardha river separates it from Berar. Wardha is hilly in the north, and intersected by spurs from the Satpura range. The central portion includes the three peaks of Malegdon (1726 feet), Nandgton (1874 feet), and Jaitgarh (2086 feet). From this cluster of hills numerous small streams lead to the Wardha river on the one side, while on the other the Dham, Bor, and Asodé ndld flow down the length of the district in a south-easterly direction. The Wardha, and its affluent the Wana, are the only rivers of any import- ance. To the south the country spreads out in an undulating plain, intersected by watercourses, and broken here and there by isolated hills rising abruptly from the surface. In general the lowlands are well wooded. Leopards, hyzenas, wolves, jackals, and wild hogs abound in the district ; other animals found are the spotted deer, nilgar, wild goat, and antelopes. Among birds are the bustard, partridge, quail, and rock pigeon. There are numerous roads and 65 miles of railway. The district is subject to great variations of climate, and the rainfall at Wardha town averages nearly 40 inches.

The census of 1881 disclosed a population of 387,221 (males 195,564, females 191,657), Hindus numbering 328,523, Moham- medans 14,200, Christians 96, and aboriginals 41,988. The dis- trict contains five towns with a population exceeding 5000. Wardha (5816), the chief town, has wide and regular streets, having been built in 1866. Of the total area 1500 square miles are cultivated; while of the portion lying waste 380 square miles are returned 'as cultivable. The chief crops are cottou, wheat, other food-grains, and oil-seeds. The only manufacture of any

importance is cotton cloth, the greater part of which is exported ,

to Berar and to the districts farther west. Cotton thread, blankets, gunny, and rope are also made, and since the completion of the railway a considerable trade has also sprung up in butter, which finds a ready sale in the Bombay market. But by far the most unportant article exported is

the raw cotton known as ‘ Hingan- ghats,” from the cotton mart of thatname. The principal imports are salt, English piece goods, hardware, and spices. In 1886-87 the gross revenue of the district amounted to £99,955, of which the land yielded £51,494. The history of Wardha forms part of that of Nagpur district, from which it was separated in 1862 for administrative purposes.

WARE, an ancient market-town of Herts, England, is situated in a valley en the north side of the river Lea, and ona branch of the Great Eastern Railway, 2 miles east-north-east of Hertford, and 224 north of London by rail, The principal street is the spacious High Street, running east and west by the river. The houses are chiefly modern, but there are a few of the old timber frame-houses. The Lea, by means of which there is good water communication, is crossed by an iron bridge erected in 1845. The New River Head is half a mile distant, The parish church of St Mary is a large and handsome cruciform building of flint and stone in the Perpendicular style, consisting of chancel (built, it is supposed, by Lady Margaret Beaufort, countess of Richmond, and mother of Henry VIL), lady chapel to the south (about 1380), nave of five bays of the time of Richard II., transepts, aisles, south porch, and embattled tower of the time of Edward III. There is an elaborate font of the time of Henry Is, and a few old brasses and monuments. The church has

undergone restoration in 1848, 1881, and 1885-86. The modern mansion of the Priory, to the west of the town, occupies the site of a priory of the order of St Francis, founded by Margaret, countess of Leicester, sister of Henry III., who was then lady of the manor of Ware. A con- siderable portion of the original building is incorporated in the modern one. Among the modern public buildings are the corn exchange and the town-hall, which includes a literary institute and library. There is a recreation ground 6 acres in extent, and a cemetery of 4 acres. The famous “great bed of Ware” referred to in Shakespeare’s Twelfth Night, which formerly was at the Saracen’s Head; has been removed to Rye House, 2 miles distant. The town possesses breweries and brick-fields, and there is a

large trade in malt. The population of the urban sanitary district (area about 641 acres) in 1871 was 4917, and in 1881 it was 5277.

Roman remains have been discovered at various times in the neighbourhood of Warc, and the Ermine Street crossed the Lea valley just a little above it. At the time of the Domesday survey the town had 180 inhabitants, and belonged to Hugh de Grentemaisnil. In the reign of John it came into the possession of Saier de Quincy, carl of Winchester, who, by forcing the thoroughfare of the bridge by breaking the chain, and thus freeing the bridge of toll, greatly increased the tradeofthe town. The tolls were, however, again imposed. Thcy were granted by Charles I. to William, earl of Salisbury, and they are still collected from non-resident traders, Robert de Quincy in 1254 received for the town the grant of a market and fair from Henry III. In the 15th century it came into the possession of the earl of Warwick, the king-maker, On the death of Richard, duke of Gloucester, it was settled by Henry VII. on his mother, the countess of Richmond. It was then granted to Margaret Plantagenet, countess of Salisbury, on whose execution in 1541 it reverted to the crown. Queen Mary on her accession restored it to Catherine, countess of Huntingdon, granddaughter of the countess of Salisbury, who about 1570 sold it to Thomas Fanshawe, remembrancer in the exchequer. About 1700 the manor was sold to Sir Thomas Byde, a London brewer, in whose family it remained till 1846. Ware is the "town of fame" alluded to by Cowper in his "John Gilpin." William Godwin was for some time minister of the Independent chapel there. William of Ware was the teacher of Duns Scotus. a

WARMINSTER, an ancient market-town of Wiltshire, England, is situated on elevated ground, at the western extremity of Salisbury Plain, near the Somerset border, on the river Wily, and on a branch of the Great Western Railway, 17 miles south-west of Devizes, 21 north-west of Salisbury, and 105 south-south-west of London by rail. It consists chiefly of one street about a mile in length. The parish church of St Denys is an ancient stone struc- ture of various styles, the south porch and tower being of the time of Edward III, the chancel Perpendicular, and the nave of the 18th century. It is now (1888) under- going complete restoration at a cost of £9000, the nave being in process of entire reconstruction. The

town-hall was erected by the marquis of Bath in 1830. Among the benevolent institutions are the free school, established in 1707 by the first Viscount Weymouth, the missionary college of St Boniface (1860), the community of St Denys home (1866) for training young women to assist in mis- sionary work, the Wilts reformatory for boys (1856), the cottage hospital (1866), the almshouses for four aged women (1873), and an orphanage. The town possesses a large silk mill, engineering and agricultural implement works, and malt-works. There isa considerable agricultural trade. The population of the urban sanitary district (area 6370 acres) in 1871 was 5786, and in 1881 it was 5640.

Warminster is probably of ancient British origin, and the neighbourhood is remarkable for the number of its barrows. 'The old Roman road from Old Sarum to Bath skirted Warminster to the north. Camden supposes it to have been the Roman Verlucio, and, although this conjecture is probably wrong, there can be no doubt that it was a Roman station of importance. The barrows within the entrenchments at Battlesbury camp, a little to the east, indicate an earlier than Roman occupation, but the entrenchments were probably themselves the work of the Romans. A great variety

of Roman remains have been found in the neighbourhood of the town. Warminster was a royal manor in the time of Edward the Confessor, and as such was free of taxes and assessments. In Domesday the name occurs as Guerminster. It then possessed 30 burgesses and probably a total population of over 400. It was bound to provide a night's lodging for the king and all his retinue. Its early importance was chiefly owing to its situation at the junction of the roads from Bath, Frome, Salisbury, and Shaftesbury. It remained a royal manor till the reign of Henry II.
WARRANT, in law, is an authority empowering a person to act in a way which would not be lawful without such authority. The term occurs very early in consti- tutional documents : it is found in the Assize of Clarendon and the Assize of the Forest, both in the reign of Henry JI. A warrant must be under the hand and seal of the person issuing it, unless such formalities be dispensed with by statute. Warrants are of several kinds,

and may be conveniently divided into four classes, which may be called the executive, the judicial, the financial, and the private. Executive.—A. warrant under the sign-manual of the king, countersigned by the lord chancellor or a secretary of state, is still in use for some purposes. It is the means of granting ParDon (q.v.) and letters patent (except those for inventions), and of framing certain regulations for the forces. It was by royal warrant (afterwards confirmed by Act of Parliament) that purchase of commissions in the army was abolished in 1871.1 By 18 Hen. VI. c. 1 letters patent are to bear the date of the king's warrant delivered to the lord chancellor. The issue of warrants under the sign-manual has been recently regulated by the Great Seal Act, 1884. Such a warrant must bear a ten- shilling stamp. Royal warrants were at one time in con- siderably more frequent use than they are at present. For instance, in 1602 the censorship of the stage was committed to the poet Daniel by royal warrant (see THEATRE). A false representation that any goods were made by a person holding a royal warrant is now punishable under the Merchandise Marks Act, 1887. The issue of warrants under the hand of a secretary of state is now, with two exceptions, confined to cases in which there is suspicion of treason or treasonable practices, and the warrant must name the person whom it is intended to arrest. The ex- ceptions are the cases of bringing up a prisoner to give evidence under 16 and 17 Vict. c. 30, and warrants issued under the Extradition Act (see Extrapition). By 16 Car. I. c. 10, if any person be imprisoned by warrant of the king in person, of the council board, or any of the privy council, he is entitled to a writ of habeas corpus. By the Habeas Corpus Act, 31 Car. II. c. 2, detention on a legal warrant is good ground for refusing discharge to the prisoner on return to a writ of habeas corpus. General warrants of a secretary of state were decided to be illegal in 1763. A named person may still be committed by a secretary of state's warrant, but his papers cannot be seized (see Press Laws). Power to issue warrants to search for arms and to arrest for treason or treasonable practices in Ireland has been given by various Acts, eg., 44 Vict. cc. 4, 5, and by the Criminal Law and Procedure Act, 1887. The right of a secretary of state or the lord lieutenant in Jreland by warrant to detain or open letters in the post- office still exists, and has been recognized by orders in council and proclamations in the 17th century, and more recently by various Post-Office Acts, such as 9 Anne c. 10, eo Geo. ITI. en62, 7 Will. IV. and 1 Viet. e386. The right was finally

established by the reports of committees of both houses appointed in 1844 on a complaint by Mazzini and others that Sir James Graham, then home secretary, had opened their letters. It was exercised as

1 The warrant officer (so called no doubt from the mode of his appointment) is a distinct rank in both the army and navy. For the warrant officer in the navy, see vol. xvii. p. 298.

recently as 1881 over the letters of persons suspected of treasonable correspondence in Ireland. Committal for breach of privilege of the House of Commons is by war- rant of the speaker. A warrant of a law officer of the crown for sealing letters patent for invention was necessary under the old patent law, but has been superseded by other procedure since the Patents Act, 1883. The lowest form of executive warrant is the warrant of a sheriff to his bailiff in pursuance of a writ.

Judicial.— Warrants of this kind are used in either civil or criminal procedure. The only kind used in both seems to be that issued by a judge of the High Court, who has the same jurisdiction as a secretary of state under 16 and 17 Vict. c. 30. In civil procedure the warrant in a county court corresponds very nearly to the Writ (¢.v.) in the High Court. Examples of county court warrants are those of attachment, delivery, execution, and possession. The warrant of arrest in Admiralty is a form of procedure con- fined to Courts of Admiralty jurisdiction. The most im- portant and frequent use of the warrant is for the appre- hension of an accused person to be brought before a court of summary jurisdiction, either in the first instance or on failure to obey a summons (see SUMMARY JURISDICTION, Summons). Such warrants are usually issued by a justice of the peace ; when issued by the court they are called bench warrants. Where issued by a justice for execu- tion out of his jurisdiction, a warrant must usually be backed by another justice having jurisdiction where it is to be executed. The warrant of a justice may also issue in some non-judicial matters, e.g., for the compul sory supply of carriages under the Army Act, 1881. There are certain warrants which by common law or statute extend much further than ordinary judicial warrants. Those issued under the Fugitive Offenders Act, 1881, if duly

backed, extend throughout the British empire. Warrants of a court having jurisdiction in bankruptcy run throughout the United Kingdom. A judge of the Queen's Bench Division has, both at common law and by statute, authority to issue a warrant in certain cases. Such a warrant is valid throughout England. Execution of the decisions of a court of summary jurisdiction is secured by warrants, part of the process of the court, such as warrants of distress or commitment. A warrant may also issue for the apprehension of a witness whose attendance cannot be otherwise assured. A search warrant may be granted for the purpose of searching suspected premises for stolen goods. Special powers for issuing such warrants are given by the Army, Merchant Shipping, Customs, Pawnbrokers, Stamp, and other Acts. The Criminal Law Amendment Act, 1885, allows the issue of search warrants where it is suspected that a female is unlawfully detained for immoral purposes. As a general rule no one can be arrested with- out warrant. To this rule there are certain exceptions either at common law or by statute. At common law a justice of the peace, a sheriff, a coroner, a constable, and even a private person, may arrest any one without warrant for a treason, felony, or breach of the peace committed, or attempted to be committed, in his presence. A constable (whether a constable at common law or a police constable appointed under the Police Acts) may arrest a person indicted for felony ; a constable or a private person may arrest on reasonable suspicion that he who is arrested has committed a felony. But in the latter case he does so at his peril, for he must prove (what the constable need not) that there has been an actual commission of the crime by some one, as well as a reasonable ground for suspecting the particular person. What is a reasonable ground it is of course impossible to define, but, in the case of a constable, a charge by a person not manifestly unworthy of credit is generally regarded as sufficient. An accused person who

has been bailed may be arrested by his bail, and the police may assist in the arrest. In neither case is a warrant necessary. Nor is it necessary for the apprehension of one against whom the hue and cry is raised (see THEFT). The king cannot arrest in person or by verbal command, as no action would lie against him for wrongful arrest. Statutory powers of

arrest without warrant are given to both constables and private persons by numerous Acts of Parliament, for instance, the Game Act of 9 Geo. IV. c. 69, various Police Acts, the Criminal Law Consolidation Acts of 1861, the Prevention of Crime Act, 1871. The possession of a legal warrant by a peace officer on arrest is of great importance in determining whether the person resisting apprehension is justified or not in so doing. Should the officer attempt to apprehend him on an illegal warrant, or without a warrant in a case where a warrant is necessary, and be killed in the attempt, the killing would probably be held to be manslaughter and not murder. The authorities on this point are, however, conflicting. In an action against a peace officer for arrest on an illegal

warrant, he is, by 24 Geo. II. c. 44, entitled to demand:

perusal and a copy of the warrant. Execution of warrants in border counties of England and Scotland, and backing and execution of warrants issued in one part of the kingdom by justices and officers of another part, are specially pro- vided for by numerous Acts of Parliament. Forms of warrants will be found in the schedule to the rules under the Summary Jurisdiction Act and the appendix to the County Court Rules, 1886.

Financial.—Payment out of the Treasury is generally made upon warrant. Treasury warrants are regulated by many of the Acts dealing with the national debt. Payment of dividends by trading corporations and companies is generally made by means of dividend warrants.

Private. —Warrants issued by private persons are either mercantile or non-mercantile. Mercantile warrants are negotiable instruments giving a right to the delivery of goods, generally those deposited at a dock or warehouse, and by mercantile custom regarded as documents of title to the goods to which they relate. They have been recog- nized by the legislature, especially in the Factors Acts (see Factor). Thus the interpretation clause of one of those Acts, 5 and 6 Vict. c. 39, included under the head of documents of title India warrants, dock warrants, and warehouse keepers' warrants. The forgery of any warrant or endorsement or assignment of any warrant of this kind is by 24 and 25 Vict. c. 98 punishable with a maximum penalty of penal servitude for life. The stamp

on such a warrant is, with certain exceptions, threepence. Among private warrants of a non-mercantile kind those in the most frequent use are warrants of distress, by which a land- lord empowers his agent to distrain for arrears of rent,

Warrant of Attorney to confess judgment is a security for money (now practically obsolete) in the form of a war- rant to a solicitor named by the creditor, empowering him to sign judgment in an action against the debtor for the sum due, with a defeasance, or clause that the warrant shall not be put into force in case of due payment of the money secured. It was often used as a collateral security for the payment of an annuity. The Debtors Act, 1869, contained various provisions for making known to the debtor the extent of the liability incurred by him, among others that the warrant must be executed in the presence of a solicitor named by the debtor, and that it and the defeasance must be written on the same paper. A warrant of attorney must be duly stamped, generally as a Morv- GAGE (q.v.), and must be registered as a judgment in the central office of the Supreme Court.

Quo WarranTo (¢.v.) is a means of determining the right of a person to continue to hold an office,

WAR—WAR

Scotland.—By Art. xxiv. of the Articles of Union royal warrauts were to continue to be kept as before the union. The Secretary for Seotland Act, 1885, enabled the crown by royal warrant to appoint the secretary to be viee-president of the Scotch Education Department. The lord advocate's warrant runs throughout the whole of Seotland. Warrants issued by courts of summary juris- diction agrcc in the main with those in use in England, though their names are not the same (see SUMMARY JURISDICTION). There are numerous statutory provisions as to warrants of other kinds, By I and 2 Vict. ce, 114 warrants for diligence, and to charge the debtor under pain of imprisonment, may be inserted in an extract of deeree ; and in a summons concluding for payment of money a warrant to arrest the movables, debts, and money of the defender may be included. By 31 and 82 Vict. c. 100 a warrant of in- hibition may be inserted in the will of asummons. A crown writ is a warrant for

infeftment (31 and 32 Vict. c. 101). The same Act gives forms of warrants of REGISTRATION (g.v.). The practice as to warrants of citation and commitment in the High Court of Justiciary and the sheriff court now depends chiefly on the Crimiual Procedure Act, 1887, 50 and 51 Vict. c. 85. The medi- tatio fuge warrant is a judicial warrant on which imprisonment may follow until the debtor give eautio judicio sisti. It corresponds to some extent to the writ ne exeat regno of English practice, but it may be issued by a sheriff (1 and 2 Vict. c. 119). A border war- vant for arresting a debtor on the English side of the border is another kind of judicial warrant. The warrant of attorney is not known in Scotland, its place being taken by the clause of registra- tion, which has this advantage over the warrant of attorney that: it is not avoided, as is the warrant, by the death of the persou giving it.

United States.—By the constitutions of the United States and of almost all the States, warrants are uot to issue but upon prob- able cause, supported by oath or affirmation, and particularly describing the place to be searched and the persons or thing to be seized. These provisions have been held not to mean that there shall be no arrest without warrant, but to confine the right of arrest to circumstances similar to those which justify it in English law. The constitutions of some States forbid general warrants. A warrant is generally necessary for the payment of moncy out of the United States or a State treasury. (J. Wt.)

WARRANTY is etymologically another form of GUARANTEE (q.v.). It is used, however, in a rather different sense. The sense common to both words is that of a collateral contract, under which responsibility for an act is incurred, and for the breach of which an action for damages lies. Warranty generally expresses the responsi- bility of the person doing the act, guarantee the responsi- bility of some other person on his behalf. A warranty may be defined, in the words of Lord Abinger, as "an express or implied statement of something which the party undertakes shall be part of the contract, and, though part of the contract, collateral to the express object of it" (Chanter v. Hopkins, 4 Meeson and Welsby's Reports, 404). It differs from a condition in that a condition forms the basis of the contract and a breach of it discharges from the contract, and from a representation in that the latter does not affect the contract unless made a

part of it expressly or by implication, as in contracts of insurance and other contracts wherreme fide, or unless it be fraudulent. These

_ distinctions are not always accurately maintained. Thus

in 8 and 9 Vict. c. 106, § 4, condition seems to be used for warranty.

Warranty as it affected the law of real estate was, up to halfa century ago, a matter of the highest importance. A warranty ina conveyance was a covenant real annexed to an estate of freehold, and either expressed in a clause of warranty or implied in cases where a feudal relation might exist between feoffor and feoffee. The warranty, as deseribed by Littleton, § 697, was an outgrowth of feudalism, and something very like it is to be found in the Liber Feudorum. At the time of Glanvill the heir was bound to warrant the reasonable donations of his ancestor. Warranty was one of the elements in Bracton's definition of homage, 78), " juris vin- culum quo quis astringitur ad warrantizandum defendendum et acquietandum tenentem suuni in seisina versus omnes." For an express warranty the word warrantizo or warrant was necessary. The word " give" implied a warranty, as did an cxchange and certain kinds of partition. In order to bind heirs a clause of warranty was required. This. was either lineal, collateral, or commencing by disseisin. The differences between the three kinds were very technical, and depended on abstruse and obsolete

learning. They are treated at great length in old works on real property, especially Coke upon Littleton by Butler, 3646. The feoffor or his heirs were bound by voucher to warranty or judg- ment in a writ of warrantia chartz to yield other lands to the feoffee in case of the eviction of the latter. Vouching to warranty was a part of the old fictitious proceedings in a common recovery in use for the purpose of barring an entail before the Fines and Recoveries Act (see ENTAIL). Warranty of this nature, as far as it relates to the conveyance of real estate, though not actually abolished in all possible cases, is now superseded by covenants for title. The more usual of these are now by the Conveyancing Act, 1881, deemed to be implied in conveyances (see REAL ESTATE). For the implied warranties of title and quality sce SALE. Vouch- ing to warranty was at one time

important in the law of personalty as well as of realty. The procedure is fully described in Glanvill. The right of calling on the holder of lost or stolen goods to vouch to warranty (interciare), t.c., to give up the name of the person from whom he received them, under pain of forfeiture, was often granted under the name of thcam as a local franchise (see THEFT). Warranty, as it exists at present in the law of personalty, is either express or implied. There is no general] rule as to what constitutes a warranty. It is not necessary that an express warranty should be in writing, the law being that every affirmation at the time of sale of personal chattels is a warranty, provided that it appears to have been so intended, The principal cases of implied warranty occur in the contracts of sale and INSURANCE (q.v.). There is also an implied warranty in other kinds of contract, e.g., of seaworthi- ness by the shipowner in a contract between him and a charterer for the hire of a ship. In all cases of implicd warranty the warranty may be excluded by the special terms of the contract. For breach of warranty an action may be brought directly, or the breach may be used as ground for a counter claini or for reduction of damages, but the breach will not in the case of a warranty proper entitle the person suffering by it to a rescission of the contract. Thusina sale the property passes although the warranty be broken. In some cases warranties on sale are the subject of statutory enact- ments. By the Merchandise Marks Act, 1887, a vendor is deemed to warrant that the trade mark or trade description on any goods sold is genuinc. The Chain Cables and Anchors Act, 1874, enacts that every contract for the sale of a chain cable shall (in the absence of any stipulation to the contrary) imply a warranty that the cable has been duly tested and stamped. In some other Acts, such as the Bills of Exchange Act, 1882, the term warranty does not occur, but the practical effect is the same.

Scotland.—The term corresponding to warranty in the law of heritable property is " warrandice." Warranty, strictly speaking, seems confined to movables. Warrandice appears early in Scots law, the heir by Regiam Majestatem being bound to warrant the reasonable donations of lis ancestor. Warrandice in the existing law is either real or personal. Real warrandice is that whereby warrandice lands are made over, as indemnity for those conveyed, to assure the person to whom they were conveyed from loss by the appearance of a superior title. Real warrandice is implied

in ex- cambion. Its effect is that the excamber, in case of eviction, may recover possession of his original lands. This is not in accordance with the English law in exchange. Personal warrandice is either express or implied. There is an implied warrandice in every onerous deed, and an absolute warrandice presumes an onerous consideration. Express warrandice is either simple, against the future acts of the vendor, from fact and deed, against acts whether past or future, or absolute, or against all deadly, that is, on any ground existing before the sale. A clause of warrandicc is the Scottish equivalent of the English covenants for title. By 32 and 33 Vict. c. 116 a clause of warrandice in the form given in the schedule to the Act imports absolute warrandice as regards the lands and the title-deeds thereof, and warrandice from fact and deed as regards the rents. For the warranty in the sale of mov- ables see SALE.

United States.—Warranty in conveyances of real estate is ex- pressly abolished by statute in many States. In some States warranty is implied on the transfer and indorsement of negotiable instruments. (J. Wt.)

WARREN, Samuzt (1807-1877), author of Ten Thousand a Year, was born in Denbighshire in 1807. After a curriculum at the university of Edinburgh, of such distinction that he made the acquaintance of " Christopher North" through his undergraduate fame, he began the study of medicine, but soon abandoned it for the English bar. He entered at the Inner Temple in 1828, and was success- ful in his profession. He took silk in 1851, was made recorder of Hull in 1854, represented Medhurst in parliament for three years (1856-59), and was rewarded by his party leaders in 1859 with a mastership in lunacy. Meantime he had made a much more brilliant success in

fiction-writing. Very early in his career, before he was called to the bar, he had begun to write for Blackwood. His Passages from the Diary of a Late Physician appeared in that magazine between August 1830 and October 1831, being collected into two volumes in 1832. A third volume was published in 1838, the contents of which appeared originally in the same magazine between September 1832 and August 1837. These short stories, most of them of a horrible character, with morbid interest shielded under

a moral purpose, were extremely popular, and so realistic that as long as the writer remained anonymous it was customary for doctors to declare that some brother must be making capital of the secrets of his profession. Warren's brief experience as a medical student thus stood him in good stead. But his great success was Z'en Thousand a Year, which ran in Blackwood from October 1839 to August 1841, and was published separately immediately on its conclusion. Critics com- plained of the coarseness of the workmanship, of the banality of the moralizing, the crudeness of the pathos, the farcical extravagance of the humour; but meantime the work established itself as one of the most popular novels of the century. Of the higher qualities of imagination and passion Warren was destitute, but his sketches of character, especially farcical character, —Tittlebat Titmouse, Oily Gammon, Mr Quicksilver (an open caricature of Lord Brougham),—are bold and strong, forcibly imprinted on the memory, and the interest of the story is made to run with a powerful current. For several years Warren was content to be known as the author of Zen Thousand a Year, and many tales were told of his open pride in the achievement. In 1847 he made another venture, but Now and Then was not a success. The Lily and the Bee, a squib on the Crystal Palace, published in 1851, though it had the honour of translation into Italian, was a signal failure. A pessimistic dissertation on Zhe Intellectual and Moral Development of the Age, published in 1853, also fell flat, and thenceforth Warren, after publishing his Works, Critical and Imaginative, in four volumes in 1854, retired on his laurels. He died at London, July 29, 1877.

Besides his novels and other contributions to Blackwood, Warren wrote several legal works of repute—Jntroduction to Law Studies (1835), Extracts from Blackstone (1837), Manual of Parliamentary Law (1852).

His whole attitude towards the subject of insanity in its legal relations was determined by his clear perception and tenacious grasp of the fact that the disease insanity is merely one of the indicia of legal "unsoundness of mind;" he thus reduced medical expertism to its proper proportions, by treating the alienist as a witness and not a judge. The masterly brevity with which he addressed the jury in the Windham inquiry branded as practically irrelevant the mass of the evidence produced at the trial, and

pre- pared the public mind for the third section of the Lunacy Regulation Act of 1862.1 To the doctrine of moral insanity he offered an uncompromising but ineffective and, it must be confessed, an ignorant opposition. It is doubtful whether he understood the meaning, and it is certain that he had never studicd the evidenccs, of the theory which he so severely condemns. A writer who imagined that the cases of Oxford and MacNaughten bore any resemblance to the " observations" of Pinel was hardly qualified to criticize even the less worthy of his disciples. Yet this hostility was not altogether irrational. Exaggerating, indecd mistranslating, the language of Pinel, in whose work moral insanity appears as "manie sans délire," the English alienists had pressed into thcir service cases which were far less closely allied to insanity than to crime, and had claimed, in the name of science, to return the verdict whenever mental incompetence existed or was presumcd. Against these extravagant pretensions the school of Alderson and Rolfe arose in healthy revolt. Ignorant of, or possibly not caring to sift, the residuum of fact which undoubtedly they would have Se eRe ig

1]It is substantially as follows:—Under every commission, the inquiry shall be confined to the question whether or not the alleged lunatie is, at the time of sueh inquiry, of unsound mind, and no evidence as to his acts, demeanour, or state of mind at any time being more than two years before the date of the inquiry shall be receivable in proof of insanity, unless the judge or master shall otherwise direct.

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found in the standard literature of "manie sans délire," they believed moral insanity to be nothing more than the immoral and illogical plea with which English alienists had made them familiar, and they sternly refused to recognize it. To the exertions of this school, of which Samuel Warren was a distinguished member, we owe the wise jealousy with which the defence of moral insanity is now regardcd by alienists themselves. See Warren's Miscellanies, vol. ii., " High Treason and Murder—Moral Insanity" (1854); also Lhe Windham Trial, published by Wm. Olliver.

WARRINGTON, a municipal and parliamentary borough and market-town of England, chiefly in Lancashire but partly in Cheshire, is situated

on the Mersey, near the Sankey Canal, and on the London and North-Western main line and several branch lines of other railways, 18 miles west-south-west of Manchester, 20 east of Liver- pool, and 182 from London, The bridge across the Mersey, formerly forming the chief passage over the river from Lancashire to Cheshire, was partly destroyed on the approach of the rebels in 1745, was restored with a watch tower in the middle by parliament in 1747, was replaced by a wooden structure in 1812, and was rebuilt of stone in 1836 at a cost of £6000. The parish church of St Elphin, a cruciform building in the Decorated style, occupies the site of the ancient church, which was taken down about the beginning of the 15th century, the crypt being all of the old structure that now remains. The church now consists of chancel with chapels, nave, aisles, crypt, and embattled central tower and spire rising to the height of 300 feet. It was restored in 1859-67 at a cost of over £15,000. Among the principal modern public buildings are the town-hall, formerly the seat of Colonel Wilson- Patten, now Lord Winmarleigh, purchased in 1872 at a cost of £20,000; the museum and library, erected in 1857, enlarged by the addition of an art gallery and lecture-room in 1876, and again extended in 1881; the market hall (1857); the large covered market shed (1879, enlarged 1885); the public hall (1862); the public baths (1866); the school of art (1883); the infirmary and dis- pensary (1872); the infectious diseases hospital; and the Warrington clergy orphan institution (1697). The educa- tional institutions include a free grammar school, founded by one of the Boteler family in 1526, and a blue coat school.

Warrington, in the period before the introduction of railways, possessed specialadvantages through its connexion with the Mersey and Irwell navigation, and it now enjoys unusual facilities for the transit of heavy goods both by canal and railway, while its situation midway between Manchester and Liverpool, and on the main line of the London and North-Western Railway, forms one of the chief sources of its prosperity. It was referred to by Blome in 1683 as "a very fine and large town which hath a con- siderable market on Wednesday for linen cloth, corn, cattle, provisions, and fish, being much resorted to by the Welshmen." It was among the earliest of the manu- facturing towns of Lancashire,—coarse linens and checks being the manufactures which at first formed its staple goods, and afterwards sailcloth and sacking, Perhaps it is now best known

for its trade in heavy leather, the tanneries in its immediate neighbourhood consuming on an average about 10,000 hides a week. It has also a great variety of important iron manufactures, including iron in bar, hoop, and wire rod, and files and tools and pins. There are, besides, soap factorics, breweries, maltings, cotton mills, and glass-works. The town is divided into five wards, four of which are in Warrington proper, and one in Latchford. The corporation act as the urban sanitary authority. There isa commission of the peace and a police force. The gas supply is managed by the corporation, but the water supply is in the hands of a company. The population of the parliamentary borough (area 3783 acres)

in 1871 was 33,050, and in 1881 it was 45,253. The population of the municipal borough (area 1442 acres) in the same years was 32,144 and 41,452.

Warrington is stated to have been an ancient British and Roman town, but there are no traces of a Roman settlement on the north side of the Mersey. On the south side, however, near Wilderspool there are a considerable varicty of remains, which some identify with the station Condate. At Domesday, Warrington, under the name of Walintune, was at the head of a hundred now merged in West Derby. Its present name first occurs in the 12th century, when Matthew de Vilers gave the church of Warrington to the priory of Thurgarton. Shortly afterwards Warrington came into the family of Pincerna, or Boteler, the progenitors of the Butlers, earls and dukes of Ormonde. Sir William Boteler, who was high sheriff of the county, and governor of the castle of Lancaster, obtained for it, in 1255, from Henry IJI. the grant of a fair of three days' duration. In the 5th of Edward I. (1277) the charter was renewed, and another was obtained in 1285. About 1592 it was bought by the Irelands, and in 1631 it came into the possession of William Booth, father of Sir George Booth, first Lord Delamere. During the civil war it was held, in 1648, for the king by James, Lord Strange, seventh earl of Derby, who fortified it at great expense, and made it a centre for Royalist excursions, but after a siege of five days it surrendered to the Parliamentary troops. After the battle of

Preston in 1648, the remnant of the duke of Hamilton's army under General Baillie rallied at Warrington, and possessed themselves of the bridge, but surrendered on the approach of Cromwell. Henry Booth, second Lord Delamere, was created earl of Warrington on his retirement from the chancellorship of the exchequer in 1690. The town received parliamentary representa- tion in 1832, and was incorporated in 1847. Among persons of eminence connected with Warrington are Dr Aikin, editor of the Dictionary of General Biography, Lucy Aikin, Mrs Barbauld, John Kay, the clockmaker who assisted Arkwright in his mechanical experiments, and Dr Joseph Priestley.

See Warrington in 1165, in Chetham Society's Publieations, vol. xvii; Annals of the Lords of Warrington during the first Five Centuries after the Conquest, tbid., vols. Ixxxvi. and Ixxxvii.; Homage Roll of the Manor of Warrington, 14,91- 1517, in the publications of the Manchester Record Society, 1885; Kendrick, Profiles of Warrington Worthies, 1859.

WARSAW, a government of Russian Poland, occupies a narrow strip of land to the left of the lower Bug and of the Vistula from its junction with the Bug to the Prussian frontier, and is bounded by the Polish govern- ments of Ptock and Eomza on the N., Siedlce on the E, and Radom, Piotrkow, and Kalisz on the S. It has an area of 5623 square miles and in 1885 the population was 971,730, of whom 384,000 were then reckoned as living in the capital. It occupies the great plain of central Poland and Mazovia, and is low and flat, with only.a few hills in the south, and along the course of the Vistula in the north- west, where the terraces on the left bank descend by steep slopes to the river. Terrible inundations often devastate the region adjacent to the confluence of the Vistula with the Narew and Bug, and marshes cover the low-lying grounds. The soil, which consists chiefly either of boulder clay, lacustrine clays, or sandy fluviatile deposits, is not particularly fertile. The Vistula traverses the government from south-east to north-west, and is joined by the Narew and Bug from the right, and by the Bzura from the left. It is an important channel of communication (see PoLanp, vol. xix. p. 307).

The population consists of Poles and Mazurs (Roman Catholics, 76 per cent.), Jews (15 per cent.), and Germans (9 per cent.). The Great and

Little Russians number only a few thousands, and the former are gathercd chiefly in the towns.

Of the 3,256,800 acres registercd, nearly two-thirds of which are arable land, 1,197,000 acres belong to the pcasantry (70,724 house- holds), 257,000 to the crown, and the remainder to 4526 small and 1190 large proprietors; 118,000 acres are under forests. In the west the Germans are rapidly colonizing the country, and it was reckoned in 1885 that no less than 373,000 acres, 7.€., nearly one- eighth of the territory, and a still larger proportion of the arable land, belonged to 4260 foreigners, chiefly Germans. Agriculture is the prevailing occupation, and reaches great perfection on some estates. Beet is extensively grown. Cattle-breeding is also of importance,

Manufactures have developed rapidly of late, especially in Warsaw and its vicinity. In 1885 there were 1575 establishments, employing 35,400 operatives, with an output valued at 54,700,000 roubles. Sugar works occupied a prominent place. In 1886 nine-

teen sugar works and refineries employed 8925 operatives, and produced 6,450,000 ewts. of raw and 8,220,000-of refined sugar. Plated silver, carpets, woollen cloth, machinery, boots and shoes, spirits and beer are among the other items produced.

The government is divided into thirteen districts, the chief towns of which are WaArsAw (g.v.), Btonie (1870 inhabitants), Géra Kalwaria (2630), Gostynin (8870), Grojec (8500), Kutno (18,210), Lowicz (8720), Novo-Minsk (1830), Radziejewo (7680), Radzymin (4200), Skiernewice (3720), Sochaczew (5180), and Wtoclawek (20,660). Novy Dwor (4420), Neszawa (2380), Gombin (8000),

and several others have municipal institutions.

WARSAW (Warszawa), capital of Poland, and chief town of the above government, is beautifully situated on the left bank of the Vistula, 395 miles to the east of

Plan of Warsaw,

towards the river, leaving a broad beach at its base. The suburb of Praga on the right bank of the Vistula, here from 450 to 880 yards broad, is connected with Warsaw by two bridges,—the railway bridge, which passes right under the guns of the Alexandrovsk citadel to the north, and the Alexandrovsk bridge in the centre of the town.

With its population of nearly 450,000, its beautiful river, its ample communications and its commerce, its university and scientific societies, its palaces and numerous places of amusement, Warsaw is one of the most pleasant as well as one of the most animated cities of eastern Europe. In Russia it is excelled in importance by the two Russian capitals only; and doubtless it would have attained even a larger population, and a yet higher place in the world of commerce and intellect, were it not for its sad and chequered history, and the foreign domination of which the traveller is reminded at every step.

Situated in a fertile plain, on a great navigable river, below its junction with the Pilica and Weprz, which water southern Poland, and above its junction with the Narew and Bug, which water a wide region in the east, it became in mediaeval times the chief entrepdt for the trade of those fertile and populous valleys with western Europe. Its position in the territory of Mazovia, which was neither Polish nor Lithuanian, and, so to say, remained neutral between the two rival powers which constituted the united kingdom, it became the capital of both, to the de-

triment of the purely Polish Cracow and the Lithuanian Vilna. And now, connected as it is by six trunk lines with Vienna, south-western Russia, Moscow, St Peters- burg, Dantzic, and Berlin (via Bromberg), it has become one of the most important commercial cities of eastern Europe. The south-western railway connects it with Lodz, the Manchester of Poland, as also with the rich coal fields of Kielce, which supply its steadily growing manu- factures with coal and iron, so that Warsaw and its neigh- bourhood have become a centre for all kinds of manufac- tures, greatly aided in their development by the high technical training and general

superiority of the engineers of the-Polish capital, as well as by the skill, taste, and in- telligence of its artisans. The periodical wholesale depor- tations of Warsaw artisans, who never failed to take an active part in the Polish insurrections, especially in 1794, 1831, and 1863, considerably checked, but could not wholly stop the industrial progress of the town; but the lines of customhouses which surround Poland, and thus limit the Warsaw market, as also the Russian rule, which militates against the progress of Polish science, technology, and art, are so many obstacles to the development of its natural resources. The population of Warsaw has nevertheless grown rapidly of late, having risen from 161,008 in 1860, and 276,000 in 1872, to 436,570 in 1887; of these more than 25,000 are Germans, and one-third are Jews (43,000 in 1860, and 117,300 in 1879). The Russian garrison amounts to nearly 20,000 men.

The streets of Warsaw are very animated, and are adorned with many fine buildings—partly, due to the old Polish nobility's love of display (there are more than 160 palaces, 60 of which have been confiscated by the Russian Government), partly churches and cathedrals (179 Catholic, 6 Greek, and 2 Lutheran, several synagogues, 14 monasteries, and 4 nunneries), and partly public build- ings,—schools, hospitals, scientific societies,—erected at great expense by the muuicipality or by private bodies. Fine public gardens and several monuments further em- bellish the city. The present university, founded as the "Glawnaja Szkota," in 1816, but closed in 1832, was again opened in 1864; it has a remarkable library of more than 350,000 volumes, rich natural history collections, a fine botanic garden, and an observatory well known for its astronomical work. There are 75 professors and nearly 1000 students. The teaching is in Russian, and mostly by Russians, and the close intercourse which used to exist between the university and the educated classes of Poland is becoming a thing of the past. The rich university library, one of the largest in the world, was confiscated in 1794, and transferred to St Petersburg, where it became the nucleus of the present imperial public library ; and, after the insurrection of 1831, it was again ransacked for the same purpose. The medical school, which enjoys high repute in the scientific world, still retains the right of teaching in Polish, and has about 220 students. The same privilege is enjoyed by the school of arts, the academy of agriculture and forestry, and the conservatory of music, all of

which are high-class institutions. There are, besides, six classical gymnasia, two "real" schools, and numerous elementary schools. The museum of the society of fine arts is rich in examples of ancient and modern art. The association of the friends of science and the historical and agricultural societies of Warsaw were once well known, but all were closed after the insurrections, and now they live but a precarious life, the scientific works which continue to be produced in Poland being partly published at Cracow.

The great theatre for Polish drama and the ballet is a fine building which really includes two theatres under the same roof; but the pride of Warsaw is its theatre in the Hazienki gardens, which were laid out in an old bed of

the Vistula by Stanislaus Augustus Poniatowski, and have beautiful shady alleys, artificial ponds, an elegant little palace with ceilings painted by Bacciarelli, several impe- rial villas, and a monument to Sobieski. An artificial ruin on an island makes an open-air theatre, the stage of which is separated from the auditorium by a channel of water, and the decorations of which blend with the parks and the palace behind. Two other public gardens, with alleys of old chestnut trees, are situated in the centre of the city. One of these, the Saski Ogrod, or Saxon garden (17 acres), which has a summer theatre and excellent fountains, and is richly adorned with statues and flowers, is one of the most beautiful in Europe; it is the resort of the Warsaw aristocracy. The Krasinski garden, now some- what less frequented, and many other smaller squares and gardens in the theatres of which Polish and German companies give their summer representations, contribute very inuch to the enlivenment of the streets of Warsaw; while the variety of smart national costumes still worn by the Polish peasantry gives colour and brightness to the crowds which throng them.

Warsaw is semieireular in plan, the diameter, nearly 5 miles in length, lying along the Vistula. The central point of the life of the plaee is the castle (Zamek Krélewski) on Sigismund Square. It was built by the dukes of Mazovia, enlarged by Sigismund III. (whose memorial stands opposite) and Ladislaus IV., and em- bellished by Stanislaus Augustus. At present it

is inhabited by the "governor-general of the provinees on the Vistula," and its pietures and other art treasures have been removed to St Peters- burg. Four main thoroughfares radiate fronit: one, the Krakow- skie Przedmieseie, the best street in Warsaw, runs southward. It is continued by the Nowy Swiat and the Ujazdowska Aleja avenue, whieh leads to the Eazienki gardens. Many fine buildings are found in these two streets:— the ehureh of the Bernardine eonvent; the house of the benevolent society; the Carmelite ehureh, now elosed, where the crown archives of Poland are still kept; the rieh Radziwill palace, now inhabited by the governor-general; the university, Saxon Square, on whieh Nieholas I. ordered the erection of a memorial to the Polish generals who refused to take part in the insurrection of 1831 and were therefore shot by the insurgents ; the Saxon garden behind the square ; the fine palaces of the Potockis, the Oginskis, the Uruskis, &c.; the ehureh of the Holy Cross, ereeted in 1682-96, the richest in Warsaw; the palaee of the Krasinskis, with library and museum; the statuo of Copernicus, by Thorwaldsen, erected in 1822 by national subscrip- tion; the house of the friends of natural history, now a gym- nasium ; the palaee of the Zamojskis, now eonfiscated aud trans- formed into a building for subalterns of the garrison ; the ehureh of St Alexander, ereeted to commemorate the re-establishment of the kingdom of Poland; and the deaf and dumb asylum. The Ujazdowska Aleja avenue, planted with lime-trees and' surrounded by eafés and various places of amusement, is the Champs Elysées of Warsaw. It leads to the Lazienki park, and to the Belvedere palace, now the summer residence of the governor-general, and farther west to the Mokotowski parade ground, which is surrounded on the south and west by the smoky chimneys of the manufaeturing distriet. Another great street, the Marszatkowska, runs parallel to the Ujazdowska from the Saxon garden to this parade ground, on the south-east of whieh are the Russian barracks. The above- mentioned streets are erossed by another series running west and east, the ehief of them being the Senatorska, which begins at Sigismund Square and contains the best shops. The palaee of the archbishops of Gnesen and primates of Poland, confiseated by the Prussian Government, and now used by the ministry of edueation, the bank of Poland, the fine mansion-house burned in 1863 and now rebuilt as police bureau, the small Pod Blachoi palaee, now oeeupied by a ehaneery, the theatre, the old mint, the chief post- offiee, the beautiful

Reformed ehureh, the exchange, the sehool of subaltern officers, and several palaees are grouped in Senators' Street, which is joined from the north by Miodowa Street, in whieh are situated the fine ehureh of the Capuehins, ereeted in 1683 to commemorate the victory of John Sobieski over the Turks, the palace of the arehbishops of Warsaw, and the Russian cathedral.

To the west Senators' Street is eontinued by Electors' Street, where is the very elegant modern ehureh of St Charles Borromco and the Chiodna leading to the suburb of Wola, with a large field where the kings of Poland used to be elected. In Leshno Street, which branelies off from Senators' Street, are the Zelazna Braina, or Iron Gate, in the market-plaee, the gostinyi dvor or bazaar, the arsenal, and the Wielopolski barraeks. The cemeteries, the summer barracks of the troops (Powonzski lager), and the artillery barraeks lie to the north-west.

WARSAW

To the north of Sigismund Square is the old town—Staro Miasto —the Jewish quarter, and farther north still the Alexandrovsk citadel, The old town very mueh reealls old Germany by its narrow streets and old buildings; it has the church of .St John at its entranee, and farther down the cathedral, whieh is the oldest ehureh of Warsaw, having been built in the 18th eentury and re- stored in the 17th. The eitadel, erccted in 1832-35 as a punish- ment for the insurrection of 1831, is of the old type, with six forts too elose to the walls of the fortress to be useful in modern warfare. The railway bridge, built in 1865 and 570 yards long, begins under the walls of the eitadel and is protected on the right bank of the Vistula by the Sliwnieki ¢éte de pont.

The suburb of Praga, on the right bank of the Vistula, is poorly built and often flooded ; but the bloody assaults whieh led to its eapture in 1794 by the Russians under Suwaroff, and in 1831 by Paskevitch, give it a name in history.

Industry and Trade.—Warsaw has of late beeome industrially important, and now has moro than 320 establishments employing nearly 20,000 workmen, and produeing to the amount of nearly 40 million roubles

annually. The leading industries are the produe- tion of plated silver ware, with a wide market throughout Russia, maehinery and engines, ehemicals, musical instruments, especi- ally pianos, carpets, boots, and shoes, largely exported, earriages, woollen cloth, leather wares, spirits, and beer. The trade of Warsaw is considerable. Nearly 14,000,000 ewts. of eoal and 4,800,000 cwts. of miscellaneous goods are imported by rail from the south-west (Kielee, Lodz, and Galicia), and 3,200,000 ewts. of manufaetured goods, corn, flax, &e., are exported in the same direction, Corn and flax are imported to the amount of 7,000,000 ewts. from the south-east and east, and exported to Prussia to the amount of 5,300,000 ewts. by rail and partly down the Vistula, while the total railway traffie is represented by 34,400,000 ewts. of merchandise brought in aud 18,000,000 ewts. sent away. To all this must be added the traffie on the Vistula (about 3,000,000 ewts.). A great proportion of the trade is in the hands of Gernians, espeeially of Jews.

The suburbs of Warsaw are surrounded by villas, palaces, and battlefields. Wilanow, the palace of John Sobieski, now belonging to the Potoekis, was partly built by Turkish prisoners in a fine Italian style, and is now renowned for its historieal portraits and pictures. It is situated to the south of Warsaw, together with many other fine villas (Morysin, Natolin, Krolikarnia, which also has a pieture gallery, &e.). The Marymont, an old country residenee of the wife of John Sobieski, and the Kaskada, much visited by the inhabitants of Warsaw, in the north, the Saska Kempa on the right bank of the Vistula, and the castle of Jabtona down the Vistula are among others that deserve mention.

The events associated with the name of Praga have been already alluded to. Among other battlefields in the neighbourhood of Warsaw is that of Groehowo, where the Polish troops were defeated in 1831 after a gallant fight. Raszyn saw its fields covered with blood in the war of 1809 with Austria ; at Maciejowice, 50 miles up the Vistula, Koseiuszko was wounded and taken by the Russians in 1794; and 20 miles down the river stands the fortress of Modlin, now Novogeorgievsk, fortified by Napoleon, taken in 1813 by the Russians, and the last stronghold of the Poles during the insurrec- tion of 1831.

History.—The history of Warsaw from the 16th century onwards is intimately conneeted with that of PoLanp (g.v.). The preeise date of the foundation of the town is not known. The banks of the Vistula between the Pilica and the Narew must have been inhabited from a very early period, and it is supposed that Conrad, duke of Mazovia, erected a eastle on the present site of Warsaw as early as the 9th century. Casimir the Just is supposed to have fortified it in the 11th century, but Warsaw is not mentioned in annals before 1224. Until 1526 it was the residenee of the dukes of Mazovia, but when their dynasty was extinguished the land of the Mazurs, till then independent, was annexed to Poland. When Poland and Lithuania beeame united, it was chosen as the royal residenee. Sigismund Augustus (Wasa) made it the real eapital of Poland, and from 1572 onwards the eleetion of the kings of Poland took plaee on the field of Wola. From the 17th eentury possession of it was eontinually disputed by the Swedes, the Russians, and the Brandenburgers and the Austrians, Charles Gustavus of Sweden took it in 1655 and kept it for a year; the Poles retook it in July 1656 but lost it again almost immediately. Augustus II, and Augustus III. did mueh for its embellishment, but it had much to suffer during the northern war. Charles XII. took it in 1702, but in the following year peaee was made between the Swedes and Stanislaus Lezezynski, and it beeame free again. The disorderly rule of the Rzee Pospolita opened a large field for Russian intrigue, and in 1764 the Russians took possession of it and seeured the election of Stauislaus Poniatowski, which led in 1773 to the first partition of Poland. In November 1794 the Russians took it again. after the bloody assault on Praga, but next year, in the third partition of Poland, Warsaw was given to Prussia. In November 1806 the town was oeeupied by the troops of Napoleon, and after

the peace of Tilsit was made the capital of the independent duchy of Warsaw; but the Austrians took it on April 21, 1809, and kept it till June 2, when it once more became independent, but only for afew years. The Russians finally took it on February 8, 1818, since which time they have always retained it. On November 29, 1830, Warsaw gave the signal of the great but unsuccessful insurrection which lasted nearly one year ; it was

taken after great bloodshed by Paskevitch, on September 7, 1831. Deportations on a large scale, executions, and confiscation of the domains of the nobility followed, and until 1856 Warsaw remained under severe inilitary rule. In 1862 a series of demonstrations began to be made in Warsaw in favour of the independence of Poland, and after a bloody repression a general insurrection followed in January 1863, the Russians remaining, however, masters of the situation. The Russian Government now decided to take the most stringent measures to erush the powers of the clergy, the landed nobility, and the turbulent Warsaw artisans and educated classes. Executions, banishment to the convict prisons of Siberia, and con- fiscation of estates followed. Deportation to Siberia and the interior of Russia was carried out on an unheard-of scale. Scientific socicties and high schools were closed; monasteries and nunneries were emptied. Hundreds of Russian officials were called in to fill up administrative posts, the schools, and the university; the Russian language was rendered obligatory in official acts, in all legal pro- ceedings, and even, to a great extent, in trade. The very name of Poland was expunged from official writings, and, while the old institutions were abolished, the Russian tribunals and administra- tive institutions were introduced. The serfs were liberated. See POLAND.

Officially, Warsaw is now simply the chief town of the govern- ment of Warsaw, the residerice of the governor-general of the pro- vinces on the Vistula and the commander of the Warsaw military district, and the see of the Roman and Greek archbishops. But it continues to be the heart of the Polish nationality. (P. A. K.)

WART is a papillary excrescence of the surface, most commonly of the skin, but in special circumstances also of the transitional and mucous membranes. The ordinary broad and flat warts of the skin occur mostly upon the hands of children and young persons ; a long pendulous variety occurs about the chin or neck of children who are constitutionally delicate (it used to be thought a mark of scrofula) and on the scalp in adults. Both the broad sessile warts of the fingers or hands and the thin hanging warts of the neck and head are apt to come out in numbers at a time ; a crop of them suddenly appears, to disappear after a time with equal suddenness. Hence the supposed efficacy of charms. A single wart

will sometimes remain when the general eruption has vanished. The liability to crops of warts runs in families, In after life a wart on the hands or fingers is usually brought on by some irritation, often repeated, even if it be slight. A special form has been observed on the hands of those much Occupied with anatomical dissection. Chimney-sweeps and workers in coal-tar, petroleum, &c., are subject to warts, which often become cancerous. Ordinary innocent warts occur singly in later life on the nose or lips or other parts of the face, sometimes on the tongue. Towards old age there are apt to be broad and flattened patches of warts on the back, of a greasy consistence and brownish colour.

A wart consists essentially of a framework or ground- plan of small blood-vessels supported by bands of fibrous tissue, and a more or less thick covering of epidermic scales. When the wart is young, the surface is a rounded and even knob; as it gets rubbed and worn the surface appears cleft into thread-like projecting points. The blood-vessels, whose outgrowth from the surface really makes the wart, may either be in a cluster of parallel loops, in which case we have the comnion broad and sessile wart, or the vessels may branch from a single stem, inaking the dendriform pattern of the long, slim, and pendulous warts of the chin and neck. The same two kinds of pattern occur also in warts of the transitional or mucous surfaces. (For a figure of a dendriform wart, see PatHowoey, vol. xviii. fig. 43, p. 379.) A wart of either pattern is a projection of the system of cutaneous blood-

vessels beyond the surface. It is owing to its vascular ground-plan that a wart is liable to come back after being shaved off ; the vessel or vessels are cut down to tlie level of the skin, but the current of blood is still forced into the stem, and the branches tend to be thrown out beyond the surface as before. This fact has a bearing on the treatment of warts. If they are shaved or snipped off, the blood-vessels of the stem should be destroyed at the same time by caustic, or made to shrivel by an astringent. The same end is served by a gradually tightening ligature (such as a thread of elastic pulled out from an old brace) round tlie base or neck of the wart ; an ordinary thread is apt to cut too deep and may cause suppuration. The

best treatment is to rub an astringent, or acid, or caustic substance into the surface of the wart. Glacial acetic acid may be applied on the end of a glass rod, or by a camel-hair brush, care being taken not to touch the adjoining skin. A solution of perchloride of iron is also effective in the same way. Nitrate of silver is objectionable, owing to the black stains left by it. A simple domestic remedy, often effectual, is the astringent and acrid juice of the common stonecrop (Sedum acre) rubbed into the wart, time after time, from the freshly gathered herb. 'The result of these various applications is that the wart loses its turgor or firmness, shrivels up, and eventually falls off.

A peculiar form of wart, known as verrugas, occurs endemically in certain valleys of the Peruvian Andes, especially in the region of the Cerro de Pasco. Itis believed to have been one of the causes of the excessive mortality from hemorrhages of the skin among the troops of Pizarro. In recent times attention was ealled to it by Dr Archibald Smith in 1842; in 1874, during the making of the Trans-Andean Railway, it caused a considerable loss of life among English navvies and engineers. Strangers of the white race suffer much more severely from it than the acelimatized or the natives. It is sometimes epidemic and peculiarly fatal. Its en- demic seats are certain deep and narrow valleys traversed by a mountain stream or torrent and covered with luxuriant vegetation ; where the valley widens the endemic influence is no longer felt. The warts may be few or many, up to several hundreds; they oeeur on internal mucous membranes as well as on the skin. Their out- break is preceded for some weeks by a feverish state and by pains in the limbs. These symptoms disappear when the warts come out; they are at first reddish spots about the size of a pea, but grow to be rounded or conical excrescences as large as a raspberry or filbert, or pigeon's egg ; after a time the surface becomes ragged or fissured (as in an ordinary wart), especially when rubbed or chafed, and blood begins to ooze, which may amount to consider- able hemorrhage. Death (in about 10 per cent. of cases) is due to loss of blood, or to the protracted ulceration following the fall of the warts. The disease lasts usually several months ; but a feeble state of the system may remain long after the warts are all gone. The excrescences (besides those of the internal membraues) occur in the favourite situations of common warts—the fingers and back of the hand (also the

toes and back of the foot), the face and neck, and among the hair of the head.

See Hirsch, Geographical and Historical Pathology, vol. ii., Engl. trans., 1885.

WARTON. Three authors of this name, a father and two sons, were leaders of reaction against the didactic poetry of Pope's school, and did much to help forward the descriptive and romantic revival. ;

Tuomas Warton (1688-1745), satirized in Terre Filius (February 18, 1721) as "squinting Tom of Maudlin," was vicar of Basingstoke in Hampshire, and professor of poetry at Oxford. He published nothing during his lifetime, but after his death his son Joseph published some of his poetry under the title Poems on Several Occasions, 1748.

JosePH Warton (1722-1800), eldest son of the preced- ing, was born at Dunsford, in Surrey, in 1722, and sent to Winchester school in 1736. Collins was already there, and the school seems to have been at the time quite a nest of singing birds, quickened into unusual ambition by a visit from Pope. Collins and Warton became close friends, read Milton and Spenser together, and wrote verses which they sent to the Gentleman's Magazine, verses of such promise that Johnson formally criticized them. The two friends

went to Oxford together, and took the degree of B.A. in the same year (1743). Warton was far from having the genius of Collins, but he had abundance of poetical enthu- siasm, and they were at one in their impatience under the prevailing taste for moral and ethical poetry. Whoever wishes to understand how early the discontent under Pope's ascendency began should read Warton's The En- thusiast, or The Love of Nature, and remember that it was written by an undergraduate in 1740, while Pope was still alive. Warton sounded a bold note in 1746, in the preface to his Odes on Several Subjects. " As he is convinced," he wrote,

“ that the fashion of moralizing in verses has been carried too far, and as he looks upon invention and imagination to be the chief faculties of a poet, so he will be happy if the following odes may be looked upon as an attempt to bring back poetry into its right channel.” Warton thereafter married, became a country clergyman, a master in Winchester school, eventually for thirty years (1766-96) a much respected headmaster, but all his leisure was given to literature, and he remained constant to his conception of the “right channel” in poetry, though he soon abandoned the idea of setting the world right by his own example. He became an active and prominent man of letters, produced an edition of Virgil, in 1753, with distinguished coadjutors, and a translation of the Hclogues and the G’eorgics, and a preparatory essay by him- self; made the acquaintance of Johnson, and wrote papers on Shakespeare and Homer in The Adventurer ; published the first part of an essay on Pope in 1756, an essay re- garded at the time as revolutionary, by Dictator Johnson at least, because it put Pope in the second rank to Shakespeare, Spenser, and Milton, on the ground that moral and ethical poetry, however excellent, is an inferior species ; held his own against Johnson in the Literary Club ; and, after enduring many jests about the promised second part and the delay in its appearance, published it at last, retracting nothing, in 1782. Of this essay Campbell justly says that “it abounds with criticism of more research than Addison’s, of more amenity than Hurd’s or Warburton’s, and of more insinuating tact than Johnson’s,” Warton’s edition of Pope was the work of his old age ; when pub- lished in 1797, it found a larger number of sympathizers with his criticism of the poetic idol of the 18th century than had welcomed his first essay forty years before in the same vein. The last three years of the critic’s life were spent in preparing an edition of Dryden, which was completed and published by his son in 1811. He died in London in February 1800, at the age of seventy-eight. THomas Warton (1728-1790), the younger brother of

Joseph, at least as active and influential as he in enlarg- ing the poetic ideas of the 18th century, was born at Basingstoke in 1728. He was still more precocious as a poet than his brother—translated one of Martial’s epigrams at nine, aud wrote The Pleasures of M elancholy at seventeen —and he showed exactly the same bent, Milton and Spenser being his favourite poets, though he “did not fail to cultivate his mind with the soft

thrillings of the tragic muse” of Shakespeare. He wrote as follows in 1745 »—

Through Pope’s soft song though all the Graces breathe,

And happiest art adorn his Attic page,

Yet does my mind with sweeter transport glow

As, at the root of mossy trunk reclined,

In magic Spenser’s wildly warbled song

I sce deserted Una, &c.

_In the same poem he shows the delight in Gothic churches and ruined castles which inspired so much of his subsequent work in romantic revival. Most of Warton’s poetry, humorous and serious,—and the humorous mock heroic was better within his powers than serious verse,—was written before the age of twenty-three, when he took his M.A. degree and became a fellow of his college (Trinity,

Oxford). He did not altogether abandon verse; hissonnets, especially, which are the best of his poems, were written later, and during the last six years of his life he was poet- laureate, and one of the happiest in the execution of the delicate duties that have ever held the office. But his main energies were given to omnivorous poetical reading and criticism. He was the first to turn to literary account the medizval treasures of the Bodleian Library. It was through him, in fact, that the medieval spirit which always lingered in Oxford first began to stir after its long inaction, and to claim an influence in themodern world. Warton, like his brother, entered the church, and held, one after another, various livings, but he did not marry. He gave little atten- tion to his clerical duties, and Oxford always remained his home. He was a very easy and convivial as well as a very learned don, with a taste for pothouses and crowds as well as dim aisles and romances in manuscript and black letter. The first proof that he

gave of his extraordinarily wide scholarship was in his Observations on the Poetry of Spenser, published in 1754, when the author was twenty-six. Three years later he was appointed professor of poetry and held the office for ten years, sending round, according to the story, at the beginning of term to inquire whether anybody wished him to lecture. The first volume of his monumental work, The History of English Poetry, appeared twenty years later, in 1774, the second volume in 1778, and the third in 1781. A work of such enormous labour and research could proceed but slowly, and it was no wonder that Warton flagged in the execution of it, and stopped to refresh himself with annotating the minor poems of Milton, pouring out in this delightful work the accumu- lated suggestions of forty years. Specialists may here and there detect errors and imperfections in Warton's History, but its miscellaneous and curious lore must make it always an interesting book, while its breadth and exactness of scholarship must always command wonder and respect. Through this work Warton became the veritable literary father. of Sir Walter Scott; if he could have lived to read the Lay and Jfarmion he would have found realized there what he vaguely desiderated in modern poetry. Among Warton's minor works were a selection of Roman metrical inscriptions (1758); the humorous Oxford Companion to the Gude and Guide to the Companion (1762); The Oxford Sausage (1764); an edition of Theocritus (1770) ; lives of Thomas Pope and Bathurst, college benefactors; a History of the Antiquities of Kiddington Parish, of which he held the living (1781); and an Inquiry into the Authenticity of the Poems attributed to Thomas Rowley (1782). His busy and convivial life was ended by a paralytic stroke in May 1790. (Ww. M.)

WARWICK, a midland county of England, is bounded Plate on the N. by Stafford, on the E. by Leicester and North- VUJ.

ampton, on the §. by Oxford and Gloucester, and on the W. by Worcester. Its greatest length from north to south is 50 miles, and its greatest breadth 33 miles, Its area is 566,458 acres, or about 885 square miles. Camden describes it as being " divided into two parts, the Feldon and, Woodland [or Arden], that is into a plain champain and a woody country; which parts, the Avon, running crookedlie from north-east to south-west, doth, after a sort, sever one from the other."

Surface and Geology.—The surface of the county is of a gently undulating nature. For a description of the scenery and early history the reader is referred to the article SHAKESPEARE, vol. xxi. pp. 738 sg.

The chief elevations are the Edge Hills on the southern border of the county, where they rise in some places to about 800 feet above sea-level. In the same neighbourhood are the Burton Dassett and Farnborough Hills; north- east of these are the Napton and Shuckburgh Hills, and

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south-west of the Edge Hills is Brailes Hill. Some elevated land is found at Corley, Oldbury, Hartshill, &., in the north of the county.

The lofty elevation of the county in general is evidenced by the fact that rivers flow from it in several directions, contributing to each of the three systems of the Severn, Trent, and Thames. The Avon rises in Northampton- shire, and flowing south-west through the county receives on its way the Swift, Sowe, Leam, Itchene, Stour, Alne, and other tributaries, and falls into the Severn at Tewkesbury. It is navigable for barges up to Stratford, and is rich in its associations with Shakespeare. The Tame rises in Staffordshire, and flowing through the northern portion of Warwickshire takes in the Cole, Blythe, Anker, Rea, and other minor streams. A few small rivulets in the south of the county fall into the Cherwell, a tributary of the Thames.

The New Red Sandstone is the principal geological formation of the county, but towards the south the Lias prevails. In the north central district there is a large deposit of gravel, which consists of "small boulders and sea-worn pebbles, and ancient rocks traceable to the parent beds in Yorkshire, Cumberland, and Scotland, and commonly known as the northern drift. Quartz pebbles especially abound in it; granite, gneiss, syenite, porphyry, slate, mica schist, trap, and almost every other variety of the primary rocks may be collected." 'The Lias is near Edge Hill; the strata immediately below it consist of clay and ironstone, rich in iron ore. The Upper Lias crosses the county by Henley-in-Arden, Stratford,

Kineton, Southam, and Rugby. With the exception of one coal- field, small but rich, extending from Tamworth to near Wyken, about 15 miles, the New Red Sandstone and Permian occupy the whole of the central part of the county. In the north Upper Cambrian quartzites and shales are found, together with some volcanic rocks. The Coal- Measures dip under the Lower Permian rocks, and in the southern part of the field underlie the Trias. According to the report of the Coal Commission in 1871, the area of the Warwickshire coal-field is 30 square miles, the thickness of the coal being from 26 to 30 feet. The quantity raised in 1870 was 647,540 tons, and in 1885 it was 1,281,724.

The minerals of the county are limestone, freestone, iron, blue flagstone, marl, and blue clay. The blue flag- stone is found in many places, and ironstone at Bedworth, Oldbury, and Merevale. The limestone quarries are principally at Bearley, Grafton Court, Stretton, Prince- thorpe, Ufton, Harbury, Arlescote, Bidford, Newbold-on- Avon, Stockton, and Southam ; freestone is found largely about Warwick, Leamington, Kenilworth, and Coventry.

Climate and Agricultwre.—The climate is generally mild and healthy. The soil ison the whole good, and consists of various loams, marls, gravels, and clays, well suited for most of the usual crops. It is rich in pasture-land, and dairy farming is increasing. It has excellent orchards and market gardens, and. possesses some of the finest woodlands in England. Nearly all the farm build- Ings are good; and many of the cottages of the labourers are exceedingly picturesque. There are many charming villages in the county. According to the agricultural returns, out of a total area of 566,458 acres there were 496,429 acres under cultivation in 1887, corn crops occupying 105,089 acres, green crops 31,411, rotation grasses 40,783, permanent pasture 308,689, and fallow 10,493 ; of the corn crops much the largest area was under wheat, which occupied 43,728 acres, barley occupying 16,290, oats 26,297, rye 256, beans 14,050, and pease 4418. Of the green crops turnips occupied 16,918 acres, potatoes 4936 acres, while 4198 were under mangolds, 114 under carrots, 971 under cabbage, &., and 4279 under vetches and other green crops.

The number of horses in 1887 was 20,769, cattle 107,555, of which 37,080 were cows and heifers in milk or in calf, sheep 294,442, 172,151 of them one-year-old and above, and pigs 37,099.

According to the Return of Owners of Land, 1878, the total number of proprietors in the county was 51,516, possessing 541,022 acres, with a gross annual rental of £3,318,304, or about £6, 2s. 8d.

per acre all over. Of these owners of land only 4622 had one acre and upwards. Of waste or common land there was 1838 acres.

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The following possessed over 5000 acres:—Lord Leigh, 14,892 acres ; Lord Willoughby de Broke, 12,621; earl of Aylesford, 12,159 ; marquis of Hertford, 10,282; earl of Craven, 8448 ; earl of Warwick, 8263; Sir N. W. Throckmorton, 7619; duke of Buccleuch, 6881; H. J. Lucy, 5766; W.S. Dugdale, 5689; Sir G. R. Philips, 5897 ; and C. N. Newdegate, 5318.

Manufactures.—The principal seats of mannfacture in the county are BIRMINGHAM and CovENtRY (q9.v.). Suffice it to say here that in Birmingham almost every article of use, from a pin to a steam engine, is produced, and that Coventry has long been famous for its ribbons and watches, and has recently won a well-merited reputation for bicycles and tricycles.

Communication.—The county is well supplied with excellently preserved roads, There are also a great number of canals giving access to the Trent, the Mersey, the Thames, and the Severn. The London and North-Western, the Great Western, the Midland, and various branch railways traverse the county in various directions.

Population and Administration.—The population in 1871 was 634,189, and in 1881 737,339 (357,146 males and 380,193 females). More than half the population is contained in the borough of Birmingham. The county is divided into four hundreds :-— (1) Hemlingford, (2) Knightlow, (8) Barlichway, (4) Kineton. It has one city, Coventry (42,111), which is also a municipal borough ; five other boroughs—Birmingham (400,774),

Leamington (22,979), Stratford-on-Avon (8054), Warwick (11,800), and Sutton Coldfield (7737); and, besides the boroughs, ten market towns, viz., Alcester (2430), Atherstone (4645), Coleshill (2356), Henley in Arden (1119), Kenilworth (4150), Kineton (1053), Nuneaton (8465), Rugby (9891), Solihull (5280), and Southam (1784). It is mostly in the diocese of Worcester. It is in the midland judicial circuit, has one court of quarter sessions, and is divided into fourteen petty and special sessional divisions. The boroughs of Birmingham and Warwick have separate courts of quarter sessions and commissions of the peace, and the city of Coventry and the boroughs of Leamington and Stratford-on-Avon have commissions of the peace.

By the Redistribution Bill of 1885 Warwickshire was for parliamentary purposes divided into four boroughs and four county divisions. 'he boroughs are Birmingham, Aston Manor, Coventry, and Warwick and Leamington united, Birmingham has seven divisions, each returning a member—Bordesley, Central, Kast, Edgbaston, North, South, and West ; the other three boroughs return one member each. The county divisions (Nuneaton, Rugby, Stratford-on-Avon, and Tamworth) each return one member.

History and Antiquities.—Warwickshire was occupied by the British tribes Cornaviiand Dobuni. The Romans named this part of England Flavia Cesariensis, and many evidences of their occupa- tion and works exist in the county. It was crossed by the three great roads—Watling Street, the Fosse Way, and Icknield Street; the last-named gives its name to a street in Birmingham which is on the lines of the old Roman road. The Ridgeway borders a part of Warwickshire on the west. Roman stations or camps were at Mancetter, High Cross, Alcester, Chesterton, and other places ; coins, pottery, and other remains have been found at Warwick, Willoughby, Hampton-in-Arden, Birmingham, and elsewhere. The Teutons followed the Romans, and after suffering many changes Warwickshire became part of Mercia. From 598 to 918 it was the scene of frequent invasions, conquests, and reconquests.

Although Mercia was for the most part peopled by Angles, the Saxons seem to have occupied the portion now known as Warwick- shire in very

considerable numbers; for, if we except Alcester, Mancetter, and a few other places, nearly all the towns and villages have Saxon names. Ofthe three hundred and sixty places in the county mentioned in Domesday nearly all are of Saxon origin. As Verstegan says,

"In Foord, in Ham, in Ley, in Tun, The most of English surnames run."

And these terminations are found in the vast majority of the names of places in Warwickshire. This prevalence of the Saxons here is also confirmed by the fact that Mr Kemble discovered no fewer than thirty-one Mark names in places in Warwickshire. The Danes, although they made inroads into Warwickshire severaltimes, seem to have made no settlements in the county, the only names bearing the Danish suffix by being on the north-east border. In later times the "king-maker"' carl of Warwick made the county memorable by the part he took in the Wars of the Roses. In the civil war under Charles I. "scarcely a place of any note escaped" without a struggle: at Edge Hill the first engagement was fought; Aston Hall was besieged; Birmingham was sacked and burned by Prince Rupert; Coventry endured a sicge; Warwick was the centre of several encounters; and a skirmish took place near Southam.

Few remains of Saxon architecture are to be found in the county, and these are of minor importance. Saxon jewels have been found at Compton-Verney ; a fine burial urn filled with ashes, an iron sword, a spear head, and other relics, at Church Over; in a tumulus or barrow, at Marston, were found two sepulchral urns, one of them containing bones, a fibula, a pin, part of a sword, and two

spear heads. In 1824 an Anglo-Saxon cemetery was discovered on Watling Street, near Bensford Bridge, in which a large number of articles, both of use and ornament, were found. Other burial places have been opened, and similar remains found. Some good examples of Norman work exist in the churches at Kenilworth, Ryton, Stoneleigh, Berkeswell, Wolston, and Beaudesert. Of famous and interesting places may be mentioned the noble structure Warwick Castle; the ruins of Kenilworth Castle and Maxstoke Priory; Maxstoke Castle; Compton Wyniates;

Temple Balsall church ; the "three tall spires" at Coventry, with the beautiful churches of St Michael, Holy Trinity, and St John Baptist ; Ragley Hall, Combe Abbey, Wroxhall Abbey, Newnham Padox, Astley Castle, Arbury Hall, Walton Hall, Guy's Cliff, Baddesley Clinton, Tamworth Castle and church, Packington Hall, and Stoneleigh Abbey.

Among the eminent persons connected with Warwickshire besides William Shakespeare are John Rogcrs the martyr, Michael Drayton, Sir W. Dugdale, Dr Parr, Dr Joseph Priestley, Matthew Boulton, John Baskerville, Walter Savage Landor, and Marian Evans (" George Eliot ").

See Dugdale, Antiquities of Warwickshire, Thomas's edition (2 vols. fol., 1730); Brewer, Description of Warwickshire (8vo, 1810); Murray. Agriculture of War- wickshire (8vo, 1813); Smith, History of Warwickshire (4to, 1830); Langford, Staffordshire and Warwickshire (4 vols. 4to, 1868); Langford, '"'The Saxons in Warwickshire" (Birmingham Archxological Society, 4to, 1881),

WARWICK, the county town of Warwickshire, and a municipal and parliamentary borough, is finely situated on the Avon, on the Warwick and Birmingham and Warwick and Napton Canals, and on a branch of the Great Western Railway, 8 miles north-east of Stratford-on-Avon and 108 north-west of London. The glory of Warwick is still its castle, which has been truly pronounced to be the "'most magnificent of the ancient feudal mansions of the English nobility still used as a residence." Its position is at once commanding and picturesque, standing as it does on a rock overhanging the Avon. Its principal features are Cesar's Tower, 147 feet high, built in the 14th century; the Gateway Tower, in the centre; and Guy's Tower, 128 feet, also of the 14th century. There is a fine collection of pictures. The Great Hall and the family apartments were destroyed by fire in 1871, but have been restored. In the collegiate church of St Mary Warwick possesses one of the most interesting ecclesiastical buildings in the country. We learn from Domesday that a church existed before the Conquest, but of its foundation nothing is really known. It was made collegiate by Roger de New- burgh, the second Norman earl. It was dissolved by Henry VIII. in 1545, by whom it was granted to the burgesses

of the town, with an estate then worth £58, 14s. 4d. to main- tain it, together with the king's school. A great part of the church was destroyed by fire in 1694, and afterwards rebuilt. The glory of this church, however, is the Beau- champ Chapel, founded by Earl Richard Beauchamp by will, and commenced in 1443 and completed 1464. It is one of the finest examples of pure Gothic in the kingdom. In the centre of the chapel is the splendid tomb of the earl. The church of St Nicholas, near the entrance to the castle grounds, is modern, with a tower and spire, and was erected towards the end of the 18th century. St Paul's is new. The priory of St Sepulchre was founded by Henry de Newburgh on the site of an ancient church for a society of canons regular. It is now a private residence. One of the most interesting places in Warwick is the hospital of Robert Dudley, earl of Leicester, one of the most picturesque examples of half- timber buildings in England. It was originally used as the hall of the united guilds of the Holy Trinity, the Blessed Virgin, and St George the Martyr. The earl of Leicester, by an Act of Incorporation obtained in 157 tl, founded the hospital for the reception of twelve poor men possessing not more than £5 a year, and a master. The first master, appointed by the earl himself, was the famous Puritan, Thomas Cartwright. There are numerous charities in the town, the principal being those of Henry VIII, Sir Thomas White, and Thomas Oken. The first

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is derived from the tithes of St Mary, St Nicholas in Warwick, the parish of Budbrooke, and Chaddesley Corbett, Worcestershire, together with the rents of houses and lands in the borough. It produces about £3000 a year, and is used for paying the stipends of the vicar and an assistant minister for St Mary's, the vicars of St Nicholas and Budbrooke, the mayor, the town-clerk, yeoman, serjeant- at-mass, and a beadle; while £460, 10s. is annually given in aid of the king's school. By the charity of Sir Thomas White the sum of £100 is lent, without interest, to young tradesmen for a period of nine years. From the funds left for that purpose by Thomas Oken, allowances are made to the poor. The area of the borough is 5512 acres; the population in 1861 was 10,570, in 1871 10,986, and in 1881 11,800.

A fortress is said to have been erected here as early as the year 50, by P. Octavius Scapula, and it is supposed to have been the presidium Romanorum at which a cohort of Dalmatian horse was stationed. It was destroyed by the Danes in one of their incur- sions into Mercia, and in 915 Alfred's daughter Ethelfleda built the fortress on which the castle now stands. The town is mentioned in Domesday, where we learn that "in the borough the king has in his demesne 113 houses, and the king's barons have 112, from which the king receives Danegeld. The bishop of Worcester has 9 dwellings, the bishop of Chester 7, the abbot of Coventry 36, and four were destroyed to enlarge the castle." In the time of Edward the Confessor the sheriffwick of Warwick, with the borough and royal manors, rendered £65, and " thirty-six sextars of honey, or £24, 6s. instead of honey (pro omnibus que ad mel pertinebant). Now, with the forra of the royal manors and pleas of the county, it pays per annuin £145 by weight, £23 for the custom of dogs, 20s. for a sumpter horse, £10 for a hawk, and 100s. for Queengold. Besides this it renders twenty-four sextars of honey of the larger measure, and from the borough six sextars of honcy, at the sextar for 15d." The celebrated Thurkill (or Turchill) was the last Saxon earl of Warwick.

William the Conqueror began his first northern campaign in 1068, and the first place where his presence is distinctly recorded is Warwick. He erected here one of his strong fortifications on the site of the old one. Not a vestige of it now exists, but, as Mr Freeman writes, "the mound itself still remains, a monument of the wisdom and energy of the mighty daughter of Alfred, while the keep.of William has so utterly perished that its very site can only now be guessed at."

Of the earls of Warwick who may be noticed, of course the legendary Guy, with the numerous traditions relating his wonder- ful achievements, stands first. In proof of his prowess do not his gigantic helmet, his furnace-like pot, and his mighty fork remain in the castle to this day, to testify against all unbelievers? Prominently in history we have Guy de Beauchamp, who came to the title in 1298, and who was called by the favourite Piers Gaveston "the Black Hound of Arden." He was instrumental in taking Piers prisoner, and in leading him to Blacklow Hill, close to Warwick, and there beheading him in 1311. Richard Nevil,

the famous "king-maker" (see below), assumed the title in right of his wife Anne, and was slain at the battle of Barnet, 1471. Then the unfortunate George Plantagenet, duke of Clarence, was created earl by his brother Edward IV., but afterwards perished, it is said, by being drowned in a butt of Malmsey wine. The title has frequently lain dormant. In 1547 it was revived in favour of the Dudleys, when Viscount Lisle was created earl by Edward VI. It became extinct in 1589, and in 1618 was renewed in the person of Robert, Lord Rich, whose eldest son was lord high admiral for the Commonwealth. Again the title became extinct in 1759. The castle had long been in the possession of the Greville family, having been granted to Sir Fulke Greville, Lord Brooke, by James I. when it was in a ruinous condition, and he restored it, at a cost, it is said, of £20,000. Dugdale says he made it "not only a place of great strength, but extraordinary delight, with most pleasant gardens, walks, and thickets, such as this part of Eng- land can hardly parallel; so that now it is the most princely seat that is within the midland parts of this realm." He died from the effects of a wound inflicted by his own servant, September 8, 1628. His successor, Robert Greville, was the son of Fulke's first cousin, and is the Lord Brooke who is famous in the civil war between Charles and the Parliament, and was appointed commander-in-chief of the Parlia- mentary forces of Warwickshire and Staffordshire. He was engaged in the first fight of the war at Edge Hill, and was killed at the siege of Lichfield cathedral, on March 1, 1648. The title of earl of Warwick was bestowed on Francis, eighth Lord Brooke, by George II. in 1746. His son George, who succeeded to the title in 1773, was a great benefactor of the borough, and was lavish in his ex- penditure on the castle.

WARWICK

WARWICK, Ricuarp Nevit, Earu or (c. 1420-1471), was born between 1420 and 1430. He was descended from a family of note in the north of England, that of the Nevils, who enjoyed for many generations the title of earls of Westmorland. His grandmother on the father's side was Joan, daughter of John of Gaunt. He inherited the title of earl of Salisbury from his father, a younger son of Ralph Nevil, and by his marriage with Anne, daughter of Richard Beauchamp, he became earl of Warwick. His

descent from John of Gaunt made him naturally a member of the Lancastrian party, but the marriage of his aunt, Cicely Nevil, to Richard, duke of York, connected him also with the Yorkist house. As first cousin of Edward IV. and second cousin of Henry VI. he was well fitted for the double part which he was destined to play in English history.

When the struggle between the Roses began, he and his father threw in their lot with the Yorkists. The first attempt of the duke of York (in 1450) to assert his claims proved unsuccessful, but three years later the final loss of Guienne, coupled with the king's imbecility, enabled him to renew his efforts. The duke became pro- tector, but the king's recovery drove him from power and forced him to take up arms a second time. He was now joined actively by Warwick and his father, the former of whom raised a body of troops and contributed largely to the Yorkist victory at St Albans (1455). Warwick was rewarded for his services with the governorship of Calais. This important post gave him the control of the narrow seas, and supplied him with a harbour of refuge whither he could safely retire in case of a change of affairs in England. In the latter capacity Calais soon proved useful.

In 1457, when Henry had recovered his senses, Warwick attended a council at Coventry, at which he took an oath of fealty to the king. Next year he attended a great meeting in London, summoned for the purpose of recon- ciling the two parties. He was followed on this occasion by six hundred men clad in his livery, and wearing red coats embroidered with ragged staves, the badge of the house of Warwick. An apparent reconciliation was effected, but Warwick, accused of misconduct in attacking a fleet of North Sea merchant-ships near Calais, took advantage of an affray between his followers and some of the king's men to assert that a plot was laid against his life, and retired to his fortress across the Channel. When in 1459 the duke of York took up arms for the third time, Warwick and his father, the earl of Salisbury, joined him at Ludlow. The confederates were strongly posted, but, being deserted by Sir Andrew Trollop, they lost heart and dispersed, Salisbury and Warwick again taking refuge at Calais. A parliament which met at Coventry now attainted Warwick and his father, with other leaders, of high treason, and Somerset was sent to supersede Warwick in his command. The latter,

however, made a strong resistance, repelled Somerset, and took his ships, after which he sailed to Dublin to concert further measures with the duke of York. The results of this negotiation were seen early in 1460, when the duke of York issued a manifesto to rouse tle people against the Government, and Warwick, landing in Kent, marchedon London. The king retired northward and intrenched himself at Northampton, where he was defeated with much loss by Warwick, and taken prisoner. Warwick returned with his captive to London, and the duke of York at once claimed the crown. After much debate the king was induced to consent toa compromise, by which he was to retain the crown during life, and the duke of York and his heirs were to succeed him. The queen, however, refused to sanction this arrangement, and assembled an army in the north. The

duke of York, marching against her, was defeated and killed at Wakefield (December 1460), and the earl of Salisbury was taken and beheaded shortly after. The Yorkist victory of Mortimer's Cross (1461) did not stop the queen's march on London, and Warwick, attempting to bar her progress, was entirely defeated at the second battle of St Albans. The king fell into the hands of his own party, but Warwick escaped. The Lancastrian triumph was, however, short-lived. The citizens of London, already devoted to the house of York, were exasperated by the excesses of the Lancastrian troops, and when Warwick, with Edward, earl of March, raised another army and marched towards the capital, the queen was forced to retire to the north. Warwick and Edward entered the city, and the latter was proclaimed king under the title of Edward IV. The sanguinary battle of Towton (March 1461), in which the victory was greatly due to the skill and energy of Warwick, secured the crown for Edward, and gave the nation peace for several years.

Honours and emoluments were showered on Warwick. The governorship of Guisnes and Dammes, with the lieutenancy of the marches there, was added to his com- mand at Calais; he became warden of the western marches towards Scotland, constable of Dover, and lord high chamberlain. The revenue derived from these employments was

calculated at 80,000 crowns a year. His brother, John, Lord Montague, was made earl of Northumberland and warden of the eastern marches, and his brother George became archbishop of York and lord chancellor. For some time Warwick did his best to main- tain Edward on his throne. An attempt on the part of the Lancastrians in 1463 to recover their power was put down by the united efforts of the Nevils. Montague defeated Percy at Hedgley Moor and Somerset at Hexham, while Warwick besieged and took Bamborough Castle, which was held by Sir Ralph Grey. Soon afterwards Henry VI. was taken prisoner and was lodged by Warwick in the Tower.

But the power and ambition of Warwick were too great to allow the good understanding between the king-maker and the king to be of long duration. The first difference between them arose on the question of the king's marriage. In 1464 Warwick was employed to treat for peace with France, and was anxious to establish it on the firm basis of a matrimonial alliance. His plans were frustrated by Edward's marriage with Elizabeth Woodville. At this time Warwick is said to have been negotiating for a marriage between the king and Bona of Savoy, niece of Louis XI. According to another authority, the princess proposed was Isabella of Castile. Whatever may be the truth of these reports, it is clear that Edward's marriage was not approved by Warwick, and that on the question of foreign policy they followed divergent aims. The rapid advancement of the queen's family contributed to widen the breach. When in 1467 a marriage was proposed between the king's sister Margaret and Charles of Burgundy, Warwick, true to his policy of reconciling England and France, vigorously opposed the match, and suggested in its stead a marriage with a French prince. For a time Edward seemed willing to yield, and Warwick was sent over to treat with the French king. Hemet him at Rouen, and was received with unusual marks of respect. The result of the conference was that ambassadors were sent by Louis to offer Edward a treaty on favourable terms. But the latter, who had already shown his dis- pleasure by depriving the archbishop of his chancellor- ship, rejected the offer, and Warwick retired in disgust to one of his castles in the north. Shortly afterwards the marriage between Charles and Margaret took place. An apparent reconciliation between Edward and Warwick was

now effected, but its hollowness was shown by the marriage of Isabella, eldest daughter of Warwick, with George, duke of Clarence, a match which Edward strenuously but vainly opposed (1468). A period of intrigue and insurrection followed. A rising in the north, under Robin of Redesdale, was at first defeated by Montague, but the rebels were allowed to make head again. They were soon joined by Warwick and his party, who, if they did not originate, at all events encouraged the rebellion. Edward, whose troops were defeated at Edgecote, fell into Warwick's hands, and was removed to his castle at Middleham. When, however, the Lancastrians took advantage of this state of affairs and rose in arms, they were speedily put down by Warwick. Edward was released and a formal reconciliation followed (1469).

The situation had, however, by this time become in- tolerable. A fresh insurrection broke out in Lincolnshire, and the confessions of the leaders, who were taken by the royal troops, showed that it had been instigated by Clarence and Warwick. The king at once marched against the conspirators, who in vain attempted to collect sufficient forces, and with some difficulty escaped from the country. Warwick made for his old stronghold at Calais, but his lieutenant proved faithless, and turned his guns against him. Thereupon he took refuge at the court of France and resolved to side openly with the Lancastrians. A treaty was made between Warwick and Queen Margaret, which was cemented by the marriage of Prince Edward with Warwick's daughter Anne. This change of front naturally caused a coolness between Warwick and Clarence; but, before the latter could trim his course anew, Warwick, having obtained assistance from Louis XI., landed in the south of England. Edward was taken by surprise, and, unable to make any resistance, fled to Flanders. Warwick at once marched to London, released Henry VI. from captivity, and replaced him on the throne. A general restoration of property and position to the Lancastrians took place. Warwick and his brothers resumed their offices, and Clarence was recognized as successor to the throne in default of heirs-male to Henry VI. (1470).

But this turn of fortune was as brief as it was sudden. The house of Lancaster was finally overthrown by another revolution as capricious and inexplicable as any of those which had already marked this extraordinary conflict. Henry VI. had only been a few months on the throne when Kdward, with the assistance of the duke of Burgundy, landed in Yorkshire, and, gathering troops as he went, marched upon London. He was joined by "false, fleeting, perjured"" Clarence, and admitted into the capital by Warwick's brother the archbishop. On Easter-Day 1471 the forces of the king and the earl met at Barnet, and the former won a complete victory. The earl and his brother Montague were slain. Soon afterwards the battle of Tewkesbury and the death of Prince Edward extinguished the last hopes of the Lancastrian party.

The carecr of the king-makeris chiefly remarkable as illustrating the grandeurs and the evils of feudalism. Warwick's landed property was enormous, comprising, according to the deed by which his widow made it over to Henry VIL, upwards of 110 manors in 21 counties, besides the city of Worcester, the islands of Guern- sey, Jersey, Alderney, and Sark, and various places in Wales. Commynes tells us that at Calais he was so popular that cvery one wore his badge, "no man esteeming himself gallant whose head was not adorned with his ragged staff." Stow (Annals) says that "at his house in London six oxen were usually eaten at a break-fast, and every tavern was full of his meat, for who that had any acquaintance in his family should have as much sodden and roast as he could carry on a long dagger." In a time of civil war and a disputed title to the throne, such a man was naturally too strong for a subject. The restoration of order and the maintenance of the sovereignty of the state rendcred inevitable the disappearance of the class so vigorously represented by the " Last of the Barons."

See Dugdale, Baronage of England; P. de Commynes, Memoirs: Lingard, History of England; Pauli, Geschichte England's. (G. W. P.)

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WASHINGTON, the seat of government of the United States, forms a part of the District of Columbia, which is under the immediate government of the United States. The city of Washington as a corporation has had no

exist- ence since 1871, when Congress abolished the charters of that city and of Georgetown (also within the District of Columbia), and placed the entire District under one government.

The District of Columbia occupies an area of about 70 square miles, on the north-eastern bank of the Potomac, about 100 miles above its mouth, and at the head of tide and of navigation. Most of its area is a plateau, elevated 300 to 400 feet above the river, and traversed by the Anacostia river and Rock creek. Just above the mouth of the former stream, the bluffs, which form the descent from the plateau, recede from the river, leaving an area of bottom land about 6 square miles in extent between that stream and the Potomac. This bottom land is undulating, much of it being but slightly elevated above the river, while the highest parts are scarcely more than 100 feet above high tide. The city of Washington is built upon this bottom land, while its immediate suburbs extend up the bluffs and over the plateau to the northward. The bluffs return to the river imme- diately above the city, and upon their slopes is built the old city of Georgetown, which is practically con- tinuous with Washington. There are several suburban villages scattered over the district, including Mount Pleasant, Tenallytown, Brightwood, Le Droit Park, and Uniontown.

The climate of Washington is characterized by great humidity, long-continued but not excessive heat in summer, with mild winters. Snow does not often fall, and never lies long on the ground.

Three railroads enter the city, the Baltimore and Ohio and the Pennsylvania, which afford communication with the north and west, and the Richmond and West Point Terminal, which extends southward. Besides its railroad connexions, regular lines of steamers ply to northern and southern ports during most of the year.

The plan of the city is regular and symmetrical. Radiating from the Capitol are three streets, running north, south, and east, and known respectively as North, South, and East Capitol Streets. These, together with a line of public parks running west from the Capitol, divide the city into quarters, known as the north-west, north- east, south-east, and south-west quarters. The streets run in the cardinal directions, the north and south ones being designated by numbers, and the east and west ones by

the letters of the alphabet,—the numbers increasing eastward and westward from the meridian of the Capitol, the letters progressing northward and southward from a parallel through that building. In addition to these streets, there is a system of avenues, which run diagonally to the cardinal directions, and which bear the names of States. The intersections of the streets and avenues have given opportunity for the construction of many small parks in the forms of triangles, circles, quadrilaterals, é&c., which, with the numerous larger parks scattered about the city, add greatly to its beauty and healthfulness. The streets have a total length of 2334 miles. They are wider than in any other city on the globe, the avenues ranging in width from 120 to 160 feet, while the streets range from 80 to 120 feet. The area comprised in the streets, avenues, and public parks is considerably more than half the area of the city. As the width of the streets is in most cases in excess of the demands of travel, a portion of this width has, in the residence streets, been left between the side walks and the houses, and has been improved as a public parking. In some cases, similar parking has been

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left in the middle of the streets. Of the 233} miles of streets, 30 per cent. are paved with smooth pavements, either asphalt, coal-tar, concrete, or asphalt blocks ; 10 per cent. are paved with granite or trap blocks, and an equal extent with cobble or rubble; 44 per cent. are macadamized, and 14 per cent. are gravelled, while the remainder are unimproved. The paved streets are swept by machinery at frequent intervals, With the exception of the business streets every street is lined with shade trees, which, arching over the pavements, form continuous shade for miles. The trees are mainly elms and maples.

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The river is crossed by three bridges,—the Long Bridge, by which the city is directly connected with the Virginia shore, the Aqueduct Bridge, so named because it formerly carried the Chesapeake and Ohio Canal, and the Chain Bridge, farther up the river.

The water supply of the District comes from the It is taken out of the river at the head of a

Potomac.

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cataract, known as Great Falls, about 16 miles above the city. It is brought to the distributing reservoir, just above Georgetown, in an aqueduct, passing through a receiving reservoir on the way, and is thence brought to Washington and Georgetown through iron mains. No pumping is done, except to supply the suburbs on the bluffs. The water is excellent, and the supply ample. In order to give a stronger head in certain sections of the city, a tunnel has been constructed to conduct a part of the supply from the distributing reservoir to a third reservoir, north of the middle of the city. The sewer system of the city was not, like its streets, planned in advance, but was suffered to grow up, and is in con- sequence imperfect. There are three main outlet sewers, one emptying into the Potomac just above the Long Bridge, another near the mouth of the Anacostia, while the third, after skirting the city at the base of the blufis, empties into the Anacostia. The houses are generally

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Plan of Washington.

connected with the sewers. with gas and electric lights.

The District has an excellent common school system, modelled after that of New England ; it is managed by a board of trustees appointed by the commissioners. Sepa- rate schools are maintained for white and coloured pupils.

The District of Columbia is governed by three com- Inissioners, appointed by the president of the United States. They perform the executive duties, the various departments of the civic government being apportioned among them. Legislation for the District is enacted by Congress. The District has courts of its own, the judges being appointed by the president. The people have no voice in the management of affairs. Thus is presented the singular spectacle of the capital of a great republic governed by an absolute monarchy. Still more singular, perhaps, is the fact that this is the best governed municipality in the United States. The assessed valuation of the District in 1886 was $234,039,436. Of this, nearly

The city is fairly well lighted

one-half, or $113,803,090, was non-taxable, the exemp- tions being as follows :—property of the United States, $105,389,684; property of the District of Columbia, $2,058,772; private property, $6,354,634. The net debt was $21,279,600, and the rate of taxation $1°50 per $100. This enormous indebtedness was incurred in building up a beautiful city from a swampy waste. One-half of the interest upon it, as well as one-half of the current expenses of the District, is borne by the United States. Washing- ton is unique in the fact that it was planned and con- structed solely for the purpose of serving as the seat of government. It is therefore not surprising that it is without commerce or manufactures, excepting such as are required for the support of its inhabitants.

The population of the District by the last census, taken in 1885, was 203,459 (136,271 white and 67,188 coloured, the two races being in about the proportion of two to one). The population comprised within the old corporate limits of Washington was 173,606. The death-

rate of the District in 1886 was—for whites 17-96, for negroes 32°35, and for all inhabitants 22°80 per thousand. The death-rate among the white population is less than in any other American city approaching Washington in size.

The public buildings are scattered widely over the city. The Capitol (see vol. ii. p. 454) stands upon an eminence towards the eastern edge of the thickly settled portion, in the midst of extensive grounds. It consists of a central building, surmounted by a dome, and flanked by two wings, in which are the chambers of the two houses of Congress. The length of the building is 751 feet, while its breadth ranges in different parts from 121 to 324 feet. It covers nearly 34 acres. Its extreme height, from the ground to the top of the statue of Liberty, which stands upon the dome, is 307} feet. The material of the central building is sandstone, that of the wings marble, while the dome is of iron. The entire cost of the building has been $13,000,000. Besides the two houses of Congress, the Capitol is occupied by the United States Supreme Court and the library of Congress. For the latter a separate building is now in process of erection, upon ground just east of the Capitol.

The Treasury is situated 14 miles west of the Capitol, at the corner of 15th Street and Pennsylvania Avenue ; it is built mainly of granite, in the Ionic style, and measures 468 by 264 feet, with a court in the interior. It contains some 500 rooms, and cost $6,000,000. The building occupied by the state, war, and navy departments is just west of the Treasury, separated from it by the president's residence, which is known as the White House. It is

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Washington—Central Portion.

5. Interior Department. 6. Department of Justice. 3. State, War, and Navy | 7. Department of Agriculture.

1. Capitol.

9. int- 2. White House. Government Print

ing Office. 10. Smithsonian Inst. 8. Bureau of Engraving and | 11. National Museum. Printing. 12. City Hall.

built entirely of granite, is 567 feet long by 471 feet wide, and 128 feet in height, and cost $10,000,000. The interior department building is on F Street North, nearly equidistant from the Capitol and Treasury. It occupies two squares of the city, being 453 by 331 feet, with an interior court. It is simple in its proportion, and in the Doric style. It is built in part of freestone, in part of marble, while the interior is-of granite. This building cost $2,700,000. The post-office department building is directly opposite the interior department, and occupies a whole square. The style is Corinthian, and the material is marble. The dimensions are 300 by 204 feet, with an interior court, and its cost was $1,700,000,

Running westward from the Capitol grounds to the river is a line of public reservations, having a breadth of four squares, from B Street North to B Street 'South. Within these extensive grounds are several public structures,—the botanic gardens, the buildings of the Fish Commission, the army medical museum, the national museum, the Smithsonian Institution, the department of

Departments. 4. Treasury.

WASHINGTON

lorry.

agriculture, and the Washington monument. All these are of brick, with the exception of the Smithsonian Institu- tion, which is of brown sandstone, and the monument, which is of marble. This is a plain obelisk, 55 feet square at the base and 555 feet in height. The White House is situated between the Treasury and the building of the state, war, and navy departments, on Pennsylvania Avenue, in the midst of ample grounds. It is of sandstone, 170 feet long by 86 feet wide. Among the other public buildings are the naval observatory, the Government printing office, the navy yard, artillery barracks, marine barracks, naval hospital, the city hall, the bureau of engraving and printing, and the pension office. Outside the former city limits are the Government asylum for the insane, the national college for the deaf and dumb, the reform school, and in the midst of a large and beautiful public park the soldiers' home, a retreat for aged and disabled soldiers.

It was the design of those who laid out the city that its principal growth should be east of the Capitol. Certain causes, however, prevented this result, and sent the wealth and fashion into the north-western quarter. This quarter contains at present more than half the population and over three-quarters of the taxable property of the District. In this section are many thousands of residences of fine and varied architecture, the display of which has been much encouraged by the freedom of the building regulations.

Washington is one of the most cosmopolitan of cities. Its population is not only drawn from all parts of the United States, but every civilized nation has its represent- atives there. Its social life is characterized by a degree of variety and freedom rarely enjoyed elsewhere. It has become in recent years the American centre of scientific thought, and is rapidly gathering men of letters.

Washington was sclected as the site for the federal capital in 1790. The States of Maryland and Virginia had ceded to the

. general Government a tract of land 10 miles square, lying on both

sides of the Potomac, for that purpose. The Virginia portion was subsequently re-ceded to that State. In 1790 Georgetown was a city of considerable importance, but upon the site of Washington there were very few settlers. The plan of the city was drawn by Major l'Enfant, and the city laid out in accordance therewith by Andrew Ellicott. At that time the greater part of the site lying west of the Capitol was a morass, well-nigh impassable. The machinery of the government was moved to Washington in 1800, when it was "a backwoods settlement in the wilderness." It existed principally upon paper, and the magnificence of the plan only served to emphasize the poverty of the execution. In 1814, during the second war with Great Britain, it was captured by the British troops, and the Capitol, together with most of the other public buildings, was burned. In 1839 it was described as a "large straggling village reared in a drained swamp." Indeed, in 1871, although it had attained to considerable size, it was exceed- ingly backward in all municipal improvements. The public build- ings and grounds were neglected. The streets were deep in mud, or clouded with dust; the unbuilt portions were morasses; and the sewerage was worse than useless. In that year Congress abolished the charters of the two cities, and instituted a form of territorial government, with a governor and a legislative assembly. The matter of municipal improvement was placed in the hands of a board of public works, with authority to carry out a comprehensive scheme. The work was commenced and pushed forward with the greatest encrgy, and almost fabulous results were achieved. In a very few years the appearance of the city was revolutionized. The cost of these improvements, was, however, enormous, and it was increased greatly by the rapidity with which the work was done. Much of it, too, was badly executed, so that it has been necessary to replace it. But, in spite of these drawbacks, the fact that Washington is one of the most beautiful and comfortable cities in the world is principally due to the first governor of the District and his board of public works. This government lived too fast to live long, In 1874

Congress abolished the territorial form, and established the present government by three commiissioners.

The following figures illustrate the growth of the District in popu- lation : —1800, 14,093; 1820, 33,039; 1840, 43,712; 1860, 75,080; 1870, 131,700; 1880, 177,624; 1885, 203,459. Washington had 109,199 inhabitants in 1870, and 147,293 in 1880, (2, G,)*

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See vol. xvii, Plate XXIV.

TERRITORY. |

WASHINGTON, a Territory of the United States, is the extreme north-western political subdivision of the Union (except the detached Alaska), and is bounded on the N. by the Canadian province of British Columbia, on the E. by Idaho Territory, on the S. by Oregon, and on the W. by the Pacific Ocean. It lies between 45° 40’ and 49° 0’ N. lat. and 117° 0’ and 124° 44’ W. long., and has a total land area within its boundaries of 66,880 square miles and a water area of 3114 square niles ; its average length from east to west is 330 miles and from north to south is 220 miles. The Territory is divided by the Cascade Mountains into two unequal sections, which have very different climatic and physical characteristics and commercial and business interests. The climate is very mild, on account of the warm oceanic current from Japan which flows south along the coast. The moisture-bearing winds moving inland from the ocean are chilled against the Cascade Mountains, and cause the western section of the Territory to have’a very heavy annual rainfall (about 53 inches), which is quite evenly distributed throughout the year. ‘The summers are cool and pleasant and the winters mild; flowers bloom in the open air every month in the year, and the nights are always cool and refreshing. The climate in the western section is similar to that of Scotland. That of the eastern section is remarkable for clearness and brightness; it is hot and dry in summer, and has a brief and severe winter. The climate is tempered by a remarkable balmy wind, called the Chinook wind, coming over the mountains from the great Japanese current of the Pacific. In the summer it is a cool wind tempering the heat, and in the winter it is a

warm wind, before which snow and ice disappear with marvellous rapidity.

The Cascade range is the local name of the extension through the Territory of the Sierra Nevada, the great and sharply-defined mountain chain which extends at a distance from shore of about 100 miles through the Pacific States and Territories (see vol. xxiii. pp. 800-1). To the north of the Columbia river the range widens out considerably into a region of high grassy mountain plateaus, of deep caiions, heavily timbered slopes, and high peaks of volcanic origin, furnishing mountain scenery of indescribable grandeur. The western slopes are covered with magnificent forests, principally of fir, the trees growing to an immense size. The mountain plateaus are from 3000 to 5000 feet in elevation, untimbered and covered with excellent grass, furnishing a large extent of valuable pasture-land. On the eastern slope the forests are more open, and consist principally of blue and yellow pine, tamarack, fir, and white cedar. The Northern Pacific Railroad reaches the sea by two routes, one of which goes down the Columbia river, and the other crosses the Cascade range by the Yakima Pass in 47° 20' N. lat.; this pass has an elevation

of 3600 feet, and is in a region of beautiful deeply-

embosomed lakes, the high cliff-like banks of which are crowned with splendid evergreen forests. To the north of the Yakima Pass the range becomes higher, and more rough and rugged than it is farther south. There seems to have been a volcanic centre between the Yakima and Wenatchee and about midway between the upper Yakima lakes and the Columbia, the highest peak of which is known as Mount Stuart, from which poured a grand flood of lava to the east and south, forming the elevated range between the Yakima and Wenatchee known as the Wenatchee Mountains, and crossing the present channel of the Columbia and forming Badger Mountain on the east. To the north of the 48th parallel, which is about the line of the Spokane river and the westward-flowing portion of the upper Columbia, the country changes, becoming more independent in its mountain formations,

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and the eastern jutting ranges of the Cascades meet and join with the earlier rock materials of the western spurs of the Rocky Mountains. Here the great interior basin may be considered as ending, for to the north the Rocky and Cascade ranges approach, and are blended in inextricable confusion. The principal rivers having their sources in the Cascade Mountains on the west are the Nooksack, Skagit, Steilaguamish, Snohomish, Puyallup, and Nisqually flowing into Puget Sound, the Chehalis flowing into Gray's Harbour, and the Cowlitz and Lewis rivers flowing into the Columbia; while on the east are the Methow, Chelan, Wenatchee, Yakima, and Klickitat, flowing into the Columbia, The mountains are well stocked with large game, as deer, bear, mountain sheep, mountain goats, wolves, panthers, foxes, &c., the valleys, plateaus, and lakes with feathered game, and the streams and lakes with trout and salmon.

The western section of the Territory lying between the Cascades and the ocean is the smaller of the two, and is covered with timber throughout nearly its entire extent. The principal natural feature is Puget Sound—one of the most beautiful sheets of salt water in the world, if not in- deed the most beautiful. It isan arm of the sea joining the waters of the Gulf of Georgia and Strait of Juan de Fuca, and stretching about a hundred miles to the south into the heart of the country; it has a great number of bays, coves, inlets, and channels branching off from the main sound, altogether forming a collection of harbours unsurpassed in the world. The total area of the Sound is about 2000 square miles, with a shore-line of about 1600 miles. The water is very deep, in places more than 800 feet, the ordinary depths in the inlets and channels being from 300 to 600 feet. These depths in some places continue right up to the shore, so that vessels of the deepest draught could go and tie up to the trees on the banks as to a wharf. The tides in Puget Sound vary ordinarily from about 9 feet at Port Townsend to 15 feet or more at Olympia and the remote inlets. Along the shores, and for many miles back, the country is covered with the densest growth of very fine timber. The region of the Olympic Mountains lying between Puget Sound and the Pacific has never been explored to any extent, owing to the enormous difficulties of penetrating the forests,

which, besides the standing trees, consist of masses of fallen timber and undergrowth. No rivers or creeks navigable for canoes penetrate any distance into it. There is no doubt that Puget Sound once extended much farther south, and occupied the Willamette valley of Oregon. Its retrogres- sion has left large areas of low-lying land bordering the Sound and between it and the Columbia, which, when brought under cultivation, are found to be remarkably fertile. There are large areas of these low-lying lands covered with water at the highest tides which could be easily reclaimed by dyking ; about 30,000 acres have been so reclaimed, and it is estimated that 150,000 acres besides can be thus improved. There are no good harbours along the Pacific coast of the Territory ; but on the Straits of Juan de Fuca several fine ones exist. Western Waslhing- ton is specially adapted to raising all the grasses, oats, hops, the root-crops, and fruits; whatever requires great heat does not ripen well.

Eastern Washington Territory differs in a very marked manner and in almost every material respect from the western section. South of the 48th parallel and east of the Cascades it is essentially a prairie country, which owes its origin to the great lava flow that covered eastern Oregon and northern California. This lava has disinte- grated in the course of ages, and produced a soil which is unsurpassed in the world for richness. The region lying between the Blue Mountains and the Snake river, known

as the Walla Walla country, and that between the Snake and the Spokane, known as the Palouse and Spokane countries, are noted for their fertility. This is also the case with the regions along the eastern foot-hills of the Cascades known generally as the Yakima and Kittitass countries. In these regions there is sufficient rainfall to enable the agriculturist to raise almost every product of the temperate zone of the finest quality and in the greatest abundance. Besides the cereals, such as wheat, oats, barley, flax, &c., there are grown grapes, apples, cherries, peaches, prunes, potatoes, both white and sweet, tobacco, cotton, broom corn, sorghum, peanuts, egg plants, dc. Over a large part of this eastern section, however, the rainfall is not sufficient, and irrigation must be resorted to. With irrigation

properly conducted it is safe to say that nearly every foot of land now classed as desert will be found to be as productive as the regions more favoured by rain.

That part of eastern Washington Territory north of the Columbia and Spokane rivers is a region of low-timbered mountains and fertile valleys. This is mostly given up to the Indians, there being the two large reservations called the Columbia and Colville reservations stretching from the Cascade Mountains eastward to the southward-flowing portion of the Columbia, and embracing 7880 square miles of land. North of the Spokane river is the Colville country, which is open to settlement, and in which are much good land and large quantities of valuable timber.

The most important feature of eastern Washington is the Columbia river, which enters the Territory from British Columbia at abont 117° 30' W. long., and pursues nearly a southerly course to the "Big Bend," a distance of 110 miles, where it takes a westerly course, which it keeps for 93 miles until it receives the waters of the Okinakanc, where it changes its course again to the south, keeping it for 224 miles, until it unites with its greatest tributary, the Snake river; from this point it keeps a westerly coursc, breaking through the Cascades, and entering the Pacific in lat. 46° 15'. It forms the boundary between Washington Territory and Oregon for this latter part of its course. The lower portion of the Columbia is described under OrEGoN (g.v). The upper part ulay be briefly described as a deeply cafioned river with numerous rapids and falls, which make it unnavigable and in all probability incapable of improvement. The Kettle Falls, near the northern boundary, are the most marked on the river, being about 25 feet at low water. Here each year the Indians from all directions gather on neutral ground to take salmon for their next ycar's subsistence. A salmon chief is elected, whose dutics are to keep order and to divide equitably all the fish taken. 'The fish are taken in baskets as they try to jump the falls, those that fail falling back into the baskets. That part of the Columbia from the northern boundary-line to the "Big Bend" is the most beautiful portion of the river within the Territory, except where it breaks through the Cascades. Throughout this portion there is considerable bottom-land, and this and the neighbouring hills and mountains are well covered with fine open timber, with charming little grassy prairies

scattered here and there. Below the Big Bend the cafion of the Columbia becomes more prominent, the timber recedes fvom the banks, and the channel narrows between basalt rocks, and in places is highly dangerous to anyone who entrusts himsclf upon the waters. The general depth of the cafion is about 2000 feet. Much gold is found in the sand bars and low terraces along the river.

The principal tributaries of the Columbia within the Territory are Clarke's Fork, the outlet of Lake Pend d'Oreille, an unnavigable stream flowing througha deep cafion, which enters the Columbia just above the northern boundary of the Tervitory. The Spokane river, one of the most important tributaries, is the outlet of Lake Coour d'Alenc, which drains a large extent of the Bitter Root Mountains. The Spokane, from the lake to Spokane Falls, a distance of about 30 miles, flows just below the level of a lovely prairie country ; at the falls the river takes a plunge of 156 feet, and from there to the Columbia it flows through a decp cafion. These falls of the Spokane furnish one of the finest, most accessible, and most casily controlled water-powers in the world, and already they are util- ized to a considerable extent for manufacturing purposes. The Okinakane is the next important tributary; it rises in British Columbia and flows southward through Lakes Okinakane and Oso- yoos, and enters the Territory in 119° 30' W. long. Its course lies through a rich and inviting country. At its mouth was one of the most important of the old Hudson's Bay Company's trading posts.

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The Methow river, Lake Chelan and its outlet, and the Wenatchee are rivers of considerable magnitude, draining the eastern slopes of the Cascades. They are in a mountainous country presenting few attractions to the settler. The Yakima, which also comes from the Cascades, is of far greater importance, as about its headwaters is a large amount of fine agricultural land, and the river itself and its tributaries will ultimately furnish the water for irrigating an enormous extent of very fine land now virtually desert. Already large irrigating canals, having a total length of 325 miles, are pro- jected, and work on them has been commenced.

The largest tributary of the Columbia, the Snake, joins it about 8 miles below the mouth of the Yakima. The Snake is navigable for the whole 150 miles of its course through the Territory, but has some difficult rapids. It flows through a cafion 1000 to 2000 feet deep, which it has cut for itself through the lava deposits.

An area nearly encircled by the Columbia, below the Big Bend, and the Snake, in the last 50 miles of its course, is knowu as the Great Plain of the Columbia. Its southern part is an alkalina nearly waterless desert, the principal vegetation being sage brush; the northern part is somewhat more elevated, and is for the most part a rich rolling grassy country intersected here and there by coules, or deep and almost vertical cuts, through the basalt rock underlying the soil. They indicate the former presence of large streams of water,

Forests.—Very valuable forests exist in every part of western Washington and in the northern part of eastern Washington. The sawmills on Puget Sound have a capacity of 350,000,000 feet per year, and the total capacity of the mills of the Territory is over 650,000,000 feet per year. The principal timber is yellow and red fir, ordinarily known as " Oregon pine," which constitutes the bulk of the forests; white and red cedar, spruce, and larch also abound. White pine of magnificent size grows on the upper benches of the Cascade Mountains; white fir and hemlock are also found. Alder, maple, ash, oak, and cottonwood occur in abundance on the bottom-lands of western Washington, but are not equal to timber of the same names in the east. Bull pine, yellow pine, and tamarack grow on the eastern slopes of the Cascade range, and constitute the bulk of the forests of eastern Washington. They make a fair quality of lumber, but greatly inferior to the products of the western slopes and the Pacific coast regions,

Fisheries. —The salmon fisheries of the Columbia river, Shoal- water Bay, Gray's Harbour, and Puget Sound form one of the leading industries of the Territory. The preservation of salmon in cans was commenced in 1866 on the Columbia river, and the business rapidly increased, so that now the annnal value of the pack is from 2 to 24 million dollars.

Mines and Mining.—The mineral resources of the Tervitory arc very great upon both sides of the Cascade Mountains. There are large tracts of valuable coal-lands between Puget Sound and the Cascades, stretching all the way from Bellingham Bay on the north to the Chehalis valley on the south. The veins at present worked vary from 5 to 12 feet in thickness, and in quality from lignite to bituminous coal, some of which produccs gas and coke of superio excellence. Mines are also worked on the eastern slope of the Cascades about the head of the Yakima river. The present known area of coal-lands in the Territory is about 180,000 acres, and the total shipments for the year ending June 30, 1887, amounted to 525,705 tons. The supply of coal for the Pacific coast is mainly drawn from the beds in Washington Territory and their continua- tion in British Columbia.

There are large deposits of valuable iron ore in the western part of the Territory and in the Snoqualmie Pass. Brown hematite iron ore is found in Skagit county, magnetic ore in King county, and bog iron ore of the best quality in several counties, notably Jeffer- son, King, and Pierce; but these deposits have uot yet been worked to any great extent. There can be no question, however, that the existence of coal, iron, and timber in the near vicinity of Puget Sound must make this a great manufacturing and ship- building centre. Limestone is found in great abundance on San Juan Island, in the Puyallup valley, and in the north-castern part of the Territory. Copper and lead are found in different localitics.

The northern part of eastern Washington abounds in mines of the precious mictals,.and these are now being worked on quite an extensive scale. In the Colville district (between the Columbia, Clarke's Fork, and Spokane rivers) the prevailing country rock is limestone, and the prevailing mineral is argentiferous galena ; at some points grey copper ore is found carrying both silver and lead, and in others silver chlorides are found. The development of these mines has been delayed by lack of railway facilities, but this will be remedied in a short time by lines now projected and incorporated.

The Kettle river district lies to the west of the Columbia, and in regions about the headwaters of the river. The mines are very varied in their character, comprising placer gold, gold quartz, copper, and galena with carbonates. Some of the placer mines have yielded heavily, the gold being coarse and obtained by ground sluicing.

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Very valuable quartz ledges, assaying 80 to 2000 ounces of gold per ton, have been discovered in a formation of granite and slate.

The Okinakane district comprises the mines in the vicinity of the Okinakane, Salmon, and the Similkameen rivers and Osoyoos lake. Here the formation is granite, syenitc, and porphyry, and the ores are galena, grey copper, and quartz, carrying sulphurcts and native silver.

The city of Spokane Falls, on the Northern Pacific Railroad, is the distributing point for all these mines, as well as for the Coeur d'Alene mines in northern Idaho.

Shipbuilding.—Shipyards exist at Seattle and Tacoma, and at other points on Puget Sound, at Gray's Harbour and Shoalwater Bay, and on the Columbia river. The vessels constructed are mainly schooners for the lumber-carrying trade; many of them also are provided with auxiliary steam-power. All raw materials for their construction are found in the vicinity. The yellow fir of the northern Pacific ranks next to oak for strength and durability, and constitutes excellent material for

shipbuilding. Vessels of 4854 tons were built during 1886, and the industry is rapidly growing.

Commerce.—The principal articles of export are lumber, coal, wheat, and salmon, and their annual value is from 8 to 10 millions of dollars. In the year from July 1886 to June 1887 the total entrances at Puget Sound were 994 vessels (539,597 tons), and the clearances 988 (514,441 tons).

Railways.—Washington Territory was the last of the political subdivisions of the United States to be reached by railroads, In 1883 the Northern Pacific was completed and direct rail connec- tion secured with the east.

Education.—There are about a thousand common schools in the Territory, under the supervision of a superintendent of public in- struction and a board of education of three persons, all of whom are appointed by the governor. In each county, county superin- tendents and a board of county examiners visit the schools and report to the superintendent of public instruction. There is held each year a territorial teachers' institute, and local teachers' insti- tutes are also held in different sections. These common schools are supported by county taxes and by certain criminal fines. Special taxes are also permitted in counties under certain con- ditions. There are at present about 65,000 children under instruc- tion, at a cost of about $500,000 per annum.

The general Government has set aside for educational purposes one-eighteenth of all the land in the Territory, comprising about 24 million acres. This land, however, does not become available until the Territory becomes a State. All children must attend school at least three months in the year.

There is a university at Seattle, supported by large annual appro- priations of the legislature. It has four departments at present :— literature, science, and the arts; law; medicine; and military in- struction. There are also twenty-four higher institutions of learn- ing scattered throughout the Territory, consisting of colleges, seminaries, and academies, most of which are under sectarian con- trol, and some of which have already a liberal endowment.

Churches. —All the leading Christian sects are well represented in the Territory, their membership and value of church property being about in the order given below :—Mcthodist Episcopal, Roman Catholic, Protestant Episcopal, Congregational, Baptist, Presby- terian, Christian, Lutheran, German Reformed, and Unitarian,

Government.—The administrative affairs of the Territory are in the hands of a governor, secretary, and chief justice, all appointed by the president of the United States, and a treasurer and comp- troller and an upper and lower legislative house elected by the people. The Territory is represented in Congress by a delegate also elected by the people.

Population.—The total population, 75,116 in 1880, was 143,669 (84,470 males, 59,199 females) according to the census taken in 1886 and 1887, classified as follows :—whites, 137,480; blacks, 254; mulattoes, 69; Chinese, 2584; Indian half-breeds, 3288 ; and Kanakas, 44. In addition to these there are about 11,000 Indians. The total population is now (1888) about 175,000. The capital is Olympia, and the chief city Seattle, both on Puget Sound.

Banks.—There are in the Territory 18 national banks, with a capital of $1,430,000, 5 territorial banks, with a capital of $355,000, and also a number of private banks.

History.—The first event in history relating to Washington Territory was the discovery, in 1592, of the Strait of Juan de Fuca by an old Greek pilot of that name in the service of Spain. In 1775 Captain Hecata, a Spanish navigator, discovered the mouth of the Columbia, but was unable to enter theriver. Captain Kendrick, an American navigator, in 1789 sailed into the Strait of Fuca and through the Gulf of Georgia and Queen Charlotte Sound to the Pacific, and was the first to clearly make known the character of these inland waters. On the 11th of May 1792 Captain Gray, of the American ship ' Columbia," sailed into and explored for about 15 miles the great river to which he gave the name of his ship. This first entrance into the Columbia river gave the United States their principal claim to the territory drained by the river, and is thus a very important episode in the history of the Oregon region,*

which formerly comprised the present State of Oregon and the Territories of Washington andIdaho. In October of the same ycar (1792) an Englishman, Lieutenant Broughton, sailed up and ex- amined the Columbia for about 100 miles fromits mouth. The coast soon became quite well known, and the Government of the United States fitted out a number of expeditions to obtain a knowledge of the interior. The most important of these was that of Lewis and Clarke, who were directed to ascend the Missouri, cross the Rocky Mountains, and trace the Columbia from its sources to the sca. They began the ascent of the Missouri in 1804, and spent the winter of 1804-5 at Fort Mandan. In the next season, after incredible hardships and great sufferings, they crossed the Rocky Mountains, and reached the Clearwater river. Here they made boats, and pro- ceeded down it, the Snake river, and the main Columbia, reaching the Pacific in December 1805. They returned by nearly the same route.

The next important erain the history of the Territory was the attempt of J. J. Astor to establish a fur-trading empire on the Columbia and its tributary lands and streams. Two expedition were sent out in 1810 for this purpose, one by land and one by sea. The latter reached the Columbia in 1811, and established a trading post at Astoria near the mouth of the river. The land expedition reached this post in 1812. In the meantime, in hopes of forestall- ing Astor's expeditions, the North-West Fur Company sent a party in 1810 to cross the mountains and reach the mouth of the Columbia beforethem. This expedition experienced great difficulty in crossing the mountains in 52° N. lat., but in the spring of 1811 they reached the Columbia, and went down to its mouth, where they found Astor's sea party already established. This North-West Fur Company's expedition was the first to navigate the upper Columbia, or to traverse any part of the country drained by it. In 1813 the fortunes of war compelled the transfer of the Astor Fur Company to the North-West Fur Company. MHenceforward for many years the history of the Territory is the history of the operations of the great North-West and Hudson's Bay Companies, and of the effort of private parties to get a share in the profits of the fur

trade. A number of trading posts were built, and exploring and trading expeditions sent into all parts of the country. Missionaries began to arrive, and emigrants to drift in by sea and land.

During all the years in which this region was first being cxplored and settled, a dispute had been going on between the United States and Great Britain in regard to its ownership, which at different times waxed so fierce as to threaten war. Finally an arrangement was arrived at, and in 1846 the treaty was signed fixing the boundary- line at the 49th parallel. The Territory of Oregon (comprising Washington, Idaho, and Oregon) was formed in 1848, and General Joseph Lane, the first Territorial governor, arrived in 1849, after which United States courts were established. The present Territory of Washington was established in 1853, and its first governor was Isaac I. Stevens.

The settlement of the Territory has been slow, on account of its remoteness and the fact' that it has had no great mining excitement to attract adventurous settlers. Since the advent of railroads, however, its development has been rapid. (LE Weass)

WASHINGTON, Gurorez (1732-1799), the first president of the United States, was born in Westmoreland county, Virginia, February 22 (Old Style, Feb. 11), 1732. One lawless genealogist has traced his ancestry back to Odin. Another genealogy, since given up with much regret, connected the family with the Washingtons of Northumberland or Durham, England. The ancestry of Washington can be traced no farther back than his great- grandfather, John Washington, who settled in Virginia about 1657. His eldest son, Lawrence, had three children — John, Augustine, and Mildred. Augustine Washington married twice. By the first marriage, with Jane Butler, there were four children, two of whom, Lawrence and Augustine, grew to manhood. By the second marriage, with Mary Ball, in 1730, there were six children—George, Betty, Samuel, John, Augustine, Charles, and Mildred. The father died when George was but twelve years old ; Lawrence inherited the estate now known as Mount Vernon, and George his father's usual residence, nearly opposite Fredericksburgh.

Very little is known of Washington's early life, probably because there was little unusual to tell. The story of the hatchet and the cherry-tree, and similar tales, are quite apocryphal, having been coined by Washington's most popular biographer, Weems. The boy's life was not different from that common to Virginia families in easy circumstances ; hunting, fishing, plantation affairs, and a

little reading made up its substance. His education was but elementary and very defective, except in mathematics, in which he was largely self-taught. Sparks has " edited " the spelling, grammar, and rhetoric of Washington's Writings to such an extent as to destroy their value as evidence. About 1748 we begin to know something of Washington's life. He was then at Mount Vernon with his half-brother Lawrence, who was his guardian. Law- rence was the son-in-law of his neighbour Lord Fairfax, with whom he had served at Carthagena, and had made the acquaintance of Admiral Vernon, from whom Mount Vernon was named, A commission as midshipman was obtained for George through the admiral, but the opposi- tion of the boy's mother put an end to the scheme. As a substitute, the appointment as surveyor of the enormous Fairfax property was given to Washington at the age of sixteen ; and the next three years of his life were spent in this service. He always retained a disposition to speculate in Western lands; many of his later investments were of this kind, and they are treated in Buiterfield's Washing- ton-Crawford Letters. He seems already to have impressed others with a belief in his force of mind and character, for at the age of nineteen, when the first indications of the "French and Indian war" appeared, he was appointed adjutant of the Virginia troops, with the rank of major ; on the death of his half-brother Lawrence in the following year he was executor under the will, and. residuary heir of Mount Vernon; and in 1753, when he had barely attained his majority, the young man was made commander of the northern military district of Virginia by the new leutenant-governor, Dinwiddie. It is at this point in his career that Washington appears in Thackeray's Virginians, but the portrait there drawn of a "shrewd young man" on the lookout for a rich wife is not accepted as life-like by Americans.

At the outbreak of the French and Indian war in 1753-54 Washington was the agent sent by Governor Dinwiddie to warn the French away from their new forts in western Pennsylvania ; the command of the Virginia troops who began hostilities fell to him, and his vigorous defence of Fort Necessity (see Unrrep Stars, vol. xxiii. pp. 7 34-35) made him so prominent a figure that in 1755, at the age of twenty-three, he was commissioned commander-in-chief of "all the Virginia forces. He served in Braddock's campaign, and in the final defeat showed for the first time that fiery energy which always lay hidden beneath his calm and unruffled exterior. He ranged the whole field on horseback, making himself the most conspicuous mark for Indian bullets, and, in spite of what he called the "dastardly behaviour" of the regular troops, brought the little remnant of his Virginians out of action in fair order. In spite of this reckless exposure he was one of the few unwounded officers. For a year or two his task was that of "defending a frontier of more than 350 miles with 700 men ;" but in 1758 he had the pleasure of commanding the advance guard of the expedition which captured Fort Du Quesne and renamed it Fort Pitt. The war in Virginia being then at an end, he resigned his post, married Mrs Custis, a widow, and settled at Mount Vernon.

Washington's life for the next twenty years was merely that of a typical Virginia planter, a consistent member of the Established (Episcopal) Church, a large slaveholder, a strict but considerate master, and a widely trusted man of affairs. His extraordinary escape in Braddock's defeat had led a colonial minister to declare in a sermon his be- lief that the young man had been preserved to be "the saviour of his country." If there was any such impression it soon died away, and Washington gave none of his associates reason to consider him an uncommonly endowed man. His marriage had brought him an increase of about

$100,000 in his estate ; and his diaries show comparatively little reading, a minutely methodical conduct of business, a wide acquaintance with the leading men of the country, but no strong indications of what is usually

considered to be " greatness." As in the case of Lincoln, he was educated into greatness by the increasing weight of his responsibilities and the manner in which he met them. Like others of the dominant caste in Virginia, he was repeatedly elected to the legislature, but he is not known to have made any set speeches in that body, or to have said anything beyond a statement of his opinion and the reasons for it. That he thought a great deal, and took full advantage of his legislative experiences as a political education, is shown by his letter of April 5, 1769, to his neighbour George Mason, communicating the Philadelphia non-importation resolu- tions, which had just reached him. He considers briefly the best peaceable means of resistance to the policy of the ministry, but even at that early date faces frankly and fully the probable final necessity of resisting by force, and endorses it. Without speech-making, he took a promi- nent part in struggles of his legislature against Governor Dunmore, and his position was always a radical one. He even opposed petitions to the king and parliament, on the ground that the question had been put by the ministry on the basis of right, not of expediency, that the ministry could not abandon the right and the colonists could not admit it, and that petitions must be, as they had been, | rejected. 'Shall we," says he in a letter, "after this whine and cry for relief?" In 1774 the Virginia Conven- tion, appointing seven of its members as delegates to the Continental Congress, named Washington as one of them ; and with this appointment his national career begins. Washington's letters during his service in Congress show that he was under no delusions as to the outcome of the taxation struggle, and that he expected war. In one letter he says that if the ministerial policy is persisted in 'more blood will be shed than history has ever yet furnished instances of in the annals of North America." His associates in Congress recognized his military ability at once, and most of the details of work looking towards pre-parations for armed resistance were by common consent left to him. Even in the intervals of his Congressional service he was occupied in urging on the formation, equipment, and training of Virginia troops, and it was generally understood that, in case of war, Virginia would expect him to act as her commander-in-chief. History was not to be cheated in that fashion. The two most powerful colonies were Virginia and Massachusetts. War began in Massachusetts; New England troops poured in almost spoutaneously ; it was necessary to ensure the support of the

colonies to the southward ; and the Virginia colonel who was at the head of all the military committees was just the man whom the New England delegates desired. When Congress, after the fights at Lexington and Concord, resolved to put the colonies into a state of defence, the first practical step was the unanimous selection, on motion of John Adams of Massachusetts, of Washington as commander-in-chief of the armed forces of the United Colonies. Refusing any salary, he accepted the position, asking "every gentleman in the room," however, to remember his declaration that he did not believe himself to be equal to the command, and that he accepted it only as a duty made imperative by the unanimity of the call. He reiterated this belief in private letters even to his wife ; and there seems to be no doubt that, to the day of his death, he was the most determined sceptic as to his fitness for the positions to which he was called in succession. He was commissioned June 19, 1775, and reached Cambridge, Mass., July 2, taking command of the levies there assembled for action against the British

garrison of Boston. The battle of Bunker Hill had already taken place, and Washington's work until the following spring was to bring about some semblance of military discipline, to obtain ammunition and military stores, to correspond with Congress and the colonial governors, to guide military operations in the widely separated parts of a great continent, to create a military system and organization for a people who were entirely unaccustomed to such a thing and impatient under it, and to bend the course of events steadily towards driving the British out of Boston. It is not easy to see how Washing- ton survived the year 1775; the colonial poverty, the exasperating annoyances, the selfishness or stupidity which cropped out again and again from the most patriotic of his coadjutors, were enough to have broken down most men. They completed his training. The change in this one winter is very evident. If he was not a great man when he went to Cambridge, he was a general and a statesman in the best sense when he drove the British out of Boston in March 1776. From that time until his death he was the foremost man of the continent.

The military operations of the remainder of the war are given elsewhere(see UNITED STATES, vol. xxili. pp. 743-745). Washington's retreat through the Jerseys ; the manner in which he turned and struck his pursuers at Trenton and Princeton, and then established himself at Morristown so as to make the way to Philadelphia impassable; the vigour with which he handled his army at Chad's Ford and Germantown; the persistence with which he held the strategic position of Valley Forge through the dreadful winter of 1777-78, in spite of the misery of his men, the clamours of the people, and the impotence of the fugitive Congress,— all went to show that the fibre of his public character had been hardened to its permanent quality. The Valley Forge winter was said to be "the time that tried men's souls: " Washington's had no need to fear the test. It was a serious addition to his burdens that the spirit which culminated in Benedict Arnold chose this moment to make its appearance. Many of the American officers had been affronted by the close personal friendship which had sprung up between La Fayette and Washington, and by the diplomatic deference which the commander- in-chief felt compelled to show to other foreign officers. Some of the latter showed no gratitude. The name of one of them, Conway, an Irish soldier of fortune from the French service, is attached to what was called "' Conway's Cabal." He formed a scheme for replacing Washington in the command by Gates, who had just succeeded in forcing Burgoyne to surrender at Saratoga; and a number of officers and men in civil life were mixed up init. The methods employed were the lowest forms of anonymous slander, and at the first breath of exposure every one con- cerned hurried to cover up his part in it, leaving Conway to shoulder all the responsibility. The treaty of 1778 with France put an end to every such plan. It was a flat absurdity to expect foreign nations to deal with a second. rate man as commander-in-chief while Washington was in existence, and he seems to have had no more trouble of this kind. The prompt and vigorous pursuit of Clinton across the Jerseys towards New York, and the battle of Monmouth, in which the plan of battle was thwarted by Charles Lee, another of the foreign officers, closed the direct military record of Washington until the end of the war. The enemy confined their movements to other parts of the continent, and Washington did little more than watch their headquarters in New York city. It was more than appropriate, however, that he who had been the mainspring of the war, and had borne far more than his share of

its burdens and discouragements, should end it with the campaign of Yorktown, conceived by himself, and

the surrender of Cornwallis. The war was then really over, but the commander-in-chief retained his commission until December 28, 1783, when he returned it to Congress, then in session at Annapolis, Md., and retired to Mount Vernon.

By this time the canonization of Washington had fairly begun. He occupied such a position in the American political system as no man could possibly hold again. He had become a political element, quite apart from the Union, the States, or the people of either. Ina country where communication was still slow and difficult, the general knowledge that Washington favoured anything superseded argument and the necessity of information with very many men. His constant correspondence with the governors of the States gave him a quasi-paternal attitude towards government in general. On resigning his com- mission, for example, he was able to do what no other man could have done with propriety or safety: he addressed a circular letter to the governors of the States, pointing out changes in the existing form of government which he believed to be necessary. His refusal to accept a salary, as general or as president, would have been taken as affectation or impertinence in anyone else; it seemed natural and proper enough in the case of Washington, but it was his peculiar privilege. It is possible that he might have had a crown if he had even been willing. The army, at the end of the war, was justly dissatisfied with its treat- ment. The officers were called to meet at Newburgh, and it was the avowed purpose of the leaders of the movement that the army should march westward, appropriate vacant lands, leave Congress to negotiate for peace without an army, and "mock at their calamity and laugh when their fear cometh." It was the less publicly avowed purpose to make their commander-in-chief king, if he could be per- suaded to aid in establishing a monarchy. Washington put a summary stop to the whole proceeding. Their letter to him detailed the weakness of a republican form of government as they had experienced it,

their desire for ‘“‘a mixed government,” with him at its head, and their belief that “the title of king” would be objectionable to few and of material advantage to the country. His reply was peremptory, andevenangry. He stated in plain terms his abhorrence of the proposal ; he was at a loss to conceive what part of his conduct could have encouraged their ad- dress ; they could not have found “a person to whom their schemes were more disagreeable ;” and he threatened them with exposure unless the affair was stopped at once. His influence, and that alone, secured the quiet disbanding of the discontented army. His influence was as powerful after he had retired to Mount Vernon as before his resigna- tion. He was in constant correspondence with public men in every part of the country. He received from them such a store of suggestions as came to no other man, digested it, and was able from it to speak with what seemed infal- lible wisdom. In the midst of his voluminous correspond- ence, the minute details in his diaries of tree-planting and rotation of crops, and his increasing reading on the political side of history, he found time for a stream of visitors. Among these, in March 1785, were the commissioners from Virginia and Maryland, who met at Alexandria to form a commercial code for Chesapeake Bay, and made an opportunity to visit Mount Vernon. From that moment the current of events, leading into the Annapolis convention of 1786 and the final convention of the next year, shows Washington’s close supervision at every point.

When the Federal Convention met at Philadelphia in May 1787 to frame the present constitution he was present as a delegate from Virginia, though much against his will ; and a unanimous vote at once made him its presiding officer. He took no part in the debates, however, beyond

such suggestive hints as his proposal to amend a restriction of the standing army to 5000 men by forbidding any enemy to invade the United States with more than 3000. He approved the constitution which was decided upon, believ- ing, as he said, “that it was the best constitution which could be obtained at that epoch, and that this or a dissolu- tion awaits our choice, and is the only alternative.” All his influence was given

to secure its ratification, and his influence was probably decisive. When it had been ratified, and the time came to elect a president, there was no more hesitation than if the country had been a theocracy. The office of president had been 'cut to fit the measure of George Washington," and no one thought of any other person for it. The unanimous vote of the electors made him the first president of the United States ; their unani- mous vote re-elected him in 1792-93 ; and, even after he had positively refused to serve for a third term, two electors obstinately voted for him in 1796-97. The public events of his presidency are given elsewhere (see UNITED STATES, vol. xxill. pp. 752-755). One can hardly follow them with- out receiving the conviction that the sudden success of the new system was due mainly to the existence at that time of such a character as Washington. He held the two natural parties apart, and prevented party contest until the new form of government had been firmly established. It seems hardly possible that the final result should have been baulked, even if 'blood and iron" had been necessary to bring it about. It would be unwise to attribute the quiet attainment of the result to the political sense of the American people alone, or to use it as an historical pre- cedent for the voluntary assumption of such a risk again, without the advantage of such a political factor as Washington.

No greater mistake could be made, however, than to think that the influence of the president was fairly appreciated during his term of office. He attempted to balance party against party, to divide his cabinet between them, and to neutralize the effects of parties in that way. The consequence was that the two leading members of the cabinet soon occupied the position, to use the words of one of them, of "two game-cocks in a pit." The unconscious drift of Washington's mind was toward the Federal party ; his letters to La Fayette and Henry, in December 1798 and January 1799, are enough to make that evident. When the Republican party was formed, about 1793, it could not have been expected that its leaders would long submit with patience to the continual interposition of Washington's name and influence between themselves and their opponents; but they maintained a calm exterior. Some of their followers were less discreet. The president's proclamation of neutrality between France and Great Britain excited them to anger ; his support of Jay's treaty with Great Britain roused them to fury. Forged letters, purporting

to show his desire to abandon the revolutionary struggle, were published ; he was accused of drawing more than his salary ; hints of the propriety of a guillotine for his benefit began to appear; some spoke of him as the "stepfather of his country." The attacks embittered the close of his term of service; he declared, in a cabinet meeting in 1793, that "he had never repented but once the having slipped the moment of resigning his office, and that was every moment since." Indeed, the most un- pleasant portions of Jefferson's Ana are those in which, with an air of psychological dissection, he details the storms of passion into which the president was hurried by the news- paper attacks upon him. These attacks, however, came from a very small fraction of the politicians ; the people never wavered in their devotion to the president, and his election would have been unanimous in 1796, as in 1789 and. 1792, if he had been willing to serve.

WABHINGTON

[PRESIDENT.

All accounts agree that Washington was of imposing presence. He measured just 6 feet when prepared for burial ; but his height, in his prime, as given in his orders for clothes from London, was 3 inches more. La Fayette says that his hands were "the largest he ever saw on aman." Custis says that his complexion was " fair, but considerably florid." His weight was about 220 ib. The various and widely-differing portraits of him find exhaustive treatment in the seventh volume of Winsor's Narrative and Critical History of the United States. The editor thinks that " the favourite profile has been unquestionably Houdon's, with Stuart's canvass for the full face, and probably Trumbull's for the figure." Stuart's face, however, gives the popular notion of Washington, though it has always been a subject of curious speculation to some minds how much of the calm and benign expres- sion of the face was due to the shape of Washington's false teeth.

Washington was childless: said the people of his time, he was the father only of his country. Collateral branches of the family have given the Lees, the Custises, and other families a claim to an infusion of the blood ; but no direct descendants of Washington can claim his honours, or disgrace

his name. His estate of Mount Vernon was acquired in 1858 by an association, and has been practically national property ever since.

Retiring from the presidency in 1797, Washington resumed the plantation life which he most loved, the society of his family, and the care of his slaves. He had resolved some time before never to obtain another slave, and 'wished from his soul" that his State could be persuaded to abolish slavery; "it might prevent much future mischief." He was too old, however, to attempt further innovations. In 1798 he was made commander- in-chief of the provisional army raised in expectation of open war with France, and was fretted almost beyond endurance by the quarrels of Federalist politicians about the distribution of commissions. In the midst of his inilitary preparations, he was struck down by sudden illness, which lasted but for a day, and he died at Mount Vernon, December 14, 1799. The third of the series of resolutions introduced in the house of representatives five days after his death, by John Marshall, and passed unanimously, states exactly, ifa trifle rhetorically, the position of. Washington in American history: 'first in war, first in peace, and first in the hearts of his countrymen."

Washington's disorder was an cedematous affection of the wind-pipe, contracted by careless exposure during a ride in a snow-storm, and aggravated by neglect afterwards, and by such contemporary remedies as excessive bleeding, gargles of " molasses, vinegar, and butter" and "' vinegar and sage tea," which 'almost suffocated him," and a blister of cantharides on the throat. He died without theatrical adieus ; his last words were only business direc- tions, affectionate remembrances to relatives, and repeated apologies to the physicians and attendants for the trouble he was giving them. Just before he died, says his secre- tary, Mr Lear, he felt his own pulse; his countenance changed ; the attending physician placed his hands over the eyes of the dying man, '"'and he expired without a struggle or a sigh."

Any complete bibliography of books relating to Washington would be voluminous. Lives have been written by Weems, Marshall (1804-7), Ramsay (1807), A. Bancroft (1826), and Irving (1855). See also Sparks's Writings of Washington (1834-87) ; Rush's Domestic Life of Washington

(1857); G. W. P. Custis's Recollections of Washington (1860) ; Baker's Character Portraits of Washington (1887); Science, December 11, 1885 (an attempt to make a composite portrait of Washington); Winsor's Narrative

| and Critical History of the United States (editor's article) ;

Bancroft's United States (final revision) ; Schouler's United States ; M'Master's United States. (A. J.)

WASPS

WASPS. The order Hymenoptera is divided into two sub-orders, the Zerebrantia and the Aculeata. The latter is subdivided into several sub-sections, one of which, the Diploptera (Latreille), includes all the true wasps.

The Diploptera are in their turn divided into three families—(1) the Vespida, (2) the Hwmenidz, and (3) the Masaridx, which together comprise some 1000 different species. They are characterized by their wings, which are present in both sexes and also in the neuters, being longitudinally folded when at rest. The antenne are usually elbowed, and contain twelve or thirteen joints; in some cases they are clavate. A pair of notched faceted eyes are present, and three ocelli in the top of the head. The mouth-parts are arranged for sucking, but have not reached that degree of perfection found amongst the bees. Hence wasps cannot obtain the sugary secretion from deeply- seated nectaries, and their visits to flowers are confined to such as are shallow or widely opened; they particularly frequent the Umbellifere. The maxille are elongated, and compressed, the maxillary palp six-jointed. The labinm bears a tongue which is glandular at the tip; the paraglossze are linear. The labial palp has three or four joints. The thorax is oval, and its sides prolonged backward to the base of the wings. The fore wing has two or three sub-marginal cells. The legs are not provided with any adaptations for collecting pollen. The abdomen is some- times pedunculate, its anterior segment being drawn out into a long stalk, which connects it with the thorax. The females and the neuters are armed with a powerful sting. The

usual colour of these insects is black, relieved to a greater or less degree by spots and patches of yellow or buff.

The Diploptera may be subdivided into two groups in accordance with the habits of life of the insects comprising the section. One of the groups includes the family Vespide, which is composed of social wasps, and includes the hornet (Vespa crabro) and the common wasp (V. vulgaris). The other group contains two smaller families, the Humenide and the Masaridx, the members of which are solitary in their mode of life.

Family I. Vespide.—In addition to their social habits the members of this family are characterized by certain structural features. The anterior wings have three sub- marginal cells. The antenne have thirteen joints in the males and twelve in the females; the claws of the tarsi are simple ; the anterior four tibice have two spines at the tip ; the abdomen is but rarely pedunculated, and the posterior segments are often very contractile.

The members of this family approximate very closely to bees in their social manner of life. The communities are composed of males, females, and neuters or workers. The latter are females in which the ovary remains undeveloped ; they resemble the perfect female in external appearance, but are slightly smaller. Unlike the bees', the wasps' com- munity is annual, existing for one summer only. Most of the members die at the approach of autumn, but a few females which have been fertilized hibernate through the winter, sheltered under stones or in hollow trees. In the spring and with the returning warm weather the female regains her activity and emerges from her hiding-place. She then sets about finding a convenient place for building a nest and establishing a new colony. The common wasp (V. vulgaris) usually selects some burrow or hole in the ground, which, if too small, she may enlarge into a chamber suitable for her purpose. She then commences to build the nest. This is constructed of small fibres of old wood, which the wasp gnaws, and kneads, when mixed with the secretion from the salivary glands, into a sort of papier-maché pulp. Some of this is formed into a hanging pillar attached to the roof of the cavity, and in the lower

ool

free end of this three shallow cup-like cells are hung. In each of these an egg is laid. The foundress of the society then continues to add cells to the comb, and as soon as the grubs appear from the first-laid eggs she has in addition to tend and feed them.

The grubs are apodal, thicker in the middle than at either end ; the mandibles bear three teeth ; the maxille and labium are represented by fleshy tubercles. The body, including the head, consists of fourteen segments, which bear lateral tubercles and spiracles. They have no anus: They are suspended with the head downwards in the cells, and require a good deal of attention, being fed by their mother upon insects which are well chewed before they are given to the larve, or upon honey. At the same time the mother is enlarging and deepening the cells in which they live, building new cells, and lay- ing more eggs, which are usually suspended in the same angle of each cell. The development within the egg takes eight days.

After about a fortnight the grubs cease to feed, and, forming a silky cover to their cells, become pupe. This quiescent stage lasts about ten days, at the end of which period they emerge as the imago or perfect insect. The silky covering of the cell is round or convex outwards ; and to leave the cell the insect either pushes it out, when it opens like a box lid, or gnaws a round hole through it. As soon as the cell is vacated it is cleaned out and another egg deposited. In this way two or three larve occupy successively the same cell during the summer. The first

'wasps that appear in a nest are neuters or workers, and

these at once set to work to enlarge the comb, and feed the larve, &e.

The material which forms the substance of the nest is usually dried wood, worked by the mandibles of the wasp, with the addition of its salivary secretion, into a pulp, which can easily be moulded whilst moist ; it dries into a substance of a papery appearance, but possessing consider- able tenacity. Sometimes paper itself, such as old cart- ridge cases, is used. The combs are arranged horizontally ; each contains a single layer of cells opening downwards. The second comb is suspended from the first by a number of hanging pillars which are built from the point of union of

three cells. The space between two combs is just sufficient to allow the wasps to cross each other. The combs are roughly circular in outline, and increase in size for the first four or five layers, after which they begin to decrease; the whole is covered by a roughly made coating of the same papery substance which composes the combs. This at first forms a cap-shaped protection, but as each comb is built it is continued down until finally it forms a roughly spherical covering for the whole, but not giving any support to the combs, which are independent of it. The covering is pierced by apertures for the passage of the wasps. The cells are hexagonal at their mouths, but above become more rounded in their cross section.

During the first half of the summer only workers are produced, but, as fruit ripens and food becomes more abundant, fully developed females and males appear, the latter from parthenogenetically developed eggs of the later broods of workers. The males and females are larger than the workers, and require larger cells for their development ; these are usually kept apart from one another and from those of the workers. The males may be distinguished by their longer antenne, by the more elongated outline of their body, and by the absence of a sting. ;

In a favourable season, when the weather 1s warm and food plentiful, a nest may contain many thousands of cells full of wasps in various stages of development; and, as each cell is occupied two or three times in the course of a

summer, those authorities who put the number of the members of the community as high as 30,000 are probably not far wrong.

At the approach of autumn the society begins to break up ; the males fertilize the females whilst flying high in the air. They then die, often within a few hours. The workers leave the nest, carrying with them any grubs that remain in the cells, and both soon perish. The nest is entirely deserted. The females which have been fertilized creep into crevices under stones or trees, or hide amongst moss, and hibernate until the warmth of the following spring induces them to leave their hiding-places and set about founding a new community.

There are altogether seven species of Vespa met with in Britain. V. vulgaris, the common or ground wasp, V. rufa, the red wasp, distinguished by its reddish-

The hornet, /. crabro, is the largest species occurring in Great Britain. They have a more distinctly red colour than the common wasp, and a row of red spots upon each side of the abdomen. They occur much more rarely than the common wasp, and appear to be almost confined to the southern half of England. Their nests resemble those described above, but are larger; they are found in hollow trees or deserted ont- houses. Their com- munities are smaller in uumber than those of wasps.

The hornet, where it occurs in any number, does a con- siderable amount of damage to forest trees, by gnawing the bark off the younger branches to obtain material for constructingitsncest. It usually selects the ash or alder, but sometimes attacks the lime, birch, and willow, Like the wasp, it does much damage to fruit, upon the juices of which it lives. On the other hand, the wasp is useful by keeping down the numbers of flies and other insects. It catches these in large numbers, killing them with its jaws and not with its sting. It then tears off the legs and wings, and bears the body back to its nest as food for the larvee. Wasps also act to some extent as flower fertilizers, but in this respect they cannot compare with bees; they visit fewer flowers, and have no adaptations on their limbs for carrying off the pollen.

The genus Vespa is very widely spread; it contains over forty species, distributed all over the world. Some of the largest and handsomest come from eastern Asia. V. mandarina of China and Japan, and V. magnifiea of the East Indies and N epal, measure 2 inches across the wings; V. orientalis, found in Greece, Egypt, and the East, builds its nest of clay.

The only other genus of Vespide which is found in Europe is Polistes, which occurs in the countries bordering the Mediterranean. The colonies of this genus are much smaller than those of Vesna. Each nest consists of a single tier of cells in the form of a round plate, supported in the middle by a single stalk. This comb is sometimes vertical, the cells then being horizontal or slightly

Fie. 2,—Nest of Vespa sylvestris.

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oblique. Some of the members of this genus store up honey, which in the case of a South-American species is poisonous, from the nature of the flowers from which it is gathered. The members of this genus have a slender body; the thorax is more oblong than in the genus Vespa, the palps stouter, and the abdomen more distinctly peduncu- late.

The genus Jschnogaster, from the East

Fic. 3.— Polistes tepidus and nest.

Indies, has many structural features in common with the Eumenide, but the character of its communities, and its nest, which is very small, justify its position amongst the social wasps.

The genus Zcaria, common in Australia and the East Indies, builds very small nests, of two or three rows of cells, hanging on one side from a stalk.

Synwea is a South-American genus, which builds large nests, sometimes 3 feet in length, closely applied to the branch of a tree; they never contain more than one layer of cells, which are horizon- tally placed. The whole nest is built of coarse material, chiefly rity pieces of bark ; and there is only one opening, at the lower end,

Another South-American genus, Chartergus, makes a tough nest, pendant from boughs of trees, and opening to the exterior below by a median aperture. The combs are arranged, somewhat like funnels, inside one another, but with spaces between. The apex of each comb is picrced by a hole for the wasps to pass from one gallery to another.

The nest of Tatwa, which occurs in Mexico and Sonth America, is also pendant, but the combs are horizontal ; the opening from the exterior is at

the side, and the passage from one gallery to another is also lateral.

The external appearance of the nest of Nectarina, found in Brazil and other parts of South America, resembles that of the common wasp, but isrongher. Internally the combs are arranged concentri- cally, more or less parallel with the external covering which affords them support.

The members of the two remaining families, the Eumenidx and the Masaridx, resemble one another in their solitary mode of life; only males and females exist,—no workers or neuters being found.

Family IL Humenide.—Solitary species, with three submarginal cells in the fore wing; antenne with thirteen joints in the male, twelve in the female; abdomen some- times pedunculate, posterior segments contractile. In the foregoing structural features the Zumenidx resemble the Vespidx, but they differ in having bifid claws on their tarsi, and the four anterior tibiz have but one spine at the tip. The mandibles are elongated, and form a kind of rostrum, in this respect approaching the Fossores.

Humenes coarctata is the only British species of this genus. The female is half an inch long, the male somewhat shorter. The abdomen is connected with the thorax by a long peduncle. The colour is black, relieved by spots of yellow. It constructs small spherical cells of mud, which are found attached to stems of plants, very generally to the heath. At first the cell opens to the exterior by means of a round pore ; one egg is deposited in each cell, anda / store of honey as food for the larva when hatched; the cell is then closed with mud. The larva of some species are carnivorous, and then the food supply stored up in the cell con- sists of caterpillars and other insect larvae which have been paralysed by the parent wasp stinging them through the cerebral ganglion; when the larva of the Ewmenes emerges from the egg it scts upon these and devours them.

The genus Odynerus contains a very large number of species, found in all parts of the world. The meinbers of this genus are about the size of a fly, and they differ from Hwmenes in having a sessile abdomen. Some of the species construct their cells in

Fic. 4.—£umenes smitthit.

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sand heaps, lining them with agglutinated grains of sand; others live in cavities of trees lined with the same material, whilst others build their nests of mud. Like some of the species of Eumenes, they store up paralysed Lepidopterous and Chrysomeleous larve as food for their carnivorous grubs.

Family III. Masaride.—-The members of the third family, the Masaridz, are sharply distinguished by the possession of only two submarginal cells in the fore wing. Their antennz are fre- quently clavate, particularly so in the genus Celonites ; they are twelve-jointed, but as the terminal joints are almost fuse they appear to be composed of only eight joints. The Wings are not so completely folded as in the other two families, and the ab- domen is but slight- ly contractile. The maxille are short and their palps very small, with but three or four joints.

The number of genera comprised in this family is small; none occur in Britain, but in southern Europe some species are found. They make their nest in cavities in the earth, generally in a bank, and construct an irregular gallery leading down to it.

During hot fine summers wasps cause a good deal of loss to market gardeners and fruit growers. During this time of year they live almost exclusively upon the sweet juices of ripe fruit, occasionally carrying off small particles of the flesh. At the same time they have not entirely lost their carnivorous tastes, for they frequently attack the meat in butcher's shops, but render compensation by killing and carrying off to feed their grubs considerable numbers of blow-flies. Wasps also perform an important service in keeping down the numbers of caterpillars. The larvee are almost exclusively carnivorous, living upon insects captured by their parents and reduced by them to a pulp before being given to the young. During the spring the first broods that appear live largely upon honey; and this forms the staple food of the genus Polistes throughout their whole life.

In attempting to rid a district of wasps, unless the nest can be taken, there is little good in killing stray members of the community. On the other hand, the killing of wasps in early spring probably means that the formation of a nest and the production of a society whose members are counted by thousands is in each case prevented.

The number of wasps is kept down by numerous enemies. The most effective of these live in the nests and devour the larve; among them are two species of beetle, Riupiphorus paradoxus and Lebia linearis. Two species of Ichnewmon, a species of Anthomyia, and the larva of a Volucella also infest the nests of wasps and prey upon the grubs. The last-named is also found in beehives. In the tropics some species are attacked by fungi, the hyphe of which protrude between the segments of the abdomen, and give the wasp a very extraordinary appearance. . (A. E, 8.)

WASTE (Vastum) is used in law in several senses, of which four are the most important. (1) Waste of a manor is that part of a manor subject to rights of common, as distinguished from the lord's demesne (see Commons, Manor). (2) Year, day, and waste was a part of the royal prerogative, acknowledged by the statute De Prerogativa ftegis. The king had the profits of freehold lands of those attainted of felony and petit treason and of fugitives for a year and a day with a right of committing waste in sense (3) thereon. After the expiration of a year anda day the lands returned to the lord of the fee. Attainder for felony being

Fic. 5.—Masaris vespiformis.

uow abolished, the right has ceased to exist (see FELONY, Treason). (3) The most usual signification of the word is "any unauthorized act of a tenant for a freehold estate, not of inheritance or for any lesser interest, which tends to the destruction of the tenement, or otherwise to the injury of the inheritance" (Pollock, Law of Torts, p. 285). Waste is either voluntary or permissive. Voluntary waste is by act of commission, as by pulling down a house, cutting down trees, opening new quarries or mines (though not con- tinuing the working of existing ones), or doing anything which may destroy evidence, such as conversion of arable into meadow

land. Permissive waste is by act of omission, such as allowing buildings to fall out of repair. A fermor, by the Statute of Marlbridge, 52 Hen. III. c. 23, may not

{ commit waste without licence in writing from the rever-

sioner. The same statute mentions a form of waste which has long become extinct, viz., exile (exiliwm), or the im- poverishment of villeins or tenants at will on an estate. In case a tenant for life or for any smaller interest holds (as is often the case by the terms of a will or settlement) without impeachment of waste, his rights are considerably greater, and he may use the profits salva rerum substantia

(to use the language of Roman law). For instance, he may

cut timber in a husband-like manner and open mines, but he may not commit what is called equitable waste, that is, pull down or deface the mansion or destroy ornamental timber. Acts of equitable waste were, before 1875, not cognizable in courts of common law, but it is now provided by the Judicature Act, 1873, § 25 (3), that in the absence of special provision to that effect an estate for life without impeachment of waste shall not confer upon the tenant for life any legal right to commit equitable waste. Removal of fixtures, which would be prima facie waste, is recognized by the law to a limited extent (see Fixtures). A copy- holder may not commit waste unless allowed by the cus- tom of the manor (see CopyHoLD). Various remedies for waste have been given to the reversioner at different periods of law. At common law only single damages seem to have been recoverable. This was altered by the legislature, and for some centuries waste was a criminal or quasi-criminal offence. Magna Charta enacted that a guardian committing waste of the lands in his custody should make amends and lose his office. The Statute of Marlbridge made a fermor committing waste liable to grievous amerciament as well as to damages, and followed Magna Charta in forbidding waste by a guardian. The Statute of Gloucester, 6 Edw. I. c. 5, enacted that a writ of waste might be granted against a tenant for life or years or in courtesy or dower, and on being attainted of waste the tenant was to forfeit the land wasted and to pay thrice the amount of the waste. In addition to the writ of waste the writ of estrepement (said to be a

corruption of exstirpamentum) lay to prevent injury to an estate to which the title was disputed. Numerous other acts dealt with remedies for waste. The writ of waste was superseded at common law by the mixed action of waste, itself abolished by 3 and 4 Will. IV. c. 27, and the action of trespass on the case (see Tort, Trespass). The Court of Chancery also established a jurisdiction by suit or injunc- tion, especially to restrain equitable waste. At present proceedings may be taken either by action for damages, or by application for an injunction, or by both combined, and either in the Queen's Bench or Chancery Division. By the Judicature Act, 1873, § 25 (8), the old jurisdiction to grant injunctions to prevent threatened waste is considerably enlarged. The rules of the Supreme Court, 1883, Ord. xvi. r. 37, enable a representative action to be brought for the prevention of waste. In order to obtain damages or an injunction, substantial injury or danger of it must be proved. In England only the High Court (unless by agree- ment of the parties) has jurisdiction in questions of waste, XXIV. — 50

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but in Ireland the civil bill courts and courts of summary jurisdiction have co-ordinate authority to a limited extent. The law of waste as it affects ecclesiastical benefices will be found under Dizaprpations. (4) Waste of assets or devastavit isa squandering and misapplication of the estate and effects of a deceased person by his executors or ad- ministrators, for which they are answerable out of their own pockets as far as they have or might have had assets of the deceased. The legal liability of the representatives of the deceased is recognized by 30 Car. IL c. 7 and 4 W. and M. e. 24.

In Seots law waste is not used as a technical term, but the respective rights of fiar and liferenter are much the same as in England. The latter, however, has not the right of continuing the working of existing mines unless the deed specially confers it upon him. Interdicts have in strong cases been granted against the sale of ornamental timber.

In the United States, especially in the western States, many acts, such as the felling of timber, are not considered waste which would be waste in

England. In some States waste is a cause of forfeiture; in some it gives a right to treble damages. The writ of estrepement is still in use.

WATCH. Timepieces moved by a spiral spring instead of a weight were made as early as the 16th century, though the law which governs the mechanical theory of springs was first enunciated by Huygens in the 17th century (ut tensio sic vis); this, however, is not invariable.

Fig. 1 shows the general arrangement of a watch or chronometer (both of which are here considered together). The barrel and eee ‘ fusee will be re- he ed cognized at once. The fusee is a sort of grooved hollow-sidedcone; the more rapid swell towards the thick end is re- quired, because one turn of the fusee, when the chain is at that end, takes much more of it off the barrel than at the thin end; and on the assumption that the force of the spring varies as its tension the radius of the cone must increase more rapidly, in order to make the increase of leverage keep pace with the decrease in the force of the spring as it unwinds with an increasing velocity off the thick end of the fusee. The fusee itself is con- nected with the great wheel by a ratchet and click and going ratchet (of which the spring and click are strongly shown in the figure), just as described under Cxocks (vol. vi. p. 22). Something is also required to prevent the watch from being overwound, or the chain strained so as to break. This is done by means of a hooked lever, set on a hinge in the upper frame-plate (which is taken off in this drawing) ; and when the watch is nearly wound up the chain moving upwards reaches this lever, and moves it into such a posi- tion that its hook catches hold of the long tooth projecting from the thin end of the fusee; and thus the winding is stopped without any strain on the chain by the sudden check.

By far the greater number of watches now made both on the Continent and in America have the mechanism known as the going barrel in substitution for the chain and fusee. In the going barrel the mainspring is of great length, and only a few coils of it are brought into action. To the going barrel itself the main wheel is attached, and thus the force of the mainspring is transmitted direct to the escapement. The general adoption of the going barrel

mechanism is due to the introduction of keyless winding, °

which can only be adapted to the fusee watches with diffi- culty, and to the greater cheapness of the arrangement. Moreover, it is found that for three or four coils of a long spring, at a certain degree of winding up, the tension varies very little. best English work, in which absolute uniformity of motion is aimed at; but for ordinary purposes it is not of so much consequence that the same rate from hour to hour should be maintained provided the daily rate is uniform.

In watches without a fusee the apparatus for preventing overwinding is different from that in the old form of watch ; it goes by the name of the Geneva stop, and the principle of it is simple. If two wheels work together, of which one has the spaces between some two or more adjacent teeth filled up, it is evident that that wheel cannot be turned quite round, And it will be the same thing if one of the wheels is only a cylinder with a single tooth in it, and the other has a certain number of notches, not going all round, through which that tooth can pass. If, therefore, a one-toothed wheel of this kind is fixed to the barrel arbor, which is turned by the key, and works into a wheel with only 4 or 5 notches in it and a blank space through which the tooth cannot pass, it will evidently allow the barrel to be wound up the 4 or 5 turns and no more; and as it unwinds it turns the stopping wheel back again with it.

The other parts of a watch do not differ from those of a clock, except in size, and the position in which they are arranged, to bring them within the circle of the dial, until we come to the escapement ; and there a different state of things arises, mainly from the fact that the balance of a watch revolves through sometimes as much as 270°, while a clock pendulum only vibrates through 4° or 5°, The balance being common to all the watch escapements, it will be proper first to describe that, and the conditions to which it is subject. The two equal arms, with equal weights at each end, in fig. 3 of article CLocxs (vol. vi. p. 17) are really a balance just as much as the wheel which is commonly used as the more convenient form. But in that figure there is not to be seen that essential element of a modern balance—the thin spiral spring, opening and closing itself at every vibration. The outer end of this spring is attached to the

*frame by a cock R (fig. 2), and the inner to the balance at S; and the time of vibration depends only on the strength of the spring and the moment of inertia of the balance, and not at all upon the extent or angle of the vibration. And, as the force of a spring varies (ap- proximately) inversely as its length, this * suggests a ready method of regulating the watch; for it is easy to make a pointer or index, or "regulator" PT, turning on a ring fixed to the watch plate, concentri¢ with the balance, and having two pins in it at P, called curb pins, just close enough together to embrace the spring, so that, as the index is moved one way or the other, the length of the spring which is free to vibrate may become shorter or longer. When the regulator has been moved as far as it can go towards fast, suppose, and the watch still loses, the spring has to be shortened at the cock R into which its outer end is pinned ; and, in order that the balance may be capable of alteration, so as still to stand square with the escapement when the spring is inits neutral state, the other end is not actually pinned to the balance, but the cock S is on a small ring which is set on the axis or verge of the balance pretty tight by friction, but capable of being turned by hand. An index-plate like that in fig. 2 enables one to see smaller movements of the index than radial marks.*

The going barrel is not used in the

WATCH

It is almost impossible to move such a regulator little enough, and with sufficient accuracy, for a very small variation of rate. One way of obtaining greater accuracy, and probably the best, is to make the regulator movable by a tangent screw acting on its end, and capable of being turned by the watch key. Another mode of giving a small motion to the regulator is by putting a portion of a wheel with teeth on it, and turning it by a small pinion with the index attached to it, so that the motion of the index exceeds that of the regulator itself as much as the radius of that wheel exceeds the radius of the pinion. Chronometers are regulated in a different way altogether. It is not expedient to alter the effective length of the spring after its length is once fixed. For it has long been ascertained that a spring does not give isochronous vibra- tions at all lengths, but only at certain intervals; and therefore it is necessary In

an accurate timekeeper to use only one of those lengths of the spring which are found to be isochronous for different ares of vibration ; and, that being fixed, the timing of the balance can only be done by altering its moment of inertia, and this is done in chrono- meters by screws with heavy heads in the rim of the balance, set farther in or out as it is wanted to go faster or slower. In marine chronometers, where there is plenty of room for it, the balance-spring is generally made in a cylindrical form, with the coils all of the same diameter, instead of the flat spiral used in watches,—though it does not seem to be quite clear that the cylindrical form is materially better than the other.

The timing of a watch for position, as it is called, is a matter which requires some attention. Ifthe balance is not exactly poised on its axis, it will have a tendency to take one position when the watch is carried vertically, as it always is in the pocket; and the time of vibration will be affected by its disposition thus to act as a pendulum. The watch ought therefore to be tried with XII, IX, VI, and III successively upwards, and if it does not keep the same rate the balance is not properly poised. Marine chronometers, indeed, being set in gumbals (a ring with the two pivots into the box at right angles with the pivots which carry the chronometer), will remain horizontal, though not without some degree of motion under the motion of the ship ; and this gives the balance the further advantage of having its weight resting only on the end of the axis or verge, a position in which there is much less friction than that of a watch carried in the pocket; but there it is not of so much consequence, because the balance is so much lighter than a chronometer balance.

Compensated Balances.—A pendulum requires scarcely any com- pensation except for its own elongation by heat ; but a balancé re- quires compensation, not only for its own expansion, which increases its moment of inertia just like the pendulum, but far more on account of the decrease in the strength of the spring under increased heat. Dent, in a pamphlet on compensation balances, gave the following results of some experiments with a glass balance, which he used for the purpose on account of its less expansibility than a metal one :—at 32° F., 3606 vibrations in an hour ; at 66°, 3598°5 ; and at 100°, 3599. If therefore it had been adjusted to go right (or 3600 times in an hour) at 32°, it would

have lost 74 and 84 seconds an hour, or more than three minutes a-day, for each successive in- crease of 34°, which is about fifteen times as much as a common wire pendulum would lose under the same increase of heat ; and if a metal balance had been used instead of a glass one the difference would have been still greater.

The necessity for this large amount of compensation having arisen from the variation of the elasticity of the spring, the first attempts at correcting it were by acting on the spring itself in the manner of a common regulator. Harrison's compensation consisted of a compound bar of brass and steel soldered together, having one end fixed to the watch-frame and the other carrying two curb pins which embraced the spring, as was described at fig. 2. Asthe brass expands more than the steel, any increasc of heat made the bar bend ; and so, if it was set the right way, it carried the pins along

the spring, so as to shorten it. This contrivance is called a com- pensation curb; and it has often been reinvented, or applied in a

modified form. But there are two objections to it: the motion of the curb pins does not correspond accurately enough to the varia- tions in the force of the spring, and it disturbs the isochronism, which only subsists at certain definite lengths of the spring.

The compensation which was next invented left the spring un- touched, and provided for the variations of temperature by the construction of the balance itself. Fig. 3 shows the plan of the ordinary compensation balance. Each por- tion of the rim of the balance is composed of an inner bar of steel with an outer onc of brass soldered upon it, and carrying the weights 6,0, which are screwed toit. Asthe { temperature increases, the brass expanding must bend the stcel inwards, and so carries the weights farther in, and diminishes the moment of inertia of the balance. The metals are generally soldered together by pouring melted brass round a solid stecl disk, and the whole is afterwards turned and filed away till it leaves only the crossbar in the middle lying flat and the two portions of the rim standing edgeways. The first person who practised this method of

uniting them appears to have been Thomas Earnshaw, who brought the chronometer to the state in which it has remained for the last century, with scarcely any alteration except more com- plete compensation.

The adjustment of a balance for compensation can only be done by trial, and requires a good deal of time. It must be done in- dependently of that for time,—the former by shifting the weights, because the nearer they are to the crossbar the less distance they will move over as the rim bends with them. The timing is done by screws with heavy heads (¢,t, fig. 3), which are just opposite to the ends of the crossbar, and consequently not affected by the bend- ing of the rim. The compensation may be done approximately by the known results of previous experience with similar balances ; and many watches are sold with compensation balances which have never been tried or adjusted, and sometimes with a mere sham compensation balance, not cven cut through.

Secondary Compensation. —When chronometers had been brought to great perfection it was perccived that there was a residuary error, which was due to changes of temperature, but which no adjust- ment of the compensation would correct. Tor, if the compensation was adjusted for two extreme temperatures, such as 32° and 100°, then the chronometer gained at mean temperatures; and, if ad- justed for any two mean temperatures, it would lose for all beyond them. This error was observed, and attempts were made to correct it before anybody had pointed out how it arose: this appears to have been first done in a paper in the Nautical Magazine by E. J. Dent in 1833; and he gave the following illustration of it. The variation of the force of the spring proceeds uniformly in proportion to the temperature, and therefore may be represented by a straight line inclined at some angle to another straight line divided into degrees of temperature. But the inertia of a balance of the common construction cannot be made to vary uniformly according to the temperature, but will vary more rapidly in cold than heat ; and con- sequently its rate of variation can only be represented by a curve, and the curve can only be made to coincide with the straight line representing the rate of variation of the spring in two points, —either two extremes, or two means, or one extreme and one mean point.

The same thing may be shown mathematically, as follows. Let r be the distance of the compensation weights 0, 6, in fig. 3 (which we may assume for convenience to be the whole mass M of the balance) from the centre at some mean temperature, and let dr be their increase of distance due to a decrease of some given number of degrees of heat, under the action of the compensation bars. Then the new moment of inertia will be M (7r?+ 2rdr+ dr'), and the ratio

2 2

2dr, (de ; and the term (=)

Fig. 3.

of the new to the old will be 1 sear atl ers is now too large to be disregarded, as it might be in pendulums,

where the compensation 7 is only required to be about th

d : of the (+) in a balance. It is found that an equal increase

of temperature will produce an equal or rather a less motion (—dr) of the weights towards the centre than from it at any given point; but, calling it only equal, the ratio of the decreased moment of

~ : 2d ars? inertia to the original one will be 1—= + < , so that the

increase and the decrease from the mean amount differ by twice

2 .

(=) ; in other words, the moment of inertia of the balance varies e

less in passing from mean to hot temperature than from mean to cold ; and consequently if it is adjusted for mean and cold it will not have decreased enough at an equal increase from mean to hot, or the chronometer will lose, and if adjusted for the two extremes 1t will gain at mean temperatures. : The correction of this error is ealled the secondary compensation,

We shall give a short deseription of the principal classes of inven- tions for this purpose.

The first that was disclosed was Eiffe's (sometimes called Moly- neux's), communicated to the astronomer-royal in 1835. In one of several methods proposed by him a compensation eurb was used ; and, though, for the reasons given before, this will not answer for the primary compensation, it may for the secondary, where the motion required is very much smaller. In another the primary compensation bar, or a serew in it, was made to reach a spring set within it with a small weight attached at some mean temperature, and, as it bent farther in, it earried this secondary compensation weight along with it. The obvious objeetion to this is that it is discontinuous ; but the whole motion is so small, not more than the thickness of a piece of paper, that this and other compensations on the same principle appear to have been on some oeeasions quite successful. Molyneux took a patent for a secondary compensation exactly the same as this of Eiffe's, then before the astronomer-royal.

Another large elass of balanees, all more or less alike, may be represented by E. J. Dent's, which came next in order of time. He deseribed several forms of his invention ; the following deserip- tion applies to the one he thought the best. In fig. 4 the flat erossbar 77 is itself a eompensation bar which bends upwards under inereased heat ; so that, if the weights v, » were merely set upon up- right stems rising from the ends of the eross- bar, they would approach the axis when that. bar bends upwards. But, instead of the stems: 9 rising from the crossbar, they rise from the two seeondary eompensation pieces stu, in the form of staples, which are set on the crossbar ; and, as these seeondary pieces themselves also bend upwards, they make the weights approach the axis more rapidly as the heat inereases ; Fig. 4. and by a proper adjustment of the height of the weights on the stems the moment of inertia of the balauce can be made to vary in the proper ratio to the variation of the intensity of the spring. The eylindrieal spring stands above the crossbar and between the staples,

Fig. 5 represents Loseby's mercurial compensation balance. Besides the weights D, D, set near the end of the primary compen- sation bars B, B,

there are small bent tubes FE, FE with mereury in them, like a thermometer, the bulbs being at F, F. As the heat increases, not only do the primary weights D, D and the bulbs F, F approach the centre of the bal- ance, but some of the mereury is driven along the tube, thus carry- ing some more of the weight towards the centre, at a ratio in- creasing more rapidly than the temperature. The tubes are sealed at the thin end, with a little air included. The aetion is here equally continuous with Dent's, and the adjustments for primary and secondary compensation are apparently more independent of each other; and this modification of Le Roy's use of mercury for compensated balances (which does not appear to have answered) is certainly very elegant and ingenious. Nevertheless an analysis of the Greenwich lists for seven years of Mr Loseby's trials proved that the advantage of this method over the others was more theo- retical than praetieal ; Dent's eompensation was the most suceessful of all in three years out of the seven, and Loseby's in only one. Loseby's method has never been adopted by any other ehronometer- maker, whereas the principles both of Eiffe's and of Dent's methods have been adopted by several other makers.

A few ehronometers have been made with glass balanee-springs, which have the advantage of requiring very little primary and no secondary compensation, on account of the very small variation in their elasticity, eompared with springs of steel or any other metal.

Dent also invented a very different method of effecting the primary and secondary compensation at onee, and without any additional appendage to the balance or addition to the cost, He called it the prismatic balance, from the shape of the steel rim, of which the section is shown in fig. 6, BC being the brass, and the dark triangle within it the

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bend more easily from the ke | edge than the other way, and eonsequently the motion is is not quite so great as it ought to be for complete secondary com- pensation for a very wide range of temperature, but it is enough to give the requisite compensation for all ordinary variations of tem-

Fig. 6.

seetion of the steel part of the rim. A prism of cast-steel will greater when it is being eurved by heat than when it is pulled straighter by cold, whieh is exactly what is wanted. The difference

perature, aud chronometers so compensated were found to be also more than usually steady in their rate, for even in the best ehrono meters there appear every now and then quite capricious variations.

Several other forms of secondary compensation have been invented and found sueeessful, all on the same principle of so arranging the eompound bars that the weights move more under any given ehange of temperature in hot weather, or when they are nearest to the axis of the balance, than in eold when they are farthest off. Notices of these may be seen in various volumes of the Horological Journal.

The best chronometers, with all these improvements, eannot be relied on to keep a rate equal to that of a good astronomical clock of the usual kind, though they oceasionally do so for a short time.

Watch Eseapements.—The eseapements in practical use are—(1) the old vertical eseapement, now almost disused ; (2) the lever, very mueh the most common in English watches ; (8) the horizontal or cylinder, which is equally eommon in foreign watehes, though it was of English invention ; (4) the duplex, which used to be more in fashion for first-rate watches than itis now; and (5) the detached or chronometer eseapement, so called because it is always used in marine ehronometers.

The vertieal escapement is simply the original clock eseapement (see Cocks, fig. 3) adapted to the position of the wheels in a watch and the balanee, in the manner exhibited in fig. 7. As it requires considerable thickness in the watch, it is inferior in going to all the others, and no eheaper than the lever eseapement can now be made; and for these reasons it has gone out of use.

The Jdever eseapement, as it is now uni- versally made, was invented late in the last century by Thomas Mudge. Fig. 8 shows its action. The position of the lever with reference to the pallets is immaterial in prin- eiple, and is only a question of convenience in the arrangement ; but it is generally such as we have given it. The prineiple is the same as in the dead-beat eseapement clock (see Cocks, fig. 5), with the advantage that there is no frietion on the dead faces of the pallets beyond what is necessary for locking. The reason why this frietion eannot be avoided with a pendulum is that its are of vibration is so small that the requisite depth of intersection eannot be got between the two eireles deseribed by the end S of the lever and any pin in the pendulum whieh would work into it;

Fig. 7.

Fig. 8.

whereas, in a watch, the pin P, which is set in a cylinder on the verge of the balance, does not generally slip out of the niek in the end of the lever until the

balance has got 15° past its middle position. The pallets are under- eut a little, as it is ealled, ¢.e., the dead faces are so sloped as to give a little recoil the wrong way, or slightly to resist the unlock- ing, beeause otherwise there would be a risk that a shake of the watch would let a tooth escape while the pin is disengaged from the lever. There is also a further provision added for safety. In the eylinder whieh earries the impulse pin P there is a noteh just in front of P, into which the other pin S on the lever fits as they pass; but when the notch has got past the eylinder it would pre- vent the lever from returning, beeause the safety-pin S cannot pass exeept through the notch, which is only in the position for letting it pass at the same time that the impulse-pin is engaged in the lever. The pallets in a lever escapement (except bad and cheap ones) are always jewelled, and the scape-wheel is of brass. The staff of the lever also has jewelled pivot-holes in expensive watehes, and the scape-wheel has in all good ones. The holes for the balanee- pivots are now always jewelled, if nothing else is. The scape-wheel in this and most of the watch escapements generally beats five times in a second, in large chronometers

four times ; and the wheel next to the scape-wheel carries the seconds-hand, Macdowall's single-pin escapement was adapted to watehes exactly as the dead escapement of clocks is turned into the lever escapement of watches.

Fig. 9 is a plan of the horizontal or cylinder escapement, cutting through the eylinder, which is on the verge of the balance, at the level of the tops of the teeth of the escape-wheel; for the trian- gular pieces A, B are not flat projections in the same plane as the teeth, but are raised on short stems above the plane of o the wheel ; and still more of the cylinder than the portion shown at ACD is eut away where the wheel itself has to pass, The author of this eseapement was Graham, and it resembles his dead; escapement in eloeks in principle more than the lever escapement does, though much less in appearance, beeause in this escapement there is the dead frietion of the teeth against the eylinder, first on the outside, as here represented, and then on the inside, as shown by the dotted lines, during the whole vibration of the balance, except that portion which belongs to the impulse. The impulse is given by the oblique outside edges Aa, Bd

on" Ca

Fig. 9.

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*of the teeth against the edges A, D of the cylinder alternately. The portion of the cylinder which is cut away at the point of action is about 30° less than the semicircle. The cylinder itself is made either of steel or ruby, and, from the small quantity of it which is left at the level of the wheel, it is evidently a very delicate affair ; and probably this has been the main reason why, although it is an English invention, it has been almost entirely abandoned by the English watchmakers in favour of the lever, which was originally a French invention, though very much improved by Mudge, for before his invention the lever had a rack or portion of a toothed wheel on its end, working into a pinion on the balance verge, and consequently it was affected by the dead friction, and that of this wheel] and pinion besides. This used to be called the rack lever, and Mudge's the de- tached lever ; but, the rack lever being now quite obsolete, the word '**

detached" has become detached from the lever escapement, and confined to the chronometer, to which it is more appropriate, as will be seen presently. The Swiss watches have almost universally the horizontal escapement. It is found that—for some reason which is apparently unknown, as the rule certainly does not hold in cases seemingly analogous—a steel scape-wheel acts better in this escapement than a brass one, although in some other cases steel upon steel, or even upon a ruby, very soon throws off a film of rust, unless they are kept well oiled, while brass and steel, or stone, will act with scarcely any oil at all, and in some cases with none.

The duplex escapement (fig. 10) is probably so called because there is a double set of teeth in the scape-wheel,—the long ones (like those of the lever escapement in shape) for locking only, and short ones (or rather upright pins on the rim of the wheel) for giving the impulse to the pallet P on the verge of the balance. It is a single-beat escapement ; 7.¢., the balance only receives the impulse one way, or at every alternate beat, as in the chrono- meter escapement, and in a few clock escapements which have never come into use. When the balance is turning in the direction marked by the arrow, and arrives at the position in which the dotted tooth } has its point against the triangular notch V, the tooth end slips into the notch, J and, as the verge turns farther round, the Fig. 10. tooth goes on with it till at last it escapes when the tooth has got into the position A ; and by that time the long tooth or pallet which projects from the verge has moved from pto P, and just come in front of the pin T, which stands on the rim of the scape-wheel, and which now begins to push against P, and so gives the impulse until it also escapes when it has arrived at ¢; and the wheel is then stopped by the next tooth B having got into the position 6, with its point resting against the verge, and there is evidently what we have called dead friction between them ; but, as the verge is smaller than the cylinder of the horizontal escapement, and is also made of a jewel, the friction does not seriously affect the motion of the balance. The impulse is also given very directly across the line of centres, and therefore with very little friction, as in the three- legged dead escapement for clocks and in the chronometer escape- ment. A little impulse is also received from the long teeth on the notch ; but the greatest part of that motion is wasted. As the

balance turns back, the nick V goes past the end of the tooth 3, and —

in consequence of its smallness, it passes without visibly affecting the motion of the scape-wheel, though of course it does produce a very slight shake in passing. It is evident that, if it did not pass, the tooth could not get into the nick for the next escape. The objection to this escapement is that it requires very great delicacy of adjustment, and the watch also requires to be worn carefully ; for, if by accident the balance is once stopped from swinging back far enough to carry the nick V past the tooth end, it will stop alto- gether, as it will lose still more of its vibration the next time from receiving no impulse. The performance of this escapement, when well made, and its independence of oil, are nearly equal to those of the detached escapement ; but, as lever watches are now made suffi- ciently good for all but astronomical purposes, for which chrono- meters are used, and they are cheaper both to make and to mend than duplex ones, the manufacture of duplex watches has almost disappeared.

The chronometer or detached escapement is shown at fig. 11, in the form to which it was brought by Earnshaw nearly a century ago, and in which it has remained ever since, with the very slight difference that the pallet P, on which the impulse is given (corre- sponding exactly to the pallet P in the duplex escapement), is now generally set in a radial direction from the verge, whereas Earn- shaw made it sloped backward, or undercut, like the scape-wheel teeth. The early history of escapements on this principle does not seem to be very clear. They appear to have originated in France ; but there is no doubt that they were considerably improved by the first Arnold, who died in 1799. Earnshaw's watches, however, generally beat his in trials.

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In fig. 11 the small tooth or cam V, on the verge of the balance, is just on the point of unlocking the detent DT from the tooth T of the scape-wheel ; and the tooth A will immediately begin to give the impulse on the pallet P, which, in good chronometers, is always a jewel set in the cylinder ; the tooth V is also a jewel. This part of the action is so evident as to requir no further notice. When the balance returns, the tooth V has to get past the

end of the detent, without disturbing it; for, as soon as it has been unlocked, it falls against the bankine- pin E, and is ready to receive the next tooth B, and must stay there until it is again un- locked. It ends, or rather begins, in a stiffish spring, which is screwed to the block D on = oy the watch frame, so that it moves without any friction of pivots, like a pendulum. The passing is done by means of another spring TV, called the passing spring, which can be pushed away from the body of the detent towards the left, but cannot be pushed the other way without carrying the detent with it. In the back vibration, therefore, as in the duplex escapcment, the balance receives no impulse, and it has to overcome the slight resistance of the passing spring besides ; but it has no other friction, and is entirely detached from the scape-wheel the whole time, except when receiving the impulse. That is also the case in the lever escape- ment; but the impulse in that escapement is given obliquely, and consequently with a good deal of friction ; and, besides, the scape- wheel only acts on the balance through the intervention of the lever, which has the friction of its own pivots and of the impulse pin. The locking-pallet T is undercut a little for safety, and is also a, jewel in the best chronometers ; and the passing spring is of gold, as steel will rust. In the duplex and detached escapements, the timing of the action of the different parts requires great care, t.€., the adjusting them so that each may be ready to act exactly at the right time ; and it is curious that the arrangement which would be geometrically correct, or suitable for a very slow motion of the balance, will not do for the real motion. If the pallet P were really set so as just to point to the tooth A in both escapements at the moment of unlocking (as it has been drawn, because otherwise it would look as if it could not act at all), it would run away some distance before the tooth could catch it, because in the duplex escapement the scape-wheel is then only moving slowly, and in the detached it is not moving at all, and has to start from rest. The pallet P is therefore, in fact, set a little farther back, so that it may arrive at the tooth A just at the time when A is ready for it, without wasting time and force inrunning after it. This, however, seems now to be doubted in practice. The detached escapement has also been made on the duplex plan of having long teeth for the locking and short ones or pins nearer the centre for the impulse ; but the advantages do not appear to be worth the additional trouble, and the force required for unlocking is not sensibly diminished by the arrangement, as the spring D

must in any case be pretty stiff, to provide against the watch being carried in the position in which the weight of the detent helps to unlock it.

An escapement called the lever chronometer has been several times reinvented, which implies that it has never come into genera] use. It is a combination of the lever as to the locking and the chrono- meter as to the impulse. It involves a little drop and therefore waste of force as a tooth of the wheel just escapes at the " passing" beat where no impulse is given. But it should be understood (as it is not by some who write on clock-work) that a single-beat escape- ment involves no more loss of force and the escape of no more teeth than a double one, except the slight drop in the duplex and this lever chronometer or others on the same principle.

There have been several contrivances for remontotre escapements ; but there are defects in all of them ; and there is not the same ad- vantage to be obtained by giving the impulse to a watch-balance by means of some other spring instead of the mainspring as there is in turret-clocks, where the force of the train is liable to very much greater variations than in chronometers or small clocks.

Tourbillon escapements, and a few other things not necessary to notice here, are described in the 7th edition of Sir E. Beckett's (now Lord Grimthorpe) Rudimentary Treatise on Clocks, Watches, and Bells.

Repeaters, Keyless Watehes, &c.—Repcating-watches, 7.e., watches which strike the hours and quarters on pushing in the handle, are now scarcely ever made in England, and with very good reason, for it is almost impossible to crowd into the space of even a large- sized watch the quantity of wheels and other things required for the repeating work without unduly interfering with the going part, and, besides that, the striking work itself is very liable to get out of order. : é

The winding of watches without a key is an object for which there have been several inventions, and it possesses a considerablo advantage, besides the mere convenience of being independent of a key, for, as there is then no occasion to open it, the case may be made to fit more closely, and the air is more completely excluded,

and consequently the watch will go longer without cleaning ; and it also saves the thickness and the cost of a double back to the case. The first plan of the kind was that of pulling out the knob of the handle, which went into the watch, and had a gathering click attached to it which wound up the fusee, or the barrel, by means of a ratchet. But this was not found to answer: it was liable to get out of order; and, moreover, at every time of winding fresh air was pumped into the watch, which soon produced injurious effects. A far better plan is that of combining the two objects of winding and setting the hands by means of the handle, in the manner we shall now describe. In fig, 12 d is a wheel on the barrel, with bevelled teeth, and there is an- other small bevelled wheel on a spindle 6, which ends in a milled head a, within the handle or pendant; these two wheels cannot conveniently be arranged so as to work into each other without the inter- vention of a third between them, which is marked e in the left-hand section. It is easy to see that turn- ing the milled head will wind up the barrel. The same arrangement might of course be applied to the fusee, though it would increase the size; but in fact these watches are made withont one, and the practice is increasing, The winding wheel d is also made with the well-known contrivance of Breguet, known by the name of the " tipsy key" when applied to a common winding key, which enables you to turn the handle the wrong way without doing anything except moving a ratchet-wheel over its click, and consequently without straining the watch in attempting to wind it the wrong way. The same handle and wheels are also made use of to set the hands, thus :—thcre is a small wheel f which turns on a stud at the end of the lever fyh, and as the lever turns on a pivot at g, when its end #, which just projects through the rim of the watch, is pushed on one side, the wheel f will then be thrown into gear with the winding wheel d and the hour pinion in the middle of the watch ; and consequently, if the handle is then turned, it will alter the hands, just as they are usually altered from the back by a key in foreign watches, so that the face need never be opened. Of conrse, while this is doing, you do at the same time wind up the watch a little if the hand has to be turned the way for winding ; but that is of no consequence, except that you cannot put the hands forward immediately after you have completely wound up the watch. There are various other arrangements

for winding and setting by the handle substantially on the same principle. The ring is difficult to fix firmly when flexible on a stud perforated for the winding arbor, as no screw can go through it. 'The ring and the stud should be made in one piece. There is no use in it being hinged, as usnal.

In the chronograph watch there is, in addition to the centre seconds-hand, an independent seconds-hand which, when not in operation, stands at zero. Pressure on the crown-piece acts succes- sively (1) on a starting motion, (2)on a stopping motion, and (8) on a motion which sends the hand back by the shortest path to zero,

Watches are also made with what are called split seconds-hands, —the two hands being in their ordinary state together and appear- ing as one, but when you push in a knob one of them is stopped, while the other goes on ; the time shown by the stopped one is of course the time of the observation. Sometimes this is done by merely connecting the hands by a very slight spiral spring, which will allow itself to be untwisted one or two coils without stopping the watch; and, as it cannot be of any use to stop the seconds- hand longer than a minute, this seems to answer. There is, how- ever, another plan, in which these two hands, or at least the socket of one and the arbor of the other, are connected by a pair of disks set obliquely on the arbor and the socket respectively, so that, whenever the spring which keeps them together is allowed to act, it brings the loose hand up to the hand fixed on the arbor; and it does not signify how long it may be stopped by throwing the disks out of contact. One of the disks is heart-shaped, and is connected with the other by a spring, forming what is called a jumper.

For the use of electrical engineers and others who are bronght within the influence of powerful electrical machinery, it has been found necessary to introduce non-magnetizable watches, At present this is best secured by making the balance of silver or platinum alloy, and the balance spring of gold or palladium. The use of steel in moving parts of the works is carefully avoided, and thus fairly good timekeepers indifferent to magnetic influences are pro- duced.

The introduction of machinery for the manufacture of watch movements has had the effect of greatly cheapening the commoner class of watches,

and yet supplying a fairly satisfactory timekeeper.

Fig. 12.

WAT—-WAT

It is in America that the application of machinery to watclimaking has found its greatest development, and its success has enabled the American manufacturers to obtain considerable foothold in the European market for cheap watches. But watch movements are also now very extensively made by machinery in Birmingham, Coventry, and several Lancashire towns.

Under the auspices of the Royal Society a department has been established at Kew observatory for the testing and certifying of watches in respect of their compensation for variations of tempera- ture, and their uniformity of motion in different positions. Watches which obtain certificates of the first class have also awarded to them merit marks up to 40 for complete absence of variation in daily rate, 40 for absolute frecdom from change of rate in different positions, and 20 for perfect compensation for variations of temperature. The testing establishment has only been insti- tuted for a few years; but its services are being largely-sought by manufacturers of the high class of watches, who have laboured with equal zeal and success to keep the English-made watch un-approached by the product of any other nation. (G.)

WATER,! as everybody knows, is a generic term which includes a great variety of different substances. But when we compare any two species we always find more of agreement than of difference in properties which suggest that all waters consist essentially of the same thing, which is only modified differently in the several varieties by the nature or proportion of impurities. This surmise is confirmed by the results of scientific inquiry. In all ordinary waters, such as are used for primary purposes, the impurities amount to very little by weight— as a rule to less than =},th of 1 per cent.

Of all natural stores of water the ocean is by far the most abundant, and from it all other water may be said to bederived. From the surface of the

ocean a continuous stream of vapour is rising up into the atmosphere to be recondensed in colder regions and precipitated as rain, snow, or sleet, &c. Some 58,ths of these precipitates of course return directly to the ocean; the rest, falling on land, collects into pools, lakes, rivers, &c., or else penetrates into the earth, perhaps to come to light again, or to be brought to light, as springs or wells.

As all the saline components of the ocean are non- volatile, rain-water, in its natural state, can be con- taminated only with atmospheric gases—oxygen, nitrogen, and carbonic acid. So we should presume, and so it is,

'except that these gases, having different rates of solubility,

are not associated in rain-water (or natural water generally) in the proportions characteristic of their source. Thus, for instance, while atmospheric air contains 21 per cent. by volume of oxygen, a solution of air in water contains about 34:0 per cent. of that gas. Besides, rain-water, for the reason stated, contains perceptible traces of ammonia, combined as a rule, at least partly, with nitric acid, which latter is being produced wherever an electric discharge per- vades the atmosphere. 'This electrically-produced nitrate of ammonia forms no doubt the primary source of all organic nitrogen.

Lake waters, as a class, are relatively pure, especially so if the mountain slopes over which the rain collects into a lake are relatively free of soluble components. As an example we may refer to the water of Loch Katrine (Scotland), which is almost chemically pure, apart from small, but perceptible, traces of richly carboniferous matter taken up from the peat of the surrounding hills, which impart to it a faint brownish hue, while really pure water is blue.

twwer water varies very much in composition even in the same bed, as a river in the course of its journey towards the ocean passes from one kind of earth to others; while, compared with spring-waters, relatively poor in dissolved salts, rivers are liable to be contaminated with more or less of suspended matter.

Spring waters, having been filtered through more or

1 Compare CHEMISTRY, vol. v. pp. 483-485, and Sra WaTER.

WATER

less considerable strata of earth, are, as a class, clear of suspended, but rich in dissolved, mineral matter. Of ordinarily occurring minerals only a few are perceptibly soluble in water, and of these carbonate of lime, sulphate of lime, and common salt are most widely diffused. Common salt, however, in its natural occurrence, is very much localized; and so it comes that spring and well waters are contaminated chiefly with carbonate andsulphate of lime. Of these two salts, however, the former is held in solution only by the carbonic acid of the water, as bicarbonate of lime. But a carbonate-of-lime water, if exposed to the atmosphere, even at ordinary temperatures, loses its carbonic acid, and the carbonate of lime crystallizes out. The fantastically shaped "stalactites " which adorn the roofs and sides of certain caverns are produced in this manner.

In the relatively rare cases where a spring water in the course of its migrations meets with a deposit of common salt or other soluble salts, it dissolves more or less of these and becomes a salt-water. Most salt-waters are substan- tially solutions of .common salt (chloride of sodium), associated with only little of salts of potash and magnesia. But there are exceptions; in the so-called " bitter waters" the dissolved matter consists chiefly of sulphate of magnesia and other magnesia salts.

Immense quantities of carbonic acid gas are being con- stantly produced in the interior of the earth, probably by the action, at high temperatures, of steam on the carbonates of lime and magnesia. Some of it collects and is stored up temporarily in cavities, but the bulk streams out into the atmosphere, invisibly as a rule, through what one might call the capillaries of the earth's body; but here and there it unites into veins and arteries and comes forth, it may be, as a mighty carbonic acid spring. Carbonic acid being one and a half times as heavy as atmospheric air, it may collect into pools or even lakes ; the " Dog's Grotto," near Naples, and the " Valley of Death," in Asia Minor, are illustrative examples ; but, carbonic acid being a gas, and consequently diffusible, such lakes can maintain their level only if there is a constant and abundant supply of the gas from below.

A far more frequent occurrence is that a mass of water and a mass of carbonic acid meet within the earth. Asa rule, the pressure on the gas is more than one atmosphere, and the supply of the gas is abundant. The water then takes up considerably more carbonic acid than it would under ordinary atmospheric pressure, and if an outlet be provided, perhaps artificially by a boring, a frothy mass of carbonic-acid water comes forth as a fountain, sometimes of great volume. Such carbonic-acid waters are met with in many parts of the world,—chiefly, however, in Germany. The well-known Apollinaris water is an example. In this connexion we may refer also to the soffiont of Tuscany— jets of steam charged with ammonia or vapour of boric acid, which condense in the air and collect into "lagoons" of (substantially) a very dilute solution of boric acid. Boric acid waters, however, appear to be entirely confined to a limited district in Tuscany to the south of Volterra.

In addition to its natural components, water is liable to be con- taminated through accidental influxes of foreign matter. Thus, for instance, all the Scottish Highland lochs are brown through the presence in them of dissolved peaty matter. Rivers flowing through, or wells sunk in, populous districts may be contaminated with excrementitious matter, discharges from industrial establish- ments, &c. Our instinct rebels against the drinking of a contam- inated water, and it guides us correctly. Not that those organic compounds are in themselves hurtful. An otherwise pure water, contaminated with, say, one ten thousandth of its volume of urine, might be drunk with perfect confidence. Yet the presence of especially nitrogenous organic matter is a serious source of danger, inasmuch as such matter forms the natural food or soil for the

development of micro-organisms, including those kinds of bacteria which are now supposed to propagate infectious diseases. Happily

nature has provided a remedy. The nitrogenous organic matter dissolved in (say) a river speedily suffers disintegration by the action of certain kinds of bacteria, with formation of ammonia and other (harmless) products of simple constitution; and the ammonia, again, is no sooner formed than, by the conjoint action of other bacteria and atmospheric

oxygen, it passes first into (salts of) nitrous and then nitric acid. A water which contains combined nitrogen in the form of nitrates only is, as a rule, safe organically ; if nitrites are present it becomes liable to suspicion; the presence of ammonia is a worse symptom ; and if actual nitrogenous organic matter is found in more than microscopic traces the water is possibly (uot necessarily) a dangerous water to drink.

Wanklyn's method of water analysis is based upon these ideas. Starting with half a litre of the water, he distils it with a small quantity of carbonate of soda, aud in the distillate determines the ammonia colorimetrically with Nessler's reagent (see MERCURY, vol. xvi. p. 84). When all the saline ammonia (the free ammonia) is thus eliminated, alkaline permanganate of potash is added to the residue and the distillation resumed. Part of the nitrogen of the organic matter is eliminated as ammonia ; it is determined in the distillate, by Nessler's reagent, and reported as albwmenoid am- monia. The results are customarily referred to onc million parts of water analysed. To give an idea of the order of quantities here dealt with, let us say that a water yielding 0°1 part of free and 0°1 part of albumenoid ammonia would be condemned by any chemist, as possibly dangerous. The peaty waters of the Scottish Highlands, however, contain much of both amnionias, and yet are drunk by the natives with perfect impunity.

All waters, unless very impure, become safe by boiling, which process kills any bacteria or germs that may be present.

Of the ordinary saline components of waters, soluble magnesia and lime salts are the only ones which are objectionable sanitarily if present in relatively large proportion. Carbonate of lime is harmless ; but, on the other hand, the widely diffused notion that the presence of this component adds to the value of a water as a drinking water is a mistake. The farinaceous part of food alone is sufficient to supply all the lime the body needs; besides, it is questionable whether lime introduced in any other form than that of phosphate is available for the formation of, for instance, bone tissue.

The fitness of a water for washing is determined by its degree of softness. A water which contains lime or maguesia salts decom- poses soap with

formation of insoluble lime or magnesia salts of the fatty acids of the soap used. So much of the soap is simply wasted ; only the surplus can effect any cleansing action. An excellent and easy method for the determination of the hardness of a water has been devised by Clark. A measured volume of the water is placed in a stoppered bottle, and a standard solution of soap is then dropped in from a graduated vessel, until the mixture, by addition of the last drop of soap, has acquired the property of throwing up a peculiar kind of creamy froth when violently shaken, which shows that all the soap-destroying components have been pre- cipitated. The volume of soap required measures the hardness of the water. The soap-solution is referred to a standard by means of a watcr ofa known degree of hardness prepared from a known weight of carbonate of lime by converting it into neutral chloride of cal- cium, dissolving this in water and diluting toa certain volume. A water is said to have '1, 2, 8,... " degrees of hardness,' if it is equivalent in soap-destroying power to a solution of carbonate of lime containing 1, 2,3, ... grains of this salt per imperial gallon.

That part of the hardness of a water which is actually owing to carbonate of lime (or magnesia) can easily be removed in two ways. (1) By boiling, the free carbonic acid gocs off with the steam, and the carbonate of lime, being bereft of its solvent, comes down as a precipitate which can be removed by filtration, or by allowing 1t to settle, and decanting off the clear supernatant liquor. (2) A method of Clark's is to mix the water with just enough of milk of lime to convert the free carbonic acid into carbonate. Both this and the original carbonate of lime are precipitated, and can be removed as in the first case. See p. 409 infra. ; ;

From any uncontaminated natural water pure water is easily pre- pared. The dissolved salts are removed by distillation ; if care be taken that the stcam to be condensed is dry, and if its condensation be effected within a tube made of a suitable metal (platinum or silver are best, but copper or block tin work well enough for ordinary purposes), the distillate can contain no impurities except atmospheric gases, which latter, if necessary, must be removed by boiling the distilled water in a narrow-necked flask until it begins to "bump," and then allowing it to cool in the absence of air. This latter operation ought, strictly speaking, to be performed in a silver or platinum flask, as glass is appreciably attacked by hot water. For

most purposes distilled water, taken as it comes from the con- denser, is sufficiently pure. : e 2

Pure water, being so casily procured in any quantity, 1s used largely as a standard of reference in metrology and in the quantita- tive definition of physical properties. Thus a 'gallon " is defined as the volume at 62° F. of a quantity of water whose uncorrected

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niass, as determined by weighing in air of 30-inch pressure and 62° F. of temperature, is equal to 10 tb avoirdupois. The kilo- gramme in like mauner is the mass of 1 cubic decimetre of water, neasured at the temperature corresponding to its maximum density (4°C.). The two fixed points of the thermometer correspond —the lower (0° C., or 82° F.) to the temperature at which ice nielts, the upper (100° C. or 212° F.) to that at which the maximum tension of steam, as it rises from boiling water, is equal to 760 mm. or 30- inch mercury pressure. 80 inches being a little more than 760 mm., 212° F. is, strictly speaking, a higher temperature than 100° C., but the difference is very trifling. Specific heats are customarily measured by that of water, which is taken as=1. All other specific heats of liquids or solids (with one solitary exception, formed by a certain strength of aqueous methyl alcohol) are less than 1. The temperate character of insular climates is greatly owing to this property of water. Another physiographically important peculi- arity of water is that it expands on freezing (into ice), while most other liquids do the reverse. 11 volumes of ice fuse into only 10 volumes of water at 0°C.; and the ice-water produced, when brought up gradually to higher and higher temperatures, again exhibits the very exceptional property that it contracts between 0° and 4° C. (by about zg455 of its volume) and then expands again by more aud more per degree of increase of temperature, so that the volume at 100° C. is 1°043 times that at 4°C. Imagine two lakes, one containing ordinary water and another containing a liquid which differs from water only in this that it-has no maxi- mum density. Imagine both to be, say, at 5° C., and cold winter weather to set in. Both lakes become colder, being cooled down by convection until they are at 4° C. The imaginary lake then continues losing heat in the same way ; in the

real lake the colder water floats on the surface and the underlying mass of water can lose heat only by the slow process of conduction. The real lake retains its heat more tenaciously, but for the reason stated will draw a sheet of ice, while the imaginary lake ig still on its way to 0° C. The latter, indeed, if the winter is short, may fail to freeze altogether, while the former does freeze superficially. In either the freezing is a slow process, because for every pound of ice pro- duced 80 pound-centigrade units of heat are set free. Let us now assume that, after even the imaginary lake had drawn a shect of ice, warm weather sets in. In either case a layer of liquid water of 0° C. is formed on the ice, and through it the heat from the air travels, in the imaginary case by slow conduction, in the real case by quick convection. The real ice is the first to disappear, and the upper strata of relatively cold water will soon come up to 4° C, by the prompt effect of convection, while in the case of the imagin- ary lake it takes a far longer time before all the mass has come up to 4° C. by conduction. From 4° C. upwards, heat is taken in at the same rate on both sides.

In former times water was viewed as an "element," and the uotion remained in force after this term (about the time of Boyle) had assumed its present meaning, although cases of decomposition of water were familiar to chemists. In Boyle's time it was already well known that iron, tin, and zine dissolve in aqueous muriatic acid or vitriol with evolution of a stinking inflammable gas. Even Boyle, however, took this gas to be ordinary air contaminated with inflammable stinking oils. This view was held by all chemists until Cavendish, before 1784, showed that the gas referred to, properly purified, is free of smell and constant in its properties, which are widely different from those of air,—the most important point of difference being that the gas when kindled in air burns with evolution of much heat and formation of water. Cavendish, however, did not satisfy himself with merely proving this fact qualitatively ; he determined the quantitative relations, and found that it takes very nearly 1000 volumes of air to burn 423 volumes of "hydrogen" gas ; but 1000 volumes of air, again, according to Cavendish, contain 210 volumes of oxygen; hence, very nearly, 2 volumes of hydrogen take up 1 volume of oxygen to become water. This important discovery was only confirmed by the sub- sequent experiments of Humboldt and Gay-Lussae, which were no more competent than Cavendish's to prove that the surplus of 3 units

(423 volumes instead of 420) of hydrogen was an observa- tional error. (W. D.)

WATERBURY, a city in Newhaven county, Con- necticut, United States, is situated on the N: augatuck river, 77 miles north-east of New York, at the junction of three railroads connecting it with Bridgeport, Hartford, and Meri- den. It was settled by colonists from Hartford in 1677 ; and bore at first the Indian name of Mattatuck. The land, rocky and hilly, was poor for farming, and the inhabitants began to turn to manufacturing pursuits, in a humble way, before 1800. But the growth in population and business was very slow, till the civil war created such a demand for brass and manufactured articles of that metal that the small factories rapidly grew in number and size, and Water-

bury has now become the centre of the brass industry in the United States. Its factories represent an outlay of 10 million dollars, and turn out a great quantity of sheet brass and copper, wire, and tubing, with a multitude of small articles—clocks, watches, lamps, pins, silver-plated ware, &c. The population, which is largely German and Trish, was 17,806 in 1880, and is now (1888) believed to approach 27,000. The city is well lighted by electric lights, and supplied with pure water from a spring-fed reservoir 6 miles distant. A free loan and reference library, founded in 1868, contains 42,000 volumes. Waterbury was incorporated as a city in 1853.

WATERFORD, a maritime county of Ireland, in the province of Munster, is bounded E. by Waterford Harbour, separating it from Wexford, N. by Kilkenny and by Tipperary, W. by Cork, and 8. by the Atlantic. Its greatest length from east to west is 52 miles, and its greatest breadth from north to south is 28 miles. The total area is 461,552 acres, or about 721 square miles. The coast-line is in some parts bold and rocky, and is in- dented by numerous bays and inlets, the principal being Waterford Harbour ; Tramore Bay, with picturesque cliffs and some extensive caves, and noted for its shipwrecks, on account of the rocky character of its bed; Dungarvan Harbour, much frequented for refuge in stormy weather ; and Youghal Harbour, partly separating county Waterford from county Cork. The surface of the county is to a large extent mountainous, especially

towards the west and north- west, consisting chiefly of metamorphosed Lower Silurian rocks, the valleys being occupied by Carboniferous Lime- stone. There is also evidence on an extensive scale of former glacial action. The Knockmealdown Mountains, which attain a height of 2609 feet, form the northern boundary with Tipperary. A wide extent of country between Clonmel and Dungarvan is occupied by the two ranges of the Commeragh and Monavallagh Mountains, reaching in Knockanarian a height of 2478 feet. To the south of Dungarvan there is a lower but very rugged range, called the Drum Hills. The south-eastern division of the county is for the most part level, consisting chiefly of clay slate interrupted by patches of primitive limestone, and also by conglomerate and basalt, forming in some parts of the coast lofty columnar cliffs. Coal and irén were formerly wrought, but the only mineral product now of importance is copper, the mines at Knockmahon ranking next in Ireland to those at Berehaven. Lead mining, for- merly prosecuted with some success, has now practically ceased. Lime is abundant, and coralline sea- sand is ob- tained. Slate is quarried in considerable quantities at Lismore, and there are also quarries of valuable sandstone and of marble. Ochres and clays for the manufacture of earthenware are also obtained. Though Waterford has benefited in its communications by the important rivers in its vicinity, the only large river it can properly claim as belonging to it is the Blackwater. This enters the county to the east of Fermoy, and flows eastward along a trough of Carboniferous Limestone to Cappoquin, where it turns abruptly southwards, to fall into the sea at Youghal Har- bour. At its junction with the Bride below Cappoquin it is navigable for vessels of 100 tons burden. Waterford Harbour may be called the estuary of three important rivers, the Suir, the Nore, and the Barrow, but neither of the last two touches the county. The Suir reaches it at its union with the Nier about 8 miles from Clonmel, and thence forms its northern boundary with Tipperary and Kilkenny. It is navigable for vessels of 800 tons burden to Waterford, for barques and large lighters to Carrick-on-Suir, and for boats of 50 tons to Clonmel.

Agricuiture.—The land is generally better adapted for pasturage than for tillage, although there are considerable tracts of rich soil in

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the south-eastern districts. The total number of holdings in 1886 was 10,188, of which 26 were above 500 acres in extent, 1029 between 100 and 500 acres, 1660 between 50 and 100 acres, 2726 between 15 and 50 acres, 2530 between 1 and 15 acres, and 2217 did not exceed lacre. Out of a total of 456,198 acres only 83,968 acres, or 18°4 per cent., were under crops, 235,801 acres, or 51‘7 per cent., were under grass; 330 acres fallow; 19,317 acres, or 4°2 per cent., woods and plantations; 22,791 acres, or 50 per cent., bog and marsh; 76,187 acres, or 16°7 per cent., barren mountain land; and 17,854, or 3°9 per cent., water, roads, fences, &c. Since 1859 the area under crops has decreased nearly a third, the amount in that year being 116,940 acres. Corn crops occupied 59,848 acres in 1859 and only 35,461 in 1886, the areas under wheat in these years being respec- tively 23,671 and 1326 acres, nnder oats 32,526 and 32,795 acres, and under barley, bere, &c., 3651 and 1340 acres. The area under green crops in 1859 was 38,213 acres, and in 1886 it was 24,436 acres, the areas under potatoes in these years being respectively 23,385 and 14,361 acres, under turnips 10,886 and 6171 acres, and under other green crops 4042 and 3904 acres. Horses between 1859 and 1886 diminished from 14,184 to 12,794, of which 9122 were two years old and upwards, but cattle increased from 84,440 to 102,878, of which 39,428 werc milch cows, and sheep from 42,408 to 55,805, while pigs decreased from 55,701 to 44,510. The number of mules in 1886 was 942, of asses 4319, of goats 5510, and of poultry

258, 058.

In 1876, according to the Return of Owners of Land, Waterford was divided among 814 proprietors, possessing 454,937 acres at an annual valuation of £276,642, or an average of about 12s, 2d. per acre. The estimated extent of waste lands was 880 acres. Of the owners 600 possessed one acre and upwards. The number of large estates is exceptionally great. The following possessed upwards of 8000 acres:— marquis of Waterford, 39,884; Lord Stuart de Decies, 30,823 ; duke of Devonshire, 27,484 ; R. A. Chearnley, 18,166 ; Edmond De La Poer, 138,448; John Palisser, 9825; Lord Ashtown, 9435; Sir J. H. Keane, Bart., 8909; and Sir R. J. Musgrave, Bart.,

8282.

Manufactures and Trade.—The woollen manufacture, except for private use, is now practically extinct, but the cotton manufacture is still of some importance. There are also breweries, distilleries, and a large number of flour-mills. Sea-fishing is prosecuted chiefly at Dungarvan. There are valuable salmon fisheries on the Black- water and the Suir.

Railways. —From the city of Waterford the Waterford and Central Jreland line goes northwards by Kilkenny, the Waterford and Limerick by Carrick-on-Suir and Clonmel to Limerick, the Water- ford and Tramore to Tramore, and the Waterford, Dungarvan, and Lismore to Lismore, where it joins a branch of the Great South- Western.

Administration and Population.—From 119,457 in 1812 the population increased by 1841 to 196,187, but by 1861 it diminished to 134,252, by 1871 to 123,310, and by 1881 to 112,768 (males 54,618, females 58,150), or 8°5 per cent. less than in 1871. The total number of emigrants from 1st May 1857 to 31st December 1878 was 67,080, and to 3lst December 1885 it was 79,240. In 1880 the number reached 2675, and in 1885 it was 13833. The county is divided into 8 baronies, with 82 parishes and 1557 town- lands. The principal towns are Waterford (population 29,181), Dungarvan (6306), Tramore (2036), Portlaw (1891), and Lismore (1860). Before the Redistribution Act of 1885 the county returned two members to parliament, the borough of Waterford two, and Dungarvan one,—Clonmel, which is partly in Waterford, also re- turning one. The county now returns two members, for the East and West Divisions respectively, while the county of the city of Waterford returns one member, and Dungarvan and Clonmel have been disfranchised. It is in the Leinster circuit, and assizes are held at Waterford, and quarter sessions at Lismore, Dungarvan, and Waterford. It is in the Cork military district, and there is a brigade depét at Clonmel, and barrack stations at Dungarvan and Waterford. The Catholics formed 94°8 per cent. of the population in 1871 and 95:0 in 1881, the Episcopalians in the same years 4°1 per cent. The proportion of persons who could read and write in 1871 was 35°7 per cent., and in 1881 it was 45°8; in 1881 10°6 per cent. could

read but could not write, and 43°6 could neither read nor writc,—14°3 per cent. being under seven years of age.

History and Antiquities.—In the 9th century the Danes landed in the district, and afterwards made a permancnt settlement there. There are in the county a considerable number of barrows, duns, cromlechs, and similar relics of the ancient inhabitants. At Ard- more there is a round tower 97 feet in height, and near it a huge rath and a large number of circular entrenchments. Waterford was one of the twelve counties into which King John, in 1205, divided that part of Ireland which he nominally anncxed to the English crown. On account of the convenience of the city as a landing place, many subsequent expeditions passed through the county directed against disaffected or rebellious tribes. In 1444 the greater part of it was granted to James, carl of Desmond, and

in 1447 it was bestowed on John Talbot, earl of Shrewsbury, who was created earl of Waterford. The county suffered severely during the Desmond rebellion, in the reign of Elizabeth, as well as in the rebellion of 1641 and during the Cromwellian period. Among the old castles special mention may be made of Lismore, originally erected by John, afterwards king of England, in 1185, but now in great part comparatively modern. The chief ecclesiastical re- mains are those of the chancel and nave of the cathedral of Ardmore, whcre a monastery and oratory were founded by St Declan in the 7th century. The sce of Ardmore was abolished in the 12th century.

WATERFORD, a city, county of a city, municipal and parliamentary borough, and the chief town of the above county, is finely situated on the south bank of the Suir 4 miles above its junction with the Barrow, at the head of the tidal estuary called Waterford Harbour, and on several railway lines, which afford it convenient communication with all parts of Ireland. It is 32 miles west of Wexford, 76 north-east of Cork, and 97 south-south-west of Dublin. The Suir is crossed by a wooden bridge of thirty-nine arches, and 832 feet long, connecting Waterford with the suburb of Ferrybank. The town is built chiefly along the banks of the river, occupying for the most part low and level ground except at its western extremity. The modern Protestant cathedral of the Holy Trinity, generally called Christ Church, a plain structure with a lofty spire, occupies the site of the church built by the Danes in 1096. Near it are the episcopal palace and deanery. There is a handsome Catholic cathedral, erected at a cost of £20,000; and the training seminary for priests called St John's College deserves notice. The principal secular buildings are the town-hall, the county and city courts and prisons, the new custom-house, erected in 1876, at a cost of £9000, the barracks, and the union workhouse. At the extremity of the quay is a large circular tower, called Reginald's Tower, forming at one time a portion of the city walls, and occupy- ing the site of the tower built by Reginald the Dane in 1003. Near the summit one of the balls shot from the cannon of Cromwell while besieging the city is still em- bedded in the wall. There are a number of hospitals and similar benevolent institutions, including the leper house founded in the reign of King John, now possessing an income of £1000 a year, and made use of practically as an infirmary. The town possesses breweries, salt-houses, foundries, and fiour-mills; and there is a large export trade in cattle, sheep, and pigs, and in agricultural pro- duce. The population of the city (area 10,059 acres) in 1871 was 29,979, and in 1881 it was 29,181.

Waterford Harbour is a winding and well-sheltered bay, formed by the estuary of the river Suir, and afterwards by tho joint estuary of the Nore and Barrow. Its length to the sea is about 15 miles. Its entrance is about 24 miles wide, and is well lighted by a fixed bright light on the ancient donjon of Hook Tower (189 feet in height), by a red light on Dunmore

pier, and by two leading lights at Duncannon. The quay, at which vessels of 2000 tons burden can discharge, was enlarged in 1705 by the removal of the city walls, and is about 14 miles in length. At Ferrybank, on the Kilkenny side of the river, there is a shipbuilding yard with patent slip and graving dock. By the Suir there is navigation for barges to Clonmel, by the Barrow for sailing vessels to New Ross and thence for barges to Athy, and by the Nore for barges to Inistiogue. The total number of vessels connected with the port in 1885 was 38, of 5246 tons. The number of British and foreign vessels that entered the port in the same year was 1784 of 530,092 tons, while 1255 of 412,326 tons cleared.

Anciently Waterford was called Cuan-na-groith, the haven of the sun. By early writers it was named Menapia. It is supposcd to have existed in very early times, but first acquired importanco under the Danes, of whom it remaincd one of the principal strong- holds until its capture by Strongbow in 1171. On 18th October 1172 Henry II. landed near Waterford, and he here received the hostages of the people of Munster. It became a cathedral city in 1096. Prince John, afterwards king of England, who had been declared lord of Ireland in 1177, landed at Waterford in 1185. After asccnding the English throne he in 1204 granted it a fair, and in 1206 a charter of incorporation. He landed at Waterford in 1210, in order to establish within his nominal territories in Ireland a more distinct form of government. The city received a new

charter from Henry III. in 1232. Richard II. landed at Waterford in October 1394 and again in 1399. In 1447 it was granted by Henry VI. to John Talbot, earl of Shrewsbury, who was created earl of Waterford. In 1497 it suecessfully resisted an attempt of Perkin Warbeck to eapture it, in recognition of which it received various privileges from Henry VII., who gave it the title of wrbs tintactia. In 1603, after the accession of James I. to the English crown, the city, along with Cork, took a prominent part in opposition to the Government and to the Protestant religion, but on the approach of Mountjoy it formally submitted. From this time, however, the magistrates whom it elected refused to take the oath of supremacy, and, as

by its charter it possessed the right to refuse admission to the king's judges, and therefore to dispenso with the right of holding assizes, a rule was obtained in the Irish chancery for the seizure of its charter, which was carried into effect in 1618. In 1619 an attempt was made to induce Bristol merehants to settle in the city and undertake its government, but no one would respond to the invitation, and in 1626 the charter was restored. The eity was unsuceessfully attacked by Cromwell in 1649, but surrendered to Ireton 10th August 1650. After the battle of the Boyne James IJ. embarked at it for France (July 1690). Shortly afterwards it surrendered to William, who sailed from it to England. It sent two members to parliament from 1874 to 1885, when the number was reduced to one.

WATER-GLASS. See S1uica, vol. xxii. pp. 53, 54.

WATER-HEN. See Moor-Hen.

WATER-LILY, a somewhat vague term, given to almost any floating plant with conspicuous flowers, but applying more especially to the species of Vymphxa and Nuphar. These are aquatic plants with their thick fleshy rootstocks or tubers embedded in the mud, and throwing up to the surface circular shield-like leaves, and leafless flower-stalks, each terminated by a single flower, often of great beauty, and consisting of four or five sepals, and numerous petals gradually passing into the very numerous hypogynous or perigynous stamens without any definite line of demarcation between them. The ovary consists of numerous carpels united together and free, or more or less embedded in the top of the flower-stalk. The ovary has many cavities with a large number of ovules attached to its walls, and is surmounted by a flat stigma of many radiating rowsasin a poppy. The fruit is baccate, and the seeds are remarkable for having their embryo surrounded by an endosperm as well as by a perisperm. The ana- tomical construction of these plants presents many pecu- liarities which have given rise to discussion as to the allocation of the order among the dicotyledons or among the monocotyledons, the general balance of opinion being in favour of the former view. The leaf-stalks and flower-stalks are traversed by longitudinal air-passages, whose disposition varies in different species. The species of Vymphza are found

in every quarter of the globe. Their flowers range from white to rose-coloured, yellow, and blue. Some expand in the evening only, others close soon after noon. Nymphxa alba is common in some parts of Britain, as is also the yellow Nuphar luteum. The seeds and the rhizomes contain an abundance of starch, which renders them serviceable in some places for food,

Under the general head of water-lily are ineluded the lotus of Egypt, Vymphxa Lotus, and the saered lotus of India and China, Nelumbiwm speciosum, formerly a native of the Nile, as shown by Egyptian seulptures and other evidence, but no longer found in that river. The gigantie Victoria regia, a native of tropical South America, also belongs to this group.

WATERLOO, a village of Belgium, in the province of Brabant, 94 miles to the south-south-east of Brussels, was the headquarters of the duke of Wellington from 17th to 19th June 1815, and has given its name throughout the English-speaking world to the famous battle fought in its neighbourhood on June 18, 1815. See Navozzon, vol. XVil. pp. 224-25,

WATERLOO, a city and the county seat of Black Hawk county, Iowa, United States, is situated in a rich farming and stock-raising country, on both sides of the Cedar river, which here furnishes a valuable water power.

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The population in 1885 was 6479, of whom 1048 were foreign-born. . WATERLOO-WITH-SEAFORTH, a watering-place of Lancashire, England, on the Irish Sea, at the mouth of the Mersey, nearly opposite New Brighton in Cheshire, and on the Liverpool, Crosby, 'and Southport Railway, 4 miles north by west of Liverpool. On account of its facilities for bathing, firm sands, pleasant scenery, and nearness to Liverpool, of which indeed it may now be considered a suburb, it is much frequented during the summer months. It is well and regularly built, and possesses the usual characteristics of a rising watering-place. The population of the urban sanitary district (area 740 acres) was 9118 TielSsSi, WATERPROOF. See Inp1a-Rupser, vol. xii. p. 842. WATERSPOUT. See

Muzrzoronoey, vol, xvi. p. 130. WATER-SUPPLY. An ample supply of pure water is of the utmost importance for the healthiness of towns. When the population of a district is scattered it is possible to supply individual wants by means of streams, springs, or shallow wells ; but when a number of people are con- gregated within the limited area of a town the natural supply of water in this area is liable to be insufficient, and is also in danger of being contaminated by sewage and house refuse. Accordingly, works for the collection, storage, purification, and distribution of water are indis- pensable necessities in towns, for the preservation of health and the promotion of cleanliness. The remains of aqueducts near Rome and at other places (see AquEDUCT) show that important works for providing water were undertaken many centuries ago; and water for irrigation and other purposes has for ages been stored, in the rainy season, in tanks by the natives of India. Artificial pro- visions for the supply of water were, however, entirely neglected in Europe during the Middle Ages, and the colossal works of earlier times were allowed to fall into decay; and most of the present systems of water-supply are of comparatively modern date.

ORIGIN oF SUPPLY.

Rainfall.—All supplies of fresh water come primarily from the clouds, though portions may eventually be drawn from the bowels of the earth. Water when distilled is obtained in its purest form; and the heat of the sun is continually drawing up large quantities of moisture from sea and land, forming clouds which return it as rain to the earth. Some of the rain is quickly evaporated from the surface of the earth, and returned to the clouds ; some sinks into the ground to feed springs and underground stores of water; and some passes into streams and rivers, whence it flows into the sea, from which the greater portion of the rain is derived. The available water-supply of any district, accordingly, principally depends on the rainfall of the locality and the extent of the gathering ground, The rainfall varies greatly in different places, and at different periods of the year (see METEOROLOGY); and, in England alone, the average annual rainfall at the Stye, the wettest part of the lake district in Cumberland, is about eight times the rainfall at Hunstanton, the driest locality in Norfolk. The rainfall, moreover, varies from year to year; and the driest years

must: be taken into con- sideration in estimating the available water-supply.

Evaporation.—The proportion of the rainfall which is actually serviceable for water-supply depends greatly upon the season of the.year in which the rain falls; for evaporation is very active in the hot season, whereas in the cold season its influence is slight. Accordingly, for hydrological purposes, the year may be divided into two seasons in the latitudes of the British Isles,—the warm season, extending from the beginning of May to the

end of October, and the cold season, embracing the other half of the year. Comparatively little effect is produced by variations in the amount of rain in the warm season, except in extreme cases, owing to the large proportion drawn off by evaporation, whereas the rainfall during the cold season is of the utmost importance for replenish- ing the sources of supply which have been drained during the summer, 'The period of the year, therefore, in which the rain falls is of more consequence than the total amount in the year; and a drought is much more likely to result from a dry winter than from a dry summer. Any deficiency in the supply is generally felt towards the close of the warm season, when the reserves of water, furnished by the rains of the preceding cold season, have been reduced to their lowest level by the demands of the suinmer.

Other circumstances also modify the influence of evapor- ation. Rain descending in a heavy continuous fall, by sinking into the ground or escaping into the water- courses, is less exposed to diminution by evaporation than several separate showers of rain, equivalent in total volume, but spread over a longer period. Forests and vegetation shelter the ground from the influence of evaporation ; and thereby, in spite of abstracting some of the moisture for their own requirements, they augment the proportion of available rainfall, The nature and slope of the surface stratum, moreover, notably affect the loss from evaporation. Rain falling on an impermeable stratum is almost wholly evaporated in hot weather, when the surface is flat; but it flows off from a steep slope before evaporation can produce its full effect. Rain readily sinks into a porous

stratum; and when a depth of three or four feet below the surface is reached it is toa great extent withdrawn from the influence of evaporation.

Percolation.—The percolation of rain through porous strata is the origin of springs and subterranean reservoirs of water, from whence so many supplies are derived. Sand, gravel, chalk, and sandstone are very absorbent strata ; whilst the oolites and other limestones are per- meable toa smaller extent. The excess of rainfall over evaporation sinks into the ground till it reaches the level of saturation of the stratum by previous rainfalls, and adds to the underground supply. The water thus intro- duced is prevented from sinking lower down into the earth by encountering an underlying impermeable stratum ; and it is hindered in flowing away to the lowest point of the outcrop of the permeable stratum by friction, which causes the surface of saturation to slope towards its outlet, the inclination varying with the head of water and the resistance offered to, its flow. The amount of percolation depends upon the rainfall, the porosity of the stratum, and the extent of its exposed surface ; and it varies inversely as the evaporation, being greatest in winter and during heavy long-continued rainfalls, and least in the summer and with short showers of rain.

Watercourses.—On impermeable strata, the whole of the rain not removed by evaporation finds its way into the watercourses. The streams, however, draining these strata have a very variable discharge, as they are rapidly swollen after a heavy fall of rain, and soon subside (see River Encrnerrine), whilst in fine summer weather they are liable to be dried up. Accordingly, torrential streams, in their natural condition, are not suitable for water-supply, as they tend to fail when they are most wanted, and owing to their rapid flow they carry along a large quantity of matter in suspension. The flow of streams draining permeable strata is more regular, both on account of the smaller fall generally of the river-bed, and also owing to the rainfall being delayed by percolation in its passage to the river. Some of the rain sinking into

a permeable stratum tends to find an outlet outside the valley in which it falls, but most of it reappears again in the form of springs which feed the river gradually at a lower part of its course; and the loss which may occur is more than compensated for by the greater regularity of flow. In olden times, towns, villages, and monasteries were established on the banks of these streams, owing to the ready, ample, and never-failing water-supply thus ensured.

Sources or SuPPLy.

Tanks.—The simplest method of procuring pure water is to collect the rain as it falls from the clouds; and this method is a necessity where, as in tropical countries, there is an excessive rainfall during one period of the year, followed by a long drought, unless the rain sinks into a permeable stratum whence it can subsequently be drawn. These open tanks, however, excavated in the ground, have to be numerous, and often large in extent, to collect sufficient rain to supply the wants of the surrounding population for several months; and the water in them is subject to loss from evaporation during the dry season.

The collection of rain-water is also advantageous in the rural districts of temperate regions, especially for large institutions and isolated mansions and farms, where, by a simple arrangement of gutters and pipes, a large pro- portion of the rain falling on the sloping roofs can be stored in underground tanks. In large towns, the rain- water is liable to contamination by smoke, dust, and other impurities, and is only serviceable for gardens and water- closets, or where softness is of more consequence than purity.

Springs—A very valuable source of water-supply is provided by springs. These springs appear at the lowest point § of the outcrop of a permeable stratum, where it rests upon an impermeable stratum (fig. 1); and they constitute the outflow of the rain which has percolated

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oxidized and eliminated in the passage of the water through the ground. The water, however, collects any soluble gases and salts which exist in the strata through which it flows ; and most springs contain some inorganic compounds in solution, depending upon the nature of the strata and the distance traversed. Occasionally springs are so strongly impregnated with certain substances as to receive specific names, such as sulphuretted, chalybeate, and saline springs; but in such cases they are of more value for medicinal purposes than as sources of water- supply. The abundant springs derived from the chalk, though containing considerable quantities of carbonate of lime, are quite suitable for domestic purposes. Springs from large underground supplies possess the advantage of a fairly constant temperature, as their sources are pro- tected from atmospheric changes ; but underground waters are subject to the rise of temperature,

experienced in descending below the surface of the earth, of 1° F., on the average, for each 52 feet of depth.

Small springs frequently supply little. hamlets 3 and a shallow tank, formed at the spring, into which the water trickles, serves as a reservoir, which is gradually filled, and from which water is readily drawn. Large springs may afford adequate supplies for towns; but before relying upon such a source it is essential to gauge their discharge at the close of the autumn, in a dry year, so as to ascertain their sufficiency under unfavourable conditions. When springs have been selected, it only remains for the engineer to design suitable conduits for conveying the water to the place to be supplied. The fine chalk-water springs of Amwell and Chadwell, in Hertfordshire, have been thus utilized by the New River Company for supplying London, by means of a conduit 40 miles long, completed in 1613 ; and the springs issuing from the Malvern Hills furnish Malvern with a plentiful supply of the purest water.

Springs were naturally much prized in ancient times, when the simplest means of procuring water had to be resorted to ; and ignorance of their real origin led to their being the subject of mythological legends. They were used for the supply of public fountains by the Greeks and Romans (see Founratn), and provided water for some of the Roman aqueducts,

Streams and Rivers.—In olden times, the only other obvious sources of water-supply, besides rain and springs, were the watercourses which carried off the surplus rain- fall. Streams and rivers afford the most ample supply, but they become turbid in flood-time ; and when they have a rapid fall, and drain an impermeable basin, they fail‘in times of drought. These objections have, however, been overcome by settling-tanks, filter-beds, and storage- reservoirs,—so that now the principal supplies are drawn from these sources. The increase, indeed, of population, and especially the introduction of the system of discharg- ing the sewage of towns into the adjacent streams, have polluted many rivers. Fortunately, in process of time, some of the organic impurities are removed by aquatic animals and plants, and some become oxidized and thus rendered innocuous (see WATER), —so that, after a sufficient length of unpolluted flow, the river again becomes suit- able for supply. The

enactments against river-pollution have attacked this evil at its source ; but some rivers, passing through large manufacturing centres, are hopelessly contaminated with refuse products. The best sources of water are found in streams draining uncultivated mountainous districts, where a plentiful rainfall on steep impervious strata affords a very pure though somewhat intermittent supply. The freedom from habitations, the rapid flow of rain off the surface, the absence of organic impurities and of soluble salts, prevent any chance of contamination beyond occasional discoloration by peat.

WATER-SUPPLY

Distance, however, from hilly regions and a considerable population render it frequently necessary to resort to larger rivers, which, passing towns and villages in their

course, become more or less contaminated, and, being fed by springs from permeable strata, contain the salts dis- solved by those springs. London, for instance, draws its principal supplies from the Thames and the Lea 3 and, though microscopical investigations and the reports of the water-examiners are not always reassuring about the qualities of the water thus supplied and the recuperative powers of nature, waters containing some organic matters and certain kinds of micro-organisms do not appear to be injurious, as is evidenced by the general absence of specific diseases in the inhabitants supplied from these sources.

Wells.—There are two distinct kinds of wells, namely, shallow wells, sunk into a superficial permeable stratum 5 and deep wells, sunk through an impermeable stratum into an underlying permeable stratum. Both kinds of wells tap the underground waters which are the sources of springs, and furnish artificial outlets for waters which would either find a natural outlet in springs at the outcrop, or which, owing to a depression of the strata, may not possess a natural outlet at a low enough level ever to drain the lower part of the underground reservoir.

Shallow wells, sunk in the ordinary manner, have long been used for collecting moderate supplies of water, Where a permeable stratum, such as the Bagshot sands, or the gravel covering parts of the London basin,

overlies a watertight stratum such as the London Clay, especially where a slight depression in the impervious stratum towards the centre, or a considerable expanse of the surface stratum, prevents a ready outflow from the per- meable beds. Many parts of London were supplied for a long time in this manner; for the rain percolating the bed of gravel flowed into the wells sunk in it, from whence the water could be drawn up. Indeed, as pointed out by Professor Prestwich, the growth of London was restricted, till the regular establishment of 'waterworks, to those districts possessing a gravel subsoil, in which water could be readily procured, as no such facilities existed where the clay rose to the surface. The sites also of many of the older towns and villages were doubtless determined by similar considerations. Shallow wells are still very useful in supplying scattered populations, but they are exposed to the worst forms of contamination when the houses are near together. Any surface impurities are washed in with the rain ; frequently cesspools are given an outlet into the permeable stratum from which the water-supply is derived ; and pumping in the well, to increase the supply, creates a flow from the contaminated areas to the well. Such utter neglect of sanitary pre-cautions has led to serious outbreaks of illness ; and the sparkling water from some of the old wells in the City of London has proved very deleterious, from the infiltration into them of the decaying matter from graveyards and elsewhere. Shallow wells, in fact, must be resorted to with great caution, and only when an absence of habita- tions, or a thorough inspection of the district drained by the well, affords assurance of freedom fron organic pollution.

Deep wells, passing generally through impervious beds into a permeable water-bearing stratum to a depth at which an adequate supply of water is obtained, are mostly free from organic impurities, partly owing to the protection of the superincumbent impervious stratum, and partly to the filtration any impurities must undergo before reaching the well. The wells are usually formed by sinking a shaft lined with brick for the upper portion, and then carrying down a boring below to the requisite depth. The level of the water in the well depends upon the water-level in the

WATER-

stratum ; and generally the water has to be raised by pumping to the surface. Occasionally, owing to a de- pression of the strata, the top of the well is below the level of the lowest part of the outcrop of the permeable stratum into which the well is sunk, and the water rises in the well directly this stratum is reached, and flows over if the hydrostatic pressure is sufficient to overcome the friction. These latter wells, known as Artesian wells, have been already described (see ARTESIAN WELLS) ; and the methods of boring other deep wells are precisely similar. The most favourable strata for deep wells in England are the Chalk, Oolites, New Red Sandstone, and Lower Greensand. The yield of these wells depends upon the extent of the portion of the underground reservoir which they can drain; and the reservoir depends for its supply, as in the case of springs, on the extent of the stratum exposed at the surface, the drainage it may receive from adjoining impermeable strata, and the amount of rainfall over these areas. As these points can only be roughly estimated, it is impossible to judge of the yield beforehand ; and much depends on the fissures the well may happen to pierce, as the main flow in many rocks takes place along their fissures. It is dis- advantageous to sink a well where the superincumbent impervious stratum is very thick, not merely because of the depth that has to be sunk before reaching water, but also on account of the slow rate of the underground flow at a long distance from the outcrop, and owing to the com- pression of the porous stratum by the mass aboveit. For instance, the deep well on Southampton Common, sunk through 465 feet of impervious beds, has only yielded a small supply of water, though carried 852 feet into the chalk. A well may also prove a failure owing to a fault or an impervious barrier interrupting the underground flow, if it is sunk on the side of the fault or barrier away from which the dip of the stratum inclines. Thus a well sunk at A (fig. 2) will receive the water flowing along

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Fig. 2.

the permeable stratum ; whilst an adjacent deeper well at B will yield no water, on account of the interruption of the flow. As there is a limit to the underground waters, only a limited number of wells can be advantageously sunk within a certain area; and a multiplication of wells, such as has occurred in the London basin, permanently lowers the water-level of the underground reservoir, and involves an increased lift in pumping to maintain the supply. Wells drawing their supplies from the same sources as springs reduce the yield of the springs issuing from the strata which they pierce; and when these springs feed rivers the volume of these rivers is thereby somewhat diminished. Wells, however, sunk into strata draining to the sea-coast merely intercept water which otherwise would be absolutely lost. A useful well for small sup- plies is a tube well, which consists of a series of strong wrought-iron pipes, between 1 and 2 inches in diameter, the bottom length being terminated in a point, and per- forated with little holes for a short distance up. The point is driven into the ground by a falling weight, as in pile-driving ; and, as the tube descends, fresh lengths of

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pipe are screwed on the top. When the perforated pipe reaches a water-bearing stratum, the water enters through the holes and is raised by a pump (compare descriptions and diagrams of tube-wells under PETRoLEuM, vol. xviii. pp. 716-718).

EXTENSION OF SUPPLY.

A supply obtained from wells may be increased by reaching the water flowing through undrained fissures or lying in untouched cavities, either by sinking fresh wells, or by driving headings from the bottom of existing wells in various directions, both of which courses were adopted for extending the Brighton water-supply. Continued pumping sometimes improves the supply when the stratum is well saturated and the drain is not sufficient to lower the water-level permanently. This result is due to the steepening of the gradient of flow towards the well by the depression of the water-level in the well, which increases the velocity of flow,

whereby the channels of access are cleared out and enlarged, so that the water flows more readily and quickly into the well than at the commence- ment. |

The supply from springs and streams can only be increased by storing up the excess of supply in the wet season, to make up for the deficiency in the dry season. This can be accomplished by means of storage reservoirs, which sometimes are found suitably provided by nature in the form of lakes, or may be constructed in mountain valleys by means of dams.

RESERVOIRS.

Lakes as Reservoirs.—A lake is a natural reservoir of water, caused by the influx of a stream into a depression of an impermeable stratum, which is barred to a certain height by a ridge across its outlet, over which the water has to rise before it can flow away (see LaKz). The water of lakes is generally of exceptional purity, owing to its being usually supplied by the drainage from the impervious uncultivated ground of uninhabited mountainous districts, and its general freedom from pollu- tion, and on account of the lake serving as a deep subsiding reservoir for any matters in suspension contained in the inflowing streams, of which the Lake of Geneva in relation to the turbid upper Rhone is a notable instance. Glasgow is supplied with excellent water from Loch Katrine (see Aquepuct, vol. ii. p. 224); it was at one time proposed to supply Edinburgh from St Mary's Loch, and London from Bala Lake ; and works for the conveyance of water from Thirlmere, in Cumberland, to Manchester are in progress. To increase the storage capacity of a lake intended to serve as a reservoir, and avoid injury to vested interests, the ordinary water-level of the lake has to be raised by heightening the barrier at its outlet. By this means the lake is not unduly lowered by the drain upon it during the dry season, and compensation water is pro- vided to supply the water-rights along the stream below. The extent to which the water-level of the lake has to be raised depends upon the area of the lake, the influx into it, and the supply drawn off ; thus Loch Katrine, with an area of 3000 acres, needed only a rise of 4 feet in order that, with a maximum lowering of 7 feet, it might provide a storage of 5687 million gallons for a supply of fifty million gallons per day ; whereas the water-level of Thirlmere, with an

existing area of only 350 acres, requires raising 50 feet to furnish a storage of 8100 million gallons for a similar daily supply. The amount of water that can be collected depends on the catchment area, and the rainfall of the driest years, less the loss from evaporation; and the supply which can be relied upon from any definite gathering ground is given by the

formula Q=62.15 A (4 R-E), where Q is the daily supply in gallons, A is the catchment area in acres,.R is the average annual rainfall and E the loss from evaporation, both in inches! The storage capacity must be regulated by the number of consecutive days, in time of drought, that the supply might have to be drawn from the reservoir without its receiving any accession of water. This period has been variously estimated at from 70 to 300 days according to the locality ; for, owing to the smaller fluctuations in the rainfall and in the periods of drought in very rainy districts, and the less amount of evaporation, a much smaller storage suffices for very wet districts than for very dry ones.

Storage Reservoirs.—Where no natural lake is available for a reservoir, an artificial lake may be formed by con- structing a dam across a narrow gorge of a mountainous valley, thereby impounding, in the winter, the stream draining the valley, and storing up a supply for the following summer. To prevent an escape of the water thus impounded, the reservoir must be formed on an impervious stratum, and all cracks and fissures closed, or the bed and banks must be rendered watertight by a surface layer of impervious material. Occasionally the configuration of the ground and the amount of storage re- quired render it neces- sary to form a series of

near at hand, and where a rock foundation is not easily attainable. All loose material must be removed from the site of the dam; and the puddle trench in the centre must be carried down to a solid impervious bed (fig. 3). Tha embankment must be brought up in thin layers carefully

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Fig, 3.—Nethertrees Reseryoir Embankment, Paisley.

punned or rolled, the most retentive materials being placed near the middle, and the looser materials towards the outside. 'The inner slope, facing the reservoir, is usually made 3 to 1, and pitched on the surface to protect it from the wash of the waves. The outer slope is formed to the angle of stability of the material employed, generally 2 to 1; and occasionally berms are introduced, diminish- ing the liability to slips (fig. 4). The best puddled clay is used for the central trench; but the remainder of the embankment should not be composed exclusively of clay,

impounding reservoirs — at different levels along a valley, thereby in- creasing the number, eae

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height of the dams.

For instance, in supplying Manchester from the Long- dendale valley, six large reservoirs, having a total area of 497 acres, and a capacity of 4160

million gallons, were formed in steps by dams from 70 to 100 feet high (see Aquepvuct, vol. ii. p. 224).

ReEsERVoIR Dams,

The capacity of a reservoir depends upon the form and levels of the valley in which it is situated, and the height of the dam retaining it. As, however, the extent of the water surface is considerably increased by raising the water-level, an additional height of dam adds largely to the capacity of a reservoir. Thus Thirlmere, with an existing maximum depth of 108 feet, will have its area increased from 350 to 800 acres by raising the barrier at its outlet 50 feet. Accordingly, dams of considerable height are sometimes erected: as, for instance,the Entwistle embankment of the Bolton waterworks, retaining a reservoir 120 feet deep, the Villar dam, for the supply of Madrid, founded 1584 feet below the water-level of its reservoir (fig. 7), and the Furens dam, near St Etienne, with a height of 164 feet at the water-level (fig. 5); whilst the Gileppe dam, near Verviers, was made 1473 feet high (fig. 6) in preference to four dams of 95 feet.

A reservoir dam is constructed either with earthwork in an embankment sloped on each side, and with a water- tight puddle or concrete trench along the centre, or of masonry. Earthwork embankments have, till within the last three or four years, been exclusively adopted in Great Britain ; whilst masonry dams have been long ago con- structed in Spain, and more recently introduced int France.

Earthen Embankments.—In moist climates, and for moderate heights, embankments of earth are adopted with advantage for reservoir dams, more especially when ample materials can be readily obtained, either by excavations in the reservoir, thus enlarging its capacity, or elsewhere

1 Theory and Practice of Hydro-Mechanics, Inst. C. E., p. 44.

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Fia. 4.—Gladhouse Reservoir Embankment, Edinburgh.

as stiff clay under the influence of the weather, especially on the exposed outer slope, tends to slip. An earthen dam possesses ample stability if it is perfectly solid ; but it may fail from the infiltration of water through it, owing to faulty construction, or from settlement, leading to its overtopping by the water in the reservoir. –

Masonry Dams.—In hot dry countries, an earthen embankment is liable to crack and become somewhat dis- integrated ; and high embankments, owing to their flat side slopes, require a very large amount of material. Accordingly, in Spain, masonry dams have been adopted; and they are preferable to earthen dams when the height exceeds about 80 feet, and where a rock foundation can be secured. The Spanish masonry dam of Puentes (Lorca), 164 feet high, was indeed built upon piles; but it was eventually undermined, and settled; and the outburst of the water from the reservoir on its failure in 1802 caused the loss of 608 lives. Besides a solid rock founda- tion, the conditions of stability of a masonry dam are that the maximum pressure shall not exceed the limit that the masonry can sustain without injury, and that the lines of resultant pressures, with the reservoir empty and full, shall not anywhere pass outside the middle third of the section of the dam, so as to prevent the possibility of tension at the faces. With the reservoir empty, the pres- sures on the dam are merely those due to its weight; and the line of resultant pressures is the locus of the points of intersection of the verticals from the centres of gravities of the several portions of the dam above a series of horizontal lines, with the base lines of those portions (figs. 5 and 8). With the reservoir full, the water exerts a horizontal thrust against the inner face of the dam, equal to the weight of a column of water having the depth of the water resting against the dam, and acting at the centre of pressure, which is at two-thirds of the depth down from the water-level. 'The line of resultant pressures, in this case, is the locus of the points obtained by the intersection of the resultant lines of the pressures of the masonry and

WATER-

the water on the portions of dam, at different distances from the top, with the horizontal base lines of these portions (figs. 5 and 8). The direction and amount of the resultant are readily obtained graphically by the

parallelogram of forces, the point of application being at . the intersection of the vertical from the centre of gravity with the horizontal line one-third up from the base; for, by drawing the horizontal and vertical lines proportionate in length to the water-pressure and weight of the dam respectively, the diagonal represents the resultant of these forces both in magnitude and direction. When the inner face of the dam is battered, the weight of water resting on this face must be added to the weight of the dam when the reservoir is full The resultant pressures neces- sarily increase with the depth; and the maximum pres- sure is at or near the base of the inner face when the reservoir is empty, and of the outer face when the reservoir is full. The top has only to be made wide enough to resist the shock of the waves and floating ice in the reservoir; but the base, having to bear the weight of the dam together with the water-pressure, requires widening out adequately for the safe limit of pressure on the masonry not to be exceeded ; and, as the water-pressure with the full reservoir deflects the resultant towards the outer face, this face is given a considerable batter (fig. 5). All dams have to be raised high enough not to be over- topped by the highest waves in a storm, depending on the size and exposure of the reservoir.

Sections of three of the largest masonry dams erected within the last twenty-five years, namely, Furens, Gileppe, and Villar (figs. 5, 6, and 7), as well as the Vyrnwy rubble concrete dam, now in course of construction (fig. 8), drawn to the same scale, illustrate the forms adopted for these dams. The Furens and Villar dams follow closely the theoretical requirements; whilst the Gileppe and Vyrnwy dams, with their excess of thickness, impose an un- necessary weight on the base, and absorb extra material, without any adequate compensating advantage. Provision, however, was made in the section of the Gileppe dam to admit of its being raised at some future time, and for a roadway along the top, which in Some measure accounts for its excess of width; and the Gileppe and Vyrnwy dams are the first examples of such structures in Belgium and Great Britain.

The Furens dam (fig. 5), constructed in 1859-66, across the Gouffre d'Enfer, for forming -a reservoir with a capacity of 563 million cubic feet,

has a maximum height of 183 feet, and a length along the top of 887 feet; and the maximum pressure on the

a. masonry is 6°1 tons per square foot on the inner face, a few feet above the base, with the reservoir empty; whereas, with the reservoir full, the maximum pressure on the outer face is under 6 tons. No allowance was made for the: arched form of the dam, in plan, towards the re- servoir, which reduces the pressure, due to the head of water, at the lower part where the valley is very contracted, and would have admit- ted of the omis- sion of the pro- jecting outer portion for the bottom 60 feet.

very low limit of pres- sure, in addi- tion to the ex- cess of strength

Scale to Figs. 5, 6,7, and 8. iin

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Fie. 5.—Fnrens Reservoir Dam, near St Etienne.

just referred to, was adopted, owing to the unprecedented height and type of the Furens dam. By raising, however, the limit to 6°6 tons per square foot, it was possible to reduce the section of the Ban dam, 188 feet in height at the water-line, making it 110 fect wide at the base, as compared with 1164 feet for the Furens dam at the same depth; whilst with the samo limit applied to a dam of the full height of the Furens dam, the reduction in width

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at the base would be from 161 feet to 154 feet.1 Any further raising of the limit of pressure, which might be safely effected, would be of little advantage for dams down toa depth of about 100 feet, as the reduction in width is restricted by the condition of the middle third; but beyond that depth the width is regulated by the pressure.

The Gileppe dam (fig. 6), built in 1869-75, having a maximum height of 154 feet, and a length along the top of 771 feet, retains a reservoir with a capacity of 4233 million cubie feet. The average pressure on the base is

8‘2 tons per square foot; so that, even allowing for tho specific gravity of the masonry being about one-seventh greater at Gileppe than at Furens, the maximum _ pressure on the Gileppe dam

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Fic. 6,—Gileppe Reservoir Dam, near Verviers.

is considerably greater than on the Furens dam, in spite of its greater base and the smaller head of water (compare figs. 5 and 6), owing to the excess of material employed in its construction.

The Villar dam (fig. 7), built across the river Lozoya in 1870-78, convex towards the reservoir as at Furens and Gileppe, has a maximum height of 1683 fect, and a length along the top of 546 feet; and it forms a reservoir having a capacity of 702 million cubic feet. It differs very little in height and type from the Furens dam; but the form given to the batter of the outer face is cal- culated to render the pressures more uniform towards the base. é

The Vyrnwy dam (fig. 8), now (1888) in course of construction, across the Vyrnwy in Montgo- meryshire, for form- ing a reservoir, 1100 acres in area, to supply 40 million

allons per day to iverpool, is to sus- Yff tain a maximum

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i$: 51 3 Fid. 7.—Villar Reservoir Dam, near Madrid.

as it has to be car- ried down about 60 fect below the sur- face, in the centre of the valley, to reach solid rock, its maximum height is about 140 feet, and its length along the top is 1850 feet, The maximum pressure on the inner face with the reservoir ee empty has been estimated at a7 tons

20.0” per square foot, and with the reservoir full at 6°7 tons on the outer face. These pressures are considerably in ex- cess of the maxima pressures ou the Furens dam, though the head of water to be supported is much less, and the width at the base is greater in propor- tion to the depth. The pressures at the base in . the Vyrnwy and Gileppe sy dams show that a super- abundant mass of material in a masonry dam, whilst involving a larger outlay, imposes a greater pres- sure upon the masonry, whereas the stability is ample in the Furens type ;

Fig, 8.—Vyrnwy Reservoir Dam. and the oozing of water through the dam should be provided against by the quality of the materials and workmanship, rather than by an extra thickness of masonry.

1 Annales des Ponts et Chaussées, 4th ser., vol. xii. pl. 127.

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Accessory Works. Sometimes a small dam isplacedacross the upper end of a reservoir, so as to form a small settling reservoir, in which the inflowing stream can deposit any sediment before passing into the main reservoir.

A waste weir is provided at a suitable place in the dam with its sill slightly lower than the highest proposed water-level in the reservoir, so that the surplus water, when this level is reached, may flow over into the lye-wash. The length of the weir should be made sufficient for the discharge over it to pass off the inflow during a flood, so as to ensure the dam against being overtopped by a rise of water in the reservoir, which would

be fatal to an earthen dam. To provide for a large discharge without a great length of weir, the sill of the weir may be placed somewhat lower, and planks placed temporarily across it to retain the water at its highest level on the approach of the summer.

The water is drawn off from the reservoir, as required for supply, through an outlet culvert passing from a low level in the reservoir into a conduit in the valley below. This culvert was formerly frequently placed through the lowest part of the dam, being readily formed during the construction of the dam, and giving command of all the water in the reservoir. Accidents, however, have often been traced to the unequal settlement of the earthen embankment near the culvert, or to infiltration of water into the embankment, either by escaping from the culvert fractured by settlement, or by finding a passage along the outside line of the culvert or pipes. Thus the bursting of the Dale Dike embankment, 95 feet high, near Sheffield, in 1864, on the occasion of the first filling of the reservoir behind it, having a capacity of 114 million cubic feet, which entailed the loss of 238 lives, was attributed to the unequal settlement and consequent cracking of the puddle wall over the trench in the rock in which the outlet pipes were laid, aggravated in this instance by the defectiveness of the material in the main bank, the rough manner in which the bank. was raised, and the rapid filling of the reservoir. The percolation of the water under pressure along the line of outlet pipes was the cause of the gradual failure of the embankment, 41 feet high, across the Lynde Brook, Worcester, Mass., which burst in 1876 and set free a reservoir with a capacity of 110 million cubic feet.

No possible considerations can justify the burying of outlet pipes at the base of a high embankment, with the valves regulating the discharge at the outer extremity, whereby the water-pressure always acts along the whole length of the pipes, and their inspection is impracticable. In some cases a valve-tower is erected in the centre of the embankment, by which means the water can be shut off from a portion of the pipes. If, however, the outlet pipes are carried under the embankment, they should be laid in the solid ground, and should be commanded along their entire length by a valve-tower placed at the inner toe of the embankment (fig. 4). Nevertheless, it is far safer to carry the outlet pipes in a tunnel

constructed through the side of the valley, beyond one end of the embankment, In the case of masonry dams, the outlet is generally constructed in the solid rock distinct from the dam ; but at Villar the outlet culvert has been carried through the centre of the dam (fig. 7).

CONVEYANCE oF SUPPLY.

A reservoir in a mountain valley is at a sufficient elevation for the water to flow by gravitation to the locality to be supplied ; and it is only necessary to form a conduit by canals, tunnels, aqueducts, and pipes, of adequate size in relation to the gradient, to convey the daily supply required (see HypRomxcuanics). In olden times hills were contoured, and valleys were crossed by

colossal aqueducts, at great expense, to obtain a regular inclination, which was reduced by the circuitous route that had to be taken (see AquEpuct). Now, however, hills are pierced by tunnels; and, by the employment of cast- iron, deep wide valleys can be crossed by inverted siphons following the depressions of the land,—so that a much straighter course is attainable, affording better gradients, and therefore enabling smaller conduits to be adopted, which is of great importance when long distances have to be traversed. Thus the waters of Thirlmere, after being discharged through a tunnel formed under the Kirkstone Pass at the south end of the lake, instead of at the natural outlet to the north, will be conveyed to Manchester by a conduit 96 miles long, with a total fall of 178 feet. Portions of the route are in tunnels, 7 feet square, the longest tunnel being a little over 3 miles long ; and there are several inverted siphons, to be formed of five cast-iron pipes, each 34 feet in diameter, the longest siphon being 3% miles, and that under the river Lune having to bear a water-pressure of 416 feet. The water from the Vyrnwy reservoir will be conveyed to Liverpool in a conduit 67 miles long, of which 4 miles will be in tunnel, and will furnish a supply of 40 million gallons per day. A large supply of water from the river Verdon for the district round Aix, serving for irrigation and manufactures, as well as for domestic purposes,

is conveyed across the valley of St Paul in an inverted siphon formed of two wrought-iron tubes, each 53 feet in diameter.

The water obtained from rivers in low districts, and from wells, has to be raised by pumping to the height necessary to obtain a proper pressure for supply ; and the pumps have to be in duplicate, to prevent a failure in the supply in the event of a break-down. Thus the water- supply of London has to be raised by pumping to fill the service reservoirs.

PURIFICATION.

The water obtained for supply is frequently not sufficiently pure to be at once distributed for domestic purposes. The impurities to which water is liable are of three kinds, namely, particles of matter in suspension, inorganic substances in solution, and organic matters in solution or of extreme minuteness. Suspended matters are readily removed by subsidence if the particles are heavy, and by filtration if the particles are flocculent or light. Some inorganic compounds are readily removed, whilst others cannot be dealt with in a practical manner. The removal of organic impurities is of the most im- portance, and the most difficult, which has led to the great care exercised in selecting unpolluted supply.

Settling-Reservoirs.—Allusion has already been made to subsiding reservoirs formed at the head of large storage reservoirs ; the object of these, however, is rather to pre- vent the accumulation of silt and sand in the principal reservoir than for the purpose of purification, but the principle is the same. Supplies from large reservoirs are generally free from matters in suspension, except some- times during heavy floods, owing to the subsidence in the reservoir itself; but river supplies have often to be led into settling-reservoirs, where the water, whilst at rest, can deposit its heavier particles before passing on to the filter-beds for the removal of the lighter portions.

Lilter-Beds.—Over the bottom of brick tanks layers of clean material are spread, decreasing in coarseness from small rubble to sharp sand, with a total average thickness of about 4 feet. The actual filtration is effected by the upper layer of sand; and the lower layers allow the passage of the water unaccompanied by the sand. The efficiency of the filtration depends

upon the slowness of the passage of the water, which should not exceed a flow

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of from 24 to 3 gallons per square foot of area per hour. The filter must periodically be cleaned by scraping off the top surface of the sand, which becomes choked with the matter removed from the water ; and after a time a fresh layer of sand has to be provided. Filtration, though in itself a purely mechanical operation, has been found to reduce the organic impurities in the water, which must be due either to their oxidation from exposure in thin layers to the air in the process of filtering or to the actual removal of very minute organisms floating in the water, or probably to both causes combined.

Filters of spongy iron mixed with gravel were set up at the Antwerp waterworks in 1881, and arrested a quantity of matter which had passed through an upper layer of sand, and proved very efficient agents for purification. Their large cost, however, their becoming rapidly clogged and caked on the top, necessitating the removal of the upper layer of sand to break up the hard top iron crust, and the rather frequent renewal of the iron required, as compared with sand, were a bar to the extension of the system, which had become inadequate for its work. Eventually, it was found that the purification could be effected more economically and rapidly, and quite as effectually, by scattering cast-iron borings in the water as it flowed through horizontal revolving cylinders, furnished with projecting plates fastened at intervals round the inside, which, in revolving, scooped up the iron at the bottom, which had fallen through the water, and dis- charged it on reaching the top. The iron is first converted into ferrous oxide, FeO, which dissolves, at least partly, as bicarbonate, and then by further oxidation into ferric oxide, Fe,O,, which readily precipitates, and is easily removed by filtration through sand, a small portion only of the oxide remaining in. solution. Iron appears to purify water from organic matter, partly by its fatal influence on the growth and even life of micro-organisms, and partly by dragging down the floating organisms in the process of precipitation.

Softening Water.—Many waters drawn from springs, wells, and rivers fed by springs contain inorganic salts in solution, and, though innocuous and pleasant for drinking, are not good for general domestic and manufacturing purposes, owing to their curdling soap and encrusting kettles, boilers, and pipes. This quality, known as hardness, is mainly due to salts of lime, which are found in large quantities in waters drawn from the chalk. Most of the lime in solution is in the form of bicarbonate, CaO.2CO,, having been produced from the very slightly soluble carbonate of lime, CaO.CO,, of which chalk and other limestones are mainly composed, by combination with free carbonic acid, CO, It is only therefore neces- sary to remove half of the carbonic acid from the bicar- bonate to reconvert it into the insoluble carbonate. This can be done either by boiling, which drives off the excess of carbonic acid, depositing the carbonate of lime which forms the troublesome incrustation in pipes and boilers where chalk water is used, or by adding caustic lime, CaO, to the water, which, combining with the excess of carbonic acid, reduces the bicarbonate, forming carbonate of lime, which is precipitated. This reaction is indicated by the formula CaO + Ca0.2CO, = 2Ca0.CO,, and is the basis of Dr Clark's process for softening water. To indicate the degree of hardness of various waters, Dr Clark's scale of 1 degree of hardness for each grain of chalk in 1 gallon of water is employed. Some waters have 22°, or even more degrees of hardness; and all waters are termed hard which contain more than 5°; but by the softening process waters of 22° of hardness can be reduced to about 5°. The remaining or permanent hardness consists of sulphate of lime and other soluble

salts. The conversion of the bicarbonate in the process of softening is rapid ; but the difficulty of dealing with the fine precipitate, which requires time to settle, has hindered the general adoption of the process, though it has been applied successfully at various works deriving their supply from chalk wells. The precipitation of the carbonate of lime in the softening process has been observed to remove to a great extent the micro-organisms in the water, confirming the view expressed above, that precipitation sweeps down with it the minute germs, as in this case the chemical action could not influence them. The waters obtained from

mountainous districts are very soft, and therefore very valuable for manufacturing districts ; but they have more action upon lead, and are more liable to absorb organic impurities than water highly charged with inorganic salts.

STORAGE.

Quantity of Daily Supply.—The water-supply required is estimated in gallons per head of population, with additions in manufacturing districts for trade purposes. The consumption varies greatly in different towns, ranging from about 12 to 50 gallons per head per day; and it depends more upon the fittings and other sources of waste than upon the habits of the population, though the con- sumption per head is greater in the wealthier quarters. An ample supply, for domestic and general requirements, is from 20 to 25 gallons per head daily. The actual rate of consumption varies with the time of day, and also with the period of the year, being greatest between 7 and 10 a.m., and in June, July, and August, and least from 9 p.m. to 5 A.M., and in January, February, and March.

Where the quality of the supply drawn from different sources varies, as in London (the water from the deep wells in the chalk being far superior to that derived from the Lea), and where filtration has to be largely adopted, it is unfortunate that the best supply cannot be devoted to drinking and cooking, and the inferior in quality and unfiltered waters used for cleaning, for gardens, stables, water-closets, flushing sewers, watering the streets, and extinguishing fires. Besides, however, the cost of a duplicate system of mains and pipes, with the addition, in London, of difficulties between independent companies, the carelessness of persons in drawing from the two supplies has been considered a bar to this separation. It is possible, however, that, when the population becomes still more dense, and pure water more difficult to obtain, these objec- tions may be overruled, and the purest supply devoted to special uses.

Service-Reservoir.—To provide a sufficient reserve for sudden demands, such as for a fire, and to ensure an adequate supply to every house, a service-reservoir has to be constructed, into which the water from the source of supply is led. 'The reservoir consists generally of a brick or

concrete tank, rendered inside with cement, sunk in the ground, and roofed over with brick arches resting on the side walls and intermediate pillars, over which a covering of earth is spread. By this means light and heat are excluded, which, together with a depth of at least 15 feet of water, prevents the growth of minute aquatic plants, of which the germs are found in some well waters, particularly from the New Red Sandstone, and maintains the water at a tolerably even temperature. The reservoir should have a capacity of not less than twenty- four hours' supply, and should be at a sufficient elevation to command the whole of the district it serves, and if pos- sible afford a good pressure on the fire-hydrants. Where a town stands at very different levels, separate reservours at different elevations for supplying the high-level and

low-level districts are advisable, to equalize the pressure. XXIV. — 52

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DISTRIBUTION.

The water is led from the service-reservoir through cast- iron mains to the branch mains, from which the service pipes convey it to the several houses. Lead is generally preferred for house connexions, owing to the facility with which it can be adapted to structural requirements. The only objection to it is that it is attacked by some very soft waters, oxide of lead being formed, which is partially soluble and very injurious to health. With free carbonic acid, however, the pipe becomes coated with carbonate of lead, which is insoluble in water and protects the pipe from further action. Peat also in water protects the lead pipes, by depositing a surface film. In the case of hard waters, the lead soon becomes coated with sulphate of lime. Accordingly, it is only under exceptional conditions that the employment of lead for pipes is deleterious ; but it should be prohibited for the lining of cisterns where the water may be stored for long periods.

Domestic filters are very valuable for local well and spring supplies, and afford an additional safeguard against accidental impurities in public supplies (see FiuTEr).

Intermittent and Constant Supply.—¥Formerly the com- mon form of supply was on the intermittent system. On this plan, each house is provided with a cistern, into which water from the main is admitted for a short period, once or twice a day, by means of a valve on each service main, which is opened and closed by the turncock for each separate district. When the cistern is filled, the inlet pipe is closed by the rising of the floating ball shutting the ball tap. The supply is, accordingly, limited to the contents of the cistern, except during the short period the water is turned on ; and the cistern is proportioned to the accommodation of the house. The water in these open cisterns is liable to contamination from impurities of various kinds settling in them and not being cleaned out ; and it is often exposed to heat, a smoky atmosphere, and dust, and sometimes to sewage gas. Moreover, in thie event of a fire, the turncock has to be summoned before a supply of water can be obtained. Accordingly, the adoption of the constant system has been urged, and in many places carried out. The advantages of drawing a fresh supply always direct from the main, and of having an ample supply constantly at hand to meet any emergency are unquestionable ; but the constant supply of water necessitates the strengthening and very careful inspection of the pipes, joints, and fittings, to prevent fracture and avoid leakage under a continual and increased pressure, and is liable to lead to a careless waste 'of water if unchecked by a meter. Before substituting a constant for an intermittent supply, it is essential to overhaul thoroughly the pipes and joints, and to substitute screw- down taps, which close gradually, for the leaky suddenly- closing plug-taps, which throw a sudden pressure on the pipes. Waste in water-closets can be stopped by the insertion of a waste preventer, which only allows a definite quantity of water to pass each time the plug is raised (see SEWERAGE). The detection of accidental waste from leakages has been much facilitated by the introduction of a waste-water meter, which records graphically, on a revolving cylinder, the amount of water which is passing the place where the meter is fixed. By fixing the meter on one of the district mains at night, when most of the recorded flow is running to waste, and shutting off suc- cessively the service pipes through which water is heard to be flowing, the change in the diagram of flow at each closing of a service pipe localizes the position and extent of each source of waste, showing at what places leaks must be

occurring, and which are the worst, needing attention first. This method of inspection was first adopted at

Liverpool in 1873; and, besides effecting a considerable economy, it enabled the constant service to be restored, which the previous waste had rendered impracticable.

Water-Meters.—There are two classes of water-meters, —-the positive and the inferential. The positive meter, such as Kennedy's and Frost's piston meters, measures the actual quantity of water passed through it, as recorded by the strokes of a piston working in the cylinder, which is successively filled from the top and bottom, and affords a measure of the water introduced ; whilst the inferential meter, such as that of Siemens, measures only the revolu- tions of a turbine actuated by the flow of the passing water, of which the quantity is deduced from the velocity. The posi- tive meter is more accurate, and measures very small flows; whereas the turbine meter may sometimes not be turned by very small flows which are gradually increased. Measure- ment by meter would seem naturally to follow the adoption of the constant service for domestic supply, as well as for manufactories. Its general adoption has, however, been hindered by the fear that a charge by quantity, instead of by rental, might press unduly upon the poorer classes, and induce them to stint themselves of a proper supply, and also the difficulty of obtaining a very cheap and at the same time a perfectly trustworthy meter of adequate durability. To avoid the possibility of checking a sufli- cient use of water in the poorer tenements, it has been proposed to allow a definite supply at the ordinary rate, and only to charge by meter for any excess over this amount. (ls F. V.-H.)

WATERTON, Cuartzs (1782-1865), naturalist and traveller, descended from a very ancient English family, was born at Walton Hall, near Pontefract, Yorkshire, in 1782. After being educated at the Roman Catholic college of Stonyhurst, and travelling a short time on the Continent, he went to Demerara to manage some estates belonging to his family. He continued in this occupa- tion for about eight years, when he began those wander- ings upon the results of which his fame as a naturalist principally rests. In his first journey, which began in 1812, and

the principal object of which was to collect the poison known as curari, he travelled through British Guiana by the Demerara and Essequibo rivers to the frontiers of Brazilian Guiana, making many natural history collections and observations by the way. After spending some time in England he returned to South America in 1816, going by Pernambuco and Cayenne to British Guiana, where again he devoted his time to the most varied observations in natural history. For the third time, in 1820, he sailed from England for Demerara, and again he spent his time in similar pursuits. Another sojourn in England of about three years was followed by a visit to the United States in 1824; and, having touched at several of the West India islands, he again went on to Demerara, returning to England at the end of the year. In 1828 he published the results of his four journeys, under the title of Wanderings in South America, —consisting largely of a collection of observations on the appearance, character, and habits of many of the animals to be found in British Guiana. Waterton was a keen and accurate observer, and his descriptions are of a graphic and humorous character, rarely to be found in works on natural history. He married in 1829, and from that time lived mostly at Walton Hall, devoting himself to the improvement of his estate, to country pursuits, and to natural history observations. Waterton also published three series of essays on various subjects connected with natural history. He died May 27, 1865, from the result of an accident.

WATERTOWN, a city of the United States, the county seat of Jefferson county, New York, is situated upon both

sides of Black River, 7 miles above its mouth, and is 140 miles north-west of Albany. It is laid out rather irregu- larly, with 60 miles of streets, is supplied with water by pumping, water-power being used, and is well sewered. The population in 1880 was 10,697, including 2444 of foreign birth. The river at this point is 60 yards wide. Tt falls 112 feet in two miles, and flows through the city in a succession of rapids, furnishing a magnificent water- power to the numerous paper, woollen, and cotton mills and machine shops which line its banks.

The first settlement was made in 1800, and the town had a rapid growth from the start. The eity was chartered in 1869.

WATERTOWN, a city in Jefferson and Dodge counties, Wisconsin, United States, is situated upon both sides of Rock river, in a rich farming region. Its population in 1880 was 7883, 3072 of them of foreign birth. The river furnishes a valuable water-power for extensive manufac- tures. Watertown contains the North-Western University, a Lutheran institution, and a Roman Catholic seminary. About two-thirds of the present population are Germans or their direct descendants.

WATERWORKS. See WarTER-SUPPLY.

WATFORD, an ancient market town of Herts, is situated on a ridge of gravel overlooking the river Colne, on the Grand Junction Canal and on the London and North- Western Railway, branches of which here diverge to St Albans and to Rickmansworth, 8 miles south-west of St Albans and 173 north-west of London by rail, the distance by road from Charing Cross being 15 miles. It consists chiefly of one spacious street, about 14 mile in length, running north-westwards from the river.

Watford is not mentioned in Domesday, being then included in the manor of Cashio, belonging to the abbey of St Albans. The town received the grant of a market from Henry I. When the abbey of St Albans was dissolved in 1549, Watford fell to the erown. In 1609 it came into the possession of Thomas Marbury, and it has belonged to the earls of Essex sinee 1767.

WATSON, Ricwarp (1737-1816), bishop of Llandaff, was born in August 1737 at Heversham, in Westmorland, and was the son of the master of the grammar school of that place. He was entirely educated by his father, who sent him in 1754 to Trinity College, Cambridge, with "a considerable stock of classical learning, a spirit of per- severing industry, and an obstinate provincial accent." He was elected a fellow of Trinity in 1760, and about the same time had the offer of the post of chaplain to the factory at Bencoolen. "You are too good," said the master of Trinity, "to die of drinking punch in the torrid zone," and Watson, instead of becoming, as he had flattered

himself, a great Orientalist, remained at home to be elected professor of chemistry, a science of which he did not at the time possess the simplest rudiments. “ I buried myself,” he says, “in my laboratory, and in fourteen months read a course of chemical lectures to a very full audience.” Not the least of his services was to procure an endowment for the chair, which served as a precedent in similar instances.

In 1771 he became a candidate for the regius pro- fessorship of divinity, and at the age of thirty-four gained what he calls “ the first place for honour in the university,” “Cand,” he adds, “exclusive of the mastership of Trinity College, I have made it the first for profit. I found it not worth £330 a year; it is now (1814) worth £1000 at the least.” He did not entirely renounce the study of chemistry : in 1768 he had published Jnstetutiones Metal- lurgicx, intended to give a scientific form to chemistry by digesting facts established by experiment into a connected series of propositions. In 1781 he followed this up with a volume of Chemical Essays, which Davy told De Quincey remained as late as 1813, after all recent discoveries, unsurpassed as a manual of introductory discipline. But on the day on which he composed his preface he burned all his chemical manuscripts, and never returned to the subject. His course as professor of divinity was no less decisive. “I reduced the study of divinity into as narrow a compass as I could, for I determined to study nothing but my Bible.” He produced several anonymous pamphlets on the liberal side in the subscription con- troversy and other topics of the day, and some sermons, one of which was thought likely to have involved him in a prosecution, but which, Dunning said, contained ‘just such treason as ought to be preached once a month at St James’s.” It is said to have prevented his obtaining the provostship of Trinity College, Dublin. In 1776 he answered Gibbon’s chapters on Christianity, and had the honour of being one of the only two opponents whom Gibbon treated with respect. In 1781 he was prostrated with a malignant fever, from the effects of which he never wholly recovered, and which served as an excuse for that neglect of many duties which remains the chief stain upon his character. THe had always opposed the American War, and when the accession of Lord Shelburne to power in 1782 afforded the then unfrequent opportunity of advanc- ing a Liberalin

politics and religion to a bishopric, Watson was made bishop of Llandaff, being permitted to retain his other preferments on account of the poverty of the see. Shelburne, he says, expected great service from him as a pamphleteer, but Watson proved from the ministerial point of view a most impracticable prelate. He imme- diately brought forward a scheme for improving the con- dition of the poorer clergy by equalizing the incomes of the bishops, the reception of which at the time may be imagined, though it was substantially the same as that carried into effect by Lord Melbourne's Government fifty years later. Watson now found that he possessed no influence with the minister, and that he had destroyed his chance of the great object of his ambition, promotion to a better diocese. Neglecting both his see and his professor- ship, to which latter he appointed a deputy described as highly incompetent, he withdrew to Calgarth Park, in his native county, where he occupied himself largely in form- ing plantations and the improvement of agriculture. He nevertheless frequently came forward as a preacher and a speaker in the House of Lords, but his only very con- spicuous appearance before the public was his warm support of the prince of Wales's unqualified claim to the regency on the insanity of the king in 1788, which com- pleted his disgrace at court. In 1796 he published his Apology for the Bible, in answer to Thomas Paine, at

present the best known of his numerous writings. It was most effective in its day; in ours Christianity would hardly be attacked or defended by the arms employed by either disputant. Undismayed by the displeasure of the court, or perhaps hoping to overcome it, Watson continued to exert his pen with vigour, and in general to good purpose, denouncing the slave trade, advocating the union with Ireland, and offering financial suggestions to Pitt, who seems to have frequently consulted him. In 1798 his Address to the People of Great Britain, enforcing resistance to French arms and French principles, ran through fourteen editions, but estranged him from many old friends, who accused him, probably with injustice, of aiming to make his peace with the Government. In 1807 the advent of a Whig ministry almost brought the coveted preferment within reach. Had Dr Markham died a few months sooner Watson would have been

archbishop of York. Such a disappointment might palliate the querulous strain of his conversation and published references to himself, though it could not render it dignified or decorous. De Quincey, however, who knew the bishop personally in his latter years, while severely criticizing his complaints, allows that his temper had not been soured by disappoint- ment. "His lordship was a joyous, jovial, and cordial host." He died on July 2, 1816, having occupied his latter years in the composition and revision of an autobio- graphy, which, with all its egotism and partiality, is a valuable work, and the chief authority for his life.

As an advocate of liberal principles in church and state, Watson stands almost alone among the prelates of his day; and it cannot be said that his longing for preferment, violent and unbecoming as it was, seduced him into mean actions or unworthy compliances. His character is high enough to make it cause for regret that it should stand no higher, as it easily might if he had possessed a nicer sense of dignity and had not measured success so exclu- sively by the attainment of wealth and station. Hard-headed and pushing, he yet had an intellectual conscience ; the two main ele- ments of his character stood in each other's way : he failed as a courtier, and did not leave a wholly unblemished reputation as a patriot. As a bishop he neither was nor endeavoured to be anything ; as an ecclesiastical statesman it was his misfortune to have been born fifty years too soon. His massive but unoriginal

intellect is justly characterized by De Quincey as "robust and commonplace." (R. G.)

| WATT, James (1736-1819), the inventor of the modern condensing steam-engine, was born at Greenock on the 19th of January 1736. His father was a small merchant there, who lost his trade and fortune by unsuc- cessful speculation, and James was early thrown on his own resources. Having a taste for mechanics he made his way to London, at the age of nineteen, to learn the business of a philosophical-instrument maker, and became apprenticed to one Morgan, in whose service he remained for twelve months. From a child he had been extremely delicate, and the hard work and frugal living of his London pupilage taxed his strength so severely that he was forced at the end of a year to seek rest at

home, not, however, until he had gained a fair knowledge of the trade and become handy in the use of tools. Before going to London he had made acquaintance with some of the professors in Glasgow college, and on his return to Scotland in 1756 he sought them out and obtained work in repairing astrono- mical instruments. He next tried to establish himself as an instrument maker in Glasgow, but the city guilds would not recognize a craftsman who had not served the full term of common apprenticeship, and Watt was forbidden to open shop in the burgh. The college, how- ever, took him under its protection, and in 1757 he was established in its precincts with the title of mathematical- instrument maker to the university.

Before many months Black, the discoverer of latent heat, then lecturer on chemistry, and Robison, then a student, afterwards professor of natural philosophy, became

his intimate friends, and with them he often discussed the possibility of improving the steam-engine, of which at that time Newcomen's was the most advanced type. The engine was then applied only to pumping water, —chiefly in the drainage of mines; and it was so, clumsy and wasteful of fuel as to be but little used. Some early experiments of Watt in 1761 or 1762 led to no positive result, but in 1764 his attention was seriously drawn to the matter by having a model of Newcomen's engine, which formed part of the college collection of scientific apparatus, given him to repair. Having put the model in order, he was at once struck with its enormous consumption of steam, and set himself to examine the cause of this and to find a remedy. .

In Newcomen's engine the cylinder stood vertically under one end of the main lever or "beam" and was open at the top. Steam, at a pressure scarcely greater than that of the atmosphere, was admitted to the under side; this allowed the piston to be pulled up by a counterpoise at the other end of the beam. Communication with the boiler was then shut off, and the steam in the cylinder was condensed by injecting a jet of cold water from a cistern above. The pressure of the air on the top of the piston then drove it down, raising the counterpoise and doing work. The injection

water and condensed steam which had gathered in the cylinder were drained out by a pipe leading down into a well.

Watt at once noticed that the alternate heating and cooling of the cylinder in Newcomen's engine made it work with tedious slowness and excessive consumption of steam. When steam was admitted at the beginning of each stroke, it found the metal of the cylinder and piston chilled by contact with the condensed steam and cold injection water of the previous stroke, and it was not until much steam had been condensed in heating the chilled surfaces that the cylinder was able to fill and the piston to rise. His first attempt at a remedy was to use for the material of the cylinder a substance that would take in and give out heat slowly. Wood was tried, but it made matters only a little better, and did not promise to be durable. Watt observed that the evil was intensified whenever, for the sake of making a good vacuum under the piston, a specially large quantity of injection water was supplied. :

He then entered on a scientific examination of the pro- perties of steam, studying by experiment the relation of its density and pressure to the temperature, and concluded that two conditions were essential to the economic use of steam in a condensing steam-engine. One was that the temperature of the condensed steam should be as low as possible, 100° F. or lower, otherwise the vacuum would not be good; the other was, to quote his own words, "that the cylinder should be always as hot as the steam which entered it." In Newcomen's engine these two con- ditions were incompatible, and it was not for some months that Watt saw a means of reconciling them. Early in 1765, while walking on a Sunday afternoon in Glasgow Green, the idea flashed upon him that, if the steam were condensed in a vessel distinct from the cylinder, it would be practicable to make the temperature of condensation low, and still keep the cylinder hot. Let this separate vessel be kept cold, either by injecting cold water or by letting it stream over the outside, and let a vacuum be niaintained in the vessel. Then, whenever communication was made between it and the cylinder, steam would pass over from the cylinder and be condensed ; the pressure in the cylinder would be as low as the pressure in the con- denser, but the temperature of the metal of the cylinder would remain

high, since no injection water need touch it. Without delay Watt put this idea to the test, and found

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that the separate condenser did act as he had anticipated. To maintain the vacuum in it he added another new organ, namely, the air-pump, the function of which is to remove the condensed steam and water of injection along with any air that gathers in the condenser.

To further his object of keeping the cylinder as hot as the steam that entered it, Watt supplemented his great invention of the separate condenser by several less notable but still important improvements. In Newcomen's engine a layer of water over the piston had been used to keep it steam-tight; Watt substituted a tighter packing lubricated by oil. In Newcomen's engine the upper end of the cylinder was open to the air; Watt covered it in, leading the piston rod through a steam-tight stuffing-box in the cover, and allowed steam instead of air to press on the top of the piston. In Newcomen's engine the cylinder had no clothing to reduce loss of heat by radiation and conduction from its outer surface ; Watt not only cased it in non-con- ducting material, such as wood, but introduced a steam- jacket, or layer of steam, between the cylinder proper and an outer shell. All these features were specified in his first patent, in words which have been quoted in the article STEAM-ENGINE, vol. xxii. p. 475 (q.v.).

This patent was not obtained till January 1769, nearly four years after the inventions it covers had been made. In the interval Watt had been striving to demonstrate the merits of his engine by trial on a large scale. His earliest experiments left him in debt, and, finding that his own means were quite insufficient to allow him to continue them, he agreed that Dr Roebuck, founder of the Carron iron-works, should take two-thirds of the profits of the invention in consideration of his bearing the cost. An engine was then erected at Kinneil, near Linlithgow, where Roebuck lived, and this gave Watt the opportunity of facing many difficulties in details of construction. But the experiments made slow progress, for Roebuck's affairs became embarrassed, and Watt's attention was engaged by other work. He had taken to surveying, and was fast gaining reputation asa

civil engineer. In 1767 he was employed to make a survey for a Forth and Clyde canal, —a scheme which failed to secure parliamentary sanction. This was followed during the next six years by surveys for a canal at Monkland, for another through the valley of Strathmore from Perth to Forfar, and for others along the lines afterwards followed by the Crinan and Caledonian Canals. He prepared plans for the harbours of Ayr, Port-Glasgow, and Greenock, for deepening the Clyde, and for building a bridge over it at Hamilton. In the course of this work he invented a simple micrometer for measuring distances, consisting of a pair of horizontal hairs placed in the focus of a telescope, through which sights were taken to a fixed and movable target on a rod held upright at the place whose distance from the observer was to be determined. The micrometer was varied in a number of ways; and another fruit of his ingenuity about the same time was a machine to facilitate drawing in perspective.

Meanwhile the engine had not been wholly neglected. Watt had secured his patent; the Kinneil trials had given him a store of valuable experience ; Roebuck had failed, but another partner was ready to take his place. In 1768 Watt had made the acquaintance, through his friend Dr Small, of Matthew Boulton, a man of energy and capital, who owned the Soho engineering works at Birmingham. Boulton agreed to buy Roebuck's share in the invention, and to join Watt in applying to parliament for an Act to prolong the term of the patent. The application was successful. In 1775 an Act was passed continuing the patent for twenty-five years. By this time the inventor had abandoned his civil engineering work and had settled in Birmingham, where the manufacture of steam-engines

was begun by the firm of Boulton and Watt. The partnership was a singularly happy one. Boulton had the good sense to leave the work of inventing to Watt, in whose genius he had the fullest faith ; on the other hand, his substantial means, his enterprise, resolution, and business capacity, supplied what was wanting to bring the invention to commercial success.

During the next ten years we find Watt assiduously en- gaged in developing and introducing the engine. Its first and for a time its only

application was in pumping ; it was at once put to this use in the mines of Cornwall, where Watt was now frequently engaged in superintending the erection of engines. Further inventions were required to fit it for other uses, and these followed in quick succession. Watt's second steam-engine patent is dated 1781. It de- scribes five different methods of converting the reciprocat- ing motion of the piston into motion of rotation, so as to adapt the engine for driving ordinary machinery. The simplest way of doing this, and the means now universally followed, is by a crank and fly-wheel ; this had occurred to Watt but had meanwhile been patented by another, and hence he devised the "'sun and planet wheels " and other equivalent contrivances. A third patent, in 1782, con- tained two new inventions of the first importance. Up to this time the engine had been single-acting ; Watt now made it double-acting ; that is to say, both ends of the cylinder, instead of only one, were alternately put in com- munication with the boiler and thecondenser. Up to this time also the steam had been admitted from the boiler throughout the whole stroke of the piston ; Watt now intro- duced the system of expansive working, in which the ad- mission valve is closed after a portion only of the stroke is performed, and the steam enclosed in the cylinder is then allowed to expand during the remainder of the stroke, doing additional work upon the piston without making any further demand upon the boiler until the next stroke requires a fresh admission of steam. Ile calculated that, as the piston advanced after admission had ceased, the pressure of the steam in the cylinder would fall in the same proportion as its volume increased,—a law which, although not strictly true, does accord very closely with the actual behaviour of steam expanding in the cylinder of an engine. Recognizing that this would cause a gradual reduction of the force with which the piston pulled or pushed against the beam, Watt devised a number of con- trivances for equalizing the effort throughout the stroke. He found, however, that the inertia of the pump-rods in his mine engines, and the fly-wheel in his rotative engines, served to compensate for the inequality of thrust sufficiently to make these contrivances unnecessary. His fourth patent, taken out in 1784, describes the well-known 'parallel motion," an arrangement of links by which the top of the piston-rod is connected to the beam so that it may either pull or push, and is at the same time guided to move in a sensibly straight line. 'I have started a new hare," he writes to Boulton in June of that year; "I have gota glimpse of a method of

causing a piston-rod to move up and down perpendicularly by only fixing it to a piece of iron upon the beam, without chains or perpendicular guides or untowardly frictions, arch-heads, or other pieces of clumsiness. I think it a very probable thing to succeed, and one of the most ingenious simple pieces of mechanism I have contrived."

Still a later invention was the throttle-valve and centrifugal governor, by which the speed of rotative engines was automatically controlled. One more item in the list of Watt's contributions to the development of the steam-engine is too important to be passed without mention: the indicator, which draws a diagram of the relation of the steam's pressure to its volume as the stroke proceeds,

was first used by Boulton and Watt to measure the work done by their engines, and so to give a basis on which the charges levied.

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from their eustomers were adjusted. It would be diffieult to ex- aggerate the part which this simple little instrument las played in the evolution of the steam-engine. The eminently philosophie notion of an indicator diagram is fundamental in the theory of thermodynamies; the instrument itself is to the steam-engincer what the stethoseope is to the physician, and more, for with it he not only diagnoses the ailments of a faulty machine, whether in one or another of its organs, but gauges its power in health.

The eommereial suceess of the engine was not long in being established. By 1788 all but one of the Neweomen pumping- engines in Cornwall had been displaced by Watt's. The mines were then far from thriving; many were even on the point of being abandoned through the diffieulty of dealing with large volumes of water ; and Watt's invention, which allowed this to be done at a moderate eost, meant for many of them a new lease of life. His engine used no more than a fourth of the fuel that had formerly been needed to do the same work, and the Soho firm usually elaimed by way of royalty a sum equivalent to one-third of the saving—a sum whieh must have been nearly equal to the cost of the fuel actually consumed. Rival manufaeturers came forward, amongst whom Bull and Hornblower aro the most eonspicuous names. They varied the form of the engine, but

they eould not avoid in- fringing Watt's patent by the use of a separate condenser. When aetion was taken against them on that ground, they retaliated by disputing the validity of the fundamental patent of 1769. In the ease of Boulton and Watt v. Bull the eourt was divided on this point, but in an aetion against Hornblower the patent was definitely affirmed to be valid by a unanimous finding of the Court of King's Beneh. This was in 1799, only a year before the monopoly ex- pired, but the deeision enabled the firm to elaim a large sum as arrears of patent dues. In eonnexion with these trials Watt him- self, as well as his early friends Blaek and Robison, drew up narratives of the invention of the steam-engine, whieh are of mueh interest to the student of its history.

Before Watt's time the steam-engine was exelusively a steam- pump, slow-working, eumbrous, and exeessively wasteful of fuel. His first patent made it quiek in working, powerful, and effieient, but still only as a steam-pump. His later inventions adapted it to drive maehinery of all kinds, and left it virtually what it is to- day, save in three respects. In respeet of meehanieal arrangement the modern engine differs from Watt's chiefly in this, that the beam, an indispensable feature in the early pumping-engines, and one which held its plaee long after the need for it had vanished, has gradually given way to more direet modes of connecting the piston with the erank. Another differenee is in the modern use of high-pressure steam. Itis remarkable that Watt, notwithstanding the faet that his own invention of expansive working must have opened his eyes to the advantage of high-pressure steam, declined to admit it into his praetiee. He persisted in the use of pressures that were little if at all abovo that of the atmosphere. His rivals in Cornwall were not so squeamish. 'Trevithick ventured as far as 120 tb on the square ineh, and a curious episode in the history of the steam-engine is an attempt whieh Boulton and Watt made to have an Aet of Parliament passed forbidding the use of high pressure on the ground that the lives of the publie were endangered. The third and only other respect in which a great improvement has been effeeted is in the introduction of eeompound expansion. Here, too, one eannot but regret to find the Soho firm hostile, though the necessity of defending their monopoly makes their aetion natural enough. Hornblower had in faet stumbled on the invention of the eompound engine, but as his machine employed Watt's condenser it was

suppressed, to be revived after some years by Woolf. In one of his patents (1784) Watt deseribes a steam-loeomotive, but he never proseeuted this, and when Murdoeh, his chief assistant (famous as the inventor of gas-light- ing), made experiments on the same lines, Watt gave him little encouragement, The notion then was to use a steam-earriage on ordinary roads ; its use on railways had not yet been thought of. When that idea took form later in the last years of Watt's life, the old man refused to smile upon his offspring ; it is even said that Watt put a clause in the lease of his house that no steam-carriace should on any pretext be allowed to approaeh it. –

On the expiry in 1800 of the Act by which the patent of 1769 had been extended, Watt gave up his share in the business of engine-building to his sons, J ames, who carried it on along with a son of Boulton for many years, and Gregory, who died in 1804. The remainder of his life was quietly spent at Heathfield Hall? his house near

1 Another narrative of the utmost interest was written by Watt in 1814 in the form of a footnote to Robison's artiele « Steam-Engine," from the fourth edition of the Encyclopxdia Britannica, which Watt revised before it was reprinted in the eolleeted edition of Robison's works, See Robison's Mechanical Philosophy, vol. ii.*

? His workroom at Heathfield (now in the possession of Mr

Birmingham, where he devoted his time, with scarcely an interruption, to mechanical pursuits. His last work was the invention of machines for copying sculpture,—one for making reduced copies, another for taking facsimiles by means of a light stiff frame, which carried a pointer over the surface of the work while a revolving tool fixed to the frame alongside of the pointer cut a corresponding surface on a suitable block. We find him in correspondence with Chantrey about this machine not many months before his death, and presenting copies of busts to his friends as the work "of a young artist just entering on his eighty-third year." His life drew to a tranquil close, and the end came at Heathfield on the 19th of August

1819. His remains were interred in the neighbouring parish church of Handsworth.

Watt was twice married,—first in 1763 to his cousin Miss Miller, who died ten years later. Of four children born of the marriage, two died in infancy; another was James, who succeeded his father in business; the fourth was a daughter who lived to maturity, but died early, leaving two children. His second wife, Miss Macgregor, whom he married before settling in Birmingham in 1775, survived him; but her two children, Gregory and a daughter, died young.

Some of Watt's minor inventions have been already notieed. Another, which has proved of great practical value, was the letter- eopying press, for copying manuseript by using a glutinous ink and pressing the written page against a moistened sheet of thin paper. He patented this in 1780, deseribing both a roller press, the use of which he seems to havo preferred in copying his own corre- spondence, and also tho form of serew press now found in every merehant's offiee.

In the domain of pure seienee Watt elaims reeognition not only as having had ideas greatly in advanee of his age regarding what is now ealled energy, but as a diseoverer of the eomposition of water. Writing to Priestley in April 1783, with referenee to some of Priestley's experiments, he suggests the theory that " water is eomposed of dephlogistieated air and phlogiston deprived of part of their latent or elementary heat." It is diffieult to determine the exaet meaning attached to these antiquated terms, and to say how far Watt's suggestion antieipated the fuller diseovery of Cavendish. Watt's views were communicated to the Royal Soeiety in 1783, Cavendish's experiments in 1784, and both are printed in tho same volume of the Philosophical Transactions.

The carly and middle part of Watt's life was a long strugglo with poor health: severe headaehe prostrated him for days at a time; but as he grew old his eonstitution seems to have beeomo more robust. His disposition was despondent and shrinking; ho speaks of himself, but evidently with unfair severity, as " indolent to excess." 'I am not enterprising," he writes; "I would rather face a loaded cannon than settle an account or make a bargain; in short, I find myself out of my sphere when I have

anything to do with mankind." Ho was a man of warm friendships, and has left a personal memorial of the greatest interest in his numerous letters to Dr Small and others. They are full of sagaeity and insight: his own aehievements are told with a shrewd but extremely modest estimate of their value, and in a style of remarkable terseness and lueidity, lightened here and there by a touch of dry humour. In his old age Watt is deseribed by his contemporaries as a man riehly stored with the most various knowledge, full of aneedote, familiar with most modern languages and their literature, a great talker. Seott speaks of "the alert, kind, benevolent old man, his talents and faney overflowing on every subjeet, with his attention alive to every one's question, his information at every one's eom- mand."

See J. P. Muirhead, Origin and Progress of the Mechanical Inventions of James Watt, 3 vols., 1854 (vols, i. and ii. eontain a memoir and Watt's letters; vol. iii. gives a reprint of his patent speeifications and other papers); Muirhead, Life of Watt, 1858 ; Smiles, Lives of Boulton and Watt; Williamson, Afemoriais of the Lineage, &c., of James Watt, published by the Watt Club, Greenock, 1856; Corre- spondence of the late James Watt on his Discovery of the Theory of the Composition of Water, edited by Muirhead, 1846; Cowper, "On the Inventions of James Watt and his Models preserved at Handsworth and South Kensington," Proc. Inst. Mech. Eng., 1883; artiele " Watt" in the Hncyclopedia Britannica, 6th edition

(1823), by James Watt, junior; Robison, Mechanical Philosophy, vol, ii., 1822 (letters and notes by Watt on the History of the Steam-Engine). (J. A. E.)

WATTEAU, Antoine (1684-1721), French painter, was born at Valenciennes in 1684. Thrown on his own resources at an early age, the boy went moneyless and

Tangye) has been preserved full of his tools and models of his inven- tions. These are described, along with other Watt relies now at South Kensington, in an interesting paper by Mr E. A. Cowper, Proc. Inst. Mech. Eng., Nov. 1883.

ragged alone to Paris. There, after a hard struggle, he succeeded in getting work with a painter of saints for country customers, who assigned to Watteau, the future limner of gallant feastings, the repetition of dozens of St Nicholas. The saint brought him food and shelter, and in his few holidays Watteau sketched and drew. From this shop he passed to the studio of Gillot, whose influence helped him to follow the true direction of his own special gifts, but he left him, finding employment with Audran the decorator, then at work in the Luxembourg. Then Watteau quarrelled with Audran and went his way, fancying that Audran had blamed his first picture, the Departing Regiment, out of jealousy; and, flushed with success (for he had sold the work), he went off to show him- self in his native Valenciennes. There Watteau produced a second work, a Regiment Halting, which also sold in Paris, so thither he returned, and, welcomed by the celebrated Crozat, received fresh inspiration from his taste and the study of hisimmense collections. In 1709 he competed for the great prize, and, standing only second, applied fora crown pension to enable him to go to Italy. As proofs of his deserts, he carried to the Academy his first two pictures. His cause was warmly espoused by De la Fosse, and he was instantly made an associate of that body, becoming a full member in 1717. His diploma picture, Embarkation for the Isle of Venus, isnow inthe Louvre. Suffering always from lung disease, and of a highly nervous temperament, Watteau was, however, unfitted to live and work with others, and, in spite of his professional success and his assured re-putation, he held himself apart, illat ease with himself and seldom happy in his work, which suffered in sympathy with his changing moods. A visit to London further disturbed his health, and in 1721 he returned to Paris, establishing himself for a while in the house of his friend Gersaint, the picture dealer, for whom he painted a sign-board which had an extraordinary success (a fragment in the collection Schwitzer). Hoping to find rest and some alleviation to his increasing sufferings from country air, he accepted a lodging at Nogent, in the house of M. Lefebvre, which had been obtained for him through his constant friend the abbé Haranger, canon of St Germain]'Auxerrois. At Nogent, shortly after his arrival, on 18th July 1821, Watteau died, having bequeathed to the abbé,

to Gersaint, to M. Henin, and to M. Julienne the vast quantity of drawings which constituted almost the whole of his fortune.

No greater contrast can be found than that whieh Watteau's work presents to the painful condition under whieh he lived his life, a eontrast such as that whieh the boyish glee of Caldecott's designs showed in comparison to the physical misery against which his gallant spirit made so brave a stand. Watteau sought refuge, as it were, from his bodily pain in that fairyland which he created, where the pompous art of the "Grand Siecle" still cumbered the ground. His work, always conceived in a poetical spirit, lived in spite of the artificial atmosphere of the moek pastoral style of the day, and lives in virtue of the exquisite precision of his observation and of the extraordinary brillianey and lightness of his art.

WATTS, Isaac (1674-1748), theologian and hymn writer, was born at Southampton 17th July 1674. He was the eldest of uine children, and was named after his father, who kept a boarding establishment at Southampton. The father also wrote poetry, and a number of his pieces were included by mistake in vol. i. of the son's Posthumous Works. Young Watts is stated to have entered on the study of the classics when only in his fifth year, and at the age of seven or eight to have composed some devotional pieces to please his mother. His nonconformity precluded him from entering either of the universities, but in his sixteenth year he went to study at an academy in London kept by the Rev. Thomas Rowe, minister of the Inde- pendent meeting at Haberdashers' Hall. In his Jmprove- ment of the Mind (1741) Watts has expounded his method of study, but the precepts there laid down can hardly be

said to be justified by his example, for it is overwork at

this period of his life that is believed to have caused the weak and uncertain health of his subsequent years. Prob- ably it was as much from this cause as from diffidence that he deferred preaching his first sermon till the day he entered on his twenty-fourth year. Meantime he resided as tutor in the family of Sir John Hartopp at Stoke Newington, where he

probably prepared the materials of his two educational works,—Logick, or the Right Use of Reason in the Enquiry after Truth (1725), and Lhe Knowledge of the Leavens and the Earth Made Easy, or the First Principles of Geography and Astronomy Explained (1726). His Logic, Dr Samuel Johnson states, ‘ had been received into the universities," but this must be regarded rather as an indication of the decadence of logical studies there than a proof of the special excellence of the work. What merits it possesses are of a hortatory and moral kind, and, as Sir William Hamilton says, it is "not worth reading as a book of logic." In his twenty-fourth year Watts was chosen assistant to Dr Chauncy, pastor of the Independent congregation, Mark Lane, London, and two years later he succeeded as sole pastor. The state of his health led to the appointment of an assistant in 1703. In 1704 the congregation removed to Pinner's Hall, and in 1708 they built a new meeting-house in Bury Street. In 1712 Watts took up his residence with Sir Thomas Abney of Abney Park, where he spent the remainder of his life, the arrangement being continued by Lady Abney after her husband's death. Watts preached only occasionally, devoting his leisure chiefly to the writing of hymns, the preparation of his sermons for publication, and the com- position of theological works. Being little over 5 feet in height, and far from robust in health, he did not specially excel as an orator, although the felicity of his illustrations, his transparent sincerity, and his benevolent wisdom gave to his preaching an exceptional charm. His religious opinions were more liberal in tone than was at that time common in the community to which he belonged ; his views regarding Sunday recreation and labour were scarcely of Puritanical strictness; his Calvinism was modified by his rejection of the doctrine of reprobation, and he was in the habit of representing the heaven of the Christian as affording wide scope for the exercise of the special habits and tastes formed by the employments of earth. For an estimate of Watts as a hymn writer, see Hymns, vol. xii. p. 593. He died 25th November 1748, and was buried at Bunhill Fields, where a tombstone was erected to his memory by Sir John Hartopp and Lady Abney. A memorial was also erected to him in Westminster Abbey, and a memorial hall, erected in his honour at Southampton, was opened 6th May 1875.

In 1706 appeared his Hore Lyricw, of which an edition, with memoir by Robert Southey, forms vol. ix. of Sacred Classics (1834) ; in 1707 a volume of Hymns; in 1719 The Psalms of David; and in 1720 Divine and Moral Songs for Children. Various collected editions of his saered poetry have been published, and in 1869 an edition appeared with music for four voices. Among the theo- logical treatises of Watts, in addition to volumes of sermons, are Doetrine of the Trinity (1726); Treatise on the Love of God and on the Use and Abuse of the Passions (1729) ; Cateehisms for Children and Youth (1730); Essays towards a Proof of a Separate State for Souls (1732); Essay on the Freedom of the Will (1732); Essay on the Strength and Weakness of Human Reason (1737); Essay on the Ruin and Recovery of Mankind (1740); Glory of Christ as God-Man Unveiled (1746); and Useful and Important Questions concerning Jesus Christ (1746). He was also the author of a variety of miseel- laneous treatises. His Posthwnous Works appeared in 1773, and a further instalment of them in 1779. Several editions of his col- leeted works, with memoirs, have also been published.

The Life and Times of Watts by Milner appeared in 1834; a lifc is also included in Johnson's Lives of ihe Poets.

WAVE. By this term is commonly understood a state of disturbance which is propagated from one part of a medium to another. Thus it is energy which passes, and

not matter,—though in some cases the wave permanently displaces, usually to a small amount only, the medium through which it has passed. Currents, on the other hand, imply the passage of matter associated with energy.

The subject is one which, except in a few very simple or very special cases, has as yet been treated only by approximation even when the most formidable processes of modern mathematics have been employed,—so that this sketch, in which it is desired that as little as possible of higher mathematics should be employed, must be confined mainly to the

statement of results. And the effects of viscosity, though very important, cannot be treated.

There are few branches of physics which do not present us with some forms of wave, so that the subject is a very extensive one:—tides, rollers, ripples, bores, breakers, sounds, radiations (whether luminous or obscure), tele- graphic and telephonic signalling, earthquakes, the pro- pagation of changes of surface-temperature into the earth's crust—all are forms of wave-motion. Several of these phenomena have been treated in other parts of this work, and will now be but briefly referred to; others require more detailed notice.

When a medium is in stable equilibrium, it has no kinetic energy, and its potential energy is a minimum. Any local disturbance, therefore, in general involves a communication of energy to part of the medium, and it is usually by some form of wave-motion that this energy spreads to other parts of the medium. The mere with- drawal of a quantity of matter (as by lifting a floating body out of still water), local condensation of vapour in the air, the crushing of a hollow shell by external pressure, the change of volume resulting from an explosion, or from the sudden vaporization of a liquid—are known to all as common sources of violent wave-disturbance.

Waves may be free or forced. In the former class the disturbance is produced once for all, and is then propagated according to the nature of the medium and the form of the disturbance. Or the disturbance may be continued, provided the waves travel faster than does the centre of disturbance. In forced waves, on the other hand, the disturbing force continues to act so as to modify the pro- pagation of the waves already produced. Thus, while a gale is blowing, the character of the water-waves is con- tinually being modified ; when it subsides, we have regular oscillatory waves, or rollers, for the longer ones not only outstrip the shorter but are less speedily worn down by fluid friction. The huge mass of water which some steamers raise, especially when running at a high speed, is an excellent example of a forced wave. The ocean-tide is mainly a forced wave, depending on the continued action of the moon and sun; but the tide-wave in an estuary or a tidal river is practically free,—being almost independent of moon and sun, and depending mainly upon the

con- figuration of the channel, the rate of the current, and the tidal disturbance at the mouth.

In what follows we commence with a special case of extreme simplicity, where an exact solution is possible. This will be treated fully, partly on account of its own interest, partly because its results will be of material assistance in some of the less simple, and sometimes apparently quite different, cases which will afterwards come up for consideration.

(1) Transverse Waves on a Stretched Wire.—In the article MecHantcs, § 265, it has been proved by the most elementary considerations that an inextensible but flexible rope, under uniform tension, when moving at a certain definite rate through a smooth tube of any form, exerts no pressure on the interior of the tube. In fact, the rope must press with a force T/r (where T is the tension and r the radius of curvature) on the unit of length in con-

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sequence of its tension, and with a force — pv?/r (where v is the speed, and p the mass of unit length) in consequence of its inertia. That there may be no pressure on the tube, t.e., that it may be dispensed with, we must therefore have T—pv?=0, or v= J/T/u. From this it follows that a disturbance of any form (of course with continuous curva- ture) runs along a stretched rope at this definite rate, and is unchanged during its progress. In the proof, the influ- ence of gravity was left out of consideration, and this result may therefore be applied to the motion of a transverse disturbance along a stretched wire, such as that of a pianoforte, where the tension is very great in comparison with the weight of the wire. But the italicized word any, above, gives an excellent example of one of the most difficult parts of the whole subject, viz., the possibility of a solitary wave. This is a question upon which we cannot here enter.

If we restrict ourselves to slight disturbances only, theory points out and trial verifies that they are super- posable. In fact, in the great majority of investigations which have been made with regard to waves, the disturb- ances have been assumed to be slight, so that we can avail ourselves of the principle of superposition of small motions (Mecuanics, § 73), which

is merely an application of the mathematical principle of "neglecting the second order of small quantities." The verification by ¢rval is given at once by watching how the ring-ripples produced by two stones thrown into a pool pass through one another with- out any alteration; that by observation is evident to any one who sees an object in sunlight, when the whole inter- vening space is full of intense wave-motion.

Returning to our wire, let us confine ourselves to a small transverse disturbance, in one plane, and try to dis- cover what happens when the disturbance reaches one of the fixed ends of the wire. Whether a point of the wire be fixed or not does not matter, provided it do not move. In the figure below, two disturbances are shown, moving in opposite directions (and of course with equal speed). Of these, either is the perversion, as well as the inversion, of the other. When any part of the one reaches O,

the point halfway between them, so as to displace it upwards, the other contributes an exactly equal displace- ment downwards. Thus O remains permanently at rest, while the two waves pass through it without affecting one another; and we may therefore assert that the wave A when it reaches the end of the wire is reflected as B, or rather that each part of A when it reaches O goes back as the corresponding part of B. 3B, in the same way, is seen to be reflected from O as A.

Now we can see what happens with a pianoforte wire. Any disturbance A is reflected from one end O as B, and at the other end is reflected as A again. Hence the state of the wire, whatever it may be, recurs exactly after such an interval as is required for the disturbance to travel, twice over, the length of the string.

Remembering that the displacements are supposed to be very small, our fundamental result may now be ex- pressed by saying that the force acting on unit length of the disturbed wire, to restore it to its undisturbed position, is T/r or pe?/r. Thus the ratio of the acceleration of each element to its curvature is the square of the rate of pro- pagation of the wave. It will be shown below that this is the immediate interpretation of the differential equation of the wave-motion.

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Let us express the position of a point of. the wire, when undis- turbed, by zits distance (say) from one end. Let y represent its transverse displacement at time ¢. Then, bearing in mind that the disturbance travels with a constant speed v, the nature of the motion, so far as we have yet limited it, will be expressed by saying that the value of y, at x, at time ¢, will be the value of y, at x+ 7, at time ¢-+7; or, simply,

y=f(vt – 2).

For this expression, whatever be the function f, is unchanged in value, if ¢+7 be put for ¢, and #+-vr for x; and no other expres- sion possesses this special property. If there be a disturbance run- ning the opposite way along the wire, we easily see that it will be represented by an expression of the form F(vt +2). These disturbances are superposable, so that y=f(vt-x)+F(tt+e). . 2. . . . (1)

expresses the most general state of disturbance which the wire can suffer under the limitations we have imposed. Before going farther we may use this to reproduce the results given above.

Now xz=0 is one end of the wire, and there yis necessarily always

zero. Hence

0=f(vt) + F(t), so that the functions fand F differ only in sign. This condition, inserted in (1), gives us at once the state of matters indicated by the cut above.

If x=2 be the other end of the wire, we have the new condition

O=f(vt —2)—f(vt +2).

The meaning of this is simply that the disturbance is periodic, the period being 22/v, the other result already obtained.

Fourier's theorem (see HARMONIC ANALYSIS, or MECHANICS, § 67) now shows that the expression f may be broken up into one definite series of sines and cosines, whence the usual results as to the various simple sounds which can be produced, together or separately, from a free stretched string.

It may be asked, and very naturally, How can this explanation of the nature of all possible transverse motions of a harp or piano- forte wire, as the result of sets of equal disturbances running along i with constant speed, be consistent with the appearance which it often presents of vibrating as a whole, or as a number of equal parts separated from one another by nodes which remain apparently at rest in spite of the disturbances to which, if the explanation be correct, they are constantly subjected? The answer is given at once by a consideration of the expression

y=sin F (vt —%)—sin F(ot-+2) (where 7 is any integer), which is a particular case of the general expression (1), limited to the cirenmstances of a wire of length 2. This indicates, as we have seen, two exactly similar and equal sets of simple harmonic waves running simultaneously, with equal speed, in opposite directions along the wire. By elementary trigonometry we can put the expression in the form . tre trvt y= — 2sin ~~ cos —- :

This indicates—jirst, that the points of the string where x has the valucs

OG, Bees, 2 3 yt remain constantly at rest (these are the ends, and the 7-1 equidistant nodes by which the wire is divided into 7 practically independent parts); second, that the form of the wire, at any instant, is a curve of sines, and that the ordinates of this curve Increase and diminish simultaneously with a simple harmonic motion,—the wire resuming its undisturbed form at intervals of time ¢/iv.

This discussion has been entered into for the purpose of

showing, from as simple a point of view as possible, the production of a stationary or standing wave. The same principle applies to more complex cases, so that we need not revert to the question. __ Recurring to the general expression for y in (1), it is clear that if we differentiate it twice with respect to ¢, and again twice with respect to x, the results will differ only by the factor v? which occurs in cach term of the first. Thus

(2)

is merely another way of writing (1). But in this new form it — of the immediate interpretation given above in italics. 5 a?

For oe is the acceleration, and = the curvature.

: (2) Longitudinal Waves in a Wire or Rod.—If the displacements of the various parts of the wire be longi- tudinal instead of transverse, we may still suppose them to be represented graphically by the figure above—by

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laying off the longitudinal displacement of each point in a line through that point, in a definite plane, and perpendicular to the wire. In the figure a displacement to the right is represented by an upward line, and a dis- placement to the left by a downward line. The ex- tremities of these lines will, in general, form a curve of continued curvature. And it is easy to see that the tangent of the inclination of the curve to the axis (¢.e., its steepness at any point) represents the elongation of unit length of the wire

at that point, while the curvature measures the rate at which this elongation increases per unit of length. The force required to produce the elon- gation bears to the elongation itself the ratio H, viz., Young's modulus. The acceleration of unit length is the change of this force per unit length, divided by ». Hence, by the italicized statement in (1), we have v= /E/p (Mrecuanics, § 270). All the investigations above given apply to this case also, and their interpretations, with the necessary change of a word or two, remain as before.

Thus, according to our new interpretation of the figure, the front part of A indicates a wave of compression, its hind part one of elongation, of the wire,—the displacement of every point, however, being to the right. B is an equal and similar wave, its front being also a compression, and its rear an elongation, but in it the displacement of each point of the wire is to the left.

Hence the displacements of O continually compensate one another ; and thus a wave of compression is reflected from the fixed end of the wire as a wave of compression, but positive displacements are reflected as negative.

If we now consider a free rod, set into longitudinal vibration by friction, we are led to a particular case of reflection of a wave from a free end. The condition is obviously that, at such a point, there can be neither compression nor elongation. To represent the reflected wave we must therefore take B of such a form that each part of it, when it meets at O the corresponding part of A, shall just annul the compression. On account of the smallness of the displacements, this amounts to saying that the successive parts of B must be equally inclined to the axis with the corresponding parts of A, but they must slope the other way. Thus the proper figure for this case is

A B ee ee ee

and the interpretation is that a wave of compression is reflected from a free end as an equal and similar wave of elongation; but the disturbance at each point of the wire in the reflected wave is to the same side of its equilibrium position as in the incident wave. os

This enables us to understand the nature of reflexion of a wave of sound from the end of an open organ pipe,‘as the former illustration suited the corresponding pheno- inenon in a closed one. .

(3) Waves in a Linear System of Discrete Masses.— Suppose the wire above spoken of to be massless, or at least so thin, and of such materials, that the whole mass of it may be neglected in comparison with the masses of a system of equal pellets, which we now suppose to be at- tached to the wire at equal distances from one another. The weights of these pellets may be supported by a set of very long vertical strings, one attached to each, so that the arrangement is unaffected by gravity. The wire may be supposed to be stretched, as before, with a definite tension which is not affected by small trans- verse disturbances. We will take the case of transverse disturbances only, but it is easy to see that results of precisely the same form will be obtained for longitudinal

disturbances. A moment’s thought will convince the reader that there must be a limit to the frequency of the oscillations which can be transmitted along a system like this, though there was none such with the continuous wire. It is not difficult to find this limit.

Let the transverse displacement, at time ¢, of the n pellet of the series, be called y,; and let T be the tension of the wire, m the mass of a pellet, and @ the distance from one pellet to the next. Then the equation of motion is obviously*

2 =% 7 Gn nm poe orig # ,,

T 1 (D-2+5, Jum.

ao a

where D stands for ¢°@. ; : [We remark in passing that, if a be very small, this equation tends to become

But in this case we have ultimately m=ay; so that we recover the equation for transverse vibrations of a uniform wire.] Suppose Yn= A cos (pt — gx) (where z=) to be a possible free motion of the system. this value is substituted in the equation above it gives

When

— mp" cos (pt — ga) =- [cos at g.@ +a) +cos(pt —9.2-a) —2cos (vt- gx) | = — cos (pt -— qx) . (1—cos qa), so that mp sin? ga/2.

It appears from the form of this expression that the greatest value of p is 24/T/am; or 2v/a, if v be the speed of a disturbance in a uniform wire under the same tension, and of the same actual mass per unit of length. The time of oscillation of a pellet is 2x/p, and cannot therefore be less than

arfam/T, or nav.

The result is that, if v be the speed of propagation of a disturbance in a uniform wire with the same tension and same mass, the period of the quickest simple harmonic transverse oscillation which can be freely transmitted in such a system is 7 times the time of running from one pellet to the next with speed »v.

Instead of pellets on a tended wire, we might have a series of equal bar magnets, supported horizontally at proper distances from one another, ina line. The mag- netic forces here take the place of the tension; and by arranging the magnets with their like poles together, i.e, by inverting the alternate ones, we can produce the equivalent of pressure instead of tension along the series. If the magnets have each bifilar suspension, their masses will come in, as well as their moments of inertia, in the treatment of transverse disturbances.

This question is closely connected with Stokes's explan- ation of fluorescence (see Lieut, vol. xiv. p. 602), for the effect of a disturbing force, of a shorter period than the limit given above, applted continuously to one of the pellets, would be to accumulate energy mainly in the immediate neighbourhood ; and this, if we suppose the disturbing force to

cease, would be transmitted along the system in waves of periods equal at least to the limit. These would correspond to light of lower refrangibility than the inci- dent, but having as characteristic a definite upper limit of refrangibility.

Such investigations, with their results, prepare us to expect that the usual mode of investigating the propa- gation of sound, to which we proceed, cannot be correct in the case of exceedingly high notes if the medium consist of discrete particles.

(4) Waves of Compression and Dilatation in a Fluid ; Sound; Explosions. —Consider the case of plane waves,

WAVE

where each layer of the medium moves perpendicularly to itself, and therefore may suffer dilatation or compres- sion. The case is practically the same as that treated in (2) above, and can be represented by the same graphic method. For we may obviously consider only the matter contained in a rigid cylinder of unit sectional area, whose axis is parallel to the displacements. The only point of difference is in the law connecting pressure and conse- quent compression, and that, of course, depends upon the properties of the medium considered.

(a) If the medium be a liquid, such as water, for instance, the compression may be taken as proportional to the pressure. Thus the acceleration on unit length of the column, multiplied by its mass (which in this case is 'simply the density of the medium), is equal to the increase of pres- sure per unit length, 2.¢., to the increase of condensation per unit length, multiplied by the resistance to compression, R. Thus the speed of the wave is ,/R/p, which is exactly analogous to the forms of (1) and (2). The density, p, of water is 62°3 Ib per cubic foot, and for it R is about 20,000 atmospheres at 0° C., so that the speed of sound at that temperature is about 4700 feet per second.

That even intense differences of pressure take time to adjust themselves over very short distances in water was well shown by the damage sustained by the open copper cases of those of the " Challenger"

thermometers which were crushed by pressure in the deep sea. When a strong glass shell (containing air only) is enclosed in a stout open iron tube whose length is two or three of its diameters, and is crushed by water pressure, the tube is flattened by excess of external pressure before the relief can reach the outside.

(6) In the case of a gas, such as air, we must take the adiabatic relation between pressure and density. The pressure increases faster than, instead of at the same rate with, the density, as it would do if the gas followed Boyle's law. Thus the changes of pressure, instead of being equal to the changes of compression (multiplied by the modulus), exceed them in the proportion of the specific heat at constant pressure (K) to that at constant volume (N). Thus the speed of sound is ,/K/N. p/p, where p is the pressure and p the density in the undisturbed air. The ratio of the two latter quantities, as we know, is very approximately proportional to the absolute temperature.

The questions of the gradual change of type or the dying away even of plane waves of sound, whether by reason of their form, by fluid friction, or by loss of energy due to radiation, are much too complex to be treated here.

In all ordinary simple sounds even of very high pitch the displacements are extremely small compared with the wave length, so that the approximate solution gives the speed with considerable accuracy. And a very refined experimental test that this speed is independent of the pitch consists in listening to a rapid movement played by a good band at a great distance. But there seems to be little doubt that, under certain conditions at least, very loud sounds travel a great deal faster than ordinary sounds.

The above investigation gives the speed of sound relatively to the air. Relatively to the earth's surface, it has to be compounded with the motion of the air itself. But, as the speed of. wind usually increases from the surface upwards, at least for a considerable height, the front of a sound-wave, moving with the wind, leans forward, and the sound (being propagated perpendicularly to the front) moves downwards ; if against the wind, upwards.

In the case of a disturbance in air due to a very sudden explosion, as of dynamite or as by the passage of a flash of lightning, it is probable that for some distance from the source the motion is of a projectile character ;

and that part at least of the flash is due to the heat developed by practically instantaneous and very great compression of each layer of air to which this violent motion extends.

(5) Gravitation and Surface-Tension Waves in Liquids. —Leaving out of consideration, as already sufficiently treated in a special article, the whole subject of Tipzs, whether in oceans or in tidal rivers, there remain many different forms of water-waves all alike interesting and important. The most usual division of the free waves is into long waves, oscillatory waves, and ripples. The first two classes run by gravity, the third mainly by surface- tension (see CapinLaRy Action). But, while the long waves agitate the water to nearly the same amount at all depths, the chief disturbance due to oscillatory waves or to ripples is confined to the upper layers of the water, from which it dies away with great rapidity in successive layers below. We will treat of these three forms in the order named.

(6) Long Waves.—The first careful study of these waves was made by Scott Russeiu (q.v.) in the course of an inquiry into traffic on canals. He arrived at the remarkable result that there is a definite speed, depending on the depth of the water, at which a horse can draw a canal-boat more easily than at any other speed, whether less or greater. And he pointed out that, when the boat moves at this speed, it agitates the water less, and there- fore damages the banks less, than at any lower. This particular speed is thus, in fact, that of free propagation of the wave raised by the boat; and, when the boat rides, as it were, on this wave, its speed is maintained with but little exertion on the part of the horse. If the boat be made to move slower, it leaves behind it an ever- lengthening procession of waves, of course at the expense of additional labour on the part of the horse.

The theory of the motion of such a wave is based on the hypothesis that all particles in a transverse section of the canal have, at the same instant, the same horizontal speed. However great this horizontal motion may be, the vertical motion of the water may be very small, for it depends on the change of horizontal speed from section to section only. In the investigation which follows, the energy of this vertical motion will be neglected (even at the surface, where it is greatest) in comparison with that of the horizontal motion. The hypothesis is proved to be well grounded by the actual observation of the motion of the water when a long wave of slight elevation or depression passes. A long box, with parallel sides of glass, partly filled with water, represents the canal ; and the wave is produced by slowly and slightly tilting the box, and at once restoring it to the horizontal position. The nature of the motion of the water is shown by particles of bran suspended in it. Such an apparatus may be usefully employed in verifying the theoretical result below, as to the connexion between the speed of the wave and the depth of the water, —observations of the passage of the crest being made with great exactness by means of a ray of light reflected from the surface of the water in a vertical plane parallel to the length of the canal. It may also be employed, by tilting it about an inclined position, for the study of the changes which take place in the wave as it passes from deeper to shallower water, or the reverse.

The statement of (1) above is immediately applicable to this question. For, if 4 be the (undisturbed) depth of the water, p its density, y and y' the elevations in two succes- sive transverse sections at unit distance from one another, the difference of pressures (at the same level) in the two sections is gp(y'—y). The acceleration of a horizontal cylinder of unit section is the difference of pressures

divided by p. But the whole depth is increased at each point in proportion as the thickness of a transverse slice is diminished. Hence, by the reasoning in (2) above, , CMS) a Oe

p diggin 7 Fig or i — 9h: and the speed of propagation of the wave is that which a stone would acquire by falling through half the depth of the water. That the speed ought to be independent of the density of the liquid

is clear from the fact that it is the weight of the disturbed portion which causes the motion, and that this (for equal waves in different liquids) changes proportionally to the mass to be moved.

Since we have made no hypothesis as to the form of the wave, our only assumptions being that the vertical motion is not only small in comparison with the depth, but incon- siderable in comparison with the horizontal motion, while the latter is the same at all depths in any one transverse section, it is clear that, under the same limitations, a wave of depression will run at the same speed as does a wave of elevation.

A solitary wave of elevation obviously carries across any fixed transverse plane a quantity of water equal to that which lies above the undisturbed level. If H be the mean height of this raised water, 6 the breadth of the canal (supposed rectangular), and A the length of the wave, the volume of this water is AH. But all particles in the transverse section behave alike ; and, when the wave has passed, the particles in a// transverse sections have been treated alike. Hence the final result of the passage of the wave is that the whole of the water of the canal has been translated, in the direction of the wave's motion, through the space bAH/b/, or AH/h. If the wave had been one of depression, the translation of the water would have been in the opposite direction to that of the wave's motion. Hence, when the wave consists of an elevation followed by a depression of equal volume, it leaves the water as it found it. Thus any permanent displacement of the water is due to inequality of troughs and crests.

A hint, though a very imperfect one, as to the formation of breakers on a gently sloping beach, is given by con- sidering that in shallow water the front and rear of an ordinary surface-wave must move at different rates, the front being in shallower water than the rear and therefore allowing the rear to gain upon it.

(7) Oscillatory Waves.—The typical example of these waves is found in what is called a "swell," or the regular rolling waves which continue to run in deep water after astorm. Their character is essentially periodic, and this feature at once enables us to select from the general integrals of the equations of non-rotatory fluid-motion the special forms which we require. The investigation may, without sensible loss of completeness for

application, be still further simplified by the assumption that the disturb- ance is two-dimensional, 7.c., that the motion is precisely the same in any two vertical planes drawn parallel to the direction in which the waves are travelling. The investi- gation is, unfortunately, very much more simple in an analytical than in a geometrical form.

If the axis of x be taken in the surface of the undisturbed water, in the direction in which the waves are travelling, and that of

y vertically downwards, the equation for the velocity-potential (see HyDROMECHANICS) is simply

dp Fo _,

This is merely the "equation of continuity,"—the condition that no liquid is generated, and none annihilated, during the motion. The type of solution we seek, as above, is represented by o=Y cos(mt—- na), where Y depends on y alone. If this can be made to satisfy the

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*equation of continuity, we may proceed to further tests and restric- tions of it. Substitution lcads to d?Y *y 0 ae" Y-0, so that Y=Aé"¥+Bé-"%, where A and B are arbitrary constants. (a) If the depth of the water be unlimited, the value of A must be zero, for otherwise we should be dealing with disturbances which increase, without limit, as we go farther down. Hence, in this case, a particular integral of the equation, corresponding to a disturbance which can exist by itself, is ' o=Bé-"# cos (mt — nz). We will now avail ourselves of the supposition under which, as we have seen, disturbances are necessarily superposable, 7.¢., assume terms in B? to be negligible. The ordinary kinetic equation (HypRoMECHANICS) then becomes dp*

C+plp=gy- €3) =gy+mBe-™ sin (mt — nz). If we differentiate this expression with regard to ¢, and apply the result to the surface only, where v is constant, and remember that dy add : rr ~(st) ; we have simply 0O= -ng+m?,

which is the condition that no water crosses the bounding surface. This determines 7, without ambiguity, when m is given, and thus gives a relation between the period of a wave and its length, or between the period or the length and the speed of propagation. For we may write

mt — na= “= (vt 2) ‘

where A is the wave-length, and v the speed; so that

Thus we have

7

and the longer waves move faster, even when the vertical displace- ment is smallin both. This is quite different from the result for sound-waves. The components of the velocity of the particle of water whose mean position is x, y are

o) =Bng-” sin (mt—nzx), parallel to x, and (3) = — Bné-“¥ cos (mt—nx), parallel to y.

Hence the path is a circle whose radius is Bo ¢-“¥, or B me e-mm.

At the surface this is Bm/g, as in fact we see at once by the equa- tion for the pressure, which gives for the form of the surface C=gn+mB sin (mt—nzx).

Each surface-particle is at the highest point of its circular path, and moving forwards, when the crest of the wave passes it. When the trough passes, it is at the lowest point of its circle and moving backwards. The radii of the circles diminish in geometrical pro- gression at depths increasing in arithmetical progression. The factor is €~”Y =¢—?”¥/4, so that at a depth of one wave-length only disturbance is reduced to €—?” or about 1/585 of its surface- value.

From the investigation above we see that Atlantic rollers, of a wave-length of (say) 300 feet, travel at the rate of about 40 feet per second, or 27 miles an hour. But, even if they be of 40 feet height from trough to

crest (which is probably an exaggerated estimate), the utmost disturbance of a water particle at a depth of 300 feet is not quite half an inch from its mean position. This shows, in a very striking manner, what a mere surface-effect is in this way due to winds, and how the depths of the ocean are practically undisturbed by such causes.

This investigation has been carried to a second, and even to a third, approximation by Stokes, with the result that the form of a section of the surface is no longer the curve of sines, in which the crests and troughs are equal. The crests are steeper and higher, and the troughs wider and shallower, than the first approximation shows. Also the forward horizontal motion of each particle under the crest is no longer quite compensated for by its backward motion under the trough, so that what sailors call the "heave of the sea" is explained. The water is per-

manently displaced forwards by each succeeding wave. But this effect, like the whole disturbance, is greatest in the surface-layer and diminishes rapidly for each lower layer. The third approximation shows that the speed of the waves is greater than that above assigned, by a term depending on the square of the ratio of the height to the length of a wave.

(6) When the depth of the water is limited, we cannot make the simplification adopted in the last investigation.

If % be the depth of the water, our condition is that the vertical motion vanishes at that depth, and the relation between m and 18s Now

m?=ng(er —§¢ ~nh)1(g nh +. € cm) .

If % be regarded as infinite this gives as before

. m=ng. If, on the other hand, % be smal] compared with the wave-length, the equation approximates to

m=n"gh,

or v=gh; and we have the formula for long waves again. Thus the expres- sion above: includes both extremes,—though, so far as long waves go, it limits them to harmonic forms of section.

The surface-section is still the curve of sines, but the paths of the individual particles are now ellipses whose major axes are horizontal. Both axes decrease with great rapidity for particles considered at gradually increasing depths ; but the minor axes diminish faster than the major, so that the particles at the bottom oscillate in horizontal lines.

(8) Ripples.—Stokes in 1848 pointed out that the surface-tension of a liquid should be taken account of in finding the pressure at the free surface, but this seems not to have been done till 1871, when W. Thomson discussed its consequences. If T be the surface-tension, and 7 the radius of curvature of the (cylindrical) surface, in the case of oscillatory waves, the pressure at the free surface must be considered as differing from that in the air by the quantity T/r (Carrnuary Action). As T/gp is usually a small quantity, this. term will be negligible unless 7 is very small. If the waves be oscillatory, this means that their lengths must be very short, so that the depth of the fluid may be treated as infinite in comparison.

The curvature is practically d?y/dz®, becausc y/A is small; so that the term —Td?y/dz? must be introduced into the kinetic equa- tion along with p. The result is that

eT

—_ eee

mM 9 + onp 9

or Aue ar T or Ap

Thus the speed is, in all cases, increased by the surface-tension ; and the more so the shorter is the wave-length. Hence, as the speed increases indefinitely with increase of wave-length when gravity alone acts, and also increases indefinitely the shorter the wave when surface-tension alone acts, there must be a minimum speed, for some definite wave-

length, when both causes are at work, It is easily seen that v? is a minimum when

A=Ag=2er/T/9p , and that the corresponding value of v? is 2/gT/p. In the case of water the value of Ay is about 0°68 inch, and 1 is 0°76 in feet-seconds, nearly.

This slowest-moving oscillatory wave may therefore be regarded as the limit between waves proper and ripples. That ripples run faster the shorter they are is easily seen by watching the apparently rigid pattern of them which precedes a body moving uniformly through still water. The more rapid the motion the closer do the ripple-ridges approach one another. Excellent examples of ripples are produced by applying the stem of a vibrating tuning-fork to one side of a large rectangular box full of liquid. From the pitch of the note, and the wave-length of the ripples, we can make (by the use of the above formula) an approximate determination of surface-tension, a quantity somewhat difficult to measure by statical processes.

- very fully treated under Mecuanics (S$ 56-67).

Various forms of wave theory,

W A V—

The conditions of production of ripples by wind, or generally in a surface of separation of two fluids, each of which has any motion parallel to this surface, are given in HyYDROMECHANICS.

(9) Interference of Waves.—While the disturbances con- sidered are so small as to be superposable, z.e., inde- pendent of one another, the effect of superposition is merely a kinematical question, and, as such, has been See also Acoustics, LicHt, and Wave Turory. Thus ripple- patterns, ordinary beats of musical sounds, composition of lunar and solar ocean tides, diffraction, phenomena of polarized light in crystals or in transparent bodies in the magnetic field, &c., are all, in principle at least, simple kinematical consequences of superposition. But the pheno- mena called Tartini's beats, breakers, a bore, a jabble, and (generally) cases in

which a sufficient approximation cannot be obtained by omitting powers of the displacements higher than the first, are not of this simple character.

As a single illustration, take one case of the first of these phenomena. The fact to be explained is that when two pure musical sounds, of frequencies 2 and 3 (say), that is, forming a "perfect fifth," are sounded together, we hear in addition to them a graver note, viz., that of which the first sound is the octave and the second the twelfth. When a resonator, carefully tuned to this graver note, is applied to the ear the note is usually not heard. Hence Helmholtz attributes its production to the fact that the drum of the ear (in consequence of the attachments of the ossicles) has different elastic properties for inward and for outward displacements.

The force tending to restore the drum from a displacement x may therefore be represented approximately by

—pu+ge. Thus, when the drum is exposed to the two sounds above mentioned, its equation of motion is*

a? : : Gat Pea qe? +asin 3mi b sin (2mt B).

By successive approximations, it is found that there is a term in the value of a of the form labq cos (mt — B) (p? — 9m?)(p? — 4on?)(p? — m?) ' which is the " difference-tone" referred to. This, of course, is communicated to the internal ear.

Helmholtz points out, however, that such sounds may be produced objectively, provided the interfering disturbances are sufficiently great. No one seems yet to have obtained any really accurate notion of the smallness of the disturb- ances of air which can be heard as sound. That they are excessively small has long been shown by many processes, but even more perfectly by the comparatively recent invention of the telephone. :

(10) Waves in an Elastic Solid.—Some of the more elementary parts of this very difficult question have been treated from a theoretical point of view in the article Exasticiry. From an observational and experimental

point of view some are treated under EARTHQUAKE. See also Licgut, and Wave Tueory, for the luminiferous medium appears to behave like an elastic solid.

(11) Waves of Temperature and of Electric Potential. —In Hear (§ 78), and specially in the mathematical appendix to that article, will be found Fourier's treatment of heat-waves produced by periodic sources of various characters. It is sufficient to call attention here to the form of the equation for the linear motion of heat (which is the same as that for electricity and for diffu-

sion), viz., oe = pee) dt dx\ dx /]' where v represents temperature, c specific heat, and / thermal conductivity.

When ¢ and & are constants, this takes the very simple form dv dv

If plane harmonic waves of the type v= X cos (mt — nx) are to be transmitted, we must have simultaneously

2

o> ~n?K=0 . 21m —MX. The first gives X= Ant + BE-M; and the second, by means of this, gives Qun?(A€™* — BE-"2) = — m(AE™* + BE-7), Thus A vanishes, which implies that the amplitude of the waves must continuously diminish as they progress. Also Q2un=m, so that v= Bg-"* cos (2xnt — nx). If the conductivity be not constant, then, even in the simple case of k=k(1+av), where a is small, the wave throws off others of inferior amplitude and of a different period.

12, Works and Memoirs on Waves.—The literature is very extensive, so a few references only are given. The works of Lagrange, Laplace, Poisson, and Cauchy may be specially cited. Weber's Wellenlehre, and Scott Russell's papers, contain valuable experimental details. Theoretical papers of importance by Earnshaw, Kelland, Green, &c., treat of long waves. The collected works of Rankine, and particularly those of Stokes, deal in part with oscillatory waves. Stokes's " Reports on

Hydrodynamics," in the Trans. of the British Association, are of great value in themselves, and contain numerous references. A very complete discussion of the mathematics of the subject is given by Professor Greenhill in the American Journal of Mathematics. Lord Rayleigh's Sound, and the memoirs of De St Venant and Von Helmholtz, together with a remarkable series of papers by Sir W. Thomson, in recent volumes of the PA7l. Afag. and Proc. R, 8S. E., may fitly conclude the list. (P. G. T.)

WAVERTREE, a township of Lancashire, partly included within the parliamentary limits of Liverpool, 3 miles south-east of Liverpool Exchange. The churches are all modern. There is a small circle of monoliths on the south-east boundary of the township, called the Calder Stones. A cemetery of the Neolithic period was opened a few years ago. The town possesses roperies and a brewery. An extensive pumping station connected with the Liverpool water-works is in the vicinity. The population of the urban sanitary district (area 1838 acres) in 1871 was 7810, and in 1881 it was 11,097.

WAVE THEORY OF LIGHT

Sl. A GENERAL statement of the principles of the

undulatory theory, with elementary explanations, has already been given under Licut, and in the article on Erver the arguments which point to the existence of an all-pervading medium, susceptible in its various parts of an alternating change of state, have been traced bya master hand; but the subject is of such great importance, and is so intimately involved in recent optical investigation and discovery, that a more detailed exposition of the theory, with application to the leading phenomena, was reserved for a special article. That the subject is one of difficulty

may be at once admitted. Even in the theory of sound, as conveyed by aerial vibrations, where we are well acquainted with the nature and properties of the vehicle, the fundamental conceptions are not very easy to grasp, and their development makes heavy demands upon our mathematical resources. That the situation is not im- proved when the medium is hypothetical will be easily understood. For, although the

evidence is overwhelming in favour of the conclusion that light is propagated as a vibration, we are almost entirely in the dark as to what it is that vibrates and the manner of vibration. This ignor-

ance entails an appearance of vagueness even in those parts of the subject the treatment of which would not really be modified by the acquisition of a more precise knowledge, ¢.g., the theory of the colours of thin plates, and of the resolving power of optical instruments. But in other parts of the subject, such as the explanation of the laws of double refraction and of the intensity of light reflected at the surface of a transparent medium, the vagueness is not merely one of language ; and if we wish to reach definite results by the a priort road we must admit a hypothetical element, for which little justification can be given. The distinction here indicated should be borne clearly in mind. Many optical phenomena must necessarily agree with any kind of wave theory that can be proposed ; others may agree or disagree with a parti- cular form of it. In the latter case we may regard the special form as disproved, but the undulatory theory in the proper wider sense remains untouched.

too wide for optical double refraction, which is of a much simpler character.

For these and other reasons, especially the awkwardness with which it lends itself to the explanation of dispersion, the elastic solid theory, valuable as a piece of purely dynamical reasoning, and probably not without mathematical analogy to the truth, can in optics be regarded only as an illustration.

In recent years a theory has been received with much favour in which light is regarded as an electromagnetic phenomenon. The dielectric medium is conceived to be subject to a rapidly periodic "electric displacement," the variations of which have the magnetic properties of an electric current. On the basis of purely electrical observa- tions Maxwell calculated the velocity of propagation of such disturbances, and obtained

a value not certainly dis- tinguishable from the velocity of light. Such an agree- ment is very striking ; and a further deduction from the theory, that the specific inductive capacity of a transparent

Elastio Of such special forms of the wave theory the most | medium is equal to the square of the refractive index, is solid famous is that which assimilates light to the transverse | supported to some extent by observation. The founda- theory. vibrations of an elastic solid. Zransverse they must be in | tions of the electrical theory are not as yet quite cleared

order to give room for the phenomena of polarization. This theory is a great help to the imagination, and allows of the deduction of definite results which are at any rate mechanically possible. An isotropic solid has in general two elastic properties—one relating to the recovery from an alteration of volume, and the other to the recovery from a state of shear, in which the strata are caused to slide over one another. It has been shown by Green that it would be necessary to suppose the luminiferous medium to be incompressible, and thus the only admissible differences between one isotropic medium and another are those of rigidity and of density. Between these we are in the first instance free to choose. The slower propagation of light in glass than in air may be equally well explained by supposing the rigidity the same in both cases while the density is greater in glass, or by supposing that the density is the same in both cases while the rigidity is greater in air. Indeed there is nothing, so far, to exclude a more complicated condition of things, in which both the density and rigidity vary in passing from one medium to another, subject to the one condition only of making the ratio of velocities of pro- pagation equal to the known refractive index between the media.

When we come to apply this theory to investigate the intensity of light reflected from (say) a glass surface, and to the diffraction of light by very small particles (as in the sky), we find that a reasonable agreement with the facts can be brought about only upon the supposition that the rigidity is the same (approximately, at any rate) in various media, and that the density alone varies. At the same

of more or less arbitrary hypothesis ; but, when it becomes certain that a dielectric medium is susceptible of vibrations propagated with the velocity

of light, there will be no hesitation in accepting the identity of such vibrations with those to which optical phenomena are due. In the mean-time, and apart altogether from the question of its probable truth, the electromagnetic theory is very instructive, in showing us how careful we must be to avoid limiting our ideas too much as to the nature of the luminous vibrations.

§ 2. Plane Waves of Simple Type.

Whatever may be the character of the medium and of its vibra- tion, the analytical expression for an infinite train of plane waves is

Acos | (Vt-2)+0 — (1),

in which A represents the wave-length, and V the corresponding velocity of propagation. The coefficient A is called the ampli- tude, and its nature depends upon the medium and must there- fore here be left an open question. The phase of the wave at a given time and place is represented by a The expression retains the same value whatever integral number of wave-lengths be added to or subtracted from x It is also periodic with respect to ¢, and

the period is ey is aug (2).

In experimenting upon sound we are able to determine inde- pendently 7, a, and V ; but on account of its smallness the periodic time of luminous vibrations eludes altogether our means of observa- tion, and is only known indirectly from A and V by means of (2).

There is nothing arbitrary in the use of a circular function to re- present the waves. Asa general rule this is the only kind of wave which can be propagated without a change of form ; and, even in the exceptional cases where the velocity is independent of wave- length, no generalitygis really lost by this procedure, because in accordance with Fourier's theorem any kind of periodic wave may be regarded as compounded of a series of such as (1), with wave- lengths in harmonical progression.

Electro- magnetic theory.

A well-known characteristic of waves of type (1) is that any Compo- number of trains of various amplitudes and phases, but of the same sition of wave-length, are equivalent to a single train of the sametype. Thus waves of

? like

time we have to suppose that the vibration is perpen- dicular to the plane of polarization. Up to this point the accordance may be regarded as

Qa fairly satisfactory ; but, when we extend the investigation zee Ut ; period. to crystalline media in the hope of explaining the observed 2a si Me ‘ == .cos — (Vé-a)-3A . sin— (Vt- laws of double refraction, we find that the suppositions >. mn 4 ins ae 3 which would suit best here are inconsistent with the con- =P cos “T(Vt— a) +9 (ay clusions we have already arrived at. In the first place, ae P2=(SA cos.a)?+3(Asin a)” (4),

and so long as we hold strictly to the analogy of an elastic solid, we can only explain double refraction as depending upon anisotropic rigidity, and this can hardly be recon- ciled with the view that the rigidity is the same in different isotropic media. And if we pass over this diffi- culty, and inquire what kind of double refraction a erystalline solid would admit of, we find no such corre- spondence with observation as would lead us to think that we are upon the right track. The theory of anisotropic solids, with its twenty-one elastic constants, seems to be

3=(A sin a) =(A cos a) op An important particular case is that of two component trains only. Tyo

Qa , 2a ‘ trains of Acos | S(Vt~1)+a} +A’eos } (Ve—2) +a —*

tan =

= Pecos Zr (Via) +o ’ Pim A2— Al OA A’cos(a— a’) « (6).

1 Sce Stokes, “ Report on Double Refraction,” Brit. Assoc. Report, 1862, p. 253.

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Photo- metry.

WAVE THEORY

The composition of vibrations of the same period is precisely analogous, as was pointed out by Fresnel, to the composition of forces, or indeed of any other two-dimensional vector quantities. The magnitude of the force corresponds to the amplitude of the vi- bration, and the inclination of the force corresponds to the phase. A group of forces, of equal intensity, represented by lines drawn from the centre to the angular points of a regular polygon, consti- tute a system in equilibrium. Consequently, a system of vibrations of equal amplitude and of phases symmetrically distributed round the period has a zero resultant.

According to the phase-relation, determined by (a-a'), the am- plitnde of the resultant may vary from (A — A') to (A+A'). If A' and A are equal, the minimum resultant is zero, showing that two equal trains of waves may neutralize one another. This happens when the phases are opposite, or differ by half a (complete) period, and the effect is usually spoken of as the interference of light. From a purely dynamical point of view the word is not very ap- propriate, the vibrations being simply superposed with as little inter- ference as ean be imagined.

§ 3. Intensity.

The intensity of light of given wave-length must depend upon the amplitude, but the precise nature of the relation is not at once apparent. We are not able to appreciate by simple inspection the relative intensities of two unequal lights; and, when we say, for example, that one candle is twice as bright as another, we mean that two of the latter burning independently would give us tho samo light as one of the former. This may be regarded as the definition ; and then experiment may be appealed to to prove that the intensity of light from a given source varies inversely as the square of the distance. But our conviction of the truth of the law is perhaps founded quite as much upon the idea that something not liable to loss is radiated outwards, and is distributed in succession over the

surfaces of spheres eoncentrie with the source, whose areas are as the squares of the radii. The something can only be energy; and thus we are led to regard the rate at which energy is propagated across a given area parallel to tho waves as the measure of inten- sity; and this is proportional, not to the first power, but to the square of the amplitude.

Practical photometry is usually founded upon the law of inverse squares (LIGHT, vol. xiv. p. 583); andit should be remembered that the method involves essentially the use of a diffusing screen, the illumination of which, seen in a eertain direction, is assumed to be independent of the precise direction in which the light falls upon it; for the distance of a candle, for example, cannot be altered without introducing at the same time a ehange in the apparent magnitude, and therefore in the incidence of some part at any rate of the light.

With this objection is connected another which is often of greater importance, the necessary enfeeblement of the light by the process of diffusion. And, if to maintain the brillianey we substitute regular reflectors for diffusing sereens, the method breaks down altogether by the apparent illumination becoming independent of the distance of the source of light.

The use of a revolving disk with transparent and opaque sectors in order to control the brightness, as proposed by Fox Talbot,! may often be recommended in scientific photometry, when a great loss of light is inadmissible. The law that, when the frequency of inter- mittence is sufficient to give a steady appearance, the brightness is proportional to the angular magnitude of the open sectors appears to be well established.

§ 4. Resultant of a Large Number of Vibrations of Arbitrary Phase.

We have seen that the resultant of two vibrations of equal amplitude is wholly dependent upon their phase-relation, and it is of interest to inquire what we are to expect from the composition of a large number (m) of equal vibrations of amplitude unity, and of arbitrary phases. The intensity of the resultant will of course depend upon the precise manner in which tho phases are distri- buted, and may vary from 7? to zero. But is there a

definite intensity which becomes more and more probable as 7 is increased without limit ?

The nature of the question here raised is well illustrated by the special case in which the possible phases are restricted to two opposite phases. We may then conveniently discard the idea of phase, and regard the amplitudes as at random positive or negative. If all the signs are the same, the intensity is 7 ; if, on the other hand, there are as many positive as negative, the result is zero. But, although the intensity may range from 0 to »?, the smaller values are much more probable than the greater.

The simplest part of the problem relates to what is called in the theory of probabilities the " expectation " of intensity, that is, the mean intensity to be expected after a great number of trials, in each of which the phases are taken at random. The ehance that all the vibrations are positive is 2-", and thus the expectation of intensity eorresponding to this eontingeucy is 2-"."%. In like manner the ee eee

1 Phil. Mag., v. p. 831, 1834.

expectation corresponding to the number of positive vibrations being (7 —1) is Pee te :

andsoon. The whole expectation of intensity is thus

= L.n?+n.(n-2) ae (n— 4)? n(n —1)(r— 2 a (a= 6). . (1).

Now the sum of the (n+1) terms of this series is simply , as may be proved by comparison of coefficients of 2? in the equivalent forms (c#$e-tP I(t det…) —= pn n-2)x nn — 1) ent 4. nen-2)x4 1.2

The expectation of intensity is therefore n, and this whether be great or small.

The same eonclusion holds good when the phases are unrestricted. From (4), § 2, if A=1,

Poan+2e0s(a_—-a) « + (2), where under the sign of summation are to be included the cosines of the 4n(n — 1) differences of phase. When the phases are arbitrary, this sum is as likely to be positive as negative, and thus the mean value of P? is n.

The reader must be on his guard here against a fallaey which has misled some high authorities. We have not proved that when n is large there is any tendency for a single combination to give the intensity equal to n, but the quite different proposition that in a large number of trials, in each of which tho phases are rearranged arbitrarily, the mean intensity will tend more and more to the value n. It is true that even ina single combination there is no reason why any of the cosines in (2) should be positive rather than negative, and from this we may infer that when 1 is inereased the sum of the terms tends to vanish in eomparison with the number of terms. But, the number of terms being of the order n?, we can infer nothing as to the value of the sum of the series in com- parison with 2.

Indeed it is not true that the intensity in a single combination approximates to , when 7 is large. It can be proved? that the probability of a resultant intermediate in amplitude between r and r+dr is

ee-4)x 4 ae

2 er rde (3). The probability of an amplitude less than 7 is thus 5 [er hdr jovere . gs s Nu S0 ‘

or, which is the same thing, the probability of an amplitude greater than 7 is

(5).

The accompanying table gives the probabilities of intensities less than the fractions of m named inj—_77~__y |

—72[n Z |

° ° . . . . .

the first column. For example, the | ‘05 | 0488 | “80 | 5906 probability of intensity less than 2 10 | 0952 |} 1°00 | °6321 1s °6321. 20 | 1813 || 1°50 | °7768 It will be seen that, however great | °40 | 8296 || 2°00 | 8647 60 | °4512 |) 8°00 | “9502

m may be, there is a fair ehance of considerable relative fluctuations of ——~————————————” intensity in consecutive eombinations.

The mean intensity, expressed by

leo} =f et 2 dr, n/o

is, as we have already seen, equal to . ;

It is with this mean intensity only that we are concerned in ordinary photometry. A source of light, such as a candle or even a soda flame, may be regarded as composed of a very large number of luminous eentres disposed throughout a very sensible space ; and, even though it be true that the intensity at a particular point of a screen illuminated by it and at a particular moment of time is a matter of chance, further processes of averaging must be gone through before anything is arrived at of which our Senses could ordinarily take cognizance. In the smallest interval of time during which the eye could be impressed, there would be opportunity for any number of rearrangements of phase, due either to motions of the particles or to irregularities in their modes of vibration. And even if we supposed that each luminous centro was fixed, and emitted perfectly regular vibrations, the manner of eomposition and consequent intensity would vary rapidly from point to point of the screen, and in ordinary cases the mean illumination over the smallest appreciable area would eorrespond to a thorough averaging of the phase-relationships. In this way the idea of the intensity of a Inminous source, independently of any questions of phase, is seen to be justified, and we may properly say that two candles are twice as bright as one.

2 Phil. Mag., Aug. 1880.

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Fermat's From the law of propagation, according to which the wave- In practical applications it is of importance to recognize the Symme- prin- surfaces are always as far advanced as possible, it follows that the | effects of a small departure of the wave-surface from its ideal plane trical ciple. —_ course of a ray is that for which the time, represented by / V-ids, | or spherical form. Let the surface be referred to a system of rect- aberra- isa minimum. This is Fermat's principle of least time. Since the | 22gular coordinates, the axis of z being normal at the centre of tion. refractive index («) varies as V-1, we may take JS wds as the measure einer or alae se ha SH eee GaP ae ! ee. of the retardation between one wave surface and another ; and itis – a ah eee oe G 7 mee ae a eee. wt tr the same along whichever ray it may be measured. P irecotliodeat ero tie by jf – ' Law of The priuciple that /uds is a minimum along a ray lends itself z=r2otArt+ . . . . . » (1), magnify- readily to the investigation of optical laws. As an example, we | ip which pis the radius of curvature, or focal length, and r? =2? + 7, ing. will consider the very important theory of magnifying power. Let | If the surface be truly spherical, A=1/83, and any deviation Ao,Bg be two points upon a wave-surface before the light enters | of A from this value indicates ordinary symmetrical spherical the object-glass of a telescope, A, B the corresponding points upon | aberration. a wave-surface after emergence from the eye-piece, both surfaces If, however, the surface be not symmetrical, we may have to Unsym- being planc. The value of /uds is the same along the tay AjA | encounter aberration of a lower order of small quantities, and metrical as along ByB; and, if from any cause B, be slightly retarded | therefore presumably of higher importance. By taking the axis of aberra- relatively to Ay, then B will be retarded to the same amount | «and y coincident with the directions of principal curvature at , tion, rey to A. Suppose now that the retardation in question is | we may write the equation of the surface due to a small rotation () of the wave-surface A,B, about an hee in its own plane Boe to AB. The eee of e <5, toy tat + Baty + yay? + By i (2), relatively to Ay is then Aj)By.; and in like manner, if ¢ be hat oa a af the commanion ditt rotation of AB, the retardation is AB.¢. Since peered ele pea a ae of souayatiines ij a nae a these rcOirdapion sare the same, we have most Nate ig – 3 a ee a indo 1s ath Cc b _ ArBy xia atu thule basal uaa RN RVe settee ony Peace 8 AB? adjustments be rendered symmetrical with respect to the horizontal or the magnifying power is

equal to the ratio of the widths of the ane . This plane eae then be neaattled as primary, p being : stream of light before and after passing the telescope. the primary focal length, at which distance the spectrum is formed. Prisms. The niagnifying power is not necessarily the same in all direc- | Under these circumstances 8 and 6 may be omittcd from (2), Ea eee oe ae "e a pee ae = om ee which thus takes the form | P work. Passage throug e€ prism does not alter the vertica ee of ie es of light; neates there is no magnifying power 2 <5, t bt ant + yay? 3 in this direction. at happens in a horizontal direction de- ; i : i pends upon circumstances. m single prism in the position of ees 'dal be 2 ae an eek is a es Me 7s ae oe minimum deviation does not alter the horizontal width of the tere Hen voaealicrat eee pete ane a oe ae beam. The same is true of a sequence of any number of usual formula the radius of curvature at the point x of the intcr- prisms each in the position of minimum deviation, or of the com- | S°¢Ho2 Br) miigibe piste 40 sap Dey Ca babe). bination called by Thollon a couple, when the deviation is the Since me mts ee = SN +n ae of a apa least that can be obtained by rotating the couple as a rigid system, 1s 4 principal radius of the surfaes ; so that, EE eH Iatere although a further diminution might be arrived at by violating have z this tie. In all these cases there is neither horizontal nor age : (4) vertical magnification, and the instrument behaves as a telescope ae : dae anges " of power unity. If, however, a prism be so placed that the angle of Again, in the neighbourhood of the origin, the approximate value emergence differs from the angle of incidence, the horizontal | of the product of the principal curvatures is width of the beam undergoes a change. If the emergence be 1 Sau | Qyx nearly grazing, there will be a high magnifying power in the pp. cr 3: horizontal direction ; and, whatever may be the character of the | Thus system of prisms, the horizontal magnifying power is represented a dp dp' Gar 2Qyx by the ratio of widths. Brewster suggested that, by combining (=)= > Dt © 5) a two prisms with refracting edges at right angles, it would be hence by (4) a ie eee possible to secure equal magnifying power in the two directions, | °° dp'~~1 and thus to imitate the action of an ordinary telescope. a} ae (5). Appar~~ The theory of magnifying power is intimately connected with ; er : ent that of apparent brightness. By the use of a telescope in regarding | The equation of the normal at the point x, y, z is, bright- a bright body, such, for example, asthe moon, there is a concentra- Soe g-@ ie | 6): ness. tion of light upon

*the pupil in proportion to the ratio of the area "~1 plat 8ar+yy? pty + Qyay * (6);*

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§ 5. Propagation of Waves in General.

It has been shown under Oprics that a system of rays, how- ever many reflexions or refractions they may have undergone, are always normal to a certain surface, or rather system of surfaces. From our present point of view these surfaces are to be regarded as wave-surfaces, that is, surfaces of constant phase. It is evident that, so long as the radius of curvature is very large in comparison with A, each small part of a wave-surface propagates itself just as an infinite plane wave coincident with the tangent plane would do. If we start at time ¢ with a given surface, the corresponding wave- surface at time ¢-+dt is to be found by prolonging every normal by the length Vat, where V denotes the velocity of propagation at the place in question. If the ncdium be uniform, so that V is constant, the new surface is parallel to the old one, and this property is re- tained however many short intcrvals of time be considered in suc- cession. A wave-surfacc thus propagates itself normally, and the corresponding parts of successive surfaces are those which lie upon the same normal. In this sense the normal may be regarded as a ray, but the idea must not be pushed to streams of light limited to pass through small apertures. The manner in which the phase is determined by the length of the ray, and the conditions under which energy may be regarded as travelling along a ray, will be better treated under the head of Huygens's principle, and the theory of shadows (§ 10).

of the object-glass to that of the pupil. But the apparent bright- ness remains unaltered, the apparent superficial magnitude of the

1 Jt is here assumed that the object-glass is large cnough to fill the whole of the pupil with light; also that the glasses are perfectly transparent, and that there is no toss of light by reflexion. For theorctical purposes the latter re- quirement may be satisfied by supposing the transition between one optical medium and another to be gradual in all cases.

object being changed in preciscly the same proportion, in accord- ance with the law just established.

These fundamental propositions were proved a long while since by Cotes and Smith; and a complete exposition of them, from the point of view of geometrical optics, is to be found in Smith's treatise."

§ 6. Waves Approximately Plane or Spherical.

A plane wave of course remains plane after reflexion from a truly plane surface ; but any irregularities in the surface impress themselves upon the wave. In the simplest case, that of perpen- dicular incidence, the irregularities are doubled, any depressed portion of the surface giving rise to a retardation in the wave front of twice its own amount. It is assumed that the lateral dimen- sions of the depressed or elevated parts are large multiples of the wave-length ; otherwise the assimilation of the various parts to plane waves is not legitimate.

In like manner, if a plane wave passes perpendicularly through a parallel plate of refracting material, a small elevation ¢ at any part of onc of the surfaces introduces a retardation («—1)¢ in the corre- sponding part of the wave-surface. An error in a glass surface is thus of only one-quarter of the importance of an equal error ina reflecting surface. Further, if a plate, otherwise true, be distorted by bending, the errors introduced at the two surfaces are approxi- mately opposite, and neutralize one another.?®

2 Smith, Compleat System of Optics, Cambridge, 1738. The reader may be referred to a paper entitled "Notes, chiefly Historical, on some Fundamental Pro- positions in Optics" (Phi?. Mag., June 1886), in which some account is given of Smith's work, and its relation to' modern investigations.

3 On this principle Grubb has explained the observation that the effects of bending stress arc nearly as prejudicial in the case of thick Object-glasses as in the case of thin ones,

Primary focal line.

Second-

ary focal

line,

Fresnel's experi- ment.

WAVE

and its intersection with the plane ¢=p occurs at the point determined approximately by

E= — p(Bax? + yy') 7= eae — Apyxy

terms of the third ordcr being omitted.

According to geometrical optics, the thickness of the image of a luminous line at the primary focus is determined by the extreme value of ; and for good definition in the spectroscope it is neccs- sary to reduce this thickness as much as possible. One way of attaining the desired result would be to narrow the aperture ; but, as we shall see later, to narrow the horizontal aperture is really to throw away the peculiar advantage of large instruments. The same objection, however, does not apply to narrowing the vertical aper- ture ; and in many spectroscopes a great improvement in definition may be thus secured. In general, it is necessary that both y and a besmall. Since the value of & does not depend on p', it would seem that in respect of definition there is no advantage iu avoiding astigmatism.

The width of the image when 7=0 (corresponding to y=0) is 3apx', and vanishes when a=0, 7z.e., when there is no aberration for rays in the primary plane. In this case the image reduces to a linear are. If further y=0, this are becomes straight, and then the image at the primary focus is perfect to this order of approxi- mation. As an example where a=0, the

image of a luminous point, formed at an equal distance on the further side of a sloped equi-convex lens, may be mentioned.

At the secondary focus, (= p's and from (6)

5 > n=—-Qpyay . . . . . (8). If y==0, the secondary focal line is formed without aberration, but not otherwise. Both focal lines are well formed when parallel rays fall upon a plano-convex lens, sloped at about 30°, the curved side of the lens being turned towards the parallel rays.

oe eee

§ 7. Interference Fringes.

We have seen (§ 2) that, when two trains of parallel waves of equal wave-length are superposed, the intensity of the resultant depends upon the phase-relation of the components; but it is necessarily the same at all points of the wave-front. It not un- frequently happens that the parallelism of the component trains is approximate only, and there then arises the phenomenon known as interference fringes. If the two directions of propagation be inclined on opposite sides to the axis of 2 at small angles a, the expressions for two components of equal amplitudes are

cos | Vt-xcosa—ysina ! : and

cos = Vi-weosatysina } ;

so that the resultant is expressed by 2 cos ATYSIT # cos =" (Vé-aoos @) Bl pee eee able

from which it appears that the vibrations advance parallel to the axis of x, unchanged in type, and with a uniform velocity V/cosa. Considered as depending on y, the vibration is a maximum when ysina is equal to 0, A, 2A, 38a, &c., corresponding to the centres of the bright bands, while for the intermediate values 4a, $a, &c., there is no vibration. This is the interference of light proceeding from two similar homogeneous and very distant sources,

In the form of experiment adopted. by Fresnel the sources O,, 0,1 are situated at a finite distance D from the place of observa- tion (Lieut, vol. xiv. p. 606). If A be the point of the screen equidistant from 0,, O,, and P a neighbouring point, then approximately

O,P – 0,P=/{D?+ (w+ 40)?} —s/{D?+ (uw —40)} =ud/D, where 0,0,=b, AP=w.*

Thus, if A be the wave-length, the places where the phases are accordant are given by

WONDIO. 6 we sw we «6 (DS n being an integer.

If the light were really homogeneous, the successive fringes would be similar to one another and unlimited in number; more- over there would be no place that could be picked out by inspec- tion as the centre of the system. In practice A varies, and tho only place of complete accordance for all kinds of light is at A, where w=0. Theoretically, there is no place of complete discord- ance for all kinds of light, and consequently no complete blackness. In consequence, however, of the fact that the range of sensitiveness

1 It is scarcely necessary to say that 0), O2 must not be distinct sources of Nght; otherwise there could be no fixed phase-relation and consequently no regular interference. In Fresnel's experiment 0), O, are virtual images of one real source O, obtained by reflexion in two mirrors. The mirrors may be re- placed by a bi-prism. Or, as in Lloyd's arrangement, 0, may be identical with O, and O, obtained by a grazing reficxion from a single mirror.

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of the eye is limited to less than an "octave," the centre of the first dark band (on either side) is sensibly black, cven when whito light is employed ; but it should be carefully remarked that the existence of even one band is due to selection, and that the forma- tion of several visible bands is favoured by the capability of the retina to make chromatic distinctions within the visible range.

The number of perceptible bands increases part passu with the approach of the light to homogeneity. For this purpose there are two methods that may be used.

We may employ light, such as that from the soda flame, which Light possesses ab initio a high degrce of homogeneity. If the range of origin- wave-length included be sy$y5, a corresponding number of inter- ally ference fringes may be made visible. The above is the number homo- obtained by Fizeau, and Michelson has recently gone as far as gencons. 200,000. 'The narrowness of the bright line of light seen in the spectroscope, and the possibility of a large number, of Fresnel's bands, depend upon preciscly the same conditions; the one is in truth as much an interference phenomenon as the other.

In the second method the original light may be highly composite, Spectro- and homogeneity is brought about with the aid of a spectroscope. scopic The analogy with the first method is closest if we uso the spectro- method. scope to give us a line of homogeneous light in simple substitution for the artificial flame. Or, following Foucault and Fizeau, we may allow the white light to pass, and subsequently analyse the mixture transmitted by a narrow slit in the screen upon which the interference bands are thrown. In the latter case we observe a channelled spectrum, with maxima of brightness corresponding to the wave-lengths bu/(nD). In either case the number of bands observable is limited solely by the resolving power of the spectro- scope (§ 18), and proves nothing with respect to the regularity, or otherwise, of the vibrations of the original light.

The truth of this remark is strikingly illustrated by the possible Achro- formation, with white light, of a large number of achromatic bands. matic The unequal widths of the bands for the various colours, and bands. consequent overlapping and obliteration, met with in the usual form of the experiment, depend upon the constancy of 6 (the mutual distance of the two sources) while A varies. It is obvious that, if 6 were proportional to a, the widths of the bands would be independent of A, and that the various systems would fit together perfectly. To carry out the idea in its entirety, it would be necessary to nse a diffraction spectrum as a source, and to dupli- cate this by Lloyd's method with a single reflector placed so

that b=0 when a=0. In practice a sufficiently good result could doubtless be obtained with a prismatic spectrum (especially if the red aud violet were removed by absorbing agents) under the con- dition that d(b/A)=0 in the yellow-green, It is remarkable that, in spite of the achromatic character of the bands, thcir possible number is limited still by the resolving power of the instrument used to form the spectrum.

If a system of Fresnel's bands be examined through a prism, the Airy's central white band undergoes an abnormal displacement, which theory has been supposed to be inconsistent with theory. The explana- of the tion has been shown by Airy? to depend upon the peculiar manner white in which the white band is in general formed. centre.

" Any one of the kinds of homogeneous light composing the incident hetero- geneous light will produce a series of bright and dark bars, unlimited in number as far as the mixture of light from the two pencils extends, and undistinguish- able in quality. The consideration, therefore, of homogeneous light will never enable us to determine which is the point that the eye immediately turns to as the centre of the fringes. What then is the physical circumstance that deter- mines the centre of the fringes?

"The answer is very casy. For different colours the bars have different breadths. If then the bars of all colours coincide at one part of the mixture of light, they will not coincide at any other part; but at equal distances on both sides from that place of coincidence they will be equally far from a state of coin- cidence. If then we can find where the bars of all colours coincide, that point is the centre of the fringes. ?

'It appears then that the centre"of the fringes is mot necessarily the point where the two pencils of light have described equal paths, but is determined by con- siderations of a perfectly different kind….. The distinction is important in this and in other experiments."

The effect in question depends upon the dispersive power of the prism. If v be the linear shifting due to the prism of the originally central band, v must be regarded as a function of A. Measured from the original centre, the position of the n'® bar is now

v+naD/b. ; The coincidence of the various bright bands occurs when this quantity is as independent as possible of a, that is, when ” is the nearest integer to ile

ME =a S 45 5 o 2 2 5 4, (BP or, as Airy expresses it in terms of the width of a band (h), n= —dv/dh. The apparent displacement of the white band is thus not v simply, but va (4). The signs of dv and dh being opposite, the abnormal displacement is in addition to the normal effect of the prism. But, since dv/dh, 2 ‘Remarks on Mr Potter’s Experiment on Interference,” Phil. Mag., bs Soe

161, 1833.

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Limits to the width

of the

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or dv/da, is not constant, the achromatism of the white band is less perfect than when no prism is used.

If a grating were substituted for the prism, v would vary as h, and (4) would vanish, so that in all orders of spectra the white band would be seen undisplaced.

The theoretical error, dependent upon the dispersive power, involved in the method of determining the refractive index of a plate by means of the displacement of a system of interference fringes (Licut, vol. xiv. p. 607) has been discussed by Stokes.} In the absence of dispersion the retardation R due to the plate would be independent of a, and therefore completely compensated at the point determined by«=DR/d; but when there is dispersion it is accompanied by a fictitious displacement of the fringes on the principle explained by Airy.

More recently the matter has engaged the attention of Cornu,? who thus formulates the general principle :—“ Dans un systéme de Sranges @interférences produites & Vaide d’une lumiere hétérogene ayant un spectre continu, il existe toujours une frange achromatique qui joue le réle de frange centrale et qui se trowve au point de champ ow les radiations les plus intenses présentent une différence de phase maximum ou minimum.”

In Fresnel’s experiment, if the retardation of phase due to an interposed plate, or to any other cause, be F(a), the whole relative retardation of the two pencils at the point w is

o=Fa)+ a 4 ieee Me ae (5);

and the situation of the central, or achromatic, band is determined, not by ¢=0, but by d¢/da=0, or

WSIEDPIAE 4 « g- e mw & TOR

In the theoretical statement we have supposed the source of light

to be limited to a mathematical point, or to be extended only in

the vertical direction (parallel to the bands). Such a vertical

extension, while it increases illumination, has no prejudicial effect

source of upon distinctness, the various systems due to different points of the

light.

Diffrae- tion and Fres- nel’s bands.

Summa- tion of partial waves.

luminous line being sensibly superposed. On the other hand, the horizontal dimension of the source must be confined within narrow limits, the condition obviously being that the displacement of the centre of the

system incurred by using in succession the two edges only of the slit should be small in comparison with the width of an interference band.

Before quitting this subject it is proper to remark that Fresnel's bands are more influenced by diffraction than their discoverer supposed. On this account the fringes are often unequally broad and undergo fluctuations of brightness. A more precise calcula- tion has been given by H. F. Weber® and by H. Struve, but the matter is too complicated to be further considered here. The observations of Struve appear to agree well with the corrected theory.*

§ 8. Colours of Thin Plates.

When plane waves of homogeneous light (a) fall upon a parallel plate of index p, the resultant reflected wave is made up of an infinite number of components, of which the most important are the first, reflected at the upper surface of the plate, and the second, transmitted at the upper surface, reflected at the under surface, and then transmitted at the upper surface. It is readily proved (Lieut, vol. xiv. p. 608) that so far as it depends upon the distances to be travelled in the plate and in air the retardation (8) of the second wave relatively to the first is given by

5=2ut cos a' Me yee where ¢ denotes the thickness of the plate, and a' the angle of refraction corresponding to the first entrance. If we represent all the vibrations by complex quantities, from which finally the imaginary parts are to be rejected, the retardation 8 may be expressed by the introduction of the factor e—® where i= /(-1), and «=2n/a,*

At each reflexion or refraction the amplitude of the incident wave must be supposed to be altered by a certain factor. When the light proceeds from the surrounding medium to the plate, the factor for reflexion will be supposed to be 6, and for refraction c; the corresponding quantities when the progress is from the plate to the surrounding medium will be denoted bye, 7 Denoting the incident vibration by unity, we have then for the first component of the reflected wave 6, for the second cefe—® for the third cee 28 and so on. Adding these together, and summing the geometric series, we find*

*Z coffe **8 sal — ee 8 (2). In like manner for the wave transmitted through the plate we get of te 2% tK8 (3).*

The quantities 4, ¢, e, f are not independent. The simplest way to find the relations between them is to trace the consequences

1 Brit. Ass. Rep., 1850.

] 2 Jour, de Physique, i. p. 293, 1882. 2 Wied. Ann., Vili. p. 407,

4 Wied. Ann., xv. p. 49.

of supposing 5=0 in (2) and(8). For it is evident a priori that with a plate of vanishing thickness there must be a vanishing re- flexion, and a total transmission. Accordingly,

b+e=0, f=1-é (4), the first of which embodies Arago's law of the equality of reflexions, as well as the famous "loss of half an undulation." Using these

we find for the reflected vibration,

e (1 = er) 5 nan " and for the transmitted vibration 1-¢é 1-a% ii

The intensities of the reflected and transmitted lights are the squares of the moduli of these expressions. Thus

*(1 ~ cos #5)? + sin 2×5 (1 — cos «8)?+ 4 sin xd 4¢? sin *(418)*

1 — 2¢? cos x8 +e!

, : . (1 — e?)? Intensity of transmitted light i-Waseer the sum of the two expressions being unity.

According to (7) not only does the reflected light vanish con- pletely when 3=0, but also whenever 4%5=nz, n being an integer, that is, whenever 5=na. When the first and third medium are the same, as we have here

supposed, the central spot in the system of Newton's rings is black, even though the original light contain a mixture of all wave lengths, The general explanation of the colours of Newton's rings is given under Lieut, to which reference must be made. If the light reflected from a plate of any thickness be examined with a spectroscope of sufficient resolving power (§ 13), the spectrum will be traversed by dark bands, of which the centre corresponds to those wave lengths which the plate is incompetent to reflect. It is obvious that there is no limit to the fineness of the bands which may be thus impressed upon a spectrum, whatever may be the character of the original mixed light.

The relations between the factors 8, c, ¢, f have been proved, independently of the theory of thin plates, in a general manner by Stokes,® who called to his aid the general mechanical principle of reversibility. If the motions constituting the refleeted and refracted rays to which an incident ray gives rise be supposed to be reversed, they will reconstitute a reversed incident ray. This gives one relation ; and another is obtained from the consideration that there is no ray in the second medium, such as would be generated by the operation alone of either the reversed reflected or refracted rays. Space docs not allow of the reproduc-> tion of the argument at length, but a few words may perhaps give the reader an idea of how the conclusions 4 are arrived at. The incident ray (IA) being 1, the re- flected (AR) and refracted (AF) rays are denoted by db . and ce. When d is reversed, it gives rise to a reflected Fr' \e ray 6? along AI, and a refracted ray be along AG (say), Fig. 1. When ¢ is reversed, it gives rise to of along Al, and ce along AG. Hence be+ce=0, 6? +¢f=1, which agree with (4).

It is here assumed that there is no change of phase in the act of reflexion or refraction, except such as can be represented by a change of sign. Professor Stokes has, however, pushed the applica- tion of his method to the case where changes of phase are admitted, and arrives at the conclusion that 'the sum of the accelerations of phase at the two reflexions is equal to the sum of the accelera- tions at the two refractions, and the accelerations of the two re- fractions are equal to each other." The accelerations are su pposed to be so measured as to give like signs to

¢ and, and unlike to } and ¢. The same relations as before obtain between the factors b, ¢, e, f, expressing the ratios of amplitudes. §

When the third medium differs from the first, the theory of thin plates is more complicated, and need not here be discussed. One particular case, however, may be mentioned. When a thin trans-

*5 *'On the Perfect Blackness of the Central Spot in Newton's Rings, and on the Verification of Fresnel's Formule for the Intensities of Reflected and Refracted Rays," Camb. and Dub. Math. Jour., vol. iv. p. 1, 1849 ; reprint vol. ii, p. 89.*

6 It would appear, however, that these laws cannot be properly applied to the calculation of reflexion from a thin plate, This is sufficiently proved by the fact that the resultant expression for the intensity founded upon them does not vanish with the thickness, The truth is that the method of deducing the aggregate reflexion from the consideration of the successive partial reflexions and refrac- tions is applicable only when the disturbance in the interior of the plate is fully represented by the transverse waves considered in the argument, whereas the occurrence of a change of phase is probably connected with the existence of additional superficial waves (§ 27). The existence of these superficial waves may be ignored when the reflected and refracted waves are to be considered only at distances from the surface exceeding a few wave-lengths, but in the application to thin plates this limitation is violated, If indeed the method of calculating the aggregate reflexion from a thin plate were sound when a change of phase occurs, we could still use the expressions (2) and (3), merely under- standing by 8, ¢, e, f, factors which may be complex ; and the same formal rela- tions (4) would still hold good. These do not agree with those found by Stokes by the method of reversion ; and the discrepancy indicates that, when there are changes of phase, the action of a thin plate cannot be calculated in the usual way.

Intensity of reflected light = ¢?

(7); (8),

Inten- sities,

Zero re- flexion at certain thick- nesses,

Prin- ciple of reversi- bility.

Thin plate in eontaet with a perfeet reflector.

Colours of ancient glass.

Colours of New- ton's scale,

Bands approxi- mately achro- matic,

WAVE

parent film is backed by a perfect reflector, no colours should be visible, all the light being ultimately reflected, whatever the wave length may be. The experiment may be tried witha thin layer of gelatin on a polished silvcr plate. In other cases where a different result is observed, the inference is that either thc metal does not reflect perfectly, or else that the material of which the film is composed is not sufficiently transparent.

Theory and observation alike show that the transmitted colours of a thin plate, ¢.g., a soap film or a layer of air, are very infcrior to those reflected. Specimens of ancient glass, which have under- gone superficial decomposition, on the other hand, somctimes show transmitted colours of remarkable brilliancy. The probable ex- planation, suggested by Brewster, is that we have here to deal not merely with one, but with a series of thin plates of not very different thicknesses. It is evident that with such a series the transmitted colours would be much purcr, and the reflected much brighter, than usual. If the thicknesses are strictly equal, certain wave-lengths must still be absolutely missing in the reflected light ; while on the other hand a constancy of the interval between the plates will in general lead to a special preponderance of light of some other wave-length for which all the component parts as they ultimately emerge are in agreement as to phase.?

All that can be expected from a physical theory is the determina- tion of the composition of the light reflected from or transmitted by a thin plate

in terms of the composition of the incident light. The further question of the chromatic character of the mixturcs thus obtained belongs rather to physiological optics, and cannot be answered without a complete knowledge of the chromatic re- lations of the spectral colours themselves. Experiments upon this subject have been made by various observers, and especially by Max- well,? who has exhibited his results on a colour diagram as used by Newton. A calculation of the colours of thin plates, based upon Maxwell's data, and accompanied by a drawing showing the curve representative of the cntire series up to the fifth order, has recently been published ;3 and to this the reader who desires further infor- mation must be referred, with the remark that the true colours are not seen in the usual manner of operating with a plate of air encloscd between glass surfaces, on account of the contamination with white light reflected at the other surfaces of the glasses. This objection is avoided when a soap film is employed, to the manifest advantage of the darker colours, such as the red of the first order. The colours of Newton's scale are met with also in the light transmitted by a somewhat thin plate of doubly-refracting material, such as mica, the plane of analysis being perpendicular to that of primitive polarization.

The same series of colours occur also in other optical experi- ments, ¢g., at the centre of the illuminated area when light issuing from a point passes through a small round aperture in an otherwise opaque screen (§ 10).

The colours of which we have been speaking are those formed at nearly perpendicular incidence, so that the retardation (reckoned as a distance), viz., 2uécosa', is sensibly independent ofa. This state of things may be greatly departed from when the thin plate is rarcr than its surroundings, and the incidence is such that a' is nearly equal to 90°, for then, in consequence of the powerful dispersion, cosa' may vary greatly as we pass from onc colour to another. Under these circumstances the series of colours entirely alters its character, and the bands (corresponding to a graduated thickness) may even lose their coloration, becoming sensibly black and white through many alternations.4 The general explanation of this remarkable pheno- menon was suggested by Newton, but it does not appcar to have been followed out in accordance with the wave theory.

Let us suppose that plane waves of white light travelling in glass are incident at angle a upon a plate of air, which is bounded again on the other side by glass. If mu be the index of the glass, a' the angle of refraction, then sina'=sina; and the retardation, ex- pressed by the equivalent distance in air, is

2 seca' —w. 2ttana' sina=2t cosa'; and the retardation in phase is 2tcosa'/a, A being as usual the wave- length in air.

The first thing to be noticed is that, when a approaches the critical angle, cosa' becomes as small as we please, and that conse- quently the retardation corresponding to a given thickness is very much less than at perpendicular incidence. Hence the glass surfaces need not be so close as usual.

A second feature is the increased brilliaucy of the light.

1 The analytical investigations and formule given by Stokes for a pile of plates (Proc, Roy. Soc., xi, p. 545, 1860) may be applied to this question, provided that we understand the quantities 7, ¢, 6, yw, &c , to be complex, so as to express the luminous displacement in phase as well as in amplitude, instead of real quantities relating merety to intensities.

2 Maxwell, " Theory of Compound Colours," Phil, Trans., 1860.

3 Edin, Trans., 1887.

4 Newton's Optics, bk. il.; Fox Talbot, Phil. Mag., ix. p. 401, 1886,

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But the peculiarity which most demands attention 18 the lessened influence of a variation in A upon the phase-retardation. A diminution of a of itself increases the retardation of phase, but, since waves of shorter wave-length are more refrangiblc, this effect may be more or less perfectly compensated by the greater obliquity, and consequent diminution in the

value of cose'. We will investi- gate the conditions under which the retardation of phase is stationary in spite of a variation of a.

In order that A-! cosa' may be stationary, we must have

Asin a'da' +cosa'dA=0, where (a being constant) cos a'da' =sina du. Thus

(9),

rv giving a' when the relation between yp and A is known. According to Cauchy's formula, which represents the facts very well throughout most of the visible spectrum, p=A+Baz? . (10),

eae) (11). be If we take, as for Chance's "extra-dense flint," B= '984 × 10-?°, and, as for the soda lines, te A=5'89 × 10-5, we get a' =79° 30'. At this angle of refraction, and with this kind of glass, the retardation of phase is accordingly nearly independent of wave-length, and therefore the bands formed, as the thickness varies, are approxi- mately achromatic. Perfect achromatism would be possible only under a law of dispersion pe=A'— B'd?, If the source of light be distant and very small, the black bands are wonderfully fine and numerous. The experiment is best made (after Newton) with a right-angled prism, whose hypothenusal surface may be brought into approximate contact with a plate of black glass. The bands should be observed with a convex lens, of about 8 inches focus. If the eye be at twice this distance from the prism, and the lens be held midway between, the advantages are combined of a large field and of maximum distinctness.

so that

cot 2a! =

2B ru

If Newton's rings are examined through a prism, some very Effect of remarkable phenomena are exhibited, described in his twenty-fourth a prism.

observation.> “ When the two object-glasses are laid upon one another, so as to make the rings of the colours appear, though with my naked eye I could not discern above eight or nine of those rings, yet by viewing them through a prism I could sce a far greater multi- tude, insomuch that I could number more than forty….. And I believe that the expcriment may be improved to the discovery of far greater numbers. ... . But it was on but one side of these rings, namely, that towards which the refraction was made, which by the refraction was rendered distinct, and the other side became more confused than when viewed with the naked eye… . .

“J have sometimes so laid one object-glass upon the other that to the naked eye they have all over seemed uniformly white, without the least appearance of any of the coloured rings ; and yet by viewing them through a prisin great multitudes of those rings have discovered themselves.”

Newton was evidently much struck with these “so odd circum- stances ;” and he explains the occurrence of the rings at unusual thicknesses as due to the dispersing power of the prism. The blue system being more refracted than the red, it is possible under cer- tain conditions that the nt blue ring may be so much displaced relatively to the corresponding red ring as at one part of the cir- cumference to compensate for the different diameters. A white stripe may thus be formed in a situation where without the prism the mixture of colours would be complete, so far as could be judged by the eye.)

The simplest case that can be considered is when the “ thin plate” is bounded by plane surfaces inclined to one another at a small angle. By drawing back the prism (whose edge is parallel to the intersection of the above-mentioned planes) it will always be possible so to adjust the effective dispersing powcr as to bring the nth bars to coincidence for any two assigned colours, and therefore approximately for the entire spectrum. The formation of the achromatic band, or rather central black band, depends indeed upon the same principles as the fictitious shifting of the centre of a system of Fresnel’s bands when viewed through a prism.

But neither Newton nor, as would appear, any of his successors Condi- has explained why the bands should be more numerous than usual, tion

of and under certain conditions sensibly achromatic for a large num- achro- ber of alternatious. It is evident that, in the particular case of the matism.

wedge-shaped plate above specified, such a result would not occur. The width of the bands for any colour would be proportional to A, as well after the displacement by the prism as before; and the succession of colours formed in white light and the number of perceptible bands would be much as usual.

5 Newton's Optics, See also Place, Pogg. Ann., exiy. p. 504, 1861.

Stokes's prin- ciple.

Plane mirror and lens,

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The peculiarity to be explained appears to depend upon the cwr- vatwre of the surfaces bounding the plate. or simplicity suppose that the lower surface is plane (y=0), and that the approximate equation of the upper surface is y=a+ ba', a being thus the least distance between the plates, The black of the nt" order for wave- length A occurs when

dnra=a+ be? . a (12); and thus the width (8x) at this place of the band is given by 4A =2d28x sos = KOBE or a r oe Tie dnb. /(YMA~ A) ee

If the glasses be in contact, as is usually supposed in the theory of Newton's rings, a=0, and dxaai, or the width of the band of the nb order varies as the square root of the wave-length, instead of as the first power. Even in this case the overlapping and subse- quent obliteration of the bands is greatly retarded by the use of the prism, but the full development of the phenomenon requires that a should be finite. Let us inquire what is the condition in order that the width of the band of the n order may be stationary, as A varies, By (14) it is necessary that the variation of A?/(4na —@) should vanish. Hence a=4mna, so that the interval between the surfaces at the place where the n*" band is formed should be half due to curvature and half to imperfect contact at the place of closest*

*approach. If this condition be satisfied, the achromatism of the n** band, effected by the prism, carries with it the achromatism of a large number of neighbouring bands, and thus gives rise to the remarkable effects described by Newton.*

§ 9. Newton's Diffusion Rings.

In the fourth part of the second book of his Optics Newton investigates another series of rings, usually (though not very appropriately) known as the colours of thick plates. The funda- mental experiment is as follows. At the centre of curvature of a concave looking-glass, quicksilvered behind, is pet an opaque card, perforated by a small hole through which sunlight is admitted. The main body of the light returns through the aperture ; but a series of concentric rings are seen upon the card, the formation of which was proved by Newton to require the co-operation of the two surfaces of the mirror. Thus the diameters of the rings depend upon the thickness of the glass, and none are formed when the glass is replaced by a metallic speculum. The brillianey of the rings depends upon imperfect polish of the anterior surface of the glass, and may be augmented by a coat of diluted milk, a device used by the Duc de Chaulnes. The rings may also be well observed without a screen in the manner recommended by Stokes. For this purpose all that is required is to place a small flame at the centre of curvature of the prepared glass, so as to concide with its image. The rings are then seen surrounding the flame and occupying a definite position in space.

The explanation of the rings, suggested by Young, and developed by Herschel, refers them to interference between one portion of light scattered or diffracted by a particle of dust, and then regularly refracted and reflected, and another portion first regularly refracted and reflected and then diffracted at emergence by the same particle. It has been shown by Stokes! that no regular inter- ference is to be expected between portions of light diffracted by different particles of dust,

_ In the memoir of Stokes will be found a very complete discus- sion of the whole subject, and to this the reader must be referred who desires a fuller knowledge. Our limits will not allow us to do more than touch upon one or two points. The condition of fixity of the rings when observed in

air, and of distinctness when a screen is used, is that the systems due to all parts of the diffusing surface should concide; and it is fulfilled only when, as in Newton's experiments, the source and screen are in the plane passing through the centre of curvature of the glass.

'As the simplest for actual calculation, we will consider a little further the case where the glass is plane and parallel, of thickness ¢t and index y, and is supp! marital by a lens at whose focus the source of light is placed. This lens acts both as collimator and as object-glass, so that the combination of lens and plane mirror replaces the concave mirror of Newton's experiment. The retardation is caleu- lated in the same way as for thin plates. In fig. 2 the diffracting particle is situated at B, and we have to find the relative retardation of the two rays which emerge finally at inclina- tion 6, the one diffracted at emergence following the path ABDBIE, and the other diffracted at entrance and following the path ABFGH. The retardation of the former from B to I is 2u¢+BI, and of the latter from B to the equivalent place Gis 2uBF. Now FB=tsecé', ¢' being the angle

Fig. 2.

1 Camb. Trans., ix. p. 147, 1851.

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of refraction ; BI=2¢tané'sin@ ; so that the relative rctardation R is given by R=2ut{1+u-1tan & sin 0 —sec 6'} =2ut(1 —cos 6'). If 6,6' be small, we may take mee tO is te i eu et ao as sufficiently approximate.

The condition of distinctness is here satisfied, since R is the same for every ray emergent parallel to a given one. The rays of one parallel system are collected by the lens to a focus at a definite point in the neighbourhood of the original source.

The formula (1) was discussed by Herschel, and shown to aerce with Newton's measures. The law of formation of the rings follows immediately from the expression for the retardation, the radius of the ring

of n‘ order being proportional to m and to the square root of the wave-length.*

§ 10. Huygens’s Principle. Theory of Shadows,

The objection most frequently brought against the undulatory theory in its infancy was the difficulty of explaining in accordance with it the existence of shadows. Thanks to Fresnel and his fol- lowers, this department of optics is now precisely the one in which the theory has secured its greatest triumphs.

The principle employed in these investigations is due to Huygens, Hyy- Pp. ploy keen age ys ry: e origin of waves an gens’s

and may be thus formulated. If roun ideal closed surface be drawn, the whole action of the waves in the region beyond may be regarded as due to the motion continually propagated across the various elements of this surface. The wave motion due to any element of the surface is called a secondary wave, and in estimating the total effect regard must be paid to the phases as well as the amplitudes of the components. It is usually convenient to choose as the surface of resolution a wave-front, 4.¢., a surface at which the primary vibrations are in one phase.

Any obscurity that may hang over Huygens’s principle is due mainly to the indefiniteness of thought and expression which we must be content to put up with if we wish to avoid pledging our- selves as to the character of the vibrations. In the gpa to sound, where we know what we are dealing with, the matter is simple enough in principle, although mathematical difficulties would often stand in the way of the calculations we might wish to make. The ideal surface of resolution may be there regarded as a flexible lamina; and we know that, if by forces locally applied every element of the lamina be made to move normally to itself exactly as the air at that place does, the external aerial motion is fully determined. By the principle of superposition the whole effect may be found by integration of the partial effects due to each ele- ment of the surface, the other elements remaining at rest.

We will now consider in detail the important case in which Plane uniform plane waves are resolved at a surface coincident with a primary wave-front (OQ). We imagine the wave-front divided into clement- wave. ary rings or zones, called Huygens's zones, by spheres described Huy-

round P(the point at which the aggregate effect is to be estimated), the first sphere, touching the plane at O, with a radius equal to PO, and the succeeding spheres with radii increasing at each step by 4a. There are thus marked out a series of circles, whose radii # are given by a +7°= (r+4ma)', or 22=nar nearly; so that the rings are at first of nearly equal area. Now the effect upon P of each element of 7| /P the plane is proportional to its area; but it depends

also upon the distance from P, and possibly upon b the inclination of the secondary ray to the direc- Fig. 8 tion of vibration and to the wave-front. These ce questions will be further considered in connexion with the dyna-mical theory; but under all ordinary circumstances the result is independent of the precise answer that may be given. All that it is necessary to assume is that the effects of the successive zones gradually diminish, whether from the increasing obliquity of the secondary ray or because (on account of the limitation of the region of integration) the zones become at last more and more incomplete. The component vibrations at P due to the successive zones are thus nearly equal in amplitude and opposite in pee (the r= of each corresponding to that of the infinitesimal circle midway between the boundaries), and the series which we have to sum is one in which the terms are alternately opposite in sign and, while at first nearly constant in numerical magnitude, gradually diminish to zero. In such aseries cach term may be regarded as very nearly indeed destroyed by the halves of its immediate neighbours, and thus the sum of the whole series is represented by half the first term, which stands over uncompensated. The question is thus reduced to that of finding the effect of the first zone, or central circle, of which the area is rar.

We have seen that the problem before us is independent of the law of the secondary wave as regards obliquity; but the result of the integration necessarily involves the law of the intensity and phase of a secondary

wave as a function of 7, the distance from the origin. And we may in fact, as was done by A. Smith,? determine

ox

2 Camb. Math. Jour., iii. p, 46, 1843,

+ zones,

Initial phase of second- ary waves.

Faetor for seeond- ary wave.

Analy- tical

investi- gation.

Primary wave eurved,

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the law of the secondary wave, by comparing the result of the integration with that obtained by supposing the primary wave to pass on to P without resolution.

Now as to the phase of the secondary wave, it might appear natural to suppose that it starts from any point Q with the phase of the primary wave, so that on arrival at P it is retarded by the amount corresponding toQP. Buta little consideration will prove that in that ease the series of secondary waves could not reconstitute the primary wave. For the aggregate effect of the secondary waves is the half of that of the first Huygens zone, and it is the central element only of that zone for which the distance to be travelled is equal to vr, Let us conceive the zone in question to be divided into infinitesimal rings of equal area. The effects due to each of these rings are equal in amplitude and of phase ranging uniformly over half a complete period. The phase of the resultant is midway between those of the extreme elements, that is to say, a quarter of a period behind that due to the element at the centre of the circle. It is accordingly necessary to suppose that the secondary waves start with a

phase one-quarter of a period in advance of that of the primary wave at the surface of resolution.

Further, it is evident that account must be taken of the variation of phase in estimating the magnitude of the effect at P of the first zone. The middle element alone contributes without deduction ; the effect of every other must be found by introduction of a resolv- ing factor, equal to cosé, if @ represent the difference of phase between this element and the resultant. Accordingly, the ampli- tude of the resultant will be less than if all its components had the same phase, in the ratio

+40

a cos0d0:7,

or 2:r. Now 2area/r=2ar; so that, in order to reconcile the amplitude of the primary wave (taken as unity) with the half effect of the first zone, the amplitude, at distance 7, of the secondarv wave emitted from the element of area dS must be taken to be

rare ry

ar (1).

By this expression, in conjunction with the quarter-period accelera- tion of phase, the law of the secondary wave is determined.

That the amplitude of the secondary wave should vary as r~} was to be expected from considerations respecting energy; but the occurrence of the factor a-1, and the acceleration of phase, have sometimes been regarded as mysterious. It may be well therefore to remember that precisely these laws apply to a secondary wave of sound, which can be investigated upon the strictest mechanical principles.

The recomposition of the secondary waves may also be treated analytically. If the primary wave at O be cos xaé, the effect of the secondary wave proceeding from the element dS at Q is

ie = cos K(at — p+4a)= —- = sin «(at —p).

If dS=2nxdzx, we have for the whole effect

a= K({at — p)xdx

ASO Pp or, since xdxz=pdp, n=2n/A,

- xf, sin k(at — p)dp= [— cos x(at— e) |r :

In order to obtain the effect of the primary wave, as retarded by traversing the distance 7, Viz., cos « (at—r), it is necessary to suppose that the integrated term vanishes at the upper limit. And itis important to notice that without some further understanding the integral is really ambiguous. According to the assumed law of the secondary wave, the result must actually depend upon the precise radius of the outer boundary of the region of integration, supposed to be exactly circular. This case is, however, at most very special and exceptional. We may usually suppose that a large number of the outer rings are incomplete, so that the in- tegrated term at the upper limit may properly be taken to vanish. If a formal proof be desired, it may be obtained by introducing into the intcgral a factor such as e¢~”?,in which A is ultimately made to diminish without limit.

When the primary wave is plaue, the area of the first Huygens zone is rar, and, since the secondary waves vary as 7~!, the intensity is independent ofr, as of courseit shouldbe. If, however, the prim- ary wave be spherical, and of radius a at the wave-front of resolu- tion, then we know that at a distance 7 further on the amplitude of the primary wave will be diminished in the ratio a:(r+a). This may be regarded as a consequence of the altered area of the first Huygens zone. For, if x be its radius, we have

{(rttaPe—-2}t+/{e-e}=arta, so that fe Pen csill nearly. a+r

Since the distance to be travelled by the secondary waves is still 7, we see how the effect of the first zone, and therefore of the whole series is proportional to a/(a@+7r). In like manner may be

treated other cases, such as that of a primary wave-front of un- equal principal curvatures.

The general explanation of the formation of shadows may also be conveniently based upon Huygens's zones. If the point under consideration be so far away from the geometrical shadow that a large number of the earlier zones are complete, then the illumina- tion, determincd sensibly by the first zone, is the same as if there were no obstruction at all. If, on the other hand, the point be well immersed in the geometrical shadow, the earlicr zones are alto- gether missing, and, instead of a serics of terms beginning with finite numerical magnitude and gradually diminishing to zero, we have now to deal with one of which the terms diminish to zero at both ends. The suin of such a series is very approximately zero, each term being neutralized by the halves of its immediate neigh- bours, which are of the opposite sign. The question of light or darkness then depends upon whether the series begins or cnds abruptly. With few exceptions, abruptness ean occur only in the presence of the first term, viz., when the secondary wave of least retardation is unobstructed, or when a ray passes throngh the point under consideration. According to the undulatory theory the light cannot be regarded strictly as travelling along a ray ; but the existence of an unobstructed ray implies that the system of Huygens's zones can be commenced, and, if a large number of these zones are fully developed and do not terminate abruptly, the illumination is unaffected by the neighbourhood of obstacles. Intermediate cases in which a few zones only are formed belong especially to the province of diffraction.

Shadows.

An interesting exception to the geueral rule that full brightness Poisson's requires the existence of the first zone occurs when the obstacle problem.

assumes the form of a small circular disk parallel to the plane of the incident waves. In the earlier half of the 18th century? Delisle found that the centre of the circular shadow was occupied by a bright point of light, but the observation passed into oblivion until Poisson brought forward as

an objection to Fresnel's theory that it required at the centre of a circular shadow a point as bright as if no obstacle were intervening. If we conceive the primary wave to be broken up at the plane of the disk, asystem of Huygens's zones can be constructed which begin from the circumfercnce; and the first zone external to the disk plays the part ordinarily taken by the centre of the entire system. The whole effect is the half of that of the first existing zone, and this is sensibly the same as if there were no obstruction.

When light passes through a small circular or annular aperture, the illumination at any point along the axis depends upon the precise relation between the aperture and the distance from it at which the point is taken. If, as in the last paragraph, we imagine a system of zones to be drawn commencing from the inner circular boundary of the aperture, the question turns upon the manner in which the series terminates at the outer boundary. If the aperture be such as to fit exactly an integral number of zones, the aggregate effect may be regarded as the half of those due to the first and last zones. Ifthe number of zones be even, the action of the first and last zones are antagonistic, and there is complete darkness at the point. If on the other hand the number of zones be odd, the effects con- spire; and the illumination (proportional to the square of the ampli- tude) is four times as great as if there were no obstruction at all.

The process of augmenting the resultant illumination at a particular point by stopping some of the seeondary rays may be carried much furthcr.? By the aid of photography it is easy to prepare a plate, transparent where the zones of odd order fall, and opaque where those of even order fall. Such a plate has the power of a condensing lens, and gives an illumination out of all propor- tion to what could be obtained without it. An even greater eficct (fourfold) would be attained if it were possible to provide that the stoppage of the light from the alternate zones were replaced by a phase-reversal without loss of amplitude.

In such experiments the narrowness of the zones renders necessary a pretty close approximation to the geometrical conditions. Thus in the case of the circular disk, equidistant ® from the source of light and from the

scrcen upon which the shadow is observed, the width of the first exterior zone is given by

a(2r) cea)'

2x being the diameter of the disk. If2r=1000 cm., 2e—1cm., ~a=6×10-5cm., then dz='0015 cm. Hence, in order that this zone may be perfectly formed, there should be no error in the cir- cumference of the order of '001 cm.3 The cxperiment succeeds in a dark room of the length above mentioned, with a threepenny bit (supported by three threads) as obstacle, the origin of light being a small needle hole in a plate of tin, through which the sun's rays shine horizontally after reflexion from an external mirror. In the absence of a heliostat it is more convenient to obtain a point of light with the aid of a lens of short foeus.

1 Verdet, Lecons d' Optique Physique, i. § 66. 2 Soret, Pogg. Ann., elvi. p. 99, 1875. 3 It is easy to see that the radius of the bright spot is of the same order of magnitude.

Cireular or annular aperture,

Soret's experi- ment.

Degree of aecuraey required.

Analyti- cal ex- pression.

Uncer- tainty in the ap- plication of Huy- gens's principle.

iixpres- sion for intensity.

Theorems of Bridge.

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The amplitude of the light at any point in the axis, when plane waves are incident perpendicularly upon an annular aperture, is, as above,

cos x(at — 7,) — cos k(at — 1.) =2sin kat. sink(7,—7,), T, 7, being the distances of the outer and inner boundaries from the point in question. It is scarcely necessary to remark that in all such cases the calculation applies in the first instance to homo- geneous light, and that, in accordance with Fourier's theorem, each homogeneous component of a mixture may be treated separ- ately. When the original light is white, the presence of some components and the absence of others will usually give rise to coloured effects, variable with the precise circumstances of the case.

Although what we have to say upon the subject is better post- poned until we consider the dynamical theory, it is proper to point out at once that there is an element of assumption in the appli- cation of Huygens's principle to the calculation of the effects pro- duced by opaque screens of limited extent. Properly applied, the principle could not fail ; but, as may readily be proved in the case of sonorous waves, it is not in strictness sufficient to assume the expression for a secondary wave suitable when the primary wave is undisturbed, with mere limitation of the integration to the transparent parts of the screen. But, except perhaps in the case of very fine gratings, it is probable that the error thus caused is insignificant ; for the incorrect estimation of the secondary wavcs will be limited to distances of a few wave-lengths only from the boundary of opaque and transparent parts.

§ 11. Fraunhofer's Diffraction Phenomena.

A very general problem in diffraction is the investigation of the distribution of light over a screen upon which inipinge divergent or convergent sphcrical waves after passage through various diffracting apertures. When the waves are convergent and the recipient screen is placed so as to contain the centre of convergency—the image of the original radiant point, the calcu- lation assumes a less complicated form. This class of phenomena was investigated by Fraunhofer (upon principles laid down by Fresnel), and are sometimes called after his name. iz We may conveniently commence with them on account of their simplicity and great importance in respect to the theory of optical instruments.

If f be the radius of the spherical wave at the place of resolution, where the vibration is repre- y sented by cos xat, then at any point M (fig. 4) in

Fig. 4.

the recipient screen the vibration due to an element dS of the wave-front is (§ 9)

-& sin x(at—p) ,

p being the distance between M and the element dS.

Taking coordinates in the plane of the screen with the centre of the wave as origin, let us represent M by é, y, and P (where dS is situated) by x, y, 2 Then

pi=(x- EPH (yn P+2, faat+y2ter; so that pr =f? — Qxk — Quy + 2+ a? In the applications with which we are concerned, &, 7 are very small quantities ; and we may take we +

pays l= ow . At the same time dS may be identified with dad) , and in the de- nominator p may be treated as constant and equal to 7. Thus the expression for the vibration at M becomes

1 :

sy; [friar at- pe BE away ay: and for the intensity, represented by the square of the amplitude,

Pesral [fin away | tal_f/e0s Mandy)". ee

This expression for the intensity becomes rigorously applicable when / is indefinitely great, so that ordinary optical aberration disappears. The incident waves are thus plane, and are limited to a plane aperture coincident with a wave-front. The integrals are then properly functions of the direction in which the light is to be estimated.

{n experiment under ordinary circumstances it makes no differ- ence whether the collecting lens is in front of or behind the diffract- ing

aperture. It is usually most convenient to employ a telescope focused upon the radiant point, and to place the diffracting aper- tures immediately in front of the object-glass. What is seen through the eye-piece in any case is the same as would be depicted upon a screen in the focal plane.

Before proceeding to special cases it may be well to call attention to some gencral properties of the solution expressed by (2).4

1 Bridge, Phil. Mag., Nov. 1858.

WAVE THHORY

If, when the aperture is given, the wave-length (proportional to «~1) varies, the composition of the integrals is unaltered, provided ~ and 7 are taken universely proportional to a. A diminution of A thus leads to a simple proportional shrinkage of the diffraction pattern, attended by an augmentation of brilliancy in proportion TOA 2. ;

If the wave-length remains unchanged, similar effects are pro- duced by an increase in the scale of the aperture. The linear dimension of the diffraction pattcrn is inversely as that of the aperture, and the brightness at corresponding points is as the square of the arca of aperture.

If the aperture and wave-length increase in the same proportion, the size and shape of the diffraction pattern undergo no change.

We will now apply the integrals (2) to the case of a rectangular Rect- aperture of width @ parallel to « and of width 6 parallel to y. angular The limits of integration for z may thus be taken to be —4a and aperture.

+4a, and for y tobe —40,+36. We readily find (with substitution

for « of 2a/a ae me eu ab? nen "= a ar > a (3), fn : frre

as represcnting the distribution of light in the image of a mathematical point when the aperture is rectangular, as is often the case in spectroscopes.

The second and third factors of (3) being each of the form sin2u/2?2, we have to examine the character of this function. It vanishcs

when %=mn, m being any whole number other than zero. When w=0, it takes the value unity. The maxima occur when w=tanw,. (4),

and then sin 2x/u? =cos 21 (5). To calculate the roots of (5) we may assume u=(m+h)r-—y=U -y,

where y is a positive quantity which is small when w is large Substituting this, we find cot y=U — y, whence

1 y,¥ ye _ 2? y=q(1tg+ gt oe .) -— ae

This equation is to be solved by successive approximation. It will readily be found that

2 13 146

U-U gU iZU ios U ; (8)

In the first quadrant there is no root after zero, since tau u>w, and in the second quadrant there is none because the signs of w and tan ware opposite. The first root after zero is thus in the third quadrant, corresponding to m=1. Even in this case the series converges sufficiently to give the value of the root with considcrable accuracy, while for higher values of m it is all that could be desired. The actual values of u/m (calculated in another manner by Schwerd) are 1°4403, 2°4590, 3°4709, 4°4747, 5°4818, 6°4844, &c.

Since the maxima occur when u=(m+4)m nearly, the successive values are not very different from

4 4 4

mi'? Doak? dgqa? &

The application of these results to (3) shows that the field is Diffrac- brightest at the centre £=0,y=0, viz., at the geometrical image. tion

It is traversed by dark lines whose equations are

t=mfala, n=mfald. Within the rectangle formed by pairs of consecutive dark lines, and not far from its centre, the brightness rises to a maximum ; but these subsequent maxima are in all cases much inferior to the brightness at the centre of the entire pattern (¢=0,7=0).

pattern.

By the principle of energy the illumination over the entire foca] Total plane must be equal to that over the diffracting area ; and thus, in illumin-

accordance with the suppositions by which (3) was obtained, its ation.

value when integrated from = — o to =+ o, and from y= — to »=-+0 should be equal to ad, This integration, employed originally by Kelland? to determine the absolute intensity of a secondary wave, may be at once effected by means of the known

formula g Fin 2 + du = – oO Uu oO

It will be obscrved that, while the total intensity is proportional to ab, the intensity at the focal point is proportional to b%. If the aperture be increased, not only is the total brightness over the focal plane increased with it, but there is also a concentration of the diffraction pattern. The form of (3) shows immediatcly that, if a and b be altered, the coordinates of any characteristic poiut in the pattern vary as a-1 and 0-1,

The contraction of the diffraction pattern with increase of aperture is of fundamental importance with reference to the resolving power of optical instruments. According to common optics, where images are absolute, the diffraction pattern is sup-

2 Ed. Trans., xv. 315,

Os sin &

U=T.

Diffusion of images due to finite wave- length.

WAVE THEORY

posed to be infinitely small, and two radiant points, however near together, form separated images. This is tantamount to an assumption that a is infinitely small. The actual finiteness of A imposes a limit upon the separating or resolving power of an optical instrument.

This indefiniteness of images is sometimes said to be due to diffraction by the edge of the aperture, and proposals have even been made for curing it by causing the transition between the interrupted and transmitted parts of the primary wave to be less abrupt. Such a view of the matter is altogethcr misleading. What requires explanation is not the imperfection of actual images so much as the possibility of their being as good as we find them.

At the focal point (§=0,y7=0) all the secondary waves agree in phase, and the intensity is easily expressed, whatever be the form of the aperture. From the general formula (2), if A be the arca

of aperture, I,?=A2/a7f? . em @ (7).

The formation of a sharp imago of the radiant point requires that the illumination become insignificant when é, 7 attain small values, and this insignificance can only arise as a consequence of discrepancies of phase among the secondary waves from various parts of the aperture. So long as there is no sensible discrepancy of phase there can be no sensible diminution of brightness as compared with that to be found at the focal point itself. We may go further, and lay it down that there can be no considerable loss of brightness until the difference of phase of the waves pro- ceeding from the nearest and furthest parts of the aperture amounts to 4A.

When the difference of phase amounts to A, we may expect the resultant illumination to be very much reduced. In the par- ticular case of a rectangular aperture the course of things can be readily followed, especially if we conceive f to be infinite. In the direction (suppose horizontal) for which »=0, é/f=sin@, the phases of the secondary waves range over a complete period when sin?=A/a, and, since all parts of the horizontal aperture are equally effective, there is in this direction a complete compensation and consequent absence of illumination. When sin@=#aA/a, the phases range one and a half periods, and there is revival of illu- mination. We may compare the brightness with that in the direc- tion @=0. The phase of the resultant amplitude is the same as that due to the central secondary wave, and the discrepancies of phase among the components reduce the amplitude in the proportion

, 2

maximum at 6=0. In like manner we may find the illumination in any other direction, and it is obvious that it vanishes when sin 6 is any multiple of A/a.

The reason of the augmentation of resolving power with aper- ture will now be evident. The larger the aperture the smaller are the angles through which it is necessary to deviate from the principal direction in order to bring in specified discrepancies of phase—the more concentrated is the image.

4

1; so that thé brightness in this direction is 9,2 of the

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to his instrument would recognize the duplicity with certainty. The obliquity, corresponding to w=7, is such that the phases of the secondary waves range over a complete period, 7.¢., such that the projection of the horizontal aperture upon this direction is one wave-length. We conclude that a@ double line cannot be fairly resolved unless its components sub- tend an angle exceeding that sub- tended by the wave-length. of light at a distance equal to the horizontat aperture. This rule is convenient on account of its simplicity ; and it is sufficiently accurate in view of the necessary uncertainty as to what exactly is meant by resolu- tion.

On the expe- rimental eonfir-

0 # mation of the

Fig. 5. theory of the by ae power of rectangular apertures, sce Optics, vol. xvii. p. 807.

If the angular interval between the components of a double line be half as great again as that supposed in the figure, the brightness midway between is ‘1802 as against 1°0450 at the central lines of each image. Such a falling off in the middle must be more than sufficient for resolution. If the angle subtended by the components of a double line be twice that subtended by the wave-length at a distance equal to the horizontal aperture, the central bands are just clear of one another, and there isa line of absolute blackness in the middle of the combined images.

E ros,

~, ~. ~. 2

~ a et) nl

Since the limitation of the width of the central band in the Central image of a luminous line depends upon discrepancies of phase stops.

among the secondary waves, and since the discrepancy is greatest for the waves which come from the edges of the aperturc, the ques- tion arises how far the operation of the central parts of the aperture is advantageous. If we imagine the aperture reduced to two equal narrow slits bordering its edges, compensation will evidently be complete when the projection on an oblique dircction is equal to $A, Instead of A as for the complete aperture. By this procedure the width of the central band in the diffraction pattern is halved, and so far an advantage is attained. But, as will be evident, the bright bands bordering the central band are now not inferior to it in brightness ; in fact, a band similar to the central band is repro- duced an indefinite number of times, so long as there is no sensible discrepancy of phase in the secondary waves proceeding from the various parts of the same slit. Under these circumstances the narrowing of the band is paid for at a ruinous price, and the arrangement must be condemned altogether.

A more moderate suppression of the central parts is, however, sometimes advantageous. Thcory and experiment alike prove that a double line, of which the components are equally strong, is better resolved when, for example, one-sixth of the horizontal

Lumin- In many cases the subject of examination is a luminous line of : ‘ : ous line, uniform intensity, the various points of which are to bo treated as | SPof™ be clowed tg pass, while othorea Httle further removed hae ama ie aan big be ie = – Giffen – Le ae ed cae are blocked off. Stops, each occupying one-eighth of the width, ks tee y at any point ¢, y of the omen patiern May Ye | and with centres situated at the points of trisection, answer well P y +g Wak the required purpose. ue = 3 a% eva It has already been suggested that the principle of cnergy Total 3 1°dy = Mf wate? (8), requires that the general expression for I? in (2) when integrated intensity 5 over the whole of the plane ¢, 7 should be equal to A, where A propor- i is the area of the aperture. A general analytical verification has tional to the same law as obtains for a luminous point when horizontal | becn given by Stokes! The expression for J? may be

written in aperture. ery are alone considered. The definition of a fine vertical | the form ine, and consequently the resolving power for contiguous vertical 1 K ? ; lines, is thus independent of the vertical aperture of the instrument, cae erz) Wik cos 7 E(a' ~ 2) +n(y'-y) dady da dy'. (9), a law of great importance in the theory of the spectroscope. ; : : ! . Hos distribution of illumination in the image of a luminous line fas ey ot – = ete miedo gy pee _ io, is shown by the curve ABC (fig. 5), representing the value of the ? oe : oe oer function sin?x/u? from w=0 to u=2n. The part corresponding to Pee Be rae ae ated again. with respect to &, 9 over the negative values of u« is similar, OA being a line of symmetry. : A cache : : Double Let us now consider the distribution of brightness in the image In oes by order of ie, ohh = Len line, of a double line whose components are of equal strength, and at | T°SP°Ct %° me We ESE, TA Ss RY guys

such an angular interval that the central line in the image of one coincides with the first zero of brightness in the image of the other. In fig. 5 the curve of brightness for one component is ABO, and for the other OA'C'; and the curve representing half the combined brightnesses is E'BE. The brightness (corresponding to B) mid- way between the two central points AA' is '8106 of the brightness at the central points themselves. We may consider this to be about the limit of closencss at which there could be any decided appearance of resolution, though doubtless an observer accustomed

duce under the integral sign the factor etsFhn, the + or being chosen so as to make the elements of the integral vanish at infinity. After the operations have been performed, a and £ are to be supposed to vanish.

Thus //T°dédy= Limit of

Giff erPreos % { et ~n)+nly ~w) } dndydetdy/ dean

1 Ed. Trans., xx. p. 317, 1853.

+00 mee now a ee 'eee H)dt= 2a cos H

*2 athe ? and thus //** Idt dn= Limit of*

2 a 4aB daedy dax' dy' SPL ap OEY Se TPT oe —— ae a au, dat = au.

(a! =) _

a

The limits for wu are ultimately — oo and +00, and we have

ae: 2a da! a ft ae ye me nerccoon Beas, -2 f/f i

ene

Let

In like manner the integration for y' may be performed; and we

*find Sf*2 Vdtdn= ff dedy=A (10).*

We saw that I> (the intensity at the focal point) was equal to A?/.27?, If A' be the arca over which the intensity must be IG in order to give the actual total intensity in accordance with

AT P= [[TPP dtdn, the relation between A and A' is AA'=A2f?2, Since A' is in some sense the area of the diffraction pattern, it may be considered to be a rough criterion of the definition, and we infer that the definition of a point depends principally upon the area of the aperture, and only in a very secondary degree upon the shape when the arca is maintained constant. §12. Theory of Circular Aperture.

We will now consider the important case where the form of the aperture is circular. Writing for brevity .

nt /f=p, HE SG ee we i);

we have for the general expression (§ 11) of the intensity A2f2= 924.02, , (2), where S= //sin(px+qy) dedy, . (8), C= ff cos (pu+gqy) dedy, . (4).

When, as in the application to rectangular or circular apertures, the form is symmetrical with respect to the axes both of x and ¢ ; S=0, and C reduces to

C= f/f cospxcosqydxdy, . » 6), In the case of the circular aperture the distribution of light is of course symmetrical with respect to the focal point p=0, g=0; and C is a function of p and g only through A/(p?+¢”). It is thus sufficient to determine the intensity along the axis of p. Putting q=0, we get

C= ff cos pe dx dy=2 “cos pe A/(R? — 2%) da,

R being the radius of the aperture. This integral is the Bessel’s function of order unity, defined by

J (2) == [00s (zcos¢) sin¢d¢ . (6). Thus, if z=Reos¢,*

C=7R? re GA)

and the illumination at distance ry from the focal point is

4J ( ) pao ee) (8) ez =a” (e ‘ (i)

The ascending series for J,(z), used by Airy? in his original inves- tigation of the diffraction of a circular object-glass, and readily obtained from (6), is B # ae ral hO->~ site ee weet + + 9). When z is great, we may employ the semi-convergent series

es oe Bacay 35. IN? Os a/(&)sine-40)} Saree) 8.7 oie 5/1

5 NG, Bs BY z

2 yeas 1 0355. 7.1.37 08

+ J (gone ae z 8.16.94 @ See Owl 1 WB ANS

8.16.24. 32. 40 z a (10).

llIt is casy to show that this conclusion is not disturbed by the introduction at every point of an arbitrary retardation p, a function of x,y. The terms (p'—p) are then to be added under the cosine in (9); but they are ultimately without cffect, since the only elements which contribute are those for which in the limit z'=2, y'=y, and therefore p'=p.

2"On the Diffraction of an Object-Glass with Circular Aperture," Camb. Trans., 1834, –

Tod

WAVE THEORY

A table of the values of 22-1J,(z) has been given by Lommel,? to whom is due the first systematic application of Bessel's functions to the diffraction integrals,

The illumination vanishes in correspondence with the roots of the equation J,(z)=0. If these be called 2, 2, %, . . . the radii of the dark rings in the diffraction pattern are

*Sry Pre 2aR' QR'? * * * being thus inversely proportional to R.*

The integrations may also be effected by means of polar co- ordinates, taking first the integration with respect to ¢ so as to obtain the result for an infinitely thin annular aperture. Thus, if

L=pcos gh, y=psing, C= Sf cos px da dy= S Jy" cos (pp cos 6) pdp de. Now by definition*

ies gp Re Same ["cos (2 cos@) d0=1 ~ 55+ a9 —a5— on 4agat ao (liye

The value of C for an annular aperture of radius 7 and width dr is thus

AC = 25 q(pp)p dp, . For the complete circle,

2 pR Cn © Sle)ede

(12).

_2n oR? pA pPRo 7 pile .4°R..e °°: =m? 25,(PR) |

pk

as before.

In these expressions we are to replace p by Ké/f, or rather, since the diffraction pattern is symmetrical, by kr/7f, where r is the dis- tance of any point in the focal plane from the centre of the system.

The roots of J,(z) after the first may be found from

4 050661 053041 -262051

ces = Pesci 200! 13),

- = ey Gere GET 3) and those of J,(z) from

2 “151982 -015399 -245835

& gg egg — 151988 — a 14

ee are rane? EL oe

formule derived by Stokes from the descending series.5 The following table gives the actual values:—*

2 z 2 g i | =forJTo(2)=0 —forJ,@)=0 || ¢ = for Jo(e)=0 = for J,(z)=0 1 7655 1°2197 6 5°7522 6°2439 2 Te goral 2°2330 7 6°7519 7‘2448 3 2°7546 3°2383 3 7°7516 8°2454 4 Bh7iee! 4°2411 9 8°7514 9°2459 5 4°7527 5°2428 10 9°7513 10°2463

In both cases the image of a mathematical point is thus a sym- metrical ring system. The greatest brightness is at the centre, where adC=2rpdp, C=nR?,

For a certain distance outwards this remains sensibly unimpaired, and then gradually diminishes to zero, as the secondary waves become discrepant in phase. The subsequent revivals of bright- ness forming the

bright rings are necessarily of inferior brilliancy as compared with the central disk.

The first dark ring in the diffraction pattern of the complete circular aperture occurs when

rif = 1:2197 xa/2k . (15). We may compare this with the corresponding result for a rect- angular aperture of width a, Elf ala;

and it appears that in consequence of the preponderance of the central parts, the compensation in the case of the circle does not set in at so small an obliquity as when the circle is replaced by a rectangular aperture, whose side is equal to the diameter of the circle.

Again, if we compare the complete circle with a narrow annular aperture of the same radius, we see that in the latter case the first dark ring occurs at a much smaller obliquity, viz.,

rf = °7655 x A/2R.

It has been found by Herschel and others that the definition of Central a telescope is often improved by stopping off a part of the central stop.

area of the object-glass; but the advantage to be obtained:in this way is in no case great, and anything like a reduction of the aper- ture to a narrow annulus is attended by a development of the

3 Schlémtich, xv. p. 166, 1870. 4 Camb. Trans., vol. ix., 1850. 5 The descending series for Jo(z) appears to have been first given by Sir W. Hamilton in a memoir on " Fluctuating Functions," Roy, Jrish Trans., 1840.

ayer PTHEOR Y

external luminous rings sufficient to outweigh any improvement due to the diminished diameter of the central area.?

The maximum brightnesses and the places at which they occur are easily dctermined with the aid of certain properties of the Bessel's functions. It

is known? that

Jo (z)= -Jy(z), Tale) =— Ty(e) ~ Hye)

Maxi- mum of bright- ness,

(16); (17);

Je(2) +Io(2) == Jy) (18),

The maxima of C occur when (hE) _ HE) 10) _ o, a ? GaN 2 2 Z or by (17) when J,(z)=0.

determined,

When z has one of the values thus

® B Jx(2) = Jo(2).

The accompanying table is given by Lommel,® in which the first column gives the roots of J,(z)=0, ; ————___—__,-___- and the second and third columns z the corresponding values of the |~ -og9999_ functions specified. It appears | 5-135630 that the maximum brightness in | 8°417236 the first ring is only about +; of A es the brightness at the centre. 17959820

Nie will now investigate tho! ! _____/ total illumination distributed over the area of the circle of radius r. We have

22-1J\(z) | 42-23)2(2)

1000000 017498 004158 001601 000779 000437

-++1:000000

*— *182279 + °064482 — 040008*

++ +027919

*— *020905 – Inte- grated intensity. mR4 4J,°(2)*

P= Pt id : ae

(19),

where 2=QrRr/af. (20).

Thus

rw 2

On RE zdz—rR?, 2

Om af oe Now by (17), (18)

2-1J,2(z) dz.

2.1J\(2)=Jo(z) -Jy'(z); so that

d d 2-1Ji%(2)= -—4 Goo ®) = 47,01 ? and 2 v,. 2-1J,(2) dz=1-J,2(2) — Jy2(2) . (21).

*If 7, or z, be infinite, J9(z), J,(z) vanish, and the whole illumination is expressed by 7R%, in accordance with the general principle. In any case the proportion of the whole illumination to be found out- side the circle of radius 7 is given by * J ?(2) +572). For the dark rings J,(z)=0; so that the fraction of illumination outside any dark ring is simply J,. Thus for the first, second, third, and fourth dark rings we get respectively 161, '090, ~~062, '047, showing that more than ths of the whole light is concen~~ trated within the area of the second dark ring. When z is grcat, the descending series (10) gives*

a) = 2 /(Z)sme-¥) é

so that the places of maxima and minima occur at equal intervals. The mean brightness varies as z~° (or as r~8), and the integral found by multiplying it by zdz and integrating between 0 and converges. It may be

instructive to contrast this with the case of an in- finitely narrow annular aperture, where the brightness is propor- tional to J,(z). When z is great,*

Jo(z) = J(2) cos(¢—47).

The mean brightness varies as 2-1; and the integral J, TXa)zdz

(22);

is not convergent.

The efficiency of a telescope is of course intimately connected with the size of the disk by which it represents a mathematical point. The resolving power upon double stars of telescopes of various apertures has been investigated by Dawes and others (Optics, vol. xvii. p. 807), with results that agree fairly well with theory.

If we integrate the expression (8) for I? with respect to 7, we shall obtain a result applicable to a linear luminous source of which the various parts are supposed to act independently.

power of tele-

Scopes.

Luminous line,

1 Airy, loc. cit. 'Thus the magnitude of the central spot is diminished, and the brightness of the rings increased, by covering the central parts of the object- glass," 2 Todhunter's Laplace's Functions, ch. Xxxi.

3 Loe. cit. 4 Phil. Mag., March 1881,

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From (19), (20)

ae 2R4 ce} 5 at f ee Ldn ai af 4z-2J,?(z) dn =2R? dt – (2) dz since n?=7? — £2, 7 If we write (CSUN 9 5 6 4 & (23), whe » JP (z)dz we get ad ve Ld*

= oR2d is oy (2)ae i é nes uy] ¢ , nIG-O) (24)

This integral has been investigated by H. Struve,® who, calling to his aid various properties of Bessel's functions, shows that

Tees 21 , : Tees.

*i IGE) 22 f sin (2¢sin 8)cos*BdBp . (25),*

of which the right-hand member is readily expanded in powers of ¢. By means of (24) we may verify that

+0

Leaef, 12d =aR?.

Contrary to what would naturally be expected, the subject is more easily treated without using the results of the integration with respect to « and y, by taking first of all, as in the investiga- tion of Stokes (§ 11), the integration with respect to y, Thus

nape [t? 12d Limit of —~o

ff vor E(x'-2x)+n(y'-y) da dy dzx' dy' dn. (26); and [eri Preos 5 g(a' -2) + nly -y)t dn

26 cos (al —«)

= — ar 27). e+ (y -y) (7) if We have now to consider E We 28 dy dy' (28) B+ Ky! — y)?/f?*

In the integration with respect to y' every element vanishes in the limit (8=0), unless y'/=y. If the range of integration for y' includes the valuc 7, then ces 28 dy' Se Sait fara ap otherwise it vanishes. The limit of (28) may thus be denoted by Af Y, where Y is the common part of the ranges of integration for 7/ and y corresponding to any values of z' and z. Hence

ae Pan a-17-1 ff Yeos e (a! — x) dae da!

=f ¥c0s”$ cos SE ade ere (025).

if, as for the present purposc, the aperture is symmetrical with respect to the axis of y. In the application to the circle we may write

+o RR Kia tae! 2dy—=4a-1f-1 eee eee ’ ye Pdn=4a-f vg Ycos Ff Os F da dz’,

where Y is the smallcr of the two quantities

2n/(R?—a”?), 2a/(R?- 2°), z.e., corresponds to the larger of the two abscisse 2’, x If we take Y=2,/(R?-x?), and limit the integration to those values of x’ which are less than x, we should obtain exactly the half of the required result. Thus

[er Panter yf MB 22) cos cos EE dada! —% 0 So HE ij R -if /(R2 = 22) sin 28" dee ESO : op a eS Fe mESO uf

Hence, writing as before (= a » We get

af “Ldn = eal T 08% sin(2¢g)d8. . (30),

in which we may replace dt/t by d¢/¢, in agreement with the result obtained by Struve. The integral in (30) may be written in another form. We have

*J ¢sin{2¢8)cos”B dB = — 4c0s 8 cos(2¢sin B) — 4 / cos(2¢sin B)sin 8 dp; and thus OD ap Bi : ; Ve ¢sin (2¢a)eos*aap—4 f, 1-cos(2¢sin 8) sin B dB*

-f =? na(caeyailads (31).

5 Wied, Ann., xvii, 1008, 1882.

SX, == 98,

Double line.

Compari- son with rect- angular

aperture.

Uniform field of light ter- minated by straight edge.

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The integral is thus expressible by means of the function K,,! and we have

*ae ** Pd = 488d CK (20) (32).*

The ascending series for K,(z) is I id Og a K@=i)ae-maretmee f+; 8 and this is always convergent. The descending semi-cortivergent series is

Ke == 24272 =3.2-84 12,32,5.2-5- 12,82. 52.7.2-74+ 2, 2_ AV\(22_ = a/ (2)-coste-am) {1 – SO aba

, 1.2.(82)? – a/ (2).sine—am) tees (34),

Ped (i= 8s” —- 657-4) Le =i 2B.

the series within braces being the same as those which occur in

the expression of the function J,(z).

When ¢ (or £) is very great,

2

dt vA ec ode,

so that the intensity of the image of a luminous line is ultimately inversely as the square of the distance from the central axis, or geometrical image.

As is evident from its composition, the intensity remains finite for all values of (: it is, however, Oo subject to fluctuations presenting

¢ | Intensity.

maxima and minima, which have | On the axis itself..| 0-00 1 been calculated by Ch. André,? See me a = 7 Irst Maxi1mum…. ” using apparently the method of | cocona minimum. | 6-80 bo quadratures. Second maximum.]| 8-00 ae The results are also exhibited gird minimum…. in ats 54 : ird maximum…| 11° xt by M. André in the form of a Beers Mint | 18-90 te ba

curve, of which fig. 6 is a copy.

It will be seen that the distribution of brightness does not differ greatly from that due to a rectangular aperture whose width (perpendicular to the luminous line) is equal to the diameter of the circular aperture. It will be in- structive to examine the image of a double line, whose components present an interval correspond- ing to (=a, and to compare the result with that already found for a rectangular aperture (§ 11). We may consider the brightness at distance ¢ pro- portional to

1 92¢2 Ud) Ss Tro

2ae Bee 7 In the compound image the illumination at the geometrical focus of one of the luminous lines is represented by L(0)+ L(x) ;

and the illumination midway between the geo-

n (35).

metrical images of thé two lines is SNS ae ee Oe 2L(47). Fig. 6. We find by actual

calculation from the = ‘33338, so that L(0) + L(m) = 3497, 2L(32) = 8342, 2L ($7) _ L(0)+L® © The corresponding number for the rectangular aperture was ‘811 ; so that, as might have been expected, the resolving power of the circular aperture is distinctly less than that of the rectangular aperture of equal width. Hence a telescope will not resolve a double line unless the angular interval between them decidedly exceeds that subtended by the wave-length of light at a distance equal to the diameter of the object-glags. Experiment shows that resolution begins

when the angular interval is about a tenth part greater than that mentioned.

If we integrate (30) with respect to & between the limits — oo and +o we obtain wR?, as hasalready been remarked. This represents the whole illumination over the focal plane due to a radiant point whose inlage is at O, or, reciprocally, the illumination at O (the same as at any other point) due to an infinitely extended luminous area, If we take the integration from £ (supposed positive) to oo we get the illumination at O due to a uniform luminous area extending over this region, that is to say, the illumination at a point situated at distance ~ outside the border of the geometrical image of a large uniform area. Ifthe point is supposed to be inside the geometri- cal image and at a distance ¢ from its edge, we are to take the in-

1 Theory of Sound, § 802. 2 Ann, d. U Ecole Normale, v. p. 810, 1876.

series, L(m)=-0164, L(}r)=-167i, L(0)

and 955.

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tegration from —o to é. Thus, if we choose the scale of intensities

so that the full intensity is unity, then the intensity at a distance

corresponding to + ¢ (outside the geometrical image) may be repre-

sented by (), and that at a distance – ¢ by if(-(¢), where (¢)+3(—{) =1,

*and EQ=5-f CPaeKeQ=4-3- [°C-*aC KOO). . (86).*

This is the result obtained by Struve, who gives the following series for 3(). The ascending series, obtained at once by integration from (33), is @) 2 ee gai 201 ES Cees HC) = 4 1 ral ” 2n -—1 17.37.57… (2n+1)?° (37). When ¢ is great, we have approximately from the descending series ay Aa 1 cos(2¢+41) 80m otha) aan ge Thus “at great distances from the edge of the geometrical image the intensity is inversely proportional to the

distance, and to the radius of the object-glass." The following table, abbreviated from that given by Struve, will serve to calculate the enlargement of an image due to diffraction in any case that may arise. —

C=2rRe/a/. a =()=1-2(+¢). ¢ £(¢) 4 ¥(¢) 4 £(¢) 0°0 5000 2°5 0765 7°0 0293 0°5 3678 3°0 0630 9°0 "0222 10 "2521 4°0 "0528 11:0 0186 igs) "1642 5:0 0410 15°0 0135 2°0 1073 6°0 0328

It may perhaps have struck the reader that there is some want of rigour in our treatment of (30) when we integrate it over the whole focal plane of ¢, , inasmuch as in the proof of the formule £and 7 are supposed to be small. The inconsistency becomes very apparent when we observe that according to the formule there is no limit to the relative retardation of secondary waves coming from various parts of the aperture, whereas in reality this retardation could never exceed the longest line capable of being drawn within the aperture. It will be worth while to consider this point a little further, although our limits forbid an extended treatment.

The formula becomes rigorous if we regard it as giving the illumination on the surface of a sphere of very large radius /, in a direction such that

é=/fsin Ocosd, n=/sin ésing ; it may then be written

P= a-2f-2 f/f cose { (a! — a) sin Acosp +(y' —y)sin @sin }dedyda! dy'.

The whole intensity over the infinite hemisphere is given by

w fir Af" I?sin 6 dé d¢.

According to the plan formerly adopted, we postpone the intcgra- tion with respect to x, y, x', y', and take first that with respect to gand ¢. Thus fora single pair of elements of area dx dy, da! dy' we have to consider

ff sue (~2)sin dos 9+ (y'-¥) sin 6sing }sing dé do,

or, if we write

(38).

xe’ -#=recosa, y —y=rsina,

An (27 : vA v4 cos(xrsin 6cos) sin dé dd.

Now it may be proved (¢.g., by expansion in powers of xr) that

br 2 vA yi “cos(rersin 0cos#)sind dadp—2m —. , (89); 0 /0 — and thus Qa sin kr ‘ {= ahh yp Cady de dy (40),

r being the distance between the two elements of area dx dy, dx’dy/. In the case of a circular area of radius R, we have 3

sin xr pat, 2TR?§ , J,(2eR) MY ep edly dat! dy’ = a 1 r= , and thus . f— aR? 1 et (41). cR When cR=0,

=7R?, as before. 3 Theory of Sound, § 302.

Struve’s results.

Integra- tion of intensity further con- sidered.

WAVE

It appears therefore that according to the assumed law of the secondary wave the total illumination is proportional to the area of aperture, only under the restriction that the linear dimensions of the aperture are very large in comparison with the wave-length. A word as to the significance of (39) may not be out of place. We know that y=cose{sin@cospx+sin dsingy +cosdz} 0 6 (42)

satisfies Laplace’s extended equation (v?+«?))=0, being of the form cosxz’, where # is drawn in an oblique direction; and it follows that // y sin 60 d@ satisfies the same equation. Now this, if the integration be taken over the hemisphere =0 to =}2, must become a function of 7, or s/(a?+y?+2%), only.

Hence, putting =r, y=0, z=0, we get

am (2 : Hf vinedoao= uA “cos (xrsin 6cos)sin eded¢.

But the only function of 7 which satisfies Laplace's equation continuously through the origin is A sin «r/(x7r); and that A=2z is proved at once by putting r=0. The truth of the formula may also be established independently of the differential equation by

ko (72 equating the values of "A 7 sin 6dédd¢, whenx=7, y=0, 2=0,

and when x=0, y=0, z=7. Thus

au f Qe B ' 3 rag cos(«rsin@cos¢)sin édéd@

1 2

a 2 sin xr

cos (Krcos 6)sin db dp =2n —-

The formula itself may also be written

ef OR. ¥

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By measurements of coronas it is possible to infer the size of the particles to which they are due, an application of considerable interest in the case of natural corona—the general rule being the larger the corona the smaller the water spherules, Young employed this method not only to determine the diameters of cloud particles (¢.9-, tvo~ inch), but also those of fibrous material, for which the theory is analogous. His instrument was ealled the eriometer.?

§ 13. Influence of Aberration. Optical Power of Instruments.

Our investigations and estimates of resolving power have thus Optical far proceeded upon the supposition that there are no optical errors.

imperfections, whether of the nature of a regular aberration or dependent upon irregularities of material and workmanship. In practice there will always be a certain aberration or error of phase, which we may also

regard as the deviation of the actual wave- surface from its intended position. In general, we may say that aberration is unimportant, when it nowhere (or at any rate over a relatively small area only) exceeds a small fraction of the wave- length (A). Thus in estimating the intensity at a focal point, where, in the absence of aberration, all the secondary waves would have exactly the same phase, we see that an aberration nowhere exceeding $a can have but little effect.

The only case in which the influence of small aberration upon Unsym- the entire image has been calculated is that of a rectangular metrical aperture, traversed by a cylindrical wave with aberration equal to aber- cw. The aberration is here unsymmetrical, the wave being in ration.*

advance of its proper place in one half of the aperture, but behind in the other half. No terms in x or 2? need be considered. The first would correspond to a general turning of the beam; and the second would imply imperfect focusing of the central parts. The

% 4! o(xr sin) sin 6d = a ing (43). effect of aberration may be considered in two ways. We may 0 ue suppose the aperture (a) constant, and inquire into the operation Coronas The results of the preceding theory of circular apertures admit | of an increasing aberration ; or we may take a given value of ¢ (z.e., or of an interesting application to coronas, such as are often seen | a given wave-surface) and examine the effect of a varying aperture. glories. encircling the sun and moon, They are due to the interposition of | The results in the second case show that an increase of aperture

small spherules of water, which act the part of diffracting obstacles. In order to the formation of a well-defined corona it is essential that the particles be exclusively, or preponderatingly, of one size. If the origin of light be treated as infinitely small, and be seen iu focus, whether with the naked eye or with the aid of a telescope, the whole of the light in the absence of obstacles would be concen- trated in the immediate neighbourhood of the focus. At other parts of the field the effect is the same, by Babinet's principle, whether the imaginary screen in front of the object-glass is gene- rally transparent but studded with a number of opaque circular disks, or is generally opaque but perforated with

corresponding apertures. Consider uow the light diffracted in a direction many times more oblique than any with which we should be concerned, were the whole aperture uninterrupted, and take first the effect of

up to that corresponding to an extreme aberration of half a period has no ill effect upon the central band (§ 11), but it increases unduly the intensity of one of the neighbouring lateral bands; and the practical conclusion is that the best results will be obtained from an aperture giving an extreme aberration of from a quarter to half a period, and that with an increased aperture aberration is not so much a direct cause of deterioration as an obstacle to the attainment of that improved definition which should accompany the increase of aperture.

If, on the other hand, we suppose the aperture given, we find that aberration begins to be distinctly mischievous when it amounts to about a quarter period, 7.e., when the wave-surface deviates at each end by a quarter wave-length from the true plane.

For the focal point itself the calculations are much simpler. Circular We will consider the case of a circular object-glass with a sym- aperture. metrical aberration proportional to hp. The vibration will be re- gymme-

presented by trical Ve cos (nt — hp) pdp,*

a single small aperture. The light in the proposed direction is that determined by the sizo of the small aperture in accordance with the laws already investigated, and its phase depends upon the position of the aperture. If we take a direction such that the light

aberra- (of given wave-length) from a single aperture vanishes, the evan-

tion.

escence continues even when the whole series of apertures is brought into contemplation. Hence, whatever else may happen, there must be a system of dark rings formed, the same as from a single small aperture. In directions other than these it is a more delicate question how the partial effects should be compounded. If we make the extreme suppositions of an

infinitely small source and absolutely homogeneous light, there is no escape from the conclusion that the light in a definite direction is arbitrary, that is, dependent upon the chance distribution of apertures. If, however, as in practice, the light be heterogeneous, the source of finite area, the obstacles in notion, and the discrimination of different directions imperfect, we are concerned merely with the mean brightness found by varying the arbitrary phase-relatious, and this is obtained by simply multiplying the brightness due to a single aperture by the number of apertures (7).1 The diffraction pattern is therefore that due to a single aperture, merely brightened x times.

In his experiments upon this subject Fraunhofer employed plates of glass dusted over with lycopodium, or studded with small metallic disks of uniform size; and he found that the diameters of the rings were proportional to the length of the waves and in- versely as the diameter of the disks.

In another respect the observations of Fraunhofer appear at first sight to be in disaecord with theory; for his measures of the diameters of the red rings, visible when white light was employed, correspond with the law applicable to dark rings, and not to the different law applicable to the luminous maxima. Verdet has, however, pointed out that the observation in this form is essentially different from that in which homogeneous red light is employed, and that the position of the red rings would correspond to the absence of blue-green light rather than to the greatest abundance of red light. Verdet's own observations, conducted with great care, fully eonfirm this view, and exhibit a complete agreement with theory.

1 See § 4.

in which the radius of the aperture is supposed to be unity. The intensity is thus expressed by

*rou [2f *costtet)pdp | + [_2/,*sin(ip')pdp | – ely*

the scale being such that the intensity is unity when there is no aberration (h=0). By integration by parts it can be shown that a

i. : 7 ao ae af a” pdp=e™ } 1 Sh __ (ih) 4

6.10 6.10.14

so that ; ee ae 2 ff cos(ipt)pdp=oosh 1 tet ar ag- cs sina T 2 [sin(tp”) pdp=sin 1-2) 4 OO – a Leena y ooo a Le*

Hence, when 4=4r, 2 4 1 0s (dmp) pdp= 1°32945/4/2, af, ‘sin (dup!) pdp=“35424/x/2,*

[2 = +9464. Similarly, when h=47 ” -[2= 8008 ; and when h=7,

12 = “8947.

2 “ Chromatics,” in vol. iii. of Supp. to Ency. Brit., 1817, 3 “Investigations in Optics,” Phil. Mag., Nov. 1879.

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These numbers represent the influence of aberration upon the intensity at the central point, upon the understanding that the focusing is that adapted to a small aperture, for which 2 might be neglected. If a readjustment of focus be permitted, the num- bers will be sensibly raised. The general conclusion is that an aberration betwcen the centre and circumference of a quarter period has but little effect upon the intensity at the central point of the image.

Disturb- ‘a an application of this result, let us investigate what amount ance due of temperature disturbance in the tube of a telescope may be to varia- expected to impair definition. According to Biot and Arago, the tion of index y for air at ¢° C. and at atmospheric pressure is given by temper- ; i= “00029 ature, BO’ T+ 0087 ¢’ If we take 0° C. as standard temperature,

: du= —1°1¢x 10-8, Thus, on the supposition that the irregularity of temperaturet extends through a length 7, and produces an acceleration of a quarter of a wave-length,

ZA=1°11¢x 10-8; or, if we take A=5°3 × 10-5, ti=12,

the unit of length being the centimetre.

We may infer that, in the case of a telescope tube 12 cm. long, a stratum of air heated 1° C. lying along the top of the tube, and occupying a moderate fraction of the whole volume, would pro- duce a not insensible effect. If the change of temperature pro- gressed uniformly from one side to the other, the result would be a lateral displacement of the image without loss of definition; but in general both cffects would be observable. In longer tubes a similar disturbance would be caused by a proportionally less dif- ference of temperature.

We will now consider the application of the principle to the formation of images, unassisted by reflexion or refraction.! The function of a lens in forming an image is to compensate by its vari- able thickness the differences of phase which would otherwise exist between secondary waves arriving at the focal point from various parts of the aperture (Optics, vol. xvii. p. 802). If we sup- pose the diameter of the lens to be given (2R), and its focal length Jf gradually to increase, the original differences of phase at the image of an infinitely distant luminous point diminish without limit. When / attains a certain value, say f;, the extreme error of phase to be compensated falls to 4a. But, as we have seen, such an error of phase causes no sensible deterioration in the definition; so that from this point onwards the lens is useless, as only improving an image already sensibly as perfect as the aperture admits of. Throughout the operation of increasing the focal length, the resolving power of the instrument, which depends only upon the aperture, remains unchanged ; and we thus arrive at the rather startling conclusion that a telescope of any degree of resolving power might be constructed without an object-glass, if only there were no limit to the admissible focal length. This last proviso, however, as we shall see, takes away almost all practical importance from the proposition.

To get an idea of the magnitudes of the quantities involved, let us take the case of an aperture of + inch, about that of the pupil of the eye. The distance Jy, Which the actual focal length must exceed, is given by

MAP +R) -f,=4;

JiH2Rn . ww, Thus, if A=aog00> R=, we find J, = 800 inches. The image of the sun thrown upon a screen at a distance exceeding 66 feet, through a hole 4 inch in diameter, is therefore at least as well defined as that seen direct,

As the minimum focal length increases with the square of the aperture, a quite impracticable distance would be required to rival the resolving power of a modern telescope. Even for an aperture of 4 inches, /; would have to be 5 miles,

Images by simple aper- tures.

so that

(4).

Simple A similar argument may be applied to find at what point an versus achromatic lens becomes sensibly superior to a single one, The achro- question is whether, when the adjustment of focus is correct for the matic central rays of the spectrum, the error of phase for the most lens. extreme rays (which it is necessary to consider) amounts to a

quarter of awave-length. If not, the substitution of an achromatic lens will be of no advantage. Calculation shows that, if the aper- ture be 4 inch, an achromatic lens has no sensible advantage if the focal length be greater than about 11 inches. If we suppose the focal length to be 66 feet, a single lens is practically perfect up to an aperture of 1°7 inch.

Some estimates of the admissible aberration in a spherical lens have already been given under Optics, vol. xvii. p. 807. Ina similar manner we may estimate the least visible displacement of

1 Phil. Mag., March 1881.

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the eye-piece of a telescope focused upon a distant object, a Accu-

question of interest in connexion with range-finders. It appears ? racy of that a displacement 8f from the true focus will not sensibly focusing. impair definition, provided

af

2R being the diameter of aperture. The linear accuracy required is thus a function of the ratio of aperture to focal length. The formula agrees well with experiment.

The principle gives an instantaneous solution of the question of Delicacy the ultimate optical efficiency in the method of ‘ mirror-reading,” of mirror- as commonly practised in various physical observations. A rotation reading. by which one edge of the mirror advances }a (while the other edge retreats to a like amount) introduces a phase-discrepancy of a whole period where before the rotation there was complete agreement.

A comparison with the method of a material pointer, attached to Compari- the parts whose rotation is under observation, and viewed through son with a microscope, is of interest. The limiting efficiency of the micro- material – scope is attained when the angular aperture amounts to 180° pointer, (Microscopg, vol. xvi. p. 267; Optics, vol. xvii. p. 807); and it is evident that a lateral displacement of the point under observation through 4A entails (at the old image) a phase-discrepancy of a whole period, one extreme ray being accelerated and the other retarded by half that amount. We may infer that the limits of efficiency in the two methods are the same when the length of the pointer is equal to the width of the mirror.

An important practical question is the amount of error admis- Admis- sible in optical surfaces. In the case of a mirror, reflecting sible at nearly perpendicular incidence, pA errors there should be no deviation from A’ of optical truth (over any appreciable area) of ; surfaces. more than $A. For glass, ~-1=4 nearly; and hence the admissible error in a refracting surface of that material 4 is four times as great.

In the case of oblique reflexion at an angle ¢, the error of retardation due to an elevation BD (fig. 7) is QQ’ — QS = BDsec (1 — cos8QQ’) = BD sec $(1+cos2¢)=2BDcos¢ ; from which it follows that an error of given

magnitude in the figure of a surface is less important in oblique than in perpendicular reflexion. It must, however, be borne in mind that errors can sometimes be compensated by altering adjustments. If a surface intended to be flat is affected with a slight general curvature, a remedy may be found in an alteration of focus, and the remedy is the less complete as the reflexion is more oblique.

The formula expressing the optical power of prismatic spectro- Optical scopes is given with examples under Optics, vol. xvii. p. 807, and power of may readily be investigated upon the principles of the wave theory. prisms, Let AB, (fig.8) be a plane wave-surface of the light before it falls upon the prisms, AB the correspouding wave-surface for a parti- cular part of the spectrum after the light has passed the prisms, or after it has passed Fig. 8. the eye-piece of the observing telescope. The path of a ray from the wave-surface A,B, to A or B is determined by the condition that the optical distance, /uds, is a minimum (Optics, vol. xvii.

798); and, as AB is by supposition a wave-surface, this optical distance is the same for both points. Thus

J ds (for A) = [ds (for B) . . 4OY. We have now to consider the behaviour of light belonging to a neighbouring part of the spectrum. The path of a ray from the wave-surface AyBy to the point A is changed ; but in virtue of the minimum property the change may be neglected in calculating the optical distance, as it influences the result by quantities of the second order only in the changes of refrangibility. Accordingly, the optical distance from AjB, to A is represented by

JS (ut du)ds, the integration being along the original path Bg. i. Ae

Fig. 7.

Ao

ai

&o

? and similarly the optical distance between A,B, and B is represented

by /(u+8u)ds, the integration being along By… B. In virtue of (6) the difference of the optical distances to A and B is

JS suds (along By… B)- fduds (along A,... A). The new wave-surface is formed in such a distance is constant; and therefore the dispersion, or the angle through which the wave surface is turned by the change of refrangibility, is found simply by dividing (7) by the distance AB. If, as in common flint-glass spectroscopes, there is only one dispers- ing substance, Si du.ds—8y.s, where s is simply the thickness tra- versed by the ray. If ¢, and ¢, be the thicknesses traversed by the

2 Phil. Mag., xx. p. 354, 1885,

(7).

position that the optical

evi PAE OR Y

extreme rays, and a denote the width of the emergent beam, the dispersion @ is given by 6=Sy(t,—4)/a,

O=Spt/a . (8). The condition of resolution of a double line whose components subtend an angle is that must exceed A/a. Hence, in order that a double line may be resolved whose components have indices pand »+6y, it is necessary that ¢ should exceed the value given by the following equation :—

at! (9). For applications of these results, see SPECTROSCOPE.

or, if ¢, be negligible,

§ 14. Theory of Gratings.

The general explanation of the mode of action of gratings has been given under Lieut (vol. xiv. p. 607). If the grating be com- ee of alternate transparent and opaque parts, the question may

e treated by means of the general integrals (§11) by merely limiting the integration to the transparent parts of the aperture. For au investigation upon these lines the reader is referred to Airy's Tracts and to Verdet's Legons. If, however, we assume the theory of a simple rectangular aperture (§ 11), the results of the ruling can be inferred by elementary methods, which are perhaps imore instructive.

Apart from the ruling, we know that the image of a mathematical line will be a series of narrow bands, of which the central one is by far the brightest. At the middle of this band there is complete agreement of phase among the secondary waves. The dark lines which separate the bands are the places at which the phases of the secondary wave range over an integral number of periods. If now we suppose the aperture AB to be covered by a great number of opaque strips or bars of width d, separated by transparent inter- vals of width a, the condition of things in the directions just spoken of is not materially changed. At the central point there is still complete agreement of phase ; but the amplitude is dimin- ished in the ratio of a: a+d. In another direction, making a small angle with the last, such that the projection of AB upon it amounts to a few wave-lengths, it is easy to see that the mode of interference is the same as if there were no ruling. For example, when the direction is such that the projection of AB upon it amounts to one wave-length, the elementary components neutralize one another, because their phases are distributed symmetrically, though discontinuously, round the entire period. The only effect of the ruling is to diminish the amplitude in the ratioa: a+d; and, except for the difference in illumination, the appearance of a line of light is the same as if the aperture were perfectly free.

The lateral (spectral) images occur in such directions that the projection of the element (a+d) of the grating upon them is an exact multiple of A. The effect of each of the n elements of the grat- ing is then the same ; and, unless this vanishes on account of a parti- cular adjustment of the ratio a: d, the resultant amplitude be- comes comparatively very great. These directions, in which the retardation between A and B is exactly mma, may be called the principal direetions. On either side of any one of them the illum- ination is distributed according to the same law as for the central image (m=0), vanishing, for example, when the retardation

amounts to (mn+1)a. In considering the relative brightnesses of the different spectra, it is therefore sufficient to attend merely to the principal directions, provided that the whole deviation be not so great that its cosine differs considerably from unity.

We have now to consider the amplitude due to a single element, which we may conveniently regard as composed of a transparent part @ bounded by two opaque parts of width 4d. The phase of the resultant effect is by symmetry that of the component which comes from the middle of a. The fact that the other components have phases differing from this by amounts ranging between -amn/(a+d) causes the resultant amplitude to be less than for the central image (where there is complete phase agreement). Tf B, denote the brightness of the m lateral image, and B, that of the central image, we have*

amr

E..:B heh 2 cocci _2amn7? _ fatd ? in 20™ ke _amr "atd\) \ amr a+d a+d

If B denote the brightness of the central image when the whole of the space occupied by the'grating is transparent, we have By: B=a?:(a+d)?,

(1).

and thus Bn: B=

1

*mx atd @). The sine of an angle can never be greater than unity ; and con- sequently under the most favourable circumstances only 1/m?x? of the original light cau be obtained in the m** spectrum. We con- clude that, with a grating composed of transparent and opaque parts, the utmost light obtainable in any one spectrum is in the first,*

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and there amounts to 1/x', or about 4, and that for this purpose a and d must be equal. When d=a, the general formula becomes Equal

sin ? 4mr opaque Ba: B= er = wed (3), and trans-

showing that, when m is even, B», vanishes, and that, when m is odd, er : Bn: B=1/m?x?. The third spectrum has thus only 4 of the brilliancy of the first.

Another particular case of interest is obtained by supposing `Trans- small relatively to(a`*+d). Unless the spectrum be of very high parent order, we have simply parts*

Bae B= {a/(a+d)}? (4); small, so that the brightnesses of all the spectra are the same.

The light stopped by the opaque parts of the grating, together with that distributed in the central image and lateral spectra, ought to make up the brightness that would be found in the central image, were all the apertures transparent. Thus, if a=d, we should have

yt 1.2 ee lap 47+ (145 tygt s+) which is true by a known theorem. In the general case

ee el eee Oe 2 n? (2a) a+d \a+d Gna)

5} 2 oe si Tw m=) ™M a formula which may be verified by Fourier's theorem.

According to a general principle formulated by Babinet, the Babinet's brightness of a lateral spectrum is not affected by an inter- prineiple. change of the transparent and opaque parts of the grating. The vibrations corresponding to the two parts are precisely antagonistic, since if both were operative the resultant would be zero. So far as the application to gratings is concerned, the same conclusion may be derived from (2).

From the value of By : B, we see that no lateral spectrum can sur- pass the central image in brightness ; but this result depends upon the hypothesis that the ruling acts by opacity, which is geuerally very far from being the case in practice. In an engraved glass grat- Gratings ing there is no opaque material present by which light could be aeting by absorbed,

and the effect depends upon a difference of retardation in retarda- passing the alternate parts. It is possible to prepare gratings which tion, give a lateral spectrum brighter than the central image, and the ex- planation is easy. For if the alternate parts were equal and alike transparent, but so constituted as to givearelative retardation of 4X, it is evident that the central image would be entirely extin- guished, while the first speetrum would be four times as bright as if the alternate parts were opaque. If it were possible to introduce at every part of the aperture of the grating an arbitrary retardation, all the light might be concentrated in any desired spectrum. By The supposing the retardation to vary uniformly and continuously we whole fall upon the case of an ordinary prism ; but thereis then no diffrac- light in tion spectrum in the usual sense. To obtain suchit would be neces- one sary that the retardation should gradually alter by a wave-length speetrum. in passing over any element of the grating, and then fall back to

Oblique ineidence.

Fig. 10.

its previous value, thus springing suddenly over a wave-length. It is not likely that such a result will ever be fully attained in practice ; but the case is worth stating, in order to show that there is no theoretical limit to the concentration of light of assigned wave-length in one spectrum, and as illustrating the frequently observed unsymmetrical character of the spectra on the two sides of the central image aq We have hitherto supposed that the light is inci- <> dent perpendicularly upon the grating ; but the theory 6 is easily extended. If the incident rays make an angle with the normal (fig. 9), and the diffracted ang rays make an angle ¢ (upon the same side), the rela- Bae tive retardation from each element of width (a+d) to the next is (a+d) (sin+sin); and this is the quantity which is to be equated to ma. Thus sin 6+sing=2sin4(6 + ¢).cos$(6-— ¢)=ma/(a+a) (5). The ‘‘deviation” is (0+), and is therefore a minimum when 6=¢, t. ¢., when the grating is so situated that the angles of inci- dence and difiraction are equal. d ‘ In the case of a reflexion grating the same method applies. If Refleeting 6 and ¢ denote*

the angles with the normal made by the incident grating. and diffracted rays, the formula (5) still holds, and, if the deviation be reckoned from the direction of the regularly reflected rays, it is expressed as before by (+), and is a minimum when 6=4¢, that is, when the diffracted rays re- turn upon the course of the incident rays. ; In either case (as also with a prism) the posi- tion of minimum deviation leaves the width of se the beam unaltered, ¢.¢., neither magnifies nor diminishes the angular width of the object under view. ; From (5) we see that, when the light falls perpendicularly upon bal ees. 1 Phil, Mag., xivii. 193, 1874. A.

Grating

sponding to m=0 not being counted as a spectrum), if the grating interval o or (a+d) is less than a. Under these circumstances, if the material of the grating be completely transparent, the whole of the light must appear in the direct image, and the ruling is not perceptible. From the absence of speetra Fraunhofer argued that there must be a microscopic limit represented by A; and the infer- ence is plausible, to say the least.! Fraunhofer should, however, have fixed the microscopic limit at 4a, as appears from (5), when we suppose 6=47, d=4dr.

Resolving We will now consider the important subject of the resolving

power.

No theo- retical limit.

Expres- sion for « disper- sion.”*

Aceu- raey of ruling.

power of gratings, as dependent upon the number of lines (7) and the order of the spectrum observed (m). Let BP (fig. 11) be the direction of the

B

principal maximum (middle of central band) for ¢ the wave-length a in the mt spectrum. Then the

relative retardation of the extreme rays (corre- ip sponding to the edges A, B of the grating) is mna. ms

If BQ be the direction for the first minimum (the Fig. 11

darkness between the central and first lateral band), the rela- tive retardation of the extreme rays is (mn+1)a. Suppose now that A+6a is the wave-length for which BQ gives the principal maximum, then (mn+1)A=mn(a+da);

whence

SAfA=1/mm . . . . . « . (6) According to our former standard, this gives the smallest difference of wave-lengths in a double line which can be just resolved; and we conclude that the resolving power of a grating depends only upon the total number of lines, and upon the order of the spectrum, without regard to any other considerations. It is here of course assumed that the 7 lines are really utilized.

In the case of the D-lines the value of 8a/a is about 1/1000 ; so that to resolve this double line in the first spectrum requires 1000 lines, in the second spectrum 500, and so on.

It is espeeially to be noticed that the resolving power does not depend directly upon the closeness of the ruling. Let us take the case of a grating 1 inch broad, and containing 1000 lines, and consider the effect of interpolating an additional 1000 lines, so as to bisect the former intervals. There will be destruction by inter- ference of the first, third, and odd spectra generally; while the advantage gained in the spectra of even order is not in dispersion, nor in resolving power, but simply in brilliancy, which is increased four times. If we now suppose half the grating cut away, so as to leave 1000 lines in half an inch, the dispersion will not be altered, while the brightness and resolving power are halved.

There is clearly no theoretical limit to the resolving power of gratings, even in spectra of given order. But it is possible that, as suggested by Rowland,? the structure of natural spectra may be too coarse to give opportunity for resolving powers much higher than those now in use. However this may be, it would always be possible, with the aid of a grating of given resolving power, to construct artificially from white light mixtures of slightly different wave-length whose resolution or otherwise would discriminate between powers inferior and supcrior to the given one.?

If we define as the "dispersion" in a particular part of the spectrum the ratio of the angular interval d@ to the corresponding increment of wave-length da, we may express it by a very simple formula. For the alteration of wave-length entails, at the two limits of a diffracted wave-front, a relative retardation equal to mnda. Hence, if a be the width of the diffracted beam, and dé the angle through which the wave-front is turned,

add=mndar, or dispersion=mn/a. . . . . (7),

The resolving power and the width of the emergent beam fix the optical character of the instrument. The latter element must eventually be decreased until less than the diameter of the pupil of the eye. Hence a wide beam demands treatment with further apparatus (usually a telescope) of high magnifying power.

In the above discussion it has-been supposed that the ruling is accurate, and we have seen that by increase of m a high resolving power is attainable with a moderate number of lines. But this procedure (apart from the question of illumination) is open to the objection that it makes excessive demands upon accuracy. Accord- ing to the principle already laid down, it can make but little dif- ference in the principal direction corresponding to the first spectrum provided each line lie within a quarter of an interyal (a+d) from its theoretical position, But, to obtain an equally good result in the m spectrum, the error must be less than 1 /m of the above amount.4 ee on Some Fundamental Propositions in Optics," Przl. Afag., June e rs we also Lippich, Pogg. Ann., cxxxix. Pp. 465, 1870; Rayleigh, Nature,*

3 The power of a grating to construct light of nearly definite wave-length is well illustrated by Young's comparison with the production of a musical note by reflexion of a sudden sound from a row of palings. The objection raised by Herschel (Light, § 703) to this comparison depends on a misconception.

4 It must not be supposed that errors of this order of magnitude are unob- jectionable in all cases. The position of the middle of the bright band represen-

There are certain errors of a systematie character which demand special consideration. The spacing is usually effected by means of a screw, to each revolution of which corresponds a large number (¢.g., one hundred) of lines. In this way it may happen that, Approxi- although there is almost perfect periodicity with each revolution mate of the screw after (say) 100 lines, yet the 100 lines themselves are period- not equally spaced. The ‘“‘ ghosts" thus arising were first de- ieity. scribed by Quincke,® and have been elaborately investigated by Peirce, both theoretically and experimentally. The general nature of the effects to be expected in such a ease may be made clear by means of an illustration already employed for another purpose. Suppose two similar and accurately ruled transparent gratings to be superposed in such a manner that the lines are parallel. If the one set of lines exactly biseet the intervals between the others, the grating interval is practically halved, and the previously exist- ing spectra of odd order vanish. But a very slight relative dis- placement will cause the apparition of the odd spectra. In this case there is approximate periodicity in the half interval, but com- plete periodieity only after the whole interval. The advantage of approximate bisection lies in the superior brilliancy of the surviving spectra; but in any case the compound grating may be considered to be perfect in the longer interval, and the definition is as good as if the bisection were accurate.*

The effect of a gradual increase in the interval (fig. 12) as we Gradually pass across the grating has been investigated by Cornu,' who thus increasing explains an anomaly observed by Mascart. The latter found that interval. certain gratings exercised a converging power upon the spectra formed upon one side, and a corresponding diverging power upon

the spectra on the other side. Let us suppose that the light is incident perpendicularly, and that the grating interval incrcases from the centre towards that edge which lies nearest to the spec- trum under observation, and decreases towards the hinder edge.

Fie. 12.—22, Fie, 13.—y2. Fig, 14.—23, Fig. 15.—ay2.

It is evident that the waves from both halves of the grating are accelerated in an increasing degree, as we pass from the centre outwards, as compared with the phase they would possess were the central value of the grating interval maintained throughout. The irregularity of spacing

has thus the effect of |

a convex lens, which

accelerates the mar-

ginal relatively to the

central rays. On the y 4 other side the effect F14- 16.—2y. Fig, 17,—~22y, Fig. 18.—y3. is reversed, This kind of irregularity may clearly be present in a degree surpassing the usual limits, without loss of definition, when the telescope is focused so as to secure the best effect.

It may be worth while to examine further the other variations from correct ruling which correspond to the various terms express- ing the deviation of the wave-surface from a perfect plane. If « and y be coordinates in the plane of the wave-surface, the axis of y being parallel to the lines of the grating, and the origin corre- sponding to the centre of the beam, we have as an approximate equation to the wave-surface (§ 6)

2 eon ga . + Bay Foyt a + Baty + yay” + By? + 4 TH

and, as we have just seen, the term in x corresponds toa linear error in the spacing. In like manner, the term in y corresponds to a Qurva- general curvature of the lines (fig. 18), and does not influence the ture. definition at the (primary) focus, although it may introduce astigmatism.® If we*

suppose that everything is symmetrical on the two sides of the primary plane y=0, the coefficients B, B, 8 vanish. In spite of any inequality between p and p', the definition will be good to this order of approximation, provided a and y vanish. The former measures the thickness of the primary focal line, and the latter measures its curvature. The error of ruling Other giving rise to a is one in which the intervals increase or decrease in errors, both directions from the centre outwards (fig. 14), and it may often be compensated by a slight rotation in azimuth of the object-glass of the observing telescope. The term in y corresponds to a varia- tion of curvature in crossing the grating (fig. 15).

When the plane zx is not a plane of symmetry, we have to con- sider the terms in xy, x?y, and y. The first of these corresponds a ee*

tative of a mathematical line can be fixed with a spider-line micrometer within a small fraction of the width of the band, just as the accuracy of astronomical observations far transcends the separating power of the instrument,

5 Pogg. Ann., cxlvi. p. 1, 1872.

8 Ann. Jour, Math. ; vol. ii. p. 330, 1879, vO. R., xxx. p. 645, 1875,

8 "In the same way we may conclude that in flat gratings any departure from a straight line has the effect of causing the dust in the slit and the spec- trum to have different foci—a fact sometimes observed " (Rowland, "On Concave Gratings for Optical Purposes," Pail. Mag., September 1883),

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to a deviation from parallelism, causing the interval to alter gradu- ally as we pass along the lines (fig. 16). The error thus arising may be compensated by a rotation of the object-glass about one of the diameters y=-+x. The term in xy corresponds to a deviation from parallelism in the same direction on both sides of the central line (fig. 17); and that in y? would be caused by a curvature such that there is a point of inflexion at the middle of each line (fig. 18).

All the errors, except that depending on a, and especially those depending on y and 34, can be diminished, without loss of resolving power, by contracting the vertical aperture. A linear error in the spacing, and a general curvature of the lines, are eliminated in the ordinary use of a grating.

The explanation of the difference of focus upon the two sides as due to unequal spacing was verified by Cornu upon gratings pur- poly constructed with an increasing interval. He has also shown

ow to rule a plane surface with lines so disposed that the grating shall of itself give well-focused spectra.?

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where o denotes the constant interval between the planes contain- ing the lines. This is the ordinary formula for a reflecting plane grating, and it shows that the spectra are formed in the usual directions. They are here focused (so far as the rays in the primary plane are concerned) upon the circle OQ'A, and the out- standing aberration is of the fourth order.

In order that a large part of the field of view may be in focus at once, it is desirable that the locus of the focused spectrum should be nearly perpendicular to the line of vision. For this purpose Rowland places the eye-piece at O, so that ¢=0, and then by (11) the value of ¢' in the m spectrum is*

csingg=+ma . s If w now relate to the edge of the grating, on altogether 7 lines,

: t= Ge which there are

no=2asinw, and the value of the last term in (10) becomes

Row- A similar idea appears to have guided Rowland to his brilliant feno sinFwsin ¢'tang',

land's imvention of concave gratings, by which spectra can be photo- | °F , :

concave graphed without any further optical appli- femnasin?etan p (18). gratings, ance. In these instruments the lines are This expresses the retardation of the extreme relatively to the

ruled upon a spherical surface of speculum metal, and mark the intersections of the surface by a system of parallel and equidis- tant planes, of which the middle member passes through the centre of the sphere. If we consider for the present only the primary plane of symmetry, the figure is reduced to two dimensions. Let AP (fig. 19) represent the surface of the grating, O being the centre of the circle. Then, if Q be any radiant point and Q' its image (primary focus) in the spherieal mirror AP, we have

1, lk 2cos@

—+— => ——

On a

Fig. 19.

U '

where v, = AQ', w= AQ, a=OA, d=angle of incidence QAO, equal to the angle of reflexion Q'AO.? If Q be on the circle described upon OA as diameter, so that w=acos ¢, then Q' lies also upon the same circle; and in this case it follows from the symmetry that the unsymmetrical aberration (depending upon a) vanishes.

central ray, and is to be reckoned positive, whatever may be the signs of w and ¢'. If the semi-angular aperture (w) be x+y, and tan ¢'=1, mn might be as great as four millions before the error of phase would reach $a. If it were desired to usean angular aperture so large that the aberration according to (13) would be injurious, Rowland points out that on his machine there would be no difficulty in applying a remedy by making o

slightly variable towards the edges. Or, retaining o constant, we might attain compensation by so polish- ing the surface as to bring the eircumference slightly forward in comparison with the position it would occupy upon a true sphere.

It may be remarked that these calculations apply to the rays in the primary plane only. The image is greatly atiected with astig- matism; but this is of little consequence, if y in (8) be small enough. Curvature of the primary focal line having a very in- jurious effect upon definition, it may be inferred from the excellent performance of these gratings that y is in fact small. Its value does not appear to have been calculated. The other coefficients in (8) vanish in virtue of the symmetry.

Aber- ration.

The mechanical arrangements for maintaining the focus are of Rowland's great simplicity. The grating at A and the eye-picce at O are mechanical rigidly attached to a bar AO, whose ends rest on carriages, moving arrange-

This disposition is adopted in Rowland's instrument; only, in addition to the central image formed at the angle ¢'=¢@, there are

a series of spectra with various values of ¢', but all disposed upon the same circle. Rowland's investigation is contained in the paper already referred to; but the following account of the theory is in the form adopted by Glazebrook.

In order to find the difference of optical distances between the courses QAQ', QPQ', we have to express QP—QA, PQ'- AQ'. To find the former, we have, if OAQ=¢, AOP=a,

*QP?= wu? + 4a7sin*4w — 4awsin $wsin (fw —) =(u+asingsin w)?— asin*psin 2w + 4asin*4w (a— wcos¢). Now as far as w! 4sin*4w=sin? w+4sin4w, and thus to the same order QP?=(u+asin ¢sin w) —acos¢ (u— acos¢) sin *w + ta (a—ucos¢) sintw. But if we now suppose that Q lies on the circle w=acos@, the middle term vanishes, and we get, correct as far as w4,*

QP-(wtasingsina) , / {14 Zsintesinte} u

*so that QP -u=asingsinw+asin¢tangsintfw . . . (9), in which it is to be noticed that the adjustment necessary to secure the disappearance of sin*w is sufficient also to destroy the term in SIN °'w. A similar expression can be found for Q'P-Q'A; and thus, if Q'A=v, Q'AO=¢', where v=a cos 9', we get QP+ PQ'- QA – AQ'=asin w(sin ¢ – sin ¢') + asin 4w(singtan ¢+sin ¢' tan ¢') (10). If ¢'=¢, the term of the first order vanishes, and the reduction of the difference of path via P and via A to a term of the fourth order*

on rails OQ, AQ at right angles to each other. A tie between C and Q can be used if thought desirable.

*The absence of chromatic aberration gives a great advantage in the comparison of overlapping spectra, which Rowland has turned to excellent account in his determinations of the relative wave- lengths of lines in the solar spectrum.**

For absolute determinations of wave-lengths plane gratings are used. It is found® that the angular measurements present less difficulty than the comparison of the grating interval with the standard metre. There is also some uncertainty as to the actual temperature of the grating when in use. In order to minimize the heating action of the light, it might be submitted to a preliminary prismatic analysis before it reachcs the slit of the spectrometer, after the manner of Von Helmholtz (Optics, vol. xvii. p. 802).

Bell found further that it is necessary to submit the gratings to calibration, and not to rest satisfied with a knowledge of the num- ber of lines and of the total width. It not unfrequently happens that near the beginning of the ruling the interval is anomalous. If the width of this region be small, it has scarcely any effect upon the angular measurements, and should be left out of account in estimating the effective interval.

§ 15. Theory of Corrugated Waves.

The theory of gratings is usually given in a form applicable only to the case where the alternate parts are transparent and opaque. Even then it is very improbable that the process of simply including the transparent parts and excluding the opaque parts in the integrations of § 11 gives an accurate result. The condition of things in actual gratings is inuch more complicated, and all that can with confidence be asserted is the approxi-

ments.

Absolute measure-

ments,

proves not only that Q and Q' are eonjugate foci, but also that the | mate periodicity in the interval ¢. The Wave foci are exempt from the most important term in the aberration. | problem thus presents itself—to determine diverg- In the present application ¢' is not necessarily equal to ¢; but if | the eourse of events on the further side of ing in P correspond to a line upon the grating, the difference of retarda- | the plane z=0 when the amplitude and two tions for consecutive positions of P, so far as expressed by the term | phase over that plane are periodie functions # : dimen- of the first order, will be equal to =-ma (m integral), and therefore | of z; and the first step in the solution Pigs Ms sions,

without influence, provided

o (sing —sing')=-Fma. (11),

1 The ruling required is evidently that which would be marked out by inter- ference bands, supposing sources of light of the prescribed wave-length to be Situated at the radiant point and at the desired image.

2 This formula may be obtained as in Oprics, vol. xvii. p. 800, equation (8), and may indeed be derived from that equation by writing ¢'=¢, u=—lL

3 Phil. Mag., June 1883, Nov. 1883.

would naturally be to determine the effect corresponding to the infinitesimal strip ydx over which the amplitude and phase are constant. In fig. 20 QQ' represents the strip in question, of which the effect is to be estimated at P(0, 0, 2); QR=y, RP=r7, QP =p. ae

If we assume the law of secondary wave determined in § 10 so

4 Phil. Mag., March 1887. 5 Bell, Phil. Mag., March 1887.

Plane uniform wave.

Variable ampli-

tude and but periodic functions of x.

phase.

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as to suit the resolution of an infinite uniform primary wave, we have, as the effect of QQ',

ie] ade [®Y cos «(at —p+4a) o Ap

x Ae Mea) sin x(at— p) @: The development of this cxpression for the operation of a linear source would take us too far! We must content ourselves with the limiting form assumed when xr is great, as it would almost always be in optics. Under these circumstances the denominator may be simplified by writing

J (p? = 7) = A/(2r). (p= 7); so that (1) becomes

2dx ? d(p-r) . ~ AN/(2r) Jo ee Now sin eu du cosxudts rd Ce of ae Ne

and thus we obtain

- sane k(at — 7) — cosK(at — r)} ' dz, , en sink(at—7—}4Aa) .)) which gives the effect of a linear source at a great distance. The

occurrence of the factor r-? is a consequence of the cylindrical ex- pansion of the waves. The whole effect is retarded one-eighth of a period in comparison with that of the central element, instead of one-quarter of a period as in the case of a uniform wave extending over the whole plane.

The effect of the uniform plane wave can be recovered by inte- grating (2) with respect to x from —o to +, on the supposition that xr is great. We have

ah Pale /r.d(r —2)

Jr Afr. /(r+2).A/(r—2)' and in this, since the only elements which contribute sensibly to the integral are those for which (7 —2) is small, we may write aes S(r+2) 2°

The integral can then be evaluated by the same formula as before, and we get finally cos« (a#—z), the same as if the primary wave were supposed to advance without resolution. The recomposition of the primary wave by integration with rectangular coordinates is thus verified, but only under the limitation, not really required by the nature of the case, that the point at which the effect is to be estimated is distant by a very great number of wave-lengths from the plane of resolution.

We will now suppose that the amplitude and phase of the pri- mary wave at the plane of resolution z=0 are no longer constants, Instead of cosxat simply, we should

have to take in general

A cos (pe +f) cos xat + B cos (px +g) sin «at ; but it will be sufficient for our purpose to consider the first term only, in which we may further put for simplicity A=1, =0. The effect of the linear element at 2, 0, upon a point at é, 2, will be, according to (2),

xe 5 = Ce te sink(at—7- a), where 7 is the distance, expressed by 72=2?+ (x — &)?. Thus, if we write x=t+a, the whole effect is

Se eee

where 7?= 2 + a2.

In the two terms of this integral the elements are in general of rapidly fluctuating sign; and the only important part of the range of integration in (for example) the first term is in the neigh- bourhood of the place where a—«r is stationary in value, or where

pda-xdr=0 . ....., (4),

In general ada-—rdr=0, so that if the values of a and r corre- sponding to (4) be called ao, 79, we have

pg & vaP) Now, in the neighbourhood of these values, if a=a)+a,,

a Kay" vp Pol) ye ery p- «St)- (a – | ;

1 Theory of Sound, § 341,

{ sin (xat + pt — dor — er +pa)

+sin («at — pt —4m—r—pa)}. (3),

(5).

Wavt TADWORY

in which by (5) the term of the first order vanishes. Using this

in (3), we get for the first term +o da. 5 9 -f. TOR) { sin (kat + pt — d9 — Kr) + Pay) cosha,

— cos(xat+ pt — dm — Kr) + pao) sinha," }, where for brevity / is written for ae _# 27 K2 The integration is effected by means of the formula

Log cotati = fy sin du = NACE

and we find K Ine =P) cos (Kat + pi — KT + Pay) . The other term in (8) gives in like manner

K Ine =p) Cos (Kat — pi — Kp + Pao) § so that the complete value is

C08 PE cog at —a/(K2-p?).z } « 6). Ne P { \/(? —p?).2 } (8)

When »=0, we fall back on the uniform plane wave travelling Velocity

with velocity a. In general the velocity is not a, but of pro- wat] n/ (x? — p?) . (7). pagation,

The wave represented by (6) is one in which the amplitude at various points of a wave-front is proportional to cos pé, or cos px; and, beyond the reversals of phase herein implied, the phase is con- stant, so that the wave-surfaces are given by z= constant. The wave thus described moves forward at the velocity given by (7), and with type unchanged.

The above investigation may be regarded as applicable to gratings which give spectra of the first order only. Although « vary, there is no separation of colours. Such a separation requires either a limitation in the width of the grating (here supposed to be infinite), or the use of a focusing lens.

It is important to remark that p has been assumed to be less than x, or o greater than A; otherwise no part of the range of integration in (8) is exempt from rapid fluctuation of sign, and the result must be considered to be zero. The principle that irregularities in a wave-front of periods less than a cannot be pro- pagated is of great consequence. Further light will be thrown upon it by a different investigation to be given presently.

The possibility of the wave represented by (6) is perhaps sufficiently established by the preceding method, but the occur- rence of the factor «/a/(x? – p”) shows that the laws of the secondary wave (determined originally from a consideration of uniform plane waves) was not rightly assumed.

The correct law applicable in any case may be investigated as Cor-

follows. Let us assume that the expression for the wave of given rected periodic time is law of teat f{f~) —4 second- ya] pe? Bley 9) de dy; 3), wave.

and let us inquire what the value of F (x, y) must be in order that the application of Huygens's principle may givea correctresult. From (8)

a /\ zd (—) F(a, y) dx dy, dz d

*pdp\ p / f(s —) = rie dp\ p p**

We propose now to find the limiting value of dy/dz when z is very

small. The value of the integral will depend upon those elements . only for which z and y are very small, so that we replace F(a, y) in the limit by F(0, 0). Also, in the limit,

*2 d fe—**P -% ee pe*

so that

and

Limit v Ge NO, 0). a

The proper value of ¢" F(a, y) is therefore that of —dy/dz at the same point (x, y, 0) divided by 2m, and we have in general*

In the case of the uniform plane wave, (at —z)

woe , ab/dze= -%.

; Ge teat eo —iKp gix(at—p+}A) —— ——dx dy = —— f eS ae ae =, fe

agreeing with what we have already found for the secondary wave in this case,

(9).

ix(at—z) Ke 3

so that

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But, if p=cos px. clet—V(?—p?). 2],

. (2=0) = -—ta/(x? — p?) cos px eas B

Daeg ix(at—p-+HAr) — AY wos pe dady .

2a The occurrence of the anomalous factor in (6) is thus explained. It must be admitted that the present process of investigation is rather artificial ; and the cause lies in the attempt to dispense with the differential equation satisfied by y, viz.,

and

*ay ey Oyo, at ap age * ~y=0 (10), on which in the case of sound the whole theory is based. It is in*

fact easy to verify that any value of y included under (8), where pa (E—2)+ (n-y)?+ (2, satisfies the cquation Py dy Py ae dy? dt? When there is no question of resolution by Huygens's principle, the distinction between ¢, 7 and x, ¥ may be dropped. Starting from the differential equation, we may recover previous

+e~=0.

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then shows that the field is uniform: when the screen occupies positions midway between those which give the most distinct patterns. These results are of interest in connexion with the photographic reproduction of gratings.

§ 16. Talbot's Bands.

These very remarkable bands are seen under certain conditions when a tolerably pure spectrum is regarded with the naked eye, or with a telescope, half the aperture being covered by a thin plate, @.9., of glass or mica. The view of the matter taken by the dis- coverer" was that any ray

which suffered in traversing the plate a retardation of an odd number of half wave-lengths would be extinguished, and that thus the spectrum would be seen inter- rupted by a number of dark bars. But this explanation cannot be accepted as it stands, being open to the same objection as Arago's theory of stellar scintillation.® It is as far as possible from being true that a body emitting homogeneous light would disappear on merely covcring half the aperture of vision with a half-wave plate. Such a conclusion would be in the face of the principle of energy, which teaches plainly that the retardation in question leaves the ageregate brightness unaltercd. The actual formation of the bands comes about in a very curious way, as is shown by a circumstance

first observed by Brewster. When the retarding plate is held on Brew- the side towards the red of the spectrum, the bands are not seen. ster's ob-

results very simply. If y be proportional to cospx cosqy, we have 2 Even in the eontrary case, the thickness of the plate must not serva-

Corruga- tions of

d 9 2 Get (ep) $0 (a1), If «?—p?~~¢?=p2, w being real, the solution of (11) is p=ne™ + Be, where A and B are independent of z Restoring the factors in~~ volving ¢, 2, y, we may write p= cos pa cos gyl a Meattue) 4 B lleat—me)} (12), of which the first term may be dropped when we contemplate waves travclling in the positive direction only. The corresponding realized solution 1s of the type y=cos pa cos gy cos{ at — 4/ (1? —p-q).z . (18). When «?>(p?+9"), the wave travels without change of type and

with velocity os

exceed a certain limit, however pure the spectrum may be. satisfaetory explanation of these bands was first given by Airy,' but we shall here follow the investigation of Stokes,® limiting ourselves, however, to the case where the retarded and unretarded beanis are contiguous and of equal width. The aperture of the unretarded beain may thus be taken to be limited by z= —h, x=0, y= —1, y—=+1; and that of the beam retarded by R to be given by ~=0, 2=h, y=-l, y=+1. For the former (1) § 11 gives

spf Jy sine tpt \ dedy

a ee ee ee sf a oe ee ai on integration and reduction.

(1),

V=—5 oe (14). For the retarded stream the only difference is that we must sub- V(x? — p? — 7) tract R from at, and that the limits of x are 0 and+h. We thus We have now to consider what occurs when «°<(p?+92). If we get for the disturbance at £, 7 due to this stream write x? — p? — q?= — p?, we have in place of (12) Qin f . «nl Of . wth . th Y=cos px cos qy{ A cleat tHe 4 B gteat—ne} : (15); ay sin eh sin 5F 'sin { at —f- Rt oF (ey and for the realized solution corresponding to (18) If we put for shortness 7 for the quantity under the last circnlar Y=cos pa cos gy e— cos eat . (16). | function in (1), the expressions (1), (2) may be put under the

We conclude that under these circumstances the motion rapidly diminishes as z increases, and that no wave in the usual sense can be propagated at all.

It follows that corrugations of a reflecting surface (no matter how deep) will not disturb the regularity of a perpendicularly reflected

forms usint, vsin(r—a) respectively ; and, if I be the intensity, I will be measured by the sum of the squares of the coefficients of sin + and cos 7 in the expression

usin + sin (tr —«), so that

Period wave, provided the wave-length of the corrugation do not exceed T=u?2? 2uv cosa,

less that of the vibration. And, whatever the former wave-length may | which becomcs on putting for w, v, and « their values, and putting than A be in relation to the latter, regular reflexion will occur when the y nl) 2

die out. incidence is sufficiently oblique. sin — } =()) . (3),

The first form of solution may be applied to give an explanation pees f ,

Shadow of the appearances observed when a plane wave traverses a parallel —(Ay ein 2a { Dee ege 2nR =e)} (4) of a coarse grating and then impinges upon a screen held at varying mt? wa BEN TNE D Ys ; grating. distances behind.' As the general expression of the wave periodic | 1¢ the subject of examination be a luminous line parallel to y, we

with respect to x in distance « we may take Aycos (kat — xz) + A, cos(pu+jf,) cos(Kat — 42) + By cos(p+ g,) sin (at — 42) + A,cos(2px +fy) cosx(at — poz) +..., where pH2rlo, e=2n/r, and pP=K?~~p, peta — ABs the series being continued as long as » is real. We shall here, however, limit ourselves to the first three terms, and in them sup~~ pose A, and B, to be small relatively to Ay. The intensity may then be represented by Ag? + 2A9A, cos (px-+f) cos (2 — p22)

+ 2A,)B,cos (pa +g)sin (Kz — p42) . (ly) The stripes thrown upou the screen in various positions are thus periodic functions of z, and the period is

2am Eg Ne P) OK

if A be supposed small in comparison with c. It may be noticed that, if the position of the screen be altered by the half of this amount, the effect is equivalent to a shifting parallel to 2 through the distance 4¢. Hence, if the grating consists of alternate trans- parent and opaque parts of width 40, the stripes seen upon the screen are reversed wlien thie latter is drawn back through the dis- tance o/aA. In this case we may supposc B, to vanish, and (17)*

(18),

1 Phil. Mag., March 1881, "On Copying Diffraction Gratings and on Some Phenomena Connected Therewith."

shall obtain what we require by integrating (4) with respect to 7 from—o to+o. The constant multiplier is of no especial interest, so that we may take as applicable to the image of a line

If R=}a, I vanishes at ¢=0; but the whole illumination, repre-

+

sented ryf; a dt, is independent of the value of R. If R=0,

1 : 2

I= PE sin? 2 » in agreement with § 11, where a has the meaning

here attached to 2h.

The expression (5) gives the illumination at ¢ due to that part of the complete image whose geometrical focus is at ¢=0, the retardation for this component being R. Since we have now to integrate for the whole illumination at a particular point O due to all the components which have their foci in its neighbourhood, we

Im sin 2

2 Phil. Mag., x. p. 864, 1837.

3 On account of inequalities in the atmosphere giving a variable refraction, the light from a star would be irregularly distributed over ascreen. The experiment is easily made on a laboratory scale, with a small source of light, the rays from which, in their course towards a rather distant scrcen, are disturbed by the neighbourhood of a heatcd body. At amoment when the eye, or object-glass of a telescope, occupies a dark position, the star vanishes. A fraction of a second later the aperture occupies a bright place, and the star reappears. According to this view the chromatic effects depend entirely upon atmospheric dispersion.

4 Phil. Trans., 1840, p. 225; 1841, p. 1. 5 Phil. Trans., 1848, p. 227.

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A tions.

Best thick- ness,

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may conveniently regard O as origin. ¢& is then the coordinate relatively to O of any focal point O° for which the retardation is R ; and the required result is obtained by simply integrating (5) with respect to from —o to +0. To each value of & corresponds a different value of A, and (in consequence of the dispersing power of the plate) of R. The variation of A may, however, be neglected in the integration, except in 27R/a, where a small variation of A entails a comparatively large alteration of phase. If we write

p=2rR/a ww, Oe OS (6), we must regard p asa function of t, and we may take with sufficient approximation under any ordinary circumstances

hom p. +a. (7), where p' denotes the value of p at O, and wis a constant, which is positive when the retarding plate is held at the side on which the blue of the spectrum 7s seen. The possibility of dark bands depends upon @ being positive. Only in this case can

cos{p' +(a- Qah/rf)e } retain the constant value —1 throughout the integration, and then only when

(8),

e603 p= lh yy ae ee FO)

The first of these equations is the condition for the formation of

dark bands, and the second marks their situation, which is the same as that determined by the imperfect theory.

The integration can be effected without much difficulty. For

the first term in (5) the evaluation is effected at once by a known formula. In the second term it we observe that

cos{p' + (a- Qah/rf) E} =cos{ p' – gt} = 08 pcos %¢+Sin p' sin HE, we see that the second part vanishes when integrated, and that the remaining integral is of the form

w=" sin hak cose os

w= Qnh/raf and

where h=Th/Af, (= a—-Qrh/af (10). By differentiation with respect to g, it may be proved that w=0 from 4=-0© to 9,=-2h,, w=4n(2h,+9,) from g,=-— 2h, to g,=0, w=tn(2h,-9,) from g;= 0 to 9,=2h,, w=0 from 9,=22, to g=c. The integrated intensity, I', or Qrh,+2cospw, is thus I =2nh, (11),

when g, numerically exceeds 2/,; and, when g, lies between + 2h/,, T= { 2h, + (2h, — 4/92) cos p'} . (12). It appears therefore that there are no bands at all unless lies between 0 and +4h/,, and that within these limits the best bands are formed at the middle of the range when w=2h,. The formation of bands thus requires that the retarding plate be held upon the side already specified, so that = be positive ; and that the thickness of the plate (to which is proportional) do not exceed a certain limit, which we may call 2T,. At the best thickness T, the bands are black, and not otherwise. The linear width of the band (e) is the increment of ¢ which alters p by 2m, so that

e=2n/a . (18). With the best thickness w=2nh/af (14), so that in this case e=Aflh . (15).

Width of The bands are thus of the same width as those due to two infinitely

bands.

Experi- mental condi- tions.

narrow apertures coincident with the central lines of the retarded and unretarded streams, the subject of examination being itself a fine luminous line.

If it be desired to see a given number of bands in the whole or in any part of the spectrum, the thickness of the retarding plate is thereby determined, independently of all other considerations. But in order that the bands may be really visible, and still more in order that they may be black, another condition must be satisfied. It is necessary that the aperture of the pupil

be accommodated to the angular extent of the spectrum, or reciprocally. Black bands will be too fine to be well seen unless the aperture (2h) of the pupil besomewhat contracted. One-twentieth to one-fiftieth of an inch is suitable. The aperture and the number of bands being both fixed, the condition of blackness determines the angular magni- tude of a band and of the spectrum. The use of a grating is very convenient, for not only are there several spectra in view at the same time, but the dispersion can be varied continuously by sloping the grating. Theslits may be cut out of tin-plate, and half covered by mica or ' microscopic glass," held in position by a little cement.*

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If a telescope be employed there is a distinction to be observed,

Use of

according as the half-covered aperture is between the eye and telescope,

the ocular, or in front of the object-glass. In the former case the function of the telescope is simply to increase the dispersion, and the formation of the bands is of course independent of the par- ticular manner in which the dispersion arises. If, however, the half-ecovered aperture be in front of the object-glass, the pheno- menon is magnified as a whole, and the desirable relation between the (unmagnified) dispersion and the aperture is the same as with- out the telescope. There appears to be no further advantage in the use of a telescope than the increased facility of accommodation, and for this of course a very low power suflices.

The original investigation of Stokes, here briefly sketched, ex- More tends also to the case where the streams are of unequal width general

h, k, and are separated by an interval 2g.

In the case of unequal investiga.

width the bands cannot be black; but if h=k, the finiteness of tion of

2g does not preclude the formation of black bands. The theory of Talbot's bands with a half-covered circular aperture has been treated by H. Struve.!

§ 17. Diffraction when the Source of Light is not Seen in Focus.

The phenomena to be considered under this head are of less importance than those investigated by Fraunhofer, and will be treated in less detail; but, in view of their historical interest and of the ease with which many of the experiments may be tried, some account of their theory could not be excluded from such a work as the present. One or two examples have already attracted our attention when considering Huygens's zones, viz., the shadow of a circular disk, and of a screen circularly perforated ; but the most famous problem of this class—first solved by Fresnel—relates to the shadow of a screen bounded by a straight edge.

In theoretical investigations these problems are usually treated as of two dimensions only, everything being referred to the. plane passing through the luminous point and perpendicular to the dif- fracting edges, supposed to be straight and parallel. In strictness this idea is appropriate only when the source is a luminous line, emitting cylindrical waves, such as might be obtained from a luminous point with the aid of a cylindrical lens. When, in order to apply Huygens's principle, the wave is supposed to be broken up, the phase is the same at every clement of the surface of resolution which lies upon a line perpendicular to the plane of reference, and thus the effect of the whole line, or rather infinitesimal strip, is related in a constant manner (§ [5) to that of the element which lies in the plane of reference, and may be considered to be repre- sented thereby. The same method of representation

is applicable to spherical waves, issuing from a point, .

if the radius of curvature be large; for, although

there is variation of phase along the length of the P infinitesimal strip, the whole effect depends practi- A

cally upon that of the central parts where the phase is sensibly constant.?

*In fig. 21 APQ is the are of the circle representa- eh tive of the wave-front of resolution, the centre being _—*Fig- 21. at O, and the radius OA being equal to a. B is the point at which the effect is required, distant a+b from O, so that AB=); AP=s, PQ=ds.*

Taking as the standard phase that of the secondary wave from A, we may represent the effect of PQ by

cos ae (2 ->) ds, T OX

where 6=BP—AP is the retardation at Bof the wave from P relatively to that from A.

Now ‘ 5=(a+b)s/2ab . (1), so that, if we write 2n5 _ x(a +b)s? Te (2) i. wa. 2 Ye FY ce ee the effect at B is sa oh . cos att [es $nv*.dv +sin = f sin 4rv* . dv (8),*

the limits of integration depending upon the disposition of the diffracting edges. When a, 6, A are regarded as constant, the first factor may be omitted, —as indeed should be done for consistency’s sake, inasmuch as other factors of the same nature have been omitted already.

The intensity I, the quantity with which we are principally concerned, may thus be expressed*

P={ feos dnv®.dv}?+ { fsin drv.do}? oe oe*

1 St Petersburg Trans., xxxi., No. 1, 1883.

2 In experiment a line of light is sometimes substituted for a point in order to increase the illumination. The various parts of the line are here independent sources, and should be treated accordingly. To assume a cylindrical form of primary wave would be justifiable only when there is synchronism among the secondary waves issuing from the various centres.

Stokes,

:

Fresnel's i

integrals.

<<

Knocken- hauer's series.

- Gilbert's integrals.

Cauchy's series,

Straight edge,

WwaAWYeT THEORY

These integrals, taken from v=0, are known as Fresnel's integrals ; we will denote them by C and §, so that

v a, C -[cos 4nv7.dv, S -/{ sin 4av, dv (5).

0 0

When the upper limit is infinity, so that the limits correspond to the inclusion of half the primary wave, C and § are both equal to 4, by a known formula ; and on account of the rapid fluctuation of sign the parts of the range beyond very moderate values of v con- tribute but little to the result.

Aseending series for C and S were given by Knockenhauer, and are readily investigated. Integrating by parts, we find

: v there? tdny2 : vy t.grv2 o+i8=/"%e dv=e ™ wn hinfe ~ Ge:

0 0

and, by continuing this process, tn tn tm in 6 What. <6 L

b tine? tn id C+iS=e ~ 8 ae +4 v OP ae v 3°57 f

3 3 5

By separation of real and imaginary parts,

C=M cos 4rv?+ N sin rv? S =Msin 4rv?- N cos ir (6), where ue? er aiy? a le) ae (7); N re ry? qoyll ras ei? Lee. 7 oll (8).

These series are convergent for all values of v, but are practically useful only when v is sinall.

Expressions suitable for discussion when v is large were obtained by Gilbert… Taking

*é amv =U . (9), we may write — , ueiug, ee Gao Ne: a Again, by a known formula, ites NN NN us Substituting this in (10), and inverting the order of integration, we get 6 1 ce aha u u(i—x) Cee fe y oo dee mr/2fy ru So 1 way Cpe al Taal Ja i-e ae Thus, if we take 1 e—urr/x, dx 1 ° e-undy (.—RON Ha ES a pe Ce oy) eo m/2/y Jx(l+x) * (18), C=4-Geosu+Hsinu, S=4-Gsinu—Heoswu . (14).*

The constant parts in (14), viz. 4, may be determined by direct integration of (12), or from the observation that by their constitu- tion G and H vanish when uw=oo, coupled with the fact that C and § then assume the value 3.

Comparing the expressions for C, S in terms of M, N, and in terms

of G, H, we find that

G=(cosu+sinw)-M, H=2(cosw—sinw)+N . (15), formule which may be utilized for the calculation of G, H when 2 (or v) is small. For example, when «=0, M=0, N=0, and con- sequently G=H=},

Descending series of the semi-convergent class, available for numerical calculation when w is moderately large, can be obtained from (12) by writing x=wy, and expanding the denominator in powers of y. The integration of the several terms may then be effected by the formula

” © oly hay = 1(¢+4)=(¢-BG-B). AV

and we get in terms of v

Ge 1 1.3.5, 1.8.5.7.9 7 er qoyll (16), St Ae TD Wye ru (17).

The corresponding values of C and 8 were originally derived by

ey, without the use of Gilbert's integrals, by direct integration y parts.

From the series for Gand H just obtained it is easy to verify that

(18).

_ We now proceed to consider more particularly the distribution of light upon a screen PBQ near the shadow of a straight edge A. At a point P within the geometrical shadow of the obstacle, the half of the wave to the right of C (fig. 22), the nearest point on the

a, Mém. couronnés de lV Acad. de Bruxelles, xxxi. 1. See also Verdet, Lecons,

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wave-front, is wholly intercepted, and on the left the integra- tion is to be taken from s=CA to s=o, If V be the value of v corresponding to CA, viz.,

= 2(a + b) ve ee ote ! (OL (19), we may write DN wo 2 = (f cos Ano? dv) Cf sin dne. dv) : (20),*

Vv Vv or, according to our previous notation,

I?=(4- Cy)?<u>?=G?</u> H?. C21);

Now in the integrals represented by G and H every element No bands diminishes as V increases from zero. Hence, as 0 inside CA increases, viz., as the point P is more and shadow. more deeply immersed in the shadow, the illumi- nation continwously decreases, and that without limit. It has long been known from observa- tion that there are no bands on the interior side of the shadow of the edge.

The law of diminution when V is mode- = rately large is easily expressed with the aid of Fig. 22. the series (16), (17) for G, H. We have ultimately G=0, H=(7V)-}, so that

PHlpey?,..

or the illumination is inversely as the square of the distance from the shadow of the edge.

For a point Q outside the shadow the integration extends over more than half the primary wave. The intensity may be expressed by

I2=(4+Cy)?? (22); and the maxima and minima occur when aC ds ($ Cv) ay + (8 +8v) Fy =9, whence sin 4rV2+cos$aV7=G (28).

When V=0, viz., at the edge of the shadow, I?=4; when V=o,

I?=2, on the scale adopted. The latter is the intensity due to the uninterrupted wave. The quadrupling of the intensity in passing Position outwards from the edge of the shadow is, however, accompanied by of ex- fluctuations giving rise to bright and dark bands, The position terior of these bands determined by (23) may be very simply expressed bands. when V is large, for then sensibly G=0, an

4a V2=3a+n0 . (24), n being an integer. In terms of 5, we have from (2) S=(F+4n)a . (25).

The first maximum in fact occurs when 5= 2a — '0046, and the first minimum when = {a — 0016a,? the correctious being readily obtainable from a table of G by substitution of the approximate value of V.

The position of Q corresponding toa given value of V, that is, Hyper- to a band of given order, is by (19) bolic pro-

BQ= ie of bands. By means of this expression we may trace the locus of a band of given order as } varies. With sufficient approximation we may regard BQ and Jas rectangular coordinates of Q. Denoting them by x, y, so that AB is axis of y and a perpendicular through A the axis of x, and

rationalizing (26), we have Qax— Vay? — Vaay=0, which represents a hyperbola with vertices at O and A. From (24), (26) we see that the width of the bands is of the order 4/{ba(a+0)/a}. From this we may infer the limitation upon the width of the source of light, in order that the bands may be properly formed. If w be the apparent magnitude of the source seen from A, wb should be much smaller than the above quantity, or w*

2 Verdet, Lecons, § 90. i 3 "Die Beugungserscheinungen geradlinig begrenzter Schirme," AbA. bayer.

Akad. der Wiss., ii, Cl., xv. Bd., ifi, Abth., 1886.

v 2

a

27413 Fresnel' s 1:5570 | table, 2°3990

1°6867

First maximum…. First minimum….. Second maximum.. Second minimum..| 2°7392 Third maximum…| 3°0820 | 2°3022 Third minimum….| 3°3913 | 1°7440

ES

12172

1°8726 2°3449

Cornu's method.

Diffrac- tion through a slit.

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When the funetions C and S have once been calculated, the discussion of various diffraction problems is much facilitated by the idea, due to Cornu,! of exhibiting as a curve the relationship between C and 8,

considered as the rectangular coordinates (x, y) of a point. Such a curve is shown in fig. 23, where, according to the definition (5) of C, 8,

v Vv af cos $rv.dv, y= sin drv?, dv*

The origin of coordinates O corresponds to v=0 ; and the asymptotic points J, J', round which the curve revolves in an ever-closing spiral, correspond to v=+o.

The intrinsic equation, expressing the relation between the arc o (measured from O) and the inclination ¢ of the tangent at any point to the axis of x, assumes a very simple form. For

dx=cos$rv2.dv, dy=sindrv2.dv;

(29),

*so that =f /(da?+dy)=%, (30), Ly @=tan-} z =r? (31). Accordingly, * Ge Vite wo oe fe (32); and for the curvature, tno (33).*

Cornu remarks that this equation suffices to determine the general character of the curve. For the osculating circle at any point includes the whole of the curve which lies beyond ; and the suecessive con- volutions envelop one another with- out intersection,

The utility of the curve depends upon the fact that the elenients of are represent, in ampli- tude and phase, the component vibra- tions due to the corresponding por- tions of the pri- mary wave-front. For by (380) do = adv, Fig. 23, and by (2)dvis proportional to ds. Moreover by (2) and (31) the retardation of phase of the elementary vibration from PQ (fig. 21) is 2r8/a, or @. Hence, in accordance with the rule for compounding vector quantitics, the resultant vibration at B, due to any finite part of the primary wave, is represented in amplitude and phase by the chord joining the extremities of the corresponding are (¢,— 4).

In applying the curve in special cases of diffraction to exhibit the effect at any point P (fig. 22) the centre of the curve O is to be considered to correspond to that point C of the primary wave-front which lies nearest to

P. The operative part, or parts, of the curve are of course those which represent the unobstructed portions of the primary wave.

Let us reconsider, following Cornu, the diffraction of a screen unlimited on one side, and on the other terminated by a straight edge. On the illuminated side, at a distance from the shadow, the vibration is represented by JJ'. The coordinates of J, J' being (4, 4), (~~4, —4), I? is 2; and the phase is 4 period in arrear of that of theelement at O. As the point under contemplation is sup~~ posed to approach the shadow, the vibration is represented by the chord drawn from J to a point on the other half of the curve, which travels inwards from J' towards O. The amplitude is thus subject to fluctuations, which increase as the shadow is approached. At the point O the intensity is one-quarter of that of the entire wave, and after this point is passed, that is, when we have entered the geometrical shadow, the intensity falls off gradually to zero, without jiuctuations. The whole progress of the phenomenon is thus ex- hibited to the eye in a very instructive manner,

We will next suppose that the light is transmitted by a slit, and inquire what is the effect of varying the width of the slit upon the illumination at the projection of its centre. Under these circum- stances the arc to be considered is bisected at O, and its length is proportional to the width of the slit. It is easy to see that the length of the chord (which passes in all cases through O) increases to a maximum near the place where the phase-retardation is 2 of a period, then diminishes to a minimum when the retardation is about of a period, and so on.

If the slit is of constant width and we require the illumination at various points on the screen behind it, we must regard the arc

1 Journal de Physique, iit. p.1,1874. A similar suggestion has recently been made indepeudently by Fitzgerald.

of the curve as of constant length. The intensity is then, asalways, represented by the square of the length of the chord. If the slit be narrow, so that the arc is short, the intensity is constant over a wide range, and

does not fall off to an important extent until the discrepancy of the extreme phases reaches about a quarter of a

eriod, ¥ We have hitherto supposed that the shadow of a diffracting Silvery obstacle is received upon a diffusing screen, or, which comes to lining nearly the same thing, is observed with an eye-piece. If the eye, of an provided if necessary with a perforated plate in order to reduce the obstacle. aperture, be situated inside the shadow at a place where the illumina- tion is still sensible, and be focused upon the diffracting edge, the light which it receives will appear to come from the neighbourhood of the edge, and will present the effect of a silver lining. This is doubtless the explanation of a "pretty optical phenomenon, seen in Switzerland, when the sun rises from behind distant trees stand- ing on the summit of a mountain." 2

§ 18. Diffraction Symmetrical about an Axis.

The general problem of the diffraction pattern due to a source of light concentrated in a point, when the system is symmetrical about an axis, has been ably investigated by Lommel.? "We must content ourselves here with a very slight sketch of some of his results.

Spherical waves, centred upon the axis, of radius a fall upon | the diffracting screen; and the illumination is required ona second | screen, like the first_ perpendicular to the axis, at a distance (a+b) | from the source. We have first to express the distance (d) between | an element dS of the wave-front and a point M in the plane of the | second screen. Let ¢denote the distance of M from the axis of symmetry ; then, if we take an axis of # to pass through M, the coordinates of M are (¢ 0, 0). On the same system the coordinates of dS are

asin@cos?, asiné@sing, a(1—cosé@)+); and the distance is given by

P= + (2— 2aCsin 6cos p+ 4a(a+b) sin 240. In this expression ¢ and @ are to be treated as small quantities, Writing p for a sin 6, we get approximately

4,07 (eosg atbd, age P+ oab

2

bb

The vibration at the wave-front of resolution being denoted by a- cos 2Qnt/r,

the integral expressive of the resultant of the secondary waves is

(§ 17) . :

aL] sree? -2)as (2).

Substituting p dp d¢ for dS, and for d its value from (1), we obtain as the expression for the intensity at the point ¢

ao

uy P= BAS (C? +8?) (3), | where C=// cos (sp? — Ip cos ¢).p dp dd, (4), 48=// sin (dup? — Ip cos ¢).pdpdd (5), and the following abbreviations have been introduced Qratb — Sat a 2b 2? QR! (8).

The range of integration is for ¢ from 0 to 2x. The limits for p depend upon the partieular problem in hand; but for the sake of definiteness we will suppose that in the analytical definitions of Cand § the limits are 0 and 7, so as to apply immediately to the problem of a circular aperture of radius 7. If we introduce the notation of Bessel's functions, we have

r C=27 4 J (Zp) cos ($xp?). p dp (7).

(8).

By integration by parts of these expressions Lommel develops Lommel's series suitable for calculation. Setting series.

la S=2r A Jo(Zp) sin (4xp?). p dp

cr=y, lr=z (9), he finds in the first place C=nr ae v.49 U, (10), 2 § sin dy cos 4y sis yo} ay Ue (11),

*2 Necker, Phil. Mag., Nov. 1832; Fox Talbot, Phil. Mag., June 1833. '*When the sun is about to emerge… . every branch and leaf is lighted up with asilvery lustre of indescribable beauty. .... The birds, as Mr Necker very truly de- scribes, appear like flying brilliant sparks." Talbot ascribes the appearance to diffraction; and he recommends the use of a telescope.*

3 Abh. der bayer. Akad, der Wiss., ii. Cl., xv. Bd., ii. Abth.

4 Used now in an altered sense.

Shadow of cir- cular disk.

Condition of mathe. matical

similarity.

"Tay Eb THEO R Y 445

where

3

Uy! 54 2) -& Sale) + GI) ee oe Ci

2 a Ua 25 Ja(e)— GI) + Da ee. OD

These series are convenient when y is less than 2. The second set of expressions are

2) wae". sinlsey costy,.) SS sine 22 Vy eee ah gata ge a) geo S 2. 6 cosdy. simay S=ar) peosge – SEALY, oe – + + (15), where Be ZA Vo=Jol@) 7a Sole) t aa Julz)—- – + (16), z 2 Vi= 7 A@)— 98 JA a. ke a ee

Thesc serics are suitable when z/y is small. When the primary wave is complete, r=, and we have at once from the second set of expressions tee 4 OF Qa i Ca = sings Sco =" COS. se (18), so that Pe a ObAZ (a+b) " as we know it should be. In the application to the problem of the shadow of a circular disk the limits of integration are from 7 tooo. If these integrals be denoted by C', 8', we have

(19),

‘ 5 sin 42 cos 4 C’=Cn – Cami?) – 7m Vet ang a (CA0y , 4 sin S—ce ~Sanrt | ay, + my, t. . . (21); and 4x? Ch Pee Ve 1) Ha 4 Go BON Moe a a 5 te A (23).

When the point where the illumination is required is situated upon the axis, ¢, 7, z are zero. Hence V)=1,V,=0, and il

| eee (a+b? the same as if the primary wave had come on unbroken. This is Poisson’s theorem, already found (§ 10) by a mueh simpler method, in which attention: is limited from the first to points upon the axis. The distribution of light at other points upon the screen is to be found from (23) by means of the series (16), (17) for Vy and V,. Lommel gives eurves for the intensity when y=7, 2r, 37, ... 6x. The bright central spot is accompanied by rings of vary- ing intensity. The limit of the geometrical shadow [¢/(a+b)=7/a] corresponds to y=z. In this case Vo=Jo(2) ~~—Ix(z) +IA2) — ..~~=F{Io(z)+eosz} . . (24), Vi =J,(2) -J3(z)+-d,(z)- ...=$sineg . . . . . (25). The numbers computed for special values of y and z apply to a whole classof problems. Since alt ath re) aul e MO RE both y and z remain unchanged, even when A is constant, if we suppose

vr,

CCH, TERESA. . » « « E26). We may fall back upon Fraunhofer’s phenomena by supposing a=b=o, or more generally b= —a, so that y=0-

Under these circumstances cer = 920.

But it is unnecessary to add anything further under this head.

§ 19. Polarization.

_A ray of ordinary light is symmetrical with respect to the direc- tion of propagation. If, for example, this direction be vertical, there is nothing that can be said concerning the north and south sides of the ray that is not equally true concerning the east and west sides. In polarized light this symmetry is lost. Huygens showed that when a ray of such light falls upon

a crystal of Iceland spar, which is made to revolve about the ray as an axis, the pheno- mena vary in a manner not to be represented as a mere revolution

with the spar. In Newton's language, the ray itself has sides, or is polarized.

Malus discovered that ordinary light may be polarized by-reflexion Brew- as well as by double refraction; and Brewster proved that the ster's effect is nearly complete when the tangent of the augle of incidence law. is equal to the refractive index, or (which comes to the same) when the reflected and refracted rays are perpendicular to one another. ae light thus obtained is said to be polarized in the plane of re-

exion.

Reciprocally, the character of a polarized ray may be revealed by

submitting it to the test of reflexion at the appropriate angle. As the normal to the reflecting surface revolves (in a cone) about the ray, there are two azimuths of the plane of incidence, distant 180°, at which the reflexion is a maximum, aud two others, distant 90° from the former, at which the reflexion (nearly) vanishes. In the latter case the plane of incidence is perpendicular to that in which the light must be supposed to have been reflected in order to acquire its polarization.

The full statement of the law of double refraction is somewhat Double coinplicated, and scarcely to be made intelligible except in terms refrac- of the wave theory; but, in order merely to show the relation of tion. double refraction in' a uniaxal crystal, such as Iceland spar, to polarized light, we may take the case of a prism so cut that the refracting edge is parallel to the optic axis. By traversing such a prism, in a plane perpendicular to the edge, a ray of ordinary light is divided into two, of equal intensity, each of which is re- fracted according to the ordinary law of Snell. Whatever may be the angle and setting of the prism, the phenomenon may be repre- sented by supposing half the light to be refracted with one index (1°65), and the other half with the different index (1°48). The rays thus arising are polarized,—the one more

refracted in thc plane of refraction, and the other in the perpendicular plane. If these rays arc now allowed to fall upon a second similar prism, held so that its edge is parallel to that of the first prism, there is no further duplication. The ray first refracted with index 1°65 is refracted again in like manner, and similarly the ray first refracted with index 1°48 is again so refracted. But the case is altered if the second prism be caused to rotate about the incident ray. If the rotation be through an angle of 90°, each ray is indeed refracted singly ; but the indices are exchanged. The ray that suffered most refraction at the first prism now suffers least at the second, and vice versa, At intermediate rotations the double refraction reasserts itself, each ray being divided into two, refracted with the above-mentioned indices, and of intensity dependent upon the amount of rotation, but always such that no light is lost (or gained) on the whole by the separation.

The law governing the intensity was formulated by Malus, and Law of has been verified by the measures of Arago and other workers. If Malus. be the angle of rotation from the position in which one of the rays is at a maximum, while the other vanishes, the intensities are proportional to cos? and sin?@. On the same scale, if we neglect the loss by reflexion and absorption, the intensity of the incident light is represented by unity.

A similar law applies to the intensity with which a polarized ray is reflected from a glass surface at the Brewsterian angle. If be reckoned from the azimuth of maximum reflexion, the intensity at other angles may be represented by cos, vanishing when 6=90°.*

The phenomena here briefly sketched force upon us the view Trans- that the vibrations of light are transverse to the direction of pro- verse pagation. In ordinary light the vibrations are as much in one vibra- transverse direction as in another ; and when such light falls upon tions. a doubly refracting, or reflecting, medium, the vibrations arc resolved into two definite directions, constituting two rays polarized in perpendicular planes, and differently influenced by the medium.

In this case the two rays are necessarily of equal intensity.

Consider, for example, the application of this idea to the reflexion of a ray of ordinary light at the Brewsterian, or polarizing, angle. The incident light may be resolved into two, of equal intensity, and polarized respectively in and perpendicular to the plane of incidence. Now we know that a ray polarized in the plane per- pendicular to that of incidence will not be reflected, will in fact be entirely transmitted; and the necessary consequence is that all the light reflected at this angle will be polarized in the plane of inei- dence. The operation of the plate is thus purely selective, the polarized component, which is missing in the reflected light, being represented in undue proportion in the transmitted light.

If the incident light be polarized, suppose at an angle with the plane of incidence, the incident vibration may be resolved into cos in the one plane and sin@ in the other. The latter polarized component is not reflected. The reflected light is thus in all cases polarized in the plane of reflexion ; and its intensity, proportional to the square of the vibration, is represented by heos"8, if h be the intensity in which light is reflected when polarized in the plane of reflexion. The law of Malus is thus a necessary consequence of the principle of resolution. .

The idea of transverse vibrations was admitted with reluctance, Elastic even by Young and Fresnel themselves. A perfect fluid, such as solid the ethereal medium was then supposed to be, is essentially incap: theory.

able of transverse vibrations. But there seems to be no reason @ priori for preferring one kind of vibration to another; and the phenomena of polarization prove conclusively that, if luminous vibrations are analogous to those of a material medium, it is to solids, and not to fluids, that we must look. An isotropic solid is capable of propagating two distinct kinds of waves,—the first

The phase-relations being unknown, this quantity is quite indeter- minate. But, since each cosine varies from moment to moment, and on the whole is as much positive as negative, the mean intensity is

M(a,2)+M(a”)+..., that is to say, is to be found by simple addition of the separate intensities,

dependent upon rigidity, or the force by which shear is resisted, and the second analogous to waves of sound aud dependent upon In the former the vibrations are transverse to

Let us now dispense with the restriction to one direction of Elliptic vibration, and consider in the first place the character of a regular polariza- tion.

Medium The possibility of longitudinal waves, in which the displacement | to one plane, so that the light is not plane-polarized, but, in con- incom- is perpendicular to the wave-front, is an objection to the elastic formity with the path denoted by (2), it is said to be eddiptically- pressible. solid theory of light, for there is nothing known in optics corre- polarized. If one of the constituents of elliptically-polarized light sponding thereto. If, however, we suppose with Green that the be suitably accelerated or retarded relatively to the other, it may medium is incompressible, the velocity of longitudinal waves be- | be converted into plane-polarized light, and so identified by the comes infinite, and the objection is in great degree obviated. Such usual tests. Or, conversely, plane-polarized light may be converted a supposition is hardly a departure from the original idea, inas- | into elliptically-polarized by a similar operation. The relative much as, so far as we know, there is nothing to prevent a solid } acceleration in question is readily effected by a plate of doubly material possessing these properties, and an approximation is actu- | refracting crystal cut parallel to the axis. ally presented by such bodies as jelly, for which the velocity of If 8=a-+47, whether in the first instance or after the action of longitudinal vibrations is a large multiple of that of transverse | 4 crystalline plate, vibrations. x=a cos (P— a), y=rbsin(g-a) . . (8). § 20. Interference of Polarized Light. The maxima and minima values of the one coordinate here occur The conditions of interference of polarized light are most easily synchronously with the evanescence of the other, and the co- deduced from the phenomena of the colours of crystalline plates, if ordinate axes are the principal axes of the elliptic path. ; we once admit Young’s view that the origin of the colours is to | An important particular

case arises when further b=a, The Circular be sought in the interference of the differently refracted rays. path is then a circle, and the light is said to be etrewlarly-polarized. polariza- Independently of any hypothesis of this kind, the subject was According to the sign adopted in the second equation (3), the circle tion. directly investigated by Fresnel and Arago,! who summarized their | 1s described in the one direction or in the other. : conclusions thus :-— Circularly-polarized light can he resolved into plane-polarized Laws of | (1) Under the same conditions in which two rays of ordinary | Components in any two rectangular directions, which are such that interfer- light appear to destroy one another, two rays polarized in contrary the intensities are equal and the phases different by a quarter ence. (viz., perpendicular) directions are without mutual influence. period. If a crystalline plate be of such thickness that it retards (2) Two rays of light polarized in the same direction act upon | 02 component by a quarter of a wave-length (or indeed by any one another like ordinary rays; so that, with these two kinds of odd multiple thereof) relatively to the other, it will convert plane- light, the phenomena of interference are identical. polarized light into circularly ~~*polarized, and conversely »—in the (3) Two rays originally polarized in opposite directions may after*~~ *latter case without regard to the azimuth in which it is held. wards be brought to the same plane of polarization, without thereby The property of circularly-polarized light whereby it is capable acquiring the power to influence one another. of resolution into oppositely plane-polarized components of equal (4) Two rays polarized in opposite directions, and afterwards | intensities is possessed also by natural unpolarized light; but the brought to similar polarizations, react in the same manner as discrimination may be effected experimentally with the aid of the natural rays, if they are derived from a beam originally polarized | quarter-wave plate. By this agency the circularly-polarized ray is in one direction. converted into plane-polarized, while the natural light remains The fact that oppositely polarized rays cannot be made to inter- | apparently unaltered. The difficulty which remains is rather to fere may of itsclf be regarded as a proof that the vibrations are | ¢XPlain the physical character of natural light. To this we shall transverse ; and the principle, once admitted, gives an intelligible | Preseutly return; but in the meantime it is obvious that the con- account of all the varied phenomena in this field of optics. The | Stitution of natural light is essentially*

irregular, for we have seen only points on which any difficulty arises are as to the nature of | that absolutely regular, 7.¢., absolutely homogeneous, light 7s ordinary unpolarized light, and the rules according to which in- | ”@essarily (elliptically) polarized. ‘ tensity is to be calculated. It will be proper to consider these In discussing the vibration represented by (2), we have considered questions somewhat fully. the amplitudes and phases to be constant; but in nature this is no Plane In ordinary (plane) polarized light the vibrations are supposed to | More attainable than in the case of plane-polarized light. In order polariza- be in one direction only. If # and y be rectangular coordinates | that the elliptic polarization may be of a definite character, it is tion. in the plane of the wave, we may take, as representing a regular | OMly necessary that the ratio of amplitudes and the difference of

compressibility. t the direction of propagation, that is, they may take place in any direction parallel to the wave front, and they are thus suitable representatives of the vibrations of light. In this theory the luminiferous ether is distinctly assimilated to an elastic solid, and the velocity of light depends upon the rigidity and density assigned to the medium.

vibration of plane-polarized light,

“Z=acos(@—-a) . (1), where ¢=2nt/r, and a, a denote constants. It must be remembered, however, that in optics a regular vibration of this kind never pre- sents itself. In the simplest case of approximately monochromatic light, the amplitude and phase must be regarded (§ 4) as liable to incessant variation, and all that we are able to appreciate is the mean intensity, represeuted by M(a?). If a number of these irre- gular streams of light are combined, the intensity of the mixture cannot be calculated from a mere knowledge of the separate inten- sities, unless we have assurance that the streams are independent, that is, without mutual phase-relations of a durable character. For instance, two thoroughly similar streams combine into one of four- fold intensity, if the phases are the same; while, if the phases are opposed, the intensity falls to zero. It is only when the streams are independent, so that the phase-relation is arbitrary and variable from moment to moment, that the apparent resultant intensity is necessarily the double of the separate intensities.

If any number of independent vibrations of type (1) be super- posed, the resultant is [2 a, cos a] cos $+[Za, sin a,]sing, and the momentary intensity is [Z a, cos ay]? +[Za, sin a), or A> +2 +... + 2d4W COS (4, — ag) +... 1 Fresnel s Works, vol. i. p. 521.

vibration, of given frequency. The general expression will be =a cos (— a), y=beos(@—8) (2), where a, a, 0, 8 are constants. If 8=a, the vibrations are executed entirely in the plane x/y=a/d, or the light is plane-polarized. Or if B=a-a, the light is again plane-polarized, the plane of vibration being a/y=-—a/b. In other cases the vibrations are not confined

phases should be absolute constants, and this of course is consistent with the same degree of irregularity as was admitted for plane vibrations.

The intensity of elliptically-polarized light is the sum of the intensities of its rectangular components. This we may consider to be an experimental fact, as well as a consequence of the theory of transverse vibrations. In whatever form such a theory may be adopted, the energy propagated will certainly conform to this law. When the constants in (2) are regarded as subject to variation, the apparent intensity is represented by

(4).

M(a)+M(B) . 2. we.

We are now ina position to examine the constitution which must Unpolar- The conditions to be satisfied are ized light.

be ascribed to natural light. that when resolved in any plane the mean intensity of the vibra- tions shall be independent of the orientation of the plane, and, further, that this property shall be unaffected by any previous rela- tive retardation of the rectangular components into which it may have been resolved. The original vibration being represented by x=acos(p —a), y=bcos(¢- 8), or, a' We may write it, since we are concerned only with phase

differences, x=acos¢, y=b cos (@— 8) (5),

let us suppose that the second component is subjected to a retarda- tion e. Thus

xL=AC089, y=bcos(p—-8—e) (6), in which a, b, 5 will be regarded as subject to rapid variation,

Neces- sary eon- ditions.

WAV SE

while « remains constant. If the vibration represented by (6) be now resolved in a direction x', making an angle w with x, we have xz' =a cos? cosw+bcos(–S–e) sin w =[acos w+ dbsin w cos (8+ ¢)]cosG+bsinwsin (S+e)sin¢ ;

and the intensity is

a cos "w+ 6? sin2w+2abcoswsinweos(Ste) . . (7). Of this expression we take the mean, w and ¢ remaining constant. Thus the apparent intensity may be written M(x') =M(a*) cos'w + M(b?) sin 2w + 2M[ad cos (8+ €)] cos w sin w (8). In order now that the stream may satisfy the conditions laid down*

as necessary for natural light, (8) must be independent of w and e; so that

Mi@y= WG) . . . ss ws M(abcos$)=M(absins)=0. . . . .(10).?

In these equations a" and 5? represent simply the intensities, or squares of amplitudes, of the x and y vibrations; and the other two quantities adinit also of a simple interpretation. The value of y may be written

y=bcosdcos@+bsindsing . . . . (11); from which we see that bcosd is the coefficient of that part of the y vibration which has the same phase as the x vibration. Thus abcos' may be interpreted as the product of the coefficients of the parts of the x and y vibrations which have the same phase. Next suppose the phase of y accclerated by writing 41+ ¢ in place of ¢. We should thus have

y= —beosSsing+bsindcos¢, and bsin& represents the product of the coefficients of the parts which are now in the same phase, or (wliich is the same) the pro- duct of the coefficients of the x vibration and of that part of the y vibration which was 90° behind in phase. In general, if x=hcospth'sind¢, y=keos+k'sing . (12), the first product is hk+h'k' and the second is hk' — Wh.

Let us next examine how the quantities which we have been considering are affected by a transformation of coordinates in accordance with the formule

x =2COSwW+Y Sill @ , y'=-xsmew+ycosw . (13). We find

a =cos d{acosw+bsinwcosdsing.dsindsinw . (14), y' = COS o{ — asin w 6 cos w cos 5} +sing.bsindcosw. (15); whence amp." of x' =a? cos? w b? sin? w 2abcosdsinwcosw . (16), amp.? of y' =a? sin? w + 6? cos? w- 2abcos8sinwcosw . (17). In like manner First product = (6? – a?) sin w cos w+ ab cos 8 (cos? w —sin?w) (18), Second product=adsin & a 0 9 ogee w CD), The second product, representing the circulating part of the motion, is thus unaltered by the transformation. Let us pass on to the consideration of the mean quantities which occur in (9), (10), writing for brevity M(a)=A, M(6?) =B, M(aé cos 8) =C, M(adsin 3)=D, From (16), (17), (18), (19), if A', B', ©', D' denote the corre- sponding quantities after transformation,*

*A'=Acos?#+Bsin?w+2Ccoswsinw. . . . (20), B'=Asin?#+Bcos*w- 2Ccoswsinw. . . . (21), C' = C(cos*w—sin?w)+(B-A)coswsinw. . . (22), IDI) 5 5s 5 0 (CR).*

These formule prove that, if the conditions (9), (10), shown to be necessary in order that the light may behave as natural light, be satisfied for one set of axes, they are equally satisfied with any other. It is thus a matter of indifference with respect to what axes the retardation ¢ is supposed to be introduced, and the con- ditions (9), (10) are sufficient, as well as necessary, to characterize natural light.

Reverting to (8), we see that, whether the light be natural or not, its character, so far as experimental tests can show, is deter- mined by the

values of A, B, C, D. The effect of a change of axes 1s given by (20), &c., and it is evident that the uew axes may always be so chosen that C'=0. For this purpose it is only necessary to take w such that

*tan 2w=2C/(A-B). lf we choose these new axes as fundamental axes, the valucs of the oon for any others inclined to them at angle w will be of the orm A=A, cos? w + B, sin? w B=A,sin?w+B,cos*w? . . . . . (24). C=(B,—A,) cos w sin w*

If A, and B, are here equal, then C=0, A=B for all values of #. In this case, the light cannot be distinguished from natural light by mere resolution; but if D be finite, the difference may be made apparent with the aid of a retarding plate.

1 Verdet, Legons d'Optique Physique, vol. il. p. 83.

2 er OR OY 447

If A, and B, are unequal, they represent the maximum and minimuni values of A and B. 'The intensity is then a function of the plane of resolution, and the light may be recognized as partially polarized by the usual tests. If either A, or B, vanishes, the light is plane-polarized.?

When several independent streams of light are combined, the values, not only of A and B, but also of C and D, for the mixture, are to be found by simple addition. It must here be distinctly understood that there are no permanent phase-relations between one component and another. Suppose, for example, that there are two streams of light, each of which satisfies the relations A—B, C=0, but makes the value of D finite. If the two values of D are equal and opposite, and the streams are independent, the mixture constitutes natural light. A particular case arises when each com- ponent is circularly-polarized (D=+A=+B), one in the right- handed and the other in the left-handed direction. The intensities being equal, the mixture is equivalent to natural light, but only under the restriction that the streams are without phase-relation. If, on the contrary, the second stream be similar to the first, affected merely with a constant retardation, the resultant is not natural, but completely (plane) polarized light.

We will now prove that the most general mixture of light may Analysis be regarded as compounded of one stream of light elliptically- of general polarized in a definite manner, and of an independent stream of ease, natural light. The theorem is due to Stokes,? but the method that we shall follow is that of Verdet.4

In the first place, it is necessary to observe that the values of the fundamental quantities A, B, C, D are not free from restriction. It will be shown that in no case can C?+ D? exceed AB.

In equations (2), expressing the vibration at any moment, let @, 54, a,, By, be the values of a, b, a, 8 during an interval of time proportional to m,, and in like manner let the suffixes 2, 3,.... correspond to times proportional to 7, 23,.... Then

AB = 11420770? + 3701.75? +... + mye(0470.” + 47D”) +...

Again, by (12),

C=m,a,b,(cos a, cos 8, sin a, sin B,)...

= 7,00, COS 8) + WMollaby COS Bg+...,

D= mya), sin 8, + ttyoby Sin By +... 5

where, as before, 3:=B,— a, 5,=B2,—a2,

Thus, C2 + D2 = 172,704,701? + g2ig2hg? +... + My MLyAD Aighy COS (5z — By) +...

From these equations we see that AB —C?—- D® reduces itsclf to a sum of terms of the form

My Mol 42by? + 27d? — 24,0, Ayb, COS (82 – 8,)], each of which is cssentially positive. The only case in which the sum can vanish is when

8, = 6,=83=. 229

and further Dy 304 = 0g 3 Mg—= dg Qg=... Under these conditions the light is reduced to be of a definite elliptic character, although the amplitude and phase of the system as a whole may be subject to rapid variation. The clliptic con- stants are given by B/at=B/A, tao Ca . 25),

In general AB exceeds (C?D?); but it will always be possible to find a positive quantity H, which when subtracted from A and B (themselves necessarily positive) shall reduce the product to equality with C? D?, in accordance with

(A-H)(B-H)=C?+D?. . . . ; (26). The original light may thus be resolved into two groups. For the first group the constants are H, H, 0, 0; and for the second A — H, B-H,C, D. Each of these is of a simple character; for the first represents natural light, and the second light elliptically polarized. , It is thus proved that in general a stream of light may be regarded Stokes s as composed of one stream of natural light and of another elliptic- theorem. ally-polarized. The intensity of the natural light is 2H, where from (26)

H=4(A+B)-4/{(A-B)?+4(C?+D%)} . (27). The elliptic constants of the second component are given by b?/a?=(B-H)/(A- H), tand=D/C. . (28), and 3) ea 5) 5

If D=0, and therefore by (28) 3=0, the second component is plane-polarized. This is regarded as a particular case of elliptic polarization. Again, if A=B, C=0, the polarization is circular. The laws of interference of polarized light, discovered by Fresnel and Arago, are exactly what the theory of transverse vibrations would lead us to expect, when once we have cleared up the idea of unpolarized light. Ordinary sources, such as the sun, emit un- polarized light. If this be resolved in two opposite directions, the pean ee a ee eee 2 In this case D, necessarily vanishes.

2 "On the Composition and Resolution of Streams of Light from Different Sources," Camb. Phil. Trans,, 1852. 4 Loc. ctt., p. 94.

Wave- surface.

Direc- tion of ray.

Fresnel's views,

polarized components are not only each irregular, but there is uo permaneut phase-relation between them. No light derived from one can therefore ever interfere regularly with light derived from the other. If, however, we commence with plane-polarized light, we have only one series of irregularities to deal with. When resolved in two rectangular directions, the components cannot then interfere, but only on account of the perpendicularity. If brought back by resolution to the same plane of polarization, interference becomes possible, because the same serics of irregularities are to be found in both components.

§ 21. Double Refraction.

*The construction by which Huygens explained the ordinary and extraordinary refraction of Iceland spar has already been given (Licut, vol. xiv. p. 610). The wave-sarface is in two sheets, com- posed of a sphere and of an ellipsoid of revolution, in*contact with one another at the extremities of the polar axis. In biaxal crystals the wave-surface is of a more complicated character, including that of Huygens as a particular case.*

~ is not unimportant to remark that the essential problem of double refraction is to determine the two velocities with which plane waves are propagated, when the direction of the normal to the wave-frout is assigned. When this problem has been solved, the determination of the wave-surface isa mere matter of geometry, not absolutely necessary for the explanation of the leading pheno- mena, but convenient as affording a concise summary of the principal laws. In all cases the wave-surface is to be regarded as the envelope at any subsequent time of all the plane wave-fronts which at a given instant may be supposed to be passing through a particular point.

In singly refracting media, where the velocity of a wave is the saine in all directions, the wave-normal coincides with the ray. In doubly refracting crystals this law no longer holds good. The principles by which the

conception of a ray is justified (§ 10), when applied to this case, show that the centre of the zone system is not in general to be found at the foot of the perpendicular upon the primary wave-front. The surface whose contact with the primary wave-front determines the element from which the secondary dis- turbance arrives with least retardation is now not a sphere, but whatever wave-surface is appropriate to the medium. The direc- tion of the ray, corresponding to any tangent plane of the wave-surface, is thus not the normal, but the radius vector drawn from the centre to the point of contact.

The velocity of propagation (reckoned always perpendicularly to the wave-front) may be conceived to depend upon the direction of the wave-front, or wave-normal, and upon what we may call (at any rate figuratively) the direction of vibration. If the velocity depended exclusively upon the wave-normal, there could be no double, though there might be extraordinary, refraction, i.e., refraction deviating from the law of Snell; but of this nothing is known in nature. The fact that there are in general two velocities for one wave-front proves that the velocity depends upon the direction of vibration.

According to the Huygenian law, confirmed to a high degree of accuracy by the observations of Brewster and Swan,! a ray polarized in a principal plane (7.¢., a plane passing through the axis) of a uniaxal crystal suffers ordinary refraction only, that is, propagates itself with the same velocity in all directions. The interpretation which Fresnel put upon this is that the vibrations (understood now in a literal sense) are perpendicular to the plane of polarization, and that the velocity is constant because the direction of vibration is in all cases similarly related (perpendicular) to the axis. The development of this idea in the fertile brain of Fresnel led him to the remarkable discovery of the law of refraction in biaxal crystals.

The hypotheses upon which Fresnel based his attempt at a mechanical theory are thus summarized by Verdet:—

(1) The vibrations of polarized light are perpendicular to the plane of polarization ;

(2) The elastic forces called into play during the propagation of a system of plane waves (of rectilinear transverse vibrations) differ from the elastic forces developed by the parallel displacement of a single molecule only by a constant factor, independent of the par- ticular direction of the plane of the wave;

(3) When a plane wave propagates itself in any homogeneous medium, the components parallel tothe wave-front of the elastic forces called into play by the vibrations of the wave are alone operative ;

(4) The velocity of a plane wave which propagates itself with type unchanged in any homogeneous medium is proportional to the square root of the effective component of the elastic force developed by the vibrations.

Fresnel himself was perfectly aware that his theory was deficient in rigour, and indeed there is little to be said in defeuce of his second hypothesis. Nevertheless, the great historical interest of this theory, and the support that experiment gives to Fresnel's conclusion as to the actual form of the wave-surface in biaxal crystals, render some account of his work in this field imperative.

J Edinb. Trans., vol. xvi. p. 875.

THEORY

The potential energy of displacement of a single molecule from Energy of its position of equilibrium is ultimately a quadratic function of the displace- three components reckoned parallel to any set of rectangular axes. ment. These axes may be so chosen as to reduce the quadratic function to a sum of squares, so that the energy may be expressed,

Vim a'e? + 509? + BC? . (1),

where &, y, ¢ are the three component displacements. The corre- sponding forces of restitution, obtained at once by differentiation, a X=a%, Y=2, Z=e¢ (2). The force of restitution is thus in. gencral inclined to the direction of displacement. The relation between the two directions

X, Y, Z and , , ¢is the same as that between the normal to a tangent plane and the radius vector p to the point of contact in the ellipsoid

e+ PP te a1 F (8). If a', 67, c are unequal, the directions of the coordinate axes are the only ones in which a displacement calls into operation a parallel force of restitution. If two of the quantities a, 6%, c? arc equal, the ellipsoid (3) is of revolution, and every direction in the plane of the equal axes possesses the property in question. This is the case of a uniaxal crystal. If the three quantities a?, 02, c are all equal, the medium is isotropic.

If we resolve the force of restitution in the dircction of displace- ment, we obtain a quantity dependent upon this direction in a manner readily expressible by means of the ellipsoid of elasticity

(3). For, when the total displacement is given, this quantity is proportional to Ge ee 5, oe

that is to say, to the inverse square of the radius vector p in (8).

We have now to inquire in what directions, limited toa particular pjrec- plane, a displacement may be so made that the projection of the tions of force of restitution upon the plane may be parallel to the displace- yibra- ment. The answer tollows at once froin the property of the ellip- tion, soid of elasticity. For, if in any section of the ellipsoid we have a radius vector such that the plane containing it and the normal to the corresponding tangent plane is perpendicular to the plane of the section, the tangent line to the section must be perpendicular to the radius vector, that is, the radius vector must be a principal axis of the section. There are therefore two, and in general only two, directions in any plane satisfying the proposed condition, and | these are perpendicular to one another. If, however, the plane be | one of those of circular section, every line of displacement is such that the component of the force, resolved parallel to the plane, coincides with it.

According to the principles laid down by Fresnel, we have now complete data for the solution of the problem of double refraction. If the direction of the wave-front be given, there are (in general) only two directions of

vibration such that a single wave is propa- gated. Ifthe actual displacements do not conform to this condi- tion, they will be resolved into two of the required character, and the components will in gencral be propagated with different velocities. The two directions are the principal axes of the section of (3) made by the wave-front, and the velocities of propagation are inversely proportional to the lengths of these axes.

The law connecting the lengths of the axcs with the direction (2, m, n) of the plane is a question of geometry ;? and indeed the whole investigation of the wave-surface may be elegantly carried through geometrically with the aid of certain theorems of Mac- Cullagh respecting apsidal surfaces (Salmon, ch. xiv.). For this, however, we have not space, and must content ourselves with a sketch of the analytical method of treatment.

If v be the velocity of propagation in direction J, mm, n, the wave- surface is the envelope of planes

letmy+nz=v . (4), where v is a function of 7, m, n, whose fori is to be determined. If (A, », v) be the corresponding direction of vibration, then

lA+mptnv=0. (5).

once

According to the principles laid down by Fresnel, we sce at that the force of restitution (aa, bu, cv), corresponding to a displacement unity, is equivalent to a force v along (A, p, v), to- gether with some force (P) along (2, m,). Resolving parallel to the coordinate axes, we get*

*1P=@a-7,, mP=b*n- vu, nP=cy— vy, or 1P mP nP “gp? B= Bip | Be o*

Multiplying these by 7, m, respectively, and taking account of Law of (5), we see that velocity.

er) (7)

is the relation sought for between v and (J, m, 2). In this equia- tion 6, ¢ are the velocities when the direction of propagation is

2

nN

=0,

2 See Salmon's Analytical Geometry of Three Dimensions, Dublin, 1882, § 102.

WAVE THEORY

along x, the former being applicable when the vibration is parallel to y, and the latter when it is parallel to x.

The directions of vibration are determined by (5) and by the consideration that (J, m, 7), (A, m, v), and (aa, Dy, cv) lie in a plane, or (as we may put it) are all perpendicular to one direction (Ff, 9 1). Thus Uf+ mg+nh o}

Af+ wgtvh =0 @rf+ Pug + evh=0 The determinant expressing the result of the elimination of f: g: A may be put into the form

Mm

$8) 4 (Pat) + (oP) =O . (9),

which with (5) suffices to determine (A, m, v) 28 a function of (2, m, n).

The fact that the system of equations (5), (8) is symmetrical as between (A, yn, v) and (f, g, %) proves that the two directions of vibration corresponding to a given (7, m,) are perpendicular to one another,

The direct investigation of the wave-surface from (4) and (7) was first effected by Ampére, but his analytical process was very labori- ous. Fresnel had indeed been forced to content himself with an indirect method of verification. Butin the following investigation

(8),

A.Smith's of A. Smith} the eliminations are effected with comparatively little investiga- trouble.

tion.

Fresnel's wave- surface.

Principal Sections,

In addition to (4) and (7), we know that Pim+V?=1. . . (10). To find the equation to the envelope, we have to differentiate these equations, making 7, m, », v vary. Eliminating the differentials by the method of multipliers, we obtain the following :—

x=Al +Bi/(v?-a?) . (11);

y=Am+ Bm/(v? — 0) (12),

z—An +Bnj(—e) . (13); and ; ' m W

1=Bo } (Fate (e_ P(e (14).

The equations (11), (12), (18) multiplied by 7, m, n respectively and added, give a. (15). The same equations, squared and added, give ey? +22—= A24 B/v.

If we put 7? for x? + y?+2%, and for A the value just found, we obtain

B=v(r? —v?) . (16). If these values of A and B be substituted in (11), ~—y pus v=10} 1+ 3B =ly @uaal or vw — a? x ee 17). : y-ay mt)

If we substitute this value of 7, and the corresponding values of m, nin (4), we get

(v?—a?)a? (v—b?)y? (v2 -c?) 2? 2 vat yay? yy? Pog 1 pe T pie ~ Oe Ta Bp? whence Fg SM ze?

a-@t apt Ae? 18), as. the equation of the wave-surface.

By (6) equation (11) may be written

w=Al+BP-h, from which and the corresponding equations we see that the direc- tion (x, y, z) lies in the same plane as (J, m, m) and (A, yu, »). Hence in any tangent plane of the wave-surface the direction of vibration is that of the line joining the foot of the perpendicular and the point of contact (x, y, 2).

The equation (18) leads to another geometrical definition of Fresnel's wave-surface. If through the centre of the ellipsoid reciprocal to the ellipsoid of elasticity (3), viz.,

e/e+y/P+e/e=1 (19), a plane be drawn, and on the normal to this plane two lengths be marked off proportional to the axes of the elliptic section deter- mined by the plane, the locus of the points thus obtained, the apsidal surfacc of (19), is the wave-surface (18).

Fully developed in integral powers of the coordinates, (18) takes the form

(ac? + y® + 22)(a2x? + b2y? + 022") — a?(b? + a?

— (2 + a)y? — P(e? +07) +07P=0 . (20). The section of (20) by the coordinate plane y=0 is (ac? + 22 — b?)(a2x:? + e722 — a%c) =0 (21),*

1 Camb. Trans., vi., 18385.

representing a circle and an ellipse (fig, 24). That the sections by each of the principal planes would be a circle and an ellipse might have been foreseen independently of a general solution of the en- velope problem. The forms of the sections prescribed in (21) and the two similar equations are suffi- cient to determine the character of the wave-surface, if we assume that it is of the fourth degree, and involves only the even powers of the coordi- nates. It was somewhat in this way that the equation was first obtained by Fresnel.

If two of the principal velocities, é.g., @ and b, are equal, (20) becomes (22+ y? +27 — a?)(a2a? + ay?

+ 722 — a?c?) =0 (22), so that the wave-surface degenerates into the Huygenian sphere and ellip- soid of revolution appropriate to a uniaxal crystal. x=0, y=0, z=ha. external to the sphere. the ellipsoid is internal.

We have secn that when the wave-front is parallel to the circular sections of (3), the two wave velocities coincide. Thus in (7), if a?, b?, c? be in descending order of magnitude, we have m=0, v=b ; so that

Fig. 24,

The two sheets touch one another at the points If c>a, as in Iceland spar, the ellipsoid is On the other hand, if c

n? 1

Pe ge

aR (23). In general, if 6, 6' be the angles which the normal to the actual wave-front makes with the optic axes, it may be proved that the difference of the squares of the two roots of (7) is given by V9" — v2 = (a? — c") sin 6 sin 6" (24). In a uniaxal crystal the optic axes coincide with the axis of symmetry, and there is no distinction between 6' and 6.

Since waves in a biaxal crystal propagated along either optic axis have but one velocity, it follows that tangent planes to the wave- surface, perpendicular to these directions, touch both sheets of the surface. It may be proved further that each plane touches the surface not merely at two, but at an infinite number of points, which lie upon a circle.

The directions of the optic axes, and the angle included between them, are found frequently to vary with the colour of the light. Such a variation is to be expected, in view of dispersion, which renders a', b?, c® functions of the wave-length.

A knowledge of the form of the wave-surface determines in all cases the law of refraction according to the construction of Huygens. We will suppose for simplicity that the first medium is air, and that the surface of separation between the media is plane. The incident wave-front at any moment of time cuts the surface of separation in a straight line. On this line take any point, and with it as centre construct the wave-surface in the second medium corresponding to a certain interval of time. At the end of this interval the trace of the incident wave-front upon the surface will have advanced toa new position, parallel to the former. Planes drawn through this line so as to touch the wave- surface give the positions of the refracted wave-fronts. None other could satisfy the two conditions—(1) that the refracted wave- front should move within the crystal with the normal velocity suitable to its direction, and (2) that the traces of the incident and refracted waves upon the surface of separation should move together. The normal to a refracted wave lies necessarily in the plane of incidence, but the refracted ray, coinciding with the radius vector of the wave-surface, in general deviates from it. In most cases it is sufficient to attend to the wave normal.

As in total reflexion by simply refracting media, it may happen that no tangent planes can be drawn to satisfy the prescribed conditions, or that but one such can be drawn.

When the crystal is uniaxal, one wave is refracted according to the ordinary law of Snell. The accuracy of both the sphere and the ellipsoid of the Huygenian construction has been fully verified by modern observations, ?

The simplest case of uniaxal refraction is when the axis of the crystal is perpendicular to the plane of incidence, with respect to which every thing then becomes symmetrical. The section of the wave-surface with which we have to deal reduces to two con- centric circles; so that both waves are refracted according to the ordinary law, though of course with different indices.

In biaxal crystals one wave follows the ordinary law of refrac- tion, if the plane of incidence coincide with a principal plane of the crystal. This consequence of his theory was verified by Fresnel himself, and

subsequently by Rudberg and others. But the most remarkable phenomena of biaxal refraction are undoubtedly we ali ac Sil lla a iliac ele eae AOS ARI Ks

2 Stokes, Proc. Roy. Soc., vol. xx. p. 443, 1872; Glazebrook, Phil. Trans., 1880, p. 421; Hastings, Amer. Jour., Jan. 1888. #

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Uniaxal crystals.

Optic axes,

Huygeus's

construc- tion

Total re- flexion,

Conical refrac- tion.

Electro-

450

those discovered by Hamilton and Lloyd, generally known as conical refraction.

In general there are two refracted rays, corresponding to two distinct waves. But the refracted waves coalesce when they are perpendicular to either optic axis, and (as we have seen) this wave touches the wave-surface along a circle. Thus corresponding to one wave direction there are an infinite number of rays, lying upon a cone. The division of a single incident ray into a cone of refracted rays is called internal conical refraction. If the second face of the crystal is parallel to the first, each refracted ray resumes on emer- gence its original direction, so that the emergent bundle forms a hollow cylinder. oe |

External conical refraction depends upon the singular points in the principal plane of zz, where the two sheets of the surface cross one another (fig. 24). At such a point (P) an infinite number of tangent planes may be drawn to the surface, and each of the per- pendiculars from O represents a wave direction, corresponding to the single ray OP. On emergence these waves will be differently refracted ; and thus corresponding to a single internal ray there are an infinite number of external rays, lying upon a cone.

It has already been admitted that the dynamical foundations of Fresnel's theory are unsound; and it must be added that the rigorous theory of crystalline solids investigated by Cauchy and Green does not readily lend itself to the explanation of Fresnel's laws of double refraction. On this subject the reader should con- sult Prof. Stokes's Report. Sir W. Thomson has recently shown! that an originally isotropic medium, pressed unequally in different directions, may be so constituted as to vibrate in accordance with Fresnel's laws. ,

It may perhaps be worth while to remark that the equations, analogous to (2) § (24), which lead to these laws are

at dp 252 dn dp 2052,

ap gg OSS gue we &e (25),

where a, 0, ¢ are the principal wave velocities. If we here assume E=A0, n=O, (=r6,

6/6, = p/Do = ¢ ik(la—my-+nz- vay,

and substitute in (25), the condition of transversality leads at once to the desired results. But the equations (25) are not applicable to the vibrations of a crystalline solid.

In the electromagnetic theory double refraction is attributed to

magnetic zolotropic inductive capacity, and appears to offer no particular

theory.

Double absorp- tion.

difficulty.

If the present position of the theory of double refraction is still somewhat unsatisfactory, it must be remembered that the un- certainty does not affect the general principle. Almost any form of wave theory involving transverse vibrations will explain the leading phenomenon, viz., the bifurcation of the ray. It is safe to predict that when ordinary refraction is well understood there will be little further trouble over double refraction.

The wave-velocity is not the only property of light rendered un- symmetrical by crystalline structure. In many cases the two polarized rays are subject to a different rate of absorption. Tour- malines and other crystals may be prepared in plates of such thickness that one ray is sensibly stopped and the other sensibly transmitted, and will then serve as polarizing (or analysing) ap- paratus. Although for practical purposes Nicol's prisms (LIGHT, vol. xiv. p. 612) are usually to be preferred, the phenomenon of double absorption is of great theoretical interest. The explanation is doubtless closely connected with that of double refraction.

§ 22. Colours of Crystalline Plates.

When polarized light is transmitted through a moderately thin plate of doubly refracting crystal, and is then analysed, e.g. with a Nicol, brilliant colours are often exhibited, analogous in their character to the tints of Newton's scale. With his usual acuteness, Young at once attributed these colours to interference between the ordinary and extraordinary waves, and showed that the thickness of crystal required to develop a given tint, inversely proportional to the doubly refracting power, was in agreenient with this view. But the complete explanation, demanding a fuller knowledge of the laws of interference of polarized light, was reserved for Fresnel and Arago. The subject is one which admits of great development ;? but the interest turns principally upon the beauty of the effects, and upon the facility with which many of them may be obtained in

experiment. We must limit ourselves to a brief treatment of one or two of the simpler cases,

The incident vibration being plane-polarized, we will suppose that its plane makes an angle a with the principal plane of the crystal. On entcring the crystal it is accordingly resolved into the two components represented by

cosacos@, sinacosd, where p=2Qrt/r.

1 "On Cauchy's and Green's Doctrine of Extraneous Force to explain dynami- cally Fresnel's Kinematics of Double Refraction," Phil, Mag., Feb. 1888. 2 See Verdet's Zecons, vol. ii.

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In traversing the crystal both waves are retarded, but we are concerned only with the difference of the retardations. Denoting the difference by p, we may take as the expressions of the waves on emergence

cosa cos ¢, sin a cos (— p). It may be remarked that, in the absence of dispersion, p would be inversely proportional to A; but in fact there are many cases where it deviates greatly from this law.

Now let the plane of analysation be inclined at the angle B to that of primitive polarization (fig. 25). Then for the sum of the two resolved components we have

cos a cos (a — 8) cos P+sin asin (a — 8) cos (¢-p), of which the intensity is {cos a cos (a— 8)-+sin asin (a — 8) cos p}?+sin 2a sin (a — 8) sin 2g

*= cos 98 — sin 2asin 2(a—f)sin hp . (1). If in (1) we write 8+4m in place of 8, we get sin®8+sin 2asin 2(a—) sin *4p (2);*

and we notice that the sum of (1) and (2) is unity under all cireum- stances. The effect of rotating the analyser through 90° is thus always to transform the tint into its . : complementary. The two complemen- g x tary tints may be seen at the same time if we employ a double image prism. In

the absence of an analyser we may regard the two images as superposed, and there is no colour.

These expressions may be applied at

once to the explanation of the colours

of thin plates of mica or selenite. In

this case the retardation p is propor-

tional to the thickness, and approxi-

mately independent of the precise direction of the light, supposed to be nearly perpendicular to the plate, viz., nearly parallel to a principal axis of the crystal.

The most important cases are when B=0, B=47. In the latter the field would be dark were the plate removed; and the actual intensity is

*ein*2e sin Ye 2k ee we The composition of the light is thus independent of the azimuth of*

the plate (a); but the catensity varies greatly, vanishing four times during the complete revolution. The greatest brightness occurs when the principal plane bisects the angle between the planes of polarization and analysis. If 8=0, the light is complementary to that represented by (8).

If two plates be superposed, the retardations are added if the azimuths correspond ; but they are subtracted if one plate be rotated relatively to the other through 90°. It is thus possible to obtain colour by the superposition of two nearly similar plates, although they may be too thick to answer the purpose separately.

If dispersion be neglected, the law of the colours in (3) is the same as that of the reflected tints of Newton's scale. The thick- nesses of the plates of mica (acting by double refraction) and of air required to give the same colour are as 400: 1. When a plate is too thick to show colour, its action may be analysed with the aid of a spectroscope.

Still thicker plates may be caused to exhibit colour, if the direc- tion of the light within them makes but a small angle with an optic axis. Let us suppose that a plate of Iceland spar, or other uniaxal crystal (except quartz), cut perpendicularly to the axis, is interposed between the polarizing and analysing apparatus, and that the latter is so turned that the field is originally dark. The ray which passes perpendicularly is not doubly refracted, so that the centre of the field remains dark. At small angles to the optic axis the relative retardation is evidently proportional to the square of the inclination, so that the colours are disposed in concentric rings. But the intensity is not the same at the various parts of the circum- ference. In the plane of polarization and in the perpendicular plane there is no double refraction, or rather one of the refracted rays vanishes. Along the corresponding lines in the field of view there is no

revival of light, and the ring system is seen to be tra- versed by a black cross.

In many crystals the influence of dispersion is sufficient to sensibly modify the proportionality of p to A. In one variety of uniaxal apophyllite Herschel found the rings nearly achromatic, indicating that p was almost independent of a. Under these circumstances a much larger number of rings than usual became visible.

In biaxal crystals, cut so that the surfaces are equally inclined to the optic axes, the rings take the form of lemniscates.

A medium originally isotropic may acquire the doubly refracting property under the influence of strain; and, if the strain be homo- geneous, the conditions are optically identical with those found ina natural crystal. The principal axes of the wave-surface coincide with those of strain. If the strain be symmetrical, the medium is optically uniaxal. In general, if P, Q, R be the principal stresses,

Colours of mica and

selenite.

Rings from uniaxal crystals.

Double

refraction

due to strain.

KH ——

Effects of heat.

Rotation by quartz.

WAVE THEORY

the difference of velocities for waves propagated parallel to R is evidently proportional to (P— Q), and so on.

More often it happens that the strain is not homogeneous. Even then the small parts may be compared to crystals, but the optical constants vary from point to point. The comparatively feeble doubly refracting power thus developed in glass may best be made evident by the production of the colours of polarized light. Thus, in an experiment due to Brewster, a somewhat stout slab of glass, polished on the edges, is interposed between crossed Nicols. When the slab is bent in a plane perpendicular to that of vision, a revival of light takes place along the edges, where the elongation and con- traction is greatest. If the width (in the direction of vision) be sufficient, the effect may be increased until the various colours of Newton's scale are seen. These colours vary from point to point of the thickness in the plane of bending, the "neutral axis" remaining dark. The optic axis, being everywhere coincident with the direction of elongation (or contraction), is parallel to the length of the slab. 'To this direction the plane of polarization should be inclined at about 45°.

The condition of internal strain is not necessarily due to forces applied from without. Thus, if glass originally free from strain be unequally heated, the accompanying expansions give rise to internal strains which manifest themselves in polarized light. If the heating be moderate, so as not to approach the softening point, the state of ease is recovered upon cooling, and the double refrac- tion disappears. But if the local temperature be raised further, the hot parts may relieve themselves of the temporary strain, and then upon cooling they and other parts may be left in a condition of permanent strain. Sudden cooling of glass heated to the soften- ing point leads toa similar result. The outer parts harden while the interior is still at a higher temperature, so that, when the whole is cooled down, the outside, being as it were too large for the inside, is in a condition of radial tension and circumferential compression, An examination in polarized light shows that the strains thus occasioned are often very severe. If any small part be relieved by fracture from the constraint exercised upon it by the remainder, the doubly refracting property almost or wholly disappears. In this respect unannealed glass differs essentially from a crystal, all parts of which are similar and

independent. It may be remarked that it is difficult to find large pieces of glass so free from internal strain as to show no revival of light when examined between crossed Nicols.

§ 23. Rotatory Polarization.

In general a polarized ray travelling along the axis of a uniaxal erystal undergoes no change; but it was observed by Arago that, if quartz be used in this experiment, the plane of polarization is found to be rotated through an angle proportional to the thickness of crystal traversed. The subject was further studied by Biot, who ascertained that the rotation due to a given thickness is in- versely as the square of the wave-length of the light, thus varying very rapidly with the colour. In some, specimens of quartz (called in conscquence right-handed) the rotation is to the right, while in others it is to the left. Equal thicknesses of right- and left-handed quartz may thus compensate one another.

Fresnel has shown that the rotation of the plane may be inter- preted as indicating a different velocity of propagation of the two circularly-polarized components into which plane-polarized light may always be resolved. In ordinary media the right- and left- handed cireularly-polarized rays travel at the same speed, and at any stage of their progress recompound a ray rectilinearly-polar- ized in a fixed direction. But it is otherwise if the velocities of propagation of the circular components be even slightly different.

The first circularly-polarized wave may be expressed by

&,=7 cos (vt — kz), m=rsin(nt—hyz) . (De and the second (of equal amplitude) by f =r cos (nt — kz), No= —7sin (nt—kyz) . . (2). The resultant of (1) and (2) is E=8 +£,=2r cos 4(ky — ky)z cos{nt—4(ky+kq)2}, =m + no=2r sin $key —ky)z cos{ nt — $k, + hy)z} ; so that nlé=tanh(kg-hy)z. 2. 1 (3),

which shows that for any fixed value of z the light is plane-polar- ized. The direction of this plane, however, varies with z. Thus, if n/E= tan 6, so that @ gives the angular position of the plane in reference to , we have

0=4(hey—h,)2 a

indicating a rotation proportional to z The quantities 4, k, are inversely as the wave-lengths of the two circular components for the samc periodic time. When the relative retardation amounts to an entire period, (k.-%,)2=27m, and then, by (4), =. The revolution of the plane through two right angles restores the original state of polarization. In quartz the rotation is very rapid,

amounting in the case of yellow light to about 24° for each milli- metre traversed.

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It is interesting to observe with what a high degree of accuracy the comparison of the velocities of the two waves can be effected. If the plane of polarization be determined to one minute of angle, a relative retardation of A/10800 is made manifest. If 7 be the thickness traversed, v and v+8v the two velocities, the relative retardation is J3v/v. To take an example, pl ag that /=20 inches, A=xzphop inch; so that if 5v/v exceed 10-8, the fact might be detected.

In quartz the rotation of the plane depends upon the crystalline structure, but there are many liquids, ¢.g., oil of turpentine and common syrup, which exhibit a like effect. In such cases the rota- tion is of course independent of the direction of the light ; it must be due to some peculiarity in the constitution of the molecules.

A remarkable connexion has been observed between the rotatory property and the crystalline form. Thus Herschel found that in many specimens the right-handed and left-handed varicties of quartz could be distinguished by the disposition of certain sub- ordinate faces. The crystals of opposite kinds are symmetrical in a certain sense, but are yet not superposable. The difference is like that between otherwise similar right- and left-handed screws. The researches of Pasteur upon the rotatory properties of tartaric acid have opened up a new and most interesting field of chemistry. At that time two isomeric varieties were known,—ordinary tartaric acid, which rotates to the right, and racemic

acid, which is optically in- active, properties of the acids shared also by the salts. Pasteur found that the crystals of tartaric acid and of the tartrates possessed a right-handed structure, and endeavoured to discover correspond- ing bodies with a left-handed structure. After many trials crystal- lizations of the double racemate of soda and ammonia were obtained, including crystals of opposite kinds. A selection of the right-handed specimens yielded ordinary dextro-tartaric acid, while a similar selection of the left-handed crystals gave a new variety— levo-tartaric acid, rotating the plane of polarization to the left in the same degree as ordiuary tartaric acid rotates it to the right. A mixture in equal proportions of the two kinds of tartaric acid, which differ scarcely at all in their chemical properties,' reconsti- tutes racemic acid.

The possibility of inducing the rotatory property in bodies other- wise free from it was one of the finest of Faraday's discoveries. He found that, if heavy glass, bisulphide of carbon, &c., are placed in a magnetic field, a ray of polarized light, propagated ead the lines of magnetic force, suffers rotation. The laws of the pheno- menon were carefully studied by Verdet, whose conclusions may be summed up by saying that in a given medium the rotation of the plane for a ray proceeding in any direction is proportional to the difference of magnetic potential at the initial and final points. In bisulphide of carbon, at 18° and for a difference of potential equal to unity C. G. S., the rotation of the plane of polarization of a ray of soda light is 0402 minute of angle.

A very important distinction should be noted between the magnetic rotation and that natural to quartz, syrup, &c. In the latter the rotation is always right-handed or always left-handcd with respect to the direction of the ray. Hence when the ray is reversed the absolute direction of rotation is reversed also.

*The importance of polarimetric determinations has led to the con- trivancc of various forms of apparatus adapted to the special require- ments of the case. If the light be bright enough, fairly accurate measurements may be made by merely rotating a Nicol until the field appears dark. Probably the best form of analyser, when white light is used and the plane is the same for all the coloured com- ponents, is the Jellet,**

formed by the combination of two portions of Iceland spar. By this instrument the field of view is duplicated, and the setting is effected by turning it until the two portions of the field, much reduced in brightness, appear equally dark. A similar result is attained in the Laurent, which, however, is only applicable to homogeneous light. In this apparatus, advantage is taken of the action of a half-wave plate. In passing such a plate the plane of polarization is as it were reflected by the principal section, that is, rotated until it makes the same angle with the priucipal section as at first, but upon the further side. The plate covers only half of the field of view, and the eye is focused upon the

1 It would seem that the two varieties could be chemically distinguished only by their relations with bodies themselves right-handed or left-handed.

2 Phil. Trans,, 1885, p. 343.

3 Maxwell's Electricity and Magnetism, vol. ii. chap. xxi. 4 A description is given in Glazebrook's Physical Optics, London, 1883,

Delicacy of test.

Right- and left- handed. varieties,

Magnetic rotation.

Polari- metry.

Laurent analyser.

Soleil's appa- ratus.

Equa- tions for elastic solid,

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dividing edge. The planes of polarization of the two halves of the field are different, unless the original plane be parallel (or perpen- dicular) to the principal section. In the Laurent analyser the half- wave plate is rigidly

combined with a Nicol in such a position that the principal section of the latter makes a small but. finite angle with that of the plate. The consequence is that the two halves of the field of view cannot be blackened simultaneously, but are rendered equally dark when the instrument is so turned that the principal section of the plate is parallel to the plane of original polarization, which is also that of the uncovered half of the field. A slight rotation in either direction darkens one half of the field and brightens the other half,

In another form of "half-shade" polarimeter, invented by Poynting, the half-wave plate of the Laurent is dispensed with, a small] rotation of onc half of the field with respect to the other half being obtained by quartz (cut perpendicularly to the axis) or by syrup. In the simplest construction the syrup is contained in a small cell with parallel glass sides, and the division into two parts is effected by the insertion of a small piece of plate glass about 33, inch thick, a straight edge of which forms the dividing line. If the syrup be strong, the difference of thickness of is inch gives a relative rotation of about 2°. In this arrangement the sugar cell is a fixture, and only the Nicol rotates. The reading of the divided circle corresponds to the mean of the planes for the two halves of the field, and this of course differs from the original position of the plane before entering the sugar. This circumstance is usually of no importance, the object being to determine the rotation of the plane of polarization when some of the conditions are altered.

A discussion of the accuracy obtainable in polarimetry will be found in a recent paper by Lippich.?

In Soleil's apparatus, designed for practical use in the estima- tion of the strength of sugar solutions, the rotation due to the sugar is compensated by a wedge of quartz. right-handed and the other of left-handed quartz, may be fitted together, so that a movement of the combination in either direction increases the thickness of one variety traversed and diminishes that of the other. The linear movement required to compensate the introduction of a tube of syrup measures the quantity of sugar present.

§ 24. Dynamical Theory of Diffraction. The explanation of diffraction phenomena given by Fresnel and

his followers is independent of special views as to the nature of

the ether, at least in its main features; for in the absence of a more complete foundation it is impossible to treat rigorously the mode of action of a solid obstacle such asa screen. The full solu- tion of problems of this kind is scarcely to be expected. Even in the much simpler ease of sound, where we know what we have to deal with, the mathematical difficulties are formidable; and we are not able to solve even such an apparently elementary question as the transmission of sound past a rigid infinitely thin plane screen, bounded by a straight edge, or perforated with a circular aperture. But, without entering upon matters of this kind, we may inquire in what manner a primary wave may be resolved into elementary secondary waves, and in particular as to the law of intensity and polarization in a secondary wave as dependent upon its direction of propagation, and upon the character as regards polarization of the primary wave. This question is treated by Stokes in his " Dynamical Theory of Diffraction"? on the basis of the elastic solid theory.

_ Let x, y, z be the coordinates of any particle of the medium in its natural state, and £, 7, ¢ the displacements of the same particle at the end of timc ¢, mcasured in the directions of the three axes

respectively. Then the first of the equations of motion may be put under the form

u ofVE PE a . ae Pat at ge reo) (a a),

ae" dae tay ae da" dy dz where a and b? denote the two arbitrary constants. Put for short- ness dé dy ag AR at dy oP a 6 (1),*

aud represent by v°é the quantity multiplied by 7.

(; According to this notation, the three equations of motion are

aE 272 2 _ 22,48 }

ap OVE t (a aa Sr

On _ 272 2 PCL

ap 7 Vent (a mer (2). ae Qe72 2 _ 428

*BP b*y7¢+ (a |*

It is to be observed that 8 denotes the dilatation of volume of the clement situated at (x, y, z). In the limiting case in which the medium is regarded as absolutely incompressible 5 vanishes A lovin in order that cquations (2) may preserve their gencrality, we must

1 Wien. Ber, 1xxxv., 9th Feb. 1882. See also Phil. Trans., 1885, p. 360. 2 Camb. Phil. Trans., vol. ix. p.1; reprint, vol. ii, p 243,

waves. parallel to OZ, we have €=0, »=0, while (is a function of x and ¢only. Equation (1) and the first pair of equations (2) are thus satisfied identically. The third equation gives :

answered by Stokes. placements corresponding to the incident light ; let O, be any point secondary in the plane P (of the wave-front), adjacent to O, ; only of the incident disturbance which passes continually across dS. Let O be any point in the medium situated at a distance from the

Two wedges, one of

Tet © kh ¥

suppose a at the same time to become infinite, and replace a28 by a new function of the coordinates.

These equations simplify very much in their application to plane Plane If the ray be parallel to OX, and the direction of vibration waves,

ae 9 VE of which the solution is C=f(bt-a) . (4)

where fis an arbitrary function.

The question as to the law of the secondary waves is thus Stokes's "Let €=0, n=0, ¢=f(bt—x) be the dis- law of

dS an element of that plane wave. and consider the disturbance due to that portion

point O, which is large in comparison with the length of a wave; let 0,0 =7, and let this line make an angle with the direction of propagation of the incident light, or the axis of x, and with the direction of vibration, or axis of z. Then the displacement at O will take place in a direction perpendicular to 0,0, and lying in the plane ZO,O; and, if ¢' be the displacement at O, reckoned positive in the direction nearest to that in which the incident

vibrations are reckoned positive,

»_ aS som Pipi ¢ =7,,(1 + cos 6)sin gp f(bt—1) . In particular, if

f(bt-2)=csin "(bE – 2) (5), we shall have (=F (1 +005 6) sin g cos (4-7), « (By.

It is then verified that, after integration with respect to dS, (6) gives the same disturbance as if the primary wave had becn sup- posed to pass on unbroken.

The occurrence of sin p as a factor in (6) shows that the relative intensities of the primary light and of that diffracted in the direc- tion 6 depend upon the condition of the former as regards polar- ization. Ifthe direction of primary vibration be perpendicular to the plane of diffraction (containing both primary and secondary rays), sing@=1; but, if the primary vibration be in the plane of diffraction, sin¢=cos@. This result was employed by Stokes as a criterion of the direction of vibration ; and his experiments, con- ducted with gratings, led him to the conclusion that the vibrations of polarized light are executed in a direction perpendicular to the plane of polarization.

The factor (1+cos@) shows in what manner the secondary dis- turbance depends upon the direction in which it is propagated with respect to the front of the primary wave.

If, as suffices for all practical purposes, we limit the application of the formule to points in advance of the plane at which the wave is supposed tobe broken up, we may use simpler methods of resolu- tion than that above considered. It appears indeed that the purely mathematical question has no definite answer. In illustra- Analogy tion of this the analogous problem for sound may be referred to. of sound. Imagine a flexible lamina to be introduced so as to coincide with the plane at which resolution is to be effected. The introduction of the lamina (supposed to be devoid of inertia) will make no differ- ence to the propagation of plane parallel sonorous waves through the position which it occupies. At every point the motion of the lamina will be the same as would have occurred in its absence, the pressure of the waves impinging from behind being just what is required to generate the waves in front. Now it is evident that the aerial motion in front of the lamina is determined by what happens at the lamina without regard to the cause of the motion there existing. Whether the necessary forces are due to acrial pressures acting on the rear, or to forces directly impressed from without, is a matter of indifference. The conception of the lamina leads immediately to two schemes, according to which a primary wave may be supposed to be broken up. In the first of these the element dS, the effect of which is to be estimated, is supposed to execute its actual motion, while every other element of the plane lamina is maintained at rest. The resulting aerial motion in front is readily calculated ; it is symmetrical with respect to the origin, z.e., independent of 6. When the secondary disturbance thus ob- tained is integrated with respect to dS over the entire plane of the lamina, the result is necessarily the same as would have been obtained had the primary wave been supposed to pass on without resolution, for this is precisely the motion generated when every element of the lamina vibrates with a common motion, equal to that attributed to dS. The only assumption here involved is the evidently legitimate one that, when two systems of variously distri-

3 Theory of Sound, § 278.

af

Various The method of resolution just described is the simplest, but it 2 ~ikr 5 ~ thr methods is only one of an indefinite number that might be

*papas and . a: at /- ea a () é of reso- which are all equally legitimate, so long as the question is regarded is. 7 acl ie ee ae lution. as a merely mathematical one, without reference to the physical | ¢ denoting the angle between r and z. In differentiating e-**/r properties of actual screens. If, instead of supposing the motion | with respect to 7, we may neglect the term divided by 7? as altogether at dS to be that of the primary wave, and to be zero elsewhere, we | insensible, &r being an exceedingly great quantity at any moderate suppose-the force operative over the element dS of the lamina to be | distance from the origin of disturbance. Thus that corresponding to the primary wave, and to vanish elsewhere, —tk.TZsing er we obtain a secondary wave following quite a different law.1 In ee en ee Os (15), this case the motion in different directions varies as cos 6, vanishing Rep eae ee eee : : at right angles to the direction of propagation of the primary wave. | "UC? Comp etely determines the rotation at any point. For a dis- Here again, on integration over the entire lamina, the aggregate turbing force of given integral magnitude it is seen Lo be every- effect of the secondary waves is necessarily the same as that of the ee se Set ae eterenly aa the angle Gb ih – rimary. ? oe : oe pene Impressed. Y In oe to apply these ideas to the investigation of the secondary bo tye directions and upon the distance (7). : force. wave of light, we require the solution of a problem, first treated eamicusity of ight isghowever, more maually expressed: in by Stokes," viz., the determination of the motion in an infinitely terms of the actual displacement in the plane of the wave. This extended elastic solid due to a locally applied periodic force. If displacement, which we may denote by ¢', is in the plane containing we suppose that the force impressed upon the element of mass | * and 7, and perpendicular to the latter. Its connexion with @ is Ddadyde is expressed by w=d(/dr; so that DZ dx dy dz, , TZLsing etlnt-m) being pata oe to the axis of Z, the only change required ¢ "ie ~~ (16), in our equations (1), (2) is the addition of the term Z to the second ene member of the third equation (2). In the forced vibration, now mae No ee . – ee mal eB under considcration, Z, and the quantities £, y, ¢, 5 expressing the 1 i ie Aa f fe real part of (16), we find, as the result of a resulting motion, are to be supposed proportional to ¢", where ST a 0 t=/ (-1), and n=2n/7, + being the periodic time. Under these DTZ cos nt (17), circumstances the double differentiation with respect to ¢ of any | the disturbance expressed by Resulting quantity is equivalent to multiplication by the factor — n?, and*

*thus , TZsing cos(nt-kr) disturb- our equations take the form ¢ aoe = ee (18). ance. (b?v? -n?)é4- (a? — my mo The occurrence of sing shows that there is no disturbance radi- ~ ated in ie oe a the force, a feature which might have been pi 2 72) 40 _ anticipated from considerations of symmetry. pe) ee dy i (7). Ae We sal sag) (18) to the istodligetien of a law of secondary ds isturbancc, when a primary wave (By? n?) ((a? – 0?) — = Z : dz J ¢=sin (nt — kz) (19) It will now be convenient to introduce the quantities a, a, 3, | 18 supposed to be broken up in passing the planew=0. The first which express the rotations of the elements of the medium round axes | Step is to calculate the force which represents the reaction between parallel to those of coordinates, in accordance with the equations the parts of the medium separated by w=0. he force operative dt dn dn d¢ dt dk upon the positive half is parallel to OZ, and of amount per unit of oe ie aR tae oe (8). } area equal to In terms of th ' btain f i = differenti ye ; dsub Piiliiitinenet tion, rom), bya enon aise and to this force acting over the whole of the plane the actual (By? +7?)e73=0 motion on the positive side may be conceived to be due. Tho (B2y? + n2)ex, = dZ/dy (9) secondary disturbance corresponding to the element dS of the plano ai ee 4 * | may be supposed to be that caused by a force of the above magni (Gv* +n*)a_= – dZ/dx tude acting over dS and vanishing elsewhere; and it only remains The first of equations (9) gives to examine what the result of such a force would be. y= (10). Now it is evident that the force in question, supposed to act Law of For a, we have upon the positive half only of the medium, produces Just double of secondary il OW ee the effect that would be caused by the same force if the medium wave. seas SY dy da dy da (11),? | were undivided, and on the latter supposition (being also loealized ae F . at a point) it comes under the head already considered. According ae A Se ae ila ———— a tho et to (18), the 'tee of the force acting at dS parallel to OZ, and of k=nfb=2n/r . LO een ae A being the wave length. / j { : : : 2b°D dS cos nt , Force We will now introduce the supposition that the force Z acts only will be a disturbance . locally within a small space of volume T, situated at (x, y, 2), and for /_25 sin > = 20 Peeled. simnlici me ee ' ? ¢ cos (nt — kr) (20), ppied. simplicity suppose that it is at the origin of coordinates that the Ar*

WAVE

buted motion at the lamina are superposed, the corresponding motions in front are superposed also,

rotations are to be estimated. Integrating by parts in (11), we get

eo tkr aZ, e7tkr d [e-#r fee fa)

in which the integrated terms at the limits vanish, Z being finite only within the region T. Thus

ill ad fe-tr

Since the dimensions of T are supposed to be very small in com-

parison with a, the factor ag aa

dy if Zstand for the mean valuc of Z over the volume T, we may

is sensibly constant; so that,

i BPO UR ¥

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the direction of the force and to the line joining the point to the source of disturbance. Ifthe resultant rotation be w, we have

regard being' had to (12). This therefore expresses the secondary disturbance at a distance r and in a direction making an angle ¢ with OZ (the direction of primary vibration) due to the element dS of the wave-front.

The proportionality of the secondary disturbance to sing is Compari-eommon to the present law and to that given by Stokes, but here son with there is no dependence upon the angle @ between the primary and Stokes's The occurrence of the factor (ar)-1, and the law.

secondary rays. necessity of supposing the phase of the secondary wave accelerated by a quarter of an undulation, were first established by

Archibald Smith, as the result of a comparison between the primary wave, supposed to pass on without resolution, and the integrated effect The occurrence of factors such

write of all the secondary waves (§ 10). TZ y cd fe- as sing, or $(1+cos@), in the expression of the secondary wave Oa oe = —) (18). | has no influence upon the result of the integration, the eflects of In like ma: iad oe eN all the elements for which the factors differ appreciably from unity oo, a _ tte being destroyed by mutual interference. ; BS ele Ee a). (14). The choice between various methods of resolution, all mathe- 4nb r dr\ 1 matically admissible, would be guided by physical considerations*

From (10), (18), (14) we see that, as might have been expected, the rotation at any point is about an axis perpendicular both to eee soe ERRNO On axis pele ee

1 Loe, cit., equation (10). 2 Loe. cit., §§ 27-30.

q a Oa potion may be verified in the same manner as Poisson's theorem, in which k=0. –

respecting the mode of action of obstacles. Thus, to refer again to the acoustical analogue in which plane waves are incident upon a perforated rigid screen, the circumstances of the case aro best represented by the first method of resolution, leading to symme- trical secondary waves, in which the normal motion is supposed to

Polariza- tion of diffracted light.

be zero over the unperforated parts. Indeed, if the aperture is very small, this method gives the correct result, save as to a constant factor. In like manner our present law (20) would apply to the kind of obstruction that would be caused by an actual physical division of the elastic medium, extending over the whole of the area supposed to be occupied by the intercepting screen, but of course not extending to the parts supposed to

be perforated. In the present state of our ignorance this law seems to be at least as plausible as any other.

§ 25. The Diffraction of Light by Small Particles.

The theory of the diffraction, dispersion, or scattering of light by small particles, as it has variously been called, is of im- portance, not only from its bearings upon fundamental optical hypotheses, but on account of its application to explain the origin and nature of the light from the sky. The view, suggested by Newton and advocated in more recent times by such authoritics as Herschel? and Clausius,? that the light of the sky is a blue of the first order reflected from aqueous particles, was connected with the then prevalent notion that the suspended moisture of clouds and mists was in the form of vesicles or bubbles. Experiments such as those of Briicke® pointed to a different conclusion. When a weak alcoholic solution of mastic is agitated with water, the pre- cipitated guin seatters a blue light, obviously similar in character to that from the sky. Not only would it be unreasonable to attribute a vesicular structure to the mastic, but (as Briicke remarked) the dispersed light is much richer in quality than the blue of the first order. Another point of great importance is well brought out in the experiments of Tyndall‘ upon clouds precipitated by the chemical action of light. Whenever the particles are suffi- ciently fine, the light emitted laterally is blue in colour, and, in a direction perpendicular to the incident beam, is completely polarized.

About the colour there can be no prima facie difficulty; for, as soon as the question is raised, it is seen that the standard of linear dimension, with reference to which the particles are called sinall, is the wave-length of light, and that a given set of particles would (on any conceivable view as to their mode of action) produce a continually increasing disturbance as we pass along the spectrum towards the more refrangible end.

On the other hand, that the direction of complete polarization should be independent of the refracting power of the matter com- posing the cloud has been considered mysterious. Of course, on the theory of thin plates, this direction would be determined by Brewster’s law ; but, if the particles of foreign matter are small in all their dimensions, the circumstances are materially different from those under which Brewster’s law is applicable.

The investigation of this question upon the elastic solid theory will depend upon how we suppose the solid to vary from one optical medium to another. The slower propagation of light in glass or water than in air or vacuum may be attributed to a greater density, or to a less rigidity, in the former case; or we may adopt the more complicated supposition that both these quantities vary, subject only to the condition which restricts the ratio of velocities to equality with the known refractive index. It will presently appear that the original hypothesis of Fresnel, that the rigidity remains the same in both media, is the only one that can be reconciled with the facts; and we will therefore investigate upon this basis the nature of the secondary waves dispersed by small particles.

Conceive a beam of plane polarized light to move among a number of particles, all small compared with any of the wave- lengths. According to our hypothesis, the foreign matter may be supposed to Joad the ether, so as to increase its ¢nertia without altering its resistance to distortion. If the particles were away, the wave would pass on unbroken and no light would be cmitted laterally. Even with the particles retarding the motion of the eether, the same will be true if, to counterbalance the increased inertia, suitable forces are caused to act on the ether at all points where the inertia is altered. These forces have the same period and direction as the undisturbed luminous vibrations themselves. The light actually emitted laterally is thus the same as would be caused by forces exactly the opposite of these acting on the medium otherwise free from disturbance, and it only remains to see what the effect of such force would be.

On account of the smallness of the particles, the forces acting throughout the volume of any individual particle are all of the same intensity and direction, and may be considered as a whole. The determination of the motion in the ether, due to the action of a periodic force at a given point, is a problem with which we have recently been occupied (§ 24). But, before applying the solution to a mathematical investigation of the present qucstion, it may be well to consider the matter for a few moments from a more general point of view.

In the first place, there is necessarily a complete symmetry round the direction of the force. The disturbance, consisting of trans-

1 Article " Light," Enc. Metrop., 1830, § 1143.

2 Pogg. Ann., vols. 1xxii., Ixxvi., Ixxxviii; Crelle, vols. xxxiv., xxxvi,

3 Poyg. Ann., vol. Ixxxiti. 4 Phil. Mag. (4), vol. cxxxvil. p. 388,

verse vibrations, is propagated outwards in all directions from the centre; and, in consequence of the symmetry, the direction of vibration in any ray lies in the plane containing the ray and the axis of symmetry; that is to say, the direction of vibration in the scattered or diffracted ray makes with the direction of vibration in the incident or primary ray the least possible angle. The symmetry also requires that the intensity of the scattered light should vanish for the ray which would be propagated along the axis; for there is nothing to distinguish one direction transverse to the ray from another. The application of this is obvious. Suppose, for dis- tinctness of statement, that the primary ray is vertical, and that the plane of vibration is that of the meridian. The intensity of the light scattered by a small particle is constant, and a maximum, for rays which lie in the vertical plane running east and west, while there is no scattered ray along the north and south line. If the primary ray is unpolarized, the light scattered north and south is entirely due to that component which vibrates east and west, and is therefore perfectly polarized, the direction of its vibra- tion being also east and west. Similarly any other ray scattercd horizontally is perfectly polarized, and the vibration is performed in the horizontal plane. In other directions the polarization becomes less and less complete as we approach the vertical.

The observed facts as to polarization are thus readily explained, and the general law connecting the intensity of the scattered light with the wave-length follows almost as easily from considerations of dimensions.

The object is to compare the intensities of the incident and Method

scattered light, for these will clearly be proportional. The number of dimen- (z) expressing the ratio of the two amplitudes is a function of the sions, following quantities :—(T) the volume of the disturbing particle; (r) the distance of the point under consideration from it ; (A) the wave-length; (0) the velocity of propagation of light; (D) and (D') the original

and altered densities: of which the first three depend only upon space, the fourth on space and time, while the fifth and sixth introduce the consideration of mass. Other elements of the problem there are none, except mere numbers aud angles, which do not depend upon the fundamental measurements of space, time, and mass. Since the ratio (2), whose expression we seck, is of no dimensions in mass, it follows at once that ID and D' occur only under the form D: D', which is asimple number and may therefore be disregarded. It remains to find how 7 varies with T, 7, a, 0.

Now, of these quantities, 6 is the only one depending on time ; and therefore, as 2 is of no dimensions in time, 6 cannot occur in its expression.

Moreover, since the same amount of energy is propagated across all spheres concentric with the particle, we recognize that 7 varies as7. It is equally evident that 7 varies as T, and therefore that it must be proportional to T/ar, T being of three dimensions in space.

In passing from one part of the spectrum to another, A is the only quantity which varies, and we have the important law :—

When light is scattered by particles whicli are very small coni- Law of pared with any of the wave-lengths, the ratio of the amplitudes of inten- the vibrations of the scattered and incident lights varies inversely sities, as the square of the wave-length, and the ratio of cntensities as the inverse fourth power.

The light scattered from small particles is of a much richer blue than the blue of the first order as reflected from a very thin plate.

From the general theory (§ 8), or by the method of dimensions, it is easy to prove that in the latter case the intensity varics as A~?, instead of A~+4.

The principle of energy makes it clear that the light emitted Intensity laterally is not a new creation, but only diverted from the main of trans-

stream. If I represent the intensity of the primary light after mitted traversing a thickness x of the turbid medium, we have light.

dl = —hIa-4tdz, where / is a constant independent of A. On integration, lope ane. sel. (0), if I, correspond to x=0,—a law altogether similar to that of absorption, and showing how the light tends to become yellow and finally red as the thickness of the medium increases.®

Captain Abney has found that the above law agrees remarkably well with his observations on the transmission of light through water in which particles of mastic are suspended. ®

We may now investigate the mathematical expression for the Mathema- disturbance propagated in any direction from a small particle upon ticalin- | which a beam of light strikes. Let the particle be at the origin of vestiga- coordinates, and lct the expression for the primary vibration be _ tion. .

*Comite). 2 1. ws cs (2), The acceleration of the element at the origin is— 7?sin 2é; so that the force which would have to be applied to the parts where the density is D' (instead of D), in order that the waves might pass on undisturbed, is per unit of volume, —(D'-D)n*sin né.*

*5 **On the Light from the Sky, its Polarization and Colour," Phil, Mag., Feb, 1871, & Proc. Roy. Soc., May 1886,*

General expres- sions,

Hither

- *AN or AD van- ishes.*

AN must vanish.

Weave THEOR Y

To obtain the total force which must be supposed to act, the factor T (representing the volume of the particle) must be introduced. The opposite of this, conceived to act at O, would give the same disturbance as is

actually caused by the presence of the particle. Thus by (18) (§ 24) the secondary disturbance is expressed by

,_ D'-D n7T sin ¢ sin (nt – kr) we Aah? r

D — DID xl sin $ sin (nt- kr) « ee

1

D (3).

The preceding investigation is based upon the assumption that in passing from one medium to another the rigidity of the «ther does not change. If we forego this assumption, the question is necessarily more complicated ; but, on the supposition that the changes of rigidity (AN) and of density (AD) are relatively small, the results are fairly simple. If the primary wave be represented

by Cmte wl | (4), the component rotations in the secondary wave are AN yz aie ON AD AN ay anP(S ety a): " AD x , AN 2-2 moh (Sy eH SS) where UeT e- ter To daa ©)

The expression for the resultant rotation in the general case would be rather complicated, and is not needed for our purpose, It is easily seen to be about an axis perpendicular to the scattered ray (x, y, 2), inasmuch as ta +Yayt+2a,=0. Let us consider the more special case of a ray scattered normally to the incident ray, so that x=0. We have . AN 2 oe AD 2 a2 wow! tai+ a=? (SS) 2+P() gz)

If AN, AD be both finite, we learn from (7) that there is no direction perpendicular to the primary (polarized) ray in which the secondary light vanishes. Now experiment tells us plainly that there is such a direction, and therefore we are driven to the conclu- sion that either AN or AD must vanish.

The consequences of supposing AN to be zero have already been traced. They agree very well with experiment, and require us to suppose that the vibrations are perpendicular to the plane of polarization. So far as (7) is

concerned the alternative supposition that AD vanishes would answer equally well, if we suppose the vibrations to be executed in the plane of polarization ; but let us now revert to (5), which gives

According to these equations there would be, in all, six directions from O along which there is no scattered light, —two along the axis of y normal to the original ray, and four (y=0, z=+2) at angles of 45° with that ray. So long as the particles are small no such

vanishing of light in oblique directions is observed, and

z we are thus led to the conclusion that the hypothesis of

a finite AN and of vibrations in the plane of polarization

Q cannot be reconciled with the facts. No form of the

elastic solid theory is admissible except that in which

the vibrations are supposed to be perpendicular to the

plane of polarization, and the dif-

ference between one medium and

another to be a difference of density only.?

Before leaving this subject it may be instructive to show the applica- tion of a method, similar to that used for small particles, to the case of an obstructing cylinder, whose axis is parallel to the fronts of the primary waves. We will suppose (1) that the variation of optical properties depends upon a difference of density (D'—D), and is small in amount; (2) that the diameter of the cylinder is very small in comparison with the wave-length of light.

Let the axis of the cylinder be the axis of z (fig. 26), and (as before) let the incident light be parallel to x. The original vibration is thus, in the principal cases, parallel to either z or y. We will take

1 In strictness the force must be supposed to act upon the medium inits actual condition, whereas in (18) the medium is supposed to be absolutely uniform. It is not (difficult to prove that (3) remains unaltered, when this circumstance is taken into account; and it is evident in any case that a correction would depend upon the square of (D'—D).

Pag paper, "On the Scattering of Light by Small Particles," Pail. Mag.,

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first the former case, where the disturbance due to the cylinder must evidently be symmetrical round OZ and parallel toit. The element of the disturbance at A, due to PQ(dz), will be proportional to dz in amplitude, and will be retarded in phase by an amount corre- sponding to the distance 7. In calculating the effect of the whole bar we have to consider the integral

ee _ [dr sin (nt — kr) ZL a $10 (né kr) -/, ~a/(P— RY) ° The integral on the left may be treated as in § 15, and we find

J. " r-Tsin (nt — r)de=4/(a/R) ein (nt -ER— 40),

showing that the total effect is retarded 4A behind that due to the central element at O. We have seen (8) that, if « be the sectional area, the effect of the element PQ is D'—D wodzsin D wr where @ is the angle OPA. In strictness this should be reckoned perpendicular to PA, and therefore, considered as a contribution to the resultant at A, should be multiplied by sing. But the faetor sin', being sensibly equal to unity for the only parts which are really operative, may be omitted without influencing the result. In this way we find, for the disturbance at A,

D'-D oO sin (nt-ER—4n)

sin (nt -

Oo D ytR? corresponding to the incident wave sin (ni— zx).

When the original vibration is parallel to y, the disturbance due to the cylinder will no longer be symmetrical about OZ. If a be the angle between OX and the scattered ray, which is of course always perpendicular to OZ, it is only necessary to introduce the factor cos a in order to make the previous expression (9) applicable.

The investigation shows that the light diffracted by an ideal wire- grating would, according to the principles of Fresnel, follow the law of polarization enunciated by Stokes. On the other hand, this law would be departed from were we to suppose that there is any difference of rigidity between the cylinder and the surrounding medium.

(9),

§ 26. Reflexion and Refraction.

So far as the directions of the rays are concerned, the laws of reflexion and refraction were satisfactorily explained by Huygens on the principles of the wave theory. The question of the amownt of light reflected, as dependent upon the characters of the media and upon the angle of incidence, 1s a much more difficult one, and cannot be dealt with a priori without special hypotheses as to the nature of the luminous vibrations, and as to the cause of the differ- ence between various media. By a train of reasoning, not strictly

dynamical, but of great ingenuity, Fresnel was led to certain Fresnel's formule, since known by his name, expressing the ratio of the re- formule.

flected to the incident vibration in terms of one constant (mu). If 6 be the angle of incidence and 6, the angle of refraction, Fresnel's expression for light polarized in the plane of incidence is

sin (0 ~ @,)

sin (6+ 6;) (), where the rclation between the angles , ,, and u (the relative re- fractive index) is, as usual,

sin @=p sin 6, ee ae In like manner, for light polarized perpendicularly to the plane of incidence, Fresnel found

tan (–,) ’ (3).

tan (6+ 6) In the particular case of perpendicular incidence, both formule coincide with one previously given by Young, viz.,

(4).

*(u-1)/(u+1)- Since these formule agree fairly well with observation, and are at any rate the simplest that can at all represent the facts, it may be advisable to consider their significance a little in detail. As increases from 0 to 42, the sine-formula increases from Young’s value to unity. We may see this most easily with the aid of a slight transformation :— sin(-6,) 1-tan6,/tan@ yu —cos 6/cos 6; sin(+06,) 1+tané,/tan p+cos6/cos 6, Now, writing cos 6/cos@, in the form 1 — sin? 6 a 1=p-*sin?¢§ ’ we recognize that, as increases from 0 to $7, cos 9/ COs 0 dimin- ishes continuously from 1 to 0, and therefore (1) increases from (4 —1)/(w4+1) to unity. y It is quite otherwise with the tangent-formula. Commencing at Young’s value, it diminishes, as increases, until it attains zero, when 0+ 6,— 47, or sin ,=cos; or by (2) tand=m. This is the polarizing angle defined by Brewster. It presents itself here as the*

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angle of incidence for which there is no reflexion of the polarized light under consideration. As the angle of incidence passes through the polarizing angle, the reflected vibration changes sign, and increases in numerical value until it attains unity at a grazing incidence (@=4r).

Wavy Trait on ¥

By means of this expression we may obtain in succession the valucs of ¢(2), (8), &c., in terms of #(1), viz., 7. The general value is

mr go(m) = Tear (10),

Total We have hitherto supposed that the second medium (into which | § aA easily be Piha by ae Hee ted b + reflexion. the light enters at the refracting surface) is the denser. In the Pal ae Ing XP Teg eoayaer IRS NBL Cnenmmcd" Dyeaamie contrary case, total reflexion sets in as soon as sind =y-!, at which | °f ™ plates is oe point 6, becomes imaginary. We shall be able to follow this better Y(m)=1- ¢(m) = Sa . (11). in connexion with a mechanical theory. 1+ (mw 1)r If light falls upon the first surface of a parallel plate at the | The investigation has been extended by Stokes so as to cover the polarizing angle, the refracted ray also meets the second surface | case in which the plates exercise an absorbing influence.? of the plate at the appropriate polarizing angle. For if w be the The verification of Fresnel's formule by direct photometric index of the second medium relatively to the first, the tangent of | measurement is a matter of some difficulty. The proportion of the angle of incidence, which is also the cotangent of the angle | perpendicularly incident ight transmitted by a glass plate has of refraction, is equal to w. At the second surface (the third | been investigated by Rood ;? but the deficiency may have been medium being the same as the first) the angles of incidence and | partly due to absorption. If we attempt to deal directly with the refraction are interchanged, and therefore the condition for the | reflected Hight, the experimental difficulties are much increased; polarizing angle is satistied, since the index for the second refrac- | but the evidence is in favour of the approximate correctness of tion is w7}. Fresnel's formulz when light is reflected nearly perpendicularly Oblique The principal formule apply to light polarized in, and perpen- | from a recently polished glass surface. When the surface is old, polariza- dicular to, the plane of incidence. If the plane of polarization | even.though carefully cleaned, there may be a considerable falling tion. make an angle a with that of incidence, the original vibration may | off of reflecting power.4 be resolved into two,— cos a polarized in the plane of incidence, and We have seen that according to Fresnel's tangent-formula there sin a polarized in the perpendicular plane. These components are | would be absolutely no reflexion of light polarized perpendicularly reflected according to the laws already considered, and reconstitute | to the plane of incidence, when the angle of incidence is tan-1u, plane-polarized light, of intensity or, which comes to the same thing, common light reflected at this »_sin?(–6,), . . tan?(—6;) angle could be perfectly extinguished with a Nicol's prism.

*cos? a Sa Canes a tan® (0+ 6) (5). It was first observed by Airy that in the case of the diamond and eo ae – aj , ki 45° with the | ter highly refracting media this law is only approximately in are erica aC Mirae pee se WE ° | accordance with the facts. It is readily proved by experiment that, plane of incidence, or be circularly-polarized (§ 20), or be unpolar- | whatever be the angle of incidence, sunlight reflected from a plate ized, (5) applies to the reflected light, with substitution of 4 for | of bivioeless is incapable ofbenmuniencked byw a Neeolkwnd 16 cos*a and sin?a. If 8 denote in the general case the angle between iheetore tesperettly ice ae d y : os lee of incidence and that in which the reflected light is This subject has been studied by Jamin. The character of the Jamin's ees Aaa reflected vibration can be represented, as regards both amplitude observa- tan B=tana cos (6 + 6) P (6), | and phase, by the situation in a plane of a point P relatively to tions. cos (8 — 6) "| the origin of coordinates O. The length of the line OP represents a result the approximate truth of which has been verified by Fresnel | the amplitude, while the inclination of OP to the axis of x repre- and Brewster. sents the phase. According to Fresnel's formula appropriate to Reflected The formule for the intensities of the refracted light follow | light polarized perpendicularly to the plane of incidence, P is rays. immediately from the corresponding formule relative to the re- | situated throughout on the axis of «, passing through O when the flected light in virtue of the principle of energy. The simplest | angle of incidence is tan-4z. Jamin found, however, that in general way to regard the mattcr is to suppose the refracted light to emerge | P does not pass through O, but above or bclowit. When P is on from the second medium into a third medium similar to the first | the axis of y, the amplitude is a minimum, and the phase is mid- without undergoing loss from a second reflexion, a supposition | way between the extreme phases. For one class of bodies the which would be realized if the transition between the two media | phase is in arrear of that corresponding to perpendicular incidence, were very gradual instead of abrupt. The intensities of the different | and for another class of bodies in advance. In a few intermediate lights may then be measured in the same way; and the sup- | cases P passes sensibly through O; and then the change of phase position that no loss of energy is incurred when the incident light | is sudden, and the minimum amplitude is zcro. gives rise to the reflected and refracted lights requires that the In the case of metals the polarization produced by reflexion is*

Metallic sum of the squares of the vibrations representing the latter shall be | still more incomplete. Light polarized perpendicularly to the reflexion. — equal to the square of the vibration representing the former, viz., | plane of incidence is reflected at all angles, the amount, however, unity. We thus obtain, in the two cases corresponding to (1) and | decreasing as the angle of incidence increases from 0° to about 75°, (3), P and then again increasing up to a grazing incidence. The most _sin?(–6,) _ sin 26sin 26, : marked effect is the relative retardation of one polarized component sin?(+6,) — sin?(+,) (7), with respect to the other. At an angle of about 75° this retarda- tan? (9 — 6,) ein aoe tion amounts to a quarter period. ‘ : – oH = So (8). The intensity of reflexion from metals is often very high. From tan” (+6,) sin?(+ 6) cos? (8 ~ 0,) silver, even at perpendicular incidence, as much as 95 per cent. of A plate of glass, or a pile of parallel plates, is often convenient as | the incident light is reflected. There is reason for regarding the a polarizer, when it is not necessary that the polarization be quite | high reflecting power of metals as connected with the intense complete, At the precise angle of incidence (tan-2u) there would | absorption which they exercise. Many aniline dyes reflect in be, according to Fresnel’s formulx, only one kind of polarized light | abnormal proportion from their surface those rays of the spectrum reflected, even when the incident light is unpolarized. The polar- | to which they are most opaque. The peculiar absorption spectrum ization of the transmitted light, on the other hand, is imperfect ; | of permanganate of potash is reproduced in the light reflected from but it improves as the number of plates is increased. ” | a surface of a crystal.® Reflexion If we suppose that there is no regular interference, the intensity bya ® of the light reflected from a plate is readily calculated by a § 27. Reflewion on the Elastic Solid Theory. plate. geometric series when the intensit of the light refie ‘ : ee s ‘ single surface is known. The light ies fea the fait te so me Hy et Claes see ee Ra Gueic sale ies) Eeseranenneawsttne fe he investigation of reflexion and refraction presents no very serious peel aan yt st surface, reflected at the second, difficulties, but the results do not harmonize very well with optical and then transmitted at the first, is p(1-p)% The next component b ee Tt Gen hae f ; it uM t d = al reflected three times and transmitted twice, is p?(1 —)?, and so on. | he ee pe et a 2 aaa ame oa Pies alae P)‘s ‘| that reflexion and refraction can be explained, at least in their ‘ principal*

features, on a perfectly definite and intelligible theory, r=pt(1—p){ptp?p 5... ya? oe RO which, if not strictly applicable to the ether, has at any rate a dis- , : : ; +p "| tinct mechanical significance. The refracting surface and the Pile of The intensity of the light reflected from a pile of plates has been | wave-fronts may for this purpose be supposed to be plane. plates. investigated by Provostaye and Desains.! If (mm) be the reflexion When the vibrations are perpendicular to the plane of incidence Vibra-*

from m plates, we may find as above for the reflexion from (m-+1) plates, ' p(m+1)=r+(1—rPgo(m){1+rd(m) +7 [o(m)P+73[b(m) P+... } r+(1—2r)¢ (m) = ro(m) 1 Ann. d. Chim. xxx. p. 159, 1850.

(z=0), the solution of the problem is very simple. We suppose tions per- that the refracting surface is ~—0, the rigidity and density in the pendicu- first medium being N, D, and in the second N;, D,. The displace- Jar to

2 Proc, Roy. Soc., xi, p. 545, 1862. 3 Am, Jour., vol. 1., July 1870, Plane of

4 "On the Intensity of Light reflected from Certain Surfaces at nearly Per- incidence. pendicular Incidence," Proc. Roy. Soc., 1886.

5 Stokes, 'On the Metallic Reflection exhibited by Certain Non-Metallic Substances," Phil, Mag., Dec. 1853:

way h- TmHoOR Y

ments in the two media are in general denoted by & 7, ¢3 &» mp G3 but in the present case é 7, &, 7, all vanish. Moreover ¢, ¢, are independent of z. The equations to be satisfied in the interior of the media are accordingly (§ 24)

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supposed to vibrate normally to the plane of polarization; while, if D=D,, the vibrations are parallel to that plane.

An intermediate supposition, according to which the refraction is regarded as due partly to a difference of density and partly to a

ae N/de ae difference of rigidity, could scarcely be reconciled with observation,

ap D(Se os) (1), | unless one variation were very subordinate ‘to the other. But the

PL Nag ae inost satisfactory argument against the joint variation is that

“a = ~ (a +59) Fe ee ee ek Cae Pee from the theory of the diffraction of light by small particles

:

At the boundary the conditions to be satisfied are the continuity of displacement and of stress ; so that, when x=0,

4 oa…

We will now, limiting ourselves for simplicity to Fresnel’s sup- Total position (N,=N), inquire into the character of the solution when reflexion.

total reflexion sets in.

The symbolical expressions for the reflected and refracted waves are

ee ws The incident waves may be represented by ¢= 1 gi(-axtbytet) (3), (= etlaxtby+et), a+Q, where Gs 20 gilayetryret) (14), De? =N(a?+ 6?) . (4); ; a+ My ; _— and aa+by=const. gives the equation of the wave-fronts. The and so long as a, is real they may be intrepreted to indicate reflected and refracted waves may be represented by (= 7 cos (-ax4 by ct) . (15), (= (eil-axtbytet) (5), a, i 2 Cages (6). Gao cos (a,x + by + ct) (16), The coefficient of ¢ is necessarily the same in all three waves on ; fee deena 4 gente account of the periodicity, and the coefficient of y must be the ee Le eee same sinee the traces of all the waves upon the plane of separation ¢=cos (axz+by+ct) . (17).

must move together. With regard to the coefficient of x, it appears by substitution in the differential equations that its sign is ehanged in passing from the incident to the reflected wave ;

in fact @=V2{(taP+P}=V2f{ar+o}. . M7); where V, V, are the velocities of propagation in the two media

given by

V=N/D, Viele. . . . 2 (8): Now 6/,/(a? + 6?) is the sine of the angle included between the axis of x and the normal to the plane of waves—in optical language, the sine of the angle of incidence—and b/a/(a,7+67) is in like manner the sine of the angle of refraction. If these angles be de- noted (as before) by , 6), (7) asserts that sin: sin 6, is equal to the constant ratio V: V,, the well-known law of sines. The laws

In this case there is a refracted wave of the ordinary kind, cqn- veying away a part of the original energy. When, however, the second medium is the rarer (V;>V), and the angle of incidence exeeeds the so-called eritical angle [sin-}(V/V,)], there can be no refracted wave of the ordinary kind. In whatever direction it nay be supposed to lic, its trace must necessarily outrun the trace of the incident wave upon the separating surface. The quantity a@,, as defined by our equations, is then imaginary, so that (13) and (14) no longer express the real parts of the symbolical expressions (5) and (6). If — 2a,' be written in place of a, the symbolical equations are Ot tty i artbytot oe a ey.

oa corn Thy tect) | Sta ert a Teese)

from which, by discarding the imaginary parts, we obtain

of reflexion and refraction follow simply from the fact that the ¢=cos(-ax+by+et+2e). (18), velocity of propagation normal to the wave-fronts is constant in 2a .

each medium, that is to say, independent of the direction of the Tae (oby+e+e). (19), wave-front, taken in connexion with the equal velocities of the ites ss

traces of all the waves on the plane of separation (V/sin@é= tan e=a,'/a (20).

V,/sin 6,). The boundary conditions (3) now give

Since 2 is supposed to be negative in the second medium, we see that the disturbance is there confined to a small distance (a few

a f iE f Phénce Te a SO Nal – C)= Ning (9), wave-lengths) from the surface, and no energy is propagated into Neate the interior. The whole of the energy of the incident waves is to C= ee] (10), | be found in the reflected waves, or the reflexion is total. There is, Nat+Nyy however, a ehange of phase of 2e, given by (20), or in terms of Realized a formula giving the reflected wave in terms of the incident wave V, V,, and expres- (supposed to be unity). This completes the symbolical solution. tan e=/{ tan? 6 – sec? a(v7/V,7)} 4, "ER (Al) sions. If a, (and ,) be real, we see that, if the incident wave be The principal application of the formule being to reflexions when Fresnel's ¢=cos (aa + by + et), the second medium is air, it will be convenient to denote by » the interpre- or in terms of V, A, and 6, index of the first medium relatively to the second, so that z= V,/V. tation. Qn ; Thus ¢=cos 5 & cosé+ysin@+ Vz) . (11), tan e=/{tan? 6 — sec? 6/u?} (22). the reflected wave is The above interpretation of his formula sin (0, —)/sin (6, +8), in N cot 6—N, cot @ Qe ' the case where 6, becomes imaginary, is due to the sagacity of em 1 cos —(-—axcos0+ysin 6+ Vt) (12). | Fresnel. His argument was perhaps not set forth with full rigour, cot +N, cot 0, be but of its substantial validity there can be no question. By a The formula for intensity of the reflected wave is here obtained on | similar process Fresnel deduced from his tangent-formula for the the supposition that the waves are of harmonie type ; but, since it change of phase (2e') accompanying total reflexion when the vibra- does not involve A and there is no change of phase, it may be ex- | tions are executed in the plane of incidence, tended by Fourier's theorem to waves of any type whatever. It Rane { Sas ganeee? 0} (28) may be remarked that when the first and second media are inter- ane = w/e ; i 2 s changed the coefficient in (12) simply changes sign, retaining its | The phase-differences represented by 2¢ and 2' eannot be investi- numerical value. gated experimentally, but the difference (2e'

— 2e)is rendered evident Alter- The amplitude of the reflected wave, given in general by (12), | when the incident light is polarized obliquely so as to contribute Native assumes special forms when we introduce more particular supposi- | components in both the principal planes. If in the act of reflexion Supposi- tions as to the nature of the difference between media of diverse | one component is retarded more or less than the other, the resultant tions, —_ refracting power. According to Fresnel and Grecn the rigidity | light is no longer plane but elliptically polarized.

does not vary, or N=N,. In this ease

If, on the other hand, the density is the same in various media, N,: N=V,?: V?=sin? 6,: sin? , and then Neot-N,cot 6, tan (6,—@) Neot@+N,coté@, tan(6,+6) ° If we assume the complete aeeuracy of Fresnel's expressions, either alternative agrees with observation; only, if N=N,, light must be

From (22) and (23) we have tan (e' —«)=cos 0a/{1-~?cosec? 6} , whence , Qu? sin 46 — (1+?) sin? @+1

24),

(1 +p?) sin 76-1 (28)

cos (2e' — 2e)=

The most interesting case oceurs when the difference of phase Difference amounts to a quarter of a period, corresponding to light circularly of phases.

If, however, we put eos (2e' – Ze) =9, we find 4p? sin? @=1 +wWtr/{(1 +P 8y?} 5 from which it appears that, in order that sin # may be real, «7 must

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polarized.

Fresnel's rhomb, Vibra- tions in the plane of inei- dence,

Green's formula.

Reflexion depend- ent upon diseon- tinuity.

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exceed 8+4/8. So large a value of yn? not being available, the conversion of plane-polarized into circularly-polarized light by one reflexion is impracticable.

The desired object may, however, be attained by two successive reflexions. The angle of incidence may be so accommodated to the index that the alteration of phase amounts to 4 period, in which case a second reflexion under the same conditions will give rise to light circularly polarized. Putting (2e- 2e«')=40, we get

Qp? sint =(1+/4){(1+m?)sin?6+1} . . . (25), an equation by which is determined when yp is given.

It appears that, when »=1°51, 6=48° 37' or 54° 37'.

These results were verified by Fresnel by means of the rhomb shown in fig. 27.

The problem of reflexion upon the elastie solid theory, when the vibrations are executed in the plane of incidence, is more complicated, on account of the tendency to form waves of dilatation. In order to get rid of these, to which no optical phenomena correspond, it is necessary to follow Green in supposing that the velocity of such waves is infinite, or that the media are incompressible.! Even then we have to introduce in the neighbour- hood of the interface waves variously called longitudinal, pressural, or surface waves; other- wise it is impossible to satisfy the conditions of continuity of strain and stress. These waves, analogous in this respect to those occurring in the second medium when total reflexion 1s in progress (19), extend to a depth of a few wave-lengths only, and they are so constituted that there is neither dilatation nor rotation. On account of them the final formule are less simple than those of Fresnel. If we suppose the densities to be the same in the two media, there is no correspondence whatever between theory and observation. In this case, as we have seen, vibrations perpendicular to the plane of incidence are

reflected according to Fresnel's tangent-formula; and thus vibrations in the plane of incidence should follow the sine-formula. The actual result of theory is, however, quite different. In the case where the relative index does not differ greatly from unity, polarizing angles of 224° and 674° are indicated, a result totally at variance with observation. As in the case of diffraction by small particles, an elastic solid theory, in which the densities in various media are supposed to be equal, is inadmissible. If, on the other hand, following Green, we regard the rigidities as equal, we get results in better agreement with observation. To a first approximation indeed (when the refraction is small) Green's formula coincides with Fresnel's tangent-formula; so that light vibrating in the plane of incidence is reflected according to this law, and light vibrating in the perpendicular plane according to the sine-fornila. The vibrations are accordingly perpendicular to the plane of polarization.

The deviations from the tangent-formula, indicated by theory when the refraction is not very small, are of the same general charaeter as those observed by Jamin, but of much larger amount. The minimum reflexion at the surface of glass (u=$) would be 4,,? nearly the half of that which takes place at perpendicular incidence, and very much in excess of the truth. This theory cannot there- fore be considered satisfactory as it stands, and various suggestions have been made for its improvement. The only variations from Green's suppositions admissible in strict harmony with an elastic solid theory is to suppose that the transition from one medium to the other is gradual instead of abrupt, that is, that the transitional layer is of thickness comparable with the wave-length. This modification would be of more service to a theory which gave Fresnel's tangent-formula as the result of a sudden transition than to one in which the deviations from that formula are already too great.

_It seems doubtful whether there is much to be gained by further discussion upon this subject, in view of the failure of the elastic solid theory to deal with double refraction. The deviations from Fresnel's formule for reflexion are comparatively small ; and the whole problem of reflexion is so much concerned with the condition of things at the interface of two media, about which we know little that valuable guidance can hardly be expected from this quarter. It is desirable to bear constantly

in mind that reflexion depends entirely upon an approach to discontinuity in the properties of the medinm, If the thickness of the transitional layer amounted to a few wave-lengths, there would be no sensible reflexion at all.

Another point may here be mentioned. Our theories of reflexion take no account of the fact that one at least of the media is disper- sive, The example of a stretched string, executing transverse vibrations, and composed of two parts, one of which in virtue of

1 The supposition that the velocity is zero, favoured by some writers, is in-admissible. Even dilatational waves involve a shearing of the medium, and must therefore be propagated at a finite rate, unless the resistance to compression were negative. But in that case the equilibrium would be unstable.

2 Green's Papers, by Ferrers, p. 333.

stiffness possesses in some degree the es property, shows that the boundary conditions upon which reflexion depends are thereby modified. "We may thus expect a finite reflexion at the interface of two media, if the dispersive powers are different, even though the indices be absolutely the same for the waves under consideration, in which case there is no refraction, But a know- ledge of the dispersive properties of the media is not sufficieut to determine the reflexion without recourse to hypothesis.3

§ 28. Phe Velocity of Light. According to the principles of the wave theory, the dispersion of

No dis-

refraction can only be explained as due to a variation of velocity persion in

with wave-length or period. propagated through an elastic solid, there is no such variation ; and so the existence of dispersion was at one time

considered to be a serious objection to the wave theory. Dispersion 7 vacwo would indeed present some difficulty, or at least force upon us views which at present seem unlikely as to the constitution of free ether. The weight of the evidence is, however, against the existence of dis- persion 7m vacuo. ' Were there a difference of oue hour in the times of the blue and red rays reaching us from Algol, this star would show a well-marked coloration in its phases of increase and decrease, No trace of coloration having been noticed, the differ- ence of times cannot exceed a fraction of an hour. It is not at all probable that the parallax of this star amounts to one-tenth of a second, so that its distance, probably, exceeds two million radii of the earth's orbit, and the time which is required for its light to reach us probably exceeds thirty years, or a quarter of a million hours. It is therefore difficult to see how there can be a difference as great as four parts in a million between the velocities of light coming from near the two ends of the bright part of the spectrum.'"#*

For the velocity of light in vacwo, as determined in kilometres per second by terrestrial methods (Licut, vol xiv. p. 585), New- comb gives the following tabular statement :—

Michelson, at Naval Academy, im 1879…….cscsseeceeceseeee 299,910 MNGHEISOM, Ab Clovelmitd, USSOe yaa scc cut. ce cee anes ceasasiins nclovnennie 299,853 Newcomb at Washington, 1882, using only results sup-

posed to be nearly frec from constant e1TOY's…….0008 299,860 Newcomb, including all determinations …..cccccccsseoccescenees 299,810

To these may be added, for reference—

HouCanl 6 fit; Paria, Win 1882s isceasds.teWeieeas sceads Ss cdvesccsedesntnns 298,000 Ome He Baris, 1a USTs. cvanasiasssdeenassesee neve essa nuwslertinseccccterins 298,500 Cormac Prarie, AWS 18s. wescinescnue stwuss casi scivensuesleeisls asians 300,400 This last result, as discussed by Listing……. 299,990 Young and Forbes, 1880-1881 ……..sscssecsssseceees So 301,382

Newcomb concelndes, as the most probable result— Velocity of light in vacuo =299,860+30 kilometres.

It should be mentioned that Young and Forbes inferred from their observations a difference of velocities of blue and red light amount- ing to about 2 per cent., but that neither Michelson nor Newcomb, using Foucault's method, could detect any trace of such a difference.

When we come to consider the propagation of light through ponderable media, there seems to be little reason for expecting to find the velocity independent of wave-length. The interaction of matter and ether may well give rise to such a degree of compli- cation that the differential equation expressing the vibrations shall contain more than one constant. The law of constant velocity is a special property of certain very simple media. Even in the case of a stretched string, vibrating transversely, the velocity becomes a function of wave-length as soon as we admit the existence of finite stiffness.

As regards the law of dispersion, a formula, derived by Cauchy from theoretical considerations, was at one time gencrally accepted. According to this,

pwedsBa-+0.7*4 2 2 « « s & (L; and there is no doubt that eveu the first two terms give a good representation of the truth in media not very dispersive, and over the more luminous portion of the spectrum. A formula of this kind treats dispersion as due to the smallness of wave-lengths, giving a definite limit to refraction (A) when the wave-length is very large. Recent investigations by Langley ou the law of disper- sion for rock-salt in the ultra red region of the spectrum are not very favourable to this idea. 'The phenomena of abnormal disper-*

3 The reader who desires to pursue this subject may consult Green, ''On the Laws of Reflexion and Refraction of Light at the Common Surface of Two Non- Crystallized Media," Camb. Trans., 1838 (Green's Works, London, 1871, pp. 242, 283); Lorenz, '" Ueber die Reflexion des Lichts an der Grinzflache zweier iso- tropen, durchsichtigen Mittel," Pogg. Ann., cxi. p. 460 (1860), and " Bestimmung der Schwingungsrichtung des Lichtethers durch die Reflexion und Brechung des Lichtes," 7b¢d., exiy.

p. 238 (1861); Strutt (Rayleigh), "On the Reflection of Light from Transparent Matter," Phil. Mag., [4] xiii. (1871); Von der Miihll, ' Ueber die Reflexion und Brechung des Lichtes an der Grenze unkrystallinischen Medien," Math. Ann., v. 470 (1872), and 'Ueber Greeus Theorie der Reflexion und Brechung des Lichtes," Math. Ann., xxvii, 506 (1886); Thomson, Baltimore Lectures; Glazebrook, "Report on Optical Theories," Brit. Ass. Rep., 1886; Rayleigh, 'On Reflection of Vibrations at the Confines of Two Media between which the Transition is gradual," Proc. Math. Soc., xi. and Walker, " An Account of Cauchy's Theory of Reflection aud Refraction of Light," Phi/, Mag., 151 (1887). References to recent German writers, Ketteler, Lommel, Voigt, &e., will be found in Glazebrook's Report.*

4 Newcomb, Astron. Papers, vol. ii. parts iii. and iv., Washington, 1885.

In aerial vibrations, and in those vacuo,

Table of & velocities.

Formule for dis- persion.

Michel- son's re-

searches.

WAX—-WAX

sion indieate a elose connexion between refraction and absorption, and Helmholtz has formulated a general theory of dispersion based upon the hypothesis that it may be connected with an absorbing influence operative upon invisible portions of the spectrum. Upon this subject, which is as yet little understood, the reader may con- sult Glazebrook's "' Report on Optical Theories," 2

The limits of this article do not permit the consideration of the more speeulative parts of our subjeet. We will conclude by calling attention to two reeent experimental researehes by Michelson, the results of whieh cannot fail to give valuable guidance to optieal theorists. The first of

these? was a repetition under improved eonditions of a remarkable experiment of Fizeau, by which it is proved that when light is propagated through water, itself in rapid movement in the direction of the ray, the velocity is indeed influ- eneed, but not to the full extent of the veloeity of the water (v). Within the limits of experimental error, the velocity agrees with a

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formula suggested by Fizeau on the basis of certain views of

Fresnel, viz.,

1

v

2

VaVyt" (2),

Me V, being the velocity when the medium is stationary. In the ease of water, (u?-1)/u?=-°437. Conformably with (2), a similar experiment upon air, moving at a velocity of 25 metres per seeond, gave no distinct effect.

From the result of the experiments upon water we should be tempted to infer that at the surface of the earth, moving through space, the ether still retains what must be coarsely called relative motion. Nevertheless, the seeond researeh above alluded to? appears to negative this conclusion, and to prove that, at any rate within the walls of a building, the ether must be regarded as fully partaking in the motion of material bodies. (R.)

WAX is a solid fatty substance of animal and vegetable origin, allied both in sources and constitution to the fixed oils and fats. From fats or solid oils wax differs principally in its greater hardness and higher melting-point; but in the strictly chemical sense, while oils and fats are glycerides, a true wax contains no glycerin, but is a combination of fatty acids with certain solid monatomic alcohols. Of wax from animal sources there are

in commerce beeswax, which forms wax par excellence, Chinese insect wax, and sper- maceti. The more important vegetable waxes are Japanese wax, myrtle-berry wax, carnauba wax, and palm wax.

Beeswax is secreted by all honey bees, and by them formed into the cell walls, &c., of their comb. It is separ- ated by draining the honey, melting the drained comb in boiling water, and collecting the wax which solidifies on the top as the water cools. In this state it is formed into cakes of raw or yellow wax, good examples of which are of a light yellow colour, translucent, with a faint pleasant odour of honey. At ordinary temperatures it breaks with a granular fracture ; and in thin flakes or pellets it softens with the heat of the hand, and can be kneaded between the fingers, Its specific gravity is 0°960; it melts at about 62° C., and solidifies just under its melting-point without evolution of heat. It is soluble in hot ether, essential and fixed oils, benzol, bisulphide of carbon, and chloro- form, and to some extent in boiling alcohol, but it is unaffected by water and cold alcohol. In chemical con- stitution it contains 10 per cent. of cerin, an ether of Co7Heg0 O, and 90 per cent. of myricin—ether of palmitic aad and myricy] alcohol,

C,¢H;,0

30H gy matter and other contaminations it contains, is unfit for many uses. The chief of these is candle-making. To remove soluble matter it is first melted over boiling water; and for bleaching it is formed into thin shreds and strips so as to expose the greatest possible surface. So prepared, it is spread out and frequently watered and turned in the direct sunlight, a slow but effective process. To hasten the bleaching action the wax may be mixed with about one-sixth of pure spirit of turpentine; and this preparation, on exposure, by its copious production of ozone, effects in four or five days a bleaching which otherwise would occupy three or four weeks. When the bleaching is complete all trace of turpentine oil will have disappeared. Bleaching may also be effected by chlorine, permanganate of potash, and other chemicals, but these injuriously affect the wax, in some cases forming substitution products which cannot be removed, and which in burning give off deleterious

cerotic acid and ceryl alcohol,

} O. Yellow wax, on account of the colouring

- *Brit. Ass. Rep., 1886. In this matter, aS in most others, the advantage lies with the leetromagnetic theory. See J. W. Gibbs, Amer, Jour., xxiii., 1882.*

- *“Influence of Motion of the Medium on the Velocity of Light,” by A. Michelson and E. W. Morley, Amer. Jour., xxxi., May 1886.*

consists of cerin, one of the eonstituents of beeswax.

fumes. Wax is obtained in all parts of the world where there is vegetation sufficient to support bees ; but it is most largely forthcoming from tropical and subtropical regions. It is subject to extensive adulteration from powdered mineral substances, flour, cheaper waxes, paraffin, &ec. Its uses are multifarious ; but it is most largely con- sumed in making candles for the religious services of Roman Catholic and Orthodox Greek Christians, and for wax figures and models (see Wax Figures).

Chinese Insect Wax, or Pe La, is a seeretion deposited by an insect, Coccus ceriferus, Fabr., in the twigs of a species of ash, Fraxinus chinensis, Roxb. The wax is, in its origin and the funetions it performs in the insect ceonomy, elosely related to the lac produced by the allied species of Coccws (see Lac, vol. xiv. p. 181). When separated from the twigs which it encrusts, and purified, it is a hard translucent white erystalline body, similar to spermaceti. It melts at from 82° to 86° C., and in composition It is little known in European eomnierce, but forms a highly important article of trade in China and Japan, where it is largely used for candle- making and for medicinal purposes.

For SPERMACETI, see vol. xxii. p. 395.

Japanese Wax is a hard wax-like fat which now forms an im- portant export from Japan, prineipally to London. It is obtained from the small stone fruits of several species of Rhus cultivated in Japan. For the extraction of the wax, which is present to the extent of about 20 per eent., the fruits are ground and treated by either of three methods—(1) heating and pressure, (2) boiling in water, and (8) maceration with ether or

bisulphide of carbon. The wax is subsequently bleached, and as it comes into the market eonsists of yellowish hard eakes, eovered often with a fine white powdery efflorescence. It has a resinous unpleasant raneid odour. It melts at about 54° C., and solidifies from melting at 41° C. with evolution of heat which raises the temperature about 5°C. Japanese wax becomes translueent about 12° C. under its melting-point, and when it has newly solidified from melting it can again be liquefied at 42° C., from which the melting-point rises by slow degrees with the lapse of time till it reaches the normal. It is not a true wax, but eonsists principally of the glyeeride palmitin with small pro- portions of stearin and disseminated erystals of free palmitic acid. It is largely mixed with and used as a substitute for beeswax, excepting for uses where its raneidity renders it objectionable.

Myrtle-Berry Wace is obtained from the fruit of several species of Myrica in the United States, New Granada, Venezuela, the Cape of Good Hope, and other regions. It is a hard greenish substanee, with a pleasant balsamic odour. Its melting-point is about 45°C., and it eonsists prineipally of frec palmitie acid with a little stearic acid and myristie acid, —a very small proportion of these being eombined as glycerides. It is consumed principally in the United States in combination with beeswax for candles; and it is said the Hottentots eat it like cheese.

Carnauba Wax is an exudation on the surface of the growing leaves of the earnauba palm, Corypha cerifera, L., which flourishes in tropieal South Ameriea. The wax is obtained by eutting off and drying the young leaves, from which it is then shaken as fine dust, and eaked by melting either over an open fire or in boiling water. It is a true wax, consisting of ethers of myricyl aleohol and eeryl alcohol with eerotie acid, and its melting-point ranges from 85° to 90° C. Carnauba wax is a substance of considerable commercial importance in Brazil, whence large quantities are sent to Europe for use in the candle-trade and otherwise as a substitute for beeswax.

Palm-Tree Wax is an exudation formed on the stems of two South Ameriean palms, Cerorylon andicola, H, and K., and Klop-

3 'Qn the Relative Motion of the Earth and the Luminiferous ARther," by Michelson and Morley, Phil. Mag., Dee. 1887.

stockta certfera, Kars. As scraped from the trecs and compacted by melting it is a mixture of resin and wax, having a melting-point as high as 102° to 105°C. The pure wax may be separated by digesting with boiling spirit, when it is obtained with a melting- point of 72° C. and a composition analogous to carnauba Wax, like which it is used for candles. Palm-tree wax is little seen in European commerce. For the compound called Szeaninc Wax, see vol. xxi. p. 586.

WAX FIGURES. Beeswax is possessed of properties which render it a most convenient medium for preparing figures and models, either by modelling or by casting in moulds. At ordinary temperatures it can be cut and shaped with facility ; it melts to a limpid fluid at a low heat ; it mixes with any colouring matter, and takes surface tints well ; and its texture and consistency may be modified by the addition of earthy matters and oils or fats. When molten, it takes the minutest impressions of a mould, and it sets and hardens at sucha temperature that no ordinary climatic influences affect the form it assumes, even when it is cast in thin lamine. The facilities which wax offers for modelling have been taken advantage of from the remotest times. Figures in wax of their deities were used in the funeral rites of the ancient Egyptians, and deposited among other offerings in their graves; many of these are now pre- served in museums. That the Egyptians also modelled fruits can be learned from numerous allusions in early litera- ture. Among the Greeks during their best art period, wax figures were largely used as dolls for children; statuettes of deities were modelled for votive offerings and for religious ceremonies, and wax images to which magical properties were attributed were treasured by the people. Wax figures and models held a still more important place among the ancient Romans. The masks (effigtes or imagines) of ancestors, modelled in wax, were preserved by patrician families, this jus ¢maginum being one of the privileges of the nobles, and these masks were exposed to view on ceremonial occasions, and carried in their funeral processions. The closing days of the Saturnalia were known as Sigillarta on account of the custom of making, towards the end of the festival, presents of wax models of fruits and waxen statuettes which were fashioned by the Sigillarti or manufacturers of small figures in wax and

other media. The practice of wax modelling can be traced through the Middle Ages, when votive offerings of wax figures were made to churches, and the memory and lineaments of monarchs and great personages were pre- served by means of wax masks as in the days of Roman patricians. In these ages malice and superstition found expression in the formation of wax images of hated persons, into the bodies of which long pins were thrust, in the confident expectation that thereby deadly injury would be induced to the person represented ; and this belief and practice continued till the 17th century. Indeed the superstition still holds a place in the Highlands of Scot- land, where within the Jast few years a clay model of an enemy was found in a stream, having been placed there in the belief that, as the clay was washed away, so would the health of the hated one decline. With the renaissance of art in Italy, modelling in wax took a position of high importance, and it was practised by some of the greatest of the early masters. The bronze medallions of Pisano and the other famous medallists owe their value to the art qualities of wax models from which they were cast by the cae perdue process ; and indeed all early bronzes and metal work were cast from wax models. The T%éte de cire in the Wicar collection at Lille, the work of a Florentine artist of the 15th century, is one of the most lovely creations of that fertile era. From that period till towards the close of the 18th century modelling of medallion portraits and of relief groups, the latter frequently polychromatic, was in considerable vogue throughout

Europe. About the end of the 18th century Flaxman executed in wax many portraits and other relief figures which Josiah Wedgwood translated into pottery for his Jasper ware. The modelling of the soft parts of dissec- tions, &c., for teaching illustrations of anatomy was first practised at Florence, and is now very common. Such preparations formed part of a show at Hamburg in 1721, and from that time wax-works, on a plane lower than art, have been popular attractions. These exhibitions con- sist principally of images of historical or notorious person- ages, made up of waxen masks on lay figures in which sometimes mechanism is fitted to give motion to the figure. Such an exhibition of wax-works with mechanical motions was shown in Germany early in the 18th century, and is described by Steele in the Zatler. The most famous modern wax-work exhibition is that of Madame Tussaud in London. This

collection was originated in Paris, dur- ing the Revolution, by that lady, who, having modelled Charlotte Corday, Marat, and other well-known persons of that bloody period, settled in London with her collection early in the present century.

WAXWING, a bird first so-called apparently by Selby in 1825 (Lllustr. Brit. Ornithology, p. 87), having been before known as the "Silk-tail " (Philos. Transactions, 1685, p. 1161)—a literal rendering of the German Seidenschwanz—or "Chatterer "—the prefix "German," ' Bohemian," or "Waxen" being often also applied. Selby's convenient name has now been generally adopted, since the bird is readily distinguished from almost all others by the curious expausion of the shaft of some of its wing- feathers at the tip into a flake that looks like scarlet sealing- wax, while its exceedingly silent habit makes the name "'Chatterer " wholly inappropriate, and indeed this last arose from a misinterpretation of the specific term garrulus, meaning a Jay (from the general resemblance in colour of the two birds), and not referring to any garrulous quality.

It is the Ampelis garrulus of Linneeus and of more recent ornithologists,

The Waxwing is a bird that for man y years excited vast interest. An irregular Winter-visitant, sometimes in countless hordes, to the whole of the central and some parts of southern Europe, it was of old time looked upon as the harbinger of war, plague, or death, and, while its harmonious coloration and the grace of its form were attractive, the curiosity with which its irregular appearances were regarded was enhanced by the mystery which enshrouded its birth- place, and until the summer of 1856 defied the searching of any explorer. In that year, however, all doubt was dispelled, through the successful search in Lapland, organized by the late John Wolley, as briefly described by him to the Zoological Society (Proceedings, 1857, pp. 55, 56, pl. exxii.).? In 1858 Mr Dresser found a small settlement of the species on an island in the Baltic near Uleaborg, and with his own hands took anest. It is now pretty evident that the Waxwing, though doubtless breeding yearly in some parts of northern Europe, is as irregular in the choice of its summer-quarters as in that of its winter-retrcats. Moreover, the species exhibits the same irregular habits in America. Mr Drexler on one occasion, in Nebraska, saw it in

“millions.” In 1861 Kennicott found it breed- ing on the Yukon, and later Mr MacFarlane had the like good fortune on the Anderson River.

Beautiful as is the bird with its drooping crest, its cinnamon-

1 Some writers, ignoring historical facts, have taken a South- American form (now known to belong to a wholly distinct Suborder of Birds) as the “type” of the Linnean genus Ampelis. Linneus had, as is well known, no conception of what is meant by the modern idea of a “type”; but none can doubt that, if such a notion had been entertained by him, he would have declared his type-species to be that to which the name was first applied, viz., the present, and hence those systematists are wrong who would remove this to a genus variously called Bombycilla, Bombiciphora, or, most absurd of all, Bombicivora. The birds which ought to be removed from Ampelis are those which are now generally recognized as forming a Family Cotingide, allied to the Pipride (cf. MaNAKIN), and like them peculiar to the Neotropical Region, in the fauna of which they constitute, according to the in- vestigations of Garrod and Forbes (ORNITHOLOGY, vol. xviii. pp. 41, 47), the natural group Oligomyode.

2 A fuller account of his discovery, illustrated by Hewitson, is given in The Ibis (1861, pp. 92-106, pl. iv.).

brown plumage passing in parts into grey or chestnut, and relieved by black, white, and yellow—all of the purest tint—the external feature which has invited most attention is the “scaling-wax ” (already mentioned) which tips some of the secondary or radial quills, and occasionally those of the tail.1 This is nearly as much exhibited by the kindred species, 4. cedrorwm—the well-known

Cedar-bird of the English in North America—which is easily dis-‘

tinguished by its smaller size, less black ehin-spot, the ycllower tinge of the lower parts, and the want of white on the wings. In the A. phenicoptcrus of south-eastern Siberia and Japan, the remiges and rectrices are tipped with red in the ordinary way

without dilatation of the shaft of the feathers.

Both the Waxwing and Cedar-bird seem to live chiefly on insects in summer, but are marvellously addicted to berries during the rest of the year, and will gorge themselves if opportunity allow. Hence they are not pleasant cage-birds, though quickly becoming tame. The erratic habits of the Waxwing are probably due chiefly to the supplies of food it may require, prompted also by the number of mouths to be fed, for there is some reason to think that this varies greatly from one year to another, according to season. The flocks which visit Britain and other countries outside the breeding range of the species naturally contain a very large proportion of young birds.

The systematic position of the genus Ampelis is very doubt- ful. It can hardly be said to have any near ally, for neither of the Neotropical and Antillean genera, Ptilogonys and Myvodectes (often erroneously spelt A/yiadestes), can as yet be safely declared of kin to it, as has been alleged. (a. N.)

WEALTH. The most commonly accepted definition of wealth is that it consists of all useful and agreeable things which possess exchange value, and this again is generally regarded as coextensive with all desirable things except those which do not involve Jabour or sacrifice for their acquisition in the quantity desired. On analysis it will be evident that this definition implies, directly, preliminary conceptions of utility and value, and, indirectly, of sacrifice and labour, and these terms, familiar though they may appear, are by no means simple and obvious in their meaning. Utility, for the purposes of economic reasoning, is usually held to mean the capacity to satisfy a desire or serve a purpose (J. S. Mill), and in this sense is clearly a much wider term than wealth. Sunshine and fresh air, good temper and pleasant manners, and all the infinite variety of means of gratification, material and immaterial, are covered by utility as thus defined. Wealth is thus a species of utility, and in order to separate it from other Species some differentia must be found. This, according to the general definition, is exchange value, but a little reflexion will show that in some cases it is necessary rather to contrast value with wealth. "Value," says Ricardo, expanding a thought of Adam Smith, "essentially

differs from riches, for value depends not on abundance but on the difficulty or facility of production." According to the well-known tables ascribed to Gregory King, a deficiency of a small amount in the annual supply of corn will raise its value far more than in proportion, but it would be paradoxical to argue that this rise in value indicated an increase in an important item of national wealth. Again, as the mines of a country are exhausted and its natural resources otherwise impaired, a rise in the value of the remainder may take place, and as the free gifts of nature are appropriated they become valuable for exchange, but the country can hardly be said to be so much the wealthier In consequence. And these difficulties are rather increased then diminished if we substitute for value the more familiar concrete term " money-price,'—for the contrast between the quantity of wealth and its nominal value becomes more sharply marked. Suppose, for example, that in the total money value of the national inventory a

1 The strueture of these appendages has been earefully described by Herr Andersen (Cifvers. K. Vet.~~Ak. Férhandlingar, 1859, pp. 219~~ 231, pl. ii.) Their development seems chiefly due to age, though, as Wolley shewed, they are perceptible in the nestling plumage. Mr Turner states (Contr. Nat. ist. Alaska, p. 177) that the Eskimo

name of the Waxwing means a "killer of small birds," these append- ages being held to be 'the clotted blood of its victims"!

decline were observed to be in progress, whilst at the same time, as is quite possible, an increase was noticed in the quantity of all the important items and an improvement in their quality, it would be in accordance with common- sense to say that the wealth of the country was increasing and not decreasing.

So great are these difficulties that some economists (e.9., Ricardo) have proposed to take utility as the direct measure of wealth, and, as Mr Sidgwick has pointed out, if double the quantity meant double the utility this would be an easy and natural procedure. But even to the same individual the increase in utility is by no means simply proportioned to the increase in quantity, and the utility of different commodities to different individuals, and a fortiori of different amounts, is proverbial. The very

same things may to the same individual be productive of more utility simply owing to a change in his tastes or habits, and a different distribution of the very same things, which make up the wealth of a nation, might indefinitely change the quantity of utility, but it would be paradoxical to say that the wealth had increased because it was put to better uses.

We thus seem thrown back on value as the essential characteristic, allowance being made for any change in the standard of value; but there are still difficulties to be overcome. Some things that undoubtedly possess value or that can command a price are immaterial, eg., the advice of a lawyer or physician or the song of a prima donna, and, although perhaps the skill of a workman (in any grade of the social scale) might be considered as at- tached to the man, as a coal mine is attached to a place, it is more in accordance with popular usage to consider skill as immaterial, whilst at the same time it seems equally natural prima facie to confine the term wealth to material things in the common sense. Again, the credit system of a country is a product of great labour and sacrifice, it is most closely connected with the production of its material wealth in the narrowest sense, and it certainly commands a pecuniary value, and yet credit is more generally held to be a representative rather than a part of wealth, owing apparently to its insubstantial character. Apart from the question of materiality some writers have insisted on relative permanence and possibility of accumulation as essential attributes of wealth, and have thus still further narrowed the scope of the definition.

There can be no doubt that it is on many grounds desirable in economics to use terms as far as possible in their popular acceptations ; but this rule must always be subordinate to the primary object in view. In nearly every department of knowledge in which popular terms have been retained it has been found necessary either con- stantly to use qualifying adjectives where the context is not a sufficient guide, and in some cases, when analysis discloses very different elements, to make a selection. Sometimes it has been found convenient to use a term with some variation in the definition according to the branch of the subject in hand.2 Applying these rules to the definition of wealth, perhaps the best solution is that which is generally connected with German economists (e.g., Held). Wealth consists

of utilities, and in the first great department of economics—the consumption of wealth —it is utility with which we are principally concerned,— the idea of value, for example, being overshadowed. The most general law of the consumption of wealth is that successive portions of any stock give a diminishing amount of utility when consumed. Thenin the department of the production of wealth the most important characteristics are the labour and sacrifice necessary to put the utilities

2 On the uses and difficulties of definitions in pahies ee sy, eompare Mr Sidgwiek's Principles, bk. i. ch. ii., and Caimes's Logical Method of Political Economy.

desired into the things and to place the things where they are wanted. 'The idea of value is again secondary and subordinate. We can readily see the part played by nature, labour, and capital respectively in the production of any commodity without considering the effects on its value of the various factors; we can understand the principles of division of labour and of the relative productiveness of large and small industries without entering into questions of value except in the most general manner. In the department of the distribution of wealth the fundamental conception is the right of appropriation; and accordingly J. S. Mill very properly commences this part of his subject by an account of the relative advantages of the socialistic and individual systems of property. It is quite possible under the former to conceive of all the distribution being made without any exchange and with reference simply to the wants or the deserts of the members of the society. Thus it is not until we arrive at the department of the exchange of wealth that the characteristic of value becomes predominant, although of course value is closely connected with utility and labour and sacrifice.

Usually, however, it will be found that in most cases anything which can fairly be classed as wealth in one department is also wealth in the others, and thus the definition is reached that wealth in general consists of all 'consumable utilities which require labour for their pro- duction and can be appropriated and exchanged." It only remains to add that "utilities" may be divided into "inner" and "outer " (to translate the German

literally), ~—the “inner ” being such as are simply sources of personal gratification to their possessor, e.g., a good ear for music; the “outer” utilities again may be divided into “ free” and “economic,” the former, as a rule, e.g., sunlight, not being the result of labour and not capable of appropriation or exchange, and the latter as a rule possessing each of these marks. It is these “economic utilities ” which con- stitute wealth in the specific sense of the term, although its use may be extended by analogy to include almost all utilities, (3. 8. NT.)

WEASEL, The smallest species of the group of animals of which the polecat and stoat are well-known members (see Mamaia, vol. xv. p. 440). It is Mustela vulgaris of Linnzus, but belongs to the section (Putorius) of the genus which has but three premolar teeth on each side above and below, instead of four as in the martens (to which Mustela is commonly restricted) and hence is now called Putorius vulgaris, The dentition is 7 3, ¢ 4, p 3, m4z=8; total 34,

The weasel is an extremely elegant little animal, with elongated slender body, the back generally much arched, the head small and flattened, ears short and rounded, neck long and flexible, limbs very short, five toes on each foot, all with sharp, compressed, curved claws, tail rather short, slender, cylindrical, and pointed at the tip, fur short and close. The upper parts, outside of limbs and tail, are a uniform reddish-brown, the under parts pure white. In very cold regions, both in Europe and America, it turns completely white in winter, but less regularly and at a lower temperature than its near ally the stoat or ermine, from which it is easily distinguished by its smaller size, and by its wanting the black end of the tail. The length of the head and body of the male is usually about 8 inches, that of the tail 24 inches; the female is smaller. The common weasel is pretty generally distributed through- out Europe, Northern and Central Asia, British North America, and the northern portions of the United States, It possesses in a full degree all the active, courageous, and bloodthirsty disposition of the rest of the genus, but its diminutive size prevents it attacking and destroying any but the smaller mammals and birds. Mice, rats, voles,

and moles, as well as frogs, constitute its principal food. It is generally found on or near the surface of the ground, but it can not only pursue its prey through very small holes and crevices of rocks and under dense tangled herbage,

Weasel. but follow it up the stems and branches of trees, or even into the water, swimming with perfect ease.

It constructs a nest of dried leaves and herbage, placed in a hole in the ground or a bank or hollow tree, in which it brings up its litter of four to six (usually five) young ones. The mother will defend her young with the utmost desperation against any assailant, having been often known to sacrifice her own life rather than desert them.

WEAVER-BIRD, the name! by which a group of between 200 and 300 species are now usually called, from the elaborately interwoven nests that many of them build, some of the structures being of the most marvellous kind. By the older systematists such of these birds as were then known were distributed among the genera Oriolus, Loxia, Emberiza, and Fringilla ; and it was Cuvier who in 1817 first brought together these dissevered forms, comprising them in a genus Ploceus. Since his time others have been referred to its neighbourhood, and especially the genus V2dua with its allies, so as to make of them a Subfamily Ploceinz, which in 1847 was raised by Prof. Cabanis to the rank of a Family Ploceide,—a step the propriety of which has since been generally admitted, though the grounds for taking it—far too technical to be here criticized—are very slight, and such as could not be held valid in any other Order than that of Passeres.

Where so many forms are coucerned, only a few of the most im- portant can now be mentioned. The type of Cuvier's genus is certainly the Loxia philippina of Linneus, so termed from the islands it inhabits. But the typical Weaver-bird of Latham (not that he had the name in that precise form) is the Hyphantornis cucullata or textor of modern writers, an African species, and it is to the Ethiopian Region that by far the greatest number of these ~ birds belong, and in it they seem to attain thcir maximum of development. They are all small, with, generally speaking, a Sparrow-like build ; but in richness of colouring the males of some are

very conspicuous—glowing in crimson, scarlet or golden-yellow, set off by jet-black, while the females are usually dull in hue. Some species build nests that are not very remarkable, except in

? First bestowed in this form apparently by Stephens in 1826 (Gen. Zoology, xiv. pt. i. p. 84); but in 1782 Latham (Synopsis, i. p. 435) had called the ' Troupiale du Sénégal" of Buffon the '* Weever Oriole," from its habit of entwining the wires of the cage in which it was kept with such vegetable fibres as it could get, and hence in 1788 Gmelin named it Oriolus textor. In 1800 Daudin used the term "Tisserin" for several species of the Linnzan genus Loxia, and this was adopted some years later by Cuvier as the equivalent of his Ploceus, as mentioned in the text.*

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being almost invariably domed—others (such as the Philippine Weaver-bird, Ploccus philippinus, just named) fabricate singular structures! of closely and uniformly interwoven tendrils or fine roots, that often hang from the bough of a tree over water, and, starting with a solidly wrought rope, open out into a globular chamber, and then contract into a tube several inches in length, through which the birds effect their exit and entrance. But the most wonderful nests of all, and indeed the most wonderful built by birds, arc those of the so-called Sociable Grosbeak, Philhetwrus socius, of Africa. 'These are composed wholly of grass, and are joined to- gether to the number of 100 or 200—indeed 320 are said to have been found in one of these aggregated masses, which usually take the form of a gigantié mushroom,? affording a home and nursery to many pairs of the birds which have been at the trouble of build- ing it. These nests, however, have been so often described and ficured by South-African travellers that there is no need here to dilate longer on their marvels. It may be added that this species of Weaver-bird, known to French writers as the Aépudlicain, is of exceptionally dull plumage.

The group of Widow-birds,? Vidwinw, is remarkable for the extraordinary growth of the tail-feathers in the males at the breed- ing-season. In the largest species, Vidwa (sometimes called Chera) progne, the cock-bird,

which, with the exception ofa scarlet and buff bar on the upper wing-coverts, is wholly black, there is simply a, great elongation of the rectrices ; but in V. paradisea the form of the tailis quite unique. The middle pair of feathers have the webs greatly widened, and through the twisting of the shafts their inferior surfaces are vertically opposed. These feathers are com- paratively short, and end ina hair-like filament. The next pair are produced to the length of about a foot—the bird not being so big as a Sparrow—and droop gracefully in the form ofa sickle. But this is not all: each has attached to its base a hair-like filament of the same length as the feather, and this filament originally adhered toand ran along the margin of the outer web, only becoming detached when the featheris full grown.4 In another species, V. principalis, the two middle pairs of rectrices are equally elongated, but their webs are convex, and the outer pair contains the inner, so that when the

'margins of the two pairs are applied a sort of cylinder is formed.®

The females of all the Widow-birds differ greatly in appearance from the males, and are generally clothed in a plumage of mottled brown. Usually classed with the Weaver-birds is a vast group of small seed-eating forms, often called Spermestine, but for which Hstreldine would seem to be a more fitting name. These comprehend the numerous species so commonly seen in cages, and known as Amadavats, Hstrelda amandava, Nutmeg-birds, Munia punctularia, Waxbills, Pytelia melba and phenicoptera, Cutthroats, Amadina fasciata, the Java Sparrow, Padda oryzivora, and many more than we can name. Many of these genera are common to Africa and India, and some also to Australia, but the last has several genera peculiar to itself, such as Donacicola and Poophila, there known as Grass-finches. The true affinity of these seems to require further investigation.® (A. N. _ WEAVING is the art of forming cloth by the interlac- ing of yarn or other filaments in a loom. In weaving two kinds or sets of yarn are used, the warp and the weft. The warp consists of the threads of yarn which extend generally but not always in parallel lines from end to end the whole length of the web; the weft yarn crosses and Intersects the warp at right angles, and fills up the breadth of the web. 'The warp is mounted on the loom for weav-

1 These differ from those built by some of the ORIOLES (g.v.) and other birds, whose nests may be compared to pensile pockets, while those of these Weaver-birds can best be likened to a stocking hung up by the "toe," with the " heel" enlarged to receive the eggs, while access and exit are obtained through the " leg."

- *But ata distance they may often be mistaken for a native hut, with its grass-roof,*

**It has been ingeniously suggested that this name should be more correctly written Whydah bird—from the place on the West Coast of Africa so named; but Edwards, who in 1745 figured one of the Species, states that he was informed that " the Portuguese call this bird i Widow, from its Colour and long Train" (Nat. Hist. Birds, i. p. 86). ~~" This curious structure was long ago described by Brisson (Orni~~ thologie, iii, p. 128), and more recently by Strickland (Contr. Orns- thology, 1850, pp. 88 and 149, pl. 59).*

_ " Both these species seem to have been first described and figured in 1600 by Aldrovandus (lib. xv. cap. 22, 238) from pictures sent to 2 by Ferdinando de' Medici, duke of Tuscany.

An illustrated Monograph of the Weaver-Birds by Mr Edward Bartlett is now in course of publication.

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ing, and into it the weft is thrown by means of a shuttle. Weaving is thus distinct from knitting, netting, looping, and plaiting, by all of which methods cloth may be made from yarns. Cloth also is prepared by felting, but in that operation the fibres are simply matted together without either spinning or intertwisting.

To appearance the varieties of woven cloth are endless; but these differences are only in part due to the method of weaving. The textile materials employed, the methods used in spinning and preparing yarns, the dye colours resorted to, and the finishing processes may vary indefinitely and so contribute to give variety of character to the resultant

pro- duct. The complexities of the art of weaving itself are reducible to a few fundamental operations, which do not of necessity demand the most intricate mechanism. The gorgeous medieval textiles of which numerous examples remain were made in looms of primitive construction. For producing the Indian muslins of the present day with their marvellous delicacy of texture, and for the elaborate and sumptuous shawls of Kashmir, the weavers have only rude and simple looms. But patient and tedious handiwork in these instances is devoted to produce effects which, with the application of modern machinery, can be automatically secured with as great rapidity as in the case of the plainest fabric.

"The series of inventions which have led up to the marvel- lously ingenious looms of the present day began with the invention of the fly shuttle, so called because of the rapidity of its motion, by John Kay of Bury in 1733. Previous to Kay's time the shuttle was thrown by the weaver's hand across and through the warp threads from side to side of the web. His invention brought the plain hand-loom practically into the form in which it continues at present ; and, as it forms the basis of all modern ma- chinery, a description of its parts and working, and of the operations connected with plain weaving, may here be given. In accordance with the definition already laid down, plain cloth, such as an ordinary piece of calico or linen, will, on examination, be found to consist of two sets of threads, the one intersecting the other at right angles, with each single thread passing alternately over one and under the next. Such a web is produced by passing the weft thread over and under each alternate warp thread in the breadth of the loom, the warp threads under one shot of weft being above the next. To do this, and to beat or close up each successive weft thread so as to make an even and suffi- ciently close cloth, necessitates a series of operations of which the following is an outline.

Warping.—The number of longitudinal threads which go to form the web will vary, of course, according to its breadth and to the closeness with which they lie together; for fine webs several thousand warp threads, of sufficient length to form a web of many yards, may have to be laid parallel to each other. This is done in the warping frame, which consists of a large reel, set vertically, on which separate threads drawn from a

range of bobbins are wound together in a spiral manner to the rcquired length of the web. The yarns conling from the bobbins are brought together in a heck, which is made to slide up and down a guide post as the reel or warp- ing frame revolves, and thus it delivers to the reel a band of thread which winds up and down the reel spirally by the rise and fall of the heck. Supposing 100 "ends" or warp threads are being reeled from bobbins, and 1000 ends of warp are required in the web, then the full lengths wound on the rcel must be repeated upward and. downward ten times. At each end of the warp the threads are, by a mechanical device in the heck, made to intersect alternately, forming leashes which are, when taken from the reel, scparately tied up, and thus aid in maintaining the parallelism of the ends when they are bundled up. Such a bundle of warp when required for weaving is taken in hand by the beamer, whose duty is to spread the threads evenly and wind them on the warp beam, spreading the ends in the order in which they are to appear in the woven fabric, and giving them about the breadth of the web. Cotton warps are wound direct from the bobbins on the beam,

there being a mechanical arrangement in the warping machine which stops its motion when any thread breaks, or when a bobbin

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is exhausted. The contents of several beams filled from bobbins may be required to be rewound together on a single beam to supply the requisite quantity of ends for a web.

Plain Weaving.—The warp beam thus filled is laid in the loom (fig. 1), and the euds of warp are then separately drafted or drawn through a pair of heddles or healds. The essential features of the

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Fic. 1.—Diagram of Hand-Loom, heddle are the eyes, loops, or mails through which the warp is

threaded, one end of warp only passing through any mail. This eye or mail is placed in the heddle half-way between an upper and a lower

wooden sheaf, over which pass the heald threads or between which extend the wires on which such mails are supported. The distance between the mails and the lathes at each end must be sufficient to allow of that opening or "shedding" of the warp which it is the function of the heddle to secure. Through the mails of one heddle each alternate end of warp is drafted, and the remaining ends are passed similarly through the other. Thus each heddle reeeives every alternate thread across the whole breadth of the warp. From the heddles the ends are carried through the reed (fig. 2), which is the ultimate distributor of the warp, and the instrument by which the weft is beaten up and closed in weaving. It consists

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of an oblong narrow frame filled with fine strips of cane or of flat- tened brass or steel wire, these strips being placed in fine comb-like order more or less closely together, up to as many as 120 strips or "dents," or even more, per inch; two or more ends are passed through each slit of the reed, which is fixed in a "lay" or "batten," a suspended frame for moving the reed backward and forward in beat- ing up the weft. On the lower part of the batten a ledge projects, which forms the ''shuttle race" for carrying the shuttle in " pick- ing" from and to the shuttle boxes at each end of the lay. From the reed the ends are carried forward and fastened to the cloth beam, and now the warp is ready for the weaving operation.

*The three essential movements in weaving are (1) the ''shed- ding" or dividing of the warp threads to permit of the passage between them of the shuttle containing the weft ; (2) the «« picking" or shooting of the weft ; and (8) the * battening" or beating up of the weft. The shedding motion depends upon the heddles, which are corded or attached to a pair of treadles worked by the weaver's feet. Each treadle is eonnected with the heddles above and below by a system of levers or pulleys, so that the depression of one treadle while it raises one heddle depresses the other, and thus the opening or shed is made in the warp, one-half—consisting of alternate threads—being raised, the corresponding half pulled down, The weaver then with the left hand pushes the lay or batten back towards the heddles, till a sufficient portion of the shed is brought in front of the reed,*

and the depressed ends lie just over the shuttle race. A clear way is thus provided for picking or shooting the shuttle, which is done with a whipping jerk of the picking stick held in the right hand. This pulls the cord attached to the picker and projects the shuttle from one shuttle box into that at the opposite end of the lay. The lay is now drawn forward with the left hand, and the reed combs and beats up the weft thread, Treadle number two is next depressed and thereby a new shed is formed, the last made pick or shoot being enwrapped between the intersecting warp sheds; the lay is again thrown back, the pick of weft is shot and beaten up, and so on in regular succession (sec fig. 3).

} satin, it would be necessary were the

WEAVING

In plain weaving it is possible to produce stripes by the use of bands of coloured warp, and checks where both warp and weft are particoloured. In the latter case shuttles, or at least cops, equal in number to the different colours of weft required, must be pro- vided. It is obvious that the repeated changing of shuttles, and

Fig. 3.—Section of plain web in process of weaving on the loom: a, warp beam; b, leash rods where the warp is divided and crossed ; c,c, heddles; d, reed ; é, the woven cloth; 7, the cloth beam.

still more the withdrawing and replacing of cops in weaving with

frequently changing weft, would occasion great loss of time. To

avoid that, and to provide for the use of different coloured wefts, or of wefts of various counts, the drop box was invented, a deviee by which two or more shuttles can be successively used in any order desired. The drop box, and its numerous subsequent modi- fications of circular and other change boxes, consists of a series of

compartments or divisions in the shuttle box, each made to hold a

separate shuttle. These several compartments are by mechanical

agency brought in line with the shuttle race in the order in which the changes of weft picks are necessary.

Twill Weaving.—So long as only two sets or leaves of treadles are used in a loom very little in the form of a pattern can be pro- duced, seeing no variation can be effected in the alternate raising of each heddle. To a limited extent a corded surface may be pro- duced by passing two or three warp ends through each mail, and by throwing two or three picks of weft between each shed. But for effective figure-weaving there must be numerous possible variations of shed; and that is secured first by increasing the number of heddles in the loom. Thus with threc heddles alone it is possible to effect six combinations of shedding, and as the number of heddles is added to the variations of possible shedding increase in geo- inetrical ratio. But the number of treadles which can be corded up to separate heddles is in practice limited, and therefore only simple twill patterns are for the most part woven with treadles and heddles, A twillis a cloth in which the warp and weft do not intersect alternately, but where the warp predominates on the one side and the weft on the other. The simplest of all is the three- leaf twill, in which the warp passes over two and under one weit thread, and vice versa, in regular succession, giving the appearance of a succession of diagonal lines on the surface. Regular twills of from four to eight leaves are woven in the same manner, the weft rising over each fourth to eighth warp thread as the case may be. Many variations and combinations are possible in connexion with these regular twills. For example, they may be combincd with plain weaving: a cashmere twill may be made,—that is, a four-leaf com- bination, in which the weft passes altcrnately over and under two warp euds, and two picks are shot for each shed. Further, zig-zags, lozenges, squares, and other geometrical designs can be produced by reversing the order of the treading, and thereby causing the twill to run in different directions. The diagrams, figs. 4 and 5, show two arrangements of a four-leaf twill, the first being a regular twill and the second BN a dimity, the dark Wy 8 ti Ya

quares representing the point at which the weft rises to the.

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Fig. 4.

Fig. 5.

surfaces. Satin or broken twills are those in which the warp threads are not intersected by the weft in regular succession, but only at intervals, and thereby the smooth continnons surface characteristic

of satin and damask is secured. Com- mon satin and double damask are eight- leaf twills, the order in which the weft rises being shown in the diagram, fig. 6. Rich satins may consist of sixteen to twenty leaf twills, the weft intersecting and binding down the warp at every sixteenth to twentieth pick as the case may be. Satins are usually woven with the face of the cloth downwards, be- cause in weaving, say a sixteen-leaf

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Fig. 6,

raised and one down, whereas, with the face of the cloth under, ouly one heddle has to be raised at a time.

Figure Weaving.—Only a limited number of heddles can in actual working be attached each to a separate treadle to be under

surface upwards to keep fifteen heddles

the control of the feet of the weaver. But to produce a complicated

and irregular pattern a large number of different sheds of warp must be provided, aud to secure with promptitude and certainty such manifold and complicated sheddings many of the most elegant and ingenious devices ever applied to mechanism have been in- vented. Before invention culminated in the Jacquard apparatus the draw loom or draw-boy loom was the machine employed for making figured patterns such as damasks.

In it each separate heddle shaft was fastened to a cord, which passed over a pulley, and coming down by the side of the loom these cords were arranged in a board in the order in which the heddles required to be drawn. The drawing of the cords and consequent formation of the shed was originally the work of a boy assistant, whence the name draw-boy loom ; but it was found possible, by various mechanical attachments worked from the treadles, to dispense with extra aid to the weaver. But even with this arrangement the number of heddles which can be hung in any loom is limited, though, by using thin shafts and arranging them in tiers, as many as eighty or ninety may be ac- commodated. Since as many as a thousand separate sheds may be required to form a complete pattern, a device other than shafts or leaves of heddles becomes necessary ; and the solution of the diffi- culty is found in hanging the individual heddle mails, not in shafts, but independently, each with a small lead weight called a lingo attached to it. Thus in effect a separate heddle is provided for each thread of warp, and it becomes possible to effect any com- bination of shed by cording together such leashes or mails as carry the warp threads to be raised. This tying together of the separate leashes, called " tying the harness" in the case of elaborate designs, isa tedious and difficult operation, requiring the exercise of con- siderable skill and patience. The successive sheds of a pattern being tied up, it is only necessary to have the cords arranged in the order in which they are to be drawn and attached to the mechanical device for pulling them, and forming the sheds in proper succession.

The Jacquard Loom.—The Jacquard apparatus is the most important and ingenious appliance which has ever been adapted to weaving, since by its agency it has become possible to produce the most intricate and extended patterns with the same certainty and with almost as much rapidity as plain cloth. The credit of introducing and making the machine a practical success—if not the whole honour of the invention—is due to Joseph Marie Jacquard of Lyons (see vol. xiii. p. 539). Attention was first directed to this ingenious artisan by a model of a net- making machine invented by him, which was deposited in the Conservatoire des Arts et Métiers. He was requested in 1801 by Napoleon to examine and improve on a com- plicated loom, and thereupon he undertook to produce a simple appliance to supplant the involved mechanism. The germs of the idea which he

perfected had been, early in the eighteenth century, conceived by Bouchon and Falcon, and in 1745 it was further developed and im- proved by Jacques de Vaucan- son. Indeed, had Vaucanson been acquainted with the fly shuttle which was then known and used at least in England, it is probable he would have come to be re- garded as the real inventor at once of the power-loom and of the apparatus which bears Jacquard's name.

The fundamental principle of the Jacquard apparatus is simple, although in its working fine mechanical details are essential. Its object is to effect the raising of any number of separate leashes, corded leashes, or heddles, in any order and succession without special tying of harness. How the apparatus works will bemade 4 – plain by the diagram, fig. 7. Here A, A represent the separate leashes through which the warp threads are drafted. It will be 16 7.—Diagram of Jacquard Loom. observed that these leashes are tied in pairs, but they might equally well be single, many together, or shafts of heddles. The cord from each separate leash passes through a finely perforated

board B, called the comber-board, between which and ,C, the bottom board, the pairs are tied to a cord. These cords pass up through the bottom board, and are caught in the lower hooks of a range of double-hooked long wires D, D. These hooked wires are supported and kept in position by being passed through loops or eyes in a range of cross-wires E, E. The head of each cross- wire is formed into an oblong eye as at @ (an enlarged representa- tion of a single cross-wire), through which a pin is passed for securing it in the spring-box F, in which each separate cross-wire presses against a small helical spring. The oblong eye permits a certain amount of play in the cross-wire, so that it can be pressed back against the helical spring when a force is applied at the opposite end. The points of the cross-wires pass through a perfor- ated board G, called the necdle-board, projecting about a quarter of an inch beyond its outer surface. The upper hooks of the up- right wires threaded through these cross-wires are attached to a board H, called the griffe. The whole function of the apparatus is to liberate these hooks in the order and to the extent necessary for the successive sheds. The hooks are dislocated thus. At the side of the projecting points of the cross-wires there is a

quadrangular frame I, called the cylinder. This cylinder can be drawn back, and turned so that each face may in succession be presented to and pressed against the face from which the cross-wires protrude. The cylinder alone does not affect the wires, but its function is to carry on its rotating faces a succession of pasteboard cards which are punctured with holes in a definite order. The wires connected with hooks which are not to be disturbed pass throngh the punctured holes and remain unaffected, while those supporting the hooks to be displaced are pressed back by the cardboard surface, and this motion of the cross-wire lifts the hook of the upright wire off the griffe. The griffe now rises, carrying with it the undis- turbed hooks, making a shed of the warp threads attached to their cords. The weft is then shot, the griffe descends, and the next punctured card is by a quarter revolution of the cylinder brought into contact with the cross-wires, and so the work goes on, succes- sive Jacquard cards being presented, new combinations of shed effected, and the weft shot till the pattern is completed. Hooks to any desired number may be arranged in a Jacquard apparatus, and when a separate hook is applied to each individual leash the most complete control and variety of shed may be secured. But in practice this is not necessary. Hach repeat of a pattern across a web may be corded up to one series of hooks, and in many ways it is practicable to limit the number of hooks required in weaving and thus to simplify the apparatus itself, and the system of punc- tured cards by which its operation is governed. If the Jacquard apparatus, for example, is controlling only a few leaves of heddles, then only a corresponding number of hooks are called into use. Usually the machines are provided with 300, 400, 600, 900, and sometimes more hooks, and when intricate and extensive patterns are being woven two or more machines may be sinultaneously brought to bear on the same loom.

The Power-Loom.—The first loom in which all the motions in weaving were connected and controlled by one motive power was the ribbon loom, known also as the Dutch or Dutch engine loom. A machine in which four to six pieces could be woven simultaneously is recorded to have been in existence in Dantzic in the last quarter of the sixteenth century (see RipBons, vol. xx. p. 531). In 1745 John Kay, inventor of the fly shuttle, and Joseph Stell patented improvements on the Dutch engine loom, which they said " may go or be worked by hands, water, or any other force." The

ribbon loom may be regarded as a series of distinct looms mounted within one frame, each having its own warp and cloth beams, heddles, and shuttle, but all worked by one set of treadles and with a single batten. The shuttles are thrown across the narrow web by a rack-and-pinion arrangement ; they are simultane- ously shot, and each occupies the place of its next neigh- bour to the right or left alternately. The Jacquard appar- atus and the drop-box arrangement for changing shuttles with change of weft are applied to the ribbon loom.

The application of power to the weaving of ordinary webs has developed along a different line, and the common power-loom has nothing to do with the ribbon loom. So early as 1678 there was figured and described in the French Journal des Seavans a machine " for making linen cloth without the aid of a workman," the invention of De Gennes, a French naval officer: The loom made in 1745 by Vaucanson, which also foreshadowed the Jacquard apparatus, embodied many improvements on the

conception of De Gennes, and presented some of the im- portant features of the modern power-loom. The practical realization of automatic weaving was, however, deferred for forty years, and the world owes it to a clergyman of the Church of England, the Rev. Dr Edmund Cartwright. His own graphic account of the history of his invention has already been given under Corton (see vol. vi. p. 500). Dr Cartwright's original loom was but an imperfect machine, although his patent was minute and detailed. Both he and others devoted much labour to its improve- ment; and in bringing the invention to a successful issue he spent from £30,000 to £40,000, while in return he re- ceived only a gift of £10,000 in 1809 from the Government. The power-loom fought its way to supremacy but slowly, for an imperfect power-loom is no better than a hand-loom; and it was only after the minor adaptations and adjustments which frequently make the difference between success and failure were brought into operation that the real advan- tages of power-loom weaving became

obvious. Even yet for many purposes the power-loom has not succeeded in supplanting hand-loom weaving.

The power-loom (fig. 8) differs much in appearance from the hand-loom, and is altogether more compact, from the fact that the lay, which is suspended from above in the latter, is in the power- loom centred below. The three principal motions, shedding, pick-

ing, and beating up, are of course the same in both. Motion is communicated to the working parts of the power-loom by the main

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Fie. 8.—Power-Loom.

tappets, and (2) for the treadles called the shedding tappets. picking tappets have always a direct relation to the motion of the

shot to the side at which the apparatus is fixed. If the prongs

WEAVING

meet no thread they are not thrown up, and being unmoved a con- nexion is formed to the moving lay, and by a system of levers the loom is immediately thrown out of gear and stopped. Equally essential is it to provide means to stop the loom should the shuttle stick in the warp or otherwise fail to be carried from side to side of the lay. It is clear that, should the lay beat up with the shuttle sticking in the weft, there would ensue complete wreck of the warp. There are two ways of dealing with such a contingency. The first, invented in 1796 by Miller of Glasgow, is the "stop-rod motion," the action of which depends on the shuttle raising, as it enters the shuttle-box, a catch which if left down would strike against a frog or stop, and so throw the loom out of gear. The second device is

. the loose reed, in which there is an appliance for liberating the

lower part of the reed when any obstruction is met in the warp, and thereby preventing a blow being given by the beating-up motion. Double

Cloth.— For many purposes the weaving of double cloth is important. It permits of the formation of a ground of inferior material with a surface of finer texture; and it affords great scope for the formation of coloured patterns, allowing of the production of double-faced textures, which may or may not correspond in pattern according to pleasure. It moreover increases the thickness and weight of woven fabrics, and it is the basis of tubular weaving, such as is practised for making hose, tubes, seamless sacking, &c. There are three classes of double textures. The first consists of double warp surfaces with the weft in the centre; in the second it is the reverse—a warp centre and two weft faces; and in both these classes the two sides may be of different colours if two colours of warp and weft respectively are employed. In the third case the cloth may consist of distinct warps and wefts throughout, and practically be two separate cloths. These, if bound at the selvedges, would become woven tubes, and if at regular intervals over the surface a thread of warp or weft passes from the one into the other they are united as one texture. The intersection of double warps and wefts gives the opportunity of producing great diversity of colour and pattern in any fabric without waste of material, and the manner in which patterns may pass from side to side is illustrated in the sectional diagram, fig. 9. The diagram, fig. 10, illustrates

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Fre. 9.—Section of Double Cloth.

the method of producing a plain double cloth with the use of four heddles. Heddles 1 and 2 shed the upper cloth, 3 and 4 the

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*noe lee * i = through the lower web _heddles eng putin through the 1 2,3 are raised and heddle 4 is upper warp heddle 1 is depressed. :*

up and all the others Gauze Weaving.—Hitherto we are down; and when the shuttle is passed

have dealt only with methods of weaving in which the warp threads run parallel with each other and are intersected at right angles by the weft. In

gauze weaving, by which effects intermediate between lace and plain cloth are produced, the warp threads are made to intertwist more or less among themselves, thereby favouring the production of light open textures, in which many ornamental lace-like combinations can be effected. Plain gauze isa thin open texture, in which two contiguous threads of warp make each a half twist around the other at every pick, the cloth having in section the appearance shown in fig. 11. A leno con- sists of a kind of

muslin in which SSOeSSOZOSBEKOEOBG the crossing or whip warp inter- twists with its neighbour only at every fourth pick. In fancy gauzes the crossing or whip warp may cross and entwine several ordinary warp threads at once, and in numerous other ways the simple principle of intertwisting may be used for ornamental effect. The mutual entwining of warp threads is accomplished by an extra heddle called a "doup," placed in front of the common heddles. The doup consists of a half heddle threaded through the eye of a plain heddle, of which it forms a part. The cross or whip warps are drafted first through one of the ordinary heddles and then passed under the thread or threads they are intended to entwine, and drafted through the doup heddle, as seen in the diagram, fig. 12, which shows the drafting of a plain gauze. The whole of the warp yarns which are to be entwined must with the whip

Fre. 10,— Method of Weaving Double Cloth.

Fig. 11.—Section of ordinary Gauze.

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warp be passed through a single split of the reed, except when the doups are placed in front of the reed, which is done in the case of complicated gauze weaving. ; Piled fabrics are textures woven with a looped or otherwise raised surface. Looped pile is any fabric in which the woven loops remain uncut, as in Brussels and tapestry carpets and terry velvets. When these loops are cut in the finished texture then the material is a cut pile, such as ordinary velvet, fustian, imitation scalskin, om and other imitation furs. For oe! ordinary loop and cut pile ry fabrics two warps are re- f quired, the regular beam warp Y and the " pole" or pile warp. The latter, being raised into loops, is worked up more rapidly than the

ordinary warp, and it has consequently to be of greater length and wound on a separate beam. The ground or foundation may be either a plain or a twilled texture, and after every third pick of weft a wire is introduced into the shed and beaten up and woven into the cloth. In this way, by the stretching of the pile warp over the wire, a row of loops is formed across the web, the size of the loops being regulated by the size of the wire. Ifa looped pile is being woven then it only remains to pull out the wires from behind and again weave them in in front as the work proceeds. Butif cut pile is being made, then either the loops must be cut along the top before the wire is withdrawn, or the wire may at one end be provided with a knife edge which itself cuts the loops as it is being pulled out. For velvets, &c., the wires are provided with a groove on their upper face, and along this groove a cutting knife called a trivet is run to cut the loops. In fig. 13 the structure of a looped and cut velvet is illustrated. Fustian

is a cut pile fabric in

i – EVV VEY. e which thevelt mate: TSS surface, forms the Fig. 13.—Section of Looped Pile Fabric. substance of the pile. It is not woven over wires, aud the pile is cut by hand after the web leaves the loom. A third method of weaving pile fabrics consists of making a double web, the pile warp passing from the one to the other and binding them together, as shown in fig. 14. When the connecting threads are cut they form a pile surface for each separate cloth. The great difficulty which has Fie, 14.—Section of Double-Web Plush. been encountered in per- feeting this method of pile weaving has been to keep the connecting pile equal in length throughout, and to cut it so as to produce uniform level surfaces. The success which has been attained in plush weaving with double cloth is largely due to the patient and well-directed efforts of Mr S. C, Lister, of Manningham Mills, Bradford.

Fig, 12.—Drafting of Gauze Web. 1 and 2 ordinary heddles; D, doup heddle.

There are many subsidiary but highly important and most ingenious features of the art of weaving, specially in connexion with the production of ornamental surfaces, for notice of which it has been impossible to find room in the preceding Summary. The extent and complexity of the whole

subject renders the present- ation of a satisfactory outline of the art a matter of unusual difficulty; but those who wish to pursue the subject in detail, in addition to copious information to be gleaned from technical journals, may consult Darlow's History and Principles of Weaving (London, 1878), Ashenhurst's Weaving and Designing of Textile Fabrics (Bradford, 1879), and Brown's Practical Treatise on the Art of Weaving (4th ed., Dundee, 1883). To the two works first named we have to acknowledge our indebtedness for the suggestions of several diagrams.

WEBER, Cart Maria Friepricu Ernst von (1786- 1826), musical composer and creator of "romantic opera," was born at Eutin, near Liibeck, December 18, 1786, of a family that had long been devoted to art. His father, Baron Franz Anton von Weber, a military officer in the service of the palgrave Karl Theodor, was an excellent violinist, and his mother once sang on the stage. His cousins, Josepha, Aloysia, Constanze, and Sophie, daughters of Franz Anton's brother Fridolin, attained a high reputation as vocalists. Mozart, after having been cruelly deceived by Aloysia, made Constanze his wife, and thus became Franz Anton's nephew by marriage. Fridolin played the violin nearly as well as his brother; and the whole family displayed exceptional talent for music.

Franz Anton von Weber was a man of thriftless habits and culpable eccentricity. Having been wounded at Ros-

bach, he quitted the army, and in 1758 he was appointed financial councillor to Clement August, elector of Cologne, who for nine years overlooked his incorrigible neglect of duty. But the elector's successor dismissed him in 1768; and for many years after this he lived in idleness at Hildesheim, squandering the property of his wife, Anna de' Fumetti, and doing nothing for the support of his children until 1778, when he was appointed director of the opera at Liibeck. In 1779 the prince bishop of Eutin made him his kapellmeister, and not long afterwards his wife died of a broken heart. Five years later he went to Vienna, placed two of his sons under Michael Haydn, and in 1785 married the young Viennese singer Genovefa von Brenner, who in the following year gave birth, at

Eutin, to the subject of the present article—a delicate child, afflicted with congenital disease of the hip-joint.

On his return from Vienna, Franz Anton, finding that a new kapellmeister had been chosen in his place, ac- cepted the humbler position of " Stadt Musikant." This, however, he soon relinquished; and for some years he wandered from town to town, giving dramatic perform- ances, in conjunction with the children of his first wife, wherever he could collect an audience. The effect of this restless life upon the little Carl Maria's health and educa- tion was deplorable ; but, as he accompanied his father everywhere, he became familiarized with the stage from his earliest infancy, and thus gained an amount of dramatic experience that indisputably laid the foundation of his future greatness. Franz Anton hoped to see him develop into an infant prodigy, like his cousin Mozart, whose marvellous career was then rapidly approaching its close. In furtherance of this scheme, the child was taught to sing and place his fingers upon the pianoforte almost as soon as he could speak, though he was unable to walk until he was four years old. Happily his power of observation and aptitude for general learning were so precocious that he seems, in spite of all these disadvantages, to have in- stinctively educated himself as became a gentleman. His first music- master was Keuschler, who gave him instruction at Weimar in 1796. In 1798 Michael Haydn taught him gratuitously at Salzburg. In the March of that year his mother died, like her predecessor, of chagrin. In April the family visited Vienna, removing in the autumn to Munich. Here the child's first composition—a set of "Six Fughettas " —was published, with a pompous dedication to his half- brother Edmund; and here also he took lessons in singing from Valesi, and in composition from Kalcher, under whom he made rapid progress. Soon after this he began to play successfully in public, and his father compelled him to write incessantly. Among the compositions of this period were a mass and an opera—Die Macht der Liebe und des Weins— now destroyed. A set of "Variations for the Pianoforte," composed a little later, and dedicated to Kalcher, was lithographed by Carl Maria himself, under the guidance of Senefelder, the inventor of the process, in which both the father and the child took great interest.

In 1800 the family removed to Freiberg, where the Ritter von Steinsberg gave Carl Maria the libretto of an opera called Das Waldmddchen, which the boy, though not yet fourteen years old, at once set to music, and produced in November at the Freiberg theatre. The performance was by no means successful, and the composer himself was accustomed to speak of the work as "a very immature production"; yet it was afterwards reproduced at Chemnitz, and even at Vienna.

Carl Maria returned with his father to Saizburg in 1801, resuming his studies under Michael Haydn, and forming a close friendship with the Chevalier Neukomm. Here also he composed his second opera, Peter Schmoll und seine Nachbarn, which was unsuccessfully produced at Nurem-

berg in 1803. In that year he again visited Vienna, where, though the veterans Haydn and Albrechtsberger were both receiving pupils, his father preferred placing him under the Abbé Vogler, a man of kind and sympathetic nature, but quite unfit to train so great a genius. Through Vogler's instrumentality Carl Maria was appointed con- ductor of the opera at Breslau, before he had completed his eighteenth year. In this capacity he greatly enlarged his experience of the stage; but he lived a sadly irregular life, contracted debts which his slender salary was insuffi- cient to defray, and lost his beautiful voice through accidentally drinking a poisonous liquid used in litho- graphy,—a mishap that nearly cost him his life. These hindrances, however, did not prevent him from beginning a new opera called Aiibezahl, the libretto of which was based upon a well-known legend of the Riesengebirge. The plot of the piece was "romantic" to the last degree, and Weber worked at it enthusiastically, but it was never completed, and little of it has been preserved beyond a quintett and the masterly overture, which, re-written in 1811 under the title of Der Beherrscher der Geister, now ranks among its author's finest instrumental compositions.

Quitting Breslau in 1806, Weber removed in the fol- lowing year to Stuttgart, where he had been offered the post of private secretary to Duke Ludwig, brother of Irederick, king of Wiirtemberg. The appointment was

a disastrous one. The stipend attached to it was insufficient to meet the twofold demands of the young man's new social position and the thriftlessness of his father, who was entirely dependent upon him for support. Court life at Stuttgart was uncongenial to him, though he yielded to its temptations. The king hated him. He fell hopelessly into debt, and, worse than all, became involved in a fatal intimacy with Margarethe Lang, a singer at the opera. Notwithstanding these distractions he worked hard, and in 1809 re-modelled Das Waldméddchen, under the title of Sylvana,! and prepared to produce it at the court theatre. Buta dreadful calamity prevented its performance. Franz Anton had misappropriated a large sum of money placed in the young secretary's hands for the purpose of clearing a niortgage upon one of the duke's estates.2. Both father and son were charged with embezzlement, and, on February 9, 1810, they were arrested at the theatre, during a rehearsal of Sylvana, and thrown by the king's order into prison. No one doubted Weber's innocence, but after a summary trial he and his father were ordered to quit the country, and on February 27 they began a new life at Mannheim.

Having provided a comfortable home for his father,and begun the composition of a new comic opera, in one act, called Abu Hassan, Weber removed to Darmstadt in order to be near his old master the Abbé Vogler, and his fellow- pupils Meyerbeer and Gansbacher, with whom he lived on terms of the closest intimacy. On September 16, 1810, he reproduced Sylvana under its new title at Frankfort, but with very doubtful success. Abu Hassan was com. pleted at Darmstadt in January 1811, after many inter- ruptions, one of which exercised a memorable influence upon his later career. While reading with his friend, Alexander von Dusch, George Apel's then recently pub- lished Gespensterbuch, he was so much struck with the story of Der Freischiitz that he at once began to meditate upon its transformation into an opera, and the two friends actually set to work upon it then and there. But it was not until many years afterwards that the idea was carried out in a practical form. ee ee ee ee ae

1 As the MS. of Das Waldmddchen has been lost, it is impossible now to determine its exact relation to the later work.

2 Spitta gives a different account of the occurrence, and attributes the robbery to a servant.

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Weber started in Iebruary 1811 on an extended artistic tour, during the course of which he made many influential friends, and on June 4 brought out Abu Hassan with marked success at Munich. His father died at Mannheim in 1812, and after this he had no settled home, until in 1813 his wanderings were brought to an end by the unexpected offer of an appointment as kapellmeister at Prague, coupled with the duty of entirely remodelling the performances at the opera-house. The terms were so liberal that he accepted at once, engaged a new company of performers, and governed them with uninterrupted success until the autumn of 1816. During this period he composed no new operas, but he had already written much of his best pianoforte music, and played it with never-failing success, while the disturbed state of Europe inspired him with some of the finest patriotic melodies in exist- ence. First among these stand ten songs from Kérner's Leyer und Schwerdt, including " Vater, ich rufe dich," and "Liitzow's wilde Jagd"; and in no respect inferior to these are the splendid choruses in his cantata Kampf und Steg, which was first performed at Prague, December 22, 1815.

Weber resigned his office at Prague, September 30, 1816, and on December 21 Frederick Augustus, king of Saxony, appointed him kapellmeister at the German opera at Dresden. The Italian operas performed at the court theatre were superintended by Morlacchi, whose jealous and intriguing disposition produced an endless amount of trouble and annoyance. The king, however, placed the two kapellmeisters on an exact equality both of title and salary, and Weber found ample opportunity for the exercise of his remarkable power of organization and control. And now he once more gave his attention to the story of Der Freischiitz, which, with the assistance of Friedrich Kind, he developed into an admirable libretto, under the title of Des Jagers Braut.

The legend of ' The Seventh Bullet," though well known in the 17th century, and probably much earlier, seems to have been first given to the world in a connected form in a work entitled Unterredungen vom Reiche

der Geister, the second edition of which was printed at Leipsic in 1731. In this version of the story the scene is laid in Bohenia, and the action referred tothe year 1710. Apel reproduced the legend, under the title of "' Der Freischiitz," in the first volume of his Gespensterbuch, in 1810. Since then the story has been repeated in many varying forms, but it was Apel's version that first attracted Weber's attention, and it was from this that he and Kind together made their first sketch of the libretto, on February 21, 1817, though they found it necessary to increase the interest of the drama by the introduction of some accessory characters, and to substitute a happy ending for the fatal catastrophe of the original story. No subject could have been better fitted than this to serve as a vehicle for the new art-form which, under Weber's skilful management, developed into what is now universally recognized as the prototype of the true 'romantic opera." He had dealt with the supernatural in Liibezahl, and in Sylvana with the pomp and circumstance of chivalry, but in neither case with the unquestioning faith which alone can invest the treatment of such subjects with befitting dignity. The shadowy impersonations in fitibezahl are scarcely less human than the heroine who invokes them; and the music of Sylvana might easily have been adapted to a story of the 19th century. But in the master's later operas all this is changed. We cannot choose but shudder at the fiend in Der Freischiitz, for the .nfernal apparition comes straight to us from the nether world. Every note in Zuryanthe breathes the spirit of mediseval romance ; and the fairies in Oberon have a real existence, quite distinct from the tinsel of thestage. And this it is,—this uncompromising reality, even in face of the

unreal,—that forms the strongest characteristic of the pure "romantic school," as Weber understood and created it. It is true to nature even when dealing with the super- natural, for it treats its wildest subjects in earnest, and without a doubt as to the reality of the scenes it ventures to depict, or the truthfulness of their dramatic interpre- tation.

Weber and Kind sketched the scenario of the new opera in February 1817. On March 1 the poet placed the com- plete libretto in the hands of the composer, who wrote the first note of the music on July 2—beginning

with the duet which opens the second act. But so numerous were the interruptions caused by Morlacchi's intrigues, the insol- ence of unfriendly courtiers, and the attacks of jealous critics that nearly three years elapsed before the piece was completed. In the meantime the performances at the opera-house were no less successfully remodelled at Dresden than they had already been at Prague, though the work of reformation was far more difficult ; for the new kapellmeister was surrounded by enemies who openly subjected him to every possible annoyance, and even the king himself was at one time strongly prejudiced against him. Happily, he no longer stood alone in the world. Having, after much difficulty, broken off his miserable intimacy with Margarethe Lang, he married the well-known vocalist, Carolina Brandt, a noble-minded woman and consuinmate artiste, whose advice, even on subjects con- nected with the new opera, was extremely valuable. The great work was completed May 13, 1820, on which day Weber wrote the last note of the overture,—a portion of the design which, for obvious reasons, it was his custom to postpone until the rest of the music was finished. There is abundant. evidence to prove that he was well satisfied with the result of his labours ; but he gave him- self no rest. He had engaged to compose the music to Wolff's Gipsy drama, Preciosa. Two months later this also was finished, and both pieces ready for the stage.

In consequence of the unsatisfactory state of affairs at Dresden, it had been arranged that both Preciosa and Der Freischiitz—no longer known by its original title, Des Jagers Bravt—should be produced at Berlin. In February 1821 Sir Julius Benedict was accepted by Weber as a pupil; and to his pen we owe a delightful account of the rehearsals and first performance of his master's chef @ewre. Preciosa was produced with great success at the old Berlin opera-house on June 14, 1821. On June 18, the anniversary of the battle of Waterloo, the opening of the new "Schauspielhaus" was celebrated by the produc- tion of Der Freischiitz. Much anxiety was caused by unforeseen difficulties at the rehearsals; yet, so calm was Weber's mind that he devoted his leisure time to the composition of his Concertstiick in F minor—one of his finest pianoforte pieces. Until the last moment his friends Were anxious; the author was not; and the result justified his confidence in his own powers. The success of the plece was triumphant. The work was received with equal

enthusiasm at Vienna on October 3, and at Dresden on January 26, 1822. Yet Weber's position as kapellmeister was not much improved by his success, though, in order to remain faithful to his engagements, he had refused tempting offers at Berlin and Cassel, and, at the last- named place, had installed Ludwig Spohr in a position much more advantageous than his own.

For his next opera Weber accepted a libretto based, by Frau Wilhelmine von Chezy, on the story of Huryanthe, as originally told in the 13th century, in Gilbert de Montreuil's Roman de la Violette, and repeated with alter- ations in the Decamerone, in Shakespeare's Cymbeline, and in several later forms. In place of the ghostly horrors of Der Freischitz, the romantic element was hére supplied

by the chivalric pomp of the Middle Ages. The libretto, though soundly abused by shallow critics, is really an exceptionally good one—in one respect superior to that of Der Freischiitz, inasmuch as it substitutes elaborate recitative for the spoken dialogue peculiar to the German '"Schauspiel"" and French '"opéra comique." It is, in fact, a " grand opera" in every sense of the words,—the prototype of the "musical drama" perfected fifty years later by Wagner. The overture—as usual, written last— presents a feature that has never been imitated. During its performance the curtain temporarily rises, to exhibit, in a tableau vivant, the scene in the sepulchral vault upon which the whole story turns. This episode is now rarely presented ; but Weber himself well knew how much the interest of the piece depended on it. The work was pro- duced at the Kirntnerthor theatre in Vienna, October 25, 1823, and received with enthusiasm. Being of a less popular character than Der Freischiitz, it is not so fre- quently performed ; but it still retains its place upon the stage, and ranks among the finest 'romantic operas" that have ever been written.*

Weber's third and last dramatic masterpiece was an English opera, written for Covent Garden theatre, upon a libretto adapted by Planché from Wieland's Oberon. Destined for the English stage sixty years ago, this was necessarily disfigured by the spoken dialogue abandoned in

Huryanthe ; but in musical beauty it is quite equal to it, while its fairies and mermaids are as vividly real as the spectres in Der Freischiitz. 'Though already far gone in consumption, Weber began to compose the music on January 23, 1825. Charles Kemble had offered him £1000 for the work, and he could not afford to rest. He finished the overture in London, at the house of Sir George Smart, soon after his arrival, in March 1826; and on April 12 the work was produced with triumphant success. But it cost the composer his life. Wearied out with rehearsals and performances of the opera, and concerts at which he was received with rapturous applause, he grew daily perceptibly weaker; and, notwithstanding the care of his kind host, Sir George Smart, and his family, he was found dead in his bed on the morning of June 5, 1826. For eighteen years his remains rested in a temporary grave in Moorfields chapel; but in 1844 they were removed and placed in the family vault at Dresden.

Besides his three great dramatic masterpieces and the other works already mentioned, Weber wrote two masses, two sym- phonies, eight cantatas, anda vast amount of songs, orchestral and

pianoforte pieces, and music of other kinds, amounting altogether to more than 250 compositions. (W. S. R.)

WEBER'S LAW is the principal generalization of that branch of scientific investigation which has come to be known as "psycho-physics." According to Fechner, who has done most to prosecute these inquiries and to consolidate them under a separate name, '" psycho-physics is an exact doctrine of the relation of function or dependence between body and soul." In other words, it is throughout an attempt to submit to definite measurement the relation of physical stimuli to the resulting psychical or mental facts, and forms an important department of experimental psychology. It deals with the quantitative aspects of mental facts—their intensity or quantity proper and their duration. Physical science enables us, at least in the case of some of the senses, to measure with accuracy the objective amount of the stimulus, and introspection enables us to state the nature of the subjective result. Thus we are able to say whether a stimulus produces any psychical result, and can fix in that way the minimum

sensibile or "threshold of consciousness" for each of the senses. Tn like nanner (though with less accuracy, owing to the dis- turbing nature of the conditions) we can fix the sensational

maximum, or upper limit of sensibility, in the different senses, that is to say, the point beyond which no increase of stimulus produces any appreciable increase of sensation. We thus determine, as Wundt puts it, the limit-values between which changes of intensity in the stimulus are accompanied by changes in sensation. But the central inquiry of psycho-physics remains behind. Between the quantitative minimum and the quantitative maximum thus fixed can we discover any definite relation between changes in the objective intensity of the stimuli and changes in the intensity of the sensations as estimated by consciousness? The answer of psycho-physics to this in- quiry is given in the generalization variously known as ""Weber's law," " Fechner's law," or the '" psycho-physical law," which professes to formulate with exactitude the rela- tions which exist between change of stimulus and change of sensation.

As we have no means of subjectively measuring the absolute intensity of our sensations, it is necessary to de- pend upon the mental estimate or comparison of two or more sensations. Comparison enables us to say whether they are equal in intensity, or if unequal which is the greater and which is the less. But as they approach equality in this respect it becomes more and more difficult to detect the difference. By a series of experiments, therefore, it will be possible, in the case of any particular individual, to determine the least observable difference in intensity between two sensations of any particular sense. This least observable difference is called by Fechner the "Unterschiedsschwelle," or '"difference-threshold," that is to say, the limit of the discriminative sensibility of the sense in question. That such a "threshold," or least observable difference, exists is plain from very simple examples. Very small increases may be made in the objective amount of light, sound, or pressure—that is, in the physical stimuli applied to these senses—without the subject on whom the experiment is made detecting any change. It is further evident that, by means of this " Unterschiedsschwelle," it is

possible to compare the discriminative sensibility of different individuals, or of different senses, or (as in the case of the skin) of different parts of the same sense organ : the smaller the difference observable the finer the dis- criminative sensibility. Thus the discrimination of the muscular sense is much more delicate than that of the sense of touch or pressure, and the discriminative sensibility of the skin and the retina varies very much according to the parts of the surface affected. Various methods have been adopted with a view to determine these minima of discriminative sensibility with an approach to scientific precision. The first is that employed by Weber himself, and has been named the method of just observable differ- ences. It consists either in gradually adding to a given stimulus small amounts which at first cause no perceptible difference in sensation but at a certain point do cause a difference to emerge in consciousness, or, vice versa, in gradually decreasing the amount of additional stimulus, till the difference originally perceived becomes imper- ceptible. By taking the average of a number of such results, the minimum may be determined with tolerable accuracy. The second method is called by Fechner the method of correct and incorrect instances. When two stimuli are very nearly equal the subject will often fail to recognize which is the greater, saying sometimes that A is greater, sometimes that B is greater. When in a large number of trials the right and wrong guesses exactly balance one another we may conclude that the difference between the two stimuli is not appreciable by the sense. On the other hand, as soon as the number of correct guesses definitely exceeds half of the total number of cases, it may be in- ferred that there is a certain subjective appreciation of

difference. This method was first employed by Vierordt. The third method, that of average errors, is very similar to the one just explained. Here a certain weight (to take a concrete example) is laid upon the hand of the person experimented upon, and he is asked, by the aid of subjec- tive impression alone, to fix upon a second weight exactly equal to the first. It is found that the second weight sometimes slightly exceeds the first,

sometimes slightly falls below it. Whether above or below is of no con- sequence to the method, which depends solely on the amount of the error. After a number of experiments, the different errors are added together, and the result being divided by the number of experiments gives us the average error which the subject may be calculated upon to make. This marks the amount of stimulus which is just below the difference-threshold for him. This method was first employed by Fechner and Volkmann. The different methods were first named, and the theory of their applica- tion developed by Fechner, in his Elemente der Psycho-physik (1860).

These methods have been chiefly applied to determine the relation of the difference-threshold to the absolute magni- tude of the stimuli employed. For a very little reflexion tells us that the smallest perceivable difference is not an amount whose absolute intensity is constant even within the same sense. It varies with the intensity of the stimuli employed. We are unable, for example, to recognize slight differences in weight when the weights compared are heavy, though we should be perfectly able to make the distinction if the weights compared were both light. Ordinary observation would lead us, therefore, to the conclu- sion that the greater the intensity of the original stimulus at work the greater must be the increase of stimulus in order that there may be a perceptible difference in the resulting sensation. E. H. Weber (1795-1878) was the first (after a prolonged series of experiments on the sensa- tions of sight, hearing, and touch) to clothe this generality with scientific precision by formulating the law which has since gone by his name. The purport of the law is that, in order that the sensational difference may remain un- changed, the increase of stimulus must maintain the same proportion to the intensity of the preceding stimulus. The smallest perceptible difference is therefore not absol- utely the same, but it remains relatively the same, that is, it remains the same fraction of the preceding stimulus. For example, if we can: distinguish 16 oz. and 17 02z., we shall be able to distinguish 32 oz, and 34 oz. but not 32 oz. and 33 oz., the addition being in each case 7, of the preceding stimulus. This fraction (supposing it to be the difference-threshold of the muscular sense) remains a con- stant, however light or however heavy the weights com- pared. The law may be formulated thus : —The difference between any two stimuli is experienced as of equal

magni- tude, in case the mathematical relation of these stimuli remains unaltered. Or, otherwise expressed, In order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical pro- gression. It is also expressed by Fechner in the form— The sensation increases as the logarithm of the stimulus.

The law has been variously interpreted. Fechner him- self designated it the psycho-physical law, and treated it as the fundamental formula of the relation between body and mind, thus assigning to it an ontological dignity and significance. But in this " psycho-physical" interpreta- tion of his results he has not had a numerous following. Wundt interprets the law in a purely 'psychological " sense, making it a special instance of the general law of relativity which governs our mental states. Introspection can give us no information as to the absolute intensity of the stimulus; for a stimulus is known in consciousness

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only through its sensational resultant. Hence, he argues, we can only compare one psychical state with another, and our standard of measurement is therefore necessarily a relative one; it depends directly upon the preceding state with which we compare the present. Others have attempted to give the law a purely physical or " physio- logical" explanation. Instead of holding with Fechner that the law expresses a recondite relation between the material and the spiritual world, they prefer to regard the quanti- tative relation between the last physical antecedent in the brain and the resultant mental change as prima facie one of simple proportion, and to treat Weber's law as holding between the initial physical stimulus and the final action of the nerve-centres. According to this interpretation, the law would be altogether due to the nature of nervous action, As a nerve, says Sully, after a temporary degree of stimulation temporarily loses its sensibility, so the greater the previous stimulation of a nerve the greater is the additional stimulus required to produce an appreciable amount of sensation.

Weber's law, it must be added, holds only within certain limits. In the "chemical" senses of taste and smell experiinents are almost impossible. It is not practicable to limit the amount of the stimulus with the necessary

exactitude, and the results are further vitiated by the long continuance of the physiological effects. The same con- siderations apply with still more force to the organic sensations, and the results in the case of temperature sensations are completely uncertain. The law is approxi- mately true in the case of sight, hearing, pressure, and the muscular sense,—most exactly in the case of sound. As this is the sense which affords the greatest facilities for measuring the precise amount of the stimulus, it may per- haps be inferred that, if we could attain the same exacti- tude in the other senses, with the elimination of the numerous disturbing extraneous influences at work, the law would vindicate itself with the same exactitude and certainty. It is further to be noted, however, that even in those senses in which it has been approximately verified, the law holds with stringency only within certain limits. The results are most exact in the middle regions' of the sensory scale; on the contrary, when we approach the upper or lower limit of sensibility, they become quite un- certain.

Literatwre.—W eber's investigations were given to the public in his articlesin Wagner's Handwérterbuch der Physiologie. Fechner's Elemente der Psycho-physik, referred to above, was published in 1860, and contains an elaborate exposition of the whole subject. He replied to his critics in two later works, Zn Sachen der Psycho- physitk (1877) and Revision der Hauptpunkte der Psycho-physik (1882). Delbeuf's Hiude psychophysique (1873), and G. E. Miiller's Zur Grundlegung der Psycho-physik, are also important documents ; and the subject is fully treated in Wundt's Physiologische Psycho- logie and in Ladd's Physiological Psychology, which is based upon Wundt. Two English monographs may be referred to as containing important criticisms of the law,—the paper of Messrs Dewar and M'Kendrick in the Transactions of the Royal Society of Edinburgh

for 1873, and Mr James Ward's ' Attempt to Interpret Fechner's Law," in Mind, i. 452 sq. (A. SE.)*

WEBSTER, Danren (1782-1852), American states- man, was born at Salisbury, New Hampshire, January 18, 1782. His family can be traced back without difficulty to Thomas Webster, of Scottish ancestry, who settled in New Hampshire in 1636, but no further. Ebenezer Webster, the

father of Daniel, rose to the rank of captain in the "French and Indian War." From him his sons Ezekiel and Daniel inherited great physical force ; their mother, Abigail Eastman, gave them their intellectual Powers. Daniel always insisted on considering his elder brother, who became a leading lawyer in his native State, as really his superior in intellect, and the correspondence between them was close and confidential until Ezekiel's

death in 1829. Living on the frontier, Daniel was com- pelled to depend for early education on his mother and on the scanty schooling customary in winter ; and for much of this he was indebted to the fact that he was physically the weakest of his family. It is a little odd, however, that he failed utterly in that with which his final reputation was so closely connected. In his own words: "There was one thing I could not do: I could not make a declamation; I could not speak before the school." When he was fifteen years old a family council decided to send him to college, a step involving severe abstinence and additional struggle on the part of his immediate relatives. After an imperfect preparation, he graduated at Dartmouth College in 1801, studied law, and was admitted to the bar in Boston in 1805, from the office of Christopher Gore.

Regard for his father made Webster begin practice in the town of Boscawen, near his early home; but his father died within a year, and he removed to Portsmouth, the largest town of the State. Here he took a leading place at the bar, having but one rival. In May 1813 he entered Congress as a representative from New Hampshire, being placed at once on the committee of foreign affairs. As a moderate Federalist, he held that attacks on Canada should cease, and that the war should be confined to the ocean. His first speech showed that the raw New Hamp- shire boy of a dozen years before had developed new powers. "Ifthe war must continue, goto the ocean. If you are seriously contending for maritime rights, go to the theatre where alone those rights can be defended. Thither every indication of your fortune points you. There the united wishes and exertions of the nation will go with you. Even our party divisions, acrimonious as they are, cease at the water's edge." The position of any Federalist in Congress, however, was not a wide sphere of influence ; and Webster, removing to Boston in 1816, gave up political life for some years.

At the Massachusetts bar Webster soon gained a place as prominent as he had held in New Hampshire, and within three years his reputation as a lawyer had become national. His national standing was gained by his argu- ment in the " Dartmouth College case," practically endorsed by the Supreme Court. Dartmouth College had been chartered by the king in 1769. In 1816 the New Hampshire legislature undertook to alter the charter and reorganize the corporation ; and the State courts sustained the legislature in a suit brought by the old trustees against the new. On appeal to the Supreme Court of the United States in 1818, Webster contended that the College was an eleemosynary corporation, over which the legislature had no more power than the king who chartered it ; that the king had no power to void such a charter, and the New Hampshire legislature no such sovereign powers as parliament ; that the legislature's action came within the Federal constitution's prohibition of State legislation altering contracts; that "the charter of 1769 is a con- tract ;" that "the acts in question impair this contract ;" and that they were therefore unconstitutional and void. The Supreme Court upheld Webster's view, and it was soon seen that he had worked a serious change in the relations of the States to corporations, as they had thus far been

understood. The States endeavoured to meet the new rule by inserting in their charters clauses retaining the right to alter them; but the spirit of the ‘ Dartmouth College case,” which has always had its opponents among American lawyers, has had its influence upon judges every- where, in every variety of cognate cases. From this time Webster was recognized as the leading lawyer of the country, and his services were in constant demand.

His cases are quite beyond statement within the space here available. Some of his leading constitutional cases

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were those of Gibbons v. Ogden, in 1824, in which he overthrew the action of the New York legislature, in granting to Ogden, assignee of Fulton and Livingstone, a monopoly of steam navigation in New York waters, as an interference with the right of Congress to regulate com- merce ; Ogden v. Saunders, in 1827, in which he attacked the right of a State to pass bankruptcy laws; the Girard College case, in 1844, in which he maintained that Chris- tianity was an essential part of the common law; and the case of Luther v. Borden, commonly known as the Rhode Island case, in 1848, in which he laid the foundation for the subsequent definition of the ‘guarantee clause” of the constitution, and stated the meaning of the “repub- lican government” of a State. Like other American lawyers, he made no distinction in his practice between kinds of cases, and was often retained in criminal causes. The most celebrated of these were the trials of Goodridge and Knapp; in the latter (6 Webster’s Works, 53) is the passage on the power of conscience, which has been de- claimed by countless American schoolboys.

Webster’s reputation as an orator began with his address at Plymouth in 1820, on the 200th anniversary of the landing of the Pilgrims. It was increased by his address at the laying of the corner-stone of the Bunker Hill monument in 1825, on the 50th anniversary of the battle, and by that which commemorated in 1826 the 50th anniversary of the Declaration of Independence and the coincident deaths of Jefferson and John Adams. On every great public occasion thereafter, if Webster was obtainable, he was held to be the natural speaker to be chosen. His finest subsequent

speeches were made on the completion of the Bunker Hill monument in 1843, and at the laying of the corner-stone of the addition to the Capitol at Wash- ington in 1851.

In December 1823 Webster returned to Congress as a representative from Massachusetts, and his first speech, in January 1824, in support of a resolution to send a com- missioner to Greece, then in insurrection, made him the first of Congressional speakers. During his service in the house the tariff of 1824 came up for discussion. Re- presenting a commercial district, Webster's speech has always been a source of gratification to American opponents of protection. He repudiated the name of " American system," claimed by Clay for the system of protection which he was introducing. He cited with cordial approval the expressed belief of English statesmen that English manufactures had prospered in spite of protection, not because of it, and their desire for " unrestricted trade." He attacked the "old notion" of the balance of trade with such vigour that he felt compelled to apologize "for speaking irreverently of the dead." He stated the manner in which, under unrestricted trade, the American production in cotton, woollens, and iron had already come to rival that of England, protected for hundreds of years, and the loss in labour which would come from an attempt, by legal protection, to "support a business that cannot support itself." The whole speech would be a very striking free-trade argument even at the present day. When the tariff of 1828, which was still more protective, came up for discussion, Webster had ceased to oppose protection; but his speech does not attempt to argue in favour of it. It states that his pedple, after giving warning in 1824 that they would consider protection as the policy of the Government, had gone into protected manufactures, and that he now asked that that policy be not reversed to the injury of his constituents. It can hardly escape notice that, in his published Works, Webster has but two subsequent speeches in Congress on the tariff, both defending protection rather as a policy under which industries had been called into being than as

an advisable policy, if the stage had been clear for the adop- tion of a new policy.

In 1827 Webster was sent to the senate, in which he remained until his death, with the exception of his service in the cabinet in Tyler's administration. In January 1830 came the crowning event of his political life. A debate on public lands, under a resolution offered by Senator Foot, thence known as ' Foot's resolution," had wandered off into all possible fields. In course of it, Hayne, of South Carolina, attacked New England for having pursued a selfish policy as to western lands. Webster replied. During Hayne's answer Webster drew from him the first distinct and public statement of the new doctrine of nullifi- cation, of the constitutional right of a State to forbid the execution within its jurisdiction of Acts of Congress which it considered unconstitutional. This had been the product of Calhoun's intellect, which was generally taken to be the source of Hayne's inspiration. Webster's reply is his famous ' second speech on Foot's resolution." He began by a defence of Massachusetts, which has been severely criticized, and is perhaps open to criticism. But if effect is to be taken as a test, it is above criticisn.. The remainder of the speech was of intense interest, not merely to New England, but to the whole North and West, and to all the progressive elements of the country. He stated the anarchistic doctrine of nullification in its naked- ness, extorted from Hayne an unwilling half-admission of the exactness of his statement, and then went on to trample on it with such an exhibition of logic, sarcasm, and elephantine humour as has never been heard in the senate before or since. It is on this speech that Webster's fame was built. Southern men had taken the lead so long that it was a new sensation to the North and West to see a Southern leader completely overmatched by their champion ; and ' Black Dan Webster," a popular name, due to his dark complexion, beetling brows, and heavy cast of features, was for twenty years the representative of Northern sentiment as to the nature of the Union.

Calhoun took Hayne's place in the senate in 1833, introduced and defended resolutions endorsing the right of nullification, and was still more fully answered by Webster. For the next seventeen years the records of the senate are full of constitutional arguments between the two. Webster's oratory made him an invaluable member of the Whig party, and his addresses at political meetings are so numerous as to defy special mention. A leader so distinguished had a fair right to think of the

presidency, but it always remained just beyond his reach. In the general Whig confusion of 1836 he received the fourteen electoral votes of Massachusetts. In 1840 the candidature of Harrison left him no chance. In 1844 Webster's retention of his position under Tyler gave Clay an over-whelming advantage with his party. In 1848 the nomina- tion of Taylor, which Webster declared to be " one not fit to be made," was a fatal blow to the prospects of the Massachusetts leader. His final failure to obtain the Whig nomination in 1852 put an end to his political career.

When the Whig party came into power in 1841, Webster was appointed secretary of state (foreign affairs), and he retained his post under Tyler, after his colleagues had broken with the new president and resigned. There was good reason for his action. When he entered office war with Great Britain was a probable event of the near future. The M'Leod case, in which the State of New York insisted on trying a British subject, with whose trial the Federal Government had no power to interfere, while the British Government had declared that it would consider conviction and execution a casus belli; the exercise of the right of search by British vessels on the coast of Africa, of which Americans had a deep-seated detestation, quite apart from

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any feeling about the slave-trade ; the Maine boundary, as to which the action of a State might at any time bring the federal Government into armed collision with Great Britain,—all these at once met the new secretary, and he felt that he had no right to abandon his work for party reasons. With the special commissioner from Great Britain, Lord Ashburton, he concluded the treaty of 1842, which settled all these questions satisfactorily to both parties. At the same time Webster took the opportunity to end the long controversy as to the right of impressment. Sixteen years afterwards the British Government admitted at last the correctness of the American position.

The treaty of 1842 also introduced the principle of extradition into the connexion between the two countries. It had been admitted once before, in Jay's treaty of 1794, but only as to murder and forgery, and only until 1806.

Leaving the cabinet in 1843, Webster was returned to the senate in 1845 and spent the remainder of his life there. He opposed the annexation of Texas and the Mexican War, and was, as before, the recognized spokes- man of his party. As the growing intensity of the quarrel over the organization of the territory acquired from Mexico revealed the depth of the chasm which now yawned between the sections, Webster's standing- ground in American politics disappeared. His 7th of March speech, in 1850, which stamped him, in the opinion of many of his former Northern worshippers, as a recreant bidding for Southern votes for the presidency, was really little different from his former words. It was the country that had changed. He was still for the Union as the one controlling consideration, with an equal dislike for the abolitionist and the secessionist, who endangered the Union. But the North and the South were already so far apart that not even Webster could stand with one foot in one and the other foot in the other section; and his fate was parallel with that of John Dickinson, who essayed a similar réle during the revolution. Angered at the spirit with which his speech was received, Webster threw all his influence towards driving through the Whig Convention of 1852 an endorsement of the compromise of 1850 "in all its parts," including, of course, the Fugitive Slave Act.

The result was his own failure to receive the Whig nomina-

tion for the presidency, and the downfall of his party. Just before the election he died at his home, Marshfield, Massachusetts, October 1852.

Webster was twice married—-to Grace Fletcher, of New Hampshire, in 1808, and two years after her death to Catherine Bayard le Roy, of New York, in 1829. One of his sons, Edward, lost his life in the Mexican War; his only surviving child, Fletcher Webster, colonel of a Massa- chusetts regiment, was killed at Bull Run. In marked contrast to Webster's wonderfully able treatment of public financial affairs, his management of his private finances was notoriously shiftless,—so much so that, in his later years, the care of them was assumed by a voluntary com- mittee of Boston business men. Like other men of his time, he was neither careful nor temperate in table enjoy- ment. Washington people still tell of the enthusiasm with which, after dinner, he once insisted on standing up in a

theatre-box, to join in the chorus of the American national hymn. He was a devoted angler, and intensely interested in scientific agriculture ; much of his Private Correspond- ence 1s connected with the latter subject.

Webster named as his literary executors Edward' Everett, C. C. Felton, George Ticknor, and George Ticknor Curtis. By this 'rangement the standard edition of his Works, in six volumes, appeared (1851), In the first volume is a Life by Everett. See also Webster's Private Correspondence, Knapp's Life of Webster (1835), March's Reminiscences of Congress (1850), Laninan's Private Life of Webster (1856), Curtis's Life of Webster (1869), Harvey's Reminis- cences of Webster (1877), Lodge's Life of Webster (1883). (A. J.)

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WEBSTER, Joun, the greatest of Shakespeare's con- temporaries or successors, was a writer for the stage in the year 1601, and published in 1624 the city pageant for that year, "invented and written by John Webster, merchant-tailor." In the same year a tragedy by Ford and Webster was licensed for the stage; it is one of the numberless treasures now lost to us through the careless- ness of genius or the malignity of chance. Beyond the period included between these two dates there are no traces to be found of his existence ; nor is anything known of it with any certainty during that period, except that seven plays appeared with his name on the title page, three of them only the work of his unassisted hand. His first noteworthy appearance in print, as far as we know, was as the author of certain additions to Marston's tragi- comedy of The Malcontent ; these probably do not extend beyond the induction, a curious and vivacious prelude to a powerful and irregular work of somewhat morbid and sardonic genius. 'Three years later, in 1607, two comedies and a tragedy, 'written by Thomas Dekker and John Webster," were given to the press. The comedies are lively and humorous, full of movement and incident ; but the beautiful interlude of poetry which distinguishes the second scene of the fourth act of Westward Ho/ is unmistakably and unquestionably the work of Dekker; while the companion comedy of Worthward Ho/ is com- posed throughout of homespun and coarse-grained prose. The Famous History of Sir Thomas

Wyatt is apparently a most awkward and injurious abridgment of a historical play in two parts on a pathetic but undramatic subject, the fate of Lady Jane Grey. In this lost play of Lady Jane Heywood, Chettle, and Smith had also taken part ; so that even in its original form it can hardly have been other than a rough piece of patchwork. There are some touches of simple eloquence and rude dramatic ability in the mangled and corrupt residue which is all that survives of it; but on the whole this "history " is crude, meagre, and unimpressive. In 1612 John Webster stood revealed to the then somewhat narrow world of readers as a tragic poet and dramatist of the very foremost rank in the very highest class. The White Devil, also known as Vittoria Corombona, is a tragedy based on events then compara- tively recent—on a chronicle of crime and retribution in which the leading circumstances were altered and adapted with the most delicate art and the most consummate judgment from the incompleteness of incomposite reality to the requisites of the stage of Shakespeare. By him alone among English poets have the finest scenes and passages of this tragedy been ever surpassed or equalled in the crowning qualities of tragic or dramatic poetry,—in pathos and passion, in subtlety and strength, in harmonious variety of art and infallible fidelity to nature. Eleven years had elapsed when the twin masterpiece of its author —if not indeed a still greater or more absolute masterpiece —was published by the poet who had given it to the stage seven years before. Zhe Duchess of Malfy (an Anglicized version of Amalfi, corresponding to such designations as Florence, Venice, and Naples) was probably brought on the stage about the time of the death of Shakespeare ; it was first printed in the memorable year which witnessed the first publication of his collected plays. This tragedy stands out among its compeers as one of the imperish- able and ineradicable landmarks of literature. All the great qualities apparent in The White Devil reappear in The Duchess of Malfy, combined with a yet more per- fect execution, and utilized with a yet more consummate skill. No poet has ever so long and so successfully sus- tained at their utmost height and intensity the expressed emotions and the united effects of terror and pity. The transcendent imagination and the impassioned sympathy

which inspire this most tragic of all tragedies save King Lear are fused together in the fourth act into a creation which has hardly been excelled for unflagging energy of impression and of pathos in all the dramatic or poetic literature of the world. Its wild and fearful sublimity of invention is not more exceptional than the exquisite justice and tenderness and subtlety of its expression. Some of these executive merits may be found in an ill-constructed and ill-conditioned tragi-comedy which was printed in the same year ; but few readers will care to remember much more of The Devil's Law-Case than the admirable scenes and passages which found favour in the unerring and untiring sight of Webster's first and final interpreter or commentator, Charles Lamb. Thirty-one years later the noble tragedy of Appius and Virginia was given to the world,—a work which would alone have sufficed to per- petuate the memory of its author among all competent lovers of English poetry at its best. Seven years after- wards an unprincipled and ignorant bookseller published, under the title of A Cure for a Cuckold, a play of which he assigned the authorship to John Webster and William Rowley. This attribution may or may not be accurate ; the play is a mixture of coarsely realistic farce and grace- fully romantic comedy. An elegy on Henry, prince of Wales, and a few slight occasional verses, compose the rest of Webster's remaining works.

Webster's claims to a place among the chief writers of his country were ignored for upwards of two centuries. In 1880 the Rev. Alexander Dyce first collected and edited the works of a poet who had found his first adequate recognition twenty-two years earlier at the pious and fortunate hands of Lamb. But we cannot imagine that a preseutiment or even a foreknowledge of this long delay in the payment of a debt so long due from his countrymen to the memory of so great a poet would seriously have disturbed or dis- tressed the mind of the man who has given us the clue to his nature in a single and an impcrishable sentence—"I rest silent in my own work." CARICES®)

WEBSTER, Noan (1758-1843), American lexico- grapher, was descended on the father's side from John Webster of Warwickshire, England, one of

the original settlers at Hartford, and for a time governor of Connecti- cut, and on the mother's side from William Bradford, second governor of Plymouth and one of the founders of that colony. He was the son of a farmer, and was born in West Hartford, Connecticut, 16th October 1758. In his early years he was engaged in agricultural work, but attended a district school in the winter, and when fourteen years of age began the study of the classics under the Rev. Nathan Perkins, D.D. He entered the freshman's class at Yale College in 1774, and while in his junior year there he took part as a volunteer in the expedition against General Burgoyne. After graduating in 1778 he supported himself by teaching while prosecuting the study of law. Having begun at this time to note down every word whose meaning he did not properly understand, he was first led to conceive the scheme of a new dictionary from his frequent inability to find proper definitions of words in those in current use. His experience as a teacher soon convinced him also of the need of better instruction books in English, and this he endeavoured to supply by his Grammatical Institute of the English Language, the first part of which appeared in 1783, and a second and third part in the following years. It comprehended a spelling- book, English grammar, and compilation of Jnglish reading, and very soon found a place in most of the schools of the United States. In 1785 he prepared a course of lectures on the English language, which he delivered in the principal American cities, and published in 1789 under the title Dissertations on the English Language. Meanwhile he also continued to take a deep interest in all prominent political questions. In his Sketches of American Policy (1784) he made the first

distinct proposal for a new constitution for the United States, and when the work of the commissioners was completed in 1787 he was asked by them to recommend the new constitution to the American people, which he did in an Examination of the Leading Principles of the Federal Constitution. After his marriage in 1789 he established himself in the practice of law at Hartford. In 1793 he was induced to found at New York a paper called Minerva, with which was connected the Herald, a semi-weekly ; the titles of the papers were subsequently altered respectively to

the Commercial Advertiser and the Mew York Spectator. In 1795 he contributed to his paper several articles, under the signature of Curtius, in vindi- cation of Jay's treaty with Great Britain, which were reprinted and had considerable effect in allaying opposition to it. In 1798 he removed to New Haven, which town he was chosen soon afterwards to represent in the general assembly of Connecticut. In 1802 appeared his well- known treatise on Zhe Sights of Neutrals. Having removed in 1812 to Amherst, he took there a leading part in the establishment of the academy and then of the college, of which he was chosen the first president. He also represented Amherst in the court of Massachusetts. In 1822 he returned to New Haven. Meanwhile his lexicographical studies, though much interrupted by his professional and political duties, had never been entirely suspended. In 1806 he published his Com- pendious Dictionary of the English Language, but this was only preparatory to a larger work. In 1824 he sailed for Europe to complete his researches, and after spending some time in Paris continued his labours in the library at Cambridge, where he finished the dictionary. It was published in 1828, and a second edition with many additions appeared in 1841. He also completed the revision of an appendix a few days before his death, which took place 20th May 1843.

In 1833 Webster published an edition of the Bible, " with amendments of the language," and again in 1839 an edition of the New Testament. In early life he wrote a History of the United States, of which a revised edition appeared in 1839. He was also the author of Historical Notices of Banking Institutions and Insurance Companics (1802), and a Collection of Papers on Political and Literary Subjects (1848). Since his death several revised and enlarged editions of the Dictionary have appeared. It was the result of much labour and research, and on this account, as well as for the clearness and carefulness of its definitions, it still holds a leading place among dictionaries of the English lan- guage, especially in America. A biography of Webster, by C. A. Goodrich, D.D., is prefixed to the quarto editions of the Dictionary.

WEBSTER, Tuomas (1800-1886), figure painter, was born at Ranelagh Street, Pimlico, London, on March 20, 1800. His father was a member of the household of George III.; and the son, having shown an aptitude for

music, became a chorister in the Chapel Royal, St James's. He, however, developed a still stronger love for painting, and in 1821 he was admitted student of the Royal Academy, to whose exhibition he contributed, in 1824, portraits of Mrs Robinson and Family. In the following year he gained the first medal in the school of painting. Till 1879 he con- tinued to exhibit in the Royal Academy work of a genial and gently humorous character, dealing commonly with subjects of familiar incident, and especially of child life. Many of these were exceedingly popular, particularly his Punch (1840), which procured in 1841 his election as A.R.A., followed five years later by full membership. He became an honorary retired academician in 1877, and died at Cranbrook, Kent, on September 23, 1886. His Going into School, or the Truant (1836), and his Dame's School (1845) are in the National Gallery, and five of his works are in the South Kensington Museum. Many of his paintings have been transcribed by Lumb Stocks, A.R.A., and other of the best engravers of the time.

WEHEDDERBURN

WEDDERBURN, AtEexanpeR (1733-1805), Baron Loughborough in 1780, earl of Rosslyn in 1801, lord high chancellor of Great Britain, was the eldest son of Peter Wedderburn (a lord of session as Lord Chesterhall), and was born in East Lothian on 13th February 1733. He acquired the rudiments of his education at Dalkeith, and in his fourteenth year was sent to the university of Edin- burgh, where he matriculated on 18th March 1746. It was from the first his desire to practise at the English bar, though in deference to his father's wishes he qualified as an advocate at Edinburgli on 29th June 1754, and he did not neglect to enter himself at the Inner Temple on 8th May 1753, so that he might keep the Easter and Trinity terms in that year. His father was called to the bench in 1755, and for the next three years Wedderburn stuck to his practice in Edinburgh, during which period he zealously, with an eye to the main chance, employed his oratorical powers in the General Assembly of the Church of Scotland, and passed his evenings in the social and argumentative clubs which abound in its capital. In 1755 a short-lived precursor of the more famous Hdinburgh Review of a later generation was started in Edinburgh, and it is chiefly remembered now from the

circumstance that in its pages Adam Smith criticized the dictionary of Dr Johnson, and that the contents of its two numbers were edited by Wedderburn. The dean of faculty at this time, Lockhart, afterwards Lord Covington, a lawyer notorious for his harsh demeanour, in the autumn of 1757 assailed Wedder- burn with more than ordinary insolence. His victim re- torted with extraordinary powers of invective, and on being rebuked by the bench declined to retract or apologize, but placed his gown upon the table, and with a low bow left the court for ever. It was long supposed that this step was unpremeditated, but it is now believed that the alter- cation only made him act upon his previous decision of quitting the Scottish for the English courts. Through his prudence in having taken the preliminary steps some years previously he was called to the English bar at the Inner Temple on 25th November 1757. In his new position he acted with characteristic energy. To shake off his native accent and to acquire the graces of oratorical action, he en- gaged the services of Sheridan and Macklin. To secure business and to conduct his cases with adequate knowledge, he diligently studied the forms of English law, he solicited Strahan, the printer, "to get him employed in city causes," and he entered into social intercourse (as is noted in Alexander Carlyle's autobiography) with busy London solicitors, such as the brothers Dagge. His local connex- ions and the incidents of his previous career introduced him to the notice of his countrymen Lords Bute and Mansfield. When Bute was prime minister this legal satellite used, says Dr Johnson, to go on errands for him, and it is to Wedderburn's credit that he first suggested to the premier the propriety of granting Johnson a pension. Through the favour of the royal favourite he was returned to parliament (28th December 1761) for the Ayr burghs, and in consequence of the same patronage he was introduced into Churchill's Rosciad as "a pert prim prater," conspicuous for "guilt in his heart and famine in his face." In 1763 he became king's counsel and bencher of Lincoln's Inn, and for a short time went the northern circuits, but was more successful in obtaining business in the Court of Chancery, He obtained a considerable addition to his resources (Carlyle puts the amount at £10,000) on his marriage (31st December 1767) to Betty Anne, sole child and heiress of John Dawson of Marly in Yorkshire. When George Grenville, whose principles leaned to Toryism, quarrelled with the court, Wedderburn affected to regard him as

his leader in politics. At the dissolution in the spring of 1768 he was returned by Sir Lawrence Dundas for Richmond as

.Commons.

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a Tory, but in the struggles over Wilkes he took the popular side of "Wilkes and liberty," and resigned his seat (May 1769). Inthe opinion of the people he was now regarded as the embodiment of all legal virtue; his health was toasted at the dinners of the Whigs amid rounds of applause, and, in recompense for the loss of his seat in parliament, he was returned by Lord Clive for his pocket-borough of Bishop's Castle, in Shropshire (January 1770). During the next session he acted vigorously in opposition, but his conduct was always viewed with distrust by his new associates, and his attacks on the ministry of Lord North grew less and less animated in proportion to its apparent fixity of tenure. In January 1771 he was offered and accepted the prize of solicitor-general. The high road to the woolsack was now open to his steps, but his defection from his former path has stamped his character with general infamy. Junius wrote of him—"As for Mr Wedderburn, there is something about him which even treachery cannot trust," and Colonel Barré attacked him in the House of The new law officer defended his conduct with the assertion that his alliance in politics had been with Mr George Grenville, and that the connexion had been severed onhis death. In his new position his services were warmly appreciated. He was cool and ready in debate, and when his advice was sought for the deliberation of the cabinet it was given with promptness and energy. The expression of Gibbon that Lord North "was upholden on either hand by the majestic sense of Thurlow and the skilful eloquence of Wedderburn" was not overstrained. All through the lengthened folly of the American War his declamation was consistently employed against the cause of the colonies, but one incident in his conduct is indelibly written in history. Dr Franklin obtained in 1773, by means of some unknown member of parliament, certain letters from crown officials in Massachusetts, written before the outbreak of hostilities, and recommending the employment of a military force for the suppression of the discontent which prevailed in America. These letters he

sent to the speaker of the house of assembly, and that body thereupon prayed for the recall of the officials. The application came before a committee of the privy council, when Wedderburn, amid the unrestrained applause of the majority of the judges, denounced Franklin in unmeasured terms, comparing "the coolness and apathy of the wily New Englander " with the "revengeful temper of the negro Zanga" in Dr Young's play of the Revenge. His victim preserved an impassive demeanour, but was cut to the quick. Years afterwards, on the termination of the war, when articles of peace were signed at Versailles—this is the usually accepted version of a story on which some doubt has been cast—Franklin wore the same clothes which he had worn when exposed to this invective. In June 1778 Wedderburn was promoted to the post of attorney-general, and in the same year he refused the dignity of chief baron of the exchequer because the offer was not accom- panied by the promise of a peerage. At the dissolution in 1774 he had been returned for Okehampton in Devonshire, and for Castle Rising in Norfolk, and selected the former constituency; on his promotion as leading law officer of the crown he returned to his old love of Bishop's Castle. The coveted peerage was not long delayed. In June 1780 he was created chief justice of the Court of Common Pleas, and he was at the same time gratified by the title of Baron Loughborough. For thirteen years he presided over this court, and, although his knowledge of the principles and precedents of law was always deficient, his skill in marshal- ling his facts and his clearness of diction made his appoint- ment generally acceptable. During the existence of the coalition ministry of North and Fox, the great seal was in commission (April to December 1783), and Lord Loughborough held

the leading place among the commissioners. For some time after its fall he was considered as the leader of the Whig party in the House of Lords, and, had the illness of the king brought about the return of the Whigs to power, the great seal would have been placed in his hands. The king's restoration to health secured Pitt's continuance in office, and disappointed the expectations of the Whigs. In 1792, during the period of the French Revolution, Lord Loughborough seceded from Fox, and on the 28th January 1793 he received the great seal in the Tory cabinet of

Pitt. In legal knowledge he was exceeded by many of his predecessors, but his judgments were always remarkable for their perspicuity, and in the appeal cases to the House of Lords, where it was his function to criticize and elucidate the opinions of others, he shone pre- eminent. All the political acts of the administration in which he served met with his zealous support, and he re- mained faithful to his leader until the question of Catholic emancipation became of urgent importance, when he is supposed to have influenced by unfair means the mind of his sovereign. It was probably through his advice that George III. refused his assent to Pitt's proposals, and that the removal of the disabilities under which the Catholics groaned was delayed for another quarter of a century. When the prime minister found that he could not carry out his compact with his Catholic fellow-subjects he re- signed, and Addington succeeded to his place. Much to Lord Loughborough 's surprise, no place was found for him in Addington's cabinet, and he was obliged to resign his post of lord chancellor (14th April 1801). His first wife died 15th February 1781 without leaving issue, and he married in the following year (12th September) Charlotte, youngest daughter of William, Viscount Courtenay, but her only son died in childhood. Lord Loughborough accordingly obtained in 1795 a re-grant of his barony with remainder to his nephew, Sir James St Clair Erskine. His fall in 1801 was softened by the grant of an earldom (he was created earl of Rosslyn 21st April 1801, with remainder to his nephew), and by a pension of £4000 per annum. After this date he rarely appeared in public, but he was a constant figure at all the royal festivities. He attended one of those gatherings at Frogmore, 31st December 1804. On the following day he was seized with an attack of gout in the stomach, and on 2d January 1805 he died at his seat, Baylis, near Salt Hill, Windsor. His remains were buried in St Paul's Cathedral on the 11th January.

At the bar Wedderburn was the most elegant speaker of his time, but in legal erudition he was excelled by many of his contempor- aries, and he is said to have been markedly afraid of Dunning's forensie powers. For cool and sustained declamation he stood un- rivalled in parliament, and his readiness in debate was universally acknowledged. In social life, in the company of the wits and writers of his day, his faculties seemed to desert him. He was not only dull but the cause of dulness in others, and even

Alexander Carlyle confesses that in conversation his illustrious countryman was "stiff and pompous." In Wedderburn's character ambition banished all reetitude of principle, but the love of money for money's sake was not among his faults. ve Jeg 2p)

WEDGWOOD, Jostan (1730-1795), the most distin- guished of English manufacturers of pottery. Many members of the Wedgwood family had been established as potters in Staffordshire throughout the 17th century, but their productions were in no way remarkable. Josiah, born in 1730, was the youngest child of Thomas Wedgwood, who owned a thriving pottery in Burslem. At a very early age he distinguished himself by keen powers of observation and love for all that was curious and beautiful. Soon after the death of his father in 1739, Josiah, then scarcely ten years of age, was taken away from school and set to learn the art of moulding or "throwing" clay pottery, at which he soon became extraordinarily skilful.

In 1744 he was apprenticed to his eldest brother, who had succeeded to the management of his father's pottery ; and in 1751, when the term of his apprenticeship had expired, Josiah Wedgwood became manager of the neighbouring Alder pottery, with a very moderate salary. In 1759 he started as an independent potter at the Ivy-House works in Burslem, and soon introduced many improvements among the simple classes of pottery which were then made in Staffordshire. Soon, however, Wedgwood's tastes were turned in an archzological direction by the increasing interest then taken in Greek or (as they were then called) Etruscan vases. His enthusiasm was specially aroused by the illustrations in Comte de Caylus's Recueil d Antiquités (1752-67); aided by this work he began to attempt to copy Greek designs, and in later years he was further assisted by loans of vases from the fine collection of Greek pottery possessed by Sir William Hamilton. In 1769 Wedgwood opened new potteries on a larger scale at Etruria in Staffordshire, having entered into partner- ship with Thomas Bentley of Liverpool, a man of great taste and culture, and in all respects a kindred spirit. Many able artists, and among them the young Flaxman, were engaged to design and model reliefs, busts, and

other designs for the Wedgwood and Bentley pottery ; and in a short time the productions of their kilns were widely sold and highly esteemed in all the chief countries of Europe. After Bentley's death in 1780, Wedgwood became sole owner of the Etruria pottery till 1790, when he took some of his sons into partnership. His chief artistic feat was perhaps the production of an accurate copy in clay of the celebrated glass Portland vase ; reproductions of this were sold at £50 a piece, and about 50 copies —not all of equal merit—were produced during Wedgwood's lifetime. In 1764 Josiah married his cousin Sarah Wedgwood. He died on January 3, 1795, in the 65th year of his age, leaving to his children a well-earned fortune of more than half a million.

Josiah Wedgwood was a man of the highest moral worth, and skilled in many branches of knowledge. He was the intimate friend of Dr Erasmus Darwin and other distinguished men of science. For the chief characteristics of the Wedgwood pottery the reader is referred to the article PorTERY, vol. xix. p. 632. See also Jewitt, Life of Wedgwood, 1865 ; and Eliza Meteyard, Life of Wedgwood, Ist ed., 1865-66.

WEDNESBURY, a market-town and parliamentary borough of Staffordshire, England, is situated near the source of the Tame, on the Great Western and London and North-Western railway lines, 8 miles north-west of Birmingham, and 1364 miles north-west of London. The church of St Bartholomew, a fine building in the Perpen- dicular style, is supposed to occupy the site of a heathen temple to Woden, and some remains of the ancient castle adjoin it. The church was erected probably in the 11th century, and from 1301 the advowson, tithes, &c., belonged to the abbot of Halesowen until 1535. It was partially re- built towards the close of the 15th century, and restored in 1766, in 1827, in 1878, andin 1885. Among other public buildings are the town-hall (1871-72), the free library in the Gothic style (1878), containing about 9000 volumes, the Liberal club (1875), the assembly rooms, the public baths, and the temperance hall. The neighbourhood of Wednesbury has been long celebrated for its iron and coal mines, the coal being unequalled as fuel for the smith's forge. A special kind of iron ore is obtained which is manufactured into axes and other edge-tools. The town possesses large steel and iron works, the more important manufactures being those of the

large kind of iron work used by railway companies (such as bridges, cranes, switches, roofs, wheels, axletrees, boiler-plates, and rails), water, steam, and gas pipes, and various kinds of wrought- iron work. The population of the urban sanitary district

(area 2124 acres), which is identical with the township, in 1871 was 25,030, and in 1881 it was 24,566. In 1811 the population was only 5372. Until 1885 the parlia- mentary borough had an area of 11,340 acres, with a population in 1871 of 116,809 and in 1881 of 124,437. West Bromwich, formerly included in it, has been erected into a separate borough, leaving in Wednesbury an area which in 1881 had a population of 68,142.

At Weduesbury (Wodensborough), Ethelfleda, widow of Ethelred of Mercia, in 916 constructed a castle. The place is not mentioned in Domesday, but appears to have belonged to the barony of Dudley. After the Conquest it became a demesne of the crown, and it was bestowed by Henry II. on the Heronvilles. It first received parlia- mentary representation in 1867.

WEEK. See CaLenpDar and SaBBaTa,

WEEVER. The weevers (7'rachinus) are small marine fishes which are common on the coasts of Europe, and which have attained notoriety from the painful and some- times dangerous wounds they are able to inflict upon those who incautiously handle them. They belong toa family of spiny-rayed fishes (7rachinidz), and are distinguished by a long low body with two dorsal fins, the anterior of which is composed of six or seven spines only, the posterior being long and many-rayed ; their anal resembles in form and composition the second dorsal fin. The ventral fins are placed in advance of the pectorals, and consist of a spine and five rays. The caudal fin has the hind margin not excised. The body is covered with very small scales, sunk in and firmly adherent to the skin, but the upper surface of the head is bony, without integument. The head, like the body, is compressed, with the eyes of moderate size and placed on the side of the head; the mouth is wide, oblique, and armed with bands of very small teeth.

Several species of weevers are known, but two only occur on the British coasts, viz., the Greater Weever (7vrachinus draco) and the Lesser Weever (7. vipera); the former is frequently found of a length of 12 inches, and possesses some thirty rays in the second dorsal fin, whilst the latter grows only to about half that length, and has about ten rays less in the dorsal. The coloration of both is plain, but the short first dorsal fin is always of a deep black colour. The weevers are bottom fish, burying and hiding them- selves in the sand or between shingle,—the lesser species living close inshore and the greater preferring deeper water, and being found sometimes floating on the surface at a distance of several miles from the shore. Although weevers, especially the lesser, are in the habit of burying themselves in the sand, and are abundant in some localities much resorted to by bathers, accidents from step- ping upon them are much more rare than from incautiously handling them after capture. They probably make their escape on perceiving the approach of a person. The wounds are inflicted by the dorsal and opercular spines, are very painful, and sometimes cause violent local inflammation. In the absence of any special poison organ it 1s most probable that the mucous secretion in the vicinity of the spines has poisonous properties. The spines are deeply grooved, the poisonous fluid which is lodged in the grooves being thus intro- duced into the punctured wound.

WEEVIL, a very old Anglo-Saxon term, now commonly applied to the members of a group of Coleoptera termed the Rhyncophora (see vol. vi. p. 133). This group is characterized by the prolongation of the head into a rostrum or proboscis, at the end of which the mouth, with its appendages, is placed. The antenna are short, usually elbowed, and often end in a club-shaped swelling. The basal portion of the antennz frequently lies in a depression at the side of the rostrum, and this gives the antenne the appearance of emerging half-way along the rostrum. The mouth appendages are small; the mandibles, however, are stout. 'The palps are very short and conical as a rule. The body is usually small ; in shape it varies very much. The elytra are very hard, and in some cases fused with one another, rendering flight impossible. The larve are white, fleshy, apodal grubs, with a series of tubercles along each side of the body; the head is round, and bears strong Jaws, and sometimes rudimentary ocelli. They are ex- clusively phytophagous. The Ehyncophora embrace three

families,—(1) the Curculionide, or true weevils, (2) the Brenthidz, and (3) the Bruchide.

The Curculionidx form one of the largest familics amongst the Coleoptera, the number of specics described exceeding 10,000, arranged in 1150 genera. The antenne are elbowed, and clavate, with the basal portion inserted in a groove. The third tarsal joint is generally bilobed. Over 400 specics exist in Great Britain, few of which exceed half an inch in length. The genera Phyllobius and Polydrosus include some of the most beautiful insects found in Britain, their brilliancy, like that of the Lepidoptera, being due to the presence of microscopic scales. The diamond beetle of South America, Entimus imperialis, is another singularly beautiful wecvil ; its colour is black, studded with spangles of golden green. The immense family of the Cuwrewlionide includes members which differ greatly from one another in size, colour, and appearance; even the rostrum, the most striking common characteristic, varies greatly. The form of the body is very varions: some are rounded or oval, others elongated, almost linear ; some are covered with warty protuberances, whilst others are smooth and shining, often with a metallic lustre.

One of the commonest members of this family in Great Britain is the Nut Weevil, Balaninus nucwm. It is of a brownish colour, varied with yellow, the legs reddish. Its rostrum is unusually long, being five-sixths of the body length in the female, and slightly shorter in the male, The antenne are 7-jointed. The first three joints are much longer than thick ; the four following are shorter, and the seventh not longer than thick. The larva is very common in hazel nuts and filberts). When the nuts are about half-grown, the female bores, with its rostrum, a minute hole in the still comparatively soft nut shell, and deposits an egg within the nut. The egg is said to be pushed in by means of the long rostrum. As the nut grows the slight puncture becomes almost obliterated, so that it is unnoticed by all but the most observant eye. The larva is a thick white grub with a brownish head, bearing fleshy tu- bercles along its side. It feeds upon the sub- stance of the nut. The nuts which are infested by this insect are

usually the first to fall to the ground ; the larva then bores a round hole through the nut shell, by means of its jaws, and creeps out, It hides itself in the ground during the winter, and in the spring it passes into the pupa stage, from which it emerges about August as the full-grown insect. A nearly allied form, Balaninus glan- dium, attacks both hazel nuts and acorns.

In an unobtrusive way weevilsdoimmense harm to vegetation. This is effected not so much by their numbers and their powers of consumption, as amongst cater- pillars, but by their habits of attacking the essential parts of a plant, and causing by their injuries the death of the plant affected. They destroy the young buds, shoots, and fruits, and attack the young plants in their most delicate organs. Many of them devour seed, as the Corn Weevils, Calandra granaria (see WHEAT) and C. oryze, and in this way vegetation is severely injured, and its spread seriously checked. Others cause much damage in forests, by boring uuder the bark and through the wood of trees, whilst some even burrow in the tissue of the leaves. 4 :

The Brenthide are by some authorities included in the family Cuwrculionide. They include some 275 species, and are almost exclusively tropical. Their antenne are 11-jointed, not elbowed. The rostrum is straight and very long. The shape of the body is very long and narrow, the first and second abdominal segment being very long, Allied to these is the sub-family Attelabides.

The Bruchide form a somewhat larger family than the fore- going, containing over 400 species. The antennz are straight, and inserted upon the head just in front of the eyes; they are 11-jointed, and serrated or toothed in the inside. The rostrum is short. Bruchus pisi causes considerable damage to pease ; during the spring the beetle lays its eggs in the young pea, which is devoured by the larva which hatches out in it. (A. E. 8.)

WEIGHING MACHINES. See Batance; also Mecuanics (vol. xv. p. 771) and Mint (vol. xvi. p. 490),

. Balaninus glandium, magnified.

. The same, natural size.

The larva, magnified.

The sume, natural size.

. Head and snout of the female, magnified.

. The same parts of the male, magnified, to show arrangement of antenne.

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WEIGHTS AND MEASURES

HIS subject may be best divided for convenience of

reference into three parts :—I. ScIENTIFIC, including

the facts and data usually needed for scientific reference ;

II. Historicat, including the principles of research and

results in ancient metrology; and III. ComMmeErctaL, in-

cluding the weights and measures of modern countries as used in commerce.

I. ScrENTIFIC.

A unit of length is the distance between two points defined by some natural or artificial standard, or a multiple of that. For instance, in

Britain the unit of the yard is defined by the distance between two parallel lines on gold studs sunk in a bar of bronze, when at 62° F., which bar is preserved in the Standards Office. There are other units, such as the inch, foot, mile, &c.; but, as these are aliquot parts or multiples of the yard, there is no separate standard provided for them.

A unit of mass is the matter of a standard of mass, or a multiple of that. For instance, in Britain the unit of the pound is defined by a piece of platinum preserved in the Standards Office.

A unit of weight is the attractive force exerted between a unit of mass and some given body at a fixed distance,— this force being the weight of the unit in relation to the given body, or any other body of equal mass.1 Usually the given body is the earth, and the distance a radius of the earth. For instance, the unit of weight in Britain is the attraction between the earth and the standard pound when that is placed at sea-level at London, in a vacuum. For astronomical comparisons the unit of mass is the sun, and a unit of weight is not needed.

Standards of length are all defined on metal bars at present in civilized countries. Various natural standards have been proposed, such as the length of the polar diameter of the earth (inch), the circumference of} the earth (metre) in a given longitude, a pendulum vibrating in one second at a fixed distance from the earth, a wave of light emitted by an incandescent gas, &c. But the difficulty of ascertaining the exact value of these lengths prevents any material standard being based upon them with the amount of accuracy that actual measurements, to be taken from the standard, require. A natural standard is therefore only a matter of sentiment.

Standards of length are of two types, the defining points being either at a certain part of two parallel lines engraven in one plane (a line-standard), or else points on two parallel surfaces, which can only be observed by contact (an end-standard). The first type is always used for accurate purposes. Units of surface are always directly related to standards of length, without any separate standards. Volume is either determined by the lineal dimensions of a space or a solid, or, for accurate pur- poses, by the mass of water contained in a volume at a given temperature, which

again is measured either by liquid measure, or, more accurately, by weight. The standard of volume in Britain is a hollow cylinder of bronze, with a plate glass cover, when at 62° (gallon), legally defined as 277-274 cubic inches, or containing 10 pounds of water at 62° F.

Comparisons.—Lengths nearly equal are

compared

1 The word weight has incommon use two meanings, —(1) the force exerted between the earth and a body, and (2) a mass which is weighed against other bodies. In scientific use, however, weight means only a property of matter by which it is most convenient to compare the relative amounts of masses.

accurately by fixing two micrometer microscopes with their axes parallel, and at the required distance apart, on a@ massive support which will not quickly vary with temperature ; then the two lengths to be compared, e.g., the standard yard and another, are alternately placed beneath the microscopes, and their lengths observed several times. The error of a single observation in the Standards Department is stated to be a 100,000th of an inch. For fractional lengths a divided bar is required, the accuracy of which is ascertained by a shorter measure, which can be compared with successive sections of the whole length by micrometers. For ordinary purposes, where not less than ‘001 inch is to be observed, measures may be placed in

contact if one is divided on the edge, and the comparison

made with a magnifier. In large field-work the ends of a measure are transferred vertically to the ground by a small transit instrument or theodolite. End-measures between surfaces are read by means of a pair of contact pieces bearing line marks, the value of which is ascertained separately, or by a second end-measure; if both measures bear a line for observation, reversals then give the value of each measure.

Volumes are always most accurately defined by their weight of water, as weighing can be more accurately done than measuring. If the volume is

hollow, it may be filled with water and closed with a sheet of plate glass, or if solid the body may be weighed in water and out, the difference giving the weight of its volume of water. Un- fortunately the relation between water-weight and absolute volume is not yet accurately known. Volumes of liquid are similarly ascertained by their weight. Volumes of gas are measured in a graduated glass vessel inverted over a liquid, or for commercial purposes by some form of registering flow-meter.

Masses are compared by the BALANCE (q.v.), which may be made to indicate a 100,000,000th of the mass. They may also be estimated, not by their attractive force being balanced by an equal mass, but by the elasticity of a spring ; this, which is the only true weighing-machine showing weight and not mass, is useful for rough purposes, owing to its quick indication ; the most accurate form probably is that with angular readings.'

Temperature and the Atmosphere.—All the serious diffi- culties of weighing and measuring result from these causes, the effects of which and their corrections we will briefly notice. In measurement, since all bodies expand by heat, the temperature at which any measure or standard bar represents the abstract unit requires to be accurately "" stated and observed, the accuracy of optical observation being about equal to 735 of a degree F. of expansion in a standard. Great accuracy is therefore needed in the manufacture and reading of thermometers, and care that the standard and the thermometer shall be at the same temperature. Another method is to attach a parallel bar of very expansible metal to one end of the standard, and read its length on the standard at the other end; this ensures a more thorough uniformity of mean temperature between the standard and the heat-measurer. The most accurate method is by immersing the measures in a liquid, of which the temperature is read by several thermometers ; but this is scarcely needful unless high or low temperatures are required to ascertain the rate of expansion. A room with thick walls, double windows, and the temperature regulated by a gas stove is practically sufficiently equable for comparisons.

The temperature adopted for the standards is not the

2 See Mature, xxx. 205.

same in different countries. In Britain 62° F. has been adopted since the revision of the standards in 1822, as being a convenient average temperature for work; but, as it is purely a temperature of convenience, the rather higher point of 68° F. would be better. In any case an aliquot part of the thermal unit from freezing to boiling of water should be adopted ; 62° is $ and 68° is 3 of this interval. Whether a much higher temperature would not be more conducive to accuracy is a question; 92°, or 4 of the thermal unit, would be so near the temperature of the observer's skin and breath that measures and balances could be approached with less production of error ; and such a heat does not at all hinder accurate observing. The French temperature of 32° F. for standards has abandoned all other considerations in favour of readily fixing the temperature in practice by melting ice. This is a ready means of regulation, but a point so far from ordinary working temperatures has two great disadvantages: the observer's warmth produces more error, and the corrections for all observations not iced are so large that the rates of expansion require to be known very accurately for every substance employed: For water their standard tempera- ture is 39°°2 F., when it is at its maximum density ; this has the advantage that the density varies less with temperature than at any other point, but it is very doubt- ful if this is much used for actual work.

No substance expands uniformly with temperature, most materials expanding more rapidly at higher tempera- tures. The expansion of rods of the following metals, of 100 inches long, is given in decimals of an inch for the 90° from 32° to 122° F. (0 to 50° C.), and from 122° to 212° F. (50° to 100° C.):4—

; Platino- ; : : Platinum. serdtigms Steel. Iron. | Bronze.} Brass. | Zinc. 32° to 122° "0445 0435 "0536 0591 0876 0915 1469 122° to 212° 0471 0454 0574 0637 0927 0964 1487

But variations of 3 or 4 per cent. may easily be found in the rates of different specimens apparently alike ; hence the individual expansion of every important measure needs to be ascertained.

Weighing is complicated by being done in a dense and ‘variable atmosphere, unless—as in the most refined work —the whole balance is placed in a vacuum. When in the air all bodies placed in the balance must, for accurate purposes, have their volume known; and the weight of an equal volume of such air as they are weighed in must be added to their apparent weight to get their true weight. The weight of air displaced by a pound of the following materials is given in grains, at temperature 62° F., —barometer 30 inches,—also with barometer 29 inches (temperature 62°), and with temperature 32° (barometer 30 inches), to illustrate the variation? (allowing for contraction of the material as well):—

Tron, with Lead Adjustment,

Quartz. | Glass. | Water.

2°518 | 1°000

21°157 2°650

Sp. Gr, 8-143 | 8-283 7127

62”, 30) -403 | 1°047 | 1:029 1-196 3°217 | 3°385 | 8523 62°, 29 | 390 | 1012 | -995 1°156 3°110 | 3-272 | 8-240 82°, 30 | -429 | 1-112 | 1-093 1-271 3°422 | 3°600 | 9°05

The above is for London at sea-level ; but where the force of gravity is less 30 inches height of mercury will weigh less, and will therefore balance a less weight of air ; the air allowance must therefore be less for 30 inches of mercury barometer in lower latitudes and greater heights over sea-level. The change, for instance, in the allowance of air equal to the brass pound will make it, instead of

Computed from Fizeau, Ann. Bur. Long., 1878.

- *Computed from Chisholm, Weighing and Measuring, 1877, p. 162; also see p. 158.*

1:047 grains, become 1:046 when 15,000 feet above the sea, or 10° S. of London. Hence this reduction need rarely be noticed. The composition of the air also varies, and most seriously in the amount of aqueous vapour ; the

‘above is ordinary air, but if quite dry the 1:047 grains

would become 1°052 grains; the change in carbonic acid is quite immaterial, unless in very close rooms, so that it may be concluded that the moisture of the air is the main point to be noted, after its temperature and pressure,— small errors in any of these three data making far more difference than any other compensation that can be made in the weight of air.

The more complex allowances for the expansion of water in glass, brass, or other vessels we need not enter on here; the principles are simple, but the data require to be accurately determined for the material in question. The expansion of water is, however, so often in question, especially for taking specific gravities, that it is here given. A constant volume which contains or displaces 10,000 grains of water at 62° will contain ?—

At 32° F. (0° C.), 10,009°84 grains. | At 62° F. (163° C.), 10,000°00 grains. yy 89°°2 F. (4° C.), 10,011-20 —„ 5 68° F. (20° C.), 9,998°76 „ ;, 50° F. (10° C.), 10,008-89 5, », 86°F. (80°C), 9,968°76 ,

Hence if a specific gravity is observed at any of these temperatures it must be x the corresponding weight + 10,000 to reduce it toa comparison with water at 62°; the expansion of the body observed is another question altogether, and must be compensated also.

The weight of a cubic inch, or other linearly measured volume, of water is not yet very accurately known. The observations have been made by weighing closed hollow metal cases in and out of water (thus obtaining the weight of an equal volume of water), and then gauging the size of the case with exactitude. Cubes, cylinders, and spheres have been employed. The results are : +—

*Cubic | Cubic Cubic | Inch at} Foot at | Decimetre 62°F. | 62°: at 4° C, Grains. | Ounces.| Grammes, In France, by Lefevre-Gineau (legal French)! 252°603 | 997°70 | 1000-000 In England, by Shuckburgh and Kater eee ‘ = (egal British) Peiseacn teas sivas seaenactnoacette 252°724 | 998-18 | 1000-480 In Sweden, by Berzelius, Svanberg. a * 4 and Akermann…...s..c00-0 oietesecіy evens / SOD ETS | SID 3) MNUEIS In Austria, by Stampfer. ....svecccctissessesesses 252°515 | 997°35 999°653 Tat Rassia, by Kuptlets…cteesctsesssmscdsenseos 252°600 | 997-69 999-989*

National Standards and Copies.—Having now noticed the principles and constants involved, we will consider the British and metric standards, the only ones now used in scientific work.

The imperial standard yard is a bronze bar 38 inches long, 1 inch square; the defining lines, 36 inches apart, are cut on gold studs, sunk in holes, so that their surface passes

through the axis of the bar. Thus flexure does not tend to tip the engraved surfaces nearer or farther apart. This bar when in use rests on a lever frame, which supports it at 8 points, 4°78 inches apart, on rollers which divide the pressure exactly equally. This standard is in actual use for all important comparisons at the Standards Office. Four copies, which are all equal to it, within 4° of tempera-_ ture, are deposited in other places in case of injury or loss of the standard. The standard pound is a thick disk of platinum about 14 inches across, and 1 inch high, with a shallow groove around it near the top. Tour copies are deposited with the above copies of the yard. For public use there are a series of end-standards exposed on the outer wall of Greenwich observatory ; and a length of 100 feet, and another of 66 feet (1 chain), marked on brass

3 Computed from Report of Standards Department, 1883.

4 Computed from Chisholm, op. cié., p. 112.

5 See Chisholm, op. cit., pp. 188, 189. For less refined purposes measuring bars should be supported on two points, 21 per cent. of the whole length from the ends. This equalizes the strains in the curves, and makes a minimum distortion.

plates let into the granite step along the back of Trafalgar Square. As this is a practically invariable earth-fast standard, and most convenient for reference, it is important to know the minute errors of it, as determined by the Standards Department.) Starting from 0 the errors are in inches—

*at0 «6-10 «20s 80s —CisCisCTD = 8D 90—s— 100 feet, error 0 —-007 —*019 —-022 —015 —-008 —-007 -+-011 4-021 +0-17 —-008 inches.*

The mean uncertainty in these values is 003, and the greatest uncertainty ‘01. The total length of the chain standard is —°019 inch from the truth. ‘There is alsoa public balance provided at Greenwich observatory, which shows the accuracy of any pound weight placed upon it. For important scientific standards comparisons are made gratuitously, as a matter of courtesy, by the officials of the Standards Office, 7 Old Palace Yard, Westminster. The most delicate weighings are all performed in a vacuum case with glass sides, which is so constructed that the weights can be exchanged from one arm to the other without opening the case, so as to obtain double weighings.

The toleration of error in copies for scientific purposes, by the Standards Department, is 0005 inch on the yard or lesser lengths, about equal to 15 divisions of the micrometer ; on the pound ‘0025 grain, about $ a division of the official balances ; on the ounce ‘001 grain; on the gallon 1 grain; and on the cubic foot 4 grains. The toleration for commercial copies is ‘005 on the yard, ‘001 on the foot and under, and ‘1 grain on weights of 1 ounce to 1 pound.2 The Standards Commission of 1851 recom- mended a limit of 1 in 20,000.

For practical work of moderate accuracy the most convenient forms of measures are—for lengths under a foot, feather-edge metal scales divided to 4 inch (finer divisions are only confusing, and zjy9 of an inch can be safely read by estimation); for lengths of 1 to 10 feet, metal tubes or deep bars bearing line-divisions, and with permanent feet attached at 21 per cent. from either end, so that the deformation by flexure is always the same ; for long distances a steel tape with fine divisions scratched across itand numbered by etching. The most accurate way of using such a tape is

not to prepare a flat bed for it, but to support it at points not more than 50 feet apart; then by observing the distances and levels of these points, and knowing the weight of the tape, the correction for the sloping distance between the points and the difference of the catenary. length of the tape from the straight distance can be precisely calculated ; the corrections for stretching of the tape (best done by a lever arm with fixed weight), and for temperature, are all that are needful besides.

*The first French standard metre (of 1799) is a platinum bar end-standard of about 1 inch wide and } inch thick ; the new standard of the International Metric Commission is a line-standard of platino-iridium, 40 inches long and *8 inches square, grooved out on all four sides so that its section is between x and H form; this provides the greatest rigidity, and also a surface in the axis of the bar to bear the lines of the standard. The new standard kilogramme, like the old one, is a cylinder of platinum of equal diameter and height. These new standards are pre- served in the International Metric Bureau at Paris, to which seventeen nations contribute in support and direc- tion, and in which the most refined methods of comparison are adopted. For lineal comparisons the alternate sub- stitution of the measures on a sliding bed beneath fixed micrometer microscopes is provided as in the British office, and a bath for the heating of one measure in a liquid to ascertain its expansion. Jor weighing four balances are*

1 Report of Warden of the Standards, 1875. 2 Report of Warden, 1868, see also 1872.

provided, each with mechanisni for the transposition of the weights, and the lowering of the balance into play on its bearings, so that weighings can be performed at 13 feet distance from the balance, thus avoiding the disturb- ance caised by the warmth of the observer. The readings of the balance scale are made by a fixed telescope, the motion being observed by the reflexion of a fixed scale from a mirror attached to the beam of the balance. In this bureau are also an equally fine hydrostatic balance for taking specific gravities by water weighing, a standard baronieter, and an air thermometer, with all subsidiary apparatus. 'The special work of the

bureau is the con- struction and comparison of metric standards for all the countries supporting it, and for scientific work of all kinds.

The legal theory of the British system of weights and measures is—(A) the standard yard, with all lineal measures and their squares and cubes based upon that; (B) the standard pound of 7000 grains, with all weights based upon that, with the troy pound of 5760 grains for trade purposes; (C) the standard gallon (and multiples and fractions of it), declared to contain 10 tb of water at 62° F., being in volume 277°274 cubic inches, which con- tain each 252-724 grains of water in a vacuum at 62°, or 252°458 grains of water weighed with brass weights in air of 62° with the barometer at 30 inches.

The legal theory of the metric system of weights and measures is—(A) the standard metre, with decimal fractions and multiples thereof; (B) the standard kilogramme, with decimal fractions and multiples thereof; (C) the litre (with decimal fractions and multiples), declared to be a cube of +5 metre, and to contain a kilogramme of water at 4° C. ina vacuum. No standard litre exists, all liquid measures being legally fixed by weight. The metre was supposed, when established in 1799, to be a ten-millionth of the quadrant of the earth through Paris; it differs from this theoretical amount by about 1 in 4000.

The legal equivalents between the British and French systems are—metre = 39°37079 inches; kilogramme = 15432°34874 grains. By the more exact comparisons of Captain Clarke (1866) the metre (at 0° C., 32° F.) is equal to 39:37043196 inches of the yard at 62° F.; but Rogers in 1882 compared the metre as 39°37027. It must always be remembered that a French metre of per- fect legal exactitude will, by expanding from 32° to 62° F., become equal to a greater number of inches when the two measures are placed together ; thus a brass metre is equal to 39°382 inches when compared with British measures at the same temperature, and this is its true commercial equivalent. The kilogramme determination above is that of Professor Miller (1844), against the kilo- gramme des Archives, but in 1884 the international kilo- gramme yielded 15432°35639.

For further details, see H. W. Chisholm, Weighing and Measuring (Nature series), 1877, and Reports of the Warden of the Standards,

subsequently of the Standards Department (all in British Museum Newspaper Room), for all practical details,—especially reports on metre (1868-9), errors of grain weights (1872), principles of measur- ing (long paper of German Standards Commission, translated 1872), Trafalgar Square standards (1876), density of water (1883), tolera- tion of error, British and international (1883), standard wire and plate gauges in inches (1883), besides numerous practical tables, inainly in the earlier numbers before the wardenship was merged in the Board of Trade.

II. Historica.

'Though no line can be drawn between ancient and modern metrology, yet, owing to neglect, and partly to the scarcity of materials, there is a gap of more than a thousand years over which the connexion of units? of

8 In the absence of the actual standards of ancient times the units of measure and of weight have to be inferred from the other remains ;

hence unit in this division is used for any more or less closely defined amount of length or weight in terms of which matter was measured.

measure is mostly guess-work. Hence, except in a few eases, we shall not here consider any units of the Middle Ages. A constant difficulty in studying works on metro- logy is the need of distinguishing the absolute facts of the ease from the web of theory into which each writer has woven them,—often the names used, and sometinies the very existence of the units in question, being entirely an assumption of the writer. Therefore we sliall here take the more pains to show what the actual authority is for each conciusion. Again, each writer has his own leaning : Béckh, to the study of water-volumes and weights, even deriving linear measures therefrom ; Queipo, to the con- nexion with Arabic and Spanish measures ; Brandis, to the basis of Assyrian standards ; Mommsen, to coin weights ; and Bortolotti to Egyptian units; but Hultsch is more general, and appears to give a more equal representation of all sides than do other authors. In this article the tendency will be to trust far more to actual measures and weights than to the statements of ancient writers; and this

position seems to be justified by the great increase in materials, and the more accurate means of study of late. The usual arrangement by countries has been mainly abandoned in favour of following out each unit as a whole, without recurring to it separately for every locality.

The materials for study are of three kinds. (1) Literary, both in direct statements in works on measures (e.g., Elias of Nisibis), medicine (Galen), and cosmetics (Cleopatra), in ready-reckoners (Didymus), clerk's (katib's) guides, and like handbooks, and in indirect explanations of the equiva- lents of measures mentioned by authors (¢.g., Josephus). But all such sources are liable to the most confounding errors, and some passages relied on have in any case to submit to conjectural emendation. These authors are of great value for connecting the monumental information, but must yield more and more to the increasing evidence of actual weights and measures. Besides this, all their evidence is but approximate, often only stating quantities to a half or quarter of the aniount, and seldom nearer than 5 or 10 per cent.; hence they are entirely worthless for all the closer questions of the approximation or original identity of standards in different countries ; and it is just in this line that the imagination of writers has led them into the greatest speculations, unchecked by accurate evi- dence of the original standards. (2) Weights and measures actually remaining. These are the prime sources, and, as they increase and are more fully studied, so the subject will be cleared and obtain a fixed basis. A difficulty has been in the paucity of examples, more due to the neglect of collectors than the rarity of specimens. The number of published weights did not exceed 600 of all standards a short time ago; but the collections in the last three years from Naucratis (28),1 Defenneh (29), and Memphis (44) have supplied over six times this quantity, and of an earlier age than most other examples, while existing collections have been more thoroughly examined; hence there is need for a general revision of the whole subject. It is above all desirable to make allowances for the changes which weights have undergone ; and, as this has only been done for the above Egyptian collections and that of the British Museum, conclusions as to the accurate values of different standards will here be drawn from these rather than Continental sources. (3) Objects which have been made by measure or weight, and from which the unit of construction can be deduced. Buildings will generally yield up

their builder's foot or cubit when examined (Inductive Metrology, p. 9). Vases may also be found bearing such relations to one another as to show their unit of volume. And coins have long been recognized as one

- *These figures refer to the list of PUlo nee brois SURES ond Olathe present section, p. 489,*

of the great sources of metrology,—valuable for their wide and detailed range of information, though most unsatis- factory on account of the constant temptation to diminish their weight, a weakness which seldom allows us to reckon them as of the full standard. Another defect in the evi- dence of coins is that, when one variety of the unit of weight was once fixed on for the coinage, there was (bar- ring the depreciation) no departure from it, because of the need of a fixed value, and hence coins do not show the range and character of the real variations of units as do buildings, or vases, or the actual commercial weights.

PRINCIPLES OF Stupy.—(1) Limits of Variation in Different Copies, Places, and Times.—Unfortunately, so very little is known of the ages of weights and measures that this datum—most essential in considering their his- tory—has been scarcely considered. In measure, Egyptians of Dynasty IV. at Gizeh on an average varied 1 in 350 between different buildings (27). Buildings at Persepolis, all of nearly the same age, vary in unit 1 in 450 (25). In- cluding a greater range of time and place, the Roman foot in Italy varied during two or three centuries on an average zoo from the mean. Covering a longer time, we find an average variation of =4,5 in the Attic foot (25), ;4, in the English foot (25), y+ 9 in the English itinerary foot (25). So we may say that an average variation of 71, by tolera- tion, extending to double that by change of place and time, is usual in ancient measures. In weights of the same place and age there is a far wider range; at Defenneh (29), within a century probably, the average variation of different units is 51, g/g, and g,, the range being just the same as in all times and places taken together. Even in a set of weights all found together, the average variation is only reduced to 35, in place of yy (29). Taking a wider range of place and time, the Roman libra has an average variation of J; in the examples or better period (43), and in those

of Byzantine age =; (44). Altogether, we see that weights have descended from original varieties with so little intercomparison that no rectification of their values has been made, and hence there is as much variety in any one place and time as in all together. Average variation may be said to range from gy to +; in different units, doubtless greatly due to defective balances.

2. Rate of Variation.—Though large differences may exist, the rate of general variation is but slow,—excluding, of course, all monetary standards. In Egypt the cubit lengthened ;75 in some thousands of years (25, 44). The Italian mile has lengthened 3, since Roman times (2) ; the English mile lengthened about 5}, in four centuries (31). The English foot has not appreciably varied in several centuries (25). Of weights there are scarce any dated, excepting coins, which nearly all decrease; the Attic tetradrachm, however, increased |, in three centuries (28), owing probably to its being below the average trade weight to begin with. Roughly dividing the Roman weights, there appears a decrease of 4, from imperial to Byzantine times (43).

3. Tendency of Variation.—This is, in the above cases of lengths, to an increase in course of time. The Roman foot is also probably 53, larger than the earlier form of it, and the later form in Britain and Africa perhaps another gdp larger (25). Probably measures tend to increase and weights to decrease in transmission from time to time or place to place ; but far more data are needed to study this.

4. Details of Variation.—Having noticed variation in the gross, we must next observe its details. The only way of examining these is by drawing curves (28, 29), repre- senting the frequency of occurrence of all the variations of a unit ; for instance, in the Egyptian unit—the kat—counting in a large number how many occur between 140

and 141 grains, 141 and 142, and so on; such numbers represented by curves show at once where any particular varieties of the unit lie (see

Nawkratis, i. p. 83). This method is only applicable where there is a large number of examples; but there is no other way of studying the details. The results from such a study—of the Egyptian kat, for example—show that there are several distinct families or types of a unit, which originated in early times, have been perpetuated by copying, and reappear alike in each locality (see Z'anis, ii. pl. 1.). Hence we see that if one unit is derived from another it may be possible, by the similarity or difference of the forms of the curves, to dis- cern whether it was derived by general consent and recog- nition from a standard in the same condition of distribu- tion as that in which we know it, or whether it was derived from it in earlier times before it became so varied, or by some one action forming it from an individual example of the other standard without any variation being trans- mitted. As our knowledge of the age and locality of weights increases these criteria in curves will prove of greater value; but even now no consideration of the con- nexion of different units should be made without a graphic representation to compare their relative extent and nature of variation.

5. Transfer of Units.—The transfer of units from one people to another takes place almost always by trade. Hence the value of such evidence in pointing out the ancient course of trade, and commercial connexions (17). The great spread of the Phoenician weight on the Mediter- ranean, of the Persian in Asia Minor, and of the Assyrian in Egypt are evident cases ; and that the decimal weights of the laws of Manu (43) are decidedly not Assyrian or Persian, but on exactly the Phcenician standard, is a curious evidence of trade by water and not overland. If, as seems probable, units of length may be traced in pre- historic remains, they are of great value ; at Stonehenge, for instance, the earlier parts are laid out by the Pheenician foot, and the later by the Pelasgo-Roman foot (26). The earlier foot is continually to be traced in other megalithic remains, whereas the later very seldom occurs (25). This bears strongly on the Pheenician origin of our prehistoric civilization. Again, the Belgic foot of the Tungri is the basis of the present English land measures, which we thus see are neither Roman nor British in origin, but Belgic. Generally a unit is transferred from a higher to a less civilized people; but the near resemblance of measures in different countries should always be corroborated by historical considerations of a probable connexion by

com- merce or origin (Head, Historia Numorum, xxxvii.). It should be borne in mind that in early times the larger values, such as min, would be transmitted by commerce, while after the introduction of coinage the lesser values of shekels and drachmz would be the units ; and this needs notice, because usually a borrowed unit was multiplied or divided according to the ideas of the borrowers, and strange modifications thus arose.

6. Connexions of Lengths, Volumes, and Weights.—This is the most difficult branch of metrology, owing to the variety of connexions which can be suggested, to the vague information we have, especially on volumes, and to the liability of writers to rationalize connexions which were never intended. To illustrate how easy it is to go astray in this line, observe the continual reference in modern handbooks to the cubic foot as 1000 ounces of water ; also the cubic inch is very nearly 250 grains, while the gallon has actually been fixed at 10 tb of water; the first two are certainly mere coincidences, as may very prob- ably be the last also, and yet they offer quite as tempting a base for theorizing as any connexions in ancient metro- logy. No such theories can be counted as more than

coincidences which have been adopted, unless we find a very exact connexion, or some positive statement of origination. The idea of connecting volume and weight has received an immense impetus through the metric system, but it is not very prominent in ancient times. The Egyptians report the weight of a measure of various articles, amongst others water (6), but lay no special stress on it; and the fact that there is no measure of water equal to a direct decimal multiple of the weight-unit, except very high in the scale, does not seem as if the volume was directly based upon weight. Again, there are many theories of the equivalence of different cubic cubits of water with various multiples of talents (2, 3, 18, 24, 33); but connexion by lesser units would be far more probable, as the primary use of weights is not to weigh large cubical vessels of liquid, but rather small portions of precious metals. The Roman amphora being equal to the cubic foot, and containing 80 libre of water, is one of the

strongest cases of such relations, being often mentioned by ancient writers. Yetit appears to be only an approximate relation, and therefore probably accidental, as the volume by the examples is too large to agree to the cube of the length or to the weight, differing ;4,, or sometimes even zz. All that can be said therefore to the many theories connecting weight and measure is that they are possible, but our knowledge at present does not admit of proving or disproving their exactitude, Certainly vastly more evidence is needed before we would, with Bockh (2), derive fundamental measures through the intermediary of the cube roots of volumes. Soutzo wisely remarks on the intrinsic improbability of refined relations of this kind (Etalons Ponderaua Primitifs, note, p. 4).

Another idea which has haunted the older metrologists, but is still less likely, is the connexion of various measures with degrees on the earth's surface. The lameness of the Greeks in angular measurement would alone show that they could not derive itinerary measures from long and accurately determined distances on the earth.

7. Connexions with Coimage-———From the 7th century B.c. onward, the relations of units of weight have been complicated by the need of the interrelations of gold, silver, and copper coinage; and various standards have been derived theoretically from others through the weight of one metal equal in value toa unit of another. That this mode of originating standards was greatly promoted, if not started, by the use of coinage we may see by the rarity of the Persian silver weight (derived from the Assyrian standard), soon after the introduction of coinage, as shown in the weights of Defenneh (29). The relative value of gold and silver (17, 21) in Asia is agreed gene- rally to have been 134 to 1 in the early ages of coinage ; at Athens in 434 B.c. it was 14: 15; in Macedon, 350 B.c., 124:1; in Sicily, 400 Bic. 15:1, and 300 Bc. 12:1; in Italy, in lst century, it was 12: 1, in the later empire 13°9: 1, under Justinian 14°4:1, and in modern times 15°5: 1, but at present 23 : 1,—the fluctuations depend- ing mainly on the opening of large mines. Silver stood to copper in Egypt as 80:1 (Brugsch), or 120: 1 (Revil- lout); in early Italy and Sicily as 250: 1 (Mommsen), or 120 : 1 (Soutzo), under the empire 120 : 1, under Justinian 100: 1; at present itis 150:1. The distinc- tion of the use of standards for trade in general, or for silver or gold in particular, should

be noted. The early observance of the relative values may be inferred from Num. vii. 13, 14, where silver offerings are 13 and 7 times the weight of the gold, or of equal value and one- half value.

8. Legal Regulation of Measwres.—Most states have preserved official standards, usually in temples under priestly custody. The Hebrew "shekel of the sanctuary "

WHIGHTS AND

is familiar ; the standard volume of the apet was secured in the dromus of Anubis at Memphis (35); in Athens, besides the standard weight, twelve copies for public com- parison were kept in the city; also standard volume measures in several places (2) ; at Pompeii the block with standard volumes cut in it was found in the portico of the forum (33); other such standards are known in Greek cities (Gythium, Panidum, and Trajanopolis) (11, 33) ; at Rome the standards were kept in the Capitol, and weights also in the temple of Hercules (2) ; the standard cubit of the Nilometer was before Constantine in the Serapzum, but was removed by him to the church (2). In England the Saxon standards were kept at Winchester before 950 A.D., and copies were legally compared and stamped ; the Normans removed them to Westminster to the custody of the king's chamberlains at the exchequer ; and they were preserved in the crypt of Edward the Confessor, while re- maining royal property (9). The oldest English standards remaining are those of Henry VII. Many weights have been found in the temenos of Demeter at Cnidus, the temple of Artemis at Ephesus, and in a temple of Aphro- dite at Byblus (44); and the making or sale of weights may have been a business of the custodians of the temple standards.

9. Names of Units.—It is needful to observe that most names of measures are generic and not specific, and cover a great variety of units. Thus foot, digit, palm, cubit, stadium, mile, talent, mina, stater, drachm, obol, pound, ounce, grain, metretes, medimnus, modius, hin, and many others mean nothing exact unless qualified by the name of their country or city. Also, it should be noted that some ethnic qualifications have been applied to different systems, and such names as Babylonian and Euboic are ambiguous ; the normal value of a standard will therefore be used here

rather than its name, in order to avoid con- fusion, unless specific names exist, such as kat and uten.

All quantities stated in this article without distinguish- ing names are in British units of inch, cubic inch, or grain.

STANDARDS or LEeNcTN.—Most ancient measures have been derived from one of two great systems, that of the cubit of 20°63 inches, or the digit of '729 inch; and both these systems are found in the earliest remains.

20:63 ins.—First known in Dynasty IV. in Egypt, most accurately 20°620 in the Great Pyramid, varying 20°51 to 20°71 in Dyn. IV. to VI. (27). Divided decimally in 100ths ; but usually marked in Egypt into 7 palms or 28 digits, approximately ; a mere juxtaposition (for convenience) of two incommensurate systems (25, 27). The average of several cubit rods remaining is 20°65, age in general about 1000 B.c. (33). At Phile, &c., in Roman times 20°76 on the Nilometers (44). This unit is also re- corded by cubit lengths scratched on a tomb at Beni Hasan (44), and by dimensions of the tomb of Ramessu IV. and of Edfu temple(5)inpapyri. From this cubit, mahi, was formed the xylon of 3 cubits, the usual length of a walking-staff; fathom, nent, of 4 cubits, and the khet of 40 cubits (18); also the schanus of 12,000 cubits, actually found marked on the Memphis-Faium road (44).

Babylonia had this unit nearly as early as Egypt. The divided plotting scales lying on the drawing boards of the statues of Gudea (Nature, xxviii. 341) are of 4 20°89, ora span of 10°44, which is divided in 16 digits of '658, a fraction of the cubit also found in Egypt. Buildings in Assyria and Babylonia show 20°5 to 20°6. The Babylonian system was sexagcsimal, thus (18)—

uban, 5=qat, G=ammat, 6=qanu, 60=sos, 30=parasang, 2=kaspu.

'69inch = 3-44 20°6 124 7430 223,000 446,000

Asia Minor had this unit in early times,—in the temples of Ephesus 20°55, Samos 20°62 ; Hultsch also claims Priene 20°90, and the stadia of

Aphrodisias 20°67, and Laodicea 20:94. Ten build- Ings in all give 20°63 mean (18, 25); but in Armenia it rose to 20°76 in late Roman times, like the late rise in Egypt (25). It was speci- oe into ith, the foot of #ths being as important as the

*4m+,. This was especially the Greck derivative of the 20°63 ne * eubit. It ae in Babylonia as the foot of that*

*; * system (24), in accordance with the sexary system applied to the early decimal division of the cubit. In Greece it is the most usual unit, occurring in the Propylea at Athens 12°44,*

temple at Agina 12°40, Miletus 12°51, the Olympic course 12°62, &c. (18); thirteen buildings giving an average of 12°45, mean variation '06 (25), =%of 20°75, m. var. '10. The digit=4 paleste, =+ foot of 12°4; then the system is We—Cubit, "—Orewia……..coressose Lgaeeeeeeeee taniatees es = al, ee ae =acena, 10=plethron, . = } stadion. 12-4 inch 18°7 74:7 124°5 1245 7470

In Etruria it probably appears in tombs as 12°45 (25) ; perhaps in Roman Britain ; and in medieval England as 12°47 (25).

138 ins This foot is scarcely known monumentally. On three

2 of 20-7. Egyptian cubits there is a prominent mark at the 19th

*i" * digit or 14 inches, which shows the existence of such a measure (33). It became prominent when adopted by Phileterus about 280 B.c. as the standard of Pergamum (42), and probably it had been shortly before adopted by the Ptolemies for Egypt. From that time it isone of the principal units in the literature (Didymus, &c.), and is said to occur in the temple of Augustus at Pcrgamum as 13°8 (18). Fixed by the Romans at 16 digits (134= Roman foot), or its cubit at 1£ Roman feet, it was legally =18°94 at 128 B.c. (42); and 74 Philetercan stadia were=Roman mile (18). The multiples of the 20°63 cubit are in late times generally reckoned in these feet of % cubit. The name "Babylonian foot" used by Bockh (2) is*

only a theory of his, from which to derive volumes and weights; and no evidence for this name, or connexion with Babylon, is to be found. Much has been written (2, 3, 33) on sup- posed cubits of about 17-18 inches derived from 20°63,—mainly, in endeavouring to get a basis for the Greek and Roman feet, but these are really connected with the digit system ; and the monu- mental or literary evidence for such a division of 20°63 will not

*17°30 bear examination. There is, however, fair evidence for 5 of 20°76 units of 17°30 and 1:730 or 5 of 20°76 in Persian build- e * ings (25); and the same is found in Asia Minor as 17°25 or § of 20°70. On the Egyptian cubits a small cubit is marked as about 17 inches, which may well be this unit, as § of 20°6 is 172; and, as these marks are placed before the 28rd digit or 17:0, they cannot refer to 6 palms, or 17°7, which is the 24th digit, though they are usually attributed to that (33).*

*We now turn to the sccond great family based on the digit. This has been so usually confounded with the 20°63 family, owing to the juxtaposition of 28 digits with that cubit in Egypt, that it should be observed how the difficulty of their incommensurability has been felt. For instance, Lepsius (3) supposed two primitive eubits of 13°2 and 20°68, to account for 28 digits being only 20°4 when free from the cubit of 20°63, —the first 24 digits being in some cases made shorter on the cubits to agrec with the true digitstandard, while the remaining 4 are lengthened to fill up to 20°6. In the 70‘7 ins Dynasties IV. and V. in Egypt the digit is found in tomb * sculptures as °727 (27); while from a dozen examples in the later remains we find the mean ‘728 (25). A length of 10 digits is marked on all the inscribed Egyptian cubits as the ‘‘lesser span” (33). In Assyria the same digit appears as 730, particularly at Nimrud (25); and in Persia buildings show the 10-digit length of 7°34 (25). In Syria it was about *728, but variable ; in eastern Asia Minor more like the Persian, being *732 (25). In these cases the digit itself, or decimal multiples, seem to have been used.*

18:23 The pre-Greek examples of this cubit in Egypt, men-

25 x “729 tioned by Bockh (2), give 18°23 as a mean, which is ‘25 digits of ‘729, and has no relation to the 20°63 cubit. This cubit, or one nearly equal, was used in Judea in the times of the kings, as the Siloam

inscription names a distance of 1758 feet as roundly 1200 cubits, showing a cubit of about 17°6 inches. This is also evidently the Olympic cubit ; and, in pursuance of the decimal multiple of the digit found in Egypt and Persia, the cubit of 25 digits was $ of the orguia of 100 digits, the serics being old digit, = borguia, 10=amma, 10=stadion. 729 inch 182 72°9 729 7296 Then, taking 3 of the cubit, or } of the orguia, as a foot, the Greeks arrived at their foot of 12°14; this, though very well known in literature, is but rarely found, and then generally in the form of the cubit, in monumental measures. The Parthenon step, cele- brated as 100 feet wide, and apparently 225 feet long, gives by Stuart 12°137, by Penrose 12°165, by Paccard 12°148, differences due to scale and not to slips in measuring. Probably 12°16 is the nearest value. There are but few buildings wrought on this foot in Asia Minor, Greece, or Roman remains. The Greek system, however, adopted this foot as a basis for decimal multiplication, forming

foot, 10=aceena, 12°16 inches 121°6

which stand as 4th of the other decimal series based on the digit. This is the agrarian system, in contrast to the orguia system, which was the itinerary series (33). ; f

*Then a further modification took place, to avoid the inconven- ience of dividing the foot in 163 digits, and a new digit was formed —longer than any value of the old digit—of 7's of the foot, or *760, so that the series ran*

10=plethron,

1216

484

*digit, 06. : a i orguia, 10=stadion. '76 inch HS Ge 7296 This formation of the Greek system (25) is only an inference from the facts yet known, for we have not sufficient information to prove it, though it seems much the simplest and most likely history. li: Seeing the good reasons for this digit having been ex- 16 × 726 ported to the West from Egypt—from the presence of the * 18-23 cubit in Egypt, and from the '729 digit being the*

decimal base of the Greek long measures—it is not surprising to find it in use in Italy asa digit, and multiplied by 16 asa foot. The more so, as the half of this foot, or 8 digits, is marked off as a measure on the Egyptian cubit rods (33). 'Though Queipo has opposed this con- nexion (not noticing the Greek link of the digit), he agrees that it is supported by the Egyptian square measure of the plethron, being equal to the Roman actus (33). The foot of 11°6 appears probably first in the prehistoric and early Greek remains, and is certainly found in Etrurian tomb dimensions as 11°59 (25). Dérpfeld con- siders this as the Attic foot, and states the foot of the Greek metrological relief at Oxford as 11°65 (or 11°61, Hultsch). Hence we see that it probably passed from the East through Greece to Etruria, and thence became the standard foot of Romc; there, though divided by the Italian duodecimal system into 12 uncie, it always maintained its original 16 digits, which are found marked on some of the foot-measures. The well-known ratio of 25: 24 between the 12°16 foot and this we see to have arisen through one being 3 of 100 and the other 16 digits,—162: 16 being as 25: 24, the legal ratio. The mean of a dozen foot-measures (1) gives 11°616+ 008, and of long lengths and buildings 11°6074 '01. In Britain and Africa, however, the Romans used a rather longer form (25) of about 11°68, or a digit of 730. Their series of measures was

10=amma,

729

digitus, 4=palmus, 4=pes, 5=passus, 125=stadium, S=milliare; 726 inch 2°90 11°62 58°71 7262 58,100 also

uncia '968=,% pes, palmipes 14°52=65 palmi, cubitus 17-48=6 palmi.

Either from its Pelasgic or Etrurian use or from Romans, this foot appears to have come into prehistoric remains, as the circle of Stonehenge (26) is 100 feet of 11°68 across, and the same is found in one or two other cases. 11°60 also appears as the foot of some medieval English buildings (25).

We now pass to units between which we cannot state any con- nexion.

25 ~~1.—The earliest sign of this cubit is in a chamber at Abydos (44) about 1400 B.c.; there, below the sculptures, the plain wall is marked out by red designing lines in spaces of 25°13~~+ '03 inches, which have no relation to the size of the chamber or to the sculpture. They must therefore have been marked by a workman using a cubit of 25°13. Apart from medieval and other very uncertain data, such as the Sabbath day's journey being 2000 middling paces for 2000 cubits, it appears that Josephus, using the Greek or Roman cubit, gives half as many more to each dimension of the temple than does the Talmud ; this shows the cubit used in the Talmud for temple measures to be certainly not under 25 inches. Evidence of the early period is given, moreover, by the statement in 1 Kings (vil, 26) that the brazen sea held 2000 baths; the bath being about 2300 cubic inches, this would show a cubit of 25 inches. The corrupt text in Chronicles of 3000 baths would need a still longer cnbit; and, if a lesser cubit of 21°6 or 18 inches be taken, the result for the size of the bath would be impossibly small. For other Jewish cubits see 18°2 and 21°6. Oppert (24) concludes from inscriptions that there wasin Assyria a royal cubit of Z the U cubit, or 25°20 ; and four monuments show (25) a cubit averaging 25°28. For Persia Queipo (33) relies on, and develops, an Arab statement that the Arab hashama cubit was the royal Persian, thus fixing it at about 25 inches; and the Persian guerze at present is 25, the royal guerze being 14 times this, or 374 inches. Asa unitof 1°013, decimally multiplied, is most commonly to be deduced from the ancient Persian buildings, we may take 25°34 as the nearest ap- proach to the ancient Persian unit.

21:6.—The circuit of the city wall of Khorsabad (24) is minutely stated on a tablet as 24,740 feet (U), and from the actual size the U is therefore 10°806 inches. Hence the recorded series of measures on the Senkereh tablet are valued (Oppert) as—

7 Desl0f, aS eal 2=sa, 5=(n), 30=kasbu.

susi, n) 18 inch 3°6 648 1296 648 7,776 293,280 Other units are the suklum or 4U=5-4, and cubit of 2U=21°6, which are not named in this tablet. In Persia (24) the series on

the same base was—

12=us,

vitasti, 2=arasni 3860=asparasa, 30=parathafiha, 2=giv; 10-7 inches 21°4 7704 231,120 462,240 probably yava, 6=angusta, 10=vitasti; and gama=#? arasni; also bizu=2 arasni. 18 inch 07 107 12°38 21-4 42:8 214

The values here given are from some Persian buildings (25), which indicate 21°4, or slightly less; Oppert's value, on lcss certain data, is 21°52. The Egyptian cubits have an arm at 15 digits or about 10°9 marked on them, which seems like this same unit (33).

WEIGHTS AwyD

MEASURES

This cubit was also much used by the Jews (33), and is so often referred to that it has eclipsed the 25°1 cubit in most writers. The Gemara names 8 Jewish cubits (2) of 5, 6, and 7 palms; and, as Oppert (24) shows that 25°2 was reckoned 7 palins, 21°6 being 6 palms, we may reasonably apply this scale to the Gemara list, and read it as 18, 21°6, and 25°2 inches. There is also a great amount of medieval and other data showing this cubit of 21°6 to have been familiar to the Jews after their captivity ; but there is no evidence for its carlier date, as there is for the 25-inch cubit (from the brazen sea) and for the 18-inch cubit from the Siloam inscription,

From Assyria also it passed into Asia Minor, being found on the city standard of Ushak in Phrygia (33), engraved as 21°8, divided into the Assyrian foot of 10°8, and half and quarter, 5°4 and 2°7. Apparently the same unit is found (18) at Heraclea in Lucania, 21°86; and, as the general foot of the South Italians, or Oscan foot (18), best defined by the 100 feet square being 53, of the jugerum, and therefore=10°80 or half of 21°60. A cubit of 21°5 seems certainly to be indicated in prehistoric remains in Britain, and also in early Christian buildings in Ireland (25).

22:-2.—Another unit not far different, but yet distinct, is found apparently in Punic remains at Carthage (25), about 11°16 (22°32), and probably also in Sardinia as 11°07 (22°14), where it would naturally be of

Punic origin. In the Hauran 22°16 is shown by a basalt door (British Museum), and perhaps elsewhere in Syria (25). It is of some value to trace this measure, since it is indicated by some prehistoric English remains as 22°4.

20-0.—This unit may be that of the pre-Semitic Mesopotamians, as it is found at the early temple of Mukayyir (Ur); and, with a few other cases (25), it averages 19°97. It is described by Oppert (24), from literary sources, as the great U of 222 susi or 39°96, double of 19°98; from which was formed a reed of 4 great U or 159°8. The samme measure decimally divided is also indicated by buildings in Asia Minor and Syria (25).

19°2.—In Persia some buildings at Persepolis and other places (25) are constructed on a foot of 9°6, or cubit of 19°2; while the modern Persian arish is 38°27 or 2×19°13. The same is found very clearly in Asia Minor (25), averaging 19°3; and it is known in literature as the Pythic foot (18, 33) of 9°75, or 4 of 19°5, if Censorinus is rightly understood. It may be shown by a mark (33) on the 26th digit of Sharpe's Egyptian cubit= 19-2 inches.

13-3.—This measure does not seem to belong to very early times, and it may probably have originated in Asia Minor. It is found there as 13°35 in buildings. Hultsch gives it rather less, at 13°1, as the "small Asiatic foot." Thence it passed to Greece, where it is found (25) as 13°36. In Romano-African remains it is often found, rather higher, or 18°45 average (25). It lasted in Asia apparently till the building of the palace at Mashita (620 a.p.), where it is 13°22, according to the rough measures we have (25). And it may well be the origin of the diré Stambuli of 26°6, twice 13°3. Found in Asia Minor and northern Greece, it does not appear unreasonable to connect it, as Hultsch does, with the Belgic foot of the Tungri, which was legalized (or perhaps introduced) by Drusus when governor, as 4 longer than the Roman foot, or 13°07; this statement was evidently an approximation by an increase of 2 digits, so that the small difference from 13°3 is not worth notice. Further the pertica was 12 feet of 18 digits, z.e., Drusian feet.

Turning now to England, we find (25) the commonest building foot up to the 15th century averaged 13°22. Here we see the Belgic foot passed over

to England, and we can fill the gap toa considerable extent from the itinerary measures. It has been shown (31) that the old English mile, at least as far back as the 18th century, was of 10 and not 8 furlongs. It was therefore equal to 79,200 inches, and divided decimally into 10 furlongs, 100 chains, or 1000 fathoms. For the existence of this fathom (half the Belgic pertica) we have the proof of its half, or yard, needing to be suppressed by statute (9) in 1489, as "the yard and full hand," or about 40 inches,—cvidently the yard of the most usual old English foot of 18°22, which would be 39°66. We can restore then the old English system of long measure from the buildings, the statutc-prohibition, the surviving chain and furlong, and the old English mile shown by maps and itineraries, thus :—

foot, 3=yard, 2=fathom, 10=chain, 10=furlong, 10=mile.

13°22 39°66 79°32 793 7932 79,320 Such a regular and extensive system could not have been put into use throughout the whole country suddenly in 1250, especially as it must have had to resist the legal foot now in use, which was enforced (9) as early as 950. We cannot suppose that such a system would be invented and become general in face of the laws enforcing the 12-inch foot. Therefore it must be dated some time before the 10th century, and this brings it as near as we can now hope to the Belgic foot, which lasted certainly to the 3d or 4th century, and is exactly in the line of migration of the Belgic tribes into Britain. It is remarkable how near this early decimal system of Germany and Britain is the double of the modern decimal metric system. Had it not been unhappily driven out by the 12-inch foot, and repressed by statutes both against its yard and mile, we should need but a small change to place our measures in accord with the metre.

WEIGHTS AND

The Gallic leuga, or league, is a different unit, being 1°59 British miles by the very concordant itinerary of the Bordeaux pilgrim. This appears to be the great Celtic measure, as opposed to the old English, or Germanic, mile. In the north-west of England and in Wales this mile lasted as 1°56 British miles till 1500; and the perch of those parts was correspondingly longer till this eentury (31). The "old London mile" was 5000 feet, and

probably this was the mile which was modified to 5280 feet, or 8 furlongs, and so became the British statute mile.

STANDARDS OF AREA.—We cannot here describe these in detail. Usually they were formed in each country on the squares of the long measures. The Greek system was—

foot, aad

0 = eaniconoonereeo acena, 25=aroura, 4=plethron. 1:027 sq. ft. 36°96 102°68 2567 10,268 The Roman system was— pes, 100=decempeda, 36=clima, 4=actus, 2=jugerum, 94 sq. ft. 94 8384 13,536 27,072 jugerum, 2=heredium, 100=centuria, 4=saltus. 6205 acre 1241 1241 496-4

STANDARDS OF VOLUME.—There is great uncertainty as to the exact values of all ancient standards of volume,—the only precise data being those resulting from the theories of volumes derived from the cubes of feet and cubits. Such theories, as we have noticed, are extremely likely to be only approximations in ancient times, even if recognized then; and our data are quite inadequate for clearing the subject. If certain equivalences between volumes in different countries are stated here, it must be plainly understood that they are only known to be approximate results, and not to give a certain basis for any theories of derivation. All the actual monumental data that we have are alluded to here, with their amounts. The impossibility of safe correlation of units necessitates a division by countries.

Egypt.—The hon was the usual small standard; by 8 vases whieh have contents stated in hons (8, 12, 20, 22, 33, 40) the mean is 29°2 cubic inches ‘6; by 9 unmarked pottery measures (30) 29°14°16, and divided by 20; by 18 vases, supposed multiples of hon (1), 82°14°2. These last are probably only rough, and we may take 29:2 cubic inches +°5. This was reckoned (6) to hold 5 utens of watcr (uten.. 1470 grains), which agrees well to the weight ; but this was probably an approximation, and not derivative, as there is (14) a weight called shet of 4°70 or 4°95 uten, and this was perhaps the actual weight ofa hon. The variations of hon and uten, however, covcr one another completely. From ratios stated before Greek times (35) the series of multiples was*

To, S=hon, 4=honnu, 10Sapet /.....0. 10=(Theban), 10=sa. or besha \4=tama 8°65 cub, in. 29°2 1168 1168 4672 11,680 116,800

(Theban) is the "great Theban measure."

In Ptolemaic times the artaba (2336), modified from the Persian, was general in Egypt, a working equivalent to the Attic metretes, — value 2 apet or 4 tama ; medimnus=tama or 2 artabas, and fractions down to zi, artaba (35). In Roman times the artaba remained (Didymus), but 4 was the usual unit (name unknown), and this was divided down to +4 or tq artaba (35),—thus producing, by 7y artaba a working equivalent to the xestes and sextarius (35). Also a new Roman artaba (Didymus) of 1540° was brought in. Beside the equivalence of the hon to 5 utens weight of water, the mathematical papyrus (35) gives 5 besha= % cubic cubit (Revillout's interpretation of this as 1 cubit? is impossible geometrically, see Rev. Eg., 1881, for data); this is very concordant, but it is very unlikely for 3 to be introduced in an Egyptian derivation, and probably therefore only a working equivalent. The other ratio of Revillout and Hultsch, 320 hons=cubit? is certainly approximate.

Syria, Palestine, and Babylonia.—Here there are no monumental data known ; and the literary information does not distinguish the closely connected, perhaps identical, units of these lands. More- over, nonce of the writers are before the Roman period, and many relied on are medixval rabbis. A large number of their statements are rough (2, 18, 33), being based on the working equivalence of the bath or epha with the Attic metretes, from which are some- times drawn fractional statements which seem more accurate than they are. This, however, shows the bath to be about 2500 cubic inches. There are two better data (2) of Epiphanius and Theo- doret,—Attic medimnus= 14 baths, and saton (4 bath)=12 modii; these give about 2240 and 2260 cubic inches. The best datum is in Josephus (Ant., iii. 15, 3), where 10 baths=41 Attic or 31 Sicilian medimni, for which it is agrecd we must read modii (33); hence the bath =2300 cubic inches. Thus these three different reckonings agree elosely, but all equally depend on the Greek and Roman standards, which are not well fixed. The Sicilian modius here is #4, or slightly under 3, of the bath, and so probably a Punic variant of the 4 bath or saton of Pheenicia. One

close datum, if trust- worthy, would be log of water= Assyrian mina .. bath about 2200 cubic inches. The rabbinical statement of cubic cubit of 21°5 holding 320 logs puts the bath at about 2250 cubic inches; their log-measure, holding six hen's eggs, shows it to be over rather than under this amount ; but their reckoning of bath =4 cubit cubed is*

but approximate; by 21°5 it is 1240, by 25:1 it is 1990 cubic

inches. The earliest Hebrew system was— ez, 4S)ab)i. wees… 8=hin, 6) _ fbath, or 1o= { homer—wet. SISSAROM...3.:.<<00. 10f— epha 4 ~ Lor kor—dry. 82 cub. in. 128 230 283 2300 23,000

'Issarén (" tenth-deal") is also called gomer. The log and kab are not found till the later writings ; but the ratio of hin to 'issarén is practically fixed in early times by the proportions in Num. xv. 4-9, Epiphanius stating great hin=18 xestes, and holy hin=9, must refer to Syrian xestes, equal to 24 and 12 Roman; this makes holy hin as above, and great hin a double hin, 7.¢., seah or saton. His other statements of saton=56 or 50 sextaria remain unex- plained, unless this be an crror for bath=56 or 50 Syr. sext. and .. =2290 or 2560 cubic inches. The wholesale theory of Revillout (35) that all Hebrew and Syrian measures were doubled by the Ptolemaic revision, while retaining the same names, rests entirely on the resemblance of the names apet and epha, and of log to the Coptic and late measure lok. But there are other reasons against accepting this, besides the improbability of such a change. The Pheenician and old Carthaginian system was (18)— log, 4=kab, 6=saton, 30=corus, 31 cub. in. 123 740 22,200 valuing them by 31 Sicilian=41 Attic modii (Josephus, above). The old Syrian system was (18)—*

cotyle, 2=Syr.xestes, 18=sabitha or saton, 1i=collathon, 2=bath-artaba ;

1 2220

21 cub. in. 41 740 1110 also Syr. xestes, 45—=maris, 2-=metretes or artaba.

41 1850 8700

The later or Selencidan system was (18)— cotyle, 2=Syr. xestes, 90=Syr. metretes,~

22 44 4000

the Syrian being 14 Roman sextarii. The Babylonian system was very similar (18) —

ap pany: 15=maris \G), 3 4=capitha, { WS vos. ccus: epha, 10=homer, 6=achane. 33 cub. in. 132

1980 2380 23,800 142,800

The approximate value from capitha-2 Attic cheenices (Xenophon) warrants us in taking the achane as fixed in the following system, which places it closely in accord with the preceding.

In Persia Hultsch states—

CAPCLIGI Te, «.esesese0e 48 =artaba, = =achane,

74-4 cub.in. 1983 142,800

the absolute values being fixed by artaba =51 Attic cheeniccs (Herod., i. 192). The maris of the Pontic system is 4 of the above, and the Macedonian and Naxian maris 7, of the Pontic (18). By the theory of maris=+ of 20°6? it is 1755:; by maris— Assyrian talent, 1850, in place of 1850 or 1980 stated above; hence the more likely theory of weight, rather than cubit, connexion is nearer to the facts.

Hyinetan System.—This is so called from according with the Aiginetan weight. The absolute data are all dependent on the Attic and Roman systems, as there are no monumental data. The series of names is the same as in the Attic system (18). The values are 14 x the Attic (Athenzus, Theophrastus, &c.) (2, 18), or more closely 11 to 12 times } of Attic. Hence, the Attic cotyle being 17°5 cubic inches, the ASginetan is about 25°7. The Beeotian system (18) included the achane; if this—Persian,

then cotyle=24°7. Or, separately through the Roman system, the mnasis of Cyprus (18)=170 sextarii; then the cotyle=24‘8. By the theory of the metretes being 14 talents Mginctan, the cotyle would be 23°3 to 24°7 cubic inches by the actual weights, whieh have tended to decrease. Probably then 25-0 is the best approximation. By the theory (18) of 2 metretes=cube of the 18°67 cubit from the 12°45 foot, the cotyle would be about 25:4, within “4; but then such a eubit is unknown among measures, and not likely to be formed, as 12°4 is 3 of 20°6. The Aiginetan systcm then was—

P J COM Serres ene eaccs: | LOMlees E a, Si esstaies hecteus, 4=metrctes, $y } =medimnus.

100 00 8200

25 cub. in. 300 4800

This was the system of Sparta, of Beotia (where the aporryma =4 cheenices, the cophinns=6 cheenices, and saites or saton or hecteus=2 aporryme, while 30 medimni=achane, evidently Asiatic connexions throughout), and of Cyprus (where 2 choes= Cyprian medimnus, of which 5=medimnus of Salamis, of which 2 =munasis) (18).

Altic or Usual Greek System.—The absolute value of this system is far from certain. The best data are three stone slabs, each with several standard volumes cut in them (11, 18), and two named vases. The value of the cotyle from the Naxian slab is 15°4 (best, others 14°6-19°6); from a vase about 16°6; from the Panidum slab 17°1 (var. 16°2~-18°2) ; from a Capuan vase 17°8; from the Ganus slab 17°8 (var. 17'-18"). From these we may take 17°5 as a fair approximation. It is supposed that the Panathenaic vases were intended as metretes ; this would show a cotyle of 14:4-17°1. The theories of connexion give, for the value of the cotyle, metretes= Aginetan talent, .:. 15°4-16°6; metretes $ of 12°16 cubed, .°. 16°6;

metretes= 2% of 12°16 eubed, .. 16°8; medimnus=2 Attic talents, hecteus=20 mine, ehenix=—24 mine, .. 16°75; metretes=3 eubie spithami (4 eubit=9°12), .°. 17°5; 6 metretes=2 feet of 12°45 eubed, .. 17°8 eubic inehes for eotyle. But probably as good theories eould be found for any other amount; and certainly the facts should not be set aside, as almost every author has done, in favour of some one of half a dozen theories. The system of multiples was for liquids— : cyathus, 1}=oxybaphon, 4¢=cotyle, 12=chous, 12=metretes,*

2-9 cub. in, 4°4 17°5 210 2520 with the tetarton (8°8), 2=cotyle, 2—xestes (85°), introduced from the Roman system. For dry measure—

eyathus, 6=cotyle, 4=chonix, 8=hecteus, 6=medimnus, 2°9 cub. in. 175 70 560 3360 with the xestes, and amphorens (1680)—4 medimnus, from the Roman system. The various late provincial systems of division are beyond our present seope (18).

System of Gythiwm.—A system differing widely both in units and names from the preceding is found on the standard slab of Gythium in the southern Peloponnesus (Rev. Arch., 1872). Writers have unified it with the Attie, but it is deeidedly larger in its unit, giving 19°4 (var. 19°1-19°8) for the supposed eotyle. Its system is—

cotyle, 38=(n). 58 cub. in. 2796 And with this agrees a pottery cylindrieal vessel, with official stamp on it (AHMOZION, &e.), and having a fine black line traced round the inside, near the top, to show its limit; this seems to be probably very accurate, and eontains 58°5 eubie inehes, elosely agreeing with the eotyle of Gythium. It has been described (Rev. Arch., 1872) as an Attie eheenix. Gythium being the southern port of Greece, it seems not too far to conneet this 58 eubie inehes with the double of the Egyptian hon=58°4, as it is different from every other Greek system.

Roman System.—The eelebrated Farnesian standard congius of bronze of Vespasian, " mensurae exaetae in Capitolio P, X.," eon- tains 206°7 eubie inches (2), and henee the amphora 1654. By the sextarius of Dresden (2) the amphora is 1695; by the congius of Ste Genevieve (2) 1700 eubie inches; and by the ponderarium measures at Pompeii (33) 1540 to 1840,

or about 1620 for a mean. So the Farnesian eongius, or about 1650, may best be adopted. The system for liquid was—

quartarius, 4=sextarius, 2=amphora;

8-6 cub. ins. 34-4 1650 for dry measure 16 sextarii=modius, 550 eubie inches; and to both systems were added from the Attie the cyathus (2°87), aceta- bulum (4°3), and hemina (17°2 eubie inches). The Roman theory of the amphora being the cubic foot makes it 1569 eubie inches, or deeidedly less than the aetual measures ; the other theory of its containing 80 libre of water would make it 1575 by the eom- mereial or 1605 by the monetary libra,—again too low for the measures. Both of these theories therefore are rather working equivalents than original derivations ; or at least the interrelation was allowed to beeome far from exact.

Indian and Chinese Systems.—On the ancient Indian system see Numismata Orientalia, new ed., i. 24; on the ancient Chinese, Nature, xxx. 565, and xxxv. 318.

STANDARDS OF WeEIGuT.—For these we have far more complete data than for volumes or even lengths, and ean ascertain in many cases the nature of the variations, and their type in each place. The main series on whieh we shall rely here are those— (1) from Assyria (38) about 800 3.c. ; (2) from the eastern Delta of Egypt (29) (Defenneh) ; (8) from western Delta (28) (Naucratis) ; (4) from. Memphis (44),—all these about the 6th century z.c., and therefore before mueh interference from the deereasing coin standards; (5) from Cnidus; (6) from Athens; (7) from Corfu ; and (8) from Italy (British Museum) (44). As other collections are but a fraction of the whole of these, and are much less completely examined, little if any good would be done by including them in the combined results, though for special types or inseriptions they will be mentioned.

146 grains.—The Egyptian unit was the kat, which varied between 138 and 155 grains (28, 29). There were several families or varieties within this range, at least in the Delta, probably five or sixinall(29). The original places and dates of these cannot yet be fixed, exeept for the lowest type of 1388-140 grains; this belonged to Heliopolis (7), as two weights (35)

inseribed of "the treasury of An" show 139°9 and 140°4, while a plain one from there gives 138°8; the variety 147-149 may belong to Hermopolis (35), aceord- ing to an inseribed weight. The names of the kat and tema are fixed by being found on weights, the uten by inseriptions; the series was—

4=hemihecton, 4=chous,

232 932

6=congius, 4=urna,

206 825

(2), 10=kat, 10=uten, 10=tema.

14-6 grs. 146 1460 14,600 The tema is the same name as the large wheat measure (35), which was worth 30,000 to 19,000 grains of eopper, according to Ptolemaic receipts and accounts (Rev. Hg., 1881, 150), and therefore very

likely worth 10 utens of eopper in earlier times when metals were seareer. The kat was regularly divided into 10; but another divi- sion, for the sake of interrelation with another system, was in } and 4, searcely found exeept in the eastern Delta, where it is common (29); and it is known from a papyrus (38) to be a Syrian weight. The uten is found+-6=245, in Upper Egypt (rare) (44). Another division (in a papyrus) (38) isa silver weight of { kat—about 88,— vee the Babylonian siglus of 86. The uten was also binarily ivided into 128 peks of gold in Ethiopia; this may refer to another standard (see 129) (33). The Ptolemaic copper coinage is on two bases,— the uten, binarily divided, and the Ptolemaic five shekels (1050), also binarily divided. (This result is from a larger number than other students have used, and study by diagrams.) The theory (3) of the derivation of the uten from 7255 eubile eubit of water would fix it at 1472, which is

accordant; but there seems no authority either in volumes or weights for taking 1500 utens. Another theory (3) derives the uten from 7455 of the eubie eubit of 24 digits, or better $ of 20°63; that, however, will only fit the very lowest variety of the uten, while there is no evidence of the existenee of sueh acubit. The kat is not unusual in Syria (44), and among the hematite weights of Troy (44) are nine examples, average 144, but not of extreme varieties. ; The great standard of Babylonia beeame the ae (ha paren of several other areca: and itself aan d its derivatives beeame more widel 465,000. ion 3 y : spread than any other standard. It was known in two forms,—one system (24) of— um, 60=sikhir, 6=shekel, 10=stone, 6=maneh, 60=talent; 36 ers. 21-5 129 1290 7750 465,000 and the other system double of this in each stage except the talent. These two systems are distinetly named on the weights, and are known now as the light and heavy Assyrian systems (19, 24). (It is better to avoid the name Babylonian, as it has other meanings also.) There are no weights dated before the Assyrian bronze lion weights (9, 17, 19, 38) of the 11th to 8th centuries n.c, Thirteen of this elass average 127°2 for the shekel ; 9 hematite barrel-shaped weights (38) give 128°2; 16 stone duek-weights (38), 126°5. A heavier value is shown by the precious metals,—the gold plates from Khorsabad (18) giving 129, and the gold darie coinage (21, 35) of Persia 129°2. Nine weights from Syria (44) average 128°8. This is the system of the " Babylonian " talent, by Herodotus =70 mine Euboie, by Pollux=70 mine Attic, by Hlian=72 mine Attie, and therefore about 470,000 grains. In Egypt this is found largely at Naueratis (28, 29), and less commonly at Defenneh (29). In both places the distribution, a high type of 129 and a lower of 127, is like the monetary and trade varieties above noticed ; while a smaller number of examples are found, fewer and fewer, down to 118 grains. At Memphis (44) the shekel is seareely known, anda 4 mina weight was there converted into another standard (of 200). A few barrel weights are found at Karnak, and several egg-shaped shekel weights at Gebelen (44); also two euboid weights from there (44) of 1 and 10 utens are marked as 6 and 60, whieh can hardly refer to any unit but the heavy shekel, giving 245. Hultseh refers to Egyptian gold rings of Dynasty XVIII. of 125 grains. That this unit penetrated far to the south in early times is shown by the tribute of Kush (34) in Dynasty XVIII.; this is of 801, 1448, and 23,741 kats, or 15 and 27 manehs and 74 talents when redueed to this system. And the later Ethiopie gold unit of the pek (7), or

y+, of the uten, was 10°8 or more, and may therefore be the 4 sikhir or obolos of 21°5. But the fraetion ;45, or a continued binary division repeated seven times, is such a likely mode of rude subdivision that little stress ean be Jaid on this. In later times in Egypt aelass of large glass scarabs for funerary purposes seem to be adjusted to the shekel (30). Whether this system or the Pheenician on 224 grains was that of the Hebrews is uneertain. There is no doubt but that in the Maceabean times and onward 218 was the shekel ; but, the use of the word darkemén by Ezra and Nehemiah, and the probabilities of their ease, point to the darag-maneh, ¢y maneh, or shekel of Assyria; and the mention of § shekel by Nehemiah as poll tax nearly proves that the 129 and not 218 grains is intended, as 218 was never+3. But the Maecabcan use of 218 may have been a reversion to the older shekel ; and this is strongly shown by the fraction 4} shekel (1 Sam. ix. 8), the eontinual mention of large decimal numbers of shekels in the earlier books, and the certain faet of 100 shekels being=mina. This would all be against the 129 or 258 shekel, and for the 218 or 224, There is, however, one good datum if it ean be trusted: 300 talents of silver (2 Kings xviii. 14) are 800 talents on Sennacherib's eylinder (34), while the 30 talents of gold is the same in both accounts. Fight hundred talents on the Assyrian silver standard would be 267 —or roundly 300—talents on the heavy trade or gold system, which is therefore probably the Hebrew. Probably the 129 and 224 systems coexisted in the country; but on the whole it seems more likely that 129 or rather 258 grains was the Hebrew shekel before the Ptolemaie times,—especially as the 100 shekels to the mina is parallelled by the following Persian system (Hultsch)—

WEIGHTS AND MEASURES

60=mina…...-.. 60=talent of gold BCE Y Gmice cM. 0s 0.cccececazscovee-oseee 60 =talent of trade, 129 grs. 6450 7750 387,000 465,000 the Hebrew system being gerah, 20=shekel, 100=maneh, 380=talent, 12-9 prs. 258? 25,800 774,000

and, considering that the two Hebrew cubits are the Babylonian and Persian units, and the volumes are also Babylonian, it is the more likely that the weights should have come with these. From the east this unit

passed to Asia Minor; and six multiples of 2 to 20 shekels (av. 127) are found among the hematite weights of Troy (44), including the oldest of them. On the Aigean coast it often occurs in early coinage (17), at Lampsacus 131-129, Phoceea 256-4, Cyzicus 252-247, Methymna 124°6, &c. In later times it was a main unit of North Syria, and also on the Euxine, leaden weights of Antioch (3), Callatia, and Tomis being known (38). The mean of these easteru weights is 7700 for the mina, or 128. But the leaden weights of the west (44) from Corfu, &c., average 7580, or 126°3 ; this standard was kept up at Cyzicus in trade long after it was lost in coinage. At Corinth thc unit was evidently the Assyrian and not the Attic, being 129-6 at the earliest (17) (though modified to double Attic, or 133, later) and being+3, and not into 2drachms. And this agrees with the mina being repeatedly found at Corcyra, and with the same standard passing to the Italian coinage (17) similar in weight, and in division into $,—the heaviest coinages (17) down to 400 B.c. (Terina, Velia, Sybaris, Posidonia, Mctapontum, Tarcntum, &c.) being none over 126, while later on may were adjusted to the Attic, and rose to 134. Six disk weights from Carthage (44) show 126. It is usually the case that a unit lasts later in trade than in coinage; and the prominence of this standard in Italy may show how it is that this mina (18 nncie =7400) was known as the "Italic" in the days of Galen and Dioscorides (2).

126 prs A variation on the main system was made by forming a

*6300 * mina of 50shekels. This is one of the Persian series(gold),*

- *and the } of the Hebrew series noted above. But it is most striking when it is found in the mina form which distinguishes it. Eleven weights from Syria and Cnidus (44) (of the curious type with two breasts on a rectangular block) show a mina of 6250 (125°0); and it is singular that this class is exactly like weights of the 224 system found with it, but yet quite distinct in standard. The same passed into Italy and Corfu (44), averaging 6000, —divided in Italy into uucie (,/5), and scripule ($5), and called litra (in Corfu'). It is known iu the coinage of Hatria (18) as 6320, And a strange division of the shekel in 10 (probably therefore connected with this decimal mina) is shown by a series of bronze weights (44) with four curved sidcs and marked*

with circles (British Museum, place unknown), which may be Romano-Gallic, averaging 125—-10. This whole class seems to cling to sites of Phcenician trade, and to keep clear of Greece and the north,—perhaps a Pheenician form of the 129 system, avoiding the sexagesimal multiples.

If this unit have any connexion with the kat, it is that a kat of gold is worth 15 shekcls or } mina of silver; this agrees well with the range of both units, only it must be remembered that 129 was used as gold unit, and another silver unit deduced from it. More likely then the 147 and 129 units originated independently in Egypt and Babylonia.

86 prs, From 129 grains of gold was adopted an equal value

8600: of silver—1720, on the proportion of 1: 13%, and this 516 000 was divided in 10=172,—which was used either in ~" this form, or its half, 86, best known as the siglus (17). Such a proportion is indicated in Num. vii., where the gold spoon of 10 shekels is equal in value to the bowl! of 180 shekels, or double that of 70, i.¢., the silver vessels were 200 and 100 sigli. The silver plates at Khorsabad (18) we find to be 80 sigli of 84°6. The Persian silver coinage shows about 86°0; the danak was } of this, or 28°7. Xcnophon and others state it at about 84. As a monetary weight it seems to have spread, perhaps entirely, in consequence of the Persian dominion; it varies from 174° downwards, usually 167, in Aradus, Cilicia, and on to the Aigean coast, in Lydia and in Macedonia (17). The silver bars found at Troy averaging 2744, or % mina of 8232, have been attributed to this unit (17); but no divisiou of the mina in 4is to be expected, and the average is rather low. Two hematite weights from Troy (44) show 86 and 87°2. The mean from leaden weights of Chios, Tenedos (44), &c., is 8430. A duck-weight of Camirus, probably early, gives 8480; the same passed on to Greece and Italy (17), averaging 8610; but in Italy it was divided, like all other units, into uncie and scripule (44). It is perhaps found in Etrnrian coinage as 175-172 (17). By the Romans it was used on the Danube (18), two weights of the first legion there showing 8610; and this is the mina of 20 uncie

(8400) named by Roman writers. The system was—

obol, 6=siglus, 100=mina, 60=talent.

14°3 grs. 86 8600 516,000

A derivation from this was the 4 of 172, or 57°3, the so-called Phocean drachma, equal in silver value to the ¢y of the gold 258 grains. It was used at Phocea as 58°5, and passed to the colonies

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of Posidonia and Velia as 59 or 118. The colony of Massilia brought it into Gaul as 58°2-54°9. 224 ors. That this unit (commonly called Pheenician) is derived 11.200: from the 129 system can hardly be doubted, both being 3 an, so intimately associated in Syria and Asia Minor. 672, 000. pec ws ' The relation is 258: 229::9:8; but the exact form in which the descent took place is not settled : y of 129 of gold is worth 57 of silver or a drachm, } of 230 (or by trade weights 127 and 226) ; otherwise, deriving it from the silver weight of 86 already formed, the drachm is 3 of the stater, 172, or double of the Persian danak of 28-7, and the sacred unit of Didyma in Ionia was this half drachm, 27; or thirdly, what is indicated by the Lydian coinage (17), 86 of gold was equal to 1150 of silver, 5 shekels, or yy Mina. Other proposed derivations from the kat or pek are not satisfactory. In actual use this unit varied greatly: at Naucratis (29) there are groups of it at 231, 223, and others down to 208; this is the earliest form in which we can study it, and the corre- sponding values to these are 130 and 126, or the gold and trade varieties of the Babylonian, while the lower tail down to 208 cor- responds to the shekel down to 118, which is just what is found. Hence the 224 unit seems to have been formed from the 129, after the main families or types of that had arisen. It is scarcer at Defenneh (29) and rare at Memphis (44). Under the Ptolemies, however, it became the great unit of Egypt, and is very prominent in the later literature in consequence (18, 35). The average of coins (21) of Ptolemy I. gives 219°6, and thence they gradually diminish to 210, the average (33) of the whole series of Ptolemies being 218. The ''argenteus" (as Revillout

transcribes a sign in the papyri) (35) was of 5 shekels, or 1090; it arose about 440 B.c., and became aftcr 160 B.c. a weight unit for copper. In Syria, as early as the 15th century B.c., the tribute of the Rutennu, of Naharaina, Megiddo, Anaukasa, &c. (34), is on a basis of 454-484 kats, or 300 shekels (,!, talent) of 226 grains, The commonest weight at Troy (44) is the shekel, averaging 224. In coinage it is one of the commonest units in early times ; from Phoenicia, round the coast to Maccdonia, it is predominant (17); at a maximum of 230 (Ialysus), it is in Macedonia 224, but seldom excceds 220 else- where, the earliest Lydian of the 7th century being 219, and the general average of coins 218. The system was—), 8=drachm, 4=shekel, 25=mina, 120=talent. 7 grs. 56 224 5600 672,000 From the Phenician coinage it was adopted for the Maccabean. It is needless to give the continual evidenccs of this being the later Jewish shekel, both from coins (max. 223) and writers (2, 18, 33) ; the question of the early shekel we have noticed already under 129. In Phenicia and Asia Minor the mina was specially made in the form with two breasts (.,4), 19 such weights averaging 5600 (=224) ; and thence it passed into Greece, more in a double value of 11,200 (=224). From Pheenicia this naturally became the main Punic unit ; a bronze weight from Iol (18), marked 100, gives a drachma of 56 or 57 (224~228); and a Punie inscription (18) names 28 drachmez=25 Attic, and .. 57 to 59 grains (228-236); while a prob- ably later series of 8 marble disks from Carthage (44) show 208, but vary from 197 to 234. In Spain it was 236 to 216 in different series (17), and it is a question whether the Massiliote drachme of 58-55 are not Phoenician rather than Phocaic. In Italy this mina became naturalized, and formed the "Italic mina" of Hero, Priscian, &c.; also its double, the mina of 26 uncie or 10,800, =50 shekels of 216; the average of 42 weights gives 5390 (=215°6), and it was divided both into 100 drachme, and also in the Italic mode of 12 unciz and 288 scripule (44). The talent was of 120 mine of 5400, or 3000 shekels, shown by the talent from Hercu- laneum, TA, 660,000 and by the weight inscribed PoNDO CxXXV. (z.¢., 125 libre) TALENTUM SICLORVM. ill., ¢.¢., talent of 3000 shekels (2) (the M being omitted ; just as Epiphanins describes this talent as 125 libre, or @(=9) nomismata, for 9000). This gives the same approximate ratio 96 : 100 to the libra as the usual drachma reckon- ing. The Alexandrian talent

of Festus, 12,000 denarii, is the same talent again. It is believed that this mina+12 unciz by the Romans is the origin of the Arabic ratl of 12 uktyas, or 5500 grains (33), which is said to have been sent by Harun al-Rashid to Charlemagne, and so to have originated the French monetary pound of 5666 grains. But, as this is probably the same as the English monetary pound, or tower pound of 5400, which was in use earlier (see Saxon coins), it seems more likely that this pound (which is common in Roman weights) was directly inherited from the Roman civilization. ‘ 80 ors,’ Another unit, which has scarcely been recognized in aa metrology hitherto, is prominent in the weights from 400.000, LSyPt,—some 50 weights from Naucratis and 15 from » Defenneh plainly agreeing on this and on no other basis. Its value varies between 76°5 aud 81°5,—mean 79 at Naucratis (29) or 81 at Defenneh (29). It has been conuected theoretically with a binary division of the 10 shekels or “‘stone” of the Assyrian systems (28), 1290 +16 being 80°6; this is suggested by the most usual mul- tiples being 40 and 80=25 and 50 shekels of 129; it is thus akin to the mina of 50 shekels previously noticed. The tribute of the Asi,*

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Rutennu, Khita, Assaru, &c., to Thothmes III. (34), though in un- even numbers of kats, comes out in round thousands of units when reduced to this standard. That this unit is quite distinct from the Persian 86 grains is clear in the Egyptian weights, which maintain a wide gap between the two systems. Next, in Syria three inscribed weights of Antioch and Berytus (18) show a mina of about 16,400, or 200× 82. Then at Abydus, or more probably from Babylonia, there is the large bronze lion-weight, stated to have been origin- ally 400,500 grains ; this has been continually+60 by different writers, regardless of the fact (Rev. Arch., 1862, 30) that it bears the numeral 100 ; this therefore is certainly a talent of 100 mine of 4005 ; and as the mina is generally 50 shekels in Greek systems it points to a weight of 801. Farther west the same unit oceurs in several Greek weights (44) which show a mina of 7800 to 8310, mean 8050+100=80°5. ‘Turning to coinage, we find this often, but usually overlooked as a degraded form of the Persian 86 grains siglos. But the earliest coinage in Cilicia, before the general Persian coinage (17) about 380 B.c., is Tarsus, 164 grains; Soli, 169, 163, 158; Nagidus, 158,161-158 later; Issus, 166; Mallus, 163-

154, — all of which can only by straining be classed as Persian ; but they agree to this standard, which, as we have seen, was used in Syria in earlier times by the Khita, &. The Milesian or "native" system of Asia Minor (18) is fixed by Hultsch at 168 and 81°6 grains,—the coins of Miletus (17) showing 160, 80, and 39. Coming down to literary evidence, this is abundant. Bockh decides that the "Alexandrian drachma" was ~ of the Solonic 67, or=80°5, and shows that it was not Ptolemaic, or Rhodian, or Mginetan, being distinguished from these in inscriptions (2). Then the " Alex- andrian mina" of Dioscorides and Galen (2) is 20 uncie =8250 ; in the " Analecta" (2) it is 150 or 158 drachmee=8100. Then Attic: Euboic or Aginetan : : 18: 25 in the metrologists (2), and the Euboic talent=7000 " Alexandrian" drachme; the drachma there- fore is 80°0. The "Alexandrian" wood talent: Attic talent: : 6 : 5 (Hero, Didymus), and.. 480,000, which is 60 minee of 8000. Pliny states the Egyptian talent at 80 libre 396,000 ; evidently = the Abydus lion talent, which is+100, and the mina is .'. 3960, or 50× 79-2, The largest weight is the "wood" talent of Syria (18)=6 Roman talents, or 1,860,000, evidently 120 Antioch minz of 15,500 or 2× 7750. This evidence is too distinct to be get aside; and, exactly confirming as it does the Egyptian weights and coin weights, and agreeing with the early Asiatic tribute, it cannot be overlooked in future. The system was*

drachm, 2=stater, 50=mina, 50=talent. 60= Grecictalent: 80 ars. 160 8000 400,000 480,000 This system, the Mginetan, one of the most im- 20m Coy. ee portant to the Greek world, has been thought to 579 000 be a degradation of the Pheenieian (17, 21), sup-

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posing 220 grains tohave been reduced in primitive Greek usage to 194. But we are now able to prove that it was an independent system—(1) by its not ranging usually over 200 grains in Egypt before it passed to Greece ; (2) by its earliest example, le before the 224 unit existed, not being over 208; and (3) by there being no intermediate linking on of this to the Phoenician unit in the large number of Egyptian weights, nor in the Ptolemaic coinage, in which both standards are used. The first example (30) is one with the name of Amenhotep I. (17th century 8.c,) marked as "

gold 5," whieh is 5 × 207°6. Two other marked weights are from Memphis (44), showing 201 °8and 196°4, and another Egyptian 19174. The range of the (34) Naucratis weights is 186 to 199, divided in two groups averaging 190 and 196, equal to the Greek monetary and trade varieties. Ptolemy I, and II. also struck a series of coins (32) averaging 199. In Syria hematite weights ave found (30) averaging 198°5, divided into 99°2, 49°6, and 24:8; and the same division is shown by gold rings from Egypt (38) of 24-9. In the medical Ronee (38) a weight of % kat is used, which is thought to be

yrian; now § kat—92 to 101 grains, or just this weight which we have found in Syria ; and the weights of 3 and 1 kat are very rare in Egypt except at Defenneh (29), on the Syrian road, where they abound. – So we have thus a weight of 207-191 in Egypt on marked weights, joining therefore completely with the Mginetan unit in Egypt of 199 to 186, and coinage of 199, and strongly connected with Syria, where a double mina of Sidon (18) is 10,460 or 50x 209°2. Probably before any Greek coinage we find this among the hematite weights of Troy (44), ranging from 208 to 193-2 (or 104— 96°6), z.¢., just covering the range from the earliest Egyptian down to the early aren. eoinage. Turning now to the early coinage, we see the fuller weight kept up (17) at Samos (202), Miletus (201), Calymna (100, 50), Methymna and Scepsis (99, 49),1 Ionia (197); while the coinage of Mgina (17, 12), which by its wide diffusion made this unit best known, though a few of its earliest staters go up even to 207, yet is characteristically on the lower of the two groups which we recognize in Egypt, and thus started

1 That this unit was used for gold in Egypt, one thousand years before becom- ing a silver coin weight in Asia Minor, need not be dwelt on, when we see in the coinage of Lydia (17) gold pieces and sitvcr on the same standard. which was expressly formed for silver alone, ¢.¢., 84 grains. The Attic and Assyrian stand- ards were uscd indifferently for either gold or silver.

WEIGHTS AND

MEASURES what has been considered the standard value of 194, or usually 190, decreasing afterwards to 184. In later times, in Asia,

however, the fuller weight, or higher Egyptian group, which we have just noticed in the coinage, was kept up (17) into the series of cistophori (196-191), as in the Ptolemaic series of 199. At Athens the old mina was fixed by Solon at 150 of his drachme (18) or 9800 grains, according to the earliest drachme, showing a stater of 196; and this continued to be the trade mina in Athens, at least until 160 B.c., but in a reduced form, in which it equalled only 138 Attic drachme, or 9200. The Greek mina weights show (44), on an average of 57, 9650 (=stater of 193), varying from186 to 199. In the Hellenic coinage it varies (18) froma maximum of 200 at Phare to 192, usual full weight; this unit occupied (17) all central Greece, Peloponnesus, and most of the islands, The system was— obol, 6=drachm, 2=stater, 50=mina, 60=talent. 16 grs. 96 192 9600 576,000 It also passed into Italy, but in a smaller multiple of 25 drachme, or } of the Greek mina; 12 Italian weights (44) bearing value marks (which cannot therefore be differently attributed) show a libra of 2400 or } of 9660, which was divided in unciz and sextule, and the full-sized mina is known as the 24 uncia mina, or talent of 120 libre of Vitruvius and Isidore (18)=9900. Hultsch states this to be the old Etruscan pound. 1 With the trade mina of 9650 in Greece, and recognized 4950 ors, 11 Italy, we can hardly doubt that the Roman libra is S'S: the halfof thismina. At Athens it was 2× 4900, and on the average of all the Greek weights it is 2 × 4825, so that 4950 —the libra—is as close as we need expect. The division by 12 does not affect the question, as every standard that came into Italy was similarly divided. In the libra, as in most other standards, the value which happened to be first at hand for the coinage was not the mean of the whole of the weightsin the country ; the Phoenician coin weight is below the trade average, the Assyrian is above, the figinetan is below, but the Roman coinage is above the average of trade weights, or the mean standard. Rejecting all weights of the lower empire, the average (44) of about 100 is 4956; while 42 later Greek weights (nomisma, &c.) average 4857, and 16 later Latin ones (solidus, &c.)show 4819. The coinage standard, however, was always higher (18) ; the oldest gold shows 5056, the Campanian Roman 5054, the consular gold 5037, the aurei 5037, the Constantine solidi 5053, and the Justinian gold 4996. Thus, though it fell in the later entpire, like the trade weight, yet it was always above that. Though it has no exact relation to the congius or amphora, yet it is closely 4977 grains, the x5 of the cubic foot of water. If, however, the weight in a

degraded form, and the foot in an unde- graded form, come from the East, it is needless to look for an exact relation between them, but rather for a mere working equivalent, like the 1000 ounces to the cubic foot in England. Béckh has re- marked the great diversity between weights of the same age,—those marked "Ad Augusti Temp" ranging 4971 to 5535, those tested by the fussy prefect Q. Junius Rusticus vary 4362 to 5625, aud a set in the British Museum (44) belonging together vary 4700 to 5168. The series was— siliqua, 6=scripnlum, 4=sextula, 6=uncia, 12=libra, 2°87 grs. 172 68°7 412 4950 the greater weight being the centumpondium of 495,000. weights were added to these from the Greek system— obolus, 6=drachma, 2=sicilicus, 4=uncia; 7 8°6 grs. 515 103 412 and the sextula after Constantine had the name of solidus as a coin weight, or nomisma in Greek, marked N on the weights. A beautiful set of multiples of the scripulum was found near Lyons (38), from 1 to 10× 17°28 grains, showing a libra of 4976. In Byzantine times in Egypt glass was used for coin-weights (30), averaging 68:0 for the solidus = 4896 for the libra. The Saxon and Norman ounce is said to average 416°5 (Num. Chron., 1871, 42), apparently the Roman uncia inherited. The system which is perhaps the best known, through

Other

oe its adoption by Solon in Athens, and is thence called 402,000 Attic or Solonic, is nevertheless far older than its intro-

000.

duction into Greece, being found in full vigour in Egypt in the 6th century z.c. It has been usually reckoned as a rather heavier form of the 129 shekel, increased to 134 on its adoption by Solon. But the Egyptian weights render this view impossible. Among them (29) the two contiguous groups can be discriminated by the 129 being multiplied by 30 aud 60, while the 67 or 134 is differently x 25, 40, 50, and 100. Hence, although the two groups overlap owing to their nearness, it is impossible to regard them as all one unit. The 129 range is up to 131°8, while the Attic range is 130 to 138 (65-69). Hultsch reckons on a ratio of 24 : 25 between them, and this is very near the true values; the full Attic being 67°3, the Assyrian should be 129:2, and this is just the full gold coinage weight. We

may perhaps see the sense of this ratio through another system. The 80 grain system, as we have seen, was prob- ably formed by binarily dividing the 10 shekels, or "stone"; and it had a talent (Abydus lion) of 5000 drachme ; this is praetically identical with the talent of 6000 Attic drachniz. So the talent of

the 80 grain system was sexagesimally divided for the mina which was afterwards adopted by Solon. Such seems the most likely history of it, and this is in exact accord with the full original weight of each system. In Egypt the mean value at Naucratis (29) was 66°7, while at Defennch (29) and Memphis (44)—probably rather earlier—it was 67°0. The type of the grouping is not alike in different places, showing that no distinct families had arisen before the diffusion of this unit in Egypt; but the usual range is 65°5 to 69°0. Next it is found at Troy (44) in tliree cases, all high examples of 68°2 to 68°7; and thesc are very important, since they cannot be dissociated from the Greek Attic unit, and yet they are of a variety as far removed as may be from the half of the Assyrian, which ranges there from 123°5 to 131; thus the difference of unit between Assyrian and Attic in these earliest of all Greek weights is very strongly marked. At Athens a low variety of the unit was adopted for the coinage, true to the object of Solon in depreciating debts; and the first coinage is of only 65°2, or scarcely within the range of the trade weights (28); this seems to have been felt, as, contrary to all other states, Athens slowly increased its coin weight up to 66°6, or but little under the trade average. It gradually supplanted the Aiginetan standard in Greece and Italy as the power of Athens rose; and it was adopted by Philip and Alexander (17) for their great gold coinage of 183 and 66°5. This system is often known as the "Euboic," owing to its early use in Eubcea, and its diffusion by trade from thence. Thc series was— chaleous, 8=obolus, 6=drachma, 100=mina, 60=talanton.

1-4 grs. 11:17 6700 402,000 Turning now to its usual trade values in Greece (44), the mean of 113 gives 67°15; but they vary more than the Egyptian examples, having a sub-variety both above and below the main

body, which itself exactly coincides with the Egyptian weights. Thc greater part of those weights which bear names indicate a mina of double the usual reckoning, so that there was a light and a heavy system, a mina of the drachma and a mina of the stater, as in the Pheenician and Assyrian weights. In trade both the mine were divided in 4, 2, 4, 3, and 4, regardless of the drachme. This unit passed also into Italy, the libra of Picenuni and the double of the Etrurian and Sicilian libra (17); it was there divided in uncie and scripule (44), the mean of 6 from Italy and Sicily being 6600; one weight (bought in Smyrna) has the name "Leitra" on it. In literature it is constantly referred to; but we may notice the " general mina" (Cleopatra), in Egypt, 16 uncie =6600; the Ptolemaic talent, equal to the Attic in weight and divisions (Hero, Didymus); the Antiochian talent, equal to the Attic (Hero); the treaty of the Romans with Antiochus, naming talents of 80 libre, ¢.¢., mina of 16 unciz; the Roman miua in Egypt, of 15 uncie, probably the same diminished; and the Italic mina of 16 uncix. It seems even to have lasted in Egypt till the Middle Ages, as Jabarti and the "'katib's guide" both name the ratl misri (of Cairo) as 144 dirhems

= 6760.

We have now ended our outline of ancient metrology, omitting all details that were not really necessary to a fair judgment on the

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standard was probably 7002 grains.) Ale gallon of 1601=282 cubic inches, and wine gallon of 1707=231 cubic inches, both abolished in 1824. Winchester corn bushel of 8 × 268°8 cubic inches and gallon of 274} are the oldest cxamples known (Henry VII.), gradu- ally modified until fixed in 1826 at 277-274, or 10 pounds of water.

French Weights and Measures Abolished. —Often needed in read- ing older works.

*ligne, 12=pouce, 12=pied, 6=toise, 2000=lieue de poste, "08883 in. 1:0658 12°7892 716°735 2°42219 miles. grain, 72=gros, 8=once, 8=mare, 2=poids de marc. *8197 or. 59°021 472°17 3777°33 1:0792 ib.*

Rhineland foot, much used in Germany, =12°357 inches=the foot of the Scotch or English cloth ell of 87°06 inches, or 3 × 12°353.

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of weights, allin next); (38) M. C.Soutzo, Htalons Pondéeraux Primitifs, 1884 (lists of all weights published to date); (39) Id., Systémes Monctaires Primitifs, 1884 (derivation of units); (40) G. Smith, in Zeits. Aeg. Sp., 1875; (4x) L. Stern, in Rev. £g., 1881, 171 (Egyptian weights); (42) P. Tannery, Rev. Arch., xli., 1523; (43) E. Thomas, Numismata Orientalia, pt. i. (Indian weights). Many isolated papers in Revue Archéologique, Hellenic Journal, &c., are not specified above; and (44) a great amount of material is yet unpublished of weighings of weights of Troy (supplied through Dr Schliemann's kindness), Memphis, at the British Museum, Turin, &c., which may probably appear before long, and which has been utilized in this article.

TIL. CommeErctat.

In this section we shall only refer to such measures as are in actual use at the present time ; the various systems of the Continental towns have been superseded by the metric system now in force, and are therefore not needed

now except for historical purposes.

subject, but trying to make as plain as possible the actual bases of English information, to trust to no opinions apart from facts, and to leave Great Britain. — weights what is stated as free as possible from the influence of theories. Length :— and Theoretical values have nowhere been adopted here as the standards, inch, 5k=pole, 4=chain, 10=furlong, 8=mile. ypeasures,

12=foot, 38=yard, lin. Wy 36 198 792 7920 63360 Hand, 4 inches; fathom, 2 yards; knot or geographical nile = 1'= 1'1507 miles. The chain is divided in 100 links for land measure ; link = 7°92 inches.

Terms of square measure are squares of the long measures.

contrary to the general practice of metrologists; but in each case the standard value is stated solely from the evidence in hand, quite regardless of how it will agree with the theoretical deduction from other weights or

measures. Great refinement in statements of values is ncedless, looking to the uncertainties which beset us.

There are innumerable theories unnoticed here; ouly those arc Volume: dry :— explained which seem to have a reasonable likelihood, and others pint, 2=quart, 4=gallon, 2=peck, 4=bushel, 8=quarter. arc only mentioned where it is needful to show that they have not cub, in. 34°659 69-318 277-274 554-548 221819 117456

been overlooked. In many cases fuller detail is given of less im- portant points, when they have not been published before, and no other information can be referred to elsewhere; when any point is abundantly proved and known, it has been passed with a mere

Gill=} pint; pottle=2 quarts; 5 quarters=wey or load; 2 weys= last. Volume : wet :—

. : i : : 5 Pint and quart ae 4=barrel or 2=pipe, butt, or mention. Finally, to indicate where further information on different : ae ey } gallon, 9=firkin, sen puncheon. matters may be found reference is frequently made by a nuinber to cub. ins. 277°274 —-:2495‘5 9981°9 19963°8

the list of works given below, some early and other works bcin omitted, of which all the data will be found in later books.

For historical reference we may state the following units legally abolished,

English Weights and Measwres Abolished.—The yard and hand- ful, or 40 inch ell, abolished in 1439. The yard and inch, or

§ | Avoirdupois weight, for everything not excepted below :—

drachm, 16=ounce, 16=pound, 14=stone, 2=quarter, 4=hundred, 20=ton. 27°3 grains. 437°5 7000 98,000 196,000 grs. 112 tb 2240 ib.

Troy weight (gold, silver, platinum, and jewels, exccpt diamonds and pearls) :—

. i = i — = (al, 37 inch ell (cloth measure), abolished after 1553; known later eat 2 Sn pene al = Po760 as the Scotch ell=37:06. Cloth ell of 45 inches, used till 1600. Diamond and pearl weight: —

The yard of Heury VII. =35°963 inches. Saxon moneyers pound, or Tower pound, 5400 grains, abolished in 1527. Mark, 2 pound= 3600 grains, Troy pound in use in 1415, established as monetary pound 1527, now restricted to gold, silver, and jewels, excepting

grain, 4=carat, 8 grain 3°2 Apothecaries' dispensing weight, for prescriptions only :—

150 =ounce Troy.

480

diamonds and pearls. Merchant's pound, in 1270 established for Tein cca ean me ee oa im oe all except gold, silver, and medicines=6750 grains, generally ea es' Hild ieaedis —

superseded by avoirdupois in 1303. Merchant's pound Ceo adi foes 20=pint, 8=gallon. grains, from France and Germany, also superseded. (" Avoirdepois " Siete Waker —e ee 8,750 70,000 occurs in 1386, and has been thence continued ; the Elizabethan 036 cub. in. '216 1733 34659 = Q77-274

XXIV. — 62

Metric system,

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Metric System.—The report to the French National Assembly proposing this system was presented 17th March 1791, the meridian measurements finished and adopted 22d June 1799, an intermediate system of division and names tolerated 28th May 1812, abolished and pure decimal system enforced Ist January 1840. Since then Netherlands, Spain (1850), Italy, Greece, Austria (legalized 1876), Germany, Norway and Sweden (1878),

Switzerland, Portugal, Mexico, Venezuela, Argentine Republic, Hayti, New Grenada, Mauritius, Congo Free State, and other states have adopted this system. The use of it is permissive in Great Britain, India, Canada, Chili, &. The theory of the system is that the metre is a 10,000,000th of a quadrant of the earth through Paris; the litre is a cube of #5 metre; the gramme is zy/y5 of the litre filled with water at 4° C.; the franc weighs 5 grammes. The multiples are as follows :—

British. France. Netherlands. Other Names.

strich zentimeter

streep

duim

palm

elle or auno

millimetre centimetre decimetre METRE kilometre

039 inch

metre, stab 62138 mile kilometer, stadion 176 pint decilitre 7G, LITRE 17°608 , decalitre 88-038 (50 litres)

176°077 hectolitre

liter or kanne schepel ~ fig scheffel hektoliter, fasse, mudde kilot milligramme GRAMME decagramme hectogramme (500 grammes) kilogramme

(50 kilogr.) 100 kilogr. Pn. { 1000 kilogr,

drom loth

wigtije lood

ons 2190 pfund, livre

15432°35 pond

110°23 ib zentner, zolleent- centner métri- que, quintal

tonne, tonneau

220°46 „

2204-62 „

In land measure the unit is the are (10 metres square)=119°60 square yards; and the hectare=2°4736 acres. Other multiples of the units are merely nominal and not practically used.

Table for Conversion of British and Metric Units.

*Milli- Cubic Cubic Cubic Cubic Inches. metres. Metres.| Feet. Inches.| Centimetres.|} Metres. Feet, 1 25°399 1 3°2809 1 16°386 1 35°316 2 50°799 2 6°5618 32°772 g 70°633 3 76°199 3 9°8427 3 49°168 2 105°950 4 101°598 4 13°1236 4 85545 4 141°266 5 126-998 5 16°4045 5 81°931 5 176°583 6 152°397 6 19°6854 6 98°317 6 211°899 df 177°797 i 22°9663 7 114‘703 7 247°216 8 203°196 8 26°2472 8 131-089 8 282°533 9 228°596 9 29°5281 #) 147°476 9 317°849 Pints. | Litres. || Litres.) Gallons. ||Grains.| Grammes. Kilos. | Pounds. 1 “56755 1 *22024 1 “064799 1 2°6792 2 1°13510 2 “44049 2 *129598 2 5°3584 3 1°70265 3 66073 3 “194397 3 8°0377 4 2°27020 4 *88098 4 “259196 4 10°7169 5 2°83775 5 1°10122 5 °323994 5 13°3961 6 3°40530 6 1°32146 6 “388794 6 16°0754 7 3°97286 7 1°54171 Z 453593 i 18°7546 8 4°54041 8 1:76195 8 518392 8 21°4338 9 5°10796 9 1°98220 9 *583190 9 24°1130*

For approximate conversion either way use the following ratios: — 8 metres=315 inches (to z>$a5); 8 kilometres=5 miles (to 45); 4 litres=7 pints (to $5); 7 grammes=108 grains (to rd55).

Burmah, —Paulgaut 1 inch, taim 18 inches, saundaung 22 inches, dha 154 inches, dain 2°48 miles. Kait 251 grains, vis 3°59 Th, sait 14°36, ten

57°36, candy 533 Ib.

Candia.—Pic 25°11 inches, carga (corn) 4°19 bushels, rottolo 1°165 tb, cantaro 116°5 Ib, okka 2°65 tb.

Ceylon. —Seer 1°86 pints; 10 parrahs, 1 amomam, 5°6 bushels.

China,—Fau '141 inches, tsun 1°41, chik 14°1, cheung 141, yan 1410=117°5 feet. Other chiks—itinerary 12°17, imperial 12°61 surveyors 12°70, Peking 13°12, Canton 14°70 inches. Li=1800 chiks of 12°17, 13°12, or 14°1. Kop 3°3 cubic inches; 10=shing tsong 96 pint, tau 9°6 (12 catties of water), hwuh 96 pints. Tael 580°3 grains; 16=catty, 9328 grains or 1'333 Ib; picul 133°3 th.

Denmark.—Tomme 1°03 inches, fod 12°357, aln 24°714; miil 4°6807 miles. Pott °2126 gallons; 2=kande, 2=stiibchen, 2=— viertel 1°7008 gallons; anker 8°2914 gallons. Pot '02657 bushel, skieppe °47835, fjerding '9567, tonne 3°8268, last 84°188 bushels. Ort 15°1 grains, quintin 60°3, lod 241°2, nnze 482°5, mark 3860, pund 7720=1'103 tb=} kilogramine. Lispund 17°646 tb, skip- pund 8'151 cwt. Tonde (land) 1°25 acres, (coal) 4°6775 bushels.

Egypt.—Dir& of Nilometer 21°3 inches, dira' beledi 22°7, dira' handasi 25°18, pie or dira Stambuli 26°65 inches; pic of land,

WEIGHTS AND MEASURES

29°58, kasab 139°8 inches. Feddan 1,5 acre. Ruba 6°6 pints or quarts, wébe 6°6 gallons, ardeb 39°6 or 46°4 gallons. Dirhem 60°65 grains, ratl 1°0181 tb, okka 2°7274 tb, kantdr 101°31 Tb. India. —Bengal—gaz=yard. Bombay—gaz 27 inches, hath 18 inches. Madras—covid 18°6 inches. Bengal—cottah (kattha) 80 square yards; 20=biggah, 1600 square yards. Madras—24 mauris =cawri, 6400 square yards. Seer, 40=maund, 20—candy. Equivalents of Indian and other weights are as follows :—

Bengal

Factory. Madras.

Commercial Weights, &c. | Avoirdupois. Bombay.

tb oz. dr. Imds. s. ch. |mds. vis, pol.) mds. s. pice.

Acheen bahar of 200

oniiesoMeela f.ce 423 6 13 5 2613 16 719 15 4 27 Ache suncha of Meee | @ 87 197| eyhae | 7 34 sc a 560 0 0 & 20) 0 22 3 8 20 0 0 Bencoolen bahar……., 560 0 0 7 20 Sac 20 0 0 Bengal factory maund….| 7410 10:7] 1 7 35°7 2 26 20 Bengal bazaar maund…..) 82 2 21] 1 vA AER 2 37 10 Bombay candy of 20 MIAUNOS. .Mese-scssness en — 2 — BOE 8S) Bussorah maund of 76 ; SVELELOS ognncioososocoosonnd oe et : 4 352 seis

28 8 0 0 1 48 1 0 21:4

p 30 0 0 0 1 24 ly 2925:7 Cochin candy of 20 ; i TIPU ier ceecsrecease oe 7 PoE cag) NEES Gombroon bazaar candy.| 7 & 0 0 216 0 10 21-4 Goa candy of 20 maunds} 495 0 0 6 6 16 17 27 4:3 Jonkceylon bahar of 8 _ i CaypllSpeevenereneecers cane seb Bobs) 6 PLL Mt Te Madras candy of 20 ois IMAUWOSs. occ creereseces — . pO ie Mocha bahar of 15 frazils| 450 0 0 6 0 0 16 2 25-7 Muscat custom – house 812 0 0 2 32 012.15 Mysorecandyof7 morahs| 560 0 0 | 7 3 8 | 20 0 0 Pegu candy of 150 vis…..) 500 0 0 6 0 0 17 34 86

133 5 53) 1 2 26 4 30 14:3

Surat maund of 40 seers..| 37 5 53] 0 3 37:9 113 10 Surat pucca maund…….. 7410 10-7/ 1 7 357 2 26 20 Tillycherry candy of 20 MAUNAS.....0c.0006 } aw © = a i ie

Bengal bazaar weights are -y greater than factory weights. Grain and native liquids are usually weighed.

Japan.—Boo, 10=sun, 10=shaku (11°948 inches=}$ metre), 6=ken, 60=cho, 39=ri (2°647 miles). Go (11°1 cubic inches), 10=sho, 10=to, 10=koku (5°011 bushels). Momme 57°97 grains, 160=kin or catty (1°325 tb), 1000 momme=kuanme (8°281 fb).

Java.—FEll 27? inches. Kanne °3282 gallon ; rand, 396 =leaguer of arrack, 1834 gallons; 360 rands=leaguer of wine. Rice—sack, 2=picul 1853 Ib, 5=timbang; coyang 3581 fb.

Malacca,—Covid 18} inches; buncal 832 grains (gold and silver) ; kip 41 fb (tin); 100 catties=picul, 135 fb; 3 piculs=bahar; 40 piculs=coyau of salt or rice; 500 gantons=50 measures—1 last, nearly 29 cwts.; chupah=24 tb; gautang (=ganton?), 9 Ib of water at 62°.

Malta.—Palmo 10°83 inches, foot 7°2 and 11°17 inches, canna 82‘4 inches; 16 tumoli=salma, 4°44 acres. Caffiso (oil) 4°58 gallons; barile (wine) 9°16 gallons; salma (corn) 7°9 bushels. Ounce 407°2 grains ; rottolo 1°745 Ib; cantaro 174°5 ib.

Mexico. —Vara 32°97 inches. Fanega 1°50 bushels. Libra 1°0142 fb.

Morocco.—Canna 21 inches: commercial rottolo 1°19 tb, 100= quintal; market rottolo 1°785 Ib.

Persia, —Gaz (gueze), 6 handbreadths or 25 inches. Royal gaz 374 inches. Arash 38°27 inches. Parasang or farsakh 3 geographical miles (an hour’s walk for a horse). Sextario (21 cubic inches), 4= chenica, 2=capicha (2°4 quarts), 25=artaba(1°9 bushels). (These, as the native names show, are not native measures. As Chardin remarks, there are no true measures of capacity; even liquids are sold by weight.) Dirhem, 143 (Bussora), 147°8 (Tabriz), or 150 grs. Mescal, 2=dirhem, 50=ratl (7300 grains), 6=man or batman.

Russia.—Vershok (1°75 inches), 16=archine, 3=sagene (7 feet British, legally), 500=verst (“663 mile); 2400 square sagenes= deciatine (2°7 acres). Tcharkey (‘216 pint), 100 —vedro, 3=anker, 40 vedros=sarakovaia (324°6 gallons). Garnietz 2=tchetverka, 4=tchetverik, 2=paiak, 2=osmin, 2=tchetvert (5°77 bushels). Dola (°68578 grains) ; 96=zolotnic ; 8=lana; 12=funt (6319°7279 grains); 40=pud (36°112 tb); 10=berkovitz; 3=packen. Also 3 zolotnices=1 loth.

Siam.—Nin, 12=ktib (10 inches), 2=sok, 4=wa (79°999 inches on silver bar at 85° Fahr.), Thangsat, 10× 10×20 nin, actual standard 1159°8477

cubic inches at 85°=2°08 pecks. Thanan, 5×5×4 nin, standard 57°8800 at 85°=1°67 pints. Tical or bat (234°04 grains), 4=tael, 4=catty or chang, 50=picul or hap (133°738 tb).

Turkey.—Pic 26°8 or 27°06 inches; larger pic 27°9. Almud 1°15 gallons (of oil=8 okas) ; 4 killows=fortin of 3°7 bushels (killow

of rice=10 okas). Dram (49°5 grains), 100=chequi, 4=oka

As weights of grain are often needed we add pounds weight in

(2°8286 tb); dram (49°5 grains), 180=rotl, 100=kintal or kantar | cubic feet.

(127°29 tb).

United States. —Inch=1°000049 British inch, and other measures in proportion. Gallon=-83292 British gallon. Bushel= ‘96946 British bushel. Weight, as Great Britain.

See Kelly’s Universal Cambist ; Dourstber’s Dictionnaire Universelle des Poids et Mesures; Woolhouse, Weights and Measures; recent Reports of Board of Trade and Standards Department.

WEIMAR, the capital of the grand-duchy of Saxe- Weimar-Eisenach, the largest of the Thuringian states, is situated in a pleasant valley on the Ilm, 50 miles south- west of Leipsic and 136 miles south-west of Berlin. Containing no very imposing edifices, and plainly and irregularly built, the town presents at first a somewhat unpretending and even dull appearance ; but there is an air of elegance in its quiet and clean streets, which recalls the fact that it is the residence of a grand-duke and his court, and it still retains an indescribable atmosphere of refinement, dating from its golden age, when it won the titles of “ poets’ city” and “‘ the German Athens.” Weimar has now no actual importance, though it

will always remain a literary Mecca. It is a peaceful little German town, abounding in excellent educational, literary, artistic, and. benevolent institutions; its society is cultured, though perhaps a little narrow ; while the even tenour of its existence is undisturbed by any great commercial or manufacturing activity. The population in 1885 was 21,565; in 1782, six years after Goethe's arrival, it was about 7000; and in 1834, two years after his death, it was 10,638.

The reign of Goethe's friend and patron, the grand-duke Charles

Augustus (1775-1828), represents accurately enough the golden age of Weimar ; though even during the duke's minority, his mother,

theduchess Amalia " a Vat

had begun to make the little court a

focus of light and |_ "© JEG leading in Ger- many. The most SAD sf

striking building Fae in Weimar is the Bo extensive palace, erected for Charles Augustus under the superintendence of Goethe in 1789- 1808, in place of one burned down mo y 77 0: This building, with the associations of its erection, and its "noets' rooms," de- dicated to Goethe, Schiller, Herder, and Wieland, epi- tomizes the charac- teristics of the town. The main interest of Weimar centresin these men and their more or less illustrious con- temporaries; and, above all, Goethe, whose altar to the 'genius hujus loci" still stands in the ducal park, is himself the genius of the place, just as Shakespeare is of Stratford-on-Avon, or Luther of Wittenberg. Goethe's residence from 1782 to 1832 (now opened as a "Goethe museum," with his collections and other reminiscences), the simple " garden-house" in the park, where he spent many summers, Schiller's humble abode, where he lived from 1802 till his death in 1805, and the grand-ducal burial vault, where the two poets rest side by side, are among the most frequented pilgrim resorts in Germany. Rietschel's bronze group of Goethe and Schiller (unveiled in 1857) stands appropriately in front of the theatre (much altered in 1868) which attained such distinction under their combined auspices. Not far off is the

large and clumsy parish church, built about 1400, of which Herder became

Plan of Weimar.

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Close…...

See Report of Standards Department, 1884. (W.M. F. P.)

pastor in 1776; close to the church is his statue, and his house is still the parsonage. Within the church are the tombs of Herder and of Duke Bernhard of Weimar, the hero of the Thirty Years' War. The altar-piece—a Crucifixion—is said to be the masterpiece of Lucas Cranach, whose house is pointed out in the market-place. Wieland, who came to Weimar in 1772 as the duke's tutor, is also commemorated by a statue, and his house is indicated by a tablet. Among the other prominent buildings in Weimar are the library, containing 200,000 volumes and a valuable collection of portraits, busts, and literary and other curiosities ; the museum, built in 1863-68 in the Renaissance style; the ancient church of St James, with the tombs of Lucas Cranach and Museus; and the town-house, built in 1841, Various points in the environs of Weimar are also interesting from their associations. Separated from the town by the park, laid out in the so-called English style by Goethe, is the chateau of Belvedere, built in 1724. To the north-east is Tiefurt, often the scene of al-fresco plays, in which the courtiers were the actors and the rocks and trees the scenery; and to the north-west is the chateau of Ettersburg, another favourite resort of Charles Augustus and his court.

The history of Weimar, apart from its brilliant record at the end of the 18th and the beginning of the 19th century, is of compara- tively little

interest. The town is said to have existed in the 9th century, and in the 10th to have belonged to a collateral branch of the family of the counts of Orlamiinde. About 1376 it fell to the landgraves of Thuringia, and in 1440 it passed to the electors of Saxony. In 1806 it was visited by Napoleon, whose half-formed intention of abolishing the duchy was only averted by the tact and address of the duchess Luise. The Muses have never left Weimar. Since 1860 it has been the seat of a good school of painting, repre- sented by the landscape painters Preller, Kalckreuth, and Max Schmidt, and the historical painters Pauwels, Heumann, and Verlat. The frequent residence here also of the Abbé Liszt, from 1848 till his death in 1886, has preserved for Weimar quite an im- portant place in the musical world.

WEISSENFELS, an industrial town in the province of Saxony, Prussia, is situated on the Saale, 184 miles south- west of Leipsic and 19 miles south of Halle. It contains three churches, a spacious market-place, and various educational and benevolent institutions. The former palace, called the Augustusburg, built in 1664-90, occupies a site on a sandstone eminence near the town; this spacious edifice is now used as a military school. Weissenfels manufactures machinery, sugar, pasteboard, paper, leather goods, pottery, and gold and silver wares. It contains also an irou-foundry, and carries on trade in timber and grain. In the neighbourhood are large deposits of sandstone and lignite. Weissenfels is a place of considerable antiquity, and from 1657 till 1746 it was the capital of the dukes of Saxe-Weissenfels, a branch of the electoral house of Saxony. The body of Gustavus Adolphus was embalmed at Weissenfels after the battle of Liitzen. The population of the town in 1885 was 21,766.

WEKA, or Weexa. See OcyDROME.

WELLESLEY, Ricaarp Westey (or WELLESLEY), Marquis oF (1760-1842), eldest son of the first earl of Mornington, an Irish peer, and eldest brother of the duke of Wellington, was born June 20, 1760. He was sent to Eton, where he was distinguished as an excellent classical scholar, and to Christ Church, Oxford. 'By his father's death in 1781 he became earl of Mornington, taking his seat in the Irish House of Peers. In 1784 he entered the English House of Commons as member for Beeralston. Soon

after- wards he was appointed a lord of the treasury by Pitt, with whom he rapidly grew in favour. In 1793 he became a member of the board of control over Indian affairs; and, although he was best known to the public by his speeches

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in defence of Pitt's foreign policy, he was now gaining the acquaintance with Oriental affairs which made his rule over India so wonderfully effective from the moment when, in 1797, he accepted the office of governor-general. Wellesley seems in a peculiar manner to have caught Pitt's own large political spirit during the years of his intercourse with him from 1793 to 1797. With equally profound con- viction of the antagonism between the French republic and the interests of Great Britain all over the world, he had gained the same habit of dealing with political affairs in vast combinations and on the broadest survey. That Pitt and Wellesley had consciously formed the design of acquiring a great empire in India to compensate for the loss of the American colonies has not been proved ; but the rivalry with France, which in Europe placed England at the head of coalition after coalition against the French republic and empire, made Wellesley's rule in India an epoch of enormous and rapid extension of English power, On the journey outwards he formed, after a discussion at the Cape with officials and soldiers returning home, the design of annihilating French influence in the Deccan. Soon after his landing, in April 1798, he learnt that an alliance had actually been formed between Tippoo Saib and the French republic. Wellesley resolved to anticipate the action of the enemy, and ordered preparations for war. The invasion of Mysore followed in February 1799, and the campaign was brought to a rapid close by the capture of Seringapatam (see Inp1A and WetiineTon). In 1803 the restoration of the peshwa was taken in hand, which proved the prelude to the great Mahratta war against Sindhia and the raja of Berar. The result of these wars and of the treaties which followed them was that French influence in India was extinguished, that forty millions of population and ten millions of revenue were added to the British dominions, and that the

powers of the Mahratta and all other princes were so reduced that England became the really dominant authority over all India. Nor was Wellesley's rule distinguished only by conquest. He was an- excellent administrator, and sought to provide, by the foundation of the college of Fort William, for the training of a class of men adequate to the great work of governing India. In connexion with this college he established the governor-general's office, to which civilians who had shown great talent at the college were transferred, in order that they might learn something of the highest statesmanship in the immediate service of their chief. A free-trader, like Pitt, he endeavoured to remove some of the restrictions on the trade between England and India. Both the commer- cial policy of Wellesley and his educational projects brought him into hostility with the court of directors, and he more than once tendered his resignation, which, however, public necessities led him to postpone till the autumn of 1805. He reached England just in time to see Pitt before his death. On the fall of the coalition ministry in 1807 Wellesley (an English peer from 1797 and marquis in the peerage of Ireland from 1799) was invited by George ITT. to jom the duke of Portland's cabinet, but he declined, pending the discussion in parliament of certain charges brought against him in respect of his Indian administra- tion. Resolutions condemning him for the abuse of power were moved both in the Lords and Commons, but defeated by large majorities. In 1809 Wellesley was appointed ambassador to Spain. He landed at Cadiz just after the battle of Talavera, and endeavoured, but without "success, to bring the Spanish Government into effective co-operation with his brother, who, through the failure of his allies, was compelled to retreat into Portugal. A few months later, after the duel between Canning and Castlereagh and the resignation of both, Wellesley accepted the post of foreign secretary in Perceval's cabinet. He held this

office until February 1812, when he retired, partly from dissatisfaction at the inadequate support given to Welling- ton by the ministry, but also because he had become con- vinced that the question of Catholic

emancipation could no longer be kept in the background. From early life Wellesley had, unlike his brother, been an advocate of Catholic emancipation, and with the claim of the Irish Catholics to justice he henceforward identified himself. On Perceval's assassination he refused to join Lord Liver- pool's administration, and he remained out of office till 1821, criticizing with severity the proceedings of the congress of Vienna and the European settlement of 1814, which, while it reduced France to its ancient limits, left to the other great powers the territory that they had acquired by the partition of Poland and the destruction of Venice. He was one of the peers who signed the protest against the enactment of the Corn Laws in 1815. In 1821 he was appointed to the lord-lieutenancy of Ireland. Catholic emancipation had now become an open question in the cabinet, and Wellesley's acceptance of the viceroyalty was believed in Ireland to herald the immediate settlement of the Catholic claims. The Orange faction were incensed by the firmness with which their excesses were now repressed, and Wellesley was on'one occasion mobbed and insulted. But the hopes of the Catholics still remained unfulfilled. Lord Liverpool died without having grappled with the problem. Canning in turn passed away ; and on the assumption of office by Wellington, who was opposed to Catholic emancipation, his brother resigned the lord- lieutenancy. He had, however, the satisfaction of seeing the Catholic claims settled in the next year by the very statesmen who had declared against them. In 1833 he resumed the office of lord-lieutenant under Earl Grey, but the ministry fell a few months later, and, with one short exception, Wellesley did not further take part in official life. His old age, which was vigorous and animated to the last, was occupied with literary and classical pursuits. He died on September 26, 1842. He had no successor in the marquisate, but the earldom of Mornington and minor honours devolved on his brother William, Lord Mary- borough, on the failure of whose issue in 1863 they fell to the second duke of Wellington.

WELLINGBOROUGH, amarket-townof Northampton- shire, England, is situated on the declivity of a hill near the junction of the Ise with the Nen, and on the London and North-Western and Midland railway lints, 634 miles north-north-west of London, and 104 east-north-east of Northampton. The church of St Luke contains some Norman and Early English portions, with later work of various periods, and a Decorated

western tower and spire. The grammar-schools, founded in 1594 and endowed with the revenues of a suppressed guild, include a school of the second and a school of the third grade, the former a build- ing of red brick in the Renaissance style erected in 1880 at a cost of £6000, and the latter an old Elizabethan structure. Another educational endowment is Freeman's school, founded by John Freeman in 1711. There are also several charities. The market-place, situated in the centre of the town, was founded in 1874. The principal public buildings include the corn exchange (erected in 1861 at a cost of £4000), and the "Priory," an old residence now used for Sunday school and other parochial purposes. Formerly the town was famed for the chalybeate springs to which it owes its name. It is now of some importance as a centre of agricultural trade; but the staple industry is leather. A great impulse to the prosperity of the town was given by the introduction of the boot and shoe trade, especially the manufacture of uppers. Smelting, brewing, and iron-founding are also carried on, as well as the manu- facture of portable steam-engines. A coal depét of the

Midland Railway is also situated in the town. The popu- lation of the township and urban sanitary district (area 3992 acres) in 1871 was 9385 and in 1881 it was 13,794.

In 948 Edred gave the church at Wellingborough to Croyland abbey, and the grant was confirmed by King Edgar in 966. In the reign of Edward II. the abbot was lord in full. It received the grant of a market in the 2d year of King John. In 1621 it was visited by Charles I. and his queen, who resided in tents during a whole season that they might drink the waters. It was after its almost total destruction by fire in 1788 that the town was built on its present site on the hill.

WELLINGTON, a town of Shropshire, England, on the Great Western and London and North-Western rail- way lines, and on the Shropshire Union Canal, 1514 miles north-west of London, 11 east of Shrewsbury, and 31 north-west of Birmingham. The neighbourhood is pictur- esque, the Wrekin, about 14 miles from the town, rising to a height of 1320 feet. The church of All Saints, built in 1790, was restored in 1876, and again

in 1883. There are a number of charities. The manufacture of agricultural implements, iron and brass founding, and malting are carried on. The population of the urban sanitary district (area 352 acres) in 1871 was 5926, and in 1881 it was

6217.

Wellington, which is situated near the old Roman Watling Street, is referred to in Domesday as held by Earl Roger. It was grauted by King John to Thomas de Erdinton for serviccs rendered at Rome at the time of the interdict. It was held by Earl Edwin, but by the rebellion of Robert de Belesme was forfeited to the king. The church of Wellington was given by Earl Roger to Shrewsbury abbey. Wellington was the first rendezvous of Charles I., who on 19th September 1642 mustered his forces ncar the town.

WELLINGTON, a market-town of Somerset, England, is situated on a gentle elevation at the foot of the Black- downs near the river Tone, and on the Great Western Railway, 170 miles south-south-west of London, and 7 south-west of Taunton. The church of St John, a hand- some structure, with one of the characteristic Somersetshire towers, is of the Perpendicular style of architecture, except the nave, which is Early English. The church contains a monument to Sir J. Popham, lord justice of England in the time of Elizabeth and James I. Among other public buildings are the market-house or town-hall (1833), the West Somerset county school (1880), and the Popham hospital for aged men and women, founded by Sir John Popham in 1606 and rebuilt in 1833. On the highest summit of the Blackdowns, 24 miles south of the town, is a triangular stone tower erected in honour of the duke of Wellington, who took his title from the town. The staple industry is the woollen manufacture ; iron-founding and brick and tile making are also carried on. The population of the township and urban sanitary district (area 5195 acres) in 1871 was 6286, and in 1881 it was 6360.

King Alfred gave Wellington, with other two neighbouring manors, to Asser, who was afterwards raised to the sce of Sherborne, and died in 883. Subsequently it was conferred on Aldhelm, the first bishop of Wells. In Domesday it occurs as Wallintone, and is valued at £25. In the 2d of

Edward VI. the manor was granted by Bishop Barlow, together with the borough of Wellington, to Edward, duke of Somerset. On the duke's attainder it came to the crown, with whom it remained till the 22d of James I.

WELLINGTON, the chief town of Hutt county, New Zealand, and the seat of the colonial Government, is situated in the south-west of North Island, on the shores of Port Nicholson, in 41° 16' 25" S. lat. and 174° 47' 25" E. long., 80 miles east of Nelson, 160 south of New Plymouth, and 1200 south-east of Sydney. The imme- diate surroundings of Wellington were originally very uninviting, as it is walled in by high ranges unsuitable for tillage, but great enterprise has been shown in the con- struction of roads to the more fertile regions. Railways are being gradually extended towards both the north and the north-east. Owing to the prevalence of earthquakes the city is built chiefly of wood, but within recent years

there has been an increasing tendency to make use of concrete and brick. Among the principal public buildings are the Government house, the houses of legislature, the Government buildings, the new postal and telegraph office, Wellington college, St Patrick's Catholic college, the odd- fellows' hall, the freemasons' hall, the hospital, and the lunaticasylum. The city also possesses a colonial museum, an atheneum and mechanics' institute, a lyceum, and three theatres. The botanical gardens have an area of 100 acres. There is also a public park called the Town Belt. To supplement the water supply from two large reservoirs at Polhill's Gully, an aqueduct has lately been constructed from the Wainuiomata river, 16 miles distant, at an expense of £130,000.

Wellington was the first settlement of the New Zealand colonists. It owes its commercial prosperity and its selec- tion as the capital to its convenient and central position. It is the seat of both a Protestant and a Catholic see. The harbour, which has lately been extended and improved, is one of the best and safest in New Zealand. There is a lighthouse at the eastern entrance, on Pincarrow Head, opposite which is the pilot station. There are two large wharves, and in Evans Bay there is a patent slip capable of

receiving vessels of 2000 tons. As a shipping port Wellington ranks next to Auckland and Lyttelton. It possesses foundries, shipbuilding yards, boot factories, soap and candle works, tanneries, woollen, coffee, flour, and saw mills, breweries, aerated water works, coach factories, brick and tile works, and a very extensive meat- preserving establishment, which exports large supplies to Europe. The area of the municipal borough is 1100 acres, and from 4176 in 1861 the population increased to 13,488 in 1871 and 20,563 in 1881, while in 1886 the city and suburbs had 27,833 inhabitants.

WELLINGTON, Artuur WELLESLEY, DUKE oF (1769- 1852), was the fourth son of Garrett, earl of Mornington, now remembered only as a musician. He was descended from the family of Colley or Cowley, which had been settled in Ireland for some centuries. The duke's grand- father assumed the name of Wesley on succeeding to the estates of Mr Garrett Wesley, a kinsman of the famous divine; the affinity between the families of Colley and Wesley rests, however, on nothing nearer than a common ancestor in the 15th century. In the duke's early letters the family name is spelt Wesley ; the change to Wellesley seems to have been made about 1790. Arthur (born in Ireland in the spring of 17691) was sent to Eton, and subsequently to the military college at Angers. He entered the army as ensign of the 73d regiment in 1787, passed rapidly through the subaltern grades, became major of the 33d, and purchased the lieutenant-colonelcy of that regiment in 1793 with money advanced to him by his eldest brother. Before reaching full age he was returned to the Irish parliament by the family borough of Trim. Little is known of his history during these years; but neither in boyhood nor early youth does he appear to have made any mark among his contemporaries. His first experience of active service was in the disastrous campaign of 1794-95, when the British force under the duke of York was driven out of Holland by Pichegru. In 1796 he was sent with his regiment to India.

the world, but we have his own testimony that it was during these years of obscurity that he qualified himself in one direction for the great military career before him. As colonel commanding a regiment he gained the most minute and accurate acquaintance with every detail of the soldier's life, learned the precise amount of food

1 In Merrion Street, Dublin, or at Dungan Castle, Meath, towards the end of April or on Ist May; but both place and date are uncertain.

Three Indian years more passed before Wellesley became known to S¢vice.

required for every mouth, the exact weight that could be carried, the distances that could be traversed without exhaustion, the whole body of conditions in short which govern the activity both in peace and war of man and beast. It was to this absolutely complete knowledge of practical details that Wellington ascribed in great part his own success in the highest commands. It is probable, moreover, that he at this time made a serious study of the science and history of warfare. His training at the college of Angers is not sufficient to account for his great technical knowledge ; no record, however, exists of the stages by which this was acquired. In 1798 Colonel Wellesley's eldest brother, Lord Mornington, afterwards marquis of Wellesley, arrived in India as governor-general. The war with Tippoo Saib followed. The 33d regiment was attached to the subsidiary force furnished by the nizam, and Colonel Wellesley was entrusted with the command of this division, under the orders of General Harris. In a preliminary attack upon the works of Seringapatam Wellesley met with a repulse; in the successful assault upon the town he commanded the reserve. Though his military services in this short campaign were not of a striking character, he was appointed by his brother to the supreme military and political command in Mysore. His great faculties now for the first time found opportunity for their exercise. In the settlement and administration of the conquered territory Wellesley rapidly acquired the habits and experience of a statesman. Nor, in the midst of his work of peaceful reorganization, was it possible for him to abandon the life of the soldier. The frontiers of Mysore were harassed by independent chieftains or marauders, especially by one Doondiah, an energetic leader, who had assumed the title of "' the king of two worlds." Wellesley's operations against Doondiah were conducted with extraordinary energy ; his marches in pursuit were prodigious, and his final success complete. More im- portant, however, than the military side

of these operations was their political character. When pressed in Mysore, Doondiah moved into Mahratta territory, and into this, territory it was necessary for Wellesley to follow him. Here, negotiating and bargaining with the Mahratta chiefs, Wellesley acquired a knowledge of their affairs and an in- fluence over them such as no other Englishman possessed. Simple and honourable himself, he was shrewd and pene- trating in his judgment of Orientals ; and, unlike his great predecessor Clive, he rigidly adhered to the rule of good faith in his own actions, however depraved and however exasperating the conduct of those with whom he had to deal. The result of Wellesley's singular personal ascend- ency among the Mahrattas came into full view when the Mahratta war broke out. In the meantime, however, his Indian career seemed likely to be sacrificed to the calls of warfare in another quarter. Wellesley was ordered by the governor-general, in December 1800, to take command of a body of troops collected for foreign service at Trincoma- lee, in Ceylon. It was at first intended that these troops should act against Java or Mauritius ; their destination

was, however, altered to Egypt, and a notification was –

made to Wellesley that in consequence of this change General Baird would be placed in command above him. Though deeply offended at the loss of the command, Wellesley so completely sank all personal grievance in hig devotion to the public cause that, in opposition to his instructions, and at the risk of incurring severe censure, he moved the troops on his own responsibility from Trincomalee to Bombay, from the conviction that, if they were to be of any use in Egypt, it was absolutely necessary that they should provision at Bombay without delay. The documents in which Wellesley justified this step prove his singularly clear and profound acquaintance with the

conditions of a successful invasion of Egypt from India. At Bombay Wellesley was attacked by fever, and prevented from going on to Egypt. He returned with great satis- faction to his government in Mysore, where he remained until the Mahratta war broke out.

been overthrown by his rivals Holkar and others, and he had himself fled from Poona to Bassein on the coast. By the treaty of Bassein, made in

December 1802, the Indian Government entered into an alliance with this potentate, and pledged itself to restore his authority. Wellesley was placed in command of the army charged with this task. Starting from Seringapatam, he crossed the frontier on March 12, 1803, and moved through the southern Mahratta territory on Poona. The march was one unbroken success. Wellesley's own arrangements, which displayed the utmost forethought and sagacity in dealing with the physical conditions to be encountered on the march, would no doubt have secured his victory had resistance been encountered; but his personal and diplo- matic ascendency among the chieftains of the district worked even more powerfully than the fear of his arms. No hand was raised against him, and a march of six hundred miles was conducted without even a skirmish. "The confidence and respect of every class in the provinces south of the Kistna," wrote Major Malcolm, the political agent who accompanied the march, "is in a very great degree personal to Major-General Wellesley. To the admiration which the Mahratta chiefs entertain for that officer's military character, and the firm reliance which the inhabitants place on his justice and protection, the extra- ordinary success which has hitherto attended the progress of the march must be principally attributed." Wellesley had intended to reach Poona on the 23d of April. On the night of the 18th, when 60 miles distant from Poona, he re- ceived intelligence that Amrut Rao, a rival of the peshwa's, intended to burn the city at the approach of the English. Counting no moment to be lost, Wellesley pressed on with the cavalry, accomplished the march of 60 miles in thirty-two hours, and entered Poona on the afternoon of the 20th, in time to save the city from destruction. The peshwa was now restored to power, and entered into various military obligations with Wellesley, which he very imper- fectly fulfilled.

In the meantime Sindhia and Holkar, with the raja of Berar, maintained a doubtful but threatening aspect farther north. It was uncertain whether or not a con- federacy of the northern Mahrattas had been formed against the British Government. In these critical circum- stances, while peace and war hung in the balance, Wellesley was charged with " the general direction and control of all the military and political affairs of the British Government in the territories of the nizam, of the peshwa, and of the Mabhratta states and chiefs." Acting in execution of these powers, he

required Sindhia, as a proof of good faith, to withdraw to the north of the Nerbudda. Sindhia not doing so, war was declared on August 6, 1803. Wellesley marched northwards, captured Ahmadnagar on August 11, crossed the Godavery ten days later, and moved against the combined forces of Sindhia and the rajah of Berar. Colonel Stevenson was meanwhile approaching with a second division from the east, and it was intended that the two corps should unite in an attack on the enemy. On the 23d of September Wellesley supposed himself to be still some miles from the Mahratta headquarters ; he suddenly found that the entire forces of Sindhia and the rajah of Berar were close in front of him at Assaye. Weighing the dangers of delay, of retreat, and of an attack with his own unsupported division, Wellesley convinced himself that an immediate attack, though against greatly

The power of the Mahratta peshwa, nominally supreme in the Mahratta territory, had war.

superior forces in a strong position, was the wisest course. He threw himself upon the Mahratta host, and ultimately gained a complete victory, though with the loss of 2500 men out of a total probably not much exceeding 7000. In comparison with the battle of Assaye, all fighting that had hitherto taken place in India was child's play. The enemy's artillery was of the most formidable character, and worked with deadly effect. A hundred cannon were taken by the conqueror, who now, uniting with Stevenson's division, followed up the pursuit, and brought the war to a close by a second victory at Argaum on November 29. The treaties with Sindhia and the raja of Berar which followed the overthrow of their arms, and which marked the downfall of the Mahratta power, were negotiated and signed by Wellesley in the course of the following month. Not yet thirty-five years old, Wellesley had proved himself as thorough a master in the sphere of Indian statesmanship and diplomacy as on the field of battle. Had his career ended at this time, his despatches on the negotiations with the Mahrattas and on the general conduct of Indian policy would have proved him to have been one of the wisest and

attack of Victor, who had defeated Cuesta and driven him

back on the English. The battle was begun on the 27th Battle of Wellesley gained a Talavera.

and continued on the 28th of July. complete victory, and decisively proved the superiority of English troops under his command over those of the enemy. But within the next few days Soult's approach on the line of communication was discovered. It was impossible for Wellesley to follow up his advantages. The victory of Talavera had brought prestige but nothing else. Superi- ority of numbers had made the French the real winners of the campaign, and Wellesley, disgusted with his Spanish allies, had no choice but to withdraw into Portugal and there stand upon the defensive. A peerage, with the title of Viscount Wellington, was conferred upon him for his victory at Talavera.

Up to this time Napoleon, with the bulk of his armies, had been occupied with the war against Austria. The peace of Vienna, concluded in October 1809, made him free to throw an almost unlimited force into the Spanish Peninsula. Wellington, foreseeing that Portugal would now be invaded by a very powerful army, began the

strongest heads that have ever served England in the East. In the spring of 1805 Wellesley, now Sir Arthur, quitted

fortification of the celebrated lines of Torres Vedras, which Lines of

followed the mountain-bastion on the north of Lisbon, and Torres

India and returned home.. Vedras.

Service in the

Penin- sula,

He was immediately sent on the expedition to Hanover which was rendered abortive by the battle of Austerlitz. In 1806 he was elected member of parliament for the borough of Rye, and in the following year

was appointed Irish secretary. After serving in this office for a few months he was employed in the expedition against Copenhagen, where little glory was to be gained. In the summer of 1808 he took command of a body of troops destined to operate against the French in Spain or Portugal. Finding that the junta of Corunna wished for no foreign soldiery, he proceeded to fulfil his instructions by acting against Junot at Lisbon. He landed at Mondego Bay in the first week of August, and moved southwards, driving in the enemy's posts at Rolica on August 17. On the 21st the battle of Vimiero was fought and won. In the midst of this engagement, however, Sir Harry Burrard landed, and superseded Wellesley in the command. Wellesley in vain called upon this general to follow up the pursuit when the victory was gained. The consequence was that Junot's army, which would have been captured or annihilated if Wellesley's advice had been executed, escaped into a position which secured it the means of retreat if favourable terms of capitulation were refused. The convention of Cintra provided for the evacuation of Portugal by the French, but it gave Junot and all his troops a free return to France. So great was the public displeasure in England at the escape of the enemy that a court of inquiry was held into all the circumstances attending the convention of Cintra. At this inquiry the rejection of Wellesley's counsels by his superior officer at the close of the battle of Vimiero was fully proved.

After the failure of Sir John Moore's campaign in the winter of 1808-9, Wellesley, who had in the meantime resumed his duties as Irish secretary, returned to the Peninsula as chief in command. His first move was against Soult, who had captured Oporto. He drove the French out of this city by a singularly bold and fortunate attack, and then prepared to march against Madrid by the valley of the Tagus. Some appearance of additional strength was given him by the support of a Spanish army under General Cuesta ; but his movements were delayed by the neglect and bad faith of the Spanish Government, and time was given to Soult to collect a large force at Salamanca, with which he intended to fall upon the English line of communications. Wellesley, unconscious of Soult's presence in force on his flank, advanced against Madrid, and finally drew up at Talavera to meet the

left no single point open between the Tagus and the sea. The English army in the meantime wintered in the neigh- bourhood of Almeida. As summer approached Welling- ton's anticipations were realized. Mass¢na, who had distin- guished himself above every other general in the Austrian war of 1809, arrived in Spain, and moved against Portugal with an army of 70,000 men. Wellington was unable to prevent Ciudad Rodrigo from falling into the hands of the French. He retreated down the valley of the Mondego, devastating the country, and at length halted at Busaco, and gave battle. The French attack was repelled, but other roads were open to the invader, and Wellington continued his retreat. Masséna followed, and heard for the first time of the fortifications of Torres Vedras when he was within five days' march of them. On approaching the mountain-barrier the French general sought in vain for an unprotected point. It was with the utmost difficulty, while waiting for reinforcements, that he could keep his army from starving. At length, when the country was utterly exhausted, he commenced his retreat. Wellington descended from the heights, but his marching-force was too weak to risk a pitched battle. Masséna was in con- sequence able to maintain himself at Santarem for the winter. But in the spring of 1811 Wellington received reinforcements from England. He now moved against the enemy. Masséna retreated northwards, devastating the country with unsparing severity in order to check the pursuit. Such were the sufferings of his army, both in the invasion and in the retreat, that, although only one battle was fought during the campaign, the French, when they re-entered Spain, had lost 30,000 men.

In the meantime Soult, who was besieging Cadiz, had received orders from Napoleon to move to the support of Masséna. Leaving part of his force in front of Cadiz, he marched northwards and captured Badajoz. Here, how- ever, he learnt that Masséna was in full retreat, and also that his own army besieging Cadiz had been attacked and beaten. He in consequence returned and resumed the blockade. Wellington, freed from pressure on the south, and believing Masséna to be thoroughly disabled, con- sidered that the time had come for an advance into Spain. The fortresses of Almeida, Ciudad Rodrigo, and Badajoz had to be recaptured from the French. Leaving a small force to besiege Almeida, Wellington went southwards to arrange with Beresford for the siege of Badajoz.

During his absence Masséna again took the field, and marched to the relief of Almeida. Wellington returned in time to

Badajoz captured.

Advance into Spain.

Battle of Sala- manca,

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defeat him at Fuentes d'Onoro, and Almeida passed into the hands of the British. In the south Soult advanced to the relief of Badajoz. He was overthrown by Beresford at Albuera ; but the junction of the two French armies compelled the English to raise the siege, and Wellington had to retire within the Portuguese frontier. Moving northwards with the view of laying siege to Ciudad Rodrigo, he was again outnumbered by the French, and forced to withdraw to cantonments on the Coa.

Wellington had from the first seen that, whatever number of men Napoleon might send against Portugal, it was impossible, owing to the poverty of the country, that any great mass of troops could long be held together. The French generals, by combining their armies, might for a while be superior to him, but the want of provisions would inevitably lead to their separation after a longer or shorter interval. This was verified at the end of 1811. Soult's division had to move southwards for support, and the English were again more than a match for the enemy in front of them. Wellington resumed the offensive, and on the 19th of January 1812 Ciudad Rodrigo was taken by storm. The road into Spain was now open; it only remained to secure Portugal itself and the line of com- munication by the capture of Badajoz. Wellington crossed the Tagus and completed the investment of this fortress by the middle of March. It was necessary at whatever cost to anticipate the arrival of Soult with a relieving army, and on the 6th of April Wellington ordered the assault. The fearful slaughter which took place before the British were masters of the defences caused Wellington to be charged with indifference to the loss of human life ; but, whatever faults may have been made in the actual operations, a postponement of the attack would merely have resulted in more battles

against Soult, in which a greater number of men would have perished. Of all generals Wellington was the last to throw away a single life needlessly.

The advance into Spain against the French line of com- munication between Madrid and the Pyrenees was now begun. Marmont, who had succeeded Masséna in the command, fell back and allowed Wellington to occupy Salamanca ; but on reaching the Douro he turned upon his assailant, and, by superior swiftness in marching, threatened to cut the English off from Portugal. Wellington now retreated as far as Salamanca, and there extricated himself from his peril by one of the most brilliant victories which he ever gained (July 22). The French fell back on Burgos. Instead of immediately following them, which from a military point of view would have been the better course, Wellington thought it wise to advance upon the Spanish capital. King Joseph retired southwards and the English entered Madrid in triumph. The political effect of this act was very great, but the delay gave the French northern army time to rally. On march- ing against them Wellington was checked by the obstinate defence of Burgos. Moreover, in consequence of the loss of the capital, Soult was now ordered to raise the siege of Cadiz, and to move to the support of King Joseph. Gathering his forces, and uniting them with the French army of the centre, he pressed on towards Madrid. It was impossible for Wellington to maintain his position, and he was compelled once more to retire into Portugal, while Madrid passed back into the hands of the French. During this his last retreat the demoralization and misconduct of the British army surpassed anything that their chief had ever witnessed. The effect of the campaign was, however, that Cadiz was free, and that the southern provinces were finally cleared of the invader.

Wellington was now invested by the cortes with the supreme command of the Spanish armies. He visited

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Cadiz in December 1812, and offered counsels of modera- tion to the democratic assembly, which were not followed. During the succeeding months he was occupied with plans and preparations for a great combined attack, and at length, in May 1813, the hour for his final and victorious advance arrived. The disasters of the Russian campaign had compelled Napoleon to withdraw some of his best regiments from the Peninsula. Against a weakened and discouraged adversary Wellington took the field with greatly increased numbers, and with the utmost confidence of victory. His design was to throw himself directly upon the French line of communication, keeping his left pushed forward in advance of his centre, so as to threaten the envelopment of the fortified posts held by the enemy. Napoleon had foreseen that this would be the strategy of the English commander, and had ordered King Joseph to neglect every point to the centre and east, and to concen- trate at Valladolid. This order had been but imperfectly obeyed. The advance of the allied army was irresistible. Position after position was evacuated by the French, until Wellington, driving everything before him, came up with

the retreating enemy at Vitoria, now encumbered with an Battle of enormous train of fugitives, and with the spoils of five Vitoria.

years' occupation of Spain. His victory, won on the 21st of June, was overwhelming. All the artillery and almost all the treasure and stores of the French army fell into the hands of the conquerors. It only remained for Napoleon to commit to Marshal Soult, as his lieutenant, the task of defending the Pyrenees, and of delivering, if possible, the fortresses of St Sebastian and Pamplona, which Wellington now besieged. Soult's combats in the Pyrenees, and the desperate resistance of St Sebastian, prolonged the struggle through the autumn of 1813, and cost the English torrents of blood. But at length the frontier was passed, and after a succession of encounters on French soil Soult was forced back into his entrenched camp at Bayonne. Both armies now rested for some weeks,

during which interval Wellington gained the con- fidence of the inhabitants of the district by his unsparing repression of marauding, his business-like payment for supplies, and the excellent discipline which he maintained among his soldiers. In February 1814 the advance was renewed. The Adour was crossed, and Soult, leaving a garrison in Bayonne, fell back on Orthes. At Orthes he was attacked and defeated. Bordeaux now declared in favour of the Bourbons and admitted the English. Soult's last move was upon Toulouse. Here, after the allies had entered Paris, but before the abdication of Napoleon had become known, the last battle of the war was fought.

where he was received with extraordinary honours.

After the treaty of Paris (May 30) Wellington was Ambas- appointed British ambassador at the French capital. sador at | During the autumn and winter of 1814 he witnessed and Ps

reported the mistakes of the restored Bourbon dynasty, and warned his Government of the growing danger from conspiracies and from the army, which was visibly hostile to the Bourbons. '" The truth is," he wrote, 'that the king of France without the army is no king." His insight, however, did not extend beyond the circumstances immediately before and around him, and he entirely failed to apprehend the fact that the great mass of the French nation was still with Napoleon at heart. He remained in France until February 1815, when, in con- sequence of the return of Lord Castlereagh to England to meet the House of Commons, he took that minister's place at the congress of Vienna. All the great questions of the congress had already been settled, and Wellington's diplomatic work here was not of importance. His im-

Peace being proclaimed, Wellington took Return to | leave of his army at Bordeaux, and returned to England, England. |

The Hundred

Days.

Waterloo,

Restora- tion of the Bour- bons,

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perfect acquaintance with French feeling was strikingly proved in the despatch which he sent home on learning of Napoleon's escape from Elba. 'He has acted," he wrote, "upon false or no information, and the king (Louis XVIII.) will destroy him without difficulty and in a short time." Almost before Wellington's unfor- tunate prediction could reach London, Louis had fled beyond the frontier, and France was at Napoleon's feet. The ban of the congress, however, went out against the common enemy of mankind, and the presence of Wellington at Vienna enabled the allies at once to decide upon their plans for the campaign. To Wellington and Bliicher was committed the invasion of France from the north, while the Russians and Austrians entered it from the east. Pre- parations were pushed forward, and it was supposed that the war would be opened by an attack upon Alsace about the middle of June. Wellington, with 35,000 English troops and about 60,000 Dutch, Germans, and Belgians, took his post in the Netherlands, guarding the country west of the Charleroi road. Bliicher, with 120,000 Prussians, lay between Charleroi, Namur, and Liége. In the meantime Napoleon had outstripped the preparations of his adversaries, and by the 13th of June had con- centrated 130,000 men on the northern frontier about Philippeville. It now became known to the allied leaders that large French forces were near at hand, but Wellington believed that Napoleon himself was still in Paris, and still expected that the war would be opened by a forward movement of Schwarzenberg into Alsace. He was, more- over, strongly of opinion that, if Napoleon did take up the offensive on the north, he would throw himself upon the west of the English line and endeavour to cut the English off from the sea. Persuaded that the danger lay rather towards the coast than at the centre of the Anglo-Prussian line, he kept his forces farther westward than he would have done if he had known Napoleon's real intentions. Although the French advance on the centre became evident at the front on the morning of the 14th, it was unknown to Wellington till the afternoon of the 15th (after the Prussians had been driven out of Charleroi) that the French had made any movement whatever. How it was that the advance remained unknown to Wellington

for twenty-four hours has not been explained; had he learnt of it at once, he would probably have been able to reach Ligny with sufficient force to turn the Prussian defeat into a victory and to end the war at one blow. Commencing his concentration eastwards twenty-four hours too late, he was unable to fulfil his design of assisting Bliicher. Ney, getting a start on the Brussels road, kept the English occupied at Quatre Bras during the 16th, while Napoleon was dealing with the Prussians at Ligny,— though the ultimate defeat of the French at Quatre Bras, and Napoleon's own failure to follow up his victory at Ligny by a rapid pursuit, rendered it possible for the allies to effect two days later the combination which they had failed to effect at Ligny. On the morning of Sunday, June 18, Wellington, assured of Bliicher's assistance, awaited Napoleon's attack on the memorable plain of Waterloo. How, at the head of 30,000 English and 40,000 mixed troops, he withstood the onslaught of the French army, and ultimately, in union with Bliicher, swept them from the field, needs not to be recounted here.

Ending his military career with one of the greatest achievements in history, Wellington suddenly became, from the peculiar circumstances of the moment, the most influential politician in Europe. The czar and the emperor of Austria were still at Nancy when Paris surrendered. Vellington had reason to believe that Alexander bore so hostile a feeling towards Louis XVIII. that, if matters were not settled before the arrival of the czar at Paris, the

Bourbon dynasty might not be restored at all. He there- fore took affairs into his own hands, and concluded an arrangement whereby the regicide Fouché, at that moment the most powerful man in Paris, was accepted as the minister of Louis XVIII. The difficulties which might otherwise have been thrown in the way of this monarch's return to the Tuileries by the troops or by the populace of Paris were thus removed; and when Alexander arrived he found Louis XVIII. already in possession. The negotiation with Fouché was not a dignified episode in Wellington's life; he stooped, however, to a somewhat humiliating expedient in order to

avert substantial mischief. The next manifestation of his personal ascend- ency was of a finer kind.

territory, Prussia demanded, as a guarantee against re- newed aggression, the annexation of Alsace and Lorraine. The British cabinet at first inclined to the Prussian view. Wellington, however, argued strongly for the opposite policy. He urged that the Bourbon dynasty would be hopelessly discredited if its second restoration were ac- companied by the loss of the border provinces ; that the allies had in their proclamations distinguished between the cause of Napoleon and the cause of the French people; and that the French people, by refraining from offering any general resistance, had shown their practical accept- ance of this distinction and so entitled themselves to the advantages held out in it. Wellington's arguments brought the English Government round to his own view, and so turned the balance in favour of the czar's policy of forbearance and against the annexations demanded by Prussia. The policy which he thus successfully advocated has naturally been condemned by most German statesmen and historians; but its justification is to be found in the long continuance of the peace of 1815, a continuance which would hardly have been possible if the recovery of Alsace and Lorraine had been added to the other motives which, during the next thirty years, repeatedly brought France to the verge of war.

Peace being concluded, Wellington was appointed commander-in-chief of the joint army of occupation, by which it was stipulated that France should be watched for the next five years. The administrative duties attaching to this post, and the reconstruction of the military frontier of the Netherlands, were, however, but a sinall part of the work now imposed upon him. In conjunction, and some- times in rivalry, with the representatives of the other powers, he observed the course of French politics, coun- selling King Louis XVIII., checking to the best of his ability the extravagances of the count of Artois and the ultra-royalist party, and advancing the financial negotia- tions with Messrs Baring which enabled the French Government to pay the indemnities due from it, and thus rendered it possible for the powers to reduce the period of occupation from five to three years. When this re- duction was first proposed, Wellington had not been con- fident of its wisdom; he

subsequently became convinced that it might be granted with safety, and at the congress of Aix-la-Chapelle in 1818 he supported the proposal for the immediate evacuation of France, though this cut short by two years his own tenure of an office of almost unparalleled influence and emolument. Returning to England, he sank into the comparative insignificance of master-general of the ordnance, with a seat in the cabinet. For the next three years he was little before the world ; but in 1822, on the death of Castlereagh, he was sent in the place of this minister to represent Great Britain at the congress of Verona.

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*The conditions of peace with Condi- France had to be determined by the allies; and, while the tions of czar urged that France should be left with undiminished ?°****

The main question before the Congress congress was the policy to be adopted with regard to ofVerona.

Negotia- tions at St Peters- burg.

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the Spanish movement, whether called revolutionary or constitutional, by which the absolute monarchy of King Ferdinand had been overthrown. It was the settled policy of the British Government to oppose any joint intervention of the powers in Spain ; it was not, however, known at London before Wellington set out that the pro- ject of intervention yet existed anywhere in a definite form. In passing through Paris the duke discovered the danger to be more imminent than had been supposed ; he also learnt that, whatever might be the intentions of the French Government with regard to intervention in Spain by its own army, it was determined under no circumstances to give Russian troops a passage through France. No sooner had Wellington arrived at Verona than he found that the czar was bent upon obtaining a joint declaration of all the powers condemning the Spanish constitution, and committing to the Russian army, as the mandatory of Europe, the task of overthrowing it. In pursuance of his instructions, Wellington now stated that Great Britain

would rather sever itself from the European alliance cemented at Aix-la-Chapelle than consent to any such joint declaration ; and the information which he had privately acquired at Paris enabled him to inform the ezar that his project of employing Russian troops in Spain would certainly be thwarted by France. Armed with these two powerful arguments—the one public and official, the other personal and private-—-Wellington had no great difficulty in preventing the summary framing of a decree against Spain like that which had been issued two years before by the congress of Troppau against the constitution of Naples. In this respect the British Government had gained its point; but its success was apparent rather than real. Although the congress of Verona published no declaration of joint European action against the Spanish constitution, it was not in Wellington's power to prevent the negotiations which followed between the French representative and the three Eastern courts. Out of these negotiations arose the French attack upon Spain in 1823, accompanied by diplomatic action on the part of the Eastern powers which rendered the restoration of Spanish absolutism more complete and more unqualified than it would have been if France had entered upon the work entirely alone.

In the cabinet of Lord Liverpool the influence of Canning had, since Castlereagh's death, been predominant on all matters of foreign policy. Though Wellington disliked the tone of defiance frequently used by Canning towards the autocratic courts, he was sincerely at one with Canning's Spanish policy ; he did not oppose his recog- nition of the independence of the South-American re- publics; and, when Canning, abandoning his position of passive neutrality between the Turkish Government and insurgent Greece, proposed to attempt joint diplomatic action with Russia in hope of terminating the struggle, the duke was willing to co-operate in this policy within certain limits. Canning, while really anxious to assist the Greeks, based his new policy officially on the need of preventing Russia from acting alone. With the duke, the design of putting a check upon Russia was the sole active motive. He cared nothing whatever for the Greeks, but he did feel anxious to prevent Russia from making their cause a pre- text of war with the Porte. He therefore consented, on the coronation of the ezar Nicholas in 1826, to carry pro- posals to St Petersburg for the diplomatic co-operation of Russia and

England in bringing about a settlement of the Greek question. On the 4th of April 1827 the protocol of St Petersburg was signed, by which the two powers agreed that the mediation of England should be offered to the Porte, on terms that Greece should be granted local autonomy, but remain part of the Ottoman empire and

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tributary to the sultan. No provision was made for further action in case the Porte should not. accept England's mediation on these terms, nor was employment of force even alluded to. Scarcely had this protocol been signed when the accession of Canning to the premiership caused Wellington to withdraw from the Government. He was willing to serve with Canning under a common leader, but would not serve under him. The effect of his withdrawal was momentous in its bearing upon Eastern affairs. Canning, freed from Wellington's restraint, carried his intervention on behalf of Greece a step further, and con- cluded, on the 27th of July, the treaty of London, whereby France, England, and Russia bound themselves to put an end to the conflict in the East and to enforce the condi- tions of the St Petersburg protocol upon the belligerents. Against this treaty Wellington protested, on the ground that it "specified means of compulsion which were neither more nor less than measures of war." His apprehensions were fulfilled by the battle of Navarino.

Canning died in August 1827, and on the fall of Lord Prime Goderich's cabinet five months later Wellington became minister.

prime minister. He had declared some time before that it would be an act of madness for him to take this post ; but the sense of public duty led him to accept it when it was pressed upon him by the king. His cabinet included at the first Huskisson, Palmerston, and other followers of Canning. The repeal of the Test and Corpor- ation Acts having been carried in the House of Commons in the session of 1828, Wellington, to the great disap- pointment of Tories like Lord Eldon, recommended the House of Lords not to offer further resistance, and the measure was accordingly carried through. Soon after- wards a quarrel between the duke and Huskisson led to the retirement from the ministry of all its more liberal members. It was now hoped by the so-called Protestant party that

Wellington, at the head of a more united cabinet, would offer a steady resistance to Catholic eman- cipation. Never were men more bitterly disappointed.

The Clare election and the progress of the Catholic Catholic Association convinced both Wellington and Peel that the emanci-

*tine had come when Catholic emancipation must be P**

granted ; and, submitting when further resistance would have led to civil war, the ministry itself brought in at the beginning of the session of 1829 a bill for the relief of the Catholics. Wellington, who had hitherto always op- posed Catholic emancipation, explained and justified his change of front in simple and impressive language. His undoubted seriousness and his immense personal reputation did not, however, save him from the excesses of calumny and misinterpretation; and in order to impose some modera- tion upon his aspersers the duke thought it necessary to send a challenge to one of the most violent of these, the earl of Winchelsea. No mischief resulted from the encounter.

Catholic emancipation was the great act of Wellington's ministry ; in other respects his tenure of office was not marked by much success. The imagination and the breadth of view necessary to a statesman of the highest order were not part of his endowment, nor had he the power of working harmoniously with his subordinates.

tion.

His Eastern policy was singularly short-sighted. There Hastern might have been good reason, from Wellington's point policy.

of view, for condemning Canning's treaty of London ; but when, in consequence of this treaty, the battle of Navarino had been fought, the Turkish fleet sunk, and the independence of Greece practically established, it was the weakest of all possible courses to withdraw England from its active intervention, and to leave to Russia the gains of a private and isolated war. This, however, was Wellington's policy; and, having permitted Russia tc go

Agitation for re- form.

Fall of Welling- tonminis- try.

Later life.

to war alone in 1828, nothing remained for him but to treat Greece as a pawn in Russia's hands, and to cut down the territory of the Greek kingdom to the narrowest possible limits, as if the restoration to the sultan of an inaccessible mountain-tract, inhabited by the bitterest of his enemies, could permanently add to the strength of the Ottoman empire. The result was the renunciation of the Greek crown by Prince Leopold ; and, although, after the fall of Wellington's ministry, a somewhat better frontier was given to Greece, it was then too late to establish this kingdom in adequate strength, and to make it, as it might have been made, a counterpoise to Russia's influence in the Levant. Nor was the indulgence shown by the cabinet towards Dom Miguel and the absolutists of Portugal quite worthy of England. That Wellington actively assisted despotic Governments against the constitutional movements of the time is not true. He had indeed none of the sympathy with national causes which began to influence British policy under Canning, and which became so powerful under Palmerston; but the rule which he followed in foreign affairs, so far as he considered it possible, was that of non-intervention.

As soon as Catholic emancipation was carried, the demand for a reform of: parliament agitated Great Britain from end to end. The duke was ill-informed as to the real spirit of the nation. He conceived the agitation for reform to be a purely fictitious one, worked up by partisans and men of disorder in their own interest, and expressing no real want on the part of the public at large. Met with a firm resistance, it would, he believed, vanish away, with no worse result than the possible plunder of a few houses by the city mobs. Thus wholly unaware of the strength of the forces which he was pro- voking, the duke, at the opening of the parliament which met after the death of George IV., declared against any parliamentary reform whatever. This declaration led to the immediate fall of his Government. Lord Grey, the chief of the new ministry, brought in

the Reform Bill, which was resisted by Wellington as long as anything was to be gained by resistance. When the creation of new peers was known to be imminent, Wellington was among those who counselled the abandonment of a hopeless struggle. His opposition to reform made him for a while unpopular. He was hooted by the mob on the anniversary of Waterloo, and considered it necessary to protect the windows of Apsley House with iron shutters.

For the next two years the duke was in opposition. On the removal of Lord Althorp to the House of Lords in 1834, King William IV. unexpectedly dismissed the Whig ministry and requested Wellington to forma cabinet. The duke, however, recommended that Peel should be at the head of the Government, and served under him, during the few months that his ministry lasted, as foreign secretary. On Peel's later return to power in 1841 Wellington was again in the cabinet, but without departmental office beyond that of commander-in-chief. He supported Peel in his Corn- Law legislation, and throughout all this later period of his life, whether in office or in opposition, gained the admiration of discerning men, and excited the wonder of zealots, by his habitual subordination of party spirit and party connexion to whatever appeared to him the real interest of the nation. On Peel's defeat in 1846, the duke retired from active public life. He was now nearly eighty. His organization of the military force in London against the Chartists in April 1848, and his letter to Sir John Burgoyne on the defences of the country, proved that the old man had still something of his youth about him. But the general character of Wellington's last years was rather that of the old age of a great man idealized. To the unbroken splendours of his military career, to his honour-

able and conscientious labours as a parliamentary states- man, life unusually prolonged added an evening of impressive beauty and calm. The passions excited during the stormy epoch of the Reform Bill had long passed away. Venerated and beloved by the greatest and the lowliest, the old hero entered, as it were, into the immortality of his fame while still among his countrymen. Death came to him at last in its gentlest form. He

passed away on the 14th of September 1852, and was buried under the dome of St Paul's, in a manner worthy both of the nation and of the man. His monument, a mere fraction of the work originally designed, stands in the chapel at the south-western end of the cathedral.

Authorities.—The Wellington Despatches, edited by Gurwood ; Supplementary Despatches ; and Wellington Despatches, New Series, edited by the second duke of Wellington. Unlike Napoleon's despatches and correspondence, everything from Wellington's pen is absolutely trustworthy: not a word is written for effect, and no fact is misrepresented. Almost all the political memoirs of the period 1830-1850 contain more or less about Wellington in his later life. Those of Greville and Croker have perhaps most of interest. (C. A. F.)

WELLS, a municipal borough in the county of Somerset, England, at the foot of the Mendip Hills, 135 miles west of London. At present it is a place of little importance, except for its cathedral, markets, and assizes. The popu- lation of the city (726 acres) in 1881 was 4634.

The city of Wells is said to have derived its name from some springs called St Andrew's Wells, which during the Middle Ages were thought to have valuable curative properties. The munici- pality, consisting of a mayor, seven aldermen, and sixteen chief burgesses, was incorporated by a charter granted by King John in 1202. During Saxon times Wells was one of the most important towns of Wessex, and in 905 it was made the seat of a bishopric by King Edward the Elder. About the year 1091-92 Bishop John de Villula removed the see to Bath; and for some years Wells ceased to be an episeopal city. After many struggles between the secular clergy of Wells and the regulars of Bath, it was finally arranged in 1189 that the bishop should take the title of 'bishop of Bath and Wells," and should for the future be elected by delegates appointed partly by the monks of Bath and partly by the canons of Wells. The foundation attached to the cathedral chureh of Wells consisted of a college of secular canons of St Augustine, governed by a dean, sub-dean, chancellor, and other officials.

The existing cathedral, one of the most magnificent of all the secular churches of England, was begun by Bishop Joceline soon after his election to the episcopate in 1220; and the greater part of the building was

completed before his death in 1244. According to the usual medieval practice, the eastern part of the church was begun first, and the choir was consecrated for use long before the completion of the nave, the western part of which, with the mag- nificent series of statues on the facade, was carried out during the second half of the 13th century, and probably finished about the year 1300. 'The upper half of the two western towers has never been built. The very noble and well-designed central tower, 160 feet high, was built carly in the 14th century; the beautiful octagonal chapter-house on the north side, and the lady chapel at the extreme east, were the next important additions in the same century. The whole church is a building of very exceptional splendour and beauty; it is covered throughout with stone groming of various dates, from the Early English of the choir to the fan vaulting of the central tower. Its plan consists of a nave and aisles, with two short transepts, each with a western aisle and two eastern chapels. The choir and its aisles are of unusual length, and behind the high altar are two smaller transepts, beyond which is the very rich Decorated lady chapel, with an eastern scml- octagonal apse. The main tower is at the crossing. Ou the north of the choir is the octagonal chapter-house, the vaulting of which springs from a slender central shaft; as the church belonged to secular clergy, it was not necessary to place it in its usual position: by the cloister. The cloister, 160 by 150 feet, extends along the whole southern wall of the nave. The extreme length of the church from east to west is 371 feet. The oak stalls and bishop's throne in the choir are magnificent examples of 15th-century woodwork, still well preserved. ; : f

The great glory of the church, and that which makes it unique among the many splendid buildings of medieval England, is the wonderful series of sculptured figures whieh decorate the exterior of the west front,—-the work of English sculptors of the latter part of the 13th century,—a series which shows that at that time Eng- land was, as far as the plastie art is concerned, in no degree inferior to Germany and France, or even Italy, if we except the work done

by Niccola, the sculptor of the wonderful baptistery pulpit at Pisa. The whole of the fagade, 147 feet wide, including the two western towers, is completely covered with this magnificent series; there are nine tiers of single figures under canopies, over 600 in number, mostly large life size, with some as much as 8 feet in height, and other smaller statues; these represent angels, saints, prophets, kings and queens of the Saxon, Norman, and Plantagenet dynasties, and bishops and others who had been benefactors to the see. There are also forty-eight reliefs with subjects from Bible history, and immense representations of the Last Judgment and the Resurrec- tion, the latter alone containing about 150 figures. The whole composition is devised so as to present a comprehensive scheme of theology and history, evidently thought out with much care and ingenuity. As works of art, these statues and reliefs are of very high merit; the faccs are noble in type, the folds of the drapery very gracefully treated with true sculpturesque simplicity, and the pose of the figures remarkable for dignity. The main lines of the sculpture throughout are carefully arranged in a severely architec- tonic manner, so as to emphasize and harmonize with the chief features of the structure. Complete self-restraint is shown in the subordination of each part to the general effect of the whole—one of the great merits of English sculpture down to the 16th century. Of course a great variety of hands and much diversity of workman- ship can be traced in this mass of sculpture, but in very few cases does the work fall conspicuously below the general level of excel- lence, and some of the best figures show the very flower and crown of English plastic art, which was reaching its highest point about the time that the west front of Wells was completed.?

The interior of the central tower presents an interesting example of the very skilful way in which the medizval builders could turn an unexpected constructional necessity into a novel and beautiful architectural feature. While it was being built the four piers of the great tower arches showed signs of failure, and therefore, in order to strengthen them, a second lower arch was built below each main arch of the tower; and on this a third inverted arch was added. Thus the piers received a steady support along their whole height from top to bottom, and yet the opening of each archway was blocked up in the smallest possible degree. The contrasting

lines of these three adjacent arches on each side of the tower have a very striking and graceful effect; nothing similar exists elsewhere.

On the south side of the cathedral stands the bishop's palace, a stately moated building, originally built in the form of a quad- rangle by Bishop Joceline (1205-1244), and surrounded. by a lofty circuit wall, The hall and chapel are very beautiful structures, of rather later date, mostly of the 14th century.

The vicars' college was a secular foundation for two principals and twelve vicars; fine remains of this, dating from the 15th cen- tury, and other residences of the clergy stand within and near the cathedral close; some of these are among the most beautifnl examples of inedieval domestic architecture which exist any where in England.

The church of St Cuthbert in Wells is one of the finest of the many fine parochial churches in Somersetshire, with a very noble tower and spire at the west end. It was originally an Early Eng- lish cruciform building, but the central tower fell in during the 16th century, and the whole building was much altered during the Perpendicular period. Though much damaged, a very interesting reredos exists behind the high altar; erected in 1470, itconsists of a 'Jesse tree" sculptured in relief. Another very beautiful reredos was discovered in 1848, hidden in the plaster on the east wall of the lady chapel, which is on the north side. (J. H. M.)

WELSHPOOL, or Poot, a market-town and municipal and parliamentary borough in Montgomeryshire, North Wales, is situated in the upper Severn valley not far from the river, on the Shropshire Union Canal, and on the Cambrian Railway, 207 miles north-west of London, 8 north of Montgomery, and 18 west of Shrewsbury. The church of St Mary's, a Gothic structure, restored by Street at a cost of £4000, is a building of some antiquity ; Christ Church, in Powis Park, in the Norman style, was erected in 1839. The town-hall, erected in 1873 et aa cost of £6000, includes a corn and general market- house, assize courts, and assembly rooms. The Powysland Museum, containing a collection of local fossils and antj- quities and a library, was in 1887 vested in the corpora- tion as a free public library and museum.

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1 See Cockerell, Iconography of Wells Cath., 1851; Reynolds, Wells Cath., 1881; and Britton, Wells Cath., 1821. The stone used for this sculpture is from the neighbouring Doulting quarry ; it was once decorated with gold and colour, applied on a ground of fine gesso in the usual way.

baronial residence of the earl of Powis, and about the same distance to the east is Leighton Hall. The site of an old moated mound is now occupied by a bowling green. The flannel manufacture has now ceased, but there is a large manufactory of tweeds and woollen shawls. The population of the municipal borough (area 19,549 acres) in 1871 was 7370 and in 1881 it was 7107. The population of the parliamentary borough (area 6761 acres) in 1881 was 5211.

About 1109 a castle was begun at Welshpool by Cadwygan ap Bleddyn ap Cynvyn, and completed by Gwenwynwyn. In 1191 it was besicged by Hubert, archbishop of Canterbury, and after being undermined surrendered, but it was retaken by Gwenwynwyn in 1197. It was dismantled in 1233 by Llewelyn, prince of North Wales, and for several generations it remained in the hands of the lords of Powis. During the civil war Lord Powis declared for the royal cause, but he was taken prisoner, and the castle was subsequently demolished. The town was incorporated about 1279 by the lords of Powis. In 1406 its boundaries were enlarged to the present enormous dimensions, and in 1615 it received a cliarter from James I., which was confirmed and enlarged by Charles II. From the 27th of Henry VIII. it has been included in the Mont- gomery district of boroughs, which returns one member to parlia- ment, The Welsh name of the town is Trallwns or Trallwm.

WENCESLAUS (1361-1419), German king, was the eldest son of the emperor Charles IV., of the house of Luxemburg. He was born in 1361, and when three years of age was crowned as his father's successor in Bohemia. In 1376 he was elected king of the Romans, and in 1378, on the death of Charles IV., he mounted the Bohemian and German thrones. He repeatedly thought of going to Rome to receive the imperial crown, but

this intention was never fulfilled. During his reign there was great confusion both in church and state, and he was wholly powerless to cope with the forces of disorder. Although not without a rude sense of justice, he was of a rough and violent temper, and too fond of pleasure to devote much attention to serious duty. The cities of Germany, in which were some of the best elements of the national life, had been gradually learning how to defend themselves by combining with one another against princes and robber knights; and a wise king or emperor might with their aid have succeeded in re-establishing the authority of the crown. Wenceslaus, however, never understood the importance of the cities, and missed every opportunity of winning their friendship. At a diet in Nuremberg in 1383 an attempt was made to secure the public peace, but the cities, knowing that their liberties were threatened, gave no heed to the measures adopted by the diet. In 1381 the Rhenish cities had formed a confederation, and notwithstanding the threats of Wenceslaus had united with the Swabian League, which was' regarded with fear and hatred by most of the southern princes. The battle of Sempach, in which the Swiss confederates gained a decisive victory over the house of Hapsburg, greatly encouraged the cities, but in 1388 a powerful coalition was formed against them, and at the battle of Déffingen their troops suffered so crushing a defeat that they were rendered incapable of further resistance. Ata diet held in Eger in 1389 public peace was therefore proclaimed, and the cities of Swabia, the Rhine country, Alsace, the Wetterau, Franconia, and Bavaria were ordered, on pain of the king's displeasure, to dissolve their alliances. This really meant that the princes had both the king and the towns at their mercy. Wenceslaus was not more successful in his native king- dom Bohemia than in Germany. In 1393, in the course of a struggle with the archbishop of Prague, he shocked both friends and enemies by the murder of the vicar- general John of Pomuk, who, after being subjected to torture, was bound and thrown into the river Moldau. With all his faults, Wenceslaus was sincerely anxious to check the violence of the Bohemian nobles. They accord-

ingly plotted against him, and in Jobst of Moravia, to whom Brandenburg had been given in pledge by Sigismund, the brother of Wenceslaus, they

found a powerful friend and leader. Wenceslaus was taken prisoner in 1394, and kept for some months in close confinement, and he was set free only when the German princes threatened that if he were detained the conspirators would be treated as enemies of the empire. He was unable to recover more than the appearance of power, and in 1395 he made himself an object of general contempt by selling to John Galeazzo Visconti, of Milan, the dignity of a duke of Lombardy. Afterthe defeat of his brother Sigismund, king of Hungary, at Nicopolis, Wenceslaus came to an under-standing with Jobst, to whom he gave Brandenburg in fief; and he afterwards tried to assert authority in Germany by summoning a diet at Frankfort, where, early 'In 1398, public peace was once more proclaimed. But Wenceslaus could not now undo the results of his indolence and incapacity, and when, in association with the king of France, he supported a plan for the deposition of Popes Boniface IX. and Benedict XIII, and for the assembling of a general council, the spiritual electors and Rupert, elector of the Palatinate, resolved that he himself should be deposed. These electors met at Oberlahnstein, and on the 20th August 1400 a decree depriving Wences- laus of the German crown was read by the elector of Mainz as chancellor of the empire. The decree was informal, but Wenceslaus was not in a position to set it aside, and Rupert of the Palatinate was elected king in his stead. Fresh troubles had overtaken him in Bohemia, and in 1402 he was made prisoner by his brother Sigismund, who kept him in confinement for nineteen months. After his release he was not less arbitrary than before, and he caused much discontent by encouraging the disciples of Huss, whom he supported, not apparently because he cared for their doctrines, but because he found it convenient to use them as an instrument against the clergy. On the death of Rupert in 1410 Wenceslaus, while retaining the title of king of the Romans, resigned his claims to the imperial dignity in favour of Sigismund, who was elected to the German throne. Wenceslaus died of a stroke of apoplexy on the 16th August 1419.

See Pelzel, Lebensgeschichte des rémischen wad béhmischen Kénigs Wenzel (1788-90); Weizsiicker, Deutsche Reichstagsacten unter

Konig Wenzel (1868-74) ; Lindner, Gesehiehte des Deutschen Reichs unter Konig Wenzel (1875).

WENDS. See Saxony, vol. xxi. p. 353, and Stavs.

WENLOCK, or Much Wentocg, a market-town and municipal borough of Shropshire, England, is situated on a branch of the Great Western Railway, 1634 miles north- west of London, 11 south of Wellington, and 12 south-east of Shrewsbury. There are some beautiful remains of the old priory church, including the southern half of the west front, three bays of the south aisle, and three sides of the south transept. The priory was originally founded as a nunnery by St Milburg, granddaughter of Penda, about 680, and after being destroyed by the Danes was refounded by Leofric in 1017. Afterwards it was remodelled by Roger de Montgomery as a house for Cluniac monks, and rose to great magnificence. The church of Holy Trinity is Norman and Early English, with portions of Decorated and Perpendicular. The other principal public buildings are the guild-hall, a quaint old timbered structure, the market-hall adjoining (erected in 1879 to harmonize with the old building), the corn exchange (1852), and the museum, occupying the site of the hospital of St John. The town is chiefly dependent on its agricultural trade. There are limestone quarries in the neigbourhood. The population of the municipal borough (the area of which is about 33,000 acres and embraces 17 parishes) in 1871

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was 19,401 and in 1881 it was 18,442. In addition to the municipal authority the town itself is under the government of a local board. The population of the urban sanitary district (area 9737 acres) in 1871 was 2531 and in 1881 it was 2321.

Wenlock is said to date from the pre-Roman period, but owed its rise to importance to the religious foundation of St Milburg. It received the grant of a market from Henry III. in 1224. It was incorporated by Edward IV. in 1448, when it also received the privilege of returning members to parliament, but in 1885 it ceased to have separate representation.

WENTWORTH, Tuomas. See Strarrorp.

WENZEL, Karu Frieprich (1740-1793), German metallurgist, was born at Dresden in 1740. His father was a bookbinder, and Wenzel began to learn the same trade ; but finding it monotonous he quietly left home and went to Holland at the age of fifteen. In Amsterdam he took lessons in surgery and chemistry, and then entered the Dutch navy as a surgeon. After some years a sea life lost its charm for him, and he resigned, returning to his native land in 1766 to complete his chemical studies at Leipsic. Wenzel now devoted his attention to metallurgy and assaying, working for a time with great success in the town of his birth. He received a prize for the best solution of a problem in working metals from the Copenhagen Society of Sciences. He also made some very careful chemical experiments, particularly on the mixture of solutions of various salts, and wrote several books on chemical subjects ; his claim for remembrance rests on one of these, Vorleswngen tiber die chemische Verwandtschaft der Korper. It was published in 1777; a second edition appeared in 1782, and a third with addi- tions in 1800. In 1780 Wenzel received the appointment of director of mines at Freiberg from the elector of Saxony, and in 1786 that of chemist in the porcelain works at Meissen. He died at Freiberg on February 26, 1793.

The discovery of the law of reciprocal proportions in chemistry (see CHEMISTRY, vol. v. p. 463) has been claimed for Wenzel as the result of his researches on the affinities of bodies; and, on the ground of his work being prior to that of Richter, and much more accurate than the earlier experiments of Bergmann on the same subject, he has been regarded as Dalton's precursor in laying the foundation of the atomic theory. It was pointed out by Hess in 1840 that this was a mistake, since Wenzel's researches led him to no definite conclusions as to invariable and reciprocal proportions in the combination of acids and bases, but rather pointed in the opposite direction. Kopp overlooked this criticism in writing his great Geschichte der Chemie (1844-1847), which has deservedly taken the highest place as an authority on chemical history ; and, although in the supplementary work published in 1873 he acknowledges his mistake as to Wenzel and confirms Hess's statement, the writers of text-books continue in many cases to give currency to the erroneous view.

WERDAU, a manufacturing town of Saxony, is situated on the Pleisse, in the industrial district of Zwickau, about 40 miles south of Leipsic. Its chief industries are cotton and wool-spinning and the weaving of cloth; but machinery of various kinds, paper, and a few other articles are also manufactured. In addition to the usual schools, Werdau contains a weaving-school. The town is mentioned as early as 1304, and in 1398 it was purchased by the margrave of Meissen, who afterwards became elector of Saxony. The population, 4994 in 1834, was 14,638 in 1885. The adjoining village of Leubnitz, with 2400 inhabitants, 1s now practically a part of Werdau.

WEREWOLF. See LycantTuropy.

WERGELAND, Henrik Arnotp (1808-1845), Nor- wegian poet and prose writer. See vol. xvii. p. 590.

WERNER, Asranam Gorrios (1750-1817), the father of German geology, was born in Oberlausitz, Saxony, 25th September 1750. The family to which he belonged had been engaged for several hundred years in mining pursuits. His father was inspector of Count Solm's iron-works at Mehrau and Lorzendorf, and from young Werner's infancy cultivated in him a taste for minerals and rocks. The boy showed early promise of distinction. In his fourth year he had learnt to read; in his fifth he could write and cipher; and by the time he was six or seven years old he had grown to be agreat reader. Already, when only three years of age, he had begun to collect specimens of stones, and, when he could read, one of his favourite employments was to pore over the pages of a dictionary of mining. At the age of nine he was sent to school at Bunzlau in Silesia, where he remained until 1764, when he joined his father, with the idea of ultimately succeeding him in the post which the latter held there. In his eighteenth year ill- health compelled him to seek the mineral waters of Carlsbad. In journeying thither by way of Freiberg he showed such enthusiasm and knowledge in an excursion in that neighbourhood as to attract the notice of the officials there, who invited him to attend their mining school which had been established two years previously. This was the turning point in Werner's career. He came to Freiberg in 1769 when he was nineteen

years of age, and found the school in its merest infancy. He soon distinguished himself by his industry and by the large amount of practical knowledge of mineralogy which he acquired. In 1771 he repaired to the university of Leipsic and went through the usual curriculum of study, but continued to devote himself with the greatest ardour to mineralogical pursuits. While still a student he wrote his first work on the external characters of minerals (Ueber die dussern Kennzeichen der Fossilien, Leipsic, 1764), which at once gave him a name among the mineralogists of the day. His friends in Freiberg, who had watched his pro- gress with much gratification, called him at the close of his college life to be inspector in the mining school and teacher of mineralogy there. To the development of that school and to the cultivation of mineralogy and geognosy he thenceforth devoted the whole of his active and indefatigable industry. From a mere provincial institution the Freiberg academy under his care rose to be one of the great centres of scientific light in Europe, to which students from all parts of the world flocked to listen to his eloquent teaching. He wrote but little, and though he elaborated a complete system of geognosy and mineralogy he never could be induced to publish it. From the notes of his pupils, however, the general purport of his teaching was well known, and it widely influenced the science of his time. He had the art of infusing into those who listened to him some of his own ardent enthusiasm. His disciples accordingly left his rooms with the determination to preach his doctrine everywhere. They became ardent partisans, and carried on an active propaganda in most countries of Europe. He died at Freiberg on June 30, 1817.

One of the distinguishing featu : i eare with which He eT 1 eRe Meta He showed that the roeks of the earth are not disposed at random, but follow each other in a certain definite order. Unfortunately he had never enlarged his experience by travel, and the sequenee of rock-masses which he had reeognized in Saxony was believed by him to be of universal applieation all over the globe. He taught that the roeks were the precipitates of a primeval ocean, and followed each other in sueeessive deposits of world-wide extent. Volcanoes were regarded by him as abnormal phenomena, probably due to the combustion of subterranean beds of eoal. Basalt and similar roeks, whieh even then were reeognized

by other observers as of igneous origin, were believed by lim to be water-formed accumulations of the same ancient ocean. Henee arose one of the

great historical controversies of geology. Werner's followers preached the doctrine of the aqueous origin of roeks, and were

| though its present form dates from 1521.

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known as Neptunists ; their opponents, who recognized the import- ant part taken in the construction of the earth's crust by subter- ranean heat, were styled Vuleanists. Though much of Werner's theoretical work was erroneous, science is indebted to him for so elearly demonstrating the ehronological suceession of rocks, for the enthusiastie zeal which he infused into his pupils, and for the im- pulse whieh he thereby gave to the study of geology.

See 8. G, Frisch, Lebensbeschretbung A. G. Werners, Leipsic, 1825; Cuvier, Eloge de Werner; and Lyell, Principles of Geology.

WERNER, Frieprich Lupwic ZACHARIAS, German poet, was born at Kénigsberg on November 18, 1768, and died at Vienna on January 17, 1823. After an irregular life he joined the Church of Rome in 1809, was consecrated priest in 1814, and in his later years was well known asa preacher. As a dramatist he is remembered as thie originator of the so-called "' fate tragedies "; see GERMANY, vol. x. p. 543.

WERNIGERODE, a town of Prussian Saxony, about. 12 miles to the south-west of Halberstadt, is picturesquely situated on the Holzemme, on the north slopes of the Harz Mountains. It contains several interesting Gothic buildings, including the fine town-house dating from the 14th century. Some of the quaint old houses which have escaped the numerous fires that have visited the town are elaborately adorned with wood-carving. The gymnasium, occupying a modern Gothic building, is the successor of an ancient grammar-school, which existed until 1825. Wooden articles, cigars, and dye-stuffs are among the manufactures of the place. Above the town rises the chateau of the count of Stolberg-

Wernigerode. A pavilion in the park contains the library of 96,000 volumes, the chief feature in which is the collection of over 3000 Bibles and over 3600 volumes on hymnology. The population of Wernigerode in 1885 was 9083 ; including the imme- diately adjoining villages of Néscherode and Hasserode, it was 13,804.

Wernigerode is the chief town of the county (grafschaft) of Stol- berg-Wernigerode, which still retains a few shreds of nominal in- dependence, though really an integral part of Prussia since the congress of Vienna. It was originally a free and independent im- perial fief, and retains its peeuliar national colours. The eounty has an extent of 107 square miles, with 26,484 inhabitants, and includes the Brocken within its limits.

WESEL, a strongly fortified industrial town in West- phalia, Prussia, is situated at the confluence of the Rhine and the Lippe, 46 miles south-west of Mtinster, and 35 miles south-east of Nimeguen in Holland. The Rhine is here crossed by a large railway bridge and by a bridge of boats. The island of Biiderich in mid-stream is fortified, and the town is further protected by detached forts, one of which serves as a ¢éte-de-pont on the left bank of the Rhine. Wesel contains some quaint old houses with high-pitched roofs, and a town-house, dating from 1396, with an elaborate fagade. The large church of St Willibrord, a handsome late-Gothic edifice, was consecrated in 1181, Since 1883 it has been undergoing a much-needed restoration. St Matthew's church dates from 1472-77. The two Roman Catholic churches, the commandant's house (built in 1417), the Berlin gateway (1722), and the modern gymnasium and military hospital are among the other chief buildings. Wesel carries on a considerable trade both by railway and its two rivers ; wood and fish are perhaps the main exports. It has manufactures of wire, leaden pipes, and other metal goods, pianofortes, sugar, &c. The population, more than half Roman Catholic, was 20,677 in 1885.

Wesel, formerly known as Lippemiinde, was one of the points from which Charlemagne direeted his operations against the heathen Saxons. The present name is said to be derived from the numerous weasels (Germ., Wiesel) at one time found in the neighbourhood. In the Middle Ages it was a flourishing eommereial town, and a member of the Hanseatic

League, and as late as 1495 a free im- perial eity. A monument outside the town commeniorates eleven of Sehill's officers who were shot here in 1809 after their unsuc-

cessful attempt at Stralsund. Wesel is occasionally spoken of as Unterwesel, to distinguish it from Oberwesel, a small town also on the Rhine (18 miles south-south-east of Coblentz), and also at one time a free imperial town.

WESEL, Joun Kucuratu, of Oberwesel (see above), was born in the early years of the 15th century, and died under sentence of imprisonment for life on a charge of heresy in the Augustinian convent in Mainz in 1481. He appears to have been one of the leaders of the humanist movement in Germany, and to have had some intercourse and sympathy with the leaders of the Hussites in Bohemia. Erfurt was then the headquarters of a humanism which was at the same time devout and opposed to the realist metaphysic and the Thomist theology which prevailed in the Rhenish universities at Cologne and at Heidelberg. Wesel was one of the professors at Erfurt between 1445 and 1456, and was vice-rector in 1458. In 1460 he was called to be a preacher either at Worms or at Mainz, and in 1479, when an old and worn-out man (he was led into the room by two Franciscans, and was obliged to support himself on a staff), he was brought before the Dominican inquisitor Gerhard Elten of Cologne. The charges brought against him were chiefly based on a treatise, De /: ndulgentiis, which he had composed while at Erfurt twenty-five years before.

It is somewhat difficult to determine the exact theo- logical position of Wesel. Ullmann claims him as a "reformer before the Reformation," but it is more than doubtful that he had that experimental view of the doctrines of grace which lay at the basis of Reformation theology. He held that Christ is our righteousness in so far as we are guided by the Holy Ghost and the love towards God is shed abroad in our hearts, which clearly shows that he held the medizval idea that justification is an habitual grace implanted in men by the gracious act of God. He seems, however, to have protested against certain medieval ecclesiastical ideas

which he held to be exerescences erroneously grafted on Christian faith and practice. He objected to the whole system of indulgences; he denied the infallibility of the church, on the ground that the church contains within it sinners as well as saints ; he insisted that papal authority could be upheld only when the pope remained true to the evangel; and he held that a sharp distinction ought to be drawn between ecclesiastical sentences and punishments and the judgments of God.

The best account of Wesel is to be found in Ullmann's Reformers before the Reformation. His tract on Indulgences has been pub- lished in Walch's Monumenta Medti vt, vol. i., while a report of his trial is given in Ortuin Gratius's Faseeulus Rerwm Expeten- darum ct Fugiendarum (ed. by Browne, London, 1690).

WESER (0. Germ. Visuracha, Wisura; Lat. Visurgis), one of the chief rivers of Germany, formed by the union of the Werra and the Fulda at Miinden, in the Prussian province of Hanover, flows to the north and north-north- west, and enters the North Sea below Bremerhafen, to the east of the Jade Bay. The mouth is 170 miles from Miinden, but the winding course of the river is 279 miles long ; if the measurement be made from the source of the Werra, in Thuringia, the total length of the stream is 439 miles. At Miinden the river surface is 380 feet above sea-level; the most rapid fall in its course is between Carlshafen and Minden in Westphalia, where it descends 70 feet in 20 miles. Nearly the entire course of the Weser lies in Prussia, but it also touches part of Brunswick and Lippe, and after flowing through Bremen expands into an estuary separating the duchy of Oldenburg from the Prussian province of Hanover. Between Miinden and Minden its course lies through a series of picturesque valleys flanked by the irregular and disjointed mountain system known as the Weser Hills; but after it emerges from these mountains by the narrow pass called the " Porta

Westphalica," to the north of Minden, its banks become flat and uninteresting. The breadth of the river varies from 110 yards at Miinden to 220 yards at Minden, 250 yards at Bremen, 1} miles at Elsfleth, and 74% miles at its entrance into the sea. The Weser on the whole is shallow;

and navigation on the upper Weser, 7.2, above Bremen, is sometimes interrupted for months by drought. Sea-going ships may ascend to Elsfleth, though Bremer- hafen is the chief port for large vessels; smaller craft may reach Vegesack, and barges of 200 tons make their way to Miinden. The stream discharges itself into the sea amid sandbanks, which leave only a single narrow fairway, 19-22 feet deep at high water and 12 feet at low water ; on the upper Weser the navigation of the only available narrow channel, which is interrupted by occasional rapids, is assisted by locks and weirs. The Weser drains a basin estimated at 18,360 square miles. Its principal tributaries on the right are the Aller, Wiimme, Drepte, Lune, and Geeste, and on the left the Diemel, Nethe, Emmer, Werre, Aue, and Hunte. The Werra and Fulda are both navi- gable when they unite to form the Weser; the Aller, Wiimme, Geeste, and Hunte are also navigable. Beyond the junction of the Hunte the Weser, hitherto a single stream, is divided into several channels by islands.

The navigation of the Weser was long hampercd by the various and vexatious claims and rights of the different states through whose territories it ran. Before 1866 the joint stream, including the Werra and the Fulda, changed its ruler no less than thirty-five times on its way to the sea. In 1823, however, a treaty was made establishing a fixed toll and a uniform system of management; this was further improved in 1856 and 1865; and when Prussia took possession of Hanover and Hesse-Nassau in 1866 the chief diffi- culties in the way of organizing the river-trade disappeared. The principal town on the Weser is Bremen (population in 1885, 118,043). Other towns past which it flows betwixt Miinden and the sea are Carlshafen, Hoxter, Holzminden, Bodenwerder, Hameln, Rinteln, Viotho, Minden, Nienburg, Vegesack, Elsfleth, Braake, Blexen, Geestemiinde, and Bremerhafen. The Weser gave name to a department in the short-lived kingdom of Westphalia; the chief town was Osnabriick. A canal between the Wiimmce and the Oste, and another between the Geeste and the mouth of the Elbe, connect the Weser system with that of the Elbe. A canal is also being constructed from the Hunte to a tributary of the Ems.

WESLEY, an English family of special ecclesiastical distinction, claims descent from the ancient De Wellesleys, one of whom, Guy, was made a

thane by Athelstan about 938, the family seat being at Welswe, near Wells, in Somerset. Two brothers, John and Bartholomew, were among the ministers ejected for nonconformity in 1662.

SAMUEL (1662-1735), son of the above John, was born 17th December 1662. He was educated at an academy at Stepney, London, and in August 1683 entered Exeter College, Oxford, as a pauper scholaris, shortly after which he joined the Church of England, a step which so deeply offended his family that they left him henceforth to his own resources. While still an undergraduate he pub- lished Maggots, or Poems on Several Subjects never before Handled, 1685. He graduated B.A. 1688, was ordained priest 24th February 1689, and the following year was presented to the living of South Ormsby, Lincolnshire. In 1697 he removed to Epworth, Lincolnshire, where he died 25th April 1735. Among other works he was the author of Life of Christ (1693), Elegies on Queen Mary and Archbishop Tillotson (1695), LHistory of the Old and New Testaments in Verse (1704), Pious Communicant fughily Prepared (1700), and Latin Commentary on the Book of Job (1733). After the battle of Blenheim he published (1705) a long poem on Marlborough, or the fate of Europe, for which Marlborough made him chap- lain of a regiment. He had nineteen children, of whom three sons, Samuel, John, and Charles, acquired eminence.

SAMUEL (1690-1739) was born in London 10th February 1690, and educated at Westminster school, where he was

nominated king's scholar. In 1711 he entered Christ Church, Oxford, and on taking his M.A. degree returned to Westminster as tutor. He lived on intimate terms with Harley, earl of Oxford, Pope, Swift, and Prior, and wrote somewhat clever squibs against Sir Robert Walpole, the Whigs, and the Low Church divines. They were col- lected and published 1736, reached a second edition 1743, and were reprinted, with notes by James Nicholls and life by W. Nicholls, in 1862. Wesley became master of Tiverton grammar-school in 1732, and died there 6th November 1739.

Joun (1703-1791), brother of the preceding and founder of Methodism, was born, probably at Epworth, 17th June (O.S., 28th N.S.) 1703. There was a tradi- tion in the family that he was christened John Benjamin, but he never made use of the second name. When his father's rectory was burnt down in 1709 he was for a time left in the building, and narrowly escaped death. He entered Charterhouse in 1714, whence in 1720 he was elected to Christ Church, Oxford. In 1726 he became fellow of Lincoln, and in 1727 graduated M.A. After acting for some time as his father's curate he settled in November 1729 .at Oxford, and began to take pupils. About the same time, along with his brother Charles and others, he commenced that systematic course of religious life which led to their being termed by the Oxonians Methodists. A full record of the religious labours of Wesley is given under MerHopism (vol. xvi. pp. 185-189). In the organization of Methodism he dis- played not only extraordinary energy and capacity for work but remarkable administrative powers. His oratory was colloquial, terse, and homely, but never vulgar, while his expressive and refined features and intense yet reasoned earnestness enabled him to acquire among his followers a personal influence of an unrivalled kind. Although from overwork or exposure he had one or two serious illnesses, he generally enjoyed robust health, an experience probably partly accounted for by his constant journeys on horseback. In 1790 he said, "I do not remember to have felt lowness of spirits for a quarter of an hour since I was born." He preached usually at 5 o'clock in the morning, and fre- quently twice again in the same day, the number of sermons he delivered in a year being over 800. He continued his labours almost to the last, but wrote, 1st January 1790, "I am now an old man decayed from head to foot." He died 2d March 1791. Wesley translated several hymns from the German for the col- lections edited by him and his brother Charles, but is not known to have been the author of any original hymns (see Hymns, vol. xii. p. 594). The first collection of Psalms and Hymns edited by the brothers appeared anonymously in 1738, and a Collection of Moral and Sacred Poems, from the Most Celebrated Authors, in 1744. Wesley has no claims to rank as a thinker or even asa theologian, but within certain narrow limits was a skilful controversialist. He was the author of Primitive Physic (1747), Lxplanatory Notes on the New Testament (1755), Notes on the Old and New Testaments (1764), Doctrine of Original Sin (1757), Survey of the Wisdom of God in Creation

(1763), Preservative against Unsettled Notions in Religion (1770), and A Calm Address to our American Colonies (1775). He also edited the Christian Library, in fifty volumes. His Works appeared in 1818, and an eleventh edition, with life by J. Beecham and preface by T. Jackson, was published in 15 vols., 1856-57.

Cuarues (1708-1788), brother of the preceding, was born prematurely at Epworth, 18th December 1708. He entered Westminster school in 1716, was admitted a king's scholar in 1721, and entered Christ Church, Oxford, in 1726. He accompanied his brother John to

Georgia in 1735 as secretary to the managing committee, having been ordained priest a few days before leaving England ; but on account of a strong feeling of opposition manifested against him in the religious communities of Frederica he left Georgia for England five months after landing. 'To a serious illness which happened to him in February 1738 he attributed a moral change which he associated with conversion and a conscious sense of pardon. He seconded his brother in his evangelizing labours in England with unceasing diligence, and, al- though not possessing his brother's gifts of oratory and personal magnetism, contributed by his hymns an element of success to the movement of prime and permanent importance. He published no fewer than 4100 hymns of his own composition, and left about 2000 in manuscript. Numerous editions both of the special and general col- lections of his hymns have been published. Both as regards the number of his compositions and their various excellences, he is entitled to the chief place among Methodist hymn writers (see Hymns, wé supra). He died 29th March 1788. His Sermons, with memoir, appeared in 1816; a Life, by Rev. Thomas Jackson, in 1841; and his Journal, with notes by Rev. Thomas Jackson, 1849.

Two sons of Charles Wesley attained eminence as musi- cians :— CHARLES (1757-1815), organist of St George's, Hanover Square, London, who in 1778 published Six Con- certos for the Organ and Harp; and Samus. (1766-1837), organist of the Chapel Royal, noticed below.

See, in addition to the authorities already mentioned, the Lives by Hampson (1791), Coke and Moore (1792), Whitehead (1793-96), Southey (1820), Moore (1824), Watson (1831), Miss Wedgwood (1870), and Tyerman (exhaustive and complete) (1870); J. Dove, Biographical History of the Wesleys (1833); and G. J. Stevenson, Memorials of the Wesley Family (1876).

WESLEY, Samuet (1766-1837), musical composer, son of Charles Wesley (see above), was born at Bristol, February 24, 1766, and developed so precocious a talent for music that at three years old he played the organ and at eight composed an oratorio entitled Ruth—a fact which is duly chronicled on a curious portrait, painted in 1774, and afterwards engraved, wherein he is represented in the childish costume of the period. Though suffering for many years from an accidental injury to the brain, Wesley was long regarded as the most brilliant organist and the most accomplished extempore fugue- ° player in England. He may indeed be regarded as the father of our present style of organ-playing, for he it was who, aided by his friends Benjamin Jacob and C. F. Horn, first introduced the works of Sebastian Bach to English organists, not only by his superb playing, but by editing with Horn, in 1810, the first copy of Das wohltem- perirte Clavier ever printed in Erigland. Wesley's last per- formance took place, September 12, 1837, at Christ Church, Newgate Street, London, where, after hearing the wonder- ful performances of Mendelssohn, he was himself induced to play an extempore fugue. He died, October 11, 1837, leaving a vast number of MS. and printed compositions.

His brother Charles (1757-1815) was also an accomplished organist, and still more famous was his son, Samuel Sebastian, (1810-1876), Mus. Doc., and organist of Gloucester cathedral.

WESSEL, Wessetus Gansrortius! was born at Gron- ingen in 1400 (Hardenberg), in-1419 (Suffridus Petri), or in 1421, and on the death of his parents was adopted by a noble lady, Oda Clantes, who sent him along with her only son to the famous school at Deventer, which was under the supervision of the Brothers of Common Life, and was in close connexion

with the convent of Mount St Agnes at Zwolle, where then lived Thomas a Kempis,

1 The surname is from Gansfort or Gésevort, a Westphalian village

from which his family came; the Christian name is the equivalent of the Greek Basilius.

the author of the Znutatio Christi. At Deventer, where the best traditions of the 14th-century mysticism were still cultivated, Wessel imbibed that earnest devotional mysticism which was the basis of his theology and which drew him irresistibly, after a busy life, to spend his last days among the Friends of God in the Low Countries. From Deventer he went to Cologne to be taught the Thomist theology, which was fondly cherished in that famous Dominican school; and there he learnt realism, which, although he afterwards became a nominalist in metaphysics, always coloured his theology. At Cologne too he came in contact with humanism. He learnt Greek and Hebrew from monks who, it is said, had been driven out of Greece. The Thomist theology sent him to study Augustine, and his Greek reading led him to Plato, and from both of these great thinkers he learnt much that went to enrich his own theological system. The echoes of the din raised in Paris by the disputes between the realists and the nominalists reached Wessel in Cologne, and a desire to mingle in the fray, or perhaps to learn on which side truth was, induced him to go to Paris, where he remained sixteen years, scholar and teacher. There he eventually took the nominalist side, pronipted as much by his mystical anti-ecclesiastical tendencies as from any metaphysical insight ; for the nominalists were then the anti-papal party. A desire to know more about humanism sent him to Rome, where we find him in 1470 the intimate friend of Italian scholars and under the protection of Cardinals Bessarion and Della Rovere (afterwards Pope Sixtus IV.). It is said that Sixtus would have gladly made Wessel a bishop, but that he had no desire for any ecclesiastical preferment. From Rome he returned to Paris, and speedily became a famous teacher, gathering round him a band of enthusiastic young students, among whom was Reuchlin. As old age approached he came to have a growing dislike to the wordy theological strife which

surrounded him, and turned away from that uni- versity discipline, 'non studia sacrarum literarum sed studiorum commixtee corruptiones." After thirty years of academic life he went back to his native Groningen, and spent the rest of his life partly as director in a nuns' cloister there and partly in the convent of St Agnes at Zwolle. He was welcomed as the most renowned scholar 'of his time, and it was fabled that he had travelled through all lands, Egypt as well as Greece, gathering everywhere the fruits of all sciences—"a man of rare erudition," says the title page of the first edition of his collected works, 'who in the shadow of papal darkness was called the light of the world." His remaining years were spent amid a circle of warm admirers, friends, and disciples, to whom he imparted the mystical theology, the devotion to higher learning, and the deep devotional spirit which characterized his own life. He died on October 4, 1489, with the confession on his lips, "' I know only Jesus the crucified." He is buried in the middle of the choir of the church of the '"Geestlichen Maegden," whose director he had been.

Wessel has been called one of the "reformers before the Refor- mation," and the title is a true one if by it is meant a man of deeply spiritual life, who protested against the growing paganizing of the papacy, the superstitious and magical uses of the sacraments, the authority of ecclesiastical tradition, and that tendency in later scholastic theology to lay greater stress in a doctrine of justifica- tion upon the instrumentality of the human will than on the objective work of Christ for man's salvation. His own theology was, however, essentially mcdixval in type, and he never grasped that experimental thought of justification on which Reformation theology rests.

See Vila Wesseli Groningensis, by Albert Hardenberg, published in an ineom- Plete form in the preface to Wessel's eolleeted works, Amsterdam, 1614 (this preface also contains extracts from the works of several writers who have given facts About the life of Wessel); Muurling, Com. Hist. Theol. de Wesselt Gans- Sortti Vita, dc., 1831; Ullmann, Reformers before the Reformation (the seeond volume of the German edition is a second and enlarged edition of a previous

work, entitled Johann Wessel, ein Vorgdnger Luther's, 1884); Friedrich, Johann Wessel, ein Bild aus der Kirchengeschichte des 15ten Jahrhunderts, 1862; Ritschl, ITistory of the Christian Doctrine of Justification and Reconciliation (Edin., 1872). Wessel's two most important writings are his Treatise on Prayer (De Oratione) and his Scala Meditationis.

WESSEX. See Encuanp, vol. viii. pp. 270, 282 s¢., and Plate IT. of same volume.

WEST, Bensamin (1738-1820), history and portrait painter, was born in 1738, at Springfield, in Pennsylvania, coming of an old Quaker family who had emigrated from Buckinghamshire. When a boy of seven he began to show his inclinations to art. According to the well- known story, he was sitting by the cradle of his sister's child, watching its sleep, when the infant happened to smile in its dreams, and, struck with its beauty, young Benjamin got sonie paper, aad drew its portrait. The career thus begun was prosecuted amid many difficulties; but his perseverance overcame every obstacle, and at the age of eighteen he settled in Philadelphia as a portrait- painter. After a short time he removed to New York, where he practised his profession with considerable success. In 1760, through the assistance of some friends, he was enabled to complete his artistic education by a visit to Italy, where he remained nearly three years. Here he acquired reputation, and was elected a member of the principal academies of Italy. On the expiry of his Italian visit he settled in London as an historical painter. His success was not long doubtful. George III. took him under his special patronage ; and commissions flowed in upon him from all quarters. In 1768 he was one of the four artists who submitted to the king the plan for a royal academy, of which he was one of the earliest members ; and in 1772 he was appointed His Majesty's historical painter. He devoted his attention mainly to the painting of large pictures on historical and religious subjects, con- ceived, as he believed, in the style of the old masters, and executed with great care and much taste. So high did he stand in public favour that on the death of Sir Joshua Reynolds, in 1792, he was elected his successor as presi- dent of the Royal Academy, an office which he held for twenty-eight years. In 1802 he took advantage of the opportunity afforded by the peace

of Amiens to visit Paris, and inspect the magnificent collection of the masterpieces of art, pillaged from the gallery of almost every capital in Europe, which then adorned the Louvre. On his return to London he devoted himself anew to the labours of his profession, which were, however, somewhat broken in upon by quarrels with some of the members of the Royal Academy. In 1804 he resigned his office, but an all but unanimous request that he should return to the chair induced him to recall his resignation. Time did not at all weaken the energy with which he laboured at his easel. When sixty-five he painted one of his largest works, Christ Healing the Sick. This was originally designed to be presented to the Quakers in Philadelphia, to assist in erecting a hospital. On its completion it was exhibited in London to immense crowds, and was purchased by the British Institution for 3000 guineas, West sending a replica to Philadelphia. His subsequent works were nearly all on the same grand scale with the picture which had been so successful, but for obvious reasons they did not meet with very ready sale. He died in 1820, in his eighty-second year, and was buried in St Paul's.

Since his death West's reputation has seriously declined. His works, which fond criticism ranked during his life with the great productions of the old masters, are now considered as in general formal, tame, wanting that freedom of nature and that life which genius alone can breathe into the canvas. His Death of Wolfe is interesting as introducing modern costume instead of the classical draperies which had been previously universal in similar subjects by English artists; and his Battle of La Hogue is en- titled to an honourable place among British historical paintings.

An account of West's life was published by Galt (Zhe Progress of ay. — Gy

Genius, 1816); and biographics of him occur in Cunningham's Lives of Eminent British Painters and Redgrave's Century of Painters of the English School.

WESTALL, RicHarp (1765-1836), subject painter, was born in Hertford in 1765, of a Norwich family. In 1779 he went to London, and was apprenticed to an engraver on silver, and in 1785 he began to study in the schools of the Royal Academy. He painted Esau Seeking Jacob's Blessing, Mary Queen of Scots Going to Execution, and other historical subjects in water-colour, and some good portraits in the same medium, but he is mainly known' as a book-illustrator. He produced five subjects for the Shakespeare Gallery, illustrated an edition of Milton, executed a very popular series of illustrations to the Bible and the prayer-book, and designed plates for numerous other works. In 1808 he published a poem, A Day in Spring, illustrated by his own pencil. His designs are rather tame, mannered, and effeminate. He became an associate of the Royal Academy in 1792, and a full member in 1794; and during his later years he was a pensioner of the Academy. His last employment was to give art instruction to the Princess Victoria. He died on December 4, 1836. His brother, William Westall, A.R.A. (1781-1850), landscape painter, is mainly known by his illustrations to works of travel.

WEST BAY CITY, a city of Bay county, Michigan, United States, is situated on the Saginaw river, near its mouth, opposite Bay City. The city lies in one of the largest lumber districts of the United States, and its industries consist mainly in manufacturing and shipping lumber. It had a population of 9492 in 1885.

WEST BROMWICH, a municipal and parliamentary borough of Staffordshire, England, is situated near the – river Tame, and on the Great Western Railway, 6 miles north-west of Birmingham, and 1333 miles from London. It consists chiefly of one main street, the High Street, upwards of 1} miles in length. The parish church (All Saints, formerly St Clement's) is of very early origin, aud was given by Henry I. to the convent of Worcester, which subsequently gave it to the priory of Sandwell. The present church, a handsome structure in the Decorated style, was built in 1871-72. The principal other public buildings are the West Bromwich district hospital (erected in 1867 at a cost of £9000, and enlarged in 1882 at a cost of £4000), the town-hall and municipal offices (1875), the inarket-hall, the free library (1874), and the Liberal club (1884). There are two public charities—the Stanley (1613) and the

Whorwood (1614). Since 1880 the town has manufactured its own gas, but the water is supplied by the South Staffordshire Waterworks Company. There are several large foundries, smelting-furnaces, and forges, but the staple manufactures are the various kinds of implements of wrought-iron used for household, agri- cultural, or mechanical purposes. The town also possesses brass foundries, maltings, limekilns, and brickyards. There are large collieries in the neighbourhood. The area of the municipal and parliamentary borough and urban sanitary district is 5719 acres, with a population in 1871 of 47,918 and in 1881 of 56,295.

In 1230 the manor of West Bromwich was vested in the barons of Dudley, and in 1298 it descended to Walter de Evereus; in 1448 it passed to the Stanleys, from whom it was purchased by Sir Richard Skelton, solicitor-general to Charles I.; and in 1626 it came into the possession of Sir Samuel Clarke, by whose descendants, who subsequently assumed the name of Clarke-Jervoise, it was sold in 1823 to the earl of Dartmouth. West Bromwich was incor- porated 13th September 1882. By the Act of 1885 its parliamen- tary representation was separated from that of Wednesbury, and it was erected into a parliamentary borough returning one member.

WESTBURY, Ricuarp Beruett, Baron (1800-1873), was the son of Dr Richard Bethell, and was born at Bradford, Wilts. He was placed in the first class in

classics and the second in mathematics at Oxford in 1818, and was elected a fellow of Wadham College. In 1823 he was called to the bar at the Middle Temple. On attaining the dignity of queen's counsel in 1840 he rapidly took the foremost place at the Chancery bar, and was appointed vice-chancellor of the county palatine of Lancaster in 1851. His most important public service was the reform of the then existing mode of legal education, a reform which ensured that students before call to the bar should have at least some acquaintance with the elements of the subject which they were to profess. In 1851 he obtained a seat in the House of Commons, where he continued to sit, first as member for Aylesbury, then as member for Wolverhampton, until he was raised to the peerage.

Attaching himself to the Liberals, he became solicitor- general in 1852 and attorney-general in 1856 and again in 1859. On June 26, 1861, on the death of Lord Campbell, he was created lord high chancellor of Great Britain, with the title of Baron Westbury of Westbury, county Wilts. The object of his life was to set on foot the compilation of a digest of the whole law, but for various reasons this became impracticable. The conclu- sion of his tenure of the chancellorship was unfortunately marked by events which, although they did not render personal corruption imputable to him, made it evident that he had acted with laxity of practice and want of caution. Owing to the reception by parliament of reports of com- mittees nominated to consider the circumstances of the acceptance by him of the resignations of Mr Wilde, the bankruptcy registrar at Leeds, and Mr Leonard Edmunds, a clerk in the patent office, and clerk of the parliaments, the lord chancellor felt it incumbent upon him to resign his office, which he accordingly did on July 5, 1865, and was succeeded by Lord Cranworth. After his resignation he continued to take part in the judicial sittings of the House of Lords and the privy council until his death. In 1872 he was appointed arbitrator under the European Assurance Society Act, 1872, and his judgments in that capacity have been collected and published by Mr F. §. Reilly. As a writer on law he made no mark, and few of his decisions take the highest judicial rank. Perhaps the best known is the judgment delivering the opinion of the judicial committee of the privy council in 1863 against the heretical character of certain extracts from the well- known publication Hssays and Reviews. His principal legislative achievements were the passing of the Divorce Act, 1857, and of the Land Registry Act, 1862 (generally known as Lord Westbury's Act), the latter of which in practice proved a failure. What chiefly distinguished Lord Westbury was the possession of a certain sarcastic humour; and numerous are the stories, authentic and apocryphal, of its exercise. In fact, he and Mr Justice Maule fill a position analogous to that of Sydney Smith, convenient names to whom "good things" may be attri- buted. Lord Westbury died on July 20, 1873, within a day of the time of the death of Bishop Wilberforce, his special antagonist in debate.

A Life of Lord Westbury by T. A. Nash is now (1888) in the press.

WEST CHESTER, a borough and the county seat of Chester county, Pennsylvania, United States, is situated 27 miles west of Philadelphia, in a thickly settled farming region, devoted principally to market gardening and the dairy industry. Its population in 1880 was 7046, of whom 1164 were coloured and 517 of foreign birth.

WEST DERBY, a township in Lancashire, England, now virtually a suburb of Liverpool, about 4 miles north- east of Liverpool Exchange. It is chiefly composed of houses inhabited by the wealthier merchants of Liverpool. The parish church of St Mary was re-erected in 1856 in

the Early English style from the designs of Sir Gilbert Scott, and has a massive central tower with four pinnacles. The site of the former church is marked by a cross, Attached to the church of St James, also a modern structure in the Early English style, there is a library of 1800 volumes. In the centre of the old village there is an old court-house, erected in 1662, now belonging to the marquis of Salisbury as lord of the manor. Croxteth Hall, the seat of the earl of Sefton, is in the immediate vicinity. The population of the urban sanitary district (area 5561 acres) was 27,292 in 1871 and 33,614 in 1881.

In Saxon times West Derby gave its name to a hundred. Edward the Confessor had a castle there, the sito of whieh is still called the Castle Hill. In 1266 the manor was bestowed on Edmund, earl of Lancaster. When Henry de Bolingbroke, duke of Lancaster, became king, this and other manors reverted to the crown. In the 4th of Charles I. it was granted to various citizens of London, who resold it in 1639 to James, Lord Stanley and Strange. The property of the Stanleys was afterwards partly sequestrated and partly alienated.

WESTERN AUSTRALIA. This British colony, the portion of Australia that lies to the west of 129° E. long., forming considerably more than one-third of the whole, has an area of 1,060,000 square miles, is 1400 miles in length and 850 in breadth, and has a coast-line of 3500 miles. It is divided

into five districts—Central, Central Eastern, South-Eastern, North, and Kimberley. The Central or settled district, in the south-west, is divided into twenty-six counties. Apart from the coast lands, the map presents almost a blank, as the major portion is practically a dry waste of stone and sand, relieved by a few shallow salt lakes. The rivers of the south are small,—the Blackwood being the most considerable. To the north of this are the Murray, the well-known Swan, the Moore, the Greenough, and the Murchison. The last is 400 miles long. Sharks Bay receives the Gascoigne (200 miles long), with its tributary the Lyons. Still farther north, where the coast trends eastward, the principal rivers are the Ashburton, the Fortescue, and the De Grey. Kimberley district to the north-east has some fine streams,—the Fitzroy and Ord and their tributaries, on some of which (the Mary, Elvira, &c.) are the gold-fields, 250 miles south of Cambridge Gulf. The Darling mountain range is in the south-west, Mount William reaching 3000 feet; in the same quarter are Toolbrunup (3341 feet), Ellen's Peak (3420), and the Stirling and Victoria ranges. Gardner and Moresby are flat-topped ranges. Mount Elizabeth rises behind Perth. Hampton tableland overlooks the Bight. In the north-west are Mount Bruce (4000 feet), Augustus (3580), Dalgeranger (2100), Barlee, Pyrton, and the Capricorn range. Kimberley has the Leopold, M'Clintock, Albert Edward, Hardman, Geikie, Napier, Lubbock, Oscar, Mueller, and St George ranges. The lake district of the interior is in the Gibson and Victoria deserts from 24° to 32° §. The lakes receive the trifling drainage of that low region. Almost all of them are salt from the presence of saline marl.

Climate.—With little or no cold anywhere, the heat of summer over the whole area is considerable. Westcrn Australia differs from the country to the east in having no extensive ranges to collect vapour, while the trade winds blow off the dry land instead of from the ocean; for these two reasous the climate is very dry. Thunderstorms often supply almost the only rainfall in the interior. The south-western corner, the seat of settlements, is the only portion where rains can be depended on for cultivation; but even there few places have a rainfall of 40 inches. As one goes north- ward the moisture lessens. The north-west and all the coast along to Kimberley, with most of that district, suffer much from dryness, The north-east comes in summer within the sphere of the north- west

monsoons, though just over the low coast-range few showers are known. The south coast, exposed to polar breezes, with un- interrupted sea, has to endure lengthened droughts. In the Swan river quarter the rainfall is in winter, being brought by north-west Winds, and summer days have little moisture. While the south Wind cools the settled region, it comes over the parched interior to

the northern lands. The hot wind of Swan river is from the east and north-east ; but it is from the south in summer to Kimberley and the north-west. In one season the land breeze is hot, in another cool, but alwaysdry. In the year 1885 Perth had a rainfall of 29 inches with an evaporation of 66. The temperature ranged from 34° to 109° in the shade. In 1885 there fell 32% inches on 100 days, while Albany had 32 on 188 days, Augusta 46 on 122 days, and York less than 18 on 81 days. Geraldton port received the same as York, but on 63 days, while Cossack, the pearl port of the north-west, had but 94 on 18 days throughout the year, Northampton showed 213, Beverley 142, and Eucla 9,9 inches.

Geology.—The base of Western Australia is of granite and its kindred formations, which underlie Silurian or more ancient rocks. Not only are the principal elevations so composed, but throughout the vast extent of bare and sterile land eastward and inland granite is most prominent, rising through recent deposits in knobs and tables onward into South Australia, It is the rock of the Australian desert. The great lake district is a depression, with a granite floor permeated with igneous veins, surrounded by isolated hills and ranges of the Primary and metamorphic rocks. King George's Sound and the mountains around are granite, as also are disjointed ranges northward to Sharks Bay. The streams in the north-west, as well as the Lyons and Gascoigne, take their rise among the old igneous and Paleozoic formations. Kimberley is full of similar rocks. The upper Irwin has garnetiferous granite. Granite, both on the south and western shores, supports the recent deposits of calcareous and arenaceous material. The horizontal sandstone of the interior and the flat-topped hills of sandstone rest npon the granite. The arid region around Sharks Bay, glistening with limestone and sand, has the ancient

stone for a foundation, upon which coralline forms built their reefs, All sorts of meta- morphic rocks prevail in the Leopold, Weld, and other ranges of Kimberley. Quartz veins are common in the hills, Cambridge Gulf is lined with quartzose grit embodying rock crystal, and the Blackwood river with gneiss. Porphyry appears at York, on the Murchison, and elsewhere. Blue slate occurs on the Cauning at Champion Bay, and on Hampton Plains. Carboniferous rocks are present near the Irwin, Canning, Fitzroy, and Murchison, Mr Hardman traced them north-east over 1500 square miles, bearing coal plants. Secondary formations are rare: a deposit of Oolite 400 feet thick is reported from the Murchison. Tertiary beds of limestone are more plentiful, generally seen near the coast; others of a coralline nature are more recent. Arenaceous lime- stone cliffs rise two to four hundred feet along the southern shore for hundreds of miles, and similar stone is seen at the junction of the Fitzroy and the Margaret. The spiriferous sandstone on the Denison Plains of Kimberley, like that of the Moresby range, is doubtless Paleozoic. The desert sandstone, so easily decomposed to furnish moving sand-duunes, is regarded as Miocene by Prof. Tate. Freemantle stands upon a recent calcareous sand- stone. Roeburne is similarly situated. The south-west abounds in calcareous accretions. Cape Arid stops with its granite the progress of Tertiary beds. Tertiary agates and jaspers occur on the Ord and the Ashburton, Three terraces lead from the calcareous mud of the north-west shore to the granite of Mount Bruce. Nuyt's Land is probably Pliocene, Volcanic rocks of various ages have burst through other formations, from Kimberley down to King George's Sound, Basalt runs under the limestone of Bunbury, and even rises in pillars; it is in scoriaceous dykes at King Sound. Columnar greenstone occurs about Cape Leeuwin and Cape Natu- raliste, while greenstone dykes yield copper in the Champion Bay district, There is a sort of Giant's Causeway at Géographe Bay. Dampier Archipelago, Nickol Bay, the sources of the Fortescue and the De Grey, Glenelg river, Camden harbour, Mount Waterloo, Fitzroy river, and the gold field all show traces of volcanic action. Of the geology of three-fourths of the colony, however, we know scarcely anything. The presence of a new carbonaceous mineral called cliftonite has been recently determined by Mr L. Fletcher ina meteorite brought by the Rev. Mr Nicholai from Western Australia.

Minerals.—The earliest mines were of lead and eopper in Victoria district, the ore being sent to Geraldton, the port of Champion Bay, 30 miles from the Northampton mines of silver, lead, and copper. Berkshire valley has in addition plumbago, the Irwin antimony, and Woongong silver. The Geraldine lead and silver ores were first worked in 1845, and produced £43,000 in' 1878. Wheal Fortune and Tortura mines are of silver-lead ; Gelira, Whecl Alpha, and Narra Narra of copper. Iron ores are abundant; they are magnetic at Mount Magnet, Coal has not yet been found in any quantity. Carboniferous rocks are seen in several places, and fair specimens of coal have been obtained. A semi-bituminous mineral near the Swan and the Murray yields a pale oil, which would serve to varnish wood. Gold, long looked for, has been found in Kim- berley; and diggers rushed to the country about the Margaret, Mary, and Elvira rivers. he majority did not find returns equal to expen- diture; but auriferous quartz of great richness has been reported recently. The proclaimed gold-field lies between 16 and 193° S., 126° and 129° E, Building stone is found of many varieties.

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Agriculture.—This was ouce confined to the Swan river quarter, but is rapidly extending northward in Victoria district, where the land is free of timber, though the rainfall is very light. In Kimberley tropical produce, especially sugar, cotton, spices, and riee, can be readily raised. The south- west is essentially a farm- ing country, but the soil is generally sandy. In 1886 86,248 acres were in crop (hay 25,718; wheat, 24,048; barley, 5185; oats, 1766; inaize, 171; potatoes, 356; green forage, 1075 ; vines, 649). No settlement has a finer variety of fruits, and both wine and raisins are being exported. The eottage homesteads are surrounded with pleasant gardens, vineyards, and orchards.

Live Stock.—Timber was too thick in the old settlement for flocks and herds; the squatting distriets are eastward of the divid- ing range and north of the Swan. The want of watcr both eastward and northward stops progress, but sheep stations arc established in oases of reputed eastern deserts. The north-west, in spite of drought, is a favourite locality for squatters; but the better- watered Kimberley is regarded as the most

hopeful. At the beginning of 1887 129,219,079 acres of the available country were leased by 6469 persons, at the rental of £73,868, averaging a little over half a farthing an acre. The horses numbered 38,360; cattle, 88,254; sheep, 1,809,071; pigs, 24,655; goats, 5801. Some parts, chiefly in the south-west, are troubled with poison plants. Borings in ill-watered places, as the southern and central districts, furnish water for stock. The Angora goat has been a success there. Rabbits already begin to trouble squatters. In proportion to inha- bitants, Western Australia has advanced in pastoral pursuits beyond its neighbours, excepting in the quality of stock and the get-up of wool. Of 678,400,220 acres in the colony only 1,851,742 are alienated, though 130,000,000 are leased out by Government. The land laws are liberal. Lessees have pre-emptive rights over parts of runs at 5s. per acre, within a certain period. Inferior land is much cheaper, Kimberley leases are for not less than 50,000 acres at 10s. rent per 1000 aeres,—this being the best pastoral country. A certain limited amount of stock is required according to acreage and district. Poisoned land can be leased for twenty-one years at £1 rent per 1000 acres, when the area is granted free if it be fenced and the poison plants eradicated ; a licence, for that term, of such land, costs one-eighth of that rent. The break-up of the extensive original grants is still essential to further progress.

Flora.—Judged by its vegetable forms, Western Australia would seem to be older than eastern Australia, South Australia being of intermediate age. Indian relations appear on the northern side, and South African on the western. There are fewer Antarctic and Polynesian representatives than in the eastern colonies. European forms are extremely scarce. Compared with the other side of Australia, a third of the genera on the south-west are almost wanting in the south-east. In the latter, 55, having more than ten species eaeh, have 1260 species; but the former has as many in 55 of its 80 genera. Of those 55, 36 are wanting in the south-east, and 17 are absolutely peculiar. There are fewer natural orders and genera westward, but more species. Baron Von Mueller declared that 'nearly half of the whole vegetation of the Austra- lian continent has been traced to within the boundaries of the Western Australian territory." He includes 9 Malvacex, 6 Ewphor- biacce, 2 Rubiacese, 9 Proteacece, 47 Leguminose, 10 Myrtacez, 12 Composite, 5 Labiate, 6 Cyperacer, 13 Convolvulacez,, 16

Graminee, 3 Filices, 10 Amaranthacee. Yet over 500 of its tropical species are identified with those of India or Indian islands. While seven- tenths of the orders reaeh their maximum south-west, three-tenths do so south-east. Cypress pines abound in the north, and ordinary pines in Rottnest Island. Sandalwood (Santalum cygnorum) is exported. The gouty stem baobab (Adansonia) is in the tropics. Aanthorrhea, the grass tree, abounds in sandy districts. Mangrove bark yields a purple tan. Palms and zamias begin in the north- west. The Melaleuca Leucadendron is the paperbark tree of settlers. The rigid-leafed Banksia is known as the honeysuckle. Casuarinz are the he and she oaks of colonists, and the Hxocarpus is their cherry tree. Beautiful flowering shrubs distinguish the south- west ; ad the eS are all ablaze with flowers after a fall of rain. Poison plants are generall J 1 ae Dee oioiea g y showy Leguminose, Sida, and

The timber trees of the south-west are almost unequalled. Of the Eucalypts, the jarrah or mwaho any, L. marginata, is first for value. It runs over five degrees of latitude, and its wood resists the teredo and the ant. Sir Malcolm Fraser assigns 14,000 square miles to the jarrah, 10,000 to Z. viminalis, 2300 to the karri (2. colossea or E. diversicolor), 2400 to York gum (2. loxo- phieba), 800 to the red gum (Zz, calophylla), and 500 to tuart or native pear (Z. gomphocephala). Not much good wood is got within 20 niiles of the coast. The coachbuilder's coorup rises over 300 feet. Morrel furnishes good timber and rich oil, An ever- increasing trade is done in the timber of the south-western forests. _ Fauna.—Among the mamials are the Macropus giganteus, M. irma, M. dama, M. brachyurus, Lagorchestes Jasciatus Bettongia penicillata, Phalangista vulpecula, Pscudochirus cooki, Dasywrus geofroyi, Tarsipes rostratus, Antechinus apicalis, Perameles

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obcsula, Perameles myosurus, Myrmecobius fasciatus. Fossil forms partake of the existing marsupial character, Diprotodon being allied to the wombat and kangaroo. WNail-bearing kangaroos are in the north-west ; the banded one, size of a rabbit, is on Sharks Bay. Nocturnal phalangers live in holes of trees or in the ground. Carnivorous Phascogale are found in south-west. There are three kinds of wombat.

The rock-loving marsupial Osphranter is only in the north-east, and Perameles bougainvillei at Sharks Bay. The dalgyte or Petrogale lagotis is at Swan river and Hypsiprymnus in the south. The colony has only two species of wallabies to five in New South Wales. The Halmaturus of the Abrolhos is a sort of wallaby; a very elegant speeies is 18 inches long. The pretty Dromicia, 6 inches long, lives on stamens and nectar, like the Tarsipes, having a brush at the tip of its tongue; its tail is pre- hensile. The hare-like Lagorchestes fasciatus is a great leaper. The Hapalotis of the interior has nests in trees. Beaver rats and other small rodents are troublesome, and bats are numerous. The dingo is the wild dog. The platypus (Ornithorhynchus) and the Echidna are the only forms of the Monotremata. The seal, whale, and dugong occur in the adjacent seas.

The west is not so rich as the east of Australia in birds. Many forms are absent and others but poorly represented, though some are peculiar to the west. The timbered south-west has the greatest variety of birds, which are scarce enough in the dry and treeless interior. Of lizards the west has 12 genera not found in eastcrn Australia. Of snakes there are but 15 species to 8 in Tasmania and 31 in New South Wales. While the poisonous sorts are 2 to 1 in the east, they are 3 to 1 in the west. The turtle is obtained as an article of food. The freshwater fishes are not all like those of the east. They include the mullet, snapper, ring fish, guard fish, bonita, roek cod, shark, saw fish, parrot fish, and cobbler. Under the head of fisheries may be mentioned the pearl oyster, which is dived for by natives at Sharks Bay; the trepang or béche-de-mer is also met with in the north. Inseets are well repre- sented, especially Coleoptera, Lepidoptera, Hymcnoptera, Hemiptera, and Diptera.

Trade and Commerce.—Safe harbours are few, and hundreds of miles of the coast-line are without shelter for a vessel. The coasting traffic, until recently, was confined to the south-west, from the Sound to Vietoria district ; but wool is now shipped at the north-west, as well as pearls, while wool, pearl shells, hides, tallow, and gold are claiming attention in the tropical north-east. The imports for 1886 amounted to £758,011, of which £847,915 came from the United Kingdom, and £396,871 from other British possessions, principally the neighbouring colonics and India. The exports reached £630,392,—the main items being wool (£322,578), shells

(£104,964), guano, timber, sandalwood, pearls, lead, copper, manna gum, and gold. Of these exports, £505,331 went to Great Britain, and £92,716 to other British ports.

Industries. —The pastoral industry occupies the first place. Fisheries are taking an important position (pearl shell, béclic-de- mer, and preserved or tinned fish), Mandurah, at the mouth of the Murray, and Freemantle have preserving sheds for mullet and snapper. Guano beds are worked to much advantage at the Lace- pede Isles. Salt is produced largely at Rottnest Island. Raisins are dried, and the oil of castor trees is expressed. The mulberry tree succeeds well, and sericulture is making progress. Dugong oil is got from Sharks Bay. Honey and wax are becoming valuable exports ; from the abundance of flowers the hives can be emptied twice a year. Mauna and gums of various kinds are among the resources of the country. Among the wines made are the Riesling, Burgundy, Sweetwater, Hock, and Fontaincbleau.

Roads and Railways.—Excellent roads were made during the period of convict labour. The northern railway from Northampton mines to Port Geraldton is 35 miles long. The eastcrn line is from Freemantle through Perth to Guildford (20 miles) and to Beverley (90 miles). A concession of 12,000 acres per mile is bringing the rail from York northward to Victoria district, and from Beverley southward to Albany on King George's Sound. Communieation between the several ports is conducted by steamers, which have been aided by a state subsidy.

Administration.—W estern Australia is a crown colony, adminis- tered by a governor, his ereeutive council, aud a legislative council partly nominated by the governor. The colonial revenue for 1887 amounted to £461,322, the expenditure to £456,897.

Edueation.—As in other colonies, the denominational system formerly prevailed ; but lately an cffort has been made to have public schools on a broader basis. The state in 1886 granted £7505 for 3169 scholars in the public sehools, and £1415 for 1339, principally Roman Catholics, in the assisted schools. The Perth Inquirer was the first newspaper ; there are now 11 in the colony.

Population.—Of the 42,000 inhabitants 7000 are in.Perth, the capital, 5000 in Freemantle, 1000 at Albany, 900 at York. Some trouble from the aborigines was cxperienced by settlers at first, but how many of them are useful upon stations, making good shepherds. A successful mission for natives has been conducted for many years at New Norcia, about 80 miles north of Perth, by Spanish monks.

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*History.—Both the western and northern coasts of the colony are pretty accurately laid down on maps said to date from 1540 to 1550, where the western side of the continent terminates at Cape Leeuwen. The discovery of the coast may be attributed to Portuguese and Spanish navigators, who were in the seas northward of Australia as early as 1520. The next visitors, nearly a century later, were the Dutch. Edel explored northward in 1619, and De Witt in 1628. The "Gulde Zeepaard" in 1627 sailed along the south coast for 1000 miles, the territory being named Nuyt's Land. Tasman made a survey of the north shore in 1644, but did not advance far on the western border. Dampier was off the north-west in 1688 and 1696, naming Sharks Bay. Van- couver entered King George's Sound in 1791. The French, under D'Entrecasteaux, were off Western Australia in 1792; and their commodore Baudin, of the "Géographe" and '*Naturaliste," in 1801 and 1802 made important discoveries along the western and north-western shores. Captain Flinders about the same time paid a visit to the Sound, and traced Nuyt's Land to beyond the South Australian boundary. Freycinet went thither in 1818. Captain King surveyed the northern waters between 1818 and 1822.*

The earliest settlement was made from Port J ackson, at the end of 1825. Owing to a fear that the French might occupy King George's Sound, Major Lockyer carried thither a party of convicts and soldiers, seventy-five in all, and took formal British possession, though Vancouver had previously done so. Yet the Dutch had long before declared New Holland, which then meant only the western portion of Australia, to be Dutch property. This convict establishment returned to Sydney in 1829. In 1827 Captain Stirling was sent to report upon the Swan river, and his narrative excited such interest in England as to lead to an actual free settle- ment at

the Swan river. Captain Freemantle, R.N., in 1827 took official possession of the whole country. Stirling's account stimu- lated the emigration ardour of Sir F. Vincent, and Messrs Peel, Macqueen, &c., who formed an association, securing from the British Government permission to occupy land in Western Australia pro- portionate to the capital invested, and the number of emigrants they despatched thither. In this way Mr Peel had a grant of 250,000 acres, and Colonel Latour of 103,000. Captain (afterwards Sir James) Stirling was appointed heutenant-governor, arriving June 1, 1829. The people were scattered on large grants. The land was poor, and the forests heavy; provisions were at famine prices; and many left for Sydney or Hobart Town. The others struggled on, finding a healthful climate, and a soil favouring fruits and vegetables, whilst their stock grazed in the more open but distant quarters. The overland journey of Eyrc from Adelaide to King George's Sound in 1839-40, through a waterless waste, dis- couraged settlers ; but Grey's overland walk in 1838 from Sharks Bay to Perth revealed fine rivers and good land in Victoria district, subsequently occupied by farmers, graziers, and miners. Com- manders Wickham and Stokes about that time made discoveries on the northern coast. Roe was an active explorer, and Austin in 1854 investigated the country to the eastward. F, H. Gregory traced the Gascoigne in 1857, and made known superior land to the north-west about Nickol Bay four years later. Austin in 1864 saw a good future for the Glenelg district, previously described by Grey. A. Gregory was at the north-east in 1856, and J. Forrest in 1870 proved the way along the south coast to be no hopeless desert. Giles crossed from the east. Major Warburton in 1873 had severe trials with his camels before reaching De Grey river from the east. 'The Messrs Forrest suffered much in another attempt to penetrate the eastern barren country. A. Forrest had a successful tour in 1877 through the Kimberley province; two years later he made the connexion between Kimberley and the north-west. The difficulties of the settlers had compelled them to seek help from the British treasury, in the offer to accept convicts. These came in 1850; but transportation ceased in 1868, in consequence of loud protests from the other colonies. Seeking responsible government, the scttlers were told in 1888 that, if this were granted for the southern part, the north would still be retained as a crown colony. The discoveries of lead and copper, and lately of gold, must increase the working community; while the newly

opened pastures have brought in a great accession of stockholders. Settlers are arriving from South Australia and other colonies, so that the prospects of Western Australia are brightening. (J. BO.)

WEST HAM, an eastern suburb of London, in the county of Essex, which gives its name to an extensive parish, urban sanitary district, and parliamentary borough stretching north and south from Wanstead and Leyton to the Thames, and east and west from Little Ilford and East Ham to the river Lea. West Ham proper is situated on the main road between Stratford and Plaistow, three- quarters of a mile south-east of the Stratford station on the Great Eastern Railway, but the original village is now

completely absorbed in the new buildings which have Sprung up around it. The church of All Saints has an Early English nave and a good Perpendicular tower, but the architecture of the remainder of the building is non- descript and incongruous. Some mural paintings have within recent years been laid bare, and there are a number of old monuments. Among other public buildings are the West Ham, Stratford, and South Essex dispensary (1878), and the conference hall for public meetings. There are a considerable number of charities. West Ham park, 80 acres in extent, was opened 20th July 1874 at a cost of £25,000. A large public cemetery was consecrated in 1857, and there is a Jews' cemetery. The northern main sewer of the metropolitan main drainage system traverses the parish, the chief pumping station being at Abbey Mills. In 1762 West Ham had 700 houses. Morant, in his History of Essex, 1768, describes it as the "residence of considerable merchants, dealers, and industrious artists." Since then its character has completely changed, and it is now a busy industrial district, its prosperity being in a large degree traceable to the formation of the Victoria and Albert docks at Plaistow. It possesses large chemical works, match works, candle factories, manure works, flour- mills, cocoa-nut fibre factories, patent leather cloth fac- tories, smelting works, and copper works. The population of the parish, urban sanitary district, and parliamentary borough (area about 5390 acres) in 1871 was 62,919, and in 1881 it was 128,953.

At the time of the Conquest West Ham belonged to Alestan and Leured, two freemen, and at Domesday to Ralph Gernon and Ralph Pevercl. West Ham village was included in the part which descended to the Gernons, who took the name of Mont- fichet. It received the grant of a market and annual fair in 1253, but these have not been kept for many years. The lord- ship was given to the abbey of Stratford, and, passing to tho crown at the dissolution, it formed part of the dowry of Cathcrine of Portugal, and was therefore called the Qucen's Manor. In 1885 the urban sanitary district was erected into a parliamentary borough, returning two members for the Northern and Southern Divisions respectively.

WEST HOUGHTON, a township of Lancashire, Eng- land, on the Lancashire and Yorkshire Railway, 5 miles west-south-west of Bolton, 15 north-west of Manchester, and 5 east-north-east of Wigan. The church of St Bar- tholomew was rebuilt in 1870 in the Gothic style at a cost of £6000. There are coal-mines in the neighbour- hood, and the town possesses a silk factory, print-works, and cotton-mills. The population of the urban sanitary district (area 4341 acres) in 1871 was 6609 and in 1881 it was 9197.

West Houghton before the time of Richard II. was a manor belonging to the abbey of Cockersand. It was confiscated at the Reformation, and since then has been vestcd in the crown. It is now held by the representatives of the late Colonel Wilbraham. The army of Prince Rupert assembled on West Houghton moor before the attack on Bolton.

WEST INDIES. This important archipelago received Plates X., the name of the West Indies from Columbus, who hoped XI. that, through the islands, he had found a new route to India. It is also sometimes known as the Antilles (a name, however, more properly applied to a part than to the whole), as Columbus, on his arrival here, was supposed to have reached Antilla, a fabled country, said to lie far to the westward of the Azores, which found a vague and uncertain place on the maps and charts of many geo- graphers before that time. Columbus first landed on St Salvador, or Watling Island, named by the natives Guanahani, and several voyages to this new land were made in rapid succession by the great discoverer, resulting in the finding of most of the larger islands, and

a more intimate knowledge of those already known. The import- ance of its latest possession was at once recognized by the court of Spain, and, as a first move towards turning the

West Indies to profitable account, numbers of the natives, for the most part a harmless and gentle people, were shipped beyond seas and sold into slavery, others being employed in forced labour in the mines which the Spaniards had opened throughout the archipelago, and from which large returns were expected. Thus early in its history began that traffic in humanity with which the West-India plantations are so widely associated, and which endured for so long a time. Goaded to madness by the wrongs inflicted upon them, the aborigines at last took arms against their masters, but with the result which might have been expected—their almost utter extirpation. Many of the survivors sought release from their sufferings in suicide, and numbers of others perished in the mines, so that the native race soon almost ceased to exist. Spain was not long allowed to retain an undisputed hold upon the islands: British and Dutch seamen soon sought the new region, accounts concerning the fabulous wealth and treasure of which stirred all Europe, and a desultory warfare began to be waged amongst the various voyagers who flocked to this E] Dorado, in consequence of which the Spaniards found themselves gradually but surely forced from many of their vantage grounds, and compelled very materially to reduce the area over which they had held unchecked sway. The first care of the English settlers was to find out the real agricultural capabilities of the islands, and they diligently set about planting tobacco, cotton, and indigo. A French West India Company was incorporated in 1625, and a settlement established on the island of St Christopher, where a small English colony was already engaged in clearing and cultivating the ground ; these were driven out by the Spaniards in 1630, but only to return and again assume possession. About this time, also, the celebrated buccaneers, Dutch smugglers, and British and French pirates began to infest the neigh- bouring seas, doing much damage to legitimate traders, and causing commerce to be carried on only under force of arms, and with much difficulty and danger. Indeed, it was not till the beginning of last century—some time after Spain had, in 1670, given up her claim to

the exclusive possession of the archipelago—that these rovers were rendered comparatively harmless; and piracy yet lingered off the coasts down to the early years of the present century. In 1640 sugar-cane began to be systematically planted, and the marvellous prosperity of the West Indies commenced; it was not from the gold and precious stones, to which the Spaniards had looked for wealth and power, but from the cane that the fortunes of the West Indies were to spring. The successful propagation of this plant drew to the islands crowds of adventurers, many of them men of considerable wealth. In Barbados alone, it is said that 50,000 British subjects arrived in one year about this period. The West Indies were for many years used by the English Government as penal settlements, the prisoners working on the plantations as slaves. In 1655 a British force made an unsuccessful attack on Hayti, but a sudden descent on Jamaica was more fortunate in its result, and that rich and beautiful island has since remained in the possession of Great Britain. The Portu- guese were the first to import Negroes as slaves, and their example was followed by other nations having West-Indian colonies, the traffic existing for about 300 years. In 1660 a division of the islands was arranged between England and France, the remaining aborigines being driven to specified localities, but this treaty did not produce the benefits expected from it, and as wars raged in Europe the islands frequently changed hands. Hayti, now divided into two republics, has suffered much from internal broils and revolutions.

The West Indies are situated in about 20° N. lat. and

75° W. long., and form a broken, but upon the whole, con- tinuous barrier, shutting out as it were the Atlantic Ocean, with its contents of 34,804,000 cubic miles of water, and its mean depth of 2135 fathoms, from the lesser basins of the Caribbean Sea and Gulf of Mexico, containing respectively 1,675,000 cubic miles and 628,000 cubic miles, and with mean depths of 1269 fathoms and 772 fathoms. These two seas are separated by the island of Cuba and the isthmus of Yucatan, with the great Campeche Bank surrounding three sides of the latter. Spring tides do not rise above 4 feet, nor neaps above 24 feet. Complicated currents

and dangerous shoals, especially in the neighbour- hood of the Bahamas, necessitate the exercise of consider- able skill and care when navigating this region. The equa- torial current sweeps around Trinidad and the Antilles into the Caribbean Sea, and the Gulf Stream passes from the Gulf of Mexico by way of the Florida Channel. The well- known Sargasso Sea lies to the north-east of the islands.

The physical features of the region are clearly shown on the accompanying map (Plate XI.), the orographical and bathymetrical data being reproduced from a yet unpublished chart intended to illustrate one of the "Challenger" Reports, and inserted here by permission of Dr Murray, Director of the ' Challenger" Expedition Commission. In the Gulf of Mexico and Caribbean Sea there are 394,850 square miles covered by depths of 100 fathoms and less, 363,950 square miles with from 100 to 500 fathoms, 263,250 square miles by from 500 to 1000 fathoms, 572,950 square miles by from 1000 to 2000 fathoms, 274,850 square miles by from 2000 to 3000 fathoms, and 7750 square miles by over 3000 fathoms. The average surface temperature of the sea in the neighbourhood of the islands is from 75° to 78° F. in February, from 79° to 80° in May, and from 82° to 84° in August. The mean annual temperature of the Gulf Stream in the Florida Channel is 80° F. .

The various groups which go to form the West Indies have in some cases more than one name, but the follow- ing classification is that usually adopted. 'To the north lie the Bahamas, situated upon the Great Bahama Bank, south from which is Cuba; Jamaica, again, lies to the south of the latter, and to the east of Jamaica are Hayti and Porto Rico. Still farther to the east lie the Virgin Islands, south of which are the Caribbee Islands, or Antilles proper, divided by mariners into the Leeward and Windward groups. 'Trinidad lies close to the coast of South America. Thus the whole archipelago stretches, in the form of a rude arc, from Florida and Yucatan in North America to Venezuela in South America.

Area and Population of the Islands according to the latest Returns.

Square| Popula- Square) Popula- Miles. tion. Miles. tion. SpaNnisu 2)275,997 INDEPENDENT...| 29,000 | 1,150,000 GOD Bierce vcunee M21 O54 lll WMG hi..c..:.sss50°.<BRUTIS Hessian. 12,031 | 1,213,144

TRENCH says… I, 103 352,400 Bahamas, ...sccses 4,466 43,521 || Guadeloupe, &e…... 714{| 180,800 Turks and Caicos..; 169 4,732 || St Bartholomew….. 8 2,370 aoa Sea 4,193 | 580,804 || Martinique…..... 381] 169,230 indward Islands. Sides… 268) alam | et) ee St Vincent…..... Te] AO ||) Sea ace e sere tens :

: y BOING) sores sccicscees: 129 4,008 Barbados…..... 166 | 171,860 || iin 62 6407 Grenada, &..... Te) a ES saeco csencacae: Bal. eae ODA Ol eessce- e 114 18,051 23 6347

Leeward Islands… U Virgin Islands .. 57 5,287 223] 33,763 St Christopher .. 65] 29,137 135 18,430 Nevisn. fret 50] 11,864 53] 14,389 Antigua, &¢...,.. 170 34,964 35 944 Montserrat. ..... 32 10,083 eS. se Dominica…..... 291| 98,911 ERG HRI Pes ctec.ss5 92,270 | 5,070,038

Trinidad. eres. ore 1,754 153,128

The principal rivers are the Cauto, the Sagua la Grande, and the Sagua le Chica in Cuba, the Rio Grande and Plantain Garden in Jamaica, and the Gran Yacui, the

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Neiba, and Yuna in Hayti. All have, necessarily, short courses, and none of them are of much importance.

The population is almost entirely of European, Negro, or East-Asiatic origin. The Negroes far outnumber the others, but the Asiatics are rapidly increasing in numbers.

As in most tropical countries where considerable heights are met with—and here over 15,500 square miles lie at an elevation of more than 1500 feet. above sea-level—the climate of the West Indies (in so far at least as heat and cold are concerned) varies at different altitudes, and on the higher parts of many of the islands a marked degree of coolness may generally be found. With the exception of part of the Bahamas, all the islands lie between the isotherms of 77° and 82° F. The extreme heat, however, is greatly tempered by the sea breezes, and by long, cool,

refreshing nights. Frost is occasionally formed in the cold season when hail falls, but snow is unknown. The seasons may be divided as follows. The short wet season, or spring, begins in April and lasts from two to six weeks, and is succeeded by the short dry season, when the thermometer remains almost stationary at about 80° F. In July the heat increases to an extent well nigh unbear- able, and thunder is heard to rumble in the distance. No change need now be looked for till after a period varying from the end of July to the beginning of October, when the great rainfall of the year commences, accompanied by those tremendous and destructive hurricanes, so intimately and truly associated with popular ideas regarding this region, on which the annual rainfall averages 63 inches— an amount of precipitation calculated to represent a mass of water of 12,465,437,000,000 cubic feet. This season is locally known as the "hurricane months." Out of a total of 355 hurricanes, or, more properly, cyclones, recorded during the last three hundred years, 42 have occurred in July, 96 in August, 80 in September, and 69 in October. These storms commence in the Atlantic and towards the east. or a day or two they follow a westerly course, inclining, at the same time, one or two points towards the north, the polar tendency becoming gradually more marked as the distance from the equator increases. When the hurricanes reach latitude 25° N., they curve to the north- east, and almost invariably wheel round on arriving at the northern portion of the Gulf of Mexico, after which they follow the coast line of North America. Their rate of speed varies considerably, but may be said to average 300 miles per day among the islands. The usual signs of the approach of the cyclones are an ugly and threatening appearance of the weather, sharp and frequent puffs of wind increasing in force with each blast, accompanied with a long heavy swell and confused choppy sea, coming from the direction of the approaching storm. But the baro- meter is the true guide, which should always be consulted when a cyclone is expected. If a sudden fall of the baro- meter is observed, or even if a marked irregularity of its diurnal variations takes place, a storm may be confidently looked for. In some of these hurricanes the barometer has been found to stand 2 inches lower in the centre of the disturbance than it did outside the limits of the storm field. December marks the commencement of the long dry season, which, accompanied by fresh winds and occasional hail showers, lasts till April. The average temperature of the air at Barbados, which may be taken as a

favourable average, is, throughout the year, 80° F. in the forenoon, and about 82° in the afternoon. The maxi- mum is 87°, and the minimum 75°.

The geological features of the West Indies are interesting. A calcareous formation, often assuming the shape of marbles, is most common, and indeed preponderates above all the other rocks to aremarkable degree. The Bahamas, which are low, are composed wholly of limestone formed from coral

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and shells, crushed into aconcretionary mass, hard on the surface, but soft where not exposed to atmospheric action, full of holes and indentations, and disposed in nearly level beds. The lower parts of the Antilles present a like forma- tion where the land does not riseabove 230 feet. Cuba shows two distinct compact limestones, one a clayey sand-stone and the other a gypsum. These are confined to the central and western parts of the island, which has also syenitic rocks, with some serpentine from which petroleum is obtained, Four-fifths of Jamaica consists of limestone overlying granite and other igneous rocks. Hayti has much metamorphic strata, generally greatly uptilted, and often exhibiting marked folding. These rocks appear to have been limestones, shales, sandstones, and conglomer- ates. Auriferous quartz veins occur in slates, where these are found near eruptive masses; there is also some syenite, and both active and extinct craters are upon this island. The western Antilles are entirely of volcanic origin, and coral reefs occur along their shores ; coral reefs are also presented on the coasts of many of the other islands, but are most irregular in their mode of occurrence, sometimes forming complete belts surrounding the land on all sides, but oftener appearing in the shape of unconnected masses. The fossils of the West Indies are important, as from many of them clear evidence is obtained to show that at no very remote geological period the islands formed part of the adjoining continents. The remains of the megatherium, mylodon, and cabylara, essentially South- American, are also found in North America, but only along the seaboards of Georgia and Carolina. As these are also found in some of the West India islands, as well as in South America, it is

thus perfectly clear that at one time the archipelago formed a land passage between the two great divisions of the New World. These remains have also been found in conjunction with the fossil human skeletons of Guadeloupe and the rude weapons associated with them. We may therefore fairly conclude that in Pleistocene times the West Indies formed the connecting link between the two Americas. The occurrence of tree stumps tm situ several feet below high-water mark also points to a comparatively late sinking of the land in some areas.

The mineral wealth of the islands is not remarkable. Gold, silver, iron, copper, tin, platinum, lead, coal of a poor quality, cobalt, mercury, arsenic, antimony, manganese, and rock salt either have been or are worked. Of late years asphalt has been worked to considerable advantage among the pitch lakes of Trinidad. Opal and chalcedony are the principal precious stones.

The fauna of the region is Neotropical, belonging to that region which includes South and part of Central America, although great numbers of birds from the North- American portion of the Holarctic realm migrate to the islands. The resident birds, however, eighteen genera of which are certainly Neotropical, show beyond doubt to which faunal region the islands properly belong. Mammals are, as in most island groups, rare. The agouti abounds, and wild pigs and dogs are sufficiently numerous to afford good sport to the hunter, as well as smaller game, in the shape of armadillos, opossums, musk-rats, and raccoons. The non-migrating birds include trogons, sugar- birds, chatterers, and many parrots and humming birds. Waterfowl and various kinds of pigeons are in abundance. Reptiles are numerous: snakes—both the boa and adder —are innumerable, while lizards, scorpions, tarantulas, and centipedes are everywhere. Insects are in great numbers, and are often very annoying. Among domestic animals mules are largely reared, and where the country affords suitable pasture and forage cattle-breeding 1s extensively engaged in. Much attention is not bestowed

on horse-breeding, except in regard to the comparatively small numbers required for use in driving and riding by the officials and planters. Goats

abound, and large flocks of sheep are kept for the sake of their flesh alone, as the climate is not adapted for wool-growing.

The flora of the islands is of great variety and richness, as plants have been introduced from most parts of the globe, and flourish either in a wild state or under cultivation ; grain, vegetables, and fruits, generally common in cool climates, may be seen growing in luxuriance within a short distance of like plants which only attain perfection under the influence of extreme heat, nothing being here required for the successful propagation of both but a difference in the height of the lands upon which they grow. The forests, which are numerous and wide- spreading, produce the most valuable woods and delicious fruits. Palms are in great variety, and there are several species of gum-producing trees. Some locust trees have been estimated to have attained an age of 4000 years, and are of immense height and bulk. Prptadenia is, on account of its almost imperishable character when in the ground, universally used as a material for house-building. Xanthoxylon, the admired and valuable satin-wood of commerce, is common; Sapindus finds a ready market on account of its toughness ; crab-wood yields a useful oil and affords reliable timber ; and tree ferns of various species are common. Pimento is peculiar to Jamaica. But it is to the agricultural resources of the islands that the greatest importance attaches. For centuries almost the whole care of the planters was bestowed upon the culti- vation of the sugar-cane and tobacco plant, but since the emancipation of the slaves and the fall in the price of sugar attention has been turned to the production of other and more varying crops. Perhaps this change has been most marked in the trade which has now sprung up in fruit, which is very large, and annually increasing. Sugar, however, is still the staple product, and has for some time been grown in considerable quantities on the small holdings of the Negroes and other labourers. Crops of tobacco, beans, pease, maize, and Guinea corn are also becoming popular, and a species of rice, which requires no flooding for its successful propagation, is largely produced. Hymenachne striatum covers many of the plains, and affords food for numerous herds of cattle.

For further particulars see Cuba, JAMAICA, Hayti, and other articles on separate islands. Interesting information regarding the state of the islands

immediately after the abolition of slavery may be found in Extracts from Papers Printed by Order of the House of Commons, 1839, Relative to the West Indies; and notices of the earlier British settlers are contained in Hotten's Original Lists of Emigrants, &c. (J, GU.)

WESTMACOTT, Str Ricnarp (1775-1856), one of the principal English sculptors of the classical revival, was born in London in 1775, and while yet a boy learned the rudiments of the plastic art in the studio of his father, who was then a sculptor of some reputation. In 1793, at the age of eighteen, he went to Rome and became a pupil of the Venetian Canova, who was then at the height of his fame. Under the prevailing influences of Italy, at that time Westmacott devoted all his energies to the study of classical sculpture, and throughout his life his real sympathies were with pagan rather than Christian art. Within a year of his arrival in Rome he won the first prize for sculpture offered by the Florentine academy of arts, and in the following year (1795) he gained the papal gold medal awarded by the Roman Academy of St Luke. On his return to London Westmacott began to exhibit his works yearly at the Royal Academy, and soon became the most popular of English sculptors. In 1805 he was elected an associate, and in 1811 a full member of the Royal Academy ; in 1827 he was appointed to succeed

Flaxman as Royal Academy professor of sculpture, and in 1837 he was knighted. A very large number of important public monuments were executed by him, including many portrait statues; but, like most sculptors of the pseudo- classic revival, he was not successful with this class of draped figure. Little can be said in praise of such works as the statue on the duke of York's column, the portrait of Fox in Bloomsbury Square, or that of the duke of Bedford in Russell Square. Much admiration was expressed at the time for Westmacott's monuments to Collingwood and Sir Ralph Abercromby in St Paul's Cathedral, and that of Mrs Warren in Westminster Abbey; but subjects like these were far less congenial to him than sculpture of a more classical type, such as the pedimental figures over the portico of the British Museum, and his colossal nude statue of Achilles in bronze, set up in Hyde Park in honour of the duke of

Wellington; this last statue, though possessing little originality of design, is not without grandeur, and shows a skilful treatment of the nude. Originality was not Westmacott's strong point, but he was highly trained, and, in spite of his artisti- cally degraded time, possessed a strong natural good taste, which preserved him from reproducing the mere- tricious feebleness of his master Canova. Westmacott wrote the article ScutprurE for the 8th edition of the Encyclopedia Britannica. He died September 1, 1856, after about fifteen years of retirement from active work.

WESTMEATH, an inland county of Ireland, in the province of Leinster, is bounded N.W. by Longford, N. by Cavan, N.E. and E. by Meath, S. by King's County, and W. by Roscommon. Its greatest length from east to west is about 40 miles, and its greatest breadth from north to south about 35 miles. The total area is 453,453 acres, or about 708 square miles. Westmeath is included within the great central limestone plain of Ireland, but at Moat-a-Genogue and near Ballymahon the sandstone rises above the limestone bed and forms isolated protuberances. The general average height of the surface of the county is over 250 feet above sea-level. Being diversified with hill, valley, lake, and river it is highly picturesque, but in no part can it be termed mountainous, the highest summits being Knocklayde (795 feet), Hill of Ben (710 feet), and Knockayon (707 feet). Good limestone is obtainable for building or agricultural purposes, but in some cases the limestone is difficult to calcine. Copper, lead, coal, and marble have been dug, but are not found in sufficient quantities to make the speculation profitable. In some parts there are numerous eskers of calcareous gravel. A large surface is occupied by bog. A special feature of Westmeath is the number of large loughs, which have a combined area of nearly 17,000 acres. In the north, on the borders of Cavan, is Lough Sheelin, with a length of 5 miles and an average breadth of between 2 and 3 miles, and adjoining it is the smaller Lough Kinale. In the centre of the county there is a group of large loughs, of which Lough Dereveragh has an area of 2555 acres. To the north of it are Loughs Lene, Glore, Bawn, and others, and to the south Loughs Iron and Owel. Farther south is Lough Ennell or Belvidere, and in the south-west Lough Ree, forming part of the boundary with Roscommon. The river Inny, which rises in Cavan, enters Westmeath from Lough Sheelin, and, forming for parts of its course the boundary with Longford, falls into Lough Ree. The Inny

has as one of its tributaries the Glore, flowing from Lough Lene through Lough Glore, a considerable part of its course being underground. From Lough Lene the Dale also flows southwards to the Irish Sea, and thus this lake sends its waters to the opposite shores of the island. The Brosna flows from Lough Ennell southwards by King's County into the Shannon.

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*Agriculturc.—According to the Return of Owners of Land, 1876, Westmeath was divided among 668 proprietors possessing 480,003 acres, at an annual value of £301,696, or about 14s. an acre. There werc also 4262 acres of common or wastc lands. Of the proprietors only 111 possessed less than one acre. The following possessed over 8000 acres :—ear] of Longford, 15,014; John Malone, 12,555; Lord Castlemaine, 11,445; Lord Greville, 9784; Captain Thomas Smyth, 9779; Patrick Edward Murphy, 9694; Sir Benjamin Chapman, Bart., 9517; G. A. Roehfort-Boyd, 9481; Charles Brinsley Marley, 9060 ; and Sir John Ennis, Bart., 8775. The soil is generally a rich loam of great depth resting on limestone, and is well adapted both for tillage and pasturage. Even the hills when not under tillage are clothed with a rich pasturage to thcir sunimits. In 1886 22°2 per cent. of the entire area was under crops, 62°83 per cent. under grass, '1 per cent. fallow, 1°8 per cent. woods and plantations, 9°4 per cent. bog and marsh, '1 per cent. barren mountain land, and 4*1 per cent. watcr, roads, &c. The total number of holdings in 1886 was 10,992, of which 42 were above 500 acres in extent, 281 between 200 and 500 acres, 535 between 100 and 200 acres, 1094 between 50 and 100 acres, 3589 between 15 and 50 acres, 2466 between 5 and 15 acres, 1698 between 1 and 5 acres, and 1287 not excecding 1 acre. Within about the last forty years the area under crops has diminished nearly a third. In 1849 it was 130,913 acres, and in 1859 it was 122,684. Between 1876 and 1886 it has becn fluctuating rather than decreasing ; in the former year it was 98,959, and in the latter 96,287. Only in the area under mcadow and clover has there been an increase: in 1849 it was 35,359 acres, and by 1859 it had increased to 41,535, by 1876 to 51,262, and by 1886 to 56,619. The decline in the area under green crops has not been marked: in 1876 the arca was 21,369 acres, and in 1886 it was 19,292; but since 1849, when it was 76,173 acres, the area under corn crops has*

declincd more than two-thirds, and the decline has becn continuous, the area in 1876 being 26,305 acres, and in 1886 only 20,375. More than half the area under green crops is occupied by potatoes (11,948 acres in 1876, aud 11,106 acres in 1886), turnips occupying in these years respectively 6155 acres and 5362 acres, mangel-wurzel, &c., 1232 and 1129, and other green crops 2584 and 1695. The bulk of the area under corn crops has always been occupied by cats, but their area has declined from 59,424 acres in 1849 to 25,709 in 1876, and 19,969 in 1886. The areas under other corn crops are inconsiderable. The number of horses in 1886 was 13,014, of which 883 were kcpt for amusement and recreation. Mules numbered 659, and asses 4891. Cattle numbered 102,878, 15,806 of them milch cows, and 45,915 other cattle above two years ofage. The number of sheep was 118,401, of which 44,265 were under one year old. Pigs numbered only 17,308, goats 6811, and poultry 265,759, including 21,014 turkeys and 36,908 geese.

Manufactures. —The occupations are almost wholly agricultural, dairy farming predominating. Flour and meal are largely made. The only textile manufactures are those of friczes, flannels, and coarse linens for home use. The only mineral of any value is limestone.

Administration and Population.—De Burgo in 1760 placed the population at 50,340; in the parliamentary census of 1812 it was

given as 112,000; in 1821 it amounted to 128,819, in 1841 to 141,800, –

in 1861 to 90,879, and in 1881 to 71,798 (males 36,478, females 35,320). Between 1841 and 1881 the decrease has thus been 49:18 per cent. Roman Catholics in 1881 numbered 92:2 per cent, of the population, and Protestant Episcopalians 6°9. In 1881 54 per cent. of the population could read and write, 14°7 per cent. could read but could not write, and 31°3 per cent. could neither read nor write,—14°8 per cent. being under seven years of age. There were none who could speak Irish only; 828 could speak Irish and English. By the Act of 1885 Westmeath, which formerly returned two mem- bers to Parliament, was formed into two parliamentary divisions, North and South, each returning onc member; and, Athlone having been disfranchised, that part of the borough within the county was included in the South Division. The principal towns are

Athlone, of which about half (3072 inhabitants out of 6755) is within the county, the remainder being in Roscommon, and Mullingar (4787), the county town, a Catholic cathedral city, and an important rail- way junction. The county is divided into 12 baronics, and contains 63 parishes and 1356 townlands. It is in the home circuit, and assizcs are held at Mullingar, and quarter sessions at Mullingar and Moate. There are 16 petty session districts. The county is within the Dublin military district, and forms part of No. 67 sub-district, the brigade depét of which is at Birr. There is a barrack station at Mullingar.

Listory and Antiquitics.—Westmeath was included in the kingdom of Meath formed by Tuathal, overlord of the Scoti (0b. cir. 160 a.D.), to serve as his mensal land. The district suffered much in the 10th and 11th centurics from the Danes, who burnt the town and abbcy of Fore. In 1153 the northern region was the scene of a bloody battle under the leadership of the two sons of Dermod O'Brien, after which Turlough, having obtained the victory, put out his brother's eyes. On the settlement of the English in Leinster it formed part of the palatinate of Hugh de Lacy, who received about

800,000 acres from the king, and allotted large tracts to his followers. In the reign of Henry VIII. the palatinate was divided into two parts, the western of whieh was distinguished by the name of Westmeath. In the latter division a portion of Longford was included until this district was formed into a separate county by Elizabeth. The plan for the insurrection of 1641 was concerted in the abbey of Multifarnham, and both in the wars of this period and those of 1688 the gentry of the county were so deeply impli- cated that the majority of the estates were confiscated. There are a considerable number of old raths: one at Rathconrath is of great extent; another at Ballymore, originally a Danish fort, was fortified during the wars of the Cromwellian period and those of 1688, and afterwards was the headquarters of General Ginckell, when pre- paring to besiege Athlone ; and there is a third of considerable sizo near Lough Lene. The ruins of the Franciscan abbey of Multifarn- ham, founded in 1236 by William Delaware, picturesquely situated near Lough

Dereveragh, include a tower 93 feet in height. Others of less importance are at Fore, Kilmocahill, and Kilbcggan.

WESTMINSTER. See Lonpon.

WESTMORLAND, a northern inland county of England, adjoins Cumberland on the north-west, Lancashire on the south-west and south, Yorkshire on the east, and a small part of Durham on the extreme north-east. In form it may be regarded as an irregular polygon, with two large re-entering angles on the south-west and south-east. Its length from N.E. to §.W. is 42 miles, while from east to west it measures 40 miles. The total area is 505,864 acres, whereof 4958 acres are foreshore, and 8519 are water. No part of the county touches the sea, unless the estuary of the Kent be regarded as such.

Physically the county may be roughly divided into four areas. (1) The great upland tract in the north- eastern part, bordering on the western margin of York- shire and part of Durham, consists mainly of a wild moorland area, rising to elevations of 2780 feet in Dun Fell, 2803 in Dufton Fell, 2591 feet in Mickle Fell, 2008 Nine Standards, 2328 High Seat, 2323 Wilbert Fell, and Swarth Fell 2235 feet above the sea, (2) The second area comprises about a third of the massif of the Lake District proper, with its eastward continuation, the Langdale and Ravenstonedale Fells, and also the fells of Middleton and Barbon farther south. These include Helvellyn (3118 feet), Bow Fell (2959), Pika Blisca (2304), Langdale Pike (2300), High Street (2663), Fairfield (2950), the Calf (2220), besides others of considerable elevation. All but the lower parts of the valleys within these two areas lie at or above 1000 feet above Ordnance datum ; and more than half the remainder lies between that elevation and 1750 feet, the main mass of high land lying in the area first mentioned. (3) The third area includes the comparatively low country between the northern slopes of that just described and the edge of the uplands to the north-east thereof. This includes the so-called Vale of Eden. About three-fifths of this area lies between the 500 and the 1000 feet contour. (4) The Kendal area consists mainly of undulating lowlands, varied by hills ranging in only a few cases up to 1000 feet. More than half this area lies below the 500-feet contour. Westmorland may thus be said to

be divided in the middle by uplands ranging in a general south- easterly direction, and to be bordered all along its eastern side by the elevated moorlands of the Pennine chain. The principal rivers are—in the northern area the higher part of the Tees, the Eden with its main tributaries, the Lowther and the Eamont, and in the southern area the Lune and the Kent, with their numerous tributary becks and gills. The lakes include Ullswater (the greater part), Windermere (the whole), Grasmere, Hawes Water, and numerous smaller lakes and tarns, which are chiefly con- fined to the north-western parts of the county. Amongst the other physical features of more or less interest are numerous crags and scars, chiefly in the neighbourhood of the lakes; others are Mallerstang Edge, Helbeck, above

Brough ; Haikable, or High Cup Gill, near Appleby ; Orton Scars; and the limestone crags west of Kirkby Lonsdale. Amongst the waterfalls are Caldron Snout, on the northern confines of the county, flowing over the Whin Sill, and Stock Gill Force, Rydal Force, Colwith Force, and Dungeon Gill Force, all situated amongst the volcanic rocks in the west. Hell Gill, near the head of the Eden, and Stenkrith, near Kirkby Stephen, are conspicuous examples of natural arches eroded by the streams flowing through them. Amongst the more striking hills outside the massif of the Lake District are Wilbert Fell, Roman Fell, Murton Pike (1949 feet), Dufton Pike (1578 feet), and Knock Pike (1306 feet).

Geology.—The geological formations represented in Westmor- land are : —(A) (1) recent deposits, and (2) glacial drift; (B) New Red rocks—(1) Upper New Red, and (2) Lower New Red or Permian ; (C) Carboniferous rocks—(1) Coal-Measures and Millstone Grit, (2) Yoredale Rocks and Mountain Limestone, including the Roman Fell beds, Calciferous Sandstones, and the Lower Limestone Shale, and (3) the Upper Old Red ; (D) Siluro-Cambrian rocks—(1) Silurian rocks proper, (2) Upper Cambrian, Ordovieian or Lower Silurian rocks, and (3) Cambrian rocks ; (E) Metamorphic rocks of different ages ; and (F) various Plutonic rocks.

Alluvium in some form or another occurs as marginal deposits alongside streams, or as deltas where streams euter lakes, or where they spread at the foot of a hill-side. Peat forms a mantle of varying thickness on the damper or the more shady parts of nearly all the uplands, ranging locally up to a thickness of 10 feet, and occurs on the sites of old tarns or of old swamps. Screes of rock waste are of general occurrence about the lower parts of nearly all the crags, and as such they play an important part in the scenery of the district. Glacial deposits, in the form of boulder clay, of sand and gravel, or of boulders, are extensively distributed over the lowlands, and to a variable distance up the hill-sides also. They seldom much exceed 100 feet in thickness ; but their occur- rence is of considerable importance in relation to the scenery, and still more so to the character of the subsoil. Boulders of various kinds are scattered far and wide over nearly all but the highest parts of the county.

Between the period represented by the boulder clay and the next older deposit in Westmorland a great hiatus exists, which is else- where represented by several very important geological formations, Here the newest rock next in the series is the St Bees Sandstone and the gypseous shales at its base, which together' probably re- present the Bunter serics. Thesc soft red sandstones, flags, and marls with gypsum are all confined to the northern part of the county, where they form much of the low ground extending along the foot of the Cross Fell escarpment from the county boundary east of Penrith south-eastward to Kirkby Stephen. Some of the prettiest scenery of these parts (Crowdundle Beck ; Mill Beck, Dufton ; and Podgill, Kirkby Stephen) owes its character to these rocks. The stone is used extensively for building. Gypsum occurs in workable quantities in the shales near the base. Where fully developed these rocks are not less thau 2000 feet in thickness. The next formations in descending order consist of the Magnesian Limestone (0-30 feet), the Helton Plant Beds (0-40 feet), the Penrith Sandstone and its horizontal equivalents the Brockrams (0-1200 feet). All these are older than the rocks previously men- tioned, but belong to the samc series. They occur in the samc tract of country.

The highest rocks of the Carboniferous age in Westmorland are represented by a tiny patch of true Coal-Measures, let down, and so

preserved from denudation, by one of the great Pennine faults between Brough and Barras, in north-eastern Westmorland. These roeks consist of several thick and valuable seams of coal, and of beds of fireclay equally valuable, interbedded with several hundred feet of the usual sandstones and shales.! True Coal-Measures are not yet known to occur elsewhere in Westmorland. Millstone Grit of the ordinary type underlies these Coal-Measures, and is seen to perhaps a thickness of nearly 2000 feet, Except a small patch exposed near Appleby, and also another near Kirkby Lonsdale, the remainder of the Millstone Grit is confined to the higher parts of the wild moorlands along the eastern border of the county Lhe highest member of the second subdivision of the Carboniferous is the Yoredale Rocks, which form the chief mass of the hills forming the Westmorland part of the great central watershed of northern England. Most of the Cross Fell escarpment, of Stainmoor, and of the higher parts of the valley of the Eden consist of these rocks as do also much of the lowlands. They consist essentially of a series of thin beds of limestone, parted by variable thicknesses of sandstone and shales, with here and there a thiu eoal-seam. Their thickness ranges from 1500 to 2500 feet. The Borradale coal-seam,

1 These will be found described in detail in the 7 (sate op er rans. Cumb. and West, Assoc.,

and the Tan Hill seam, in these rocks, have long been worked for local purposes. Below the Yoredale Rocks limestone preponderates, and the grey limestones of this series form very conspicuous and striking features in the landscape around Kendal, Beetham, and Farleton; Kirkby Stephen, Orton, and Shap; Brough, Helgill, and Murton, and thence north-westward. Near Kirkby Stephen is nearly 2000 feet of this limestone, locally almost undivided. Near Kendal, at Barbon, between Ravenstonedale and Shap Wells, and near Helton occur masses of red gravelly conglomerate and red sandstones belonging to the Upper Old Red. The materials of the conglomerate largely consist of rocks foreign to the district. Fora period of immense length preceding the deposition of the Upper Old Red the older rocks of Westmorland seem to have been

exposed to a complicated scries of disturbances and denudations, with, as a result, the removal from some areas of a thickness of strata above (rather than below) 5 miles in thickness. It was aeross the up- turned and denuded ends of this vast pile of rock that the Upper Old Red was laid down. The older strata, grouped under D above, are thercfore separated from the Upper Old Red by an un- conformity representing the removal from this area, and the ac- cumulation in some unknown arca elsewhere, of a pile of rock 5 miles in thickness. This is one of the greatest breaks yet made known in the whole of the geological record.

The Siluro-Cambrian rocks are perhaps more fully developed in Westmorland and Cumberland than they arc anywhere else,—thc aggregate thickness of strata referable to one or other of the hori- zons in this group being at least 6 miles. The highest member of this series is the Kirkby Moor Flags, which consist of a considerable thickness of mudstones and sandstones, much disturbed and con- torted in places, and form the whole. of the low hill country on the east side of the turnpike road between Kendal and Kirkby Lonsdale, and extending thence eastward to a little beyond the Lune. Lithologically and palxontologically these rocks agree in a general way with the Ludlow rocks of Shropshire. Their highest beds are unconformable to the Upper Old Red, sometimes violently so. These rocks graduate downward into the Bannisdale Slates, 5200 feet of close alternations of flaggy grits and rudely cleaved sandy mudstones. These rocks occupy a large area around Kendal, and to the south-west of thattown. They also form a large part of the Howgill Fells. These in turn graduate downward into the Coniston Grits and Flags, which consist of 7000 feet of altcrnations of tough micaceous grits and rudely-cleaved mudstones,—the whole mass tending near its base to pass into finely-striped and cleaved mudstones, the Coniston Flags. The tough and durable nature of the harder beds of this series gives rise to a series of mammillated hills. All the rocks of the series here referred to give rise to a type of scenery different in many essential respects from that result- ing from the wastc of any other rocks in Westmorland, so that the hill scenery south of a line joining Ambleside and Shap Wells is distinctly different from that to the north of that line. Near their base the argillaceous members of the series graduate downwards into a few hundred feet of pale grey-green mudstone, with a peculiar porcellanous

texture; and these, in their turn, graduate downwards into a small thickness of pitch-black mudstones, with much tho general character of indurated fuller's earth, and usually crowded with graptolites having the general facies of those elsewhere found in the Llandeilo rocks. The pale grey beds are the Stock- dale Beds, or " pale slates." The Graptolitic Mudstones locally have at their basc a conglomerate, which consists of rolled fragments of rocks from various horizons in the older series. In general terms these two groups of rocks may be described as oceurring along a narrow outcrop extending from near Ambleside to Shap Wells. They reappear also near Dufton and at Cautla. In West- morland the Llandovery beds of Wales appear to be absent, as the rocks next older than the Graptolitic Mudstones consist of rocks characterized by fossils of an unmistakably Bala type. The West- morland type of these rocks consists of a mass of altcrnations of volcanic tufts and lavas, with the marine equivalents of these, and with limestones and shales, the whole series thinning as it is traced toward the centre of the Lake District near the head of Windermere. The Coniston Limestone is the best known member. of this series. The series as a whole, however, finds its best and most fully- developed representatives outside the area of old subaerial volcanic cones and craters on whose surface the Coniston Limestone lies, The calcareous members of this series are usually replete with well-preserved fossils in grcat variety. The series under notice forms some conspicuous features along the foot of the Cross Fell escarp- ment. Rising from beneath these series just mentioned comes the vast pile of old volcanic ejectamenta, largely subacrial in the typical district, which is known as the Borradale Volcanic Series (see CUMBERLAND). Outside the massif of the Lake District we

meet with the submarine cquivalents of these subaerial accumula-

tions. These are well seen at Milburn. They consist of many thousands of feet of alternations of submarine tuffs, with shales and mudstones, seemingly identical in character with the Skiddaw Slates, which in the centre of the Lake District mainly lie at the base of the volcanic rocks. The next type may be described as a

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vast pile of old marine sedimentary accumulations, ten or more thousand feet in total thickness, and mainly consisting of alterna- tions of indurated shales, mudstones, and flags, with subordinate beds of grit. This is the Skiddaw Slate, which may be couveniently exainined on and around Murton Pike, near Appleby. The same general type of strata prevails over a very wide area. The bottom of these rocks has never been reached. The principal areas of metamorphic rocks in Westmorland are situated in the volcanic area. Rocks more or less altered by deep-seated action occur also around the Shap Granite. The alteration of the volcanic rocks here takes the form of an approach to the mineral characters of granite; but there is no passage from the one to the other. The sedimentary rocks are altered also, more or less, but in a different way: the calcareous beds are developed into idocrase rocks, the cleavage in the Coniston Flags is sealed or welded up anew, while the grits are rendered more or less quartzitic.

Amongst the plutonic rocks the chief is the well-known granitic porphyry, fragments of which occur in the Upper Old Red near Shap. There are many intrudes of diorite, gabbro, felsite, mica trap, and the like,—all Post-Silurian and Pre-Carboniferous in age. Another well-known plutonic rock, of later date than the Carboniferous period, is the Whin Sill, an intrusive sheet of dolerite, which has eaten its way into the Carboniferous rocks over hundreds of square miles in the north of England. It forms the most characteristic feature of the sombre and gloomy fell-side recess known as " High Cup Gill," or Haikable, near Appleby ; and it also forms the waterfall known as Caldron Snout. It is the newest intrusive rock known in Westmorland.

The whole county is traversed in many directions by great numbers of faults. One set, the Pennine faults, call for a brief notice here. Two lines of disturbance continued northward from the Craven faults enter the county east of Kirkby Lonsdale. One ranges north-north-eastwards, on the east of the Barbon Fells, and lets in the Carboniferous rocks forming Gragreth, throwing down about 2000 feet on the east; it ranges by Dent, aud east of Sedbergh, entering the county again in the valley between Clouds and the Raveustonedale Fells. Here its effects are as strik- ingly exhibited as at Gragreth, as the Millstone Grit summit of Wilbert Fell on

one side of the fault islet down to the same level as the summits of the Silurian hills on the other. The second set of faults referred to throws down in the opposite direction, letting down the Millstone Grit, the Yoredale Rocks, the Mountain Lime- stone, and finally, as its throw diminishes, the Old Red, against the foot of the Silurian massif of the Barbon Fells. This fault ranges parallel to the general course of the Lune nearly as far northward as Sedbergh, where it is joined by another set ranging east-north-east, which joins the set first described as ranging north-north-east to Ravenstonedale at a point near the county boundary north of Cautla. Thence the conjoined faults run northward in a very complex manner, producing some important effects upon the scenery about the foot of Mallerstang. Near Kirkby Stephen its throw changes from a downthrow to the east to one in the opposite direction, which throw increases rapidly in amount as the faults trend northwards, until at the foot of Stain- moor, below Barras, its throw amounts to quite 6000 feet down to the west; and we find the important patch of Coal-Measures above noticed let down in consequence. At this point it changes in direction, running north-westerly, with many complications, past Brough, Helton, Dufton, and Milburn, out of the county at the foot of Cross Fell. Along this line it throws down to the southi- west several thousands of feet; and it is to the complicated disturb- ances accompanying this great dislocation that nearly the whole of the more striking physical features of North Westmorland owe their origin. It is in connexion with the same important sets of disturbances also that the existence of most of the mineral veins of the district is due.

Climate. —The rainfall is exceptionally heavy. The largest quan- tity recorded appears to be that in the mountains along the county boundary west of Grasmere, where the mean amounts to as much as 140 inches. At Sty Head the rainfall in 1872 amounted to 243°98 inches. The area of greatest rainfall forms a rude ellipsoid around these two places, lying with its longest dimensions towards the south-east, nearly coinciding with the distribution of land above 1500 feet. The heaviest precipitation takes place in the months of January, September, and October, and the smallest in July. At Grasmcre, well inthe heart of the mountains, but farther east, and at a much lower elevation, the mean rainfall for the past twenty years has been 80 inches, rain of ‘01 inch or more falling on about 210 days of

the year. Between Grasmere and Shap the rainfall diminishes somewhat in the mountain areas. But in the lower ground still farther east the rainfall steadily but more rapidly diminishes, until at Milburn (644 feet) the mean for the last ten years has been about 38 inches on 175 days in the year. At Kendal the mean appears to be about 50 inches, and the number of wet days about 190 in the year; at Kirkby Lonsdale it is rather less, and at Kirkby Stephen less again. The mean tem- perature for January is between 38° and 39° F., February 40°-41°,

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March 41°-42°, April 46°-47°, May 51°, June 58°, July 60°-61°, August 60°, September 56°, October 49°, November 42°, and December 38°-40°. The principal characteristic of the climate is the preponderance of cloudy, wet, and cold days, especially in the spring and the autumn,—combining to retard the growth of vege- tation. The late stay of cold winds in the spring has much to do with the samie, especially in the lowlands extending along the foot of the Cross Fell escarpment from Brough north-westwards. Here, for weeks at a time, prevails a kind of cyclone revolving on a horizontal axis parallel to the escarpment,—the "helm-wind." The remark- able feature connected with it is that, when the wind is rushing furi- ously from the slopes of the escarpment in the direction of the low grounds, little movement of the air can be detected on the summit.

Flora and Fauna.—Among the denizens of the mountains are several plants distinctly alpine in character ; and others, more or less boreal in their principal stations, are here found at nearly their southernmost pointof distribution. Bog plants are also conspicu- ous in their variety, and include several forms of some rarity. The lichens, mosses, and ferns are well represented. Of trees the oak and the common elm do not seem quite at home anywhere except in the more sheltercd nooks, and in parks and other cultivated places. But the place of the common elm is well supplied by the wych elin, which grows to great perfection. In place of the oak the sycamore is seen almost everywhere in the lower lands ; and there are probably few parts of England where the ash thrives so well, or attains to so large dimensions. On the higher lands, up to the upper limit of woodland growth, the birch, the hazel, and the mountain ash, and, in limestone districts especially, the yew are the prevailing trees. The alder is abundant, and willows of various kinds occur. The upland character of the region affects also its fauna. The badger, the polecat, and perhaps even the wild cat are still met with in Westmorland. The lineal descendants of the wild red deer range over a carefully-preserved remnant of the primeval forest in more than one place. The raven, the peregrine, and the buzzard may still be seen, and the moors sustain a considerable variety of birds other than grouse. The whistle of the golden plover and the note of the curlew are intimately associated with the scenery of the moory uplands. In the lowlands the avifauna is characterized rather by the absence of many forms common in the south than by the presence of birds elsewhere rare. The orni- thologist cannot, however, help being struck with the comparative abundance of the redstart, the woodwren, and the grasshopper warbler, none of them very common in other parts of England.

Minerals. —Coal, the most important mineral product, occurs in connexion with the Carboniferous rocks, but most of the seams are thin and their quality is inferior, so that they have long ceased to have the industrial importance they once possessed. Fireclays of excellent quality and of unusual thickness occur with the coals at Argill, but have not hitherto been turned to indus- trial account. Amongst the building-stones those of the New Red certainly deserve the first rank. The warm-tinted,

easily- worked, and durable Penrith Sandstone furnishes one of the finest building-stones in the kingdom; while the associated Brockrams are in their own way hardly less valuable ; and the same may be said of the St Bees Sandstone, whence the materials used ou so many of the larger public buildings of the northern part of the county have been derived. The Carboniferous rocks nearly everywhere furnish durable freestones and good flags, The Silurian rocks likewise yield building-stones, but somewhat difficult to work. Some of the thinner beds of Carboniferous sandstone are occasionally quarried for roofing purposes. The Coniston Flags are quarried at several places on the south side of the county ; while in the north-western parts cleaved beds of volcanic ash, belonging to the Borradale Series, have long furnished an ample supply of the well-known "green slates." Amongst stones available for ornamental purposes the Shap granite-porphyry is undoubtedly the finest, as its choice for decorative purposes iu our large cities has shown abundantly. In the way of marbles there are the bituminous limestones at the base of the Yoredale Rocks, and the encrinital limestones nearer their top, both much appreciated ; while among limestones of different character there are the mottled and variegated limestones of several places in the neighbourhood of Kendal in the southern and of Asby in the northern parts of the county. Well-chosen specimens of Brockram have a pleasing effect when polished. Gypsum is worked extensively in the New Red rocks in the neighbourhood of Kirkby Thore and Temple Sowerby. Amongst the ores of the useful metals those of lead are of prime importance. The rich lodes of Greenside mines were until lately reckoned amongst the finest of their kind in the United Kingdom, and they have also supplied considerable quantities of silver, which has been extracted from the lead. These were worked in the voleanic rocks. Copper and zinc ores also occur in small quan- tities. Hematite has been discovered here and there at many points, especially where calcareous strata have been affected by infiltration from the New Red rocks.!

1 For other minerals of Westmorland, the interest of which is chiefly scientific, see Trans, Cumd. and West, Assoc., Nos. 7, 8, and 9.

Agriculture.—According to the Agricultural Returns for 1887 the total extent of green crops was 10,232 acres; of corn crops, 19,124, whereof 17,320 were of oats, and only 469 of wheat, and 118 of rye; seed-grasses, 14,951; and 207,017 acres of permanent pasture. The total number of horses is given as 8547; of cows and heifers in milk or in calf, 24,097; of other cattle, 39,225; of sheep, 334,978; and of pigs, 4731. There were 59 holdings of less than an acre; 495 of from 1 to 5 acres; 792 of from 5 to 20; 819 of from 20 to 50; 790 of from 50 to 100; 641 from 100 to 300; 64 from 300 to 500; 31 from 500 to 1000 ; and 3 holdings of above 1000 acres. The total number of owners is stated in the Return of Owners of Land, 1873, as 4876; the extent of lands held by them was 335,160 acres, with a gross estimated rental of £442,320, while 114,282 acres were commons or waste land. Seven pro- prietors then owned more than 5000 acres each :—earl of Lonsdale, 39,229; Sir H. J. Tufton, 16,094; marquis of Headfort, 12,851; Hon. Mary Howard, 8868; W. Wilson, 8690; G. E. Wilson, 7630; W. H. Wakefield, 5584. A large part of Westmorland was for- merly in the hands of what are called "statesmen," whose hold- ings were usually of small extent, but were sufficicnt, with careful management, for the respectable maintenance of themselves and their families. The proportion of landowners of this class is now, however, comparatively small. The meadow-land yields grass of first-rate quality. Grass of inferior value characterizes the pasture- lands; while on the fell (or unenclosed) land, except in limestone areas, the herbage consists chiefly of the coarser kinds of grass, bents, and heather. These, however, furnish nourishment for the hardier breeds of sheep, which are pastured there in large numbers. It is from the sale of these, of their stock cattle, horses, aud pigs, and of their dairy produce that the staple of the farmers' income is derived.

Manufacturcs.—The manufacturing industries, owing to the absence of any large supplies of native fuel, are not numerous. The principal is woollen manufacture in one form or another, and this is chiefly confined to the low country in and near Kendal. Bobbin-making, fulling, snuff-grinding, and several small industries are carried on at a profit, owing to the water-power available at so many points. Paper-making is also carried on.

Admainistration.—There are five lieutenancy subdivisions, and two police divisions. There are 109 civil parishes in the county. It 1s in the diocese of Carlisle, is in the York military district, and forms part of the northern circuit. There is onc court of quarter sessions for the county, and five petty sessional divisions. The assizes are now held at Carlisle. The principal town is Kendal, which had in 1881 a population of 13,696. Other towns, all much less important as regards both size and population, are Appleby, Kirkby Lonsdale, Bowness, Kirkby Stephen, Ambleside, Shap, and Orton. The county sends two members to parliament, representing the Northern (or Appleby) and the Southern (or Kendal) Divisions respectively.

Population.—According to the census of 1881 there were 64,191 inhabitants (31,515 males, 32,676 females), the decrease since 1871 being 819. The proportion of population to acreage is 1 person to 7°80 acres. The people of Westmorland may be described as a prevalently tall, wiry, long-armed, big-handed, dark-grey-eyed, fresh-coloured race. In disposition they are a cautious, reserved, staid, matter-of-fact, sober-minded, unemotional race, somewhat slow-witted, but not by any means dull, and are thrifty beyond measure. The general character of the dialects of Westmorland is that of a basis of Anglian speech, influenced to a certain extent by the speech current amongst the nou-Anglian peoples of Strath- clyde. This is overlain to a much greater though variable ex-tent by the more decidedly Scandinavian forms of speech intro- duced at various periods between the 10th and the 12th centurics. Three well-marked dialects can be made out.

Antiquities and History.—Amongst the oldest monuments of Westmorland are the circular earthworks called King Arthur's Round Table and Maybrough, both close to Penrith. Barrows and tumuli are common in the wilder parts of the county, more espe- cially along the limestone hills near Orton. 'Traces of earthworks, regarded as Celtic, occur near Crosby Ravensworth, and at a few other places. Rude stone circles and other structures of the same nature exist at several places between Ravenstonedale and Shap. Stone implements of the Neolithic type and implements of bronze have been found all over the county. Cup-marked stones have been noticed near Penrith. At Brough chureh was found a

slab bearing an inscription variously regarded as Greek, or Celtic, or Scandinavian. Well-marked traces of the occupation of the county by the Romans exist in their roads, their camps, their altars, and their coins, Monuments of later date, prior to the reign of Rufus, are excecdingly rare, and are chiefly confined to objects of an ecelesiastical character which mostly owe their preservation to their having been worked up as building material in some of the older churches. Good examples are to be found at Kirkby Stephen, Long Marton Bongate, and other churches. Vestiges of late Norman work, rarely carlier than 12th century, are preserved iu several of the

churches, and in a few of the castles. In the case of the castles

especially it is evident that their sites had been used as strongholds through a long succession of periods, extending in some cases far back into prehistoric times. From the 12th century downward each period of the history of Westmorland may be said to be fairly well represented. } (J. G. G.)

WESTON-SUPER-MARE, a watering-place of Somer- set, England, is situated at the northern extremity of Uphill Bay, a recess of the Bristol Channel, and on a branch of the Great Western Railway, 1384 miles from London, 20 south-west of Bristol, and 20 north-west of Wells. It-is built partly on level ground near the shore, and partly on the slopes of Worlebury Hill, which aids in sheltering it from the north and east. On this account, as well as from its bracing and dry air, it has won con- siderable favour both as a winter residence and as a summer resort. Many villas have been built in it by persons engaged in business in Bristol. An esplanade about 3 miles in length has been constructed at a cost of £30,000. The pier, which altogether is 1040 feet in length, and includes the rocky island of Birnbeck, is north from the town at the extreme end of Worlebury Hill, where also are the Prince Consort promenade gardens. The church of St John, built in 1824, mostly on the site of the old one, contains some old monuments. The other principal public buildings are the town-hall in the Venetian style, the assembly rooms, the market-house, the Weston county club, the church institute, the hospital and dispensary,

and the West of England sanatorium, which since its enlargement in 1882 contains 100 beds. The town has been long famed for its potteries. The population of the urban sanitary district (area 2770 acres) in 1871 was 10,568, and in 1881 it was 12,884.

The town was included in an ancient British settlement, of which Worlebury Hili was the citadel. The ramparts of this fortress stil] remain, including a number of hut circles, beneath which skeletons and Celtic remains have been found. In Domesday Westone is described as held by the bishop. In the time of Edward the Con- fessor it was held by Algar. In 1696 it was purchased by the Pigotts, the present lords of the manor. The growth of the town is entirely modern. About the beginning of the century it consisted of about twenty-four cottages inhabited by fishermen. A hotel for the re-

ception of visitors was erected in 1805, and an esplanade begun in 1825, since which time it has made rapid progress.

WESTPHALIA (Germ. Westfalen), a province in the west of Prussia, is bounded on the N. by the province of Hanover, on the E. by the province of Hanover, the principalities of Lippe-Detmold and Schaumburg-Lippe, the duchy of Brunswick, the province of Hesse, and the principality of Waldeck, on the S.W. by Rhenish Prussia, and on the N.W. by Holland. Its greatest length from north to south is 110 miles, its greatest breadth is 124 miles, and its total area is 7800 square miles.

The Lippe, an affluent of the Rhine, flowing from east to west across the province, divides it into two parts, dis- similar in their character. The northern portion, a con- tinuation of the plain of the Netherlands, is flat, with the exception of the east, which is occupied by the Weser Hills. South of the Lippe, on the other hand, the province is occupied by numerous small chains and groups of hills, enclosing many beautiful valleys. Between the parallel courses of the Lippe and Ruhr stretches the low chain of the Haar or Haarstrang (850-1050 feet), which is steep on its southern face, but slopes gradually down on the north to the valley of the Lippe, known as the Hellweg. The rugged mountain district south of the Ruhr is known as the Sauerland, and its eastern portion, the plateau of Winterberg, is the highest part of the province. The culminating point is

the Astenberg (2760 feet). This plateau is connected with the Westerwald on the south- west border by the Rothhaar or Rothlagergebirge. West- phalia is divided between the basins of the Rhine, Ems, and Weser. The Rhine itself does not touch Westphalia, but its aifluents, the Lippe and Ruhr, are the leading

streams in the province. The Ems, entering Westphalia from Lippe, flows north-west and enters Hanover. The Weser crosses the north-east of the province, piercing the Weser Hills by means of the narrow pass known as the Porta Westphalica or Westphalian Gate. All these streams are navigable for barges and small vessels. There are no lakes in the province. The climate is on the whole tem- perate, though sometimes the winters are severe among the mountains, .

About 42 per cent. of the surface is given up to agriculture, 25 per cent. to pastures and moors; 28 per cent. is under wood; and the remainder is unproductive. The fertility of the soil varies ; it is most unfertile in the north and north-east. A great proportion of the land is in the hands of small farmers and peasant proprietors, who as a class are well-to-do, though their system of farming is in some respects antiquated. Grain of various kinds is grown, though not in sufficient quantity to meet the demands of the pro- vinee ; potatoes, pease and beans, fruit, and tobacco are also pro- duced ; but perhaps the most important crops are hemp and flax, which places Westphalia among the leading flax-producing districts ofGermany. 'The forests are chiefly on the mountains of the Saner- land, and in the south generally. Considerable numbers of cattle and pigs are reared, the latter yielding the well-known Westphalian hams; goats are also numerous in some districts ; and Government pays some attention to the breeding of horses in this province. Sheep are comparatively few. (Compare the agricultural statistics under PrusstiA.)

In virtue of its abundant coal and iron Westphalia is onc of the busiest industrial quarters of Germany. There are coal-fields in the north and in other districts, and the great coal-ficld of the Ruhr extends into the province. The district of Arnsberg, occupy- ing the south of the province, is the eentre of the mineral industry. Dortmund gives name to one of the

five mining districtsinto which Prussia is officially divided. Westphalia produces more iron ore than any other province in Prussia except the Rhine province and Silesia ; next to Silesia it produces the most zinc, and next to Saxony the most copper; and it yields more sulphur than any other province. Argentiferous lead, antimony, limestone, gypsum, marble, and slates are also worked. There are seven salt-works and numerous mineral springs.

The mineral wealth of the province encourages an extensive manufacturing industry, the leading branches of whieh are linen-weaving and iron-working. The linen industry is very ancicnt, and since the 14th century has flourished in this province between the Lippe and Weser. Its chief centre is now Bielefeld, which also manufactures jute. The cotton factories of Miinster are im- portant. Woollens, stockings, and ribbons are also manufactured to some extent. The principal seats of the metallic industries are Iserlohn, Liidenscheid, Altena, Hagen, and the " Enneper Strasse," a valley 7 miles long and three quarters of a mile wide, lying along the Ennepeand containing as its chief towns Haspe (7318 inhabi- tants) and Gevelsberg (7055). Cast and wrought iron, steel, rails, wire, blades and tools, machinery and smali iron and steel goods, bronze, brass, and plated articles are among the leading products, Vitriol, glass, and paper are also made. An active trade is carried on in the manufactured goods, and in timber, hams, and sausages. The leading commercial towns are Bielefeld, Iserlohn, and Dort- mund. Minden has a port on the Weser; Beverungen is the centre of the ¢orn trade; and Paderborn is the chief wool-market. The roads are good, and the railways numerous and convenient.

The population in 1885 was 2,202,726, or 282 per square mile. About 52 per cent. are Roman Catholics, most of whom are found in the southern district of Arnsberg. About 464 per cent. are Protestants, the remainder are Jews and others. Education is well attended to. The seat of government isat Miinster ; and the province is divided into the three districts of Minden, Miinster, and Arnsberg. It has thirty-one members in the Prussian parlia- ment, and seventeen in the imperial diet.

Westphalia was the name given to the westcrn portion of the early duchy of Saxony (vol. xxi. p. 351). When Henry the Lion fell under the ban of the empire his Saxon domains were distributed by the emperor. The Sauerland and some othcr parts of West- phalia fell to the archbishops of Cologne, who afterwards received from Frederick Barbarossa the title of dukes of Westphalia and Angria. The northern portion of the original Westphalia became the nucleus of the circle of Westphalia in Maximilian's adminis- trative organization of the empire, while the duchy of Westphalia, as an apanage of Cologne, was included in the scattered circle of the Lower Rhine. The circle of Westphalia embraced, roughly speaking, what is now Oldenburg, Hanover to the west of the Weser, the districts of Miinster and Minden, and a few other territories, an area of about 27,000 square miles, which in Maxi- milian's time was divided among four bishoprics and innumer- able small sccular states with an aggregate population of about

3,000,000. The peace of Lunéville in 1801 transfcrred all parts of this circle west of the Rhine to France, while in 1803 the duchy of Westphalia was granted to the duke of Hesse-Nassau as com- pensation for his former possessions to the west of the Rhine, which had also been added to France.

In 1807 Napoleon constituted the kingdom of Westphalia 'and gave it to his youngest brother Jerome. It comprised all the Prussian provinces as far east as the Elbe, and extended south to Fulda and the Thuringian states, embracing an area of about 14,880 square miles, with a population of 2,000,000. Nearly the whole of Hanover was added to this kingdom in 1810; but next year Napolcon again took away the greater part, as well as other tceiritorics, leaving, however, 17,740 square miles, with 2,057,000 inhabitants. This kingdom was intended to take the lead in the Confederation of the Rhine. After the battle of Leipsic in 1813 the kingdom of Westphalia was abolished, and things reverted to their previous order until the congress of Vienna rearranged the map of Europe, whcn Westphalia as we now understand the term was assigned to Prussia.

The peace of Westphalia, concluded in 1648 at Osnabriick and Miinster, put an end to the Thirty Years' War (see GERMANY, vol. p oan oO

WEST POINT, the seat of the United States military academy, on the Hudson, in Orange county, New York. See Army, vol. ii. p. 619.

WEST TROY, a village of Albany county, New York, United States, is situated in the bottom-land on the west bank of the Hudson, opposite Troy, with which it is con- nected by an iron bridge, and 5 miles north of Albany. It is at the termini of the Erie and Champlain Canals, and is on a railroad line of the Delaware and Hudson Canal Company. The village is well laid out, has water and gas, is provided with street cars, and has extensive manu- factures of a varied character, but particularly of iron. The Watervliet (United States) arsenal is situated here. The population, 10,693 in 1870, was 8820 (2427 of foreign birth) in 1880.

WEST VIRGINIA, one of the North-Eastern Central

'States of the American Union, lying between 37° 6' and

40° 38' N. lat., is bounded on the N. by Pennsylvania and Maryland, on the E. and 8S. by Virginia, and on the W. by Kentucky and Ohio, and has an area of 24,780 square miles,

The form of the State is extremely irregular. It may be roughly likened to an ellipse, the greatest diameter of which lies nearly north-east and south-west. Its boundary upon the east and south is made up of the irregular line which limited the counties which were set off from Virginia for the formation of this State. Upon the west the boundary is low-water upon the further shore of the Big Sandy and Ohio rivers. A long narrow strip, known as the "Panhandle," projects northward some sixty miles along the Ohio,—the boundary being the con- tinuation of the straight line which separates Ohio and Pennsylvania. To the east of this the northern boundary follows Mason and Dixon's line; then, dropping in a due south direction to the "Fairfax Stone," it follows thence easterly the course of the Potomac to its junction with the Shenandoah.

The entire State is mountainous or hilly, being com- prised within the region known as the Cumberland or Alleghany plateau. The highest land in the State is upon the castern and southern boundary, where the plateau in many placcs reaches elevations exceeding 4000 feet. Thence the country has a general slope to the north-west, and is lowest along the Ohio, where the elevation is but 600 to 800 feet. This plateau has been subjected to stream erosion until it has become a network of narrow crooked ridges with deep gorges or narrow valleys. The height of the ridges and the depth of the valleys, together with the ruggedness of the country, diminish towards the north-west, until near the Ohio the hills become rounded and softened in outline, and the valleys are broad and fertile.

Climate.

Fauna.

Timber.

Minerals.

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The drainage system of the State is in some respects peculiar. Although the general slope is towards the north-west, the Potomac, which flows south-easterly to the Atlantic Ocean, has cut its way far back into the plateau, and drains, by means of numerous long branches, the north-eastern quarter of the State. The remainder of the State is drained to the Ohio by means of several large branches which flow in a general north-westerly direction. Heading in the south-west is the Big Sandy, forming a portion of the State boundary. Fourteen miles above its mouth enters the Guyandotte, and 50 miles above the Guyandotte comes the Great Kanawha, one of the principal branches of the Ohio. This large and powerful stream has cut its way back beyond the crest-line of the plateau, tapping numerous streams in south-west Virginia and western North Carolina, so that its sources are now against the Blue Ridge in the latter State. It is known in North Carolina and Virginia, and in West Virginia to the Great Falls, by the name of New River. In West Virginia it has

numerous large tributaries—the Big and Little Coal rivers, Piney, and Bluestone from the south, and the Pocotaligo, Elk, Gauley, and Greenbrier from the north. The next branch of the Ohio, proceeding northward, is the Little Kanawha, which empties into the Ohio at Parkersburg. The north-western part of the State is drained by the Monongahela, one of the two head branches of the Ohio, and its tributaries, the principal of which are the Tygart's Valley, Cheat, and Buckhannon rivers. Of these streams the Ohio is navigable for river steamers at nearly all stages of water. The same may be said of the Kanawha to a point near the Kanawha Falls, while the Big Sandy, the Guyandotte, and the Monongahela are navigable for flat boats for long distances, and these, as well as numerous other streams, are largely used for the floating of lumber. All the streams of the State, and especially the smaller ones, have a rapid fall, but their enormous water-power has as yet been utilized only to a trifling extent.

The climate is nowhere severe, although, owing to the range in elevation within the State, there is a considerable range in tem- perature. The mean annual temperature ranges from 54° to 55° F., being highest in the neighbourhood of the Ohio, in the western part of the State, and lowest upon the high mountains in the eastern and north-eastern portion. The maximum is rarely above 25° aha any portion of the State, while the minimum occasionally reaches 10° in the more mountainous section. The rainfall may be given broadly at between 40 and 50 inches annually. It also varies with the elevation, being less in the lower portions and greatest upon the high mountains,

The fauna of the State is that common to the whole southern Appalachian region. Much of the area being as yet in a state of nature, deer of the white-tailed species are still abundant, and black bear are not unfrequently met with in the more rugged and remote portions. Wild turkeys are still found in some localities, and the mountains have long been a popular resort for hunters, while the streams, abounding in trout, afford an equally attractive field for the angler.

The timber resources of the State are enormous, and a small pro- portion of its area, amounting to only about 25 per eent., has been eleared. The

remainder is covered with virgin forest. This consists mainly of broad-leafed trees of the most valuable sorts for lumber, such as chestnut, black walnut, cherry, ash, poplar, hickory, locust, maple, oak, &c. Considerable areas of white pine are found in the highest portions of the plateau, being practically the only original forests of this wood left in the United States. Besides these there are considerable quantities of yellow pine, hemlock, spruce, and cedar seattered through the State.

Viewed broadly, the geological structure of West Virginia is extremely simple. Practically the entire State is overlaid by uearly horizontal beds of the Carboniferous formation. The coal of West Virginia forms its principal mineral wealth. It is estimated that of its entire area not less than 16,000 square miles are underlaid by workable beds of coal. The Report of the United States Geo- logical Survey upon ntineral resources defines the general boundaries of the coal fields of the State as follows : —" The eastern boundary begins at the south on the mountain range just east of the Bluestone River, and proceeds east to Little Sewell Mountattl: ac. ans . thence with the common boundary of Nicholas and Greenbrier and of

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Webster and Pocahontas counties to Rich Mountain in Randolph county; following this last-named ridge to Laurel Mountain, the dividing line between Upshur county on the west and Randolph and Barbour counties on the east, and thence with the Briery Mountain into Preston county, and soon to the Pennsylvania State line." All the area to the west of this line is underlain by coal. To the east of it there are small outlying patches, as in Greenbrier, Meadow Mountain, and possibly in Pocahontas, Tucker, Grant, and Mineral counties, but these are unimportant as compared with the vast areas in the west. In the gorge of every large stream flowing through this area are seen outcropping beds of coal, easily acces- sible to the miner, and requiring only facilities of transportation to render the mineral of commercial value. In the matter of coal production the State is rapidly acquiring prominence. From a production in 1873 of 600,000 tons, it reached in 1886 a production of over 4,000,000 tons, being exceeded by only four of the States, viz., Pennsylvania, Illinois, Ohio, and

Iowa. The production is limited only by the demand, as the supply is almost inexhaustible. The coals of the State are of every variety except anthracite, and are noted for their purity for coking, steam, and gas purposcs and for domestic fuel.

Iron ore is abundant in various portions of the State, but is worked only to a comparatively limited extent.

Salt springs are found in the valley of the Kanawha and in that Mineral of the Ohio, and there are extensive evaporating works in both these springs.

localities. The production, however, has been retarded by the competition of those in Michigan, owing to the greater cheapness of fuel and better facilities for transportation in the latter locality. The production of salt in West Virginia in 1886 amounted to 250,000 barrels. West Virginia contains numerous valuable mineral springs, among the best known of which are the Greenbrier White Sulphur springs in Greenbrier county, Capon springs in Hampshire county, Irondale springs in Preston eounty, and Red Sulphur springs and Salt Sulphur springs both in Monroe county. These are well-known and popular summer resorts iu the mountains, and the waters from them are shipped to all parts of the United States.

While the entire State may be said to be either mountainous or Agricul-hilly, it contains a large extent of avable land. Nearly all of the ture.

lower hill country can be cultivated, while in the mountainous region there are numerous broad valleys of exeellent soil, and everywhere the hill and mountain sides can be eultivated if the slope is not excessively steep. The tenth eensus (1880) reported an area of 10,198,779 acres of land in farms, of which 3,792,327 acres, or about one-fourth the area of the State, wasimproved land, this being mainly in the lower and less mountainous portion. The average size of farms was 168 acres, showing as compared with the average 10 years earlier, viz., 214 acres, a decided decrease. The value of farms and farming'implements was very nearly $136,000,000. The numbers of live stock upon farms, as distinguished from animals owned for business purposes in cities, cousisted in January

1888 of 138,231 horses, 6475 mules, 474,933 sheep, 432,778 hogs, 171,273 mileh cows, and 780,892 other cattle,—showing that the live-stock interests of the State are very large. The estimated value ofall farm products sold, consumed, or on hand, as returned in 1880, was $19,360,049. The prineipal agricultural products are wheat, Indian corn, hay, tobacco, oats, and garden vegetables. The cereal products for 1887 consisted of 12,516,000 bushels of corn, 2,840,000 of wheat, and 2,531,000 of oats.

The manufactures, which are not extensive, are concentrated Manufac- mainly at Wheeling, the largest city, on the Ohio, in the northern tures,

part of the State; they consist mainly of manufactures of iron and steel, glass, flouring and grist mill products, lumber, and leather. There were in 1880 2375 manufacturing establishments, employ- ing a capital of $13,883,390 and 14,351 persons. The value of manufactured products was $22,867,126.

There are-1200 miles of completed railroads, with several Railways.

branches and one trunk line in process of construction. The Baltimore and Ohio Railroad traverses the State from Parkersburg and Bellaire on the Ohio, the two branches meeting at Grafton, and running thence eastward to Washington, Baltimore, and New York. The Newport News and Mississippi Valley Railroad runs across the State from the mouth of the Big Sandy on the west to the Alleghanies near White Sulphur springs, and thence extends to Richmond and Newport News. The Ohio River line runs from Wheeling to Huntington on the Ohio. The West Virginia Central extends from Piedmont on the Baltimore and Ohio linc to a point in Randolph county, and is now in process of econstruc- tion south-westward to intersect the Newport News and Mississippi Valley line. The Clarksburg and Weston, intersecting the Baltt- more and Ohio at Clarksburg, extends to Weston in Lewis county, and this has two branches, one to Glenville in Gilmer county, and the other to Buckhannon in Upshurcounty. The Grafton and Greenbrier Railroad, intersecting the Baltimore and Ohio at Grafton, extends up the Valley river to Belington in Barbour county. The Norfolk and Western Railroad,

one of the main trunk lines of the Atlantic States, has a part of its lines in the southern portion of

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West Virginia. Railway construction is exceedingly active in all parts of the State, several new lines and numerous branches of existing lines being under construction and in contemplation.

The State early in its history (December 1868) adopted a liberal system of free schools. The plan is kuown as the township or district system,—the magisterial district or subdivison of each county being taken as the unit for taxation, and the general control of all the school interests of the district being placed in the hands of a district board of education elected by the people, and authorized among other dutics to levy taxes, to determine the number of months of school and the number of sub-districts, to plant and build schoolhouses, and to manage the financial and other school interests of the districts. There is likewise in each county a superintendent, and in the State a general superintendent. This system has since been maintained and strengthened by legislative enactment till from 133 schoolhouses and 431 public schools of all grades in 1865 there were in 1887 4587 schoolhouses in the State. In 1865 the amount expended in support of free schools was $7722 ; this gradually increased till in 1887 the amount was $1,087,674. The number of teachers employed by public appropriation was 387 in 1865; in 1887 it was 5106. 'The estimated value of school- houses in the State, 140,000 in 1865, was 2,000,000 in 1887. The average attendance in 1865 was 44 days; in 1887 it was 108. The school system of the State is made permanent by the constitutional enactment referred to, which requires that the legislature shall provide by general law for a thorough and efficient system of free schools. The general school system involves the education of teachers, and with this object from 1867 to 1872 the legislature provided for the establishment of six normal schools, which are in successful operation. In these schools tuition is free to all who desire to prepare themselves for teaching. They are popular among the people, and have done much to elevate the general standard of education. They prescribe courses of three years; nearly all of them have preparatory courses ; four of them give

collegiate training, and in all of them the study of ancient and modcrn languages is optional. The school system involves also what is known as the irreducible school fund. The principal, which now amounts to $600,000, is permanently invested. This fund is constantly augmented from sources provided by law and by voluntary coutributions.

Public The United States Government has erected public buildings for institu- its judicial, postal, and revenue departments within the State at tions, Wheeling, Clarksburg, Parkersburg, and Charleston, the capital of the State. While WHEELING (¢.v.) was temporarily the capital, a building was crected by its citizens for the uses of the State, which is now used for city purposes. The six normal schools already referred to have suitable buildings at Fairmont, Glenville, Hunt- ington, Concord, Shepherdstown, and West Liberty. The hospital for the insane at Weston in Lewis county and a branch asylum in course of construction at Spencer in Roane couuty, a deaf-mute and blind asylum at Romncy in Hampshire county, a penitentiary at Moundsville in Marshall county, and a university supported by the State at Morgantown in Monongalia county may be mentioned among the other public institutions of West Virginia. Valueof The assessed valuation of real estate in 1887 amounted to property, 118,753,342, and that of personal property to $48,710,175; that of railroad property in 1880 was $4,497,030, and in 1887 $22,797,984. The State tax is 80 cents on each hundred dollars of valuation.

An amendment to the constitution is now pending, by which it is proposed to prohibit the sale or manufacture of intoxicating liquors. At present the laws of the State—and they have been en- forced with more or less of modification almost since its foundation —involve the high licence system. The granting of the licence is based in all cases on good character, and is subject to the discretion of the county commissioners. Under the operation of these laws, and by virtue of local sentiment in its enforcement, no licence has been granted (and hence in effect the traffic has been prohibited) in as manyas 88 of the 54 counties. The licence is subject to a tax fixed by the State law, and where sales are to be made in incorporated villages it is subject to an additional tax, which is fixed by the authorities of the incorporation.

In 1880 the population of the State was 618,457. That of the principal cities was—Wheeling, 30,787; Parkersburg, 6582 ; Martinsburg, 6335 ; Charleston (the State capital), 4192; Grafton, 3030; and Charlestown, 2016. The coloured population numbered 25,886, the foreign-born population 18,265. The increase in population from 1870 to 1880 was 39°9 per cent. The proportion of native whites was 93 per cent. of the whole number of whites, which is larger than that of any other State in the Union. The popular vote at late elections indicates a population of 800,000, and that of Wheeling, Charleston, and Parkersburg is shown by local investigation to have very largely increased.

Adminis. _ The executive power is vested in a governor elected by the people tration, for a term of four years, and ineligible under the constitution for re-election. There are also an auditor, a treasurer, an attorney- general, a secretary of state and State superintendent of free schools, who with the governor constitute a board of public works,

Educa- tion.

Liquor laws,

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and are likewise elected by the people for terms of four ycars, except the secretary of state and a librarian (who is ex officio adjutant- general), who are appointed by the governor. 'The legislative power is vested in a senate and house of delegates. The senate embraces 26 members, half of whorn are elected every alternate two years, for a term of four years. The house of delegates consists of 66 members, who are elected every two years. The legislature meets biennially, and may be convened in extraordinary session by the goveruor, or by the concurrence of three-fifths of its members. The veto power is vested in the governor, but a majority con- curring in each house of the legislature overrides it. The judiciary consists of a supreme court of appeals, with four judges, who in case of their equal division affirm the judgment of the lower court, and of circuit courts, with one judge each, exercising general original power and

appellate jurisdiction over magistrates or justices of the peace, and of magistrates and justices of the peace, whose Jurisdiction in civil cases is limited to $300, and who exercise criminal jurisdiction in petty offences, and may issue warrants of arrest and make preliminary examination and commit for trial in the circuit court in cases of crime. The fiscal regulations of the counties are confided to a board, consisting of three county commis- sioners. The county organization consists of these commissioners, a sheriff, deputy sheriffs, a circuit court clerk, a county clerk, who is recorder of deeds, wills, &c., board of education, school trustees, overseers of roads, a commissioner of school lands, an overseer of the poor, and a commissioner of accounts. All these except the deputy sheriffs, commissioner of accounts, commissioner of school lands, and overseer of the poor are elected by the people.

History.—The establishment of West Virginia as a State was consummated on 20th June 1863. Its creation and admission were due to conditions which existed prior to the civil war of 1861-65, to popular sentiment which those conditions developed when the war was precipitated, and to the exigencies of the war itself. The Alleghany Mountains had divided the State of Virginia politically and commercially, and in the sentiment relating to her systems of taxation, revenue, and public expenditure into a Virginia and a "Western" Virginia, long before the civil conflict gave perma- nent result and fixed an official definition to the line of demar- cation between them. Even after the war and the formation of the new State the title to two counties, Jefferson and Berkeley, "lying east of the mountains," was the subject of legislation and contention before the courts. They were in 1870 judicially de- clared by the supreme court of the United States to be a part of the State of West Virginia. The western part of Virginia was sparsely peopled, its great forests undeveloped, its vast mineral resources only partially realized, and its slave interests compar- atively small. The eastern section contained the larger population, owned the great bulk of slave property, and exercised controlling power over State affairs. The Alleghanies, dividing the two sec- tions, in the absence of transverse railroad facilities naturally sent the citizens of one side with the flow of their navigable waters to western and southern markets, while those of the other, moved by similar natural causes, turned to the seaboard for their commercial and business

intercourse. The basis of taxation, the basis of re- presentation, and the relation of the, slave interests to these, with the measure and distribution of public funds for works of internal improvement and other questions of local concern, constituted elements of continual controversy, and served to detract largely from the homogeneity of the population. Early in January 1861 the legislature of Virginia, in extra session, passed a bill calling a convention of the people to meet in the following month. At the same election the people were to vote ou the question whether the separation of Virginia from the Union should be determined by the convention or be submitted by the convention to the people for ratification or rejection. The majority at the election in favour of submitting the question of secession to the people was overwhelming, and was construed as indicating the loyal sentiment of the people of north-western Virginia, On the 17th of April, after the bom- bardment of Fort Sumter, the convention passed an ordinance of secession, and on the 24th a schedule submitting it to the people. The ordinance of secession was adopted by the people of Virginia, but the majority against it in the north-western part of the State was very large. A convention of the unionist counties, which met at Wheeling in June, adopted an ordinance for the reorganization of the State government, and in August adopted an ordinance pro- viding for the formation of a new State, to be named " Kanawha," comprising thirty-nine specified counties, and to include other counties also named, provided their vote should indicate such desire. Under this provision a number of counties were afterwards added to the original thirty-nine. At the time of the vote upon the proposition to form a new State war was raging throughout its proposed borders, and many of its counties had been the scene of violence and blooodshed. Many citizens were in the field as soldiers on the respective sides, and this fact, coupled with the general con- ditions, caused a small vote to be polled. Of this comparatively small vote, however, a large majority was for the new State, aud members were elected to a constitutional convention. This conven-

tion met at Wheeling in November, and formed a constitution for the roposed new State, and designated it the State of West Virginia. his constitution was submitted to the people, and adopted by an overwhelming

majority in April 1862, In May the legislature of the "reorganized Government" of Virginia passed a bill to author- ize the formation of the new State out of the territory of the old State of Virginia, as indicated by the recently ratified constitution, and in the same month this Act of the Legislature, accompanied by its memorial and a certified copy of the constitution and _proceed- ings by which it had been adopted, was presented to Congress. The subject led to grave discussion in that body, hut ultimately the proposed constitution was carried, with but one modification affecting the freedom of children of slaves thereafter to be born within the limits of the new State. A new constitution was adopted in 1872. The State of West Virginia being the result of a double revolution—that of the State of Virginia against the Federal Union and that of her north-western counties against the seceding State of Virginia—its people are conservative and strikingly homogeneous. Even in the throes of revolution declaring separation from the mother State provision was made for the assumption of a just share of the old State debt, though its adjustment has never yet been reached. West Virginia has no other debt. Falling naturally, as did most of the border States, immediately after the war, into violent proscriptions of the returning Confederate element, West Virginia was one of the first of the States to modify and repeal these enactments. By the election of 1870 they were abrogated for ever, and since that time the issues and consequences of war have so far disappeared as to leave no perceptible trace behind, (J. E. K.)

WETSTEIN, Jonn Jacos (1693-1754), New Testament critic, was born at Basel, March 5, 1693. His father, John Rudolph Wetstein, was pastor of St Leonard's in that city, and belonged to a learned family with wide ramifications. John Jacob studied the classics, Hebrew, and mathematics under distinguished professors, amongst whom was one of the Buxtorfs. Theology he studied under Samuel Werenfels, an influential anticipator of modern scientific theology and exegesis, While still a student he began to direct his attention to the special pursuit of his life—the text of the Greek New Testa- ment. A relative, John Wetstein, who was the university librarian, gave him permission to examine and collate the principal MSS. of the New Testament in the library, and he copied the various readings which they contained into his copy of Gerard of Maestricht's edition of the Greek text. In 1713 in his public examination he defended a disserta-

tion entitled De Varits Novi T'estamenti Lectionibus, and sought to show that variety of readings did not detract from the authority of Sacred Scripture. Wetstein paid great attention also to Syriac and Talmudic Hebrew. In the spring of 1714 he undertook a learned tour, which led him to Paris and England, the great object of his inquiry everywhere being manuscripts of the New Testament. In Paris he examined the Codex Ephraemi, and on arriving in England in August 1715 the Codex Alevandrinus and the Codex Beze with many others. Early the next year he made the acquaintance of Bentley at Cambridge, who took great interest in his textual inquiries. The great scholar induced him to return to Paris to collate for him more carefully the Codea Ephraemi, Bentley having then in view a critical edition of the New Testament. In July 1717 Wetstein returned to Basel to take the office of a curate at large in his native city, a post which he held for three years, at the expiration of which he exchanged it to become his father's assistant in the parish of St Leonard's, At the same time he pursued his favourite study, and lectured also in the university on New Testament exegesis, It was then that he formed the resolution to prepare a critical edition of the Greek New Testament. He had in the meantime broken with Bentley, whose famous Proposals appeared in 1720. Wetstein was not permitted, however, to pursue his purpose without molestation. The rumour

got abroad that his projected text would take the Socinian | | Gass, Protestantische Dogmattk, vol. iii, ; Bertheau's art. in-Herzog's Real-Ency-

side in the case of such passages as 1 Timothy iii, 16, and in other ways he gave occasion for the suspicion of heresy.

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At length in 1729 the charge of projecting an edition of the Greek Testament savouring of Socinianism was form- ally laid against him. The end of the long and unedifying trial was his dismissal, May 13, 1730, from his office of curate of St Leonard's. He then removed from Basel to Amsterdam, where a relative, John Henry Wetstein, had an important

printing and publishing business, from whose office excellent editions of the classics were issued, and also Gerard of Maestricht's edition of the Greek Testa- ment. Previous to his removal from Basel Wetstein had commenced printing in this office an edition of the Greek Testament, which was suddenly stopped for some unknown reason. At his trial the first sheets of this edition were brought into court against him, though the new readings which had been adopted in his text were simply those which are now universally accepted. As soon as he reached Amsterdam he published anonymously the Pro- legomena, which he had proposed should accompany his Greek Testament, and which was republished by him, with additions, as part of his great work, 1751. The next year (1731) the Remonstrants offered him the chair of philosophy in their college at Amsterdam, vacated by the illness of John Le Clerc, on condition that he should clear himself of the suspicion of heresy. He thereupon returned to Basel, and procured a reversal (March 22, 1732) of the previous decision, and readmission to all his clerical offices, But, on his becoming a candidate for the Hebrew chair at Basel, his orthodox opponents procured his defeat and his retirement to Amsterdam. Here the Remonstrants per- mitted him to hold lectures in their college, which led, however, to renewed opposition on the part of the Calvin- istic party. At length, after much painful contention, he was allowed to instruct the Remonstrant students in philosophy and Hebrew on certain somewhat humiliating conditions. For the rest of his life he continued professor in the Remonstrant college, declining in 1744 the Greek chair at Basel. In 1746 he once more visited England, and collated Syriac MSS. for his great work. At last this appeared in 1751-52, in two folio volumes, under the title Novum Testamentum Grecum Editionis Recepte cum Lectionibus Variantibus Codicum MSS., &e. He did not venture to put new readings in the body of his page, but consigned those of them which he recommended to a place between the text and the full list of various readings. Beneath the latter he gave a commentary, consisting principally of a mass of invaluable illustrations and parallels drawn from classical and rabbinical literature, which has formed a storehouse for all later com- mentators. In his Prolegomena he gave an admirable methodical account of the MSS., the versions, and the readings of the fathers, as well as the troubled story of the difficulties with which he had had to contend

in the pro- secution of the work of his life, He did not long survive the completion of this work. He died at Amsterdam, March 9, 1754.

Wetstein's New Testament has never been republished entire. The London printer Bowyer published, in 1763, a text in which he introduced thie readings recommended by Wetstein; Semler re- published the Prolegomena and appendix,1764; A. Lotze commenced a_new edition of the work, but the Prolegomena only appeared (Rotterdam, 1831), and this "'castigated." It is geuerally allowed that Wetstein rendered invaluable service to textual criticism by his collection of various readings and his methodical account of the MSS. and other sources, and that his work was rendered less valuable through his prejudice against the Latin version and the principle of grouping MSS. in families which had been recommended by Bentley and Bengel.

See Wetstein's account of his labours and trials in his Nov. Test., 1; articles in Igen's Zischr. fiir histor. Theol. by C. R. Hagenbach (1839), by Van Rhyn in 1843, and again by Béttger in 1870; Tregelles, Account of the Printed Text of the New Testament ; Scrivener's Introduction to she Criticism of the New Testament ;

klopddie, 24 ed., 1886,

WETTE, Dr. See Dz Werte.

WEXFORD

WEXFORD, a maritime county of Ireland, in the province of Leinster, is bounded N. by Wicklow, E. and S. by St George's Channel, and W. by Waterford, Kilkenny, and Carlow. Its greatest length from its north-eastern extremity at Kilmichael Point to Hookhead Point at Waterford Harbour is upwards of 60 miles, and its greatest breadth from east to west 34 miles. The area is 576,588 acres, or about 901 square miles,

The coast-line does not present any striking features, and owing to the number of sandbanks navigation is dangerous near the shore. The only inlet of importance on the east coast and the only safe harbour is Wexford Harbour, which owing to a bar is not accessible to large vessels at ebb-

tide. On the south coast are the fishing harbours of Crossfarnogue and Fethard. Several islets adjoin the coast. South from Crossfarnogue Point are the Saltee Islands, and Coningmore and Coningbeg, beyond the latter of which is the Saltee lightship, South-east from Greenore Point is the Tuskar Rock.

The basis of the county is clay-slate, and the surface is chiefly a series of verdant low hills, except towards the northern and western boundaries. The clay-slate for- mation is interrupted by patches of quartz rock near Gorey, one south of Enniscorthy, and another south of Wexford. To the north of Gorey there is a protrusion of greenstone trap. The elevated ridge on the north- western boundary forms the termination of the granitic range in Wicklow, and in Croghan Kinshela, on the borders of Wicklow, rises toa height of 1985 feet. On the western border, a granitic range, situated chiefly in Carlow, extends from the valley of the Slaney at Newton- barry to the confluence of the Barrow with the Nore at New Ross. In the southern district, a hilly region, reach- ing in Forth Mountain a height of 725 feet, forms with Wexford Harbour the northern boundaries of the baronies of Forth and Bargy, a peninsula of flat and fertile land. Carboniferous limestone crops to the surface on the southern shore of Wexford Harbour, and forms also the extremity of Hookhead Point. Marble is quarried on the right bank of the Barrow, and ochres are dug on the coast districts. The river Slaney enters the county at its north-western extremity, and flows south-east to Wexford Harbour. Its chief tributary is the Bann, which flows south-westwards from the borders of Wicklow. The Barrow forms the western boundary of the county from the Blackstairs range of mountains till its confluence with the Suir at Waterford Harbour.

Agricultwre.—The soil for the most part is a cold and stiff clay resting on clay-slate. The interior and western districts have it much inferior to those round the coasts. In the south-eastern peninsula of Forth and Bargy the soil is a rich alluvial mould mixed with coralline sandstone and limestone. The peninsula of Hookhead, owing to the limestone formation, is specially fruitful. In the western districts of the county there are large tracts of turf and peat-moss. In 1876, according to the Return of Owners of Land, Wexford was divided among 1757 proprietors possessing 573,052

acres at an annual value of £374,517, or about 138s. an acre all over. Of these proprietors 581 possessed less than 1 acre. There were about 4500 acres of waste or common land. The following proprietors possessed upwards of 8000 acres:—Lord Carew, 17,831; Lady Adelaide Forbes, 15,216; marquis of Ely, 14,023; Viscount Powerscourt, 11,730; Lord Templemore, 11,327 ; William Orme Foster, 9724; Hon. Mrs Deane Morgan, 9413; Anne Colclough, 9328 ; Sir James Power, 8599; F. A. Leigh, 8281; and representatives of J. H. R. Rowe, 8008. Out of a total area of 575,700 acres in 1886, there were 202,548 acres, or 35-2 per cent., under crops, including mcadow and clover, 303,788 or 52°8 per cent. under grass, 431 acres fallow, 10,588 woods and plantations, 15,090 bog and marsh, 19,082 barren mountain land, and 24,183 water, roads, fences, &c. The total number of holdings in 1886 was 16,074, of which only 16 were above 500 acres in extent, 1045 between 100 and 500 acres, 2429 between 50 and 100, 2703 between 30 and 50, 3019 between 15 and 30, 3081 between 5 and 15, 2161 between 1 and 5, and 1620 not exceeding 1 acre. The decline in the area under crops between 1849 and 1886 has been

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much below the average for Ireland—from 245,514 acres to 202,543. In 1876 the area was 221,018 acres, so that there has been a large decline within the last ten years. In the area under meadow and clover there has been an increase from 39,343 in 1849 to 61,327 in 1876 and 64,064 in 1886, but within the last ten years the arca has been fluctuating. There has been no marked change in the area under green crops, which was 44,735 acres in 1849, 50,498 in 1876, and 45,958 in 1886. The area under corn crops has, however, declined nearly a half, being in 1849 163,321 acres, in 1876 109,193 acres, and in 1886 only 92,512 acres. Of green crops there has been since 1849 a great increase in the area under turnips, and a corresponding decrease in the area under potatoes : in 1849 they were respectively 9763 and 32,017 acres, and by 1876 they had changed to 19,704 and 23,974 acres, and by 1886 to 21,857 and 18,888 acres. There were also in 1886 2848 acres under mangel-wurzel and beetroot, and 3365 under other green crops. Of the corn crops the arca under wheat has declined from 44,592 acres in 1849 to 6948 in 1876 and

4541 in 1886, the area under oats from 80,166 acres to 47,065 in 1876 and 50,381 in 1886, while that under barley and bere increased from 36,563 acres in 1849 to 51,321 acres in 1876, but since then has declined to 35,036 acres. The number of horses in 1886 was 27,878, of which 942 were used for recreation. Mules numbered 1767, and asses 8031. Cattle numbered 126,410, of which 37,936 were milch cows. The number of sheep was 122,373, of which 48,243 were one year old and upwards. Pigs numbered 67,478, goats 6369, and poultry 571,107, of which 34,293 were turkeys and 60,414 geese.

Communications.—The Dublin, Wicklow, and Wexford Railway intersects the county ; and from Wexford a branch of the Great Southern and Western passes north-westwards joining the lines to Kilkenny and Kildare. The river Slaney is navigable for barges to Enniscorthy, and the Barrow for large vessels to New Ross.

Manufactures. —-Except in the town of Wexford the manufactures and trade are of smallimportance. Therc are important fisheries at Wexford, and one or two fishing villages along the south coast. The fishing grounds are good.

Administration and Population.—According to the calculation of De Burgo the population in 1760 was 66,804 ; the parliamentary census of 1812 places it at 112,000 ; in 1821 it amounted to 170,806, in 1841 to 202,033, in 1861 to 143,954, in 1871 to 182,666, and in 1881 to 123,854 (60,928 males and 62,926 females), Roman Catholics in 1881 formed 91°1 per cent. of the population, and Pro- testant Episcopalians 8°2 per cent. In 1881 the number of persons who could read and write amounted to 51°5 per cent. of the popu- lation, 15°3 per cent. could read but not write, and 33°2 per cent. could neither read nor write,—14°7 per cent. being under seven years of age. All could speak English, and 512 could speak English and Irish. By the Act of 1885 Wexford, which formerly returned two members to parliament, was divided into two parlia- mentary divisions, North and South, each returning one member, the borough of Wexford, which formerly returned one member, and the portion of the borough of New Ross within the county, being merged in the South Division. The principal towns are Wexford (12,163), New Ross (of which

a portion containing 6375 is in this county, the other portion containing 295 inhabitants being in Kilkenny), Enniscorthy (5666), and Gorey (2450). The county is divided into ten baronies, and contains 144 parishes and 1600 town-lands. Episcopally it is in Ferns diocese, except a small portion, whichis in Dublin. Judicially it is in the Leinster circuit, and assizes are held at Wexford, and quarter sessions at Enniscorthy, Gorey, New Ross, and Wexford. There are eleven petty sessions districts, and parts of two others. Wexford includes the poor law unions of Gorey and Wexford, and parts of Enniscorthy, New Ross, and Shillelagh. It is within the Cork military district, and along with Kilkenny, Tipperary, and Waterford forms No. 69 sub- district, the brigade depét of which is at Clonmcl. There are barrack stations at Wexford, Duncannon Fort, and New Ross.

History and Antiquities.—The peninsula of Hookhead is the ancient Sacrum Promontorium. The northern portion of Wexford was included in Hy Kinselagh, the peculiar territory of the Mac- morroughs, overlords of Leinster, who had their chief residence at Ferns. Dermod Macmorrough, having been deposed from the kingdom of Leinster, asked help of Henry II., king of England, who authorized him to raise forces in England for the assertion of his claim, He secured the aid of Strongbow by promising him the hand of Eva, and in addition obtained assistance from Robert Fitzstephen and Maurice Fitzgerald of Wales. On the Ist May 1169 Fitzstephen landed at Bagenbon on the south side of Fethard, and after four days' siege captured the town of Wexford from its Danish inhabitants. After this Dermod granted the territory of Wexford to Fitzstephen and Fitzgerald and their heirs for ever. Macmorrough having died in 1172, Strongbow became lord of Leinster. At first Henry II. retained Wexford in his own pos- session, but in 1174 he committed it to Strongbow. The barony of Forth is almost entirely peopled by the descendants of those who accompanied these English expeditions. Wexford was one of the twelve counties into which the conquered territory in Ireland

was divided by King John in 1210, and formed part of the pos- sessions of William Mareschal, earl of Pembroke, who had married Strongbow's daughter. Through the female line it ultimately passed to John Talbot, earl of Shrewsbury, who in 1446 was made earl of Waterford and baron of Dungarvan. In 1474 George Talbot was seneschal of the liberty of Wexford. The district was actively concerned in the rebellion of 1641; and during the Cromwellian campaign the town of Wexford was on 9th October 1649 carried by storm, and a week later the garrison at New Ross surrendered,—a "seasonable mercy," according to Cromwell, as giving him an 'opportunity towards Munster." Wexford was the chief seat of the rebellion of 1798, the leaders there being the priests. Evidences of the Danish occupation are seen in the numerous raths, especially at Dunbrody, Enniscorthy, and New Ross. Among the monastic ruins special mention may be made of Dunbrody abbey, of great extent, founded in 1182 for Cistercian monks by Henry de Montmorency, marshal of Henry II.; Tintern abbey, founded in 1200 by William Mareschal, earl of Pembroke, and peopled by monks from Tintern abbey in Mon- mouthshire; the abbey of St Sepulchre, Wexford, founded shortly after the invasion by the Roches, lords of Fermoy; Ferns abbey, founded by Dermod Macmorrough; and the abbey of New Ross, founded by St Alban in the 6th century. There are a consider- able number of old castles, including Ferns, dismantled by the Parlia- mentary forces under Sir Charles Coote in 1641, and occupying the site of the old palace of the Macmorroughs; the massive pile of Enniscorthy, founded by Raymond le Gros; Carrick Castle, near Wexford, the first built by the English ; and the fort of Duncannon, which has been garrisoned since the time of the Spanish Armada, and caused some trouble to Cromwell when in Wexford.

WEXFORD, a seaport, market-town, and municipal borough, and the chief town of the above county, is finely situated on the south side of the Slaney, where it discharges into Wexford Harbour, on the Dublin, Wicklow, and Wex- ford Railway and a branch line of the Great Southern and Western, 82 miles south of Dublin and 15 south-east of Enniscorthy. Wexford Harbour, formed by the estuary of the Slaney, is about 3 miles from north to south and about 4 from east to west, and has an area of about 1300 acres. A fine bridge of wood and iron 1500 feet in length crosses a narrow part of the estuary. The harbour affords splendid

accommodation for shipping, but its advantages have been in great part lost by a bar at its mouth pre- venting the entrance of vessels drawing more than 12 feet. The construction of a pier at Rosslare connected with Wexford by a railway has, however, proved of great benefit. The town consists of the quay, about 1000 feet in length, with two narrow streets running parallel with it, and other smaller ones branching off at intervals. Some remains of the old walls and flanking towers still exist. The Protestant Episcopal church, near the ruins of the ancient abbey of St Sepulchre, is said to occupy the spot where the treaty was signed between the Irish and their English invaders in 1169. The principal modern buildings are the town-hall, the theatre, the court-house, the barracks, occupying the site of the ancient castle, St Peter's College for the education of Catholic clergy, the county infirmary, the union workhouse, and a number of convents. 'The port has communication by steamer with Liverpool and Bristol. In 1886 the number of vessels that entered the port was 847 of 85,004 tons, the number that cleared 836 of 84,065 tons. The principal exports are agricultural produce, live stock, and whisky. Ship- building is carried on, and also tanning, malting, brewing iron-founding, distilling, and the manufacture of artificial manure, flour, agricultural implements, and rope and twine. The population of the town in 1871 was 12.077 and in 1881 it was 12,163. a:

Wexford was one of the earliest colonies of been taken by Fitzstephen. It was the second town that Cromwell besieged in 1649. It was garrisoned for William III. in 1690, In 1798 it was made the headquarters of the rebels, who, however surrendered it on the 2lst June. In 1318 the town received a charter from Aldomar de Valence, which was extended by Henry IV. in 1411, and confirmed by Elizabeth in 1558. By James I.

it was in 1608 made a free borough corporate, by the title of "the town and free borough corporate of Wexford." It returned two

the English, having

members to parliament from 1374 till the Union, when they were reduced to one. In 1885 it was included in the South Division

of the county.

WEYMOUTH anv MEtcomsBe Rzcis, a seaport, water- ing-place, market-town, and municipal borough of Dorset, England, is situated at the mouth of the small river Wey, on Weymouth Bay, opposite the Isle of Portland, and on the London and South-Western Railway and a branch of the Great Western, 74 miles south of Dorchester, 274 west-south-west of Poole Junction, and 1454 from London. It is formed of Weymouth, a fishing town and seaport on the south-west of the Wey, and Melcombe Regis on the north-east of the river, the two towns being connected by a bridge reconstructed in 188]. An esplanade about a mile in length fronts the sea. To the south of the esplanade is a pier of stone on wooden piles 1050 feet in length, erected in 1859 at a cost of £12,000. Theharbour lies between the pier on the north and the spur of land called the Nothe on the south, and is protected by a con- crete wall extending 500 feet northward from the Nothe. The principal buildings are the old town-hall, the market-house, the guild-hall, the masonic hall, the royal Dorset yacht clubhouse, the theatre, the Royal Victoria Jubilee Hall, the Weymouth and Dorset eye infirmary, the Wey- mouth royal hospital and dispensary, the Weymouth sana- torium for women and children, and the infantry barracks. Opposite the Royal Terrace is an equestrian statue of George III., erected in 1809 in commemoration of his jubilee. A marble statue was also erected to Sir H. Edwards in 1885. A mile south-west of Weymouth is Sandsfoot Castle, a fort erected by Henry VIII. for the protection of the shipping. 'There are a number of alms- houses and other charities. Weymouth has steam con- nexion with the Channel Islands, France, and various ports on the English coast. In 1886 903 vessels of 105,824 tons entered the port, and 905 of 98,964 tons cleared. The principal exports are Portland stone, bricks and tiles, and provisions, and the imports are coal, timber, garden and dairy produce, and wine. Ship and boat building, rope and sail making, and brewing are carried on. The population of the municipal borough of Weymouth and Melcombe Regis (area 763 acres) in 1871 was 13,259, and in 188] it was 13,715.

Both Weymouth and Melcombe Regis are very ancient. The port is supposed to have traded with Tyrian merchants before the arrival of the Romans. Various Roman remains, including pave- ments and coins, have

been found. Weymouth was the scene of Athelstan's vengeance on his half-brother Prince Edwin. It received a charter from Ethelred, which is preserved in Winchester cathedral. In the time of Edward the Confessor Weymouth and Melcombe were the property of the abbey of Cerne. In 1280 they formed a royal demesne and part of the dowry of Eleanor of Castile. Both Weymouth and Melcombe first returned members to parliament in the reign of Edward II. In 1347 they sent 20 ships and 264 men for the siege of Calais. Queen Margaret of Anjou landed at Weymouth 17th April 1471, and in 1506 Philip of Castile and his qucen were driven into the port by stress of weather. In 1571 Weymouth and Melcombe Regis were united in one borough, under the title of " mayor, aldermen, bailiffs, burgesses, and commonalty of the borough and town of Weymouth and Mel- combe Regis." The town was the scene of repeated conflicts during the Civil War, having been taken by the Royalists 9th August 1641, and retaken in 1644 by the Parliamentary forces, who stoutly defended it against an attack of nine days' duration in February of the following year. Originally the united borough sent fonr mem- bers to parliament (the only other place returning the same number being the city of London), but in 1832 these were reduced to two, and in 1885 it ceased to be separately representcd. Its importance as a watering-place dates from the time that George III. selected it as his favourite resort in the summer season. On 6th December 1881 Weymouth was constituted a port, the limits to commence at St Alban's Head, the limit of the port of Poole, and to extend ina western direction along the coast to the western bank of the river Char, being the eastern limit of the port of Exeter, and to include the island of Portland. Among the representatives of the boroughs in parliament are Sir William Penn, father of the founder of Pennsylvania, and Sir Christopher Wren.

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WHALE,! a name applied rather loosely to various | external covering all the bones, joints, and even most of animals of the order Cetacea, the general characters and | the muscles, nerves, and arteries, of the human arm and classification of which have been described in the article | hand; and rudiments even of hind legs are found buried MamMaLia (vol. xv. p. 391). All the members of the | deep in the interior of the animal,

apparently subserving sub-order Mystacoceti, or Cetacea with whalebone, are | no useful purpose, but pointing an instructive lesson to called "‘ whales." But of the Odontoceti, or Cetacea with | those who are able to read it. teeth, only certain of the larger ones are so termed, the In what follows a more detailed account is given of the smaller species being popularly spoken of as " bottlenoses," | best known of those species of Cetacea to which the name "dolphins," and "porpoises"; yet so indefinitely has the | "whale" is popularly applied, especially those frequenting word been applied that a true dolphin (Delphinus tursio), | British waters, than could be given under MAMMALIA. not exceeding 8 feet in length, is described in some works | 1 gyp order MYSTACOCETI or Whalebone Whales. as the "smaller bottlenosed whale." Genus Balena.—The Greenland, or more properly Arctic, right Green-

Although by their mode of life so far removed from | whale (Balena mysticetus) attains, when full-grown, a length of land

close observation that it is impossible to become as fami- | from 45 to 50 feet. Its external form is shown in fig. 1, from a right ce with them in ther weird condition az Sih & any careful drawing by Mr Robert Gray. In this species all the peculi- whale.

other animals, whales are in many respects the most

arities which distinguish the head and mouth of the whales from those of other mammals have attained their greatest development.

interesting and wonderful of all creatures; and there is | The head is of enormous size, exceeding one-third of the whole

much in their structure and habits which is well worthy of study, much that is difficult to understand, and much that leads to great generalizations and throws light upon far-reaching philosophical speculations.

length of the creature. The cavity of the mouth is actually larger than that of the body, thorax, and abdomen together. The upper jaw is very narrow,

but greatly arched from before backwards, to increase the height of the cavity and allow for the great length of

One of the first | the baleen or “whalebone” blades; the enormous rami of the

lessons which a study of these animals affords is that, in mandible are widely separated posteriorly, and have a still further

the endeavour to discover what a creature really is, from what others it is descended, and to what it is related, the general outward appearance affords little clue, and we must go deep below.the surface to find out the es- sential characteristics of its nature. There was once, and may be still in many places, a common idea that a whale is a fish, To 4 realize the fallacy of this notion we have only @ to consider what a fish really is, what under “ all the diversities of form, size, and colour known among fishes there is common to them all, and we see that in everything which characterizes a true fish and separates it from other classes, as reptiles, birds, and mammals, the whale resembles the last-named and differs from the fish. It is as essentially a mammal as a cow or a horse, and simply resembles a fish externally because it is adapted to inhabit the same element; but it is no more on that account a fish than is a bat, because adapted to pass a great part of its existence on the wing in the air, nearly related to a bird. The whole structure of a whale is a most instructive in- stance of a type of organization which is common to and characteristic of the class Mammalia, only specially modi- fied or adapted to a peculiar mode of life. We see in every part the result of two great principles acting and re- acting upon each other,—on the one hand, adherence to type, or rather to fundamental inherited structural condi- tions, and, on the other, adaptation to the peculiar circum- stances under which it lives, and to which in all probability it has become gradually more and more fitted. The external fish-like form is perfectly suited for swimming through the water; the tail, however, is not placed vertically as in fishes, but horizontally, a position which accords better with the constant necessity for rising to the surface for the pur- pose of breathing. The hairy covering characteristic of all mammals, which if present might interfere with rapidity of movement through the water, is reduced to the merest

rudiments,—a few short bristles about the chin or upper lip,—which are often only present in very young animals. The function of keeping the body warm is supplied by a thick layer of non-conducting material, the ‘“‘ blubber,” a peculiarly dense kind of fat placed immediately beneath the skin. The fore-limbs, though functionally reduced to mere paddles, with no power of motion except at the shoulder-joint, have beneath their smooth and continuous

pa Icel., hvalr ; Dan. and Swed., Aval ; Anglo-Saxon, hwel ; Germ., wal, walfisch. The meaning apparently is “ roller,” the word being closely allied to “ wheel” (Skeat).

outward sweep before they meet at the symphysis in front, giving the floor of the mouth the shape of an immense spoon. The baleen blades attain the number of 380 or more on each side, and those in the middle of the series have a length of 10 or sometimes 12

Fic. 1.—Greenland or Arctic right whale (Balena mysticetus),

feet. and fray out at the inner edge and ends into long, delicate, soft,

They are black in colour, fine and highly elastic in texture,

almost silky, but very tough, hairs. The remarkable development of the mouth and of the structures in connexion with it, which dis- tinguishes the right whale among all its allies, is entirely in relation to the nature of its food. It is by this apparatus that it is enabled to avail itself of the minute but highly nutritious crustaceans and pteropods which swarm in immense shoals in the seas it frequents. The large mouth enables it to take in at one time a sufficient quantity of water filled with these small organisms, and the length and delicate structure of the baleen provide an efficient strainer or hair-sieve by which the water can be drained off. If the baleen were rigid, and only as long as is the aperture between the upper and lower jaws when the mouth is shut, a space would be left beneath it when the jaws were separated, through which the water and the minute particles of food would escape together. But instead of this the long, slender, brush-like, elastic ends of the whalebone blades fold back when the mouth is closed, the front ones passing below the hinder ones in

a channel lying between the tongue and the lower jaw. When the mouth is opened, their elasticity causes them to straighten out like a bow unbent, so that at whatever distance the jaws are separated the strainer remains in perfect action, filling the whole of the interval. The mechanical perfection of the arrangement is completed by the great develop- ment of the lower lip, which rises stiffly above the jaw-bone and prevents the long, slender, flexible ends of the baleen from being carried outwards by the rush of water from the mouth, when its cavity is being diminished by the closure of the jaws and raising of the tongue.

If, as appears highly probable, the "bowhead" of the Okhotsk Sea and Behring Strait belongs to this species, its range is circum- polar. Though found in the seas on both sides of Greenland, and passing freely from one to the other, it is never seen so far south as Cape Farewell ; but on the Labrador coast, where a cold stream sets down from the north, its range is somewhat farther. In the Behring Sea, according to Scammon, "it is seldom seen south of the fifty-fifth parallel, which is about the farthest southern extent of the winter ice, while in the Sea of Okhotsk its southern limit is about the latitude of 54°." As has been abundantly shown by Eschricht and Reinhardt in the case of the Greenland seas, "'every- thing tends to prove," Scammon says, "that the Balena mysticetus

is truly an 'ice whale,' for among the scattered floes, or about the

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borders of the ice-fields or barriers, is its home and feeding-ground. © It is true that these animals are pursued in the open water during the sammer months, but in no instance have we learned of their being captured south of where winter ice-fields are occasionally met with." The occurrence of this species, therefore, on the British or any European coast is exceedingly unlikely, as when alive and in health the southern limit of its range in the North Sea has been ascertained to be from the east coast of Greenland at 64° N. lat. along the north of Iceland towards Spitzbergen, and a glance at a physical chart will show that there are no currents setting south- wards which could bear a disabled animal or a floating carcase to British shores. To this @ priort improbability may be

added the fact that no authentic instance has been recorded of the capture or stranding of this specics upon any European coast, for the cases

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of these whales have been taken within the last few years, In the North Pacific a very similar if not identical species is regularly hunted by the Japanese, who tow the carcases ashore for the pur- poses of flensing and extracting the whalebone. In the tropical seas, however, according to Captain Maury's whale charts, right whales are never or rarely seen; but the southern temperate ocean, especially the neighbourhood of the Cape of Good Hope, Kergue- len's Island, Australia, and New Zealand, is inhabited by "black whales," once abundant, but now nearly exterminated through the wanton destruction of the females as they visit the bays and inlets round the coast, their constant habit in the breeding time. The range of these whales southward has not been accurately determined ; but no species corresponding with the Arctic right whale has as yet been met with in the Antarctic icy seas.

of its having been reported as seen in British waters may be ex- Genus Megaptera.—The whale commonly called "humpback " Hump-

plained by the supposition of one of the other species of the genus at whale.

Southern right whale.

being mistaken for it. Still, as two other Arctic cetaceans, the narwhal and the beluga, have in a few undoubted instances found their way to British shores, it would be rash absolutely to deny the possi- – bility of the Greenland right whale doing the same. Further details of the migrations and habits of this species are given under "' Whale Fisheries" (see p. 526 below).

The southern right whale (B. australis) resembles the last in the absence of dorsal fin and of longi- tudinal furrows in the skin of the throat and chest, but differs in that it possesses a smaller head in proportion to its

body, shorter baleen, a different-shaped contour of the upper margin of the lower lip, and a greater number of vertebre. The

Fia. 2.—Southern right whale (B. australis).

genus inhabits the temperate seas of both northern and southern hemispheres and is divided into several species according to their geographical distribution :—B. biseayensis of the North Atlantic, B. japoniea of the North Pacific, B. australis of the South Atlantic, and B. antipodarum and B. nove-zelandia of the South Pacific. But the differential characters by which they have been separated, external as well as anatomical, are slight and subject to individual variation ; and the number of specimens available for comparison in museums is not yet sufficient to afford the neces- sary data to determine whether these characters can be regarded as specific or not. The most interesting of these is the right whale, which was formerly abundant in the North Atlantic, but is now so scarce as to appear verging on extinction. This was the whale the pursuit of which gave occupation to a numerous population on the shores of the Basque provinces of France and Spain in the Middle Ages. From the 10th to the 16th centuries Bayonne, Biarritz, St Jean de Luz, and San Sebastian, as well as numerous other towns on the north coast of Spain, were the centres of an active whale "fishery," which supplied Europe with oil and whalebone. In later times the whales were pursued as far as the coast of New- foundland. They were, however, already getting scarce when the voyages undertaken towards the close of the 16th century for the discovery of the north-eastern route to China and the East Indies opened out the seas around Spitzbergen; then for the first time the existence of the Greenland whale became known, and henceforth the energies of the European whale-fishers became concentrated npon that animal. It isa singular fact that the existence of the Atlantic right whale was quite overlooked by naturalists till lately, all accounts referring to it being attributed to the Greenland whale, supposed once to have had a wider distribution than now, and to have been driven by the persecution of man to its present circum- polar haunts. To the two Danish cetologists Eschricht and Rein- hardt is due the credit of having proved its existence as a distinct species, from a careful collation of numerous historical notices of its structure, distribution, and habits ; and their restoration of

the animal, founded upon these documents, has been abundantly con- firmed by the capture of various specimens in recent times, showing that it still lingers in some of the localities where it formerly was so abundant. The only known instances of its occurrence on the coasts of Europe in modern times are in the harbour of San Sebas- tian in January 1854, in the Gulf of Taranto, in the Mediterranean

in February 1877, and on the Spanish coast between Guetaria and Zarauz (Guipnzcoa) in February 1878. The skeletons of these three whales are preserved in the museums of Copenhagen, Naples, and San Sebastian respectively. On the coast of the United States several

(Megaptera boops) by whalers, perhaps on account of the low back

Fia. 8.—Humpbacked whale (Megaptera boops).

hump-like form of the dorsal fin, is very distinctly characterized from all others of the group, especially by the immense length of the pectoral fins or flippers, which are indented or scalloped along their margins, and are, except at their base, of a white colour, nearly all the rest of the body being black. It differs from the right whale and resembles the rorqual in having the skin of the throat and chest marked with deep longitudinal furrows. The | baleen plates are short and broad and of a deep black colour. Though common in the North Atlantic between Nor- way and Greenland, this whale does not frequently appear on the coasts of the British Isles. One came ashore at Newcastle in 1839; another, a young one, was taken in the estuary of the Dee in 1863 and its skeleton is preserved in the Liverpool museum ; and ~ a nearly full-grown animal was captured in the mouth of the Tay in the winter of 1883-84. The usual length of the adult ranges from 45 to 50 feet. Whales of the genus Megaptera are found in the South Atlantic and in both the North and the South Pacific. They resemble those of British seas so closely that it is doubtful whether the differences which have been observed, and upon which several species have been founded, may not have been individual peculiarities ; but zoologists have not yet had the op- portunity of examining and comparing such a series of specimens of different ages and sexes from different localities as would be necessary to determine these points satisfactorily.

Genus Balenoptera.—The rorqnals or fin whales have the Rorqual plicated skin of the throat like that of Megaptera, the furrows or fin being more numerous and close-set ; but the pectoral fin is com- whale,

paratively small and the dorsal fin distinct and faleate. The head is comparatively small and flat, and pointed in front, the baleen short and coarse, the body long and slender, and the tail very much compressed before it expands into the " flukes." The rorquals are perhaps the most abundant and widely distributed of all the whales, being found in some of their modifications in all seas, except the extreme Arctic, and probably Antarctic, regions. Owing to the small quantity and inferior quality of their whalebone, the com- paratively limited amount of blubber or subcutaneous fat, and their great activity and the difficulty of capturing them by the old methods, these whales were not until recently an object of pursuit by whale-fishers ; but, since the introduction of steam-vessels, and especially of explosive harpoons fired from guns, in the place of those hurled by the human hand, a regular fishery has been established on the coast of Finmark (see p. 528 below). There are four distinct species of this genus in British seas. (1) Balenoptera sibbaldii, the "blue whale," the largest of all known animals, attains a length of 80 or even sometimes 85 feet. Its colour is dark bluish grey, with small whitish spots on the breast; the baleen is black ; the flippers are larger proportionally than in other rorquals, measuring one-seventh of the total length of the body ; and the dorsal fin is small and placed very far back. This whale has usually 64 vertebre, of which 16 bear ribs. Like the others of the genus, this species seems to pass the winter in the open seas, and approaches the coast of Norway at the end of April or beginning of May. At this time its sole food is a small crustacean (Euphausia inermis), which swarms in the fjords. Several speci- mens have been taken on the British coasts, two fine skeletons from the Firth of Forth being preserved in the Edinburgh museums. (2) Balenoptera museulus, the common rorqual, has a length of 65 to 70 feet, is of a greyish slate colour above and white underneath, and the baleen is slate colour, variegated with yellow or brown.

Sperm whale.

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This is the .

It has usually 62 vertebre, of which 15 bear ribs. commonest of all the large whales on the British coasts ; scarcely a winter passes without the body of one being somewhere washed

ashore, usually after stormy weather, and more frequently on the south coast, as this species has a more southern range than the last, and frequently enters the Mediterranean. It feeds largely on fish, and is frequently seen feasting among shoals of herrings. (3) Balzxnoptera borealis, often called Rudolphi's whale from its first describer, is a smaller species, scarcely attaining a length of 50 feet. It is bluish black above, with oblong light-coloured spots, whilst the under parts are more or less white ; the whole of the tail and both sides of the flippers are black; the baleen is black, and the bristly ends fine, curling, and white ; the flippers are very small, measuring one-eleventh of the total length of the body. There are 56 vertebre, with 14 pairs of ribs. This species, according to Collett, feeds chiefly on minute crustaceans, mainly Calanus finmar- chicus and Euphausia inermis, and not on fish. Until lately it was considered the rarest of the whales of European seas, and was only known to science from a few individuals stranded on the coasts of northern Europe at long intervals, the skeletons of which have been preserved in museums. The most southern point at which it has been met with hitherto is Biarritz in France. Since the establishment of the whaling station near the North Cape it has been shown to be a regular summer visitor, and in 1885 771 individuals were captured on the coast of Finmark. (4) Balznoptera rostrata, the lesser fin whale or rorqual, is the smallest species found in the northern seas, rarely exceeding 30 feet in length. Its colour is greyish black above, whilst the under side is white, including the whole of the lower side of the tail ; the inner side of the flippers is white; and there is a broad white band across the outer side, which is a very characteristic mark of the species ; the baleen is yellowish white. The dorsal fin in this and the last species is comparatively high, and placed far forwards on the body. This whale has usually 48 vertebra, of which 11 bear ribs. It is common in summer in the fjords of Norway, and is often seen around the British Isles. It has been taken, though rarely, in the Mediterranean, and it ranges as far north as Davis Strait.

Rorquals are met with in almost all seas throughout the world, but further and more accurate observations are required before their specific characters and geographical distribution can be made

out. Nearly all the individuals hitherto examined with any care,.

whether from the North Pacific, the Australian seas, or the Indian Ocean, come very near in structure to one or the other of the Atlantic forms described above, so much so that some zoologists have been induced to believe that there are but four species, each of which has a wide, almost cosmopolitan range, while others have described and named almost every individual specimen captured as belonging to a different species.

Two totally distinct forms of whalebone whales, Rachianectes glaucus, the grey whale of the North Pacific (California and J apan), and Neobalena maryinata of New Zealand, have never been found in the British seas (see vol. xv. p. 395).

II. ODONTOCETI or Toothed Whales,

Only one member of this group, the sperm whale or cachalot (Physeter macrocephalus), rivals the large whalebone whales in size, its length and bulk being about equal to, or somewhat exceeding,

Fic. 4.—Common rorqual (Balenoptera musculus).

siderably behind the end of the snout. The lower jaw is extremely narrow, and has on each side from twenty to twenty-five stout conical teeth, which furnish ivory of good quality, though not in sufficient bulk for most of the purposes for which that article is required, The upper teeth are quite rudimentary and buried in the gum. The pectoral fin or 'flipper is short, broad, and trun- cated, and the dorsal fin a mere low protuberance. The general colour of the surface is black above and grey below, the colours gradually shading into each other. The only known species of sperm whale is one of the most widely distributed of animals, being met with, usually in herds or "schools," in almost all tropical and subtropical seas,

but not oc- curring, except accidentally, in the Polar regions. Not unfre- quently specimens appear on the coasts of Great Britain, but only as solitary stragglers, or as dead carcases, floated northwards by the Gulf Stream. It-is remarkable that every case of which we have an accurate record has been an old male. The food of the sperm whale consists mainly of various species of cephalopods (squid and cuttlefish), but they also eat fish of considerable size. The substance called "ambergris," formerly used in medicine and now in perfumery, is a concretion formed in the intestine of this whale, and is found floating on the surface of the seas it inhabits. Its genuineness is proved by the presence of the horny beaks of the cephalopods on which the whale feeds.

The remaining Odontoceti are all animals of much smaller size Bottle- than the sperm whale, but to several of them the name of nose The hyperoodon, sometimes whale.

"whale" is commonly applied. called "bottlenose," a name also vaguely given to several species of dolphin, is a regular inhabitant of the North Atlantic, passing the summer in the Spitzbergen seas and going farther south in winter. It is allied to the sperm whale, and resembles it in possessing a large store of oil in the upper part of the head, which yields spermaceti when refined ; on this account, and also for the sake of the blubber, which supplies an oil almost indistinguishable from sperm oil, this whale has been the object of a regular chase in recent years, It is stated in the article MAMMALIA (vol. xv. p: 396) that there are two species of this genus, Hyperoodon rostratus, the common hyperoodon, and H. latifrons, attaining when adult, respectively, the length of 24 and 80 feet; bnt recent investiga- tions have shown that the latter is the male and the former the female of the same species. They feed exclusively on cephalopods, and are practically toothless; the only teeth which exist in the adult,—namely, a small pair at the front of the lower jaw,—are concealed beneath the gum during life. Smaller allied species, be- longing to the genera Ziphius and Mesoplodon, occasionally find their way into British seas, but their proper habitat appcars to be the South Seas.

It frequently happens that large herds or "schools" of whales Ca'ing or are captured in bays or inlets on the rocky coasts of Scotland, pilot These

are the so-called ca'ing whale.

or the Orkney or Shetland Islands. or pilot whale (Globicephalus melas), the grindhval of the Faroe Islanders and Norwegians. They attain the length of 20 feet, and are of a nearly uniform black colour, except a line down the middle of the under surface, which is grey. They are characterized by the round or globose form of the fore-part of the head, occa- sioned by the great development of a cushion of fat placed over the rostrum of the skull in front of the blowhole, and by the great length and narrowness of the pectoral fin. Their destruction in large numbers, amounting sometimes to hundreds at a time, arises from their eminently sociable character and their habit, when attacked, of rushing together and blindly following the leaders of the herd. When they are seen in the neighbourhood of land, the fishermen endeavour to get to seaward of them in their boats, and with shouting and firing of guns to drive them into a bay or fjord, pursuing them until they run themselves on shore in their alarm.

= The beluga (Delphinapterus leucas) is often called the Beluga be = " white whale," though scarcely exceeding the length of or white = = 12 feet. Its colour is almost pure white, and it has no whale.

Fie. 5.—Sperm whale (Physeter macrocephalus).

the Arctic right whale, from which, however, it is very different in outward appearance and in structure. The head is about one-third of the length of the body, very massive, high and truncated in front, owing its huge size and remarkable form mainly to the great accumulation of a peculiarly modified form of fatty tissue, filling the large hollow on the upper surface of the skull. The oil con- tained in cells in this great cavity, when refined, yields sper- maceti, and the thick covering of blubber, which everywhere envelopes the body, produces the valuable sperm-oil of commerce. The single blowhole is a longitudinal slit, placed at the upper and anterior extremity of the head to the left side of the middle line. The opening of the mouth is on the under side of the head, con-

dorsal fin, but a low ridge in its place. It is an in- © habitant of the Arctic seas, extending on the American coast as far south as the river St

Lawrence, which it ascends for a considerable distance. Several instances of its occurrence on the coast of Scotland are recorded, and it has been kept for some time in captivity in America, and even in London. Its external char- acters are represented in vol. xv. p. 399, fig. 50. ech The other cetaceans of this group are generally distinguished as narwhals, grampuses, killers, bottlenoses, dolphins, and porpoiscs, and are not usually called whales.

We have no certain knowledge of the existence of whalebone Fossil whales before the latter part of the Eocene period. The earliest species.

known forms were allied to the existing Balwnoptere. Right whales (Balzna), as might be expected in the case of such a highly

Whaler.

Whale- boat.

Harpoon gun,

Har- poons.

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specialized form, have not been found older than the Pliocene; and |

it is intercsting to note that, instead of the individuals diminish- ing in bulk as we approach the times we live in, as with many other groups of animals, the contrary has been the case, no known extinct species of whale equalling in size those that are now to be met with in the ocean. 'he size of whales, as of all other things whose most striking attribute is magnitude, has been greatly ex- aggerated ; but, when reduced to the limits of sober fact, the Green- land right whale of 50 feet long, the sperm whale of 60, and the great northern rorqual (Balenoptera sibbaldii) of 80 exceed all other organic structures known, past or present. Instead of living in an age of degeneracy of physical growth, we are in an age of giants, but, it may be, at the end of that age. Through countless ages of time whales have been gradually shaped into their present wonderful

form and gigantic size; but the very perfection of their structure and their magnitude combined, the rich supply of oil protecting their internal parts from cold, the beautiful apparatus of whalebone by which their nutrition is provided for, have been fatal gifts, which, under the sudden revolution produced on the surface of the globe by the development of the wants and arts of civilized man, cannot but lead to their extinction in the not far future. (Ais 1eig5))

WHALE FISHERIES.

Commercially these may be conveniently classified under three heads,— the British, the American, and the Norwegian. The im- plements used, and the mode of capture of the different kinds of whales, being for the most part the same in all cases, the detailed account given below may be held to be of general application, unless the contrary is expressly stated.

The whaler is a vessel of from 400 to 500 tons gross register, rigged either as a ship or a barque, and provided with auxiliary engines of some 75 horse-power. Built after the strongest fashion, she is protected along the water-line by an additional planking of iron bark, an Australian wood of great hardness; the bows are strengthened inside by beams and knees and outside by plates of jron. Underneath the hold-beams about 50 iron tanks are fitted, each capable of containing 200 to 250 tons of oil; above the hold- beams a deck is laid, engine and boiler space being reserved in the stern.

WHALE

which was introduced by the Americans, by whom it is known as a "toggle iron." It consists of a head and shank of iron, and is mouuted on a wooden stock, by which it is darted. The head, a flattened piece of steel, somewhat triangular in form, is connected with the extremity of the shank by a stecl pin, on which it pivots and moves freely. Previous to use the head folds back along the shank, in which position it is retained by a wooden pin. After the weapon has been darted into a whale, the strain on the line breaks the wooden pin, and the head assumes a position at right angles to the shank, somewhat in the form of the letter T, and becomes transfixed in the fibrous tissue under the blubber. The shank isa rod of 4-

inch iron, 2 feet 6 inches long, expanding at its upper extremity to form a socket to receive the wooden stock. The hand harpoon measures 8 feet in length, and, exclusive of the line, weighs 10 tb. Expert harpooners can dart the weapon about 5 yards with considerable force and accuracy.

finest hemp, 32 yarns per strand ; 600 fathoms arc coiled into each whale-boat. The line is joined to the harpoon by the "foregoer," a piece of rope somewhat lighter and more pliable than whale-line. The foregoer being the only part of the line drawn out by the harpoon while in flight, its length, usually from 10 to 12 fathoms,

regulates the distance the harpoon may be fired. The whale-lance Whale- consists of a simple rod of }-inch iron, 6 feet long, one end flattened lance.

to form a small lance-shaped point with cutting edges, the other expanding to form a socket to receive a short wooden handle. Gun lances, bomb lances, and exploding harpoons of various forms and devices have from time to time been introduced ; but, mainly from the fact that in recent years the difficulty in securing a cargo lies not so much in effecting the capture of the animal as in discover- ing its whereabouts, and in approaching sufficiently near to permit the use of the harpoon, they have never come into general use.

Whether the ship is cruising amongst loose ice under canvas Whale- or lying "made fast" to a floe, a careful look-out is kept on board hunting,

from the crow's nest (a barrel lashed to the main-top-gallant mast- head) as well as from the deck. Immediately on a whale being seen, boats are manned and sent in pursuit. If the animal is feeding, which it generally does when near the surface by swimming back- wards and forwards horizontally round an ellipse, great caution is necessary to prevent its becoming aware of the approach of the boats. On the other hand, if the whale is "spauning," 7.¢., swiin- ming in a decided direction and appearing at the surface at in- tervals more or less regular, less caution is observed. In either case as well as under less usual circumstances the whale-boat, endeavouring to keep out of the angle of vision of the animal, approaches it from behind, swiftly but quietly ; the harpooner rises to his

gun and points it at the animal's back, withholding his fire, however, until within as short a distance as possible. On being harpooned the Greenland right whale usually dives per- pendicularly, remaining under water about forty minutes and drawing out some 600 to 700 fathoms of line before it returns to the surface. Whales descend with such velocity that they have been known to break their upper jaw by coming into violent con- tact with the bottom even in 400 fathoms of water. Before the animal has returned to the surface other boats have arrived upon the scene, and, on the reappearance of the whale, give chase and attach more harpoons. Again the whale dives, but soon returns to the surface, still more exhausted. Whenever its motions become sufficiently slow to permit the approach of the boats, the lance is used, a few thrusts in the region of the heart or lungs being speedily fatal. Quantities of blood are thrown up by the spiracles ; the animal lashes the water with its fins, and, after rushing violently through the water in its dying agony, rolls over on its side and lies stiff and rigid at the surface. Under favourable circumstances the capture of a full-grown whale from the time of first harpooning until its death occupies from one to one and a half hours. The operation of flensing is next performed. The body of the whale is lashed lengthwise alongside the ship with its under surface above water; the "cant-purchase," a powerful tackle, is then attached to the commencement of a transverse slip of blubber cut at the neck, known as the "cant-piece." By means of the eant-purchase the body is caused to rotate, whilst the fat is removed from the different parts as they appear above water in large "slips"' or '"blanket- pieces," each a ton or more in weight. After being received on deck, the blubber is cut into pieces about a foot square and stowed into the "'tween-decks." The whalebone is removed from each side of the upper jaw as it appears above water en bloc. The process of "cutting-in" occupies the ship's company about three hours. The only subsequent operations are the cutting up of the blubber into small pieces and its stowage in the oil tanks. The removal of the gum from the whalebone, the separation of the plates, and their stowage in the 'tween decks are operations per- formed subsequently. British Fisheries.

Greenland Right Whale.—The Greenland right whale (Balwna Green- mysticetus) is found amongst, or in the near vicinity of, the Polar land fish- Its habitat, however, is materially reduced in extent by the ing.

ice.

Whale-line Whale- is three-stranded rope, 23 inches in circumference, composed of the line.

WHALE

shallowness of many parts of the Arctic Ocean—e.g., of the Barents and Kara Seas and the sea to the north of Siberia—localities whcre the species is quite unknown. The fishing is prosecuted off Green- land and in Davis Strait by the British, and at Behring Strait by the Americans.

Sailing either directly from the home ports in April or proceeding thither after prosccuting the sealing, the British whale ships arrive at the north Greenland whaling-grounds off the west coast of Spitz- bergen early in May. If it is a "close" season, 7.¢., if the ice of the Barents Sea comes west round the south end of Spitzbergen,

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whales make their appearance in May; the former have migrated south during the previous autumn amongst the archipelago of islands forming the west side into Fox Channel, thence by Hudson's Strait to the pack-ice off Resolution Island, where, together with the old whales, they probably winter. Early in May the whale- men drag their boats over the ice to the open water at the floe edge, and the whales are seen amongst the pack-ice in the offing, the younger whales being nearest the land-floe. Encampments are formed along the floe edge, and the fishing is continued until the whales migrate north in June.

and effects a junction with the Greenland ice, so as to form a south- east pack, the ships have sometimes to force their way through several hundred niiles of ice before reaching the grounds. On the other hand, if it is an " open" season, as more usually occurs,

The average full-grown Greenland right whale yields about 15 Produce tons of oil and 15 cwts. of whalebone, although individuals are of Green-

occasionally killed which yield nearly 30 tons of oil and 30 ewts. of land whalebone. The whalebone consists of about 590 slips, the longest whale-

hitherto been generally accepted by naturalists), the animal lives Z 5 re %H upon various invertebrate forms, such as Actini#, Schix, Cliones, Year. feel | ee = cai | ae | Ofoi |Of Whale-| of Total Mcdusx, Cancri, and Helices. Scoresby states that some of these Os| “2 i 2 | 8S | £a | per ewt. Vena Produce. genera are always to be seen wherever whales are found stationary ra 3 a ve ae and feeding. Dr John Murray, however, is of opinion that whales | |___}|___|_& |__| |_| also resort for food to the larger forms of pelagic fauna which exist £s. d.|& s. 4. £& in the immediate vicinity of the bottom of the ocean, and the 1860 | 8 15389 | 112 6 | 2010 0 | 70,828 ie : ; 6 1861 | 8 2178 | 119 0 | 18 0 0} 112,305 presence of which was ascertained during the course of the “ Chal- 18621 1 910 | 1051 | 2 7 0/26 0 0| 69,185 lenger”’ investigations. The third condition is abundance of the 1863 | 15 618 | 679 | 210 0 | 27 0 0| 48,627 higher forms of life, such as birds, especially guillemots (Uria grylla) 1864 | 3 762 | 903 | 2 4 0 | 2610 0| 54,818 and looms (Alca arra), also narwhals (Monodon monoceros), seals, oe BS bo a 4 2 2 = ie pa bears, &. The whales make their appearance amongst the ice 1se7 | 7 228 | 240 | 2 3 0 | 20 0 0| 12,366 near the sea edge about 15th May, but only remain in the locality 1868 | 4 28 | 1357 | 116 0 | 22 0 0] 71,529 until the opening of the barrier ice permits them to resume their 1869 : ae a ‘ 2 . a : 9 ed northward jonrney, for usually about the middle of June they i 4 1544 | 7 6 |is10 0| 72647 suddenly disappear from these grounds, and are last seen going 1872 | 25 1486 | 1 0 | 2410 0| 87,601 north-west. The north Greenland whale-fishing is then over for 1873 | 2 29 | 1475 | 1 6 | 2410 0 | 89,508 the season. If unsuccessful in obtaining a cargo at the northern eg i eas ee ; Y “4 F ae grounds, the whale ships next proceed southwards as far as lat. 75°; is76 | 13 987 | 1118 | 116 0 | 4210 0| 79,009 then, if the sea is sufficiently open, they penetrate westwards until 1877 | 2 867 | 935 | 113 0 | 60 0 0} 79,892 the coast of Greenland isvisible. There they cruise amongst the ice i : aad : : a 8 3 pd until August, when the darkness of the nights puts an end to the bole 5 ; 1074 | 1 7 013710 0| 63858 fishing. 1881 | 23 709 | 696 | 111 0 | 35 0 o| 44,268 Davis If the south-west fishing is first prosecuted, the vessels arrive be 1 0 a 4 9 et Strait at the ice edge near Resolution Island in April. Here, although 1 a nh oo: | aenales fishing. numbers of large

whales are usually seen, yet, owing to the boister- i 9 160 0 o| 33,233 ous weather and the compact nature of the ice, the fishing is seldom 1 1 © | 8210 0 | 38,052 very successful, so that the majority of the vessels, after pro- secuting the "saddle" sealing at Newfoundland or Greenland, pro- History.—As already stated (see above, p.524)a right whale fishery History ceed direct to Disco, where they usually arrive early in May. The | of great importance was prosecuted in the temperate waters of the of Green- whales make their appearance at South-East Bay about 15th May, | Atlantic at a very early period, more especially by the hardy seamen Jand and here, where once a great fishing was carried on, a few whales | of the Basque provinces from the 10th to the 16th century. Author- whale may be killed. The dangerous passage of Melville Bay is next | itics are now agreed that the whale pursued was Balena biscwy- fishing. performed and the whale ships, entering the north water in June, | ensis, which difiers from B. mysticetus in its smaller size, its greater push on towards the sounds. If there is a "' land-floe across," ¢.¢., | activity, and its more southern distribution. The Greenland right if the land-ice of the west side is continuous across the entrance | whale fishery owes its origin to Henry Hudson's first voyage to of Ponds Bay and Lancaster Sound, whales will be seen in consi- | Greenland and Spitzbergen in 1607. His glowing accounts of the derable numbers and good cargoes may be obtained ; but imme- | great numbers of whales and morses led to the despatch of Jonas diately the land-floe breaks up the whales depart to the westward. | Poole to the Greenland Sea by the Muscovy Company, and the When there is no land-floe across, the whales proceed at once | success of his four voyages (1609-1612) speedily attracted the into the secluded waters of Eclipse Sound and Prince Regent | vessels of other nations. For a time the English endeavoured to Inlet, where they resort during the summer months. At this | obtain a monopoly of the fishing; but, the other nations resisting, season of the year most of the vessels cruise in the sounds, while | hostilities were engaged in, which resulted in the discomfiture of a few search the middle ice, until the darkness of the August nights | the English by a Dutch fleet in 1618. Thereafter it was agreed compels them to seek an anchorage in some of the liarbours of the that different parts of the Spitzbergen coast should be allotted to west side, where they await the return of the whales south. This | different nationalities. The English interest in the industry, how- migration takes

place on the formation of young ice in the sounds, ever, declined, and the fishing fell mainly into the hands of the usually in the latter part of September. Only the larger in- Dutch, who until 1640 also carried on an important fishing in the dividuals, however, and the great majority of these males, come | seas surrounding the island of Jan Mayen. Meanwhile they did close down along the land of the west side. These the ships send | not neglect the Spitzbergen fishery, in which 10,019 whales were their boats out to intercept, and this forms the inshore fishing or | taken by them in the ten years 1679-1688. About 1680, when "rock-nosing ", which is continued until the formation of young ice | their fishing was probably at its most prosperous stage, they had drives the vessels out of their harbours, usually early in October. 260 vessels and 14,000 seamen employed. Their fishery continued Hud- A few vessels, American as well as British, occasionally enter | to flourish on almost as cxtensive a scale until 1770, when it began

the barrier ice in lat. 80° may be reached without hindrance. In cruising for whales certain indications are sought which the whale- men know by experience to be favourable to the appearance of the animal. The first of these is " whaling ice," or moderately loose ice with close pack or floes in the neighbourhood. The second is abundance of food. The presence of this condition may be as- ecrtained by a surface net, or it may be inferred from the colour of the water, which varies from the barrenness of clear cold cerulean to the richness of opaque and warm olive green. The crustacean Calanus finmarchicus, the pteropod Clione limacina, and the gas- teropod Limacina helicina are amongst the most abundant forms, the first-mentioned contributing perhaps nine-tenths of the whale's food. Yet very little is known positively as to the food of the Greenland right whale. According to whalemen (and the idea has

son's Bay Hudson's Bay and prosecute the fishing in the neighbourhood of

fishing. Southampton Island, and even enter Fox Channel.

There are whaling-stations in Cumberland Inlet, and a few vessels usually remain all winter, ready to take advantage of the opening of the ice in the following spring. Here the young as well as the old

measuring 10 feet 6 inches and weighing 5} tb in an average animal, fishing.

12 feet 6 inches and 94 tb in a very large one. The following table shows the returns of these fisheries from 1860 to 1886 in- clusive, in so far as British vessels were concerned. It will be seen that a constant decrease has taken place both in the number of whales killed and in the total value of the produce. The price

to which oil has fallen little more than pays the expense and trouble attending its being taken on board and its subsequent pre- paration for the market, and there can be little doubt that, but for the high price which whalebone commands, the fishing would long ere this have been abandoned as unremunerative.

Whales Killed.

Produce. Value

oe ee OO ———————————————

1 The figures given are the values of "size-bone," i.e., slips of whalebone sieeatie fae ia length, which is twiee the value of whalebone under that length, so that before the exact value of the produce eould be arrived at it has been found necessary to compute 17 per eent. of the whalebone at half the figure given, being the proportion of whalebone under size in an average whale.

Sperm whale fishing.

Behring Strait fishery.

Sperm whale fishing.

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to decline, and finally, owing to the war, came to a close before the end of the century. At the samc time the Germans prosecuted the fishing to a very considerable extent: 79 vessels from Hamburg and Bremen were

employed in 1721, and during the fifty years 1670-1719 an average of 45 vessels sailed yearly from Hamburg alone. German vessels continued to engage in the fishing until 1873. The Spaniards, although they took part in the pursuit at an early date, and appear at first to have supplied the skilled por- tion of the crews of the English and Dutch vessels, never seem to have engaged largely in the northern fishery ; 20 of their vessels were employed in it in 1721, but before the end of the century they had entirely abandoned the occupation. The Danes, although likewise early appearing on the Spitzbergen fishing-grounds, never pursued the industry on a large scale until after the commencement of the Davis Strait fishing in 1721, in which year they had 90 sail engaged ; in 1803 the number had fallen to 35. As for the English fishing, although sundry attempts had been made to revive it, notably in 1673 and in 1725 (the latter year by the South Sea Company), it was not until a bounty of 20s. per ton on the burden of the ships employed, granted in 1733, had been increased to 40s. in 1749 that the industry began to revive ; in the same year vessels sailed from Scotland for the first time. Notwithstanding the re- duction of the bounty to 30s. the number of ships sailing from British ports in 1787 amounted to 255. In 1814 the value of the gross freights of the Greenland and Davis Strait fleets amounted to £700,000, and in the same year the " Resolution " of Peterhead, Captain Souter, returued from Greenland with 44 whales, produc- ing 299 tons of oil, the largest cargo ever brought into Great Britain. In 1824 the bounty was finally withdrawn. Since that time, owing to the scarcity of whales, and still more to their in- creasing shyness, caused in a great measure by the injudicious use of steam, the returns of the fishery have been gradually decreasing and the vessels employed have become fewer.

Sperm Whale.—Since 1853 British vessels have ceased to prose- cute this fishing. Begun in 1775, the British sperm whale fishing soon increased and by 1791 had assumed considerable importance, when the vessels engaged numbered 75, all hailing from London. It was British sperm whalemen who opened up the whaling-grounds of the Pacific and Indian Oceans.

American Fisheries.

The American whale fisheries embrace the Behring's Strait or Arctic fishery and the sperm whale or southern fishery.

Greenland Right Whale.—As already mentioned above, the object of this fishery is the capture of Balena mysticetus. In this case, however, the whales are mostly sought, not among the ice, but in open water, the vessels used being less adapted to ice navigation than those of the British, and nearly all are propelled by sail power alone. The hand harpoon is preferred and bomb lances are used to kill the whales. The vessels sail mostly from San Francisco in March, and arrive at the ice edge off Cape Navarin, where the fishing is first prosecuted, in May. The whales disappear during summer, but return in the autumn, when the "fall" fishing is carried on in the neighbourhood of Point Barrow ; between seasons the vessels go south and prosecute the sperm whaling. The Behring Strait fishery was commenced in 1848, and in the three following years 250 ships obtained cargoes. In 1871 34 vessels were abandoned in the ice off Cape Belcher, the crews making good their escape to other vessels ; again in 1876 12 vessels experienced a similar fate.

Sperm Whale.—The capture of the sperm whale (Physeter macro-cephalus) is prosecuted throughout the tropical seas of the globe. The distribution of the animal being, however, restricted to deep water, the fishing is usually carried on at a distance from land. The vessels used are generally barques of about 300 tons, carrying five boats and manned by a crew of thirty hands all told. 'The vessels have no particular time for sailing or arriving in port; the duration of a voyage is generally three years. The sperm whale is killed in the same manner as the Greenland right whale; the use of the hand harpoon is, however, preferred ; and the whale-boats which are not required to withstand contact with ice, are less strongly built, and much lighter and swifter than those uscd in the northern fisheries. The ordinary sperm whale yields about 60 barrels of oil (=10 tons), although large males are occasionally killed which yield a greater quantity. The oil is boiled at sea: hence its freedom from smell and the consequent high price which it commands as compared with that of the bottlenose whale.

Sperm whale fishing seems to have commenced early in the 18th century, the whaling community of Nantucket embarking in the industry about 1712; and in 1774, before the commencement of the War of Independence, a fleet of 360 vessels was engaged in it This fishery perhaps reached its climax in 1846, when it occupied a total of 785 vessels, having an aggregate capacity of 233,199 tons. During the period 1877 to 1886 inclusive the average annual number of vessels employed was 159, their average annual aggregate burden being 35,713 tons. The average annual imports into the United States of whaling produce were as follows: —of sperm oil

WHA—

WHA

31,824 barrels (=5804 tons), of whale oil 29,180 barrels (= 4863 tons), of whalebone 325,559 tb (=145 tons). New Bedford and San Francisco are the principal whaling-ports.

Norwegian Fisheries. The Norwegian fisheries include that of the fin whale and that of the bottle-nose whale.

Fin Whale.—Associated with this fishery is the name of Svend Fin Foyn, the seaman who first invented apparatus to attack success- whale fully the large and active fin whales which abound in northern seas, fishery

and at certain seasons frequent the fjords of the north coast of Nor- way. The principal feature of the whaling gear is the use of au exploding harpoon, which virtually kills the animal immediately it is struck. Owing to its weight, a gun of large size is required to throw the harpoon, and in turn a craft of considerable burden is required to carry the gun. The harpoon bears a shell containing 3 tb powder and weighs 123 Ib; the gun, 44 inches thick at the muzzle, with 3 inches bore, requires a charge of 1 tb powder, and weighs about 15 ewts. ; the vessel answering the purpose of a whale- boat is a steamer of about 80 tons burden and 30 horse-power. It is used not only for carrying the gun and pursuing the whales but also for towing the bodies of the animals when dead to the "factory" on shore, where the operation of flensing is performed. The whales hunted (in the

order of their size and relative value) are (1) the blue whale (Balenoptera sibbaldit), (2) the humpback (Megaptera longimana), (3) the common rorqual (Balznoptera musculus), (4) Rudolphi's rorqual (B. borealis), and (5) the lesser rorqual (B. rostrata). All are killed for their oil, which is much inferior in quality to that of the Greenland right whale, for their whalebone, which is short and brittle, and for their bones and flesh, which are converted into manure. The whalers hail from the south of Norway (Sandefjord, Tonsberg, &c.), and have their whaling sta- tions or "factories" on the fjords along the coast of Finmark. The fishing is prosecuted only in summer. In 1884 450 fin whales were killed, in 1885 1398, and in 1886 954.

Bottlenose Whale.—The bottlenose whale (Z/yperoodon rostratus) Bottle- abounds during summer in the northern seas adjacent to the ice nose edge, from the Labrador coast on the west to Nova Zembla on the whale east, but more particularly in the neighbonrhood of Jan Mayen and fishery.

Iceland, where the fishing is usually prosecuted during May, Juue, and July. Previous to May the weather is generally too stormy, and about the middle of July the whales, although hitherto numer- ous, suddenly disappear. The average-sized bottlenose whale yields 22 ewts. of oil, 5 per cent. of which is spermaceti ; the oil is superior even to sperm asa lubricant. Although the whale-ships had fre- quented the northern seas for centuries, and sailed over the haunts of these animals season after season, it was not until recent years that they were discovered to cxist there in immense numbers. The fishing may be said to date from the capture of 208 of these animals by the " Eclipse," Captain David Gray, of Peterhead in 1882. In the following year a number of British vessels took up the fishing, and at the same time the Norwegians embarked in it to such an extent that the market was soon glutted with oil, and the price fell from £55 per ton to £18, which no longer renders the industry remunerative to British vessels. A fleet of about thirty small sail- ing vessels annually leaves the Norwegian ports to prosecute this ie In 1885 they killed over 1300 whales and in 1886 about

1700.

Titerature.—On British whale fisheries, see Scoresby, Arctic Regions, Voyage to the Greenland Sea in 1822; M'Culloch, Dict. of Commerce; Markhain, Whaling Cruise ; Southwell, " Notes on the Seal and Whale Fisheries," in Zoologist, 1884, &e.; F. D. Bennett, Whaling Voyage round the Globe, 1833-36; and Beale, The Sperm Whale and its Captors, 1839. On American whale fisheries the following works may be consulted :— Starbuck, Hist. of Amer. Whale Fishery from its Earliest Inception to 1876; Report of U. S. Comm. of Fisheries, 1875, vol. iv. 5 Whalemen's Shipping List and Merchants' Transcript (New Bedford); and Scammon, Mammalia of North-Western America, 1874. On the Norwegian whale fisheries there are various papers in the Zoologist, by A. H. Cocks, 1884 and succeeding years. (R. GR.)

WHALEBONE is the inaccurate name under which the baleen plates of the right whale are popularly known ; and the trade-name of whale-fin, which the substance receives in commerce, is equally misleading. Three kinds of whale- bone are recognized by traders—the Greenland, yielded by the Greenland whale, Balena mysticetus ; the South Sea, the produce of the Antarctic black whale, B. australis ; and the Pacific or American, which is obtained from B, japonica, Of these the Greenland whalebone is the most valuable. It formed the only staple known in earlier times, when the northern whale fishery was a great and productive industry. This whalebone usually comes into the market trimmed and clean, with the hairy fringe which edges the plates removed. To prepare whalebone for its economic applications, the blades or plates are boiled for about twelve hours, till the substance is quite soft, in

which state it is cut either into narrow strips or into small bristle-like filaments, according to the use to which it is to be devoted.

Whalebone possesses a unique combination of properties which render it peculiarly and almost exclusively suitable for several pur- poses. It is light, flexible, tough, and Auten. and its fibres run parallel to each other without intertwisting. It has been found practicable to employ flexible steel for several purposes to which whalebone was formerly applied, especially in the umbrella and corset industries, in which steel is now

almost exclusively used. Whalebone is, however, still in large demand among dressmakers and milliners ; but it is principally used in the brush trade. In cases where bristles are too soft and weak, and where the available

vegetable fibres possess insufficient elasticity and durability, whale-

bone offers the great advantage of being procurable in strips or filaments, long or short, thick or thin, according to requirement. Hence it is principally used for making brushes for mechanical purposes, such as machines for road-sweeping, chimney-sweeping, boiler-flue cleaning, the cleaning of ships' bottoms, and for stable use, &c. The use of whalebone in brush-making was originally patented by Samuel Crackles in 1808, and various special inachines have been adapted for cutting the material into filaments. When whalebone came into the English market in the 17th century it cost at first about £700 per ton. In the 18th century its price ranged from £350 to £500 per ton, but early in the 19th century it fell as low as £25. Later it varied from £200 to £250 ; but with the decrease in whaling the article has becomé very scarce, and upwards of £1500 per ton is now paid for Greenland whalebone.

WHALE OILS. The whale or train (Germ., Thran) oil of commerce may be obtained from the blubber of any species of whale or dolphin (see WHALE FIsHERIES, above). The only whale oil that is otherwise commercially distin- guished is sperm or spermaceti oil, yielded by the sperm whales. Whale oil varies in colour from a bright honey yellow to a dark brown, according to the condition of the blubber from which it has been extracted. At best it has a rank fishy odour, and the darker the colour the more dis- agreeable the smell, Train oil consists of a glyceride of physetoleic acid (also found in earth-nut oil), together with

stearin, palmitin, &c. With lowering of the temperature _ stearin, accompanied with a small proportion of spermaceti, separates from the oil, and a little under the freezing-point nearly the whole of these constituents may be crystallized out. When separated and pressed, this deposit is known as whale tallow, and the oil from which it is removed is distin- guished as pressed whale oil; this, owing to its limpidity, is sometimes passed as sperm oil. Whale oil is principally used in oiling

wools for combing, in batching flax and other vegetable fibres, in currying and chamois leather-making, and as a lubricant for machinery. Sperm oil is obtained from the enormous cavity in the head of the sperm whale, and from several smaller receptacles throughout the body of the animal. During the life of the whale the contents of these cavities are in a fluid condition, but no sooner is the "head matter" removed than the solid wax spermaceti separates in white crystalline flakes, leaving the oil a clear yellow fluid having a fishy odour. The oil, which has an acid reaction, is purified by treatment with a solution of potash, which precipitates impurities held by the acid of the oil. Refined sperm oil is a most valuable lubricant for small and delicate machinery.

WHARTON, Mareguis or. Two noblemen with this title, father and son, hold a certain place in English literary history as subjects of satiric portraiture.

THomas Wuarton (1640-1715), a prominent Whig politician at the Revolution, is reputed by Dr Percy to have been the author of the famous political ballad Zili- burlero, which "sang James II. out of three kingdoms." Wharton was lord-lieutenant of Ireland in Anne's reign, and incurred the wrath of Swift, who attacked him as Verres in the Hraminer (No. 14), and drew a separate "character" of him, which is one of Swift's masterpieces. He was a man of great wit and versatile cleverness, and cynically ostentatious in his immorality, having the repu- tation of being the greatest rake and the truest Whig of

his time. Addison dedicated to him the fifth volume of the Spectator, giving him a very different "character" from Swift's.

Puitre WHARTON (1699-1731), the son of Thomas, suc- ceeded to title and fortune at the age of sixteen, and quickly earned for himself, by his wild and profligate frolics and reckless playing at politics, Pope's satire of him as "the scorn and wonder of our days" (Moral Essays, i. 179). He spent his large estates in a few years, then went abroad and gave eccentric support to the Old Pre- tender, There is a lively picture of his appearance at Madrid in 1726 in a letter from the British consul, quoted in Stanhope's History of England (ii. p. 140).

The elder Wharton is described at length by Macaulay as one of the four chiefs of the Whigs after the Revolution (History, chap. 20). He was created carl of Wharton in 1706, and marquis in 1714, immediately after the arrival of George I. in England. The younger Wharton succeeded to the marquisate in 1715 on his father's death, and was created duke on coming of age in 1720.

WHATELY, Ricnarp (1787-1863), archbishop of Dublin, was born in London on Ist February 1787. He was the youngest of the nine children of the Rev. J oseph Whately of Nonsuch Park, Surrey. After attending a pri- vate school near Bristol (where his father was prebendary), he went to Oxford in 1805 and entered Oriel College, then the most distinguished in the university. Copleston, afterwards bishop of Llandaff, was a college tutor when Whately entered, and had a marked influence upon the younger man. In their long walks together round Oxford they discussed and worked out much that was afterwards embodied in Whately's Logic. Whately took a double second-class in honours in 1808, afterwards gaining the prize for the English essay, and in 1811 he was elected fellow of Oriel. He continued to reside at Oxford as a private tutor, and in 1814 took holy orders. The Oriel common-room at that time was full of intellectual life, destined to discharge itself in very varied channels. Be- sides Copleston and Whately, Davison, Arnold, Keble, and Hawkins were among the fellows, and Newman and Pusey were added about the time of Whately's leaving Oxford. Newman has put on record in his Apologia his indebted- ness to Whately, who, he says, opened his mind and taught him to think and to use his reason. They soon became separated ; but between Arnold and Whately there was a warm friendship till the death of the

former. It was at this time that Whately wrote his celebrated tract, Historic Doubts relative to Napoleon Bonaparte, a very clever jeu @esprit directed against excessive' scepticism as applied to the Gospel history. In 1820 Whately made the acquaint- ance of Elizabeth Pope, to whom he was married in July of the following year. After his marriage he first settled in Oxford, where he continued to take pupils, and in 1822 he was appointed Bampton lecturer. The lectures, On the Use and Abuse of Party Spirit in Matters of Religion, were published in the same year, and were followed bya volume of Sermons in 1823. In August 1823 he removed to Halesworth in Suffolk, a country living to which he had been presented. Here two years were spent in vigorous parish work ; but the damp climate nearly proved fatal to Mrs Whately, and, when he was appointed in 1825 to the principalship of St Alban Hall, he returned with his family to Oxford. In the same year he took the degree of doctor of divinity. At St Alban Hall Whately found much to reform, and he left it a different place. In 1825 he published a series of Essays on Some of the Peculiarities of the Christian Religion, followed in 1828 by a second series On Some of the Difficulties in the Writings of St Paul, and in 1830 by a third On the Errors of Romanism traced to their Origin in Human Nature. He also published in 1829 a volume of his Halesworth sermons, under the title A View of the Scripture Revelations concerning a Future

State. It was while he was at St Alban Hall (1826) that the work appeared which is perhaps most closely associ- ated with his name,—his treatise on Logic, originally con- tributed to the Encyclopxdia Metropolitana. By this work, which gave a great impetus to the study of logic not only in Oxford but throughout Great Britain, Whately has been known to generation after generation of students ; and, though it is no longer so much in use, the qualities of the book make much of it as admirable now as when it was written. Whately swept the webs of scholasticism from the subject, and raised the study to a new level. A similar treatise on Rhetoric, also contributed to the Eney- clopedia, appeared in 1828. In 1829 Whately was elected to the professorship of political economy at Oxford in succession

to Senior. In writing to a friend he gives the following characteristic reason for accepting the appoint- ment: "It seems to me that before long political econo- mists of some sort will govern the world. Now the anti-Christians are striving hard to have this science to themselves, and to interweave it with their notions ; and, if these efforts are not met, the rising generation will be at the mercy of these men." It was a subject admirably suited to his lucid, practical intellect ; but his tenure of office was cut short by his appointment to the archbishopric of Dublin in 1831. He published only one course of Introductory Lectures (1831), in which he sought to establish the true scope of the science ; but one of his first acts on going to Dublin was to endow a chair of political economy in Trinity College out of his private purse. Whately's appointment by Lord Grey to the see of Dublin came asa great surprise to everybody, for though a decided Liberal Whately had from the beginning stood aloof from all political parties, and ecclesiastically his position was that of an Ishmaelite fighting for his own hand. The Evangelicals regarded him as a dangerous latitudinarian on the ground of his views on Catholic emancipation, the Sabbath question, the doctrine of election, and certain quasi-Sabellian opinions he was supposed to hold about the character and attributes of Christ, while his view of the church was diametrically opposed to that of the High Church party, and from the beginning he was the deter- mined opponent of what was afterwards called the Trac- tarian movement. The appointment was challenged in the House of Lords, but without success. In Ireland it was immensely unpopular among the Protestants, both for the reasons just mentioned and as being the appoint- ment of an Englishman and a Whig. Whately's blunt outspokenness and his "want of conciliating manners," which even his friends admit, prevented him from ever completely eradicating these prejudices ; and the amount of opposition he met with from his own clergy would have daunted a man less resolute than the new archbishop in the performance of what he conceived to be his duty. He ran counter to their most cherished prejudices from the first by connecting himself prominently with the attempt to establish a national and unsectarian system of educa- tion. He enforced strict discipline in his diocese, where it had been long unknown; and he published an un- answerable, and all the more unpalatable, statement of his views on the Sabbath (Thoughts on the Sabbath, 1832). The archbishopric of Dublin at that time—just after the

passing of the Catholic Emancipation Act, and in the midst of a general refusal to pay tithes—was anything but a bed of roses. Whately spoke of his appointment as "a call to the helm of a crazy ship in a storm," and one which nothing but an overpowering sense of duty could have in- duced him to accept. He took a small country place at Redesdale, four miles out of Dublin, where he could enjoy his favourite relaxation of gardening. Here his life was one of indefatigable industry. Questions of tithes, reform

of the Irish Church, reform of the Irish Poor Laws, and, in particular, the organization of national education occu- pied much of his time. But he found leisure for the dis- cussion of other public questions, for example, the subject of transportation and the general question of secondary punishments, in which he was strongly interested and on which he repeatedly published. In 1837 he wrote his well-known handbook of Christian Huidences, which was translated during his lifetime into more than a dozen languages. Ata later period he also wrote, in a similar form, Hasy Lessons on Reasoning, on Morals, on Mind, and on the British Constitution. He attached much im- portance himself to these unpretending but useful books. Among other works may be mentioned Charges and Tracts (1836), Essays on some of the Dangers to Christian Laath (1839), Lhe Kingdom of Christ (1841). He also edited Bacon's Hssays, Paley's Hvidences, and Paley's Jforal Philosophy. His cherished scheme of unsectarian religious instruction for Protestants and Catholics alike was carried out for a number of years with a measure of success, a selection of Scripture lessons and of Christian evidences by the archbishop himself being actually used in the model schools. But in 1852 the scheme broke down through the opposition of the new Catholic archbishop of Dublin, and Whately felt himself constrained to withdraw from the Education Board. 'This was felt by him as a grievous disappointment. From the beginning Whately was a keen-sighted observer of the condition of Ireland question, and gave much offence by openly supporting the state endowment of the Catholic clergy as a measure of justice. During the terrible years of 1846 and 1847 the archbishop and his family were unwearied in their efforts to alleviate the miseries of the people. Whately's private beneficence was not confined, however, to this period. Though so rigid a political economist that he could boast of never

having given a penny to a beggar, his charities were princely, and oftenest bestowed without the know- ledge of his nearest friends, From 1856 onwards symptoms of decline began to manifest themselves in a paralytic affection of the left side, which kept his arm in a constant tremor. In 1860 he lost his wife and a much-loved daughter. Still he continued the active discharge of his public duties till the summer of 1863, when he was pro- strated by an ulcer in the leg, and after several months of acute suffering he died on 8th October 1863. In the fol- lowing year his daughter published Miscellaneous Remains from his commonplace book and in 1866 his Life and Correspondence in two volumes. The loosely compiled Anecdotal Memoirs of Archbishop Whately, by W. J. Fitz- patrick (1864), may be used (with discretion) as enliven- ing Miss Whately's picture of her father.

Few eminent men have had more anecdotes and witty sayings attributed to them than Whately. He was a great talker, much addicted in early life to argument, in which he used others as in- struments on which to hammer out his own views, and as he ad- vanced in life much given to didactic monologue. But this didactic tendency was accompanied almost to the last by an intensely youthful delight in logic-chopping. At his monthly dinners to his clergy the archbishop would indulge even to an undignified extent in a species of logical horse-play. To this were added a keen wit, whose sharp edge often inflicted wounds never deliberately intended by the speaker, and a wholly uncontrollable love of pun- uing. Whately often offended people by the extreme unconvention- ality of his manners. When at Oxford his white hat, rough white coat, and huge white dog earned for him the sobriquet of the White Bear, and he outraged the conventious of the place by ex- hibiting the exploits of his climbing dog in Christchurch Meadow. This free and easy manner clung to him in later life and accom- panied him into the Dublin drawing-rooms, where it was often exaggerated by absence of mind. His fondness for dogs and animals generally was a passion through life, and he was also very fond of children, who, with their usual discrimination, gave him their confidence in return. He was an adept in various savage sports, more especially in throwing the boomerang.

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Whately was a man loved and reverenced by a narrow circle, hated, or at least distrusted, by a much larger number. This was largely owing to his own intellectual characteristics ; for, with a remarkably fair and lucid mind, his sympathies were narrow, and by his blunt outspokenness on points of difference he alienated many. With no mystical fibre in his own constitution, the Trac- tarian movement was incomprehensible to him, and was the object of his bitter dislike and contempt. The doctrines of the Low Church party seemed to him to be almost equally tinged with superstition. In short, it is admitted even by his admirers that he had a tendency to depreciate those minds which could not rest content with his own "common-sense"' view of Christianity. See- ing so clearly himself, he could not believe that there might be thmgs which he could not see. Though a great logician, there was nothing philosophical or speculative about his mind, and he took a practical, almost business-like view of Christianity, which seemed to High Churchmen and Evangelicals alike little better than Xationalism. In this they did Whately less than justice, for his belief in Christianity as understood by himself was thoroughly genuine, and his religion was to him a real thing. But he may be said to have continued into our own times the typical Chris- tianity of the 18th century—the Christianity of the theologians who went out to fight the Rationalists with their own weapons. It is to Whately essentially a belief in certain matters of fact, to be accepted or rejected after an examination of 'evidences." Hence his endeavour always is to convince the logical faculty, and his Christianity inevitably appears as a thing of the intellect rather than of the heart. Whately himself was well aware that he was out of harmony with the general tendency of his time, and even Broad Church theology has in general proceeded since upon other lines than his. Nevertheless, though in no sense a fruitful or suggestive mind, his clear and massive intellect inspired general respect, and his books well repay reading by the shrewdness of their observa- tion, the acutencss of the reasoning, the faculty of telling illustra- tion, and the uniform excellence of style. Whately's qualities are exhibited at their best in his Logic, which is, as it were, the quintessence of the views which he afterwards applied to different subjects. He has written nothing better

than the luminous Ap- pendix to this work on " Ambiguous Terms." (A. SE.)

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On the other side of the flower and ata slightly higher level is the "palea," of thinner texture than the other glumes, with infolded margins and with two ribs or veins. These several glumes are closely applied one to the other So as to conceal and protect the ovary, and they only separate to allow of the passage of the empty anthers after fertilization. Within the pale are two minute, ovate, pointed, white membranous scales called "lodicles." These contain three stamens with thread-like filaments and oblong, two-lobed anthers. The stamens are placed round the base of the ovary, which is a rounded or oblong body, much smaller than the glumes, covered with down, and sur- mounted by two short styles, extending into feathery brush-like stigmas. The ripe fruit or grain, sometimes called the "berry," the matured state of the ovary and its contents, is oblong or ovoid, with a longitudinal furrow on one side. The ovary adheres firmly to the seed in the interior, so that on examining a longitudinal section of the grain by the microscope the outer layer is seen to consist of epidermal cells, of which the uppermost are prolonged into short hairs to cover the apex of the grain. Two or three layers of cells inside the epidermis constitute the tissue of the ovary, and overlie somewhat similar layers which form the coats of the seed. Within these last is a layer of square cells larger and more regular in form than those on each side ; these contain the gluten or nitrogenous matter upon which so much of the nutritive value of the seed depends. This thin layer of gluten cells contains the albumen or perisperm, which constitutes the great mass of the seed, being composed of numerous cells of irregular form and size filled with starch grains. These layers of cells become more or less dry and inseparable one from

Struc- WHEAT (Zritieum), the most important and the most | another, forming the substance known as "bran." At ture of generally diffused of cereal grasses, is an annual plant, | the lower end of the albumen, and placed-obliquely, is the aos with hollow, erect, knotted stems, and

produces, in addi- | minute embryo-plant, which derives its nourishment in

tion to the direct develop- ments from the seedling plant, secondary roots and secondary shoots (tillers) from the base. Its leaves

the first instance from the albumen; this is destined to form the future plant.

Sucli in brief is the general structure of the wheat plant Origin as we now know it. Of its principal variations mention 24. will be made below. What was ae

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have each a long sheath encircling the stem, and at the junction of the blade or “flag” with the sheath a small whitish outgrowth or “ligula.” The inflorescence or ear consists of a central stalk bent zigzag, now to the one side, now to the other, thus forming a series of notches (see fig. 1), and bearing a number of flat- tened spikelets, one of which grows out of each notch and has its inner or upper face pressed up against it. At the base of each spikelet are two empty boat-shaped glumes or “chaff-scales,”

H one to the right, the other

to the left, and then a series of flowers, 2 to 8 in number, closely crowded together ;

: D. Flowering glume or lower palea. the uppermost are abortive # pala. F Podicles ai tal j, | by Bentham and or sterile,—indeed, in some the ovary, surmounted by styles’ @ | Hooker and by : j

varieties only one or two of

Fic. 1.—Spikelet and flowers of wheat.

A. Spikelet magnified. 3B. Ginmes, from side. C. Glumes, from back.

and Hf. Seed from front and back re- spectively. J. Rachis, or central stalk

its origin is not known; and opinion has differed as to whether more than one species is involved

or whether all the varieties now |

known may not have been ori- me \\i The | | iN

ginally derived from one. prevalent opinion. among botanists is Wy that the wheat plant Yay is nowhere found in a wild condition. Recently, however, M. Frédéric Houssay is alleged to have discovered the plant wild in the moun- tains to the east of / Kurdistan; but the statement requires confirmation. Some of the species of the genus Jgilops (now referred to Z'riticum

Haeckel) may pos-

Fic. 2.—I. Beardless wheat. II. Polish wheat,

the flowers are fertile. Fach of ear, spikelets removed,

flower consists of an outer or lower glume, called the flower- ing glume, of the same shape as the empty glume and ter- Minating in a long, or it may be ina short, awn or " beard."

sibly have been the with seed. IJ. Spelt wheat, All much reduced. sources of our cultivated forms, as they cross freely with wheats. Haeckel, the latest monographer of the genus, considers that there are three species. (1) Z'riticwm mono-

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coccum, which undoubtedly grows wild in Greece and Mesopotamia, is cultivated in Spain and elsewhere, and was also cultivated by the aboriginal Swiss lake-dwellers, as well as at Hissarlik, as is shown by the grain! found in those localities. (2) 7. sativum is the ordinary culti- vated wheat, of which Haeckel recognizes three principal races, spelta,

dicoccum, and tenax. Spelt wheats (see fig. 2) were cultivated by the aboriginal Swiss, by the ancient Egyptians, and throughout the Roman empire. _The variety dicocewm was also cultivated in prehistoric times, and is still grown in southern Europe as a summer wheat and one suitable for starch-making. Other sub-varieties of 7. tenax are compactum, turgidum, and durum (see below). (3) The third species, 7. polonicum, or Polish wheat, is a very distinct-looking form, with long leafy glumes; its origin is not known. As these varieties intercross with each other, the presumption is that they, like the species of d%gilops, which also intercross with wheat, may have all originated from one common stock.

hand, are subjected to an enforced rest for a period of several months, and even when grown in milder climates remain quiescent for a longer period, and start into growth later in spring,—much later than varieties of southern origin. These latter, accustomed to the mild winters of those latitudes, begin to grow early in spring, and are in consequence liable to injury from spring frosts. Wheats of dry countries and of those exposed to severe winds have, says De Vilmorin, narrow leaves, pliant straw, bearded ears, and velvety chaff,—characteristics which enable them to resist wind and drought. Wheats of moist climates, on the other hand, have broader leaves, to admit of more rapid transpiration. No doubt careful microscopic scrutiny of the niinute anatomy of the leaves of plants grown under various conditions would reveal further adaptations of structure to external conditions of climate. At any rate, it is certain that, as a general rule, the hard wheats are almost exclusively cultivated in hot, dry countries, the spelt wheats in mountainous districts and on poor soil, turgid wheats, like the Egyptian, in plains or in ill-drained valleys,—the best races of wheat being found on rich alluvial plains and in fertile valleys. The wheat used in the neighbourhood of Florence for straw-plaiting is a variety with very slender stalks. The seed is sown very thickly at the beginning of winter and pulled, not cut, about the end of May, before the ear is ripe. In the United Kingdom ordinary wheat, such as old red Lammas and Chiddam's white, is used for

Home Basing his conclusions upon philological data, such as straw-plaiting, the straw being cut some time before the berry and the names of wheat in the oldest known languages, the | ripens. The propensity to "tiller" is of the greatest importance, distribu- writings of the most ancient historians, and the observa- | as it multiplies the resources of the farmer, An instance of this tion, : of Loreanoall + Hers. De Candolle infers that the | 8 s!ven ™ the Philosophical Transactions (1768), where it is stated sane OF ORE ee a ae . | that one seedling plant in the Cambridge botanic garden was original home of the wheat plant was in Mesopotamia, | divided into eighteen parts, each of which was replanted and sub-

and that from thence its cultivation extended in very early | sequently again divided, till it produced sixty-seven plants in one

times to the Canaries on the west and to China on the pace, a "ato ee of eae | et ey eos ee

: a ivided and produce ants, which in due time yielde 108

= st. In the western hemisphere wheat Yes es known ears. (2) The variations ie root-development have noe been much

till the 16th century. Humboldt mentions that it was | attended to, although it would be well to study them in order to accidentally introduced into Mexico with rice brought from | ascertain the degree of adaptability to various depths and condi-

Spain by a negro slave belonging to Cortes, and the same | tions of soil. (3) A most important difference is observable in the

writer saw at Quito the earthen vase in which a Flemish | lability to attacks of rust (Puccinea), some varieties being almost

é invariably free from it, while others are in particular localities so

monk had introduced from Ghent the first wheat grown subject to it as to be not worth cultivating. (4) Velvet-chaffed

in South America. wheats do best in poor soil, and bearded wheats are usually hardi- Principal As might be anticipated from the cultivation of the plant from j est. (5) The ears vary, not only in size, but also in form, this varia- time immemorial and from its wide diffusion throughout the eastern | latter characteristic being dependent on the degree of closeness tions. hemisphere, the varieties of wheat—that is, of 7'. sativum—are very | with which the spikelets are set on. In such varieties as Talavera

numerous and of every grade of intensity. Those cases in which the variation is most extreme some botanists would prefer to con- sider as forming distinct species; but others, as De Vilmorin, having regard to the general facts of the case and to the numerous inter- mediate gradations, look upon all the forms as derivatives from one. In illustration of this latter point it may be mentioned that not only do the several varieties run one into the other, but their chemical composition varies likewise according to climate and season. According to Prof. Church," even in the produce of a single

the spikelets are loose, while in the club and square-headed varie- ties they are closely packed. The form of the ear depends on the relative width of the anterior and posterior surfaces as compared with that of the lateral surfaces. In the square-headed varieties the lateral surfaces are nearly as wide as the median ones, owing to the form and arrangement of the spikelets. The number of abortive or sterile spikelets at the top of the ear also varies: in some cases nearly all the spikelets are fertile, while in others several of the uppermost ones are barren.

ear there may be 3 to 4 per cent. more of albuminoid matters in soinme grains than in others; but on the average the proportion of gluten to starch is as 9°11 to 100. From the point of view of agri- culture (see vol. i. p. 854) it is generally of no great moment what

The classification of the different varieties of cultivated wheat Classifi- has occupied the attention of many botanists and agriculturists. cation of The latest and fullest account is that of M. Henry de Vilmorin in culti- his Les Blés Meilleurs (Paris, 1881). The classification adopted by vated

rank be assigned to the various forms. It is only important to take cognizance of them for purposes of cultivation under varying cir- cumstances, Hence we only allude to some of the principal varia- tions and to those characteristics which are found to be unstable. (1) Setting aside differences of constitution, such as hardihood, size, and the like, there is relatively little variation in the form of the organs of vegetation. This indicates that less attention has been paid to the straw than to the grain, for it is certain that, were it desirable, a great range of variation might be induced in the foliage and straw. As itis, some varieties are hardier and taller than others, and the straw more solid, varying in colour and having less liability to be "laid"; but in the matter of "tillering," or the production of side-shoots from the base of the stem, there is much difference. De Vilmorin points out that wheats of cold countries have flexible, thin, hollow straw, elongated fragile ears, and soft floury seeds ; Hunter's wheat may be cited asa good example. Wheats of hotter countries have a more solid, rigid straw, the ears short, stout, com- pact, the glumes provided with long awns or beards, and the sced hard and horny. Spring wheats procured from uorthern latitudes mature more rapidly than those from temperate or hot climates, whilst the reverse is the case with autumn wheats from the same source. The difference is accounted for by the greater amount of light which the plants obtain in northern regions, and, especially, by its comparatively uninterrupted continuance during the growing period, when there are more working hours for the plants in the day than in more southern climes, Autumn wheats, on the other

1 See drawings made to scale by Mr Worthington Smith in the Gardener's Chronicle, 25th December 1886. 2 Food Grains of India, p. 94.

this writer is based, in the first instance, on the nature of the ear: wheats.

when mature its axis or stem remains unbroken, as in the true wheats, or it breaks into a number of joints, as in the spelt wheats. In the first class the ripe grain readily detaches itself from the chatf- scales, while in the spelts it is more or less adhcrent to them, or not readily separable from them, The true wheats are further sub- divided into soft wheats, turgid wheats (7. turgidum), hard wheats (7. durum), and Polish wheats (7.

polonicwm). In the soft wheats the chaff-scales are boat-shaped, ovoid, of the consistence of parch- ment, and shorter than the spikelet; the seed is floury, opaque, white, and easily broken. In the turgid wheats the glumes have long awns, and the seed is turgid and floury, as in the soft wheats. In the hard wheats the outer glumes are keeled, sharply pointed, awned, and the seed is elongated and of hard glassy texture, some- what translucent, and difficult to break owing to its toughness. These seeds are richer in nitrogen than the soft wheats, so that an approximate notion of the richness in albuminoids may be gained by simply inspecting the cut surface of the seed. The Polish wheat, rarely if ever cultivated in the United Kingdom, has very large lanceolate glumes, longer than the spikelet, and elongated glassy seeds. Further subdivisions are made, according to the pre- sence or absence of awns (bearded and beardless wheats), the colour of the ears (white, fawn-coloured, or red), the texture of the ears (glabrous—i.e., smooth—or downy), and the colour of the seed or "berry." In the jointed or spelt wheats the distinctions lie in the presence of awns, the direction of the points of the glumes (straight, bent outwards, or turned inwards), the form of the ear as revealed on a cross section, and the entire or cleft palea. As illustrating the fact of the occasional instability of these variations, Prof. Church mentions that a single grain will be sometimes horny and partly

Adapta- bility to soil and ~ locality.

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opaque and soft, in which case its composition will correspond with its aspect. The division into spring wheat and winter wheat is an agricultural one solely. Any variety may be a spring or a winter wheat according to the time at which itis sown. In the summer wheats it may often be observed that the median florets do not fill out so fully as in the autumn wheats. Among the turgid wheats there is a frequent ten- i a dency in the spike to branch or become com- pound,—a_ tendency which is manifested to a less degree in other forms. The Egyptian, or so-called "mummy " wheat is of this charac- ter, the lower part of the spike branching out into several subdivi- sions. This multiplica- tion of the seed – bear- ing branches might at first sight be considered advantageous; but in p practice the

quality of the grain is found to be inferior, as if the force that should have been devoted to the maturation of the grain were, in a measure, di- verted and expended in the production of addi- tional branches to the spike.

With regard to the chemical composition of the ripe grain, the Rothamsted experiments reveal a singular uniformity, even under very varied conditions of manuring, and even where much diversity was apparent in the constitution of the straw.

Apart from the botanical interest of these diversities, as indica- tions of the faculty of variation in plants, and possibly as clues to the genealogy and origin of the cultivated plant, their practical importance is very great. Some varieties are suited to hot, others to cold countries ; some will flourish on one description of soil, others on another. Hence the paramount importance of ascertain- ing by experiment, not only what are the best varieties, but which are the best adapted for particular localities and particular climatic conditions. Porion and Dehérain have shown! the " infinite superi- ority " over the ordinary wheats of a particular square-headed variety grown on rich soil in the north of France. A good selection of seed, according to the nature of the soil, demands, says De Vil- morin, intelligence and accurate knowledge on the part of the farmer. If a good variety be grown in poor soil, the result will be unprofitable, while, if bad wheat be grown on good soil, the result may be nil. In botanical collections there exist, it is stated, her- barium specimens or other evidences of plants grown in Norway as far north as lat. 65° (Schubeler), in Switzerland at an elevation of 1200 feet above the valley of Zermatt (or 6500 feet above the sea), near the straits of Magellan, as well as in Teneriffe, the Cape of Good Hope, Abyssinia, Rodriguez, the Philippine Islands, and the Malay Archipelago. These widely-separated localities show the great area over which the culture is possible, aud illustrate the powers of adaptation of the plant. The requirements of the con- sumer have also to be considered : for some purposes the soft wheats, with their large relative proportion of starch, are the best, for others the hard wheats, with their larger hei of gluten. With the modern processes of milling, the hard wheats are preferred, for they make the best flour ; and in North America the spring wheats are, as a rule, harder than the winter wheats. The soft wheats are those which are most general in European

cultivation, and, as a rule, the beardless varieties, though more tender, are preferred. The bearded varieties are supposed to be hardier; at any rate they defy the ravages of predatory birds more completely than the unarmed varieties, and they are preferable in countries liable to storms of wind, as less likely to have their seeds detached. Hard wheats are specially employed in Italy for the fabrication of maca- roni. Polish wheat is used for similar purposes. Spelt wheats are grown in the colder mountainous districts of Europe ; their flour is very fine, and is used especially for pastry-making ; but, owing to the construction of the grain, it requires special machinery for grinding (see FLour).

The following passage, reproduced from a German source in

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Fic. 3.—Longitudinal section of a grain of wheat ; highly magnified. A. Epidermal cells. B. Cells containing gluten. OC. Cells of perisperm or albumen, filled with starch. D. Embryo cut through the middle, root-end pointing down- wards.

1 Ann. Agronom., January 1888, p, 33.

Agricultural Science (January 1887), may serve still further to illus- trate the fitness of particular varieties for special purposes.

“TInnumerable experiments have shown that the value of wheat for seed in- ereases with the size of the grain: the larger kernel yields a stronger plant, and this will bear a heavier crop; the smaller grain contains the larger proportion of gluten, yields a better flour, and brings a higher price; but with the smaller yield per acre the profit may be less. The ‘volume-weight’ is dependent more on the well-rounded form of the grain than on its size; when about alike in respect to shape, the market value of the grain is closely proportionate to its weight per bushel. Grain of a higher specific gravity is usually richer in gluten. Richness in this constituent is of the greatest importance, as affecting the market value of the grain ; it gives better baking qualities to the flour, besides a higher nutritive value, and is accompanied with greater richness in phosphate, also an important constituent of animal food. The proportion of gluten in wheat is determined largely by the climate, and especially by the proximity of the sea. Insular England produces a wheat grain with high absolute weight, but as a rule with less gluten than the wheat of eastern Europe. English wheat, and wheat in general grown in an ocean climate, seldom contains over ten per cent. of gluten, while in eastern Europe and in the western United States the proportion rises to twenty per cent. and above. Vigorous English seed wheat sown in eastern Europe yields larger crops than the native seed, _ a ~~ — in gluten than the parent, though not so rich as wheat from native seed.”

It is, however, to be observed that proximity to the sea does not produce soft wheat poor in gluten in Italy, Algeria, and other warm and tropical regions, where the plant is cultivated quite as much under the influence of the sea asin England. The soft wheat of Great Britain is to be explained rather by the mildness of the climate and the relative constancy of the temperature.

Wheat begins to grow at a temperature of 5° C. (41° Fahr.); and, when the aggregate temperature, as represented by the sum of the daily means, has mounted up to 185° Fahr., the germ begins to escape from the husk, if the seed be not deeply buried ; but if it is deeply buried, an amount of heat is required greater in proportion to the depth. Ifthe seed lies at a depth lower than a foot from the surface, it rarely germinates. The seedling plant ceases to grow if the mean temperature of the day remains

below 42° Fahr. When the young plants have been influenced by an aggregate tem- perature amounting to 1896° Fahr. from the period when sown, or 1715° from the period of germination, branching or "tillering" goes on freely, and the young ears are formed. Under the influence of a mean temperature of 55°, or a little above, the flowers are pro- duced. A still higher daily mean is required for the full develop- ment and ripening of the grain. The figures here cited are given by Risler and are calculated for the climate of Paris; but, of course, the same principles apply in the case of other countries. The amount of light and of moisture has also to be taken into account. The fact that the wheat plant requires less water than other cereals, and therefore does not suffer so much from drought, is one of great importance to the cultivator, and furnishes one reason for the greater proportionate culture of wheat in the eastern than in the western counties of England.

As for the soil requirements, see AGRICULTURE, Vol. i. p. 357. The following figures, cited by De Vilmorin from Joulie, will give an idea of the nature and amount of the demands made upon the soil by a wheat crop: in order to yield a crop of 444 bushels of wheat to the acre, the soil must supply to the crop during its growth in round numbers—202 Ib of nitrogen, 81 Ib of phosphoric acid, 55 Ib of lime, 26 tb of magnesia, and 255 tb of potash.

The numerous varieties of wheat now in cultivation have been Produc- In any wheat- tion of field there may be observed on close inspection plants differing in varieties,

obtained either by selection or by cross-breeding.

character from the majority. If seeds of these "sporting" plants be taken and grown in another season, they may (or may not) repro- duce the particular variation. If they do, and the same process of selection be continued, the variation becomes in time '' fixed," though it is always more or less liable to revert to its original con- dition. By continuously and systematically selecting the best grains from the best ears, Major Hallett has succeeded in introducing " pedigree wheats" of fine quality. But even greater results may be expected fron: cross-breeding, or the fertilization of the flowers of one description of wheat by the pollen of

another. This has been attempted by Shireff, Le Couteur, Maund, and others in the past, and more recently by H. de Vilmorin and Messrs Carter. Under natural circumstances wheat is self-fertilized: that is to say, the pollen of any given flower impregnates the stigma and ovule of the same flower, the glumes and coverings of the flower being tightly pressed round the stamens and stigmas in such a way as to prevent the access of insects and to ensure the deposit of the pollen upon the stigmas of the same flower. This process of self-fertilization is the usual method, and no doubt keeps the variety true or un- mixed ; but the occasional presence of varieties in a wheat-field shows that cross-fertilization is sometimes secured. The stamens of the wheat plant may frequently be seen protruding beyond the glumes, and their position might lead to the inference that cross-fertiliza- tion was the rule; but on closer examination it will be found that the anthers are empty or nearly so, and that they are not protruded till after they have deposited the pollen upon the stigma. The separation of the glumes, which occurs at the time of fertilization,

2 See Ritthausen, Die Eiweisskirper d. Getreidearten, Hiilsenfriichte, und Oel- samen, Bonn, 1872.

and which permits the egress of the useless stamens after that oper- ation, is stated to occur only under certain conditions of tempera- ture, when the heat, in fact, is sufficient to cause the lodicles of the flower to become turgid and thus to press apart the glumes. A temperature of about 75° Fahr. is found by Messrs Carter to be the most favourable. From what has been said it will be evident that the artificial fertilization of wheat is a very delicate operation. The glumes have to be separated and the anthers cut away before the pollen is fully formed, care being taken at the same time not to injure the stigma, and specially not to introduce, on the scissors or otherwise, any pollen except that of the variety desired. De Vilmorin's experiments have shown that all the varieties will inter- cross, and that even such a distinct form as the Polish is no excep- tion. From this he concludes that all the forms have originated from one stock and are to be comprised within one species. In the progeny of these crossed wheats, especially in the second genera- tion, much variation and

difference of character is observable,—a phenomenon commonly noticed in the descendants from crosses and hybrids and styled by Naudin "irregular variation." Sometimes characteristics appear in the crossed wheats which are not found in the parent varieties, although they occur in other wheats. Thus,

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brings an abundant crop necessarily yield a proportionate return calculated in weight per bushel. The greatest weight per bushel (634 Ib in 1876) was secured on the same plot which in the same year yielded less than an average crop, 424 bushels per acre, very little difference being observable in the different varieties in point of quality, though much in quantity. The lowest average weight per bushel (56% 1b), however, corresponded with a very low total produce, 23% bushels per acre in 1880, on a poorly manured plot. These figures, added to those representing the cost for rent and taxes, manure, labour, and expenses of production generally, and considered in connexion with the enormous supplies imported from abroad, will show how great are the risks attendant upon wheat cultivation in the United Kingdom under existing circumstances ; but of course they are of little value as regards the growth of wheat in India-and the colonies.

The production of wheat, with the use of wheat bread, has in- creased enormously since the extension of railways has made possible the transportation of grain for great distances by land. The annual crop of the world is now estimated at nearly two thousand millions of bushels. Of late years the increase of production has been most notable in southern Russia, Australia, India, and North America.

Wheat is sometimes grown as a forage crop. A variety has been Wheat introduced from Japan by Messrs Sutton which seems to be very for useful for this purpose. Although it takesa longer time to mature fodder,

De Vilmorin records the presence of turgid wheats among seedlings raised from a soft wheat fertilized with the pollen of a hard variety, and spelt wheats among the descendants of a soft crossed with a

Yield of _ To show how considerable may be the variations in the produce colour, and covered over by velvety hairs ; different yielded by different varieties, the following figures, taken from the | it is easily re- cognized by the pecu- 5 Le, varieties, “ memoranda shcet ” of the Rothamsted experiments, may be cited. | liar character of its anterior legs, ¢

turgid wheat. Other of De Vilmorin’s experiments were made with the practical object of obtaining improved varieties or forms speci- ally suitable to particular localities. Among those he has raised is one named “ Dattel,” which is highly esteemed ; it was got from the red Chiddam, a valuable variety, but one in which the straw is defective. By crossing the red Chiddam with the pollen of Prince Albert a new variety has been produced which is stated to be early, very productive, and of good quality, as far as both grain and straw are concerned. Among many varieties raised by Messrs Carter some are very interesting: in one case the sced-parent was a short-strawed, downy-chaffed, awnless variety, the pollen-parent a large bearded American wheat. The offspring exceeded the seed-parent in stature by a foot, and had a smooth chaff and stout thickset ears with minute awns. Some of the crosses were made with the view to secure denser production of awns and thus to render the ears “bird-proof”; others were devised with a view of securing an early ripening variety, which was effected by crossing with the Talavera, a known early variety. The progeny was ready for cutting (in the neighbourhood of London) on 21st July 1886.

For twelve successive years (1871-1882) Sir John Lawes cultivated 26 varieties of wheat, each variety each year in a different field and under different conditions of manuring. From various circum- stances satisfactory averages were obtained during only eight years (1871-1878). The mean produce of all the varieties taken together during that period was 43} bushels (dressed corn) per acre; the lowest average produce was 363 bushels per acre, furnished by Hallett’s original red ; and the highest produce was 538 bushels per acre, yielded by Rivett’s red. As to manuring, the highest mean produce (513 bushels per acre) from 25 varieties taken together was obtained in 1878 on a field where all the 25 varieties were manured with 2 cwts. of nitrate of soda, the previous crop having been turnips, for which farmyard dung was applied, the turnips being partly

consumed on the land, partly removed. Here again Rivett's red furnished the best crop (664 bushels per acre). This variety in almost—but not in all —cases gave the highest produce. The lowest mean produce from all the varicties taken together was 21} bushels per acre in 1879,—a most disastrous season. In that year even Rivett's red furnished no more than 16 bushels per acre, among the lowest on the record, but nearly twice as much as red Rostock, which in the same year yielded only 84 bushels per acre, the manuring consisting of 2 ewts. of nitrate of soda after clover, partly cut, partly "'fed." This same variety in another ycar and under a different condition of manuring yielded 57 bushels per acre. The disastrous effect of the scason of 1879 was manifested not only in diminished produce but in lessened germinative power ; in the season following white wheats appear to have been the worst, the most satisfactory crop in 1880 being yielded by Webb's " challenge," seeds of which were received direct from Stourbridge and not grown on the Rotham- sted farm, as in the case of the other varieties. As to the weight per bushel of the grains of the different varieties at Rothamsted

there was a more limited range than in the case of the absolute weight, the highest mean (63 tb per bushel) being yielded by the "red nursery " variety, the lowest by Rivett's red (58#), the general

its seed, it flowers a fortnight earlier than other varieties. It seems also to be a hardy plant, having withstood successfully eight degrees of frost. From a crop sown on 27th August a sample was cut on the following 13th October, with a stem more than 2 feet in length and very thick and succulent, and the autumn was not very genial. This variety tillers well, so that it makes a complete mass of green stuff, which is very serviceable either for feeding sheep or for "soiling." (M. T. M.)

INsEcTs, &C., INJURIOUS TO WHEAT.

It will be convenient to arrange the insects injurious to wheat under the natural orders to which they belong, and afterwards to describe one or two other forms of animal life, such as the myriapod, Polydesmus, and the nematode worm which causes the ear-cockle, for, although these are not insects, they must be taken into account in any description of the animal pests of the wheat crop.

The order Orthoptera contains the mole cricket, Gryllotalpa vulgaris, one of the largest insects found in Great Britain. It is 2 inches or a little more in length, of a brownish

which are very strong and short ~ and laterally com- =

pressed. These in- sects lead a sub- terranean life, bur- rowing through loose sandy soil by means of their § fore limbs, which are structurally \ well adapted for digging. The W sexes pair about the middle of j June, and the female lays from (% 200 to 400 eggs in an oval cham- ‘*

ber excavated . Z|

some inches below the level of the ground. After lay- ing her eggs, she Ne does not, as is very Fia. 1.—Mole cricket. 1, Eggs; 2, larva ; 3, larva after generally the case first moult; 4, adult. Natural size.

amongst insects, die, but lives to keep guard over the eggs and the young larve, which appear in about three weeks; many of the latter, however, she cats. The young larve at first resemble black ants; they are very voracious and feed upon the young tender rootlets of corn and other plants. The adults prefer an animal diet, but do great damage by cutting through any roots which they encounter in their subterranean burrowings, and as these are winding and extensive considerable injury is caused to the crops. One of the natural enemies of mole crickets is the mole, which devours them readily ; they are also eaten by those birds which scratch the soil for worms. They appear to be very sensitive to smell, and a dressing of a quart of paraffin oil to 1 cwt. of ashes or mould, or watering with solutions of quassia and soft soap, will

ant Le : often rid the field of them. phat harley a a amounting to 613 Ib per bushel. The The corn thri n: Thrips cerealium, is a member of the order eilect of the bad season of 1879 was also shown here: the general Thysanoptera, which is by some authorities associated with the average in that year was only 534 tb per bushel, while in 1876 it :

was 634 for the same varieties. The greatest weight per bushel does not therefore correspond in all cases with the absolute amount of crop per

acre, for a small crop often yields grain of relatively heavy weight. Nor does the same condition of manuring that

1 For a discussion of the methods of production followed in the United States, as well as in Canada, and for the chemical composition, trade, milling, and statistics of wheat, see Brewer, " Production of Cereals," in Report to tenth census of United States, vol. iii.

Orthoptcra. Itis a minute insect about 2 mm. long, with a black and brown coloration. The male is wingless; the female bears four long narrow wings fringed with long hairs. The antenne are eight- jointed. The legs terminate in characteristic swellings; there are no claws. The insects are very active. The larve are whitish yellow, with bright red eyes, and acquire their wings after the fourth casting of the skin. The damage done to corn crops by these minute insects is often very serious; they secrete themselves under the palez surrounding the seed, and feed upon the soft juices of the latter. In addition to this, they sometimes cause injury to the plant by attacking the stalk whilst it is soft and full of sap. Owing to their very small size it is ex- ceedingly difficult to devise means for getting rid of them; much may be done, however, to pre- vent their appearance by keeping the land clean and free from weeds, which harbour them, and = by destroying all refuse in which they may \ breed, and ploughing in the stubble to a con- Fy, 2.— Corn thrips siderable depth. (Thrips cerealium),

The most injurious form amongst the Hemi- female; magnified. pera is Siphonophora granaria (Aphis granaria, Kirby); it attacks wheat chiefly in England, but is also found upon oats, barley, and rye. The young Aphides attack the leaf blades whilst young and tender, and when the ear begins to appear it is covered with numbers of these insects in every stage of development, from the young larva

Fig. 3.—1, Siphonophora granaria, winged Aphis; 2, natural size of same; 8, wingless form; 4, natural size of same; 5, Aphidius avene ; 6, natural size of same ; 7, Ephedrus plagiator ; 8, natural size of same.

to the perfect insect. The larve are of a green or dark green colour, with brown antenne and yellow and black legs. The female, which produces the young viviparously, has a green abdomen, bearing two horns posteriorly ; the rest of the body is brownish green, the legs black and yellow, the eyes red. The winged females, which appear late in the season, lay eggs ; but whether these eggs serve to carry the species over the winter or whether this is done by hibernat- ing larve is not definitely known. Both larvee and females produc- ing them have been found amongst the roots of the wheat plant during the winter. This Aphis is known to occur upon several of the common grasses of England ; hence any grasses growing in a wheat field should be destroyed as much as possible when the pest is in the neighbourhood. Deep ploughing and rotation of crops may also be recommended. In cases where the insects are noticed at an early stage, a dressing of soot or gas lime will serve to check them. Their numbers are kept down by lady-birds (Coccinella), which should never be killed, and also by two species of ichneu- mons (Aphidius avene and Ephedrus plagiator), which lay their eggs in the body of the Aphides.

The order Diptera includes several insects which are very harm- ful to corn crops. The frit fly, Oscinis vastator, is a very active small fly, with a greenish black metallic lustre, about 2 to 3 mm. in length. The larve are yellow or light brown, pointed anteriorly. The flies emerge from the chrysalis about April, and the female depdsits her little red eggs upon the under surface of the leaf of the wheat ; the larva when it is hatched creeps down and bores its way into the terminal bud of the plant, thus arresting all growth of the ear. The larva assumes the chrysalis state inside one of the outermost leaf sheaths. There are believed to be two broods each year. If, as seems probable, the pup pass the winter amongst the stubble or grass weeds, it is important that these should either be burnt or ploughed deeply in.

Two closely allied species of flies also attack corn crops ; they are Chlorops teniopus and Chlorops lineata. The former is of a light straw colour, with three longitudinal dark stripes, and a greenish black abdomen ; the antenne are black, the eyes greenish ; and the dark feet have a stripe of lighter colour. It is about 3 to 4mm. long. The injury to the crops is caused by the fly laying its eggs between the leaves of the

young plant; the larve which hatch out from these bore their way down the stem from the base of the ear to the first joint, and there they form swellings known to the farmer as the "gout." The ear is aborted or misformed. The dampest part of the field is most subject to attack. Ch. lineata is about 2 mm. long; the antenne have their two proximal joints yellow, whilst the third is black on its outer side ; in its habits this insect resembles Ch. teniopus, but attacks chiefly barley crops.

The daddy long-legs, Tipula oleracea, causes great damage to corn and other crops by the larve gnawing the young plants whilst they are still below the level of the ground. 'The female deposits her eggs in the ground, or near it in some grass, &c., choosing as damp a place as possible. The larva is provided with a very tough skin and may measure 14 inches in length. It is apodal, and bores its way beneath the surface of the earth by alternately contracting and expanding. It assumes the pupal condition during the later half of the summer. The pup are provided with backwardly directed spines, by means of which they raise themselves above the level of the ground. As a means of preserva- tion against this pest, ditches and other damp places should be cleaned out. Rooks, which de- vour the larve at a great rate, should be encour- aged ; and deep plough- ing to bury the eggs and the larvee should be prac- tised, and theland dressed with some such poisonous substance as gas lime be- fore breaking up.

Two species of Cecido- myia are most destruc- tive to wheat. Cecido- myta tritici, the wheat midge, has been known in Great Britain for over ~erssgegedeiaebesene a century. This fly is rie, 4.—Daddy long-legs (Tipula oleracea). 1, a little over 2 mm. in Larva; 2, pupa case; 3, insect, natural size; length, of an orange yel- 4, eggs. low colour, with black eyes; the female is provided with a long ovipositor, by means of which it deposits ten or more eggs in the ears of wheat. The larve hatch out in about ten days. They are at first transparent, but become yellow, and their colour gradually deepens. Most of the larve fall off the plant and bury themselves in the ground, where they change into pupx; some, however, re- main in the ear and are found in some numbers in chaff. The perfect insect emerges from the pupa in the spring. It is probable that more than one brood is produced during the season. The damage caused to the crop

is due to the larva feeding upon the soft tissue of the ear and thus causing the seed to be imperfect ; some authorities state that it also devours the pollen. Since the larve exist in chaff, great care must be taken that this does not prove a source of infection, and land which has been badly affected must be ploughed deep, in order to bury them. C. destructor is well known under the name of the Hessian F fly. It was first noticed in Great Britain during the summer of | 1886, in Hertfordshire, and within a few months its presence was reported throughout the eastern half of England and Scotland,— a circumstance which led some authorities to believe that it had existed in Great Britain for some , little time ; there has been, how- ever, no definite proof of this. The fly has been known in North America since 1776, where it has | done very extensive damage, espe- Fig, 5.—Hessian fly (Cecidomyia de- cially during warm moist sum- structor). 1, Insect; 2, larva; 3, pupa mers. It is known to occur OF "'flaxseed."

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and 14 to 16 smaller joints, which diminish in length towards the ends. The male fly is smaller than the female; the abdomen terminates in two claspers. The female lays in the spring 40 or more eggs upon the leaves of the corn plants,—wheat, barley, and rye; oats are not affected. The larve are hatched in about 5 or 6 days, and make their way down to the axils of the leaves, feeding upon the sap whieh is passing up the stem. After a few weeks they are transformed into the "flax seed" pups, which are usually found just above the second joint of the stem. From these pup the autumn brood of flies emerge ; these lay eggs, and their larvae tide over the winter in the pupal condition. Sometimes only one brood is produced in the year. The injury done to the plant by the larve living upon the sap usually eauses the infeeted plants to bend over just above the second joint; this renders them easily distinguishable from the healthy plants. The numbers of this most injurious insect are fortunately kept down to a considerable extent by parasites. Five species of Chaleididw are known to be parasitie on C. destructor in America and six in Russia. Fortu- nately these are not absent in Great Britain. When a crop has been infected by this pest, the corn should be reaped above the second joint, and the stubble carefully ploughed in. A sharp look-out should be kept for the appearance of the "

flax seed" both in the plant and in samples of eorn, especially if the latter has been badly eleaned. Some species of wheat seem to have a greater power of resisting the attacks of this inseet than others, but as yet very little definite information ean be given on this point. These two pests do damage to the amount of millions of pounds every year in North America; but none of those mentioned before them are either common or destructive on that continent.

Cephus pygmeus belongs to that destructive group of the Hymeno- ptera, the saw-flies, and is commonly known as the corn saw-fly. The insect is black in eolour, with a large head and prominent eyes. The mouth parts are yellow, and in the male the legs are the same colour. The female is darker and has its black ovipositor slightly exposed. Whilst the wheat is still young and tender, the female pierees the stalk below the forming ear and there deposits an egg, The larva, which hatches out in about ten days, is when full-grown about half an inch long, whitish in colour, with a brown head. It differs from the ordinary saw-fly larva in having but three pairs of legs. This larva bores its way down the stem, cutting through the knots, and about harvest time it cuts the stem nearly through at its base. The larva assumes the pupal stage in the lowest part of the stem and remains in this condition till the following spring, when the perfect insect emerges: Plants which have been affected by this insect can easily be recognized by their thin empty ears. Since the insect passes the winter in the stubble, every effort should be made to destroy this wherever the disease has been prevalent.

The caterpillars of some species of Lepidoptera do considerable damage to corn crops. On the Continent the larve of Agrotis clavis (segetwm) devour the roots of wheat and are especially destruc- tive to autumn-sown crops. Tinea granella, a member of the family Tineide, causcs much harm to grain in store. This small moth, ofa dusky white colour, lays one or two minute eggs upon each grain; as soon as they are hatched, the caterpillars bore their way into the grain, and by means ofa web bind several grains together. Through these it bores minute passages and lives in them, devouring the substance of the grain. The larve ultimately withdraw to the angles and eorners of the granary; hence, wherever this pest is prevalent, care must be taken to keep the building free from dust,

cobwebs, &c. There isa member of the Coleoptera which is frequently mistaken for the above-mentioned pest. This beetle is known as Lrogosita mauritanica ; it is supposed to have been introduced from Africa. The larva is ¢ inch long, with a whitish body, bearing tufts of hairs and a brown head. It gnaws the corn grains and lives on their contents. The beetle is carnivorous, and is said to compensate for the damage its larva causes by devouring the above- mentioned Jinea granella.

Another beetle, Calandra granaria, the corn weevil, also attacks stored grain. The eggs are deposited in the grains of corn and the larva spends its life therein, living upon the substance of the grain, and ultimately turning toa pupa. It leaves the grain first upon attaining the mature state.

The larve of Elater (Agriotes) lineatus and of other species of this genus are amongst the most destructive insects known to agriculturists. They are commonly known as wire-worms from the exceedingly tough character of their skins. The mature beetles are known as skip-jacks, from the power they possess of regaining their normal position when placed on their back by means of a loose articulation between the pro-thorax and the meso-thorax. This when put in action causes the beetle to jump into the air, and they usually fall on their feet. The wire-worms have a rather flattened body, yellowish brown in colour ; it consists of twelve segments, and bears three pairs of legs. The larve live for several years, and then, burying themselves deep in the earth, emerge as the perfect insect in about a fortnight. The beetles pair in J une, and the female deposits her eggs upon blades of grass or the sheath-

ing leaves of corn. The best preventative for this pest is clean farming and scarifying the land after harvest, so as to kill all roots which might serve as food for the wire-worms. When a crop is badly attacked, soot or gas lime may be applied and the land well rolled to compress the earth. The numbers of the larve are to some extent kept down by moles aud insectivorous birds.

The cockchafer, Mclolontha vul- garis, is injurious to corn erops, in both its mature and its larval eon- dition. During the former state it devours

the leaves of wheat and of most other grasses, trees, and shrubs. The larva, which is very voracious, lives upon roots. This larva is very thick and fleshy, of a whitish hue, with three pairs of legs ; it usually lies in a eurled-up position. The +—-}-————“4 . larval condition lasts several years ; Fic. 6.—Wire-worm(Elater lineatus), but ultimately the larvae become showing insect and larva. pup, and in this condition live through the winter. Much may be done to prevent the spread of this pest by shaking the cock- chafers from the trees, amongst the leaves of which they hang, and destroying them. They are eagerly eaten by pigs and poultry.

An allied but much smaller species of beetle, Anisoplia horticola, with much the same habits as the above, also occurs in England, and attacks wheat and grass crops.

Millepedes, although they are not insects, but one of the groups which compose the larger division Zracheata, must be included in an account of the pests which attack wheat. The English species which is most destructive to wheat, barley, and oats is Polydesmus complanatius. Millepedes pass their life underground, and are sometimes mistaken for wire-worms, bnt can be at once distinguished by the great number of their legs. They affect damp places, which should be drained, and no rubbish or litter should be left lying about.

Ear-cockle is due to the parasitism of a small white nematoid worm, known variously as Anguillula (Vibrio) tritict or Tylenchus scandens or tritict. These worms eause the formation of a brownish black gall upon the wheat ear. When the ear ripens and falls to the ground, the nematodes escape from the gall and live in the damp earth. Ultimately they make their way on to a young plant, and, as the ear forms, they pass into it and pair inside the gall which has been caused by their presence. The female lays numerous eggs, from which young nematodes hatch out, until the gall is quite full of them. As long as the gall remains hard, the larve are motion- less ; but they become active in moisture, and develop into the adult state. If the surrounding conditions are unfavourable they will remain in the larval state for years. They are capable of resisting great

extremes of heat and cold, and are apparently un- affected by many poisons. Allied species affect the roots of wheat, grasses, and other plants.

For fungoid diseases, see Funaus, vol. ix. p. 831, and MiLpEw, vol. xvi. p. 293. (A. E. 8.)

WHEATEAR, as a bird's name perhaps of doubtful meaning,' though Taylor, the "water poet" (d. 1654), in whose writings it seems first to occur, and Willughby ex- plain it (in the words of Ray, the latter's translator) as given "because [in] the time of wheat harvest they wax very fat." It would seem also from this author to have been originally the local name for the species in Sussex, on the South Downs of which county its capture in a very simple kind of trap has been the occupation of many generations of shepherds, who thereby have made an excellent trade, since Wheatears in their proper season, from the end of July till towards the end of September, are justly esteemed for the table and fetch a price that for many years has been con- tinually rising owing to the failing supply, which is chiefly due to the bringing under tillage of so much of the sheep- walk, heath, down, and other open country that was formerly in a natural condition.

The Wheatear, the Saxicola enanthe of ornithologists, is one of the earliest migrants of its kind to return to its home, often reaching Sern eS ea i ae EE eg ne

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1 The vulgar supposition of its being an euphemism of an Anglo- Saxon name (cf. Bennett's ed. of White's Nat. Hist. Selborne, p. 69, note) must be rejected until evidence that sueh a name ever existed be addueed. It is true that " Whittaile" (ef, Dutch Wetstaart and French Culblane) is given by Cotgrave in 1611 ; but the older names, aecording to Turner, in 1544, of " Clotburd " (=Clod-bird) and Smateh (=Chat) do not favour the usual derivation. ' Fallow-chat" is another old name still loeally in use, as is " Coney-ehuck."*

England at the end of February and almost always by the middle of March. The cock bird, with his bluish grey back and light buff breast, set off by black ear-coverts, wings, and part of the tail, is rendered still more conspicuous by his white rump as he takes short flights in front of those who disturb him, while his sprightly actions and gay song harmonize so well with his delicately-tinted plumage as to render him a welcome object to all who delight in free and open country. When alarmed both sexes have a sharp monosyllabic note that sounds like chat; and this has not only entered into some of the local names of this species and of its allies, but has caused all to be frequently spoken of as " Chats." The nest is constantly placed under ground ; the bird takes advantage of the hole of some other animal, or the shelter of a clod in a fallow- field, or a recess beneath a rock. A large amount of soft materials is therein collected, and on them from 5 to 8 pale blue eggs are laid. The Wheatear has a very wide range throughout the Old World, extending in summer far within the Arctic Circle, from Norway to the Lena and Yana valleys, while it winters in Africa beyond the Equator, and in India. But it also breeds regularly in Greenland and some parts of North America. Its reaching the former and the eastern coast of the latter, as well as the Bermudas, may possibly be explained by the drifting of individuals from Iceland ; but far more interesting is the fact of its continued seasonal appearance in Alaska without ever showing itself in British Columbia or California, and without ever having been observed in Kamchatka, Japan, or China, though it is a summer resident in the Tchuktchi peninsula. Hence it would seem as though its annual flights across Bering's Strait must be in connexion with a migratory movement that passes to the north and west of the Stanovoi range of mountains, for Mr Nelson's suggestion (Cruise of the Corwen, pp. 59, 60) of a north- eet passage from Boothia Felix, where Ross observed it, is less ikely.1

More than 60 other species more or less allied to the Wheatear have been described,? but probably so many do not really exist. Some 8 are included in the European fauna ; but the majority are inhabitants of Africa. Several of them are birds of the desert ; and here it may be remarked that, while most of these exhibit the sand- coloured tints so commonly found in animals of like habitat, a few assume a black plumage, which, as explained by Canon Tristram, is equally protective, since it assimilates

them to the deep shadows cast by projecting stones and other inequalities of the surface.

Of other genera closely allied to, and by some writers included in, Saxicola there is only need here to mention Pratineola, which comprises among others two well-known British birds, the Stone- chat and Whinchat, P. rubicola and P. rubetra, the latter a summer- migrant, while the former is resident as a species, and the black head, ruddy breast, and white collar and wing-spot of the cock render him a conspicuous object on almost every furze-grown com- mon or heath in the British Islands, as he sits on a projecting twig or flits from bush to bush. This bird has a wide range in Europe, and several other species, more or less resembling it, inhabit South Africa, Madagascar, Reunion, and Asia, from some of the islands of the Indian Archipelago to Japan. The Whinchat, on the other hand, much more affects enclosed lands, and with a wide range has no very near ally.

Placed near these forms by nearly all systematists is the group containing the Australian genus Pctreca, containing about a dozen species,—the " Robins," so called of the colonists, some of them remarkable for their bright plumage ; and possibly allied to them, as indeed is generally thought, with 5 or 6 species peculiar to New Zealand, are the genera Miro and Myiomoira. But Prof. Parker has seen in the osteology of the first inferior characters which appear to him to separate them from their presumed colleagues, and, as stated before (ORNITHOLOGY, vol. xviii. p. 48), he terms them '""Struthious Warblers." Like so many other forms from the same countries, they probably preserve the more generalized structure of earlier and lower types, and should possibly be distinguished as a separate sub-family Petrecing.

All the birds mentioned in this article form the group Saxicoline of most authors. Some, however, have raised them to the rank of a distinct Family Saicolide (ef. – Warster) ; and Mr Sharpe (Cat. Birds Brit. Mus., iv. pp. 164-199) has placed Petreca and Pratincola in the Family Muscicapide. (A. N.

WHEATLEY, Francis (1747-1801), English portrait and landscape painter, was born in 1747 at Wild Court, Covent Garden, London. He

studied at Shipley's drawing-

school and the Royal Academy, and won several prizes

1 On this subject see also Dr Stejneger's observations in his "Ornitho-logical Exploration of Kamtschatka," in Bull. U.S. Nat. Museum, No, 29, pp. 349-351, and those of Prof. Palmén, Vega-Exped. Vetenskapl. lakttagelser, v. pp. 260-262.

2 Cf the monograph of Messrs Blanford and Dresser, in Proc. Zool. Society, 1874, pp. 213-241.

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from the Society of Arts. He assisted in the decoration of Vauxhall, and aided Mortimer in painting a ceiling for Lord Melbourne at Brocket Hall (Hertfordshire). In youth his life was irregular and dissipated. He eloped to Ireland with the wife of Gresse, a brother artist, and established himself in Dublin as a portrait-painter, executing, among other works, an interior of the Irish House of Commons, His scene from the London Riots of 1780 was admirably engraved by Heath. He painted several subjects for Boydell's Shakespeare Gallery, designed illustrations to Bell's edition of the poets, and practised to some small extent as an etcher and mezzotint-engraver. It is, however, as a painter, in both oil and water-colour, of landscapes and rustic subjects that Wheatley will be most favourably remembered. His work in these departments is graceful and pleasing, but lacks force and the impress of reality. He was elected an associate of the Royal Academy in 1790, and an academician in the following year. He died on 28th June 1801. His wife, afterwards Mrs Pope, was known as a painter of flowers and portraits.

WHEATON, Henry (1785-1848), American lawyer and diplomatist, was born at Providence, Rhode Island, on 27th November 1785. He graduated at Brown univer- sity in 1802, was admitted to the bar in 1805, and, after two years' study abroad, practised law at Providence (1807-12) and at New York City (1812-25). He was a justice of the Marine Court of the city

of New York from 1815 to 1819, and reporter of the United States Supreme Court from 1816 to 1827, aiding in 1825 in the revision of the laws of New York. His diplomatic career began in 1825, with an appointment to Denmark as chargé d'affaires, followed by that of minister to Prussia, 1835 to 1845. During this period he had published a Digest of the Law of Maritime Captures (1815) ; twelve volumes of Supreme Court Reports, and a Digest ; a great number of historical articles, and some collected works; Elements of International Law (1836); Histoire du Progrés du Droit des Gens en Europe (1841), translated in 1845 by William B. Lawrence as a History of the Law of Nations in Europe and America; and the Right of Visitation and Search (1842). The History took at once the rank which it has always held, that of the leading work on the subject of which it treats.2 Wheaton's general theory is that inter- national law consists of "those rules of conduct which reason deduces, as consonant to justice, from the nature of the society existing among independent nations, with such definitions and modifications as may be established by general consent." The publication of a second transla- tion by Dana in 1866 led to a prolonged lawsuit between him and Lawrence. In 1846 Wheaton, who was niore than sixty years of age, was requested to resign by the new president, Polk, who needed his place for another appointment. The request provoked general condemna- tion; but Wheaton resigned and returned to the United States. He was called at once to Harvard College as lecturer on international law; but he died at Dorchester, Massachusetts, on 11th March 1848.

WHEATSTONE, Str Cartes (1802-1875), the prac- tical founder of modern telegraphy, was born at Gloucester in February 1802, his father being a music-seller in that city. In 1806 the family removed to London. Wheat- stone's education was carried on in several private schools, at which he appears to have displayed no remarkable attainments, being mainly characterized by a morbid shy- ness and sensitiveness that prevented him from making friends. About 1816 he was sent to his uncle, a musical instrument maker in the Strand, to learn the trade ; but with his father's countenance he spent more time in read-

3 See Davis's Outlines of International Law, 26, and Woolsey's International Law (Index, under Wheaton).

ing books of all kinds than at work. For sorfle years he continued making experiments in acoustics, following out his own ideas and devising many beautiful and ingenious arrangements. Of these the "acoucryptophone" was one of the most elegant—a light box, shaped like an ancient lyre and suspended by a metallic wire from a piano in the room above. When the instrument was played, the vibra- tions were transmitted silently, and became audible in the lyre, which thus appeared to play of itself. On the death of his uncle in 1823 Wheatstone and his brother took up the business; but Charles never seems to have taken a very active part in it, and he virtually retired after six years, devoting himself to experimental research, at first chiefly with regard to sound. In 1823 he published his first paper, " New Experiments on Sound," in Thomson's Annals of Philosophy, and was greatly encouraged by the appreciative translations which appeared in several Con- tinental journals. Wheatstone's shyness still clung to him; for, although he occasionally read a paper to scientific societies when a young man, he never could become a lecturer. Hence many of his investigations were first described by Faraday in his Friday evening discourses at the Royal Institution. By 1834 Wheatstone's originality and resource in experiment were fully recognized, and he was appointed professor of experimental philosophy at King's College, London, in that year. This appointment was inaugurated by two events,—a course of eight lectures on sound, which proved no success and was not repeated, and the determination by means of a revolving mirror of the speed of electric discharge in conductors, a piece of work leading to enormously important results. The great velocity of electrical transmission suggested the possibility of utilizing it for sending messages; and, after many ex- periments and the practical advice and business-like co- operation of Cooke, a patent for an electric telegraph was taken out in their joint names in 1837. Wheatstone's early training in making musical instruments now bore rich fruit in the continuous designing of new instruments and pieces of mechanism. His life was uneventful except im so far as the variety of his work lent it colour. He became a fellow of the Royal Society in 1837; in 1847 he married ; and in 1868, after the

completion of his master- piece, the automatic telegraph, he was knighted. While in Paris perfecting a receiving instrument for submarine cables, Sir Charles Wheatstone caught cold, and died on 19th October 1875.

; Wheatstone was enthusiastic in his work ; and, in spite of the invincible repugnance to public speaking, he could explain his machines and describe results to his friends with animation and remarkable clearness. Owing to the cast of his mind he could only undertake work with some distinct end or definite application in view ; hence he applied himself chiefly to the useful embodi- nent of scientific principles, and to researches designed to throw light on such subjects as the interference of mental impressions with the evidence of the senses. As a natural consequence of the nervous enthusiasm which possessed him, several researches which had been commenced, and sometimes carried to a considerable dis- tance, were relinquished as new sources of interest presented them- selves, and remained unfinished at his death. Many of his ideas were expanded and appropriated by other workers, more persever- ing, if less original, who carried them into effect. Wheatstone's physical investigations are described in more than thirty-six papers in various scientific journals, the more important being in the Philosophical Transactions, the Proceedings of the Royal Society, the Comptes Rendus, and the British Association Reports. They natur- ally divide themselves into researches on sound, light, and elec- tricity, but extend into other branches of physics as well. But his best work by far was in the invention of complicated and delicate mechanism for various purposes, in the construction of which he employed a staff of workmen traincd to the highest de- gree of excellence. For his insight into mechanism and his power over it he was unequalled, except perhaps by Babbage. A crypto- graphic machine, which changed the cipher automatically and printed a message, entirely unintelligible until translated by a duplicate instrument, was one of the most perfect examples of

this. Cryptography had a great fascination for Wheatstonc ; he studied it deeply at one time, and deciphered many of the MSS. in the British Museum which had defied all other interpreters. In acoustics his

*principal work was a research on the transmission of sound through solids (see TELEPHONE), the explanation of Chladui's figures of vibrating solids, various investigations of the principles of acoustics and the mechanism of hearing, and the invention of new musical instruments, ¢.g., the concertina. The kaleidophone, intended to present visibly the movements of a sonorous body, consisted of a vibrating wire, which could be varied in length, carrying a silvered bead reflecting a point of light. The motion of the bead was thus shown by persistence of the successive images on the retina, and mazy lines of light traced ont its successive posi- tions. A photometer was constructed on the same principle. In light there are a series of papers on the eye, on the physiology of vision, on binocular vision, including the invention of one of the most popular of scientific toys, the STEREOSCOPE (g.v.), and on colour. The polar clock, devised for use in place of a sun-dial, applies the fact that the plane of polarization of sky light is always 90° from the position of the sun; hence by measuring the azi- muthal angle of the plane, even when the sun is below the horizon, correct apparent solar time may be obtained. In 1835, in a paper on '*The Prismatic Decomposition of Electrical Light," he proved that sparks from different metals give distinctive spectra, which could be used as a means of detecting them. This is the funda- mental expcriment of chemical analysis by spark spectra. But it is by his electrical work that Wheatstone will best be remembered. Much of this, such as the famous "bridge" for measuring resist- ances that bears his name, will be found described under ELxc- TRICITY (vol. viii. p. 44). He not only guided the growth of scientific telegraphy on land wires, but made the carliest experi- ments with submarine cables, foreseeing the practicability of this means of communication as early as 1840. For short descriptions of the 'A, B, C" telegraph instrument—so popular before the introduction of the telephone—and of the automatic transmitter, by which messages may be sent at the rate of 500 words a minute, sce TELEGRAPH. He also devised printing telegraph receivers of various forms, electrical chronoscopes, and many fornis of electrical recording apparatus,—amongst others two sets of registering me- teorological instruments, of which the earlier, described in 1842, was afterwards developed by Secchi and Van Rysscl berghe (see THERMOMETER, vol. xxiii. p. 293), but the later, put forward in*

1867, included metallic thermometers and was less successful.

Wheatstone's Scientific Papers were collected and published by the Physical Society of London in 1879. The best biographical notices of him will be found in Afin. Proc. Inst. C.E., vol. xvii. p. 283, and Proc. Roy. Soc., vol. xxiv. p. xvi. For Wheatstone's connexion with the growth of telegraphy, see Nature, xi. p. 510, and xii. p. 30 sq.

WHEELING, a city of Ohio county, West Virginia, U.S., the largest and most important in the State, stands on the eastern bank of the Ohio and on an island in the river, in what is popularly known as the " Pan-Handle." The main portion of the city les in the bottom land, 40 to 50 feet above low water in the river, and, on an average, about 650 feet above the sea. Immediately east of it the bluffs rise to a height of 400 feet above the river. The island portion is connected with the mainland by a fine suspension bridge, 1010 feet long. The surrounding country is quite open and well cultivated, being timbered only on the hillsides ; cereals and tobacco are the principal crops, and wool is largely grown. Wheeling has railway connexions eastward by the Baltimore and Ohio line to Baltimore and Washington ; westward by the same line and by the Pittsburg, Cincinnati and St Louis; northward by the Cleveland and Pittsburg; and southward by the Ohio River Railroad. The Ohio, which is navigable to Pitts- burgh, furnishes another means of communication. The depth of water in front of the city ranges from 20 inches at the lowest stage to 30 or 40 feet during floods, while the width of the river varies from 100 to 1000 feet. The principal manufacturing industries are those of iron and steel, which employ some 2600 persons or about one-twelfth of the population. Wheeling is popularly known as the "nail city" from the large quantity of cut nails made in its workshops. It has also manufactories of glass and queens- ware, wine (from home-grown grapes), cigars and tobacco, lanterns, and leather, as well as breweries. The city has a large market for ginseng, which is exported almost ex- clusively to China. The population of Wheeling in 1880 amounted to 30,737, of whom one-fifth were foreign-born.

The first settlement (Fort Fincastle) on the present site of Wheel- ing was made in 1769. In 1776 its name was changed to Fort Henry ; it was twice besieged by the British and Indians, in 1777 and 1782. It was incorporated asa village under its present name in 1806, and in 1836 it received a city charter. Upon the forma- tion of the State of West Virginia in 1863 Wheeling was made the capital. In 1870 this dignity was conferred upon Charleston ; in 1875 it was restored to Wheeling, but lost again in 1885 to Charleston. The following figures illustrate the growth of Wheel- ing :—population in 1810, 914; in 1820, 1567 ; in 1840, 7385; in 1860, 14,083 ; in 1870, 19,280; and in 1880, 30,737.

WHEWELL, Witu1am (1794-1866), philosopher and historian of science, was born on 24th May 1794 at Lan- caster, Where his father was a house-carpenter. He was educated at the blue school and the graminar school of Lancaster, and afterwards at Heversham grammar school, where he obtained the exhibition which enabled him to enter Trinity College, Cambridge, in October 1812. For the remainder of his life his home was within the walls of Trinity. He graduated as second wrangler'in 1816, was elected fellow in 1817, appointed a mathematical lecturer in the following year, and in due course became one of the college tutors. From 1828 to 1832 he held the professor- ship of mineralogy and from 1838 to 1855 that of moral philosophy, or (as it was then called) moral theology and casuistical divinity. In 1841 he was appointed master of the college on the resignation of Dr Wordsworth. He died on 6th March 1866 from the effects of a fall from his horse.

Soon after taking his degree Whewell began to lay the foundation of his reputation by great and varied activity as an author, as well as by the prominent part he took in all matters educational and constitutional concerning the college and university. His first work, An Elementary Treatise on Mechanics (1819), was influential—along with the works of Peacock and Herschel—in reforming the traditional method of mathematical teaching in Cam- bridge; and it was also largely due to him that, at a later period (1856), the circle of Cambridge studies was widened by the admission of the moral and natural sciences to an academic position. On the other hand, his attitude with respect to questions of university and college reform was (especially in later life) conservative.

Claiming to be a refornter, he had yet no sympathy with the constitutional changes proposed at the time, and since commonly accepted as desirable and necessary. He upheld strenuously the tutorial system, while endeavouring to im- prove its efficiency ; he opposed the admission of Dissenters to the university in a controversy with Thirlwall (1834) ; he defended the system of clerical fellowships, the custom which admitted a privileged class of students under the name of "fellow-commoners," and the large powers which the " caput " or head of a college then possessed in university government. The appointment of the University Commis- sion in 1850 encountered his opposition, and the proposed reform of the university in 1855 called forth from him two pamphlets of hostile Memarks. The reform really wanted was, he contended, to encourage scientific and professorial work, and to utilize the college funds, not to put elections in the hands of the members of senate.

In the summer of 1826, and again in 1828, Whewell was engaged along with Airy in conducting experiments in Doleoath mine, Cornwall, in order to determine the density of the earth. Their united labours were unsuccess- ful, and Whewell did little more in the way of experimental science. He was the author, however, of an Essay on Mineralogical Classification, published in 1828, and con- tributed various memoirs on the tides to the Philosophical Transactions of the Royal Society between 1833 and 1850. But it is on his History and Philosophy of the Sciences that his claim to an enduring reputation mainly rests. The His- tory of the Inductive Sciences, from the Earlvest to the Present

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Time appeared originally in 1837. Whewell's wide ac- quaintance with various branches of science—though he cannot be said to have been a specialist in any department —enabled him to write a comprehensive account of their development, which has not yet been superseded, although it may want the thoroughness, and even in many respects the accuracy, of various subsequent histories of the special sciences. In his own opinion, moreover, the History was to be regarded as an introduction to the Philosophy of the Inductive Sciences (1840). The latter treatise 1 analyses the method exemplified in the formation of ideas, in the new

inductions of science, and in the applications and systematization of these inductions, all exhibited by the History in the process of development.

The Philosophy is described by the author as "an application of the plan of Bacon's Novwm Organum to the present condition of physical science," and as an attempt "to extract from the actual past progress of science the elements of a more effectual and snb- stantial method of discovery" than Bacon's. The Philosophy is divided into two parts, treating respectively of ideas and of know- ledge. The first part begins with an investigation of ideas in general, analysing the fundamental nature of scientific truths, the grounds of our knowledge of them, and the mental processes by which they are ascertained, and then applies these general prin- ciples to the philosophy of each of the subdivisions of science adopted in the History. The second part discusses knowledge or the construction of science, the processes by which our conceptions are brought to bear on facts, binding them together into ideal com- binations. By the "explication of conceptions" the ideas appro- priate to particular classes of facts are brought forward and ex- plained ; and by the "colligation of facts" the conceptions involving those ideas are united to the facts for the construction of science. But no art of discovery, such as Bacon anticipated, follows from the analysis of the method of scientific discovery ; for the elements of "invention, sagacity, genius," are needed at each forward step in scientific progress. At the same time Whewell claimed that the methods exhibited in his analysis were, not only the methods by which discoveries had actually been made, but also as definite and practical as any that had been put forward. The process of induction (or colligation of ascertained facts into general proposi- tions) is analysed into three steps,—(1) the selection of the (funda- mental) idea, such as space, number, cause, or likeness; (2) the formation of the conception, or more special modification of those ideas, as a circle, a uniform force, &c.; and (3) the determination of magnitudes. Upon these follow special methods of induction applicable to quantity, viz., the method of eurves, the method of means, the method of least squares, and the method of residues, and special methods depending on resemblance (to which the transition is made through the law of continuity), viz., the method of gradation and the method of natural classification.

Whewell's philosophy of science, as well as his ethical doctrine, was conditioned by opposition to the empirical tendency then preva- lent amongst English thinkers. In this he was influenced by the results of the Kantian philosophy. He maintained the distinction between necessary and contingent truths,—the former involved in the innate constitution of the mind, the latter coming from experi- ence. It is on this reference to the mind of what the current English philosophy attempted to derive from impressions of sense that the leading positions of his philosophy depend, and on it hinges the controversy between himself and J. 8. Mill. He de- fended the a priori necessity of axioms attacked by the latter, and in his inductive theory attributed more importance to the function of the mental] idea in the colligation of facts than Mill did, while he would have dispensed with the inductive methods of Mill by his rules for the construction of conceptions.

Between 1835 and 1861 Whewell was the author of various works on the philosophy of morals and politics, the chief of which, Ele- ments of Morality, ineluding Polity, was published in 1845. The peculiarity of this work—written, of course, from what is known as the intuitional point of view—is its fivefold division of the springs of action and of their objects, of the primary and universal rights of man (personal security, property, contrast, family rights, and government), and of the cardinal virtues (benevolence, justicc, truth, purity, and order). Among Whewell's other works—too numerous to mention—reference must be made to writings popular in their day, such as the Bridgewater Treatise on Astronomy (1833), and the essay, Of the Plurality of Worlds (1854), in which heargued

1 Afterwards broken up into three parts published separately ely) the History of Scientific Ideas (1858), substantially a reproduction of the first part of the Philosophy; (2) the Novum Organum Renovatum (1858), containing the second part of the same work, but without the historical review of opinions, which was issued with large additions as (3) the Philosophy of Discovery (1860).

against the probability of planetary life, and also to the Platonic Dialogues for English Readers (1859-61), to the Lectures on the History of Moral Philosophy in England (1852), to the essay, Of a Liberal Education in General, with particular reference to the Leading Studies of the University of Cambridge (1845), to the important edition and abridged translation of Grotius, De Jure Belli et Pacis (1853), and to the edition of the Mathematical Works of Isaac Barrow (1860).

Full bibliographical details are given by Isaac Todhunter, W. IV. hewell: an Account of his Writings, 2 vols. (1876). The Life of IV. Whewell has been written by Mrs Stair Douglas (1881).

WHIG AND TORY. Parliamentary parties came into existence in England as soon as parliament achieved or aimed at predominance in the state. In 1641, shortly after the meeting of the Long Parliament, they were divided on the question of church reform, passing, as soon as political questions were involved, into Cavaliers and Roundheads. After the expulsion of the Cavaliers in 1642 and 1643 the Houses were divided into a peace party and a war party, and these in 1643 took the shape of Presbyterians and Independents. After the Restoration there was a country party and a court party, and to these the names of Whig and Tory were applied in 1679, in the heat of the struggle which preceded the meeting of the first short parliament of Charles IJ. The words were nicknames given by the opponents of each party. To call a man a Whig was to compare him with the Presbyterian rebels of the west of Scotland. To call a man a Tory was to compare him with the Papist outlaws of Ireland. In fact, at this time the Whigs were maintainers of parliamentary power over the crown and of toleration for Dissenters, the Tories maintainers of the hereditary indefeasible rights of the wearer of the crown and of the refusal of toleration to Dissenters. The relation between the parties was further qualified by the fact that the heir to the crown was a Roman Catholic, whose claim to succeed was defended by the Tories and assailed by the Whigs.

The persistency of the names of the two parties is mainly owing to their unmeaningness. As new questions arose, the names of the old parties were retained, though the objects of contention were no longer the same.

The Revolution of 1688-89 made it impossible for the Tories to retain their old attitude of attachment to the hereditary right of the occupant of the throne, with the exception of the extreme wing of the party, which remained Jacobite. They still, however, continued, though accepting the Toleration Act, to oppose the offering of further favours to Dissenters. In Anne's reign, after the war with France had gone on for some time, they supported a peace policy, whilst the Whigs advocated a continuance of the war. On the whole, during the last years of the 17th and the first years of the 18th century the Whigs may be regarded as the party of the great landowners, and of the merchants and tradesmen, the Tories as the party of the smaller land- owners and the country clergy. The Whigs established, through their hold upon the boroughs under the influence of the great landowners, a firm government, which could keep in check, and at last practically set aside, the power of the crown. The Tories, distrusting the authority of the ministerial Government, and fearing a new despotism based on parliamentary corruption, became, especially after Bolingbroke's return from exile, almost democratic in their views and in their demands for the purification of the existing system.

With the accession of George III. Toryism took a new form. The struggle about the Dissenters was now a thing of the past, and the king was accepted as a leader in carrying on the attack against the power of the great Whig families. The attack was the easier because the Whig families had split into factions. For some time the divid- ing line between Whigs and Tories was this: the Tories asserted that the king had a right to choose his ministers

and control their policy, subject to the necessity of securing a majority of the House of Commons, whilst the Whigs thought that the choice should lie with leading members of parliament, and that the king should have no controlling power. The Whig view appears to resemble that subse- quently adopted ; but in the middle of the 18th century the corruption which prevailed rendered the analogy worth- less, and the real conflict was between the corrupt influence of the crown and the influence of a clique of great land- owners resting on their possession of electoral power

through the rotten boroughs. In 1770 the king had his way and established Lord North at the treasury as his nominee. The Whigs, deprived of power, improved their position by the loss of one great instrument of corruption ; but they were weakened by the establishment of two dis- tinct currents of opinion in their own ranks. The main body under Rockingham was influenced by Burke to de- mand practical reforms, but set its face against any popular changes in the constitution. The Whigs who followed Chatham wished to place parliament on a more popular basis by the reform of the House of Commons. When in 1783 Chatham's son Pitt became prime minister, the Tory party took a new start. It retained the Tory principle of reliance on the crown, and joined to it Chatham's principle of reliance on the people as opposed to the great Whig families. It also supported Pitt in practical reforms.

All this was changed by the French Revolution. In opposition to the new democracy, the Tories coalesced with a section of the Whig families, the representatives of which entered the ministry in 1794. From this time till 1822 Toryism was synonymous with a desire to retain the existing state of things, however full of abuses it might be. When Canning and Peel entered the ministry in 1822, a gradual change took place, and a tendency to practical reform manifested itself. The refusal of Wellington to listen to any proposal for altering the constitution of the House of Commons threw power once more into the hands of the Whigs in 1830. Shortly afterwards the name Tory gave place to that of Conservative, though of late years there has been an attempt to revert to it by those Con- servatives who wish to assert their power of originating a definite policy, and who do not like to be branded with a purely negative appellation. The name of Whig on the other hand was replaced by that of Liberal, being assigned for some time to the less progressive portion of the party, and thus, by becoming a term of reproach, threatening entirely to disappear.

WHIRLPOOL, a hollow in running water, caused or accompanied by a whirling motion which attracts and engulfs floating objects. The popular conception of a whirlpool was probably based on the ancient accounts of that of Charybdis, strengthened by exaggerated rumours of the Milstroém in the Lofoten Islands, and, in Great Britain at least, largely consolidated by the legends of Corrie- vreckan. The various reports of travellers and

descriptions of poetical "philosophers" as to the appearance of the Malstrém were faithfully collated and thrown into stereo- scopic relief by Edgar Allan Poe in his celebrated story. He describes how, with the rise of the tide, "the current acquired a monstrous velocity. . . . The vast bed of the waters, seamed and scarred into a thousand conflicting channels, burst suddenly into frenzied convulsions—heav- ing, boiling, hissing—gyrating in gigantic and innumerable vortices, and all whirling and plunging on to the eastward with a rapidity water never elsewhere assumes, except in precipitous descents. In a few minutes more there came over the scene another radical alteration. .. . The gyratory motions of the subsided vortices seemed to form the germ of another more vast. Suddenly—very suddenly—this assumed a distinct and definite existence, in a circle of over

Wort teil P Om L

a mile in diameter. The edge of the whirl was represented by a broad belt of gleaming spray; but no particle of this slipped into the mouth of the terrific funnel, whose interior, as far as the eye could fathom it, was a smooth, shining, and jet-black wall of water, inclined to the horizon at an angle of some 45°, speeding dizzily round and round with a swaying and sweltering motion, and sending forth to the winds an appalling voice, half shriek, half roar, such as not even the mighty cataract of Niagara ever lifts up in its agony to heaven." Nothing could escape the violence of such a vortex. Whales caught in it were swallowed down, and the largest ship was engulfed as easily as the smallest boat. After an hour or two the funnel slowly filled, and the fragments of the vessels which it had sucked down were thrown up, dashed to pieces against rocks at an un- known depth. Bearing such a reputation, whirlpools were naturally avoided by the mariner; and their real nature long remained unknown.

It was supposed that every whirlpool formed round a central rock ; under it opened a great cavern or gulf, down which the waters rushed, and so the whirling was produced as in a basin emptying through a central hole. This notion was developed by Athanasius Kircher (1602-80). In his theory whirlpools marked the entrances to subterranean channels connecting different seas, and the phenomena of tides were produced by the alternate

flow of water in opposite directions. Kircher gives a curious diagram of the Malstrém or "umbilicus maris," illustrating his sup- position that the water, after pouring into the vast funnel, flowed along a channel under the Scandinavian peninsula and rose in the Gulf of Bothnia. When the level of this gulf had been raised to a sufficient height, he thought that the current was reversed, and, aided by a stream pouring through a subterranean tunnel from the White Sea, raised the tide on the coast of Norway. Carrying his theory a degree farther to account for the Gulf Stream and the Antarctic drift, Kircher, with great ingenuity, placed a grand vortex at the North pole, down which all the water of the ocean tumbled, and, passing through the earth's axis, emerged at the South pole, thus keeping up "a circu- lation like that of the blood in the human body."

The facts which gave rise to the wild theories of medizeval geographers and the extravagant descriptions of early voyagers are impressive enough in themselves to rank amongst the grandest phenomena of nature. No one wlio has seen the tide-streams racing through the Pentland Firth at 12 miles an hour, now swirling along with a smooth dimpled surface, like molten glass, now meeting the counter- current and leaping high into the air in columns of water and spray, or who has heard the roar of Corrievreckan as the Atlantic tide rushes between Scarba and Jura against an easterly gale, will be disposed to deny the terrible danger to small open vessels or to wonder that horror strengthened imagination to the confusion and exaggeration of fact.

The formation of whirlpools is a natural result of water flowing rapidly in an irregular channel (see Hyprome- CHANICS, vol. xii. pp. 468, 510); it takes place in all rivers and in every tide-race of the sea, the depth, diameter, and velocity depending on accidental causes. The form of the surface of an ordinary whirlpool is given by Prof. J. Thomson! as that generated by the revolution of a curve whose formula is y = c?/a?, where y is the depth of any point on the curve below the general level remote from the whirl, x the distance of the point from the axis of revolution, and caconstant. Every point on the surface moves with the velocity a heavy body would attain in falling from the general level of the water surface to

that point, and any point in the interior of the revolving mass has a velocity equal to that of the point on the surface immediately above

! Brit. Assoc. Rep., 1852, Sections, p. 130.

itself. Prof. Thomson applied his researches on the motion of whirlpools to the construction of a particularly effective form of turbine.?

All the famous whirlpools are situated in channels essentially similar in configuration and in tidal phenomena : their vortices are produced at certain phases of the tide or with certain directions of the wind; and they are all dangerous to navigation, but the danger is due to the cause which produces the whirlpools—the tidal race—not to the "roaring wells" themselves. Whirlpools in a tidal stream are not stationary, but travel along with the current, fill- ing up and again forming in irregular succession. Small boats have repeatedly been drawn into these vortices in the northern fjords and capsized ; and trading steamers in passing through a tideway are violently deflected from their course. It is on record that a seventy-four gun ship has been whirled right round in the vortices of the Straits of Messina. The fishermen of the Norwegian fjords and of the northern island groups,—Lofoten, Faroe, Shetland, and Orkney,—still believe that, if they can throw a heavy or bulky object into a whirlpool, it will close up without harming their boats. Lithgow in his 7'ravels, speaking of the Pentland Firth, says, "I denote this credibly, in a part of the north-west end of this gulf there is a certain place of sea where these distracted tides make their rencountering rendezvous, that whirleth ever about, cutting in the middle circle a sloping hole, with which, if either ship or boat shall happen to encroach, they must quickly either throw over something into it, as a barrel, a piece of timber, and such like, or that fatal euripus shall then suddenly become their swallowing sepulchre." This custom, it has been supposed, is sacrificial in its origin. Its continued prac- tice, however, suggests what is probably the case, that the bulky object splashing into the whirl breaks the continuity of the surface and causes a collapse or filling-up. In windy weather, when there is a broken sea, vortices are not formed. The tidal stream passing through the irregular channels between islands gives rise to a complicated series

of eddies and counter-currents, which, according to the British Admiralty's Sailing Dzrections, make navigation dangerous, except when guided by local knowledge and © aided by fair wind and a favourable tide. The general effect appears to be that, as the tide rises, the strength of the stream increases ; and the counter-currents set up along the shore, as well as the overfalls produced by inequalities of the bottom, thoroughly mix the water to a depth of from 50 to 100 fathoms. This has been proved by observations of temperature amongst the tidal currents off the Mull of Cantyre, where at all times of the year there is no differ- ence between the surfaceand bottom temperature. At high water a state of rest ensues; and ebb tide usually reverses the order of phenomena, the main stream, counter-currents, and eddies running in the opposite direction, but with nearly equal strength, until low tide brings another pause.

Charybdis, a whirlpool famous in classical literature, is situated in the Straits of Messina. The rise of tide at Messina does not ex- ceed one foot, but the current may attain the velocity of nearly 6 milesan hour. Where the north-going flood tide meets the south- running counter-current, and where the southerly ebb meets its induced northerly stream, great eddics or garofola are formed, one of which is Charybdis. These depend very much on the wind for the intensity of their phenomena.

In ancient maps of the united Aral-Caspian Sea two whirlpools are represented. Near the position laid down there are in the river Amu-Daria two whirlpools at the junction of several channels. These have been recently examined? and found to arise from the river flowing over two conical hollows in its bed, respectively 120 and 60 feet deep; these do not appear to have been formed by running watcr, but closely resemble craters of mud volcanoes.

The most violent tidal current is said to be that of Salten Fjord to the south of Bodé on the north-west coast of Norway, eee a EE eee

2 Brit. Assoc. Rep., 1852, Report, p. 317. 7 8 Wood, in Journ. Roy. Geogr. Soc. (1875), xlv. p. 372.

known by the name of the Salteustrém, and dreaded on account of its turbulence and its numerous vortices. Opposite Salten Fjord, on the western side of Vest Fjord, the wild jagged range of the Lofoten Islands runs like a row of shark's teeth from south to north. Between two of the southernmost of the group, Moskenzs and Moskcen, runs the Moskenstrom, a tidal current which after low water commences to flow towards the north-east, then gradually changes its direction to east, to south, and at high water to south- west ; after half an hour's cessation the ebb begins to flow towards the south-west, at half ebb due west, and theu gradually turns through north to north-east at low water. The current thus rotates round Mosken once in 12 hours. It runs with a velocity of 7 miles an hour when a strong wind blows in the same direction, and, as the sea-bed is very irregular and rises abruptly from 200 fathoms seaward of Mosken to 20 fathoms in the channel and Vest Fjord, the flow is very turbulent, with occasional whirlpools and opposing currents set up along the shore, giving it a character very similar to that of the Strait of Messina. This is the place of the Malstrém.

In the Faroe Islands several dangerous tide-races exist in which are dreaded whirlpools, the two worst being the Querne off Sand Island and one round the rock of Sumboe-musk off Siider Island.

The Shetland and Orkney Islands are traversed by a system of formidable tideways called roosts, dangerous to fishing boats and very frequently forming whirlpools. It is sufficient to refer to the swiths or wells of Swona in Orkney, to the whirlpool of the Swelchie off Stroma, and the Merry Men of Mey, also in the Pent- land Firth. The channel of Jura Sound in the Hebrides, which contains Corrievreckan whirlpool, resembles that of Mosken and Messina in being narrow and of very irregular configuration. The sea to the west is about 70 fathoms deep ; a trough over 50 fathoms in depth and quarter of a mile wide runs through towards the east, deepening about the centre to 105 and 120 fathoms in consecutive holes. The channel is less than a mile in width, and the water is shallow (15 to 20 fathoms) from the shore out to the central trough, where the deepening is abrupt. To this fact, and not to the supposed existence of "a submerged rock of pyramidal form shooting up froma depth of 100 fathoms," are due, in all probability, the tidal stream,

rnnning sometimes at 9 miles an hour, and the great vortices which are occasionally formed, as well as the danger- ous counter-currents and overfalls.

Folklore.—Many marvellous stories are told of the dwellers in whirlpools. Fish are supposed to be more abundant there than anywhere else. Whales have from earliest times been associated, if not confounded, with these gulfs ; and all manner of sea-beings, —krakens, trows (trolls), and mermaids,—claim sanctuary beneath the turmoil. Ramus, two centuries ago, tried by dint of misapplied philological ingenuity to identify Charybdis with the Malstrém, alleging that the fact of Ulysses's voyage to northern seas was plainly recorded in the names of islands and headlands. For the myth of Charybdis, see ScyttA aND CHaRyBDIS. Whirlpools have been brought forward to explain the origin of the tides ; but a well-known Norse folk-tale in one of its forms gives to a particular vortex—the Swelchie—an additional and more important office, that of maintaining the salinity of the ocean. ' Malstrém"' (mill- stream) probably refers to the rapid current resembling a mill-race. The Querne in the Faroe Islands suggests the same idea from its name. A mist of poetical romance has always played over the roaring surges of Corrievreckan, and this finds expression in many poems and tales. Horrible sea-monsters made the gulf their home in the earliest times ; but they gave place to the seductive mer- maid who captivated a Macphail of Colonsay, and entertained him in her coral caves and fairy palaces beneath the sea for many years, Scott in his Border Minstrelsy gives another version of this story, in which Macphail outwits the mermaid and remains faithful to the maid of Colonsay. The name of the whirlpool is sometimes derived from cote bhreacen, '*the speckled cauldron," referring to the foam that usually variegates its surface; but the legend makes it the corry or gulf of Vrekan, a prince of Norway, who, having come there to wooa Hebridean chieftain's daughter, was swept into the whirlpool, and drawn down from sight for ever. George Mac- donald has embodied this legend in a highly dramatic poem.*

Literatwre.—References to whirlpools occur incidentally in many places. Sce A. Kircher's Mundus Subterraneus, vol. i., Amsterdam, 1664; Pontoppidan's Natural History of Norway, 1755 (this work cites the

opinions of earlier writers Ramus, Arraboe, &e.). For a good description of Charybdis, see Nicholson's Journal, vol. i. (1798) p. 12 > Of Corrievreckan, Athenwum, 3d September 1864, Full and trustworthy details of the actual state and dangers of special whirl-

pools will be found in the Sailing Directions or Coast Pi riti miralty for the various seas. fe ia a

WHIRLWIND. See Mrrzoroxocy, vol. xvi. p. 129 sq. WHISKY, or WuisKEy, a spirit distilled for drinking which originated, at least so far as regards the name,} with the Celtic inhabitants of Ireland and Scotland; and its manufacture and use still continue to be closely associated 1 Celtic wisge (water); the term in its present use is probably an

abbreviation of "usquebaugh" (wisge-beatha, "water of life"), Cf. Skeat, Etym. Dict., s.v.

with these two countries. Distilled spirit first became popularly known as aqua vite, and it was originally used only as a powerful medicinal agent. It was not till about the middle of the 17th century that it came into use in' Scotland as an intoxicating beverage. In August 1655 the town council of Glasgow issued regulations for persons who should 'brew, sell, and tap ail and acquavite," and in 1656 the town treasurer was indemnified for "'aquavytie sent to ane friend." In 1660 an excise duty was first im- posed on "acquavitze" consumed in England; but not till the year 1684 was any record kept of the quantities on which duty was charged. In that year duty was paid on the considerable quantity of 527,492 gallons. The con- sumption thereafter rose with great rapidity, reaching one million gallons at the end of the century, and in 1743 the enormous quantity of 8,200,000 gallons was consumed. Meantime the evils of the traffic had induced the legislature to pass, in 1736, the Gin Act (see Gtx) with the view of checking the demoralization attendant on the drinking habits of the people. It was principally in the form of gin that distilled spirits were consumed in England ; but gin is nothing else than a rectified and specially flavoured variety of whisky. In Scotland and Ireland the attempts of the excise authorities to control the distillation of

whisky, and to derive revenue from it, led to unlimited smuggling and open evasion of the law, and it was not till well into the 19th century that efficient regulations and energetic supervision brought the traffic in these countries under public control. Indeed illicit distillation is still extensively practised in Ireland, where the detec- tions average more than eight hundred yearly.

It is not easy at the present day to define whisky. Originally it was made from malted barley, the fermented wort from which was distilled in the common pot-still (see DIsTILLATION, vol. vii. p. 264) ; but with the introduction of the Coffey and other continuous stills, which yield a "silent" or flavourless spirit, it has become possible to prepare alcoholic liquor, which is sold as whisky, from any cereal grain, malted or unmalted, and from potato starch, grape sugar, and numerous other starch and sugar yiclding substances. As a rule, however, whisky is made from grain, and by preference from barley, malted or raw. The bulk of the whisky made in the United Kingdom can be separated into three classes. (1) Malt whisky is the product of malted barley alone, distilled in the ordinary pot-still. Its flavour is partly due to the circumstance that the malt is dried over a peat fire; and a spirit so prepared con- stitutes the pure Highland malt whisky of Scotland. (2) Grain whisky, under which heading comes the bulk of the Irish whisky of commerce, is made in the pot-still, principally from raw barley, with only a small proportion of malted barley to favour the trans- formation of starch into sugar in the preparation of the wort. (3) Plain spirit is produced from barley, rice, aud other cereals dis- tilled in the Coffey patent still. Plain spirit forms the basis from which gin, British brandy, and other rectifier's drinks are prepared ; and it is used for blending with other flavoured pot-still spirits, to produce a certain character of potable spirit sold by wholesale dealers and known by special blend names. It is only the finer qualities of matured malt and grain whisky that can be used as single or unblended spirit. In the United States whisky is distilled chiefly from corn and rye, wheat and barley malt being used, though only to a limited extent. When spirit is distilled as whisky, it retains the natural principles which impart an agreeable flavour to the beverage ; for the fuse] oil, which is contained in alcohol, and is acrid to the taste and stupefying in its effects, is to a great extent extracted. Whisky is greatly improved by age; it is not mellow,

nor its flavour agreeable, until it is several years old. In its original state it is almost colourless, but it derives a reddish hue from the wood of the barrels into which it is drawn, the inner surfaces of which are usually charred to facilitate the colouring.

In the financial year ending 31st March 1886 there were in England 10 distilleries, in Scotland 127, aud in Ireland 27. The quantity of spirits distilled in that year in the United Kingdom was 38,961,842 gallons; the number of gallons consumed as bever- age was 26,342,851 (England 15,290,816, Scotland 6,297,365, Ire- land 4,754,670) ; the quantity exported was 2,808,198 gallons ; and the stock held in bonded stores at the end of 1885 was 64,405,817 gallons, The total excise revenue from the manufacture, sale, and consumption of British spirits was £13,140,695, a considerable de- crease on previous years; and distilled spirits are now a steadily declining source of public income.

Triumph or trunip.

Ruff-and honours.

W HI—-W HI

Distilled spirits in the United States are the principal, and an increasing, source of internal revenue. In the fiscal year ending 30th June 1887 there were in the United States 969 grain distil- leries ; and the quantity of spirits distilled in that year (including whisky, alcohol, high-wines, and cologne or neutral spirits, and excluding fruit-brandy) was 77,831,599 gallons. The stock of spirits remaining in bonded warehouse on 30th June 1887 was 65,145,269 gallons. The total revenue from the manufacture and sale of dis- tilled spirits for the fiscal year ending 30th June 1887 was $65,829,322. This includes the tax upon whisky, fruit-brandy, alcohol, high-wines, cologne spirits, and rum. The revenue from the manufacture of whisky alone was $2,263,718,070.

WHIST, a game at cards. The etymology of the name is disputed ; probablyit is of imitative origin, from "whist " (hist, hush, silence), the game being so named because of the silence required to play it attentively.

In the 16th century a card game called triwmph or trump (corrupted from "triumph ") was commonly played in Eng- land. A game called trionji is mentioned as early as 1526, and triumphus Hispanicus in 1541. La triomphe occurs in the list of games played by Gargantua (Rabelais, first half of 16th century). In Florio's Worlde of Wordes (1598) trionfo is defined as "the play called trump or ruff." It is probable that the game referred to by the writers quoted is la triomphe of the early editions of the Académie des Jeux. It is important to note that this game, called by Cotton "French ruff," is similar to écarté. " English ruff-and-honours," also described by Cotton, is similar to whist. If we admit that ruff and trump are convertible terms, of which there is scarcely a doubt, the game of trump was the precursor of whist. A purely English origin may, therefore, be claimed for trump (not la triomphe). No record is known to exist of the invention of this game, nor of the mode of its growth into ruff-and-honours, and finally into whist. The earliest reference to trump in Eng- lish is believed to occur in a sermon by Latimer, "On the Card," preached at Cambridge, in Advent, about the year 1529. He says, "The game that we play at shall be the triumph. . . . Now turn up your trump,... and cast your trump, your heart, on this card." The game of trump is frequently mentioned in the second half of the 16th century. In Gammer Gurton's Needle (1575) Dame Chat says, 'We be fast set at trumpe." Eliot (fruits for the French, 1593) calls trump "a verie common ale-house game." Rice (Invective against Vices, printed before 1600) observes that "renouncing the trompe and comming in againe" (z.e., revoking intentionally) is a common sharper's trick. Decker (Belman of London, 1608) speaks of the deceits practised at "tromp and such like games." Trump also occurs in Antony and Cleopatra (written about 1607), with other punning allusions to card-playing—

*'*She, Eros, has Packed cards with Cesar, and false-played my glory Unto an enemy's triumph." —Act iv. sc. 12.*

Ruff-and-honours, if not the same game as trump, was probably the same with the addition of a score for the four highest cards of the trump suit. A description of the game is first met with in Zhe Compleat Gamester (1674) by Charles Cotton. He states that ruff-and-honours (alzas slamm) and whist are games very commonly known in England. It was played by four

players with partners, and it was compulsory to follow suit when able. The cards ranked as at whist, and honours were scored as now. Twelve cards were dealt to each player, four being left in the stock. The top card of the stock was turned up for trumps. The holder of the ace of trumps was allowed to ruff, t.e., to take in the stock and to put out four cards from his hand. The game was played nine up; and at the point of eight honours could be called, as at long whist. Cotton adds that at whist there was no stock. The deuces were put out and the bottom card was turned up for trumps.

It is believed that the earliest mention of whist is by

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Taylor, the Water Poet (Jfotto, 1621).

He spells the word Whisk

"whisk." The earliest known use of the present spelling is °F Whist.

in Hudibras, the Second Part (spurious), 1663. The word is then spelt indifferently whisk or whist for about half a century. Cotton (1674) spells it both ways. Seymour (Court Gamester, 1734) has "whist, vulgarly called whisk." While whist was undergoing this change of name, there was associated with it the additional title of sewabbers (probably allied to sweep, or sweepstakes). Fielding (History of Mr Jonathan Wild) says that whisk-and-swab- bers was "the game then [1682] in chief vogue." Grose (Dictionary of the Vulgar Tongue, 1785) states that swabbers are "the ace of hearts, knave of clubs, ace and duce of trumps at whist." The true function of the swabbers is not positively known ; it is probable that the holders of these cards were entitled to receive a certain stake from the other players. Swabbers dropped out of general use during the 18th century. The points of the game rose from nine to ten ("nine in all," Cotton, 1725; "ten in all," Seymour, 1734, "rectified according to the present standard of play"). Simultaneously with this altera- tion, or closely following it, the entire pack of fifty-two cards was used, the deuces being no longer discarded. This improvement introduces the odd trick, an element of great interest in modern whist. Early in the 18th century whist

was not a fashionable game. The Hon. Daines Bar- rington (Archexologia, vol. viii.) says it was the game of the servants' hall. Contemporary writers refer to it in a disparaging way, as being only fit for hunting men and country squires, and not for fine ladies or people of quality. According to Barrington, whist was first played on scien- tific principles by a party of gentlemen who frequented the Crown Coffee House in Bedford Row, London, about 1728. They laid down the following rules :—' Lead from the strong suit ; study your partner's hand; and attend to the score." Shortly after the celebrated Edmond Hoytz (g.v.) published his Short Zreatise (1743). It has been surmised by some that Hoyle belonged to the Crown Coffee House party. This, however, is only a conjecture. There is abundant evidence to show that, in the middle of the 18th century, whist was regularly played at the coffee houses of London and in fashionable society. And it is notorious that, ever since the time of Hoyle, the game has continued to increase in public estimation.

It will be of interest to mark the successive stages through which whist has passed from the time of Cotton to the present day. The only suggestions as to play in Cotton are that, 'though you have but mean cards in your own hand, yet you may play them so suitable to those in your partner's hand that he may either trump them or play the best of that suit ;" also that "you ought to have a special eye to what cards are play'd out, that you may know by that means either what to play if you lead or how to trump securely and advantagiously." It appears from this that the main ideas were to make trumps by rufiing, to make winning cards, and to watch the fall of the cards with these objects. In the rules laid down by the Crown Coffee House school a distinct advance is to be noticed. Their first rule, '"' Lead from the strong suit," shows a know- ledge of the game only to be acquired by careful study, together with a long train of reasoning. The arguments in favour of the original strong-suit lead would be out of place here ; they are to be found in any modern manual. Their second rule, "Study your partner's hand," though sound, is rather vague, and savours somewhat of a repeti- tion of Cotton. 'Their third rule, "' Attend to the score," if amended into "Play to the score," is most valuable. From the Crown Coffee House school to Hoyle is rather a wide

jump; but there is no intervening record. Whether or not Hoyle derived at least a part of his inspiration from

Crown Coffee

ouse party.

Cotton.

Hoyle.

Payne.

Mat- thews.

Short whist.

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that school, certain it is that in his Short Treatzse he en- dorsed and illustrated their rules. He also brought the doctrine of probabilities to bear on the game, and gave a number of cases which show a remarkable insight into the play. Two examples will suffice. He distinguishes between the lead of king from king, queen, knave, and one small card and of knave from king, queen, knave, and more than one small card. He also directs the third hand holding queen, ten, nine, and a small card to play the nine, not the small one, to his partner's lead of ace. This whist is so good, and so advanced, that even now, a hundred and fifty years later, only the very best players can be de- pended on to observe and profit by it.

About 1770 was published Payne's Maaims for Playing the Game of Whist. The advance in this book is decided. Leading from five trumps, in the hope of bringing in your own or your partner's long suit, is made into a general rule. And here, for the first time, the rule with respect to returned leads is printed, viz., "In returning your partner's lead play the best you have, when you hold but three originally." This rule, of all elementary ones, is, according to Clay, "the most important for the observance of whist-players." Hoyle does not give any such rule for

returned leads, whence it may be inferred that no settled practice prevailed in his day. Matthews's Advice to the Young Whist-Player (anon., 1804) repeats the "maxims of the old school," with " ob- servations on those he thinks erroneous" and '"'with several new ones." Matthews's book was a valuable contribution to whist literature, but some of the maxims which he thinks erroneous are now generally allowed to be correct. Thus, he prefers leading a single card to opening a long weak suit, the modern practice being just the contrary. He rejects leads from suits of three cards, except when the leader has reason to think it is his partner's suit; then he should " play off the highest, though the king or queen," and he adds, '"'V.B.—This is contrary to the general prac- tice, but undoubtedly right." Assuming his statement to be true, the general practice was evidently wrong. Matthews is sometimes credited with the discovery of the modern principle with regard to discarding. The old rule was always to discard from the weakest suit. The modern rule is to discard from the best protected suit when the opponents have the command of trumps. What Matthews does say is, "'If weak in trumps, keep guard to your ad- versaries' suits ; if strong, throw away from them." This advice, though good, does not amount to anything like a principle of play.

Soon after Matthews wrote, the points of the game were cut down from ten to five. Clay's account of this change is that, about the beginning of the 19th century, Lord Peterborough having lost a large sum of money, the players proposed to make the game five up, in order to give the loser a chance of recovering his loss. The new game, short whist, was found to be so lively that it soon became general, and eventually superseded the long game. This produced in 1835 Short Whist by "Major A." " Major A." is only Matthews done into short whist by a literary hack, who substituted "five" for "ten," and so on through- out. The book would not call for notice here, but that Major A. was regarded as the authority on whist for a considerable time, probably because it was erroneously supposed that the author was the well-known Major Aubrey, one of the best players of his day. Similarly "Coelebs" (Laws and Practice of Whist, 1851), who mainly repeats former writers, only calls for mention because he first printed in his second edition (1856) an explanation of the call for trumps. Calling for trumps was first recog- nized as part of the game by the

players at Graham's Club about 1840. Long whist may be said to have died about the same time that Major A.'s book was published.

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The new game necessarily caused a change in the style of play, as recorded by James Clay in The Laws of Short Whist, and a Treatise on the Game (1864). That dis- tinguished player says that, when he first remembered whist, its celebrities were for the most part those who had been educated at long whist. In his judgment the old school was very accurate and careful, but was wanting in the dash and brilliancy of the best modern players, and sinned by playing what is now called a backward game.

Whist then travelled, and about 1830 some of the best French whist-players, with Deschapelles at their head, modified and improved the old-fashioned system. They were but little influenced by the traditions of long whist, and were not content merely to imitate the English. The French game was the scorn and horror of the old school, who vehemently condemned its rash trump leads. Those who adopted the practice of the new school were, however, found to be winning players. By way of example, the English player of the old school never thought of playing to win the game before it was saved; the French player never thought of saving the game until he saw he could not win it. As between the two systems, Clay preferred the rash attack to the cautious defence, and recommended a middle course, leaning more to the new than to the old doctrine.

Dr Pole (Philosophy of Whist, 1883) remarks that the long experience of adepts had led to the introduction of many improvements in detail since the time of Hoyle, but that nothing had been done to reduce the various rules of the game to a systematic form until between 1850 and 1860, when a knot of young men proceeded to a thorough investigation of whist, and in 1862 one of the members of this "little whist school" brought out a work, under the

Clay.

French whist.

pseudonym of "Cavendish," which "gave for the first Caven- time the rules which constitute the art of whist-playing 'ish-

according to the most modern form of the game." The little school was first brought prominently into notice by an article on whist in the Quarterly Renew of January 1871. On the appearance of this article it was fiercely debated by the press whether the "little school" did any- thing extraordinary, whether they elaborated anything, or compassed anything, or advanced a science, or whether they drew their inspiration from external sources, and merely gave a systematic arrangement to what was well known and procurable before. It was finally allowed that the little school did originate something, as they were the first to give, logically and completely, the reasoning on which the principles of play are based. Whist had previously been treated as though the "art" of the game depended on the practice of a number of arbitrary conven- tions. But the fact is that all rules of whist-play depend upon and are referable to general principles. Hence, as soon as these general principles were stated, and the reasons for their adoption were argued, players began to discuss and to propose innovations on the previously established rules of play.

A critical examination of the more important proposals Discard- made since 1862 may here be appropriately introduced. ins.

The older authorities laid down the rule, Discard from the weakest suit. It was shrewdly noticed that, when command of trumps was shown by the adversaries, the rule was more honoured in the breach than in the ob- servance, the reason being that, when the attack was ad- verse, the instinct of the player prompted him to guard his weak suits. Hence the rule was modified, and it be- came the practice to discard from the best protected suit when the command of trumps is with the opponents. There can be no doubt as to the soundness of this modern rule of play, and it has been generally accepted. It was sud- denly discovered that Matthews advanced a similar doctrine.

Echo of call for trumps.

Lead from penulti- mate card.

WHIST

His pretensions to this distinction have already been ex- amined. Soon after this (1872) followed the echo of the call for trumps. Calling for trumps, as all whist-players know, is effected by throwing away an unnecessarily high card. When the lower card is subsequently played, a royal invitation is given to the partner to abandon his own game and to lead trumps, there being great strength in the caller's hand. In practice it was found for various reasons (for which manuals must be consulted) to be highly advantage- ous for the caller's partner to be able to indicate whether he also had numerical strength in trumps (2.e., a minimum of four). The rule was eventually adopted that the caller's partner with at least four trumps should, if he had an opportunity, call in response, or echo, by also throwing away an unnecessarily high card; of course, if he had the opportunity, and refrained from echoing, he had less than four trumps. This rule of play was not appreciated at the time; but now (1888) it has the adherence of all thoughtful players.

Contemporaneously with the echo, the lead of the pen- ultimate card from suits of five or more cards was strenu- ously advocated in some quarters, and as strenuously opposed in others. Up to this date it had been the general practice, when leading a low card from a strong suit, to prefer the lowest card of the suit, irrespective of the number held. But some acute players departed from this rule when they held an intermediate sequence of three cards. Thus, with king, ten, nine, eight, two (intermediate sequence of ten, nine, eight), they would lead the eight in preference to the two, as a card of protection, in case the partner should happen to be very weak in the suit, when the eight must force an honour, whereas the two might enable the opponent to win the first trick with a six or a seven. Equally acute partners soon observed that, when a strong-suit player began with, say, an eight, and afterwards played a small card, the card must have been from a suit of at least five cards. As soon as this inference was established, the acute leader argued that, if he could show number in his strong suit (an important exhibition in modern whist), he need not confine this exhibition to those suits only in which he held an inter-

mediate sequence. He contended that the right play is to lead the lowest but one (or the penultimate) from all suits containing five or more cards, with which the less advanced player would begin by leading the lowest. Then ensued the grand battle of the penultimate. The old players regarded it with the same "horror" as they had formerly displayed with respect to the French school, and even went so far as to stigmatize it as a private under- standing and as cheating. The next stock objection raised was that it was an innovation. These feeble arguments were soon disposed of. The method was accessible to every one through the medium of the press; and, as Clay (Short Whast, 1864) rightly observes, "It is fair to give your partner any intimation which could be given, if the cards were placed on the table, each exactly in the same manner as the others, by a machine, the players being out of sight and hearing each of the others." The more genuine stric- tures were that penultimate leads complicate the game, that they give no advantage to the players, and that they simulate leads from weak suits (from which the highest is led). It is very doubtful whether penultimate leads do complicate the game. But, admitting for the sake of argu- ment that they do, it is no objection to an intellectual pastime that it exercises the brains of the players. The question whether those who practise penultimate leads reap any advantage therefrom is one which can only be determined by experience. The best test is the habit of those who play for a stake. They all hope to win; they are not likely to persist obstinately in a practice by which

they find they gain nothing; and at the present moment (1888) there is scarcely a player of any ability who de- liberately rejects the penultimate lead when he has a partner capable of understanding it. Hence it may be inferred that the experience of some sixteen years has resulted in a decided feeling that penultimate leads are on the whole advantageous to those who practise them. The simulation of a lead from a weak suit has no locus standi if it is borne in mind that original leads are contemplated, and that the original lead of all good players is from a strong suit. James Clay, the greatest player of his day, was at first opposed to penultimate leads. When he had considered the full arguments for and against them,

he "put then1 to the test of his individual experience, acknow- ledged their value, and did not hesitate to give his adhesion to them." !

The consideration of the proper card to lead from five- card suits naturally led to that of the correct lead from more than five cards, in the case of suits opened with a small card. General Drayson (Art of Practical Whist, 1879) was the first to lay down that six of a suit can be shown by leading the antepenultimate card. Thus, from queen, nine, seven, four, three, two of a suit he advised the lead of the four. General Drayson's proposal did not find favour with many players, though it distinctly follows where the penultimate from five is admitted.

Meanwhile, leads from high cards, having regard to the number held in the suit, had not escaped attention. Thus, from suits headed by ace, queen, knave it had always been the custom to lead ace, then queen, irrespective of num- ber. The third hand, holding king and small ones, was ex- pected to pass the queen. But, if the lead was from five cards or more, and the third hand held king and two small ones, this play often resulted in blocking the leader's strong suit. It was therefore held, after some discussion and tentative play, that with more than four of the suit the leader should proceed with knave after ace, in order to invite his partner to put on king, if it remained singly guarded. From this it follows that a similar distinction should be drawn as to the second lead from queen, knave, ten, according to the number of accompanying small cards. If the lead is from four cards only, queen should be led, then knave; if from more than four, queen, then ten. These innovations were introduced about 1874-75, It will be observed that the original idea in choosing a penulti- mate or antepenultimate card was to protect the suit, and that the original idea in choosing the higher or lower of two high indifferent cards was to give the partner the option of unblocking. Behind this there was seen to lie the collateral advantage of showing number. Hence these rules of play were frequently resorted to merely for the purpose of telling whether four or more than four cards of the suit selected to lead from were present in the hand of the original leader.

So far the indicated method, sound enough in itself, amounted only to the enunciation of modified rules of play. It yet remained for some one to

propound a constant method of treating all leads, and to classify the isolated rules so as to render it possible to lay down general principles. This was accomplished in 1883-84 by Nicholas Browse Trist of New Orleans, U.S.A.; and hence the method of leading reduced to form by him is known by the name of American leads. American leads propose a systematic course of play when opening and continuing the lead from the strong suit. First, with regard to a low card led. When you open a strong suit with a low card, lead your fourth best. When opening a four-card suit with a low card, the lowest, which is the fourth best, is the card selected. When opening a five-card suit with

1 Preface by the editors to Clay's Short Whist, 1881. XXIV. — 69

Ante-

penulti- mate

lead.

Ameri- can leads.

Play of second and third hands.

Laws of whist.

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a low card, the penultimate card is selected. Instead of

calling it the penultimate, call it the fourth best. So with a six-card suit ; but, instead of antepenultimate, say fourth best. And so on with suits of more than six cards: dis- regard all the small cards and lead the fourth best. Secondly, with regard to a high card led, followed by a low card. When you open a strong suit with a high card and next lead a low card, lead your original fourth best. The former rule was to proceed with the lowest. Thus, from ace, knave, nine, eight, seven, two the leader was expected to open with the ace, and then to lead the two. An American leader would lead ace, then eight. Thirdly, with regard to a high card led,

followed by a high card. When you remain with two high indifferent cards, lead the higher if you opened a suit of four, the lower if you opened a suit of five or more. Examples have already been given of the cases of ace, queen, knave, &c., and of queen, knave, ten, &c. On the promulgation of these general principles another pitched battle followed, which raged with great fury. The objections urged against American leads are much the same as those against the penultimate, viz.,—(1) that they complicate the game, (2) that they seldom affect the result, (3) that the informa- tion afforded may be of more use to the opponents than to the leader's partner. The complication argument has but little foundation in fact. All an American leader asks his partner to observe is that, when he originally leads a low card, he holds exactly three cards higher than the one led ; when he originally leads a high card, and next a low one, he still holds exactly two cards higher than the second card led; and when he originally leads a high card, and follows it with a high card, he indicates in many cases, to those who know the analysis of leads (as laid down in whist books), whether the strong suit consisted originally of four or of more than four cards. It cannot be denied that moderate players may lack the quick perception which will enable them to take full advantage of the information afforded ; but that is no reason why better players should be deprived of the advantage, and it is no reason why the moderate player should not learn to speak the language of whist intelligibly, for the benefit of partners who do under- stand it. The answer to the effect-on-the-result argument is that American leads add but little which is new to the game. They only aim at consolidating the received prac- tice, and at extending a law of uniformity to cases not previously provided for. The who-gets-the-best-of-the- information argument is more difficult to meet. Under other whist conditions experience tells that it is advan- tageous in the long run to convey information of strength, notwithstanding its publication to the whole table. It is most improbable, therefore, that a player will be at a dis-advantage by publishing too much and too precise inform- ation as to his strength. But it must be admitted that this is not necessarily a sequitur ; long experience can only decide on which side the balance of advantage lies. Five years' experience is hardly enough. But it may be re- inarked that no instances are known of players who, having = adopted these leads, have voluntarily relinquished

em.

The introduction of American leads rendered it neces- sary thoroughly to overhaul the received play of the second and third hands,—of the second hand, in consequence of the information given, as to when he should cover or pass the card led ; of the third hand, for the same reason. when he should play to unblock his partner's long suit. 'A dis- cussion of these refinements would be out of place here. It is to be found in Whist Developments, by ' Cavendish "

(1885).

A printed existence was first given to the laws i in 17 13. The fourteen laws stein issued were eat atl

Weise?

to twenty-four. These laws were the authority nntil 1760, when the members of White's and Saunders's Chocolate Houses revised them. The revised laws (nearly all Hoyle) were accepted by whist players for over a century, notwithstanding that they were very in- complete. In 1863 the 'Turf Club undertook to frame a more com- prehensive code, and to solicit the co-operation of the Portland Club. The laws of short whist, approved by these two clubs, were brought out in 1864. They were at once adopted by nuimerous other clubs, and are now (1888) the standard by which all disputed points are decided. Laws or Wuist.1

The Rubber.—l. Tlie rubber is the best of three games. be won by the same players, the third game is not played.

Scoring.—2. A game consists of five points. Each trick, above six, counts Scoring.

one point.

3. eons 1.e ace, king, queen, and knave of trumps—are thus reckoned : if a player and his partuer, either separately or conjointly, hold—(i.) the

four honours, they score four points ; (ii.) any three honours, they score two points ; (iii.) only two honours, they do not score.

4, Those players who, at the commencement of a deal, are at the score of four, cannot score honours.

5. The penalty for a revoke takes precedence of all other scores; tricks score next ; honours last.

6. Honours, unless claimed before the trump card of the following deal is turned up, cannot be scored.

7. To score honours is not sufficient : they must be called at the end of the hand; if so called, they nay be scored at any time during the game.

8. The winners gain—{i.) a treble, or game of three points, when their adver- saries have not scored ; (ii.) a double, or game of two points, when their adver- saries have scored less than three; (iii.) a single, or game of one point, when their adversaries have scored three or four.

9, The winners of the rubber gain two points (commonly called the rubber points), in addition to the value of their games.

10. Should the rubber have consisted of three gaines, the value of the losers' gaine is deducted from the gross number of points gained by their opponents.

11. Ifan erroneous score be proved, such mistake can be corrected prior to the conclusion of the game in which it occurred, and such game is not con- cluded until the trump card of the following deal has been turned up.

12. If an erroneous score, affecting the amount of the rubber, be proved, such mistake can be rectified at any time during the rubber.

Cutting.—13. The ace is the lowest card.

14. In all cases every one must cut from the saine pack.

15. Should a player expose more than one card, he must cut again.

Formation of Table.—16. If there are more than four candidates, the players Forma- The tion of

are selected by cutting, those first in the room having the preference. four who cut the lowest cards play first, and again cut to decide on partners. The two lowest play against the two highest ; the lowest is the dealer, who has

choice of cards and seats, and, having once made his selection, must abide by it. &¢-

17. When there are more than six candidates, those who cut the two next lowest cards belong to the table, which is complete with six players. On the retirement of one of those six players, the candidate who cut the next lowest card has a prior right to any after-comer to enter the table.

Cutting Cards of Equal Value.—18. Two players cutting cards of equal value, unless such cards are the two highest, cut again; should they be the two low- est, a fresh cut is necessary to decide which of those two deals.

19. Three players cutting cards of equal value cut again. Should the fourth (or remaining) card be the highest, the two lowest of the new cut are partners, the lower of those two the dealer. Should the fourth card be the lowest, the two highest are partners, the original lowest the dealer.

Cutting Out.—20. At the end of arubber, should admission be claimed by any one or by two candidates, he who has, or they who have, played a greater number of consecutive rubbers than the others is, or are, out. But, when all have played the same number, they inust cut to decide upon the out-goers ; the highest are out.

Entry and Re-entry.—21, A candidate wishing to enter a table must declare such intention prior to any of the players having cut a card, either for the pur- pose of commencing a fresh rubber or of cutting out.

22. In the formation of fresh tables those candidates who have neither be- longed to, nor played at, any other table have the prior right of entry; the others decide their right of admission by cutting.

23. Any one quitting a table prior to the conclusion of a rubber may, with consent of the other three players, appoint a substitute in his absence during that rubber.

24, A player cutting into one table whilst belonging to another loses his right of re-entry into that latter, and takes his chance of cutting in as if he were a fresh candidate.

25. Ifany one break up a table, the remaining players have the prior right to him of entry into any other; and, should there not be sufficient vacancies at such other table to admit all those candidates, they settle their precedence by cutting.

Shaufling.—26. The pack must neither be shuffled below the table nor so that Shuffling.

the face of any card be seen.

27. The pack must not be shuffled during the play of the hand.

28. A pack, having been played with, must neither be shuffled by dealing it into packets nor across the table.

29. Each player has a right to shuffle, once only, except as provided by rule 32, prior to a deal, after a false cut, or when a new deal has occurred. –

30. The dealer's partner must collect the cards for the ensuing deal, and has the first right to shuffle that pack.

$1. Each player after shuffling must place the cards, properly collected and face downwards, to the left of the player about to deal.

82. The dealer has always the right to shuffle last ; but, should a card or cards be seen during his shuffling or whilst giving the pack to be cut, he may be compelled to re-shuffle.

The Deal.—33. Each player deals in his turn. The right of dealing goes to Deal.

the left.

34. The player on the dealer's right cuts the pack, and in dividing it must not leave fewer than four cards in either packet. If in cutting or in replacing one of the two packets on the other a card be exposed, or if there be any con- fusion of the cards, or a doubt as to the exact place ih which the pack was divided, there must be a fresh cut.

35. When a player, whose duty it is to cut, has once separated the pack, he cannot alter his intention: he can neither re-shufile nor re-cut the cards.

a a When the pack is cut, should the dealer shuffle the cards, he loses his eal,

1 From the club code, edited by J. L. Baldwin, by permission of Messrs. De La Rue and Co.

If the first two games Rubber.

EE —

Misdeal.

Trump card.

Cards liable to be called.

W Fi S.T

A New Deal.—37. There must be a new deal—{i.) if during a deal or during the play of a hand the pack be proved incorrect or imperfect ; (ii.) if any card, excepting the last, be faced in the pack.

38. If whilst dealing a card be exposed by the dealer or his partner, should neither of the adversaries have touched the cards, the latter can claim a new deal. A card exposed by either adversary gives that claim to the dealer, pro- yided that his partner has not touched a card. If a new deal does not take place, the exposed card cannot be called.

39. If during dealing a player touch any of his cards, the adversaries may do the same, without losing their privilege of claiming a new deal, should chance give them such option.

40. Ifin dealing one of the last cards be exposed, and the dealer turn up the trump before there is reasonable time for his adversaries to decide as to a fresh deal, they do not thereby lose their privilege.

41. If a player whilst dealing look at the trump card, his adversaries have a right to see it, and may exact a new deal.

42. If a player take into the haud dealt to him a card belonging to the other pack, the adversaries, on discovery of the error, may decide whether they will have a fresh deal or not.

A Misdeal.—43. A misdeal loses the deal.

44. It is a misdeal—(i.) unless the cards are dealt into four packets, one at a time in regular rotation, beginning with the player to the dealcr's left; (ii.) should the dealer place the last (i.e., the trump) card face downwards on his own or any other pack ; (iii.) should the trump card not come in its regular order to the dealer; but he does not lose his deal if the pack be proved imper- fect; (iv.) should a player have fourteen cards and either of the other three Jess than thirteen; (v.) should the dealer, under an impression that he has made a mistake, count either the cards on the table or the remainder of the pack; (vi.) should the dealer deal two cards at once or two cards to the same hand, and then deal a third ; but if, prior to dealing that third card, the dealer can, by altering the position of one card only, rectify such error, he may do so, except as provided by the second paragraph of this law; (vii.) should the dealer omit to have the pack cut to him, and the adversaries discover the crror prior to the trump card being turned up, and before looking at their cards, but not after having done so.

45. A misdeal does not lose the deal if during the dealing either of the adver- saries touch the cards prior to the dealer's partner having done so; but, should the latter have first interfered with the cards, notwithstanding [that] either or both of the adversaries have subsequently done the same, the deal is lost.

46. Should three players have their right number of cards, the fourth have less than thirteen, and not discover such deficiency until he has played any of his cards, the deal stands good. Should he have played, he is as answerable for auy revoke he may have made as if the missing card or cards had been in his hand ; he may search the other pack for it or them.

47. If a pack during or after a rubber be proved incorrect or imperfect, such proof does not alter any past score, game, orrubber. That hand in which the imperfection was detected is null and void. The dealer deals again.

48. Any one dealing out of turn, or with the adversary's cards, may be stopped before the trump card is turned up, after which the game must procecd as if no mistake had been made.

49. A player can neither shuffle, cut, nor deal for his partner, without the permission of his opponents.

50. If the adversaries interrupt a dealer whilst dealing, either by questioning the score or asserting that it is not his deal, and fail to establish such claim, should a misdeal occur, he may deal again.

51. Should a player take' his partner's deal and misdeal, the latter is liable to the usual penalty, and the adversary next iu rotation to the player who ought to have dealt then deals.

The Trump Card.—52. The dealer, when it is his turn to play to the first trick, should take the trump card into his hand. If left on the table after the first trick be turned and quitted, itis lable to be called. His partner may at any time remind him of the liability.

58. After the dealer has taken the trump card into his hand it cannot be asked for. A player naming it at any time during the play of that hand is liable to have his highest or lowest trump called.

54, If the dealer take the trump card into his hand before it is his turn to play, he may be desired to lay it on the table. Should he show a wrong

card, this card may be called, as also a second, a third, &c., until the trump card be produced.

55. If the dealer declare himself unable to recollect the trump card, his highest or lowest trump may be called at any time during that hand, and, un- less it cause him to revoke, must be played. The call may be repeated, but not changed, .e., from highest to lowest, or vice versa, until such card is played.

Cards Liable to be Called.—56. All exposed cards are liable to be called, and must be left on the table; but a card is not an exposed card when dropped on the floor, or elsewhere below the table. The following are exposed cards :—{i.) two or more cards played at once; (ii.) any card dropped with its face upwards, or in any way exposed on or above the table, even though snatched up so quickly that no one can name it.

57. Ifany one play to an imperfect trick the best card on the table, or lead one which is a winning card as against his adversaries, and then lead again, or play several such winning cards one after the other, without waiting for his partner to play, the latter may be called on to win, if he can, the first or any other of those tricks, and the other cards thus improperly played are ex- posed cards. ;

58. If a player or players, under the impression that the game is lost or won, or for other reasons, throw his or their cards on the table face upwards, such cards are exposed, and liable to be called, each player's by the adver- sary; but, should one player alone retain his hand, he cannot be forced to abandon it.

59. If all four players throw their cards on the table face upwards, the hands are abandoned, and no one can again take up his cards. Should this gencral exhibition show that the game might have beeu saved, or won, neither claim can be entertaiued, unless a revoke be established. The revoking players are then liable to the following penalties: they cannot under any circuinstances win the game by the result of that hand, and the adversaries may add three to their score, or deduct three from that of the revoking players.

60. A card detached from the rest of the hand so as to be named is liable to be called ; but, should the adversary name a wrong card, he is liable to have a suit called when he or his partner have the lead.

61. Ifa player, who has rendered himself liable to have the highest or lowest ofa suit called, fail to play as desired, or if, when called on to lead one suit, [he] lead another, having in his hand oue or more cards of that suit demanded, he incurs the penalty of a revoke. : '

62. If any player lead out of turn, his adversaries may either call the card erroneously led, or may call a suit from him or his partner when it is next the turn of either of thein to lead. :

63. If any player lead out of turn, and the other three have followed him, the trick is complete, and the error cannot be rectified. But, if only the second or the second and third have played to the false lead, their cards, on discovery of the inistake, are taken back ; there is no penalty against any one, excepting the original offender, whose card may be called, or he or his partner, when either

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of them has next the lead, may be compelled to play any suit demanded by the adversaries.

64. In no case can a player be compelled to play a card which would oblige him to revoke.

65. The call of a card may be repeated until such card has been played.

66. Ifa player called on to lead a suit have none of it, the penalty is paid.

Cards Played in Error, or not Played to a Trick.—67. If the third hand play before the second, the fourth hand may play before his partner.

68. Should the third hand not have played, and the fourth play before his partner, the latter may be called on to win or not to win the trick.

69. If any one oinit playing to a former trick, and such error be not discovered until he has played to the next, the adversaries may claim a new deal. Should they decide that the deal stand good, the surplus card at the end of the hand is considered to have been played to the imperfect trick, but does not consti- tute a revoke therein.

70. Ifany one play two cards to the same trick, or mix his trump, or other eard, with a trick to which it does not properly belong, and the mistake be not discovered until the hand is played out, he is answerable for all consequent revokes he may have made. If during the play of the hand the error be de- tected, the tricks may be counted face downwards, in order to ascertain whether there be among them a card too many. Should this be the case, they may be searched, and the card restored ; the player is, however, liable for all revokes which he may have meanwhile made.

The Revoke.—71. [This] is when a player, holding one or more cards of the suit led, plays a card of a different suit.

72. The penalty for a revoke—ii.) is at the option of the adversaries, who at the end of the hand may either take three tricks from the revoking player, or deduct three points from his score, or add three to their own score; (ii.) can be claimed for as many revokes as occur during the hand ; (iii.) is applic- able only to the score of the game in which it occurs ; (iv.) cannot be divided, 1.€., & player cannot add one or two to his own score and deduct one or two froin the revoking player ; (v.) takes precedence of every other score, e.g.,—the claimants two, their opponents nothing—the former add three to their scorc, and thereby win a treble game, even should the latter have inade thirteen tricks and held four honours.

73. A revoke is established, if the trick in which it occur be turned and quitted, i.c., the hand removed from that trick after it has been turned face downwards on the table, or if either the revoking player or his partner, whether in his right turn or otherwise, lead or play to the following trick.

74, A player may ask his partner whetlicr he has not a card of the suit which he has renounced. Should the question be asked before the trick is turned and quitted, subsequent turning and quitting does not establish the revoke, and the error nay be corrected, unless the question be answered in

the negative, or ae the revoking player or his partner have led or played to the following

rick.

75. At the'end ofthe hand, the claimants of a revoke may search all the tricks.

76. Ifa player discover his mistake in time to save a revoke, the adversaries, whenever they think fit, may call the card thus played in error, or may require him to play his highest or lowest card to that trick in which he has renounced. Any player or players who have played after him may withdraw their cards and substitute others. The cards withdrawn are not liable to be called.

77. If a revoke be claimed, and the accused player or his partner mix the cards before they have been sufficiently examined by the adversaries, the revoke is established. The mixing of the cards only renders the proof of a revoke difficult, but does not prevent the claim, and possible establishment, of the penalty.

78.. ss] revoke cannot be claimed after the cards have been cut for the follow- ing deal.

79. The revoking player and his partner may, under all circumstances, require the hand in which the revoke has been detected to be played out.

80. If a revoke occur, be claimed, and proved, bets on the odd trick or on ainount of score must be decided by the actual state of the latter after the penalty is paid.

8I. Should the players on both sides subject themselves to the penalty of one or more revokes, neither can win the game; each is punished at the dis- cretion of his adversary.

82. In whatever way the penalty be enforced, under no circumstances can a player win the ganie by the result of the hand during which he has revoked ; he cannot score more than four. (Vide rule 61.)

Calling for New Cards.—88. Any player (on paying for them) before, but not after, the pack be cut for the deal may call for fresh cards. He must call for two new packs, of which the dealer takes his choice.

General Rules.—-84. Where a player and his partner have an option of exact- ing from their adversaries one of two penalties, thcy should agree who is to make the election, but must not consult with one another which of the two penalties it is advisable to exact. If they do so consult, they lose their right ; and if cither of them, with or without consent of his partner, demand a penalty to which he is entitled, such decision is final. Tlis rule does not apply in ex- acting the penalties for a revoke; partners have then a right to consult.

85. Any one during the play of a trick, or after the four cards are played, and before, but not after, they are touched for the purpose of gathering them to- gether, may demand that the cards be placed before their respective players.

86. If any one, prior to his partner playing, should call attention to the trick—either by saying that it is his, or by naming his card, or, without being required so to do, by drawing it towards him—the adversaries may require that opponent's partner to play the highest or lowest of the suit theu led, or to win or lose the trick. P

87. In all cases where a penalty has been incurred, the offender is bound to give reasonable time for the decision of his adversaries. .

88. Ifa bystander make any remark which calls the attention of a player or players to an oversight affecting the score, he is liable to be called on, by the players only, to pay the stakes and all bets on that game or rubber. 3

89. A bystander by agreement among the players may decide any question.

90. A card or cards torn or marked must be either replaced by agreement, or new cards called at the expense of the table.

91. Any player may demand to see the last trick turned, andnomore. Under no circumstances can more than eight cards be seen during the play of the hand, viz., the four cards on the table which have not beeu turned and quitted, and the last trick turned.

ETIQUETTE OF WHIST.

The following rules belong to the established etiquette of whist. They are not called laws, as it is difficult, in some cases impossible, to apply any penalty to their infractiou, and the ouly remedy is to cease to play with players who habitually disregard them. ; i

Two packs of cards are invariably used at clubs; if possible this should be adhered to.

Any one having the lead, and several winning cards to play, should not draw a second card out of his hand until his partner has played,to the first trick, such act being a distinct intimation that the former has played a winning card.

No intimation whatever by word or gesture should be given by a player as to the state of his hand or of the game.

Cards played in error.

Revoke.

General rules.

Etiquette of whist.

Dummy.

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A player who desires the cards to be placed, or who demands to see the last trick, should do it for his own information only, and not in order to invite the attention of his partner. , ;

No player should object to refer to a bystander who professes himself unin- terested in the game, and able to decide any disputed question of facts,—as to who played any particular card, whether honours were claimed though not scored, or vice versa, &c. : pone

It is unfair to revoke purposely: having made a revoke, a player is not justi- fied in making a second in order to conceal the first.

Until the players have made such betsas they wish, bets should not be made with bystanders.

Bystanders should inake no remark, neither should they by word or gesture give any intimation of the state of the game until concluded and scored, nor should they walk round the table to look at the different hands. . ;

No one should look over the hand of a player against whom he is betting.

Dummy.

Dummy is played by three players. One hand, called dummy's, lies exposed on the 'able the ie are Tire nia as those of whist, with the following exceptions :—(i.) dummy deals at the commencement of each rubber; (ii.) dummy is not liable to the penalty for a revoke, as his adversaries see his cards ; should he revoke and the error not be discovered until the trick is turned and quitted, it stands good ; (iii.) dummy being blind and deaf, his partner is not liable to any penalty for an error whence he can gain no advantage: thus, he may expose some or all of his cards, or may declare that he has the game or trick, &c., without incurring any penalty ; if, however, he lead from dummy's hand when he should lead from his own, or vice versa, a suit may be called from the hand which ought to have led. '

Double Dummy.—[This] is played by two players, each having a dummy or ex- posed hand for his partner. The laws of the game do not differ from dummy whist, except in the following special law :—there is no misdeal, as the deal is a disadvantage.

H. J.)

WHISTON, Witt1aM (1667-1752), English divine and mathematician, was born on 9th December 1667 at Norton in Leicestershire, of which village his father was rector. He was educated privately, partly on account of the delicacy of his health and partly that he might act as amanuensis to his father, who had lost his sight. He afterwards entered at Clare College, Cambridge, where he applied himself with extraordinary diligence to mathematical study, and obtained a fellowship in 1693. He next became chaplain to Moore, the learned bishop of Norwich, from whom he received the living of Lowestoft in 1698. He had already given several proofs of his noble but over- scrupulous conscientiousness, and at the same time of the propensity to paradox and the pragmatical and wayward temper which almost destroyed the usefulness of the fine example of disinterestedness which he gave to a lax and lukewarm age. His Theory of the Earth (1696), although destitute of sound scientific foundation, obtained the praise of both Newton and Locke, the latter of whom justly classed the author among those who, if not adding much to our knowledge, "'at least bring some new things to our thoughts." In 1701 he resigned his living, where his conduct had been most exemplary, to become deputy at Cambridge to Sir Isaac Newton, whom he shortly after- wards succeeded as Lucasian professor of mathematics, For several years Whiston continued to write and preach both on mathematical and theological subjects with con- siderable success ; but his study of the Apostolical Con- stitutions had convinced him that Arianism was the creed of the primitive church ; and with him to form an opinion and to publish it were things almost simultaneous, His heterodoxy soon became notorious, and in 1710 he was deprived of his professorship and expelled the university. The rest of his life was spent in incessant controversy, — theological, mathematical, chronological, and miscellaneous. He vindicated his estimate of the Apostolical Constitutions and the Arian views he had derived from them in his Primitive Christianity, published in 1711. In 1713 he produced a reformed liturgy, and in 1730 one of the most valuable of his books, the Life of Samuel Clarke. While heretical on so many points, he was a firm believer in super- natural Christianity, and frequently took the field in de- fence of prophecy and miracle, including anointing the sick and touching for the king's evil. His dislike to

rationalism in religion also made him one of the numerous opponents of Hoadly's Plain Account of the Lord's Supper. He proved to his own satisfaction that Canticles was apocryphal and that Baruch was not. He was ever press- ing his views of ecclesiastical government and discipline, derived from the Apostolical Constitutions, on the rulers of

the church, and was lost in sincere astonishment that they could not see the matter in the same light as himself. He assailed the memory of Athanasius with a virulence at least equal to that with which orthodox divines had treated Arius. He attacked Sir Isaac Newton's chronological system with success ; but he himself lost not only time but money in an endeavour to discover. the longitude. Of all his singular opinions the best known is his advocacy of clerical monogamy, immortalized in the Vicar of Wakefield. Of all his labours the most useful is his translation of Josephus, with valuable notes and dissertations, which continues to be reprinted to this day. This appeared in 1736. His last 'famous discovery, or rather revival of Dr Giles Fletcher's," which he mentions in his autobiography with infinite complacency, was the identification of the Tartars with the lost tribes of Israel. About the same time (1747) he finally left the communion of the Church of England for the Baptist, leaving the church literally as well as figuratively by quitting it as the clergyman began to read the Athanasian creed. He died in London, at the house of his son-in-law, on 22d August 1752, leaving an auto- biography, which deserves more attention than it has re- ceived, both for its characteristic individuality and as a storehouse of curious anecdotes and illustrations of the religious and moral tendencies of the age. It does not, however, contain any account of the proceedings taken against him at Cambridge, these having been published separately at the time.

Whiston is a striking example of a not unfrequent phenomenon, the association of an entirely paradoxical bent of mind with pro- ficiency in the exact sciences. He is still more interesting as ex- emplifying a less ordinary observation, the possibility of arriving at rationalistic conclusions in theology without the slightest tincture of the rationalistic temper. His conclusions were in many respects those of the latitudinarian

divines of his day ; but anything more unlike the processes by which they attained these, or the spirit in which they supported them, would be difficult to imagine. He was not only paradoxical to the verge of craziness, but intolerant to the verge of bigotry. "J had a mind," he says, "to hear Dr Gill preach. But, being informed that he had written a folio book on the Canticles, I declined to go to hear him." This moral and intellectual unreason effectually destroyed the weight otherwise due to his erudition and acuteness, and left nothing recommendable for imitation in his conduct as a whole, except his passion for truth and his heroic disinterestedness,—virtues in which few have rivalled him, though some may have exhibited them less ostentatiously. When not engaged in controversy he was not devoid of good sense. He

often saw men and things very clearly, and some of his bon-mots are admirable.

WHITBY, a seaport and watering-place in the North Riding of Yorkshire, England, is picturesquely situated on both banks of the Esk, at its entrance into the North Sea, and on the North-Eastern Railway, 2474 miles north of London and 56 north-east of York. The river is crossed by a bridge which opens in the centre to permit the passage of vessels. The old parts of the town present a very antique and picturesque appearance, with narrow, steep, and irregular streets and plain old-fashioned houses, while the modern portion, included chiefly in West Cliff, possesses the usual characteristics of a fashionable watering-place. Of the old abbey all that now remains are the ruins of the church, occupying the site of the old Saxon building, but exhibiting no traces of remains earlier than the 12th century. The oldest portion is the choir, which is Early English ; the transept also is Early English but of later date; and the nave is rich Decorated. The west side of the nave fell in 1763 and the tower in 1830. On the south side are foundations of cloisters and domestic build- ings. Adjoining the abbey is Whitby Hall, built by Sir Francis Cholmley about 1580 from the materials of the monastic buildings, enlarged and fortified by Sir Hugh Cholmley about 1635, and restored within recent years. A little below the abbey is the parish church of St Mary, at first Norman, which still retains some portions of the

original building, but owing to a variety of alterations and reconstructions at different periods presents a very incongruous appearance. The principal public buildings are the town-hall, the museum, the public baths, St Hilda's Hall, the temperance hall, and the sea-side home. Pre- vious to 1632 the piers of the harbour were constructed of wood, but in that year a.west pier of stone was con- structed by Sir Hugh Cholmley. Under an Act of Parlia- ment obtained in 1702 the west pier was reconstructed and the east pier greatly improved. Lately further im- provements have been in progress, including the dredging of the river and the extension of the quay to permit

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In 1886

the landing of fish close to the railway station. the number of vessels that entered the port was 384 of 48,439 tons, the number that cleared 371 of 48,504 tons. The chief exports are jet ornaments and iron, but the shipping trade is on the decline; in fact the town is being gradually transformed into a fashionable watering-

place. The manufacture of alum, by which in the reign of Elizabeth the foundations of its prosperity were laid, is now discontinued. The introduction of iron ship-building has also affected an industry (the building of wooden ships) for which Whitby was at one time famous: it was here that the ships for Captain Cook's voyages were built. In 1886 the number of vessels built at the port was 3 of 1356 tons. Whale-fishing, established in 1753, began to decline in 1823, and was abandoned in 1837. The only manufacture that maintains its importance is that of jet ornaments, peculiar to the town, and made from time immemorial from a variety of petrified wood found towards the bottom of the Upper Lias. The fishing industry, owing to improved railway communications, has been progressive within late years. In 1886 it employed 231 boats of 1830 tons. Whitby is an important herring fishing station. The popu- lation of the urban sanitary district (area 2008 acres) was 12,460 in 1871 and 14,086 in 1881.

Whitby was called by the Saxons Streonshalh, but in Domesday the name occurs as Whitteby or the “ white town.” It owes its origin to the foundation of a monastery by Oswy, king of Northum- bria, in 658, in fulfilment of a vow for a victory gained over King Penda. The monastery embraced an establishment both for nuns and for monks of the Benedictine order, and under Hilda, a grand- niece of Edwin, a former king of Northumbria, acquired high celebrity. In 664 it was the meeting-place of a synod held under the presidency of Oswy to determine the time of kecping Easter and the shape of the religious tonsure. In 867 the town and abbey were destroyed by the Danes, after which they lay waste for upwards of 200 years. At the Conquest they belonged to Gospatric, earl of Northumberland, whose lands were confiscated by William and

given to Hugh, earl of Chester, who sold them to William de Percy. In 1074 the restoration of the abbey was begun by Reinfrid, who had been a soldier in the Conqueror’s army. In 1539 the abbey and lands were surrendered to the crown, and in 1555 were pur- chased by Sir Richard Cholmley. Whitby obtained the grant of a market from Henry II., and of a fair from Henry VI. It was created a parliamentary borough in 1832, but in 1885 it was in- cluded in the Whitby division of the North Riding.

WHITE, Gitpert (1720-1793), the natural historian of Selborne, was born on 18th July 1720 in the little Hamp- shire village which his writings have rendered so familiar to all lovers of either books or nature. He was educated at Basingstoke under Warton, father of the poet, and sub- sequently at Oriel College, Oxford, where he obtained a fellowship (1744). Entering upon a country curacy in 1753, he returned to Selborne in 1755, where he. seems soon to have discontinued his ministrations. He obtained a sinecure living from his college |} in 1758; but after his father’s death in the # same year he became curate of the neigh- bouring parish of Faringdon, and repeatedly declined valuable livings elsewhere, until 1784, when he returned to the curacy of a ays\| Selborne, and there ministered until his death “5 \ } on 26th June 1793.’ He was never married.

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His daily life was practically unbroken by any great changes or incidents ; for nearly half a cen- tury his pastoral duties, his watchful country walks, the assiduous care of his garden, and the scrupulous posting of his calendar of observations made up the essentials of a full and delightful life, but hardly of a biography. At most we can only fill up the portrait by reference to the tinge of simple old- fashioned scholarship, which on its historic side made him an eager searcher for antiquities and among old records, and on its poetic occasionally stirred him to an excursion as far as that gentlest slope of Parnassus inhabited by the descriptive muse. Hence we are thrown back upon that correspondence with brother naturalists which has raised his life and its influence so far beyond the common- place. His strong naturalist tendencies are not, however, properly to be realized without a glance at the history of his younger brothers. The eldest, Thomas, retired from trade to devote himself to natural and physical science, and contributed many papers to the Royal Society, of which he was a fellow. The next, Benjamin, became the publisher of most of the leading works of natural history which appeared during his lifetime, including that of his brother. The third, John, became vicar of Gibraltar, where he accumulated much material for a work on the natural history of the rock and its neigh- bourhood, and carried on a scientific correspondence, not only with his eldest brother, but with Linneus. The youngest, Henry, who died soon after entering the church, is mentioned as having engaged in meteorological observations. The sister's son, Samuel Barker, also became in time one of White's most valued correspondents. With other naturalists, too, he had intimate relations: with Pennant and Daines Barrington he was in constant correspondence, often too with the botanist Lightfoot, and sometimes with Sir Joseph Banks and others, while Chandler and other antiquaries kept alive his historic zeal. At first he was content to furnish in- formation from which the works of Pennant and Barrington largely profited ; but gradually the ambition of separate authorship de- veloped from a suggestion thrown out by the latter of these writers in 1/70. The next year White sketched to Pennant the project of "a natural history of my native parish, an annus historico-naturalis, comprising a journal for a whole year, and illustrated with large notes and observations. Such a beginning might induce more able naturalists to write the history of various districts and might in time occasion the production of a work so much to be

wished for, a full and complete natural history of these kingdoms." Yet the famous Natural History of Selborne did not appear until 1789. It was well received from the beginning.

To be a typical parish natural history so far as completeness or order is concerned, it has of course no pretensions; batches of letters, an essay on antiquities, a naturalist's calendar, and mis- cellaneous jottings of all kinds are but the unsystematized material of the work proper, which was never written. Yet it is largely to this very piecemeal character that its popularity has been due. The style has the simple, yet fresh and graphic, directness of all good letter writing, and there is no lack of passages of keen observation, and even shrewd interpretation. White not only notes the homes

and ways, the times and seasons, of plants and animals,—com- paring, for instance, the different ways in which the squirrel, the tield-mouse, and the nuthatch eat their hazel-nuts,—or watches the migrations of birds, which were then only beginning to be properly recorded or understood, but he knows more than any other observer until Darwin about the habits and the usefulness of the earth- worms, and is as certain as the latest physicists that plants distil dew and do not merely condense it. The book is also interesting as having appeared on the borderland between the medieval and the modern school of natural history, avoiding the uncritical blundering of the old Encyclopedists, without entering on the technical and analytic character of the opening age of separate monographs. Moreover, as the first book which raised natural history into the region of literature, much as the Compleat Angler did for that gentle art, we must affiliate to it the more finished products of later writers like Thorean or Jefferies. Yet, while these are essential merits of the book, its endearing charm lies deeper, in the swect and kindly personality of the author, who on his rambles gathers no spoil, but watches the birds and field-mice without disturbing them from their nests, and quietly plants an acorn where he thinks an oak is wanted, or sows beech-nuts in what is now a stately row. He overflows with anecdotes, seldom indeed gets beyond the anecdotal stage, yet from this all study of nature must begin ;

and he sees everywhere intelligence and beauty, love and sociality, where a later view of nature insists primarily on mere adaptation of interests or purely competitive struggles. The en- cyclopedic interest in nature, although in White's day culminat- ingin the monumental synthesis of Buffon, was also disappearing betore the analytic specialism inaugurated by Linneus; yct the catholic interests of the simple naturalist of Selborne fully reappear a century later in the greater naturalist of Down.

WHITE, Josera Bianco (1775-1841), author, was born at Seville on 11th July 1775. He was educated for the Roman Catholic priesthood; but after his ordination doubts as to the principles of Catholicism led him to escape from Spain to England (1810), where he ulti- mately entered the Established Church, having studied theology at Oxford and made the friendship of Arnold, Newman, and Whately. He became tutor in the family of the last-named when he was made archbishop of Dublin (1831). While in this position he embraced Unitarian views ; and he found an asylum amongst the Unitarians of Liverpool, where he died on 20th May 1841.

His principal writings are Doblado's Letters from Spain, 1822 ; Lividence against Catholicism, 1825; Second Travels of an Irish Gentleman in Search of a Religion, 1834; Observations on Heresy and Orthodoxy, 1835. They all show literary ability, and were extensively read in their day. It is probable that his name will be longest known in the world of letters by his sonnet addressed Lo Night (" Mysterious night ! when our first parent knew"), which has found its way into almost all the recent anthologies, and was spoken of by his contemporaries, Hunt and Coleridge, as one of the finest in English or indeed in any language.

See Life of the Rev. Joseph Blanco White, written by himself, with portions of his Correspondence, edited by John Hamilton Thom, London, 1845,

WHITE, Rozerr (1645-1704), engraver and draughts- man, was born in London in 1645. He studied engraving under David Loggan, for whom he executed many architec- tural subjects; his early works also include landscapes and engraved title-pages for books. He acquired great skill in portraiture, his works of this class being commonly drawn with the black-

lead pencil upon vellum, and after- wards excellently engraved in line. Portraits executed in this manner he marked "ad vivum," and they are prized by collectors for their artistic merit and their authenticity. Virtue catalogued 275 portrait engravings by White, in- cluding the likenesses of many of the most celebrated per- sonages of his day ; and nine portraits engraved in mezzo- tint are assigned to him by J. Chaloner Smith. White died at Bloomsbury, London, in 1704.

His son, George White, who was born about 1671 and died about 1734, is also known as an engraver and portrait-painter.

WHITEBAIT, the vernacular name of a small Clupeoid fish which appears in large shoals in the estuary of the Thames during the summer months, and is held in great esteem as a delicacy for the table. As to whether or not it is a distinct form, the opinions of naturalists have been divided ever since their attention was directed to the question. Pennant and Shaw believed it to be some kind

of Cyprinoid fish, similar to the bleak, whilst Donovan, in his Natural Hestory of British Fishes (1802-8), misled by specimens sent to him as whitebait, declared it to be the young of the shad. In 1820 Yarrell proved conclu- sively that Donovan's opinion was founded upon an error; unfortunately he contented himself with comparing white- bait with the shad only, and in the end adopted the opinion of the Thames fishermen, whose interest it was to represent it as a distinct adult form; thus the whitebait is introduced into Yarrell's History of British Fishes (1836) as Clupea alba. The French ichthyologist Valenciennes went a step further, declaring it to be not only specifically but also generically distinct from all other Clupeoids. On ex- amining the specimens of Clupea alba which passed from Yarrell's collection into the British Museum, the present writer found them to be the young of the common her- ring (Catal. Fish. Brit. Afus., vii. p. 416, 1868); and this conclusion was fully borne out by visits to the Thames boats and by an examination of their captures on the spot. The bulk of the whitebait caught consists, in May and June, chiefly of the fry of herring, mixed with a number of shrimps, gobies, sticklebacks, pipe-fishes, young flounders, and an occasional sprat. But,

the Thames being unequal to the supply of the large demand for this delicacy, large quantities of whitebait are now brought to London and other markets from many parts of the coast. They fre- quently consist of a much greater proportion of young sprats than the fish obtained from the Thames; and they sometimes prove a valuable mine for the collector, who may find mixed with them pelagic animals (such as the smaller kinds of Cephalopods) which are not at all, or but rarely, met with at the mouth of the Thames or on the south coast generally. In times past whitebait were considered to be peculiar to the estuary of the Thames; and, even after the specific identification of Thames white- bait with the young of the herring from other localities, it was still thought that there was a distinctive superiority in the condition and flavour of the former. It is possible that the young herrings find in the estuary of the Thames a larger amount of suitable food than on other parts of © the coast, where the water may be of greater purity, but possesses less abundance of the minute animal life on which whitebait thrive. Indeed, Thames whitebait which have been compared with young herrings from the mouth of the Exe, the Cornish coast, Menai Strait, and the Firth of Forth seemed to be better fed; but, of course, the specific characteristics of the herring,—into which we need not enter here,—were nowise modified.

The fry of fishes is used as an article of diet in almost every country: in Germany the young of various species of Cyprinoids, in Italy and Japan the young of nearly every fish capable of being readily captured in sufficient numbers, in the South Sea Islands the fry of Zeuthis, in New Zealand young Galawxias are consumed at certain seasons in large quantities ; and, like whitebait, these fry bear distinct names, different from those of the adult fish.

Whitebait fishing in the Thames lasts from the end of March to September. The majority of the fish caught at the beginning of spring are about two inches long; as the season advances the pro- portion of larger specimens becomes greater, although very small ones occur abundantly throughout the season,—thus apparently confirming the opinion of those who maintain that the herring is in its spawning not bound to any particular month. Whitebait are caught on the flood-tide from boats moored in from 3 to 5 fathoms of water. The net used is a bag some 20

feet long, narrow and small-meshed towards the tail-end, the mouth being kept open in the direction of the advancing tide by a framework 3 or 4 feet square. It is placed alongside the boat and sunk to a depth of 4 feet below the surfacc; from time to time the end of the bag is lifted into the boat, to empty it of its contents. The "schools" of whitebait, advancing and retiring with the tide for days and probably for weeks, have to run the gauntlet of a dozen of these nets, and therefore get very much thinned in num-

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ber by the end of the season. When the view commenced to gain ground that whitebait were young herring, the question arose whether or not the immense destruction of the young brood caused by this mode of fishing injuriously affected the fishery of the mature herring. This undoubtedly it does ; but, since it has been ascertained that the herring is much more restricted in its migra- tions than was formerly believed, and that it merely moves from the feeding-grounds in the depth of the ocean to the shallower spawn- ing-grounds of the neighbouring coast, the injury, such as it is, must be local and limited to the particular district in which the fishing for whitebait is methodically practised.

WHITEFIELD, or Stanp, a large manufacturing village of Lancashire, England, in the township of Pilkington, is situated a short distance from the Radcliffe Bridge station on the Lancashire and Yorkshire Railway, 54 miles north of Manchester and 196 from London. It possesses a number of fine villas inhabited by Manchester merchants. The church of All Saints, commonly called Stand church, was erected in 1826 from the designs of Sir Charles Barry. There is a school founded and endowed by Henry Siddal in 1688. Whitefield has risen into importance since 1829. There are coal mines in the neighbourhood, and cotton- spinning and hand and power loom weaving are carried on. The population of the urban sanitary district (area 2048 acres) was 9054 in 1871 and 9516 in 1881.

A family of the name of Pilkington was settled at Pilkington Tower or Stand soon after the Conquest, Leonard Pilkington being mentioned as lord of the manor in the tenth year of Henry I. The manor of Pilkington was granted to the earl of Derby by Henry VIL. after the battle of Bosworth. The old hall of the Pilking- ton family, called Stand Hall, existed as recently as 1848, On the foundation stone was the date 1580.

WHITEFIELD, Grorce (1714-1770), one of the most eloquent of pulpit orators, was born on 16th December 1714 at the Bell Inn, Gloucester, of which his father was landlord. At about twelve years of age he was sent to the school of St Mary de Crypt, Gloucester, where on account of his skill in elocution he was chosen to perform in a piece acted before the corporation of the school. He also became very fond of reading plays, a circumstance which probably had considerable influence on his subsequent career, for his eloquence was essentially dramatic in its character. At the age of fifteen he was taken from school to assist his mother in the public-house, and for a year and a half was a common drawer. He then again returned to school to prepare for the university, and in 1733 entered as a servitor at Pembroke College, Oxford. There he came under the influence of the Methodists (see WEsLEY), and entered so enthusiastically into their practices and habits that he was attacked by a severe illness, which com- pelled him to return to his native town. His sincere and enthusiastic piety attracted the notice of Dr Benson, bishop of Gloucester, who ordained him deacon on 20th June 1736. Having in the following week returned to Oxford and taken his degree, he began an evangelizing tour in Bath, Bristol, and other towns, his eloquence at once attracting immense multitudes. In 1736 he was invited by Wesley to go out asa missionary to Georgia, and went to London to wait on the trustees. Before set- ting sail he preached in some of the principal London churches, and so rapidly did the fame of his eloquence spread that crowds began to assemble at the church doors long before daybreak. Several of the sermons which he then preached were published "at the request of the hearers." On 28th December 1737 he embarked for Georgia, which he reached on 7th May 1738. After three months' residence there he returned to England to receive priest's orders, and to raise contributions for the support of an orphanage. He was, however, coldly received by the clergy generally, and began to preach in the open air. At Bristol his

addresses to the colliers soon attracted crowds, which were latterly estimated to exceed 20,000 persons. Whitefield's voice was so powerful that it penetrated to the

utmost limits of the crowd. His fervour and dramatic action held them spell-bound, and his homely pathos soon broke down all barriers of resistance. 'The first discovery of their being affected," he says, "was by seeing the white gutters made by their tears, which plentifully fell down their black cheeks." In 1738 an account of Whitefield's voyage from London to Georgia was published without his knowledge. In 1739 he published his Journal from his arrival in Savannah to his return to London, and also his Journal from his arrival in London to his departure thence on his way to Georgia. As his embarkation was further delayed for ten weeks he published A Continua- tion of the Rev. Mr Whitefield's Journal during the time he was delayed in England by the Embargo. His unfavour- able reception in England by the clergy led him to make reprisals. To Dr Trapp's attack on the Methodists he pub- lished in 1739 A Preservative against Unsettled Notions, in which the clergy of the Church of England were rather bitterly denounced ; he also published shortly afterwards The Spirit and Doctrine and Lives of our Modern Clergy, and a reply to a pastoral letter of the bishop of London in which he had been attacked. In the same year ap- peared Sermons on Various Subjects (2 vols.), the Church Companion, or Sermons on Several Subjects, and a recom- mendatory epistle to the Life of Thomas Halyburton. He again embarked for America in August 1739, and remained there two years, preaching in all the principal towns. While there he published Three Letters from Mr White- Jjield, in which he referred to the "mystery of iniquity" in Tillotson, and asserted that that divine knew no more of Christ than Mohammed did.

During his absence from England Whitefield found that a divergence of doctrine from Calvinism had been intro- duced by Wesley ; and notwithstanding Wesley's exhorta- tions to brotherly kindness and forbearance he withdrew from the Wesleyan communion. Thereupon his friends built for him near Wesley's church a wooden structure, which was named the Tabernacle. In 1741, on the invita- tion of Ralph and Ebenezer Erskine, he paid a visit to Scotland, commencing his labours in the

Secession meeting- house, Dunfermline. But, as he refused to limit his minis- trations to one sect, the Seceders and he parted company, and without their countenance he made a tour through the principal towns of Scotland, the authorities of which in most instances presented him with the freedom of the burgh, in token of their estimate of the benefits to the com- munity resulting from his preaching. From Scotland he went to Wales, where on 14th November he married Mrs James,a widow. The marriage was not ahappyone. On his return to London he preached to the crowds in Moor- fields during the Whitsun holidays with such effect as to attract nearly all the people from the shows. After a second visit to Scotland, June to October 1742, and a tour through England and Wales, 1742-44, he embarked in August 1744 for America, where he remained till June 1748. On his return to London he found his congregation at the Taber- nacle dispersed ; and his circumstances were so depressed that he was obliged to sell his household furniture to pay his orphan-house debts. Having, however, made the ac- quaintance of the countess of Huntingdon, he soon found his pecuniary affairs on a better footing. The countess appointed him one of her chaplains, built and endowed Calvinistic Methodist chapels in various parts of the country, and erected a college for the training of candi- dates for the ministry. The remainder of Whitefield's life was spent chiefly in evangelizing tours in Great Britain, Ireland, and America. It has been stated that 'in the compass of a single week, and that for years, he spoke in general forty hours, and in very many sixty, and that to thousands." On his return from America to England for

the last time the change in his appearance forcibly im- pressed Wesley, who wrote in his Journal : "He seemed to be an old man, being fairly worn out in his Master's ser- vice, though he had hardly seen fifty years." When health was failing him he placed himself on what he called " short allowance," preaching only once every week day and thrice on Sunday. In 1769 he returned to America for the seventh and last time. He was now affected by a severe asthmatic complaint; but to those who advised him to take some rest, he answered, "I had rather wear out than rust out." He died on the 30th September 1770 at Newbury, New England, where he

had arrived on the previous evening with the intention of preaching next day. In accordance with his own desire he was buried before the pulpit in the Presbyterian church of the town where he died.

Whitefield, says Lecky, " was chiefly a creature of impulse and emotion. He had very little logical skill, no depth or range of knowlege, not much self-restraint." He possessed neither Wesley's organizing power, nor his personal authority and influence. His one talent was his gift of popular oratory, the secret of which was his command of clear and direct English, his remarkable elocution- ary and dramatic skill, and his passionate fervour and simple pathos. His printed works convey a totally inadequate idea of his oratorical powers, and are all in fact below mediocrity. They ap- peared in a collected form in 1771-72 in seven volumes, the last containing Memoirs of his Life, by Dr John Gillies. His Letters, 1734-70, were comprised in vols. i., ii., and iii. of his Works and were also published separately. His Select Works, with memoir by J. Smith, appeared in 1850.

See also Philip's Whitefield's Life and Times, 1837 ; Tyerman's Life of Whitefield, 1876-77 ; and Lecky's History of England, vol. ii. (T. F. H.)

WHITEFISH is a collective name applied in different countries to very different kinds of freshwater fishes, which, however, have this in common, that their body is covered with regularly arranged silvery scales, without spots or orna- mental colours. Thus the numerous European species of the Cyprinoid genus Leuciscus are frequently comprised under the name of '" Whitefish," whilst in North America this term is in general use for the various species of the Salmonoid genus Coregonus, which abound in every lake and river of Canada and the northern parts of the United States.

WHITEHAVEN, a parliamentary borough of England and the principal seaport of Cumberland, is situated at the extremity of the Solway Firth, facing the Irish Sea, 41 miles south-west of Carlisle and 304 north-west of London. It is connected by a branch line with the London and North Western Railway. The town is built chiefly in a valley overlooked by high grounds on the north and south. The streets are spacious, with handsome shops. The principal public buildings are the town-hall, courtroom,

custom-house, police office, theatre, baths, free library, infirmary, and dispensary. The harbour is pro- tected by two stone piers ; the west pier (erected 1824-39) is 965 feet long, and the north pier (1837-41) 918 feet. There is daily communication with Liverpool, Glasgow, Belfast, Dublin, and the Isle of Man. The town has an import trade from America, the Baltic ports, France, Spain and Portugal, and the Mediterranean, The princi- pal exports are coal, pig iron, lime, freestone, and grain. The number of vessels that entered the port in 1886 was 2377, of 269,811 tons, the number that cleared 2297, of 257,025 tons. Iron ship-building is carried on, but the number of vessels built in 1886 was only 2 of 2406 tons. The other principal industries are engineering, brass- founding, boiler-making, brick and earthenware manu- facturing, and dyeing. 'There are two large collieries, one extending about 14 miles under the sea. Fishing is carried on toa small extent, the number of boats engaged in 1886 being 18 of 441 tons. The population of the urban sani- tary district (area 679 acres) was 18,243 in 1871 and 19,295 in 1881,

Whitehaven owes its name to the light colour of the rocks adjoining it. In the reign of Henry I. the manor formed part of

the monastery of St Mary's at York, to which the priory of St Bees belonged. In 1599 the manor of St Bees was purchased from Sir Thomas Chaloner by General Lowther and Thomas Wybergh, and the whole in 1644 came into the possession of Sir John Lowther, under whose auspices the town advanced with great rapidity.

From Charles II. the Lowthers obtained an additional grant of 150

acres, now partly included in the town, soon after which mcans were taken greatly to improve the harbour. By Acts passed in the 7th and 11th years of Queen Anne's reign the town is governed by twenty-two trustees elected triennially. The earl of Lonsdale, whose castle adjoins the town, is lord of the manor. Whitehaven has returned one member to parliament since 1832.

WHITELOCKE, BurstropE (1605-1675), son of Sir James Whitelocke, a justice of the King's Bench, was born at London, on 2d August 1605. He was educated at Eton and afterwards at Merchant Taylors' School, — London. In 1620 he entered St John's College, Oxford. In preparing for the bar he became acquainted with Selden, who aided him in his studies and gave him the use of his library. Whitelocke sat for Stafford in the parliament of 1626, and in the course of that year was called to the bar. In 1630 he married a daughter of Alderman Bennett. During the years that followed he was in the favour of Laud. He was not a man likely to raise disturbances in church and state; and he took an active part in the preparation of the law of Court Masque after Prynne's condemnation in 1634, not long after which his wife died. Before the year was out he made a runaway match with the sister of Lord Willoughby of Parham.

When the troubles began Whitelocke's cautious nature led him to distrust Laud, though he kept himself from all communication with the Scots. In the Long Parliament he represented Great Marlow, and took part in the impeach- ment of Strafford. Later on he did his best to avert a civil war, but prudently remained at Westminster instead of joining the king. When the Royalists advanced after Edge- hill, his house, Fawley Court, was pillaged by the soldiers. When attempts were subsequently made to open negotia- tions with the king, he became a leading member of the peace party, though, as he tells us himself, he "kept fair with the other leading men of the House, as Mr Pym, Hampden, and the rest, and would not entirely engage in any party, which made him the more courted by all." He was one of the commissioners appointed to carry the terms of the Parliament to Oxford in May, and drew on himself suspicions of too close intercourse with the king. Having at the close of 1644 taken part in a conference between some of the Scots and the English Presbyterians, his advice did much to frustrate a proposal for a parliamentary accusa- tion of Cromwell. On the other hand, he spoke in the Com- mons against the Self-Denying Ordinance. He was again a commissioner in the negotiation with the king at Uxbridge early in 1645. Whitelocke was present at the siege of Oxford in 1646, and was on excellent terms with Fairfax and Cromwell. Later in the year he opposed an ordi- nance for punishing heretics. His common-sense seems to have rallied him to the tolerationists, and he took their side in opposing the divine right of

presbytery and in getting rid of the Scottish army. In 1647 he tried to moderate the opposition of the Presbyterians to the army, but as usual he did not throw himself violently on either side. In 1648 he was named a commissioner of the great seal. He was much troubled at the attack on the House of Commons by Pride's " purge," but he did not resign his post. He refused to have anything to do with the king's trial ; but he accepted a commissionership of the new great seal of the commonwealth after the king's execution. Both before the trial and afterwards he was on intimate terms with Cromwell. In May 1649 his second wife died. In January 1650 he proposed to Lady Hungerford, but, being refused by her, he was married in the following August to the widow of Alderman Wilson. Whitelocke was now a

member of the council of state, striving to keep on good terms with all parties. After Cromwell's return from the Scottish war in 1651 Whitelocke was much consulted by him; but he gave offence by suggesting a restoration of the young king. After the dissolution of the Long Parliament in 1653 he was sent as ambassador to Sweden, as he thought, merely to get him out of the way. Returning in July 1654, he was chosen member of the first parliament of the Protectorate by the county of Buckingham, and he again became a commissioner of the great seal. In May 1655, after the dissolution of that parliament, he refused to execute an ordinance made by the Protector and council only for the reform of Chancery, and was consequently dismissed in June, but was soon afterwards appointed com- missioner of the treasury. He again sat for Buckingham- shire in the second Protectorate parliament in 1657, and took an active part in forwarding the Humble Petition and Advice. In December he was appointed one of Crom- well's lords.

After Cromwell's death Whitelocke rallied to his son, and in January 1659 was again a commissioner of the great seal. After Richard's fall he sat in the council of state, and'when the Rump was turned out by the soldiers he accepted an appointment to the army's committee of safety. On Ist November he became keeper of the great seal ; but on the return of the Rump he thought it prudent to go into hiding. Monk's arrival delivered

him from his fears; but, when the Convention Parliament was chosen, he, characteristically " foreseeing what would come to pass, did not think fit to labour to be a Parliament man." Of course he accepted the Restoration and was included in the Act of Oblivion. He died at his seat at Chilton in Wilt- shire in 1675.

WHITETHROAT, a name commonly given to two species of little birds, one of which, the Motacilla sylvia of Linneeus and Sylvia rufa) or S. cinerea of some recent authors, is regarded as the type, not only of the genus Sylvia, but of the so-called Family Sylwide (cf. WARBLER).

Very widely spread over Great Britain, in some places tolerably common, and by its gesticulations and song rather conspicuous, it is one of those birds which has gained a familiar nickname, and " Peggy Whitethroat" is the anthropomorphic appellation of school- boys and milkmaids, though it shares " Nettle-creeper" and other homely names with perhaps more than one congener, while to the writers and readers of books it is by way of distinction the Greater Whitethroat. The song of this bird, except by association with the season at which it is uttered, can scarcely be called agreeable, some of its notes being very harsh ; but the performer may be seen to be always in earnest, erecting the feathers of his crown, puffing out those of his throat, shaking his wings, and making other rapid Movements expressive of his feelings. Occasionally he will deliver his song as he flies up in a peculiar fashion, describing small circles in the air, stopping with a jerk, and then returning to the spot whence he arose.

The Lesser Whitethroat, Sylvia cwrruca,? is both in habits and plumage a much less sightly bird: the predominant reddish brown of the upper surface, and especially the rufous edging of the wing- feathers, that are so distinctive of its larger congener, are wanting, and the whole plumage above is of a smoky-grey, while the bird in its movements is never obtrusive, and it rather shuns than courts observation, generally keeping among the thickest foliage, whence its rather monotonous song, uttered especially in sultry weather, may be continually heard without a glimpse of the vocalist being presented. The nests of each of these species are very pretty works of art, firmly built of bents or other plant-stalks, and usually lined with horsehair ; but the sides and bottom are often so finely woven

as to be like open basket-work, and the eggs, splashed, spotted, or streaked with olive-brown, are frequently visible from beneath through the interstices of the fabric. This style of nest-building seems to be common to all the species of the genus Sylvia, as now restricted, and in many districts has obtained for the builders the

1 This specific term has been very constantly but most inaccurately, not to say absurdly, used for a very different bird, the Chiffchaff (cf, [Willow] WREN). Its only proper application is to the Whitethroat.

? Of course this is not the cwrruca of ancient writers, that being almost certainly the Hedge-Sparrow (see SPaRRow), the ordinary dupe of the Cuckow.

name of "Hay-Jack," quite without reference to the kind of bird which puts the nests together, and thus is also applied to the Blackcap, S. atricapilia, and the Garden-Warbler—this last being merely a book-name —S. salicaria (8. hortensis of some writers).? The former of these deserves mention as one of the sweetest songsters of Great Britain, and fortunately it is very generally distributed in summer. To quote the praise bestowed upon it, in more than one passage, by Gilbert White would here be superfluons. The name Blackcap is applicable only to the cock bird, who further differs from his brown-capped mate by the purity of his ashy-grey upper plumage; but, notwithstanding the marked sexual difference in appearance, he takes on himself a considerable share of the duties of incubation, and has been declared by more than one writer to sing while so employed—a statement that seems hardly credible. All these four birds, as a rule, leave Great Britain at the end of summer to winter in the south. Two other species, one certainly belonging to the same genus, S. orphea, and the other, S. nisoria, a somewhat aberrant form, have occurred two or three times in Great Britain. The rest, numbering perhaps a dozen, must be passed over.

Nearly allied to Sylvia, if indeed it can be properly separated, is Melizophilus, which consists of two species, one of them the curious Dartford Warbler of English writers, I. wndatus or provincialis. This is on

many accounts a very interesting bird, for it is one of the few of its family that winter in England,—a fact the more remarkable when it is known to be migratory in most parts of the Continent. Its distribution in England is very local, and chiefly confined to the southern counties, where through causes very in- sufficiently known it has of late years become so scarce that its extermination seems probable. It is a pretty little dark-coloured bird, which here and there may be scen on furze-grown heaths from Kent to Cornwall. In spasmodic gesticulations the cock surpasses the Whitethroat ; but these feats are almost confined to the pair- ing-season, and at other times of the year the bird's habits arc retiring. Fora species with wings so feebly formed it has a wide range, inhabiting nearly all the countries of the Mediterranean seaboard, from Palestine to the Strait of Gibraltar, and thence along the west coast of Europe to the English Channel ; but every- where else it seems to be very local.

This may be the most convenient place for noticing the small group of Warblers belonging to the well-marked genus Hypolais, which, though in general appearance and certain habits resembling the Phylloscopi (cf. [Willow] WREN), would seem usually to have little to do with those birds, and to be rather allied to the Sylviinz, if not to the Acrocephaling (cf. WARBLER). They have a remark- ably loud song, and in consequence are highly valued on the con- tinent of Europe, where two species at least spend the summer. One of them, H. icterina, has occurred more than once in the British Islands, and their absence as regular visitors is to be regretted. Among the minor characteristics of this little group is one afforded by their eggs, which are of a deeper or paler brownish pink, spotted with purplish black. Their nests are beautiful structures, combin- ing warmth with lightness in a way that cannot be fully appreciated by any description. ; ;

A great number of other more or less allied forms, in- teresting as they are in various ways, cannot for want of

space be here mentioned. (A. N.) WHITFIELD, Joun Crarxe (1770-1836), organist and composer, was born at Gloucester, 13th December 1770, and educated at Oxford under Dr Philip Hayes. In 1789 he was appointed organist of the parish church at Ludlow. Four years later he

took the degree of Mus. Bac. at Cam- bridge, and in 1795 he was chosen organist of Armagh cathedral, whence he removed in the same year to Dublin, with the appointments of organist and master of the children at St Patrick's cathedral and Christchurch. Driven from Ireland by the rebellion of 1798, he accepted the post of organist at Trinity and St John's Colleges, Cambridge, and about the same time assumed the surname of Whitfield, in addition to that of Clarke, by which he had been previously known. He took the degree of Mus. Doe. at Cambridge in 1799, and in 1810 proceeded to the same grade at Oxford. In 1820 he was elected organist and master of the choristers at Hereford cathedral ; and on the death of Dr Haig he was appointed professor of

3 This bird, if it has any true English name at all, should perhaps be called the "Pettichaps," that being applied to it, though not exclusively, in Lancashire and Yorkshire, but not, it would seem, in Northampton- shire or Hampshire (cf. Yarrell's Br. Birds, 4th ed. pp. 415, 416). ;

4 The Blackcap is recorded as having occurred several times in England in winter ; but its tarryiug was doubtless involuntary.

music at Cambridge. Three years afterwards he resigned these appointments in consequence of an attack of paralysis. He died at Hereford, 22d February 1836.

Whitfield's compositions were very numerous. Among the best of them are four volumes of anthems, published in 1805. He also composed a great number of songs, one of which—Bird of the Wilderness, written to some well-known verses by James Hogg, the "Ettrick Shepherd "—attained a high degree of popularity. But the great work of his life was the publication, in a popular and eminently useful form, of the oratorios of Handel, which he was the first to present to the public with a complete pianoforte accompaniment. Before his time these works could only be obtained either in full score or with a plain-figured bass, in which forms they were absolutely useless to the unlearned musician. But so great was

the success of his experiment that at the present day the form he originated is the only one with which the general public is familiar. His own volumes, indeed, have been long out of print, and are not now very easy to obtain ; but every one of the great oratorios, arranged on a similar plan, may be bought at a price within the reach of the poorest student of art.

WHITGIFT, Joun (1530 or 1533-1604), archbishop of Canterbury, was descended from a middle-class family, the elder branch of which had been long settled in Yorkshire. He was the eldest son of Henry Whitgift, merchant of Great Grimsby, Lincolnshire, where he was born, according to one account in 1533, but according to a calculation founded on a statement of his own in 1530. At an early age his education was entrusted to his uncle, Robert Whit- gift, abbot of the neighbouring monastery of Wellow, by whose advice he was afterwards sent to St Anthony's school, London. There he lodged with his aunt, wife of the verger of St Paul's cathedral; but, having through his uncle's teaching imbibed so much of the Reformation doc- trine that he declined to attend mass in the cathedral, he quarrelled with his aunt and had to return home. In 1549 he matriculated at Queen's College, Cambridge, and in May 1550 he migrated to Pembroke Hall, where he had the martyr John Bradford for a tutor. On 3lst May 1555 he became a fellow of Peterhouse. Having taken holy orders in 1560, he became in the same year chaplain to Dr Cox, bishop of Ely, who collated him to the rectory of Teversham, Cambridgeshire. In 1563 he was appointed Lady Margaret professor of divinity at Cambridge, and his lectures gave such satisfaction to the authorities that on 5th July 1566 they considerably augmented his stipend. The following year he was appointed regius professor of divinity, and also became master of Trinity. He had a principal share in compiling the statutes of the university, which passed the great seal on 25th September 1570, and in November following he was chosen vice-chancellor. Macaulay's description of Whitgift, as "(a narrow, mean, tyrannical priest, who gained power by servility and adula- tion," is tinged with rhetorical exaggeration; but un- doubtedly Whitgift's extreme High Church notions led him to treat the Puritans with exceptional intolerance. In a pulpit controversy with Cartwright, regarding the constitutions and customs of the Church of England, he showed himself Cartwright's

inferior in oratorical effective- ness, but the balance was redressed by the exercise of arbitrary authority. Whitgift, with other heads of the university, deprived Cartwright in 1570 of his professor- ship, and in September 1571 he exercised his prerogative as master of Trinity to deprive him of his fellowship. In June of the same year Whitgift was nominated dean of Lincoln, In the following year he published An Answere to a Certain Libel intituled an Admonition to the Parlia- ment. To this Cartwright replied by a Second Admoni- tion to the Parliament ; and in 1573 Whitgift published a third edition of his Answere, with additions bearing on Cartwright's Admonition. Cartwright thereupon rejoined by a Replye to an Answere made of M. Doctor Whitegifte ; and in 1574 Whitgift published Defence of the Answere to the Admonition against the Replye of T. C. On 24th

March 1577 he was appointed bishop of Worcester, and during the absence of Sir Henry Sidney in Ireland he for two and a half years acted as vice-president of Wales. In August 1583 he was nominated archbishop of Canterbury, and thus was largely instrumental in giving its special complexion to the church of the Reformation. Although he wrote a letter to Queen Elizabeth remonstrating against the alienation of church property, Whitgift always retained her special confidence. In his policy against the Puritans, and in his vigorous enforcement of the subscription test, he was only obeying her behests. Huis course of action gave rise to the Mar-prelate tracts, in which the bishops and clergy were bitterly attacked. Through Whitgift's vigilance the printers of the tracts were, however, discovered and punished ; and in order more effectually to check the publication of such opinions he got a law passed in 1593 making Puritanism an offence against the statute law. In the controversy between Travers and Hooker he interposed by prohibiting the preaching of the former; and he more- over presented Hooker with the rectory of Boscombe in Wiltshire, in order to afford him more leisure to complete his Ecclesiastical Polity, a work which, however, cannot be said to represent either Whitgift's theological or his ecclesiastical standpoint. Towards the close of his episco- pate he, in conjunction with the bishop of London and other prelates, drew up the Calvinistic instrument known as

*the Lambeth Articles. They were, however, not ac- cepted by the church. Whitgift attended Elizabeth on her deathbed, and crowned James I. He was present at the Hampton Court Conference in January 1604, and died at Lambeth on the 29th of the following February. He was buried in the church of Croydon, and his monument there with his recumbent effigy was in great part destroyed in the fire by which the church was burnt down in 1867. Whitgift is described by his biographer, Sir G. Paule, as of ** middle stature, strong and well shaped, of a grave countenance and brown complexion, black hair and eyes, his beard neither long nor thick." He was noted for his hospitality, and was somewhat ostentatious in his habits, sometimes visiting Canterbury and other towns attended by a retinue of 800 horsemen. He left several un- published works, which are included among the MSS. Angliz. Many of his letters, articles, injunctions, &c., are calendared in the published volumes of the State Paper series of the reign of Elizabeth. His Collected Works, edited for the Parker Society by Rev. John Ayre, 8 vols., Cambridge, 1851-58, include, besides the controversial tracts already alluded to, two sermons published during his lifetime, a selection from his letters to Cecil and others,*

and some portions of his unpublished MSS.

A Life of Whitgift by Sir G. Paule appeared in 1612, 2d ed. 1649. It has been embodied by Strype in his Life and Acts of Whitgift, 1718. There is also a life in Wordsworth's Eeclesiastical Biography, Hook's Archbishops of Canterbury, and vol. i. of Whitgift's Collected Works. See also Cooper's Athene Canta- brigienses.

WHITING, a marine fish (Gadus merlangus), abundant on the shores of the German Ocean and all round the coasts of the British Islands. It is distinguished from the other species of the genus Gadus or Cod-fish by having from thirty-three to thirty-five rays in the first anal fin, and by lacking the barbel on the chin (which is so well de- veloped in the common cod-fish, whiting-pout, &c.) entirely, or possessing only a minute rudiment of it. The snout is long, and the upper jaw longer than the lower. A black spot at the root of the pectoral fin is also very character- istic of this species, and but rarely absent. The whiting is one of the most valuable food fishes of northern Europe, and is caught throughout the

year by hook and line and by the trawl. It is in better condition at the beginning of winter than after the spawning season, which falls in the months of February and March. Its usual size is from 1 to 13 pound, but it may attain to twice that weight. In the south of Europe it is replaced by an allied species, Gadus euxini, which, however, seems to be limited to the cold waters of the Adriatic and Black Seas.

WHITLOW is a name applied loosely to any inflamma-

tion involving the pulp of the finger, attended by swelling and throbbing pain. In the simplest form, apt to occur in sickly children, the inflammation results in a whitish vesicle of the skin, contaming watery or bloody fluid. In all such cases, where the deeper structures are not implicated, no radical local treatment is needed, although the illness is an indication for constitutional treatment. The affection is not usually spoken of as whitlow unless it involves the deeper structures of the last joint of the finger. These are in a peculiarly close relation to the surface; hence the liability to deep-seated formations of matter, from some slight scratch or prick (poisoned or otherwise) of the skin over the pulp of the finger, or even when there is no obvious external provocation. The intimate connexion of the surface with the deep structures is near the finger-tip ; in that region there are certain regular bundles of strong fibres passing from the under layers of the skin, through the fat of the finger pulp, down to the free end of the bone, which is roughened and expanded in a very peculiar manner for their insertion. These fibres, which are proper to adults, serve to convey an inflammatory infection from the skin down to the bone, or to the periosteum or covering of the bone, and to the tendon (of the deep flexor muscle of the finger) inserted into that part of the last joint of the finger next tothe hand. The peculiar danger of a whitlow is that, if it be not opened in time by a deep cut down to the bone along the middle line of the phalanx, the inflam- mation will attack the covering of the bone, and so produce mortification or necrosis of the latter, and then attack the insertion of the tendon, causing sloughing of it also. In this way a whitlow, which has been neglected or treated by temporizing and ineffective methods, often leads to a loss of the bony tip of the last finger-joint, or even of the whole of the joint, and to a proportionate shortening and deform- ity of the finger. In another class of cases, which are fortunately less common, the deep-seated inflammation travels along the various structures of the finger towards the palm of the hand. The inflammation extends inside the dense fibrous tunnel or sheath which contains and binds down both tendons upon the middle and proximal joints of the finger. In that confined space the inflamma- tion becomes peculiarly virulent: the tension of the part gives the pain a bursting character; the redness and swelling extend all round the fingers and to the back of the hand and wrist; and the result of all this

suppuration and sloughing may be rigidity and contraction of the fingers and hand. Whenever matter burrows in this way, the treatment must be by free incisions. In all cases of whit- low the general disturbance of health is excessive.

The general treatment of all whitlow inflammations consists at the outset in relief of a congested state of the system, where such exists, by a purge and by a restricted diet, in applying poultices or hot compresses to the affected finger, and in carrying the arm in a sling. The presence of matter will not be obvious by the ordinary signs of a gathering ; attempts to let out the matter by anything short of a free and deep incision are likely to fail and to cause the loss of more or less of the bone.

Whitlows have sometimes been observed to occur among a number of persons together, in a sort of cpidemic, especially where the individuals are all subject to the same conditions of living, as among troops in garrison. These epidemics usually occur at a season (probably the spring) when erysipelas, carbuncles, and boils are prevalent.

WHITSTABLE, a watering-place and seaport of Kent, England, is situated on the south side of the Thames estuary and on the South Eastern and the London, Chat- ham, and Dover Railway lines, 6 miles north-north-west of Canterbury and 62 south-south-east of London. It con- sists chiefly of one main street, about a mile in length, and two narrower streets parallel with it, built on an embank- ment. The church of All Saints, in the Decorated and Perpendicular styles, possesses some old brasses; it was

restored in 1875. The other principal buildings are the institute for literature, science, and art (in connexion with which there are a library, museum, and aquarium), the assembly rooms, the foresters' hall, and the Wynn Ellis almshouses. The "Street," a low narrow ledge of shingle running for three quarters of a mile towards the sea, forms a natural pier and promenade. Whitstable has been famous for its oyster beds from time immemorial. The oysters raised there greatly excel all others in delicacy of flavour, and to economize space spat from other beds is brought to

Whitstable to mature. The lands are held by a company of dredgers incorporated by Act of Parliament in 1793, the affairs being administered by a foreman, deputy foreman, and jury of twelve men. The less ex- tensive Seasalter and Ham oyster fishery adjoins. Of late years the productiveness of the beds has been declining, owing, it is said, to the emptying of refuse and rubbish into the Thames. There is a considerable coasting trade in coal in conjunction with the South Eastern Railway Company, who are the owners of the harbour. The popula- tion of the township and parish (3601 acres) in 1871 was 4881 and 4882 in 1881. A portion of Seasalter is in- cluded in Whitstable.

Whitstable and Seasalter embrace what was formerly known as the "borough of Harwich," but its boundaries are not now recogniz- able. Some Roman remains have been discovered. At Domesday the manor of Whitstable was held by Odo, bishop of Bayeux. Subsequently it came by female descent to the earls of Athole, and afterwards was several times in the hands of the crown, before it came to St John, Viscount Bolingbroke. In modern times it was

held by Wynn Ellis, who left a valuable collection of paintings to the nation.

WHITSUNDAY, or Pentecost (zevrynxoor7), the fiftieth day after Easter Sunday, one of the principal feasts of the Christian Church, is enumerated among these along with Easter Sunday, Good Friday, and the Sundays throughout the year by Origen (Cont. Cels., viii. 392), and is thus en- joined in the Apostolical Constitutions (v. 20): " After ten days from the Ascension, which from the first Lord's Day is the fiftieth day, do ye keep a great festival on the day the Lord Jesus sent on us the gift of the Holy Ghost." The origin of the Anglo-Saxon name of White Sunday, which also occurs in Icelandic, is somewhat obscure, for in the Roman Church the Dominica in Albis (Low Sunday), so called from the white robes then worn by candidates for baptism, has always been the Sunday immediately follow- ing Easter, A very probable suggestion is that in northern countries the colder climate made it desirable to postpone the great baptismal festival to a time when the spring season was further advanced.

WHITTINGTON, a town of Derbyshire, England, is situated on the Chesterfield Canal and on the Midland Railway, 94 miles south-east of Sheffield and 153 north- north-west of London. The church of St Bartholomew, in the Early English style, was erected in 1863 near the site of an older one; it contains the old font and also a mural monument to the antiquary, Dr Pegge (died 1796). The principal works are large iron factories. The manufacture of stone bottles and coarse earthenware is also carried on. Whittington was placed under the government of a local board in 1873. The population of the urban sanitary district (area 1581 acres) was 5578 in 1871 and 7271 in

1881.

WHITTINGTON, Sir Ricuarp (died 1423), was the son of Sir William de Whittington of Pauntley, Gloucester- shire, who died an outlaw in 1360. His mother was J oan, daughter of William Mansell, who was high-sheriff of Gloucestershire in 1308. Richard Whittington makes his first appearance in 1379, when he contributed five marks to a city loan. In 1392 he was elected alderman and sheriff of London, being at that time a member of the

Mercers' Company. He was appointed or elected mayor in 1397, 1398, 1406, and 1419; and in 1416 he was chosen member of parliament for London. In April 1402 he supplied cloth of gold for the marriage of the king's daughter Blanche with Louis, son of the emperor Rupert, and four years later (July 1406) for that of Philippa and Erik VII. of Denmark. Jn March 1413 the king repaid him a loan of £1000, and in September 1415 he was granted a lien on the customs of Boston, Kingston-on- Hull, and London, in discharge of 700 marks lent to Henry V. (by whom he seems to have been knighted). He died in March 1423. Among his chief benefactions by will were the rebuilding of St Michael's church, in con-nexion with which he founded a college, and of Newgate. He is said to have also restored St Bartholomew's hospital, London.

All that is known about Whittington has been carefully collected in the Rev. Samuel Lysons's Model Merchant of the Middle Ages (London,

1860), from which the above account is taken. — Lysons argues very strongly in favour of the famous story of os Whittington and his Cat," and rejects the rationalization which explains the legend by supposing Whittington's fortunes to have been made in the voyages of a medisval cat or merchant-vessel. He is, however, only able to trace back the actual quadruped to a picture which is inscribed "R Whittington 1536." Even this picture he had never seen ; and he has to admit that it bore marks of having been altered from its original size, and that the inscription is later than the alteration. 'The story, however, was evidently current by the end of the 16th century. Moreover, it is said that the figure of a cat was represented at the feet of the statue of Liberty on the gate of Newgate previous to the great fire of 1666; or, according to another account, Whittington's own "statue with the cat remained in a niche to its final demolition on the rebuilding of the present prison." In repairing a house which once belonged to the Whittington family at Gloucester in 1862, a stone of 15th-century workmanship was discovered and on it appeared in bas-relief the figure of a boy nursing acatin his arms. All this, however, cannot be said to go very far towards proving the veracity of the old legend. Clouston (Pogntlar Tales and Fictions, London, 1887, ii. 65-78) traces the main features of the story in the folk-lore of Denmark, Russia, Norway, Brittany, anl even Persia. It was current in Italy during the 15th century ; but its earliest appearance seems to be in Abdullah's History of Persia, written towards the close of the 13th century. This writer as:ribes the occurrences he tells of to the first half of the 11th cen- tury. Even this, in Clouston's opinion, is not the original form of the story, which from one or two of its details he suspects to be of Buddhist origin.

WHITWORTH, a manufacturing village of Lancashire, England, is situated on the river Spodden and on the Rochdale and Bacup branch of the Lancashire and York- shire Railway, 3 miles north of Rochdale. It possesses the usual characteristics of the cotton-manufacturing dis- tricts. Coal-mining is also carried on in the neighbour- hood. The church of St Bartholomew is in the Early English style. The manor of Whitworth was granted to the abbey of Stanilaw in the reign of John. A local board of twelve members was formed in 1874. The urban sani- tary district, which includes the villages of Hallfold, Facit, and Leavingreave, had an area of 8000 acres, with a popu- lation of 11,892, in 1881.

WHOOPING-COUGH. See Hoorinc-Coucu.

WHORTLEBERRY, a vernacular name corrupted from the Latin myrtillus, under which appellation, according to Prior, the berries of the common myrtle were employed in the Middle Ages for culinary purposes. In more modern times the term has been applied to various species of

Vaccinium, particularly to V. Myrtillus, also known ag the bilberry. The berries of this plant have a considerable similarity to those of the myrtle. Several species of Vac- cinium occur on moorlands throughout the northern hemi- sphere. They are low shrubs allied to heaths, usually with evergreen leaves and with small bell-shaped or urn- shaped flowers, which have an inferior ovary surmounted by five calyx lobes. The stamens, though in a single row, are double the number of the corolla lobes. The anthers have usually two horns at the back and are generally

prolonged at the top into two longish tubes, each with a hole at the extremity, throngh which the pollen escapes. The fruit isa globular or ovoid, many-seeded berry. J. Myrtillus and V. uliginosum have blue berries; V. Vates idea, the cowberry, has red fruits. A hybrid between V'. Myrtillus and V. Vitis idea, called V. intermedium, occurs in Shropshire and Staffordshire. The cranberry (Oxy- coccus) is very closely allied to the whortleberry.

WHYDAH. See Danomey, vol. vi. p. 765.

WICHITA, a city of the United States, the county seat of Sedgwick county, Kansas, is situated on the east bank of the Arkansas river, in the midst of an extremely fertile region. It is entered by six lines of railway, thus being one of the most important railway centres of the State. Its growth has been remarkable, even in this region of rapid development. In 1870 its site was with- out inhabitants ; in 1880 it contained 4911 persons, while in 1886 it had a population of 20,129, making it the fourth city of the State.

WICK, a royal and parliamentary burgh and seaport of Scotland, the county town of Caithness, is situated on the German Ocean at the head of

Wick Bay and at the eastern terminus of the Sutherland and Caithness section of the Highland Railway, 374 miles north of Edinburgh by rail and 184 south of John O'Groat's House. It consists of the old burgh of Wick on the north bank of the river, Louisburgh, a northern continuation of Wick, and Pultney- town, the chief seat of commerce and trade, on the south side of the river. Pultneytown, laid out in 1805 by the British Fishery Society, is built on a regular plan; and Wick proper consists chiefly of the narrow and irregular High Street, off which is the temperance hall, with Bridge Street, somewhat more regularly built, and containing the town-hall and the county buildings. In Pultneytown there are an academy, a chamber of commerce, a naval reserve station, and a fish exchange. The port consists of two harbours of fair size ; but the entrance is dangerous in stormy weather. Several expensive schemes for con- structing a breakwater have resulted in disastrous failure. In 1886 the number of vessels that entered the port was 1128 of 109,142 tons, the number that cleared 1094 of 103,162 tons. The average value of the exports for the five years ending 1887 was about £150,000; but in 1886 it was only £89,641. The chief exports are fish, cattle, and agricultural produce, and the imports include coal, wood, and provisions. Steamers from Granton and Aber- deen to Thurso, the Orkneys, and the Shetlands call at Wick going and returning. It is, however, chiefly to its fisheries that the town owes its prosperity. For many years it was the chief seat of the herring-fishing on the east coast of Scotland ; but its insufficient harbour accom- modation has greatly hampered its progress, and both Peterhead and Fraserburgh more than rival it as fishing ports. The number of boats belonging to the port in 1885 was 807; the value of the herrings cured was £117,754 and of cod, ling, and skate, £61,928. Ship- building, formerly prosecuted, has now been discontinued ; but boat-building and net-making are extensively carried on. There are also cooperages, flour-mills, steam saw-mills, a rope and a woollen manufactory, and a distillery. Wick forms one of a group of parliamentary burghs called the Wick burghs. The population of the parliamentary burgh, which includes the royal burgh of Wick, Pultneytown, and Louisburgh, was 8145 in 1871 and 8053 in 1881. In the last year the population of the royal burgh was only 1420. In 1883 the royal burgh was extended by the in- clusion of Louisburgh. The population of this extended area in 1881 was 2954.

Wick (Vik or ‘“‘bay”) is mentioned as early as 1140. It was constituted a royal burgh by James VI. in 1589, its superior being

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then George, carl of Caithness. By a parliamentary bounty in 1768 some impetus was given to the herring-fishery, but its real importance dates from the construction of a harbour in 1808. It has sent one member to parliament since 1832.

WICKLIFFE. See Wyctirre.

WICKLOW, a maritime county of Ireland, in the pro- vince of Leinster, is bounded on the E. by St George’s Channel, N. by the county of Dublin, 8. by Wexford, and W. by Carlow and detached portions of Kildare. The area is 500,178 acres or about 781 square miles.

Physical Features.—The coast is precipitous and pic- turesque, but very dangerous of approach owing to sand- banks. There are no inlets that can be properly termed bays. The harbour at Wicklow has lately been improved; but that of Arklow is suitable only for small vessels. To the north of the town of Wicklow there is a remarkable shingle beach, partly piled up by the waves and currents. The central portion of the county is occupied by a granite mountain range, forming one of the four principal mountain groups of Ireland, The direction of the range is from north-east to south-west, and the highest elevations are generally attained along the central line. The range consists of long sweeping moorlands, rising occasionally by precipitous escarpments into culminating points, the highest summits being Kippure (2473 feet), Duff Hill (2369), Douce Hill (2384), and Lugnaquilla (3039). The range rises from the north by a succession of ridges inter- sected by deep glens, and subsides towards the borders of Wexford and Carlow. Though the range is metamor- phic, it 1s also in part intrusive, and its formation has been accompanied by a considerable elevation of Silurian rocks, beyond which it does not penetrate, notwithstanding that the Cambrian rocks occupy a large tract along the sea coast. In the valleys there are many instances of old river terraces, the more remarkable being those at the lower end of Glenmalure and the lower end of Glendalough. It is in its deep glens that much of the

peculiar charm of Wicklow scenery is to be found, the frequently rugged natural features contrasting finely with the rich and luxuriant foliage of the extensive woods which line their banks. Among the more famous of these glens are the Dargle, Glencree, Glen of the Downs, Devil's Glen, Glen- malure, Glen of Ismail, and the beautiful vale of Ovoca. The eastern districts of the county are occupied by clay slate or quartzite, the latter of which presents frequently a smooth polished surface and shows indications of Glacial erosion. Evidences of Glacial action also appear in the moraines of Glenmalure and Glendalough. The principal rivers are the Liffey, on the north-western border; the Vartry, which passes through Devil's Glen to the sea north of Wicklow Head ; the Avonmore and the Avonbeg, which unite at the "meeting of the waters" to form the Ovoca, which is afterwards joined by the Aughrim and falls into the sea at Arklow; and the Slaney, in the west of the county, passing southwards into Carlow. There are a number of small but romantic lakes in the valleys, the principal being Loughs Dan, Bray, and Tay or Luggelaw, and the loughs of Glendalough.

Minerals.—WLead is raised at Lugganure (near Rathdrum), the principal lead mine in Ireland. In 1796 gold was discovered near Croghan Kinshcla, but not in quantities to render working re- munerative. Auriferous silver occurs in the slaty strata. There are important copper mines at Ovoca, where sulphur and iron are alsodug. Slates for roofing are quarried at Dunganstown and elsc- where. Limestone, limestone gravcl, and marl are obtained near the sea and in the river valleys.

Agriculture. —According to the latest landowners' return, Wick- low was divided among 1041 proprietors, possessing 497,656 acres, at an annual valuation of £254,800, or about 10s. 23d. per acre.

There were also about 2500 acres of waste land. Of the proprietors 534, or rather more than a half, possessed less than 1 acre each.

The following possessed over 8000 acres each :—William Kemmis,

8042; J. S. Moore, 8731; R. A. G. Cunninghame, 10,479 ; earl of

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Meath, 14,718; marquis of Downshire, 15,766; earl of Carysfort, 16,292; J. Mandeville Hugo, 17,937; earl of Wicklow, 22,104; marquis of Waterford, 26,035 ; Viscount Powerscourt, 36,693 seannd earl Fitzwilliam, 89,891. The climate near the sea is remarkably mild, and permits the myrtle and arbutus to grow. The land in the lower grounds is fertile; and, although the greater part of the higher districts is covered with heath and turf, it affords good pasturage for sheep. There is a considerable extent of natural timber, as well as artificial plantations. Out of a total area of 499,894 acres in 1886 105,642 or 21°1 per cent. were under crops, 234,890 or 47 per cent. under grass, 175 acres fallow, 19,479 or 3°9 per cent. woods and plantations, 29,028 or 5°8 per cent. bog and marsh, 94,347 or 18°9 per cent. barren mountain land, and 16,333 or 3°3 per cent. water, roads, fences, &c. The total number of holdings in 1886 was only 8072 and their size is much above the average for Ireland, 70 being above 500 acres in extent, 973 be- tween 100 and 500 acres, 2615 between 30 and 100 acres, 2646 between 5 and 30 acres, 855 between 1 and 5 acres, and 913 not ex- ceeding 1 acre each. Between 1849 and 1886 the area under crops decreased from 126,251 to 105,642 acres; but within the last ten years the decrease was not so marked, the area in 1876 being 111,488 acres. The area under meadow and clover has been gradu- ally increasing: in 1849 it was 50,793 acres, and, while in 1876 it was 60,086 acres, in 1886 it was 60,390. The area under green crops shows very slight fluctuations: in 1849 it was 18,837 and in 1886 it was 18,114. Potatoes and turnips, which occupied respect- ively 10,847 and 5304 acres in 1886, have not perceptibly altered in the proportions of the areas. The decrease in the arca under corn crops has, on the other hand, been remarkable ; from 56,616 acres in 1849 it fell to 31,361 in 1876 and to 27,129 in 1886. The area under wheat in 1849 was 7817 acres, but between 1876 and 1886 it decreased from 3639 to 814 acres. The area under oats has de- creased from 44,527 acres in 1849 to 26,920 in 1876 and 25,344 in 1886 ; the area under barley, bere, and other corn crops being in these years 4272, 1480, and 971 acres respectively. The number of horses in 1886 was 11,300 (of which 7206 were used for agricul- tural purposes), asses 3465, mules 351, cattle 81,577 (of which 24,523 were milch cows), sheep 169,334, pigs 22,329, and goats 6278.

Communication.—The Dublin, Wicklow, and Wexford Railway skirts the coast from Bray to the town of Wicklow, after which it bends westward to Rathdrum, and then passes by the vale of Ovoca to Arklow. At Wooden Bridge a branch goes off south-west- wards to Shillelagh.

Manufactures and Trade.—Except in the Ovoca district, where the mining industry is of some importance, the occupations are chiefly agricultural. The manufacture of flannel, which formerly gave employment to a considerable number of pcople, is now in a very depressed condition. Herring and round fish are caught off the coast, but these fisheries are much neglected. There, is, how- ever, a2 rather prosperous oystcr fishery at Arklow. Of late years the harbour at Wicklow has been improved, the bed of the river deepened, and a steam-packet pier erected.

Administration and Population.—According to De Burgo's esti- mate, the population of Wicklow in 1760 amounted to 43,872; the parliamentary census of 1812 placed it at 83,109; by 1821 it had increased to 110,767, and by 1841 to 126,143, but by 1861 it had diminished to 86,451, by 1871 to 78,697, and by 1881 to 70,386 (males 35,101, females 35,285). Roman Catholics in 1881 num- bered 79°9 per cent. of the population, Protestant Episcopalians 18-3 (an unusually large proportion for the south of Ireland), Pres- byterians 0°4, Methodists 1:0, and other denominations 0°4. The number of persons who could read and write numbered 57:4 of the population, able to read only 12°8 per cent., illiterate 29°8. There were none who could speak Ivish only, and the number who could speak Irish and English was 243. Wicklow, which formerly re- turned two members to parliament, was in 1885 formed into two parliamentary divisions, an eastern and a western, each returning one member. The principal towns arc part of Bray (4887), a fashionable watering-place, the other part (2148) being in Dublin ; Wicklow (3391), the county town; and Arklow (4777), a fishing- station of some importance. The county is divided into eight baronies and contains fifty-nine parishes. According to the Pro- testant Episcopal arrangements, it is in the dioceses of Dublin and Glendalough, with portions in those cf Leighlin and Ferns. It is in the home or Leinster circuit ; and assizes are held at Wicklow and quarter- sessions at Bray, Baltinglass, Tinahely, Arklow, and Wicklow. There are

ten petty sessions districts within the county, and portions of four others. It includes two poor-law unions and portions of the unions of Naas, Rathdown, and Shillelagh. It is in the Dublin military district. —

History and Antiquities.—On the division of the district of the Pale by King John into twelve counties Wicklow was included in Dublin county. It was made a separate county by James I. in 1605. It sided with the royal cause during the Cromwellian wars, but on Crontwell's advance submitted to him without striking a blow. During the rebellion of 1798 some of the insurgents took refuge within its mountain fastnesses. An engagement took place

between them and General Holt near Aughrim, which was speedily decided in Holt's favour ; a second was fought at Arklow between them and General Needham with a similar result. Of the ancient cromlechs there are three of some interest, one near Enniskerry, another on the summit of Lugnaquilla, and a third, with a druidical circle, at Donoughmore. There are comparatively unimportant monastic remains at Rathdrum, Baltinglass, and Wicklow. The ruins in the vale of Glendalough, known as the "seven churches," are, with the doubtful exception of Clonmacnoise, the most remark- able ecclesiastical remains in Ireland. They owe their origin to St Kevin, who lived in the vale as a hermit, and is reputed to have died on 3d June 618. On the site of St Kevin's cell an extensive monastic establishment was founded, and around it a town sprang up, which was long famed as a scat of learning. The buildings which constitute the "seven churches" are the round tower, one of the finest in Ireland, 110 feet in height and 51 in circumference ; St Kevin's kitchen or church, of which the nave, 25 feet by 15, with a curious high-pitched roof and a round belfry (supposed_to be the earliest example of a round belfry springing from the roof or gable), still remains; a structure within the cemetery called the cathedral, in a state of great dilapidation, but from its ee and dimensions seemingly well entitled to its name; the lady chapel, chiefly remarkable for its doorway of wrought granite, in a style of architecture allied to the Greek ; Trinity church, consisting of nave (29 feet 6 inches by 17 feet 6 inches), chancel (18 feet 6

inches by 9 feet), and a basement story, and presenting some of the finest characteristics of the ancient architecture of Ireland, including a very beautiful specimen of the square-headed doorway ; the monas- tery, or St Saviour's abbey, with peculiar ornamental sculpture, and supposed to contain the tomb of St Kevin ; and the Refeart or ceme- tery church. In the cemetery and all along the valley there are a large number of monuments and stone crosses of various size and style. The cave known as St Kevin's bed shows evidence of having been artificially constructed, but is probably only an enlarged natural cavity. Of the old fortalices or strongholds associated with the early wars those of special interest are Black Castle, near Wicklow, origin- ally founded by the Norse invaders, but taken by the Irish in 1301, and afterwards rebuilt by William FitzWilliam ; the scattered re- mains of Castle Kevin, the ancient stronghold of the O'Tooles, by whom it was probably originally built in the 12th century; and the ruins of the old castle of the Ormondes at Arklow, founded by Theobald Fitz Walter (died 1285), the scene of frequent conflicts up to the time of Cromwell, by whom it was demolished in 1649, and now containing within the interior of its rnined walls a constabu- lary barrack. 'The fine mansion of Powerscourt occupies the site of an old fortalice founded by De la Poer, one of the knights who landed with Strongbow ; in the reign of Henry VIII. it was taken by the O'Tooles and O'Brynes. (LES)

WIDDIN, or Win1y, a fortified town of Bulgaria, within 20 miles of the Servian frontier and about 130 miles south-east of Belgrade, in 44° N. lat. and 22° 50' E. long. It occupies a strong position on the right bank of the Danube over against the Roumanian town of Kalafat, with which it is connected by a bridge of boats over a mile long. Owing to its low situation, the soil is marshy and the city is liable to inundation (six floods having occurred since 1839). Its population in 1888 amounted to 13,435, in- cluding 6929 Bulgarians, 3387 Turks, and 1304 Jews. The citadel, always a formidable stronghold, has recently been strengthened and enlarged with a double line of ram- parts reaching to the water's edge, while on the land side the approaches are naturally protected by the extensive marshy tracts formed here by a sharp bend of the Danube from the east to the south. The old town within these lines was formerly inhabited exclusively by Mohammedans, and still presents an Oriental

aspect, with its mosques, minarets, and over 1700 stalls lining the bazaar or main thoroughfare of Plevna Ulica. There are a few local industries, such as the making of gold and silver filigree work, saddlery, beer, flour, and cutlery, besides a brisk riverine trade, mainly in the hands of the Jews and Bul- garians. 'The fisheries in the Danube are of some import- ance (£20,000 annually).

Widdin stands on the site of the Roman town of Bononta in Meesia Superior, not to be confounded with the Pannonian Bononia which stood higher up the Danube to the north of Sirmium. Its name figures conspicuously in the military annals of medieval and recent times ; and it is specially memorable for the overthrow of the Turks by the imperial forces in 1689 and for the crushing defeat of the hospodar Michael Sustos by Pasvan Oglu in 1801. It was again the scene of stirring events during the Russo-Turkish wars of

1854-55 and 1877-78, and successfully resisted the assaults of the Serviansin the Servo-Bulgarian War of 1886-87.

WIDNES, a manufacturing town of Lancashire, Eng- land, is situated on the Mersey, where it is joined by the Sankey Brook Navigation, and on the London and North- Western Railway, 13 miles south-east of Liverpool and 188 from London. Capacious private docks were constructed in 1866 and extended in 1884. The Mersey is crossed by a wrought-iron bridge, 1000 feet long and 95 in height, completed in 1868, and having two lines of railway and a footpath. The church of St Mary was erected in 1856, that of St Ambrose in 1880, and that of St Paul in 1884. Widnes is one of the principal seats of the alkali and soap manufacture, and has also grease-works for locomotives and waggons, copper-works, iron-foundries, oil and paint works, and sail-cloth manufactories. It is governed by a local board of fifteen members. Until comparatively recent years it was a small township, dependent chiefly on agri- culture. In 1851 the population was under 2000, but by 1861 the numbers had more than trebled. In 1871 the population of the urban sanitary district (area 3339 acres) was 14,359, and 24,935 in 1881; in 1888 it was estimated to exceed 30,000.

The barony of Widnes came from the Lacy family to the dukes of Lancaster and thence to the crown. In 1554-55 it was declared to be part of the duchy of Lancaster.

WIELAND, CuristopHer Martin (1733-1813), Ger- man man of letters, was born on the 5th September 1733 at Oberholzheim, a Swabian village near Biberach, then an imperial city. He was carefully educated by his father, who was a clergyman at Oberholzheim ; and at a very early age he gave evidence of a strong literary impulse. In his fourteenth year he was sent to the school of Klosterbergen, near Magdeburg, where he attracted a good deal of atten- tion, not only by his knowledge of the classics and of French and English literature, but by his power of lucid and grace- ful expression. When he was about sixteen he left school and went to live with a relative at Erfurt, who undertook to prepare him for the university by reading with him the writings of the philosopher Wolff. Having spent a year and a half with this relative, he went for some time to Biberach, whither his father had been transferred from Oberholzheim. At Biberach he met a young kinswoman, Sophie Gutermann, with whom he fell in love, and who exercised a powerful influence upon the development of his intellect and imagination. While talking with her, after they had heard his father preach a sermon on the text "God is Love," he conceived the scheme of his first poem, Die Natur der Dinge. In 1750 he went to the university of Tiibingen, nominally for the purpose of studying law; but in reality he devoted his attention wholly to literature. At Tiibingen he wrote his poem on the Nature of Things, and in 1752 it was published anony- mously. Here also he wrote Anti-Oud, Lobgesang auf den Frithling, Moralische Briefe, and Moralische Erzihlungen. At home Wieland had been strictly brought up, and his home training had been confirmed at the Klosterbergen school, the head-master of which was a member of the straitest sect of the Pietists. In his early writings, there- fore, Wieland appears as a youth of a deeply serious dis- position, with an ardent enthusiasm for what he conceives to be the highest ideas of theology and ethics.

Bodmer, the Swiss critic and poet, strongly attracted by this new literary force, cordially invited Wieland to visit him at Zurich. Wieland accepted the invitation, and lived for many months in Bodmer's house. In 1754 the

two friends parted; for, although they had apparently the same aims and motives, they were in reality very unlike one another, and Bodmer was apt to play rather too osten- tatiously the part of a guide and patron. Wieland con- tinued to reside in Switzerland, remaining in Zurich about

five years and in Bern about a year, and supporting him- self by working as a tutor. During the early part of his residence in Switzerland Wieland maintained the serious tone that had marked his first writings. In his Briefe von Verstorbenen an hinterlassene Freunde, Sympathien, Emp- Jindungen eines Christen, and other works of this period he sought to give expression to the loftiest spiritual aspira- tions ; and in the letter in which he dedicated the Hmp- Jindungen to the court preacher Sack, in Berlin, he went out of his way to rebuke the frivolity of certain Anacreontic poets, whom he denounced as "'a band of epicurean pagans." But Wieland's mystical and ascetic doctrines did not at all correspond to his real impulses, and soon after he left Bodmer's house he began to feel that he had misunderstood his own character. His piety became less enthusiastic, and he learned to have a keen appreciation of pleasures which he had formerly condemned as incompatible with any high or worthy conception of the ends of human life. This change led to a kind of literary activity wholly different from that by which he had made his reputation. He wrote two dramas, Johanna Grey (in which he made free use of Rowe's play Lady Jane Grey) and Clementina von Poretta; and he chose as the subject of an epic poem the career of Cyrus, who was to be presented as a hero closely resembling Frederick the Great. Cyrus he never finished ; but he completed Araspes und Panthea, a poem in which he developed an episode from the Cyropedia of Xenophon.

In 1760 he settled at Biberach as director of the chancery. The appointment was a poor one, and for a time Wieland found life at Biberach extremely dull and tiresome. By and by, however, he made the acquaintance of Count Stadion, an experienced man of the world, at whose house Wieland became a constant visitor ; there he met, among many other persons whose society he liked, his first love, Sophie, who had married Von Laroche, the count's confidential friend and "factotum."

Under these new influences the change of tone which had been begun in Switzerland was soon completed; and in Don Sylvio von Hosalva (1764), a romance, intended to be taken as an imitation of Don Quixote, he gave himself the pleasure of laughing at principles and sentiments which he had formerly held to be sacred. This work was followed by Komasche LErzihlungen (1766), the cynical grossness of which far surpassed that of any contemporary German writer. Wieland, himself seems to have felt that in these tales he had gone too far, for, although in his next work, Agathon (1766-67), the hero of which is a disciple of Plato, he sometimes treads on slippery ground, his ulti- mate aim is to show that the true rule of life is to hold the balance even between the spiritual and the physical impulses of man. His unfinished Jdris und Zenide (1768) has a less worthy motive ; but in the didactic poem Jfus- arion (1768) he returned to the idea of Agathon, that fanaticism and sensuality are equally opposed to enduring happiness, and that he is most to be envied who knows how to gratify all legitimate impulses without allowing any of them to become unduly powerful. To Wieland, when his mind and character were fully developed, this law of conduct seemed to be the highest to which man can attain, and he was never tired of indirectly expounding it in his later writings. At Biberach he devoted much time to the study of Shakespeare, and in 1762-66 he published, in eight volumes, translations of twenty-two of Shake- speare's plays.

In 1765 Wieland had married a lady of Augsburg, to whom he was warmly attached. Four years afterwards he was made professor of philosophy at Erfurt, where he remained until 1772. During his stay at Erfurt he wrote Dralogen des Diogenes von Sinope; Beitrdge zur geheimen

Geschichte des menschlichen Verstandes und HHerzens, aus den Archiven der Natur; Der goldene Spiegel; Die Grazten, a didactic poem ; Combabus, a disagreeable tale in verse ; and Der neue Amadis, a comic poem in eighteen cantos.

In 1772 Wieland settled for life at Weimar, his position at first being that of a tutor to the two sons of the duchess Anna Amalia. Here he founded

the monthly periodical, Der Deutsche Mercur, which he edited until 1796. For this periodical he wrote constantly, and, con- sidering the immense number of his productions, it is surprising that he was able to maintain, on the whole, so high a level of excellence. By far the best of his works is the poem Oberon, the only work by him which has still a wide circle of readers in Germany. It was published in 1780. Among other original writings produced in Weimar may be named a comic romance, Die Geschichte der Abderiten (1774), Der verklagte Amor (1774), Das Wintermdrchen (1776), and Das Sommermdrchen (1777). In 1782 and 1786 appeared translations of the Epistles and Sateres of Horace ; and in 1788 and 1789 he issued a translation of Lucian, his study of whom led to his writing Neue Gottergespriche (1791), Geheime Geschichte des Philo- sophen Peregrinus Proteus (1791), and Agathoddmon (1799). From 1793 to 1802 he was engaged in issuing a revised edition of his writings; but in 1796 he found time to establish a new periodical, Das Attische Museum, in which he printed, among other things, translations of some of the comedies of Aristophanes. In 1797 Wieland bought Osmannstidt, an estate near Weimar ; and there he lived for some years with his large family. At Osmannstiadt he wrote his last important romance, Aristipp und einige seiner Zeitgenossen (1800-2). In 1801 his wife died, and two years afterwards he sold his estate and returned to Weimar, where he spent his last years in translating and annotating the Letters of Cicero. He died on 20th January 1813.

Wieland was a man of many moods, and his friends, when talk- ing with him, could never be quite sure that they would not un- intentionally offend him. But, although vain and over-sensitive, he often gave evidence of an essentially humane and generous spirit. Asa writer he lacked force of imagination and depth of feeling ; and even at his best he had too narrow a range of vision to be a great moral teacher. Nevertheless, he has an important place in the history of German literature. He was the founder in Germany of the psychological romance, and few of his successors in this kind have surpassed his delicate and subtle analyses of complicated motives. Both in prose and in verse he was a master of the art of composition, and most of the younger writers of his day learned something from the clearness, ease, and grace of his style. To him belongs the merit of having first suggested to his countrymen that it might be

worth their while to study their native literature as well as that of France, England, and Italy.

Wieland's Collected Works, edited by Gruber, were issued in 53 vols. in 1818- 1828 and in 36 vols. in 1851-56. There are biographies of him by Gruber (1827-28), Loebell (1858), and Ofterdingen (1877). Much light is thrown on his character Anke letters; see Ausgewchlte Briefe (1815-16) and Briefe an ney

WIENER NEUSTADT. See NEusrapr.

WIESBADEN, capital of the former duchy of Nassau and now the chief town of a district in the province of Hesse-Nassau in Prussia, disputes with Baden-Baden the title to be considered the most frequented and most fashionable watering-place in Germany. It is situated in a small and fertile valley on the south-west slopes of Mount Taunus, 5 miles to the north of Mainz and 3 miles from the Rhine (see the subjoined plan). The town is neat and well-built, with broad and regular streets. Its prosperity is entirely owing to its hot springs; and the general character and appearance of the place, with its numerous hotels, lodging-houses, villas, bath-houses, pro- menades, and places of entertainment, are dictated by the requirements of the visitors, who number annually about 60,000. The principal buildings are the palace, built in 1837-42 and restored in 1882; the Cursaal, a large and

handsomely fitted up establishment, built in 1810, and adjoined by a beautiful and shady park ; the Protestant church, built of polished bricks in 1852-60, with five tall towers, in the Gothic style; the (ay (aiterotes

Roman Catholic church; the new |. An, synagogue in the Moorish style;N. ~ the museum, with a picture gal- |A lery, a collection of antiquities, and a library of 70,000 volumes ; the theatre; the Berg church; and the Russian chapel, erected on the Neroberg in 1855. Wiesbaden con- tains numerous scientific societies and educational institutions, in- cluding a well-known chemical laboratory. The thermal springs contain only 4 per cent. of salt, and very little carbonic acid ; and

a good deal of their efficacy is duep to their high temperature, which E varies from 156° to 142° Fahr. |." The water is generally cooled to Ses 93° Fahr. for bathing. The prin- |S cipal spring is the Kochbrunnen (156° Fahr.), the water of which is drunk by sufferers from gout, chronic dyspepsia, obesity,

f WIESSADEN [FB m8

SY Ss A

N. Environs of Wiesbaden.

&c, There are twenty-eight other springs used for bath- ing, and effica-

cious in cases of

rheumatism, gout,

scrofula, and ner- ue vous ailments.

The town lies 320 ie feet above the sea- [ff level. Its climate PSs

Wwysunx

is mild and warm, so that even in winter it is fre- quented by from 5000 to 6000 vi- siters. The popu- lation in 1885 was 55,457; in 1816 it was 4608 ; in 1867, 30,085. Wiesbaden is one of the oldest water- ing-places in Ger- | many, and may be f_js regarded as the capi- [7 tal of the Taunus # spas. The springs, 44 mentioned by Pliny as Fontes Mattiact, were known to the Romans, who appear to have fortified the

Plan of Wiesbaden. place. Under the Carolingian monarchs it was the site of a palace.

Otho I. made it a town. The name Wisibada appears in 830. Though the springs never passed out of knowledge, they did not attain their greatest repute until the close of the 18th century. From 1771 till 1878 Wiesbaden was a notorious gambling resort ; but in the latter year public gambling was suppressed by the Prussian Government.

See Geschichte und historiche Topographie der Stadt Wiesbaden, by F Roth, and Balneologische Studien iiber Wiesbaden, ed. by Dr Peiffer, both vub. lished at Wiesbaden in 1883, and both containing copious bibliographical lists,

WIFE. See HusBanp anD Wirz, and Women.

WIG.! Artificial hair appears to have been worn from very ancient times, as is testified by well-made wigs re- covered from Egyptian mummy figures. The full and flow-

ee a

1 Shortened from periwig, a lengthened form (through the Dutch) of peruke. This word is extant in all the Romance languages (Ital. parrucca, or, in Sardinian, pilucca ; Span. peluca; Portug. peruca ; Fr. perrugue ; Walloon perik) and is derived from pelo (pilus).

Wwir=-wié¢

ing locks which adorn the sculptured reliefs of human figures found at Nineveh also suggest that wigs were not unknown among the ancient Assyrians. In the 16th cen- tury the fashion of wearing false hair became prevalent among ladies in Europe. At one period Elizabeth of Eng- land was possessed of no fewer than eighty attires of false hair. Mary of Scotland throughout her life was also in the habit of varying the attires of hair.she wore; and much of the confusion which has arisen in connexion with her portraits is traceable to this cireumstance.? The peri- wig of the 16th century was, however, merely false hair worn like, and sometimes with, the real hair, as an adorn- ment or to supply the defects of nature. It was not till the 17th century that the peruke was worn as a distinctive feature of costume; as such it was first employed by Louis XIII. when his hair failed. His successor, Louis XIV., did not adopt it till 1673. In the meantime it had been freely donned by courtiers and gallants of the era. Charles I. of England, while in Paris on his way to Spain, ““shadowed himself the most he could under a burly per- ruque, which none in former days but bald-headed people used.” The wearing of the peruke became general in the days of Charles II. Pepys records that he parted with his

own hair, and "paid £3 for a periwigg"; and on going to church in one he says, "it did not prove so strange as I was afraid it would." About this time the peruke is described as '"'a counterfeit hair which men wear instead of their own, a thing much used in our days by the generality of our men, contrary to their forefathers." The wig obtained its maximum development during the reign of Queen Anne, who was patroness of the full-bottomed wig,—a huge head-dress which covered the back and shoulders and floated down over the chest. In 1724 the peruke-makers advertised "full-bottom tyes, full bobs, minister's bobs, naturals, half naturals, Grecian flyes, curley roys, airey levants, qu perukes, and bagg wiggs" among the variety of artificial head-gear which they supplied. Early in the reign of George III. the general fashion of wearing wigs began to wane and gradually died out; but among professional men the practice continued to hold its place, and it was by slow degrees that military officers and clergymen gave up the habit. The wig of the 17th cen- tury now holds its place only on the judicial bench, and with the speaker of the English House of Commons, bar- risters, and advocates; but even on the bench its use is being threatened. Wigs of course continue to be worn by many to make up for natural deficiencies; and on the stage the wig is, as in all times, an indispensable adjunct. Many of the modern stage wigs are made of jute, a fibre which lends itself to marvellously perfect imitations of human hair.

WIGAN, a municipal and parliamentary borough and market-town of Lancashire, England, is situated on the river Douglas and on the main line of the London and North Western Railway, 18 miles west-north-west of Man- chester, 18 north-east of Liverpool, and 195 north-west of London. The Douglas is spanned by several bridges, and is connected with the Leeds and Liverpool Canal. There is also a branch canal by Leigh and Worsley to Manchester. The older portions of the town occupy the north bank of the river, the modern additions being chiefly on the south ° bank, The church of All Saints, Late Perpendicular, con-

2 Whilst a prisoner in Lochleven Castle she received " plusieurs per- ruques et aultres choses y servant"; and there was sent after her to Carlisle "ung paqué de perruques de cheveux." Her maid, Mary Seton, was a skilled busker, and, according to Sir F. Knollys, "she did set such a

*curled hair upon the queen that was said to be a perwyke, that shewed very delicately, and every other day she hath a new device of hair dressing."' Even on the scaffold, according to an eye-witness, she wore "borrowed heire aburne," her own hair being ** polled very short."*

sisting of chancel with aisles and two chapels, was restored in 1630 and againin 1847 There are six other ecclesi- astical parishes. The principal public buildings are the Royal Albert Edward Infirmary and Dispensary (1873, enlarged 1884), the public hall (1853), the borough courts and offices (1866), the arcade (1872), the market-hall (1877), the free public library (1878), the public baths (1882), and the county justices courts and offices (1888). The educational institutions include the free grammar school (founded by James Leigh in 1619 and rebuilt in 1876), the mining and mechanical school, and the mechanics' institution. The charities are numerous but of small individual importance, their aggregate annual value amounting to about £2500. A public park of 27 acres was opened in 1878. The town owes much of its prosperity to its coal mines, which afford employment to a large proportion of the inhabitants and supply fuel for the factory furnaces. Mills for making hats were estab- lished at Wigan in 1482; and subsequently bell-founding and pottery-making were of some importance. The chief industry is now the maufacture of cotton fabrics ; the town also possesses iron forges, iron and brass foundries, oil and grease works, railway waggon factories, and bolt, screw, and nail works. The population of the municipal and parliamentary borough (area 2188 acres) was 20,774 in 1831; by 1861 it had increased to 37,658, by 1871 to 39,110, and by 1881 to 48,194 (23,508 males and 24,686 females) ; in 1888 it was estimated at 55,000.

Wigan is situated at the junction of three Roman roads, and there was a ford across the river where Millgate nowstands. Many Roman coins have been found in the neighbourhood ; hence it is supposed that Wigan was an important Roman station. Numerous Danish barrows also exist in the neighbourhood. After the Con- quest Newton (in which Wigan is situated) was bestowed on Roger de Poictou, but on account of his rebellion was forfeited to the crown. The rectory of Wigan existed before 1248, and the

rector as lord of the manor received a charter for the town in the 30th year of Henry III. Wigan was a city of refuge for runaway slaves during the Middle Ages. It was one of the 120 boroughs selected to send members to parliament in 1306; but the privilege lay dor- mant until 1547. From the charter it received in the 24th year of Edward III., confirming its liberties, it is evident that it was already an important market town, while its fairs were on a large scale and regulated by special laws. It also received charters from Richard II. and Charles Il. Leland refers to it as a paved town 'fas bigge as Warrington, and better builded." Camden describes it as 'neat and plentiful." Wigan contributed £50 of ship-money to Charles I. in 1636. On the outbreak of the Civil War in 1642 it was occupied by the earl of Derby, and formed the central garri- son for the king in Lancashire ; but the entrenchments were taken by Sir John Seaton in 1643 after a desperate battle. It was again repossessed by the earl of Derby, but was retaken by Colonel Ashton in March, when the outworks and fortifications were demolished. On 25th August 1651 the earl of Derby was defeated at Wigan by Colonel Lilburne, when Sir Thomas Tyldesley was slain. A memorial pillar to Tyldesley was crected in 1679 and restored in 1882. The town was governed by a mayor, recorder, 12 aldermen, and 2 bailiffs till the charter of 2d Wiliam IV. Under the Muni- cipal Act it was divided into five wards, and is governed by a mayor, recorder, 10 aldermen, and 30 councillors. It has a com- mission of the peace and a separate court of quarter sessions. In 1885 the number of its parliamentary representatives was reduced

to one. See Sinclair's History of Wigan, 1882.

WIGEON (French Vigeon, from the Latin Vipio),! also called locally "Whewer" and '" Whew" (names imitative of the whistling call-note of the male), the Anas penelope of Linnzeus and Mareca penelope of many modern orni- thologists, one of the most abundant species of Ducks throughout the greater part of Europe and northern Asia, reaching northern Africa and India in winter. A good many pairs breed in the north of Scotland; but the nurseries of the vast numbers which resort in autumn to

1 Just as PIGEON (q.v.) is from Pipio. Other French names, more or less local, are, according to M. Rolland, Vignon, Vingeon, Wagne, Woinge, Wignet, Wutot, Viouz,and Digeon. In some parts of England the small teasing flies, generally called midges, are known as " wigeons."

the waters of temperate Europe are in Lapland or farther to the eastward. Comparatively few breed in Iceland.

Intermediate in size between the Teal and the Mallard, and less showy in plumage than either, the drake Wigeon is a beautiful bird, with the greater part of his bill blue, his forehead cream-colour, his head and neck chestnut,? passing into pinkish grey below and above into lavender-grey, which last, produced by the transverse undulations of fine black and white lines, extends over the back and upper surface of the wings, except some of the coverts, which are conspicuously white, and shows itself again on the flanks. The wings are further ornamented by a glossy green speculum between two black bars ; the tail is pointed and dark ; the rest of the lower parts is white. The female has the inconspicuous coloration characteristic of her sex among most of the Duck tribe. In habits the Wigeon differs not a little from most of the Anatine. It greatly affects tidal waters during the season of its southern stay, and becomes the object of slaughter to hundreds of gunners on the coasts of Britain and Holland ; but, when it resorts to inland localities, as it also does to some extent, it passes much of its time in grazing, especially by day, on the pastures which surround the lakes or moors that it selects.

The Wigeon occurs occasionally on the eastern coast of North America, and not uncommonly, it would seem, on the Pribyloff Islands in the Pacific. But the New World has two allied species of its own. One of them, J/. ameri- cana (a freshly killed example of which was once found in a London market), inhabiting the northern part of that continent, and in winter reaching Central America and the West Indian islands as far as Trinidad, wholly resembles its Old-World congener in habits and much in appearance. But in it the pale frontlet and the rich chestnut are mingled into, as it were, a compromise of light warm brown, the white wing-coverts are wanting, and nearly all the plumage is subdued in tone. The

other species, J/. sibilatriz or chiloensis, inhabits the southern portion of South America and its islands, from Chili on the west to the Falklands on the east, and is easily recognized by its nearly white head, nape glossy with purple and green, and other differences, (A. N.)

WIGHT, Iste oF, a small island in the English Channel, situated off the coast of Hampshire, between 50° 35' and 50° 46' N. lat. and 1° 34' and 1° 5' W. long. (see vol. xi. Pl. VII.). It forms a portion of the county of Hampshire, and is separated from the mainland by a narrow strait, the Solent and Spithead. The island is, roughly speaking, diamond-shaped, the shorter diameter, from north to south, measuring 13 miles, and the longer, from east to west, 23 miles. The area is 92,931 acres, or about 145 square miles. The most prominent feature in its physical geo- graphy is a range of high chalk downs running from east to west across the centre of the island, and terminating in the Culver and Freshwater cliffs respectively. This range is broken through in the centre by the valley of the Medina, which flows due north and is the only river of consequence in the island ; it is navigable up to Newport. A second smaller range of chalk downs occurs in the south near Ventnor. Along the south coast, extending from St Catherine Point to Ventnor, there is the remarkable dis- trict known as the Undercliff, celebrated for its wild and romantic beauty and for its mild climate. It is sheltered from the north by a line of high cliffs. North of the central chalk range the country is for the most part flat and well-wooded. Parkhurst Forest, where timber is grown for the use of the British navy, is 3000 acres in extent. The geology of the island affords within a small area abundant opportunities for studying many different formations. The uppermost of the strata represented in the island is the Eocene, and the lowest the Wealden. All the strata between these two may be studied in good sec- tions, and very numerous and interesting fossils may be collected. The various Eocene beds are exhibited along

2 Hence come the additional local names " Bald-pate" and ' Red-

head," AXIV. — 7I

the north coast, and may also be studied to great advan- tage in White Cliff and Alum Bays. In the neighbour- hood of Gurnet Bay there is a very remarkable bed, con- taining beautifully-preserved remains of insects and spiders. In Alum Bay, in the extreme west, the strata are vertically disposed, and consist of a very curious series of coloured sands and clays. Here also the junction between the Eocene and the underlying Chalk is admirably shown. The central range of chalk downs is part of the northern slope, and the downs behind the Undercliff are part of the southern slope of a lesser anticlinal axis, the upper portion of the Chalk strata having been denuded in such a way as to expose the underlying Greensand, of which the greater portion of the southern half of the island is composed. The Greensand formation may best be studied in the cliff section from Atherfield Point to Rocken End. Beneath the Greensand the Wealden is exposed in the section from Brook to Atherfield, and also, to a much less extent, in Sandown Bay. The Wealden strata have yielded abundant fossil remains of extinct reptiles (Jguanodon), especially in the neighbourhood of Brook and Cowleaze Chines ; and at Brook Point an extensive fossil forest exists, being the remains of a great raft of timber floated down and deposited in estuarine mud at the mouth of a great river. At Brook also the characteristic Wealden mollusk, Unio valdensis, occurs abundantly.

The climate is mild and rclaxing, and enjoys the reputation of being peculiarly salubrious. In winter and spring, however, the east winds are very trying, and in summer the heat is at times very great. The climate of the Undercliff is especially mild, and a large consumption hospital (the Royal National Hospital for Consumption and Diseases of the Chest), arranged on the cottage principle, has been established here. Partly owing to the mildness of the climate, and partly to the beauty of the scenery, the island has long been a favourite resort of tourists, and within recent years several fashionable watering-places have sprung up. Of these the principal are Cowes, at the mouth of the Medina, the headquarters of the Royal Yacht Squadron, Ryde (11,461 inhabitants in 1881), Bembridge, Sandown, Ventnor (5739), Shanklin (1780), Fresh- water (2809), and Yarmouth (787). Newport (9357), on the Medina, is the capital of the island, but is comparatively little frequented by visiters. Hitherto many parts of the island have been more or less inaccessible owing to the

deficiency of railways; but it is being rapidly opened up, and a railway is now in course of construction between Newport, Carisbrooke, Yarmouth, and Freshwater. There are few industries in the island. The population is chiefly agri- cultural, a large proportion of the land being devoted to sheep- grazing. Fishing is also carried on to a considerable extent on the south coast,—lobsters, crabs, and prawns being plentiful. Oyster cultivation has been attempted in the Medina, in Brading Harbour, and in the Newtown river. At Cowes shipbuilding is carried on, and on the Medina there are cement-works. In the towns, how- ever, the chief occupation of the inhabitants consists in provid- ing for the wants of the summer visiters; in winter very little business is done. The island is divided into two liberties, East and West Medina, excluding the two boroughs of Newport and Ryde; and it forms one petty and special sessional division of the county. Until 1885 there was one member of parliament for the island and one for the borough of Newport ; now, however, there is only one member for the whole island. Enpiscopally the island has for many centuries belonged to the see of Winchester. In 1881 the population was 73,633, as against 66,219 in 1871.

_ History.—The Isle of Wight (Roman Vectis) was originally inhabited by Celts, and was conquered for the emperor Claudius by Vespasian in 43. The Romans remained in possession for four centuries. In 530 it was conquered by Cerdic and Cymric and added to the kingdom of Wessex. Later on it again became free from the control of Wessex and remained independent until the inhabitants of their own accord submitted to Edward, the son of Alfred. William the Conqueror gave the island as an independent lordship to William Fitz-Osborne, but it was again forfeited to the crown on the rebellion of his son, the earl of Hereford. Henry I. gave the lordship to Richard de Redvers, in whose family it remained until 1293, when Isabella de Fortibus, the lady of the island, sold it to Edward I. Richard II. again appointed a lord of the island, and the office continued until the reign of Henry VII., when it was finally abolished. From that date onwards the govern- ment has been vested in a captain or governor, whose office is now honorary. Charles I. was confined in Carisbrooke Castle for some time in 1649. The antiquities include the British pit villages near

Rowborough, the Celtic tumuli on several of the chalk downs, the long stone at Mottistone, the Roman villas near Brading and Caris- brooke, tlie ruins of Quarr Abbey, and numerous ancient churches. Carisbrooke Castle, almost in the centre of the island, is a fine old ruin built upon the site of an ancient British stronghold. The

-British fortifications were probably occupied as a camp by the

Romans under Vespasiau, and they were subsequently held by the Saxons, who made the high mound known as the keep. The inner walls of the castle were erected in the 11th century, and the outer defences were constructed in the reign of Elizabeth. The Roman villa near Brading contains some beautiful and well-preserved ex- amples of tesselated pavements; that at Carisbrooke is smaller and not so interesting.

WIGTOWN, or WicTon, a maritime county in the south-west corner of Scotland, forming the western division of the old district of Galloway, is bounded N. by the Irish Channel and Ayrshire, E. by Kirkcudbright and Wigtown Bay, 8. by the Irish Sea, and W. by the Irish Channel. It is of very irregular form. Its greatest breadth, east and west, is about 33 miles and its greatest length, north and south, about 26 miles. The area is 310,742 acres or 4854 square miles.

Physical Features.—The coast-line has a total length of about 120 miles. On the eastern boundary the estuary of the Cree expands into Wigtown Bay. Between Wig- town and Luce Bays is the peninsula of the Machers, of which Burrow Head is the southern extremity. Luce Bay has a length of about 15 miles and an average breadth of 12. By its indentation on the south and that of Loch Ryan (about 9 miles long and nearly 3 broad) on the north the two-pronged peninsula of the Rinns is formed, of which the Mull of Galloway, the most southerly point in Scotland, is the southern extremity, and Kirkcolm Point the northern. The coast is more or less precipitous, with many small inlets, few of which, on account of dangerous hidden rocks, afford suitable landing-places for vessels. Loch Ryan forms, however, a splendid natural harbour, of which Stranraer is the port. Portpatrick on the Irish Channel is the nearest port in Great

Britain to Ireland, and 7 miles to the south is Port Logan. With the exception of Port William on its eastern shore, Luce Bay is destitute of harbours. Wigtown Bay includes on the Wigtown side the small harbours of the Isle of Whithorn, Garliestown, Wigtown, and Carty, but the upper portions of the bay are not navigable at low water. The county is occupied almost solely by Silurian strata, its characteristic feature being a series of rocky hills, which extend more or less over the whole county, attaining their highest eleva- tion in the north, on the borders of Ayrshire. A considerable number range between 400 and 800 feet in altitude, the highest summits being Miltonish (970 feet), on the northern border, and Craigairie Fell (1000 feet) in Kirkcowan parish. A great part of the county has a wild and bleak appearance, the hills being covered with heath and whins, while in the lower parts there are long stretches of bog and moss. The Silurian rocks are in some parts interpenetrated by small areas of granite; and immense granite boulders are occasionally scattered over the lower grounds, doubtless the result of the Glacial action of the Kirkcudbrightshire ice bed. Along the western edge of Loch Ryan there is a narrow band of Carboniferous strata, consisting of sandstones which have been classed as calci- ferous. They rest unconformably on a narrow belt of Permian strata separating them from the Silurian rocks. In the Carboniferous strata various plant impressions are met with. Between Luce Bay and Loch Ryan, and on the upper shores of Wigtown Bay, there are raised beaches. Galena, copper pyrites, and barytes have been found in small quantities; grey shales for roofing slates and flags for pavement are dug at Cairn Ryan on the eastern shores of Loch Ryan, where sandstone is also quarried for build- ing purposes; from the clays in the neighbourhood of

WIGTOWN

Stranraer bricks are manufactured. Owing to the irre- gular hilly character of the county the streams, though numerous, are generally small. The Cree, forming the boundary with Kirkcudbrightshire, flows past Newton Stewart and Carty into Wigtown Bay; the Bladenoch, from Loch Maberry on the Ayrshire border, falls into Wig- town Bay at the town of Wigtown, after having received the Tarf, the Malzie, and the Black Burn; and the Luce, formed by the junction of the Main Water and

the Cross Water at New Luce, flows south into Luce Bay. There are a very large number of lochs, but none of them very extensive, the principal being the beautiful one in Inch parish included in the grounds of Castle Kennedy, Lochs Maberry and Dornal on the Ayrshire border, Loch Connel in Kirkcolm parish, Loch Ronald in Kirkcowan parish, and Castle Loch and the four lochs of Mochrum in Mochrum parish. Dowalton Loch, at the junction of Kirkinner, Sorbie, and Glasserton parishes, was drained in 1862,

Agriculture.—Although the rainfall exceeds the average in Scot- land, the climate is not specially unfavourable for the ripening of crops, and frosts are not generally of long continuance. A con- siderable portion of Wigtownshire consists of stony moors, which have insufficient soil to render reclamation possible. Along the shores there is some extent of gravelly soil, which, however, requires heavy manuring to render it fruitful. Where the highcr districts are arable a rocky soil prevails, better adapted for grass and green crops than for corn crops. A large extent of the county is black top reclaimed from moors ; in other districts loam and clay prevail. The most common method of cropping is a six years' shift of oats, green crops, corn crop, and three years' grass. According to the Agricultural Returns for 1887, the arable area was 147,068 acres or about 46 per cent. of the whole, considerably above the average for even the lowland counties of Scotland. The area under corn crops was 37,392 acres, of which 35,511 were under oats. The latter area has not materially changed within the last thirty years, the chief diminution having been in wheat, which in 1855 occupied 7343 acres and in 1887 only 736. Barley and bere in 1887 ocenpicd 796 acres, rye 38, and beans 310. The bulk of the green crops consists of turnips and swedcs, occnpying in 1887 15,678 acres, whilst 1902 acres were potatoes, 229 mangold, 100 carrots, 153 cabbage, &c., and 185 vetches. There were 69,326 acres under clover and rotation grasses and 21,883 under permanent pasture. In 1881 (the latest return) there were over 8009 acres nnder woods, and in 1887 there were 40 under nursery grounds, 6 under market gardens, and 7 under orchards. The large area under grass and turnips is owing to the general prevalence of dairy farming. In 1887 the number of cattle was 42,062, of which 21,197 were milch cows, 2 number exceeded in only fonr other connties in Scotland, although in the number of its cattle it is surpassed

by ten counties. The Galloway cattle, a black polled breed, are now chiefly confined to the eastern districts, the Ayrshire being found a much more snit- able breed for dairy purposes. In some cases Galloway bulls are kept for breeding with Ayrshire cows. Many dairy farms send milk to Glasgow and the neighbouring towns; but the mannfacture of cheese has greatly increased within late years, large cheese factories having been established. Dunlop is now almost wholly superseded by Cheddar cheese. Horses, chiefly Clydesdale, for which breed Wigtownshire has acqnired some fame, numbered 5699 in 1887 ; sheep, chiefly blackfaced on the hilly farms, and in other districts crosses with Leicesters and other long-woolled breeds, numbered 116,264 ; and pigs 10,380. From 1345 returns obtained from occu- piers of land in 1887, ont of 147,104 acres 142,266 were rented and occupied and 4838 owned and ocenpied. The following table gives a classification of agricultural holdings according to size in 1880 and 1885 :—

|50 acresand| 50 to 100 | under, acres,

100 to 200

200 to 500 | 500 to 1000 acres.

Year. acres. acres.

No. | Acres. | No. | Acres. | No.

Above 1000 acres.

Acres.

063

Hamilton, 6300; Mrs 8. O. M'Taggart, 5998; Lient.-Col. Sir W. T. F. Agnew Wallace, 5785 ; and R. H. J. Stewart, 5552.1

Communication.—The Portpatrick Railway crosses the county from Newton Stewart by Kirkcowan, Glenluce, and Stranraer to Portpatrick. From Newton Stewart the Wigtownshire Railway passes south by

Wigtown and Garliestown to Whithorn. The Girvan and Portpatrick Railway branches off from the Portpatrick line at East Challoch near Dunragit and passes northwards by New Luce. 'There is a line of steamers to Ireland by Portpatrick.

Manufactures and Trade.—Although agriculture is the main industry, there is a variety of small manufactures in the towns, including a woollen factory at Kirkcowan, engineering and locomo- tive works at Stranraer, hand-loom weaving in various places, distilling, tanning, and currying. The fishing industry is of al- most no account. There is, however, an oyster fishery in Loch Ryan, and herrings are canght in Loch Ryan and the Bay of Luce. The value of the salmon fisheries, including those of the rivers, is less than £1000 a year.

Administration and Population.—From 22,918 in 1801 the popn- lation had by 1821 increased to 33,240 and by 1851 to 43,389; but it declined to 42,095 in 1861, to 38,830 in 1871, and to 38,611 (males 18,143, females 20,468) in 1881. In point of density Wig- town stands twenty-first among the counties of Scotland, the number of persons to the square inile being 79. The proportion of females to every 100 males was 112°82, the largest proportion of any county with the exceptions of Orkney and Shetland and Forfar. The number of persons who conld speak Gaelie was only twenty-eight. The town population in 1881 numbered 9060, the village 8574, and the rural 20,977. The county has three royal burghs— Wigtown (1789), Stranraer (8455), and Whithorn (1648). The last two are also police burghs (Stranraer, 63842). Part (2645) of the police burgh of Newton Stewart is within the county, the remainder being in Kirkcudbrightshire. Newton Stewart is also a burgh of barony, as are likewise Glenluce (901) and Portpatrick (591). The county returns one member to parliament. Formerly Wigtown, Stranraer, and Whithorn formed with New Galloway a group of burghs returning one member, but by the Act of 1885 they were merged in the county. The county includes seventeen parishes. Wigtownshire is in the same sheriffdom as the counties of Kirkcud- bright and Dumfries. Sheriff conrts are held during certain periods at Wigtown and Stranraer, and quarter sessions are held at Wig- town and Glenluce.

Listory and Antiquities,—The portion of Galloway now forming Wigtownshire was in early times occupied chiefly by the Novante. When the district was overrun by the Romans under Agricola in 82, they fixed their headquarters at Whithorn (Leucophibia), and one of their principal stations, Rerigonitwm, was on the eastern shore of Loch Ryan. The Devil's dyke, a defensive work of the Romans, extended from Loch Ryan to the upper part of the Solway Firth. A sketch of the early history of Galloway, inclnding Wig- townshire, is given under KIRKCUDBRIGHT (vol. xiv. p. 98). The district was the scene of the labours of the Christian missionary St NINIAN (g.v.), who arrived at Whithorn (Candida Casa) towards the close of the 4th century. Whithorn was a bishop's see from 727 till the Reformation. In addition to the caves on the sea coast, which, like those of Kirkcudbrightshire, are associated with early human occupation, the ancient inhabitants have left traces of themselves in cairns, standing stones, hut circles, and remains of ancient villages. Numerous early relics have also becn dug up, in- cluding flint and other stone implements, as well as a great variety of ancient bronze implements and ornaments.2 The Dowalton crannogs were the first lake dwellings discovered in Scotland, and are among the most remarkable in the country. Among the ancient fortalices may be mentioned the sea towers of Carghidown and Castle Feather, south of Whithorn ; the ruins of Baldoon, south of Wigtown, associated with events which suggested to Scott the tale of the Bride of Lammermoor ; the tower of Corsewall near the west shore of Loch Ryan ; the foundations of a Norse stronghold in Crnggleton Bay ; Dunskey at the head of Castle Bay, built in the 16th century, but occupying the site of an ancient fortress; the fragments of Long Castle at Dowalton Loch, the ancient seat of the M'Doualls ; the castle of Mochrum and Myrtoun Castle, the seat of the Maccullochs, in Mochrum parish ; and the ruined tower of Sorbie, the an- cient keep of the Hannays. Of the Cistercian abbey

Total.

Acres.

32,638 | 20 34,426 | 18

12,271! 1

11,186 | 1

_ According to the latest landowners' Return, the divided among 1820 proprietors, possessing 309,087 acres at an

county was

annual value of £230,589, or about 14s. 11d. per acre. Of the pro- prietors 1674 possessed less than one acre each. The following owned over 5000 acres each :—earl of Stair, 79,174; E. J. S. Blair, 37,268 ; earl of Galloway, 28,203 ; marquis of Bute, 20,157 ; Sir W. Maxwell, 16,877; James M'Donall, 16,290; Sir Andrew Agnew, 12,962; D. Hunter Blair, 8255 ; William Maitland, 7848 ; Sir J. Dalrymple Hay, 7400; R. Vans Agnew, 6777; W. C. S.

1,210 1,220

1347 | 146,026| Of Glenluce, founded in 1190 by Roland, lord of 1344 | 147,208) Galloway, the principal remains are the chapter

house in the Decorated style, the walls of the cloister, and a small portion of the church in the Early English

1 For further particulars regarding the agriculture, see a paper by W. H. Ral- stone, in Trans. Royal and Highland Agric. Soc., vol. Xvil., new ser. (1885).

2 For lists with illustrations, see papers by Rev. G. Wilson and Sir Herbert Maxwell in Ayr and Wigton Archeological Collections, vols. i., ii., and v.

3 See CRANNoGS, vol. vi. 552; and for descriptions of these and other lake dwellings in Wigtownshire, consult a paper by Robert Monro, in Ayr and Wigton Arch. Coll., vol. v., and ' Notes on Crannogs and Lake Dwellings of Wigtonshire," by Rev. G. Wilson, in Proceedings Soc. Antig. Scot., vol. ix. pp. 368-378 and x. 737-739.

style. The ancient cathedral of Whithorn, though in a dila- pidated condition, forms a picturesque ruin, and near it are some slight remains of the ancient priory founded by St Ninian. The Dominican priory of Wigtown, founded in 1267, has, like the ancient castle, entirely disappeared ; and only some slight mounds remain of Saulseat abbey, founded for Premonstratensians by Fer- gus, lord of Galloway, in 1148. Wigtown was probably created a sheriffdom in the 13th century. In 1341 the earldom of Wigton, which included the whole of the county, with the jurisdiction of a regality, was bestowed upon Sir Malcolm Fleming. In 1372 the earldom was purchased by Archibald Douglas, who the same year was created lord of Galloway. In the reign of James I. William Douglas of Leswalt was sheriff of Wigtown and keeper of the castle of Lochnaw ; but in 1426 the constableship of Lochnaw, with the sheriffdom of Wigtown, was acquired by Andrew Agnew. These dignities continued to be held by the Agnew family till 1682, when Sir Andrew Agnew refused to take the test and was superseded by Graham of Claverhouse. At the Restoration in 1688 the office of sheritf was restored to the Agnew family, and they held it till the abolition of hereditary jurisdictions in 1747. The principal modern mansions are Galloway House, built in 1740, the seat of the earls of Galloway ; Castle Kennedy, built by the first earl of Stair after the destruction of the old castle by fire in 1716; the baronial castle of Lochnaw, including, with large modern additions, the battlemented tower of the ancient building ; and Barnbarroch House, the seat of R. Vans Agnew.

See Symson, Description of Galloway, 1823; Murray, Literary History of Gal-

loway, 1882 ; Sir Andrew Agnew, Hereditary Sheriffs of Galloway, 1864; Histories of Galloway, by Mackenzie, 1841, and P. H. Mackerlie, 1870-78. (Gly 38e, Jal

WILBERFORCE, Samvet (1805-1873), bishop of Ox- ford and afterwards of Winchester, was the third son of William WILBERFORCE (see below), and was born at Clap- ham Common near London on 7th September 1805. Until he entered Oriel College, Oxford, in 1823 he was educated privately. In the “ United Debating Society,” which afterwards

developed into the “ Union,” Wilberforce distinguished himself as a zealous advocate of liberalism. The set of friends with whom he chiefly associated at Ox- ford were sometimes named, on account of their excep- tionally decorous conduct, the ‘Bethel Union”; but he was by no means averse to amusements, and specially de- lighted in hurdle jumping and hunting. He graduated in 1826 ; and the summer and autumn of 1827 were spent ina Continental tour. After his marriage on 11th June 1828 to Emily Sargent, he was in December ordained and ap- pointed curate-in-charge at Checkenden near Henley-on- Thames. In 1830 he was presented by Bishop Sumner of Winchester to the rectory of Brightstone in the Isle of Wight. In this comparatively retired sphere he soon found scope for that manifold activity which so promi- nently characterized his subsequent career. In 1831 he published a tract on tithes, “to correct the prejudices of the lower order of farmers,” and in the following year a collection of hymns for use in his parish, which had a large general circulation ; a small volume of stories entitled the Note Book of a Country Clergyman ; and a sermon, The Apostolical Ministry. He now began to be sought for as a preacher and declined several offers of appointments. In February 1836 he was made a rural dean. At the close of 1837 he published the Letters and Journals of Henry Martyn. Although a High Churchman Wilberforce held aloof from the Oxford movement, and in 1838 his diver- gence from the “Tract” writers became so marked that J. H. Newman declined further contributions from him to the British Critic, not deeming it advisable that they should longer “co-operate very closely.” _In 1838 Wilberforce pub- lished, with his elder brother Robert, the Life of his father and two years later his father’s Correspondence. In 1839 he also published Hucharistica (from the old English divines), to which he wrote an introduction, Agathos and other Sunday Stories, and a volume of University Sermons and in the following year Rocky Island and other Parables, In November 1839 he was installed archdeacon of Surrey, in August 1840 collated canon of Winchester, and in October he accepted the rectory of Alverstoke. In 1841 he was chosen Bampton lecturer, and shortly afterwards

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made chaplain to the Prince Consort, an appointment he owed to the impression produced by a speech at an anti- slavery meeting some months previously. In October 1843 he was appointed by the archbishop of York to be sub-almoner to the queen. In 1844 appeared his History of the American Church. In March of the following year he accepted the deanery of Westminster, and in October the bishopric of Oxford.

The bishop in 1847 became involved in the Hampden controversy, and signed the remonstrance of the thirteen bishops to Lord John Russell against Dr Hampden's appointment to the bishopric of Hereford. He also en- deavoured to obtain satisfactory assurances from Dr Hampden ; but, though unsuccessful in this, he withdrew from the suit against him. The publication of a papal bull in 1850 establishing a Roman hierarchy in England brought the High Church party, of whom Wilberforce was the most prominent member, into temporary disrepute. The secession to the Church of Rome of his brother-in-law, Archdeacon (now Cardinal) Manning, and afterwards of his two brothers, brought him under further suspicion, and his revival of the powers of convocation lessened his influence at court; but his unfailing tact and wide sympathies, his marvellous energy in church organization, the magnetism of his personality, and his eloquence, both on the platform and in the pulpit, gradually won for him recognition as without a rival on the episcopal bench. In the House of Lords he took a prominent part in the discussion of social and ecclesiastical questions. He has been styled the 'bishop of society"; but society occupied only a fraction of his time. The great bent of his energies was ceaselessly directed to the better organization of his diocese and to the furtherance of schemes for increasing the influence and efficiency of the church. In 1854 he opened a theological college at Cuddesdon, which was afterwards the subject of some controversy on account of its alleged Romanist tend- encies. His attitude towards Hssays and Reviews in 1861, against which he wrote an article in the Quarterly, won him the special gratitude of the Low Church party, and latterly he enjoyed the full confidence and esteem of all except the extreme men of either side and party. On the publication of Colenso's Commentary on the Romans in 1861 Wilberforce endeavoured to induce the author to hold a private conference with him ; but after the publica- tion of the first two parts of the Pentateuch Critically Ex- amined he drew up the address of

the bishops which called on Colenso to resign his bishopric. In 1867 he framed the first Report of the Ritualistic Commission, in which coercive measures against ritualism were discountenanced by the use of the word "restrain" instead of 'abolish " or "prohibit." He also endeavoured to take the sting out of some resolutions of the second Ritualistic Commission in 1868, and was one of the four who signed the Report with qualifications. Though strongly opposed to the disestab- lishment of the Irish Church, yet, when the constituencies decided for it, he prudently advised that no opposition should be made to it by the House of Lords. After twenty- four years' labour in the diocese of Oxford, he was named by Mr Gladstone for the bishopric of Winchester. His unremitting labours had, however, seriously told on his constitution, and the change to a new diocese, entailing a repetition of the work of organization which he had com- pleted in the old one, proved too much for his health. The result was a severe affection of the heart, which on more than one occasion threatened to prove fatal. He was killed on 19th July 1873 by the shock of a fall from his horse near Dorking, Surrey.

Besides the works already mentioned, Wilberforce wrote Heroes

of Hebrew History (1870), originally contributed to Good Words, and several volumes of sermons. See Life of Samuel Wilberforee, with

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Selections from his Diary and Correspondence, vol. i., ed. by Ash- well, and vols. ii. and iii., ed. by his son Reginald G. Wilberforce.

WILBERFORCE, Wi11aM (1759-1833), whose name is chiefly associated with the abolition of the slave trade, was descended from a Yorkshire family which possessed the manor of Wilberfoss in the East Riding from the time of 'Henry II. till the middle of the 18th century. He was the only son of Robert Wilberforce, member of a com- mercial house at Hull, by his wife Ehzabeth, daughter of Thomas Bird of Barton, Oxon, and was born at Hull on 24th August 1759. It was from his mother that he in- herited both his feeble frame and his many rich mental endowments. He was not a diligent scholar, but at the grammar school of Hull his skill in elocution attracted the attention of the master. Before he had completed

his tenth year he lost his father and was transferred to the care of a paternal uncle in London; but in his twelfth year he returned to Hull, and soon afterwards was placed under the care of the master of the endowed school of Pocklington. Here his love of social pleasure made him neglectful of his studies ; but he entered St John's College, Cambridge, in October 1766. Left by the death of his grandfather and uncle the possessor of an independent fortune under his mother's sole guardianship, he was somewhat idle at the university, though he acquitted him- self in the examinations with credit; but in his serious years he "could not look back without unfeigned remorse" on the opportunities he had then neglected. In 1780 he was elected to the House of Commons for his native town, his success being due to his personal popularity and his lavish expenditure. He soon found his way into the fast political society of London, and at the club at Goosetrees renewed an acquaintance begun at Cambridge with Pitt, which ripened into a friendship of the closest kind. In the autumn of 1783 he set out with Pitt on a tour in France; and after his return his eloquence proved of great assistance to Pitt in his struggle against the majority of the House of Commons. In 1784 Wilberforce was elected for both Hull and Yorkshire, and took his seat for the latter constituency.

A journey to Nice in the autumn of the same year with Dr Isaac Milner led to his conversion to Evangelical Chris- tianity and the adoption of more serious views of life. The change had a marked effect on his public conduct. In the beginning of 1787 he busied himself with the estab- lishment of a society for the reformation of manners. About the same time he made the acquaintance of Thomas Clarkson, and began the agitation against the slave trade. Pitt entered heartily into their plans, and recommended Wilberforce to undertake the guidance of the project as a subject suited to his character and talents. While Clark- son conducted the agitation throughout the country, Wil- berforce took every opportunity in the House of Commons of exposing the evils and horrors of the trade. In 1788, however, a failure of his digestive powers compelled him to retire for some months from public life, and the introduc- tion of the subject in parliament therefore devolved on Pitt, whose representations were so far successful that an Act was passed providing that the number of slaves carried in ships should be in proportion to the tonnage. On 12th May of

the following year Wilberforce, in co-operation with Pitt, brought the subject of abolition again before the House of Commons; but the friends of the planters suc- ceeded in getting the matter deferred. On 27th January following Wilberforce carried a motion for referring to a special committee the further examination of witnesses, but after full inquiry the motion for abolition in May 1791 was lost by 163 votes to 88. In the following April he carried a motion for gradual abolition by 238 to 85 votes ; but in the House of Lords the discussion was finally post-

poned till the following session. Notwithstanding his un- remitting labours in educating public opinion and annual motions in the House of Commons, it was not till 1807, the year following Pitt's death, that the first great step towards the abolition of slavery was accomplished. When the anti-slavery society was formed in 1823, Wilberforce and Clarkson became vice-presidents ; but before their aim was accomplished Wilberforce had retired from public life, and the Emancipation Bill was not passed till August 1833, a month after his death.

In 1797 Wilberforce published A Practical View of the Prevailing Religious System of Professed Christians in the Higher and Middle Classes of this Country Contrasted with Real Christianity, which within half a year went through five editions and was afterwards translated into French, Italian, Dutch, and German. Shortly after the appear- ance of this work he occupied himself with a plan for a religious periodical which should admit "'a moderate degree of political and common intelligence," the result being the appearance in January 1801 of the Christian Observer. He also interested himself in a variety of schemes for the ad- vancement of the social and religious welfare of the com- munity, including the establishment of the Association for the Better Observance of Sunday, the foundation, with Hannah More (q.v.), of schools at Cheddar, Somersetshire, a project for opening a school in every parish for the religious instruction of children, a plan for the education of the children of the lower classes, a bill for securing better salaries to curates, and a method for disseminating, by Government help, Christianity in India. In parlia- ment he was a supporter of parliamentary reform and of

Catholic emancipation. Jn 1812, on account of failing health, he exchanged the representation of Yorkshire for that of a constituency which would make less demands on his time, and was returned for Bramber. In 1825 he retired from the House of Commons, and the following year settled at Highwood Hill, "just beyond the disk of the metropolis." He died at London on 29th July 1833, and was buried in Westminster Abbey close to Pitt, Fox, and Canning. In Westminster Abbey a statue was erected to his memory, and in Yorkshire a county asylum for the blind was founded in his honour. A column was also erected to him by his townsmen of Hull.

See Life of William Wilberforce, by lis sons, 1888, 5 vols.; Correspondence, 2 vols., 1840.

WILDBAD, a watering-place in the north-west of Wiirt- emberg, is picturesquely situated in the romantic pine- clad gorge of the Enz, 28 miles west of Stuttgart and 14 east of Baden-Baden. Its thermal alkaline springs have a temperature of 90°-100° Fahr., and are used for bathing in cases of rheumatism, gout, neuralgia, and similar ail- ments (see MINERAL WaTERS, vol. xvi. p. 433). The fact that the springs rise within the baths, and are thus used at the fountain-head, is considered to contribute materially to their curative influence. The system of bathing in com- mon is customary at Wildbad, although of course separate baths may be obtained. The water is applied internally for affections of the stomach and digestive organs, and of the kidneys, bladder, &c. Wildbad possesses all the usual arrangements for the comfort and amusement of the visiters (over 6000 annually), including large and well-appointed hotels, a curhaus, a trink-halle, and promenades. The neighbourhood is picturesque, the most attractive spot being the Wildsee, of which many legends are told. The population of the town in 1885 was 3514.

WILFRID (c. 634-709), archbishop of York from 665 till 709, was born of good parentage in Northumbria, c. 634. When nearly fourteen years of age he was sent away froma harsh stepmother to serve in King Oswy's court, where he attracted the notice of the queen, Eanfled.

She, fostering his inclination for a religious life, placed him under the care of an old noble, Cudda, who had be- taken himself to a monastic life at Lindisfarne. Later on Eanfled enabled him to visit Rome under the protection of Benedict Biscop, the son of a Northumbrian, or rather Anglian, noble. At Lyons Wilfrid's pleasing features and quick intelligence made Dalfinus, or Aunemund, the archbishop, desire to adopt him and marry him to his niece. Resisting his offers, the youth went on to Rome, received the papal benediction, and then, in accordance with his promise, returned to Lyons, where he stayed for three years, till the murder of his patron (27656), whose fate he would have shared had not his beauty stayed the hand of the executioners. On his return home, Oswy's son Alchfrid gave him a monastery at Ripon, and before long Bishop Agilbert of Paris ordained him priest. He was probably already regarded as the leading exponent of the Roman discipline in England when his speech at the council of Whitby determined the overthrow of the Celtic party (664). About a year later he was consecrated to the see of York (not in England, where perhaps he could not find the fitting number of orthodox prelates, but at Compiégne). On his return journey he narrowly escaped the pagan wreckers of Sussex, and only reached his own country to find he had been supplanted in his see. The rest of his life is a record of wandering and misfortune. For three years (665-668) he ruled his monastery at Ripon in peace, occasionally, however, exercising his episcopal functions in Mercia and Kent. On Archbishop Theodore's arrival (668) he was restored to his see, but only to be driven out through the anger of King Egfrid's queen (677). Theodore now divided Wilfrid's large diocese into three ; and the aggrieved prelate went to lay his case before the bishop of Rome. On his way he narrowly escaped murder at the hands of foreign princes, whom his own countrymen had stirred up against him. A synod held at Rome under Agatho (7679) ordained his restitution ; but even a papal decision could not prevent his being cast into prison on his return home. When released he wandered first to Mercia, whence Egfrid once more drove him forth to Sussex. Here he rescued the pagan folk from an impending famine, and established a bishop's see at Selsea. After Egfrid's death (20th May 685) Wilfrid was restored to York and Ripon (686-687). He was once more driven out in 691- 692, and after appealing to Rome in person obtained an- other decision in his favour (703-704). Despite the inter- cession of Berghtwald,

archbishop of Canterbury, Egbert's brother Aldfrid refused to admit the aged prelate into his kingdom till his last illness (705). This year or the next a council was held near the river Nidd, the papal letters were read, and, despite the opposition of the bishops, Wilfrid once more received the abbeys of Ripon and Hexham. Not long after he died at Oundle (Northamptonshire) as he was going on a visit to Ceolred, king of Mercia (709). He was buried at Ripon, whence, according to Eadmer, his bones were afterwards removed to Canterbury. Wilfrid's is a memorable name in English history, not only be- cause of the large part he played in supplanting the Celtic discipline

and in establishing a precedent of appeal to papal authority, but

also by reason of his services to architecture and learning. At York he renewed Panulinus's old church, roofing it with lead and furnish- ing it with glass windows ; at Ripon he built an entirely new basilica with- columns and porches; at Hexham in honour of St Andrew he reared a still nobler church, over which Eddius grows eloquent

In the early days of his bishopric he used to travel about his diocese attended by a little troop of skilled masons. He seems to have also reformed the method of conducting the divine services by the aid of his skilled chanters, Addde and Honan, and to have established or tenewed the rule of St Benedict in the monasteries. On each visit to Rome it was his delight to collect relics for his native land: and to his favourite basilica at Ripon he gave a bookcase wrought in gold and precious stones, besides a splendid copy of the Gospels. Asa missionary his success was extraordinary, and even on his way

to Rome in 679 he found time to convert the Frisian king, Ald- gislus, though the latter had been bribed to slay him by the offer of "a measure of gold solidi." Later in life he ordained Suidbert as the first bishop of Frisia. In earlier years his influence was so great that he supplied the Franks with one of their later Mero- vingian kings, Dagobert II.

Wilfrid's life was written shortly after his death by Eddius at the request of Acca, his successor at Hexham, and Tatbert, abbot of Ripon,—both intimate friends of the great bishop. Other lives were written by Frithegode in the 10th, by Foleard in the 11th, and by Eadmer early in the 12th century. The dates have to be supplied mainly from Bede's Hist. Eccl., iii. c. 25, &e., 13, &e., v. 19, &c. All the lives are printed in Raine's Historians of the Church of York, vol. i. (Rolls Series).

WILHELMSHAVEN, or WILHELMSHAFEN, the chief naval station and war harbour of Germany on the North Sea, is situated on the east side of the Jahde, a large basin united with the sea by a channel 3 miles long. The ground on which it stands was purchased by Prussia from the duke of Oldenburg in 1853, and though reckoned a part of the province of Hanover is completely surrounded on the land- ward side by Oldenburg territory. The town is laid out on a regular and ample scale, and the streets are wide and shaded with trees. A statue has been erected to Admiral Prince Adalbert of Prussia (d. 1873). Most of the inhabit- ants, who numbered 13,972 in 1885, including 1326 Roman Catholics, are connected with the dockyard and fleet ; and there is an additional colony of dockyard em- ployés at Bant (3000 inhabitants), on Oldenburg soil.

The original harbour, constructed in 1855-69, consists of an inner and outer basin. To the south-east of the inner harbour, which is used by war-vessels not iu active service, a large new harbour has recently been constructed for war-vessels in commission and for commercial purposes. The entrance to both the old and the new harbour is sheltered by long and massive moles. A torpedo har- bour has also been formed. The inner harbour and the adjacent docks, building-slips, machine-shops, &c., form the Government dockyard, which is enclosed by a lofty wall with fourtecn iron gates. The whole establishment is defended by strong fortifications.

WILKES, Joun (1727-1797), the champion of the right of free representation by British constituencies, was de- scended from a family long connected with Leighton- Buzzard in Bedfordshire, but he himself was born at Clerkenwell, London, on 17th October 1727. His father, Israel Wilkes, was a rich distiller, and the owner, through his wife Sarah, daughter of John Heaton of Hoxton, of considerable house property in its

north-eastern suburbs. After some training under private tuition John Wilkes was sent to the university of Leyden, matriculating there on 8th September 1744. Several young men of talent from Scotland and England were studying in this Dutch uni- versity at that period, and a lively picture of their life, in which Wilkes displays the gaiety of temper which remained faithful to him all his days, is presented to us by "Jupiter " Carlyle. With this training he acquired an intimate know- ledge of classical literature, and he enlarged his mind by travelling through Holland, Flanders, and part of Germany. At the close of 1748 he returned to his native land, and in a few months (October 1749) was drawn by his relations into marrying Mary, sole daughter and heiress of John Mead, citizen and grocer of London, who was ten years his senior. The ill-assorted pair,—for she was grave and staid, while he rioted in exuberant spirits and love of society,—lived together in the country for some months, when, to make matters worse, they returned to town to dwell with the wife's mother. One child, a daughter, was born to them, when Wilkes left his wife and removed to West- minster, where he kept open house for many young men about town possessing more wit than morals. To this un- fortunate marriage should in justice be attributed some of his errors in life. In 1754 he contested the constituency of Berwick-upon-Tweed, but failed to gain the seat. Wilkes was now a well-known figure in the life of the West End, and among his associates were Thomas Potter, the son of the archbishop of Canterbury, Sir Francis Dashwood, after- wards Lord le Despencer, and Lord Sandwich, the last of

whom in after years showed great animosity towards his old companion in revelry. In July 1757, by a triangular arrangement in which Potter and the first William Pitt played the other parts, Wilkes was elected for Aylesbury, and for this constituency he was again returned at the general election in March 1761. Pitt was his leader in politics ; but to Pitt he applied in vain for a seat at the board of trade; nor was he successful in his other applica- tions for office. Stung by these disappointments, Wilkes threw himself into bitter opposition to Bute, and to make his antagonism more effective established a paper called The North Briton, in which he from the first attacked the Scotch prime minister with exceeding

bitterness, and grew bolder as it proceeded in its course. One of its articles ridiculed Lord Talbot, the steward of the royal household, and a duel was the result. When Bute resigned, the issue of the journal was suspended ; but, when the royal speech framed by George Grenville's ministry showed that the change was one of men only, not of measures, a supple- mentary number, No. 45, was published, 23d April 1763, containing a caustic criticism of the king's message to his – parliament. Lord Halifax, the leading secretary of state, issued a general warrant "to search for authors, printers, and publishers," and to bring them before him for examin- ation. Charles Churchill, the poet and a coadjutor in this newspaper enterprise, escaped through the good offices of Wilkes; but the chief offender was arrested and thrown into the Tower. A week later, however, he was released by order of the Court of Common Pleas on the ground that his privilege as a member of parliament afforded him immunity from arrest. General warrants were afterwards declared illegal, and Halifax himself after a series of dis- creditable shifts was cast in heavy sums, on actions brought against him by the persons whom he had injured,—the total expenses incurred by the ministry in these lawless pro- ceedings amounting to at least £100,000. So far Wilkes had triumphed over his enemies, but he gave them cause for rejoicing by an indiscreet reprint of the obnoxious No. 45, and by striking off at his private press thirteen copies of an obscene Essay on Woman, written by his friend Potter, in parody of Pope's Essay on Man, one of which got into the hands of Lord Sandwich. Immediately on the meeting of the House of Commons (15th November 1763) proceedings were taken against him. Lord North moved that No. 45 was "'a false, scandalous, and seditious libel," and, as the motion was of course carried, the paper was publicly burnt in Cheapside on 4th December. The Essay on Woman was brought before the Upper House by Lord Sandwich, and, on account of the improper use which had been made of Bishop Warburton's name as_ the author of some coarse notes, the work was voted a breach of privilege, and Wilkes was ordered to be prosecuted in the Court of King's Bench for printing and publishing an impious libel. He was expelled from the House of Com- mons on 19th January 1764 ; and on 21st February he was found guilty in the King's Bench of reprinting No. 45 and of printing and publishing the Lssay on Woman. Wilkes was on these dates absent from England. Some strong expressions applied to him by Samuel Martin, an

ex-secre- tary of the treasury, had provoked a duel (16th November 1763), in which Wilkes was severely wounded in the stomach. He withdrew to Paris, and as he did not return to England to receive his sentence in the law courts was pronounced an outlaw.

For several years Wilkes remained abroad, receiving £1000 a year from the leading Whigs, and in the course of his travels he visited many parts of Italy. In March 1768 he returned to London and sued the king for pardon, but in vain. His next step was to offer himself as a candi- date for the representation of the City of London, when he

was the lowest at the poll. Undaunted by this defeat, he solicited the freeholders of Middlesex to return him as their champion, and they placed him at the head of all com- petitors. He appeared before the King's Bench, and on a technical point procured a reversal of his outlawry ; but the original verdict was maintained, and he was sentenced to imprisonment for twenty-two months as well as toa fine of £1000, and he was further ordered to produce securities for good behaviour for seven years after his liberation. His conduct was brought before the House of Commons, with the result that he was expelled from the House on 3d February 1769, and with this proceeding there began a series of contests between the ministry and the electors of Middlesex without parallel in English history. They promptly re-elected him (16th February), only to find him pronounced incapable of sitting and his election void. Again they returned him (16th March) and again he was rejected. A fourth election then followed, when Colonel Henry Lawes Luttrell, with all the influence of the court and the Fox family in his favour, obtained but 296 votes to 1143 given for Wilkes, whereupon the House declared that Luttrell had been duly elected. Through these audacious proceedings a storm of fury broke out through- out the country. In the cause of " Wilkes and liberty" high and low enlisted themselves. His prison cell was thronged daily by the chief of the Whigs, and large sums of money were subscribed for his support. So great was the popular sympathy in his favour that a keen judge of contemporary politics declared that, had George III. pos- sessed a bad and Wilkes a good character, the king would

have been an outcast from his dominions. At the height of the combat in January 1769 Wilkes was elected an alder- man for the City of London ; in 1771 he served as sheriff for London and Middlesex, and as alderman he took an active part in the struggle between the corporation and the House of Commons by which freedom of publication of the parliamentary debates was obtained. His admirers endeavoured in 1772 to procure his election as lord mayor of London, but he was set aside by the aldermen, some of whom were allied with the ministry of Lord North, while others, as Oliver and Townshend, leant to the Liberalism of Lord Shelburne. In 1774, however, he obtained that dignity, and he retained his seat for Middlesex from the dissolution in 1774 until 1790. He moved in 1776 for leave to bring in a bill "for a just and equal representa- tion of the people of England in parliament" ; but attempts at parliamentary reform were premature by at least half a century. After several failures better fortune attended his efforts in another direction, for in 1782 all the declarations and orders against him for his elections in Middlesex were ordered to be expunged from the journals of the House. In 1779 Wilkes was elected chamberlain of the city by a large majority, and the office became his freehold for life. He died at his house in Grosvenor Square, London, on 20th December 1797.

Wilkes printed editions of Catullus and Theophrastus, and at the time of his death had made considerable progress with a translation of Anacreon. His conversation was often sullied by obscenity and profanity ; but he knew how to suit his conversation to his com- pany, and his well-known assertion that, ugly as he was, with the start of a quarter of an hour he could get the better of any man, however good-looking, in the graces of any lady, shows his confi- dence in his powers of fascination. The king was obliged to own that he had never met so well-bred a lord mayor, and Dr Johnson, who made his acquaintance at the house of Dilly, the bookseller in the Poultry, confessed that "Jack has great variety of talk, Jack is a scholar, and Jack has the manners of a gentleman." It is doubtful how far he himself believed in the justice of the principles which he espoused. To George III. he remarked of his devoted friend and legal adviser, Serjeant Glynn, "Ah sir! he was a Wilkite, which I never was." His writings were marked by great powcr of

sarcasm. Two collections of his letters were published, one of Letters to his Daughter, in four volumes in 1804, the other Corre-

spondence with his Friends, in five volumes in 1805. WILKESBARRE, a city of the United States, the county seat of Luzerne county, Pennsylvania, is situated on the right bank of the north branch of the Susquehanna river in the Wyoming valley, 98 miles north-north-west from Philadelphia. The business portion lies in the bottom lands, while the residence portions have extended into the adjacent hilly country. It is entered by four rail-ways,—the Central of New Jersey, that of the Delaware and Hudson Canal Company, the Lehigh Valley, and the Pennsylvania. The city is irregularly laid out. The population in 1880 was 23,339; in 1870 it was 10,174. Wilkesbarre is in an anthracite mining district, and its industries all relate more or less directly to this product. It is a centre for the distribution of mining supplies of

all kinds and for the shipment of coal.

After several attempts, which were rendered futile by Indian hostilities, a settlement was finally effected upon the site of Wilkesbarre in 1770. Eight years later the whole region was depopulated by the Wyoming massacre, and the infant town, with many others, was sacked and burned. In the same year a fort was erected upon the site of the ruined village, around which the town was rebuilt. Up to 1855 its growth was very slow and uncertain. The discovery of means of using the anthracite coal, which is found in abundance in the neighbourhood, gave an immense impetus to the growth and prosperity of the city.

WILKIE, Str Davin (1785-1841), Scottish subject- painter, was born on 18th November 1785, the son of the parish minister of Cults in Fifeshire. He very early de- veloped an extraordinary love for art: he was accustomed to say that he could draw before he could read and paint before he could spell, and at school he used to barter his sketches and portraits for slate-pencils and marbles. He was also noted for his keen and constant observation of the village life around him ; and a friend has recorded that he "liked better to stand and look at his companions at their

games than to join in their play." In 1799, after he had attended school at Pitlessie, Kettle, and Cupar, his father reluctantly yielded to his desire to become a painter ; and through the influence of the earl of Leven Wilkie was admitted to the Trustees' Academy in Edinburgh, and began the study of art under John Graham, the able teacher of the school. From William Allan (afterwards Sir William Allan and president of the Royal Scottish Academy) and John Burnet, the engraver of Wilkie's works, we have an interesting account of his early studies, of his indomitable persever- ance and power of close application, of his habit of haunt- ing fairs and market-places, and transferring to his sketch- book all that struck him as characteristic and telling in figure or incident, and of his admiration for the works of Carse and David Allan, two Scottish painters of scenes from humble life. Among his pictures of this period are mentioned a subject from Macbeth, Ceres in Search of Proserpine, and Diana and Calisto, which in 1803 gained a premium of ten guineas at the Trustees' Academy, while his pencil portraits of himself and his mother, dated that year, and now in the possession of the duke of Buccleuch, prove that he had already attained considerable certainty of touch and power of rendering character. A scene from Allan Ramsay, and a sketch from Macneill's ballad of Scot- land's Skaith, afterwards developed into the well-known Village Politicians, were the first subjects in which his true artistic individuality began to assert itself.

_ In 1804 Wilkie returned to Cults, established himself in the manse, and commenced his first important subject- picture, Pitlessie Fair, which includes about 140 figures, and in which he introduced portraits of his neighbours and of several members of his family circle. This work, which was purchased by Kinnear of Kinloch for £25, is rather hot and unpleasant in tone and colouring ; but it is a picture of the greatest interest and promise, so full of

incident and character as to justify its painter's remark, when he saw it twelve years afterwards, that it contains "more subject and entertainment than any other three pictures which I have since produced." In addition

to this elaborate figure-piece, Wilkie was much employed at the time upon portraits, both at home and in Kinghorn, St Andrews, and Aberdeen.

In the spring of 1805 he left Scotland for London, carrying with him his Bounty-Money, or the Village Recruit, which he soon disposed of for £6, and began to study in the schools of the Royal Academy. One of his first patrons in London was Stodart, a pianoforte maker, a distant connexion of the Wilkie family, who commis- sioned his portrait and other works and introduced the young artist to the dowager countess of Mansfield. This lady's son was the purchaser of the Village Politicians, which attracted great attention when it was exhibited in the Royal Academy of 1806, where it was followed in the succeeding year by the Blind Fiddler, a commission from the painter's lifelong friend Sir George Beaumont. Wilkie now turned aside into the paths of historical art, and painted his Alfred in the Neatherd's Cottage, for the gallery illustrative of English history which was being formed by Alexander Davison. The picture was executed with the most conscientious care, and subjected to many alterations, but in the end it proved far from a success. It bears no vivid impress of reality; the figure of the king is wanting in dignity and character ; indeed the subject was one for which the artist had no essential sympathy, and into which he was unable to project his imagination effectively. After its completion he wisely returned to genre-painting, producing the Card-Players and the admir- able picture of the Rent Day, which was composed during recovery from a fever contracted in 1807 while on a visit to his native village. His next great work was the Ale- House Door, afterwards entitled the Village Festival (now in the National Gallery), which was purchased by J. J. Angerstein for 800 guineas. It has been styled by Leslie 'the most artificial of Wilkie's earlier productions." Its figures seem rather small for the extent of canvas; but the separate groups are excellent, and in its handling, in the exquisite delicacy and refinement of touch, and in the variety and beauty of its broken tints it bears marks of the most distinct progress. It was followed in 1813 by the well-known Blind Man's Buff, a commission from the prince regent, to which a companion picture, the Penny Wedding, was added in 1818.

Meanwhile Wilkie's eminent success in art had been rewarded by professional honours. In November 1809 he was elected an associate of the Royal Academy, when he had hardly attained the age prescribed by its laws, and in February 1811 he became a full academician. In 1812 he opened an exhibition of his collected works in Pall Mall; but the experiment was unsuccessful, entailing pecuniary loss upon the artist. In 1814 he executed the Letter of Introduction, one of the most delicately finished and perfect of his cabinet pictures. In the same year he made his first visit to the Continent, and at Paris entered upon a profitable and delighted study of the works of art collected in the Louvre. Interesting particulars of the time are preserved in his own matter-of-fact diary, and in the more sprightly and flowing pages of the journal of Haydon, his fellow-traveller. On his return he began Distraining for Rent, one of the most popular and dramatic of his works. In 1816 he made a tour through Holland and Belgium in company with Raimbach, the engraver of many of his paintings. The Sir Walter Scott and his Family, a cabinet-sized picture with small full-length figures in the dress of Scottish peasants, was the result of a visit to Abbotsford in 1818. Reading a Will, a commission

from the king of Bavaria, now in the New Pinakothek at Munich, was completed in 1820; and two years later the great picture of Chelsea Pensioners Reading the Gazette of the Battle of Waterloo, commissioned by the duke of Wellington in 1816, at a cost of 1200 gnineas, was ex- hibited at the Royal Academy. The subject was a par- ticularly happy one, and was carried out with the greatest fulness of incident and variety of character; it appealed powerfully to the popular sentiment of the time, while the accomplished and masterly technique of the work won the admiration of the artistic portion of the public.

In 1822 Wilkie visited Edinburgh, in order to select from the royal progress of George IV. a fitting subject for a picture. The Reception of the King at the Entrance of Holyrood Palace was the incident ultimately chosen; and in the following year, when the artist, upon the death of Raeburn, had been appointed royal limner for Scotland, he received

sittings from the monarch, and began to work diligently upon the subject. But several years elapsed before its completion ; for, like all such ceremonial works, it proved a harassing commission, uncongenial to the painter while in progress and unsatisfactory when finished. His health suffered from the strain to which he was sub- jected, and his condition was aggravated by heavy domestic trials and responsibilities. In 1825 he sought relief in foreign travel: after visiting Paris, he passed into Italy, where, at Rome, he received the news of fresh disasters through the failure of his publishers. A residence at Toplitz and Carlsbad was tried in 1826, with little good result, and then Wilkie returned to Italy, to Venice and Florence. The summer of 1837 was spent in Geneva, where he had sufficiently recovered to paint his Princess Doria Washing the Pilgrims' Feet, a work which, like several small pictures executed at Rome, was strongly influenced by the Italian art by which the painter had been surrounded. In October he passed into Spain, whence he returned to England in June 1828.

It is impossible to over-estimate the influence upon Wilkie's art of these three years of foreign travel. It amounts to nothing short of a complete change of style. Up to the period of his leaving England he had been mainly influenced by the Dutch genre-painters, whose technique he had carefully studied, whose works he fre- quently kept beside him in his studio for reference as he painted, and whose method he applied to the rendering of those scenes of English and Scottish life of which he was so close and faithful an observer. 'Teniers, in particular, appears to have been his chief master; and in his earlier productions we find the sharp, precise, spirited touch, the rather subdued colouring, and the clear, silvery grey tone which distinguish this master; while in his subjects of a slightly later period,—those, such as the Chelsea Pen- sioners, the Highland Whisky Still, and the Rabbit on the Wall, executed in what Burnet styles his second manner, which, however, may be regarded as only the development and maturity of his first,—he begins to unite to the qualities of Teniers that greater richness and fulness of effect which are characteristic of Ostade. But now he experienced the spell of the Italian masters, and of Velaz- quez and the great Spaniards. His change of feeling is accurately marked in an entry in his journal during his last visit to The Hague. "One feels wearied," he writes, "with the perfections of the

minor Dutch paintings, and finds relief in contemplating even the imperfect sketches and incomplete thoughts of those great Italians. My friend Woodburn used to say when we were in Italy that 'all collectors begin with Dutch pictures but end with Italian.'"

In the works whicli Wilkie produced in his final period he exchanged the detailed handling, the delicate finish,

and the reticent hues of his earlier works for a style dis- tinguished by breadth of touch, largeness of effect, richness of tone, and full force of melting and powerful colour. His subjects, too, were no longer the homely things of the genre-painter : with his broader method he attempted the portrayal of scenes from history, suggested for the most part by the associations of his foreign travel. His change of style and change of subject were severely criticized at the time; to some extent he lost his hold upon the public, who regretted the familiar subjects and the interest and pathos of his earlier productions, and were less ready to follow him into the historic scenes towards which this final phase of his art sought to lead them. The popular verdict had in it a basis of truth: Wilkie was indeed greatest as a genre-painter. He possessed the keenest in- stinct for the portrayal of what was around him, the truest insight for the effective selection, the artistic and telling combination, of the things that met his every-day sight, and were dear to him through life-long nearness; but he was destitute of that higher and more recondite kind of imagination which "bodies forth the form of things un- seen," and gives life and reality to its re-creations of the past. It is, however, undoubtedly true that on technical grounds his change of style was criticized with undue severity. While his later works are admittedly more fre- quently faulty in form and draughtsmanship than those of his earlier period, some of them at least (the Bride's Toilet, 1837, for instance) show a true gain and development in power of handling, and in mastery over complex and for- cible colour harmonies. . Most of Wilkie's foreign subjects, ~—the Pifferari, Princess Doria, the Maid of Saragossa, the Spanish Podado, a Guerilla Council of War, the Guerilla Taking Leave of his Family, and the Guerilla's Return to his Family,—passed into the English royal

collection; but the dramatic Two Spanish Monks of Toledo, also entitled the Confessor Confessing, became the property of the marquis of Lansdowne. On his return to England Wilkie completed the Reception of the King at the Entrance of Holyrood Palace,—a curious example of a union of his earlier and later styles, a "mixture" which was very justly pronounced by Haydon to be "like oil and water." His Preaching of John Knox before the Lords of the Congre- gation had also been begun before he left for abroad ; but it was painted throughout in the later style, and conse- quently presents a more satisfactory unity and harmony of treatment and handling. It was one of the most suc- cessful pictures of the artist's later period.

In the beginning of 1830 Sir Thomas Lawrence died, and Wilkie was appointed to succeed him as painter in ordinary to the king, and in 1836 he received the honour of knighthood. The main figure-pictures which occupied him until the end were Columbus in the Convent at La Rabida, 1835; Napoleon and Pius VII. at Fontainebleau, 1836 ; Sir David Baird Discovering the Body of Tippoo Sahib, 1838; the Empress Josephine and the Fortune- Teller, 1838 ; and Queen Victoria Presiding at her First Council, 1838. His time was also much occupied with portraiture, many of his works of this class being royal commissions. His portraits are pictorial and excellent in general distribution, but the faces are frequently wanting in drawing and character. He seldom succeeded in show- ing his sitters at their best, and his female portraits, in particular, rarely gave satisfaction. A favourable example of his cabinet-sized portraits is that of Sir Robert Liston; his likeness of W. Esdaile is an admirable three-quarter length ; and one of his finest full-lengths is the gallery portrait of Lord Kellie, now in the town-hall of Cupar.

In the autumn of 1840 Wilkie resolved on a voyage to the East. In a letter to Sir Robert Peel he states that his object was '"'to judge, not whether I can, but whether

those that are younger, or with far higher attainments and powers, may not in future be required, in the advance and spread of our knowledge, to refer at once to the locali- ties of Scripture events, when the great work is to be essayed of representing Scripture history,'"—-a sentence which foreshadows the new direction and aims of Mr Hol- man Hunt and other modern realists. Passing through Holland and Germany, he reached Constantinople, where, while detained by the war in Syria, he painted a portrait of the young sultan. He then sailed for Smyrna and travelled to Jerusalem, where he remained for some five busy weeks. The last work of all upon which he was en- gaged was a portrait of Mehemet Ali, done at Alexandria. On his return voyage he suffered from an attack of illness at Malta, and died at sea off Gibraltar on the morning of lst June 1841. His body was consigned to the deep in the Bay of Gibraltar.

An elaborate Life of Sir David Wilkie, by Allan Cunningham, containing the painter's journals and his observant and well-con- sidered 'Critical Remarks on Works of Art," was published in 1843. Redgrave's Century of Painters of the English School and John Burnet's Practical Essays on the Fine Arts may also be referred to for a critical estimate of his works. A list of the exceptionally numerous and excellent engravings from his pictures will be found in the Art Union Journal for January 1840. Apart from his skill as a painter Wilkie was an admirable etcher. The best of his plates, such as the Gentleman at his Desk (Laing, VII.), the Pope examining a Censer (Laing, VIII.), and the Seat of Hands (Laing, IV.), are worthy to rank with the work of the greatest figure- etchers. During his lifetime he issued a portfolio of seven plates, and in 1875 Dr David Laing catalogued and published the complete series of his etchings and dry-points, supplying the place of a few copper-plates that had been lost by reproductions, in his Ltchings of David Wilkie and Andrew Geddes. (J. M. G.)

WILL, or TESTAMENT, is an instrument by which a per- son regulates the rights of others over his property or family after his death. For the devolution of property not disposed of by will, see INHERITANCE, INTESTACY. In strictness ' will" is a general term, whilst " testament" applies only to dispositions of personalty ; but this dis- tinction is seldom observed. The conception of freedom of disposition by will, familiar as it

is in modern England, is by no means universal, In fact, complete freedom is the exception rather than the rule. Legal systems which are based upon Roman law, such as those of Scotland and France, allow the whole property to be alienated only where the deceased leaves no widow or near relatives. In France this restriction has met with condemnation from eminent legal and economical authorities. M. Troplong, for instance, holds that "un peuple n'est pas libre, s'il n'a pas le droit de tester, et la liberté du testament est la plus grande preuve de la liberté civile." 1

History.—The will, if not purely Roman in origin, at least owes to Roman law its complete development,—a development which in most European countries was greatly aided at a later period by ecclesiastics versed in Roman law. In India, according to the better opinion, it was unknown before the English conquest ; in the Mosaic law and in ancient Athens the will, if it existed at all, was of a very rudimentary character. The same is the case with the Leges Barbarorwm, where they are unaffected by Roman law. The will is, on the other hand, recog- nized by Rabbinical and Mohammedan law. The early Roman will, as Sir H. Maine shows,? differed from the modern will in most important respects. It was at first effectual during the lifetime of the person who made it: it was made in public ; and it was irrevocable. Its original object, like that of adoption, was to secure the perpetua- tion of the family. This was done by securing the due vesting of the Aereditas in a person who could be relied upon to keep up the family rites. There is much prob-

1 Traité des donations entre-vifs et des testuments (1855), preface. 2 Ancient Law, chap. vi.

ability in the conjecture that a will was only allowed to be made when the testator had no genézles discoverable, or when the gentiles had waived their rights. It is certain from the text of Gaius® that the earliest forms of will were those made in the comitia calata, and those made in procinctu, or on the eve of battle. The former were pub- lished before the comztia, as representative of the patrician gentes, and were originally a legislative act. 'These wills were the peculiar privilege of patricians. At a later time

*grew up a form of plebeian will (testamentum per xs et Libram), and the law of succession under testament was further modified by the influence of the preetor, especially in the direction of recognition of jideicommissa (see TRUST). Codicilli, or informal wills, also came into use, and were sufficient for almost every purpose but the appointment of an heir. In the time of Justinian a will founded partly on the jus civile, partly on the edict of the preetor, partly on imperial constitutions and so called testamentum tripar- titum, was generally in use. The main points essential to its validity were that the testator should possess testa- mentary capacity, and that the will should be signed or acknowledged by the testator in the presence of seven witnesses, or published orally in open court. The wit- nesses must be zdonet, or free from legal disability. For instance, women and slaves were not good witnesses. The whole property of the testator could not be alienated. The rights of heirs and descendants were protected by enact- ments which secured to them a legal minimum. The age at which testamentary capacity began was fourteen in the case of males, twelve in the case of females. Up to 439 A.D, a will must have been in Latin ; after that date Greek was allowed. Certain persons, especially soldiers, were privileged from observing the ordinary forms. 'The liability of the heir to the debts of the testator varied at different periods. At first it was practically unlimited. Then the law was gradually modified in his favour, until in the time of Justinian the heir who duly made an in- ventory of the property of the deceased was liable only to the amount of the property to which he had succeeded. This limitation of liability is generally termed by the civilians beneficiwm inventarii. Closely connected with the will was the donatio mortis causa, the rules of which have been as a whole adopted in England (see below). An immense space in the Corpus Juris is occupied with testamentary law. The whole of part v. of the Dugest (books xxvili.-xxxvi.) deals with the subject, and so doa large number of constitutions in the Code and Novels.**

The effect of Christianity upon the will was very marked. For instance, the duty of bequeathing to the church was inculeated as early as Constantine, and heretics and monks were placed under a disability to make a will or take gifts left by will. A will was often deposited in a church. The canon law follows the Roman law with a still greater leaning to the advantage of the church. No church property could be bequeathed.

Manifest usurers were added to the list of those under disability. For the validity of a will it was generally necessary that it should be made in the presence of a priest and two witnesses, unless where it was made in pias causas. The witnesses, as in Roman law, must be zdonet. Gifts to the church were not subject to the deductions in favour of the heir and the children necessary in ordinary cases.2 In Eng- land the church succeeded in holding in its own hands for centuries jurisdiction in testamentary matters.

The Roman law of wills has had considerable effect upon English law. In the words of Sir H. Maine, " The

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4 For further information as to the history of the Roman will, see Roman Law, especially pp. 674, 691, 702, 706, 718.

® Most of the law is contained in Deeretals, iii. 26, 'De Testamentis."

Roman and English law con- trasted.

Real estate in England.

WiLL kh

English law of testamentary succession to personalty has become a modified form of the dispensation under which the inheritances of Roman citizens were administered." 1 At the same time there are some broad and striking differ- ences which should be borne in mind. The following among others may be noticed. (1) A Roman testator could not, unless a soldier, die partly testate and partly intestate. The will must stand or fall asa whole. This is not the case in England. (2) There is no one in English law to whom the unversitas juris of the testator descends as it did to the Roman heres, whose appointment was essential to the validity of a formal will, and who partook of the nature of the English heir, executor, ad- ministrator, devisee, and legatee. (3) The disabilities of testators differed in the two systems. The disability of a slave or a heretic is peculiar to Roman law, of a youth between fourteen and twenty-one to

English law. (4) The whole property may be disposed of in England ; but it was not so at Rome, where, except by the wills of soldiers, children could not be disinherited unless for specified acts of misconduct. During the greater part of the period of Roman law the heir must also have had his fourth in order to induce him to accept the inheritance. (5) In English law all wills must conform to certain statutory require- ments ; the Romans recognized from the time of Augustus an informal will called codicilli. The English codicil has little in common with this but the name. It is not an informal will, but an addition to a will, read as a part of it, and needing the same formalities of execution. (6) There is a striking difference, unknown to Roman law, between wills of realty and wills of personalty. Probate is necessary for the latter but not for the former. The Roman legatum applied to both movables and immovables; in England a legacy or bequest is a gift of personalty only, a gift of real estate being called a devise.2 (7) The Roman will spoke from the time of making; the English speaks from the time of death. This difference becomes very important in case of alteration in the position of the testator between the making of the will and his death. As a rule the Roman will could not, the English can, pass after- acquired property.

Liberty of alienation by will is found at an early period in England. To judge from the words of a law of Canute, intestacy appears to have been the exception at that time.® How far the liberty extended is uncertain: it is the opinion of some authorities that complete disposition of land and goods was allowed, of others that limited rights of wife and children were recognized. However this may be, after the Conquest a distinction, the result of feudalism, to use a convenient if inaccurate term, arose between real and personal property. It will be convenient to treat the history of the two kinds of will separately.

It became the law after the Conquest, according to Sir E. Coke,‘ that no estate greater than for a term of years could be disposed of by will, unless in Kent, where the custom of GAVELKIND (q.v.) prevailed, and in some manors and boroughs (especially the City of London), where the pre-Conquest law was preserved by special indulgence. The reason why devise of land was not acknowledged by law was, no doubt, partly to discourage death-bed gifts in mortmain, partly because the testator could not give the

devisee that SEISIN (q¢.v.) which was the principal element ina feudal conveyance. By means of the doctrine of uses, however, the devise of land was secured by a circuitous method, generally by conveyance to feoffees to uses in the lifetime of the feoffer to such uses as he should appoint

1 Ancient Law, chap. vi.

2 The distinction between bequest and devise did not always exist. For instance, the Assize of Northampton, c. 4, speaks of a devise (divisa) of chattels. 3 Secular Laws, c. 68. SD Tsien, Te

571

by his will (see Trusr).6 On the passing of the Statute of Uses lands again became non-devisable, with a saving in the statute for the validity of wills made before the Ist of May 1536. The inconvenience of this state of things soon began to be felt, and was probably aggravated by the large amount of land thrown into the market after the dissolution of the monasteries. Asa remedy the Act of 32 Hen. VIII. c. 1 was passed in 1540, and was after- wards explained by 34 and 85 Hen. VIII. c. 5. The effect of these Acts was to make lands held in fee simple de- visable by will in writing, to the extent of two-thirds where the tenure was by knight service, and the whole where it was in socage. Corporations were incapacitated to receive, and married women, infants, idiots, and lunatics to devise. The Act 12 Car. IT. c. 24, by abolishing tenure by knight service, made all lands devisable. In the same reign the Statute of Frauds (29 Car. IT. c. 3) dealt with the formalities of execution. Up to this time simple notes, even in the handwriting of another person, constituted a sufficient will, if published by the testator as such. The Statute of Frauds required, inter alia, that all devises should be in writing, signed by the testator or by some person for him in his presence and by his direction, and should also be subscribed by three credible witnesses. The strict interpretation by the courts of the credibility of witnesses led to the passing of 26 Geo. II. c. 6, making interested witnesses sufficient for the due execution of the will, but declaring gifts to them void. The will of a man was revoked by marriage and the birth of a child, of a woman by marriage only. A will was also revoked by an alteration in circumstances, and even by a void conveyance inter vivos of land devised by the will made subsequently to the date of the

will, which was presumed to be an attempt by the grantor to give legal effect to a change of intention. As in Roman law, a will spoke from the time of the making, so that it could not avail to pass after- acquired property without republication, which was equiva- lent to making a new will. Copyholds were not devisable before 1815, but were usually surrendered to the use of the will of the copyhold tenant; 55 Geo. III. c. 192 made them devisable simply. Devises of lands have gradually been made liable to the claims of creditors by a series of statutes beginning with 3 and 4 W. and M. c. 14.

The history of wills of personalty was considerably Person- Tn alty.

different, but to some extent followed parallel lines. both cases partial preceded complete power of disposition. The general opinion of the best authorities is that by the common law of England a man could only dispose of his whole personal property if he left no wife or children ; if he left either wife or children he could only dispose of one- half, and one-third if he left both wife and children. The shares of wife and children were called their pars ration- alilis. This pars rationabilis is expressly recognized in Magna Charta. At what period the right of disposition of the whole personalty superseded the old law is uncertain. That it did so is certain, and the places where the old rule still existed,—the province of York, Wales, and the City of London,—were regarded as exceptions. The right of be- quest in these places was not assimilated to the general law until comparatively recent times by Acts passed between 1693 and 1726. A good will of personalty could be made by a male at fourteen, by a female at twelve. The formalities in the case of wills of personalty were not as numerous as in the case of wills of land. Up to 1838 a nuncupative or oral will was sufficient, subject, where the gift was of £30 or more, to the restrictions contained in the Statute of Frauds. The witnesses to a written will need not be

5 Many instances of such conveyances occur in Sir Harris N icolas's Testamenta Vetuste and in Fifty Earliest English Wills (13887-1439), edited by Mr F. J. Furnivall in 1882.

“credible,” and it was specially enacted by 4 and 5 Anne c. 3 that anyone who could give evidence in a court of law was a good witness toa will of personalty. A will entirely in the testator’s handwriting, called a holograph will, was valid without signature. At one time the executor was entitled to the residue in default of a residuary legatee. But 11 Geo. IV. and 1 Will. IV. c. 40 made him in such an event trustee for the next of kin.

Jurisdiction over wills of personalty was till 1858 in the ecclesiastical courts, probate being granted by the diocesan court! if the goods of the deceased lay in the same diocese, in the provincial court of Canterbury or York (the Pre- rogative Court) if the deceased had bona notabilia, that 1s, goods to the value of £5 in two dioceses. The ecclesiastical jurisdiction was of very ancient origin. It was fully established under Henry IL., as it is mentioned by Glanvill. In the City of London wills were enrolled in the Court of Hustings from 1258 to 1688 after having been proved before the ordinary. Contested cases before 1858 were tried in the Prerogative Court with an appeal originally to the Court of Delegates, later to the judicial committee of the privy council. There were also a few special local jurisdictions, probably for the most part survivals of the pre-Conquest period, when wills seem to have been pub- lished in the county court. The ecclesiastical courts had no jurisdiction over wills of land, and the common law courts were careful to keep the ecclesiastical courts within their limits by means of PRroHrsITIon (q.v.). No probate of a will of land was necessary, and title to real estate by will might be made by production of the will as a document of title. This is still the law in ordinary cases ; but the Act of 1857 has introduced probate of will of land as an ex- ceptional proceeding. The liability of the executor and legatee for the debts of the testator has been gradually established by legislation. In general it is limited to the amount of the succession. Personal liability of the exe- cutor beyond this can by the Statute of Frauds only be established by contract in writing.

Such were the principal stages in the history of the law as it affected wills made before 1838 or proved before 1858. The principal Acts now in force are the Wills Act, 1837 (7 Will. IV. and 1 Vict. c. 26), the Court of Probate Act, 1857 (20 and 21 Vict. ¢. 77), and the Judicature Acts. Some of the earlier Acts arc still law, though of little importance since the more

modern and compre- hensive enactinents. The earliest on the statute roll is 20 Hen. III. c. 2, cnabling a widow to bequeath the crops of her lands. Before the Wills Act uniformity in the law had been urgently recommended by the Real Property Commissioners in 1833. It appears from their report? that at the time of its appearance there were ten different ways in which a will might be made under different cir- cumstances.

The Act of 1837 affected both the making and the interpretation of wills? Excluding the latter for the present, its main provisions were these. All property, real and personal, and of whatever tenure, may be disposed of by will. If customary freeholds or copyholds be devised, the will must be entered on the court rolls. No will made by any person under the age of twenty-one is valid. Every will is to be in writing, signed at the foot or end thereof by the testator or by some person in his presence and by his direetion, and such signature is to be made or acknowledged by the testator in the presence of two or more witnesses present at the same time, who are to subscribe the will in the presence of the testator. Publi- cation is not necessary. A will is not void on account of the icompetency of a witness. Gifts to a witness or the husband or wife of a witness are void. A creditor or executor may attest. A will is revoked (except where made in exercise of a power of appoint- ment of a certain kind) by a later will, or by destruction with the intention of revoking, but not by presumption arising from an alteration in circumstances. Alterations in a will must be executed and attested as a will. A will speaks from the death of the testator, unless a contrary intention appear. The Act of 1857 transferred the jurisdiction, both voluntary and contentious, of all ecclesiastical,

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1 The testamentary jurisdiction of the archdeacon's court is alluded to by Chaucer in the " Friar's Tale," but it was afterwards completely superseded by the bishop's court.

2 Fourth Report, p. 12.

3 By sect. 1 of the Act the word " will" includes codicil.

royal peculiar, peculiar, and manorial courts to the Court of Probate constituted by the Act, created a judge and registrars of that court, abolished the old exclusive rights in testamentary matters of the advocates of Doctors' Commons, and laid down rules of procedure. Contentious jurisdiction was given to county courts where the per- sonal estate of the deceased was under £200 in value. The Judi- cature Act, 1873, merged the old Court of Probate in the Probate, Divorce, and Admiralty Division of the High Court of Justice. The division now consists of the president and one other judge. The practice of the division is mainly regulated by the Rules of the Supreme Court, 1883. Appeals lie to the Court of Appeal and thence to the House of Lords. Before the Judicature Act they lay directly to the House of Lords. The principal rules now obtaining as to probate are these. Probate is confined as a rule to wills of per- sonalty or of mixed personalty and realty, and is either in common form, where no opposition to the grant is made, or in solenin form, generally after opposition, when the witnesses appear in court. The Act of 1857 introduced proof of wills of realty in solemn form after citation of the heir-at-law and devisees.. Probate may be granted either in the principal or in a district registry, and should be obtained within six months after the testator's death. Where no executor is named in a will, the will is not now invalid, as was once the case, but administration ewm testamento annexo is granted. The same course is pursued where the exccutor renounces or dies intestate before administering the estate of the deceased. After probate the probate (as the official copy of the will is called) itself becomes evidence, the original will being deposited in the principal registry at Somerset House, London. On grant of probate a duty, denoted by a stamp on the probate, is payable. It varices accord- ing to the amount at which the personalty is fixed by the oath of the executor. Other Acts dealing with the practice in wills and probate may be shortly stated. 15 and 16 Vict. c. 24 removed some of the difficulties which had arisen on the clause of the Wills Act that the signature was to be at the foot or end. 44 Vict. c 12 enabled any officer of inland revenue to grant probate where the personal estate does not exceed £300. The main duty of an exe- cutor is to pay the debts of the deceased in a certain order of priority, to administer the estate, to pay probate and legacy duties, and in general to

carry out the intention of the testator. There are numerous Acts, especially the Conveyancing Act, 1881, dealing with the rights and liabilities of exccutors, the general effect of which is to discharge an executor from liability for bona jide pay- ment of debts, for distribution of assets after public notice to persons interested, &c. (see EXECUTORS).

Rules of interpretation or construction depend chiefly on decisions Interpre- The tation of law was gradually brought into its present condition through pre- wills.

of the courts, to a smaller extent on statutory enactment.

cedents extending back for centuries, especially decisions of the Court of Chancery, the court par exeellenee of construction, as dis- tinguished from the Court of Probate. The Court of Probate did not deal unless incidentally with the meaning of the will ; its juris- diction was confined to seeing that it was duly executed. The present state of the law of interpretation is highly technical. Some phrases have obtained a conventional meaning which the testators who uscd them probably did not dream of. Many of the judicial doctrines which had gradually become established were altered by the Wills Act. These provisions of the Act have since that time themselves become the subject of judicial decision. Among other provisions are thesc, most of them to take effect only in the absence of a contrary intention. A residuary devise is to include estates comprised in lapsed and void devises. A general gift of the testator's lands is to include copyholds and leaseholds. A general gift of real or personal estate is to include real or personal estate over which the testator had a general power of appointment. A devise without words of limitation is to pass the fee simple. The words "die without issue" or similar words are to mean die with- out issue living at the time of the death of the person whosc issue was named. 'Trustees under an unlimited devise are to take the fee simple. Devises of estates tail are not to lapse if the devisee, though he predeceased the testator, left issue inheritable under the entail. Gifts to children or other issue leaving issue living at the testator's death are not to lapse. Rules of interpretation founded on principles of equity independent of statute arc very numerous, and for thein the works devoted to the subject must be consulted. Some of the more important, stated in as general a form as possible, are these. The intention of the testator is to be observed. This rule is called by Sir E. Coke the pole star to guide the judges. There is a presumption against intestacy, against double portions, against constructing merely precatory words to import a trust, &c. One part of the will is to be expounded by another. Interlineations and alterations are presumed to have becn made after, not as in deeds before, execution. Words are supposed to be nsed in their strict and primary sense. Many words and phrases, however, such as "money," "'residue," and 'issue' and otlier words of relation- ship, have become

invested with a technical meaning, Evidence is admissible in certain cases to explain latent ambiguity, and parol evidence of the terms of a lost will may be given.

WILL 573

Tnvalida- A will may be void, in whole or in part, for many reasons, which nay at its discretion dispense with probate of the will of a merchant

tion of may be divided into two great classes, those arising from external | seaman whose effects do not exceed £50 in value. By an Act

wills. circumstances and those arising from the will itself. The main passed in 1868 the existing exemptions are extended to a sum of examples of the former class are revocation by burning, tearing, | £100 in the case of civil service pay or annuities, of civil or military &e., by a later will, or by marriage of the testator, incapacity of | allowances chargeable to the army votes, and of army prize money the testator from insanity, infancy, or legal disability (such as | JVcll made under power.—A will made under a power of appoint being a convict), undue influence, and fraud, any one of which is | ment is not revoked by marriage when the real or personal estate ground for the court to refuse or revoke probate of a will good on | thereby appointed would not in default of appointment pass to the the face of it, or declare a will of lands void. Undue influence is | testator's executor or administrator or to the next of kin. Before a ground upon which frequent attempts are made to set aside wills. | the Wills Act a will exercising a power of appointment had to Its nature is well explained in a judgment of Lord Penzance's: | conform to any special requisitions in the power, but since the Act "Pressure of whatever character, whether acting on the fears or | the power is duly exercised if executed and attested like an ordinary the hopes, if so exerted as to overpower the volition without con- | will. hegistration.—In the register counties memorials of wills vincing the judgment, is a species of restraint under which no affecting lands in those counties must be registered (see Reqis- valid will can be made."! The circumstances appearing on the | TRATION). va face of the will which make it open to objection may either avoid At common law there eould be no larceny of a will of lands, Criminal it altogether or create a partial intestacy, the will remaining good | But now by the

Larceny Act of 1861 stealing, injuring, or conceal- law re- aga whole. Where the will is not duly executed, c.g., if it is a ing a will, whether of real or personal estate, is punishable with lating to forgery or if it isnot signed by the testator or the proper number | penal servitude for life. Forgery of a will (at one time a capital wills. of witnesses, the will is not admitted to probate at all. Where it crime) renders the offender liable to the same penalty. Fraudulent contains devises or bequests bad in law, as in general restraint of | concealment of a will material to the title by a vendor or mortgagor Inarriage, or tending to create perpetuities, or contrary to public | of land or chattels is by 22 and 28 Vict. c. 835 a misdemeanour policy, or to some particular enactment, only the illegal part is | punishable by fine or imprisonment or both. void. A remarkable instance is a well-known case in which a con- Connected with the subject of this article, though not falling Donatio dition subsequent in a devise was held void as against public policy, | directly under it, is the donatio mortis causa, depending for the mortis being a gift over of the estate devised in case the first devisee, the | most part upon rules adopted from Roman law. Unlike a bequest causa. eldest son of an earl, did not before his death obtain the lapsed | under a will, such a gift passes without probate and does not need title of duke of Bridgewater.? the presence of any statutory number of witnesses. It is, however,

Wills of | There are some wills of an exceptional kind which demand special | liable to legacy duty and is part of the assets of the deccased. For

excep- notice. ing.—It was resolved in parliament in the 16th Ric. II. | its validity two elements are essential: the gift must be conditional

tional that the king, his heirs and successors, might lawfully make their | on the donor's dying from his existing illness, and therefore revoc-

character. testaments. In some later cases parliamentary authority has been able, and there must be delivery. Money, jewels, or other chattels*

given to royal wills, in others not. The executors of Henry IV. were confirmed in their office by letters patent of Henry V., those of Henry V. by parliament. The largest testamentary powers ever conferred on an English king were given to Henry VIII. by 25 Hen. VIII. c. 7, empowering

him to limit and appoint the succcs- sion to the crown by will, in default of children by Jane Scymour or any future wife. By 39 and 40 Geo. III. c. 88 the king and his successor may devise or bequeath their private property. No court, however, has jurisdiction to grant probate of the will of a king. Guardianship.—As a general rule wills deal with property, but even at common law a will simply appointing a guardian was good. The common law was superseded by 12 Car. II. c. 24, under which a father may dispose of the custody of his unmarried infant children by will. The Guardianship of Infants Act, 1886, extended such powers in certain cases to the mother. JMarricd Woman.—At common law a married woman could not (with a few exceptions) make a will without her husband's licence and consent, and this disability was specially preserved by the Wills Acts of Henry VIII. and of 1837. A common mode of avoiding this difficulty was for the husband to contract before marriage to permit the wife to make an appointment disposing of personalty to a certain value. Courts of equity from an early time allowed her, under certain restrictions, to make a will of property held for her separate use. In some cases her husband could dispose of her property by will, in others not. The law as it existed previously to 1882 is now practically obsolete, the Married Women's Property Act of that year enabling a married woman to dispose by will of any real or personal property as her separate property as a fcme sole without the intervention of any trustee. 'The Act also enables a married woman who is execu- trix of a will to act as if she were a feme sole. -Alicn.—Before 1870 an alien enemy resident in England could only dispose of property by will with the king's licence. The Naturalization Act, 1870, enables him to do so as fully as a natural-born British sub- ject. Soldicr and Sailor.—Wills of soldiers in actual military service, and of sailors, are subject to special legislation, and are excepted from the operation of the Wills Act. The privilege only applics to wills of personal estate. Wills of soldiers on an expedi- tion may be made by unattested writing or by nuncupative testa- ment before two witnesses. Wills of petty officers and seamen in the navy, and of marines, as far as relates to their pay or prize- money, must be attested by an officer, and wills made by a seaman in the merchant service must, if made at sea, be attested by the master or mate, if made on land by a superintendent of a mercantile marine office, a elergyman, justice of the peace, or consular or customs officer. The wills of prisoners of war are subject to special

regulations, and the Admiralty may at its discretion waive the due execution of wills in other instances. The effects of seamen, marines, and soldiers, killed or dying in the service, are exempt from probate duty. Pay, wages, prize money, and pensions due to persons employed in the navy may be paid out without probate where the whole assets do not exceed £32. The Board of Trade

1 Hall v. Hall, Law Rep., 1 Probate, 481.

2 Egerton v. Earl Brownlow, 4 House of Lords Ouses, 210.

3 4 Inst., 335.

4 See the Collection of Royal Wills printed for the Society of Antiquaries by J. Nichols (1780).

may be the subjects of a donatio mortis causa ; so may negotiable instruments passing by delivery, but not cheques signed by the giver, as his authority to draw is revoked by his death. It pre- sented before his death, the gift, being unconditional, is wanting in one of the elements of a good donatio mortis causa.) Lreland.—The Act of 1837 applies to Ireland. on lines similar to the English Act was passed for Ireland, 21 and 22 Vict. c. 79. Under the Irish Judicature Act of 1877 the then existing Court of Probate was merged in the High Court of Justice.

Scotland.—Up to 1868 wills of immovables were not allowed in Scotland.

Scotland. The usual means of obtaining disposition of heritage after death was a trust disposition and settlement by deed de prz- senti, under which the truster disponed the property to trustees according to the trusts of the settlement, reserving a life interest. Thus something very similar to a testamentary disposition was secured by means resembling those employed in England before the Wills Act of Henry VIII. The main disadvantage of the trust disposition was that it was liable to be overthrown by the heir, who could reduce ex capite Iccti all voluntary deeds made to his prejudice within sixty days of the death of his ancestor. In 1868 the Titles to Land Consolidation Act made it competent to any owner of lands to settle the succession to the same in the event of death by

testamentary or mortis causa deeds or writings. In 1871 reduction ex capite lectt was abolished by 34 and 35 Vict. c. 81. A will of immovables must be executed with the formalities of a deed and registered to give title (see REGIsrRATION). The disability of a woman as a witness was removed by the Titles to Land Con- solidation Act. As to wills of movables, there are several import- aut points in which they differ from corresponding wills in Eng- land, the influence of Roman law being more marked. Males may make a will at fourteen, females at twelve. A nuncupative legacy is good to the amount of £100 Scots (£8, 6s. 8d.), and a holograph testament is good without witnesses, but it must be signed by tlie testator, differing in this from the old English holograph. By the Conveyancing Act, 1874, such a will is presumed to have been exc- cuted on the date which it bears. Not all movables can be left, as in England. The movable property of the deceased is subject to jus relicte, or widow's right to half if there be no child or children, one-third if there be a child or children, and the legitim, or bairn's part, of half if there be no widow, one-third if there be a widow. Only the remainder is disponible as dead's part. Legitim depends upon survivance and is not transmissible on predecease of a person prospectively entitled to it. Both jus relicte and legitim may be excluded hy discharge or satisfaction, as by provision in the coutract of marriage. Executor in Scotch law is a more extensive term than in English. He is either nominate or dative, the latter appointed by the court and corresponding in most respects to the English adniinistrator. Caution is required from the latter, but not from the former. Confirmation includes both the probate and letters of administration of English procedure. Without confirma- tion by the court interference by the executor becomes a vitious

The principal authorities for the English law are, for the formalities, Williams, Executors; for the construction, the works of Sir James Wigram and of Messrs Jarman, F. V. Hawkins, and Theobald. Precedents will be found in Hayes and Jarman's Concise Forms of Wills and in ordinary collections of precedents in conveyancing.

In 1857 an Act Ireland.

United States.

intromission. Originally confirmation of testaments of movables fell, as in England, under the cognizance of the church courts. Such jurisdiction certainly existed at the time of regiam majestatem. This ecclesiastical right continued through the Commissary Court at Edinburgh (constituted by Queen Mary in 1568) and the local commissaries until modern times, when the jurisdiction of these courts was at first transferred and then abolished by a series of en- actments from 4 Geo. IV. c. 97 to the Sheriff Courts Act, 1876. The Act of George IV. placed the commissary jurisdiction in the sheriff courts ; by the Act of 1876 the sheriffs sit as sheriffs in testamentary matters, no longer as commissaries. Confirmation of wills where the whole estate is under £300 is regulated by 44 Vict. e. 12 and other Acts. An eik is an addition to a confirmation made on discovery of additional effects of the deceased after con- firmation. By the common law doctrine of passive representation the heir or executor was liable to be sued for implement of the de- ceased's obligations. The Roman principle of benefictum inventarii was first introduced by an Act of 1695. As the law at present stands, the heir or executor is liable only to the value of the suc- cession, except where there has been vitious intromission in mov- ables, and in gestio pro herede and some other cases in heritables. The present inventory duty on succession to movables depends upon 44 Vict. c. 12 In England the executor is bound to pay the debts of the deceased in a certain order; in Scotland they all rank pari passu, except privileged debts.!_ (See PRIVILEGE.)

The will of a summons is the conclusion of a writ containing the will of the sovereign or judge, charging the executive officer to cite the party whose attendance is requircd. It is regulated by several Acts, ¢.g., 1 and 2 Vict. c. 114, 31 and 32 Vict. c. 100. (See Sum- MONS, WARRANT, WRIT.)

United States.—By the constitutions of many States laws giving effect to informal or invalid wills are forbidden. The age of testa- mentary capacity varies very much. Eighteen is a common one. Full liberty of disposition is not universal. Homesteads generally, and dower estates frequently, are

not devisable. In some States only a disposable portion of the property can be left, so that child- yen cannot be disinherited without good cause, and in some children omitted in a will may: still take their share. It is frequently provided that a certain amount must be left to the widow. Louisiana follows French law, by which the testator can under no circumstances alienate by will more than half his property if he leave issue or ascendants. In some States a married woman may not leave more than half her property away from her husband. Some require the husband's consent and subscription to make the will of a married woman valid. Nuncupative and holograph wills are in use. The former are confined to personalty and must gener- ally be reduced to writing within a short time after the words are spoken. In Louisiana there is a special form of will, borrowed from Roman law, called the mystic or sealed will, in which the testator declares a sealed packet to be his will before witnesses. The number of witnesses necessary for the validity of a will of any kind is usually two, sometimes three. Wills of soldiers and sailors are privileged, as in England. Probate is granted sometimes by the ordinary chancery or common law courts, more frequently by courts of special jurisdiction, such as the Prerogative Court in New Jersey, the Surrogate's Court in New York.?

International Law.—There are three main directions which the opinion of jurists and the practice of courts have taken. (1) The whole property of the testator may be subjected to the law of his domicil. To this effect is the opinion of Savigny and the German practice. (2) The property may be subjected to the law of the place where it happens to be at the time of the testator's death. (3) The movable property may be subjected to the law of the domicil, the immovable to the law of the place where it is situate, the lex loct ret site. England and the United States follow this rule. Testamentary capacity is generally governed by the law of the testator's domicil, the form of the instrument in most countries either by the law of his domicil or the law of the place where the will was made, at his option. The old rule of English law was to allow the former alternative only. The law was altered for the United Kingdom in 1861 by Lord Kingsdown's Act (24 and 25 Vict, c. 114), by which a will made out of the United Kingdom by a British subject is, as far as regards personal estate, good if made according to the forms required by the law of the place where it was

made, or by. the law of the testator's domicil at the time of making it, or by the law of the place of his domicil of origin. Sub- sequent change of domicil does not avoid such a will. Another Act passed on the same day (24 and 25 Vict. c. 121) enacted that by convention with any foreign Government foreign domicil could not be acquired by a testator without a year's residence and a written declaration of intention to become domiciled. In the United States some States have adopted the narrow policy of enact- ing by statute the old common law rule, and providing that no will SS

1 See M'Laren, Wills and Succession. Styles of wills will be found both in that work and in Juridical Styles.

2 See Stimson, American Statute Law, 8$ 2600-2844.

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is valid unless made in the form required by the law of the State of the testator's domicil. The construction of a will is governed by the law of the domicil of the testator, as he must be supposed to have used language in consonance with that law, unless indeed. he express himself in technical language of another country. The persons who are to take under a will are decided by different rules according as the property is movable or immovable, the former being governed by the law of the domicil, the latter by the lex loci rei site. It was held recently by the Court of Appeal in England that, under the will of an Englishman domiciled in Holland, leaving personal property to children, children legitimated per subscquens matrimoniwm could take, as they were legitimate by the law of Holland, though not by the law of England.? Such children could not, however, have succeeded simply under that designation to real property in England devised by the will. A will duly executed abroad is generally required to be clothed with the authority of a court of the country where any property affected by the will is situate. As far as regards the different kingdoms composing the United Kingdom, 21 and 22 Vict. c. 56 enables an English or Irish probate, or a Scotch confirmation, to be sealed as of course in the proper court of one of the other kingdoms. (J. Wt.) WILLENHALL, a

township of Staffordshire, England, in the parish of Wolverhampton, is situated on a branch of the Birmingham Canal and on the Midland and the London and North Western Railways, 3 miles east of Wolverhampton, 12 north-west of Birmingham, and 124 north-west of London. The township includes seven ham- lets. The church of St Giles, originally erected in 1350, was rebuilt in 1867 in the Decorated style. There are three other churches in connexion with the Established Church, all of modern origin,and a Roman Catholic church. Willenhall possesses a literary institute, a free library, and a higher grade board school, erected in 1883, The water- works became in 1868 the property of the Wolverhampton corporation. Willenhall is situated in the neighbourhood of extensive coal and iron mines, and possesses brass and iron foundries, and manufactories of various kinds of iron- ware, including door locks and padlocks, ironmongery for doors and gates, ferules, files, gridirons, steel traps, screws, and currycombs. There are also varnishing works and maltings. The population of the urban sanitary district (area 1368 acres) was 15,902 in 1871 and 16,067 in 1881.

The village began to be of importance in the reign of Elizabeth, when the coal and iron were first wrought.

WILLESDEN, a suburb and parish of London, about 4 miles north-west from Hyde Park Corner, is situated on a number of railway lines affording very convenient access to the City. It consists of a number of houses grouped round the parish church of St Mary, Queenstown, a district inhabited chiefly by the working classes ; Willesden Green and the outlying hamlets of Brondesbury, Harlesden, Neasdon, Dollis Hill, Stroud Green, and Stonebridge Park are now largely occupied by villas. The church of St Mary, dating probably from the early part of the 14th century, contains some remains of Early English, with a Perpendicular chancel and tower. It was enlarged in 1851 and again in 1872. At Queenstown there are a working-

‘men’s institute, a workmen’s hall, and a Good Templars’

orphanage. In Willesden Lane there is a Jewish cemetery. The population of the urban sanitary district (area 4383 acres) was 15,869 in 1871 and 27,453 in 1881.

At Domesday the manor of Willesden and Harlesden was held by the canons of St Paul's. In the 12th century it was formed into eight distinct manors, seven of which are held by the same number of prebendaries. The district is associated with the exploits of Jack Sheppard.

WILLIAM I. (1027 or 1028-1087), king of England, surnamed the ConquERoR, was born in 1027 or 1028. He was the bastard son of Robert, duke of Normandy, and Herleva, daughter of Fulbert, a tanner of Falaise. When he was about seven years old his father, intending to go on pilgrimage and having no legitimate sons, proposed him as his heir. The great men of the duchy did homage to the child, and a year later (1035) his father's death left

3 " Re Goodman's Trusts," Law Rep., 17 Chancery Div., 266.

him to make good his claim. Anarchy was the natural result of a mmority. William's life was on more than one occasion in danger and several of his guardians perished in his service. At the earliest possible age he received knighthood from the hands of Henry I. of France, and speedily began to show signs of his capacity for govern- ment. In 1042 he insisted that the "truce of God" should be proclaimed and observed in Normandy. When he was about twenty years old, his authority was threat- ened by a general conspiracy, which spread through the western half of his duchy. An attempt was made to seize him at Valognes, and he only escaped by riding hard all night to his own castle at Falaise. Bessin and Cotentin, the most Norman parts of Normandy, rose in rebellion. William sought and obtained aid from King Henry, and completely defeated the rebels at Val-es-Dunes near Caen (1047). The battle was but a combat of horse, but it decided the fate of the war and left William master of his duchy. The debt which he owed to Henry was repaid next year. War broke out between Geoffrey, count of Anjou, and Henry (1048), and William came to his suzer- ain's assistance. Alencon, one of the chief border fortresses between Normandy and Maine, which had received an Angevin garrison, was captured by the duke. The inhabit- ants had taunted him with his birth, and William, who had dealt leniently with the rebels after Val-es-

Dunes, took a cruel revenge. Soon afterwards Domfront, another important border fortress, fell into his hands.

In 1051 William visited England (see vol. viii. p. 289). Two years later he married Matilda, daughter of Baldwin, earl of Flanders, and a descendant of Alfred. The marriage had been forbidden by a council at Rheims as uncanonical, and was opposed by Lanfranc, prior of Bec. This produced a quarrel between Lanfrane and William, who ravaged the lands of the abbey and ordered the banishment of its prior. Lanfranc, however, soon came to terms with the duke, and engaged to obtain a dispensation from Rome, which, how- ever, was not granted till 1059. Strengthened by this alliance with Flanders, William showed himself more than a match for all his enemies. Henry, who had hitherto been for the most part friendly, now turned against him. After the suppression of some isolated revolts, William was threatened in 1054 by a great confederacy. His dominions were invaded by the forces of the French king, in com- bination with those of Geoffrey of Anjou, Theobald of Blois, and others. William remained at first on the defen- sive; then, falling suddenly on one of the French armies at Mortemer, in the north-eastern corner of his duchy, he cut it to pieces. This blow put an end to the war; Henry made peace (1055) and William took the opportunity of extending his dominions in a southerly direction. He built fresh fortresses and exacted homage from Count Geoffrey of Mayenne. In 1058 Henry and Count Geoffrey made a final effort to crush their dangerous neighbour ; but the effort failed, like those which preceded it. William again allowed the allies to enter and ravage his territory ; but, while the French army was crossing the Dive at Varaville, he attacked and completely destroyed their rear-guard, which was cut off from the van by the advancing tide. Henry again made peace, and soon afterwards died (1060). The death of Geoffrey of Anjou in the same year relieved William of his most formidable rival for the possession of Maine. Herbert Wake-Dog, the lawful ruler of that terri- tory, who had been dispossessed by Geoffrey, recovered his dominions on the latter's death. He at once '"com- mended" himself to William, thus making the duke his heir. On his death in 1063 William took possession of Le Mans and the county of which it was the capital,—an acquisition which extended his southern frontier nearly to the Loire, almost severed Brittany from the rest of

France, and paved the way for the subsequent junction with Anjou.

It was apparently soon after this event, in the year 1064, that Harold, then earl of Wessex, visited Nor- mandy. For the relations between him and William which grew out of this visit, see ENGLAND, vol. viii. pp. 290-291. When Harold was elected and crowned king of England (1066), William's first step was to send an embassy to him demanding the fulfilment of his promise. The purport of the demand is as uncertain as that of the pledge ; but, whatever it was, Harold rejected it. The duke thereupon summoned a council of his supporters, who advised him to call together an assembly representing the whole duchy. This assembly, a typical feudal parliament, met at Lillebonne. While acting together it appears to have opposed the scheme for the conquest of England which William laid before it, but its members were won over singly. He then made a compact with Tostig, the banished brother of Harold; he came to terms with the emperor Henry; he conciliated Philip, king of France, by offering to hold England as his vassal ; and—most important of all—he obtained the sanction of Rome. Pope Alexander II. not only issued a bull declaring William to be the rightful heir to the throne, but sent him a ring and a banner as symbols that the blessing of heaven was on his claim, Embarking at St Valéry, William landed on 28th September at Pevensey. The battle of Senlac or Hastings (14th October 1066) was a decisive victory for the duke of Normandy; but it took five years more to complete the conquest of England.

Early in 1067 William made a progress through the eastern and central parts of his new dominions. All that had as yet submitted to him was comprised in the old kingdoms of Wessex and East Anglia, and a small portion of Mercia. He at once secured his hold over these districts by the erection of fortresses in London, Norwich, and else- where. He received homage from the great men; he con- fiscated the lands of those who had resisted him; and, while keeping a large number of manors for himself, he granted others to his followers, Even those who had not resisted were regarded as having legally forfeited their title and had to submit to a re-

grant on less advantageous terms. In March 1067 William returned to Normandy, taking with him as hostages the earls Eadwine, Morkere, and Waltheof. The revolts which broke out in the north and south-west compelled him toreturn to Englandin December. Early in 1068 he marched on Exeter, as the centre of the western revolt. He took the town and built a castle, after which he subdued Cornwall, and then marching northward forced Bristol to submit. In the summer of 1068 there was a general rising of the north, of which Eadgar was the nominal head; but Eadwine and Morkere were the moving spirits. The insurgents were aided by Malcolm, king of Scotland. William had, however, only to show himself in order to put down the insurrection. He journeyed northward, by way of Warwick and Nottingham, to York, received the submission of Eadwine, Morkere, and Malcolm, and returned by way of Lincoln and Cambridge. His march was accompanied by heavy confiscations, and great castles, rising in places of vantage, rendered the Norman power at once visible and secure. In the spring of 1069 a fresh revolt broke out. Robert of Comines, the newly appointed earl of Northumberland, was slain at Durham ; a Danish fleet entered the Humber, and a Danish army, joined by Eadgar and Waltheof, seized and burned York. The sons of Harold attacked Devon, while other isolated outbreaks took place in the west. These were speedily put down by William's lieutenants ; and in the autumn the king himself, going northward a second time, recovered York and harried Northumberland with ruthless delibera-

tion. Returning to keep Christmas at York, he set out again in January 1070 to oppose Malcolm, who had crossed the border in aid of the insurgents. He forced Waltheof to submit, and drove the Scottish king back into his own country; then, marching over pathless fells in the depth of winter, he reached Chester, took the town, and founded another castle. Northumbria, exhausted and ruined, gave up the struggle, and the omission of the northern counties from the Domesday survey throws a grim light on the com- pleteness of the Conquest. In one district only, the fens of Cambridgeshire, where Hereward still held out, the spirit of

resistance survived. In April 1071 William arrived at Cambridge and commenced a regular blockade. Advancing cautiously by means of a causeway through the fens, he entered Ely in October, and therewith the last flicker of independence died out. The conquest of England was completed. To guard against any fresh incitements to rebellion from Scotland, William in 1072°invaded that country and forced Malcolm to do him homage,—an event which had an important effect on the subsequent relations of the two countries.

Henceforward such trouble as William met with came, not from the English, but from his Norman vassals or his own family. In 1073 the citizens of Le Mans took advan- tage of his absence to set up a "commune," and invited Fulk of Anjou to protect them. William was soon in the field, this time assisted by English troops. He harried the country, recovered Le Mans, and made an advantageous peace with the count. By a skilful compromise he recog- nized Fulk as overlord of Maine, but kept actual posses- sion of the district, for which his son Robert did homage. A year later a formidable revolt broke out in England. Two of William's great vassals, Ralph, earl of Norfolk, and Roger, earl of Hereford, rebelled, and a Danish fleet, prob- ably in alliance with them, appeared in the Humber. William returned at once to England and put down the insurrection. A great meeting of the witan was summoned to try Roger and Waltheof, for the latter, though he took no part in the rebellion, had undoubtedly been privy to it. Roger was imprisoned for life and Waltheof was condemned to death. This was the last instance of opposition to William in England ; but the remaining ten years of his life were occupied with almost continuous troubles on the Continent. In 1076 he was engaged in a war with Brittany, which the interference of Philip of France forced him to bring to an unsuccessful conclusion. Next year he quarrelled with his son Robert. Matilda took the young man's side against her husband, and Philip lent him his assistance. In 1080 William was at open war with his son. While besieging him at Gerberoi he received a wound and was forced to raise the siege. A temporary reconcilia- tion followed, soon to give way to another and a final quarrel. Three years later Matilda died, and troubles thickened upon William. A rebellious vassal, Hubert of Beaumont, seems to have held him at bay for nearly three years. Rival claims to Vexin, a district on the eastern frontier of

Normandy, involved him in another. war with France. He was growing old and weary, and, as he lay sick at Rouen in the summer of 1087, the French army harried his territories with impunity. When he had recovered sufficiently to take the field, he invaded Vexin and burned the town of Mantes. But his horse, plunging in the burning cinders, inflicted on him an internal injury which proved his death-wound. He was carried to St Gervais, where, on 9th September 1087, he died. His body was conveyed to Caen and buried in the great minster which he had built.

The career of William as a warrior and conqueror occupies of necessity the largest space in his life; but his fame as a statesman and administrator is not less than that which he won on the battle- field. This is not the place to discuss the results of the Conquest,

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but the policy of the Conqueror in regard to church and state cannot be overlooked. An orthodox churchman, a supporter of union under the successor of Peter against the schismatic tendeucies of the English Church, he nevertheless repelled any claim on the part of Rome to interference with his political sovereignty. He allowed Peter's pence to be collected, but refused to pay tribute to the pope. While recognizing him as head of the church, he declined to hold his kingdom as his vassal, nor would he permit papal bulls to enter England or excommunications to be issucd agaiust any of his subjects without his leave. He controlled all appointments to important ecclesiastical dignities ; he made laws for the church ; he dealt justice to ecclesiastics, high and low, in his own courts. At the same time he had no desire to humiliate the church; on the contrary, he sought to elevate it to a higher position in the state, to make it a more potent agent of civilization. A weaker states- man might have seen his own advantage in encouraging the rivalry between Canterbury and York ; William strengthened the church by forcing the younger to give way to the elder see. With the same object, that of increasing the efficiency of ecclesiastical organi- zation, he severed the temporal and

spiritual jurisdictions and furthered the enforcement of clerical celibacy. Finally, the trust which he reposed in Lanfranc from the time of his appointment to the see of Canterbury in 1070 shows not only his insight into character but his respect for the head of the English Church.

In regard to temporal affairs William was rather an adminis- trator than a lawgiver. His reign is not marked by a series of legislative acts like those of Henry II. or Edward I. ; but his work was the indispensable preliminary to theirs, for a strong monarchy was the first requisite of the state. To cstablish the power of the crown was William's principal care. The disintegrating tendencies of feudalism had already been visible under the Anglo-Saxon kings. William, while he established fully developed feudalism as a social, territorial, and military system in his new dominions, took measures to prevent it from undermining his own authority. He seattered the estates of his great vassals, so as to hinder them from building up provincial principalities; he maintained the higher popular courts against the encroachments of manorial jurisdictions ; he prevented the claims of feudal lordship from standing between himself and the mass of his subjects by exacting an oath from every landholder at the meeting on Salisbury plain ; finally, by the great survey which resulted in Domesday Book he not only asserted his right to make a general inquisition into property, but laid the firm basis of knowledge which was indispensable to centralized govern- inent and taxation. The care which he took to maintain English laws and institutions is part of the same policy. He balanced the two nationalities over which he ruled, and obliged each to depend upon him as its leader or protector against the other. He ruled as an English king; his feudal council was the witenagemot with a new qualification ; but at the same time he was lord of the land as no king had been before him, and he enjoyed not only all the in- come of his predecessors but in addition all the dues which came to lim as feudal sovereign. He was thus perhaps the strongest and most absolute monarch that has ever sat wpon the English throne.

In character William was stern, self-reliant, and imperious in a He was not naturally cruel; but he was ruthless if it served his purpose, and could take pitiless vengeance for an insult ora wrong. He was too strong to prefer deceit wheu force would serve as well, but his diplomacy was subtle

and guileful, and no scruple turned him aside from his aim. His temper, originally forgiving, was soured by opposition towards the end of his life, and his tyrannical tendencies were strengthened by the long cxercise of uncontrolled power. His passionate devotion to the chase is only too clearly shown in the harshness of his forest laws. In private life he displayed domestic virtues, and his fidelity to his wife was exceptional in the annals of his house and time.

Authorities. William of Jumiéges, Hist. Norman., and William of Poitiers, Gesta Willelmi (both in Duchesne's Hist. Norm. Script.); Wace, Roman de Row ; Ordericus Vitalis, Hist. Eccl.; the Anglo-Saxon Chronicle; the Bayeux tapestry ; Freeman, Hist. of Norman Conquest. (G. W. P.)

GENEALOGICAL TABLE OF NORMAN KinGS oF ENGLAND.
Witwiam [,= Matilda. |

| | | | Robert, duke Richard. Wiittau If. Henry I.=Matilda, rece

of Normandy. daughter count of of Mal- Blois. colm and STEPHEN, Margaret.

Matilda=Geoffrey, count of Anjou. Henry If.

WILLIAM IT. (1056-1100), king of England, surnamed Rorus, third son of William I. and Matilda, was born in 1056. Little is known of his youth, except that in the quarrel between the Conqueror and Robert he remained loyal to his father. When the Conqueror was on his death-

| William.

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bed he sent William to England with a letter to Lanfranc, requesting the archbishop to secure his election to the throne. Accordingly on 26th September 1087 William was elected and crowned at Westminster. His brother Robert, to whom the Conqueror had bequeathed the duchy, was not likely to give up his claim to the larger part of his father's dominions without a struggle. A general revolt in his favour broke out in the summer

of 1088, Roger Bigod rose in Norfolk, Roger, earl of Shrewsbury, and Robert of Mowbray on the western border, while Odo of Bayeux, the king's uncle, whom he had reinstated against his father's advice in the earldom of Kent, occu- pied Rochester. But there was little combination among the rebels. After being foiled in attacks on Ilchester and Worcester, the rebellion in the west seems to have died away. William won over the earl of Shrewsbury, and summoned his English subjects to his aid. He promised good government, the repeal of the forest laws, and the reduction of taxes. Thus conciliated, the fyrd, or national levy, flocked to his standard. It was the beginning of that alliance between the monarchy and the people which, fostered by Henry I. and Henry II. and confirmed by the great Edward, secured victory for the crown in its struggle with the feudal aristocracy. With the aid of his English troops William took castle after castle, repelled an at- tempted landing of the Norman fleet, and forced Odo to surrender his stronghold of Rochester. The rebellion being thus suppressed, he held a great council, at which, although the rebels in general were leniently treated, many confisca- tions and sentences of banishment were pronounced. A later meeting at Salisbury (November 1088) was notable for the trial of William of Saint-Calais, bishop of Durham, who had been one of the chief promoters of the rebellion. The bishop denied the jurisdiction of the king's court and appealed to Rome. It was the first instance of such an ap- peal. The court, however, acting under the advice of Lan- franc, refused to allow the plea, and the bishop, condemned to lose the temporalities of his see, retired to Normandy. Two years later William sent an army to Normandy (Easter 1090), which under the misgovernment of Robert had lapsed into a state of anarchy. The re-conquest of the duchy by England was begun by the capture of St Valéry ; but there was not much fighting, place after place yielding to William's lieutenants or to English gold. Robert called King Philip to his aid, but William bribed him to retire. In Rouen itself a popular movement took place for the surrender of the town; but Henry, the duke's youngest brother, put a stop to it by killing its leader, Conan, with his own hands. In February 1091 William himself crossed the Channel, and at once received homage from many of his brother's subjects. Unable to resist, Robert consented to a disgraceful peace. By the treaty of Caen William engaged to pay Robert a sum of money, in return for which he received some of the most important districts of eastern Normandy, as well as

Cherbourg and other places in the west. It was agreed, among other stipulations, that whichever brother died first the other should succeed to his dominions. Later in the same year William marched against Malcolm III., who had invaded Northumberland, and, penetrating as far as the Firth of Forth, obliged the Scottish king to do him homage. Whether it was for the whole of Scotland or for Lothian only, history does not say ; but the latter is most probable. For an account of the subsequent relations between Malcolm and William, see ScoTLAND, vol. xxi. p. 481. Meanwhile war had broken out again with Normandy. At Christmas 1093 Robert sent a challenge to his brother, reproaching him with violations of the treaty. Accord- ingly in March 1094 William. invaded Normandy a second time. On this occasion fortune turned against him. Philip

assisted the duke, and William, who had exhausted his supplies, was unable to buy him off as before. In this predicament his justiciar, Ralph Flambard, assembled an English army on the pretext of an expedition to Normandy, took from each man the money which had been provided for his expenses, and then dismissed the soldiers to their homes. With the money so obtained William bribed the French king, and then returned to England. Next year the first crusade was being preached, and Robert took the cross. A peace was made between the brothers through papal mediation, William supplying Robert with funds, for the repayment of which the latter pledged his duchy. When, in September 1096, Robert set off for the crusade, William took possession of Normandy, where he soon put an end to the anarchy which had resulted from Robert's misrule ; and he held the country till his death. Shortly before the acquisition of Normandy William had subdued a second rebellion in England. Robert of Mowbray was again one of the chief conspirators, and he was joined by William of Saint-Calais, whom the king, in accordance with the treaty of Caen, had restored to his bishopric, and by others. Mowbray refused to obey a summons to the king's court, whereupon William marched against him, captured his castles of Bamborough and Tynemouth, and took him prisoner (1095). As on the suppression of the earlier rebellion, William

called a great assembly, this time con- sisting of all his tenants-in-chief, and by their judgment the rebels were condemned. During the next two years he made a serious attempt at the conquest of Wales. The southern portion of the principality had been to a great extent reduced, first by Harold, afterwards by the Norman border lords. William's efforts were mainly directed against the northern districts. He made three invasions, and pene- trated to Snowdon, but seeming victories were immediately followed by revolts, and in the end little ground was actually won.

The last three years of the 11th century were much occupied by tedious wars with France and efforts to recover Maine. In 1097 he quarrelled with Philip about Vexin, and crossed the Channel to make good his claim to that district ; but the French king was able to hold his own. Next year William set about the recovery of Maine. That territory had been allowed by Robert to slip out of his hands, and had been governed since 1091 by Helias de la Fléche. William's vassal, Robert of Belléme, attacked Helias, and, having succeeded in taking him prisoner, handed over his prize to the king. William thereupon marched into Maine, and a desultory war of forays, sieges, and skirmishes followed. Fulk of Anjou opposed the Norman claim ; but in August 1098 a treaty was made, by which Williaim's rights over the country were recognized, and Helias was at the same time set free. William now turned again to France. Strengthened by an alliance with the duke of Aquitaine, he invaded the French territory and advanced as far as Pontoise. But, tiring of the fruit- less war, he made a truce with Philip and returned to England early in 1099. He had only been there a few months when he heard that Helias de la Fléche was attacking his castles in Maine and had won back Le Mans. He crossed the Channel with great speed, and a last cam- paign replaced him in possession of the coveted border- land. But he took no pains to secure his hold, and the Norman power in Maine fell to pieces immediately on his death.

William II.'s relations with Anselm form perhaps the most important episode of his reign. Lanfranc died in 1089. The worst features of William's character began at once to show themselves. At the instigation or with the assistance of Ralph Flambard, he applied to the posses- sions of the church all the principles of feudal law developed

in the interest of the monarchy. He treated vacant bene- fices as if they had been lay fiefs and bishops as tenants- in-chief, while he made simony the rule and degraded the heads of the church into servile courtiers. He had kept the see of Canterbury vacant for nearly four years, when a severe illness aroused him to a sense of his enormities. Sending for Anselm, at that time abbot of Bec, he forced the crozier into his unwilling hands (1093). Anselm in- sisted on three conditions,—that the temporalities of the see should be fully restored, that William should act in ecclesiastical affairs by his counsel, and that he should be allowed to recognize Urban II. as pope. After some hesi- tation William yielded the first demand, and Anselm did homage for the temporalities. The other two demands remained unsettled. In December 1093 Anselm was con- secrated archbishop of Canterbury. On the outbreak of war against Normandy in 1094 Anselm offered William a contribution of £500. William declared the sum in- sufficient and angrily rejected the gift. Anselm refused to offer more, lest he should seem, even by a gift after his appointment, to be guilty of simony. Other grounds of quarrel were found in the reproofs which the archbishop levelled against the vices of the court, and his demand for ecclesiastical reform. In 1095 a more serious dispute arose. Anselm asked leave to go to Rome in order to obtain his pallium from the pope. As this involved a recognition of Urban, and William wished to secure his independence by acknowledging no pope, the permission was refused. The archbishop demanded that the question should be discussed at a great council. Accordingly an assembly was held at Rockingham (March 1095), in which Anselm was treated by the king as if he had been on trial for contumacy. The bishops sided with the king; the laity took part mostly with the primate. Anselm refused to renounce allegiance to the pope, but denied that this was incompatible with obedience to the king. The assembly broke up without coming toa decision, William now tried to win over the pope and received a legate who brought with him the pall. In the hope of getting the legate to suspend Anselm, he consented to recognize Urban. But, when he found that the pope had no intention of throwing over the archbishop, he

reconciled himself with Anselm and allowed him to take the pall from the altar at Canter- bury. But it was not long before he found an opportunity of taking his revenge. A contingent of knights sent by the primate to aid the king in his Welsh war (1097) was de- clared to be worthless, and- Anselm was summoned to ex- plain his conduct at court. Tired of the persecution and despairing of reform, Anselm again asked leave to go to Rome. William, believing, whether rightly or not, that Anselm intended to appeal against him, refused his request. Twice repeated, it met with the same answer. Anselni was charged with having broken his oath to observe the laws of the kingdom in threatening to leave England with- out the king's permission. He answered that he had only sworn to the laws subject to his duty to God and the verdict of his conscience. This answer alienated many who had supported him on the previous occasion. He was asked to swear that he would not appeal against the king, and on his refusal was ordered to leave the country. In October 1097 Anselm left England. William at once seized the archbishopric and kept possession of it till his death.

The unscrupulous tyranny which Rufus displayed in his quarrel with Anselm was equally characteristic of his tem- poral government. The feudal customs of aids, reliefs, escheats, &c., were developed into a great system of extor- tion. The townsfolk and the cultivators of the soil were weighed down by heavy taxes. The forest laws were carried out with ruthless severity. On the other hand, order was maintained, and the tyranny was to a certain extent veiled

or limited by the frequent use which William made of his great councils, in the trials of great men like Odo, in the declaration of war, in the settlement of disputes such as that with Anselm. It is clear that the national assembly was neither extinct nor inefficient during this reign. It was in this period too that the office of justiciar became permanent in the person of William's chief minister, Ralph Flambard, although in his hands its powers were used merely in support of despotism.

In his private character William was as vicious as in his public capacity he was tyrannical. He was harsh and violent, extravagant and lustful, regardless of God and pitiless to man. He had a strong vein of mockery and sarcasm, and no little of the grim Norman humour. Almost the only redeeming feature of his character is his chivalrous observation of his plighted word; but for ordinary promises or obligations he had no respect. He died under mys- terious circumstances in the New Forest, Hampshire, on 2d August 1100. William IJ. was not married ; he was succeeded by his brother Henry.

Authorities,—Ordericus Vitalis, Historia Tcclesiastica ; Geoffrey Gaimar, Histoire des Angles; Eadmer, Historia Novorum; the Anglo-Saxon Chronicle;

Freeman, Reign of William Rufus. (Gaiene»)

WILLIAM IIT. (1650-1702), king of England and prince of Orange,! was the son of William IT., stadtholder of the United Netherlands, and Mary, daughter of Charles I. of England. He was born on 14th November 1650. His father died eight days before his birth, whereupon the states-general abolished the office of stadtholder. As he grew up, William became the head of the party, at once democratic and monarchical, which was attached to the house of Orange. But all power was concentrated in the hands of John de Witt and other leaders of the rival or aristocratic republican party. Hence William learned caution, reserve, insight into character, and the art of biding his time. .

When, however, France and England declared war upon the Netherlands in the spring of 1672, the rapid success of the French arms, and the rejection by Louis of the terms offered by the Dutch Government, produced a revolu- tion in favour of William. A popular rising obliged De Witt to repeal the perpetual edict (which ratified the sup- pression of the stadtholdership in 1667), and on 8th July 1672 the prince of Orange was declared by the states- general stadtholder, captain-general, and admiral for life. The revolution was followed by a riot in which John and Cornelius de Witt lost their lives. There appears no evi- dence connecting William with the attack on the De Witts ; but he made no attempt to punish it: on the contrary, he rewarded the leaders. Then, rejecting the

outrageous terms offered by the allies, he placed his private fortune and the revenues of his offices at the disposal of the state, and declared himself ready to die in the last ditch. In order to check the French advance the sluices were opened and vast tracts of country placed under water. The Dutch fleet prevented an English landing. An alliance was made with the elector of Brandenburg, whose forces effected a useful diversion on the eastern frontier. Next year (1673) William lost Maestricht, but he more than balanced this disaster by treaties with Spain and the empire. The war now began to turn in his favour. Early in 1674 the French troops evacuated Holland, and in February of the same year peace was made with England in the treaty of Westminster. As the tide turned, William's allies became more active in his behalf. The league of The Hague, the first of those great coalitions by which he sought to set a limit to the aggressions of Louis XIV., was joined by the elector of Brandenburg, who had been obliged a year

1 For some account of this family, see HoLLAnD, vol. xii. pp. 74 and 79 sq.

before to come to terms with France, and by several other German princes. In Flanders William himself opposed Condé and fought the indecisive battle of Senefie (August 1674). For the next two years the war dragged on with- out very important results. William, although he had saved Holland, could not prevent France from winning places at the expense of the empire and Spain. In April 1677 he was decisively beaten by the duke of Orleans near St Omer. A great part of the Spanish Netherlands as well as Franche Comté was now in the hands of France. These advances caused much alarm in England ; and the prince of Orange linked himself closer to that country by marrying Mary, elder daughter of James, duke of York, in November 1677. Early next year William signed a treaty of alliance with England, the object of which was to compel Louis to come to terms. The duplicity of Charles and the attitude of the country party in England, anxious for war with France but unwilling to put an army into the king's hands, prevented this arrangement from taking effect. A fresh treaty was, however, made

between the two powers (July), and the pressure thus brought to bear upon Louis led to the peace of Nimeguen (August 1678). Four days after the peace was signed William attacked the French army under the duke of Luxembourg in its en- trenchments round Mons. A sanguinary but resultless battle ensued, William attempted to justify this bloodshed by the insufficient and incredible plea that he was not aware that the peace had been signed. He can hardly have wished to prolong the war ; but it is not surprising if he was dis- satisfied with a peace which gave Franche Comté and many places in the Spanish Netherlands to France.

During the years which immediately followed the peace of Nimeguen, Louis's aggressive proceedings provoked a general uneasiness, of which the prince of Orange made skilful use. The French king had seized on William's ancestral principality of Orange in the south of France. William declared publicly that he would make Louis repent the outrage, and when called on to withdraw his words refused to do so. Personal affront was thus added to the national grounds of his hostility. The second of his coali- tions against France began by a treaty between the Nether- lands and Sweden (October 1681) for the maintenance of the peace of Nimegucn, which was soon joined by the empire and Spain, and by several of the German states. When, however, Louis declared war on Spain, invaded the Spanish Netherlands, and even took Luxemburg (1683-84), William could not persuade the states-general to raise an army, and the allied powers acquiesced in the truce of Ratisbon, which left the French king in possession of all that he had won (1685). Certain claims on the Palatinate which Louis urged on behalf of his sister-in-law, the duchess of Orleans, gave William an occasion for organizing a further combination against him. In July 1686 the emperor, with the kings of Spain and Sweden, acting as members of the empire, and the most important German princes entered into the league of Augsburg, which, how- ever, William did not himself join.

Meanwhile, as heir presumptive to the English throne, he paid close attention to what was passing in England. He sought to win Charles by sheltering the duke of Mon- mouth during the exile to which his father had unwillingly condemned him. The same motives led him to dismiss the duke when James II. succeeded his brother, and to dis- courage the

attempt which Monmouth made to win the crown. Healso endeavoured to stop Argyll and his friends when they were setting out for England; and he tried to dissuade Monmouth from his rash expedition, and to induce him to take service against the Turks in Hungary, and, when this failed, he sought, with as little success, to prevent his crossing to England. Throughout the

whole crisis he showed a scrupulous regard for the interests of his father-in-law, which fortunately coincided with his own; but at the same time he astutely avoided any step which would have alienated from him the constitu- tional party. When, however, James II. began to show himself in his true colours, William became the head of the opposition in England. As such, he strongly disap- proved of the first Declaration of Indulgence (1686) and remonstrated with James on the unconstitutional nature of his act. When the king requested him, a year later, to place Papists instead of Protestants in command of the English regiments then in the service of Holland, he declined to do so, and rejected with equal firmness a demand from James that he should send the troops back to England. Nevertheless he refused to listen to Mor- daunt's premature suggestion that he should undertake an invasion in 1686, and, even when Edward Russell visited him at The Hague (May 1688), he was unwilling to move till he was assured that the majority of the nation would be with him. The letter, signed by seven leaders of the two great English parties, which Adiniral Herbert carried to Holland (June 30) set his scruples at rest.

On 30th September he issued a declaration in which he recapitulated James's unconstitutional acts, and stated that he was coming to England in order to secure the assembling of a free parliament, by whose decision he was resolved to abide. On 2d November he sailed from Holland, and three days later landed at Torbay. At first only few persons joined him, but presently the gentry began to come in. James, who had massed his troops at Salisbury, was compelled by William's advance and by the desertion of Churchill and others to fall back upon London. Here he attempted to treat with the invader. William, anxious to avoid all appearance of conquest,

consented to negotiate, and it was agreed that a parliament should be summoned, both armies meanwhile holding aloof. James, however, attempted to leave the country, but was stopped and returned to Whitehall. For a moment he seemed to contemplate resistance, but William now insisted on his retiring from London. His final flight relieved the prince of a great difficulty. On 19th December William arrived in London, and at once called a meeting of peers and others who had sat in the parlia- ments of Charles II.'s reign. By their advice he summoned a convention, wluch met on 22d January 1689 and settled the crown on William and Mary, who, after accepting the Declaration of Rights, were on 13th February proclaimed king and queen.

The revolution had so far succeeded beyond expectation ; but William's difficulties had only begun. His primary object was to bring England into the field against France. But he had first to secure his own throne, which was still endangered by resistance in Scotland and Ireland; in order to do it with effect he had to gain the good will of the Eng- lish parliament and to harmonize or control its two great factions, which, momentarily united by the imminence of despotism, were again almost on the verge of civil war. He wished to be superior to party, which he could only become by being independent of parliament, and this the revolution had rendered impossible. The revolution was due mainly to the Whigs, who were therefore Williain's natural allies; but the political principles of the Whigs led them to curtail the power of the sovereign. The principles of the Tories were much more to his taste ; but the Tories were disinclined to apply their principles on behalf of a sovereign whose title they could not conscien- tiously acknowledge. In selecting his first mumistry William endeavoured to conciliate both sides and to hold the balance even. He eventually saw that such a policy was impracticable, and that, the nation having arrived at

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its majority, ministers must represent the party which was strongest in parliament. His natural reluctance to recog- nize this change, or to give up any of the powers which his predecessors had possessed, led to not unfrequent collisions with parliament and exposed him to some

humiliation, while the struggle between the two parties at times re- duced him to despair, and constantly hampered his action on the Continent.

For nearly a year and a half after William's acceptance of the crown he was occupied in forming the coalition against Louis XIV. known as the Grand Alliance. As stadtholder of the United Netherlands, William had already entered into an alliance with the emperor, In December he joined the league as king of England, and in 1690 the coalition was completed by the adhesion of Spain, Brandenburg, and Savoy. William had thus gained his first great object : he had united Europe against the Bourbon. Meanwhile, however, his arms had made little progress in Scotland and Ireland. James had landed in Ireland in March 1689 and nearly the whole island was in his hands. The relief of Londonderry (July) and the battle of Newtown Butler (August) saved the north for William, but elsewhere Schomberg could make no way. In Scotland the convention had offered the crown to William and Mary; but in the battle of Killiecrankie (July) the clans under Dundee had routed William's army. The convention, which shortly after his accession had been turned into a parliament, met for its second session in the autumn of 1689, and the two parties quarrelled so violently over the Corporation and Indemnity Bills that William threatened to leave the country. He was induced by Nottingham and Shrewsbury to give up this intention, but in January 1690 he dissolved the parliament. William put an end to the quarrel about the indemnity by issuing an Act of Grace, which gave an almost complete amnesty ; and, after placing the government in the hands of the queen and a council of nine persons, he left for Ireland. The defeat of the English and Dutch fleets off Beachy Head and the repulse of the allied forces at Fleurus (June and July 1690) were severe blows to William's hopes ; but the former led to no important results and the latter was more than balanced by the victory which William won at the battle of the Boyne (1st July 1690). James fled from the country, and William entered Dublin in triumph. In September he returned to England, leaving Marlborough to conquer the south of Ireland in a short but brilliant campaign. Meanwhile the resistance in Scot- land had collapsed, and Mackay reduced the Highlands to tranquillity. In 1691 William was able to go abroad and to take the command in Flanders, where, however, his efforts were unsuccessful.

The next year (1692) opened with the massacre of Glencoe. It is improbable that, in signing an order for the "extirpation" of the Macdonalds, he intended that the order should be literally executed. Nevertheless, the order came from him, and he cannot be acquitted of all blame. About the same time the insecurity of his position was shown by the discovery of Marlborough's treachery ; and Marlborough did not standalone. While many whom William trusted or appeared to trust were intriguing with James, an invasion of England was being organized by the French Government. Fortunately, and in great measure owing to the politic conduct of Mary, the commanders of the fleet were induced to stand firm, and the great victory of La Hogue (19th May 1692) put a stop to the projected mvasion, But the fortune of war went against William on the Continent. He could not save Namur from the French, and he was severely defeated in an attempt to surprise the duke of Luxembourg at Steenkerke (4th August 1692). Next year he was again beaten by the

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same commander at Neerwinden (19th July). The battle of La Hogue had not given England the command of the seas, and French privateers inflicted great damage on English trade. In June 1693 the Smyrna fleet was almost entirely destroyed off Cape St Vincent.

In spite of these reverses William struggled on with indomitable courage, and he was well supported by the country. Parliament, under the skilful guidance of Montague, adopted various important financial measures to meet the expenses of the war. The land-tax was re-assessed, the national debt created, the Bank of England established, and the coinage renewed (1693-95). In 1694 William confirmed the parliamentary system by giving his consent, though an unwilling consent, to the Triennial Act, and he recognized the principles of ministerial government by modifying the ministry, until in 1696 it was in thorough harmony with the parliamentary majority. In 1695 Wil- liam won his first important success on the Continent by recovering Namur, and, though no advance was made by the allies next year, the exhaustion of France was becoming more and more evident. At length, in March 1697, a con- gress met at Ryswick, and in

September peace was made. Louis was obliged to give up all (with the exception of Strasburg) that he had added to his dominions since 1678, and he recognized William as king of England. With the conclusion of the war the dread of a standing army revived in England, and, much to William's disgust, a vote of parliament reduced the military force to 10,000 men, although the question of the Spanish succession (see vol. ix. p. 580) was pending. The new parliament which met early in 1699 reduced the army still further and resolved that it should consist solely of English troops, thus com- pelling William to dismiss his favourite Dutch guards. They went on to institute an inquiry into the manner in which the forfeited estates in Ireland had been disposed of, and in their second session (November 1699) they passed a bill for the "resumption" of these estates. William died on 8th March 1702 from the consequences of a fall from his horse on 20th February.

Authorities. Burnet, History of his own Times; Voltaire, Siécle de Louis XIV.; Negotiations of the Count @ Avaux (London, 1754) ; Négociations relatives & la Succession d' Espagne, &c., collected by Mignet (Paris, 1835); Lettres et Mémoires de Marie, Reine d Angle- terre, &c. (The Hague, 1880); Harris, History of the Lifeand Reign of William IT. (Dublin, 1749); Mackintosh, History of the Revolu- tion in England; Macaulay, History of England; Ranke, English History. (G. W. P.)

WILLIAM IV. (1765-1837), king of England, was the third son of George III. He was born at Windsor, 21st August 1765. When he was fourteen years old he was sent to sea as a midshipman under Admiral Digby. Next year he sailed under Rodney and took part in the action off Cape St Vincent (16th January 1780). During the rest of the war the young prince saw plenty of service, for which he imbibed a strong liking, and so laid the founda- tion of his popularity. On the conclusion of the war he travelled in Germany, visiting Hanover and Berlin, where he was entertained by Frederick the Great. In 1785 he passed for heutenant ; next year he was made captain and stationed in the West Indies. Shortly after 1787, being tired of his station, he sailed home without orders, and was punished for his insubordination by being obliged to stay at Plymouth till his ship was refitted, when he again sailed for the West Indies.

In 1789 he was made duke of Clarence. When war was declared against the French republic in 1793, he strongly supported it and was anxious for active employ- ment; but, though he was made rear-admiral of the red, he could obtain no command. Thus condemned to in- activity, he amused or revenged himself by joining the prince of Wales and the duke of York in their opposition

to the king. He threw himself into the dissipations of society, and his hearty geniality and bluff, sailor-like man- ners gained him popularity, though they did not secure him respect. He took his seat in the House of Lords, where he defended the extravagancies of the prince of Wales, spoke on the Divorce Bill, vehemently opposed the emanci- pation of slaves, and defended slavery on the ground of his experience in the West Indies. Meanwhile he formed a connexion with Mrs Jordan, the actress, with whom he lived on terms of mutual affection and fidelity for nearly twenty years, and the union was only broken off eventually for political reasons. During all this period the prince had lived in comparative obscurity. The death of Princess Charlotte in 1817 brought him forward as in the line of succession to the crown. In 1818 he married Adelaide of Saxe-Meiningen, a lady half his age, without special attrac- tions, but of a strong, self-willed nature, which enabled her subsequently to obtain great influence over her husband. On the death of the duke of York in 1827 the duke of Clarence became heir to the throne, and in the same year he was appointed lord high admiral. In discharging the functions of that office he endeavoured to assume indepen- dent control of naval affairs, although his patent precluded him from acting without the advice of two members of his council. This involved him in a quarrel with Sir George Cockburn, in which he had to give way. As he still continued to act in defiance of rules, the king was at length obliged to call upon him to resign.

On 28th June 1830 the death of George IV. placed him on the throne. During the first two years of his reign England underwent an agitation more violent than any from which it had suffered since 1688. William IV. was well-meaning and conscientious ; but his timidity and irre- solution

drove ministers to despair, while his anxiety to avoid extremes and his want of insight into affairs pro- longed a dangerous crisis and brought the country to the verge of revolution. Immediately after his accession the revolution of July broke out in France and gave a great impulse to the reform movement in England. The king, though he called himself an "old Whig," did not dismiss the Tory ministry which had governed the country during the last two years of his brother's reign ; but the elections for the new parliament placed them in a minority. Within a fortnight of the opening of parliament they were beaten on a motion for the reform of the civil list, and resigned. Lord Grey undertook to form a ministry, with the avowed intention of bringing in a large measure of reform. This was not in itself displeasing to the king, who had liberal tendencies, and a few years before had supported Catholic emancipation. But, when the struggle in parliament began, his disinclination to take up a decided attitude soon exposed the Government to difficulties. The first Reform Bill was introduced on Ist March 1831; the second read- ing was carried on 21st March by a majority of one. Shortly afterwards the Government were beaten in commit- tee, and offered to resign. The king declined to accept their resignation, but at the same time was unwilling to dissolve, although it was obvious that in the existing parliament a ministry pledged to reform could not retain office. From this dilemma William was rescued by the conduct of the opposition, which, anxious to bring on a change of ministry, moved an address against dissolution. Regarding this as an attack on his prerogative, William at once dissolved parliament (April 1831). The elections gave the ministry an overwhelining majority. The second Reform Bill was brought in in June, and passed its third reading (21st September) by a majority of 109. A fort- night later (8th October) the Lords threw out the Bill by a majority of 41. For an account of the subsequent stages of the struggle, see GREY, vol. xi. pp. 191-192.

During the rest of his reign William IV. had not much opportunity of active political interference, but on one other occasion he made an unjustifiable use of his pre- rogative. Two years after the passing of the

Reform Bill the ministry of Lord Grey had become unpopular. In July 1834 Lord Grey himself retired and Lord Melbourne took the lead. There were divergences of opinion in the cabinet, and the king strongly objected to the ministerial policy respecting the Irish Church. On the shallow pre-text that Lord Althorp's removal to the Upper House would weaken the ministry in the House of Commons, where, however, they still had a majority, he suddenly dismissed them and summoned Sir Robert Peel (14th November). Peel's ministry, containing many members who had been in the government on the king's accession, was called from its short duration "the ministry of the hundred days." Its formation clearly indicated that the Whig proclivities of the king, which had never been more than partial or lukewarm, had wholly disappeared. The step was regarded with general disapprobation. It was immediately followed by a dissolution, and the ministry soon found themselves ina minority. Beaten on Lord John Russell's motion re- specting the Irish Church (3d April 1835), Peel resigned and Melbourne again came into power. Under him the Whigs retained the lead during the remainder of the reign. This coup détat of November 1834 was the last occasion on which the English sovereign has attempted to impose an unpopular ministry on the majority in parliament.

In May 1837 the king began to show signs of debility, and died from an affection of the heart on the 20th of June, leaving behind him the memory of a genial, frank, warm- hearted man, but a blundering, though well-intentioned prince. He was succeeded by his niece Victoria.

Authorities. —Correspondence of Earl Grey with William IV. and Sir Herbert Taylor, London, 1867 ; Fitzgerald's Life and Times of William IV.; Greville's Memoirs; Memoirs of Sir Robert Peel ; Civil Correspondence of the Duke of Wellington ; Walpole's History of England; Martineau's History of the Peace; Molesworth's History of England. (G2 Wis-Bs)

WILLIAM, surnamed the Lion, king of Scotland from 1165 to 1214. See Scoriann, vol. xxi. p. 484.

WILLIAM I. (1797-1888), king of Prussia and German emperor, was the second son of Frederick William III. of Prussia and Louisa, a princess of

Mecklenburg-Strelitz. He was born at Berlin on 22d March 1797, and received the names of Wilhelm Friedrich Ludwig. He was a delicate child and had to be carefully nurtured. His con- stitution, however, was sound, and he became one of the most vigorous men in Germany. After the battle of Jena he spent three years at Kénigsberg and Memel. Mean- while he had given evidence of sterling honesty, a strict love of order, and an almost passionate interest in every- thing relating to war. On Ist January 1807 he received an officer's patent, and on 30th October 1813 was ap- pointed a captain. William accompanied his father in the campaign of 1814, and early in the following year received the iron cross for personal bravery shown at Bar- sur-Aube. He took part in the entry into Paris on 31st March 1814, and afterwards visited London. He joined the Prussian army in the final campaign of the Napoleonic wars, and again entered Paris. The prince was made a colonel and a member of the permanent military commis- sion immediately after his twentieth birthday, and at the age of twenty-one became a major-general. In 1820 he received the command of a division; and during the fol- lowing nine years he not only made himself master of the military system of his own country but studied closely those of the other European states. In 1825 he was pro- moted to the rank of lieutenant-general, and obtained the command of the corps of guards. On 11th June 1829 he married Augusta of Saxe- Weimar.

On the death of his father in 1840—the new king, Frederick William IV., being childless—Prince William, as heir presumptive to the throne, received the title of prince of Prussia. He was also made lieutenant-governor of Pomerania and appointed a general of infantry. In politics he was decidedly Conservative; but at the outbreak of the revolutionary movement of 1848 he saw that some concessions to the popular demand for liberal forms of government were necessary. He urged, however, that order should be restored before the establishment of a constitutional system. At this time he was the best-hated man in Germany, the mass of the Prussian people believ- ing him to be a vehement supporter of an absolutist and reactionary policy. He was even held responsible for the blood shed in Berlin on 18th March, although he had been relieved nine days before of his command of the guards. So bitter was the feeling

against him that the king entreated him to leave the country for some time, and accordingly he went to London, where he formed intimate personal relations with Prince Albert, Sir Robert Peel, Lord John Russell, Lord Palmerston, and other English statesmen. On 8th June he was back at Berlin, and on the same day he took his seat as member for Wirsitz in the Prussian national assembly, and delivered a speech in which he expressed belief in constitutional principles. In 1849, when the revolutionary party in the grand-duchy of Baden be- came dangerous, he accepted the command of "the army of operation in Baden and the Palatinate," and his plans were so judiciously formed and so skilfully executed that in the course of a few days the rebellion was crushed. At the beginning of the campaign an unsuccessful attempt was made on his life. In October 1849 he was appointed military governor of the Rhineland and Westphalia, and took up his residence at Coblentz. In 1854 the prince was raised to the rank of a field-marshal and made governor of the confederate fortress of Mainz. When the king was attacked with a disease of the brain, Prince William assumed the regency (7th October 1858).

On 2d January 1861 Frederick William IV. died, and his brother succeeded him as William I. For the internal conflict between the king and the house of representatives on the question of military reorganization, which filled up the first years of his reign, see Germany (vol. x. p. 510) and Prussia (vol. xx. p. 12), Thé events and results of the war with Denmark, and of that with Austria which arose out of the Schleswig-Holstein question, belong to the history of Austria and of Prussia, and have been already described under those articles. The brilliant achievements of the army in this last contest finally convinced the king's subjects that his aims had been wise. On his return to Berlin he was received with unbounded enthusiasm, and from this time he was looked up to as a father rather than as a sovereign. On the outbreak of the war with France in 1870 all Germans rallied round the king of Prussia, and, when on 31st July he quitted Berlin to join his army, he knew that he had the support of a united nation. He crossed the French frontier on the 11th of August, and personally commanded at the battles of Gravelotte and Sedan. It was during the siege of Paris, at his head-quarters in Versailles, that he was proclaimed German emperor on 18th January 1871. On 3d March 1871 he signed the preliminaries of peace

which had been accepted by the French assembly ; and on 21st March he opened the first imperial parliament of Germany. On 16th June he triumphantly entered Berlin at the head of his troops.

After that period the emperor left the destinies of Ger- many almost entirely in the hands of Bismarck, who held the office of imperial chancellor (see Prussta). In his personal history the most notable events were two attempts upon his life in 1878,—one by a working lad called Hédel,

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another by an educated man, Karl Nobiling. On the first occasion the emperor escaped without injury, but on the second he was seriously wounded. These attacks grew out of the socialist agitation ; and a newreichstag, elected for the purpose, passed a severe anti-socialist law, which was afterwards from time to time renewed. The socialists, however, far from being crushed, again and again gave proof of their power by returning a considerable number of deputies to parliament. In the hope of alienating from them the mass of the working class, Bismarck introduced, with the cordial approval of the emperor, a series of measures for the benefit of the poorer members of the community. Until within a few days of his death the emperor's health was remarkably robust; he died at Berlin on 9th March 1888,

The reign of William I. marked an era of vast importance in the history of Germany. In his time Prussia became the first power in Germany and Germany the first power in Europe. These momentous changes were due in a less degree to him than to Bismarck and Moltke; but to him belongs the credit of having recognized the genius of these men, and of having trusted them absolutely. Personally William was a man of a singularly noble and attractive character. His supreme wish was to discharge loyally the duties which had been imposed upon him, and he never shrank from any personal sacrifice that seemed to be demanded in the interests of his people. The best traditions of the Hohenzollerns were maintained, not only by the splendour of the achievements with which his name will

always be intimately associated, but by the simplicity, manliness, and uprightness of his daily life.

WILLIAM IV. (1532-1592), landgrave of Hesse, well known as an astronomer, son of Philip the Magnanimous, was born at Cassel on 14th June 1532. During his father's captivity after the battle of Miihlberg (1547) he carried on the government in his'name for five years, and succeeded him on his death in 1567. At an early age he became interested in astronomy ; and in 1561 he built an observa- tory at Cassel, where observations were regularly made, first by himself, afterwards by Rothmann and Biirgi. The last-named was not only a very skilful mechanic (it seems probable that he applied the pendulum to clocks long be- fore Huygens did) but an original mathematician, who independently invented logarithms. William died on 25th August 1592,

Most of the mechanical contrivances which made Tycho Brahe's instruments so superior to those of his contemporaries were adopted at Cassel about 1584, and from that time the observations made there seem to have been about as accurate as Tycho's; but the re- sulting longitudes were 6' too great in consequence of the adopted solar parallax of 3'. The principal fruit of the observations was a catalogue of about a thousand stars, the places of which were deter- mined by the methods usually employed in the 16th century, con- necting a fundamental star by means of Venus with the sun, and thus finding its longitude and latitude, while other stars could at any time he referred to the fundamental star. It should be noticed that clocks (on which Tycho Brahe depended very little) were used at Cassel for finding the difference of right ascension between Venus and the sun before sunset ; Tycho preferred observing the angular distance between the sun and Venus when the latter was visible in the day time. The Hessian star catalogue was published in Lucius Barettus's Historia Celestis (Augsburg, 1668), and a number of other observations are to be found in Celi et Siderum in eo Errantium Observationes Hassiace, Leyden, 1618, edited by SNELLIUS (¢.¥.). R. Wolf, in his " Astronomische Mittheilungen," No. 45 (Vierte- jahrsschrift d. naturforschenden Gesellschaft in Ziirich, 1878), has given a résumé of the manuscripts still preserved at Cassel, which throw much light on the methods adopted in the observations and reductions.

WILLIAM (1533-1584), surnamed the Stent, prince of Orange, count of Nassau, was born at the castle of Dil- lenburg in Nassau on 16th April 1533. He was the eldest son of William of Nassau (died 1559) and his second wife, Juliana of Stolberg, a woman of remarkable piety and discretion, who devoted much thought and care to the training of her children. In 1544 he inherited from his cousin René or Renatus the principality of Orange and the great estates belonging to his family in the Netherlands (see HoLLann, vol. xii. p. 74 sq.). He was educated at the court

of Brussels in the Roman Catholic faith. Having attracted the attention of Charles V., he was invested by the emperor at the age of twenty-two with the command of the army on the French frontier; and it was on his shoulder that Charles V. leaned when in 1555, in the presence of a great assembly at Brussels, he transferred to his son Philip the sovereignty of the Netherlands. Orange was also selected to carry the insignia of the empire to Ferdinand, king of the Romans, when Charles resigned the imperial crown. He took part in Philip IT's first war with France, and negotiated the preliminary arrangements for the treaty of Cateau-Cambrésis (1559). He was one of the hostages sent to France for the due execution of the treaty, and during his stay in that country Henry II., who entirely misunderstood his character, revealed to him a plan for the massacre of all Protestants in France and the Netherlands. The prince was horrified by this disclosure, but said nothing ; and it was on account of his extraordinary discretion on this occasion that he received the surname of "the Silent." The epithet is apt to convey a mistaken impression as to his general character. He was of a frank, open, and generous nature, without a touch of moroseness in the ordinary intercourse of life.

The persecution of the Protestants in the Netherlands, carried on with such reckless ferocity by Cardinal Gran- vella, led Orange, Egmont, and Horn, the most prominent of the great nobles, to protest against the violence of the Government ; and in 1563 they wrote to Philip urging him to withdraw Granvella, and ceased to attend the state council, In the

following year Granvella was displaced, whereupon they resumed their seats at the council; yet shortly afterwards it was decided by Philip that the canons of the Council of Trent, the edicts, and the Inquisition should be immediately promulgated in every town and village of the provinces, and that the process should be repeated 'every six months. At the meeting of the state council at which this was formally decided Orange dis- claimed any responsibility for the consequences, and he whispered to his neighbour that now the most extra- ordinary tragedy the world had ever seen was about to begin. The proceedings of the Gueux or reforming party so alarmed the regent, Margaret of Parma, that she was persuaded to sign an accord, declaring the abolition of the Inquisition and granting liberty of worship in all places where the new forms of religion had been already accepted. In consequence of these concessions the great nobles undertook to restore order, the prince of Orange especially distinguishing himself at Antwerp. But Philip, who had been longing for an excuse to crush the inde- pendent spirits of the Netherlanders, now resolved to send the duke of Alva into the country, with a Spanish force. Orange, since he could not count upon the hearty support of Egmont or Horn, had no alternative but to resign his offices and withdraw from the Netherlands (1567), taking up his residence at Dillenburg. He was warmly attached to Egmont, and before his departure, at an interview at Willebroeck, urged him to seek refuge in some foreign land ; but Egmont was not to be persuaded, and the two friends parted never to see one another again.

Orange was repeatedly summoned to Brussels; but he declined to appear before the Council of Disturbances, on the ground that it had no jurisdiction over an inde- pendent prince and a knight of the order of the Fleece. The havoc wrought by Alva filled him with grief and anger ; and in 1568 he contrived to collect two forces, one of which, commanded by his brothers Louis and Adolphus, gained a victory in Groningen, where Adolphus fell. Alva, having ordered the execution of Egmont and Horn, advanced against Louis and defeated him in East Fries- land. Orange then invaded Brabant, but could neither

bring Alva to a decisive engagement nor induce the people to rise against him. The army had therefore to be dis- banded, and its disappointed leader joined Wolfgang of Zweibriicken in an attempt to aid the Huguenots. Acting on the advice of Coligny, Orange issued letters of mark to seamen against the Spaniards; and for years the "sea beggars" harassed the enemy along the coast, and often did no little harm to their own countrymen, In 1572 the revolt against Spain was so far successful that Orange resumed the functions of stadtholder of Holland and Zealand, a position to which he had been appointed in 1559; but he professed to rule in the name of the king, for as yet the people had no wish to throw off their allegiance to the Spanish crown. Orange had won their confidence not only by acting as their champion but by accepting the Protestant faith. He had never been an enthusiastic Catholic, and as a Protestant he was dis- tinguished aiong the eminent men of his time by his mastery of the true principles of toleration. Meanwhile he had been using the utmost diligence in bringing to- gether an army, and his brother Louis, by a_ brilliant stroke, had captured the city of Mons. On 15th July 1572 the estates of Holland met at Dort, and, recognizing Orange as the legal stadtholder of Holland, Zealand, Fries- land, and Utrecht, voted the sums necessary for the pro- secution of the war. In August he crossed the Meuse at the head of an army, trusting mainly to the promised co-operation of France. All his hopes, however, were shattered by the massacre of St Bartholomew. He was obliged to disband his troops, and Mons was re-taken by the Spamards. On 14th April 1574, at the village of Mook, near Nimeguen, the patriots were again routed, and Orange's brothers, Louis and Henry, slain. But many fortified places held out, and on 3d October Orange, who had ordered the country to be inundated, was able to relieve Leyden, which had for months been defended with splendid bravery and self-sacrifice. At length the brutality and despotism of the Spaniards were so fiercely and gener- ally resented that Orange was able to enter upon a series of negotiations, which resulted on 8th November 1576 in the pacification of Ghent, signed on behalf of nearly all the provinces. By this treaty the provinces bound them- selves to drive the Spaniards from the Netherlands, to convoke the states-general, and to establish freedom of worship both for Roman Catholics and for Protestants. Don John of Austria, Spanish regent of the Netherlands (1576-78), granted all the demands of the states; but Orange was

suspicious of the intentions of the Govern- ment, and in no way relaxed his vigilance. Troubles soon broke out, and Orange was called to Brussels to the aid of the states, being elected ruwaard (governor) of Brabant. When the archduke Matthias (afterwards emperor) was invited by the Catholic nobles to accept the position of governor-general, Orange prudently refrained from resist- ing the scheme; and he acted with equal discretion in regard to the duke of Alencon, who came nominally as the protector of the liberties of the Netherlands. Orange, however, retained in his own hands complete control over the movement in the seven northern provinces, which by the Union of Utrecht, signed on behalf of five of the pro- vinces on 23d January 1579, laid the foundations of the comnionwealth of the United Netherlands. Orange's rela- tion to the new federal republic was somewhat vaguely defined ; but in his lifetime it was not felt that there was any very urgent need for an exact delimitation of the relative functions of the executive and the legislative authorities. Negotiations for the conclusion of peace with Spain were carried on for some time in vain; and in 1580 Philip issued a ban against the prince, and set a price of 25,000 gold crowns upon his head. Orange pub-

lished a vigorous "apology," and on 26th July 1581 the estates of the United Provinces formally renounced their allegiance to the Spanish crown, An unsuccessful attempt on the life of Orange was made in 1582. But on 10th July 1584 he was shot dead in his house at Delft by Balthazar Gerard, who seems to have been actuated in part by fana- ticism, in part by the hope of gain.

William of Orange was tall and well-formed, of a dark complexion, with brown hair and eyes. He was a man of a singularly upright and noble character. He has been charged with excessive ambition ; but his ruling motive was undoubtedly a love of justice, for the sake of which he often risked his life and willingly sacrificed his wealth and leisure. He was a born statesman, capable of forming wise and far-reaching plans, and of modifying them to suit the changing circumstances in which it was necessary to execute them. In moments of difficulty he displayed splendid resource and courage, and he had a will of iron, which misfortunes were

never able either to bend or to break. To him chiefly belongs the honour of having permanently crippled the tyrannical power of Spain, and of having founded the independence and greatness of the United Provinces.

He was married four times. His wives were (1) Anne of Egmont (died 1558), by whom he had a daughter and a son, Philip William, who was seized by Alva in 1567 and sent to the court at Madrid, where he was educated ; (2) Anne of Saxony (divorced in 1575, died in 1577), the mother of several daughters and of Maurice of Orange (see HoLLAND, vol. xii. p. 77); (8) Charlotte of Bourbon (died 1582), who had six daughters ; (4) Louisa, Coligny's daughter, the mother of Frederick Henry of Orange (Joe. cit., p. 79), who represented the family after the death of his two elder brothers, and succeeded Maurice as stadtholder.

See Schiller, Geschichte des Abfalls der Vereinigten Niederlande; Klose, Withelm I, von Oranien; Gachard, Correspondance de Guillaume le Taciturne and Corre- spondance de Philippe II. sur les Affaires des Pays-Bas ; Groen van Prinsterer, Archives ou Correspondance Inédite de la Maison d'Orange-Nassau; Juste, Guillaume le Taciturne d'aprés sw Correspondance et les Papiers d'Etat; Motley, The Rise of the Dutch Republic. (J. SL.)

WILLIAM of Holland, second count of the name, was born about 1227, succeeded his brother Floris IV. in 1235, and was chosen king of the Romans by the papal party in 1247. See Germany, vol. x. p. 491, and Hoxzanp, vol. xii. p. 71. He died on 28th January 1256.

WILLIAM L, king of the Netherlands from 1815 to 1840, was born at The Hague on 24th August 1772, and died at Berlin on 7th November 1843. His son, WiLL1AM IT. (1792-1849), reigned from 1840, and was in turn suc- ceeded by his son, Witt1am III. (born 1817). See Hot- LAND, vol. xii. p. 83.

WILLIAM, archbishop of Tyre, was doubtless a native

of the Holy Land. He was perhaps born about 1137; but this is a mere inference from his own statement that he was still pursuing his studies "across the seas" when Amalric came to the throne (17th February 1163),

and did not return till late in 1166 or early in 1167. Asa child he had seen Ralph, the patriarch of Antioch, who died about 1141-42; he remembered the fall of Edessa (December 1144); and he seems to call himself a contemporary historian from the accession of Baldwin IIL, an event which he dates 10th November 1142 (Hist. Rer, Lransmarin., xvi., pref., and xix. 4, 12). Unfortunately the chapter (xix. 12) which relates to his own early life has been excised or omitted from every MS. of his great work now extant,—a remark which holds good, not only for the original Latin, but also for the 13th-century French translation. William was appointed archdeacon of Tyre at the request of Amalric on 31st August 1167. Next summer he was despatched on an embassy to the emperor Manuel. At the time of the disastrous campaign against Damietta (October-December 1169) he had to take refuge at Rome from the "unmerited anger" of his archbishop. About 1170 he was appointed tutor to Amalric's son Baldwin, afterwards Baldwin IV. A very few months after Baldwin's accession William was made chancellor of the kingdom (¢. October 1174), and less than a year later (13th June 1175) was consecrated archbishop of Tyre. The former office he still held in 1182. He belonged to the commission which negotiated with Philip of Flanders

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in 1177; and in the following October (1178) he was one of six bishops sent to represent the Latin Church of the East at the Lateran Council (19th March 1179). He returned home by way of Constantinople, where he stayed seven months (October 1179-April 1180) with Manuel. This is his last authentic appearance in history; but we know from his own works that he was writing his History in 1182 (xix. 20), and that it breaks off abruptly at the end of 1183 or the beginning of 1184. Some fifty years later his first continuator accused Heraclius, patriarch of Jerusalem, of having procured William's death at Rome. This story, however, seems to be pure legend ; nor perhaps is much more credit to be attached to the theory that identifies him with the archbishop of Tyre sent over to Europe to preach a new crusade in 1188. It is true that Matthew Paris speaks of Henry II.'s receiving the cross from the hands of " Willelmus episcopus

Tyrensis"; but more contemporary writers omit the Christian name, while others write it Josce or Joscius. '

If not the greatest, William of Tyre is at least among the greatest, of medizval historians. His Historia Rerum in Partibus Trans- marinis Gestarum is the main authority for the Latin kingdom of the East between 1127, where Fulcher of Chartres leaves off, and 1184, where Ernonl takes up the narrative. It was translated into French in the 18th century, or possibly before the end of the 12th. A little later it was united to Ernoul's chronicle or that of Bernard the Treasurer, and continued in more than one form to 1249, 1261, or 1275. In this shape the combined histories form the Livre d'Outremer quoted by Joinville (cxvil. § 77),—the standard medi- zval account of the exploits of the Frankish warriors in the East. William's own work consists of twenty-two books and a fragment (one chapter and a preface) of book xxiii. It extends from the preaching of the first crusade by Peter the Hermit and Urban II. to the end of 1188 or the beginning of 1184. Like William's other work, the Historia de Orientalibus Prinetpibus, it was under- taken at the request of Aimalric, who was himself a lover of history and supplied the author with Arabic MSS.; but, whereas the latter book (now unfortunately lost) was mainly based upon the writings of a certain "Seith, the son of Patrick (Patricit), patriarch of Alexandria," of the Historia Transmarina its author remarks, "Iu this work we have had no guide, whether Greek or Arab, but have had recourse to traditions only, save as regards a few things that we have ourselves seen." The " traditions" here spoken of must be taken to include the Gesta Francorum of Tudebode, Raymund of Agiles, Fulcher of Chartres, and, above all, Albert of Aix. It is only with the accession of Baldwin I., even if so early as this, that William's claim to originality can fairly be sustained; and even here his narrative, till towards the close of book Xiii., is based upon that of Fulcher. From this point William of Tyre is indebted to no other historian. Of the remaining books two are devoted to the reign of Fulk (xiv.-xv.), three to that of Baldwin III. (xvi.-xviii.), two to that of Amalric, and the rest to that of Baldwin LY.

No medieval writer, except perhaps Giraldus Cambrensis, pos- sesses William's power of delineating the physical and mental features of his heroes. Again, very few had his instinctive insight into what would be of

real value to future ages: genealogy, topo- graphy, archeology, social life (political and ecclesiastical), military matters and naval, all find a due exposition in his pages. It is hardly too much to say that from his work alone a fairly detailed map of the Levant, as it was in the 12th century, might be con- structed ; and it is impossible to praise too highly the scrupulous fidelity with which he defines nearly all the techuical terms (whether relating to land or sea) of which he makes use. His chief fault is in the matter of chronology, where indeed he is not unfrequently at discord with himself. In the later books his information, even as regards what was taking place beyond the Nile or the Euphrates, as well as in Europe, is singularly exact. Nor did he consider any trouble too severe if by its means he might attain to the truth. Though a man of great learning and almost certainly acquainted with Arabic and Greek, he is as ready to enliven his pages with a country proverb as to embellish them with quotations from Cicero, Virgil, Ovid, or Plato. He was a prelate of pious character, in- clined to see the judgment of God on the iniquities of his fellow- countrymen in every disaster that overtook his native land and every Saracen success.

WILLIAM or Cuampzravx. xk. pp. 4228103,

WILLIAM or Lorris, the first author of the Roman de la Rose, derives his surname from a small town about equidistant from Montargis and Gien, in the old district of

See SCHOLASTICISM, vol.

WYKEHAM. |

the Gatinais, and in the present department of Loiret. This and the fact of his authorship may be said to be the only things positively known about him. The rubric of the poem, where his own part finishes, attributes Jean de Meung's continuation to a period forty years later than William's death and the consequent interruption of the romance. Arguing backwards, this death used to be put at about 1260; but Jean de Meung's own work has recently been dated earlier, and so the composition of the first part has been thrown back to a period before 1240. The author represents himself as having dreamed the dream which furnished the substance of the poem

in his twentieth year, and as having set to work to "rhyme it" five years later. The general characteristics of the Roman will be found noticed under FRaNcz (see vol. ix. p. 643). It may be added here that, though the later and longer part shows signs of greater intellectual vigour and wider knowledge than the earlier and shorter, William of Lorris has more poetry than his continuator, made a much greater impression on the spirit of his own and following ages, and is to all appearance more original. The great features of his four or five thousand lines are, in the first place, the extraordi- nary vividness and beauty of his word-pictures, in which for colour, freshness, and individuality he has not many rivals except in the greatest masters, and, secondly, the fashion of allegorical presentation, which, hackneyed and wearisome as it afterwards became, was evidently in his time new and striking. There are of course traces of it before, as in some romances, such as those of Raoul de Houdenc, in the troubadours, and in other writers ; but it was unquestion- ably William of Lorris who fixed the style. And to have fixed a style which captivated Europe for at least two centuries, if not three, does not happen to many of the personages of literary history.

The most convenient edition of the Roman de la Rose is that of F, Michel (2 vols., Paris, 1864).

WILLIAM or Matmuszoury. LIAM OF.

WILLIAM or Newsureu, born about 1136, was a canon of Newburgh in the North Riding of Yorkshire, and author of a valuable chronicle of English affairs from the Norman Conquest to 1197, He calls himself Gulielmus Parvus, and is frequently referred to as William Petyt or Little. His work (Gulielmi Neubrigensis Rerum Anglicarum Jnbri V.) was edited by Silvius at Antwerp in 1567 and by Hearne at Oxford in 1719 (3 vols. 8vo); the latest edition is that by H. C. Hamilton for the English Historical Society (Historia Rerum Anglicarum Willelmi Parvi, S.T.D., Ordinis Sancti Augustini Canonici Regularis in Coenobio B, Marize de Novoburgo in Agro Eboracensi, 2 vols., 1856).

WILLIAM oF Occam. See Occam.

WILLIAM or Wyxernam (1324-1404), bishop of Win- chester and chancellor of England, was born in 1324 at Wickham in Hampshire. His father was a yeoman ; his mother is said to have been of noble descent. He was educated at the priory school, Winchester, at the cost of Sir John Scures, lord of the manor of Wickham and governor of Winchester Castle, who afterwards took him into his service. When he was twenty-two years old he passed into the service of Edingdon, bishop of Winchester. In 1347 the bishop introduced him to the king asa young man likely to be useful from his skill in architecture. Edward IIL, who was then completing the Round Tower at Windsor, made him his chaplain. But his employment for some time was mainly secular : he acted as guardian of several of the king's manors and as clerk of the works at Henley and elsewhere. In 1356 he was appointed surveyor of the works at Windsor, and a little later surveyor and warden of several other castles. In 1359 he began the building of the great quadrangle to the east of the keep at

See MALMEsBuRy, WIL-

Windsor, a work which occupied ten years. This building established his fame as an architect. Two years after its completion he was employed to build Queenborough Castle (Kent). Meanwhile he was also gaining experience in affairs of state. In 1360 he must have been a member of the king's council, for he appears as a witness to the ratification of the treaty of Brétigny. In 1364 he became keeper of the privy seal. In 1365 he was one of the commissioners to treat for peace with Scotland. And, although he was not yet in holy orders, he was loaded by the king with preferments, one of which, the living of Pulham in Norfolk, involved him (about 1360) in a dispute with the pope. In fact he had attained to such eminence that Froissart says, 'At this time there reigned in England a priest called Sir William de Wican, so much in favour with the king that by him everything was done."

Early in life William had received the tonsure; but it was not till 1362 that he was ordained deacon and priest. In 1363 he became archdeacon of

Northampton, and pro- vost and prebendary of Wells. Although at this time he possessed a number of prebends, it appears, from a return which he made in 1366 on account of a papal bull against pluralities, that he only held one benefice with cure of souls. On the translation of Bishop Edingdon in this year from Winchester to Canterbury William was nominated by the king to the vacant bishopric ; but the pope withheld his confirmation for some time, and it was not till October 1367 that William was consecrated bishop of Winchester. A month previously he had been made chancellor of Eng- land. During his first chancellorship the war with France was renewed and went against the English. The blame for this fell in great measure on the ministry, and in 1371 William resigned the great seal. But in 1373 he was one of a committee of the Lords appointed to confer with the Commons on the question of an aid. About this time he fell out with John of Gaunt, with whom he had pre- viously been on good terms. Since the overthrow of the clerical ministry in 1371 John of Gaunt had been practi- cally head of the government, but the conduct of his sup- porters caused general discontent. In the "Good Parlia- ment" of 1376 Lord Latimer was impeached, and the bishop was active in promoting his trial and punishment. This was a great blow to John of Gaunt. The death of the Black Prince in June 1376 enabled him to take his revenge. The bishop was attacked in the council on the ground of malversation and misconduct of public affairs during his chancellorship, condemned to pay an enormous fine, and deprived of the temporalities of his see. The other bishops took his side and regarded his punishment as an insult to their order. It was not, however, till after the accession of Richard II. (1377) that William recovered his position. He then received a full pardon, and was reconciled to John of Gaunt.

During the next ten years he became more and more clearly identified with the constitutional or Lancastrian party. In 1380 and 1381 he was named on commissions for the reform of the king's household. In 1382 he took part in a conference with the Commons. Next year he successfully opposed a demand from the lords of the Scot- tish marches for a share in the public funds in order to defray the expense of guarding the border, a duty on the performance of which rested their title to their lands. In 1386 he became one of the commission appointed to examine into the Exchequer and to act as a sort of council of regency. It was before this

commission that the five "lords appellant" impeached Richard II.'s favourites, who next year were condemned by the " Merciless Parliament." A year later (1389) the king suddenly resumed the reins of power. In order, apparently, to conciliate the clergy, Richard at once offered the great seal to the

bishop of Winchester, who after some hesitation accepted the charge. His second chancellorship lasted for two years, and was marked by efforts on his part to reform the government and place it on a more constitutional basis. After he had held office for a year he and his colleagues in the ministry resigned their appointments, and challenged a public inquiry into their conduct. This being pro- nounced satisfactory, they resumed their offices. The chancellor drew up rules for the conduct of business in the council; and from this time minutes of the proceedings were regularly kept. In 1391 he resigned the great seal, and thenceforward retired from public life.

It is, however, as the founder of two great colleges that William is principally known to fame. Immediately after his promotion to the bishopric of Winchester he appears to have begun to carry out his educational schemes. Between 1369 and 1379 he bought the land enclosed in the north-eastern corner of the city walls at Oxford on which New College now stands (see OxrorD, vol. xviii. p. 97). Meanwhile he was taking steps to establish the sister foundation at Winchester. In 1378 he obtained a licence from the pope to found a college there, which was confirmed by the king four years later. The ground on which Winchester College stands belonged partly to the bishop and partly to other proprietors, from whom he bought it. In 1387 he began to build, and the buildings were occupied by his scholars in 1393, though they do not appear to have been finished till 1395. When his two colleges were established and endowed, he provided them with statutes, which after several revisions took their final form in 1400. Nor does he appear to have neglected his duties as a bishop. He visited and reformed the hospital of St Cross near Winchester; he corrected the abuses which had

crept into the priory of St Swithin; and he rebuilt or transformed the nave of Winchester cathedral. He kept a strict watch on the clergy under his charge, endeavouring to ensure their efficiency by frequently moving them from one living to another, and he promoted the material prosperity of his diocese by repairs of bridges and roads. In the relations between England and the papacy William of Wykeham strongly supported the nationalist policy of Edward III. The Statutes of Provisors and Premunire niet with his full approval. So far he was in accord with Wycliffe, but he showed no sympathy with the doctrinal opinions of the reformer. Bishop Courtenay, who headed the attack on Wycliffe, was a life- long friend of the bishop of Winchester, who published in 1382 the interdict condemning Wycliffe's heresies, and in 1392 sat on an episcopal commission to try his follower Henry Crumpe. William of Wykeham died at Waltham on 27th September 1404, and was buried in the cathedral of Winchester.

Authorities.—The episcopal register of William of Wykeham (pre- served at Winchester); Walsingham, Historia Anglicana ; Lowth, Life of William of Wykeham, London, 1758 ; Walcott, Welliam of Wykeham and his Colleges, 1852; Moberly, Life of William of Wykeham, Winchester, 1887. (G. WoaP.)

WILLIAMS, Joun (1796-1839), English missionary, was born at Tottenham near London, on 29th June 1796, He was trained as an ironmonger, and acquired while young considerable experience in mechanical work. Having offered himself. to the London Missionary Society, he was sent, after some training, in 1816 to the South Sea Islands asa missionary. He was first stationed at Kimeo, in the Society Islands, where he rapidly acquired a knowledge of the native language. After staying there fora short time he finally settled at Raiatea, which became his permanent headquarters, His success as a missionary here and elsewhere was remarkable. The people rapidly became Christianized and adopted many of the habits of civiliza- tion, Williams was fairly liberal for his age, and the results

of his labours among the Pacific Islands were essentially beneficial. He travelled unceasingly among the various island groups, planting stations and settling native mis- sionaries whom he himself had trained. From the Society Islands he visited the Hervey group, where he discovered, and stayed for a considerable time on, the island of Raro- tonga. Most of the inhabitants of the group were con- verted in a remarkably short time, and Williams's influence over them, as over the people of other groups, was very great. Besides establishing Christianity and civilization among them, he also, at their own request, helped them to draw up a code of laws for civil administration upon the basis of the new religion. While at Rarotonga he, with the help of the natives, built himself a ship, within about four months ; with this he returned to Raiatea, and made voyages among other island groups, including Samoa and the neighbouring islands, Williams returned to England in 1834 (having previously visited New South Wales in 1821); and during his four years' stay at home he had the New Testament, which he had translated into Rarotongan, printed. Returning in 1838 to the Pacific, he visited the stations already established by him, as well as several fresh groups. He went as far west as the New Hebrides, and, while visiting Erromango, one of the group, for the first time, was murdered by the natives, 20th November 1839.

Williams was probably on the whole one of the most successful of Christian missionaries, both as regards the extent and the per- manence of the work he accomplished. His Narrative of Mis- sionary Enterprises in the South Sea Islands was published in 1837, and formed an important contribution to our knowledge of the islands with which Williams was acquainted. See Alemoir of John Williams, by Rev. Ebenezer Prout, London, 1843.

WILLIAMS, Roger (c. 1600—c. 1684), one of the founders of the colony of Rhode Island, North America, was born either of Welsh or Cornish parents, but this as well as the date of his birth has been the subject of dis- pute. In early life he went to London, where his skill as a reporter commended him to the notice of Sir Edward Coke, who sent him to Sutton's Hospital (Charterhouse school). From Charterhouse he went to one of the uni- versities, but whether to Oxford or Cambridge there is no direct evidence to show. The register of Jesus College, Oxford, has the

following entry under date 30th April 1624: "Rodericus Williams, filius Gulielmi Williams, de Conwelgaio Pleb., an. Nat. 18." If this entry refers to the founder of Rhode Island he was of Welsh parentage and born about 1606. As Coke was a Cambridge student, the probability is, however, that Williams was sent there ; and a Roger Williams matriculated at Pembroke College of that university on Ist July 1625, and took his B.A. degree in January 1627. This Roger Williams was the second son of William Williams, and was baptized at Gwinsea, Cornwall, on 24th July 1600, a date which cor- responds with a statement regarding his age made by Williams himself. After leaving the university he entered on the study of law; but, soon forsaking it for theology, he was admitted into holy orders and is said to have had a parochial charge. On account of his Puritan beliefs he left England for Massachusetts Bay, where he arrived in the beginning of 1631. He accepted an invitation to become pastor of a church at Salem, on 12th April 1631, the same day that the magistrates were assembled at Boston to express disapproval of the scheine. To escape persecution he went to Plymouth, beyond the jurisdiction of Massachusetts Bay, and became assistant pastor there ; but in the autumn of 1633 he returned to Salem as assist- ant pastor, succeeding in the following year as sole pastor. Chiefly on account of his pronounced opinions regarding the restricted sphere of the civil magistrate in religious matters, he came into conflict with the court of Massa- chusetts, and, being banished from the colony, left with a

few sympathizers in January 1636 for Narragansett Bay. At first they received a grant of land from an Indian chief, which is now included in Seekonk, Massachusetts, and began to build houses, but in June following he and five others embarked in a canoe for Rhode Island, and founded a settlement to which Williams, in remembrance "of God's providence to him in his distress," gave the name of Pro- vidence. In 1639 he was publicly immersed and became pastor of the first Baptist church of Providence. As Massachusetts now began to claim jurisdiction over Nar- ragansett Bay, Williams proceeded in June 1643 to Eng- land, and through the mediation of his friend Sir Henry Vane, whose acquaintance he had made at Massachusetts, obtained an independent charter, 14th

March 1644. In 1649 he was chosen deputy president. He again visited England in 1651 to obtain a more explicit charter, and remained there till 1654, enjoying the friendship of Milton, Cromwell, and other prominent Puritans. On his return to the colony in 1654 he was chosen president or governor, and remained in office till 1658. He lived to the age of eighty-four, but the exact date of his death is uncertain.

Williams was the author of a Key into the Language of the Indians of America (written at sea on his first voyage to England; London, 1643, reprinted in vol. i. of Collections of Rhode Island Historical Society, 1827) ; Afr Cotton's Letter Examined and Answered, 1644 ; The Bloody Tenent of Persecution for the Cause of Conscience, 1644 ; Queries of Highest Consideration, 1644; The Bloody Tenent yet more Bloody, 1652; The Hireling Ministry None of Christ's, 1652 ; Experiments of Spiritual Life and Health, 1652; and George Fox Digged out of his Burrows, 1676. A complete collection of all his letters that have been recovered forms vol. vi. of the Publications of the Narragansett Club. See Lives by Knowles (1833), Gammell (1846), and Elton (1852); Spark's Library of American Biography ; Savage's Genealogical Dictionary of New England Settlers; Bio- graphical Cyclopedia of Representative Men of Rhode Island, 1883 ; Guild's Account of the Writings of Roger Williams, 1862; and Dexter's As to Roger Williams and his Banishment from Massa- chusetts Bay, 1876.

WILLIAMSPORT, a city of the United States, the county seat of Lycoming county, Pennsylvania, is situated in the valley of the west branch of the Susquehanna river, amid the hills of the Alleghany plateau, and is entered by four railway lines,—the Northern Central, the Philadelphia and Erie, the Philadelphia and Reading, and the Corning, Cowanesque, and Antrim. The city is somewhat irregularly laid out, and the streets are mainly unpaved. The popu- lation in 1880 was 18,934; in 1870 it was 16,030. Williamsport owes its importance chiefly to its large lumber industry. The healthfulness of its climate and the beauty of the surrounding scenery have made it a popular summer resort in recent years.

WILLIBRORD, St, the apostle of the Frisians, was born about 657. His father, Wilgils, an Angle or, as Alcuin styles him, a Saxon, of

Northumbria, withdrew from the world and constructed for himself a little oratory dedicated to St Andrew. The king and nobles of the district endowed him with estates till he was at last able to build a church, over which Alcuin afterwards ruled. Willibrord, almost as soon as he was weaned, was sent to be brought up at Ripon, where he must doubtless have come under the influence of Wilfrid. About the age of twenty the desire of increasing his stock of knowledge (c. 679) drew him to Ireland, which had so long been the headquarters of learning in western Europe. Here he stayed for twelve years, enjoying the society of Egbert and Wictbert, from the former of whom he doubtless received his first impulse to missionary work among the North-German tribes. In his thirty-third year (c. 690) he started with twelve companions for the mouth of the Rhine. These districts were then occupied by the Frisians under their king Rabbod or Radbod. After a time he found in Pippin, the mayor of the palace, a strong supporter, who sent him to Rome, where he was consecrated bishop by

Pope Sergius on St Cecilia's Day 696. Bede says that when he returned to Frisia his see was fixed in Utrecht. He now seems to have spent several years in founding churches and the work of conversion, till his success tempted him to pass into those parts of the land which did not own the Frankish sway. Being kindly received by Radbod, but failing to convert him, he passed on to Denmark, whence he carried away thirty boys to be brought up among the Franks. On his return he was wrecked on the holy island of Fosite (Heligoland), where his disregard of the pagan superstition nearly cost him his life. When Pippin died, Willibrord found a supporter in his son Charles Martel, who, according to Alcuin's version of the story, established the bishop in Utrecht upon Radbod's death (719). At this time he was assisted for three years in his missionary work by St Boniface (719- 722). Of the later years of his life we have no special chronological details. He passed throughout his diocese on horseback, working petty miracles and prophetically anticipating the future glory of Charles's son Pippin at his baptism. He was still living when Bede wrote in 731. A passage in one of Boniface's letters to Stephen III. speaks of his preaching to the Frisians for fifty years, apparently reckoning from the

time of his consecration. This would fix the date of his death in 738; and, as Alcuin tells us he was eighty-one years old when he died, it may be inferred that he was born in 657,—a theory on which all the dates given above are based, though it must be added that they are substantially confirmed by the inci- dental notices of Bede. The day of his death was 6th November, and his body was buried in the monastery of Epternac, which he had himself founded. Even in Alecuin's time miracles were reported to be still wrought at his tomb.

The chief authorities for Willibrord's life are Alenin's Vita Willi- brordi, both in prose and in verse, and Bede's Hist. Eccl., v. ce. 9-11. See also Eddius's Vita Wilfridit.

WILLIMANTIC, a borough in the town of Windham, Windham county, Connecticut, United States, is situated in a broken hilly country, on the Westfield river and on three railway lines,—the New York and New England, the New York, New Haven, and Hartford, and the Central Vermont. The population in 1880 was 6608. The indus- tries consist chiefly of cotton manufactures, in which the town has acquired great prominence, owing to the fine water power afforded by the Westfield river.

WILLIS, NarHanret Parker (1806-1867), American author, was descended from George Willis, described as a '"' Puritan of considerable distinction," who arrived in New England about 1630 and settled in Cambridge, Mass. Nathaniel Parker was the eldest son and second child of Nathaniel Willis, a newspaper proprietor in Boston, and was born in Portland, Maine, 20th January 1806. After attending Boston grammar school and the academy at Andover, he entered Yale College in October 1823. Although he did not specially distinguish himself as a student, university life had considerable influence in the development of his character, and furnished him with much of his literary material. Immediately after leaving Yale he published in 1827 a volume of Poetical Sketches, which attracted some attention, although the critics found in his verses more to blame than to praise. It was followed by Fugitive Poetry (1829) and Poems (1831). He also con- tributed frequently to magazines and periodicals. In 1829 he started the American Monthly Magazine, which was continued from April of that year to August 1831, but failed to

achieve success. On its discontinuance he went to Europe as foreign editor and correspondent of the Vew York Mirror. To this journal he contributed a series of letters, which, under the title Pencillings by the Way, were

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published at London in 1835 (3 vols.; Philadelphia, 1836, 2 vols.; and first complete edition, New York, 1841). Their vivid and rapid sketches of scenes and modes of life in the Old World at once gained them a wide popularity ; but he was censured by some critics for indiscretion in reporting conversations in private gatherings. Notwithstanding, however, the small affectations and fopperies which were his besetting weaknesses as a man as well as an author, the grace, ease, and artistic finish of his style won general recognition. His Slingsby Papers, containing descriptions of American life and adventure, republished in 1836 under the title Inklings of Adventure, were as successful in England as were his Pencillings by the Way in America. He also published while in England Melaine and Other Poems (London, 1835 ; New York, 1837), which was introduced by a preface by Barry Cornwall. After his marriage to Mary Stace, daughter of General Stace of Woolwich, he returned to America, and settled at a small estate on Oswego Creek, just above its junction with the Susquehanna. Here he lived off and on from 1837 to 1842 and wrote Letters from Under a Bridge (1840), the most charming of all his works. During a short visit to England in 1839-40 he published Two Ways of Dying for a Husband. Returning to New York, he established, along with George P. Morris, a news- paper entitled the Evening Mirror. On the death of his wife in 1845 he again visited England. Returning to America in the spring of 1846, he again married, and established the Vational Press, afterwards named the Home Journal. In 1845 he published Dashes at Life, in 1846 a collected edition of his Prose and Poetical Works, in 1849 Rural Letters, and in 1850 Life Here and There. In the

last-mentioned year he settled at Idlewild, and on account |

of failing health spent the remainder of his life chiefly in retirement. Among his later works were Hurrygraphs, 1851; Outdoors at Idlewild,

1854; Ragbag, 1855; Pearl Fane, 1856 ; and the Convalescent, 1859. He died 20th July 1867, and was buried in Mount Auburn, Boston.

His Poems, with memoir, appeared in 1867, an English edition of his Poems in 1868, and a Selection from his Prose Writings, edited by Henry A. Beers, New York, 1885. His Life, by Henry A. Beers, appeared in the series of American Men of Letters the same year.

WILLIS, Tomas (1621-1675), English physician, was born at Great Bedwin, Wiltshire, on 27th January 1621. He studied at Christ Church, Oxford ; and when that city was garrisoned for the king he bore arms for the Royalists. He took the degree of bachelor of medicine in 1646, and after the surrender of the garrison applied himself to the practice of his profession. In 1660, shortly after the Restoration, he became Sedleian professor of natural philo- sophy in place of Dr Joshua Cross, who was ejected, and the same year he took the degree of doctor of physic. In 1664 he discovered the medicinal spring at Astrop, near Brackley in Northamptonshire. He was one of the first members of the Royal Society, and was elected an honorary fellow of the Royal College of Physicians in 1664. In 1666, after the fire of London, he removed to Westminster, on the in- vitation of Dr Sheldon, archbishop of Canterbury. There he rapidly acquired an extensive practice, his reputation and skill marking him out as one of the first physicians of his time. He died at St Martin's on 11th November 1675 and was buried in Westminster Abbey.

_ Willis was admired for his piety and charity, for his deep insight into natural and experimental philosophy, anatomy, and chemistry and for the elegance and purity of his Latin style. He wrote in English A Plain and Easy Method Jor Preserving those that are Well from the Infection of the Plague, and Sor Curing such as are Infected. His Latin works were printed in two vols, 4to at Geneva in 1676, and at Amsterdam in 1682. His grandson, Browne Willis,

was the author of several antiquarian works,

See Munk, Roll of the Royal Col Physici i Deedes rey oy ge of Physicians, London (2a ed., vol. i.,

_ WILLMORE, James Tresrrts (1800-1863), English line engraver, was born at Bristnall's End, Handsworth,

near Birmingham, on 15th September 1800. At the age of fourteen he was apprenticed to William Radcliffe, a Birmingham engraver, and in 1823 he went to London and was employed for three years by Charles Heath. He was afterwards engaged upon the plates of Brockedon's Passes of the Alps and Turner's England and Wales. He engraved after Chalon, Leitch, Stanfield, Landseer, East- lake, Creswick, and Ansdell, and especially after Turner, from whose Alnwick Castle by Moonlight, the Old Témé- raire, Mercury and Argus, Ancient Rome, and the sub- jects of the Rivers of France he executed many admirable plates. He was elected an associate engraver of the Royal Academy in 1843. He died on 12th March 1863. WILLOW (Salix), a very well marked genus of plants constituting, with the Poplar (Populus), the order Salica- cex. Willows are trees or shrubs, varying in stature from a few inches to a hundred feet, and occurring most abund- antly in cold or temperate climates in both hemispheres, and generally in moist situations. They are not unrepre- sented in the tropics, but have hitherto not been discovered in Australia or the South Sea Islands. Their leaves are deciduous, alternate, simple, generally much more long than broad, whence the term willow-leaved has become proverbial. At their base they are provided with stipules, which are also modified to form the scales investing the winter buds. The flowers are borne in catkins or amenta, which are on one tree male only, on another female. Each

(1) Leaf shoot ; (2) male catkin ; (3) male flower; (4) female catkin ; (5) female flower ; (6) capsule, opened ; (7) seed.

Willow.

male flower consists of a small scale or bract, in whose axil are usually two, sometimes three, rarely five stamens, and still more rarely a larger number. In addition there is a small glandular disk, which assumes different shapes in different species. The female flowers are equally simple, consisting of a bract, from whose axil arises usually a very short

stalk, surmounted by two carpels adherent one to the other for their whole length, except that the upper ends of the styles are separated into two stigmas. When ripe the two carpels separate in the form of two valves and liberate a large number of seeds, each provided at the base with a tuft of silky hairs, and containing a straight embryo with- out any investing perisperm or albumen. Fertilization is effected by insects, especially by bees, which are directed in their search by the colour and fragrance of the flowers.

Some pollen must also be transported by the wind to the female flowers. The tuft of hairs at the base of the seed doubtless facilitates rapid dispersion of the seed, early germination of which is rendered desirable owing to its tenuity and the absence of any perisperm. Although the limitations of the genus are well marked, and its recogni- tion in consequence easy, it is otherwise with regard to the species. The greatest difference of opinion exists among botanists as to their number and the bounds to be assigned to each. The cross-fertilization that takes place between the species of course intensifies the difficulty. Andersson, a Swede, spent nearly a quarter of a century in their investigation, and ultimately published a monograph which is the standard authority on the subject. He admits about a hundred species. Some botanists have enumerated eighty species from Great Britain alone, while others count only a dozen or fifteen. To illustrate the great perplexity surrounding the subject, we may mention that to one species, S. nigricans, one hundred and twenty synonyms have been attached. Some of these are doubtless such as no botanist, with adequate material for forming an opinion, would accept ; but, after making the necessary deductions for actual mistakes and misstatements, there still remains a large number upon which legitimate differences of opinion prevail. Andersson says that he has rarely seen two speci- mens of this species which were alike in the collective characters offered by the stature, foliage, and catkins. No better example could be found of the almost limitless varia- tion in so-called species, so that the attempt to define the indefinable can at best result only in an arbitrary grouping.

Few genera have greater claims to notice from an economic point of view. As timber trees many of the species are valuable from their rapidity of growth and for the production of light durable wood, serviceable for many purposes. Among the best trees of this kind are S. fragilis, especially the variety known as S. fragilis, var. Russelliana, and S. alba, the white or Huntingdon willow. These trees are usually found growing by rivers' banks or in other moist situations, and are generally pollarded for the purposc of securing a crop of straight poles. This plan is, however, objection- able, as inducing decay in the centre of the trunk. Where poles are required, it is better to treat the trees as coppice and to cut the trunk level with the soil. S&. Capra, a hedgerow tree, generally grows in drier situations. It is a useful timber tree, and its wood, like that of S. alba, is prized in the manufacture of charcoal. Its catkins are collected in England in celebration of Palm Sunday, the gaily-coloured flowers being available in early spring when other decorations of the kind are scarce. Certain sorts of willow are largely used for basket-making and wicker-work. The species employed for this purpose are mostly of shrubby habit, and are known under the collective name of osiers. The best for planting, according to Mr Scaling, is the bitter osier, S. purpurea ; planted on rich, well-drained soil, subject to occasional immersion, this willow may be grown profitably for basket-work. It is also well adapted for forming wind-breaks or screens, or for holding the banks of streams and preventing the removal of the soil by the current. . viminalis is one of the best of the green osiers, suitable for hoops and valuable for retaining the soil on sloping embank- ments. SS. vitellina yields the yellow osiers. Osiers are largely imported into England from Belgium and France, but might with advantage be much more abundantly grown in the United King- dom than they are. They are easily propagated by truncheons or cuttings, inserted in a slanting direction into the soil for a depth of 8 to 10 inches. Mr Scaling recommends that they be planted 18 inches apart, thus employing about 20,000 cuttings per acre, the whole cost of planting being estimated at £25 the acre. A crop is obtained the third year after planting, and one may be expected annually for the succeeding ten years. The average yield is cited at 6 to 74 tons, ranging in price from £2, 10s. to £3, 10s. a ton (unpeeled), Land unsuitable for root or grain crops can be utilized for the growth of osiers ; but, as in the case of all other plants, good cultivation, including the selection of sorts appropriate to the

locality, drainage, manure, &c., ensures the best return. S. acwmi- nata and other species do well by the seaside, and are serviceable as wind-screens, nurse-trees, and hedges. S. daphnoides, S. repens, and other dwarf kinds are useful for binding heathy or sandy soil.

In addition to their use for timber or basket-making, willows con- .

tain a large quantity of tannin in their bark. A bitter principle named SALICIN (q.v.) is also extracted from the bark. As orna- mental trees some willows also take a high rank, The white willow

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is a great favourite, while the drooping habit of the weeping willow renders it very attractive. Though named S. babylonica, it is really a native of China, the willow of the Euphrates (Ps. cxxxvii.) being in all probability Populus euphratica. SS. babylonica is sometimes spoken of' as Pope's willow, having been cultivated by that poct, or as Napoleon's willow, because his tomb at St Helena is overshadowed by a tree of this species, from which many offsets exist or are reputed to exist in modern gardens. 8. regalis has very white, silvery leaves. S. rosmarinifolia is remarkable for its very narrow leaves, —purplish above, silvery beneath.

WILLUGHBY, Francis (1635-1672), English orni- thologist and ichthyologist, who is memorable as the pupil, friend, and patron as well as the active and original co- worker of John Ray (g.v.), and hence to be reckoned as one of the most important precursors of Linneus. He was the son of Sir Francis Willughby, and was born in 1635, His connexion with Ray dated from his studies at Cambridge (1653-59) ; and, after concluding his academic life by a brief sojourn at Oxford, and acquiring consider- able experience of travel in England, he made an exten- sive Continental tour in his company. The specimens, figures, and notes thus accumulated were in great part elaborated on his return into his Ornithologia, which, how- ever, he did not live to publish, having injured a naturally delicate constitution by alternate exposure and over-study. This work was published in 1676, and translated by Ray as the Ornithology of Fr. Willughby (London, 1678, fol.) ; the same friend

published his Historia Piscium (1686, fol.). Willughby died on 3d July 1672.

In Ray's preface to the former work he gives Willughby much of the credit usually assigned to himself, both as critic and system- atist. Thus, while founding on Gesner and Aldrovandus, he omitted their irrelevancies, being careful to exclude " hieroglyphics, emblems, morals, fables, presages, or ought else pertaining to divinity, ethics, grammar, or any sort of humane learning, and present him [the reader] with what properly belongs only to natural history." Again, he not only devised artificial keys to his species and genera, but, "that he might clear up all these obscurities [of former writers] and render the knowledge and distinction of species facile to all that should come after, he bent his endeavours mainly to find out certain characteristic notes of each kind," while finally, in apologizing for his engravings, he yet not unjustly claims that "they are best and truest of any hitherto graven in brass." See further ORNITHOLOGY, vol. xviii. p. 4.

WILMINGTON, the largest city of the State of Dela- ware, United States, and the county seat of New Castle county, is situated between Brandywine and Christiana creeks and near the Delaware river. The site is low, but with sufficient slope to afford suitable drainage. The surrounding country is level and fertile, and is devoted mainly to agriculture and manufactures. Wilmington is a railway centre of considerable importance, being entered by the Philadelphia, Wilmington, and Baltimore,: the Baltimore and Ohio, and the Wilmington and Northern Railways. The Brandywine and Christiana creeks are navigable for vessels of light draught, and the Delaware can float vessels of the largest size and affords ample harbour accommodation. The city is laid out quite regu- larly. The population, which in 1870 was 30,841, in 1880 was 42,478, The manufactures in 1880 gave occupation to 7852 persons, the principal branches being the manufac- ture of paper and of iron and steel, shipbuilding, and waggon and carriage making. The trade of the city is inconsiderable.

Wilmington was settled by Swedes in 1638. The settlement was conquered by the Dutch, who in turn handed it over to the English. It was chartered

as a city in 1832, and since the middle of the century has grown rapidly.

WILMINGTON, the county seat of New Hanover county, North Carolina, United States, the principal sea- port and the largest city of the State, is situated on the east bank of Cape Fear river, 30 miles from the ocean. It has railroad communication to the north, south, and west, and this, together with its maritime position, makes it an important shipping point. The principal objects of trade

are lumber (southern pine), naval stores, and cotton. The value of its exports by sea exceeds $4,000,000 annually. The city, which is in the main regularly laid out, had in 1870 a population of 13,446, and in 1880 of 17,350, of whom 60 per cent. were Negroes.

The site of Wilmington was originally occupied by a town named Newton, laid out in 1733. The name was changed to Wilmington six years later. The place was incorporated as a city in 1866. During the Civil War it was the principal port of entry for the Confederate blockade-runners.

WILMOT, Joun. See Rocuzsrer, Earu oF.

WILNO. See Vina.

WILSON, Atexanper (1766-1813), 'the American ornithologist," was born in Paisley, Scotland, on 6th July 1766. His father, a handloom weaver, soon removed to the country, and there combined weaving with agriculture, distilling, and smuggling,—conditions which no doubt helped to develop in the boy that love of rural pursuits and adventure which was to determine his career. At first he was placed with a tutor and destined for the church; but his father's circumstances soon compelled him to apprentice the boy to his own trade. 'The lad's real life, however, was spent in reverie and versification, and in long woodland rambles, in the course of which he combined his poetic musings with the keen observation of a naturalist, supplemented by the woodcraft of an accomplished poacher. As these tastes developed, he decided to exchange the loom for the pedlar's pack, and then spent a year or two in travelling

through Scotland, recording in his journal every matter of. natural history or antiquarian interest, like another Sibbald or White of Selborne. Having incurred a short imprisonment for lampooning the master-weavers in a trade dispute, he emigrated to America in 1794. After a few years of weaving, peddling, and desultory observation, he became a village schoolmaster, and in 1800 obtained an appointment near Philadelphia, where he formed the acquaintance of Bartram the naturalist, from whom he received much instruction and encourage-ment. Under his influence Wilson commenced to draw birds, having conceived the idea of illustrating the orni- thology of the United States; and thenceforward he steadily accumulated materials and made many expeditions. In 1806 he obtained the assistant-editorship of Rees's Encyclo- pzdia, and thus acquired more means and leisure for his great work, the first volume of which appeared in the autumn of 1808, after which he spent the winter in a journey "in search of birds and subscribers." By the spring of 1813 seven volumes had appeared; but the arduous expedition of that summer, in search of the marine waterfowl to which the remaining volume was to be de- voted, gave a shock to his already impaired health, and soon after he succumbed to dysentery after a short illness, dying at Philadelphia on 23d August 1813.

Of his poems, not cxcepting the Foresters (Philadelphia, 1805), nothing need now be said, save that they no doubt served to develop his descriptive powers. His American Ornithology, however, re- mains a fundamental classic. In the words of Jardine, "He was the first who studied the birds of North America in their natural abodes and from real observation ; and his work will remain an ever to be admired testimony of enthusiasm and perseverance, one certainly unrivalled in description ; and, if some plates and illustra- tions may vie with it in finer workmanship or pictorial splendour, few indeed can rival it in fidelity and truth of delineation." The eighth and ninth volumes were edited after his decease by his friend Ord, and the work was continued by Lucien Bonaparte (4 vols., Philadelphia, 1828-33). The American Ornithology was also repub- lished by Sir William Jardine (3 vols., London, 1832), and an edi- tion of his entire works has been edited by Rev. A. B. Grosart (Paisley, 1876). A statue was also erected to him at Paisley in 1876,

WILSON, Frorence. See Vonusenvs.

WILSON, Hzyry (1812-1875), vice-president of the United States from 1873 to 1875, was born at Farmington, N.H., on 16th February 1812. His proper name was Jeremiah J. Colbath. His parents were day-labourers and

very poor. Atten years of age he went to work as a farm- labourer. The boy was greedy for reading, and before the end of his apprenticeship had read more than a thousand volumes. At the age of twenty-one, for some unstated reason, he had his name changed by Act of the Legislature to that of Henry Wilson. Walking to Natick, Mass., he learned the trade of shoemaker, and by it supported himself through the Concord academy. After successfully estab- lishing himself as a shoe manufacturer, he became a noted public speaker in support of Harrison during the presi- dential election of 1840. For the next ten years he was regularly returned to the State legislature. In 1848 he left the Whig party and became a "Free Soiler." The Free Soil party nominated him for governor of the State in 1853, but he was defeated. In 1855 he was sent to the United States Senate by the Free Soil and Democratic parties, and remained there by re-elections until 1873. When the Civil War broke out he found a severe test awaiting him. He had been deeply interested from 1840 until 1850 in the militia of his State, and had risen through its grades of service to that of brigadier-general. He was now made chairman of the military committee, and in this position performed most laborious and important work for the four years of the war. The position offered boundless and safe opportunities for becoming wealthy. But so far was Wilson from using them that he died poor, owing to his necessary neglect of his private affairs. Sumner says that in 1873 Wilson was obliged to borrow a hundred dollars from him to meet the expenses of his inauguration as vice-president. The Republicans nomi- nated Wilson for the vice-presidency in 1872, and he was elected ; but he died, before completing his term of service, at Washington on 22d November 1875. He left two small but useful works, Anti-Slavery Measures in Congress (Boston, 1864) and Military Measures in Congress (Hart- ford, 1868), and a larger work in

three volumes, The Rise and Fall of the Slave Power in America (Boston, 1871-76). His Lafe has been written by E. Nason and by J. B. Mann.

WILSON, Horacze Hayman (1786-1860), one of the most distinguished Orientalists of England, was born in London on 26th September 1786. He was educated for the medical profession, and on completing his studies went out to India in 1808 as an assistant-surgeon on the Bengal establishment of the East India Conipany. Instead of entering the regular medical service, however, his know- ledge of chemistry and the practical analysis of metals caused him to be attached to the mint at Calcutta, where he was for a time associated with John Leyden, the Scottish poet and Orientalist. It was not long before he himself became deeply interested in the ancient language and litera- ture of India, and attracted the attention of Henry T. Colebrooke, the famous Sanskrit scholar, on whose recom- mendation he was in 1811 appointed secretary to the Asiatic Society of Bengal. In 1813 he published the Sanskrit text —with a graceful, if somewhat free, translation in English rhymed verse—of Kalidasa's charming lyrical poem, the Meghadiita, or Cloud-Messenger (2d ed. 18438, 3d ed. 1867). He then undertook the arduous task of preparing the first Sanskrit-English Dictionary from materials compiled by native scholars for the college of Fort William, supple- mented by his own researches. The work appeared in 1819, prefaced with an excellent general survey of Sanskrit lexicology. A second, much enlarged, edition, but without the introduction, was published in 1832, and has recently been reprinted at Calcutta. The appearance of the Dic- tionary at once placed Wilson in the first rank of Sanskrit scholars ; and, while patiently pursuing his study of the writings and institutions of ancient India, he became one of the most valuable contributors to the Asiatic Researches and the Caleutta Quarterly. Among his more important

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contributions to these journals may be mentioned essays on the 'Medical and Surgical Sciences of the Hindus" (1823); the "Hindu History of Kashmir" (1824); "Hindu Fiction" (1825); and his masterly "Account of the Re- ligious Sects of the Hindus, their History, Doctrines, and Practices" (1828-32). In 1827 he published Select Speci- mens of the

Theatre of the Hindus, in 3 vols., in which, besides a very full and highly appreciative survey of Indian dramaturgy, which still remains the standard authority on the subject, he offered elegant translations of six complete plays and short accounts of twenty-three others. This work was reprinted in London in 1835, in 2 vols., and again in Wilson's Collected Works (vols. xi. and xii.) Of considerable importance, alike to Sanskrit and vernacular students, and to Eastern antiquarians generally, was his next publication, the Mackenzie Collection (2 vols., 1828 ; 2d ed. in one vol., 1882), being a descriptive catalogue of the extensive collection of Oriental, especially South Indian, MSS. and antiquities made by Col. Colin Mackenzie, and purchased from his widow by the Indian Governnient, now deposited partly in the India Office, London, and partly at Madras. Neither his extensive literary researches, how- ever, nor the official duties of an assay master and mint secretary, at any time prevented Wilson from taking a pro- minent part in all social amusements of the Anglo-Indian community of Calcutta, especially in musical and theatrical entertainments. His interest in political and economic affairs in India is shown by his Historical Sketch of the First Burmese War, with Documents, Political and Geo- graphical (1827, reprinted in London), and his Review of the External Commerce of Bengal from 1818 to 1828 (1830), as well as by his History of British India from 1805 to 1835, in continuation of Mill's History, 3 vols. (1844-48), and largely based on his personal impressions and recollections. He also acted for many years as secre- tary to the committee of public instruction. As such, he not only organized and superintended the studies of the Hindu College from the time of its establishment, but took a leading part in the promotion of public education among the natives, and the introduction of the English language and European science, although, as one of the staunchest opponents, on grounds of expediency and feasibleness, of the proposal that English should be made the sole medium of instruction in native schools, he became for a time the object of bitter attacks. Long, however, before this con- troversy came to an end he had been called away to a different sphere of scholarly activity. In 1832 the uni- versity of Oxford, in recognition of his services to Oriental scholarship, selected Dr Wilson to be the first occupant of the newly founded Boden chair of Sanskrit. Shortly after his return to England he was also appointed librarian to the East India Company. He now found himself in a position singularly

favourable to learned research and literary pursuits; and the long record of his subsequent work shows that he made the best of his opportunities. He immediately joined the Royal Asiatic Society, and, succeeding Colebrooke as director (in 1837), he was the very soul of the society up to the time of his death, scarcely a number of its journal appearing. without some interest- ing contribution from his pen. His death took place at London on 8th May 1860.

Of these contributions we need only mention here his " Historical Sketch of the Kingdom of Pandya" (1836), based on documents con- tained in the Mackenzie collection ; the continuation of his " Ana- lysis of the Puranas" (1836), begun in the Bengal Socicty's Joyrnal (1832) ; "Civil and Religious Institutions of the Sikhs" and " Re- ligious Festivals of the Hindus" (1848); "Analysis and Revised Translation of the Rock Inscriptions of Kapur di Giri" (1850); and his popular lecture "On the Present State of the Cultivation of Oriental Literature" (1852). Hardly less numerous, and certainly not less valuable, are his separate publications during this period, by which important light was thrown on many departments of

Eastern inquiry. The most noteworthy of these works are the text of, and commentary on, the Sankhyakarika (1837), being a very popular summary of the Sankhya philosophy, with a translation (of the text by Colebrooke, and the commentary by Wilson) ; trans- lation of the Vishnu Purdna (1840, 2d annotated ed. by F. E. Hall; Works, vols. vi.~~x.); Ariana Antiqua, Antiquities and Coins of Afghanistan (1841); edition of Dasakwmaracharita (1846); Gloss~~ ary of Indian Revenue, Judicial, &c., Terms (1855) ; Translation of the First Four Ashtakas (rather more than one-half) of the Sacred Hymns of the Ligveda, 3 vols., 1850-57; Grammar of the Sanskrit Lan- guage, in several editions ; and two lectures on the Religious Practices and Opinions of the Hindus, delivered at Oxford in 1840. In tlic Collected Works (12 vols.) the more valuable of his papers and lec- tures form three volumes of essays on Sanskrit Literature and two volumes of essays on The Religion of the Hindus, edited by Dr R. Rost. While in point of accurate scholarship Wilson was per- haps

scarcely the equal of Colebrooke, any deficiency in this respect is far more than counterbalanced by the many-sidedness of his genius, by literary powers of a very high order, by his admirable artistic taste, and by broad human sympathies, which enabled him fully to appreciate and enjoy the merits and beauties of the ancient Indian literature. A considerable number of Sanskrit MSS. (540 vols.) collected by Wilson in India are now in the Bodleian.

WILSON, Joun (1785-1854), better known as Curisto- PHER Norra (the pen-name which he used in his contvi- butions to Blackwood's Magazine), was born at Paisley on 18th May 1785. His father, who bore the same name with himself, was a wealthy gauze manufacturer of no particular family or education. His mother, Margaret Sym, was of gentler blood, possessing also beauty and talents. John was the fourth child, but the eldest son, and he had nine brothers and sisters.1 He appears, like many Scotchmen of genius, to have been rather irregularly educated in his earlier days,—the best of his physical and sporting, if not of his scholastic, training being received at the manse of the village of Mearns, of which constant notices appear in the Hssays. He was only twelve when he was first entered at the university of Glasgow, and he continued to attend various classes in that university for six years, being for the most part domiciled with and under the tutorship of Prof. Jardine. His father's death had immediately preceded his first entry at Glasgow. In these six years Wilson "made himself " in all ways, acquiring not inconsiderable scholar- ship, perfecting himself in all sports and exercises, and falling in love with a certain '" Margaret," who was the object of his affections for several years. The most curious literary memorial of these early years is a letter to Words- worth, written in 1802 without any personal acquaintance or introduction, and betraying not a little priggishness, as we should now count it, but in that respect only showing the difference of contemporary manners, and interesting as being the first evidence of what was nearly a lifelong connexion of admiring though sometimes recalcitrant criticism.

In June 1803 Wilson was entered as a gentleman commoner at Magdalen College, Oxford. Men have seldom felt more than Wilson the charm which Oxford exercises on all but a very few, and generally (with some noteworthy exceptions, such as Gibbon and Jeffrey) very worthless, sons ;

and in much of his later work, notably in the essay called "Old North and Young North," he has expressed his feeling. But it does not appear that his Magdalen days were altogether happy, though he perfected himself in "bruising," pedestrianism, and other sports, and read so as to obtain a brilliant first class. His love affairs with "Margaret" did not go happily, and he seems to have made no intimate friends at his own college and few in the university. He took his degree in 1807 and found himself at twenty-two his own master; and he had a good

1 The youngest brother was James Wilson " of Woodville" (1795- 1856), who became a Zoologist of some repute. He contributed to Blackwood's Magazine and to the North British and Quarterly Reviews, and wrote most of the articles on natural history (" Entomology,"

'¢ Welminthology," " Mammalia," ' Ornithology," " Reptiles," &c.) in the seventh cdition of the Encyclopedia Britannica.*

income, no father or guardian to control him, no property requiring management, and apparently was not under the influence of the etiquette which in similar circumstances generally makes it necessary for a young man to adopt some profession, if only in name. His profession was an estate on Windermere called Elleray, and ever since iniperishably connected with his name. Here he built, boated, wrestled, shot, fished, walked (he was always an astonishing pedes- trian), and otherwise diverted himself for four years, besides composing or collecting fron previous compositions a con- siderable volume of poems. But Wilson was too genuine a man to be happy without a wife, and in 1810 the place of "Margaret " was taken by Jane Penny, a Liverpool girl of some family and fortune, whom he married on 11th May 1811. Zhe Isle of Palms, his first published volume, consisting of poems, was issued not long after this. Four years of married life at Elleray succeeded, which, except as being happier and therefore less historied, do not seem to have differed much from the earlier four. Then came the event which definitely made a working man of letters of Wilson, and without which he would probably have produced a few volumes of verse and nothing more. His whole fortune, or at least the major part of it, was lost by the dishonest

speculation of an uncle in whose hands, with no doubt rather culpable carelessness, Wilson had left it. At the same time this hard fate was by no means unquali- fied in its hardness, His mother had a house in Edin- burgh, in which she was able and willing to receive her son and his family ; nor had he even to give up Elleray, though henceforward he was not able constantly to reside init. He read law and was called to the Scotch bar, taking plentiful sporting and pedestrian excursions, on some of which his wife accompanied him, publishing in 1816 a second volume of poems (Zhe City of the Plague), and generally leading a very pleasant life, if not such an entirely independent one as formerly. The year 1817 was the turning point in Wilson's life. The famous Cevallos article, which resulted in the secession of Scott and other Tories from the Hdinburgh Review and the establishment of the Quarterly, was years earlier; but there had still been no formal declaration that the "Blue and Yellow" was for Whigs only. Wilson was a Tory and the son of Tories ("If you turn Whig, John," said his mother to him, "this house will not hold you and me"), but he was glad to accept Jeffrey's invitation to contribute. Almost at the same time, however, a far more suitable chance appeared. Wilson was not patient of being edited, and his reckless humour as well as his political bias would in the long run have pretty certainly disqualified him for the Edinburgh. The growth of Blackwood's Magazine, and its sudden trans- formation from a colourless or Whiggish monthly rival to Constable's Review into an organ at once of the most red-hot Toryism in politics and of the wildest irreverence towards received notions in literature and other matters, took place in the same year. The petard of the "'Chaldee Manuscript," nominally due to Hogg, but with most of the gunpowder put in by Wilson and Lockhart, determined the character of the new periodical, and Wilson's career was fixed. He was never exactly editor, for the powers of ' Christopher North" in that respect were a fantastic imagination 3 and we have definite and authoritative assertions, not only that he never received any stipend for editing, but that the pub- lishers always retained a certain supervision even over Wilson's own contributions. The famous series of the Noctes Ambrosianz is said to have been of Maginn's inven- tion, and for nearly ten years was so very partially representa- tive of Wilson's own work and thought that none of its numbers during that time have been included by his son-in- law in the

authorized, but by no means complete, edition. Lockhart, a somewhat less genial but far more concentrated

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and deliberate writer, was, until his departure for London to take charge of the Quarterly, at least as potent in the management as Wilson ; and, although the facts are not known with absolute certainty, thereis no doubt that it was a daring "alarum and excursion" of Lockhart's, under the alias (one of many) of Baron von Lauerwinkel, which caused Jeffrey, nominally because of an attack on Prof. Playfair, but obviously for other reasons, to inform Wilson, almost in so many words, that his further contributions were not desired for the Ldinburgh. Wilson had also some share—though, if internal evidence may be trusted, not much—in Lockhart's Peter's Letters, which, harmless as they seem nowadays, infuriated the Whig society of the Scottish capital.

The first result of this new business on Wilson's general mode of life was that he left his mother's house and estab- lished himself (1819) in Ann Street, Edinburgh, on his own account with his wife and family of five children. The second was much more unlooked for: it was his candidature for and election to the chair of moral philo- sophy in the university of Edinburgh (1820). To speak honestly, his qualifications for the post were almost nil, even if the fact that the best qualified man in Great Britain, Sir William Hamilton, was also a candidate, be left out of the question. But, luckily for Wilson and for letters, the matter was made a political one; the Tories still had a majority in the town council; he was power- fully backed up by friends, Scott at their head; and his adversaries played into his hands by attacking, not his competence (which, as has been said, was very vulnerable), but his moral character, which was not open to any fair reproach. Yet he made a very excellent professor, never perhaps attaining to any great scientific knowledge in his subject or power of expounding it, but acting on generation after generation of students with a stimulating force that is far more valuable than the most exhaustive knowledge of a particular topic. His duties left him plenty of time for magazine work, and for many years his contributions to blackwood were extraordinarily voluminous. Most of the best and best-known of them appeared between 1825 and 1835, that is, between the departure of Lockhart for London in the former year and the death of Blackwood the publisher and of Mrs Wilson in the latter.

The domestic events of Wilson's life in the last thirty years of it may be very briefly told. He oscillated between Edinburgh and Elleray, with plentiful excursions and summer residences elsewhere, a sea trip on board the Experimental Squadron in the Channel during the summer of 1832, and a few other unimportant diversions. The death of his wife was an exceedingly severe blow to him, especially as it coincided very nearly with that of his friend Blackwood. For many years after it (though he never up to the date of his death gave up writing) his literary work was intermittent, and, with some exceptions, not up to the level of the earlier. Late in 1850 his health showed definite signs of breaking up ; and in the next year a civil list pension of £300 a year was conferred on him. He died at Edinburgh on 3d April 1854.

But a very small part of Wilson's extensive work was published in a collected and generally accessible form during his lifetime, the chief and almost sole exceptions being the two volumes of poems above referred to, the Lights and Shadows of Scottish Life (prose tales and sketches), and the Recreations of Christopher North, a selection, mostly limited to sporting and descriptive pieces, of his magazine articles. These volumes, with a selected edition of the Noctes Ambrosiane in four volumes, and of further essays, critical and imaginative, also in four volumes, were collected and re-issued uniformly after his death by his son-in-law, Prof. Ferrier. The collection is very far from exhaustive ; and, though it undoubtedly contains most of his best work and comparatively little that is not good, it has been complained, with some justice, that the characteristic, if rather immature, productions of his first eight years on Blackwood are almost entirely omitted, that the Noctes are

given but in part, if in their best part, and that at least three long, important, and interesting series of papers, less desultory than is his wont, on "Spenser," on " British Critics," and the set called ' Dies Boreales," have been left out altogether. Wilson's characteristics are, however, uniform enough, and the standard edition exhibits them sufficiently, if not exhaustively. His poems may be dismissed at once as little more than interesting. They would probably not have been written at all if he had not been a young man in the time of the full flood of influence of Coleridge, Wordsworth, Byron, and Scott. His prose tales have in some estimates stood higher, but will hardly survive the tests of universal criticism. It is as an essayist and critic of the most abounding geniality, if not genius, of great acuteness, of extraordinary eloqnence, and of a fervid and manifold sympathy, in which he has hardly an equal, that " Christo- pher North" lives and will live. The Noctes Ambrosianz, a series of convivial table-talk, giving occasion to wonderfully various digressions of criticism, description, and miscellaneous writing, have been of late years ranked far below their real value. From their origin it necessarily followed that there was much that is ephemeral, a certain amount that is purely local, and something that is purely trivial in them. But their dramatic force, their incessant flashes of happy thought and happy expression, their almost*

incomparable fulness of life, and their magnificent humour give them all but the highest place among genial and recreative literature. It is often thought, and sometimes said, that no one but a Scotchman can relish them—an utter mistake, against which it is desirable most ener- getically to testify in the name of lovers of them who have not a drop of Scottish blood in their veins. The same qualities, together with a greater share of purely literary and critical power (to the display of which the form of the Noctes was inimical), and of a sometimes abused but very admirable faculty of word-painting, appear in the miscellaneous essays. Wilson's defects lay in the directions of measure and of taste properly so called, that is to say, of the modification of capricious likes and dislikes by reason and principle. He is constantly exaggerated, boisterous, wanting in refinement. But these are the almost necessary defects of his qualities of enthusiasm, eloquence, and generous feeling. The well- known adaptation of phrase in which he not recanted but made up for numerous earlier attacks on Leigh Hunt, "the Animosities are mortal, but the Humanities live for ever," shows him as a writer at his very best, but not without a little characteristic touch of grandiosity and emphasis. As a literary critic, as a sportsman, as a lover of nature, and as a convivial humorist, he is not to be shown at equal advantage in miniature ; but almost any volume of his miscellaneous works will exhibit him at full length in either capacity or in all.

The chief, if not the sole, authentic source of information for Wilson's life is the memoir by his daughter, Mrs Gordon (Edinburgh, 1862). (G. SA.)

WILSON, Ricwarp (1714-1782), English landscape painter, was born at Penegoes, Montgomeryshire, where his father was a clergyman, on Ist August 1714. His early taste for art was observed by a relative of his mother, Sir George Wynne, who in 1729 sent him to London to study under Thomas Wright, a little-known portrait painter of the time, by whom he was instructed for six years. He then started on his own account, and was soon in a good practice. Among his commissions was a full-length of the prince of Wales and the duke of York, painted for their tutor, the bishop of Norwich. Examples of his portraits may be studied in Greenwich Hospital, in the Garrick Club, and in various private collections. In 1749 Wilson visited Italy, where he spent six years. He had

previously executed some landscapes, but it was now that the advice of Zuccarelli and Joseph Vernet decided him to adopt this department of art exclusively. He studied Claude and Poussin, but retained his own individuality, and produced some admirable views of Rome and the Campagna. In 1755 he returned to England, and became one of the first of English landscape painters. Niobe, one of his most powerful works, was exhibited at the Society of Artists in 1760. On the establishment of the Royal Academy in 1768 he was appointed one of the original members, and he was a regular contributor to its exhibi- tions till 1780. He frequently executed replicas of his more important subjects, repeating some of them several times; in the figures which he introduced in his land- scapes he was occasionally assisted by Mortimer and Hay- man. During his lifetime his landscapes were never widely popular; his temper was consequently embittered

by neglect, and so impoverished was he that he was obliged to seclude himself in an obscure, half-furnished room in Tottenham Court Road, London. In 1776, however, he obtained the post of librarian to the Academy ; and by the death of a brother he acquired a small property near Llanferras, Denbighshire, to which he retired to spend his last days, and where he died suddenly in May 1782. After his death his fame increased, and in 1814 about seventy of his works were exhibited in the British Institu- tion. The National Gallery, London, contains nine of his landscapes.

The works of Wilson are skilled and learned compositions rather than direct transcripts from nature. His landscapes are treated with great breadth, and with a power of generalization which occa- sionally led to a disregard of detail. They are full of classical feeling and poetic sentiment ; they possess noble qualities of colour, and of delicate silvern tone ; and their handling is vigorous and easy,

the work of a painter who was thoroughly master of his materials.

See Studies and Designs by Richard Wilson, done at Rome in the year 1752 (Oxford, 1811); T. Wright, Some Account of the Life of Richard

Wilson (London, 1824) ; Thomas Hastings, Etchings from the Works of Richard Wilson, with some Memoirs of his Life (London, 1825). Many of Wilson's best works were repro- duced by Woollett and other engravers of the time.

WILTS, a south-western county of England, is bounded Plate

N.W. and N. by Gloucestershire, E. by Berks and Hants, S. by Hants and Dorset, and W. by Somerset. It is of an irregular oval form, its greatest length from north to south being 54 miles and its greatest breadth from east to west 37. The area is 866,677 acres, or about 1354 square miles.

About two-thirds of the surface of Wilts is occupied by Geology.

a great Chalk upland, embracing the greater part of the wild wooded tract of Cranborne Chase, the undulating elevation of Salisbury Plain, and the hilly district of the Marlborough Downs, with Savernake Forest. In some cases the Chalk rises into steep escarpments ; and the scenery of the north-western region, bordering on the lower ground, is varied and picturesque. A large portion of the Chalk region is over 600 feet above sea-level, and several summits have an elevation of over 900 feet, the highest being Inkpen Beacon (1011 feet) at the junction of Wilts, Hants, and Berks. Scattered over the surface of the northern downs are huge blocks of silicious Tertiary grits, called sarsen stones or grey wethers, which have been used in the formation of the Druidical circles of Stonehenge and Avebury. The underlying Greensand is exposed in the deep valleys of the Chalk, especially in the broad vale of Pewsey, separating the Marlborough Downs from Salisbury Plain. It also appears as a narrow fringe between the Chalk and Oolite formations on the north and west, and in Alfred's Tower near Stourton on the Somersetshire border reaches an elevation of 800 feet. Outliers of the London Clay cap some of the hills in the neighbourhood of Great and Little Bedwin and Savernake Forest; and the clays and sands of the Woolwich and Reading beds appear in the south-eastern extremity of the county. About a third of the surface of the county, to the north-west of the Chalk, including a portion of the White Horse Vale, consists mainly of Oolite limestones and clays resting chiefly on the Greensand. The Lower, Middle, and Upper varieties are all represented. At one time the fuller's earth of the Lower

Oolite was dug for use in the cloth-mills. In the Coral Rag of the Middle Oolite a useful bed of iron is wrought near Westbury, the annual output of ore varying in value from £12,000 to £20,000. The valuable Portland stone of the Upper Oolite is quarried for building purposes at Chilmark, Tisbury, and Swindon, and the famous Bath stone of the Great Oolite is obtained at Corsham and Box on the Somersetshire border. The Oolite yields a variety of interesting fossils: the pear encrinite (Apiocrinites rotundus) is found in the Bradford clay ; many fine corals are obtained in the Coral Rag; and Jsastrxa oblonga is

very plentiful at Tisbury. = XXIV. — 75

Rivers,

Agricul- ture.

Com- munica- tion.

Manu- faetures and trade.

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One of the most charming features of Wilts is its rich and finely wooded valleys. The three principal rivers are the Kennet, the Lower or Bristol Avon, and the Southern or Christchurch Avon. The Kennet, rising in the Marl- borough Downs, winds eastwards past Marlborough and Hungerford into Berkshire, to join the Thames at Reading. The Lower Avon, which rises in Gloucestershire, flows southwards by Malmesbury, Chippenham, Melksham, and Bradford, where it bends north-westwards into Somerset- shire. Besides several smaller streams, it receives from the south the Frome, which forms for a short distance the boundary between Wilts and Somersetshire. The Southern Avon, which rises near Bishop's Cannings in the centre of the county, flows southwards by Amesbury and Salisbury into Hants. At Salisbury it receives from the west the Nadder, after its junction with the Wily at Wilton, and from the north-east the Bourne. The Thames skirts the north-eastern border of the county.

Agriculture.—According to returns made on 4th June 1887, the total area of land occupied was 759,538 acres, of which 646,653 were rented and 112,885 owned and occupied ; 759,412 acres, or about seven-eighths of the whole area, were under cultivation. Of this area 395,010 acres were permanent pasture, a great portion consisting of sheep-runs on the Chalk downs. In some places, especially in Salisbury Plain, tillage was in former years extensively introduced in the Chalk districts, but much of this has again re- verted to pasture. There were 174,876 acres under corn crops, 99,388 under green crops, 79,049 under rotation grasses, and 11,086 under fallow. In north-west Wilts the prevailing soil is a reddish chalky clay resting on a subsoil of broken stones, whilst on the Chalk for- mation the arable land is of a lighter character. There are also extensive tracts of richer soil well adapted for wheat and beans. In 1887 wheat occupied 67,357 acres, barley 50,928, oats 44,047, rye 1728, beans 7274, and pease 3542. The bulk of the green crops are grown for the feeding of cattle and sheep, potatoes occupying only 3339 acres and carrots 237, while 54,869 acres were under turnips and swedes, 5673 mangold, 10,473 cabbage, rape, &c., and 24,527 vetches, &c. The total area under nursery grounds in 1887 was 91 acres, while market gardens occupied 3525, and orchards 3346. Woods in 1881 occupied 45,270 acres, a great part being comprised in the ancient forests, including Cranborne Chase and Savernake Forest, which contain some remarkable old oaks and beeches. The number of horses in 1887 was 28,616, of whieh 18,980 were used solely for purposes of agriculture. Cattle num- bered 106,020, 60,113 being cows and heifers in milk or in calf. Dairy farming is the leading industry in the north-western districts, Wiltshire being famous for its cheese. Of the cattle 15,505 were two years and above, and 30,402 under two years, an indication that comparatively few cattle are kept for purposes of feeding. Sheep in 1887 numbered 643,125, and pigs 66, 422.

According to the latest landowners' Return, Wiltshire was divided

among 14,013 owners, possessing 828,949 acres at an annual valua- tion of £1,599, 239, or about £1, 18s. 7d. per acre. There were 9685 owners possessing less than one acre each, 1519 acres being divided amongst them. The estimated extent of commons or waste lands was 1931 acres. The following proprietors owned over 7000 acres each :—earl of

Pembroke, 39,601 acres; marquis of Ailesbury, 37,994 ; marquis of Bath, 19,978; earl of Radnor, 17,173; Simon W. Taylor, 14,960; R. P. Long, 13,618 ; Sir John Neeld, 13,113; trustees of Sir H. Meux, 11,896; marquis of Lansdowne, 11,146; earl of Suffolk, 11,098 ; earl of Normanton, 9812; Lord Ashburton, 9592; Sir E. Antrobus, 8374 ; Sir Francis D. Astley, 7888 ; Sir M. E. Hicks Beach, 7200; and T. Fraser Grove, 7179. _ Communication.—A considerable amount of traffic is carried on in the northern districts by means of canals. The Thames and Severn Canal crosses the north-west corner of the county. Between Cricklade and Swindon it is joined by a branch eanal to the Wilts and Berks Canal. This last has a semicircular course south- westwards by Swindon, Wootton Basset, and Melksham, 2 miles beyond which it is joined by the Kennet and Avon Canal, which crosses the centre of the county by Hungerford, Devizes, and Brad- ford. The railway communication is supplied chiefly by the Great Western and the London and South Western lines.

Manufactures and Trade,—Wiltshire has long been celebrated for its cloths, the chief seats of the industry being Bradford and Trowbridge, while among other places Melksham and Chippenham are perhaps the most important. Wilton is still celebrated for its carpets. Haircloth weaving and the manufacture of cocoa-nut fibres are carried on at Melksham, and there are silk works at Chippen- ham, Malmesbury, Mere, and Warminster. Tron-smelting from the mines of the neighbourhood is carried on at Westbury ; portable engines are made at Devizes ; and at Swindon are the engineering

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works of the Great Western Railway. Various towns are associated with different branches of the agricultural trade: Salisbury and Devizes have important corn markets; Chippenham, besides a trade in cheese, has a condensed milk nianufactory ; Wilton has a large sheep fair ; and Calne is the centre of the Wiltshire bacon trade.

Administration and Population.—Wiltshire comprises 29 hun- dreds, the city of Salisbury or New Sarum (population 14,792 in 1881), and the municipal boroughs of Calne (2474), Chippenham (1852), Devizes (6645), and Marlborough (3343). The county has one court of quarter sessions

and is divided into fifteen petty sessional divisions. The city of Salisbury and the borough of Devizes have commissions of the peace and separate courts of quarter sessions, and the borough of Marlborough has a commission of the peace. Previous to the Act of 1885 the county was divided for parliamentary purposes into North and South Wilts, each returning two members, and included the following parliamentary boroughs—Calne, Chippenham, part of Cricklade, Devizes, Malmes- bury, Marlborough, Salisbury city, part of Shaftesbury, Westbury, and Wilton. All these returned one member each, with the ex- ception of Salisbury, which returned two; by the Act of 1885 they were all merged in the county divisions, with the exception of Salisbury, which was deprived of one member. The county was re- formed into five parliamentary divisions, each returning one mem- ber,—north (Cricklade), into which the Wiltshire portion of Crick- lade is merged ; north-west (Chippenham), into which Chippenham and Malmesbury are merged ; south (Wilton), into which Wilton is merged ; east (Devizes), into which Devizes and Marlborough are merged ; and west (Westbury), into which Westbury is merged. The county contains 340 civil parishes, with parts of seven others. It is mostly in the diocese of Salisbury. From 183,820 in 1801 the population by 1821 had increased to 219,574, and by 1841 to 256,280, and, although by 1861 it had diminished to 249,311, by 1871 it had again increased to 257,177 ; in 1881 it was 258,965, of whom 128,114 were males and 130,851 females. The number of persons to an acre is 0°30 and of acres to a person 3°35.

History and Antiquities.—In the importance of its early archxo- logical remains Wilts takes a foremost place among the counties of England. In the river gravel-beds near Salisbury and _ else- where several specimens of flint implements of the Paleolithic age have been dug up, and the numerous barrows of the Chalk downs have yielded a great variety of stone implements of the Neolithic age, as well as of a later period. The ancient British boundary, the Wans Dyke, passed westwards across the county from Great Bedwin; west of Marlborough it still remains for many miles in a perfect condition. Traces of several other bound- aries of a somewhat similar character are met with in other parts of the county. The British "ridgeway" runs north-eastwards from Avebury, near the tumulus of Silbury Hill, to the ancient forts of Barbury and Badbury; other

ancient British trackways have been converted into Roman roads. Among the principal ancient defensive works are Battlesbury and Scratchbury near War- minster; the entrenchments of Barbury and Badbury ; Bratton, near Westbury, defended by double ramparts, in some places 36 feet in height, to which Guthrum the Dane is said to have retreated after his defeat by King Alfred; Casterly, on a ridgeway about 7 miles south-east of Devizes, described by Sir R. C. Hoare as "one of the most original and unaltered works of the British era which our country can produce"; Figbury Ring, 3 miles north-east of Salisbury, sometimes called Chlorus's camp, from the tradition that it was made by the British general Constantine Chlorus ; Sidbury, 3 miles south-west of Collingbourne, probably an ancient British town ; Vespasian's camp, between Amesbury and Stonehenge ; and Yarnbury camp, in very perfect preservation, to the north of Wily. Ogbury camp, 6 miles north of Salisbury, is an undoubted British entrenchment, but probably a sheep-fold. The stone circles of Avebury and Stonehenge are the most remarkable megalithic struc- tures in the kingdom ; but their origin and date are the subject of much dispute. Durrington " walls," north of Amesbury, are prob- ably the remains of a British village; there are also traces of others at several places on the slopes of the Marlborough Downs and Salisbury Plain.

There are no records of the Roman invasion, though many evi- dences of Roman occupation remain. The ancient Fosse Way crossed the north-west corner of the county from Bath to Cirencester. From this last town another road passed southwards to Cunetro (Folly Farm near Marlborough), joining the Via Julia, which crossed the county from Bath to Silchester. From Salisbury one went north-east to Silchester, another east to Winchester, and another north-west to Bath. On the line of these roads remains of Roman villages have been found at different places.

After the departure of the Romans Wilts was the scene of fre- quent contests, first between the Britons and the Saxons and after- wards betwcen the Saxons and the Danes. Badbury is the reputed Mons Badonicus where King Arthur defeated Cerdic in 520. In 552 Cynric inflicted a severe defeat on a large army of Britons at Old Sarum, and in 556, after a great victory over them at Barbury Hill, he incorporated the country of the Wilsaetas in the kingdom

Popula- tion, &e,

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of Wessex. In 823 Egbert, king of the West Saxons, gained a victory over Beornwulf, king of Mercia, at Ellandune near Wilton. Wilton itself was the scene of Alfred's defeat by the Danes in 871. In 878 the Danes plundered Chippenham, where Alfred had one of his residences, and made the town their headquarters ; but after- wards Alfred inflicted on Guthrum such a severe defeat at Ethan- dune (supposed to be Edington near Westbury) that the Danes came to terms with him, the south-western part of Mercia being henceforth held by the Saxons and the north-eastern by the Danes. During the Danish invasions at the close of the 10th and the be- ginning of the 11th century the district was overrnn by Sweyn, who pillaged and burned Wilton, as well as Old Sarum. At the latter town Canute died in 1036. During the conflict between Stephen and Matilda the strongholds of Sarum, Devizes, and Malmesbury were held by Bishop Roger for Matilda, until he was compelled to surrender them. During the Civil War Wiltshire sided chiefly with the Parliament. In 1643 Wardour Castle near Tisbury was bravely defended by Lady Blanche Arundel] against Sir Edward Hungerford, and, although she was forced to capitulate, the castle was again taken by her son in 1645. In 1643 Essex was routed by Charles I. and Rupert at Aldbourn, and the same year Waller was defeated by Wilmot at Roundaway near Devizes. After the storm- ing of Devizes Castle by Cromwell in September 1645 the Cavaliers were wholly driven from the county.

The church of St Lawrence, Bradford, converted at one time into cottages, is one of the most perfect specimens of ancient Saxon architecture existing ; and there is also Saxon work in the churches of Britford (north and south door), Burcombe (cast end of the chancel), Manningford Bruce, and a few other places. There is a large amount of Roman work in the church of Malmesbury abbey, much of it, however, being Transition ; the church of St John's, Devizes, retains its original Norman tower and exhibits Norman vaulting in the«chancel; the chancel of St Mary's in the same town is also Norman, and its porch has characteristic Norman mouldings ; the churches of Preshute and Corsham contain interesting examples of the same style. Salisbury cathedral is the finest and most per- fect example of Early English existing; and there is much good architecture of the same style in the churches of Amesbury, Bishop's Cannings, Cricklade, Collingbourne-Kingston, Downton, Edington, and Purton. The prevailing architecture is, however, Perpendicular, of which there are numerous fine examples, especially in the districts where good building stone is found; but in the Chalk districts, where the churches are constructed of flint, the architecture is generally inferior. There are numerous interesting examples of domestic architecture of the 14th, 15th, and 16th centuries. The only monastic remains of importance within the county are the abbey church of Malmesbury ; the picturesque ruins of Lacock or Laycock abbey (3 miles sonth of Chippenham), founded in 1232 by Ella, countess of Salisbury; the walls of Bradcnstoke priory (north- east of Chippenham), founded in 1142 by Walter d'Evreux for Augustinian canons, now converted into a farmhouse ; and slight remains of the Cluniac priory of Monkton-Farleigh, founded in 1125. The fortress of Old Sarum is almost completely demolished, but the outlines of the defences remain ; Devizes retains a few frag- ments, " built up again," according to Freeman, as " meaningless ornaments in the midst of the most fearful piece of modern gim- crack that human eyes ever beheld"; and the mound of Marl- borough has been made into a 'hill of pleasure." Trowbridge Castle, which was held for Matilda by Humphrey de Bohun, has completely disappeared, its site being occupied by modern build- ings ; and only a few small fragments remain of Ludgershall, which Matilda occupied on her escape from Winchester.

*Wilts has an unusually long roll of illustrious persons. Among divines, Hugh Latimer was rector of West Kington; Richard Hooker was rector of Boscombe ; George Crabbe was for eighteen years rector of Trowbridge, and was buried in the chanccl of the church ; Dr Henry Sacheverell was the son of a Marlborough clergy- man; George Herbert and Archdeacon William Coxe were both rectors of Bemerton (ncar Salisbury) ; and Dr Joshua Marshman, the Indian missionary, was born at Westbury. Of persons who have distinguished themselves in some form of literature we may mention Thomas Chubb, the Deist, who was a native of Harnham ; Hobbes of Malmesbury; Philip Massinger, who was born at Salisbury; Joseph Addison, the son of the rector of Milston ; Bryan Edwards, the historian ; Aubrey and Britton, the antiquaries ; Edmund Lud- low, author of the Afemoirs of the Restoration period ; and Sir R. Colt Hoare, the historian of Wilts. Statesmen are represented by **Orator" Hunt, Sir John Davies, Bolingbroke, Hyde first earl of Clarendon, Harris first earl of Malmesbury, Fox first Lord Holland, Protector Somerset, and Henry Fawcett. Other persons of special distinction are Sir Christopher Wren, Sir B. Collins Brodie, and*

Thomas Willis, one of the founders of the Royal Society.

See Sir H. C. Hoare's Ancient Wiltshire, 1812-21, and Modern Wiltshire, 1829- 1844; Aubrey and Jackson's Topographical Collections for Wilts, 1864; Britton's Beauties, 1801; Kite's Monumental Brasses of Wilts, 1860; Jackson's Ancient Chapels of Wilts, 1867; Jones's Karly Annals, 1871; Saint George's Visitation of Wilts 1623, 1882; Stratford's Wiltshire and tts Worthies, 1882; and A. C. Smith's British and Roman Antiquities in North Wilts, 1884-85. (T. F. H.)

WIMBLEDON, a suburb of London, in the county of Surrey, is situated on the London and South Western Rail- way, 74 miles south-west of London. The old village of Wimbledon has been greatly extended of late years, the district being now a favourite residence for the London middle classes. Wimbledon Common, to the north-west of the village, was the meeting-place of the Rifle Association from its foundation in 1860 till 1888. At its south- western extremity are the outlines of a British

earthwork, called Czesar's camp, having an extreme diameter of 950 feet and a diameter within the vallum of 750 feet. At Coombe's Hill and elsewhere British relics have been found. The parish church of St Mary is supposed to date from Saxon times; but, after it had undergone various restorations and reconstructions, it was rebuilt in 1833 in the Perpendicular style. There are various other churches and chapels, all modern. A free library was established in 1887. The benevolent institutions include nine alms- houses (1838), a cottage hospital (1867), a convalescent hospital (1867), and a hospital for infectious diseases (1877). The population of the urban sanitary district (area 3220 acres) was 9087 in 1871 and 15,950 in 1881.

Wimbledon (Wibbandune) is supposed to have been the scene of a battle in 568 between Ceawlin, king of Wessex, and Ethelbert, king of Kent, in which the latter was defeated. At Domesday it formed part of the manor of Mortlake, held by the archbishops of Canterbury. Afterwards the name was sometimes used inter- changeably with Mortlake, and in 1327 it is described as a grange or farm belonging to Mortlake. On the impeachment of Arundel, archbishop of Canterbury, in 1398, it was confiscated. In the reign of Henry VIII. Cromwell, earl of Essex, held the manor of Wimbledon, with Bristow Park as an appendage. On the confisca- tion of Cromwell's estates in 1540 it again fell to the crown, and by Henry VIII. it was settled on Cathcrine Parr for life. By Queen Mary it was granted to Cardinal Pole. In 1574 Elizabeth bestowed the manor house, while retaining the manor, on Sir Christopher Hatton, who sold it the same year to Sir Thomas Cecil. In 1588 Elizabeth transferred the manor to his son Sir Edward Cecil, in exchange for an estate in Lincolnshire. At the time of the Civil War the manor was sold to Adam Baynes, who shortly afterwards sold it to General Lambert ; and at the Restora- tion it was granted to the queen dowager, Henrietta Maria, who sold it in 1661 to George Digby, earl of Bristol. On his death in 1676 it was sold by his widow to the lord-treasurer Danby. Some years after Danby's death it was purchased by Sarah, duchess of Marlborough, who demised it to her grandson, John Spencer. It was sold by the fifth Earl Spencer in 1877. Wimbledon House, built by Sir Thomas Cecil in 1588, was destroycd by fire in 1785, and a new house, called Winibledon Park House, was erected about

1801.

WIMBORNE MINSTER, a market town of Dorset, England, is situated on a gentle slope above the river Allen, near its confluence with the Stour, and on the Great Western Railway, 6 miles north of Poole and 114 west-south-west of London. The feature of the town is the ancient minster. As it now stands, it is a fine cruciform structure of various styles from Early Norman to Perpen- dicular, and consists of a central lantern tower, nave and choir with aisles, transepts without aisles, western or bell tower, north and south porches, crypt, and vestry or sacristy, with the library over it. Its maximum length is 182 feet, and its maximum breadth 102. The interior was restored in 1856-57. It contains a large number of interesting monuments, including a brass with the date 873 (supposed to mark the resting-place of Ethelred, third son of Ethelwulf), an orrery of the 14th century, and an octagonal Norman font of Purbeck marble. A new church, dedicated to St John the Evangelist, was built and partly endowed in 1876. The free grammar-school, established in 1497, was refounded by Elizabeth, a portion of the revenues of the monastery being devoted to this purpose. New school buildings in the Elizabethan style were erected in 1851. There are two hospitals, St Margaret's and Courtenay's. Near Wimborne is Canford Hall, the seat of Lord Wimborne, a mansion in the Tudor style, built by

Blore in 1826, and improved from designs of Sir Charles Barry. The town depends chiefly on agriculture ; but the manufacture of hose is carried on to a small extent, and there are also coachbuilding works. The population of the parish of Wimborne Minster (area 11,966 acres) was 5019 in 1871 and 5390 in 1881.

Wimborne (Saxon Vinburnan) is supposed to have been the Vindogladia or Ventagladia of the Romans. A nunnery was founded here in 712 by St Cuthberga, sister of Ina, king of the West Saxons. It was destroyed by the Danes about 900, and _subse- quently became a house of secular canons, when the church became collegiate. The establishment existed till 1547. Wimborne is supposed to have been the scene of a battle between the earl of Devon and the Danes in 851, in which the latter were defeated. It was

taken possession of by Ethelwold in 901. The duke of Mon- mouth was apprehended near Wimborne after his escape from Sedgemoor. The town claims to have been the birthplace of Matthew Prior, the poet.

WINCHESTER, a city, and a parliamentary and muni- cipal borough, of Hampshire, England, is situated on the river Itchen, 66 miles south-west of London by the London and South Western Railway. The Caer Gwent (White City) of the Britons and Venta Belgarum of the Romans, Winchester was a town of much importance in early times, mainly on account of its central position on the Roman high roads in the south of England.1 Temples to Apollo and Concord stood within the precincts of the present cathedral close; but in the 3d century the place is said to have become one of the chief centres of the early Celtic Christians. The Saxon invaders at the end of the 5th century treated the Roman name Venta as if it were a feminine substantive, and, transforming it into " Winte," called the town Winte-ceaster, "the City of the Winte ;" hence the modern name Winchester. Throughout the Saxon period the city was one of the highest importance : early in the 6th century it became the capital of Wessex ; and the kings of Wessex were crowned and usually buried in the cathedral. Even after the formation of the united kingdom of Anglia by Egbert, the great witan was still held in Winchester. It was also one of the chief centres for the coining of money under the pre-Norman kings: in the time of Athelstan it contained six mints, while London possessed only three. Even after the Norman Conquest many sovereigns were crowned and many parliaments held here; the celebrated Statutes of Winchester were passed in a parliament held in 1285. The city continued to be a favourite royal residence, and Henry II. rebuilt the palace on a larger scale? This same king gave it its first regu- lar charter of incorporation (1184). In the Middle Ages Winchester was famed for its wool trade and textile fabrics ; in the 14th century it was the chief wool mart of England and had an extensive trade with France, Bel- gium, and Holland. In the 15th century its prosperity began to decline. In Cromwell's time the city suffered severely from a siege, during which Winchester Castle was dismantled. Charles II. began to build a palace on the site of this fortress, after designs by Sir Christopher Wren, but the death of the king prevented the work from being completed.®

The first Christian church at Winchester is said to have been destroyed during the persecution of Aurelian, and rebuilt in 293. It was again burned by the Saxons in 495. St Swithun held the episcopate from 852 to 862 and enlarged the cathedral. The foundations of the ad. jacent abbey church of Hyde, in which some of the Saxon kings were buried, were discovered in 1886 close to the north side of the cathedral nave. The cathedral church 1 See Milner, History of Winchester, and Smirke, " Consuetadinary of Winchester," in Arch. Jour., vol. ix.

? The hall of this palace still exists ; it is illustrated by Turner in Domestic Architecture, London, 1851, vol. i. p. 176.

3 Evelyn in his Diary (16th Sept. 1685) speaks of this as a " stately fabric" which had been " brought almost to the covering."

was at one time associated with a priory of secular canons, but St Ethelwold, bishop from 963 to 984, suppressed the secular foundation and built a Benedictine abbey in its place.# A wholly new cathedral was begun by Bishop Walkelin (1070-98), and in 1093 the eastern portion was consecrated jointly to St Peter, St Paul, and St Swithun. The two Norman transepts and the low central tower still exist, as does also the very curious early crypt, east of the crossing. This isa low vaulted structure partly sup- ported by a central row of columns; it has an apsidal ter- mination, and is surrounded by an ambulatory, out of which a second smaller apse extends eastwards,—apparently a survival of the "confessio" of the earlier cathedral. The whole of the Norman nave was pulled down and rebuilt on a more magnificent scale by William of Wykeham at the end of the 14th century; the work was completed after his death by means of a large bequest. The choir was also remodelled in the 14th century and again much altered by Bishop Fox (1501-28).

In plan Winchester cathedral consists of a nave, two transepts, choir, and retro-choir, all with aisles. A large lady chapel extends still further eastwards. The length of the whole building is no less than 546 feet, thus being greater than that of any other church in England, with the exception of St Albans, which measures about the same length. One of its chief beauties is the magnificent reredos behind the high altar ; this consists of a lofty wall, the full width of the choir, pierced by two

processional doors, and covered with tiers of rich canopied niches, which once contained colossal statues. A eross of plain ashlar stone in the centre shows where an immense silver crucifix was once attached ; and a plain rectangular recess above the altar once contained a massive silver-gilt retable, covered with cast and repoussé statuettes and reliefs, an elaborate work of the most costly magnificence. A second stone screen, placed at the interval of one bay behind the great reredos, served to enclose the small chapel in which stood the magnificent gold shrine, studded with jewels, the gift of King Edgar, which contained the body of St Swithun. In the choir is the plain tomb of William II., and under many of the arches of the nave and choir are a number of very elaborate chantry chapels, each containing the tomb of its founder. Some of these have fine recumbent effigies, noble ex- amples of English medieval sculpture ; the most notable are the monuments of Bishops Edingdon, Wykeham, Waynflete, Cardinal Beaufort, Langton, and Fox. The font of black marble is an inter- esting example of 11th-century art; its sides are covered with curious reliefs representing scenes from the life of St Nicholas. A good deal of very magnificent 14th-century stained glass still exists at Winchester.

Winchester College was built from 1387 to 1393 by WILLIAM oF WYKEHAM (g.v.). The foundation of the school consisted of a warden, ten fellows, three chaplains, seventy scholars, and sixteen choristers. Its fine chapel, hall, cloister, and other buildings still exist in good pre- servation. About a mile distant from the town stands the hospital of St Cross, founded in 1136 by Henry de Blois, bishop of Winchester, to provide board and lodging for 13 poor men and a daily dinner for 100 others, It was enlarged and mostly rebuilt by Cardinal Beaufort, 1405-47. The buildings are still in a good state of preser- vation, including the simple but very stately cruciform chapel, built about the year 1180, which in plan resembles a fine parochial church.6 The whole place has been much injured by so-called "restoration."

Winchester suffered greatly in the plague of 1666, and its population was much reduced. At present its pros- perity chiefly depends on the presence of the cathedral, the college, and its barracks, which accommodate about 2000 men. The city has several good schools and the usual public and

charitable institutions. From the 23d year of Edward J. it returned two members to parliament until

- *See Britton, Winchester Cathedral, London, 1817.*

> Great treasures of gold and jewels were presented to this cathedral by many of the early kings of England, especially by Canute, who gave his gold gem-studded crown to be hung over the great crucifix above the high altar.

8 See a valuable account of St Cross in the Winchester volume of the Archxological Institute, by E. A. Freeman.

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1885, when it lost one member. The population of the municipal and parliamentary borough (area 1032 acres) was 16,366 in 1871 and 17,780 in 1881. (J. H. M.)

WINCHESTER, a city and the county seat of Frederick county, Virginia, United States, is situated in the Shen- andoah valley, about 700 feet above sea-level, and on a branch of the Baltimore and Ohio Railroad. It lies about 67 miles west-north-west of Washington. The surrounding country is rich and fertile, devoted to agriculture and cattle-raising, for which Winchester serves as a centre of supply and distribution. The city has manufactories of shoes, furniture, gloves, &c., and some iron foundries and tanneries. The population in 1880 was 4958 (1517 coloured), In 1888 it was estimated at over 5000.

Winchester was laid out as a town in 1752 and incorporated in 1779. It has had a very slow growth, and during the Civil War it suffered severely from the armies of both combatants.

WINCKELMANN, Jowann Joacumm (1717-17 68), historian of ancient art and the founder of scientific archzo- logy, was born at Stendal in the Altmark (Prussia) on 9th December 1717. His father was a poor shoemaker, and in his early years Winckelmann had to contend with great difficulties. With a passion for knowledge, however, he combined a,

resolute will; and by acting for some time as amanuensis to an old and blind rector he contrived to pass through the necessary courses of instruction at school. In 1737 he attended a gymnasium at Berlin and the school at Salzwedel, and in the following year he went as a student of theology to the university of Halle. He took little real interest in theology, and such interest as he had was quenched partly by the influence of the philo- sophy of Wolff, partly by the unfavourable impression made upon him by the Pietists. Through his connexion with the chancellor Von Ludewig he was led to enter upon the study of German history ; he devoted himself also with great enthusiasm to the study of Greek literature. He thought of becoming a physician, and began to attend medical classes at Jena; but the accomplishment of this scheme was beyond his means, and he was obliged to accept a tutorship near Magdeburg. In 1743 he was made associate-rector of a school at Seehausen in the Altmark, and this appointment he held for five years. He then went to Dresden, where he acted as librarian and general assistant to Count Henry Von Biinau, for whose history of the Holy Roman empire he collected materials. The treasures in the Dresden gallery awakened in his mind an intense interest in art, which was deepened by association with various artists, and especially with Oeser, who after- wards exercised so powerful an influence over Goethe when Goethe was a young student at Leipsic. Winckelmann's study of ancient literature had inspired him with a strong desire to visit Rome, and now he sought, through the papal nuncio Archinto, to obtain the appointment of librarian to Cardinal Passionei. Nothing could be done for him, however, unless he joined the Roman Catholic Church ; this condition, after long hesitation, he ultimately decided to comply with.

In 1755 Winckelmann gave the first indication of his genius by the publication of his Gedanken uber die Nach- ahmung der griechischen Werke in Maleret und Bildhauer- kunst. This was followed by a pretended attack on the work, and a defence of its principles, nominally by an im- partial critic. In the Gedanken Winckelmann suggested most of the doctrines he afterwards developed ; and the book was warmly admired not only for the new ideas it contained but for the power and charm of its style. One good result of the impression it produced was that Augustus IIL., elector of Saxony and king of Poland, was induced to grant him a

pension of 200 thalers, that he might have an opportunity of prosecuting his studies in Rome. He

arrived in Rome in November 1755, and, with the excep- tion of some brief intervals, remained there during the rest, of his life. He became librarian to Cardinal Archinto, and also received much kindness from Cardinal Passionei ; and after their death he was received as librarian and as a friend into the house of Cardinal Albani, who was forming his magnificent collection in his villa at Porta Salara. In 1763, while retaining this position, Winckelmann was made prefect of antiquities.

From the time of his arrival in Rome he devoted him- self earnestly, at first with the aid of his friend Raphael Mengs, to the study of Roman antiquities, and he gradu- ally acquired what was then an unrivalled knowledge of ancient art. In 1760 appeared his Description des Pierres Gravées du Feu Baron de Stosch, embodying the results of much work at Florence, where he had spent nine months in cataloguing the engraved gems collected by his friend Baron von Stosch. He published in 1762 Anmerkungen tiber die Baukunst der Alten, including an account of the temples at Pestum. In 1758 and 1762 Winckelmann visited Naples for the purpose of studying the treasures excavated at Pompeii and Herculaneum ; and from his Sendschreiben von den herculanischen Entdeckungen (1762) and his Nachricht von den neuesten herculanischen Entdeckungen (1764) scholars obtained their first au- thentic information about those groups of antiquities. Winckelmann again visited Naples in 1765 and 1767, and wrote for the use of the electoral prince and princess of Saxony his Briefe an Bianconi, which were published, eleven years after his death, in the Antologia Romana. For several years his energies were devoted chiefly to the preparation of his masterpiece, the Geschichte der Kunst des Alterthums, which was issued in 1764. It at once commanded attention and was soon recognized as a book that would take a permanent place in the litera- ture not only of Germany but of Europe. In this great work Winckelmann sets forth both the history of Greek art and the principles on which it seemed to him to be based. He also presents a glowing picture of the con- ditions, political, social, and intellectual, which tended to foster creative activity in ancient Greece. The funda- mental idea of his theory is that the end of art is beauty, and that this end

can be attained only when individual and characteristic features are strictly subordinated to the artist's general scheme. According to Winckelmann, the true artist, selecting from nature the phenomena fitted for his purpose, and combining them through the imagination, creates an ideal type marked in action by "noble simplicity and calm greatness,"—an ideal type in which normal pro- portions are maintained, particular parts, such as muscles and veins, not being permitted to break the harmony of the general outlines. In the historical part he used not only the works of art he himself had studied but the scattered notices on the subject to be found in ancient writers; and his wide knowledge and active imagination enabled him to offer many fruitful suggestions as to periods about which he had little direct information. The materials for the study of Greek art which have been recovered since Winckelmann's time have compelled archeologists to reject some of his conclusions, to modify others, and to present the subject as a whole in a somewhat different light ; but the writer was penetrated by so fine an enthusiasm, his style is at once so strong, so graceful, and so animated, and his descriptions of particular works of art are so vivid and true, that his book can never wholly lose its freshness. It marked an epoch by indicating the spirit in which the study of Greek art should be approached, and the methods by which investigators might hope to attain to solid results. To Winckelmann's contemporaries the work came as a revelation, and it exercised a profound influence on the

best minds of the age. Goethe studied it eagerly, and it was read with intense interest by Lessing, who had found in a statement in the earliest of Winckelmann's works the starting-point for his Laocoon.

Winckelmann contributed various admirable essays to the Bibliothek der Schénen Wissenschaften ; and in 1766 he published his Versuch einer Allegorie, which, although con- taining the results of much thought and reading, is not conceived in a thoroughly critical spirit. Of far greater importance was the splendid work entited Monument Antichi Inediti (1767-68), prefaced by a 7'rattato Prelumi- nare, presenting a general sketch of the history of art. The plates in this work are representations of

objects which had either been falsely explained or not explained at all. Winckelmann's explanations were of the highest service to archeology, by showing that in the case of many works of art which had been supposed to be connected with Roman history the ultimate sources of inspiration were to be found in Homer.

In 1768 Winckelmann left Rome with the Italian sculp- tor Cavaceppi, intending to visit Germany. But he went no farther than to Vienna, where he was received with honour by Maria Theresa, At Trieste on his way back to Italy he made the acquaintance of a man called Arcangeli, to whom he showed some gold coins that had been given to him by the empress; Arcangeli's cupidity was excited, and during the night he entered Winckelmann's room, and, after having tried to throttle him, stabbed him five times. Winckelmann died of his wounds on 8th June 1768. His murderer was caught and executed.

Winckelmann ranks among the foremost writers of the 18th cen- tury, and it is hardly possible to overrate the services rendered by him to archeology and the study of ancient art. With wide learning and an extraordinary power of accurate observation he combined imagination and feeling, and through him the modern world ob- tained for the first time something like a true conception not only of particular works of Greek art but of the general intellectual movement from which they sprang. If inany of his ideas have now been abandoned, that is to a large extent due to the fact that scholars and thinkers were put upon the right track by his re- searches. His character as a man corresponded to his greatness as a writer. No difficulty was formidable enough to deter him from working out his vast schemes; and in relation to his friends and in general social intercourse he was distinguished by a noble gener- osity of spirit and thorough honesty of purpose.

An edition of his works was begun by Fernow in 1808 and completed by Meyer and Schulze (1808-20). There is an admirable study of his character and work in Goethe's Winckelmann und sein Jahrhundert (1805), to which contributions were made by Meyer and Wolf, The best biography of Winckelmann is the one by Justi, 2 vols., Leipsic, 1866-72. (J. SL.)

ia See Merrorotoey, vol. xvi. pp. 124, 143,

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WINDHAM, Witt1am (1750-1810), English politician, came from an ancient family long resident at Felbrigg near Cromer in Norfolk. His father, Colonel William Windham, was an adventurous soldier with a taste for languages, both ancient and modern; William Windham, the statesman, was born in Golden Square, London, on 3d May 1750. At the age of seven he went to Eton, which he quitted in 1766 for the university of Glasgow, and under the care of Dr Simson he acquired the taste for mathematics which always distinguished him. In 1767 he matriculated as gentleman commoner at University College, Oxford, where he remained until 1771. He never took the degree of B.A., but qualified as M.A. on 7th October 1782, and received the degree of D.C.L. on 3d July 1793. He made a tour in Norway in 1773 and visited Switzerland and Italy between 1778 and 1780. His maiden speech on the political platform was delivered at Norwich on 28th January 1778, when he vehemently opposed the prosecution of the American War. On his return to England in 1780 he contested the representation of the city of Norwich, but was not successful. His entrance into public life took place in April 1783, when he

went to Ireland as chief secretary to Lord Northington, the lord-lieutenant under the coalition ministry of Fox and Lord North. Windham was his own keenest critic, his distrust in his own powers and his disappointment at his own achievements being conspicuous on every page of his Diary. Sickness compelled his return to England early in July 1783; but change of scene and constant exercise restored him to health before the end of that year. In April 1784 he again contested Norwich and was returned by a majority of 64 votes, thus scoring one of the few triumphs attained by the adherents of the coalition cabinet. This seat he retained until 1802, when he was beaten by William Smith, one of the leaders of the Nonconformists. Though he strenuously opposed all proposals for parliamentary reform, to which most of the Whigs were deeply committed, Windham remained in alliance with that party until after the outbreak of the French Revolution, when he and several of his chief allies joined Pitt. The place of secretary-at-war was conferred upon him in July 1794, and

he was at the same time created a privy coun- cillor and admitted to a seat in the cabinet. Windham discharged the duties of his office with unflagging zeal, his efforts being particularly directed towards amelior- ating the condition of the inferior grades of the army. In the autumn of 1794 he was despatched to the duke of York's camp in Flanders with the views of his ministerial colleagues, but their advice could not counteract the military incapacity of the royal duke. When Pitt was frustrated in his intention of freeing the Catholics from their political disabilities, Windham, who in religious matters always inclined to liberal opinions, took his place among the ministers who retired from office (February 1801). He was a constant opponent of all negotiations for peace with France, preferring to prosecute the cam- paign at whatever cost until some decisive victory had been gained, and the temporary peace of Amiens, which was carried through under Addington's administration, did not meet with his approval. When he was ousted from the representation of Norwich (July 1802), a seat for the pocket borough of St Mawes in Cornwall was found for him by its patron, the marquis of Buckingham, whose opinions coincided with Windham's on the leading political questions of the day. He declined a place in Pitt's new cabinet (May 1802) on the ground that the exclusion of Fox, who had joined with them in opposition to the weak ministry of Addington, prevented the formation of an administration sufficiently strong in parliament and the country to cope with the dangers which threatened the safety of the nation, and he offered a general opposition to the measures which the prime minister proposed. On Pitt's death in January 1806 the ministry of " All the Talents" was formed under the leadership of Lord Grenville, and Windham accepted the seals as secretary of state for war and the colonies. Fox's death necessitated several official changes ; and a peerage was proposed for Windham, but he declined the proffered honour, and remained in office as long as the ministry existed. A general election took place in October 1806 and Windham was elected for the county of Norfolk ; but the election was declared void on petition, and he was compelled to sit for the Treasury borough of New Romney, for which he had also been elected. In 1807, when the House was dissolved under the influence of the "No Popery " cry of Spencer Perceval, a seat was found for Windham by Lord Fitzwilliam in his close constituency of Higham Ferrers. Liberty of religious opinion he uniformly supported at all periods

of his life, and with equal consistency he opposed all outbreaks of religious fanaticism ; hence with these convictions in his mind few of the domestic measures of the new ministers met with his approbation. Moreover, he disapproved of

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the expedition to the Scheldt, and thought the charges brought against the duke of York, as commander-in-chief, required his retirement from office. At the same time he actively opposed the bill of Sir Samuel Romilly, his col- league on most political questions, for reducing the number of offences visited with the punishment of death. In July 1809 he received a blow on the hip whilst rendering assistance at a fire, which he thought little of at the time; but a tumour subsequently formed on the spot and an operation became necessary. This brought on a fever, and Windham rapidly sank. He died on 4th June 1810, and was buried in the family vault at Felbrigg.

Windham was tall and well-proportioned ; and the impressive- ness of his speeches was heightened by the excellence of his address. Exercise of all kinds had charms for him. He attended all the celebrated prize-fights of his day, and he more than once spoke in the House of Commons against the prevention of bull-baiting. Nor did he neglect the pleasures of literature and science. His speeches were published in three volumes in 1806, with a memoir by Thomas Amyot, his private secretary while he was in office in 1806, and his Diary was edited by Mrs Henry Baring in 1866. The passages in the latter work relative to Dr Johuson's declining days have been of considerable use to the later editors of Boswell.

WINDMILL. The date when windmills were first erected is unknown; but they were certainly used in Europe in the 12th century. Of late they have generally been replaced by steam engines in Great Britain ; but they are still extensively employed in Holland in draining the polders and grinding trass. In America they are largely used ; Wolff states that in some cities in the United States over 5000 windmills are manufactured annually. In spite of the competition of more powerful and tractable motors, windmills

may often be used with success and economy, especially in new countries where fuel is scarce, and for work which can be done intermittently. The Indian Government recently made inquiries with a view to using windmills for irrigation, and a good deal of information will be found in a report by Colonel Brownlow in the Pro- fessional Papers on Indian Engineering, vol. viii. A wind- mill is not a very powerful motor, and in its employment its power is variable and intermittent. In good situations it will generally work for about eight hours out of the twenty-four on an average. Small windmills are useful on farms for working machines and pumping, in brickfields for pumping, and on ships for clearing out bilge water. They are employed for drainage purposes in Holland and Nor- folk, and for mining purposes in some new countries. In America they are used to pump water at railway stations. Sir W. Thomson has proposed to utilize them in charging electric accumulators. As an auxiliary to a steam engine they are sometimes useful ; thus at Faversham a 15-horse- power windmill raised in ten months 21,000,000 gallons of water from a depth of 109 feet, saving 100 tons of coal.

European Windmills.—In all the older windmills a shaft, called the wind shaft, carried four to six arms or whips on which long rectangular narrow sails were spread. The wind shaft was placed at an inclination of 10° or 15° with the horizontal, to enable the sails to clear the lower part of the mill. The whip carrying the sail was often 30 to 40 feet in length, so that the tips of the sails described a circle 60 to 80 feet in diameter. The sails were rectangu- lar, 5 to 6 feet wide, and occupying five-sixths of the length of the whip. A triangular leading sail was sometimes added. Sometimes the sails consisted of a sail-cloth spread on a framework ; at other times narrow boards were used. The oldest mill was no doubt the post mill, the whole struc- ture being carried on a post; to bring the sails to face the wind, the structure was turned round by along lever. The post mill was succeeded by the tower, smock, or frock mill, in which the mill itself consisted of a stationary tower, and the wind shaft and sails were carried in a revolving cap rotating on the top of the tower. Meikle introduced in

1750 an auxiliary windmill or fan, placed at right angles to the principal sails, for automatically turning the mill face to the wind. If the wind shifts, the small fan begins to revolve and, acting through gearing, rotates the cap of the mill. Mills are exposed to great danger if the sails are not reefed or furled in high winds, and the reefing serves also to prevent the speed of the mill becoming excessive. In 1807 Sir W. Cubitt introduced automatic reefing arrange- ments. The sails were made of thin boards held up to the wind by a weight. As the strength of the wind increased, the boards were pressed back and exposed less surface.

American Windmills.—American windmills generally have the sails arranged in an annulus or disk. The sails consist of narrow boards or slats arranged radially, each board inclined at a constant angle of weather (see below); and the impulse of the wind on these inclined surfaces drives the mill. An American mill presents a larger sur- face for a given length of sail, and consequently the con- struction is lighter. To turn the mill face to the wind, a simple large rudder or fish-tail is used, projecting back- wards in a plane at right angles to the plane of rotation of the sails. There are a great variety of mills in America, but those most commonly used are of two types. (1) In those which have side-vane governor wheels the action equivalent to reefing the sails is effected by turning the whole wheel formed by the sails oblique to the wind, so as to diminish the wind's action.

Warner's Annular Sail Windmill.— Messrs Warner of Cripplegate (London) make a windmill somewhat similar to American mills. The shut- ters or vanes consist of a frame covered with canvas, and these are pivoted between two angle-iron rings so as to form an annular sail. The vanes are connected with spiral springs, which keep them up to the best angle of weather for light winds. If the strength of the wind in- ereases, the vanes give to the wind, forcing back the springs, and thus the area on which the wind acts dimin-

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iB ishes. In addition, there are : ed y

a striking lever and tackle ad", for setting the vanes edge- awd, ways to the wind when the VON K mill is stopped or a storm is {} eS > expected. The wheel is kept Rui Ny | INS WZ } face to the wind by a rudder (i ae, Dia in small mills; in large mills (Al y Y/N y

a subsidiary fan and gear are used. Fig. 1 shows a large mill of this kind, erected in a similar manner to a tower ' mill. The tower is a framework of iron, and carries a revolving cap, on which the wind shaft is fixed. Behind is the subsi-

Frc. 1.—Warner's annular sail windmill.

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diary fan with its gearing, acting on a toothed wheel fixed to the cap.

Relation between the Velocity of the Wind and its Pressure on Sur- faces. —When a flat thin plate is exposed normally to the wind, the pressure on its front surface.is increased and that on its back sur- face somewhat diminished. The resultant total pressure per square ' foot in the direction of the wind is given approximately by the

equation pr OO BA Sacks er enaqoaeosaah ks (1)

if v is in miles per hour, or 3 et ee eee (1a) if vis in feet per second. Thus, winds at velocities of 5, 10, and 20 miles per hour would give a pressure of § Ib, 4 1b, and 2 Ib respect- ively on each square foot of a surface normal to the wind, and these may be considered ordinary working velocities for windmills. In storms the velocity of the wind may reach a much greater value. Pressures of 28 or 30 tb per square foot have been frequently regis- tered by anemometers, and at exceptionally exposed stations press- ures of 50, 80, and even 90 Ib per square foot have been recorded. These pressures, which are useless for working the windmill,

must, nevertheless, be reckoned with in deciding on its structural strength. j _

Pressure on Surfaces Oblique to the Wind.—The variation of press- ure with inclination of surface is only known. experimentally. Let R be the direction of the wind, making an angle @ with the normal to the surface, supposed to be at rest. Then, if pis the pressure per square foot of sur- face when the wind is normal to

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the surface, the resultant normal Fig. 2. ‘ pressure on the oblique surface is

n=; oe Tb per square foot ……. (2). But the windmill sail moves in a direction perpendicular to the wind, Hence, if v is the velocity of a the wind and w that of the sail, the | e

*relative velocity is Vu?+¥%, and the direction of relative motion can be found as follows. Let aa be the plane of rotation of the sail. The inclination @ of the sail to the plane of rotation is called the angle of weather, and is the same as the angle the wind makes with the nor- mal to the sail. Set off c&b=v, be=w, then o¢ is the relative velocity, and **

this makes an angle ¢=tan- — with the direction of the wind

and an angle @+¢ with the normal to the sail. Hence for the moving sail

_ 2cos(0+¢)

“PT + 00s 6+ 6) Be Oe ng ey (3).

Before replacing p by its value in (1) another consideration re- quires attention. The sail generally moves faster than the wind ; it is not a thin- edged plane, but presents a not inconsiderable surface at right angles to its direction of motion, and thus creates resist- ance. Of the whole pressure of the wind a part only is effective, the rest being used to overcome the resistance of the sail. It will be assumed that the effective

pressure driving the sails is only, for v in feet per second, p=-001 v? Ib per square foot, and, therefore, the effective normal pressure on the sails is, for the relative velocity

wen G ae 9), ¢0s (0+ ¢) yi +4', n=001(v? 4 TF c0s" (0 6)" in the direction of motion of the sail is m sin 6. Consequently the useful work of the sail expressed in foot-pounds per square foot is nu sin 0=-001(0? u2}y——— 9 ; ' te = Le (0)+cos (0+) into strips and introducing the known values of w, v, and 6 the work done is easily found.

Best Angle of Weather.—The best angle of weather is that which

sin @

makes ——————_———. j sec (0+) + cos (0+ ¢) simple rule 6=674°—2¢. Given the velocity of the wind and that of the tips of the sails, the value of ¢ is easily found for any point

The component of this

By dividing the sail

a maximum. This gives the very

of the sail, and thence 6. Thus, for ry – =3°'0 2°5 2°0 15 10 0°5, ot 68° = 64° 57° 45° 1 @=184° 164° 198° o44° 334° 472°,

Horse-Power of Windmills. —For the older kinds of windmills the following rule derived from some experiments by Coulomb may be used. Let m = no. of sails, 4 area of each sail in square feet, v velocity of wind in feet per second ; then the horse-power of the

WIN—WIN

*a, tae. mr *S J, 660,000 ' : be about 24 to 8 times the wind velocity. For American wheels Wolff gives the horse-power which may be expected for an aver-*

age of 8 hours per day as follows :—

this assumes the speed of the tips of the sails to

Velocity of Wind in Miles per Hour.

Diameter of Revolutions of

Horse-Power of Wheel in Feet. i

Mill. Wheel per Minute.

16 0°04 16 0°12 16 0°21 16 0°28 16 0°41 16 0°61 16 0°78

16 1:34

70-75. 60-65 55-60 50-55 45-50 40-45 35-40 30-35

Further information will be found in Rankine, The Steam Engine and other Prime Movers; Weisbach, The Mechanics of Engineering ; and Wolff, The Wind- mill as a Prime Mover. (CW. C. U.)

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WINDSOR,! a parliamentary and municipal borough of Berkshire, England, 21 miles from London by the Great Western Railway, situated on the right bank of the Thames, is chiefly remarkable for its royal castle. The town itself? is of no special interest, in spite of its great antiquity. In 1276 Edward I. made Windsor a free borough. In 1302 it began to send representatives to parliament, though at uregular intervals, and from the time of Henry VI. it returned two members till 1867, when they were reduced to one. The town is presided over by a mayor, aldermen, and councillors, who were incorporated by a charter of Edward IV. The town-hall was built in 1686 by Sir

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Plan.of Windsor.

Christopher Wren, but was much altered in 1852. The Thames is crossed here by a bridge resting on three granite piers (1823). The parish church of St John the Baptist was rebuilt in 1822; the other two churches are also modern. The town was formerly celebrated for the number of its inns, of which “‘ The Garter ” and “ The White Hart” were the chief. The former was the favourite inn of Shakespeare’s Sir John Falstaff, and is frequently men- tioned in the Merry Wives of Windsor. In 1650 the town contained 70 inns, many of which were very picturesque half-timbered buildings; but none of these now exist. In

1The name is said to be derived from Windelsora (A.8. windel, “to wind,” and or, a “shore,” from the winding course of the Thames).

2 In official documents the town is called New Windsor, to dis- tinguish it from its parent settlement Old Windsor, which is now a

village prettily situated about two miles to the south-east of Windsor Castle.

1871 the population of the municipal borough was 11,769 and in 1881 12,273; that of the parliamentary borough (area 3253 acres) in the same years was 17,281 and 19,082 respectively. Of this last total 3464 were in Buckinghamshire, into which county the parliamentary borough of Windsor extends.

Windsor Castle, from its commanding position, its stately group of ancient buildings, and its long list of historical associations, is one of the most magnificent and interesting of royal palaces. It has for many centuries

been the chief residence of the English sovereigns! As early as the time of the Heptarchy a stronghold of some importance existed at Windsor ; the chief part of this still remains, and forms the great circular mound, about 125 feet in diameter, on which the Round Tower now stands. This great earth- work was once surrounded by the fosse, agger, and vallum which were usually constructed to defend both Roman and Saxon strongholds. The primitive wooden enclosure was replaced by a stone circuit-wall in the time of William the Conqueror ; and the first complete Round Tower was built by Henry III. about 1272, but was wholly reconstructed on a more massive scale by Edward III., who in 1344 designed the new tower to form a meeting-place for his newly-estab- lished order of the Knights of the Garter. Edward selected this spot because, according to a popular legend (quoted by Froissart), it was on the summit of the circular mound that King Arthur used to sit surrounded by his knights of the Round Table. The main bulk of the present Round Tower is of this date; but its walls were heightened, and the tall flag-turret was added by the court architect, Sir Jeffrey Wyatville, in the reign of George IV. In addition to the Round Tower, Henry III. constructed long lines of circuit-walls, crowned at intervals with many smaller towers, one of which, named after him, still exists in good preserva- tion. He also built a great hall, kitchen, and other apart- ments, together with a chapel, which was afterwards pulled down to make room for the present chapel of St George. The beautiful little chapel cloister which Henry III. built still exists, and on its walls are traces of contemporary paintings in distemper. Another chapel was built by Henry III. and dedicated to his favourite saint, Edward the Confessor. This graceful building, with an eastern apse, is now called the Albert Memorial Chapel; a good deal of Henry III.'s work still exists in the lower part of its walls, but the upper part was rebuilt in 1501-3 by Henry VII. Some years later the unfinished chapel was given by Henry VIII. to Cardinal Wolsey, and for long after it was known as '"Wolsey's tomb-house." Wolsey engaged a Florentine sculptor named Benedetto? to make him a very magnificent and costly tomb of marble and gilt bronze, with a recumbent effigy at the top, probably very similar in design to Torrigiano's tomb of Henry VII. at Westminster. The rich bronze work of Wolsey's tomb was torn off and melted by order of the Commonwealth in 1642, and the mere metal was sold for the then large sum of £600. In 1805 the black marble sarcophagus, stripped of its bronze ornaments, was

moved from Windsor and used as a monument over Nelson's grave in the crypt of St

Paul's. Though Wolsey's tomb-house was roofed in and used for mass by James II., the stone vaulting was not com- pleted till recent times, when the whole place was fitted up by Sir Gilbert Scott as a memorial to the Prince Consort. Its internal walls were then lined with rich marbles, and decorated with reliefs by Baron Triqueti, in a style some- what tawdry and discordant with the old building.

The magnificent chapel of St George ranks next to Westminster Abbey as a royal mausoleum, though no king was buried there before Edward IV., who left directions in his will that a very splendid tomb was to be erected with an effigy of himself in silver. Nothing now remains of this, except part of the wrought iron grille which sur- rounded the tomb—one of the most elaborate and skilfully wrought pieces of iron-work in the world. This grille has recently been moved from the north aisle to the north side of the sanctuary. The next sovereign buried here was Henry VIII., who directed that his body should be laid beside that of Jane Seymour, in a magnificent bronze and marble tomb. The tomb was never completed, and what existed of its metal-work was probably melted down by the Commonwealth. No trace of it now remains. The chapel itself is one of the finest examples of Perpendicular archi- tecture in England, and is on the whole finer in design than the other two royal chapels, those of King's College at Cambridge and that of Henry VII. at Westminster, which were a little later in date. The existing building was begun by Edward IV., who in 1473 pulled down almost the whole of the earlier chapel, which had been completed and filled with stained glass by Edward III. in 1363. The nave of St George's was vaulted about the year 1490, but the choir groining was not finished till 1507; the hanging pendants from the fan vaulting of the choir mark a later development of style, which contrasts strongly with the simpler lines of the earlier nave vault. In 1516 the lantern and the rood-screen were completed, but the stalls and other fittings were not finished till after 1519.

The present private apartments of the sovereign at Windsor were mostly rebuilt or remodelled by Sir Jeffrey Wyatville, but some of the rooms, and

especially the library, contain fine mantelpieces and ceilings of the 16th and 17th centuries. Among the many treasures preserved in the royal library is a fine collection of drawings by the chief Italian painters, together with three volumes of MSS. in the auto- graph of Leonardo da Vinci, illustrated with many draw- ings by his hand.5 The library also contains a magnificent series of portraits by Holbein, eighty-seven in number, highly finished in sepia and chalk, representing the chief personages of Henry VIII.'s court—all of them works of the highest beauty and marvels of iconic vigour. The foundation at- tached to the royal chapel, which possesses the privileges of a "royal peculiar," consists of a dean, who is exempt from any episcopal jurisdiction, and a college of canons.

The royal forest of Windsor is one of the finest in the country, though it has been much reduced in size even since 1790, when it contained about 60,000 acres; many of its oaks are of great size and antiquity. (J. H. M.)

WINDWARD ISLANDS. See Wesr Inorzs.

WINE

HE word "wine" in its widest sense includes all alcoholic beverages derived from _ sacchariferous vegetable juices by spontaneous fermentation; in the

1 See Loftie, Windsor, reprinted with etchings from The Portfolio, London, 1885; Tighe and Davis, Annals of Windsor, 1860; and Ashton, Illustrations of Windsor Castle, 1841.

2 Probably a son or nephew of the Florentine sculptor Benedetto da Maiano, who died in 1497 ; another member of the same family was employed by Wolsey at Hampton Court.

narrower sense of its ordinary acceptance it designates the fermented product of grape juice, with which alone the present article proposes to deal.

Part I.—CuHEMIsTRY. Vinous fermentation, phenomenally and chemically, is

3 These have recently been printed with an English translation by Dr Richter, London, 1883. See also Dr Waagen, Treasures of Art in Britain, London, 1854, vol. ii.

fully explained under FrrMenTATION (vol. ix. p. 92 sq.). From what is said there it will be readily understood that winemaking is an easy art where there is a sufficient supply of perfectly ripe grapes. In Italy, Spain, Greece, and other countries of southern Europe nature takes care of this; in the more northern of the wine-producing dis- tricts of France, and especially on the Rhine in Germany, the culture of the vine means hard work from one end of the year to the other, which only exceptionally finds its full reward. And yet it is in those naturally less favoured districts that the most generous wines are produced. Southern wines excel in body and strength ; but even the best of them lack the beautiful aroma (Blume or bouquet) characteristic of high-class Rhine wine. The large propor- tion of sugar in southern grape juice would appear to be inimical to the development of that superior flavour. Yet in Missouri, for instance, where wine is produced in pretty much the Rhenish way, from Rhenish kinds of grapes, which there ripen far more readily than they do at home, no wine equal in flavour to real Rhine wine has as yet been made. It seems that the hard struggle for existence which the vine-plant has to fight on the Rhine is essential for the development of the peculiar flavour of the wine. To secure the highest attainable degree of maturity in the grapes, the vintage on the Rhine is postponed until the grapes almost begin to wither, and the white grapes on the sunny side of the bunches exhibit a yellowish brown (instead of a green) colour and show signs of flac- cidity. In the best vineyards (where it is worth the trouble) the bunches are carefully

sorted, the ripest being put aside and pressed by themselves. In some places even the individual bunches are analysed and the best berries cut out with a pair of scissors, to be used by themselves. The processes concerned in the extraction of the juice are described below (p. 605). If the production of red wine is intended, the juice is allowed to ferment over the stalks and skins until enough of alcohol has been produced to enable the juice to extract the pigment from the skins. After that juice and residue are separated. The alcohol, however, extracts other things besides the pigment, especi- ally tannin, which imparts to red wines their characteristic astringency. The must (or magma of crushed grapes) is immediately conveyed to a cool cellar, the temperature of which should lie between 9° and 12° C., and is placed in large tubs or vats or open casks, and is then left to itself. Although no yeast is added from without, vinous fermenta- tion sets in sooner or later, and after some four to five days is in full swing. On the seventh day, as a rule, the pro- cess has passed its climax, and after ten to fourteen days the yeast-scum on the surface disappears and the liquid clears up. It now constitutes what is called Jungwein, which still contains a considerable remnant of unfermented sugar. This young wine is drawn off into large casks and placed in cellars having a temperature of 9° to 12° C.; there it is left for some months, generally until the following March. 'The casks are filled almost to the bung-hole and kept full by the occasional addition of wine, the small bung-hole being covered so as to provide an outlet for the carbonic acid, without giving any greater access to the air than is absolutely unavoidable, to prevent acetous fer- mentation. During this period the small remnant of sugar in the young wine gradually ferments away, while the percentage of alcohol undergoes a corresponding gradual in- crease. As this after-fermentation progresses very slowly, there is no perceptible increase of temperature in the liquid, and even the newly-formed yeast cells remain deposited at the bottom as a precipitate. On it certain components of the must, being less soluble in (alcoholic) wine than in the must, separate out, as, for instance, the albumenoids and, most markedly, the bitartrate of potash; this last

separates out conjointly with tartrate of lime and colour- ing-matters, as a coherent crust known as avgol. The finished young wine is drawn off clear into smaller casks, bunged up, and allowed to mature. It is during this period that the "bloom" of the wine develops, probably through the very slow formation of ethers from the alcohol and the acids previously produced, or from traces of higher alcohols by oxidation. How long a wine should be allowed to mature depends on its richness. With relatively poor wines a year's maturing may be aniply sufficient; rich wines continue improving for years.

To give an idea of the composition of grape juice, we quote two analyses of high-class musts of 1868, by Neubauer :—

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0°47 %

Supposing such musts to ferment, the albumenoids are partly precipitated as components of the yeast or other- wise, or decomposed, with formation of ammonia salt; part of the phosphates go into the yeast likewise; the greater part of the bitartrate of potash of the juice is pre- cipitated as argol; and the greater part, if not all, of the sugar is decomposed, with formation from every 100 parts of sugar destroyed of alcohol 48°5, carbonic acid 46°9, succinic acid 0°7, glycerin 3:0, matter passing into the yeast 0°9 as principal products.

Besides the predominating process of vinous fermenta- Minor

tion proper, certain minor fermentations and other bye- reactions take place, which lead to the formation of free acetic and other fatty acids, ethers, and traces of higher alcohols. Of these last, however, which play such an important part in whisky-brewing, only very little is formed in

grape-juice fermentation. Of the bye-products the ethers are undoubtedly the most important, because it is they that constitute the bloom ; but our knowledge regard- ing them is very limited. The flavour of a wine is due to two sets of volatile bodies, namely—(i.) cenanthic ether (see Ginantuic Acid, vol. xvii. p. 731), to which is due the smell common to all wines (which remains in an empty wine cask after the bloom proper has gone), and (ii.) a set of ethers (are they ethers ?) which constitute the Llume. Geiger distilled a bottle of good wine and then re-mixed residue and distillate. But the mixture was not drink- able ; yet, after having been bottled up for a long time, it gradually regained its original virtues. These remarks apply only to white Rhenish wines. Red wines, in addi- tion to the components named, contain chiefly colouring and astringent matters. The wines of Hungary, France, &c., as is well known, have a different character from those of the Rhine region; but the scientific analysis of the relations is of comparatively little importance.

In all rich musts part of the sugar escapes fermentation and imparts to the wine a higher or lower degree of sweet- ness; southern wines (port, sherry, &c.), even in their natural condition, contain relatively large percentages of sugar. In their case it is chiefly this sugar, in Rhine wine the glycerin and what there may be of unchanged sugar, which constitute the "body" of the wine. Spanish and Portuguese wines, however, especially those intended

ne 7 Wine-Brewing.—One mae of assisting nature in wine-'| widely spread practice that prevails of disinfecting wine- 'making is the process of gallisizing," so called from its | casks with sulphurous acid (by burning sulphur within

inventor (Gall), which is largely practised on the Rhine. them) before they are used. Ina given vineyard the must produced in a good year is Want of space will not allow of the treatment of wine characterized by certain percentages of free acid and of | analysis generally ; but sufficient has been said to show sugar. In bad years the latter decreases and the former | how far the genuineness of a wine can be proved by increases. But this, according to Gall, can be easily | chemical analysis. Against the most important and fre- remedied by adding sugar and water in sufficient

quantity | quently occurring fraud, namely, the substitution of a to establish the percentages of free acid and sugar which are | genuine, but inferior, for a high class wine of a similar characteristic of the best years, and then allowing the mix- | kind, chemical analysis is at present absolutely powerless. ture to ferment. The sugar is added sometimes in the form It sometimes happens that wine becomes viscous and Injurious of cane sugar (which is no doubt the best substitute for | forms threads when poured from the bottle. This mischief, ferments, natural grape sugar obtainable), but more frequently in the | which is caused by the development of a foreign ferment, °° form of what is known in commerce as "grape sugar," | can be cured by the judicious addition of a solution of which is in reality more or less impure dextrose produced | tannin, which precipitates the "gum." From a similar from potatoes or maize starch (see SuaaR, vol. xxii. p. 623). | cause comes acetous fermentation, which always takes place Scientifically speaking, Gall's method appears to be un- | in a moderate degree, but may assume undue dimensions. objectionable ; but that it does so is really owing to our | Red wines are liable to develop a foreign substance which ignorance of the intricacies of the actual process of grape- | imparts to them a bitter taste. A wine kept in a mouldy Juice fermentation. In any case, grape juice is one thing | cask assumes of course a mouldy taste and smell. Some- and dextrose plus so much pump-water is another; and | times a wine will "capsize": the alcohol and the acid the sale of gallisized as "natural" wine must be pro-| disappear and what was wine becomes an insipid un- nounced a fraud. Science affords a means of distinguishing | drinkable liquid. Most of the injurious effects caused in a gallisized from a natural wine, if the added sugar con- | wine by foreign ferments can be prevented by a process sisted of dextrose. The sugar of normal grape juice is | introduced by Pasteur. The wine is kept for a sufficient half dextrose and half levulose ; a similar mixture is pro- | time at a temperature of 70° C. in the absence of air, and duced from added cane sugar. In the process of fermenta- | then transferred to a germ-free cask, without allowing it tion the dextrose is the first to disappear ; the rest of the | to come in contact with more air than can be helped. The lzvulose then follows. Hence a finished natural wine, if | only objection to Pasteur's precautionary method is that it it turns the plane of polarized light at all, will turn it to | renders the wine slightly flat through the removal of part the left; but, if the wine was doctored with

*dextrose, | of its carbonic acid. No doubt these deleterious con- certain dextro-rotatory impurities survive to the end and | sequences might be prevented to a very great extent if the the wine turns the plane of polarization to the right | fermentation were conducted from the first in casks which (Neubauer). A commission of experts who met in Berlin | communicated with the air only through a (wide enough) in 1884 declared gallisizing to be a legitimate practice as | tube full of cotton wool, which medium is known to filter long as the water added does not amount to more than | off all germs (see FERMENTATION, vol. ix. p. 95). twice the weight of the added sugar. Liebig long ago Efervescing or Sparkling Wines.—These wines are Spark- recommended the addition of a concentrated solution of | largely impregnated with carbonic acid engendered by an ling neutral tartrate of potash to ready-made wine, as a means | after-fermentation in the closed bottle by means of added "™** for reducing its acidity. If the free acid is tartaric, it | sugar. The art originated in Champagne, where the best combines with the tartrate into cream of tartar, which | sparkling wines are produced, and whence it has spread gradually separates out and can be removed by decanta- | to the Rhine, the Moselle, and other districts. The natural tion or filtration. Long before Gall, Chaptal showed | wine of Champagne is not of a very high order ; yet it pro- that bad must may be improved by adding the calculated | duces the best champagne. For champagne-making blue weight of (cane) sugar and neutralizing the excessive acid | grapes are preferred. In eliminating the juice excessive by means of powdered marble. The principal feature in | pressure is avoided, so as to keep the must clear of particles Chaptal's, as compared with Gall's method, is that it dis- | of skin. The processes of fermentation and clearing, as cards the resources of the pump. well as those connected with the making of champagne*

Plaster- In Spain, Portugal, and France it is a very common | generally, are described in detail below (p. 606). Cham-

ing wine. practice to dust over the grapes with plaster of Paris or to | pagne-makers distinguish three grades of effervescence.

WINE

for exportation into Great Britain, are habitually doctored by the addition of cane sugar and cognac.

add the plaster to the must. The intention is, in the former case, to prevent putrefaction of the berries, in the latter to add to the chemical stability of the wine. Ac- cording to experience, a plastered wine is ready for bottling sooner than it would be in its natural condition. The chemical process involved consists in this: the sulphate of lime, CaSO,, decomposes the bitartrate of potash, (C,H,O,) KH, of the must, with the formation of insoluble tartrate of lime, (C,H,0,)Ca, and soluble acid sulphate of potash, KHSO,. 'The latter takes up potash from, chiefly, the phosphate present and becomes normal salt, K,SO,, with the formation of free acid (e.g., phosphoric acid),

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sulphuric acid determination, in the case of German wines more especially, is rendered very uncertain owing to the

In mousseux the pressure in the bottle amounts to from 4 to 44 atmospheres; in grand mousseux it reaches 5 atmospheres ; and less than 4 atmospheres' pressure con- stitutes cremant (from la créme, "cream"), a wine which throws up a froth but does not give off carbonic acid violently. A champagne which contains relatively little sugar is called "dry"; it is chiefly this kind which is imported into Great Britain, where champagne is used habitually as a dinner wine. In France a sweet wine 18 preferred. The intensely sweet substance called "saccha- rine" (see Sucar, vol. xxii. p. 623) has been utilized for producing a sparkling wine which is both sweet and dry. Cheap champagnes may be (and we believe are) produced by simply adding sugar and some flavouring matter to wine, and then pumping in carbonic acid in the soda-water fashion. The following extract from a table by August Dupré will show the chemical composition of the wines most popular in Great Britain. The numbers may be

Histori- cal sketch.

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read as grammes per litre or as ounces per 1000 fluid ounces.

*Free * Aleohol.| Acid, Be ae. | Glucose. xed Hock at 30s. a dozen 96 3°5 0°6 18°6 nil » at 120s „ | 104 3 09 | 206 | 1°71 Claret at 15s. „ | 85 | 4:2 15 | a14 | 4:3 » at 66s. 55 85 oe 1°8 18 10 Sherry at 22s. __„ iz at 15} 42 26 say en price: ..... 184 2°8 16 56 35 Port at 32s. a dozen… 186 onl | "Ors 75 43 FIs price 2.65… 182 i isl 31 10 (WEEDS)*

Part Il.—Inpustry AND TRADE.

At the present day wine is practically a European product, although a certain quantity is made in the United States, at the Cape of Good Hope, and in Australia. The principal countries in Europe where the vine is grown to any extent are France, Spain, Portugal, Austria-Hungary, Italy, Germany, and the southern por- tions of Russia and Greece; but in the first six alone is wine an article of much comniercial importance.

In the lands of the Levant the use of wine is as old as the earliest memory of civilization, and we find its introduction ascribed to gods (Dionysus in Greece, Osiris in Egypt), or, in the case of the Hebrews, to the patriarch Noah, the second father of mankind. Corn, wine, and oil appear together (as in the Old Testament) as the main gifts of the soil, the material bases of life and comfort. The cultivation of the vine was the highest achievement of ancient husbandry, impossible to semi-nomadic peoples, who might grow a corn crop, but did not remain long enough in one spot to form vineyards. Thus the vine and the olive are in antiquity the marks and almost the symbols of settled and cultured life. Starting perhaps from Armenia and eastern Pontus, viticulture gradually made its way through the lands of ancient civilization, rejected only by a race like the NABATHANS (q.v.), whose laws were directed to prevent the transition from nomadic to settled life (cp. the Old Testament Rechabites). Of Asiatic wines the most famous was that of Chalybon (Helbon) near Damascus, which was an article of Phcenician commerce in the time of Ezekiel (xxvii. 18) and at a later date furnished the tables of the Persian kings. Of Greek wines the most famous came from the islands (as Chios, Lesbos, Cos) or from points on the Asiatic coast (Strabo, xiv. p. 637). The vine reached Spain through the Phoenicians, and Italy and southern Gaul (Marseilles) from Greece; it had no place in the oldest Roman husbandry,

nor was wine used in the oldest Roman ritual. But in time Italy became a great wine country, and Cato regards viticulture as the most profitable branch of hus- bandry. It was indeed artificially fostered by the Roman republic, which prohibited the import of foreign growths into Italy and stimulated exports by restrictions on wine-growing in the provinces, especially in southern Gaul, which thus became a great market for Italian wines. These restrictions were not wholly removed till the time of Prosus (q.v.), when the reins of empire were no longer in Italian hands. In the first century of our era Spanish and Gaulish as well as Greek wines were drunk at Rome (Pliny), but in Gaul the production seems to have been limited to the districts of the Allobroges and Bituriges on the Rhone and the Gironde. It was after Probus's time that viticulture seems to have been established on the Seine and the Moselle, and Julian when in Gaul still found occasion to discharge an epigram against the false Dionysus of Celtic beer. The northward spread of the vine was doubtless also retarded by difficulties of acclimatization, which were only gradually over- come. In the Middle Ages, when transport was difticult, wine was produced in the south of England and in several parts of Germany where there is now no motive for urging a precarious husbandry. ! The exact mode of vine-culture and wine-making amongst the ancients is somewhat obscure ; but there is reason to believe that the latter, although in a somewhat cruder form, closely resembled the system in use at the present day. As far as viticulture is con- cerned, we find from Pliny and others that the Romans encouraged the upward growth of the vine upon trees and palisades in prefer- ence to the dwarf system now followed in the more northern regions, such as France,—a fact doubtless attributable to the almost tropical luxuriance which the vine attains in Italy. Little comparative information can be obtained as to the style of wine made by the ancients ; but from the few facts we do know it may be presumed that, apart from alcoholic qualities, the wines of Greece and Rome had not the high properties possessed by those of the present day.

1 On the history of viticulture, see especially Hehn, Culturpflanzen, &c., 3d ed., p. 63 sq., and Mommsen, Rom. Gesch., v. 98 sq. In accordance with the history of the plant, the names wine, vinum, &c., are traced by philologists to oives. The further history of the name is obscure; but it

seems to be Indo- European ; the Hebrew yayin is almost certainly a loan-word.

WINE

The introduction of resinous flavours or of salt, then usually resorted to, would hardly suit the present high rearing of vinous products. The vintage in the more favoured districts began towards the end of September and in the less favoured during the following month. Grapes were not gathered until they had attained their fullest maturity, and in many instances they were allowed to dry three or four days in the sun after gathering in order to obtain further sweetness aud body. The grapes were trodden and then submitted to the press, much after the custom still prevalent in Burgundy and Portugal. When, however, the juice was deemed too thin and watery for the production of good wine, it was boiled down to a greater consistency, whilst a small portion of gypsum was added to it. The original receptacles for wine appear to have becn the skins of animals, rendered impervious by oil or resinous substances, but later on the principal vessels were made of earthenware (amphorz aud the like) or, in certain districts, though less frequently, of wood, after the style of modern casks. In modern as compared with ancient times the wine-growing industry has considerably changed its locality. Although Italy and (in a very ininor degree) Greece still produce a considerable quantity of wine, yet France, Spain, and Portugal must now be recognized as the chief homes of viticulture. France is the country whose modern agricultural' history aud export trade are most connected with wine production ; and, although, in consequence of the Phylloxerw and mildew, the yield has fallen off of late years, it still holds the premier position for quantity, variety, and general excellence of quality.

France.

It was only by degrees, owing partly to its soil and partly to France.

the aptitude of its inhabitants, that France developed the position which it now holds as a wine-producing country. Geographically and meteorologically speaking, it is in every way cminently fitted for this. The winters are not too cold, nor, on the other hand, have the summers the

intense heat and drought which are often so prejudicial to the vine in southern climates. The country is throughout of that gently undulating charactér which is so import- ant for the proper exposure and ripening of the grape, whilst the calcareous properties of the soil are especially favourable to the growth of the plant. The habits of the people, moreover, and the system of small holdings have also undoubtedly done much in developing the industry ; for there is, perhaps, no branch of agri- culture which requires more minute attention, or for which such a system of land tenure is more suitable, than vine culture. At present throughout all France there are only ten departments in which wine is not produced,—Calvados, Cétes-du-Nord, Finistére, Manche, Nord, Oise, Orne, Pas-de-Calais, Seine-Inférieure, and Somme ; and in 1887 the total production amounted to 24,333,284 hectolitres, or some 585,332,250 gallons, which, however, is con- siderably less than the average for the previous ten years, owing to the immense injury caused by the Phylloxera. In 1875, the annus mirabilis of wine-production in France, the yield amounted to 83,632,391 hectolitres, or nearly three and a half times that of twelve years later.

As France is the home of wine-growing, so must the Médoc dis- Médoc,

trict in its turn be considered the very heart of that industry in France, for nowhere have such elegance, finesse, and distinct variety been obtained as on the banks of the Gironde. Unlike the products of the different vineyards of most other districts, which are purchased by the merchant and vatted to supply a general wine of commerce, the yields of the principal estates of Médoc are kept distinct, and reach the consumer as the product of the particular growth and the particular year. This practice is, almost without exception, resorted to with what are known as the classed growths and the superior bourgeois, whilst in seasons in which the wines are of good quality it is continued down to the lower grades. The area of the department of Gironde is about 2,407,000 acres, of which some 500,000 acres are under the vine. There are six descriptions of soil :—(1) that of the valleys, chiefly alluvial, the vines on which produce wines of considerable colour and vinosity, but wanting in Jinesse ; (2) the strong lands, which require frequent working and the assistance of lighter earths and manures, although, when of a ferruginous colour, this soil is

very favourable to the vine; (3) the marshy lands, which are of considerable extent, and which, when gravel enters into their composition, are extremely fertile ; (4) lands formed at the surface of gravel, quartz, and heavy sand, with clay subsoil, over which are grown most of the finest vines of the Médoc ; (5) the silicious or flinty soils, covering about one- half of the department, of which some portions, when worked with clay and calcareous elements, are suitable for vine cultivation ; (6) the intermediate lands, between the strong soil and the last-named, which are chiefly available for the growth of the commoner descrip- tions of white wines. The principal vines used in the Médoc are, for red wines, the Cabernets (2), the Merlot, and the Malbec, and for white wines, the Semillon, the Sauvignon, and the Muscatelle. The vines of the Cabernet species, although producing excellent grapes, are especially susceptible to damage from weather at flower- ing time, and consequently are not so greatly used as the Merlot,

wily &

which is very productive, and not so liable to attacks from Oidiwm as other descriptions. The grapes of this vine, however, have to be gathered with promptitude, as they ripen very quickly and if subjected to rain soon become rotten. The vine most generally selected, however, is the Malbec, which is a remarkably early bearer, its chief disadvantage being that it is very susceptible to frost. Of the various vine diseases and pests the chief is undoubtedly the Phylloxera (see VINE, p. 238 above), which was first seen in Médoc in 1869. The amount of damage caused by this insect during the past fifteen years is almost incredible, and at one time it was feared that the vineyards would be wholly destroyed. Of late, however, con- siderable success has been met with in checking its inroads, the area now under vine cultivation being larger than was the case when its ravages first began to make themselves severely felt. Another evil which has occasionally been very virulent is the Oidium, a species of fungus, which first made its appearance in France in 1851, about which time it also devastated the vineyards of Madeira. Another cause from which an enormous amount of damage has been done of recent years is the mildew, which not only destroys the leaves and fruit, but further leaves its taint on wines made from grapes affected by it. It is believed, however, that a

complete cure or prevention for this pest has been found in a solution of sulphate of copper. In addition to these enemies, the vine-grower has to take account of hail, frost, and coulure— this last cansed by too great humidity of the soil, which leads to large quantities of flowers falling from the branches before turning into grapes, and also to the grapes themselves falling. The vintage in Médoc nsually commences between the middle and end of Sep- tember and lasts from two to three weeks. The process is a very simple one. The grapes are gathered and brought on bullock drays to tle press-house ; here they are separated from the stalks and placed in vats, where they are allowed to ferment for a period of from seven to fifteen days. As soon as the wine is sufficiently made, it is drawn off into hogsheads and removed to light and airy stores. The first month the bung is put lightly in and the cask filled up every three or four days ; the second month it is put in more firmly and the cask filled every eight days. In March, the lees having fallen, the first sowéirage or drawing-off takes place. A second is made in June and a third in November, after which the hogsheads are turned on their side and the fillings-up cease. In the second and following years, after the wine has been removed to dark cellars, two drawings-off suffice, one in spring and the other in autumn. After this, if the wine ferments, it is drawn off in a sulphured eask, and if necessary fined with eggs and again drawn off in a fortnight.

The great variety of qualities that the wines of Médoc possess has necessitated their classification, by which they have been divided into paysan, artisan, bourgeois, and fine growths, the last- named being subdivided into five categories, and known as the "classed growths." This classification is the result of years of observation and study, going back to the 18th century, its present form being the result of a eonference of brokers in 1855. Subjoined is a list of the red wines of Médoc (the English "claret"'), with the names of the eantons to which they belong.

First GROWTHS.

Chatcau Latour, Pauillac. Haut-Brion, Pessac.

Chateau Lafitte, Pauillac. As Margaux, Margaux. of

SECOND GROWTHS. Chateau Mouton-Rothschild, Pauillac. | Chateau Gruaud-Larose, St Julien. 5 Rauzan-Segla, Margaux. » Branne-Cantenac, Cantenac. a Rauzan-Gassies, _„ »» Pichon-Longueville, Pauillac. 35 Léoville-Lascases, St Julien. 1 Pichon- Longueville-Lalande, Léoville-Poyferré, Se Pauillac.

- Léoville-Barton, Ss 33 Dueru-Beaucaillou, St Julien. – Durfort-Vivens, Margaux. Cos d'Estournel, St Estéphe. aA Lascombes, fr Chateau Montrose, es Gruaud – Larose -Sarget, St Julien.

THIRD GROWTHS.

Chateau Palmer, Cantenac.

Chateau Kirwan, Cantenac. La Lagune, Ludon.

D'Issan, Cantenac. fe

*Fe Lagrange, St Julien. Sp Desmirail, Margaux. » Langoa, 3 », Calon-Ségur, St Estéphe. * Giscours, Labarde. rp Ferriére, Margaux.*

AA Malescot, Margaux. . Becker, a

43 Brown Cantenac, Cantenac.

FourtH GRoWTHs.

Chateau Saint-Pierre, St Julien. Chateau La Tour Carnet, St Laurent. », Branaire-Duluc, „ », Rochet, St Estéphe. . Talbot, – ap Beychevelle, St Julien. aA Duhart-Milon, Pauillac. | Le Prieuré, Cantenac. », Poujet, Cantenac. | Marquis de Therme, Margaux.

FiIrTH GROWTHS. Chateau Pontet-Canet, Pauillac. Chateau Le Tertre, Arsac.

5 Batailley, a es Haut-Bages, Pauillac. Grand-Puy-Lacoste, eS » Pedesclaux, 9 Ducasse-Grand-Puy, : fp Belgrave, St Laurent. Chateau Lynch-Bages, as ne Camensac, 35

» Lynch-Moussas, ,, Cos-Labory, St Estéphe.

»» Dauzac, Labarde. Chateau Clerc-Milon, Pauillac.

+3 Mouton-d'Armailhacq, Pauil- a5 Croizet-Bages __,, lac. op Cantemerle, Macau.

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The average yield of the Gironde during the ten years 1876-1886 amounted to 1,435,863 heetolitres, or about 31,589,000 gallons, an average which has been placed considerably lower than that of the preceding decade by the small yields of 1881, 1882, 1884, and 1885. In each of the prolific years of 1874 and 1875 the production of the Gironde exceeded 5,000,000 hectolitres, and in 1869 it reached 4,500,000. The principal claret vintages of the 19th century are considered to have been those of 1815, '25, '28, '31, '34, "41, °47, "48, 58, 64, 69, 70, '74, and '75. From 1875 to 1882 nothing exceptional was produced. Of the vintages since 1882 it is still too early to speak, although it is probable that some of the 1884's, where they have escaped the mildew, and the 1887's will turn out well.

Sauterne, or what is known as the white-wine-produeing district Sauterne.

of Médoc, lies to the south of Bordeaux ; and to those who are only familiar with the Médoc vineyards it gives the impression of being quite a distinct country, having more the appearance of the Rhine provinces than of the south of France. The vintage in the Sauterne district is frequently as late as the end of October, and in some cases does not take place until November. The method followed differs from that of Médoc, the grapes being gathered almost one by one, and not until they have almost assumed the appearance of rottenness, or extreme ripeness, so that in faet fermentation has commenced before the fruit is taken from the plant. The Sauterne grapes are white and of medium size, and yield a must which does not lose the whole of the sugar during fermentation, but remains sweet without the addition of spirit. In gathering the grapes, it is customary for women to cut off with seissors the berries as they ripen, the

vintage thus lasting over a considerable time. The grapes, moreover, are not put into vats, but are carefully pressed and the juice put into hogsheads, while the fermentation completes itself. 'The first result is a very sweet luscious wine, known as the téte, which is chiefly sent to Russia, where it makes enormous prices. Following this a second wine, of a drier character, called millieu, is made from the less saccharine grapes, this being the class of wine generally known as Sauterne. There is also a third process, in which all the remaining grapes are mixed together and pressed, the result being called the quewe. In the preparation of the better class wines for the English markct the three varieties are usually mixed in certain proportions, so that the wine sent to the United Kingdom is very different from the oily liqueur-like article which is in such favour in the colder elimate of Russia. As a rule all the finer descriptions are put into bottle before ship- ment, the corks bearing the name of the chateau and the vintage, as is the case with the chateau-bottled red wine. The charaeter of Sauterne may be best described as being, in good years, very luscious and yet very delicate, and possessing a special séve, or, in other words, having that special taste which, while it remains in the mouth, leaves the palate perfectly fresh. The Sauterne district comprises the communes of Sauternes, Bommes, and Barsac, with part of those of Preignac, Saint-Pierre-de-Mons, and Fargues. The finer growths, like the red wines of Médoc, are arranged in classes, in the following order :—

GRAND First GRowTH. Chateau Yquem, Sauternes.

First GROWTHS. Chateau La Tour Blanche, Bommes. Chateau Climens, Barsac. ;

» Peyraguey, "A », Bayle (Guiraud), Sauternes. 9) Vigneau, 3 pe Rieussec, Fargues. 7 Suduiraut, Preignac. ~~ Rabaut, Bommes.

a3 Coutet, Barsac. SECOND GROWTHS.

Chateau Myrat, Barsac. Chateau Caillou, Barsac.

7 Doisy, 2? ” Suau, ”

a Peyxotto, Bommes. vs Malle, Preignac.

90 D’Arche, Sauternes. 00 Romer, _,,

An Filhot, ap x Lamothe, Sauternes.

» Bronstet-Nérac, Barsac.

The prices of the “grand” Sauterne wines vary enormously accord- ing to the year, the quality of which is also very various. Between 1870 and 1885 the first growths have ranged from £8 to £60 per hogshead. Chateau Yquem in the ordinary way fetches from one- fifth to one-fourth more than the other first growths, whilst a rather greater difference rules between the first and second growths. There is, however, no positive rule in this respect; for if, as occasionally happens, a first growth is vintaged a little too late and does not succeed so well as some second growths, the latter will fetch quite as high, if not higher, prices.

Champagne takes its name from the old province which is now Cham- represented by the departments of Marne, Haute-Marne, Aube, and pagne.

Ardennes. It is from the first two that the greater portion of this description of wine is derived, the best qualities being pro- duced in Marne. The vineyards are situated on the banks of the river in the neighbourhood of Epernay, and extend from the right bank over the mountains of Rheims to the vicinity of that city and from the left bank to the small town of Vertus. Of those near the river the principal are at Ay, Dizy, Hautvillers, and Mareuil on the right bank, and at Pierry and Moussy on the left, whilst in the district reaching to the south of these are those of Avize, Cramant,

Saumur,

and Vertus. The vineyards of the mountain include those of Verzenay, Sillery, Rilly-en-Montagne, and Bouzy. The sparkling champagnes arc made from both white and red grapes, carefully pressed, and the wine is of an amber colour, more or less deep ac- cording to vintage and to the proportion of black grapes used. The grapes are pressed in a large pressoir, the first pressing yielding the best quality, whilst the second and third are proportionately in- ferior. The wine from the first pressing is about equal in quantity to that of the other two combined. The vintage usually takes place in the first week in October, the young wines being left to ferment in the cask until the winter, when the first racking takes place, which operation is repeated a month later, when the wines are fined previously to being put in bottle. The wines of the various growths are mixed in the proportions desired, and a certain quantity of old wine (preserved in cask) is added. The amount of saccharine in the wine is also ascertained, and if deficient the requisite quantity in the form of refined candied sugar is added to bring it to the necessary degree for producing fermentation in the bottle. The bottles, which are carefully selected, — those showing the least flaw being rejected, —have sloping shoulders, in order that the sediment may not adhere to the sides in the after-process. The wine, after being corked, is secured by an iron clip, and the bottles are arranged in piles in a horizontal position, in which they remain throughout the summer months. During this time the carbonic acid gas is generated, as is also a sediment, which falls to the side of the bottle. The wines are then stacked away in cellars until required for shipment. Previous to the wine being prepared for this pur- pose, the bottles are placed in a slanting position, neck downwards, in cranks made in the shape of the letter A, and are daily shaken very slightly, so that by degrees the sediment falls into the cork. This operation is very delicate, the slightest twist being disastrous. The incline is gradually increased, so that at last the bottle is almost perpendicular,—a process which generally takes from three to six weeks, With the sediment thus on the cork, the iron clip is removed, when the force of the wine sends out the cork together with the sediment. The wine is now subjected to dosage or liqueur- ing, the amount of which depends upon the sweetness required ; the bottles are then filled up with wine, corked, and wired ready for shipment. The liqueur used is made from the finest wine, candied sugar, and cognac, the usual amount of which for wine sent to the United Kingdom is from one

to four per cent. For colder countries the percentage of liqueur is much greater, in some cases exceeding twenty per cent. The liqueuring is regulated by a machine, by which the quantity is measured to a nicety ; but in some establishments it is still measured by hand with a small ladle. The principal centres of the champagne trade are Rheims and Epernay, although important establishments exist at Ay, Avize, Chalons, and Dizy. The total production of Marne averages about a million hectolitres annually. A large proportion of this, however, is unsuited for making champagne. At the same time the supply is still considerably in excess of the demand, the stock in mer- chants' cellars in the district having amounted in May 1887 to upwards of 82,000,000 bottles, whilst at least half that quantity existed in cask, the total stock thus equalling nearly six years' requirements.

Another district of France which produces large quantities of sparkling white wine is that of Saumur, in the department of Maine-et-Loire. These wines have been known for centuries, but up to 1834 were only used as still wines. At that date a successful attempt was made to convert them into sparkling wines, after which they were principally used to supplement the deficient vintages in Champagne. In 1874 sparkling Saumur was introduced into the United Kingdom in its own name, and has since inade con- siderable advance in the English market, owing mainly to its good quality and its moderate price. It has a great resemblance to the winés of Champagne, and is very fine and wholesome; and, although it lacks the body and finesse of the best growths of Marne, it com- pares very favourably with the lower grades of these wines, and is also much lower in price, the best descriptions being obtainable by the English consumer at little more than three shillings a bottle. The judges of taste and analysis at the Paris exhibition in 1878 gave the following award: "The wine does not differ from Cham- pagne in respect of sweetness and lightness; it is equally white, clear, and sparkling. It contains in nearly the same proportion the same substances as the wines of Champagne." The town of Saumur is situated on the banks of the Loire and at the foot of a command- ing range of hills, to which latter fact the country in a great measure owes its success as a producer of sparkling wines, as the hills furnish, at a trifling cost and in excellent quality, mile upon mile of the excellent cellarage which is indispensable to their preparation. These

cellars are excavations in the hills from which the limestone has been taken, and possess the advantages of easy access and even temperature. The best wines of the district are made from black grapes pressed en blanc, as in Champagne, the usual variety of vine being the Breton. The white grapes employed are the Pincaw blanc, which are vintaged a full fortnight later than the red grapes. According to the system of manufacturing sparkling Saumur, one-

Wink

half of each year's must is put into barrels by itsclf to ferment and become wine, and is kept to be mixed with one-half of the next year's must. In the following May the mixture is put into bottles to undergo its second fermentation, which is induced in the same manner as in champagne, the wine being treated in precisely the same manner. The scdiment is also worked into the neck in a similar way, and is thrown off by the system of disgorgement. The average yield of Maine-et-Loire for the ten years ended 1887 was about 11,990,000 gallons.

Next to those of Médoc, the wines of Burgundy are the best Bur- French red wines known in England. This district comprises the gundy. departments of Céte-d'Or, Yonne, and Saéne-et-Loire, known in former days as Upper and Lower Burgundy. By far the finest qualities are grown in Céte-d'Or, in the two communes of Nuits and Beaune. The former lies in the neighbourhood of Dijon, and comprises some of the choicest growths, merging into Beaune in the south, which in its turn adjoins the Macon district, in the department of Saéne-et-Loire. The wines of Céte-d'Or are grown on the slopes of a range of hills which traverses the department, the best vineyards lying about half-way up the side, where they get the full rays of the sun, the vine apparently deteriorating as it is planted above or below this altitude. As in the case of Médoc wines, the best growths are kept distinct and have a high reputa- tion. The usual classification is as follows :—

Red Wines.

Class I.—Romanée-Conti, Chaibertin, | Class III.—Continued. Clos Vougeot, Richebourg, La mont, Cailles, Cras-Murge, Bou- Tache. dots,

Porrets, Pruliers, Thaurey, Class II.—Musigny, Romanée – St-Vaucrains, Cailleret, Champans, Vivant, Le Clos Saint-Georges, Clavoillon, Clos Margeot, Clos Le Corton, Les Bonnes Mares, Le Tavannes,, Noyer, Bart, part of Clos du Tart. ‘ Corton, Echezaux, Féves, Gréves, Class III.—Arvelets, Rugiens, Beau- Ferriére, Sautenot.

White Wines.

Class II.— Continued. Combettes, Genevriéres, Goutte d’Or, Charlemagne.

Class J.—Montrachet. Class II.— Chevalier Batard Montrachet,

The wines of Céte-d’Or are full-bodicd and of excellent colour ; they are of great reputation on the Continent, especially in Belgium, although till recently not so well known in England, owing to the difficulty experienced in keeping them. But this drawback has now been removed by increased care in their treatment, and by a system of freezing in the young wines, by which a quantity of the natural water is removed and the alcoholic strength of the re- mainder thereby increased. One of the principal features of the Céte-d’Or is the Hospice de Beaune, a celebrated charitable institu- tion and hospital, the revenues of which are principally derived from certain vineyards in Beaune, Corton, Volnay, and Pommard.

The wines of these vineyards are sold every year by auction on the

first Sunday in November, and the prices they make serve as standards for the various growths of Burgundy. In Yonne, lying

to the north-west of Céte-d’Or, a considerable quantity of wine is

made, both red and white. The former has good colour and body,

with a fair bouquet, but is much inferior to the wines of Burgundy proper. The latter, grown mostly in the commune of Chablis, is Chablis, of fair quality and is generally known by the name of this district. Saéne-et-Loire, which lies to the south of Beaune, produces the

wine known as Macon, grown in the neighbourhood of that town, Macon. the best growths being those of Théorine. The wines of MAcon

have most of the Burgundy characteristics, but are lighter in colour

and body, and lack much of their bouquet and flavour.

Red and white wines are produced in the arrondissement of Hermit-Valence in the department of Dréme. These wines are of excellent age. quality and improve greatly in bottle, in which state they will keep for many years. The white wines are especially choice, and have a far greater reputation than the red. They are soft and rich, and are said to have no analogy to any other white wine known.

The departments of Charente and Charente-Inférieure, although Charente. their wines are unknown in the United Kingdom, are celebrated on account of the brandy distilled from them. This industry has suffered enormously of late years from the ravages of the Phylloxera, which has destroyed many of the best vineyards in the neighbour- hood of Cognac. The wines of the district are in themselves common and of little use but for the still, for which purpose they cannot be approached by those of any other department. But the proportion of wine required to make brandy is so high that, unless it can be produced at a moderate price, the cost of the spirit becomes enormous ; hence the proprietors have been unable to obtain a sufficiently high price for their wines to make it worth their while to incur the cost of resisting the plague, and consequently a large quantity of vine-land has gone out of cultivation. In 1874 the produce of the two departments amounted to over 250,000,000 gallons, whereas that of 1887 was little over 14,000,000 gallons. During the last two or three years re-planting has been diligently carried on.

The above constitute the principal varieties of French wines known in the United Kingdom ; they form, however, but a sinal]l fraction of the entire production of the country. Enormous quan-

Montrachet, Charmes,

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tities are produced in the southern provinces, but they are of a commoner description and are reserved for home consumption. Thus in 1887 the two departments of Aude and Hérault yielded between them 5,643,832 hectolitres, or about 124,160,000 gallons, which was considerably in excess of the total produce of the districts previously alluded to. In the department of Pyrénées-

of wine, however, has not hitherto been in great demand in Great

Britain. In addition to Manzanilla, there is another description of somewhat similar wine, but with less characteristic taste and some-

what more body, known as Montilla ; it is grown in the province Montilla, of Cordova. Yet another description of wine grown in the vicinity, Moguer, on the right bank of the Guadalquivir, is that known as Moguer, &e.

Algeria.

Sherry.

Orientales, in the old province of Roussillon, a full-bodied and deep-coloured wine is produced, a small portion of which is sent to Great Britain and is of a better quality than most southern growths. This wine is known by the old name of the province and is of considerable value for blending light thin wines. There are also some very fair wines made in the department of Jura and in the district lying east of Burgundy.

Algeria.—Owing to the devastation caused by the Phylloxera in France much attention has of recent years been bestowed on vine culture in Algeria. The result of the first experiments has been very encouraging. M. Bouchardat in a recent report to the Medical Society of Paris wrote—" In the not very distant future by means of the vine we may look for the definite conquest of Algeria. Through its cultivation new colonists will be brought into the country and the habit of labour and its accompaniment, wealth, will result both for them and for the natives. It is through the cultivation of the vine also that we may hope to remove the greatest

present obstacle to progress in Algeria, viz., the unhealthiness of the marshlands ; for in reality on all the soils where the vine is cultivated we soon see those conditions disappear to which intermittent fevers owe their origin." Algeria undoubtedly possesses soil and climate suit- able to vine culture ; in fact, the vine seems almost to grow at will and is productive in the third year after being planted. The laying out of vineyards is consequently proceeding very rapidly, and con- siderable improvement by means of skilled labour is becoming noticeable in the making of the wines. The wines of Algeria re- semble that of Roussillon in general character, being full-bodied, with good colour and alcoholic strength. The greatest quantity is produced in the province of Algiers, although there is a consider- able yield in the provinces of Constantine and Oran, the latter being cultivated principally by Spaniards.

Spain.

Spain is second only in reputation to France among wine-growing countries. Its white wine, known as sherry, first brought it into prominence ; and the red wines of Tarragona and Rioja have of late years formed a great feature in the commerce of the Peninsula. The reduced yield of the French vineyards, especially of those pro- ducing the cheapest wines, owing to the ravages of the Phylloxera, combined with an increased home consumption, has compelled that country to import large quantities of wine for its own use, and Spain has taken a foremost place in supplying the demand which has thus sprung up. In addition to this, a considerable quantity is exported to other countries, Great Britain amongst the number, in the shape of Spanish claret and port, which are perhaps of as good an intrinsic value as any that reach the United Kingdom. The wines of Andalusia naturally claim a priority in description.

Sherry, so called from the town of Jerez (Xeres) de la Frontera, the headquarters of this industry, is produced in Andalusia in the area included between San Lucar in the north, Port St Mary in the south, and Jerez in the east. This tract of country contains in all about 25,000 acres of vine-growing soil. The system of pre- paring sherry is different from that followed in the case of most other wines. In France every small

grower can make his few hogsheads of wine, and when these have been made the process is complete. In Jerez, on the contrary, the immense establishments, many of them owned by Englishmen, purchase the grape juice or fruit and make their own must. The wines, which are stored in bodegas or sheds above ground, are reared for a number of years as soleras. These soleras consist of vats of various characters of sherry, the style of which is unvaryingly kept up, and whenever a quantity is drawn off they are filled up with wines of the same description. Certain quantities taken from various soleras are blended in order to make up the regular marks, by which means the style of different shipments is maintained. There are several different varieties of sherry known in the United Kingdom, which may be divided into the Amontillado and the Manzanilla classes. The Amontillado class may be again subdivided into Fino and Oloroso, the former being the more delicate; frequently the two descriptions are different developments of exactly the same wine. The Manzanilla wines are very much lighter and drier, and are the produce of vines grown on the coast. In making up the marks for the different markets several varieties of sweetness and colour are required. 'These are obtained by the addition of vino dulce made from grapes which are allowed to grow dead-ripe, and of colouring matters made from wine boiled down almost toa liqueur. A cer- tain amount of grape spirit is added to check the tendency to re- fermentation. This system applies only to the Amontillado class. The Manzanillas are mostly shipped in their natural state, with spirit added in small quantities only where it is feared that the wines will otherwise not be able to stand the journey. This description

which resembles a cheap sherry, and is only used for blending with the commonest qualities. Of late a large quantity of this wine has found its way to France to assist in making a cheap wine for the French consumers. Other districts in the south of Spain well known for the production of wine are those of Malaga and Rota. The former yields a sweet description, principally made from Muscat grapes, although a coarse drier wine of the sherry type is also produced. The Rota district is known principally for a sweet red wine, known in England as '"'teut" (tinto), mainly used for ecclesiastical purposes.

The central districts of Spain also produce some good red wines Val de suitable for exportation, such as Val de Pefias, which have moderate Peiias.

colour and considerable strength, and are said to be the produce of vines brought from Burgundy. The name Val de Pefias, how- ever, is often given also to wines grown in the neighbouring dis- tricts. The system of storing these wines is very similar to that mentioned by Horace in connexion with Falernian, and is still practised at Montilla. The wines are placed in large earthen jars (tinajas) like Roman amphore, which are prepared inside with a kind of varnish with a view to the preservation of the wine.

Leon and Old Castile in the northern and central parts of Spain Riojaand furnish about one-half of the wine grown in the entire country. Tarra- On the border of this region is the rich and fertile district of Rioja gona.

(Logrofio), which has a climate admirably suited to the production of wines of moderate strength, The wines of Navarre are more full-bodied and have more colour and alcoholic strength, but owing to want of care in their production are less suitable for exportation. In Catalonia there isa much more important wine industry, the district producing what is known in England as Tarragona or Spanish red. The best quality produced is the wine of the Priorato district (about 15 miles inland from Tarragona), which is very rich and full-bodied, and keeps well. Unfortunately this particular area, Which is chiefly mountainous, is limited. The next descrip- tion to this is the wine of Huesca, which is also fine-coloured and full-flavoured. The wines of Aragon are also good, but require special care owing to their liability to a second fermentation. The best growth is that of Carinena (Zaragoza). The greater part of the Spanish wines imported into France are supplied from Catalonia and Aragon. A French authority on the subject states that " of all the towns in Catalonia which supply wines to France Manresa is in reality the one which, for several years, has sent the largest quantity. This region enjoys a climate more temperate than that of Roussillon, and from hence are derived three-quarters of the wine shipped to France from Barcelona.

Hence may be found all types of wines, including dry white and natural red."

The only islands of the Canary group on which vine culture is Canary now carried on on a commercial scale are those of Gran Canaria wine.

(Grand Canary) and Teneriffe, for although a certain amount is produced at Palma it is all used for local purposes. On the two first- named islands the industry has fallen away of late, owing to the attacks of Oidium, which destroyed the vines at about the same period as in Madeira. Since then the islands have been chiefly de- voted to the production of cochineal, until the recent discovery of aniline dyes, which has, to a great extent, ruined the industry, and again led the inhabitants to turn their attention to vine culture. This has been especially the case in Gran Canaria, where a consider- able area of ground is now planted with vines, and a fair return of wine is obtained. These are being treated similarly to those of Madeira, which they greatly resemble in character. In Teneriffe a wine known as Vidonia, which is of a somewhat similar type, is produced, and is exported in small quantities. Vine-growers in this island adhere more to the methods in vogue in Spain.

Portugal.

The generous, full-flavoured wines known as port are the produce Port.

of the district of Alto Douro in the north-east of Portugal, which begins at a point on the river Douro some 60 miles above Oporto, whence these wines are shipped. 'The whole of the port-wine dis- trict, comprising a region between 30 and 40 miles in length with a maximum breadth of about 12, is rugged and mountainous, necessitating the construction of terraces supported by walls, with- out which protection the soil would inevitably be washed away by the winter rains. The climate of Alto Douro is very cold in winter and extremely hot in summer (frequently 108° Fahr. in the shade). It is owing to this intense heat combined with the peculiar richness of the soil, which is of argillaceous schist formation, that port wines attain to such perfection of colour, body, and ripeness. Till quite recently the means of communication between Oporto and Alto Douro were extremely limited. Roads in the district itself there were none, or very

few, and the only way of getting the produce to the port of shipment was by the river, the naviga-

Cultiva- tion of

the vine for port.

Vintage in Alto Douro.

tion of which, at all times difficult and even dangerous, on account of the numerous rocks and rapids which obstruct its course, is often rendered impossible by freshets. The Douro railway, however, now traverses the whole length of the wine country along the river bank from Oporto, and other lateral railways are in course of con- struction which will open up several fine wine-producing districts hitherto unavailable owing to want of roads.

The method of cultivating the vine in Alto Douro differs con- siderably from those employed in various other parts of the country, where the vines are either trained over pollarded trees or treillaged at a certain height from the ground, or where they are plantcd in rows and grown like bushes. The method is as follows. In November or December trenches are dug, 3 feet to 3 feet 6 inches deep, according as the soil is heavy or light, and 2 feet broad, in which vine cuttings are placed at a distance of 3 feet to 4 feet 6 inches apart from each other. The trenches are then partly filled in, in order that the vines may get all the benefit of the rain-water collecting in them. During the first year of planting great care is taken to keep down all weeds whilst the vines are shooting. At the end of two years the young vines, if they have come on well, can be grafted, the best time for performing this operation being October or February; in this way the period of production is hastened, and the vineyard will yield in four instead of five years' time. Should some of the vines die, their places are usually sup- plied by the process called mergulho or layering: that is, a trench is dug in the direction of the space left bare and in it the stock of the nearest vine is turned down. The trench is then partly filled in, leaving two or three shoots of the buried vine visible to the extent of a couple of

‘“‘eyes”’ above the surface, which shoots are to take the place of the missing vines. There is also the system of planting from nurseries, which are made with either Portuguese or American varieties. The plot of ground used for the nursery must be kept well clear of weeds and, if in a dry situation, well watered. In two years’ time and during the month of February the young vines can be transplanted, and the year after grafted, when the vineyard is planted. The first of the regular operations in the course of cultivation is to clear away the soil from the feet of the stocks, which takes place directly the vintage is over. At the same time mawure may be given, and, if the vines are strong enough to bear the application, sulphate of carbon may be injected, ou account of the prevalence of Phylloxera. After this the vines are pruned. In March the first annual turning of the soil takes place ; then the branches of the vines are tied to stakes or canes, in which process considerable skill is brought to bear so as to make the vine shoot in the required direction. Immediately after or about the time they blossom the vines are sulphured, to keep off the Oidiwm, which disease is still active in Portugal; and lastly in June the soil is hoed over to destroy the weeds. The turning of the soil, which is effected with an implement resembling a two-pronged hoe, and the cultivation of the vineyards generally, are to a great extent performed by labourers (Gallegos) from Galicia in Spain, but at vintage time serranos from the neighbouring serras also flock in to work.

The vintage in Alto Douro generally commences late in Sep- tember. The grapes are cut by women and children, and are con- veyed in large baskets—twenty-two of which full of grapes will yield a pipe of wine—by Gallegos to the place whcre the wine is to be made. Here they are emptied into large stone tanks, 2 feet to 2 feet 6 inches in depth, each holding from seven to thirty pipes of wine. Each tank is fitted with a beam press, except where the modern screw press has taken its place. As the grapes come in, the stalks are removed, either with a kind of rake or, as in the best managed establishments, with machines called desingacadores, made for the purpose. The white grapes are separated from the red, the “white port” being made from the former; this wine was formerly much appreciated in England, but now finds its chief market on the Continent. When the tank is full, a number of men, and sometimes even women, begin the process of treading, which is coutinued for about forty-eight

hours; after that the must is left to ferment by itself. When the weather has been cold or the year a very ripe one, it has sometimes been found necessary to give as much as seventy-two hours' treading ; nowadays, how- ever, there is seldom need for so much work. When the must has sufficiently fermented, it is drawn off into huge vats, holding as a rule about twenty-five pipes each; at the same time sufficient alcohol is added to prevent acetous fermentation and retain part of the sweetness of the grape. Formerly the drawing-off of the must from the tank was determined simply by taste or Judgment, but of late years the saccharometer is employed to decide when the must has reached the requisite degree of sweetness. The wines are left untouched in the vats till the cold weather causes them to deposit the lees, when they are racked, and at the same time another small addition of brandy is made. The brandy used is with hardly any exception simply distilled wine, and is of very fine quality. About March or April the wines are again racked from their lees into casks, and are sent down either by boat or rail to Oporto, where they are stored, in most cases for a considerable number of years previous

to being shipped. The cheaper wines are an exception, being as a rule shipped when young, also those of the so-called 'vintage " class, which are the finest wines of a good year kept separate and shipped as the produce of that particular year. The following is a list of the most famous " vintages" of the 19th century—1809, '12, "15, 720, 727, 784, "40, °47, "51, °63, G8, "70, 73, 78, Sd, the Imat year when the wine was shipped as a vintage being 1884. The stores or lodges where the wines are warehoused are chiefly situated on the Villa Nova side of the river, facing Oporto, and generally speaking comprise a series of long one-storied stone buildings, with thick partition walls and heavy tiled roofs. The wines are kept in casks ranged in rows of two or three tiers ; in some establishnients large vats, holding from 10 to 110 pipes, are also used, being especi- ally serviceable for blending purposes. The amount of wine con- tained at the present day in these lodges is calculated at something like 80,000 pipes, the gross value of which cannot be less than two and a

half or three million pounds sterling, by far the greater part of this sum representing English capital.

The chief market for port wine is, as it always has been, England. Port- Its introduction into England, which was the beginning of the wine trade in these wines, dates from the end of the 17th century. At trade. first the exportation was small, the annual average for the first ten years being just over 600 pipes. The consumption, however, gradu- ally increased till 1753, when, owing to adulterations and various other causes, port wine fell into disrepute, and the shipments receded to a very low figure. The prices of new wine to the farmer at this time varied between £2 and £3 per pipe, whilst the shipping prices for old wine did not exceed £9. To remedy this state of things the Old Wine Company was established in 1756 by the marquis of Pombal. The first act of the company was to make an arbitrary circumscription of what they considered the viticultural region of Alto Douro, outside of which no vines could be planted. The territory within the limits of the demarcation was then divided into three districts,—(1) that producing the factory wines, z.c., those set apart for England, (2) that whence the supplies for the Brazils were drawn, and (8) that the produce of which was reserved for tavern use or distillation. For all the wine allowed to be exported permits were issued, without which not a single cask could be sent dowu to Oporto for shipment. Later on, however, these permits were openly sold in the market, fetching asa rule about £3. The inconvenience and damage to the trade resulting from these absurd regulations led to the abolition of the company in 1833. But in 1843 the creditors of the Old Wine Company, whose lodges, with their valuable contents, had been destroyed at the raising of the siege of Oporto by the retreating Miguelites, induced the Govern- ment, as an indemnity for their losses, to re-establish the former company's monopoly. The new company had no authority to pre- vent the planting of vines ; but their powers as to the classification and exportation of port wine were the same as those possessed by the old company. For instance, in 1848 over 11,000 pipes were produced, but only 7000 were approved for exportation to England. At this time the export duty on wine destined for England was £3 per pipe—in reality £6, if the £3 permit is taken into considera- tion, whilst that on wine destined for countries out of Europe was only 6d. per pipe. The consequence was that considerable quantities of wine were

shipped to America and thence to England, the differ- ence in the duty just paying expenses with a slight profit to the shipper. This state of things lasted till 1853, when the company was finally 'exonerated from its official duties" and the export duty equalized on wine to all countries. Since that time the port- ° wine trade has been entirely unrestricted.

Besides the curse of monopolies, Alto Douro has suffered severely Ravages from the Oidiwm and Phylloxera. The former appeared about 1848, of Phyl- but it was not till 1853 that the disease assumed serious proportions. loxera The climax was reached in 1856, when only 15,000 pipes were vin- and taged, about one-sixth of the usual quantity. At one time it Oidium. seemed as if the whole trade would collapse, as the exportation dropped from 41,621 pipes in 1856 to 16,696 pipes in 1858. For- tunately, however, the sulphur remedy was discovered and applied in time, and since then the Oidiwm, though not eutirely got rid of, has at any rate been effectually prevented from doing much harm. The same, as yet, cannot be said of the Phylloxera, the ravages of which have been much more serious. Its presence in Alto Douro was suspected as early as 1868; but for years hardly any attempt was made to save the vines, owing to the incredulity of the large farmers, who considered the cause of the withering of their vines to be the coutinuous drought of successive dry seasons. More energetic efforts are now being made to cope with the disease ; but in the meantime the yield has been getting less year by year, and at the present time is little more than half what it used to be during the three years previous to the appearance of the Oidiwm, when the average was over 100,000 pipes. The excess of exportation over production for the last few years is owing, in the first place, to the enormous increase in the Brazilian trade, which is largely made up of wines from the Minho and Beira districts, and, secondly, to the new trade in commion country wines with France. The shipments of wine of all kinds from Oporto to the Brazils amounted during

1887 to over 25,000 pipes, whilst those to France exceeded 10,000. According to the latest accounts, the Phylloxera still continues to extend the area of its attacks, although, on the other hand, many of the

abandoned vineyards are again being brought under cultiva- tion; also the number and extent of the new plantations are steadily increasing. Statistics Exportation of wine from Oporto from 1678 to 1756, when the of port- Wine Company monopoly was established :—1678-87, average 632 wine pipes per annum; 1688-97, 7668 ; 1698-1707, 7188 ; 1708-17, 9644 ; trade. 1718-27, 17,692; 1728-37, 19,234; 1738-47, 18,556; 1748-56, 16,354. Total, 953,362 pipes. Total exportation of wine from Oporto from 1757 to 1833, or during the existence of the Wine Company mono- poly, 2,564,096 pipes. Average to Great Britain, 27,938 pipes; to rest of the world, 5362. Total, 33,300 pipes. Total exportation of wine from Oporto from 1834 to 1842 during the absence of re- strictions—to Great Britain, 233,469 pipes ; to continent of Europe,

11,980 ; to rest of the world, 41,600; total, 287,049 pipes. Average ©

to Great Britain, 25,941 pipes per annum ; to continent of Europe, 1331; to rest of the world, 4622. Total exportation of wine from Oporto from 1843 to 1853 during the existence of the New Winc Company monopoly— to Great Britain, 272,799 pipes; to continent of Europe, 47,271; to the rest of the world, 75,197; total, 395,267 pipes. Average to Great Britain, 24,800 pipes per annum; to continent of Europe, 42974; to rest of the world, 6836.

Exportation of Wine from Oporto from 1854 to 1887, during the absence of restrictions and equalized rate of export duties to all

paris. To Great) Rest of To Great] Rest of Year. Britain. jthe world. Total. Year. Britain. |the world. Total. Pipes, |- Pipes. Pipes. Pipes. Pipes. Pipes.

1854 | 88,881 | 5,421 | 39,252 || 1885 | 29,656 | 35,071 | 64,727 1864 | 29,042 | 5,677 | 85,619 || 1886 | 31,467 | 43,362 | 74,829 1874 | 35,758 | 20,778 | 56,5381 || 1887 | 32,052 | 39,459 | 71,511 1884 | 30,281 | 31,741 | 62,022

Total | 992,436 | 569,365 1,561,801

Lisbon In addition to port, a large quantity of wine is produced in other

wines. districts of Portugal, notably in the neighbourhood of Lisbon. Of these the principal are Torres Vedras, to the north of the city, where a large quantity of red wine of a coarse claret type is grown ; Collares, the vineyards of which lie beyond Cintra, and where a higher class is produced ; Carcavellos, at the mouth of the Tagus ; and Bucellas, in which a white wine is produced from the Riesling grape, known in the United Kingdom as Bucellas hock. Car- cavellos yields a fuller-bodied description, which savours more of the Madeira type.

Madeira. There is every reason to believe that vines were introduced into Madeira soon after the discovery of the island. But it was not till some 200 years later, after the marriage of the infanta Catherine of Portugal with Charles II. of England, that British merchants established themselves at Funchal, from which point the wine trade of Madeira commenced. The system of cultivation is some- what peculiar. The vines are trained over a lattice-work of cane, about 4 feet from the ground, supported on stakes, thus giving room for the vine-dresser to pass underneath and keep the ground clear from weeds. This system of keeping the ground clear and moist has much to do with the excellent character of the wine produced. An English acre can yield about seven pipes (644

- gallons), but the average is considerably below this quantity. The vintage commences as a rule about the last week in August, and the grapes are all pressed before the October rains set in. This latter operation is still carried out in the primitive fashion, the fruit being thrown into large presses and trodden with the naked feet. Madeira wine improves much with age, and is occasionally to be met with from fifty to a hundred years old. The choicest descriptions are Malmsey, Sercial, Bual, and Tinta. The Jesuits at one time contrived to hold the monopoly of the Malmsey wine, aud were owners of the vineyards at Cama de Lobos, in which it was produced. Of the other wines the choicest are found on the south side of the island ; but here as the elevation above the sea increases the quality falls off. The grapes from which Malmsey is made are not gathered till a month later than those for other wines of a drier character. Sercial is also a much-esteemed wine; it is said to combine all the attributes of a perfect wine, being full- bodied and having a rich aromatic flavour peculiar to itself. The grape from which it is produced is of the Riesling variety, and

is supposed to have been transplanted from the banks of the Rhine. Bual is a very luscious wine, the produce of a white grape. Tinta, on the other hand, is obtained from a red grape, and has somewhat of the character and appearance of the wines of Burgundy, whence the vines are said to have been derived.

Trade in Madeira wine became well known in England about the middle

Madeira. of the 18th century, when it became fashionable, owing to the strong recommendation of officers who had served in the West Indies and America. The great demand at the beginning of the 19th century caused the culture of the vine on the island to be greatly increased. The annual production must ultimately have

reached over 30,000 pipes, larger quantities of the commoner sorts being consumed on the island or turned into brandy. So much of the land indeed was under the vine that nearly ali bread-stuffs had to be imported, the corn grown on the island being at that time only equal to three months' consumption, whereas now, owing to the decreased number of the vineyards, it grows an amount equal to nine months' requirements. In evidence of the importance whieh at one time attached.to the Madeira wine trade, it may be mentioned that in 1799 a fleet of ninety-six ships was convoyed from Portsmouth to the port of Funchal by three men-of-war. This fleet took on to the West Indies 30414 pipes of Madeira, partly for the supply of the West Indian colonies and partly shipped for the voyage there and back to England. For many years this practice of sending wine for a voyage to the East or West Indies and back has existed amongst the Madeira merchants. The voyage matures the wine, and at the same time gives it a peculiar bouquet and flavour, derived most probably from the intense heat of the ship's hold and the continual motion to which it is subjected. There is, however, a marked difference between wines shipped to the East and those sent to the West Indies, the only reason assign- able being the difference in the length of the voyage. A custom prevails of submitting the wine, shortly after its manufacture, to a high temperature in buildings especially designed for the purpose, the result of which is the earlier development and mellowing of the wine, and the prevention of re-fermentation. The exact tempera- ture to which the wines

are thus subjected and the length of time depend on individual judgment, although the temperature never exceeds 130° to 140° Fahr. for inferior and 100° to 120° for better class wines. Itis this process which gives Madeira its charaeteristic flavour, to which again its popularity in Great Britain is due. The large stone buildings, two stories high, in which this process is carried on are divided into compartments and heated by flucs with hot air from stoves below. On the wines being removed after a lapse of three, four, or six months, as the case may be, they are fined and racked, a second proportion of brandy being added if necessary, and they are then left to themselves, except for an occa- sional fining and racking, until they are shipped, which scarcely ever takes place before the second or third year.

As long ago as 1785 the quantity of Madeira shipped to England was 120,000 gallons, which gradually increased up to 1820, when it reached 520,000 gallons. After 1852, however, this amount was greatly reduced, and, although it has again improved of late years, the quantity imported in 1885 was only 108,771 gallons. With reference to the wine trade of Madeira with all parts of the world, it appears that in 1646 as many as 2000 pipes were exported. About this time English and other foreign houses established them- selves in Funchal, and it is without doubt owing to them that the culture of the vine was increased and an export trade of some im- portance commenced. It was not, however, until the latter half of the 18th century that, in consequence of the wars between France aud England and the closing of the French ports, the Madeira trade increased to large proportions. In 1774 some 7000 pipes were shipped, which by 1780 had increased to over 16,000. In 1813 it is said some 22,000 pipes of Madeira were exported, at an average price of 300 dollars per pipe. After the war the large convoys to the Hast and West Indies ceased, but the Indiamen still called at Madeira on their outward voyage. Nearly all the regimeutal messes in the East Indies were supplied with Madcira wine, whilst large shipments were also made to America, Russia, and Germany. The taste for Madeira has of late very much died away, the cause of which must be traced to the appearanec, in the spring of 1852, of the Oidiwm Tuckeri, which devastated the vineyards of the island. Vines were rooted up and sugar- canes planted in their stead, whilst, with production practically at a standstill, holders refused to part with their wines except

at enormous figures. In consequence of these high prices Madeira was soon placed beyond the reach of all but the wealthiest classes. When in the course of time a cessation of the disease came about, the Madeira vineyards began to be re-planted, so that the produc- tion of the island has again reached some 5000 to 6000 pipes annu- ally, and brought about a corresponding reduetion in price, genuine wine being now obtainable at considerably less than £20 per pipe. Popular prejudice is in consequence being removed, and a gradual although slow revival in the Madeira trade is taking place.

Tialy.

In point of quantity of production, though far inferior in quality, Italian Italy ranks ahead of France. The estimated area under the vine wines.

is in excess of that of France. The annual yield is some 660,000,000 gallons, valued at about £100,000,000. Whereas in France and Spain the acreage under the vine is devoted exclusively to that plant, the vine in Italy is grown simultaneously with the olive, corn, &c. The vines are simply trained on wires at some distance from the ground, and are frequently allowed to run from tree to tree, mingling in the general vegetation, nature doing so much for the vine-grower that he, in most instances, does but little to assist her. The vintage usually takes place in September and October, XXIV. — 77

Sicilian.

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and, except in Sicily and some of the southern provinces, the system employed is somewhat rude in comparison with those of other nations. Yet considerable improvement has taken place during the last few years. Greater attention is being paid to the selection of suitable plants, whilst on the larger estates modern wine-presses and utensils are coming into use, and the necessity of care and cleanliness for the production of good wine is beginning to be better understood. Amongst the chief faults still noticeable, but remediable with cultivation and care, are a strong flavour peculiar to the soil and a disposition on the part of the proprietors to over-

alcoholize wines destined for exportation. In many instances also the grapes are gathered indiscriminately, often before they are ripe, whilst the quality is also frequently further damaged by want of attention and cleanliness in treatment. There can be no doubt that with proper treatment the wines of Italy would hold a much higher position than they do at present, the exports being, so far, trifling compared with the amount of production, and consisting to a great extent of Sicilian wines. Of the wines of northern Italy the best known descriptions are perhaps those of Montferrat and Asti. These are mostly light in colour, hard, and somewhat diffi- cult to keep. Some of the white wines of this district are very good. A large quantity of sparkling wine is also produced. The general nature of the soil is extremely fertile and the climate moderate, so that everything points to northern Italy as very suit- able for wine production. In central Italy the best wines are those of Montepulciano, Chianti, Pomino, Montalcino, and Carmignano. The greater proportion of the wine made here is from the province of Tuscany, which is also a very suitable one for the vine. These wines have considerable alcoholic strength, and are fit for consump- tion in about six to twelve months after the vintage, attaining per- fection in two years. The price usually varies from 11d. to 2s. 11d. per gallon, according to growth. The wines of Montepulciano have a brilliant purple colour and a luscious flavour, although not cloy- ing to the palate, their sweetness being gcnerally tempered with an agreeable sharpness and astringency. The rocky hills of Chianti near Siena furnish another description of red wine, which is also sweet, but less aromatic. An excellent wine of the claret type is produced at Artimino. But perhaps the choicest wines grown in Italy are those of the Neapolitan district. Of these the best known are the Lacryma Christi a red wine of good bouquet and an elegant taste, several descriptions of good class Muscat wine, and also a de- scription of Malvoisie. These three sorts are the produce of vines grown on the slopes of Mount Vesuvius nearest the sea. Of the Lacryma Christi only a small quantity is made, but many of the second-rate wines of the neighbourhood take the name and pass in common for the growth.

Until recently the greater portion of the wines exported by Italy to other countries were for blending purposes. Lately, however, there has been a marked improvement in this respect, and a con- siderable quantity of wine

is now exported in bottle. A trade of some importance is being developed with the United States, the imports in 1887 having amounted to 26,340 dozen bottles and 71,020 gallons in bulk.

The principal wine produced in Sicily is that grown in the neigh- bourhood of Marsala, from which town it takes its name. The character of the wine is somewhat after the style of Madeira, it having good bouquet and improving with age. It is the result of a mixture of various kinds of grapes carefully selected, amongst which are included the usual Madeira varieties. Thanks to the eave bestowed upon its production, Marsala has of late years ac- quired considerable reputation. The vintage usually takes place about the third week in September, which, although somewhat late for so southern a latitude, allows the grapes to mature thoroughly, whilst all the rotten ones are carefully picked out before the fruit is put into the press. The shippers usually arrange to purchase the vintage from the growers, subject to the condition that the wine is made in a certain manner. The must is collected in large casks capable of holding about 250 gallons each, in which it is allowed to ferment. The system pursued in the preparation of Marsala, as in the case of other strong wines, consists in the addi- tion of a certain quantity of spirit, according as the wine is intended for shipment to England or for consumption in Italy, the former being generally brought up to a strength of 33° to 35°, or about 5° more than that reserved for home consumption, the extra strength being to enable the wine to stand the sea voyage. Taken generally, there is very little difference between the qualities of the different growths of Marsala ; in fact, where the system of fortifying and sweetening is properly carried out and the best description of finings used to reduce the reddish tint found in most of the wines, it is almost impossible when the wines are two or three years old to detect any great variation, whilst such a thing as bad Marsala can scarcely be said to exist. Formerly all Marsala wines judged not sufficiently good for consumption as such were made into spirit for fortifying the better description ; but, since the Italian Govern. ment have raised the duty on alcohol, a different system is adopted. The inferior class of must is not now fermented, but is reduced by evaporation to about two-thirds of its original bulk, thus forming

a sort of essence. This essence is added to the wine intended for consumption in the proportion of from 5 to 10 per cent. at the com- mencement of the fermentation. Within about two months of the first drawing-off of the wine the contents of each cask are carefully examined, and all which may be considered not sufficiently good for Marsala is sct aside ; and this operation is repeated in March or April. Immediately after the next vintage it is examined for the third time, after which it is fined and drawn off into large vats capable of holding up to 18,000 gallons each. These vats, like the Spanish soleras, are never entirely emptied, a certain quantity of old wine being allowed to remain in them, which gives the new wines the bouquet and character peculiar to true Marsala.

Austria-Hungary.

Of the Austrian-Hungarian empire Hungary, from a viticultural Hun- point of view, forms by far the most important part. The quantity garian.

of wine produced in that country has assumed of late years con- siderable proportions, the white wines page both greater in quan- tity and of better description than the red. Inclusive of Croatia aud Slavonia, it is estimated that there are in Hungary upwards of 1,000,000 acres of vineland, producing annually some 250,000,000 gallons of wine, the value of which is estimated at over £16,000,000. The wines of central Hungary are strong, and include white varieties varying in colour from a light to a deep yellow tinge, as well as wines of considerable depth of colour. Those of the south of Croatia are as a rule less strong, but are for the most part of a deep colour and are generally known as black wines. The produce of Transylvania ranks extremely high,and is for the most part white, although some excellent red wines arc grown. The strength of Hungarian wines is moderate, that of Tokay being from about 20 to 25 per cent. of proof spirit, whilst Carlowitz averages from 24 to 25. The other descriptions generally have a less alcoholic strength. Foremost among the wines of Hungary is the sweet Tokay, grown in the submontane district around the town of Tokay, which covers a space of about 20 square miles. Throughout the whole of this district it is the custom to collect the grapes only when they have become dry and sweet, almost like raisius. The fruit is gathered separately and the best wine made from selected grapes. The

grapes are first put together in a cask, in the bottom of which holes are bored to let that portion of the juice escape which will run away without pressure. This forms the highest quality. The grapes are then squeezed for the ordinary wine. In abundant years the yield of Tokay reaches nearly 2,000,000 gallons, of which about 15 per cent. are of really superior quality, and of this about one-fifth is classified as extra fine. The three classes of Tokay are known as essentia, ausbruch, and mdslds, the first-named being the yield of the juice taken without pressure. It is, however, so scarce that it never appears in the market. The vineyards of Menes (in the county of Arad) produce a sweet red wine. Cavlowitz is produced farther south, on the banks of the Danube, some 40 miles north-west of Belgrade. It has somewhat of the character of port wine, although more astringent and lacking in fruitiness. Many of the Hungarian vineyards also produce Muscat-flavoured wines which are highly appreciated. The vintage in Hungary lasts from the commencement of October to the end of November, and for the most part is conducted on an imperfect principle, although great improvements have becn introduced of late years. The grapes are crushed by the feet in some places, whilst in others a kind of mill is used, and in others again they are pressed in sacks, The wine is usually prepared in wooden utensils, generally made on the spot, the trade of the cooper being but little known. The system of carrying on the fermentation in closed barrels is not always adopted, and the wine is frequently spoilt by not being drawn off in time.

Next to Hungary the principal vine-growing district of the empire Dalma is Dalmatia, in which the vine culture has of late increased to an tian.

enormous extent. Fifty years ago the vine was scarcely grown, except in the islands and on the sea-coast; but it has now pene- trated into the interior, and occupies about one-twentieth part of the soil under cultivation. The Dalmatian wines, which are almost entirely red, have generally full colour and contain a high degree of alcohol, whilst they also possess a good body and bouquet, re- sembling in a great measure the wines of Burgundy. The average annual production is 22,000,000 gallons, of which only about 4,000,000 are exported ; but this branch of the trade is gradually increasing, Defective cellarage, imperfect fermentation, and general

ignorance as to manipulation prevented the development of the

wine trade of Dalmatia for many years ; but these defects have of late been in a great manner remedied by the action of the Austrian Government in educating the proprietors in this respect. The best wines produced in the province are Moscato Roso, Vino Taitaro, Prosecco Vugova, Maraschino, and Malvasia.

Germany.

German wines, gencrically spoken of as Hock and Moselle, arc Rhine the products of the most northern latitude of successful vinc-culture wines.

in Europe. To this circumstance must be attributed the fact that

Moselle wines.

Russia and Greeee.

United States.

Wins

a greater inequality exists in the different vintages than is known in connexion with the wines of any other country. In a successful season, when the grapes have been able to mature thoroughly, per- haps no class of wine shows more elegance and quality than do those of the Rhine provinces, while, on the other hand, there are none on which the adverse influence of cold and wet is more appar- ent. 'The principal wine-producing districts of Germany are Alsace- Lorraine, Baden, Wiirtemberg, the Hessian and Bavarian Palatinates, and the Rheingau, the total annual production of which is about 80,000,000 gallons. Of thesc the first three give half the aggregate yield ; but their wines are chiefly light and poor, and are only used for home consumption. The best wines of Germany are grown on the banks of the Rhine in the neighbourhood of Mainz: the Rhein- gau, in which the choicest descriptions are grown, lies on the right bank of the river, whilst the vineyards of Hesse lie on the left. The wines produced on the left bank are

full-bodied and with good flavour, the best growths being Liebfraumilch, Nierstein, Schar- lachberg, and Forst, which are considered nearly equal to the Rheingau wines. Amongst the latter are the wines of Johannisberg and Steinberg; the first-named is looked upon as the king of German wines. In the samc neighbourhood are also the celebrated vineyards of Riidesheim, Grafenberg, and Rauenthal. The vineyard of Johannisberg is said to have been planted about the year 1009, under the direction of Ruthard, archbishop of Mainz. During the Thirty Years' War these vineyards were destroyed, but in 1722 the abbot of Fulda built a chateau on the site of the old convent and re-planted the vineyards. Hochheimer is the produce of a compara- tively small district situated on the banks of the Main, several miles above its junction with the Rhine. The name (whence Hock) has been known in England for upwards of two hundred years, and no doubt originally included and denoted the general body of Rhine wines. The wines of the Moselle, many of which are shipped as sparkling wines, occupy only a secondary position, although in favourable seasons they are characterized by a light pleasant flavour with a marked aroma. The wines of Germany, at least of the descriptions exported, are mostly white, although a small quantity of red is grown in the Palatinate, notably at Assmannshausen, which resembles Burgundy. The yield, however, is comparatively trifling. Amongst the leading descriptions of vine plants in German vineyards the Riesling stands out pre-eminent. It is gener- ally planted on the rocky mountain slopes, and the bunches of white grapes which it produces only ripen perfectly in years of high temperature. When this is the casc, however, they yield a wine of high quality, the characteristics of which develop as the wine grows older. On the lower lands the speeies known as the Klein- berger and Oestreicher are planted, the grapes of which ripen more easily and produce more freely than the Pineau Riesling grape. The French vines, the Pineau and Gros Blane, are also cultivated in Germany. But one-half of the vines growing on the banks of the Rhine are Riesling plants, which are probably indigenous to the valley, as, although planted elsewhere, they have never been found to yield fruit of such quality as in the Rheingau. Great care is bestowed upon the process of vintage, which usually takes place at as late a date as possible, as a rule not before the end of October or beginning of November, in order to allow the grapes to ripen as thoroughly as may be. The wine is allowed to ferment in casks instead of in vats, as in most other

countries, owing to which cir- cumstance considerable difference in quality and price is apt to exist in the produce of the same growth and vintage. After the grapes are gathered, they are pressed as they attain ripeness ; and, after the fermentation is duly effected, the wine is fined and racked into vats, which are constantly filled up so that the wine improves with age. The time for racking varies with different proprietors, some taking the wine off the lees in the February following the vintage, whilst others allow the lees to remain a year in the wine, a process which gives it a fuller and sweeter taste. Several years are required to get the wine fit for bottling, as there is no fixed peviod at which it will finish its fermentation, in fact the finer the wine the longer the time requisite to get it in condition. During this period it receives the greatest attention and is frequently tested, condition being perhaps the greatest difficulty in connexion with German wines. Russia and Greeee,

A certain quantity of wine is made in the southern portions of Russia and in Greece ; but the quality is mostly coarse and common, and the produce is almost entirely used for home consumption.

United States.

The cultivation of the vine has made rapid progress of late years in the United States, and American wines are steadily taking the place of the foreign product. The soil and climate of the Pacific coast seem best adapted to the growth of the vine, and wine-making appears likely to beeome one of the leading industries of California, where the vine was first introduced by the Franciscan fathers about the year 1769. The variety of grape first planted in that region was known as the " Mission" grape, and is gencrally supposed to have been imported from Mexico. Subsequently the principal

varieties of French, German, and Spanish vines were introduced into that State and have all been tried with more or less success. The result is that several descriptions of wine are now made in California resembling, to a certain extent, the leading European types, although, as a rule, of a coarser style,—a defect, however, which is disappearing with the spread

of technical knowledge. Although California is by far the largest grape-growing State in the Union, producing nearly one-half of the wines madc in the United States, yet the rate of increase of the product during the past five years has been greatest in other States. In Ohio, upon the shores of Lake Erie and along the Ohio river, the vine is ex- tensively cultivated. 'The champagnes and clarets made in the neighbourhood of Sandusky and Cleveland, and the 'sparkling Catawba," made originally by Nicholas Longworth of Cincinnati, are produced in considerable quantities. New York, Missouri, Illinois, and Pennsylvania are likewise large wine-producing States, the largest wine-manufacturing establishment bemg in New York State, in Steuben county. The annual yield in each of these States ranges now (1888) from 2,000,000 to 4,000,000 gallons. Wines of inferior quality are made in small quantities in nearly all the States. In the eastern and middle States the principal grapes are the Catawba and Ives seedling, while in the south the Virginia seedling and the Scuppernong grapes are the favourites. The wine-grapes in these regions resemble the grapes of Germany and France, con- taining more acid and flavour, while those grown on the Pacitic coast are of a milder and sweeter character, resembling the wines of Spain. The principal obstacles in the way of the cultivation of the vine in the United States are mildew and blight, which sometimes destroy the entire foliage of the vine, and the grape-rot, whieh in some localities has bafiled the grower and caused the abandonment of grape-culture. The ravages of the Phylloxera are likewise encountered in certain localities, but these are not so ex- tensive in the United States as in France, and, indeed, certain varieties of vine are entirely free from them. The exports of American wines, though still small, are rapidly increasing. The imports of foreign wines have steadily decreased during the past fifteen years. The total annual production of wine in the United States now amounts to about 35,000,000 gallons.

Cape of Good Hope.

Previous to the alteration of the wine duties in 1860, which placed Cape of foreign and colonial wines on a similar basis, a considerable business Good was developing in the United Kingdom in favour of Cape wines, Hope.

especially of those descriptions most resembling the traditional port and sherry. The Cape of Good Hope in its geographical and climatic elements greatly resembles the vine-growing countries of Europe, and, notwithstanding certain earthy characteristics (due in the main to imperfect cultivation) which were inseparable from its wines, bade fair at one time to rival the best of its competitors north of the equator. The equalization of duty, however, has con- siderably checked the trade in Great Britain, notwithstanding the great improvement which has since taken place in wine-making at the Cape. Australia.

Wine-producing has been prosecuted as an industry for many Australia.

years in the Australian colonies, and in some instances with con- siderable energy. But it has not hitherto developed to any great extent, owing to the absence of differential dutics to favour the growers and the cost of freight, although from the quality of their production they have no reason to dread competition with the wine-growers of Europe. The Australian colonies (Victoria, South Australia, New South Wales) have suffered much from want of technieal knowledge both in vine selection and wine preparation, though in both of these branches considerable progress has been made during the last few years. According to Mr J. P. Stow, in his History of South Australia, the tentative stage of vine culturc in that colony has now passed. Good markets for its vintages may be expected in Europe as soon as wines of certain qualities are made in sufficient quantities to allow of heavy stocks being kept. As with the growths of Médoc, attempts are being made to keep the yields of the various vineyards distinct, those of Highercombe, Auldana, Tintara, &c., in South Australia being well known in Great Britain. In their principal characteristics these wines re- semble those of France, the red wines being intermcdiate between claret and Burgundy, while the white wines, although the fuller descriptions eome ncar Sauterne and Chablis, as a rule take more after those of the Rhine. The quantity imported into England during 1887 amounted to 168,188 gallons.

Asia.

Although holding a position of little importance in wine-grow- Asia.

ing, as compared with Europe, Asia yields a certain quantity for home consumption. Chief amongst these are the wines of Caueasia and Armenia, which, according to Thudicum, are more notable for their alcoholic strength than for their colour. Wines are also made in Persia, especially in the district of Shiraz; these, however, rarely find their way into the market. (H. J. N.)

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WINKELRIED, Arnotp von. The incident with which this name is connected is, after the feat of Tell, the best known and most popular in the early history of the Swiss Confederation. We are told how, at a critical moment in the great battle of Sempach, when the Swiss had failed to break the serried ranks of the Austrian knights, a man of Unterwalden, Arnold von Winkelried by name, came to the rescue. Comrhending his wife and children to the care of his comrades, he rushed towards the Austrians, gathered a number of their spears together against his breast, and fell pierced through and through, having opened a way into the hostile ranks for his fellow- countrymen, though at the price of his own life. But the Tell and Winkelried stories stand in a very different posi- tion when looked at in the dry light of history, for, while in the former case imaginary and impossible men (bearing now and then a real historical name) do imaginary and

impossible deeds at a very uncertain period, in the latter

we have some solid ground to rest on, and Winkelried's act might very well have been performed, though, as yet, the amount of genuine and early evidence in support of it is very far from being sufficient.

The Winkelrieds of Stanz! were a knightly family when we first hear of them,though towards the end of the 14th century they seem to have been but simple men without the honours of knighthood, and not always using their prefix "von." Among its members we find an Erni Winkelried acting as a witness to a contract of sale on May 1, 1367, while the same man, or perhaps another member of the family, Erni von Winkelried, is plaintiff in a suit at Stanz on September 29, 1389, and in 1417 is the landamman (or head man) of Unterwalden, being then called Arnold Winkelriet. We have,

therefore, a real man named Arnold Winkelried living at Stanz about the time of the battle of Sempach. The question is thus narrowed to the points, Was he present at the battle, and did he then perform the deed commonly attributed to him? involving a minute investigation of the history of that battle, to ascertain if there are any authentic traces of this incident, or any opportunity for it to have taken place.

(1) Evidence of Chronieles.—The earliest known mention of the incident is found in a Zurich chronicle (discovered in 1862 by Herr G. von Wyss), which is a copy, made in 1476, of a chronicle written in or at any rate not earlier than 1438, though it is wanting in the 16th-century transcript of another chronicle written in 1466, which up to 1389 closely agrees with the former. It appears in the well- known form, but the hero is stated to be "ein getriiwer man under den Eidgenozen," no name being given, and it seems clear that his death did not take place at that time. No other mention has been found in any of the numerous Swiss or Austrian chronicles till we come to the book De Helvetize Origine, written in 1538 by Rudolph Gwalther (Zwiugli's son-in-law), when the hero is still nanieless, being compared to Decius or Codrus, but is said to have been killed by his brave act. Finally, we read the full story in the original draft of Giles Tschudi's chronicle, where the hero is described as "a man of Unterwalden, of the Winkelried family," this being expanded in the final recension of the ehronicle (1564) into 'fa man of Unterwalden, Arnold von Winckelried by name, a brave knight," while he is entered (in the same book, on the authority of the " Anniversary Book" of Stanz, now lost) on the list of those who fell at Sempach at the head of the Nidwald (or Stanz) men as "' Herr Arnold von Winckelriet, ritter," this being in the first draft " Arnold Winckclriet."

(2) Ballads.—There are several war songs on the battle of Sem- pach which have come down to us, but in one only is there men- tion of Winkelried and his deed. This is a long ballad of 67 four- line stanzas, part of which (including the Winkelried section) is found in the additions made between 1531 and 1545 to Etterlin's chronicle by H. Berlinger of Basel, and the whole in Werner Steiner's chronicle (written 1532). It is agreed on all sides that the last stanza, attributing the authorship to

Halbsuter of Lucerne, "'as he came back from the battle," is a very late addition. Many

1 Their history from 1248 to 1534 has been minutely worked out from the documents by Herr Hermann von Liebenau, in a paper published in 1854, and reprinted at Aarau in 1862, with much other matter, in his book, Arnold von Winkelried, seine Zeit und seine That,

authorities regard it as made up of three distinct songs (one of which refers to the battle and Winkelried), possibly put together by the younger Halbsuter (citizen of Lucerne in 1435, died between 1470 and 1480), though others contend that the Sempach- Winkcl- ried section bears clear traces of having been composed after the Reformation began, that is, about 1520 or 1530. Some recent discoveries have proved that certain statements in the song usually regarded as anachronisms are quite accurate; but no nearer approach has been made towards fixing its exact date, or that of any of the three bits into which it has been cut up. In this song the story appears in its full-blown shape, the name of Winckelrict being given.

(3) Lists of Those who Fell at Sempach.—We find in the " Anni- versary Book" of Emmetten in Unterwalden (drawn up in 1560) the name of "der Winkelriedt" at the head of the Nidwald men Gi and in a book by Horolanus, a pastor at Lucerne (about 1563), that of "Erni Winckelried" occurs some way down the list of Unterwalden men.

(4) Pictures and Drawings.—In the MS. of the chronicle of Die- bold Schilling of Bern (c. 1480) there is in the picture of the battle of Sempach a warrior pierced with spears falling to the ground, which may possibly be meant for Winkelried; while in that of Diebold Schilling of Lucerne (1511), though in the text no allu- sion is made to any such incident, there is a similar picture of a man who has accomplished Winkelried's feat, but he is dressed in the colours of Lucerne. Then there is an engraving in Stumpf's chronicle (1548), and, finally, the celebrated one by Hans Rudolph Manuel (1551), which follows the chronicle of 1476 rather than the ballad.

The story seems to have been first questioned about 1850 by Moritz von Stiirler of Bern, but the public discussion of the subject originated with a lecture by Prof. O. Lorenz on "Leopold III. und die Schweizer Biinde," which he delivered in Vienna on March 21, 1860. This began the lively paper war humorously called "the second war of Sempach," in which the Swiss (with but rare exceptions) maintained the historical character of the feat against various foreigners—Austrians and others.

Most of the arguments against the genuineness of the story have been already more or less directly indicated. (1) There is the total silence of all the old Swiss and Austrian chroniclers until 1538, with the solitary exception of the Zurich chronicle of 1476 (and this while they nearly all describe the battle in more or less detail). The tale, as told in the 1476 chronicle, is clearly an inter- polation, for it comes immediately after a distinct statement that 'God had helped the Confederates, and that with great labour they had defeated the knights and Duke Leopold," while the passage immediately following joins on to the former quite naturally if we strike out the episode of the "true man," who is not even called Winkelried. (2) The date of the ballad is extremely uncertain, but cannot be placed earlier than at least 60 or 70 years after the battle, possibly 130 or 140, so that its claims to be regarded as embodying an oral eontemporary tradition are of the slightest. (3) Similar feats have been frequently recorded, but in each case they are sup- ported by authentic evidence which is lacking in this case. Five cases at least are known: a follower of the count of Hapsburg, in a skirmish with the Bernese in 1271; Stiilinger of Ratisbon in 1B, in the war of the eount of Kyburg against the men of Bern and Solothurn; Conrad Royt of Lucerne, at Nancy in 1477; Herni Wolleben, at Frastenz in 1499, in the course of the Swabian war; aud a man at the battle of Kappel in 1531. (4) It is argued that the course of the battle was such that there was little or no chance of such an act being performed, or, if performed, of having turned the day. This argument rests on the careful critical narrative of the fight constructed by Herr Kleissner and Herr Hartmann from the contemporary accounts which have come down to us, in which the pride of the knights, their heavy armour, the heat of the J uly sun, the panic which befell a sudden part of the Austrian army, added to the valour of the Swiss, fully explain the complete rout. Herr Hartmann, too, points out

that, even if the knights (on foot) had been ranged in serried ranks, there must have been sufficient space left between them to allow them to move their arms, and therefore that no man, however gigantic he might have been, could have seized hold of more than half a dozen spears at once.

Herr K. Biirkli (Der Wahre Winkelried,—die Taktik der alten Ursehweizer, Zurich, 1886) has put forth a thcory of the battle which is, he allows, opposed to all modern aceounts, but entirely agrees, he strongly maintains, with the contemporary authorities, According to this the fight was not a pitched battle but a surprise, the Austrians not having had time to form up into ranks. Assuming this, and rejecting the evidence of the 1476 chronicle as an inter- polation and full of mistakes, and that of the song as not proved to have been in existence before 1531, Herr Biirkli comes to the startling conclusion that the phalanx formation of the Austrians, as well as the name and act of Winkelried, have been transferred to Sempach from the fight of Bicocca, near Milan (April 27, 1522), where a real lcader of the Swiss mercenaries in the pay of France, Arnold Winkelried, really met his death in very much the way

that his namesake perished according to the story. Herr Biirkli confines his criticism to the first struggle, in which alone mention is made of the driving back of the Swiss, pointing out also that tho chronicle of 1476 and other later accounts attribute to the Austrians the manner of attack and the long spears which were the special characteristics of Swiss warriors, and that if Winkelried were a knight (as is asserted by Tschudi) he would have been clad in a coat of mail, or at least had a breastplate, neither of which could have been pierced by hostile lances.

Whatever may be thought of this daring theory, it seems clear that, while there is some doubt as to whether such an act as Winkelried's was possiblo at Sempach, taking into account the known details of the battle, there can be none as to the utter lack of any early and trustworthy. evidence in support of his having per- formed that act in that battle. It is quite conceivable that such evidence may later come to light; for the present it is wanting.

Authorities.—Sce in particular Theodor von Liebenau's Die Schlacht bei Sempach —Gedenkbuch zur fiinften Sdcularfeier (1886), published at the expense of the Governmentof Lucerne. This contains every mention or description of the battle or of anything rclating to it, published or unpublished, in prose or in verse, com- posed within 300 ycars after the battle, and is a most marvellous and invaluable collection of original materials, in which all the evidence for Winkelried's dced has been brought together in a handy shape. Besides the works mentioned in the text, the following are the most noteworthy pamphlets relating to this con- troversy. 1nsupport of Winkelried's act: G. v. Wyss, Ueber eine Zurcher-Chronik aus dem 15ten Jahrhundert, Zurich, 1862; A. Daguet, " La Question de Winkel- ricd," in Afusée Neuchdtelois for Dec. 1883; G. H. Oclisenbein, " Die Winkelried- frage," in Sonntagsblatt of the Bund newspaper for Jan. and Feb. 1879; A. Bernouilli, Winkelrieds That bei Sempach, Basel, 1886; W. Oechsli, Zur Sempacher Schlachtfeier, Zurich, 1886; E. Secretan, Sempach et Winkelried, Lausanne, 1886 ; and the summary in K. Dindliker's larger Geschichte der Schweiz, i. 510-525, Zurich, 1884. Against Winkelried's claims we have the remarkable study of O. Kleissner, Die Quellen zur Sempacher Schlacht und die Winkelriedsage, Gottingen, 1873; O. Hartmann, Die Schiacht bet Sempach, Frauenfeld, 1886; and the concise summary of the evidence given by M. v. Stiirler (the first to suspect the story) in the Anzeiger fiir Schweiz. Geschichte, 1881, 3892-394. (W. A.B. C.)

WINNIPEG, capital of the province of Manitoba, in the Dominion of Canada, stands at the confluence of the Red River and the Assiniboine, in 49° 56' N. lat. and 97° 7' W. long., and 764 feet above the sea. Its name is taken from Lake Winnipeg (Ojibway, Wen, " muddy, " and Wzpz, "water"). The waters of the Red River reach the lake 45 miles north of the city. For some five miles north of "the Forks," as the junction of the rivers was formerly called, lay the old Red River colony of Lord Selkirk, founded in 1812 (see vol. xx. p. 315). Five fur traders' or colonists' forts have stood within the city limits:—(1) Fort Rouge (1736), of the French voyageurs; (2) Fort Gibraltar (1804-15), built by the north-west traders of Montreal; (3) Fort Douglas (1813-35), Lord Selkirk's fort; (4) old Fort Garry (1821-35), of Hudson's Bay Company; and (5) new Fort Garry (1835-82). The transfer of Rupert's Land to Canada in 1870 led to the

formation of the province of Manitoba. 'Then, too, Winnipeg was begun as a village, half a mile north of Fort Garry. The city is built on the prairie; a part of the site was swampy, but is being well drained. The city includes both sides of the Assiniboine, but on the east side of the Red River there is an independent corpor- ation, the town of St Boniface, which is virtually a suburb. St Boniface, with 1449 inhabitants, was first settled by Lord Selkirk's German De Meuron soldiers in 1817. The growth of Winnipeg has been remarkable. Living on its site in 1871 there were but 241 souls. As Canadian im- migration increased the village grew, and in 1873 it was incorporated as a city, in the face of strenuous opposition by the Hudson's Bay Company. 'The census of 1881 gave the city 7985 inhabitants. In the following year Winni- peg, as being the central point of the Canadian Pacific Railway, which connects the Atlantic and Pacific Oceans, became a place of great prospective importance. An enormous rise in values took place. The population of the city doubled in a few months, and the wildest specu- lation took place. This inflation, locally known as "the boom," caused much damage, and in the following year the collapse brought down almost all the business men of the city. The population diminished very rapidly, but has risen again, and is now increasing. The census of 1886 gave Winnipeg 20,238 inhabitants. The city has water, gas, electricity, and ample fire protection, and archi-

tecturally presents a fine appearance. Main Street, which is 132 feet wide and block-paved for a mile, is stated to be one of the best streets in Canada. Being on the eastern edge of the prairies, which run for a thousand miles to the Rocky Mountains, and standing to the west of the great Laurentian formation extending from Montreal, Winnipeg is an important railway centre. The first railway to reach the city was the Pembina branch of the Canadian Pacific Railway, which connects with the railway system of the United States. This took place in December 1878. The Canadian Pacific Railway has not only its main line now running through the city, but five other branches radiat- ing from this centre. Forty miles of the Hudson's Bay Railway, to run from Winnipeg to York Factory, are already completed, and the Government of Manitoba is

construct- ing (1888) an independent line to connect with the Ameri- can railway system, to be known as the Red River Valley Railway. The total. valuation of property for the city for 1887 was $19,392,410, while the exports of the port of Winnipeg for the year were of the value of $816,260, with $1,929,120 of imports. There are seven chartered banks, and many branches of Canadian and English life assurance and loan associations are in operation. In education Winnipeg is the centre of the Canadian North- West. The Winnipeg public and secondary schools com- pare favourably with those of other Canadian cities, and employ 50 teachers, male and female. At Winnipeg is situated the provincial university, to which are affiliated four colleges,—St Boniface (Roman Catholic), St Jolin's (Church of England), Manitoba (Presbyterian), and Mani- toba medical college. The university has been voted 150,000 acres of wild land by the Dominion Government, and has received $85,000 of a legacy from a native of Rupert's Land. There are 24 church buildings in the city and neighbourhood. The census of 1886 gives the religion of the population as follows :—Church of England, 5962; Presbyterians, 5271; Methodists, 3217; Roman Catholics, 2244. The societies are the historical and scientific society, and St Andrew's, St George's, St Patrick's, St Jean Baptiste, Scandinavian, and Hebrew national societies. Masonic, oddfellows', and temperance organizations are strong. There are two hospitals, besides a children's home and maternity hospital. The finer build- ings and erections are the city hall, post-office, parliament buildings, governor's residence, court-house, college build- ings, Hudson's Bay Company warehouse, Westminster block, Cauchon block, and the volunteer monument of 1886 on the City Square.

WINONA, a city and the county seat of Winona county, Minnesota, United States, is situated upon the west bank of the Mississippi, on a terrace slightly elevated above the river. This terrace is in the bottom-land, which is here 5 to 7 miles in width between the bluffs, which rise 400 to 500 feet above it. The surrounding country is fertile and well settled, being devoted principally to the culture of the cereals. There are ample railroad communications, and the Mississippi is navigable for 160 miles above the city. Lumber and flour are manufactured largely. The population in 1885 was 15,664; in 1880 it was 10,208, one-third being foreign-born. The coloured element was inconsiderable.

The town was laid out in 1852, and five years later a city government was organized. In 1860 a large part of the city was

destroyed by fire, but the losses were speedily repaired, and since that time the growth of Winona has been rapid.

WINSLOW, Epwarp (1595-1655), was born in Wor- cestershire, England, October 19, 1595. He became a member of Robinson's church at Leyden, and in 1620 joined the " Mayflower " company of pilgrims with his wife and brother, being one of the party which discovered Plymouth Harbour. His wife died soon after their arrival,

and his marriage with Mrs Susanna White was the first marriage in Plymouth colony. He was chosen a magis- trate in 1624, and governor in 1633, 1636, and 1644, when Bradford, the usual governor, " by importunity got off." He made several voyages to England as the colony's agent. 1655, when Cromwell sent him on a mission to the 'West Indies. He died on the voyage, May 8, 1655.

Winslow's portrait is in the gallery of the Pilgrim Society at Plymouth. Winsor (Narrative and Critical History of the United States, 277, and autograph at page 268) gives a copy of it as "the only authentie likeness of any of the ' Mayflower' pilgrims." The list of his writings is given in the same volume. See also Allen's American Biography, and Belknap's American Biography.

WINTER, Peter (1754-1825), dramatic composer, was born at Mannheim in 1754 (or, according to other accounts, in 1758). the abbé Vogler, but so little that he may be almost con- sidered as self-taught. After playing in the "kapelle " of the elector Karl Theodor, at Munich, he became in 1776 director of the court theatre. When Mozart pro- duced his [domeneo at Munich in 1781, Winter, annoyed at his success, conceived a violent hatred towards him ; yet his own popularity was both brilliant and lasting, and of more than thirty operas written by him between 1778 and 1820 very few were unsuccessful, though, through

lack of dramatic power, none have survived him. His

most popular work, Das unterbrochene Opferfest, was pro- duced in 1796 at Vienna, where in 1797-98 he composed Die Pyramiden von Babylon and Das Labyrinth, both written for him by Schickaneder in continuation of the story of Mozart's Zauberflite. While in Vienna Winter gratified his spite against Mozart by propagating scan- dalous and utterly baseless reports concerning his private life. He returned to Munich in 1798. Five years later he visited London, where he produced Calypso in 1803, Proserpina in 1804, and Zaira in 1805, with great success. His last opera, Sanger und Schneider, was produced in 1820 at Munich, where he died October 17, 1825. Besides his dramatic works he composed some effective sacred music, including twenty-six masses.

WINTERTHUR, a flourishing industrial town in the Toss valley, canton of Zurich, Switzerland. It is 1450 feet above sea-level, and has a rapidly increasing population (in 1870, 9404; in 1880, 13,595; in 1887, 15,516), all German-speaking and nearly all Protestants. It is the point of junction of eight lines of railway, and is therefore of considerable commercial importance. Its main in- dustries are cambric-weaving, cotton-printing, the manu- facture of machinery, and wine-growing, Stadtberg being the best variety of wine grown in the neighbourhood of the town. It is a modern well-built town with a fine town-hall and well-arranged school buildings. It was formerly very wealthy and thriving, but has suffered severely from the disastrous financial enterprise of the National Railway of Switzerland which it promoted. In 1878 it had to sell its property in that line, and from 1881 to 1885 it was in great difficulties in the matter of a loan of nine million frances guaranteed in 1874 by the town, together with three others in Aargau, to that ill-fated rail- way. As the three co-guarantor towns were unable to pay their share, the whole burden fell on Winterthur, which has struggled valiantly to meet its liabilities, and has been helped by large loans from the cantonal and federal Governments.

The Roman settlement of Vitudurum (Celtic dur, water) was a little north-east of the present town, at the plaee now known as Ober- Winterthur. It was there that in 919 Burkhard II., duke of Alemannia, defeated Rudolph II., king of Transjurane Burgundy. It was practieally refounded in the

valley in 1180 by the eounts of Kyburg, who granted it great liberty and privileges, making it the seat of their district court forthe Thurgau. In 1260 the towusmen,

Returning to England in 1649, he remained until |

He received some instruction from |

WIN—WIR

in their zeal for additional power, overthrew the castle of the counts. In 1264 the town passed with the rest of the Kyburg inheritanee to the Hapsburgs, who showed very great favour to it, and thus sceured its unswerving loyalty. In 1292 the men of Zurich were beaten baek in an attempt to take the town. Fora short time after the out- lawry of Duke Frederiek of Austria, it beeame a free iniperial eity (1415-42) ; but after the conquest of the Thurgau by the Swiss confederates (1460-61) Wintcrthur, which had gallantly stood a nine weeks' siege, was isolated in the midst of non-Austrian terri- tory. Henee it was sold by the duke to the town of Zurieh in 1467, its rights and liberties being reserved, and its history sinee then has been that of the other lands ruled by Zurieh. In 1717~ 26 Zurieh tried hard by means of heavy dues to erush the rival silk and eotton industries at Winterthur, whieh, however, on the whole very successfully maintained its ancient rights and liberties against the eneroachments of Zurich. J. C. Troll, Gesch. d. Stadt Winterthur, 1840.

WINTHROP, Joun (1587-1649), was born at Groton, Suffolk, England, January 12, 1587. He graduated at Trinity College, Cambridge, about 1605, and was bred to the law. He became a Puritan, and in 1629 was made governor of the Massachusetts Bay Company. The next year he headed the great emigration to Massachusetts, landing at Salem and settling at Boston. The remainder of his life was closely identified with the history of his colony. He was re-elected governor until 1634, and afterwards in 1637-40, 1641-43, and 1646-49. He died at Boston, March 26, 1649.

The tenderness and gentleness of Winthrop's nature are beyond dispute ; even sueh political opponents as Vane retained their personal friendship

for him. These qualities, however, were sup- plemented by a deeided antipathy to demoeraey in every form, whieh inade him the best of eivil leaders for the supporters of the eeelesiastieal system of early Massachusetts. A vigorous, perhaps captious, statement of this side of his influenee will be found in Brooks Adams's Hmaneipation of Massachusetts. His Life and Letters have been edited by his deseendant, R. C. Winthrop. His Journal has been edited by James Savage, who has given it the more appropriate and exaet title of The History of New England, 1630-1649. The Winthrop Papers are in the Collections of the Massaehusetts Historical Soeiety. Winthrop's deseendants have been numerous, and have ineluded an unusual number of men and women of marked ability ; see Whitimore's Notes on the WV inthrop Family. One of them, Theodore Winthrop (1828-1861), of New Haven, was one of the earliest victims of the civil war.

WINTHROP, Joun (1606-1676), son of the preceding, was born at Groton, England, February 12, 1606. He graduated at Trinity College, Dublin, studied law at the Inner Temple, London, and then travelled on the Con- tinent, seeing some military and diplomatic service. In 1631 he followed his father to Massachusetts, being made a magistrate in 1633. Returning to England, he obtained a commission as governor of Connecticut under the Say and Sele patent, and sent out the party which put up the fort at Saybrook, at the mouth of the Connecticut river. In 1645 he obtained a title to lands in south-eastern Connecticut, and founded there the present city of New London. Connecticut made him a magistrate in 1651, and elected him governor annually from 1657 until his death. He was the agent who obtained for the colony the charter of 1662. He died at Boston, April 5, 1676.

All of the father's fine qualities, and more, came out in the son. The father has had a few unfavourable critics ; the son has always been looked upon as the flower of American Puritanism. Even the son, however, was only the representative, in obtaining the eharter, of a knot of able and determined men, who had clearer notions of the commonwealth life at whieh they were aiming; and the governor does not seem to have approved all of their somewhat vigorous proeeedings in putting it into effect. Physical seienee had strong attractions for Winthrop. He was one

of the first members of the Royal Society, and was eonstantly interested in mines and mining in New England. The authorities for his life are those given in the preceding sketch.

WINTON, or Wyntoun, ANDREW or. See Wyntoun. WIRE. The physical properties requisite to make useful wire are possessed by only a limited number of metals and metallic alloys. The metals must in the first place be ductile ; and, further, the wire when drawn out

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must possess a certain amount of tenacity, the quality on which the utility of wire principally depends. The metals suitable for wire, possessing almost equal ductility, are platinum, silver, iron, copper, and gold; and it is only from these and certain of their alloys with other metals, principally brass and bronze, that wire is prepared. By careful treatment wire of excessive tenuity can be pro- duced. Dr Wollaston first succeeded in drawing a platinum wire sgdqo inch in diameter by encasing a fine platinum wire within silver to ten times its diameter. The cored wire he then reduced to x21,, inch, and by dissolving away the silver coating the platinum wire 3od09 inch thick only remained. By continued treatment in this way wires of platinum used for spider-lines of telescopes are now obtained of such —————_—____—

| | Diameter. Strain. extreme tenuity that = . We GHA cles nccxt "0162 inches.| 5°61- 5-42 tb a mile length of the | Platinum .. | 0161, 6°70- 6°59 ,, Wire weighs not more pu " ee | than a grain; and it 0169 3? | 1112-10-89 " is said that platinum cae? ig . " wire has been made 0600 7" 342». Phosphor Bronze | -0630 Be 394 ,,

which measures not pee aap ely eee 2 more than g5g mm., equal to less than the fifty-thousandth part of an inch. The accompanying table shows the com- parative tenacity of the wire of metals and metallic alloys.

Wire was originally made by beating the metal out into plates, »

which were then eut into continuous strips, and afterwards rounded by beating. The art of wire-drawing does not appear to have been known till

the 14th century, and it was not introduced into England before the second half of the 17th century. Wire is usually drawn of eylindrical form ; but it may be made of any desired section by varying the outline of the holes in the draw-plate through whieh it is passed in the process of manufacture. The draw-plate is a disk of hard steel pierced with a scries of holes correspouding in aperture with the size and section of the wire to be-made. The holes are funnel-shaped, being widest at the side where the metal enters, and tapering to their small diameter at the face where the wire is drawn away. The excessive friction, which is partly relieved by lubricants, causes a rapid enlargement of the holes; and where great uniformity of size is required, as in the case of fine gold, silver, and platinum wire, perforated rubies or similar hard stones are fitted in the draw-plate. The draw-plate is mounted in the draw-bench, which is provided with a reel on which the wire is wound, and in drawing down to smaller dimensions it passes through successive smaller holes in the draw-plate—one at a time—and is wound on another reel or frame on the bench. During the drawing the wire requires to be annealed more or less frequently according to the nature of the metal under treatment. The ductility of the metal and the diameter of the wire operated on determine the rapidity with which the wire can be drawn: iron and brass travel at rates varying from 12 to 45 inehes per sccond, while gold and silver wires of fine section may be drawn through at 60 to 70 inches per second. Stout iron wire down to a section of } inch or thereby is made by rolling bars of fine fibrous metal in a rolling mill, in the same way as nail rods, small bars, and angles are rolled. The thinner wires are drawn from these stout wires by the ordinary process of draw- ing. Iron requires repeated annealing in the process of attenuation, and to preserve it from oxidation it is treated with a scour-bath, consisting of dilute sulphuric acid and a proportion of sulphate of eopper. The minute film of copper thus deposited on the wire not only prevents oxidation, but also favours the drawing by lessening the friction in passing through the draw-plate. Much of the iron wire whieh is to be used in exposed situations is further protected from oxidation by a covering of zinc in the so-called galvanizing process.

In commerce the sizes of wire are estimated by ecrtain more or less recognized standard wire gauges. The most commonly quoted is the

Birmingham wire gauge. It gives forty mcasuremenis, which bear no definite relation to each other, ranging from the largest No. 0000= “454 inch to No. 836=-004 inch. Sir Joseph Whitworth in 1857 proposed a standard wire gauge which is coming to be generally recognized. His measurements range from half an ineh to one-thousandth of an inch by regular gradations of one- thousandth. Beginning at the smallest, No. 1 is 001 ineh, 2=-002 inch, 10=-010 inch, and so on, larger breaks being made in the scale as the size inereases, but the number and ratio continuing the same till it ends at No. 500=°500 inch. In America a standard wire gauge, proposed in 1864 by Messrs Brown and Sharpe, of Providence, R.I., is now extensively recognized. In it the grada- tions are uniform, increasing in geometric ratio, so that the size of each successive number is found by multiplying the preceding by

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1123. The standard is calculated from wire No. 36, which in the American gauge represents a diameter of ‘005, while in the Birming- ham gauge No. 36 is equal to -004 inch.

It must be obvious that the uses of wire are multifarious and diverse beyond all enumeration. It forms the raw material of important manufactures, such as the wire-net industry, wire-cloth making, and wire-rope spinning, in which it occupies a place ana- logous to a textile fibre. Wire-cloth of all degrees of strength and fineness of mesh is used for sifting and screening machinery, for draining paper pulp, for window screens, and for many other purposes. Vast quantities of copper and iron wire are employed for telegraph and telephone wires and cables, and as conductors in electric light- ing. Itisin no less demand-for fencing, and much is consumed in the construction of suspension bridges, and eages, &e. In the manufacture of stringed musical instruments and philosophical apparatus wire is again largely used. Among its other sources of consumption it is sufficient to mention pin and hair-pin making, the needle and fish-hook industries, nail, peg, and rivet making, and earding machinery; but indeed there are few industries into which wire does not more or less enter.

WIRE ROPE. See Rops, vol. xx. p. 846.

WISBECH, or WisBEacu, a municipal borough, market- town, and seaport of Cambridge, England, in the Isle of Ely, is situated on the river Nene, on the Wisbech Canal, by which there is conncxion by the Ouse with Hertford, and on branches of the Great Eastern and Midland Rail- ways, 40 miles north of Cambridge, 21 east-north-east of Peterborough, and about 90 from London. It possesses a spacious market-place, a handsome crescent, and several good streets. There is a public park, 18 acres in extent. The greater part of the town is situated on the south side the river, which is crossed by aniron bridge. The churcli of St Peter and St Paul is very singularly constructed, having two parallel naves, two aisles, and two chancels, with a large square tower at the west end, originally dating from the 12th century, but almost entirely recon- structed about the close of the 15th century. The churcli contains some semicircular Saxon arches as well as some traces of Early Norman. Among the other public build- ings are the corn exchange (re-erected 1811), the public hall, the custom-house, the new cattle market, the work- ing men's club and institute, and the museum and literary institute, with a library of 12,000 volumes and a fine collection of Roman remains and other antiquities. Be- sides the Cambridgeshire Hospital (1873) and the twelve corporation almshouses there are a large number of other charities. A grammar-school was established in the middle of the 16th century, and provision was made in the charter of Edward VI. for its continuance. A Gothic monument was erected here to Thomas Clarkson, the anti-slavery orator, in 1881. Vessels of 500 tons burden can enter the port, and extensive wharfage has been erected at a cost of £60,000. The number of vessels that entered the port in 1886 was 294, of 50,721 tons, and the number that cleared 286, of 50,812 tons. The chief imports are corn, potatoes, wool, timber, and iron, and the exports agricul- tural produce and salt. In the neighbourhood immense quantities of fruit are grown, including apples, pears, plums, gooseberries, and strawberries. Potatoes, asparagus, and other vegetables are also largely grown for the London market. The town possesses agricultural implement works, coach-building works, breweries, ropeworks, planing and sawing mills, and corn and oil-cake mills, many of them driven by water, and others by steam. The town is divided into two wards, and is governed by a mayor, six alder- men, and eighteen councillors. It has a separate commis- sion of the peace. The corporation act as the urban sanitary authority. Water is obtained from chalk springs

near Norfolk. The population of the municipal borough in 1871 was 9362 and in 1881 it was 9249.

Wisbech was most probably a fort of the Romans, who it is sup- posed constructed the river banks in the neighbourhood. It takes

its name from the river Ouse (Wyse). It is first noticed in 664, in a charter of Wulfhere, son of Penda. In the early part of the

Plate XV.

11th century it was given by Oswy and Leoflede to the convent of Ely, on the admission of their son Alwyn into that monastery. After the subjugation of the Isle of Ely William erected a strong castle at Wisbech to hold the district in subjection. At Domesday the manor was held by the abbot of Ely, and possessed extensive fisheries, especially of eels. In 1190 Richard I. granted to the tenants of the manor exemption from tolls at all fairs and markets in England, a privilege confirmed by King John, who in 1216 visited the town. In 1236 the town and a great part of the castle was destroyed by an inundation, and the castle lay in ruins till the 15th century, when Morton, bishop of Ely, erected a new building of brick for an episcopal residence. In the reign of Elizabeth it was appropriated to the confinement of state prisoners, among others of robert Catesby. During the Protectorate it was purchased by Thurloe, afterwards secretary of state, who in 1660 ereeted an en- tirely new one from designs of Inigo Jones, when some Roman bricks were discovered. On the Restoration it again came into the possession of the bishops of Ely, who sold itin 1793, and all remains of it have now disappeared. Anciently the town possessed eight guilds in addition to that of the Holy Trinity, to which they were subordinate. This guild received royal sanction from Richard 1I. in 1393, and held its last meeting in 1557. The town received a chartcr of incorporation from Edward VI. in 1549, which was re- newed by James 1. in 1611, and confirmed by Charles II. in 1669, remaining in force till the passing of the Municipal Act.

See Watson's Historical Account of Wisbech, 1827; IHistory of Wisbech, 1833; and " Wisbech Castle," in Journal of Brit. Arch. Assoc., 1879.

WISBY, a picturesque old town on the west coast of the Swedish island of Gotland. It has a considerable trade, but does not occupy half the space enclosed within its old walls, which, with their towers, still survive. These walls, which were built partly on the site of older struc- tures, date from the thirteenth century. The vacant spaces of the town are used as gardens, in some of which are fine ruined churches. The church of St Mary (built 1190- 1225) is used as the cathedral. Of the ten ruined churches the most interesting is that of St Nicholas, partly in the Romanesque partly in the Gothic style. In 1880 the

population of the town was 6924.

In the Middle Ages Wisby was a port of the Hanseatic League, and a great centre of trade. Its wealth was so celebrated that in an old ballad the people were said to play with the choicest jewels, and the women to spin with golden distaffs. All the principal nations of Kurope had representatives at Wisby, and some of its beantiful churches were built by foreign residents. In 1361 it was attacked and plundered by King Waldemar I1l. (Atterdag) of Denmark. 1t never recovered from this blow, and when, in 1645, Gotland was finally united to Sweden by the treaty of Brémsebro Wisby had altogether lost its importance.

WISCONSIN, one of the North-Eastern Central States of the American Union, has the parallel of 42° 30' N. lat. for its southern limit, Lake Michigan for its border on the E., Lake Superior on the N., and the Mississippi on theW. Michigan on the E., Minnesota and Iowa on the W., and Illinois on the S. are its neighbour States. Its area, exclusive of water surface, is estimated at 54,450 square miles. Its length from north to south is 300 miles, its breadth 250 miles ; its lake shore-line exceeds 500 miles. Its surface contours are gentle and pleasing. The lower parts of the State lie about 600 feet above the sea, the highest summits about 1800 feet. Few peaks rise more than 400 feet above their bases, and abrupt elevations of more than 200 or 300 feet are not common except along the Mississippi. The State is merely a swell of land between three notable depressions,—the basins of Lake Michigan, Lake Superior, and the

Mississippi. The summit of the swell lies within 30 miles of Lake Superior, whence there is a rapid descent northward, with gentler declines to the south-east and south-west, separated by a low swell extending from the summit southward into Illinois. This is traversed in the south-central portion of the State by a remarkable diagonal valley, occupied by Green Bay and the Fox and Wisconsin rivers, cutting it down to within about 200 feet of the lake levels. The easterly slope is traversed longitudinally by a ridge of Niagara limestone, running nearly parallel to the shore of Lake Michigan, at an average distance of about 30 miles.

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The greatest topographical interest—and it is very con- siderable—lies in the minor surface features. The ice of the Glacial period invaded in force the eastern and northern parts of the State, while an area of 10,000 square miles in the south-western portion was left untouched. Flowing but very irregular contours, accented by morainic peaks and ridges, by gravel knolls, and by domes of drift, mark the former area; while deep dendritic valleys, erosion cliffs, and castellated outliers give more striking relief to the latter. About 2000 minor lakes dot the eastern and northern portions, all lying within the glaciated area, and caused by the irregular heaping of the drift, or by the erosion of the glaciers. Numerous waterfalls occur in this portion, likewise due to the disturbance of the river- courses by the ice incursion. None occur in the un- glaciated area.

Geology.—The geological structure of the State is unusually sym- metrical (see general geological map in Plate XV.). It has for its nucleus a great mass of the most ancient crystalline rocks (Archean). This nucleus occupies the north-central portion of the State, and about it are wrapped successive layers of later-formed rocks, lying concentrically upon each other, and occupying all the rest of the State. The ancient nucleus consists of granites, gneisses, syenites, and various highly crystalline schists. These are warped, contorted, and twisted among themselves in the most intricate fashion, and, since their origina] upheaval, have been extensively cut away, exhibiting what was formerly the interior of a much distorted mass. Whether this was originally sedimentary or igneous is

undetermined, so great are the vicissitudes it has suffered since its original forma- tion. It is extensively traversed by dykes and veins. As yet it has not proved to be productive in minerals of notable commercial value, but affords a wealth of the finest of building material. This forma- tion is confidently referred to the Laurentian age, and ranks among the earliest known formations. Around the borders of this nucleus, though not skirting it continuously at the surface, are tracts of Huronian rocks. For the greater part these lie in highly inclined beds, and exhibit evidence of much disturbance since their original formation. Where they come in contact with the Laurentian nucleus, they show, by their unconformity to it, and the erosion of the strata at the contact, that a vast but unknown interval of time separated the two formations. The Huronian rocks are chiefly quartzites, with which are associated quartz-porphyries and various slates and schists, together with layers of igneous rock, either formed at the same time with other members of the series, or subsequently intruded, They embrace also, especially in the north- eastern and northern portions of the State, and extending into the upper peninsula of Michigan, valuable beds of iron-ore, as well as beds of carbonaceous matcrial. The amount of carbon contained is large, but_unfortunately impure and in the graphitic condition. Limestone also occurs, among the most ancient of its kind. The quartzites of Barron county embrace deposits of pipestone, which also occurs in the Baraboo quartzite, but less notably. Several isolated knobs of quartz-porphyry in central Wisconsin are referred to this formation, and are being extensively utilized for building material, paving, and macadamizing. Apart from the igneous beds, the members of this series were originally sediments, and even now show clearly their fragmental origin. The thickness of the Huronian beds reaches at least 13,000 feet. Overlying the Huronian rocks in the north-western part of the State is an im- mense series of igneous beds, sandwiched between which, and also overlying which, are layers of sandstone, shale, and conglomerate, the whole constituting the great copper-bearing (Keweenaw) forma- tion of Lakc Superior. This crosses the entire north-western corner of the State. The strata are bowed downwards, forming a great trough, the axis of which stretches from near the mouth of the Montreal river to the St Croix. The igneous beds were formed by great outwellings of molten matter, which spread widely over the surface, following each other at longer or shorter intervals, as shown

by the presence or absence of intervening deposits or by erosion. The copper of the formation appears to have been brought up by these igneous ejections, and to have been subsequently con- centrated by percolating water in the vesicular portions of the old lavas, or in the intervening sandstones or conglomerates, or in fissures traversing the beds,—all these forms being present. The formation in Wisconsin has not yet proved sufficiently rich to pay the expense of mining. The thickness of this formation is truly stupendous, estimates ranging from 25,000 to 45,000 feet.

The preceding formations are found tilted at various angles; those which follow lie nearly flat. The Potsdam sandstone, next in order, rests upon all of these at points, coming in contact with different ones in different places. The wear which they had suffered before it was placed upon them indicates a long interval of time. The thickness of the Potsdam is very irregular, owing to the un-

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even worn surface of these underlying formations. In places it is upwards of 1000 feet deep. Being an open-textured water-bearing formation, dipping south-eastward and south-westward from the central axis of the State, and embracing and being overlaid by im- pervious beds, it furnishes many fine-flowing wells to the districts bordering Lake Michigan and the Mississippi. Some of its beds supply excellent building material, though in general it is not sufficiently firm. The Potsdam sandstone forms a broad irregular crescentic belt, sweeping around the southern border of the Archean nucleus. It also skirts the northern side in the Lake Superior basin. Overlying the Potsdam sandstone is a stratum of impure Magnesian Limestone, ranging from 50 to 250 feet in thickness. It forms the surface rock in an irregular ragged belt, stretching from the St Croix southward along the Mississippi, and south-easterly to the south-central part of the State, and thence north-easterly to the upper peninsula of Michigan. Small quantities of the ores of lead, iron, and copper are found in it, and certain portions furnish an excel- lent building stone. Overlying this, the Lower Magnesian Lime- stone, is an irregular stratum of nearly

pure sandstone (St Peter's), ranging from a few feet to upwards of 200 feet in thickness. It is composed of nearly pure grains of quartz, and from the absence of cementing material generally crumbles with ease, though in excep- tional places it is sufficiently hard to be used as a building-stone. Being porous and gently dipping between impervious beds, it sup- plies some of the finest artesian fountains in the State. Its purer portions afford sand.

Upon the St Peter's sandstone rests a series of limestone beds, the lower part of which is known as Trenton, the upper as Galena. Their united thickness varies considerably, averaging about 250 feet. In the south-western part of the State they have' yielded large quantities of lead and zinc ores, and some copper. 'The formation occupies a small area in the north-west of the State,'a large area in the south-west, and a belt stretching from south to north through the valleys of Rock river and Green Bay.

Overlying the above limestones is a stratum of about 200 feet in thickness, composed of clay, earthy, and calcarcous shales (Hudson River). This is a soft formation and easily eroded, and hence occupies little area at the surface. It forms a narrow north- and-south belt on the eastern margin of the Green Bay and Rock river valley. It has little economic value. At a few points on the surface of these shales there are accumulations of a peculiar Oolitic iron ore (Clinton), popularly known as "seed" or "shot ore," from its concretionary structure. Its highest development is at Iron Ridge in Dodge county, where its thickness ranges from 15 to 25 feet. It is a soft ore, lying in regular horizontal beds, is quarried with great ease, and yields about 45 per cent. of metallic iron.

The next formation is a thick limestone stratum (Niagara), rang- ing from 400 to 800 feet. The different portions vary greatly in texture and purity, some being very fine-grained, others of admir- able granular texture, and others uneven, cavernous, or full of chert nodules. It furnishes excellent building rock, and quicklime of high quality. The formation occupies a broad tract adjacent to Lake Michigan, reaching from the southern line of the State to the head of the Green Bay peninsula. Italso caps the elevated mounds in the south-west of the State. The Lower Helderberg

limestone, which attains great thickness farther east, is barely (indeed, some- what doubtfully) represented in the State by some thin shaly beds of limestone found north of Milwaukee. The remainder of the normal Silurian beds and the Lower Devonian formations are not represented in the State, but just north of Milwaukce is a small area of limestone which represents the Hamilton period (Middle Devonian), a portion of which possesses hydraulic properties of a high degree of excellence, and is the basis of an important industry.

From the middle of the Devonian age until the ice incursion of the Glacial period, Wisconsin appears to have been a land surface, subjected to erosion, which developed the hills and valleys that diversify its surface, except as they were modified by the invading ice. As previously indicated, the ice of the Glacial period over- rode the northern and eastern portions of the State, while it left about one-fifth of the State in the south-west untouched. The paths of the invading ice were determined by the great valleys of Lake Superior, Lake Michigan, and Green Bay, aided by the divert- ing influence of the intervening heights. There appear to have been two important invasions,—the earlier covering the larger area, while the later exhibited the more forceful action. There were also minor episodes of glacial advance and retreat. Both spread out an irregular sheet of mixed rock debris, partly derived from the old decomposed surface, and partly produced by the grinding action of the glaciers themselves, The underlying rock was smoothed, scratched, and polished, and in some moderate measure filed down by the overriding ice. A remarkable chain of hills formed about the edge of the ice (the Kettle moraine) constitutes an interesting feature topographically and geologically. It forms a part of an extensive series of terminal moraines that stretch from the Atlantic to the Saskatchewan.

Soils.—The soils of the State are varied. Those of the drift-

bearing region are-derived from the heterogeneous mixture of pre- glacial soils and glacial grindings, and constitute for the greater part loamy clays and sandy loams of a high degree of fertility and permanence. In the south-west a considerable portion of the soils are derived from the decomposition of the underlying limestone, and are highly fertile and

*easily tilled. In the central portion there is a considerable area underlaid by the Potsdam sandstone, from which sandy soils, of relatively low fertility, have been derived. Vegetation.—The greater part of the State was originally covered by forest, but in the south and west considerable areas of prairies were found interspersed with woodlands. The prevalent trees of this region are the oaks, poplars, hickories, and their usual associ- ates. Along the eastern border of the State, except at the very south, is an extensive tract of heavy timber, in which maple, elm, ash, and their usual associates predominate. Towards the north the pines, hemlocks, and spruces come in. The north part of the State was originally eovered by an almost unbroken forest, com- posed of groves of pine, of hard wood, and of a promiscuous mixture of species embracing both conifers and deciduous trees. This constitutes the great lumber region of Wisconsin. Climate.—Lying between 424° and 47° N. lat., and near the centre of the continent, Wisconsin has a typical temperate con- tinental climate. Its summers are warm, and diversified by short rains and clear skies; its winters are somewhat severe but rela- tively dry and stimulating, and are less chilly than more humid atmospheres at similar or even higher temperatures. The average rainfall is about 30 inches. The mean summer temperature varies from about 70° in the south to about 60° in the north; the mean winter temperature varies from about 25° in the south to about 15° in the extreme north. The great lakes produce a marked effect on the seasonal temperature of the State, elevating it in winter and depressing it in summer, so that the summer isotherms run from the north-west to south-east, forced south by the cooling influence of the lakes; while those of the winter run from south-west to north-east, forced north by their warming influence. As a result, productions requiring a high summer temperature flourish in the south-western and central portions of the State, but are precarious in the vicinity of the lakes, while fruits and crops requiring milder winters and more equable temperatures can be produced near the lakes, but are uncertain away from them. (EvG: ©.) Population. —In 1840 Wisconsin Territory had a population of 30,945. The accompanying table exhibits the population from 1850 to 1880. The State census of 1885 gives the number as 1,563,423. The Federal – Density census of 1880 showed Population. per 1,309,618 whites, 2702 ise * hee eee > coloured, and 3161 Indians. Total. | Males. | Femaled.| ils. The foreign-born popula- | yg50 | 305,391 | 164,716 | 140,675 | 5°61*

tion numbered 405,425, or | 1860 | 775,881 | 407,449 | 368,432 | 14-25 30°81 per cent. of the | 1870 | 1,054,670 | 544,886 | 509,784 | 19°37

315,497 | 680,069 | 635,428 | 24:16 whole, of whom 184,328 os : :

eame from the German empire, 66,284 from the Scandinavian countries, and 78,057 from Great Britaiu and Ireland.

Cities. —In 1885 Milwaukee had a population of 158,509; Osh- kosh, 22,064; La Crosse, 21,740; Eau Claire, 21,668; Racine, 19,636; Fond du Lac, 12,726; Madison (the State capital), 12,064; Sheboygan, 11,727 ; Appleton, 10,927 ; and Janesville, 9941.

Agriculture.—By the United States eensus of 1880 Wisconsin had 134,322 farms, embracing 15,353,118 acres, of which 9,162,528 acres were improved land. Of these farms 122,163 were cultivated by the owners and 12,159 were rented. The State census of 1885 estimates the total number of persons engaged in agriculture at 332,500, and the value of farms and agricultural products at $568,187,288. The produce is estimated approximately as fol- lows :—wheat, 21,000,000 bushels; Indian corn, 37,700,000; oats, 43,000,000 ; barley, 11,500,000; rye, 2,100,000 ; potatoes, 11,700,000; hay, 2,300,000 tons; sorghum, 599,000 gallons ; apples, 1,671,000 bushels; berries, 71,000 bushels. 29,500 acres of tobacco produced nearly 29,595,000 ib (this is in demand for cigar wrappers). Of cheese nearly 33,480,000 Ib were produced, and of butter 36,240,000 ib. There were in 1886 about 389,000 horses, 1,256,000 cattle, 6700 mules and asses, 917,000 sheep and lambs, and 777,000 swine. }

Manufactures, &c.—Large water-powers are found, ehiefly on the Fox, Wisconsin, and Chippewa rivers. In 1885 the value of real estate and machinery used in manufacturing was over $38,000,000 : stock and fixtures over $24,000,000 ; value of manufacturing estab- lishments and their products, $193,700,000. There were about 58,500 menemployed. The lumber, shingles, and lath manufactured amounted to $27,113,000 ; milling (including all flour manufactured from eereals), $19,870,000; wooden articles, $13,719,000 ; iron products and manufactured articles of iron, $10,300,000 ; beer, more than 1,445,000 barrels, valued at $9,081,000 (over 75 per cent.

of this coming from the great brewing city of Milwaukee) ; manu-

factured articles of leather, $8,629,000; waggons, carriages, and

sleighs, $4,678,000 ; paper, $2,804,000 ; woollen fabrics, $613,000 ;

cotton fabrics, $556,000. 'The census of 1880 valued the slaughter=

ing and meat-packing product at about $6,534,000 and agricultural implements at $3,742,000.

Lumbering.—The proximity of Wisconsin to the prairie States renders its lumbering interests especially important. In 1886 the total forest area of the State was 17,000,000 acres, or 48°8 per cent. of the whole area. Aceording to the census of 1880, Wisconsin was exceeded only by Michigan and Pennsylvania in the value of its lumber product. Operations are chiefly carried on along the Menomonee, Peshtigo, Oconto, Wolf, Wisconsin, Yellow, Black, Chippewa, Red Cedar, and St Croix rivers; but the rapid increase in railroads has opened the northern forests very generally. The lumber, shingles, and lath manufactured amounted to about 3,323,390,000 feet in 1885.

Mines and Quarries.—In 1880 Wisconsin ranked sixth among the iron-producing States, but since then its importance has in- ereased. 'The most extensive iron deposits occur in the Huronian formation in the Menominee region, and along the Montreal river. In 1882 the total product of the Menominee region was 276,017 tons; the Montreal range, divided between Wisconsin and Michigan, about a dozen miles south of Lake Superior, has just been opened up, and there is a rich deposit of Bessemer ore. In 1886 the pro- duct of the whole range was about 800,000 tons. The lead and zinc region lics in the south-west of the State; production had been declining, but recently new discoveries have revived it. There is a rich supply of building-stone; limestone quarries are most numerous, but the red-brown sandstone of Bayfield county and the granite of Marquette county are especially valued.

Fisheries.—The white fish and lake-trout fishing industries of Lake Miehigan and Lake Superior are extensive, and the inland lakes? and streams abound in bass, pike, pickerel, sturgeon, and brook-trout. A State fisheries commission annually stocks the waters with brook-trout, white fish, and pike.

Railways and Canals.—There were in Wisconsin in June 1886 4576 miles of railway. The leading lines are the Chicago, Milwaukee, and St Paul; the Chicago and North-Western; the Chicago, Min- neapolis, St Paul, and Omaha; the Milwaukee, Lake Shore, and Western ; and the Wisconsin Central. A canal connects the Fox and Wisconsin rivers at Portage, and the Sturgeon Bay Canal unites Green Bay and Lake Michigan.

Administration, &c.—The State, which is divided into sixty- eight counties, is represented in the Congress of the United States by two senators and nine representatives. The supreme court is composed of a chief justice and four associate justices; there are fourteen judicial circuits, each with a judge; and besides these are county and municipal judges and justices of the peace. The State legislature, composed of the senate (33 members) and the assembly (100 members), meets bienially.

Finances.—The value of all taxable property of the State for the year 1886, as determined by the State board of assessment, was as follows :—personal property, $114,922,900; city and village lots, $110,564,625; lands, $271,019,627; total assessed value of all woperty, $496,507,152. Taxes were as follows:—State tax,

241,137; county taxes, $2,590,375; town, city, and village taxes, $7,835,385. The total indebtedness of the towns, cities, villages, aud school districts in 1885 was $6,848,123; total indebtedness of counties, $1,569,444; bonded debt of the State, $2,252,000.

Charitable, Reformatory, and Penal Institutions. —The State sup- ports two hospitals for the insane, containing together 1141 inmates in 1885, while there are 1240 insane in county asylums, jails, and poorhouses. The school for the deaf has an attendance of 205, school for the blind, 62; industrial school for boys, 292; industrial school for girls, 268; State prison school, 443; a school for de- pendent children has just been

established. The whole number of prisoners in all places of confinement during 1885 was 19,829, and ui reformatories 771. The State board of contro! and the board of charities and reforms have charge of these institutions.

Edwcation.—The State makes liberal provision for its public schools; it sets apart as a permanent fund the Federal grant of section 16 in each township, with 500,000 acres of land, and 5 per cent. of the proceeds of the sale of public lands in the State, together with less important items. In 1886 there were still 103,130 acres unsold, and the amount of the fund at interest was nearly $3,000,000. This school-fund income, which in 1887 was $341,289, is supplemented by a State tax of one mill on the dolar, which amounted to $896,138; the combined amount is annually apportioned among the counties, towns, villages, and cities in pro- portion to the number of children in each of from four to twenty years of age; in their turn the counties must levy upon each town, city, and village a tax equal to their proportion of the com- bined school fund and State mill tax. The total receipts from all sources for school purposes in 1886 was $4,192,962, and the dis- bursements $3,184,958. In the same year there were 556,093 persons of school age. Of these 59°4 per cent. were enrolled in the public schools. The enrolments in normal schools and uni- versity (2481), in colleges, seminaries, and academies (1131), and

1 There are about 3000 square miles of clear-water lakes.

in private schools (14,164) made the total enrolment over 350,000. In 1879 attendance at a public or private school for at least twelve weeks each year was made compulsory on all children between the ages of seven and fifteen years. Women are eligible to all school offices, except that of State superintendent of public instruction. In 1888 there are 137 free high schools, receiving special aid from the State. Provision is made for the education of teachers by the five normal schools. The leading denominational colleges are Beloit, Ripon, Milton, Racine, and Lawrence university. The public school system is crowned by the State university at Madison, organized in 1848. It derives its support chiefly from an annual State tax of one-eighth of a mill on the dollar. The total regular income of

the university in 1886 was $105,000; the attendance in 1887 was 600. Connected with the university are a teachers' institute lectureship and farmers' institutes-held in different por- tions of the State, as well as over sixty accredited high schools.

The State historieal society at Madison, the capital, has a refer- ence library of 125,000 volumes and pamphlets, and is the richest in the nation upon the history of the Mississippi basin; the State law library there has 19,000 volumes, the university library 14,500, and the city library 9000. Milwaukee has a public library of 35,000 volumes.

Antiquities and History.—The State is noted for its exceptionally large number of animal mounds, the work of the " mound-builders." They are found along rivers and lake banks, and are from 2 to 6 feet high, sometimes 200 feet long; remains of prehistoric cir- cumvallations, with brick baked in sitw, have been found, and the largest collection of prehistoric copper implements has been made in this State. Wisconsin was the meeting ground of the Algonkin aud Dakota Indian tribes. Its water system connecting the Great Lakes and' the Mississippi made it the keystone of the French possessions in Canada and Louisiana. The genesis of Wisconsin was from the fur trade. French explorers, ascending the Ottawa, crossed to Lake Huron, whence they easily passed throngh the Straits of Mackinaw to Green Bay, thence up the Fox to the portage between it and the Wisconsin, and on to the Mississippi. In 1634 an agent of Champlain, Jean Nicolet, first of recorded white men to reach Wisconsin soil, ascended the Fox a eonsiderable distance. In 1658-59 Radisson and Groseilliers, two fur traders who afterwards induced England to enter the Hudson Bay region, passing along the south shore of Lake Superior, struek southward to the tributaries of the Mississippi. Radisson's journal describes a great river visited by him, which was probably the Mississippi. In 1665 Father Claude Allouez founded a Jesuit mission at La Pointe, and in 1669 the mission of St Francis Xavier on the shores of Green Bay. Louis Joliet, leaving Quebec under orders to dis- cover the South Sea, in 1678, took with him Father Marquette from Mackinaw, and reached the Mississippi by the diagonal water- way of the Fox and Wisconsin rivers. In 1679 La Salle, aceom- panied by Father Hennepin, passed along the western shore of Lake Michigan to the

Illinois, and in the next year Hennepin, ascending the Mississippi, met Du Luth, who had reached it by way of the western extremity of Lake Superior. Thus were traced out the bounds and principal river-courses of Wisconsin. The epoch of the fur trade followed, during which stockade posts were erected at various key-points on the trading routes ; they became depend- encies of Mackinaw, long the emporium of the fur trade. In the French and Indian war of 1755-60 Wisconsin savages served under Charles de Langlade against the English at Braddock's defeat and elsewhere. Near the middle of the 18th century De Langlade and his father had established a trading post at Green Bay, whieh after- wards became a fixed settlement ; at the close of the revolutionary war Prairie du Chien, at the mouth of the Wisconsin, grew into a like settlement; and towards the close of the century Milwaukee, La Pointe, and Portage became permanent trading posts. The British garrison that was sent in 1761 to hold Green Bay left at the outbreak of Pontiac's war, and did notreturn. In the revolutionary war Wisconsin Indians under De Langlade supported the British, England having retained Mackinaw despite the treaty of 1788, American domination was not practically felt by the Wisconsin traders until after the war of 1812. In this war they favoured Great Britain, and in 1814 the latter wrested Prairie du Chien from an American detachment. But the formation of Astor's American Fur Company to deal in this region was followed by a United States law excluding English traders, which resulted in an increase of American influence. At the close of the war the United States placed forts at Green Bay and Prairiedu Chien. By the ordinance of 1787 Wisconsin had been a part of the territory north-west of the river Ohio; in 1800 it was included in Indiana Territory, whence in 1809 it passed to Illinois Territory, and in 1818 to Michigan Territory. In 1825 the lead-mines in south-western Wisconsin, which had been known from the earliest days of French exploration, and had been worked by the Sacs and Foxes and by Winnebagoes, attracted a considerable mining population. Hos- tilities with the Winnebagoes followed, resulting in the cession by the latter of the lead region, and the erection of Fort Winnebago in 1828 at Portage. In 1832 occurred Black Hawk's War, occasioned

by the refusal of a Sac band to remove beyond the Mississippi from Illinois, in accordance with treaty stipulations. Pursued by regulars and Illinois militia to the head-waters of Rock river, the band fled across south-western Wisconsin to the Mississippi, where they were nearly exterminated. This expedition disclosed the rich farming lands of the region. formed. Before this the fur trade and lead-mining .had been the chief factors in development, but a wave of land speculation and immigration reached here at this period. In 1840 there was a population of 30,945, more than double that of four years before. On August 9, 1846, Congress authorized Wisconsin to form a State government. The constitution framed in 1846 being rejected by the people, a second one was ratified in 1848, and Wisconsin be- came a State on May 29 of that year.

At an early period the State adopted the policy of attracting im- migration by cheap lands, a work in which the railroads have greatly aided, with the result that Wisconsin has the remarkable

are whole communities of the same foreign nationality,—such as the German groups along the shore of Lake Michigan, the Scandi- navian in various localities, the Swiss colony of New Glarus, the Belgians in Door county, and many others. The recent develop- ment of lumbering has rapidly built up northern Wisconsin, a process now being accelerated by the mining interests on the Montreal range. Wisconsin furnished to the Union armies in the civil war over 91,000 men, the famous Iron Brigade being chiefly from that State. (UBS dls #8)

WISHAW, a police burgh of Lanarkshire, Scotland, and an important mining and iron town, is situated on the face of a hill, a short distance south of the South Calder water, and on the Caledonian Railway, 12 miles east-south-east of Glasgow. It is rather irregularly built, but contains some spacious streets, although the majority of the houses are inhabited by the working classes. It has numerous churches belonging to the different denom- inations, and a public library. Wishaw has risen to importance since the development of the coal and iron industry within recent years. The coal-pits of the district are among the most extensive in Scotland, and in the town there are iron and steel works, malleable-iron

works, fireclay works, and a distillery. Wishaw was created a police burgh in 1855, and in 1874 the limits of the burgh were extended so as to include the villages of Cambusnethan and Craigneuk. The population of Wishaw according to its old limits was 8812 in 1871 and 8953 in 1881, that of the extended area in 1881 being 13,112, of which 1829 belonged to Cambusnethan and 2330 to Craigneuk. The town has borne in succession the following names:—New Town of Cambusnethan, New Town of Wishaw, Wishaw- town, and Wishaw.

WISMAR, the second commercial town and seaport of Mecklenburg-Schwerin, Germany, is situated on the Bay of Wisinar, one of the best harbours on the Baltic, 18 miles almost due north of Schwerin. The town is well and regularly built, with broad and straight streets, and contains numerous handsome and quaint buildings in the northern Gothic style. The church of St Mary, a Gothic edifice of 1353, with a tower 260 feet high, and the church of St Nicholas (1381-1460), with very lofty vaulting, are regarded as good examples of the influence exercised in these northern provinces by the large church of St Mary in Ltibeck. The elegant cruciform church of St George dates from the 14th and 15th centuries. The Fiirstenhof, at one time a ducal residence but now occupied by the municipal authorities, is a richly decorated specimen of German Renaissance. Built in 1554, it was restored in 1877-79. The "Old School," dating from about 1300, has been restored, and is now occupied as a museum. The chief manufactures of Wismar are iron, chicory, cigars, roofing-felt, asphalt, &e. Fishing and agriculture are carried on by the inhabitants, but their main industry is connected with shipping and trade. The leading ex- ports are grain, oil-seeds, butter, and cattle ; the imports are coal, timber, iron, stoneware, and lime. The harbour is deep enough to admit vessels of 16-feet draught. In

In 1836 Wisconsin Territory was |

1886 the port owned 35 ships (2 steamers), of 8302 tons burden ; in 1875, however, it had 46 ships, with a total burden of 10,447 tons. The population, 6009 in 1810 and 14,462 in 1875, was 16,011 in 1885.

Wismar is said to have received town-rights in 1229. In the 18th and 14th centuries it was a flourishing Hanse town, with important woollen factories, Though a plague carried off 10,000 of the inhabitants in 1376, the town seems to have remained toler- ably prosperous until the 16th century. By the peace of West- phalia in 1649 it passed to Sweden, along with a barony to which it gives name. In 1803 Sweden pledged both town and barony to Mecklenburg for a sum of money, reserving, however, the right of redemption after 100 years. In view of this contingent right of Sweden, Wismar is not represented in the diet of Mecklenburg ; but it still enjoys some of its ancient rights and privileges as a free

| town. proportion of persons of foreign parentage indicated above. There |

WITCHCRAFT. This subject has already been con- sidered in its general aspects under Astrotocy, DEMOoN- oLoey, Divination, Macic, and Sprrirvauism. In this place what will be mainly attempted will be to illustrate the position assumed by the law towards a crime which was regarded for centuries not only as' possible but also as specially noxious. It is a long interval from the Twelve Tables to the Bill of Rights, but the lawyers of the latter

age accepted the existence of witchcraft with a faith

almost as unquestioning as those of the former, and com- paratively few were they, whether lawyers or laymen, who in the interval dared to raise their voices against the prevailing superstition. The writings of Shakespeare and the other Elizabethan dramatists are sufficient of them- selves to show the universal prevalence of the belief in England. For the purposes of this article witchcraft may be taken to include any claim of a power to produce effects by other than natural causes. By whatever name such a power might be called in a particular case, whether witch- craft, conjuration, sorcery, incantation, divination, or any similar name, the legal effects attaching to its supposed exercise were usually the same. Witchcraft was the most comprehensive English name, sortilegium the most com- prehensive in ecclesiastical Latin.

In Roman law it was provided by the Twelve Tables that no one should remove his neighbour's crops to another field by incantation or conjure away his corn. At a later date the Lex Cornelia de Sicariis et Veneficis was extended by decree of the senate to cases of offering sacrifice to injure a neighbour.1_ Exercise of magical and diabolical arts rendered the magicians themselves liable to be burned alive, and those who consulted them to crucifixion. Even the possession of magical books was criminal. To administer a love potion, even though harmless, was punished by labour in the mines, or relegation and fine in the case of persons of rank.2 One title of the Code of Justinian is entirely taken up with the subject. Astro- logers (mathematict) seem to have been specially

objection- able to both the pagan and Christian emperors. Sorcery was punished by Constantine with banishment, or death by burning; and an accusation of witchcraft, as of treason, rendered every one, whatever his rank, liable to torture. To teach or to learn magic art was equally criminal. The

. only exceptions allowed (and these were afterwards re-

moved by Leo) were magic remedies for disease and for drought, storms, and other natural phenomena injurious to agriculture. A constitution of Honorius and Theodosius in 409 rendered mathematici liable to banishment unless they gave up their books to be burned in the presence of a bishop. The trial of ApuLEivs (¢.v.) for magic in 150 a.p. is the most familiar instance occurring under Roman law.*

The church followed and amplified Roman law. The

tome. sive Sls. 2 Paulus, Sententia, v. 21, 23 3 Cod., ix. 18 (De Maleficis et Mathematicis). 4 Const., 65.) (OliYihen i dh, ILO.

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graver forms of witchcraft constituted Heresy (q.v.), and jurisdiction over such offences was claimed by the church courts to a comparatively late date. This authorization of belief in witchcraft was based partly on well-known texts of the Mosaic law—especially Exodus xxii. 18,— partly on peculiar constructions of other parts of Scripture, such as 1 Cor. xi. 10, where the words "because of the angels" were supposed to prove the reality of the class of demons called encubi.2 What kinds of witchcraft were heresy was a question learnedly discussed by Farinaccius and other writers on criminal law. The practical effect of this mode of regarding witchcraft was that, although according to the better opinion the offence was in itself the subject of both secular and ecclesiastical cognizance, in fact it was on the continent of Europe seldom punished by the secular power, except as the mere executive of ecclesiastical sentences. The earliest ecclesiastical decree appears to have been that of Ancyra, 315 a.p., condemning soothsayers to five years' penance. In canon law the Decretum subjected them to excommunication as idolaters and enemies of

Christ, and the bishop was to take all means in his power to put down the practice of divination.® The Decretals contained, among others, the provision that a priest seeking to recover stolen goods by inspection of an astrolabe might be suspended from his office and benefice.t In the 14th century John XXII. published a bull against witchcraft. In the 15th a vigorous crusade was begun by the bull ““Summis desiderantes affectibus ” of Innocent VIII. in 1484. Under the authority of this bull Sprenger and Kramer (Latinized into “ Institor ”) were appointed inquisitors, and five years later they published the famous work Malleus Maleficarum or Hexenhammer, the great text-book on procedure in witchcraft cases, especially in Germany. The third part of the work deals with the practice at length. One or two of the more interesting points of practice deserve a brief notice. Witnesses incompetent in ordinary cases were on account of the gravity of the offence admissible on a charge of witchcrafé against but not for the accused. An alleged witch was to be conjured by the tears of our Saviour and of our Lady and the saints to weep, which she could not do if she were guilty. The authors explain that witch- ‘craft is more natural to women than to men, on account of the inherent wickedness of their hearts. In the Roman and Greek Churches the form of Exorcism (q.v.) still survives,© and was acknowledged by the Church of England as lately as 1603. The 72d canon of that year forbade attempts by the clergy at casting out devils by fasting and prayer unless by special licence from the bishop. No such canon appears among the Irish canons of 1634. On one occasion in 1612 punishment of the exorcised demons was attempted. The bishop of Beauvais, in a document which Garinet has preserved, pronounced sentence of excommunication against five such demons.’ England.—As in other countries, ecclesiastical law claimed cognizance of witchcraft as a crime against God. The Penttentials of Archbishops Theodore and Egbert and

1 The name of one form of heresy (vauderie) came in time to denote a particular kind of witchcraft.

? A reference to the incubus as a matter of common knowledge occurs in the prologue to Chaucer’s Wife of Bath’s Tale.

3) Bin iLecalsa

5 The practice was also regulated by instructions promulgated by the Inquisition. A code of such instructions framed in 1657 will be found in the later editions of Cautio Criminalis (see below).

6 The extraordinary minuteness of detail by which the practice of exorcism was regulated, even in the last century, appears from a curious little Portuguese book by Brognolo, Methodo de exorcizar expelindo Demonios (Coimbra, 1727).

' For the Roman and ancient church law, see Smith's Dict. of Antiquities, s.vv. " Magica," ""'Mathematici," and Dict. of Chr. Antig., s.v. ' Magic."*

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the Confessional of Egbert are full of condemnations of magic divinations, diabolical incantations, love-philtres, &c. An exception is made in favour of incantation by a priest by means of the Lord's prayer or the creed. The practice of magic by women is set out in the same document with minute and disgusting detail. After the Conquest, commissions were from time to time issued empowering bishops to search for sorcerers. -A form of such a commission to the bishop of Lincoln in 1406 is given by Rymer.® The ecclesiastical courts punished by penance and fine up to 1542.9 For graver punishments the secular power acted as executive. Many persons guilty of sorcery were, according to Sir Edward Coke,1° burned by the king's writ de heretico comburendo after condemnation in the ecclesiastical courts. The secular courts dealt with witchcraft from a very early period. It was an indictable offence at common law and later by statute, though apparently not a felony until the Act of Henry VIII. The earliest trial recorded in England was in a secular court. In 1324 several persons were appealed before the coroners of the king's household, and the record, certifying acquittal by a jury, was then brought up by writ of certiorari.

In proceedings against a woman the doctrine of coercion by the husband (see Women) did not apply. A distinc- tion, more curious than important, was drawn between conjurers, witches, and sorcerers. Conjurers by force of magic words endeavoured to raise the devil and compel him to execute their commands. Witches by way of friendly conference bargained with

an evil spirit that he should do what they desired of him. Sorcerers or charmers, by the use of superstitious forms of words or by means of images or other representations of persons or things, produced.strange effects above the ordinary course of nature. Legislation on the subject began in the pre-Conquest codes. Thus the laws of Ethelred banished witches, soothsayers, and magicians. The laws of Canute included love-witchcraft under heathendom. It was evi- dently regarded as a survival of paganism. The first Act after the Conquest was passed in 1541 (33 Hen. VIII. c. 8), which dealt with a somewhat remarkable mixture of offences. It declared felony without benefit of clergy various kinds of sorceries, discovery of hidden treasure, destruction of a neighbour's person or goods, making images and pictures of men, women, children, angels, devils, beasts, and fowls, and pulling down crosses. The Act having been repealed at the accession of Edward VI., another Act on similar lines but distinguishing different grades of witchcraft was passed in 1562. By this Act, 5 Eliz. c. 16, conjuration and invocation of evil spirits, and the practice of sorceries, enchantments, charms, and witchcrafts, whereby death ensued, were made felonies without benefit of clergy and punishable with death. If only bodily harm ensued, the punishment for a first offence was a@ year's imprisonment and the pillory, and for a second death. If the practice was to discover hidden treasure or to provoke to unlawful love, the punishment for a first offence was the same as in the last case, for a second imprisonment for life and forfeiture of goods. At the accession of James I., perhaps in compliment to the king's position as an expert and specialist in the matter, was passed 1 Jac. I. c. 12, which continued law for more than a century. The strange verbiage of the most im- portant section of the Act is worth quoting in full. "If any person or persons shall use, practise, or exercise any

8 Federa, vol. vii. p. 427.

® See Hale, Heclesiastical Precedents, cited in Stephen, JHist. of the Criminal Law, vol. ii. p. 410. 103 Inst., 44.

Parliamentary Writs (Record Commission edition), vol. ii. div, i, p. 403.

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invocation or conjuration of any evil and wicked spirit, or shall consult, covenant with, entertain, employ, feed, or reward any evil and wicked spirit to or for any intent or purpose, or take up any dead man, woman, or child out of his, her, or their grave or any other place where the dead body resteth, or the skin, bone, or any part of any dead person, to be employed or used in any manner of witchcraft, sorcery, charm, or enchantment, or shall use, practise, or exercise any witchcraft, enchantment, charm, or sorcery, whereby any person shall be killed, destroyed, wasted, consumed, pined, or lamed in his or her body or any part thereof," every such offender is a felon without benefit of clergy. The Act further punished with im- prisoument for a first offence, and for a second made it felony without benefit of clergy, to declare by witchcraft where treasure was, to provoke to unlawful love, or to attempt to hurt cattle, goods, or persons. This Act was repealed in 1736 by 9 Geo. II. c. 5. It will be noticed that in all the Acts it was necessary (except in the case of love-philtres) that injury should have been caused or intended or gain made. There were statutes which, although not directly concerned with witchcraft, aimed at the suppression of analogous offences. Thus multiplication of gold and silver (by means of the philosopher's stone) was made felony in 1403 by 5 Hen. IV. ¢. 4. This was repealed by 1 Will. and M. c. 30,—it is said, by the influ- ence of Robert Boyle. Numerous Acts dealing with the practice of palmistry and fortune-telling by Egyptians or Gipsies were passed at different times, beginning in 1530 with 22 Hen. VIII. c. 10. They are now superseded by the provisions of the Vagrant Act of 1824.

Trials for witchcraft in England do not seem to have been proportionately as numerous or to have been accom- panied with such circumstances of cruelty as those in niost other countries. This may be accounted for partly by the diminishing authority of the church courts, partly by the absence of TorTURE (q¢.v.) as a recognized means of procedure, though no doubt it was too often used in an informal manner. The pricking of the body of an alleged witch by Hopkins the witch-finder and similar wretches in order to find the insensible spot or devil's mark, the proof by water (a popular survival of the old water ordeal), and similar proceedings, if not judicial torture, at least caused as much pain to the victims. Charges of witch-craft seem to have been made with great frequency against persons of rank during the Wars of the Roses for political purposes. The cases of the

duchess of Gloucester and Jane Shore will at once occur to the mind, and neither Edward IV. nor his queen were exempt. The duke of Clarence was accused of imputing witchcraft to the former ; and the latter and her mother, the duchess of Bedford, were charged with having obtained the promise of marriage from the king by magical means. Trials in England were most numerous in the 17th century. In the case of the Lancashire witches in 1634 seventeen persons were condemned on the evidence of one boy. In the period from 1645 to 1647 between two and three hundred are said to have been indicted in Suffolk and Essex alone, of whom more than half were convicted.? The State Z'rials contain several instances of such trials, viz., those of Anne Turner in 1615,? and the countess of Somerset in 1616 ®(where a charge of witchcraft was joined with the charge of poisoning Sir Thomas Overbury), Mary Smith in 1616, the Essex witches in 1645,° the Suffolk witches in 1665,° and the Devon witches in 1682." The most interesting trial is that of the Suffolk witches, because Sir Matthew Hale was the judge and Sir Thomas

2 Ibid., 930. 5 4 Ibid., 817. 7 8 Ibid., 1017.

1 2 State Trials, 1052 n. 3 Tbid., 951. 4 Toid., 1050. 8 6 Tbid., 647.

Browne was the medical expert witness.§ In many of these trials the accused confessed before execution. The reasons which urged them to confess not only impossi- bilities, but impossibilities of the most revolting kind, are not very easy to discover. In some cases, no doubt, the object was to escape the misery of life as a reputed witch. The theory of witchcraft, too, was universal and well known, and the revolting details of worship of the devil and of the witches' sabbath must have been familiar to all. Torture, as the Milan case shows (see ToRTURE), might force from the accused confession of an impossible crime, and even without torture instances have been known in modern times where women have charged themselves with offences in which they were the only believers.9 These considerations may partially, if not fully, solve a difficulty which has been felt ever since the time of Cardan. Towards the end of the 17th century the feeling towards witchcraft began to change. The case of Hatha- way in 1702 no doubt accelerated the decay of the old belief. He was convicted of

cheating and assault by falsely pretending to be bewitched and by making an attack on an alleged witch.!° The last trial in England was that of Jane Wenham in 1712, convicted at Hertford, but not executed. A case said to have occurred in 1716 does not rest on good authority. This change of feeling was no doubt caused to a great extent by the works of writers, few in number but strong in argument, who from the time of Reginald Scor (g.v.) struck at the very found- ations of the popular belief. One of the most interesting but least-known writers is George Gifford, whose views are in the nature of a compromise. His point is that the devil may deceive not only witches but their accusers. The jury who convict may sometimes be right, but it must be very seldom. As lately as 1718 Dr Hutchinson, bishop of Down and Connor, thought it worth while to argue against witchcraft, but rather from the popular than the scientific point of view.!2 Legal writers did little to shake the prevailing opinion. Coke, Bacon, and Hale certainly admitted the possibility of witchcraft; Selden at least

8 In this case, tried at the assizes at Bury St Edmunds on March 16, 1664-65, two widows named Rose Cullender and Annie Duny were accused of bewitching young children. The main points of the evidence were these. There had been a quarrel between the accused and the parents of the children, and the accused had uttered threats against them. The children fell into fits and vomited crooked pins, ané once one of them vomited a twopenny nail with a broad head ; they cried out the names of the accused in their fits; they could not pronounce the words " Lord," " Jesus," or "Christ"' in reading, but when they came to " Satan" or "devil" they cried, " This bites, but makes me speak it right well." One of the children fell into a swoon after being suckled by one of the accused, and out of the child's blanket fell a great toad which exploded in the fire like gunpowder, and immediately afterwards the alleged witch was seen sitting at home maimed and scorched. Evidence of finding the witch's mark was given, and then evidence of reputation, viz., that the accused, besides being themselves accounted witches, had had some of their kindred condemned as such. A farmer swore that once when his cart had touched Cullender's house it overturned continually and they could not get it home. Sir Thomas Browne testified that the swooning fits were natural, heightened to great excess by the subtlety of the devil co-operating with the witches.

Experiments upon the children were then made in court by bringing them into contact with the witches and others. These were of so unsatisfactory a nature that many present openly declared that they thought the children impostors. The chief baron in his summing up said that there were such creatures as witches was undoubted, for the Scriptures affirmed it and the wisdom of nations had provided laws against such persons. The report alleges that after conviction of the accused the children immediately re- covered.

9 A remarkable instance is a case of Robinson v. Robinson and Lane (to be found in the Divorce Court Reports in 1859), where purely imaginary acts of adultery were recorded by the respondent in her diary. 014 St. Tr., 643.

11 A Discourse of the Subtle Practices of the Devil by Witches (1587), and A Dialogue concerning Witches and Witchcraft (1603). _John Webster's Displaying of Supposed Witchcraft (1677) takes a similar line. 12 Historical Essay concerning Witcheraft, 1st ed., 1718.

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approved the statutory provisions on the subject ; and Blackstone in guarded language said that its exclusion from the list of crimes was not to be understood as imply- ing a denial of the possibility of such an offence, though, following Addison, he would not give credit to any particular modern instance.

In the present state of the law pretended supernatural powers may be such as to bring those professing them under the criminal law, or to make void a transfer of pro- perty caused by belief in their existence. The Act of 1736 enacted that any person pretending to use witchcraft, tell fortunes, or discover stolen goods by skill in any occult or crafty science, was to be imprisoned for a year, to stand in the pillory, and to find sureties for good behaviour. This is still law, except as to the pillory. By the Vagrant Act of 1824, 5 Geo. IV. c. 83, s. 4, any person pretending or professing to tell fortunes, or using any subtle craft, means, or device, by palmistry or otherwise, to deceive and impose on any of Her Majesty's subjects, is to be deemed a rogue and vagabond. Under this Act a person may be convicted

for attempting to deceive by falsely pretending to have the supernatural faculty of obtaining from invisible agents and the spirits of the dead answers, messages, and manifestations of power, viz., noises, raps, and the winding up of a musical box.! So may one who issues an advertisement professing to forecast the future, though no money is received, and the future of a particular person is not told.? A false pretence of witchcraft is also punishable under the Larceny Act of 1861, 24 and 25 Vict. c. 96. It has been held that a false pretence that the defendant had the power to bring back the husband of the prosecutrix over hedges and ditches was within the statute. In a case in Chancery in 1868 a widow lady, aged seventy-five, was induced by the defendant, a spiritual medium, to transfer a large sum of money to him, under the belief that such was the wish of her deceased husband as declared in spiritualistic manifestations. The court held that his claim of supernatural power constituted undue influence, and that the gift must be set aside.4

See, in addition to the authorities cited, Sir Walter Scott's Letters on Demonology and Witeheraft,; Stephen, Hist. of the Criminal Law, vol. ii. ch. xxv.; Pike, Hist. of Crime in England, esp. vol. ii. p. 1381 sg.; Dr Nicholson's Introduction to Reginald Scot's Discovery of Witeheraft ; Spalding, Elizabethan Demonology, ch. iii.; also reports of particular cases, such as the trial of the Suffolk witches, published in a separate form in 1682, and the indictment of the astrologer Lilly for advising to recover stolen goods (when the grand jury threw out the bill), to be found in his autobiography.

Scotland.—The principal Act of the Scottish parliament was 1568, c. 73 (ratified and confirmed in 1649), making it a capital offence to use witchcraft, Sorcery, or necromancy, or to pretend to such knowledge, or to seek help from witches. "It was repealed by 9 Geo. IJ. c. 5. Trials were either before the ordinary courts or, more frequently, before special tribunals erected by the authority of commissions from time to time issued by the privy council, often on the petition of a presbytery or the General Assembly. Boxes were placed in the churches to receive accusations. The frequency of cases is shown by an order of parliament in 1661 that justices depute should go once a week at least to Musselburgh and Dalkeith to try persons accused of witchcraft. In these trials evidence of

the wildest description was admitted. Anything was relevant, especially if sworn to by a professed witch-finder or witeh-pricker, a position in which one Kincaid, like Hopkins in England, attained special eminence. Torture was used in most eases, and in an aggravated form, as it was supposed that the devil protected his votaries from the effects of ordinary torture. A special form of iron collar and gag called " the witch's bridle" was generally used. The details of the trials in Piteairn's Criminal Trials are utterly revolting, especially those of Bessie Dunlop in 1576 and of Dr Fian in 1590. One of the charges in the former case is very remarkable, and the accused herself confessed it, that she acted under the

1 Monck v. Hilton, Law Rep., 2 Exch. Div., 268.

? Penny v. Hauson, 16 Cox Crim. Cas., 173.

® Reg. v. Giles, Leigh and Cave's Rep., 502.

4 Lyon v. Home, Law Rep., 6 Equity, 655.

guidance of the spirit of Thome Reid who had been killed at Pinkie in 1547. In some cases a charge of witchcraft was joined with a charge of another crime, as of murder in the master of Orkney's case, of treason in Dr Fian's, accused of raising a stormat sea when the king was on a voyage.5 James VI. was frequently present in person at trials for witcheraft, and the most horrible cases recorded are those which occurred in his reign. The full pleadings in a charge are given in the case of Margaret Wallace.® Itis noticeable that the articles of dittay began by resting the criminality of sorcery upon the divine law as contained in the 20th chapter of Leviticus and the 18th chapter of Deuteronomy. The punishment was gene- rally burning. The last execution took place in 1722, after convic- tion before the sheriff of Sutherland. As to pretended powers, the Act of 1736 applies to Scotland, and at common law obtaining money by pretending to tell fortunes or recover property by enchant- ment is punishable as falsehood, fraud, and wilful imposition.

See, further, Sir Walter Scott's Letters; appendix vii. to Pitcairn: the Register of the Privy Council of Scotland, passim ; Buekle, /Tist, of Civilization, vol. ii. p.

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Lreland.—The earliest recorded case is in the same year as the earliest in England, 1324, but in an ecclesiastical and not as in England in a secular tribunal. It was a proceeding against Dame Alice Kyteler and others in the bishop of Ossory's court, which led to a considerable conflict between the church and the civil power.' The English statute of Elizabeth was adopted almost word for word by 28 Eliz. c. 2(I.). The only other Act of the Irish parliament bearing on the question was 10 Car. I. , sess. 2, c, 19 (I.), enacting that if a person bewitched in one county died in another the person guilty of causing his death might be tried in the county where the death happened. It is remarkable that this Act is based upon an English Act, 2 and 3 Edw. VI. c. 24, dealing with the venue in criminal trials, but the English Act does not mention witchcraft. 28 Eliz. c. 2 was not repealed until 1821 by 1 and 2 Geo. IV. «. 18, so that Ireland appears to be distinguished as the last country in which peualties against witchcraft were retained in statute law.

United States.—The earliest execution in New England is said to have been in 1648. In the abstract of the laws of New England printed in 1655 appear these articles :~-' IIL Witcheraft, which is fellowship by covenant witha familiar spirit, to be punished with death. IV. Consulters with witches not to be tolerated, but either to be cut off by death or banishment or other suitable punishment." 8 The fanatical outbreak at Salem in 1691-92 is one of the most strik- ing incidents in the history of New England. Nineteen persons were executed for witchcraft, among whom was Giles Cory, the only person who ever perished by the peine Sorte et durein America (see TorTURE). In 1692 fifty were tried, but only three convicted, and they received the governor's pardon. For these proceedings the writing and preaching of Cotton Mather were largely responsible, The States have now their own legislation against pretended super- natural powers. Provisions similar to those of the English Vagrant Act are common.

A full account of the proceedings at Salem will be found in Hutchinson's J7is¢. of Massachusetts Bay (vol. ii. ch. 1), in Baneroft's Hist. of the Colonization of the United States (iii. 84), and in Cotton Mather's Memorable Providences (Boston, 1689) and Wonders of the Invisible World (Boston, 1693).

Continental States.—The law against witchcraft was minutely treated by Continental jurists of the 16th and 17th centuries, especially by those who, like Farinaccius and Julius Clarus, were either churchmen or laymen holding ecclesiastical appointments. The extent to which legal refinement could go is well illustrated by the treatise on criminal law by Sinistrari de Ameno,? an Italian writer of the 17th century, whose belief in sorcery is strikingly shown by his strange work on the subject called Demonialitas.1 He defines sortilegium as "actus humanus quo per media inutilia aut vetita aliquis effectus procuratur ad damnum aut utilitatem propriam aut alienam." Six species, it appears, were recognized, called amatorium, defensorium, revelatorium, lweratorium, male- Jactorium, divinatorium. There were eleven distinct modes of profession to the service of the devil. Some of the tndicta on which torture might be inflicted were absence of the accused from bed during the night, drawing cabalistic signs on the ground, threats of injury, anointing the body. The text of Roman law was sometimes distorted in an extraordinary Way: ¢ €.g., it Was a maxim that a contract with a demon was not binding, and this was ex- pressed in the language of Roman law in the formula "in demonem cadere non potest obligatio." In Germany the ecclesiastical courts generally acted, though the crime was sometimes the subject of secular legislation, especially in the Constdtautio Criminalis of

> All these cases will be found in vol. i. of Pitcairn. In one case (noted at p. 216), a jury having acquitted an accused woman who had eonfessed under torture, the-king had them tried for wilful error.

6 Pitcairn, vol. iii. p. 508.

" The ease, edited by Mr Thomas Wright, forms vol. xxiv. of the Camden Society's publications.

8 Cited in 6 State Trials, 647, where an account of the Salem trials will be fonnd.

9 De Delietis et Penis Traetatus Absolutissimus, Rome, 1754.

**° Published at Paris with an English translation in 1879,*

Charles V. (the Carolina).1_ The number of victims perhaps ex- eceded that in any other country. It was in Germany too that the last exeeution for witchcraft in Europe took place, at Posen in 1793. In France prosecutions for vauderic oceurred in the 13th and 14th centuries. In the 15th century Joan of Arc was con- demned on a eharge of witchcraft.2 Henry III., like Edward IV. of England, was accused by his eneinies of practising sorcery. The most numerous prosecutions were set on foot in the 17th century, and as in other countries they met with the firmest support from some literary men, among whom P. de]'Ancre is conspicuous for his orthodoxy.? A royal edict of 1682 revived all previous ordin- ances against the practice of sorcery and divination, and punished with corporal punishment any persons consulting sorcerers, with death those who exercised magic themselves. The "Chambrc Ardente" tried some cases, and the last case ever brought before such a tribunal resulted in the condemnation in 1680 of a woman named Voisin for sorcery and poisoning in connexion with the Marquise de Brinvilliers. The law against sorcery held its plaee in French legal works till at least the middle of the last century. It was treated at length both by the Sieur de Lamarre and by Muyart de Vouglans.® The latter distinguishes white from black magic, the black only being criminal as a part of the larger offence of lése-majesté divine, which included also heresy, blasphemy, and perjury. Burning was the usual punishment. Among the more remarkable of the 7ndicia upon which torture might be inflicted was the finding on the premises of the accused instruments of magic, as wax figures transfixed with needles, feathers in the form of a eircle, or a written pact with the devil. Pretended exercise of magic is now punished by the Code Pénal. A very curious case of slander is mentioned by Merlin. It was tried in 1811 in the de- partment of Yonne. The slander consisted in an allegation by the defendant that the complainants had danced around the devil, who*

was seated on a gilded arm-chair as president of the dance. The tribunal of police thought the matter more a subjeet of ridicule than of injury and dismisscd it, but this judgment was quashed by the court of eassation on the ground that the charge was one which might trouble the publie peace. In Spain and Italy there is a eonsiderable body of legislation on the subject of witchcraft. For instance, the code of the Siete Partidas' in Spain punished with death those who acted as diviners or witches, especially in love matters. A distinction was drawn between divination by astronomy, whieh was legitimate, and that by augury from birds or by incan- tation over water or a mirror. On the Continent, as in England, there was during two centuries a steady flow of literary attack on the reasonableness of belief in witchcraft. The earliest attack was made in Germany, the country which had distinguished itself by the vigour of its prosecutions of the crime. Cornelius Agrippa, in his De Oceulta Philosophia, was not entirely orthodox on the subject ; and it was more directly treated in the De Prestigiis Demonum of Johann Wier or Weier in 1563, twenty-one years earlier than Reginald Scot's work. Wier was followed in the next century by Father Frederick Spee® in Germany, and by B. Bekker (g.v.) in the Netherlands. The work of Spee, originally pub- lished anonymously, appears to have caused a great sensation at the time and to have eaused a relaxation of prosccutions in order to give opportunity for further inquiry. The work takes the form of fifty-two doubts, the first of which is "An Sage Striges seu Malefici revera existant?" The general conclusion is that, although witches exist in general, the question of their operation in particular cases is open to so much doubt that it would be well to suspend proceedings for a time. The writer did not profess entire disbelief, as did Bekker. The main idea of De Bctooverde Wereld of the

latter is that good and evil spirits could have no effect or influence

on earthly affairs, for spirit could not act on inatter. All proseen- tions for witchcraft were therefore unjust, and against the honour of God and the advantage of man. During the same period other writers both lay and legal treated the question incidentally. Montaigne was sceptical; Montesquieu, while not actually intimat- ing disbclief, enjoined the

greatest care in trying accusations. As in England, the current of literary feeling was not uniformly op-

1 Art, 44 gives the cndicia which suffice to put tothe torture. Art 52 gives the questions whieh are to be asked by the judge.

2 The numerous allusions to Joan of Arc's witeheraft in the First Part of Shakespeare's Tenry V7. will be familiar.

3 DP' Inieredulité et Mescréance du Sortilége Plainement Convaineue, Paris, 1622.

4 Traité sur la Magie, Sortilégc, Possessions, Obsessions, et Maléfices, Paris, 1737. > Institutes au Droit Criminel, Paris, 1757.

6 Répertoire de Jurisprudence, s.v. ' Sortilége."*

7 Partida vii. tit. 23.

8 Cautio Criminalis, seu de Processibus Contra Sagas, the first edition (Frankfort, 1632) being anonymous, " auetore ineerto theologo Romano," while later ones bear the name of the author. A full aeeount of an ordinary trial for witcheraft will be found in the work. One of the most shameful parts of it, the stripping and shaving of an alleged witch, meets with the author's strongest reprobation.

posed to popular belief, for Wier was answered by Bodin, and Luther and other eminent writers no doubt had full faith in the existence of witchcraft.

See Lecky, Hist. of Rationalism in Europe, vol. i. ch. i., where an immense number of authorities are cited; works on magic, such as those by Delrio and Garinet ; Schcltema, Geschiedenis der Heksenprocessen, Haarlem, 1828; Soldan, Geschichte der Hexenprocesse, Stuttgart, 1843; and various reports of particular trials, e.g., the proceedings against fifty-three magicians at Logrofio in Castile in 1610, by P. de l'Ancre (Paris,

1612), the trials in Sweden in 1669 and 1670, by Dr Anthony Horneck (London, 1700), the proceedings against G. Kébbing at Coesfeld in 1632, by Niesert (Coesfeld, 1827), and Les Procedures de Sorcellerie & Neuchatel, by Lardy (Neuchatel. 1866). (J. Wt.)

WITENAGEMOT. See Eneianp, vol. viii. p. 276. WITHER, Grorce (1588-1667), appears inthe Dunciad as "sleeping among the dull of ancient days, safe where no critics damn." The once ardent poet's slumbers were disturbed towards the close of the 18th century by George Ellis, who in his Specimens resuscitated some of Wither's poetry, not to condemn but to praise. Thereafter he was speedily released from Pope's limbo. Wordsworth pre- fixed a dozen of Wither's most exquisite lines to his own poem To the Daisy; Southey quoted him eulogistically ; Brydges republished a selection of his poems, and searched out the facts of his life ; Park madea list of his voluminous writings, over 100 in number, for The British Libliographer; and, most fortunate stroke of all for Wither's memory, Charles Lamb wrote upon him one of his most delightful essays, re-creating and immortalizing the old poet's poetic spirit.2 Wither's life was full of adventure. Born June 11, 1588, the son of a Hampshire gentleman, educated at Magdalen College, Oxford, he entered at Lincoln's Inn, conceived an ardent passion for poetry, put forward as a satirist in 1613 with Abuses Stript and Whipt, and was promptly lodged in the Marshalsea. It was the year of the Essex divorce case, when so plain a satirist, though he whipt abuses in the abstract, might easily have given offence. In prison he wrote The Shepherd's Hunting, the fourth eclogue of which contains his memorable praise of poetry. Wither's dfotto was published in 1618; Fair Virtue, or The Mistress of Philarete, the longest, freshest, and most captivating lover's panegyric in the language, in 1622. When the civil war broke out, Wither took the side of the Parliament, sold his estate in Hampshire and raised a troop of horse, was taken prisoner and saved from death at the intercession of Denham, backed by a timely jest, was promoted aud enriched by Cromwell, was stript of his possessions at the Restoration and thrown into prison, but released under bond for good behaviour. Besides the poems above mentioned, which are the basis of Lamb's admiration, and his curious #mblems, published in 1635, Wither, a man of most radiant energy and eloquence, wrote a host of satirical and polemical tracts, for which readers may be referred to the

Bibliographer. The famous song “Shall I, wasting in despair,” occurs in The Mistress of Philarete. Ue died in London May 2, 1667. WITHINGTON, a township of Lancashire, England, 4 miles south of Manchester, of which it is practically a suburb. It is chiefly occupied by better-class mansions and villas. The township is within the old parish of Man- chester, but was formed into a separate ecclesiastical parish in 1854. The urban sanitary district includes part of the parish of Withington and three other parishes (area 5728 acres), the population being 10,099 in 1871 and 17,109 in 1881. The population of the Withington portion (area 2229 acres) in 1871 was 4863, and in 1881 it was 9328. WITNESS, in law, is a person who gives or might give evidence in a court of justice. The law of witnesses is on the one hand a branch of the law of EvipENCcE (q.v.), and on the other is closely connected with the Jury (q.v.), for the jurors were originally chosen for their knowledge or presumed knowledge of the facts in dispute. The part of the Scotch juror’s oath “and no truth conceal” is an 9 The marginal notes forming the original MS. of this essay have recently been reprodueed by Mr Swinburne, Aiscellanies, p. 157.

obvious survival of the time when the juror was a witness. It is only by gradual steps that the law has reached its present stage in the United Kingdom and the United States. At present the disabilities of witnesses are few; almost every one is a capable witness, and the main question has become one of credibility rather than of capability. It was far otherwise in Roman and ecclesi- astical law and in the older law of England and Scotland. A reference to Torture will show that in Roman and medizval law the testimony of many persons was not admissible without the application of torture. At the same time a large body of possible witnesses was excluded for reasons which have now ceased to be considered expedient, and was subject to rules which have long become obsolete. In Roman law witnesses must be zdonez, or duly qualified. Minors, certain heretics, infamous persons (such as women convicted of adultery), and those interested in the result of the trial were inadmissible. Parents and children could not testify against one another, nor could slaves against their masters, or those at enmity with the party against whom their

evidence was offered. Women and slaves were under a disability to be witnesses to a will. The canon law extended the disability to testify to an excommunicated person, and to a layman in a

criminal charge against a clerk, unless he were actually.

the prosecutor. In the days of trial by battle a party could render a witness against him incompetent by challenging and defeating him in the judicial combat. A policy similar to that of Roman law was followed for centuries in England by excluding the testimony of parties or persons interested, of witnesses for a prisoner, and of infamous persons, such as those who had been attainted, or had been vanquished in the trial by battle, or had stood in the pillory. All these were said vocem non habere. Many systems of law excluded witnesses from policy of a local or temporary nature. _WoMmEN (¢.v.) were generally regarded as wholly or partially incompetent. The evidence of Jews was frequently rejected in Spain and other countries during the 14th and 15th centuries. In the United States, while slavery was lawful, the evidence of slaves (and in some States that of free persons of colour) was not received for or against whites. There were in Roman law some hard and fast rules as tonumber. Seven Witnesses were necessary for a will, five for a mancipatio or manumission or to determine the question whether a person; were free or a slave. Five was also the number necessary under the Liber Feudorum for proving ingrati- tude to the lord. Two were generally necessary, as in the Mosaic law, as a minimum number to prove any fact. Unius responsio testis omnino non audiatur are the words of a constitution of Constantine. The evidence of a single witness was simply semiplena probatio, to be supplemented, in default of a second witness, by torture or by reference to oath. In the canon law the evidence of a notary was generally equivalent to that of two ordinary witnesses. The evidence of the pope and that of a witness who simply proved baptism or heresy (according to some authorities) are perhaps the only other cases in which canon law dispensed with confirmatory evidence. In England one witness is as arule sufficient. But in certain cases two or more are necessary. 'Two must attest a marriage or a will,' and two are necessary for a conviction of perjury, treason, and some other crimes, such as offences against the Act of Supremacy of Elizabeth. Inthe United States the number necessary for

the attestation of a marriage or will is not uniform inall the States. Sometimes a special number has been fixed in England by statute in excep-

1 The absence of two witnesses does not, however, avoid a marriage as it does a will, The section of 4 Geo. IV. c. 76 providing for the presence of witnesses at a marriage has been held to be merely directory.

tional cases. A curious Act of Richard II., passed in 1383 (6 Ric. IT. st. 2, c. 5), fixed the number of compurgators necessary to free an accused person from complicity in the peasant revolt at three or four. Corroborative evidence —not necessarily the evidence of another witness, but corroboration in a material particular—must in England be given to entitle the complainant or plaintiff to succeed in an affiliation summons or in an action for breach of pronuse of marriage. The evidence of an accomplice also needs confirmation, if not in strict law, at least in practice. The number of witnesses had in one instance in old Scotch law the curious effect of determining the punishment. By the assizes of King William, the ordeal of water was under- gone by the accused on the oaths of three witnesses; if to them the oaths of three seniores were added, the penalty was immediate hanging. Witnesses need not now in English law be ¢donet or credible, except in the case of witnesses to bills of sale under the Bills of Sale Act, 1882, The "credible" of the Statute of Frauds has not been repeated in the Wills Act (see WiLL). In the case of dishonour of a foreign bill of exchange the evidence of a notary is required, and a solicitor must attest a warrant of attorney, as was also required for a bill of sale from 1878 to 1882.

The modern law of witnesses has been already treated to a con- siderable extent under Evipence. It should be noticed that since the date of that article a new rule of great importance has received statutory sanction. The rules of the Supreme Court, 1883 (Ord. XXXVI, 1, 38), enable the judge in all cases to disallow any questions put in cross-examination of any party or other witness which may appear to him to be vexatious and not relevant to any matter proper to be inquired into in the cause or matter. It will suffice here to give a brief statement of the law as it at

present stands, rather by way of supplement to what has been already said than as an ex- haustive notice. Witnesses may be either sworn or unsworn, either judicial or non-judicial, the unsworn and non-judicial almost coin- ciding. The evidence of judicial witnesses may be given viva voce or by deposition or affidavit, the latter being the more usnal course in chancery and bankruptcy proceedings. Where evidence is taken on commission, the usual course where the witness is out of the jurisdiction, the questions and the witness's answers are produced in writing to the court which issued the commission, it being a delegation of the authority of the court. As a rule all witnesses coming before a court of justice, whether to give evidence as to a fact or a professional opinion, must be sworn (see OATHS).2 To this rule certain exceptions exist at common law and have been introduced by statute, the one of the most importance being the law by which persons objecting to take an oath may affirm. Another exception was introduced by the Criminal Law Amendment Act, 1885, the Act allowing the evidence of a child of tender years to be received without oath. But to eusure a conviction such evidence must be corroborated. At common law a person merely produc- ing documentary evidence need not as a rule besworn. A witness, too, may be examined unsworn on the voir dire, as it is called, to decide the preliminary question of his competency. Non-judicial witnesses are those who attest an act of unusual importance, for the due execution of which evidence may afterwards be required. They are either made necessary by law, as the witnesses to marriages and wills, or used by general custom, as the witnesses to deeds. In some cases the attestation has become a mere form, such as the attestation of the lord chancellor to a writ of summons (see WRIT). Those witnesses whose evidence is not received may be divided into incompetent and privileged,—classes which must be carefully distinguished. The evidence of the former is wholly inadmissible ; that of the latter is admissible if they waive their privilege. Among the incompetent witnesses are those of too tender years to under- stand the nature of an oath, idiots and lunatics, those convicted of perjury under an Act of Elizabeth (see Persury),? and accused persons or their husbands or wives (except where the trial is for treason or for personal injuries inflicted by one spouse against the other), The exclusion of the latter class has led to much dis-

2 The giving of evidence unsworn appears to have been at one time regarded as a privilege. The men of Ripon, for instance, were by a charter of Athelstan to be believed on their yea and nay in all disputes.

3 A person convicted of perjury at common law is not on that account incompetent in England ; his evidence may be given for what itis worth. It is otherwise in the United States, see Revised Statutes, § 5392. In France disability to be a witness may be inflicted as part of the punishment on conviction for certain crimes (see Code Pénal, § 42).

cussion among English lawyers. In 1878 the Criminal Code Commission recominended that prisoners shonld be allowed to give evidence on their own behalf on oath. Several recent Acts have modificd in some degree the rigour of the common law. The accused, or the husband or wife of the accused, may give evidence on oath in certain proceedings, nominally criminal, substantially of a civil nature, such as indictments for nuisance or non-repair of a highway (40 Vict. and 41 Vict. c. 14). The same is the case under the Merchant Shipping, Licensing, and Customs Acts, the Married Women's Property Act, 1882, the Criminal Law Amendment Act, 1885, the Merchandise Marks Act, 1887, and other Acts. Up to 1702 the prisoner was under the further disability of not being able to have his witnesses examined on oath. This harsh rule, borrowed from Roman law, was not abrogated in Ireland until 1711, in Scotland until 1735. Where a witness is competent, he is also compellable, except the king. The only privileged witnesses practically now recognized in England are high officers of state, executive or judicial, and members of the legal profession, who need not divulge what has been disclosed to them in professional confidence. Clergy and medical men are not privileged, though attempts have sometimes been made to protect disclosures to them, especially to priests in the confessional. Any witness is privileged from answering questions the answers to which might expose him to penalty or forfeiture or to a charge of adultery. Lists of wit- nesses intended to be called by the crown must be supplied to the accused in charges of TREASON (q.v.), and are generally on the back of the indictment in ordinary cases, though the prosecution is not bound to call them. In

Scotland lists of the witnesses are supplied in all cases, and in the United States in capital charges.

The mode of securing the attendance of a witness is by subpoena (see Writ) in civil actions in the High Court, by subpeena or RECOGNIZANCE (¢.v.) before an assize court, by SUMMONS (q.v.) in a county court or court of summary jurisdiction. In exccptional cases attendance may be secured by writ of habeas corpus ad testi- Jicandum or by WARRANT (q.v.) of a secretary of state. In Scotland attendance is generally secured by citation. Disobedience to a sub- poena is punishable as ConrEemrt or Courtr (qg.v.).1 False evidence renders the offender liable to the penalties of perjury. Various Acts of Parliament deal with compelling appearance before com- mittees of parliament, courts of martial, and other tribunals of a special nature. A witness is protected from any action for slander for words spoken in the witness box. He is also protected from arrest cundo, morando, et redeundo. The scale of allowances to witnesses depends upon orders of court made with the approval of the Treasury. It is graduated according to the social position of the witnesses. (J. Wt.)

WITSIUS, Hermann (1636-1708), Dutch theologian, was born February 12, 1636, at Enckhuysen, North Hol- land, studied at Utrecht, Leyden, and Groningen, and was ordained to the ministry in 1657. In 1675 he became professor of divinity at Franeker, and in 1680 he was translated to a corresponding chair at Utrecht. In 1685 he acted as chaplain to the Dutch embassy sent to London to congratulate James II. on his accession. In 1698 he succeeded Spanheim at Leyden, where he died on October

22, 1708.

*Subjoined is a list of his more important works. Judzus Christianizans,— circa Principia Fidei et SS. Trinitatem, Utrecht, 1661; De Geonomia Federum Dei cum Hominibus, 1677 (often re- printed, both in Latin and in English, and still regarded as one of the clearest and most suggestive expositions of the so-called "*federal" theology); Diatribe de Septem Epistolarum Apocalypti- carum Sensu Historico ac Prophetico, Franeker, 1678; Eaxcrcitationcs Sacre in Symbolum quod Apostolorum dicitur et in*

Orationem Dominicam, Franeker, 1681; Miscellanea Sacra, Utrecht, 1692- 1700 (2 vols. 4to).

WITT. See Dz Wirt.

WITTEN, a rapidly growing town of Westphalia, Prussia, is favourably situated among the coalfields of the Ruhr, 14 miles east of Essen and 15 miles north- east of Elberfeld. The coal-mines in the neighbourhood provide abundant fuel for large cast-steel works, iron- foundries, railway workshops, machinery and boiler works, glass-works, distilleries, and other industrial establishments. In 1843 the population was 3444; in 1885 it was 23,903.

WITTENBERG, now an unimportant manufacturing town in the province of Saxony, Prussia, is situated 55 miles to the south-west of Berlin, on the Elbe, which is here spanned by a stone bridge 300 yards long, and by an

1 Jn the ecclesiastical courts it was formerly punished by Excom- MUNICATION (g.v.).

iron railway bridge 320 yards long. The three suburbs which adjoin the town are not older than 1817. Witten- berg is interesting chiefly on account of its close connexion with Luther and the dawn of the Reformation; and several of its buildings are associated with the events of that time. Part of the Augustinian monastery in which Luther dwelt, at first as a monk and in later life as owner with his wife and family, is still preserved, and has been fitted up as a "Luther museum." The Augusteum, built in 1564-83 on the site of the monastery, is now a clerical seminary. The Schlosskirche, to the doors of which Luther nailed his famous ninety-five theses in 1517, dated originally from 1490-99 ; it was, however, seriously damaged by fire during the bombardment of 1760, and has practically been re-built. The old wooden doors, burnt in 1760, are replaced by bronze doors, bearing the Latin text of the theses. In the interior of the church are the tombs of Luther, Melanch- thon, and the electors Frederick the Wise and John the Constant. The parish

church, in which Luther often preached, was built in the 14th century, but has been much altered since Luther's time. The present infantry barracks were at one time occupied by the university of Witten- berg, founded in 1502, but incorporated with the university of Halle in 1817. Luther was appointed professor of philosophy here in 1508; and the new university rapidly acquired a considerable reputation from its connexion with the early Reformers. Shakespeare makes Hamlet and Horatio study at Wittenberg. The ancient electoral palace is another of the buildings that suffered severely in 1760 ; it now contains archives. Melanchthon's house and the house of Lucas Cranach the Elder (1472-1553), who was burgomaster of Wittenberg, are also pointed out. Statues of Luther and Melanchthon embellish the town. The spot, outside the Elster Gate, where Luther publicly burned the papal bull in 1520 is marked by an oak tree. Woollen and linen-weaving, stocking-making, leather-work- ing, distilling, and brewing are carried on in Wittenberg. The formerly considerable manufacture of the heavier kinds of cloth has died out. The population in 1885 was 13,856 ; in 1816 it was 6206. :

Wittenberg is mentioned as early as 1180. It was the capital of the little duchy of Saxe-Wittenberg (vol. xxi. p. 352), the rulers of which afterwards became electors of Saxony;.and it con- tinued to be the chief town of Saxony under the Ernestine electors. The capitulation of Wittenberg (1547) is the name given to the treaty by which John Frederick the Magnanimous was compelled to resign the electoral dignity and most of his territory to the Albertine branch of the Saxon family. In 1760 the town was" bombarded by the Austrians. In 1813 it was refortified by com- inand of Napoleon; but in 1814 it was stormed by the Prussians under Tauentzien, who received the title of " Von Wittenberg " as a reward. Wittenberg continued to be a fortress of the third class

until the reorganization of the German defences after the founda- tion of the new empire in 1871 led to its being dismantled.

WLOCEAWEK, or VLoTSLAVSK, a district town of the government of Warsaw, on the left bank of the Vistula, which is crossed by an iron bridge, 118 miles by rail to the N.W. of Warsaw. It was founded about 1139, and became known under the name of Vladislavia, or Old

Ladislaus, as a centre for trade of some importance. Later on it fell into decay; but, owing to its position on the great water highway of Poland and on the railway connecting Warsaw with Berlin and Dantzic, its popula- tion has rapidly increased of late, and now amounts to 22,600. Its merchants carry on an active trade in grain. It has a fine cathedral, dating from the 14th century.

WOBURN, a town of Middlesex county, Massachusetts, United States, lies about 10 miles somewhat west of north from Boston ; it comprises within its limits four villages of

greater or less size, besides a small rural population. The town contains 75 miles of streets. The population in 1885 was 11,750, about three-tenths of foreign birth. The

industries, which are largely manufacturing, are connected chiefly with the tanning of leather and the making of boots and shoes.

Woburn is one of the older towns of Massachusetts, having been settled in 1642. Its growth, however, was slow, and it is only in recent years that it has attained to importance.

WOELFL, Josep (1772-1812), pianist and composer, was born in 1772 at Salzburg, where he studied music under Leopold Mozart and Michael Haydn. After a short residence at Warsaw he produced his first opera, Der Hollenberg, with some success at Vienna, where it was soon followed by Das schine Milchmddchen and some other drainatic pieces. These, however, have been long for- gotten, and his fame now rests upon his compositions for the pianoforte, and the skill with which he is said to have met their formidable demands upon his power as an executant. The perfection of his technique was im- measurably enhanced by the enormous stretch of his fingers; and to the wide grasp of the key-board this placed at his command he owed a facility of execution which he turned to excellent account, especially in his extempore perform- ances.

So remarkable were these that even the youthful Beethoven did not disdain to play in company with him at the house of Count Wetzlar, and in memory of this exhibi- tion of good-humoured rivalry he dedicated to Beethoven his Three Sonatas, Op. 6. Quitting Vienna in 1798 Woelfl exhibited his skill in most of the great European capitals, and, after spending some years in Paris, made his first appearance in London, May 27, 1805. Here he enjoyed a long term of popularity, crowned about 1808 by the publication of his Sonata, Op. 41, containing some variations on " Life let us cherish." This, on account of its technical difficulty, he entitled Non Plus Ultra; and, in reply to the challenge, Dussek's London publishers reprinted a sonata by that composer, originally called Le Retour & Paris, with the title Plus Ultra, and an ironical dedication to Mon Plus Ultra, Woelfl died in Great Marylebone Street, London, May 21, 1812. Some stories once current concerning his ruin by a card-sharper and death upon a heap of straw are proved to have been utterly without foundation.

WOHLER, Friepricu (1800-1882), chemist, was born on July 31, 1800, in Eschersheim, near Frankfort-on-the Main. While attending the village school of Rodelheim, he received valuable additional instruction from his father, a man of more than ordinary acquirements. In 1812 the family removed to Frankfort, where he entered the gym- nasium, and by the kindness of a scientific friend, Dr Buch, was introduced to the study of mineralogy, chemistry, and physics. He afterwards studied medicine at Marburg and Heidelberg, graduating in that faculty at the latter university. Having, on the advice of Leopold Gmelin, decided upon devoting himself henceforth to chemistry, he completed his chemical education at Stock- holm, under Berzelius, in whose laboratory he worked for a considerable time, and with whom, during his subsequent life, he maintained the most friendly relations. While in Sweden he took part in a scientific expedition through Norway, which made him acquainted with the brothers Brongniart and with Humphrey Davy.

After his return from Sweden in 1825, he accepted a call to Berlin as teacher of chemistry in the then newly- erected " gewerbschule," and remained there until 1832, when family affairs caused him to take up his abode in Cassel. In 1836 Wéhler became professor of chemistry in the

medical faculty of the university of Gdottingen, which office, in his case, was combined with that of inspector-general of pharmacy for Hanover. He held his chair till his death, which occurred, after a short illness, on the 23rd September 1882.

WOE—-WOH

Wohler's career as a chemist extends over two generations. Some sixty years ago, when the elementary nature of chlorine had just been established, and the isolation of cyanogen was still a novelty, young Wohler already worked as an investigator, the same Wohler who rejoiced with the chemists of to-day over the synthesis of indigo. Of the world of chemical discoveries that lie between he magna pars fuit. Within the limits of the prescnt article, however, it is impossible to do more than indicate briefly the nature of some of his greater achievements, Amongst these his discovery of cyanicacid, and what it led him to, oceupy a prominent place. From these investigations of his the science of organic chemistry may be said to date.

When, in 1828, Wohler prepared the ammonia salt of his acid, he was astonished to find that the salt, although made by what appeared to be a straightforward double decomposition, did not exhibit the character of an ammonia salt at all, but turned out to be identical with urea, a substance which heretofore had been known only as one of the organic components of urine. Prior to this discovery a wide and impassable gulf had in the minds

-of chemists separated the mineral from the organic kingdom.

Inorganic bodies all appeared to be derivable from their elements by a succession of acts of binary combination; the full analysis of such a body contained in itself the full instruction for its synthetical production in the laboratory. Organic substances, on the other hand, were supposed to be things of an entirely different order; in them the few elements which they all consist of were assumed to be united with one another, each with each, in a mysterious manner, which could be brought about only by theagency of " vital force."" Vital force, it was now seen, had nothing to do with the formation of urea at any rate. The gulf was bridged over, and a great and

new morning full of the highest promise dawned over chemistry. If the promise was more than fulfilled, if organic chemistry from a mere possibility developed into a reality, we owe this chiefly to the great researches which were carried out con- jointly by Wchler and Liebig.

One of the first, if not the first, of these was an investigation on the oxygenated acids of cyanogen, which they published in 1830. In their research they proved, both analytically and synthetically, that cyanic and cyanuric acid, although distinct bodies, have the same elementary composition, and that the former, when simply kept in a sealed-up tube, gradually passes wholly into a porcelain- like neutral solid, cyamelide, which is widely different from either. By these discoveries, and by Wohler's synthesis of urea, the fact of isomerism was firmly established. Compared with this great conquest their joint work on mellitic acid (1830) and on sulpho- vinic acid (1831) appears small; it sinks into insignificance when viewed in the light of their immortal researches on bitter-almond oil and on uric acid.

In 1832 bitter-almond oil was supposed to be to bitter almonds what a hundred and one other essential oils are to their vegetable sources. Of its chemistry nothing was known except the fact that it contains loosely combined prussic acid, and that, when kept for a long time, it is liable to deposit a crystalline solid, as various other essential oils do. Liebig and Wohler, being struck by the absence from even powdered bitter almonds of the intense smell characteristic of the oil, set about tracing the latter to its origin, and soon solved the question. In 1830 Robiquet and Boutron-Charlard had succeeded in extracting from bitter almonds a crystal- line nitrogenous solid, soluble without decomposition in alcohol and in water, which they called amygdaline. What Liebig and Wohler found was that, when bitter-almond meal is mashed up with water, this amygdaline, by the action of the water and a ferment (common to both sweet and bitter almonds), breaks up into sugar, prussic acid, and bitter-almond oil. They also succeeded in separating the prussic acid from the distilled oil, and found the thus purified oil to be a non-poisonous liquid of the composition C,H,O. This liquid, when exposed to the air, readily takes up oxygen and assumes the form of a solid, which is identical at the same timne with the quasi-stearoptene of the oil and with Scheele's benzoic

acid, C,H,0,,_ When treated with chlorine, the purified oil yields a chloride, C,H;0.Cl,—the chlorine of which, by treatment with the respective potassium compounds, is displaced by its equivalent in bromine, iodine, sulphur, cyanogen, and, on treat- ment with ammonia, by the group NH,. Water converts it into hydrochloric and benzoic acids. In all these reactions the group C,H,O holds together; it moves forwards and backwards as if it were a compound element, —a common-place enough fact in the eyes of the chemical student of 1882, but a most wonderful revelation to the chemist of 1832. Berzelins, who certainly was not much given to dealing in superlatives, greeted the discovery in his Jahresbericht as opening up a new era in organic chemistry, and, rejecting the prosaic name of benzoyl which Wéhler and Liebig had given to their radical, proposed to name it proine, from mpwit, early in the day, or orthrine, from dpépos, the dawn.

Equally important in a scientific sense, but greater as a piece of experimental work, was their joint research on Uric Acip (q.¥.). After their uric acid research the ways of Wéhler and Liebig

diverged. The latter continued to prosecute organic rescarch ; the former turned his attention more to inorganic subjects, —not ex- clusively, however, as the well-known research on narcotine (which was carried out in his laboratory, partly by himself partly by Blyth, and published in 1848) is alone sufficient to prove.

Amongst Wohler's inorganic publications, a short notice on the improvements in the preparation of potassium is significant as forming the small beginning of a brilliant series of researches on the isolation of elementary substances and on their properties, a subject for which he evidently had a great love, as he always comes back to it in the intervals of other work. In 1827 he for the first time succeeded in isolating aluminium, the metal of clay, by means of a method which was soon found to be more generally applicable. Alumina, like many other metallic oxides, is not reducible by electrolysis or by the action of charcoal at any tcmper- ature. But, when heated with charcoal in chlorine gas, it passes into the state of a volatile chloride. What Wohler found was that this

chloride, when heated with potassium or sodium, readily gives up its chlorine and assumes the elementary form. The aluminium which Wohler thus obtained was a grey powder; but in 1845 he succeeded in producing the metal in the shape of well-fused, fully metallic globules. Wohler, on this second occasion, correctly ascertained all the properties which everybody now knows to be characteristic of this metal; and it is as well to add that where Wohler's aluminium differed from what now occurs in commerce under this name it differed to its own advantage. That Wohler should not have seen the practical importance of his discovery is not to be credited ; if he never suggested an attempt to manu- facture the metal industrially, that is only the natural consequence of the circumstances in which he was placed.

The earlier aluminium research was followed in 1828 by the isolation of beryllium and yttrium. These earlier metal reductions fall into the Berlin period. While in Cassel he worked out pro- cesses for the manfacture of nickel free from arsenic, and this laid the foundation for what is now a flourishing chemical industry in Germany. The several methods for the analysis of nickel and cobalt ores which he describes in his Mineral-Analyse: appear to be an incidental outcome of this work. This subject was one of his favourite topics ; as late as 1877 we see him coming back to it in the publication of a short process for the separation of nickel and cobalt from arsenic and iron.

In 1849 metallic titanium arrested his attention. Since the days of Wollaston those beautiful copper-like cubes which are occasionally met with in blown-out blast furnaces had been sup- posed to be metallic titanium pure and simple. Wéohler observed that the reputed metal, when fused with caustic alkali, emitted torrents of ammonia, and on further inquiry ascertained the crystals to be a ternary compound, containing the elements of a nitride and of a cyanide of the metal. In pursuance of this research Wohler taught us how to prepare real titanium and really pure titanic acid.

In 1854 Deville's energetic attempts to produce aluminium in- dustrially caused Wéhler to turn his attention again to this early and almost forgotten child of his genius. His first incentive, no doubt, was the natural

and just desire to claim his right as the real discoverer of what Deville, in his ignorance of foreign scientifie work, quite honestly thought he had been the first to find out. This dispute came to a very satisfactory issue: Deville, after a

little pardonable hesitation, fully acknowledged Wohler's priority, |

and the two henceforth were friends, and worked together.

The first fruit of this happy union was a memorable joint re- search (published in 1856 and 1857), which led to their discovery of an adamantine and of a graphitoidal (in addition to the long known ainorphous) modification of boron. This graphitoidal species subsequently, in their own hands, proved to be a mistake ; but the adamantine modification lives to this day asa true analogue of ordinary (carbon) diamond.

From boron to silicon is an easy transition, so we need not wonder at finding Wohler, in 1857, engaged (conjointly with the physicist Buff) in a research on new compounds of silicon. On electrolysing a solution of common salt with silicon-containing aluminium as a positive electrode, they obtained a self-inflammable gas which they recognized as hydrogen contaminated with the previously unknown hydride of silicon, SiH,, which body Wéhler subsequently, with the co-operation of Martius, obtained in a state of greater purity. Wéohler and Buff also obtained, though in an impure state, what were subsequently recognized by Friedel and Ladenburg as silicon-chloroform and as silicon-formic anhydride.

Space does not allow of more than a mere reference to Wéhler's researches on metallic or semimetallie nitrides. What we know of this as yet little understood class of bodies, with barely an exception, came out of his laboratory, if it was not done by himself in the strict sense of the word. And only a reference can be made to the numerous processes which Wohler, in the course of his long laboratory practice, has worked out for the preparation of pure chemicals, and for the execution of exact analytical separations. He had better work to do than to take up analytical problems for their own sake; but what he did in this direction incidentally

amounts to a great deal. The analysis of meteorites was one of his favourite specialties,—one of his results being the discovery of organic matter in a ineteorite which he examined in 1864.

As a teacher Wohler ranks with Liebig and Berzclius. In a sense he was the greatest of the three. Berzelius never had the opportunity to teach large numbers of students in his laboratory; and Liebig lacked the many-sideduess so characteristic of the Git. tingen laboratory as long as it really was under Wéhler's personal direction. One student might wish to work on organic chemistry, another on minerals, a third on metallurgy, a fourth on rare ele- ments; let them all go to Wohler, and all, as well as the fifth or sixth, would find themselves in the right place. That Wohler in these circumstances was able to do much literary work is truly marvellous. His Grundriss der Chemvie, which he published anony-mously at first, has passed through many editions, and been trans- lated into various foreign languages,—never, unfortunately, into English. A more valuable teaching book still, and more unique in its character, is his excellent Practische Uebungen in der chemischen Analyse (entitled in the second edition AMineral-Analyse in Bei- spielen), of which we have two English translations. To a man like him the compilation of either book probably gave little trouble ; what must have taken up a very large portion of his valuable time are his translations of Berzelius's Lehrbuch der Chemie, and of all the successive volumes of Berzelius's Jahresbericht, which only thus became really available to the scicntific world at large. From 1838, too, Wohler was one of the editors of Licbig's Annalen.

Wohler's last publication (1880) treats of a new kind of galvanic element in which the one metal aluminium serves for either pole.

A very excellent biography of Wéhler by Hofmann is published in the Berichte der deutschen chemischen Gesellschaft for 1882. (W. D.)

WOHLGEMUTH, Micwazt (1434-1519), an able painter of the school of Franconia, of which Nuremberg, where he was born in 1434, was the chief artistic centre. Little is known of his private life beyond the fact that in 1472 he married the widow of the painter Hans Pleyden- wurff, whose

son Wilhelm worked as an assistant to his stepfather. The importance of Wohlgemuth as an artist rests, not only on his own individual paintings, but also on the fact that he was the head of a large workshop, in which many different branches of the fine arts were carried on by a great number of pupil-assistants, including Albert Diirer (see vol. vil. pp. 555-56). In this atelier not only large altar-pieces and other sacred paintings were executed, but also elaborate retables in carved wood, consisting of crowded subjects in high relief, richly decorated with gold and colour, such as pleased the rather doubtful Teutonic taste of that time (see p. 648 infra). Wood-engraving was also carried on in the same workshop, the blocks being cut from Wohlgemuth's designs, many of which are remarkable for their vigour and clever adaptation to the special necessities of the technique of woodcutting. Two large and copiously illustrated books have woodcuts supplied by Wohlgemuth and his stepson Wilhelm Pleydenwurff. The first is the Schatzkammer der wahren Reichthiimer des Hels, printed by Koberger in 1491; the other is the Historia Mundi, by Schedel, 1493-94, a sort of encyclopedia, usually known as the Nuremberg Chronicle, which attained a very high degree of popularity at the time, and is now highly valued, not for the text, but for its remarkable collection of spirited engravings.

Among the paintings ascribed to Wohlgemuth a large number are clearly the work of less able assistants, but those by the hand of the master himself possess merit of a very high order, in their rich colour, powerful drawing, and refined delicacy of finish. The earliest known work by Wohlgemuth is a retable consisting of four panels, dated 1465, now in the Munich gallery, a decorative work of much beauty. In 1479 he painted the retable of the high altar in the church of St Mary at Zwickau, which still exists, receiving for it the large sum of 1400 gulden. One of his finest and largest works is the great retable painted for the church of the Austin friars at Nuremberg, now moved into the museum ; it consists of a great many panels, with figures of those saints whose worship was specially popular at Nuremberg. In 1501 Wohlgemuth was employed to decorate the town-hall at Goslar with a

large series of paintings ; some on the ceiling are on panel, and others on the walls are painted thinly in tempera on canvas. As a portrait-painter he enjoyed much repute, and some of his works of this class are very admirable for their realistic vigour and minute finish. Outside Germany Wohlgemuth's paintings are scarce ; the Royal Institution at Liverpool possesses two good examples,—Pilate Washing his Hands, and the Deposition from the Cross, parts prob- ably of a large altarpiece. During the last ten years of his life Wohlgemuth appears to have produced little by his own hand. One of his latest paintings is the retable at Schwabach, executed in 1508, the contract for which still exists. He died at Nuremberg in 1519.

WOLCOT, Joun (1738-1819), painter and satirist under the pseudonym of PrTER Pinpar, was son of Alexander Wolcot, surgeon at Dodbrooke, adjoining Kings- bridge, in Devonshire, and was baptized there 9th May 1738. He was educated at Kingsbridge free school under John Morris, at the Bodmin grammar school, and in France, and as the result of this training was well acquainted with Greek and Latin, and spoke French with facility. For seven years he was apprenticed to his uncle, John Wolcot, a surgeon at Fowey, and it was intended that he should in due course succeed to the practice. Among his uncle's patients were Sir William Trelawny and his household, at Trelawne, near Fowey, and when Trelawny went to Jamaica as governor in 1769 he was accompanied by Wolcot, who had now qualified as M.D. of the uni- versity of Aberdeen (8th September 1767). Considerable ecclesiastical patronage was in the gift of the governor of Jamaica, and, to render himself eligible for any desirable living which might fall vacant, Wolcot returned to England, and was ordained deacon on 24th June 1769 and priest on the following day. With these qualifications he once more repaired to the West Indies, and in 1772 became incumbent of Vere, Jamaica, but on the death of his patron (11th December 1772) he bade adieu to the colony, and on his arrival in England settled as a physician at Truro. Party politics ran high in that borough, and Wolcot threw him- self into the fray, making an especial butt of an influential merchant, afterwards the representative of Truro in par- liament. In consequence of those indiscretions he left in 1779, and in 1781 he fixed his permanent abode in London. He brought with him the young Cornish artist John Opie, whose talents in painting received the

enthu- siastic admiration of the doctor. Wolcot exerted himself energetically in spreading the fame of his young protegé by puffs in the papers and by introductions to the leaders of fashion.1 From this date he dropped the profession of medicine, as he had previously thrown off his clerical orders, and earned the means of subsistence by his satirical productions. Wolcot had long dabbled in poetry. His first effusion, on the recovery of the elder Pitt from gout, is said to have appeared in Martin's Magazine, about 1756, when he was resident at Fowey, and he dictated verses until within a few days of his death. Many of his serious pieces were marked by taste and feeling, and his translation of Thomas Warton's Latin epigram on sleep dwells in the memory through its happy simplicity. After his settlement in London he threw off with marvellous rapidity a succession of pungent satires. George III. was his favourite subject of ridicule, and his peculiarities were described or distorted in The Lousiad, Peeps at St James's, The Royal Visit to Exeter, Two of Wolcot's happiest satires on the " farmer king " depicted the royal survey of Whitbread's brewery and the king's wonder how the apples got into the apple dumplings. The most entertaining biography which the Fnglish language has yet produced was ridiculed in An Epistle to James Boswell, and in a piece on the rival

1 See Opie and his Works, by J. Jope Rogers.

biographers, happily called Bozzyand Piozzi. The leading man of science and the adventurous traveller fell under his lash,—the former in Sir Joseph Banks and the Emperor of Morocco, and the latter in a Complimentary Epistle to James Bruce. When Woleot came to London with his rough artistic genius from the west his hand was directed against the painters of the day who had already established their reputation, and his Lyric Odes to the Academiciuns often turned their modes of painting into a jest with marvellous effect. Wolcot was himself no mean artist, and in 1797 there was published Six Picturesque Views from Paintings by Peter Pindar, engraved by Alken. His knowledge of the art of painting lent force to his strictures on the academicians of the age. In 1795 he disposed of his works to the booksellers for an annuity of £250 a year,

which he lived to enjoy for many more years than the purchasers expected or desired. His various pieces were published in 1796 in four octavo volumes, and they were often reprinted. His satires are said to have exercised such an effect on public opinion that the ministers pressed upon him a Government pension, on condition that he refrained from any further attacks on the king's peculiarities; but it is also asserted that he speedily declined to accept it any longer, and that he even returned the moneys which he had received. Like many another ridiculer of the idiosyncracies of others he was himself very susceptible to criticism, and for some attacks made on him by Gifford, the editor of the Quarterly Review, he attempted to belabour his satirical opponent in Wright's shop in Piccadilly, but Gifford was too quick for him, and Wolcot was soundly thrashed. He died at Latham Place, Somer's Town, London, on 14th January 1819, and seven days later was buried near Samuel Butler, the author of Hudibras, in the vestry vault in the churchyard of St Paul's, Covent Garden.

Polwhele, the Cornish historian, was well acquainted with Wolcot in his early life, and the best account of his residence in the west is found in vol. i. of Polwhele's 7raditions and in Polwhele's Bio- graphical Sketches, vol. ii. Cyrus Redding was a frequent visitor at the old man's house, and has described Wolcot's later days in his Past Celebrities, vol. i., and his Fifty Years' Recollections, vols. i. and ii. John Taylor, "everybody's Taylor," lived "on the most friendly footing with the doctor," who figures in the Records of my Life. Wolcot's humour was broad, and he cared little whether he hit above or below the belt, but he had a keen eye for the ridiculous, and was endowed with a wondrous facility of diction.

WOLF. The zoological position and general characters of the wolf (Canis lupus) are described in the article Mammatia (vol. xv. p. 438), where the difficulties that naturalists meet with in separating and defining the numerous variations of the animals called wolves, dogs, jackals, and foxes are shown. The true wolves are (excluding some varieties of the domestic dog) the largest members of the genus, and have a wide geographical range, extending over nearly the whole of Europe and Asia, and North America from Greenland to Mexico, but they are not found in South America or Africa, being replaced in both of these continents by

various species of jackals and foxes. As might be expected from this extensive range, and the varied character of the climatic conditions of the countries they inhabit, they present great diversities of size, length and thickness of fur, and coloration, although resembling each other in all important structural characters. These differences have given rise to a supposed multiplicity of species, expressed by the names of C. lupus, C. lycaon (Central Europe), C. laniger and C. niger (Tibet), C. pallipes (India), C. occidentalis, C. nubilis, C. mexicanus, &c., of North America, but it is very doubtful whether these ought to be distinguished as other than local varieties. In North America there is a second distinct smaller species, called the coyote or prairie wolf (Canis latrans), and perhaps the Japanese wolf (C.

hodophylax) may also be distinct, although, except for its smaller size and shorter legs, it is scarcely distinguishable from the common species. Though generally distributed throughout the Indian peninsula, the wolf is not found in Ceylon nor in Burmah and Siam. The ordinary colour of the wolf is a yellowish or fulvous grey, but specimens have been met with almost pure white and others entirely black. In northern countries the fur is longer and thicker, and the animal generally larger and more powerful than in the southern portion of its range. Its habits are similar everywhere, and it is still, and has been from time imme- morial, especially known to man in all the countries it inhabits as the devastator of his flocks of sheep. Wolves do not catch their prey by lying in ambush, or stealing up close to it, and making a sudden spring as the cat tribe do, but by fairly running it down in open chase, which their speed and remarkable endurance enable them to do, and usually, except during summer, when the young families of cubs are being separately provided for by their parents, they assemble in troops or packs, and by their combined and persevering efforts are able to overpower and kill even such great animals as the American bison. It is singular that such closely allied species as the domestic dog and the Arctic fox are among the favourite prey of wolves, and, as is well known, children and even full-grown people are not unfrequently the objects of their attack when pressed by hunger. Notwithstanding the proverbial ferocity of the wolf in

a wild state, many instances are recorded of animals taken when quite young becoming perfectly tame and attached to the person who has brought them up, when they exhibit many of the ways of a dog. They can, however, rarely be trusted by strangers.

The history of the wolf in the British Isles, and its gradual extirpation, has been thoroughly investigated by Harting in his work on Extinct British Animals, from which the following account is abridged. To judge by the osteological remains which the re- searches of geologists have brought to light, there was perhaps searcely a county in England or Wales in which, at one time or another, wolves did not abound, while in Scotland and Ireland they must have been still more numerous. The fossil remains which have been discovered in Britain are not larger than, nor in any way to be distinguished from, those of European wolves of the present day. Wolf-hunting was a favourite pursuit of the ancient Britons as well as of the Anglo-Saxons, In Athelstan's reign these animals abounded to such an extent in Yorkshire that a retreat was built by one Acchorn, at Flixton, near Filey, whcrein travellers might seek refuge if attacked by them. As is well known, great efforts were made by King Edgar to reduce the number of wolves in the country, but, notwithstanding the annual tribute of 300 skins paid to him during several years by the king of Wales, he was not altogether so successful as has been commonly imagined. In the reign of Henry III. wolves were sufficiently numerous in some parts of the country to induce the king to make grants of land to various individuals upon the express condition of thcir taking measures to destroy these animals wherever they could be found. In Edward II.'s time, the king's forest of the Peak, in Derbyshire, is especially mentioned as infested with wolves, and it was not until the reign of Henry VII. (1485-1509) that wolves appear to have become finally extinct in England. This, however, is rather a matter of inference from the cessation of all mention of them in local records than from any definite evidence of their extirpation. Their last retreat was probably in the desolate wolds of Yorkshire. In Scotland, as might be supposed from the nature of the country, the wolf maintained its hold for a much longer period. There is a well-known story of the last of the race being killed by Sir Ewen Cameron of Lochiel in 1680, but there is evidence of wolves having survived in Sutherlandshire and other parts into the following century (perhaps as

late as 1743), though the date of their final extinction cannot be accurately fixed. In Ireland, in Cromwell's time, wolves were particularly troublesome, and said to be increas- ing in numbers, so that special measures were taken for their destruc- tion, such as the offering of large rewards for their heads, and the prohibition (in 1652) of the exportation of " wolf-dogs," the large dogs used for hunting the wolves. The active measures taken then and later reduced their numbers greatly, so that towards the end of the century they became scarce, but, as in the case of the sister island, the date of their final disappearance cannot now be ascertained. It has been placed, upon the evidence of somewhat doubtful traditions, as late as 1766.

It is entirely owing to their insular position that the British Islands have been able to clear themselves of these formidable and destructive animals, for the neighbouring country of France, with no natural barriers to prevent their incursions from the vast conti- nent to the east, is still liable every winter to visits from numbers of them, as the following figures indicate. Government rewards were paid in 1883 for 1316 wolves destroyed, in 1884 for 1035, in 1885 for 900, and in 1886 for 760. The increase of the reward just before the first-named date seems thus to have had some effect in lessening the number. (W. H. F.)

WOLF, Frieprich Avcust (1759-1824), was born in 1759 at Hainrode, a little village not far from Nordhausen, in the province of Hanover. His father, who was village schoolmaster and organist, was in his way an enthusiast in education, and gave his son whatever advantage is to be gained by the earliest possible cultivation. In time the family removed to Nordhausen, and there young Wolf went to the grammar school, where he soon acquired all the Latin and Greek that the masters could teach him, besides learning French, Italian, Spanish, and music. This, however, was in the earlier and (as he himself regarded it) the idler part of his schooltime. He pre- sently took his education into his own hands, devoted himself entirely to classics, borrowed books wherever he could, and rapidly stored his young and powerful memory with their contents. The

precocity of his attainments was only equalled by the force of will and confidence in his own powers which characterized him throughout life.

After two years of solitary study, at the age of eighteen, Wolf went to the university of Gottingen. His first act there was a prophecy—one of those prophecies which spring from the conscious power to bring about their fulfilment. He had to choose his "faculty," and chose one which then existed only in his own mind, the faculty of " philology." What is even more remarkable, the omen was accepted. He carried his point, and was enrolled as he desired.

Wolf's relations with Heyne, who was then the chief ornament of Gottingen, form an unpleasant chapter, which may well be passed over here. Heyne was a scholar of little force or originality, but he was one of those who, by their power of assimilating and transmitting the thoughts of others, often rise to the highest reputation. Wolf soon left him, and fell back upon the university library, from which he borrowed with his old avidity.

During the years 1779-83 Wolf was a schoolmaster, first at Ilfeld, then at Osterode. His success as a teacher was striking, and he found time to publish an edition of the Symposium, which excited notice, and led to his pro- motion to a chair in the Prussian university of Halle.

The moment was a critical one in the history of educa- tion. The literary impulse of the Renaissance was almost spent ; scholarship had become dry and trivial. A new school, that of Locke and Rousseau, sought to make teach- ing more modern and more human, but at the sacrifice of mental discipline and scientific aim. Wolf was eager to throw himself into the contest on the side of anti- quity. In Halle (1783-1807), by the force of his will and the enlightened aid of tle ministers of Frederick the Great, he was able to carry out his long-cherished ideas, and found the science of philology. By one of England's insular aberrations, the word " philology " threatens to be confined to the study of the forms of language. Wolf defined it to be "knowledge of human nature as exhibited in antiquity." The matter of such a science, he held, must be sought in the history and education of some highly cultivated nation, to be studied in written remains, works of art, and what- ever else bears the stamp of national

thought or skill. It has therefore to do with both history and language, but primarily as a science of ¢nterpretation, in which historical facts and linguistic facts take their place in an organic whole. Such was the ideal which Wolf had in his mind when he established the philological seminarium at Halle.

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Wolf's writings make little show in a library, and were | always subordinate to his teaching. During his time at Halle he published his commentary on the Leptines (1789) —which suggested to his pupil, Aug. Boeckh, the Public Economy of Athens—and a little later the Prolegomena to Homer (1795). This book, the work with which his name is chiefly associated, was thrown off in comparative haste to meet an immediate need. It has all the merits of a great piece of oral teaching—command of method, sug- gestiveness, breadth of view. The reader does not feel that he has to do with a theory, but with great ideas, which are left to bear fruit in his mind (see Homer).

The Halle professorship ended tragically, and with it the happy and productive period of Wolf's life. He was swept away, and his university with him, by the deluge of the French invasion. A painful gloom oppressed his remaining years (1807-24), which he spent at Berlin. He became so fractious and intolerant as to alienate some of his warmest friends. He gained a place in the depart- ment of education, through the exertions of W. von Humboldt. When this became unendurable, he once more took a professorship. But he no longer taught with his old success ; and he wrote very little. His most finished work, the Darstellung der Alterthumswissenschaft, though published at Berlin (1807), belongs essentially to the Halle time. At length his health gave way. He was advised to try the south of France. He got as far as Marseilles, and was laid in the classic soil of that ancient Hellenic city.

The chief source of this sketch has been the admirable artiele by Mr Mark Pattison in the North British Review of June 1865, soon (we believe) to be reprinted by the Clarendon Press. Since the date of that artiele Wolf's Kleine Schriften have been edited by G. Bernhardy (Halle, 1869). The works not included in that eol- leetion are the Prolegomena, the Letters to

Heyne (Berlin, 1797), the eommentary on the Leptines (Halle, 1789), and a translation of the Clouds of Aristophanes (Berlin, 1811). To these must be added the Vorlesungen on Iliad i.-iy., taken from the notes of a pupil, and edited by Usteri (Bern, 1880). (D. B. M.)

WOLFE, Cuarwes (1791-1823), author of The Burial of Sir John Moore, born in Dublin in 1791, was an Irish clergyman, curate of Ballyclog, in Tyrone, and after- wards of Donoughmore. The poem seems to have been written when Wolfe was still a student in Trinity College, Dublin, and it originally appeared in an Irish newspaper (the Vewry Telegraph) in 1817. The initials C. W. were affixed to it at first, but as it was quoted from newspaper to newspaper these were dropped, and, eventually finding its way into the Edinburgh Annual Register, it was claimed for and by as many people as Punch's famous advice to those about to marry. Wolfe's Trinity College friends came to the rescue, and one of them (Archdeacon Russell) wrote a memoir which, in spite of its being one of the dullest memoirs ever written, went through at least eight editions—a curious testimony to the popularity of the poem. Wolfe died of consumption at Cork in 1823, at the early age of thirty-two.

WOLFE, James (1727-1759), the hero of Quebec, was the son of Lieutenant-General Edward Wolfe, and was born in the vicarage of Westerham, Kent, on J anuary 2, 1727. At an early age he evinced a keen interest in the adventures and achievements of war, and at thirteen accompanied his father to Cartagena. Obtaining a commission as ensign in the 12th regiment of foot in 1741, he embarked for Flanders on the 10th May of the following year, and during the campaign of 1743, in which he acted as adjutant, he was present at the battle of Dettingen. Hav- ing exhibited, in addition to high courage, a rare talent for command, he received while yet a youth a commission, on 3d June 1744, as captain in the 4th or king's regiment of foot, and shortly afterwards was made brigade-major. In this capacity he took part in the suppression of the |

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rebellion of 1745, being present both at Falkirk and at Culloden. In January 1747 he sailed for the Continent, and for his valour at the battle of Lawfeldt on the 2d July he received the public thanks of the commander-in-chief, the duke of Cumberland. On 5th January 1749 he was gazetted major of the 20th regiment, and in the following year he became lieutenant-colonel. In this position he began to manifest those great qualities as a commander which were the secret of his success, and, while introducing into the regiment that perfect discipline necessary to the highest proficiency, secured the personal affection of almost every soldier. In the luckless Rochefort expedition he was quartermaster-general, and by his dashing gallantry attracted the special notice of Pitt. When therefore it was decided in 1758 to send an expedition to Cape Breton under

Amherst, Wolfe was appointed by Pitt brigadier-general.

Under the eye of Amherst and Admiral Boscawen he con- ducted the landing at Louisburg through a heavy surf and in face of the well-directed fire of the enemy. He himself was the first to land, and forming his division into compact order attacked and carried with the bayonet the nearest French battery, after which he formed thecamp. Chiefly through his ardent energy the siege operations were brought to a successful issue after an investment of six months. Wolfe then eagerly urged an attack on Quebec, expressing his determination to leave the service if nothing further was to be done. Pitt not only acted on his advice, but selected him as the leader of the difficult and almost chimerical enterprise. Quebec, besides being strongly fortified, was occupied by forces which greatly outnumbered those placed at Wolfe's disposal. Moreover, Montcalm the French commander had an open country behind him for supplies, and was only called upon to protract the defence behind his ramparts till the resources of the besiegers were exhausted. It was incumbent on Wolfe to force Montcalm to give battle, and this could only be effected by manceuvres of the most daring kind. After bombarding the city from the heights of Point Levi, Wolfe made an attempt, 29th June 1759, to attack Montcalm's camp in front, but his instructions were not carried out with suffi- cient accuracy, and foreseeing that irretrievable disaster was imminent he found it necessary after the attack had begun to recall his

troops and retire. As the enemy were now on their guard against a second attack of a similar kind, Wolfe saw that the problem must be solved by some other method, and after some time spent in careful con- sideration he hit upon a still more daring plan. In the evening of the 12th September with 5000 men he silently descended the St Lawrence in boats, and, scaling the heights of Abraham in the darkness, drew up his forces on the plains so as to cut off Montcalm's supplies. The audacity of the movement was too much for Montcalm's patience. Onhis attention being called to it he exclaimed " Oui, je les vois ot ils ne doivent pas étre; je vais les écraser." But the genius of Wolfe was equal to the occasion. With calm self-possession he forbade a single shot to be fired till the enemy were within thirty yards. The crushing volleys with which they were then met, followed by an impetuous attack with the bayonet, was decisive of the action. While leading a charge at the head of the Louisburg grenadiers, Wolfe had one of his wrists shattered by a shot, but wrapping a handkerchief round it he kept on. Another shot struck him, and he still advanced, when a third lodged in his breast. While he was lying in a swoon some one near him exclaimed, " They run; see how theyrun!" 'Whorun?" demanded Wolfe, like one roused from sleep. " The enemy," was the answer; "' they give way everywhere." Wolfe then signified that a regiment should be sent down to Charles liver to cut off their retreat, and on learning that his

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orders had been obeyed he turned on his side, and murmured as his last words, " Now God be praised, I will die in peace." Montcalm, the French commander, was mortally wounded in the same action, and died soon after- wards. By the surrender of Quebec Canada was lost to the French.

See Wright, Life of Major-General James Wolfe Parkman, Montcalm and Wolfe (2 vols., 1884),

WOLFENBUTTEL, a small town in the duchy of Brunswick, is situated on both banks of the Oker, 7 miles to the south of Brunswick. It contains various minor tribunals, some schools, and a small garrison; and it carries on a few unimportant manufactures (machinery, copper goods, linen, cork, preserves, &c.). Wolfenbiittel, in fact, may be accepted as

tolerably representative of the average dull German provincial town, clinging more or less faithfully to the traditions of the period when it was the residence of the ducal family. It owes its chief interest to its connexion with Lessing, who was ducal librarian there from 1770 till his death in1781. The old library building, designed in 1723 in imitation of the Pantheon at Rome, contains a marble statue of the poet. The library, including 300,000 printed books and 7000 MSS., has, however, been transferred to a large new Renaissance edifice, opened in October 1887. It is espe- cially rich in copies of the Bible and in books of the early Reformation period. Opposite the old library is the palace, occupied since 1835 by a theatre, a law court, and a seminary. The ducal burial-vault is in the church of St Mary. There are two other Evangelical churches and a Roman Catholic church in Wolfenbiittel, and perhaps the only other noteworthy building is the large prison. The ancient fortifications have been converted into pro- menades, once a favourite resort of Lessing. In 1885 the population of Wolfenbiittel, including the suburbs of Auguststadt and Juliusstadt, was 13,455. The " Wolfen- biittel Fragments " are alluded to under Lessrne, vol. xiv. p- 481; see also REIMARUS.

A castle is said to have been founded on the site of Wolfenbiittel by a margrave of Meissen about 1046. When this began in 1267 to be the residence of the early Brunswick or Wolfenbiittel line of counts, a town gradually grew up around it. In 1542 it was taken by the Saxons and Hessians, who however evacuated it five years later after the battle of Miihlberg. In the Thirty Years' War, in June 1641, the Swedish, under Wrangel and Konigsmark, defeated the Austrians under the archduke Leopold at Wolfenbiittel. The town passed wholly into the possession of the Brunswick-Wolfen- biittel family in 1671, and for nearly one hundred years enjoyed the distinction of being the ducal capital. In 1754, however, Duke Charles transferred the ducal residence to Brunswick, a blow from which Wolfenbiittel has never recovered.

WOLFF, Caspar Friepricn (1733-17 94), who is justly reckoned the founder of modern embryology, was born at Berlin in 1733, and studied anatomy and physiology under Meckel, and later at Halle, where he graduated in medicine in 1759, his thesis being his famous Theorra Generationis. After serving as a surgeon in the Seven Years' War, he

wished to lecture on anatomy and physiology in Berlin; but being refused permission he accepted a call from the empress Catherine to become professor of those subjects at the academy of St Petersburg, and acted in this capacity until his death in 1794.

While the theory of "evolution" in the crude sense of a simple growth in size and unfolding of organs all previously existent in the germ was in possession of the field, his researches on the develop- ment of the alimentary canal in the chick first clearly established the converse view, that of epigenesis, i.e., of progressive formation and differentiation of organs from a germ primitively homogeneous (see EMBRYOLOGY, vol. viii. p. 165). He also largely anticipated the modern conception of embryonic layers, and is said even to have foreshadowed the cell theory. It is certain that he discerned, long before Goethe, the leafy homology of the parts of flowers.

WOLFF, Curistran (1679-1754), is an important figure in the history of philosophy, and his life has more

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dramatic interest than is usually the case with an academic teacher. He was the son of a tanner, and was born at Breslau on the 24th January 1679. His father had dedi- cated him before his birth to a life of learning, having been disappointed himself in similar aspirations, and Wolff accordingly received a gymnasium training in Breslau, whence he proceeded in 1699 to the university of Jena. Mathe- matics and physics formed at first his chief attraction, to which he soon added philosophy. He studied the Cartesian philosophy as well as the works of Grotius and Pufendorf, but was chiefly influenced by Tschirnhausen's Medicina Mentis. In 1703 he qualified as privat-docent in the university of Leipsic, where he lectured till 1706, when he was called as professor of mathematics to Halle. Before this time he had made the acquaintance of Leibnitz, of whose philosophy his own system is a modification. In Halle Wolff limited himself at first to mathematics, but on the departure of a colleague he annexed physics, and presently included in his lectures all

the main philosophical disciplines. He followed the example of Thomasius in lecturing in German instead of Latin. This fact, and the remarkableclearness of his exposition, caused his class-rooms to be crowded. He also became known as a writer toa wider circle, and was made member of the Royal Society of London and the Academy of Berlin. But the claims which Wolff advanced on behalf of the philosophic reason appeared impious to his theological colleagues. Halle was the headquarters of Pietism, which, after a long struggle against the rigidity of the older Lutheran dogmatism, had itself assumed the characteristics of a new orthodoxy. This orthodoxy, represented by Joachim Lange and A. H. Francke, considered the cause of supernaturalism en- dangered by a philosophy which professed by the un- assisted reason to present the whole universe as a rational and necessarilydetermined system. Wolff's professed ideal was to base theological truths on evidence of mathematical certitude. Personal grounds accentuated the bitterness. Strife broke out openly in 1721, when Wolff, on the occasion of laying down the office of pro-rector, delivered an oration "On the Moral Philosophy of the Chinese," in which he praised the purity of the moral precepts of Confucius, pointing to them as an evidence of the power of human reason to attain by its own efforts to moral truth. The attacks and accusations in connexion with this address were unsuccessful at the time, but Wolff con- tinued to give offence to his colleagues, and to Lange in particular, by his action in the filling up of university chairs, and in 1723 a disappointed pupil, a docent in the same university, published a hostile criticism upon Wolff's system, at the instigation, it is said, of Lange. This was contrary to university etiquette and statute, and Wolff some- what injudiciously appealed to the Government for an in- terdict upon such attacks. He succeeded in obtaining this, but his enemies retaliated by sending to court a united representation of the dangerous character of his views. Through a worthless courtier, they gained the ear of the king, Frederick William I., by a concrete example, which touched him most nearly. If one of His Majesty's famous grenadiers at Potsdam should desert, the king would have no right, it was represented, upon the principles of Wolff, to punish the man, seeing that he only did what it was necessarily predetermined that he should do. The result of this representation was swifter and more drastic than Wolff's bitterest enemies had calculated on. On the 13th November 1723 a cabinet order arrived in

Halle de- posing Wolff from his office, and commanding him to leave Halle and quit Prussian territory within forty-eight hours on pain of ahalter. 'The same day Wolff passed into Saxony, and presently proceeded to Marburg, to which university he had received a call before this crisis. The landgrave of

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Hesse received him with every mark of distinction, and the circumstances of his expulsion drew universal atten- tion to his philosophy. It was everywhere discussed, and over two hundred books and pamphlets appeared for or against it before 1737, not reckoning the systematic treatises of Wolff and his followers. The seventeen years which Wolff spent at Marburg witnessed the publication of his chief works, and the rise of his philosophy to almost un- disputed sway throughout Germany. His earlier treatises were, like his lectures, composed in German :—a treatise on logic, called Verniinftige Gedanken von den Kriiften des menschlichen Verstandes (1712); ametaphysic, Verniinftige Gedanken von Gott, der Welt, und der Seele des Menschen, auch aller Dinge tiberhaupt (1719) ; treatises on ethics and politics with similar titles (1721) ; three on the philosophy

of nature (1723—4—5), followed by an encyclopzedic review of.

his system in 1726. From that time he began to go over the same ground more fully and methodically in a series of Latin works. The logic, ontology, cosmology, and em- pirical psychology appeared between 1728 and 1732, followed by the rational psychology and natural theology in 1734. Meanwhile, after some years the king of Prussia made overtures to Wolff to return, and in 1739, by the irony of events, a cabinet order prescribed the study of the Wolffian philosophy to all candidates for ecclesiastical pre- ferment. In 1740 Frederick William died suddenly, and one of the first acts of his successor, Frederick the Great, was to recall Wolff to Halle on the most flattering and advantageous terms.- His entry into Halle on the 6th of December 1740 partook of the nature of a triumphal pro- cession. In 1743 he became chancellor of the university, and in 1745 he received the title of "freiherr" from the elector of Bavaria. But, though he was thus loaded with honours, and his philosophy

everywhere triumphant, he found that he had outlived his power of attracting the academic youth. His matter was no longer fresh, nor were his own powers what they had been when he left Halle seventeen years before, and he had the bitter ex- perience of lecturing to empty class-rooms. He died on the 9th April 1754, in the seventy-sixth year of his age, fourteen years after his return to Halle.

The Wolffian philosophy held almost undisputed sway in Germany till it was displaced by the Kantian revolution. It is essentially a common-sense adaptation or watering-down of the Leibnitian system; or, as we can hardly speak of a system in con- nexion with: Leibnitz, Wolff may be said to have methodized and reduced to dogmatic form the thoughts of his great predecessor, which often, however, lose the greater part of their suggestiveness in the process. Since his philosophy disappeared before the influx of new ideas and the appearance of more speculative minds, it has been customary to dwell almost exclusively on its defects—the want of depth or freshness of insight, and the aridity of its neo- scholastic formalism, which tends to relapse into verbose platitudes. But this is to do injustice to Wolff's real merits. These are mainly his comprehensive view of philosophy, as embracing in its survey the whole field of human knowledge, his insistence every- where on clear and methodic exposition, and his confidence in the power of reason to reduce all subjects to this form. To these must be added that he was practically the first to "teach philosophy to speak German." It will be seen that these merits concern the form rather than the matter of philosophy, the latter being mainly derived:-from Leibnitz, with some modifications in the sense of the older scholastic Aristotelianism. The Wolffian system retains the determinism and optimism of Leibnitz, but the monadology recedes into the background, the monads falling asunder into souls or conscious beings on the one hand and mere atoms on the other. The doctrine of the pre-established harmony also loses its meta- physical significance, and the principle of sufficient reason intro- duced by Leibnitz is once more discarded in favour of the principle of contradiction which Wolff seeks to make the fundamental principle of philosophy. Philosophy is defined by him as the science of the possible, and divided, according to the two faculties of the human individual, into a theoretical and a practical part. Logic, sometimes called philosophia rationalis, forms the introduc- tion

or propedeutic to both. Theoretical philosophy has for its parts ontology or philosophia prima, cosmology, rational psycho- logy, and natural theology; ontology treats of the existent in

general, psychology of the soul as a simple non-extended substance, cosmology of the world as a whole, and rational theology of the existence and attributes of God. 'These are best known to philo- sophical students by Kant's treatment of them in the Critique of Pure Reason. Practical philosophy is subdivided into ethics, economics, and politics. Wolff's moral principle is the realization of human perfection. (A. SE.)

WOLF-FISH. See Sra-Worr.

WOLFRAM VON ESCHENBACH, medieval German poet, lived in the latter part of the 12th and the early part of the 13th century. Little is known about the facts of his life, and such knowledge as we possess is derived wholly from his own writings. He belonged to a poor but noble family, He speaks of himself as a Bavarian, and refers to the count of Wertheim as his feudal lord. His home was the castle of Eschenbach (near Ansbach), and in the churchyard at Eschenbach what was said to be his grave was shown as late as the beginning of the 17th century. He spent some time at the court of Hermann, landgrave of Thuringia, where he met Walther von der Vogelweide, to whom he makes two references in his works. Wolfram survived Hermann, who died in 1216. His residence at the Thuringian court led to his being included among the poets who were afterwards said to have taken part in a great competition for poetic supremacy at the Wartburg. Wolfram seems to have been happily married, and to have had children. In politics he was a supporter of the emperor Otho IV. He understood French, but could neither read nor write.

His greatest work is Parzival, an epic poem completed between 1205 and 1215. It combines the story of the Holy Grail with in- cidents from the legends of southern France about the old princes of Anjou and from the legendary history of Arthur and the Knights of the Round Table. 'To Wolfram's contemporary, Gottfried of Strasburg, the style of this poem seemed abstract and obscure ; and Parzival certainly lacks the lightness

and grace of Gottfried's masterpiece Tristan. It has, however, high imaginative qualities, and, regarded as a whole, is the most splendid achievement in the literature of Germany during the period of Middle High German. Even in Wolfram's day the poem produced a profound impres- sion, and in the 15th century it was still so warmly appreciated that it was one of the earliest works made accessible to the public through the invention of printing. The principal authority used by Wolfram seems to have been the Conte del Gral of Chrestien de Troyes. He mentions, besides this work, a poem by Kiot, a Pro- vengal poet ; but nothing is known of Kiot, and it may be that he never really existed. Whatever may have been the sources of Parzival, Wolfram gave to everything he borrowed from others a wholly new character, impressing upon it strongly the mark of his own great ideal spirit. Besides his chief work and various lyrics he composed two epic fragments, Titurel and Willehalm, the former before Parzival, the latter after. Titurel, a love-tale, be- longs to the same cycle of legends as the story of Parzival, and, so far as form is concerned, it is the brightest and niost artistic of Wolfram's works. Willehalm presents the legendary history of St William of Orange, a contemporary of Charlemagne. The so- called third part of this poem was continued by Ulrich von Tiir-

heim about 1250, the first part by Ulrich von dem Tiirlin between 1252 and 1278.

A complete edition of Wolfram's works was issued by Lachmann in 1833, Bartsch afterwards published, with notes, an edition of Parzival and Titurel. There are renderings into modern German by San-Marte and Simrock. See San- Marte's Parzival-Studien, and essays by Bartsch, Pfeiffer, Rochat, and Zingerle in Pfeiffer's Germania.

WOLLASTON, Wit1am (1659-1724), English philo- sophical writer, was born at Coton-Clanford in Stafford- shire, March 1659. He was educated under disadvantages both at school and at the university, but left his college (Sidney, Cambridge) with a high reputation for his acquirements, in September 1681. He then became assistant-master of the Birmingham grammar school, and in that position took holy orders. In 1688 an uncle unexpectedly left him an ample fortune, on which he retired, moving to

London, where he married a lady of fortune, and devoted himself to his domestic duties and the pursuit of learning and philosophy. In his studies he occupied himself more especially with the foundation of the common doctrines of "natural religion," which were

in those years so universally discussed. The substance of his thinking on these doctrines he embodied, towards the end of his life, in the one book by which he is now remembered, The Religion of Nature Delineated, the first edition of which was privately printed in 1722, and the second, revised, in 1724, He died in October of the same year.

Wollaston's Religion of Nature, which falls between Clarke's Discourse of the Unchangeable Obligations of Natural Religion and Butler's Sermons, was one of the popular philosophical books of its day. More than 10,000 copies of it were sold ina few years. It was highly valued by Bishop Butler and a favourite book of Queen Caroline, the wife of George II., and she ordered the numerous quotations from Latin, Greek, and Hebrew in the notes to be translated into English for her use. To the 8th edition (1750) was added a life of the author. Thongh the book is now re- membered chiefly for the theory of the nature of moral good and evil advocated in it, it was rather its defence of natural religion, and its bold, sometimes original, penetrating, and often eloquent discussion of great ethical religious problems which secured for it ""descrved reputation." It was designed to be an answer to the two questions—Is there such a thing as natural religion? and If there is, what is it? Wollaston starts with the assumption that religion and morality are identical, and labours to show that religion is "the pursuit of happiness by the practice of truth and reason." The moral theory on which he values himself as propounding a view met with nowhere else is that moral evil is the practical denial of a true proposition and moral good the affirma- tion of it. To steal is wrong because it is to deny that the thing stolen is what it is—the property of another. In Wollaston's view " happiness" occupies a large place. He makes pain an evil and pleasure a good. Happiness is a duty and an end to be aimed at by every intelligent being. He makes the produetion of happiness also the test of the rightness or wrongness of all social

regulations. But he admits that in this world happiness and virtue only tend to coincide, and derives from their defective coin- cidence his argument for a state of future rewards and punishments.

In addition to this work Wollaston published anonymously a small book On the Design of the Book of Ecclesiastes, or the Unreasonableness of Men's Restless Contention for the Present Enjoyments, represented in an English Poem, London, 1691. The subject of the book is sufficiently indicated in its title, and was in form and argument so worthless that its author consulted his reputation by im- mediately suppressing it. It is now very scarce. The university library of Cambridge possesses @ copy.

See Wollaston's fife prefixed to the 8th ed. of his Religion of Nature; John Clarke, Examination of the notion of Moral Good and Evil advanced tn a late book entitled The Religion of Nature Delineated, London, 1725; Drechsler, Ueber Wollaston's Moral-Philosophte, Erlangen, 1802; Leslie Stephen's History tof English Thought in the Eighteenth Century, London, 1876, ch. iii. and ch. ix.; H. Sidgwick's History of Ethics, 1886, p. 194 sg. A French translation of his book, bauche de la Religion Naturelle, appeared at The Hague in 1726.

WOLLASTON, Wittram Hyper (1766-1828), chemist and natural philosopher, was born at East Dereham, in Norfolk, on August 6, 1766, the second of seventeen children. His father, the Rev. Francis Wollaston, rector of Chislehurst, grandson of William Wollaston noticed above, was an enthusiastic astronomer. Wollaston studied at Caius College, Cambridge, of which he remained a fellow until his death. He took the degree of M.B. in 1787, and that of M.D. six years later, and commenced to practise medicine in 1789 at Bury St Edmunds. Failing to make headway he removed to London, where he was equally unsuccessful. He applied for a vacant physician- ship at St George's Hospital, but was not appointed ; and he never got over the feeling of irritation, which indeed led him to abandon medicine altogether. Wollaston betook himself to original research, and for a time ranged pretty impartially over the sciences. He is said to have accumu- lated a fortune by the manufacture of platinum and of various optical and mechanical inventions. He devoted much attention to the affairs of the Royal Society, of which he was elected

a fellow in 1793 and made secretary in 1806. For many years he was a vice-president, but did not care to enter on competition with Sir Humphry Davy when the latter was elected president in 1820. Beyond appearing at the meetings of learned societies Wollaston took little part in public affairs ; he lived alone, conducting his investigations in a deliberate and very exhaustive manner, but in the most rigid seclusion, no person being admitted to his laboratory on any pretext. Towards the close of 1828 he felt the approach of the

fatal malady—a tumour in the brain—and devoted his last days to a careful revisal of his unpublished researches and industrial processes, dictating several papers on these subjects, which were afterwards published in the Philo- sophical Transactions. On December 22, 1828, he died, as he had lived, self-possessed, stern, and silent.

Wollaston's character presents a very remarkable analogy with that of Henry Cavendish: both studied all branches of science; both were highly respected by their contemporaries for intellectual power and achievements in research; both were reserved and distant, making few friends, never acting from impulse, but occasionally displaying unexpected generosity. Wollaston's char- acter can only be partially divined from his public actions and relations with other scientific men, and unfortunately no other data are available. A dispute as to priority in discovering electro- magnetic rotation is referred to under FARADAY, vol. ix. p. 29; and suggestions as to the prior invention of his process of manu- facturing platinum are to be found in the article PLatinum (vol. xix. p. 190). The incidents associated with the discovery of the metal palladium were more serious than either of these. Wollaston detected this element, extracted a considerable quantity, and ex- posed it for sale in an instrument-maker's shop, calling attention to it by an anonymous advertisement. A chemist, Chenevix, purchased some of the metal, and concluded from a few hasty experiments that it was an amalgam of platinum. He submitted a paper to the Royal Society, which Wollaston as secretary read, after, it is said, vainly advising Chenevix to withdraw it. A con- troversy, supported by elaborate series of experiments, took place,

and was ouly terminated when Wollaston acknowledged that he was the discoverer, and described the process of extraction from the ores of platinum. Chenevix was disgusted, and deserted chemistry. Yet Wollaston was a most thorough and conscientions worker: it was his extreme caution in coming to conclusions until the facts were irresistible that occasionally led him to the unfor- tunate method of tentative anonymous publication; but the same quality ensured a solidity and trustworthiness in his Royal Society memoirs which make them models to subsequent investigators.

Most of Wollaston's papers deal more or less directly with chemistry, but they diverge beyond that science on all sides into optics, physiology, botany, acoustics, astronomy, and even touch on art. He discovered the metals palladium and rhodinm, and proved the identity of columbium with titanium. The minute scale on which his analytical processes were carried out was rendered possible by his extraordinary keenness of sight and neatness in manipulation.

The Royal Society awarded him a royal medal for his process of manufacturing platinum,—a work which, in its immediate effects, it is almost impossible to over-estimate. Wollaston was the first to produce the metal in a state fit to manufacture, and in quantity sufficient to make platinum crucibles generally available, thus sup- plying analytical chemistry with its most powerful instrument of advance. In optics his most important theoretical observation, to which, however, he gave little attention, was the discovery in 1802 of dark lines in the solar spectrum (see Licut, vol. xiv. p. 593), but practically the reflecting GonloMETER and CAMERA LuctDA (qq.v.) were of greatest value, the former supplying the crystallo- graphcr with his chief data, the latter indispensable in the develop- ment of modern microscopical research. Amongst his other papers may be mentioned those dealing with the physiology of vision, the apparent direction of the eyes in a portrait, a comparison of the light of the sun with that of the moon and fixed stars, a slide-rule for calculating chemical equivalents, sounds inandible to certain ears, and a theory of the formation of fairy-rings.

An appreciative essay on the 'Life of Wollaston" will be found in George Wilson's Religio Chemici (1862).

WOLLIN, an island belonging to Prussia, is the more easterly of the islands at the mouth of the Oder, which separate the Stettiner Haff from the Baltic Sea (vol. xvii. p. 724). It is divided from the mainland on the E. by the Dievenow, and from Usedom on the W. by the Swine. It is roughly triangular in shape, and has an area of 90 square miles. Heath and sand alternate with swamps, lakes, and forest on its surface, which is quite flat, except towards the south-west, where the low hills of Lebbin rise. The coast is fenced with dunes and shifting sand-hills. Cattle-rearing and fishing are the chief re- sources of the inhabitants, who number about 14,000. Misdroy, on the north-west coast, is a favourite sea-bathing resort, and some of the other villages, as Ostswine, opposite Swinemiinde, Pritter, famous for its eels, and

Lebbin, are also visited in summer. XXIV. — 80

Wot.n, the only town, is situated on the Dievenow, and is | present money, for a year's singing of masses 'for me and

connected with the mainland by three bridges. It carries on the industries of a small scaport and fishing-town, and has (1885) a population of 5241. Near the site of the present town once stood the ancient and opulent Baltic capital of the Slavs, called Wolin by the Wends, Julin by the Danes, and Winetha or Vineta by the Germans. Jomsburg, Hynnisborg, and Waltzborg, names or epithets occurring in several of the northern sagas, are said by Schafarik also to refer to this town. In the 10th and 11th centuries Wolin was the centre of an active and extensive trade. Adam of Bremen (d. 1076) extols its size and wealth ; he mentions that " Greeks" and other foreigners frequented it, and that "Saxons'"' were per- mitted to settle there on equal terms with the Wends, so long as they did not obtrude the fact of their Christianity. In 1125, how- ever, Wolin itself became the scat of a Christian bishopric, which was removed to Cammin

in 1170. A colony of Scandinavian vik- ings, often mentioned iu the sagas, flourished in this neighbour- hood from about 970 till their stronghold of Jomsburg was de- stroyed in 1083 by Magnus of Norway and Denmark. In 1183 Wolin itself was burned by Canute VI. of Denmark. Within modern times Wollin was captured by the Swedish in 1630 and 1759, and by the Brandenburgers in 1659 and 1675. A tradition long reigned, though now proved to be baseless, that the Wendish Vineta had been overwhelmed by the sea, and some submarine granite blocks ncar Damerow, in Usedom, were popularly recognized as its ruins. These arc still pointed out as such to strangers.

WOLLSTONECRAFT, Mary. See Gopwin, Mary W., and SHEetuey, Mary W.

WOLSEY, Tuomas (c. 1471-1530), cardinal, was born at Ipswich, and seems to have been the eldest son, as perhaps he was the eldest of all the four known children, of Robert Wolsey and his wife Joan. The name Wolsey, spelt Wulcy by both Robert and Thomas, is a diminutive of Wulf, that is, Wolf, and clearly proves their descent from those Teutonic folk who gave names to two English counties, to the southern one of which the Wolseys belonged. Simple repetition has made it commonly believed that Robert Wolsey was to trade a butcher. The assertion was first set afloat by enemies of the great cardinal, and was intended to be disparaging. The prob- ability, however, seems to be that he was really a grazier, and perhaps also a wool merchant. He certainly belonged to the better class of merchants, was connected with wealthy people, and himself died possessed of lands and_pro- perty in and about Ipswich. Fairly trustworthy tradition points to a house in St Nicholas Street there as occupy- ing the site of his own dwelling. According to Fiddes, supported as to the year by Cavendish, Wolsey's birth happened in March 1471, though contemporary evidence would place it some years later. His education began doubtless at the grammar school of his native town, where he showed himself an apt scholar. That reputation was fully sustained when he passed to Magdalen College, Oxford, for he took his B.A. degree at the early age of fifteen, whence he was known as "the boy bachelor." He became M.A. with such credit and distinction that he had conferred upon him a fellowship and the mastership of the grammar

school attached to his college, of which last in 1498 we find him bursar. The whole course of college training was scholastic; it strengthened and trained the intellect for actual life. Wolsey is said to have been deeply versed in the subtleties of Aquinism ; certain it is he remained wholly unaffected by the Greek revival of the Renaissance, and looked but indifferently upon its followers. From arts he went on to the study of divinity, in which the unfriendly Polydore Virgil is compelled to admit he was "not unlearned," but of which he did not become bachelor till 1510. That there was in fact, from whatever cause, some delay in Wolsey's taking orders is evidenced by his father's will, made on the last day of September 1496, probably just before his death. That instrument appointed Joan sole legatee, and directed "that if Thomas my son be a priest within a year next after my decease" he, or, failing him, another priest, should be paid ten marks, equal to about £60

my friends."

Among Wolsey's pupils at Magdalen school were three sons of the marquis of Dorset. So well was the marquis satisfied with the progress of his children that he invited Wolsey to spend with him the Christmas holidays of what must have been the year 1499. When Wolsey returned to Oxford it was with the presentation to the quiet Somerset parish of Lymington. In the October following he was inducted. He had not been long placed when a neighbouring squire, Sir Amias Paulet, put him in the stocks. The cause of this indignity is not clear; but it was remembered and resented with all the keenness attaching to an injustice suffered. Fifteen years after, as soon as he became lord chancellor, Wolsey summoned Paulet before him, administered a severe rebuke, and ordered him not to leave London without licence. From then till 1523 Paulet's name disappears from the state papers, where previously its occurrence had been frequent. In September 1501 Dorset died, and that event finally decided Wolsey to quit Lymington. Paulet's proceeding had not affected Wolsey's character, for he now became one of the private chaplains of Henry Dean, archbishop of Canterbury. But any hopes he may have founded on this appointment were soon blighted by the death of Dean in February 1503. Dean's executors, of whom the chief was the favoured servant of Henry VIL, Sir Reginald Bray, deputed the carrying out of his

instructions respecting his funeral to Wolsey and another chaplain. Through Bray, probably, Wolsey next obtained a chaplaincy with another favourite agent of Henry's, Sir Richard Nanfan, deputy- lieutenant of Calais. Nanfan was an old man; and so excellent did Wolsey's business capacity prove that the knight soon entrusted to him the whole work of the deputyship. In 1505 Nanfan resigned and returned to England to pass his latter days in peace; but so thoroughly had his chaplain gained his esteem that, "through his instant labour and especial favour," Wolsey became chaplain to Henry VII. himself, and when in 1506 Sir Richard died Wolsey was one of his executors.

Henry was a cold master, and did not offer much oppor- tunity for making way in his favour, but Wolsey imme- diately set himself to win the approval of the leading privy councillors, Bishop Fox and Sir Thomas Lovell. As usual he succeeded. And he retained their friendship to the last,—his relations with Fox being perhaps the most beautiful episode in all Wolsey's life. Through their recommendation he began his political life by a mission, probably in 1507 and to the emperor Maximilian. According to Cavendish, who gives Wolsey himself as his authority, not only was the embassy performed in the extraordinarily short space of about eighty hours, but Wolsey took upon him to add to his instructions some items which he afterwards found the king had sent after him. The expedition and bold intelligence displayed established him in the king's good opinion. Other missions ensued, one of them to Scotland in the spring of 1508, all executed to the royal satisfaction. Under Henry high ecclesiastical promotion came by political service. On the 2d February 1509 Wolsey, who by this time held several minor preferments, was collated to the deanery of Lincoln. Within three months Henry died and his son came to the throne. Already had Wolsey ingratiated himself with the young Henry, and almost at once com- menced his unprecedentedly rapid rise to power. Lyming- ton having been resigned by July, he in October received a grant of The Parsonage, part of the forfeited property of Sir Richard Empson; and another month brought him the office and title by which he was chiefly known for the next four years, that of king's almoner. From that time forward

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his history becomes entwined with the annals of his country, where all that concerns the statesman must be sought.

On the 20th November 1511 his signature as a privy councillor first occurs. The council was composed of two parties,—the old officials, chiefly ecclesiastics and headed by Fox, who favoured peace, and the old nobility, led by Surrey, who advocated a spirited policy, even at the risk of war. Friendship and his cloth naturally attached Wolsey to the former, thereby giving rise to that family hatred of the Howards which pursued him to the end of his life. Fox had long been anxious to withdraw from political life, and he now gradually shifted his state duties on to the willing, able, and younger shoulders of Wolsey. Nor was Wolsey's opportunity of distinguishing himself long in coming. An expedition against Guienne in 1512 had effected nothing and returned in disgrace. This only roused Henry's pride and persistence, and he resolved to invade France from the north in the following year. The organization of the necessary force he committed to Wolsey. Churchman though he was, Wolsey succeeded to admiration. The royal army crossed the Channel, fought what French wit styled the Battle of Spurs, and took Thérouanne and Tournai, while at home Surrey won the bloody battle of Flodden. Success had crowned Wolsey's labours and covered his royal master with glory. Wolsey's favour with Henry was confirmed. Rewards came thick and fast. On the capture of Tournai, Henry named Wolsey to the bishopric of that see, which just then fell vacant ; but the English nomination was never ratified by the pope, who in the end issued bulls promoting the French nominee Guillard. Despite this miscarriage Wolsey was not long in being a bishop. In the succeeding January (1514) the see of Lincoln lost its episcopal head, and next month the new pope Leo X. confirmed Wolsey's appointment to it. The preferment proved but temporary; for in July Cardinal Bainbridge, archbishop of York, was poisoned at Rome, and on the 5th August Wolsey was raised to his place.

Two days later Wolsey brought to a triumphant ter- mination his first great effort in diplomacy, and made with Louis XII. of France a treaty which really undid the notorious league of Cambrai, defeated Ferdinand of Spain with his own weapons, and left England, for the moment, the first power in Europe. Wolsey thereby began a new era in English politics.

Since its origin with the Norman Conquest English foreign policy had been bounded by the horizon of France. It had been dynastic and insular. Wolsey made it European by taking the empire, Italy, and Spain into his calculations. He deliberately set himself to preserve the balance of power in Europe as a means of raising his country from a third to a first rate state. And that end he accomplished solely by diplomacy founded on the successes of 1513, which impressed on Continental statesmen a sense of England's power and thus gave to Wolsey's succeeding diplomacy a weight it would not otherwise have commanded and which it never afterwards lost. The character of the policy accounts for its fluctuations : as the scales turned, so was Wolsey com- pelled to vary his pressure.

The year 1515 brought him two new honours. For years Warham, archbishop of Canterbury, had desired to be released from the lord chancellorship, and Henry had repeatedly urged Wolsey to accept it. Wolsey naturally shrank from adding to his already arduous duties ; but both Warham and the king became so urgent that he at last yielded. By patent dated 21st December he assumed the post, and at once threw himself into its work with his accustomed vigour, dispensing justice and introducing reforms with fearless impartiality. The second dignity, the cardinalate, was obtained through the active interven- tion of Henry himself, and only by the most threatening

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| arguments did the king overcome the fears and reluctance

of Leo. On the 10th September Wolsey was elected cardinal sole. The bearer of the red hat and ring arrived in London in November, and on Sunday the 18th Wolsey was installed amidst all the ceremonial magnificence which he valued not only for his own sake but for his king's. By similar strong measures was wrung from Leo the legateship, an office Wolsey sought in order to carry out ecclesiastical reforms. In 1518 Leo, ostensibly on account of a crusade, sent legates to the four chief courts of Europe. Campeggio, the legate to England, was allowed to reach Calais, where his further progress was stopped till the pope had joined Wolsey with him. Next year Wolsey was appointed sole legate for a year, and, finally, in 1524, following several extensions, he became legate for

life, after receiving unusual powers. In virtue of this commission he erected a court and instituted reformations by which he incurred much odium. In 1518 he received the see of Bath and Wells zm commendam, which in 1523 he resigned for Durham, replaced in turn by Fox's bishopric of Win- chester in 1529. At the conclusion of the Calais con- ference in 1521, Henry recompensed him with the rich abbacy of St Albans, held, like the episcopates, in com- mendam. From these and other sources he received immense revenues, which were almost entirely devoted to state purposes or national objects. He was prime minister of Henry, and in his income as in his master's there was no distinction between public and private money. Vast sums were used in founding his college at Ipswich and Cardinal College at Oxford, now known as Christ Church, which formed but part of a splendid scheme of national education, a scheme ultimately ruined by the greed of the king. Even what was expended on his own resplendent establishment redounded to the honour of his king and country. His was an age when power and pomp were more closely connected than they are now, and Wolsey's power was extraordinary. "He is in great repute," reported the unfriendly Venetian ambassador Giustinian ; "seven times more so than if he were pope." No wonder, then, that he cared but little to fill the papal chair. When, in 1522, and again in 1523, his candidature for the papacy came to nothing, he was not disappointed. And, if in 1529, on the illness of Clement VII., he showed himself seriously anxious on the subject, it was in all likelihood that he might compass Henry's will respecting divorce from Catherine, and prevent that rupture with the apostolic see which he foresaw would result from papal opposition.

Wolsey's favour with the king had been founded on success, and it fell by failure. In the region of politics one diplomatic victory had followed another. The balance had been firmly held between Francis I. and the emperor Charles V., an enterprise rendered memorable by the splendours of the Field of the Cloth of Gold (1520), planned and directed by Wolsey, and amidst which the Middle Ages passed away. Suddenly across his minister's diplomatics Henry dragged the question of the divorce, and everything had to be sacrificed to its accomplishment. Seeing too clearly how much, both personal and national, depended on attaining Henry's desire, Wolsey strove his very utter- most to further a design to which he

was himself opposed, stooping to the most discreditable and unworthy means. But the decision lay with Pope Clement, who was in the power of Charles V., Catherine's nephew, and all Wolsey's efforts were in vain. Vain, too, were all attempts to intimidate Catherine herself. A collusive suit was begun before Wolsey by which she was to be condemned unheard : she got word of it and thwarted the plan by demanding counsel. A commission was obtained from the pope for Campeggio and Wolsey to try the cause in England (1529); she appeared before the legatine court at Blackfriars only

to appeal to Rome, and thither under imperial pressure Clement revoked the case. It was plain Wolsey had failed, and all Henry's wrath burst out against his too faithful servant. He pointedly employed a secretary, and Wolsey's occupation was gone. Wolsey's foreign policy and domestic reforms had united against him every party and class in the nation, while at the same time he bore the blame of Henry's mistakes and extravagance. So long, however, as his royal master remained true to him he could defy all hostility. But now that the king, too, had turned against him his sole support had given way, and the hungry pack of enemies was unloosed. On the 20th September Henry parted from Wolsey without any sign of displeasure, but they parted for the last time. Anne Boleyn and her uncle Norfolk were Wolsey's bitter foes. By Anne's sway over Henry Wolsey was kept from the royal presence while Norfolk plotted his ruin. On the 17th October, at the king's command, Wolsey delivered up the great seal to Norfolk and the base ungrateful Suffolk. He was deprived of his dignities, his goods were confiscated, and, surrendering York Place, he retired to Esher. The Court of King's Bench found him guilty in a pramunire, and sentenced him to imprison- ment, while a bill precluding his restoration to power or dignities reached the Commons. The bill was dropped, but not till February 1530 did Henry grant him a full pardon and restore him to the archbishopric of York, on condition that he resigned Winchester and St Albans. Dreading his proximity to the king, his enemies procured his banishment into his diocese. Thither he went in April, and won the hearts of the people by his simplicity of life and graciousness of manner. His foes were alarmed ; his death alone could quiet their fears. He was

preparing to be installed archbishop on Monday, 7th November, when on the 4th he was arrested at Cawood Castle by the earl of Northumberland for high treason. On the way south, at Sheffield Park, Nottinghamshire, he was met by Sir William Kingston, keeper of the Tower, and at last Wolsey knew his doom. Long years of toil, anxiety, and the ceaseless vexations of his cruel enemies had shattered his health, and some pears sufficed to bring on dysentery, which was unskilfully treated, and aggravated by Kingston's appearance. Nevertheless he set out, and by three stages reached Leicester abbey on Saturday the 26th. '" Father abbot," he said, as the convent with its head came out to receive him, "I am come hither to leave my bones among you." He felt that he was dying. Kingston assisted him upstairs, and he at once went to bed. Vomiting and faintings came on, and he rapidly sank, yet his last moments were spent in speaking to Kingston of the objects of his life's best energies, his king and country. At eight o'clock on the morning of the 29th he died; and within twenty-four hours was buried in a rude coffin all that remained of the genius who made possible the glories of Elizabeth and the British empire of to-day. He left two children, born before he became a bishop, of " one Larke's daughter,'—a son who went by the name of Thomas Winter and was an ecclesiastic, and a daughter who passed as Dorothy Clansey and was a nun.

See Lives of Wolsey by Cavendish, Fiddes, and Grove, and J. S. Brewer's Reign of Henry VIII, 1509-30. There is no complete correct account of his life up to 1509, in connexion with which see Pinkerton's History of Scotland, ii, app. 445-50, along with J. Gardiner's Letters and Papers, &c., of Richard IIT. and Henry VIT., M. R. Series, pref. ; and Letters, &c., pref. and i., app. B, 426-52.

An excellent short view of Wolsey as a statesman will be found in Prof. M. Creighton's Thomas Wolsey. (i We C5)

WOLVERHAMPTON, a municipal and parliamentary borough and market-town of Staffordshire, England, one of the principal seats of the hardware manufacture in the Midlands, is situated on an eminence commanding an

extensive view towards Wales, on the Birmingham and Liverpool, the Staffordshire and Worcestershire, and the Wyrley and Essington Canals, and on the London and North-Western, the Midland, and the Great Western Rail- ways, 13 miles north-west of Birmingham, 16 south of Stafford, and 126 from London. The principal streets diverge from Queen Square, and are for the most part regular and well built, with numerous handsome shops. Towards the west there are pleasant suburbs of villas, the country being rich and well wooded. 'The old church of Wolverhampton, founded by Wulfruna in 996 and dedi- cated to the Virgin, was in the reign of Henry III. rededi- cated to St Peter. It has undergone frequent alterations, and in 1862-65 underwent extensive restoration. It is now a fine cruciform building, with south porch and central tower. Internally the church consists of a long and lofty nave with side aisles and north and south tran- septs, and terminating in a chancel with apsidal ending. The lower portion of the tower, south transept, &c., belong to the 13th century; the nave, clerestory, upper part of the tower, and north transept were erected in the 15th century; and the chancel is wholly modern, having been rebuilt in 1865. Wolverhampton was formerly a deanery, and on its abolition in 1846 the township was divided into ecclesiastical parishes, the number of which is now thirteen. At the old free grammar school, founded in 1515 by Sir Stephen Jenyns, a native of the town and an alderman of London, Sir W. Congreve and Dr Abernethy received their education. New buildings for the school were erected in 1876 in the western part of the town at a cost of £22,000. There is also a blue-coat school, founded in 1710. The other principal public buildings are the town-hall (1871), the corn exchange (1851, £15,000), the market-hall (1853, £10,500), the agricultural hall (1863, £6000), the public baths (1850), the post-office (1873), the art gallery, museum, and school of art (1884-85), and the free library. There is a cattle market about 5 acres in extent, and also a large pig market. The theatre royal (1844) is a handsome building in the Doric style. The benevolent institutions include a general hospital, the eye infirmary, the orphan asylum, and the institute of the society for outdoor blind. In Queen Square there is an equestrian statue of the late Prince Consort, unveiled by the queen in 1866, and on Snow Hilla statue in Sicilian marble (1879) of the Right Honourable Charles Pelham Villiers, who has represented the borough from 1835 to the present time (1888). Street improvements

have been carried out on a large scale within recent years. Main drainage works on a thorough method have also been completed, and a large farm purchased for the utilization of the sewage. The water-works, opened in 1847, belong to the corporation. The water is supplied from springs in the Red Sandstone by wells sunk to a great depth. The old racecourse, 50 acres in extent, has been laid out as a public park ; and a new racecourse was opened in 1887. The population of the municipal borough and urban sanitary district (area 3396 acres) in 1871 was 68,291, and in 1881 it was 75,766 (males 37,827, females 37,939); while that of the parliamentary borough (18,888 acres) was 156,978 in 1871, and 164,332 (males 82,657, females 81,675) in 1881.

Situated in a district abounding in coal and ironstone, Wolver- hampton has become famous for the manufacture both of the heavier and the smaller kinds of iron-wares, although in the finer class of metal manufactures for which the neighbouring town of Birmingham is famous it has little or no share. It possesses large smelting furnaces, and iron and brass foundries, but is specially occupied in the manufacture of all kinds of iron implements, tools, and domestic requisites, including locks and fastenings, hinges and nails, kitchen furniture, gardeners', wrights', and smiths' tools and implements, tinplate goods, and every variety of japanned ware, of which it may be regarded as the principal seat. There are also

extensive clay-retort works, chemical works, grease works, dye- works, varnish works, coach works, corn and saw mills, cooperages, ropewalks, maltings, and breweries.

The place was originally called Hanton or Hamtune, but on the foundation of a college for a dean and secular canons in 996 by Wulfruna, sister of Ethelred IJ. and widow of Anthelm, duke of Northumberland, it was named Wulfrunahamton. By William Rufus the echureh was placed under the eare of Sampson, bishop of Worcester, who settled it on a prior and convent of his own cathedral. In the reign of Stephen it was taken possession of by Roger, bishop of Salisbury, and subsequently it came into the hands of the secular canons, who held it

until Dean Peter of Blois resigned it to Hubert, archbishop of Canterbury, that he might build an abbey of Cistercian monks. The church was accounted one of the king's free chapels, and was annexed by Edward IV. to the deanery of Windsor. The college and prebends were granted to the duke of Northumberland in the reign of Edward VI., and on his attainder they came again to the crown. The deanery and prebends were refounded by Queen Mary, and this was confirmed by James I. The town received the grant of a market and fair from Henry III. in 1258. It suffered severely from fire in 1590, the conflagration lasting five days. During the Civil War its sympathies were Royalist, and it was visited by Charles I. » aceom- panied by his sons Charles and James. In 1645 it was for a time the headquarters of Prince Rupert. Its importance as a seat of manufactures is entirely of modern date and due to the rise of the iron industry. Although it reeeived the privilege of returning members to parliament in 1832, it was not ineorporated as a muni- cipal borough till 1848. It is divided into eight wards, and is governed by a mayor, 12 aldermen, and 36 councillors. It has separate commissions of the peace and quarter sessions. In 1885 the number of its parliamentary representatives was increased to three, the borough being separated into three parliamentary divi- sions—EHast, South, and West.

WOMBAT. The animals which have received this name belong to the Marsupial family Phascolomyide (see MamMatia, vol. xv. p. 383). They have the following dental formula: 74, ¢9, p31, m4=8; total 24. All the teeth are of continuous growth, having persistent pulps. The incisors are large and scalpriform, much as in Rodents. The body is broad and depressed, the neck short, the head large and flat, the eyes small. The tail is rudimentary, hidden in the fur. The limbs are equal, stout, and short. The feet have broad, naked, tuberculated soles; the fore-feet

Common Wombat (Phascolomys ursinus).

with five distinct toes, each furnished with a long, strong, and slightly curved nail, the first and fifth considerably shorter than the other three. The hind feet have a very short nailless hallux ; the second, third, and fourth toes partially united by integument, of nearly equal length ; the

fifth distinct and rather shorter; these four are pro- vided with long and curved nails.

There are two distinct forms of wombat :—

(1) Phascolomys proper. Fur rough and coarse. Ears short and rounded. Muffle naked. Post-orbital process of

the frontal bone obsolete. Ribs fifteen pairs. Vertebra : C7, D 15, L 4, 8 4, © 10-12. The wombat of Tasmania and the islands of Bass's Straits (P. wrsinus) and the closely similar but larger animal of the southern portion of the mainland of Australia (P. platyrhinus) belong to this form.

(2) Lasiorhinus. Fur smooth and silky. Ears large and more pointed. Muffle hairy. Frontal region of skull broader than in the other section, with well-marked post- orbital processes. Ribs thirteen. Vertebre: C7, D 13, L 6,8 4, C 15-16. One species, P. latifrons, the Hairy- Nosed Wombat of Southern Australia.

In their general form and actions the wombats resemble small bears, having a somewhat similar shuffling manner of walking, but they are still shorter in the legs, and have broader flatter backs than bears. They live entirely on the ground, or in burrows or holes among rocks, never climbing trees, and they feed-entirely on grass, roots, and other vegetable substances. They sleep during the day, and wander forth at night in search of food, and are shy and gentle in their habits generally, though they can bite strongly when provoked. The only noise the common wombat makes is a low kind of hissing, but the hairy- nosed wombat is said to emit a short quick grunt when annoyed. 'The prevailing colour of the last-named species, as well as P. ursinus of Tasmania, is a brownish grey. The large wombat of the mainland is very variable in colour, some individuals being found of a pale yellowish brown, others dark grey, and some quite black. The length of head and body is about three feet. Fossil remains of wombats, some of larger size than any now existing, have been found in caves and post-Pliocene deposits in Australia, but in no other part of the world. (w. H. F.)

WOMBWELL, a township of England, in the West Riding of Yorkshire, on the Manchester, Sheffield, and Lincolnshire Railway, 44 miles south-east of Barnsley, 7 north-west of Rotherham, and 184 from London by rail. The church of St Mary is an ancient structure, enlarged and altered in 1835. The inhabitants are chiefly employed in the extensive collieries. The population of the urban sanitary district (area 3851 acres) in 1871 was 5009, and in 188i it was 8451.

WOMEN, Law RELATING To. The law as it relates to women has been gradual in its operation, but its tend- ency has been almost uniformly in one direction. Dis- abilities of women, married or unmarried, have been one after another removed, until at the present day, in most civilized countries, the legal position of women differs little from that of men as far as regards private rights. Politi- cally and professionally the sexes are still not upon an equality, but even in this aspect women have considerably greater rights than they once possessed, and the old theory of their intellectual and moral inferiority is virtually exploded. Those who defend their exclusion must now do so on other grounds. Much of the law relating to married women has been already dealt with under the heads of ADULTERY, Bicamy, Divorcr, Marriace, HusBanD AND Wire, and SETTLEMENT, the last two especially dealing with their rights of property.

The dependent position of women in early law is proved by the evidence of most ancient systems which have in whole or in part descended to us. In the Mosaic law divorce was a privilege of the husband only,! the vow of a woman might be disallowed by her father or husband,? and daughters could inherit only in the absence of sons, and then they must marry in their tribe The guilt or innocence of a wife accused of adultery might be tried by the ordeal of the bitter water. Besides these instances,*

1 Deut. xxiv. 1. 3 Numb, xxvii., xxxvi.

2 Numb. xxx. 8. “ Numb. v. 11.

much legislation dealing with, inter alia, offences against chastity, and marriage of a man with a captive heathen woman or with a purchased slave. So far from second marriages being restrained, as they were by Christian legislation, it was the duty of a childless widow to marry her deceased husband’s brother. In India subjection was a cardinal principle. “ Day and night must women be held by their protectors in a state of dependence,” says Manu.! The rule of inheritance was agnatic, that is, descent traced through males to the exclusion of females.2 The gradual

growth of stridhana, or property of a woman given by the husband before or after marriage, or by the wife's family, was probably what led to the suttee, for both the family of the widow and the Brahmans had an interest in getting the life estate of a woman out of the way. Women in Hindu law had only limited rights of inheritance, and were disqualified as witnesses. In Roman law a woman was even in historic times completely dependent. If married she and her property passed into the power of her husband; if unmarried she was (unless a vestal virgin) under the perpetual tutelage of her father during his life, and after his death of her agnates, that is, those of her kinsmen by blood or adoption who would have been under the power of the common ancestor had he lived. Failing agnates, the tutelage probably passed to the gens. The wife was the purchased property of her husband, and, like a slave, acquired only for his benefit. A woman could not exercise any civil or public office. In the words of Ulpian, "feminz ab omnibus officiis civilibus vel publicis remotze sunt.'4 A woman could not continue a family, for she was " caput et finis familie suz,"> could not be a witness, surety, tutor, or curator; she could not adopt or be adopted, or make a will or contract. She could not succeed ab tmtestato as an agnate, if further removed than a sister. A daughter might be disinherited by a general clause, a son only byname. On the other hand, a woman was privileged in some matters, but rather from a feeling of pity for her bodily weakness and presumed mental incapacity ® than for any more worthy reason. Thus she could plead ignorance of law as a ground for dissolving an obligation, which a man could not as a rule do; she could accuse only in cases of treason and witchcraft; and she was in certain cases exempt from torture. In succession ab intestato to im- movable property Roman law did not, as does English, recognize any privilege of males over females. Legal dis- abilities were gradually mitigated by the influence of fictions, the preetorian equity, and legislation. An example of the first was the mode by which a woman freed herself from the authority of her tutor by fictitious cession into the authority of a tutor nominated by herself, or by sale of herself into the power of a nominal husband on the understanding that he was at once to emancipate her to another person, who then manumitted her. The action of equity is illustrated by the recognition by the praetor of cognatic or natural as distinguished from agnatic or artificial relationship, and of a widow's claim to succeed on the death of her husband intestate and without relations. Legislation,*

beginning as early as the Twelve Tables, which forbade excessive mourning for the dead by female mourners, did not progress uniformly towards

1 Ch. ix. § 2 (Sir W. Jones's translation),

? Whether this was the oldest rule of inheritance has been much debated. See Famity. That birth of a child gave the mother certain legal rights in a primitive stage of society is the view of many writers. See especially Das Mutterrecht of J. J. Bachoffen (Stutt- gart, 1861). 3 Maine, Harly History of Institutions, lect. xi.

- *Dig;, i. 16, 195. > [bid.*

5 Imbecillitas is the term used more than once in the texts of Roman law,

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which illustrate the subordination of women, there was | enfranchisement of women.

For instance, the Lex Voconia (about 169 B.c.), called by St Augustine the most unjust of all laws, provided that a woman could not be instituted heir to a man who was registered as owner of a fortune of 100,000 asses." A constitution of Valentinian I. forbade bequests by women to ecclesiastics. But the tendency of legislation was undoubtedly in the direction indicated. Adoption of women was allowed by Diocletian and Maximian in 291. The tutelage of women of full age was removed by Claudius, and, though afterwards in part revived, has disappeared by the time of Justinian. This implied full testamentary and contractual liberty. In regard to the separate property of the married woman, the period of dos had by the time of Justinian long super- seded the period of manus (see SETTLEMENT). 'The result was that, in spite of a few remaining disabilities, such as the general incapacity to be surety or witness to a will or contract, of a wife to make a gift to her husband, of a widow to marry within a year of her husband's death, the position of women had become, in the words of Sir H. Maine, "one of great personal and proprietary inde- pendence."® For this improvement in their position they were largely indebted to the*

legislation of the Christian emperors, especially of Justinian, who prided himself on being a protector of women. The following are a few of the matters in which Christianity appears to have made alterations, generally but perhaps not always improve- ments, in the law. As a rule the influence of the church was exercised in favour of the abolition of the disabilities imposed by the older law upon celibacy and childlessness, of increased facilities for entering a professed religious life,® and of due provision for the wife. The church also supported the political power of those who were her best friends. The government of Pulcheria or Irene would hardly have been endured in the days of the pagan empire. Other cases in which Christianity probably exercised influence may be briefly stated. (1) All differences in the law of succession ab intestato of males and females were abolished by Justinian. (2) The appointment of mothers and grandmothers as tutors was sanctioned by the same emperor. (3) He extended to all cases the principle established by the Senatus Consultum Tertullianum (158), enabling the mother of three (if a freed woman four) children to succeed to the property of her children who died intestate, and gave increased rights of succession to a widow. (4) The restrictions on the marriage of senators and other men of high rank with women of low rank were extended by Constantine, but almost entirely removed by Justinian. (5) Second marriages were discouraged (especially by making it legal to impose a condition that a widow's right to property should cease on re-marriage), and the Leonine Constitutions at the end of the 9th century made third marriages punishable. (6) The same constitutions made the benediction of a priest a necessary part of the ceremony of marriage.!° The criminal law in its relation to women presents some points of interest. Adultery was punished with death by Constantine, but the penalty was reduced by Justinian to relegation to a convent. A woman condemned for adultery could not re-marry. A marriage between a Christian and a Jew

7 The way in which this law was evaded was by non-enrolment of the testator in the census (see Montesquieu, Esprit des Lois, bk. xxvii.). Another way was by leaving her the inheritance by jidercommissum (see TRUST).

8 Ancient Law, ch.v. Hence the necessity of such laws as the Lex Oppia (see SuMpruaRY Laws).

® A remarkable example of this tendency was the provision that an actress might leave the stage and break her contract of service with impunity in order to become a nun (see THEATRE). Even under the pagan emperors a constitution of Diocletian and Maximian in 285 had enacted that no one was to be compelled to marry (Cod., v. 4, 14).

**° See Troplong, De U' Influence du Christianisme sur le Droit Civil,*

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rendered the parties guilty of adultery. Severe laws were enacted against offences of unchastity, especially procure- ment and incest. It was a capital crime to carry off or offer violence toa nun. A wife could not commit furtum of her husband's goods, but he had a special action rerum amotarum against her. By several sumptuary consti- tutions, contained in the Code, bk. xi., women as well as men were subject to penalties for wearing dress or orna- ments (except rings) imitating those reserved for the emperor and his family. Actresses and women of bad fame were not to wear the dress of virgins dedicated to Heaven. If a consul had a wife or mother living with him, he was allowed to incur greater expense than if he lived alone. The interests of working women were pro- tected by enactments for the regulation of the gynecia, or workshops for spinning, dyeing, &e.

The canon law, looking with disfavour on the female independence prevailing in the later Roman law, tended rather in the opposite direction. The Decretum specially inculeated subjection of the wife to the husband, and obedience to his will in all things! The chief differences between canon and Roman law were in the law of marriage, especially in the introduction of publicity and of the formalities of the ring and the kiss. The benediction of a priest was made a necessary part of the ceremony, as indeed it had been made by the civil power, as has been already stated, in the post-Justinian period of Roman law. But in practice this rule appears to have fallen into disuse until it was again revived by the council of Trent. It was, however, the rule of the English common law after the Reformation. The ceremony was not to be performed during Lent. The woman was to be veiled during the ceremony. A promise of marriage was so sacred that it made a subsequent marriage with another person void.

Spiritual cognation was a bar to marriage. The sentence of the church was made necessary for divorce. As to women in general the law does not say very much. Women, even relatives, were not to live with priests unless in case of necessity. They were not to approach the altar or fill any public office of the church ; nor might they lend money on usury. Baptism might be valid although administered by a woman. Women who had professed religion could not be forced to give evidence as witnesses. In some cases the evidence of women was not receivable (see Wirnzss).?

The early law of the northern parts of Europe is interesting from the different ways in which it treated women. In the words of Sir H. Maine? —" The position of women in these barbarous systems of inheritance varies very greatly. Sometimes they inherit, either as individuals or as classes, only when males of the same generation have failed. Sometimes they do not inherit, but transmit a right of inheritance to their male issue. Sometimes they succeed to one kind of property, for the most part movable property, which they probably took a great share in producing by their household labour ; for example, in the real Salic law (not in the imaginary code) there is a set of rules of succession which, in my opinion, clearly admit women and their descendants to a share in the inheritance of movable property, but confine land exclusively to males and the descendants of males… . The idea is that the proper mode of providing for a woman is by giving her a marriage portion ; but, when she is once married into a separate community consisting of strangers in blood, neither she nor her children are deemed to have any further claim on the parent group." Among the Scandinavian races

1 Pt. ii. caus. xxxiii. qu. v. ch. 16.

? On this branch of the subject Manssen's Het Christendom en de Vrouw (Leyden, 1877) may be consulted with advantage.

3 Early Law and Custom, ch. v.

women were under perpetual tutelage, whether married or unmarried. The first to obtain freedom were the widows. As late as the code of*

Christian V., atthe end of the 17th century, it was enacted that if a woman married without the consent of her tutor he might have, if he wished, administration and usufruct of her goods during her life.5 The provision made by the Scandinavian laws under the name of morning-gift was perhaps the parent of the modern settled property.6 The Brehon law of Ireland excepted women from the ordinary course of the law. They could distrain or contract only in certain named cases, and distress upon their property was regulated by special rules. In the pre-Conquest codes in England severe laws were denounced against unchastity, and by a law of Canute a woman was to lose nose and ears for adultery. The laws of Athelstan contained the peculiarly brutal pro- vision for the punishment of a female slave convicted of theft by her being burned alive by eighty other female slaves. Other laws were directed against the practice of Wiroucrart (9.v.) by women. Monogamy was enforced both by the civil and ecclesiastical law; and second and third niarriages involved penance. A glimpse of cruelty in the household «is afforded by the provision, occurring no less than three times in the ecclesiastical legislation, that if a woman scourged her female slave to death she must do penance. 'Traces of wife-purchase are seen in the law of Ethelbert, enacting that if a man carry off a freeman's wife he must at his own expense procure the husband another wife. The codes contain few provisions as to the property of married women, but those few appear to prove that she was in a better position than at a later period. The laws of Ine gave her a third of her husband's property ; the laws of Edmund as to betrothal allowed this to be increased to half by antenuptial contract, to the whole if she had children and did not re-marry after her husband's death. No doubt the dower ad ostium ecclesiz favoured by the church generally superseded the legal rights where the property was large—in fact this is specially provided by Magna Charta, c. 7—just as at present rights under a marriage settlement take the place of those given by statute. " Provisio hominis tollit provisionem legis." The legal rights of a married woman apart from contract were gradually limited, until by the time of Glanvill her person and property had become during her husband's lifetime entirely at his disposal, and after his death limited to her dower and her pars rationabilis (see WiLL).

A few of the more interesting matters in which the old common and statute law of England placed women in a special position may be noticed. A woman was exempt from legal duties more particularly attaching to men and not performable by deputy. She could apparently origin- ally not hold a proper feud, i.e, one of which the tenure was by military service.' The same principle appears in the rule that she could not be endowed of a castle main- tained for the defence of the realm and not for the private use of the owner. She could receive homage, but not render it in the form used by men, and she was privileged from suit and service at the sheriff's tourn. She was not sworn to the law by the oath of allegiance in the leet or

4 See Stiernhodk, De Jure Sveonwm (Stockholm, 1672), bk. ii. ch. i.; Messenius, Leges Svecorum (Stockholm, 1714).

® Bk. iii. ch. xvi. §§ 1, 2.

° The development of the bride-price no doubt was in the same direction. Its original meaning was, however, different. It was the sum paid by the husband to the wife's family for the purchase of part of the family property, while the morning-gift was paid as pretium virginitatis to the bride herself. In its English form morning-gift occurs in the laws of Canute; in its Latinized form of morgangiva it occurs in the Leges Henrict Primi.

7 It is remarkable that the great fiefs of France except the Isle of France, the special apanage of the crown, all became in time female fiefs. This is shown by the table at the end of Laboulaye's Recherches.

tourn, and so could not be outlawed (see OuTLAW), but was said to be waived. She could be constable, either of a castle or a vill, but not sheriff, unless in the one case of Westmorland, an hereditary office, exercised in person in the 17th century by the famous Anne, countess of Dorset, Pembroke, and Montgomery. In certain cases a woman could transmit rights which she could not enjoy. On such a power of transmission, as Sir H. Maine shows,! rested the claim of Edward III. to the crown of France. The claim through a woman was nota breach of the French constitutional

law, which rejected the claim of a woman. The jealousy of a woman's political influence is strikingly shown by the case of Alice Perrers, the mistress of Edward UL She was accused of breaking an ordinance by which women had been forbidden to do business for hire and by way of maintenance in the king's court.?

By Magna Charta a woman could not appeal any one for murder except that of her husband. This disability no doubt arose from the fact that in trial by battle she naturally did not appear in person but by a champion. She was not admitted as a witness to prove the status of a man on the question arising whether he were free or a villein. She could not appoint a testamentary guardian, and could only be a guardian even of her own children to a limited extent. Her will was revoked by marriage, that of a man only by marriage and the subsequent birth of a child (see Winn). By 31 Hen. VI. ¢. 9 the king's writ out of chancery was granted to a woman alleging that she had become bound by an obligation through force or fraud. By 39 Hen. VI. c. 2 a woman might have livery of land as heiress at fourteen. Benefit of clergy was first allowed to women partially by 21 Jac. I. c. 6, fully by 3 Will. and M. c. 9 and 4 and 5 Will. and M. c. 24. Public whipping was not abolished until 57 Geo. III. c. 75, whipping in all cases until 1 Geo. IV. c. 57. Burning was the punish- ment specially appropriated to women convicted of treason or witchcraft. A case of sentence to execution by burning for petit treason occurred as lately as 1784. In some old statutes very curious sumptuary regulations as to women's dress occur. By the sumptuary laws of Edward III. in 1363 (37 Edw. IIL cc. 8-14) women were in general to be dressed according to the position of their fathers or husbands. Wives and daughters of servants were not to wear veils above twelve pence in value. Handicraftsmen's and yeomen's wives were not to wear silk veils. The use

traceable in the early law of procedure. For instance, by the Statute of Essoins (12 Edw. II. st. 2), essoin de sernitio regis did not lie where the party was a woman ; that is, a woman (with a few exceptions) could not excuse her absence from court by alleging that she was on public duty. The influence of the church is very clearly traceable in some of the earlier

criminal legislation. Thus by 13 Edw. I. st. 1, c. 34, it was punishable with three years' imprisonment to carry away a nun, even with her consent. The Six Articles, 31 Hen. VIII. c. 14, for- bade marriage and concubinage of priests and sanctioned vows of chastity by women.

The present position of women in English law may be treated, English Sex alone, as law.

for purposes of convenience, under several heads. will appear, does not determine the law: scx and marriage together must often be taken into consideration.

Political Rights.—This branch of the law is full of singular Politieal A woman may fill some of the highest positions in the rights.

anomalies. state. She may be a queen, a regent, ora peeress in her own right.3 A queen regnant has, by 1 Mary, sess. 3, c. 1, as full rights as a king. A peeress is entitled, by 20 Hen. VI. c. 9, to be tried like a peer by the House of Lords or the court of the lord high steward (see TRIAL), and has a seat in the House of Lords, but no right of speaking or voting. Other public offices which a woman can fill are those of overseer, guardian of the poor, churchwarden, and sexton. She may also, if married, be one of a jury of matrons empanelled to determine the question of pregnancy of a widow on a writ de ventre inspiciendo or of a female prisoner, but she cannot serve on an ordinary jury. If unmarried or a widow she can vote in municipal, school board, local government, poor law, and other elections of a local character (such as polls of ratepayers under the Free Libraries and Borough Funds Acts), and can be a member (whether married or not) of a school board, but apparently not an overseer or guardian if married and living with her husband. She cannot be registered as a voter or vote at a parliamentary election or be elected a member of parliament. It was decided in 1868 that the words of Lord Brougham's Act (13 and 14 Vict. c. 21, § 4), by which in all Acts words importing the masculine gendcr are to be taken to include females unless the contrary is expressly provided, did not bring a woman within the word '""man" in the Representation of the People Act, 1867.4. The same would no doubt be held, if the point were raised, under the Representation of the People Act, 1884. The question of granting the parlia- mentary franchise to women

was first brought before the House of Commons by John Stuart Mill in 1867, as an amendment to the Representation of the People Bill of that year, and has uniformly been rejected on that and several subsequent occasions. At present the Isle of Man is the only part of the United Kingdom where such a right exists. It was there conceded in 1882 to unmarried women with sufficient property qualification. For the precedence of women, see PRECEDENCE. 'The national status of married women and widows is provided for by the Naturalization Act, 1870.

Professions and Trades.—The only one of the learned professions Profes- open to women is the medical. Such rights as may be possessed by sians the Society of Apothecaries and the College of Surgeons to admit and women to their respective qualifications are specially saved by 87 trades,

of fur was confined to the ladies of knights with a rental above 200 marks a year. Careful observance of difference of rank in the dress was also inculcated by 3 Edw. IV. c. 5.

The wife or daughter of a knight was not to wear cloth of gold or sable fur, of a knight-bachelor not velvet, of an esquire or gentleman not velvet, satin, or ermine, of a labourer not clothes beyond a certain price or a girdle garnished with silver. By 22 Edw. IV. c. 1, cloth of gold and purple silk were confined to women of the royal family. It is worthy of notice that at the times of passing these sumptuary laws the trade interests of women were pro- tected by the legislature. By 37 Edw. III. c. 6, handi- craftsmen were to use only one mystery, but women might work as they had been accustomed. 3 Edw. IV. c. 3 forbade importation of silk and lace by Lombards and other alien strangers, imagining to destroy the craft of the silk spinsters and all such virtuous occupations for women. In some cases the wives and daughters of tradesmen were allowed to assist in the trades of their husbands and fathers; see, for instance, the Act con- cerning tanners, 1 Jac. Lc. 22. Some trading cor- porations, such as the East India Company, recognized no distinction of sex in their members. The disabilities imposed on women by substantive law are sometimes

1 Karly Law and Custom, ch. v. 2 Rot. Parl., vol. iii. p. 12.

and 38 Vict. c. 34 and 38 and 39 Vict. c. 48. By an Act of 1876 (39 and 40 Vict. c. 41) medical qualifications may be granted, irrespective of sex, by any body empowered to grant such qualifica- tions. As a matter of fact the College of Surgeons does not at present allow women to qualify, but the Society of Apothecaries and the College of Surgeons of Ireland and the King's and Queen's College of Physicians in Ireland follow the more liberal course. Admission to degrees, medical and others, in the universities is only allowed to a limited extent. Oxford and Cambridge admit women to examinations, but not to degrees. London, under its supple- mental charter of 1878, admits to all degrees. The University Education (Ireland) Act, 1879, contains a section empowering the Royal University of Ireland to examine women for degrees and certificates of proficiency. The Endowed Schools Act, 1869, pro- vides for extending to girls the benefits of educational endowments. A similar provision is included in the City of Loudon Parochial Charities Act, 1883. Under the powers of these Acts, as well as by private munificence, a considerable sum of money has been during the last few years provided for the purposes of female education. Special regulations are made by the Factories and Mines Acts as to the employment of women and girls in factories and mines. Under no circumstances is a woman allowed to work underground. The Shop Hours Regulation Act, 1886 (a temporary provision), forbids the employment in shops of girls under eighteen for more than ee = es ee eee

3 Most peeresses are those who have suceeeded to ancient peerages by writ. Modern peerages are almost always limited to heirs-male.

4 Chorlton v. Lings, Law Rep., 4 Common Pleas, 374.

Family rights.

Rights of pro- perty.

WOMEN

seventy-four hours in a week. Women have recently been em- ployed to a greater extent than formerly in Government depart- ments, especially in the post-office. A married woman may, since the Married Women's

Property Act, 1882, carry on a trade separ- ately from her husband, and in such a case is liable to be made a bankrupt. She may apparently be a partner of her husband, and may lend him money, but in this case her claim to a dividend on his bankruptcy is postponed to that of other creditors.

Family Rights.—The age at which a girl can contract a valid marriage is, following Roman law, twelve; she is thus two years in advance of a boy, who must be fourteen. Under the Infants Settlement Act (see SerrLEMENT) a valid settlement can be made by a wonian at seventeen with the approval of the conrt, the age for a man being tweuty. support of illegitimate children till they attain the age of sixteen. She is generally assisted, in the absence of agreement, by an affilia- tion order granted by magistrates. A married woman having separate property is, under the Married Women's Property Act, liable for the support of her husband, children, and grandchildren beeoming chargeable to any union or parish. At common law the father was entitled as against the mother to the custody of a legitimate child up to the age of sixteen, and could only forfeit such right by misconduet. But the Court of Chancery, wherever there was trust property and the infant could be made a ward of court, took a less rigid view of the paternal rights and looked more to the interest of the child, and consequently in some cases to the extension of the mother's rights at common law. Legislation has tended in the same direction. By 36 Vict. e. 12 the Court of Chancery was empowered to enforce a provision in a separation deed, giving up the custody or control of a child to the mother. The Judicature Act, 1873, § 25 (10), enacted that in questions relating to the custody and education of infants the rules of equity should prevail. The Guardianship of Infants Act, 1886, largely extended the mother's powers of appointing and acting as a guardian, and gave the court a discretion to regard the mother's wishes as to the custody of the children. he children of women convicted of crime or frequenting the company of prostitutes may be sent to an industrial school. The principal disabilities under which women are now placed may perhaps be classed under the head of family rights, viz., exclusion of female heirs from intestate succession to real estate, unless in absence of a male heir (see INHERITANCE, Primo- GENITURE), and the obtaining of Divorcr (g.v.) by a husband for the adultery of his wife, while

the wife can only obtain it for adul- tery coupled with some further cause, such as cruelty or desertion.

fights of Property.—Unmarried women and widows have praeti- cally equal rights with men. Since the date of the article HusBanp AND WiFE the Married Women's Property Act, 1882, has extended the change in the law attempted to a limited degree by the previous Acts of 1870 and 1874. The most important provisions of the Act (45 and 46 Vict. c. 75) falling under this head are the following. A married woman is capable of acquiring, holding, and disposing by will or otherwise of any real and personal property as her separate property, in the same imanner as if she were a feme sole, without the intervention of any trustee. Every contract entcred into by a married woman is to be deemed to bind her separate property, unless the contrary be shown. Property of a woman niarried after the commencement of the Act, whether belonging to her at the time of marriage or acquired after marriage, is to be held by her as a feme sole. The same is the case with property acquired after the commencement of the Act by a woman married before the Act. After marriage a woman remains liable for antenuptial debts and liabilities, and as between her and her husband, in the absence of contract to the contrary, her separate property is to be deemed primarily liable. The husband is only liable to the extent of property acquired fromi or through his wife. The Act also contains provisions as to stock, investment, insurance, evidence (see Wit- NESS), and other matters. The effect of the Act is to render obsolete the old law as to what creates a separate use or a reduction into possession of choses in action (see PERSONAL Estate), as to equity to a settlement, as to fraud on the husband's marital rights, ! and as to the inability of one of two married persons to give a gift to the other. Also, in the case of a gift to a husband and wife in terms which would make them joint-tenants if unmarried, they no longer take as one person but as two. The construction of the Act by the courts has been in one or two cases perhaps somewhat narrow; still there is no doubt that it has affected the proprietary rights of married women to an immense extent. Its effect has been principally to improve the position of wives of the humbler elass unprotected by marriage settlement. 'There is a special saving in

1 This was a rule of law, confirmed, though not for the first time established, by the well-known decision of Lord Thurlow in Countess of Strathmore v. Bowes, in 1789, to the effect that a sccret conveyance by a woman during her engage- ment to her future husband might be set aside by him after marriage A legal relation was in this case created by engagement or betrothal. The only other instance in English law in which betrothal gives any rights appears to be the action for breach of promise of marriage. In the Mosaie law betrothal was, for the purposes of punishment of adultery, equivalent to marriage (see Deut. xxii. 23). In some modern systems betrothal is a matter of more importance than it isin England. In Germany, for instance, it is publicly advertised.

An unmarried woman is liable for the-

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the Act of existing and future settlement. A settlement is still necessary where it is desired to secure only the enjoyment of the income to the wife and to provide for children. The Act by itself would enable the wife, without regard to family claims, instantly to part with the whole of any property which might come to her. Restraint on anticipation, a means of protecting a married woman's property from her husband's influence, is also preserved by the Act, subject to the liability of such property for antenuptial debts, and to the power given to the court by the Conveyancing Act, 1881, to bind a married woman's interest notwithstanding a clause of restraint. This possibility of being restrained from anticipation is now one of the principal points of difference between the proprietary rights of nen and women. Formerly remaining unmarried could be attached as a condition of the enjoyment of property by a widow only, but it has been recently decided that such a condition may be imposed upon a widower as well. In one case, however,the widow has still an advantage over the widower. Limitations contained in her marriage settlement in favour of her children by a former marriage are not treated as voluntary, while similar limitations in the settle- ment of a widower are regarded as voluntary, and therefore void as against a subsequent

mortgagee of the settled property.2. By Magna Charta, c. 7, a widow is to have her QUARANTINE (q.v.), and is not to be forced to re-marry.

Procedure.—An action for breach of promise of marriage and an Proce- affiliation summons under the Bastardy Acts are, the former prac- dure. tically, the latter entirely, confined 'to women. An action of SEDUCTION (q.v.), though not brought in England by the woman herself, is for injury suffered by her. The Rules of the Supreme Court and the Married Women's Property Act contain various pro- visions for the bringing and defending of actions by married women. The main provision is § 1 (2) of the Act, enabling a inarried woman to sue and be sued, either in contract or in tort or otherwise, in all respects as if she were a feme sole. Her position, however, is not, owing to the judicial interpretation of the Act, as completely independent as the words of the Act would at first sight appear toimply. It has been held, for instance, that she cannot smece the Act, any more than before it, be next friend or guardian ad litem of au infant. The husband and wife too may still be sued jointly for a tort committed by the wife after marriage. Apart from proceedings for divorce or judicial separation, a husband cannot sue his wife for a tort committed during the coverture, nor a wife her husband, unless for the protection and security of her separate property. She can, however, eanse him to be bound over in reeognizances to keep the peace towards her in case of violence on his part. The Married Women's Property Act contains a useful section enabling questions between husband and wife as to property to be decided in a summary way. A judgment against a married woman under the Act is limited to execution against her separate property; she cannot like an ordinary debtor be committed to prison under the Debtors Act for default in payment.*

Criminal Law.—There ave some offences which can be eommitted Criminal only by women, others which can be committed only against them. law. Annong the former are concealment of birth (in ninety-nine cases out of a hundred), the now obsolete offence of being a common scold, and prostitution and kindred offences. Many offences of the latter kind were up to a recent date dealt with under the Contagious Diseases Acts, which were repealed in 1886. Where a married woman eominits a crime in company with her husband, she is generally presumed to have

acted by his coercion, and so to be entitled to acquittal. This presumption, however, was never made in witcheraft cases, and is not now made in cases of treason, murder, and other grave crimes, or in crimes in which the principal part must necessarily be taken by the wife, such as keeping a brothel. In fact, the exceptions to the old presumption are now perhaps more numerous than those falling within it. The doctrine of coercion and the practice of separate acknowledgment of deeds by married women (necessary before the Married Women's Property Act) seem to be vestiges of the period when women, besides being chattels, were treated as chattels.+ Formerly a wife could not steal her husband's property, but since the Married Women's Property Act this has become possible. he evidence of a wife is not usually receivable for or against her husband (see Witness). She does not become an accessory after the fact by receiving and harbouring her husband after he has committed a felony; the husband, however, is not equally privileged if the offence be committed by the wife. Adultery is now no crime, England being almost the only countiy where such is the case. It was punished by fine in the ecclesiastical courts up to the 17th century, and was made criminal for a short

2 See Re Cameron and Wells, Law Rep., 37 Chancery Div., 32.

3 A brief sketch of the law relating to this braneli of the subject has been added by way of appendix to this article.

4 It was certainly laid down by the Court of Chancery, in more than one case, that the reason for enforcing acknowledgment of deeds by a married woman apart from her hnsband was the presumption that in matters of property she was sure to be coerced by him. If such were the truth, the separate acknowledgment —a matter of a few minntes' eonversation— was but a poor safeguard. The doctrine of cocrcion in felonies is attributed by Mr Justice Stephen to the wish to give women, while they had not benefit of clergy, the same chance of escape as nen (see his Digest of the Criminal Law, App., note J).

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Scottish law.

time by an ordinance of the Long Parliament. The offences which ean be committed only against women are chiefly those against decency, such as rape, procuremeut, and similar erimes, in which a considerable change in the law in the direction of increased pro- tection to women was made by the Criminal Law Amendment Act, 1885. Another offence is abduction, which needs to be separately mentioned, as it appears in law to be an offence partly against the person, partly against property, for a difference is made between the abduction of a woman with property and of one without pro- perty. As to offences committed against a wife, reeent legislation has made some considerable changes. By the Matrimonial Causes Act, 1878, if a husband be convicted of an aggravated assault upon lis wife, the court before which he is tried may order (subjeet to an appeal to the Probate, Divorce, and Admiralty Division of the High Court) that the wife be no longer bound to cohabit with him, such order to have the effeet of a judicial separation on the ground of cruelty. The order may also provide for payment of a weekly allowance by the husband to the wife and for the custody of the children of the marriage. That of the ehildren under ten may be given to the wife. The Married Women's Property Act gives a married woman criminal remedies against all persons (including her husband) for the protection of her separate property, with a proviso that no such eriminal proceeding shall be taken against a husband while they are living together, nor while they are living apart, con- cerning any act done while they were living together, unless the wife's property have been wrongfully taken by the husband on deser- tion of his wife. The section just cited extends the common law, under which the wife's redress for injuries committed by her husband was confined to injuries to the person. But it extends it only to injuries to the separate property, and it has recently been held that a wife cannot, under the terms of the section, proceed against her hus- band criminally fora libel.!| The Married Women (Maintenance in Case of Desertion) Act, 1886, enables a wife to summon her husband before a court of summary jurisdiction for desertion, and the court may make an order for her support. Before the Aet the wife's only course was to become chargeable to the parish, allowing the guardians to seek to reeover from the husband the cost of her maintenanee. The punishment of a woman may still be different from

that of a man in TREASON (qg.v.). Where whipping is allowed after convic- tion for robbery, or of juvenile offenders for larceny, it cannot be inflicted on females. Chastisement of a wife by a husband, pos- sibly at one time lawful to a reasonable extent, would now certainly constitute an assault. The husband's rights are limited to restrain- ing the wife's liberty in case of her misconduct.

Scotland.—As early as Regiam Majestatem (12th century) women were the object of special legal regulation. In that work the mercheta mulieris (probably a tax paid to the lord on the marriage of his tenant's daughter) was fixed at a sum differing according to the rank of the woman. Numerous ancient laws dealt with trade and sumptuary matters. By the Leges Quatuor Burgorum female brewsters making bad ale were to forfeit eightpence and be put on the cucking-stool, and were to set au ale-wand outside their houses under a penalty of fourpence. The same laws also provided that a married woman committing a trespass without her husband's knowledge might be chastised like a child under age. The Statuta Gilde of the 13th century enacted that a married woman might not buy wool in the streets or buy more than a limited amount of oats. The same code also ensured a provision for the daughter of one of the guild-brethren unable to provide for herself through poverty, either by marrying her or putting her in a eonvent. By the Act 1429, e. 9, wives were to be arrayed after the estate of their husbands. By 1457, c. 18, no woman was to go to church with her face covered so that she could not be known. 1581, c. 18, was con- ceived in a more liberal spirit, and allowed women to wear any head-dress to which they had been accustomed. 1621, c. 25, permitted servants to wear their mistress's cast-off clothes. 1681, c. 80, contained the remarkable provision that not more than two changes of raiment were to be made by a bride at her wedding. In its more modern aspect the law is in most respects similar to that of England. A woman may be queen or a peeress of Scotland. In the old law she could not do homage, but only fealty, and she could not be arbiter, eautioner, or witness. A married woman could be warrantor of heritables only where her husband was under age and she was of full age. All disabilities of women as witnesses were removed by 31 and 32 Vict. c. 101, § 139. A woman is still not receivable as cautioner for an executor-dative. Nor ean she be tutor-at-law, but she may be appointed tutor by testament or by the

court. While tests existed women were exempt from the test oath (see Tesr Acrs). The Court of Session decided in 1868 that the parliamentary suffrage was confined to

1 Reg. v. Lord Mayor of London, Law Rep., 16 Qucen's Bench Diy., 772.

2 The rule of succession to Scottish peerages is different from that regulating the succession to English peerages by writ. In ease of the death of a peer leay- ing severa] daughters and no son, the English peerage would fall into abeyance among the daugliters, but the eldest daughter would succeed to the Scottish peerage. In the peerage law of Scotland there was no presumption that a peerage was limited to males, and the more ancient peerages were often held by females or their husbands in their right.

WOMEN

males. But, as in England, women possess votes in elections to school boards and to municipal and local bodies, the latter specially conferred by the Municipal Elections Amendment Act, 1881, and the General Police and Inryrovement Act, 1882. The right of married women to vote at school-board elections under the Education Act, 1872, appears to have eaused some diffieulty, and to have been differently deeided in different counties. Women are not admitted to degrees by the Scottish universities, though several attempts have been made to confer upon them this privilege. At one time, in- deed, they seem to have practised medicine without qualification, for in 1641, in a ratification of the privileges of the Edinburgh ehirurgeons, a complaint was recited that women practised chirurgy without having learned the art. In 1873 the Court of Session de- cided that female students could not graduate in medicine at Edin- burgh. A bill to enable the universities to grant degrees to women was rejected in 1875. St Andrews grants them not the ordinary degrec but a special title of L.L.A.5 The powers given by the Act of 1876 (39 and 40 Vict. c. 41) have recently been exercised in favour of women by the Colleges of Physicians and of Surgeons of Edinburgh and the Faeulty of Physicians and Surgeons of Glasgow. By the Educational Endowments Act, 1882, the benefits of endow- ments are to be extended as far as possible to both sexes. In 1881 the Married Women's Property Act (44 and*

45 Vict. c. 21) made important extensions of the rights given to married women by the Act of 1877, for whieh see HusBAND AND Wirs. A wife married after the date of the Act has a separate estate in movable and heritable property. A husband has the same rights in the movable estate of his deeeased wife as a widow had before the Aet in the estate of her deceased husband. Children have a right of legitim in their mother's movable estate. The criminal law differs slightly from that of England. At one time drowning was a punishment specially reserved for women. Incest or an attempt to commit incest is still punishable asa crime, and has been so punished within the last few years. Adultery and fornieation are still nominally crimes under old Acts, but criminal proceedings in these cases have fallen into desuetude. The age of testamentary capacity is still twelve, not twenty-one, as in England.

United States.—The Acts of Congress contain little affecting the Law in subject. Any woman married to a citizen of the United States United who might herself be lawfully naturalized is to be deemed a citizen. States,

Women are allowed as clerks in Government departments, and may be employed as nurses and hospital matrons in the army. The right of voting for Congress or for the State legislatures is still denied in the country as a whole, in spite of the strong attempts which have been made by the advoeates of female suffrage. The right, however, exists to a limited extent. In the Territories of Washington, Wyoming, and Utah women vote, and in the consti- tutions of some States, such as Colorado and Wisconsin, it is pro- vided that the right of suffrage may be extended to women by a majority of electors at a general election. The constitutions of most States confine the parliamentary franchise to male electors. The admission of women to the school franchise is, however, largely increasing, and had in 1887 been adopted by fourteen States. Ina limited number of States the professions (except the military) are open to women. Where the legal profession is not so open, a refusal by a State court to grant a licence to practise law is no breach of the Federal constitution (see PRIVILEGE). In most States the policy adopted in England by the Married Women's Property Act is the rule, and there is in general no distinction of sex in succession to real estate. For the testamentary rights of married women see WILL. In some of the State universities women are

admitted to full privileges of instruction and graduation. In others, sueh as the university of Pennsylvania, they are admitted to instruction and examination, but not to graduation. The law in some cases gives women remedies for tort which are unknown in England. For instance, by the law of some States a woman may bring an action of SEDUCTION (q.v.) in her own name, and may re- eover damages for slander imputing unchastity, without proof of special damage, which cannot be done in England. The criminal law is also more extensive. In the New England and some of the other States mere fornication is punishable as a erime. Adultery is criminal by the law of most States.

Literature.—Besides those already cited, the following authorities may be consulted. Forthe general law Montesquieu, Esprit des Lots, bk. vii.; Laboulaye, Recherches sur la Condition Civile et Politique des Femmes, 1843; Thos. Wright, Womankind in Western Europe, 1869; Sheldon Amos, Differenceof Sex asa Topic of Jurisprudence and Legislation, 1870; Paul Gide, Etude sur la Condition Privée de la Femme, 1885, Ernest Naville, " La Condition Sociale des Femmes," in the Biblio- théque Universelle et Revue Suisse, for Oet., Nov., and Dee., 1887. For old English law, The Law's Resolutions of Women's Rights, 1632; The Lady's Law, 1737 ; The Laus Respecting Women, 1777 (these three works are anonymous); C. S. Kenny, Hist. of the Law of England as to the Effects of Marriage on Property and on the Wife's Legal Capacity, 1879. For modern English law, T, Barrett- Lennard, The Position in Law of Women, 1883 ; R. Thicknesse, Digest of the Law of Husband and Wife, 1884; Wolstenholme and Turner, Conveyancing Acts (4th ed,), 1885; W. P. Eversley, Law of the Domestic Relations, 1885; Félix Remo, L' Egalité des Sexes en Angleterre, 1886.

3 Brown v. Ingrain, 7 Court of Sess. Cases, 3d ser., 281. 4 Jex-Blake v. Edinburgh Univ., 11 Court of Sess. Cases, 3d ser., 784. 5 Lady Literate in Arts.

Breach of pro- mise.

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Breach of Promise of Marriage.—The action for breach of promise of marriage is in some of its incidents peculiar to English law. In Roman law, betrothal (sponsalia) imposed a duty on the be- trothed to become husband and wife within a reasonable time, subject to the termination of the obligation by death, repudiation by the words conditione tua non utor, or lapse of time, the time fixed being two years. No action lay for breach of promise to marry unless arrhe sponsaliti# had been given, i.¢., earnest of the bargain, to be forfeited by the party refusing to carry it out. The arrha might also be given by a parent, and was equally liable to forfeiture.

A provincial governor, or one of his relations or household, could |

not recover any arrha that might have been given, it being sup- posed that he was in a positiqn of authority and able to exercise influence in forcing consent toa betrothal.

In the canon law breach of the promise made by the sponsalia, whether de presenti or de futuro, a division unknown to Roman law, does not without more appear to have sufficed to found an action for its breach, except so far as it fell under ecclesiastical cognizance as lxsio fidei, but it had the more serious legal effect of avoiding as a canonical disability the subsequent marriage, while the original sponsalia continued, of a betrothed person to any other than the one to whom he or she was originally betrothed. The sponsalia became inoperative, either by mutual consent or by cer- tain supervening impediments, such as ordination or a vow of chastity. The canonical disability of pre-contract was removed in England by 32 Hen. VIII. c. 38, re-established in the reign of Edward VI., and finally abolished in 1753.

In England the duty of the partics is the same as in Roman law, viz., to carry out the contract within a reasonable time, if no time be specially fixed. Formerly a contract to marry could be specifically enforced by the ecclesiastical court conrpelling a cele- bration of the marriage in faete ecelesix. The last instance of a suit for this purpose was in 1752, and the right to bring it was abolished in 1753 by Lord Hardwicke's Act (26 Geo. II. c. 33). The action for breach of promise may be brought by a man or a woman, though the former case has been of rare occurrence, and a male plaintiff has still more rarely been rewarded with anything more than

nominal damages. It may be brought by but not against an infant, and not against an adult if he or she has merely ratified a promise inade during infancy; it may be brought against but not by a married man or woman (in spite of the inherent incapacity of such a person to haye married the plaintiff), and neither by nor against the personal representatives of a deceased party to the promise (unless where special damage has accrued to the personal estate of the deceased). The promise need not be in writing. The parties to an action are by 32 and 33 Vict. c. 68 competent witnesses; the plaintiff cannot, how- ever, recover a verdict without his or her testimony being cor- roborated by other material evidence. The measure of damages is to a greater extent than in most actions at the discretion of the jury ; they may take into consideration the injury to the plaintiff's feelings, especially if the breach of promise be aggravated by seduction. Either party has a right to trial by jury under the rules of the Supreme Court, 1883. The. action cannot be tried in a county court, unless by consent, or unless remitted for trial there by the High Court. Unchastity of the plaintiff unknown to the defendant when the promise was made and dissolution of the

contract by mutual consent are the principal defences which are | Bodily infirmity of the defendant |

usually raised to the action. is no defence to the action, though it may justify the other party in refusing to marry the person thus affected. Where the betrothed are within prohibited degrees of consanguinity or affinity, there can be no valid promise at all, and so no action for its breach.

In Scotland a promise in the nature of sponsalia de futuro not followed by consummation may be resiled from, subject to the liability of the party in fault to an action for the breach, which by 6 Geo. IV. c. 120, s. 28, is a proper cause for trial by jury. If, however, the sponsalia be de presenti, and, according to the more probable opinion, if they be de futuro followed by consum- mation, a pre-contract is constituted, giving a right to a decree of declarator of marriage and equivalent to marriage, unless declared void during the lifetime of the parties.

In the United States the law is in general accordance with that of England. The statute law of California and Dakota pro- vides that the unchastity of one party of which the other is igno- rant is a good defence, but it is no defence if both participate therein. (J. Wt.)

WOOD. See Botany, vol. iv. p. 100; Burprne, Forests, STRENGTH OF MATERIALS ; also Frr, OAK, PINE, TEAK, &c.

WOOD, Antuony A! (1632-1695), antiquary, was the fourth son of Thomas Wood (1580-1643), B.C.L. of Oxford,

1 In the Life he speaks of himself and his family as Wood and not

a Wood, a pedantic return to old usage adopted by himself. A pedigree is given in Bliss's edition, 1848, p. 357.

| clvil war skirmishes.

_and after, was a perfect Elysium" (ibid., p. 68).

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where Anthony was born 17th December 1632. He was sent to New College school in that city in 1641, and at the age of twelve was removed to the free grammar school at Thame, where his studies were interrupted by He was then placed under the tuition of his brother Edward (1627-55), of Trinity College ;

| "while he continued in this condition his mother would

alwaies be soliciting him to be an apprentice which he could never endure to heare of " (Life, 1848, p. 33). He was entered at Merton College in 1647, and made post- master. In 1652 "he began to exercise his natural and insatiable genie he had to musick" (cbid., 53), and was examined for the degree of B.A. He engaged a music- master, and obtained permission to use the Bodleian, "which he took to be the happiness of his life." He was admitted M.A. in 1655, and in the following year published a volume of sermons of his late brother Edward. Dugdale's Warwickshire came into

his hands, and he describes how 'his tender affections and insatiable desire of knowledge were ravished and melted downe by the reading of that book. What by musick and rare books that he found in the public library, his life, at this time ie now began systematically to copy monumental inscriptions and to search for antiquities in the city and neighbour- hood. He went through the Christ Church registers, "at this time being resolved to set himself to the study of antiquities." Dr John Wallis, the keeper, allowed him free access to the university registers in 1660; "here he layd the foundation of that book which fourteen years afterwards he published, viz., ist. et Antig. Univ. Oxon." He steadily investigated the muniments of all the colleges, and in 1667 made his first journey to London, where he visited Dugdale, who introduced him into the Cottonian library, and Prynne showed him the same civility for the Tower records. On October 22, 1669, he was sent for by the delegates of the press, "that whereas he had taken a great deal of paines in writing the list. and Antiq. of the Universitie of Oxon, they would for his paines give him an 100 li. for his copie, conditionally, that he would suffer the book to be translated into Latine" (cbid., 167). He accepted the offer and set to work to prepare his English

_ MS. for the translators, Richard Peers and Richard

Reeve, both appointed by Dr Fell, dean of Christ Church, who undertook the expense of printing. The translation was supervised by Fell, with whom and the translators Wood has endless quarrels about alterations of his text. In 1674 appeared J/istoria et Antiquitates Universitatis

| Oxomiensis, handsomely printed '"e Theatro Sheldoniano,"

in two folio volumes, the first devoted to the university in general and the second to the colleges. Copies were widely distributed, and university and author received niuch praise. On the other hand, Bishop Barlow told a correspondent that "not only the Latine but the history itself is in many things ridiculously false" (Genuine Remains, 1693, p. 183). In 1678 the university registers which had been in his custody for eighteen years were removed, as it was feared that he would be implicated in the Popish Plot. To relieve himself from suspicion he took the oaths of supremacy and allegiance. During this time he had been gradually completing his great

work, which was produced by a London publisher in 1691-92, 2 vols. folio, Athenz Oxonienses: an Exact History of all the Writers and Bishops who have had their Education in the University of Oxford from 1500 to 1690, to which are added the Fasti, or Annals for the said time. On 29th July 1693 he was condemned in the vice-chancellor's court for certain libels against the late earl of Clarendon, fined, banished from the university until he recanted, and the book burnt. The proceedings were printed in a volume of Miscellanies

published by Curll in 1714. Wood was attacked by Bishop Burnet in a Letter to the Bishop of Lichfield and Coventry, 1693, 4to, and defended by his nephew Dr Thomas Wood, in a Vindication of the Historiogrupher, to which 1s added the Historiographer's Answer, 1693, 4to, reproduced in the subsequent editions of the Athene. The nephew also defended his uncle in An Appendix to the Life of Bishop Seth Ward, 1697, 8vo. On 9th October 1695 Wood had an interview with the earl of Clarendon, but was not able to get his fine remitted. After a short illness he died 28th November 1695, in his sixty-third year, and was buried in the ante-chapel of St John Baptist (Merton College), in Oxford, where he superintended the digging of his own grave but a few days before.

He is described as "a very strong lusty man," of uncouth manners and appearance, not so deaf as he pretended, of reserved and temperate habits, not avaricious, and a despiser of honours. He reccived ncither office nor reward from the university which owed so niuch to his labours. He never married, and led a life of self-denial, entirely devoted to antiquarian research. Bell-ringing and inusic were his chief relaxations. His literary style is poor, and his taste and judgment are frequently warped by prejudice, but his two great works and unpublished collections form a price- less source of information on Oxford and her worthies. He was always suspected of being a Roman Catholic, and invariably treated Jacobites and Papists better than Dissenters in the Athenx, but he died in communion with the Church of England.

Wood's original manuscript (purchased by the Bodleian in 1846), was first published by John Gutch, as The History and Antiquities of the

*Colleges and Halls in the University of Oxford, with a con- tinuation, 1786-90, 2 vols. 4to, and The History and Antiquities of the University of Oxford, 1792-96, 3 vols. 4to, with portrait of Wood. To these should be added The Antient and Present State of the City of Oxford, chiefly collected by A. & Wood, with additions by Sir J. Peshall, 1778, 4to. A new edition is in preparation by the Oxford Historical Society. Modius Saliwm, a Colleetion of Pieces of Humour, chiefly ill-natured personal stories, was published at Oxford in1751,12mo. Some letters between Aubrey and Wood were given in the Gentleman's Magazine (3d ser., ix., x., xi.). Wood consulted Dr Hudson about getting a third volume of the Athenz printed in Holland, saying, " When this volume comes out I'll make you laugh " (Relig. Hearniane, i, 59). This was included in a second edition of the Athenx published by Tonson in 1721, 2 vols. folio, ** very much corrected and enlarged, with the addition of above 500 new lives." The third appeared as "a new edition, with additions, and a continuation by Philip Bliss," 1818-20, 4 vols. 4to. The Eeelesiastical History Society proposed to bring out 'a fourth edition, which stopped at the Life, ed. by Bliss, 1848, 8vo (see Gent. Mag., N.S., xxix. 135, 268). Dr Bliss's interleaved copy is in the Bodleian, and Dr Griffiths announced in 1859 that a new edition was contemplated by the Press, aud asked for additioual matter (see Notes and Queries, 2d ser., vii. 514, and 6th ser., vi. 5, 51). Wood bequeathed his library (127 MSS. and 970 printed books) to the Ashmolean Museum, and the keeper, William Huddesford, printed a catalogue of the MSS. in 1761. In 1860 the whole collection was transferred to the Bodleian, where 25 volumes of Wood's MSS. had been since 1690. Many of the original papers from which the Athens was written, as well as several large volumes of Wood's correspondence and all his diaries, are in the Bodleian.*

The chief authority is the Zife of Wood written by himself, and first published by Hearne in the appendix to T. Caii Vindicte, 1730; tne memoirs after 1672 were compiled by Rawlinson from the original diaries, and printed by Huddesford with the Lives of Leland and Hearne, 1772, 2 vols. 8vo. A new edition was issued by Bliss, 1848. See also Reliquiw Hearnianex, ed. Bliss, 2d ed., 1869, 3 vols. 12mo ; Hearne's Remarks and Collections (Oxford Hist. Soc., 1885, &e.); Macray's Annals

of the Bodleian Library, 1868; Nichols's Literary Anecdotes, i., iv., v., viii.; Noble's Biogr. History of England, i. (HER)

WOOD, Mrs Henry (1814-1887), novelist, was born on the 17th January 1814. Her maiden name was Ellen Price ; her father was a glove manufacturer in Worcester —the original of the cathedral city which, with its church dignitaries and schools, is the scene of so many of her tales. From certain vague memoirs published by her son in the Argosy! (of which her novels were the mainstay for the last twenty years of her life) it appears that the industrial distress described in Afildred Arkell is a reminiscence of the collapse of the glove trade in Wor-

cester, consequent on Huskisson's tariff reforms in 1823, |

from which her father suffered along with other English

1 See "Mrs Henry Wood, In Memoriam," Argosy, vol. xliii., 1887.

glove manufacturers. She married young, it is said, and after her marriage lived for the most part in France, her husband being "at the head of a large shipping and banking firm abroad." She first came before the public in her own name as the author of a temperance tale (Danesbury House), which had gained the prize of £100 offered by the Scottish Teniperance League. This was in 1860; but it appears from the memoirs already referred to that "for many years" before this she had been a regular contributor of stories anonymously, month after month, to Mr Harrison Ainsworth's magazines, Bentley's Miscellany, and Colburn's New Monthly. Danesbury House was very favourably reviewed, her genuine gifts as a story-teller making themselves apparent in spite of the didactic purpose of the tale; but Mrs Wood's first great success was made in the following year with Hast Lynne, one of the most popular novels of the century. A long review in the Z%mes, in which a place was claimed for her in the foremost rank of novelists, was the loudest note in a general chorus of praise, and fairly established her position, The praise of the critics continued throughout the next half-dozen of her novels, which followed one another with great rapidity: The Channings and Mrs

Halliburton's Troubles, in 1862; Verner's Pride and The Shadow of Ashlydyat, in 1863 ; Lord Oakburn's Daughters, Oswald Cray, and Trevlyn Hold, in 1864. These works were held to confirm the promise of Hast Lynne, and The Shadow of Ashlydyat was pronounced to be (as it is still generally considered) the best of them all. Complaints of sameness,— almost inevitable, considering the rate of production, — of commonplaceness of sentiment and material, and of a certain narrowness and insufficiency in her conceptions of poetical justice first began to be heard in connexion with Mildred Arkell (1865), and became louder as the fertile novelist continued to pour forth her stories with inexhaustible fluency. She became owner of the Argosy in 1867, and her stories quickly raised it to an enormous circulation. She had a certain triumph over her critics with the Johnny Ludlow tales, an imitation of Miss Mitford's Zales of Our Village. Mrs Wood's name was not put to them as they appeared in the Argosy, and when the first series was collected and published separately in 1874 they excited among reviewers an approach to the enthusiasm with which her first efforts had been welcomed. Undoubtedly Mrs Wood possessed many of the qualities of a first-rate story-teller,— great simplicity of style, unfailing fluency, a lively interest in prominent traits of character, abundant circumstantiality, skill in exciting curiosity and keeping up suspense, and withal a wonderful clearness of method. Amidst her crowd of characters and incidents you are never puzzled or perplexed, and she very rarely lapses into tediousness. If ever she is tedious, it is from repeating herself. Her "criticism of life" is not very broad or very profound, though it is generally for moral edification ; she is simply an excellent story-teller out of the ordinary materials of the craft. In private life Mrs Wood seems to have been a most amiable person: her son gives a very lovable picture of her. Her death took place on 10th February 1887, at the age of seventy-three. She was active in her work till the very last, and left several completed stories, short and long, ready for publication.

WOOD-CARVING. In most countries, during the early development of the plastic art, sculpture in wood took a very important position, and was much used for statues on a large scale, as well as for small works decorated with surface carving. On the whole, wood is much more suitable for carving in slight relief than for sculpture in the round, aud its

special structure, with bundles of long fibres, strong in one diretivon and weak in

another, make it very necessary for the carver to suit his design to the exigencies of the material. Large curves should be avoided, on account of their tendency to split across with the grain, and deep under-cutting is objection- able for the same reason. A tough fibrous substance like wood obviously calls for a very different treatment from that which is suitable to a homogeneous substance like stone or marble. 'This adaptation of the design to the material is very conspicuous in the wood-carving of the finest kinds, such as the Scandinavian doorways of the 9th to the 12th centuries, the Perpendicular roofs and screens of England in the 15th century, and the richly carved panelling of Moslem countries throughout the Middle Ages.

Some woods, such as pear, lime, and more especially box, are comparatively free from any distinct grain, and may be carved almost like marble, but these woods are only to be had in small pieces, and from their want of fibre are structurally weak, and are therefore only avail- able for decorative purposes ona small scale. It is this absence of grain which makes boxwood the material selected for engraving on wood, a form of wood-carving in which the artist needs to be as little as possible hampered by the structure of his material. In ancient.times cedar wood was specially used for decorative carving, and in the East various perfumed woods, such as that of' the sandal- tree, have always been favourites with the carver. In Europe the oak, the chestnut, the fir, and the walnut have been chiefly used, and for sculpture in the round or high relief the sycamore and the plane-tree, as well as the oak.

One objection to using wood for life-sized or colossal | sculpture is that large blocks are very liable to crack and |

split from end to end, owing to the fact that the parts near the surface dry and shrink more rapidly than the core. For this reason the medieval carvers usually hollowed out their wooden statues from the back, so as to equalize the shrinkage and prevent splitting. In all cases wood for carving

should be very well seasoned, and it is especially necessary to get rid of the natural sap, which causes rot if it is not dried out. It is useful to soak newly cut timber in running water, so that the sap may be washed away; it is then comparatively easy to dry out the water which has soaked into the pores of the wood and taken the place of the sap.

Lgyptian.—One of the most remarkable examples of ancient Egyptian art, dating probably from nearly 4000 years B.C., is a life-sized portrait statue of a stout elderly man, now in the Boulak museum. This is carved out of a solid block of sycamore wood, except that the right arm is worked separately and attached by a mortice and tenon ; the eyes are formed by inlaid bits of shell and crystal, and the whole is a most wonderful piece of life-like realism (see fig. 1). Although dating from so remote a period, this statue bears witness to an amount of technical skill

and artistic knowledge which shows that long centuries |

of experience and artistic development must have preceded its production, —a period of which we have no remains, this statue being one of the earliest works of art which even Egypt has preserved for us. In the same museum are also some very remarkable wooden panels from the

tomb of Hosi, about four feet high, carved in low relief These |

with standing figures of men and_ hieroglyphs. large slabs of wood formed part of the wall lining of the tomb. The reliefs are executed with the utmost spirit and extreme delicacy of treatment, and are highly decorative in style ; they show, moreover, a keen sense of the special treatment suitable to the material in which

=) i a i ee ee er 1 In many cases_it is almost impossible to distinguish between chestnut and oak, especially in the medizval roofs of England.

they are carved. These also date from nearly 4000 B.c. After the early dynasties in Egypt wood does not seem to have been used for sculpture on a large scale, although it was very commonly employed for mummy cases

or coffins, one end carved with a human face and the rest almost plain, except for its elaborate painted ornaments in gold and colours, applied on a thin coat of stucco laid evenly over the wood. A large number of smaller examples of Egyptian wood-carving exist in various museums, such as furniture, boxes, im- plements for the toilet, and the like, frequently decorated with — slight surface reliefs of animals or plants, and graceful patterns formed of the lotus or papyrus flower treated with great deco- rative skill. Greek.—Owing to the perishable nature of the material, almost the only ancient examples of wood-carving which have survived to our time are those from the tombs of Egypt.2 The many important pieces of wooden sculpture which once existed in Greece and other ancient countries are only known to us by the descriptions of Pausanias and various classical writers. It is probable that the earliest examples of the plastic art among the Hellenic race were the rude wooden images of the gods (Edava), of which many examples were preserved down to late historic times. The art of sculpture, and especially sculpture in wood, is probably older than that of painting, as it requires less artistic knowledge to rudely fashion a log of wood into a rough body with rounded head, two holes for the eyes and slits for the mouth and nose, than to conceive mentally and set down on a plane surface any attempt even at the rudest outline drawing,—a process which requires a distinct act of abstraction and some notion of treating the subject in a conventionally symbolic way. Real things have of course.no enclosing line, and the representation of an object in outline conveys little or no idea to the mind of a man who is yet in a very early stage of culture. The Palladium, or sacred figure of Pallas, which was guarded by the vestal virgins in Rome, and which was fabled to have been brought by Aineas from the burn- ing Troy, was one of these wooden gdava (see VusTa).. A wooden figure of the Armed Aphrodite at Cythera is men- tioned by Pausanias, iii. 23, 1. Of the same kind was the wooden statue of Hermes in the shrine of Athene Polias on the Acropolis of Athens, said to have been the offering of Cecrops (Pausan., i. 27, 1); and the figure of Athene Polias itself was an ancient wooden édavoy. Another very ancient statue, carved out of cedar wood, was the statue of Apollo in his temple, dedicated 428 B.c., in the Campus Martius of Rome; this statue was called Apollo

Fic, 1—Life-sized Portrait Statue from a Tomb of the Fourth Dynasty.

2 Acacia and sycamore wood were chiefly used for the larger wood sculpture of Egypt. A wooden coffin, covered with fine Greek paint- ings of c. 800 B.c., was discovered in a tomb at Panticapeum (Kertch), and is now in the museum at St Petersburg.

Sosianus, from Sosius the prefect of Syria, who presented it to the temple (Pliny, H. W., xiii. 5 and xxxvi. 4). Pausanias (ii. 24) mentions another early wooden statue at Argos,—that of Zeus Larisseeus, which was remarkable for having three eyes. A very elaborate example of cedar-wood carving enriched with gold and ivory is described by Pausanias (v. 17 to 19). This was a coffer dedicated at Olympia by the children of Cypselus, tyrant of Corinth in the 7th century B.c. It was decorated with bands in relief, with scenes from the lives of various gods and heroes. A cedar box, with two carved dogs attached to it, was found at Mycene by Dr Schliemann, and is now in the museum at Athens. During the most flourishing period of Greek art wood was sometimes used for important plastic purposes, as, for example, the colossal statue of Athene at Plateea, carved by Phidias. The figure was of gilt or plated wood, with the exception of the nude parts,— the face, hands, and feet,—which were of Pentelic marble.

Roman.—Of the wood-carving of the Roman period almost no important examples now exist; but the carved panels of the main doors of 8S. Sabina on the Aventine Hill are very interesting specimens of wooden relief-

sculpture of early Christian times, dating, as the costumes |

show, from the 5th century. The doors are made up of a large number of small square panels, each minutely carved with a scene from the Old or New Testament ; the whole feeling of these reliefs is thoroughly classical, though of course in a very debased form.

Medizxval.—The most remarkable examples of early medizeval wood-carving are the doorways of wooden churches of Scandinavia and Denmark, dating from the 9th to the 13th centuries. These are framed

with great planks or slabs of pine wood, the whole surface of which is covered with rich and intricate patterns of interlacing scroll-work, mixed with figures of dragons and serpents, designed with extraordinary wealth of invention, and of the highest decorative value. The relief is very low, except where occasionally a monster's head projects from the general level ; and yet the utmost vigour of effect is gained by the grand sweeping curves of the leading lines. These are masterpieces of wood-carving, designed and 'executed with the most perfect sense of the necessities of the material.

Fig. 2 shows part of the architrave of a door from Aal |

church, Norway, dating from the 12th century. Unhappily almost the last of these interesting wooden churches have been destroyed in recent years, and merely the wrecks of their grand wooden sculpture have been occasionally pre- served in some museum ; some very valuable casts of these are in the South Kensington Museum.

Lnglish.—For various ecclesiastical purposes a large amount of important sculpture in wood was produced in Britain throughout the Middle Ages. At the time of the Reformation every church had its rood-screen, surmounted by a large crucifix between two standing figures of St Mary and St John. These were of wood, except perhaps in some of the richest cathedral or abbey churches, which occasionally had the rood made of silver. nuinber of churches also had retables over the various

altars, with reliefs carved in wood and decorated with gold |

and colours. Many examples of this class still exist in Germany and Spain, but almost all the English examples perished under the iconoclasm of the Reformation.! Another important class of wood-carving was that of large recumbent effigies from tombs, of which a good inany examples still exist. One of the earliest is that of Robert, duke of Normandy, in Gloucester cathedral,

1 Only three English examples of the figure of Christ on the rood are now known to exist. One of these was recently found built up in the rood-

staircase of a small church in Wales. It is a work of the 14th century, carved roughly, but with much spirit.

A very large |

ARVING

| illustrated in ScuLprurg, fig. 5 (vol. xxi. p. 558). Itisa _work of the 12th century, but was broken to pieces, and is now much restored. Like most wooden sculpture in _ England, it is carved out of oak. The finest example of English wood sculpture is a life-sized effigy in the south choir aisle of Aber- gavenny church, that of the young knight George de Cantelupe (d. 1273). The face is a portrait of very ‘ high plastic merit, and the whole treatment of the figure, with the graceful drapery of its tunic, and its care- fully carved armour, is very remarkable as an example of the very high level of excellence that was reached by the Eng- lish contemporaries of Niccola Pisano. The usual treatment of these wooden figures was to cover the whole surface with a thin coating of gesso or fine stucco, in which various details or ornaments were modelled or stamped in relief, and then richly decorated with gold and colour. A _ similar treatment was adopted for all the wooden sculpture of the medieval period throughout Europe.

The church at Abergavenny, already referred to, also contains part of what once must have been a very large and magnificent example of wooden sculpture. This is a colossal recumbent figure of Jesse, and formed the lower part of what was called a ‘Jesse tree.” Out of the recumbent figure grew a great tree, on the branches of which were figures of the illustrious descendants of Jesse’s line. Merely the stump of this tree now remains, springing from the side of Jesse, but when complete the whole tree must have reached high up towards the roof, with its network of branches form- ing a sort of screen behind the high altar— very rich and magnificent in effect, when the whole was perfect with its brilliant coloured decora- tion, and the stained glass of the large east window seen dimly through the open branches of the tree. The existing figure of Jesse, which is 10 feet long, is cut out of a solid block of oak; a figure of an-angel at the head is worked out of the same piece of wood.?

Another very important application of wood-carving was for the decoration of the church stalls, screens, and

Fig. 2.—Part of the Carved Architrave of a Door from Aal Church.

2 See a valuable monograph on the church of Abergavenny by Octavius Morgan, published by the Cambrian Archeological Society. For an account of other wooden effigies, see Arch. Jour., xi. p. 149; and on existing rood figures, a paper by J. T. Micklethwaite in the Proc. Soc. Ant. for 1886, p. 127.

roofs, which in the 15th century in England reached so high a pitch of splendour. The development of archi-

tectural wood-carving was much slower than that of |

sculpture in stone. During the "Early English " period wood-work was rather heavy in style and coarse in detail;

in "Decorated" times wood-work of much beauty and |

richness was produced, but forms more suitable to stone were still used, and it was not till the later '" Perpendi- cular" period in the 15th century that the wood-carvers of England learnt to perfectly adapt their designs to the nature of their material. Very beautiful roofs, for example, were produced in the 14th century, such as that at Adder- bury,' but the principals are frequently constructed with large arched braces, richly moulded and very graceful in effect but constructionally weak, and very wasteful of the material. Enormous balks of oak were required to enable the large curves of the braces to be cut out of the solid. The builders of the 15th century corrected these defects, and designed their sumptuous screens, stall-canopies, and open roofs with straight lines for the leading framework, — only using curves on a smaller scale, and in places where mucli strain does not fall upon them. the beauty, in its own class, of the 15th and early 16th century wood-work in England ; the many fine examples that still exist give us some notion of the wealth of the country

in this branch of art at a time when every church was obliged by canon law to have its rood-screen, and almost always also possessed carved oak stalls and many other fittings, such as statues and retables, in the same material.?

The rich oak work of England was no exception to the universal application of coloured decoration, and nearly every screen, roof, or choir-stall was covered with minute painting in gold and colours. The modern notion that oak should be left unpainted was quite unknown to our medizval forefathers ; and they, as a rule, preferred even a simple coating of white, red, or other colour to the natural tint of the oak, which would haye looked very dull and heavy in tone when surrounded by the polychro- matic brilliance of the floor, the walls, and the windows. In most cases, however, the wood-work was not left with its uniform ground of paint ; delicate and graceful patterns of diapers or sprigs of foliage were added on to all the main lines of the work, and covered the chief members of all the mouldings, in exactly the same way as was done with the sculpture in stone. Many of the Norfolk screens still have much of their painted orna- ment in good preservation?; and additional richness was gained by the groundwork of delicately moulded stucco with which the whole surface of the wood was covered before the colouring and gilding were applied. Modern "restorers" have in most cases scraped off all that remained of this brilliant decoration, and frequently no signs are now visible of this universal system of decora- tion. in the abbey church of St Albans is now bare of any colouring, though it was once a very brilliant example of polychromatic decoration.

Great richness of carving is lavished on the church roofs especially of Norfolk and Suffolk. Carved bosses cover the intersections of the moulded timbers, some with

1 The roof of Westminster Hall, of the early part of the 15th cen- tury, is in size and richness of detail the most magnificent open timber roof in the world; it has curved braces of very wide span, cut out of enormous balks of oak or chestnut.

2 It should be noted that in Old English the word " picture" was often used for a statue or a relief, —partly no doubt from the fact that all

sculpture was decorated with painting.

3 See Talbot Bury, Ecclesiastical Wood-Work, London, 1847.

4 So called because from it a guardian used constantly to watch, day and night, the great gold shrine of St Alban, with its treasure of precious offerings all round it.

Nothing can exceed |

The very rich and graceful "watching gallery" 4.

| open cresting or " brattishing " along the top. _ which fills in the upper part of these screens is of wonder-

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bunches of delicate foliage, others carved into figures of angels with outspread wings. Other statuettes of angels often cover the ends of the hammer-beams, and the whole cornice frequently has running foliage inserted in a hollow of the moulding. All this wood-carving is usually of very high artistic merit, and combines delicacy of detail with strength of decorative effect in a way that has never been surpassed by the medizeval artists of any country of the. Continent. These magnificent roofs, which are peculiar to England, and even to certain districts such as East Anglia, are amoug the most perfect artistic productions of the

| Middle Ages.

Norfolk, Suffolk, Devonshire, and other counties are still rich in elaborate chancel screens, carved with delicate foliage, especially in the hollows of the cornice, and light The tracery

ful beauty, and executed with the most minute finish and

| delicate moulding. The ends of the 15th-century stalls

were often richly decorated with carving, and are crowned with finials or " poppy-heads" of the most elaborate and spirited design. The underside

of the “ iisericords” § of the monastic stalls were specially selected for minute en- richment, in spite of their very inconspicuous position. The utmost wealth of fancy and minuteness of workmanship is often lavished upon these, and their reliefs are frequently works of art of a very high order. In some cases the carver took his design from contemporary engravings by some distinguished German or Flemish artist, such as Schongauer or Albert Diirer. One of these in the chapel of Henry VII. at Westminster, representing “The Golden Age,” is a work of wonderful beauty and delicacy of touch. Genre and satirical subjects are often selected: the regulars are made fun of in the churches of the secular clergy, and the vices of the secular priests are satirized on the stalls of the monastic churches. This satire is often carried to the verge of indecency, especially in the scenes frequently selected by clerical carvers to set forth the miseries of the married state.

In England during the 16th and 17th centuries little wood-carving of much merit was produced; the oak panelling, furniture, and other fittings of the Elizabethan and Jacobean periods were largely enriched with surface reliefs, coarse in execution, but often decorative in effect, and chiefly remarkable for their showy appearance pro- duced with the minimum of labour,’ a great contrast to the rich detail and exquisite finish of the pre-Reformation work. Towards the end of the 17th century a very realistic style of wood-carving came into use, in which great technical skill was displayed but little real artistic feeling. Grinling Gibbons (1648-1721) and his pupils produced the most elaborate works of this class, such as wreaths, scrolls, and friezes carved in high relief, or in the round, with fruit and flowers, modelled and carved with wonderful imitative skill, but weak in true decorative effect. These clever groups of foliage and fruit were carved in pear or lime wood, and fastened on to the surface of wall-panels, mantelpieces, and other wooden fittings. The stalls and screens in St Paul’s Cathedral are some of Gibbons’s best works, and a great deal of his realistic carving still exists at Oxford in Trinity College, at Trinity College, Cambridge, at Chatsworth, at Petworth, and in many of the great country houses of that time. Since then wood-carving has not taken an important position among the lesser arts of the country.

—® A number of fine examples are well illustrated by Brandon,

Open Timber Roofs, London, 1856.

§ Often wrongly called “ misereres.” ;

7 See Sanders, Woodwork of the 16th and 17th Centuries, London, 1883; and Small, Scottish Wood-Work of the 16th and 17th Centuries, Edinburgh, 1878.

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Ltalian.—During the medizval period wood was often used by the greatest sculptors of Italy, especially for crucifixes and statues of saints for ecclesiastical purposes. Fig. 3 shows a magnificent example of the school of Nino Pisano, dating from about the middle of the 14th century. It is a colossal figure of the Angel of the Annunciation, said to have once be- — longed to Pisa cathedral, Zed and now one of the chief treasures of the South Kensington Museum. It is very remarkable for the delicate beauty of the face, and for the sculp- turesque simplicity of the folds of the drapery. The original wings were prob- ably much larger than the present ones, which are restorations.

Many fine roods or crucifixes of life size still exist in the churches of Italy. One attributed to Donatello is preserved at Florence, in the church of 8. Croce ; another by Brunelleschi still exists. Nothing like the magni- ficent oak open roofs and choir screens of England were made in Italy. The latter were usually of marble or of metal, and the roofs were of the plain king-post construc- tion, usually concealed by vaulted or panelled ceil- ings. Towards the end of the 15th century, and especially in the first half of the 16th, wood-carving of the most elaborate and magnificent sort was largely used to decorate church stalls, wall-panelling, doors, and the like.

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Fig. 3.—Colossal Statue of an Angel in the South Kensington Museum.

Fie, 4.—Example of a Carved Walnut-Wood Panel; school of Raphael. panel with carving of this school, which is always remark- able for its high finish and delicate cameo-like execution. Spanish.—Spain during the 15th and 16th centuries was specially remarkable for the production of large and

1 Bergamo, Ornati del Coro di S. Pietro dei Cassinesi, Rome, 1845. 2 See Finochietti, Scu/tura in Legno, Florence, 1873.

elaborate retables, carved with statues and reliefs, very like those of contemporary Germany. Alonso Cano and other sculptors frequently used wood for large statuary, which was painted ina very realistic way with the most startling life-like effect.

Danish.—Denmark also possessed a school of able wood- carvers, who imitated the great altarpieces of Germany. A very large and well-carved example still exists in the | metropolitan cathedral of Roskilde.

Hrench.—In France during the medieval period wooden sculpture was produced which was very similar in character to that of England, and was decorated with similar colour- ing. Many of the French cathedral and abbey choir stalls are works of the utmost magnificence. Those at Amiens are specially remarkable. Fig. 5 shows an example of the delicate tracery work of the 15th century. In the 16th century many wood-carvers in France imitated the rich and delicate work of the Raphaelesque school in Italy, and much wood-work of men m great refinement was pro- duced, very different from the coarsely effective work of Elizabethan and Jaco- bean England. In the 18th century large sums were spent on elaborate

wooden panelling for rooms, the walls being divided into series of |

spaces with rococo fram- | ing, formed by applied | scroll-work, made up of | many fantastic and in- congruous bits of curved mouldings, which were usually gilt. The general effect was very inartistic, | and was unredeemed by | any beauty of detail. The intermediate spaces were sometimes

Boucher, or other popu- lar artists.

German.—In Germany, during the 15th century, wood was used for the [i most important sculp- turesque purposes, such as large triptychs or retables made up of many reliefs, with sacred subjects, and statues of saints,—the whole framed and canopied with rich Gothic " tabernacle work." See Scunprurse, vol. xxi. p. 565. Fig. 6 shows a fine example of one of these retables, said to be the work of Veit Stoss, now in the South Kensington Museum. As in England the whole of the wood was covered with fine gesso, and then richly gilt and painted with vivid colours. Nothing could exceed the decorative effect of these great retables, rich with minute sculpture and carved foliage, and shining with gold and brilliant colours, some of which were mixed with a transparent varnish medium, and applied over a ground of gold leaf, so that the metallic lustre shone through the transparent pigments over it. Stall ends and panels were enriched with carving of the highest order of merit ; life-sized human figures are often introduced at the ends of the book-rests, and large surfaces

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Fig, 5,—Traceried Panel in Oak; French work of the 15th century.

3 See Roumier, Sculptureen Bois… . U0 Eglise des Péres Jaecobins, Paris, n.d. (17th cent.) ; and Pascal, Boiseries sculptées de Notre- | Dame de Paris, 1855.

WOOD-CARVING

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Fig. 6,-The Centre of a Wooden Triptych, attributed to Veit Stoss, now in the South Kensington Museum.

with bold conventional foliage, full of spirit and vigorous beauty. These splendid stalls were executed in 1468 by Jorg Syrlin. During this period

the wood-carving of Germany occupied a foremost position in the world, and

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in many places, such as Nuremberg and parts of Bavaria, great technical skill has survived down to the present time.

Switzerland and Tyrol have also been for long cele- brated for delicate wood-carving on a small scale. The

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cleverly executed figures of peasants and of animals, especially the chamois, are widely popular, and their pro- duction gives occupation to a large class of able artisans, who, however, rarely rise to the level of original artists, though they attain a fairly high average of excellence. Mohammedan.—Nothing can exceed the skill with which the Moslem wood-carvers of Persia, Syria, Egypt, and Spain designed and executed the richest panelling and other decorations for wall-lining, ceilings, pulpits, and all kinds of fittings and furniture. The mosques and private houses of Cairo, Damascus, and other Oriental cities are full of the most elaborate and minutely delicate wood-work.

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Fig. 8.—Example of Moslem Wood-Panelling, with inlay of different woods.

| skill is shown by the way in which the Moslem carver has adapted his design to his material—avoiding curved lines,

and utilizing woods which he could only get in small pieces. Another very elaborate class of Oriental wood- work is the rich ceilings and domes built up of small pieces of wood into the ingeniously intricate ‘stalactite ”

patterns, which were then covered with stucco and decorated with rich painting in gold and colours.

In the early medizeval period very elaborate wood-work for screens and other fittings was produced for the Coptic churches of Egypt by native Christian workmen ; some of these had small panels carved in a hard dark wood, with saints and Bible subjects in low relief, very Byzantine in style. The British Museum possesses some fine examples of this carved work from a church in Old Cairo. These early wood fittings are now rapidly disappearing.!

Asvatic.—In India wood-carving of the most magnificent kind has been constantly produced for many centuries. The ancient Hindu temples were decorated with doors, ceilings, and other fittings, carved in sandal and other

1 See Butler, Coptic Churches of Egypt, Oxford, 1884. XXIV 82

woods, with patterns of extreme richness and minute elaboration. The doors of the temple at Somnauth, on the north-west coast of India, were especially famed for their magnificence, and were very highly valued as sacred relics. In 1024 they were carried off to Ghuznee by the Moslem conqueror Sultan Mahmoud, and are now lying in the fort at Agra. The gates which still exist are very fine specimens of ancient wood-carving, but they are probably only copies of the original very early doors.

In many parts of India wood-carving of the most beautiful kind is largely used for architectural purposes, especially for the enrichment of the wooden framework of houses, and for forming delicate open lattices for windows. In the main, however, the native carvers of India excel rather in richness of effect and minute delicacy of work- manship than in general gracefulness of line and purity of design. In these respects the wood-work of Moslem carvers in India is very far superior to that of the Hindus.

In China and Japan the wood-carvers are absolutely unrivalled in technical skill; grotesque and imitative work of the most wonderful

perfection is produced, and some of the wood-carvings of these countries are really beautiful as works of art, especially when the carver copies the lotus lily or other aquatic plants. In many cases, however, as in the other arts of Japan and China, extreme ugliness of design is combined with the most perfect execution and exquisite finish, and the carvers have very little notion of the really decorative treatment of surface reliefs. The extensive use of wood or bamboo for archi- tectural purposes creates a wide field for the wood-carver, whose very limited sense of true beauty is to some extent made up for by his wealth of grotesque fancy and extreme deftness of hand, which are the main characteristics of the workmen of China and Japan in all branches of art.

Wood-Carving of Savage Races.—Many savage races, such as the Maoris and Polynesians, are very skilful in the decorative treatment of wood in slight relief. Intricate geometrical designs of much beauty and suitability to the material are used to decorate canoes, paddles, and the beams of huts. Great richness of effect is often produced by the smallest possible amount of cutting into the surface of the wood. The wooden architecture of the Maoris is sometimes decorated in the most lavish way. The main uprights of the walls are carved into grotesque semi-human monsters, enriched with painting and inlay of iridescent shell, which show much imaginative power. Other beams are carved with series of spirals, bearing much resemblance to the very early sculptured ornaments of Mycene, Tiryns, and other Hellenic cities,—one of the many examples which show that very similar stages of artistic develop- ment are passed through by men of the most different races and age. In many cases the freshness of invention and freedom of hand shown in the carved ornament of savage races give a more really artistic value to their work than is usually found in the modern laboured and mechanical carving of highly civilized people.

In modern Europe decorative wood-carving shares the general low level of the lesser arts. The commercial spirit of the age, and the general desire to produce the utmost display with the smallest cost and labour, have reduced the art of wood-carving to a very low state.

Sec Williams, History of the Art of Sculpture in W ood, London, 1835; for practical information see Bemrose and Jewitt, Manual of Wood-Carving, London, 1862; Rogers, Art of Wood-Carving, London, 1867; and Lacombe, Manuel de la Sculpture sur Bots, Paris, 1868. (J. H. M.)

WOODCOCK (A.-8., Wade-coce, Wudu-coc, and Wudu- snite), a bird as much extolled for the table, on account

1 See art, ELLENBOROUGH for an account of the recent history of these celebrated doors. They are illustrated in wrchxologia, xxx. p. 174.

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of its flavour, as by the sportsman, who, from its relative scarcity in regard to other kinds of winged game, the uncertainty of its occurrence, as well as the suddenness of its appearance and the irregularity of its flight, thinks himself lucky when he has laid one low. Yet, under favourable conditions, large bags of Woodcocks are made in many parts of Great Britain, and still larger in Ireland, though the numbers are trifling compared with those that have fallen to the gun in various parts of the European Continent, and especially in Albania and Epirus. In England of old time Woodcocks were taken in nets and springes, and, though the former method of capture seems to have been disused for many years, the latter was practised in some places until nearly the middle of the

present century (cf. Knox, Game-birds and Wild Foul, pp. 148-151) or even later.

The Woodcock is the Scolopax rusticula® of ornithology, and is well enough known to need no minute description. Its long bill, short legs, and large eyes—suggestive of its nocturnal or crepuscular habits—have over and over again been the subject of remark, while' its mottled plumage of black, chestnut- and umber-brown, ashy- grey, buff, and shining white—the last being confined to the tip of the lower side of the tail-quills, but the rest intermixed for the most part in beautiful combination—could not be

adequately de- scribed within the present allotted space. Setting aside the many extreme aberrations froin the normal colouring which examples of this species occasionally present (and some of them are extremely curious, not to say beautiful), there is much variation to be almost constantly observed in the plumage of individuals, in some of which the richer tints prevail while others exhibit a greyer coloration. This variation is often, but not always accompanied by a variation in size or at least in weight.4 The paler birds arc generally the larger, but the difference, whether in bulk or tint, cannot be attri- buted to age, sex, season, or, so far as can be ascertained, to locality. It is, notwithstanding, a very common belief among sportsmen that there are two ‘“‘species” of Woodcock, and many persons of experience will have it that, beside the differences just named, the “little red Woodcock” invariably flies more sharply than the other. However, a sluggish behaviour is not really associ- ated with colour, though it may possibly be correlated with weight —for it is quite conccivable that a fat bird will rise more slowly, when flushed, than one which is in poor condition. It may suffice here to say that ornithologists, some of whom have taken a vast amount of trouble about the mattcr, are practically unanimous in declaring against the existence of two “species” or even ““races,” and morcover in agrecing that the sex of the bird cannot be detcr- mined from its plumage, though there are a few who believe that the young of the year can be discriminated from the adults by having the outer web of the first quill-feather in the wing marked with angular notches of a light colour, while the old birds have no trace of this “vandyke” ornament. Careful dissections, weighings, and measurings seem to shew that the male varies most in size; on an average he is slightly heavier than the female, yct some of the lightest birds have proved to be cocks.®

Though there are probably few if any counties in the United Kingdom in which the Woodcock does not almost yearly breed, especially since a ‘close time” has been afforded by the legislature for the protection of the species, there can be no doubt that by far the greatcr number of those shot in the British Islands have come from abroad,—mostly, it is presumed, from Scandinavia. These arrive on the east coast in autumn—generally about the middle of October —often in an exhausted and impoverished state. Most of them seem to cross the sea by night, and at that season it is

a brutal practice for men to sally forth and slaughter the helpless and almost starving wanderers, who are often found seeking refuge in any shelter that may present itself. If unmolested, however, they are soon rested, pass inland, and, as would appear, ina marvellously short time recover their condition. Their future destination seems to be greatly influenced by the state of the weather. If cold or frost stop their supply of food on the eastern side of Great Britain — eee ee eee: eee

*2 In the legal sense of the word, however, Woodcocks are not '*game,"' though Acts of Parliament require a " game licence" from those who would shoot them.*

3 By Linneus, and many others after him, misspelt rusticola. The correct form of Pliny and the older writers seems to have been first restored in 1816 by Oken (Zoologie, ii. p. 589).

- *The difference in weight is very great, though this seems to have been exaggerated by some writers. A friend who has had much experience tells us that the heaviest bird he ever knew weighed 16} oz., and the lightest 9 oz. and a fraction.*

° Cf. Dr Hoffmann's monograph Die Waldschnepfe,

ed. @, p. 35, published at Stuttgart in 1887.

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they press onward and, letting alone Ireland, into which the im- migrant stream is pretty constant, often crowd into the extreme south-west, as Devonshire and Cornwall, and to the Isles of Scilly, while not a few betake themselves to the unknown ocean, finding there doubtless a watery grave, though instances are on record of examples having successfully crossed the Atlantic and reaching Newfoundland, New Jersey, and Virginia. To return, however, to the Woodcocks which breed in Britain, whose habits have been much more frequently observed since the folly and cruelty of killing them in spring has becn recognized, and it may be hoped abandoned. Pairing takes place very early in February and the eggs are laid often before the middle of March. These are four in number,

of a yellowish cream-colour blotched and spotted with reddish-brown, and seldom take the pyriform shape so common among those of Limicoline birds.

or underwood, and usually near water or at least ina damp locality

—is at first little more than a slight hollow in the soil, but as in- | cubation proceeds dead leaves are collected around its margin until | a considerable mass is accumulated. During this season the male |

Woodcock performs at twilight flights of a remarkable kind (c. Birps, vol. iii. p. 771), repeating evening after evening (and it is believed at dawn also) precisely the same course, which generally describes a triangle, the sides of which may be a quarter of a mile or more long. On these occasions the bird's appearance on the wing is quite unlike that which it presents when hurriedly flying after being flushed, and though its spced is great the beats of the wings are steady and slow. produced, whether from the throat of the bird, as is commonly averred, or from the plumage is uncertain.

have tried to syllable it.

of England called "roading," and the track taken by the bird a

The nest—always made on the ground amid trees |

At intervals an extraordinary sound is |

To the present | writer the sound seems to defy description, though some hearers | This characteristic flight is in some parts |

*“‘cock-road.”1 In England in former times advantage was taken | of this habit to catch the simple performer in nets called *‘cock- |*

shutts,” which were hung between trees across the open glades or rides of a wood, and in many parts of the Continent it still is, or was till very lately, the disgraceful habit of persons calling them- selves sportsmen to lie in wait and shoot the bird as he indulges in his measured love-flight. A still more interesting matter in rela- tion to the breeding of Woodcocks is the fact, asserted by several

ancient writers, but for long doubted if not disbelieved, and yet™

finally established on good evidence, that the old birds transport their newly-hatched offspring, presumably to places where food is more accessible. The young are clasped between the thighs of the parent, whose legs hang down during the opcration, while the bill is to some extent, possibly only at starting, bronght into operation to assist in adjusting the load if not in bearing it through the air.?

The Woodcock inhabits suitable localities across the northern part of the Old World, from Iveland to Japan, migrating southward towards autumm. As a species it is said to be resident in the Azores and other Atlantic Islands; but itis not known to penetrate very far into Africa during the winter, though in many parts of India it is abundant during the cold weather, and reaches even

Ceylon and Tenasserim. The popular belief that Woodcocks live _and the Australian Region, save Celebes and Flores; but it

‘by suction” is perhaps hardly yet exploded ; but those who have observed them in confinement know that they have an almost insatiable appetite for earthworms, which the birds scck by probing soft ground with their highly sensitive and ficxible bill.2 This fact seems to have been first placed on record by Bowles, who noticed it in the royal aviary at San Ildefonso in Spain, and it has been corroborated by other observers, and especially by Montagu, who discovered that bread and milk made an excellent substitute for their ordinary food.*

The eastern part of North America possesses a Wood- cock, much smaller than though generally (and especially in habits) similar to that of the Old continent. It is the Scolapax minor of most authors ; but, chiefly on account

1 The etymology and consequently the correct spelling of these ex- pressions seem to be very uncertain. Some would derive the word from the French réder, to rove or wandcr, but others connect it with the Scandinavian rode, an open space in a wood (see Notes and Quertes, ser. 5, ix. p. 214, and ser. 6, viii. pp. 528, 524). Looking to the regular routine followed by the bird, the natural supposition would be that it is simply an application of the English word road ; but of course natural suppositions are often wrong, and they always require the support of evidence before acceptance.

2 Cf. J. E. Harting, Zoologist, 1879, pp. 433-440, and Mr. Wolf’s excellent illustration. Sir R. Payne-Gallwey, in the “ Badminton Library” (Shooting, ii. p. 118, note), states that he himself has witnessed the performance.

3 The pair of muscles said by Loche (Expl. Scient. de V Algérie, ii: p. 293) to exist in the maxilla, and presumably to direct the move- ment of the bill, do not seem to have as yet been precisely described.

4 Introduccion a la Historia Natural y a la Geografia fisica de Espata, pp. 454, 455 (Madrid, 1775).

of its having the outer three primaries remarkably attenuated, it has been placed in a separate genus, Philohela. In Java is found a distinct and curiously coloured species, described and figured many years ago by Horsfield (Zrans. Linn. Society, xiii. p. 191, and Zoolog. Researches, pl.) as S. saturata. To this Mr Seebohm ° has lately referred the S. rosenbergi of Schlegel (Wederl. Tijds. v. d. Dierkunde, iv. p. 54) from New Guinea; but, as the culpable destruction of the type- specimen of the former (during its transfer from the old museum of the East India Company to the British Museum) has made a comparison of the two impossible, the identification can scarcely be said to be free from doubt. Another species is S. rochusseni from the Moluccas, but this last, though resembling the other Woodeocks in most of the characters which distinguish them from the SNIPES (¢7.v.), has like the latter the lower part of the tibia bare of feathers. (A. N.) WOOD-ENGRAVING. See Encravine. WOODPECKER, a bird that pecks or picks holes in wood, and from this habit is commonly reputed to have its name; but since it is in some parts of England also known as " Woodspeight" (erroneously written "Wood- spite")—the latter syllable being cognate with the German Specht and the French Lyeiche, to say nothing possibly of the Latin Picws—the vulgar explanation seems open to doubt. More than 300 species of Woodpecker have been described, and they have been very variously grouped by systematists ; but all admit that they form a very natural Family Picide, which according to the view taken in this series of articles belongs to the Order Picarie. Prof. Huxley (Proc. Zool. Society, 1867, p. 467) would separate the Woodpeckers still more under the name of Celeo- morphex, and Prof. Parker (Yrans, R. Microsc. Socrety, 1872, p. 219) would raise them still higher as Saurognathe. They are generally of bright particoloured plumage, in which black, white, brown, olive, green, yellow, orange, or scarlet—the last commonly visible on some part of the head—mingled in varying proportions, and most often strongly contrasted with one another, appear; while the less conspicuous markings take the form of bars, spangles, tear-drops, arrow-heads, or scales. Woodpeckers inhabit most parts of the world, with the exception of Madagascar

may be worth stating that no member of the group is known to have occurred in Egypt.

*Of the three British species, the Green Woodpecker, Gecinus or Picus viridis, though almost unknown in Scotland or Ireland, is the commonest, frequenting wooded districts, and more often heard than seen, its laughing cry (whence the namc " Yaffil" or **Yafile,'" by which it is in many parts known), and undulating flight afford equally good means of recognition, even when it is not near enough for its coleurs to be discerned. About the size of a Jay, its scarlet crown and bright ycllow rump, added to its prevailing grass-green plumage, make it a sightly bird, and hence it often suffers at the hands of those who wish to keep its stuffed skin as an ornament. Besides the scarlet crown, the cock bird has a patch of the same colour running backward from the base of*

> Geographical Distribution of the Family Charadriide, p. 506, pl. This work will be found of much interest to those who would speculate on the causes which have lcd to the distribution of existing Limicoline birds.

*§ The number of English names, ancient and modern, by which these birds are known is very great, and even a bare list of them could not be here given. 'The Anglo-Saxon was Migera or Higere, and to this may plausibly be traced " Hickwall," now-a-days used in some parts of the country, and the older " Hickway," corrupted first into " Highhaw," and, after its original meaning was lost, into "Hewhole," which in North America has been still further corrupted into " Highhole" and more recently into "High-holder." Another set of names includcs **Whietile'" and " Woodwale," which, different as they look, have a common derivation perceptible in the intermediate form " Witwalc." The Anglo-Saxon Wodake (= Woodhack) is another name apparently identical in meaning with that commonly applied to Woodpecker.*

the lower mandible, a patch that in the hen is black.! Wood- peckers in general are very shy birds, and to observe the habits of the species is not easy. Its ways, however, are well worth watch- ing, since the ease with which it mounts, almost always spirally, the vertical trunks and oblique arms of trees as it searches the inter- stices of the bark for its food, flying off when it reaches the smaller or upper brauches—either to return to the base of the same tree and renew its course on a fresh line, or to begin

upon another tree near by—and the care it shews in its close examination, will repay a patient observer. The nest almost always consists of a hole, chiselled by the birds' strong beak, impelled by very powerful muscles, in the upright trunk or arni of a tree, the opening being quite circular, and continued as a horizontal passage that reaches to the core, whence it is pierced downward for nearly a foot. There a chamber is hollowed out in which the eggs, often to the number of six, white, translucent, and glossy, are laid with no bedding but a few chips that may have not been thrown out.? The young are not only hatched entirely naked, but seem to become fledged without any of the downy growth common to most birds. Their first plumage is dull in colour, and much marked beneath with bars, crescents, aud arrowheads.

Of generally similar habits are the two other Woodpeckers which inhabit Britain—the Pied or Greater Spotted, and the Barred or Lesser Spotted Woodpecker—Dendrocopus major and D. minor—each of great beauty, from the contrasted white, blue- black, and scarlet that enter into its plumage. Both of these birds have an extraordinary habit of causing by qnickly-repeated blows of their beak on a branch, or even on a small bough, a vibrating noise, louder than that of a watchman's rattle, and enough to excite the attention of the most incurious. Though the Picd Woodpecker is a resident in Britain, its numbers receive a consider- able accession nearly every autumn.

The three species just mentioned are the only Woodpeckers that inhabit Britain, though several others are mistakenly recorded as occurring in the country—and especially the Great Black Wood- pecker, the Picus martius of Linneus, which must be regarded as the type of that genus.? This fine species considerably exceeds the Green Woodpecker in size, and except for its red cap is wholly black. It is chiefly an inhabitant of the fir forests of the Old World, from Lapland to Galicia, and across Siberia to Japan,4 In North America this species is replaced by Picus pileatus, there generally known as the Logcock, an equally fine species, but variegated with white; and further to the southward occur two that are finer still, P. princtpalis, the Ivory-billed Woodpecker, and P. tmperialis. The Picine indeed flourish in the New World, nearly one-half of the described species

being American, but out of the large number that inhabit Canada and the United States there is here room to mention only a few.

First of these is the Californian Woodpecker, Mclanerpes for- micivorus, which has been said to display an amount of providence beyond almost any other bird in the number of acorns which it collects and, as shewn in the accompanying figure, fixes tightly in holes which it purposely makes in the bark of trees, and thus "a large pine forty or fifty feet high will present the appearance of being closely studded with brass nails, the heads only being visible." An extraordinary thing is that this is not done to furnish food in winter, for the species migrates, and after journeying a thousand miles or PS a a FS

1 A patch of conspicuous colour, generally red, on this part is characteristic of very many Woodpeckers, and careless writers often call it " mystacial," or some more barbarously " moustachial." Con- sidering that moustaches spring from above the mouth, and have nothing to do with the mandible or lower jaw, no term could be more inisleading,

2 It often happens that, just as the Woodpecker's labours are over, a pair of STARLINGS (¢.v.) will take possession of the newly-bored hole, and, by conveying into it some nesting-furniture, render it unfit for the rightful tenants, who thereby suffer ejectment, and have to begin all their trouble again. It has been stated of this and other Woodpeckers that the chips made in cutting the hole are carefully re- moved by the birds to guard against their leading to the discovery of the nest. The present writer has had ample opportunity of observing the contrary as regards this species and, to some extent, the Pied Woodpecker next to be mentioned. Indeed there is no surer way of finding the nest of the Green Woodpecker than by scanning the ground in the presumed locality, for the tree which holds the nest is always recognizable by the chips scattered at its foot.

3 The expression Picus martius was by old writers used in a very general sense for all birds that climbed trees, not only Woodpeckers, but for the NursatcH and TREE-CREEPER (qqg.v.) as well. The ad- jective martius loses all its significance if it be removed from Picus, as some even respectable authorities have separated it.

4 The persistency with which many writers on British birds have for years included this species among them is a marvellous instance of the durability of error, for not a case of its asserted occurrence in this country is on record that will bear strict investigation, and the origin of the mistake has been more than once shewn.

WOODPECKER

more only returns in spring to the forests where its supplies are laid up. It has been asserted that the acorns thus stored are always those which contain a maggot, and, being fitted into the sockets pre- pared for them cup-end foremost, the enclosed insects are unable to escape, as they otherwise would, and are thus ready for consump- tion by the birds on their return from the south. But this state- ment has again been contradicted, and moreover it is alleged tha these Woodpeckers fol- p= eee a low their instinct so j : blindly that "they do not distinguish between an acorn and a pebble," so that they "fill up the holes they have drilled with so much labor, not only with acorns but occasionally with stones" (cf. Baird, Brewer, and Ridgway, North American Birds, ii, pp. 569-571).

The next North- American form deserv- ing notice is the genns Colaptes, represented in the north and east by AQ C. auratus, the Golden- winged Woodpecker or Flicker, in most parts f ws OV ced, bakin spond Californian Woodpecker (Melanerpes aud west replaced by Sormicivorus). the allied C. mexieanus, easily distinguishable among other char- acteristics by having the shafts of its quills red instead of yellow. It is curious, however, that, in the valleys of the upper Missouri and Yellowstone rivers, where the range of the two kinds overlaps, birds are found presenting an extraordinary mixture of the other- wise distinctive features of each, and these birds have been de- scribed as hybrids. It would be premature to say whether this view be correct or not, and in regard to it Dr Coues has well re- marked (Birds of the Northwest, p. 294), "that it is only in virtue of missing links we are enabled to predicate species in any case," thereby indicating the possibility (not entertained for the first time) that these supposed hybrids are examples of the more generalized form of Colaptes, which becomes differeutiated further to the north and south into the specialized C. auratus and C.

mexicanus. Thus the subject is one highly interesting to the student of evolution.®

Some other Woodpeckers deserve especial notice,—among them the Colaptes or Soroplex campestris, which inhabits the treeless plains of Paraguay and La Plata, and had become fnlly adapted to a terri- | torial mode of life, as long ago observed by Azara and Darwin, but yet has readily returned, since the opportunity has been afforded, to the arboreal habits of its relatives, as remarked by Mr Hudson (Proc. Zool. Society, 1870, pp. 158-160). A similar provision of habit and haunt obtains in a Sonth-African Woodpecker, Go- colaptes olivaceus, which lives almost entirely on the ground or rocks, and picks a hole for its nest in the bank of a stream (Zoolo- gist, 1882, p. 208).

The Picide offer a fruitful ground for taxonomical speculation. At least three Subfamilies are admitted by all modern systematists—the Woodpeckers proper, Picine; the Piculets, Pecumnine, which are small birds wanting the stiff rectrices of the former; and the WRYNECKS (¢.v.). Sundevall (Conspectus Avium Picinarum, Stockholm, 1866) gave up the attempt to establish genera in the first of these, though he separated the 254 species which he admitted into 4 Series and 30 Tribes, thereby differing from the method of Malherbe, who, in his great monograph of the Family,® recognized 277 species and 19 genera, as well as from Prof. Cabanis, who (Mus. Heineanum, iv. part 2) strove to establish 48 genera in.about three- fourths of the whole Family, and from G. R. Gray, who in his Hand List recognized 4 Subfamilies, 19 genera, 74 subgenera, and 312 species. It seems obvious that until

5 When more is known it will very likely be found that a somewhat similar state of things exists in the Palearctic area in regard to the various local races of, or "species" allied to, Dendrocopus major and D. minor respectively. At present the only cases that seem to be strictly parallel are those furnished by the genera Coracias (ef, RoLLeER) and Huploeamus (ef. PHEASANT).

§ Monographie des Picidées, 4 vols. folio, Metz, 1859-62.

WO0O0—WO0O0

the aid of the anatomist is invoked no satisfactory arrangement can be supplied, and it is not certain that even then will the desired end be reached, for Macgilli- vray, who furnished Audubon with elaborate descriptions of parts of the structure of several North-American forms, found considerable differences to exist between species whicli can hardly be but nearly allied. Some of the most striking of these differences often lie in the form and development of the hyoid bones, and of the muscles which work the extensile tongue. Unhappily the subject does not seem to have been pursued by any other investigator ; but it may be mentioned that some limited researches on the pterylosis, conducted by Kessler (Bull. Soc. Nat. Jfoscou, xvi. p. 285), in addition to those of Nitzsch, indicate that as being also a promising line of inquiry, though one that has scarcely been attempted by any other workers.1 (A. N.)

WOODSTOCK, an ancient corporate market-town of Oxfordshire, England, is situated on a stream formerly called the Ennis and now the Glyme, which separates Old and New Woodstock, about 8 miles north-west of Oxford. The church of St Mary Magdalene, in New Woodstock, is of Nornian date, but has been greatly altered by restoration, and now has Decorated chancel with Perpendicular additions, clerestoried nave, Decorated north aisle and Early English south aisle retaining a por- tion of the Norman doorway, Perpendicular west porch, and Perpendicular west tower. interesting monuments. The town-hall, erected in 1766 after the designs of Sir William Chambers, includes a market-place and the fire brigade station, with public hall and council-chamber above. Almshouses were erected in 1798 by Caroline, duchess of Marlborough, and endowed with £3500, which has been increased by bequest at different periods. The town is dependent chiefly on agri- culture, but the manufacture of leather gloves has been carried on from an early period. By the Municipal Cor- porations Act, 1882, the borough (area about 30 acres), formerly governed by a charter of Charles II., was placed under a corporation. The population of the parliamentary borough (area 20,804 acres), which had been extended in 1832 and ceased to be separately represented in 1885, was 7033 in 1881.

The old manor house of Woodstock, which is supposed to have been built upon the site of a Roman villa, was at an early period a royal residence.

Here Alfred the Great is said to have resided while translating Boetius. At a witenagemot held at Woodstock by King Ethelred a code of laws was published for the govern- ment of the Anglo-Saxon kingdom. Henry I. made Woodstock a favourite residence, and formed a zoological garden there. Wood- stock was the scene of Henry II.'s courtship of Rosamond Clifford, and his frequent visits to the place led to the building of the nucleus of the town of New Woodstock. A first assize was held at Woodstock in 1184. It sent representatives to parliament from 1301-2 till 1885. It was incorporated by Henry VI. in 1453, and the charter was confirmed and extended by successive monarchs, that granted by Charles II. remaining the governing charter till 1882. Queen Elizabeth was a prisoner at Woodstock from May 1554 till May 1555, and after her accession to the throne visited it in 1566 and again in 1575. In 1576 she made the town a staple of wool and yarn. Woodstock was visited by James J. and by Ara- bella Stuart. During the Civil War it was the scene of frequent military operations, and after a siege it surrendered to the parlia- ment 20th April 1646. After the battle of Blenhcim the manor of Woodstock was by Act 3 and 4 of Queen Anne, chap. 4, bestowed in perpetuity on John duke of Marlborough. Blenheim palace, built by the duke from the designs of Sir John Vanbrugh, was completed in 1715. In 1723 the old manor house was destroyed and the site levelled.

See Marshall's Larly History of Woodstock Manor, 1873.

WOODSTOCK, a town, port of entry, and the capital of Oxford county, province of Ontario, Canada, is situated

1 Mr Hargitt, author of many papers in The Ibis on birds of this Family, has undertaken a catalogue of the specimens belonging to it contained in the British Museum.

The church contains many |

on the river Thames and Cedar Creek, and on the Great Western Railway, 80 miles south-west of Toronto. The trade is of growing importance. There is good water- power, and the town possesses several corn-mills and

a woollen factory. Its healthy situation and the beauty of the neighbouring scenery attract a number of summer visitors. The population in 1881 was 5373.

WOOD-WORK. See Buirprne, vol. iv. pp. 476-500.

WOOL AND WOOLLEN MANUFACTURES. Wool is a modified form of hair, distinguished by its slender, soft, and wavy or curly structure, and by the highly imbricated or serrated surface of its filaments. The numerous varieties of the sheep are the niost characteristic, as they are also by far the most importaut, producers of wool ; but the sheep is by no means the only animal which yields wool employed for industrial purposes. The alpaca and other allied fibres obtained from the alpaca and its con- geners in South America (see ALPACA, vol. i. p. 597, and LiaMa, vol. xiv. p. 738), the mohair yielded by the Angora goat (Monae, vol. xvi. p. 544), and the soft woolly hair of the camel are all wools of much industrial importance, while the most costly wool in the world is that yielded by the Cashmere goat of the Himalayan Mountains. At what point indeed it can be said that an animal fibre ceases to be hair and becomes wool it is impossible to determine, because in every characteristic the one class by imper- ceptible gradations merges into the other, so that a con- tinuous chain can be formed from the finest and softest merino to the rigid bristles of the wild boar.

Next to cotton, wool is the most important of all textile Early fibres used by mankind. From the ease with which it History.

may be made into thread, and owing to the comfort derived from clothing of woollen texture, it naturally would be the textile first used by mankind for clothing. The testimony of all ancient records goes to prove the high antiquity of woollen textures and the early importance of the sheep. The different kinds of wool and the cloth made from them in antiquity are described by Pliny (7. W., viii. 73, 74, 190 sq.).

Among the arts of civilized life which the British Isles Wool in owe to the Romans not the least important was the spin- Britain.

ning and weaving of wool. The sheep certainly was a domestic animal in England long before the period of the Roman occupation ; and it is most probable that such use was made of sheep skins and of wool as was common among uncivilized races. But the Romans established a woollen factory whence the occupying army was supplied with clothing, and the value of the manufacture was soon recognized by the Britons, of whom Tacitus remarks, "Inde etiam habitus nostri honor et frequens toga" (Agric. c. 21). The product of the Winchester looms, and the wool whence it was made, soon established a reputation abroad, it being remarked that 'the wool of Britain is often spun so fine that it is in a manner comparable to the spider's thread." The reputation which English wool at this early period established was miain- tained throughout medieval times; and the fibre was in great demand in the Low Countries and other Continental centres where skill in manufacture was highly developed. There are many allusions to woollen manufactures in England in early times; but altogether the native industry could not rival the products of the Continent, although the troubles in various industrial centres, from time to time, caused skilled workers in woot to seek an asylum in England. In the time of William the Conqueror Flemish weavers settled under the protection of the queen at Carlisle, but subsequently they were removed to Pembrokeshire. At various periods in the reigns of succeeding monarchs further immigrations of skilled Flemish weavers occurred, and they were planted at different places throughout the

country. priory of St Bartholomew was instituted by Henry II. ; guilds of weavers were established; and the exclusive privilege of exporting woollen cloth was granted to the city of London. Edward IIL made special efforts to encourage woollen industries according to the manner in which it was supposed in mediaeval times that trade could be best encouraged. He brought weavers, dyers, and fullers from Flanders; he himself wore Flemish cloth; and to stimulate native industry he prohibited under pain of life and limb the exportation of English wool. Previous to the time of Edward III. English wool had been in larger demand on the Continent, where it had a reputation exceeded only by the wool of Spain, which for ages pro- vided Kurope with the best material for cloth-making. The

customs duties levied on the export of wool were an important source of the royal revenue, and Edward III.'s attempt to stop the trade appears to have been an honest though misguided attempt to foster native manufactures. His prohibitory law was, however, found to be unworkable, and the utmost that both he and his successors were able to effect was to hamper the export trade by vexatious restrictions and to encourage much "running" or smuggling of wool, Thus while Edward III. limited the right of exporting to merchant strangers, we find that Edward IV. decreed that no alien should export wool and that denizens should export it only to Calais. Legislation of this kind prevailed till the reign of Elizabeth, when the freeexportation of English wool was permitted; and Smith, in his Memoirs of Wool, points out that it was during this reign that the manufacture made the most rapid progress in the country. In 1660 the absolute prohibition of the export of wool was again decreed, and it was not till 1825 that this prohibitory law was finally repealed. The prohibition appears to have been based on the mistaken notion that England possessed a monopoly of the finest kinds of wool, and that by withholding it from foreign competitors the home manufacturers would command the markets of the world. The results of the prohibitory law were exceedingly detrimental: the production of wool far exceeded the consumption; the price of the raw material fell; wool "running" or smuggling became an organized traffic; and the whole industry became disarranged. Extraordinary expedients were resorted to for stimulating the demand for woollen manufactures, among which was an Act passed in the reign of Charles II. decreeing that all dead bodies should be buried in woollen shrouds,—an enactment which remained in the Statute Book, if not in force, for a period of 120 years. On the opening up of the colonies, every effort was made to encourage the use of English cloth, and the manufacture was discouraged and even prohibited in Ireland.

It was not without reason that the attention of monarchs and legislators was so frequently directed to the woollen industries. Wool was indeed "the flower and strength and revenue and blood of England," and till the develop- ment of the cotton trade, towards the end of the 18th century, the woollen industries were, beyond comparison, the most important sources of wealth in the country. What the actual value of the trade at any early period was it is impossible to ascertain, and the estimates of wool pro-

duction and the value of the manufactures in the 17th and 18th centuries vary widely. Towards the close of the 17th century the wool produced in England was estimated to be worth £2,000,000 yearly, furnishing £8,000,000 worth of manufactured goods, of which there was exported about £2,000,000 in value. In 1700 the official value of woollen goods exported was about £3,000,000, and in the third quarter of the century the exports had increased in value by about £500,000 only. In 1774 Dr Campbell

Wook

The cloth fair in the church yard of the | (Political Survey of Great Britain) estimated the number of

sheep in England at 10,000,000 or 12,000,000, the value of the wool produced yearly at £3,000,000, the manu- factured products at £12,000,000, and the exports at £3,000,000 to £4,000,000. He also reckoned that the industry then gave employment to 1,000,000 persons. These figures, in the light of the dimensions of present day industries, may appear small, but they bore a predominant relationship to the other great sources of employment and trade of the period. In 1800 the native crop of wool was estimated to amount to 96,000,000 ib; and, import duty not being imposed till 1802, the quantity brought from abroad was 8,600,000 Ib, 6,000,000 ib of which came from Spain. In 1825 the importation of colonial wool became free, the duty leviable having been for several previous years as high as 6d. per tb, and in 1844 the duty was finally remitted on foreign wool also.

Sheep were introduced at Jamestown in Virginia in Wool in 1609, and in 1633 the animals were first brought to America.

Boston. Ten years later a fulling mill was erected at Rowley, Mass., " by Mr Rowley's people, who were the first that set upon making cloth in this western world." The factory woollen industry was, however, not established till the close of the 18th century, and it is recorded that the first carding machine put in operation in the United

| States was constructed in 1794 under the supervision of

John and Arthur Schofield.

The prevailing colour of sheep's wool is white, but it must not be forgotten that there are races with black, brown, fawn, yellow, and grey shades of wool. For manu-

facturing purposes generally white wool is, of course, most

valuable, but for the homespuns, which in earlier times absorbed the bulk of wool, natural colours were in many cases desirable and used with good effect. In dontestic spinning, knitting, and weaving, natural colours are still largely taken advantage of, as in the cases of rough yarns, Shetland knitted shawls, Highland tweeds, &c.

As has already been indicated, the distinction between Charac- wool and hair lies chiefly in the great fineness, softness, teristics

and waved delicacy of woollen fibre, combined with a highly serrated surface. These peculiarities are precisely the characters which give wool its distinctive value as a textile fibre, and most distinctive of all is the serrated structure which specially belongs to wool and gives it the important property of felting, upon which many of its applications depend. 'The serrations of wool and the wavy structure it assumes are closely connected, those wools which have the greatest number of serrations being also most finely waved in structure. The appearance pre-sented by wool under the microscope, as compared with the aspect of certain other animal fibres, is shown in fig. 1 (compare vol. ix. p. 133). The imbrications all lie in one direction,—from the root, their growing point, upwards to the apex of the fibre,—so that, while a lock of wool drawn between the finger and thumb from the root end outwards slips quite smoothly, if drawn in the contrary direction from point to root it offers a distinct resistance, and the fibre feels harsh and rough. Under the influence of moisture and pressure, tangled masses of wool thoroughly interlock and mat together, by the mutual clutching of the serrations of the fibres, and it is thus that the shrinking and thickening of woollen textures under washing is accounted for, and the capacity of cloth for felting or fulling is due to this condition of the fibre. The serrations are most numerous, acute, pointed, and distinct in fine merino wools, as

many as 2800 per inch being counted in specimens of the finest Saxony wools. In the Leicester wool of England, on the other hand, which is a long bright staple, the serratures are not only much fewer in number, counting about 1800, but they are also less pronounced

in character, so that the fibre presents a smoother, less waved character. In some inferior wools the serrations are not so many as 500 per inch. A similar difference may be noted in the fineness of the fibres. Saxony lambs' wool has a diameter of from rs00 tO yep inch, whilst coarse Algerian wools may rise to a maximum diameter of about s+, inch.

Other distinguishing qualities of good wool consist in uniformity and strength of fibre with freedom from tender or weak portions in its length, a condition which not unfre- quently arises from ill health in the sheep. In ill-bred wool there may also be found inter- mingled "kemps" or dead hairs,— straight coarse shining fibres which show con- spicuously among the wool, and be- come even more prominent in the manufacturedand dyed goods. Wool also possesses a softness of touch : and an elasticity both in the raw and manufactured = condition which distinguish it from all other fibres. In length ' of staple it varies very much, attain- ing in combing wools to a length of as much as 15 to 20 inches. As a rule the fine ; felting wools are' === short in staple, these constituting carding or woollen yarn wools ; and the longer are lustrous and comparatively straight, and thus most suitable for combing or worsted wools. The latter wools approach mohair and alpaca in their characters, and they are pre- pared and spun by the same class of machinery.

The bulk of the wool of commerce comes into the market in the form of fleece wool, the product of a single year's growth, cut from the body of the living animal. The first and finest clip, called lambs' wool, may be taken from the young sheep at about the age of eight months. When the animal is not shorn till it attains the age of twelve or fourteen months the wool is known as hogg or hogget, and it, like lambs' wool, is fine and tapers into long thin ends. All subsequently cut fleeces are known as wether wool, and possess relatively somewhat less value than the first clip. Fleece wool as it comes into the market is either "in the grease," that is, unwashed,

and with all the dirt which gathers to the surface of the greasy wool present; or it is received as "washed" wool, the washing being done as a preliminary to the sheep-shearing. Skin wool is that which is obtained from sheep which either die or are killed. Such wool is always of inferior value and inuch impregnated with lime from the steeping -pits in the tan-yards in which the skins are first treated to soften and swell the skin for facilitating the easy separa- tion of the wool from it.

The wool market is supplied from almost every quarter

F1a. 1.—Microscopic Structure of Wool. b, Southdown; c, Leicester: d, mohair,

a, merino;

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of the globe, and the qualities and varieties of the article are exceedingly numerous. The range of woollen and worsted manufactures is also very wide, and the raw material suitable for one section of the trade is not at all fitted to supply other sections. Much more than is the case in any other textile industry we have in the woollen trades practically a series of separate and distinct industries, each with its own appropriate class of raw materials. The main distinctions are—(1) carding wools, in which felting properties are desirable ; (2) combing wools, requiring length of staple and brightness of fibre, for hard-spun non= felting worsteds ; and (3) carpet and knitting wools, in which long and strong if somewhat coarse staple are the essential qualities. Breeding, climate, and food are the main factors in developing and rearing special races of sheep in which the qualities essential for producing the raw materials of any of these sections of industry are secured,

For centuries the finer wools used for cloth-making Merino throughout Europe were obtained from Spain, which was Wool.

the home of the famous merino breed developed from races of sheep originally introduced into the Peninsula by the Romans. Till early in the present century the superiority of Spanish merinos remained

unchallenged, but the Penin- sular War and its attendant evils produced a depreciation of quality concurrently with the introduction of Saxon and Silesian wools, which suddenly supplanted the product

| of Spain, and hold the first place down to the present | day. The Spanish merino sheep was introduced into

Saxony by the elector in 1765, and by judicious crossing with the best native race developed the famous electoral breed. Merinos were carried to Hungary in 1775, and to France in 1776, and in 1786 Daubenton brought then to Rambouillet, whence a famous race developed. In 1802 the first merinos known to have left pure descendants were taken to the United States, and in 1809-10 an importa- tion (4000) of merino sheep was made. The introduction of merino blood has also largely modified certain of the breeds of English sheep, and from them, crossed with the English breeds, Southdowns and Leicesters, have sprung the vast flocks of sheep in the various Australasian colonies, which now bid fair to supply the whole. world with wools of the merino class, and of the very highest quality.

Of colonial wools, which are now by a long way the Colonial most important supplied to the British market, the best wool.

qualities come from Port Phillip, Sydney, and Adelaide, the first of these being excelled in quality as a cloth- making wool by the merinos of Saxony and Silesia alone. New Zealand also yields a very large annual crop of wool of high quality, and the wool of Tasmania is generally of fine colour, sound and uniform in staple. The Cape of Good Hope is the source of a large supply of wool, much of which, however, is unequal in strength and somewhat kempy in character. A great proportion of the wool which comes from South America is seriously deteriorated by burrs, and it is of a character which fits it for the worsted manufacture alone.

The wools grown in the United Kingdom may be British separated into three classes—(1) short or carding wool ; wool.

(2) long or combing wool; and (3) blanket, carpet, and knitting wool. Of short wools Southdown may be taken as the type and best example. It is a

staple of excellent quality, milling well, and suitable either for the woollen or worsted trade. The long wools of greatest importance

_are obtained from the Lincoln and Leicester sheep. These

breeds yield a long fleece of remarkable lustre, and it was the possession of this class of wool which gave England its high reputation in former times as a wool-producing country. A similar quality of wool is also obtained from the East Riding Yorkshire breed of sheep. Cheviot wool

Sheep washing.

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approaches the Leicester class in some qualities, but is destitute of the latter's peculiar lustre, and is shorter in staple, though strong in fibre, with good milling qualities, which render it valuable for the tweed manufacture. Intermediate between the long and short there are several British breeds, which have been established either by crosses or local conditions and treatment, the most im- portant of these being found in Shropshire, Staffordshire, and Norfolk. The carpet wools are yielded by sheep of the type of the Blackface of the mountainous regions of Scotland, from which is obtained a fleece of long staple but somewhat unequal qualities. Much of the Highland wool is "laid," that is, impregnated with tar, from the practice of the stock-masters of smearing the animals with a nlixture of tar and fat immediately after shearing, with a view of protecting them from the rigours of the climate. Of wools of a special character there may be noted Welsh wool, which possesses properties fitting it pre-eminently for the making of the famed Welsh flannels, and Shetland wool, which being very fine and soft inits nature is almost entirely worked up into delicate yarns for knitting the well-known Shetland shawls and other knitted work.

The weight of a fleece of wool of the various breeds of sheep ranges from under 2 tb in the case of the small Shetland breeds up to 8 or 9 ib for the large merinos and other heavy races, and in exceptional cases a heavy ram's fleece may reach so much as 15 ib; but, taken all over, sheep may be reckoned to yield on an average 5 tb of wool in a year.

Where there is abundance of water and other con- veniences it is the practice to wash or half-wash sheep previous to shearing, and such wool comes into the market as washed or half-washed fleece. The surface of a fleece has usually a thick coating of dirt adhering to it, and in the cases of merino breeds the fleece surface is firmly caked together into large solid masses, from the adhesion of dirt to the wool constantly moist with the exudation from the skin of the greasy yolk or "suint," so that in an un-washed fleece nearly 30 per cent. of weight may represent dirt, and about 40 per cent. the greasy suint, which lubri- cates the wool, while the pure wool is not more than one-third part of the whole. The yolk forms a protective covering to the sheep, rendering the fleece impervious to moisture, and while left in the wool also preserves it soft, pliant, and silky to touch. It forms a kind of natural soap, consisting principally of potash salts with animal oil, almost entirely soluble in cold water. The following analyses of German merino wool—the variety in which suint is most largely developed—illustrate the difference which may result in the composition of the fibre from the simple washing of the fleece on the sheep's back :—

Unwashed Merino. Washed Merino. Momeral mathen. soncece0eds 6°3 16°8 0°94 1°3 Suint and fatty matter…) 44°3 44-7 21:00 40°0 URS WORE 6 sotaciecaes cap gar es 38°8 28°5 72°00 56:0 WOMstihre. tent bec. ooecc bese. 11°4 70 6°06 a7

Wool, however, which is merely washed in the rough- and-ready manner described below still retains great and variable quantities of suint, &c. Where running streams exist, the sheep are penned by the side of the water, and taken -one by one and held in the stream while they are washed, one man holding and the other washing. The operation is objectionable in many ways, as it pollutes the stream, and it dissipates no mean amount of potash salts, valuable for manure or for other chemical purposes. Sheep washing appliances are now largely employed, the arrangement consisting of a pen into which the sheep are driven and subjected to a strong spray of water either hot or cold, which soaks the fleece and softens the dirt. This

done, they are caused to swim along a tank which narrows towards the exit, and just as they pass out of the pen they are- caught and subjected to a strong douche of pure water. After a few days the wool of a washed sheep is sufficiently dry for shearing or clipping, which is there- upon done.

A skilful shepherd will clip the fleece from a sheep in Sheep one unbroken continuous sheet, retaining the form and Shearing.

relative positions of the mass almost as if the creature had been skinned. In this unbroken condition each fleece is rolled up by itself, which greatly facilitates the sorting or stapling which all wool undergoes for the separation of the several qualities which make up the fleece.

Sorting or stapling was formerly a distinct industry, Wool and to some extent it is so still, though frequently the work stapling.

is done in the premises of the spinners. Carding wools are separated and classed differently from combing wools, and in dealing with fleeces from different races the classifica- tion of thesorter varies. In the woollen trade short-staple wool is separated into qualities, known, in descending series from the finest to the most worthless, as picklock, prime, choice, super, head, seconds, abb, and breech, and tle pro- portions in which the higher and lower qualities are present are determined by the qualities of the fleece or the race yielding the wool. In the worsted trade the classification goes, also in descending series, from fine, blue, neat, brown, breech, downright, seconds, to abb. The last three are short and not commonly used in the worsted trade. The greater proportion of good English long wool will be classified as blue, neat, and brown; it is only in exceptional cases that more than from 5 to 8 per cent. is "fine" on the one hand, or of lower quality than breech on the other. Generally speaking, the best portion of a fleece is from the shoulders and side of the animal (1 in fig. 2). The wool from 2 is irregular in growth, and often filled with burrs, . &c.; from the loin 3 it is shorter of staple and coarser,

*a 4 ' *

a ee et vf.

characters which become _increas- ingly pronounced as we approach the 4s tail and hind quar- ss ter 4. The belly

Fre. 2.—Qualities of Fleece.

wool 5 is. short, worn, and dirty, as is also the front of the throat 6, while on the head and shins 7 the product is short, stiff, and straight, more like hair than wool.

The sorter works at a table or frame covered with wire netting through which dust and dirt fall as he handles the wool. Fleeces which have been hard packed in bales, especially if unwashed, go into dense hard masses, which must be heated till the softening of the yolk and the swell- ing of the fibres make them pliable and easily opened up. When the fleece is spread out the stapler first divides it into two equal sides; then he picks away all straws, large burrs, and tarry fragments which are visible ; and then with marvellous precision and certainty he picks out his separate qualities, throwing each lot into its allotted receptacle. Sorting is very far removed from being a mere mechanical process of selecting and separating the wool from certain regions of the fleece, because in each individual fleece qualities and proportions differ, and it is only by long experience that a stapler is enabled, almost as it were by instinct, rightly to divide up his lots, so as to produce even qualities of raw material.

The washing which a fleece receives on the live sheep Scouring.

Drying.

MANUFACTURE. |

is not sufficient for the ordinary purposes of the manu- facturer. The scouring process is thus the first link in the long chain of manufacturing processes through which wool passes. On the careful and complete manner in which scouring is effected much depends. 'The qualities of the fibre may be seriously injured by injudicious treat- ment, while, if the wool is imperfectly cleansed, it will take on dye colours unevenly, and all the subsequent manufacturing operations will be more or less unsatisfac- tory. The water used should be soft and pure, both to save soap and still

more because the insoluble lime soap formed in dissolving soap in hard water is deposited on the woollen fibres and becomes so entangled that its removal is a matter of extreme difficulty. Wool washed with hard water is always harsh to the touch, and takes on dye colours but unevenly, owing to the interference of unremoved lime soap. In former times stale urine was a favourite medium in which to scour wool; but that is now disused, and a specially prepared potash soap is the detergent principally relied on. Excess of alkali has to be guarded against, since uncombined caustic acts ener- getically on the wool fibre, and is indeed a solvent of it. On this account a soap solution of too great strength leaves the wool harsh and brittle, and the same detrimental result arises when the soapy solution is applied too hot.

In former days, when the method of hand-scouring pre- vailed, the wool to be washed was placed with hot soap- sud in a large scouring "bowl" or vat, and two men with long poles kept stirring it gently about till the detergent loosened and separated the dirt and dissolved the grease. The wool was then lifted out and drained, after which it was rinsed in a current of clean water to remove the "scour," and then dried. These operations are now per- formed by mechanical agencies; and, to save soap, it is the practice to first steep the wool in steepers,—tubs having a perforated false bottom in which steam is blown through the wool steeped in pure water. The process removes much mechanically mixed dirt, and softens the other impurities, expanding the fibres themselves, and thus rendering the scouring operation easier and more expedi- tious. In machine scouring the object aimed at is to bring all the wool equally under the influence of the soapy solution, and to prevent it from matting into lumps in its progress through the washing bowls. Usually the wool passes through two sets of bowls, the soap solution being stronger in the first set. The wool is fed into one extre- mity of the bowl, which is an oblong vat, by an endless apron from which it passes to an immersed plate which sinks it into the hot soapy solution, where the whole is thoroughly soaked. It is then carried to the opposite end of the bowl, either by a series of forks or rakes with reciprocating motion, or by sets of iron prongs fixed at a uniform distance on a frame to which recipro- cating action is cominunicated by eccentric mounting. These carry the wool forward by gentle progression, so as not to ball it, till at the upper end it is caught and

squeezed between rollers to wring out part of the water from the fibres, and then passed on for further drying.

The more gently and uniformly the drying can be effected the better is the result attained, and over-drying of wool has to be specially guarded against. By some manufacturers the wool from the squeezing rollers is whizzed in a hydro-extractor, which drives out so much of the moisture that the further drying is easily effected. The commonest way, however, of drying is to spread the wool as uniformly as possible over a framework of wire netting, under which are a range of steam-heated pipes, the sides being enclosed in a framing of wood. A fan blast blows air over these hot pipes, and the heated air passes up and is forced through the layer of wool which

rests on the netting. Unless the wool is spread with great evenness it gets unequally dried, and at points where the hot air escapes freely it may be much over-dried. A more rapid and uniform result is obtained by the use of Petrie's wool drier, which consists of a close chamber divided into five horizontal compartments, the floors of which consist of alternate fixed and movable bars. Under the chamber are a tubular heating apparatus and a fan by which a powerful current of heated air is blown up the side of the chamber, and through all the shelves or compartments successively, passing in the path over which the wool slowly travels. The wool is entered by con- tinuous feed at one side of the chamber; the strength of the blast carries it up and deposits it on the upper shelf, and by the action of the movable bars, which are worked by cranks, it is carried forward to the opposite end, whence it drops to the next lower shelf, and so on it travels till at the extremity of the lower shelf it passes out by the delivery lattice well and equally dried. Moore's drier is a simpler and less expensive form of drying apparatus, intermittent in its action. It consists of a case enclosed except as regards the top, where there are openings to allow the escape of moist air. It contains two tiers of steam-heated pipes, and directly over the top of each tier there is a row of iron rollers of small diameter set close together. Atone end of the machine is a door for

feeding wool into it, and at the opposite extremity is a spiked drum geared to rotate at a high speed. A fixed quantity of wool is fed into the machine at one time and placed on the lower series of rollers. These in their rotation carry the wool forward exposed to the heat of the pipes both above and below, till it reaches the drum, which, revolving rapidly, lifts it to the higher range of rollers. Over these the wool is carried back, till at- the other end it again falls to the lower range, and so it circulates through the machine till the drying is completed. To withdraw the dried wool it is only necessary to raise the outlet door over the revolving drum, when it throws out the contents of the machine as fast as the wool comes within its range.

The dried wool, notwithstanding the several manipula- Teazing.

tions to which it has been subjected, is still in the condition of matted locks, which have to be opened up and the whole material brought into a uniformly free and loose condition. 'This is effected in the Willey or teazing machine, which consists of a large drum and three small cylinders mounted in an enclosed frame. The drum is armed with ranges of powerful hooked teeth or spikes, and is geared to rotate with great rapidity, making about 500 revolutions per minute. The smaller cylinders, called workers, are also provided with strong spikes ; they are mounted over the drum and revolve more slowly in a direction contrary to the drum, the spikes of which just clear those of the workers. The wool is fed into the drum, which carries it round with great velocity; but, as it passes on, the locks are caught by the spikes of the workers, and in the contest for possessing the wool the matted locks are torn asunder till the whole wool is delivered in a light, free, and disentangled condition.

For certain classes of dirty wool, notably such as that Buring.

which comes from Buenos Ayres, still another preparing operation is essential at this stage—that is, the removal of burrs or small persistently adherent seeds and other fragments of vegetable matter which remain in the wool. Two methods of effecting this—one chemical, the other mechanical—may be pursued. The chemical treatment consists in steeping the wool in a dilute solution of sulphuric acid, draining off the dilute acid by means of the hydro-extractor, and then immediately

exposing the wool to further rapid drying in a heat of about 250° F. The acid leaves the wool itself uninjured, but is retained XXIV. — 83

Oiling. There remains yet another preliminary operation through a gentle reciprocating motion is communicated, so that the material which wool generally has to pass previous to the spinning | is felted as it passes on. When duly condensed, the cloth, of processes, As delivered from the drying apparatus the | leathery consistence, is dyed, printed, dressed, and finished, when wool is bright and clean, but somewhat harsh and wiry to required, like ordinary woollen cloths. Felt has extensive appli-

h Keown th loot a Ie welch eat cations, there being made from it druggets, carpets, table-covers, the touc Bs to € eg) 0 e@ york which 1s 1 8 horse-cloths, &c.; the coarser varieties are used for boiler-covering natural lubricant. To render it properly soft and elastic, | and other mechanical purposes. and to improve its spinning qualities, the fibre is sprinkled It becomes necessary here to indicate the specific distinction of Woollens with a percentage of oil, comparatively small quantities | Woollen and worsted yarns and cloth. In a general way it may be and

: : said that woollen yarns are those made from short wools possessed worsteds.

~—by some spinners none—being used for worsted wools, of high felting qualities, which are prepared by a process of carding, but a larger amount being applied in the oiling of wool for whereby the fibres are as far as possible crossed and interlocked woollen manufactures. The oil further has the advantage | with each other, and that these cardings, though hard spun on the of producing contelti adhestwénais of. the ilteyarl TH | er es aiveaing Wace niin aie eerai-oNenCrnnTTiNh

. . : . Vi roug. = spinning process, and thus it enables the spinner to get | 4, milling which is the distinguishing characteristic of woollen a more level and finer yarn, and it prevents loss from the | efoth. On the other hand, worsted yarns are generally made from flying off of te fibres. As the oil is a costly item, | the long lust aa MeO Ie. ey ocowonaihel

ying off of separate fibres. s the oil is a costly item, e long lustrous varieties of wool; the fibres are so combe it is of consequence that it should be equally distributed to bring ae as far poe oe Ae i ee con other ;

. : . : e spinning is done on r rame, e yarn is spun and used De thrifty manner, for which £ nd ve | ih compact, smooth, and level thread, which, when woven into forms of oiling apparatus have been devised, which cloth, is not milled or felted. At all points, however, woollen and sprinkle the oil in a very fine spray over thinly distributed | worsted yarns as thus defined overlap each other, some woollens wool carried by an endless cloth under the sprinkler. be a ae vonge ee Pea eee ey ae a

ee ae +) 3 . +): : eing, when made from short staple wool, also carded as well as Gallipoli olive oil . the best medium for oiling combing combed ; and occasionally worsted yarn is spun on the mule frame, wool ; and for carding wool the liquid olein expressed from | while milling or felting is a proccss done in all degrees,—woollen tallow and lard in the preparation of stearin is employed | being sometimes not at all milled, while to some worsteds a certain with advantage. milling finish is given. The fundamental distinction between the idisnanne. Ab wee: : eae classes rests in the crossing and interlacing of the fibres in preparing eee a ee On Be for se Van OUS Oye || Mou lled yarn,—an operation confined to this alone among all tex- and other processes by which it is worked into useful | tiles, while for worsted yarn the fibres are treated, as in the caso forms ; but pure wool of one quality alone is not gene- | of all other textile materials, by processes designed to bring them rally used in the production of woven fabrics. For many | into a smooth parallel relationship to each other. reasons-—alnong wvhich cheapness figures prominently | _, Woolen sams, as above cxlainl, er exclusiva made by the Caning wools are blended, and to no inconsiderable extent the which carding was done before the introduction of machinery and added material consists of shoddy, mungo, or extract wools | factory-work consisted of square or oblong pieces of board with

(see below). Blending with cotton is also practised, and | handles, one face of the board being covered with card Icather,

for some purposes silk and wool are mixed. The question of which was closely studded with fine elastic steel teeth, pointed 1 1] a alee das : Hleneh in onc direction and bent as in fig. 3. These teeth were strong or colour as well as quailty also determines blending opera- | fine according to the nature, length, and strength of the fibre to be tions, natural coloured wools being frequently intermixed | carded, but the finer the teeth the more

to obtain particular shades for tweeds, knitting yarns, &c. | closely were they studded together. A The various materials to be intermixed are bedded in due ae a pee a oiled — ch NUURUNUOARRETOEEREOELEED

° ° ace on e suriace o one cara 5 ri 5 BSS SSS SSS SSS TAC SSDS proportion in separate layers over each other, and passed a in the left hand, was held teeth Fre. 8.—Card Teeth. through a teazer, from which they issue SO intimately | upward on the lap of the operator, while the other card, held in intermixed that they present a uniform appearance. the right hand teeth downward, and consequently pointed in an

Woollen The processes hitherto described—although woollen ee ieee me re. end jeeheate oe on

anu- ; oe a us taking up a share of the wool which becam ngled in its oe manufacture has been specially kept in view—are more or | oth. In this way, by drawing the one card over he. ober

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by the more absorbent vegetable matter, and the high heat causes it to combine so energetically with the water left in the burrs that the vegetable matter becomes com- pletely carbonized. The wool is thereupon washed in water rendered sufficiently alkaline to neutralize any free acid which may remain, and dried. The same _burr- renioving effect is obtained by the use of a solution of chloride of aluminium, a method said to be safer for the wool and less hurtful to the attendant workmen than is the sulphuric acid process. For mechanical removing of burrs, a machine something like the Willey in appearance is employed. The main feature of this

apparatus is a large drum or swift armed with fine short spikes curved slightly in the direction in which it rotates. By a series of beaters and circular brushes the wool is carried to and fed on these short spikes, and in its rotation the burrs, owing to their weight, hang out from the swift. The swift as it travels round is met by a series of three burring rollers rotating in an opposite direction, the projecting rails of which knock the burrs off the wool. The burrs fall on a grating and are ejected, with, of course, a good deal of wool adhering to them, by another rotating cylinder.

less essential to wool for all purposes to which it is applied. But from this point the manufacturing opera- tions diverge into three main channels, which may be regarded as almost distinct textile industries. First and simplest we have the felt manufacture, in which cloth is

woollen yarn and cloth manufacture, embracing the pre- paration of carded yarns and of cloth which is so milled or felted as to have the appearance of felt; and, thirdly, in the worsted yarn and cloth industry combed yarn is prepared and cloth showing the yarn and pattern is woven. These definitions must be taken to be accurate only in the broad general acceptation.

Felt is a kind of cloth made without spinning or weaving, but Felt.

simply by the mutual adhesion of the imbricated fibres. The peculiar property is most distinctly developed in the short or carding wools, but all wool, in common with mohair, alpaca, vicugna, and camel's hair, possesses it. Felting properties are also found in the hair of other animals; the rabbit, espeeially, supplies the finer felts used for hat-making, while the beaver hat, which is the ancestor of the modern dress hat, was a felt of beaver hair. Felted cloth is made by the combined influence of heat, moisture, and pressure or rubbing on a uniformly spread-ont mass of woollen fibres. The wool is scribbled or carded out

into a uniform lap of extreme thinness, but of a length and breadth sufficient for the size of the cloth to be made.

repeatedly, the whole of the wool was ultimately separated and equally distributed over the pair of cards. The wool was then stripped out of the cards by drawing the teeth of onc through those of the other in the direction of their inclination. The carded wool thus lifted out was condensed into a loose but uniform round pipe or "carding" by rolling on the back of the card, and these

made without either spinning or weaving ; second is the | cardings were then ready for spinning on the wheel.

MANUFACTURE. |

For the apparently simple operation of carding, the factory machinery is complex, delicate, and very expensive. Ordinarily it consists of three carding-engines, called respectively the scribbler, the intermediate, and the finisher, but sometimes the intermediate is omitted. In each of these there is a complicated series of card- covered cylinders of different diameters running at different rates of speed, sometimes in a contrary and sometimes in the same direction, which are engaged in contending with each other for the

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ox | Z ZO) fA 9: Fig. 4.—Diagram of Scribbling Card. "2)

wool supplied to the machine, in abstracting it altogether from their neighbours, and passing it on to be again contended for and teased in the operation, and finally passed clean out of the machine. A sectional illustration (fig. 4) of the first portion of a "scribbler'"' will serve as an illustration of the whole operation from beginning to end. The wool is entered to the appa- ;,

ratus by a travelling lattice, the supply being equalized and carefully distributed by a mechanical feed. It is caught between the lower two of a range of three fecd- rollers a, revolving immediately behind which is the

“licker-in” roller 6, which immediately takes possession of the por- tion of the feed which has fallen to the share of the lower or No. 1 feed-roller. The remainder of the feed is carried upward on the middle feed-roller, from which it is taken by the uppermost of the three rollers a, and from it the wool is delivered 4 to the “licker-in.” In this way a certain amount of preliminary blending and in- termixing is accomplished. Against the licker-in revolves the “angle stripper” e, the function of which is to remove the wool from the former and deliver it over to the great breast cylinder, which re- volves at a high speed (surface-velocity about + mile per minute). By the cylinder it is carried on till it comes against a small roller revolving slowly in the opposite direction, called “ worker No. 1” d, which abstracts part of the wool, and carrying it round gives it up to the somewhat smaller roller, the “ stripper” e, which again delivers it to the breast cylinder. Passing on it carries the wool partly to

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Fie. 5.—Single-Cylinder Carding Engine. the second worker f, and stripper g, when the same operation is re-

peated. Continuing its progress, the cylinder with its covering of wool next comes in contact with the “fancy” h, the teeth of which are set so as to pass a little way into those of the cylinder. Its effect is to throw the wool partly out of its teeth and prepare it for being entirely removed by the “doffer” 7, which is the next roller met by the cylinder, and which, like the “ fancy,” revolves in a contrary direction to the breast cylinder. The angle stripper j passes the wool from the doffer to the next cylinder, which is called a “ swift,” and which has the same workers, strippers, fancy and doffer rollers as the breast cylinders. The scribbler contains

three such sets of cylinders and rollers over which the wool passes till it is delivered. The intermediate carding-engine has two swifts, with relative workers, &c., and the finisher has also two swifts and acondenser. In some carding-cngines the swifts are provided with more than two sets of

workers and strippers. This is particularly the case in a class of carding-engines provided with only one swift or cylinder of very large diameter, around which there arc five sets of workers and strippers (fig. 5).

The carded wool, as it leaves the last swift of the finisher card, is Condens- in the form of a continuous equally-distributed lap. To prepare it ing, for spinning, this lap must now be divided into a series of equal strips or ribbons, and these then condensed into a rounded carding or sliver sufficiently compact to bear winding on a bobbin. The condenser for doing this is attached to the finisher card, and con- sists of rings or bands of card-cloth the width of the strips to be made, placed on one or on two cylinders, which rings doff the portion of the lap against which they revolve and yield it up to a stripper. These strips as they pass out are acted on by a pair of rubbers which, bya partly oscillating motion, rub the strip into the form of a carding of rounded loose untwisted fibres, which in the subsequent operation of spinning is easily drawn out to the degree of tenuity required in the yarn to be made.

The mule-frame employed for spinning woollen yarns is the same Mule in principle as, but in some respects modified in action from, the spinning. spinning-mule used for fine counts of cotton yarn. The mule (fig.

6) consists of a stationary frame on which the bobbins of sliver are placed, and of a carriage which travels back and forward a distance of in all about 2 yards from the stationary frame. The carriage contains in a horizontal row the spindles which give twist to the yarn and wind it on the bobbins or paper tubes fixed on them;

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Fig. 6.—Wool Spinning Mule.

and the complicated motions of the whoie machine are regulated by gearing and belting from head-stocks on the stationary frame. The carriage being close up to the stationary frame, the ends of the slivers are passed through a pair of small giving-off rollers and attached to the bobbins or tubes in the carriage. The carriage then begins to travel back on its rails, the slivers being simultaneously delivered to it through the rollers, at the same rate at which it travels, till, say, a yard length is given ont, and as the carriage has been moving back the spindles have been revolving slowly so as to communicate some twist to the sliver; but up to this point there has been no drawing out or drafting. But now the rollers cease to give out sliver, the carriage continues travelling back, and the spindles revolve at a greatly increased rate, simultaneously drawing out the sliver and giving it the requisite twist, till, when it comes to the end of the rails over which it runs, the yard of original sliver is drawn out to 2 yards of yarn and twisted almost enough. The full twist is given while the carriage remains standing at the end; then the spindles are reversed two or three times to unwind a small proportion of yarn which the twisting operation leaves near the point of the bobbin; and lastly the carriage is run in to the stationary frame while the spindles wind the now finished yarn on the bobbins or tubes, an automatic arrangement securing due tension and the proper wind- ing of the yarn.

Yarn, as delivered from the mule in woollen-spinning, or from the Woollen throstle in the case of worsteds, is in the condition known as singles. yarn. For twisting the singles into yarn of two or more ply it is wound on bobbins ; sometimes the bobbins from the spinning-frame are used direct, and placed on pegs in the twisting-frame, which is a mechanism like the throstle, but without the arrangement for

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Worsted yarn,

Combing.

drafting. The twist is given in the reverse direction from that in which the singles are spun, and thereby the single is to some extent untwisted. Yarns of two-, three-, and five-ply and upwards are made ; these are sometimes redoubled or again twisted together. The yarn may be made up of preeisely the same singles, sometimes different counts or sizes of singles are twisted together; in other cases the colours may be different; and yet again yarns may be made of distinct fibres, such as wool and cotton, or wool and silk, &c. Nunierous variations of the method of twisting are employed to pro- duce loops, knots, and other irregularities in the yarn, for con- venicnce in weaving and knitting fancy textures.

If we adhere to the definition of worsted yarn which distin- guishes it as being made from wool fibres brought as far as possible into a level parallel condition, we shall have to do only with two methods of manufacture, —(1) of yarn from long wool by the method of drawing, gilling, and combing, and (2) of yarn from medium and short staple wools, which are first carded and afterwards combed. But there is commonly added a third class of worsted yarns, worsted only in the sense that they are not meant for felting. These are carpet yarns and lightly twisted knitting yarns, which, being meant to be full and open in structure, are prepared for spinning by carding alone, precisely as in making woollen yarns.

The primitive method of wool-combing, and the simple imple- ments employed till comparatively recent days, when the ingenious machinery now used was invented, will serve to illustrate the problem of preparing long wool for spinning. The hand combs employed were studded with two —sometimes three—rows of long, smooth, rounded, and sharp-pointed steel spikes. The operative was provided with a pair of these combs. He had a comb-post to which he could attach them, and a comb-pot or small stove in which he heated the teeth of his combs and the wool which he worked. The teeth of one comb being duly heated he fixed it in the eomb-post, and taking a quantity of wool previously oiled he dashed it in portions into the teeth of the comb and drew it through, leaving a portion locked in the spikes, and this operation he continucd till the comb was well filled with wool. Then he placed it in the comb-pot to heat up, while he similarly proceeded to fill the teeth of the seeond comb, which in the

meantime had been heating. With both filled and duly heated, he took one comb in his left hand, laying it in his lap teeth upwards, and with the other in his right he proceeded to comb out the locks, beginning first at the tips and working gradually in as the fibres were smoothed and opened out. In the end the combs were worked with teeth close up to each other and through the entire mass, the noils or short fibre being thus entirely combed out, excepting a small quantity left Gs the teeth which could not be reached by the opposing combs.

The typical modern process in worsted-yarn fabrication is that in which the preparation consists in gilling and subsequent comb- ing, as practised when long wool is the staple to be treated. The object of gilling is to bring all the fibres level and parallel to each other, and to prepare a uniform sliver for the subsequent combing operation. The gilling-machine or gill-box (fig. 7) in its essen- tial features consists first of a pair of rollers to which the wool is

Fra. 7.——Screw Gilling Machine.

fed. Beyond these it is caught by rows of steel pins fixed in heavy stecl bars, termed fallers, which rise in close and constant succession immediately behind the feed-rollers, penetrate the wool presented to them, and travel forward with it towards a second pair of rollers which catch the fibre and draw it away. The spike-covered fallers are so called because they travel from one to the other pair of rollers, carried forward by endless screws into which they are

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threaded, then, falling down, are returned by the action of similar screws operating in the opposite direction, till just under the feed- rollers they rise again to catch the feed of wool, and so continue to circulate. ‘There is thus a continuous line of fallers travelling be- tween feed-rollers and back rollers, but as the back rollers revolve much more quickly than the front rollers, and also draw the wool through them more rapidly than it is presented to them by the fallers, there is a constant and steady drawing of

wool away from the front rollers and through the teeth of the fallers, and this draught tends to cause all the fibres to arrange themselves in the direction in which they are being gently dragged. A set of gill- boxes consists of five or six machines constructed on the same principle, but with the pins of the fallers finer and more closely studded as the fibre travels on and as the orderly and symmetrical arrangement of the sliver increases. From the first two or three machines the wool is generally delivered as a broad lap, and it is similarly presented to the next, but in the later boxes the pro- duct is condensed into a sliver, which is received in large eylin- drical tin cans. Six of these cans are brought to the front of the next gill-box, and the six slivers are, in passing through, drawn into and delivered as one, and, such an operation being repeated three times, it will be seen that any original portion of sliver must be distributed over a great length, and in this way the fibres are brought even with cach other and a very level and uniform strand is produced. In the original form of gill-box the fallers travelled from front to back at a uniform speed, and thus all the draughting was done by the rapid rotation of the back rollers. Now, by a graduated pitch in the screws which carry the fallers forward, they travel at a steadily accelerated rate, beginning slow, and reaching their greatest rapidity just as they deliver the wool to the back rollers, which revolve still more rapidly. Thus there is steady draughting throughout the whole range of the machine, and the wool is at once more gently treated and more uniformly drawn out than in the old forms of the machine.

It will be obvious that the gill-boxes through which long wool passes, while possessing the power of bringing the fibres into a smooth, equal, and regular condition, do nothing in the way of selecting and separating out the long and straight from the short and curly fibres which are always intermixed. To obtain an even and smooth worsted yarn it is necessary to effect this separation, and it is the function of the various forms of combing machine now in use to separate the " top" or long fibre from the "noil" or short and broken wool, and to deliver the former as a continuous sliver of uniform size, The invention of a successful combing machine has been the great triumph of the modern worsted in- dustry, and the introduction of the apparatus led, as is commonly the case with all great inventions, to a vast amount of dispute and litigation, and many

conflicting claims of merit. About 1840 at least three investigators were separately at work on the problem —Mr S. C. Lister of Bradford, Mr Donisthorpe of Leicester, and M. Heilmann of Alsace. Messrs Lister and Donisthorpe conjointly secured a patent for a combing machine, in connexion with which they entercd into partnership, but their patent rights were success- fully disputed by Heilmann under a patent granted to him in 1847, and they were obliged to buy up his invention for £80,000. Since that time much attention has been given to combing machinery, not for wool alone, but also for spun silk and cotton; and now there are many varicties of apparatus in the market for doing what not very long ago was pronounced to be utterly impracticable. The three principal classes of machine at present used for wool-combing are—(1) the Lister or nip machine, which is most suitable for long combing wools, mohair, and alpaca; (2) the Noble or circular comb, principally useful for combing shorter staple or intermediate wools ; and (3) the Holden or square-motion comb, which is applicable for short staple wools. It is impossible here to convey a full con- ception of the delicate almost intelligent manner in which these machines work.

Drawing.

Carded worsted.

Throstle spinning.

Shoddy and mungo,

MANUFACTURE. |

rollers, which thus deliver four continuous slivers of top, and lcave the noil to be otherwise lifted out of the tecth.

The sliver as delivered from the combing machine is made up into a ball by a balling gill-box, behind the back rollers of which instead of a can there is a large bobbin for recciving the sliver, which is wound on it in a diagonal manner from the oscillating rotation given to the bobbin. Such balls of sliver then undergo the operation of drawing, the purpose of which is still further to equalize the strand of fibre, and to bring it into a

sufficiently attenuated form for spinning. The principle of drawing or draughting consists in presenting the sliver to a pair of receiving rollers which pass it on to a pair of delivery rollers, which rotate proportionately faster than the receivers, and to that extent draw out and attenuate the sliver. Supposing the wool to pass through six such drawing frames, six slivers may be fed into the first and drawn out to the dimensions of one; the same may be repeated in the second, five slivers may be reduced to onc in the third, four to one in the fourth and fifth frames; and in the roving frame, in which a little twist is given to the sliver before it is wound on a bobbin, two slivers may be elongated into onc. Thus we have any length of sliver drawn out 6×6×5×4×4×2=5760 times its original extension, and with increase of framcs this extension multiplies enormously. Treating the slivers in nine drawing frames, we may have 8×6×5×5×5×4×3 ×2 × 2=288,000 of extension.

Short and medium staple wools are carded before being gilled and combed. The preliminary operations differ in no way from those employed for woollen yarns. After carding the wool is gencrally washed, previous to gilling in a back washer. The machine consists of two sud bowls or vats provided with immersers and squeezing rollers through whieh the eardings are passed ; then they are carried round two eopper cylinders internally heated by steam, from which they are passed on and delivered by the fallers of a gilling apparatus.

The bobbins of elongated and slightly twisted rovings are now ready for spinning on the throstle spinning-frame, on which it is simultaneously drawn out to its ultimate tenuity, twisted, and wouud ona bobbin. The drawing out is done practically by the same device as the drafting of sliver in the drawing-frame. The bobbins of rove are placed on pegs on the frame slightly canted forward, so that the roving as drawn off comes away at right angles from the bobbin. The rovings pass first between a pair of rollers, and are earried on and supported by small carrier rollers till they reacha front pair of rollers, the upper of which is covered with leather and the lower grooved or furrowed. The space between the back and front pairs of rollers, termed the ratch, is that in which the final drawing is effected, and the amount of attenuation effected is dependent on the relatively faster rate at which the front rollers rotate as compared with the

back pair. Immediately the slender cord has passed the front pair of rollers, twist is imparted to it by the spindle working either on the old flyer principle, on the cup principle, or with the more recent ring and traveller. See also Yarn. The doubling and subsequent treatment of worsted singles are the same as in the case of woollen yarn singles from the mule frame.

The term shoddy was formerly one of some opprobrium in con- nexion with woollen manufactures, but the substance is now frankly recognized as a material of great utility for many purposes when body and warmth are more essential than toughness or elasticity. Shoddy consists of rags and shreds of stockings, flannels, and other soft worsted fabrics torn and reduced to such fragments of the original fibre as ean be made by the operation. Mungo is a similar pre- paration made from rags, and from shreds and clippings of milled woollen cloths, being divided into new mungo made from tailor's waste, and old mungo from rags of all degrees of degradation. Extract wool is that which is recovered from rags of various cloths in which cotton and wool are variously woven together. The wool is freed from the cotton by the same chemical or earboning process which is employed in freeing dirty wool from burrs, viz., by treating the union fabric with a solution of sulphuric acid and heating it in a stove, when the acid energetically attacks and chars the vegetable fibre, leaving the wool unharmed. Shoddy and mungo are prepared by dusting the rags and fragments, elassifying them according to eolour and quality, picking out seams, oiling the material, and then passing it intoa machine significantly called the "devil," which literally rends the rags, &c., to fragments, which look more like dust than fibres, by the exceedingly rapid rotation of a swift or large cylinder armed with powerful iron spikes, with equally strong toothed rollers revolving in an opposite direction. Into the same eategory with these come the flocks formed in the various pro- cesses of finishing cloth, which are, of course, even shorter than the others. Indeed the shoddy manufacturers hold that " anything long enough to have two ends "' is sufficient for manufacturing purposes. The shoddy trade was begun in Batley, Yorkshire, by Mr Benjamin Law in 1813, and, notwithstanding the disfavour with which it was long viewed, it prospered and developed till the shoddy district of Batley, Dewsbury, and their surroundings became the eentre of a great and prosperous branch of the woollen trade entirely

dependent on these disintegrated materials. It is said that as much as 125,000,000 tb of shoddy material is now yearly worked up into cloth in England aloné. Shoddy, &c., cannot be used without a due proportion of natural-length wool, usually one-third of pure wool being employed in spinning shoddy yarn ; but sometimes as much as 80 per eent. of the finished cloth eonsists of shoddy. It finds its way into a very large proportion of woollen goods, but its use is detrimental where tenacity and wear are required, For linings, rugs, wraps, and heavy friezes, pilots, druggets, blankets, &c., in which bulk and warmth more than wear-resisting qualities are required, it is suitable, and it also makes into good light milled cloth for ladies' jackets. Shoddy is practically a new source of textile material; its employment is a utilization of waste, and fur- nishes eheap serviceable textures.

For the dyeing and weaving of woollen and worsted fabrics the reader is referred to the separate articles relating to these processes, But a piece of cloth—woollen eloth especially—as it coines from the loom is very far from being a finished product. Indeed the most characteristic operations in woollen-cloth manufacture are subsequent to the weaving stage. Woollen cloth from the loom, ealled "roughers," has an irregular, slack aspect, very different from the same web when it comes to be sold as, say, broad-eloth, The web as it leaves the loom is still saturated with the oil with which it was sprinkled before spinning, and impregnated with the size applied to the yarn to give it tenacity and consistency in weav- ing. 'To remove these it is scoured with hot soap-sud in a trough having a convex bottom, and fitted with wooden mallets which are made to fall obliquely against the cloth. After being scoured in this way, it is stretched in a frame for burling or perching, an operation which eonsists in going carefully over the whole web, picking out all burrs and knots in the texture, and darning up holes aud open spots which it may show.

Fulling is the one process which is specially distinctive of woollen texturcs,—its results being shown in the highest degree in broad- cloths, doeskins, and other like goods. Every one knows how flannels, blankets,

and hosiery tend to contract with frequent washing, gaining in thickness and solidity what they lose in exten- sion and elasticity ; such shrinking is greatly accelerated when. woollen articles are much rubbed in very hot water. This shrink- ing or fulling is, as already explained, the result of the serrated wavy structure of wool. The operation of fulling or milling is performed in the fulling stocks, or in the more modern milling- machine; but, by whatever agency carried out, the effect is always the same. The old method of fulling by the stocks is wasteful of power, and the blows the stocks give tend sometimes to tear the eloth, drawbacks from which the milling-machine is comparatively free. The cloth to be fulled is well saturated with hot soap and water, and either worked under the falling weight of the stocks or pressed and rubbed between rollers in the milling-machine while so heated and soaped. The more prolonged the operation the more docs the material shrink up and thicken, and a piece of cloth may even be milled till it is reduced to half its original length and breadth. The degree of fulling is a distinctive feature of many different varieties of eloth. In the treatment of broad-cloth, doe- skins, meltons, and all nap-finished cloth, the milling is carried so far that the fibres become densely matted, obliterating the appear- ance of weave, and giving the piece more the aspect of felt than of cloth. Fabrics such as Venetian cloths, and diagonals, &c., to which no pile-finish: is given, are milled only to the extent of solidifying and increasing the substance and strength of the texture, and tweeds are only very slightly felted to give them a dressed surface, On the conclusion of the fulling operation the goods are scoured to free them from soap, which is very simply done by gradually supplanting the soap-sud with pure water, which is tepid at first but is gradually cooled by additions till in the end the cloth is being worked in pure cold water. ;

The cloth that is taken from the fulling-maehine must immedi- atcly be stretched uniformly in all directions by hooks on a frame, so that it may dry evenly without wrinkle or eurl. The fraime may be placed in a hot-air chamber to hasten the drying, or the eloth may be allowed to dry under ordinary atmospheric eonditious. In this operation a pile or nap is raised on the surface of milled cloth. The raising of the pile is effected by the agency of the flower-head of the teasle (Dipsacus fullonum), which forms a cone- like spike eovered with imbricated scales. These scales end in

sharp, recurved hooks, possessed of high elasticity, combined with just sufficient stiffness for the work they have to do. The use of these hooked teasles is to scratch the surface of the milled cloths, and getting entangled with minute surfaee fibres break these or pull out their ends, and so raise over the whole surface a fine but un- equal nap. Formerly the teasles were set together in a flat frame, and by hand the workmen brushed them in a uniform manner over the whole surface of the tightly stretched eloth. But this labori- ous handicraft has long been superseded by the use of the gig-mill or dressing-machine. 'This apparatus consists of a eylinder made to rotate at a high rate of speed. The surface of the eloth to be raised is, in a state of uniform tension, brought in contact with the

Cloth finishing.

Fulling.

Teasling.

Cropping.

Pressing.

Manufae- tures in wool.

Trade.

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revolving cylinder. An automatic arrangement in the machine regulates the lightness or eloseness of contact of cloth and teasles. The myriads of elastic hooks scrateh the entire surface, disengaging and opening up short fibres, and thus covering the whole with a nap. There are, however, several varieties of pile desired in dressing woollen cloths, and a pile may be raised in a certain class of fabrics for a purpose quite the opposite of that for which other piles are formed. Thus in cloth dressing the object is to get a glossy and smooth nap which quite covers and conceals the under- lying structure, while tweeds and similar goods are teasled with the view of ultimately removing all pile from the surface and leaving the

pattern of the cloth well defined and free from all hairiness. Pile-dressed fabrics are raised by the wet method: that is, the cloth to be operated upon in the dressing-machinc is first damped, and the nap so produced lies smooth, flat, and level in one direc- tion, covering the surface in much the same way as short hairs cover the skin of an animal. Cloth raised dry, on the other hand, throws its fibre ends straight out from the cloth, the action indeed being a kind of eombing-up of all the more loose and open surface fibres so as to prepare them for being entirely cropped or shorn off in order to leave the fabric with a elean, bare surface. Metallic teasles have frequently been suggested and to some extent employed as a substitute for the vegetable product, but hitherto such devices have not proved quite satisfactory.

The operation of cropping was also formerly a handicraft, the worker using a huge pair of shears, and the employment demanded much dexterity and skill to produce a uniform smooth pile or a well-cleaned surface. It is now done with equal rapidity and certainty by a machine which in principle is the same as the lawn-mower. It consists of a eylinder armed with a series of helical knives or cutters, the cylinder revolving with great velocity against the smooth stretched surface of the cloth, partly cutting away and partly tearing off the tips of the projecting fibres which come within the range of its ledger-blades. Four hundred years before the practical introduction of this helical cropping machine, it was invented and proposed for moderna use by Leonardo da Vinci.

With the view of giving lustre to the finished cloth, it is, when taken from the cropping machine and brushed on the brushing machine to reniove the flocks produced in shearing, wound tightly round a huge drum, and boiled, or rather immersed in water heated to from 160° to 180° F., for three or four hours. It is then nnwound, the ends are reversed, winding first on the roller the end whieh was on the outside in the previous boiling, and again boiled. Finally it is pressed in an hydraulic press, in which the cloth is heated either by the introduction of hot iron-plates between the folds or by forcing steam through it in the press, this last process adding to the solidity and smoothness of the cloth and developing the lustre characteristic of a well-finished fabric.

The range and variety of cloths and other textures made from wool are exceedingly great. Under the heading of cloth manufac- tures, there may be enumerated, of piled cloths, broad-cloth, doeskins, cassimeres, meltons, beavers, and friezes. Of cloths milled and cropped bare there are venetians, sataras, and diagonals, which differ in the arrangements of warp and weft in the weaving. Tweeds, which form an important item, are cloths only slightly felted, raised dry, eropped, and pressed. The variety of worsted cloths is still greater, embracing says, serges, sateens, repps, merinos, mousselaines-de-laine, tartans, camlets, Russell cords, coburgs, lastings, delaines, and Orleans cloth. Hosiery forms a manufacture apart, as do also the processes of making carpets, blankets, flannels, shawls, rugs, and wrappers, curtain-cloths, and alpaca and mohair textures.

Asan illustration of the advantages which have resulted from the application of machinery to the many and complicated pro- cesses of cloth manufacture, it has been calculated by M. Alcan that, whereas in the 17th century the labour of more than 10,000 men was needed to produce in one day a ton of cloth from a ton of wool, that amount of work now can be done in one day by about 1900.

Wherever civilized mankind dwell there is found wool produc- tion, with more or less of woollen manufaeture. This fact not- withstanding, the eultivation of wool tends to become increasingly associated with special localities, and from age to age different regions cnter into competition as sources of wool, and the great sources of supply correspondingly change their position. Neglect- ing the produce of Britain, which probably has not varied to any notable extent during the century, though its movement as an article of export has developed greatly in that interval, we may briefly note the vast developments which have taken place in some sources of supply. In 1800 most of the wool, other than that from native sources, used in England came from Spain. In 1810 167 tb was imported from the Australian colonies, and now the imports from these colonies reach 400,000,000 Ib yearly, and the imports from Spain have dwindled to 1,700,000 ib. Similarly the quantity brought from the Cape of Good Hope has grown from about 30,000 ib in 1820 to 61,250,000 tb in 1886. The growth and fluctuation in the imports from these and other regions are exhibited in the following table :—

WOOL

[MANUFACTURE.

Imports of Wool into the United Kingdom from the Princtpal

Countries, Foreign and Colonial (given in thousands of lbs.). a aie South East Total from Spain, | Gorey, | neiela, Africa. Indies, {all Countries.

1800 6,062 412 f oS 8,609 1810 5,592 778 167 pat 10,914

1820 3,536 5,113 99 30 9,775 1830 1,643 26,073 1,967 33 32,305 1840 1,266 21,812 9,721 751 2,441 49,436

1850 440 9,166 39,018 | 5,709 3,473 74,326 1860 1,000 9,954 59,166 | 16,574 | 20,214 151,218

1870 25 4,406 175,081 32,785 11,148 263,250

1880 1,580 7,174 | 300,627 | 51,386 | 29,190 463,309 1886 1,710 3,281 | 401,426 | 61,257 | 34,597 615,998

The exports of raw wool have risen in fairly steady proportion to the imports, springing up from 92,542,384 fb in 1870 to 311,902,741 tb in 1886, the average excess of the imports over the exports each year being froni 200,000,000 to 230,000,000 fb.

The following table exhibits the relative position and progress of the principal textile manufactures in the United Kingdom at various periods : —

Description Persons Employed. Power Looms.

1878, 1836,

1856.

1870, | 1878.

Cotton…...

259,104 |379,213 |450;087 | 482,903 |108,751 |298,847 |440,676 |514,911 Woollen….| 54,808} 79,091 |125,130| 134,344 | 2,150) 14,453 | 48,140) 56,944 Worsted….| 31.628] 87,794|109,587] 130,925 | 2,969) 38,956) 64,654) 87,393 Flax .| 43,557 | 80,262 |129,772| 108,806 | 1,714] 9,260) 35,300] 40,448 Pa lRsusipace- 34,303 | 56,137| 48,124 40,985 209| 7,689] 12,878) 12,546 Totals……. 423.400 |682,497 |862,700| 897,963 |115,793 |369,205 |601,148 |712,242

The growth of the export trade from the United Kingdom in woollen and worsted manufactures from 1820 is exhibited in the

subjoined table (in thousands of pounds sterling) :—

Woollen Total Woollen Total

Porro and Woollen Pte and Woollen reel Worsted jJandWorsted Gana Worsted jand Worsted

*sea Yarns. | Exports. * | Yarns. Exports.*

1820 | 5,586 ora 5,586 1857 | 10,703 2,943 13,646

1830 4,728 122 4,851 1865 | 20,141; 5,100 25,241

1840 5,327 452 5,780 1870 | 21,665 4,994 26,659

1850 | 8,588 1,451 10,040 1880 | 17,265 3,345 20,610

The following is the detailed statement of exports from the United Kingdom from the Board of Trade Returns for 1887 :—

Quantities.

Woollen and worsted yarns…….-.ceseeeees 40,165,100 tb. £3,970,205 Coatings, all WOO].....-scsseseeesscesssensssees 17,175,900 yds. 3,843,872 Do., mingled with other materials….} 29,057,500 yds. 3,682,913 Woollen Stuffs…....-ccccrescccsscseccescescceseeees 49,582,300 yds.

2,311,107 Worsted Coatings…....cccccssssnssessesessessesees 10,038,800 yds. 1,832,072 Worsted (B6088.6..sca-vadsannsaistvscrssesacéassexsey 151,362,000 yds. 5,113,191 IGE ihren Steen nen eden ate (3a ee pe Bae 10,925,000 yds. 416,307 Carpets … rcccccccccesccerssetcscoscecscesscorsceaceses 12,980,300 yds, 1,310,241 Blankets……....cccccoseccsecerssescsvvessesssescessrs 1,578,912 pairs. 545,576 WROSLOTY ccc viswcesucsncsssasesseceuaneesosccsscessesnes 'ee 734,691 Small wares and unenumerated…....+ 794,539 Total… :.cceccccecsessssecsenssee sae £24,554,714

Alpaca ana Mohair YarN……....cceseer eer eeeens 12,196,100 tb. £1,081,971

Particular districts have attained a predominant hold on certain branches of the manufacture, and with great tenacity the industries have clung for long periods to the districts which have succeeded in establishing a reputation for the branches they cultivated. In this way the manufacture of superfine broad-cloths has been long associated with the West of England, specially with Wiltshire and Gloucestershire, and in that district the trade in fine cloth is still chiefly centred. In point of quantities produced, how- ever, and of persons employed, the West Riding of Yorkshire woollen cloth districts far outstrip the West of England, and are the true centres of all industries connected with wool. Of woollen cloths of all kinds the towns of Leeds and Huddersfield are the most important producers. The shoddy trade has been specially developed at Batley and Dewsbury, and the numerous manufac- tures of worsted have their principal centre in Bradford and the populous district surrounding it. Norwich, at one time the eapi- tal of worsted manufactures, and a large producer of shawls, thanks to the immigration of Flemings, has entirely lost its supremacy, probably owing to the superior coal facilities of Yorkshire, but it is yet the seat of no inconsiderable worsted manufacture. The hosiery trade is developed chiefly in and around Leicester, and at Kilmarnock the allied knitting of bonnets is a specialty. Flannels and blankets are associated with Wales ; the carpet trade belongs principally to Kidderminster, Halifax, Glasgow, and Kilmarnock. Shawls are made in Paisley, Alva, and Alloa in Scotland, knitting- yarns being a largely developed industry in the two last-mentioned towns. Tweeds are the

special industry of Hawick, Galashiels, Dumfries, and Aberdeen, and also form an important part of the manufactures of Leeds, (J. PA.)

Imports of wool.

Exports of wool.

Factory employ- ment.

Export of manu- faetures.

Centres of industry.

WO0O0O—WO0O0

WOOLLETT, Wittiam (1735-1785), engraver, was born at Maidstone, of a family which came originally from Holland, on August 15, 1735. He was apprenticed to John Tinney, an engraver in Fleet Street, London, and he also studied in the St Martin's Lane academy. His first important plate was from the Niobe of Richard Wilson, published by Boydell in 1761, which was followed in 1763 by a companion engraving from the Phaethon of the same painter. After West he engraved his fine plate of the Battle of La Hogue (1781), and the Death of General Wolfe (1776), which is usually considered Woollett's masterpiece. In 1775 he was appointed engraver-in- ordinary to George III; and he was a member of the ' Incorporated Society of Artists, of which for several years he acted as secretary. He died in London May 23, 1785.

In his plates, which unite work with the etching-needle, the dry-point, and the graver, Woollett shows the greatest riehness and variety of execution. In his landscapes the foregrounds are distinguished by depth and vigour, the distanees by the utmost tenderness; and his rendering of water is particularly excellent. In his portraits and historieal subjects the textures are varied and well diseriminated, and the rendering of flesh is characterized by great softness and delicacy. His works rank among the great productions of the English school of engraving. Louis Fagan, in his Catalogue Raisonné of the Engraved Works of William Woollett (1885), has enumerated 123 plates by this engraver.

WOOLSORTER'S DISEASE (Antarax, ANTHRAC- MIA, CHARBON, or MALIGNANT Pustutz) is the term applied toa virulent acute malady occasionally occurring in workers in the wool or hair, as well as in those handling the carcases, of animals, chiefly sheep and oxen, which had been affected with splenic fever. The disease, as it is seen in animals, has been described in the article Mourrain (9.v.). The present notice refers only to the malady in man.

For many years cases of sudden death had been observed to occur from time to time among healthy men engaged in woollen manufactories, particularly in the work of sorting or combing wool. In some instances death appeared to be due to the direct inoculation of some poisonous material into the body, for a form of malignant pustule was observed upon the skin; but, on the other hand, in not afew cases without any external manifestation, symptoms of blood-poisoning, often proving rapidly fatal, suggested the probability of other channels for the introduction of the disease.

In 1880 the occurrence of several such cases among woolsorters at Bradford, reported by Dr Bell of that town, led to an official inquiry by the Local Government Board, and an elaborate investigation into the pathology of the disease was at the same time conducted at the Brown Institution, London, by Professor Greenfield.

Among the results of this inquiry it was ascertained— (1) that the disease appeared to be identical with that known by the name of splenic fever or anthrax occurring among sheep and cattle; (2) that in the blood and tissues of the body was found in abundance, as in the disease in animals, the bacillus anthracis, which is held to be the infecting agent in communicating the malady ; and (3) that the skins, hair, wool, &c., of animals dying of splenic fever retain this infecting organism, which, under certain conditions, finds ready access to the bodies of the workers.

Two well-marked forms of this disease are recognized, external anthrax and internal anthrax. In external anthrax the infecting agent is accidentally inoculated into some portion of skin, the seat of a slight abrasion, often the hand, arm, or face. A minute swelling soon appears at the part, and develops into a vesicle containing serum or bloody matter,

and varying in size, but seldom larger than a shilling. This vesicle speedily bursts, and leaves an ulcerated or sloughing surface, round about which are

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numerous smaller vesicles which undergo similar changes, and the whole affected part becomes hard and _ tender, while the surrounding surface participates in the inflam- matory action, and the neighbouring lymphatic glands are also inflamed. This condition, termed malignant pustule, is frequently accompanied with severe constitu- tional disturbance, in the form of fever, delirium, perspira- tions, together with great prostration and a tendency to death from septicemia, although on the other hand recovery is not uncommon. It was repeatedly found that the matter taken from the vesicle during the progress of the disease, as well as the blood in the body after death, contained the bacillus anthracis, and when inoculated into small animals produced rapid death, with all the symptoms and post-mortem appearances characteristic of splenic fever.

In internal anthrax there is no visible local mani- festation of the disease, and the infecting material appears to gain access to the system from the air charged with it, as in rooms where the contaminated wool or hair is unpacked, or again during the process of sorting. The symptoms usually observed are those of rapid physical prostration, with a small pulse, somewhat lowered tem- perature (rarely fever), and quickened breathing. Exam- ination of the chest reveals inflammation of the lungs and pleura. In some cases death takes place by collapse in less than one day, while in others the fatal issue is postponed for three or four days, and is preceded by symptoms of blood-poisoning, including rigors, perspira- tions, extreme exhaustion, &c. In some cases of internal anthrax the symptoms are more intestinal than pul- monary, and consist in severe exhausting diarrhcea, with vomiting and rapid sinking. Recovery from the internal variety, although not unknown, is more rare than from the external, and its most striking phenomena are its sudden onset in the midst of apparent health, the rapid develop- ment of physical prostration, and its tendency to a fatal termination despite treatment. The post-mortem appear- ances in internal anthrax are such as are usually observed in septicemia, but in

addition evidence of extensive inflammation of the lungs, pleura, and bronchial glands has in most ca:es been met with. The blood and other fluids and the diseased tissues are found loaded with the bacillus anthracis, and inoculation experiments, such as those already referred to, produced similar results.

Treatment in this disease appears to be of but little avail, except as regards the external form, where the malignant pustule may be dealt with early by strong caustics to destroy the affected textures. For the relief of the general constitutional symptoms, quinine, stimulants, and strong nourishment appear to be the only available means. As preventive measures in woollen manufactories, the disinfection of suspicious material, or the wetting of it before handling, is recommended as lessening the risk to the workers.

WOOLSTON, Tuomas (1669-1731), English deist, born at Northampton in 1669, was the son of a "reputable tradesman," entered Sidney College, Cambridge, in 1685, studied theology, and was made a fellow of his college. Whiston states that he " was in his younger days a clergy- man of very good reputation, a scholar, and well esteemed as a preacher, charitable to the poor, and beloved by all good men that knew him." After a time, by the study of Origen, he became possessed, to fanaticism bordering on insanity, with the notion of the importance of an allegorical interpretation of Scripture, and advocated its use in the defence of Christianity both in his sermons and in his first book, Zhe Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived (1705). For many years he published nothing, and was left to pursue

his allegorical fancies in peace. But in 1720-21 the publication of letters and pamphlets in advocacy of his notions, with open challenges to the clergy to refute them, brought him into trouble. It was reported that his mind was disordered, and Whiston states that his college allowed him his fellowship, though not in residence, on account of his illness, but that when he appeared at college to prove that he was well he was ordered to go into residence. On his refusing to do this his fellowship was taken from

him (1721). Whiston interceded for him in vain, " the clamour against him running so high." In the " Life" prefixed to the collected edition of his works, his non-residence is de- scribed as only "a pretence for depriving him." From 1721 he lived for the most part in London, on an allowance of £30 a year from his brother and other presents. He continued to publish bitter and scurrilous pamphlets against the clergy and the advocates of the literal sense of Scripture. His influence on the course of the deistical controversy commenced with his book, Zhe Moderator between an Infidel and an Apostate, or the Controversy between the Author of the Discourse of the Grounds and Reasons of the Christian Religion and his Reverend Ecclesiastical Opponents Set in a Clear Light (1725, 3d ed. 1729). The 'infidel " intended was Anthony Collins, who had maintained in his book alluded to that the New Testament is based on the Old, and that not the literal but only the allegorical sense of the prophecies can be quoted in proof of the Messiahship of Jesus. Woolston interposed as umpire in the contro- versy thus started, and, passing from the evidence from prophecy, which alone he allowed, opened the great debate on the evidential value of the miracles of Christ. He denied absolutely the proof from miracles, called in ques- tion the fact of the resurrection of Christ and other miracles of the New Testament, and maintained that they must be interpreted allegorically, or as types of spiritual things. Two years later he commenced a series of Descourses on the same subject, in which he applied the principles of his Moderator to the miracles of the Gospels in detail. The Discourses, 30,000 copies of which were said to have been sold, were six in number, the first appearing in 1727, the next five 1728-29, with two Defences in 1729-30. The pub- lication of the Jfoderator drew upon him a prosecution by the attorney-general in 1726 for blasphemy and profaneness, which was suspended in consequence of Whiston's interces- sion. But the appearance of the first four of his Discourses caused the renewal of the prosecution, and on March 4, 1729, the trial ended in his being found guilty of the alleged crime. He was sentenced (Noy. 28) to pay a fine of £25 for each of the first four Descourses, with imprisonment till paid, and also to a year's imprisonment and to give security for his good behaviour during life, namely, to be bound himself in a recognizance of £2000 and two securities of £1000 each, or four of £500 each. He failed to find this

security, and remained in confinement until his death, though he mitigated its severity by purchasing the liberty of the rules of the King's Bench. Dr Samuel Clarke solicited at court for his release, but Woolston's death auticipated any results of his efforts. He died in prison January 21, 1731.

In his attack on the miracles Woolston does not raise the general philosophical question of their possibility, but confines himself to the task of seeking to prove that the accounts of them as given in the Gospels arc, when taken literally, full of contradictions, absurdities, and ineredibilities, and that thcy must therefore be interpreted as allegory, and emblems of Christ's more mysterious work. In his view, however, that work of Christ appears to be nothing more than to teach the mystical sense of the Old Testament, the best part of which is the "simple golden religion of nature." He evidently had formed to himself no clear theory of the origin of the accounts of the miracles, sometimes ascribing them to the fancy of the writers, sometimes to deliberate invention, and he does not scek to harmonize any such view of them with their emblem-

| atic character, of which he is such a fanatical advocate. Whiston remarks, probably with truth, "When Woolston died he hardly knew himself whether he believed the Christian religion or not." Though it cannot be denied that he anticipated, in some of his criticisms of the details of the miraculous narratives, many points since urged by Reimarus, Strauss, and others, he nowhere exhibits the least soundness of judgment, historical sense, or eonsistency of thought, while his language and illustrations are coarse and offensive in the extreine.

Upwards of sixty more or less weighty pamphlets appcared in the next few years in reply to his Afoderator and Discourses. As amongst the abler and most popular of them may be mentioned Dr Z. Pearce's The Miracles of Jesus Vindicated, 1729; Sherlock's The Tryal of the Witnesses of the Resurreetion of Jesus, 1729, 13th ed. 1755; and Lardner's Vindication of Three of Our Saviour's Miracles, 1729, Lardner being onc of those who

did not approve of the prose- cution of Woolston (see Lardner's Life by Kippis, in Lardner's Works, vol. i.).

See Life of Woolston prefixed to his Works in five volumes, London, 1733; Memoirs of Life and Writings of William Whiston, London, 1749, pp. 231-85 ; Appendix to A Vindication of the Miracles of our Saviour, &c., by J. Ray, 2d ed. 1731; Lechler's Geschichte des Englischen Detsmus, 1841; Leland's View of the Principal Deistical Writers, 1734; Leslie Stephen's History of English Thought in 18th Century, ch. iv.; Cairns's Unbelief in the Eighteenth Century, 1880; Sayons's Les Déistes Anglais, 1882.

WOOLWICH, a parliamentary borough and garrison town of Kent, England, is situated chiefly on the south bank of the Thames, on the declivity of Shooter's Hill, which slopes downwards to the river, 10 miles from Charing Cross by rail and 12 by steamer. The town is irregularly built, with narrow streets, and for the most part mean-looking houses. The spacious level at the summit of the hill is known as Woolwich Common. The feature of Woolwich is the Royal Arsenal, at which the number of men usually employed is about 10,000. It occupies an area of 333 acres, and includes four depart- ments :—the royal gun factories, employed in the manu- facture of rifled wrought-iron and steel ordnance, the principal divisions being the rolling and puddling furnaces, the coiling mills, the boring mills, the tanneries, and the steam-hammers, including one of 40 tons; the royal carriage department, for the manufacture of gun carriages, pontoon trains, baggage and store waggons, and ambulances for the sick and wounded ; the royal laboratory department, for the manufacture of shot and shell, caps, fuzes, &c. ; and the ordnance store department of the army, for the supply of every kind of military equipment. Separated from the other portions of the arsenal are the laboratories for the manufacture of rockets and cannon cartridges. The Royal Artillery Barracks, facing the Common, originally erected in 1775, has been greatly extended at different times, and now consists of six ranges of brick building, each over 400 feet in length. It includes a church in the Italian Gothic style erected in 1863, a theatre, and a library of 40,000 volumes in connexion with the officers' mess room. Opposite the barracks is the memorial to the officers and men of the royal artillery who fell in the Crimean War, a bronze figure of Victory cast out of

cannon cap- tured in the Crimea. Near the barracks is the Royal Artillery Institution, with a fine museum and a lecture hall. On the western side of the barrack field is the Royal Military Repository, where all officers of artillery pass a term of instruction. Within the Repository enclosure is the Rotunda, originally erected in St James's Park for the reception of the allied sovereigns in 1814, and shortly afterwards transferred to its present site. It contains models of the principal dockyards and fortifications of the British empire, naval models of all dates, and numerous specimens of weapons of war from the remotest times to the present day. On the Common is the Royal Military Academy, where cadets are trained for the artillery and engineering services, erected in the castellated style from the design of Sir R. Wyatville in 1801. Within the grounds is a memorial erected to the prince imperial of France, for two years a student in the academy; while near | the Rotunda is a monument erected in 1882 to the memory

of the members of the royal artillery who fell in the Zulu and Afghan wars of 1879. In addition to the great barracks of the royal artillery there are a number of other barracks, and a permanent camp of huts. At the south- east extremity of the Common is the Hubert military hospital. The parish church of St Mary Magdalene was rebuilt, in 1726-29, near the site of the old one dating from before the 12th century. The other parishes are Holy Trinity, St John the Evangelist, and St Michael's and All Angels. 'The Goldsmiths' almshouses, originally founded by Sir Martin Bowes, who was lord mayor of London in 1545, and rebuilt in 1771 by the Goldsmiths' Company, are (1888), on the appropriation of the charity to pensions, to be purchased by the trustees of the present parochial almshouses, built by private benevolence. Behind the Royal Military Academy is a mineral well, " the Shooter's Hill waters" of Evelyn. Near Woolwich Common there are brick and tile kilns and sand and chalk pits. In the neighbourhood are extensive market-gardens. The town is governed by a local board of health, and is within the juris- diction of the central criminal court and the metropolitan police. The population of the

entire parish of Woolwich (area 1126 acres) in 1871 was 35,557 and in 1881 it was 36,665, The population of the district now included in the parliamentary borough, which comprises the parishes of Woolwich, Eltham, and Plumstead, was 74,963 in 1881.

Woolwich (Wulewich) is mentioned in a grant of land by King Edward in 964 to the abbey of St Peter at Ghent. In Domesday, where the manor is mentioned as consisting of 68 acres of land, it is named Hulviz. The Roman Watling Street crossed Shooter's Hill, and a Roman cemetery is supposed to have occupied the site of the Royal Arsenal, numerons Roman urns and fragments of Roman pottery having been dug up in the neighbourhood. Wool- wich secms to have been a small fishing village until in the beginning of the 16th century it rose into prominence as a dock- yard and naval station. There is evidence that ships were built at Woolwich in the reign of Henry VII., but it was with the purchase by Henry VII]. of two parcels of land in the manor of Woolwich, called Boughton's Docks, that the foundation of the town's prosperity was laid, the launching of the " Harry Grace de Dieu," of 1000 tons burden, making an epoch in its history. Woolwich remained the chief dockyard of the English navy until the introduction of iron ship building, but the dockyard was finally closed in 1870. The town has been the headquarters of the royal artillery since the establishment of a separate branch of this service in the reign of George I. An arsenal existed at Woolwich in the reign of Henry VI1., and the laboratory is mentioned in 1695. On account of an explosion at Moorfields, the gun foundry was removed to Woolwich in 1716, but the establishment was of minor importance until the commencement of the Napoleonic wars. In 1860 the arsenal was greatly extended. Formerly Woolwich was included in the parliamentary borough of Greenwich, but in 1885 it was made a separate borough returning one member.

WOONSOCKET, a town of Providence county, Rhode Island, United States, on the Blackstone river, 16 miles from Providence and 37 from Boston. The surrounding country, which is fertile, is devoted to market-gardening and dairying. 'There are 64 miles of streets. The popu- lation (11,527 in 1870) was 16,050 in 1880, being nearly half of foreign birth, a fact explained by its extensive manufactures. The principal industries are

the manufac- ture of cotton and woollen goods; of the latter Woon- socket produces more than any other city in the United States, while in the former industry it is excelled by few. Its importance as a manufacturing town is due to the magnificent water-power within its limits.

WORCESTER, a midland county of England, of a very irregular shape, and of curious arrangement. Some of its parishes are detached from the county, while portions of other counties extend within its boundaries. It is bounded on the N. by Staffordshire, E. by Warwickshire, S. by Gloucestershire, W. by Herefordshire, and N.W. by Shrop- shire. The greatest length from north to south is 34 miles, and its breadth 30 miles. The area is 472,453 acres, or about 738 square miles.

Surface and Geology.—The surface consists of very fine and picturesque hills and well-watered and fruitful valleys, and the county is certainly one of the fairest and most picturesque in England. Its finest hills are the well- known Malvern Hills on its south-west border, the Abberley Hills running north from them, the Lickey and Clent Hills in the east, and in the south the Bredon Hills, which are a continuation of the Cotswolds. The principal rivers are the Severn, which is navigable, and runs through the county from north to south; the Stour, which joins the Severn at Stourport; the Teme, which enters the county at Tenbury, receives the Kyre and the Leigh, and falls into the Severn below Worcester; and the Warwickshire Avon, which joins the Severn at Tewkesbury. The valley of the Severn is appropriately named the Vale of Worcester, and that of the Avon the Vale of Evesham,— the latter being generally considered one of the loveliest valleysin England. The rivers are well stocked with fish,— salmon, trout, grayling, shad, and lampreys being found in most of them.

The chief geological formation of the county is the Triassic, and a line running north and south through the Malvern Hills and the Forest of Wyre ccalfield would divide the hard and ancient Paleozoic strata from the softer and more recent Mesozoic. Black shales, of about 1000 feet thick, rest upon the Hollybush sandstone. near Bransill Castle ; and the Silurian formation extends west of the Malverns as far as Abberley. The sandstone known as May Hill exists in the south-west, reaching the

Herefordshire Beacon ; fossils are often found in it. To the west of Raggedston and Midsummer Hills the Cambrian formation extends; this also is fairly rich in fossils. There is but little of the Old Red Sandstone in the county, but the Carboniferous formation extends from the Forest of Wyre coalfield to the Abberley Hills, and from Bewdley to the western limits of the county. The Permian formation is found near Martley, Abberley, Bewdley, and the Clent Hills, while red marls and sand- stones of the Triassic period constitute about three-fourths of the county. At Droitwich and in the Vale of Evesham limestones and a bluish clay exist; and in the gravels deposited by the Severn and the Avon the remains of extinct mammals have been found.

Climate and Agriculture.—The climate is generally equable and healthy, and is very favourable to the cultivation of fruit, vegetables, and hops, for which Worcestershire has long held a high reputation, the red marls and the rich loams which are so prevalent being good both for market gardens and tillage. Its agricultural production consists principally of wheat, barley, beans, fruit, and hops, in the cultivation of which great care and skill areemployed. The large and well-stocked orchards, the picturesque hop fields, and the wonderfully productive market gardens are the pride of the county, and one of the most attractive objects to all visitors. According to the agricultural returns for 1887, the area under cultivation was 401,936 acres, distributed as follows:—corn crops, 90,785; green crops, 32,709; clover and rotation grasses, 31,519; permanent pasture, 232,998; flax, 2; hops, 2828; and fallow, 11,145. The area under orchards was 18,687 acres; market gardens, 8525; and nursery grounds, 386. In 1881—the latest return—there were 18,871 acres under woods and plantations. The number of horses in 1887 was 20,249, of which 14,155 were used solely for agriculture; cows in milk or calf, 27,808; other cattle, 38,472; sheep, 174,371, of which 75,065 werc under one year; pigs, 33,695.

According to the landowners' return of 1872-3, the total number of proprietors in the county was 21,804, possessing 441,060 acres, with a gross annual estimated rental of £1,685,736. Ofthe owners, only 5796 possessed one acre or upwards. There were also 3415 acres of waste land. The following are the names of the larger landowners :—earl of Dudley,

14,699 acres; earl of Coventry, 13,021; Earl Beauchamp, 10,624; Lord Windsor, 8519; Harry F. Vernon, 7448; Karl Somers, 6265; Lord Lyttelton, 5908; the Ecclesiastical Cominissioners, 5213; R. Berkeley, 4812; Duc D'Aumale, 4604; Sir John Pakington, 4868; Lord Northwick,

4215; and Sir F. Winnington, 4196. ; — Industries.—Agriculture in its various branches is the principal

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industry of the county. and salt; and a considerable number of people find employment in the quarries of limestone around Pershore and Evesham, and at other quarries of freestone and flagstone. There is not much mining in the county; the largest number of artisans are employed in the various hardware trades, as the making of nails, at Halesowen and the neighbouring villages, and of needles at Redditch, Astwood Bank, and elsewhere. Glass is largely produced at Dudley and Stourbridge. Worcester is famous for its porcelain, its gloves, and its coach-building, and Kidderminster for its carpets. The salt works at Droitwich are as old as the Roman occupation, and there are others at Stoke. There are a large variety of other trades, including crate making, coke burning, alkali, vinegar, and vitriol works, button inaking, leather staining, paper making, and tanning.

Communication.—The county is well provided with railways and canals. 'The roads are good, and the means of intercourse and communieation are excellent.

Administration and Population.—Worcestershire comprises five hundreds (Halfshire, Doddingtree, Oswaldslow, Pershore, and Blackenhurst), the city of Worcester, and the municipal boroughs of Bewdley, Droitwieh, Dudley, Evesham, and Kidderminster. There are eleven market towns. The city of Worcester has a separate court of quarter sessions, and a cominission of the peace, and all the boroughs have commissions of the peace. Itis in the Oxford circuit ; the assizes as well as quarter sessions are held at Worcester. There is one court of quarter sessions in the whole

county, and there are sixteen petty sessional divisions. The shire contains 248 civil parishes, and is mostly in the diocese of Worcester but partly in that of Hereford. The principal places besides the city of Woreester are Bewdley (population 3088 in 1881), Bromsgrove (12,813), Droit- wich (3761), Dudley (46,252), Evesham (5112), Halesowen (7768), Kidderminster (24,270), Oldbury (18,841), Redditch (9961), Stour- bridge (9757), and Tenbury (2083).

By the Redistribution Act of 1885, the county was divided into three parliamentary boroughs and five county divisions. The boroughs, each returning one member, are Dudley, Kidderminster, and Worcester; the county divisions are West (Bewdley), East, South (Evesham), Mid. (Droitwich), and North (Oldbury). The population in 1861 was 307,397; in 1871, 338,837; and in 1881, 380,283 (males 184,205, females 196,078). The number of persons to an acre was 0°80, and of acres to a person 1°24,

History.—W orcestershire was not a district of much importance in the days of the Roman occupation of Britain. By occupying Gloucester the Romans held the valley of the lower Severn, and thence their roads ran to Hereford, and not till Uriconium (Wroxeter) on the side of the Wrekin did they regard the Severn valley as again habitable. This was due to the fact that the greater part of the district now contained in Worcestershire was forest and jungle, not inviting occupation to the colonist. Here and there the Romans held a military outpost, as at Worcester, keeping on the east side of the river ; but the west side was left to the Britons, who found a home on the summits of the Malvern Hills. It was long before the English invaders thought the Severn valley worthy of their arms; but in the beginning of the 7th century the tribe of the Hwiccas was in possession of the lands now contained in Warwick- shire, Worcestershire, and Gloucestershire. The Hwiccas formed part of the Mercian kingdom, and when Archbishop Theodore undertook the ecclesiastical organization of England he set up at Worcester a bishop of the Hwiccas, and the diocese of Worcester continued to mark the limits of the Hwiccan territory till Henry VIII. founded the separate see of Gloucester.

The church was the main instrument of civilization in Wor- cestershire. The abbey of Evesham was the centre of agricultural life along the valley of the Avon ; the priory of Malvern began the clearing of the forest whieh reached from the hills to the Severn. Many other religious houses were spread over the county. There were no great barons, as much of the land was given in early times to the church, and much consisted of forest which was only slowly cleared. The bishop of Worcester was the undoubted head of the district, and provided for its defence. The chief historical event connected with the county in the Middle Ages, the battle of Evesham, was owing to the fact that Walter de Cantilupe, bishop of Worcester, was a firm friend and adherent of Simon de Montfort in his opposition to the misgovernment of Henry III. When Earl Simon had seized the king's person in the battle of Lewes, the chief opposition to his government was raised by the lords marchers on the Welsh borders. Simon went to Hereford for the purpose of reducing them to submission; but Edward's escape from captivity gave them a leader, and awakened the hopes of the royalists. Simon sent for reinforcements, but his son was sur- prised and cut off at Kenilworth. Ignorant of the fact, but afraid to wait any longer lest the passage of the Severn should be closed against him, Simon withdrew to the friendly territory of the bishop of Worcester, aud took up his abode in the abbey of Evesham. There in 1265 he was surprised by Edward, and died fighting a hopeless fight.

As Wales became more settled, Worcester developed its trade

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Its mineral wealth consists of coal, iron, | slowly. From early times the salt mines at Droitwich were worked,

and a "salt-way " was made for the carriage of their produce. A trade with Wales and Bristol was established, and clothiers sent their wares from Bewdley and Worcester down the Severn. The dissolution of the monasteries affected very seriously a district whieh was so closely connected with the church, and it was some time before it recovered from the shock which its soeial life then received. In the great civil war Worcestershire, in common with the west of England, was Royalist, and suffered considerably from the Parliamentary forces. In 1651 Charles II.

with the Scottish army marched to Worcester, where he was weleomed by the citizens. Cromwell followed, and took up his position on the Red Hill just outside the city gates. Lambert succeeded in passing the Severn at Upton, and drove back the Royalist troops to the neighbourhood of Worcester, on the other side of the Severn. Charles determined to take advantage of this division of the Parliamentary army on the two sides of the river, and made an attack on Cromwell's camp. At first he was successful, but Crom- well was reinforced by Lambert's troops from the other side in time to drive back Charles's foot, who were not supported by the Scottish horse. Their rout was complete ; Charles managed to escape into the city, where he escaped in disguise, and began his adventurous journey to Boscobel. Since that time Worcestershire has pursued a eourse of peaceful development.

See Nash, History of Worcestershire (2 vols. fol., 1799); Chambers, Biographical Illustrations of Worcestershire (1820); Turberville, Worcestershire in the 19th Century (1852); Allies, Antiquities and Folk-Lore of Worcestershire (1852), and Noake, Guide to Worcestershire (1868).

WORCESTER, an episcopal city, municipal and parlia- mentary borough, the capital of the above county, and a county of itself, is situated on the eastern bank of the Severn, 120 miles from London by rail, and a little over 26 from Birmingham.

The principal building and chief glory of the city is the cathedral. The see was founded by the advice of Arch-_ bishop Theodore in 673, though, owing to opposition on the

Plan of Worcester.

till 780. In its formation the tribal division was followed, and it contained the people of the Hwiccas. The bishop's church of St Peter's, with its secular canons, was absorbed by Bishop Oswald into the monastery of St Mary. The canons became monks, and in 983 Oswald finished the building of a new monastic cathedral. After the Norman Conquest the saintly bishop of Worcester, Wulfstan, was the only English prelate who

was left in possession of his see. He so far adopted Norman customs as to undertake

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the building of a great church of stone according to the Norman pattern. In 1088 an incursion of the Welsh stopped his labours for a time, but in 1094 he held a synod in the crypt. Of the work of Wulfstan, the outer walls of the nave, aisles, a part of the walls of the tran- septs, some shafts, and the crypt remain. The crypt is apsidal, a style of which there are only four examples in England—Winchester, 1079; Worcester, 1084; Glou- cester, 1089 ; and Canterbury, 1096. Wulfstan's building seenis to have extended no farther than the transepts, but the nave was continued, though much of it was destroyed by the fall of the central tower in 1175. In 1203 Wulfstan was canonized, and the monks, growing richer by the offerings at his shrine, finished the cathedral in 1216. Soon after this date they built a lady chapel at the east end, extending the building by 50 feet; then they were so satisfied with their new work that the choir was rebuilt to match in the Early English style. The nave was sunilarly remodelled in the 14th century, the north side in the Decorated, the south side in the Perpendicular style. The building is cruciform, and is without transept aisles, but has secondary transepts to the choir. The tower is in the centre, and is 162 feet high. There is an interesting chapter house of Late Norman architecture, a round build- ing with its stone roof supported on a central pillar. The refectory is a fine room of Decorated architecture, and the cloisters are Perpendicular. The cathedral was very much out of repair in 1857, when the restoration was undertaken by the cathedral architect, Mr Perkins, in which most of the work of previous generations was wholly swept away, and in some important particulars replaced by conjectural work of Early English style. The cost was about £100,000, raised principally by publie subscription, though for four years the dean and chapter had provided the funds required.

In the cathedral are several good monuments and-

monumental effigies. That of King John, in the choir, is the earliest sepulchral effigy of an English king in the country. There is an altar tomb, in a chantry chapel, of Arthur, prince of Wales, son of Henry VII.,

who died in 1503. There are also monuments of Jolin Gauden, the bishop who wrote Icon Basilike, so often attributed to Charles I., of Bishop Hough by Roubillac, and of Mrs Digby by Chantrey. There are many other monuments ; and in the north alley of the cloister is a stone ou which is cut the sad and significant word " Miserrimus," and nothing more—a tragedy in a single word.

There are eleven parish churchesin the city :—St Helen's, the oldest, was rebuilt in 1820; St Albans, ancient, partially restored in 1850 ; All Saints, built in 1740, which contains a peal of ten bells; St Andrew's, repewed in 1850 ; St Nicholas, begun in 1728 and finished in 1730; St Martin's, erected in 1772; St Swithin's, in 1736; St Peter's, dating from 1686, which has annexed to it the chapelry of Whittington; St Michael's, in Bedwardine, modern ; St John's, Bedwardine, made a parish church in 1371; and St Clement's, built in 1823. In 1874 a parish was formed out of Claines, named the Tything, and in 1876 the church (St Mary Magdalene) was built; St Paul's was built in 1837, and constituted a separate parish in 1844; St George's, built by subscription in 1830, was made a parish out of Claines, in 1862; Holy Trinity, erected in 1865, was formed a parish in 1866. There are also a Roman Catholic chapel and places of worship for all descriptions of Dissenters.

There are no remains of the old castle of Worcester ; it adjoined the monastery so closely that King John gave its yard to the monks, and after that time it ceased to be a stronghold. The Commandery, founded by St Wulfstan in 1095, is one of the "rarest specimens of early house

architecture in existence." The hall contains an open timber roof of the time of Henry VIL, "a good bay window, a fine door, the projecting canopy of the dais, a music-screen and gallery, and some fragments of stained glass." The cathedral grammar school, founded by Henry VIII. in 1541, occupies the refectory of the old monastery, which has just been restored by Mr Christian, and hay many interesting architectural features.

The guild-hall, built in 1723, is an admirable building in the Ltalian style; it contains a portrait of George III, painted by Sir Joshua Reynolds, and presented by the king to commemorate his visit to the city at the triennial musical festival in 1788. The corporation possess some very interesting old charters and manuscripts, and good municipal regalia. The shire-hall, erected in 1835 at a cost of £35,000, is a fine stone building in the Ionic style, with a portico supported by six fluted columns. The county jail, built in 1809 at a cost of £19,000, was entirely reconstructed on the separate principle in 1860, at a further cost of £24,000. The infirmary was built in 1770, the dispensary in 1822, and the ophthalmic insti- tution in 1866, There is a museum of natural history; and a free library was opened in 1881. Worcester has long been famous for several important branches of industry. The Clothiers' Company possess a charter granted by Queen Elizabeth ; but the great industries are now the manufac- ture of gloves and of porcelain. A company of glovers was incorporated in 1661; it is principally occupied with the making of skin gloves, in which the skins of deer, sheep, lambs, goats, and kids are used. The manufacture of porcelain was introduced by Dr Wall, a Worcester physician, in 1751 (see vol. xix. p. 642). The materials employed are china clay and china stone from Cornwall, felspar from Sweden, fire-clay from Stourbridge and Broseley, marl, flint, and calcined bones. Pickles and sauces are among the notable productions of the city: and among its other trades are those of carriage making, rope and twine spinning, boat and barge building, tanning, and the production of chemical manures and of cider and perry.

The charities of Worcester are numerous, and include St Oswald's hospital, Nash's almshouses, Wyatt's alms- houses, the Berkeley hospital, Goulding hospital, Shew- ring's hospital, Inglethorpe's almshouses, Waldgrave's alms- houses, Moore's blue-coat school, Queen Elizabeth's charity, and others, which produce an annual income of more than £10,000. The population of the city and municipal borough (area 1263 acres) in 1871 was 33,226 and in 1881 it was 33,956. The population of the parliamentary borough (area 3266 acres) in 1871 was 38,116 and ia 1881 it was 40,354,

Among the charters still preserved in the guild-hall is one of Richard I. dated November 12, 1189, which grants to the burgesses to hold of the

king and his heirs the town of Worcester at a yearly rental of £24. In the reign of Philip and Mary the town was raised to the dignity of a city, and this with other privileges was confirmed by Elizabeth in 1558; and in 1622 James I. granted a charter ordaining that the city shall be a free city of itself, and a county separate from all other countics. From the time of Edward I, until 1885 Worcester returned two membcrs to parliament, but the number was then reduced to one. Municipally the city is divided into five wards. The county assizes are held in the city, as are also the quarter sessions, the county court, the borough court, town and county petty sessions, and the ecclesiastical and probate court.

The Romans found a British settlement and held it as a military station, to which they gave the name Vigorna. By the Saxons it was called Wigorna-ceaster, whence we have tlre present name of Worcester. It was more than once burnt and pillaged by the Danes, but at the date of the Conquest it was of sufficient import- anee to havea mint. From its proximity to Wales, it frequently suffered from the inroads of the Welsl. It was taken by the

empress Maud, and retaken by Stephen, after severe contests, The king kept the Easter week there in 1139,—as it is recorded, with

‘“‘oreat pomp”; and in 1234 Henry III. held the Whitsuntide festival in the city. Queen Elizabeth rested there in one of her progresses; in 1687 James Il. came, and touched for the king’s evil. He attended mass in the Catholic chapel; but the mayor and the corporation, though accompanying him to the chapel door, firmly and patriotically declined to enter.

For the part this city took in the great civil war sce p. 666.

WORCESTER, a city and the county seat of Worcester county, Massachusetts, United States, is situated in a region of Glacial hills, lakes, and ponds, which form varied and pleasing landscapes, 39 miles west of Boston. Besides the closely-built portion, the city includes a large suburban district, which contains fourteen villages of various sizes. The closely-built portion is very irregularly laid out, con- forming in some

degree to the slope of the ground. ‘There are 197 niles of streets, very little of which is paved. The public parks have an aggregate area of 35 acres. The population in 1885 was 68,389 (20,182, or 29°51 per cent. of foreign birth). The proportion of coloured people was very small, The manufacturing industries are very large and varied; prominent among them are the manufactures of iron and steel, foundryand machine shop products and tools, and second to these the manufacture of boots and shoes.

The settlement of Worcester began in 1718. Earlier attempts had been made, but the incursions of Indians had frustrated them. 1t was incorporated as a town in 1722, but made very slow progress in growth until the completion of the Boston and Worcester (now

3oston and Albany) Railroad in 1835. Since that date, with the extension of its railroad connexions, it has developed rapidly. In 1848 it received a city charter, and at present itis the third eity of the State in population and wealth. The population, which in 1765 was 1478 and in 1790 was 2095, rose to 4173 in 1830, 7497 in 1840, 17,049 in 1850, 41,105 in 1870, and 58,291 in 1880.

WORCESTER, FLorencE oF. See vol. ix. p. 337.

WORDSWORTH, Wittiam (1770-1850), the poet, was born at Cockermouth, on the Derwent, in Cumber- land, on the 7th of April 1770. His parentage offers a curious parallel to Scott’s: he was the son of an attorney, law-agent to the earl of Lonsdale, a prosperous man in his profession, descended from an old Yorkshire family of landed gentry. On the mother’s side also Wordsworth was connected with the middle territorial class: his nother, Anne Cookson, was the daughter of a well-to-do mercer in Penrith, but her mother was a Crackanthorpe, whose ancestors had been lords of the manor of New- biggin, near Penrith, from the time of Edward III. He was thus, as Scott put it in his own case, come of “gentle” kin, and like Scott he was proud of it, and dictated the fact in his short fragment of prose auto- biography. The country squires and farmers whose blood flowed in Wordsworth’s veins were not far enough above local life to be out of sympathy with it, and the poet’s interest in the

common scenes and common folk of the North country hills and dales had a traceable hereditary bias.

Though his parents were of sturdy stock, both died prematurely, his mother when he was five years old, his father when he was thirteen, the ultimate cause of death in his mother's case being exposure to cold in "a best bedroom" in London, in his father's exposure on a Cuniberland hill, where he had been befogged and lost his way. At the age of eight Wordsworth was sent to school at Hawkshead, in the Esthwaite valley in Lanca- shire. His father died while he was there, and at the age of seventeen he was sent by his uncle to St John's College, Cambridge. He did not distinguish himself in the studies of the university, and for some time after taking his degree of B.A., which he did in January 1791, he showed what seemed to his relatives a most perverse reluctance to adopt any regular profession. His mother had noted his "stiff, moody, and violent temper" in childhood, and it seemed as if this family judgment was to be confirmed

in his manhood, After taking his degree, he was pressed |

to take holy orders, but would not; he had no taste for the law; he idled a few months aimlessly in London, a few months more with a Welsh college friend, with whom he had made a pedestrian tour in France and Switzerland during his last Cambridge vacation ; then in the November of 1791 he crossed to France, ostensibly to learn the language, made the acquaintance of revolu- tionaries, sympathized with them vehemently, and was within an ace of throwing in his lot with the Brissotins to give them the steady direction that they needed. When it came to this, his relatives cut off his supplies, and he was obliged to return to London towards the close of 1792. But still he resisted all pressure to enter any of the regular professions, published An Lvening Walk and Descriptive Sketches in 1793, and in 1794, still moving about to all appearance in stubborn aimlessness among his friends and relatives, had no more rational purpose of livelihood than drawing up the prospectus of a periodical of strictly republican principles to be called ''The Phil- anthropist." At this

stage, at the age of twenty-four, Wordsworth seemed to his friends a very hopeless and impracticable young man.

But all the time from his boyhood upwards a great purpose had been growing and maturing in his mind. The Prelude expounds in lofty impassioned strain, treat- ing of simple facts in diction that would be "poetic" beyond the worst extravagances of the panegyrical school but for the genuine emotion that inspires its amplitude of phrase, how his sensibility for nature was "augmented and sustained," and how it never, except for a brief interval, ceased to be "creative" in the special sense of his subsequent theory. But it is with his feelings towards nature that Zhe Prelude mainly deals; it says little re- garding the history of his ambition to express those feelings in verse. It is the autobiography, not of the poet of nature, but of the worshipper and priest. The salient incidents in the history of the poet he communi- cated in prose notes and in familiar discourses. And it appears that, while he was still a schoolboy of fourteen, the delight that he took in contemplating and moralizing from nature was mingled with the enthusiasm of a poet's ainbition and joy in the discovery of a fresh imperfectly worked field. Commenting on the couplet in the Evening Walk—

" And, fronting the bright west, yon oak entwines Its darkening boughs and leaves in stronger lines—" he said :

"This is feebly and imperfectly exprest ; but J recollect distinctly the very spot where this first struck me. It was on the way between Hawkshead and Ambleside, and gave me extreme pleasure. The moment was important in my poctical history; for I date from it my consciousness of the infinite variety of natural appearances which had becn unnoticed by the poets of any age or country, so far as I was acquainted with them; and I made a resolution to supply in some degree the defieieney. I could not at that time have been above fourteen years of age."

About the same time he wrote, as a school task at Hawkshead, verses that show considerable acquaintance with the poets of his own country at least, as well as some previous practice in the art of verse-making.' The fragment that stands at the beginning of his collected works, recording a resolution to end his life among his

1 Memoirs of William Wordsworth, by Canon Wordsworth, vol. i. pp. 10, 11. Aceording to his own statement in the memoranda die- tated to his biographer, it was the suecess of this exercise that ' put it into his head to eompose verses from the impulse of his own mind." The resolution to supply the deficiencics of poetry in the exact de- seription of natural appearances was probably formed while he was in this state of boyish eestasy at the accidental revelation of his own powers. The date of his beginnings as a poet is confirmed by the lines in The Idiot Boy, written in 1798—*

"T to the Muses have been bound These fourteen years by strong indentures."

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native hills, was the conclusion of a long poem written while he was still at school. And, undistinguished as he was at Cambridge in the contest for academic honours, the Evening Walk, his first publication, was written during his vacations! He published it in 1793, to show, as he said, that he could do something, although he had not distinguished himself in university work. It is significant of his persistency of purpose that in this poem, as well as in the Descriptive Sketches founded on his tour abroad during his last vacation, he is seen to be steadily fulfill- ing his resolution to supply defects in the minute descrip- tion of nature. There are touches here and there of the bent of imagination that became dominant in him soon afterwards, notably in the moral aspiration that accom- panies his Kemembrance of Collins on the Thames :— "O glide, fair stream! for ever so Thy quiet soul on all bestowing, Till all our minds for ever flow As thy deep waters now are flowing." But in the main this first publication represents the poet in the stage described in the twelfth book of Zhe Prelude :— " Bent overmuch on superficial things, Pampering myself with meagre novelties Of colour and proportion ; to the moods Of time and season, to the moral power, The affections, and the spirit of the place Insensible." i Nature was little more than a picture-gallery to him ; the pleasures of the eye had all but absolute dominion ; and he " Roamed from hill to hill, from rock to rock, Still craving combinations of new forms, New pleasures, wider empire for the sight, Proud of her own

endowments, and rejoiced To lay the inner faculties asleep." But, though he had not yet found his distinctive aim as a poet, he was inwardly bent, all the time that his relatives saw in him only a wayward and unpromising aversion to work in any regular line, upon poetry as " his office upon earth."

In this determination he was strengthened by his sister Dorothy, who witli rare devotion consecrated her life henceforward to his service. A timely legacy enabled them to carry their purpose into effect. A friend of his, whom he had nursed in a last illness, Raisley Calvert, son of the steward of the duke of Norfolk, who had large estates in Cumberland, died early in 1795, leaving him a legacy of £900. And here it may be well to notice how opportunely, as De Quincey half-ruefully remarked, money always fell in to Wordsworth, enabling him to pursue his poetic career without distraction. Calvert's bequest came to him when he was on the point of concluding an engage- ment as a journalist in London. On it and other small resources he and his sister, thanks to her frugal manage- ment, contrived to live for nearly eight years. By the end of that time Lord Lonsdale, who owed Wordsworth's father a large sum for professional services, and had steadily refused to pay it, died, and his successor paid the debt with interest. is wife, Mary Hutchinson, whom he married in 1802, brought him some fortune; and in 1813, when in spite of his plain living his family began to press upon his income, he was appointed stamp- dis- tributor for Westmorland, with an income of £500, after- wards nearly doubled by the increase of his district. By this succession of timely godsends, Wordsworth, though

1 In The Prelude, book iv., he speaks of himself during his first vaeation as " harassed with the toil of verse, much pains and little progress." To the same time belongs an incident recorded later in the same book, when he was returning in early morning from a dance—

'« My heart was full: I made no vows, but vows Were then made for me; bond unknown to me Was given, that I should be, else sinning greatly, – A dedicated spirit."

he did not escape some periods of sharp anxiety, was saved from the necessity of turning aside from his vocation.

To return, however, to the course of his life from the time when he resolved to labour with all his powers in the office of poet. 'The first two years, during which he lived with his self-sacrificing sister at Racedown, in Dorset, were spent in half-hearted and very imperfectly successful experiments, satires in imitation of Juvenal, the tragedy of The Borderers,? and a poem in the Spenserian stanza, the poem now entitled Guilt and Sorrow. Wow much longer this time of doubtful self-distrustful endeavour might have continued is a subject for curious speculation; an end was put to it by a fortunate incident, a visit from Coleridge, who had read his first publication, and seen in it, what none of the public critics had discerned, the advent of "an original poetic genius." It would be impossible to exaggerate the importance for Wordsworth of the arrival of this enthusiastic Columbus. Under his sister's genial influence he was groping his way doubtfully out of the labyrinth of poetic conventions, beginning to see a new pathos and sublimity in human life, but not yet con- vinced except by fits and starts of the rightness of his own vision. Stubborn and independent as Wordsworth was, he needed some friendly voice from the outer world to give him confidence in himself. Coleridge rendered him this indispensable service. He had begun to seek his themes in*

"Sorrow, that is not sorrow, but delight ;

And miserable love, that is not pain

To hear of, for the glory that redounds

Therefrom to human kind, and what we are." He read to his visitor one of these experiments, the story of the ruined cottage, afterwards introduced into the first book of Zhe Excursion. Coleridge, who had already seen original poetic genius in the poems published before, was enthusiastic in his praise of them as having "a character, by books not hitherto reflected," and his praise gave new heart and hope to the poet hitherto hesitating and un- certain.

June 1797 was the date of this memorable visit. So pleasant was the companionship on both sides that, when Coleridge returned to Nether Stowey in Somerset, Words- worth at his instance changed his quarters to Alfoxden, within a mile and a half of Coleridge's temporary resi- dence, and the two poets lived in almost daily intercourse for the next twelve months. During that period Words- worth's powers rapidly expanded and matured; ideas that had been gathering in his mind for years, and lying there in dim confusion, felt the stir of a new life, and ranged themselves in clearer shapes under the fresh quickening breath of Coleridge's swift and discursive

2 Not published till 1842. For the history of this tragedy see Memoirs, vol. i. p. 118; for a sound, if severe, eriticism of it, Mr Swinburne's AMiscellanies, p. 118. And yet it was of the blank verse of The Borderers that Coleridge spoke when he wrote to Cottle that "he felt a little man by the side of his friend."

3 The charaeter of Dorothy Wordsworth is shown in the extracts from her Journal printed in the Memoirs, and in her Lecollections of & Tour in Scotland, edited by the late Principal Shairp, 1874. The poet's aeknowledgments of obligation to her were not mere grateful words thrown ont at random—

- *She gave me eyes, she gave me ears,*

And humble cares, and delicate fears;

A heart, the fountain of sweet tears,

And love, and faith, and joy." The fourteenth book of The Prelude espeeially enables us to under- stand the full meaning of this enlogium, every word of whieh has been earefully weighed. This book contains a complete picture of the state of mind in which Coleridge found the poet, when he " seemed to gain elear sight of a new world—a world, too, that was fit to be transmitted and made visible to other eyes."

4 The version read to Coleridge, however, must have been in Spen- serian stanzas, if Coleridge was right in his reeolleetion that it was in the same

metre with The Female Vagrant, the original title of Guilt and Sorrow.

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dialectic. The radiant restless vitality of the more vari- ously gifted man stirred the stiffer and more sluggish nature of the recluse to its depths, and Coleridge's quick and generous appreciation of his power gave him precisely the encouragement that he needed.

The Lyrical Ballads were the poetic fruits of their com- panionship. Out of their frequent discussions of the relative value of common life and supernatural incidents as themes for imaginative treatment grew the idea of writing a volume together, composed of poems of the two kinds. Coleridge was to take the supernatural ; and, as his industry was not equal to his friend's, this kind was represented by the Ancient Mariner alone. Among Wordsworth's contributions were The Female Vagrant, We are Seven, Complaint of a Forsaken Indian Woman, The Last of the Llock, The Idiot Boy, The Mad Mother ("Her eyes are wild"), The Thorn, Goody Blake and Larry Gill, The Reverie of Poor Susan, Simon Lee, Ex- postulation and Reply, The Tables Turned, Lines left upon a Yew-tree Seat, An Old Man Travelling (" Animal Tran- quillity and Decay"), Lines above Tintern Abbey. The volume was published by Cottle of Bristol in September,

1798.

It is necessary to enumerate the contents of this volume in fairness to the contemporaries of Wordsworth, whom it is the fashion to reproach for their cold or scoffing recep- tion of lis first distinctive work. Those Wordsworthians who give up The Idiot Boy, Goody Blake, and The Thorn as mistaken experiments have no right to triumph over the first derisive critics of the Lyrical Ballads, or to wonder at the dulness that failed to see at once in this humble issue from an obscure provincial press the advent of a great master in literature. The poems that have not yet won general acceptance even among the most devoted Wordsworthians formed a large part of the whole revela- tion, and attention was specially drawn to them by the title. While the taste for Zhe Idiot Boy is still uncreated, still far from general, while critics of authority can still so completely miss the

poet's intention as to suggest that the poem might have been enjoyable if Betty Foy's im- becile son had been described as beautiful and the word "idiot " had not been left to convey uncorrected its repul- sive associations, while intimate disciples acknowledge themselves unable to understand the "glee" with which Wordsworth told the simple story, and wonder whether he intended it as a "comic poem,"! it may be doubted whether now, after nearly a century of discipleship and exposition, the Lyricai Ballads would receive a much more cordial or much wider welcome than they did in 1798. It is true that Tintern Abbey was in the volume, and that all the highest qualities of Wordsworth's imagination and of his verse could be illustrated now from the lyrical ballads proper in this first publication ; but before we accuse our predecessors of purblindness, corrupt taste, and critical malignity, as is the sweet and reasonable custom of too

1 The defect of The Idiot Boy is really rhetorical, rather than poetic. Wordsworth himself said that "he never wrote anything with so much glee," and, once the source of his glee is felt in the nobly affectionate relations between the two half-witted irrational old women and the glorious imbecile, the work is seen to be executed with a harmony that should satisfy the most exacting criticism. The poet not only felt but gave complete expression to the most exquisitely tender humour in telling the story of the simple incident. Poetically, there- fore, the poem is a success ; not a note is out of tune, with the excep- tion perhaps of the boisterous ridicule of the romantic ballad in his speculations as to the employment of the lost horseman; otherwise, as a work of art in a rare vein of humorous tenderness elevated by the moral dignity of the subject, The Idiot Boy is as perfect as any- thing that Wordsworth wrote. But rhetorically this particular attempt to " breathe grandeur upon the very humblest face of human life " must be pronounced a failure, inasmuch as the writer did not use sufficiently forcible means to disabuse his readers of vulgar pre- possessious.

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many professing Wordsworthians,? we should remember that clear vision is easier for us than it was for them when the revelation was fragmentary

and incomplete.

Although Wordsworth was not received at first with the respect to which we now see that he was entitled, his power was not entirely without recognition. There is a curious commercial evidence of this, which ought to be noted, because a perversion of the fact is sometimes used to exaggerate the supposed neglect of Wordsworth at the outset of his career. When the Longmans took over Cottle's publishing business in 1799, the value of the copyright of the Lyrical Ballads, for which Cottle had paid thirty guineas, was assessed at nil. Cottle therefore begged that it might be excluded altogether from the bargain, and presented it to the authors. But in 1800, when the first edition was exhausted, the Longmans offered Wordsworth £100 for two issues of a new edition with an additional volume and an explanatory preface. The sum was small compared with what Scott and Byron soon afterwards received, but it shows that the public neglect was not quite so complete as is sometimes represented. Another edition was called for in 1802, and a fourth in 1805. The new volume in the 1800 edition was made up of poems composed during his residence at Goslar in the winter of 1798-99, and after his settlement at Grasmere in December 1799. It contained a large portion of poems now universally accepted :—Ruth, Nutting, Three Years She Grew, A Poet's Epitaph, Hartleap Well, Lucy Gray, The Brothers, Michael, The Old Cumberland Beggar, Poems on the Naming of Places. But it contained also the famous Preface, in which he infuriated critics by presuming to defend his eccentricities in an elaborate theory of poetry and poetic diction.

Comparatively few in the present day have actually read and studied this famous document, although it is con- stantly referred to as a sort of revolutionary proclamation against the established taste of the eighteenth century. For one that has read Wordsworth's original, hundreds have read Coleridge's brilliant criticism, and the fixed con- ception of the doctrines actually put forth by Wordsworth is taken from this. Now, although the Preface and the ex- tensive and bitter discussion provoked by it had not a tithe of the influence on poetry ascribed to it by a natural liking for sudden changes and simple personal agencies, although the result on literary practice was little more than the banishment of a few

overdriven phrases and figures of speech from poetic diction, it is desirable, considering the celebrity of the affair, that Wordsworth's exact position should be made clear. To do this is to contradict several 'vulgar errors" on the subject, probably too vulgar and deeply rooted to be affected by any exposure. Coleridge's criticism of his friend's theory proceeded avowedly "on the assumption that his words had been rightly interpreted, as purporting that the proper diction for poetry in general consists altogether in a language taken, with due excep- tions, from the mouths of men in real life, a language which actually constitutes the natural conversation of men under the influence of natural feelings." Coleridge assumed further that, when Wordsworth spoke of there being "no essential difference between the language of prose and metrical composition," he meant by language not the mere words but the style, the structure, and the order of the sentences ; on this assumption he argued as if Words- worth had held that the metrical order should always be the same as the prose order. Given these assumptions, which formed the popular interpretation of the theory

- *Herein curiously, if not ridiculously, inconsistent, as their master was not, with his tranquillizing creed.*

3 Sir Henry Taylor, one of the most acute and judicious of Words- worth's champions, came to this conclusion in 1834.

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by its opponents, it was easy to demonstrate its absurdity, and Coleridge is very generally supposed to have given Wordsworth's theory in its bare and naked extravagance the coup de grdce. But the truth is that neither of the two assumptions is warranted; not only so, but both were expressly disclaimed by Wordsworth in the Preface itself. There is not a single qualification introduced by Coleridge in correction of the theory that was not made by Wordsworth himself in the original statement.! In the first place, it was not put forward as a theory of poetry in general, though from the vigour with which he carried the war into the enemy's country it was naturally enough for polemic purposes taken as such ; it was a statement and defence of the principles on which his own poems. of humbler life were composed, undertaken at the instance of friends interested in "a

class of poetry well adapted to in- terest mankind permanently, and not unimportant in the quality and in the multiplicity of its moral relations." He assailed the public taste as "depraved," first and mainly in so far as it was adverse to simple incidents simply treated, being accustomed to "gross and violent stimulants," – "craving after extraordinary incident," possessed with a "degrading thirst after outrageous stimulation," "frantic novels, sickly and stupid German tragedies, and deluges of idle and extravagant stories in verse." This, and not adherence to the classical rule of Pope, which had really suffered deposition a good half century before, was the first count in Wordsworth's defensive indictment of the taste of his age. To make it perfectly clear that he was pleading only for his own maligned and misunder- stood poems, he repeated at the close of the Preface that, "af his purpose were fulfilled, a species of poetry would be produced which is genuine poetry, in its nature well adapted to interest mankind, &e." It is true that he said also that, "in order entirely to enjoy the poetry which I am recommending, it would be necessary to give up much of what is ordinarily enjoyed "; but the context makes it plain that in so saying he referred to startling incident and gaudy ornament, his own purpose being to make "'the feel- ing give importance to the action and situation, not the action and situation to the feeling," and to use language as near as possible to the language of real life. In the second place, as regards this language of real life, and the "poetic diction," the liking for which was the second count in his indictment of the public taste, it is most explicitly clear that, when he said that there was no essential difference between the language of poetry and the language of prose, he meant words, plain and figur- ative, and not structure and order, or, as Coleridge other- wise puts it, the "ordonnance" of composition. Coleridge says that if he meant this he was only uttering a truism, which nobody that knew Wordsworth would suspect him of doing; but, strange to say, it is as a truism, nominally acknowledged by everybody, that Wordsworth does ad- vance his doctrine on this point. Only he adds—" if in what I am about to say it shall appear to some that my labour is unnecessary, and that I am like a man fighting a

1 Although Coleridge makes the qualifieations more prominent than they were in the original statement, the two theories are at bottom so elosely the same that one is sometinies inclined to suspeet that parts, at least, of

the original emanated from the fertile mind of Cole- ridge himself. The two poets eertainly discussed the subjeet together in Somerset when the first ballads were written, and Coleridge was at Grasmere when the Prefaee was prepared in 1800, The diction of the Prefaee is curiously Hartleian, and, when they first met, Cole- ridge was a devoted disciple of Hartley, naming his first son after the philosopher, while Wordsworth detested analytie psyehology. If Coleridge did contribute to the original theory in 1798 or 1800, he was likely enough to have forgotten the fact by 1814. At any rate he evidently wrote his criticism without niaking a elose study of the Prefaee, and what he did in effect was to restate the original theory agaiust popular misconceptions of it,

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battle without enemies, such persons may be reminded that, whatever be the language outwardly holden by men, a practical faith in the opinions which I am wishing to establish is almost unknown"; and what he wished to establish, as may be seen by any person of average intelli- gence who grapples honestly with his stiff and condensed exposition, and interprets it with reference to the contro- versy in which it was an incident, was the simple truth that what is false, unreal, affected, bombastic, or non-sensical in prose is not less so in verse. There was no greater heresy than this in Wordsworth's theory of poetic diction. The form in which he expresses the theory was conditioned by the circumstances of the polemic, and readers were put on a false scent by his purely incidental and collateral and very much overstrained defence of the language of rustics, as being less conventional and more permanent, and therefore better fitted to afford materials for the poet's selection. But this was a side issue, a para- doxical retort on his critics, seized upon by them in turn and made prominent as a matter for easy ridicule ; all that he says on this head might be cut out of the Preface with- out affecting in the least his main thesis. The drift of this is fairly apparent all through, but stands out in un- mistakable clearness in his criticism of the passages from Johnson and Cowper. " But the sound of the church-going bell These valleys aud rocks never heard,

Ne'er sighed at the sound of a knell Or smiled when a Sabbath appeared."

The epithet '"church-going" offends him as a puritan in grammar; whether his objection is well founded or ill founded, it applies equally to prose and verse. Poetic licence does not justify bad grammar. Whether this is strictly defensible or not, all the same it illustrates his contention. To represent the valleys and rocks as sighing and siniling in the circumstances would appear feeble and absurd in prose composition, and is not less so in metrical composition; "the occasion does not justify such violent expressions." These are examples of all that Wordsworth meant by saying that "there is no essential difference between the language of prose and metrical composition"; and it is mere pedantry to detach this phrase from the context, and hold him bound by the precise scliolastic sense of the word essential to a meaning that he expressly repudiates. So far is Wordsworth from contending that the metrical order should always be the same with the prose order, that part of the preface is devoted to a subtle analysis of the peculiar effect of metrical arrangement, assigning the pleasure proper to this as his reason for writing in verse rather than in prose, and repeating again and again such phrases as "fitting to metrical arrangement a selection of the real language of men in a state of vivid sensation," and "language closely resembling that of real life, and yet in the circumstance of metre differing from it so widely."2 What he objects to is not departure from the structure of prose, but the assumption, which seemed to him to underlie the criticisms of his ballads, that a writer of verse is not a poet unless he uses artificially ornamental language, not justified by the strength of the emotion expressed. The farthest that he went in defence of prose structure in poetry was to maintain that, if the words in a verse happened to be in the order of prose, it did not follow that they were prosaic in the sense of being unpoetic,—a side-stroke at critics who complained of his prosaisms for no better reason than that the words stood in the order of prose composition.

2 He expressly admitted also that, in the expression of passion, owing

to "the tendency of metre to divest language to a certain degree of its reality," a strength of language might be used in verse that good

taste would not tolerate in prose.

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Wordsworth was far from repudiating elevation of style in poetry. "If," he said, "the poet's subject be judici- ously chosen, it will naturally, and upon fit occasion, lead him to passions the language of which, if selected truly and judiciously, must necessarily be dignified and varic- gated, and alive with metaphors and figures." But no "foreign splendours" should be interwoven with what "the passion naturally suggests," and " where the passions are of a milder character the style also should be subdued and temperate."

Such was Wordsworth's theory of poetic diction. Nothing could be more grossly mistaken than the current notion, which has been repeated by so many critics of authority that it has become an established belief, that the greater part of Wordsworth's poetry was composed in defiance of his own theory, and that he succeeded best when he set his own theory most at defiance. All com- mentators on Wordsworth who feel tempted to repeat this pretty paradox should pause and read his own state- ment of his theory before giving further currency to a misconception which they will see is absurdly unwarrant- able. It is traceable to the authority of Coleridge. His just, sympathetic, and penetrating criticism on Words- worth's work as a poet did immense service in securing for him a wider recognition; but his proved friendship and brilliant style have done sad injustice to the poet as a theorist. It was natural to assume that Coleridge, if anybody, must have known what his friend's theory was ; and it was natural also that readers under the charm of his lucid and melodious prose should gladly grant themselves a dispensation from the trouble of verifying his facts in the harsh and cumbrous exposition of the theorist himself.1 After all, the theory is a minor affair. It is the work that counts; only it is hardly fair to Wordsworth that he should go down as a stupid genius who did right against his own reasoned principles, or an arrogant person who knew himself to be wrong but refused to admit it.

The question of diction made most noise, but it was far from being the most important point of poetic doctrine set forth in the Preface. If in this he merely enunciated a truism, generally admitted in words but too

generally ignored in practice, there was real novelty in his plea for humble subjects, and in his theory of poetic composition. We might, indeed, easily exaggerate to ourselves the amount of innovation in mere abstract theory; this might have been insignificant enough but for the turn that was given to it by the poet's individuality. But in view of

1 So deeply rooted is the misconception that even Mr Myers, after quoting the Preface itself, and the famous stanza " Perhaps some dungeon hears thee groan," &c., from The A filiction of Margaret, com- ments as follows:—" These lines, supposed to be spoken by 'a poor widow at Penrith,' afford a fair illustration of what Wordsworth calls 'the language really spoken by men,' with 'metre siperadded.' 'What other distinction from prose,' he asks, 'would we have?' We may answer that we would have what he has actually given us, viz., an appropriate and attractive music, lying both in the rhythm and the actual sound of the words used." But in the theory this is covered by the phrases metrical arrangement and selection of the real language of men in a state of wiwid sensation, dignified and variegated and alive with metaphors and figures. Wordsworth was not an adroit expositor in prose, and he did not make his qnalifications sufficiently prominent, but the theory of diction taken with those qualitications left him free without inconsistency to use any language that was not contrary to 'true taste and feeling." He acknowledged that he might occasionally have substituted "particular for general associ- ations," and that thus language charged with poetic feeling to himself night appear trivial and ridiculous to others, as in The Idiot Boy and Goody Blake; he even went so far as to withdraw Alice Fell, first published in 1807, from several subsequent editions ; but he argued that it was dangerous for a poet to make alterations on the simple authority of a few individuals or even classes of men, because if he did not follow his own judgment and feelings his mind would infallibly be debilitated.

all that was most distinctive and influential in Words- worth's own work, his remarks on poetry in general, on the supreme function of the imagination in dignifying humble and commonplace incidents, and on

the need of active exercise of imagination in the reader as well as in the poet—passiveness in this particular not being recoin- mended as wise—his remarks on these points are im- measurably more important than his theory of poetic diction. It is much to be regretted that Coleridge's genius for luminous and brilliant exposition was not applied to the development of the few stiff phrases in which Wordsworth sought to generalize his own practice. Such sayings as that poetry "takes its origin from emotion recollected in tranquillity," or that it is the business of a poet to trace ""'how men associate ideas in a state of excitement," are, like the detached parts of a Chinese puzzle, meaningless till they are pieced together with views of the poet's art expressed and illustrated elsewhere. They are significant of Words- worth's endeavour to lay the foundations of his art in an independent study of the feelings and faculties of men in real life, unbiassed as far as possible by poetic custom and convention. If this had meant, as many might suppose from the bare statement of the idea, that the new poet was to turn his back on his pre- decessors and never look behind him to what they had done, was to reject absolutely as valueless for him the accumulating tradition of thought and expression, was to write in short as if nobody before him had ever written a line, even going to common speech for his diction, a more foolish and unfruitful, silly and presumptuous, ambition could not be conceived. But Wordsworth was guilty of no such extravagance. He was from boyhood upwards a diligent student of poetry, and was not insensible of his obligations to the past. His purpose was only to use real life as a touchstone of poetic substance. Imagination operates in all men for the increase or the abatement of emotion. Incidents that have lodged in the memory are not allowed to lie there unchanged ; joy is sustained by the instinctive activity of the imagination in assembling kindred ideas round the original incident, and under the instinctive operation of the same faculty pain is relieved by the suggestion of ideas that console and tranquillize. Now the poet, in Wordsworth's conception, is distinctively a man in whom this beneficent energy of imagination, operative as a blind instinct more or less in all men, is stronger than in others, and is voluntarily and rationally exercised for the benefit of all in its proper work of increase and consolation. If the poet is to discharge this mission profitably, he must study how the imagination works in real life, that is to say, "how men associate ideas in a state of excitement." Not every image

that the excited mind conjures up in real life is necessarily poetical. Joy may be chilled and pain exaggerated by morbid imaginative activity. It is the business of the poet to select and modify for his special purpose of producing immediate pleasure. " Nor," says the ardent theorist, "let this necessity of producing immediate pleasure be considered as a degradation of the poet's art. It is far otherwise. It is an acknowledgment of the beauty of the universe, an acknowledgment the more sincere because it is not formal but indirect ; it is a task light and easy to him who looks at the world in the spirit of love; further, it is a homage paid to the native and naked dignity of man, to the grand elementary principle of pleasure, by which he knows and feels and moves."

All this is elementary enough as Hartleian psychology. The formal recognition of it will not make a man a poet. But there were several respects in which the formal

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recognition of these elementary principles of poetic evolution powerfully affected Wordsworth's practice. One of these may be indicated, though not fully ex- pressed, by saying that he endeavoured always to work out an emotional motive from within. Instead of choosing a striking theme and working at it like a decorative painter, embellishing, enriching, dressing to advantage, standing back from it and studying effects, his plan was to take incidents that had set his own imagination spontaneously to work, and to study and reproduce with artistic judgment the modification of the initial feeling, the emotional motive, within himself. There is room for an endless amount of subtle discussion, which would be out of place here, as to the exact difference between the methods thus broadly stated. It is obvious that they tend to approximate, inasmuch as all poets must work to some extent from within and all to some extent from without. The mere fact of using words, the medium of communication between man and man, implies a reference, unconscious or deliberate, to the effect produced on others. But undoubtedly in Wordsworth's case the reference to others was of deliberate purpose as much as _ possible suppressed. Probably from natural stiffness of temper, he could not make it easily, and found the effort, as it must always be when it is an effort and not a happy

instinct, embarrassing and chilling. At any rate, if an association, to use his own terminology, gave pleasure to himself, he did not pause long to consider the probable effect on others. If he did reflect upon it when the act of composition was over, he was often able to satisfy him- self that, if an association which seemed to him just, reasonable, and humane, was not acceptable to general sentiment, the general sentiment was corrupt. To this, as he himself with his‘ habits of self-criticism was fully aware, was owing much of his strength and much of his unpopularity. By keeping his eye on the object, as spontaneously modified by his own imaginative energy, he was able to give full and undistracted scope to all his powers in poetic coinage of the wealth that his imagina- tion brought. On the other hand, readers whose nature or education was different from his own, were repelled or left cold and indifferent, or obliged to make the sympa- thetic effort to see with his eyes, which he refused to make in order that he might see with theirs. “ He is retired as noontide dew Or fountain in a noon-day grove,

And you must love him ere to you He will seem worthy of your love.”

From this habit of taking the processes of his own mind as the standard of the way in which “men associate ideas in a state of excitement,” and language familiar to himself as the standard of the language of “real men,” arises a superficial anomaly in Wordsworth’s poetry, an apparent contradiction between his practice and his theory. His own imagination, judged by ordinary standards, was easily excited, excited by emotional motives that have little force with ordinary men. Most of his poems start from humbler, slighter, less generally striking themes than those of any other poet of high rank. But his poetry is not corre- spondingly simple. On the contrary, much of it, much of the best of it—for example, the Ode to Duty, and that on the Intimations of Immortality—is as intricate, elaborate, and abstruse, as remote from the ordinary paths of thought, as is to be found in literature. The emotional motive is simple; the passion has almost always a simple origin, and often is of no great intensity; but the imaginative structure is generally elaborate, and, when the poet is at his best, supremely splendid and gorgeous. No poet has built such magnificent palaces of rare material for the ordinary everyday homely human affections. It is because

he has invested our ordinary everyday principles of con- duct, which are so apt to become threadbare, with such imperishable robes of finest texture and richest design that Wordsworth holds so high a place among the great moral- ists, the greatest of moralists in verse. And yet he attained this end in his most effectively moral poems, though not by any means in all his poems, without in the least con- fusing the boundaries between poetry and preaching, his conception of the end of poetry as immediate pleasure serving him as a load-star.

His practice was influenced also, and not always for good, by his theory that poetry "takes its origin from emotion recollected in tranquillity." This was a somewhat doubtful corollary from his general theory of poetic evolu- tion. A poem is complete in itself; there must be no sting in it to disturb the reader's content with the whole ; through whatever agitations it progresses, to whatever elevations it soars, to this end it must come, otherwise it is imperfect as a poem. Now the imagination in ordinary men, though the process is not expressed in verse, and the

poet's special art has thus no share in producing the effect,

reaches the poetic end when it has so transfigured a dis- turbing experience, whether of joy or grief, that this rests tranquilly in the memory, can be recalled without dis- quietude, and dwelt upon with some mode and degree of pleasure, more or less keen, more or less pure or mixed with pain. True to his idea of imitating real life, Words- worth made it a rule for himself not to write on any theme till his imagination had operated upon it for some time involuntarily ; it was not in his view ripe for poetic treat-

- ment till this transforming agency had subdued the original

einotion to a state of tranquillity.1 Out of this tranquillity arises the favourable moment for poetic composition, some day when, as he contemplates the subject, the tranquillity disappears, an emotion kindred to the original emotion is reinstated, and the poet retraces and

supplements with all his art the previous involuntary and perhaps unconscious imaginative chemistry.

When we study the moments that Wordsworth found favourable for successful composition, a very curious law reveals itself, somewhat at variance with the common con- ception of him as a poet who derived all his strength froin solitary.communion with nature. We find that the recluse's best poems were written under the excitement of some break in the monotony of his quiet life—change of scene, change of companionship, change of occupation. The law holds from the beginning to the end of his poetic career. We have already noticed the immense stimulus given to his powers by his first contact with Coleridge after two years of solitary and abortive effort. Above Tintern Abbey was composed during a four days' ramble with his sister; he began it on leaving Tintern, and con- cluded it as he was entering Bristol. His residence amidst strange scenes and "unknown men" at Goslar was parti- eularly fruitful: She Dwelt among the Untrodden Ways, Ruth, Nutting, There was a Boy, Wisdom and Spirit of the Universe, all belong to those few months of unfamiliar environment. The breeze that met him as he issued from the city gates on his homeward journey brought him the first thought of Zhe Prelude. The second year of his residence at Grasmere was unproductive ; he was " hard at work" then on The Hxcursion; but the excitement of his tour on the Continent in the autumn of 1802, combined perhaps with a happy change in his pecuniary circuni- stances and the near prospect of marriage, roused him to one of his happiest fits of activity. His first great sonnet,

1 The Prelude contains a record of his practice, after the opening lines of the first book—. '¢ Thus far, O friend! did J, not used to make A present joy the matter of a song, . Pour forth, &c."

the Lines on Westminster Bridge, was composed on the roof of the Dover coach; the first of the splendid series "dedicated to national independence and liberty," the most generally impressive and universally intelligible of

his poems, Fair Star of Evening, Once did she Hold the Gorgeous East in Fee, Toussaint, Milton, thou shouldst be Living at this Hour, It is not to be Thought of that the Flood, When I have Borne in Memory what has Tamed, were all written in the course of the tour, or in London in the month after his return. A tour in Scotland in the follow- ing year, 1803, yielded the Highland Girl and The Solitary Reaper. Soon after his return he resumed The Prelude ; and The Affliction of Margaret and the Ode to Duty, his greatest poems in two different veins, were coincident with the exaltation of spirit due to the triumphant and success- ful prosecution of the long-delayed work. The Character of the Happy Warrior, which he described to Miss Martineau as '"'a chain of extremely valooable thouglits," though it did not fulfil "' poetic conditions,"! was the pro- duct of a calmer period. The excitement of preparing for publication always had a rousing effect upon him; thie preparation for the edition of 1807 resulted in the com- pletion of the ode on the Intimations of Immortality, the sonnets The World is too much with us, Methought I saw the Footsteps of a Throne, Two Voices are there, and Lady, the Songs of Spring were in the Grove, and the Song at the Least of Brougham Castle. After 1807 there is a marked falling off in the quality, though not in the quantity, of Wordsworth's poetic work. It is significant of the com- paratively sober and laborious spirit in which he wrote The Excursion that its progress was accompanied by none of those casual sallies of exulting and exuberant power that mark the period of the happier Prelude. The com- pletion of The Lxcursion was signalized by the production of Laodamia. The chorus of adverse criticism with which it was received inspired him in the noble sonnet to Haydon —High is our Calling, Friend. He rarely or never again touched the same lofty height.

It is interesting to compare with what he actually accomplished the plan of life-work with which Wordsworth settled at Grasmere in the last month of the eighteenth century.2_ The plan was definitely conceived as he left the German town of Goslar in the spring of 1799. Tired of the wandering unsettled life that he had led hitherto, dissatisfied also with the fragmentary occasional and disconnected char- acter of his lyrical poems, he longed for a permanent home among his native hills, where he might, as one called and consecrated to the task, devote his powers continuously to the composition of a great philosophical poem on "Man, Nature, and

Society." The poem was to be called The Recluse, "as having for its principal subject the sensations and opinions of a poet living in retirement." He com- municated the design to Coleridge, who gave him enthusi- astic encouragement to proceed. In the first transport of the conception he felt as if he needed only solitude and leisure for the continuous execution of it. But, though he had still before him fifty years of peaceful life amidst his beloved scenery, the work in the projected form at least was destined to remain incomplete. Doubts and misgiv- ings soon arose, and favourable moments of felt inspiration delayed their coming. To sustain him in his resolution he thought of writing as an introduction, or, as he put it, an antechapel to the church which he proposed to build, a

1 This casual estimate of his own work is not merely amusing but also instructive, as showing—what is sometimes denied—that Words- worth himself knew well enongh the difference between ' poetry" and such " valuable thoughts"' as he propounded in The Hxcurston.

2 Wordsworth's residences in the Lake District were Townend, Grasmere, from December 1799 till the spring of 1808; Allan Bank, from 1808 to 1811; the parsonage at Grasmere, from 1811 to 1813; Rydal Mount, for the rest of his life.

history of his own mind up to the time when he recognized the great mission of his life. One of the many laughs at his expense by unsympathetic critics has been directed against his saying that he wrote this Prelude of fourteen books about himself out of diffidence. But in truth the original motive was none other than distrust of his own powers. He began this review of his early life to reassure himself from misgivings whether nature and education had fitted him for his proposed task, partly by elevating his mind to a confidence in uature's special destination, and partly by making practical trial of his powers in a simpler work. He turned aside from Vhe Prelude to prepare the second volume of the Lyrical Ballads and write the explan- atory Preface, which as a statement of his aims in poetry had partly the same purpose of strengthening his

self-con- fidence. From his sister's Journal we learn that in the winter of 1801-2 he was "hard at work on The Pedlar" — the original title of Zhe Excursion. But this experiment on the larger work was also soon abandoned. It appears from a letter to his friend Sir George Beaumont that his health was far from robust, and in particular that he could not write without intolerable physical uneasiness. We should probably not be wrong in connecting his physical weakness with his rule of waiting for favourable moments. His next start with The Prelude, in the spring of 1804, was more prosperous ; he dropped it for several months, but, resuming again in the spring of 1805, he completed it in the summer of that year. But still the composition of the great work to which it was intended to be a portico proceeded by fits and starts. It was not till 1814 that the second of the three divisions of The Recluse, ultimately named The Excursion, was ready for publication ; and he went no further in the execution of his great design. It is possible that he had his own unfinished project in mind when he wrote the sonnet on Malham Cove.— "? Mid the wreck of Is and Was, Things incomplete and purposes betrayed

Make sadder transits o'er thought's optic glass Than noblest objects utterly decayed."

We shall speak presently of the reception of The Excur- ston. Meantime we must look elsewhere for the virtual accomplishment of the great design of Z'he Recluse. The purpose was not after all betrayed ; it was really fulfilled, though not in the form intended, in his various occasional poems. In relation to the edifice that he aspired to con- struct, he likened these poems to little cells, oratories, and sepulchral recesses ; they are really the completed work, much more firmly united by their common purpose than by any formal and visible nexus of words. Formally dis- connected, they really, as we read and feel them, range themselves to spiritual music as the component parts of a great poetic temple, finding a rendezvous amidst the scenery of the district where the poet had his local habita- tion. The Lake District, as transfigured by Wordsworth's imagination, is the fulfilment of his ambition after an en- during memorial. The Poems collected and published in 1807 compose in effect 'a philosophical poem on man, nature, and society," the title of which might fitly have been Zhe Recluse, "as having for its principal subject the

sensations and opinions of a poet living in retirement." As a realization of the idea of Zhe Fecluse, these poems are from every poetical point of view infinitely superior to the kind of thing that he projected and failed to complete.

The derisive fury with which The Excursion was assailed upon its first appearance has long been a stock example of critical blindness, conceit, and malignity. And yet, if we look at the position claimed for the Hacursion now by competent authorities, the error of the first critics is seen to lie not in their indictment of faults, but in the pro- minence they gave to the faults and their generally dis-

respectful tone towards a poet of Wordsworth's greatness. Jetfrey's petulant ' This will never do," uttered, professedly at least, more in sorrow than in anger, because the poet would persist in spite of all friendly counsel in misapply- ing his powers,! has become a byword of ridiculous critical cocksureness. But the curious thing is that The Hxcursion has not "done," and that the Wordsworthians who laugh at Jeffrey are in the habit of repeating the substance of his criticism, though in more temperate and becoming language. Thus Dean Church, in a criticism at once sympathetic and judicious, after the usual fling at Jeffrey's "insolence," goes on to say—

"In The Excursion and The Prelude there are passages as magnificent as perhaps poet ever wrote; but thcy are not specimens of the context in which they are cmbedded, and which in spite of them does not carry along with it the reader's honest enjoyment. We read on because we must." ?

This is the very substance of Jeffrey's criticism, which was far from being unreservedly damnatory, as the following will show :—

"Besides those more extended passages of interest or beauty which we have quoted and omitted to quote, there are scattered up and down the book, and in the midst of its most repulsive portions, a very great nuniber of single lines and images that sparkle like gems in the desert and startle

us by an intimation of the great poetic powers that lie buried in the rubbish that has been heaped around them."

Jeffrey, it will be seen, was not blind to the occasional felicities and unforgetable lines celebrated by Coleridge, and his general judgment on The Hucursion has been abundantly ratified? It is not upon The Excursion that Wordsworth's reputation as a poet can ever rest, whatever defence may be made for it as "a chain of extremely valuable thoughts," varied by passages of lofty or quietly beautiful description, invigorating exhortation, and gentle pathos. The two " books" entitled The Churchyard among the Mountains are the only parts of the poem that derive much force from the scenic setting ; if they had been pub- lished separately, they would probably have obtained at once a reception very different from that given to The Excursion as a whole. The dramatic setting is merely dead weight, not because the chief speaker is a pedlar—Wordsworth fairly justifies this selection—but because the pedlar, as a personality to be known, and loved, and respected, and listened to with interest, is not completely created. We know Uncle Toby better than Sterne, but we do not know the Wanderer so well as Wordsworth, and consequently we are more easily bored by him than by the poet speaking in his own person as he does in The Prelude. His cheerfulness after reciting the tale of Margaret at the ruined cottage is almost offensive; the assigned motive

1 The lively lawyer, to whom reviewing was a recreation, obviously enjoyed the process of "slating"' more than is quite consistent with his strong protestations of sorrow over the poet's waywardness; but it should not be overlooked that he did make ample acknowledgment, when he had sated himself with denunciations of the Wanderer's ver- bosity, of the power and beauty of isolated passages. In the second part of his article, indeed, he quoted so much that was admirable that he confessed himself disposed to rescind his severe judgment, but re- perusal of the Wanderer's arguments convinced him that it could not be rescinded. Jeffrey's criticisms in their entirety are dead and buried, except for the professional student, but even critics have their humble rights, and it is time that his four opening words should re- ceive the privilege of interment also, if they are not to be fairly interpreted. His criticism of The White Doe is

valueless enough, because the sentiment of that poem is more abstruse, less palpable to the running reader; but what he said of The Hxecursion has simply been repeated in duller language by the Wordsworthians who have denounced his arrogance in daring to say it.

2 Ward's English Poets, vol. iv. p. 138. Oliphant might be quoted to the same effect.

5 In joining The Prelude with The Excursion in the same condem- nation, Dean Church goes farther than Jeffrey. Asa poem The Pre- lude is infinitely superior ; its autobiographical character gives it a certain unity, and it contains a greater number of lofty passages in Wordsworth's best vein.

Mr Myers and Mrs

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for it in the beauty of nature that remains though the poor broken- hearted woman is gone is hardly higher than the dropsical scullion's philosophy in Tristram Shandy. "¢We is dead. He is certainly dead,' said Obadiah. 'So am not I,' said the foolish scullion."4

There can be little doubt that adverse criticism had a depressing influence on Wordsworth's poetical powers, not- withstanding his nobly expressed defiance of it and his determination to hold on in his own path undisturbed. Its effect in retarding the sale of his poems and thus de- priving him of the legitimate fruits of his industry was a favourite topic with him in his later years ;° but the absence of general appreciation, and the ridicule of what he considered his best and most distinctive work, contributed in all probability to a still more unfortunate result—the premature depression and deadening of his powers. He schooled himself to stoical endurance, but he was not superhuman, and in the absence of sympathy not only was any possibility of development checked but he ceased to write with the spontaneity and rapture of his earlier verse. The common theory that the marked stiffening of his powers after 1807 was the effect of age only may be true; but the coincidence of this falling off with the failure of the strenuous effort made in that year to conquer the

hostility of critics and the indifference of the public makes the theory extremely doubtful as a whole truth. Words- worth's true nature is often misjudged under the fallacy that the preacher of high and serene fortitude in the face of failure and misfortune must himself be imperturbable. On the contrary the most eloquent advocate of this heroic virtue is the man who most feels the need of it in the frailty of his own temper. It is on record that Words- worth, with all his philosophy of consolation, did not easily recover serenity after domestic bereavements, and we go very far wrong when we confound his proud and self- reliant defiance of criticism with insensibility to it or power to rise at will above its disheartening and benumb- ing influence.

For five years after the condemnation of The Excursion Wordsworth published almost nothing that had not been composed before. The chief exception is the Thanksgiving Ode of 1816. He was occupied mainly in the task of putting his work and his aims more fully before the world, maintaining his position with dignity and unflinch- ing courage, so far unmoved by criticism that he would not alter his course one jot for the sake of public favour. In 1815 he published a new edition of his poems, in the arrangement according to faculties and feelings in which they have since stood; aud he sought to explain his

4 Charles Lamb's review of The Excursion in the Quarterly (Oct. 1814), in spite of the editor Gifford's modifications, remains the most sympathetic of competent criticisms of the poem. In one point there is an oversight, significant of the indefiniteness of Wordsworth's ex- position; Lamb supposes the conversion of the Solitary to be accom- plished within The Excursion. It was really reserved for the third part of The Recluse. It was the poet's intention, as expressed in his conversations with Miss Fenwick, to effect this conversion not by argument, but by carrying the sceptic back to his native Scotland, making him witness of a sacrament service, and making early associ- ations thereupon reassert themselves. This would have been in accordance with his theory of the value of early associations, Whiat makes the position of the Solitary a little difficult to grasp at first is that Wordsworth, on principle, does not present this character in marked contrast to the other characters in the poem, but rather lays stress on what he has in common with them, tender-

heartedness to- wards suffering and intense enthusiasm for nature; hence it arises that the reader cannot see without some study what it is that the other interlocutors find lacking in him, and aim at supplying to him.

5 Mr Matthew Arnold heard him say that "for he knew not how many years his poetry had never brought him in enough to buy his shoe-strings " (preface to Selection, p. v.). The literal facts are that he received £100 from the Longmans in 1800, and nothing more till he was sixty-five, when Moxon bought the copyright of his writings for £1000 (Prose Works, iii. 437).

purposes more completely than before in an essay on "Poetry as a Study." In the same year he was persuaded. to publish the The White Doe of Eylstone, written mainly eight years before. In purely poetic charm the White Doe ought to be ranked among the most perfect of Wordsworth's poems, the most completely successful exhibition of his finest qualities ; nowhere is the peculiar music of his verse more happily sustained or more per- fectly in harmony with the noble and tender feeling which here springs as if from infinite depths, to flow round and subdue the tragic agony of the incidents. But Jeffrey, who was much too busy a man to enter into a vein of poetry so remote from common romantic sentiment, would have none of the White Doe: he pronounced it "the very worst poem ever written," and the public too readily endorsed his judgment. Two other poems, with which Wordsworth made another appeal, were not more successful. Peter Bell, written in 1798, was published in 1819; and at the instigation of Charles Lamb it was followed by The Waggoner, written in 1805. Both were mercilessly ridiculed and parodied. These tales from humble life are written in Wordsworth's most unconventional style, and with them emphatically " not to sympathize is not to understand," but when they are read sympathetically they are felt to be written with the spontaneity and freedom of the poet's most inspired moments, although they are not in his high serious vein.

Meantime, the great design of The Recluse languished. The neglect of what Wordsworth himself conceived to be his best and most characteristic work was not encouraging; and there was another reason why the

philosophical poem on man, nature, and society did not make progress. Again and again in his poetry Wordsworth celebrates the value of constraint, and the disadvantage of "too much liberty," of "unchartered freedom."! This thought was impressed upon him by his own experience. There was "too much liberty" in his vague scheme of a philosophical poem. He needed more of the constraint of a definite form to stimulate his working powers to prosperous vigour. The formlessness of the scheme prevented his 'working at it continuously. Hence his " philosophy" was expressed in casual disconnected sonnets, or in sonnets and other short poems connected by the simplest of all links, sequence in time or place. He stumbled upon three or four such serial ideas in the latter part of his life, and thus found beginning and end for chains of considerable length, which may be regarded as fragments of the project which he had not sufficient energy of constructive power to execute. The Sonnets on the River Duddon, written in 1820, follow the river from its source to the sea, and form a partial embodiment of his philosophy of nature. The Ecclesiastical Sonnets, written in 1820-21, trace the history of the church from the Druids onwards, following one of the great streams of human affairs, and exhibit part of his philosophy of society. A tour on the Continent in 1820, a tour in Scotland in 1831, a tour on the west coast in 1833, a tour in Italy in 1837, furnished him with other serial forms, serving to connect miscel- laneous reflections on man, nature, and society ; and his views on the punishment of death were strung together in still another series in 1840. He sought relief from "the weight of too much liberty" in this voluntary subjection to serial form, taking upon himself that

" Constraint Whence oft invigorating transports flow That choice lacked courage to bestow."

His resolute industry was productive of many wise, impressive, and charitable reflexions, and many casual

1 See the Sonnet, Nuns fret not, &c., The Pass of Kirkstone, and the Ode to Duty.

felicities of diction, but the poet very seldom reached the highest level of his earlier inspirations.

Wordsworth was appointed poet-laureate on the death of Southey in 1843. His only official composition was an ode on the installation of the Prince Consort as chan- cellor of Cambridge university in 1847. This was his last writing in verse. He died at Rydal Mount after a short illness, on the 23d of April 1850, and was buried in Grasmere churchyard.

It was Wordsworth's own desire that there should be no elaborate criticisni of his poetry. This desire has not been respected. We have already referred to Lamb's severely edited review of The Excursion (1814), and to Coleridge's criticism in the Biographia Literaria (1817). This last, together with the enthusiastic and unreserved championship of Wilson in Blavkwood's Magazine in a series of articles between 1819 and 1822 (see Recreations of Chris- topher North), formed the turning point in Wordsworth's reputation. From 1820 to 1830 De Quincey says it was militant, from 1830 to 1840 triumphant. By 1850 there were signs of reaction, but, though the language of criticism has become more judicial, there has been no falling off in veneration for Wordsworth's character or appreciation of his best work. Among critics that are specially interesting for various reasons we may mention De Quincey (Works, vols. ii, and v.), Sir Henry Taylor (Works, vol. v.), George Brimley (Essays), Matthew Arnold (preface to Selection), Mr Swinburne (Miscellanies), Mr F. W. H. Myers ("' Men of Letters" series), and eee Stephen (Hours in a Library, 3d series, '¢Wordsworth's

igs").

Wordsworth's writings in prose have been collected by Mr Grosart (London, 1876). This collection contains the previously unpub- lished Apology for a French Revolution, written in 1793, besides the scarce tract on the Convention of Cintra (1809) and the political addresses Jo the Freeholders of Westmoreland (1818). The bulk of three volumes is made up by including letters, notes, prefaces, &c. Wordsworth's Guide to the Lakes originally appeared in 1810 as an introduction to Wilkinson's Select Views, and was first published separately in 1822.

The standard editions of Wordsworth are Moxon's six-volume edition originally settled by the poet himself in 1836-7, and Moxon's single-volume double-column edition sanctioned by the poet in 1845. A carefully annotated edition in nine large volumes, by Prof. Knight, is in course of publication. It contains a useful chronological table of the poems; and the hitherto unpublished part of The Recluse is promised for the ninth volume. Prof. Knight's book on The English Lake District is also useful to minute students of Wordsworth. (W. M.)

WORKINGTON, a seaport and market-town of Cumber- land, England, on the south bank of the Derwent, whiere it enters the Solway Firth, and on several branch railway lines, 34 miles south-west of Carlisle and 311 miles from London by rail. The Derwent is crossed by a stone bridge of three arches erected in 1841. In the more ancient portions of the town the streets are narrow and irregular, but there are now many spacious streets with handsome houses and shops. The ancient parish church of St Michael was rebuilt in 1770, and, this building having been destroyed by fire in 1887, another is now (1888) in course of erection. The other public buildings are the jubilee hall, the assembly-rooms, the temperance hall, the mechanics' institute, the infirmary, the new covered market, the custom-house, and the bonded warehouses. Near the town is Workington Hall, the seat of the ancient lords of the manor, a quadrilateral castellated structure in great part modern, but still retaining some of the ancient rooms, including that in which Mary queen of Scots is said to have slept when she escaped to England after the battle of Langside in May 1568. The harbour is remark- ably safe, and has been improved by the construction of a breakwater 600 feet in length. The Lonsdale dock, 41 acres in extent, was opened in 1862. In 1886 37 vessels in the foreign and colonial trade (19,806 tons) entered the port, and 24 cleared (10,495 tons) ; 1687 in the coasting-trade entered (197,487 tons), and 1682 cleared (206,404 tons). The value of the exports of the produce of the United Kingdom in 1882 was £181,012, but in 1885 it was only £13,845, and in 1886 it was £38,468. The chief exports are pig-iron, lime, coal, steel rails, and

steel plates. The value of the imports of foreign and colonial merchandise in 1882 was £57,512, but since then it has declined, and was only £18,282 in 1885, and £27,448 in 1886.

1888).

WORKSOP, a market-town of Nottinghamshire, Eng- land, is situated on the Chesterfield Canal, and on the Manchester, Sheffield, and Lincoln Railway and the Midland Railway, 16 miles east-south-east of Sheffield and 1464 from London. It is a well-built and pleasant country town, with considerable traces of antiquity. The church of St Mary and St Cuthbert is an old priory church, once divided internally into two buildings, the eastern dedicated to St Mary being for the use of the canons, and the western dedicated to St Cuthbert for the parishioners. When the priory was demolished at the Reformation only the western portion of the church was spared, and for many years it was in a dilapidated con- dition until it was restored with Perpendicular additions. Behind it are the ruins of the lady chapel, containing some fine Early English work. The priory gatehouse, chiefly in the Decorated style, now forms the entrance to the precincts of the church. It is supposed to have been built early in the 14th century by the third Lord Furnival, when the market was established. Of the priory itself the only remains are a wall at the north- west corner of the church which includes the cloister gateway. There wasa Norman keep on the castle hill, but no remains of the building are now left. The magnificent manor-house, built by Gilbert, first earl of Shrewsbury, and occasionally occupied by Mary queen of Scots during her captivity under the sixth earl, was in great part destroyed by fire in 1761, while being restored at great expense by the duke of Norfolk, and when the estate came into the possession of the duke of Newcastle in 1840 the ruined portion of the mansion remaining was removed anda smaller mansion built near it. The ecclesiastical parish of St John's was formed in 1867. There is a corn exchange, erected in 1854, in the Venetian style, and a mechanics' institute, erected in 1852. Form- erly liquorice was extensively grown, but malting is now the principal industry. A large corn market and a cattle and horse fair are held. The town also possesses brass and iron foundries, agricultural implement works, saw-mills, and chemical works.

The population of the urban sanitary district (18,220 acres) was 10,409 in 1871, and 11,625 in 1881.

Worksop occurs in Domesday as Withercope. By William the Conqueror the manor was bestowed on Roger de Busli. It subse- quently passed to William de Lovitot, who in 1103 founded a priory for Augustinian canons dedicated to St Mary. From the De Lovitots it passed successively to the Furnivals, the Nevilles, the Talbots, earls of Shrewsbury, and the Howards, earls of Arundel and afterwards dukes of Norfolk. By the duke of Norfolk it was sold in 1840 to the duke of Newcastle, whose country mansion, Clumber, is in the parish. In December 1460 an engagement took place at Worksop between the forces of the duke of York and those of the duke of Somerset.

See White's Worksop, 1875; and Sissons, Guide to Worksop, 1888.

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WORM. This word has no definite significance in modern zoological classification ; it is constantly applied to several phyla of the animal kingdom which have for the most part no special relations to each other. By Linnzus the Latin equivalent "' Vermes " was applied to the modern divisions of MoLiusca, C@LENTERA, Protozoa, TUNI- CaTA, ECHINODERMATA (qq.v.), a3 well as to those animals which are in many current text-books of zoology grouped together under the same name! The group Vermes as used, for example, by Claus includes several distinct phyla, viz., NemaromwEa (9.v.), Platyhelminthes (see PLANARIANS, TaPe-Worms, and TrEeMaToDA), NEMER- TINES (9.v.), Chetognatha (see Sacitta), Gephyrea (see ANNELIDA), ROTIFERA (q.v.), Discophora (see Lerxcu), Chetopoda.

The Chetopoda are divided into Oligocheta and Polycheta, which have been shortly treated of, together with Dis- cophora and Grephyrea, in the article ANNELIDA (¢.v.). The leech and its kindred (Discophora) have been more fully described in another article (Lezcu, g.v.). The present article will treat of the earthworm and its immediate allies. The earthworm belongs to the order Oligocheta, which also includes a number of freshwater forms; these latter Oligocheta have been distinguished as "

Limicole ” from the earthworms or “ Terricole.” There are, how- ever, no structural peculiarities of any importance which ab- solutely distinguish the terrestrial from the aquatic forms. Earthworms are, it is true, characterized by the simplicity of their sete, by the absence of cilia upon the body, by the thickness of the body-wall, which im- plies an increased thickness of the mus- cular layers, and by the thickness of the intersegmental septa, particularly in the

anterior region of

Fig. 1.~—Diagrams of Various Earthworms, to illus- the body . All these trate external characters. A, B,C, anterior seg- ments from the ventral surface; D, hinder end of body of Urochxta. A. Lumbricus: 9, 10, seg- ments containing spermathecex, the orifices of which are indicated; 14, segment bearing ovi- ducal pores; 15, segment bearing male pores; 32, 37, first and last segments of clitellum. B, Acanthodrilus: cp, orifices of spermathece; 9, oviducal pores; ¢ , male pores; on 17th and 19th segments are the apertures of the atria. C, Peri- cheta: the spermathecal pores are between seg- ments 6 and 7, 7 and 8, 8 and 9, the oviducal pores upon the 14th and the male pores upon the 18th segment. In all the figures the nephridial pores are indicated by dots and the sete by strokes.

structural modifica- tions, however, are so obviously connected with the density of the medium in which they live that they cannot be held to be of primary import- ance. On the other hand, there is no deep-seated anatomical character which distinguishes earth- worms from the freshwater Oligocheta. An article on earthworms must therefore necessarily include an account of the aquatic and mud-inhabiting Oligocheta.

The Oligocheta range in size from a few lines to several feet in length; the large earthworm from the Cape Col- ony (Microcheta rappi) measures 5 or 6 feet in length when fully extended. On the whole the terrestrial forms (earthworms) are larger than the aquatic forms. The Oligochxta are found all over the globe, but at present no details of value can be given as to their distributional

1 Gegenbaur, Elements of Comp. Anat., Eng. trans., 1878; Claus, Text-Book of Zoology, Eng. trans., 1884.

areas. As might be imagined from their soft perish- able bodies, nothing is known respecting the distribution

of the Oligocheta in past time.

The most prominent characteristic of the Oligocheta, as of the Chetopoda generally, is the segmentation of the body: the body is divided into a series of segments or metameres, which resemble each other most closely in the lowest forms. This metamerism is seen externally in the presence of transverse furrows, corresponding with the internal divisions of the body cavity, and in the dis- position of the sete. The mouth opens into the first segment, which is usually unprovided with setz ; in front of the mouth is a preoral lobe; this latter is aborted in some Oligochxta (Urochexta, Thamnodrilus). oa

Body- Wall.—In all Oligochexta three layers can be distinguished in the body-wall—(1) an outer epidermis, which secretes a delicate cuticle, (2) a circular muscle layer, (3) a longitudinal muscle layer. Within the last-named is the peritoneal lining of the ccelom.

Clitellum.—During sexual maturity certain of the segments of the body in Luwmbricus and other earthworms undergo a change in appearance which is caused by the development of several layers of unicellular glands beneath the epidermis. Among the "'Limicolz (e.g.,in Limnodrilus, Rhynchelmis, Enchytreidex) the clitellum is, on the contrary, furnished with an epidermal layer only one cell thick ; some of these cells become large and glandular. In these points Criodrilus agrees with earthworms. The sccretion of these glands may form the cocoon in which the eggs are deposited, but it appears to be also used to attach individuals together during copu- lation. The clitellum is universal among the Oligocheta. Monili- gaster and Criodrilus were for some time considered as an

exception to this rule, but a clitellum has recently been demonstrated in these two genera by Bourne (17)? and Benham (7). The clitellum in carthworms never occupies less than two segments, and in Trigaster it extends over twenty-seven.

Sete#.-—These are universally found in the Oligochexta, but differ in their shape, as well as in their number and arrangement, in different families. In the majority of forms the sete are disposed in four longitudinal rows ; the sete in each of these rows may be comparatively numerous (Naidomorpha), or may be limited to two

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Fig. 2.—Sete of Oligocheta. a, penial seta of Pericheta ceylontca ; b, extremity of penial seta of Acanthodrilus (after Horst); ¢, seta of Urochexta (Perier) ; da, seta of Lumbricus; e, seta of Criodrilus; f, g, sete of Bohemitlla comata; h, 4,7, sete of Psammoryctes barbatus (f to j after Vejdovsky).

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Lumbriculide and many earthworms). In Acanthodrilus multt- porus and other earthworms the eight sete are no longer in pairs, but separated by nearly cquivalent intervals. In Urochwta (fig. 1,D) and Diachexta each segment has also eight setz, but these are dis- posed more or less

alternately in successive segments. In the former of these two genera, as also in Eudrilus, peculiar structures of a chitinous nature exist between the individual set of a OS SS ee a

1 The genus Acanthodrilus is almost entirely Antarctic in its range.

It occurs in Patagonia, 8. Georgia, Kerguelen's Land, New Zealand, Cape of Good Hope and other parts of Africa, Madagasear, and New Caledonia. Perichxta is charaeteristie of the Old and New World tropies, particularly of the former; in the Old World it ranges from India to China and Japan, and through the Indian Islands to Australia and New Zealand. Australia has the peeuliar genera Megascolides, Notoscolex, and Cryptodrilus, but the greatest number of peculiar genera are found in the Neotropical region. In Europe the most characteristic genera are Lumbricus and Allolobophora; these are found in most other parts of the world, but it is possible that they have been accidentally imported.

? These figures refer to the " Literature," p. 684.

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segment; these are similar to certain structures described in Anachxta by Vejdovsky (15) as abortive sete; their presence in Urochxta and Eudrilus may indicate that the number of sete in these worms has been reduced from a continuous eircle round each

'segment, such as exists in the family Perichetide (fig. 1, C).

Among the Natdomorpha there are delicate hair-like sete which pass by numerous intermediate forms into sete with a bifurcate extremity; in many limicolous forms, as in earthworms, the set are simple in form, ending in a slightly curved extremity. The sete are developed in the interior of cells of ectodermic origin ; special muscles effect their movements.

Celom.—The Oligochxtia, like other Annelids, have a ccelom Celom.

which is formed by the excavation of paired mesoblastic somites ; the intersegmental septa represent the walls of each two adjacent somites ; the dorsal and ventral mesenteries, which in the Archt- annelida suspend the gut from the body-wall, are largely absent in the Oligochzxta, the cavities of each pair of somitcs becoming continuous. 'Traces of the dorsal mesentery are met with in some forms ; in almost all the ventral mesentery persists to a great extent in a sheet which suspends the ventral blood-vessel from the intestine.

The coelom communicates with the exterior by the nephridia and ducts of the reproductive organs and by certain dorsally-placed pores. These latter are sometimes present only on the head seg- ment (Criodrilus and many aquatic genera), sometimes on the body segments also (Hnchytreida); in the majority of earthworms they appear to exist only on the body segments, and the first one does not usually appear before the third and fourth segment. In Pon- todrilus and a few other species the dorsal pores are entirely absent. The ccelom is lined with a peritoneum, the cells of which exhibit different characters in different parts of the body. The intestine is covered with a layer of large cells containing numerous granules; this cellular investment was originally described as hepatic, but it is now known to have no relation to the alimentary tract. The investigations of Kiikenthal (16) show that these cells are concerned with the excretory function.

Nervous System.—This consists of (1) a pair of cerebral ganglia Nervous connected by a circumcesophageal ring with a chain of ventral system.

ganglia arranged in pairs—a pair to each segment; (2) a system of small ganglia and nerves arising from the cerebral ganglia and innervating the anterior part of the alimentary tract ; and (3) two lateral ganglionated cords, which have a special interest for those who believe that the segmented worms are the Invertebrate group from which the Chordata (including the Vertebrata) have sprung. The discovery of Kisig (" Die Capitelliden," Naples Monographs), that this lateral cord is on both sides connected with segmentally arranged sense-organs in the Capitellida, is an additional argument for considering this lateral system as the homologue of the lateral line in fishes.

The nervous system of olosoma is probably degenerate ; it con- sists merely of a pair of cerebral ganglia, which are situated in the procephalic lobe in connexion with the epidermis. In Ctenodrilus the nervous system, like that of the Archiannelida (see below), is imbedded in the epidermis throughout its whole extent. In the higher forms, in fact in all the remaining Oligochexta, the central nervous system has lost its primitive connexion with the epidermis. Moreover, in these forms the cerebral ganglia, originally developed in the procephalic lobe, have moved back, and may lie as far back as in the fourth segment.

Vascular System.—All the Oligochxta possess, in addition to the Vascular corpusculated fluid of the ccelom, a system of closed vessels which system.

in the higher forms attains to a very highly developed condition. This vascular system contains in nearly all the Ol¢gocheta, as in the Polychxta and Hirudinca, a red-coloured fluid, which has been proved to owe its coloration to hemoglobin, and in which are suspeuded corpuscles. - #olosoma has a colourless pseudhemal fluid. In the lower forms the walls of the blood-vessels are exces- sively delicate, and contain no muscles ; in the higher forms (e.g., Lumbricus) the blood-vessels are furnished with muscular tissne as well as with an epithelial lining. The cells of the latter give rise to the corpuscles of the blood, which consist of little more than the nucleus.

The simplest form of vascular system occurs in olosoma and Ctenodrilus. The alimentary tract is surrounded with a network of blood capillaries, which in the cesophageal region unite to form a dorsal vessel; this passes along the cesophagus, but is situated between the walls of the intestine and its covering of peritoneal cells ; beneath the cerebral ganglia the dorsal vessel gives off a branch on either side; these unite with a ventral vessel, which passes beneath the intestine, and gives off branches to it, which are regularly arranged in pairs. In the Enchytreide the dorsal vessel is also restricted to the anterior segments of the body, and originates from a blood sinus in the walls of the alimentary tract. The dorsal vessel gives off anteriorly two branches which unite to form the ventral vessel; three pairs of slender vessels, a pair to each segment,

originate from the dorsal vessel, and are connected with these two branches. In all the higher Oligochexta there is reticulum of blood capillaries developed in the walls of the alimen-

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Excretory Organs.—It has been recently shown by Vejdovsky Excretory

tary canal, but the dorsal vessel, although connected with this (15) that the Oligocheta, like Polygordius, many Polycheta, organs.

network, does not originate from it, but passes from end to end of

the body. The dorsal vessel is also connected with the ventral vessel by paired trunks, which are segmentally disposed, 7.e., a pair to each segment. In the Naidomorpha and Lumbriculide, the vascular system consists only of these parts, together with some few branches which penetrate the layers of the body-wall and reach to the epidermis. Among earthworms the vascular system is more complex ; our knowledge of the details of the circulation in certain tropical genera (Urocheta, Pontodrilus) is due to Perrier, and but little of importance has been added to his descriptions. The circulation of Lwmbricus is known principally from the investi- gations of D'Udekem, Claparéde, and recently of Horst. In Lwm- bricus there are three longitudinal trunks (fig. 3) which run from end to end of the body—(1) dorsal, (2) supranervian, (3) subnervian. The dorsal vessel is connected with the supranervian by seven

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Fia. 3.—Diagrammatic Transverse Section through one of the Posterior Segments of Lumbricus (partly after Marshall and Hurst). 2, nephridium;

f, funnel of nephridium ; 7.c, nerve cord; e, epidermis; m, transverse muscles ; m', longi- tudinal muscles; s, s', ventral and dorsal pairs of sete ; ¢, typhlosole ; d, dorsal blood-vessel, connected by a vertical branch with typhlosole and by branches with intestinal blood-plexus; s.x, supranervian vessel; v, infranervian vessel. On the left side are indicated the chief vessels given off from the main trunk to the body-wall and nephridium.

pairs of stout trunks in the outer part of the body ; from the dorsal vessel in front of the last of these originates on either side a lateral longitudinal vessel which passes along the sides of the cesophagus and gives off branches to it. In the intestinal region the dorsal vessel is connected by branches with the capillary network of the intestine, and also directly by lateral branches with the sub- nervian vessel; the latter gives off branches to the body-walls. The majority of earthworms possess in addition a small vessel running above the alimentary canal, but below the dorsal vessel ; this is especially concerned with the blood supply of the alimen- tary tract, and in the intestinal region it runs in the interior of the typhlosole; the presence of this supra-intestinal trunk was first noted by Perrier, who also discovered that more or fewer of the large contractile "hearts" of the anterior segments are connected with this vessel as well as with the dorsal vessel. The subnervian vessel is absent in Pontodrilus and other genera. The immense development of the integumental capillary system is eharacteristic of earthworms, and is no doubt to be explained by the much greater thickness of the body-wall; it has been already stated that among the lower Oligocheta the integumental capillary system is present though feebly developed. In some genera of earthworms the capillaries penetrate the epidermic layer, as in some of the aquatic genera and in many leeches. It has been recently stated by Sarasin that these epidermic capillaries open by pores on to the exterior. That the vascular. system of 4olosoma represents a primitive condition is shown by the investi- gations of Vejdovsky (15) into the development of Rhynchelmis. In this worm the dorsal vessel is at first only visible in the anterior region of the body, where it lies upon the cesophagus below the peritoneal covering of the latter; posteriorly it communicates with a blood sinus surrounding the intestine ; this stage exactly corresponds to the adult olosoma, and the blood is also colour- less ; subsequently the dorsal vessel becomes

connected with the ventral by a few lateral trunks; this stage is retained in the Enchytreide. Moreover, in the Chloremidez a similar condition exists (Horst, Zool. Anzeig., viii. p. 12), and in the larval Teredella.

Gephyrea, and Hirudinea, possess temporary larval excretory tubules as well as the definitive nephridia. These organs have been found in Rhynchelmis, Nais, Chetogaster, and Afolosoma, In the first mentioned type they appear as a pair of fine tubes with a ciliated lumen, without any apparent internal aperture; they run on either side of the pharynx, and each opens by a pore placed at the side of the mouth, In the young asexually produced individual of Nais, Chextogaster, and Aolosoma similar organs are to be seen. The permanent excretory organs consist in the majority of Oligochxta of three parts:—(1) a funnel-shaped expansion furnished with cilia, opening into the body cavity; (2) a eoiled glandular tube; and (3) a terminal vesicle furnished with muscular layers, and opening on to the exterior of the body. 'The latter section may be absent, and in the relative proportions of the different parts as well as in certain details of their structure there are great differences. Asa general rule, the funnel lies in a segment anterior to that which bears the external pore; but in Plutellus Perrier states that the whole organ lies in one segment. In the majority of forms there are not more than a single pair of nephridia to each segment (except in Perichxta, &c.). In the limicolous Oligocheta nephridia are generally wanting in the anterior segments of the body, and disappear in those which contain the generative ducts when the latter are developed ; in the terricolous forms, on the other hand, the nephridia usually eommence in the second or third segment. Ctenodrilus is remarkable for the fact that it only possesses a single pair of nephridia, the funnel of which is situated on the anterior side of the first dissepiment; but in no form are these organs entirely wanting. The glandular part of the organ consists, as in the Hirudinea and most Platyhelminths, of a row of cells placed end to end, which are perforated by the lumen; the lumen of the tubule is therefore, as was first discovered by Claparéde, intra- cellular; in this particular the nephridia of the Oligocheta differ from those of the Polycheta, where the walls of the duct are made up of rows of cells, the lumen therefore being inter-cellular.! While in the greater number of Oligochxta the lumen of the tubule is simple and unbranched, in Chetogaster fine branches are given off,

which ramify in the substance of the cells; this is an important point of resemblance to the nephridia of the Hirudinea, where Vejdovsky and Bourne (Q. J. M. S., 1884) have described a similar branching of the duct. The glandular part of the nephridium is often, as in Lumbricus, differentiated into two parts; the anterior section is composed of more delicate cells, the posterior of larger and more glandular cells; the lumen is furnished with cilia. The external surface of the organ is frequently covered with rounded cells of a glandular appearance, which are to be looked upon as modified peritoneal cells; in certain cases (e.g., Pontodrilus and many "' Limicole"') those cells form a solid mass in the interior of which are concealed the windings of the excretory tubule. Special dilatations of the tubule are occasionally met with, as in Rhynchelmis ; and, among leeches, Clepsine, Pontobdella, &c., show a similar dilatation, which, as in Rhynchelmis, comes imme- diately after the funnel. The terminal section of the nephridium, the "contractile" vesicle, is more marked among earthworms than in the "Limicolw"; it is lined by a delicate layer of cells and furnished with muscular fibres; in Urobenus (Benham, 7), as well as in many other species, this region of the nephridium is very largely developed, and is furnished with a long sac-like diver- ticulum. The differences in strueture between the various parts of the nephridium are due to their different origin : the funnel is formed independently of the glandular tubule, though both take their origin from the mesoblast ; the contractile vesicle is inva-

| ginated from the ectoderm.

In Acanthodrilus muiltiporus Beddard found that the number of nephridial pores in the anterior region of the body to each segment was more than 100. In Zypheus an almost identical arrangement exists, and in Pericheta (Beddard, 4). In the last-named genus, as well as in an Australian form, Megascolides (Spencer, 12), the nephridial system forms a continuous network of tubules, uniuter- rupted by the septa. In Acanthodrilus the network of each segment is independent. In this genus, as in Pericheta, there are numerous ciliated funnels in each segment.

The relation of the nephridia of the Chetopoda to those of the Platyhelminths, on the one hand, and to those of the Hirudinca and

Gephyrea are variously interpreted. It has been proved that in Polygordius, many Chextopoda, and many Hirudinea and Gephyrea, the larve, like those of the Oligochexta, possess excretory organs, which are constructed on the type of the nephridia in Platyhel- minths. Thisisatany rate the case with Polygordius, the Chetopod larva, and the larva of Echiurus; in all these types the nephridia are paired branched tubes, which open separately on to the exterior; they have, however, no internal openings, the flagellate cells of the Platyhelminth, with their single flagellum and funnel-shaped per-

1 Nussbaum has lately (Arch. Slav. de Biol., i.) found that in the leech a number of cells fuse to form a single drain-pipe cell. This would tend to prove that the intercellular lumen preceded the intracellular.

foration, being absent. The larval excretory organs of the Hirudinea, like these of the Oligochezta referred to above, are to be looked upon as in a more rudimentary condition; they are unbranched, and are sometimes without an external orifice. Moreover, essentially similar organs are found in the larval mollusc. In many of the above- cited examples it is certain that the larval excretory organs have no connexion with the permanent excretory organs; they atrophy before the latter appear. Hatchek, however, has stated that there is a connexion between the larval and permanent excretory organs in Polygordius; doubts have been thrown upon this observation by some who believe that the facts already cited showed (1) that the excretory system of Annelida and Hirudinca isa new formation, while (2) the exerctory system of their Platyhelminth ancestors 1s represented by the transitory excretory system of the Annelida, which has therefore naturally no connexion with the permanent excretory system. This view has the merit of explaining the presence of apparently similar structures (7.¢., the larval nephridia) in such diverse types as Mollusca, Hirudinea, and Gephyrea, and is perhaps further supported by the high devclopment of the larval excretory organ in the active larve of Polygordius, Echiurus, and the Chzxtopoda, and its rudimentary character in the embryo Oligochzta. It follows from this that the permanent nephridia of the Chxtopoda are new structures, unless the

views of Bergh (18) be accepted, who would derive these organs from the generative ducts of the Platyhelminths.

Against this hypothesis may be urged (1) the unlikelihood of a new formation of excretory organs in Annelids, and the probability of these organs being really homologous with those of their Platy- helminth ancestors, and (2) the fact that the larval excretory organs of Polygordius, Polychxta, and Oligocheta and Hirudinca are con- nected with the permanent system or at least are not in any way replaced by the permanent excretory system ; in the Oligocheta the larval excretory organs appear comparatively late, and the segment occupied by them never gives rise to a pair of permanent nephridia.

The following facts lead to another hypothesis, which is in many respects more acceptable.

A connexion between the nephridia of consecutive segments has becn recently stated by Wilson to occur in the embryo Lumbricus. Meyer and Cunningham have observed the same in Terebeila. Vejdvosky (15) has recorded in Anacheta bohemica a connexion between the nephridia of the 21st and 22d segments, and moreover the first pair of nephridia has two internal funnels. In the leech Pontobdella the nephridia (Bourne, Q. J. Min. Sct., 1884) form a network, the internal funnels and external apertures alone being arranged metamerically. The presence of numerous external pores to each segment in certain earthworms, and the continuity of nephridia of adjacent segments are facts to be referred to the same category. Kisig's discovery of the presence of many nephridia in each of the seg- ments of the Capitellidx, which are conncted together, is also, like the other facts referred to, in harmony with the supposition that the excretory system of the Annelida has been directly derived from that of the Platyhelminths somewhat asfollows. The excretory system is at first, as in the Platyhelminth, a continuous system, opening by numerous apertures into the body cavity by a single orifice ora pair of orifices on to the exterior. Secondary external apertures are then formed, which are irregular in their disposition (these actually occurin certain Platyhelminths), and more or less numerous; this condition is largely retained in Acanthodrilus and Pericheta; the secondary external

apertures as well as the internal apertures then become reduced in number and metanierically arranged ; this condition occurs in Pontobdella and Terebella, and toa very limited extent in Anachxia. The connexion between the nephridial system of succession segments then disappears, and the characteristic Annelid excretory system is arrived at.

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duct which opens into the pharynx. Similar glands appear to occur in most Lumbricidw in the form of unicellular glands attached to the pharynx.

Another series of glandular structures are connected with the

. pharynx, which have been termed by Vejdovsky salivary glands ;

these are found in the Enchytreidz, and consist of simple or branched tubes, which open into the hinder end of the pharynx at each side by a single duct; since these glands agrce in their minute structure with nephridia, which are not found in the scginents which contain the glands, it is probable that they represent slightly metamorphosed nephridia (Vejdovsky). Among earthworms Uro- cheta, Diacheta, and Acanthodrilus multiporus possess a pair of glands at the anterior end of the body (glandes & mucosité, Perrier), which are larger and more complicated than the nephridia, though their structure is the same ; in Acanthodrilus these glands open into the buccal cavity ; in Urocheta they are branched and open on to the surface of the body on the one hand, and into the ccelom by several funnels (Beddard). It is possible that they are the homo- logues of the salivary glands in the Enchytrxide.

The cesophagus is ciliated in the lower forms, but among earth- worms cilia appear to be limited to that section of the cesophagus which lies behind the gizzard. The intestine, however, appears to be ciliated in all the Oligochewta. There is thus a gradual diminu- tion in the ciliation of the alimentary tract in passing from the lower to the higher forms. In 4olosoma the whole canal from mouth to anus is ciliated. When the

buccal cavity first appears it is lined with a cuticle, and has no cilia. The pharynx loses its cilia in the Enchytrzidx, while the rest of the alimentary tract is cili- ated. Among earthworms the cilia are partially wanting in the cesophagus, whilc the intestine is lined with a ciliated epithelium.

In some Oligochxta the esophagus is furnished with a muscular dilatation, which is usually termed gizzard. This organ first makes its appearance among the Naidomorpha, but is absent from other genera of " Limicolx." Itis, on the contrary, present in nearly all earthworms; the gizzard is lined with a tall columnar epithclium, which secretes a specially thickened cuticle, and the muscular layers are enormously increased. In ZLumbricus the gizzard lies at the posterior end of the csophagus, but in all other earthworms it is succeeded as well as preceded by a section of cesophagus, as in Nais. In Lwmnbricus, as well as in many other genera of earth- worms, the gizzard occupies two segments, and the septum dividing these segments has disappeared, or is at most represented by a few bands of muscle, which bind down the gizzard to the body- wall. On the other hand, in some earthworms as well as in the Naidomorpha the gizzard only occupies one segment. In Digaster and Vrigaster there are, as the names of these genera imply, two or three separate gizzards, while in Montligaster there are four or five. In Zrigaster and Moniligaster each gizzard only occupies a single segment; it is possible that the single gizzard of Lumbricus, &c., which occupies two segments, is due to the fusion of two separate gizzards lying in as many consecutive segments.

The cesophagus in most earthworms is furnished with from one to six pairs of glandular diverticula, which are known as "calci- ferous glands" or "glands of Morren." Those glands produce a calcareous secretion.

The intestine is wider than the esophagus, but has much the same structure; in Molosoma the walls of the intestine consist of little more than a single layer of ciliated cells, but in the higher forms this is surrounded by a layer of circular and longitudinal muscular fibres. A remarkable peculiarity distinguishes the intestine of the majority of earthworms; this is a longitudinal fold on the dorsal side which projects into the lumen of the intestine, and which is known as the "typhlosole"

(fig. 3, ¢). A typhlosole does not exist in Pontodrilus nor in any known limi-

Alimen- ; Alimentary Tract.—The alimentary canal of all the Oligochzta | colous form. In Pericheta the intestine is furnished with one or tary is a straight tube running from mouth to anus, but even in the | more pairs of short ceca; in Megascolex and other genera there tract. lowest forms is specialized into different regions. A pharynx, | are series of compact glands opening into the intestine.

cesophagus, and intestine can be recognized universally ; the pharynx is formed by the stomodzal invagination of the epiblast, while the terminal section of the intestine is formed by the proc- todeal invagination; the rest of the alimentary canal is hypo- blastic. In olosoma the pharynx is restricted to the first segment

Reproductive Organs.—The Oligochxta are, so far as is known, Repro- invariably hermaphrodite ; in this particular they differ from the ductive Polychzxta, where as a rule the testes and ovaries are found in organs, distinct individuals. Among the Polychexta, however, Protwla and other Serpulide are hermaphrodite. The reproductive organs

of the body, a condition which is seen in the embryonic stages of other Oligochxia, but also in the adult Polygordius (see below). This is followed by the narrow cesophagus, which leads, in the fourth segment, into the intestine; the intestine is at first wide

but afterwards becomes narrower; the whole alimentary canal is ciliated. In the higher types the pharynx occupies several seg- ments, and is preceded by a buccal cavity, the epithelium of which is not ciliated ; in many Oligochzxta (e.g., Enchytreus) the pharynx is protrusible. It is frequently furnished with glands, which are of two kinds, and probably not morphologically comparable. In many Enchytreide and Naidomorpha certain of the anterior segments contain glands attached to the anterior faces of the intersegmental septa; these have been termed septal glands. In Anachexta there are only two pairs of these glands, but four in Pachydrilus ; the glands of each side of the body are connected by a continuous longitudinal

consist of testes and ovaries, with their ducts, and spermathece, which are filled with spermatozoa during copulation, The repro- ductive glands are developed as a proliferation of the peritoneal epithelium, but are restricted to one or two segments ; these organs moreover have a definite form, and are commonly surrounded by a layer of cells of different nature from the sexual cells which make up the substance of the gland.

(1) Male Reproductive Organs—(a) Testes.—In Lumbricus these organs consist of two minute pairs of solid cellular masses attached close to the median ventral line upon the posterior face of the septa which divide segments 9-10 and 10-11 (fig. 4). These organs were first discovered by Hering. In the majority of earthworms (Acantho-

1 For an account of the function of these glands, as well as of the part which

earthworms play as geological agents, see Darwin, formatiun of Vegetable Mould, &c.

drilus, Eudrilus, Perwhsta, &c.) there is an identical number of testes occupying the same segments. It is probable but not yet proved that in Urochwta and Moniligaster, where there is only a single seminal reservoir and vas defcrens on each side, there is but one pair of testes; at any rate, in Typheus, where the seminal reservoirs and vasa deferentia are single, there is but one testis on each side placed in the 10th segment.

Among the "Zimicolz" there is rarely (Phrcoryctes) more than a single pair of testes, which may be in the 5th (Naidomorpha), 9th (Lumbriculidz), 10th (Tubifex), or 11th (Enchytreus, &c.) segment.

(b) Seminal Reservoirs. —The spermatozoa are not, however, de- veloped within the testes, but in special receptacles, the seminal reservoirs (seminal vesicles, vesicule seminales). These structures frequently enclose the testes, with which they have been con- founded by many writers. By the earlier writers the seminal reservoirs were regarded as ovaries; this opinion was due to the numerous parasitic Gregarines which these

organs contain; the encysted parasites were mistaken forova. In Lwmbricus terrestris, &c. (Bergh), there is a single median reservoir, which encloses the testes, the funnels of the vasa deferentia, and the nerve cord in each of segments 9 and 10; with these are connected three pairs of lateral outgrowths situated respectively in segments 8, 10,and11. In Allolobophora fetida there are four pairs of isolated seminal reservoirs in segments 8, 9, 10, and 11; there is no median unpaired portion; and the testes as well as the vasa deferentia lie freely in the body cavity; the first two pairs lie on the posterior septa of their segments, and open by an aperture into the cavity of the segment behind; the last two pairs lie upon the anterior septa of their segments, and open into the cavity of the segment in front. In all cases the seminal reservoirs are formed as outgrowths of the septa. The cavity of the seminal reservoirs is broken up by anastomosing trabecule, in the interstices of which the spermatozoa undergo their development. There is very great variety among earthworms in the number and arrangement of the seminal reservoirs, but there is no form known in which they are absent. In Urocheta, Typheus, Titanus, and Diacheta there appear to be only a single pair, which are of great length. In Diachxta (Benham) they oceupy 26 segments.

In many of the " Limicole," as was first proved by Lankester in Tubifex, seminal reservoirs are found ; a where their develop- ment has been traced they appear to originate as outgrowths of the septa. In some of the simpler forms, ¢.g., Chatogaster, seminal reservoirs are not developed, but the testicular products float freely in the perivisceral cavity, where they undergo their de- velopment.

(c) Vasa Deferen- tia.—It is a rule without any excep- tions among the Oligocheta that the Spermatozoa are car- ried out of the body by special ducts, which perform only this function. In this respect the Oligoche#ta are in marked contrast to the Polychxta,where Fig, 4.—Genital Segments of Lumbricus (slightly altered theripespermatozoa from Howes, Biological Atias). The left side repre-

are either set free sents the immature, the right the mature condition, by a rup haa of the so far as the male reproductive organs are concerned,

body-wall, or are conveyed to the ex- terior by means of the nephridia, which, however, may be slightly modified in relation to this function. These ducts are termed vasa deferentia ; they in- variably open freely into the body cavity, and only sometimes (¢.g., Lumbricus) acquire a secondary relation with the testes by way of the seminal reservoirs ; they are developed independently of the testes. In the Hirudinca and Platyhelminths, on the other hand, the efferent ducts are continuous with the testes, of which they appear to be mere outgrowths ; Nussbaum has, however, recently (Zool. Anzeiger, viii. p. 181) stated that in Clepsine the vasa deferentia are aoiabged independently of the testes.

In their simplest form (in many Enchytreidz) the vasa deferentia consist of a single pair of convoluted tubes, which open by a wide funnel-shaped aperture into one segment, while the external aper- ture is situated in the following segment. Very generally in those

t, anterior pair of testes (the second pair are in the next segment); vs, seminal vesicles; sp, spermathece ; vd, vas deferens; 0, ovary; od, oviduct; ro, recep- taculum ovorum; 7, nephridia; nc, nerve cord.

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Oligocheta the funnel-shaped expansion is continued into a wide cylindrical tube, which narrows abruptly on passing through the intersegmental septum into a slender tube; the walls of both sections of the vas deferens are formed of cylindrical ciliated cells; the external aperture is often surrounded by several rows of large glandular cells. Among a large number of the lower Oligocheta there is a single pair of vasa deferentia, which occupy in the same way two segments; the internal funnel-shaped aperture opens into one segment, while the greater part of the tube and the external orifice are situated in the following segment. A further complica- tion is, however, introduced in the form of a glandular terminal organ, which opens on to the exterior by one extremity, and com- municates with the vas deferens at the other. In Stylaria lacustris this organ is pear-shaped, narrowing towards the external aperture ; it is lined by a layer of cylindrical glandular cells, outside of which is a layer of muscular fibres ; the whole organ is covered by large peritoneal cells of a glandular appearance. This organ is termed the atriwm; the vas deferens,

which is short, only curved (not convoluted), opens by one end into the broad extremity of the atrium, and terminates in a ciliated funnel, which has this peculiarity that it does not lie in the segment in front, but in the same segment (in the 6th) as the atrium; it is, however, closely applied to the intersegmental septum of segments 5-6.

This condition of the vasa deferentia is exactly repeated in the earthworm Moniligaster barwellt ; the seminal reservoirs (Beddard) lie partly in the 8th and partly in the 9th segment; the vas deferens, which is much coiled, lies in the same segment; it is con- tinuous at one end with the seminal reservoir, and at the other with a glandular body opening between segments 9-10, which has a structure apparently identical with that of the atrium of Stylaria. Cheetogaster diaphanus (Vejdovsky, 15) has the same general dis- position of the vasa deferentia, but the atrium is divided into a glandular "vesicula seminalis," into which opens the vas deferens, and a distal non-glandular portion, which can be everted during copulation.

The reproductive ducts of the 7'ubifictde# are still further com- plicated in their structure. In Tubzfex rivulorwm the structure of the atrium at an early stage is like that of Stylaria ; a simple globular or pear-shaped atrium is formed as an invagination of the integument; later this is differentiated into two parts, as in Chaetogaster ; an additional structure is, however, developed in

Fic. 5.—Male Genital Ducts of Various Oligocheta. In most cases the whole length of the vasa deferentia is shown; the transverse lines indicate the boundaries of the segments through which they pass. The thick black lines indicate the atria, the dotted lines the muscular part of the atria. In F, G, H the penial sete are shown lying in a sac opening in common with the atria. A, Moniligaster barwelli (outside the atrium in A and C is a layer of glandular tissue); C, Phreatothrix pragensis (after Vejdovsky); D, Zudrilus silvicola; E, Pontodrilus marionis; F, Pericheta armata; G, Typheus gammii; H, Acanthodrilus novx-zelandiz ; I, Ocnerodrilus (after Eisen).

the form of a group of unicellular glands, collectively termed the prostate, which open into the glandular distal region of the atrium ; in theadult 7'ubifex the proximal section of the atrium 1s developed into a protrusible

penis; this is surrounded by a second invagina- tion of the integument, which forms a penis sheath and part of the penis proper. The glandular part of the atrium (vesicula seminalis) is ciliated, but cilia are wanting in the penis. In Telmatodrilus

(Kisen) the prostates are very nunierous, and arranged in pairs ; in Psammoryetes (Vejdovsky) and in Hemitubifex (Kiscn) the upper part of the vesicula seminalis, into which open the vas deferens and the prostate, forms a globular chamber distinct from the re- mainder of the atrium.

Another type of efferent apparatus is found in the Lumbriculidx, In Stylodrilus there is a single pair of atria, which have much the same structure as in Sty/aria, but the proximal end of the organ is less glandular and can be everted asa penis. With each atrium, however, are connected two vasa deferentia; one of these opens by a funnel-like expansion into the segment in front, the other passes back into the segment behind that which contains the atrium, and after again perforating the septum opens by a funnel-shaped ex- pansion into the atrial segment. Among earthworms Afoniligaster, as already stated, is furnished with an efferent apparatus exactly eomparable to that of the lower " Zimicolz." In other genera the same divisions can be recognized in the efferent apparatus, which may also be single ordouble. In all earthworms, however, with the exception of Aloniligaster, the internal funnels are situated several segments in front of the external pore, instead of being placed in the next segment. This is the case also with Oenerodrilus (Hisen), a form usually referred to the " Limicolx." Urocheta and Typhxus are the only genera known, besides AMoniligaster, in which there is a single vas deferens on each side. In all others there are a pair of vasa deferentia on each side, which open by separate funnels into two consecutive segments (10th and 11th); the vasa deferentia open on to the exterior by a common pore; they may become united into asingle tube in the segment behind that which contains the posterior funnel (Lumbricus, Pericheta), or one or two segments farther back

(Aficrocheta), or, finally, as in Eudrilus, they may unite in the terminal apparatus.

The structure of the vasa deferentia and the funnels corresponds to that of the lower Oligochzta, except that the funnels are usually much plicated. In Lumbricus, Urochxta, &c., the vasa deferentia open directly on to the exterior; in other types, however, an atrium can be recognized. The most primitive form of these organs (in some respects) is seen in the genus Hudrilus (Beddard, 3); the two vasa deferentia open into the interior of a glandular organ, which is probably the homologue of the atrium; thisorgan is divided into two parts by a longitudinal septum, but is covered by continuous layers of muscles ; it communicates with two muscular tubes, also covered by a continuous layer of muscle, which unite into a single muscular penis, which is probably eversible. The penis, like the atrium, is lined by a single layer of non-ciliate cells; the cells of the glandular portion are non-ciliate, and are arranged in two layers ; the penis projects into the interior of a cavity open to the exterior ; this corresponds to the penis sheath of the Naidomorpha. With the penis sheath ("bursa copulatrix," Perrier) is also connected a small rigid diverticulum with muscular walls.

It is not certain whethcr the partial longitudinal division of the atrium and vesicula represents the partial fusion of the primitively distinct atria or the commencing separation into two parts of a single atrium; the latter alternative, on the whole, is the more probable.

In Perichxta, Acanthodrilus, &c., certain glandular bodies are

connected with the termination of the vas deferens, which have been termed "prostates." These glands are of two kinds: (1) in Acan- thodrilus, Pontodrilus, &c., they consist of a single somewhat con- voluted tube of uniform diameter ; (2) in Perichzta, &c., they have aracemose lobulated appearance. It is probable that these structures are homologous. The prostates of Perichexta (fig. 5, F) are made up of numerous ductules, which are connected with groups of cells that have the character of unicellular glands ; each cell:is connected bya long stalk with the termination of the ductule; in Acanthodrilus, &c., the prostate is lined by a double layer of cells which surround a central lumen; the innermost

layer of cells are narrow and columnar, the outer layer are large pear-shaped glandular cells. The difference between the two organs is this: in Perichzta the glandular cells have become segregated into groups, while the lumen of the glandis branched. In atleast one species of Perichexta both these differences from Acanthodrilus are less marked. _ The so-called prostates of Acanthodrilus and Pontodrilus agree in their minute structure with the vesicula seminalis of Eudrilus, and they open on to the exterior, like the corresponding structures in Perichata, by a thick-walled muscular tube ; the vas deferens, however, is connected in Pontodrilus with the muscular part of the atrium, and not with the vesicula ; the condition of the efferent apparatus is therefore a more modified one. In Typheus this modification is carried still further: the vas deferens enters the body- wall independently of the vesicula and atrium, and only joins the latter below the epidermis just before its opening on to the exterior. If Vejdovsky be right in interpreting the so-called receptaculum seminis of Oenerodrilus (Hisen) as the atrium, the relations of the several parts of the efferent system in this worm are much the same asin Typheus. In Acanthodrilus (fig. 5, H) the two pairs of atria open on to the 17th and 19th segments respectively; the vasa deferentia open on to the 18th independently of them.

(d) Genital Setz.—It is commonly the case among the Oligochzxta

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that the sete upon the clitellum, in the neighbourhood of the spermathecee and the male sexual apertures, undergo a_ certain amount of modification. Thus in Lwmbricus the sete in these regions of the body are longer and more slender than the sete else- where (Hering); in Urochxta and Thammodrilus the sete upon the elitellum are ridged. Analogous modifications are found in Nais and other "‘ Limicolz." The function of these setz is prob- ably, as Lankester has suggested, to assist in attaching the worms together during copulation. Before the individual is mature these setee are absent, and the ordinary sete occupy their place; when the clitellum is developed the ordinary sete drop out, and are replaced by the genital sete (Vejdovsky).

*In Acanthodrilus, Typheus, and some species of Pericheta the apertures of the atria are furnished with a thin-walled muscular diverticulum in which are found a bundle of extraordinarily long sete ; these can be protruded through the sexual orifice and may possibly serve to assist in the transference of the sperm to the spermathece of another individual. These setee may be termed '*penial" sete (Lankester) (fig. 2, a, b).*

(2) Female Reproductive Apparatus—(a) Ovaries.—The ovaries of Lumbricus were first discovered by D'Udekem ; they consist of a pair of minute pear-shaped bodies attached to the anterior septum of the 13th segment (fig. 4, 0); their position exactly corresponds to that of the testes, and like those organs they are covered by a delicate layer of flattened peritoneal cells. In Pericheta and Acanthodrilus, where the testes are prolonged into numerous digi- tate processes, the ovaries have an identical form; finally, the contents of the young ovaries and testes consist of entirely similar germinal cells (Bergh); these facts all tend to prove the serial homology of the ovaries and testes. With the exception of Hucli- pidrilus and Phreoryctes, the Oligocheta possess but a single pair of ovaries, which appear to be invariably! placed behind the testes.

(0) Receptaculum Ovorwm.—Correspouding to the seminal reser- voirs are a paiv of outgrowths from the posterior side of the septum which separates segments 13-14; the ripe or nearly ripe ova are stored in these receptacles. Their presence in Lwmbricus was first discovered by Hering. They have the same structure as the seminal reservoirs ; their eavity is similarly divided by anastomosing trabecule; and they have been proved by Bergh (19) to originate in the same way. In Afoniligaster (Horst) these bodies are of large size, and therefore resemble more closely the seminal reservoirs. They are generally present in earthworms. Among the Naido- morpha organs are niet with which appear to resemble the recep- tacula. In Stylaria lacustris a pair of delicate sacs are developed in the same segment as that which contains the ovaries; in these the ova undergo their development ; the extremity of the sac encircles the ovary, so that the ova can readily find their way into it. This organ is, however, compared by Vejdovsky (15) to the delicate peritoneal covering of the ovary in Lwmbricus, and more particularly to a tube-like projection of this

peritoneal covering at the free extremity of the ovary where the ripe ova are found.

(ce) Oviduct.—The oviducts in Lwmbricus are two minute trumpet-shaped bodies composed of a single layer of ciliated cells; the funnel-shaped expansion opens into the 13th segment; the tube perforates the mesentery, and opens on to the exterior in the 14th segment. The mouth of the oviduct is in close relation with the aperture of the receptaculum ovorum into the same segment. In most earthworms a pair of oviducts of similar structure have been recognized; in Pericheta the two oviducts open by a common pore situated in the median ventral line of the 14th segment. The aper- tures of the oviducts are, with the exception of Aloniligaster (Horst) and Allurus (Beddard, 5), invariably placed in front of the male gene- rative pores. Among the "limicolous" forms oviducts have been described in Rhynchelmts, Phreoryctes, and Phreatothriz ; in these genera, however, the oviducts consist of little more than the funnel which is sessile on the ventral body-wall of the 11th segment, and opens on to the exterior in the groove between this and the following segment; in Phreoryctes, Beddard (6), there are two pairs of oviducts entirely contained in one segment. It is important to note that in Rhynchelmis and Phreatothrix the female pore is behind the male pore, while in earthworms (except Aoniligaster, All/urus) it is in front. Among the lower Oligochexta oviducts are abscnt; their place is taken in the Hnchytrzidez and others by a pair of slit-like orifices placed on the clitellar segment behind the apertures of the vasa deferentia. That these pores represent the external orifices of the oviducts in the higher forms is shown by the following considera- tions: (1) their position behind the male pores; (2) the probability urged by Vejdovsky that the clitellar segment really represents three fused segments, in which case the oviducal pores are really one segment behind the male efferent pores; (3) the remarkable analogy with the Cyelostomata among fishes, where the abdominal pores act as oviduct (Weber, Zeitsch. f. wiss. Zool., 1887).

The ovaries and oviducts of Hudrilus (Beddard, Horst), differ in many particulars from those of other Oligochzta. The ovaries (fig. 6) are two solid bodies situated on the anterior septum of segment

1 Plutellus is, according to Perrier, an exception ; the ovaries are in front of the testes.

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14, They are surrounded by layers of muscles, and the interior is divided by trabecule into numerous compartments ; directly con- tinuous with each ovary isa contorted tube which passes through the septum into the 13th segment, and then again passes through the septum, and opens on to the exterior in the 14th segment, in common with a large spermathecal pouch and a small glandular body. The oviduct opens by a wide the ovary, and is lined throughout with a ciliated epithelium; it is covered by layers of muscular fibres, which aro continuous with those of the ovary. The continuity of the ovary and its duct is unknown in any other Oligocheta, but is analo- gous to the condition of the ovaries Fie. 6.2 atemile Beamianie Mad. and their ducts in the leeches. It ratus of pkey On te right is possible that the muscular wall side the spermatheca has been cut of the ovary is to be regarded as an away to show the contorted ovi- hypertrophy of the peritoneal cover- {uct ol gina shone ease ing of the ovary in Lumbricus, &c., joined duct of spermatheca and and that this has involved the ovi- oviduct.

duct; or the muscular coat of the ovary may be regarded as the receptaculum ovorum, which, as in Stylaria, is developed in the same segment as the ovary; this supposition is strengthened by the fact that the oviduct traverses the septum between the 18th and 14th segments,

Spermathecee.—Of these organs there are from onc to eight pairs ; they consist of spherical or pear-shaped vesicles, often furnished with accessory diverticula. They receive the semen during copu- lation and by their epithelium is fabricated the generally chitinous spermatophore in which the spermatozoa are enveloped, and in which they are conveyed to the neighbourhood of the clitellum of another individual.

The genital ducts have been compared with nephridia by many writers ; there is not only a considerable anatomical resemblance, but a

developmental similarity ; the vasa deferentia (and the ovi- ducts ?), like the nephridia, consist of a funnel, of a more or less elongated tubule, and of a distal vesicular part. The ¢ntracellular duct of the nephridium and the intercellular duct of the vas deferens may be explained by the different functions which the organs perform.1 The sperimathecew, on the other hand, are com- parable to the vesicle of the nephridium, which is formed in both cases by an ectodermic ingrowth. The fact that the funnel and the tubule in both cases are developed independently, but both from the mesoblast, isa striking point of similarity between the vasa deferentia and oviducts and the nephridia. The belief of Claparéde that in the "Limicolx" the genital ducts were the homo- logues of nephridia, but not in the " Lerricole," was based upon the erroneous assumption that nephridia are absent in the genital segments of the former. This has been shown by Vejdovsky to be an error: nephridia are present at first in the genital segments, but degenerate and disappear when the genital ducts are formed. Moreover, enough has been already said to prove the extreme unlikelihood of a non-homology between the generative ducts in earthworms and those in the "limicolous" forms. Lankester put forward the theory that there were primitively two pairs of nephridia in each segment, each series being connected with one of the pairs of sete ; the genital ducts were supposed to be the remains of one series which had aborted, except in the genital segments. This theory was at first espoused by Perrier, who found that the nephridia were sometimes connected with one series of sete and sometimes with the other, and sometimes (Plutellus) alternated from segment to segment, opening in one segment by the ventral and in another by the dorsal sete; these facts appeared to show that one or other of the two series of nephridia was partially or entirely retained in different genera. In his later publications Perrier was not inclined to attach much weight to this hypothesis, inasmuch as it did not satisfactorily refer the genital ducts to one or other of the presumed double series of nephridia ; the apertures of the genital ducts and nephridia were found occasionally to co- incide at the same pair of sete.

The discovery that each segment of a worm may contain numerous nephridial pores disposes of any a@ priori difficulties as to the homology between nephridia and genital ducts, though the question is far from being settled.

Classification and Affinities. —It has already been stated that the Oligocheta form a group which cannot be subdivided into Limicole and Terricolw as was proposed by Claparéde. The genera of Oligo- cheta have been arranged in families by Vejdovsky (14), to whom the reader is referred for a classification, which is satisfactory as regards the "limicolous " forms, and some of the families (2.g., Lumbricidz and Perichetidx) of earthworms. Since that time, how-

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1 The difference between the nephridia and genital ducts in this respect cannot be regarded as being of importance; the nephridia of Polychta differ from those of Oligochzta in having an intercellular lumen. Lang, moreover, has shown ('"' Dice Polycladen," Maples Monographs) that in some Planarians the reproductive ducts, like the nephridia, may have an intracellular lumen.

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ever, a large number of new genera and species of earthworms have been described, which cannot at present be satisfactorily arranged. Perrier divided earthworms into threc groups :—(1) Preclitellians (e.g., Lumbricus), where the male pores are situated in front of the clitellum ; (2) Intraclitellians (e.g. , Eudrilus), where the male pores are within the clitellum ; and (3) Postclitellians (e.g., Perichzta), where the male pores open behind the clitellum. Advaneing knowledge has shown this classification to be untenable, for two principal reasons: first, because it separates some species of Acanthodrilus which are postclitellian from others which are intraclitellian, and it separates the intraclitellian Megascolex from the postclitellian Perichzta, between which genera there are numer- ous points of affinity ; and, secondly, because this classification is based on the assumption that earthworms can be considered as a group apart from other Oligochewta, whereas it is now impossible to draw any line of division between any two such groups.

The simplest forms of Oligochewta are the genera Holosoma and Ctenodrilus. 4olosoma has a "head," consisting of one segment which contains the pharynx. The nervous system consists of cerebral ganglia, which are placed in the first segment, and retain connexion with the epiblast ; the apparent absence of a ventral nervous cord is in all probability to be looked upon as evidence of degeneration. The body possesses considerable traces of the primitively continuous ciliation ; upon the head are a pair of ciliated pits. In all these particulars, as well as in the characters of the vascular system, "olosoma agrees with Ctenodrilus; the latter form has, however, a ventral nerve cord, which, like the cerebral ganglia, is lodged in the epidermis. In most of these points olosoma and Ctenodrilus resemble larval forms of the higher Oligocheta. The reproductive organs of Ctenodrilus are not known, but those of Zolosoma are constituted on the Oligocheetous plan. These two genera are also closely allied to the Archiannclida, of which a short description is appended, as they are not treated elsewhere in this work.

The affinities of Ctenodrilus are not so plain ; but, in the absence of any knowledge respecting the generative organs, it is impossible to refer them definitely to the. Oligocheta or to the Polychexta.

Archiannelida.—This subclass includes certain small marine Archian- worms which were formerly placed among the Polychwta. Hatchek nelida. originally created the group for the reception of Polygordius and Protodrilus; and recently Fottinger has placed Histriodrilus? (an animal formerly referred to the Discophora) in the same group. The name Arechiannelida implies that these forms stand at the base of the Annelida, and that they represent most nearly the common ancestral form from which both the Polychewta and Oligochzta have been derived. Their structure, which bears out this supposition, suggested the name.

Polygordius is found on the northern and southern coasts of Europe; it is a small slender worm, varying in length (according to the species) from 30 m. to 1 decim. The segmentation is hardly marked externally. The head segment is divided as in the Chetopoda generally into a prostomium and a peristomial ring; the prostomium gives rise to two tentacles. On either side of the prostomium is a ciliated pit, which is of special interest, as it

occurs on the one hand among the NEMERTINES (q.v.), and on the other among certain Polychsta (e.g., Ophelidz), and in the lowly organized Oligochxt olosoma. Cilia are found in certain species in the neighbourhood of the mouth and on the anal segment.

The ciliation of the body is more marked in Protodrilus, where there is a continuous ventral groove lined by cilia; there are rings of cilia also on each segment. The partial ciliation of Polygordius is to be derived from this by reduction. Certain Oligochsta retain traces of the primitive ciliation of the body (e.9., olosoma),

There are no traces of sete in Polygordius or its allies. The segmentation of the body, although hardly marked externally, is very clearly marked internally ; the body-cavity is divided by suc- cessive septa into a series of segments ; there is no such fusion of the anterior segments as is met with among tho Polycheta and Oligocheta, and the segments are less differentiated among them- selves than is usually the caso in the higher Chaetopoda. The head segment contains the pharynx, which is limited to this segment ; the nephridia, which consist of simple tubes (probably but not certainly formed of a chain of "'drain-pipe" cells, as in Oligocheta) are found in all the segments except the first and last. The nephridia do not lie freely within the celom, but in the thickness of the parietal peritoneum ; the funnel only just opens into the cavity of the segment preceding that which bears the external pore; that is to say, it is chiefly contained within the thickness of the septum.

3 The correct name of this worm is Histrtobdella. The altered termination is to express the change in the view regarding its affinities,

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In having the form of simple sinuous (not eoiled) tubes, and in lying within the peritoneum, the nephridia are in a very arehaie condition ; the same thing oeeurs in the Capitellidz ; in the higher Annelids the nephridia lie within the celom, and are usually much eoiled and complieated in structure. ts

The vaseular system eonsists of a dorsal and a ventral trunk, which traverse the thiekness of the dorsal and ventral mesenteries. The development of these vessels shows that their cavity is eontinuous with the blastocele, and is not a secondary eanalization of a solid chain of mesoblast eells, as is so eommonly the ease in the Annelida. The two trunks eommunieate in every segment exeept the last two or three by two lateral vessels, one on eaeh side; each of these latter gives off a eecal tube running backwards along the somatie peritoneum. Thus the vascular system undergoes but little modification in different segments. In Protodrilus the blood- vessels have no walls, and therefore permanently retain a eondition whieh is found in the young Polygordius before the adjacent mesoblast eclls have become differentiated into an extremely dclicate membrane. The condition of the vascular channels in Polygordius represents that of the larval Polychata and Oligocheta before the spccial muscular walls have been formed. olosoma, however, is identical with the adult Polygordius in these particulars.

The digestive tube consists of only a single layer of eiliated cells covered by a single layer of peritoneal eclls, and is therefore in an embryonic condition as eompared with the Chetopoda and Oligo- cheta. It is, however, specialized into a pharynx, cesophagus, and intestine. The nervous system is extremely simple, and lies in the thickness of the epidermis, thus presenting an embryonie charaeter, which is, however, met with in certain Polycheta.

In Polygordius the cerebral mass is situated in the prostomium, and communicates by a circumcesophageal commissure with a ventral cord which is single and median, and shows no traee of ganglionic enlargements. In Protodrilus there are two ventral cords, while in Histriodrilus there are a series of ganglionic swell- ings. A nervous plexus also exists in the thiekness of the longitudinal muscles.

Polygordius is of separate sexes; Protodrilus is hermaphrodite. The sexual products are developed in all execpt the first few and last few segments from the lining of the eelom ; the ova and sper- matozoa are apparently liberated by the rupture of the body-wall. Histriodrilus has

special efferent ducts for the ovaries and testes (found in different individuals), the nature of which is not yet settled.

Polygordius leaves the egg as an active larva, first diseoverea oy Loven. This larva is shaped like a humming-top, and has a preoral circlet of eilia ; immediately behind this on one sidc is the mouth, which leads into an alimentary eanal opening at the posterior end of the body; at the apical region is an ectodermie thickening.

*Literature.—(x) Beddard, " On the Nephridia of Acanthodrilus," Proc. Roy. Soc., 1885 ; Ann. Sci. Nat., 1886; (2) 1d., 'On the Atrium in Earthworm," Zool. Anz., 1888; (3) 1d., "Structure of Hudrilus," Proc. Zool. Soc., 1886; (4) 1d., * Nephridia of Perichzta," Q. J. M.S., 1888 ; (5) Id., '* Allurus," ibid.; (6) 1d., " Phreoryctes," Ann. Nat. Hist., 1888; (7) Benham, "Studies in Earthworms," Nos, i., if., iii, Q. J. M. S., 1886-7; (8) Id., ""Brachydrilus," Zool. Anz., 1887; (9) Horst, 'Notes on Earthworms," Notes from Leyden Museum, 1886-7; (zo) Rosa, " Criodrilus," Attt R. Acad. Sci. Torino, 1886; (11) 1d., '* Hormogaster," tbid., 1888; (12) Spencer, ft Nephridia of Earthworms," Nature, June 28, 1888; (x3) Scharff,*

Ctenodrilus," Q. J. M. S., 1887; (14) Fletcher, " Australian Earthworms," Proc. L. S. N.S. W., 1886 ; (15) Vejdovsky, System u. Morphol, d. Oligochiditen :1 (26) Kukenthal, " Lymphoidzellen d. Anneliden," Jen. Zeitsch., 1885; (17) Bourne, "Indian Earthworms," Proc. Zool. Soc., 1886; (18) Bergh, " Excretionsorgane d. Wiirmer," Kosmos, 1885; (19) 1d., " Geschlechtsorgane d. Regenwiirmer," Zetisch. J. wiss. Zool., 1886. On Archiannelida see Fraipont, " Polygor- dius," Fauna und Flora des Golfen v. Neapel (complete references to previous papers). (F. E. B.)

WORMS, one of the oldest, and from an historical point of view one of the most interesting, cities in Germany, is situated on the left bank of the Rhine, in the grand-duchy of Hesse-Darmstadt, 25 miles south of Mainz and 20 miles north-west of Heidelberg. The town is irregularly built, and some of the old walls and towers still remain, but its general aspect is modern and commercial. The chief squares are the market-place and the Dom-Platz. Worms formerly contained many ecclesiastical buildings, now

represented by eight churches, two of which, however, are no longer used for divine service. The principal church and chief building is the spacious Romanesque cathedral which ranks beside the cathedrals of Spires and Mainz among the famous ecclesiastical edifices of the Rhine. This magnificent building, with four round towers, two large domes, and a choir. at each end, has a specially

LS y This work is a general summary of investigation into anatomy of Oligochxta up to 1884, with complete list of literature. For this

reason the present bibliography refers only to more important published since that date, : portant papers

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imposing exterior, though the impression produced by the interior is also one of great dignity and simplicity, height- ened by the natural colour of the red sandstone of which it is built. In this last particular it differs from the cathedrals of Mainz and Spires, where the natural colour of the stone no longer appears in the interior. Only the lower part of the western towers belongs to the original building consecrated in 1110; the remainder dates from 1181, with the exception of the west choir and the vault- ing, which were built in the 13th century, and the elabor- ate south portal, which was added in the 14th century. The ornamentation of the older parts is simple to the verge of rudeness ; and even the more elaborate later forms show no high development of workmanship. The church is 485 feet long and 114 feet wide ; the transepts, which are at the west end, are about 120 feet long (inside measure- ment), and the choir is 160 feet high. The cathedral belongs to the Roman Catholic community, who possess also the church of St Martin and the Liebfrauenkirche, a handsome Gothic edifice outside the town, finished in 1467. The principal Protestant place of worship is Trinity church, built in 1726. Second in interest to the cathedral is the church of St Paul, also in the Romanesque style, and dating from 1102-16, with a choir of the early 13th century. It is adjoined by the remains of an abbey and cloisters of various epochs. Since 1881 this church has contained an interesting museum of national antiquities. The late Romanesque St Andrew's church is also used for secular purposes. The synagogue, an unassuming build- ing erected in

the 11th century and restored in the 13th, is now completely modernized. The Jewish community of Worms (about 1400 in number) claims to be the most ancient in Germany, and to have existed continuously since before the Christian era, though the earliest authentic mention of it occurs in 588. A curious tradition, illustrat- ing the efforts of the dispersed people to conciliate their oppressors, asserts that the Jews of Worms gave their voice against the crucifixion, but that their messenger did not arrive at Jerusalem until after the event.

The town-house of Worms was restored in 1884. The Bischofshof, in which the most famous diet of Worms (1521) was held, is now replaced by a handsome modern residence. The Luginsland is an old watch-tower of the 13th century. Worms also contains numerous schools and a richly endowed hospital. In the Luther-Platz rises the imposing Luther monument (unveiled in 1868), consisting of a series of twelve statues on a platform 16 feet square. In the centre the colossal statue of Luther rises, on a pedestal at the base of which are sitting figures of Peter Waldus, Wycliffe, Huss, and Savonarola, the heralds of the Reformation ; at the corners of the platform, on lower pedestals, are statues of Luther's contemporaries, Melanch- thon, Reuchlin, Philip of Hesse, and Frederick the Wise of Saxony, between which are allegorical figures of Magdeburg (mourning), Spires (protesting), and Augsburg (confessing). The greater part of the work, which took nine years to execute, was designed by Rietschel, and carried out after his death in 1861 by Kietz, Dondorf, and Schelling.

The trade and industry of Worms are not unimportant. The leading resource of the inhabitants is wine-growing, the most famous vintage being known as Liebfrauenmilch, grown on vineyards near the Liebfrauenkirche. Lugin- lander and Katterlocher are also well-known varieties. The manufacture of patent leather employs 3000 hands. Machinery, chicory, slates, &c., are also produced. Worms possesses a river-harbour, and carries on some trade by water. The population in 1885 was 21,903, of whom about one-third were Roman Catholic. In its prosperous days Worms is estimated to have had from 40,000 to 70,000 inhabitants.

Borbetomagus, the name by which Worms was known in Roman times, seems to indicate a Celtic origin for the town. The modern name is usually connected with Wurm or Lindwurm, the German word fora dragon. Drusus is said to have erected a fort on the site of the town in 14.3B.c. Asa settlement of the Germanic tribe of the Vangiones, it existed under Roman protection till about the middle of the 5th century. The Burgundians then took it and made it their capital, and its name appears in many of the heroic legends of that people. King Gunther and Brunhilde held their court at Worms; and here Sigfried wooed the fair Chriemhild. The "Rosengarten," often mentioned in these legends, lay on the opposite bank of the Rhine. Under the Franconians this town was also important ; and it wasa frequent residence of Charlemagne and his successors. The scene of the graceful though unhistorical romance of Eginhard and Emma, the danghter of Charlemagne, is laid at Worms. The first bishop of Worms of whom anything authentic is known was Erembert (670), though an "' episcopus Vangionum " is said to have attended a council at Cologne in 347. Worms seems to have thriven under the bishops, but the citizens invariably espoused the cause of the emperors against them, and were rewarded by privileges which fostered the trade of the town and eventually led to its recognition as a free imperial city. Worms was frequently visited by the imperial court, and won the proud title of 'Mother of Diets." The most famous diet was that held in 1521, at which Luther appeared to defend his doctrines before Charles V. Four years later the town formally embraced Protestantism. Worms preserved a tolerable prosperity even through the hardships of the Thirty Years' War; but in 1689 it was laid in ashes by the French, a blow from which it has never thoronghly recovered. The peace of Lunéville annexed it in 1801 to France ; but in 1815 it passed to Hesse-Darmstadt, being then an unimportant town with 6250 inhabitants.

WORSBROUGH, a township in the West Riding of Yorkshire, is situated on a branch of the Dearne and Dove Canal, and near several branch lines of the Manchester, Sheffield, and Lincolnshire Railway, 9 miles north-west of Rotherham and 3 south of Barnsley. The church of St Mary, an interesting structure with remains of Norman work, but chiefly

in the Transition Early English style, underwent restoration in 1864. It contains some old monuments and brasses. There are extensive collieries and gunpowder mills in the neighbourhood, and the town- ship possesses iron and steel works and corn-mills. A short distance to the west is Wentworth Castle, built in 1730 by Thomas, earl of Strafford, on the site of an ancient fortress, and,containing a large number of portraits of historical interest. The population of the urban sanitary district (3779 acres) was 6030 in 1871, and 8443 in 1881.

WORSTED. See Woot.

WORTHING, a watering-place of Sussex, is situated on the London, Brighton, and South Coast Railway, 61 miles south of London and 104 west of Brighton. On account of its sheltered situation at the foot of the South Downs it has some reputation as a health-resort for pulmonary complaints. Asa general sea-side resort it is increasing in favour, especially with the wealthier classes. There is a marine parade 14 mile in length, a long range of firm sands, and an iron promenade pier, 960 feet in length, constructed in 1882. A public park, 21 acres in extent, was opened in 1881. The churches and chapels are all modern. The other principal buildings are the town-hall (1834), a quadrangular structure with square clock tower, Montague hall, the literary institute, the workmen's insti- tute, the infirmary and dispensary (1882), the Thomas Banting memorial convalescent home, the public baths, erected in 1886, Humphrey's almshouses, and Queen Elizabeth's almshouses. The mother parish of Worthing is Broadwater, the church of which, three-quarters of a mile north of Worthing, a cruciform building in the Transition style, has some old monuments and brasses. The popu- lation of the urban sanitary district (979 acres) was 7401 in 1871, and 10,976 in 1881.

Pottery and other Roman remains have been found at Worthing. In Domesday the manor appears under the name of Ordinges, and consisted of eleven hides, or about 110 acres. In the reign of Edward I. it was valued at 100 shillings. It formed part of the endowment of the priory of Easebourne, near Midhurst, and at the

Reformation was granted with other possessions to Henry Fitz- william, earl of Southampton. It afterwards passed through several hands to the earl of Warwick. It was of some importance in the reign of Edward III., who granted it the privilege of a market, but it declined to a poor fishing hamlet. Its rise as a watering place began about 1760, and after a visit of the Princess Amelia in 1797 it made rapid progress.

WOTTON, Sir Henry (1568-1639), an accomplished literary amateur, was one of the favourite diplomatists of James I. of England, although, following the quietistic habit of his family, he never would undertake employ- ments of the greatest weight and difficulty. The seat of the family, which was founded in the 14th century by a lord mayor of London, was Bocton or Boughton Malherbe in Kent. It was,as described by Izaak Walton in his Lefe of Sir Henry, a typical English family of wealthy landed gentry, keeping up a connexion with the court, but avoiding the risks of factious ambition, often holding offices of high trust, but always prudently declining the highest. Henry, the youngest of four sons, was sent to school at Winchester, and thence to Oxford (New College and afterwards Queen's). At the age of twenty-two, with a high academic reputation for wit and scholarship, he was sent abroad to complete his education, and spent eight years in France, Spain, and Germany, making acquaintance with men of learning as well as courtiers, a general favourite. Returning to England at the age of thirty, he sought political employment, and became one of the secretaries of Essex. On the fall of Essex he made his escape from England and took refuge at Florence, where he employed his leisure in writing a sketch of "the state of Christendom." While he was at Florence the grand-duke discovered a plot against King James, and Wotton was sent to Scotland with the infor- mation and a casket of antidotes. King James was so charmed with the emissary that on his accession to the English throne he at once offered Wotton ambassadorial employment. He might have had the embassy to Spain, but this he prudently declined, and chose instead the easier duty of managing relations with Venice and the German states. After twenty years of diplomatic service he craved and obtained the post of provost of Eton in 1624. He had studied and written nota little at odd times during his active life, and when he settled at Eton he intended to write a life of Luther; but in this and other large lite- rary projects he never got beyond the stage of

collecting materials. In his fifteen years' provostship he set an example of careful, dignified, and gracious supervision ; and his wit, wisdom, courtesy, and benignity are well represented in the Reliquiz Wottianx, published with Walton's Life in 1651. Two of his witticisms are im- mortal,—his definition of an ambassador as "an honest man sent to lie abroad for the good of his country,"' and his advice toa young diplomatist to tell the truth, and so puzzle and confound his adversaries. He died in 1639.

WOTTON, Witt1aMm (1666-1726), is now remembered chiefly for his part in the famous " Battle of the Books," but to his own generation his Reflections upon Ancient and Modern Learning was only one of many proofs of his extraordinary amount and variety of scholarship. Born in 1666, the son of an English clergyman, rector of Wrentham, in Suffolk, he was one of the wonders of his age in precocity. He could translate from several languages at the age of five. He was under ten when he was sent to Cambridge, and he took the degree of B.A. at the age of twelve years and five months, having already created such a sensation by his linguistic attain- ments that Latin poems were addressed to him as a prodigy. In the Battle of the Books he took a judicious middle course between the extreme champions, Fontenelle

1 The full story of this witticism is given in Walton's Life.

and Temple, making a succinct, elaborate, and careful com- parison between ancients and moderns in oratory, poetry, mathematics, philosophy, astronomy, anatomy, botany, and other arts and sciences. of which appeared in 1694, show that his prodigious memory was not confined to languages, and that he possessed also strong judgment and argumentative power. The treatise may still be read with interest, as a survey of the state of various sciences at the close of the 17th century. Wotton, who was made D.D. in 1707, wrote also on subjects so diverse as fossils and Welsh laws, besides producing various historical works. He was en- gaged on his translation of the Welsh laws at the time of his death, which took place in 1726.

WOUWERMAN, Partie (1619-1668), a Dutch painter of battle and hunting scenes, was born at Haarlem in May 1619. He received the elements of his art instruction from his father, Paul Joosten Wouwer- man, an historical painter of moderate ability, and he then studied under Jan Wynants, and for a short time under Evert Decker. Returning to Haarlem, he became a member of its guild of painters in 1640. In that city he seems to have led the rest of his singularly produc- tive life, and there he died in May 1668. About seven or eight hundred pictures are enumerated in Smith's Catalogue Raisonné as the work of Philip Wouwerman, but probably many of these are the productions of his brothers Peter and Jan, and of his many other imitators. His authentic works are distinguished by great spirit and animation, and are infinitely varied and full of incident, though dealing recurrently with cavalry battle- pieces, military encampments, scenes of cavalcades, and hunting or hawking parties. He is equally excellent in his vivacious treatment of figures, in his skilful animal painting, and in his admirable and appropriate intro- duction of landscape backgrounds. Three different styles have been observed as characteristic of the various periods of his art. His earlier works are marked by the pre- valence of a foxy-brown colouring, and by a tendency to an angular form in the draughtsmanship ; the productions of his middle period have greater purity and brilliancy ; and his latest and greatest pictures possess more of force and breadth, and are full of a delicate silvery-grey tone.

WRASSE. This name is applied to the fishes of the family Labridx generally, and more especially to certain members of the family to be mentioned hereafter. They are without exception inhabitants of the sea, very abundant in the tropical zone, less so in the temperate, and dis- appearing altogether on the confines of the Arctic and Antarctic Circles. Their body is generally compressed, like that of a carp, covered with smooth (cycloid) scales ; they possess one dorsal fin only, the anterior portion of which consists of numerous spines. Many wrasses are readily recognized by their thick lips, the inside of which is some- times curiously folded, a pecu- liarity which has given to them the German name of " lip- fishes." The dentition of their jaws con- sists of strong conical teeth, of which some in front, and often one at the hinder end of the upper jaw, are larger than the others.

Lips of Labrus festivus,

But the principal organs with which they crush shell-fish, crustaceans, and other hard substances are the solid and strongly-toothed pharyngeal bones, of which the lower are

coalesced into a single flat triangular plate. The majority of wrasses are beautifully coloured, exhibiting extra- ordinarily varied patterns of permanent pigmentary colours, as well as evanescent reflexions of the scales. All of

His Keflections, the first edition °

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them are surface fishes, living close to the shore or coral- banks. Rocky parts of the coast overgrown with sca- weed are their favourite haunts in the temperate, and coral-reefs in the tropical seas. Some 450 species of wrasses (including Parrot-Wrasses) are known, chiefly from the tropics; some grow to a large size and are esteemed as food, whilst others, like the British species, are small and but rarely eaten.

Of the British wrasses the Ballan Wrasse (Labrus maculatus) and the Striped or Red Wrasse or Cook (Labrus mixtus) are the most common. Both belong to the genus Labrus, in which the teeth stand in a single series, and which has a smooth edge of the preoperculum and only three spines in the anal fin. The ballan wrasse is the larger, attaining to a length of 18 inches, and, it is said, to a weight of 8 ib; its colours are singularly variegated, green or brownish, with red and blue lines and spots ; the dorsal spines are twenty in number. The cook wrasse offers an instance of well-marked secondary sexual difference,—the male being ornamented with blue streaks or a blackish band along the side of the body, whilst the female has two or three. large black spots across the back of the tail. This species possesses only from sixteen to eighteen spines in the dorsal fin. The Goldsinny or Corkwing (Crenilabrus melops) is much more frequent on the southern coasts of England and Ireland than farther north, and rarely exceeds a length of 10 inches. As in other wrasses, its colours are beautiful, but variable; but it may be readily

distinguished from the two preceding species by the toothed edge of the preoperculum. The three other British wrasses are much scarcer and more local, viz., Jago's Goldsinny (Ctenolabrus rupestris), with a large black spot on the anterior dorsal spines, and another on the base of the upper caudal rays ; Acantholabrus palloni, which is so rarely captured that it lacks a vernacular name, but may be easily recognized by its five anal spines and by the teeth in the jaws forming a band ; and the Rock-Cook (Centrolabrus exoletus), which also has five anal spines, but has the jaws armed with a single series of teeth.

On the Atlantic coasts of the Northern States of North America the wrasses are represented by the genus Z'autoga, which is distinct from the European forms. The only species of this genus, known by the names of Tautog or Blackfish, is a fish of considerable economic value, being much esteemed as food, It is caught in great numbers, and generally sold of a weight of about 2 Ib.

WRECK (in Low Latin wreceum or warectum maris) is a ship or goods cast on land by the sea in tidal waters. While still at sea such ship or goods do not constitute wreck but derelict, which includes flotsam, jetsam, and lagan (see Fiotsam). In Roman law wreck was restored to the owner if he claimed it before a judicial tribunal within a year and a day, the fiscus waiving its claim after a constitution attributed to either Marcus Aurelius or Constantine. Theft from a wreck was regarded as agera-vated by the helpless position of the owner, and the thief was liable for fourfold the loss if an action was brought against him within a year, after that time for the loss simply. Plunderers of wreck and exhibitors of false lights were also punished criminally. Most of the Roman law on the subject is contained in Digest xlvii. 9, Code xi. 5. The Leonine Constitutions, c. 64, made a concealer of wreck liable to the fourfold penalty. In France it was provided by the laws of Oléron (see Sea Laws) that succour was to be afforded to shipwrecked persons, and their property returned to them. Wreck afterwards became a right of the crown (a right limited to one-third of the value by an ordinance of Francis I.), but was often granted to feudal seigneurs under the name of droit de

bris. In England the rule seems in the time of Bracton (the reign of Henry III.) to have been the same as that of the Roman law, that wreck only belonged to the king if no claimant appeared within a year and a day. It would perhaps be more accurate to say that it vested in the crown, subject to be divested on proof of ownership within the period limited. The reason for this rule of law appears to be the necessity of enabling persons in authority to protect wreck from the pillage which it was otherwise certain to have undergone at a time when wreck was looked upon as legitimate prey of the wrecker. In Bracton (120, 5) it is said that even if a dog escaped, or if any certain mark were put upon the goods, it was no wreck. The Statute of Westminster the First (3 Edw. I. c. 4) is merely declaratory of the common law as it is found in Bracton. It enacts that, where a man, a dog, or a cat escaped alive out of a ship, such ship should not be adjudged wreck, but the goods should be saved and kept by view of the sheriff, coroner, or king's bailiff, and delivered into the hands of such as were of the town where the goods were found, so that if any sued for the goods, and proved that they were his or perished in his keeping within a year and a day, they should be restored to him without delay ; if not, they should remain to the king, and where wreck belonged to another than the king he should have it in like manner. In both Bracton and the statute the escape of a living thing appears to be used rather as an example of a means of proof than as the sole means of proof. The latter, however, became the doctrine of the courts for centuries ; it was wreck unless a living thing escaped, and as such part of the hereditary revenue of the crown, and expressly recognized by the Statute De Prerogativa Regis (see PREROGATIVE). To hold inquests of wreck was by the Statute De Officio Coronatoris (4 Edw. I. c. 2) one of the duties of the coroner, of which he has only recently been relieved by the Coroners Act, 1887, repealing the Act of Edward I, In 1771 a return was made by Lord Mansfield to the older and more reasonable view of the common law as it stood in Bracton, That distinguished judge considered that the rule that it was wreck unless a living thing came to shore was contrary to principles of law, justice, and humanity, and that the escape of an animal was simply a medium of proof. 'It was the proof and not the escape that was the important fact.1 Claims to wreck were, by Ric. H..c:8, not cognizable in the Admiralty Court as was derelict, for that was in and upon the sea, while wreck must have touched the land before it became wreck.

Unclaimed derelict was, like unclaimed wreck, a right of the crown, but in a different way. It was not a direct right jure coronez, but claimed by the king in his office of Admiralty as an admiralty droit. As wreck in the last resort became crown property, it was never subject to forfeiture as a DEODAND (g.v.) where lives were lost. Wreck was frequently granted to subjects as a franchise, e.g., to lords of manors and to various maritime cities and boroughs, among others to the Cinque Ports. Within the Cinque Ports the serjeants of the Admiralty of the Cinque Ports still act as receivers of wreck (17 and 18 Vict. c. 120).

So stood the common law as affected by early legislation. It is now of comparatively small importance, as the law now depends chiefly on the Merchant Shipping Act, 1854, part viil., and the amendments introduced by later Acts.

The definition of wreck for the purposes of the Merchant Shipping Acts (which is in effect for all practical purposes) is considerably extended beyond its common law meaning. By s. 2 of the Act of 1854, it includes jetsam, flotsam, lagan, and derelict. By the Sea Fisheries Act, 1883, it is still further extended to include all fish- ing boats, all their small boats, all rigging gear or other appur- tenances of fishing boats, all nets, lines, buoys, floats, or other

‘ Hamilton v. Davis, 5 Burrow’s Rep., 2733.

fishing implements whatsocver found or picked up at sea whether marked or unmarked. The principal provisions of the Act of 1854 are as follows. »The general superintendence throughout the United Kingdom of all matters relating to wreck is committed to the Board of Trade. No person exercising Admiralty jurisdiction is to interfere with wreck. Whenever any ship or boat is stranded or in distress at any place on the shore of the sea, or of any tidal water, the receiver of wreck of the district is to procecd thither and take command, and issue such directions as he may think fit with a view to the preservation of the ship. All cargo and other articles washed ashore, or lost or taken from the ship, are to be delivered to the receiver. In the absence of the receiver, customs officers, justices of the

peace, and others have the power of the receiver, Tho receiver is as soon as possible to examine on oath any person who may be able to give any account of a ship in distress or her cargo or stores, and forward the result of his examination to the Board of Trade (where it is deposited in the wreck register) and to Lloyd's. On proof of title of a lord of the manor or other person entitled to unclaimed wreck, the receiver is to hold it on behalf of such person. The receiver is aided and protected by numerous provisions making it punishable to refuse men or vehicles on his demand, to scerete or fail to give notice of wreck, to obstruct the receiver or any other person on his way to the wreck, &c. In case of suspected concealment of wreck, he may obtain a search warrant (see WARRANT) from a justice of the peace. Whenever any wreck is saved by any person other than a receiver, SALVAGE (g.v.) is payable. In case of no claim being made within a year by the owner, and in the absence of any private right of a lord of a manor or other person, tho receiver is to sell the wreck, and pay the pro- ceeds, after deducting expenses and salvage, to the exchequer, to become part of the consolidated fund. The Admiralty Division of the High Court of Justice has jurisdiction to decide upon all claims of salvage, whether the wreck is found at sea or cast upon the land, or partly in the sea and partly on land. Wreck, if foreign goods, is liable to customs dutics. Goods saved from a ship wrecked on its homeward voyage are to be forwarded to the port of its original destination. A seaman is entitled to wages up to the time of a vessel being wrecked, unless he has not exerted himself to the ut- most to save the ship, cargo, and stores. Receivers' districts under the Act of 1854 were formed by a Board of Trade order of October fi: 1856. The Merchant Shipping Act, 1862, provides, inter alia, that the receiver may appoint a valuer in salvage cases, that the delivery of wreck by the receiver to any person is not to prejudico the right of third parties, and that the payment of proceeds of wreck claimed by the crown is to be made to the consolidated fund or the revenues of the duchies of Cornwall or Lancaster according to circumstances. Instructions to receivers were issued by the Board of Trade in 1865 and 1886, In 1876 a new tribunal for the investigation of shipping casualties was created by the Merchant Shipping Act, 1876, which las in most cases superseded the pro- cedure provided by the Act of 1854. The Act cnabled the lord chancellor to appoint a wreck commissioner, or wreck commis- sioners not exceeding

three, and gave the commissioner or com- missioners power to act with or without skilled assessors, and in certain cases which were not within the purview of tho Act of 1854, viz., where a ship on the coast of the United Kingdom or a British ship elsewhero has been stranded or damaged and any witness is found at any place in the United Kingdom, and where a British ship has been lost or is supposed to have been lost, and any evidenco can be obtained in the United Kingdom as to the circumstances under which she proceeded to sea or was last heard of. In addition to the Acts mentioned, there are sevcral others which affect the subject of wreck more or less directly. By 6 Geo. IV. c. 87 cousuls in foreign ports are to have credit for disburse- ments on behalf of shipwrecked persons. Where a foreign ship is wrecked, the consul-general or other consular officer is by 18 and 19 Vict. c. 91 to be deemed the owner. Removal of wrecks is provided for in dockyards by 28 and 29 Vict. c. 125, in most other cases by the Harbours Clauses Act, 1847, and the Removal of Wrecks Act, 1877, giving powers of removal to the harbour or general lighthouse authorities. Provision is made by special Acts for raising wreck in the Thames, Mersey, Humber, Clyde, and other rivers. Burial of bodies washed ashore from wrecks is regulated by 48 Geo. III. c. 75 and 49 Vict. c. 20. The criminal Jaw re- lating to wreck has been the subject of a considerable mass of legis- lation. The protection of the receiver in his duties by the Act of 1854 has been already mentioned. The Act further provides against wrongfully carrying off or removing wreck, impeding or hindering the saving of wreck, and secreting wreck or obliterating or defacing any marks thereon. Taking wreck into a foreign port and there disposing of it is made felony, punishable with ten years' penal servitude. Other provisions are made by the Criminal Law Consolidation Acts of 1861. To plunder or steal any part of a wrecked ship or vessel, or any goods belonging to such vessel, is a felony, punishable with fourteeen years' penal servitude. Any person in possession of such goods, and not giving a satisfactory account of how he came by them, may be committed to prison on summary

conviction, and such goods, if exposed for sale, may be seized and carried before a justice of the peace, and the vendor called upon to satisfy the

justice that he came lawfully by them, 24 and 25 Vict. c. 96, ss. 64-66. Destruction of and injury to ships or wrecks, and masking, alteration, or removal of lights or exhibition of false lights, and injury to or concealment of buoys and other marks of navigation, are all punishable by 24 and 25 Vict. ¢. 97, ss. 42-49, penal servitude for life being the maximum penalty. To impede a shipwrecked person or any person in his endeavour to save him, and to assault any magistrate, officer, or other person in the exercise of his duty in the preservation of wreck, are crimes by 24 and 25 Vict. c. 100, ss. 17, 87. In the case of plunder, damage, or destruction of any ship or boat stranded or in distress on the shore of the sea or tidal water, or of any part of its cargo or e aaige by persons riotously and tumultuously assembled, either ashore or afloat, the owner has a right to compensation against the police authority of the district under the Riot (Damages) Act, 1886.

Scotland.—As in England, unclaimed wreck was a right of the crown, often granted to subjects, generally under the style of "wrak, waith, and ware," the last two words signifying derelict and seaweed. It was so granted to the earl of Orkney in 1581. It was occasionally dealt with by the Scottish Parliament. Thus by 1426, c. 15, ships wrecked on the coast of Scotland were to be escheat to the king if they belonged to a country observing a simi- lar law, otherwise to have the favour shown to ships of Scotland. Compensation for destruction of wreck by a riotous assembly is to be made by the inhabitants of the nearest county, city, or borough under the Riot Act of George I. (see Riot), the Act of 1886 not applying to Scotland.

Onited States.—The State legislation as to disposition of wrecked property is generally in favour of the owner on his claim being made within a limited time. As to the Acts of Congress on the subject, the secretary of the treasury is empowered to make con- tracts and provisions for the preservation, sale, or collection of wrecked property, Revised Statutes, § 3755, and may issue a register for a foreign vessel wrecked in the United States and purchased and repaired by a citizen of the United States, § 4136. Special provisions are made as to wreck in Florida, §§ 4289-4241. Plun- dering wreck, or impeding the escape of a shipwrecked person, or showing false or extinguishing true lights in order to cause wreck are

punishable offences, § 5358. Wreck is not confined as in Eng- land to loss on tidal waters, but extends to that happening on the great freshwater lakes and rivers. Wreck commissioners and wreck masters are generally appointed, with powers and duties similar to those of the receiver in the United Kingdom. (i. Wit)

WREN (Anglo-Saxon Wrenna and Wrenne, Icelandic Etindill), the well-known little brown bird—with its short tail, cocked on high—inquisitive and familiar, that braves the winter of the British Islands and even that of the European continent, and, except in the hardest of frosts, will daily sing its spirit-stirring strain. Itis the Motacilla or Sylvia troglodytes of the earlier systematists, and the Troglodytes parvulus, europzus, or vulgaris of most later writers, save a few who (ignoring not only common sense but also the accepted rules of scientific nomenclature), by an utterly mistaken view of Vieillot's intention in establishing the genus Z'roglodytes, reserve that term for some American species—which can hardly be generically separated from the European form—and have attempted to fix on the latter the generic term Anorthura, which is its strict equi- valent and was proposed by Rennie on grounds that are wholly inadmissible,

The interest taken in this bird throughout all European countries is scarcely exceeded by that taken in any other, and, though in Britain comparatively few vernacular names have been applied to it, two of them —" Jenny " or " Kitty-Wren "—are terms of endear- ment, M. Rolland records no fewer than 139 local names for it in France ; and Italy, Germany, and other lands are only less prolific. Many of these carry on the old belief that the Wren was the King of Birds, a belief connected with the fable that on one occasion the fowls of the air in general assembly resolved to choose for their leader that one of them which should mount highest. This the Hagle seemed to do, and all were ready to accept his rule, when a loud burst of song was heard, and perched upon him was seen the exultant Wren, which unseen and unfelt had been borne aloft by the giant. The curious association of this bird with the Feast of the Three Kings, on which day in South Wales, or, in Ireland and in the south of France, on or about Christmas Day, it was customary for men and boys to

“hunt the Wren,” addressing it in a song as “the King of Birds,” is very remarkable, and has never yet been explained.

The Wren hardly needs description here, and its domed nest,

a ~———

WRE—-WEREE

apparently so needlessly large for the size of the bird, is a well- known object, for it is built with uncommon care, and often (though certainly not always) in such a fashion as to assimilate its exterior to its surroundings and so to escape observation. Very curious too is the equally unaccountable fact, that near any occupied nest may generally be found another nest, or more than one, of imperfect construction. The widespread belief concerning these unfinished fabrics is implied by their common name of ‘cocks’ nests,” but evidence to that effect is not forthcoming. The breed- ing-habits of the Wren were most closely studied and accurately reported by Mr Weir to Macgillivray (Brit. Birds, iii. pp. 23-80) in a way that leads every ornithologist to wish that the same care might be bestowed on other kinds of birds.

The range of the Wren in Europe? is very extensive, though it seems to stop short of the Arctic Circle; but it occurs in Algeria, Madeira, and, according to Bolle, in the Canaries. It also inhabits Palestine. Further to the eastward its limits are difficult to trace, because they inosculate with those of a considerable number of local races er species. As might be expected, the form inhabiting Japan, 7. fumigatus, seems to be justifiably deemed a species. In North America, 7’. alascensis occurs in the extreme north-west, and is replaced further to the southward by Z. pacificus. East-ward of the Rocky Mountains, the form is 7’. hyemalis—the well- known Winter-Wren of Canada and the United States, The number of species of Wrens inhabiting North America is, however, very considerable; but authorities are by no means agreed as to how many should be reckoned valid, and they have been segregated into six or seven genera, Here the House-Wren, 7’. domesticus or aedon, can alone be mentioned, It is a very common summer- visitant to most parts of the Eastern States, and where it occurs is of a very familiar disposition, entering into the closest

relations with those that cultivate its acquaintance, It is represented in the West by 7. parkmanni.

The Z'roglodytide, if they are to be regarded as forming a distinct Family, predominate in the New World, no fewer than 60 species being enumerated in the Nomenclator of Messrs Sclater and Salvin as belonging to the Neotropical Region. But the Treglodytide by no means contain all the birds to which the name " Wren " is applied. Several of the Sylviide (cf. WARBLER) bear it, especially the beautiful little Golden-crested Wren (cf. Kryeiet) and the group commonly known in Britain as " Willow-Wrens "—— forming the genus Phylloscopus. Three of these are habitual summer-visitants, which differ much more in their manners than in theirlook. The largest, usually called the Wood-Wren, P. sibilatriz, is more abundant in the north than in the south of England, and chiefly frequents woods of oak or beech. It has a loud and very peculiar song, like the word ¢wéé, sounded very long, and repeated several times in succession—at first slowly, but afterwards more quickly, and near the end accompanied by a peculiar quivering of the wings, while at uncertain intervals comes another note, which has been syllabled as chea, uttered about three times in succession. The Willow-Wren proper, P. trochilus, is in many parts of Great Britain the com- monest summer-bird, and is the most generally dispersed. In spring its joyous burst of song is repeated time after time, until all around thrills with the loud and merry chorus, and yet never tires the ear. The restless but graceful activity of the bird, as it flits from twig to twig, adds to the charm of its appearance, which Hewitson so well appreciated. The third species, P. collybita or minor (frequently but most wrongly. called Syluia rufa or P. rufus), commonly known as the Chiffchaff, from the peculiarity of its constantly repeated two-noted cry, is very numerous in the southern and western part of England, but seems to be scarcer northward. These three species make their nest upon or very close to the

1 Much interest has lately attached to the discovery, announced by Mr Seebohm (Zoologist, 1884, p. 333), that the Wren, for 200 years and upwards, known to inhabit St Kilda differed in hue from that of the other British Islands and of the continent of Europe, and it has by him been described as a distinct species, Z. hirtensis. It had for mote than twenty

years been known that the Wren of the Feroes and Iceland deserved separation from the ordinary 7. parvulus, by being larger, and especially by having larger and stouter feet. It is the 7. borealis of Fischer (Journ. fiir Ornithologie, 1861, p. 14, pl. i.).

WREN

ground, and the building is always domed. Hence they are commonly called " Oven-birds,"! and occasionally, from the grass used in their structure, " Hay-jacks," a name common to the WuITE-THRoat (q.v.) and its allies.

To return, however, to the Z'roglodytide or true Wrens. If it cannot be said that they form a peculiar Family, it would be rather to the Sylwide that they and the Certhiide (cf. TRrex-CREEPER) should be assigned, and they seem to be very unfitly placed among the Z7%meludz, as has lately been done (Cat. B. Brit. Museum, vi. p. 1). These last, so far as any definition can be given of them, belong to the Ethiopian and Indian Regions, while the pre- dominance of the 7'roglodytidx in the Neotropical Region, as already remarked, is very obvious. A. N.)

WREN, Sir CuristopHer (1631-1723), the son of a clergyman, was born at East Knoyle, Wiltshire, in 1631; he entered at Wadham College, Oxford, in 1646, took his degree in 1650, and in 1653 was made a fellow of All Souls. While at Oxford Wren distinguished himself in geometry and applied mathematics ;? in 1657 he became professor of astronomy at Gresham College, and in 1660 was elected Savilian professor of astronomy at Oxford. It is, however, as an architect that Wren is best known, and the great fire of London, by its destruction of the cathedral and nearly all the city churches, gave Wren a scope for his talent such as probably no architect has ever had to the same extent. Just before the fire Wren was asked by Charles II. to prepare a scheme for the restoration of the old St Paul's. In May 1666 Wren submitted his report and designs? for this work; the old cathedral was in a very ruinous state, and Wren proposed to remodel the greater part, as he said, "after a good Roman manner," and not "to follow the Gothick Rudeness of the old Design." According to this scheme, only the old choir was left; the nave and

transepts were to be rebuilt after the classical style, with a lofty dome at the crossing—not unlike the plan which was eventually carried out.

In September of the same year (1666) the fire occurred, and the old St Paul's was completely gutted, though the greater part of its walls still remained standing. From 1668 to 1670 attempts were being made by the chapter to restore the ruined building; but Dean Sancroft was anxious to have the cathedral wholly rebuilt, and in 1668 he had asked Wren to prepare a design for a wholly new church. This first design, the model for which is preserved in the South Kensington Museum, is very inferior to what Wren afterwards devised. In plan it is an immense rotunda surrounded by a wide aisle, and approached by a double portico ; the rotunda is covered with a dome taken from that of the Pantheon in Rome; on this a second dome stands, set on a lofty drum, and this second dome is crowned by a tall spire. This plan was devised as being specially suitable to the needs of a Protestant church, but the dean and chapter objected to the absence of a structural choir, nave, and aisles, and wished to follow the medieval cathedral arrangement, at least as far as concerned the plan. Thus, in spite of its having been approved by the king, this design was happily abandoned —much to Wren's disgust ; and he prepared another scheme with a similar treatment of a dome crowned by a spire, which in 1675 was ordered to be carried out. Wren had, however, been much hampered by ignorant interference, and apparently

1 By ornithologists this name is given to a wholly distinct group— not even belonging to the Oscines—the Furnariid# of Garrod, con- sisting of about 8 genera of Tracheophonine Birds, some of which build marvellous nests of mud spherical inform. For their habits see Darwin (Jour. of Researches, chap. v.) and Mr Hudson's account (Argentine Ornithology, i. pp. 167-170).

2 Newton, in his Principia, p. 19, ed. of 1718, speaks very highly of Wren's work as a geometrician.

3 Wren's drawing for this exists in the All Souls collection.

did not himself approve of this second design, for he got the king to give him permission to alter it as much as he liked, without showing models or drawings to any one. Wren fully availed himself of this permission, and the actual building bears little resemblance to the approved design, to which it is very superior in almost every possible point. Wren's earlier designs have the exterior of the church arranged with one order of columns; the division of the whole height into two orders was an immense gain in increasing the apparent scale of the whole, and makes the exterior of St Paul's very superior to that of St Peter's in Rome, which is utterly dwarfed by the colossal size of the columns and pilasters of its single order. The present very graceful dome and the drum on which it stands, masterpieces of graceful line and harmonious proportion, were very important alterations from the earlier scheme. As a scientific engineer and practical architect Wren was perhaps more remarkable than as an artistic designer. The construction of the wooden external dome, and the support of the stone lantern by an inner cone of brickwork, quite independent of either the external or internal dome, are wonderful examples of Wren's constructive ingenuity. The first stone of the new St Paul's was laid on June 21, 1675; the choir was opened for use December 2, 1697; and the last stone of the cathedral was set in 1710. The stone used is from the Portland quarries ; the wooden dome is covered with lead, not copper as was at first proposed. The fine oak stalls were carved by Grinling Gibbons, who received £1333, 7s. 5d. for them. The whole cost of the cathedral was £1,167,474,—of which £810,181 was pro- vided by the London import duty on coal.é

After the destruction of the city of London Wren was employed to make designs for rebuilding its fifty burnt churches, and he also prepared a scheme for laying out the whole city on a new plan, with a series of wide streets radiating from a central space. Difficulties arising from the various ownerships of the ground prevented the accom- plishment of this scheme.

Among Wren's city churches the most noteworthy are St Michael's, Cornhill; St Bride's and St Mary le Bow, Fleet Street, the latter remarkable for its graceful spire ; and St Stephen's, Walbrook, with a plain exterior, but very elaborate and graceful interior. In the design of

spires Wren showed much taste and wonderful power of inven- tion. He was also very judicious in the way in whicli he expended the limited money at his command; he did not fritter it away in an attempt to make the whole of a building remarkable, but devoted it chiefly to one part or feature, such as a spire ora rich scheme of internal decora- tion. Thus he was in some cases, as in that of St James's, Piccadilly, content to make the exterior of an almost barn- like plainness.

The other buildings designed by Wren were very numer- ous. Only afew of the principal ones can be mentioned :— the custom house, the royal exchange, Marlborough House, Buckingham House, and the Hall of the College of Physicians—now destroyed; others which exist are—at Oxford, the Sheldonian theatre, the Ashmolean museum, the Tom Tower of Christ Church, and Queen's College chapel ; at Cambridge, the library of Trinity College and

4 Proportionally the apparently greater size of St Paul's is very remarkable; it is very difficult to realize that the top of the dome of St Paul's is only as high as the springing of that of St Peter's. In actual fact the one looks about as high as the other.

5 Wren also designed a colonnade to enclose a large piazza forming a clear space round the church, somewhat after the fashion of Berniui's colonnade in front of St Peter's, but space in the city was too valuable to admit of this. Wren was an enthusiastic admirer of Bernini's designs, and visited Paris in 1665 in order to see him and his pro- posed scheme for the rebuilding of the Louvre. Bernini showed his design to Wren, but would not let him copy it, though, as he said, he 'would have given his skin'"' to be allowed to do so.

the chapel of Pembroke, the latter at the cost of Bishop

Matthew Wren, his uncle. The western towers of West- minster Abbey are usually attributed to Wren, but they

were not carried out till 1735-45, many years after Wren's. death, and there is no reason to think that his design was

used. Wren (D.C.L. from 1660) was knighted in 1673, and was elected president of the Royal Society in 1681.1. He was in parliament for many years, representing Plympton from 1685, Windsor from 1689, and Weymouth from 1700. He occupied the post of surveyor of the royal works for fifty years, but by a shameful cabal was dis- missed from this office a few years before his death. He died in 1723, and is buried under the choir of St Paul's; on a tablet over the inner north doorway is the well-known epitaph —"' Si monumentum requiris, cireumspice."

Wren's genius as an artist is very difficult to estimate; he lived at a most unhappy time, when architecture had sunk almost to its lowest point of degradation. If, how- ever, we bear this in mind we must admit that he was an artist of very remarkable ability; his inventive genius no one can dispute.

For further information the reader should consult the Parentalia, published by Wren's grandson in 1750, an account of the Wren family and especially of Sir Christopher and his works; also the two biographies of Wren by Elmes and Miss Phillimore; Milman, Annals of St Paul's, 1868; and Longman, Three Cathedrals dedi- eated to St Paul in London, 1873, pp. 77 sg. See also Clayton, Churehes of Sir C. Wren, 1848-49; Taylor, Towers and Steeples of Wren, London, 1881; and Niven, City Churches, London, 1887, illustrated with fine etchings. In the library of All Souls at Oxford are prescrved a large number of drawings by Wren, including the designs for almost all his chief works, and a fine series showing his various schemes for St Paul's Cathedral. (J. H. M.)

WRESTLING anp BOXING. Wrestling is the art of forcing an antagonist to the ground without resorting to blows or kicks. It is a trial of strength and skill between two opponents standing face to face, who strive to throw one another. As a gymnastic exercise it was greatly encouraged among the ancient Greeks, and the highest honours and rewards were bestowed on the victors at the Olympic, Isthmian, Nemean, and other games (see Games). It was also cultivated by the Romans, though their tastes inclined to more savage and brutalizing exhibitions than that of wrestling. It was

not unknown in Egypt and at Nineveh, as may be seen from the sculptures in the British Museum. At the same time it differed very much in its ancient form from the wrestling of to-day, the wrestlers of old being wont to compete almost if not quite nude, their bodies besmeared with oil or some other kind of grease by way of making their muscles supple; but, as this practice rendered it very difficult to get fair hold of one another, the wrestlers were accustomed to use sand on their hands, or even to roll in the dust of the arena as a corrective. In their contests they took hold of each other by the arms, drew forward, pushed backward, used many contortions of the body, interlocked their limbs, seized one another by the neck, throttled, lifted each other off the ground, and butted like rams, though the chief point of their art was to become master of their opponent's legs, when a fall was the immediate result. In England the pastime has been popular from an early period, more especially in the Middle Ages, for in 1222, in Henry IIL's reign, it is on record that a wrestling match took place between the men of Westminster and the citizens of London in St Giles Fields, the latter winning easily. The return match was held at Westminster on Lammas day following, but was interrupted by the bailiff of West- minster and his associates, who maltreated the Londoners and drove them into the city. Ata later period Clerken- well was the usual trysting place. At one of the matches there in 1453 another riot occurred, and the lord mayor,

a a ERE Ser? _} The Royal Society possesses a good portrait of Wren by Kneller,

WRE-—-WRE

who usually attended these athletic carnivals, was again routed and driven within the city boundary. In those days the prize was sometimes a ram and sometimes a cock.

The four English systems of wrestling include those of (1) Cornwall and Devon, (2) Lancashire, (3) Catch hold, first down to lose, and (4) Cumberland and Westmorland. The Cornwall and Devon men compete in strong loose linen jackets, catching hold above the waist or of any portion of the jacket. Kicking, which used to bea pro-' minent feature of the west-country style, is now forbidden, and the men wrestle in their stockinged

feet. In order to be fairly thrown, two shoulders and one hip must be on the ground, or two hips and one shoulder, and a man must be thrown flat on his back before any other portion of his body touches the earth ere a decision can be given against him. Formerly each county wrestled under different rules, but the systems are now amalgamated and are classed as one and the same. In Lancashire the wrestlers compete in their stockinged feet, but are allowed to catch hold of any portion of the body. This is the most barbarous of all the English systems, and includes the objectionable battling on the ground which is the fatal characteristic of the French method. Tripping, however, is not forbidden, and a fall is sometimes secured without a resort to scrambling tactics, which is impossible under French rules. The 'catch hold, first down to lose" style of wrestling is of recent origin and promises to become popular. The utmost simplicity distinguishes it. Ordi- nary wrestling attire is worn, such as jersey, drawers or knickerbockers, and stockings. The men on closing must not grip lower than the waist, and the competitor who touches the ground first by any part of his body is the loser. This system is perhaps the fairest for all parties, as the competitors set to work on equal terms without that delay in getting into holds so frequent in north-country wrestling. The Cumberland and Westmorland system is probably the best and most scientific of all. On taking hold, the wrestlers stand up chest to chest, each placing his chin on his opponent's right shoulder and grasping him round the body, the right arm of each being under the left arm of the other, and each joins his hands behind his opponent. When both have got hold the play commences. Kicking is forbidden, and if one competitor lets go his hold before the other the decision is given against him. If both fall on the ground—an undecided or dogfall, as it is termed —they wrestle over again, but if one falls before the other his defeat is registered at once. This kind of wrestling is free from danger, and the German style much resembles it, but in the latter a competitor's hands are not required to remain locked behind his adver- sary's back, as is the practice in the north of England. No catching hold of legs, thighs, or arms is allowed, but each man tries to throw his adversary by using the "buttock," which consists of facing to the right, twisting so as to place the left hip under an opponent's middle, pulling him close, stooping forwards and lifting him off the ground, and throwing him; or the "crossbuttock," facing to the right about to such an extent as to turn the back to the

adversary, and then proceeding as before ; or the "back-hank," which consists in commencing as in the "buttock," and then passing the left leg from inside round an antagonist's left leg, when by keeping a tight hold with the arms and pulling backwards the leverage supplied by the leg being inside usually secures the fall; or the " back heel," which consists in pulling an opponent towards one, putting the left heel behind his right heel, forcing his leg up forwards, and throwing him bodily backwards; or the "left leg hipe," which consists in lifting and swinging him round to the right, then striking the inside of his

' right thigh with the outside of the left thigh, by which he

gets off his balance and falls; the "right leg hipe" is the same action mutatis mutandis. There is also the "left leg stroke," which consists in striking an antagonist's right leg with one's left leg, swinging him round to the left and off his balance; the "right leg stroke" is the same thing with the right leg. Of course there is an umpire to see that no competitor takes an unfair advantage or plays foul, and to determine disputed points according to the rules in force.

Box1nc.—This, though perhaps hardly as popular as wrestling, is closely identified with it in the gymnasium, if not outside it. In the United Kingdom prize fighting is an illegal sport, but it is hardly likely that glove boxing will ever fall into the same disrepute. Its present comparative popularity is principally due to the efforts of the late Mr John G. Chambers, who in 1866 founded the Amateur Athletic Club, and in conjunction with the marquis of Queensberry drew up a code of rules (known as the Queensberry rules), which regulate the principal glove con- tests throughout the kingdom, as follows :—

Challenge Cups (Open to Gentlemen Amateurs).—1. That the entries be drawn to contend by lots. 2. That the entrance fee be 10s. .8. Heavy weights to be over 11 stone 4 Ib; middle weights not to exceed 11 stone 4 tb; light weights not to exceed 10 stone. 4, That there be three judges appointed by the committee. 5. That the boxing take place in a 24 feet ring. 6. That no wrest- ling, roughing, or hugging on the ropes be

allowed. 7. That cach heat consist of three rounds, with one minute interval between ; the duration of each round to be at the discretion of the judges, but not to exceed five minutes. 8. Any competitor not coming up to time shall be deemed to have lost. 9. That no shoes or boots with spikes or spriggs be allowed. 10. Competitors to wear jerseys. 11. Gloves to be provided by the club. 12. The cups to be boxed for once in each year; the winner to receive a silver medal.

Definition of Gentleman Amatewr.—Any gentleman who has never conipeted in an open competition, or for public money, or for adniission money, or with professionals for a prize, public money, or admission money, and who has never at any period of his life taught, pursued, or assisted in the pursuit of athletic exercises as a means of livelihood. The committee reserve the right of requiring a reference or of refusing an entry.

Contests for Endurance.—To be a fair stand-up boxing match, in a 24 feet ring, or as near that size as practicable ; no wrestling or hugging allowed ; the rounds to be of three minutes' duration and one minute time ; if either man fall through weakness or otherwise he must get up unassisted; ten seconds to be allowed him to do so; the other man meanwhile to retire to his corner, and when the fallen man is on his legs the round is to be resumed and continued until the three minutes have expired, and, if one man fails to come to the scratch in the teu seconds allowed, it shall be in the power of the referee to give his award in favour of the other man; a man hanging on the ropes in a helpless state, with his toes off the ground, shall be considered down ; no seconds or any other person to be allowed in the ring during the rounds; should the contest be stopped by any unavoidable interference, the referee to name time and place for finishing the contest as soon as possible, so that the match must be won or lost, unless the backers of both men agrec to draw the stakes. The gloves to be fair-sized boxing gloves of the best quality, and new ; should a glove burst or come off, it must be replaced to the referec's satisfaction. A man on one knee is considered down, and if struck is entitled to the stakes. No shoes or boots with spriggs allowed. (Ue Ide 18.)

WREXHAM, a market-town and municipal and parlia- mentary borough of Denbighshire, North Wales, 11 miles south-south-west of Chester and 201 miles from London by rail. It was characterized by the poet Churchyard in the 16th century as "Trim Wricksam towne, a pearle of Denbighshiere," and the description is not altogether inap- plicable at the present day, the streets being spacious, with many handsome houses. Wrexham church, dedicated to St Giles, contains 14th and 15th century work, but was in great part reconstructed at the beginning of the 16th century. The tower, erected between 1506 and 1520, has been styled "' one of the seven wonders of Wales." It is 135 feet in height, and consists of several successive stages panelled throughout, and decorated with numerous statues of saints placed in niches of the buttresses. It is sur- mounted by an open-work balustrade, from which spring

four lantern-shaped turrets of pierced open-work. The church was restored in 1867. It contains a large number of monuments. The bells, ten in number, are the most famous in the principality. In 1647 the church was used as a prison by Cromwell. The other principal public buildings are the guild-hall (formerly the old grammar school); the public and corn exchange (formerly the Union Hall), opened in 1873, after alteration, at a cost of £4900; the infirmary ; and the infantry barracks of the Royal Welsh Fusiliers. In the neighbourhood there are a racecourse and training-ground. The town is situated on the edge of the Denbighshire coalfield, in the vicinity of coal, iron, and lead mines. It has long been celebrated for its ales, and possesses also corn and paper mills and tanneries. The surrounding country is very fertile, and the agricultural trade is of some importance. The parliamentary borough unites with Denbigh, Ruthin, and Holt in returning a member to parliament. The town has a special commission of the peace and a petty sessions court. The population of the municipal borough and urban sanitary district (1306 acres) was 8576 in 1871, and 10,978 in 1881. The population of the parliamentary borough (1791 acres) in 1881 was 12,333.

Although Wrexham was situated on the eastern side of Offa's Dyke, it was reckoned one of the towns of Mercia. In the Saxon Chronicle the name

occursas Wrightesham. Edward I. granted the town with the lordship of Bromfield and Yale to John Earl Warren. The township of Wrexham Regis within the borough and the town- ship of Stansty without constitute ancient manors. Formerly the township of Wrexham Abbot was ecclesiastical property, and an appendage to the abbey of Valle Crucis, near Llangollen. During the civil war the town was occupied by the Parliamentary troops. Wrexham town was constituted a parliamentary borough in 1832, and incorporated as a municipal borongh in 1857.

See A. N. Palmer's Wrexham and History of the Parish Church of Wrexham.

WRIGHT, Josepn (1734-1797), styled Wright of Derby, subject, landscape, and portrait painter, was born at Derby on September 3, 1734, the son of an attorney of the place, who was afterwards town-clerk. During his early years he manifested an aptitude for mechanical pursuits, and also for music, but he finally resolved to become a painter, and in 1751 he went to London and for two years studied under Thomas Hudson, the master of Reynolds. Return- ing to Derby he practised portrait-painting ; but feeling the need for further instruction he again placed himself for fifteen months under his former master. He then settled in Derby, and varied his work in portraiture by the productions of the subjects seen under artificial light with which his name is chiefly associated, and by landscape paint- ing. He married in 1773, and in the end of that year he visited Italy, where he remained till 1775. While at Naples he witnessed an eruption of Vesuvius, which under various treatment formed the subject of many of his subsequent pictures. On his return from Italy he established him- self at Bath as a portrait-painter ; but meeting with little encouragement he returned to Derby, where he speut the rest of his life. He was a frequent contributor to the ex- hibitions of the Society of Artists, and to those of the Royal Academy, of which he was elected an associate in 1781 and a full member in 1784. He, however, declined the latter honour on account of a slight which he believed that he had received, and severed his official connexion with the Academy, though he continued to contribute to the exhibitions from 1783 till 1794. He died at Derby on August 29, 1797.

There has been a tendency in recent criticism to over-estimate the works of Joseph Wright. His portraits are frequently defective in drawing, and without quality or variety of handling, while their flesh tints are often hard, and unpleasant in their purple-grey shadows. He is seen at his best in his subjects of artificial light, of which the Orrery (1766), the property of the corporation of Derby, and the Air-pump (1768), in the National Gallery, are ex- cellent examples. His Old Man and Death (1774) is also a strik-

ing and individual production. An exhibition of Wright's works was brought together at Derby in 1883, and twelve of his pictures were shown in the winter exhibition of the Royal Academy in 1886.

WRIGHT, Sizas (1795-1847), was born at Amherst,

Massachusetts, May 24, 1795. He graduated at Middle- bury College, Vermont, in 1815, was admitted to the bar in 1819, and began practice at Canton, in northern New York. From the first he showed those characteristics which finally made him a representative American Democratic leader. He had settled in what was almost a wilderness. His farm was a small one, and no hired labourer upon it worked harder than he. His manner of life was of the simplest. In his professional work he was a type of the lawyer of the old school,—shrewd, skilful, rigidly just, and controlled by the belief that his pro- fession was a public trust, and that judicial qualities must mingle with those of the advocate. He seems never to have sought an office, and never to have felt at liberty to refuse one, even that of village postmaster, if he could possibly serve. He was appointed surrogate in 1820, and was elected successively to the State senate in 1823, to the house of representatives in 1827-29, comptroller of the State 1829-33, United States senator 1833-44, and governor of New York 1844-46. During his public life he had become a leader of the Democratic party of New York, Van Buren being his closest associate. When the national Democratic party in 1844 nominated and elected Polk to the presidency, instead of Van Buren, Wright and the State organization took an attitude of armed neutrality towards the new administration. Re- nominated for governor-in 1846, Wright was

defeated, and the result was ascribed to the hostility of the Polk administration. The death of the defeated candidate, at Canton, August 27, 1847, gave intense bitterness to New York politics for several years ; and his faction, in 1848, succeeded in defeating their national party's candidates in the presidential election.

Wright was one of a elass of politicians whieh has influeneed American development largely, finding its most eharacteristie types in the State of New York. It may be traeed elearly from about 1820, beginning with what was then known as " the Albany Regeney," ineluding Dix, Marcy, Wright, Seymour, Tilden, to Cleveland (president from 1885), and many of the new men who have eome into the national administration with him. Absolutely and punctiliously honest, devoted to the publie good, and believing intensely that the public good depended on the political prineiples of their party, they have been prone to consider politics as a warfare, and merciless exelusion of opponents from office as a legitimate war-weapon. One of their earliest leaders, Marey, deelared the rule of party struggle, that "the spoils (of offiee) belong to the vietor"'; the latest, President Cleveland, has been the first to recognize the merit system of appointment in practice, Tilden having already aeeepted it in theory. The sternness of Wright's integrity in office was illustrated in 1845, when the "anti- rent troubles" broke out again, and it seemed probable that the votes of the disaffeeted would decide the coming election. The governor asked and obtained from the legislature the power to sup- press the disturbanee by armed foree, ordered the militia into the disturbed distriet, arrested the offenders, had them tried, eonvieted and punished, and put an end to what was really an insurrection. His defeat in 1846 was a transition from the old to the new phase

of Ameriean politics ; but his name is still the representative of all that was best in the old.

Wright's Zife has been written by Jenkins, who also has a sketch of him i his Governors of New York; but the best biography of him is that of WamRiond.

WRIGHT, THomas (1810-1877), antiquary, was born at Ludlow, in Shropshire, 21st April 1810, and was de- scended from a Quaker family

formerly living at Bradford, in Yorkshire. He was educated at the old grammar school at Ludlow, and afterwards at Trinity College, Cambridge, where he graduated in 1834. While at Cambridge he contributed to the Gentleman's Magazine and other periodicals, and in 1835 he came to London to devote himself to a literary career. His first separate work was Early English

Poetry in Black Letter, with Prefaces and Notes, 1836, 4 vols. 12mo, which was followed during the next forty years by a very extensive series of publications, many of lasting value. He helped to found the British Archeological Association and the Percy, Camden, and Shakespeare societies. In 1842 he was elected corresponding member of the Acadéinie des Inscriptions et Belles Lettres of Paris, and was a fellow of the Society of Antiquaries as well as member of many other learned British and foreign bodies. In 1859 he superintended the excavations of the Roman city of Uriconium, near Shrewsbury, of which he issued a description. He died at Chelsea, 23d December 1877, in his sixty-seventh year. A portrait of him is in the Draw- ing Room Portrait Gallery for October 1,1859. His fer- tility was remarkable, and the list of seventy-eight articles in Allibone's Dictionary (1871, iii. pp. 2864-67) includes exainples of almost every department of literature. He was a great scholar, but will be chiefly remembered as an industrious antiquary and the editor of many relics of the Middle Ages. In the British Museum catalogue are 121 references under his name.

His chief publieations are—Queen Elizabeth and Her Times, a Series of Original Letters, 1888, 2 vols.; Reliquiw Antiqux#, 1839- 43, again 1845, 2 vols., edited with Mr J. O. Halliwell-Phillipps; W. Mapes's Latin Poems, 1841, 4to, Camden Society; Political Ballads and Carols, published by the Perey Soeiety, 1841; Popular Tveatises on Setence, 1841; History of Ludlow, 1841, &e., again 1852; Collection of Latin Stories, 1842, Perey Soeiety; The Vision aud Creed of Piers Ploughman, 1842, 2 vols., 2d ed. 1855; Bio- graphia Literaria, vol i., Anglo-Saxon Period, 1842, vol. ii, Anglo-Norman Period, 1846; The Chester Plays, 1848-47, 2 vols., Shakespeare Soeiety; St Patrick's Purgatory, 1844; Aneedota Literaria,

1844; Arehzxological Album, 1845, 4to; Hssays connected with England in the Middle Ages, 1846, 2 vols.; Chaueer's Canter- bury Tales, 1847-51, Perey Society, a new text with notes, re- printed in 1 vol., 1853 and 1867; ZLarly Travels in Palestine, 1848, Bohn's Antiq. Lib.; England wnder the House of Hanover, 1848, 2 vols., several editions, reprodueed in 1868 as Caricatwre History of the Georges; Mapes, De Nugis Curialium, 1850, 4to, Camden Soeiety; Geoffrey Gaimar's JMJetrical Chroniele, 1850, Caxton Society; Narratives of Soreery and Magic, 1851, 2 vols.; The Celt, the Roman, and the Saxon, 1852, 4th ed. 1885; History of Fulke Fitz Warine, 1855; Jo. de Garlandia, De Triumphis Eeelesiv, 1856, 4to, Roxburghe Club; Dietionary of Obsolete and Provincial English, 1857; A Volume of Vocabularies, 1857, 2d ed. by R. P. Wiilcker, 1884, 2 vols.; Les Cent Nouvelles Nouvelles, Paris, 1858, 2 vols.; Malory's History of King Arthwr, 1858, 2 vols., revised 1865; Political Poems and Songs from Edward ITT. to Riehard 1IZ., 1859-61, 2 vols., Rolls Series; Songs and Ballads of the Reign of Philip and Mary, 1860, 4to, Roxburghe Club; Essays on Archxological Subjects, 1861, 2 vols.; Domestie Manners and Sentiments in England in the Middle Ages, 1862, 4to, reproduced in 1871 as The Homes of other Days; Roll of Arms of Edward I., 1864, 4to; Autobiography of Thomas Wright (1736-97), his grandfather, 1864; History of Caricature, 1865, 4to; Womankind in Western Europe, 1869, 4to; Anglo-Latin Satirical Poets of 12th Cent., 1872, 2 vols., Rolls Series.

WRIT, in law, is a formal commission from the crown or other supreme executive officer to an inferior executive officer or to a private person, enjoining some act or omission. The word represents the Latin brevis or breve (both forms are found, the latter more commonly), so called, according to Bracton, from its shortly expressing the intention of the framer, "' quia breviter et paucis verbis intentionent proferentis exponit."! The breve can be traced back as far as the Codex Theodosianus (438 a.p.), where one of its meanings is that of an official report or letter. It bears a similar meaning in some of the capitularies of the Frankish kings. The interdictum of Roman law some- times represents the writ of English law; ¢.g., there is con- siderable likeness between the Roman interdictum de libero homine exhibendo and the English writs of habeas corpus and de homine replegiando, From Roman law the breve passed into the Liber Feudorum and the canon law, in

1 It is perhaps doubtful whether zntentio is here used in its ordinary sense or in the technical signification which it bore as a part of the Roman formula (see Roman Law, vol. xx. p. 707-8).

both in a sense differing from that at present borne by the writ of English law. The breve testatwm of the Liber Feudorum was an instrument in writing made on the land at the time of giving seisin by the lord to the tenant, and attested by the seals of the lord and the pares curie or other witnesses. In England such witnesses were part of the inquest, and joined in the verdict in case of disputed right until 12 Edw. IL. st. 1,¢. 2. The breve testatum in England developed into the FrEorrMENT (g.v.), later into the deed of grant (see Reat Estate) ; in Scotland into the charter, and later into the disposition. In canon law breve denoted a letter under the pope's seal. In old English ecclesiastical law a brief meant letters patent issued out of Chancery to churchwardens or other officers for the collection of money for church purposes. Such briefs were regulated by 4 Anne c. 14, but are now obsolete, although they are still to be found named in one of the rubrics in the communion service of the Book of Common Prayer. In English legal practice brief now denotes the written instructions put into the hands of counsel to form the basis of his case. It was probably so called from its at first being only a copy of the original writ. Such a brief is in Scotland called a memorial. History The writ in English law still occupies a very important of writin position, which can scarcely be understood without a oe sketch of its history. To a certain extent this history has p already been given under Pirapine, for the whole theory of pleading depends in the last resort upon the writ. Writ or breve was at first used in a less technical sense than that which it afterwards assumed: thus in the Leges Henrict Primi it simply means a letter from the king, and in the Assize of Clarendon (1166) imbreviart means to be registered. It became formalized by the reign of Henry IL, and precedents are given by Glanvill. The writ process was at that date the foundation of all civil justice in the king's court, and of much in the lower courts, and was a profitable source of revenue to the exchequer. Every writ had to be purchased (breve perquirere was the technical term). This purchase developed in later times into the payment of a fine to the king where the

damages were laid above £40. The usual scale was 6s. 8d. for every 100 marks claimed. Insuing outa writ of covenant, the basis of the proceedings in levying a fine (see ENTAIL), the king was entitled to his primer jine, 2.¢., one-tenth of the annual value of the land concerned. The sale of writs was forbidden by Magna Charta and other statutes in certain cases, especially that of the writ de odio et atea in favour of the liberty of the subject. A solicitor was so called because his original duty was to solicit or sue out a writ and take the due proceedings by paying the proper fine. The costs of a writ purchased were first allowed to a successful demandant by the Statute of Gloucester, 6 Edw. I.c. 1. Through the Norman period the 'pre- rogative of issuing writs seems to have been undisputed. Glanvill's precedents did not exhaust all possible forms, for in the time of Bracton, in the 13th century, it was still possible to frame new writs at the pleasure of the crown. The Provisions of Oxford in 1258 put an end to this by enacting that the chancellor should not seal anything out of course (7.2, any writ for which there was no precedent) by the will of the king, but that he should do it by the council. In 1285 the Statute of Westminster the Second, 13 Edw. I. st. 1, c. 24, re-established the power of the crown within certain limits, that is, in causes of action in a similar case falling under the same law (12 consimili casu cadente sub eodem jure) as those for which precedents of writs already existed in the Chancery (see Trespass, Trover). These precedents were at an early date recorded in the Registrum Brevium, called by Sir Edward Coke the oldest book in the common law. Apart from the powers

given by the statute, new writs could only be issued by the authority of parliament, and writs are sometimes found set out in statutes, especially in the Statutum Wallix, 12 Edw. I. c. 7, where precedents of the most usual writs will be found. The Statute of Westminster the Second itself contained precedents of the writ of formedon and of many others. The original flexibility of the writ was thus limited within comparatively narrow bounds. The right to the issue of the writ determined the right of action. So essential was the writ that it was a legal axiom in Bracton that no one could sue at law without a writ, and it was called by Coke, in his introduction to Littleton, "the heartstrings of the common law." As such it occupied an important place in some of the leading statutes dealing with constitutional rights. The Statute of Marl- bridge, 52 Hen. III. c. 22,

forbade a lord to distrain his freeholders to answer for their freeholds, or for anything touching their freeholds, without the king's writ. By 25 Edw. III. st. 5, c. 4, it was accorded, asserted, and stablished that none should be taken by petition or sug- gestion made to the king or his council unless by indict- ment or presentment in due manner or by process made by writ original at the common law. 42 Edw. II c. 3 provided that no man should be put to answer without presentment before justices, or matter of record, or by due process and writ original according to the old law of the land. Both these statutes were recited and the general principle confirmed by 16 Car. Ic. 10. Uniformity of procedure was secured by 27 Hen. VIII. c. 24, by which all writs were to be in the king's name in a county palatine or liberty, but tested by those who had the county palatine or liberty. It was not until 1731 that, by virtue of 4 Geo. II. c. 26, writs were framed in the English language. They had previously been in Latin; this accounts for the Latin names by which a large number are still known. The writ was issued from the common law side of the Chancery, and was in the special charge of the manager and petty bag offices. Though issuing from the king's Chancery, it did not necessarily direct the trial of the question in the king's court. In whatever court it was returnable, it called in the aid of the sheriff as executive officer. It was either addressed to him or, if addressed to the party alleged to be in default, it concluded with a threat of con- straint by the sheriff in the event of disobedience, generally in those terms, 'et, nisi feceris, vicecomes de N. faciat ne amplius clamorem audiam pro defectu justitie." If the writ was returnable in the county court or the lord's court, the sheriff or the lord sat as the deputy of the king, not by virtue of his inherent jurisdiction. The writ was not necessary for the initiation of proceedings in these courts or before the justices in eyre (who sat as judges of the county court),! but a custom seems to have grown up of suing out a writ from the king where the claim was above 40s. Cases were transferred from the lord's court to the county court by writ of tolt (so called because it removed, tollit, the case), from the latter to the king's court by writ of pone (so called from its first word). By Magna Charta the power of bringing a suit in the king's court in the first instance by writ of precipe was taken away, and the writ was thenceforth only returnable in the king's court where the tenant held of the king i capite, or where the lord had no court or abandoned his right. Hence it became a common form in the writ of right to allege that the lord had

renounced his court (dominus remisit curiam) so as to secure trial in the king's court. Besides being used for the trial of disputes, writs addressed to sheriffs, mayors, commissioners, or others were in constant use for financial

1 The distinction between the royal and local courts was not per- haps at all times very strictly drawn. Thus in the Leges Henrica Primi, c. 31, the county court is called curia regis.

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and political purposes, ¢.g., for the collection of fifteenths, | alternative of the judicial combat was accepted was

scutage, tallage, &c., for summons to the council and later to parliament, and for recalling a parliament, the last by means of the rarely occurring writ de revocatione parlia- mentt,

There were several divisions of writs (excluding those purely financial and political), the most important being that into original and judicial, the former (tested in the name of the king) issued to bring a suit before the proper court, the latter (tested in the name of a judge) issued during the progress of a suit or to enforce judgment. Original were either optional, ¢. ¢., giving an option of doing a certain act or of showing cause why it was not done, beginning with the words precipe quod reddat, the principal example being the writ on which proceedings in a common recovery (see ENnTaiL) were based, or per- emptory, 2.e., calling on a person to do a certain act, beginning with the words si A fecerit tesecurum. Original were also either de cursu or magistralia, the former those fixed in form and depending on precedent, the latter those framed by the masters in Chancery under the powers of the Statute of Westminster the Second. They were also either general or special, the latter setting forth the grounds of the demand with greater particularity than the former. By 5 Geo. II. c. 27 special writs were confined to causes of action amounting to £10 or upwards. There was also a division of writs into writs of right (ea debito Justitiz), such as habeas corpus, and prerogative writs (ex gratia),

such as mandamus (see PREROGATIVE). Coke and other authorities mention numerous other divisions, but those which have been named appear to be the principal.

The most interesting form of writ from the historical point of view was the writ of right (breve de recto), called by Blackstone "the highest writ in the law," used at first for debt and other personal claims, afterwards confined to the recovery of real estate as the writ of right par excellence. It was so called from the words plenum rectum contained in it, and was the remedy for obtaining justice for ouster from or privation of the freehold. By it property as well as possession could be recovered. It generally lay in the king's court, as has been said, by virtue of a fictitious allegation. In that case it was addressed to the sheriff and was called a writ of right close. It was also a writ of right close where the lands in dispute were held in antient demesne. When addressed to the lord and tried in his court, it was generally a writ of right patent. After the appearance of the tenant the demandant in a writ of right counted, that is, claimed against the tenant according to the writ, but in more precise terms, the writ being as it were the embryo of the future count. The trial was originally by battle (see TriaL), but in the reign of Henry II. an alternative pro- cedure was introduced, interesting as the earliest example of the substitution of something like the Jury (q.v.) system for the judicial combat. A writ de magna assisa elagenda was directed to the sheriff commanding him to return four knights of the county and vicinage to the court, there to return twelve other knights of the vicinage to try upon oath the question contained in the writ of right (technically called the mise). This mode of trial was known as trial by the grand assize. Generally the whole of the sixteen knights were sworn, though twelve was a sufficient number. The last occasion of trial by the grand assize was in 1835. But long before that date possessory had from their greater convenience tended to supersede proprietary remedies, and in most cases the title was sufficiently determined by the assizes of other kinds, especially that of novel disseisin and later by pro- ceedings in ejectment (see Possession). The oath of the champion on proceedings in a writ of right where the

regulated by statute, 3 Edw. I.c. 41. The writ of right is also interesting as being the basis of the law of Limira- TION (q.v.). By the Statute of

Merton, 20 Hen. III. c. 8, no seisin could be alleged by the demandant but from the time of Henry II. By 3 Edw. I. c. 39 the time was fixed at the reign of Richard I., by 32 Hen. VIII. c. 2 at sixty years at the most. There were other writs of right with special names, eg., the writ of right by the custom of London for land in London, the writ of right of advowson, brought by the patron to recover his right of presentation to a benefice, and the writs of right of dower and de rationabili parte, the latter brought by coparceners or brothers in gavelkind. There were also writs in the nature of a writ of right, e.g., formedon, brought by a reversioner on discontinuance by a tenant in tail and given by the Statute De Donis (see Enratz) ; escheat, brought by the lord where the tenant died without an heir; ne cnjuste vexes, to prohibit the lord from exacting services or rents beyond his due; de nativo habendo, to recover the inherit- ance in a villein; and the little writ of right close according to the custom of the inanor, to try in the lord's court the right of the king's tenants in antient demesne. Up to 1832 an action was (except as against certain privileged persons, such as attorneys) commenced by original writ, and writ practically became the equivalent of action, and is so used in old books of practice, such as Booth on Real Actions. The law was gradually altered by legislation and still more by the introduction of fictitious proceedings in the common law courts, to be described later, by which the issue of the original writ was suspended, except in real actions, which were of comparatively rare occurrence. The original writ is no longer in use in civil procedure, an action being now in all cases commenced by the writ of summons, a judicial writ, a procedure first introduced in 1832 by 2 Will. IV. c. 39. In the follow- ing year an immense number of the old writs were abolished by 3and 4 Will. IV. c. 27. An exception was made in favour of the writ of right of dower, writ of dower unde mihil habet, QUARE IMPEDIT (q.v.), and EJECTMENT (¢.2.), and of the plaints for free bench and dower in the nature of writs of right. Ejectment was remodelled by the Common Law Procedure Act, 1852; the other writs and plaints remained up to the Common Law Procedure Act, 1860, by which they were abolished. Other writs which have been superseded by simpler proceedings, generally by ordinary actions, are those of the four assizes of novel disseisin, jurzs utrum, mort d'auncester, and darrein presentment (see ASSIZE), estrepement and waste (see Waste), monstrans de droit (see PETITION), NUISANCE (g.v.), PARTITION (¢.v.), premunire (see

TREASON), Quo WaRRANTO (q.v.), SciRE Factas (q.v.), subpoena (see Trust), and warrantia chartz (see WaRRANTY). The number of writs was so large that any exhaustive list of them is almost impossible, but a few of those of more

special interest which have become obsolete may be shortly Obsolete mentioned. Admensuratio lay against persons usurping writs.

more than their share of property. It was either dots or pasture, the latter, like the Scotch '"souming and rouming," being the remedy for surcharge of common. Alias and pluries writs were issued when a previous writ had been disobeyed. Attaint lay to inquire by a jury of twenty-four whether a jury of twelve had given a false verdict. It was superseded in the 16th century by the practice of setting aside a verdict or granting a new trial, and was finally abolished by 6 Geo. IV. c. 50.

| querela was a means of relieving a defendant by a matter

of discharge occurring after judgment. After having been long practically superseded by stay of execution it was finally abolished by the rules made under the Judicature

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Act, 1875. Capias, latitat, and quominus are interesting as showing the extraordinary mass of fictitious allegation in the old procedure of the common law courts before 1832. By capias ad respondendum followed by alias and pluries the Court of Common Pleas was enabled to take cognizance of an action without the actual issue of an original writ. The capias was a judicial writ issued to follow an original writ of trespass quia clauswm Sregit. The issue of the original writ and after a time the issue of the capias became mere fictions, and proceedings com- menced with the issue of another writ called capias testatum. On return of the writ the plaintiff elected to proceed with a cause of action other than trespass, and the real merits of the case were eventually reached in this tortuous manner. After being served with the capias the defendant was bound to put in common or special bail, the former being sufficient in all but exceptional cases. Here again there was a fiction, for his common bail

were John Doe and Richard Roe. The same fictitious pair also appeared on the side of the plaintiff as his pledges for the due prosecution of his action. By datitat and quominus the Courts of King's Bench and Exchequer respectively assumed jurisdiction by a further series of fictions over ordinary civil actions. The writ of Jatitat, following the bill of. Middlesex, itself in later times generally a fiction, alleged that the defendant was in hiding out of Middlesex, after committing a trespass guia clausum fregit, for which he was in the custody of the king's marshal in the Marshalsea prison. The real cause of action was then stated in what was called the ac etiam clause. Writs filed in the King's Bench and Common Pleas were in the custody of an officer of each court called the custos brevinm. The writ of guominus alleged that the plaintiff was the king's debtor and that through the defendant's default he was unable to discharge the debt. Deceit or disceit lay for the redress of anything done deceitfully in the name of another, but was especially used to reverse a judgment in a real action obtained by collusion. Déstraint of knighthood was a mode of obtaining money for the crown by the exercise of the prerogative of forcing every one who held a knight's fee under the crown to be knighted or to pay a fine. The earliest extant writ was issued in 1278. It was abolished by 16 Car. L c. 20. Entry was & possessory remedy against one alleged to hold land unlawfully. It was divided into a large number of kinds, and was the subject of much of the old real property learning. The ones most commonly occurring were the writs of entry in the per and in the post, the former alleg- ing, the latter not, the title of the heir from the original disseisor. When writ had come to be equivalent in mean- ing to action, one of the divisions of possessory actions was into writs of entry and writs of assize. A special writ of entry for dower was given by 6 Edw. I. c. 7. Excommunicato capiendo was the authority for arresting an excommunicated person and detaining him until he was reconciled to the church, when he was liberated by the writ de eacommunicato deliberando. These proceedings were abolished and the writ de contumace capiendo substi- tuted by 57 Geo. IIL c. 127 (see Excommunicarton), Heretico comburendo was issued on certificate of conviction for heresy by the ecclesiastical court. A case of burning two Arians under this writ occurred as lately as the reign of James I. It was abolished by 29 Car. I. c. 9. Homine replegiando, mainprize, and odio et atia (or bono et malo) were all ancient means of securing the liberty of

the sub- ject, long superseded by the more effective procedure of habeas corpus. The last of the three enjoined the sheriff to inquire whether a committal on suspicion of murder was on just cause or from malice and ill-will. It was regulated by Magna Charta and the Statute of Westminster

the Second, but, having been abused to the advantage of sherifis, it was taken away by 28 Edw. IIL c. 9. Wise prius was given by the Statute of Westminster the Second, 13 Edw. I. c. 30. Its place is now taken by the com- mission of Nisr Prius (¢.v.). Orando pro rege et regno, before the present Book of Common Prayer, enjoined public prayers for the high court of parliament. Privilege com- manded the release of a prisoner entitled to privilege of parliament. Protection was given for enabling a man to be quit of suits brought against him while absent beyond seas. It was dealt with by a large number of old statutes, but none has been issued since 1692. Rebellion was a means of enforcing obedience to the process of the Court of Chancery. In modern procedure attachment takes its place. Rege inconsulto commanded judges of a court not to proceed in a case which might prejudice the king until his pleasure should be known. Replevin was a survival of the most archaic law. The procedure consisted of writ on writ to an almost unlimited extent. It originally began by the issue of a writ of replevin or replegiart facias. The case might be removed from the county court toa superior court by writ of recordari facias loquelam. If the dis- trainor claimed a property in the goods distrained, the question of property or no property was determined by a writ de proprietate probanda, and, if decided in favour of the distrainor, the distress was to be returned to him by writ de retorno habendo. Ifthe goods were removed or concealed ; a writ of capias in withernam enabled the sheriff, after due issue of alias and pluries writs, to take a second distress in place of the one removed. It is said that the question whether goods taken in withernam could be replevied was the only one which the Admirable Crichton found himself unable to answer. For the modern practice, see DISTRESS, REPLEVIN. Restitutione extracti ab ecclesia lay for restor- ing a man to a sanctuary from which he had been wrong- fully taken (see Sanctuary). Secta lay for enforcing the duties of tenants to their lord's court, ¢.g., secta ad molen- dinum, where the tenants were bound to have their corn ground at the lord's mill. Secsina habenda allowed delivery of lands of a felon to the lord after the king had had his year, day, and waste (see Waste). Vi laica removenda is curiously illustrative of ancient manners. It lay where two parsons contended for a church, and one of then entered with a great number of laymen and kept out the other by force. As lately as 1867 an application for the issue of the

writ was made to the Chancery Court of the Bermuda Islands, but refused on the ground that the writ was obsolete, and that the same relief could be obtained by injunction. On appeal this refusal was sustained by the privy council.

Of writs now in use, other than those for elections, all are Writs judicial, or part of the Process (q.v.)! of the court, except per- now in They are to be hereafter use,

haps the writ of error in criminal cases. issued out of the central office of the Supreme Court, or the office of the clerk of the crown in Chancery, provision having been made by the Great Seal (Officers) Act, 1874, and the Judicature (Officers) Act, 1879, for the transfer on the next vacancy of the duties of the clerk of the petty bag to those officers. By the latter Act the record and writ clerks, previously officers of the Chancery Division, were abolished. By 40 and 41 Vict. c. 41 the wafer great scal or the wafer privy seal may be attached to writs instead of the im pression of the great or privy seal. The judicial writs issue chiefly, if not entirely, from the central office, with which the old crown office was incorporated by the Act of 1879. The crown office had charge of writs occurring in crown practice, such as quo warranto and certiorart.

In local civil courts, other than county courts, writs are usually Judicial issued out of the office of the registrar, or an officer of similar writs,

jurisdiction. By 35 and 36 Vict. c. 86 writs of cxecution from such courts for sums under £20 may be stamped or sealed as of course by the registrar of a county court, and executed as if they had issued from the county court. In county court practice the

1 Tt may be noticed that by the interpretation clause of the Sheriffs Act, 1887, the expression " writ" includes any process.

WARRANT (q.v.) corresponds generally to the writ of the Supreme Court. Most of the present law on the subject of writs is contained in the Rules of the Supreme Court, 1883, Ord. xlii.—xliv., and in the Crown Office

Rules, 1886. Both sets of rules contain numerous pre- cedents in their schedules. all writs (with certain exceptions) are to be tested in the name of the lord chancellor, or, if that office be vacant, in the name of the lord chief justice. The main exceptions are those whieh occur in crown practice, which are tested by the lord chief justice. The writ of error bears the tests of the king or queen, "'witness our- selves." Before the issue of most writs a pracipe, or authority to the proper offices to issue the writ, is necessary. This is of course not to be confounded with the old original writ of precipe. Writs affecting land must generally 'be registered in order to bind the land (see RecisTRATIoN). A writ cannot as a rule be served on Sunday (see SUNDAY). Some of the more important modern writs (other than those of an extrajudicial nature) may be shortly noticed. Hasrsas Corpus, MANDAMUS, and PROHIBITION (9g.¥.) have been already treated. Writs are generally, unless where the contrary is Stated, addressed to the sheriff. Abatement or nocu- mento amovendo enjoins the removal of a nuisance in pursuance of a judgment to that effect. Ad quod damnum is for the purpose of inquiring whether a proposed crown grant will be to the damage of the crown or others. It is still in use, and recent examples will be found in the London Gazette. If the inquiry be determined in favour of the subject, a reasonable fine is payable to the exchequcr by 27 Edw. I. st. 2. Attachment is issued as a means of support- ing the dignity of the court by punishment for contempt of its orders (see CONTEMPT OF CouRT). Since the Judicature Acts a uniform practice has been followed in all the branches of the High Court, and a writ of attachment can now only be issued by leave of the court or a judge after notice to the party against whom it is to be issued. Capias: the old writs of capias ad satisfaciendum and capias utligatwm may still be used, but their importance has been much diminished since the alterations made in the law by the Debtors Act, 1869, and the abolition of civil outlawry (see OuT-LAW). Certiorari is a writ in very frequent use, by which the pro- ceedings of an inferior court are brought up for review by the High Court. In general it lies for excess of jurisdiction as mandamus does for defect. The Summary Jurisdiction Act, 1879, makes the writ no longer necessary where a special case has been stated by a court of quarter sessions. Delivery enforces a judgment for the delivery of property without giving the defendant (unless at the option of the plaintiff) power to retain it on payment of the assessed value. Distringas lay to distrain a person for a

crown debt or for his appearance on a certain day. Its opcration has been much curtailed by the substitution of other proceedings by 28 and 29 Vict. c. 104, and the rules of the Supreme Court. It now seems to lie only against inhabitants for non-repair of a highway. Dis- tringas nuper vicccomitem is a writ calling on an ex-sheriff to account for the proceeds of goods taken in execution. Elcgit is founded on the Statute of Westminster the Second, andisso named from the words of the writ, that the plaintiff has chosen (elcgié) this particular mode of satisfaction. It originally ordered the sheriff to seize a moiety of the debtor's land and all his goods, save his oxen and beasts of the plough. By 1 and 2 Vict. c. 110 the elegit was extended to include the whole of the lands, and copy- holds as well as freeholds. By the Bankruptcy Act, 1883, an clegit no longer applies to goods. Error, the only example of an original writ remaining, was at one time largely used in both civil and criminal proceedings. It was abolished in civil procedure by the Common Law Procedure Act, 1852, and proceedings in error by the rules made under the Judicature Act, 1875. III., 25 Edw. III. st. 6. Haxtent is the writ of execution issued by the crown fora crown debt of record. The sale of chattels seized under an extent takes place under a writ of venditiont exponas. A crown debtor is eutitled to an catent im aid against a person indebted to him. Where a crown debtor has died a writ reciting his death, and so called diem clausit cxtremum, issues against his property. Fieri facias is the ordinary writ of execution on a judgment commanding the sheriff to levy the sum, interest, and costs on the personal pro- perty of the party. Where the sheriff has not sold the goods, venditiont cxponas issues to compel him to do so. Where the party is a beneficed clergyman, the writ is one of fiert facias de bonis ceclesiasticis or of sequestrari facias (addressed to the bishop). The latter writ also issues in other eases of an exceptional nature, as against a corporation and to seize a pension. It is addressed to eommissioners, not to the sheriff. Habere facias possessionem is given to the owner of a tithe or rent charge, enabling him to have

By -Ord. ii. r. 8 of the rules of 1883 .

WRIT

possession of the lands chargeablo therewith until arrears due to him are paid (see TirHEs). Jndicavit is still nominally grantable under the Statute De Conjunctim Feoffatis of 34 Edw. L., and is a particular kind of prohibition granted to the patron of an advow- son. Inquiry issues for the assessment of damages by the sheriff or his deputy. It represents to some extent the old writ of justicies, and the later writ of trial allowed by 3 and 4 Will. IV. ¢. 42, butis narrower in its operation, for under the last-named writs the whole case or issues under it could be tried. Before an inquiry the liability has been already established. Zevari facias is the means of levying execution for forfeited recognizances (see RECOGNIZANCE). The Bankruptcy Act, 1883, abolished it in civil proceedings. Ne cacat regno was at one time issued by virtue of the prerogative to prevent any person from leaving the realm, a form of restraint of liberty recognized by parliament in 5 Ric. II. c. 2. It has now become a means of preventing a debtor from quitting the kingdom, and so withdrawing himself from the jurisdiction of the court with out giving security for the debt. There is some doubt whether it has not been impliedly superseded by the powers given by Ord. xix. of the Rules of the Supreme Court. Von omittas is for executing pro- cess by the sheriff in a liberty or franchise, where the proper oflicer has neglected to do so. It rested originally ehiefly upon the Statute of Westminster the Second, c.39, and is now regulated by the Sheriffs Act, 1887, which repeals the previous enactment. Posscssion (also called assistance) enjoins the sheriff to give possession of land to the party entitled thereto under a judgment for such possession. In admiralty, where the judgment is for possession of a ship, the writ is addressed to the marshal. Procedendo is the converse of prohibi- tion. It directs the lower court to proceed with the case. It also lies to restore the authority of commissioners suspended by super- sedeas. Restitution restores property, either real or personal, after the right to it has been judicially declared. Thus it lies on behalf of the owner of real property under the statutes of forcible entry and of personal property under the Larceny Act, 1861. Signijicavit, once a writ, appears since 57 Geo. III. c. 127 to be merely a notice. It is a‘part of the proceedings against a person disobeying the order of an ecclesiastical court, and consists in a notification to the crown in Chancery of the disobedience. Thereupon a writ de contwmace capiendo issues for his arrest. On his subsequent obedience or

satisfaction, a writ of deliverance is granted. Precedents of these writs are given in the Act named. Subpena is the ordinary mcans

| of securing the presence of a witness in court, and is addressed to

the person whose attendance is required. It is so called from its containing the words "and this you are not to omit under the penalty of £100," &c. The subpena may be either ad testificandum, to-give evidence, or duces teewm, to produce docunients, &c., or both combined. By special order of a judge under 17 and 18 Vict. ¢. 23 a subpena may be issued from any court in England, Scotland, or Ireland to compel the attendance of a witness out of the juris- diction. Summons is the universal means of commencing an action in the High Court. It is addressed to the defendant, and may be either generally or specially indorsed with a statement of the nature of the claim made. The latter form of indorsement is allowed in certain cases of debt or liquidated demand, and gives the plaintiff the great advantage of entitling him to final judgment in default of appearance by the defendant, and even in spite of appearance unless the defendant can satisfy a judge that he has a defence or ought to be allowed to defend. No statement of claim is necessary in case of a specially indorsed writ, the indorse- ment being deemed to be the statement. The writ may be issued out of the central office or out of a district registry, and the plaintiff may name on his writ the division of the High Court in which he proposes to have the case tried. There are special rules governing the issue of writs in probate and admiralty actions. The writ remains in force for twelve months, but may be renewed for good cause after the expiration of that time. Service must be personal, unless where substituted service is allowed, and in special cases, such as actions to recover land and admiralty actions. Service out of the jurisdiction of a writ or notice of a writ is allowed only by leave of the court or a judge. Notice of the issue of a writ, and not the writ itself, is served on a defendant who is neither a British subject nor in British dominions. The law is contained in the Rules of tho Supreme Court, especially Ord. ii—xi. and xiv. Supersedcas com- mands the stay of proceedings on another writ. Itis often combined with procedendo, where on a certiorari the High Court has decided in favour of the jurisdiction of the inferior court. It is also used for removing from the commission of the peace, and for putting

an end to the authority of, any persons acting under commission from the crown. Venire facias is the first proceeding in outlawry, call- ing upon the party toappear. Under the old practice a venire facias de novo was the means of obtaining a new trial. Ventre inspiciendo appears still to be competent, and is a curious relic of antiquity. It issues on the application of an heir presumptive in order to determine by a jury of matrons whether the widow of a deceased owner of lands be with child or not. Almost exactly the same pro- ceeding was known in Roman law under the name of interdictum de inspiciendo ventre, the pretor sending five women to make a report.

Non- judicial writs.

Scotland.

WRI—W RI

The principal writs of a non-judicial nature relate to parliament or some of its constituent elements. Parliament is summoned by the king's writ issued out of Chancery by advice of the privy coun- cil. The period of forty days once necessary between the writ and the assembling is now by 15 and 16 Vict. c. 23 reduced to thirty- five days. Writs of summons are issued to the lords spiritual and temiporal before every new parliament. Those to Irish represen- tative peers are rcgulated by the Act of Union, those to archbishops and bishops by 10 and 11 Vict. e. 108. New peerages are no Ionger created by writ, but the eldest son of a peer is occasionally summoned to the House of Lords in the name of a barony of his father's, Earl Percy, the eldest son of the duke of Northumber- land, was so summoned in 1887, and sits as Baron Lovaine (see PEERAGE). With respect to election of members of the House of Commons, the procedure differs as the election takes place after a dissolution or on a casual vacancy. After a dissolution the writ is issued, as already stated, by order of the crown in council. For a single election the warrant for a new writ is issued during the session by the spcaker after an order of the house made upon motion ; during the recess by the speaker's authority alone, under the powers given by 24 Geo. III. sess. 2, c. 26, 21 and 22 Vict. c. 110, and 26 Vict. c. 20. The warrant is addressed to the clerk of the crown in Chancery for Great Britain, to the clerk of the crown and hanaper of

Ireland. A superscdeas to a writ has some- times been ordered where the writ was improvidently issued. The time allowed to elapse between the receipt of the writ and the elec- tion is fixed by the Ballot Act, 1872, sched. 1, at nine days for a county ora district borough, four days for any other borough. The writ is to be returned by the returning officer to the clerk of the crown with the name of the member elected endorsed on the writ. Sched. 2 gives a form of the writ, which is tested, like the writ of error, by the quecn herself. The returning officer is the sheriff in eounties and counties of cities (such as Chester), generally the mayor in cities and boroughs, and the vice-chancellor in univer- sities (see PARLIAMENT). Other writs for election are those for ConvocaTION (q.v.), which is by 25 Hen. VIII. c. 19 summoned by the archbishop of the province on receipt of the king's writ, and for election of coroners, verderers of royal forests, and some other officers whose office is of great antiquity. The writ de coronatore eligendo, addressed to the sheriff, is specially preserved by the Coroners Act, 1887.

Offences relating to writs are dealt with by the Criminal Law Con- solidation Acts of 1861; larceny by 24 and 25 Vict. c. 96, s. 30; forgery by 24 and 25 Vict. c. 98, s. 27. The maximum penalty is seven years' penal servitude. :

Scotland.—Writ is a more extensive term than in England. Writs are either judicial or extrajudicial, the latter including deeds and other instruments,—as, for instance, in 42 and 48 Vict. c. 44, and in the common use of the phrase " oath or writ" as a means of proof. In the narrower English sense both "writ" and "'brieve" are used. The brieve was as indispensable a part of the old procedure as it was in England, and many forms are given in Regiam Majestatem and Quoniam Attachiamenta. It was a com- mand issued in the king's name, addressed to a judge, and ordering trial of a question stated therein. Its conclusion was the will of the summons (see WinL, Summons). In some cases proceedings which were by writ in England took another form in Scotland. For instance, the writ of attaint was not known in Scotland, but a similar end was reached by trial of the jury for wilful crror.t_ The English writ of ne excat regno is represented by the meditatio fuge warrant. Most proceedings by brieve, being addressed to the sheriff,

became obsolete after the institution of the Court of Session, when the sheriffs lost much of that judicial power which they had enjoyed to a greater extent than the English sheriff (see SHERIFF). The executive functions of the English sheriff are performed by the messengers-at-arms. An English writ of execution is represented in Scotland by diligence, chiefly by means by warrants to messen- gers-at-arms under the authority of signet letters in the name of the king. The brieve, however, has not wholly disappeared. Brieves of tutory, terce, and division are still eompetent, but not in use. Other kinds of brieve have been superseded by simpler procedure, c.g., the brieve of service of heirs by 10 and 11 Vict. c. 47, for which a petition to the sheriff was substituted by that Act and 31 and 82 Vict. c. 101. The brieve of cognition of insane persons is now the only one of practical importance. The old brieves of furiosity and idiotcy were abolished, and this new form was introduced by the Act last named. Writs eo nomine have been the subject of much recent legislation. The writs of capias, habeas, certiorari, and extent were replaced by other proceedings by 19 and 20 Vict. c. 56. The writ of clare constat was introduced by 21 and 22 Vict. c. 76. It and the writs of resignation and confirmation (whether granted by the crown or a subject superior) were regulated by 31 and 32 Vict. c. 101. By the same Act crown writs are to be in the English language, and registered in the regis-

1 An example occurring in the reign of James VI. will be found in Piteairn's Criminal Trials, vol. i. p. 216.

ter of crown writs. They need not be sealed unless at the instance of the party against whom they are issued. Writs of progress (except crown writs, writs of clare constat, and writs of acknow- ledgment) were abolished by 37 and 38 Vict. c. 94. The clare constat writ is one granted by the crown or a subject superior for the purpose of completing title of a vassal's heirs to lands held by the deceased vassal. Where the lands are leasehold the writ of acknowledgment under 20 and 21 Vict. ¢: 26 is used for the same purpose. By 40 and 41 Vict. c. 40 the form of warrant of execution on certain extracts of registered writs is amended. Extracts of registered writs are to be equivalent to the registered writs them- selves. Writs registered in

the register of sasines for preserva- tion only may atterwards be registered for preservation and execution. By 22 Geo. II. c. 48, passed for the purpose of assimi- lating the practice of outlawry for treason in Scotland to that in use in England, the court before which an indictment for treason or misprision of treason is found, is entitled on proper cause to issue writs of capias, proclamation, and exigent. Many writs are by the Stamp Act, 1870, chargeable with a duty of tive shillings. In some respects the proceedings in parliamentary elections differ from those in use in England. Thus the writ in university elec- tions is directed to the vice-chancellors of Edinburgh and Glasgow respectively, but not to those of St Andrews and Aberdeen, and there is an extension of the time for the return in elections for Orkney and Shetland, and for the Wick burghs. Representative peers of Scotland were by the Act of Union to be elected after writ issued to the privy council of Scotland. On the abolition of the privy council a proclamation under the great seal was substituted by 6 Anne, c. 23.

United States.—Writs in United States courts are by Act of United Congress to be tested in the name of the chief justice of the United States.

States. By State laws writs are generally bound to be in the name of the people of the State, in the English language, and tested in the name of a judge. Writs of error have been the subject of much legislation by the United States and by the States. In New York writs of error and of ne exeat have been abolished. Writs as parts of real actions have been generally superseded, but in Massachu- setts a writ of entry on disseisin is still a mode of trying title. Writs of dower and of estrepement are still in use in some States. By the law of some States, ¢.g., New Jersey, writs of election are issued to supply casually occurring vacancies in the legislature.

Authorities.—The importance of the writ in procedure led to the compilation of a great body of law and precedent at; an early date. In addition to the Registrum Brevtum there were, among other old works, the Natura Brevium, first published in 1525; Theloall, Le Digest des Briefes Originales (1579); Fitzherbert, Le Nouvel Natura Brevium (1588); Oficina Brevium (1679). See too Coke upon Littleton, 158, 159, 2

Coke's /nstitutes, 39. Many precedents will also be found in the collection of Parliamentary Writs and in Stubbs's Select Charters. Old books of practice, such as Tidd's Practice, Corner's Crown Practice, and Booth On Real Actions, contained much law on the subject. For the history Spence's Equitable Jurisdiction, vol. i. bk. ii. ch. viii., Forsyth's Hist. of Trial by Jury, Stephen On Pleading, and Bigelow's ist. of Procedure, ch. iv., may be consulted. There appears to be no book dealing with the writ in modern practice, but sufficient information is contained in the ordinary treatises on procedure. (J. Wt.)

WRITING MACHINES. Machines and appliances of various kinds are in common use to facilitate the process of writing, and to produce copies of writings already made with the pen. Such facsimile writings are obtained by numerous devices, all of which, however, come under the heads (1) of manifolding, (2) of processes analogous in principle to lithography, and (3) of stencilling. The simplest form of manifold writing is by sheets of paper prepared with lamp-black being interleaved between the sheets of white paper on which the impressions are to be taken, and writing over the whole with a style or other sharp-pointed instrument. By this means a considerable number of copies can be made at one time, and the method is in general use among newspaper writers and _tele- graphists in the production of what is technically known as "flimsy," where several copies of the same matter are required. Of processes analogous to lithography, the best known is the "hektograph " method, in which the writing is done in the first instance on paper with aniline ink, and then a transfer is made to a gelatine composition which gives off a considerable number of impressions. In principle the autocopyist is like the hektograph, but in this apparatus the writing is done with a special ink, which is transferred to a prepared and properly stretched sheet of parchment. From this parchment copies are obtained precisely as from a lithographic stone on which a transfer has been impressed. Of the apparatus worked in the stencil method, the cyclostyle has been most extensively

adopted. This machine consists of a frame of sufficient size containing a plate of tin on which the paper from which the impression is to be taken is rested. The paper

is prepared in a particular way, and the "pen" with which |

the writing is done consists of an ordinary wooden holder, at the end of which is fixed on a pivot a minute wheel. The edge of the wheel is studded with fine points, which, as it revolves and turns in the direction of the writing, pierce the paper, thus making a perfect stencil. The ink is passed over the top of this stencil by means of a roller, and the impression is left on a sheet of ordinary paper placed beneath.}

The principal substitute for the pen, however, is 'the machine now generally known as the type-writer, which in its present form dates only from 1873, but it has within that time come into extensive use, especially in America, the country of its origin. Numerous attempts to produce type-writing machines had been previously made both in England and America. So long ago as 1714 one Henry Mill took out a patent for a machine which he described as "an artificial machine or method for the impressing or transcribing of letters, singly or progressively, one after another as in writing, whereby all writings whatsoever may be engrossed in paper or parchment so neat and exact as not to be distinguished from print"; but his instrument is said to have been clumsy and useless, and led to no practical result. In 1867 the idea was taken up by Messrs C, Latham Sholes and Samuel W. Soulé, printers in Milwaukee, and Mr Carlos Glidden, and, after many experiments and failures, a practical working machine was elaborated in 1873, which, being originally made by Messrs E. Remington and Sons, of Ilion, N.Y., is known as the Remington standard type-writer. The success of this machine has induced many inventors to enter the field, and now three principal classes of type-writers are more or less in use. These are (1) type-bar machines, (2) cylinder machines, and (3) wheel machines. The Remington is the type and original of all type-bar machines, which are so called because the steel types are fixed at the extremity of a bar or rod of iron. These bars are in the Remington arranged in a circle around a common centre, and by striking the key of any particular letter, a lever is moved which raises the

type-bar, and causes the type at its point to strike on an inked ribbon, and impresses the letter on the paper, which lies against an india-rubber roller. The type-bars are so hinged that all the types as they are struck hit precisely the same spot, so that were the paper to remain stationary the impressions of all the types struck would be superimposed on each other : but, by an automatic mechanism, the cylinder with the paper moves a space to the left after the impression of each type, and the depression of a wooden bar similarly moves the cylinder a space after each word without impressing any sign. In the recent forms of the Remington machine, each type bar carries two types, capital and lower case, or other duplicate signs, the one a little behind the other, and when a capital letter is to be printed the depression of a key shifts the position of the cylinder so as to bring the second type in contact with the ink ribbon. In this way from one set of keys two sets of type can be with facility acted upon. With practice, an average writing speed of forty words per minute can easily be attained on the Remington type-writer, and very expert writers have been able to keep up a speed of from sixty to seventy words for ashort time. It is safe to say that type-writing can be ordinarily done at about three times the speed of

‘ The trypograph is also a stencil-using device, in which a simple style is used for writing, but the paper is stretched over a fine and sharply corrugated metallic plate which punctures the paper as the style passes over it.

ordinary handwriting. In the cylindrical machines the letters and signs are all upon a cylinder or “sleeve,” and the striking of a key produces a combined lateral and rotary motion for bringing the proper type to the common printing point. Thus, for every separate impression the entire cylinder has ordinarily to make two movements of variable length, and the instrument is noisy in operation, and does not possess the rapid direct action of the type-bar machines. On the other hand, it is a variable spacer, giving more space to such wide letters as m and w than to the narrow

letters i, t, and 1, a distinct advantage over the type bar machines, where each letter, wide or narrow, occupies precisely the same space. Of such cylinder machines the newest form is the Crandall type-writer, an apparatus supplied with spare type cylinders or "sleeves," which are easily separated and attached, so that many kinds of type can be brought into actual use. Of wheel machines the Columbia may be taken as one of the most recent examples. It is a simple and cheap apparatus in which the letters and signs are placed on the periphery of a wheel by the rotation of which any desired type is brought into position for printing. The machine is furnished with a dial index and pointer to indicate the type which is in position. The wheel machine has the advantages of variable spacing, and wheels with type of different character can readily be placed on it; on the other hand, it is not capable of being run with a rapidity nearly so great as can be secured with type-bar machines,

WRYNECK (Germ. Wendehals, Dutch Draathalzen, French 7orcol), a bird so called from its wonderful way of writhing its head and neck, especially when captured, as it may easily be, on its nest in a hollow tree. The Jyna 2 torquilla of ornithology, it is a regular summer-visitant to most parts of Europe, generally arriving a few days before the Cuckow, and it is in many countries known by some name associating it with that well-known bird—as in England "Cuckow's leader" and "Cuckow's mate"— but occasionally it is called "Snake-bird," not only from the undulatory motions just mentioned, but from the violent hissing with which it seeks to repel an intruder from its hole.?

The very unmistakable note of the Wryneck, without having any intrinsic merit, is always pleasant to hear as a harbinger of spring. Itis merely a repetition of what may be syllabled que, que, que, many times in succession, rapidly uttercd at first, but gradually slowing and in a continually falling key. This, how- ever, is only heard during a few weeks, and for the rest of the bird's stay in Europe it seems to be mute. It feeds almost ex- clusively on insects, especially on ants, and may often be seen on the ground, busily engaged at their nests. Somewhat larger than a Sparrow, its plumage is not easily described, being beautifully variegated with black, brown, buff, and grey—the last produced by minute specks of blackish-brown on a light ground—the darker markings disposed in

patches, vermiculated bars, freckles, streaks, or arrow-heads—and the whole blended most harmoniously, so as to recall the coloration of a GoATSUCKER (q.v.) or of a Woopcock (g.v.). The Wryneck builds no nest, but commonly lays its translucent white eggs on the bare wood of a hole in a tree, and it is one of the few wild birds that can be induced to go on laying by abstracting its eggs day after day, and thus upwards of forty have been taken from a single hole—but the proper complement is from six to ten. As regards Britain, the bird is most common in the south-east, its numbers decreasing rapidly towards the west and north, so that in Cornwall and Wales and beyond Cheshire and Yorkshire its occurrence is but rare, while it appears only by accident in Scotland and Ireland.

Some writers have been inclined to recognize five other

2 Frequently misspelt, as by Linnzeus in his later years, FPunz.

3 The peculiarity was known to Aristotle, and possibly led to the cruel use of the bird as a love-charm, to which several classical writers refer, as Pindar (Pyth. iv. 214; Nem. iv. 85), Theocritus (iv. 17, 30), and Xenophon (Memorabilia, 11. xi. 17, 18). In one part at least of China a name, Shay-ling, signifying "Snake's neck," is given to it (Zois, 1875, p. 125).

WURTEMBERG,} or WURTTEMBERG, a European king- See dom, forms a tolerably compact mass in the south-west sketch angle of the German empire, of which it is the third ae :

species of the genus ZJynxz ; but the so-called J. Japonica is specifically indistinguishable from J. torquilla ; while that designated, through a mistake in the locality assigned to it,

L. indica, has been found to be identical with the J. pector- alts of South Africa. Near to this is I. pulchricollis, dis- covered by Emin Pasha in the east of the Bar-el-Djebel (Lées, 1884, p. 28, pl. iii.) Another distinct African species is the L. exquatorialis, originally described from Abyssinia. The Wrynecks, as already stated (Woop- PECKER, supra, p. 652), form a Subfamily Zyngine of the Picide, from the more normal

groups of which they differ but little in internal structure, but much in coloration and in having the tail-quills flexible, or at least not stiffened to serve as props as in the climbing Picine. (a. WN.)

WUHU, or Woo-Hoo, a district city in the province of Gan-hwuy, China, is situated about a mile from the south bank of the Yang-tsze Keang river, with which it is con- nected by a straggling suburb. By the treaty of 1858 it was marked out as one of the treaty ports, but it was not opened to trade until 1877. At first its commercial pro- gress was very slow, the neighbourhood of the older ports of Kew-keang and Chin-keang militating against its suc- cess ; but of late years there has been a distinct improve- ment in the trade of the port, the gross value of which was £1,316,863 in 1885 and £2,011,327 in 1886. The principal exports are rice and silk piece goods, while next in importance come feathers, hides, nutgalls, and tea. For the production of feathers large quantities of ducks are reared in the surrounding districts. Of imports, opium is by far the most considerable item, amounting in 1886 to 779,728 1b, of the value of £652,223. In the same year £126,093 worth of cotton goods were imported, and £124,014 worth of sugar. Of the minor articles, matches, needles, sandalwood, and window glass form the largest items. During the same period 1088 vessels entered the port (691 British, 362 Chinese). The city, which is one of the largest of its rank in China, was laid desolate during the T'ai-p'ing rebellion, but it is gradually becoming repeopled.

WUN, a British district in the chief commissionership of Berar, lying between 19° 46' and 20° 42' N. lat. and between 77° 26' and 79° 10' E. long., and containing an area of 3907 square miles. It is bounded on the N. and W. by Ainraoti and Basim districts, on the S. by the Nizam's Dominions, and on the E. by Wardh& and Chanda districts of the Central Provinces. Win is a wild hilly country intersected by offshoots from the Ajanta chain of mountains. For the most part the hills in the district are bare, or clothed only with dwarf teak or small jungle; but on the heights near Win town the bamboo grows abundantly, and elsewhere small bamboos are found in the ravines. The Wardhd4 and Paingangd, which bound the district on the east and south, unite at its south-east corner. The Paingangé carries off nearly all the drainage of the district. Wun is

rich in coal and iron ores. Of wild animals the tiger, leopard, and hyzena abound; bears,

wolves, and jackals are also numerous; while small game |

is plentiful in all parts. There is a great want of means of communication ; during the rains cart traffic is entirely suspended, the only means of transit at this time of the year being that afforded by water from the Wardha for a short distance. The climate is enervating and unhealthy, and the average annual rainfall is about 41 inches.

Wun district forms part of the territory assigned by the nizam to the British Government undcr the treaties of 1853 and 1860. It was undisturbed during the mutiny of 1857. In 1886-87 the gross revellue amounted to £86,174, of which the land contributed £57,391. The population in 1881 was 392,102 (inales 201,491, females 190,611); Hindus numbered 335,787, Mohammedans 17,031, Christians 127, and aboriginals 37,252. Wun, the chief town of the district (population 4207), has some fine temples.

factor in point of area and the fourth in point of popu- lation, In the south it is cleft by the long narrow territory of Hohenzollern, belonging to Prussia; and it encloses six small enclaves of Baden and Hohenzollern, while it owns seven small exclaves within the limits of these two states. It lies between 47° 34' 48" and 49° 35' 17" N. lat., and between 8° 15' and 10° 30' E. long. Its greatest length from north to south is 140 miles; its greatest breadth is 100 miles; its boundaries, almost entirely arbitrary, have a circuit of 1116 miles ; and its total area is 7531 square miles, or about one twenty- eighth of the entire empire. It is bounded on the E. by Bavaria, and on the other three sides by Baden, with the exception of a short distance on the S., where it touches Hohenzollern and the Lake of Constance. For adminis- trative purposes the country is divided into the four circles ("kreise") of the Neckar in the north-west, the Jagst in the north-east, the Black Forest in the south- west, and the Danube in the south-east.

Wiirtemberg forms part of the South-German tableland, and is hilly rather than mountainous. In fact the undu- lating fertile terraces of

Upper and Lower Swabia may be taken as the characteristic parts of this agricultural country. The usual estimates return one-fourth of the entire surface as "plain," less than one-third as " moun- tainous," and nearly one-half as "hilly." The average elevation. above the sea-level is 1640 feet ; the lowest point is at Béttingen (410 feet), where the Neckar quits the country ; the highest is the Katzenkopf (3775 feet), on the Hornisgrinde, on the western border.

The chief mountains are the Black Forest on the west, the Swabian Jura or Rauhe Alb, stretching across the middle of the country from south-west to north-east, and the Adelegg Mountains in the extreme south-east, adjoining the Algau Alpsin Bavaria. The Rauhe Alb or Alp slopes gradually down into the plateau on its south side, but on the north it is sometimes rugged and steep, and has its line broken by isolated projecting hills. The highest summits are in the south-west, viz., the Lemberg (3326 feet), Ober-Hohenberg (3312 feet), and Plettenberg (3293 feet). In a narrower sense the name Rauhe Alb is re- served for the eastern portion only of the Swabian J ura, lying between Hohenzollern and Bavaria; in the narrowest sense of all it is applied to a single group near Reutlingen. Most of the isolated summits above referred to (none of which are over 2630 feet) project from this eastern section ; among them are the hills of Hohenstaufen, Teck, Mossingen, and Hohenzollern.

The Black Forest (Germ. Schwarzwald), a mountain group or system deriving its name from the dark foliage of its pine forests, hes partly in Wiirtemberg and partly in Baden. Its general shape is that of a triangle, its base resting on the Rhine between the Lake of Constance and Basel, and its apex pointing north. It stretches along the east bank of the Rhine from Basel to Durlach, at a distance varying from 4 to 15 miles from the river, and parallel to the Vosges range on the west bank. The south, west, and north faces of the group are rugged and steep, but on the east it loses its mountainous character, and melts so gradually into the bounding plateau that it is difficult to assign it definite limits on that side. The total length of the Black Forest range is 98 miles, its breadth varies from 46 to 13 miles, and its area is 1913 square

1 The origin of the name is disputed, though the once popular derivation from “ Wirth am Berg” is universally rejected. Some authorities derive it from an old proper name Wirnto or Wirtino, others from a Celtic place-name Virodunum or Verdunum. Wirten- bere, Wirtenberg, Wirtemberc are early forms. Wirtemberg was long current, and in the latter half of the 16th century Wiirtemberg and Wiirttemberg appear. The last was adopted in 1806 as the official spelling, though Wiirtemberg, the ordinary English spelling, is also common, and occurs sometimes in official documents and even on coins issued after that date.

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224.

Moun- tains.

Black Forest.

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miles. The average elevation decreases from south to north from 3280 feet to 2296 feet. The hills do not rise in peaks but in rounded summits and plateau-like masses and combs, separated from each other by the deep ravines of the streams.

The south part of the Black Forest was called Mons Abnoba by the Romans, and the whole was known to them from the 3rd century as Silva Marciana. The uame Silva Nigra appears in medieval Latin. This retired district, always somewhat over- shadowed by the majestic beauties of the neighbouring Swiss Alps, was long unvisited and almost unheard of. Within comparatively recent years, however, it has become a favourite resort for summer visitors and tourists. Though not boasting any very striking mountain scenery, the Black Forest includes romantic and wild vales as well as smiling and picturesque valleys; and the beauty of its streams and waterfalls, its fragrant and shady forests, the quaintness of its sequestered villages, and the primitive sim- plicity of its inhabitants, who still retain their peculiar costume, are all objects of interest.

About two-thirds of the Black Forest belongs to Baden and the remaining third to Wiirtemberg; but it is convenient to disregard the political boundaries, and to consider it as formed of the Southern or Upper and the Northern or Lower Black Forest, separated from each other by the deep and romantic gorge of the Kinzig. The principal rocks are stratified gneiss and eruptive granite, though some of the summits are porphyritic. In the north and east those rocks are covered with a tolerably thick layer of variegated and red sandstone, which also appears, though not so abundantly, in the south and west. The kernel of the Southern Black Forest is the Feldberg (4803 feet), the highest point in the range, round which the othcr summits and masses are grouped. Among the chief summits are the Belchen (4640 feet), the Erz- kasten (4218 feet), the Hochkopf (4150 feet), and the Kandelberg (4077 feet). The average height of the erest in this division of the forest is about 3300 feet. 'The chief streams are the Wutach, Alb, Wehra, Wiese, Neumagen, and Dreisam, all tributaries of the Rhine, and the Brege and Bregach, regarded as the head-waters of the Danube. On the eastern slopes lie the Feldsee, Titisee, Schuchsce, and numerous other small lakes, most of them in bleak and solitary situations among the extensive moors. The waterfall on the Gutach, at Triberg, is 170 feet high. The central height of the Northern Black Forest is the Hornisgrinde (3825 feet), on the border between Wiirtemberg and Baden. Other heights arc the Hohe Ochenskopf (3460 feet), the Hohloh (3225 feet), and the Kniebishohen (3180 feet), with the Kniebis Pass. The average height of the crest is 2470 feet. The principal streams are the Kinzig and Murg, which join the Rhine, and the Glatt, Enz, and Nagold, which fall into the Neekar. The eastern slopes of this division also are sprinkled with lakes, the chief of which are the gloony Mummelsee and the Wildesee.

As the name implies, the Schwarzwald is largely covered with forests, chiefly of pines and firs. Oaks, beeches, &c., also flourish, especially in the valleys and towards the west. The timber trade and its eognate industries are thus the chicf resources of the in- habitants. The felled timber is floated in the form of rafts down the numerous streams to the Neckar or Rhine, where larger rafts are formed, sometimes requiring a crew of several hundred men, for the voyage to Holland, the principal market. The increase of railways has, however, considerably diminished

the quantity of wood thus exported by water; and numerous sawmills within the limits of the forest are engaged in cutting timber into planks for export by rail. Perhaps, however, the most characteristic industry of the Black Forest is the manufacture of wooden elocks (often spoken of as " Dutch clocks"). This industry has long flourished in the district, and has recently been organized and extended, while considerable factories have been established at Furtwangen, Triberg, and other chief centres. Clocks to the value of about £2,000,000 are said to be annually produced, and 1400 persons are engaged in their manufacture. Musical-boxes are also extensively made here. Straw-plaiting occupies a large number of girls and wonien, especially in winter ; and glass-blowing, charcoal-burning, and potash-boiling are also carried on. Agriculture is of no great importance, as the soil is poor, and the crops scanty. Cattle are kept in considerable numbers ; they are driven up to the mountains in summer, and return to the valleys in autumn. The mining in- dustry is quite insignificant ; coal is worked to a small extent in and near Rotliegenden. In spite of their industrial resources, aided by the wealth introduced by tourists and visitors to the numerous mineral springs, the population of the Black Forest is too numerous to find support at home, and large numbers go abroad as pedlars, merchants, servants, &c.

The climate of the Schwarzwald is severe, but healthy. The forests cease at 4250 feet, and are succeeded by scanty grass and herbs. On iwmany of the snmmits snow lies for ten months in the year, yet in some of the valleys vines, almonds, and chestnuts ripen. Wild boars, deer, hares, foxes, and various kinds of game are found. The carriage-roads follow the vallcys, but innumerable footpaths lead in all directions through the magnificent woods. The Black

MBERG

Forest railway, opened in 1873, ascends the picturesque valleys of the Kinzig and Gutach by means of bridges, viaducts, and tunnels, ofteu of the boldest construction.

To the south of the Rauhe Alb the plateau of Upper Swabia stretches to the Lake of Constance and eastwards across the Iller into Bavaria. Between the Alb and the Black Forest in the north-west are the fertile

terraces of Lower Swabia, continued on the north-east by those of Franconia.

About 70 per cent. of Wiirtemberg belongs to the Rivers.

basin of the Rhine, and about 30 per cent. to that of the Danube. The principal river is the Neckar, which flows northward for 186 miles through the country to join the Rhine, and with its tributaries drains 57 per cent. of the kingdom. On the west it receives the Enz, swelled by the Nagold, and on the east the Fils, Rems, Murr, Kocher, and Jagst. The Danube flows from east to west across the south half of Wiirtemberg, a distance of 65 miles, a small section of which is in Hohenzollern. Just above Ulm it is joined by the Iller, which forms the boundary between Bavaria and Wiirtemberg for about 35 miles. The Tauber in the north-east joins the Main; the Argen and Schussen in the south enter the Lake of Constance. The lakes of Wiirtemberg, with the exception of those in the Black Forest, all lie south of the Danube. The largest is the Federsee (640 acres) near Buchau. About one-fifth of the Lake of Constance is reckoned to belong to Wiirtem- berg. Mineral springs are abundant; the most famous spa is Wildbad, in the Black Forest.

The climate is temperate,—colder among the mountains Climate in the south than in the north. The mean temperature and varies. at different points from 43° to 50° F. The soil.

abundant forests induce much rain, most of which falls in summer. The soil is on the whole fertile and well- cultivated ; and for many centuries agriculture was almost the only resource of the inhabitants. Middle and Lower Swabia are the most fertile districts. The removal of burdens and restrictions in 1848 and 1849, and intelligent state-aid, combined with the formation of agricultural societies, have encouraged farming, but the practice of parcelling the land in minute patches among the members of the communities still retards progress. According to returns made in 1878, 45°2 per cent. of the land was under agriculture, 30°7 under forest, 19°4 in pasture, 1-2 in vineyards, and the remainder unproductive. Grain is produced in excess of the home demand.

The following table shows the average annual extent (in acres) Agricul-

of the chief crops in 1878-1880, and the value :—

Spelt….| 492,000 | £3,001, 410 || Barley..| 225,000 | £1,288,200 Oats…..| 334,400 | 1,475,470 || Potatoes| 194,900] 718,600 Rye…..| 96,800 493,475 || Beetroot) 49,242 340,200

Pease, maize, rape, hemp, flax, hops, and chicory are also pro- duced in considerable quantity ; tobaceo is grown in the valley of the Neckar. Wiirtemberg is very rich in fruit trecs of various kinds, and market-gardening flourishes near the larger towns and in the Remsthal. In 1880 there were 35,000 acres under veget- ables. The cultivation of the vine is a highly important industry in the valleys of the Neckar and some of the other streams. In the period 1827-1882 the average annual area under vines was 63,327 acres, yielding 5,701,454 gallons of wine, worth £411,700. The best year was 1835, when 22,303,006 gallons were produced, the worst was 1854, with 1,696,376 gallons. Among the best Wiirtemberg wines are those known as Rothenberger, Tiirkheimer, Lammler, Brodwasser, Kisberger, Elpinger, Schalksteiner, Weins- berger, Markelsheimer, Verrenberger, and Lindelberger. About one-third of the entire country is under forest, the greater propor- tion of which consist of deciduous trees (oaks, beeches, &c.). Coni- ferous trees are most numerous in the Black Forest, in Upper Swabia, and in the circle of Jagst. Most of the forests belong to the state or to public companics, and are carefully and skilfully managed. Large tracts in the Black Forest are in the hands of the " Schiffergesellschaft," a very ancient guild of timber merchants.

In 1883 Wiirtemberg contained 96,885 horses, 904,139 cattle, Live The breeding of stock.

550,104 sheep, 292,206 swine, and 54,876 goats.

Minerals.

Manu- factures.

Trade.

Commu- nication.

Popula- tion.

Wwwuk T's

horses commands a good deal of attention from Government, which maintains several stud-farms. Cattle, bred for export, are reared mainly in the Jagst and Danube divisions, sheep on and near the Alb.

Salt and iron are the only minerals of industrial importance found in Wirtemberg, and both are worked alinost entirely by Government. There are five Government salt-works (the chief of which are Friedrichshall and Wilhelmsgliick), employing together 425 hands. In 1879-80 970,084 tons of salt were produced, two- thirds by mining. The salt industry only began to be of import- ance at the beginning of the present century. The iron industry on the other hand is of great antiquity, though it is much hampered by the entire absence of coal mines in Wiirtemberg. The chief fuel used in smelting the iron is wood or charcoal. Iron is mined at Neuenbiirg, Freudenstetten, and, to a very limited extent, in the Black Forest. In 1877-80 15,546 tons of ore were raised by 110 miners, yielding about 33 per cent. of raw metal. Cement, gypsum, grindstones, millstones, building-stones, &c., are also found. The annual value of the minerals of all kinds raised in Wiirtemberg has been roughly estimated at about £350,000.

Until the close of the Napoleonic wars, Wiirtemberg was almost exclusively an agricultural and bucolic country ; but since that period it has turned its attention to trade and manufactures, and perhaps now stands second only to Saxony among the German states in commercial and industrial activity. The want of coal is naturally a serious drawback, but it is to a certain extent com- pensated by the abundant water-power. The textile industry is carried on in most of its branches. Wool, from both domestic and foreign sources, is woven at Esslingen, Goppingen, and other towns in Lower Swabia; cotton is manufactured in Goppingen and Esslingen, and linen in Upper Swabia. lLace-making also flourishes in the last-named district, as a rural house-industry. The silk industry of Wiirtemberg, which employs about 1100 hands, though not very extensive

in itself, is the most important silk industry in Germany. Ravensburg claims to have possessed the earliest paper-mill in Germany ; paper-making is still important in that town and at Heidenheim, Heilbronn, Goppingen, and other places in Lower Swabia. Government owns six iron foundries and puddling works, the most important of which is at Wasseralfingen, where over 1000 hands are employed. The locomotive engines of Esslingen enjoy a wide reputation; and agricultural and other machinery, boilers, and tools of various kinds are also manufactured and exported by various towns. The organs of Ludwigsburg are well known ; bell-founding is carried on at Stuttgart, Reutlingen, and Cannstatt; beetroot sugar and beer are considerable items in the list of annual produce ;—wine has been already mentioned. The manufacture of chemicals at Stuttgart, Heilbronn, &c., is important.

Trade has prospered since Wiirtemberg joined the North German Customs Union in 1834. The leading trading towns are Heilbronn, Stuttgart, Ulm, and Friedrichshafen. Cattle, horses, sheep, agricultural produce, timber, salt, and various manufactured goods are the chief exports; coal, hops, stcel goods of various kinds, eggs, and poultry are among the chief imports. The book- trade of Stuttgart is very extensive ; that town has been called the Leipsic of southern Germany.

In 1887 991 miles of railway were open for traffic in Wiirtemberg. With the insignificant exception of two private lines, togcther no more than 31 miles long, all the railways are in the hands of the state. The Neckar, the Schussen, and the Lake of Constance are all navigable for boats ; the Danube begins to be navigable at Ulm. The roads of Wiirtemberg are fairly good; the oldest are Roman. Wiirtemberg, like Bavaria, retained the control of its own postal and telegraph system on the foundation of the new German empire. In 1885 there were 1750 miles of telegraph wires in the kingdom.

In 1885 the population of Wiirtemberg was 1,995,168, or one twenty-third of the total population of Germany on one twenty- eighth of its area. The average per square mile is 264°9. The following table shows the distribution of the population among the administrative districts, and their religion. The Neckar divi- sion contains most large towns.

Area in | Inhabitants Roman

Division. Population.| Square | per Square ie is Catholics Miles, Mile. : in 1880,

Neckar…....| 639,470 1285 497 °6 562,700 53,026 Black Forest] 475,299 1843 257°8 351,144 | 119,750 Jagst Mr orsineite ar 405,034 1984 204°1 280,374 122,987 Danube …... 475,365 2419 196°5 170,362 | 294,527

The people of the north-west belong to the Alcmannic stock, those of the north-east to the Franconian, and those of the centre and south to the Swabian. According to the occupation census of 1882, the following were the numbers of those (including their families and dependants) engaged in the various departments of work :—in agriculture, forestry, &c., 942,924; in mining and industrial pursuits, 674,081 ; in trade and commerce, 143,258 ; in

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domestic and other servicc, 11,254; in professions, 95,712 ; 'no returns," 90,240. In 1886 there were 3717 emigrants; in 1881 there were 11,470.

In 1885 there were 15 towns with more than 10,000 inhabitants, viz., Stuttgart (125,906), Ulm (33,610), Heilbronn (27,758), Ess- lingen (20,864), Cannstatt or Canstatt (18,031), Reutlingen (17,319), Ludwigsburg (16,201), Gmiind (15,321), Tiibingen (12,551), Gop- pingen (12,102), and Ravensburg (11,482).

About two-thirds of the population are Protestant. In 1880, when the total population was 1,971,118, there were 1,364,580 Protestants, 590,290 Roman Catholics, 13,331 Jews, 2817 of other Christian sects, and 98 "others."" The Protestant church is con- trolled (under the minister of religion and education) by a consis- tory and a synod,—the latter being made up of the consistory and six general superintendents or " prelates'"' from six principal towns. But no laws are made or altered without the consent of a repre- sentative council, including both lay and clerical members. The Roman Catholie church is subject to the bishop of Rottenburg, in the archdiocese of Freiburg. Politically it is under a

Roman Catholic council, appointed by Government. The Jews also since 1828 have been subject to a state-appointed council.

Wiirtemberg is one of the best educated countries of Europe. Educa- School attendance is compulsory on children from seven to fourteen tion.

years of age, and young people from fourteen to eightecn must either attend the schools on Sunday or some other educational establishinent. Every community of at least 30 families must have aschool. The different churches attend to the schools of their own confession. There is a university at Tiibingen, and a polytechnic school at Stuttgart. Technical schools of various kinds are estab- lished in many of the towns, in addition to a thorough equipment of gymnasia, commercial schools, seminaries, &c. The conservatory of music at Stuttgart enjoys a high reputation.

Wiirtemberg is a constitutional monarchy and a member of the Consti- German empire, with 4 votes in the federal council and 17 in the tution.

imperial diet. The constitution rests on a law of 1819, amended in 1868 and 1874. The crown is hereditary, and conveys the simple title of king of Wiirtemberg. The king receives a civil list of £90,670, and the "apanages" of the crown amount to £14,900 more. The legislature is bi-cameral. The upper chamber (Standesherren) is composed of adult princes of the blood, heads of noble families from the rank of count (Graf) upwards, representa- tives of territories (Standesherrschaften) which possessed votes in the old German diet, and of life members nominated by the king. The number of this last class must not exceed one-third of the house. The lower house (Abgeordneten-Haus) has 98 members, viz., 13 noble landowners, elected by their peers (Ritterschaft), the 6 Protestant " prelates," the Roman Catholic bishop, and 2 other official Roman Catholic members, the chancellor of the university of Tubingen, 7 representatives from the chief towns, and 68 repre- sentatives from country districts. The king appoints the president of the upper chamber ; since 1874 the lower chamber has elected its own chairman. Membcrs are elected for six years by ballot ; the suffrage is enjoyed by all male citizens. With the exception of the royal princes and the life-members of the upper

house that reside in Stuttgart, the members of both houses receive a daily payment of 9m. 41pf. (9s. 5d.) each. eee

The highest executive is in the hands of a ministry of state (Staatsministerium), consisting of six ministers and the privy coun- cil, the members of which are nominated by the king. There are ministers of justice, war, finance, home affairs, religion and edu- cation, and foreign affairs, railways, and the royal household. The legal system is framed in imitation of that of the German empire. The judges of the supreme court for impeachments of ministers, &c., named the Staatsgerichtshof, are partly elected by the chambers and partly appointed by the king. The country is divided into four administrative "circles," subdivided into 64 " Oberamter," each of which is under an "Oberamtmann," assisted by an " Amtsver- sammlung" or local council. At the head of each of the four large divisions is a " Regierung."

The official finance period of Wiirtemberg embraces two years. Finance.

For 1885-87 the budget showed an annual income of £2,811,921, balanced by the expenditure, which included a payment of £2500 to a reserve fund. The chief sources of income were taxes (£1,392,893, including £691,773 of direct taxes), and public domains and monopolies (£1,095,336, including £662,385 from railways and £72,741 from post and telegraphs). The chief expenditure was on the interest (£875,525) and sinking fund (£122,873) of the public debt. This debt amounted in 1887 to £21, 202,570, of which by far the greater proportion (£18, 966,700) was incurred for constructing and buying railways. Most of it bears interest at 4 per cent.

In terms of the convention of 1870 the troops of Wiirtemberg Army.

form the 13th army corps in the imperial German army. They include 8 regiments of infantry, 4 of cavalry, and 2 of field artillery, &c. By the army law of March 11, 1887, the peace strength of the army was fixed at 773 officers, 18,815 men, and 64 cannon, The town of Ulm is one of the strongest fortresses in Germany.

History.

The earliest known inhabitants of the country now called Wiir- temberg seem to have been Suevi. The Romans, who appeared first about 15 B.c., added the south part of the land to the province of Gaul in 84 A.D., and defended their positions there by a wall or rainpart, drove the Romans beyond the Rhine and the Danube ; but they in their turn were conquered by the Franks under Clovis (496), and the land was divided between Rhenish Franconia and the duchy of Alemannia. The latter, however, disappears about 760, and its territories were administered for the Frankish monarchs by " grafs" or counts, until they were finally absorbed in the duchy of Swabia. The last duke of Swabia dicd in 1268, and a large share of his power and possessions fell into the hands of the "grafs" of Wiir- temberg, whose ancestral castle crowned a hill between Esslingen and Cannstatt. Tradition mentions a Conradus de Wirtembere in 1090, but the earliest authentic count seems to have been Ulrich (1241-1265), who had large possessions in the valleys of the Neckar and the Rems. The power of this family grew steadily under suc- cessive counts ; and in 1482 their possessions were declared indi- visible. This early adoption of the principle of primogeniture saved Wiirtemberg from the wasting effects of those family feuds and jealousies which interfered so seriously with the development of some of the other German states. Eberhard V., surnamed "im Bart " (1482-1496), was one of the most energetie and illustrious rulers that Wiirtemberg ever had, and in 1495 his possessions were raised by the emperor to the dignity of an immediate imperial duchy. The reign of Ulrich I. (1498-1550), who succeeded to the duchy while still a child, was a most eventful period for the country, and many stories and traditions cluster round the name of this gifted and vigorous but unscrupulous aud ambitious man. The extortions by which he sought to raise money for his extrava- gant pleasures excitcd a rising known as the "arme Konrad " (poor Conrad)—not unlike ithe rising of Wat Tyler in England ; and by the treaty of Tubingen in 1514 his people undertook to pay his debts in exchange for various political privileges, which in effect laid the foundation of the constitutional liberties of the country. A few years later, however, Ulrich quarrelled with the Swabian league of imperial towns, and their army headed by the duke of Bavaria, who was incensed by Ulrich's ill-treatment of his wife, a Bavarian

princess, invaded Wiirtemberg, expelled the duke, and in 1520 sold the duchy to Austria for 220,000 florins, Ulrich, however, found his opportunity in the discontent caused in Wir- temberg by the military and religious oppression of Austria, and in the disturbed state of the empire during the Peasants' War, and the commotions excited by the Reformation. Aided by Philip of Hesse and other Protestant princes, he fought a victorious battle at Lauffen in 1534 ; and by the treaty of Kadan he was recognized once more as duke, though forced to acknowledge his duchy a fief of Austria. One of his first acts was to introduce the Reformation, and to endow Protestant churches and schools throughout his land. His connexion with the Schmalkaldian League once more cost hima temporary expulsion from his throne, but Charles V. reinstated him in 1547, though under severe conditions. Ulrich's son Christopher (1550-1568) introduced systems of law and church government (Grosse Kirchenordnung) which have endured in part to the present day. The establishment in this reign of a kind of stand- Ing committee to superintend the finances was the beginning of popular representation in the government, though its members belonged exclusively, of course, to the higher ranks. Frederick I. (1593-1608), an energetic and ambitious prince, induced the em- peror Rudolph II. in 1599 to raise the duchy once more to the dignity of an immediate fief of the empire. In the reign of his successor, Johu Frederick (1608-1628), Wiirtemberg — suffered severely from the Thirty Years' War, though the duke took no active share in that struggle. His son and successor, however, Eberhard IIT. (1628-1674), eagerly joined in it, but with disastrous effects. Wiirtemberg was occupied by imperial troops, the duke was driven into exile, and when the peace of Westphalia once more reinstated him he found but 50,000 subjects where he had left 400,000. In the reign of Eberhard IV. (1677-1733), who was but one year old when his father William died, Wiirtemberg made acquaintance with another destructive enemy. In 1688, 1692, 1703, and 1707 the French entered the country with fire and sword, annihilating whole villages in their ruthless brutality, and leaving deserts in their track. The depopulated country eagerly afforded a welcome and a home to the Waldensians, who had been driven from their valleys by the duke of Savoy in 1699. Charles Alexander, who became duke in 1738, had embraced the Roman Catholic faith when an officer in the Austrian service, while his favourite minister was the unscrupulous Jew Siiss

Oppenheimer, The duke, instigated by his minister, was believed to aim at the suppression of the diet, and at the introduction of the Romish faith, but Charles's sudden death in 1737 put an abrupt end to these plans. Siiss Oppenheimer was hanged by the regent, before the next duke, Charles Eugene (1737-1798) came of age in 1744, The prince was gifted but vicious, and he soon fell into the hands of unworthy favourites. His whole reign was disturbed by dis-

About the beginning of the 3d century the Alemanni.

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sensions betwixt the ruler and the ruled, in which the intervention of foreign powers (Prussia and England) was invoked, though in vain, by the unhappy people. Alarmed by the gathering discontent, Charles made a few concessions in his old age. Frederick Eugene (1795-1797), a brother of Charles Eugene, had been brought wp at the court of Frederick the Great, whose niece he married. His children were, through this influence, educated as Protestants, and the royal faniily of Wiirtemberg have been Protestants since his death.

Frederick II. (1797-1816) resembled the first of his name in becoming embroiled with the diet. He declared war against France in defiance of the wishes of his people, and when the French in- vaded the country he retired to Erlangen, till after the peace of Lunéville (1801). By a private treaty at the same date, he cx- changed Montbéliard (which had belonged to Wiirtemberg since 1418) and his Alsatian possessions for nine imperial towns and other territories, amounting in all to 850 square miles, with 124,000 inhabitants. He accepted also the title of elector from Napoleon. The newly acquired districts were not incorporated with his former possessions, but reniained separate under the name " New Wiirtem-berg." The new district had no diet. This was the first of a series of transactions with the national enemy, which swelled Frederick's territory, though they added but little to his credit, In 1805 Wiirtemberg took up arms on the side of France, and the elector was rewarded at the peace of Pressburg by various Austrian possessions in Swabia, and the title of king. On January 1, 1806, Frederick assumed the royal style, abrogated the constitution, and united old and new Wiirtemberg. He subsequently

united church and state, and proclaimed religious equality. In 1806 King Frederick I. joined the Confederation of the Rhine, and received fresh territories, with 160,000 inhabitants ; and the peace of Vienna brought 110,000 new subjects under his sceptre. But he had to perform his part of the bargain by joining Napoleon in his cam- paigns against Prussia, Austria, and Russia. Of 16,000 Wiirtem- bergers who marched to Moscow, only a few hundred returned, When fortune turned, Frederick with ready adroitness changed sides, and managed to preserve his royal title and most of his new- won lands by joining the allies immediately after the battle of Leipsic.

Wiirtemberg had been promised a constitution by Frederick before he died in 1816, but a good deal of discussion took place before it was granted in 1819 by William I. (1816-1864). A period of quiet now sct in, and the educational condition of the kingdom, its agriculture, and its trade and manufactures began to receive earnest attention. The desire for political freedom had by no means been satisfied by the constitution of 1819, and a "liberal opposition "' began to make itself felt about 1830. The agitation of 1848 did not leave Wiirtemberg undisturbed, though no scenes of actual violence took place in the kingdom. The conservative ministry granted freedom of the press and -other privileges, too late, however, to avert their fall. The king was compelled to call the liberals to power in March 1848, and a new liberal constitution was granted. But as soon as the stress was over the " March ministry " was dismissed, and the reactionary party were again in the ascendant. By a high-handed interference with recently granted popular rights on the part of the king and his ministers a servile diet was assembled in 1851, which yielded up without hesitation all that had been gained since 1848. The constitution of 1819 was reinstituted, and it has remained, with only a few modifications, ever since. In 1864 Charles ascended the throne. In the duel between Prussia and Austria for supremacy in Germany, the sympathies of the rulers of Wurtemberg were always on the side of the latter, although the country entered the Customs Union under Prussia's protection in 1864. In 1866 Wiirtemberg took up arms on behalf of Austria ; but the Wiirtemberg troops were defeated at Tauberbischofsheim, three wecks after Sadowa, and its ministers sued for peace. Prussia exacted an indemnity of 8 million florins, and Wiirtemberg

struck a secret offensive and defensive treaty with its conqueror. In 1870 this kingdom shared in the national enthusiasm which swept over Germany when France declared war ; and its troops had a creditable share in the memorable campaign of 1870-71. Since the foundation of the present German empire, the separate history of Wiirtemberg has been of almost exclusively local interest. The tendency of legislation has been, ou the whole, liberal.

A very full and minute description of Wiirtemberg, together with eopious lists of authorities on all subjeets conneeted with it, will be found in Das Kénig- reich Wurttemberg, Stuttgart, 1882 sq, offieially published by the Konigliches Statistiseh-Topographisehes Bureau. (F. MU.)

WURTZ, Cuartes ApotpHe (1817-1884), chemist, was born at Strasburg on November 26, 1817. His father, Jean Jacques Wurtz, was then Lutheran pastor at the small village of Wolfisheim near Strasburg. His mother, Sophie Kreiss, was the sister of Theodore Kreiss, professor of Greek at the Protestant gymnasium of Strasburg, and of Adolphe Kreiss, a Lutheran pastor. When Wurtz was

nine years old his father was translated to the church of St Pierre le Jeune in Strasburg, and died there in 1845. Madame Wurtz, after the death of her husband, remained at Strasburg with her brother Theodore, and after his death lived with her son Adolphe in Paris till her own death in 1878.

Wurtz was educated first at Wolfisheim and afterwards at the Protestant gymnasium of Strasburg. There he obtained several prizes, but seems rather to have disap- pointed his father, who said he would never turn out any- thing extraordinary. He took special interest in those studies which bore upon nature ; in 1828 he took part ina botanical class with excursions, which developed his taste for natural science.

His education owed more perhaps to his home circle than to the school. His learned and pious father, his more generally cultured uncles, and the circle of friends attracted by them opened to him a wide view of what

there is for a man to know. His holidays were mostly spent at the house of a grand-aunt at Rothau, where he learned to know the hills and woods of Alsace, and amused himself in the spinning, weaving, bleaching, and _print- ing works in the neighbourhood. In 1834 he left the gymnasium with the degree of bachelier-és-lettres. His father seems to have wished him to devote himself to the church. But he had already made his choice. For some time he had fitted up a sort of laboratory in the washing- house, and had there repeated the experiments he had seen performed in the class-rooms of the gymnasium. His father took no interest in science, but consented to his study of medicine as next best to theology. He went through his studies conscientiously, and passed all his examinations with credit, but of course devoted himself specially to the chemical side of his profession. In 1839 he was appointed superintendent of practical chemistry in the faculty of medicine under Professor Cailliot. He graduated as M.D. 13th August 1843, the title of his thesis being "On Albumin and Fibrin." He then went for a year to Giessen, to study under Liebig. There he made the acquaintance of Hofmann, Strecker, and Kopp. On leaving Giessen he went to Paris, where he worked in Dumas's private laboratory, and in 1845 was appointed assistant to Dumas in the Ecole de Médecine. In 1847, on his presentation of a thesis "On Pyrogenic Bodies," he was appointed 'professor agerégé," and in 1849 he gave the lectures on organic chemistry in place of Dumas. His laboratory in the Ecole Pratique dela Faculté de Médecine was very inconvenient and ill fitted up; he therefore, in 1850, along with Dollfus and Verdeil, who had just re- turned to Paris from Giessen, opened a private laboratory in the Rue Garanciére. The adventure was successful in a scientific sense as long as it lasted ; but unfortunately the three chemists had neglected to secure fixity of tenure, the house was sold, and they had to retire and sell their furnishings. The same year Wurtz was appointed pro- fessor of chemistry in the Institut Agronomique, then founded at Versailles. But here also the want of fixity was felt. Louis Napoleon abolished the Institut in 1859. In 1853 Dumas resigned the chair of organic chemistry in the faculty of medicine ; at the same time the chair of mineral chemistry and toxicology became vacant by the death of Orfila; the two chairs were united, and Wurtz was appointed to the post thus constituted. In 1866 he was made dean of the faculty of medicine, and used his influence for the rearrangement and reconstruction of the

buildings devoted to scientific teaching. In 1874 he persuaded the Government to found a chair of organic chemistry at the Sorbonne, and resigned his office of dean, retaining the title of honorary dean. At the Sorbonne he had a smaller but better prepared audience than at the

Ecole de Médecine. But he had great difficulty in per- suading the Government to build him a suitable laboratory, and indeed did not live to see the new laboratory opened. He was appointed senator in 1881. He was one of the founders of the Chemical Society of Paris, of which he was the first secretary, and was three times president. He was elected member of the Academy of Sciences in 1867, in succession to Pelouze. He was vice-president in 1880 and president in the following year. He died, after a short illness, May 12, 1884. Wurtz was an honorary member of nearly every scientific society in Europe. In 1878 he gave the Faraday lecture of the Chemical Society of London, and in 1881 was awarded the Copley medal by the Royal Society of London. Through life he remained warmly attached to the church of his fathers, and took a practical interest in its affairs.

Wurtz's work is chiefly to be found in the Annales de Chimie et de Physique, in the Comptes Rendus, and in the Bulletin de la Société Chimique. The following is a short outline of his most important discoveries. First, with respect to the constitution of hypophosphorous and phosphorous acids, he showed that the salts of these acids all contain the elements of water, and proposed formule for them, in which the salt radical is represented as containing hydrogen. These formule, translated, of course, into the modern language, which Wurtz did so much to introduce, are still used as the best representations of the constitution of these salts, In the course of this investigation he discovered the curious and interest- ing compound cuprous hydride. He also discovered sulphophos- phoric acid and the oxychloride of phosphorus. His next great work was on cyanuric acid. He discovered the eyanic ethers (R-N=C=0), and from them obtained the mono-alkyl ureas. From the cyanic ethers he produced a class of substances which opened the way into a new field of organic chemistry. On treat- ing these ethers with caustic potash

he obtained potassium carbon- ate and an ammoniacal vapour. These vapours he soon recognized as ammonia, in which an equivalent of hydrogen had been replaced by methylium, CHg, or ethylium, C.H;. By acting on the cyanic ethers with his new bases he obtained the dialkyl ureas. In 1855 he reviewed the various substances that had been obtained from glycerin, and came to the conclusion that glycerin is a body of alcoholic nature formed on the type of three molecules of water, as common alcohol is on that of one. This speculation led him in 1856 to the discovery of the glycols, alcoholic bodies similarly related to the type of two molecules of water. This discovery he worked out very thoroughly, in investigations on oxide of cthylene and the polyethylenic alcohols. The oxidation of the glycols led him to homologues of lactic acid, and to a discussion of the constitution of the latter. On this question a controversy arose with Kolbe, in the course of which many important facts were discovered, and valuable additions were made to chemical theory. In 1867 Wurtz obtained neurine synthetically, by the action of trimethylamine on glycol-chlorhydrine. In 1873 he discovered aldol, CH;-CH(OH)-CH,-CHO, and pointed out its double character as at once an alcohol and an aldehyde.

His investigations on the olcfines had led him to the discovery of the peculiar behaviour of the substance called by him chlor- hydrate of amylene and of its analogues, when the temperature of their vapour is raised. The gradual passage from a gas of approxi- mately normal vapour density to one of half the normal density was used by him as a powerful argument in favour of the opinion that abnormal vapour densitics, such as those of sal-ammoniac and pentachloride of phosphorus, are to be explained by dissociation. By experiments at low temperatures and pressures he obtained nearly the normal density in the case of the pentachloride of phosphorus, and showed how the dissociation depends on thie temperature and pressure. He took an active part in the discus- sion as to the dissociation of the vapour of hydrate of chloral, in which H. Sainte-Claire Deville and M. Berthelot were his chief opponents. By well-chosen experiments he brought to light the facts involved, and stated the case for dissociation in a very clear and to most minds very convincing way.

Wurtz for twenty years, from 1852 to 1872, published in the Annales de Chimie'et de Physique abstracts of chemical work done out of France. In 1868 he began, with the assistance of many French chemists, the publication of the Dietionnaire de Chimie Pure et Appliquée. This great work, many important articles in which were written by himself, was finished in 1878. (Two volumes of appendix have since been added.) In 1864 he published a book in two volumes entitled Chimie Médieale, and in 1867 Lecons Elémen- tatres de Chimie Moderne, an excellent little text-book which has gone through five editions in French, and has been translated into English by Prof. Greene. In 1879 appeared his Théorie Atomique, and in 1885 Traité de Chimie Biologique. This was his last work .

he corrected the last proof-shcets himself, and the last part of the book was published a few weeks after his death.

A full account of the life and work of Wurtz, with a list of his published books and papers, will be found in the obituary notice by M. Friedel in the Bulletin de la Société Chimique, vol. xliii., i.Ixxx., 1885. (A. C. B.)

WURZBURG, or Wirzzerc, the fourth largest town

in Bavaria, and the chief town of the district of Lower Franconia in the north-west of that kingdom, is situated on both sides of the Main, 60 miles south-east of Frank- fort. An ancient stone bridge (1474-1607), 650 feet long, and adorned with statues of saints, connects the two parts of the town. Wiirzburg is quaintly and irregularly built; many of the houses are interesting specimens of medizval antiquity; and the numerous old churches recall the fact that it was long the capital of an ecclesiastical principality. The principal church is the imposing Romanesque cathedral, a basilica with transepts, begun in 1042 and consecrated in 1189. The four towers, however, date from 1240, the (rococo) fagade from 1711-19, and the dome from 1731. The spacious transepts terminate inapses. The beautiful Marienkapelle, a Gothic edifice of 1377-1441, was restored in 1856; it is embellished with fourteen statues by Tilman Riemenschneider, who died at Wiirzburg in 1531. The Stifthaug church, with two towers and

a lofty dome, was built in the Italian Renaissance style in 1670-91. The bones of St Kilian, patron saint of Wiirzburg, are preserved in the Neumiinster church, which dates from the 11th century ; Walther von der Vogelweide is buried in the adjoining cloisters. The church of St Burkard is externally one of the best pre- served architectural monuments in the city. It was built in 1033-42, in the Romanesque style, and was restored in 1168. The Late Gothic choir dates from 1494-97. The Neubaukirche, or university church, curiously unites a Gothic exterior with a Classical interior. The Protestant church of St Stephen (1782-89) originally belonged to a Benedictine abbey. Of the secular buildings in Wiirzburg the most conspicuous is the royal (formerly episcopal) palace, a huge and magnificent edifice built in 1720-44 in imitation of Versailles. The Julius hospital, a large and richly endowed institution affording food and lodging to 600 persons daily, was founded in 1576 by Bishop Julius Kichter von Mespelbrunn. The quaint town-house dates in part from 1456. Among the other chief buildings are the Government offices, the theatre, the Maxschule, the observatory, and the various university buildings. A university was founded at Wiirzburg in 1403, but only existed for a few years. The present university was founded by Bishop Julius in 1582. Owing to its con- nexion with the large hospital, its laboratories, and its rich anatomical collections, the medical faculty speedily became famous, and has remained the most important faculty at Wurzburg ever since. The university library contains 200,000 volumes, and there are numerous scientific insti- tutes connected with the main institution. In 1886 it was attended by 800 students (600 medical), and had a teach- ing staff of 70 professors and lecturers. The other edu- cational establishments of Wiirzburg are numerous; among them is a music institute, which gives instruction gratis in vocal and instrumental music.

Wiirzburg is surrounded by vineyards, which yield some of the best wines in Germany; it also carries on the manufacture of beer, leather, tobacco, and railway car- riages. The environs are highly picturesque as well as fertile ; the most interesting point is the Leistenburg, on which stands the fortress of Marienburg, the resi- dence of the bishops until 1720. This position was occupied by a Roman fort, and seems to have been fortified by Bishop Conrad, who died in 1203. The population of Wiirzburg in 1885 was 55,100, of whom 9000 were Protestants.

Wiirzburg is one of the most ancient and interesting towns of Germany, and as the capital of an immediate episcopal principality long played an important part in the history of the empire. The first bishop was Burkard, consecrated in 741, though the town seems to have existed in the previous century. The bishops soon acquired a considerable share of temporal power, and in the 15th ecntury enjoyed the title of dukes of East Franconia. The citizens of Wiirzburg espoused the cause of Henry IV. against their bishop, and in 1086 the town was twice taken by the contending armies. Various imperial diets were held in Wiirzburg, the chief being those of 1180, when Henry the Lion was placed under the ban, and of 1209, when Otto IV. was betrothed. In 1525 the rebellions peasants under Gotz von Berlichingen took the town, but were repnised from the Marienburg, and were defeated with great slaughter by the Swabian forces. The bishopric, which at one time embraced an area of 190 square miles, with 250,000 inhabitants, was secularized at the peace of Lunéville, and passed to Bavaria in 1803. The peace of Pressburg (1805) transferred it, under the name of an electorate, to the grand-duke of Tuscany, who joined the Confedera- tion of the Rhine, assuming the title grand-duke of Wiirzburg. The congress of Vienna restored it to Bavaria. Archduke Charles defeated Marshal Jourdan near Wiirzburg in 1796; and in 1866 the bombarding of the citadel was the last warlike act of the Prussian army of the Main. The Wiirzburg conference is the name given to the mceting of the representatives of the smaller German states in November 1859 to devise some means of mutual support in the imperial dict. Wircebirgunv is the old Latin form of the name of the town; Herbipolis (herb-town; Wurz is the German for root or herb) appears in the 12th century.

WYANDOTTE, formerly a city and the county seat of Wyandotte county, Kansas, United States, had in 1886 a population of 13,840. In that year Armourdale (2634) and Kansas City, Kansas (4755), were consolidated with Wyandotte under the name of Kansas City, Kansas. The city is situated upon the west bank of the Missouri river and north bank of the Kansas river, in eastern Kansas, immediately adjoining the State line, and separated by it from Kansas City, Missouri. The surrounding country is a

fertile and highly cultivated prairie. The city is intersected by several railroads, most of which are branches of the Missouri Pacific system. It is rather irregularly laid out, being an aggregation of independent settlements, and its municipal improvements are in a formative stage. The population in 1886 was 21,229 (about 16 per cent. of foreign birth and 20 per cent. coloured). Kansas City is the third in the State in point of population.

WYAT, Sm Tuomas (1503-1542), is an important figure historically in English literature, although his poetry does not rank very high in intrinsic value. He was undoubtedly the leader, the first in point of time, and the acknowledged master of "the company of courtly makers" who in the reign of Henry VIIL, under Italian influence, transformed the character of English poetry. SurRReEy (q.v.) is usually associated with Wvyat in this leadership, and his influence was probably greater, as his verse was superior in fluency, dexterity, and force. But the priority, the actual lead, undoubtedly belongs to Wyat, who was Surrey's senior by fourteen years, and was celebrated by the younger poet with all the homage of an enthusiastic disciple. That there should ever have been any doubt upon the point arises from the fact that their poems were not printed till several years after both were dead, that they were then printed together in the same collection (Tottel's Miscellany, 1557), and that Surrey's name was placed first on the title-page by the publisher, while his poems preceded Wyat's in the Miscellany. It is to Wyat that the praise rightfully belongs of being the first writer of sonnets in English. He is also our first writer of satires in the classical form. Apart from the question of their services as pioneers of new metres and a new vein of love sentiment, there is a wide difference in character between Surrey and Wyat. Their poetry strongly cor- roborates the evidence of their portraits by Holbein. Wyat is much less bright and radiant, of a grave, sedate cast, with a vein of humorous melancholy and _ satiric

observation. It is not known for certain that Wyat ever travelled in Italy, but the probability that he did so is strong. Wyat's father, Sir Henry, the owner of Allington castle in Kent, was a prominent figure at the court of

Henry VII., and a residence at one of the Italian courts was then a usual part of the education of a young man of rank. Wyat was born in 1503, and we have no record of him between his taking his bachelor's degree at Cambridge at the age of fifteen and his being sworn a member of the privy council at the age of thirty, except that he took part in the tournament at a great feast held by the king at Greenwich in 1525. He was knighted in 1536, and twice sent as ambassador to the emperor, a strong proof of his repute as a statesman and diplomatist. He died in 1542, in the course of a hurried journey to Falmouth to meet and convoy an ambassador from the emperor. Wyat is commonly known as Sir Thomas Wyat the elder, to distinguish him from his son of the same name, who headed an insurrection against Mary in 1554, and paid the penalty of failure.

WYATT, Jamzs (1743-1813), a popular architect, born in Staffordshire in 1743, who lived at a time when architec- tural taste was at its lowest ebb. He spent some time in Rome making measured drawings of the classical remains, and on his return to England became one of the most successful architects of his time, and eventually was elected president of the Royal Academy. On the death of Sir William Chambers in 1796, Wyatt was appointed surveyor to the Board of Works. His chief works were a number of buildings at Kew for George IIL, all in the worst taste, and Fonthill Abbey for the rich and eccentric Mr Beckford, author of Vathek. This enormous and costly mansion, a sort of theatrical parody of a Gothic abbey, was erected in an incredibly short space of time by relays of workmen labouring day and night. The massive and lofty tower collapsed soon after it was finished, and a great part of this extravagant architectural freak has since been pulled down. James Wyatt was killed by a fall from his carriage in 1813.

WYCHERLEY, Witttam (c. 1640-1715), the typical "Restoration dramatist," and one of the greatest masters of the comedy of repartee, was born about 1640 at Clive, near Shrewsbury, where for several generations his family had been settled on a moderate estate of about £600 a year. Like Vanbrugh, Wycherley spent his early years in France, whither, at the age of fifteen, he was sent to be educated in the very heart of the "precious" circle who disported on the banks of the Charente.

Wycherley's friend, Major Pack, tells us that his hero "improved, with the greatest refinements," the "extraordinary talents" for which he was 'obliged to nature." Although the harmless affecta- tions of the Rambouillets and Montausiers, among whom he was thrown, are certainly not chargeable with the "refinements" of Wycherley's comedies —comedies which caused even his great admirer Voltaire to say afterwards of them, "Il semble que les Anglais prennent trop de liberté et que les Frangaises n'en prennent pas assez "— these same affectations seem to have been much more potent in regard to the "refinements" of Wycherley's religion.

Wycherley, though a man of far more intellectual power than is generally supposed, was a fine gentleman first, a responsible being afterwards. Hence under the mani- pulations of the heroine of the "Garland" he turned from the Protestantism of his fathers to Romanism—turned at once, and with the same easy alacrity as afterwards, at Oxford, he turned back to Protestantism under the mani- pulations of such an accomplished master in the art of turning as Bishop Barlow. And if, as Macaulay hints, Wycherley's turning back to Romanism once more had something to do with the patronage and unwonted

liberality of James IL, this merely proves that the deity he worshipped was the deity of the "polite world" of his time—gentility. Moreover, as a professional fine gentle- man, at a period when, as the genial Major Pack says, "the amours of Britain would furnish as diverting memoirs, if well related, as those of France published by Rabutin, or those of Nero's court writ by Petronius," Wycherley was obliged to be a loose liver. But, for all that, Wycherley's sobriquet of "Manly Wycherley" seems to have been fairly earned by him, earned by that frank and straightforward way of confronting life which, according to Pope and Swift, charac- terized also his brilliant successor Vanbrugh.

That effort of Wycherley's to bring to Buckingham's notice the case of Samuel Butler (so shamefully neglected by the court Butler had served) shows that the writer of even such heartless plays as The Country Wife may be familiar with generous impulses, while his uncompromising lines

in defence of Buckingham, when the duke in his turn fell into trouble, show that the inventor of so shameless a fraud as that which forms the pivot of The Plain Dealer may in actual life possess that passion for fairplay which is believed to be a specially English quality. But amoug the 'ninety-nine " religions with which Voltaire accredited England there is one whose permanency has never been shaken—the worship of gentility. To this Wycherley remained as faithful to the day of his death as Congreve himself. And, if his relations to that "other world beyond this," which the Puritans had adopted, were liable to change with his environments, it was because that "other world" was really out of fashion altogether.

Wycherley's university career seems also to have been influenced by the same causes. Although Puritanism had certainly not contaminated the universities, yet English "quality and politeness" (to use Major Pack's words) have always, since the great rebellion, been rather ashamed of possessing too much learning. As a fellow-commoner of Queen's College, Oxford, Wycherley only lived (according to Wood) in the provost's lodgings, being entered in the public library under the title of "Philosophize Studiosus" in July 1660. And he does not seem to have matriculated or to have taken a degree.

Nor when, on quitting Oxford, he entered himself of the Middle Temple, did he give any more attention to the dry study of the law than was proper to one so warmly caressed "by the persons most eminent for their quality or politeness." Pleasure and the stage were alone open to him, and in 1672 was produced, at the Theatre Royal, Love in a Wood. With regard to this comedy W ycherley told Pope—told him "over and over" till Pope believed him—believed him, at least, until they quarrelled about Wycherley's verses—that he wrote it the year before he went to Oxford. But we need not believe him: the worst witness against a man is mostly himself. To pose as the wicked boy of genius has been the foolish ambition of many writers, but on inquiry it will generally be found that these inkhorn Lotharios are not nearly so wicked as they would have us believe. When Wycherley charges himself with having written, as a boy of nineteen, scenes so callous and so depraved that even Barbara Palmer's appetite for pro- fligacy was, if not satisfied, appeased, there is, we repeat,

no need to believe him. Indeed, there is every reason to disbelieve him, — not for the reasons advanced by Macaulay, however, who in challenging Wycherley's date does not go nearly deep enough. Macaulay points to the allusions in the play to gentlemen's periwigs, to guineas, to the vests which Charles ordered to be worn at court, to the great fire, &c., as showing that the comedy could not have been written the year before the author went to Oxford. We must remember, however, that even if the play had been written in that year, and delayed in its production

till 1672, it is exactly this kind of allusion to recent |

events which any dramatist with an eye to fresliness of colour would be certain to weave into his dialogue. It is

not that 'the whole air and spirit of the piece belong to.)

a period subsequent to that mentioned by Wycherley," but that "' the whole air and spirit of the piece" belong to a man,—an experienced and hardened young man of the world,—and not to a boy who would fain pose as an experienced and hardened young man of the world. The real defence of Wycherley against his foolish impeachment of himself is this, that Love in a Wood, howsoever inferior in structure and in all the artistic economies to The Country Wife and The Plain Dealer, contains scenes which no inexperienced boy could have written—scenes which, not for moral hardness merely, but often for real dramatic ripeness, are almost the strongest to be found amongst his four plays. With regard to dramatic ripeness, indeed, if we were asked to indicate the finest touch in all Wycherley, we should very likely select a speech in the third scene of the third act of this very play, where the vain, foolish, and boastful rake Dapperwit, having taken his friend to see his mistress for the express purpose of advertising his lordship over her, is coolly denied by her and insolently repulsed. 'I think,"says Dapperwit, " women take incon- stancy from me worse than from any man breathing."

Now, does the subsequent development of Wycherley's dramatic genius lead us to believe that, at nineteen, he could have given this touch, worthy of the hand that drew Malvolio? Is there anything in his two masterpieces — The Country Wife or The Plain Dealer—that makes it credible that Wycherley, the boy, could have thus delineated by a single quiet touch vanity as a chain-armour which no shaft can pierce—vanity, that is to say, in its perfect development? However, Macaulay (forgetting that, among the myriad vanities of the writing fraternity, this of pre- tending to an early development of intellectual powers that ought not to be, even if they could be, developed early is at once the most comic and the most common) is rather too severe upon Wycherley's disingenuousness in regard to the dates of his plays. That the writer of a play far more daring than Etheredge's She Would if She Could—and far more brilliant too—should at once become the talk of Charles's court was inevitable ; equally inevitable was it that the author of the song at the end of the first act, in praise of harlots and their offspring, should touch to its depths the soul of the duchess of Cleveland. Possibly Wycherley intended this famous song as a glorification of Her Grace and her profession, for he seems to have been more delighted than surprised when, as he passed in his coach through Pall Mall, he heard the duchess address him from her coach window as a "rascal," a " villain," and as a son of the very kind of lady his song had lauded. For his answer was perfect in its readiness: '" Madam, you have been pleased to bestow a title on me which belongs only to the fortunate." Perceiving that Her Grace received the compliment in the spirit in which it was meant, he lost no time in calling upon her, and was from that moment the recipient of those "favours" to which he alludes with pride in the dedication of the play to her. Voltaire's story (in his Letters on the English Nation) that Her Grace used to go to Wycherley's chambers in the Temple disguised as a country wench, in a straw hat, with pattens on and a basket in her hand, may be apocryphal, —very likely it is,—for disguise was quite superfiuous in the case of the mistress of Charles If. and Jacob Hall,— but it at least shows how general was the opinion that, under such patronage as this, Wycherley's fortune as poet and dramatist, "eminent for his quality and politeness," was now niade,

Charles, who had determined to bring up his son, the

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duke of Richmond, like a prince, was desirous of securing for tutor a man so entirely qualified as was Wycherley to impart what was then recognized as the princely education, and it seems pretty clear that, but for the accident, to which we shall have to recur, of his meeting the countess of Drogheda at Bath and secretly marrying her, the educa- tion of the young man would actually liave been entrusted by his father to Wycherley as a reward for the dramatist's having written Love in a Wood.

Whether Wycherley's experiences as a naval officer, which he alludes to in his lines "On a Sea Fight which the Author was in betwixt the English and the Dutch," occurred before or after the production of Love in a Wood is a point upon which opinions differ, but on the whole we are inclined to agree with Macaulay, against Leigh Hunt, that these experiences took place not only after the production of Love in a Wood but after the production of The Gentleman Dancing Master, in 1673. We also think, with Macaulay, that he went to sea simply because it was the " polite" thing to do so—simply because, as he himself in the epilogue to The Gentleman Dancing Master says, "all gentlemen must pack to sea."

This second comedy is inferior to Love in a Wood, and for the reasons already discussed in connexion with the works of another dramatist (see VanprucH). In The Stelapse, however, the artistic mistake of blending comedy and farce damages a splendid play, but leaves it a splendid play still. In Zhe Gentleman Dancing Master this ming- ling of discordant elements destroys a play that would never under any circumstances have been strong,—a play nevertheless which abounds in animal spirits, and is luminous here and there with true dramatic points.

It is, however, oa his two last comedies—The Country Wife and The Plain Dealer—that must rest Wycherley's fame as a master of that comedy of repartee which, inaugurated by Etheredge, and afterwards brought to perfection by Congreve and Vanbrugh, supplanted the humoristic comedy of the Elizabethans. Zhe Country Wife, produced in 1675, is so full of wit, ingenuity, animal spirits, and conventional humour that, had it not been for its motive—a motive which in any healthy state . of society must always be as repulsive to the most lax as to the niost moral reader—it

would probably have survived as long as the acted drama remained a literary form in England. So strong, indeed, is the hand that could draw such a character as Marjory Pinchwife (the undoubted original not only of Congreve's Miss Prue but of Vanbrugh's Hoyden), such a character as Sparkish (the undoubted original of Congreve's Tattle), such a character as Horner (the undoubted original of all those cool impudent rakes with whom our stage has since been familiar), that Wycherley is certainly entitled to a place alongside Congreve and Vanbrugh. And, indeed, if priority of date is to have its fair and full weight, it seems difficult to challenge Prof. Spalding's dictum that Wycherley is "the most vigorous of the set."

In order to do justice to the life and brilliance of The Country Wife we have only to compare it with The Country Girl, afterwards made famous by the acting of Mrs Jordan, that Bowdlerized form of Zhe Country Wife in which Garrick, with an object more praiseworthy than his success, endeavoured to free it of its load of un- paralleled licentiousness by disturbing and sweetening the motive,—even as Voltaire afterwards (with an object also more praiseworthy than his success) endeavoured to disturb and sweeten the motive of The Plain Dealer in La Prude. While the two Bowdlerized forms of Garrick and Voltaire are as dull as the sop of Boursault, the texture of Wycherley's scandalous dialogue would seem to scintillate with the changing hues of shot silk or of the neck of a

pigeon or of a shaken prism, were it not that the many- coloured lights rather suggest the miasmatic radiance of a foul ditch shimmering in the sun. It is easy to share Macaulay's indignation at Wycherley's satyr-like defilement of art, and yet, at the same time, to protest against that disparagement of their literary riches which nullifies the value of Macaulay's criticism. And scarcely inferior to The Country Wifeis The Plain Dealer, produced in 1677,— a play of which Voltaire said, "Je ne connais point de comédie chez les anciens ni chez les moderns ou il y ait autant d'esprit." Strong language, no doubt ; but Voltaire has prevented it from seeming too strong by turning the play into Za Prude, and offering us in that a subject for comparison. No one has pointed out the immense

influence of this comedy, as regards manipulation of dialogue, upon all our subsequent comedies of repartee, from those of Congreve and Vanbrugh to those of Douglas Jerrold and T. W. Robertson; and, as to characters, he who wants to trace the ancestry of Tony Lumpkin and Mrs Hardcastle has only to turn to Jerry Blackacre and his mother, while Manly (for whom Wycherley's early patron, the duke of Montausier, sat), though he is perhaps overdone, has dominated this kind of stage character ever since. If but few readers know how constantly the blunt sententious utterances of this character are reappearing, not on the.stage alone, but in the novel and even in poetry, it is because a play whose motive is monstrous and intoler- able can only live in a monstrous and intolerable state of society ; it is because Wycherley's genius was followed by Nemesis, who always dogs the footsteps of the defiler of literary art. When Burns said— 'The rank is but the guinea stamp The man's the gowd for a' that,"

when Sterne, in Z'ristram Shandy, said, " Honours, like impressions upon coin, may give an ideal and local value to a bit of base metal, but gold and silver will pass all the world over without any other recommendation than their own weight," what did these writers do but adopt— adopt without improving—Manly's fine saying to Freeman, in the first act :—"I weigh the man, not his title; 'tis not the king's stamp can make the metal better or heavier "? And yet it is in the fourth and fifth acts that the coruscations of Wycherley's comic genius are the most dazzling ; also, it is there that the licentiousness is the most astonishing. Not that the worst scenes in this play are really more wicked than the worst scenes in Vanbrugh's Relapse, but they are more seriously imagined. Being less humorous than Vanbrugh's scenes, they are more terribly and earnestly realistic ; therefore they seem more wicked. They form indeed a striking instance of the folly of the artist who selects a story which cannot be actualized with- out hurting the finer instincts of human nature. When Menander declared that, having selected his plot, he looked upon his comedy as three parts finished, he touched upona subject which all workers in drama—all workers in imagin- ative literature of every kind—would do well to consider. In all literatures—ancient and modern —an infinite wealth of material has been wasted upon subjects that are unworthy, orelse incapable, of artistic realization; and yet Wycherley's

case is, in our literature at least, without a parallel. No doubt it may be right to say, with Aristotle, that comedy is an imitation of bad characters, but this does not mean that in comedy art may imitate bad characters as earnestly as she may imitate good ones,—a fact which Thackeray forgot when he made Becky Sharp a murderess, thereby destroying at once what would otherwise have been the finest specimen of the comedy of convention in the world. And perhaps it was because Vanbrugh was conscious of this law of art that he blended comedy with farce. Perhaps he felt that the colossal depravity of intrigue in

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which the English comedians indulged needs to be not only warmed by a superabundance of humour but softened by the playful mockery of farce before a dramatic circle such as that of the Restoration drama can be really brought within human sympathy. Plutarch's impeach- ment of Aristophanes, which affirms that the master of the Old Comedy wrote less for honest men than for men sunk in baseness and debauchery, was no doubt unjust to the Greek poet, one side of whose humour, and one alone, could thus be impeached. But does it not touch all sides of a comedy like Wycherley's—a Comedy which strikes at the very root of the social compact npon which civilization is built? As to comparing such a Comedy as that of the Restoration with the Comedy of the Elizabethans, Jeremy Collier did but a poor service to the cause he undertook to advocate when he set the occasional coarseness of Shakespeare alongside the wickedness of Congreve and Vanbrugh. And yet, ever since Macaulay's essay, it has been the fashion to speak of Collier's attack as being levelled against the immorality of the 'Restoration dramatists." It is nothing of the kind. It is (as was pointed out so long ago as 1699 by Dr Drake in his little- known vigorous reply to Collier) an attack upon the English drania generally, with a special reference to the case of Shakespeare. While dwelling upon that noxious and highly immoral play //amlet, Collier actually leaves un- scathed the author of Zhe Country Wife, but fastens on Congreve and Vanbrugh, whose plays—profligate enough in all conscience—seem almost decent beside a comedy whose incredible vis motrix is "the modish distenper."

That a stage, indeed, upon which was given with applause A Woman Killed with Kindness (where a wife dies of a broken heart for doing what any one of Wycherley's married women would have gloried in doing) should, in seventy years, have given with applause Zhe Country Wefe shows that in historic and social evolution, as in the evolution of organisms, "change" and " progress" are very far from being convertible terms. For the barbarism of the society depicted in these plays was, in the true sense of the word, far deeper and more brutal than any barbarism that has ever existed in these islands within the historic period. If civilization has any meaning at all for the soul of man, the Englishmen of Chaucer's time, the Anglo-Saxons of the Heptarchy, nay, those half-naked heroes, who in the dawn of English history clustered along the southern coast to defend it from the invasion of Cesar, were far more civilized than that "race gangrenée"—the treacherous rakes, mercenary slaves, and brazen strumpets of the court of Charles II., who did their best to substitute for the human passion of love (a passion which was known perhaps even to paleeolithic man) the promiscuous inter- course of the beasts of the field. Yet Collier leaves Wycherley unassailed, and classes Vanbrugh and Congreve with Shakespeare!

It was after the success of Zhe Plain Dealer that the turning-point came in Wycherley's career. The great dream of all the men about town in Charles's time, as Wycherley's plays all show, was to marry a widow, young and handsome, a peer's daughter if possible,—but in any event rich, and spend her money upon wine and women. While talking to a friend in a bookseller's shop at Tun- bridge, Wycherley heard Zhe Plain Dealer asked for by a lady who, in the person of the countess of Drogheda, answered all the requirements. An introduction ensued, then love-making, then marriage—a secret marriage, for, fearing to lose the king's patronage and the income there- from, Wycherley still thought it politic to pass as a bachelor. He had not seen enough of life to learn that in the long run nothing is politic but " straightforwardness, " Whether because his countenance wore a pensive and sub-

dued expression, suggestive of a poet who had married a dowager countess and awakened to the situation, or whether because treacherous confidants divulged his secret,

does not appear, but the news of his marriage oozed out, .

—it reached the royal ears, and deeply wounded the father anxious about the education of his son. Wycherley lost the appointment that was so nearly within his grasp, —lost indeed the royal favour for ever. He never had an opportunity of regaining it, for the countess seems to have really loved him, and Love in a Wood had proclaimed the writer to be the kind of husband whose virtue prospers best when closely guarded at the domestic hearth. Wherever he went the countess followed him, and when she did allow him to meet his boon companions it was in a tavern in Bow Street opposite to his own house, and even there under certain protective conditions. In summer or in winter he was obliged to sit with the window open and the blinds up, so that his wife might see that the party included no member of a sex for which her hushand's plays had advertised his partiality. She died at last, however, and left him the whole of her fortune. But the title to the property was disputed ; the costs of the litigation were heavy—so heavy that his father was unable (or else he was unwilling) to come to his aid; and the result of his marrying the rich, beautiful, and titled widow was that the poet was thrown into the Fleet prison. There he languished for seven years, being finally released by the liberality of James II.,—a liberality which, incredible as it seems, is too well authenticated to be challenged. James had been so much gratified by seeing Zhe Plain Dealer acted that, finding a parallel between Manly's "manliness" and his own, such as no spectator had before discovered, he paid off Wycherley's execution creditor. Other debts still troubled Wycherley, however, and lie never was released from his embarrassments, not even after succeeding to a life estate in the family property. In coming to Wycherley's death, we come to the worst allegation that has ever been made against him as a man and asa gentleman. At the age of seventy-five he married a young girl, and is said to have done so in order to spite his nephew, the next in succession, knowing that he himself must shortly die and that the jointure would impoverish the estate. No doubt it is true enough that he did marry the girl and did die eleven days afterwards ; but,

if we consider that the lady he married was young and an heiress (or was supposed to be an heiress), and 'if we further consider how difficult it was for an old gallant of Wycherley's extraordinary personal vanity to realize his true physical condition, we may well suppose that, even if he talked about "marrying to spite his nephew," he did so as a cloak for other impulses, such as senile desire or senile cupidity, or a blending of these impulses. Wycherley wrote verses, and, when quite an old man, prepared them for the press by the aid of Alexander Pope, then not much more than a boy. But, notwithstanding all Pope's tinkering, they remain contemptible. He died in December 1715, and was buried in the vault of the church in Covent Garden. (T. w.) WYCLIFFE,' or Wycuir, Joun (c. 1320-1384), was

' A note is necessary as to the spelling of Wycliffe's name. Out of thirteen contemporary entries in documents, twelve give "'y" in the first syllable; the seven entries in the Queen's College accounts show four with '"'y"' to three with "i," but these do not certainly refer to the reformer. In not one of these is there a "ck" (though once a "'ke") (see Mr F. D. Matthew, in the Academy, June 7, 1884). The chroniclers, &c., oifer every imaginable variety of spelling, and it is possible that our favourite form in more recent times, ' Wickliffe," derived its popularity from the old play on the name, " nequam vita," which we find in Gascoigne. Our choice must be decided by usage, and the spelling adopted in the present article is that of the village from which Wycliffe derived his name; it is also preferred by the editors of the Wycliffe Bible, by Milman, and by Bishop Stubbs.*

born, according to Leland,? our single authority on the point, at Ipreswel (evidently the place now called Hipswell), a mile from Richmond, in Yorkshire. The date may have been somewhere about 1320. Leland elsewhere mentions that he "drew his origin" from Wycliffe-on-Tees (Collectanea, ii. 329), so that his lineage was of the ancient family which is celebrated by Scott in Marmion. The Wyclifies had a natural connexion with the college at Oxford which had been founded in the latter part of the previous century by their neiglibours, the Balliols of Barnard Castle; and to Balliol College, then distinctively an "arts" college? John Wycliffe

in due time proceeded. It has been generally believed, and was in fact believed not many years after his death, that he was a fellow of Merton College in 1356; but in all probability this identification rests upon a confusion with another and contemporary John Wyeliffe. That the future reformer was a fellow of Balliol College is implied in the fact that some time after 1356, but before the summer of 1360, he was elected master of the college. This office he held but a short time. So soon as 1361 he accepted a college living, that of Fillingham in Lincoln- shire, and probably left Oxford for some time. In 1363, however, he was back again, this time resident in Queen's College, where he seems to have rented rooms at various dates from this year onwards ; on the 13th April 1378 he obtained from his bishop leave of absence " insistendo literarum studio in universitate Oxon. per biennium," and in the following November he exchanged his benefice for one more conveniently situate, at Ludgarshall, in Buckinghamshire. A certain amount of residence at Oxford was necessary if he was now proceeding to a degree in divinity, and still more if, as is generally under- stood, he is the same person with the John Wycliffe who was appointed, December 1365, to the wardenship of Canterbury Hall, a house which Archbishop Islip had lately founded for a mixed body of monks and secular clergy- men, and then, changing his mind, had filled exclusively with the latter. His successor Archbishop Langham in 1367 reversed the arrangement, expelled Wycliffe and his colleagues, and substituted monks. Wycliffe appealed to Rome and lost his case, 1370. There seems no reason to dispute the legality of the action either of Archbishop Langham or of the cardinal who tried the appeal at Viterbo ; but Wycliffe no doubt felt himself hardly used, and (if he be rightly identified with the reformer) the experience may have confirmed him in some of the opinions which are characteristic of his subsequent career, and which have been attributed, but only on the authority of a bitter opponent, Thomas Netter of Walden, to dis- appointment at not receiving the bishopric of Worcester (perhaps at its voidance in 1368). But the doubt as to the identification in the one case, and the suspicion attach- ing to the evidence in the other, may disincline us to reason about the motives which directed Wycliffe on to the path of reform.*

Among the rest ' Wyclif" has the support of Shirley, of Mr T. Arnold, and of the Wyclif Society ; while " Wiclif" is the popular form in*

Germany.

2 Ttinerary, Stow's transcript, Bodleian Library, Tanner MS., p. 464, f. 45 (Leland's original being mutilated at this place). Hearne misprinted the name "Spreswel," and thus set all Wycliffe's bio- graphers on a search after a vox nihili.

3 See a document of 1325 printed in the appendix to the Fourth Report of the Historical Manuscripts Commission, p. 442 sg. Pro- vision for theological study was made by the benefaction of Sir Philip Somerville in 13840 (Lyte, Hist. of the Univ. of Oxford, p. 154, 1886).

4 Hence arose the common mistake, which was repeated so lately as in Milman's Hist. of Latin Christianity, bk. xiii. ch. vi., that Wycliffe began his university career at Queen's College. It is indeed open to question whether this be not yet another John Wycliffe ; see

Mr H. T. Riley's remarks in the Second Report of the Historical Manuscripts Commission, appendix, p. 141 sq.

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Some years indeed before this time he had thrown himself publicly into the defence of what had become the national resistance to the papacy at Avignon, closely associated as the latter was with the interests of France. He had entered the service of the royal court, and apparently as king's chaplain (" peculiaris regis clericus ") had published a tract, Determinatio quedam de Dominio, in support of the action of parliament in 1366, when it repudiated the tribute due to the pope. The tract is of interest, not only because it contains the first trace of the writer's special doctrine of "dominium" or lordship (adjusting the spiritual relation to a feudal framework), but also because it shows the line of thought by which Wycliffe's position became determined in a sense hostile to the papal system. It was not at the outset dogmatic but political elements in it which provoked his censure. He disputed the right of the spiritual power to interfere in teniporal matters, and was gradually led on to deny the lawfulness of any temporal possessions of the church, and thus to become the common enemy of the beneficed clergy and of the endowed monks ;

with the friars he was at present on friendly terms. Wycliffe thus drew from Richard Fitz- Ralph, archbishop of Armagh, whose instruction he may have personally followed in his youth,! his doctrine of '"dominium," which the latter had employed against the friars and in favour of the endowed clergy; while at the same time he combined it with the doctrine of the excellence of "evangelical poverty" which he derived from William of Ockham and the tradition of the Spiritual Franciscans nearly half a century earlier. Wycliffe's position may appear paradoxical ; but in truth he made a selection from the discordant views, and built up a con- sistent theory of his own, of which the salient principles were (1) that sin deprived a man of all right to possess anything; (2) that all property should be held in common; (3) that the spiritual power is entirely separate from the civil, and thus (4) that, should it overstep its bounds and come into contact with temporal concerns, it becomes thereby subject to civil jurisdiction ; (5) that the church should hold no property ; (6) that excommunication is of no effect unless justified by the sin of him against whom it is directed ; and (7) that in no case should it be pro- nounced for any offence connected with temporal affairs. These views are expounded in Wycliffe's several treatises De Dominio, which were written some time before 1377 and probably not long after 1370, though their precise date has not yet been established.?

Plainly such a writer was likely to be useful to the court, where John of Gaunt was now supreme,—especially since Wycliffe enjoyed the reputation of an unmatched proficiency in the scholastic learning of his day. On the 7th April 1374 he was presented by the crown to the rectory of Lutterworth, in Leicestershire, which he held until his death ; and on the following July 26th he was

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1 Archbishop FitzRalph had been a fellow of Balliol College, and was vice-chancellor of the university in or about 1333 (A. A 'Wood, Fasti Oxon., p. 21, ed. Gutch, 1790). His work, on which Wycliffe mainly based his theory, is entitled De Pauperie Salvatoris, aud exists only in manuscript; but Mr R. L. Poole is preparing the greater part of it for publication. An old legend makes Wycliffe take part in the archbishop's

controversy with the friars so early as 1360. It was suspected by Robert Vaughan, and then denied by Shirley. The further researches of Dr Lechler have placed the late date at which Wycliffe began his opposition to the friars on a sure foundation ; and the fact has been confirmed decisively by the publication of the St Albans Chronicon Angliw, by Mr E. M. Thompson, in 1874 (see pp. 116, 118), and more recently by that of the reformer's earlier Latin works.

? It is uniformly asserted that Wycliffe fell into heresy after his admission to the degree of doctor (Fasc. Ziz., p. 2). The process about Canterbury Hall makes the warden B.D. in 1367 or 1368 (Lyte, p. 252, n. 5),—so that if he be the reformer we have an approximate terminus a quo for his inception.

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nominated one of the royal ambassadors to proceed to Bruges to confer with the papal representatives on the long-vexed question of "provisions." The rank he took is shown by the facts that his name stands second, next after that of the bishop of Bangor, on the commission, and that he received pay at the princely rate of twenty shillings per diem. The commission itself was appointed in con- sequence of urgent and repeated complaints on the part of the Commons, but the negotiations were practically fruitless ; the king had an interest in keeping up the system of papal provisions and reservations, and it could hardly be expected that any concessions that might be gained by his commissioners would imply more than a temporary compromise or an illusory advantage. Yet it is possible that the real result of the negotiations is to be found, not in the formal stipulations, but in certain articles not then committed to writing which were laid before the English parliament in February 1377.

Some time after his return Wycliffe was given the pre- bend of Aust in the collegiate church of Westbury-on- Trim, which he held but a short time, the confirmation of his appointment (November 6, 1375) being followed within a fortnight by the grant of the benefice to another person. Henceforth he lived mainly at Lutterworth and Oxford, making, however, frequent and, as it seems, prolonged visits to London from time to time. He assumed the position of a popular preacher there, and delighted an

audience already sufficiently disaffected towards the rich and powerful clergy. He was also closely allied with John of Gaunt, who welcomed him as an instrument towards his design of humbling the church. Wycliffe indeed expressly refused to affirm that it was in such a condition as to deserve spoliation ; but when to this he added that the decision was the affair of statesmen, "politicoram qui intendunt praxi et statui regnorum" (De Civili Dominio, i. 37, p. 269), it is plain that his theory might readily commend itself to the duke, while the proviso could only increase the hostility towards him of the endowed clergy. For some years he was suffered to spread his doctrines without hindrance. The archbishop of Canterbury, Simon Sudbury, had no mind to proceed against him until at length the pressure of the bishops compelled him to summon the dangerous preacher to appear before the bishop of London and answer certain charges laid against him. The nature of these accusations is not stated, but their purport can hardly be doubtful. On the 19th February 1377 Wycliffe made his appearance at St Paul's. He was accompanied by the duke of Lancaster, by Lord Percy the marshal of England, and by four doctors of the four mendicant orders. 'The trial, however, came to nothing; for, before Wycliffe could open his mouth, the court was broken up by a rude brawl between his protectors and Bishop Courtenay, ending in a general riot of the citizens of London, who were so much enraged by the insult to their bishop in his own cathedral church—coming as this did at the same time as a serious attempt at an invasion by the duke in parliament of their civic liberties (Chron. Angl., p. 120)—that they would have sacked his palace of the Savoy had not Courtenay himself intervened.

Wycliffe had escaped for the time, but his enemies did not rely solely on their own weapons. Probably before this they had set their case before the pope; and towards the end of May five bulls were issued by Gregory XI, who had just returned to Rome from Avignon, condemning eighteen (or in other copies nineteen) " conclusions " drawn from Wycliffe's writings. All the articles but one are taken from his first book De Civili Dominio, the recent publication of which shows the charges to be honestly | made and the quotations to be entirely free from any

suspicion of unfairness. The bulls truly stated Wycliffe's intellectual lineage ; he was following in the error of Marsiglio of Padua ; and the articles laid against him are concerned entirely with questions agitated between church and state—how far ecclesiastical censures could lawfully affect a man's civil position, and whether the church had a right to receive and hold temporal endowments. The bulls were addressed (May 22) to the archbishop of Canterbury and the bisliop of London, the university of Oxford, and the king. The university was to take Wycliffe and send him to the prelates; the latter were then to examine the truth of the charges and to report to the pope, Wycliffe being meanwhile kept in confinement. The execution of the papal bulls was impeded by three separate causes,—the king's death on the 21st June; the

tardy action of the bishops, who enjoined the university |

to make a report, instead of simply sending Wycliffe to them ; and the unwillingness of the university to admit external authority, and, above all, the pope's right to order the imprisonment of any man in England. The con- vocation, indeed, as the St Albans chronicler! states with lamentation, made serious objections to receiving the bull at all; and in the end it merely directed Wycliffe to keep within his lodgings at Black Hall for a time.

If the university was disposed to favour the reformer, the Government was not less so. John of Gaunt was for the moment in retirement ; but the mother of the young king appears to have adopted his policy in church affairs, and she naturally occupied a chief position in the new council. As soon as parliament met in the autumn of 1377 Wycliffe was consulted by it as to the lawfulness of prohibiting that treasure should pass out of the country in obedience to the pope's demand. Wycliffe's affirmative Judgment is contained in a state paper still extant; and its tone is plain proof enough of his confidence that his views on the main question of church and state had the support of the nation.2, Indeed he had laid before this same parliament his answer to the pope's bulls, with a defence of the soundness of his opinions. His university, moreover, confirmed his argument ; his tenets, it said, were true (7.e., orthodox), though their expression was such as to admit of an incorrect interpretation. But

Wycliffe was still bound to clear himself before the prelates who had summoned him, and early in 1378 he appeared for this purpose in the chapel of Lambeth Palace. His written defence, expressed in some respects in more cautious language than he had previously used, was laid before the council; but its session was rudely interrupted, not only by an inroad of the London citizens with a crowd of the rabble, but also by a messenger from the princess of Wales enjoining them not to pass judgment against Wycliffe ; and thus a second time he escaped, either without sentence, or at most with a gentle request that he would avoid dis- cussing the matters in question. Meanwhile his " pro- testatio" was sent on to Rome.*

In the autumn of this year Wycliffe was once .aore called upon to prove his loyalty to John of Gaunt. The duke had violated the sanctuary of Westminster by sending a band of armed men to seize two knights who had taken refuge there. They resisted, and one of them was killed. After a while the bishop of London excommunicated all concerned in the crime (excepting only the king, his mother, and his uncle), and preached against the culprits ee a en ee ee

1 When he says that the bull was only received at Oxford shortly before Christmas, he is apparently confounding it with the prelates' mandate, which is dated December 18 (Lewis, appendix xvii.)—Chron. Angl., p. 178.

2 In one text of this document a noteis appended, to the effect that the council enjoined silence on the writer as touching the matter therein contained (Fasciculi Zizaniorum, p. 271). This, if true, was appar- ently a measure of precaution.

publicly at St Paul's Cross. The duke, fearing the anger of the Londoners, arranged that the ensuing parliament should be held at a safe distance, at Gloucester, and, it was rumoured, proposed to bring before it a sweeping scheme of spoliation of church property. Wycliffe was required to write an apology for the duke's actions at Westminster. His paper, which is still preserved, and forms part of the De Ecclesia, seeks, without excusing the

homicide, to lay down the limits within which the privilege of asylum is permissible, and maintains that the duke was right in invading the sanctuary in order to bring escaped prisoners to justice. But the duke's whole behaviour seems to have been high-handed, and Wycliffe can with difficulty be excused from a charge of subserviency to his patron.

The year 1378 forms a turning point in Wycliffe's career. The schism in the papacy caused by the election in September of Clement VIL. in opposition to Urban VI. slowly decided Wycliffe towards a more revolutionary attitude with respect to the Roman see, a power which he now convinced himself was at the root of the disorders of the church. He set on foot an active propaganda, choosing the two special means of sending forth his "poor" or 'simple priests" to preach pure doctrine throughout the country, and of making the first complete English version of the Bible. This latter work was mainly executed by Wycliffe himself, but his friend Nicholas Hereford did part of the Old Testament. Afterwards the whole was revised by John Purvey, who assisted Wycliffe in his parish duty at Lutterworth, and finished his edition probably not long after the reformer's death. Most existing copies are of the latter redaction, which is printed in parallel columns with the older one in the great edition of the version edited by J. Forshall and Sir F. Madden (Oxford, 1851). Wycliffe's translation of the Bible, and still more his numerous English sermons and tracts, establish his now undisputed position as the founder of English prose writing.

Wycliffe's itinerant preachers were not necessarily intended to work as rivals to the beneficed clergy. The idea that underlay their mission was rather analogous to that which animated Wesley four centuries later. Wycliffe aimed at supplementing the services of the church by regular religious instruction in the vernacular ; and his organization included a good number of men who held or had held respectable positions in their colleges at Oxford. The influence of their teaching was soon felt throughout the country. The common people were rejoiced by the plain and homely doctrine which dwelt chiefly on the simple "law" of the gospel, while they no doubt relished the denunciation of existing evils in the church which formed, as it were, the burthen of such discourses. The feeling of disaffection against the rich and careless clergy, monks, and

friars was widespread but undefined. Wycliffe turned it into a definite channel (he was now persuaded that the friars were as bad as the monks) ; he insensibly passed from an assailant of the papal to an assailant of the sacerdotal power ; and in this way he was led to reject the distinctive symbol of that power, the doctrine of tran- substantiation. It was in the summer of 13813 that Wycliffe propounded at Oxford a set of theses, substituting for the accredited doctrine of the church one which

3 This is the date given in the Fasciculi Zizaniorum. Wood, how- ever, makes Berton chancellor in 1880 and 1882, But if Wycliffe's heresy was first put forth in the latter year there seems to be hardly time for the condemnation and then for the archbishop's summons to the London council in May. It is safest therefore to leave the date of the Fasciculi Zizaniorum undisturbed. The Peasants' Revolt in June 1381, and the murder of Archbishop Sudbury, may sufficiently account for the interval between the Oxford and the London pro- ceedings,

allowed the real presence of Christ in the consecrated elements, but denied any change of substance, a doctrine practically undistinguishabie (unless by its scholastic form) from the modern Lutheran doctrine. The theologians of the university were at once roused. The chancellor, William Berton, sat with twelve doctors (half of whom were friars), and solemnly condemned the theses; Wycliffe appealed to the king, and John of Gaunt hastily sent down a messenger enjoining the reformer to keep silence on the subject.

The condemnation at Oxford was almost immediately followed by the Peasants' Revolt, with which it has been supposed that Wycliffe had something to do. The only positive fact implicating him is the confession of one of its leaders, John Ball, that he learned his subversive doctrines from Wycliffe. But the confession of a con- demned man can seldom be accepted without reserve; and we have not only the precise and repeated testimony of Knyghton that he was a " precursor" of Wycliffe, but also documentary evidence that he was excommunicated as early as 1366, long before Wycliffe exposed himself to ecclesiastical ceusure. Wycliffe in truth was always careful to state his communistic views in a theoretical way ;

they are confined to his Latin scholastic writings, and thus could not reach the people from him directly. At the same time it is very possible that his less scrupulous followers translated them in their popular discourses, and thus fed the flame that burst forth in the rebellion. Perhaps it was a consciousness of a share of responsibility for it that led them to cast the blame on the friars. In any case Wycliffe's advocates must regret that in all his known works there is only one trace of any repro- bation of the excesses that accompanied the outbreak.

In the following spring his old enemy William Courtenay, now archbishop of Canterbury, resolved to take measures for stamping out Wycliffe's crowning heresy. He called a provincial council at the Blackfriars in London, which assembled on the 21st May 1382, and sat with intervals until July. The council was met by a hardly expected manifestation of university feeling on Wyeliffe's side. The chancellor and both the proctors stood by him. They allowed a Wycliffite sermon to be preached before the uni- versity on Ascension Day. The archbishop's commissary complained that his life was not safe at Oxford. Still no steps were taken to bring Wycliffe to judgment. Twenty- four articles extracted from his works were condemned ; some of his prominent adherents were imprisoned until they recanted ; the university officers were soon brought to submission, but Wycliffe himself remained at large and unmolested. It is said indeed by Knyghton that at a council held by Courtenay at Oxford in the following November Wycliffe was brought forward and made a recantation ; but our authority fortunately gives the text of the recantation, which proves to be nothing more yor less than a plain English statement of the condemned doctrine. It is therefore lawful to doubt whether Wycliffe appeared before the council at all, and even whether he was ever summoned before it. Probably after the over- throw of his party at Oxford by the action of the Black- friars council Wycliffe found it advisable to withdraw permanently to Lutterworth. That his strength among the laity was undiminished is shown by the fact that an ordinance passed by the House of Lords alone, in May 1382, against the itinerant preachers was annulled on the petition of the Commons in the following autumn. In London, Leicester, and elsewhere there is abundant evidence of his popularity. The reformer, however, was growing old. There was work, he

probably felt, for him to do, more lasting than personal controversy. So in his retirement he occupied himself, with restless activity, in

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writing numerous tracts, Latin and English, as well as one of his most important books, the Zrialogus. In spite of a paralytic seizure which came upon him in 1382 or early in 1383, he continued his labours. In 1384 it is stated that he was cited by pope Urban VI. to appear before him at Rome ; but to Rome he never went. On the 28th December of this year, while he was hearing mass in his own church, he received a final stroke, from the effects of which he died on the New Year's eve! He was buried

_at Lutterworth ; but by a decree of the council of Con-

stance, May 4, 1415, his remains were ordered to be dug up and burned, an order which was carried out by Bishop Fleming in 1428.

At this distance of time Wycliffe's reputation is still a battle- ground of parties. By those who uphold the indefeasible sanctity of church property, the exemption of the church from all control or oversight on the part of the state, or yet more the apostolic pre- rogative of the Roman see, his political doctrine is judged as revolutionary, sacrilegious, and heretical. His denial of tran- substantiation is conceived to imply a base hypocrisy in his con- tinued discharge of priestly functions; but they who maintain this argument should bear in mind that the office of the mass is older than the doctrine of transubstantiation, and a man cannot be fairly accused of dishonesty in using words in a sense at all events nearer that in which they were originally written. A sober study of Wycliffe's life and works justifies a conviction of his complete sincerity and earnest striving after what he believed to be right. If he cannot be credited (as he has been by most of his biographers) with all the Protestant virtues, he may at least claim. to have dis- covered the secret of the immediate dependence of the individual Christian upon God, a relation which needs no mediation of any pricst, and to which the very sacraments of the church, however desirable, are not essentially necessary. When he divorces the idea of the church from any connexion with its official or formal constitution, and conceives it as consisting exclusively of the righteous, he may seem to

have gone the whole length of the most radical reformers of the 16th century. And yet, powerful as was his influence in England, it was but transicnt, and within forty years it was nearly extinct. His true tradition is to be found not in his own country but in Bohemia, where his works were eagerly read and multiplied, and where his disciple John Huss, with less origin- ality but greater simplicity of character and greater spiritual force, raiscd Wyclitlism to the dignity of national religion. To Huss, whose works are to a great extent acento of extracts from Wycliffe, Luther owed much; and thus the spirit of the English teacher had its influence on the reformed churches of Europe.

The documentary materlals for Wycliffe's biograpliy are to be found in John

Lewis's Life and Sufferings of J. Wiclif (new ed., Oxford, 1820), which contains ~

a valuable appendix of illustrative papers and records; Foxe's Acts and Monu- ments, vol. iii., ed. 1855, with app.; Forshall and Madden's preface to the Wycliffe

Bible, p. vii. note, Oxford, 1851; W. W. Shirley's edition of the Fasciculi Zizani- –

orum (probably the work of Thomas Netter of Walden), 1858; and H. T. Riley's notices in the appendices to the Second and Fourth Reports of the Historical Manuscripts Commission. Among contemporary records the recently discovered narrative of a monk of St Albans—a bitter opponent of John of Gaunt—is of

conspicuous value; it was published under thie title of Chronicon Angliz, by –

Mr E. M. Thompson, 1874. Of this the account in Walsingham's ZHistoria Anglicana (ed. H. T. Riley, 1863, 1864) is mainly a modified version. Knyghton, who wrote De Eventibus Angliz at Leicester in the heart of what may be called the Wycliffe country, is very well informed as to certain passages in the reformer's history, though his chronology is

extremely faulty (printed in Twysden's Hist. Anglic. Scriptores Decem, 1652). There are valuable 1otices also in the continuation of the Eulogium Historiarum (vol. iii., ed. F. S. Haydon, 1863), in the Chronicle of Adam of Usk (ed. E. M. Thompson, 1876), and in more than one of the continuations of Higden. For the study of Wycliffe's theology the controversial works of Wodeford and Walden are important, but must necessarily be used with caution.

Of modern biographies that by Dr G. V. Lechle: (Johann von Wiclif und die Vorgeschichte der Reformation, 2 vols., Leipsic, 1873; partial Engl. trans., by P. Lorimer, 1878, 1881, and 1884) is by far the most comprehensive; it includes a detailed exposition of the reformer's system, based to a considerable extent on works which were then unpublished. Shirley's masterly introduction to the Fasciculi Zizaniorum, and Mr F, D. Matthew's to his edition of English Works of Wyclif hitherto unprinted (1880). as well as Mr Creighton's History of the Papacy during the Period of the Reformation, vol. i., 1882, and Mr H. C. Max- well Lyte's account in his 7/istory of the University of Oxford (1886), add to or correct our stock of biographleal materials, and contain much valuable criticism. Wycliffe's political doctrine is discussed by Mr R. L. Poole (dllustrations of the Listory of Medizxval : Thought, 1884); and his relation to Huss is elaborately demonstrated by Dr J. Loserth (Hus und Wiclif, Prague, 1884; also Engl. trans.)

Wycliffe's works are enumerated in a Catalogue by Shirley (Oxford,1865). The following are published:—A. Latin.—De Oficio Pastorali, ed. G. V. Lechler, Leipsic, 1863; 7rialogus, ed. G. V. Lechiler, Oxford, 1869; portions of the Summa in Theologia, viz., De Civili Donvinio, i., ed. R. L. Poole, 1885, aud De Ecclesia, ed. J. Loserth, 1886; De Benedicta Incarnatione, ed. E. Harris, 1886; Dialogus sive Speculum Ecclesiz Militantis, ed. A. W. Pollard, 1886 3 Sermones, ed. J. Loserth, 2 vols., 1887-88; Polemical Tracts, ed. R. Buddensieg, 2 vols., 1883; De Compositione Hominis, an early work, ed. R. Beer, 1884. All but the first two of these are issued by the Wyclif Society, which was founded in 1882 for the purpose of publishing all the reformer's unedited works.

1 Of Wycliffe's personal appearance we know hardly more than that he was a spare man with frail health. None of the existing portraits of him is contemporary.

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B. English.—Select English Works, ed. T. Arnold, 3 vols., 1869-71, and English Works hitherto unprinted, ed. F. D. Matthew, 1880, chiefly sermons and short tracts, of many of which the authenticity is uncertain. The Wicket (Nuremberg, 1546; re- printed Oxford, 1828) is not included in either of these collections. CeETe:)

WYCOMBE, Hich Wycomss, or Cuippinc WyYcoMBE,

a municipal borough and market-town of Bucks, is situ-°

ated in the valley of the Wyck and on a branch of the Great Western Railway, 29 miles west-north-west of London, 25 south-east of Oxford, and 10 north of Maiden- head. Notwithstanding many additions to the town within recent years, it still retains many evidences of antiquity, including several medieval buildings. The parish church of All Saints, the largest in the county, was rebuilt in 1273 by the abbess and uuns of Godstowe, Oxfordshire, on the site of an earlier Norman structure, and underwent extensive reconstruction in the beginning of the 15th century. The present western tower, 108 feet in height, was completed in 1522, and adorned with pinnacles in 1753. The style of the building is now Early English with Decorated and Perpendicular addi- tions. The interior underwent extensive restoration in 1874, under the direction of the late G. E. Street, and the restoration of the exterior is at present (1888) in progress. For the grammar school, founded in 1555 by the mayor and

burgesses of Wycombe, and now under the direction of the charity commissioners, a hand- some new building was erected in 1883. The remains of the Norman hall of St John the Baptist, incorporated in the old school building, with its chapel in the Early English style, adjoins the new building. The other princi- pal public buildings are the guild-hall, originally erected by the earl of Shelburne in 1757, and altered and improved in 1859; the literary institute, 1854; the free library, per- manently endowed by a subscription of the townspeople after the premises had been presented by J. O. Griffiths ; the High Wycombe hospital, established in 1875; the shambles, erected in 1761 on the site of the old hog market ; and the South Bucks auction mart, 1887. Some remains still exist of Desborough Castle, supposed to have been erected for defence against the Danes. There are a number of almshouses, including those of Queen Elizabeth, endowed in 1562 out of the revenues of the dissolved fraternity of St Mary. In 1797 a military college was established at Wycombe, which was transferred to Farn- ham and the junior department to Sandhurst in 1812 and 1813. The Frogmore gardens were presented to the town by J. O. Griffiths in 1877 as public pleasure- grounds. 'Thereisa common pasturage, 30 acres in extent, called the Rye. Formerly lace and strawplait making were the staple industries, but they have been superseded by chair-making, which of late years has greatly increased, the number of chairs made annually now amounting to over 1} millions. The rise of the industry was due to the beech-woods in the neighbourhood ; but, in addition to the cane and rush-bottomed chairs, for which these woods supply the frames, chairs of a finer kind are now also made from walnut, cherry, and other more valuable woods. There are also flour and paper mills. The borough, which is divided into three wards, is governed by a mayor, six aldermen, and eighteen councillors. The population of the municipal borough in 1871 (area then 122 acres) was 4811; in 1880 the area was extended to 400 acres, and the population in 1881 was 10,618. The population of the parliamentary borough (area 6395 acres), which existed till 1885, was 10,492 in 1871 and 13,154 in 1881.

From the character of Roman remains fonnd at Wycombe it seems to have been an important Roman station. By the Saxons a fortress called Desborough castle was erected for its defence. At the Conquest it was a borough town, and was then held by Robert Doily or Doyley. In the 9th

year of Edward I. it reverted to the crown. 'The incorporation of the borough is ascribed to Henry I. From the 28th of Edward I. it returned two members to

parliament, but in 1867 the number was reduced to onc, and in 1885 it was merged in the Sonth or Wycombe Division of the county. Camden, writing in the beginning of the 17th century, says of it, " This town for largeness and beauty comparcs with the best in the county, and as it is governed by a mayor is justly pre- ferred to the rest.'"" During the Civil War it was the scene of a skirmish between Prince Rupert and the Parliamentarian forces, in

which the latter were defeated. See Parker's Antiquities of Wycombe, 1878,

WYNTOUN, Anprew oF, a Scottish monk who flourished at the beginning of the 15th century, was the author of the Orygynale Cronykil of Scotland. The chronicle, whicli is in verse and has some historical value from the use made in it of the St Andrews registers, is called "original" because it begins with the beginning of the world, the second chapter giving an account of the creation of man. The history of Scotland is brought down to the death of Robert III. in 1406. Of the chronicler himself nothing is known except what he tells us in his prologue, namely, that he was a canon regular of St Andrews, and prior of Serf's Inch in Lochleven. The chronicle has been twice carefully edited and annotated, —by Macpherson in 1795, and by David Laing in 1872-79.

WYOMING, a Territory of the United States, is Plate nearly rectangular in shape, having as its boundaries XVII.

the 41st and 45th parallels of N. latitude and the 27th and 34th meridians west of Washington. South of it are Colorado and Utah; on the west, Utah, Idaho, and Montana; on the north, Montana; and on the east, Dakota and Nebraska. The area is 97,890 square miles.

The surface is greatly diversified. great, being probably not less than 6400 feet. est portions of the Territory are along the northern and eastern borders, where in several places the surface is less than 5000 feet above sea-level, while its highest points exceed 13,000 feet. By far the greater part consists of high plains, which are broken by numerous inountain ranges and ridges, which form parts of the Rocky Mountain system. This system enters the Territory in the south-eastern part, and traverses it in a north-west direction. On the south it consists of three members, the Laramie range, which is crossed by the Union Pacific railroad at Sherman, and the Medicine Bow and Park ranges, which separate branches of the North Platte river. These ranges run out and fall down into the plain in the southern part of the Territory, leaving for 150 miles a broad flat plateau to re- present the Rocky Mountain system. The ill-defined sum- mit of this plateau forms the parting between the waters of the Missouri and Colorado. Eastward this plateau slopes to the Great Plains, and westward to the Green river basin. The Union Pacific Railroad traverses it, and therefore the traveller upon this road sees little of the Rocky Mountains except at a distance. Farther north the mountains rise again from this plateau in several ranges. The principal of these is that known as the Wind River range, which in a sense is continued northward beyond the northern boundary of the Territory by the Absaroka range. The former contains the most elevated land in the Territory, its highest peak being Frémont's, with an elevation of 13,790 feet. The latter range is in its southern part a great volcanic plateau, elevated 10,000 to 11,000 feet above the sea, while farther north it is eroded into very rugged mountain forms. About the point where these ranges join, there is a confused mass of mountains of great breadth and considerable height. In this elevated mass rise streams flowing to the

Atlantic, the Gulf of California, and the Pacific. The highest peaks of these mountains are those known as the Three Tétons, the most elevated of which, Mount Hayden, has an altitude of 13,691 feet. East of the Wind River and Absaroka ranges, and separated from them by the valley of the Wind River and the Big Horn basin, is the range

Its mean elevation is Moun- The low- tains.

Rivers.

Geology.

Fauna.

Flora.

Climate.

Ww YO—-W YO

known as the Big Horn Mountains, which is reputed to contain peaks having'an altitude of 12,000 feet. These ranges form the backbone of the Territory. Eastward from the Big Horn and Laramie ranges stretch the plains in an almost unbroken expanse, gently sloping to the eastward from an altitude of about 6000 feet at the base of the mountains, while south-west of the Wind River range is spread the expanse of the Green river basin, through which flows the principal fork of the Colorado.

The drainage system of Wyoming is somewhat complex. While the mountainous regions are well watered by numerous streams, the broad valleys and the plaius are poorly supplied with streams. Many of those which flow full in the mountains during the entire year run dry in summer upon the plains. None of the streams are navigable, The eastern three-fourths of the Territory is drained by the tributaries of the Missouri to the Atlantic. Of this area the North Platte drains the southern portion of the Rocky Mountain system, together with a large part of the plains lying north and east of it. Farther north- ward and eastward the plains are drained by the Cheyenne river. The eastern face of the Big Horn

mountains is drained by the Powder and Tongue rivers, while from its western slopes, and from the eastern slopes of the-Wind River and Absaroka ranges, the Wind River, known lower down in its course as the Big Horn, collects the waters. The Yellowstone, heading in the confused mass of moun- tains about the north end of the Wind River range, flows northward through a beautiful lake, draining the west slope of the Absaroka rauge. The Snake, or "' Mad" river of the early explorers, heading in the same mass of mountains, flows south-westward to seek an exit from them, while the Green, whose sources are in the same elevated country, drains the west slope of the Wind River range, and flows southward through the broad sage-covered expanse known as the Green river basin. In the south- west corner of the Territory is a small area drained by means of Bear river into Great Salt Lake.

The geological structure of Wyoming is even more complicated than its surface features. In the north- western corner is an area in which volcanic action, as represented in hot springs and geysers, is still alive, while the evidences of volcanic action upon a tremendous scale, in recent geological time, are seen in the form of sheets of lava and volcanic breccia, which are spread over the land, and from which mountain ranges have been carved. Most of this region is comprised in the Yettowstonz NationaL Park (q.v.), which has been set apart from settlement by the general Government. Many of the niountain slopes show a succession of the stratified formations, from the Triassic downwards through the series. The plains region is mainly floored by Tertiary and Cretaceous formations, as is also the case with the higher plateaus and with the Green river basin.

The native fauna of Wyoming resembles that of the other north- west Territories. The larger quadrupeds, which were formerly very abundant, and which are now not unfrequently to be met with, are the grizzly, black, and cinnamon bears, the North American panther, the elk, the moose, two or three species of deer, and the antelope. Upon the plains are seen the grey wolf and the coyote, the jack rabbit, the prairie dog, and the gopher. The buffalo, which was formerly extremely abundant upon the plains, is now practically extinct.

The eastern plains are mainly grass-covered, but as one goes westward the grass gradually disappears, and gives place to artemisia and greasewood. Forests are confined almost entirely to the mountains, although the high plains in the Yellowstone Park, in the north-western corner of the Territory, are covered with timber, The forests are composed of quaking aspen upon the lower slopes, succeeded at greater elevations by pines and spruces, the ite' limit of timber in the Territory being about 10,000 feet above the sea.

Wyoming has, in common with most of the western States, an arid climate. In the arable regions the rainfall is nowhere sufficient for the needs of agriculture, and irrigation is universally practised. The rainfall ranges in this part of the Territory from

' France.

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8 to 15 inches, being greater in the eastern part and diminishing westward, vee the mountains it probably reaches, if it does not exceed, 30 inches annually. :

The temperature ranges with the elevation. Upon the plains and plateaus and in the valleys (this comprising nearly all the habitable parts of Wyoming) the aunual temperature is between 40° and 50° F. Upon the mountains it diminishes until at an altitude of 10,000 feet it reaches approximately the freezing point.

At the last census (1880) the Territory contained 20,789 inhabit- Popula- In 1870 there were only 9118, showing an increase of 128 tion.

ants, per cent, The population is now (1888) estimated at not far from 40,000. Asin all frontier communities, a large proportion con- sists of adult males. In 1880 there were 14,152 males to 6637 females. The proportion of the foreign born was large, there being 5850 of this class to 14,939 natives. ;

The Territory contains eight counties :—Albany (population 4626), Carbon (3438), Crook (239), Johnson (637), Laramie (6409), Sweet-water (2561), Uinta (2879), and Frémout (formed since 1880). The principal cities are Cheyenne, the capital, which is situated upon the plains, near the east base of the Laramie range (population in 1880, 3456); Laramie City, near the west base of the same range (2696); Rawlins, upon the high plateau forming the continental watershed (1451); and Evanston, in the south-west corner of the Territory (1277).

The industries of Wyoming mainly relate to the raising of cattle Cattle and to mining. The former industry is in proportion to the raising.

number of inhabitants very large, and has been until recently ex- tremely profitable. The raising of cattle is carried on at slight expense, the cattle being allowed to range freely over the plains, and little provision is made for feeding and shelter, even in winter, as the loss from exposure and starvation is not sufficiently great to warrant the additional expense. In 1880 the number of cattle was returned as 521.213, and sheep as 450,225. In 1887 the report of the governor states that the number of cattle has increased to 753,648, while that of sheep has slightly diminished, being 421,688.

Mines of gold and silver have been worked to a limited extent near the east base of the Wind River range and in the north-western part of the Territory, and also at the extreme south, in the Park range, but the production is insignificant. On the other hand, the coal mines of Wyoming are very valuable ; they are mainly situated in the southern part of the Territory, at Carbon, Rock Spring, Almy, and Twin Creek, on or near the Union Pacific Railroad. The production in 1886 was 829,355 tons, valued at $2,488,065.

As in other Territories, the government of Wyoming is under Govern- the immediate jurisdiction of the United States, the executive and ment.

judicial officers being appointed by the president. The treasurer is appointed bythe governor. TheTerritoryhas a legislature consisting of two houses, the members of which are elected by the people.

The area of Wyoming was in the main included in the Territory History.

of Louisiana, acquired by the United States by purchase from The western part was acquired by prior settlement, as was the case with Washington, Oregon, and Idaho. It was or- ganized as a Territory in 1868. The progress of settlement has until recent years been very slow, owing to the inhospitable character of the country along its southern border, traversed by the Union Pacific railroad, and to the occupation by Indians of the more fertile districts. Latterly, as the Indians have been removed, settlement has progressed more rapidly. (HieG.))*

WYON, THomas (1792-1817), medallist, was born at Birmingham in 1792, He was apprenticed to his father, the chief engraver of His Majesty's seals, and studied in the schools of the Royal Academy, London, where he gained silver medals in both the antique and the life class; he also obtained a gold medal from the Society of Arts, He was appointed probationary engraver to the mint in 1811, and soon after engraved his medal commemorative of the peace, and his Manchester Pitt medal. In 1815 he was appointed chief engraver to the mint; but he sank into ill-health, and died at Hastings on September 22, 1817, at the age of twenty-five.

A memoir of Wyon, with a list of his works, appeared in the Gentleman's Magazine for February 1818. His younger brother, Benjamin Wyon (1802-1858), and his nephews, Joseph Shepherd Wyon (1836-1873) and Alfred Benjamin Wyon (1837-1884), were also well-known medallists. They successively held the appointment of chief engraver of Her Majesty's seals.

WYON, Wittiam (1795-1851), medallist, cousin of Thomas Wyon, was born at Birmingham in 1795. In 1809 he was apprenticed to his father, a die-sinker. Removing to London, he studied the works of Flaxman, attended the schools of the Royal Academy, and gained a gold medal from the Society of Arts for a copy of the head

of Ceres, and a second for an original group. In 1816 he was appointed assistant engraver to the mint, and in 1828 chief engraver; in 1831 he was elected associate and in 1838 full member of the Royal Academy. He executed coinages for George IV., William IV., and Queen Victoria, the Peninsular, Trafalgar, and Cabul medals, the William TV. coronation medal, and those of many learned societies. He died at Brighton on October 29, 1851. A memoir, with a list of his works, by Nicholas Carlisle, was privately issued in 1837.

WYTTENBACH, Daniez Atpert (1746-1820), a famous classical scholar, was born at Bern, of a family whose nobility and distinction he loved to recall. In par- ticular, he was proud of his descent from Thomas Wytten-bach, professor of theology in Basel at the end of the 15th and beginning of the 16th centuries, who numbered the Reformer Zwingli and other distinguished men among his pupils. Wyttenbach's own father was also a theological professor of considerable note, first at Bern, and then at Marburg. His removal to Marburg, which took place in 1756, was partly due to old associations, for the elder Wyttenbach had studied there under the famous Christian Wolff, and embodied the philosophical principles-of his master in his own theological teaching. Soon after the Wyttenbachs settled in Germany the great war broke out, and the region around Marburg suffered severely, so that the scenes and excitement of military life must have powerfully affected the growth of the boy's somewhat sensitive character. After a careful preliminary education, partly in the schools of Bern and Marburg, partly by private tutors, and always under the eye of a severe but conscientious and affectionate father, young Wyttenbach entered at the age of fourteen the university of Marburg, and passed through a four years' course there. His parents intended that he should become a Lutheran pastor. The first two years were given up to general education, principally to mathematics, ' philology," and history. The professor of mathematics, Spangenberg, acquired great influence over young Wyttenbach. He is said to have taught his subject with great clearness, and with equal seriousness and piety, often referring to God as the supreme mathematician, who had constructed all things by number, measure, and weight. " Philology" in the German univer- sities of that age meant Hebrew and Greek. These two languages were generally handled by the same professor, and were taught almost solely to

theological students. Wyttenbach's university course at Marburg was troubled about the middle of the time by mental unrest, due to the fascination exercised over him by Bunyan's Pilgrim's Pro- gress, Like Bunyan himself, he believed that he was doomed to perdition, and that he had committed the inex- piable sin against the Holy Ghost. The disorder was cured by Spangenberg, The principal study of the third year was metaphysics, which took Wyttenbach entirely captive. The fourth aud last year was to be devoted to theology and Christian dogma. Wyttenbach had hitherto submitted passively to his father's wishes concerning his career, in the hope that some unexpected occurrence might set him free. But he now turned away from theological lectures, and privately devoted his time to the task of deepening and extending his knowledge of Greek literature. His father was wise enough to leave him to follow his own bent. To use Wyttenbach's own words, he looked up to every Greek book as a temple of wisdom. But the struggle for knowledge was hard, and taxed all his powers, He possessed at the time, as he tells us, no more acquaint- ance with Greek than his own pupils at a later time could acquire from him during four months' study. He was almost entirely without equipment beyond the bare texts of the authors. Each author only yielded after a pro-

tracted siege. But Wyttenbach was undaunted, and four years' persistent study gave him a knowledge of Greek such as few Germans of that time possessed. His love for philosophy carried him towards the Greek philosophers, especially Plato. He describes himself as walking about the meadows near Marburg, conning portions of his text of Plato, which he had taken to pieces for easier carriage. During this period Ruhnken's notes on the Platonic lexicon of 7imzus fell into his hands. Ruhnken was for him al- most a superhuman being, whom he worshipped day and night, and with whom he imagined himself as holding converse in the spirit. Taking up the works of Julian, he emended them on the principles of Ruhnken. When Wyttenbach was twenty-two he determined to seek else- where the aids to study which Marburg could not afford. His father, fully realizing the strength of his son's pure passion for scholarship, permitted and even advised him to seek Heyne at Gottingen. From this teacher he received the utmost kindness and encouragement, and he was

urged by him to dedicate to Ruhnken the first fruits of his scholarship. Wyttenbach therefore set to work on some notes to Julian, Eunapius, and Aristeenetus, and Heyne wrote to Ruhnken to bespeak his favourable consideration for the work. Before it reached him Ruhnken wrote a kind letter to Wyttenbach, which the recipient "read, re-read, and kissed," and another on receipt of the tract, in which the great scholar declared that he had not looked to find in Germany such knowledge of Greek, such power of criticism, and such mature judgment, especially in one so young. Wyttenbach was now able with boldness to devote himself to the career of a scholar. He studied with ardour the works of the great scholars of the Nether- lands, and in his morning and evening petitions prayed that it might be given him to see Valckenaer and Ruhnken in the flesh, By Heyne's advice, he now worked hard at Latin, which he knew far less thoroughly than Greek, and we soon find Heyne praising his progress in Latin style to both Ruhnken and Valckenaer. He now wrote to ask their advice about his scheme of coming to the Netherlands to follow the profession of a scholar. Ruhnken strongly exhorted Wyttenbach to follow his own example, for he too had been designed by his parents for the Christian ministry in Germany, but had settled at Leyden on the invitation of Hemsterhuis. Valckenaer's answer was to the same effect, but he added that Wyttenbach's letter would have been pleasanter to him had it been free from excessive compliments. These letters were forwarded to the elder Wyttenbach, with a strong recommendation from Heyne. The old man had been himself in Leyden in his youth, and entertained an admiration for the scholarship of the Netherlands; so his consent was easily won. Young Wyttenbach reached Leyden in 1770. According to his own description, he approached the gates of the city with a feeling of religious awe such as might have passed over an ancient visitant to Athens and the Acropolis. As he neared Ruhnken's door, the words of Homer "surely there is some god within" were in his mind. He was delighted to find the great man entirely free from the pomposity and assumption which had made many of the German professors disagreeable to him. A year was spent with great contentment, in learning the language of the people, in attending the lectures of the great "duumviri" of Leyden, and in collating MSS. of Plutarch. At the end of 1771 a professor was wanted at Amsterdam for the College of the Remonstrants. By the recommendation of Ruhnken, Wyttenbach obtained the chair, which he

filled with great success for eight years. His lectures took a wide range. Those on Greek were repeated also to the students of the university of Amsterdam (the " Atheneum"), In 1775 a visit was made to Paris, which was fruitful both of new

friendships and of progress in study. About this time, on the advice of Ruhnken, Wyttenbach began the issue of his Bibliotheca Critica, which appeared at intervals for the next thirty years. The object professed in the preface was to help in rescuing classical studies from the neglect into which they had fallen, by creating an interest in new works of merit, through critical notices, embody- ing the results of original research by the writer himself. Tt was in fact a kind of critical review written by one man. The methods of criticism employed were in the main those established by Hemsterhuis, and carried on by Valckenaer and Ruhnken, and the publication met with acceptance from the learned all over Europe. In 1777 the younger Burmann (' Burmannus Secundus ") retired from his professorship at the Atheneum, and Wyttenbach hoped to succeed him. When another received the appoint- ment, he was sorely discouraged. Only his regard for Ruhnken and for Dutch freedom (in his own words "Ruhnkeni et Batavee libertatis cogitatio") kept him in Holland. For fear of losing him, the authorities at Amsterdam nominated him in 1779 professor of philosophy. Some of his lectures given in this capacity were worked up for publication ; in particular a treatise on logic belongs to this period. In philosophy Wyttenbach never shook off the influence of Woltf, and the Kantians were irate because he failed to appreciate their master. In 1785 Toll, Burmann's successor, resigned, and Wyttenbach was at once appointed to succeed him. His full title was " pro- fessor of history and eloquence and Greek and Latin liter- ature." Hehad hardly got to work in his new office when Valckenaer died, and he received a call to Leyden. Greatly to Ruhnken's disappointment, he declined to abandon the dnties he had so recently undertaken. In 1787 began the internal commotions in Holland, afterwards to be aggra- vated by foreign interference. Scarcely during the re- maining thirty-three years of Wyttenbach's life was there a moment of peace in the land. He held entirely aloof from factions, and yearned continually after quiet and

reconciliation. About this time two requests were made to him for an edition of the Moralia of Plutarch, for which a recension of the tract 'De sera numinis vindicta" had marked him out in the eyes of scholars. One request came from the famous '"Societas Bipontina," the other from the delegates of the Clarendon Press at Oxford. Wyttenbach, influenced at once by the reputation of the university, and by the liberality of the Oxonians in tendering him assistance of different kinds, declined the offer of the Bipontine Society,—very fortunately, since their press was soon destroyed by the French. 'The fortunes of Wyttenbach's edition curiously illustrate the text '"habent sua fata libelli." The first portion was safely conveyed to Oxford in 1794. Then war broke out between Holland and Great Britain. Randolph, Wyttenbach's Oxford correspondent, advised that the next portion should be sent through the British ambassador at Hamburg, and the MS. was duly consigned to him "in a little chest well pro- tected by pitch." After sending Randolph a number of letters without getting any answer, Wyttenbach in disgust put all thought of the edition from him, and a shudder ran throngh his frame whenever Plutarch was mentioned. At last, after simultaneous letters had been despatched to a good many delegates of the Clarendon Press, the missing box was discovered in a forgotten corner at Hamburg, where it had lain for two years and a half. The work was finally completed in 1805. Meanwhile Wyttenbach received repeated invitations to leave Amsterdam, which were refused. One came from his native city Bern, another from Leyden, where vacancies had been created by the refusal of professors to swear allegiance to the new Dutch republic set up in 1795, in which Wyttenbach had

acquiesced. But he only left Amsterdam in 1799, when on Ruhnken's death he succeeded him at Leyden. Even then his chief object in removing was to facilitate an arrangement by which the necessities of his old master's family might be relieved. His removal came too late in life, and he was never so happy at Leyden as he had been at Amsterdam. Before long appeared the ever-delightful Lnfe of Dad Ruhnken. Though written in Latin, this biography deserves to rank high in the modern literature of its class. It is composed in a style that is lucid, flowing, and graceful, not

imitated from any one ancient author, but (a few grammatical matters apart) such as we can inlagine that some gifted Roman of the classical time might well have struck out for himself. One of Ruhnken's friends called it "a Milesian tale," partly from the fascin- ation of the style, and partly because the book often took such a wide range that Ruhnken was lost amid extended observations springing out of his relation to the classical studies of his age. Of Wyttenbach's life at Leyden there is little to tell. The continual changes in state affairs greatly disorganized the universities of Holland, and Wyttenbach had to work in face of much detraction ; still his success as a teacher was very great. In 1805 he narrowly escaped with his life from the great gunpowder explosion, which killed 150 people, among them the Greek scholar Luzac, Wyttenbach's colleague in the university. One of Wyttenbach's letters gives a vivid account of the disaster. During the last years of his life he suffered severely from illness and became nearly blind. After the conclusion of his edition of Plutarch's MJoralia in 1805, the only important work he was able to publish was his well-known edition of Plato's Phzdo. Many honours were conferred upon him both at home and abroad, and in particular he was made a member of the French Institute. Shortly before his death, he obtained the licence of the

| king of Holland to marry his sister's daughter, Johanna

Gallien, who had for twenty years devoted herself to him as housekeeper, secretary, and aider in his studies. The sole object of the marriage was to secure for her a_ better provision after her husband's death, because as the widow of a professor she would be entitled toa pension. Johanna Gallien was a woman of remarkable culture and ability, and wrote works held in great repute at that time. On the festival of the tercentenary of the foundation of the university of Marburg, celebrated in 1827, the degree of doctor was conferred upon her. Wyttenbach died of apoplexy in 1820, and he was buried in the garden of his country house near Amsterdam, within sight, as he noted, of the dwellings of Descartes and Boerhaave.

Although his work can hardly be set on the same level as that of Hemsterhuis, Valckcnaer, and Ruhnken, yet he was a very eminent exponent of the sound methods of criticism which they established. These

four men, more than any others after Bentley, laid the foundations of Greek scholarship as it exists to-day. The precise study of grammar, syntax, and style, and the careful criticism of texts by the light of the best manuscript evidence, were upheld by these scholars in the Netherlands when they were almost entirely neglected elsewhere on the Continent, and were only pursued with partial success in England. Wyttenbach may fairly be regarded as closing a great period in the history of scholarship. He lived indeed to see the new birth of German classical learning, but his work was donc, and he was unaffected by it. Wyttenbach's criticism was less rigorons, precise, and masterly, but perhaps more sensitive and sympathetic than that of his great predecessors in the Netherlands. In aetual acquaintance with the philosophical writings of the ancients, he has probably never been surpassed. In character he was upright and simple-minded, but shy and retiring, and often failed to make himself appreciated. His life was not passed without strife, but his few friends were warmly attached to him, and his many pupils were for the most part his cnthusiastie admirers. Wyttenbach's biography was written in a somewhat dry and lifeless manner by Mahne, one of his pupils, who also published some of his letters. His Opuscula, other than those published in the Bibliotheca Critica, were collected in two volumes (Leyden, 1823). @. S2R9)

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*represents the Pheenician letter Samekh, to which the *% old Ionian %& is singularly close in form. This form is familiar to Greek students, because it belongs to the alphabet that superseded the alphabet of the Eubcean type which was first in use at Athens. But the Eubcean form of the letter was + (see Roehl, [.G.A., No. 372) ; and this form went with the Eubcean alphabet of Chalcis to the western Hellenic world, and passed in Italy into the form X, which survives with us. The history of the symbol in Italy is not, however, perfectly clear, because in the extremely archaic alphabets of Czere and Formello we find not only + but also a symbol &, and this has the place of Xt in the Jonian alphabet, whereas + stands after U, instead of in its proper place, which has been thus usurped by*

this huge and otherwise unknown intruder. There would be no difficulty in supposing that + is only a curtailed portion of the fuller form, and that the two survived for a time side by side in the alphabet, perhaps with some differ- entiation of value, were it not that this is inconsistent with the ultimate derivation of the Italic alphabet from Chalcis, where the large form certainly does not appear. 'The name Xt (ksi) is clearly Greek, not, like the names of the letters in general, borrowed from the Pheenician. It is obviously modelled upon Psi, just as Psi was itself modelled upon Pi. The value of the sound in Phcenician was probably a strong sibilant, with a weak guttural preceding. In the old inscrip- tions of the Aigean Islands —Thera, Naxos, &c.—we find a double symbol KM (z.e., &s); in Naxos we find also XZ and 8 (z.e., hs), which indicates a guttural breathing before the s; andin old Attic inscriptions also we find X®.

But this same symbol X had another very different value in Greece from fs, and by this value, 7.¢c., a guttural aspirate, £h or ch, it is familiar to Greek students under the name Chi. This value is confined to alphabets of the Ionian type. In the islands we find KQ or KH, also § at Thera, digraphs being employed in the same manner as for ks and ps. This same guttural sound is represented in alphabets of the Eubcean type under the form Y or , which appears naturally in the Cere alphabet, but in the derived Italian alphabets was retained by the Etruscan only. In Greece it was found in Beotia and the Pelo- ponnesus: ¢.g., it appears on the tripod at Delphi set up by the Lacedemonians to commemorate the victory of Plateeze. But in the Ionic alphabet alone this same symbol has a totally different value, to wit, ps, and to this value the Greeks gave the name Psi. It is noteworthy that the old Attic way of writing this double sound was 2. The origin of this second X and that of its companion Y is very uncertain. The Attic writings above mentioned, and the of Thera, give colour to the idea that X and ® may be survivals of a ruder alphabet, superseded by the Phoenician, with the values & and p. On the other hand, it does not seem impossible that Y, with the value ch, may be a descendant of the useless $ (koppa), obtained by opening out the circle (Taylor, Alphabet, ii. 93); but the same writer maintains that X is a variation of K, which seems very improbable. It is at

least as credible that it is a variant of Samekh, in which the guttural element of the original complex sound superseded the sibilant.

There is nothing noteworthy in the history of # in English. In French, when medial, it has generally passed into ss, as in lazsser (from laxare); and it has the same sound, even when written, as in soixante. It is frequently found at the end of words owing to a mis-writing, the contraction for final ws having been confounded with it,

las in plurals, yeux, animaux, &c., where the uw has been added again, also in époux (esponsus), faux (falsus), roux (russus), &c. Not unnaturally the x has. been substituted still further, as in prox; in other cases, like croix, we have probably a learned imitation of the Latin. Italian also substitutes ss for x, as in massemo for maximus, lussuria, &c. ,On « in Spanish, see vol. xxii. p. 350.

XALAPA. See Janapa.

XANTHUS, an ancient city of Lycta (¢.v.), on the river Xanthus, about 8 miles above its mouth. It is chiefly memorable in history for its two sieges, and the desperate but unavailing resistance made on both occasions. The first siege was by the Persian general Harpagus (see vol. xviii. p. 566), when the acropolis was burned and the inhabitants, with all their possessions, perished (Herod., i. 176). The city was afterwards rebuilt; and in 42 B.c. it was besieged by the Romans under Brutus. It was taken by storm and set on fire; and the inhabitants, refusing to surrender, all perished in the flames. During its prosper- ity, Xanthus contained many fine temples and other build- ings, extensive remains of which, in excellent preservation, were discovered by Sir C. Fellows (Lxcursion in Asia Minor, 1839). A large collection of marbles, chiefly sepulchral, from Xanthus is now in the British Museum.

*XAVIER, Francisco (1506-1552), surnamed the ** Apostle of the Indies," was the youngest son of Juan de Jasso, privy councillor to Jean d'Albret, king of Navarre, and his wife Maria Azpilcueta Xavier, sole heiress of two noble Navarrese families. He was born at his mother's castle of Xavero or Xavier, at the foot of the Pyrenees and close to the little town of Sanguesa, on 7th April 1506, according to a family register, though his earlier*

biographers fix his birth in 1497. Following a Spanish custom of the time, which left the surname of either parent optional with children, he was called by his mother's family name, and grew up tall, strong, healthy, and active both in mind and body, with a lively, cheerful disposition. He showed no taste, however, for the career of arms, and early dis- closed a preference for literary pursuits. His father accordingly strained his slender resources to send him, in 1524, to the university of Paris, then much frequented by Spaniards, where he entered the College of St Barbara, and made such rapid progress that he was appointed in 1528 lecturer in Aristotelian philosophy at the Collége de Beau- vais. In 1530 he took his degree as master of arts. The same year which saw his nomination as lecturer at the university saw also the arrival there of the man who was to mould his destiny and that of his chamber-mate Pierre le Fevre, namely, Ignatius Loyola, even then meditating the foundation of his celebrated institute (see JEsurrs, vol. xill. p. 652). Ignatius speedily recognized in Xavier the qualities which made him the first missionary of his time, —and set himself to win him as an associate in his vast enterprise. Xavier, after a protracted resistance, yielded to the spell, and was one of the little band of seven persons, including Loyola himself, who took the original Jesuit vows and founded the company, on 15th August 1534, in the crypt of Notre Dame de Montmartre. They continued in Paris for two years longer, though there is some uncertainty whether Xavier retained his chair; but on 15th November 1536 they started for Italy, to concert with Ignatius (then in Spain, but purposing to join them) plans for a mission to convert the Moslems of Palestine. About Epiphany-tide 1537, after a journey attended with much fatigue and some danger, owing to the disturbed

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posture of political affairs, they arrived in Venice, where they found Ignatius awaiting them. As some months must needs elapse before they could sail for the Holy Land, Ignatius determined that the time should be spent partly in hospital work at Venice and later in the journey to Rome, there to obtain their credentials, Accordingly, Xavier devoted himself for

nine weeks to the care of the patients in the hospital for incurables, at the end of which time he set out with eight companions for Rome, where Pope Paul IIT. received them favourably, sanctioned their enterprise, and gave them facilities for obtaining ordina- tion. Returning to Venice, Xavier was ordained priest on Midsummer Day 1537; but the outbreak of war between Venice and Turkey put an end to the Palestine expedition. Hereupon the companions agreed to disperse for a twelve- month's home mission work in the Italian cities, and Boba- dilla and Xavier betook themselves, first to Monselice, thence to Bologna, where they remained till summoned to Rome by Ignatius at the close of 1538, to consider his plans for erecting the company into a religious order, with a formal constitution under papal sanction. 'The draft rules were signed by the whole number on 15th April

1539, though it was not till 1540 that the pope's confirma-

tion was given, nor was it published till 1541. While the remaining members dispersed anew for work in various parts of Italy, Ignatius retained Xavier at Rome as secret- ary to the new institute. Meanwhile John IIL, king of Portugal, had resolved on sending a mission to his East Indian dominions, and, at the instance of his minister Govea, applied through his envoy Pedro de Mascarenhas to the pope for six Jesuits to undertake the task. Ignatius could spare but two, and chose Rodriguez and Bobadilla for the purpose ; and the former set out at once for Lisbon to confer with the king. Bobadilla, sent for to Rome, arrived there just before Mascarenhas was about to depart, but fell too ill to respond to the call made on him. Hereupon Ignatius on 15th March 1540 told Xavier to leave Rome the next day with Mascarenhas, in order to join Rodriguez in the Indian mission. Xavier complied, merely waiting long enough to obtain the pope's benediction, and set out for Lisbon, where he was presented to the king, and soon won his entire confidence, attested notably by procuring for him from the pope four briefs, one of them appointing him papal nuncio in the Indies. On 7th April 1541, his thirty-fifth birthday, he sailed from Lisbon with Martin Alphonso de Souza, governor of India, and, refusing all accommodations for the voyage offered him, except a few books and some clotliing, lived amongst the common sailors on board, ministering to their religious and temporal

needs, especially during an outbreak of scurvy. After five months' voyage the ship reached Mozambique, where the captain resolved to winter, and Xavier was prostrated with a severe attack of fever. When the voyage was resumed, the ship touched at the Mohammedan town of Melinde, whose sultan told Xavier of the marked decline of Islam. But neither there nor at the island of Socotra, the next point of arrival, where Christianity was equally declining, was the missionary able to remain long enough to attempt any work ; and he finally reached Goa on 6th May 1542. Exhibiting his brief to Joao d' Albuquerque, bishop of Goa, he asked his permission to officiate in the diocese, and at once began a mission, walking through the streets ringing a small bell, and telling all those attracted by its sound to come themselves, and send their children and servants, to the " Christian doctrine" or catechetical instruc- tion in the principal church. He spent five months actively employed in Goa, where he is stated to have effected much reformation in morals, and then turned his attention to

the fishery coast, extending from Cape Comorin to the:

Paumbum Pass, where he had heard that the Paravas, a

tribe engaged in the pearl-fishery, had relapsed into heathen- ism after having professed Christianity. He laboured assiduously amongst them for fifteen months, and at the end of 1543 returned to Goa to procure colleagues for the mission. 'Travancore was his next field of action, and there he is said to have succeeded in founding no fewer than forty- five Christian settlements, each with numerous converts. It is to be noted that his own letters contain, both at this time and later on, express disproof of his possession of that miraculous gift of tongues with which he was credited even in his lifetime, and which is attributed to hin in the Breviary office for his festival. Not only was he obliged to employ interpreters, but he relates that in their absence he was compelled to use signs only, and he never appears to have displayed any special aptitude for acquiring new languages. He sent a missionary to the isle of Manaar, and himself visited Ceylon, where he proved unsuccessful in an effort to invoke Portuguese interference in a dynastic dispute, and betook himself thence to Meliapur, the tradi- tionary tomb of St Thomas the apostle, which he reached in

April 1544, continuing there four months. His next sphere of active work was Malacca, which he reached on 25th September 1545, and where he remained another four months, but had comparatively little success, and abandoned it at last as wholly intractable. While there he addressed a letter to King John of Portugal, urging him to set up the Inquisition in Goa to repress Judaism, and was readily listened to, although the actual erection of the tribunal did not take place till 1560, some years after his own death. After a missionary expedition to Amboyna and other isles of the Molucca group, he returned to Malacca in July 1547, and found three Jesuit recruits from Europe awaiting him. An attack upon Malacca by the sultan of Acheen, which the governor was disinclined to punish, aroused the warlike temper which slumbered in Xavier's breast, and he compelled the organization of an expedition to chastise the invaders, which proved a triumph and much increased his local influence. While in Malacca ho met one Han-Siro, a Japanese exile (known to the bio- graphies as Anger), whose conversation fired him with zeal for the conversion of Japan. But he first paid a series of visits to the scenes of his former labours, and then, return- ing to Malacca, took ship for Japan, accoinpanied by Han- Siro, now known as Paul of the Holy Faith. After a perilous voyage they reached Kagoshima, at the south of Kiusiu, the southernmost of the larger Japanese islands, and in the territory of the daimio of Satsuma. Kago- shima was Han-Siro's birthplace, and he was himself heartily welcomed by his friends, whom he induced to extend their good-will to his companions. The daimio, who desired to secure the Portuguese trade, was friendly at first; but, finding that the merchant vessels preferred the safer anchorage of Firando (or Hirado) far to the north of his fief, he withdrew his permission to preach and threatened converts with the penalty of death. Xavier judged it well to move elsewhither, and travelled on foot to Firando, making some converts on the road, aud prov- ing far more successful at Firando itself than in Kagoshima. Thence he proceeded to the capital of the empire, the city then known as Miako, subsequently as Kioto, and now as Saikio or "western capital." But the mikados or emperors had been little more than puppets under the control of the shoguns or hereditary commanders-in-chief for some centuries before this time, so that Xavier judged that he could work more effectually at the courts of the great daimios than at that of their nominal sovereign. He also noticed that asceticism and poverty

had no such attractive power in Japan as they had exercised in India, and deter- mined to try the effect of some measure of pomp and dis- play on his return from Miako. Making but a brief stay

at Firando, he went to Amanguchi (Yamaguchi), capital of Suwo, and there presented himself to the daimio in some state, bringing him valuable presents. He was allowed to preach, and had some success, which encouraged him to proceed to Fucheo, capital of the fief of Bungo (Bugo), where his mission prospered more than anywhere else in Japan ; and, feeling that he could now safely leave the work in other hands, he quitted that empire in 1551, in- tending to attempt next the conversion of China. On board the "Santa Cruz," the vessel in which he sailed to Malacca, he discussed this project with Diego Pereira, the captain, and devised the plan of persuading the viceroy of Portuguese India to despatch an embassy to China, in whose train he might enter, in despite of the law which then excluded foreigners from that empire. He reached Goa in February 1552, and after settling some disputes which had arisen in his absence obtained from the viceroy consent to the plan of a Chinese embassy and to the nomination of Pereira as envoy. Large sums for the necessary expenses were contributed by the treasury, by Pereira himself, and by subscriptions from private persons interested in the missionary part of the scheme. Xavier left India on 25th April 1552 and betook himself to Malacca, there to meet Pereira and to re-embark on the "Santa Cruz." But Alvaro d' Ataide, governor of Malacca, had a private grudge against Pereira, and besides desired the Chinese embassy for himself, and therefore threw diffi- culties in the way of the expedition, though Xavier, anticipating something of the kind, had procured for him the high office of captaincy of the neighbouring seas, and had also provided himself with stringent orders from the viceroy for the furtherance of his object, with threats of punishment for disobedience. Ataide, however, paid no attention to them, and laid an embargo on the "Santa Cruz." Xavier, who with characteristic modesty had kept his dignity as papal nuncio private (save for exhibit- ing the brief to the bishop at Goa on his first arrival in India), determined to avail himself of it now, and desired the vicar-general of Malacca to inform the governor, and to remind him that such

as impeded a nuncio in the dis- charge of his office were subject to excommunication by the pope himself. Ataide paid no more regard to the papal brief than he had done to the viceroy's letter, and even charged Xavier with having forged it,—if not both docu- ments,—while the people of Malacca sided with him against Xavier and Pereira. At last, however, he agreed to a com- promise. The embassy was stopped and Pereira detained, while some of the governor's people were substituted for as many of the crew of the "Santa Cruz," in which Xavier and two companions were allowed to proceed. The vicar- general asked him to take formal leave of the governor; but he refused, saying that they would meet no more till the day of judgment, when Ataide must give account for his resistance to the spread of the gospel, and, shaking the dust of Malacca from his shoes, he embarked 16th July 1552. After a short stay at Singapore, whence he de- spatched several letters to India and Europe, the ship at the end of August 1552 reached San-chan (Chang-chuang), an island at no great distance from Canton, which served as port and rendezvous for Europeans, not then admitted to trade directly with China. Xavier was seized with fever soon after his arrival, and was, in addition, delayed by the failure of the interpreter he had engaged, as well as by the reluctance of the Portuguese to attempt the voyage to Canton for the purpose of landing him. He arranged for his passage in a Chinese junk and had made all other preparations for starting, when he was again attacked by fever, and died on 2d December 1552. He was buried close to the cabin where he had died, but his body was later transferred to Malacca, and thence to Goa, where it

.purity, integrity, and benevolence.

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still lies. He was beatified by Paul V. in 1619 and canonized by Gregory XV. in 1621.

The chicf authorities for the life of St Francis Xavier are De Vita Sancti Francisct Xaverti Libri VI., by the Jesuit Torsellino (Tur-

'sellinus), Rome, 1596, of which there is a vigorous English version,

Paris, 1632; another biography by Lucena, Lisbon, 1600; his Letters, published in seven books by the Jesuit Poussines (Pos- sinus), Rome, 1667 ; a fuller collection of the Letters by another Jesuit, Menchacha, Bologna, 1795, translated into French by Léon Pagés, Paris, 1854 ; Faria y Souza, Asia Portuguesa, Lisbon, 1655 ; Bouhours, Vie de St Francois Xavier, Paris, 1684; Bartoli, Asia, part i, Rome, 1653; H. J. Coleridge, Life and Letters of St Francis Xavier, London, 1872; while a graphic sketch of the more striking episodes is to be found in Sir James Stephen's article on the " Founders of Jesuitism," reprinted in his Hssays in Ecclesi- astical Biography, London, 1849. (Re Es)

XENTA, a city of the United States, the county seat of Greene county, Ohio, is situated in the midst of a rich agricultural region, and on the Pittsburg, Cincinnati, and St Louis and the Dayton, Fort Wayne, and Chicago Rail- ways. Itis one of the oldest cities of Ohio, having been laid out in 1803. It is the seat of the Methodist Episco- pal Xenia college (1850), a Presbyterian theological semi- nary (1794), and Wilberforce university (1863), this last designed for the education of coloured youth of both sexes. The population in 1880 was 7026.

XENOCRATES of Chalcedon, scholarch or rector of the Academy from 339 to 314 B.c., was born in 396. Removing to Athens in early youth, he became the pupil of the Socratic /Mschines, but presently joined himself to Plato, whom he attended to Sicily in 361. Upon his master's death (347 B.c.), in company with Aristotle he paid a visit to Hermias at Atarneus. In 339, Aristotle being then in Macedonia, Xenocrates succeeded Speusippus in the presidency of the school, defeating his competitors Menedemus and Heracleides by a few votes. On three occasions he was member of an Athenian legation, once to Philip, twice to Antipater. Soon after the death of Demosthenes in 322, resenting the Macedonian influence then dominant at Athens, Xenocrates declined the citizen- ship offered to him at the instance of Phocion, and, being unable to pay the tax levied upon resident aliens, was, it is said, sold, or on the point of being sold, into slavery. He died in 314, and was succeeded as scholarch by Polemon, whom he had reclaimed from a life of profligacy. Besides Polemon, the statesman Phocion, Cheron tyrant of Pellene, the Academic Crantor, the Stoic Zeno, and Epicurus are alleged to have frequented his lectures.

Xenocrates's earnestness and strength of character won for him universal respect, and stories were remembered in proof of his Wanting in quickness of apprehension and in native grace, he made up for these deficiencies by a conscientious love of truth and an untiring industry. Less original than Speusippus, he adhered more closely to the letter of Platonic doctrinc, and is accounted the typical representative of the Old Academy. In his writings, which were numerous, he seems to have covered nearly the whole of the Academic programme ; but metaphysics and ethics were the subjects which principally engaged his thoughts. He is said to have invented, or at least to have emphasized, the tripartition of philosophy under the heads of physic, dialectic, and ethic.

In his ontology Xenocrates built upon Plato's foundations: that is to say, with Plato he postulated ideas or numbers to be the causes of nature's organic products, and derived these ideas or numbers from unity (which is active) and plurality (which is pass- ive). But he put upon this fundamental dogma a new interpreta- tion. According to Plato, existence is mind pluralized : mind as a unity, ¢.¢., universal mind, apprehends its own plurality as eternal, immutable, intelligible ideas; and mind as a plurality, «e., particular mind, perceives its own plurality as transitory, mutable, sensible things. The idea, inasmuch as it is a law of universal mind, which in particular minds produces aggregates of sensations called things, is a "determinant" (wépas éxov), and as sueh is styled " quantity " (ooév) and perhaps " number" (dp:Oués) ; but the ideal numbers are distinet from arithmetical numbers, and the elements of ideal numbers from the elements of arithmetical num- bers. Xenocrates, however, failing, as it would seem, to grasp the idealism which was the metaphysical foundation of Plato's theory

of natural kinds, took for his principles arithmetical unity and plurality, and accordingly identified ideal numbers with arithmetical numbers. In thus reverting to the crudities of certain Pytha- goreans he laid himself open to the criticisms of Aristotle, who, in his Metaphysics, recognizing amongst contemporary Platonists three principal groups—(1) those who, like Plato, distinguished mathematical and ideal numbers ; (2) those who,

like Xenocrates, identified them ; and (3) those who, like Speusippus, postulated mathematical numbers only—has much to say against the Xeno- crateau interpretation of the thcory, and in particular points out that, if the ideas are numbers made up of arithmetical units, they not only cease to be principles but also become subject to arithmetical operations. Xenocrates's theory of inorganic nature was substanti- ally identical with the theory of the elements which is propounded in the Timzus, 58 C sq. Nevertheless, holding that every dimen- sion has a principle of its own, he rejected the derivation of the elemental solids—pyramid, octahedron, icosahedron, and cube— from triangular surfaces, and in so far approximated to atomism. Moreover, to the tetrad of simple elements—namely, fire, air, water, carth—he added the wéumrry ovcla, ether.

His cosmology, which is drawn almost entirely from the Timexus, and, as he intimated, is not to be regarded as a cosmogony, should be studied in connexion with his psychology. Soul is a self-mov- ing number, derived from the two fundamental principles, unity (&) and plurality (vas dépicros), whence it obtains its powers of rest and motion. It is incorporeal, and may exist apart from body. The irrational soul, as well as the rational soul, is immortal. The universe, the heavenly bodies, man, animals, and presumably plants, are each of them endowed with a soul, which is more or less perfect according to the position which it occupies in the descend- ing scale of creation. With this Platonic philosopheme Xenocrates combines the eurrent theology, identifying the universe and the heavenly bodies with the greater gods, and reserving a place be- tween them and mortals for the lesser divinities.

If the extant authorities are to be trusted, Xenocrates recognized three grades of eognition, each appropriated to a region of its own, —namely, knowledge, opinion, and sensation, having for their re- spective objects supra-celestials or ideas, celestials or stars, and infra- celestials or things. Even here the mythological tendency displays itself, —voynrd, dofacrd, and aic@nrd being severally committed to Atropos, Lachesis, and Clotho. Of Xenocrates's logic we know only that with Plato he distinguished 76 xa@' atré and 7d mpés Ti, re- jecting the Aristotelian list of ten categorics as a superfluity.

Valuing philosophy chiefly for its influence upon conduct, Xeno- crates bestowed especial attention upon ethics. The catalogue of his works shows that he had written largely upon this subject ; but the indications of doctrine which have survived are scanty, and may be summed up in a few sentences. Things are goods, ills, or neutrals. Goods are of three sorts—mental, bodily, external ; but of all goods virtue is incomparably the greatest. Happiness con- sists in the practice of virtue, the requisite powers and opportunities being presupposed. Hence the virtuous man is always happy, though his happiness cannot be perfect unless he is adequately provided with personal aud extraneous advantages. The virtuous man is pure, not in act only, butalso in heart. To the attainment of virtue the best help is philosophy; for the philosopher does of his own accord what others do under the compulsion of law. Specula- tive wisdom and practical wisdom are to be distinguished. Meagre as these statements are, they suffice to show that in ethics, as else- where, Xenocrates worked npon Platonic lincs, and that in his theory of the relations of external advantages to happiness, as well as in the technicalities of his exposition, he closely resembled Aristotle.

Xenocrates was not in any sense a great thinker. His meta- physic was a travesty rather than a reproduction of that of his master. His ethic had little which was distinctive. But his austere life and commanding personality made him an effective teacher, and his influence, kept alive by his pnpils Polemon and Crates, ceased only when Arcesilaus, the founder of the so-called Second Academy, gave a new direction to the studies of the school.

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XENOPHANES of Colophon, the reputed founder of the Eleatic school of philosophy, is supposed to have been born in the third or fourth decade of the 6th century B.c. An exile from his Ionian home, he resided for a time in Sicily, at Zancle and at Catana, and afterwards estab- lished

himself in southern Italy, at Elea, a Phoczean colony founded in the sixty-first Olympiad (536-533). In one of the extant fragments he speaks of himself as having begun his wanderings sixty-seven years before, when he was twenty-five years of age, so that he was not less than ninety-two when he died. His teaching found expression

in poems, which he recited rhapsodically in the course of his travels. In the more considerable of the elegiac frag- ments which have survived he ridicules the doctrine of the migration of souls (xviii.), asserts the claims of wisdom against the prevalent athleticism, which seemed to him to conduce neither to the good government of states nor to their material prosperity (xix.), reprobates the introduction of Lydian luxury into Colophon (xx.), and recommends the reasonable enjoyment of social pleasures (xxi.), Of the epic fragments the more important are those in which he attacks the "anthropomorphic and anthropopathic poly-theism" of his contemporaries. According to Aristotle, "this first of Eleatic unitarians was not careful to say whether the unity which he postulated was finite or infinite, but, contemplating the whole firmament," (or perhaps "the whole world," for the word ovpavés is ambiguous), "declared that the One is God." Whether Xenophanes was a monotheist, whose assertion of the unity of God suggested to Parmenides the doctrine of the unity of Being, or a pantheist, whose assertion of the unity of God was also a declaration of the unity of Being, so that he anticipated Parmenides,—in other words, whether Xenophanes's teach-ing was purely theological or had also a philosophical significance,—is a question about which authorities have differed and will probably continue to differ. The silence of the extant fragments, which have not one word about the unity of Being, favours the one view ; the voice of anti- quity, which proclaims Xenophanes the founder of Eleati- cism, has been thought to favour the other.

Of Xenophanes's utterances about (1) God, (2) the world, (3) knowledge, the following survive. (1) " There is one God, greatest among gods and men, neither in shape nor in thought like unto mortals. .. . He is all sight, all mind, all ear (7.e., not a com- posite organism). . . . Without an effort

ruleth he all things by thought. . . . He abideth ever in the same place motionless, and it befitteth him not to wander hither and thither. . . . Yet men imagine gods to be born, and to have senscs, and voice, and body, like themselves. . . . Even so the gods of the Ethiopians are swarthy and fiat-nosed, the gods of the Thracians are fair-haired and blue-eyed. . . . Even so Homer and Hesiod attributcd to the gods all that is a shame and a reproach among men—theft, adultery, deceit, and other lawless acts. . . . Even so lions and horses and oxen, if they had hands wherewith to gravc images, would fashion gods after thcir own shapes and make them bodies like to their own. (2) From earth all things are and to earth all things return. . .. From carth and water come all of us… . The sea is the well whence water springeth. . . . Here at our fect is the end of the earth where it reacheth unto air, but, below, its foundations are without end. . . . The rainbow, which men call Iris, is a cloud that is purple and red and yellow. (3) No man hath certainly known, nor shall certainly know, aught of that which I say about the gods and about all things ; for, be that which he saith ever so perfect, yet doth he not know it ; all things are matters of opinion. . . – That which I say is opinion like unto truth. . . . The gods did not reveal all things to mortals in the beginning ; long is the search ere man findeth that which is better."

There is very little secondary evidence to record. " The Eleatic school," says the Stranger in Plato's Sophist, 242 D, " beginning with Xenophanes, and even earlier, starts from the principle of the unity of all things."" Aristotle, in a passage already cited, Jleta- physics, A5,speaks of Xenophanes as the first of the Eleatic unitarians, adding that his monotheism was reached through the contempla- tion of the ovpavés. Theophrastus (in Simplicius's 4d Physica, 5) sums up Xenophanes's teaching in the propositions, "The All is One and the One is God." Timon (in Sext. Empir., Pyrrh., i. 224), ignoring Xenophancs's theology, makes him resolve all things into one and the same unity. The demonstrations of the unity and the attributes of God, with which the treatise De Melisso, Xenophane, et Gorgia (now no longer ascribed to Aristotle or Theophrastus) ac- credits Xenophanes, are plainly framed on the model of Eleatic proofs of the unity and the attributes of the Ent, and must therec- fore be sct aside. The epitomators of a later time add nothing to the testimonies already enumerated.

Thus, whereas in his writings, so far as they are known to us, Xenophanes appears as a theologian protesting against an anthropo- morphic polytheism, the ancients seem to have regarded him asa philosopher asserting the unity of Being. How are we to under- stand these conflicting, though not irreconcilable, testimonies ? According to Zeller, the discrepancy is only apparent. The Greek

gods being the powers of nature personified, pantheism lay nearer to hand than monotheism. Xcnophanes was then a pantheist. Accordingly his assertion of the unity of God was at the same time a declaration of the unity of Being, and in virtue of this declaration he is entitled to rank as the founder of Eleaticism, inasmuch as the philosophy of Parmenides was his forerunner's pantheism divested of its theistic element. This reconciliation of the internal and the external evidence, countenanced as it is by Theophrastus, one of the best-informed of the ancient historians, and approved by Zeller, one of the most acute of the modern critics, is more than plausible ; but there is something to be said on the contrary part. In the first place, it may be doubted whether to a Greek of the 6th century pantheism was nearer than monotheism. Secondly, the external evidence does not bear examination. The Platonic testimony, if it proved anything, would prove too much, namely, that the doctrine of the unity of Being originated, not with Xeno- phanes, but before him ; and, in fact, the passage from the Sophist no more proves that Plato attributed to Xenophanes the philosophy of Parmenides than Theaxtetus, 160 D, proves that Plato attributed to Homer the philosophy of Heraclitus. Again, Aristotle's descrip- tion of Xenophanes as the first of the Eleatie unitarians does not necessarily imply that the unity asserted by Xenophanes was the unity asserted by Parmenides; the phrase, "contemplating the firmament (or the world), he declared that the One is God," leaves it doubtful whether Aristotle attributed to Xenophanes any philosophical theory whatever; and the epithet d-ypocxbrepos dis- courages the belief that Aristotle regarded Xenophanes as the author of a new and important departure. Thirdly, when Xeno- phanes himself says that his theories about gods and about things are not knowledge, that his utterances are not verities but verisi- militudes, and that, so far from

learning things by revelation, man must laboriously seek a better opinion, he plainly renounces the "disinterested pursuit of truth." If then he was indifferent to the problem, he ean hardly be credited with the Eleatic solution. In the judgment of the present writer, Xenophanes was neither a philosopher nor a sceptic. He was not a philosopher, for he despaired of knowledge. He was nota sceptic, if by '"'sceptic" is meant the misologist whose despair of knowledge is the consequence of disappointed endeavour, for he had never hoped. Rather he was a theologian who arrived at his theory of the unity of God by the rejection of the contemporary mythology. But, while he thus stood aloof from philosophy, Xenophanes influenced its de- velopment in two ways: first, his theological monism led the way to the philosophical monism of Parmenides and Zeno; secondly, his assertion that so-called knowledge was in reality no more than opinion taught his successors to distinguish knowledge and opinion, and to assign to each a separate province.

Apart from the old controversy about Xenophanes's relations to philosophy, doubts have recently arisen about his theological posi- tion. In fragments i., xiv., xvi., xxi., &c., he recognizes, thinks Freudenthal, a plurality of deities; whence it is inferred that, besides the One God, most high, perfect, eternal, who, as immanent intelligent cause, unifies the plurality of things, there were also lesser divinities, who govern portions of the universe, being them- selves eternal parts of the one all-embracing Godhead. Whilst it can hardly be allowed that Xenophanes, so far from denying, actu- ally affirms a plurality of gods, it must be conceded to Freudenthal that Xenophanes's polemic was directed against the anthropomor- phic tendencies and the mythological details of the contemporary polythcism rather than against the polythcistic principle, and that, apart from the treatise De Melisso, Xenophane, et Gorgia, now generally discredited, there is no direct evidence to prove him a consistent monotheist. The wisdom of Xenophanes, like the wisdom of the Hebrew Preacher, showed itself, not in a theory of the uni- verse, but in a sorrowful recognition of the nothingness of things and the futility of endeavour. His theism was a declaration not so much of the greatness of God as rather of the littleness of man, His cosmology was an assertion not so much of the immutability of the One as rather of the mutability of the Many. Like Socrates, he was not a philosopher, and did not pretend to be

*one; but, as the reasoned scepticism of Socrates cleared the way for the philo- sophy of Plato, so did Xenophanes's *' abnormis sapientia " for the philosophy of Parmenides.*

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XENOPHON, Greek historian and essayist, was born at Athens about 430 B.c.1 He was a citizen of good position, belonging to the order of the knights. Early in

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1 The story that he was present at the battle of Delium in 424 p. Cr which would carry back the date of his birth to 444 or 443, is now generally rejected, as it is impossible to reconcile it with his own

life he came under the influence of Socrates. In 401 3.c., being invited by his friend Proxenus to join the expedition of the younger Cyrus against his brother, Artaxerxes II.

of Persia, he jumped at the offer, for he was a needy man,

and his prospects at home may not have been very good, as the knights were at this time out of favour from hav- ing supported the Thirty Tyrants. At the suggestion of Socrates Xenophon went to Delphi to consult the oracle ; but his mind was already made up, and he at once crossed to Asia, to Sardis, the place of rendezvous. He joined neither as officer nor as soldier: he went simply to see new countries and peoples out

of a spirit of curiosity and love of excitement. Of the expedition itself he has given a full and detailed account in his Anabasis, or the "Up-Country March." (See Persta, vol. xviii. p. 577.) After the battle of Cunaxa the officers in command of the Greeks were treacherously murdered by the Persian satrap Tissa- phernes, with whom they were negotiating an armistice with a view to a safe return. The army was now in the heart of an unknown country, more than a thousand miles from home and in the presence of a troublesome enemy. It was decided to march northwards up the Tigris valley and make for the shores of the Euxine, on which there were several Greek colonies. Xenophon became the leading spirit of the army; he was elected an officer, and he it was who mainly directed the retreat. To his skill, good temper, and firmness the Greeks seem to have largely owed their safety. He seems indeed to have been an Athenian of the best type, having tact and sympathy, with a singular readiness of resource and a straightforward businesslike eloquence which could both persuade and convince. All through the perils and hardships of the retreat he shared the men's privations. Part of the way lay through the wilds of Kurdistan, where they had to encounter the harassing guerilla attacks of savage mountain tribes, and part through the highlands of Armenia and Georgia. After a five months' march they reached Trapezus (Trebizond) on the Black Sea (February 400 B.c.), having given splendid proof of what Greek discipline and spirit could accomplish. When they reached the Euxine a tendency to demoraliza- tion began to show itself, and even Xenophon almost lost his control over the soldiery. At Cotyora he aspired to found a new colony ; but the idea, not being unanimously accepted, was abandoned, and ultimately Xenophon with his Greeks arrived at Chrysopolis (Scutari) on the Bos- phorus, opposite Byzantium. After a brief period of ser- vice under a Thracian chief, Seuthes, they were finally in- corporated in a Lacedznmionian army which had crossed over into Asia to wage war against the Persian satraps Tissa- phernes and Pharnabazus, Xenophon going with them. Near Pergamum he captured a wealthy Persian nobleman with his family, and the ransom paid for his recovery seems to have been sufficient to provide Xenophon with a fair competency.

On his return to Greece Xenophon served under Agesi- laus, king of Sparta, which state was at this time at the head of the Greek world. With

his native Athens and its general policy and institutions he was not in sympathy. | At Coronea he fought with the Spartans against the Athenians and Thebans, for which his fellow-citizens de- creed his banishment. 'The exile found a home at Scillus in Elis, about two miles from Olympia; there he settled down to indulge his tastes for sport and for literature. It was probably at Scillus that he wrote most of his books ; there too he built and endowed a temple to Artemis, modelled on the great temple at Ephesus. After Sparta's great defeat at Leuctra in 371 3.c., which fatally shattered ps

statements about himself in the Anabasis, implying that in 401 n.e.

he was a comparatively young man,—we may fairly assume not over thirty years of age,

XEN—X IM

its ascendency, Xenophon was driven from his home by the people of Elis. Meantime Sparta and Athens had become allies, and the Athenians repealed the decree which had condemned Xenophon to exile. There is, however, no evidence that he ever returned to his native city. According to the not very trustworthy authority of his biographer (Diogenes Laertius), he made his home at Corinth. He was still living in 357 B.c.;1 but how much

longer he lived we have no means of knowing.

The Anabasis is a work of singular interest, and is brightly and pleasantly written. Xenophon, like Cesar, tells the story in the third person, and there is a straightforward manliness about the

style, with a distinct flavour of a cheerful lightheartedness, which .

at once enlists our sympathies. His description of placcs and of relative distances is very minute and painstaking. The researches of modern travellers attest his general accuracy."

The Cyropxdia, which describes the boyhood and training of Cyrus, hardly answers to its name, being for the most part an account of the beginnings of the Persian empire and of the victori- ous career of Cyrus its founder. But Xenophon had little or nothing to build on except the floating stories and traditions of the East that had gathered round the figure of the great Persian hero-king. The Cyropedia contains in fact the author's own ideas of training and education, as derived conjointly from the teachings of Socrates and his favourite Spartan institutions. A distinct moral purpose, to which literal truth is sacrificed, runs through the work.

The Hellenica, though by no means a first-class historical work, fills a gap by giving the events of the fifty years from 411 to 362 B.c. Thus it includes the downfall of the Athenian empire, the supremacy of Sparta, and the sudden collapse of that power after Leuctra in 371 Bc. It takes up Greek history at the point at which Thucydides's great work abruptly ends. His credit as an historian has been specially impugned, and it has been suggested that he was much more influenced by his political likes and dislikes than by a love of truth. However that may be, there are certainly serious omissions and defects in the work, which greatly detract from its value. At the time he probably wrote it he was no doubt a strong political partisan and a thorough believer in Sparta. But subsequently a change came over him; and, when he described the terrible reverse at Leuctra, he seems to have felt that Sparta's pres- tige had becn deservedly destroyed, and that its downfall was licaven's vengeance on an ungracious and treacherous policy. He always clings to a belief in a divine overruling providence, though in the Hellenica there are unmistakable traces of a pettiness of mind and narrowness of view very far below the dignity of an historian. :

The Memorabilia, or " Recollections of Socrates," is the tribute of an affectionate and admiring disciple who felt that the nobleness of his master's aims and life was his best defence. The work is not a literary masterpiece: it lacks coherence and unity, and the picture it gives of Socrates fails todo him justice. Stillit is an honest piece of work and a labour of love, and, as far as it goes, we may well believe it faithfully describes the philosopher's manner of life and style of conversation. It was the moral and practical side of Socrates's teaching which most

interested Xenophon ; into his abstruse meta- physical speculations he seems to have made no attempt to enter ; for these indeed he had neither taste nor genius. It was the philosophy which aims at "a sound mind in a sound body " which specially suited the robust and healthy mind of Xenophon. Moving within a limited range of ideas, he doubtless gives us " considerably less than the real Socrates, while Plato gives us something more."

Xenophon has left several minor works, some of which are very interesting and give us an insight into the home-life of the Greeks.

The Gconomics, which deals with the management of the house and of the farm, presents a pleasant and amusing picture of the Greek wife and of her home duties. She was to be thoroughly domestic, devoted to her household work, without any intellectual aspiration ; she must keep up her good looks by healthy exercise, not by rouging or painting. There are some good practical remarks on matrimony and on the respective duties of husband and wife; in these it is assumed that providence has endowed each sex with capa- cities peculiar to itself and that the highest happiness is to be found in union and in well-organized cooperation. 'The true sphere of woman is in the faithful and diligent discharge of her home duties; this, above all things, will win her husband's respect and esteem.

In the essays on horsemanship ('Immx#) and hunting (Cynegeticus), Xenophon deals with matters with which he had a thorough

1'In the Hellenics (vi. 4, 37) he mentions Tisiphonus, who succeeded Alexander, tyrant of Phers, in 357 B.c.

2 Major Milligan, in his Wild Life among the Koords, says, " My researches have put beyond doubt the accuracy of his statements, and are of a nature to show the historical, geographical, and ethnological importance which is to be attached to the accounts handed down to posterity by that illustrious writer."

practical acquaintance. In the former he gives rules how to choose a horse, and then tells how it is to be groomed and ridden and generally managed. All this has still great interest for the modern reader. We gather from this little work that the ancient Greeks never used the stirrup, nor had they any idea of providing their horses with iron shoes. The book on hunting deals chiefly with the hare, though the author speaks also of boar-hunting and describes the hounds, tells how they are to be bred and trained, and gives speciinens of suitable names for them. On all this he writes with the zest of an enthusiastic sportsman, and he observes that those uations will be most likely to be successful in war of which the upper classes have a taste for field-sports.

The Hipparchicus explains the duties of a cavalry officer ; it is not, according to our ideas, a very scientific treatise, showing that the art of war was but very imperfectly developed and that the military operations of the Greeks were on a somewhat petty scale. He dwells at some length on the moral qualities which go to the making of a good cavalry officer, and hints very plainly that there must be strict attention to religious duties.

The Agesilaus is a eulogy of the Spartan king, who had two special merits in Xenophon's eyes: he was a rigid disciplinarian and he was particularly attentive to all religious observances. We have a summary of his virtues rather than a good and striking picture of the man himself.

The Hiero works out the line of thought indicated in the story of the Sword of Damocles. It is a protest against the notion that the "tyrant" is a man to be envied, as having more abundant means of happiness than a private person. This is one of the most pleasing of his minor works ; it is cast into the form of a dialogue between Hiero, tyrant of Syracuse, and the lyric poet Simonides.

The Symposium, or " Banquet," is a brilliant little dialogue in which Socrates is the prominent figure. He is represented as "'improving the occasion," which is that of a lively Athenian supper-party, at which there is much drinking, with flute-playing, aud a dancing girl from Syracuse, who amuses the guests with the feats of a professional conjuror. Socrates's table-talk runs through a variety of topics, and winds up with a philosophical disquisition on the superiority of true heavenly love to its

earthly or sensual counterfcit, and with an earnest exhortation to one of the party, who had just won a victory in the public games, to lead a noble life and do his duty to his country.

There are also two short essays on the political constitution of Sparta and Athens, written with a decided bias in favour of the former, which he praises without attempting to criticize. Sparta seems to have presented to Xenophon the best conceivable mixture of monarchy and aristocracy.

In the essay on the Revenues of Athens, he offers suggestions for making Athens less dependent on tribute received from its allies : first, more foreign settlers should be attracted to the city by holding out strong commercial inducements and from these a moderate capi- tation tax should be collected ; secondly, more should be made of the silver mines of Laurium by leasing them out to private capi- talists, who might work them by slaves purchased with public money and hired at a fixed rate by the lessees. But above all, he would have Athens use its influence for the maintenance of peace in the Greek world and for the settlement of questions by diplo- macy, the temple at Delphi being for this purpose an independent centre and supplying a divine sanction.

The Apology, Socrates's defence before his judges, is rather a feeble production, and in the general opinion of modern critics not a genuine work of Xenophon.

The editions both of Xenophon's entire and of his separate works, especially of the Anabasis, are very numerous. A few of the best are enumerated below :— (1) Anabasis, text of L. Dindorf, with notes by J. S. Watson, 1868 ; (2) Memora- bilia, edited, with short notes, by J. R. King, 1874 (Oxford); (3) Hellenics, text of C. G. Cobet, 1862; (4) Cyropedia, from the text of L. Dindorf, with notes by E. H. Barker, 1831. The minor works have been repeatedly edited. Useful editions of the Hiero (London, 1883) and conomics (London, 1884) have been issued by H. A. Holden. There is an English translation of the entire works by various hands, published in 1831; also a French translation, similarly executed, in 1845. To Sir A. Grant's monograph on Xenophon, in Blackwood's " Ancient Classics for English Readers," the present writer is considerably indebted. Gy. Jo B:)

XENOPHON or Epuezsus. See Romance, vol. xx. p.635.

XERES. See JEREZ DE LA FRoNTERA and WINE, p. 607 above.

XERXES (Old Persian Khshaydrshd ; in the book of Esther, Ahaswerus), the name of two Achemenian kings of Persia. Xerxes I., son of Darius Hystaspis and of Atossa, daughter of Cyrus, reigned from 485 to 464 B.c., and is famous for his unsuccessful expedition against Greece (480 B.C.) ; see Persta, vol. xviii. p. 572 sg. Xerxes IL, the son of Artaxerxes J. and grandson of Xerxes I, came to the throne in 424 and was murdered by his brother Secy- dianus after a reign of a month and a half;

XIMENES. See Jimenrs.

XXIV, — g1

The history of this symbol has already been given under U. The three symbols U, V, Y are only differentiations of one original form.

The sound of yin Greek was that of French w in "lune" and German % in "iibel." In Beotian and Laconian Greek the old w-sound was retained; but it was represented by ov, a digraph which had also the value of u in other dia- lects where it arose from phonetic change, ¢.g., in tods (for tévs). The name ¥ yAdv was probably given to distin- guish it from ¥ dca depOdyyou,—that is, the same sound, but denoted by o:, which in the 2d century B.c. was be- ginning to have the value of v; just so € YAdv is opposed to at, or €6ca SiOdyyov, The difference in sound between the full and the modified ~ is this: for the first the lips are rounded as much as possible, and the back part of the tongue is raised towards the palate; for the second the rounding of the lips is the same, but the tongue is in the position for 7, so that in sounding & we are sounding 7 with the lips rounded in addition. This explains the ease with which the 2-sound is produced instead of w% by persons unfamiliar with the latter sound: when an Englishman pronouncing " Miiller " says " Miller," he puts the tongue right for 2 but omits to round the lips as well. This change has been a regular one in our language. There is no doubt that y (¢.e, %) was a sound of Early English (or Anglo- Saxon), as of the other Teutonic languages, in words like "fyr" (fire), "synn" (sin); it was the "'umlaut" of

x, especially when followed in the next syllable by 2 or e; so “burg” has for gen. and dat. “byrig,” orig. “ burges,” “burge.” Butin Middle English y passed into7: thus ‘“f¥r” (sounded as fiir) came to be sounded as ‘‘fir” (feer), and this (as in other cases where i occurs) was diphthongized in com- paratively modern times into “fire” (faior). Thus in the middle of a word y lost its special value; on the other hand, at the beginning of a word it easily passed into the con- sonant y, the value which it has regularly in modern English. This explains the fact that the English language had no symbol for the sound of French w when this sound was re-introduced into England after the Norman Conquest. Accordingly the French symbol as well as the sound was taken : it is found in words like “muse,” “lute,” sounded as “myyz,” “lyyte.”” The yy gradually developed into the zw sound with which we are familiar in “ miiiz,” “iat”; but the spelling remained unchanged. It must have been awkward to have the symbol u representing both the full (native) sound and the modified (French) sound; this was partially obviated by borrowing for the full w-sound the French writing ow: e.g., “his” was written “house,” with- out at first any change of sound; but this was not consist- ently carried out. Much later, at the end of the 16th century, the sound was diphthongized into “haus” (as now), but the spelling (ow) remained. The fact that y and ¢ became indistinguishable led to the use of y at the end of a word instead of 7: thus we write “day” instead of the older “ dai.”

In Early English we find the symbol 3 (which is a modi- fication of the Anglo-Saxon g) used initially with the value of g, and medially (chiefly before ¢) where modern English writes gh, as in laght. . This is due to French scribes, who used the French (z.e., our modern) form of g for the g-sound, and then the 5 for the sound which had been weakened in Anglo-Saxon from g to y, as in 3jeard (our yard) for ori- ginal gard (Norse garth ; in North English Aysgarth and Gatesgarth). About the 15th century this same symbol was mistaken for z, and as such it is still occasionally em- ployed in cursive, when 3 is written instead of z.

YACHOW-FU, a prefectural city in the Chinese province of Sze-cl’uen, is situated in 30° 4’ N. lat. and 103° 4’ E. long., and is a place of some antiquity and note, being first mentioned in history during the Chow dynasty (1122- 255 B.c.). It is prettily placed in a valley surrounded by an

amphitheatre of hills, on the banks of the river Ya. The town is large, populous, and busy, and owes its im- portance to the fact that it stands at the parting of the

"tea and tobacco trade route to Tibet via Tatsien-lu and the cotton trade route to western Yun-nan wa Ningyuen-Fu. Yachow-Fu is the seat also of a considerable silk manu- facture; and in its immediate neighbourhood there exist both coal and iron. The city wall measures 2 miles in circumference, and-is pierced by four gates. The popula- tion is estimated at about 40,000.

YACHTING is the sport of racing in yachts! and boats with sails for money or plate, and also the pastime of cruising for pleasure in sailing or steam vessels. The history of yachting is the history of yacht-racing, inas- much as competition improved yachts just as horse-racing improved horses. It dates from the beginning of the 19th century; for, although there were sailing yachts long before, they were but few, and belonged exclusively to princes and other illustrious personages. Jor instance, in the Anglo-Saxon period Athelstan had presented to him by the king of Norway a magnificent royal vessel, the sails of which were purple and the head and deck wrought with gold, apparently a kind of state barge. Elizabeth had one, and so has every English sovereign since. During her reign a pleasure ship was built (1588) at Cowes, so that the association of that place with the sport goes back three hundred years. In 1660 Charles IJ. was presented by the Dutch with a yacht named the " Mary," until which time the word " yacht" was unknown in England. The Merrie Monarch was fond of sailing, for he designed a yacht of 25 tons called the "Jamie," built at Lambeth in 1662, as well as several others later on. In that year the "Jamie" was matched for £100 against a small Dutch yacht, under the duke of York, from Greenwich to Graves- end and back, and beat her, the king steering part of the time—apparently the first record of a yacht match and of an amateur helmsman.

The first authentic record of a sailing club is in 1720, when the Cork Harbour Water Club, now known as the Royal Cork Yacht Club, was established in Ireland, but the yachts were small. Maitland, in his History of London (1739), mentions sailing and rowing on the Thames as among

the amusements then indulged in; and Strutt, in his Sports and Pastimes (1801), says that the Cumberland Society, consisting of gentlemen partial to this pastime, gave yearly a silver cup to be sailed for in the vicinity of London. The boats usually started from Blackfriars Bridge, went up the Thames to Putney, and returned to Vauxhall, being, no doubt, mere sailing boats and not yachts or decked vessels. From the middle to the end of the 18th century yachting developed very slowly: although matches were sailed at Cowes as far back as 1780, very few yachts of any size, say 35 tons, existed in 1800 there or elsewhere. In 1812 the Royal Yacht Squadron was established by fifty yacht-owners at Cowes and was called the Yacht Club, altered to the Royal Yacht Club in 1820; but no regular regatta was held there until some years later. The yachts of the time were built of heavy materials, like the revenue cutters, full in the fore body and fine aft ;

1 The English word yacht is the Dutch jacht, jagt, from jachten, " to hurry," "to hunt."

but it was soon discovered that their timbers and scantlings were unnecessarily strong, and they were made much lighter. It was also found that the single-masted cutter was more weatherly than the brigs and schooners of the time, and the former rig was adopted for racing, and, as there was no time allowance for difference of size, they were all built of considerable dimensions. Among the earliest of which there is any record were the "Pearl," 95 tons, built by Sainty at Wivenhoe near Colchester in 1820, for the mar- quis of Anglesey, and the " Arrow," 84 tons, originally 61 feet 94 inches long and 18 feet 54 inches beam, built by Joseph Weld in 1822, which is still extant as a racing yacht, having been rebuilt and altered several times, and again entirely rebuilt in 1887-88. The Thames soon followed the example of the Solent and established the Royal Thames Yacht Club in 1823, the Clyde founding the Royal Northern Yacht Club in 1824, and Plymouth the Royal Western in 1827. In this year the Royal Yacht Squadron passed a resolution disqualifying any member who should apply steam to his yacht,—the enactment being aimed at 'T. Assheton Smith, an enthusiastic yachts- man and fox-hunter, who was

having a paddle-wheel steam yacht called the ‘ Menai” built on the Clyde. In 1830 one of the largest cutters ever constructed was launched, viz., the “‘ Alarm,” built by Inman at Lymington for Joseph Weld of Lulworth Castle, from the lines of a famous smuggler captured off the Isle of Wight. She was 82 feet on the load line by 24 feet beam, and was reckoned of 193 tons, old measurement, in which length, breadth, and half- breadth (supposed to represent depth) were the factors for computation. Some yachtsmen at this time preferred still larger vessels and owned square-topsail schooners and brigs like the man-o’-war brigs of the day, such as the “Waterwitch,” 381 tons, built by White of Cowes, in 1832, for Lord Belfast, and the “ Brilliant,” barque, 493 tons, belonging to J. Holland Ackers, who invented a scale of time allowance for competitive sailing. In 1834 the first royal cup was given by William IV. to the Royal Yacht Squadron—a gift which has been continued ever since (except in 1862, when it was dropped for one year, owing to the death of the Prince Consort), and in recent years supplemented by similar gifts to other clubs. In 1836 the Royal Eastern Yacht Club was founded at Granton near Edinburgh ; in 1838 the Royal St George’s at Kingstown and the Royal London ; in 1843 the Royal Southern at Southampton and the Royal Harwich; in 1844 the Royal Mersey at Liverpool and the Royal Vic- toria at Ryde. The number of vessels kept pace with the clubs—the fifty yachts of 1812 increasing nearly tenfold before the middle of the century, which was the critical epoch of yacht-building.

In 1848, after J. Scott Russell had repeatedly drawn attention to the unwisdom of constructing sailing vessels on the “cod’s head and mackerel tail” plan, and had enunciated his wave-line theory, Mare built at Blackwall an entirely new type of vessel, with a long hollow bow and a short after body of considerable fulness. This was the iron cutter “‘ Mosquito,” of 59 feet 2 inches water line, 15 feet 3 inches beam, and measuring 50 tons. Prejudice against the new type of yacht being as strong as against the introduction of steam, there were no vessels built like the “ Mosquito,” with the exception of the “ Volante,” 59 tons, by Harvey of Wivenhoe, until the eyes of English yachtsmen were opened by the Americans three years later. About this period yacht-racing had been gradually coming into favour in the United States, the first yacht club being founded at New York in 1844 by nine yacht-owners ; and in 1846

the first match between yachts in the States was sailed, 25 miles to windward and back from Sandy Hook lightship, between J. C. Stevens's new centre-board sloop

"Maria," 170 tons, 100 feet water line and 26 feet 8 inches beam, with a draught of 5 feet 3 inches of water, and 'the "Coquette," schooner, 74 tons, belonging to J. H. Perkins, the latter winning; but the appearance of the " Maria," which had a clipper or schooner bow, like that of the newest racing cutters of 1887-1888, did much for yachting in America. Stevens then commissioned George Steers of New York, builder of the crack pilot schooners, to con- struct a racing schooner to visit England in the year of the great exhibition, and the result was the '' America" of 170 tons. Like the " Mosquito," she had a very long and hollow bow, with considerable fulness aft. She crossed the Atlantic in the summer of 1851, but failed to compete for the queen's cup at Cowes in August, although the club for that occasion threw the prize open to all the world, as her owner declined to concede the usual time allowance for difference of size. The members of the Yacht Squadron, not wishing to risk the reproach of denying the stranger a fair race, decided that their match for a cup given by the club, to be sailed round the Isle of Wight later on in the same month, should be without any time allowance. The '"' America," thus exceptionally treated, entered and com- peted against fifteen other vessels. The three most dan- gerous competitors being put out through accidents, the '"' America" passed the winning-post 18 minutes ahead of the 47-ton cutter "' Aurora," and won the cup; but, even if the time allowance had not been waived, the American schooner yacht would still have won by fully a couple of minutes.

The prize was given to the New York Yacht Club and constituted a challenge cup, called the America cup, for the yachts of all nations, by the deed of gift of the owners of the winner. Not only was the "America" as great a departure from the conventional British type of yacht as the " Mosquito," but the set of her sails was a decided novelty. In England it had been the practice to make them baggy, whereas those of the "America" were flat, which told materially in working to windward. The re- volution in yacht designing and canvassing was complete, and the bows of existing cutters were lengthened, that of the "Arrow" among

others. The ‘“ Alarm” was also lengthened and turned into a schooner of 248 tons, and the ‘ Wildfire,” cutter, 59 tons, was likewise converted. Indeed there was a complete craze for schooners, the “Fly- ing Cloud,” “Gloriana,” ‘Lalla Rookh,” ‘“ Albertine,” “ Aline,” “ Egeria,” “ Pantomime,” and others being built between 1852 and 1865, during which period the centre board, or sliding keel, was applied to schooners as well as sloops in America. The national or cutter rig was never- theless not neglected in England, for Hatcher of South- ampton built the 35-ton cutter “‘Glance ”—the pioneer of the subsequent 40-tonners—in 1855, and the “Vampire” —the pioneer of the 20-tonners—in 1857, in which year Weld also had the “ Lulworth,” an 82-ton cutter of com- paratively shallow draught, constructed at Lymington. At this time too there came into existence a group of cutters, called “flying fifties” from their tonnage, taking after the “Mosquito” as their pioneer; such were the ‘ Extrava- ganza,” “ Audax,” and “Vanguard.” In 1866 a large cutter was constructed on the Clyde called the ‘‘Condor,” 135 tons, followed by the still larger “ Oimara,” 163 tons, in 1867. In 1868 the “Cambria” schooner was built by Ratsey at Cowes for Ashbury of Brighton, and, having proved a suc- cessful match-sailer, was taken to the United States in 1870 to compete for the America cup, but was badly beaten, as also was the ‘“ Livonia” in 1871.

The decade between 1870 and 1880 may be termed the Golden Age of yachting, inasmuch as the racing fleet had some very notable additions made to it, of which it will suffice to mention the schooners “‘ Gwendolin,” “ Cetonia,”

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“Corinne,” “ Miranda,” and ‘‘Waterwitch ;” the large cutters ‘“Kriemhilda,” ‘Vol au Vent,” “Formosa,” “Sameena,” and ‘‘Vanduara;” the 40-tonners “ Foxhound,” “Myosotis,” and

“Norman;” the 20-tonners “Vanessa” (Hatcher’s master-_

piece), “Quickstep,” “Enriqueta,” “Louise,” and “Freda ;” and the yawls “ Florinda,” “ Corisande,” “‘ Jullanar,” and “Tatona.” Lead, the use of which commenced in 1846, was entirely used for ballast after 1870 and

placed on the keel outside. Of races there was a plethora; indeed no less than 400 matches took place in 1876, as against 63 matches in 1856, with classes for schooners and yawls, for large cutters, for 40-tonners, 20-tonners, and 10-ton- ners. The sport too was better regulated, and was con- ducted on a uniform system: the Yacht-Racing Association, established in 1875, drew up a simple code of laws for the regulation of yacht races, which was accepted by the yacht clubs generally, though a previous attempt to introduce uniformity, made by the Royal Victoria Yacht Club in 1868, had failed. The Association adopted the rule for ascertaining the size or tonnage of yachts which had been for many years in force, known as the Thames rule; but in 1879 they altered the plan of reckoning length from that taken on deck to that taken at the load water line, and two years later they adopted an entirely new system of calculation. Subsequently to these repeated changes yacht- racing gradually waned, the new measurement exercising a prejudicial effect on the sport, as it enabled vessels of ex- treme length, depth, and narrowness, kept upright by enor- mous masses of lead on the outside of the keel, to compete on equal terms with vessels of greater width and less depth, in other words, smaller yachts carrying an inferior area of sail. Of this type are the yawls "' Lorna" and " Wendur," the cutters " May," " Annasona," "'Sleuth-hound," " Tara," and " Marjorie,"—the most extreme of all being perhaps the 40-tonner "Tara," which is six times as long as she is broad, and unusually deep, with a displacement of 75 tons, 38 tons of lead on her keel, and the sail spread of a 60-ton- ner like " Neva."

In 1884 two large 80-ton cutters of the above type were built for racing, viz., the "Genesta" on the Clyde and the "Trex" at Southampton. Having been successful in her first season, the former went to the United States in 1885 in quest of the America cup ; but she was beaten by a new yacht, called the " Puritan," built for the purpose of defending it, with a moderate draught of 8 feet 3 inches of water, considerable beam, and a deep centre-board. The defeat of the "Genesta" is not surprising when it is re- collected that she drew 13 feet of water, had a displace- ment or weight of 141, as against the " Puritan's" 106 tons, and a sail area of 7887 square feet to the American's 7982,—a greater mass with less driving power; but she did not leave the States empty-handed, as she won

and brought back the Cape May and Brenton Reef challenge cups, though they were wrested from her by the "'Irex" in the following year. The same thing happened to the "Galatea," which was beaten by the " Mayflower" in 1886. In 1887 a new cutter, called the "Thistle," was built on the Clyde to try to win back the America cup; but, although built very differently from the "Genesta" and " Galatea," 2.e., of a much greater width than modern English racing yachts generally, the "Thistle," when matched with the new centre-board " Volunteer," had no better fortune than her predecessors, These new American racing vessels are some- thing very different from the old flat-bottomed sloop "Maria," with one head-sail and a trivial draught of water, Inasmuch as they are lead- ballasted cutters with two head-sails and a draught of nearly 10 feet of water, with the additional advantage of a centre-board descend- ing as much as 8 or 10 feet below the keel. In this connexion it is noteworthy that a prize won by a fixed-keel

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schooner should be defended by centre-board craft with a single mast.

From 1887 an entirely new system of measurement for competitive sailing has been adopted in the United King- dom, the old plan of measuring the hull having given way to the more rational one of taking the length on the water- line and the sail area of the vessel as the factors for rating. This leaves naval architects free to adopt a long and narrow or a short and "beamy" hull.

Yacht-racing as at. present conducted is simple and easily managed. A course is chosen by the committee of the club giving the prizes, averaging for first-class vessels 40 or 50 nautical miles in length, such as the old qneen's course from Cowes eastward to the Nab lightship, back past Cowes to Lymington, and returning to the starting-post. The competitors, i.¢., cutters, yawls, and schooners, —cutters sailing at their full, yawls at four-fifths, and schooners at three-fourths of their tonnage or rating— cruise about under way in readiness for crossing an imaginary line between the club-house or committee vessel and a mark-boat, which forms the starting as well as winning place, on the signal being given. No time is allowed at the start, but only at the finish, and conse: quently there

is a good deal of manceuvring to get across the line first and to windward. The yachts make the best of their way on- wards, running if the wind is abaft them, reaching if it is on the beam, and close-hauled if it is fonl, the greatest skill being shown in cross-tacking and getting the weather-gauge. When close-hauled and reaching, the ordinary fore-and-aft sail (see SAIL, SEAMANSHIP, and SHIPBUILDING) is used ; but when going free a large racing sail called a spiunaker is set on a long boom projecting from the foot of the mast at right angles to the vessel. This sail, whicli is a tri- angular one, cxtends from the topmasthead to the deck, on the opposite side to that occupied by the main boom, though occa- sionally shifted to the bowsprit end. After leaving all the marks on the port or starboard hand, as may be directed in their instruc- tions, the competing yachts arrive at the winning-place generally in single file, the moment at which each competitor passes the line being noted by a time-keeper. It is then ascertained whether any and which vessel has saved her time allowance, which varies ac- cording to the length of the course, and the first which has done so is declared to have won. The amount of prize money gained by the most successful vessel of the season—almost always a cutter— generally exceeds 1000 sovereigns, exclusive of cups or plate. The expense of racing is enormous ; in the case of an 80 or 100-ton cutter it amounts to fully £2000 or £3000 a year. The cost of cruising is of course not so great, the wages of non-racing crews (which are much smaller in number) being less, and averages perhaps £10 a ton. There are not such frequent renewals of sails; there are not so inany breakages of spars, no entrance fees, and no " winning money " to pay the crew, nor any of the thousand and one extras which go to swell the yearly account of the racing owner. Racing yachts make good cruisers if their spars are shortened and their wings clipped ; and it is a very common practice to turn an ex-racing cutter into a yawl, by shortening her boom and adding a mizzen- mast and mizzen-sail to her counter. The yawl rig is comfortable for cruising, but not so successful for racing as the cutter. The speed of yachts varies according to their length, and this is one reason why an allowance in time should be given by a large yacht to a smaller one. As instances of pace it is on record that the "Arrow" in 1858 sailed 45 knots in 4h. 19 m., and 50 knots in 1872 in4h. 40m. In the latter year the " Kriemhilda" did 50 knots in 4 h. 37 m., while the " Marjorie" did the same distance in 4h. 26 m., and the "Samena " in 4h, 15 m. in

1883; the “ Lorna” (yawl) in 4 h. 14 m., and the “ Irex” in 4h. 7 min., both in 1885, —all these distances being sailed inside the Isle of Wight, irrespect- ive of the state of the tide. A greater pace has been developed by schooners in bursts of speed with a fair tide and half a gale of wind behind them, but in racing inside the Isle of Wight the “‘ Egeria” in 1870 did 50 knots in 4 h. 27 m., the “Olga” in 4h. 25 m. in 1875, the “Enchantress” in 4h. 18 m, in 1879. which is not so quick as the cutters.

As to the number of yachts now afloat, cruisers as well as racers, the British yacht fleet, which in 1850 consisted of 500 sailing and 3 steam vessels, now numbers 2209 sailing yachts, of 64,051 tons, and 700 screw steam yachts, of 68,667 tons, or a gross total of 2909 yachts, of 132,718 tons—in round numbers 3000 yachts, allowing , for small craft not included in the above total. They are con- structed of wood, iron, or steel —this last gradually coming to the front in the pleasure fleet as well as in the mercantile marine and royal navy. Next to Great Britain the United States possesses the largest number afloat, amounting to nearly if not quite 1200 yachts ; and, if to the foregoing are added the yachts.of other countries included in Lloyd’s list, a grand total of upwards of 5000 is reached. While the taste for sailing vessels has made marked strides since 1850, that for steam yachts has made still more extraordinary

progress, one noteworthy feature being the increase in their size, and another their enormous prime cost. More than thirty of those recently built exceed 500 tons, while double that number range from 300 to 500 tons ; two or three even exceed 1000 tons each. Admiralty warrants are granted to clubs and their members to fly the white, blue, or red ensign with device on it, such yachts being registered according to the provisions of the Merchant Ship- ping Acts. The white man-of-war or St George’s ensign, used by ritish war-ships, is flown by the Royal Yacht Squadron alone of yacht clubs. The ordinary red ensign of the merchant navy may be flown by any English vessel without permission of Government, as it is the national flag. Yachts with Admiralty warrants are en- titled to certain privileges, such as exemption from excise and some other dues ; they may enter Government harbours without paying dues, and may make fast and

lie to Government buoys when these are not required by any of H.M. ships; they need not have their names painted on their sterns, though it is better that they should ;

and their masters need not hold Board of Trade certificates. Literature.—Vanderdecken, Yachts and Yachting (1862); H. C. Folkard, The Sailing Boat (1870); Stonehenge, British Rural Sports (1876); Dixon Kemp, Yacht Architecture (1885), Yacht Designing (1876), and Yacht and Boat Sailing (1878-86); Yacht-Racing Calendar (annual); Lloyd's Yacht Register (annual); and Hunt's Yacht List (annual). (BE. D. B.)

YAK. This animal is the Bos grunniens of Linnzus and all subsequent zoologists, so called on account of the pig-like grunting sounds it makes. It is structurally more closely allied to the common ox than to the bison, with which group of the Bovidz it has been sometimes errone- ously associated. It is only found in the lofty plateau of Asia between the Altai Mountains and the Himalayas, and occurs both wild and as the ordinary domestic animal of the inhabitants of that region, supplying milk, food, and raiment, as well as being used as a beast of burden. The

wild yaks inhabit the most inaccessible parts of the moun- tains, ranging up to an elevation of 20,000 feet,—higher it is said, than any other animal,—delighting in extreme cold, and finding their sustenance in the coarse, wiry grass which is almost the only vegetable production of those

desolate regions. They cannot live to the south of the BEG = =

Himalayas beyond the immediate neighbourhood of the snow. Their size is that of a small ox. The horns are long, nearly cylindrical, smooth, and pointed at the ends, and with a peculiar and characteristic curve, being directed at first outwards, then upwards, forwards, and inwards, and finally a little backwards. Some of the domestic yaks are hornless. The most remarkable external character is the excessive growth and peculiar distribution of the hairy covering. The upper parts of the body and sides are elothed with a thick, soft, woolly hair, more fully de- veloped along the middle of the back, especially on the shoulders, where it forms a great bunch ; on the sides it is comparatively short. From the upper parts of the limbs and the whole of the lower surface of the body a thick

_ river Atdan to make its great bend in that direction. | ridge is almost entirely unknown, having been crossed by

animals sweeping the ground and almost concealing the somewhat short legs. The tail is profusely covered with a thick mass of such hairs. The calves are at first covered only with a soft, shortish woolly hair, of nearly uniform length all over. Domestic yaks vary considerably in size and appearance according to their treatment and the purpose for which they are bred. The finest are those used for carrying the native chiefs. Those employed for ploughing are very inferior-looking animals. They vary also in colour. The wild animals are nearly uniformly black ; the domestic yaks are often quite white. It is not uncommon to see the long hair on the ridge of the back, that on the tail, and the long flowing hair of the under parts white, whilst all the rest of the animal is black. The tails of the domestic yaks are used as orna- mental standards by the Tartars, and are largely imported into India as chowries or fly-flaps.

YAKUTSK, a province of Eastern Siberia, which includes nearly the whole of the basin of the Lena, and covers an area of 1,517,127 square miles (nearly one- third of Siberia and almost one-fifth of the entire Russian empire). It has the Arctic Ocean on the N., Yeniseisk on the W., Irkutsk, Transbaikalia, and Amur on the S., and is separated from the Pacific (Sea of Okhotsk) only by the narrow Maritime Province (see vol. xxii. pl. L).

The Vitim plateau, from 2500-to 3500 feet in altitude, Physical

and bordered on the south-east by the Stanovoi Mountains, occupies the south-eastern portion of the province. Its moist, elevated valleys, intersected by ranges of flat, dome- shaped hills, which rise nearly 1000 feet above the plateau, are unsuited for agriculture, and form an immense desert of forest and marsh, visited only by Tungus hunters, save in the south-west, where a few settlements of gold-miners have lately sprung up. The high border-ridge of the plateau (see Srperra) stretches from the South Muya Mountains towards the north-east, thus compelling the The

only two geographers at points more than 500 miles apart. The alpine country fringing the plateau all along its north- western border is better known in the south-west, where rich gold-mines are wrought in the spurs between the Vitim and the Lena; and farther north-east it has been crossed by several geographers (Middendorff, Erman, the Siberian expedition) on their way from Yakutsk to the Sea of Okhotsk. The Lena, in that part of its course where it flows north-east, waters the outer base of this alpine region. It is a wild land, traversed by several chains of mountains, all having a north-eastern direction and intersected by deep, narrow valleys, where wild mountain streams flow amidst immense boulders and steep cliffs. The whole is covered with dense forests, through which none but the Tunguses can find their way, and they only by means of marks made on the trees. The summits of the mountains, ranging from 4000 to 6000 feet, mostly rise above the limits of tree vegetation, but in no case pass the snow-line. Summits and slopes alike are strewn with crystalline rock débris, mostly hidden under thick layers of lichens, where only the larch, which sends out its roots horizontally, can find support and sustenance. Birch and aspen grow on the lower slopes; and where strips of alluvium have been deposited in the narrow bottoms of the valleys thickets of poplar and willow make their ap- pearance, or a few patches of grassy soil are occasionally found. These last, however, are so rare that all of them are known to the gold-diggers for scores of miles around their settlements, and hay has to be brought at consider- able cost from the lowlands. All necessaries of life for

| the gold-diggings have to be shipped from Irkutsk down growth of long, straight pendent hair descends, in old |

the Lena, and deposited at entrepdts, whence they are

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transported in winter by means of reindeer to their desti- nation. A line drawn south-west and north-east, from the mouth of the Vitim towards that of the Atdan, separates the mountain tracts from the elevated plains (from 1500 to 2000 feet) which fringe the highlands all the way from the upper Lena to Verkhne-Kotymsk, and probably to the mouth of the Kotyma. Immense and sometimes marshy meadows extend over those

plains in the south-west ; farther north mosses and lichens are the prevalent vegetation. The surface is much furrowed by rivers and diversified by several mountain-chains (Ver- khoyansk, Tas-karyktakh, Kotymsk, and Afazeya). Little is known as to the real character of these mountains, although they are figured on maps as isolated ridges shoot- ing north-west from the highlands, between the chief rivers which flow into the Arctic Ocean. Beyond the elevated plains vast tundras, covered with mosses and _ lichens,

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*on the left is the Vilui (about 1300 miles), which has an immense drainage-area on the lower plains, and since 1887 has been navi- gated by a steamer. At Yakutsk the Lena becomes a magnificent stream of more than 4 miles in width, with numerous islands, and this character it maintains for the next 1200 miles of its course, sometimes reaching a width of 17 miles and a depth of7 to 8 fathoms. It enters the Arctic Ocean by a wide delta, occupying more than 250 miles of the coast-line; here the river divides into seven or eight principal branches, the chief of which vary from 35 to 65 miles in length, the largest being more than 6 miles broad. The bar, however, has only 8 feet of water, and the Swedish steamer '**Lena" had great difficulty in entering from the sea. The lower course of the river is subject to terrible inundations when the ice breaks up on its upper part, whilst at the same time the higher reaches of its lower course are still covered with ice several feet in thickness, Large portions of the banks are then torn away by the enormous niasses of ice. The Olenek (1200 miles), which enters the Arctic Ocean to the west of the Lena, is also a considerable river; the Yana (1000 miles), Indighirka (950), and Kotyma (1000) to the east all rise in the mountain region between 61° and 62° N. lat. and flow north and north-east into the Arctic Ocean.*

The granites, granitic syenites, and gneisses of the high plateau Geology are surrounded by a variety of crystalline slates, Huronian and and Laurentian ; and vast layers of Silurian and Devonian limestones minerals.

stretch to the shores of the ice-bound ocean; only a few trees succeed in the struggle for a miserable existence,

Northern coast.

Rivers.

though some isolated groups penetrate farther north along the courses of the Lena, the Indighirka, and the Kotyma, almost reaching in the first-named valley the seventy-second degree of north latitude.

The Arctic coast is indented by several bays—Borkhaya and Yana to the east of the wide Lena delta, and Omul- yakh, Kotyma, and Tchaunskaya still farther to the east. Islands have been explored as far as 78° N. lat. These fall into three gronps,—the Lyakhovskiye, the Anjou or New Siberian, and the De Long Islands. The Medvyezhie (Bear) Islands off the Kotyma and the two Ayun Islands in Tchaunskaya Bay are merely littoral. Wrangel's Land seems to be the outer island of a great and as yet unknown archipelago. The entire coast of Yakutsk is full of memorials of the courageous explorations made in 1735-41 by Minin, Lapteff, and Prontchischeff in small boats, with- out any of the modern appliances for Arctic explorations, and Tchaunskaya Bay recalls the loss of Shatauroff's ex- pedition. The prospects of regular navigation recently raised by Nordenskjéld's bold circumnavigation of Asia seem unlikely to be fully realized, the ice apparently having never again been in so favourable a condition as in 1878- 79, Every year, however, a narrow passage close by the coast is left almost free of ice, enabling a ship or two to reach the estuary of the Yenisei, or even the delta of the Lena.

The great artery of Yakutsk, the Lena, rises on the western slope of the Baikal Mountains, its sources being separated only by a narrow ridge from the great Siberian lake. It soon issues from the mountain valleys, and flows over the elevated plains, where it has carved a deep channel between horizontal layers of Old Red Sand- stone and further on of contorted beds of limestone. As far as Yakutsk it maintains its north-eastern direction, with but one great bend in 60° N. lat. and several small windings in its upper course. At Katchug—a lading-place 180 miles north-east from Irkutsk—it is still shallow, but soon becomes a mighty

stream of much beauty, which is increased by the high crags and inountains amidst which it has dug its channel. Though thus picturesque, its valley can hardly be called hospitable: the narrow level stretches along the base of the mountains are often marshy, while the raw and wet climate renders agriculture most difficult ; the villages are poverty-stricken, and in most of them goitre is endemic. About 60° N. lat. the Lena receives from the right its first great tributary, the Vitim (1400 miles in length), which after a very sinuous course leaves the great plateau below Lake Oron, by a narrow gorge which has not yet been visited by any geographer. It is navigable by steamers in its lower course. The next large tributary of the Lena is the Oleckma (about 800 miles), which also rises on the plateau and crosses it from south to north; it is navigable only in the very lowest part of its course ; higher up, its valley, which offers the gveatest difficulties for the traveller, has been utilized as a route only by the Cossack conquerors of Siberia and by one of the mem- bers of the Siberian expedition. The next important tnbutary, also from the right, is the Atdan (nearly 1300 tiles), which first flows parallel to the Lena and then turns north-westwards to join it, itself receiving on the left a large tributary, the Amga. It is navigated from Ust-Maya. The only large tributary of the Lena

and sandstones extend over large areas. Farther north the Carbon-iferous, Chalk, and Jurassic formations are spread over a wide region, and the whole is covered with layers of Glacial deposits in the highlands and of post-Glacial elsewhere. The mineral wealth of Yakutsk is very great; but gold (262,200 oz. in 1884) and salt (obtained from springs to the amount of about 6000 ewts. annually) only are worked. Coal has been recently discovered on the Vilui close by its mouth, as also on the lower Lena.

Though there are spots in the North-American archipelago and Climate.

in northern Greenland where the cold is as intense as at Yakutsk, no region can be named which has such extremes of cold and heat or winter temperatures so low, so long continued, or spread over so immense an area. Verkhoyansk on the Yana (67° 34’ N. lat. and 134° 20’ E. long.) is, in respect of cold, the pole of the Old World ; nowhere, even in Siberia, do

we find such low winter tem- peratures: from whatever quarter the wind imay blow it cannot fail to bring a warmer temperature to Verkhoyansk. Frosts of — 76° Fahr. have been observed there, and the average temperature of the three winter months is — 58°71; even that of March is but little above the freezing-point of mereury (~~37°:9). Neither Ust~~ Yansk (70° 55' N. lat., but close to the sea coast), nor Yakutsk, nor even the polar station of Sagastyr at the mouth of the Lena (73° 23' N. lat.), has a winter so cold and so protracted. Aud yet at Sagastyr temperatures of — 63°°6 were measured in February 1888, and the average temperature of that month was only —48°°6. At Yakutsk the average temperature of the winter is — 40°°2, and the soil is frozen to a depth of 600 feet (Middendorff), Even ata depth of 382 feet the temperature of the soi] is 26°°4 Fahr. For further particulars, see SIBERIA, vol. xxii. p.6. The Lena, both at Kirensk and at Yakutsk, is free from ice for only 161 days in the year, the Yana at Ust-Yansk for 105. While at Yakutsk only 145 days and at Verkhoyansk only 73 have no snow ; the interval between the latest frosts of one season and the earliest frosts of the next is barely 37 days, and even less in the north.

In spite of the rigours of its climate, the province of Yakutsk Popula- had 243,450 inhabitants in 1883, and the population is supposed tion.

to be increasing notwithstanding the infectious diseases which some- times sweep away whole villages. The Russians constitute but a trifling element in the population ; and their villages, numbering scarcely twenty, are chiefly peopled by exiled Nonconformists, be- longing to the sects reputed "dangerous." In 1879 there were 5400 exiles living in the towns or settled in the Yakut encamp- ments, 53800 peasants (also formerly exiles), 1890 military, and 4100 artisans, merchants, and officials. The remainder were chiefly Yakuts (211,900), and partly Tunguses (10,400), with a few Yuka- ghirs, Lamuts, and Tehuktchis. The Yakuts belong to the Turkish stem (see vol. xxiii. p. 661), and speak a dialect of Turkish, with an admixture of Mongolian words. They call themselves Sokha (pl. Sokhalar), their present name having been borrowed by the Russians from the Tunguses, who call them Yeko or Yekot. Most probably they formerly inhabited sonthern Siberia, and especially the upper Yenisei, where a Tartar stem calling itself Sakha still remains in Minusinsk. They

are middle-sized, have dark and rather narrow eyes, a broad flat nose, thick black hair, and almost no beard. On the whole they are healthy and reach an advanced age, are very laborious and enterprising, and display in schools much more intelli- gence than ithe Tunguses or Buriats. Their implements show a great degrce of skill and some artistic taste. They live in log yurtas with small windows, into which plates of ice or pieces of skin are inserted instead of glass. A large fire is kept continually burning in the middle of the yurta, which always has a wooden chimney. The yurtas are usually at some distance from one another, but at the same time are grouped into villages or naslegs. During summer

Occur a- tions.

Com- munica- tion and trade.

Y A K—

they abandon their wooden dwellings and encamp in conical tents, | consisting of a few poles covered with prepared birch bark. Their food is chiefly flesh, and their drink koumiss. Though nearly all are nominally Christians, they retain much of their original Shaman- ism. Their settlements, which formerly were limited to the valleys of the Lena and its northern tributaries, are now steadily advancing southwards into the hunting domains of the Tunguses, who give way before the superior civilization of the Yakuts. Wherever they penetrate, even in the valleys at the base of the Vitim plateau (Muya, Tchara), they always cultivate some barley, and carry on some trade.?

Both the Russians and the Yakuts earry on some agriculture wherever possible in the southern parts of the province; it was estimated in 1879 that 40,000 quartcrs of barley, summer rye, wheat, and oats were eropped in Yakutsk (23,000 quarters by the Yakuts). But eattle-breeding is the ehief means of support; in 1879 there were in Yakutsk 130,400 horses of an excellent small, but most hardy breed, 260,900 cattle, 49,000 reindeer, and several thousands of dogs, which are used for travelling purposes. The hunting of the wild reindeer affords the ehief means of subsistence in the tundras ; wealth or famine depends upon its success or failure. The herds are attacked on the routes they pursue during their migrations,

especially where they have to cross a river. Jarther north the pursuit of water-birds, which come in innumerable flocks to breed on the lakes of the tundras and the shores of the oeean, is a most important resource. Fishing also is earricd on even in winter from beneath the ice. The mountains between the Lena and the Vitim have, during the last thirty years, become a most important eentre of gold-washings, and, notwithstanding the diffi- eulties of communication, and the necessity of bringing every- thing from Irkutsk or Transbaikalia, the population of the gold- mines of the Olekma and Vitim numbered more than 13,000 in 1882. Thousands of workmen go every spring down the Lena to work at the mines and return to their villages in autumn.

The principal ehannel of communication in Yakutsk is the Lena. As soon as the spring arrives, scores of boats are built at Katchug, Verkholensk, and Ust-Ilga, and the goods brought on sledges in winter from the capital of Eastern Siberia, ineluding eonsiderable amounts of corn and salt meat, are shipped down theriver. Steamers ply all along its eourse, and enter its tributary, the Vitim, which is navigated almost to the gorges beneath Lake Oron. A few steamers descend to the delta of the Lena, and return with cargoes of fish and furs. 'There are very few overland routes. A new one, available for the transport of live stock from Transbaikalia to the gold-mines of Olekina, was opened in 1869, and cattle are brought every year from Transbaikalia, notwithstanding the hardships of the 700 miles' route across the plateau and the wild mountain tracts. Two other routes, also mere footpaths, on which travellers and goods are transported on horseback, radiate from Yakutsk to Ayan and to Okhotsk. Manufactured goods and groceries, chiefly tea, rice, and sugar, were imported to Yakutsk by the former route to the amount of some 1000 ewts. in 1883; these goods eross the Stanovoi Mountains and the plateau on sledges as far as the Maya, whence they are shipped to Yakutsk.

The province is divided into five distriets, the chief towns of which are—Yaxursk (see below), Sredne-Kotymsk (560), Olek- minsk (500), Verkhoyansk (290), and Viluisk (390). Exeept Yakutsk, these "towns" are but miserable villages. {(2 PACK)

YAKUTSK, capital of the above province, situated in 62° 2' N. lat. and 129° 44' E. long., 1800 miles to the north-east of Irkutsk, was founded by Cossacks in 1622. It stands on a branch of the Lena, Khatystakh, between which and the main river, five miles distant, lie several low islands. During the break-up of the ice the water of the Khatystakh, finding no outlet into the Lena on account of the huge masses of ice, rises and floods the lower parts of the town, leaving after its subsidence great pools, which, as well as Lake Tatoye close by, become a source of infectious disease. The town is, however, pro- tected to some extent by a wooden embankment. The old fort is now destroyed, but its five wooden towers, erected in the 17th century, are still standing. The streets are unpaved, and the wooden houses are built upon high base- ments to protect them from the inundations. The shops only are of stone. There are in Yakutsk a cathedral, three churches, a monastery, two gymnasia for boys and girls,

and several elementary schools. It is the residence of the

1 Besides the older literature, the bibliography of which is given in Semenoff's Geogr. Dictionary (Russian), compare Radloft's Aus Sibirten (Leipsic, 1884) ; F. Miiller's Tungusen und Yakuten (Leipsic, 1882) ; and Vambéry's Das Tiirkenvolk (Leipsic, 1885); and several interest- ing monographs in Jzvestia of East Siberian Geogr. Soc.

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Russian governor and the provincial authorities, as well as of a few wealthy merchants, who carry ou trade iu furs, mammoth bone, and reindeer hides, which are ex- ported to Russia, and in imported groceries and manu- factured goods. The arrival of the latter gives occasion to a fair in July, which is frequented by natives from all parts of the province ; the returns are estimated at about £450,000. 'The population was 5290 in 1885.

YAM, a term usually applied to the tubers of various species of Dioscorea. These are plants with thick root- stocks, from which protrude long slender, climbing stems, bearing alternate or opposite, entire or lobed leaves and unisexual flowers in long clusters. The flowers are gener- ally small and individually inconspicuous, though collect- ively showy. Each

consists of a greenish bell-shaped or flat perianth of six pieces, enclosing six or fewer stamens in the case of the male flowers, and a three-celled, three- winged ovary in that of the female flowers. The ovary ripens into a membranous capsule, bursting by three valves to liberate numerous flattish or globose seeds. The species are natives of the warmer regions of both hemispheres, and many of them are important on account of the large amount of starch contained in their tubers. According to Prof. Church's analysis of the Chinese yam, it contains more nutritive or nitrogenous matter, but less starch, than potatoes: in 100 parts there are of water 82°6, starch 13:1, albumen 2-4, fat 0:2, woody fibre 0-4, and mineral matter 1°3 parts.

D. sativa and D. alata are the species most widely diffused in tropieal and sub-tropical eountries. D. aculcata, grown in India, Cochin China, and the South Sea Islands, is esteemed one of the best varieties. D. japonica, the Chinese yam, is hardy in Great Britain, but the great depth to which its enormous tubers descend renders its eultivation unprofitable ; the tubers of D. alata some- times attain a weight of 100 Ib. Most of the yams contain an acrid principle, which is dissipated in cooking.

The only European Dioscorca is that known as D. pyrenaica, found in 1845 in the Pyrenees, a remarkable instance of a species growing at along distance from all its congeners. True yams must not be confounded with the sweet potato, Convolvulus Batatas (see vol. xix. p. 597), as they sometimes are in London markets. The eommon blaek briony (Zamus communis) of hedges in England is elosely allied to the yams of the tropics, and has a similar root- stock, which is reputed to be poisonous.

YAMBO, or YEMBo, more properly YAaNnBO', a town of Arabia on the Red Sea, in 24° 4' N. lat. Having the best harbour on this coast, it has taken the place of Al- Jar (which lay to the south and is now ruined) as the port of Medina, and is visited by steamships in connexion with the pilgrim traffic and for the import of grain. The town is surrounded by dilapidated walls, and the fixed population probably does not exceed 4000 (Von Maltzan). The Johaina Arabs are the dominant element, though there is a Turkish officer and guard who maintain a certain authority within the walls. Six or seven hours' journey inland at the base of the

mountains (Jebel Radwé) is the fruitful valley of Yanbo al-Nakhl, with palm-groves, several hamlets of the Johaina, and country houses of the merchants of the port. This inland town, or group of villages, is the Yanbo‘ of the old Arab geographers, and lies on the route of the Egyptian pilgrim caravan, one night’s journey from the famous battlefield of Bedr. The port is sometimes distinguished as Yanbo‘ al-Bahr (Yanbo‘ on the Sea).*

YANAON, a French settlement in India, near the mouth of the Godavari on the Orissa coast, in the Goda- vari district, Madras presidency. It is situated in 16° 44’ 10” N. lat. and 82° 12’ 5” E. long., and has an area of 2258 acres and a population of 4473.

Yanaon was founded shortly before 1750, and its fortunes followed the vieissitudes of French history in southern India. With the

other French possessions in India it was secured by the treaty of

1814-15.

YANG-CHOW FU, or Haneo-cHow Foo, a prefectural city in the Chinese province of Kiang-su, is situated on the Grand Canal in 32° 21’ N. lat. and 119° 15’ E. long. The walls are between three and four miles in circumfer- ence, and the streets both in the suburbs and in the city are well supplied with handsome shops. The temples, colleges, and other public buildings are fine and large, and there is generally a well-to-do look about the place. The flourishing trade of the town may be either the cause or the result of an almost Jewish predilection shown by the people for mercantile pursuits. Unlike Chinamen gener- ally, they prefer trade to husbandry, and have earned for themselves pre-eminence as a community of shopkeepers. Another of their characteristics is their extreme superstition. Their observance of full moons and festivals exceeds in ritualistic display that which is commonly thought to be good enough for such occasions by their fellow-country- men; and their jealousy for the honour of their gods has on more than one occasion led to religious outbreaks. The most violent of these fanatical ebullitions, so far as foreigners are

concerned, occurred in 1868, when Mr Hud- son Taylor first attempted to open a mission there. But Yang-chow Fu possesses an earlier historical connexion with foreigners. Marco Polo ruled over it for three years by appointment from Kublai Khan (7 1282-85). The great traveller speaks of it as "a noble city," " which has seven and twenty other wealthy cities under its administration. . . . The people," he adds, "are idolaters and use paper money." They "live by trade and manufactures, for a great amount of harness for knights and men-at-arms are made there." The population of the city and suburbs is esti- mated at about 360,000. In 1880 the value of foreign goods imported into the town amounted to about £96,956.

YANG-TSE KIANG, or Yane-tsz—e Keane. See Cuina, vol. v. p. 631.

YANINA. See Janina.

YANKTON, one of the principal cities of the Territory of Dakota, United States, and until recently its capital, is the county seat of Yankton county, and is situated upon both banks of the James or Dakota river at its confluence with the Missouri, and on the Chicago and St Paul and the Chicago and North Western Railroads. It serves as a centre of supply and distribution for the adjacent fertile plains. The population in 1880 was 3431; in 1888 this had probably increased to 5000.

The city derives its name from the Yankton division of the Sioux Indians. A trading-post was first established on its site in 1859, and the city was incorporated ten years later.

YARKAND, or Yarkenn, the chief town of the prin- cipal oasis of Kast Turkestan, is situated on the Yarkand- Daria, in 38° 25'N. lat. and 77° 16' E. long., at an altitude of about 4100 feet above sea-level. The settlements of the Yarkand oasis occupy the south-western corner of East Turkestan, and are scattered along the numerous rivers which issue from the steep slopes of the Pamir in the west, and the Karakorum and Kuen-Lun Mountains in the south. The oasis of Kashgar limits it in the north, and a tract of desert separates it from the oasis of Khotan in the south- east. The Yarkand-Daria and its numerous tributaries, which are fed by the glaciers of the mountain regions, as also many rivers which no longer reach the main stream but are lost in the steppe or amidst the irrigated fields, bring

abundance of water to the desert; one of them is called Zerafshan (“ gold-strewing”), as much on account of the fertility it brings to the desert as of the small amount of gold discovered in its auriferous sands. Numberless irrigation canals, some of them of considerable length, carry the water of the rivers to the fields, which occupy a broad zone of loess skirting the base of the mountains. Higher up, in the spurs of the mountains, there are rich pastur-

ages, where large numbers of goats, yaks, camels, sheep, and cattle are reared. On the whole, the oasis of Yarkand is regarded as the richest of East Turkestan, and its population probably numbers about 200,000 inhabitants (32,000 households in 1873). Wheat, barley, rice, beans, and various oil-yielding plants are grown in the fields, and the gardens supply abundance of melons, grapes, apples, and other fruits. The cotton tree and the mulberry are cultivated in the warmer parts of the oasis. There is no lack of gold, lead, and precious stones in the mountains, though only the first-named is at present extracted. A variety of petty trades are carried on in the towns; Yarkand is renowned for its leather-ware and saddlery. The population consists of Persians, who have almost given up the use of their mother tongue and now speak Turkish, and of Turkish Sarts.

The town of Yarkand, which has a population of about 60,000 according to Forsyth (5000 houses in the city, and as many in Yanghishar and the suburbs), is very favourably situated on the river of the same name, five days’ journey south-east from Kashgar. It is surrounded by a thick earthen wall, nearly four miles long, with towers in the Chinese style of architecture, and is well watered by num- berless canals, which are drawn from the river and, after having irrigated the rich gardens of the city, lead to cisterns in which water is collected for the winter. The square fortress of Yanghishar, which was built by the Chinese, stands within four hundred yards of the walls of the town. The ten mosques and madrasas of Yarkand, although much poorer than those of Bokhara or Samarcand, enjoy a wide renown in the Moslem world. There isa brisk trade, especially in horses, cotton, leather-ware, and all kinds of imported manufactured goods.

Yarkand is surrounded by a number of smaller towns, the chief of which are—Yanghi-hissar, which has about 600 houses and is the centre of a populous district, Tash- kurgan on the Pamir, now reckoned as belonging to the Russians, Posgam (1600 houses), Kargatyk, at the junction of the routes leading to Ladak and Khotan (2000 houses), Sanju (2000), Tagarchi, Kartchum, Besh-taryk (1800), Guma (3000), and several smaller ones.

Yarkand was but very imperfectly known until the second half of the 19th century. Marco Polo visited it between 1271 and 1275, and Goes in 1603; but the continnous wars which marked the his- tory of the oasis (see TURKESTAN, vol. xxiii. pp. 637-640) prevented Europeans from frequenting it, so that until 1863 the information borrowed from medizval travellers and from Chinese sources, along with that supplied by the pandit Mir Isset Ullah in 1812, was all that was known about the Yarkand region. The first European who reached it in the 19th century was Adolph Schlagintweit, who passed by Yarkand in August 1857, but was killed a few days later at Kashgar. The pandit Mohammed Hamid visited it in 1863 and determined its geographical position and altitude. The best recent information is due to Robert Shaw! and G. W. Hayward, who stayed at Yarkand in 1869, and to Sir Douglas Forsyth, who first visited itin 1870. Three years later he visited it again with an expedi- tion which had Gordon, Bellew, Chapman, Trotter, Biddulph, and Stoliczka as members, and afterwards published a detailed report upon the scientific results of the mission. In 1886, after a re- markable journey through East Turkestan, A. D. Carcy reached Yarkand and spent the winter there.

YARMOUTH, or Great YARMOUTH, a municipal and parliamentary borough, seaport, watering place, and import- ant fishing station of England, chiefly in Norfolk, with a small portion (of the municipal borough only) in Suffolk, is situated on a long and narrow peninsula of sand, bounded on the west by the river Bure, the Breydon (formed by the Yare and the Waveney), and the estuary of these rivers. It stands on the Great Eastern and the Eastern and Mid- land Railway lines, 20 miles east of Norwich and 122

‘ 1 R. Shaw, Visits to High Tartary, Yarkand, and Kashgar, London,

871.

2 Report of a Mission to Yarkund in 1878, Calcutta, 1875, with numerous photographs.

YAS OU T H

north-east of London. The old town of Great Yarmouth was built chiefly along the eastern bank of the Yare, but within recent years the town has extended beyond its ancient walls, of which some remains still exist, to the sea- shore, where there are a marine drive and three piers—two of them 700 feet long. The principal features of Yarmouth are the north and south quays, and the straight narrow lanes, 145 in number, called "rows," running at right angles to them. These rows were at one time inhabited by the wealthy burgesses, and many of the houses now tenanted by the poorer classes have curiously panelled rooms, with richly decorated ceilings. The market place of Yarmouth is one of the most spacious in the kingdom, its area being about three acres. The old town of Great Yarmouth is connected with Little Yarmouth by a bridge across the Yare of stone and iron, erected in 1854. The Bure is crossed by a suspension bridge. The church of St Nicholas, founded in 1101 by Herbert Losinga, the first bishop of Norwich (who removed the see from Thetford), and consecrated in 1119, is one of the largest parish churches in England, Originally it was in the form of a Latin cross, but only the tower of the ancient building remains ; and by successive alterations the form of the church has been completely changed. The clerestoried nave in the Early English style, with columns alternately oct- angular and circular, was rebuilt in the reign of King John. A portion of the chancel is of the same date. About fifty years later the aisles were widened, so that the nave is now the narrowest part of the building. A grand west front with towers and pinnacles was constructed in 1330-38, but the building was interrupted by a visitation of the plague. Within the church there were at one time eighteen chapels, maintained by guilds or private families, but these were demolished by the Reformers, who sold the valuable utensils of the building and applied the money to the widening of the channel of the harbour. During the Commonwealth the Independents appropriated the chancel, the Presbyterians the north aisle, and the Episcopalians were

allowed the remainder of the building. The brick walls erected at this time to separate the different por- tions of the building remained till 1847. In 1864 the tower was restored, and the east end of the chancel rebuilt ; in 1869-70 the south aisle was rebuilt; and in 1884 the south transept, the west end of the nave, and the north aisle underwent restoration. The width of the nave is 26 feet, and its length to the tower 117, that of the tower 27 feet, and of the chancel 92,—total 236 feet. The Roman Catholic church is a handsome Gothic building erected in 1850. In 1551 a grammar school was founded, the great hall of the dissolved hospital, founded in the reign of Edward I. by Thomas Fastolfe, being appropriated as the building. The school was closed from 1757 to 1860, when it was re-established by the charity trustees; and in 1872 new buildings were erected. In the hospital school a number of boys and girls were formerly boarded and educated, but since 1850 the charity has been administered as a place of free education only. Among the other principal public buildings are the town-hall and public offices, of red brick and red sandstone in the Queen Anne style of architecture, with a tower 125 feet in height, erected in 1883; the aquarium, erected in 1877 and extended in 1882; the old toll-house, formerly the town-hall, a build- ing of the 14th century, which has been carefully pre- served as a relic of antiquity; and the assembly and reading rooms, the drill-hall, the custom-house, the bar-racks at Southtown, the bathhouse, the workhouse, the public library, and two theatres. A Doric column, 144 feet in height, was erected on the downs in 1817 to the memory of Nelson. Among the charitable and benevolent institutions are the royal naval lunatic asylum, originally

afford excellent anchorage.

feet, and at high water of 18 to 20 feet.

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founded as a lunatic hospital in 1811; the sailors' home

(1859), the boys' home (1870), the Walrond memoria!

smack-boys' home (1875), the fishermen's hospital (1702), and Warne's and various minor charities.

Yarmouth Roads, except in east or north-east winds, The present channel to the quays was made in 1567 by Joost Jansen, a Netherlands engineer, It affords a depth of water at the bar of 12 The town owes its origin to the fisheries, and is now one of the chief

fishing stations on the east coast of England, being

specially famed for its herring and mackerel fisheries (see FisHERrES, vol. ix. pp. 251-252), while cod and other white fish are also caught in great quantities. The number of boats registered under the Fisheries Act in December 1886 was 439, employing from 4500 to 6100 men and boys. The boats engaged in fishing are mostly trawling smacks. The curing of fish is an important in- dustry, Yarmouth bloaters being celebrated throughout

the kingdom. A great stimulus was given to the fishing trade by the erection of a fish wharf in 1869, having a length of 2257 feet. on the rivers by means of lighters and wherries.

There is a considerable inland trade In 1883 the value of the imports of foreign and colonial produce reached £285,742, and, although in 1886 it sank to

£173,636, the average for the five years preceding 1888 was about £235,000. The value of the exports in 1882 was £3399 and in 1886 £14,706. are coal, timber, and provisions.

The principal imports

The trade is chiefly with the Baltic ports, France, Portugal, Spain, the Channel Islands, the United States, and British North America. The number of vessels engaged in the foreign and colonial trade that entered in 1886 was 191 of 38,134 tons, that cleared 99 of 18,299 tons. The number in the coasting trade was 1033 of 110,312 tons entered, and 1083 of 124,527 tons cleared. Steam-packets ply between London, Hull, and Newcastle. Ship-building and boat- building are carried on chiefly in connexion with the fisheries, the number built in 1886 being 11 of 781 tons. There are also rope, twine, and trawl-net manufactories, silk-crape works, and extensive maltings. Yarmouth is frequented in summer as a seaside resort. It is governed by a mayor, twelve aldermen, and thirty-six councillors. The corpora- tion act as the urban sanitary authority. Water is obtained from one of the "broads" at Ormesby. The borough has a separate commission of the peace and court of quarter- sessions. The population of the municipal borough (area 3685 acres) was 41,819 in 1871 and 46,159 (9008 being in Gorleston in Suffolk) in 1881.

At the close of the 5th century Yarmouth is said to have been the landing-place of a Saxon invader Cerdic. At an early period it was resorted to by fishermen from the Cinque Ports and from the Continent for the herring-fishing, who dried their nets on the denes or downs, and also erected tents where they sold their fish to mer- chants from London and elsewhere. At Domesday the place is de- scribed as the king's demesne, and as having seventy burgesses. Henry I. appointed a provost as governor, and in the 9th year of John it received a charter of incorporation. It received another charter from Henry III., who permitted the inhabitants to enclose the borough with walls and moats. In 1338-39 the town suffered severely from the plague, during which 7000 persons are said to have died. In 1381 the rebels under Wat Tyler were defeated by the inhabitants of Yarmouth. The town also rendered considerable assistance when England was threatened by the Spanish Armada ; in recognition of this Elizabeth empowered the "bailiffs, burgesses, and commonalty" to hold an admiralty court, and extended their liberties in other ways. In 1588 a castle was built in the centre of the town, and a mound called the south

mound raised and crowned with heavy ordnance. The castle was demolished in 1621 and new fortifications thrown np, having a circuit of 24 miles. On account of the hardship experienced by the town from the levying of ship-money by Charles I., it declared for the Parliament.' At the close of the war the fortifications were demolished. From an early period the Cinque Ports had the power of sending bailiffs to Yarmouth to govern the town during the herring-fishing season,

from Michaelmas to Martinmas, their jurisdiction being concurrent with that of the bailiffs of Yarmouth; but on account of the jealousies that were thus created the privilege was abolished in the reign of Charles II. Until the Act of William LV. the town was governed by a charter of Queen Anne. It sent two members to patliament from the reign of Edward I. till 1867, when it was disfranchised ; but by the Act of 1885 it was again allowed to re- turn one member. (T. B. E.)

YARN consists of any textile fibre prepared by the process of spinning for being woven into cloth. It is only in a few minor and exceptional cases, such as the weaving of hair-cloth or of wire, that there isany making of woven fabrics without the previous spinning of yarn. As weav- ing can be shown to be among the earliest and most universal of the industries of mankind, the process of spinning yarn, which of necessity accompanies or rather precedes weaving, can be claimed as one of the primal employments of the race. There is ample evidence obtain- able, not only of the great antiquity, but also of the wide —almost universal—diffusion of the art of spinning. Remains of the implements employed are found wherever traces of prehistoric and early man make their appearance. It happens that the exceedingly simple apparatus which was used in the earliest ages continued to be the spinning implements of civilized communities till comparatively recent times, and it may therefore be said that there is no art which has been more widely diffused, more uniformly practised, and which remained so long fixed and unpro- gressive, as that of yarn-spinning. On the other hand, since human ingenuity bent itself to improve the art—and these efforts only began in earnest about the middle

of the 18th century—there have not been developed in the whole range of mechanical industries implements of greater variety, complexity, delicacy of action, and manifold pro- ductive capacity than the varied machines now adapted for the production of yarn.

The primitive spinning implement consists of a spindle, a rod of wood, usually from 9 to 12 inches in length, rounded and tapering towards both extremities, as shown in the accompanying cut. At the upper extremity there

Primitive spindle. is usually a notch, in which the yarn is caught while undergoing the operation of twisting, and to the spindle there is commonly added a whorl—a perforated disk of stone or other heavy material—the object of which is by its weight to give momentum and steadiness to the spindle when it is rotated by the hands of the spinner. The fibre to be spun is commonly attached loosely to a distaff or "rock" of wood, which is held under the left arm of the operator; but in the case of certain short fibres the material is made up in rolls or cardings. A rotatory motion is given to the spindle by twirling it between the fingers of the right hand ; and the fibre to be spun is then drawn out in a uniform strand between the fingers of both hands and simultaneously twisted into yarn by the rotat- ing spindle to which it is attached. The portion that is sufficiently twisted is wound on the body of the spindle, and the operation is continued till the spindle is filled with yarn of a smooth and equal calibre. The quantity thus rolled up gives the name to a now definite measure of yarn, "the spindle." Simple and primitive as is this apparatus, a dexterous and experienced spinner is able to produce yarn of an evenness, strength, and delicacy such as can scarcely be exceeded with the aid of the most com- plicated appliances and by the numerous processes of perfected modern spinning. The cotton yarns with which the famous Dacca muslins of India,—textures which from their

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extreme flimsy airiness receive such names as ' woven air" and "evening dew,"—are spun with the aid only of these simple and rude appliances. The spindle used by the deft Hindu is a slender strip of bamboo not much bigger than a darning needle, lightly weighted with a pellet of clay ; and,

as the tender thread formed cannot even support the weight of so slight a spindle, the apparatus is rotated in a socket, which consists of a piece of hollow shell. The spindle as here described was the sole apparatus with which, so far as is known, the whole of the yarn woven into cloth by mankind till comparatively modern times was made, and even at the present day it is not wholly obsolete. Apart from its use in Eastern countries and among the untutored tribes of Central Africa, the spindle in its original form continues to be used in the remote districts of the Scottish Highlands and islands, and in many other regions of Europe.

Throughout all the changes and developments of modern yarn-spinning the rotating spindle continues to be the essential implement, and all the improvements which have been effected have had for their object,—(1) the providing of mechanical means of rotating the spindle, (2) an automatic method of drawing out and attenuating the fibre, and (3) devices for working a large group of spindles together.

The first improvement on the simple spindle consisted in mount- ing it horizontally in bearings, and giving it a rotatory motion by a band from a large wheel, passing round a small pulley or "wharve"' fixed on the spindle itself. Such was the first spin- ning wheel which, in the form of the "charka," has long been known in the East Indies ; and from a drawing in a 14th-century MS. in the British Museum it is obvious that it was not unknown, although certainly far from common, in Europe at that early date. A jewelled model hand-wheel of this description was formerly the property of Mary of Guise. This form of wheel came ultimately to be known in Scotland as the "muckle wheel," in contradistinction to one of later invention, and the method of working it is not yet an altogether forgotten art.

No strict record of the dates at which various developments of the art of spinning took place are to be found, and it is certain that many appliances were long known and to some extent used before their adoption became general. Thus it is quite clear that the flier, which is fitted around modern spindles for twisting the yarn before it is wound on the bobbin, was known to Leonardo da Vinci and probably invented by him. Among the numerous mechanical drawings left by that man of genius there is one

which shows a spindle with flier and bobbin, with a device for moving the bobbin up and down on the spindle so as to effect an even distribution of the yarn. But the use of the flier does not seem to have been known in England till about the end of the 17th century. Ina pamphlet issued in 1681 by Thomas Firmin, entitled Some Pro- posals for the Employment of the Poor, there is an illustration of an improved wheel, with two spindles provided with fliers, having on them hooks or pins for directing the yarn on different parts of the bobbin. The sketch also shows the spindle and flier driven by different bands, as was the case with the spinning-wheel which sub- sequently came into common use. In hand-spinning the further application of the treadle motion, with connecting-rod and crank-axle to drive the little wheel with the feet alone, was the final development. By this agency both hands of the spinner were free, continuous and uniform motion was secured, and the spinuer could work two spindles simultaneously, the one with the right and the other with the left hand. It was in this condition that the most advanced form of yarn-making was carried on in the 18th century, when a great series of inventions revolutionized the entire range of textile industries and laid the foundation of the gigantic factory system of spinning and weaving which now prevails.

The problem which lay before inventors was to bring tangled masses of fibrous material into parallel order, and to draw out and twist these fibres into uniform strands by automatic means, without the continuous application of intelligent attention. The first stage in the evolution of mechanical spinning was effected under the patent of Louis Paul in 1788, in which there was clearly described and foreshadowed what is now one of the most important features of spinning machinery—the drawing rollers. In his specification he says :—

"One end of the mass, rope, thread, or sliver is put betwixt a pair of rowlers, cillinders, or cones, or some such movements, which, being turned round, by their motion draws in the raw mass of wool or cotton to be spun, in proportion to the velocity given to such rowlers, cillinders, or cones. As the prepared mass passes regularly through or betwixt these rowlers, cillinders, or cones, a succession of other rowlers, cillinders, or cones, moving proportionably faster

than the first, draw the rope, thread, or sliver into any degree of fineness which may be required."

Next, to James Hargreaves of Blackburn is due the first con- ception of the famous spiuning-jenny, which he devised about 1767 and patented in 1770. In his specification Hargreaves describes his invention as a inachine or engine to be managed by one person only, and that the wheel or engine will spin, draw, and twist sixteen or more threads at one time by a turn or motion of one hand and a draw of the other. At the same time the humble barber of Preston, Richard Arkwright, was busily engaged in developing the important series of inventions and adaptations which resulted in the modern throstle spinning-frame. Arkwright's principal patents were secured in 1769 and 1775 ; and in the latter year Samuel Crompton of Bolton brought before the world his mule spinning-frame, in which the drawing rollers of Paul and Arkwright were with happy effect applied to the jenny of Hargreaves. 'These inventions are at the foundation of all modern systems of yarn-spinning ; details regard- ing them are given under Corron, LINEN, SILK, and WooL.'

The various methods by which the sizes or counts of yarn have been fixed in different countries have long been a source of much inconvenience in the international exchange of spun yarns. The methods of estimating sizes or weights of yarn are indeed com- plicated in the extreme, for not only has each country different standards, which may locally be disregarded, but for the yarn from each separate fibre there may be different lengths of hank and different methods of estimating sizes. Thus, taking English stand- ards, we find that cotton yarns are made up into hanks of 560 "threads" of 14 yards, giving 840 yards per hank, and the "counts" are the number of hanks which go to make 1tb weight of yarn. For linen yarns there are 24 yards in a thread, and 120 threads or 300 yards in a lea, and the couut is the number of leas per fb. In a hank of worsted or woollen yarn there are 560 yards, and the count similarly is the number of hanks per tb. In Continental countries the length of the hank or its equivalent is different ; the weight by which the count is reckoned also varies; and, as the weights and measures of the several countries have

only the most involved ratio to each other, to estimate comparative sizes complex calculated tables are necessary. Attempts have been made to establish an international standard of numbering yarns based on the French metric system, in which the count is the number of grams which a definite length of yarn—1000 metres—weighs. No progress, how- ever, has been made in coming to an international agreement in the

uestion. (J. PA.)

YAROSELAVL, a government of central Russia, sepa- rated from Moscow by narrow strips of Vladimir and Tver on the 8., and having Tver and Novgorod on the W., Vologda on the N., and Kostroma on the E., is one of the smallest, but at the same time one of the most populous and industrial governments of Great Russia. It has an area of 13,751 square miles, and the population was 1,118,130 in 1884. It consists of a broad and shallow depression, elongated from west to east, where the Volga flows at a level ranging from 260 to 230 feet above the sea, while the surrounding hills rise to altitudes of from 700 to 800 feet. In the west, especially between the Motoga and the Sheksna, the country is covered with marshes and ponds, which become completely flooded when the water rises in the rivers. There is another region of low and marshy tracts in the south, about Rostoff. Gentle sloping hills appear in the north on the left bank of the Sheksna.

Jurassic clays, sandstones, and sands cover nearly the whole of Yarostavl, but they are concealed almost everywhere by thick deposits of Glacial boulder clay, which is regarded by Russian geolo- gists as the bottom moraine of the great ice-cap of the Glacial period. Triassic " variegated marls," widely diffused throughout the whole of the middle Volga region, undoubtedly underlie nearly all the Jurassic deposits of the government, but only a few patches come to the surface; many salt springs exist in these deposits, Thé Upper Carboniferous limestones come to the surface only in the north-west and towards the east. The chief mineral products are bog-iron ores, sulphate of copper, and pottery clay. Peat occurs in thick beds. There are also several mineral springs. The soil is mostly a kind of loess of moderate fertility ; sandy tracts are not uncommon ; and

wide areas are covered with marshes—relics of the great lakes of the Lacustrine period.

The chief river of the government is the Volga, which traverses it for 180 miles, making a great bend to the north. The chief towns—Rybinsk, Yarostavl, Motoga, Romanoff-Borisoglyebsk, Uglitch, and Myshkin—are situated on its banks, and a brisk

1 Geological Survey of Russia, sheet 56, by Nikitin (Russian and German), St Petersburg, 1884. '

traffic is carried on, both by the river itself and by two canals, Mariinsk and Tikhvinsk, which connect it with the Neva through its tributaries the Sheksna aud the Motoga. Another tributary received by the Volga within the government is the Kotorost, which has many manufactories on its banks and is navigated, especially in spring. The Kostroma flows along the eastern border and is a channel for the export of timber and fuel. Small lakes are numerous, the chief being Lake Nero or Rostoff. The forests, which consist chiefly of fir and Scotch pine, cover one-third of the aggregate area; but they are rapidly being destroyed. The flora of Yarostavl, although similar to that of Moscow, bears a northern stamp owing to the presence of the dwarf birch, Rubus arcticus, and Linnea borealis.

The climate is as continental as that of middle Russia generally. The average temperature at Yarostavl is 36°°7 Fahr. (January 6°°5, July 61°5); the prevailing south-western and western winds render it moister than in central Russia ; and the average number of days with rain or snow is114. The rivers remain frozen from 118 to 183 days every year.

The population is thoronghly Great Russian. The aboriginal Meryas have been completely Russified; and traces of the Karel- ians, who immigrated in the 17th century, can only be discovered in the names and features of some inhabitants on the Siti river. There are moreover some 1000 Tartars, 2100 Jews, and about 500 Gipsies. Leaving out of account some 2700

Catholics and Protest- ants, the population belongs to the Greek Orthodox Church or is Raskolnik.

Although Yarostavl is one of the chief manufacturing govern- ments of the empire, its inhabitants have by no means abandoned agriculture, 27 per cent. of the total area being under crops (36 per cent. under forests and 8 per cent. untillable) ; on the lands of the peasantry the percentage is still greater (from 46 to 58 per cent.). Rye, oats, and barley, with some wheat and pease, are the chief crops, and in good seasons Yarostav] has even a surplus of corn, which is either sent to the distilleries or exported, The average crops of 1883-85 were 960,100 quarters of ryc, 36,000 of wheat, 97,400 of barley, 1,097,100 of oats, 19,600 of other grain, and 6,992,800 bushels of potatoes. Nearly 40,000 cwts. of flax are cropped every year. Market-gardening is largely engaged in and the Yarostavl gardeners have a wide repute throughout Russia. Chicory, sweet pease, cucumbers, apples, and berries are exported. Although there is no want of meadows, cattle-breeding is not greatly developed. In 1882-84 thcre were 178,370 horses, 260,000 cattle, 188,700 sheep, and 4700 pigs. One-third of the peasant households had no horses. Cheese-making on the co-operative principle has spread extensively of late, owing to the efforts of the zemstvo; 93 associations have a yearly production to the value of £12,700. Domestic trades are carried on in great variety in the villages, including the making of linen cloth, boots, gloves, sheepskins, knitted wares, clothes, felts, all kinds of wooden wares, pottery, and a variety of metallic goods. The total production is very consider- able, although no details are available. The manufactures are growing rapidly, the yearly production of 1708 establishments being estimated at £2,210,000 in 1884. Cotton and linen are the chief items (nearly £1,000,000); fiour-mills, distilleries, and tobacco works come next; and these are followed by chemical works and workshops for machinery, metallic wares, and so on, which are rapidly developing. The trade of the government is very active both on the Volga and on the two railway lines, one of which connects Rybinsk with the St Petersburg and Moscow line and the other connects Yarostavl with Moscow and Vologda. MRybinsk and Yarostav] are the chief commercial centres, but Rostoff, Motoga, Romanoff, and Poshekhonie also carry on an active trade in corn, timber, and manufactured wares. The total merchandise shipped or discharged to and

from the towns and villages of Yarostavl is estimated at 1,600,000 tons annually, one-half by rail.

One of the most distinctive features of Yarostavl is the large numbers of its male population who annually leave their homes in order to work all over Russia as locksmiths, masons, plasterers, waiters in restaurants, greengrocers, tailors, gardeners, carpenters, joiners, pilots, or boatmen. Many of these employments have been specialties of the population of Yarostavl from a remote antiquity, and the native of this government can easily be distinguished by his enterprising spirit, keen air, and energetic and nervous temperament. In Moscow and St Petersburg together there are about 76,400 employed in the above capacities, and it may be estimated that as many as 100,000 persons annually leave their homes in this way.

The educational institutions were represented in 1884 by a lyceum (197 students), six gymnasia (569 boys and 1219 girls), a military school (492 boys), a seminary for teachers (81 students), and 745 elementary schools (25,780 boys, 10,140 girls).

Yarostavl is divided into ten districts, the chief towns of which, with their population in 1884, are—YAROSLAVL (see below), Daniloff (5780), Lubim (3180), Motoga (6860), Myshkin (2390), Poshekhonie (5990), Romanoff-Borisoglyebsk (5300), Rostoff (12,450), Rybinsk (19,900), and Uglitch (11,930). Petrovsk (1760) has municipal institutions.

History. —As early as the 9th century the Slavonians had become masters of the Yarostavl territory, which was formerly occupied by the Finnish stems Vess and Merya, as also by Mordvinians, Muroms, and Tcheremisses in the south. Rostoff was already in existence ; but Yarostavl, Rybinsk, and Uglitch begin to be mentioned in the annals only in the 11th and 12th centuries. The independent prin- cipality of Rostoff was divided in the 13th century into three parts,

but these were soon afterwards successively annexed to Moscow. _ See the Trudy of the Yarostavl Statistical Committee, 8 vols., and the Vyestnik of

the Yarostavl zemstvo, published since 1872. (@. A. K.)

YAROSEAVL, capital of the above government, stands on the right bank of the Volga, at its junction with the Kotorost, 173 miles by rail to the north-east of Moscow, and had a population of 48,310 inhabitants in 1884; but this number is temporarily much increased during the period of navigation. The suburbs of the town occupy the left bank and are inundated at high water. A fine quay borders the Volga for nearly two miles. The cathedrals and several churches are very old. The Uspenskiy cathe- dral was begun in 1215 and rebuilt in 1648 ; the churches of the Preobrazhenskiy monastery, St John's, and Voskre- seniye date from the 15th and 17th centuries, the second being a fine specimen of the architectural style exemplified in the Vasiliy Blazhennyi church of Moscow. Yarostavl has a lyceum, founded by Demidoff, with a juridical faculty, three gymnasia (409 boys, 669 girls), and various primary schools. The manufactories, whose total production in 1862 barely reached the value of £200,000, now employ 5100 hands and yield an output valued at about £1,000,000 (one-half from one cotton-mill). The trade, especially that in corn, is very active and accounts for one-quarter of the whole traffic of the government. The Yarostavl merchants also carry on a large import trade in manufactured goods and groceries.

The town of Yarostavl was founded in 1026-1036 by Yarostay

_Vladimirovitch, who caused a wooden fort to be erected at the con- fluence of the Kotorost with the Volga. It became the chief town of a principality in 1218 and remained so until 1471, when it fell under the dominion-of Moscow. Even in the 13th century Yarostavl was an important town, and, although it suffered during subsequent wars, it maintained its importance until the 19th century, when the trade on the Volga and its rising manufactures

again gave it a position of predominance in the upper basin of the Volga.

YARRELL, Wiuttam (1784-1856), one of the most popular of British naturalists, was born at Westminster in June 1784. His father was a newspaper agent, and he himself succeeded to the business on his father's death, and prosecuted it till within a few years of his own. He availed

himself of any interval of relaxation to enjoy such sport as the neighbourhood of London afforded, acquired the reputation of being the best shot and the first angler in the metropolis, and soon also became an expert natural- ist. In 1824 he became a fellow of the Linnean Society, and was a diligent contributor to their 7ransactions 3 and he was one of the earliest members of the Zoological Society. The greater part of his leisure towards the end of his life was devoted to his two great works, The Listory of British Fishes (2 vols., 1836) and The Listory of British Birds (2 vols., 1843). These works are compiled on the same plan; they contain accurate figures, with accompany- ing descriptions, of every British fish or bird 3 and they have from the first taken their position as standard authorities. Few books on natural history are more agreeable to the general reader: the style is pleasant, and the truth with which he describes the habits of the birds is such as might have been expected from a keen and ob- Servant sportsman. In 1856 he had an attack of paralysis, of which he died at Yarmouth on Ist September of the same year.

YAWS is the name in use in the British West Indies and on the West Coast of Africa for a peculiar disease of the skin in Negroes. The learned name, first applied by Sauvages (1761), is frambesia, from the likeness of the

typical excrescences to a raspberry. For many years yaws

was thought to be peculiar to the African Negro, either in

his home (both west and east coasts) or in the West Indies and Brazil. long been known in the East Indies (first mentioned by Bontius early in the 17th century), affecting the Malays rather than the Negroes, its chief seats being Amboyna, Ternate, Timor, Celebes, Java, and Sumatra.

But a disease the same in every respect has

It has been identified more recently by De Rochas and other observers in New Caledonia and Fiji. The parangi of Ceylon has been shown by Kynsey to be the same as the West Indian yaws. Also in the Samoa group, to which there has been no Negro migration, an identical malady occurs.

The closely allied verrugas of the Peruvian Andes (see Wart) is so different in its endemic circumstances that it is not usually classified as a form of yaws. The account that follows applies equally to all of the local forms, while it has more especial reference to yaws in the Negroes of the West Indies.

The general course of the disease is as follows. Previons to the eruption there may or may not be any disorder of health ; in child- ren (who form a large part of the subjects of yaws) there will prob- ably be rheumatic pains in the limbs and joints, with languor, debility, and upset of the digestion ; in adults of ordinary vigour the eruption is often the first sign, and it is attended with few or no constitutional troubles. The eruption begins as small pimples like a pin's head, smooth and nearly level with the surface ; they have a little whitish speck on their tops, grow rapidly, and reach the size of a sixpence or ashilling. The pustules then break, and a thick viscid ichor exudes and dries upon them as a whitish slough, and around their base as a yellowish brown crust. Beneath the whitish slough is the raspberry excrescence or yaw proper, a reddish fungous growth with a nodular surface. The favourite seats of the eruption are the forehead, face, neck, armpits, groin, genitals, perineum, and buttocks. Hairs at the seat of a yaw turn white. In young children or infants the corners of the mouth ulcerate, as in syphilis, and the perineal excrescences resemble condylomata. The pustules and excrescences do not all arise in one crop: some are found mature while others are only starting. If the patient be of sound constitution and good reaction, the yaws may reach the full size of a mulberry in a month, in which case they will probably be few; but in persons of poor health they may take three months to attain the size of a wood-strawberry, in which case they will be numerous inversely to their size. Often there is one yaw much larger than the rest, and longer in falling; it is called the "master yaw" or "mother yaw." On the soles of the feet (less often on the palms of the hands) the bursting yaws are as if im- prisoned beueath the horny cuticle ; they cause swelling and tender- ness of the foot, until set free by paring the callous skin down to the quick ; these yaws are called "crab yaws" or tubbas. Usually a yaw is painless unless when rubbed or irritated. The absence of pain is used as a diagnostic sign if there be any doubt as to the nature of the attack : a pustule is opened, and a little of the juice of

capsicum dropped into it ; if it be a yaw, no smarting will be felt. In some cases a few yaws will show themselves long after the primary attack is over; these are called "memba yaws " (from "re- member"), the term being sometimes applied also to protracted cases with successive crops of eruption. Six weeks is the average time in a good case, from the first of the eruption to the fall of the cxcres- cences ; in such regular cases a scar remains, it may be for many months, darker than the rest of the (Negro) skin. But the disease is often a much more tedious affair, the more protracted type having become common in the West Indies of recent years. In such cases the eruption comes out by degrees and as if with difficulty, crop after crop ; foul, excavating, and corroding ulcers may remain, or a limb may be in part seamed and mutilated by the scars of old ulceration, The scars after ulceration are not so dark as the skin around.

That yaws isa communicable disease is beyond question ; but that it has always arisen by conveyance of yawey matter from a previous case is neither proved nor probable. Being to a great extent a disease of childhood, it is not usually conveyed after the manner of syphilis, but by contact in other ways (as in the epidemic syphilis of 1494-1520 and in recent circumscribed epidemics). An abrasion or wound of the surface, such as a chigoe bite or a cut of the foot, is a likely point of entrance for the virus. If the yawey matter finds access to a pre-existing sore or ulcer, it causes the latter to take on a foul and sloughing condition. No sore or yaw 1s induced at the point of infection, which will probably be healed long before the eruption appears. It is said, however, that the pustules appear earliest and in greatest numbers on the skin near the spot where the virns entered. They follow the infection at an

interval of several weeks (incubation period). Cases of yaws by infection are not unknown in white persons of good position, both children and adults, in the West Indies and elsewhere.

The nature of the disease is obscure. It is alleged to be here- ditary by some, and denied to be so by others; the fact seems to be that some constitutions are much more susceptible than others, and susceptible at some periods or states of health more than at others. As an epidemic, the

disease in a locality has seasons of activity and quiet. One attack in childhood gives a large degree of immunity for the rest of life. Yaws used to break out in the slaves on board Guineamen. Both in Africa and among the slaves in the West Indies it was a custom to inoculate the yaws, so as to get yay attack over (called "buying the yaws") or to get put upon the sick list.

As regards treatment, the malady in a person of good constitu- tion runs its course and gets well in a few weeks. Whatever tends to check the eruption, such as exposure to chill, is to be avoided. A week's course of cream of tartar and sulphur (confection of sulphur) at the beginning of the illness is often resorted to, so as to bring the eruption well out. The patient should remain indoors, in a well-aired room, and take daily warm baths and diluent drinks. If the excrescences are flabby and unhealthy, it is an indication for generous diet. Mercurial treatment is no longer in vogue. Asex- ternal applications, weak lotions of zinc or carbolic acid may be used, and, if the excrescences are irritable, a watery solution of opium. Tedious and unhealthy yaws should be dressed with a wash of sulphate of zinc or of copper; the same may be applied to a yaw ulcer. The crab yaws of the horny soles or palms, after they are let through by paring the cuticle, may be dusted with alum powder. The most intractable cases occur in badly nourished and anemic subjects, and these will often go on for months in hospital without mending. Of late in the West Indies the disease has become largely a morbus miseriz, and to that extent less amenable to treatment.

The date of the first appearance of yaws in the West Indies and Brazil is matter of dispute ; the general belief is that it came in with the African Negro. After the emancipation in 1838 there was a marked decline in the prevalence of the disease in] Jamaica and other colonies. In Jamaica it began to be seen again from 1854 to 1864, the cases being more of adult age than formerly. The worst recent centre of yaws has been Dominica, which is occupied by Negro communities unprovided with medical attendance. In 1871 the Government opened and maintained two special hospitals for yaws (under a board of commissioners), one at Morne Bruce near Roseau, and the other at Prince Rupert's. In Barbados and Antigua cases of yaws are rarely seen, the population being more creole than

Negro. Trinidad has a good deal of the disease from time to time in the inland villages ; bad cases are admitted to the leper asylum at Port of Spain. In Grenada, which has a special yaws hospital, and in St Vincent the immigration of Hindu coolies received a check owing to the ravages made by the disease among them. It prevails also in San Domingo, Guadeloupe, and others of the Antilles. At Berbice and Essequibo there were 23 fatal cases in one year (1870). The disease is common in all parts of Brazil. In western Africa cases are found along the whole coast from the Senegal to the Congo, and in the interior (Timbuktu and Bornu). On the East Coast it is found in Mozambique, Madagascar, and the Comoros. Its localities in the East Indies and islands of the Pacific have been already mentioned.

For the literature dealing with the subject, see Hirsch, Geographical and His- torical Pathology (Engl. trans.), vol. ii., London, 1885 (New Sydenham Soc.).

YAZD, or YEzp, a city of Persia, capital of the district of Yazd, province of Farsistan, in 31° 50' N. lat. and 54° 25' EK. long. Yazd stands on a flat sandy plain, about 50 miles broad and encircled by an amphitheatre of pictur- esque hills, on the high road between Ispahan and Karman, 190 miles south-east of the former and 220 north-west of the latter place. The old and dilapidated walls enclose a very large space, which, however, is much encumbered with ruins, the population having fallen from about 100,000 at the beginning of the 19th century (Christie) to about 30,000 in 1868 (Smith), Since the famine of 1870 the place has recovered some of its former prosperity, and has at present (1888) an estimated population of 50,000, includ- ing 1000 Jews and about 4000 fire-worshippers, Yazd being the only town in Persia where these still form a separate community. There are fifty mosques, sixty-five public baths, eight public schools, but no building of any note except the chief mosque, a very old and decayed structure, which still presents a lofty and imposing frontage. With the exception of a fine new bazaar, which is well stocked with goods and much frequented, the markets and other

Bs parts of the town are irregularly planned, with narrow dark streets and little life. Yazd is in fact a city of the wilder- ness, whose oasis, planted

chiefly with mulberries and other fruit trees, is everywhere surrounded by the shifting sands, which at some points already threaten to encroach on the town itself (Macgregor). In this way was engulfed its predecessor, Old Yazd or Askizdr, whose ruins are still visible 10 miles to the north-west on the road to Kashan. Nevertheless the local traders maintain their old reputation for intelligence and enterprise, and their agents still visit the distant markets of India, Java, and China. The trade with India formerly carried on through Shirdz now takes the more direct route through Karman. The exports are chiefly sugar, silks, opium (4000 chests in a single year to China), cordage, cotton, felts, and copper ; the imports wheat, rice, cotton goods, and henna. This henna, together with rang for dyeing the hair, is brought from the Mindb and Bandar-Abbas districts to be ground and prepared for the Persian market. From the neighbouring villages and the remote province of Ghilién comes the raw material for the silk-looms, which produce two kinds—sasb and aluhi —both of the very finest quality. Other noted products of the local industries are the felts, equal to the best in Karman, and the candied sugars and sweetmeats, in the preparation of which the fire-worshippers excel. A great drawback to Yazd is the defective and irregular supply of water, which largely depends on the yearly snow and rain- fall on the surrounding hills. The annual revenue averages £35,000 to £40,000, of which three-fifths go to the public treasury ; the rest supports the local administration and household of the governor, who resides in a kind of citadel within the city walls

YEADON, a manufacturing town in the West Riding of Yorkshire, is situated on a hill north of Airedale, about 14 miles from Guiseley station on the Midland Railway and 84 miles north-west of Leeds. The streets are gener- ally irregular and tortuous, but within recent years greater care has been taken in the arrangement of new buildings. The church of St John in the Pointed Gothic style, erected in 1843, consists of chancel and nave, with square tower surmounted by pinnacles. The town-hall and mechanics' institute, a handsome Gothic building erected in 1883, in- cludes a large public hall, the rooms of the Liberal club and of the local board, and class and lecture rooms. Yeadon is chiefly of modern growth, although wool-combing and cloth manufacture were carried on to some extent before the establishment of the first woollen-mill in 1831. Since

1850 the town has made rapid progress, and now possesses several mills, in which woollen cloths are manufactured, especially materials for ladies' jackets, ulsters, mantles, &c. The township was formed out of Guiseley in 1845. The local board of health was established in 1863. The popula- tion of the urban sanitary district (area 1723 acres) was 5246 in 1871 and 6534 in 1881.

YEAR. See CALenpDar, vol. iv. p. 666.

YEAST, an insoluble substance forming an essential component of all sacchariferous juices when in the state of vinous fermentation. This subject is pretty fully dealt with under FERMENTATION (see vol. ix. pp. 92, 95, 97); one important application of yeast, however, viz., that which it finds in the baker's trade, is there only referred to. To produce a spongy loaf, the dough, before being made into loaves, is mixed with a ferment which, if allowed to act for a sufficient time before baking, produces alcohol and carbonic acid from a small portion of the actual or potential sugar present; and the carbonic acid, being liberated from within the dough, causes it to "rise." In former times leaven (see Baxkine, vol. iil. p. 253) used to be employed exclusively. For higher classes of bakery yeast is now preferred. The yeast produced so abundantly

Type and

circum- stances,

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in beer-brewing is available ; but its bitter taste is an objec- tion to it. Hence it has long been customary in Germany to produce yeast expressly for bakers' and cooks' purposes, which may, of course, be done in a variety of ways. method frequently used is to produce a wort (see BREWING, vol. iv. p. 275) from barley, malt, and rye, and by the addi- tion of a little ready-made yeast to let it ferment under con- ditions which favour the growth of yeast-cells, but restrict the proportion of alcohol produced to a minimum (comp. FERMENTATION, vol. ix. p. 97). During the most tumultu- ous period of the process the yeast is skimmed off from the surface, washed with water, and either "filter-pressed " or

“centrifuged” to obtain it as a relatively dry paste ; it is then mixed with a proportion of dry starch, to give ita higher degree of dryness. Such yeast goes into commerce as presshefe or pfundhefe (German yeast or barm). This industry used to be a monopoly of Germany ; but quite lately the manufacture of German yeast has been taken up in Scotland.

YEDO. See Toxio.

YEISK, a district town of the Russian province of Kuban (Caucasus), was founded in 1848 at the mouth of the Yeia, on a narrow sandbank which separates the shallow Bay of Yeisk from the Sea of Azoff, 108 miles to the south-west of Rostoff-on-the-Don. Notwithstand- ing its shallow roadstead, which has a depth of 14 feet only at 2 miles from the shore, Yeisk has grown with great rapidity, and in 1884 had 23,725 inhabitants. Corn, linseed, and wool are exported to a considerable extent (1,730,000 cwts. of corn and flax and 10,000 ewts. of wool in 1885), and the port was visited in 1886 by 69 ships (30,000 tons) engaged in foreign trade and by 697 (80,800 tons) engaged in the coasting trade. There are large wool-cleansing factories, oil-works, and tanneries.

YEKATERINBURG. For this and similar forms of Russian town-names, see EKATERINBURG, &c.

YELETS, a district town of the Russian government of Orel, 121 miles by rail to the east of Orel, stands on the great trunk railway which connects Riga with Tsaritsyn on the lower Volga; a branch line connects it also with the railway which runs from Tula to Samara and Orenburg. Owing to its advantageous position Yelets, which had been for a long time an important entrepét for the corn trade, has rapidly grown of late, and in 1883 had 36,680 inhabit- ants. The Yelets merchants buy large quantities of grain in the fertile neighbouring provinces, and send their agents to southern and south-eastern Russia; nearly 150 flour-mills, many of them driven by steam, prepare flour, which is forwarded chiefly to Moscow and partly to Riga. The trade in cattle is also very important. Yelets has become of late a manufacturing centre, and has some im- portant tanueries, foundries for cast-iron and copper, tallow- melting works, sieve manufactories, éc. The town has several educational institutions, Its cathedral and two monasteries contain venerated historic relics.

Yelets is first mentioned in 1147, when it was a fort of Ryazah. The Polovtsys attacked it in the 12th century, and the Mongols destroyed it during their first invasion. The Tartars plundered it in 1415 and 1450 ; and it seems to have been completely abandoned in the latter half of the 15th century. Its development dates from the second half of the 17th century, when it became a centre for the trade with south Russia.

YELIZAVETGRAD. Sce Exizaseruerap.

YELIZAVETPOL. See ELizaABerHpot.

YELLOW FEVER is a typhus-like fever of certain ports, or of ships hailing from them. It differs from all other existing types of fevers and infections in largely sparing the Negro. It resembles cholera in being en-demic in some parts of the world (but only shipping places) and in being importable to others, in being an infection that issues from the soil or some medium equi-

valent thereto, and in being a virulent filth-disease ; but it differs from cholera in having at the outset a violent febrile paroxysm lasting two or three days. As a fever it resembles typhus; but it differs from typhus in all those "exogenous" characters wherein it resembles cholera. The generic place and affinities of yellow fever are perhaps best provided for in the nosology of Cullen: the symptoms. are within the sphere of the organic nervous system ; they stand for excitement first and prostration afterwards ; and they are an effect of human effluvia. Its differentia among the "' nervous" fevers due to "human effluvia" would be its maritime or amphibious habitat, its associa- tion with tropical heat, the chief part played by the liver in its symptomatology (on the lines of acute yellow atrophy), and the singular immunity of the Negro race.

An attack of yellow fever may follow definite exposure Charac-

(such as landing at an endemic port) within a few hours, as in corresponding cases of cholera; but the outbreak of symptoms is more often delayed for a few days, the limit of "incubation" being about eight.

The few hours' languor, chilliness, headache, and muscular pains, which might be the precursors of any febrile attack, are followed by a peculiar look of the eyes and face, which is charac- teristic : the face is flushed, and the eyes suffused at first and then congested or ferrety, the nostrils and lips red, and the tongue scarlet,—these being the most obvious signs of universal congestion of the skin, mucous mem- branes, and organs. Meanwhile the temperature has risen to fever heat, and may reach a very high figure (maximum of 110° Fahr., it is said); the pulse is quick, strong, and full, but may not keep up in these characters with the high temperature throughout. There are all the usual accompaniments of high fever, including hot skin, failure of appetite, thirst, nausea, restlessness, and delirium (which may or may not be violent) ; albumen will nearly always be found in the urine. The fever is a continued one so long as it lasts; but the febrile excitement comes to an end after two or three days. In a certain class of ambulatory or masked cases the febrile reaction may never come out, and the shock of the infection after a brief interval may lead unexpectedly and directly to prostration and death. The cessation of the paroxysm makes the stadiwm, or lull, characteristic of yellow fever. The hitherto militant or violent symptoms cease, and prostration or collapse ensues. The internal heat falls below the normal; the action of the heart (pulse) becomes slow and feeble, the skin cold and of a lemon-yellow tint, the act of vomiting effortless, like that of an infant, the first vomit being clear fluid, but afterwards black from an admixture of blood. It is at this period that the prospect of recovery or of a fatal issue declares itself. The prostration following the paroxysm of fever may be no more than the weakness of commencing recovery, with copious flow of urine, which even then is very dark-coloured from the presence of blood. The prostration will be all the more profound according to the height reached by the temperature during the acute paroxysm. Much blood in the vomit and in the stools, together with all other hemorrhagic signs, is of evil omen. Constant hiccough, with loud cries or wailing, is a certain sign of death, which may also be ushered in by suppression of urine, coma, and convulsions, or by fainting from failure at the heart. The proportion of recoveries is usually less than one-half; but it has been now and then very large (as in the New Orleans epidemic of 1878). Convalescence is on the whole rapid; but, if some old disease, such as ague, have been lighted up,

or abscesses induced, it may go on slowly for months. One attack of yellow fever confers a high degree of immunity from a second.

The treatment of yellow fever has been one of the classical sub- Treat- In the Philadelphia epidemics of the end of ment.

jects of controversy.

Patho- logy.

History

Y@tig oy FeV ER

the 18th century, Rush gained much credit for his incessant labours in bleeding the victims during the violence of the paroxysm. Al- though blood-letting to relieve the congestions has been given up, experience still favours the resort to vigorous measures at the out- set. The following practice was adopted with much success by Dr Joseph Jones during the epidemic of 1878 at New Orleans,—an emetic of ipecacuanha, followed by a powder of calomel (10 to 20 grains), with as much quinine added (the latter ingredient of doubt- ful utility), and that again followed by a full dose of castor oil. Beyond that heroic medication at the outset of the febrile paroxysm, the treatment was directed to assisting the action of the skin and kidneys, by keeping the temperature of the room uniform, by inustard foot-baths, and by copious draughts of lemonade or other aerated water, or of barley water. The diet indicated is fever diet : z.€., it should exclude solid food. For such symptoms as tender- ness over the stomach a mustard poultice is applied ; for diminished secretion of urine, dry cupping over the loins. When the lull occurs, the patient should on no account be allowed to get up, as sudden failure of the heart is apt to follow exertion. Iced cham- pagne and beef-tea are found to be the best supports for this stage. The only thing to do when black vomit threatens is to give the patient ice to suck, or (more questionably) to place an ice-bag on the abdomen. When the stage of prostration assumes a "typhoid" character, an enema of ice-cold water, with a little turpentine in it, helps to get rid of the flatus and to stimulate the kidneys. Re- covery is in all

cases more probable where there is abundant cubic space and good ventilation.

Yellow fever is of the nature of typhus, in the language of older writers, a nervous or putrid fever. The two salient things about it are the internal hemorrhages and the almost complete arrest of the function of the liver; of these the latter would seem to be primary and the former secondary. The state of the liver on examination after death from yellow fever is by far the most significant feature in the morbid anatomy: the bile-ducts and gall- bladder are empty, or contain only a clear albuminoid fiuid ; the organ is bloodless and ofa golden yellow colour ; and the hepatic cells are everywhere full of fatty granules or other molecular detritus. It shows, in fact, the morbid anatomy of acute yellow atrophy, or that state of the hepatic structure and functions which is due to total inhibition or arrest (see PATHOLOGY, vol. xviii. p. 386), whether the inhibiting influence be phosphorus poisoning, or emotional strain, or something in the pregnant state, or the infective influ- ence of yellow fever. All the other phenomena of this fever are grouped around the liver derangement, as around a centre, namely, the yellow tint of the skin, the fatty degeneration of the heart favouring syncope, the hemorrhages from the mucous membrancs (including the black vomit), the degeneration of the renal epithe- lium with albuminuria, and the coma and convulsions. Yellow fever therefore may be styled a sudden or arbitrary infection im- posed. from without, the distinctive mark or "note" of which is the same peculiar group of symptoms that is found in the rare and sporadic cases of ycllow atrophy. To reach the full and correct doctrine of yellow fever, we have to harmonize the clinical and pathological facts of the disease, as already given, with the histori- cal, geographical, racial, and other associated circumstances now to be stated.

The first authentic account of yellow fever comes from Bridge-

and geo- town, Barbados, in 1647, where it was recognized as a "nova graphical pestis," that was unaccountable in its origin, except that Ligon, distribu- the historian of the colony, who was then on the spot, connected it

tion.

with the arrival of ships. It was the same new pestilence that Dutertre, writing in 1667, described as having occurred in the French colony of Guadeloupe in 16385 and 1640; it recurred at Guadeloupe in 1648, and broke out in a peculiarly disastrous form at St Kitt's the same year, and again in 1652; in 1655 it was at Port Royal, Jamaica; and from those years onwards it became familiar at many harbours in the West Indies and Spanish Main, and in the Atlantic ports of the British American colonies, It is a question whether it had not occurred at Porto Rico, San Domingo, and other places in the Spanish Antilles a good many years before ; but the reports from the colonies of New Spain, both for that and subsequent periods, are highly defective as regards the data needed to distinguish yellow fever from the bilious remittent form of malarial fever, which is a non-infective sickness. The Mexican form of typhus, called " matlazahuatl," which has been an indigenous disease of the native population in the interior for several centuries, has no other connexion with yellow fever than that it belongs to the same family of typhus; its circumstances are quite different, especially in respect that it is a purely inland form of febris pauperum. In 1853 yellow fever appeared for the first time at Callao and Lima in Peru; and almost in the same months a severe epidemic prevailed among the plantation hands in the sierra region of the interior. The two forms were described as the same disease by Dr Archibald Smith ; but the fever of the sierras was afterwards shown to be a form of typhus, analogous to the native Mexican form, and quite unconnected with the yellow fever of the coast.

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In the harbours of the American colonies (United States) the history of yellow fever has been as follows. It begins to be heard of at Charleston in 1693, and at Philadelphia the same year. The South Carolina port has the fullest record of it, next in order in the earlier period being Philadelphia, New York, and Norfolk (Va.). Towards the end of the 18th century the ports of New England, as far north as New Hampshire, have visitations, and it begins to be quite common at Baltimore, Wilmington, Savannah, and New Orleans. Ata still later period (within the 19th century) we find the centre of incidence shifting so as to include Mobile, Memphis, Natchez, St Francisville, and Baton Rouge; and in the most recent period

outbreaks are recorded at Galveston and other ports of Texas, and at Pensacola, Vicksburg, and Key West. The Atlantic ports gradually lost it and the Gulf ports took up the inheritance, several of them keeping it still. Some of the epidemics were very disastrous, one of the Philadelphia outbreaks corresponding to the pestilence which figures in the last section of Longfellow's Evan- geline: "Wealth had no power to bribe, nor beauty to charm the oppressor." In the New Orleans epidemic of 1878 the deaths num- bered 4056. The American ports mentioned have been only its principal seats, many other smaller harbours having had outbreaks now and then, such as New Haven (Conn.), Providence (R.I.), Swedesborough (N.J.), Alexandria (Va.), Augusta (Ga.), St Augus- tine (Fla.), Opelousas (La.), and Houston (Tex.).

Along with the harbours and anchorages of the West Indies and Spanish Main, the three chief harbours of Guiana (Cayenne, Suri- nam, and Demerara) have had an equal share, and for almost the same period. But for Brazilian ports there is no record of yellow fever until 1849, when it appeared for the first time at Rio de Janeiro, Bahia, and other places. Thesc ports became endemic seats of the infection from that year, and are now more distinctively the head- quarters of the disease than its old West Indian and Mexican Gulf centres. Monte Video had a disastrous epidemic in 1857, and Buenos Ayres a visitation in 1858; but the shipping placcs of the river Plate are not in the same class of endemic foci as the harbours of Brazil.

There have been a few epidemics at trading places on the West Coast of Africa, most of them subsequent to 1820, and all of them confined generally to white residents.

During the great period of yellow fever (1793-1805), and for some years afterwards, the disease found its way time after time to various ports of Spain. Cadiz, indeed, suffered five epidemics in the 18th century, Malaga one, and Lisbon one; but from 1800 down to 1821 the disease assumed much more alarming proportions, Cadiz being still its chief seat, while Seville, Malaga, Cartagena, Barcc- lona, Palina, Gibraltar, and other shipping places suffered severely, as well as some of the country districts nearest to the ports. These Spanish outbreaks were clearly connected with

the ar- rival of ships, but for the most part there had not been cases of yellow fever on board the ships. The last severe epidemic on Spanish soil was at Barcelona in the summer of 1821, when 5000 persons died. The most recent disastrous epidemic in Europe was at Lisbon in 1857, when upwards of 6000 died in a few weeks. The outbreaks at St Nazaire (1861), Leghorn, Swansea (1864), and Southampton have been carefully studied, but are otherwise of minor importance,

Yellow fever is dependent upon high summer temperature for its epidemic development, and it requircs a good deal of heat to continuc even after it has once acquired epidemic intensity. In its endemic centres in the New World it clings peculiarly to the lower quarters of the seaports, to the alluvial foreshores, and to the anchorages ; on many occasions it has been prevalent among the crews of men- of-war and of merchantmen at anchor, or moored in the harbour, or lying up in the carénage, when there has been none of it among the residents ashore. It is admitted that the endemic influence which causes it is effluvial or miasmatic from the harbour mud, or from the bilge-water of a ship that had lain in the harbour, or from the alluvial foundations of houses nearest to the beach. So far as prevalence on shore is concerned, it seems to follow the same laws as cholera and typhoid fever: that is to say, it is an exogenous or soil infection, a fermentation of filth in the ground, with a seasonal activity closely following the movements of the subsoil watcr. In like manner, when it has been imported to Spain, it has clung to alluvial soil and has spread after the fashion of a soil-borne infec- tion rather than by personal contagion, although in Spanish ports, just as in Philadelphia, according to Rush's opinion, contagious- ness has been found to be "contingent " to it under certain circum- stances. To establish an epidemic in a distant port, it has been necessary that there should be carried thither a material quantity of the specifically poisonous harbour-filth in a ship's bilges, and that the conditions favourable to its increase and diffusion by fer- mentation should exist in the new soil.

The next most significant thing in the incidence of this fever is that new arrivals at an indigenous centre are peculiarly liable to take it, and most liable of all the sailors and others from northern latitudes, such as

Sweden, Finland, Holland, and Germany. In fact an epidemic outburst in a yellow-fever port or endemic centre

Special local and racial circum- stances.

Theory of the disease,

at the present day is commonly connected with an unusual influx of strangers. It is not to be supposed, however, that the residents acquire immunity by acclimatization: they have no greater im- munity in that sense than have the Bengalis from cholera, or than those who permanently reside in unsanitary localities from typhoid fever or diphtheria. The only immunity is that of the Negro race, an immunity all the more striking that the Negroes in yellow- fever ports are mostly found living in the favourite haunts of the disease, and that their race is peculiarly liable to all other infec- tions of the kind, including cholera, typhus, and typhoid. Al- though the protection of the Negro of pure blood is not absolute, itis nearly so. In ordinary circumstances Negroes become liable when of mixed blood, and almost exactly in proportion to the degree of white stock in their breeding. hese racial 'peculiarities have been so often remarked and are so universally admitted in their broad significance that no detailed proofs need be adduced. It may be stated, however, that all African Negroes, whether fresh from Africa or long acclimatized to the New World, have the same natural protection ; thus the Nubian regiment in the French ser- vice during the Mexican expedition did not lose a single man, and did not even have a single case, in the epidemic at Vera Cruz in 1866. The protection is profoundly racial, and not due to the Negroes being inured to yellow-fever localities. There is no other instance of the same racial immunity in the whole range of in- fective sickness.

Two things stand out prominently in the foregoing recital of facts,—(1) that yellow fever, in time and place, has dogged the steps of the African slave trade, and (2) that the African Negro has a very large racial immunity from yellow fever. The first of these facts was generalized by Audouard (Paris, 1825), but has been neglected and forgotten ; the

second fact, which no one seriously disputes, is the complement and confirmation of the historical and geographical induction. The circumstances in Peru, although ap- parently in contradiction, are really corroborative: a form of yellow fever established itself at certain ports of that country in the wake of a notorious Chinese coolie trade (see CoontE, vol. vi. p. 334); but the Chinese themselves were exempt from the fever at the tinie, and would appear not to have sutfered from it in the subsequent epidemics on the Peruvian coast. The question thus arises as to the particular connexion between the African slave trade (or the analogous Chinese coolie trade) and yellow fever. The first point is that the fever has not been a fever of the voyage but of the land- ing place, although there are several authentic instances (¢.9., cases of the "Regalia" and 'La Pique") of yellow fever arising at sea from the exposure of white men to the stench of a shipful of Negroes. Again, the filthy condition ofa Guineaman on her arrival from Africa was a notorious fact; and the filth of that kind was discharged into the creeks, carénages, and anchorages of slave ports in material quantity year after year for a long period. At Havana as many as a hundred slavers would arrive in one year. Steady accretions of the filth of slave-ships from the beginning of the traffic to America down to its abolition in 1808, and its final cessation previous to 1860, would account for a peculiarly pestiferous state of the harbour mud, of the beach, and even of the water ; in fact, the water in the Bay of Havana was pestiferous and full of organic matter where it was several fathoms deep, and there was a standing order in the British navy against admitting it into ships. Wher- ever the harbours were most tideless, as around the Gulf of Mexico and in the West Indian Islands, and wherever the soil was most alluvial, and the movements of the ground-water most extensive, the specific putrefaction or fermentation thus introduced into the harbour would spread farthest on shore, being aided or encouraged always by the abundance of other organic matter which it met with at particular spots, such as the foundatious of houses.

The next step is to consider the connexion between this wholesale befouling of slave ports and the particular type of endemic disease. One of the points most emphasized by Audouard was the funda- mental physiological differences between the African Negro race and the white. The discharges of the Negro body might become by their effluvia

specifically poisonous, he argued, to white men under special circumstances. A more direct factor in the etiology was the very common, if not uniform, prevalence of dysentery and diarrhcea in the passage from the Guinea coast to the western shores of the Atlantic: the filth in a slave-ship's bilges was, in part at least, dysenteric in its source and properties. Now, there is much independent evidence, collected from times of war and famine, to prove a certain correlation or equivalence between dysentery and typhus ; according to Blane's phrase, the one was vicarious to the other. Yellow fever is admittedly a form of typhus, a form distin- guished by a hemorrhagic tendency. Thus we find the connexion explained between dysentcric and other evacuations of the Negro race, carried to the mud and alluvial soil of ports under very peculiar circumstances, and a special form of endemic typhus, dif- fering from the ordinary form in being earth-borne instead of air- borne. The remaining part of the synthesis concerns the differcn- tial type of yellow fever within the genus "'typhus:" Whence did it obtain the "note" or distinctive mark, anatomical and clinical,

of an acute yellow atrophy of the liver? The dysenteric filth that was imported into the harbours of the New World represented that almost unique unwholesomeness of life which is summed up in the phrase "horrors of the middle passage." Among suchi horrors nostalgia, despair, and the sense of wrong were not the least; and these are among the states of human feeling that have been known, now and then, in the ordinary way of life to assume that peculiar visceral embodiment, or to find that means of expression, which amounts to acute yellow atrophy of the liver, and stands, in fact, for a total arrest of the hepatic functions, biliary and other.

There is no other theory of yellow fever to contest the field with the slave-trade hypothesis; that alone satisfies all the conditions ofa correct synthcesis—historical, geographical, ethnological, physio- logical, and, some would say, even ethical. There have been various other theories put forward from time to time, all of them much too fragmentary, and therefore erroneous, such as the hypo- thesis of rotting timber (in

wharves, ships' hulls, &c.), of sugar cargoes, of common foul bilge-watcr, of madrepores, and of bacilli. The bacillary or parasitic hypothesis is the fashionable one at present, but it is much too ambitious, as ordinarily held, and altogether wide of the mark. The part played by putrefactive organisms is a subordinate one. In the general grouping of factors they can only come in after we have found the specific integral of the yellow-fever soil ixfits endemic seats ; they cannot elaborate the miasmatic poison of yellow fever without a definite pabulum, any more than the "lactic bacillus" can produce lactic fermentation without milk-sugar.

The sanitary or public health aspects of yellow fever have been Sanita- discussed in great part under QUARANTINE (vol. xx. p- 156). In tion.

regard to its sanitation at the endemic seats in the West Indies, Guiana, Brazil, Central America, and the Gulf States of the American Union, the same principles apply as to other filth-diseases. The object is to secure a clean soil, and to that end drainage and sewer- age serve best. In the sanitation of yellow fever the case is so far peculiar that the harbour bottom, the adjoining mudbanks and mangrove swamps, and even the seawater itself, are apt to retain the specific taint, especially where the cleansing action of the tides is slight. But there is good reason to think that the specific taint in the soil is everywhere slowly disappearing, now thatit is no longer reinforced by fresh supplies year after year. It has practically vanished from the Atlantic ports of the United States, and has be- come almost rare in such harbours as Port Royal, Jamaica. Its headquarters are now the Brazilian ports, which were the last to develop it (in 1849).

Literature.—The chief work is that of La Roche, Yellow Fever, 2 vols., Philadelphia, 1855. A very full bibliography is given by Hirsch at the end of his section on " Yellow Fever," in Historisch-Geographische Pathologie, vol. i., Stuttgart, 1S81 (Engl. transl. by Creighton, London, 1883). Recent experience, epidemiological and clinical, is given in the writings (2 vols.) of Dr Joseph Jones of New Orleans, 1887; see also Maclean's Diseases of Tropical Climates, London, 1886. Among the numerous monographs may be specially mentioned those of Pym (Observations upon the Bulam Fever, London, 1815), who showed that

one attack gave immunity, and of Daniel Blair (Some Account of the Last Yellow Fever Epidemic of British Guiana, with plates, 3d ed., London, 1852), A popular exposition of the slave-trade hypothesis of Audouard (with additions by the writer of the present article) will be found in North. Amer. Rev., October

1884. Audouard's three papers were collected under the title Recueil de Mémoires sur le Typhus Nautique, ow Fiévre Jaume, Paris, 1825. (C. C.)

YELLOW RIVER. See Curna, vol. v. pp. 630-631.

YELLOWSTONE NATIONAL PARK, an area situ- See Plate

ated mainly in north-western Wyoming, United States, which has been withdrawn from settlement by the United States Government and dedicated to the purposes of a public park. It is a region of hot springs and geysers, mountains and cafions, lakes and waterfalls. While it is almost entirely comprised in Wyoming, a narrow strip 2 miles wide projects on the north into Montana, and on the west a strip about 5 miles in width projects into the same Territory and into Idaho. Its boundaries, which were defined at a time when the country was little known, are as follows, The northern boundary is a parallel of latitude running through the mouth of Gardiner river, a branch of the Yellowstone, 2 miles north of 45° N. The eastern boundary is a meridian 10 miles east of the most easterly point of Yellowstone Lake, which places it almost on the 110th meridian, The southern boundary is a parallel 10 miles south of the most southerly portion of the same body of water, in lat. 44° 10'N. The western boundary is a meridian 15 miles west of the most westerly portion of Madison (now Shoshone) Lake, this meridian being approxi- mately that of 111°6'. The Park is therefore very nearly a rectangle in shape, its length north and south being 61°8 miles and its breadth 53°6. Its area is 3312 square miles.

Its surface is mainly an undulating plateau, with a mean

YERREVUWSTONE

elevation above the sea of about 8000 feet, upon the surface of which the minor streams flow, while the larger ones have cut cations for themselves, several of them being of great depth. The eastern portion, however, is occupied by an extremely rugged mountain chain, known as the Absaroka Range, peaks of which rise to heights exceeding 11,000 feet. These mountains, which separate the waters of the Yellow- stone from those of the Big Horn, are unsurpassed in the United States for sublimity and grandeur of scenery. The Gallatin Range, which separates the Yellowstone from the Gallatin river, enters the Park near the north-western corner and extends southwards some 20 miles within it. It reaches its culminating point in Electric Peak, 11,050 feet high, just within the Park boundary. Another group of mountains, in the form of a horseshoe, occurs near the middle of the Park, known as the Washburne Mountains, the highest summit of which, Mount Washburne, has an elevation of 10,346 feet. The Red Mountains are in the southern part, their culminating peak being Mount Sheri- dan, 10,385 feet in height. In this part of the Park the plateau is more elevated and broken, and just beyond its southern limits it rises intoa confused maze of mountains.

The Park has an abundant rainfall, and its streams are numerous and bold. It contains many beautiful lakes and ponds, Within its area are the sources of the Yellowstone and the Madison, which go to make up the Missouri, and of the Snake, one of the forks of the Columbia. This last stream, which drains the south-western part, takes its rise in several branches, among them being Lewis Fork, which has its origin in the beautiful Shoshone Lake, and Heart river, which rises in Heart Lake, under the shadow of Mount Sheridan. The Yellowstone drains the eastern part. Rising just beyond its southern limits, it flows into and through Yellowstone Lake, a magnificent sheet of water, of very irregular shape, having an area of 150 square miles. A few miles below the lake, the river, after a succession of rapids, leaps over a cliff, making the Upper Fall, 112 feet in height. Half & mile lower down it rolls over the Lower Fall, which has a clear descent of 300 feet. The river at this point carries, at the average stage of water, about 1200 cubic feet per second. With this fall the river enters the Grand Cajion, which in many scenic effects has not its equal on the globe. Its depth is not great, at least as compared with the cafions upon the Colorado river system, ranging from 600 feet at its head

to 1200 near the middle, where it passes the Washburne Mountains. Its length to the mouth of Lamar river is 24 miles. It is cut ina volcanic plateau, and its ragged broken walls, which are inclined at very steep angles, are of a barbaric richness of colouring that almost defies description. Reds, yellows, and purples predominate, and are set off very effectively against the dark green of the forests upon the plateau, and the white foam of the rushing river which fills the bottom of the chasm. Near the foot of the Grand Cafion, Tower ereek, which drains the concavity of the horseshoe formed by the Washburne Mountains, enters the Yellowstone. Just above its mouth this stream makes a beautiful fall of 132 feet into the gorge in which it joins the river. A few miles farther down the Yellowstone is joined by an eastern branch, Lamar river, which drains a large part of the Absaroka Range. 'Then it enters the Third Cafion, from which it emerges at the mouth of Gardiner river. The latter stream drains an area of elevated land by means of its three forks, and upon each of them occurs a fine fall in its descent toward the Yellowstone. The Madison rises in the western part of the Park and flows in a generally north- ward and then westward course out of the Park. Its waters are mainly collected from the rainfall upon the plateaus, and from the hot springs and geysers, most of which are within its drainage area. Upon this river and its affluents are

several fine falls. Indeed all the streams of this region show evidence, in the character of their courses, of a recent change of level in the surface of the country.

The climate is characterized by a considerable degree of humidity and a heavy rainfall, as compared with adjacent portions of the West. The temperature is that of a semi-arctic region. Frost may occur in midsummer and snow begins to fall in September.

The native fauna is abundant and varied. The 'policy of the Government, which protects game within this reservation, has in- duced it to take shelter here against the sportsman and pot-hunter, so that elk, deer, antelope, mountain sheep, bear, and numerous smaller game animals are very abundant and tame. The only herd of wild bisons left in the United

States is upon this reservation ; and in some parts moose are occasionally seen.

The flora is very varied. With the exception of a few limited areas in the northern part, the region is covered with forests, gener- ally so dense that landmarks are invisible and the traveller is forced to guide himself by the sun or by compass. The trees are mainly the Douglas spruce and the yellow pine, and are not of large size or great commercial value.

The surface of the park is almost entirely covered with volcanic rocks. The Gallatin Range, however, in the north-western corner, is made up of stratified beds ranging from the Silurian system up to the Cretaceous. In a few localities also Tertiary lake beds and local drift are found. The plateaus generally are composed of rhyolite, while the mountain ranges are made up of later volcanic deposits, mainly conglomerates. In this region the ancient volcanic fires, which formerly extended far and wide, especially to the south and west, are still in existence, as is shown by the vast numbers of hot springs and geysers. The number of the former is by a close estimate not less than 3000, varying in size from a few inches in diameter to an area of many acres. The number of active geysers is 71, These phenomena are found in groups in numerous local- ities, the most important of which—for they contain most of the great geysers—are the Upper and the Lower Geyser basins, near the head of the Madison, here known as the Firehole, river. The former contains 26 geysers, several of which are of such power as to throw water to heights exceeding 200 feet, and the amount of water thrown out is so great as to raise the temperature of the river water many degrees. The Lower basin contains 16 geysers. The Norris basin, upon Gibbon river, a branch of the Madison, contains 9 geysers, and the Shoshone basin, upon the shore of Shoshone Lake, contains 8 active spouters. Others are found at Heart Lake, upon Pelican creek, in Hayden's valley, and in Monument basin. In all these localities the water holds silica in solution in considerable quantities, so that as it cools and evaporates it deposits siliceous matter, which has covered with a hard white floor many square miles of these valleys, and has built up craters around the springs

. and geysers of considerable size and great beauty of form. Besides

silica, the water of many of the springs contains sulphur, iron, alum, and other materials in solution, which in places stain the pure white of the siliceous deposits with bright bands of colour. Upon Gardi- ner river, near the northern boundary of the Park, there is a large group of springs, known as the Mammoth Hot Springs, which differ from the others in holding carbonate of lime in solution. These springs have deposited so freely as to build upa hill 200 feet in height, from the top of which the springs boil out. The slopes of this mound have been built in the form of a succession of basins rising one above another, and the water from the springs overflows from one into another, growing gradually cooler as it descends. Upon the bank of Yellowstone river, between the falls and the lake, there was, when the region was first explored, a geyser which at intervals of about 4 hours threw upa column of mud to a height of 40 or 50 feet. In more recent times this geyser has ceased action. These phenomena have been under observation since 1871; and, while there have been changes in them, certain geysers having ceased and others having been formed, no evidence of a diminution of power has been observed.

The Park is accessible by means of the Northern Pacific Railroad, by a branch which extends up the valley of the Yellowstone within a few miles of the northern boundary; and with this a line of stage coaches is connected.

The most stringent laws have been enacted in regard to the killing of game, the starting of forest fires, and the removal of the deposits of the springs.

Although exploring parties had at various times passed on all sides of this strange region, its wonders remained undiscovered until so late a period as 1870. This fact is all the more remarkable because at that time the frontier of settlement was in the Gallatin valley, not a hundred miles from the great geyser region. Some rumours of hot springs and geysers, coming from stray trappers and Indians, had been received, however, and these were sufficient to start a party from the Montana settlements in 1870, to investigate the strange tales. The discoveries made by this, the Washburne

party, induced Dr F. V. Hayden, then in charge of a Government survey, to turn his explorations in this direction.' The reports

brought back by him induced Congress to reserve this area from settlement, which was done in the spring of 1872. In that year further explorations were made, and in subsequent years army expeditions carried the work of exploration still farther. In 1878 a map of the Park, based upon triangulation, was drawn up by the Hayden survey, and in 1883-85 a more detailed map was made by the United States Geological Survey, and a systematic study of its geological phenomena was instituted. (H. G.) YELLOW-TAIL. This name is given by seafaring men to a variety of marine fishes, chiefly of the family of Horse-Mackerels, which have this in common, that they are edible and have a yellow caudal fin. As the latter peculiarity, which has found expression in the specific names of chrysurus, canthurus, &c., of systematic ichthyo- logy, is not confined to that family, very different kinds of fishes bear the same name: thus, for instance, the fishermen of the United States apply it to species of the Meagre family (Sciznidx) and to others. Economically the most important kinds of these fishes, the yellow-tail of the South Atlantic and the southern Indo-Pacific Ocean, are species of the genera Seriola, Seriolichthys, and Micro- pteryx, some of which, like Seriola lalandw and S. gigas, attain to the size of a cod or a coal-fish, and are preserved in a similar manner, either salted or dried. They abound in many localities, and are valued as food fish everywhere. They form a large proportion of the dried fish which are exported from the Cape of Good Hope to Mauritius and Batavia, or are sold to the whalers visiting the Southern Ocean. They are equally abundant at St Helena, where, however, their value as an article of trade does not seem to be fully understood. On the coasts of South Australia and New Zealand they are likewise a staple article of food, but are chiefly eaten fresh, the most esteemed species being Serv- ola lalandii, also known to the colonists as the '"'king-fish." YEMEN, in Arabia, literally the land "on the right hand" of one who faces east, meant originally all the land southwards from Syria (Sh4m).*

The Arabia Felix (evdaiuwv) of Ptolemy and other ancients is a mistrans- lation, the right hand being taken to mean "lucky" (Se€uds, dexter). Arabia Felix included all Arabia except the peninsula of Sinai (Arabia Petrzea) and the Syrian desert (Arabia Deserta) : 7.¢., it took in the Hij4z and Nejd as well as South Arabia. The Arabs use the term Yemen in various extensions, A tradition of the Prophet makes Yemen and Sham meet at Tabbak ; but Abt 'Abbas already confines the name to all Arabia south of Mecca. This usage, which excludes Nejd and Hijéz from Yemen, is not merely that of Moslem geographers, who take Mecca as their imaginary standpoint, but is found in the heathen poets. When Imraolkais speaks of a Yemenite trader, Tarafa, of tanned ox-hides from Yemen, Labid of a youth from Yemen who knew letters, or a poet of Hodhail of the excellent work of a Yemenite smith, they all mean by Yemen the southern region where trade, letters, and industry had their early home in the peninsula. The northern boundary of Yemen is variously laid down. Al-Asma'{ makes it a line drawn obliquely from 'Om4n to Nejran; but Hamdant rightly draws it farther north, from 'Om4n and Yebrin in the south of Yem4ma by way of Al-Hujaira, Tathlith, and Jorash to Kodommol (Kotumble of the Admi- ralty chart, in lat. 17° 52'). In its narrowest limitation Yemen comprises, not the whole south of the peninsula, but only the south-west as far as Hadramaut, which was viewed as a dependency of Yemen. The physical conformation of the south-western portion of the peninsula differs greatly from that of Arabia proper, being similar to that of Ethi- opia. A range of mountains, which rises into peaks of considerable elevation, and descends with a steep slope towards the shore of the Red Sea, stretches from the southern extremity northwards as far as Téif. This range is pierced by several streams and wadies, which flow into

the Red Sea! In old times the region cannot of course have been called " the Southland " by its own inhabitants,

eh

Regnum Charibach

MECCA ‘7

Engish Miles oO 50 400

L7 4 “Seug,

*Kamna. > * Maiin*

3 > Bardkish

5

°Khamr Sabota Az) a) = °Haura Kaukaban , Aly re © Sarid (Mariaba) – ga ™, thamae HADRAMAUT J Sana {Chatromotitae) Meonkes Gabaeans Bet el Fakth :

Taizz vd

\ Maphoritis see Lahajo

Map of Yemen.

Sabzeans.—The ancient name of the people of Yemen was Saba (Saba’ with final hemza); and the oldest notices of them are in the Hebrew Scriptures. The list of the sons of Joktan in Gen. x. 26-29 contains in genealogical form a record of peoples of South Arabia which must rest on good information from Yemen itself, Many of these names are found on the inscriptions or in the Arabic geographers,—Sheba (Saba’), Hazarmaveth (Hadramaut), Abimael (Abime‘athtar), Jobab (Yuhaibib, according to Halévy), Jerah (Wardh of the geographers), Joktan (Arab Kahtan; wakata =kahata). On the other hand, the names of some famous nations mentioned on the inscriptions are lacking, from which it may be concluded that they did not rise to prominence till a later date. Saba’ (Sheba) itself, which was in later times the chief name, has in Gen. x. 28 a subordinate place; it was perhaps only a collective name for the companies of merchants who con- ducted the South-Arabian export trade (the root saba’ in the inscriptions meaning to make a trading journey),

and in that case would be of such late origin as to hold one of the last places in a list that has genealogical form. Two other accounts in Genesis, originally independent, give supplementary information drawn from the Saban colonies, the stations and factories established to facilitate trade through the desert. The inscriptions of Al"Ola published by D. H. Miiller show that there were Minzan colonies in North Arabia. Other South Arabs, and espe- cially the Sabzeans, doubtless also planted settlers on the northern trade routes, who in process of time united into one community with their North-Arab kinsmen and neigh- bours. Thus we can understand how in Gen. xxv, 2-3 Sheba and Dedan appear among the North-Arab "sons of Keturah." Again, the Sabeeans had colonies in Africa and there mingled with the black Africans; and so in Gen. x. 7 Sheba and Dedan, the sons of Raamah (Raghma), appear in the genealogy of the Cushites. With the Ethi- opians Saba'? means "men," a clear indication of their Sabeean descent.

The queen of Sheba who visited Solomon may have come with a caravan trading to Gaza, to see the great king

ss An excellent topographical description of Yemen is given in Ham- dani's Geogr. d. Arab. Halbinsel, ed. D. H. Miiller (1884).

YEMEN

whose ships plied on the Red Sea. The other Biblical books do not mention the Sabzeans except incidentally, in allusion to their trade in incense and perfumes, gold and precious stones, ivory, ebony, and costly garments (Jer. vi. 20; Hzek. xxvii. 15, 20, 22 sq.; Isa. lx. 6; Job vi. 19). These passages attest the wealth and trading importance of Saba from the days of Solomon to those of Cyrus. When the prologue to Job speaks of plundering Sabwans (and Chaldeans) on the northern skirts of Arabia, these may be either colonists or caravans, which, like the old Phcenician and Greek traders, combined on occasion robbery with trade. The prologue may not be historical; but it is to be presumed that it deals with historical possibilities, and is good evidence thus far.

The Biblical picture of the Sabsean kingdom is confirmed and supplemented by the Assyrian inscriptions. Tiglath Pileser IT. (733 3.c.)

tells us that Teima, Saba', and Haipa (=Ephah, Gen. xxv. 4 and Isa. lx. 6) paid him tribute of gold, silver, and much incense. Similarly Sargon (715 B.C.) in his Annals mentions the tribute of Shamsi, queen of Arabia, and of Itamara of the land of Saba',—gold and fragrant spices, horses and camels.

The earliest Greek accounts of the Sabzans and other South-Arabian peoples are of the 3d century B.c. Erato- sthenes (276-194 B.c.) in Strabo (xv. 4, 2) says that the extreme south of Arabia, over against Ethiopia, is inhabited by four great nations,—the Mineans (Mewaior, Myvaio. ; Ma'in of the inscriptions) on the Red Sea, whose chief city is Carna; next to them the Sabzans, whose capital is Mariaba (Mariab of the inscriptions); then the Cata- banes (Kataban of the inscriptions), near the Straits of Bab-al-Mandeb, the seat of whose king is Tamna ; fourthly, and farthest east, the people of Hadramaut (Chatramotite), with their city Sabota. The Catabanes produce frank- incense and Hadramaut myrrh, and there is a trade in these and other spices with merchants who make the journey from /Hlana (Elath, on the Gulf of 'Akaba) to Minea in seventy days; the Gabzans (the Gaba'an of the inscriptions, Pliny's Gebanite) take forty days to go to Hadramaut. This short but important and well-informed notice is followed a little later by that of Agatharchides (120 3.c.), who speaks in glowing terms of the wealth and greatness of the Sabzans, but seems to have less exact information than Eratosthenes. He knows only the Sabzans and thinks that Saba is the name of their capi- tal. He mentions, however, the "'happy islands" beyond the straits, the station of the Indian trade (§ 103). Arte- inidorus (100 B.c.), quoted by Strabo, gives a similar account of the Sabzeans and their capital Mariaba, of their wealth and trade, adding the characteristic feature that each tribe receives the wares and passes them on to its neighbours as far as Syria and Mesopotamia.

The accounts of the wealth of the Sabzans brought back by traders and travellers excited the cupidity of Rome, and Augustus entrusted A'lius Gallus with an expedition to South Arabia, of which we have an authentic account in Strabo (xvi. 4, 22). He hoped for assistance from the friendly NaBaT#Aans (9.v.); but, as they owed everything to their position as middlemen for the South-Arabian trade, which a direct communication

between Rome and the Sabzans would have ruined, their viceroy Syllaus, who did not dare openly to refuse help, sought to frustrate the emperor's scheme by craft. Instead of showing the Romans the caravan route, he induced them to sail from Cleopatris to Leucocome, and then led them by a circuitous way through waterless regions, so that they reached South Arabia too much weakened to effect anything. But the

expedition brought back a considerable knowledge of the

country and its products, and the Roman leader seems to have perceived that the best entrance to South Arabia

was from the havens on the coast. So at least we may conclude when, a hundred years later (77 a.D., as Dillmann has shown), in the Periplus of an anonymous contemporary of Pliny (§ 23) we read that Charibael of Zafar, "the legitimate sovereign of two nations, the Homerites and Sabzeans," maintained friendly relations with Rome by frequent embassies and gifts. Pliny's account of Yemen, too, must be largely drawn from the expedition of Gallus, though he also used itineraries of travellers to India, like the Periplus Maris Erythrxi just quoted.

Nautical improvements, and the discovery that the south-west monsoon (Hippalus) gave sure navigation at certain seasons, increased the connexion of the West with South Arabia, but also wrought such a change in the trade as involved a revolution in the state of that country. The hegemony of the Sabzans now yields to that of a new people, the Homerites or Himyar, and the king henceforth bears the title "'king of the Himyarites and Sabzeans." Naval expeditions from Berenice and Myoshormus to the Arabian ports brought back the information on which Claudius Ptolemy constructed his map, which still surprises us by its wealth of geographical names.

Sabeean colonies in Africa have been already mentioned. That Abyssinia was peopled from South Arabia is proved by its language and writing; but the difference between the two languages is such as to imply that the settlement was very early and that there were many centuries of

separation, during which the Abyssinians were exposed to foreign influences. New colonies, however, seem to have followed from time to time, and, according to the Periplus (§ 16), some parts of the African coast were under the suzerainty of the Sabean kings as late as the Sabsxo-Himyaritic period ; the district of Azania was held for the Sabsean monarch by the governor of Maphoritis (Ma'Afir), and was exploited by a Saban company. Naturally difficulties would arise between Abyssinia and the Sabzean power. In the inscription of Adulis (2d century) the king of Ethiopia claims to have made war in Arabia from Leucocome to the land of the Sabean king. And the Ethiopians were not without successes, for on the Greek inscription of Akstim (c. the middle of the 4th century) King Afizanes calls himself "king of the Aksumites, the Homerites, and Raidan, and of the Ethiopians, Sabzans, and Silee." More serious was the conflict under Dht-Nuw'ds (Dht-Nuwas of the Arab historians) in the beginning of the 6th century; it ended in the overthrow of the Him- yarite king and the subjugation of Yemen, which was governed by a deputy of the Aksumite king, till (about 570) the conquerors were overthrown by a small band of Persian adventurers (see Persia, vol. xviii. p. 613).

With the exception of what the South-Arabian Hamdani relates of his own observation or from authentic tradition, the Mohammedan Arabic accounts of South Arabia and Sabzea are of little worth. The great event they dwell on is the bursting of the dam of Ma'rib, which led to the emigration northwards of the Yemenite tribes. We may be sure that this event was not the cause but the conse- quence of the decline of the country. When the inland trade fell away and the traffic of the coast towns took the sea route, the ancient metropolis and the numerous inland emporia came to ruin, while the many colonies in the north were broken up and their population dispersed. To this the Koran alludes in its oracular style, when it speaks (xxxiv. 17) of well-known cities which God appointed as trading stations between the Sabzeans and the cities He had blessed (Egypt and Syria), and which He destroyed because of their sins.

Inscriptions.—This abstract of the history of Yemen from ancient

sources can now be verified and supplemented from inscriptions. Doubts as to the greatness and importance of the Sabean state, as

attested by the ancients, and as to the existence of a special Saban writing, called " Musnad," of which the Arabs tell, were still current when Niebuhr, in the 18th century, brought to Europe the first account of the existence of ancient inscriptions (not seen by him- self) in the neighbourhood of Yarim. Following this hint, Seetzen, in 1810, was able to send to Europe, from porphyry blocks near Yarim, the first copies of Sabean inscriptions. They could not, however, be read. But the inscriptions found by Wellsted in 1834 at Hisn Ghordb were deciphered by Gesenius and Rédiger. Soon after this the courageous explorer Arnaud discovered the ancient Mariab, the royal city of the Sabeans, and at great risk copied fifty-six inscriptions and took a plan of the walls, the dam, and the temple to the east of the city. These, with other inscriptions on stone and on bronze plates brought home by Englishmen, found a cautious and sound interpreter in Osiander. The historical and geographical researches of Kremer and Sprenger gave a fresh impulse to inquiry. Then Joseph Halévy made his remarkable journey through the Jauf, visiting districts and ruins which no European foot had trod since the expedition of Gallus, and returned with almost 800 inscriptions. Of more recent travellers 8. Langer and E. Glaser have done most for epigraphy, while Manzoni is to be remembered for his excellent geographical work. ; The alphabet of the Sabean inscriptions is most closely akin to the Ethiopic, but is purely consonantal, without the modifications in the consonantal forms which Ethiopic has devised to express vowels. There are twenty-nine letters, one more than in Arabic, Samech and Sin being distinct forms, asin Hebrew. This alphabet, which is probably the parent of the South-Indian character, is un- doubtedly derived from the so-called Pheenician alphabet, the connecting link being the forms of the Safa inscriptions and of the Thamudean inscriptions found by Doughty and Euting. Of the latter we can determine twenty-six characters, while a twenty- seventh probably corresponds to Arabic z (6). A sign for also probably existed, but does not occur in the known inscriptions. In the Thamudean and Sabean alphabets the twenty-two original Pheenician characters are mostly similar, and so are the differentiated forms for ¢ and 7, while %, 3, and probably also & and U? have

been differentiated in different ways. This seems to imply that the two alphabets had a common history up to a certain point, but parted company before they were fully developed. The Tha- mudean inscriptions are locally ncarer to Pheenicia, and the letters are more like the Pheenician ; this character therefore appears to be the link connecting Pheenician with Sabean writing. It may be noticed that a Thamudeau Icgend has been found on a Baby- lonian cylinder of about 1000 B.c., and it is remarkable that the Sabean satara, "write,'? seems to be borrowed from Assyrian shatdru.

The language of the inscriptions is South Semitic, forming a link between the North Arabic and the Ethiopic, but is much nearer the former than the latter. To the details already given in the article Semitic LANGUAGES (vol. xxi. p. 653 sg.) it may be added that of the two dialects commonly called Sabean and Minean the latter might be better called Hadramitic, inasmuch as it is the dialect of the inscriptions found in Hadramaut, and the Mineans seem undoubtedly to have entered the Jauf from Hadramaut.

The inscriptions not only give names of nations corresponding to those in the Bible and in classical authors but throw a good deal of fresh light on the political history of Yemen. The inscrip- tions and coins give the names of more than forty-five Saban kings. The chronology is still vague, since only a few very late inscriptions are dated by an era and the era itself is not certain. But the rulers named can be assigned to three periods, according as they bear the title " mukrab of Saba," "king of Saba," or "king of Saba and Raidan." The last, as we know from the Aksuni inscriptions, are the latest, and thosc with the title "mukrab" must be the earliest. Four princes of the oldest period bear the name Yatha'ʻamar, and oue of these may, with the greatest probability, be held to be the "Itamara Sabai" who paid tribute to Sargon of Assyria. This helps us to the age of some buildings also. The famous dam of Ma'rib and its sluices were the work cf this ancient prince—structures which Arnaud in the 19th century found in the same state in which Hamdani saw them a thousand years ago. The power of these old sovereigns extended far beyond Ma'rib, for their names are found on buildings and monuments in the Jauf.

We cannot tell when the kings took the place of the mukrab, but the Sabzo-Himyaritic period seems to begin with, or a little after, the expedition of Ailius Gallus. A fragmentary inscription of Ma'rib (Br. Mus., 83) was made by "Ilsharh Yahdib and Ya'zil Bayyin, the two kings of Saba and Raidan, sons of Far'm Yanhab, king of Saba." If this Ilsharh is identical with the INdocapos of Strabo, king of Mariaba at the time of the Roman invasion, the inscription preserves a trace of the influence of that event on the union of the two kingdoms.

The inscriptions of the latest period present a series of dates—669, 640, 582, 573, 885—of an unknown era. Reinaud thought of the Seleucid era, which is not impossible; but Halévy observes that

the fortress of Mawiyyat (now Hisn Ghorab) bears the date 640, and is said to have been erected "when the Abyssinians overran the country and destroyed the king of Himyar and his princes." Referring this to the death of Dhu Nuwas (525 a.p.), Halévy fixes 115 B.c. as the epoch of the Sabean era. This ingenious combina- tion accords well with the circumstance that the oldest dated in- scription, of the year 385 (270 a.p.), mentions 'Athtar, Shams, and other heathen deities, while the inscriptions of 582 (467 a.p.) and 573 (458 a.p.), so far as they can be read, contain no name of a heathen god, but do speak of a god Rahmanan—that is, the Hebrew Rahman, "the compassionate" (Arabic, Al-Rahman), agreeably with the fact that Jewish and Christian influences were powerful in Arabia in the 4th century. The only objections to Halévy's hypo- thesis are (1) that we know nothing of an epoch-making event in 115 B.c., and (2) that it is a little remarkable that the latest dated inscription, of the year 669 (554 a.p.), should be twenty-five years later than the Abyssinian conquest. An inscription found by Wrede at 'Obne is dated "in the year 120 of the Lion in Heaven," which we must leave the astronomers to explain.

The inscriptions throw considerable light not only on the Sabeans but on other South-Arabian nations. The Mineans, whose import- ance has been already indicated, appear in the inscriptions as only second to the Sabeeans, and with details which have put an end to much guesswork,

¢.g., to the idea that they are connected with Mina near Mecca. Their capital, Ma‘in, lay in the heart of the Sabean country, forming a sort of enclave on the right hand of the road that leads northward from Ma’rib. South-west of Ma‘in, on the west of the mountain range, and commanding the road from San‘a to the north, lies Barakish, anciently Yathil, which the inscriptions and Arabic geographers always mention with Ma‘in. The third Minean fortress, probably identical with the Kdpva of the Greeks, lies in the middle of the northern Jauf, and north of the other two. The three Minean citadels lie nearly in this position (.°.), with old Sabeean settlements (Raiam) all round them, and even with some Sabean places (e.g., Nask and Kamna) within the triangle they form. The dialect of the Mineans is sharply distinguished from the Sabeans (see above). The inscriptions have yielded the names of twenty-seven Minean kings, who were quite independent, and, as it would seem, not always friends of the Sabeans, for neither dynasty mentions the other on its inscriptions, while minor kings and kingdoms are freely mentioned by both, presumably when they stood under the protection of the one or the other respectively. The Minzeans were evidently active rivals of the Sabean influence, and a war between the two is once mentioned. In Hadramaut they disputcd the hegemony with one another, the government there being at one time under a Minzan, at another under a Saban prince, while the language shows now the one and now the other influence. The religions also of the two powers present many points of agreement, with some notable differences. Thus, puzzling as the fact appears, it is clear that the Minzans formed a sort of political and linguistic island in the Sabean country. The origin of the Minzans from Hadramaut is rendered probable by the pre- dominance of their dialect in the inscriptions of that country (except in that of Hisn Ghorab), by the rule, already mentioned, of a Minean prince in Hadramaut, and by Pliny’s statement (H. N., xii. 63) that frankincense was collected at Sabota (the capital of

Hadramaut ; inscr. NII), but exported only through the Gebanites,

whose kings received custom dues on it, compared with xii. 69, where he speaks of Minean myrrh “in qua et Atramitica est et Gebbanitica et Ausaritis Gebbanitarum regno,” &c., implying that Minean myrrh was

really a Hadramite and Gebanite product. All this suggests a close connexion between the Minans and Hadra- maut; and from the Minean inscriptions we know that the Gebanites were at one time a Minzan race, and stood in high favour with the queen of Ma‘in. Thus we are led to conclude that the Mineaus were a Hadramite settlement in the Jauf, whose object was to secure the northern trade road for their products. We cannot but see that their fortified posts in the north of the Sabean kingdom had a strategical purpose ; and so Pliny (xii. 54) says, " Attingunt et Minei, pagus alius, per quos evehitur wno tramite angusto [from Hadramaut]. Hi primi commercium turis fecere maximeque exer- cent, a quibus et Mineum dictum est." Besides this road, they had the sea-route, for, according to Pliny, their allies, the Gebanites, held the port of Ocelis. If the Minzans were later immigrants from Hadramaut, we can understand how they are not mentioned in Gen. x. In later times, as is proved by the Minean colony in Al-‘Ol4, which Euting has revealed to us, they superseded the Sabeans in some parts of the north. In the ‘Olé inscriptions we read the names of Minean kings and gods. Notable also is the mention in 1 Chron. iv. 41 of the "Bedouin encampments

corsa) and the Ma‘inim" smitten by the Simeonites, which may possibly refer to the destruction of a Minean caravan pro- tected by these Bedouins. The LXX. at least renders Ma‘inim by Mwalovs. It seems bold to conjecture that the Minzans were in accord with the Romanus under Alius Gallus, yet it is noteworthy that no Minzan town is named among the cities which that general

destroyed, though ruin fell on Nask and Kamna, which lie inside the Minzan territory.

The inscriptions seem to indicate that the monarchics of South Arabia were hereditary, the son generally following the father, though not seldom the brother of the deceased came between, appar- ently on the principle of seniority, which we find also in North Arabia. Eratosthenes (in Strabo xvi. 4, 3) says that the first child born to one of the magnates after a king came to the throne was his designated successor ; the wives of the magnates who were pregnant at the king's accession were carefully

watched and the first child born was brought up as heir to the kingdom. There seems to be a mistake in the first part of this statement ; what Eratosthenes will have said is that the oldest prince after the king was the designated suc- cessor. This law of succession explains how we repeatedly find two kings named together among the Sabzans, and almost always find two among the Minzans; the second king is the heir. The prin- ciple of seniority, as we know from North-Arabian history, gives rise to intrigues aud palace revolutions, and was probably often violated in favour of the direct heir. On the other hand, it readily leads to a limited power of election by the magnates, and in fact good Arabian sources speak of seven electoral princes. Some inscriptions name, besides the king, an eponymus, whose office seems to have been priestly, his titles being dhu harif, eponymus, and rashiw, ' sacri- ficer." All royal inscriptions are signed by him at the beginning and the end, and he appears with the king on coins.*

Religion.—In spite of the many ruins of temples and inscriptions, the religion of the Sabeans is obscure. Most of the many names of gods are mere names that appear and vanish again in particular districts and temples. Of the great uational gods of theSabeans and Minzans we know a little more. The worship of the heavenly bodies, for which there is Arabic evidence, had really a great place in Yemen. Sun-worship seems to have been peculiar to the Sabeeans and Hamdanites ; and, 1f the Sabis of Sabota (Pliny) was in fact the sun deity Shams, this must be ascribed to Saban influence. The Saban Shams was a goddess, while the chief divinity of the Minzans was the god 'Athtar, a male figure, worshipped under several forms, of which the commonest are the Eastern 'Athtar and 'Athtar Dhu Kabd. Wadd and Nikrah, the gods of love and hate, are possibly only other forms of the two 'Athtars. The Sabzans also recognize 'Athtar ; but with them he is superseded by Almakah, who, accord- ing to Hamdani, is the planet Venus, and therefore is identical with 'Athtar. The moon-god Sin appears on an inscription of Shabwat ; but, according to Hamdani, Haubas, "the drier," was the Sabean moon-god. Ou the Shabwat inscription 'Athtar is the father of Sin, and it is noteworthy that these two deities also appear as nearly related in the Babylonian legend of 'Ishtar's descent to Hades, where 'Ishtar is conversely the daughter of the god Sin. The mother of 'Athtar on another inscription is probably the

sun. We find also the common Semitic I] (El) and a Dhu Samai answer- ing to the northern Ba‘al Shamayim. Three gods of the inscriptions are named in the Koran, — Wadd, Yaghuth, and Nasr. In the god- name Ta’lab there may be an indication of tree-worship. The many minor deities may be passed over ; but we must mention the sanc- tuary of Riyam, with its images of the sun and moon, and, according to tradition, an oracle. In conformity with old Semitic usage, pil- grimages were made at definite seasons to certain deities, and the Sabean pilgrim month, Dhu Hijjatan, is the northern Dhw’l-Hijja. The outlines, and little more, of a few of the many temples can still be traced. Noteworthy are the elliptic form of the chief temples in Ma’rib and Sirwah, and the castle of Nakab-al-Hajar with its entrances north and south.

Sacrifices and incense were offered to the gods. The names for altar (midhbah) and sacrifice (dhibh) are common Semitic words, and the altar of incense has among other names that of miktar, as in Hebrew. A variety of spices—the wealth of the land—are named on these altars, as rand, ladanum, costus, tarum, &c. Frankincense appears as Jubdn, and there are other names not yet understood. The gods received tithes of the produce of trade and of the field, in kind or in ingots and golden statues, and these tributes, with freewill offerings, erected and maintained the temples. Temples and forti- fications were often combined. The golden statues were votive offerings; thus a man and his wife offer four statues for the health of their four children and a man offers to Dhu Samai statues of a man and two camels, in prayer for his own health and the protection of his camels from disease of the joints.

Their commerce brought the Sabeans under Christian and Jewish influence ; and, though the old gods were too closely connected with their life and trade to be readily abandoned, the great change in the trading policy, already spoken of, seems to have affected religion as well as the state. The inland gods lost importance with the failure of the overland trade, and Judaism and Christianity seem for a time to have contended for the mastery in South Arabia. Jewish influence appears in the name Rahman (see above), while efforts at Christianization seem to have gone forth from several places at various times. According to Philostorgius, the Homerites were converted under Constantius II. by the Indian

Theophilus, who built churches in Zafar and Aden. Another account places their

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*conversion in the a of Anastasius (491-518). In Nejran Syrian missionaries seem to have introduced Christianity (Néldeke). But, as the religion of the hostile Ethiopians, Christianity found poli- tical obstacles to its adoption in Yemen ; and, as heathenism had quite lost its power, it is intelligible that Dhtii Nuwas, who was at war with Ethiopia before the last fatal struggle, became a Jew. His expedition against Christian Nejrdn had therefore political as well as religious motives. The Ethiopian conquest rather hurt than helped Christianity. The famous kalis (éxxdyola) of Abraha in San'a seems to have been looked on as a sign of foreign dominion, and Islam found it easy to supersede Christianity in Yemen. Coins.—In older times and in many districts coins were not used, and trade was carried on mainly by barter. Nor have there yet been many great finds of coins; indeed most of the picces in European collections probably come from the same hoard. At the same time the coins throw a general light on the relations of ancient Yemen. The oldest known pieces are imitations of the Athenian mintage of the 4th century B.c., with the legend AOE and the owl standing on an overturned amphora. The reverse has the head of Pallas with a Sabean N. Of younger coins the first series has a king's head on the reverse, and the old obverse is enriched with two Sabean monograms, which have been interpreted as meaning '*majesty"' and "eponymus" respectively. In a second series the Greek legend has disappeared, and, instead of the two Sabean monograms, we have the names of the king and the eponymus. A third series shows Roman influence and must be later than the ex- pedition of Gallus. As the standard of the coins of Attic type is not Attic but Babylonian, we must not think of direct Athenian influence. The type must have been introduced either from Persia or from Pheenicia (Gaza). One remarkable tetradrachm with the Sabzan legend Abyath'a is imitated from an Alexander of the 2d century B.C., the execution being quite artistic and the weight Attic. There are also coins struck at Raydan and Harib, which must be assigned to the Himyarite period (1st and 2d century A.D.). The inscriptions speak of " bright Hayyili coins in high relief," but of these*

none have been found. They also speak of sela‘ pieccs. The sela‘ in late Hebrew answers to the older shekel and the men-

tion of it seems to point to Jewish or Christian influence. Literature.—Fresnel, Piéces rel. aux Inserr. Himyarites déc. par M. Arnaud, 1845; Inscriptions in the Himyaritic Character in the British Musewm, London, 1863 ; Pretorius, Beitr. zur Erkldrung der himjar. Inschr., 3 parts, Halle, 1872- 74; Kremer, Siidarabische Sage, 1866; Sprenger, Alte Geogr. Arabiens, 1873; D. H. Miiller, Stidarabische Studien, Vienna, 1877; Id., Die Burgen u. Schlosser Stidarabiens, 2 parts, Vienna, 1879-81 (especially for chronology and antiquities) ; Mordtmann and Miiller, Sabdische Denkmdler, Vienna, 1883; Derenbourg, Etudes sur VEpigraphie du Yemen, Paris, 1884; Id., Nouv. Etud., 1885; Glaser, Mittheilungen tiber . . . sab. Inschr., 1886; Hamdani, Geogr. d. Arab. Halbinsel, ed. D. H. Miiller, vol. i., Leyden, 1884. See also papers by Osiander, Z.D.M.G., Xix.-xx. (1864-65); Halévy, Journ. As., 1872-74; D. H. Miiller, Z.D.41.G., xxix.- Xxxi., Xxxvii.; Prideaux, Tr. Soc. Bibl. Arch., 1873; Derenbourg, Bab. and Or. Record, London, 1887. In the press, D. H. Miiller, Epigraphische Denkmdler nach… Copien Eutings. Further cp. the travels of Niebuhr, Seetzen, Well- sted, Wrede, Maltzan, Halévy, Manzoni, and Glaser. (D. H. M.)

YENISEI. See Srperra and YENISEISK.

YENISEISK, a province of Eastern Siberia, which extends from the Chinese frontier to the shores of the Arctic Ocean, with an area of 992,870 square miles—as large as one-half of European Russia—has Tobolsk and Tomsk on the W., Yakutsk and Irkutsk on the E., north-western Mongolia on the S., and the Arctic Ocean on the N. (see vol. xxii. pl. I.). Its southern extremity being in 51° 45’ N. lat. and its northern (Cape Tcheluskin) in 77° 38’, it combines a great variety of orographical types, from the Sayan alpine regions in the south to the tundras of the Arctic littoral.

The border-ridge of the high plateau of north-western Oro- Mongolia, which is known under the general name of the graphy.

Western Sayans, and reaches altitudes of from 7000 to 8000 feet, limits it in the south. This is girdled on the north-western slope by a zone, nearly 100 miles wide, of alpine tracts, characterized by narrow valleys separated by several parallel chains of mountains, which are built up of crystalline slates, from 6000 to 7000 feet high. Here in the impenetrable forests only a few Tungus families find a precarious living by hunting. Towards the south, in the basins of the tributaries of the Tuba, the Sisim, and the Yus, and in those of the Kan, the Agut, and the Biryusa, the valleys of the alpine tracts contain rich auriferous deposits, and numerous gold-washings have been established along the taiga. In 53° 10' N. lat. the Yenisei emerges from the mountain tracts into the wide steppes of Abakan and Minusinsk, from 1500 to 2000 feet above sea-level, which extend along the base of the mountain region north-

Low- lands,

Arctic shores.

Geology.

Minerals.

Rivers.

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eastwards towards the upper Lena. A flattened ridge of mountains, hardly attaining more than 3000 to 3500 feet, shoots north-east from the Kuznetskiy Alatau (see Tomsk) and separates the dry steppes of Minusinsk and Abakan from the next terrace of plains, from 1200 to 1700 feet in height, which also stretches in a north-eastern direction from Barnaut in the Attai to Krasnoyarsk, and into the upper basin of the Vilui. Another system of mountains, known under the general name of the Yeniseisk Taiga, rises on the outer border of this terrace, in the space be-tween the Upper Tunguska, or Angara, and the Podka- mennaya Tunguska. This system consists of several parallel chains running south-west to north-east, from 2500 to 3500 feet in altitude, though they are much lower on the left bank of the Yenisei, and passing on north-

eastwards into the basin of the Olenek. For many years past the Yeniseisk Taiga has been one of the richest auriferous regions of Siberia, not so much on account of the per- centage of gold in its alluvial deposits (which are poor in comparison with those of Olekminsk) as on account of the facilities for supplying the gold-fields with articles of food produced in the steppes of Minusinsk.

Beyond the Yeniseisk Taiga begin the lowlands, which at no point rise more than a few hundred feet above the sea and which slope gently towards the Arctic Ocean. They are covered with lakes, thin forests, and marshes ; and, as they approach the ocean, they assume more and more the characters of barren tundra, devoid of tree vegetation and covered with lichens. Beyond 70° N. lat. trees occur only along the courses of the rivers. Two ranges, however, break the monotony of the lowlands,—the Tungusskiy ridge, which stretches north-east between the Khatanga and Anabara rivers, and the Byrranga Mountains, which run along the north-western shore of the Tainryr peninsula.

The shores of the Arctic Ocean are indented by deep estuaries, that of the Taz penetrating 600 miles into the interior of the continent, and that of the Yenisei 300 miles, Gyda Bay, between the estuaries of the Ob and the Yenisei, and Taimyr, Thaddeus, and Khatanga Bays, are wide and deep indentations, ice-bound almost all the year round, Taimyr peninsula, which protrudes as a massive block of land between the Yenisei and the Khatanga, is an utterly barren stony tundra.

In the south are the granites and granitic syenites of the border- ridge of the plateau. In the alpine region all varieties of erystal- line slates—gneisses, diorite slates, talc and mica-schists, and clay slates—are found, the latter being auriferous, and the whole inter- sected with dykes and veins of protogene, diorites, porphyry, marble, and quartz. The same crystalline rocks are met with in the Kuznetskiy Atatau, the Yeniseisk Taiga, and the Byrranga Mountains. The plains are built up of Silurian, Devonian, Car- boniferous, and Triassic limestones and saudstones, with extensive freshwater deposits of the Jurassic period. Chalk and Eocene de- posits are met with farther north. The mountain region bears traces of extensive glaciation, and the lowlands of having been covered during the

post-Glacial period with immense lakes and marshy tundras, where thousands of mammoths and rhinoceroses were buried, along with other (now fossil) representatives of extinct Tertiary and post-Tertiary mammals. All the country gives evi-

dence of having been covered with numberless lakes during the Lacustrine period.

Yeniseisk is exceedingly rich in all kinds of metals and minerals. Gold dust appears in three different regions,—the northern Yeniseisk Taiga, where 100,740 oz. of gold were extracted in 1884 ; the region of the Kuznetskiy Atatau and its spurs, with the basins of the Tuba, Sisim, and Black and White Yus (25,860 oz. in 1884); and the upper parts of the tributaries of the Kan and Agut (12,540 0z.), where the gold-washings merge into those of the Nijne-Udinsk district of Irkutsk. Silver ore is found at several places in the basin of the Abakan, but the mines have been abandoned. Iron ore occurs almost everywhere in south Yeniseisk, but there is only one iron- work on the Abakan (25,000 cwts. in 1884). Salt lakes are very common, and about 50,000 ewts. of salt are extracted every year.

The whole of Yeniseisk is watered by the Yenisei and its affluents. The Yenisei rises in north-western Mongolia in several branches (Bei-khem, Ulu-khem, &c.), the chief of which, the Ulu-

khem, has its source in marshes to the west of Lake Kossogol at a height of more than 5000 feet. As far as the Russian frontier its course crosses the plateau at an altitude of not less than 3000 feet ; on entering Yeniseisk it pierces the great border-ridge and the series of parallel chains of the alpine region. At Sayansk (58° 10’ N. lat.) it emerges from the highlands and traverses the elevated steppes, receiving the Abakan on the left and the Tuba on the right. In 55° N. lat. it suddenly turns to the north-east, skirting the base of a low range of hills, on the northern slope of which flows the Tchutym, a tributary of the Ob, separated from the Yenisei by an isthmus only 6 miles in width. The possibility of connecting at this point the two great river-systems of Siberia has often been discussed ; the

difficulty is that the Tchutym valley is 440 feet higher than the other. A little below Krasnoyarsk the Yenisei is joined by a great tributary, the Kan, and farther north by the Angara or Upper Tunguska, which brings the waters of Lake Baikal? and is navigable from Irkutsk, notwithstanding a series of rapids in its middle course. The right-hand tributaries of the Ob, —the Ket, the Tym, and the Vakh,—approach the Yenisei so closely, and their sources are so thoroughly inosculated with those of the left-hand tributaries of the Yenisei, that the question of con- necting the two systems by means of a canal has been more than once raised ; indeed something has been done to connect the Great Kas, a tributary of the Yeniseil, with the Ket,—a boat with some 150 ewts. of cargo having already passed from the one to the other.? A railway across the narrow isthmus between the Tchutym and the Yenisei is now regarded as the best solution of the question. In 61° N, lat. the Yenisei, already more than two miles broad, divides into several branches, which wind amidst many islands, and has several dangerous rapids. Then, before piercing a ridge of hills, it expands into a kind of lake, 10 miles across, just above its junc- tion with the Podkamennaya Tunguska, Almost exactly at the Arctic Circle, opposite Turukhansk, it receives from the right another large tributary, the Lower Tunguska, which rises within a short distance of the upper Lena. The Yenisei, thus augmented, becomes more than 6 miles wide in lat. 68°. Its estuary begins at the village of Dudino, and has a breadth of 40 miles ; it contains numberless islands, The great river narrows once more (12 miles) before entering the Arctic Ocean (Yenisei Bay), after a total course of more than 3000 miles. It is navigable on its middle and lower courses, steamers plying between Krasnoyarsk and Minusinsk, as also on the lower Yenisei. Its mouth has been visited almost every year of late by steamers from Norway or Great Britain; and it is expected that regular communication will be established between Dudino and European ports.

The climate, though very severe throughout, offers, as might be Climate.

expected, great varieties. The Minusinsk steppes have a dry and relatively mild climate, so that they are sometimes called the Italy of Siberia. At Krasnoyarsk (55° 1’ N. lat.) the climate is more severe, and the winds are exceedingly disagreeable. The yearly fall of snow is so small that the

winds blow it away in the neigh- bourhood of the town ; hence a circuit has to be made by the con- voys of sledges to avoid it, or the sledges changed for wheeled carriages. Yeniseisk (58° 27’ N. lat.) has an average temperature below freezing-point, and at Turnkhansk the coldest month (Febru- ary) has an average temperature of ~24° Fahr. On the Taimyr peninsula the average summer temperature hardly reaches 45°. For additional particulars, see SIBERIA, vol. xxii. p. 6.

The highlands of Sayan and Atatau are thickly clothed with Flora.

forests of cedar, pitch-pine, larch, elder, and birch, with a rich undergrowth of rhododendrons, Berberis, and Ribes ; the Scotch fir appears only in the lower and drier parts of the valleys. The summits and slopes of the mountains are strewn with débris and boulders, and thickly sheeted with lichens and mosses; but there are also patches of meadow land covered with flowers, most of which are known in Europe. Still, the flora is poor as a rule, and Dr Martianoff, after several years’ collecting, succeeded in gathering only 104 species of phanerogams.? On the other haud, the flora of the Minusinsk plains and of the steppes of the Abakan at once strikes the traveller by the variety and brilliancy of its forms. The meadows are covered with bright flowers scattered amid the com- mon Graminex, and in June and July they are adorned and per- fumed by the Polygala, Dianthus, Medicago, Lathyrus, yellow sweet- scented lily, and scores of other flowers, mostly familiar in Europe, but attaining in Yeniseisk a larger size and greater brilliancy of colour. The rich carpet of grass and flowers is overtopped by the tall white blossoms of Archangelica and Spirwa Ulmaria, and ie a ae

1 According to recent measurements, the Angara, where it issues from Lake Baikal, has a volume of 121,400 cubic feet per second (Zzvestia, East Siberian Geogr. Soc., xvii., 1886).

2 According to Baron Aminoff’s measurements, Lake Bolshoye, through which the canal would have to pass, is 66 feet above the Ket at its junction with the Ozernaya, and 181 feet above the Yenisei at its junction with the Kas.

3 N. Martianoff, " Materials for a Flora of the Minusinsk Region," in Trudy of the Kasan Society of Naturalists, xi. 3, 1882.

Fauna. Popula- tion.

Occupa- tions.

Manu- factures.

Towns.

Y EO—

the blue masses of the tall Veronica longifolia. The meadows of the moister localities, surrounded by thickets of willow, poplar, wild cherry, and hawthorn, are still more attractive, on account of their wealth in anemones, violets, gentians, and so on, and the numerous creepers which festoon the trees and shrubs. M. Mar- tianoff's lists enumerate a total of 760 flowering and 760 crypto- gamic plants. Of the lower Fungi and parasitical Myxomycetes 1300 species were noted, and out of the 823 species hitherto described by specialists no less than 124 have proved to be new. Farther north- ward the flora of Yeniseisk is similar in character to that of the Siberian lowlands (see SrBeRiA, vol. xxii. p. 7). In the Taimyr peninsula it is represented by only 124 species of flowering plants.

For the fauna of Yeniseisk, see SrpertA, vol. xxii. p. 7.

The steppes of the upper Yenisei have been inhabited from a very remote antiquity, and numberless kurgans, graves, rock in- scriptions, and smelting furnaces of the successive inhabitants ate scattered all over the prairies of Abakan and Minusinsk.! The present population exhibits traces of all these predecessors (see SIBERIA and TarTars). Numerous survivals of Turkish and Samoyedic stems are found in the steppe land and in the Sayans; but some of them are greatly reduced in numbers (only a few hundreds). The Kaibals, the Katcha Tartars, the Sagais, the Kyzyl and Milet Tartars, and the Kamasins have settlements of their own, aud maintain their national features ; but the Karagasses, the Kotts, and the Arintses have almost entirely disappeared, and are represented only by a

few families in the spurs of the Sayans.? The Tunguses are scattered in the least accessible tracts, and may number about 2000, or less. Several hundreds of Yakuts inhabit the Turukhansk district ; and in the tundras between the Taz and the Yenisei there are a few hundred Ostraks (q.v.) and Yuraks of the Samoyedic stem. The remainder of the population, which numbered in all 447,076 in 1885, consists of Russians,—partly exiles, but mostly voluntary settlers. Nearly 50,000 belong to the unfortunate category of "settled" exiles. The 'indigenes ""— Tartars, Tunguses, Ostiaks, &c.—number about 50,000.

The chief occupation of the Russians is agriculture, which pros- pers in Minusinsk, the granary of the province; it is also carried on in west Kansk, Krasnoyarsk, and Atchinsk, and in a few villages of the Yeniseisk district, the total area of land under corn being reckoned at nearly 2,500,000 acres. Wheat, summer and winter rye, oats, barley, and buckwheat are the chief crops. Gardening is carried on in Minusinsk. Cattle-breeding is important, especially in Minusinsk. It has been estimated that there are in Yeniseisk about 270,000 horses, 240,000 cattle, 300,000 sheep, and 30,000 rein- deer in Turukhansk. These figures, however, must be below the true ones. The cattle being kept throughout the winter in the steppes, the snow-storms of early spring prove disastrous, as also do the murrains, to which no fewer than 200,000 head succumbed in the Minusinsk district in 1881. Hunting and fishing are an import- ant resource for most of the indigenes and for many of the Russiaus.

The manufactures of Yeniseisk are hardly worth mentioning, all capital being engaged in gold-washing or in commerce. The chief trade is in furs (exported), and in groccries and manufactured goods (imported). The gold-fields of the Yeniseisk Taiga are supplied with grain and cattle by river from the Minusinsk region, and with salt, spirits, and iron by the Angara. Attempts have recently been made to stimulate the trade in tea with north-west Mongolia.

Yeniseisk is divided into five districts, the chief towns of which are KRASNOYARSK (q.v.), the capital, which had 17,155 inhabitants in 1884; Atchinsk (7190) and Kansk (4050), two small towns on the great

Siberian highway, of which the latter is an entrepdt for the gold-mines ; Minusinsk (8270) on the Tuba, close by its junc- tion with the Yenisei, which has now a small but excellent natural history and ethnographical museum; and Yeniseisk (7050), the chief entrepot for the gold-mines, having a public library and a natural history museum, created of late by exiles. Turukhansk (139) is the chief town of a vast " region" (Krai). (B2ZA., HE)

YEOLA, a municipal town of India, in the Nasik district, Bombay presidency, with a population (1881) of 17,685 (males 8975, females 8710). It is situated in 20° 4' 10" N. lat. and 74°30' 30" E. long., 44 miles east of NAsik town, 13 miles south of Manwar station on the north-east line of the Great Indian Peninsular Railway, and nearly 12 miles from the frontier of the Nizam's dominions. Yeola is a flourishing commercial town, trading in silk and cotton goods, which it weaves, and in gold-twist,

which it also manufactures. At the time of its foundation Ycola was under the emperor of

1 Besides the works of Radloff, and those mentioned in the biblio- graphy of Semenoff's Dictionary, see N. Savenkoff's paper on recent explorations, in Jzvestia of Hast Siberian Geogr. Soc., xvii., 1887, and the Descriptive Catalogue of the Minusinsk Museum, by D. Klementz.

? Radloff's Aus Sibirien (2 vols., Leipsic, 1880) contains full ac- counts of the various Turkish stems of Yeniseisk,

Delhi ; it subsequently passed into the hands of the rajas of Satara and then the peshwas. Finally it was given in grant to Vithal, the ancestor of the present chief of Vinchur, who still enjoys the revenue from the lands attached to the town, though he has no authority within it.

YEOMANRY CAVALRY. See Votuntzrrs.

YEOVIL, a market town and municipal borough of Somerset, England, is situated on the river Yeo or Ivel, which here separates Somerset from

Dorset, and on branch lines of the London and South Western and the Great Western Railways, 40 nmiles south of Bristol and 124 west- south-west of London. The streets are regular and spa- cious, with a number of handsome public buildings. A few of the houses are of considerable antiquity, but within recent years the town has undergone much alteration. The church of St John the Baptist, occupying a command- ing site in the centre of the town, is a large and beautiful cruciform structure in the Perpendicular style, consisting of chancel, nave of seven bays, aisles, transepts, and lofty western tower. It is described by Mr Freeman as "a grand and harmonious whole, as truly the work of real artistic genius as Cologne or Winchester." There are two ecclesiastical parishes within the borough, Hendford and Yeovil Marsh, The principal secular public buildings are the town-hall in the Grecian style, erected in 1849, and the corn exchange. There area reading room and a library in connexion with the young men's Christian association and mutual improvement society. The benevolent institu- tions include Woborne's almshouses for six men and six women, the portreeves' almshouses, and a few smaller charities. Water is obtained from Holywell, 8 miles dis- tant, by works constructed by the corporation. Formerly the woollen manufacture was of some consequence, but this industry has now died out. The staple industry is the manufacture of gloves, for which the town has long been celebrated. Brewing and brick-making are also carried on. The agricultural trade of Yeovil is of some importance, large corn markets and cattle and horse fairs being held. The corporation consists of a mayor, four aldermen, and twelve councillors, who hold the manorial rights and also form the urban sanitary authority. The town has a commission of the peace, and petty sessions are held both by the county and the borough magistrates. The population of the municipal borough and urban sani- tary district (area about 700 acres) in 1871 was 8527, and in 1881 it was 8479.

Yeovil was a borough by prescription. Anciently it was called the town, borough, lordship, and hundred of Yeovil, and was in- cluded in a district which soon after the Conquest was taken pos- session of by the crown. The manor of Yeovil included in this district was some time afterwards assigned to the rector of St John the Baptist church, and was incorporated under the name of the portreeve and burgesses of Yeovil. In

1418 it was resigned by the rector to Henry V., who gave the manor to the convent of the Virgin Mary and Saint Bridget. The grant was confirmed by Edward IV. After the dissolution of the monasteries the manor was settled by Henry VIII. on Catherine Parr, who held it till her death. In 1449 the town was visited by a fire, by which 117 houses were destroyed. In 1853 Yeovil was placed under the Municipal Act.

YEW. This tree (Taxus) belongs to a genus of Coni- Jerz in which the ordinarily woody cone is represented by a fleshy cup surrounding a single seed. Usually it forms a low-growing tree of very diverse habit, but generally with dense spreading branches, thickly covered with very dark green linear leaves, which are given off from all sides of the branch, but which, owing to a twist in the base of the leaf, become arranged in a single series on each side of it. The trees are usually dicecious: the male flowers are borne on one individual and the female on another, although instances occur in which flowers of both sexes are formed on the same tree. The male flowers are more or less globu- lar and occur in the axils of the leaves. They consist of a number of overlapping brownish scales, gradually increasing

in size from below upwards and surrounding a naked stalk that bears atits summit a head of anthers. Each anther has a flat five-lobed top, something like a shield ; from its under surface five, six, or more pollen cases hang down, and

Yew. magnified ; (3) fruit ; (4) male flowers; (5) stamens ; (6), (7) female flower in different stages ; (8) section of female flowers, magnified.

(1) Shoot with male flowers; (2) leaf and in section,

these open lengthwise to liberate the globose pollen-grains. Each flower thus consists of a number of monadelphous stamens ; but, according to the older view of its structure, each stamen constitutes of itself a single flower, the whole mass being considered as an amentaceous inflorescence or catkin of numerous monandrous flowers. The female flowers are also placed each separately in the axil of a leaf, and consist of a number of

overlapping scales, as in the male. These scales surround a cup which is at first shallow, green, and thin, but which subsequently becomes fleshy and red, while it increases so much in length as almost entirely to conceal the single straight seed. It is clear that the structure of the female flower differs from that of most conifers ; but the structure of the wood and other characters forbid its being separated from them except as a subdi- vision (Z'axacez).

The poisonous properties, referred to by classical writers such as Cesar, Virgil, and Livy, reside chiefly if not en- tirely in the foliage. This, if eaten by horses or cattle, especially when it has been cut and thrown in heaps so as to undergo a process of fermentation, is very injurious. The leaves have also been used for various medicinal pur- poses, but are seldom employed now. The succulent por- tion of the yew berry is quite harmless ; but it is probable that some noxious principle is contained in the seed. As, however, it is hard and disagreeable to the taste, the danger from this source is not great. As a timber tree it is used for cabinet-work, axle-trees, bows, and the like, where strength and durability are required.

The yew occurs wild over a very large area of the northern hemisphere. In north-eastern America and in Japan trees are found of a character so similar that by some botanists they are all ranged under one species, The

varieties grown in the United Kingdom are very numerous, one of the most striking being that known as the Irish yew,—a shrub with the pyramidal or columnar habit of a cypress, in which the leaves spread from all sides of the branches, not being twisted, as they usually are, out of their original position. In the ordinary yew the main branches spread more or less horizontally, and the leaves are so ar- ranged as to be conveniently exposed to the influence of the light ; but in the variety in question the branches are mostly vertical, and the leaves assume a direction in accordance with the ascending direction of the branches.

The yew is a favourite evergreen tree, either for planting sepa- rately or for hedges, for which its dense foliage renders it well suited. The wood is very hard, close-grained, and of a deep red brown colour internally. Its younger branches, owing to their toughness, were formerly used for bows. The planting of the yew in churchyards was at one time supposed to have been done with a view to the supply of yew staves. But, while importation from abroad was fostered, there seems to have been no statute enforcing the cultiva- tion of the yew in Great Britain; on the other hand, a statute of Edward I. (cited in Gard. Chron., 6th March 1880) states that the trees were often planted in churchyards to defend the church from high winds. Be this asit may, yews of huge size and great antiquity still exist in various parts of the country in the vicinity of churches, Some of these are of historic interest ; but it is hardly prudent to cite either the measurements or the allegations as to age, the cir- cumstances under which the estimates were framed being different in each case. Accurate comparative measurements made on a uni- form pian would be very serviceable. The Crowhurst yew, men- tioned by Evelyn as 30 feet in circumference, was still in existence in 1876 (Gard. Chron., 22d July 1876). The large yew at Anker- wyke near Staines, with a trunk 273 feet in circumference, might well have been in existence in 1215, when Magna Charta was signed. Considerable interest also attaches to the fine yew in Buckland

churchyard near Dover, which in 1880 was removed to a distance of 60 yards. The trunk had been split so that it had a direction nearly parallel with the soil. This huge tree was moved with a ball of soil round its roots, 16 feet 5 inches by 15 feet 8 inches, by 3 feet 64 inches in depth, the weight of the entire mass being esti- mated at 56 tons. The dimensions of the tree in 1880 were as follows—" circumference of the main trunk, 22 feet ; of the upright portion of the trunk, 6 feet 10 inches ; second horizontal trunk, 10 feet 10 inches ; do., south limb forking off at 9 feet from the main trunk, 7 feet 10 inches ; do., west limb forking off at 9 feet froin the main trunk, 8 feet 8 inches; extent of branches from centre of main trunk southwards, 30 feet 10 inches, and from north to south 48 feet; they extend from the main trunk westward 33 feet." The tree was replanted so that the horizontal portions were replaced in their original erect position and the natural symmetry restored (Gard. Chron., ist May 1880).

YEZD. See Yazp, p. 733 above.

YEZO. See Japan.

YOH-CHOW FU, a prefectural city in the Chinese province of Hoo-nan ("south of the lakes "), stands on high ground on the east side of the outlet of Tung-ting Lake, in 29° 18' N, lat. and 113° 2' E. long. ©The district in which Yoh-chow Fu stands is the ancient habitat of the aboriginal San Miao tribes, who were subsequently deported into north-western China, and who, judging from some of the non-Chinese festival customs of the people, would ap- pear to have left traditions behind them. The present city, which was built in 1371, is about 3 miles in circum-ference and is entered by four gates. The walls are high and well built, but were not strong enough to keep out the Taiping rebels in 1853. Situated between Tung-ting Lake and the Yang-tze-kiang, Yoh-chow Fu forms a depot for the native products of the province which are destined for export, and for foreign goods on their way inland. In 1885 foreign goods to the value of 28,228 taels were sent from Hankow to Yoh-chow Fu, the principal items being grey shirting, oil, and lead. The city is 4250 Chinese miles from Peking, and contains a population of about

60,000.

YOKOHAMA, situated in 35° 26’ 53” N. lat. and 139° 38’ 39” E. long. (see map in vol. xxiii. p. 433), is the most important of the five ports in Japan open by treaty to foreign commerce and residence, both on account of its

proximity to Tokio, the capital, and of the extent of its

x : Exports. Imports. trade. It stands on a plain, extending along the Bay of 1878 Tie ahok a Tokio and shut in by hills, one of which, towards the ee gt eae eae ee se get ee south-east, terminates in a promontory called Honmoku- || jggo.7 770770077 3,792,991 5,378,385 misaki, Its area extends over ‘873 of a square mile, of i ne a ee 4,319,077 4,404,289 which °26 is occupied by the foreign settlement. The Se ert echiaicta eta cen, 5,451,803 4,155,628 : ‘ ; ‘ : ea ieee aiaint 5,245,290 3,925,392 climate is variable, the range in temperature being from im… 4.381.096 3 967 644 95° to 43° Fahr., and the mean temperature 57°°7.. The seep cror tins pwd Ae cold in winter is severe owing to the prevalence of northerly Se 6,502,466 | 4,116,842

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1 Kanagawa Kew Buildings 2 Public Gardeaw 3 Gustom House Landings (4 French (5) Natwe (6)English) 7 Harbour Ligh.

Plan of Yokohama.

winds, while the heat is great in summer, though it is The rain- fall is large—according to Dr Hepburn's observations In 1859, when the neighbouring town of Kanagawa was opened to foreigners under the treaty with the United States, Yokohama was

tempered by sea breezes from the south-west.

(1863-1869) 694 inches annually.

an insignificant fishing village; and notwithstanding the

protests of the foreign representatives the Japanese Govern- ment shortly afterwards chose the latter place as the settle-

ment instead of Kanagawa. The town has since increased so rapidly that in 1886 the population was 111,179 (3904 foreigners, including 2573 Chinese, 256 Americans, and 625 British). The Japanese Government has constructed various public buildings, a granite breakwater, and a cause-way 2 miles long, connecting the town with Kanagawa. Waterworks on the most improved principle have been completed recently, the water being supplied from the Sagamigawa, The foreign settlement consists of well- constructed streets with business establishments. The wealthier portion of the foreigners reside, however, on a hilly locality to the south of the town, called the Bluff. The land occupied by foreigners has been leased to them by the Japanese Government, 20 per cent. of the annual rent being set aside for municipal expenses.

The harbour, which is a part of the Bay of Tokio, is good and commodious, extending from Honmoku-misaki (Treaty Point) to the mouth of the Tsurumi, a distance of about 5 miles. The average depth at high water is about 46 feet, with a fall of tide of about 8 feet, the entrance being marked by a lightship and two buoys. There are two landing-places, the English and the French " hatoba a but, as there are no quays available for large vessels, goods have to be carried to the shore in junks. Steamers from San Francisco, Vancouver's Island, China, d&c., call re-gularly. A railway about 18 miles long connects Yoko- hama with Tokio. This, the first railway in Japan, was constructed in 1872. Yokohama is the

terminus of the Tokaido line, which will ultimately connect Yokohama with Kioto, the former capital.

The following table shows the value of the foreign trade of Yoko- hama from 1878 to 1886 :—

The figures for the bullion trade in 1886 were—export (gold) £9291, (silver) £1,243, 569 ; import (gold) £4776, (silver) £1,903,010. The revenue from custom duties, &., in the same year was—export duties, £212,587 ; import duties, £198,866 ; warehouses, £1979 ; harbour dues, £1870.

YOKOSUKA, a seaport and naval station of Japan, is situated in the province of Sagami and on the Bay of Tokio, 12 miles south of Yokohama (see map in vol. xxiii, p. 433). The port is sheltered by hills and affords good anchorage. The site was occupied by a small fishing village until 1865, when the shogun's Government estab- lished a shipyard there. Since then it has grown rapidly and come into prominence. In 1868 the Japanese Govern- ment converted the shipyard into a naval dockyard, and subsequently carried out many improvements. In 1884 the port became a first-class naval station; and naval barracks, warehouses, offices, hospitals, &c., were estab- lished there. A large number of ships-of-war and of the mercantile marine are always found in the port, as well as an increasing number of foreign vessels, which come to be docked and repaired. The dockyard was first constructed by French engineers; but since 1875 the work has been entirely in the hands of Japanese engineers. The number of hands employed is about 2800. 'There are three dry docks and slips, The area occupied by the dockyard and other naval establishments is 7000 acres, and that of the town 270 acres. The population was 5800 in 1888,

YONKERS, a city of Westchester county, New York, United States, is situated upon the east bank of the Hudson river, about 18 miles from its mouth, and on the New York Central and Hudson River and the New York City and Northern Railroads. The site is very hilly, con- sisting of ridges forming terraces parallel to the river. The city had in 1880 a population of 18,892 (12,733 in 1870). Yonkers has important manufacturing industries, principally of carpets, hats, silk, brass goods, elevators (lifts),

steam engines, and machinery; but it is chiefly as a residence suburb, being within an hour of the business centre of the metropolis, that it has acquired its popula- tion and importance.

Yonkers was settled by the Dutch of New Amsterdam about the middle of the 17th century, and was held as a manor until 1779. In 1788 it was organized as a township, and in 1872 it received a city charter.

YONNE, a department of central France, was formed in 1790 partly from the province of Champagne proper (with its dependencies, Sénonais and Tonnerrois), partly from Burgundy proper (with its dependencies, the county of Auxerre and Avallonnais), and partly from GAtinais (Orléanais and fle-de-France). It lies between 47° 18' and 48° 25' N. lat. and 2° 50'and 4° 20' E. long., and is bounded by Aube on the N.E., Céte-d'Or on the E., Niévre on the S., Loiret on the W., and Seine-et-Marne on the N.W. The highest elevation (2000 feet) of the department is in the granite mountains of Morvan, in the south-east, where other peaks range from 1300 to 1600 feet. These moun- tains are flanked by limestone plateaus, from 700 to 1200 feet in height, traversed by the Yonne and its tributaries, The department belongs wholly to the basin of the Seine, except a small district in the south-west, which belongs to that of the Loire. The river Yonne flows through it from south to north-north-west, receiving on the right bank the

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Plate pxev iii

Geology.

746

Cure (with its tributary the Cousin), the Serein, the Ar- mancon (the valley of which is traversed by the Burgundy Canal and by the railway from Paris to Lyons through Burgundy), and the Vanne (from which Paris is partly sup- plied by an aqueduct). To the west of the Yonne le the sources of the Loing, another tributary of the Seine, and of its affluents, the Ouanne and the Lunain. ; The Yonne is navigable throughout the

department, and is connected with the Loire by the Canal of Nivernais, which in turn is connected with that of Briare joining the Seine and the Loire. The climate of Yonne resembles that of Paris; but the extremes of heat and cold are greater on the plateaus. The annual rainfall is 27 inches at Auxerre and 32 in the east of the department. 'The prevailing winds are from the south-west and west.

Of a total area of 1,835,475 acres 1,125,412 acres are arable, 426,757 are under wood, 91,309 under vines, 79,3866 under grass, and 39,316 are returned as occupied by heaths, pasture-lands, and marshes. The live stock in 1880 included 41,295 horses, 1280 mules, 8438 asses, 126,636 cattle, 238,522 sheep of native and 58,416 of superior breed (wool-clip in 1880 566 tons), 30,561 pigs, and 6516 goats. There were also 21,411 beehives (61 tons of honey). Oxen are fattened and the well-known St Florentin cheeses made. The wines of Tonnerre and Auxerrois are the finest red wines of Lower Burgundy, and those of Chablis are the finest white. The principal crops in 1884 were—wine 22,486,420 gallons (average of ten preceding years 28,607,370 gallons), wheat 5,500,000 bushels, meslin 192,600, rye 680,625, barley 948,750, oats 4,677,750, buck- wheat 35,200, potatoes 3,410,088, beetroot for fodder 25,060 tons, hops 79 tons, colza seed 206, hemp seed 138, hemp 99, linseed 40, flax 22, tobacco 338, hay 386,650, clover 34,245, lucerne 30,189, and sainfoin 6297 tons. The forests consist of oak, beech, clm, horu- beam, ash, and birch, and re-plantations are being made with dif- ferent kinds of pine and with larch; chestnut trees are not un- common. In 1880 700 tons of peat were extracted ; and there are fine quarries of Oolitic limestone, and of cement, ochre, fossil phosphates, china clay, and chalk. The chief industrial establish- ments are tanneries, forges (11,863 tons of iron in 1882), paper- mills, saw-mills, and breweries ; files and other articles of steel, boots and shoes, hosiery, and champagne are also manufactured. Cereals, wines, firewood, charcoal, ochre, and bark are exported ; southern wines and building materials are among the imports. There are 286 miles of railway, 318 of national and 6755 of other roads, and 205 of waterway. The population was 357,029 in 1881, aud 355,864 in 1886. About 217,000 are engaged in agricultural pursuits. The department constitutes the archiepiscopal diocese of Sens, has its court of appeal at Paris, its academy at Dijon, and belongs to the district of Orleans army

corps. It is divided for administrative purposes into five arrondissements. Places of note are the chef-lieu Auxerre (16,754 inhabitants in 1886), the pictur- esque Avallon (5768), Joigny (6189), famous for its wines, and Tonnerre (4650), for its wines and building stones.

YORK, a northern county of England, is bounded E. by the North Sea, N. by Durham (the boundary line being formed by the Tees), 8. by Lincoln, Nottingham, Derby, and Chester, and W. by Lancaster and Westmorland. It is much the largest county in England, being more than double the size of Lincolnshire, which ranks next to it. The area is 3,882,851 acres, or nearly 6067 square miles, almost one-eighth of the surface of England. Of the total area 750,828 acres or about 1173 square miles are in the East Riding, 1,361,664 acres or about 21274 square miles in the North Riding, and 1,768,380 acres or about 2763 square miles in the West Riding. The city of York, which forms an administrative division separate from the Ridings, embraces an area of 1979 acres or about 3 square miles.

The marked differences in the geological structure of Yorkshire are reflected in the great variety of its scenery. The stratification is for the most part regular, but owing toa great line of dislocation nearly coincident with the western boundary of the county the rocks dip towards the east, while the strike of the strata is from north to south. The bold and picturesque scenery of the western hills and dales is due to the effects of denudation among the harder rocks, which here come to the surface. A portion of the Pennine chain, stretching from Derbyshire to the Cheviots, runs north and south through Yorkshire, where it has

an average breadth of about 30 miles. The strata here consist of (1) Silurian beds, occupying a small area in the north-west corner of the county; (2) the Carboniferous or Mountain Limestone, which has been subjected to great dislocations, the more important of which are known as the North'and South Craven faults; (3) the Yoredale series, consisting of shales, flagstones, limestone, and thin seams of coal; and (4) the Millstone Grit, forming part of the hilly moorlands, and capping many of the loftier eminences. In the West Riding the Pennine range forms part of the elevated country of Craven and Dent, with Whernside (2384 feet),

Ingleborough (2361), and Penyghent (2270). Towards the east it gradually declines into a series of moorland hills. Mickle Fell in the north-west corner of the county rises to a height of 2581 feet. The scenery in the western part of the North Riding is somewhat similar to that in Craven, except that the lower hills are of sharper outline owing to the perpendicular limestone scars. To the intermingling of the limestone with the softer rocks are due the numerous "forces" or waterfalls, which are one of the special features of the scenery of this district, the more remarkable being High Force in Teesdale and Aysgarth Force in Wensleydale. The action of water on the limestone rocks has given rise to extensive caverns, of which the best examples are those of Clapham and Ingle- ton in the West Riding, as well as to subterranean water- courses. At Brimham, Plumpton, and elsewhere there are curious fantastic masses of rock due to irregular weathering of the Millstone Grit. The Pennine region is bounded on the south-east by the Coal Measures, forming the northern portion of the Derbyshire, Nottingham, and Yorkshire coalfield, which in Yorkshire extends from Sheffield north- wards to Leeds. To the east the Measures dip beneath the Permian beds, of which a narrow band crops up from Masham southwards. The Permian strata are overlain to the east by the Trias or New Red Sandstone, which is searcely ever exposed, but having been partly worn away is covered with Glacial deposits of clay and gravel, forming the low-lying Vale of York, extending from the Tees south to Tadcaster and east beyond York to Market Weighton. Farther east the Triassic beds are overlain by Lias and Oolite. The Lias crops to the surface in a curve extending from Redcar to the Humber. In the Middle Lias there is a seam of valuable iron ore, the source of the prosperity of the Cleveland region. The moorlands extending from Scarborough and Whitby are formed of Liassic strata topped with beds of Lower Oolite, rising gradually to the north-east and attaining at Burton Head a height of 1489 feet, the greatest elevation of the Oolite formation in Eng- land. In the bottom bed there is a seam of ironstone, an immense nugget of which, in Rosedale, now nearly all removed, formed at one time a conspicuous cliff. In this district there are a number of picturesque eminences capped by Lower Oolites,and among the eastern slopes of the moorlands there are several charming and fertile valleys. Along the line of the Lower Oolites there is a series of low flat hills, which slope southwards under the clays of the Vale of Pickering.

These clays are covered by the Chalk, forming the district of the Wolds, which again dips southwards below the clays and sands of Holderness.

The coast is not deeply indented at any part, the inlets Coast.

scarcely deserving the name of bays. Except in the Holderness region, the shore as far north as Saltburn is bold and rocky, and presents a great variety of picturesque cliff scenery, while below the cliffs there are in many cases long stretches of beautiful sands.

Yorkshire is famed for the beauty of its river scenery, Rivers.

in which respect it is scarcely surpassed by Scotland. The great majority of the rivers issue from the higher western regions and flow eastwards. The Tees, which rises on the

Lakes.

Minerals.

Mineral springs.

Agricul- ture.

COUNTY. |

south-east borders of Cumberland, forms throughout almost its entire length the boundary between Yorkshire and Dur- ham. The Swale rises on the confines of Westmorland, and after a semicircular course by Richmond joins the Ure a few miles below Boroughbridge. This latter river flows in a similar direction some miles south of the Swale through the beautiful Wensleydale, and then past Jervaulx Abbey, Masham, and Ripon. After its junction with the Swale it takes the name of the Ouse, and on being joined by the Nidd passes by York and Selby, beyond which it receives the Aire and the Trent, and finally it falls into the Humber. The Wharfe flows south-eastwards from the Pennine range past Bolton Abbey, Otley, Wetherby, and Tadcaster to the Ouse near Cawood. The Aire rises in full stream from the foot of Malham Cove in Craven, and, flowing past

Skipton, Keighley, and Leeds, receives the Calder at Castleford, and falls into the Ouse near Goole. The Ribble flows southwards through the district of Craven into Lancashire. The Don rises in the Penistone moors, and flowing northwards by Sheffield and Doncaster falls into the Ouse near Goole. The Hull flows southwards through the East Riding to the Humber at Hull.

The county is almost destitute of lakes, the only sheets of water of size sufficient to lay claim to that title being Semmer Water at the upper end of Wensleydale, Malham Tarn at the head of Airedale, and Hornsea Mere near the sea-coast at Hornsea.

One of the chief sources of the mineral wealth of York- shire is the coalfield in the West Riding, the most valuable seams being the Silkstone, which is bituminous and of the very highest reputation as a house coal, and the Barnsley thick coal, the great seam of the Yorkshire coalfield, which is of special value, on account of its semi-anthracitic quality, for use in iron-smelting and in engine furnaces. The average yearly production of the Yorkshire coalfield is nearly twenty million tons, the number of persons em- ployed above and below ground at the coal-pits being over 60,000. Associated with the Upper Coal Measures there is a valuable iron ore, occurring in the form of nodules. Large quantities of fire-clay are also raised, as well as of gannister and oil-shale. In the Middle Lias of the Cleve- land district there is a remarkable bed of iron ore, of which the annual production is over six million tons, the greater proportion of the ore being converted into pig-iron in Middlesbrough, by far the most important centre of pig- iron manufacture in the kingdom. Altogether the pro- duction of pig-iron in Yorkshire is nearly one-third of that produced in England, and nine-tenths of the produce of Yorkshire belongs to the Cleveland district. Lead ore is obtained in the Yoredale beds of the Pennine range in Wharfedale, Airedale, Niddesdale, Swaledale, Arkendale, and Wensleydale. Slates and flagstones are quarried in the Yoredale rocks. In the Millstone Grit there are several beds of good building stone, but that most largely quarried is the Magnesian Limestone of the Permian series, which, however, is of somewhat variable quality.

Yorkshire is noted for the number of its mineral springs, chiefly sulphureous and chalybeate, the principal, besides those at Harrogate, being Askern, Aldfield, Boston Spa, Croft, Filey, Guisbrough, Hovingham, and Scarborough.

Agriculture.—The hilly country in the west of Yorkshire, embracing the north-western corner of the North Riding and a great part of the West Riding, is chiefly pasture land, sheep being grazed on the higher grounds and cattle on the rich pastures where the limestone rock prevails. The Vale of York, with an area of about 1000 square miles, includes much fertile land occupied by all kinds of crops. The Chalk downs by careful cultivation now form oue of the best soils for corn crops, the rotation being grasses, wheat, turnips, and barley. The till or boulder clay of Holderness is the richest soil in Yorkshire. A great part of the land in this

district has been reclaimed from the sea, from 20,000 to 30,000 acres being protected by embankments. The Vale of Cleveland

in the North Riding is well cultivated, the higher grounds in the district being chiefly pastoral. The smallest proportional area under cultivation is in the North Riding, 860,820 acres out of 1,361,664 in 1887, while in the East Riding there were 666,291 acres out of 804,798, and in the West Riding 1,210,639 acres out of 1,716,389. The proportion of permanent pasture is largest in the West Riding, 803,514 acres or about two-thirds of the area under cultivation, while in the North Riding it was 488,958 acres or rather more than one-half, and in the East Riding only 191,519 acres or cousiderably less than a third. On the other hand, the area under corn crops in the West Riding was 208,890 acres, in the North Riding 197,846 acres, and in the East Riding 254,162 acres. Wheat in 1887 occupied 66,341 acres in the East Riding, 38,437 in the North, and 58,659 in the West ; barley 64,042 in the East, 61,367 in the North, and 54,592 in the West; and oats 101,410 in the East, 85,554 in the North, and 81,314 in the West. Rye, beans, and pease occupied comparatively small areas. Liquorice is grown in the neighbourhood of Pontefract. Flax is still

grown, but occupies a comparatively small area, only 868 acres in 1887. Green crops in the East Riding occupied 110,806 acres (potatoes 12,956, turnips 75,590, mangold 5297, carrots 613, cabbage, &c., 7419, and vetches, &c., 8931), in the North Riding 78,689 (potatoes 11,246, turnips 58,121, mangold 2379, carrots 110, cabbage, &c., 3329, and vetches, &c., 3504), aud in the West Riding 99,596 (potatoes 23,044, turnips 62,079, mangold 3331, carrots 250, cab- bage, &c., 2219, and vetches, &c., 8673). Clover and rotation grasses occupicd in the East, North, and West Ridings 92,982, 71,846, and 85,075 acres respectively, and fallow land 16,388, 23,460, and 138,141 acres respectively. The areas under orchards in 1887 were—in the East Riding 849 acres, in the North 1015, and in the West 1694, the areas under market gardens being 520, 369, and 2652 acres, under nursery grounds 104, 154, and 807 acres, and under woods (in 1881) 14,480, 49,106, and 66,014 acres respectively. Horses numbered 38,046 (23,508 used for agriculture, 14,538 un- broken horses and mares kept solely for breeding) in the East Rid- ing, 40,384 (26,026 used for agriculture) in the North Riding, and 53,149 (35,180 used for agriculture) in the West Riding. These horses are only such as are returned by occupiers of land, and do not include the large number used for commercial purposes. The draught horses are generally of a somewhat mixed breed, but the county is famed for its breeds of hunters and of carriage and saddle horses. A breed known as Cleveland bays is much used in London carriages. Horse-racing is a favourite Yorkshire sport, the principal stables being at Malton, Beverley, Doncaster, and Middleham. Cattle in 1887 numbered 86,169 (26,211 cows and heifers) in the East Riding, 162,462 (54,111 cows and heifers) in the North Riding, 264,876 (122,457 cows aud heifers) in the West Riding. The breeds of cattle are not much attended to, the custom in the hilly districts, in both the West and the North Riding, being to purchase lean cattle at the northern fairs to fatten for the Lancashire and York- shire butchers. The Teeswatcr breed is, however, on the incrcase in Yorkshire. In Holderness there is a short-horned breed, chiefly valuable for its milking qualities. Cheese-making is largely carried on in some districts. Sheep in 1887 numbered in the East Riding 429,252, in the North Riding 638,320, and in the West Riding 646,809. The Leicester, the Lincoln, and the South Down, and crosses betwecn the Cheviot and Leicester, are perhaps the most common breeds. The old Wolds sheep have also been improved by crossing with

Leicesters. The total number of pigs in the East Riding in 1887 was 46,332, in the North Riding 48,990, and in the West Riding 71,887. Though the large long-eared breed is still kept, the small breed is that chiefly in favour. Large numbers of pigs are kept at the dairy farms and fed mainly on whey. York- shire bacon is famed for its flavour.

According to the latest landowners' Return, 1878, the East Rid- ing was divided among 19,576 proprietors, possessing 710,733 acres at an annual value of £2,032,195, or about £2, 17s. 2d. per acre. There were 15,012 who owned less than one acre each, and there were 4049 acres of common lands. The following possessed over 10,000 acres each :—Sir Tatton Sykes 34,010 acres, Lord Londes- borough 33,006, Sir G. Cholmley 20,503, Lord Wenlock 19,453, Lord Hotham 18,683, W. H. H. Broadley 14,208, William F. Bethel 13,396, Lord Leconfield 13,247, Lord Middleton 12,295, Crown Property 12,230, Viscountess Downe 11,595, and T. A. C. Constable 10,981. The North Riding was divided among 16,313 proprietors, possessing 1,278,884 acres at an annual value of £1,841,945, or about £1, 8s. 9d. per acre. The following owned over 10,000 acres each :—John Bowes 48,887, Lord Feversham 39,312, marquis of Ailesbury 15,370, Lord Bolton 15,419, Viscount Downe 15,271, earl of Carlisle 13,030, Sir G. O. Wombwell 11,912, Lord Londesborough 11,884, Mrs D. Harcourt 11,442, Mrs J. T. D. Hutton 10,902. There were 10,115 proprietors who possessed less than one acre, and the area of common land was 247,409 acres. The West Riding was divided among 76,913 proprietors, possessing 1,632,259 acres at an annual value of £8,199,840, or about £5, Os. 54d. per acre, the large rental being duc to the increased rent of land in towns. There were 59,496 proprietors who owned less than one

acre each, and the estimated area of common land was 99,912 acres. The following proprietors owned over 10,000 acres each :—Charles Towneley 23,153, earl of Harewood 20,330, duke of Devonshire 19,333, Earl Fitzwilliam 19,165, Andrew Montagu 17,591, duke of Norfolk 15,270, George Lane Fox 15,018, earl of Dartmouth 14,723, Walter Morrison 14,118, Sir H. J. Tufton 12,202, T. W. S. Stanhope 11,357, Ayscough

Fawkes 11,205, James Farrer 11,088, marquis of Ripon 10,908, Sir H. D. Ingilby 10,610, and duke of Leeds 10,034.

Communication.—The county, especially in the manufacturing districts, is intersected with railways in all directions, the princi- pal companies being the North Eastern, the Manchester, Sheffield, and Lincoln, the Lancashire and Yorkshire, the Midland, and the Great Northern. A considerable amount of traffic, especially in coal, is carried on by means of the canals. ‘ an

Manufactures and Trade.—For many years an extensive district in the West Riding has been famed for its woollen and worsted manufactures. The early development of the industry was due partly to the abundance of water power supplicd by the numerous streams in the valleys by which the district is indented ; and in recent times the happy accident of the proximity of coal and iron has enabled the industry to keep pace with modern requirements. The West Riding is now the chief seat of the woollen manufacture in the United Kingdom, and has almost a monopoly in the manu- facture of worsted cloths. In this industry ncarly all the important towns in the Riding are engaged, Leeds having for its specialty almost every variety of woollen and worsted cloth, Bradford yarns and mixed worsted goods, Dewsbury, Batley, and the neighbouring districts shoddy, Huddersfield both plain goods and fancy trouser- ings and coatings, and Halifax, to the neighbourhood of which the cotton industry of Lancashire has also penetrated, worsted and car- pets. Next to the woollen industry comes the manufacture of iron and steel machinery and implements of every variety, Leeds being one of the principal seats of all kinds of mechanical engineering, and Sheffield of iron work and cutlery. For the minor manufac- tures in the district, and for more specific details, reference must be made to the separate articles on the different towns. Until comparatively recently agriculture was the chief calling of the North Riding; but the discovery of iron ore in the Cleveland region has led to the formation of another great manufacturing centre, mainly devoted to the production of pig-iron, the manufacturing of steel by the basic process, and iron shipbuilding. The industrial activity of the East Riding is mostly centred in Hull, the chief port of the county, although the Lancashire ports must be regarded as the principal ports for the trade,

especially of the West Riding. In the North Riding Middlesbrough is rising into importance as a shipping port, and Whitby, though not progressing as a port, has a considerable coasting trade. The fishing industry, which is of minor iniportance, is carried on at Hull, Filey, Whitby, and Scar- borough, and a considerable number of villages.

Scarborough is by far the most attractive and thriving watering- ing-place north of the Thames; anda number of others, such as Whitby, places Bridlington, Filey, and Saltburn, are rising yearly in repute. and spas. Among others, chiefly of local celebrity, are Redcar, Hornsea, and

Withernsea. There are a considerable number of inland spas fre- quented to some extent by persons from other parts of the county, but the only one of wide reputation is Harrogate.

Com- munica- tion.

Manu- factures and trade,

Water-

Adminis- Administration and Population.—Yorkshire has from an early tration period been divided into three ridings, each of which has a lord and lieutenant. The East Riding has a separate court of quarter sessions popu- and a commission of the peace. The city of York within the lation, municipal limits constitutes a separate division of the county.

The municipal city and the ainsty are for parliamentary purposes included in the North Riding, for registration purposes in the East Riding, and for all other purposes in the West Riding. The parlia- mentary city of York, which formerly extended beyond the muni- cipal limits, is partly in the North and partly in the East Riding. The following table gives the population of the county and of the three ridings in 1801, 1821, 1871, and 1881 :—

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1801 1871 1881

East Riding……. 139,433 190,449 | 268,466 315,460 North Riding (with the municipal city of ATS) \CROe, coe sen ee 155,506 183,381 346,518 395,790 West Riding……. 363,953 799,357 | 1,821,371 | 2,175,314 MOINS NE pooceo on ones 658,892 1,173,187 2,436,355 2,886,564

re ee eae ae | The population has more than quadrupled since 1801, the increase having been much the greatest in the West Riding. Though in area much the largest, Yorkshire is in population third among English counties, being exceeded in this respect both by Lancashire and Middlesex. The number of males in 1881 was 1,420,001 and of females 1,466,563. The number of persons to an acre in the county was 0°74—East Riding 0°42, North Riding (not including the city of York) 0°25, and West Riding 1-23. The East Riding comprises 6 wapentakes and the municipal boroughs of Beverley (pop. 11,425), Kingston-upon-Hull (154,240), and Hedon (966). It

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is divided into 12 petty and special sessional divisions. The borough of Kingston-upon-Hull has a separate court of quarter sessions and a commission of the peace, and the borough of Beverley has a com- mission of the peace. The riding contains 352 civil parishes with part of one other, viz., Filey, which extends into the North Riding. It is entirely in the diocese of York. The North Riding comprises 11 wapentakes, the liberties of East and West Langbaurgh and of Whitby Strand, and the municipal boroughs of Middlesbrough (55,934), Richmond (4502), and Scarborough (30,504). It is divided into 19 petty and special sessional divisions. The boroughs of Richmond and Scarborough have separate courts of quarter sessions and commissions of the peace, and the borough of Middlesbrough has a commission of the peace. The riding contains 554 civil parishes and parts of five others. It is almost entirely in the diocese of York and Ripon. The West Riding comprises 9 wapen- takes, the city of Ripon (7890), and the municipal boroughs of Barnsley (29,790), Batley (27,505), Bradford (183,032), Dewsbury (29,637), Doncaster (21,139), Halifax (73,630), Harrogate (9482), Huddersfield (81,841), Leeds (309,119), Pontefract (8798), Rother- ham (34,782), Sheffield (284,508),

Wakefield (30,854), and Keighley (12,085). The riding is divided into 25 petty and special sessional divisions. The city of York, the boroughs of Bradford, Doneaster, Leeds, Pontefract, and Sheffield, and the liberty of Ripon (including the city) have separate courts of quarter sessions and commissions of the peace, and the boroughs of Batley, Dewsbury, Halifax, Huddersfield, and Wakefield have commissions of the peace. The liberty and the borough of Ripon are not included in the West Riding for the purposes of the county rate, but are rated separately. The riding contains 724 civil parishes and parts of six others. It is mostly in the dioceses of York, Ripon, and Manchester. For parliamentary purposes the East Riding is formed into three divi- sions, —Buckrose, Holderness, and Howdenshire, each returning one member. It also includes the parliamentary borough of Kingston-upon-Hull, returning three members, with part of the borough of York city, which returns two members. The North Riding for parliamentary purposes is formed into four divisions, —Cleveland, Richmond, Thirsk, and Whitby, each returning one member. It also includes the boroughs of Middlesbrough and Scarborough, each returning one member, with portions of the boroughs of Stockton and York city. The West Riding for parliamentary purposes is formed into three divisions, which are again subdivided into districts each returning one member,—the north division into five districts, the south into eight, and the east into six. The riding also includes the following parliamentary boroughs :—Bradford returning three members, Dewsbury one, Halifax two, Huddersfield one, Leeds five, Pontefract one, Sheffield five, and Wakefield one.

History and Antiquities.—Traces of the old British inhabitants History. are numerous in the Wolds of the East Riding and the moors of the North Riding. Remains of the circular pit-dwellings of ancient Brigantian villages still exist at Egton Grange, Hole Pits, Killing Pits, Danby, and Roseberry Topping. A large number of implements, of both flint and bronze, have been discovered in the barrows on the Wolds and moors, and in the caves of the limestone district. Circles and other stone monuments are not uncommon, the most remarkable being the monolith, 29 feet in height, at Rudston, and the group of monoliths called the Devil's Arrows at Boroughbridge, 163, 214, and 22% feet in height respectively. On the hiil-sides there are numerous ancient earthworks and dykes, such as the

fortification on Flamborough Head, incorrectly called the Danes' dyke. Yorkshire was included in the territory of the Brigantes at the time of its invasion by the Romans in 51; it did not, however, niake formal submission till 79. It afterwards formed part of the district of Maxima Cesariensis, of which the capital was Eboracum (York). The central districts of Yorkshire seem to have been densely peopled by the Romans. Watling Street entered the county near Bawtry, crossed the Don at Danum (Doncaster), the Aire at Legeoliwm (Castleford), and the Wharfe at Calcaria (Tadcaster). Thence it proceeded by Eboracum (York), Iswrium (Aldborough), and Cataractonium (Catterick Bridge) to Ad Tisam (Pierce Bridge), where it crossed the Tees. Another road passed eastwards from York to Malton, and various branches traversed the county in different directions. A great variety of Roman remains have been discovered and traces of Roman camps are numerous, such as Cataractonium, the outlines of the station at Old Malton, the ancient wall with the multangular tower at York, and the remains of Isurium. After the departure of the Romans Yorkshire was overrun by the Picts. Subsequently it formed the Anglo-Saxon kingdom of Deira to the south of Bernicia (see vol. viii. p. 270). The two were included in N orthumbria, which seems to have been under the rule sometimes of a single prince and sometimes of two separate princes in Bernicia and Deira, the northern boundary of the latter kingdom being probably the Tees and the southern always the Humber (sec NORTHUMBERLAND, vol. xvii. p. 568 sg., where the early history of the district, includ- Ing a notice of the Danish invasions, is given). After the Con- quest Yorkshire was divided among several Norman earls—includ-

Ancient castles.

Ecclesi- astical struc: tures.

COUNTY. |

ing Alan of Brittany, who held Richmond Castle, Ibert de Lacy, and William de Percy. The district was at this period frequently invaded by the Scots. In 1138 David of Scotland laid waste the country to the gates of York ; but he was completely defeated by the English on 22d August of that year in the battle of the Standard at Northallerton. In 1312 Thomas

Plantagenet, earl of Lancaster, raised an insurrection in Yorkshire against Gaveston, the favourite of Edward II., whom he captured in Scarborough and beheaded at Warwick on 19th June. 'The earl again in 1322 headed a party against the Despensers, but on 16th March was defeated and captured at Boroughbridge, and on 22d was beheaded at Pontefract. During the Wars of the Roses the county was the scene of frequent conflicts, including the battle of Wakefield (31st December 1460), in which Richard, duke of York, was defeated by Queen Margaret and slain, and the battle of Towton (29th March 1461), in which Edward IV. defeated Henry VI. In 1536 the county was the sceue of the insurrection under Robert Aske, known as the 'Pilgrimage of Grace," causcd by the dissolution of the monasteries. In 1569 a rising took place in Yorkshire under the earls of Westmorland and Northumberland in behalf of Mary Queen of Scots. During the Civil War the county was chiefly Royalist, although some of the most famous Parliamentary officers were Yorkshiremen, the more noted being Fairfax and Lambert. Bradford, Hull, Scarborough, Pontefract, and York sustained long sieges ; and on 2d July 1644 the great and decisive battle of the war occurred at Marston Moor. The annals of the county are destitute of further incidents of special historic importance.

Of ancient strongholds or castles Yorkshire has still many inter- esting examples in a more or less complete condition, including Barden Tower, built in the reign of Henry VII. by Henry Clifford, 'the shepherd lord," which has been in ruins since 1774; Bolton Castle, pronounced by Leland "the fairest in Richmondshire," a square building with towers at the corners, erected in the reign of Richard II. by Richard Scrope, chancellor of England, occupied by Queen Mary while under the charge of Lord Scrope, besieged during the Civil War, and rendered untenable in 1647 ; the square tower or keep of Bowes Castle, supposed to have been built by Alan Niger,

first earl of Richmond; the gateway tower (erected in the reign of

Henry VI.) of Cawood Castle, said to have been originally built by King Athelstan in 920; the keep and various portions of the walls of the extensive fortress of Conisbrough, of uncertain origin, but probably

dating from Saxon times; the remains of Danby Castle, said to have been built shortly after the Conquest by Robert de Bruce ; Harewood, of great extent, originally founded soon after the Conquest, but now containing no portions earlier than the reign of Edward III. ; the keep, in the Early English style, and other remains of Helmsley, built in the 12th century by Robert de Roos surnamed Fursan ; detached portions, including the principal tower, of Knares- borough, probably dating originally from Norman times ; the pictur- esque remains of the quadrangular fortress of Middleham, built soon aftcr the Conquest by Robert FitzRanulph, afterwards possessed by the Nevilles, and rendered untenable by order of Parliament in 1647; the ruins of the ancient stronghold of Mulgrave, said to have been originally founded two centuries before the Conquest by a Saxon giant named Wade or Wada, dismantled after the Civil War ; the extensive remains—including Rosamond's Tower, associated with the misfortunes of Fair Rosamond, the mistress of Henry II. —of Pickering Castle, of unknown date, dismantled after the Civil War ; the ruins of Pontefract, formerly one of the most important fortresses of the kingdom, built by Ilbert de Lacy about 1080; a few remains of Ravensworth Castle, dating from before the Conquest ; the keep and other remains of the great Norman fortress of Rich- mond, founded about 1070 by Alan Rufus of Brittany; the tower of Ripley, built in 1555 by Sir William Ingilby, included in the modern mansion ; slight remains of the fortress of Sandal, erected in 1320 by John, eighth earl of Warren; the great tower, in the Roman style, and other remains of the extensive fortress of Scar- borough, founded by William le Gros in 1136 ; the detached ruins of Sheriff Hutton, founded by Bertram de Bulmer in the reign of Stephen ; slight remains of the ancient Skelton Castle; Skipton Castle, of various dates, but originally Norman; Slingsby Castle, originally built probably soon after the Conquest ; the ruins of Spofforth, originally erected by Henry de Percy in 1309 ; the founda- tions of the keep aud some fraginents of the walls of Tickhill, built or enlarged by Roger de Busli in the 11th century ; the remains of Whorlton, dating from the time of Richard II. ; and one side of the great quadrangular castle of Wressell, built by Thomas Percy, ear] of Worcester, in the reign of Richard II.

At the time of the dissolution of the monasteries Yorkshire possessed 28 abbeys, 26 priories, 23 nunneries, 30 friaries, 13 cells, 4 commanderies of

Knights Hospitallers, and 4 preceptories of the Knights Templars. The principal monastic rnins still existing are St Mary's, York (see York); Bolton Priory, generally called Bolton Abbey, one of the most romantically situated ruins in the kingdom, originally founded at Embsay, two miles distant, by William de Meschines for Augustinian cauons, removed to its present situation by his daughter Alice over against the spot where her only son

perished in the Wharfe; the church and other ruins in the Early

English style of Byland Abbey, founded for Cistercian monks in the 12th century ; the picturesque ruins of Easby near Richmond, containing interesting examples of Norman and Early English, founded in 1152 for Premonstratensians by Ronaldus, constable of Richmond Castle; Egglestone on the Tees, founded in the 12th century for Premonstratensians ; Fountains Abbey, one of the finest and most complete among the monastic ruins of the kingdom, ex- hibiting fine speci:mens of various styles of architecture from Norman to Perpendicular, founded in 1182 for certain monks of the Benedic- tine abbey of St Mary's, York, who had adopted the Cistercian rule ; the eastern end of the church of Guisbrough Priory in the Pointed style, founded in 1119 by Robert de Bruce, the burial-place of many illustrious nobles; the picturesque ruins of Jervaulx, exhibiting examples of Norman and Early English, founded in 1156 for Cis- tercian monks by Conan, fifth earl of Richmond ; the gateway and other remains of Kirkham, founded in 1121 by Walter l'Espec; the beautiful ruins of Kirkstall, exhibiting remarkably fine examples of Norman, founded in 1152 by Henry de Lacy for Cistercian monks from Fountains Abbey; the church, refectory, and other remains, in the Early English style with some traces of Norman, of Rievaulx Abbey, founded in 1131 by Walter l'Espec. There are other monastic remains of less importance at Bridlington, Coverham, Marrick, Meaux, Monk Bretton, Mount Grace, Old Malton, Roche, Rosedale, Sawley, Selby, Watton, and Whitby. In respect of church architecture Yorkshire excels any other county in the kingdom for variety

of style, and the size and importance of many of the buildings. Space forbids entrance into minute details ; but it may be mentioned here that, in addition to the cathedral churches of York, Ripon, and Beverley, there are several other churches on a very large scale, including St Mary's, Beverley, chiefly Perpendicular, very elaborate in style, originally built by Archbishop Thurstan in the 12th century ; the parish church of Bradford, a very fine ex- ample of Decorated ; the priory church of Bridlington, containing fine examples of Norman, Early English, and Perpendicular ; Halifax parish church, chiefly of the 15th century ; St Augustine's church, Hedon, Early English, Decorated, and Perpendicular, with some transition Norman ; Howden, one of the finest in Yorkshire, chiefly 18th century with latcr additions ; Holy Trinity, Hull, one of the largest parish churches in England, of the 13th century, chiefly Early English and Perpendicular; St Mary's, Masham, dating from Saxon times and having a fine Norman tower ; St Patrick's, Patrington, in the Decorated style, with a remarkably graccful spire, 189 feet in height ; All Saints, Rothcrham, a beautiful cruciform building, described by Rickman as "one of the finest Perpendicular churches of the north"; the abbey church, Selby, containing fine specimens of Norman, Early English, and Decorated ; the parish church, Sheffield, chiefly Perpendicular ; St Mary's, Thirsk, said to have been built out of the ruins of the old castle, chiefly Perpendi- cular; and Wakefield parish church, chiefly of the latter part of the 15th century, with a spire 250 feet in height, rebuilt in 1860-61. The bibliography of Yorkshire is very extensive. For histories of the several towns and districts reference may be made to Anderson's English Topography. The chief works relating to Yorkshire as a whole are Leland's Itinerary; Allen's History of Yorkshire, 3 vols., 1828-31; Baines's Yorkshire Past and Present, 4 vols., 1871-77; and Smith's Old Yorkshire, 5 vols., 1881-84. _Among numerous works on the geology, reference may be made to Phillips's Geology of the York- shire Coast, 3d ed., 1875; Davis and Lees, West Yorkshire, 1878; Bird's Sketch of the Geology of Yorkshire, 1881; and Simpson's Fossils of Yorkshire, 1884. In the publications of the Surtees Society there are many volumes of genealogical or antiquarian interest relating to the county, and in Journ. Yorks. Arch. Soc.

Many valuable topographical and historical papers. See also Lefroy's Ruined Abbeys of Yorks., 1883, and Bulmer's Arch. Studies in Yorks., 1887. (T. F. H.)

YORK, a cathedral city and archbishop's see, the county town of Yorkshire, a county in itself, and a municipal and parliamentary borough, is situated on the river Ouse at its junction with the Foss, and on the main joint line of the North Eastern and Great Northern Railways, 188 miles north of London. The surrounding country is flat, but the plain of York is one of the richest and most fertile districts in England. While the special feature of York is the cathedral, the city generally has an antique appear- ance, with narrow picturesque streets, the remains of ancient walls, and many churches and other buildings of consider- able architectural interest. The Ouse is crossed by three bridges for general traffic.—the Ouse bridge, of three elliptical arches, erected 1810-20 where a bridge had stood from time immemorial; Lendal bridge, opened in 1863, a handsome structure of iron, consisting of a single arch 175 feet in span ; and Skeldergate bridge, 1880, constructed of iron resting on stone piers. The Foss is crossed by five bridges. Of the old Roman city there are some remains of the fortifications, including ten sides of a thirteen-sided building called the multangular tower, occupying one of

the four angles of the ancient wall, with the lower part of the wall leading from this tower to Bootham Bar, the upper part of the wall being of later origin. The walls of the English city, enclosing a much wider area, though they have undergone reconstruction at various periods and were much battered during the siege of the city in 1644, are in remarkably good preservation, especially the portion to the west of the Ouse. They contain Norman and Early Eng- lish architecture, but the bulk of the walls are in the Decorated style. There are four principal gates or "bars" —Micklegate Bar, at the southern entrance to the city, where the heads of traitors were formerly exposed, consist-

ing of a square tower built over a circular arch, probably Norman, with embattled turrets at the angles; Bootham Bar, the main entrance from the north, having also a Norman arch; Monk Bar, on the Scarborough road, the most imposing of the four, probably belonging to the 14th century, formerly called Goodramgate, which after the Restoration was changed to Monk Bar in honour of General Monk ; and Walmgate Bar, belonging to the time of Edward J. and retaining the barbican rebuilt in 1648. Of the Norman fortress built by William the Conqueror in 1068 some portions were probably incorporated in Clifford's Tower, which was partly destroyed—by fire in

Plan of York.

1684. It formed the keep or donjon of the later fortress, which was dismantled at the Civil War and converted into a prison. The debtors' prison, erected in 1708, and the North and East Riding assize courts, erected in 1777, are also included within the castle wall, which was constructed in 1836.

The cathedral of St Peter, if surpassed by some other English cathedrals in certain special features, is as a whole the most striking and imposing specimen of ecclesiastical architecture in England. It is in the form of a Latin cross, consisting of nave with aisles, transepts, choir with aisles, a central tower, and two western towers. The extreme external length is 524 feet 6 inches, the breadth across the transepts 250 feet, the height of the central tower 213 feet, and the height of the western towers 202 feet. The material is magnesian limestone. The cathedral occupies the site of the wooden church in which King Edwin was baptized by Paulinus on Easter Day 627.

After his baptism Edwin, according to Bede, began to con- struct "a large and more noble basilica of stone," but it was partly destroyed during the troubles which followed his death, and was repaired by Archbishop Wilfrid. The building suffered from fire in 741, and, after it had been repaired by Archbishop Albert, was described by Alcuin as "a most magnificent basilica." At the time of the Norman invasion the Saxon cathedral, along with the library of Archbishop Egbert, perished in the fire by which the greater part of the city was destroyed, the only relic of it

now remaining being the central wall of the crypt. It was reconstructed by Archbishop Thomas of Bayeux (1070-1100) ; but of this building few portions now re- main. The apsidal choir and crypt were reconstructed by Archbishop Roger (1154-91), the south transept by Archbishop Walter de Gray (1215-55), and the north tran- sept and central tower by John Romanus, treasurer of the cathedral (1228-56). With the exception of the crypt,

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the transepts are the oldest portions of the building now remaining. They represent the Early English style at its best, and the view across the great transept is unsurpassed for architectural effect. The south transept is the richest and most elaborate in its details, one of its principal fea- tures being the magnificent rose window ; and the north transept contains a series of beautiful lancet windows called the Five Sisters. The foundation of the new nave was laid by Archbishop Romanus (1285-96), son of the treasurer, the building of it being completed by Arch- bishop Melton about 1345. The chapter-house was built during the same period. The west front, consisting of a centre and two divisions corresponding with the nave and aisles, is one of the finest features of the whole building, and has been described as "more architecturally perfect as a composition and in its details than that of any other English cathedral," the great window above the door being, in the words of Mr Britton, 'an unrivalled specimen of the leafy tracery that marks the style of the middle of the 14th century." In 1361 Archbishop Thoresby (1352-73) began the lady chapel and presbytery, both in the Early Perpendicular style. The rebuilding of the choir, begun about the same period, was not completed till about 1400. It is a very fine specimen of Late Perpendicular, the great east window being one of the finest in the world. With the rebuilding of the choir the whole of the ancient Nor- man edifice was removed, the only Norman architecture now remaining being the eastern portion of the crypt of the second period, built by Archbishop Roger (1154-91). To correspond with later alterations, the central tower was re-cased and changed into a Perpendicular lantern tower, the work being completed in 1444. The south-west tower was begun in 1432 during the treasurership of John de Bermingham, and the north-west tower in 1470. With the erection of this

tower the church was completed as it now stands, and on 3d February 1472 it was re-consecrated by Archbishop Neville. On 2d February 1829 the wood- work of the choir was set on fire by Jonathan Martin, a madman. On 2d May 1840 a fire broke out in the south- west tower, reducing it to a mere shell. The cathedral within recent years has undergone extensive restoration. Next to the cathedral the most interesting building in York is St Mary's Abbey, situated in Museum Gardens, founded for Bene- dictines by Alan, earl of Richmond, and latterly one of the most powerful ecclesiastical establishments in England, its head having the rank of a mitred abbot with a seat in parliament. The principal reniains of the abbey are the north wall and the ruins of the church, in the Early English and Decorated style, and the principal gateway with a Norman arch. The hospitium, a curious building of wood, is now used as a museum of antiquities, and contains a fine collection of Roman remains discovered in the vicinity. A con- siderable portion of the abbey was employed for the erection of the king's manor, a palace for the lord president of the north, now oc- cupicd asa school for the blind. In the gardens is also situated the ambulatory of St Leonard's hospital, founded by King Athel- stan and rebuilt by Stephen. _ Besides the cathedral, York possesses a large number of churches of special architectural interest, includ- ing All Saints, North Street, Decorated and Perpendicular, with a spire 120 feet in height ; Christ Church, with south door in the Decorated style, supposed to occupy the site of the old Roman palace ; Holy Trinity in Goodramgate, Decorated and Perpendicular with Perpendicular tower; Holy Trinity, Micklegate, in a dilapi- dated condition, with Roman masonry in its foundation walls ; St Denis, Walmgate, with rich Norman doorway and Norman tower; St Helen's, St Helen's Square, chiefly Decorated ; St John's, North Street, chiefly Perpendicular ; St Lawrence, without the bar of Walmgate, with rich Norman doorway ; St Margaret's, Walmgate, celebrated for its curiously seulptured Norman porch and doorway ; St Mary the Elder, Bishophill, Early English and Decorated, with brick tower, rebuilt in 1659; St Mary the Younger, Bishophill, with a square tower in the Saxon style, rebuilt probably in the 13th century ; St Mary, Castlegate, with Perpendicular tower and spire 154 feet in height ; St Michael-le-Belfry, founded in 1066, but re- built in 1538 in the Late Perpendicular style ; and St Olave, Mary- gate, Perpendicular, said to have been founded by Siward, earl of Northumberland. Among the

principal secular buildings are the guild hall, with a fine old room in the Perpendicular style, erected

in 1446, and containing a numbcr of stained-glass windows ; the mansion-house, built in 1725 from designs by the earl of Burling- ton ; the assembly rooms, erected in 1730, also from designs by the earl of Burlington, with the concert-room adjoining, built in 1828; the corn exehange ; the infantry barracks ; the cattle market ; the theatre, founded by Tate Wilkinson in 1765, and lately re-faced in the Gothic style by the corporation, who own the property; the De Grey rooms for balls and concerts; the fine old merchant's hall; the merchant tailors' hall; and the masonic hall. The public in- stitutions of a learned or educational character include the York- shire Philosophical Society, whose museum in the Grecian style was opened in February 1830; the subscription library, instituted 1784, and containing upwards of 20,000 volumes; the York institute of science and literature, established in 1827, and removed to the present premises in 1846; the Wilberforce school for the blind; the York fine art and industrial institution ; and the Government school of art. The charities include the York county hospital, the union workhouse, the dispensary, Colton's hospital for 8 poor men, Harrison's hospital, Dorothy Wilson's hospital (founded in 1777) for 16 poor women, Sir Arthur Ingram's hospital (founded in 1640) for 10 poor widows, and the old maids' hospital for 10 poor spinsters. The principal schools are St Peter's cathedral gramniar-school (originally endowed in 1557), Archbishop Holgate's grammiar-school, the York and diocesan grammar-school, and the blue-coat school for boys (founded in 1705), with the associated grey-coat school for irls.

_ In modern times York has ceased to retain its commercial im- portance ; but it possesses several iron foundries, railway engineer- ing works, a large glass factory, breweries, flour-mills, tanneries, glove manufactories, and confectionery and other minor establish- ments. Within its municipal limits the city of York constitutes a separate division of the county of York; the municipal city and the ainsty are for parliamentary purposes included

in the North Riding, for registration purposes in the East Riding, and for all other purposes in the West Riding. The parliamentary city of York, which formerly extended beyond the municipal limits, is partly in the North and partly in the East Riding. The eorpo- ration consists of a lord mayor, 12 aldermen, and 36 councillors. The city returns two members to parliament. In 1884 the bound- aries of the city were extended to include the townships of Holgate and St Olave, and part of the townships of Clifton, Dringhouses, Fulford, Heworth, and Middlethorpe. The population of the niunicipal borough (area 1979 acres) was 48,796 in 1871 and 49,5380 in 1881, and that of the parliamentary borough (area 2789 acres) 50,765 in 1871 and 60,343 in 1881. 'The new area is about 3553 acres, with a population estimated at over 70,000 in 1888.

York, the British name of which was Caer-Ebroc, was chosen by the Romans as an important depdt after the conquest of the Bri- gantes by Agricola in 79 and named Lboracum. Ultimately it beeame the niilitary eapital and centre of the Roman power in Britain. The original Roman city was rectangular iu form, about 650 yards by 550, and built somewhat after the plan of ancient Rome on the east bank of the Ouse. In York the emperors sat in the pretorium, and a temple was erected there to Bellona. The first emperor to take up his residence in York was Hadrian, when he visited Britain in 120. Severus died at York in February 211, and his body is supposed to have been burnt at Severus's Hill, a short distance south of the city. Constantius Chlorus also died at York in July 306, and his son Constantine the Great was there inaugurated Roman emperor. Early in the 7th century the city, under the name of Eoforwic, became the capital of the Bretwaldas. Edwin after his conversion in 627 made it au archbishop's see. The province of York, of which Paulinus was the first bishop, formerly included a great part of Seotland, but is now confined to the six northern dioceses of England. From the time of Arch- bishop Egbert (732-766) York became celebrated as a school of learning and under Alcuin was one of the most famous places of education in Europe. The city was one of the priucipal Danish settlements and seats of commerce, its population in 990 being estimated at 30,000. It was the capital of the Danish jarl; and Siward is stated to have died at York in 1055 and to have been buried in St Olave's church. After the death of Edward the Con- fessor York was eaptured by Harold Hardrada, who,

however, was shortly afterwards defeated and slain at Stamford Bridge. It was captured by William I. in 1068 and to guard it he erected a tower ; but it was re-taken and the whole Norman garrison put to death. In revenge for their slaughter William, on re-capturing the city after a siege of six months, devastated the country between York and Durham. In 1175 Henry II. held the first English parliament at York, when Malcolm of Scotland did homage for his kingdom. The city was frequently visited by subsequent monarchs, and was the scene of important conventions and parlia- ments. After the suppression of the rebellion known as the Pil-grimage of Grace in 1569, the Council of the North was established at York. The eity was besieged during the Civil War by the Parliamentary troops, to whom it surrendered on 16th July 1644. York received its first charter of incorporation from Henry I.

See Drake's Eboracum, 1736; Sheahan and Whellan's History of York, 1835-56 ; Hargrove's History of York, 1818; Dixon's Fasti Eboracenses, 1863; Ornsby's Dio- cesan History of York, 1882; Raine's Historians of the Church of York, 1879-86 ; Davies's Walks through York, 1880; Twyford's York and York Castle, 1883; and Benson and Jefferson's Picturesque York, 1886. (T. F. H.)

YORK, a borough and the county seat of York county, Pennsylvania, United States, is situated upon Codorus Creek, a branch of the Susquehanna river, and upon three railway lines,—the Pennsylvania, the Northern Central, and the Peachbottom. The surrounding country is undu- lating and is devoted to agriculture. The city is regularly laid out, with streets running diagonally to the cardinal points. It contains some manufactories of agricultural implements, paper-mills, car-shops, &c. The population in 1880 was 13,940; in 1870 it was 11,003.

The settlement of York dates from 1741. For nearly a year (1777-78) it was the place of meeting of the Continental Congress. In 1787 York was incorporated as a borough.

YORK, Hovsz or. Richard, duke of York, who claimed the crown of England in opposition to Henry VI., though he never succeeded to the

throne himself, was, nevertheless, the founder of a royal line. It may be said, indeed, that his claim, at the time it was advanced, was rightly barred by prescription, the House of Lancaster having then occu- pied the throne for three generations, and that it was really owing to the misgovernment of Margaret of Anjou and her favourites that it was advanced at all. Yet it was founded upon strict principles of lineal descent, and was certainly a strong one, if it could only be maintained that hereditary right did not suffer from interruption. For the duke was descended from Lionel, duke of Clarence, the third son of Edward III., while the House of Lancaster came of John of Gaunt, a younger brother of Lionel. The House of Lancaster, therefore, had been clearly in wrongful posses- sion of the throne, and Richard, duke of York, claimed it as the true heir. One thing which might possibly have been considered an element of weakness in his claim was that it was derived through females, —an objection actually brought against it by Chief-Justice Fortescue. For Lionel, duke of Clarence, left only a daughter, Philippa, who married Edmund Mortimer, third earl of March ; and the male line of the Mortimers also failed on the death of Edmund, the fifth earl, whose sister, and ultimately his sole heir, Anne, married Richard, earl of Cambridge, and became by him the duke of York's mother. But a suc- cession through females could not reasonably have been objected to after Edward III.'s claim to the crown of France ; and, apart from strict legality, the duke's claim was probably supported in the popular estimation by the fact that he was descended from Edward III. through his father no less than through his mother. For his father, Richard, earl of Cambridge, was the grandson of Edmund, duke of York, fifth son of Edward III.; and he himself was the direct lineal heir of this Edmund, just as much as he was of Lionel, duke of Clarence. His claim was also favoured by the accumulation of hereditary titles and estates. The earldom of Ulster, the old inheritance of the De Burghs, had descended to him from Lionel, duke of Clarence ; the earldom of March came from the Mortimers, and the dukedom of York and the earldom of Cambridge from his paternal ancestry. And in addition to all this his own marriage with Cecily Neville, though she was but the youngest daughter of Ralph, first earl of Westmoreland, allied him to a powerful family in the north of England, to whose support both he and his son were greatly indebted.

The reasons why the claims of the line of Clarence had been so long forborne are not difficult to explain. Roger Mortimer, fourth earl of March, was actually designated by Richard II. as his successor ; but he died the year before Richard was dethroned, and his son Edmund, the fifth earl, was but a child at Henry IV.'s usurpation. Henry took care to secure his person; but the claims of the family

troubled the whole of his own and the beginning of his son's reign. It was an uncle of this Edmund who took part with Owen Glendower and the Percies; and for ad- vocating the cause of Edmund Archbishop Scrope was put to death. And it was to put the crown on Edmund's head that his brother-in-law Richard, earl of Cambridge, conspired against Henry V. soon after his accession. But this was the last attempt made in favour of the family for along time. The plot was detected, being revealed, it is said, by the earl of March himself, who does not appear to have given it any encouragement ; the earl of Cambridge was beheaded. The popularity gained by Henry V. in his French campaigns secured the weak title of the House of Lancaster against further attack for forty years.

Richard, duke of York, seems to have taken warning by his father's fate; but, after seeking for many years to correct by other means the deplorable weakness of Henry VI.'s government, he first took up arms against the ill advisers who were his own personal enemies, and at length claimed the crown in parliament as his right. The Lords, or such of them as did not purposely stay away from the House, admitted that his claim was unimpeachable, but suggested as a compromise that Henry should retain the crown for life, and the duke and his heirs succeed after Henry's death. This was accepted by the duke and an Act to that effect received Henry's own assent. But the Act was repudiated by Margaret of Anjou and her followers, and the duke was slain at Wakefield fighting against them. In little more than two months, however, his son was proclaimed king at London by the title of Edward IV., and the bloody victory of Towton immediately after drove his enemies into exile and paved the way for his coronation.

We need not follow the vicissitudes of Edward's reign, of which a brief account will be found under Epwarp IV. (vol. vii. p. 684). After his recovery of the throne in 1471 he had little more to fear from the rivalry of the House of Lancaster. But the seeds of distrust had already been sown among the members of his own family, and in 1478 his brother Clarence was put to death—secretly indeed, within the Tower, but still by his authority and that of parliament—as a traitor. In 1483 Edward himself died ; and his eldest son, Edward V., after a nominal reign of two months and a half, was put aside by his uncle, the duke of Gloucester, who became Richard IIL, and then caused him and his brother Richard, duke of York, to be murdered, But in little more than two years the usurper was defeated and slain at Bosworth by the earl of Rich- mond, who, being then proclaimed king as Henry VIL, shortly afterwards fulfilled his pledge to marry the eldest daughter of Edward IV. and so unite the Houses of York and Lancaster.

Here the dynastic history of the House of York ends, for its claims were henceforth merged in those of the House of Tudor. But the family history has still much to do with the story of those reigns. For, although the union of the Roses onght to have extinguished controversy, a host of debatable questions and plausible pretexts for rebellion still remained. The legitimacy of Edward IV.'s children had been denied by Richard IIL. and his parlia- ment, and, though the Act was denounced as scandalous, the slander might still be re-asserted. The duke of Clarence had left two children,a son and a daughter, and the attainder of their father could not be a greater bar to the crown than the attainder of Henry VII. himself. Seeing this, Henry had, immediately after his victory at Bosworth, secured the person of the son, who was named Edward, earl of Warwick, and kept him a prisoner in the Tower of London. Yet a formidable rebellion was raised in his behalf by means of Lambert Simnel, who, personating the prisoner in the Tower, professed to have escaped, went to Ireland, and,

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after being actually crowned as king in Christchurch cathedral, Dublin, came over with a host of Yorkist sympathizers into England, where he was defeated and taken prisoner at the battle of Stoke in 1487. The earl of

Warwick lived for twelve years later in unjust confine- ment, and was ultimately put to death in 1499 because he had consented to a plot for his own liberation. As to his sister Margaret, she was married to one of Henry VII.'s Welsh followers, Sir Richard Pole (or Poole), and could give no trouble, so that, when Henry VIII. came to the throne, he thought it politic to treat her with kindness. He made her countess of Salisbury, reversed her brother's attainder, created her eldest son, Henry, Lord Montague, and caused one of her younger sons, Reginald, who displayed much taste for learning, to be very carefully educated. 'This, however, was the very thing which involved the whole family in ruin. For Henry looked to the learning and abilities of Reginald Pole to vindicate before Europe the justice of his divorce from Catherine of Aragon ; and, when Pole not only was unable to comply but was con- scientiously compelled to declare the very opposite, the king's indignation knew no bounds. Pole himself was safe, having secured some time before a retreat in Italy. He was even, for his great merits, made a cardinal by the pope. But this only made matters worse for his family at home: his brother, Lord Montague, and even his mother, the aged countess of Salisbury, were beheaded as traitors because they had continued to correspond with him. Cardinal Pole, however, came back to his own country with great honour in the reign of Queen Mary, and was made archbishop of Canterbury on the deprivation of Cranmer.

Two nephews of this cardinal, named Arthur and Edmund Poole, are the last members of the family whom it is needful here to mention. Early in the reign of Queen Elizabeth, being ardent young men, they conspired to go over to the duke of Guise in France, hoping to return with an army into Wales and so promote the claims of Mary Queen of Scots to the crown of England, for which service the elder, Arthur, expected to be restored to the dukedom of Clarence. The result was that they were condemned to death, but were only imprisoned for the

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rest of their days in the Tower, where they both carved inscriptions on the walls of their dungeon, which are still visible in the Beauchamp tower.

There was yet another branch of the House of York which inight have given trouble to the Tudors, if they had not been very narrowly watched and ultimately extin- guished. Of the sisters of Edward IV. the eldest, Anne, who married the duke of Exeter, left only one daughter by her second husband, Sir Thomas St Leger ; but the second, Elizabeth, married John de la Pole, duke of Suffolk, and had several children of both sexes. Their eldest son was created earl of Lincoln during his father's life, and Richard ITl., after the death of his own son, had designated him as his successor. Disappointed of a kingdom by the success of Henry VIL., he joined in Simnel's rebellion and was killed at the battle of Stoke. His brother Edmund thus became heir to his father ; but in the reduced circumstances of the family he agreed to forbear the title of duke and take that of earl of Suffolk. He continued for some years in favour with the king, who made him a knight of the Garter ; but, having killed a man in a passion, he fled abroad and was for some time entertained at the court of the emperor Maximilian and afterwards of Philip, king of Castile, when resident in the Low Countries, before his departure for Spain. But Philip, having been driven on the English coast when going to take possession of his Spanish kingdom, was entertained at Windsor by Henry VII., to whom he promised to deliver up the fugitive on condition that his life should be spared. Edmund de la Pole accordingly was brought back to his native country, to be lodged in the Tower for the remainder of his days. And, though the pro- mise to spare his life was kept by the king who gave it, his son Henry VIII. caused him to be executed in 1513, when war broke out with France, apparently for treasonable cor- respondence with his brother Richard, then in the French service. After his death Richard de la Pole, remaining in exile, called himself earl of Suffolk, and was flattered occa- sionally by Francis I. with faint hopes of the crown of England. He was killed at the battle of Pavia in 1525. There were no more De la Poles who could advance even the most shadowy pretensions to disturb the Tudor dynasty.

GENEALOGICAL TABLE OF THE HovUsE oF YORK.

Edward III. | a z | | ald val Edward, the William Lionel, = Elizabeth, d. of John of Gaunt, Edmund, William Thomas Black Prince. of Hatfield duke of | William de Burgh, duke of Lancaster. duke of York. of Windsor of

Woodstock, | (died young). Clarence. earl of Ulster. : (died young). duke of Gloucester. Richard IT. Henry IV. Edward, (dethroned 1399). Edniund Mortimer, = Philippa. duke of York. third earl of March. Henry V. | Roger Mortimer, = Eleanor Holland, Henry VI.

fourth earl of March. | eldest daughter of Thomas, second

earl of Kent.

Edward,

prince of Wales. –

| Edmund Mortimer, fifth earl of March.

| Anne Mortimer= Richard, earl of Cambridge

(executed 1415).

Cecily Neville, daughter of = Richard, duke of York Ralph, earl of Westmoreland. | (killed in battle 1460).

| Richard III. (killed in battle 1485).

| Anne, married Henry Holland, duke of

George, duke of Clarence Exeter, and had no child by him. By

| Edward IV. (0b. 1483). I (attainted 1478).

j | her second husband, Sir Thomas St (0b. 1491). Edward V. Richard, _ Edward, Leger, she had a daughter married to Sir Qnurdered 1483). duke of York prince of Wales Geo. Manners, Lord Roos, and mother (murdered 1483). (died 1484). of the first earl of Rutland. |] —_ | | | | Edward, Margaret, =Sir Richard Pole. John de la Pole, Edmund Humphrey and Richard Four earl of Warwick _ countess of Salisbury earl of Lincoln, de la Pole Edward, dela Pole = daugliters. (executed 1499). (executed 1541). (0b. 1487). (ob. 1513). churchmen. (ob. 1525).

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Ursula, married to Henry, lord Stafford, son of Edward, duke of Buck-ingham.

| Reginald Pole, cardinal.

Sir Geoffrey Pole, Arthur Pole. of Lordington,

Sussex,

| Henry Pole, Lord Montague (executed 1539).

Five sons and one daughter. Among the former were Arthur and Edmund, who were prisoners in the Tower.

| Elizabeth=John de la Pole,

duke of Suffolk

(J. GA.)

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YORUBA, or Yarrsa, a country of West Africa, occupy- ing the eastern half of the Slave Coast region in 6°-9° N. lat. and 3°-7° E. long. Taken in its widest sense, so as to include the whole domain of the Yoruba race and speech, the Yoruba country stretches from the Bight of Benin northwards in the direction of the unexplored region of Borgu, and from the ill-defined eastern frontier of Dahomey to the Niger and its delta, which enclose it on the north- east, east, and south-east. Within these limits it covers an area of at least 40,000 square miles, with a population roughly estimated at over 2,000,000. But since 1820-21, when the old Yoruba empire was broken up by the Fulah invaders, the northern part, comprised between the Niger and the water-parting of the streams flowing north to that river and south to the Gulf of Guinea, has been included in the Fulah state of Gando. This water-parting, which constitutes the main

physical feature of the land, is formed by the eastern continuation of the mountain range which in the Mahi country, north of Dahomey, appears to rise to over 6000 feet (Skertchley), but which in Yoruba gradually falls to considerably under 2000 feet. But to- wards the east, about the upper course of the river Oshun, the system again rises to what is described as "a very mountainous country" (Higgins and Smith), The city of Ilorin, near the northern slope of the divide, stands at an elevation of a little over 1300 feet, which is probably about the average height of the range in Yoruba. Gerhard Rohlfs, who in 1867 traversed the whole region from Rabba on the Niger to Lagos on the Gulf of Guinea, de- scribes the section north of the water-parting as an open, gently sloping, and highly cultivated plain, to which the profusion of flowering plants gives the aspect of a vast garden. Here abundant crops of cereals, cotton, yams, ground-nuts, and kola nuts are raised. South of the divide the land, which is intersected by the nearly parallel courses of the rivers Ogun, Omi, Oshun, Oni, and Oluwa, falls in continuous undulations down to the coast, the open cultivated ground gradually giving place in the same direction to forest tracts, where the most characteristic tree is the oil-palm. Flowering trees and shrubs are here also plentiful, while the chief cultivated plants are corn, yams, plantains, bananas, tobacco, cotton, okro, ground- nuts, and ata-ale yielding a yellow dye (Higgins and Smith). As the sea is approached, the wooded tracts merge almost ' everywhere in a broad zone of dense primeval forest, com- pletely separating the arable lands of the interior from the coast lagoons.

These lagoons, lying between the outer surf-beaten beach and the inner shore line, form a navigable highway of still waters, which in many places is several miles in extent, During the dry season the rivers discharging into the lagoons are unable to force a passage seawards ; but after the rains they find an outlet, now at one point now at another, while here and there the natives themselves often excavate passages for their boats between the inner and outer waters. Of all the lagoons the most extensive are those of Leckie in the east and Ikoradu (Lagos) in the west. At its northern extremity the latter receives the discharge of the Ogun, the largest river in Yoruba, whose current is strong enough to keep the seaward channel open throughout the year. Hence the great importance

of the British port of Lagos, which lies in smooth water at the inner entrance of this channel.

From Lagos, which, besides Badagry (about 40 miles farther west), is the only station actually occupied by England on this coast, the British Government exercises a sort of benevolent suzerainty over the whole of the Yoruba country. In 1886 it despatched to the inland tribes two commissioners (Higgins and Smith) for the purpose of bringing to a close the intertribal wars by which the

country had for years been wasted, and also of inducing the chiefs to give up the practice of human sacrifices, which, as in Dahomey and

Ashantee, though to a less degree, has always prevailed throughout this region. The commissioners obtained and cmbodied in their reports (Blue Books, 1887) a considerable amount of information regarding the present political and social condition of the Yoruba peoples. Since the dismemberment of their empire by the Fulahs (1820-21) the country has been divided into a number of semi- independent states, chieftaincies, or kingdoms, hanging loosely together, or rather constantly at war, and with a feeble sense of common nationality. The direct representative of the old Yoruba power is the "alafin" or king of the Yoruba country proper, occupying the northern and central parts of the whole region. Round about this central state are grouped the kingdoms of Ilorin,

Ijesha, Ife, and Ondo in the east, Mahin and Jebu in the south,

and Egba in the west. The alafin resides at Oyo, on a headstream of the Oshun, a place which as metropolis of the Yoruba nation has succeeded the older capitals, Bohu and Katunga, lying farther north and destroyed during the wars with the Fulahs. Oyo has an estimated population of 70,000 or 80,000; but it is greatly ex- ceeded in size by several other places in Yoruba Land, where for mutual protection the inhabitants have mainly grouped themselves in large walled towns. Thus have sprung up the great cities of Abeokuta (200,000 ?), capital of Egba, on the Ogun, due north of

Lagos ; Ibadan (150,000), on a branch of the Omi, 30 miles south of Oyo ; Llorin (200,000 2), one of the great markets of West Africa, capital of the Lorin state ; Ogbomosho (60,000), between Oyo and Torin ; Ejigbo (40,000), Tlobu (60,000), and Ikirun (60,000), fol- lowing successively nearly due east from Oyo; Ilesha (40,000), Oshogbo (60,000), and Ede (50,000), following each other due west in the Ilesha state; Ipetumodu (40,000), in Ife ; Ode Ondo (60,000), capital of Ondo; Jebu Ode (60,000), Epe (40,0002%), and Lagos (75,000), in the Jebu state and British protectorate. The consti- tution of some of these great urban groups is most remarkable. Thus Abeokuta, dating from 1825, owes its origin to the incessant inroads of the slave-hunters from Dahomey and Ibadan, which compelled the village populations scattered over the open country to take refuge in this rocky! stronghold against the common enemy. Here they constituted themselves a free confederacy of some sixty distinct tribal groups, each preserving the traditional customs, re- ligious rites, systems of government, and even the very names, of their original villages. Yet this apparently incoherent aggregate has since held its ground successfully against the powerful armies often sent against the place both by the king of Dahomey from the west and by the people of Ibadan from the east. The different tribes are clearly distinguished by their sevcral tattoo markings, usually some simple pattern of two or more parallel lines, disposed hori- zontally or vertically on both cheeks or other parts of the face.

Notwithstanding their political feuds, the Yoruba people are distinguished above all the surrounding races for their generally peaceful disposition, love of industry, friendliness, and hospitality towards strangers. Physically they resemble closely their Ewe and Dahomey neighbours, but are of somewhat lighter complexion, taller, and of less pronounced Negro features. Their superior intelligence is shown in their greater susceptibility to Christian and Mohammedan influences, their capacity for trade, and their remarkable progress in the industrial arts. Although the bulk of the nation is still pagan, Islam has made great advancement since the cessation of the Fulah wars, while Protestant and Roman Catholic missions have been at work for many years at Abeokuta, Oyo, Ibadan, and other large towns. Samuel Crowther, the first Negro bishop, who was distinguished as au explorer, geographer, and linguist, was a

native of Yoruba, rescued by the English from slavery and educated at Sierra Leone.

Although agriculture is the chief industry, such useful arts as pottery, weaving, tanning, dyeing, and forging are practised in all the towns. The people make their own agricultural implements, extract a palatable wine from the Raphia vinifera, and weave a stout cotton fabric, which was formerly exported to Brazil, but which can now scarcely stand the competition of cheaper Manchester goods even in the home market. Butas builders the Yorubas know no rivals in Negroland. The houses of the chiefs, often containing as many as fifty rooms, are constructed with rare skill, and tastefully decorated with carvings representing symbolic devices, fabulous animals, and even scenes of war or the chase.

Before the introduction of letters the Yorubas are said to have employed knotted strings, like the Peruvian quipus, for recording events of historic interest. Their language, which has been reduced to writing and carefully studied by Crowther, Bouché, Bowen, and other missionaries, is spoken with considerable uniformity throughout the whole of the Yoruba domain, and has even pene- trated with the enterprising native traders as far east as Kano in the Haussa country beyond the Niger. The best-known dialectic varieties are those of Egba, Jebu, Ondo, Ife, Ilorin, and Oyo (Yoruba proper, called also Nago) ; but the discrepancies are slight, while the divergence from the conterminous linguistic groups (Ewe in the west, Ibo, Nupe, and others in the east) appears to be fundamental.

1 Abeokuta = "under the rocks."

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The most marked featureis a strong tendency towards monosyllabism, which has been produccd by phonetic decay, and which, as in the Indo-Chinese family, has given rise to the principle of intonation, required to distinguish words originally different but reduced by corruption to the condition of homophones. Besides the tones, of which there are three,—high, low, and middle,—Yoruba has also developed a degree of vocalic

harmony, in which, as in Ural- Altaic, the vowels of the affixes are assimilated to that of the root. Inflexion, as in Bantu, is effected chiefly by prefixes; and there is a remarkable power of word-formation by the fusion of several rela- tional elements in a single compound term. The Bible and several religious treatises have been translated into Yoruba, which as a inedium of general intercourse in West Africa ranks in importance next to Haussa and Mandingan. (A. H. K.)

YOUGHAL, a seaport, borough, and market town in the county of Cork, Ireland, is situated on the west side of the estuary of the Blackwater, and on the Cork and Youghal branch of the Great Southern and Western Rail- way, 157 miles south-west of Dublin and 28 east of Cork. The fine collegiate church of St Mary, in the Later Deco- rated style, was originally erected in the 11th century, but rebuilt in the 13th, and since that time it has been frequently repaired. It contains a fine monument to the first earl of Cork. There are still a few fragments of the Dominican friary founded by Fitzgerald in 1269. Myrtle Grove, formerly the residence of Sir Water Raleigh, still remains. The harbour is safe and commodious, and there are several good quays. At the northern extremity of the harbour the river is crossed by a bridge resting on wooden piles. The principal exports are corn and other agricultural produce ; the imports are coal, culm, timber, and slate. Coarse earthenware and bricks are manufac- tured. There is a salmon fishery in the Blackwater. Youghal is of some repute as a watering-place. The population of the town (area 345 acres) in 1871 was 6081, and in 1881 it was 5826.

Youghal is one of the most ancient towns in Ireland, and was incorporated by King John in 1209. The Franciscan monastery, founded at Youghal by Fitzgerald in 1224, was the earliest house of that order in Ireland. Sir Roger Mortimer landed at Youghal in 1317. The town was plundered by the earl of Desmond in 1579. In 1641 it was garrisoned and defended by the earl of Cork. In 1649 it declared for the Parliament. It sent two members to Parliament from 13874 till the union, after that only one down to 1885, when it was for parliamentary purposes merged in the East Division of the county.

YOUNG, Arruur (1741-1820), a writer on agriculture and social economy, the third son of Rev. Arthur Young, rector of Bedingfield, in Suffolk, was born on 7th Septem- ber 1741. After having been for some time at a school at Lavenham, he was in 1758 placed in a mercantile house at Lynn, but showed no taste for commercial pursuits, He gave early evidence of literary inclinations by publishing, when only seventeen years old, a pamphlet On the War in North America and by beginning a periodical work, entitled The Universal Museum, which, however, was soon dropped by the advice of Dr Samuel Johnson.

After his father's death in 1759, his mother gave him the direction of Bradfield Hall ; and in 1767 he undertook on his own account the management of a farm in Essex. Possessing no practical acquaintance with agriculture, but being active-minded and of an inquiring turn, he engaged in experiments of various kinds, and embodied the results of them in A Course of Experimental Agriculture, which appeared in 1770. Though Young's experiments were, in general, unsuccessful, he acquired in the process of making them a solid knowledge of agriculture ; and, writing in a lively style, he was able to make his disquisitions on the subject interesting to the public. He had already com- menced a series of journeys through different parts of England and Wales, and gave an account of his observa- tions in books which appeared from 1768 to 1770 —A Stx Weeks' Tour through the Southern Counties of England and Wales, A Sia Months' Tour through the North of England,

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and the Farmer's Tour through the East of England. He says that these books contained the only extant informa- tion relative to the rental, produce, and stock of England that was founded on actual examination. They were very favourably received at home and abroad, being translated into most Continental languages by 1792.

In 1768 he published the Yarmer's Letters to the People of England, in 1771 the Farmer's Calendar, which has gone through a great number of editions, and in 1774 his Political Arithmetic, which was soon translated into several foreign languages. About this time Young acted as par- liamentary reporter for the Morning Post. He made a tour in Ireland in

1776, and drew up the results, with copious observations on the state of that kingdom, in the years 1776-79, publishing a quarto volume on them in 1780. In 1784 he commenced the publication of the Annals of Agriculture, which was continued for 45 volumes i this work had contributions from many authors, among whom was George III., writing under the nom de plume of Ralph Robinson. Young's first visit to France was made in 1787. In May of that year he went to join Rochefou- cauld-Liancourt at Paris, and accompanied by him and another gentleman travelled south to Bagnéres de Luchon, making also an excursion into Spain. In November he was again in London; but in July 1788 he returned to France to study at leisure what he had before cursorily observed. He then saw the western part of the country, travelling alone on horseback, and came back a third time to see the east. The motive of these visits was "to make himself a master of their agriculture, that, if he found anything good and applicable to England, he might copy it." But he had an eye no less for political and social phenomena, and, traversing France in every direction just before and during the first movements of the Revolution, he has given us interesting and valuable notices of the condition of the people and the conduct of public affairs at that critical juncture. The Travels in France appeared in two vols. 4toin 1792. On his return home he was appointed sec- retary of the Board of Agriculture, then just formed under the presidency of Sir John Sinclair. In this capacity he gave the most valuable assistance in the collection and preparation of agricultural surveys of the English counties. In 1765 he had married a Miss Allen; but the union is said not to have been a very happy one, though he was of domestic habits and a most affectionate father. His sight failed, and he submitted to an operation for cataract, which proved unsuccessful. He suffered also in his last years from stone. He died in February 1820.

'To the works of Arthur Young," said Kirwan, "the world is more indebted for the diffusion of agricultural knowledge than to any writer who has yet appeared." To the samc effect is the more recent testimony of Mr Hoskyns, who tells us that " the Farmer's Letters and Calendar, as well as the Tours, displayed the mind and pen of a master in his art, and went far towards laying the foundation of a practical agricultural literature." But it is as a social and political observer that Young is now

best known to the reading public, and the books which have established his reputa- tion in these departments—his Tour in Ireland and Travels in France—are still full of interest and instruction.

He found that Ireland had ‘“‘ flourished for the last thirty years to an uncommon degree, more,” he believed, “than any country in Europe”; and he protcsted against the turbulence of the population and the outcries of the gentry at a time when Ireland had “ cex- pericnced more favour from three sessions of a British parliament than from three centuries before.” But he saw clearly and exposed unsparingly the causes which retarded the progress of the nation. He strongly urged the repeal of the penal laws which pressed upon the Catholics ; he thought, however, that their disabilities should be removed, not bya single measure, but gradually. He protested against the harshness with which the labouring classes were treated by their superiors, and denounced the middlemen as being, not merely a useless class, but by their oppression and insolent manners the chief causes of popular discontent. He condemned the restric- tions imposed by Great Britain on the commerce of Ireland, and also the perpetual interference of the Irish parliament with industry

by prohibitions and bounties ; of the latter he censured in specially strong terms the bounty on the inland carriage of corn to Dublin. He deplored the drain of rents and the neglect of their tenantry by absentee proprietors. The state of agriculture, generally low though improving, he found particularly unsatisfactory in Ulster, owing to the prevalence there of the linen manufacture, at that time carried on in the homes of the people, who were constantly divided between this occupation and the labours of the field. Emigration, he thought, was not sufficiently encouraged ; indeed it scarcely existed at the period of his visit. It had previously been practised to a greater extent, and, besides relieving the population which remained, had been useful in removing restless spirits who would have been troublesome at home. He favoured a legislative union of Ireland with Great Britain, though he did not regard such a measure as absolutely necessary, many of its advantages being otherwise attain- able, without incurring the risk of some possible inconveniences.

*The soil of France he found in general superior to that of Eng- land, and its produce less. Agriculture was neither as well under- stood nor as much esteemed as in England. He severely censured the higher classes for their neglect of it. “ Banishment (from court) alone will force the French nobility to execute what the English do for pleasure—reside upon and adorn their estates. Young saw the commencement of violence and outrage in the rural districts, being himself more than once in peril from popular sus- picion. His sympathies began to take the side of the classes suffer- ing from the excesses of the Revolution, and this change of attitude was distinctly shown by his publication in 1793 of a tract entitled The Example of Franeea Warning to England. Of the profounder significance of the French outbreak, as the commencement of a world-wide movement and a new era in social history, he seems to have had little idea, and thought the crisis would be sufficiently met by a constitutional adjustment in accordance with the English type. Yet he had much of the feeling which then inspired the Revolutionary actors, and, along with it, it may be added, some- thing of the general sentimentalism of the period. Another en- thusiasm he frequently exhibits—namely, for music, and especially for the Italian opera. But his master passion was the devotion to agriculture, which constantly showed itself. He strongly con- demned the métayer system then widely prevalent in France, as “nerpetuating poverty and excluding instruction,” as, in fact, the curse and ruin of the country. Some of his phrases have been often quoted by the advocates of peasant proprietorship as favour- ing their view. “The magic of property turns sand to gold.” ‘*Give a man the secure possession of a bleak rock, and he will turn it into a garden; give him a nine years’ lease of a garden, and he will convert it into a desert.” But these sentences, in which the epigrammatic form exaggerates a truth, and which might seem to represent the possession of capital as of no import- ance in agriculture, must not be taken as conveying his approba- tion of the system of small properties in general. He approved it only when the subdivision was strictly limited, and even then with great reserves ; and he remained to the end what J. S. Mill calls him, “ the apostle of la grande eulture.”” The French acknowledge the valuable services which his criticisms and counsels rendered to their agriculture. The directory in 1801 ordered his writings on the art to be translated and published at Paris in 20 volumes under the title of Le Cultivateur Anglais. Wis Travels in France were*

translated in 1793-94 by Soulés; and a new version by M. Lesage, with an introduction by M. de Lavergne, appeared in 1856. An interesting review of the lattcr publication, under the title of Arthur Young et la France de 1789, will be found in M. Baudrillart's Publicistes Modernes, 2d ed., 1878. (in It,)

YOUNG, Bricuam (1801-1877), Mormon president, was born in Whitingham, Vermont, on lst June 1801. His father was a farmer, and he himself learned the trade of a painter and glazier. He originally belonged to the Baptist Church, but joined the Mormons at Kirtland, Ohio, in 1832, In the same year he was ordained "elder ;" in 1835 he was made an apostle; and in 1844 he succeeded Joseph Smith as president. He died at Salt Lake City, on 29th August 1877. See Mormons.

YOUNG, Epwarp (1681-1765), author of Wight Thoughts, was born at Upham, near Winchester, in 1681. The minute facts of his life are to be found in the biography contributed to Johnson's Lives of the Poets by Herbert Croft. The son of the dean of Sarum, educated at Winchester and Oxford (New College and Corpus), Young obtained a law fellowship at All Souls in 1708, and proceeded to use it as a base of operations for gratifying his "ruling passion," the love of fame. There was at the time an open career for young men of talent who showed

ability to recommend the policy and the persons of states-

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men in their struggle for power, and Young, full of un- bounded energy and eloquence, exuberant to eccentricity, joined in the. race with a vigour that soon raised him to distinction. He seems to have been for a time in the family of the earl of Exeter as tutor; but the notorious marquis of Wharton (see WHARTON) took a fancy to him, bribed him away from this post with liberal promises of maintenance and patronage, settled two annuities on him, and tried to get him into Parliament. Meantime Young began to publish and to dedicate, the poems and the dedications taken together (Zhe Last Day, 1713, and The Force of Religion, 1714) showing the simple mixture of piety and worldliness that is one of the notes of his character. He essayed tragedy, writing at mid-day with closed shutters, by

the light of a candle fixed in a human skull. Busiris was performed at Drury Lane in 1719, The Revenge in 1721. Far from gloomy in the company of Wharton and his friends, he had a decided bent for gloomy themes when alone, and a most copious and lofty— often extravagantly lofty—eloquence in the treatment of them ; a paraphrase of the book of Job was one of his productions about this time. But he showed equal facility in dashing and effective satire: his first great literary success was made with the series of satires published between 1725 and 1728, and collected in the latter year under the title Love of Fame, the Universal Passion. These satires do not bear comparison with Pope's, to which they pointed the way, but they have a charm of exuberant vitality and power, an irregular abundance of wit and bold imagery, a frequent felicity of diction, that entitle them to Johnson's praise—'"'a very great performance "—and enable us to understand the impression produced by Young in conversation. One of the features in Young's character that disarms resentment of his fulsome adulation, and other extravagances and eccentricities, is his humorous Falstaffian consciousness of his own faults. 'Who can write the true absurd like me?" he cries in one of his satires. He abundantly proved this in Ocean: an Ode, with which he hailed the accession of George IT. Soon after, when nearly fifty, he took orders, was appointed a royal chaplain, and presented by his college to the rectory of Welwyn. He was disappointed in his desire of further promotion in the church; he had succeeded some time before in extracting a pension of £200 from Walpole, and this favour was cynically treated as a satisfaction in full of his claims on the Government. The Wight Thoughts were published in separate " Nights" between 1742 and 1744. Inthe preface Young said that "the occasion of this poem was real, not fictitious, and that the facts men- tioned did naturally force these moral reflexions on the mind of the writer." Croft has shown that this statement, though justifiable in the main, has to be taken with some qualifications, and that a common belief that Lorenzo was meant for the author's own son was undoubtedly a mistake. Still, it is true that Young's wife, her daughter, and her daughter's husband died in rapid succession, and the poem —a great work in spite of all its inequalities—was, like In Memoriam, the expression of a real sorrow and search for consolation. Young continued to write occasionally even after he had passed his eightieth year. His death took place on 12th April 1765.

Besides Croft's Life, there are interesting references to Young in Boswell's Johnson (see Birkbeck's ed., iv. 119, v. 270).

YOUNG, Tuomas (1773-1829), one of the most re- markable figures alike in literature and science in the beginning of the 19th century in Great Britain. He belonged to a Quaker family of Milverton, Somerset, and was the youngest of ten children, having been born on 13th June 1773. His precocity, especially in the acquirement of languages, was remarkable, being little

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inferior to that of Sir W. Rowan Hamilton. But his thirst for knowledge was unlimited in its range. He was not content with languages, mathematics, and physical science : natural science, medicine, and even ancient philosophy were eagerly studied by him; and he was passionately devoted to athletic exercises. His medical studies were pursued successively in London, Edinburgh, Gottingen, and finally at Emmanuel College, Cambridge, where he took his doctor's degree. The death of a maternal uncle put him in a position of comfortable independence, and he did not heartily enter upon practice. He was secured in 1802 by the Royal Institution as a colleague of Davy and professor of natural philosophy. Here his special talents found ample occupation, and the chief result was the publica- tion in 1807 of his celebrated Course of Lectures on Natural Philosophy, a work which is even now regarded as a valuable authority. Some years before he had made his remarkable discovery of the interference of light, and begun that wonderful series of researches which, as com- pleted by Fresnel, secured the triumph of the undulatory theory. He was foreign secretary of the Royal Society for more than a quarter of a century ; and it is curious to note that his reputation stood higher in foreign than in home scientific circles. He was one of the eight foreign associates of the Institute of France. He was one of the Commission- ers of Weights and Measures, and secretary to the Board of Longitude, which in those days conducted the Nautical Almanac. A few years before his death he became inter- ested in life assurance, with great benefit to the company whose scientific business he conducted. His death, on 10th May 1829, was probably hastened by the extraordinary amount

and variety of the labours he undertook, and the self-sacrificing zeal with which he devoted himself to them.

His Life, by Dr Peacock, dean of Ely and a well-known mathe- matician, was published in 1855, along with a collection of his Miscellaneous Works and Scientific Memoirs. Young was a somewhat copious contributor to the 6th edition of this Encyclopedia, and some of the best of his smaller papers appeared in it for the first time. For a résumé of his contributions to the subject of hemadynamics, see VASCULAR SysTEM, p. 97 supra. Another of the multitudi- nous problems that claimed his attention was the decipherment of the Egyptian hieroglyphics, in which he had made some progress as early as 1814; see his Account of some Recent Discoveries in Hicro- glyphical Literature (London, 1823).

YOUNGSTOWN, a city and the county seat of Mahon- ing county, Ohio, United States, is situated upon the Mahoning river, a tributary of the Ohio. The prevailing industries of the surrounding country are agriculture and coal-mining. Youngstown is directly connected with six railway lines. Owing to the contour of the site, the city is laid out very irregularly. The population in 1880 was 15,435 (8075 in 1870). The industries of Youngstown are connected chiefly with the manufacture of iron: there are several furnaces and rolling-mills, and manufactories of rails and stoves and of agricultural tools and machines.

Youngstown was laid out in 1797, being one of the first settle- ments made in that part of Ohio known as the Western Reserve. Since the rebellion it has grown with great rapidity.

YPRES (Flem. Yperen), a town of Belgium, capital of an arrondissement in the province of West Flanders, stands in a fertile plain on the Yperlee, 21 miles north-north-west of Lille. In the 14th century it is said to have contained 200,000 inhabitants; and it was long famous for its woollen and linen manufactures, though the once current derivation of the word "diaper" from the name of this town can no longer be maintained. Of the old fortifica- tions some traces still remain, as well as a few picturesque dwelling-houses of the 14th and 15th centuries. The fine Gothic cloth hall (1201-1342), with a facade 462 feet in length, is pierced by two rows of

pointed windows ; there are two corner turrets; and in the centre rises a massive square clock tower. The forty-four statues of counts

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of Flanders and their consorts which formerly adorned it were restored in 1860. The town-hall (1730) contains some interesting frescos and sculptures of modern date. The finest parts of the Gothic cathedral of St Martin (1221-70) are the choir, and the portal and rose window of the south transept; in the interior is some good wood- carving ; the old frescos were "restored" in 1826, In the cloister is the tomb of Cornelius JaNsEN (q.v.). The town contains several other churches, as well as hospitals, a military school, a museum, and a public library. The chief manufactures are those of linen thread and lace and of woollen and linen cloth ; dyeing, bleaching, and tanning are also carried on. The population in 1876 was 15,515,

YRIARTE. See [Rrarre.

YTTRIUM, the name of a rare element which in its character is closely allied to, and in nature is always associ- ated with, cerium, lanthanum, didymium, and erbium (see LANTHANUM, vol. xiv. p. 291). For the preparation of yttrium compounds the best raw material is a rare Swedish mineral called gadolinite, which, according to K6nig, consists of 22°61 per cent. of silica, 34°64 of yttria, Y,0.,, and 42°75 of the oxides of erbium, cerium, didy- mium, lanthanum, iron, beryllium, calcium, magnesium, and sodium. Bunsen and Bahr, in 1866, elaborated a method for extracting the several rare oxides in the state of purity ; but the method is too complicated to reproduce here! Metallic yttrium is obtainable by reducing the chloride with potassium; but this operation has never been carried out with pure chloride. Yttria, Y,O., is a yellowish white powder, which at high temperatures radiates out a most brilliant white light. It is soluble, slowly but completely, in mineral acids. It is recognized most surely by its very characteristic spark spectrum. Solutions of yttria salts in their behaviour to reagents are not unlike those of zirconia. The atomic weight of yttrium, according to the latest researches,? is 89°02, if O=16.

YUCATAN, a peninsular region of Central America, forming the south-eastern extremity of Mexico (see vol. xvi. pl. I.), of which, since 1861, it constitutes the two confederate states of Campeche (Campeachy) in the west and Yucatan in the east. At its neck the peninsula is conterminous on the south-east with British Honduras, on the south-west with the state of Tabasco (Mexico), and on the south with the republic of Guatemala, the boundaries towards these territories being largely of a purely conventional character. From this base the land projects in a compact rectangular mass between the Gulf of Mexico and the Caribbean Sea, west and east, for 280 miles northwards, across nearly four degrees of latitude (18° to 21° 40' N.) and three of longitude (87° 30' to 90° 30' W.), to within 120 miles of Cuba, from which it is separated by the Yucatan Channel. Jt has a mean breadth of about 200 miles, a coast-line of 700 miles, and a total area of 55,400 square miles, with a population in 1882 of 393,000 (Yucatan, 29,570 square miles, population 302,500; Campeche, 25,830 square miles, population 90,500).°

The coast-line presents a uniform monotonous aspect, being fringed by no islands except Cozumel near the north- east point, and broken by no indentations except the shallow Lake Terminos on the west and the inlets of Ascension, Espiritu Santo, and Chetumal Bays on the east side. But the north coast is skirted by an almost continu- ous line of low dunes, nearly 200 miles long, enclosing a broad lagoon, which varies in length and depth with the

1 See the handbooks of chemistry and the original memoir in Liebig's Annalen, vol. cxxxvii. p. 1.

2 Cleve, Jahresber. der Chemie, 1882, p. 15.

3 Previous estimates assigned 32,650 square miles to Yucatan and 26,100 to Campeche.

Bound- aries, area, &c,

Physical features.

seasons. Behind the lagoon a bed of coralline and porous limestone rocks, composing nearly the whole tableland of Yucatan, rises continuously southwards in the direction of the Sierra Madre, which, beyond the frontier, traverses the whole of Guatemala and Central America. Geologic- ally, Yucatan thus presents the character of a compara- tively recent formation, built up by polypi in shallow waters, and gradually covered with a layer of thin dry soil by the slow weathering of the coral rocks. But the sur- face is not so uniformly level and monotonous as it appears on most maps; for, although there are scarcely any running

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which is now destitute alike of running waters, of dense vegetation, and almost of inhabitants, was at that time thickly peopled and full of populous cities remarkable for the great size, splendour, and artistic taste of their public monuments. For Maya, as the land was then called,' was the chief centre of the wide-spread Maya- Quiché power and culture, which rivalled, and in some respects excelled, those of the Peruvian Incas and of the Aztecs on the Anahuac plateau. Although the Maya nation had at that time already entered on a period of decadence, it was still strong and vigorous enough to resist the conquistadores for a period of fully twenty years (1527-47), the reduction of this barreu region costing "the lives of more Spaniards than had been expended in wresting from the Incas and the Montezumas the wealthiest empires of the western world" (Bancroft).

streams, it is diversified here and there by a few lacustrine basins, of which Lakes Bacalar and Chicankanah are the largest, as well as by some low isolated hills and ridges in the west, and on the east side by the Sierra Alta, a range

Wonder has been expressed that such a bleak, arid, and almost Mayan streamless land could have ever become the seat of empire and the irriga- home of a flourishing civilization. But the absence of rivers on the tion plateau appears to be due not so much to the deficient rainfall as works.

Climate.

Vege- All the northern districts, as well as the greater part of the Sierra | mogt fully described, are Izamal, Mayapan, Aké, Acanceh, Uxmal, table Alta, are destitute of large trees ; but the coast-lands on both sides Tikul, and Kabah, all centred in the north-west corner of the pen- produc- towards Tabasco and British Honduras enjoy a sufficient rainfall

of moderate elevation, traversing the whole peninsula from Catoche Point southwards to the neighbourhood of Lake Peten in Guatemala.

There are thus no elevations sufficiently high to intercept the moisture-bearing clouds from the Atlantic, while those from the Pacific are cut off by the Sierra Madre. Hence the climate is necessarily dry, with a deficient and uncertain rainfall, especially in the central and northern districts. Here also the tropical heats are intensified by the neighbourhood of the Gulf Stream, which in its passage through the Yucatan Channel flows much nearer to the coast of the peninsula than to that of Cuba. Still, the climate, although "hot of the hottest' (Ober), with a temperature ranging from 75° to 98° Fahr. in the shade, is comparatively healthy, owing to its great dryness and to the cool breezes which prevail night and day throughout a great part of the year. The atmosphere is also occasionally purified by the fierce temporales or " northers," which sweep across the Gulf freely over this open low-lying region. Yellow fever, however, periodically visits the Campeche coast, while ague is endemic in the undrained swampy districts towards the southern frontiers. Like most regions lying entirely within the tropics, Yucatan has two scasons only, which are determined by the alter- nations not so much of temperature as of atmospheric moisture. The dry season lasts from October to May, the wet season for the rest of the year; the hottest months appear to be March and April, when the heat is increased by the burning of the corn and henequen fields on the plateau.

numerous round the now desolate northern and north-eastern shores

of the peninsula, The whole of the northern section of Yucatan,

to the extremely porous nature of the calcareous soil, which absorbs the waters like a sponge and prevents the development of surface streams. Beneath the surface, however, the waters accumulate in such abundance

that a sufficient supply may always be had by sink- ing wells in almost any part of the tableland. What the present inhabitants neglect to do was systematically practised by the former populations, whose aguadas or artificial lakes and under- ground reservoirs must be reckoned amongst the most remarkable monuments of Maya culture. "Intelligence, much skill in masonry, and much labour were required to construct them. They were paved with several courses of stone laid in cement, and in their bottoms wells or cavities were constructed. More than forty such wells were found in the bottom of one of these aguadas at Galal, which has been repaired and restored to use. In some places long subterranean passages lead down to pools of water, which are used in the dry season. One of these subterranean reservoirs is 450 feet below the surface of the ground, and the passage lcading to it is about 1400 feet long" (Baldwin, p. 145). Thus the Mayan, like the Peruvian, the Egyptian, and the Babylonian culture, was based on a well-planned and carefully executed system of waterworks, specially adapted to the peculiar physical conditions of the country,

The monumental remains which must be assigned to the Maya- Ruined Quiché, as distinguished from other native civilizations, are spread cities.

over a great part of Central America, but are mainly comprised within the triangular space formed by connecting Mitla in Oajaca, Copan in Honduras, and the north coast of Yucatan above Tizimin by three straight lines. But of the "sixty-two ruined cities" of Yucatan proper the most important, or at least the best known and

traditions, by the people of Chichen-Itza some three centuries before the arrival of the Spaniards.

Izamal.

Chiehen- Itza.

Kabah.

Inscrip- tions.

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rangle, with one front 280 feet long and enclosing a court 258 by Here Dr Le Plongeon discovered in 1881 a surprisingly

214 feet. beautiful statue, Central America. to prevent it from falling into the hands of the Mexican authorities, who had seized another remarkable statue previously brought to light by this industrious explorer (Ober).

Conspicuous amongst the crumbling monuments of Aké, which lies ten leagues east of Merida, isa huge pyramid, with an immense flight of steps, presenting some extraordinary features different from anything elsewhere discovered in Yucatan. This strange monument is surmounted by thirty-six pillars (twenty-nine still standing), each 4 feet square and from 14 to 16 feet high; disposed in three parallel rows 10 feet apart, the whole supported by a platform 212 fect by 46 and approached by steps from 44 to 64 feet long and from 1 to 14 feet high. At Izamal, a few miles east of Aké, stands another great pyramid, with a base of nearly 650 feet, besides three others, and a colossal head 13 feet high, not, however, a monolith, but built up of rough stones coated with mortar. But the gigantic face described and reproduced by Stephens had disappeared at the time of Char- nay's visit to Izamal.

surpassing anything of the kind ever found in

To this explorer we are indebted for the first detailed account of

the wonderful remains of Chichen-Itza, which include another nunnery, a tennis-court, several temples, and other buildings pro- fusely embellished with rich friezes, statues, pillars, reliefs, and the like, the whole grouped round a central pyramid of great size, known as the Castillo, from the beautiful structure still standing on its summit. Chichen-Itza, which was certainly inhabited at the time of the conquest, was the capital of the Itzaes, one of the most powerful Maya nations, who appear to have afterwards migrated

southwards to the neighbourhood of Lake Peten, where tribes of

this name are still found. They constituted one of the eighteen semi-independent Maya states, whose incessant internecine wars at last brought about the dismemberment of the once potent theo- cratic empire of Xibalba (Palenque?) and the destruction of the Maya civilization.

Scarcely less important than those of Chichen-Itza are the monu- ments of Kabah, which lies about 12 miles south of Uxmal. The two places were formerly connected by a plastered causeway, traces of which are still visible, and Kabah must have been a very large city, for its ruins are scattered over a considerable area. Amongst them are comprised lofty pyramids, vast terraces, and sumptuous palaces or temples, with elaborate ornamentation, sometimes almost completely disguising the architectural features of the edifices. Charnay mentions "triumphal arches," but adds that he sought in vain for the unique specimen of this kind of monument in America which is mentioned and figured by Stephens, and which bears such a striking resemblance to the triumphal arches of the Roman type. Many other remaius have either disappeared or crumbled away almost beyond recognition since they were first sketched by Cather- wood.? But, on the other hand, numerous buried cities and monu- ments probably still remain concealed amid the rank tropical vege- tation, especially in the almost unknown territory of the unreduced Lacandons and Itzaes towards the Guatemala frontier. But enough has already been surveyed fully to justify Maudslay's general re- mark, that Yucatan is thickly covered with the ruins of great build- ings "even superior in some respects to those found in other parts of Central America."

Like those of Palenque, Lorillard Town, Tikul, and Copan, many of these buildings are covered with inscriptions, the key to the deciphering of which has not yet been discovered. Notwithstand- iug certain divergences, seen especially at Lorillard, all belong ob- viously to the same writing system. But whether that system is purely ideographic, phonetic, or intermediate cannot be asserted with any certainty, although Holden, who has attacked the problem from a fresh standpoint, declares emphatically that they are not phonetic, "except in so far as their rebus character may make them in a sense phonetic." He claims by his system to have fixed the order in which the inscriptions are to be read (in lines left to right, in columns vertically downwards), and fancies he has determined the meaning of three characters representing Maya divinities. But Holden is ignorant of the Maya-Quiché language, of which a few manuscripts have been rescued from the fury of the early Spanish iconoclasts. One of these documents, the Popol-Vuh, written or copied about 1558 from an older

Quiché book, has been edited and even translated by Brasseur de Bourbourg. This uncritical writer

1 On one of the palaces "two salient cornices form a frame to immense friezes which in their details would compare favourably with our proudest monuments" (Charnay). On others are sculptured some remarkable bas-reliefs, which represent Maya warriors receiving the swords of kneeling Aztec captives, the nationalities of the figures being clearly identified by their respect- ive costumes. The significance of records of this sort has either been altogether overlooked or else strangely misinterpreted by most writers on Central-Ameri- can antiquities.

2 In 1841 Stephens was assured by the eura of Santa Cruz del Quiché that the palaces of that place, then in a dilapidated state, were quite perfect thirty years before, and that the now deserted city of Utatlan in the province of Vera Paz was then almost as perfect as when its inhabitants had abandoned it. He had himself walked in its silent streets amid its colossal buildings, which were as entire as those of Santa Cruz.

But this object he again carefully hid away

makes use of a so-called Maya-Quiché alphabet preserved by Diego de Landa, first bishop of Yucatan, in his Relacion or history of the Mayas. But the alphabet in question is admittedly extremely defective and inadequate to interpret the native writings, and has even been pronounced "a Spanish fabrication" by Dr Valentini,' a view which Holden appears to endorse. The puzzle thus remains still unsolved, and no safe inference can be drawn beyond the fact that the inscriptions and manuscripts are composed in a highly conventional form of writing, and probably in more than one Maya- Quiché dialect.

Other difficult questions connected with the origin and antiquity Origin

of the Maya culture, and the nature of its relations to that of and an-Mexico, will be found discussed under Mxexrco (g.v.). But, sinee tiquity of that article was written, fresh materials have been collected and Maya

published which help to throw some further light on these obscure eulture. subjects. Unfortunatcly M. Charnay, who since the time of Stephens and Catherwood has undoubtedly contributed most to our knowledge of the Central-American remains, has revived in an exaggerated form the old views of Morelet, Orozco y Berra, and others regarding the Toltec origin of all these monuments. This observer sees evcrywhere the clearest cvidences, not merely of Toltec influ- ences, which are obvious enough, but of the Toltec institutions themselves, of the Toltec religion, architecture, and civilization, to the exclusion of all others in Central America. He even boldly traces on the map the lines of a twofold Toltec migration, from Tula along the Atlantic and from Toluca along the Pacific side, to their junction at Copan in Honduras, some few centuries before the discovery of the New World. But our faith in the soundness of these views is greatly shaken when we find M. Charnay identifying the Toltecs themselves somewhat wildly with Malays, Indo-Chinese, and other Asiatic races. Some of the present populations of Yucatan are even pronounced to be "a cross between the Malay and the Chinese," and all the exploded theories are thus revived of an Asiatic origin of the civilized inhabitants of the New World and of their cultures. But, as Ober well remarks, the evidence is cumu- lative in favour of the independent evolution of these cultures. Late contact,—that is, contact since the remote Stone Age,—with the inhabitants of the eastern hemisphere has been either of the most casual nature or else as shadowy as the Atlantis itself, which is seriously referred to in this connexion by otherwise sane writers, but which was obviously as pure an invention of Plato as the Utopia was of Sir Thomas More.

An essential condition of the Toltec theory is the assumed recent, or comparatively recent, date of all the Central-American monu- ments, and Charnay has certainly dispelled the extravagant ideas at one time prevalent regarding the hoary antiquity of some of these remains. He has shown in particular that no argument in favour of great age can be drawn from the size of the trees by which many of them are overgrown. By actual experiment he has proved that the concentric circles of these trees correspond, not to so many years, as had been supposed, but rather to so many months, ifnot even to shorter periods of growth. Thus collapse the extravagant estimates of 2000 years (Waldeck) or 1700 (Lorainzar)

assigned to the buildings on this assumption. At the same time some of the cities were already forgotten ruins at the time of the conquest, and many of the structures date evidently back to a period prior to the Toltec migrations southwards. The bas-reliefs of Kabah also clearly show that these Toltecs, probably of Nahua stock and closely related to the Aztecs, already found the land occupied by a civilized people, able to record on stone monuments their triumphs over the northern invaders. Some of these mouu- ments themselves equal, if not surpass, in artistie taste and work- manship anything the Toltec builders are known to have produced on the Anahuac plateau. They also present many distinctive features, especially in their design and decorative parts, while the inscriptions are altogether different from those of the Aztecs as seen in extant manuscripts. The conclusion seems inevitable that the Maya-Quiché culture was an independent growth, brought in later times under Nahua influences, the relations being perhaps somewhat analogous to those existing between the Greco-Bactriau and Indian or the Moorish and Spanish in the Old World.

At the time of the conquest a great part of Central America was Classifi- found to be occupied, as it still is, by peoples related, at least in eation of speech, to the Maya inhabitants of Yucatan. The numerous Maya- branches of this widespread family ranged from Tamaulipas (about Quiché the Tropic of Cancer) southwards to north Honduras and San Sal- nations, vador (14° N. lat.). But the chief divisions were the Mayas of

rucatan and the Quichés of Guatemala, whence the compound term Maya-Quiché collectively applied to the whole race. Owing partly to the uncertainty of their mutual affinities, but mainly to the confusing and inconsistent nomenclature of the early Spanish and later writers, the classification of the various Maya-Quiché natious presents serious difficulties, some of which have not yet been over- come. Inthe subjoined scheme are embodied the results of the researches of De Bourbourg, Berendt, Stoll, and others in this intricate branch of ethnology :—

3 In a paper read before the American Antiquarian Society, 28th April 1880.

Modern inhabit- ants.

Maya Grovup.—Huasteca, Vera Cruz and Tamaulipas ; Totonae(?),! north part of Vera Cruz ; Maya proper, throughout Yucatan ; Chol (Cholti, Colchi), between the Salinas and Mondaguas rivers, Gua- temala ; Jfopan, north of the Chols; Chontal, Tabasco, distinct from the Nicaraguan Chontales ; T'zental (Cendal), Ocosingo dis- trict, Chiapas; Tzotzil (Zotzil, Zotzlem), San Cristobal, Chiapas ; Chafiabal, Comitan district, Chiapas. :

Quicut Group.—Cakehiquel (Kacchikil), Tecpan to Sta Lucia and the Pacific ; Tzutwil (Sotojil, Zutuhil), Aitlan district, Guate- mala; Quiché proper (Kiché, Utatlica), Cunen and Rabinal districts, and thence south-west to the Pacific, Guatemala ; Uspanteea, San Miguel Uspantan, Guatemala. :

Poconcu! Grour.—Poconchi proper (Pokonichi, Pacomchi), Tac- tic district, Guatemala ; Quekchi (Caechi, Aquacateca), Coban dis- trict, Guatemala ; Chorti (Lenguaapay), Zacapa and Chichimula, and thence eastwards to Honduras; Pokomam, Jalapa, and thence to San Salvador.

MamE Group.—Jfame proper (Mem, Zakloh-pakap), throughout south-western Guatemala ; Jxil, Cotzal district, Guatemala ; Agua- eatecas (Sinca, Xinca), throughout south-eastern Guatemala ; Ala- gtulae (2), San Cristobal, Chiapas.

Yucatan is still almost entirely inhabited by the same Maya race that was found in possession of the land at the time of the discovery. About five-sixths of the population are of nearly pure Maya stock and speech, the Spanish and mestizo elements being mostly confined to the large towns. The mestizos are said to be the handsomest on the continent, while the full-blood natives are perhaps the least characteristic of all the aboriginal populations. They have the coarse black and straight hair, the arched nose, and the reddish-brown complexion common to most of the primitive in- habitants of America. But they can be readily distinguished from all of them by their regular features, low cheek-bones, small mouth and ears, straight jaws, frank expression, and a certain air of refine- ment betraying descent from a highly cultured people. "It would be difficult,"

says Charnay, "'to find among the rural classes of Europe men of a better build, or with more intelligent and open countenances." Although generally peaceful, patient under oppres- sion, and even somewhat indolent, their history since the conquest (1547) has not been wholly uneventful. After more than two centuries of passive resistance, there was a general revolt in 1761, brought about by the intolerable misrule of the Spanish adminis- tration. The declaration of independence (1821) was followed in 1824 by the union with the Mexican confederacy, which continued without interruption till 1840. In that year an independent re- public was set up in Yucatan, which, however, was suppressed in 1843. Then came the general uprising of the natives in 1846, when Mexico was engaged in a disastrous war with the United States. To quell the revolt, the ruling classes were obliged to call in the aid of the Mexicans (1847-53), whereby the peninsula again lost its autonomy, and was divided (1861) into the two federal states of Yucatan and Campeche. But the rebellion was not entirely suppressed, and many of the natives, withdrawing eastwards to the coast-lands beyond the Sicrra Alta, have hitherto defied all the efforts of the authorities to reduce them.

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YUCCA,? a genus of the order Liliacex, the species of which are remarkable for their stately appearance and generally magnificent inflorescence. They occur in greatest frequency in Mexico and the south-western States of the American Union, extending also into Central America, and occurring in such numbers in some places as to form "straggling forests." They have a woody or fibrous stem, sometimes short, and in other cases, even in the same species, attaining a height of 15 to 20 feet, and branching at the top into a series of forks. The leaves are crowded in tufts at the ends of the stem or branches and are generally stiff and sword-shaped, with a sharp point, sometimes flaccid eee

1 Although Totonac is grouped by Brinton and others in this family, Gatschet is inclined to regard it as an independent stock language (Réplique a Mr D. G. Brinton, Paris, 1888, p. 8).

- *A Spanish word meaning " bayonet."*

and in other cases fibrous at the edges. The numerous flowers are usually white, bell-shaped, and pendulous, and are borne in much-branched terminal panicles. Each flower consists of a perianth of six regular pieces, as many hypogynous stamens, with dilated filaments, bearing rela- tively small anthers. The three-celled ovary is surmounted by a short thick style, dividing above into three stigmas, and ripens into a succulent berry in some of the species, and into a dry three-valved capsule in others. The flowers are fertilized by the agency of moths.

A coarse fibre is obtained by the Mexicans from the stem and foliage, which they utilize for cordage. The succulent fruits, which resemble small bananas, are cooked as an article of diet ; and the roots contain a saponaceous matter used in place of soap.

Most of the species are hardy in Great Britain, and their striking appearance renders them attractive in gardens even when not in flower. Their rigid foliage, invested by thick epidermis, also enables them to resist the noxious air of towns better than most plants. A popular name for the

plant is “ Adam’s needle.” The species which split up at the margins of their leaves into filaments are called “‘ Eve’s thread.”

YUN-NAN. See Curna, vol. v. p. 640.

YUN-NAN FU, the capital of the Chinese province of Yun-nan, is situated in 25° 6’ N. lat. and 102° 52’ E. long. Originally the district surrounding Yun-nan Fu was known as the “land of the southern barbarians.” The city, which under different dynasties has borne different names, is situated on a plain, and is surrounded by well-fortified walls, 64 miles in circuit. Marco Polo describes it, under the name of Yachi, as ‘“‘a very great and noble city, in which are numerous merchants and craftsmen. The people are of sundry kinds, for there are not only Saracens and idolaters but also a few Nestorian Christians. They have wheat and rice in plenty. ... Theirmoney is… cer- tain white porcelain shells that are found in the sea.” For many years Mahommedans have been very numerous in the city and neighbourhood ; and in 1855 a Mahomme- dan rising took place within the city. Yun-nan Fu has a prosperous and busy aspect: the shops are large and well supplied with native silken goods, saddlery, &c., while Eng- lish cotton, Russian cloths, and raw cotton from Burmah constitute the main foreign merchandise. Employment for large numbers of workpeople is found in the copper factories. A local mint at Yun-nan Fu issued annually 101,000,000 cash before the outbreak of the rebellion in 1855. The population of the city is estimated at about

200,000.

YVETOT, a town of France, chef-lieu of an arrondisse- ment in the department of Seine-Inférieure, stands on the plateau of Caux, 24 miles north-west of Rouen on the railway to Havre, and is chiefly known from Béranger’s famous song. Calicoes, tickings, Siamese, rouennerie cotton, reps, and handkerchiefs are made here, as in most places in the department, and a trade is carried on in wool. The church is ugly, but contains a marble altar from the Car- thusian monastery at Rouen, some fine woodwork from the abbey of St Wandrille, and an elegant pulpit. Theremains of a Bernardine monastery are occupied in part by the court and jail. The hospital and seminary are both modern, The population was 7625 (commune 8397) in 1881 and 7333 (commune 7972) in 1886.

From the 15th till the middle of the 16th century the lords of Yvetot bore the title of king, and their lands were exempt from all service to the French crown. The town was occupied during the Hundred Years' War by Henry V. of England, and afterwards retaken by Charles VII. of France. On 8th May 1592 Henry IV. defeated here the troops of the League under the duke of Parma. A Bernardine monastery was founded at Yvetot in 1650, and sup- pressed in 1781. In 1658 part of the town was destroyed by fire.

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7, the last letter of our alphabet, has fallen away from , its old place in the Pheenician and Greek alphabets. In these it stood seventh, probably with the value of dz or zd. In shape it was Tin all the older writings both of the Tonian and the Eubcean type. Later it became Z, as we have it, by a natural and convenient change. But TL is the older Italian as well as the Greek form; it remained so in Oscan ; in Etruscan and Umbrian the cross strokes were brought near together, but the upright line remained. The Latin alphabet, however, dropped the symbol, having apparently no need of it; it appears on an old coin of Cosa (Corpus, i. 14), unless the letter there be only a modified s. Later, in the Ist century B.c., the letter in the form Z was re-introduced, where we have it, to represent more accurately the sound of z in words borrowed from the Greek, in which alone it appears ; ss (or initial s) had previously been employed for this purpose. The original place of the letter had been occupied in the meantime by G, the Latin modified form of C (see under G), so Z had to take the lowest place together with Y, which had been also borrowed from Greece for a similar purpose.

The exact value of zeta in Greek has been much dis- cussed (see Blass, Aussprache des Griechischen, p.95). That it was a double sound—not French z (the voiced sibilant corresponding to the voiceless s)—seems clear from Aris- totle's statement that €, y, and ¢ were all cunddvias, and from its power of lengthening a previous short vowel in scanning. The

arguments, however, for the dz or the zd value are about evenly balanced, and it is not improbable that it may have had both. In Latin the value was doubt- less that of the Greek z.

In Old English z hardly occurs; when it does it is in borrowed names with the value of ts,as in Betzaida, Zabulon. It was introduced in order to represent French z in words borrowed from France, as zeal, zone (see article S). But it is used in only a very small number of the words where the sound occurs : we still adhere to the usage of our fore- fathers and employ s for the s-sound and the zsound alike, indeed rather inclining to use s for z, and to differentiate s by doubling the symbol: compare his (¢.e., hiz) and hiss (2.e., his). In German z represents ¢s, the sound into which Teutonic ¢ passed in High German—e.g., inherz, our "heart." It was also used formerly, either alone or in combination with s, to denote the voiceless sibilant when final: thus the conjunction dass, which is nothing but the neuter pronoun das, was formerly written daz, and is sometimes even now written dasz. In French the Latin z became the voiced sibilant ; and a similar process has taken place in modern Greek. In French, however, the final sound must once have been stronger—e.g., in fils (filius), later fiz, and still later jis (as it is still pronounced), which passed into England in the form /%tz in proper names. Still plainer is the evidence of verbal forms like avez =avets = habetis.

For the history of the English variant 3 for z, see article Y. (5. P.)

ZAANDAM, ZAANREDAM, or SAARDAM, a village of Hol- land, in the province of North Holland, 5 miles by rail to the north-west of Amsterdam, at the confluence of the Zaan with the Y. The houses are mostly of wood, painted white or green, and the place shares with the other villages of North Holland a high reputation for neatness and cleanliness. In the immediate neighbourhood are a very large number of windmills, including corn, paper, saw, coffee, snuff, and other mills. Peter the Great of Russia wrought at Zaandam as a ship-carpenter for a short time in 1697, and the hut in which he is said to have lived is

still shown and much visited. Some shipbuilding is still carried on. The population in 1887 was 14,351.

ZACATECAS, a city of Mexico, capital of the state of the same name, lies 340 miles by rail north-west of Mexico, in 22° 46' N. lat. and 102° W. long. Zacatecas, which had a population of 46,000 in 1886, is the centre of one of the oldest and most productive silver-mining districts in the republic, and the town itself stands on the rich vein discovered here by Juan de Tolosa in 1546. It lies on the great Mexican tableland, 7976 feet above the sea, in a narrow ravine surrounded by rolling hills, all containing almost inexhaustible deposits of the precious metal. Within half an hour's walk of the centre of the town are situated twelve mines, some of which have been worked with little interruption for over three hundred years. Owing to the irregular nature of the ground and the great value of the land, the city is laid out in narrow tortuous streets, which, unlike most other Mexican towns, are lined by high houses of three and four stories. Noteworthy amongst the public buildings are the cathedral, with a finely sculptured facade, the Government palace, the city hall, the theatre, and the mint ; this last, during the period from 1772 to 1865, issued silver money to the value of £41,000,000, besides £110,000 in gold. The streets, although narrow, are well paved and partly lit by electricity. Since the completion of the Central Mexican Railway to this place in 1884 it has increased in population and prosperity. From the Bufa Hill, 500 feet high, lying to the north of the city, an ex- tensive view is commanded of the surrounding district, which is of an extremely rugged character and almost destitute of vegetation. In the neighbourhood are nine small lakes, yielding an abundance of salt and carbonate of soda. Zacatecas, which received the title of city from Philip II. in 1585, is supplied with water by a large, well- constructed aqueduct.

The state of Zacatecas lies between Coahuila and Jalisco north and south respectively, and is elsewhere conterminous with Guana- juato, Durango, and San Luis Potosi. It has an arca of 25,227 square miles and a population (1882) of 422,506, of whom a pre- ponderating proportion arc Indians or mestizos. It stands at a mean altitude of over 7000 feet above sea-level, and is traversed by the Mazapil, Norillos, Guadaloupe, and other metalliferous ranges, this state ranking among the first in the republic for mineral wealth. Next to the Veta Madre of Guanajuato and the famous Comstock lode, Nevada, the Veta Grande of Zacatecas is held to be the most remarkable silver vein in North America. The chief mining

dis- tricts are Zacatecas, Espiritu Santo, Chapala, Los Arcos, Norias, Ipala, Santa Lucia, Naranjal, and Santo Martino; and in 1886 about 324 mines were open (21 gold, 67 gold and silver, 167 silver alone, 15 copper, 37 lead, and 16 quicksilver). Besides its minerals the state possesses considcrable agricultural resources, the south- eastern parts especially being very fertile and well watered by the rivers Tlaltenango and Juchipila. Maize, wheat, fruits—such as peaches, apricots, grapes,—and all kinds of vegetables are extensively cultivated, the annual maize crop being valued at over £1,000,000, wheat at about £250,000, and the remaining crops at about £600,000. Even in the bleak and arid northern districts there are some exten- sive grazing-grounds, where cattle, horses, mules, sheep, and goats thrive well. Some of the slopes are well timbered, the chief species being the mountain cedar, oak, elm, ash, and cotton-wood. Be- sides the capital, the chief mining towns are Fresnillo (pop. 15,000), Garcia (8000), Villanueva (7000), Linos (7000), Sombrerete (6000), and Nieves (3000).

ZACH, Franz Xaver, Baron von (1754-1832), astronomer, was born at Pesth in June 1754. He served for some time in the Austrian army, and afterwards lived in London from 1783 to 1786 as tutor in the house of the Saxon minister, Count Briihl, In 1786 he was appointed by Ernest II. of Saxe-Coburg-Gotha director of the new observatory on the Seeberg at Gotha, which was finished in 1791. From 1806 Zach accompanied the duke's widow

on her travels in the south of Europe. He died in Paris

on 2d September 1832.

Zach published Tables of the Sun (Gotha, 1792 ; new and improved edition, zb/d., 1804), and numerous papers on geographical subjects, particularly on the geographical positions of many towns and places, which he determined on his travels with a sextant. His principal importance is, however, as editor of three scientific journals of great

value,—Aligemeine Geographische Ephemeriden (4 vols., Gotha, 1798-99), Monatliche Correspondenz zur Beforderung der Erd- und Himmels-Kunde (28 vols., Gotha, 1800-13, from 1807 edited by Lindenau), and Correspondance Astronomique, Géo- graphique, Hydrographique, et Statistique (Genoa, 1818-26, 14 vols., and one number of the 15th suppressed at the instigation of the Jesuits).

YZACHARIAE VON LINGENTHAL, Kart Satomo (1769-1843), German jurist, was born on 14th September 1769 at Meissen in Saxony. His family came from Austria. His father was a lawyer ; his mother, a Hessian, was the daughter of a pastor. Of feeble health and long the only child of his parents, Karl did not go to school until the age of fifteen. He afterwards studied philosophy, history, mathematics, and philology at the university of Leipsic. In 1792 he went to Wittenberg as tutor to Count zur Lippe, and whilst there he began to study law. There he came greatly under the influence of Kant, traces of whose teaching remain even in his latest writings. In 1794 Zachariae became a privat-docent, lecturing on canon law, in 1798 extraordinary professor, and in 1802 ordinary professor of feudal law. From that time to his death in 1843, with the exception of a short period in which public affairs occupied him, he poured out a succes- sion of works covering the whole field of jurisprudence and extending into other adjoining regions. He was also in- defatigable in the labour of his chair, and he was the editor of, or a copious contributor to, more than one periodical. In 1807 he went to Heidelberg, then begin- ning its period of splendour as a school of law. There, resisting many calls to Géttingen, Berlin, and other univer- sities, he remained until his death. In 1811 he married under romantic circumstances. His wife died in four years.

In 1820 he was elected representative of the university in the first Baden chamber, and four years later was made a member of the second. From 1825 to 1829 he devoted much time to political affairs and to the preparation of a code. He was a constitutional reformer, averse to great or violent changes. He loved to cite the saying of the Roman emperor to his adopted son,—'"Imperaturus es hominibus qui nec totam servitutem pati possent nec totam libertatem,"—"'a truth," he observes in one of his many brochures (Die Souverainetdtsrechte der Krone Wiirtemberg, &c.),

“which no Government and no people should ever forget.” In 1842 he was ennobled with the title of Von Lingenthal. To the last days of his life he toiled with the ardour of a young student. His fame extended beyond Germany. The German universities then enjoyed by tacit consent a jurisdiction in regard to legal questions of international importance which had come down from the Middle Ages; and Zachariae was often consulted as to questions arising in Germany, France, and England. Elaborate “opinions,” some of them forming veritable treatises,—e.g., on Sir Augustus d’Este’s claim to the duke- dom of Sussex, Baron de Bode’s claim as an English sub- ject to a share in the French indemnity, the famous dispute as to the debts due to the elector of Hesse-Cassel, confis- cated by Napoleon, and the constitutional position of the Mecklenburg landowners,—were composed by Zachariae. He died on 27th March 1843, leaving a son who has worthily continued his father’s labours in jurisprudence.

Zachariae’s true history is in his writings, which are extremely numerous and inultifarious. They deal with almost every branch of jurisprudence ; they are philosophical, historical, and practical ; they relate to Roman, canon, German, and French law ; and his curlosity extended to the writings of his contemporaries, Bentham

and Austin. A work on Sulla, in whom he sees another Napoleon, and an unpublished translation of his favourite Tacitus were some of the fruits of his restless activity. The first book of much con- sequence which he published was Die Hinheit des Staats und der Kirche mit Riicksicht auf die Deutsche Reichsverfassung (1797), one of the most original of his works, displaying the writer’s power of analysis, his skill in making a complicated set of facts appear to be deductions from a few principles, — a study even now well worth reading. His themc is the relation of religion to the state. Zachariae undertakes to show that with Christianity three systems only are possible, —(1) what he calls the system of hierarchy, according to which the state is under the power of the church, the object of the former being subordinated to that of the latter ; (2) the territorial system, according to which the church is subject to the power of the state; and (8) what he terms the collegiate system, according to which neither of the two societies is subject to the other, and both have different objects in

view. The con- sequence of the adoption of these various systems—the principles of ae which must be accepted according as one or the other of them is supreme—he deduces with much acumen. While much of his work has lost its interest, it remains a luminous example of the application of the deductive process to historical investigation, a proof that legal conceptions may often serve to give unity to the complex facts of history. In 1805 appeared Versuch einer aligemeinen Hermeneutik des Rechts. Neither in English nor in Scotch legal literature is there any book, so far as known to the present writer, covering the field to which it relates. It is an attempt to found on the rules of grammar and logic a system of interpretation applicable to all systems of law. The weak part of the book is that, like so many of Zachariae's works, it stops short at the point where the inquiry would be most fruitful. I)lustra- tions are taken from Roman law ; we miss any adequate treatment of the problems which the forms of modern legislation raise. In 1806 appeared Die Wissenschaft der Gesetzgebung, a fragment, which is a curious outcome of the French Revolution. Impressed by the overthrow or decay of the forces which had hitherto held society together, he looked about for a better substitute for them than politique de circonstance offered. Many of Zachariae's maxims seem fanciful; there are divisions which do not elucidate, and distinctions made apparently for their own sake. But the work is interesting; it shows that the author was groping after the prin- ciple of utility as the guide of the legislator ; the study of very different facts had brought him independently to much the same conclusion as Bentham had reached. Zachariae's last work of importance was Vierzig Biicher vom Staate, published in 1839-42, with the motto non omnis moriar. This was his favourite work, and is the one to which his admirers point as his enduring monu- ment. Undoubtedly it contains much erudition and, what is rarer, many original ideas as to the future of the state and of law. It has been compared to L'Esprit des Lois, and Zachariae, in spite of his pedantry, has some tincture of the discursive brilliancy of Montesquieu. It covers no small part of the field of Buckle's first volume of the History of Civilisation. The reader will, however, seek in vain for any order or system in some of the chapters of Vierzig Biicher vom Staate. He was recasting many of his ideas as he wrote, and the book ends before the process is completed. Among the most esteemed of the works of Zachariae is that on Staatsrecht, of the originality of which he was proud, and his

treatise on the Code Napoléon, a marvellous work, considering it was composed by a German professor who did not much concern himself with this subject till somewhat late in life. There are no fewer than three French cditions of his book, and it has been trans- lated into Italian. Zachariae edited with Mittermaier the Kritische Zeitschrift fiir Rechiswissenschaft und Gesetzgebung des Auslandes, and the introduction which he wrote illustrates his wide reading and his constant desire for new light upon old problems.

Zachariae exhibits the best and the worst sides of German juris- prudence: there is the desire not to base generalizations or con- clusions on the peculiarities of any one system, but to master the Whole facts. He does not assume a distinction or classification of Roman law to be necessarily scientific. He seeks real reasons ; he avoids the English lawyer's favourite fallacy of proving idem per idem, of seeking to show the reasonableness of anything by saying the same thing again in different language. Though a scholar, Zach- ariae has not the weakness of exaggerating the importance of what- ever is rare or unpublished, and he has no delight in barren erudition. Himself a learned pandectist, he had cast aside his countrymen's proneness to find all things in the Corpus Juris. His books, how- ever, have the failings of so many German works on law. They want actuality ; they have little relation to the facts of life. They are leavened by metaphysics—often very bad metaphysics, and not always by the same system. Nor is he aclear thinker. We are never sure what is his notion of the province of jurisprudence ; his favourite idea appears to be that law creates among men an order similar to that which exists in the physical world, and that it is a security for the freedom of man's will. The influence of Kant is observable in all his works. In his later that of Hegel also appears ;

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and his mental changes do not end there. He does not indeed say, "Back to Montesquieu; study facts, the simplest and primitive facts above all ; adopt his method, and improve upon it ;" but that is the wise spirit of some of his later works. Unfortunately he did not fulfil the promise which

they contain. He had not learned to distinguish sharply between the scicnce and the practical art of jurisprudence, and we are never certain in what capacity he speaks. He had not conceived clearly the truth that society forms one whole, that the phenomena of law at any given time or place are not acci- dents but the outcome of a long train of events, that, so regarded, they are as much susceptible of scientific treatment as the facts of language, and that a treatise on botany or, still more, one on com- parative philology is a better guide to what jurisprudence may yet be than a volume of Hugo or even Austin. It was made a reproach to Zachariae that he changed his opinions. He did so; it was a sign of his single- mindedness and restless curiosity. It is also one of the reasons why his works are now little read. They opened paths, and they were superseded by others which could not have existed without them.

There is no adequate account of Zachariae and his works; the best are

Robert von Mohl's Geschichte u. Literatur der Staatswissenschaften (1855-58) and Charles Brocher's K. 8. Zacharia#, sa Vie ct ses Euvres (1870). (J. Mt.)

ZACHARIAS, St, pope from 741 to 752, was a Greek by birth, and appears to have been on intimate terms with Gregory III, whom he succeeded (November 741). Contemporary history dwells chiefly on his great personal influence with the Lombard king Luitprand, and with his successor Rachis; it was largely through his tact in deal- ing with these princes in a variety of emergencies that the exarchate of Ravenna was rescued from becoming part of the Lombard kingdom.

ZAIRE," or Conco, designations of the river now gener- ally known under the latter name (see vol. i. pl. II.) This river system occupies a large part of equatorial Africa,— 1,5£0,000 square miles according to a probable estimate ; and in the length of its course (some 2900 miles) and the volume of its discharge (1,500,000 or at least 1,200,000 cubic feet per second) the river ranks among the most im- portant in the world.2_ The history of the exploration of the Congo basin is a matter of yesterday and to-day; and in several directions the exact limits, with the relations of the affluents to the system, have still to be determined. The mouth of the river lies on the west coast of the con- tinent in 6° S. lat. and 12° 25' E. long,

The head-waters of its most eastern stream (Malagarazi) rise only 370 miles from the Indian Ocean. The course of the main river de- scribes a vast bow, the central portion of which lies as far north as 2° N. lat.

To the north of the Lokinga or Mushinga Mountains, a range, reaching about 6000 feet in altitude, which sends its southward drainage to the Zambesi, lies Bangweolo (Bemba, Shuia, or Chama) Lake, at a height of 3700 feet above the sea according to Livingstone, or 4300 according to Giraud. It has a very irregular outline. Nowhere more than 18 or 20 feet deep, it is nevertheless fed by several large rivers, of which the Chambesi or Chasi ranks first. Livingstone, who discovered the Chambesi in 1867

1 Zaire is a Portuguese corruption of a native word. It is doubtful whether Congo was first the name of the kingdom or of the river; according to Janko (Petermann's Mitteilungen, 1888), the word prob- ably means originally a "spear." Stanley called the river the Living- stone; but this designation has not become popular.

- *Dr Murray of the "Challenger" Expedition estimates the mean annual discharge of the Congo at 419°291 cubic miles, making it in*

this respect only second to the Amazons (Scot. Geog. Mag., 1887). The annual rainfall of the basin he puts at 1213°344 cubic miles.

in 10° 34'S, lat., describes it as " flooded with clear water, not more than 40 yards wide, showing abundant animal life in its waters and on its banks." Its head-streams drain the country between the south end of Lake Tangan- yika and the north end of Lake Nyassa.

From the south-west extremity of Lake Bangweolo issues the Luapula, which is generally regarded as the main head- stream of the Congo. It is about 20 feet deep and 200 yards wide. Our knowledge of its course is still imper- fect, though from Giraud (1883) and Capello and Ivens (1884-85) we learn that it is interrupted by dangerous rapids (at Mambirima, é&c.) ; and there is no doubt that it is gradually deflected northwards and is the main affluent of Lake Moero. This extensive basin is quite different from

Lake Bangweolo: its southern end is situated in a low marshy plain and the difference between high and low water level is as much as the whole depth of Bang- weolo, From north to south the total length is upwards of 90 miles, though during the rainy season vast additional tracts to the south are under water. Several considerable affluents fall into the lake from the east. The river has not been followed between Lake Moero and Lake Lanji; but near the latter it is known to receive the Kamirondo from the left and the Lukugu from the right.

The basin of the Tanganyika is a " vast chasm enclosed within mountain ranges or cliffs, often rising steeply from the shore and terminating in elevated platcaus," with depths of 300 or 350 fathoms. The total length is 380 miles; and, while the northern end narrows to about 10 miles, the width towards the centre is from 30 to 50 miles. The islands are few and unimportant, and, except at the great peninsula of Ubwari on the west coast, near the northern end of the lake, the shore line is remarkably regular. The water is perfectly fresh. Of the various settlements on Tanganyika the most important is Ujiji (4° 54' S. lat. on the east coast), which formerly gave its name to the lake. "It is the terminus," in the words of Captain Hore, "of what for many years was the only safe and well-known route from the East Coast of Africa to the lake, and an important station upon a line of traffic, geographically suited and by common consent eget as convenient, right across the continent." Another point of interest is Karema (in 6° 50' 8. lat., on the eastern shore), originally a station of the African Interna- tional Association. A lighthouse has also been erected on Kavala Island.

The connexion of Tanganyika with the system of thc Congo is one of the most curious points in Central African hydrography. When Livingstone and Stanley were at Ujiji in 1871 the level of the lake was low. Between that date and 1874 it appears to have risen greatly, as Commander Cameron found that the Lukuga (mouth in 5° 35' S. lat.) was acting as an overflow pipe. In 1876 Stanley obtained further proof of the increase of the lake: three palm-trees which had stood in the market place of Ujiji in 1871 were then 100 feet in the lake, and the sand beach over which he had walked with Livingstone was over 200. But his careful exa- mination of the Lukuga outlet showed (curiously enough) that there was no distinct

outflow from the lake, though he thought it pretty certain that the Lukuga had at one time been an effluent and that it was about to resume its old function. In March 1879 Captain Hore placed a gauge on the shore at Ujiji. By the 27th of May he found the waters had fallen 2 feet, and in August 1880 they reached a point 10 feet 44 inches below the original mark. They were still subsiding in 1886. ;

The Lukuga outlet seems to be a comparatively modern formation. The portion towards Tanganyika appears to have been originally a stream flowing into the lake, all its affluents still having a lake- ward direction, while the section towards the Congo was a minor tributary of that river. At what period and by what circumstances the affluent was turned into an emissary it is hard to determine. Stanley proposed the bold theory that Tanganyika at one time consisted of two divisions, one at a higher level than the other, and that the sudden destruction of the barrier caused the lower lake to rise with such violence as to force a passage up the Lukuga and across the ridges to the Congo. Captain Storms suggests instead that Lake Hikwa or Rikwa (discovered by Joseph Thomson in 1880), which lies 50 miles to the east of Tanganyika, was more prob- ably the source of the inundation. A visit to the plain of Katawi convinced him that this must at one time have formed part of Lake Hikwa, then about three times its present size. About 12 leagues N.N.E. of Karema he says there is a gap in the chain which sepa- rates the basin of the smaller from that of the larger lake. Not improbably, however, no such cataclysm as that proposed by Stanley or Storms is really necessary to account for the Lukuga pheno-

menon. The very fact that, in the short space of time during which the Tanganyika has been observed by Europeans, its level has undergone such considerable alteration seems to suggest that a series of unusually rainy seasons may have been the source of all the inundation that was requisite. :

Below Lake Lanji there is another portion of the stream

still unexplored ; but from the junction of the Luama, a river 400 yards wide at its mouth (about 5° S. lat.), the whole course of the Congo down

to the Atlantic (1800 miles) is known. At Nyangwe the channel is about a mile wide, with (according to Stanley) a volume of 230,000 cubic feet per second. As it flows northward it receives the Elila, the Ulinde, the Lowa, and the Munduku Lilu, all of moderate importance. The first point of much interest is the series of cataracts known as the Stanley Falls, situated at the equator. The first cataract occurs just after the Congo has received the Black river and the Leopold river; about 6 miles farther down follow in somewhat rapid succession the second, third, fourth, and fifth ; and then the river is divided into two by the large inhabited island of Asama. The sixth cataract, caused by a broad dyke of greenish shale, does not occur for upwards of 20 miles, and between the sixth and seventh there is a distance of 25 miles. At the last of these the Congo is about 1300 yards broad, of which width 40 yards is occupied by the right branch, 760 yards by the island of Wemya, and 500 yards by the main river. The fall is only about 10 feet; but the enormous mass of water, and the narrow limits to which it is suddenly contracted, make it much more imposing than many a far loftier cataract. After passing the falls the first great left-hand affluent is the Lubilash or Boloko, first ascended by Grenfell in 1884 to the neighbourhood of 1° 30'. Next we come to an important right-hand affluent, the Aruwimi, Arawhimi, or Biyerre, which is now recognized as identical with the Nepoko, discovered by Junker in the south of the Monbuttu territory. About 24° 30'E. lat. this stream, which discharges 158,850 cubic feet per second, is interrupted by the Yam- buga Falls; but above the falls Stanley in 1887 found it navigable for his steel boat. Another right-hand affluent of similar rank is the Itimbiri or Loika, ascended in 1884 by Grenfell for 100 miles, as far as the Lubi Falls. No other tributary of equal importance is known to exist till we come to the Lulongo, about 45 miles north of the equator, formed by the junction of the Lopuri and the Masinga, which drain the country to the south of the great bend of the river. The Lopuri is 500 yards wide at the confluence and has a depth of from 7 to 8 feet. The Lulongo is 500 yards wide at its mouth and higher up occupies a channel from one-half to three-quarters of a mile in width. According to Von Frangois, it discharges 494,200 cubic feet per second. It was ascended in 1885 by Grenfell, who describes it as commercially the most im- portant affluent of the Congo, on account of the value of its ivory and slave trade. Just to the north of the equator is the junction of the Juapa or Chuapa, which

Grenfell has followed as far east as 23° E, long., a distance of 400 miles. This is Stanley's Black river. An unusual amount of geographical interest attaches to the next Congo tribu- tary—the Ubangi or Mobangi; if the latest reports are to be trusted, it is the recipient of the waters of the Welle-Makua, the river discovered by Schweinfurth in 1870, which has ever since been one of the hydrographic prob- lems of the time.? Grenfell ascended the Ubangi in 1885 for some distance above the rapids of Zongo, which are formed by the river striking athwart a line of hills Tunning north-west and south-east, with peaks from 600

; See Bull. Soc. Roy. Belge de Géog., 1886, or Scot. Geog. Mag., 1886.

i For the discussion of the Welle problem, see Mouvement Géogra- phique, 1886, Janko's resumé of theories in Scot. Geogr. Mag., 1888, and Wills's criticism of the same.

to 700 feet above the level of the stream. At this point the breadth is reduced to about 800 yards. In 1886 M. van Géle failed in his attempt to surmount the Zongo rapids ; but in 1888, according to the latest reports, he succeeded in advancing sufficiently far up the river (which turns eastward at the rapids) to prove its identity with the Welle-Makua. By this discovery the limits of the Congo basin are carried eastward as far as within 40 miles of the Nile at Wadelai—the Welle being mainly formed of the Kibali, a stream about 80 yards wide, whose head-waters rise in that neighbourhood.? Quite a multitude of second- ary streams join the upper course of the Ubangi, and it continues to receive accessories from the north and west. till it merges in the longer river, into which it is calculated to pour about 529,500 cubic feet per second. Its last right- hand tributary probably drains the Tukki swamp in 13 K. long. The Nghiri Muinda or Loij, a comparatively small river draining the peninsula between the Ubangi and the Congo, joins the former about 30' N. lat., with a current 100 yards wide and from 15 to 20 feet deep. It was ascended by the " Henry Reed" in 1886 as far as Mikutu (1° 20' N. lat.), where the stream, still 9 feet deep, was found to be formed of a number of small channels issu- ing from a swampy forest. The Ibangi, a right-hand tributary of the Ubangi, was also navigated for 60 miles, to a spot where the depth was

still 10 feet; but the passage was obstructed by a barrier of tree trunks. The ascent of the Lobay, which is about 200 yards wide and 13 feet deep at its junction with the Ubangi in 3°50' N. lat., was interrupted at a distance of 40 miles by a three-foot fall.

A short distance below the confluence of the Ubangi and Congo there enters from the left the emissary of Mantumba Lake, a considerable basin discovered by Stanley in 1883 and since examined by W. H. Bentley in the missionary ship " Peace." When the Congo is in flood there is a back-flow into the lake, and, as the whole country is very flat, it is quite possible that there is a connexion both with the Uruki and Bussera, on the one hand, and with Lake Leopold IL, on the other. This latter lake is much larger, and is certainly connected southward with the Lukinje or Lukatta, a tributary of the Kassai.

In its further course the Congo is joined by a number of moderate-sized streams from the west. Below Lukolela it spreads out into a kind of river lake 20 to 25 kil. (123 to 154 miles) wide, and along its left bank extends a swampy region, the chain of low wood-covered hills which has hitherto confined the valley retiring for a mile or two. In 3° 15'S. lat. it receives its last great affluent—the Kassai or Kwa, which has recently been proved to be the most important of the southern or left-hand, as the Ubangi is the most important of the northern or right-hand, tribu- taries. The Kassai rises to the south of 12' S. lat. and flows north through Muata Yamvo's kingdom. In its upper course it possibly receives an emissary from Lake Dilolo, which also sends a branch south to the Zambesi. As it advances northwards it is joined by a large number of streams, all generally flowing northward. The Kassai enters the Congo in 3°10' 8. lat., with a depth of 25 to 80 feet and a breadth of 600 yards, at a height of 942 feet above the sea. The exploration of the system was carried out by Wissmann, Wolf, Von Francois, and Mueller in 1883-85. The Kassai itself has been ascended as far as the Wissmann Fall in 5° 40'S. lat., and its course has been struck at Digundu in 10° S. lat. The Lulua, which joins it from the right, is known as high up as Kangombe Fall ; it is there about 200 yards wide ; but it does not become truly navigable till it is joined by the Luebo. The San- kuru, at one time supposed to flow directly into the Congo,

3 See map illustrating the journeys of Dr W. Junker,

Proc. Roy Geogr. Soc., 1887.

LAL—ZLAM

enters the Kassai by two arms, 820 feet and 200 feet in breadth, in 4° 17'S. lat. and 20° 15' E. long., its bright yellow waters forming a strong contrast with the brown of the larger stream. The Kuango, a fine stream, with its head-waters in the same district as those of the Kassai, flows in a wonderfully straight course north to join that river in 17° 30' E. long. It was ascended by Mechow in 1880 as far as the rocky ledge at Kikamshi or Kinganshi ; and, though it is only 3 feet high, the same barrier pre- vented the ascent of Grenfell's steamer in 1887. For 87 miles after receiving the Kassai or Kwa the Congo flows in a deep gorge, between banks sometimes 700 feet high. In 4° 5' §. lat. it enters Stanley Pool, an island-studded lake 1147 feet above the sea, expanding southward of the main course of the river. Its rim is "formed by sierras of peaked and picturesque mountains, ranging on the southern side from 1000 feet to 3000 feet in height." The banks offer considerable variety in character. A striking object on the north bank is the Dover Cliffs, so named by Stanley from their white and glistening appear- ance, produced, however, not by chalk but by silver sand, the subsidence of which into the water renders approach to the bank sometimes dangerous. Towards the lower end of the lake the country on both sides becomes comparatively low and flat, and at places swampy. On the south side, however, stands the great red cliff of Kallina Point (about 50 feet high), so named after an Austrian lieutenant drowned there in 1882. Round the point rushes a strong current 74 knots an hour, difficult to stem even for a steamer. On the river, as it leaves the Pool, are situated (south side) Leopoldville, founded by Stanley in 1881, and Brazzaville, a station established by the French explorer De Brazza. Below Stanley Pool the Congo begins to break through the coast ranges, and forms a long series of rapids and falls, often enclosed between rocky shores, and even cliffs. Among the more important falls are those named Mahiney, Zinga, Ntambo, Uataka, Itunzima, Isan- gila, Ngoma, and Yellala. At Yellala, just above Vivi, the river escapes into the lowlands and is navigable for the rest of its journey to the sea (113 miles). Below Boma

(5° 48’ S. lat.) it widens out and is interrupted by numer- ous islands ; but it does not break up into several channels so as to form a delta, though there are various creeks that appear as if they might yet become deltaic outlets. Be- tween Banana Point on the north and Shark Point on the south the mouth of the Congo has a width of 7 miles. At Banana Point (at which there is not a vestige of the plant whose name it bears) there is fair harbourage for sea-going vessels. Shark Point is also known as Padron Point, from the remains of a stone pillar (padrdo) erected by the Portuguese explorer Diogo Cao (visited by Burton, 1863; by Daunett, 1887).

The exploration of the Congo system has been accompanied and followed by one of the most remarkable political movements of modern times. On 15th September 1876 the International African Association was constituted, under the presidency of Leopold IL., king of the Belgians, for the purpose of devising the best means of opening up equatorial Africa to civilization. Later on (25th November 1878) was founded under the same auspices a Comité d’Etudes du Haut Congo, which afterwards became known as the International Association of the Congo. It was as an agent of this association that Mr Stanley undertook his epoch-making ascent of the river in 1879. In September the first permanent station of the association was founded at Vivi;! in December the second at Jangila ; and in May 1881 the third at Manyanga. The associa- tion was recognized as an independent territorial government by the United States in April 1884 and by Germany in November of the same year. An international conference for the regulation of the relations of the new state and the various European Govern- ments was held at Berlin under the presidency of Prince Bismarck (15th November 1884-26th February 1885). The permanent neu-

1 See list of stations—some of which have been since abandoned— in Scot. Geogr. Mag., 1885.

trality of the Congo State territory, freedom of commerce in the Congo basin, and the abolition of the slave trade were among the main points established by the plenipotentiaries. In the close of 1884 and the early

part of 1885 the association was recognized by England (16th December 1884), Italy, Austria-Hungary, the Nether- lands, France, &e. In April 1885 the Belgian chamber of repre- sentatives authorized King Leopold to become sovereign of the new state—the union between Belgium and the Congo to be purely personal. The total area of the Independent State of the Congo, as it is officially designated, is estimated at 807,125 square miles, and its population may be about 40,000,000. It has a very limited coast-line, being hemmed in by French territory on the north and by Portuguese territory on the south. The southern limit is a conventional line from Nokki (on the south bank of the river below Vivi) across the continent to Langi Lake; the northern limit follows the fourth parallel of N. lat. from 17° to 30° E. long. French territory occupies all the north bank of the river from Ngombi (15 E. long.) up to Lukolela. In 1888 the state main- tained 146 white officials, and had a force of upwards of 1000 native soldiers (Zanzibaris, Haussas, and Bangalas). It has four steamers on the lower Congo and five on the upper. The value of the commerce is as yet only £560,000, the principal exports being india-rubber, ivory, coffee, palm nuts and oil, copal, and wax. As to the possibility of developing the country into a great consumer of European goods, there has been much and bitter discussion ; at the present stage it is admitted that it has no native product of value in sufficient quantity to pay for a large importation. The river, however, has recently been proved navigable for sea-going vessels as far as the capital, Boma, and no serious difficulties have been met by the engineers engaged in surveying a railway from the

lower Congo up to Stanley Pool.

See Stanley, The Dark Continent and The Congo; Johnson, The Congo to Bolobo; Thy, Aw Congo et au Kasai, 1888 ; Coquithat, Sur le Haut Congo, 1888; Wiss- mann, Wolf, &c., Im Innern Afrikas, 1888.

ZALEUCUS. See Locrt.

ZAMBESI, the most important river on the East Coast of Africa (see vol. i. pl. II.), and the fourth largest on the continent, drains during its course of about 1200 miles an area of 600,000 square miles. Its head-streams, which have not yet been fully explored, are the Leeambye or Iambaji,

rising in Cazembe's country; the Lungebungo, which descends from the Mossamba Mountains; and the Leeba river, from the marshy Lake Dilolo (4740 feet), situated between 10° and 12° S. lat. and 22° and 23° E. long. These three rivers, reinforced by the Nhengo, unite to form the upper Zambesi (Leeambye), which flows at first southwards and slightly eastwards through the Barotse valley, then turns prominently to the east near its junction with the Chobe (Chuando or Linianti), and passes over the Victoria Falls. Thence, as the middle reach of the Zambesi, the river sweeps north-east towards Zumbo and the Kebrabassa rapids above Tete, and finally forms the lower Zambesi, which curves southwards until it reaches the Indian Ocean at 18° 50'S. lat. Fed chiefly from the highland country which stretches from Lake Nyassa to inner Angola, its chief tributaries are the Loangwa and the Shiré, the last an important river draining out of Lake Nyassa, and which in the dry season contains probably as great a volume of water as the Zambesi, and is much more navigable. Except for an interruption of 70 miles at the Murchison cataracts, the Shiré is open throughout its en- tire length to the lake.

On the whole the Zambesi has a gentle current, and flows through a succession of wide fertile valleys and richly wooded plains; but, owing to the terrace-like structure of the continent, the course of the river is interrupted from point to point by cataracts and rapids. These form serious, and in some cases insurmountable, hindrances to navigation. Those on the lower Zambesi begin with its delta. The bar here was long held to be impassable, except to vessels of the shallowest draught ; but the difficulty was exaggerated partly through ignorance and partly in the interests of the Portuguese settlement of Quilimane, which, before the merits of the Kongone entrance were understood, had been already established on the Qua-qua river, 60 miles to the north. The Zambesi is now known to have four mouths, the Milambe to the

west, the Kongone, the Luabo, and the Timbwe. The best of these, the Kongone, has altered and the channel im- proved recently. There are at least 18 feet of water on the bar at high water neap tides; and steamers drawing 15 feet, and sailing vessels drawing 3 feet less, have no diffi-

culty in entering. The deep water continues only a short distance ; and, after Mazaro (60 miles) is reached, where the river has already dwindled to the breadth of a mile, the channel is precariously open in the dry season as far as Senna (120 miles from the mouth) for vessels drawing 41 feet. Up to this point navigation could only be suc- cessfully and continuously carried on by vessels of much lighter draught—stern-wheelers for preference with a draught of little more than 18 inches, About 90 miles from Senna the river enters the Lupata gorge, the im- petuous current contracting between walls to a width of scarcely 200 yards. Passing Tete (240 miles from the mouth with a smooth course), the channel becomes danger- ous at Kebrabassa, 90 miles farther on. From the Kebra- bassa rapids upwards, and past the Victoria Falls, there are occasional stretches of navigable water extending for considerable distances, while the upper Zambesi with its confluents and their tributaries forms a really fine and ex- tensive waterway. Like the Nile, the Zambesi is visited by annual inundations, during which the whole country is flooded and many of the minor falls and rapids are then obliterated.

The chief physical feature of the Zambesi is the Mosi- oa-tunya ("smoke sounds there") or Victoria Falls, ad- mitted to be one of the noblest waterfalls in the world. The cataract is bounded on three sides by ridges 300 or 400 feet high, and these, along with the many islands dotted over the stream, are covered with sylvan vegetation. The falls, according to Livingstone, are caused by a stupendous crack or rent, with sharp and almost unbroken edges, stretching right across the river in the hard black basalt which here forms the bed. The cleft is 360 feet in sheer depth and close upon a mile in length. Into this chasm, of more than twice the depth of Niagara, the river rolls with a deafening roar, sending up vast columns of spray, which are visible for a distance of 20 miles. Unlike Niagara, the Mosi-oa-tunya does not terminate in an open gorge, the river immediately below the fall being blocked at 80 yards distance by the opposing side of the (supposed) cleft running parallel to the precipice which forms the waterfall. The only outlet is a narrow channel cut in this barrier at a point 1170 yards from the western end of the chasm and some 600 from its eastern, and through this the Zambesi, now only 20 or 30 yards wide, pours for 120 yards before emerging into the enormous zig-zag trough which conducts the river past the basalt plateau.

The region drained by the Zambesi may be represented as a vast broken-edged plateau 3000 or 4000 feet high, composed in the remote interior of metamorphic beds and fringed with the igneous rocks of the Victoria Falls. At Shupanga, on the lower Zambesi, thin strata of grey and yellow sandstones, with an occasional band of limestone, crop out on the bed of the river in the dry season, and these persist beyond Tete, where they are associated with extensive seams of coal. Gold is also known to occur in several places.

The higher regions of the Zambesi have only been visited by one or two explorers ; and the lower, though nominally in possession of the Portuguese since the beginning of the 16th century, are also comparatively little known. The Barotse valley or valley of the upper Zambesi 1s a vast pastoral plain, 3300 feet above sea-level about 189 miles in length and 30 to 35 broad. Though inundated in the rainy season, it is covered with villages and supports count- less herds of cattle. The Luinas who inhabit it are clothed with skins, work neatly in ivory, and live upon milk, maize, and sweet potatoes. In the neighbourhood of the falls the tsetse fly abounds so that the Batoka people who live there, and who are the only

arboriculturists in the country, live upon the produets of their gardens. Zumbo, on the north bank, and Chicova, opposite on the southern side (500 miles above the delta), were the farthest inland of the Portuguese East African settlements, and are well placed for commerce with the natives. Founded by Pereira, a native of Goa, these settlements were ultimately allowed to go to ruins; but Zumbo has been recently re-occupied. The onee eclebrated gold mines of Parda Pemba are in the vicinity. The only other Portugucse settle- ments on the Zambesi are Tete and Senna. Tete, formerly a large and important plaee, now nearly in ruins, still possesses a fort and several good tiled stone and mud houses. Thither Portuguese goods, ehiefly wines and provisions, are carried by means of canoes. The exports, which inelude ivory, gold dust, wheat, and ground- nuts, are limited owing to the diffieulty of transport ; but this diffi- culty is not insurmountable, for Tete has been twice visited by small

steam vessels. Senna, farther down the river, a negleeted and unhealthy village, has suffered much from political mismanage- ment, and has ceaseless troubles with the Landeens or Zulus, who own the southern bank of the river and collect in force every year to exact a heavy tribute-money. The industrial possibilities of the lower Zambesi, and indeed of the whole river-system, are enormous. India-rubber, indigo, archil, beeswax, and calumba root are plenti- ful, and oil seeds and the sugar-cane could be produeed in sufficient quantity to supply the whole of Europe.

The Zambesi region was known to the medieval geographers as the empire of Monomotapa, and the course of the river, as well as the position of Lakes N'gami and Nyassa, was filled in with a rude approximation to aeeuraey in the earlier maps. These were prob- ably construeted from Arab information. The first European to visit the upper Zambesi was Livingstone in his exploration from Beehuanaland between 1851 and 1853. Two or three years later he descended the Zambesi to its mouth and in the course of this journey diseovered the Victoria Falls. In 1859, aecompaniéd by Dr Kirk (now Sir John Kirk), Livingstone ascended the river as far as the falls, after tracing the course of its main tributary the Shiré and diseovering Lake Nyassa. The mouths of the Zambesi were long claimed exelusively by the Portuguese, but in 1888 the British Government opened negotiations with Portugal to have the river declared free to all nations. (EE TD»)

ZAMORA, an inland province of Spain, one of the three into which the former province of Leon has since 1833 been divided, is bounded on the W. by Tras-os-Montes (Portugal) and Orense, on the N. by Leon, on the EF. by Valladolid, and on the S. by Salamanca; its area is 4135 square miles. It is traversed from east to west by the Douro, which receives within the province the Val- deraduey and the Esla on the right and the Guarefia on the left ; the Tormes also skirts the south-western boundary for some 25 miles. Except in the north-west and west, where it is entered by spurs from the Cantabrian chain (Sierra de la Culebra and Sierra de Peiia Negra), the pro- vince is flat ; its lowest point is 1070 feet above sea-level. Its plains, especially the "tierra de campo" formed by the valley of the Esla, yield large quantities of grain and pulse ; wine and flax are also

produced ; and on the higher grounds large numbers of merino sheep are fed. The industries of Zamora are unimportant. The province is traversed by no railway except that connecting its capital with Medina del Campo on the northern line. There are eight partidos judiciales and 300 ayuntamientos ; besides ZAMORA (see below), the capital, there is only one town, the historic city of Toro (7754), with a population exceeding 5000. The total population of the province in 1877 was

250,000.

ZAMORA, capital of the above province, is situated 2000 feet above sea-level, on the right bank of the Douro (here crossed by a bridge of seventeen pointed arches) a little below its junction with the Valderaduey, 57 miles by rail west by north from Medina del Campo and 182 miles north-west from Madrid. The population in 1877 was 13,632. It has a small but fine Romanesque cathedral (completed about 1174) and an ancient castle, as well as several other interesting churches of the 12th century. It is the seat of a seminary and an academy of engineering, and has unimportant linen and woollen manufactures.

In the early period of the Christian re-conquest Zamora, from its

position on the north of the Douro, was a place of considerable strategie importanee. It was taken from the Arabs by Alonso the

the karudolia, which yields the best edible olive berry. For size, vigorous growth, and productiveness the olive tree of Zante is rivalled only by that of Corfu.

Catholic in 748, but was again held by them for short periods in 813, 939, 963, 984, and 986. It was entirely repaired by Ferdinand I., who in 1061 gave it to his daughter Dofia Urraca. After his death in 1065 Sancho disputed possession with his sister and laid siege to the town, but without success, although the famous Ruy Diaz de Bivar was among his warriors, and indeed at this time received his title of El Cid Campeador. The town became subject to Alphonso VI. in 1073.

ZANESVILLE, a city of the United States, the county seat of Muskingum county, Ohio, is situated on both banks of the Muskingum river, at the mouth of Licking river, 170 miles north-east of Cincinnati and 37 nearly due south of Cleveland. The surrounding country is thickly popu- lated, the inhabitants being engaged in agriculture and in coal and iron mining. Zanesville has railway communica- tion by several lines. The population in 1880 was 13,13, showing a gain of about 80 per cent. since 1870.

Zanesville was founded about the beginning of the 19th century, and in 1804 was made the county seat. From 1810 to 1812 the Ohio legislature met at Zanesville. It was incorporated as a city in 1855. Its growth prior to 1870 was slow.

ZANTE, the ancient Zacynruvs, an island of Greece, one of the Ionian group, in the Ionian Sea, in 37° 40' N. lat. and 21° E. long., is 25 miles long, about 12 broad, and 64 miles round, with an area of 277 square miles, and a population in 1879 of 44,522, and estimated in 1887 at 48,000. Zante lies 8 miles south of Cephalonia, forming with it, Leucas, and Ithaca a crescent-shaped insular group, which represents the crests of a submerged limestone ridge facing the Gulf of Patras. At Ithaca, its northernmost

member, the ridge almost touches the adjacent coast of Acarnania, with which it is geologically connected ; and at

Zante, its southernmost member, it recedes about 15 miles from the coast of Elis in Morea. Zante is of somewhat

irregular oval shape, with its main axis disposed in the

direction from north-west to south-east, and indented by a deep inlet at its southern extremity. The surface is mainly occupied by an extensive and highly productive central

plain, skirted on the west side by a range of bare limestone

hills from 1000 to 1200 feet high, which fall gently land- wards, but present bold steep cliffs towards the sea, and which culminate northwards

in Mount Skopos d 500 feet ?), the highest point in the island. On the east side the plain is also limited by a low ridge, which still justifies the epithet of nemorosa, or the " wooded," applied by Virgil to Zacynthus. These hills are densely clothed to their summits with an exuberant growth of olives, figs, myrtles, laurels, oranges, aloes, vines, and other sub-tropical plants. Travel- lers sailing between this coast and the mainland describe in enthusiastic language the charming effect produced by these masses of evergreen vegetation rising in long terraces above the surrounding waters, and everywhere interspersed with pleasant homesteads and hamlets embowered in verdure. Nevertheless Zante, notwithstanding its Italian title of "Fior di Levante," is inferior in picturesque beauty to Corfu, owing to the less elevation of its hills and the somewhat monotonous character of the great central plain. This plain, however, is highly cultivated, forming an almost continuous stretch of gardens and vineyards, varied here and there with a few patches of cornfields and pasture lands. Here is grown a peculiar dwarf vine, whose fruit, the "currant" (from "Corinth ") of commerce, forms the chief resource and staple export of Zante, as well as of the neighbouring mainland. In 1886 the currant crop for the whole of Greece was valued at £2,000,000, of which nearly one-fifth was raised in Zante, chiefly for the English market. The vine, which grows to a height of 3 feet, begins to yield in seven years and lasts for over a century. From the grape, which has a pleasant bitter-sweet taste, a wine is also extracted, which is said to excel all others in flavour, fire, and strength. Besides this species, there are nearly forty different kinds of vine and ten of the olive, including

The island enjoys a healthy climate ; and, although there arc no perennial streams, an abundant supply of good water is obtained from the numerous springs, occurring espetially in the eastern and central districts. But earthquakes are frequent and at times disastrous. During recent times the most destructive were those of 1811, 1820, and 1840 ; and, although the prevailing geological formations are sedimentary, chiefly calcareous, there seems no doubt that these disturbances are of igneous origin. Other indications of voleanic agency are the oil springs occurring on the coast, and even in the bed of the sea near Cape Skinari

on the north side, and especially the famous pitch or bituminous wells already mentioned by Herodotus (Hist., bk. iv.). These have been productive through- out the historic period and still yield a considerable supply of pitch. They are situated in a swamp near the coast village of Chieri, and comprise two basins, with alternate layers of water and bitumen, the lower sheet of water apparently communicating with the sea.

Zante, capital of the island, is a considerable seaport on the east side, with a population of 16,250 (1879). It occupies the site of the ancient city of Zacynthus, said to have been founded by Zacynthus, son of a legendary Arcadian chief, Dardanus, to whom was also attributed the neighbouring citadel of Psophis. But of this, as well as of the temple of Diana that formerly crowned the summit of Mount Scopus, no vestiges can now be discovered.

Traditionally the island formed part of the territory of Ulysses, king of Ithaca, and at one time it appears to have also received a colony of Achzans from Peloponnesus. Later it joined the Athenian hegemony ; but after the fall of Athens the democratic party was replaced by an oligarchy, which ruled in the interests of Sparta. Under the Romans Zacynthus was included in the province of Epirus, and passed in medizval times successively from Byzantium to the Normans (11th century), the Orsini, counts of Cephalonia (after the 4th crusade), and the Tocco family, who held it with Cephalonia as vassals of the Neapolitan Angevine dynasty. In the 15th century it was occupied by the Venetians, and was held by them till the fall of the republic in 1797. Wrested in 1799 by the Russians from the French, it was soon after seized by the English, and in 1815 constituted with the other Ionian Islands a ' sept- insular republic" under British protection, till the union with Greece in 1864.*

The long Venetian occupation is reflected in the appearance, character, and to some extent even the language and religion of the Zantiots. Nearly all the aristocracy claim Venetian descent ; most of the upper classes are bilingual, speaking both Greek and Italian ; and a considerable section of the population are Roman Catholics of the Latin rite. Even the bulk of the people, although mainly of Greek stock, form in their social usages a connecting link between the Hellenes, whose language they speak, and

the Western nations by whom they were so long ruled. They have the reputation of being industrious and enterprising, but passionate and revengeful. But no more high-minded, enlightened, and courteous people can anywhere be found than in the cirele of the Maddalenas, Terzettis,

Mercatis, and other families of Venetian lineage.

See Balthazar Raimondini, De Zacynthi Antiquitatibus ; C. Parrigopoulo, Histoire de la Civilisation Hellénique; S. de Nolhac, La Dulmatie, les les loniennes, &c., Paris, 1882.

ZANZIBAR, or, more correctly, ZANGUEBAR, a sultanate of east central Africa, which till recently comprised the four islands of Zanzibar, Pemba, Lamu, and Mafia (Monfia), together with the adjacent seaboard from about 3° N. to 10° S. lat., with undefined limits towards the interior. But by the Anglo-German convention, signed in London on 29th October 1886, the territory on the mainland was restricted to the strip of coastlands ten nautical miles broad, stretching from the mouth of the Miningani river at the bay of Tunghi, just south of Cape Delgado, northwards to Kipini at the mouth of the Tana, together with the isolated stations of Kisimayu (Kismayu), Brava, Merka, and Magdoshu (Magadoxo) on the Somal coast, each with a land circuit of ten nautical miles, and Warsheikh on the same coast, with a land circuit of five nautical miles. Since then, however, further changes have taken place. The sultan's officers have been replaced in the seaports of Dar-es-Salaam and Pangani on the Zanzibar coast proper by commissioners of the German East African Association, to whom the customs of those places have been farmed 5 the port of Tunghi below Cape Delgado has been claimed and forcibly occupied (1887) by the Portuguese; the island of Pemba appears to have been ceded (May 1888) to the

recently chartered British East African Company ; lastly,

the station of Kisimayu on the Somal coast is claimed

(June 1888) by Italy in reparation of an affront offered to

the Italian consul at Zanzibar. But, as defined by the

above-mentioned convention, the reduced dominions of the sultan have areas (in square miles) and estimated populations (1887) as under :—

Popula- tion.

220,000

10,000 7,000 20,000 500,000 8,000

Total…

7420

765,000

The political and commercial, as well as the geographical, centre of the state is the fertile and densely peopled island of Zanzibar, which lies at a mean distance of 20 miles from the Swahili coast, between 5° 40’ and 6° 30’S. lat. With the neighbouring Pemba (to the north) and the more distant Mafia (to the south) it forms an independent geological system, resting on a foundation of coralline reefs, and constituting a sort of outer coast-line, which almost every- where presents a rocky barrier to the fury of the waves rolling in from the Indian Ocean. All three are disposed parallel to the adjacent seaboard, from which they are separated by shallow waters, mostly under thirty fathoms, and strewn with numerous reefs dangerous to navigation, especially in the Mafia channel opposite the Rufiji delta.

Mafia itself is low and fertile, and extensively planted with cocoa-nut palms. It is continued southwards by an extensive reef, on which stands the chief village, Chobe, the residence of the governor and of a few Arab and Hindu (Banyan) traders. Chobe stands on a shallow creek inac- cessible to shipping.

Zanzibar, the Unguya of the natives, is not exclusively of coralline formation, but also presents several heights of a reddish ferruginous clay,

rising in gentle slopes above the central plains. In the south these heights nowhere exceed 400 or 450 feet ; but on the north-west coast they develop a chain of hills disposed parallel to the shore and attain- ing an elevation of a little over 1000 feet. The forests by which the island was formerly covered have mostly dis- appeared, and the greater part of the rich soil is carefully cultivated, yielding two annual crops of corn, and four of manioc, the staple food of the people. There are extensive cocoa-nut groves, and from India and Malaysia have been introduced the mangosteen, guava, durian, cinnamon, nut- meg, and cloves, all of which thrive well. The soil seems specially suited for the clove, which, although nearly destroyed by the terrific cyclone of 1872, has already re- covered from that disaster, and the annual export of this spice now exceeds £10,000 in value. Although the fauna is almost exclusively continental, Zanzibar till recently possessed a distinct variety of Colobus (C. kirkii), which appears to be now extinct.! Some years ago a hippopo- tamus visited the island from the mainland 3 but no car- nivora are now found larger than the serval and wild cat.

On the east side of the island there still survive a few groups of Wa-Hadimu Bantus, who represent the aboriginal stock. But elsewhere, and especially in the capital (for which, see below), the population is of an extremely hetero- geneous character, including full-blood and half-caste Arabs Indian "Canarians" (that is, half-caste Portuguese from Kanara on the Malabar Coast of India), Swahili of every shade, slaves or freedmen from all parts of East Africa Europeans, and Americans, (See SWAHILI.)

1H. H. Johnston, The Kilima-Njaro Expedition, p. 38.

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The neighbouring island of Pemba, intersected by 5° S. lat., is even more fertile, but much less cultivated, than Zanzibar. From the luxuriant vegetation which every- where clothes the cliffs to their summits it takes the name of the "Green." The land is exclusively owned by great Arab proprietors, who work their plantations with scarcely disguised slave labour and export considerable quantities of cloves, which here also find a congenial home. The capital, Shaki-Shaki, which lies at the head of a

shallow creek on the west side, is inaccessible to shipping. But at Kishi-Kashi, at the north-west extremity, there is a deep and well-sheltered harbour, though of somewhat difficult approach. Here resides the chief of the Arab landed aristocracy, who has hitherto been more of a vassal than a subject of the sultan, and whose allegiance has lately been transferred to the British East African Association.

Lamu also, the fourth member of the sultan's former insular possessions, has ceased to fly the Zanzibar flag. It is a small flat island lying close to the mainland above the mouth of the Ozi branch of the Tana delta, and appears to be now incorporated in the adjacent German territory of Vitu land. Lamu, its capital, with a reported population of 15,000, has a fine harbour, formed by a long deep channel separating it from the neighbouring island of Manda.

The Zanzibar seaboard (now more generally known as the Swahili coast) is a low-lying swampy and alluvial region, rising gently from the sea towards the first terraced escarpments of the continental plateau. Owing to the numerous streams reaching the coast along this seaboard — Rovuma, Ukeredi, Umbi-Kuru, Rufiji, Rufu, Wami, Umba, and others—a great part of the surface consists of rich alluvial soil, densely covered with a tropical vegetation. Here the warm currents setting landwards from the Indian Ocean bring both moisture and heat, so that this coast has a higher temperature and heavier rainfall than the Atlantic seaboard under the same parallels of latitude.2 Thanks to these conditions, while the climate is oppressive and malari- ous, the vegetation is extremely luxuriant, assuming about the marshy deltas the aspect of an impenetrable jungle of mangroves, reeds, and tall grasses, growing to a height of 12 or 14 feet. A characteristic plant is the msandarus? or copal-tree of the lower Rufiji valley, which yields the best gum known to commerce. Other economic plants more or less extensively cultivated are rice, maize, millet, the cocoa-nut and oil palm, besides several European species already acclimatized at Bagamoyo and other stations. But nearly the whole of this region is well suited for raising tropical produce, such as sugar, coffee, cotton, indigo, cinna- mon, cloves, and other spices.

Besides Dar-es-Salaam and Pangani, surrendered to the Germans (see above), the chief stations and seaports, going northwards, are Lindi, Kilwa (Quiloa), Bagamoyo, Mombasa (Mombas), and Malindi (Melinda). Of these Bagamoyo is at present the most important, as the starting-point of travellers and traders for the interior. Here are also the headquarters of the French Roman Catholic missions in east equatorial Africa, with training schools, extensive plantations, and gardens of acclimatization. Kilwa, Mom- basa, and Malindi, great and flourishing emporiums under the Zen} empire, are now almost abandoned. This remark applies also to Magdoshu, the chief isolated station on the Somal coast belonging to Zanzibar.

From the earliest times of which there is any authentic record the whole of the seaboard from the Somal coast to an unknown distance southwards was comprised within the dominions of the

Zenj (Zang) potentates, who for centuries claimed and vindicated the title of "sovereign of the sea." From them the seaboard

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? Mean temperature of the West and East Coasts 72° and 80° Fahr. respectively ; average annual rainfall at Zanzibar 60 inches ; at Loanda (Atlantic side) 36 inches; rainfall at Zanzibar in 1859 (exceptional) 170 inches.

LAN—ZAR

island of the site of the city. Down to 1873 Zara was strongly fortified; but its ramparts have now been con- verted into elevated promenades, which command extensive views to seaward and to landward. Of its four old gates one, the Porta Marina, incorporates the relics of a Roman arch, and another, the Porta di Terraferma, was designed by Sanmichele. oval in form, is thoroughly Venetian. dividing it into four quarters, are straight and wide, but the side-streets are ill-paved and narrow.

itself took the name of zangucbar,! the Balid-ez-Zenj, or " Land of the Zenj" of the Arabs, a term which thus corresponds to the Hindu-bar, or

“land of the Hindu,” formerly applied to the west coast of India on the opposite side of the intervening Arabian Sea. By Ibn Batuta and other Arab writers the Zen) people them- selves are spoken of in a general way as Mohammedan Negroes ; and they are no doubt still represented by the semi-civilized and highly intelligent Mohammedan Bantus now collectively known as the Swahili or “coast people.” Their empire began to decline soon after the appearance of the Portuguese in the eastern waters towards the close of the 15th century. To them fell in rapid suc- cession the great cities of Kilwa with its 300 mosques (1505), Montbasa the “ Magnificent” (1505), and soon after Malindi and Magdoshu the “Immense” (Ibn Batuta). On the ruins of the Portuguese power in the 17th century was built up that of the imams of Muscat, who ruled over a great part of south Arabia and the whole of the Zanzibar coast for over a century and a half down to 1856. On the death of the imam, or rather the “sayyid,” Said of Muscat in that year his dominions were divided between his two sons, the African section falling to Majid, who was suc- ceeded in 1870 by his younger brother Bargash ibn Said, commonly known as sultan of Zanzibar. He lived long enough to witness the recent dismemberment of his dominious, and in March 1888 left to his son and successor, Sayyid Khalif, a mere fragment of the former powerful Mohammedan empire on the East-African seaboard. The administration of the “ten-mile zone” on the mainland, al- though reserved to the sultan by the Anglo-German convention of 1886, was practically surrendered to the Germans in August 1888 when the German East African Company hoisted their flag jointly with the sultan’s at fourteen ports along this seaboard.

See J. L. Krapf, Travels, &c., London, 1830; Baron von der Decken, Reisen in Ost-Afrika, Leipsic, 1869; Captain R. F. Burton, The Lake Regions of Central Africa, London, 1860; Keith Johnston and A. H. Keane, Africa (Stanford series), London, 1878; H. M. Stanley, Through the Dark Continent, London, 1878; H. H. Johnston, The Kilima-Njaro Expedition, London, 1885; Joseph Thomson, To the Central African Lakes, &c., London, 1881. (Usk, 181, UC

ZANZIBAR, capital of the island and state of the same name, is the largest city on the African seaboard next to Alexandria and Tunis. It lies

in sheltered waters, from 30 to 40 feet deep, on the west side of the island, in 6° 10’ 8. lat., about 25 miles north-east of Bagamoyo, its port on the mainland. It comprises two distinct quarters, —Shangani, the centre of trade and residence of the sultan, and the eastern suburb occupied by the lowest classes (fishermen, porters, slaves, &c.), with a total joint population estimated in 1887 at about 100,000. Viewed from the sea, the place presents a pleasant prospect with its glittering mosques, palace, white houses, barracks, forts, and round towers, But the interior is a labyrinth of narrow filthy streets, winding through a dense mass of hovels, a “cesspool of wickedness Oriental in its appearance, Mohammedan in its religion, Arabian in its morals, . . . a fit capital for the Dark Continent.”? Nevertheless Zanzibar, which is now regularly visited by several lines of ocean steamers, is the necessary centre of trade for the eastern seaboard, the focus of all exploring and missionary work for the interior, the portal through which civilizing influences have hitherto penetrated into the eastern section of equatorial Africa. The imports, chiefly raw and bleached cottons and European wares, were valued at £1,220,000 in 1883, the exports at £800,000, of which £215,000 represented ivory, £153,000 caoutchouc, £13,000 sesame seed, £10,600 cloves. In 1885 the port was visited by 124 vessels of 115,500 tons, of which 49 of 60,674 tons were British. There are several Protestant and Roman Catholic missions stationed in Zan- zibar, the health of which has been much improved by a recently constructed aqueduct yielding a good supply of pure water.

ZARA (Slav. Zadar), an Austrian seaport, the capital of Dalmatia, and the seat of a Roman Catholic archbishop and of a Greek bishop, lies on the Adriatic, 130 miles south-east of Trieste, opposite the islands of Ugliano and Pasman, from which it is separated by the narrow Channel of Zara. The promontory on which it stands is separated from the mainland by a deep moat, practically making an

1 Mispronounced Zanzibar by the local Banyans and other Indian

traders. ? Prof. H. Drummond, Tropical Africa, p. 5.

The general aspect of the town, which is The main streets,

The chief interest of Zara lies in its churches, the most remarkable

of which is the cathedral of St Anastasia, a fine Roman-

esque basilica, founded by Doge Enrico Dandolo after the capture of the town in 1202 and finished in 1205. The churches of St Chrysogonus and St Simeon are also in

the Romanesque style, and St Mary's retains a fine Roman-

esque campanile of 1105. The old octagonal church of St Donatus, traditionally (but in all probability erroneously) said to have been erected in the 9th century on the site of

a temple of Juno, has been converted to secular purposes.

Most of the Roman remains were used up in the construc- tion of the fortifications, But two squares are embellished with lofty marble columns ; a Roman tower stands on the east side of the town ; and some remains of a Roman aque- duct inay be seen outside the ramparts. Among the other chief buildings are the Loggia del Comune, rebuilt in 1565, containing a public library of 34,000 volumes; the old palace of the priors, now the governor's residence ; and the episcopal palace. The harbour, to the north-east of the town, is safe and spacious, and it is annually entered by about 1200 vessels, of 185,000 tons, mainly engaged in the coasting trade. The chief industry is the preparation of maraschino, made from the marasco, or wild cherry, which covers the hills of Dalmatia, About 340,000 bottles of this liqueur are exported annually. Glass-making and fishing are also carried on. The population of the town in 1881 was 11,861, of the commune 24,536. Almost all of these are of Italian descent, and Italian is practic- ally the only language spoken in the town.

The foundation of Zara is ascribed by tradition to the Liburni. In the early days of the Roman empire it became a flourishing Roman colony under the name of Jadera, subsequently changed to Diadora. It remained

united with the Eastern empire down to about the year 1000, when it sought the Venetian protection. For the next four centuries it was a bone of contention between Venice and Hungary, changing hands repeatedly. It was occupied by the Hungarians at the end of the 12th century, but was re-captured by the Venetians in 1202, with the aid of French crusaders on their way to the Holy Land. In 1409 it was finally purchased from Hungary by the island republic for 100,000 ducats. In 1792 it passed, with Venice, into the possession of Austria. Fro1h 1809 to. 1813 it belonged to France.

About 15 miles to the south-east lies Zara Vecchia, or Old Zara, an insignificant village on the site of Biograd (White Town), formerly the residence of the Croatian kings, but destroyed during the Hungarian-Venetian wars.

Comp. Zara, e suoi Dintorni (Zara, 1878), and Notize Storiche della Citta di Zara (Zara, 1883), both by Angelo Nani.

ZARAGOZA, or Saracossa, an inland province of Spain, one of the three into which Aragon is now divided, is bounded on the N.E. and E. by Huesca, Lerida, and Tarragona, on the S. by Teruel and Guadalajara, and on the W. by Soria and Navarre; the area is 6607 square miles. It belongs wholly to the basin of the Ebro, by which river it is traversed from north-west to south-east. The main valley is bounded on the 8.W. by the Sierra de Moncayo, which reaches a maximum elevation—the highest in the province—of 7700 feet, and is continued ina south- easterly direction by the lower sierras of La Virgen and Vicor ; on the north-west are the spurs of the Pyrenees. The principal tributaries of the Ebro within the province are the Jalén, Huerva, and Aguas on the right and the Arva and Gallego on the left ; the Aragon also, which flows principally through Navarre, has part of its course in the

north of this province. At its lowest point, where the Ebro quits it, Zaragoza is only 105 feet above sea-level. The soil is in its level portions

comparatively fertile, the chief productions being wheat, rye, barley, oats, hemp, flax, oil, and wine. Silkworms are bred; and on the higher grounds sheep are reared. There are considerable forests on the lower mountain slopes. Zaragoza has no manufac- tures of importance. The province is traversed by the Ebro Valley Railway, which connects Miranda on the northern line with Lerida, Barcelona, and Tarragona, and has a branch to Huesca ; it also has communication with Madrid ; and there are local lines to Carifiena (south-west from Zaragoza) and to Puebla de Hijar (along the right bank of the Ebro). The Aragon Canal, originally intended to con- nect the Mediterranean with the Atlantic, is open from Tudela (El Bocal) to a point below Zaragoza. 'There are 13 partidos judiciales and 312 ayuntamientos; of these only Calatayud (11,512) and Zaracoza (see below) have more than 10,000 inhabitants. The total population of the province in 1877 was 400,587.

ZARAGOZA, capital of the above province, formerly ingdom of Aragon, lies at a

pel

EAN

Plan of Zaragoza.

1,2. Railway sta- 5. Archbishop's 10. Academy of 13. Cathedral of tions. palace. Fine Arts. La Seo.

3. Cathedral del 6. Aljaferia. 11. Government 14. University. Pilar, or of 7. Bull-ring. Offices. 15. Capitania the Pillar. 8. Civil hospital. 12. Church of St general,

4, Municipal 9. Military hos- Philip and 16. 8. Engracia. buildings. pital. St James.

feet above sea-level, on a rich plain on the right bank of the Ebro, just above its confluence with the Huerva, 212 miles by rail to the north-east of Madrid. The river js here crossed by a fine stone bridge of seven arches, erected in 1437, and another bridge—of iron—much needed for

the convenience of through railway traffic, is projected. Seen from a distance, the city with its numerous domes and towers has an imposing appearance, which it hardly main- tains on a nearer approach. The older streets are narrow, gloomy, and ill paved ; the massive buildings formerly in- habited by the Aragonese nobility are either in ruins or turned into wood-stores and granaries; and an air of poverty and decay pervades the whole town. By the river side there are public walks and avenues of poplar. The two most important buildings of Zaragoza are its cathedrals, in each of which the chapter resides alternately for six months. La Seo (‘The See”) is the older of the two, dating chiefly from the 14th century; its prevailing style is Gothic but the oldest portion, the lower portion of the apse, is Byzantine, and the fagade is of the Late Pseudo-Classical style, by which so many churches in Spain have been dis- figured. The Iglesia Metropolitana del Pilar is the larger and more modern building, dating only from the latter

half of the 17th century ; it was built after designs by Herrera el Mozo, and owes its name to one of the most venerated objects in Spain, the “ pillar ” of jasper on which the Virgin is said to have alighted when she manifested herself to Santiago as he passed through Zaragoza. It has no architectural merit ; externally its most conspicuous features are its domes, which are decorated with rows of green, yellow, and white glazed tiles. The church of San Pablo dates mainly from the 13th century. Adjoining the church of San Felipe is the Torre Nueva, an octangular clock tower in diapered brickwork, dating from 1504; it leans some 9 or 10 feet from the perpendicular, owing to faulty foundations. Among other conspicuous public build- ings are the municipal buildings, the exchange (Lonja), and the civil and military hospitals, which are among the largest in Spain. The university was founded in 1474, but its history has not been brilliant. To the west of the town is the Aljaferia or old citadel, an irregular pile origin- ally built as a palace by the Moors and also used as such by its Christian owners. It was afterwards assigned by Ferdinand and Isabella to the Inquisition, and has since been used as barracks, a

military hospital, and a prison ; it is now unoccupied and falling into decay. The chief manufactures of Zaragoza are silk, woollen cloth, leather, saltpetre, soap, and chocolate; and there is considerable trade in agricultural produce, and in wine and spirits. The population of the town in 1877 was 84,575.

Zaragoza, the Celtiberian Salduba, was colonized at the close of the Cantabrian War (25 3.c.) by Augustus, who gave it his own name, Cesarea Augusta, or Cexsaraugusta. It was a colonia immunis and the seat of a conventus juridicus. No remains of the ancient city have been preserved. It was taken by the Goths about 466 and in 712 by the Moors. In 1118 it was recovered by Alonso el Batallador of Aragon after a siege of five years, during which the defenders were reduced by famine to the direst straits. In 1710 Stanhope defeated the French under Philip V. not far from the town. The most memorable recent events in the history of Zaragoza are those which took place during the Napoleonic invasion. In 1808 the citizens rose against the French, and, under the command of PaLaFox (q.v.), defended the town for two months. The first siege was raised on 15th August 1808 ; but the respite then gained was not made use of to strengthen the defences, and, when the enemy renewed their attack in greater force in December, the place was compelled to surrender (20th February 1809), after losing in all nearly 60,000 men.

ZARLINO, Gioszrre or Gruserre (1517-1590),! musi- cal theorist, surnamed from his birthplace, ZarLmnus CLODIENSIS, was born at Chioggia, Venetia, in 1517. Studying in his youth for the church, he was admitted to the minor orders in 1539 and ordained deacon in 1541 at Venice ; but he soon devoted himself entirely to the study of music under the guidance of Adrian Willaert, then choir- master at St Mark's. Willaert, dying in 1562, was suc- ceeded by Cipriano di Rore, on whose removal to Parma in 1565 Zarlino was elected choir-master. Though now re- membered chiefly as a theorist, it is evident that he must have been famous both as a practical musician and as a composer ; for, notwithstanding the limited number of his printed works, consisting of a volume entitled Modulationes Sex Vocum (Venice, 1566), and a few motets and madrigals scattered through the collections of Scotto and other con- temporary publishers, he both produced and superintended the

public performance of some important pieces in the service of the republic. First among these was the music written to celebrate the battle of Lepanto (7th October 1571). Again, when Henry ITI. of France passed through Venice on his return from Poland in 1574, Zarlino directed on board the " Bucentaur" the performance of an ode for which he himself had composed the music, to verses supplied by Rocco Benedetti and Cornelio Frangipani. The ode eae 0. We A

! Burney and Hawkins place Zarlino's birth in 1540, and his death

in 1590. Caffi gives the true dates. Zarlino himself tells us that he was ordained deacon in 1541.

was followed by a solemn service in St Mark's, in which Zarlino's music formed a prominent feature, and the festival concluded with the representation of a dramatic piece entitled Orfeo composed by Zarlino. S. Maria della Salute was founded in 1577 to commemo- rate the plague, he composed a solemn mass for the occa- sion. Not one of these works is now known to be in existence ; the only example we possess of Zarlino's com- positions on a grand scale is a MS. mass for four voices, in the library of the Philharmonic Lyceum at Bologna. He died at Venice on 14th February 1590.

Fortunately for the science of music, Zarlino's theoretical writings have all been preserved. Though he was by no means free from

certain visionary ideas concerning the transcendental powers of

music, in which the theorists of the 16th century delighted, Zarlino was, in practical knowledge and intelligent application of scientific truth to the development of art, immeasurably in advance of the age in which he lived. His clear insight into the mathematical foundation of the scale placed him in direct antagonism to the leaders of the school of the Renaissance, which, with Vincenzo Galilei at its head, blindly followed the mistaken reasoning of Boetius (see vol. xvii. p. 80), and adhered as a matter of principle to the Pythagorean section of thecanon. This

difference of opinion, occur- ring ata critical period in the development of art, made Zarlino many bitter enemies ; but he steadily maintained his principles in temperate and unanswerable argument; and his theory is now accepted as the basis of modern art, while that of his opponents is utterly discarded.

Zarlino's first theoretical work was the Istitutiont Armoniche (Venice, 1558 ; reprinted 1562 and 1573). This was followed by the Dimostrationt Armoniche (Venice, 1571; reprinted 1573) and by the Sopplimenti Musieali (Venice, 1588). Finally, in a complete edition of his works published shortly before his death Zarlino reprinted these three treatises, accompanied by a T'ract on Patience, a Discourse on the True Date of the Crucifixion of Our Lord, an essay on Zhe Origin of the Capuehins, and the Resolution of Some Doubis Coneerning the Correetion of the Julian Calendar (Venice, 1589).}

The Jstitutiont and Dimostrationt Armoniche deal, like most other theoretical works of the period, with the whole science of music as it was understood in the 16th century. The earlier chapters, treat- ing chiefly of the arithmetical foundations of the science, differ but little in their line of argument from the principles laid down by Pietro Aron, Zacconi, and other early writers of the Boetian school; but in bk. ii. of the Jstitutioni Zarlino boldly attacks the false system of tonality to which the proportions of the Pythagorean tetrachord, if strictly carried out in practice, must inevitably lead. The fact that, so far as can now be ascertained, they never were strictly carried out in the Italian medixval schools, at least after the invention of counterpoint, in no wise diminishes the force of the reformer's argument. The point at issue was, that neither in the polyphonic school, in which Zarlino was educated, nor in the later monodic school, of which his recalcitrant pupil, Vincenzo Galilei, was the most redoubtable champion, could those proportions le tolerated in practice, however attractive they might be to the theorist in their mathematical aspect. So persistently does the human ear rebel against the division of the tetrachord into two greater tones and a leimma or hemitone, as represented by the fractions 3, 3, 243, that, centuries before the possibility of recon- ciling the demands of the ear with those of exact science was satis- factorily demonstrated, the Aristoxenian school

advocated the use of an empirical scale, sounding pleasant to the sense, in preference to an unpleasing tonality founded upon immutable proportions. Didymus, writing in the year 60, made the first step towards estab- lishing this pleasant-sounding scale upon a mathematical basis, by the discovery of the lesser tone ; but unhappily he placed it in a false position below the greater tone. Claudius Ptolemy (130) recti- fied this error, and in the so-called syntonous or intense diatonic scale reduced the proportions of his tetrachord to $, 3%, 43,—i.¢., the greater tone, lesser tone, and diatonic semitone of modern music." Ptolemy set forth this system as one of eight possible forms of the diatonic scale. But Zarlino uncompromisingly de- clared that the syntonous or intense diatonic scale was the only form that could reasonably be sung; and in proof of its perfection he exhibited the exact arrangement of its various diatonic intervals, to the fifth inclusive, in every part of the diapason or octave. The proportions are precisely those now universally accepted in the

1 Ambros mentions an edition of the Istitutiont dated 1557, and one of the Dimostrationt dated 1562, The present writer has never met with either.

2 We have given the fractions in the order in which they occur in the modern system. Ptolemy, following the invariable Greek method, placed them thus—}%, §, 3. This, however, made no difference in the actual proportions.

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system called "just intonation." But this system is practicable only by the voice and instruments of the violin class. For keyed or fretted instruments a compromise is indispensable. To meet this exigency, Zarlino proposed that for the lute the octave should be divided into twelve equal semitones ; and after centuries of dis- cussion this system of 'equal temperament" has, within the last thirty-five years, becn universally adopted as the best attainable for keyed instruments of every description.3

Again, Zarlino was in advance of his age in his classification of the ecclesiastical modes. These scales were not, as is vulgarly sup- posed, wholly abolished in favour of our modern tonality in the 17th century. Eight of them, it is true, fell into disuse; but the medieval Ionian and Hypo-ionian modes are absolutely identical with the modern natural scale of C ; and the Holian and Hypo- zolian modes differ from our minor scale, not in constitution, but in treatment only. Medieval composers, however, regarded the Ionian mode as the least perfect of the series and placed it last in order. Zarlino thought differently and made it the first mode, changing all the others to accord with it. His numerical table, therefore, differs from all others made before or since, prophetically assigning the place of honour to the one ancient scale now recognized as the foundation of the modern tonal system.

These innovations were violently opposed by the apostles of the monodie school. Vincenzo Galilei led the attack in a tract entitled Discorso Intorno alle Opere di Messer Gioseffe Zarlino, and followed it up in his famous Dialogo, defending the Pythagorean system in very unmeasured language. It was in answer to these strictures that Zarlino published his Sopplementi.

ZEA. See Cros.

ZEALAND, or SsAELLAND, the largest and most easterly island of DENMARK (¢.v.), is separated from Fiinen on the west by the Great Belt and from Sweden on the east by the Sound ; its greatest length from north to south is 81 miles, its breadth 65, and its area 2636 square miles.‘ Its surface is for the most part undulating, but on the whole little above sea-level; the highest elevations are in the south-east, where Cretaceous hills (the oldest geological formation on the island) reach heights of upwards of 350 feet. The coast is indented by numerous deep bays and fjords : the Ise fjord in the north in particular, with its branches the Roeskilde fjord on the east and the Lamme fjord on the west, penetrates inland for about 40 miles. There are no rivers of importance ; but several large lakes, the most considerable being Arre and Esrom, occur in the north-east. The soil is fertile and produces grain, especi- ally rye and barley, in great abundance, as well as potatoes and other vegetables, and fruit.

Agriculture and cattle- raising, along with some fishing, are the leading occupa- tions of the inhabitants ; linen is almost the only article of domestic industry. The population in 1880 was 610,000. The principal towns, besides CopENHAGEN (q.v.), the capital (234,850 inhabitants in 1880), are Roeskilde (5893), formerly the capital and still the see of the primate; Elsinore (8978); Slagelse (6076), a great agricultural centre ; Soré (1464), formerly the seat of a university and still educationally important ; and Korsér (3954), the port for mail steamers to the mainland, connected by rail with Soré, Roeskilde, and Copenhagen.

ZEALAND, the most westerly province of Holland, is bounded on the north by South Holland, on the east by North Brabant and Belgium, on the south-east and south by Belgium, and on the west by the North Sea. Its area is 689 square miles, the greater part of which consists of the islands Schouwen, Duiveland, St Philipsland, Tholen, North, South, and East Beveland, Wolfaartsdyk, and Wal- cheren. 'The greater part of the surface is below sea-level. The westward coasts of Schouwen and Walcheren are partly sheltered by dunes; but the province is mainly

3 It was first used in France, for the organ, in 1835; in England, for the pianoforte in 1846 and for the organ in 1854. Bach had advocated it in Germany a century earlier; but it was not generally adopted.

4 The province of Zealand and Méen, which includes the island of Samsé as well as that of Méen, has an area of 2828 square miles and a population of 721,703 ; the "stift" or bishopric of Zealand includes also the island of Bornholm.

dependent for protection from the sea on its artificial dykes, which have a total length of 300 miles, and on the repair of which upwards of £80,000 is spent annually. The soil consists of a fertile sea clay (see vol. xii. p. 62), which specially favours the production of wheat ; much rye is also cultivated, as well as barley (for malting), beans and pease, flax, and madder. Cattle and swine are reared, and dairy produce is largely exported ; but the sheep of the province are small and their wool indifferent. The indus- tries (linen, yarn-spinning, distilling, brewing,

salt-refining, shipbuilding) are comparatively unimportant. The in- habitants, who still retain many quaint and archaic peculiarities of manner and dress, speak the variety of Dutch known as Low Frankish (see vol. xii. p. 84). The capital is Middelburg (population 16,378 in 1887), in Walcheren, where also is Flushing (12,005). The total population of the province in 1887 was 198,567.

ZEBRA. In the article Horsz (vol. xii. p. 175) the general zoological and anatomical characters of the genus Fquus, and its relationship to other animals, were fully described. Among the existing species mention was made of certain forms distinguished from the rest by the peculiar coloration, being marked by conspicuous dark stripes on a lighter ground, and by their exclusively African habitat. These are the Quacea (see vol. xx. p. 146) and two, if not three, distinct species to which the name zebra is com- monly applied. The animal of this group which was first known to Europeans, and was formerly considered the most common, is the True Zebra (Zquus zebra, Linn.), sometimes called the Mountain Zebra. It inhabits the mountainous regions of the Cape Colony; but now, owing to the advances of civilized man into its somewhat restricted range, it has become very scarce, and is even, like its ally the quagga, threatened with extermination at no distant date. The second species, Burchell's Zebra (Zquus burch- ell, Gray), still roams in large herds over the plains to the north of the Orange river, but in yearly diminishing numbers, Both species are subject to considerable indi- vidual variations in marking, but the following are the

principal characters by which they can be distinguished. Equus zebra is the smaller of the two (about 4 feet high at the shoulders), and has longer ears, a tail more scantily clothed with

Fig, 1.—True or mountain zebra (Equus zebra).

The and the stripes are black; the lower brown.

thighs, the whole of the surface is covered with stripes, the legs

hair, and a shorter mane. general ground colour is white,

i : part of the face is bright With the exception of the abdomen and the inside of i

having narrow transverse bars reaching quite to the hoofs, and the base of the tail being also barred. The outsides of the ie have a white tip and a broad black mark occupying the greater part of the surface, but are white at the base. Perhaps the most

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constant and obvious distinction between this species and the next is the arrangement of the stripes on the hinder part of the back, where there are a number of short transverse bands reaching to the median longitudinal dorsal stripe, and unconnected with the uppermost of the broad stripes which pass obliquely across the haunch from the flanks towards the root of the tail. There is often a median longitudinal stripe under the chest.

Equus burchelli is a rather larger and more robust animal, with smaller ears, a longer mane, and fuller tail. The general ground colour of the body is pale yellowish brown, the limbs nearly white, the stripes dark brown or black. In the typical form they do not extend on to the limbs or the tail; but there is a great variation in this respect, even in animals of the same herd, some being striped quite down to the hoofs (this form has been named EZ. chapmanni).

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LMIWNSS y Yayo ONIN ld! Fig. 2.—Burchell's zebra (Z. burchelli).

There is a strongly marked median longitudinal ventral black stripe, to which the lower ends of the transverse side stripes are usually united, but the dorsal stripe (also strongly marked) is com- pletely isolated in its posterior half, and the uppermost of the broad haunch stripes runs nearly parallel to it. A much larger proportion of the ears is white than in the other species. In the middle of the wide intervals between the broad black stripes of the flanks and haunches fainter stripes are generally seen.

E. grevyi.—Under this name a zebra has lately been described which was sent in 1882 to Paris from the Galla country, lying to the south of Abyssinia, the most northern locality in which zebras have hitherto been met with. In most ofits characters it resembles E. zebra, but the stripes are finer and more numerous than in the typical examples of that species, and it has a strong, black, and isolated dorsal stripe. Considering the great variations that are met with in the markings of animals of this group, it is doubtful whether the aberrant characters of this individual are sufficient to separate it eae! from the true zebra of South Africa. The question will be cleared up when any complete scientific examina- tion has been made of other specimens, and also of the zebras which are known to exist in the neighbourhood of Lake Nyanza, and which are apparently of the same form. It is curious that the most northern and the most southern of the districts inhabited by zebras both contain identical or closely allied species, while the interme- diate territory is occupied by a totally different form, EZ. burchelli. It should be mentioned that the last-named animal is generally spoken of as the "quagga" by colonists and hunters. Its flesh is relished by the natives as food, and its hide is very valuable for leather, Although the many attempts that have been made to break in and train zebras for riding or driving have sometimes been rewarded with partial success, the animal has never been domesticated in the true sense of the word. (W. H. F.)

ZEBULUN (aban), one of the twelve tribes of Israel,

derived, according to Gen. xxx. 20, from the sixth son of Leah. The verse offers two etymologies of the name, from the roots ZBD, "give," and ZBL, "inhabit." The form ZoBovdwv (LXX.), with 6 in the last syllable, agrees with the vocalization of the adjective 955301, "Zebulonite." The

country of Zebulun lay in the fertile hilly country to the north of the plain of Jezreel, which forms the first step towards the mountains of Asher and Naphtali, and in- cluded the goodly upland plain of Battauf. The descrip-

tion of its boundaries in Josh. xix. 10 sg. contains few names that can be identified with any certainty : Chisloth- tabor is apparently the modern

Iksil, a little to the west of Tabor, Daberath the modern Dabiriya, at the foot of Tabor, Gath-hepher (A.V. Gittah-hepher) the village of Al-Meshhed, and Remmon Rummana. Thus the eastern boundary laid down in Conder and Kitchener's reduced Ordnance Survey map comes too near the Lake of Tiberias. The west boundary is not defined in Josh. xix., but should agree with the somewhat vague east boundary of Asher in verse 27. At one period Zebulun must have reached the sea and bordered on Pheenician territory (Gen. xlix. 13, Deut. xxxiii. 18, 19). In the latter passage allusion is made to a feast upon a sacred mountain (Mount Tabor ?) held by Zebulun and Issachar in common, and to the wealth these tribes derived from commerce by sea. Zebulun had a chief part in the war with Sisera (Jud. iv. 6); it furnished one of the judges, Elon the Zebulonite (Jud. xii. 11, 12); andthe prophet Jonah, who foretold the victories of Jeroboam IL, came from the town of Gath-hepher (2 Kings xiv. 25). The captivity of the northern tribes under Tiglath Pileser (2 Kings xv. 29) appears to have included Zebulun (Isa. ix. 1 [viii. 23]). Nazareth lay within the territory of Zebulun, but is not mentioned in the Old Testament.

ZECHARIAH, son of Berechiah, son of Iddo, or by con- traction son of Iddo, appeared as a prophet in Jerusalem along with Hacear (g.v.), in the second year of Darius Hystaspes (520 8.c.), to warn and encourage the Jews to address themselves at length to the restoration of the temple, which, since their return from exile eighteen years before, had lain unaccomplished, less through want of zeal than through the pressure of unfavourable circumstances. Supported by the prophets, Zerubbabel and Joshua set about the work, and the elders of Judah built and the work went forward (Ezra v. 1 sq., vi. 14). The first eight chapters of the book of Zechariah exactly fit into this his- torical setting. They are divided by precise chronological headings into three sections,—(a) chap. i. 1-6, in the eighth month of the second year of Darius; (6) chap. i. 7-vi. 15, on the twenty-fourth day of the eleventh month of the same year ; (c) chap. vii.~~viii, on the fourth day of the ninth month of the fourth year of Darius. The first sec~~ tion is a preface containing exhortation in general terms. The main section is the second, containing a series of night visions, the significant features of which are pointed out by an angel who stands by the prophet and answers his questions.

i. 7-17. The divine chariots and horses that make the round of the world by Jehovah's orders return to the heavenly palace and report that there is still no movement among the nations, no sign of the Messianic crisis. Seventy years have passed, and Zion and the cities of Judah still mourn. Sad news! but Jehovah gives a comfortable assurance of His gracious return to Jerusalem and the rebuilding of His temple.

i. 18-21 (Heb. ii. 1-4). Four horns, representing the hostile world-power that oppresses Israel and Jernsalem, are routed by four smiths.

ii. 1-18 (Heb. ii. 5-17). The new Jerusalem is laid out with the measuring line. It is to have no walls, that its population may not be limited, and it needs none, for Jehovah is its protection. The catastrophe of the nations is near to come; then the exiles of Zion shall stream back from all quarters, the converted heathen shall join them, Jehovah Himself will dwell in the midst of them, even now He stirs Himself from His holy habitation.

iii. 1-10. The high priest Joshua is accused before Jehovah by Satan, but is acquitted and given rule in Jehovah's house and courts, with the right of access to Jehovah in priestly intercession. The restoration of the temple and its service is a pledge of still higher things. The promised " branch" (or " shoot," MD¥), the Messiah, will come: 7.¢., the Persian lordship hasan end ; the national king- dom is restored in its old splendour ; and a time of general felicity dawns, when every man shall sit happy under his vine and under his fig tree. As by rights the Messianic kingdom should follow immediately on the exile, it is probable that the prophet designs to

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hint in a guarded way that Zerubbabcl, who in all other places is mentioned along with Joshua, is on the point of ascending the throne of his ancestor David. The jewel with seven facets is already there, only the inscription has still to be engraved on it (iii. 9). The charges brought against the high priest consist simply in the obstacles that have hitherto impeded the restoration of the temple and its service ; and in like manner the guilt of the land (iii. 9) is simply the still continuing domination of foreigners.

iv. 1-14. Beside a lighted golden candlestick of seven branches stand two olive trees—Zerubbabel and Joshua, the two anointed ones—specially watched over by Him whose seven eyes run through the whole earth. This explanation of the vision is separated from the description by an animated dialogue, not quite clear in its expression, in which it is said that the mountain of obstacles shall disappear before Zerubbabel, and that, having begun the building of the temple, he shall also bring it to an end in spite of those who now inock at the day of small beginnings.

v. 1-4. A written roll flies over the Holy Land; this is a con- crete representation of the curse which in future will fall of itself on all crime, so that, ¢.g.. no man who has suffered theft will have occasion himself to pronounce a curse against the thief (¢f. Jud. Xvil. 2).

v. 5-11. Guilt, personified as a woman, is cast into an epha- measure with a heavy lid and carried from Judah to Chaldea, where it is to have its

home for the future.

vi. 1-8. The divine teams, four in number, again traverse the world toward the four winds, to execute Jehovah's commands. That which goes northward is charged to wreak His anger on the north country. The series of visions has now reached its close, returning to its starting-point in i. 7 sqq.

An appendix follows (vi. 9-15). Jews from Babylon have brought gold and silver to Jerusalem ; of these the prophet must make a crown designed for the " branch " who is to build Jehovah's house and sit king on the throne, but retain a good understanding with the high priest. Zerubbabel is certainly meant here, and, if the received text names Joshua instead of him (vi. 11), this is only a correction, made for reasons easy to understand, but which breaks the context and destroys the sense and the reference of " them both" in verse 13.

The third section (chaps. vii.-viii.), dated from the fourth year of Darius, contains an inquiry whether the fast days that arose in the captivity are still to be observed, with a comforting and encouraging reply of the prophet.

Thus throughout the first eight chapters the scene is Jerusalem in the early part of the reign of Darius. Zerub- babel and Joshua, the prince and the priest, are the leaders of the community. But, while the spiritual head is in office, the authority of the civil head is rather moral than official, and is not so much actual as hoped for. The great concern of the time and the chief practical theme of these chapters is the building of the temple; but its restoration is only the earnest of greater things to follow, viz., the glorious restoration of David's kingdom. The horizon of these prophecies is everywhere limited by the narrow con- ditions of the time, and their aim is clearly seen. The visions hardly veil the thought, and the mode of expression is usually simple, except in the Messianic passages, where the tortuousness and obscurity are perhaps intentional. Noteworthy is the affinity between some notions evidently not franied by the prophet himself and the prologue to Job,—the heavenly hosts that wander through the earth and bring back their report to Jehovah's throne, the figure of Satan,

the idea that suffering and calamity are evidences of guilt and of accusations presented before God.

Passing from chaps. i.-viii. to chaps. ix. sg., we at once feel ourselves transported into a different world.

Jehovah's word is accomplished on Syria-Pheenicia and Philistia ; and then the Messianic kingdom begins in Zion, and the Israelites detained among the heathen, Judah and Ephraim combined, receive a partin it. The might of the sons of Javan is broken in battle against this kingdom (ch. ix.). After an intermezzo of three verses (x. 1-38: " Ask rain of Jehovah, not of the diviners") a second and quite analogous Messianic prophecy follows. The foreign tyrants fall ; the lordship of Assyria and Egypt has an end ; the autonomy and martial power of the nation are restored. The scattered exiles return as citizens of the new theocracy, all obstacles in their way parting asunder as when the waves of the Red Sea gave passage to Israel at the founding of the old theocracy (x. 3-12). Again there is an interlude of three verses (xi. 1-8): fire seizes the cedars of Lebanon and the oaks of Bashan, which the rabbins refer to the

burning of the sanctuary of Jerusalem.! The difficult passage about the shepherds follows. y :

The shepherds (rulers) of the nation make their flock an article of trade and treat the sheep as sheep for the shambles. Therefore the inhabited world shall fall a sacrifice to the tyranny of its kings, while Israel is delivered to a shepherd who feeds the sheep for those who make a trade of the flock (jN¥T "IYI3, xi. 7, 11="they that sell them," ver. 5) and enters on his office with two staves, " Favour i and "Union." He destroys "the three shepherds" in one month, but is soon weary of his flock and the flock of him. He breaks the staff " Favour," 7.¢., the covenant of peace with the nations, and asks the traders for his hire. Receiving thirty pieces of silver, he casts it into the temple treasury and breaks the staff " Union 4.€., the brotherhood between Judah and Israel. He is succeeded by a foolish shepherd, who neglects his flock and lets it go to ruin. At length Jehovah intervenes; the foolish shepherd falls by the sword ; two-thirds of

the people perish with him in the Messianic crisis, but the remnant of one-third forms the seed of the new theocracy (xi. 4-17 taken with xiii. 7-9, according to the necessary transposition proposed by Ewald). All this must be an allegory of past events, the time present to the author and his hopes for the future beginning only at xi. 17, xiii. 7-9. The general situation is clear: foreign kings govern Israel through native princes. The details cannot be explained in the absence of information as to the date and historical course of the events described by the prophet in allegorical form. But those who seek to escape this difficulty, by supposing that the word of the prophet was unintelligible to lus contemporaries, and gained a true meaning only in its New Testament fulfilment,? must forget that in Zech. xi. 9 the shepherd wearies of his office and abandons the flock, while in the New Testament the shepherd gives his life for the sheep, and that in Zech. xi. 12, 18 the price is paid to the shepherd, but in the New Testament to the traitor. ;

Chap. xii. presents a third variation on the Messianic promise. All heathendom is gathered together against Jerusalem and perishes there. Jehovah first gives victory to the countryfolk of Judah and then they rescue the capital. "After this triumph the noblest houses of Jerusalem hold, each by itself, a great lamentation over a martyr "whom they have pierced" (or " whom men have pierced "). In xii. 10 bys followed by yy cannot be right. If TN be deleted, we may read WW bye, but not WN yyy, which is not Hebrew. Yet it is very doubtful if the deletion of NN is justifiable or suffi- cient. It is taken for granted that the readers will know who the martyr is, and the exegesis of the church applies the passage to our Lord. Chap. xiii. 1-6 is a continuation of chap. xii. ; the dawn of the day of salvation is accompanied by a general purging away of idolatry and the enthusiasm of false prophets. Yet a fourth varia- tion of the picture of the incoming of the Messianic deliverance is given in chap. xiv. The heathen gather against Jcrusalem and take the city, but do not utterly destroy the inhabitants. Then Jehovah, at a time known only to Himself, shall appcar with all His saints on Mount Olivet and destroy the heathen in battle, while the men of Jerusalem take refuge in their terror in the great cleft that opens where Jehovah sets His foot. Now the new era begins, and even the heathen do homage to Jehovah by bringing due

tribute to the annual feast of tabernacles. Allin Jerusalem is holy down to the bells on the horses and the cooking- pots.

There is a striking contrast between chaps. i.-viii. and chaps. ix.~~xlv, The former prophecy is closely tied to the situation and wants of the community of Jerusalein in the second year of Darius [., and all that it aims at arises out of the necessities of the time, and is of a practical and possible kind—the restoration of the temple and perhaps the elevation of Zerubbabel to the throne of David. The latter chapters, on the other hand, soar far above the field of reality; the historical situation from which they start can hardly be recognized ; and the future hope has very little connexion with the present, The fundamental differ~~ ence between the two parts of the book lies, not in the subject but in the nature of the prophecy, —in the first part realistic and almost prosaic, in the second vague and fantastic. There are corresponding differences in style and speech > and it 18 particularly to be noted that, while the superscriptions in the first part name the author and give the date of each oracle with precision, those in the second part (ix. 1, xii. 1) are without name or date, That both parts do not belong to the same author must be ad-

‘ See Wagenseil, Sota, p. 927 ; Lightfoot, on Matt. xxvi, 3. Matt. xxvii. 8-10; cp. Jahrbb. J. D. Theol., 1878, p. 471 sq.

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mitted. But most recent critics make the second part the older. Chaps. ix.-xl. are ascribed to a contemporary of Amos and Hosea, about the middle of the 8th century B.c., because Ephraim is mentioned as well as Judah, and Assyria along with Egypt (x. 10), while the neighbours of Israel appear in ix. 1 sg. in the same way as in Amos i-ii, That chaps. xii.-xiv. are also pre-exilic is held to appear especially in the attack on idolatry and lying pro- phecy (xiii. 1-6); but, as this prophecy speaks only of Judah and Jerusalem, it is dated after the fall of Samaria, and is assigned to the last days of the Judean kingdom on the strength of xii. 11, where an allusion is seen to the mourn- ing for King Josiah, slain in battle at Megiddo. Some suppose that the author of ix.-xi. is the Zechariah, son of Jeberechiah, of Isa. viii. 2; and Bunsen ascribes xii.-xiv. to the prophet Urijah, son of Shemaiah (Jer. xxvi. 20 sq.). It is more likely that chaps.

ix.-xiv. go all together and are of much later date. These vague predictions have no real spiritual affinity either with the prophecy of Amos, Hosea, and Isaiah, or with that of Jeremiah, where we always feel the solid ground of present reality under our feet. It was only after the exile that prophecy lost its close connexion with history and ceased to be built on present realities. The kind of eschatology which we find in Zech. ix.-xiv. was first introduced by Ezekiel, who in particular is the author of the conception that the time of deliverance is to be preceded by a joint attack of all nations on Jerusalem, in which they come to final overthrow (Ezek. xxxvill. sg.; Isa. Ixvi. 18-24; Joel). The importance at- tached to the temple service, even in Messianic times (Zech. xiv.), implies an author who lived in the ideas of the religious commonwealth of post-exile times. A future king is hoped for; but in the present there is no Davidic king, only a Davidic family standing on the same level with other noble families in Jerusalem Gai, 7, 12). 'The "bastard" (mixed race) of Ashdod reminds us of Neh. Xiil. 23 sgg.; and the words of ix. 12 (to-day, also, do I declare that I will render double unto thee") have no sense unless they refer back to the deliverance from Babylonian exile. But the decisive argument is that in ix. 13 the sons of Javan, 2.e., the Greeks, appear as the representatives of the heathen world-power. The prophecy, therefore, is later than Alexander; and indeed the hostility to the Jews implied in the passage just cited dates only from the time when Palestine passed from the hands of the Ptolemies to those of the Seleucids. Assyria and Egypt (x. 11) may well be the Ptolemaic and Seleucid kingdoms, which to- gether made up for the Jews the empire of the sons of Javan, In ix. 1 sq. (imitated from Amos i.~~ii.) Seleucid Syria is described as parcelled out into a number of small principalities, some of which were at the time nearly inde~~ pendent. That the Jews had reason enough to hate their neighbours, even in later times, appears, e.g., in 1 Mac. v. : compare especially ix. 6, 7 with 1 Mac. v. 68. The reference in ix. 8 would fit well with the Egyptian cam- paigns of Antiochus IV. Epiphanes, when Jerusalem suf- fered so much on the outward march and still more on the return of his troops. That the victory of Judah over the heathens is to precede the deliverance of Jerusalem (xii. 5 sqq.) is a remarkable feature, hardly to be explained except by the history of the Maccabee wars. The complaint about idolatry also fits this period ; and that a new kind of prophecy then came up, in an age where it no longer had a legitimate place, is far from unlikely.

If this date is assumed for chaps. ix,-xlv., we must hold that, by the copious use of phrases from older prophets and other means, the author sought to give his oracles an archaic garb. That this is no unfair assumption appears especially in xiv. 5, in the reference to the earthquake in the days of Uzziah, which is natural only if the author addressed

contemporaries of that catastrophe. This passage is indeed a stronger argument for a date in the Assyrian period than anything cited from chaps. ix.-xi. If, notwithstanding this, no commentator dates chap. xiv. less than 150 years after Uzziah, it is illegitimate to protest against the view that in chaps. ix. sg. Ephraim is an archaizing name for the Diaspora (1 Mac. v. 23, 45, 53).

How so late a piece was admitted among the prophetic writings, while Daniel, written about the same time, is placed only among the hagiographa, is a question not yet answered. We know too little about the history of the canon. A similar case is that of Isa. xxiv.-xxvii. But it is not less difficult to explain how a prophecy of the 8th century could have turned up in post-exile times and been appended to the book of Zechariah.

The literature of the book is cited by C. H. H. Wright, Zechariah and his Prophecies, 2d ed., London, 1879. See also Stade, " Deu- terozacharja," in Zeitschr. f. AT. Wiss., 1881, p. 1 sg.; 1882, pp. 151 sg., 275 sq. (J. WE.)

ZEITZ, an ancient manufacturing town in the extreme south of the province of Saxony, Prussia, is pleasantly situated on a hill on the White Elster, 22 miles south- south-west of Leipsic and 29 south-south-east of Halle. The river is here crossed by two iron bridges, and one stone and one timber bridge. The Gothic abbey church dates from the 15th century, but its Romanesque crypt from the 12th. The old Franciscan monastery, now occupied by a seminary, contains a library of 20,000 volumes. Just outside the town rises the Moritzburg, built in 1564 by the dukes of Saxe-Zeitz, on the site of the bishop's palace ; it is now a reformatory and poorhouse. Zeitz has manufactures of cottons and woollens, machinery, wax- cloth, musical instruments, vinegar, cigars, &c. ; and wood- carving,

dyeing, and calico-printing are carried on. In the neighbourhood there are considerable deposits of lignite, and mineral-oil works. In 1885 the population was 21,261 (18,265 in 1880); in 1816 it was 6640.

Zeitz is an ancient place of Slavonic origin. From 968 till 1028 it was the seat of a bishopric, afterwards removed to Naumburg, 15% miles to the north-west, and styled Naumburg-Zeitz. In 1564 the last Roman Catholic bishop died, and his dominions were thenceforward administered by princes of Saxony. From 1653 till 1718 Zeitz was the capital of the dukes of Saxe-Zeitz or Sachsen- Zeitz. It thereafter remained in the possession of the electors of Saxony until 1815, when it passed to Prussia.

ZELLE, or more usually Crtzz, an industrial and com- mercial town in the district of Liineburg in Prussia, is situated on the left bank of the navigable Aller, near its junction with the Fuse and the Lachte, 23 miles to the north-east of Hanover. The town, with which three suburbs were incorporated in 1869, is well built. It is the legal and official centre of a "circle," and contains the usual tribunals and bureaux, besides several schools, benevolent institutions, and a prison. The library of the appeal court-house consists of 60,000 vols. The principal church contains a ducal burial vault, in which is buried Sophia Dorothea, first wife of the elector George of Hanover, afterwards George I. of England. The town-house dates from the 14th century. The most interesting building in Zelle is the former ducal castle, begun in 1485 in the Late Gothic style, but with extensive Renaissance additions of the close of the 17th century. Caroline Matilda, the divorced wife of Christian VII. of Denmark and sister of George ITI. of England, resided here from 1772 till her death in 1775; she is buried in the above-mentioned church, and a memorial tablet has been erected to her in the "French garden" outside the town. The industries of the place include the manufacture of woollen yarn, cigars, glue, printers' ink, philosophical instruments, stoves, bricks, &c. ; and it carries on trade in wood, wool, honey, wax, cranberries, and other articles, Nursery-gardening flourishes in the fertile environs, where there are also a

large paper-mill and a Government stud farm. The popula- tion in 1885 was 18,782, almost entirely Protestant.

Zelle received town-rights in 1292. From about 1369 it was the residence of the ducal family of Brunswick – Liineburg – Zelle, which became extinct in 1705. In the 17th century Zelle was the most strongly-fortified town in Liineburg. In 1757 it was besieged and partly laid in ashes by Richelieu. At the peace of Zelle (5th February 1679) Sweden gave in her adhesion to the peace of Nime- guen. Zelle is the birthplace of Thaer (1752-1828), the eminent agriculturist, and of Ernst K. F. Schulze (1789-1817), the poet.

ZEND-AVESTA, the original document of the religion of ZoROASTER (q.v.), and still used by the ParsrxEs (g.v.) as their bible and prayer book. The name " Zend-Avesta" has been current in Europe since the time of Anquetil Duperron (c.1771), but the Parsees themselves call it simply Avesta,— Zend (1.¢., "interpretation ") being specially employed to denote the translation and exposition of a great part of the Avesta which exists in Pantavi (g.v.). Text and transla- tion are often spoken of together in Pahlavi books as Avistak va Zand ("Avesta and Zend"), whence (through a misunderstanding) our word Zend-Avesta. The origin and meaning of the word "Avesta" (or in its older form Avistak) are alike obscure; it cannot be traced further back than the Sasanian period. The language of the Avesta is still frequently called Zend; but, as already implied, this is a mistake. We possess no other document written in it, and on this account modern Parsee scholars, as well as the older Pahlavi books, speak of the language and the writing indifferently as Avesta. As the original home of the lan- guage can only be very doubtfully conjectured, we shall do well to follow the usage sanctioned by old custom and apply the word to both. Although the Avesta is a work of but moderate compass (comparable, say, to the Jliad and Odyssey taken together), there nevertheless exists no single MS. which gives it in its entirety. This circum- stance alone is enough to reveal the true nature of the book : it is a composite whole, a collection of writings as the Old Testament is. It consists, as we shall afterwards see, of the last remains of the extensive sacred literature in which the Zoroastrian faith was formerly set forth.

Contents and Character.—As we now have it, the Avesta consists of four parts,—the Yasna, the Vispered, the Vendidad, and the Khordah Avesta.

1. The Yasna, the principal liturgical book of the Parsees, in 72 chapters (Aditi, hd), contains the texts that are read by the priest at the solemn Yasna (Izeshne) ceremony. The arrangement of the chapters is purely liturgical, although their matter in many cases has nothing to do with the liturgical action. The kernel of the whole book, around which the remaining portions are grouped, consists of the Gdthds or "hymns" of ZOROASTER (g.v.), the oldest and most sacred portion of the entire canon. The Yasna accordingly falls into three sections of about equal length. (a) The introduc- tion (chaps. 1-27) for the most part is made up of long-winded, monotonous, reiterated invocations. (b) The Gathds (chs. 28-54) contain the discourses, exhortations, and revelations of the prophet, written in a metrical style and an archaic language, different in many respects from that ordinarily used in the Avesta. As to the authenticity of these hymns, see ZoROASTER. The GAthds proper, arranged according to the metres in which they are written, fall into five subdivisions (28-37, 43-46, 47-50, 51, 53). Between chap. 37 and chap. 43 is inserted the so-called Seven-Chapter Yasna (haptanghditi), a number of small prose pieces not far behind the Gathas in antiquity. (c) The so-called Later Yasna (Aparé Yasné) (chaps. 54-72) has contents of considerable variety, but consists mainly of invocations.

2. The Vispercd, a minor liturgical work in 24 chapters (karde), is alike in form and substance completely dependent on the Yasna; it is based upon the arrangement of the Yasna in its present form, a circumstance proving its much later date asa whole. The name Vispered, meaning "all the chiefs" (vispé ratavé), has reference to the spiritual heads of the religion of Ormuzd, invocations to whom form the main contents of the book.

3. The Vendidad (Vitdaévé Datem), ¢.c., the law for the "enemies of the devil," contains in 22 chapters (fargard) a kind of dualistic account of creation (chap. 1), the legend of Yima and the golden age (chap. 2), the praises of agriculture (chap. 3), and in the bulk of the remaining chapters the circumstantial precepts of the religion

with reference to purification and ecclesiastical penance. It may with propriety be called the "' priestly code" of the Parsees.

The Yasna, Vispered, and Vendidad together constitute the Avesta in the stricter sense of that word, and the reading of them appertains to the priest alone. For liturgical purposes the sepa- rate chapters of the Vendidad and the Vispered are sometimes in- serted amongst those of the Yasna so as to form what is known as the Vendidad Sade, which then, accompanied by certain liturgical actions, is publicly read in the Parsee worship. The reading of the GAthds and Vendidad in this case may, when viewed according to the original intention, be taken as corresponding in some sense to the sermon, while that of the Vispered and the rest of the Yasna may be taken as corresponding to the hymns and prayers of Chris- tian worship. e ,

4. In marked contrast to the three already mentioned is the Khordah Avesta, or Little Avesta, which is designed equally for priesthood and laity, and serves rather as a_book of private devo- tion. Besides some short prayers, such as the Nydishes, the favourite daily prayers of the Parsees, it contains the Yashts or songs of praise, twenty-one in number, addressed to the Yazatas (Izads), the deities and angels of the Ormuzd creed.

Over and above the four books just enumerated there are a con- siderable number of fragments from other books, as well as quota- tions, glosses, and glossaries.

In its present form, however, the Avesta is only a frag- mentary reninant of the old priestly literature of Zoroas- trianism, a fact confessed by the learned tradition of the Parsees theniselves, according to which the number of Yashts was originally thirty. The truth is that we possess but a trifling portion of a very much larger original Avesta, if we are to believe native tradition, carrying us back to the Sasanian period, which tells of an original Avesta in twenty-one books called nasks or nosks, as to the names, contents, and chapters of which we have several more or less detailed accounts, particularly in the Pahlavi Dinkard and in the Rivayats. From the same sources we learn that even then a considerable portion of the original Avesta had been lost : we are told that of a number of nosks only a small portion was found to be extant "after Alexander."

For example, of the seventh nosk, which "before Alexander " had as many as fifty chapters, there then remained only thirteen ; and similar things are alleged about the eighth, ninth, tenth, and other nosks. But even of the remains of the original Avesta, as these lay before the authors referred to, only a small portion has survived to our time. Of all the nosks one only, the nineteenth, has come down to us unimpaired and intact,—the Vendidad. All the others, with the exception of slight traces, have disappeared in the course of centuries.

It would be rash to treat in an offhand way this old tradition about the twenty-one nosks as pure invention. The number twenty-one indeed points to an artificial arrangement of the material; for twenty-one is a sacred number, and the most sacred prayer of the Parsees, the so- called Ahuné Vairyé (Honovar) contains twenty-one words : and it is also true that in the enumeration of the nosks we miss the names of the books we know—Yasna, Vispered, as well as the Yashts and the Khordah Avesta. But either we must regard them as having been included among the nosks, though under other names, or, what is even more probable, we must assume that even at that early date special liturgical manuals—the Yasna especially—distinct from the nosks had already been compiled for the practical use of the priests. Further, the statements of the Dinkard and other writings leave on one a very distinct impression that the authors actually had before them the text of the nosks, or at all events of a large part of them. And, besides in other directions there are numerous indications that such books had once really existed. In the Khordah Avesta as we now have it we find two Srésh Yashts ; with regard to the first, it is expressly stated in old MSS. that it was taken from the Hadékht nosk (the twentieth, accord- ing to the Dinkard). From the same nosk also a consider- able fragment (Y¢., 21 and 22 in Westergaard) has been

taken. So also the extensive quotations from Avesta texts in the Wiringistén, a Pahlavi book, are probably the disjecta membra of the seventeenth (or Haspéram) nosk. Lastly, the numerous other fragments, the quotations in the Pahlavi translation, the many references in the

Bunda- hish to passages of this Avesta not now known to us, all presuppose the existence in the Sasanian period of a much more extensive Avesta literature than the mere prayer book now in our hands. The existence of an original Avesta is far from being a mere myth. But, even granting that a certain obscurity still hangs undispelled over the problem of the old Avesta, with its twenty-one nosks, we may well believe the Parsees themselves, when they tell us that their sacred literature has passed through successive stages of decay, the last of which is represented by the present Avesta. There is evidence of this in the patchwork and fragmentary character of some portions of the present Avesta; and, moreover, in the MS. evidence of recent centuries we are able to observe with our own eyes the actual process of abridgment gradually going on, and to trace the manner in which certain portions of the present Avesta slowly passed out of currency. This holds good, in particular, of the greater Yashts. The transcribers of the Khordah Avesta satisfied themselves for the most part with those prayers which were currently in use, such as the Nydishes and one or two of the smaller and inter- mediate Yashts. The great Yashts are not of very frequent occurrence: some of them indeed are already met with but seldom, and MSS. containing all the Yashts are of great rarity. Of the fifteenth, seventeenth, and nineteenth Yashts we might even venture to predict that some centuries hence they may perhaps be found defying the tooth of time in not more than a single manuscript copy.

Origin and History.—While all that Herodotus (i. 132) has got to say is that the Magi sang "the theogony" at their sacrifices, Pausanias is able to add (v. 27, 3) that they read from a book. Hermippus in the 3d century B.c. affirmed that Zoroaster, the founder of the doctrine of the Magi, was the author of twenty books, each containing 100,000 verses. According to the Arab historian Tabari, these were written on 1200 cowhides, a statenient confirmed by Masudi, who writes, "Zartusht gave to the Persians the book called Avesta. It consisted of twenty-one parts, each containing 200 leaves. This book, in the writing which Zartusht invented and which the Magi called the writing of religion, was written on 12,000 cowhides, bound together by golden bands. Its language was the Old Persian, which no one now understands." These statements suffi- ciently establish the existence and great bulk of the sacred writings. Parsee

tradition adds a number of interesting statements as to their history. According to the Arda- Viraf-Ndma, stated to have been written during the Sasanian period, the religion revealed through Zoroaster had subsisted in its purity for 300 years when Iskander Rumi (Alexander the Great) invaded and devastated Iran, and burnt the Avesta which, written on cowhides with golden ink, was preserved in the archives at Persepolis. According to the Dinkard, there were two copies, of which one was burnt, while the second perished at the hands of the Greeks in some other way. The Rivayats have it that Alexander burnt the greater part of the twenty-one nosks, and go on to say that after his death the Zoroastrian priests met, gathered the scattered fragments which had escaped the ravages of war, and put together the present collection, which is but a small portion of the original book. With regard to this editing the Dinkard gives various details. It tells us that the collecting of the Avesta fragments, so far as these were still extant, whether in writing or in oral tradition, began under the last of the Arsacids at the command of King Vologeses. The first of the Sasanians,

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Ardeshir Babagan, and his son Shapar J. resumed and con- tinued the work, and proclaimed the new Avesta thus pro- duced as canonical. Finally, under Shaptr II. (309-380) a new revision and final redaction were made by Adarbid Mahraspand

It is possible enough for historical criticism to regard this tradition in many of its features as mere fiction, or as a perversion of facts made for the purpose of transferring the blame for the loss of a sacred literature to other shoulders than those really responsible for it. People may, if they choose, absolve Alexander from the charge of vandalism of which he is accused; but the fact nevertheless remains, that he suffered the palace at Persepolis to be burnt (Diod., xvil. 72; Curt., v. 7). Even the statement as to the one or two complete copies of the Avesta may be given up as the invention of a later day. Nevertheless the essential elements of the tradition remain unshaken, viz., that the original Avesta or old sacred literature, divided on account of its great bulk and heterogeneous contents into many portions and a variety of separate works, had an

actual existence in numerous copies and also in the memories of priests, that, although gradually diminishing in bulk, it remained extant during the long period of foreign domina- tion and ecclesiastical decay after the time of Alexander, and that it served as a basis for the redaction subsequently made. The kernel of this native tradition—the fact of a late collection of older fragments—appears indisputable. The character of the book is entirely that of a compilation.

In its outward form the Avesta as we now have it belongs to the Sasanian period, the last survival of the compilers' work already alluded to. And it need hardly be said that the collecting and arranging of the scattered fragments often rendered necessary, or at least desirable, certain ad- ditions by the redactors' own hands. But, broadly speaking, the materials out of which the compilers reared their build- ing belonged originally to older structures and are of very various dates. Opinions differ greatly as to the precise age of the original texts brought together by subsequent redactors : according to some, they are pre-Achzemenian : according to Darmesteter, they were written in Media under the Achemenian dynasty; according to Eduard Meyer, they are on the whole of Sasanian origin ; according to some, their source must be sought in the east, according to others, in the west, of Iran. But to search for a precise time or exact locality is to deal with the question too narrowly ; it is more correct to say that the Avesta was worked at from the time of Zoroaster down to the Sasanian period. Its oldest portions, the Gathas, proceed from Zoroaster himself. This conclusion is inevitable for every- one to whom Zoroaster is an historical personality, and who does not shun the labour of an unprejudiced research into the meaning of those difficult texts (comp. ZOROASTER). The rest of the Avesta, in spite of the opposite opinion of learned Parsees, does not even claim to come from Zoroaster. As the Gathas constitute the kernel of the Later Yasna, so they ultimately proved to be the first nucleus of a religious literature at large. The language in which Zoroaster taught, especially a later development of it,—an idiom in- disputably belonging to eastern Iran,—remained as the standard with the followers of Zoroaster, and became the sacred language of the priesthood of the faith which he had founded ; as such it became, so to speak, absolved from the ordinary conditions of time and space. Taught and acquired as an ecclesiastical language, it was enabled to live an

artificial life long after it had become extinct as a vernacular,—in this respect comparable to the Latin of the Middle Ages or the Hebrew of the rabbinical schools. The various texts themselves enable us to trace its gradual paralysis, decay, and death. It is only from this point of view that the language can be used as a criterion for the

relative chronology of these. Any more exact arrangement seems almost impossible ; we have practically no other tests to apply. The priests by whom the texts were edited gave them the form intended to be valid once for all and refrained from any allusion to ephemeral relations, The following conclusions may be stated in a general way.

The language of the Avesta travelled with the Zoroastrian religion and with the main body of the priesthood, in all probability, that is to say, from east to west; within the limits of Iran it became international. The Avesta texts must have passed through a long process of development, which did not reach its close till at a comparatively late period. Many portions are the result of repeated redacting and compiling ; older texts are removed from their original connexion, and worked into new ones or made use of in these. In these operations the revisers of the Sasanian epoch may be presumed to have had only the smallest share; the texts they had before them were already for the most part in a revised form. They were no longer in a position to give a relatively correct text ; what they still had in their power to some extent to perform is approxi- mately exhibited in such passages as Y¢., 1, 12 sg.; Ye, 2, 11 sg. ; Yt., 10, 120 sq.,—perhaps in part translated back from the Pahlavi.

The great Yashts and the Vendidad are the most instructive portions for the history of the text. The original kernel of Yashkts 5, 8, 15, 17, 19 consists of the Iranian mythology of gods and heroes which had its origin in the East, and there also was cast into a poetical form. Fragments of it were worked into the framework of the great Yashts at a much later date. The author of Vend., 2 used in a fragmentary way a poetic version of the Yima legend. 'The redactor of Verdes, judging from the monotonous and clumsy style of the opening sections, must have been prosaic enough ; yet from the twenty-fourth paragraph onwards we have a bright and pleasant

description of the blessings of agriculture, in a poetical form, that contrasts singularly with what im- mediately precedes it, and must certainly have been borrowed from an older source. In this way alone can we in other instances also account for the numerous verses with which the prose is often interspersed. Their function often was merely to set off and ornament the later prose. Of "genuine" and "spurious" there can be in this connexion no question, but only of "older" and "more recent." However vague and obscure the question may remain after all has been said, we can at least lay so much down as fundamentally fixed, namely, that all that is metrical in the Avesta bears the stamp of a higher antiquity than does the prose.

As has been already stated, the Avesta now in our hands is but a small portion of the book as edited under the Sasanians. The large part perished under the devastating wave of persecution which broke over Iran with the Mohammedan invasion, or under the still more fatal influ- ences of the apathy and forgetfulness of its proper guardians, The understanding of the older Avesta texts was far from perfect even at the time when they were being edited and revised. The need for a translation and interpretation became evident; and under the later Sasanians the majority of the books, if not the whole of them, were rendered into the current Pahlavi. A thorough use of this translation will not be possible until we have it in good critical editions, and acquaintance with its language ceases to be the mono- poly of a few privileged individuals. For the interpretation of the older texts it is of great value. The Parsee priest Neryosangh subsequently translated a portion of the Pahlavi version into Sanskrit.

The MSS. of the Avesta are comparatively speaking of recent date. The oldest is the Pahlavi Vispered in Copenhagen, of date

1258. Next come the four MSS. of the Herbad Mihiraépan Kat Khusro at Cambay (1323 and 1324), two Vendidads with Pahlavi in London and Copenhagen, and two Yasnas with Pallavi in Copenhagen and Bombay,

in the possession of Dastur Jamaspji Minocheherji, who of all the Parsees is richest in old and good MSS. Generally speaking, the MSS. fall off in quality and carefulness in proportion to their lateness ; an honourable exception must be made in favour of those proceeding from Kirman and Yazd in Persia, mostly dating from the 17th and 18th centuries.

The first European scholar to direct attention to the Avesta was Hyde of Oxford, in his Historia Religionis Veterum Persarwm eorumgue Magorum (1700), which, however, failed to awaken any lasting interest in the sacred writings of the Parsees. The merit of achieving this belongs to the enthusiastic Orientalist Anquetil Duperron, the fruit of whose prolonged stay in India (from 1754 to 1761) and his acquaintance with the Parsee priests was a translation (certainly very defective) of the Zcud-Avesta. The foundation of a scientific exegesis was laid by Burnouf. The interpretation of the Avesta is one of the most difficult problems of Oriental philology. To this very day no kind of agreement has been reached by conflicting schools even upon some of the most important points. The most salient contributions are those of Westergaard, Spiegel, Darmesteter, Roth, and Bartholomae. Opi- nion is divided also as to the significance of the Avesta in the liter- ature of the world. The exaggerated enthusiasm of Anqnetil Du- perron has been followed, especially since Spiegel's translation, by an excessive reaction. The future will doubtless be more just with regard to the importance of the book for the history of religion in general and even of Christianity.

Editions.—The first complete editions were that by Westergaard (Copenhagen, 1852-54) and that of the Avesta in the stricter sense, along with the Pahlavi translation, by Spiegel (Vienna, 1853-58). A new and complete edition by Geldner has been in course of publication since 1885. The best translation is that by Darmesteter and Mills in Sacred Books of the East (3 vols., Oxford, 1880 sq., with an excellent introduction by the first-named).

Literature.—See Anquetil Duperron, Zend-Avesia, Ouvrage de Zoroastre, &e., (Paris, 1771) ; Haug, Essays on the Sacred Language, &c., of the Parsis, especially in the new edition by E. W. West (London, 1878); De Harlez, Introduction

a UEtude de U Avesta (Paris, 1881); Max Duncker, Geschichte des Alterthums, vol. ;

iv.; and Eduard Meyer, Geschichte des Alterthums (Stuttgart, 1884). (K. G.)

ZENO, emperor of the East from 474 to 491, was an Isaurian of noble birth, and originally bore the name of Trascalisszeus, which he exchanged for that of Zeno on his marriage with Ariadne, daughter of LeoI., in 468. Of his early life nothing is known ; after his marriage (which was designed by Leo to secure the Isaurian support against his ambitious minister Aspar) he became patrician and com- mander of the imperial guard and of the armies in the East. While on a campaign in Thrace he narrowly escaped assassination ; and on his return to the capital he avenged himself by compassing the murder of Aspar, who had instigated the attempt. In 474 Leo I. died after appointing as his successor Leo the son of Zeno and Ariadne ; Zeno, however, with the help of his mother-in-law Verina, succeeded in getting himself crowned also, and on the death of his son before the end of the year became sole emperor. In the following year, in consequence of a revolt fomented by Verina in favour of her brother Basiliscus, he was compelled to take refuge in Isauria, whither he was pursued by Illus and Trocundus, two of the usurper's generals, and where, after sustaining a defeat, he was compelled to shut himself up in a strong castle. Basiliscus, however, soon outstripped Zeno in avarice, cruelty, and self-indulgence, and the vicissitudes of war and intrigue ultimately enabled the latter to re-enter Constantinople unopposed (July 477), while his rival was banished to Phrygia, where he soon afterwards died. The remainder of Zeno's reign was disturbed by numerous other less formid- able revolts, and it was to relieve himself of the pressure of one of these that in 487 he gave Taroporic (9.2.) permission to invade Italy and dethrone Odoacer, which led to the establishment of the Ostrogothic kingdom in Italy. At an earlier period of his reign (476) Zeno had received the deputation from the Roman senate which announced the deposition of Romulus Augustulus. In ecclesiastical history the name of Zeno is associated with the Henoticon or instrument of union, promulgated by him and signed by all

the Eastern bishops, with the design of terminating the Monophysite controversy. The docu-

ment, which is given by Evagrius (H.£., iii. 14), re-affirms the doctrine of the Niczeno-Constantinopolitan creed, and renews the condemnation of Nestorius pronounced by the council of Ephesus, but adroitly avoids the crucial point as to the unity or duality of natures in the Incarnate Word, treating this as an open question.

ZENO or Citrum. See Stores.

ZENO or Evga, son of Teleutagoras, is supposed to have been born towards the beginning of the 5th century B.c. The pupil and the friend of Parmenides, he sought to recommend his master's doctrine of the existence of the One by controverting the popular belief in the exist- ence of the Many. In virtue of this method of indirect argumentation he is regarded as the inventor of "dia- lectic," that is to say, disputation having for its end not victory but the discovery or the transmission of truth. He is said to have been concerned in a plot against a tyrant, and on its detection to have borne with exemplary constancy the tortures to which he was subjected; but authorities differ both as to the name and the residence of the tyrant and as to the circumstances and the issue of the enterprise.

In Plato's Parmenides, Socrates, "then very young," meets Parmenides, "an old man some sixty-five years of age," and Zeno, "aman of about forty, tall and person- able," and engages them in philosophical discussion. But it may be doubted whether such a meeting was chrono-logically possible. Plato's account of Zeno's teaching (Parmenides, 128 sq.) is, however, presumably as accurate as it is precise. In reply to those who thought that Parmenides's theory of the existence of the One involved inconsistencies and absurdities, Zeno tried to show that the assumption of the existence of the Many carried with it inconsistencies and absurdities grosser and more numerous. In early youth he collected his arguments in a book, which, according to Plato, was put into circulation without his knowledge.

Of the paradoxes used by Zeno to discredit the belief in plurality and motion, eight survive in the writings of Aristotle and Simpli- cius. They are commonly stated as follows.! (1) If the Existent is Many, it nwst be at once infinitely small and infinitely great,— infinitely small, because the parts of which it consists must be in- divisible and therefore without magnitude ; infinitely great, be- cause, that any part having magnitude may be separate from any other part, the intervention of a third part having magnitude is necessary, and that this third part may be separate from the other two the intervention of other parts having magnitude is necessary, and so on ad infinitum. (2) In like manner the Many must be numerically both finite and infinite,—numerically finite, because there are as many things as there are, neither more nor less; numerically infinite, because, that any two things may be separate, the intervention ofa third thing is necessary, and so on ad infinitum. (3) If all that is is in space, space itself must be in space, and so on ad infinitum. (4) Ifa bushel of corn turned out upon the floor makes a noise, each grain and each part of each grain must make a noise likewise ; but, in fact, it is not so. (5) Before a body in motion can reach a given point, it must first traverse the half of the distance ; before it can traverse the half of the distance, it must first traverse the quarter; and so on ad infinitum. Hence, that a body may pass from one point to another, it must traverse an infinite number of divisions. But an infinite distance (which Zeno fails to distinguish from a finite distance infinitely divided) cannot be traversed in a finite time. Consequently, the goal can never be reached. (6) If the tortoise has the start of Achilles, Achilles can nevcr come up with the tortoise ; for, while Achilles traverses the distance from his starting-point to the starting-point of the tortoise, the tortoise advances a certain distance, and while Achilles traverses this distance the tortoise makes a further advance, and so on ad infinitum. Consequently, Achilles may run ad infinitum without overtaking the tortoise. [This paradox is virtually identical with (5), the only difference being that, whereas in (5) there is one body, in (6) there are two bodies, moving towardsalimit. The "infinity" of the premise is an infinity of subdivisions of a distance which is finite ; the "infinity" of the conclusion is an infinity of distance. Thus Zeno again confonnds a finite distance infinitely divided with an infinite distance. Ifthe tortoise hasa start of 1000 feet, Achilles,

1 See Zeller, Die Philosophie d. Griechen, I. 540 sg.; Grundriss, 54.

on the supposition that his speed is ten times that of the tortoise, must traverse an infinite number of spaces,—1000 feet, 100 feet, 10 feet, &c.,—and the tortoise must traverse an infinite number of spaces,—100 feet, 10 feet, 1 foot, &c.,—before they reach the point, distant from their starting-points 11114 feet and 1114 feet respect- ively, at which the tortoise is overtaken. In a word, 1000, 100, 10, &c., in (6) and 4, 3, $, &., in (5) are convergent series, and 11115 and 1 are the limits to which they respectively approximate.] (7) So long as anything is in one and the same space, it is at rest. Hence an arrow is at rest during every moment of its flight, and therefore also during the whole of its flight. (8) Two bodies mov- ing with equal speed traverse equal spaces in equal times. But, when two bodics move with equal speed in opposite directions, the one passes the other in half the time in which it passes it when at rest. These propositions appeared to Zeno to be irreconcilable.

In short, the ordinary belief in plurality and motion seemed to him to involve fatal inconsistencies, whence he inferred that Par- menides was justified in distinguishing the mutable movable Many from the immutable immovable One, which alone is really existent. In other words, Zeno re-affirmed the dogma, "The Ent is, the Non- ent is not." It may seem strange that a reasoner so acute should confound that which is infinitely divisible with that which is in- finitely great, as in (1), (2), (5), and (6); that he should identify space and magnitude, as in (3); that he should neglect the imper- fection of the organs of sense, as in (4); that he should resolve motion into a series of states of rest, and on the strength of this analysis deny the reality of motion, as in (7); and that he should ignore the relativity of speed, as in (8). But Zcno's perplexity was genuine, and his end was positive. He was neither an eristic seeking an argumentative victory, nor a sceptic despairing of truth, but an honest thinker, breaking ground in a new field with indiffer- et success,

Great as was the importance of these paradoxes of plurality and motion in stimulating speculation about space and time, their direct influence upon Greek thought was less considerable than that of another paradox,—

strangely neglected by historians of philosophy,—the paradox of predication. We learn from Plato (Paurmenides, 127 D) that "the first hypothesis of the first argument " of Zeno's book above mentioned ran as follows: "If ex- istences are many, they must be both like and unlike {unlike, inasmuch as they are not one and the same, and like, inasmuch as they agree in not being one and the same, Proclus, On the Parmenides, ii. 143]. But this is impossible ; for unlike things cannot be like, nor like things unlike. Therefore existences are not many." That is to say, not perceiving that the same thing may be at once like and unlike in different relations, Zeno regarded the attribution to the same thing of likeness and unlike- ness as a violation of what was afterwards known as the principle of contradiction; and, finding that plurality entailed these attributions, he inferred its unreality. Now, when without qualification he affirmed that the unlike thing cannot be like, nor the like thing unlike, he was on the high road to the doctrine maintained three-quarters of a century later by the Cynics, that no predication which is not identical is legitimate. He was not indeed aware how deeply he had committed himself; otherwise he would have observed that his argument, if valid against the Many of the vulgar, was valid also against the One of Parmenides, with its plurality of attributes, as well as that, in the absence of a theory of predication, it was useless to specu- late about knowledge and being. But others were not slow to draw the obvious conclusions ; and it may be con- jectured that Gorgias's sceptical development of the Zeno- nian logic contributed, not less than Protagoras's sceptical development of the Ionian physics, to the diversion of the intellectual energies of Greece from the pursuit of truth to the pursuit of culture.

For three-quarters of a century, then, philosophy was at a standstill ; and, when in the second decade of the 4th century the pursuit of truth was resumed, it was plain that the difficulty raised by Zeno must be met before the problems which had occupied the earlier thinkers—the problem of knowledge and the problem of being—could be so much as attempted. Accordingly, in the seventh

book of the Republic, where Plato propounds his scheme of Academic education, he directs the attention of studious youth primarily, if not exclusively, to the concurrence of inconsistent attributes; and in the Phedo, 102 B-103 A, taking as an instance the tallness and the shortness simul- taneously discoverable in Simmias, he offers his own theory of the immanent idea as the solution of the paradox. Simmias, he says, has in him the ideas of tall and short. Again, when it presently appeared that the theory of the immanent idea was inconsistent with itself, and moreover inapplicable to explain predication except where the sub- ject was a sensible thing, so that reconstruction became necessary, the Zenonian difficulty continued to demand and to receive Plato's best attention. Thus, in the Par- menides, with the paradox of likeness and unlikeness for his text, he inquires how far the current theories of being (his own included) are capable of providing, not only for knowledge, but also for predication, and in the concluding sentence he suggests that, as likeness and unlikeness, greatness and smallness, é&c., are relations, the initial paradox is no longer paradoxical; while in the Sophist, Zeno's doctrine having been shown to be fatal to reason, thought, speech, and utterance, the principle which in the Parmenides is applied to atré xa6' attra eiSy and to sensible particulars is extended to include the case of iy which are not avra xa@' atrd. It would seem then that, not to Antisthenes only, but to Plato also, Zeno's paradox of predication was a substantial difficulty; and we shall be disposed to give Zeno credit accordingly for his percep- tion of its importance.

In all probability Zeno did not observe that in his controversial defence of Eleaticism he was interpreting Parmenides's teaching anew. But so it was. For, while Parmenides had recognized, together with the One, which is, and is the object of knowledge, a Many, which is not, and therefore is not known, but nevertheless becomes, and is the object of opinion, Zeno plainly affirmed that plur- ality, becoming, and opinion are one and all inconceivable. In a word, the fundamental dogma, "The Ent is, the Non-ent is not," which with Parmenides had been an assertion of the necessity of distinguishing between the Ent, which is, and the Non-ent, which is not, but becomes, was with Zeno a declaration of the Non-ent's absolute nullity. Thus, Just as Empedocles developed Parmenides's theory of the Many to the neglect of his theory of the One, so Zeno developed the

theory of the One to the neglect of the theory of the Many. With the severance of its two mem- bers Eleaticism proper, the Eleaticism of Parmenides, ceased to exist.

The first effect of Zeno's teaching was to complete the discomfiture of philosophy. For the parodox of predica- tion, which he had used to disprove the existence of plurality, was virtually a denial of all speech and all thought, and thus led to a more comprehensive scepticism than that which sprang from the contemporary theories of sensation. Nevertheless, he left an enduring mark upon Greek speculation, inasmuch as he not only recognized the need of a logic, and grappled, however unsuccessfully, with one of the most obvious of logical problems, but also by the invention of dialectic provided a new and powerful instrument against the time when the One and the Many should be reunited in the philosophy of Plato.

Bibliography.—F¥. W. A. Mullach, Fragmenta Philosophorum Grecorwm, Paris, 1860, i. 266 sq. ; Zeller, Die Philosophie d. Griechen, Leipsic, 1876, i. 584-552; P. Tannery, Pour I' Histoire de la Science flelléne, Paris, 1887, pp. 247-261. Ignoring the philosophical aspect of Zeno's teaching, Tannery supposcs him to have main- tained in opposition to the Pythagoreans that body is not a sum of points, time not a sum of moments, and motion not a sum of passages from point to point. For histories of philosophy and other works upon Eleaticism, see PARMENIDES. (H. JA.)

ZENOBIA. See Patmyra, vol. xviii. p. 201 sq.

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ZENTA, a market town of Hungary, in the county of Bacs-Bodrog, on the right bank of the river Theiss, 20 miles south of Szegedin, is historically known for the decisive victory won in its vicinity by Prince Eugene over the Turks in 1696. The population, which is purely agri- cultural, numbered 21,200 in 1880, and 16,000 in 1886.

ZEPHANIAH (Sophonias, Zopovias, Heb, IBY, ""whom Jehovah hides" or " protects"; compare the Phoenician man's or woman's name bynypy,

C.L.S., No. 207, Euting, Pun. Steine, p. 16), son of Cushi, the ninth, according to the order of his book, among the twelve minor prophets, flourished in the reign of Josiah of Judah, and apparently before the great reformation in the eighteenth year of that king (621 B.c.). For various forms of idolatry put down in that year are spoken of by Zephaniah as still prevalent in Judah (chap.i. 4 sg.), and are specified in such a connexion as to imply that they were not the secret sins of individuals, but held the first place among the national backslidings that could, as the prophet teaches, be removed only by a sweeping judgment on the state. Of the person of Zephaniah nothing is known ; but it has been conjectured that his great-great-grandfather Hezekiah (chap. i.1) is the king of that name, and if so he belonged to the highest class of Judean society. :

The genuineness and integrity of the short prophecy

ascribed to Zephaniah do not seem to be open to reasonable.

doubt. Stade (Gesch. Isr., i. 644) raises a question about chap. iii., and if this were a distinct oracle there would be no cogent reason to ascribe it to the author of the two chapters that precede; for the book of the minor prophets is made up of a number of short pieces, some bearing a name and some anonymous, and it is only old usage that ascribes the anonymous pieces to the last preceding prophet whose name is prefixed to his prophecy. But, though the sequence of thought in the book of Zephaniah is not so smooth as a Western reader may desire, a single leading motive runs through the whole, and the first two chapters would be incomplete without the third, which moreover is certainly pre-exilic (verses 1-4), and presents specific points of con- tact with what precedes as well as a general agreement in style and idea.

The dominating motive of the whole is the approach of a sweeping and world-wide judgment, which the prophet announces as near at hand, and interprets, on the lines laid down by Isaiah in his prophecies about Israel and Assyria, as designed to destroy the wicked and prepare the way for the visible sovereignty of the righteous God of Israel. As regards Judah, which forms the subject of the first and third chapters, the effect of the judgment will be to sift out the idolaters, the men of violence and wrong,

the false prophets and profane priests, the hardened men of the world to whom all religion is alike and who deem that the Lord will do neither good nor evil. The men who seek meekness and righteousness will be left, a poor and lowly people, trusting in the name of the Lord and eschew. ing falsehood. To them a future of gladness is reserved, a peaceful life under Jehovah's immediate kingship and loving protection. Such an ideal necessarily implies that they shall no longer be threatened by hostility from with- out, and this condition is satisfied by the prophet's view of the effect of the impending judgment on the ancient enemies of his nation. The destruction of the Philistines on the west and of Moab and Ammon on the east will enable the Hebrews to extend their settlements from the Mediterranean to the Syrian desert ; and their remoter oppressors, the Ethiopians and Assyrians, shall also perish. That Ethiopia appears instead of Egypt is in accordance with the conditions of the time. It was with Ethiopic dynasts holding sway in Egypt that Assyria had to con- tend during the 7th century B.c., when the petty kingdoms

of Palestine were so often crushed between the collision of the two great powers, and even Psammetichus, the con- temporary of Josiah, and the restorer of a truly Egyptian kingdom, was nominally the heir of the great Ethiopian sovereigns.

These conceptions are closely modelled on the scheme of Jehovah's righteous purpose worked out by Isaiah a century before, when Judah first felt the weight of the Assyrian rod, and they afford the most conclusive evidence of the depth and permanence of that great prophet's influ- ence. But in one point there is an important divergence. In Isaiah's view Assyria is the rod of God's anger; and, when the work of judgment is complete and Jehovah returns to the remnant of His people, the theodicea is com- pleted by the fall of the unconscious instrument of the divine decrees before the inviolable walls of the holy mountain. Zephaniah in like manner looks to an all-con- quering nation as the instrument of divine judgment on Judah and the rest of the known world. He represents the day of Jehovah, according to the old meaning of that phrase, as a day of battle (not an assize day); he speaks of the guests invited to Jehovah's

sacrifice, z.c., to a great slaughter, of alarm against fenced cities, of blood poured out as dust, of pillage and desolation at the hand of an enemy. But beyond this all is vague; we neither hear who the sword of Jehovah (ii. 12) is, nor what is to become of him when his work is completed. Isaiah's construction has in all its parts a definite reference to present political facts, and is worked out to a complete conclusion ; Zephaniah borrows the ideas of his predecessor without attaining to his clearness of political conception, and so his picture is incomplete. The foreign conqueror, by whom Judah is to be chastised and Nineveh and Ethiopia destroyed, is brought on to the stage, but never taken off it. It is safe to con- clude that the principal actor in the prophetic drama, who is thus strangely forgotten at the last, was not as real and prominent a figure in Zephaniah's political horizon as Assyria was in the horizon of Isaiah. At the same time it is reasonable to think that so complete a reproduction of Isaiah's ideas in the picture of a new world-judgment was not formed without some stimulus from without, and this stimulus has been sought in the Scythian invasion of western Asia, to which some of Jeremiah's earlier prophecies also appear to refer; see IsRaxt, vol. xiii. p. 415. But from the analysis given in the article Scyrura (vol. xxi. p- 577) it is doubtful whether the Scythians had appeared even on the distant horizon at the date of Zephaniah's prophecy,! while, on the other hand, the movements in the far East which preceded the first siege of Nineveh are chronologically suitable, and appear to afford quite sufficient basis for Zephaniah's undefined anticipation of a general political convulsion. How the danger that threatened Nineveh stirred the mind of the Hebrews appears also from the prophecy of Nahum.

Be this as it may, the comparison between Isaiah and Zephaniah affords an instructive example of the difference between original and reproductive prophecy. All the prophets have certain funda- meatal baat in common, and each has learned something from his predecessors. If Zephaniah draws from Isaiah, Isaiah himself drew from Amos and Hosea. But Isaiah goes to his predecessors for general principles, and shapes the application of these principles to the conditions of his own time in a manner altogether fresh and in- dependent. Zephaniah, on the other hand, goes to his predecessor for details ; he does not clearly distinguish between the form and the substance of the prophetic ideas,

and looks for a final consum- mation of the divine purpose, not only in accordance with the

rinciples of Isaiah, but on the very lines which that prophet had aid down. But these lines were drawn on the assumption that the Assyrian judgment was final and would be directly followed by the reign of righteousness. This assumption was not justified by

1 The Scythians appeared in Media about 619 B.c., and, if they were really Sacee and came from the East, their appearance in Palestine would fall still later.

the event ; the deliverance and reformation were incomplete; and the inbringing of the reign of righteonsness was again deferred. Zephaniah sees this, but fails to draw the true inference. He postulates a new crisis in history similar to the Assyrian crisis of which Isaiah wrote, and assumes that it will run such a course as to fulfil Isaiah's unfulfilled predictions. But the movements of history do not repeat themselves ; and the workings of God's right- eous providence take fresh shape in each new scene of the world's life, so that a prediction not fulfilled under the conditions for which it was given can never again be fulfilled in detail. As it is an essential fcature of prophecy that all ideas are not only presented but thought out in concrete form, and with reference to present historical conditions, the distinction between the temporary form and the permanent religious truth embodied in that form is also essential. The tendency to confound the two, to ascribe absolute truth to what is mere embodiment, and therefore to regard unful- filled predictions as simply deferred, even where the form of the prediction is obviously dependent on mere temporary conditions of the prophet's own time, gained ground from the time of Zephaniah onwards, and culminated in the Apocalyptic literature. As it grew, the eternal ideas of the great prophets fell into the background, aud were at length entirely lost in the crass Jewish conception of a Messianic age, which is little more than an apotheosis of national particularism and selfrighteousness. Zephaniah's eschatology is not open to this charge: with him, as with Isaiah, the doctrine of the salvation of the remnant of Israel is inspired by spiritual con- victious and

instinct with ethical force. The emphasis still lies on the moral idea of the remnant, not on the physical conception Israel. He does not yield to Amos or Isaiah in the courage with which he denounces sin in high places, and he is akin to Hosea in his firm hold of the principle that the divine governance is rooted not only in righteousness but in love, and that the triumph of love is the end of Jehovah's working. Yet even here we see the differ- ence between the first and second generations of prophecy. The persuasion to which Hosea attains only through an intense inward struggle, which lends a peculiar pathos to his book, appears in Zephaniah, as it were, ready made. There is no mental conflict before he can pass through the anticipation of devastating judgment to the assurance of the victory of divine love, and the sharp transi- tions that characterize the book are not, as with Hosea, due to sudden revulsion of feeling, but only mark the passage to some new topic in the circle of received prophetic truth. The finest thing in the book—in spite of certain obscurities, which may be partly due to corruptions of the text—is the closing passage ; but the description of the day of Jehovah, the dies ire dies illa of chap. i. 15, which furnishes the text of the most striking of medieval hymns, has perhaps taken firmer hold of the religious imagination. Least satisfactory is the treatment of the judgment on heathen nations, and of their subsequent conversion to Jehovah. In the scheme of Isaiah it is made clear that the fall of the power that shatters the nations cannot fail to be recognized as Jehovah's work, for Assyria falls before Jerusalem as soou as it seeks to go beyond the limits of the divine commission, and thus the doctrine ' With us is God" is openly vindicated before the nations. But Zephaniah assumes that the convulsions of history are Jehovah's work, and specially designed for the instruction and amendment of Israel (iii. 6 sg.), and neglects to show how this conviction, which he himself derives from Isaiah, is to be brought home by the com- ing judgment to the heart of heathen nations. Their own gods indeed will prove helpless (ii. 11), but this is not enough to turn their eyes towards Jehovah. Here, therefore, there is in his eschatology a sensible lacuna, from which Isaiah's construction is free, and a commencement of the tendency to look at things from a merely Israelite standpoint, which is so notable a feature of the latcr Apocalyptic.*

There is no important separate commentary on Zephaniah ; the student must refer to the commentaries on the minor prophets (see HosEa). The relative section in Duhm, Theologie der Propheten, deserves attention. An apocryphal

prophecy ascribed to Zephaniah is quoted by Clement of Alexandria, Stromata, v. Il, § 78. CW. R. 8.)

ZEPHYRINUS, Sz, bishop of Rome from about 202 to 26th August 217, succeeded Victor I. He is described as a man of little intelligence or strength of character, and the somewhat important controversies on doctrine and discipline that marked his pontificate are more appropri- ately associated with the name of Hrpponytus (q.v.) and of Calixtus, his principal adviser and afterwards his suc- cessor (see PopEpom, vol. xix. p. 489).

ZEPHYRUS, the west wind, brother of Boreas, the north wind, was the son of the Titan Astreus and Eos, the dawn (Hes., Z'heog., 579), and had his palace in Thrace (i1., ix.5; Od., v. 295). He was married to Chloris, the goddess of flowers (Ov., ast., v. 195), by whom he had a son, Carpus; by the harpy Podarge he was also the

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father of Xanthus and Balius, the horses of Achilles a, xvi. 150).

ZERAFSHAN, an independent "circle" or province of Russian Turkestan, includes the valley of the river Zeraf- shan from its sources to Katty-Kurgan, as well as the mountains which bound the valley to the north and south. It is the Socprana (q.v.) of the ancients, famed for its fertility, which is due to the waters of the Polytimetus. The present Russian province of Zerafshan, which is densely peopled along the course of the river, has a length of nearly 250 miles trom west to east, a width of from 50 to 100 miles, and an area of 19,665 square miles. It is bounded on the W. by Bokhara, on the N. by the Kizil- kum Desert of Syr-Daria and the Russian province of Ferghana, on the E. by the Alai plateau, and on the S. by the vassal khanates of Bokhara,—Karategin, Hissar, Shahr-i-Syabs, and Karshi. High chains of mountains enclose the province on

three sides. To the north are the Turke- stan Mountains, which separate the tributaries of the Syr from those of the Amu, rising to 22,000 feet in their highest snow-clad peaks, and crossed by but few passes, which themselves range from 10,000 to 13,000 feet. In the west the Turkestan Mountains are joined by the Nura- tau Mountains, which have a north-westerly direction (see TURKEsTAN). In the south-east the valley of the Zerafshan is separated from that of the Surkhab by the grand snow-clad Hissar Range, which runs from north-east to south-west, and by several chains parallel to it, while farther west a series of mountains, partly running also towards the south-west and partly towards the north-west, separate it from the Bokhara plains of the Amu. The lowest passes across these chains have altitudes of not less than 7000 feet. But the valley of the Zerafshan lies broadly open towards the steppes in the west, and has supplied an easy route for the railway from the Caspian by Merv to Samarkand.

Granites and all kinds of crystalline slates are widely developed in the mountains which enclose Zerafshan. Carboniferous lime- stones are met with in the west; but the great bulk of the deposits which overlie the crystalline slates, and are raised to the greatest heights in the highlands, belong to a more recent geological time, namely, to the Secondary—chiefly Chalk—and Tertiary periods. The Zerafshan valley owes its fertility to the thick terraces of loess which surround the base of the mountains and sometimes reach a thickness of 100 feet.

The Zerafshan river, which owes its name("gold-spreading"') prob- ably more to the fertility it brings than to the gold which is found in very small quantities in its sands, rises under the name of Matchi from a large glacier, fed by the high peaks which rise at the junction (improperly called Kok-su) of the "urkestan Mountains with the Alai Range. The altitude of the glacier is about 9000 feet, and thence the Zerafshan flows due west in a narrow valley, with a fall of not less than 40 feet per mile. Several villages are scattered over the slopes of the mountains ; and some thirty bridges,made of poplar trees felled across the river and swaying under the weight of the foot passenger, furnish means of communication. After a course of nearly 100 miles in the mountains the Zerafshan receives from the left the Fan, with the Yagnob, which flows in a high longitudinal

valley, separated from the main river by the lofty Zerafshan Range. About Pendjakent it enters on its middle course along a broad valley from 20 to 50 miles wide. Large aryks, or irrigation canals, one of which is 50 miles in length and has all the appearance of a river, distribute the waters of the Zerafshan over the valley, while the river itself divides into two great branches, 10 to 12 miles apart, forming a large island, the Miankal, which is the most fertile part of the province. Adam keeps up the water in the southern branch, Kara-Daria, close by which is situated SAMARKAND (q.v.), and five large aryks distribute its water over the fields. Numberless canals drain off its waters farther west in the neighbourhood of the city of Bokhara, so that, after carrying an insignificant volume of water to the small Lake Kara-kul, it stops its course there, some 30 miles from the Amu-Daria, of which it formerly was an affluent.

The population of Zerafshan was reckoned at 351,900 in 1883. The bulk of the inhabitants are Uzbegs and Tajiks, the remainder consisting of a few thousand Persians, Hindus, and Jews respect- ively ; the Russians are mainly military, civil functionaries, merchants, and a few peasant settlers. Wheat, barley, rice, and other cereals, as also lucerne, are widely cultivated, and the gardens

of Zerafshan are beautiful. on in the towns and villages.

Zerafshan is divided into three districts, the chief towns of which are Samarkand (36,000 inhabitants), now connected by rail with Bokhara, Merv, and Mikhailovsk on Krasnovodsk Bay in the Cas- pian Sca; Katty-Kurgan (4425), close by the frontier of Bokhara ; and Pendjakent (1880), chief town of the mountain district of the upper Zerafshan, known as Kohistan.

ZERBST, a manufacturing town in the duchy of Anhalt, Germany, is situated on the Nuthe, 11 miles north- west of Dessau and 21 south-east of Magdeburg. It con- tains five churches, one of which (St Nicholas), built in 1446-88, is a good example of the Late Gothic style as developed in Saxony, with its spacious proportions, groined vaulting, and bare

simple pillars. The town-house dates from about 1480, but it was disfigured by additions in the beginning of the 17th century. The palace (1681- 1750) has been used as a depository of archives since 1872. There are several quaint old houses, with high gables, in the market-place, in the middle of which stand a Roland column, of about 1445, and a bronze figure known as the " Butterjungfer" (butter-girl), of uncertain origin and meaning, but now regarded as the palladium of the town. The old Franciscan monastery, with fine cloisters, founded in 1250, contains the gymnasium ; a nunnery of 1214 has been converted into barracks; and the Augustinian monastery of 1390 has been a hospital since 1525. The site of the old fortifications is occupied by pretty pro- menades. Gold and silver articles, silk, plush, cloth, leather, soap, starch, chemicals, and carriages are among the chief manufactures. Iron-founding is carried on; and several breweries are engaged in the preparation of Zerbster bitter beer, which enjoys considerable repute. Market-gardening is also a profitable industry at Zerbst. The population, almost entirely Protestant, was 15,069 in 1885; in 1849 it was 9350.

Zerbst is an ancient town, mentioned in 949. In 1307 it came into the possession of the Anhalt family, and from 1603 till 1793 was the capital of the collateral branch of Anhalt-Zerbst. In 1793 it passed to Anhalt-Dessau.

ZEUS, the chief deity of ancient Greek religion, bears a name which almost certainly means "sky." His title is identified by etymologists with the Sanskrit Dyaus, the "bright one," "sky," though his legend and place in religion are not closely akin to those of the Vedic deity. It seems nearly certain that the peoples who speak Aryan languages had at some remote time a common word for the sky, and nothing can be more probable than that they also worshipped the vault of heaven. In what sense the sky may have been an Aryan deity before the distant and obscure process called the Aryan dispersion, it is not possible with certainty to say. The followers of Mr Herbert Spencer might not inconsistently suppose that there was once an Aryan medicine-man or chief named Sky, and that on his death his ghost was worshipped and his cult finally blended with that of the actual natural phenomenon. Or, again, it might be argued that the sky was originally adored as a symbol of the Infinite, and that men, losing the

original conception, and misled by the personal appearance of the name as other words for sky became more familiar, were deceived into the belief that "sky " was a personal deity. Or, once nore, theorists might urge that Sky was first worshipped at a stage of early fancy, when all things in nature were looked on as personal and of human parts and passions, while later the sky sank back into the category of lifeless things, leaving Zeus as a distinct personal being and deity. Other hypotheses might, no doubt, be invented, but unhappily we have no means of proving their historical accuracy. It is a common thing among backward races, for example on the Gold Coast, to find Sky worshipped as a god, or regarded as the dwelling-place of gods. How

A variety of petty trades are carricd

ZER—

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and in what manner such conceptions were attained by the ancestors of the ancient Greeks we can never know as a matter of fact

Coming to historical and documentary evidence, our earliest knowledge of Zeus is derived from the Homeric and Hesiodic poems. Itis very probable that in the legend and ritual of remote towns and temples in Greece we have traces of a conception of Zeus much older than that which meets us in Homer. But Homer and Hesiod are the most ancient literary testimonies ; next to these come the speculations of the early philosophers and the writings of the lyric poets, Pindar, Herodotus, and the tragedians. Finally, we have the Zeus of the philosophers of the central period,—Plato and Aristotle,—and the Zeus of the later philosophic periods down to the prevalence of Christianity.

By the time that Zeus meets us in Homer he has wandered far from the original conception of him. What- ever that may have been, Zeus cannot have been first imagined in an age of advanced society on the heroic system, that is, in an age of the fully developed monogam- ous family of city states each governed by a king, and of a general loose confederation, with a kind of upper and lower house,—the prince's council and the

assembly of the people. It is, however, on the model of such a society that the Olympian consistory is organized in Homer, with Zeus for the bretwalda, the principal chief of the gods. Such a position Zeus holds in Homer. The poet represents him as anthropomorphic,—a powerful, humorous, amorous ruler, sometimes troubled by disputes among his younger brethren, —Hades and Poseidon,—his wife, and his children. His claim to supreme authority is based on primogeniture (Z/., xv. 187), whereas in Hesiod Zeus is the successful youngest son of Cronus. Both poets agree that he has overthrown the paternal dynasty, and established his own power after violent struggles. The legends in Hesiod are full of ugly and puerile fables and conceits, dating doubtless from remote and uncivilized antiquity. Though Zeus be so much of a magnified man in Homer, there are probably traces of the elemental conception, and his union with Hera (il., xiv. 152) on the crest of Ida may be a poetic memory of the old story of Heaven wedding Earth, though Hera cannot as a rule be regarded as a form of Gea or of Demeter. While among the gods Zeus is a father, brother, and emperor, Homeric men sometimes use his name as we might use that of God, in a religious rather than in a mythological sense. Now regarded as subject to Fate, so that he cannot save even his own children from her decree, elsewhere he seems to hold the gifts of Fate in his own hand: from two vast jars he deals out good and evil to mankind. Where morals are concerned, he sanctions the oath (//., iii. 227) both in this world and the next, and he is the friend of strangers and suppliants, the patron of the hospitable hearth. In Homer Zeus does not assume the form of the lower animals, and in the strange passage where he recounts his loves, the Leporello of his own Don Juan, he says nothing of those well-known disguises. In Hesiod the old wild tales revive, and we learn, for example (Theog., 886 ; compare the scholiast), that Zeus swallowed his own wife, Metis, after inducing her to take the shape of a fly, just as Puss-in-Boots got rid of the ogre who turned himself into a mouse. In Hesiod, too, we have the tale of Prometheus and Pandora, a tale which afforded such an admirable theme for moral handling by A®schylus. Zeus tempted Epimetheus by the aid of the woman Pan- dora; hence came death into the world and all our woe. Then Prometheus pitied and aided men, whom Zeus had intended to destroy, and the hero was fixed to a rock in Caucasus by order of the god. The myth may be alle-

gorized in a dozen ways, and perhaps may be taken to mean that man does not increase happiness by increasing

knowledge, science, and the arts of life. Without the gifts of Prometheus, carried to what Horace would have thought a profane pitch of perfection, we should not have reached modern industrialism and the horrors of modern war. In Hesiod Prometheus may stand for humanity vainly struggling to be powerful and happy against that inflexible and ruthless law which is Zeus. And what shall the end be? How shall the ways of Zeus be justified to men, and man's rebellion be justified to Zeus? We no more know how Aischylus solved the problem mythically than we can dis- cover the actual solution. The idea that another shall voluntarily take the place of Prometheus (A!sch., Prom. Vonct., 1026) naturally recalls the theory of the Atonement. To such mysteries does the Greek mind attain, and in such ultimate perplexities is the conception of Zeus, the Bon Dieu of the Homeric Olympian festivals, involved.

At the opposite pole from the Hesiodic Zeus is the Zeus who practically means the unknown god, as Terpander sings, Let wavrwv apxa, TavTww ayhTwp, or, as the Orphic hymn (whatever its date) proclaims him, Zebs xepary, Leds uéooa, Ards & éx wavra rérvuxrar.

Thus Zeus becomes a shorthand symbol for the pantheistic deity.

The Zeus of pure religion and of speculation is very different from the Zeus of ritual and of local myth. To ritual, and to the local myths treasured by priests, which often tried to explain the ritual, we owe the unbecoming anecdotes of Zeus as the god who, in the form of ant, snake, bull, eagle, and so forth, made love to the daughters of men. On this point reference may be made to the work of the present writer, J/yths, Ritual, and Religion (ii. 189). The hypothesis there offered is that the Greeks in their early uncivilized state, dwelling in tribes and in scattered kraals or villages, retained traditions like the totemic and magical beliefs of Red Indians or Australians. When they became more united and more civilized, they did not drop wholly the faith that they were descended from animals, nor wholly forget such tales as the Indians tell of Manibozho

and the Australians of Punjel, but they transferred the old anec- dotes to Zeus. In place of saying, "We descend from a bull," they said, "We descend from Zeus, who for purposes of amorous disguise took the shape of a bull," or a swan, or an ant, as the case might be. Probably some foreign legends, Phoenician or African, were also borrowed and attached to Zeus. If this be a correct, as it seems a possible, hypothesis, then it will be well to be cautious in explaining the myths about Zeus as if they were all of elementary origin, and all expressed in images some natural process or series of natural phenomena. We must regard Zeus as an extremely difficult complex, in which elemental myths, myths of savage fancy, myths of perverted history, theories of early natural philosophy, and the ideas of panthe- istic speculation are all confusedly mingled. He is the sum of the religious thought of Hellas, formed in the numberless ages between savagery and complete civilization. He received human sacrifices even after the Christian era ; yet long before it he all but corresponded to the Unknown Substance of Spencerian philosophy. (See Plato, Rep., viii. 565 D; Suidas, s.v. " Laphystius.") A summary of the Zeus myths will be found in Dr William Smith's Dictionary of Classical Mythology. For a comparison between the character and attributes of Jupiter and Zeus, see the article JUPITER.

Among modern works in which the character and legend of Zeus are discussed may be recommended Welcker's @riechische Gotterlehre (Gottingen, 1857); Preller's Griechische Mythologie (Berlin, 1872); the Selected Essays of Mr Max Miiller; Le Sentiment Religieux en Greéce of M. Jules Girard (3d ed., Paris, 1887) ; and C. O. Miiller's Introduction to a Scientific System of Mythology (Eng. transl., London, 1844). The subject has not yet been reached (1888) in Rosscher's great Lexikon. The authorities named will introducc the

reader in turn to other authors, their researches and speculations. Heyne's Apollodorus (Gottingen, 1803) is also useful. (Any Li)

ZEUXIS, a Greek painter, who flourished about 420- 390 B.c., and described himself as a native of Heraclea, meaning probably the town in Magna Grecia. To this neighbourhood seem to point the facts of his

having painted a figure of Helena for a temple in Croton, of his presenting a picture of Alemena to the people of Agri- gentum, and of his having been, in one account, a pupil of Damophilus of Himera in Sicily, the other statement being that he was a pupil of Neseus of Thasos. After- wards he appears to have resided in Ephesus. His known works are—

1. Zeus Surrounded by Deities.} 8. Alemena, possibly another 2. Eros Crowned with Roses. name for 7.

3. Marsyas Bound. 9. Helena at Croton.

4, Pan. 10. Penelope.

5. Centaur Family. 11. Menelaus.

6. Boreas or Triton. 12. Athlete.

7

An Old Woman.

. Infant Hercules Strangling| 13. Boy with Grapes.

the Serpents in Presence} 14.

of his Parents, Alcmena|15. Grapes.

and Amphitryon. 16. Monochromes. 17. Plastic works in clay.

In ancient records we are told that Zeuxis, following the initiative of Apollodorus, had introduced into the art of painting a method of representing his figures in light and shadow, as opposed to the older method of outline, with large flat masses of colour for draperies, and other details, such as had been practised by Polygnotus and others of the great fresco painters. The new method led to snialler compositions, and often to pictures consisting of only a single figure, on which it was the more easy for the painter to demonstrate the combined effect of the various means by which he obtained perfect roundness of form. The effect would appear strongly realistic, as com- pared with the older'

method, and to this was probably due the origin of such stories as the contest in which Zeuxis painted a bunch of grapes so like reality that birds flew towards it, while Parrhasius painted a curtain which even Zeuxis mistook for real. The story reads in Pliny (WV. H., xxxv. 65) as if Parrhasius had brought forward a picture with an apparent curtain hung in front to protect the colours from the light, and that Zeuxis had tried to pull the curtain aside. It is perhaps a variation of this story when we are told (Pliny, loc. cit.) that Zeuxis also painted a boy holding grapes, towards which birds flew, the artist remarking that if the boy had been as well painted as the grapes the birds would have kept at a dis- tance. But, if the method of Zeuxis led him to real roundness of form, to natural colouring, and to pictures consisting of single figures or nearly so, it was likely to lead him also to search for striking attitudes or motives, which by the obviousness of their meaning should emulate the plain intelligibility of the larger compositions of older times. Lucian, in his Zeuas, speaks of him as carrying this search to a novel and strange degree, as illustrated in the group of a Female Centaur with her Young. When the picture was exhibited, the spectators admired its in- vention and overlooked the skill of the painter, to the vexation of Zeuxis. The pictures of Hercules Strangling the Serpents to the astonishment of his father and mother (7), Penelope (10), and Menelaus Weeping (11) are quoted as instances in which strong motives naturally presented themselves to him. But, in spite of the tendency towards realism inherent in the new method of Zeuxis, he is said to have retained the largeness of form which had charac- terized his predecessors. Of all his known works it would be expected that this quality would have appeared best in his famous picture of Helena, for this reason, that we cannot conceive any striking or effective incident for him in her career. In addition to this, however, Quintilian

states (Inst. Orat., xii. 10, 4) that in respect of largeness of form Zeuxis had followed Homer, while there is the fact that he had inscribed two verses of the Iliad (iii. 156 sq.) under his figure of Helena. As models for the picture he was allowed the presence of five of the most beautiful maidens of Croton at his own request, in order that he might be able to "transfer the truth of life toa mute image." Cicero (De Invent. ii. 1, 1)

assumed that Zeuxis had found distributed among these five the various elements that went to make up a figure of ideal beauty. It should not, however, be understood that the painter had made up his figure by the process of combining the good points of various models, but rather that he found among those models the points that answered to the ideal Helena in his own mind, and that he merely required the models to guide and correct himself by during the process of transferring his ideal to form and colour. This picture also is said to have been exhibited publicly, with the result that Zeuxis made much profit out of it. By this and other means, we are told, he became so rich as to rather give away his pictures than to sell them. He presented his Alemena to the Agrigentines, his Pan to King Arche- laus of Macedonia, whose palace he is also said to have decorated with paintings. According to Pliny (WV. Z.,, xxxv. 62), he made an ostentatious display of his wealth at Olympia in having his name woven in letters of gold on his dress. But, as there would not be much ostenta- tion in that, and as Pliny at times makes mistakes in translating from his Greek sources, it is possible that Zeuxis may merely have presented some piece of tapestry to a temple at Olympia with the customary inscription woven in letters of gold. Under his picture of an Athlete (12) he wrote that "It is easier to revile than to rival" (Hopnoetai tis paddov 7 Pysjoerat). A contemporary, Isocrates (De Permut., 2), remarks that no one would say that Zeuxis and Parrhasius had the same profession as those persons who paint pinakia, which is equivalent to the vase-painters of the time. We possess many examples of the vase-painting of the period circa 400 B.c., and it is noticeable on them that there is great freedom and facility in drawing the human form, so as to suggest roundness and perspective. In the absence of fresco paintings of that date we have only these vases to fall back upon. Yet, with their limited resources of colour and perspective, they in a measure show the influence of Zeuxis, while, as would be expected, they retain perhaps more of the large- ness of form of older times. It is said that he died of laughter at the quaintness of a picture he had painted of an Old Woman.

ZHITOMIR, or Jrromir, a town of western Russia, capital of the government of Volhynia, is situated on the Tetereff river, 646 miles to the south-west of Moscow. The railway which connects Riga and Kénigsberg with Odessa, wa Berditcheff, passes within 27 miles of the old Lithuanian

city without sending a branch towards at; and the whole place, with its old abandoned mansions of the Polish nobility, has an air of decay. Nor is it rich in historical monuments of its troubled past, its churches and cathedral mostly dating from the 18th century. Its popu- lation, however, reached 54,830 in 1884,—Jews constitut- ing more than one-third of the total. Two large printing offices in Zhitomir issue nearly one-half of all the Hebrew books printed in Russia. The Jewish merchants carry on a considerable export trade in the agricultural produce of the plains surrounding the city, as also in timber and wooden wares from the forests to the north.

Zhitomir is a very old city, tradition tracing its foundation as far back as the times of Askold and Dir. The annals, however, men- tion it chiefly in connexion with invasions of the Tartars who plundered it in the 13th, 14th, and even the 17th century (1606), or 1m connexion with destructive conflagrations. It fell under

| Lithuanian rule in 1320, and during the 15th century was one of

the fifteen chief cities of the kingdom. Later on it became part of Poland, and when the Cossacks rose under Khmelnitsky (1648) they sacked the town. It became annexed to Russia along with the rest of the Ukraine.

ZIMMERMANN, Joann Gezore, Rirrer von (1728- 1795), a Swiss philosophical writer and physician, was born at Brugg, in the canton of Aargau, on 8th December 1728. He studied at Géttingen, where he took the degree of doctor of medicine. Afterwards he practised as a physician in his native place, and here he wrote Ueber die Einsamkeit (1755) and Vom Nationalstolz (1758). These books made a great impression in Germany, and were translated into almost every European language. They are now only of historical interest. In Zimmermann's character there was a strange combination of sentimentalism, melancholy, and enthusiasm ; and it was by the free and eccentric expres- sion of these qualities that he excited the interest of his contemporaries. Another book by him, written at Brugg, Von der Erfahrung in der Arznewwissenschaft (1764), also attracted much attention. In 1768 he settled at Hanover as

private physician of George III. with the title of Hofrath. Catherine II. invited him to the court of St Petersburg, but this invitation he declined. He attended Frederick the Great during that monarch's last illness, and afterwards issued various books about him, of which the chief were Ueber Frederich den Grossen und meine Unterredung mit thm kurz vor seenem Tode (1788) and Fragmente tiber Friedrich den Grossen (1790). These writings display extraordinary personal vanity, and convey a wholly false impression of Frederick's character. Zimmermann died at Hanover on 7th October 1795.

See Zimmermann's Briefe an einige seiner Freunde in der Schweiz (1830) and Bodemann's Johann Georg Zimmermann (1878).

ZINC, the name both of an important useful metal and of the element of which the metal consists. Zine as a component of brass had currency in metallurgy long before it became known as an individual metal. Aristotle refers to the alleged fact that the Mossinecians produced a bright and light-coloured yaAxds, not by addition of tin, but by fusing up with an earth. Pliny explicitly speaks of a mineral cadmia as serving for the conversion of copper into aurichalcum, and says further that the deposit (of ZnO) formed in the brass furnaces could be used instead of the mineral. The same process was used for centuries after Pliny, but its rationale was not understood. Stahl, as late as 1702, quoted the formation of brass as a case of the union of a metal with an earth into a metallic compound ; but he subsequently adopted the view propounded by Kunkel in 1677, that cadmia is a metallic calx, and that it dyes the copper yellow by giving its metal up to it. In 1597 Libavius described a "peculiar kind of tin" which was prepared in India, and of which a friend had given him a quantity. From his account it is quite clear that that metal was zinc, but he did not recognize it as the metal of calamine. It is not known to whom the discovery of isolated zine is due; but we do know that the art of zine-smelting was practised in England from about 1730. The first Continental zinc-works were erected at Liége in 1807. The atomic weight of zinc is 65°37 (the mean of the results obtained by Marignac and Baubigny), O = 16.

Zine Ores.—The following may be named as important.

(1) Red Zine Ore (impure ZnO) occurs in quartz-like crystals, but more frequently presents itself in large-grained and lamellar masses. Sp. gr. 5:4 to 57. Colour, hyacinth-red to brown. Lustre, adamantine.

(2) Franklinite (RO.M,O3, where R stands for Zn, Fe, Mn; M for Fe, Mn). The zinc averages about 10 per cent. It crystallizes in regular octahedra, with rounded-off edges and angles. Sp. gr. 5°1. Colour, black ; streak, reddish-brown. Lustre, sub-metallic. This and the preceding occur in association with each other and other things in New Jersey, U.S.

(3) Calamine (ZnCO3). "The pure mineral (zine spar) forms well-

defined, though small, rhombohedra. The ordinary ore is massive, and is contaminated, often largely, with clay, silica, oxide of iron, and the like. Sp. gr. 4 to 4°5. Sometimes colourless, but as a rule light grey, yellow, or buff-coloured. Lustre, vitreous. It is found in association with silicates of zinc, zinc-blende, and lead ores, chiefly in limestone and dolomitic strata, at the Kelmisberg or Vieille Montagne in Belgium, in Derbyshire and Northumber- land, and in Silesia; but these last deposits are well nigh exhausted. Irregular deposits occur near Santander and Cartagena in Spain, and in Sardinia. At Wiesloch in Baden a yellow variety is found, which contains as much as 8 per cent. of cadmium. Smaller per- centages of cadmium are met with in many other zinc ores.

(4) Electric Calamine, the German Kieselzinkerz (ZnOSiO2 + HO), is also called hemimorphite on account of the marked hemimorphism in its (ortho-rhombic) crystals. Sp. gr. 3°35 to 3°5. Sometimes colourless, but more frequently grey, yellow, red, green, brown, blue,—always, however, light-coloured. Lustre, vitreous. The crystals, when heated, exhibit electric polarity ; hence the name. As arnule they are small and united into cuneiform, spheroidal, or kidney-shaped masses; there are also granular, dense, and earthy varieties. It occurs with willemite and calamine at the Altenberg near Aix-la-Chapelle, with blende and lead ore at Raibel and Blei. berg in Carinthia, near Iserlohn in Westphalia, at Matlock in Derbyshire, near Tarnowitz in Silesia, at Olbucs, Rezbanya in Hun- gary,

and Nertchinsk in Siberia. American sources are at Pheenix- ville and Friedensville in Pennsylvania and in the Austin mine in Virginia.

(5) Wéllemite, anhydrous ZnOSiO», occurs in New J ersey and else-where; it is a comparatively rare ore.

(6) Zinc-Blende, or shortly Blende (ZnS).—The five ores mentioned above, as indeed all oxidized zinc ores, having become scarce, most of the zine which now occurs in commerce is derived from zinc- blende. This ore crystallizes in combinations of the two tetrahedra: and other forms of the regular system. Sp. gr. 3-9 to 4-2. Colour, green, yellow, red, but mostly brown or black. Colourless crystals are scarce, Lustre, fatty or diamond-like. The ordinary ore forms crypto-crystalline or fibrous or granular masses, which sometimes present the form of kidneys, consisting of concentric layers. The finest crystals are found in Franklin, New J ersey, which are colour- less and consist of pure ZnS, and in the Pefias de Europa, Asturias (Spain), in which liquid enclosures are often met with. The darker varieties, which always include more or less of foreign sulphides, are found in a great number of places. In Cornwall, Wales, Alston Moor in Cumberland, Teesdale in Yorkshire, Derbyshire, and the Isle of Man dark-coloured blende is found in the lead- mining districts with galena, quartz, and limestone. In Belgium and on the Rhine massive blende occurs with iron pyrites and galena ; this ore requires a great deal of sorting to become fit for smelting. In Sweden blende is frequently found: at Ammeberg on Lake Wetter a vast deposit occurs in the gneiss. To English miners blende is known as " black Jack," to the South Americans as "chumbe." The principal American deposits are in Missouri.

Metallurgy.—Oxide of zinc, like most heavy metallic oxides, is easily reduced to the metallic state by heating it to redness with charcoal ; but, as zinc has the exceptional property of being readily volatile at the temperature of its reduction, the operation must be carried out in some kind of retort, and the zinc be recovered as a distillate. To pure red zinc ore the operation of distilling with charcoal might be applied quite directly; and the same might be done with pure calamine of any kind, because the carbonic acid of carbonate of zinc goes off below redness and

the silica of silicate of zinc only retards, but does not prevent, the reducing action of the charcoal. Zinc-blende, however, being sulphide of zine, is not directly reducible by char- coal ; but it is easy to convert it into oxide by roasting : the sulphur goes off as sulphurous acid, whilst the zinc re- mains in the (infusible) form of oxide, ZnO. In practice, however, wo never have to deal with pure zinc minerals, but with complex mixtures, which must first of all be subjected to mechanical operations, to remove at least part of the gangue, and if possible also of the heavy metallic impurities (see MrTaLiurey, vol. xvi. p. 59 sg). And, supposing this to be done, the ore, even if it is not blende, must be roasted, in order to remove all volatile components as com- pletely as possible, because these, if allowed to remain, would carry away a large proportion of the zinc vapour during the distillation. If the zinc is present as blende, this operation offers considerable difficulties, because in the roasting process the sulphide of zinc passes in the first

gases go out at m, where they mix with air; goes along the top of the muffle to a

slanting canal 6 and keeps it at a temperature above the

slides down the

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instance into sulphate, which demands a high temperature for its conversion into oxide. Another point to be con- sidered in this connexion is that the masses of sulphurous acid evolved, being destructive of vegetable life, are an intolerable nuisance to the neighbourhood in which the operations take place.

Hasenclever and Helbig have constructed a furnace by which some two-thirds of the sulphurous acid can be conducted into chambers and condensed into the useful form of oil of a vitriol. Figs. 1, 2, and 3 show how the furnace is constructed. & is a Siemens gas furnace, n being ¢ the orifice for the introduction of the fuel ; the 7

the flame travels between the sole g and the bottom of the muffle c, and then

the flue g; it passes below the

fusing-point of antimony (432° C.). The ore is introduced through d the funnel a; it Sid

Fig. 1.—Longitudinal section along A B of figs 2.

partition walls d, d, which follow each other at distances of half a metre, compel it to spread out evenly into a thin layer, partition walls, as shown by fig. 3, are arranged so that the gascs

The

| (~- B

Fig. 2.—Horizontal section along C D of figs 1.

coming from the muffle must travel along an undulating line and lick up as much as possible of the sulphur of the ore. From the last compartment ¢ the gaseous product goes first to a cooling chamber, and thence to the vitriol chamber. The hol- low cylinder f, which is cooled internally by air while made to revolve, con- veys the ore in instalments from the bottom end of the canal to the muffle. At in- tervals of two hours it is — spread evenly on the bot- Fig. 3.

tom of the muffle, and at last it is drawn out through o and trans- ferred to the sole g, to be finally roasted (“ todtgerdstet”) there, The apparatus works very satisfactorily even with ores poor in sulphur. An ore containing 20 per cent. of sulphur contained at the end f of the inclined canal 10 per cent., at the end 0 of the muffle 6°4 per cent., and at last, when “‘todtgeréstet,” only 1°2. About one-third of the sulphur is lost, 7.¢., goes out through the chimney, as SO.

The distillation process in former times, especially in England, used to be carried out “ per descensum.” The bottom of a crucible is perforated by a

pipe which projects into the crucible to about two-thirds of its height. The powdery mixture of ore and charcoal is put into the crucible around the pipe, the crucible closed by a luted-on lid, and placed in a furnace constructed so as to permit of the lower end of the pipe projecting into the ash-pit. The zinc vapour produced descends through the pipe and condenses into liquid zinc, which is collected in a ladle held under the outlet end of the pipe. For manufacturing purposes a furnace similar to that used for the making of glass was employed to heat a circular row of crucibles standing on a shelf along the wall of the furnace. This system, however, has long been abandoned ; at present one or other of the following methods is used as a rule.

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In the Belgian process the reduction and distillation are carried out in cylindrical retorts of fire-clay, about a metre long and 0°15 metre wide inside. Some forty-six or more retorts, arranged in eight parallel horizontal rows, are heated in one furnace. The fur- naces are square and open in front, to allow the outlet ends of the retorts to project ; they are grouped together by fours; and their several chimneys are within the same enclosure. Each retort is provided with two adapters, uamely, a conical pipe of fire-clay, about 0°4 metre long, which fits into the retort end, and a conical tube of black sheet iron, which fits over the end of the fire-clay pipe, and which at its outlet end is only 2 centimetres wide. To start a new furnace, the front side is closed provisionally bya brick wall, a fire lighted inside, and the temperature raised very gradually to a white heat. After four days' heating the provisional front wall is removed piecemeal, and the retorts, after having been heated to redness, are inserted in corresponding sets. The charge of the re- torts consists of a mixture of 1100 Ib of roasted calamine and 550 Ib of dry powdered coal per furnace. A newly-started furnace, how- ever, is used for a time with smaller charges. Supposing the last of these preliminary distillations to have been completed, the resi- dues left in the retorts are removed and the retorts, as they lie in the hot furnace, are charged by means of semi-cylindrical shovels, and their adapters put on. The charging operation

being com- pleted, the temperature is raised, and as a consequence an evolution of carbonic oxide soon begins, and becomes visible by the gas burst- ing out into the characteristic blue flame. After a time the flame becomes dazzling white, showing that zine vapour is beginning to escape. The iron adapters are now slipped on without delay, and left on for two hours, when, as a matter of experience, a consider- able amount of zinc has gone out of the retort, the greater part into the fire-clay adapter, the rest into the iron cone. The former con- tains a mixture of semi-solid and molten metal, which is raked out into iron ladles and cast into plates of 66 to 77 tb weight, to be sold as "'spelter." The contents of the iron recipient consist ofa powdery mixture of oxide and metal, which is added to the next charge, except what is put aside to be sold as "zinc dust." This dust may amount to 10 per cent. of the total production. As soon as the adapters have been cleared of their contents, they are replaced, and again left to themselves for two hours, to be once more emptied and replaced, &c. The complete exhaustion of the charge of a furnace takes about 11 hours.

In the Silesian process the distillation is conducted in specially constructed muffles, which are arranged in two parallel rows within a low-vaulted furnace, pretty much like the pots in a glass furnace. As a rule every furnace accommodates ten muffles. Through an orifice in the outlet pipe (which during the distillation is closed by a loose plug) a hot iron rod can be introduced from time to time to clear the canal of any solid zinc that may threaten to obstruct it. As soon as the outlet pipe has become sufficiently hot the zinc flows through it and collects in conveniently placed receptacles. About 6 or 8 hours after starting the distillation is in full swing, and in 24 hours it is completed. A fresh charge is then put in at once, the muffles being cleared only after three successive distillations. The distillate consists of a conglomerate of drops ("drop zinc"). It is fused up in iron basins lined with clay, and cast out into the customary form of cakes. In some modern works the muffles are heated by means of Siemens's regenerative gas furnace, by which a more uniform heat can be secured and maintained at a less cost.

Of the several metallic impurities in zinc ores iron is at once the most common and the least objectionable, because it is absolutely non-volatile

at the temperature of a zinc retort; whenever commercial zinc contains iron, this comes from its having been re-fused in iron vessels after its distillation. Lead, though hardly volatile by itself at a red heat, if present in the ore, is, so to say, carried over by the zine vapour and passes at least partly into the distillate. Cadmium and arsenic being more volatile than zinc itself, if present, accumulate in the first fractions of the distillate, but may pervade it in traces to the end. Zine made from oxidized ores is usually free from arsenic ; that derived from blende is almost sure to contain it. This in practice is equivalent to saying that, while in former times it was easy, 1 1s now very difficult, to obtain in commerce zinc free from arsenic. Traces of arsenic do not, however, in- terfere with any of the technical applications of the metal. As for cadmium, it is not (metallurgically speaking) an impurity at all, but, like silver in lead, a rather desirable admixture which it may be worth while to extract,

No reliable method is known by which commercial zinc could be purified so as to render it fit for all the purposes of the analyst ; the only way to obtain really pure zinc is

ZINC

to prepare it from pure oxide by distillation with charcoal in a non-metallic retort.

Properties of Pure Zinc.—Zine, a bluish-white metal, fuses at 415° C. and under ordinary atmospheric pressure boils at 1040° C. (Deville and Troost). The molten metal on cooling deposits crystals, and at last freezes into a com- pact crystalline solid, which may be brittle or ductile according to circumstances. According to Bolley, if zinc be cast into a mould at a red heat, the ingot produced is laminar and brittle; if cast at just the fusing-point, it is granular and sufficiently ductile to be rolled into sheet at the ordinary temperature. According to some authorities, pure zine always yields ductile ingots. A clue to the explanation of these anomalous facts is afforded by certain observations of Gustav Rose and others, from which it appears that zinc is dimorphous and may or may not crystallize in the regular system. Supposing a mass of molten zine to freeze into, say, cubes, the ingot will be ductile ; an ingot of, say, rhombohedra, on the other hand, is almost bound to be brittle, because

the crystals are orientated in a lawless fashion, and, as they cannot be expected to contract at the same rate in all directions, we must be prepared for a brittle ingot. Commercial " spelter " always breaks under the hammer ; but at 100° to 150° C. it is susceptible of being rolled out into even a very thin sheet. Such a sheet, if once produced, remains flexible when cold. At about 200° C., again, the metal becomes so brittle that it can be pounded ina mortar. The specific gravity of zinc cannot be expected to be perfectly constant ; according to Karsten, that of pure ingot is 6°915, and rises to 7°191 after rolling. The coefficient of linear expansion is 0°002,905 for 100° from 0° upwards (Fizeau). The specific heat is 0°093,93 (Schiiller and Wartha). Compact zinc is bluish white ; it does not tarnish much in the air. It is pretty soft, and clogs the file. If zinc be heated up to near its boiling-point, it catches fire and burns with a brilliant light into its powdery white oxide, which forms a reek in the air (lana philosophica). Boiling water attacks it appreciably, but no more, with evolution of hydrogen and formation of hydroxide, Zn(OH),. A rod of perfectly pure zinc, when immersed in dilute sulphuric acid, is so very slowly attacked that there is no visible evolution of gas; but, if a piece of platinum or other less basilous metal is brought into contact with the zinc, it dissolves readily, with evolution of hydrogen and formation of sul- phate. The ordinary impure metal dissolves at once, the more readily the less pure it is. Cold dilute nitric acid dissolves zinc as nitrate, with evolution of nitrous oxide, N,O, and formation of nitrate of ammonia. At higher temperatures, or with stronger acid, nitric oxide, NO, is produced besides or instead of nitrous.

Oxide of Zinc, ZnO.—There is only this one oxide. It is pre- pared chiefly in two ways,—({1) by burning the metal, a method now being carried out industrially, the zinc vapour being some- times produced extempore from a mixture of roasted ore and carbon, and (2) by heating the basic carbonate (see below). It is an infus- ible solid, which is intensely yellow at a red heat, but on cooling be- comes white. This at least is true of the oxide produced from the metal by combustion ; that produced from the carbonate, if once made yellow at a red heat, retains a yellow shade permanently. Oxide of zinc is insoluble in water, and does not combine directly with it; it dissolves readily in all aqueous acids, with formation of "zine salts." It also dissolves in aqueous caustic alkalies, including

ammonia, forming "zincates" (¢.g., ZnO.KHO). Oxide of zine is used in the arts as a white pigment; it has not by any means the covering power of white lead, but offers the advantage of being non-poisonous and of not becoming discoloured in sulphuretted hydrogen. It is used also in medicine, chiefly externally.

The hydrate, Zn(OH)s, is prepared by precipitating a solution of any zinc salt with caustic potash. The alkali must be free from carbonate and an excess of it must be avoided, otherwise the hydrate re-dissolves. It is a white powder, and is insoluble in water. To

acids and to alkalies it behaves like the oxide, but dissolves more readily,

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The basic carbonate, ZnCOj.xZn(OH),, where x is variable, is prepared by precipitation of a solution of the sulphate or chloride with carbonate of soda. To obtain a product free of Cl or SO, there must be an excess of alkali and the zinc salt must be poured into the hot solution of the carbonate. The precipitate, even after exhaustive washing with hot water, still contains a trace of alkali; but from the oxide, prepared from it by ignition, the alkali can be washed away. The basic carbonate is, like the oxide, used as a pigment. Normal carbonate of zinc, ZnCO;, has never been pre- pared artificially, but it exists in nature as zinc spar.

The sulphate, ZnSO,+7H,0, white vitriol, is prepared by dis- solving the ordinary metal in dilute sulphuric acid. If care be taken to keep the zinc in excess, the solution will be free from all foreign metals except iron and perhaps manganese. Both are easily removed by passing chlorine through the cold solution, to produce ferric and manganic salt, and then digesting the liquid with a washed precipitate of basic carbonate, produced from a small portion of the solution by means of carbonate of soda. The iron and man- ganese are precipitated as hydrated sesquioxides, and are filtered off. The filtrate is acidified with a little sulphuric acid and evapor- ated to crystallization. The salt crystallizes out on cooling with 7 molecules of water, forming colourless ortho-rhombic prisms, usually small and needle-shaped. They are permanent in the air. According to Poggiale, 100 parts of water dissolve respectively of (7H,O) salt

115°2, 138°2, 161-5, 263°8, 442°6, and 653°6 parts

at O°, 10°, 28, SU; 80> and 100°C.

At 100° C. the crystals lose 6 of their 7 H,O's ; the rest of the water goes off only at a higher temperature, which lies close to that at which the salt begins to decompose. The anhydrous salt, when exposed to a red heat, breaks up into oxide, sulphur dioxide, and oxygen. An impure form of the salt is prepared by roasting zinc- blende at a low temperature. Sulphate of zinc is used in medicine, chiefly externally. In the arts it is employed in the preparation of varnishes, and as a mordant for the production of colours on calico. A green pigment known as Rinmann's green is prepared by mixing 100 parts of zinc vitriol with 2°5 parts of nitrate of cobalt and heat- ing the mixture to redness, to produce a compound of the two oxides. Sulphate of zinc, like sulphate of magnesia, unites with the sulphates of the potassium metals and of ammonium into crystalline double salts, ZnSO,.R.SO,+ 6H,O, isomorphous with one another and the magnesium salts.

The chloride, ZnCle, is produced by heating the metal in dry chlorine gas, when it distils over as a white translucent mass, easily fusible, and boiling sufficiently low to be distillable from out of a retort of hard Bohemian glass. Its vapour-density at 900° C. is 4°57, air=1, corresponding to ZnCl, (V. and C. Meyer). Chloride of zine is extremely hygroscopic; it dissolves in a fraction of its weight of even cold water, forming a syrupy solution. A solution of chloride of zinc is easily produced from metal and hydrochloric acid, but it cannot be evaporated to dryness without considerable de- composition of the hydrated salt into oxy-chloride and hydrochloric acid. A concentrated solution of chloride of zinc converts starch, cellulose, and a great many other organic bodies into soluble com- pounds; hence the application of the fused salt as a caustic in surgery, and the impossibility of filtering a strong ZnCl, ley through paper. Ata boiling heat chloride of zine dissolves in any propor- tion of water, and highly concentrated solutions, of course, boil at high temperatures ; hence they afford a convenient medium for the maintenance of high temperatures.

Oxide of zinc unites with the chloride in a great number of pro- portions, forming oxy-chlorides. A (mixed) compound of this order is used as a cement for stuffing teeth and other purposes. One part of extremely fine glass powder is mixed with three of finely powdered oxide of zine free from carbonic acid. On the other hand, one part of borax is dissolved in the least sufficicncy of hot water and added to fifty parts of solution of chloride of zinc of 1°5 to 1:6 sp. gr. Immediately before use the powder is made into a paste with the solution ; it hardens in a few minutes, forming a stonc- like mass.

For other zinc compounds, the reader is referred to the handbooks of chemistry.

Analysis.—From neutral solutions of its salts zinc is precipitated by sulphuretted hydrogen as sulphide, ZnS,—a white precipitate, soluble, but by no means readily, in dilnte mineral acids, but in- soluble in acetic acid. In the case of acetate the precipitation is quite complete; from a sulphate or chloride solution the greatcr part of the metal gocs into the precipitate; in the presence of a sufficiency of free HCl the metal remains dissolved; sulphide of ammonium precipitates the metal completely, even in the presence ofammonia salts and free ammonia. The precipitate, when roasted at the end of an asbestos stick over a "bunsen," passes into oxide, which is yellow in the heat and white after cooling; and, if it be moistened with cobalt solution and re-heated, it exhibits a green colour after cooling. By these tests the precipitate is easily identi- fied with certainty. For further information, see handbooks of analysis. (W. D.)

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ZINCKEN, or ZINKEN, the German name of a family of wind instruments now obsolete, known in Italy as cornettz, in France as cornets & bouguin, and in England as " cornets," but differing entirely from the modern cornetsd& pistons; these last will also be noticed here, as bearing the same name.

The old cornets were of two kinds,—the straight and the curved. The straight (Germ. gerade Zincken, stille Zincken ; Ital. cornetti diritti, cornetti muti) were usually made with the mouthpiece (a cupped

mouthpiece analogous to that of the trumpet) forming part of the tube. The curved (Germ. krumme Zincken ; Ital. cornetti curvi) are formed of two pieces of wood of different lengths, each having half the channel in which the column of air is to vibrate hol- lowed out, the diameter increasing from the mouthpiece towards the lower end. The two pieces of wood, when thus prepared, are joined together with glue; they are then finished off so as to form a pipe with eight sides, and are finally covered with leather. The mouthpieces are made of wood, horn, or ivory, and are fixed by a tenon to the upper extremity of the pipe. The primitive instru- ment was an animal's horn. Pipes of such small length give only, besides the first or fundamental, the second and sometimes the third note of the harmonic series. Thus, a pipe that has for its fundamental note A will, if the

pressure of the lips be steadily in- -~—————-~+—,~— creased, give the octave A and the — twelfth E. To connect diatonically the a

first and second, the length of the pipe was progressively shortened, by making holes in its substance for the fingers to cover. The opening of these holes successively furnished the instrumentalist with the different intervals of the scale,

six holes sufficing -—p>— SS for this purpose : SS ae The fundamental Z – 2

was thus connected with its octave by all the degrees

of a diatonic scale which could become chromatic by the help of cross fingerings and greater or less pressure of

the lips within the mouthpiece. The fingering – = was completed by a seventh hole, which had —— for its object the production of the octave

without the necessity of closing all the holes in order to produce the second note of the harmonic series. The first complete octave, thus obtained by a succession of funda- mental notes, is easily octaved by a stronger pressure of the lips against the mouthpiece, and thus the ordinary limits of the compass of a zincke or cornet extend to a fifteenth.

Whether straight or curved, it is pierced laterally with seven holes, six through the front and the seventh, that nearest to the mouthpiece, through the back. The first three holes were usually covered with the third, second, and first fingers of the right hand, the next four with the third, second, and first fingers and the thumb of the left hand. But some instrumentalists inverted the position of the hands. Virdung! shows a kind of zincke made of an animal's horn with only four holes, three at the back of the pipe and one in front. Such an instrument as this had naturally a very limited compass, since with the help of these four holes only the intermediate notes between the second and third proper tones of the harmonic scale could be produced, the lower octave comprised between the first and second remaining incomplete. At the be- ginning of the 17th century Pretorius? represents the zincken as a complete family arranged thus :—(1) the little zincke, of which the lowest note was that shown in (i.); (2) the ordinary zincke, with lowest note (ii.); and @—S— (3) the cornon, corno torto, i.)

Gi.)

1 Musica getutscht und auszgezogen, Basel, 1511. 2 Syntagmatis Musici, vol. ii. ; De Organographia, Wolfenbiittel,

1618.

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or great zincke, with lowest note (iii.). In France the family was composed of the following instruments:—(1) the dessus, with 3 — —— —— —— = lowest note (a) ; aoe Se —= (2) the haute." + OL; © contre, with lowest note (6); (3) the tazdle, with lowest note (c); and (4) the basse, with lowest note (d). Numbers (2), (3), and (4) in this last series were sometimes furnished with an open key, which, when the closed tube was length- ened, augmented the compass downwards by a note.

During the Middle Ages these instruments were in such favour that an important part was given to them in all instrumental combinations. In Germany, in the 18th cen- tury, they were used with trombones in the churches to accompany the chorales, There are examples of this em-

ployment in the sacred cantatas of J. 8. Bach. Monte- verde made use of them in his opera Orfeo in 1608, as did Gluck in the opening chorus of his Orfeo, played at Vienna in 1762. The great vogue of the zincke is not to be accounted for by its musical qualities; for it has a hard, hoarse, piercing sound, and it failed utterly in truth of intonation; and these natural defects could only be modified with great difficulty. It is now hard to under- stand Mersenne's eulogium of the dessus, then more em- ployed than the other cornets, " because it was used in vocal concerts and to make the treble with the organ, which is ravishing when one knows how to play it to perfection, like the Sieur Quiclet," and, farther on, "as to the property of its tone, it resembles the brilliancy of a sunbeam piercing the darkness, when it is heard among the voices in churches, cathedrals, or chapels."

The serpent is another instrument of the cornet family, though not usually classed with it. Its construction and its acoustic principle are the same as those of the old cornet. It is, properly speaking, an enlarged cornet with one hole less, that which is stopped with the thumb. The mouth- piece is fixed to the instrument by means of a long brass crook. A detailed account of the serpent and its con- geners is given under OpuIcLerpE (vol. xvii. p. 778). The zincke or cornet has now entirely disappeared, and the rare specimens still met with are eagerly sought by collectors, The serpent has lasted longest, and even within the last twenty years has been used in many churches in the south of France.

CorneET, CoRNET A PIsToNs.

At present the names of cornet, cornet 4 pistons, and cornopean are given to an instrument that has no analogy whatever to the medi- eval cornet. It is a transformation of the old post-horn, with a shorter tube than that of the trumpet, and improved to such a de- gree that its quality of tone is intermediate between the brightness of the trumpet and the softness of the fligel-horn or bugle with pis- tons. The extent of the modern

cornet without pistons is com- ——————————— – = = prised within the second and ——————— eighth of the harmonic scale ae 8 :

The seventh, being too flat, owing to a well-known acoustic pheno- menon, is rarely used. The cornet & pistons of the highest pitch is in Bb, and is used for a trumpet in that key. The notes written therefore sound a major second lower than the notation. It is furnished with three pistons, which lower the principal tube by a whole tone (1st piston), a half tone (2d piston), and a tone and a half (3d piston) respectively. It has already been explained under TROMBONE how the different pistons are combined to produce the entire chromatic compass of the instrument from the lowest limit . At first the cornet & pistons was ——= to the —F —— supplied with a great many crooks. a: highest ——— There were crooks for A, Ab, G, F, 2 ‘ KE, Eb, and D; but it is easy to un- derstand that, if the additional tubes put in communication with the principal colunm of air by means of the pistons are adjusted for the key of Bb, the same additional tubes are too short to fulfil the same office for an instrument lowered to the extent of a minor sixth, as it would be for the key of D. Hence nearly all these crooks have disappeared, only those for Bb, A, and Ab being re- tained. The invention of the modern cornet, or more exactly the

application of pistons to the post-horn, is German, and dates from

the first quarter of the 19th century, almost immediately after the invention of pistons by Stolzel and Bliimel. It was introduced into Great Britain and France about 1830. There were at first only two pistons,— that of the whole tone and that of the half tone, — from which there naturally resulted gaps in the chromatic scale of the instrument. The history of the cornet is that of the improve- ment brought about by pistons apart from their successive trans- formations, and it has remained to the present time what it was when first invented. The great favour the cornet meets with is due to the facility with which it speaks, to the little fatigue it causes, and to the simplicity of its mechanism. We may, however, regret, from the point of view of art, that its success has been so great, and that it has ended by usurping in brass bands the place of the bugles, the quality of their tone being infinitely preferable as a foundation for an ensemble composed exclusively of brass in- struments. Even the symphonic

orchestra has not been secure from its intrusion. In fact, the cornet is taking the place of the trumpet nearly everywhere, and, if care is not taken, the latter will in a few years have completely disappeared, to the great detriment of or- chestral tone colour; for the quality of tone of the cornet can never be an adequate substitute for the brilliant and majestic sonorousness so characteristic of the trumpet. (V. M.) ZINZENDORF, Nicotavs Lupwie, Count or ZInzen- DORF AND PorreNDorF (1700-1760), religious reformer, descended from an ancient family belonging to Lower Austria, was born on 26th May 1700, at Dresden. His family had taken the Protestant side in the Reformation struggle, and in consequence his grandfather, Max Eras- mus, had abandoned his Austrian estates to settle near Nuremberg. Max's second son, George Louis, was a member of the Saxon cabinet and a personal friend of the Pietist Spener. George's second wife, Charlotte Justine, the mother of Nicolaus, who was an only son, was a daughter of Nicolas and Catherine von Gersdorf, who were also Pietist. The boy was thus born into a Pietist circle ; and Spener was his godfather. He never knew his father, who died six weeks after he was born. His mother married again when he was four years old, and he was educated under the charge of his pious and gifted grand- mother,! Catherine von Gersdorf, to whom more than to any other he was indebted for the absorbing and enthusi- astic piety which characterized him from childhood. His school days were spent at the pedagogium-at Halle amidst Pietist surroundings, and in 1716 he went to the univer- sity of Wittenberg, to study law and fit himself for a diplomatic career. Three years later he was sent to travel in Holland, in France, and in various parts of Germany. These two years of wandering were employed by him in making the personal acquaintance of men distinguished for practical piety and belonging to a variety of churches. On his return he visited the branches of his family settled at Oberbirg and at Castell. During a lengthened visit at Castell he fell in love with his cousin Theodora; but the widowed countess, her mother, objected to the malriage, and the lady afterwards became the wife of Count Henry of Reuss. Zinzendorf seems to have considered this dis- appointment to be a call in providence to betake himself to some special work for God. He had previously, in deference to his family, who wished him to become a diplomatist, rejected the invitation of Francke to take Count Canstein's place in the Halle orphanage ; and he now resolved to settle down as a Christian landowner,

spending his life on behalf of a pious tenantry. He bought Berthelsdorf from his grandmother, and selected John Andrew Rothe for pastor and John George Heiz for jactor ; hc married Erdmute Dorothea, sister of Count Henry of .tcuss, and began living on his estate. His intention was to carry out into practice the Pietist ideas of Spener. He did not mean to found a new church or religious organization distinct from the Lutheranism of the land. He meant to create a Christian association, the members of which by preaching, by tract rp eggs ee ee

1 A volume of Spiritual Songs, written by Zinzendorf's grandmother Catherine, was published in 1729 by Anton.

and book distribution, and by practical benevolence might awaken the somewhat torpid religion of the Lutheran Church. The "band of four brothers " (Rothe, pastor at Berthelsdorf; Schiffer, pastor at Gorlitz ; Francis von Watte- wille, a friend from boyhood ; and himself) set themselves by sermons, books, journeys, and correspondence to create a revival of religion, and by frequent meetings for prayer to preserve in their own hearts the warmth of personal trust in Christ. From the printing establishment at Ebersdorf large quantities of books and tracts, catechisms, collec- tions of hymns, and cheap Bibles were issued 3 and a translation of Arndt's True Christianity was published for circulation in France. Dislike to the high and dry Lutheran orthodoxy of the period gave Zinzendorf some sympathy with that side of the growing rationalism which was attacking dogma, while he at the same time felt its lack of earnestness, and of a true and deep understanding of religion and of Christianity, and endeavoured to counteract its tendency by pointing men to the historical Christ, the revelation of the Father. It is also more than probable

that he began to doubt the wisdom of Spener's plan of not.

separating from the Lutheran Church, and that he began to think that true Christianity could be best promoted by free association of Christians, who in course of time might grow into churches with no state connexion. These thoughts of his took a practical turn from his connexion with the

Bohemian or Moravian Brethren. Zinzendorf offered an asylum to a number of persecuted wanderers from Moravia (see Moravian Breturen), and built for them the village of Herrnhut on a corner of his estate of Berthelsdorf. The refugees who came to this asylum—the first detachment under Christian David in1722—and continued coming from various regions where persecution raged, for a succession of years (till 1732), belonged to more than one Protestant organization. Persecution had made them cling pertina- ciously to the small peculiarities of creed, organization, and worship, and they could scarcely be persuaded to live in peace with each other. Zinzendorf devoted himself to them. He, with his wife and children, lived in Herrnhut and brought Rothe with him. He had hard work to bring order out of the confusion. He had to satisfy the authorities that his religious community could be brought under the conditions of the peace of Augsburg; he had to quiet the suspicions of the Lutheran clergy ; and, hardest of all, he had to rule in some fashion men made fanatical by persecu- tion, who, in spite of his unwearied labours for them, on more than one occasion, it is said, combined in his own house to denounce him as the Beast of the Apocalypse, with Pastor Rothe as the False Prophet. Patience had at last its perfect work, and gradually Zinzendorf was able to organize his refugees into something like a militia Christi, based not on monastic but on family life. He was able to establish a common order of worship in 1727, and soon afterwards a common organization, which has been described in the article Moravian BreTuHrEN., Zinzendorf took the deepest interest in the wonderful missionary enterprises of the Brethren, and saw with delight the spread of this Protestant family (not monastic) order in Germany, Denmark, Russia, and England. He travelled widely in its interests, visiting America in 1741-42 and spending a long time in London in 1750. Missionary colonies had by this time been settled in the West Indies (1732), in Greenland (1733), amongst the North American Indians (1735); and before Zinzendorf's death the Brethren had sent from Herrnhut missionary colonies to Livonia and the northern shores of the Baltic, to the slaves of North Carolina, to Surinam, to the Negro slaves in several parts of South America, to Travancore in the East Indies, to the Copts in Egypt, and to the west coast of South Africa, The community in Herrnhut, from which almost all these

colonies had been sent out, had no money of its own, and its expenses had been almost exclusively furnished by Zinzendorf. His frequent journeyings from home made it almost impossible for him to look after his private affairs ; he was compelled from time to time to raise money by loans, and about 1750 was almost reduced to bankruptcy. This led to the establishment of a financial board among the Brethren, on a plan furnished by a lawyer, John Frederick Kober, which worked well. In 1752 Zinzendorf lost his only son, Christian Renatus, whom he had hoped to make his successor ; and four years later he lost his wife Erdmute, who had been his counsellor and confidante in all his work, and without whose wise guidance he could never have accomplished what he achieved. Zinzendorf remained a widower for one year, and then (June 1757) contracted a second marriage with Anna Nitschmann, on the ground that a man in his official position ought to be married. Three years later, overcome with his labours, he fell ill and died (on 9th May), leaving John de Wattewille, who had married his eldest daughter Benigna, to take his place at the head of the community.

See Spangenberg, Leben des Grafen von Zinzendorf, 1772-75; Schrautenbach, Der Graf v. Zinzendorf, 1871 (written in 1782, and interesting because it gives Zinzendorf's relations to such Pietist rationalists as Dippel); F. Bovet, Le Comte de Zinzendorf, 1860; Becker, Zinzendorf im Verhaltniss z. Philosophie u. Kirchenthum seiner Zeit, 1886 (the best account; written by the author of the article "' Zinzendorf" in Herzog-Plitt's Encyki.). See also the books mentioned under MoravIAN BRETHREN, (a 1.)

ZION. See Jerusalem and TEMPLe.

ZIRCONIUM, a rare element, closely allied to titanium. Klaproth in 1789 analysed zircon and found it to contain a new earth, which he called "zirconia." Zircon is essen- tially a silicate of zirconia, ZrO,.Si0,. For the extraction from it of zirconia the mineral is first of all heated and quenched in water to render it brittle, and then reduced to a fine powder, which is fused up with three to four parts of acid fluoride of potassium ata gentle heat ina platinum crucible. When the mass fuses tranquilly and

all the water is expelled, the platinum crucible is placed in a Hessian crucible ; the two crucibles are then covered and kept for two hours at the highest temperature producible by means of a wind-furnace. The porcelain-like fuse is powdered, boiled in water, and acidified with hydrofluoric acid, and the residual fluosilicate of potassium is filtered off. The filtrate on cooling deposits crystals of fluozircon- ate of potassium, ZrF,K,, which are purified by re-crystal- lization from hot water. The double fluoride is decomposed with hot concentrated sulphuric acid ; the mixed sulphate is dissolved in water ; and the zirconia is precipitated with ammonia in the cold. The precipitate, being difficult to wash, is (after a preliminary washing) re-dissolved in hydrochloric acid and re-precipitated with ammonia. Hydrated zirconia, Zr(OH),, as thus obtained, is quite appreciably soluble in water and easily in mineral acids, with formation of zirconic salts, e.g., ZrCl,, analogous to SnCl, But, if the hydrate is precipitated in the heat, it demands concentrated acids for its solution, The hydrate readily loses its water at a dull red heat and passes into anhydride with vivid incandescence. The anhydrous oxide, ZrO,, is with difficulty soluble even in hydrofluoric acid ; but a mixture of two parts of concen- trated sulphuric acid and one of water dissolves it on con- tinued heating as Zr(SO,),. Zirconia, when heated to whiteness remains unfused, and radiates out abundance of white light. This property has been utilized for the con- struction of a new kind of gas lamp, in which a colourless flame, produced by the combustion of a mixture of gas and air, serves to heat a hollow cylinder of zirconia suspended over it by means of platinum gauze. Zirconia, like oxide of tin and oxide of titanium, unites not only with acids

but also with basic oxides. For instance, if it be fused up | In 1410 he fought as a volunteer, on the losing side, in with an excess of carbonate of soda, 2 of CO, are expelled by | the great battle of Griinwald, near Tannenberg in Prussia,

every ZrO,, with formation of ortho-zirconate (analogous to ortho-silicate) of soda, ZrO,.2Na,O. On treating the fuse with water we obtain the salt Na,O.8ZrO, + 12H,0, which crystallizes in hexagonal plates.

Zirconic chloride, ZrOl, is prepared, by igniting a mixture of zirconia and charcoal in a current of chlorine, as a white sublimate. It has the exact vapour-density corresponding to the formula. It dissolves in water with evolution of heat; on evaporation a basic salt, 2ZrOCl, + 9H,0, separates out in star-shaped aggregates of needles.

Metallic zirconium is obtainable, by heating the double fluoride of zirconium and potassium with metallic potassium, as an iron-grey powder. 'Troost produced crystallized zirconium by fusing the double fluoride with aluminium in a graphite crucible at the temperature of melting iron, and extracting the aluminium from the fuse with hydro-chloric acid. The crystals look like antimony and are brittle ; their specific gravity is 4:15. The powdery metal burns readily in air; the crystalline metal requires to be heated in an oxyhydrogen flame if it is to catch fire. Mineral acids generally attack the crystallized metal very little even in the heat; aqua regia, however, dissolves it readily, and so does hydrofluoric acid. The spark spec- trum of zirconium is characterized by five lines, whose wave-lengths are as follows :—6127 in the red, and 4815, 4771, 4738, 4709, and 4686 in the blue. The atomic weight is not known exactly; according to Marignac and Deville, it lies near 90, if O=16.

ZITTAU, the centre of the Saxon linen trade and the most populous town in the district of Bautzen, in the king- dom of Saxony, is situated on the left bank of the Mandau, near its confluence with the Neisse, 25 miles south-east of Bautzen and 48 east-south-east of Dresden. The town is built in a regular and modern style. The town-house dates from 1844, and contains a public library of 30,000 volumes. The church of St John was rebuilt in 1834-37; and the church of St Peter and St Paul, with its elegant tower, belonged to an old Franciscan monastery. The latter was restored in 1882 and part of it fitted up as an historical museum. There are five other churches in the town. Zittau is well equipped with schools, including a gymnasium (founded in 1586) and a commercial school, both accommodated in the Johanneum, and several techni- cal institutions.

The leading branch of industry is linen and damask weaving ; but woollen stuffs, trimmings, &c., are also produced in the factories of the town, and in the surrounding weaving villages, 37 of which, with 70,000 inhabitants, are included in the municipal jurisdiction. The town, which is one of the best endowed in Saxony, also owns valuable forests on the mountains of Upper Lusatia. There are various steam-mills, iron-foundries, brick-fields, and potteries near the town, and extensive deposits of lignite, employing over 1000 hands. Zittau is situated near the border of Bohemia, with which it carries on some trade. In 1885 the population was 23,215, of whom less than one-fifth were Roman Catholics ; in 1834 the population was 8508.

Zittau is of Wendish origin (Chytawa is its Wendish name), and was made a town by Ottocar II. of Bohemia. It was one of the six towns of the Lusatian league (1346), at which period it be- longed to Bohemia. It suffered severely in the Hussite wars and in the Thirty Years' War, and was bombarded and burnt by the Austrians in 1757 during the Seven Years' War. The musical composer Marschner (1795-1861) was born at Zittau.

ZIZKA, or Ziska, Joun (c. 1360-1424), leader of the Hussires (¢.v.) from 1419, was born at Trocznow in the neighbourhood of Budweis in Bohemia about the year 1360. He was of noble descent, and was brought up from an early age at Prague at the court of King Wenceslaus.

in which the knights of the Teutonic Order were com- pletely routed by the Lithuanians and Poles. He after- wards took part in the Hungarian wars against the Turks, and is also said to have fought on the English side in the battle of Agincourt. In the discontents which followed the martyrdom of Huss and Jerome in Bohemia he sided with the liberal party, and ultimately, on the outbreak of hostilities, became its leader. He soon organized a for- midable body of infantry, and from his newly fortified stronghold of Tabor asa centre achieved various successes, of which the most signal was the victory over the imperial troops at Deutschbrod (8th January 1422). At an early period of the war,—at the siege of Raby in 1421,—Zizka, who from boyhood had been blind of an eye, completely lost his sight; but his strength of will enabled him almost

wholly to overcome this formidable disadvantage, and his extraordinary presence of mind, fertility of resource, and keenness of mental vision, coupled with a zeal that was wholly sincere, though not always free from fanaticism, continued to mark him out as the leader in the cause he had espoused until his death, which was caused by an infectious disorder while he was besieging Przibislaw (11th October 1424).

See Millauer, Diplomatisch-historische Aufsdtze tiber Johann Ziska (1824). Zizka's life has been made the subject of an epic by the German poet Meissner (1846 ; 10th edition 1867), and has also been related in prose by George Sand.

ZLATOUST, in the Russian government of Ufa, is one of the chief towns and iron-works of the Urals. It is situ- ated on the Ai, a tributary of the Ufa, in a picturesque valley of the middle Urals, at a height of 1200 feet above sea-level. The 270 miles which stretch between Zlatoust and Ufa in the west will soon be covered by rail, while a branch line is projected to connect it with Ekaterinburg in the north. The town is well built, mostly of wood, has a first-class meteorological and magnetic observatory, and is the seat of the mining administration for the Zlatoust district, which includes, besides several iron-works, the rich gold-washings of the basin of the Mias. Its merchants carry on a brisk trade in agricultural produce and cattle, as well as in manufactured wares, imported for the use of the mining villages of the neighbourhood. The Ai and several ponds supply the crown iron-works with motive power, and in 1884 the iron furnaces of Zlatoust yielded 90,800 ewts. of pig-iron, which were used almost entirely for the manufacture of swords, bayonets, and artillery munition. The population of Zlatoust in 1884 was 19,000.

ZNAIM, or ZNaym (Czech Znojmo), an interesting old town of Moravia, is picturesquely situated on the left bank of the Thaya, 45 miles north-north-west of Vienna. The town proper is adjoined by four suburbs, and it contains three fine open squares, while the site of the old fortifications is occupied by a pleasant promenade. The Rauberthurm is a relic of the old castle of the margraves of Moravia ; the round castle-chapel, known as the heathen temple (Heiden-Tempel), in the Romanesque style of the 12th century, was at one time considered the most ancient building in Moravia.

The Gothic church of St Nicholas was built about 1348 by the emperor Charles IV.; the town-house, with an elegant Gothic tower, 250 feet high, dates from about 1446. The ancient and once powerful Preemonstratensian abbey of Bruck, to the east of the town, is now occupied as barracks. The town is well equipped with technical and other schools, and carries on manufactures of earthenware, leather, chocolate, vinegar, and other articles. Large quantities of cucumbers, grain, and wine are produced in the fertile environs. In 1880 the population, chiefly of German origin, was 12,254.

The present town of Znaim was founded in 1226 by Ottocar I. of

Defini- tion.

Signs and con- stella- tions,

Duoden- ary di- Vision.

ZOD~—ZOD 791

Bohemia on the site of Znojmo, the ancient capital of the tributary margraves of Moravia, which had been destroyed in 1145. Znaim is best known to history for the armistice concluded here in 1809 after the battle of Wagram between Napoleon I. and the archduke Charles. In 1866 the Prussians occupied the town from July 18th till September 3d. The novelist Karl Postel (1793-1864), who wrote under the pseudonym of Charles Sealsfield, was born at Pop- pitz, 24 miles to the south-west.

ZODIAC (6 (wdiaxds xixdos, from (édi0v, "a little animal"), an imaginary zone of the heavens within which lie the paths of the sun, moon, and principal planets. It is bounded by two circles equidistant from the ecliptic, about eighteen degrees apart ; and it is divided into twelve signs, and marked by twelve constellations. The signs— the Greek Swéexarypopca—are geometrical divisions thirty degrees in extent, counted from the spring equinox in the direction of the sun's progress through them. The whole series accordingly shifts westward through the effect of precession by about one degree in seventy-two years. At the moment of crossing the equator towards the north the sun is said to be at

the first point of Aries; some thirty days later it enters Taurus, and so on through Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces (see Astronomy, vol. ii. p. 771). The constellations bearing the same names coin- cided approximately in position, when Hipparchus observed them at Rhodes, with the divisions they designate. The discrepancy now, however, amounts to the entire breadth of a sign, the sun's path in Aries lying among the stars of Pisces, in Taurus among those of Aries, dc.

The twelvefold division of the zodiac was evidently sug- gested by the occurrence of twelve full moons in successive parts of it in the course of each year. This approximate relation was first systematically developed by the early inhabitants of Mesopotamia, and formed the starting-point for all their divisions of time. As the year separated, as it were of itself, into twelve months, so the day was divided into twelve "double hours," and the great cosmi- cal period of 43,200 years into twelve "sars." Each sar, month, and hour was represented at once visibly and sym- bolically by a twelfth part of the "furrow" drawn by the solar Bull across the heavens. The idea of tracing the sun's

path among the stars was, when it occurred to Chaldean

astronomers, an original and, relatively to their means, a recondite one, We owe to its realization by them the constitution and nomenclature of the twelve signs of the zodiac. Assyrian cylinders and inscriptions indicate for the familiar series of our text-books an antiquity of some four thousand years, Ages before Asurbanipal reigned at Nineveh the eighth month (Marchesvan) was known as "the month of the star of the Scorpion," the tenth (Tebet) belonged to the "star of the Goat," the twelfth (Adar) to the "star of the Fish of Hea." The motive underlying the choice of symbols is in a few cases obvious, but in most remains conjectural. The attributes of the deities appointed to preside over the months and signs were to some extent influential. Two of them, indeed, took direct possession of their respective portions of the sky. The zodiacal Virgo is held to represent the As- syrian Venus, Ishtar, the ruling divinity of the sixth month, and Sagittarius the archer-god Nergal, to whom the ninth month was dedicated. But no uniform system of gelection was pursued; or

rather perhaps the results of several, adopted at various epochs, and under the influence of varying currents of ideas, became amalgamated in the final series.

This, there is reason to believe, was the upshot of a prehistoric reform. So far as positive records go, Aries was always the first sign. But the arrangement is, on the face of it, a comparatively modern one. None of the

1 Lenormant, Origines de U Histoire, vol. i. p. 286.

brighter stars of the constellation could be said even roughly to mark the equinox much before 1800 B.c. ; during a long stretch of previous time the leading position belonged to the stars of Taurus.2 Numerous indications accordingly point to a corresponding primitive zodiac. Setting aside as doubtful evidence derived from interpret- ations of cuneiform inscriptions, we meet, in connexion with Mithraic and Mylittic legends, reminiscences of a zodiac and religious calendar in which the Bull led the way. —Virgil's

Candidus auratis aperit cum cornibus annum

Taurus perpetuates the tradition. And we shall see presently that the Pleiades, not only were originally, but continued to be until well within historical memory, the first asterism of the lunar zodiac.

In the Chaldean signs fragments of several distinct strata of thought appear to be embedded, From one point of view, they shadow out the great epic of the destinies of the human race ; again, the universal solar myth claims a share in them; hoary traditions were brought into ex post facto connexion with them; or they served to com- memorate simple meteorological and astronomical facts.

The first Babylonian month Nisan, dedicated to Anu Second

and Bel, was that of "sacrifice"; and its association with sign.

the Ram as the chief primitive object of sacrifice is thus intelligible. According to an alternative explanation, how- ever, the heavenly Ram, placed as leader in front of the flock of the stars, merely embodied a spontaneous figure of the popular imagination, An antique persuasion, that the grand cycle of creation opened under the first sign, has been transmitted to modern cognizance by Dante (Inf, i. 38). The human race, on the other hand, was supposed to have come into being under Taurus. The aa inter- pretation of the sign goes back to the far-off time when the year began with Taurus, and the sun was conceived of as a bull entering upon the great furrow of heaven as he ploughed his way among the stars.

In the third month Third to

and sign the building of the first city and the fratricidal sixth

brothers—the Romulus and Remus of Roman legend— were brought to mind. The appropriate symbol was at first indifferently a pile of bricks or two male children, always on early monuments placed feet to feet. The retro- grade movement of a crab typified, by an easy association of ideas, the retreat of the sun from his farthest northern excursion, and Cancer was constituted the sign of the summer solstice. The Lion, as the symbol of fire, repre- sented the culmination of the solar heat. In the sixth month, the descent of Ishtar to Hades in search of her lost husband Tammuz was celebrated, and the sign of the Virgin had thus a purely mythological signification.

The history of the seventh sign is somewhat complicated. Seventh

The earlier Greek writers,—Eudoxus, Eratosthenes, Hip- parchus,— knew of only eleven zodiacal symbols, but made one do double duty, extending the Scorpion across the seventh and eighth divisions. The Balance, obviously indicating the equality of day and night, is first mentioned as the sign of the autumnal equinox by Geminus and Varro, and obtained, through Sosigenes of Alexandria, official recognition in the Julian calendar. Nevertheless, Virgil (Georg., i. 32) regarded the space it presided over as so much waste land, provisionally occupied by the

sign.

and eighth signs.

“Claws” of the Scorpion, but readily available for the .

2 The possibility should not, however, be overlooked that the “ stars of the months” were determined by their heliacal risings (see Bosan- quet and Sayce on Babylonian astronomy, in Monthly Notices Roy. Astr. Soc., vol. xl. p. 117). This would give a further extension backwards of over 1000 years, during which the equinox might have occurred in the month of the Ram.

3 Lajard, Recherches sur le Culte de Mithra, p. 605.

4 Sayce, Trans, Society of Biblical Archxology, vol. iii. p. 162.

apotheosis of Augustus. Libra was not of Greek inven- tion. Ptolemy, who himself chiefly used the “ Claws ” (XyAai), speaks of it as a distinctively Chaldzan sign ;’ and it occurs as an extra-zodiacal asterism in the Chinese sphere. An ancient Chinese law, moreover, prescribed the regu- larization of weights and measures at the spring equinox.” No representation of the seventh sign has yet been dis- covered on any Euphratean monument ; but it is noticeable that the eighth is frequently doubled,’ and it is difficult to avoid seeing in the pair of zodiacal scorpions carved on Assyrian cylinders the prototype of the Greek scorpion and claws. Both Libra and the sign it eventually super- seded thus owned a Chaldean birthplace. The struggle of rival systems of nomenclature, from which our zodiacal series resulted, is plainly visible in their alternations ; and the claims of the competing signs were long sought to be conciliated by representing the Balance as held between

sign Leo on Ninevite cylinders.1° The wooing of Ishtar by the hero of the epic falls under Virgo, and his encounter with two scorpion men, guardians of the rising and the setting sun, under Scorpio. The eleventh tablet narrates the deluge ; the twelfth associates the apotheosis of Hea-

bani (the Babylonian Chiron) with the zodiacal emblems of the resurrection.

In the formation of the constellations of the zodiac The con- The stella Chaldzeans chose three stars in each sign to be the " coun- tis:

very little regard was paid to stellar configurations,

cillor gods" of the planets.1! These were called by the Greeks "'decans," because ten degrees of the ecliptic and ten days of the year were presided over by each. The college of the decans was conceived as moving, by their annual risings and settings, in an "eternal circuit" between the infernal and supernal regions. Our modern asterisnis first appear in the Phenomena of Eudoxus about 370

the claws of the Scorpion. B.C. But Eudoxus, there is reason to believe, consulted, Ninth to The definitive decline of the sun's power after the | not the heavens, but a celestial globe of an anterior epoch, twelfth autumnal equinox was typified by placing a Scorpion as | on which the stars and the signs were forced into unnatural = the symbol of darkness in the eighth sign. Sagittarius, agreement. The representation thus handed down to us figured later as a Centaur, stood for the Babylonian Mars. | (in the verses of Aratus) has been thought to tally best Capricornus, the sign of the winter solstice, is plausibly with the state of the sky about 2000 B.c.;12 and the men- connected with the caprine nurse of the young solar god | tion of a pole-star, for which Eudoxus was rebuked by in Oriental legends, of which that of Zeus and Amalthea | Hipparchus, seems, as Mr W. T. Lynn has pointed out,18 is a variant.4 The fish-tailed Goat of the zodiac presents | to refer to the time when « Draconis stood near the pole. a close analogy with the Mexican calendar sign Cipactli, | The data afforded by Eudoxus, however, are far too vague a kind of marine monster resembling a narwhal.> Aquarius | to serve as the basis of any chronological conclusion. is a still more exclusively meteorological sign than Leo. The Egyptians adopted from the Greeks, with consider- Egyptian The eleventh month was known in Euphratean regions as | able modifications of its attendant symbolism, the twelve- zodiacal that of "want and rain." The deluge was traditionally | fold division of the zodiac. Aries became the Fleece; two %8" associated with it. It was represented*

in zodiacal sym- | Sprouting Plants, typifying equality or resemblance, stood bolism by the god Ramman, crowned with a tiara and | for Gemini; Cancer was re-named Scarabeeus; Leo was pouring water from a vase, or more generally by the vase | converted, from the axe-like configuration of its chief stars, and water without the god. The resumption of agricul- | into the Knife; Libra into the Mountain of the Sun, a tural labours after the deluge was conimemorated in the | reminiscence, apparently, of the Euphratean association of twelfth month, and a mystical association of the fishes, | the seventh month with a "holy mound," designating the which were its sign, with the life after death is evident | Biblical tower of Babel. A Serpent was the Egyptian ina monument of Assyrian origin described by M. Cler- | equivalent of Scorpio; the Arrow only of Sagittarius was mont-Ganneau, showing a corpse guarded by a pair of | retained ; Capricornus became " Life," or a Mirror as an fish-gods.6 The doubling of the sign of Pisces still recalls, | image of life; Aquarius survived as Water; Taurus, Virgo, according to Mr Sayce,' the arrangement of the Baby- | and Pisces remained unchanged.!4 The motive of some of lonian calendar, in which a year of 360 days was sup- | the substitutions was to avoid the confusion which must plemented once in six years by a thirteenth month, a second | have ensued from the duplication of previously existing Adar. To the double month corresponded the double sign | native asterisms ; thus, the Egyptian and Greek Lions were of the " Fishes of Hea."§ composed of totally different stars. Abstractions in other Cyclical _ The cyclical meaning of the succession of zodiacal signs, | cases replaced concrete objects, with the general result of a though now obscured by interpolations and substitutions, | effacing the distinctive character of the Greek zodiac as a succes. WaS probably once clear and entire. It is curiously re- | "circle of living things." sion of flected in the adventures of the Babylonian Hercules, the Early Zoroastrian writings, though impregnated with Spread signs. solar hero Izdubar.? They were recorded in the compara- star-worship, show no traces of an attempt to organize of Greek

tively late surviving version of the 7th century B.c., on | the heavenly array. In the Bundehish, however (9th Sem:

twelve tablets, with an obvious design of correlation with the twelve divisions of the sun's annual course. Izdubar's conquest of the winged bull Heabani was placed under Taurus; his slaying of the tyrant Houmbaba (the prototype of Geryon) in the fifth month typified the victory of light over darkness, represented in plastic art by the group of a lion killing a bull, which is the form ordinarily given to the eee

1 In citing a Chaldean observation of Mercury dating from 235 B.c. (Almagest, vol. ii. p. 170, ed. Halma).

: See Uranographie Chinoise, by Gustav Schlegel, who, however, claims an extravagant antiquity for the Chinese constellational system,

*3 Lenormant, Origines, vol. i. p. 267. * Wnd., p. 259,*

5 Humboldt, Vues des Cordilléres, 1810, p. 157.

6 Rev. Archéol., 1879, p. 344.

7 Trans. Soc. Bibl. Archeol., vol. iii. p. 166.

8 The god Hea, the Oannes of Berosus, equivalent to the fish-god

Dagon, came to the rescue of the protagonist in the Chaldean drama of the deluge.

- *Sir H. Rawlinson, Atheneum, 7th December 1872,*

century), the twelve '" Akhtars," designated by the same names as our signs, lead the army of Ormuzd, while the seven " Awakhtars" or planets (including a meteor and a comet) fight for Ahriman. The knowledge of the solar zodiac thus turned to account for dualistic purposes was undoubtedly derived from the Greeks. By them, too, it was introduced into Hindustan. Aryabhata, about the beginning of our era, reckoned by the same signs as Hip- parchus. They were transmitted from India by Buddhist missionaries to China, but remained in abeyance until the Jesuit reform of Chinese astronomy in the 17th century.

The native zodiacal system was of unexampled complex- ity. Besides divisions into twenty-eight and twenty-four

10 Lenormant, Origines, vol. i. p. 240.

11 Diod. Sic., Hist., ii. 80, where, however, by au obvious mistake the number of "councillor gods" is stated at only thirty.

- *RB. Brown, Babylonian Record, No. 8, p. 34.*

B Babylonian Record, No. 5, p. 79.

4 Brugsch, Z. D. M. G., vol. ix. b> ulsy

signs.

Aztec signs,

LODIAC 793

Chinese parts, it included two distinct duodenary series. The tse series of or "stations" were referred by Biot to the date 1111 p.c.

Measured from the winter solstice of that epoch, they corresponded, in conformity with the Chinese method of observation by intervals of what we now call right ascen- sion, to equal portions of the celestial equator.! Projected upon the ecliptic, these were, of course, considerably unequal, and the tse accordingly differed essentially from the Chaldean and Greek signs. Their use was chiefly astrological, and their highly figurative names—" (reat Splendour," " Immense Void," "Fire of the Phcenix," é&c. —had reference to no particular stars. They became vir- tually merged in the European series, stamped with official recognition upwards of two centuries ago. The twenty- four ¢sveki or demi-tse were probably invented to mark the course of weather changes throughout the year. Their appellations are purely meteorological.

The characteristic Chinese mode of dividing the "yellow road" of the sun was, however, by the twelve "cyclical animals,"—Rat, Ox, Tiger, Hare, Dragon or Crocodile, Serpent, Horse, Sheep, Monkey, Hen, Dog, Pig. The

open- ing sign corresponds to our Aquarius; and it is remarkable that the rat is, in the far East, frequently used as an ideo- graph for "water." But here the agreement ceases. For the Chinese series has the strange peculiarity of proceeding in a retrograde direction or against the course of the sun. Thus, the second sign (of the Ox) occupies the position of Capricorn, the third that of Sagittarius, and so on. The explanation of this seeming anomaly is to be found in the primitive destination of the "animals" to the purposes of an "'horary zodiac." Their succession, established to mark the hours of day and night, was not unnaturally associated with the diurnal revolution of the sphere from east to west. They are unquestionably of native origin. Tradi- tion ascribes their invention to Tajao, minister of the emperor Hwang-te, who reigned c. 2697 B.c., and it can scarcely be placed later than the 7th century 3.c.3

The Chinese circle of the "animals" obtained early a wide diffusion. It was adopted by Tartars, Turks, and Mongols, in Tibet and Tong-king, Japan and Corea, It is denominated by Humboldt' the "zodiac of hunters and shepherds," and he adds that the presence in it of a tiger gives it an exclusively Asiatic character. It appears never to have been designed for astronomical employment. From the first it served to characterize the divisions of time. The nomenclature not only of the hours of the day and of their minutest intervals was supplied by it, but of the months of the year, of the years in the Oriental sixty-year cycle, and of the days in the "little cycle" of twelve days. Nor has it yet fallen into desuetude. Years "of the Rat," "of the Tiger," "of the Pig," still figure in the almanacs of Central Asia, Cochin China, and Japan.

A large detachment of the "cyclical animals" even found its way to the New World. Seven of the twenty days constituting the Aztec month bore names evidently borrowed from those of the Chinese horary signs. The Hare (or Rabbit), Monkey, Dog, and Serpent reappeared without change ; for the Tiger, Crocodile, and Hen, unknown in America, the Ocelot, Lizard, and Eagle were substituted as analogous.© The Aztec calendar dated from the 7th cen- tury; but the zodiacal tradition embodied by it was doubtless much more ancient. Of the zodiac in its true sense of a partitioned belt of the sphere there was no ab- original knowledge on the American continent. Mexican ie Se ee

? Biot, Journ. des Savans, 1839, p. 729, and 1840, p. 151; Gaubil, Hist. del Astr. Chinoise, p. 9.

? Humboldt, Vues des Cordilléres, p. 168.

3G. Schlegel, Ur. Chin., pp. 37, 561. 4 Op. cit., p. 219.

® Ibid., p. 152; Prescott, Conguest of Mexico, vol. iii. p. 321 (ed.

1860).

acquaintance with the signs related only to their secondary function as dies (so to speak) with which to stamp recur- ring intervals of time.

The synodical revolution of the moon laid down the Lunar lines of the solar, its sidereal revolution those of the lunar Zodiac. zodiac. The first was a circlet of "full moons" ; the second marked the diurnal stages of the lunar progress round the sky, from and back again to any selected star. . The moon was the earliest "'measurer" both of time and space ; but its services can scarcely have been rendered available until stellar "milestones" were established at suitable points along its path. Such were the Hindu nakshatras, a word Hindu originally signifying stars in general, but appropriated to system designate certain small stellar groups marking the divisions ° "4" of the lunar track. They exhibit in an exaggerated form the irregularities of distribution visible in our zodiacal constellations, and present the further anomaly of being frequently reckoned as twenty-eight in number, while the ecliptical ares they characterize are invariably twenty-seven. Now, since the moon revolves round the earth in 27 4 days, hesitation between the two full numbers might easily arise; yet the real explanation of the difficulty appears to be different. The superfluous asterism, named Abhijit, included the bright star a Lyre, under whose in- fluence the gods had vanquished the Asuras. Its invoca- tion with the other nakshatras, remoteness from the ecliptic notwithstanding, was thus due (according to Prof. Max Miiller's plausible conjecture) ° to its being regarded as of especially good omen. Acquaintance with foreign systems of twenty-eight lunar divisions tended doubtless to fix its position, which remained, nevertheless, always equivocal." Alternately admitted into or rejected from the series, it was

finally, some six or seven centuries ago, eliminated by the effects of precession in reversing the order of culmination of its limiting stars.

The notion of a twenty-seven-fold division of the zodiac was deeply rooted in Hindu tradition. The number and the name were in early times almost synonymous. Thus, a nakshatra-mala denoted a necklace of twenty-seven pearls ;° and the fundamental equality of the parts was figured in an ancient legend, by the compulsion laid upon King Soma (the Moon) to share his time impartially be- tween all his wives, the twenty-seven daughters of Pra- japati. Everything points to a native origin for the system of nakshatras. Some were named after exclusively Vedic deities; they formed the basis of the sacrificial calendar of the Brahmans; the old Indian names of the months were derived from them ; their existence was pre- supposed in the entire structure of Hindu ritual and science.? They do not, however, obtain full recognition in Sanskrit literature until the Brahmana period (7th or 8th century B.c.). The Rig-Veda contains only one allu- sion to them, where it is said that "Soma is placed in the' lap of the nakshatras" ; and this is in a part including later interpolations.

Positive proof of the high antiquity of the Hindu lunar zodiac is nevertheless afforded by the undoubted fact that the primitive series opened with Krittika (the Pleiades) as the sign of the vernal equinox. The arrangement would have been correct about 2300 B.c. ; it would scarcely have been possible after 1800 B.c.l° We find nowhere else a well-authenticated zodiacal sequence corresponding to so early a date. The reform by which Krittika, now rele- gated to the third place, was superseded as the head of the series by "Acvini" 4 was accomplished under Greek

——————————————————————— ee 8 Rig-Veda Samhita, vol. iv., 1862, Preface, p. Ixii. ? Whitney, Journ. Am. Orient. Soc., vol. viii. p. 394. 8 Max Miiller, op. cit., p. lxiv. ® Tbid., p. 42. 10 A. Weber, Indische Studien, vol. x. ie 220, 1! Named from the Acvins, the Hindu Castor and Pollux. It is

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influence somewhere near the beginning of our era. For | ample, unmistakably gave its name to the Mexican day purposes of ritual, however, the Pleiades, with Agni or Ollin, signifying Le 'track of eas 3 and —_ sone "Fire" as their presiding deity, continued to be the first | further contain a "flint weapon," a stick," and a "house.

sign. Hindu astronomy received its first definite or- Several houses and. couches were ranged along the Hindu ganization in the 6th century, with results embodied in | zodiac with the naive idea of providing resting-places for

the Surya-Siddhanta. Here the "signs" and the "con- | the wandering moon, ' stellations" of the lunar zodiac form two essentially dis- Relationship of a more intimate kind connects the Hindu Relative tinct systems. The ecliptic is divided into twenty-seven | lunar mansions with those of the Arabs and Chinese. eee equal parts, called bhogas or arcs, of 800' each. But the | The resemblance between the three systems ds indeed 80 Chinese," nakshatras are twenty-eight, and are represented by as | close that it has been assumed, almost as axiomatic, that nq many "junction stars" (yogdtdra), carefully determined | they must have been framed from a single model ; and the Arabian by their spherical coordinates. The successive entries | question of their origin has been debated with all the systems.

of the moon and planets into the nakshatras (the ascer- tainment of which was of great astrological importance) were fixed by means of their conjunctions with the yogd- tdras. These, however, soon ceased to be observed, and already in the 11th century Al-Birini could meet with no Hindu astronomer capable of pointing out to him the complete series. Their successful identification by Colebrooke! in 1807 had a purely archeological interest. The modern nakshatras are twenty-seven equal ecliptical divisions, the origin of which shifts, like that of the solar signs, with the vernal equinox. They are, in fact, the bhogas of the Sirya-Siddhanta. The mean place of the moon in them, published in all Hindu almanacs, is found to serve unexceptionally the ends of astral vaticination.? The system upon which it is founded is of great antiquity. Belief in the power of the nakshatras evidently inspired the invocations of

*them in the Atharva-Veda. In the Brahmana period they were distinguished as "deva" and "'yama," the fourteen lucky asterisms being probably asso- ciated with the waxing, the fourteen unlucky with the waning moon.? A special nakshatra was appropriated to every occurrence of life. One was propitious to marriage, another to entrance upon school-life, a third to the first ploughing, a fourth to laying the foundation of a house. Festivals for the dead were appointed to be held under those that included but one star. Propitiatory abstinences were recommended when the natal asterism was menaced by unfavourable planetary conjunctions. The various members of the body were parcelled out among the nak-shatras, and a rotation of food was prescribed as a whole- some accompaniment of the moon's revolution among them.**

resources of varied erudition by scholars such as Biot, Weber, Whitney, and Max Miller. As the upshot of the controversy it appears nevertheless to have become tolerably clear that the nakshatras were both native to India, and the siew to China, but that the mandzl were mainly of Indian derivation.

sphere had nothing to do with the moon's daily motion seems to convey the actual fact. Their number, as a multiple of four, was prescribed by the quaternary partition of the heavens, fundamental in Chinese astronomy. It was considered by Biot to have been originally twenty- four, but to have been enlarged to twenty-eight about 1100 B.c., by the addition of determinants for the solstices and equinoxes of that period.6 The essential difference, however, between the nakshatras and the svew is that the latter were equatorial, not ecliptical, divisions. They were measured by the meridian-passages of the limiting stars, and varied in amplitude from 2° 42' to 30° 24'.9 The use of the specially observed stars constituting or repre- senting the szew was as points of reference for the move- ments of sun, moon, and planets. They served, in fact, and still serve (though with astrological ends in view), the precise purpose of "fundamental stars" in European as- tronomy. All that is certainly known about the antiquity of the siew is that they were well established in the 3d century B.c. Their initial point at the autumnal equinox marked by Kio (Spica Virginis) suits a still later date ; and there is no valid evidence that the modern series

resulted from the rectification of an older superannuated arrangement, analogous to the Krittika sequence of nak-

Nomen- The nomenclature of the Hindu signs of the zodiac, | skatras. The Hindu zodiacal constellations belong then ee save as regards a few standard asterisms, such as Agvini | to an earlier epoch than the Chinese "stations," such as signs, 20d Krittika, was far from uniform. Considerable dis- | they have been transmitted to our acquaintance. Yet not crepancies occur in the lists given by different authorities.5 | only were the latter an independent invention, but it is Hence it is not surprising to meet in them evidence of | almost demonstrable that the nakshatras, in their more foreign communications. Reminiscences of the Greek | recent organization, were, as far as possible, assimilated to signs of Gemini, Leo, Libra, Sagittarius, Capricornus, and | them. The whole system of junction stars was doubt- Pisces are obvious severally in the Hindu Two Faces, Lion's | less an imitation of the séew; the choice of them by the Tail, Beam of a Balance, Arrow, Gazelle's Head (figured as | Hindu astronomers of the 6th century A.D. was plainly a marine nondescript), and Fish. The correspondence does instigated by a consideration of the Chinese list, conipiled not, however, extend to the stars; and some coincidences | with a widely different intent. Where they varied from adverted to by Humboldt between the nakshatras and the | it, some intelligible reason can generally be assigned for zodiacal animals of Central Asia are of the same nominal | the change. Eight junction stars lie quite close to, seven Connex- character.® Mexican loans are more remarkable. They | others are actually identical with, Chinese determinants ae fae" were apparently direct as well as indirect. The Aztec | and many of these coincidences are between insignificant ava calendar includes nakshatra titles borrowed, not only | and, for the purposes of ecliptical division, inconveniently

through the medium of the Tartar zodiac, but likewise

situated objects.

The assertion, paradoxical at first Chinese sight, that the twenty-eight "'hostelries" of the Chinese aster-

straight from the Indian scheme, apart from any known The small stellar groups characterizing the Arab “ man- Arabian

intervention. The “three footprints of Vishnu,” for ex- | sions of the moon” (mandazil al-kamdr) were more equably oe eS ea i ee ee oie 2 : _ 7 : : of the composed of the stars in the head of Aries, and is figured by a horse’s distributed than either the Hindu or Chinese series. oI TOOL

presented, nevertheless, striking resemblances to both. Twenty-four out of twenty-eight were formed, at least in part, of nakshatra or sieu stars. That the Arab was essen- tially a copy of the Hindu lunar zodiac can scarcely admit

4 Ibid., p. 152. 8 Biot, Jour. des Suvans, 1845, p. 40. : G. Schlegel, Ur. Chin., p. 77. 10 Biot, Htudes, p. 186. ? Whitney, Notes to Strya-Siddhanta, p. 200.

head. 1 As. Res., vol. ix. p. 330.

2 J. B. Biot, Ktiudes sur ? Astronomie Indienne, Dp: 220: —

3 A. Weber, “Die Vedischen Nachrichten von den Naxatra,” in Berliner Abhandlungen, 1861, p. 309. j

4 Ibid., p. 8322; H. Kern, Die Yogatara des Varamihira ; Weber’s Ind. Stud., vol. xv. pp. 174-181. :

> Sir William Jones, As. Res., vol. ii. pp. 294-5.

§ Humboldt, Vues des Cordilléres, p. 154.

Astro- logical predic- tion.

Astro- logical influence of signs.

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of a doubt. They were divided on the same principle; each opened at the spring equinox; the first Arab sign Sharatan was strictly equivalent to the

Hindu Acvini; and eighteen constellations in each were virtually coincident. The model of the stew was, however, also regarded. Eighteen Chinese determinants were included in the Arab asterisms, and of these five or six were not nakshatra stars ; conse- quently, they must have been taken directly from the Chinese series. Nor were the Greek signs without effect in determining the names of the mandzil,! the late appearance of which, in a complete form, removes all difficulty in accounting for the various foreign influences brought to bear upon them. They were first enumerated by Alfar- ghani early in the 9th century, when the Arabs were in astronomy the avowed disciples of the Hindus. But, although they then received perhaps their earliest quasi- scientific organization, the mansions of the moon had for ages previously figured in the popular lore of the Bedouin. A set of twenty-eight rhymes associated their heliacal risings with the changes of season and the vicissi- tudes of nomad life ; their settings were of meteorological and astrological import ;? in the Koran (x. 5) they are re- garded as indispensable for the reckoning of time. Yet even this intimate penetration into the modes of thought of the desert may be explained by prehistoric Indian com- munication. The alternative view, advocated by Weber, that the lunar zodiac was primitively Chaldzan, rests on a very shadowy foundation. It is true that a word radi- cally identical with mandzil occurs twice in the Bible, under the forms mazzaloth and mazearoth (2 Kings xxiii. 5; Job xxxviil. 32); but the heavenly halting-places which it seems to designate may be solar rather than lunar. Euphratean exploration has so far brought to light no traces of ecliptical partition by the moon's diurnal motion, unless, indeed, zodiacal associations be claimed for a set of twenty-eight deprecatory formulz against evil spirits inscribed on a Ninevite tablet.

The safest general conclusions regarding this disputed subject appear to be that the séew, distinctively and un- varyingly Chinese, cannot properly be described as divisions of a lunar zodiac, that the nakshatras, though of purely Indian origin, became modified by the successive adoption of Greek and Chinese rectifications and supposed improve- ments; while the mandzil constituted a frankly eclectic system, in which elements from all quarters were combined. It was adopted by Turks, Tartars, and Persians, and forms part of the astronomical paraphernalia of the Bundehish. The szew, on the other hand, were early naturalized in Japan.

The refined system of astrological prediction based upon the solar zodiac was invented in Chaldia, obtained a second home and added elaborations in Egypt, and spread irresistibly westward about the beginning of our era. For genethliacal purposes the signs were divided into six solar and six lunar, the former counted onward from Leo, the "house" of the sun, the latter backward from the moon's domicile in Cancer. Each planet had two houses—a solar and a lunar—distributed according to the order of their revolutions. Thus Mercury, as the planet nearest the sun, obtained Virgo, the sign adjacent to Leo, with the corresponding lunar house in Gemini; Venus had Libra (solar) and Taurus (lunar); and so for the rest. A ram frequently stamped on coins of Antiochus, with head reverted towards tlhe moon and a star (the planet Mars), signified Aries to be the lunar house of Mars. With the respective and relative posi- tions in the zodiac of the sun, moon, and planets, the character of their action on human destiny varied indefinitely. The influence of the signs, though secondary, was hence overmastering: Julian called them Oe@v duvduers, and they were the objects of a corre- sponding veneration. Cities and kingdoms were allotted to their*

several patronage on a system fully expounded by Manilius :—

Hos erit in fines orbis pontusque notandus, Quem Deus in partes per singula dividit astra,

1 Whitney, Notes to Stirya-Siddhénta, p. 206.

2 A. Sprenger, Z. D. M. G., vol. xiii. p. 161; Biriini, Chronology, trans. by Sachau (London, 1879), p. 386 sg.

3 Lenormant, Chaldean Magic, p. 1.

4 "Orat. in Solem," Op., vol. i. p. 148, ed. 1696.

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Ac sua cuique dedit tutele regna per orbem, Et proprias gentes atque urbes addidit altas, In quibus exercent prestantia sidera vires.5

Syria was assigned to Aries, and Syrian coins frequently bear the effigy of a ram ; Scythia and Arabia fell to Taurus, India to Gemini. Palmyra, judging from numismatic evidence, claimed the favour of Libra, Zeugma that of Capricorn ; Leo protected Miletus, Sagittarius Singara.© The "power of the signs" was similarly distributed among the parts of the human body :—

Et quanquam communis eat tutela per omne Corpus, et in proprium divisis artubus exit: Namque aries capiti, taurus cervicibus heeret 5 Brachia sub geminis censentur, pectora cancro.7

Warnings were uttered against surgical treatment of a member through whose sign the moon happencd to be passing ;® and zodiacal anatomy was an indispensable branch of the healing art in the Middle Ages. Some curious memorials of the superstition have survived in rings and amulets, engrayen with the various signs, and worn as a kind of astral defensive armour. Many such, of the 14th and 15th centuries, have been recovered from the Thames.? Individuals, too, adopted zodiacal emblems. Capricornus was im- pressed upon the coins of Augustus, Libra on those of Pythodoris, queen of Pontus ; a sultan of Iconiuin displayed Leo as his "horo- scope" and mark of sovereignty ; Stephen of England chose the protection of Sagittarius.

In Egypt celestial influences were considered as emanating mainly Egyptian

from the thirty-six "decans" of the signs. They were called the astro- "media of the whole circle of the zodiac ;" 1° each ten-day period logy. of the Egyptian year was consecrated to the decanal god whose section of the ecliptic rose at its commencement ; the body was correspondingly apportioned, and disease was cured by invoking the zodiacal regent of the part affected As early as the 14th century B.C. a complete list of the decans was placed among the hieroglyphs adorning the tomb of Sethos I.; they figured again in the temple of Rameses II.,!2 and characterize every Egyptian astrological monument. Both the famous zodiacs of Dendera dis- play their symbols, unmistakably identified by Lepsius. The late origin of these interesting representations was established by the detection upon them of the cartouches of Tiberius and Nero. As the date of

inception of the circular one now at Paris the year 46 B.C. has, however, been suggested with high probability, from (among other indications) the position among the signs of the emblem of the planet Jupiter. Its design was most likely to serve as a sort of thema celi at the time of the birth of Cesarion. The companion rectangular zodiac still in sitw on the portico of the temple of Isis at Dendera suits, as to constellational arrange- ments, the date 29 a.p. It set forth, there is reason to belicve, the natal scheme, not of the emperor Tiberius, as had been conjectured by Lauth,! but of the building it served to decorate. The Greek signs of the zodiac, including Libra, arc obvious upon both these monuments, which have thrown some useful light upon the calendar system and method of stellar grouping of the ancient Egyptians. ®

An Egypto-Greek planisphere, first described by Bianchini,2® Plani- resembles in its general plan the circular zodiac of Dendera. The spheres. decans are ranged on the outermost of its five concentric zones ; the planets and the Greek zodiac in duplicate occupy the next three ; while the inner circle is unaccountably reserved for the Chinese cyclical animals. The relic was dug up on the Aventine in 1705, and is now in the Louvre. It dates from the 2d or 3d century of our era. The Tartar zodiac is not unfrequently found engraven on Chinese mirrors in polished bronze or steel of the 7th century, and figured on the "' plateau of the twelve hours" in the treasury of the emperors of the Tang dynasty."

Probably the most ancient zodiacal representation in existence is a fragment of a Chaldean planisphere in the British Museum, once inscribed with the names of the twelve months and their govern- ing signs, Two only now remain.® A zodiac on the "astrological altar of Gabies" in the Louvre illustrates the apportionment of the signs among the inmates of the Roman Pantheon; and they occur

> Astr., bk. iv., ver. 696 sq. ;

6 Eckhel, Descriptio Nummorum Antiochie Syriz, pp. 18, 25.

7 Manilius, Astr., bk. iv. ver. 702-5.

8 A. J. Peirce, Science of the Stars, p. 84.

® Journ. Arch. Soc., xiii. pp. 254, 310, and xx. p. 80.

10 In a fragment of Hermes translated by Th. Taylor at p. 362 of his version of Iamblichus.

11 Pettigrew, Superstitions Connected with Hist. of Medicine, p. 30.

2 Lepsius, Chronologie der Aegypter, part i. p. 68.

1 Ail 8% WO M Les Zodiaques de Denderah, p. 78.

15 See Riel's Das feste Jahr von Denderah, 1878.

16 Mém. del' Acad., Paris, 1708, Hist., p. 110 ; see also Humboldt, Vues des Cordilléres, p. 170 ; Lepsius, op. cit., p. 83 ; Froéhner, Sculp- ture du Louvre, p. 17. 3

W Schlegel, Ur. Chin., p. 561; Pettigrew, Jour. Arch. Soc., vol. viii 85 Baile 18 Fox Talbot, Trans. Soc. Bibl. Archeol., vol. iv. p. 260.

19 Ménard, La Mythologie dans I Art, p. 388.

Zodiacal symbols

in archi- crypt of San Savino at Piacenza.!

tecture.

Zodiacal hiero- glyphs,

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as a classical reminiscence in the mosaic pavements of San Miniato and the baptistery at Florence, the cathedral of Lyons, and the Zodiacal symbolism hecame conspicuous in medieval art. Nearly all the French cathedrals of the 12th and 13th centuries exhibit on their portals a species of rural calendar, in which each month and sign has its corresponding labour. The zodiac of Notre Dame of Paris, opening with Aquarius, is a noted instance." A similar series, in which sculptured figures of Christ

*and the Apostles are associated with the signs, is to be seen in perfect preservation on the chief doorway of the abbey church at Vézelay. The cathedrals of Amiens, Sens, and Rheims are decorated in the same way. In Italy the signs and works sur- vive fragmentarily in the baptistery at Parma, completely on the porch of the cathedral of Cremona and on the west doorway of St Mark's at Venice. They are less common in England; but St Margaret's, York, and the church of Iffley in Oxfordshire offer good specimens. In the zodiac of Merton College, Oxford, Libra is re- presented by a judge in his robes and Pisces by the dolphin of litzjames, warden of the college, 1482-1507.3 The great rose-win- dows of the Early Gothic period were frequently painted with zodiacal emblems; and some frescos in the cathedral of Cologne contain the signs, each with an attendant angel, just as they were depicted on the vault of the church at Mount Athos. Giotto's zodiac at Padua was remarkable (in its undisturbed condition) for the arrangement of the signs so as to be struck in turns, during the corresponding months, by the sun's rays.*_ The "' zodiac of labours' was replaced in French castles and hétels by a ''zodiac of plea- sures," in which hunting, hawking, fishing, and dancing were sub- stituted for hoeing, planting, reaping, and ploughing.®*

It is curious to find the same sequence of symbols employed for the same decorative purposes in India as in Europe. A perfect set of signs was copied in 1764 from a pagoda at Verdapettah near Cape Comorin, and one equally complete existed at the same period on the ceiling of a temple near Mindurah.®

The hieroglyphs representing the signs of the zodiac in astrono- mical works are of late introduction. They are found in manu- scripts of about the 10th century, but in carvings not until the 15th or 16th.' Their origin is unknown ; but some, if not all of them, have antique associations. The hieroglyph of Leo, for instance, occurs among the symbols of the Mithraic worship.6 (A. M. C.)

ZODIACAL LIGHT. The zodiacal light is usually de- scribed as a cone or lenticularly-shaped glow of nebulous light, seen after sunset or before sunrise, extending up- wards from the position of the sun nearly in the direction of the ecliptic or of the sun's equator. This description, though

fairly correct for the higher latitudes, does not represent accurately what is seen in the tropics, where the light is often a very conspicuous object. There, if an observer on a clear, moonless night watches the western sky from soon after sunset till the last trace of twilight has disappeared, he will notice that the twilight seems to linger longer near where the sun sank below the horizon, and that gradually a nebulous whitish band of light, broad towards the horizon and narrowing first rapidly and then more slowly upwards, begins to stand out clearly from the vanishing twilight, which spreads along a much wider and nearly horizontally-topped arc of the horizon. 'This is the zodiacal light. When seen on a perfectly clear night, it will be noticed that it fades imperceptibly on both borders and towards the vertex, and that its light is distinctly brighter towards the base than at greater altitudes. Its width and brightness, and the height of the vertex, differ very much from time to time, partly on account of actual variations, but much more from differences in the trans- parency of the atmosphere. In England it is seldom observed - except in the months of March, April, and May shortly after sunset, or about October before sunrise. This is due to no change in the light itself, but simply to the

1 Fowler, Archxologia, vol. xliv. jo 1.

? Viollet-le-Duc, Dict. de l'Arch. Francaise, vol. ix. p. 551; Le Gentil, Mém. del Acad., Paris, IPAS, jo, AO

3 Fowler, Archwologia, vol. xliv. 1 LUO)

> Viollet-le-Duc, Dict. de l'Arch., vol. ix. p. 551.

§ John Call, Phil. Trans., vol. 1xii. p. 353. Comp. Houzeau, Bidbliographie Astronomigque, vol. i. pt. i. p. 136, where a useful sketch of the general results of zodiacal research will be found.

7 R. Brown, Archeologia, vol. xvii. p. 341; Sayce, in Nature, vol. Xxyv. p. 525,

8 See Lajard, Culte de Mithra, pl. xxvii. fig. 5, &e.

4 Ibid., p. 175.

circumstance that at other seasons the ecliptic makes so small an angle with the horizon that a light lying in or near it does not rise sufficiently high above the mists of the horizon to be seen after the twilight has vanished. In lower latitudes, where the angle made with the horizon is greater, while the duration of twilight is shorter, it can be easily seen at all seasons when there is a clear sky and no moon, except when Venus is an evening star, in which case the great brightness of that planet often almost completely obliterates the comparatively faint zodiacal light, at least in its neighbourhood. The zodiacal light has frequently been described as having a reddish yellow tint ; but this seems to be erroneous, for, when seen under favourable conditions, it is distinctly white and very similar to that of the Milky Way. Any colour that may have been observed is doubtless due to atmospheric causes.

Among the Moslems, to whom it is important on ritual grounds to determine accurately the moment of daybreak, at which during Ramadan the daily fast begins, the morning zodiacal light appears to have been observed from an early period, and is known as the "false dawn" or the "wolf's tail" (Redhouse, in Journ. R. A. S., July 1878). But in Christian Europe it seems to have been first observed by Kepler, who described its appearance with considerable accuracy and came to the conclusion that it was the atmosphere of the sun. Descartes wrote about it in 1630 and Childrey in 1659; but the attention of astronomers was first prominently called to it by Dominic Cassini, who first saw it on 18th March 1683. It is to him that it owes the name which it now bears. He explained it by supposing the existence of a flat, luminous ring encircling the sun, nearly in the plane of his equator, and accounted for its disappearance on the sanie principle as that which accounts for the vanishing of Saturn's ring. Mairan (1731), like Kepler, ascribed the light to the sun's atmosphere ; and this explanation was generally accepted, till Laplace showed that it was untenable, since no real solar atmosphere could extend to anything like the distance from the sun which is reached by the zodiacal light. He further showed that, even if the solar atmosphere did extend far enough,

it would not have the lenticular appearance ascribed by observers to the zodiacal light, since the polar axis would be at least two-thirds of the equatorial axis. Since then many observers have made a study of the subject, amongst whom may be mentioned Jones, Piazzi Smyth, Jacob, Brorsen, Schmidt, Backhouse, Liais, and Wright.

Extent.—The way in which the light fades off gradually towards the boundaries makes it extremely difficult to determine accurately the true position of the light or its extent. Various observations show that at times the base, at an elongation of about 20°, may have a width of from 25° to 30°, while at an elongation of 60° the breadth is frequently as much as 20°, but usually much less. The distance of the vertex from the sun frequently exceeds 90°, and Mr Liais and others have recorded cases when the light has been traced completely round from the western to the eastern horizon. This is very uncommon ; but it is not at all rare to find the light stretching nearly to the meridian three hours aftcr sunset, and several ob- servers have recorded the existence of a bright patch of light almost opposite to the position of the sun. This is known as the @egen-schein, and though it las been secn comparatively seldom its exist- ence must be accepted as proved ; for its position has been deter- mined by actual measurement by several astronomers, and their results agree with quite as great closeness as can be expected in the determination of the position of such an object. A lengthened series of observations was made on the zodiacal light by the Rev. G. Jones, chaplain of the United States steam frigate " Mississippi," in the China and Japan Seas in 1855. He charted the apparent posi- tion of the cone of light on a large number of nights and mornings, and came to the somewhat startling conclusion that his observations could be explained only by supposing the existence of a nebulous ring round the earth within the orbit of the moon. He recorded that twice near 23° 28' N, lat., with the sun at the opposite solstice,

he had seen "the extraordinary spectacle of the zodiacal light, simultaneously at both the east and west horizons from 11 to 1

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o'clock for several nights in succession." On reading this state- ment, Baron Humboldt communicated to the Monatsberichte d. kén. preuss.

Akad. d. Wiss. some unpublished obscrvations of his own on a sunilar phenomenon. These were to the effect that on the 17th and 18th of March the light was very bright in the west, and "we constantly perceived in the east (and this is beyond doubt a very striking phenomenon) a whitish light which was also of a pyra- midal form. The latter augmented the brightness of the sky ina very striking manncr." The light in the west was so conspicuous that "even the sailors were delighted with this double light." He noted, too, what is a very important fact, that the two lights set at the same time; and there is much to be said in defence of his view that the eastern light was the reflexion of the true zodiacal light in the west, just as the eastern sunset glows are the reflexion of those in the west. The chief obstacle in the way of accepting this view is that,it is difficult to believe that a light so faint as the zodiacal light could have a reflexion bright enough to be seen, and even to be seen distinctly. On the other side must be set the cir- cumstance that the simultaneous glow at both horizons seems never to have been observed from great altitudes. This is easily under- stood if the second glow is a mere reflexion ; whereas, if it comes from another source of light, it ought to be more conspicuous at high than at low levels.

Position.—The exact position of the axis of the zodiacal light relatively to the ecliptic has not yet been satisfactorily fixed. The extreme haziness of outline and the excessive faintness of the light near the vertex make it quite impossible to use a telescope for measuring its limits. Most observers have tried to fix its position by tracing its outline on a star chart, while Prof. C. Piazzi Smyth employed two sights mounted equatorially. But even by these means no great accuracy can be attained, for the limits of the light can be traced only when the eye is quite unfatigued and when the light is looked at with averted vision. The difficulty experienced is well illustrated by the wide divergencies between the results of different observers—divergencies not only in the extent of the light, which would be quite natural, but even in the direction of the axis of the cone. Thus, Captain Jacob, who observed in Madras in 1856-57-58, found that his evening observations placed the vertex of the western cone in from 2°S. lat. to 6° N. lat., with an average of about 3° N. lat. His morning observations were less numerous and gave positions for the vertex of the eastern cone varying from 3 N, to 8° S., with an average

of about 2°S. Mr Backhouse from 418 observations found a mean deviation from the ecliptic of 2°-06, while Captain Tupman, observing in the Mediterranean in August and September, found an inclination of no less than 20°. He also found that the plane of the light did not pass through the sun. His observations, however, differ somewhat widely from those of most other observers. Mr A. Searle has made a very careful study of all the best published records. In his first paper more than 650 observations by Jones, Heis, Schmidt, and others are discussed, and he concludes that apparent changes in Jlati- tude are mainly, if not entirely, produced by the effect of atmo- spheric absorption, which affects the lower boundary more than the upper and to an extent depending on the inclination of the axis of the light to the horizon. In a second paper he discusses Jones's observations alone and comes to the conclusion that, after making allowance for the effects of absorption, there is some evidence that the zodiacal light, as seen during the second half of the 19th century, has had a more northern latitude near 180° long. than near 0° long. It seems somewhat doubtful, however, whether the observations hitherto made are sufficiently accurate to justify this conclusion, and all that can be confidently asserted is that the observations made so far point to such a difference as being probable. Similar variations in the greatest clongation, the breadth, and the bright- ness have been asserted to exist. Thus Mr J. F. Julius Schmidt, as the result of several years' observations, finds a variation in the inclination of the axis of the cone of light to the ecliptic from 4° 18' at the end of December to 0° towards the end of March, a similar variation in the greatest elongation from the sun from 120° in January to 70° in April, and a further similar variation in breadth at corresponding elongations, with a minimum for all three about 30th March. It may be pointed out that observations regarding the extent of the visible light are absolutely valueless unless accom- panied by careful records of the clearness of the sky as evidenced by the visibility of faint objects, for all obscrvers of the zodiacal light must have noticed that a thin film of mist, which hardly affects the colour of the sky or the visibility of the brighter stars, may almost completely obliterate the zodiacal light. No accurate photo- metric observations seem to have been made on the strength of the light and observers have differed widely in their estimates. Some assert that it is much brighter than the Milky Way, while others— and especially those who have observed in the tropics— say that it is

seldom so bright as the brighter parts of the Milky Way. It is certainly often brighter than most of the Milky Way. Mr Searle deduces from Sir W. Herschel's and Celoria's observa- tions that the Milky Way is about 2 magnitudes brighter than the mean brightness of the sky, and says that on this estimate the

brighter parts of the zodiacal light would be commonly 3 or 4 magnitudes brighter than the surrounding sky. This is almost certainly an over- estimate. There seems to be very little doubt that the brightness undergoes periodic fluctuations, but no estimate can as yet be made of the length of the period. It is probable that the brightness has been below the average for the last few years, but is now increasing. Most observers have also reported rapid changes of brightness, or undulations, such as are seen in the aurora and in the tails of some comets; but, as was pointed out by Olbers in 1833, these undulations must be produced in the earth's atmo- sphere. In this connexion it may be mentioned that in observing the spectrum rapid fickerings, like waves moving along the spectrum, are often very marked.

The Moon's Zodiacal Light.—Several observers have recorded observations which appeared to show that the moon produced an appearance very similar to that of the zodiacal light. Piazzi Smyth, however, when observing on the Peak of Teneriffe, saw this appear- auce and showed by actual measurement that the glow seen before moonrise does not lie near the ecliptic, but is nearly vertical, and is due simply to refraction in the earth's atmosphere. This ex- planation will hardly account for an interesting observation made by Mr L. Trouvelot, which if repeated would require to be very carefully investigated. On a night when the zodiacal light was very bright and there were magnetic disturbances followed by an auroral display, but when no aurora was actually visible, he saw a conical light rising obliquely from the top of the roof of a building behind which the moon, then about 15° or 20° above the horizon, was concealed. The axis of the light coincided nearly with the ecliptic and the light could be traced on both sides of the moon, when the moon itself was concealed. The whole of the circum- stances led Mr

Trouvelot to conclude that this light and the zodiacal light were phenomena of the same order, while this and other observations, he cousidered, rendered it probable that there was some connexion between the zodiacal light and auroras.

Physical Constitution.—As has already been pointed out, it is impossible to see the zodiacal light through a telescope, and this, taken along with the extreme faintness of the light, renders it exceedingly difficult to examine it satisfactorily with either the polariscope or the spectroscope. Many attempts have been made to determine whether or not the light was to any extent polarized, but with questionable results until Prof. A. W. Wright attacked the problem, using a polariscope specially designed for studying very faint lights. With this he was enabled to determine with certainty that the light was partially polarized in a plane passing through the sun, and that the amount of polar- ization was most probably as much as 15 per cent., but less than 20 per cent. Many attempts have been made to observe the spectrum. In 1867 Angstrém, observing at Upsala in March, obtained the bright aurora line (W. L. 5567), and concluded that in the zodiacal light there was the same material as is found in the aurora and in the solar corona, and probably through all space. Upsala, however, is a place where the aurora spectrum can often be observed in the sky even when no aurora is visible, and it has generally been believed that what Angstrém really saw was an auroral and nota zodiacal light spectrum. Sefior A. T. Acrimiz, observing at Cadiz, obtained a con- tinuous but faint spectrum with two bright lines—a yellowish line, probably an aurora line, and a line in the blue, more refrangible than F, which he could not identify, but which in all probability was another auroral line. The fact that he saw this spectrum with a five-prism spectroscope attached to an equatorial seems conclusive evidence that it was not the zodiacal light spectrum that he was observing. The most satisfactory observations hitherto published seem to be those of Prof. Piazzi Smyth and Prof. A. W. Wright. Both used spectroscopes specially designed for the examination of faint lights, and their results agree completely with each other. Prof. Smyth made his observations at Palermo and found a faint con- tinuous spectrum extending from about W. L. 5550 to W. L, 5000 (British inches scale), with a maximum brightness at about W. L. 5350. In fact, the light was almost exactly'

similar to that of faint diffused sunlight, such as is got in the last traces of twilight. Prof. Wright's conclusion was

that the spectrum differs from that of sunlight only in intensity. Some recent unpublished observations made in the tropics indicate that, while the spectrum is usually that described by Prof. Smyth, there are times when a bright line is scen. Too much stress, however, must not be laid on this, as the observations are by no means conclusive, and the apparent line may in reality be only a part of the continuous spectrum which is brighter than usual. ;

The discussion of the real cause of the zodiacal light is rendered very difficult by the want of agreement in the observations that have been made upon it, and by the existence of a small number of apparently trustworthy observations of a very abnormal extension of the light, as detailed above; but certain conclusions may be safely arrived at. The theory that it is due to a ring of small bodies surrounding the earth seems to be entirely negatived, as pointed out by Proctor and others, by several of its features. The best observations leave no room for the parallactic displacement which would be observed if there were such a ring round the earth, and the absence of a large part of the luminous circle on ordinary occasions would be inexplicable on any such hypothesis. There can therefore be very little doubt that we must look for the cause of the light to the existence of a mass of small bodies moving in orbits round the sun, and that, as shown by the polarization and the spectrum, the light is chiefly, if not entirely, reflected sunlight. To account for all the observations, Proctor has shown that the bodies must travel in orbits of considerable eccentricity, carrying them far beyond the limits of what we may term the zodiacal disk. Under these conditions the constitution of the disk would become variable within exceedingly wide limits, and all the recorded variations might be fairly explained. The appearance of a complete arch, as seen by Liais and others, would indicate an extension far beyond the earth's orbit ; but, at present at least, this must. be looked on as very exceptional. The spectroscopic evidence, so far as it goes, confirms this theory, since it indicates that the light is mainly reflected

sunlight ; and, even if further observations should confirm the opinion that bright lines are sometimes present, this need in no way invalidate the conclusions that have been arrived at. Indeed, it seems highly probable—especially if Mr Lockyer's views regarding meteorites are confirmed—that bright lines should be seen in such a body of meteorites. Olbers long ago suggested that the corona was the brightest part of the zodi- acal light, and there is nothing in recent observations to con- tradict this view, for all observations go to show that the outer corona has no definite boundary, but shades off imper- ceptibly and becomes invisible at a great distance from the sun. Dr Huggins, while holding that the corona is most probably due to the ceaseless outflow of extremely minute particles from the sun, thinks it not improbable that the zodi- acal light may be in some way connected with this outflow. Dr Siemens, when discussing his theory of the conservation of solar energy, sought for an explanation of the zodiacal light in the dust which he supposed to be ejected from equa- torial regions, rendered luminous partly by reflected sunlight, partly by phosphorescence, and partly by electrical action.

With the increasing number of observatories at high altitudes it may fairly be hoped that before long astro- nomers will be put in possession of such definite measure- ments as will enable some at least of the points still under discussion to be finally settled, and that far more accurate observations will soon be available on which to construct a satisfactory theory.

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ZOHAR. See Kappan.

ZOLLNER, JoHann Cart FRIEDRICH (1834-1882), astronomer and physicist, was born at Berlin on 8th November 1834. From 1872 he held the chair of astro- physics at Leipsic university. He is the author of numer- ous papers on photometry and spectrum analysis in Poggen- dorf's Annalen and Berichte der kh. sdichsischen Gesellschaft der Wissenschaften, of two works on astronomical photo- metry (Grundztige einer allgemeinen Photometrie des Him- mets, Berlin, 1861, 4to, and Photometrische Untersuchungen, Leipsic, 1865, 8vo), and of a very strange book, Ueber die Natur der Cometen (Leipsic, 1872, 8vo). He died at Leipsic on 25th April 1882.

Zollner's "astrophotometer"' compares the light of a star as seen in a telescope with that of an artificial star produced by a paraffin lamp. From the latter the light passes through three Nicol's prisms, of which two can be turned so as to vary the intensity of the light, the latter being proportional to the square of the cosine of the angle through which the prisms are turned, which angle is read off on a small circle. In ordcr to vary the colour of the arti- ficial star, so as to make it resemble the natural star as much as possible, there is inserted between the first and second prisms a plate of left-handed quartz, cut perpendicular to the axis, the rota- tion of which is read off on another circle. This instrument has been used by Zéllner, Lindemann, Engelmann, J. T. Wolff, and others for photometric observations of stars and planets; but it labours under

several defects, among which the difficulty of keeping the flame of the lamp at a constant height is the most serious,

ZOMBOR, a royal free city of Hungary, the capital of the county of Bacs-Bodrog, lies about 120 miles south of Buda- pest in a fertile plain, on the Francis Canal that connects the Danube and the Theiss. The town has some fine streets and squares, and several handsome buildings, among which may be mentioned the county and town halls, the theatre, and the Roman Catholic and Greek churches. Zombor is a station on the Alfold-Fiume Railway and the centre of the corn and cattle trade of an extensive area. The popu- lation numbered 24,693 in 1880 and about 31,000 in 1886.

ZONARAS, Joannes, historian and theologian, flour- ished at Constantinople in the 12th century. Under Alexius I. Comnenus he held the offices of commander of the bodyguard and private secretary to the emperor, but in the succeeding reign he retired to Mount Athos, where he spent the rest of his life in writing his books. He is said to have lived to the age of eighty-cight.

His most important work, the Chronicon, is in eighteen books, and extends from the creation of the world to the death of Alexius (1118). The carlier part is largely drawn from Josephus; for Roman history he chiefly followed Dion Cassius, whose first twenty books are only known to us through Zonaras. Of contemporary events which he himself witnessed he writes more briefly and meagrely than might have been expected. His history was con- tinued by Nicetas Acominatus. Among the other works of Zonaras is an Exposition of the Apostolical Canons. The Chrontcon or Annals was first printed at Basel in 1557; Du Cange next edited it in 1686 ; and it also forms part of the Bonn collection of Byzantine writers, having been edited by Pinder (2 vols.) in 1841-44. The latest edition is by Dindorf, with Du Cange's notes (6 vols. 8vo, Leipsic, 1868-75). The Opera Omnia Historica, Canonica, Dog- mutica, were published by Migne in 2 vols. 4to, at Paris in 1865.

A lexicon, also attributed to Zonaras, has been edited by Tittmann (Leipsic, 1808).

AW OE OG Y

‘hare branch of science to which the name zoology is

strictly applicable may be defined as that portion of biology which relates to animals, as distinguished from that portion which is concerned with plants.

theories having been rejected and nothing as yet suggested in their place.

The history of zoology as a science is therefore the his- Scope of tory of the great biological doctrine of the evolution of the his-

Relation The science of biology itself has been placed by Mr | living things by the natural selection of varieties in the ty of ; : d : 5 2 zoology.

of bio- Herbert Spencer in the group of concrete sciences, the | struggle for existence,—since that doctrine is the one

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ie ° other groups recognized by that writer being the “abstract- | medium whereby all the phenomena of life, whether of form

sciences, Concrete” and the “abstract.” The abstract sciences are | or function, are rendered capable of explanation by the laws

logic and mathematics, and treat of the blank forms in which phenomena occur in relation to time, space, and number. The abstract-concrete sciences are mechanics, physics, and chemistry. The title assigned to them is justified by the fact that, whilst their subject-matter is found in a consideration of varied concrete phenomena, they do not aim at the explanation of complex concrete phenomena as such, but at the determination of certain “abstract” quantitative relations and sequences known as the “laws” of mechanics, physics, and chemistry, which never are manifested in a pure form, but always are inferred by observation and experiment upon complex phenomena in which the abstract laws are

disguised by their simultaneous interaction. The group of concrete sciences includes astronomy, geology, biology, and socio- logy. These sciences have for their aim to "explain" the concrete complex phenomena of (a) the sidereal system, (d) the earth as a whole, (c) the living matter on the earth's surface, (d) human society, by reference to the properties of matter set forth in the generalizations or laws of the abstract-concrete sciences, 7.e., of mechanics, physics, and

of physics and chemistry, and so made the subject-matter of a true science or study of causes. A history of zoology must take account of the growth of those various kinds of information with regard to animal life which have been arrived at in past ages through the labours of a long series of ardent lovers of nature, who in each succeeding period have more and more carefully and accurately tested, proved, arranged, and tabulated their knowledge, until at last the accumulated lore of centuries—almost without the con- sciousness of its latest heirs and cultivators—took the form of the doctrine of descent and the filiation of the animal

series. History.

There is something almost pathetic in the childish wonder and delight with which mankind in its earlier phases of civilization gathered up and treasured stories of strange animals from distant lands or deep seas, such as are recorded in the Physiologus, in Albertus Magnus, and even at the present day in the popular treatises of Japan and China, That omnivorous universally credulous stage, which may be called the "legendary," was succeeded by

the age of collectors and travellers, when many of the Era of strange stories believed in were actually demonstrated as collect- true by the living or preserved trophies brought to Europe 078 224

: aera : ~~+ travel~~ by adventurous navigators. The possibility of verification ia '

chemistry.

The classification thus sketched exhibits, whatever its practical demerits, the most important fact with regard to biology, namely, that it is the aim or business of those

occupied with that branch of science to assign living things, in all their variety of form and activity, to the one set of forces recognized by the physicist and chemist. Just as the astronomer accounts for the heavenly bodies and their movements by the laws of motion and the pro- perty of attraction, as the geologist explains the present state of the earth's crust by the long-continued action of the same forces which at this moment are studied and treated in the form of "laws" by physicists and chemists, so the biologist seeks to explain in all its details the long process of the evolution of the innumerable forms of life now existing, or which have existed in the past, as a neces- sary outcome, an automatic product, of these same forces.

Science may be defined as the knowledge of causes; and, so long as biology was not a conscious attempt to ascertain the causes of living things, it could not be rightly grouped with other branches of science. For a very long period the two parallel divisions of biology,—botany and zoology,— were actually limited to the accumulation of observations, which were noted, tabulated, and contemplated by the students of these subjects with wonder and delight, but only to a limited extent and in restricted classes of facts with any hope or intention of connecting the phenomena observed with the great nexus of physical sequence or causation. A vague desire to assign the forms and the activities of living things in all their variety to general causes has always been present to thoughtful observers from the earliest times of which we have record, but the earlier attempts in this direction were fantastic in the extreme ; and it is the mere truth that, at the time when the phenomena of inorganic nature had been recognized as the outcome of uniform and constant properties capable of analysis and measurement, living things were still left hopelessly out of the domain of explanation, the earlier

established verification as a habit; and the collecting of things, instead of the accumulating of reports, developed a new faculty of minute observation. The early collectors of natural curiosities were the founders

of zoological science, and to this day the naturalist-traveller and his correlative, the museum curator and systematist, play a most important part in the progress of zoology. Indeed, the historical and present importance of this aspect or branch of zoological science is so great that the name "zoology" has until recently been associated entirely with it, to the exclusion of the study of minute anatomical structure and function which have been distinguished as anatomy and physiology. It is a curious result of the steps of the historical progress of the two divisions of biological science that, whilst the word "botany" has always been understood, and is at the present day understood, as embracing the study, not only of the external forms of plants, their systematic nomencla- ture and classification, and their geographical distribution, but also the study of their minute structure, their organs of nutrition and reproduction, and the mode of action of the mechanism furnished by those organs, the word "zoology" has been limited to such a knowledge of ani- mals as the travelling sportsman could acquire in making his collections of skins of beasts and birds, of dried insects and molluscs' shells, and such a knowledge as the museum curator could acquire by the examination and classification of these portable objects. Anatomy and the study of ani- mal mechanism, animal physics, and animal chemistry, all of which form part of a true zoology, have been excluded from the usual definition of the word by the mere accident that the zoologist of the last three centuries has had his museum but has not had his garden of living specimens as. the botanist has had ;! and, whilst the zoologist has thus

1 The medieval attitude towards both plants and animals had no

for a long time been deprived of the means of anatomical and physiological study—only supplied within the past century by the method of preserving animal bodies in alcohol—the demands of medicine for a knowledge of the structure of the human animal have in the meantime

named and independently constituted sciences, leaving at last, as a residwum to which the word might still be applied, that medical aspect of

life which is concerned with the workings of the living organism regarded as a piece of physico-chemical apparatus.

Whatever may be the history of the word " physiology," Rise of

brought into existence a separate and special study of we find zoology, which really started in the 16th century scientific

human anatomy and physiology.

Relation From these special studies of human structure the | with the awakening of the new spirit of observation and he toana~- knowledge of the anatomy of animals has proceeded, the | exploration, for a long time running a separate course tomyand same investigator who had made himself acquainted with | uninfluenced by the progress of the medical studies of te "the structure of the human body desiring to compare with | anatomy and physiology. The history of every branch of

the standard given by human anatomy the structures of other animals. Thus comparative anatomy came into exist- ence as a branch of inquiry apart from zoology, and it is only now, in the latter part of the 19th century, that the limitation of the word "zoology" to a knowledge of animals which expressly excludes the consideration of their internal structure has been rejected by the general consent of those concerned in the progress of science; it is now generally recognized that it is mere tautology to speak of zoology and comparative anatoiny, and that our museum naturalists must give attention as well to the inside as to the outside of animals.

The anatomy and physiology of plants have never been excluded from the attention of botanists, because in con- trast to the earlier zoologists they always were in possession of the whole living plant, raised from seed if need be in a hot-house, instead of having only a dried skin, skeleton, or shell. Consequently the study of vegetable anatomy and physiology has grown up naturally and in a healthy way in strict relation to the rest of botanical knowledge, whilst animal anatomy and physiology have been external to zoology in origin, the product of the medical profession and, as a consequence, subjected to a misleading anthropo- centric method.

Restricted Whilst we may consider the day as gone by in which

science involves a recognition of the history, not only of other branches of science, but of the progress of human society in every other relation. The century which de- stroyed the authority of the church, witnessed the dis- covery of the New World, and in England produced the writings of Francis Bacon is rightly regarded as the start- ing-point of the modern knowledge of natural causes or science. The true history of zoology as a science lies within the three last centuries; and, whilst the theories and fables which were current in earlier times in regard to animal life and the various kinds of animals form an im- portant subject of study from the point of view of the history of the development of the human mind, they really have no bearing upon the history of scientific zoology. The great awakening of western Europe in the 16th century led to an active search for knowledge by means of observa- tion and experiment, which found its natural home in the universities. Owing to the connexion of medicine with these seats of learning, it was natural that the study of the structure and functions of the human body and of the animals nearest to man should take root there; the spirit of inquiry which now for the first time became general showed itself in the anatomical schools of the Italian uni- versities of the 16th century, and spread fifty years later to Oxford.

so ee. zoology could be regarded as connoting solely a special In the 17th century the lovers of the new philosophy, Influence physio. Museum knowledge of animals (as twenty-five years ago | the investigators of nature by means of observation and °f aca- logy. was still the case), it is interesting to observe by the way | experiment, banded themselves into academies or societics a.

the curious usurpation of the word " physiology," which, | for mutual support and intercourse. It is difficult to ex- ties,

from having a wide connotation, indicated by its etymology, —the physiologus of the Middle Ages being nothing more nor less than the naturalist or student of nature,—has in these later days acquired a limitation which it is difficult to justify or explain. Physiology to-day means the study of the physical and chemical properties of the animal or vegetable body, and is even distinguished from the study of structure and

strictly confined to the study of function. It would hardly be in place here to discuss at length the steps by which physiology became thus limited, any more than to trace those by which the words " physician " and "physicist" (which both mean one who occupies himself with nature) came to signify respectively a medical prac- titioner and a student of the laws of mechanics, heat, light, and electricity (but not of chemistry), whilst the word "naturalist" is very usually limited to a lover and student of living things, to the exclusion of the so-called physicist, the chemist, and the astronomer. It is probable that physiology acquired its present significance, viz., the study of the properties and functions of the tissues and organs of living things, by a process of external attraction and spoliation which gradually removed from the original physiologus all his belongings and assigned them to newly

relation to real knowledge, but was part of a peculiar and in itself highly Interesting mysticism. A fantastic and elaborate doctrine of symbolism existed which comprised all nature ; witchcraft, alchemy, and medicine were its practical expressions. Animals as well as plants were regarded as "simples" and used in medicine, and a knowledge of them was valued from this point of view. Plants were collected and

cultivated for medicinal use: hence the physic botanist's advantage. aga a

aggerate the importance of the influence which has been exercised by these associations upon the progress of all branches of science and of zoology especially. The essential importance of academies is to be found, as Laplace, the great French astronomer, has said, "in the philosophic spirit which develops itself in them and spreads itself from them as centres over an entire nation and all relations. The isolated man of science can give himself up to dogma- tism without restraint ; he hears contradictions only from afar. But ina learned society the enunciation of dogmatic views leads rapidly to their destruction, and the desire of each member to convince the others necessarily leads to the agreement to admit nothing excepting what is the result of observation or of mathematical calculation."

The first founded of surviving European academies, the Academia Naturz Curiosorum (1651),! especially confined itself to the description and

illustration of the structure of plants and animals; eleven years later (1662) the Royal Society of London was incorporated by royal charter, having existed without a name or fixed organization for seventeen years previously (from 1645). A little later the Academy of Sciences of Paris was established by Louis XIV. The influence of these great academies of the 17th century on the progress of zoology was precisely to effect that bringing together of the museum-men and the physicians or anatomists which was needed for further development. Whilst the race of collectors and systema- tizers culminated in the latter part of the 18th century

1 The Academia Secretorum Nature was founded at N aples in 1560, but was suppressed by the ecclesiastical authorities.

in Linneus, a new type of student made its appearance in such men as John Hunter and other anatomists, who, not satisfied with the superficial observations of the popular "zoologists," set themselves to work to examine anatomic- ally the whole animal kingdom, and to classify its members by aid of the results of such profound study. From them we pass to the comparative anatomists of the 19th century and the introduction of the microscope as a serious instru- ment of accurate observation.

The influence of the scientific academies and the spirit in which they worked in the 17th century cannot be better illustrated than by an examination of the early records of the Royal Society of London. 'The spirit which animated the founders and leaders of that society is clearly indicated in its motto "Nullius in verba." Marvellous narrations were not permitted at the meetings of the society, but solely demonstrative experiments or the exhibition of actual specimens. Definite rules were laid down by the society for its guidance, designed to ensure the collection of solid facts and the testing of statements embodying novel or remarkable observations. Under the influence of the touch- stone of strict inquiry set on foot by the Royal Society, the marvels of witchcraft, sympathetic powders, and other relics of medizval superstition disappeared like a mist before the sun, whilst accurate observations and demon- strations of a host of new wonders accumulated, amongst which were numerous contributions to the anatomy of animals, and none perhaps more

noteworthy than the observations, made by the aid of microscopes constructed by himself, of Leeuwenhoek, the Dutch naturalist (1683), some of whose instruments were presented by him to the society.

Results of It was not until the 19th century that the microscope, useofthe thus early applied by Leeuwenhoek, Malpighi, Hook, and scope, SWammerdam to the study of animal structure, was per-

Pe fected as an instrument, and accomplished for zoology its final and most important service. The earlier half of the 19th century is remarkable for the rise, growth, and full development of a new current of thought in relation to living things, expressed in the various doctrines of develop- ment which were promulgated, whether in relation to the origin of individual animals and plants or in relation to their origin from predecessors in past ages. The perfecting of the microscope led to a full comprehension of the great doctrine of cell-structure and the establishment of the facts—(1) that all organisms are either single corpuscles (so-called cells) of living material (microscopic animalcules, &c.) or are built up of an immense number of such units (2) that all organisms begin their individual existence as a single unit or corpuscle of living substance, which multi- plies by binary fission, the products growing in size and multiplying similarly by binary fission; and (3) that the life of a multicellular organism is the sum of the activities of the corpuscular units of which it consists, and that the processes of life must be studied in and their explanation obtained from an understanding of the chemical and physical changes which go on in each individual corpuscle or unit of living material or protoplasm (cell-theory of Schwann).

On the other hand, the astronomical theories of develop- ment of the solar system from a gaseous condition to its present form, put forward by Kant and by Laplace, had impressed men's minds with the conception of a general movement of spontaneous progress or development in all nature ; and, though such ideas were not new but are to be found in some of the ancient Greek philosophers, yet now for the first time they could be considered with a sufficient knowledge and certainty as to the facts, due to the careful observation of the two preceding centuries. The science of

geology came into existence, and the whole panorama of successive stages of the earth's history, each with its dis-

Ideas of develop- ment.

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tinct population of strange animals and plants, unlike those of the present day and simpler in proportion as they recede into the past, was revealed by Cuvier, Agassiz, and others. The history of the crust of the earth was explained by Lyell as due to a process of slow development, in order to effect which he called in no cataclysmic agencies, no mysterious forces differing from those operating at the present day. Thus he carried on the narrative of orderly development from the point at which it was left by Kant and Laplace,—explaining by reference to the ascertained laws of physics and chemistry the configuration of the earth, its mountains and seas, its igneous and its stratified rocks, just as the astronomers had explained by those same laws the evolution of the sun and planets from diffused gaseous matter of high temperature.

The suggestion that living things must also be included The in this great development was obvious. They had been so Natur- included by poet-philosophers in past ages; they were so neal included by many a simple-minded student of nature xahio, watching the growth of the tree from the seed, formed a true but unverified inference in favour of a general process of growth and development of all things from simpler beginnings. The delay in the establishment of the doctrine of organic evolution was due, not to the ignorant and un- observant, but to the leaders of zoological and botanical science, Knowing as they did the almost endless com-plexity of organic structures, realizing as they did that man himself with all the mystery of his life and conscious- ness must be included in any explanation of the origin of living things, they preferred to regard living things as something apart from the rest of nature, specially cared for, specially created by a Divine Being, rather than to indulge in hypotheses which seemed to be beyond all pos- sibility of proof, and were rather of the nature of poets' dreams than in accordance with the principles of that new philosophy of rigid adherence to fact and demonstration which had hitherto served as the mainsprings of scientific progress. Thus it was that the so-called "N: atur-philoso- phen" of the last decade of the 18th century, and their successors in the first quarter of the 19th, found few adherents among the working zoologists and botanists. Lamarck, Treviranus, Erasmus Darwin, Goethe, and Saint- Hilaire preached to deaf ears, for they advanced the theory that living beings had developed by a slow process of transmutation in successive generations from simpler an- cestors, and in the beginning from simplest formless matter, without being able to demonstrate any existing mechanical causes by which such development must necessarily be brought about. They were met in fact by the criticism that possibly such a development had taken place ; but, as no one could show as a simple fact of observation that it had taken place, nor as a result of legitimate inference that it must have taken place, it was quite as likely that the past and present species of animals and plants had been separately created or individually brought into existence by unknown and inscrutahle causes, and (it was held) the truly scientific man would refuse to occupy himself with such fancies, whilst ever continuing to concern himself with the observation and record of

indisputable facts. The critics did well; for the " Natur-philosophen," though right in their main conception, were premature.

It was reserved for Charles Darwin, in the year 1859, Darwin's to place the whole theory of organic evolution on a new doctrine footing, and by his discovery of a mechanical cause actu- ee ally existing and demonstrable by which organic evolution ; must be brought about to entirely change the attitude in regard to it of even the most rigid exponents of the scien- tific method. Since its first publication in 1859 the history' of Darwin's theory has been one of continuous and decisive conquest, so that at the present day it is universally ac-

cepted as the central, all-embracing doctrine of zoological and botanical science.

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on the subject of the utility of this or that startling variety of structure; but few attempts, though some of great importance, were made to systematically explain by observa-

Intro- Darwin succeeded in establishing the doctrine of organic | ir

duction evolution by the introduction into the web of the zoological | tion and experiment the adaptation of organic structures

ofthrem" and botanical sciences of a new science. The subject- | to particular purposes in the case of the lower animals

oa matter of this new science, or branch of biological science, | and plants. Teleology had, however, an important part

is had been neglected: it did not form part of the studies | in the development of what is called physiology, viz., the

of the collector and systematist, nor was it a branch of | knowledge of the mechanism, the physical and chemical anatomy, nor of the physiology pursued by medical men, | properties, of the parts of the body of man and the higher nor again was it included in the field of microscopy and animals allied to him. The doctrine of organs and func- the cell-theory. The area of biological knowledge which | tions—the organ designed so as to execute the function, Darwin was the first to subject to scientific method and | and the whole system of organs and functions building up to render, as it were, contributory to the great stream | a complex mechanism, the complete animal or plant—was formed by the union of the various branches, the outlines | teleological in origin (see PHyYsIoLocy), and led to brilliant of which we have already traced, is that which relates to | discoveries in the hands of the physiologists of the last the breeding of animals and plants, their congenital varia- | and the preceding century. As applied to lower and more tions, and the transmission and perpetuation of those | obscure forms of life, teleology presented almost insur- variations. This branch of biological science may be called | mountable difficulties; and consequently, in place of exact thremmatology (Opéypo, "a thing bred"). Outside the | experiment and demonstration, the most reckless though scientific world an immense mass of observation and experi- | ingenious assumptions were made as to the utility of the ment had grown up in relation to this subject. From the | parts and organs of lower animals, which tended to bring earliest times the shepherd, the farmer, the horticulturist, | so-called comparative physiology and teleology generally and the "fancier" had for practical purposes made them- | into disrepute. Darwin's theory had as one of its results selves acquainted with a number of biological laws, and | the reformation and rehabilitation of teleology. Accord- successfully applied them without exciting more than an | ing to that theory, every organ, every part, colour, and occasional notice from the academic students of biology. It | peculiarity of an organism, must either be of benefit to is one of Darwin's great merits to have made use of these | that organism itself or have been so to its ancestors: no observations and to have formulated their results to a | peculiarity of structure or general conformation, no habit large extent as the laws of variation and heredity. As | or instinct in any organism, can be supposed to exist for the breeder selects a congenital variation which suits his | the benefit or amusement of another

organism, not even requirements, and by breeding from the animals (or plants) | for the delectation of man himself. Necessarily, accord- exhibiting that variation obtains a new breed specially | ing to the theory of natural selection, structures either are characterized by that variation, so in nature is there a | present because they are selected as useful or because selection aniongst all the congenital variations of each | they are still inherited from ancestors to whom they were generation of a species. This selection depends on the | useful, though no longer useful to the existing representa- fact that more young are born than the natural provision | tives of those ancestors. of food will support. In consequence of this excess of The conception thus put forward entirely re-founded tele- births there is a struggle for existence and a survival of ology. Structures previously inexplicable were explained the fittest, and consequently an ever-present necessarily- | as survivals from a past age, no longer useful though once acting selection, which either maintains accurately the form | of value. Every variety of form and colour was urgently of the species from generation to generation or leads to its | and absolutely called upon to produce its title to existence modification in correspondence with changes in the sur- | either as an active useful agent or as a survival. Darwin rounding circumstances which have relation to its fitness | himself spent a large part of the later years of his life in for success in the struggle for life. thus extending the new teleology. A beginning only has

Newde- | Darwin's introduction of thremmatology into the domain | as yet been made in the new life of that branch of zoological

velop- of scientific biology was accompanied by a new and special | and botanical study.

ee development of a branch of study which had previously The old doctrine of types, which was used by the philo-

been known as teleology, the study of the adaptation of organic structures to the service of the organisms in which they occur. It cannot be said that previously to Darwin there had been any very profound study of teleology, but it had been the delight of a certain type of mind—that of the lovers of nature or naturalists par excellence, as they were sometimes termed—to watch the habits of living animals and plants, and to point out the

remarkable ways in which the structure of each variety of organic life was adapted to the special circumstances of life of the variety or species. The astonishing colours and grotesque forms of some animals and plants which the museum zoologists gravely described without comment were shown by these observers of living nature to have their significance in the economy of the organism possessing them ; and a general doctrine was recognized, to the effect that no part or struc- ture of an organism is without definite use and adaptation, being designed by the Creator for the benefit of the creature

sophically-minded zoologists (and botanists) of the first half of the century as a ready means of explaining the failures and difficulties of the doctrine of design, fell into its proper place under the new dispensation. The adher- ence to type, the favourite conception of the transcendental morphologist, was seen to be nothing more than the ex- pression of one of the laws of thremmatology, the persist- ence of hereditary transmission of ancestral characters, even when they have ceased to be significant or valuable in the struggle for existence, whilst the so-called evidences of design which was supposed to modify the limitations of types assigned to Himself by the Creator were seen to be adaptations due to the selection and intensification by selective breeding of fortuitous congenital variations, which happened to prove more useful than the many thousand other variations which did not survive in the struggle for existence.

Thus not only did Darwin's theory give a new basis to Effects of the study of organic structure, but, whilst rendering the Darwin's : ; theory general theory of organic evolution equally acceptable and cea necessary, it explained the existence of low and simple forms zoology. of life as survivals of the earliest ancestry of more highly

complex forms, and revealed the classifications of the

to which it belongs, or else for the benefit, amusement, or instruction of his highest creature—man. Teleology in this form of the doctrine of design was never very deeply rooted amongst scientific anatomists and systematists. It was considered permissible to speculate somewhat vaguely

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systematist as unconscious attempts to construct the genealogical tree or pedigree of plants and animals. Finally, it brought the simplest living matter or formless protoplasm before the mental vision as the starting-point whence, by the operation of necessary mechanical causes, the highest forms have been evolved, and it rendered un- avoidable the conclusion that this earliest living material was itself evolved by gradual processes, the result also of the known and recognized laws of physics and chemistry, from material which we should call not living. It abolished the conception of life as an entity above and beyond the common properties of matter, and led to the conviction that the marvellous and exceptional qualities of that which we call "living" matter are nothing more nor less than an exceptionally complicated development of those chemical and physical properties which we recognize in a gradually ascending scale of evolution in the carbon compounds, containing nitrogen as well as oxygen, sulphur, and hydro- gen as constituent atoms of their enormous molecules. Thus mysticism was finally banished from the domain of biology, and zoology became one of the physical sciences, —the science which seeks to arrange and discuss the phe- nomena of animal life and form as the outcome of the operation of the laws of physics and chemistry.

Nature AND Scop oF ZooLoey.

The brief historical outline above given is sufficient to justify us in rejecting, for the purposes of an adequate appreciation of the history and scope of zoology, that simple division of the science into morphology and physio- logy which is a favourite one at the present day. No doubt the division is a logical one, based as it is upon the distinction of the study of form and structure in them- selves (morphology) from the study of what are the activi- ties and functions of the forms and structures (physiology). Such logical divisions are possible upon a variety of bases, but are not necessarily conducive to the ascertainment and remeinbrance of the historical progress and present signifi- cance of the science to which they are applied. As a matter of convenience and as the outcome of historical events it happens that in the universities of Europe, whilst botany in its entirety is usually represented by one chair, the animal side of biology is represented by a chair of so- called zoology, which is understood as the old-fashioned systematic zoology, a chair of human and comparative

anatomy, and a chair of physiology (signifying the mechanics, physics, and chemistry of animals especially in relation to man). Fifty years ago the chairs of anatomy and physiology were united in one. No such distinction of mental activities as that involved in the division of the study of animal life into morphology and physiology has ever really existed: the investigator of animal forms has never entirely ignored the functions of the forms studied by him, and the experimental inquirer into the functions and properties of animal tissues and organs has alwaystaken very careful account of the forms of those tissues and organs.

A more instructive subdivision of the science of animal division biology or zoology is one which shall correspond to the 'is f thought and mental pr ti Pistorical separate currents or thoug I preoccupation progress, Which have been historically manifested in western Europe in the gradual evolution of what is to-day the great river of zoological doctrine to which they have all been rendered contributory. Such a subdivision of zoology, whilst it enables us to trace the history of thought, corresponds very closely with the actual varieties of mental attitude exhibited at the present day by the devotees of zoological study, though it must be remembered that the gathering together of all the separate currents by Darwin is certain sooner or later to entail new developments and branchings of the stream.

Division into mor- phology and phy- siology inade- quate.

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We accordingly recognize the following five branches of zoological study : —

1, Morphograpky.—The work of the collector and systematist: exemplified by Linnzus and his pre- decessors, by Cuvier, Agassiz, Haeckel.

. Lronomics.—The lore of the farmer, gardener, sportsman, fancier, and field-naturalist, including thremmatology, or the science of breeding, and

the allied teleology, or science of organic adapta- tions: exemplified by the patriarch Jacob, the poet Virgil, Sprengel, Kirby and Spence, Wal- lace, and Darwin.

3. Zoo-Dynamvics, Zoo-Physics, Zoo-Chemistry.— The pursuit of the learned physician,—anatomy and physiology: exemplified by Harvey, Haller, Hunter, Johann Miiller.

- Plasmology.—The study of the ultimate corpuscles of living matter, their structure, development, and properties, by the aid of the microscope ; exem- plified by Malpighi, Hook, Schwann, Kowalewsky.

. Philosophical Zoology.—General conceptions with regard to the relations of living things (espe- cially animals) to the universe, to man, and to the Creator, their origin and significance: exem- plified in the writings of the philosophers of classical antiquity, and of Linnzus, Goethe, Lamarck, Cuvier, Lyell, H. Spencer, and Darwin.

It is true that it is impossible to assign the great names of the present century to a single one of the subdivisions of the science thus recognized. With men of an earlier date such special assignment is possible, and there would be no difficulty about thus separating the minor specialists of modern times. But the fact is that as we approach Darwin's epoch we find the separate streams more and more freely connected with one another by anastomosing branches ; and the men who have left their mark on the progress of science have been precisely those who have been instrumental in bringing about such confluence, and have distinguished themselves by the influence of their discoveries or generalizations upon several lines of work. At last, in Darwin we find a name which might appear in each of our subdivisions,—a zoologist to whose doctrine all are contributory, and by whose labours all are united and reformed.

We shall now briefly sketch the history of these streams of thought, premising that one has (so far as the last three centuries are concerned) but little start of another, and that sooner or later the influence of the pro- gress of one branch makes itself felt in the progress of another.

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MorpPHOGRAPHY.

Under this head we include the systematic exploration Meaning and tabulation of the facts involved in the recognition of of mor- all the recent and extinct kinds of animals and their dis- Sa tribution in space and time. (1) The museum-makers of °°?" old days and their modern representatives the curators and describers of zoological collections, (2) early explorers and modern naturalist-travellers and writers on zoo- geography, and (3) collectors of fossils and paleontologists are the chief varieties of zoological workers coming under this head. Gradually since the time of Hunter and Cuvier anatomical study has associated itself with the more super- ficial morphography until to-day no one considers a study of animal form of any value which does not include inter- nal structure, histology, and embryology in its scope.

The real dawn of zoology after the legendary period of Edward the Middle Ages is connected with the name of an English- Wotton. man, Wotton, born at Oxford in 1492, who practised as a physician in London and died in 1555. He published a treatise De Differentiis Animalium at Paris in 1552, In

Aris- be found in the works of Aristotle himself. Aristotle did | until a late date that their full influence was brought to totle's not definitely and in tabular form propound a classification | bear upon systematic zoology by Georges Cuvier (1769- pn a of animals, but from a study of his treatises Historia | 1832). ™ Animalium, De Generatione Animalium, and De Partibus | The most prominent name between that of Gesner and John Animalium the following classification can be arrived at :— cen 4 a — – ee ot is oe . Ray. % c c = ohn KAY (g.v.). ough not so extensive as that o ae Sane : (=Mammals, | Linnzeus, his work is of the highest importance, and rendered including the Whale). the subsequent labours of the Swedish naturalist far easier : es es ee than they would otherwise have been. A chief merit of Coie UE ae aS : ; 1 hs Ray is to have limited the term "species" and to have eee Bes (2 Bake) a iain inaanameis assigned to it

the significance which it has until the Dar- B. ”Avaipa, bloodless animals (= Invertebrata). winian era borne, whereas previously it was loosely and : ate st ba ee a ee vaguely applied. He also made considerable use of ana- . saga l oe ee (=Arthropoda, ex. | tomical characters in his definitions of larger groups, and clusive of Crustacea). may thus be considered as the father of modern zoology. 4. ‘Osrpaxodépuara, shell-bearing Anema (=Echini, Gastro- | Associated with Ray in his work, and more especially poda, and Lamellibranchia.) occupied with the study of the Worms and Mollusca, was Wotton’s Wotton follows Aristotle in the division of animals into | Martin Lister (1638-1712), who is celebrated also as the modifica- the Enema and the Anema, and in fact in the recognition | author of the first geological map. tions. of all the groups above given, adding only one large group After Ray’s death in London in 1705 the progress of From to those recognized by Aristotle under the Anema, namely, | anatomical knowledge, and of the discovery and illustration Ray to the group of Zoophyta, in which Wotton includes the Holo- | of new forms of animal life from distant lands, continued Lim2®“s: thurie, Star-Fishes, Jfedusx, Sea-Anemones, and Sponges. | with increasing vigour. We note the names of Vallisnieri Wotton divides the viviparous quadrupeds into the many- (1661-1730) and Alexander Monro (1697-1767); the toed, double-hoofed, and single-hoofed. By the introduc- | travellers Tournefort (1656-1708) and Shaw (1692-1751) ; tion of a method of classification which was due to the | the collectors Rumphius (1637-1706) and Hans Sloane superficial Pliny,—viz., one depending, not on structure, but (1660-1753); the entomologist Réaumur (1683-1757); on the medium inhabited by an animal, whether earth, air, Lhwyd (17038) and Linck (1674-17 34), the students of Star- or water,—Wotton is led to associate Fishes and Whales | Fishes 3 Peyssonel (b. 1694), the investigator of Polyps as aquatic animals. But this is only a momentary lapse, | and the opponent of Marsigli and Réaumur, who held for he broadly distinguishes the two kinds. ‘_ | them to be plants; Woodward, the paleontologist (1665- Gesner. Conrad Gesner (1516-1565), who was a physician and 1722),—not to speak of others of less importance. held professorial chairs in various Swiss cities, is the most Two years after Ray’s death Carl Linnaus (q.v.) was Linnaeus. voluminous and instructive of these earliest writers on | born. Unlike Jacob Theodore Klein (1685-1759), whose systematic zoology, and was so highly esteemed that his | careful treatises on various

groups of plants and animals Ht astoria Animalium was republished a hundred years after | were published during the period between Ray and Linnzus, his death. His great work appeared in successive parts,— | the latter had his career marked out for him in a university, C.9e5 Viipara, Ovipara, Aves, Pisces, Serpentes et Scorpio,— | that of Upsala, where he was first professor of medicine and contains descriptions and illustrations of a large num- | and subsequently of natural history. His lectures formed ber of animal forms with reference to the lands inhabited | a new departure in the academic treatment of zoology and by them. Gesner's work, like that of John Johnstone | botany, which, in direct continuity from the Middle Ages, (6. 1603), who was of Scottish descent and studied at St | had hitherto been subjected to the traditions of the medical Andrews, and like that of Ulysses Aldrovandi of Bologna profession and regarded as mere branches of "materia (2. 1522), was essentially a compilation, more or less | medica." Linnzus taught zoology and botany as branches critical, of all such records, pictures, and relations concern- | of knowledge to be studied for their own intrinsic interest. ing beasts, birds, reptiles, fishes, and monsters as could be | His great work, the Systema Nature, ran through twelve gathered together by one reading in the great libraries | editions during his lifetime (Ist ed. 1735, 12th 1768). of Europe, travelling from city to city, and frequenting | Apart from his special discoveries in the anatomy of the company of those who either had themselves passed | plants and animals, and his descriptions of new species, the into distant lands or possessed the letters written and great merit of Linnzus was his introduction of a method eB the specimens brought home by adventurous | of enumeration and classification which may be said to have . ; created systematic zoology and botany in their present a ia ; a oe ap of parts of the New World next brought form, and establishes' od name for – as 4 great ists and 2 : a ry Cra ws eae of many novel forms organizer, the man who recognized a great practical micro- e, a er part of the 16th century | want in the use of language and supplied it. Linnzus scopists. and the beginning of the 17th that careful study by | adopted Ray's conception of species, but he made

many respects Wotton was simply an exponent of Aristotle, whose teaching, with various fanciful additions, constituted the real basis of zoological knowledge throughout the Middle Ages. It was Wotton's merit that he rejected the legendary and fantastic accretions, and returned to Aris- totle and the observation of nature. The most ready means of noting the progress of zoology during the 16th, 17th, and 18th centuries is to compare the classificatory con- ceptions of successive naturalists with those which are to

"specialists" of the structure and life-history of particular groups of animals was commenced which, directed at first to common and familiar kinds, was gradually extended until it formed a sufficient body of knowledge to serve as an anatomical basis for classification. This minuter study

had two origins, one in the researches of the medical anatomists, such as Fabricius (1537-1619), Severinus (1580-1656), Harvey (1578-1657), and Tyson (1649-1708), the other in the careful work of the entomologists and first microscopists, such as Malpighi (1628-1694), Swam-

merdam (1637-1680), and Hook (1635-1702). The com- mencement of anatomical investigations deserves notice here as influencing the general accuracy and minuteness with which zoological work was prosecuted, but it was not

species a practical reality by insisting that every species shall have a double Latin name,—the first half to be the name of the genus common to several species, and the second half to be the specific name. Previously to Linnzeus long many-worded names had been used, sometimes with

one additional adjective, sometimes with another, so that no true names were fixed and accepted. Linnzus by his binomial system made it possible

to write and speak with accuracy of any given species of plant or animal. He was, in fact, the Adam of zoological science. He proceeded

- further to introduce into his enumeration of animals and

Classifi cation of Linneus.

plants a series of groups, viz., genus, order, class, which he compared to the subdivisions of an army or the sub- divisions of a territory, the greater containing several of the less, as follows :—

Class, Order. Genus. Species. Variety.

Genus sum- Genus inter- Genus proxi- Species. Individuum. mum. medium. mum.

Provincia. Territorium. Parcecia. Pagus. Domicilium.

Legio. Cohors. Manipulus. Contubernium. Miles.

Linnzus himself recognized the purely subjective char- acter of his larger groups; for him species were, however, objective: "there are," he said, "just so many species as in the beginning the Infinite Being created." It was re- served for a philosophic zoologist of the 19th century (Agassiz, Essay on Classification, 1859) to maintain dog- matically that genus, order, and class were also objective facts capable of precise estimation and valuation. This climax was reached at the very moment when Darwin was publishing the Origin of Species (1859), by which universal opinion has been brought to the position that species, as well as genera, orders, and classes, are the subjective ex- pressions of a vast ramifying pedigree in which the only objective existences are individuals, the apparent species as well as higher groups being marked out, not by any distributive law, but by the purely non-significant opera- tion of human experience, which cannot transcend the results of death and decay.

The classification of Linnzeus (from Syst. Vat., 12th ed., 1766) should be compared with that of Aristotle. It is as follows,—the complete list of Linnean genera being here reproduced :—

Class I. MAMMALIA.

Order 1. Primates. Genera: Homo, Simia, Lemur, Vespertilio. 59) ae. Erla. Genera: Elephas, Trichecus, Bradypus, Myrme- cophaga, Manis, Dasypus. 3 Oe Here.

Genera: Phoca, Canis, Felis, Viverra, Mustela, Ursus, Didelphys, Talpa, Sorex, Erinaceus.

> 4. Glires. Genera: Hystrix, Lepus, Castor, Mus, Sciurus, Noctilio. +) Da Leora. Genera: Camelus, Moschus, Cervus, Capra, Ovis, Bos. i>, &. Bellu. » Genera: Equus, Hippopotamus, Sus, Rhinoceros. mw he Cebe.

Genera: Monodon, Balena, Physeter, Delphinus. Class II. AvEs. Order 1. Accipitres. Genera: Vultur, Falco, Strix, Lanius. 59) ee Pee.

Genera: (a) Trochilus, Certhia, Upupa, Buphaga, Sitta, Oriolus, Coracias, Gracula, Corvus, Para- disca; (b) Ramphastos, Trogon, Psittacus, Croto- phaga, Picus, Yunx, Cuculus, Bucco ; (c) Buceros, Alcedo, Mcrops, Todos.

5, 3 Anseres.

Genera : (a) Anas, Mergus, Phacthon, Plotus ; (b) Ehyncops, Diomedea, Alca, Procellaria, Pele- canus, Larus, Sterna, Colymbus.

» «4 Gralle.

Genera: (a) Phenicopterus, Platalea, Palamedea, Mycteria, Tantalus, Ardea, Recurvirostra, Scolopax, Tringa, Fulica, Parra, Rallus, Pso- phia, Cancroma ; (b) Hematopus, Charadrius, Otis, Struthio.

» 5. Galline.

Genera: Didus, Pavo, Meleagris, Crax, Phasianus,

Tetrao, Numida.

Order 6. Passeres.

Genera: (a) Loxia, Fringilla, Emberiza; (b) Caprimulgus, Hirundo, Pipra; (c) Turdus, Ampelis, Tanagra, Muscieapa; (d) Parus, Motacilla, Alauda, Sturnus, Columba.

Class III. AMPHTBIA. Order 1. Reptilia. Genera: Testudo, Draco, Lacerta, Rana. 3, 2 Serpentes.

Genera: Crotalus, Boa, Coluber, Anguis, Amphis-

bena, Cecilia. », & Nantes,

Genera: Petromyzon, Raja, Squalus, Chimera, Lophius, Acipenser, Cyclopterus, Balistes, Os- traeion, Tetrodon, Diodon, Centriscus, Syn- gnathus, Pegasus.

Class IV. Piscxs. Order 1. Apodes,

Genera: Murena, Gymnotus, Trichiurus, Anar- rhiehas, Ammodytes, Ophidium, Stromateus, Xiphias.

», 2. Jugulares.

Genera: Callionymus, Uranoscopus, Trachinus,

Gadus, Blennius. 3 8 Thoracic.

Genera: Cepola, LEcheneis, Coryphxna, Gobius, Cottus, Scorpena, Zeus, Plewronectes, Chetodon, Sparus, Labrus, Setwxna, Perca, Gasterosteus, Scomber, Mullus, Trigla.

3, 4. Abdominales.

Genera: Cobitis, Amia, Silurus, Zeuthis, Lori- caria, Salmo, Fistularia, Esox, Elops, Argen- tina, Atherina, Mugil, Mormyrus, Exocetus, Polynemus, Clupea, Cyprinus.

Class V. INsEcTA. Order 1. Coleoptera.

Genera: (a) Scarabeus, Lucanus, Dermestes, Hister, Byrrhus, Gyrinus, Attelabus, Curculio, Silpha, Coccinella; (b) Bruchus, Cassida, Ptinus, Chrysomela, Hispa, Meloe, Tenebrio, Lampyris, Mordella, Staphylinus ; (c) Cerambyx, Leptura, Cantharis, Elater, Cicindela, Buprestis, Dytiseus, Carabus, Necydalis, Forficula.

. Hemiptera.

Genera: Blatta, Mantis, Gryllus, Fulgora, Cicada, Notonecta, Nepa, Cimex, Aphis, Chermes, Coc- cus, Thrips.

. Lepidoptera. Genera: Papilio, Sphinx, Phalena. . Neuroptera.

Genera: Libellula, Ephemera, Myrmelecon, Phry-

ganea, Hemerobius, Panorpa, Raphidia. . Hymenoptera.

Genera: Cynips, Tenthredo, Sirex, Ichnewmon,

Sphex, Chrysis, Vespa, Apis, Formica, Mutilla.

», 6. Diptera. Genera: Cstrus, Tipula, Musca, Tabanus, Culex, Empis, Conops, Asilus, Bombylius, Hippo- bosca. » «@ Aptera.

Genera: (a) Pedibus sex; capite a thorace dis- ereto: Lepisma, Podura, Termes, Pedicu- lus, Pulex.

(2) Pedibus 8-14; capite thoraceque unitis: Acarus, Phalangium,

Genera: (a) Ore supero; basi se affigens: Aetinia, Ascidia.

(6) Ore antico; corpore pertuso laterali fora- minulo: Limazx, Aplysia, Doris, Tethis,

(c) Ore antico; corpore tentaculis antice cincto: Holothuria, Terebella.

(d) Ore antico; corpore brachiato: Triton, Sepia, Clio, Lernxa, Scyllea.

(e) Ore antico; corpore pedato: Aphrodita, Nereis.

(f) Ore infero centrali: Medusa, Asteria, Echinus.

From Linnzus to Cuvier.

La- marck's classifi- cation.

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Order 3. Testacea. Genera: (a) Multivalvia: Chiton, Lepas, Pholas. (6) Bivalvia (=Conchx): Mya, Solen, Tellina, Cardium, Mactra, Donax, Venus, Spon- dylus, Chama, Arca, Ostrea, Anomia, Mytilus, Pinna. (c) Univalvia spira regulari (= Cochlex): Argo- nauta, Nautilus, Conus, Cyprea, Bulla, Voluta, Buccinum, Strombus, Murex, Trochus, Turbo, Helix, Nerita, Haliotis. (zd) Univalvia absque spira regulari: Patella, Dentaliwm, Serpula, Tercdo, Sabella. :, 4 Lithophyta. Genera: Tubipora, Madrepora, Millcpora, Celle- ; pord. 5. Zoophyta. ; Genera: (a) Fixata: Isis, Gorgonia, Alcyonium, Spongia, Flustra, Tubularia, Corallina, Sertularia, Vorticella. (6) Locomotiva: Hydra, Pennatula, Tenia, Volvox, Furia, Chaos.

The characters of the six classes are thus given by Linnzeus :—

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viviparis, Manvmalibus ; oviparis, Avibus.

pulmone arbitrario, Amphidiis ; branchiis externis, Piscibus. antennatis, Jnsectis ; tentaculatis, Vermibus.

Cor biloculare, biauritum ; Sanguine calido, rubro :

Cor uniloculare, uniauritum;} Sanguine frigido, rubro :

Cor uniloculare, inauritum ; Sanie frigida, albida :

Between Linnzus and Cuvier there are no very great names ; but under the stimulus given by the admirable method and system of Linnzeus observation and description of new forms from all parts of the world, both recent and fossil, accumulated. We can only cite the names of Charles

Bonnet (1720-1793), the entomologist, who described the reproduction of Aphis; Banks and Solander, who accom- panied Captain Cook on his first voyage (1768-177 ne Thomas Pennant (1726-1798), the describer of the English fauna ; Peter Simon Pallas (1741-1811), who specially ex- tended the knowledge of the Linnzan Vermes, and under the patronage of the empress Catherine explored Russia and Siberia ; De Geer (1720-1778), the entomologist ; Lyonnet (1707-1789), the author of the monograph of the anatomy of the caterpillar of Cossus ligniperdus ; Cavolini (1756-1810), the Neapolitan marine zoologist and forerunner of Della Chiaje (fi. 1828); O. F. Miiller (1730-1784), the describer of freshwater Oligochxta; Abraham Trembley (1700-1784), the student of Hydra; and Ledermiiller (1719- 1769), the inventor of the term Jnfusoria. The effect of the Linnzean system upon the general conceptions of zoolo- gists was no less marked than were its results in the way of stimulating the accumulation of accurately observed de- tails. The notion of a scala nature, which had since the days of classical antiquity been a part of the general philo- sophy of nature amongst those who occupied themselves with such conceptions, now took a more definite form in the minds of skilled zoologists. The species of Linnaeus were supposed to represent a series of steps in a scale of ascending complexity, and it was thought possible thus to arrange the animal kingdom in a single series,—the orders within the classes succeeding one another in regular grada- tion, and the classes succeeding one another in a similar rectilinear progression. LAMARCK (7.v.) represents most completely, both by his development theory (to be further mentioned below) and by his scheme of classification, the high-water mark of the popular but fallacious conception of a scala nature. His classification (1801 to 181 2) is as follows :—

1 The anatomical error in reference to the auricles of Reptiles and Batrachians on the part of Linneus is extremely interesting, since it shows to what an extent the most patent facts may escape the observa- tion of even the greatest observers, and what an amount of repeated dissection and unprejudiced attention has been hecessary before the structure of the commonest animals has become known.

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Invertebrata. –

1. Apathetic Animals Class I. INFUSORIA. Orders: Nuda, Appendiculata. Class II. Pouyrt.

Orders: Ciliati (Rotifera), Denudati (Hydroids), Va-

ginati (Anthozoa and Polyzoa), Natantes (Crinoids). Class III. RaDIarta. Orders: AMollia (Acalephe), Echinoderma (including Actiniz). Class TV. Tunrcara. Orders: Bothryllaria, Ascidia. Class V. VERMEs.

Orders: Molles (Tape-Worms and Flukes), Rigiduli (Nematoids), Hispiduli (Nais, &c.), Epizoariz (Lerneans, &c.).

2. Sensitive Animals. Class VI. INsEctTa (Hexapoda).

Orders: Aptera, Diptera, Hemiptera, Lepidoptera, Hymenoptera, Neuroptera, Orthoptera, Colcoptera.

Class VII. ARACHNIDA.

_ Orders: Antennato-Trachealia (=Thysanura and Myriapoda), Exantennato- Trachcalia, Exantennato- Branchialia.

Class VIII. Crusracra. Orders: Heterobranchia (Branchiopoda, Isopoda, Amphipoda, Stomapoda), Homobranchia (Decapoda).

Class IX. ANNELIDA.

Orders: Apoda, Antennata, Sedentaria. Class X. CIRRIPEDIA.

Orders: Sessilia, Pedunculata. Class XI. CoNcHIFERA.

Orders: Dimyaria, Monomyaria. Class XII. Mouiusca.

Orders: Pteropoda, Gasteropoda, Trachelipoda, Ce.

phalopoda, Hetcropoda. Vertebrata.

8. Intelligent Animals. Class XIII. Fisues. XIV. REPriuEs.

Class XV. Brrps. XVI. MamMa.s.

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The enumeration of orders above given will enable the reader to form some conception of the progress of know- ledge relating to the lower forms of life during the fifty years which intervened between Linnzus and Lamarck. The number of genera recognized by Lamarck is more than ten times as great as that recorded by Linneus.

We have mentioned Lamarck before his great contem- porary Cuvier because, in spite of his valuable philosophical doctrine of development, he was, as compared with Cuvier and estimated as a systematic zoologist, a mere enlargement and logical outcome of Linnzeus.

The distinctive merit of Cuvier (g.v.) is that he started Cuvier. a new view as to the relationships of animals, which he may be said in a large measure to have demonstrated as true by his own anatomical researches. He opposed the scala nature theory, and recognized four distinct and divergent branches or embranchemens, as he called them, in each of which he arranged a certain number of the Linnzan classes, or similar classes. The embranchemens were characterized each by a different type of anatomical structure. Cuvier thus laid the foundation of that branch- ing tree-like arrangement of the classes and orders of animals which we now recognize as being the necessary result of attempts to represent what is practically a genea- logical tree or pedigree. Apart from this, Cuvier was a keen-sighted and enthusiastic anatomist of great skill and industry. It is astonishing how many good observers it requires to dissect and draw and record over and over again the structure of an animal before an approximately correct account of it is obtained. Cuvier dissected many Molluses and other animals which had not previously been anatomized ; of others he gave more correct accounts than

had been given by earlier writers, Skilful as he was, his observations are very frequently erroneous. accuracy in work as well as great abundance

of production has only distinguished one amongst all the great names of zoology—that of Johann Miiller.

Great

It certainly did not

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distinguish Cuvier. Another special distinction of Cuvier is his remarkable work in comparing extinct with recent organisms, his descriptions of the fossil Mammalia of the Paris basin, and his general application of the knowledge of recent animals to the reconstruction of extinct ones, as indicated by fragments only of their skeletons,

It was in 1812 that Cuvier communicated to the Academy of Sciences of Paris his views on the classification of animals. He says—

'Si l'on considére le régne animal d'aprés les principes que nous venons de poser, en se debarassant des préjugés établis sur les divisions ancieunement admises, en n'ayant égard qu' & lorganisa- tion et & la nature des animaux, et non pas A leur grandeur, 4 leur utilité, au plus ou moins de connaissance que nous en avons, ni + toutes les autres circonstances accessoires, on trouvera qu'il existe quatre formes principales, quatre plans généraux, si l'on peut s'ex- primer ainsi, d'aprés lesquels tous les animaux semblent avoir été modelés et dont les divisions ultérieures, de quelque titre que les naturalistes les aient décorées, ne sont que des modifications assez légéres, fondées sur le développement, on l'addition de quelques parties qui ne changent rien & l'essence du plan."

His classification as finally elaborated in Le Régne Animal (Paris, 1829) is as follows :—

First Branch. Animalia Vertebrata. Class I. MAMMALIA.

Orders: Bimana, Quadrumana, Carnivora, Marsupialia,

Rodentia, Edentata, Pachydermata, Ruminantia, Cetacea. Class II. Brrps. Orders: Accipitres, Passercs, Scansorces, Galling, Gralle, Palmipedes. Class III. Reprint. Orders: Chelonia, Sauria, Ophidia, Batrachia. Class IV. FisHEs.

Orders: (a) Acanthopterygii, Abdominalcs, Subbrachii, Apodes, Lophobranchii, Plectognathi ; (b) Stwriones, Sel- achit, Cyclostomi.

Second Branch. Animalia Mollusca. Class I. CEPHALOPODA. Class II. Przropopa. Class III]. Gasrropopa.

Orders: Pulmonata, Nudibranchia, Inferobranchia, Tectt- branchia, Heteropoda, Pectinibranchia, Tubulibranchia, Scutibranchia, Cyclobranchia.

Class IV. ACEPHALA. Orders: Testacea, Tunicata. Class V. BRacH1opoDa. Class VI. CrkRHOPODA. Third Branch. Animalia Articulata. Class I. ANNELIDES. Orders: Tubicole, Dorsibranchix, Abranchiz. Class II. CrusTacka.

Orders: (a) Malacostrata: Decapoda, Stomapoda, Am- phipoda, Lxemodipoda, Isopoda; (b) Entomostraca: Branchiopoda, Pectlopoda, Trilobitxz.

Class II]. ARACHNIDEs. Orders: Pulmonariw, Trachearіz. Class IV. INsxEcrs.

Orders: Myriapoda, Thysanura, Parasita, Suctoria, Coleo- ptcra, Orthoptera, Hemiptera, Neuroptera, Hymenoptera, Lepidoptera, Rhipiptcra, Diptera.

Fourth Branch. Animalia Radiata. Class I. EcHINODERMS. Orders : Pediccllata, Apoda. Class II. INTESTINAL Worms. Orders: Nematoidea, Parenchymatosa. Class III. ACALEPHA.

Orders: Simplices, Hydrostaticz.

Class TV. Potypi (including the Celentcra of later authori- ties and the Polyzoa).

Orders: Carnost, Gelatinosi, Polypiarit.

Class V. INFUSORIA.

Orders: Lotifera, Homogenea (this includes the Protozoa of recent writers and some Protophyta).

The leading idea of Cuvier, his four embranchemens, was confirmed by the Russo-German naturalist Von Von Baer. Baer (1792-1876), who adopted Cuvier's divisions, speak- ing of them as the peripheric, the longitudinal, the mass- ive, and the vertebrate types of structure. Von Baer, however, has another place in the history of zoology, being the first and most striking figure in the introduc- tion of embryology into the consideration of the relations

of animals to one another.

Cuvier's classifi- cation.

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*Cuvier may be regarded as the zoologist by whom The mor- anatomy was made the one important guide to the under- Pholo- standing of the relations of animals. But it should be &** noted that the belief, dating from Malpighi (1670), that there is a relationship to be discovered, and not merely a haphazard congregation of varieties of structure to be classified, had previously gained ground. Cuvier was familiar with the speculations of the "Natur-philosophen," and with the doctrine of transmutation and filiation by which they endeavoured to account for existing animal forms. The noble aim of F. W. J. Schelling, "das ganze System der Naturlehre von dem Gesetze der Schwere bis zu den Bildungstrieben der Organismus als ein organisches Ganze darzustellen," which has ultimately been realized through Darwin, was a general one among the scientific men of the year 1800. Lamarck accepted the develop- ment theory fully, and pushed his speculations far beyond the realm of*

fact. The more cautious Cuvier adopted a view of the relationships of animals which, whilst denying genetic connexion as the explanation, recognized an essen- tial identity of structure throughout whole groups of ani- mals. This identity was held to be due to an ultimate law of nature or the Creator's plan. The tracing out of this identity in diversity, whether regarded as evidence of blood-relationship or as a remarkable display of skill on the part of the Creator in varying the details whilst re- taining the essential, became at this period a special pur- suit, to which Goethe, the poet, who himself contributed importantly to it, gave the name "morphology." (C. F. Wolff, Goethe, and Oken share the credit of having initi- ated these views, in regard especially to the structure of flowering plants and the Vertebrate skull. Cuvier's doctrine of four plans of structure was essentially a morphological one, and so was the single-scale doctrine of Buffon and Lamarck, to which it was opposed. Cuvier's morphologi- cal doctrine received its fullest development in the prin- ciple of the "correlation of parts," which he applied to paleontological investigation, namely, that every animal is a definite whole, and that no part can be varied without entailing correlated and law-abiding variations in other parts, so that from a fragment it should be possible, had we a full knowledge of the laws of animal structure or morphology, to reconstruct the whole. Here Cuvier was imperfectly formulating, without recognizing the real phy- sical basis of the phenomena, the results of the laws of heredity, which were subsequently investigated and brought to bear on the problems of animal structure by Darwin.

Richard Owen! may be regarded as the foremost of R. Owen. Cuvier's disciples. Owen not only occupied himself with the dissection of rare animals, such as the Pearly Nautilus, Lingula, Limulus, Protopterus, Apteryx, &c., and with the description and reconstruction of extinct Reptiles, Birds, and Mammals,—following the Cuvierian tradition,—but gave precision and currency to the morphological doctrines which had taken their rise in the beginning of the cen- tury by the introduction of two terms, "homology" and Homo- "analogy," which were defined so as to express two logy and different kinds of agreement in animal structures, which, "2!°8Y- owing to the want of such "counters of thought," had been hitherto continually confused. Analogous structures in any two animals compared were by Owen defined as structures performing similar*

functions, but not necessarily derived from the modification of one and the same part in the "plan" or "archetype" according to which the two animals compared were supposed to be constructed. Homologous structures were such as, though greatly dif- fering in appearance and detail from one another, and though performing widely different functions, yet were

- *Born in 1804 in Lancaster; conservator of the Hunterian Museum, London, 1830-56; superintendent Nat. Hist. Brit. Mus., 1856-84.*

capable of being shown by adequate study of a series of intermediate fornis to be derived from one and the same part or organ of the "plan-form" or "archetype." It is not easy to exaggerate the service rendered by Owen to the study of zoology by the introduction of this appar- ently small piece of verbal mechanism; it takes place with the classificatory terms of Linnzus. And, though the conceptions of "archetypal morphology," to which it had reference, are now abandoned in favour of a genetic mor- phology, yet we should remember, in estimating the value of this and of other speculations which have given place to new views in the history of science, the words of the great reformer himself. " Erroneous observations are in the highest degree injurious to the progress of science, since they often persist for a long time. But erroneous theories, when they are supported by facts, do little harm, since every one takes a healthy pleasure in proving their falsity" (Darwin). Owen's definition of analogous struc- tures holds good at the present day. His homologous structures are now spoken of as " homogenetic " structures, the idea of community of representation in an archetype giving place to community of derivation from a single representative structure present in a common ancestor. Darwinian morphology has further rendered necessary the introduction of the terms '"homoplasy" and "homoplastic"?! to express that close agreement in form which may be at- tained in the course of evolutional changes by organs or parts in two animals which have been subjected to similar moulding conditions of the environment, but have no genetic community of origin, to account for their close similarity in form and structure.

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greatness can only be estimated by a consideration of the fact that he was a great teacher not only of human and comparative anatomy and zoology but also of physiology, and that nearly all the most distinguished German zoolo- gists and physiologists of the period 1850 to 1870 were his pupils and acknowledged his leadership. The most striking feature about Johann Miiller's work, apart from the com- prehensiveness of his point of view, in which he added to the anatomical and morphological ideas of Cuvier a consideration of physiology, embryology, and microscopic structure, was the extraordinary accuracy, facility, and completeness of his recorded observations. He could do more with a single specimen of a rare animal (e.g., in his memoir on Amphioxus, Berlin, 1844) in the way of making out its complete structure than the ablest of his contemporaries or successors could do with a plethora. His power of rapid and exhaustive observation and of accurate pictorial reproduction was phenomenal. His most important memoirs, besides that just mentioned, are those on the anatomy and classification of Fishes, on the Ceecilians, and on the developmental history of the Echinoderms.

A name which is apt to be forgotten in the period J. V. between Cuvier and Darwin, because its possessor occupied Thomp-

an isolated position in England and was not borne up by any great school or university, is that of John Vaughan Thompson, who was an army surgeon, and when past the age of forty, being district medical inspector at Cork (1830), took to the study of marine Jnvertebrata by the aid of the microscope. Thompson made three great discoveries, which seem to have fallen in his way in the most natural and simple manner, but must be regarded really as the

Owen's The classification adopted by Owen in his lectures | outcome of extraordinary genius. He showed that the seta (1855) does not adequately illustrate the progress of zoologi- | organisms like Flustra are not hydroid Polyps, but of a more cation.

cal knowledge between Cuvier's death and that date, but, such as it is, it is worth citing here. Province: Vertebrata (Myelencephala, Owen). Classes:

MAMMALIA, AVES, REPTILIA, PISCEs. Province; Articulata.

Classes: ARACHNIDA, INsEcTA (including Sub-Classes Myria- poda, Hexapoda), CRusTACEA (including Sub-Classes Hnto- mostraca, Malacostraca), Epizoa (Epizootie Crustacea), AN- NELLATA (Chetopods and Leeches), CIRRIPEDIA.

Province: Mollusca.

Classes: CEPHALOPODA, GASTEROPODA, PTEROPODA, LAMELLI-

BRANCHIATA, BRACHIOPODA, TUNICATA. Province: Radiata. Sub-Province: Radiaria. Classes: ECHINODERMATA, Bryozoa, ANTHOZOA, ACA- LEPH#, Hyprozoa. Sub-Province : Entozoa. Classes : C@&LELMINTHA, STERELMINTHA. Sub-Province: Infusoria. Classes: RoTIFERA, PoLyGasrrRia (the Protozoa of recent authors).

The real centre of progress of systematic zoology was no longer in France nor with the disciples of Cuvier in England, but after his death moved to Germany. The wave of morphological speculation, with its outcome of new systems and new theories of classification, which were as numerous as the professors of zoological science,2 was necessarily succeeded in the true progress of the science by a period of minuter study in which the microscope, the discovery of embryological histories, and the all-important

complex structure resembling Molluscs, and he gave them the name Polyzoa. He discovered the Pentacrinus europzus, and showed that it was the larval form of the Feather-Star Antedon (Comatula). He upset Cuvier's retention of the Cirripedes among Mollusca, and his subsequent treatment of them as an isolated class, by showing that they begin life as free-swimming Crustacea identical with the young forms of other Crustacea. Vaughan Thompson is a type of the marine zoologists, such as Dalyell, Michael Sars, P. J. Van Beneden, Claparede, and Allman, who during the present century have approached the study of the lower marine organisms in the same spirit as that in which Trembley and Schaffer in

the last century, and Swammer- dam in the 17th, gave themselves to the study of the minute freshwater forms of animal life.

It is impossible to enumerate or to give due considera- tion to all the names in the army of anatomical and embryo- logical students of the middle third of this century whose labours bore fruit in the modification of zoological theories and in the building up of a true classification of animals. Their results are best summed up in the three schemes of classification which follow below—those of Rudolph Leuckart (b. 1823), Henri Milne-Edwards (1800-1884), and T. H. Huxley (b. 1825), all of whom individually contributed very greatly by their special discoveries and researches to the increase of exact knowledge.

Contemporaneous with these were various schemes of Single-classification which were based, not on a consideration of fact the entire structure of each animal, but on the variations °¥5™S

cell-theory came to swell the stream of exact knowledge. We have already mentioned Von Baer in this connexion, and given a passing reference to Johann MULLER (q.v.), the

Johann

Miiller. of classi-

greatest of all investigators of animal structure in the pre- sent century. Miiller (1801-1858) was in Germany the suc- cessor of Rathke (1793-1860) and of Meckel (1781-1833) as the leader of anatomical investigation; but his true Se eh eee

1 See Lankester, "On the Use of the Term Homology in Modern Zoology and the Distinction between Homogenetic and Homoplastic Agreements," Ann. and Mag. Nat. Hist., 1870.

- *See Agassiz, Lssay on Classification, 1859, for an account of them.*

of a single organ, or on the really non-significant fact of the structure of the egg. All such single-fact systems have. proved to be useless and in fact

departures from the true line of growth of the zoological system which was shaping itself year by year—unknown to those who so shaped it— as a genealogical tree. They were attempts to arrive at a true knowledge of the relationships of animals by "royal roads" ; their followers were landed in barren wastes.

Leuck- art's classifi- cation.

Milne-

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R. Leuckart's! classification is as follows :—

Type 1. Coelenterata. Class I. PoLypt. Orders: Anthozoa and Cylicozoa. ,, II. ACALEPHA. Orders : Discophore and Ctenophore. Type 2. Echinodermata. Class I. PELMATOZOA. Orders: Cystidea and Crinoidca, » Il. Acrinozoa. Orders: Echinida and Astcrida. ;, III. ScyropERMATA. Orders: Holothuri# and Sipunculida. Type 3. Vermes. Class I. ANENTER ATI. Orders : Cestodes and Acanthocephali.

», LI. APopEs. Orders: Nemertini, Turbellarii, Trematodes, and Hirudinei.

>> UL. Cina Orders: Bryozoa and Rotifera. », LY. ANNELIDES. Orders: Nematodes, Lumbricini, and Branchiati. Type 4. Arthropoda. Class I. CRUSTACEA. Orders: Entomostraca and Malacostraca.

», LL. Insecta. Orders: Afyriapoda, Arachnida (Acera, Latr.), aud Hexapoda.

Type 5. Mollusca. Class I. TunicaTa. Orders: Ascidiz and Salpe. », LI. ACEPHALA. Orders: Lamellibranchiata and Brachiopoda. >, LII. GASTEROPODA. Orders: Heterobranchia, Dermatobranchia, Hetero-poda, Ctenobranchia,Pulmonata,and Cyclobranchia. », LV. CEPHALOPODA. Type 6. Vertebrata. (Not specially dealt with.)

The classification given by Henri Milne-Edwards? is as

Edwards's follows —

classifi- cation.

Branch I. Osteozoaria or Vertebrata. Sub-Branch 1. Allantoidians. Class I. MAMMALIA. Orders: (a) Monodelphia: Bimana, Quadru- mana, Cheiroptera, Inscctivora, Rodentia, Lidentata, Carnivora, Anphibia, Pachyder- mata, Ruminantia, Cetacea ; (b) Didelphia : Marsupialia, Monotremata. 7 Li Binns: Orders: Rapaces, Passcres, Scansores, Galline, Grallz, Palmipedes. », LII. REpriLEs. Orders: Chelonia, Sauria, Ophidia. Sub-Branch 2. Anallantoidians. Class I. BATRACHIANS. Orders: Anura, Urodela, Perennibranchia, Ceciliz. », II. FisHEs. Section 1. Osset. Orders: Acanthopterygii, Abdominales, Sub- brachti, A podes, Lophobranchit, Plectognathi. Section 2. Chondropterygit. Orders: Stwriones, Sclachii, Cyclostomi. Branch II]. Kntomozoa or Annelata. Sub-Branch 1. Arthropoda. Class I. INSECTA.

Orders: Coleoptera, Orthoptera, Neuroptera, Hymenoptera, Lepidoptera, Hemiptera, Di- ptera, Rhipiptera, Anoplewra, Thysanura.

Il. Mypiapopa. Orders: Chilognatha and Chilopoda. », LI], ARACHNIDS. Orders: Pulmonaria and Trachcaria.

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1 Die Morphologie und die Verwandtschaftsverhdlinisse der wirbel- losen Thiere, Brunswick, 1848. The Protozoa, recognized as a primary group by Siebold and Stannius (Lehrbueh d. vergleich. Anatomie, Berlin, 1845), are not included at all by Leuckart in his scheme. The name Protozoa was first used by Goldfuss (1809) to include micro- scopic animals and also the Polyps and Medusx, and Siebold and Stan- nius first used it in its modern signification as comprising and limited to the Infusoria and Rhizopoda.

2 Cours Elémentaire d' Histoire Naturelle, Paris, 1855.

Class IV. CRUSTACEA. Section 1. Podophthalnvia. Orders: Decapoda and Stomopoda. Section 2. Edriophthalni. Orders: Amphipoda,

Lemodipoda, and Isopoda. Section 3. Branchiopoda. Orders: Ostracoda, Phyllopoda,and Trilo- bitz. Section 4. Entomostraca. Orders: Copepoda, Cladocera, Siphono- stoma, Lernwida, Cirripedia. Section 5. Xiphosura. (The orders of the classes which follow are not given in the work quoted.) Sub-Branch 2. Vermes. Class I. ANNELIDs. Class IV. CESTOIDEA. », IL HELMINTHS. » V. ROTATORIA. », 111. TURBELLARIA.

Branch III. Malacozoaria or Mollusca. Sub-Branch 1. Mollusca proper.

Class I. CEPHALOPODA. Class III. GASTEROPODA. », lI. PTEROPODA. », I[V. ACEPHALA. Sub-Branch 2. Molluscoidea. Class I. TuNICATA. Class II. Bryozoa.

Branch IV. Zoophytes. Sub-Branch 1. Radiaria.

Class I. EcuinopERMS. Class III. CoRALLARIA or », II. ACALEPHS. PoLyPl. Sub-Branch 2. Sarcodaria. Class I. InFusorIA. Class II. SPONGIARIA.

In England T. H. Huxley adopted in his lectures (1869) Huxley's a classification which was in many respects similar to both classifi- of the foregoing, but embodied improvements of his own. °°". It is as follows :- —

Sub-Kingdom I. Protozoa. Classes: RH1ZOPODA, GREGARINIDA, RADIOLARIA, SPONGIDA. Sub-Kingdom II. Infusoria. Sub-Kingdom III. Ceelenterata. Classes: Hyprozoa, ACTINOZOA. Sub-Kingdom IV. Annuloida. Classes: ScoLECIDA, ECHINODERMATA. Sub-Kingdom V. Annulosa. Classes: CrusTAcEA, ARACIINIDA, Myri1apopa, INsEcTA, CHa- TOGNATHA, ANNELIDA. Sub-Kingdom VI. Molluscoida. Classes: Potyzoa, BRACHIOPODA, TUNICATA. Sub-Kingdom VII. Mollusca. Classes: LAMELLIBRANCHIATA, BRANCHIOGASTROPODA, PULMO- GASTROPODA, PTEROPODA, CEPHALOPODA. Sub-Kingdom VIII. Vertebrata. Classes: Piscrs, AMPHI1BIA, Repritia, AVES, MAMMALIA.

We now arrive at the period when the doctrine of organic evolution was established by Darwin, and when naturalists, being convinced by him as

they had not been by the transmutationists of fifty years' earlier date, were com- pelled to take an entirely new view of the significance of all attempts at framing a "natural" classification.

Many zoologists—prominent among them in Great Classifi- Britain being Huxley—had been repelled by the airy fancies cations

and assumptions of the "philosophical" morphologists. ee

'The efforts of the best minds in zoology had been directed jure,

for thirty years or more to ascertaining with increased accuracy and minuteness the structure, microscopic and gross, of all possible forms of animals, and not only of the adult structure but of the steps of development of that structure in the growth of each kind of organism from the egg to maturity. Putting aside fantastic theories, these observers endeavoured to give in their classifications a strictly objective representation of the facts of animal structure and of the structural relationships of animals to one another capable of demonstration. The groups within groups adopted for this purpose were necessarily wanting in symmetry: the whole system presented a strangely irregular character. From time to time efforts were made by those who believed that the Creator must have followed a symmetrical system in his production of

animals to force one or other artificial, neatly balanced XXIV. — 102

L. Agas- siz.

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scheme of classification upon the zoological world. The last of these was that of Louis Agassiz (Hssay on Classvji- cation, 1859), who, whilst surveying all previous classifica- tions, propounded a scheme of his own, in which, as well as in the criticisms he applies to other systems, the leading notion is that sub-kingdoms, classes, orders, and families have a real existence, and that it is possible to ascertain and distinguish characters which are of class value, others which are only of ordinal value, and so on, so that the classes of one sub-kingdom should on paper,

and in nature actually do, correspond in relative value to those of another sub-kingdom, and the orders of any one class similarly should be so taken as to be of equal value with those of another class, and have been actually so created.

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adult structure. Von Baer had gained unanimous support for his dictum, "Die Entwickelungsgeschichte ist der wahre Lichttriger fiir Untersuchungen tber organische Korper." Thus J. Miiller's studies on the larval forms of Echinoderms and the discoveries of Vaughan Thompson were appreciated. But it was only after Darwin that the cell-theory of Schwann was extended to the embryology of the animal kingdom generally, and that the knowledge of the development of an animal became a knowledge of the way in which the millions of cells of which its body is composed take their origin by fission from a smaller num- ber of cells, and these at last from the single egg-cell. Kolliker (Development of Cephalopods, 1844), Remak (Development of the Frog, 1850), and others had laid the

Influence The whole position was changed by the acquiescence, | foundations of this knowledge in isolated examples; but of Dar- which became universal, in the doctrine of Darwin. That | it was Kowalewsky, by his accounts of the development of 'octrine COCtrine took some few years to produce its effect, but it | Ascidians and of Amphioxus (1866), who really made on taxo. became evident at once to those who accepted Darwinism | zoologists see that a strict and complete cellular embryo-

nomy. lectors and anatomists, morphologists, philosophers, and | the comprehension of their relationships as at the beginning embryologists had been so long striving was nothing more | of the century the coarse anatomy had been shown to be by nor less than a genealogical tree, with breaks and gaps of | Cuvier. Kowalewsky's work appeared between the dates various extent inits record. The facts of the relationships | of the Generelle Morphologie and the Schépfungsgeschichte. of animals to one another, which had been treated as the | Haeckel himself, with his pupil Miklucho-Maclay, had in outcome of an inscrutable law by most zoologists and | the meantime made studies on the growth from the egg

*glibly explained by the transcendental morphologists, were | of Sponges, —studies which resulted in the complete separa- amongst the most powerful arguments in support of | tion of the unicellular or equicellular Protozoa from the Darwin's theory, since they, together with all other vital | Sponges, hitherto confounded with them. It is this in- phenomena, received a sufficient explanation through it. | troduction of the consideration of cell-structure and cell- It is to be noted that, whilst the zoological system took | development which, subsequently to the establishment of the form of a genealogical tree, with main stem and numer- | Darwinism, has most profoundly modified the views of ous diverging branches, the actual form of that tree, its | systematists, and led in conjunction with the genealogical limitation to a certain number of branches corresponding | doctrine to the greatest activity in research,—an activity to a limited number of divergencies in structure, came to | which culminated in the work (1873-82) of F. M. Balfour, be regarded as the necessary consequence of the operation | and produced the profoundest modifications in classification. of the physico-chemical laws of the 'universe, and it was Haeckel's earlier pedigree is worth comparing with his Haeckel's recognized that the ultimate explanation of that limitation | second effort, as showing the beginning of the influence second is to be found only in the constitution of matter itself. just noted. The second pedigree is as follows :— arrange- Haeckel. The first naturalist to put into practical form the conse- Phvih Clad Cl = quences of the new theory, in so far as it affected zoological i (we ca classification, was Ernst Haeckel of Jena (b. 1834), who | OVULARIA. | Gregan in 1866, seven years after the publication of Darwin's | Protozoa. 4 Infusoria. Origin of Species, published his suggestive Generelle Morpho- | Basruzarua. (ell aber logie. Haeckel introduced into classification a number of See — ee terms intended to indicate the branchings of a genealogical Coraline tree. The whole "system" or scheme of classification oy ACALEPHA, | Herc, was termed a genealogical tree (Stammbawm) ; the main Ctenophora. branches were termed '" phyla," their branchings " sub- ele See eres: phyla"; the great branches of the sub-phyla were termed ol **cladi," and the "cladi" divided into " classes," these into | y, – i Twnicata. sub-classes, these into legions, legions into orders, orders oe C&LOMATI. Ehynchoceela. into sub-orders, sub-orders into tribes, tribes into families | ee families into genera, genera into species. Additional { iomelide*

branchings could be indicated by similar terms where neces- Spirobranchia. sary. There was no attempt in Haeckel's use of these Mollusea ae Lamellibranchia. terms to make them exactly or more than approximately EUCEPHALA. — equal in significance; such attempts were clearly futile pina wa and unimportant where the purpose was the exhibition of : Compe aa ee. lines of descent, and where no natural equality of groups Bokiandems., Dp Echinida. was to be expected ex hypothesi. Haeckel's classification of —s eg 1866 was naturally enough only a first attempt. In the — Heats edition of the Watiirliche Schépfungsgeschichte published | 4tTthropoda. TRACHEATA. ae in 1868, he made a great advance in his genealogical classi- Insecta. fication, since he now introduced the results of the extra- (AcRANIA. Leptocardia. ordinary activity in the study of embryology which followed oo Patina al on the publication of the Origin of Species. oo Cellular The pre-Darwinian systematists since the time of Von | Vertebrata. a fe: ee Baer had attached very great importance to embryological Amphibia. SY facts, holding that the stages in an animal's development Reptilia. were often more significant of its true affinities than its lb meibiins

that the natural classification of animals, after which col-

logy of animals was as necessary and feasible a factor in

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Dendri- _ In representing pictorially the groups of the animal king- | the series of forms which occur in individual development, FS in dom as the branches of a tree, it becomes obvious that a | (6) the series of existing forms from lower to higher, and tion of @8tinction may be drawn, not merely between the indivi- | (c) the series of forms which succeed one another in the animal dual main branches, but further as to the level at which | strata of the earth's crust, whilst an explanation of this

kingdom. they are given off from the main stem, so that one branch | parallelism was either not attempted, or was illusively

or set of branches may be marked off as belonging to an earlier or lower level than another set of branches; and the same plan may be adopted

with regard to the clades, classes, and smaller branches. The term "grade" was introduced by Lankester! to indicate this giving off of branches at a higher or lower, 7.¢., a later or earlier, level of a main stem. The mechanism for the statement of the genealogical relationships of the groups of the animal kingdom was thus completed. Renewed study of every group was the result of the acceptance of the genealogical idea and of the recognition of the importance of cellular embryology. On the one hand, the true method of arriving at a knowledge of the genealogical tree was recognized as lying chiefly in attacking the problem of the genealogical relationships of the smallest twigs of the tree, and pro- ceeding from them to the larger branches. Special studies of small families or orders of animals with this object in view were taken in hand by many zoologists. On the other hand, a survey of the facts of cellular embryology which were accumulated: in regard to a variety of classes within a few years of Kowalewsky's work led to a genera- lization, independently arrived at by Haeckel and Lankester, to the effect that a lower grade of animals may be dis- tinguished, the Protozoa or Plastidozoa, which consist either of single cells or colonies of equiformal cells, and a higher grade, the Metazoa or Enterozoa, in which the egg-cell by "cell division" gives rise to two layers of cells, the endoderm and the ectoderm, surrounding a primitive diges- tive chamber, the archenteron. Of these latter, two grades were further distinguished by Lankester,—those which re- main possessed of a single archenteric cavity and of two primary cell-layers (the Calentera or Dzploblastica), and those which by nipping off the archenteron give rise to two cavities, the coelom or body-cavity and the metenteron or gut (Celomata or Triploblastica). To the primitive two-cell-layered form, the hypothetical ancestor of all Metazoa or Enterozoa, Haeckel gave the name Gastrza; the embryonic form which represents in the individual growth from the egg this ancestral condition he called a "gastrula." The term "diblastula" has more recently been adopted in England for the gastrula of Haeckel. The tracing of the exact mode of development, cell by cell, of the diblas- tula, the ccelom, and the various tissues of examples of all classes of animals has been pursued during the last twenty years with immense activity and increasing instrumental facilities, and is still in progress.

Two names in connexion with post-Darwinian taxonomy and the ideas connected with it require brief mention here. Fritz Miiller, by his studies on Crustacea (Fiir Darwin, 1864), showed the way in which genealogical theory may be applied to the minute study of a limited group. He is also responsible for the formulation of an important prin- ciple, called by Haeckel "' the biogenetic fundamental law," viz., that an animal in its growth from the egg to the adult condition tends to pass through a series of stages which are recapitulative of the stages through which its ancestry has passed in the historical development of the species from a primitive form ; or, more shortly, that the development of the individual (ontogeny) is an epitome of the development of the race (phylogeny). Pre-Darwinian zoologists had been aware of the class of facts thus inter- preted by Fritz Miller, but the authoritative view on the subject had been that there is a parallelism between (a)

1 " Notes on Embryology and Classification," in Quart. Journ. Micr.

Sci., 1877.

offered in the shape of a doctrine of harmony of plan in creation. It was the application of Fritz Miiller's law of recapitulation which gave the chief stimulus to recent embryological investigations ; and, though it is now recog- nized that "recapitulation" is vastly and bewilderingly modified by special adaptations in every case, yet the principle has served, and still serves, as a guide of great value.

Another important factor in the present condition of Dohrn's zoological knowledge as represented by classification is the doctrine

doctrine of degeneration propounded by Anton Dohrn. Lamarck believed in a single progressive series of forms, whilst Cuvier introduced the conception of branches. The first post-Darwinian systematists naturally and without re- flexion accepted the idea that existing simpler forms repre- sent stages in the gradual progress of development,—are in fact survivors from past ages which have retained the exact grade of development which their ancestors had reached in past ages. The assumption made was that (with the rare exception of parasites) all the change of structure through which the successive generations of animals

have passed has been one of progressive elaboration. It is Dohrn's merit to have pointed out} that this assumption is not warranted, and that degeneration or progressive simplification of structure may have, and in many lines certainly has, taken place, as well as progressive elaboration

and continuous maintenance of the status guo. The intro- duction of this conception ¢

*necessarily has had a & 3 9 mostimportanteffect – 3 s **

*in the attemptto,, % * & eo , unravel the gen- _% * * " ealogical affini-*,, ae ties of animals. It "e as*

renders the task a more complicated one ; at the same time it removes some serious difficulties "-Srss & CELOMAatTs and throws a flood of ., és light on every group of i" * the animal kingdom. x*

*One result of the in- ra troduction of the new conceptions dating from * oN oe ATrRoson Darwin has been a healthy reaction from that attitude of mind which led to the re- garding of the classes and orders recognized by authoritative zoologists as sacred institutions which were beyond the criticism of ordinary men. That state of mind was due to the fact that the groupings so recognized did not profess to be simply the result of scientific reasoning, but were necessarily regarded as the expressions of the "insight" of some more or less gifted persons into a plan or system which had been arbi- trarily chosen by the Creator. Consequently there was a tinge of theological dogmatism about the whole matter. To deny the Linnean, or later the Cuvierian, classes was very much like denying the Mosaic cosmogony. At the present time systematic zoology is entirely free from any such prejudices, and the Linnzan taint which is apparent*

1 Ursprung der Wirbelthiere, Leipsic, 1875 ; and Lankester, Degen- eration, London, 1880.

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Grade L PROTOZOA Genealogical tree of animal kingdom.

even in Haeckel and Gegenbaur may be considered as finally expunged. Classifi- We give below the classification of Ray Lankester as cation of an example of the most recent genealogical classification. Ray Lan- Tt ig represented by the above genealogical tree and the Kester. tabular statement which follows. The chief points in this classification are the inclusion of Balanoglossus and the Tunicata in the phylum Vertebrata, the association of the Rotifera and the Chetopoda with the Arthropoda in the phylum Appendiculata, the inclusion of Limulus and the Eurypterina in the class Arachnida, and the total aban- doning of the indefinite and indefensible group of "Vermes."

Grade A. PLASTIDOZOA (PROTOZOA).

Grade a. GYMNOMYXA. Class I. PROTEOMORPHA (no orders recognized). ,, LI. Mycrrozoa. Orders.—1. Sorophora. 2. Endosporea. 3. Exosporea. », LII. Logosa. Orders.—1. Nuda. 2. Testacea. », 1V. LABYRINTHULIDEA (no orders). » VY. HELIOzOA. Orders.—1. Aphrothoraca. Chalarothoraca. }, VI. RETICULARIA. Sub-Class a. Lmperforata. Orders.—1. Gromiidca. lidea. 4. Lituwolidca. Sub-Class 0. Perforata. Orders.—1. Textularidca. 2. Chilostomellidea. 3. Lagenidea. 4. Globigerinidea. 5. Rotalidca. 6. Nunemulinidea. >, VII. RADIOLARIA. Sub-Class a. Stlicoskeleta. Orders.—1. Peripylwa. 2. Monopylza. 8. Phxodaria. Sub-Class 6. Acanthinoskelcta. Order.—1. Acanthometridea. Grade 6. CORTICATA. Class I. Sporozoa. Sub-Class a. Gregarinidca. Orders.—1. Haplocyta. Sub-Class 6. Coccidiidca.

2. Chlamydophora. 3. 4, Desmothoraca.

2. Astrorhizidea. 38. Milto-

2. Septata.

Orders.—1. Monosporca. 2. Oligosporea. 8. Poly- sporea. Sub-Class ¢. Myxosporidea (no orders). me d. Sarcocystidca (no orders). » Il. FuacELuata. Sub-Class a. Lissoflagellata. Orders.—1. Monadidea. 2. Euglenoidea. 8. Hetero-

mastigoda. 4. Isomastigoda. Sub-Class b. Choanoflagellata. Orders.—1. Nuda. 2. Lortcata. », III. DINoFLAGELLATA. Orders.—1. RHYNCHOFLAGELLATA (no orders). ©. ears Orders.—1. Peritricha. tricha. 4. Hypotricha. » VI. ACINETARIA. Orders.—1. Suctoria.

3. Gelatinigera.

2. Hetcrotricha. 8. Holo-

2. Non-Suctoria.

Grade B. ENTEROZOA.

Sub-Grade A. CHLENTERA.

Phylum 1. NEMATOPHORA. Class I. HyDROMEDUSZ.

Orders.—1. Anthomedusx (Gymnoblastea). tomeduse (Calyptoblastea). Trachomeduse. phora.

», Il. ScyPpHoMEDUSA. Sub-Class a. Tetrameralia. Orders.—1. Calycozoa. 2. Peromedusx. 3. Cubomeduse. Sub-Class &. Octomeralia. Orders.—1. Cannostomx. 2. Semostomex. 8. Rhizostome. », II]. ANTHOZOA. Sub-Class a. Actiniomorpha.

Orders.—1. Actiniaria. 2. Antipatharia. 8. Madre- poraria.

Sub-Class 0. Aleyoniomorpha.

Orders.—1. Protalcyonaria.

2. Lep- 8. Narcomeduse. 4. 5. Hydrocoralline. 6. Siphono-

2. Stolonifera. 8. Al-

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cyonaria. 4. Paragorgonaria. Pennatularia. 7. Helioporaria, Class TV. CTENOPHORA. Orders.—1. Saccata. 4, Lobata.

Phylum 2, PORIFERA.

Class I. CALCISPONGIZ (= Megamastictora). Orders.—1. Homocela. 2. Heterocela. ,, IL. Srmnicosponclz (= AMicromastictora). Sub-Class 1. Hyalospongiz. Order. Hexactinellaria. Sub-Class 2. Demospongiz. Orders. —1. Tetractinellaria. Halisarcaria.

5. Gorgonaria. 6.

2. Hurystoma. 38. Teniata.

2. Monaxonaria. 8.

Sub-Grade B. C@LOMATA.

Phylum 1. VERTEBRATA.

Branch A. Hemichorda (Balanoglossus). »,. B. Urochorda. Grade I. Larvalia (no divisions recognized). », IL. Saccata. Class J. AscIpIa. Orders.—1. Simplices. 4. Pyrosomiidca. » LI, SALPIFORMIA. Orders.—1. Salpiidea. 2. Doliolidea. Branch C. Cephalochorda (Amphiorus). » D. Craniata. Grade I. Cyclostoma. Class I, MyxINoIpEa (no orders). ,, Il. PETROMYZONTIA (uo orders). Grade II. Gnathostoma. Sub-Grade a. Branchiata Heterodactyla. Class I. Pisces. . Sub-Class 1. Selachit. Orders. —1. Squali. 2. Rait. Sub-Class 2. Holocephali (no orders). oy 3. Ganoidct. Orders.—1. Chondrostet. 2. Polypterint. 3. Lepi- dosteit. 4. Amidini. 5. Cephalaspidini. 6. Pla- codermi, 7. Acanthodini. 8. Pycnodontint. 9. Celacanthini. 10. Diptcrint. Sub-Class 4. Teleostci. Orders.—1. Physostomi. 2. Pharyngognathi. 3. Anacanthini. 4. Acanthoptert. 5. Plectognathi. 6. Lophobranchia. », II. Dipenot. Orders.—1. Monopneumones. 2. Dipnewmones. Sub-Grade 6. Branchiata Pentadactyla. Class I. AMPHIBIA. Sub-Class 1. Urodela. Orders.—1. Jchthyoidea. 2. Salamandrina. Sub-Class 2. Gymnophiona (Cecilia, &c.). iD 3. Stegoccphala (Labyrinthodon, &c.). e. 4, Anura (Rana, &c.). Sub-Grade c. Lipobranchia Pentadactyla. Branch a. MONOCONDYLA. Class I. REPTILIA. Sub-Class 1. Chelonia (orders not tabulated). 5 2. Lacertilia. Orders.—1. Rhynchoccphala. 2. Chameleonina. 3. Lacertina. Sub-Class 8. Ophidia. Orders. —1. Opoterodonta. 38. Proteroglypha.

Sub-Class 4. Crocoditia. Orders.—1. Amphicelia. 2. Opisthocelia. 3. Procelia. Sub-Class 5. Pterosauria (orders not tabulated). a 6. Dinosauria. Orders.—1. Sauropoda. 2. Stegosauria. 3. Ornithopoda. 4. Theriopoda. 5, Celuria. 6. Compsognatha. 7. Hallopoda. Sub-Class 7. Anomodontia (Dicynodon, &c.). 56 8. Plestosauria. a 9. Icthyosauria. 59 LI. Avan? Grade a. Phanerodactyla. Order. Saururz. Grade 6. Cryptodactyla. Orders.—1. Ratiiz. Branch b. AMPHICONDYLA, Class. MAMMALIA. Grade 1. Monotrema (Ornithorhynchus and Ech- tdna).

2. Sociales. 3. Composite.

2. Colubriformia. 4, Solenoglypha.

2. Carinate.

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Grade 2. Ditrema. Branch a. MMarsupialia. Orders.—1. Barypoda. 2. Rhizophaga. 3.

Maeropoda. 4. Carpophaga. 5. Pedi- manda. 6. Cantharophaga. 7. Creophaga. 8. Edentula.

Branch 6. Plaeentalia.

Sub-Branch a. Typidentata. Orders.—1. Proinseetivora. 2. Insectivora. 3. Carnivora. 4. Cetaeea. 5. Ungulata. 6. Amblypoda. 7. Sirenia. 8. Toxodon- tia. 9. Rodentia. 10. Proboseidea. 11. Hyracoidea. 12. Cheiroptera. 18. Pro- simiz. 14, Stniz. Sub-Branch 6. Edentata. Orders.—1. Bradypoda.

Phylum 2. ECHINODERMA. Branch A. Ambulacrata. Class I. HoLoTHURIDEA. Orders.—1. Elasipoda. », LI. EcHINOIDEA. Grade a. Paleechini (Melonitcs, Eocidaris). Grade 6. Autechini. Branch 1. Desmostieha. Orders.—1. Regularia. Branch 2. Petalosticha. Orders.—1. Clypeastrina. 2. Spatangina. » III. AsTEROIDEA. Orders.—1. Colastra. », LV. OPHIUROIDEA. Orders.—1. Ophiastra. Branch B. Tentaculata.

2. Effodientia.

2. Pedata. 3. Apoda.

2. Heocycliea.

2. Brisingastra. 2. Phytastra.

Class I. CRINOIDEA.

Orders.—1. Palzocrina. 2. Neocrina. », Il. Cysrorpza.

Orders.—1. Agelaerina. 2. Echinencrina. », III. BLAsToIDEA.

Orders.—1. Elzacrina. 2. Eleutherocrina.

Phylum 38. PODAXONTA. ClassI. GEPHYR™A. Sub-Class 1. Hehiuromorpha. Orders.—1. Sternaspida. Sub-Class 2. Sipwneulomorpha. Orders.—1. Sipunculina. » II. Potyzoa. Sub-Class 1. Vermtformia. (Genus: Phoronis.) 5 2. Hupolyzoa. Branch a. Eetoprocta. Orders. —1. Phylactolenu. Branch 6. Entoprocta. (Loxosoma, &c.)

[The sub-class Pterobranchia (Rhabdoplewra and Cephalodiscus) hitherto referred to Polyzoa are probably related to the Hemichorda of the Vertebrate phylum.]

», III. BracHiopopa. Orders.—1. Heardines. 2. Cardinata.

Phylum 4. NEMATOIDEA. EUNEMATOIDEA (no orders). CHETOSOMARIA.

(Chzxtosoma, Rhabdogaster.) CILETOGNATHA.

(Sagitta, Spadelia.)

Phylum 5. ACANTHOCEPHALA. (Genus: Eehinorhynehus.) Phylum 6. GASTROTRICHA. (Genera: Chetonotus, Iehthydiwm, &c.) Phylum 7. PLATYHELMIA.

Branch A. Ciliata.

Class I. RHABDOC@LA.

Orders.—1. Aeela. II. DENDROCELA..

Orders. —1. Triclada.

» LIL. NEMERTINA. Orders.—1. Palxonemertina. Hoplonemertea. [The Jesozoa of Van Beneden may be classed here as a degenerate parasitic group including Orthoneetida and Rhombozoa.]

Branch B. Cotylophora. Class I. TREMATOIDEA. Sub-Class a. Jfonogenea. Orders.—1. Tristoma. Sub-Class 6, Digenea. Orders. —1. Jfonostoma. stoma. 4. Holostoma.

2. Echiurina.

2. Priapulina.

2. Gymnolema.

Class I. 3 UE

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2. Orthoeela. 3. Alleocela.

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2. Polyelada.

2. Sehizonemertca. 3.

2. Polystonu.

2. Distoma. 3. Gastero-

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Class II. CEsTorpEA. Orders.—1. Amphilinaria. 2. Caryophyllaria. 3. Ligularia. 4, Eehinobothriaria. 5. Tetrarhyn- charia. 6. Phyllobothriaria. 7. Teniaria. » III. Hrrupinza. Orders.—1. Rhynchobdella. 2. Gnathobdella.

Phylum 8. APPENDICULATA.

Branch A. Rotifera. Class I. PARAPODIATA. (Genus: Pedalion.) >, Il. Lipopopa. Orders.—1. Ploima. Branch B. Cheetopoda. Class I. PoLycHa#Ta. Sub-Class 1. Hrrantia (orders not tabulated). 2. Sedentaria (orders not tabulated).

2. Bdelligrada. 3. Rhizota.

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» IL OLreocuata. Orders. —1. Lumbricomorpha. 2. Senuridomorpha. 3. Naidomorpha. 4. Bdellomorpha. », LI]. MyzosroMaRIa.

(Genus: JLyzostomum.) . SACCOCIRRIDEA. (Genus: Saccoeirrus.) HAPLOANNELIDA. (Genera: Polygordius, Protodrilus, Histriobdella). Branch C. Arthropoda (=Gnathopoda). Grade 1. Ceratophora. Class I, PERIPATIDEA. (Genus: Peripatus.) > Il. Myriapopa. Orders.—1. Diplopoda. », LIJ. Hexaropa. Orders. —1.

2. Chilopoda.

Orthoptera (Sub-Orders: Thysanura, Autorthoptcra, Pseudoneuroptera). 2. Neuroptera (Sub-Orders: Planipennia, Trichoptcra). 3. Strep- siptera. 4. Rhyncota (Sub-Orders: Pedieularia, Aphidaria, Cicadaria, Hemiptera). 5. Diptera (Sub-Orders: Brachyeera, Nemoccra, Aphaniptera). 6. Lepidoptera. 7. Coleoptera. 8. Hymenoptera.

Grade 2. Acerata.

Class I. CRUSTACEA.

Grade 1. Entomostraca.

Orders.—1. Phyllopoda. 2. Ostracoda. 3. Copepoda. 4. Cirrinedia.

Grade 2. Leptostraca. (Genus: Nebalia.)

Grade 3. Malacostraca. Branch a. Arthrostraca.

Orders.—1. Amphipoda. Branch b. Thoracostraca. Orders.—1. Cumacea. 2. Stomapoda. phthalmia. >, Il. ARACHNIDA.

Grade a. Delobranchia. Orders.—l. Hurypterina. 2. Xiphosura. 3. Trilobitz.

Grade 6. Embolobranchia. Orders.—1. Seorpionina. 2. Thelyphonina. 3. Ara-

nein.

Grade c. Lipobranchia. Orders.—1. Galeodina. 2. Opilionina.

4, Acarina.

2. Isopoda. 3. Podo-

3. Pscudo- scorpionina. >, LI]. PANTOPODA. (Genera: Pyenogonum, &c.) », LV. TARDIGRADA. (Genera: Afacrobiotus, Milnesium, &e.) VY. LINGUATULINA. (Genera: Pentastoma, &c.)

Phylum 9. MOLLUSCA.

Branch A. Glossophora. Class I. GASTROPODA. Grade 1. Isopleura. Orders.—1. Polyplacophora. Chetodermarta. Grade 2. Anisopleura. Branch a. Streptoncura. Orders.—1. Zygobranchia. Branch 0. Huthyneura. Orders.—1. Opisthobranchia. » Ll. ScAPHOPODA. (Genus: Dentaliwm.) ;, LI]. CEPHALOPODA (= Siphonopoda). Orders. —1. Tetrabranchia. 2. Dibranchia. Branch B. Lipocephala. Class. LAMELLIBRANCHIA. Orders.—1. Jsomya.

2, Neomeniaria. 3.

2. Azygobranehia.

2. Pulmonata.

2. Hetcromya. 3 Monomya.

Develop- ment of new species,

Geo- graphi- cal dis- tribution of ani- mals.

Study of marine fauna.

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We have now traced the history of the morphography of animals so as to show that increasingly in successive epochs independent branches of knowledge have been brought to bear on the consideration of the main problem, namely, the discrimination of the kinds and the relations to one another of animal forms. Before glancing at the history of the remaining branches of zoological science, which have had an independent history whilst ultimately contributory to taxonomy and morphography, it may be briefly pointed out that the accumulation of knowledge with regard to the distribution of animal forms on the earth's surface and in the seas has progressed simultane- ously with the discrimination of the mere forms of the species themselves, as has also the knowledge derived from fossilized remains as to the characters of former In- habitants of the globe. Both these subdivisions of mor- phography have contributed to the establishment of Dar- winism,—the one (paleontology) by direct evidence of organic evolution in time, the other (zoo-geography) in a more indirect way.

Alfred Russell Wallace stands prominently forward as a naturalist-traveller who by his observations, chiefly on Lepidopterous Insects, in both South America and the Malay Archipelago, was led to the conclusion that a pro- duction of new species is actually going on, and that, too, by means of a process of natural selection of favourable

variations. Wallace and Darwin, who each recognized cordially and fully the other's work, laid their views before the Linnean Society on the same day in 1859.

The facts of the geographical distribution of animals were systematized, and great zoo-geographical provinces first clearly recognized, by P. L. Sclater in 1857. The application of the Darwinian theory to the facts tabulated by Sclater, combined with a knowledge of the distribution of animals in past geological periods, has led to a full explanation of the migrations of terrestrial animals, and has furnished a striking corroboration of the sufficiency of the doctrine of organic evolution, as reformed by Darwin, to account for all the phenomena of zoology.

The study of the marine fauna by means of the dredge and trawl had been enthusiastically prosecuted by British, French, and Scandinavian naturalists in the two decades before Darwin's book; the collection of forms, the discovery of new species, and the recording of their bathymetrical and local distribution had produced a great mass of know- ledge through the labours of E. Forbes, Gwyn-Jeffreys, Sars, Quatrefages, Norman, and others. The post-Dar- winian developments of this line of inquiry have been two. In the first place, dredging and trawling have been extended by the aid of steamships of the Norwegian, British, Ameri- can, French, and Italian navies into greater depths than were previously supposed to contain living things. New species and genera, and a vast extension of knowledge as to distribution, have been the outcome of these expeditions, connected with the names of G. O. Sars and Daniellsen in Norway, of Alex. Agassiz in America, and of Carpenter and Wyville Thomson in Great Britain. It is worthy of note that the practical demand for sounding the Atlantic in connexion with the laying of the first deep-sea telegraph- cable is what led to these explorations, the first recognition of life at these great depths in the ocean being due to Dr Wallich, who accompanied a sounding expedition in 1860 to the North Atlantic, and to Prof. Fleeming Jenkin, who in the same year acted as engineer in raising the sub- marine cable between Sardinia and Africa, upon which living corals were found. In the second place, the study of marine zoology has, since the publication of the Origin of Species, been found to require more complete arrange- ments in the form of

laboratories and aquaria than the isolated vacation student could bring with him to the

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seaside. Seaside laboratories have come into existence: the first was founded in France by Coste (1859) at Concarneau (Brittany), again with a practical end in view, viz. the study of food-fishes with an aim to pisciculture. The demand for a knowledge of the embryology of all classes of animals, and for further facts as to the structure and life- history of the minuter microscopic or very delicate forms of marine life, is what has determined the multiplication of these marine "stations." The largest and best supported pecuniarily is that founded at Naples by Anton Dohrn in 1872; others exist at Trieste, Villefranche, Cette, and at New Haven and Beaufort in the United States, whilst a large laboratory, on a scale to compare with that at Naples, has this year (1888) been opened at Plymouth by the Marine Biological Association of the United Kingdom. Another result of the stimulus given to zoological re-

studying on the spot, and with all the advantages of abund- ant and living material, the structure, and especially the embryology, of rare and exceptionally interesting forms of animal life. In the pre-Darwinian period of this century zoologists who were convinced of the importance of anatomical and embryological study were still content to study specimens immersed in spirit and brought home, often imperfectly preserved, by unskilled collectors, or to confine their attention to such species as could be procured in Europe. Before Cuvier, as we have already pointed out, attention was, with rare exceptions, limited to the dried skeletons and external forms of animals. Now, however, the enterprising zoologist goes to the native land of an interesting animal, there to study it as fully as possible. The most important of these voyages has been that of W. H. Caldwell of Cambridge to Australia (1885-86) for the purpose of studying the embryology of the Monotrema and of Ceratodus, the fish-like Dzipnoon, which has resulted in the discovery that the Monotrema are oviparous. Similarly Adam Sedgwick proceeded to the Cape in order to study Peripatus, Bateson to the coast of Maryland to study Balanoglossus,

and the brothers Sarassin to Ceylon to in- vestigate the embryology of the Cecilia.

The task of the zoologist has changed and developed in every succeeding period. Pure morphography has long ceased to be a chief line of research; and now even the preoccupation produced by the addition to it of the study of cellular embryology is about to undergo a modification by the demand for knowledge of the facts of heredity and adaptation in greatly extended detail.

Zoo-MrcHanics, Zoo-Puysics, Zoo-CHEMISTRY.

The development of that knowledge of the structure of the human body, and of the chemical and physical pro- cesses going on in it, which is necessary for the purposes of the medical art forms a distinct history, which has both influenced and been influenced by that of other branches of zoology. The study of the structure and composition of the body of man and of the animals nearest to him was until fifty years ago one with the inquiry into the activities of those parts, and indeed the separation of anatomy and physiology has never been really carried out. For convenience of teaching, the description of the coarser anatomy of the human body has been in modern universities placed in the hands of a special professor, theoretically condemned to occupy himself with the mere formal details of structure, whilst the professor of physiology has usually retained what is called "microscopic anatomy," and necessarily occupies himself with as much structural anatomy as is required for a due description of the functions of organs and the properties of tissues. It would seem that in our medical schools and universities these arrange-

Expedi- tions for

fauna,

Study of anatomy and phy- siology.

Harvey and the Italian school.

Malpighi and Leeu- wenhoek.

Ovists UeTSUS animal- culists.

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ments should be reconsidered. Anatomy and physiology should be re-united and subdivided as follows,—(1) physi- ology with anatomy in relation to physiology, (2) anatomy in relation to surgery and medical diagnosis,—the former being a science, the latter a piece of technical training in rule of thumb.

Physiological anatomy or anatomical physiology has its beginnings in Aristotle and other observers of antiquity. The later Graeco-Roman and the Arabian physicians carried on the traditional knowledge and added to it. Galen dominated the Middle Ages. The modern development begins with Harvey and with the Italian school in which he studied. Its great names are Fabricius of Acquapendente (1537-1619), Vesalius (1514-1564), Eustachius (c. 1500- 1574), Riolan (1577-1657), Severino (1580-1656). The history of the discovery of the circulation of the blood and of the controversies connected with it gives an interesting and sufficient presentation of the anatomico-physiological knowledge of the period (see Harvey). The foundation of the scientific academies and the records of their publica- tions furnish thenceforward a picture of the progress in this study. As an early anatomist Willis (1621-1675), professor of physic in Oxford, deserves notice for his work on the anatomy of the human brain, the plates for which were drawn by young Christopher Wren, the prodigy of Oxford common-rooms, who later built St Paul's Cathedral. The Royal Society, in its early days when Wren was a fellow, met at Gresham College whenever the professor of physic there could obtain a human body for dissection, and amongst its earliest records are the memoirs of Tyson on the anatomy of the Chimpanzee and the experiments on transfusion of blood, extirpation of the spleen, and such like inquiries. —

Marcello Malpighi (1628-1694) and Anton van Leeu- wenhoek (1632-1723) were the first to introduce the microscope into anatomical research. Malpighi first used the injection of blood-vessels on a large scale, and more- over is to be credited with having first conceived that there is a definite relation of the structure of lower kinds of animals to that of higher and more elaborate kinds, and that this relation is one of gradual

transition, so that lower animals are not to be regarded as isolated and arbi- trary existences, but are really simpler exhibitions of the same kind of structure and mechanism which occurs in higher animals. It is this conception which later de- veloped into the theory of an actual transmutative deve- lopment of lower into higher organisms. Leeuwenhoek discovered the red blood corpuscles of Vertebrates, saw the circulation in the capillaries of the Frog's foot, de- scribed the fibrillar structure and cross-striping of muscular fibre, the tubular structure of dentine, the scales of the epidermis, the fibres of the lens, and the spermatozoa, these last having been independently discovered at Leyden in 1677 by Ludwig Ham of Stettin. The spermatozoa were regarded by the "animalculists" as the fully formed but minute young which had to be received in the egg, in order to be nourished and increase in size, and were hailed as a decisive blow to Harvey's doctrine of epigenesis and his dictum "'omne vivum ex ovo." Albrecht von Haller was the chainpion of the so-called "evolutionists" in the 18th century, better called "' praformationists." Haller wrote, " There is no such thing as development! No part of the animal body is made before another ; all are simul- taneously created."

whilst the "animalculists," who regarded the spermatozoon !

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as the essential germ, would have substituted Adam for Eve in the above calculation. These fanciful conceptions —containing as they do a share of important truth—were opposed by Caspar Friedrich Wolff, who in his doctorate dissertation (1759) maintained that the germ is a struc- tureless particle, and acquires its structure by " epigenesis " or gradual development. Wolff has proved to be nearer the truth than Haller; but modern conceptions as to the molecular structure of the egg-protoplasm point to a com- plexity as great as that imagined by the evolutionists. Later it was maintained that the spermatozoa are parasitic animalcules, and this view prevailed for 150 years, so that in the Physiology of Johann Miiler (1842) we read, "Whether the spermatozoa are parasitic animaleules or living parts of the animal in which they occur cannot at present be stated with certainty."

Physiology in the 18th century could only proceed by means of inferences from purely anatomical observation, aided by imaginative conceptions which had no real basis. The explanation of the processes of life in the animal body was waiting for that progress in the knowledge of physics and chemistry which at last arrived, and gave a new im- pulse to investigation. Albrecht von Haller (1708-1777) was the first to apply experimental methods to the deter- mination of the functions of the various organs made known by anatomists, and from him we may trace a bi- furcation in the tendencies of medical men who occupied themselves with the study of the structure and functions of the animal organism. The one class proceeded more and more in the direction of comparative anatomy, the other in the direction of exact analysis and measurement of both the structure and properties of the organs of Ver- tebrate animals allied to man and of man himself.

John Hunter (1728-1793) is the most striking figure of this epoch in the relation of medicine to general zoological progress ; the preservation of his museum in Lincoln's Inn Fields, London, by the combined action of the state and the Royal College of Surgeons, is an abiding record of the historical progress of biological science, Hunter col- lected, dissected, and described not only higher but lower animals, with the view of arriving at a knowledge of the function of organs by the most extensive and systematic survey of their modifications in all kinds of animals. His purpose was that of the physiologist and medical man, but he made great contributions to the general knowledge of animal structure. The same class of investigations, when taken up by Cuvier from the point of view of systematic zoology and morphology, led to a reconstruction of classi- fication and laid the foundation of anatomical zoology. Hunter was the younger brother of William Hunter, who also formed an important museum, still preserved in Glas- gow. Hunter classified the organs of animals into those which subserve the preservation of the individual, those which subserve the preservation of the species, and those which are the means of relation with the outer world, and he arranged his museum of dissections and preparations on this plan.

The great progress of chemistry at the end of the 18th and the beginning of the 19th century was followed by an application of chemical laws and

chemical methods to the study of animal life. Curiously enough, as showing how deeply interwoven are the various lines of scientific progress, Priestley in his discovery of oxygen was as much concerned in the study of a chlorophyll-bearing Protozoon, Huglena viridis, as in that of the red oxide of mercury; and the interest in "vital spirits" as a physiological factor was an important stimulus to those researches which produced modern chemical knowledge.

The purely anatomical side of physiological progress is marked in the beginning of the 19th century by the work

Von Haller.

The two

Hunters.

Rela- tions of chemis-

try and

zoology.

Begin- nings of histo- logy.

Schwann's

cell- theory.

Schwann's other dis-

coveries.

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of Bichat (1771-1802), who distinguished by naked-eye characters the different structural materials of which the organs of man and the higher animals are built, and thus founded in first outline the science of histology. By the end of the first quarter of this century it had become

clear to the minds of the anatomico-physiological students of animal life that the animal body was subject to the same physical laws as other matter, although it was still held that some additional and mysterious agent—so-called "vitality "—was at work in living bodies. It had become clear that animal material could be investigated chemically, and that the processes of digestion, assimilation, respira- tion, and secretion were chemical processes.

To a considerable extent the chemical composition and properties of the tissues, and the chemical nature of the various changes of life and of putrefaction after death, had been investigated, but one step was yet to be taken which brings the study of ultimate structure, chemical activity, form, and the formation of form to a single focus. This was taken by Theodore Schwann (1810-1881), who in 1839 published his epoch-making cell-theory. Schwann

was a pupil of Johann Miiller, and there can be little.

doubt that the ideas of the pupil are to be credited in some measure to the master. Schwann took up the thread of microscopic investigation which had been sedu- lously pursued by a distinct line of ~~*students since the days of Hook and Leeuwenhoek, and had resulted in a general doctrine among botanists of the cellular struc*~~ *ture of all the parts of plants. Schwann showed not only that plants are uniformly built up by these corpuscular units (of which Robert Browne in 1833 had described the peculiar nucleated structure), but that all animal tissues are also so built up. That, however, was not Schwann's chief point. The cell-theory for which he is famous is this, that the substance of the individual cell is the seat of those chemical processes which seen en masse we call life, and that the differences in the properties of the differ- ent tissues and organs of animals and plants depend on a difference in the chemical and physical activity of the con- stituent cells, resulting in a difference in the form of the cells and in a concomitant difference of activity. Schwann thus pointed to the microscopic cell-unit as the thing to be studied in order to arrive at a true knowledge of the processes of life and the significance of form. In founding the study of cell-substance (or protoplasm, as it was subse- quently called by Max Schultze in 1861, adopting the name used by*

botanists for vegetable cell-contents) Schwann united two lines of inquiry, viz., that of minute investi- gation of structure and development and that of zoo- chemistry and zoo-physics. He spent a large part of the next forty years in an attempt to penetrate further into the structure of cell-substance ; he hoped to be able to find in cell-substance ultimate visible molecules, a knowledge of the arrangement and characters of which would explain the varying properties of protoplasm.

It is not a little remarkable that Schwann, who thus brought about the union of physiological and morphological study by his conception of cell-substance, should also have

been the initiator of that special kind of experimental in-.

vestigation of the physical properties of tissues by the exact methods used by physicists which, by the aid of the kymo- graphion, the thermo-electric pile, and the galvanometer, has been so largely pursued during the last thirty years in our physiological laboratories. It is perhaps less surprising that Schwann, who had so vivid a conception of the activity and potentialities of the cell-unit, should have been the discoverer of the immensely important fact that putrefaction and fermentation are not the conse- quences of death but of life, and that without the presence of living Bacteria putrefaction does not occur, whilst he

also is the discoverer of the fact that the yeast which causes alcoholic fermentation is a mass of unicellular living organisms.

From Schwann's time onward the cell became more and more the point of observation and experiment in the pro- gress of both morphography and physiology. It was soon shown, chiefly through Kélliker and Remak, that all cells originate by fission from pre-existing cells,—a fact un-known to Schwann,—and the doctrine 'omnis cellula e cellula" was established. It was also demonstrated that the Mammalian egg discovered by Von Baer was a typical nucleated cell, and that all animals, and plants also (this generalization took thirty years to establish), take their origin from an egg, which is in essence and in fact a single nucleated cell. The

doctrine of Harvey, "omne vivum ex ovo," thus received its most ample justification. The study of "growth from the egg" became necessarily a study of the multiplication by fission of the egg-cell and its fission-products, their arrangement in layers, and the chemical metamorphosis of their substance and exuda- tions. This study, as well as the allied investigation of the cell-structure of the adult tissues, was immensely facilitated by methods of hardening, staining, section-cutting, and clarifying which grew up after Schwann's time, and have their present highest development in the automatic microtome of Caldwell, which can be worked by a motor, and delivers consecutive sections of animal tissues or em- bryos zgonth of an inch thick, arranged in the form of ribbons, ready for examination with the microscope, at the rate of one hundred or more per minute. Stricker of Vienna was the first to embed embryos in waxy material for the purpose of cutting thin sections of them, about twenty-five years ago, and R. Leuckart of Leipsic was subsequently the first to employ this method in the study of the structure of small [nvertebrata.

The knowledge of the anatomical facts of cellular de- velopment and cellular structure necessarily gave im- mensely increased precision to the notion of gradation of structure in the animal series from simple to complex, and rendered Darwin's doctrine the more readily accepted. It was not, however, until after Darwin's date (1859) that the existence of unicellular animals was fully admitted, and the general facts of cellular embryology established throughout the animal kingdom.

Similarly cellular physiology, by establishing the concep- tion of a simple optically homogeneous cell-substance as the seat of the activities which we call "life," rendered it possible to accept the suggestion of a simple "substance of life" which might have been evolved from simpler non-living matter by natural processes depending on physical and chemical laws. It is noteworthy that Darwin himself appears not to have been influenced directly by any such physiological or chemico-physical doctrine as to "proto- plasm" or cell-substance. Nevertheless the way was prepared for the reception of Darwin's theory by this state of physiological knowledge.

The word “protoplasm” requires a little further notice. Protoplasm was applied by Von Mohl and by Max Schultze to the slimy substance of the cell, including therein both the general thinner material and the nucleus. It is, as Roscoe remarked at Manchester (Brit. Ass. Address, 1887), a structure and not a chemical body. Nevertheless gradually physiologists have come to use the word “ protoplasm ” for one of the chemical substances of which Schultze’s proto- plasm is a structural mixture—namely, that highest point in the chemical elaboration of the molecule which is at- tained within the protoplasm, and up to which some of the chemical bodies present are tending, whilst others are degradation products resulting from a downward meta- morphosis of portions of it. This intangible, unstable, all-

Develop- ment of cell- theory.

Cellular physio- logy.

Proto- plasm.

Plasmo- logy.

Bio- nomics.

Teleo- logy.

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pervading element of the protoplasm cannot at present be identified with any visibly separable part of the cell-sub- stance, which consists of a hyaline denser network of ex- cessive tenuity, of a less dense hyaline liquid, and of finest and less fine granules of varying chemical nature. This “critical ” substance, sometimes called “true protoplasm,” should assuredly be recognized by a distinct name “ plasmo- gen,” whilst protoplasm retains its structural connotation.

The study of the process of fertilization and of the significance in that process of the distinct parts of the sperm-cell and egg-cell—the separate fibrille and granules of the nuclei of those cells—at the present moment

forms one of the engrossing subjects of zoological investigation.1 Not less important is the descent, as it were, of physiological investigation in relation to every organ into the arena of the cell: digestion, secretion, muscular contraction, nerve action, all are now questions of plasmology, or the study of cell-substance founded by Schwann.?

GENERAL TENDENCY OF ZOOLOGY SINCE DARWIN.

The serious and broadly-based study of bionomics which was introduced by Darwin, and in his hands gave rise to the doctrine of natural selection, by which the hypothesis of the origin of species by gradual transmutation in the natural process of descent from ancestral forms was established as a scientific doctrine, can hardly be said to have had any history. Buffon (1707-1788) alone among the greater writers of the three past centuries emphasized that view of living things which we call "'bionomics." Buffon deliberately opposed himself to the mere exposition of the structural resemblances and differences of animals, and, disregarding classification, devoted his treatise on natural history to a consideration of the habits of animals and their adaptations to their surroundings, whilst a special volume was devoted by him to the subject of reproduction. In special memoirs on this or that animal, and in a subor- dinate way in systematic works, material is to be found helping to build up a knowledge of bionomics, but Buffon is the only prominent writer who can be accorded historic rank in this study.? The special study of man in these relations—such as is concerned with the statistics of population—must be considered as having contributed very importantly to Darwin's wider study of bionomics in general. The work of Malthus On Population (1798) exercised the most important influence on Darwin's thought, as he himself tells us, and led him to give attention to the facts of animal population, and so to discover the great moving cause of natural selection—the struggle for exist- ence. Darwin may be said to have founded the science of bionomics, and at the same time to have given new stimulus and new direction to morphography, physiology, and plas- mology, by uniting them as contributories to one common biological doctrine—the doctrine of organic evolution— itself but a part of the wider doctrine of universal evolu- tion based on the laws of physics and chemistry.

The full influence of Darwin's work upon the progress and direction of zoological study has not yet been seen. The immediate result has been, as pointed out above, a reconstruction of the classification of animals upon a genealogical basis, and an investigation of the individual development of animals in relation to the steps of their gradual building up by cell-division, with a view to obtain- ing evidence of their genetic relationships. On the other hand, the studies which occupied Darwin himself so largely subsequently to the publication of the Origin of Species,

1 See the memoirs of Weismann on Heredity and F. M. Balfour's Embryology.

2 For a fuller and general history of PaysroLoay, see that article.

3 The main literary sources made use of by Darwin are the magazines

and treatises of horticulturists, farmers, pigeon-fanciers, and the like, in fact': what is comprised in the veld newspaper.

viz., the explanation of animal (and vegetable) mechanism, colouring, habits, &c., as advantageous to the species or to its ancestors—in fact, the new teleology,—has not yet been so vigorously pursued as it must be hereafter. The most important work in this direction has been done by Fritz Miller (tir Darwin), by Herman Miiller (Lertilization of

Plants by Insects), and by August Weismann (memoirs trans-

lated by Meldola). Here and there observations are fron1 time to time published, but no large progress has yet been made, probably on account of the fact that animals are exceedingly difficult to keep under observation, and that there is no provision in universities and like institutions for the pursuit of these inquiries or even for their academic representation. More has been done with plants than with animals in this way since Darwin, probably owing to the same cause which has, ever since the revival of learning, given botany a real advantage over zoology, namely, the existence of ' physick" gardens, now become "' botanical "

gardens, and the greater ease of management, experiment, and observation in the case of plants than in that of ani- mals. It is true that zoological gardens have existed for the last fifty years in all large European cities, but these have always been conducted with a view to popular exhibition; and, even where scientific influences have been brought to bear on their management, they have been those of the morphographer and systematist rather than of the bionomist. Moreover, zoological gardens have never been part of the equipment of the university professor of zoology, as it may be hoped in future will be the case. The foundation of marine biological laboratories under the control of scientific zoologists offers a prospect of true bionomic observation and experiment on an increased scale in the near future, and, were such laboratories founded in our universities and provided with the necessary appliances for keeping terrestrial and freshwater animals, as well as marine forms, alive and under observation in conditions resembling as nearly as possible those of nature, a step would have been taken towards carrying on the study of bionomics which cannot long be delayed. It seems to be even more important that the academic curriculum of zoology should not, by mere mechanical adhesion to the old lines of morphography, and experimental research on the chemical and physical properties of tissues and organs, confine the attention and training of young students to what are now, comparatively speaking, the less productive lines of research.

If we turn to the other branch of bionomics, that con Threm- cerned with the laws of variation and heredity (thremma- Hee tology), we find that since Darwin, and independently of °°%

his own work, there has been a more obvious progress than in teleology. In the first place, the continued study of human population has thrown additional light on some of the questions involved, whilst the progress of microscopical research in the hands of Biitschli, Hertwig, Balfour, and August Weismann promises to give us a clear foundation as to the structural facts connected with the origin of the egg-cell and sperm-cell and the process of fertilization. This is not the fitting place in which to give a sketch of the doctrines and hypotheses of thremmatology. They may be gathered from Darwin's writings, more especially the Origin of Species

and Animals and Plants under Domes- tication.4 They relate to the causes of variation in animals and plants, the laws of the transmission of parental char- acters, the share of each parent in the production of the char- acters of the offspring, atavism, and the relations of young to parents as to nuniber, sex, nourishment, and protection.

An important development of Darwin's conclusions 1s actually in progress and deserves special notice here, as it

+ The reader is also referred to Ribot's L' Hérédité, and the writings of Charles Darwin's cousin, Francis Galton.

is the most distinct advance in the department of biono- mics since Darwin's own writings, and at the same time touches questions of fundamental interest. The matter strictly relates to the consideration of the "causes of varia- tion," and is as follows.

The fact of variation is a familiar one. No two animals, even of the same brood, are alike: whilst exhibiting a close similarity to their parents, they yet present differences, sometimes very marked differences, from their parents and from one another. Lamarck had put forward the hypo- thesis that structural alterations acquired by a parent in the course of its life are transmitted to the offspring, and that, as these structural alterations are acquired by an animal or plant in consequence of the direct action of the environment, the offspring inheriting them would as a consequence not unfrequently start with a greater fitness for those conditions than its

parents started with. In its turn, being operated upon by the conditions of life, it would acquire a greater development of the same modification, which it would in turn transmit to its offspring. In the course of several generations, Lamarck argued, a structural alteration amounting to such difference as we call "specific " might be thus acquired. The familiar illustration of Lamarck's hypothesis is that of the giraffe, whose long neck might, he suggested, have been acquired by the efforts of a primitively short-necked race of herbivores, who stretched their necks to reach the foliage of trees in a land where grass was deficient, the effort producing a distinct elongation in the neck of each generation, which was then transmitted to the next. This process is known as " direct adaptation ;" and there is no doubt that such structural adaptations are acquired by an animal in the course of its life. Whether such acquired characters can be transmitted to the next generation is a separate question. It was not proved by Lamarck that they can be, and, indeed, never has been proved by actual observation. Nevertheless it has been assumed, and also indirectly argued, that such acquired characters must be transmitted. Darwin's great merit was that he excluded from his theory of develop- ment any necessary assumption of the transmission of ac- quired characters. He pointed to the admitted fact of congenital variation, and he showed that these variations to all intents and purposes have nothing to do with any characters acquired by the parents, but are arbitrary and, Their causes are extremely difficult to trace in detail, but it appears that they are largely due to a "shaking up" of the living matter which constitutes the fertilized germ or embryo-cell, by the pro- cess of mixture in it of the substance of two cells,—the germ-cell and the sperm-cell,— derived from two different individuals. Other mechanical disturbances may assist in this production of congenital variation. Whatever its causes, Darwin showed that it is all-important. In some cases a pair of animals produce ten million offspring, and in such a number a large range of congenital variation is possible. Since on the average only two of the young survive in the struggle for existence to take the place of their two parents, there is a selection out of the ten million young, none of which are exactly alike, and the selection is determined in nature by the survival of the congenital variety which is fittest to the conditions of life. Hence there is no necessity for an assumption of the perpetuation of direct adaptations. The selection of the fortuitously (fortuitously, that is to say,

so far as the conditions of sur- vival are concerned) produced varieties is sufficient, since it is ascertained that they will tend to transmit those char- acters with which they themselves were born, although it is not ascertained that they could transmit characters acquired on the way through life. A simple illustration of the differ- ence is this : a man born with four fingers only on his right

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hand is ascertained to be likely to transmit this peculiarity to some at least of his offspring ; on the other hand, there is not the slightest ground for supposing that a man who has had one finger chopped off, or has even lost his arm at any period of his life, will produce offspring who are defective in the slightest degree in regard to fingers, hand, or arm. Darwin himself, apparently influenced not merely by the consideration of certain classes of facts which seem to favour the Lamarckian hypothesis but also by a respect for the general prejudice in its favour and for Mr Herbert Spencer's authority, was of the opinion that acquired characters are im some cases transmitted. It should be observed, however, that Darwin did not attribute an es- sential part to this Lamarckian hypothesis of the trans- mission of acquired characters, but expressly assigned to it an entirely subordinate importance. –

The new attitude which has been taken since Darwin on this question is to ask for evidence of this asserted transmission of acquired characters. It is held! that the Darwinian doctrine of selection of fortuitous congenital variations is sufficient to account for all cases, that the Lamarckian hypothesis of transmission of acquired char- acters is not supported by experimental evidence, and that the latter should therefore be dismissed. Weismann has also ingeniously argued from the structure of the egg-cell and sperm-cell, and from the way in which, and the period at which, they are derived in the course of the growth of the embryo from the egg—from the fertilized egg-cell— that it is impossible (it would be better to say highly improbable) that an alteration in parental structure could produce any exactly representative change in the substance of the germ or sperm-cells.

It does not seem improbable that the doctrine of organic evolution will thus become pure Darwinism and be entirely dissociated from the Lamarckian heresy.

The one fact which the Lamarckians can produce in their favour is the account of experiments by Brown-Séquard, in which he produced epilepsy in guinea-pigs by section of the large nerves or spinal cord, and in the course of which he was led to believe that in a few rare instances the artificially produced epilepsy was transmitted. This in- stance does not stand the test of criticism. It is not clear whether the guinea-pigs operated upon had or had not already a constitutional tendency to epilepsy, and it is not clear in what proportion of cases the supposed transmission took place, and whether any other disease accompanied it. On the other hand, the vast number of experiments in the cropping of the tails and ears of domestic animals, as well as of similar operations on man, are attended with negative results. No case of the transmission of the re- sults of an injury can be produced. Stories of tailless kittens, puppies, and calves, born from parents one of whom had been thus injured, are abundant, but they have hitherto entirely failed to stand before examination.

Experimental researches on this question are most urgently needed, but they are not provided for either in the morphographical or physiological laboratories of our universities.

Whilst simple evidence of the fact of the transmission of an acquired character is wanting, the a priore argunients in its favour break down one after another when discussed. The very cases which are advanced as only to be explained on the Lamarckian assumption are found on examination and experiment to be better explained, or only to be ex- plained, by the Darwinian principle. Thus the occurrence of blind animals in caves and in the deep sea was a fact which Darwin himself regarded as best explained by the atrophy of the organ of vision in successive generations through the absence of light and consequent disuse, and

1 Weismann, Vererbung, &c., 1886.

the transmission (as Lamarck would have supposed) of a more and more weakened and structurally impaired eye to the offspring in successive generations, until the eye finally disappeared. But this instance is really fully ex- plained by the theory of natural selection acting on con- genital fortuitous variations. Many animals are thus born with distorted or defective eyes whose parents have not had their eyes submitted to any peculiar conditions. Sup- posing a number of some species of Arthropod or Fish to be swept into a cavern or to be carried from less to greater depths in the sea,—those individuals with perfect eyes would follow the glimmer of light and eventually escape to the outer air or the shallower depths, leaving behind those with imperfect eyes to breed in the dark place. A natural selection would thus be effected. In every succeeding generation this would be the case, and even those with weak but still seeing eyes would in the course of time escape, until only a pure race of eyeless or blind animals would be left in the cavern or deep sea. Experiments and inquiries with regard to this subject are in progress ; amongst those who have occupied themselves with it are August Weismann of Freiburg and E. B. Poulton of Oxford.

stance of the pure Darwinian theory without the aid of Lamarckism.

The whole of this inquiry has special importance in regard to mankind, since the great questions of influence of race and family as opposed to the influence of education are at issue. If pure Darwinism is to be accepted, then education has no value in directly affecting the mental or physical features of the race, but only in affecting those of the individual. Were acquired characters really and fully transmitted, then every child born would inherit the know- ledge of both its parents more or less completely, and from birth onwards would be able to add to its inherited stock, so that the progress of the race in mental acquirements would be prodigiously more rapid than it is. On the other hand, peculiarities of mind and body established in a race or a family acquire increased significance, for they cannot be got rid of by training, but are bound to reappear if the stock which exhibits them is allowed to breed. It seems that the laws of thremmatology may eventually give to mankind the most precise

directions, not only as to how to improve the breeds of plants and animals, but as to how to improve the human stock. It is not a little re-

Theory It has been argued that the elaborate structural adapta- | markable that the latest development of zoological science of trans- tions of the nervous system which are the corporeal correla- | should favour that respect to breeding which is becoming mission . . : . . . :

ofin- tives of complicated instincts must have been slowly built | less popular than it was, and should tend to modify the stincts, up by the transmission to offspring of acquired experience, | current estimate of the results of education.

that is to say, of acquired brain structure. At first sight

it appears difficult to understand how the complicated series of actions which are definitely exhibited as so-called "instincts" by a variety of animals can have been due to the selection of congenital variations, or can be otherwise

The relation of Darwinism to general philosophy and of Relation the history of zoology to philosophical doctrines is one of of z0o- the most interesting chapters which might be written on ee the subject of this article. It belongs, however, rather to oe

explained than by the transmission of habits acquired by the parent as the result of experience, and continuously elaborated and added to in successive generations. It is, however, to be noted, in the first place, that the imitation of the parent by the young possibly accounts for some part of these complicated actions, and, secondly, that there

the history of philosophy than to that of zoology. Undoubt- edly the conceptions of mankind at different periods of history with regard to cosmogony, and the relations of God, nature, and man, have had a very marked influence upon the study of zoology, just as in its turn the study of zoology has reacted upon those conceptions.

are cases in which curiously elaborate actions are performed by animals as a characteristic of the species, and as sub-

In this, as in other phases of mental development, the Develop-

ancient Greeks stand out in the most striking manner as ee € 10aca

serving the general advantage of the race or species, which, nevertheless, can nxo¢ be explained as resulting from the transmission of acquired experience, and must be supposed to be due to the natural selection of a fortuitously developed habit which, like fortuitous colour or form variation, happens to prove beneficial, Mr Poulton has insisted upon the habits of "shamming dead" and the combined posturing and colour peculiarities of certain caterpillars (Lepidopterous larvee) which cause them to resemble dead twigs or similar surrounding objects. The advantage to the animal of this imitation of surrounding objects is that it escapes the pursuit of (say) a bird which would, were it not deceived by the resemblance, attack and eat the cater- pillar. Now it is clear that preceding generations of cater- pillars cannot have acquired this habit of posturing by experience. Either the caterpillar postures and escapes, or it does not posture and is eaten ; it is not half eaten and allowed to profit by experience. We seem to be justified in assuming that there are many movements of stretching and posturing possible to caterpillars, and that some cater- pillars had a congenital fortuitous tendency to one position, some to another, and, finally, that among all the variety of habitual movements thus exhibited one has been selected and perpetuated because it coincided with the necessary conditions of safety, since it happened to give the caterpillar an increased resemblance to a twig.

The view that instinct is the hereditarily fixed result of habit derived from experience has hitherto dominated all inquiry into the subject, but we may now expect to see a renewed and careful study of animal instincts carried out with the view of testing the applicability to each in-

possessing what is sometimes called the modern spirit. The doctrine of evolution is formulated in unmistakable terms by Heraclitus and other philosophers of antiquity. Not only so, but the direct examination of nature, includ- ing the various-forms of animal life, was practised by

Aristotle and his disciples in a spirit which, though not altogether free from prejudice, was yet far more like that which actuated the founders of the Royal Society less than three hundred years ago than anything which was mani- fested in the two thousand years intervening between that date and the time of Alexander the Great. The study of zoology in the Middle Ages was simply a fantastic commentary on Aristotle and the records of animals in the various books of the Bible, elaborated as part of a peculiar system of mystic philosophy, which has more analogy with

‘the fetichism and totem worship of savage races than with

any Greek or modern conceptions. So far as philosophy affected the study of zoology in the beginning of the modern period, its influence was felt in the general accept- ance of what has been called the Miltonic cosmogony, — namely, that interpretation of the Mosaic writings which is set forth by the poet Milton, and of which the character- istic is the conception of the creation of existing things, including living things, nearly or just as they are, by a rapid succession of “fiats” delivered by an anthropo- morphic Creator. It was not until the end of the 18th century that Schelling (as quoted above) conceived that unity of nature and general law of development which is now called the doctrine of evolution.

In England Erasmus Darwin (Zoonomia, published in 1794-96), in France Lamarck (Philosophie Zoologique,

1809) and Geoffroy Saint-Hilaire (Principes de Philosophie Zoologique, 1830), and in Germany Oken (Lehrbuch der Natur-Philosophie, 1809-11), Goethe (Zur Natur Wiss- ensch., Stuttgart, 1817), and Treviranus (Biologie, 1802-5) were the authors of more or less complete systems of a philosophy of nature in which living things were regarded as the outcome of natural law, that is, of the same general processes which had produced the inanimate universe. The “Natur-philosophen,” as they were called in Ger- many, demand the fullest recognition and esteem. But, just in proportion as the ‘“Natur-philosophen” failed to produce an immediate effect on the study of zoology by their theory of natural development, so was the doctrine of evolution itself deprived of completeness and of the most important demonstration of its laws by the long- continued delay in the final introduction of biology into the area of that doctrine.

Darwin by his discovery of the mechanical principle of organic evolution, namely, the survival of the fittest in the struggle for existence, completed the doctrine of evolution,

ZOROASTER, one of the great teachers of the East, the founder of what was the national religion of the Perso- Iranian people from the time of the Achzmenidz to the close of the Sasanian period. The name (Zwpodorpys) is the Greek form of the old Iranian Zarathushtra and the new Persian Zardusht; it seems to mean "possessor of old camels."

Zoroaster was already famous in classical antiquity as the founder of the widely renowned wisdom of the Magi. The later Greek writers place him with almost one consent in the east of Iran, and more particularly in Bactria. The name is not mentioned by Herodotus in his sketch of the Medo-Persian religion (i. 131 sg.), but it occurs in a fragment (29) of the earlier writer Xanthus. Plato calls Zoroaster the founder of the doctrine of the Magi and a son of Oromazes. According to Hermodorus, one of Plato's disciples, he was a Persian, the first Magian ; according to Hermippus, a Bactrian; according to Trogus Pompeius, even king of the Bactrians and founder of the Magian art and knowledge of the stars; according to Diodorus, an Arian, that is, a native of east Iran. A few details as to his life are also given. Thus, according to Pliny, he laughed on the very day of his birth—a statement found also in the Zardusht-Ndma—and for thirty years he lived in the wilderness upon cheese. Plutarch speaks of his intercourse with the deity and compares him with Lycurgus and Numa. Dio Chrysostom, Plutarch's contemporary, declares that neither Homer nor Hesiod sang of the chariot and horses of Zeus so worthily as Zoroaster, of whom the Persians tell that out of love to wisdom and righteousness he withdrew himself from men and lived in solitude upon a mountain. The mountain was burnt up, but Zoroaster escaped uninjured and spoke to the multitude. His struggle with Semiramis seems to be an invention of Ctesias. Plutarch, drawing partly on Theopompus, speaks of his religion in his Isis and Osiris (cc. 46 and 47),

Ancient writers differ greatly as to Zoroaster's date. Ctesias, as we have seen, makes him a contemporary of Semiramis. Hermippus of Smyrna places him 5000 years before the Trojan War, Xanthus 6000 years before Xerxes. Aristotle assigned him a similar antiquity. Agathias remarks (ii. 24) with perfect truth that it is no longer possible to determine with any certainty when he lived and legislated. 'The Persians," he adds, "say that Zoro- aster lived under Hystaspes, but do not make it clear whether by

this name they mean the father of Darius or another Hystaspes. But, whatever may have been his date, he was their teacher and instructor in the Magian

| and gave it that unity and authority which was necessary in order that it should reform the whole range of philo- sophy. The detailed consequences of that new depart- ure in philosophy have yet to be worked out. Its most important initial conception is the derivation of man by natural processes from ape-like ancestors, and the conse- quent derivation of his mental and moral qualities by the operation of the struggle for existence and natural selection from the mental and moral qualities of animals. Not the least important of the studies thus initiated is that of the evolution of philosophy itself. Zoology thus finally arrives through Darwin at its crowning development: it touches and may even be said to comprise the history of man, socio- logy, and psychology.

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Munich, 1872; and L. Agassiz, dn Essay on Classification, London, 1859. (E. RB. L.)

| religion." All classical antiquity, however, without a dis- sentient voice speaks of Zoroaster as an historical person.

He is nowhere mentioned in the cuneiform inscriptions of the Achzemenide, although Darius and his successors were without doubt devoted adherents of Zoroastrianism. Very little value can be attached to the fabulous narratives concerning him in the later Persian and Parsee literature, the Shah-Nadma and the Zardusht-Ndma (13th century) ; and the information of the Pahlavi books is very scanty. The Zend-Avesta alone gives abundant details, which, in part at least, may be regarded as authentic.

Before proceeding to compile from these a brief sketch of the life and doctrine of Zoroaster it will be well that we should first look at the question whether we are cntitled to regard him as an his- torical character at all. For Zoroaster too, like his great fellow- teacher Buddha, has fallen under the ban of modern scepticism. According to Darmesteter and Eduard Meyer, the Parsee saint is a mere myth, a divinity invested with hnman attributes, an incarnation of the storm-god, who with his divine word, the thundcr, cones down from heaven and smites the demons. Darmesteter, however, has failed to realize sufficiently the distinction between the Zoroaster of the later Avesta and the Zoroaster of the Gathas. It cannot be denied that in the later Avesta, and still more in writings of more recent date, he is presented in a supernatural light and invested with superhuman powers. At his appearing all nature rejoices (Yasht 13, 93); he enters into conflict with the demons and rids the earth of their presence (Yasht 17, 19); Satan approaches him as tempter to make him renounce his faith (Vd., 19, 6). The Zar- dusht-Ndma is full of miracles and miraculous deliverances wrought by Zoroaster. But it is quite otherwise in the Gathas.

The Gathas alone within the Avesta make any claim to be the ipsissima verba of the prophet; in the rest of that work they are put into Zoroastcr's own mouth (Yasna, 9, 1) and are expressly called "the Gathas of the holy Zoroaster" (Yasna, 57, 8). The litanics of the Yasna, and the Yashts, refer to him as a personage belonging to a remote antiquity. The Vendidad also merely gives accounts of the dialogues between Ormuzd and Zoroaster. The Gathas alone claim to be authentic utterances of Zoroaster, his genuine expressions in presence of the assembled church.

The person too of the Zoroaster whom we meet with in these hymns differs ¢oto celo from the Zoroaster of the younger Avesta. Heisthe exact opposite of the miraculous personage of later legend, ——a mere man, standing always on the solid ground of reality, whose only arms are trust in his God and the protection of his powerful allies. And at times his position is precarious enough. He whom we hear in the Gath4s has had to face, not merely all forms of out- ward opposition and the unbelief and lukewarmness of adherents, but also the inward misgivings of his own heart as to the truth and final victory of his causc. At one time hope, at

another despond- ency, now assured confidence, now doubt and despair, here a firm faith in the speedy coming of the kingdom of heaven, there the thought of taking refuge by flight,—such is the range of the emotions which find their immediate expression in these hymns. And the whole breathes such a genuine originality, all is psycho- logically so accurate and just, the earliest beginnings of the new religious movement, the childhood of a new community of faith, are reflected so naturally in them all, that it is impossible for

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a moment to think of a later period of composition by a priesthood whom we know to have been devoid of any historical sense, and incapable of reconstructing for themselves the spiritual conditions under which Zoroaster lived. As soon as the position has been fully mastered—that in the Gathas we have firm historical ground on which Zoroaster and his surroundings may rest, that here we have the beginnings of the Zoroastrian religion—then it becomes impossible to answer otherwise than affirmatively every general question as to the historical character of Zoroaster. On the other hand, we mnst not expect too much from the Gathis in the way of definite detail. They give no historical acconnt of the life and teach- ing of their prophet, but rather are, so to say, versus memoriales, which recapitulate the main points of interest, often again in an allusive way. It must be remembered too that their extent is but limited.

As to the birthplace of Zoroaster the Avesta is silent. In later tradition two places contended for this honour : the older and more widely spread story made him a native of Rai (Rhagz) in. Media, another of Shiz, the capital of Atropatene, also in Media. It is hard to decide whether both traditions rest merely upon priestly pretensions of a later date or whether one of them is not perhaps authentic. According to Yasna, 19, 18, the "zarathushtrotema" or supreme head of the Zoroastrian priesthood had at a later (Median or Sasanian ?) time his residence in Rhage. But there is a passage in even the Gathas (Y., 53, 9) which seems to contain a lurking allusion to Rhage; unfortu- nately, however, both text and meaning are uncertain. However this may be, the activity of Zoroaster as

a teacher is certainly to be placed in the east of Iran. On this point also the Gathas say nothing. The later Avesta names, as the locality of his advent, "Airyanem vaéjé," a quite fabulous country, which, according to Vd., 1, 3 and 7, was not identified with Bactria. He taught under the reign of a ruler named Vishtaspa (later Gushtasp, the Greek Hystaspes), with whom and with whose court he stood in close and friendly relations. This Vishtaspa must be care- fully distinguished from Hystaspes the father of Darius. According to the epic legend, Vishtaspa was king of Bactria. Already in the later Avesta he has become a half mythical figure, the last in the series of heroes of east Iranian legend, in the arrangement of which series priestly influence is unmistakably evident. He stands at the meeting-point between the old world and the new era which begins with Zoroaster. In the Gathds he appears as a quite historical personage ; it is essentially to his power and good example that the prophet is indebted for his success. In Yasna, 53, 2, he is spoken of asa pioneer of the doctrine revealed by Ormuzd. In the relation between Zoroaster and Vish- taspa already lies the germ of the state church which after- wards became so completely subservient to the interests of the dynasty and sought its protection from it.

Among the grandees of the court of Vishtaspa mention is made of two brothers Frashaoshtra and Jamaspa; the latter, according to the later legend, was the minister of Vishtaspa. Zoroaster was nearly related to both ; his wife Hvévi seems to have been their sister, and the husband of her daughter, Pourucista, was a son of Jamadspa. Apart from this connexion, the new prophet relies especially upon his own kindred (hvaétush) and their followers (airy- aman). His first disciple, Maidhyéimaongha, was a rela- tion ; his father was, according to the later Avesta, Pouru- shaspa, his great-grandfather Haécataspa, and the ancestor of the whole family Spitama, for which reason Zarathushtra usually bears this surname. His sons and daughters are repeatedly spoken of. His death is, for reasons easily intelligible, nowhere inentioned in the Avesta ; in the Shah- Nédma he is said to have been murdered at the altar by the Turanians in the storming of Balkh.

We are quite in the dark as to the date of Zoroaster ; King Visht4spa has no place in any historical chronology, and the Gathas give no hint on the

subject. But at any rate he must have lived long before Cyrus, by whose time

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the new religion had already become established in western Tran (Nic. Damasc., fr. 66). Duncker places him about the year 1000 B.c. Merely conjectural also is the opinion once orally expressed by Gutschmid that Zoroaster may have been a contemporary of Moses, thus belonging, according to Gutschmid's view, to about the 14th century B.c.,—a period of great religious activity throughout western Asia.

It was a new religion that Zoroaster taught. This must not, however, be taken as meaning that everything he taught came, so to say, out of his own head. His doctrine was a product of the time, and had its roots in the nature and history of the people to which he belonged. Usually he is spoken of as a reformer of the old Iranian faith. But in order to be sure of this it would be necessary first to know something about the nature of that faith as it existed before he arose. Was it still essentially the same as that of the nearly-allied ancient Hindus, as found in the Rag- Vedat To this question no distinct answer is forthcom- ing ; we are ignorant as to how far the way had been pre- pared for Zoroastrianism or how far it was wholly new. But still there is room for conjecture as to what it was that gave the prophet the first impulse and occasion for his work.

The most striking difference between Zoroaster's doctrine of God and the old religion of India lies in this, that, while in the Avesta the evil spirits are called daéva (Modern Persian div), the Aryans of India, on the other hand, in common with the Italians, Celts, and Letts, gave the name of déva to their good spirits, the spirits of light. An alternative designation for deity in the fig-Veda is asura. In the more recent hymns of the Aig-Veda and in later India, on the other hand, only ew spirits are understood by asurds, while in Iran the corresponding word ahura was, and ever has continued to be, the designation of God the Lord, especially of the supreme God, with the epithet of Mazddo (the Wise). Thus ahura-daéva, déva-asura in Zoroastrian and in later Brahman theology are in their meanings exactly opposed. This difference no one has as yet satisfactorily accounted for, and yet it supplies the key to the doctrine of Zoroaster.

The difference proceeded from an old distinction between the ideas deva and asura. An original ideal difference, a different conception of god associated with the two words, grew in the two lands into a sharp antithesis, a formal conflict, but in opposite senses. In India the development still admits of being traced. In the older Rig-Veda the difference is latent. Here a god is spoken of as déva, but not every déva is an asura. Asura is some- thing which is attributed only to certain particular gods as a special attribute, notably to Varuna, though also to others, such as Indra, but only by the so-called "' katheno- theism" of the Vedic religion. On the other hand, it is expressly stated that in the case of Indra the dignity of an asura was only a conferred one (fig-V., 6, 10, 2). In Feg- Veda, 4, 42 Varuna claims as against Indra the priority in the asura dignity. This hymn, like 10, 124, is of import- ance for the whole question. The contrast there implied between Varuna and Indra, the rivalry between them as to which is the greater, comes to light sometimes more strongly, sometimes less so, throughout the entire Hzg- Veda. The contrast is really in other terms the old con- trast between asura and deva, between a more spiritualistic and a more materialistic conception of deity. Asura is ethically the higher conception, deva the lower: deva is the vulgar notion of God, asura is theosophic. The super- sensuous figure of Varuna is the type of an asura, the sensuous figure of Indra the type of a deva. In the Jug- Veda, Varuna, the old king of the gods, is going down, while Indra, the popular national god, is in the ascendant. Along with Varuna, but in a still higher degree, the very

conception of asura goes down; it becomes unmodern, obsolete, and acquires an undesirable flavour. The asuras thus come to form a distinct group of celestial beings men- tioned along with the devas (A.-V., 10, 10, 26): they become in rank inferior to the devas (A.-V., 6, 86, 3) and receive the designation of asurd adevés—asuras that are no devas ; and from this it is but a short step to the "aswras that are opposed to the gods."

The old contrast between asura and deva was wrought out and accentuated quite differently on Iranian soil. While in India the entire revolution took place in a blood- less manner wholly within the realm of

ideas, the old antithesis led to an open quarrel among the Aryans of Iran. In the background of the picture of Zoroaster's times set before us in the G4thds we see the people divided between two opposing and hostile cults, the watchwords of which are ahura on the one hand and daéva on the other. How it is that matters had come to this pass remains obscure, for we have no source of information to take us further back. The opposing parties are not separated by distance in space or by differing nationality, but occur side by side. "Hard by the believer in ahura dwells the worshipper of the daévas," complains Zoroaster. The en- tire people seems broken up by the religious difference.

It is difficult to focus the scattered references in the Gathas so as to obtain a clear picture of the time. Only this much is clear, that in Zoroaster's day not two cults only but two stages of culture are struggling for the mastery. The ahkura worshippers represent the higher phase; they are breeders of cattle, and the care of the cow is to them a sacred duty. The worshippers of the daévas maltreat the animal and slaughter it in their sacrifices. We perceive that the higher ethical tendency of the old asura faith is producing its effects in the higher degree of culture of the believers in Ahura, while the worshippers of the daévas stand on a lower grade.

It is to this period of religious ferment that Zoroaster's appearance on the scene belongs. It is not he who has evoked this religious conflict of parties, as the common assumption is, and just as little is it he who in Ahura with the epithet of Mazdao offers a new god to his people. He strikes decisively into the existing struggle, mounts to the position of spiritual leader of the akura party and makes the battle a victory. As zaotd (Indian hotd), for so he calls himself, the first in rank of the old Aryan priests, he had all the greater opportunity to make his views known in matters of religion. Mankind had been brought face to face with a critical choice, that of electing between two radically opposed confessions of faith, without having any clearness as to the lasting consequences of the momentous step. He determines to save them, to lead them to a right choice, for he sees further than they, and believes himself to be initiated into the secrets of the god- head and of the life to come. What the other party worship as gods under the name of daéva are in reality powers by

whom unwitting mankind are led to their destruction,—evil powers, false gods, devils. Such is the position from which all his teaching starts; and thus the change in the conception of daéva was a natural develop- ment. From the daévas proceeds all the evil in the world. But his speculation does not stop here. The daévas them- selves anon become manifest to him as being but the instru- ments of a higher principle, called by him for the most part Druj (falsehood, deception), and more rarely Angré Mainyush, that is the spirit enemy, Ahriman. This Ahri- man or evil principle is the most characteristic product of Zoroastrian speculation. From the schism or religious dualism of his time he derived the idea of that dualistic scheme of the universe which has impressed its character upon the whole of the religion called by his name.

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ZOROASTRIAN DOCTRINE.

The fundamental idea of the Zoroastrian ereed is dualistic. At the beginning of things there existed two spirits—Ahur6é Mazdao (Ormuzd) and Angré Mainyush (Ahriman)—who represented good and evil (Yasna, 30, 3). The existence of evil in the world is thus presupposed from all eternity. Both spirits possess ercative power, which manifests itself in the one positively and in the other nega- tively. Ormuzd is light and life and all that is pure and good,— in the ethieal world law, order, and truth; his antithesis is dark- ness, filth, death, all that is evil in the world, lawlessness, and lies. When the two are spoken of as yéma ("a pair"), this is not to be interpreted as meaning that they are twins:} it simply denotes a duality, an opposed eouple, a dvandva. The two spirits had until then counterbalaneed one another. The ultimate triumph of the good spirit is an ethical demand of the religious consciousness and the quintessence of Zoroaster's revelation.

The evil spirit with his wicked hosts appears in the Gathds much less endowed with the attributes of personality than does Ahura Mazda. Within the world of the good Ormuzd is Lord and God alone. In this sense Zoroastrianism is often referred to as the faith of Ormuzd or as Mazdaism. Ormuzd in his exalted majesty is the ideal figure of an Oriental king. Of other gods beside him the doetrine of the Gathds knows

nothing. The natural and symbolical gods of the popular belief have no place in it. Yet Ormuzd is not alone in his doings and conflicts, but has in con- junction with hiinself a number of genii—for the most part per- sonifieations of ethical ideas. These are his creatures, his instru- ments, servants, and assistants, like the ministers of an autoeratic sovereign. They are comprehended under the general name of ameshd spentd ('immortal holy ones") and are the prototypes of the seven amshaspands of a later date. These are—(1) Ashem, afterwards Ashem Vahishtem (Plutareh's 4\j0eva), corresponding to all that is true, good, and right,— ideas practically identical for Zoroaster, and the embodiment of all that is true, good, and right, upright law and rule; (2) Vohu Mané (etvo), good sense, 2.¢., the good principle, the idea of the good, the principle that works in man inclining him to what is good; (3) Khshathrem, afterwards Khshathrem Vairim (etvoula), the power and kingdom of Ormuzd, which have subsisted from the first but not in integral eompleteness, the evil having crept in like the tares among the wheat: the time is yet to come when it shall be fully manifested in all its unelouded majesty ; (4) Armaiti (co¢ia), or the spirit of docility and obedience, spoken of as daughter of Ormuzd and regarded as having her abode upon the earth ; (5) Haurvatat (aAooros), perfeetion ; (6) Ameretatat, immortality. Other ministering angels are Géush Tashan ("the ereator of the cow"), Géush Urvan ("the genius and defender of animals"), and the holy spirit of Ormuzd, often thought of as having personal existence. Of the elements fire alone ('the son of Ahura Mazda") receives personification and figures as his ally.*

As soon as the two at first absolutely separate spirits (comp. Bundahish, 1, 4) eneounter one another, their creative activity and at the saine time their permanent conflict begin. The history of this conflict is the history of the world. A great cleft runs right through the world: all creation divides itself into that which is Ahura's and that whieh is Ahriman's. Not that the two spirits carry on the struggle in person ; they leave it to be fought out by their respective creations and creatures which they send into the field. The field of battle is the present world.

In the centre of battle is man ; his soul is the object of the war. Man is a ereation of Ormuzd, who therefore has the right to eall him to aecount. But Ormuzd created him free in his determina- tions and in his actions,

wherefore he is accessible to the influences of the evil powers. This freedom of the will is clearly expressed in Yasna, 31,11: "Since thou, O Mazda, didst at the first ereate our being and our souls in accordanee with thy mind, and didst create our understanding and our life together with the body, and works and words in whieh man aceording to his own will can frame his confession, the liar and the truth-speaker alike lay hold of the word, the knowing and the ignorant each after his own heart and under- standing, Armaiti searches, following thy spirit, where errors are found." Man takes part in this conflict by all his life and activity in the world. By a true confession of faith, by every good deed, by continually keeping pure his body and his soul, he impairs the power of Satan and strengthens the might of goodness, and estab- lishes a claim for reward upon Ormuzd; by a false confession, by every evil deed and defilement, he increases the evil and renders serviee to Satan.

The life of man falls into two parts,—its earthly portion and that which is lived beyond the grave. The lot assigned to him after death is the result and consequence of his life upon earth. No religion has so elearly grasped the ideas of guilt and of merit. On the works of men here below a striet reckoning will be held in ee ee ee erie ee oe

1 Later sects sought to rise from the dualism to a higher unity. Thus the Zarvanites represented Ormuzd and Ahriman as twin sons proceeding from the fundamental principle of all, Zrvana Akarana, or limitless time.

heaven (according to later represcntations by Rashnu and Mithra). All thoughts, words, and dceds of each are entered in the book as separate items (ddthra, Y., 31, 14; Vend., 19, 27), all the evil works as debts (ishudé). Wicked actions cannot be undone, but in the heavenly account can be counterbalanced by a surplus of good works. It is only in this sense that an evil deed can be atoned for by a good one. Of a remission of sins the doctrine of Zoroaster knows nothing. After death the soul arrives at the cinvato pere- tush or accountant's bridge over which lies the way to heaven. Here the statement of his life account is made out. If he has a balance of good works in his favour, he passes forthwith into paradise (Garé demdna) and the blessed life. If his evil works outweigh his good he

falls finally under the power of Satan, and the pains of hell are his portion for ever. Should the evil and the good be equally balanced, the soul passes into an intermediate stage of existence (the Haméstakdns of the Pahlavi books) and his final lot is not decided until the last judgment. This court of reckoning, the judicium particulare, is called éka. The course of inexorable law cannot be turned aside by any sacrifice or offering, nor yet evcn by the free grace of God.

But man has been smitten with blindness and ignorance: he knows neither the eternal law nor the things which await him after death. He allows himself only too easily to be ensnared by the craft of the evil powers who seek to ruin his future existence. He worships and serves false gods, being unable to distinguish between truth and lies. Therefore it is that Ormuzd in his grace determined to open the cyes of mankind by sending a prophet to lead them by the right way, the way of salvation. According to later legend (Vd., 2, 1), Ormuzd at first wished to entrust this task to Yima (Jemshid), the ideal of an Iranian king. But Yima, the secular man, felt himself unfitted for it and declined it. He con- tented himself therefore with establishing in his paradise (vara) a heavenly kingdom in miniature, to serve at the same time as a pattern for the heavenly kingdom that was to come. Zoroaster at last, as being a spiritual man, was found fit for the mission. Zoroaster experienced within himself the inward call to seek the amelioration of mankind and their deliverance from everlasting ruin, and regarded this inward impulse, intensified as it was by means of dreams and visions, as being the call addressed to him by God Himself. Like Mohammed after him he often speaks of his con- versations with God. He calls himself most frequently manthran ("prophet"), ratw ("spiritual authority"), and saoshyant (meaning "he who will deliver," that is to say, when men come to be judged according to their deeds).

The full contents of his dogmatic and ethical teaching we can- not gather from the Gathas. He speaks for the most part only in general references of the divine commands and of good and evil works. Among the former those most inculcated are renunciation of Satan, adoration of Ormuzd, purity of soul and body, and care of the cow. We learn little otherwise regarding the practices con- nected with his doctrines. A ceremonial

worship is hardly men- tioned. He speaks more in the character of prophet than in that of lawgiver. The contents of the Gathas are essentially eschatological. Revelations concerning the last things and the future lot, whether bliss or woe, of human souls, promises for true believers, threaten- ings for misbelievers, his firm confidence as to the future triumph of the good—such are the themes continually dwelt on with endless variations.

It was not without special reason, Zoroaster believed, that the calling of a prophet should have taken place precisely when it did. It was, he held, the final appeal of Ormuzd to mankind at large. Like John the Baptist and the Apostles of Jesus, Zoroaster also believed that the fulness of time was near, that the kingdom of heaven was at hand. Through the whole of the Gathis runs the pious hope that the end of the present world is not far off. He himself hopes along with his followers to live to see the decisive turn of things, the dawn of the new and better eon. Ormuzd will summon together all his powers for a final decisive struggle and break the power of evil for ever; by his help the faithful will achieve the victory over their detested enemies, the daéva worshippers, and render them powerless. Thereupon Ormuzd will hold a judictum universale (vtdditi) upon all mankind and judge strictly according to justice, punish the wicked, and assign to the good the hoped-for reward. Satan will be cast, along with all those who have been delivered over to him to suffer the pains of hell, into the abyss, where he will thénceforward lie powerless. Forthwith begins the one undivided kingdom of God in heaven and on earth. This is called, sometimes the good kingdom, sometimes simply the kingdom. Here the sun will for ever shine, and all the pious and faithful will live a happy life, that no evil power can disturb, in the fellowship of Ormuzd and his angels for ever.

Zoroaster's teachings show him to have been a man of a highly speculative turn, faithful, however, with all his originality, to the Iranian national character. With zeal for the faith, and boldness and energy, he combined diplomatic skill in his dealings with his exalted protectors. His thinking is consecutive, self-restrained, practical, devoid on the whole of all that might be called fantastic

and excessive. His form of expression is tangible and concrcte. His system is constructed on a clearly conceived plan.

History and Later Development of Zoroastrianism.—F¥or the great mass of the people Zoroaster's doctrine was too abstract and spirit- ualistic. Popular faith instinctively and naturally turns to con- crete plastic forms of godhead borrowed from surrounding nature, and thus it came to pass that anumber of the old Aryan divinities, whom the newteaching had driven into the background, were again restored to their former rank,—especially Mithra, the sun-god. Besides hii, in the younger Avesta, Anahita (Anditis), the goddess of the waters, Tishtrya (Sirius), and other heavenly bodies are in- voked with special preference. The Gathas know nothing of a new belief which afterwards arose in the fravashi, or guardian angels of the faithful. Fravashi properly means "confession of faith," and when personified comes to be regarded as a protecting spirit. Un- believers have no fravashi.

On the basis of the new teaching arose a widely spread priesthood (dthravané) who systematized the doctrines, organized and carried on the worship, and laid down the minutely elaborated laws for the purifying and keeping pure of soul and body which are met with in the Vendidad. To the last-named belong in particular the numerous ablutions, bodily chastisements, love of truth, agriculture, protection of useful animals, as dogs and cattle, the destruction of noxious animals, and the prohibition either to burn or to bury the dead. In the worship the drink prepared from the haoma (Indian soma) plant had a prominent place. The last things and the end of the world are relegatcd to the close of a long period of time (3000 years after Zoroaster), when a new Saoshyant is to be born of the seed of Zoroaster, the dead are to come to life, and a new incor- ruptible world to begin.

The religion of Zoroaster, broadly speaking, never spread beyond the limits of Iran, although some isolated Turanian stems can be reckoned among those who profess it. From the East it doubtless passed in the first instance into Mcdia and thence into Persia proper (comp. Persia, vol. xviii. p."564). In the Persians of Herodotus's time we still see the new

proselytes who have indeed accepted the creed, but not yet without reserve all the religious usages which accompany it, and least of all those which run completely counter to sacred and immemorial traditions of their time-honoured customs. According to Herodotus (i. 140), they still refrained from exposing, at least from openly exposing, their dead to dogs and vultures, but continued to bury them. This was practised by the Magi only, that is, by the priesthood, in conformity with the priestly laws. The Persians, however, made so far a concession to their adopted religion that they enveloped their dead bodies in wax, so that the earth might not be defiled.

After the fall of the Achemenide (331 B.c.) Zoroastrianism lost greatly in power and dignity. It was subsequently rehabilitated, however, by the Sasanians, under whom it reached its highest prosperity. Protected by this dynasty, the priesthood developed into a completely organized state church, which was able to employ the power of the state in enforcing strict compliance with the re- ligious law-book hitherto enjoined by their unaided efforts only. The formation of sects was at this period not infrequent (comp. Manicuazism). The Mohammedan invasion (636), with the terrible persecutions of the following centuries, was the death-blow of Zoroastrianism. In Persia itself only a few followers of Zoroaster are now found (in Kirman and Yazd). The Parsrxs (q.v.) in and around Bombay hold by Zoroaster as their prophet and by the ancient religious usages, but their doctrine has reached the stage of a pure monotheisn1.

Literature.—See under ZEND-AvESsTA; also Windischmann, Zoroustrische Studien, Berlin, 1863. (K. G.)

ZOSIMUS, a Greek historical writer, held public office (Photius describes him as "comes et exadvocatus fisci") at Constantinople some time in the first half of the 5th century. His History, which is mainly a compilation from previous authors (Herennius Dexippus, Eunapius, Olympio- dorus), consists of six books: the first sketches very briefly the history of the early emperors from Augustus to Dio- eletian (305); the second, third, and fourth deal more copiously with the period from the accession of Constantius and Galerius to the death of Theodosius; the fifth and sixth cover the period between 395 and 410. The work is apparently unfinished.

The style is characterized by Photius as concise, clear,and pure. The historian's object was to account for the decline of the Roman empire from the pagan point of view, and in this undertaking he has at various points treated the Christians with some unfairness.

A Latin version of the History was published by Leunclavius in 1576 (Basel, fol.), and in 1581 H. Stephanus added the Greek text of the first two books to his edition of Herodian. All the six books were published by Sylburgius in vol. iii. of his Romanze Historiz

Seriptores Greet Minores (Frankfort, 1590). There have been several subsequent editions ; that of Reitemeier (Leipsic, 1784) was re- edited by Bekker for Niebuhr's Corpus Scriptorwm Historiz By- zantine (Bonn, 1837). Zosimus was translated into French by Consin in 1678; into English, anonymously, in 1684; and into German by Seybold and Heyler in 1804-5.

ZOSIMUS, bishop of Rome from 18th March 417 to 25th December 418, succeeded Innocent I. and was fol- lowed by Boniface I. For his attitude in the Pelagian controversy, see PeLacrus (vol. xviii. p. 472). He took a decided part in the protracted dispute in Gaul as to the jurisdiction of the see of Arles over that of Vienne, giving energetic decisions in favour of the former, but without

settling the controversy.

ZOSTEROPS,! originally the scientific name of a genus of birds founded by Vigors and Horsfield (Trans. Linn. Society, xv. p. 235) on an Australian species called by them Z. dorsalis, but subsequently shown to be identical with the Certhia cerulescens, and also with the Sylvia lateralis, previously described by Latham. Latterly the name has been Anglicized in the same sense, and, whether as a scientific or a vernacular term, applied to a great number of species? of little birds which inhabit for the most part the tropical districts of the Old World, from Africa to most of the islands in the Indian and Pacific Oceans, and northwards in Asia through India and China to Amurland and Japan.

The birds of this group are mostly of unpretending appearance, the plumage above being generally either mouse-coloured or greenish olive ; but some are sufficiently varied by the white or bright yellow of their throat, breast, or lower parts, and several have the flanks of a more or less lively bay. It is remarkable that several islands are inhabited by two perfectly distinct species, one belonging to the brown and the other to the grecn section, the former being wholly insular. The greater number of species seem to be confined to single islands, often of very small area, but others have a very wide dis- tribution, and much interest has been excited by the undoubted fact that the type-species, 7. exwrulescens, has of late years largely ex- tended its range. First described from New South Wales, where it is very plentiful, it had been long known to inhabit all the eastern part of Australia. In 1856 it was noticed by naturalists as occur- ring in the South Island of New Zealand, when it became known to the Maorics by a name signifying "Stranger," and to the English settlers as the "Blight-bird," from its clearing the fruit-trees of a blight by which they had lately been affected. It soon after appeared in the North Island, where it speedily became common, and it has thence not only spread to the Chatham Islands, but, as Sir Walter Buller states (Birds N. Zealand, ed. 2, i. p. 79), it has been met with in considerable numbers 300 miles from land, as though in search of new countries to colonize. Yet this author be- lieves it to be indigenous to the west coast of the South Island, and Sir James Hector joins in that opinion. If they be right, it is, however, pretty certain that until the year before mentioned it niust have been confined to an extremely small district, and the only assignable cause of its spreading so rapidly, when it did extend its range, is that of a large surplus population unable to find a living at home. It is known to propagate at a high rate of increase, and at times numbers have been found dead, apparently for want of food. In any case it is obvious that this Zosterops must be a compara- tively modern settler in New Zealand.+4*

All the species of Zosterops are sociable, consorting in large flocks, which only separate on the approach of the pairing season. They build nests, described as being variously placed—sometimes suspended from a horizontal fork and sometimes fixed in an upright crotch—and lay (so far as is known) pale blue, spotless eggs, thereby differing wholly from several of the groups of birds to which they have been thought allied.

Though mainly insectivorous, the birds of this genus will eat fruits of various kinds and in such quantities

1 The derivation is {wor#p-npos and &y, whence the word should be pronounced with all the vowels long. 'The allusion is to the ring of white feathers round the eyes, which is very conspicuous in many species.

: In 1883 Mr Sharpe (Cat. B. Brit. Museum, ix. pp. 146-208) ad- mitted 85 species, besides 3 more which he had not been able to examine.

3 By most English-speaking people in various parts of the world

the prevalent species of Zosterops is commonly called " White-eye" or i Silver-eye " from the feature before mentioned. __ Sir W. Buller says that he and Mr Gould were able to piek ont N ew-Zealand examples from a series otherwise made up of Australian Specimens. Hence it would seem as if a slight amount of differenti- ation had been set up; but the variation would doubtless have been greater had the species been an ancient eolonist.*

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as to be at times injurious. The habits of Z. exrulescens have been well described by Sir W. Buller (wt supra), and those of a species peculiar to Ceylon, 7. eeylonensis, by Col. Legge (B. Ceylon, p. 586), while those of the widely-ranging Indian Z. palpebrosa and of the South-African Z. capensis have been succinctly treated by Jerdon (B. India, ii. p. 266) and Mr Layard (B. South Afriea, p. 116) re- spectively.

It is a remarkable and, if capable of explanation, would doubtless be an instructive fact that the largest known species of the genus, Z. albigularis, measuring nearly 6 inches in length, is confined to so small a spot as Norfolk Island, where also another, 7. tenwz- rostris, not much less in size, occurs; while a third, of intermediate stature, Z. strenua, inhabits the still smaller Lord Howe's Island. A fourth, Z. vatensis, but little inferior in bulk, is found on one of the New Hebrides ; but, after these giants of their kind, the rest fall off considerably, being from one-fifth to one-third

less in length, and Pome of the smaller species hardly exceed 34 inches from end to end.

The affinities of the genus Zosterops are by no means clear. Placed by some writers, if not systematists, with the Paride (cf. Titmouse), by others among the Jfelv- phagide (cf. Honzy-Eater), and again by others with the Nectariniide (cf. SUNBIRD), the structure of the tongue, as shown by Dr Gadow (Proc. Zool. Society, 1883, pp. 63, 68, pl. xvi. fig. 2), entirely removes it from the first and third, and from most of the forms generally included among the second. On the whole it seems safest to regard the genus, at least provisionally, as the type of a distinct Family — Zosteropide—as Families go among Passerine birds; but, whether the Australian genera Aelithreptus and Plectrorhamphus (otherwise Plectrorhyncha) should be in- cluded under that heading, as has been done, remains to be proved, and in the meanwhile may be reasonably doubted. (A. N.)

ZOUCH, Ricwarp (c. 1590-1661), a distinguished writer on civil and international law, was born at Anstey, Wiltshire, about the year 1590. He was educated at Winchester and afterwards at Oxford, where he became a fellow of New College in 1609. In 1613 he published a poem entitled The Dove, or Passages of Cosmography, which he dedicated to his relative Edward, Lord Zouch, warden of the Cinque Ports. He was admitted at Doctor's Commons in January 1618, commenced LL.D. in April 1619, and was appointed regius professor of law at Oxford in 1620. In 1625 he became principal of St Alban Hall and chancellor of the diocese of Oxford; in 1641 he was made judge of the High Court of Admiralty. Under the Commonwealth, having submitted to the Parliamentary visitors, he retained his university appointments, though not his judgeship ; this last he resumed at the Restoration, dying soon afterwards at his apartments in Doctor's Commons, London, on 1st March 1661.

He published Elementa jurisprudentiz (1629), Deseriptio juris et judieit feudalis, seeundum consuetudines Mediolani et Normanniz, pro introductione ad jurisprudentiam Anglicanam (1684), Deseriptio

juris et judieti temporalis, seeundum consuetudines feudales et Nor-

mannieas (1636), Deseriptio juris et judieti eeclesiastie, secundum canones et consuetudines Anglicanas (1636), Deseriptiones juris et judieti sacri, .. . militaris, .. . maritimi (1640), Juris et judien fecialis sive juris inter gentes . . . explicatio (1650), and Solutio queestionis de legati delinquentis judice eompetente (1657). In virtue of the last two he has the distinction of being one of the earliest systematic writers on international law.

ZSCHOKKE, Joann Hernricu Dantex (1771-1848), German author, was born at Magdeburg on 22d March 1771. He was educated at the cloister school of his native place and at the gymnasium of Altstidt. Asa youth he spent some time with a company of strolling players, but afterwards he attended the university of Frankfort-on-the- Oder, where, in 1792, he became a privat-docent. He created much sensation by two extravagant plays, Abdllzno, der grosse Bandit (1794) and Julius von Sassen (1796), the success of which shows how urgent was the need for the elevating influence of the dramatic writings of Goethe and Schiller. The Prussian Government having declined

to make him a full professor, Zschokke in 1795, after some time spent in travel, settled in the Grisons, where, in asso- ciation with the burgomaster Tscharner, he conducted an educational institution in the castle of Reichenau. In recognition of his services the authorities of the Grisons gave him the rights of a citizen, and in 1798 he associated his name permanently with the country by the publica- tion of his Geschichte des Freistaats der drei Biinde in hétien. The political disturbances of this year compelled him to close his institution; but, being a man of great resource and energy, he was able, during the revolutionary period which now began in Switzerland, to enter upon a new and more important career. He was sent asa deputy to Aarau, where he was made head of the educational de- partment. Afterwards he was sent as Government com- missioner to Unterwalden, and his authority was ultimately extended over the cantons of Uri, Schwyz, and Zug. In this high office Zschokke distinguished himself by the vigour of his administration and by the enthusiasm with which he devoted himself to the promotion of the interests of the poorer

classes of the community. In 1800 he re- organized the institutions of the Italian cantons, and then he became lieutenant-governor of the canton of Basel. Zschokke retired for a while from public life when the central Government at Bern proposed to re-establish the federal system, but after the changes effected by Bonaparte he entered the service of the canton of Aargau, with which he remained connected. In 1801 he attracted attention by his Geschichte vom Kampfe und Untergange der schweiz- erischen Berg- und Wald-Cantone. Through his Schweizer- bote, the publication of which began in 1804, he exercised a wholesome influence on public affairs ; and the like may be said of his Afiscellen der neuesten Weltkunde, issued from 1807 to 1813. In 1811 he also started a monthly peri- odical, the Hrheiterungen. He wrote various historical works, the most important of which is Des Schweizerlandes Geschichte fir das Schweizervolk, published in 1822. He was also the author of Bilder aus der Schweiz, and of a series of popular tales which greatly extended his reputa- tion,— Der Creole, Alamontade, Jonathan Frock, Das Gold- macherdorf, and Meister Jordan. In Stunden der Andacht, which was widely read, he expounded in a rationalistic spirit what seemed to him the fundamental principles of religion and morality. Selbstschau is a kind of autobio- graphy. Zschokke was not a great original writer, but he secured for himself an eminent place in the literature of his time by his enthusiasm for modern ideas in politics and religion, by the sound, practical judgment displayed in his works, and by the energy and lucidity of his style. He died on 27th June 1848.

An edition of his selected works, in forty volumes, was issued in 1824-28. In 1851-54 an edition in thirty-five volumes was published. There are biographies of Zschokke by Miinch and by Emil Zschokke.

ZUCCARO, or ZuccuEro,! the name of two Italian painters.

I. TappEo Zuccaro (1529-1566), one of the most popular painters of the so-called Roman mannerist school, was the son of an almost unknown painter at St Angelo in Vado, called Ottaviano Zuccaro, where he was born in 1529. While yet a boy Taddeo found his way to Rome; and, though suffering great hardships from poverty and want of friends, he succeeded at an early age in gaining a knowledge of painting and in

finding patrons to employ him. His first start in life, while only seventeen years old, was due to a pupil of Correggio, named Daniele da Parma, who engaged him to assist in painting a series of frescos in a chapel at Vitto near Sora, on the borders of the Abruzzi. After that Taddeo returned to Rome in 1548, and began his career as a fresco painter, by execut-

l So spelt by Vasari.

ing a series of scenes in monochrome from the life of Furius Camillus on the front of the palace of a wealthy Roman named Jacopo Mattei. From that time his success was assured, and for the rest of his short life he was largely employed by the popes Julius III. and Paul IV., by Della Rovere, duke of Urbino, and by other rich patrons of art in Rome and elsewhere. His best frescos were an historical series painted on the walls of a new palace at Caprarola, built for Cardinal Alessandro Farnese, for which Taddeo also designed a great quantity of rich decorations in stucco relief after the style of Giulio Romano and other pupils of Raphael. Nearly all his paintings were in fresco, very large in scale, and often in chiaroscuro or monochrome; they were more remarkable for rapidity of execution and a certain boldness of style than for any higher qualities. The very great estimation in which Taddeo's frescos were held is a striking proof of the very rapid degradation of taste which took place during the second half of the 16th century. His work is mannered in style, artificial and pompous in conception, and lacks any close or accurate knowledge of the human form and its movements. The long chapter which Vasari devotes to this painter and his brother Federigo is only one of many examples of the writer's habit of giving undue prominence to the artists of his own time and school. Taddeo Zuccaro died in Rome in 1566 ; heis buried in the Pantheon, not far from Raphael.

Taddeo's easel pictures are less common than his decorative frescos. A small painting on copper of the Adoration of the Shepherds, formerly in the collection of James IJ., is now at Hampton Court ; it is a work of very small merit. The Caprarola frescos were engraved and published by Prenner, Jllustrt Fatti Farnesiani Colorits nel Real. Palazzo di Caprarola, Rome, 1748-50.

IT. Feprrico Zuccaro (1543-1609), the younger brother and pupil of Taddeo, was born in 1543. In 1550 he was placed under his brother's charge in Rome, and during his lifetime worked as his assistant ; he completed the Capra- rola frescos, which were unfinished when Taddeo died in 1566. Ina short time Federigo attained to an eminence far beyond his very limited merits as a painter, and was perhaps the most popular artist of his generation. Prob- ably no other painter has ever produced so many enormous frescos crowded with figures on the most colossal scale, all executed under the unfortunate delusion, common in his time, that grandeur of effect could be attained merely by great size combined with extravagance of attitude and ex- aggeration of every kind. Federigo's first work of this sort was the completion of the painting of the dome of the cathedral at Florence, under the patronage of the grand-duke Francesco I.; the work had been begun by the art-historian Vasari, who wrote in the most generous lan- guage about his more successful rival. The inner surface of this beautiful cupola was disfigured by Federigo in the most tasteless way. Regardless of the injury to the appar- ent scale of the interior of the church, he painted about 300 figures, each nearly 50 feet high, sprawling with violent contortions all over the surface. Happily age has so dimmed these pictures that their presence is now almost harmless.

After this achievement Federigo was recalled to Rome by Gregory XIII. to continue in the Pauline chapel of the Vatican the scheme of decoration which had been begun by Michelangelo during his failing years. A quarrel which arose between the painter and some members of the papal court led to his departure from Italy. He first visited Brussels, and there made a series of cartoons for the tapestry-weavers. Thence, in 1574, Federigo passed over to England, where his fame was already known, so that he at once received a large number of commissions to paint the portraits of various distinguished persons, among them Queen Elizabeth, Mary Queen of Scots,! Sir Nicholas

1 Engraved by Vertue. XXIV. — 104

Bacon, Sir Francis Walsingham, Lord High Admiral Howard, and others. A curious full-length portrait of Elizabeth in fancy dress, now at

Hampton Court, 1s attri- buted to this painter, though very doubtfully. Another picture in the same collection appears to be a replica of his painting of the Allegory of Calumny, as suggested by Lucian's description of a celebrated work by Apelles; it was the satire in this directed against some of his courtier enemies which was the immediate cause of the pope's dis- pleasure and Federigo's temporary exile from Rome. His success as a painter of portraits and other works in oil was more reasonable than the admiration expressed for his colossal frescos. A portrait of a Man with Two Dogs in the Pitti Palace at Florence is a work of some real merit, as is also the Dead Christ and Angels in the Borghese Gallery in Rome. After a short exile Federigo was pardoned by the pope and recalled to Rome to finish his work on the vault of the Pauline chapel. In 1585 he was invited by Philip II. of Spain to decorate the new Escorial at a yearly salary of 2000 crowns. He accepted this offer, and worked at the Escorial from January 1586 to the end of 1588, when he returned to Rome. He there founded in 1595, under a charter confirmed by Sixtus V., the Academy of St Luke, of which he was the first president. This is still the chief academy of painters in Italy, and its organization suggested to Sir Joshua Reynolds his scheme for founding the English Royal Academy.

Federigo, like his contemporary Giorgio Vasari, aimed at being an art critic and historian as well as a practical artist, but with very different success. His chief book, L' Idea de Pittori, Scultori, ed Archatettc (Turin, 1607), is a senseless mass of the most turgid bombast. Little can be said in praise of his smaller works, consisting of two volumes printed at Bologna in 1608, describing his. visit to Parma and a journey through central Italy.

Federigo was raised to the rank of a cavaliere not long before his death, which took place at Ancona in 1609.

For both Taddeo and Federigo Zuccaro, see Vasari, pt. iii., and Lanzi, Storia Pittorica, Roman School, epoch iii. (J. H. M.)

ZUG,! a canton of Switzerland, ranking as eighth in the Confederation. It includes the districts round the Lake of Egeri and on both shores of the northern half of the Lake of Zug, and is the smallest undivided canton both in area and in population. Its total area is 92°3 square miles, 75 of

which are classed as productive (forests 12°5), while of the rest 13 are covered with lakes. The highest point in the canton is the Wildspitz (5191 feet), the culminating peak of the Rossberg ridge. The popu- lation was 22,994 in 1880, an increase of 2001 on that of 1870, the numbers of men and women being nearly equal. German is the native tongue of 22,592, and 21,734 are Roman Catholics. Till 1814 Zug was in the diocese of Constance, but on the reconstruction of the diocese of Basel in 1828 it was assigned to it. The capital is Zug (4924 inhabitants in 1880); Baar has a population of 3896. The territory of Zug is very fertile and the population mainly agricultural. Cattle and fruit are among the chief articles of export, much cider and " kirschwasser " being manufactured, The town of Zug is connected by railway with Lucerne and Zurich, and a railway is planned to Arth, which will connect Zug directly with the St Gott- hard line. On 5th July 1887 a landslip carried the houses of a small portion of the capital, as in 1435, into the lake.

The town of Zug is first mentioned in 1255. In 1273 it was bought by Rudolph of Hapsburg from Anna, the heiress of Kyburg and wife of Eberhard, head of the cadet line of Hapsburg ; and in 1278 part of its territory (the valley of Egeri) was pledged by Rudolph as security for a portion of the marriage gift he promised to Joanna, daughter of Edward I. of England, betrothed to Hart-

; 1 Tts name has been rather fancifully derived from " fischzug," mean- ing a "haul of fish."

mann (Rudolph's son), whose death in 1281 prevented the marriage taking place. The town of Zug was governed by a mayor, appointed by the Hapsburgs, and a council, and was much favoured by that family. Several country districts (Baar, Menzingen, and Hgeri) had each its own " landsgemeinde," but were governed by one bailiff, also appointed by the Hapsburgs; these were known as the "Ausser Amt," and were always favourably disposed to the Con- federates. Duke Leopold of Austria was defeated on 15th November 1315 by the Confederates at Morgarten Pass, in the territory of Zug (see SWITZERLAND, vol. xxii. p. 783 sqg.). On 27th January 1352 both the town of Zug and the Ausser Amt entered the Confedera- tion, the latter being received on exactly the same terms as the

town (and not, as was usual in the case of country districts, as a subject land); but in September 1352 Zug had to acknowledge its own lords again, and in 1355 to break off its connexion with the League. But about 1364 the town and the Ausser Amt were re- covered for the League by the men of Schwyz, and from this time Zug took part as a full member in all the acts of the League. In 1379 the emperor Wenceslaus exempted Zug from all external juris- dictions ; in 1889 the Hapsburgs renounced their claims, reserving only (in the treaty of 1394) an annual payment of twenty silver marks, which came to an end in 1415. In 1400 Wenceslaus gave all criminal jurisdiction to the town only. The Ausser Amt then, in 1404, claimed that the banner and seal of Zug should be kept in one of the country districts, and were supported in this claim by Schwyz. The matter was finally settled by arbitration: the banner, &c., was to be kept in the town (access being allowed to the others), whilst the Ausser Amt was fined and Schwyz also. Finally in 1415 the right of electing their landammann was given to Zug by the Confederates, and a share in the criminal jurisdiction was grauted to the Ausser Amt by Sigismund. In 1385 Zug joined the league of the Swabian cities against Leopold and shared in the victory of Sempach (9th July 1386), as well as in the various Argo- vian (1415) and Thurgovian (1460) conquests of the Confederates, aud later in those in Italy (1512), having already taken part in the occupation of the Val d'Ossola (1410-14, 1417-22). Between 1379 and 1470 Zug had acquired various districts in her own neighbourhood, which werc ruled till 1778 by the town and the Ausser Amt as subject lands.

At the time of the Reformation Zug clung to the old faith and was a member of the "Christliche Vereinigung" of 1529. In 1586 Zug became a member of the Golden League. From 1729 to 1736 the canton was distracted by violent disputes as to the distribution of the French pensions. In 1798 it opposed the French, formed part of the Tellgau, and later one of the districts of the canton of the Waldstatten (of which in 1799 it became the capital) in the Helvetie republic. In 1803 it regained its independence as a sepa- rate canton, and by the constitution of 1815 the "landsgemeinde" or assembly ofall the citizeus (existing for both districts since 1352) became a body of electors to choose a cantonal council. The reform movement of 1830 did not affect the canton, which in 1848 was a member of the Sonderbund and shared in the war of 1847. Both in 1848

and in 1874 it voted against the acceptance of the Federal constitutions. In 1848 the remaining functions of the ‘‘lands- gemeinde” were abolished by the Liberals. Its present constitu- tion dates from 1873-76, and was amended in 1881. There is a legislature of seventy-three members, fifty-eight (one to every 400 inhabitants) elected in the communes and fifteen by the whole population, both classes holding office for three years; the execu- tive, of seven members, is elected by the communes for three years. By the “facultative or optional referendum,” in case of a demand by one-third of the members of the legislative assembly or by 500 citizens any law, and any resolution involving a capital expendi- ture of 40,000 or an annual one of 10,000 francs, must be submitted to a direct popular vote.

ZULLA, as Salt writes the name, or Z¢ta (Thulla, Déla), as it is also written, is a village near the head of Annesley Bay on the African coast of the Red Sea. It derives its only interest from ruins in its vicinity which are generally supposed to mark the site of the ancient em- porium of Adulis (“ASovdAus, “ASovAcé), the port of Axum and chief outlet in the early centuries of our era for the ivory, hides, slaves, and other exports of the interior. Cosmas Indicopleustes saw here an inscription of Ptolemy Euergetes (247-222 B.c.) ; and hence, as the earliest men- tion of Adulis is found in the geographers of the first cen- tury after Christ, it is conjectured that the town must have previously existed under another name and may have been the Berenice Panchrysus of the Ptolemies. The ruins in question, which are not very extensive or remarkable, are described by Riippel, Reise in Abyssinien, i. 266 (1838) ; see also Rohlfs in Zeitschr. d. Gesell. f. Erdkunde in Berlin,

iii, . . . (1868), and, for further references to ancient and modern sources, the editions of the Periplus by C. Miiller (Geog. Gr. Min., i. 259) and Fabricius (1883). An Italian protectorate over the district of Zulla was proclaimed in

1888.

ZULULAND, a territory of South Africa, lying to the north of the colony of Natal, with a coast-line of about 130 miles (see vol. i. pl. IL). It is

occupied chiefly by Zulu tribes ; but since its conquest by England in 1879 a Boer republic, known as the New Republic, has been carved out of it, which extends into the centre of the country from the Transvaal on its north-west, and comprises an area equal to nearly one-half of the remaining portion of Zululand. This portion is composed of a strip of country adjacent to Natal, lying to the south of the Umhlatuzi river, and the district extending along the coast to the north of that river for a distance inland varying from 50 to 70 miles. The former piece of country has been known since 1882 as the Zulu Reserve. It is bounded on the south-west by the Tugela, Buffalo, and Blood rivers, the last-named being one of the borders of the Transvaal Republic.

Zululand presents very varied physical features: undu- lating country covered with mimosa "bush," in some parts very densely, alternates with wild and fantastically broken scenery, and thickly-wooded precipices and ravines, and these again with grass-clad hills. Two considerable forests exist in the country,—one, the Ingome Forest, lying in northern Zululand, just within the territory recently ceded to the Boers, the other upon the Natal border. These pro- duce the varieties of timber mentioned under Nata. The wholesale destruction of woods for domestic purposes, which has robbed that colony of much of its beauty, and is believed to have seriously affected its rainfall, has not proceeded very far at present in Zululand. The mineral resources of the country have yet to be investigated, but gold has been recently found in the Reserve. The rivers, like those in Natal, are rapid streams of small volume, running over rocky beds; the Tugela river is the most considerable. The climate differs but little from that of Natal. The country is very healthy for the most part ; but horse sickness prevails in the valleys in the hot season, and the swampy neighbourhood of St Lucia Bay, a lagoon lying at the mouth of the Umfolosi river, is uninhabitable. Like the Natal natives, the Zulus cultivate the ground very superficially, planting maize, gourds of several kinds, and a grain from which a light beer is prepared. Cattle, the sole wealth of the people, were at one time very numerous in the country, and also goats. A few of the chiefs use horses.

Long after big game had become scarce in Natal, Zulu- land offered excellent opportunities to the sportsman. It still has antelopes of various

kinds, including a few koodoo, and, at the mouths of the more northern rivers, hippopota- muses; but the buffalo and rhinoceros are not met with farther south than the densely-wooded hills near the Um- folosi river. The lion is not seen south of the Lebombo Mountains in the north of Zululand, but the leopard and smaller carnivores are plentiful enough in the country. Its natural history is similar to that of Natal; but indica- tions are not wanting in its fauna and flora of its closer proximity to the tropics.

Language.—With the exception of the tongues spoken by the Hottentot-Bushman tribes of the south-west, the languages of Africa from about 5° north of the equator southwards are now recognized as forming one great family, for which the designation Bantu has been adopted, the word abantu in Zulu and other members of the group denoting "people" (plural inflex aba, root ntu). The Zulu tongue, as that of a conquering and superior race, extends beyond the river Zambesi, and is often understood even where another language is the vernacular. In the kingdoms of Lobengula and Umzila it is the language of the ruling classes. Philologists speak highly of the beauty and flexibility of the Bantu languages, and

of their grammatical structure. To the student of comparative philology they offer a field of inquiry of the highest importance, both on account of the vast domain occupied by them and of the deep insight they afford into the structure and growth of human speecli in general. This great linguistic family occupies about one-half of Africa, extending from near the Niger delta in the north-west, and from Lake Albert Nyanza farther east, to the south-eastern ex- tremity of the continent. It thus comprises such widely separated peoples as the Ba-Farami and Ba-Kwiri of the Cameroons region and the Zulu-Kaffres of the south-east coast on the one hand, and on the other the Wa-Ganda of the Somerset Nile and the Ova-Herero of Damaraland on the south-west coast. But, notwithstanding this widespread range, and although none of the dialects have possessed any written standard till quite recent times, being in fact every- where spoken by peoples of low culture, the Bantu is distinguished above all other great linguistic families, except perhaps the Semitic, for its

astonishing homogeneous character. So close is the resem- blance the different branches bear to each other that philologists have been able to describe in broad traits the more salient features of the phonetic system, structure, and syntax common alike to all. They speak unconsciously of the Bantu language, as if it were every- where essentially one, and this surprising uniformity is reflected in the geographical, and especially the ethnological, terminology of the southern half of the continent. Thus the national or tribal place prefix in its various dialectic forms—aba, ba, ama, bua, vua, ova, wa, mu, ap, &e.,—is of constant occurrence throughout the whole of this region.

Their close uniformity is further shown in their common phonetic system, which is at once simple and harmonious, requiring all words to end in a vowel, rejecting all consonantal juxtapositions, except a few characteristic nasal combinations, such as ng, mb, nd, nt, nw, mf, nk, ns, throwing the accent as a rule on the first vowel of the stem (méso), and lastly repelling all harsh sounds, except the three intruding Hottentot clicks in the Zulu-Kaffre group. Nearly all the consonantal sounds, ranging from about eighteen to twenty, occur in English, while the vowel system everywhere corresponds to that of Italian. But the most marked feature of the Bantu tongues is their so-called alliterative concord, which has been com- pared both to the gender concordance of Aryan and the progressive vowel harmony of Ural-Altaic. But it differs from the former inasmuch as it is initial and not final, and extends to the verb as well as to noun, adjective, participle, and pronoun, as if we should say in Latin, Domina mea pulchra, ama eum. Thus, in the Kongo dialect, ¢ kintuku kiaku kiavididi exono kisolokele=“the coat you lost yesterday it turned up.” It differs from the Ural-Altaic system inasmuch as the concordance is regulated, not by the root vowel influencing those of the agglutinated postfixes (see URAL-ALTAIC), but by the prefixed particle, the true nature of which has not yet been determined. Buta comparative study of the Bantu tongues shows that in the archaic language whence all descend cach noun had a proper prefix of its own, which prefix determined both the class to which the noun belonged and the concordance of all words in the sentence dependent on that noun. ‘That such is the correct view is evident from the fact that, even where the noun has lost its prefix, as sometimes happens, this prefix nevertheless reappears in the dependent adjective,

thus revealing its original form. We see, for instance, that nti= " tree" was originally in the plural m#- nti, because the following adjective still takes m7, as in nti miandwelo = "small trees." Bleek, the true founder of Bantu philology, has determined in the organic language eighteen such prefixes which still persist to a greater or less extent in the different branches, and have in some even been added to, as fi, for instance, in Kongo (W. H. Bentley). The analogy of this alliterative concord with the so-called Aryan grammatical gender is obvious, showing that the Aryan languages themselves were originally non-gender lan- guages and that their present gender agreement is essentially a ques- tion of phonetic harmony and not of sex in any intelligible sense of the term. Hence also the extraordinary phcnomenon of sex in this system apparently applied to inanimate objects.

Another remarkable feature of Bantu grammar is the wonderful development of verbal inflexion, which is both final and initial. The final, which in some groups yields as many as 300 distinct forms, each conjugated throughout, belongs to the verb itself in its various active, passive, middle, negative, repetitive, reciprocal, causative, and other meanings. The initial expresses mood, tense, person, number, and alliterative concord, and the whole system is immensely complicated by the fact that, as in Basque, the Caucasian, American, and some Ural-Altaic languages, the verb incorporates the direct pronominal object. Thus: ikuntala="I-see-him ;" tukutala =' we-see-you ;" bekwatala = " they-see-them ;" and so on. Hence the form kuntonda= "to-see-her," for instance, will be conjugated throughout, the result being a luxuriant growth of verbal forms fully comparable to that of the richest Ural-Altaic languages.

Bleek has subjected to a comparative study twenty-five members of the family, selected from almost every region that had been ex- plored up to his time (1862). Since then further geographical dis- covery, especially in the Congo and Ogoway basins, has revealed

many more Bantu tongues, of which, however, too little is known to determine their mutual relations with any pretence to accuracy. But, although any attempt at a strictly scientific classification would

*consequently be premature, the subjoined table, based on geographical distribution, will be found convenient for the purpose of reference.**

Norru-Wxst Group (CAMEROONS AND OcowAy-GABOON BASINS).—Ba-Kisk, Ba-Farami, Ba-Mbuku, Mu-Fundu, Dwalla, Wuri, Ba- Koko, Ba-Kwiri, Ba-Kundu, Mpongwe, Benga, Fernandian, Ba- Kale, Ba-Ngwe, Ivili, Ajuma, Fan (?), A-Shango, Okando, Cabinda, (Ba-Fyot). ; : .

Conco Group.—Vua-Nyamezi, Vua-Tuzi, Vua-Hha, Vua-Fipa, Vua-Vinza, Ba-Regga, Ba-Ngala, Wa-Buma, Ba-Bemba, Wa-Biza, Vua-Rua, Ma-Rungu, Ba-Songo, Ka-Lunda, Mboshi, Ba-Mbu, Kioko.

SouTH-WrEst Grove (Ancota, DAMARALAND).—Mu-Sorongo, Mu-Shicongo, Kongo proper, (S. Salvador), Bunda, Ba-Nano, Ba- Bwero, Ganguella, Libollo, Mu-Ndombe, Ba-Kwando, Ba-Simba, Ova-Mbo (Ovampo), Ova-Herero, :

ZAMBESI Group.—Amboella, Ba-Lunda, Ba-Viko, Ra-Najoa, Ba-Toana, Ba-Kuba, Ba-Rotse, Ba-Toka, Ba-Shukulompo, Ma-Kalaka, Ma-Shona, Ba-Nyai, Ma-Nyanja.

SouTH CENTRAL Group (BECHUANA AND BasuTo LANDs).—Ba-Rolong, Ba-Tlapi, Ba-Katla, Ba-Mapela, Ba-Hlokoa, Ba-Soetla, Ba- Suto, Ma-Kololo.

SoUTH-EASTERN Group (ZULULAND, NaTAL, KAFFRARIA).—See under article KAFFRARIA.

EASTERN Group (GASALAND, MoZAMBIQUE, ZANZIBAR COAST, EquaToRIAL LAKES).—Chobi, Ma-Kwakwa, Ma-Gwanza, Ma-Long-wa, Ba-Hlengwe, Bila-Kulu, Ma-Ndonda, Gwa-Tevi, Ma-Kua, Ma-Ngwangwara, Ma-Tambwe, Wa-Nindi, Ma-Wa, Wa-Hiyao (Yao or Ajawa), Ma-Ganya, Wa-Swaheli, Wa-Segua, Wa-Sambara, Wa- Zaramo, Wa-Kamba, Wa-Nika, Wa-Pokomo.

The pedigree and affinity of the Zulus, that is, the northern branch of the Zulu-Kaffre group, are given under KAFFRARIA. Here it will suffice to add that since the establishment of the Zulu military ascendency early in

the 19th century various Zulu hordes have successively invaded and overrun a great part of south- east Africa, as far as and even beyond the Lake Nyassa district. Throughout these regions they are variously known as Ma-Zitu, Ma-Ravi, Ma-Ngone (Umgone), Matebele (Ama-Ndebeli), Ma-Viti, and Aba-Zanzi. Such is the terror inspired by these fierce warriors that many of the conquered tribes, such as the Wa-Nindi of Mozam- bique, have adopted the very name of their conquerors or oppressors. Hence the impression that the true Zulus are far more numerous north of the Limpopo than has ever been the case. In niost places they have already become extinct or absorbed in the surrounding populations. But they still hold their ground as the ruling element in the region between the Limpopo and the lower Zambesi, which from them takes the name of Matebeleland, and which, like Zulu- land itself, has recently (1888) become a British protectorate.

Laws and Customs.—The Zulus possess an elaborate system of laws regulating the inheritance of personal property (which consists chiefly of cattle), the complexity arising from the practice of poly- gamy and the exchange of cattle made upon marriage. The giving of cattle in the latter case is generally referred to as a barter and sale of the bride, from which indeed it is not easily distinguishable. But it is regarded ina different light by the natives themselves. The kraal is under the immediate rule of its hcadman, who is a patriarch responsible for the good behaviour of all its members. Over the headman, whose authority nay extend to more than one kraal, is the tribal chief. The exercise by some of the principal chiefs, during the reigns of mPande and his son, of the power of life and death could not always be controlled by the central author- ity. Several of the Zulu customs resemble those of the Jews, such as the Feast of First Fruits, held upon the ripening of the maize, when the whole nation gathers at the king's kraal, and the custom of raising up seed to a deceased brother. By the custom of ukuh- lonipa a woman carefully avoids the utterance of any word which occurs in the names of the principal members of her husband's family: e.g., if she have a brother-in-law named uNkomo, she would not use the Zulu for "cow," inkomo, but would invent some other word for it. The employment of " witch doctors" for "smell- ing out" criminals or abatagati (usually translated " wizards," but meaning evildoers of any kind, such as poisoners) is still common in

Zululand, as in neighbouring countries, although it was discouraged by Cetshwayo, who established "kraals of refuge" for the reception of persons rescued by him from condemnation as abatagatt.

Population.—No means exist for estimating the present population of Zululand. The country was at the time of the late war regarded as less densely inhabited than the colony of Natal. The Zulu army was estimated to contain twenty-three regiments, of 40,400 men in all, and, although the enrolment was voluntary, it may be assumed that it comprised nearly all the able-bodied men of the nation. In addition to the heavy mortality sustained by the Zulus

1 To avoid confusion the names are given with their ethnical instead of thei linguistie prefixes. Thus, Ba-Suto, not Se-Suto. pees

in the war many lives have been lost in subsequent conflicts in which they have engaged amongst themselves.

History.—The earliest record of contact between Europeans and the Zulu race is probably the account of the wreck of the " Dodding- ton" in 1756. The survivors met with hospitable treatment at the hands of the natives of Natal, and afterwards proceeded up the coast to St Lucia Bay, where they landed. They describe the natives as "very proud and haughty, and not so accommodating as those lately Jett. "- They differed from the other natives in the superior neatness of their method of preparing their food, and were more cleanly in their persons, bathing every morning, apparently as anact of devotion. Their chief pride seemed to be to keep their hair in order. It is added that they watched strictly over their women.

In 1780 the Zulu tribe inhabited the valley of the White Um- folosi river under the chieftainship of Senzangakona, At that time the Zulus numbered some few thousands only, being subject to the paramount chief Dingiswayo, who ruled over the mTetwa tribe, which inhabited the country to the north-east of the Tugela. Dingiswayo is represented as having been very much in advance of other chiefs in those-parts in enlightenment and intelligence. He opened up a trade with the Portuguese, bartering ivory and oxen for beads and brass. He was also very warlike, and introduced a strict military organization among his

people, by means of which he obtained the ascendency over neighbouring tribes, including that of the Zulus. Upon the death of Senzangakona at the beginning of the 19th century he was succeeded by a son named Tshaka, who had served as an officer in the army of Dingiswayo, whose favour he won through his force of character and talents. Dingiswayo having been killed in battle, the mTetwa tribe sought the protec- tion of Tshaka, who lost no time in further developing the new military organization, and very soon became master of nearly the whole of south-eastern Africa from the Limpopo to Cape Colony, including the settlement of Natal, Basutoland, a large part of the Orange Free Statc, and the Transvaal Republic. The terror of the Zulu arms was, moreover, carried far into the interior through the revolt of a Zulu chief, Mzilikazi (Mosclekatse), who conquered a vast territory towards the north-west.

Tshaka's strict discipline and mode of attack, in which the long missile weapon of the other tribes was replaced by a short stabbing assegai, was such that nothing in the mode of warfare of those opposed to him could withstand him. He overran the district of Natal with his armies in 1820; but crowds of the northern tribes driven before his onslaught passed through the country about 1812.

In 1825 an English naval officer, Lieutenant Farewell, visited Tshaka with the object of obtaining leave to establish a settlement in what is now the district of Natal. He found the king at Umgun- gindhlovu, "surrounded by a large number of chiefs, and about 8000 or 9000 armed men, observing a state and ceremony in our introduction that we little expected." The king showed his visiter much friendliness, making him a grant of land in that neighbour- hood. Lieutenant Farewell took formal possession of the territory he had received, which he described as nearly depopulated and not containing more than 300 or 400 inhabitants, on 27th August 1825. The Zulu monarch, being anxious to open a political connexion with the Cape and English Governments, entrusted in 1828 one of his principal chiefs, Sotobi, and a companion to the care of Lieutenant King, to be conducted on an embassage to Cape Town, Sotobi being commissioned to proceed to the king of England. From causes which are not now certainly known these people were not allowed to proceed beyond Port Elizabeth, and were soon sent back to Zulu- land.

On 28d September 1828 Tshaka was murdered by his brother, Mhlangana, and a few days afterwards Mhlangana was killed by another brother, Dingane. Tshaka's reign had involved an immense sacrifice of human life, but he had set before himself the aim of establishing a great kingdom, and, having succeeded in that, his home rule had been relieved by acts of generosity and statesmanship.

What is recorded of Dingane's reign shows him in the light of a bloodthirsty and cruel monster without a redeeming feature. The attempts made by the emigrant Dutch Boers under Piet Retief to establish friendly relations with him, and obtain a cession of the district of Natal, ended in the massacre of the whole party of seventy of their leading men at the king's kraal (February 1838), and of all members of their families left behind in Natal who could not be collected into fortified camps. Two unsuccessful attempts were made to avenge the deaths of the emigrant Boers. A Dutch command under Pieter Uys invaded the Zulu country, but was compelled to retreat, leaving thcir leader behind them, while a considerable force, composed of English settlers, Boers, and natives, entered Zululand at the mouth of the Tugela, and was completely annihilated, after inflicting very great loss on the Zulus. A de- tachment of the Zulu army on this occasion entered Natal and compelled the settlers at the port to take refuge on board a ship. After a further attack by Dingane the emigrant Boers and settlers again invaded Zululand in December 1838, and after a severe

engagement defeated the Zulu army with great slaughter on the banks of the Blood river, which owes its name to the results of the victory. In 1840 the Boers agreed to support Dingane's brother mPande in rebellion against him. The movement was completely successful, several of Dingane's regiments going over to mPande. Dingane passed into Swaziland in advance of his retreating forces, and was there murdered, while mPande was crowned king of Zulu- land by the Boers, who received in exchange for their services the much-coveted district of Natal. During the next sixteen years of mPande's reign nothing occurred to disturb the peaccful relations between the Zulus and the Natal Government. 1In1856

a civil war broke out between two of mPande's sons, Cetshwayo and Umbulazi, who were rival claimants for the succession. A bloody battle was fought between them on the banks of the Tugela in December 1856, in which Umbulazi and many of his followers were slain. The Zulu country continued, however, excited and disturbed, until the Government of Natal in 1861 obtained the formal nomination of a successor to n1Pande ; and Cetshwayo was appointed. mPande died in October 1872, but practically the government of Zululand had been in Cetshwayo's hands since the victory of 1856, owing both to political circumstances and the failing health of his father. In 1873 the Zulu nation appealed to the Natal Government to pre- side over the installation of Cetshwayo as king; and tlis request was acceded to. The rnle of mPande was in earlier years a severe one, the executions ordered by him being so numerous in 1859 as to evoke remonstrances from Cetshwayo, who warned the king that he would drive all the people over into Natal. In 1856 and for some years afterwards a considerable exodus of refugees did take place into the colony, but by 1871 the tide appeared to be turn- ing the other way. In 1854 the native population in Natal was reckoned at from 100,000 to 120,000. By 1873, owing largely to the influx of refugecs from Zululand, it had risen to 282,783 ; but five years later it had not increased to more than 290,035, some hundreds of heads of families having returned to Zululand.

The encroachments of the Transvaal Bocrs upon the borders of Zululand having for many years exposed the British Government to urgent appeals on the part of the Zulus for its intervention, a second attempt was made by the Government of Natal, and this time with success, to induce the Boers to submit the boundary disputes between them and their neighbours to arbitration. A commission was appointed, composed of three British officers, who in June 1878 pronounced a decision substantially in favour of the Zulus. But the high commissioner, Sir Bartle Frere, lad deter- mined upon measures for re-modelling the Zulu nation with a view to the confederation of the South African colonies and states. The invasion of Zululand took place in January 1879, and the war was ended by the capture of the king at the end of August. Cetshwayo having been conveyed to Cape Town, the Zulu country was portioned out among eleven Zulu chicfs, a white adventurer, and a Basuto chief who had done

good service in the war. This arrangement was productive of much bloodshed and disturbance, and in 1882 the British Government determined to restore Cetshwayo again to power. In the meantime, however, the deepest blood feuds had been engendered between the chiefs Zibebu and Hamu ou the one side and the neighbouring tribes who supported the ex-king and his family on the other. These people suffered severely at the hands of the two chiefs, who were assisted by a band of white free- booters. Zibebu, having created a formidable force of well-armed and trained warriors, was left in independence on the borders of Cetshwayo's territory, while the latter was restrained by the con- ditious of his restoration from any military enterprise or defensive measures. A collision very soon took place; but in the conflicts that followed Zibebu's forces were victorious, and on 22d July 1883, led by a troop of mounted whites, he made a sudden descent upon Cetshwayo's kraal at Ulundi, which he destroyed, massacring such of the inmates of both sexes as could not save themselves by flight. The king escaped, though wounded, into the Reserve, which had been placcd nnder British rule ; there he died in 1884. He left a son, Dinuzulu, who sought the assistance of some of the Transvaal Boers against Zibebu, whom he defeated and drove into the Reserve. These Boers, not a large number, claimed as a stipulated reward for their services the cession of the greater part, and the more valuable part, of central Zululand. The Government of Natal has recently attempted to mediate on behalf of the Zulus and has accepted on their behalf, in spite of their protests, a line which roughly divides ecntral Zululand into two equal portions. Of these the north- western has been created into the independent Boer state already mentioned. The rest of central Zululand is administered, with the Reserve, as a British protectorate.

See John Chase, A Reprint of Authentic Documents relating to Natal (Grahams- town, 1843); Saxe Bannister, Humane Policy (London, 1830), and_authorities collected in Appendix; Delegorgue, Voyage de l'Afrique Australe (Paris, 1847); Allen Francis Gardiner, Narrative of a Journey to the Zoolu Country (London, 1836) ; Leslie, Among the Zulus (Edinburgh, 1875); Bishop Colenso, Extracts from the Blue Books or Digest upon Zulu Affairs (in the British Museum) ; Cetshwayo"s Dutchman (London, 1880); Frances Colenso, The Ruin of Zululand (London, 1884); R. N.

Cust, Sketch of the Modern Languages of Africa (London, 1883). See also authorities cited under Natat. (F. E. C.-A. H. K.)

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ZURBARAN, Francisco (1598-1662), a distinguished Spanish painter, was born at Fuente de Cantos in Estremadura on 7th November 1598. His father was named Luis Zurbaran, a country labourer, his mother Isabel Marquet. The lot apparently marked out for Francisco was that of tilling the ground, like his father; but his natural faculty had decided otherwise. In mere childhood he set about imitating objects with charcoal; and his father was quick-witted and long-headed enough to take him off, still extremely young, to the school of Juan de Roélas in Seville. Francisco soon became the best pupil in the studio of Roélas, surpassing the master himself ; and before leaving him he had achieved a solid reputation, full though Seville then was of able painters. He may probably have had here the opportunity of copying some of the paintings of Michelangelo da Caravaggio; at any rate he gained the name of "the Spanish Caravaggio," owing to the very forcible realistic style in which he excelled. He constantly painted direct from nature, following but occasionally improving on his model ; and he made great use of the lay-figure in the study of draperies, in which he was peculiarly proficient. He had a special gift for white draperies; and, as a natural consequence, Carthusian monks are abundant in his paintings. To these rigidly faithful methods of work Zurbaran is said to have adhered through- out his career, which was always eminent and prosperous, wholly confined to his native Spain, and varied by few incidents beyond those of his daily laborious and continu- ally productive diligence. His subjects were mostly of a severe and ascetic kind,—religious vigils, the flesh chastised into subjection to the spiritt—the compositions seldom thronged, and often reduced to a single figure. The style is more reserved and chastened than Caravaggio's, the tone of colour often bluish to a morbid excess. Exceptional effects are attained by the precise finish of foregrounds, largely massed out in light and shade. Zurbaran married in Seville Leonor de Jordera, by whom he had several children. Towards 1630 he was appointed painter to Philip IV. ; and there is a story that on one occasion the sovereign laid his hand on the artist's shoulder, saying, '"'

Painter to the king, king of painters." It was only late in life that Zurbaran made a prolonged stay in Madrid, Seville being the chief scene of his operations. He died in 1662 in Madrid.

In 1627 he painted the great altarpiece of St Thomas Aquinas, now in the Seville museum ; it was exccuted for the church of the college of that saint in the same city. This is Zurbaran's largest composition, containing figures of Christ and the Madonna, various saints, Charles V. with knights, and Archbishop Deza (founder of the college) with monks and servitors, all the principal personages being beyond the size of life ; this work is full of fine portrait-like heads, and it ranks, both in importance and in elevated style, as the painter's masterpiece. It had been preceded by the numerous pictures of the screen of St Peter Nolasco in the cathedral. In the church of Guadalupe he painted various large pictures, eight of which relate to the history of St Jerome, and in the church of St Paul, Seville, a famous figure of the Crucified Saviour, in grisaille, presenting an illusive effect of marble. In 1633 he finished the paintings of the high altar of the Carthusians in Jerez. In the palace of Buenretiro, Madrid, are four large canvases representing the Labours of Hercules, an unusual instance of non-Christian subjects from the hand of Zurbaran. A very finc specimen is in the London National Gallery, a whole-length life-sized figure of a kneeling Franciscan holding a skull (figured in vol. xxi. p. 440, fig. 36).

"The principal scholars of this master, whose style has as much affinity to that of Ribera as to Caravaggio's, were Bernabe dc Ayala and the brothers Polanco.

ZURICH (Germ. Ziirich),} a canton in Switzerland, ranking as the first in dignity. It is of very irregular shape, consisting simply of the conquests made by the city.

It extends from the Lake of Zurich to the Rhine, taking in 1 The name is derived from the Celtic dur (water), The true and

accurate Latinized form is Turicum, but the false form Tigurum was given currency to by Glareanus and held its ground from 1512 to 1748.

the district of Eglisau on the right bank of that river. the east it is, roughly speaking, limited by the ranges of low hills which separate it from the valley of the Thur, and on the west by those (e.g., the Albis) which divide it from the valleys of the Reuss and the Aar. Its total area is 655°9 square miles, of which 610°6 are classified as fertile (woods covering 186 and vines 21°5). Of 45:2 square miles of non-fertile land 26°2 are covered by the lake. The highest point in the canton is the Schnebelhorn (4250 feet) in the south-east corner. The population in 1880 was 317,576 (an increase of 32,790 since 1870), and in 1887 was estimated to be 339,163. In 1880 there were 313,762 German-speaking and 283,134 Protestant inhabitants. The number of Roman Catholics nearly doubled from 1870 to 1880 (17,942 and 30,298). Be- sides ZuricH (see below), the capital, the only other town of any size in the canton is WINTERTHUR (q.v). The land is very highly cultivated and is held by no less than 36,000 proprietors. The canton is well supplied with railways, the first line of any length in Switzerland being that from Zurich to Baden in Aargau (opened 1847). The line from Zurich to the summit of the Uetliberg (2861 feet) was made in 1875. For the history of the canton, see under the town, below.

ZURICH, chief city of the above canton, and until 1848 practically the capital of the Swiss Confederation, is beautifully situated, at a height of 1506 feet, on the banks of the Limmat where it issues from the Lake of Zurich, and on the river Sihl, which joins the Limmat just above the north end of the lake. That part which lies on the right bank of the Limmat is known as the Large Town, that on the left as the Little Town. The central portion— the '"city"—is governed by an executive of seven members and a town council of sixty, both elected by the citizens, and in 1887 had 27,638 inhabitants. The nine outlying townships or "' gemeinden" have each a separate organiza- tion, distinct from that of the city, and in 1887 had 60,836 inhabitants, of whom 18,527 were in Aussersihl and 10,883 in Riesbach. The total population of the town and its suburbs was thus 88,474 in 1887. These are nearly all Protestants and German-speaking. The number of Roman Catholics has doubled in the last ten years ; they are mainly resident in Aussersihl, the work- men's quarter, where also

many Italian-speaking persons dwell. There are in Zurich about 7000 Old Catholics.

Of the old buildings the finest and most important is the Gross Munster (or Propstei) on the right bank of the Limmat. This was originally the church of the king's tenants, and in one of the chapels the bodies of Felix, Regula, and Exuperantius, the patron saints of the city, were buried, the town treasury being formerly kept above this chapel. The present building was erected at two periods (1090-1150 and 1225-1300), the high altar having been dedicated in 1278. The towers were first raised above the roof at the end of the 15th century and took their present form in 1779. The chapter consisted of twenty-four secular canons ; it was reorganized at the Reformation (1526), and suppressed in 1832. On the site of the canons' houses stands a girls' school (opened 1853), but the fine Romanesque cloisters (12th and 13th centuries) stillremain. There 1s a curious figure of Charlemagne in a niche on one of the towers : to him is attributed the founding or reform of the chapter. On the left bank of the Limmat stands the other great church of Zurich, the Frau Munster (or Abtei), founded for nuns in 853 by Louis the German. The high altar was dedicated in 1170 ; but the greater part of the buildings are of the 13th and 14th centuries. It was in this church that the relics of the three patron saints of the town were preserved till the Reformation, and it was here that the burgo- nlaster Waldmann was buried in 1489. There were only twelve nuns of noble family, comparatively free from the severer monastic vows ; the convent was suppressed in 1524. Of the other old churches may be mentioned St Peter's, the oldest parish church, though the present buildings date from the 13th century only, and formerly the meeting-place of the citizens ; the Dominican church (18th century), in the choir of which the cantonal library of 80,000 volumes has been stored since 1873 ; the church of the Austin friars

(14th century), now used by the Old Catholics ; and the Wasser- kirche. The last-named churzh is on the site of an old pagan holy

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place, where the patron saints of the city were martyred ; since 1631 it has housed the city library, the largest in Switzerland, which contains 120,000

printed volumes and 4000 MSS. (among these be- ing letters of Zwingli, Bullinger, and Lady Jane Grey), as well as a splendid collection of objects from the lake dwellings of Switzer- land. The building itself was erected 1479 to 1484, and near it is a statue of Zwingli, erected in 1885. The existing council house dates from 1698, and the guild houses were mostly rebuilt in the 18th century. Among the modern buildings the polytechnic school, the cantonal school, the reading rooms (museum), the hospital, and the railway station are the most conspicuous. There are some fine old fountains (the oldest dating back to 1568). The quays along the river and the lake are extensive and afford fine views ; and there are several good bridges, Roman traces being still seen in the case of the Niederbriicke. The mound of the Lindenhof was formerly crowned by the king's house, which disappeared in the 13th cen- tury, and the hillock was planted with limes as early as 1422. Zurich possesses a large number of charitable institutions.

The inhabitants are very industrious and of social habits among themselves, the town being noted for its clubs and societies. It is the intellectual capital of German-speaking Switzerland, and has been called " Athens on the Limmat." Cotton-spinning and the manufacture of machinery are two of the leading industries, but by far the most important of all is the silk trade. This flourished in Zurich in the 12th and 13th centuries, but disappeared about 1420 ; it was revived by the Protestant exiles from Locarno (1555) and by the Huguenot refugees from France (1682 and 1685). The value of the silk annually exportéd (mainly to France, the United States, and England) is estimated at £2,916,000 to £3,333,000. The trade employs about 20,000 hand looms and 4500 steam-power looms ; but the number of the former is diminishing, while that of the latter is increasing. Poor wine is also made. Zurich is the bank- ing centre of Switzerland. There are a large number of educational establishments, public and private. Besides the excellent primary and secondary schools, there are the cantonal school, including a gymnasium and a technical side (opened 1842), and a high school for girls (opened 1875). The cantonal university and the Federal polytechnic school are housed in the same building, but have no other connexion. The university was founded in 1832-33 (no doubt as a successor to the ancient chapter school at the Gross Miinster, said to date back to Charlemagne's time—

hence its name the Caro- linum—reorganized at the Reformation, and suppressed in 1832) ; in 1886 it had 51 professors and 481 matriculated students, besides 65 persons attending special courses of lectures. The polytechnie school, founded in 1854, includes six main sections (industrial chemistry, mechanics, engineering, training of scientific and mathe- matical teachers, architecture, forestry and agriculture), and a general philosophical, mathematical, and literary department. The numbers of students in the first three sections were, in 1885, 122, 97, and 90—in all the six 412, of whom 192 were foreigners ; there were about fifty-four professors. The polytechnic school has good collections of botanical specimens and of engravings. Near it is the observatory (1542 feet). There are also in Zurich many institutions for special branches of education—eg., veterinary surgery, music, industrial art, silk-weaving, &c.

*History.—The earliest inhabitants of the future site of Zurich were the lake dwellers. The Celtic Helvetians had a settlement on the Lindenhof when they were succeeded by the Romans, who established a customs station here for goods going to and coming from Italy ; during their rule Christianity was introduced early in the 3d century by Felix and Regula, with whom Exuperantius was afterwards associated. The district was later occupied by the Alemanni, who were conquered by the Franks. It is not till the 9th century that we find the beginnings of the Teutonic town of Zurich, which arose from the union of four elements :—(1) the royal house and castle on the Lindenhof, with the king's tenants around, (2) the Gross Miinster, (3) the Frau Miinster, (4) the com- munity of *‘ free men” (of Alemannian origin) on the Ztrichberg. The Frankish kings had special rights over their tenants, were the protectors of the two churches, and had jurisdiction over the free community. In 870 the sovereign' placed his powers over all four in the hands of a single official (the Reichsvogt), and the union was still further strengthened by the wall built round the four settle- ments in the 10th century as a safeguard against Saracen marauders and feudal barons. The Reichsvogtei passed to the counts of Lenz- burg (1063-1172), and then to the dukes of Zaringen (extinct 1218). Meanwhile the abbess of the Frau Minster had been acquiring ex- tensive rights and privileges over all the inhabitants, though she never obtained the criminal jurisdiction. The town flourished greatly*

in the 12th and 18th centuries, the silk trade being intro- duced from Italy. In 1218 the Reichsvogtei passed back into the hands of the king, who appointed one of the burghers as his deputy, the town thus becoming a free imperial city under the nominal rule of a distant sovereign. The abbess in 1234 became a princess of the empire, but power rapidly passed from her to the council, which she had originally named to look after police, &c., but which (c. 124C) came to be elected by the buzghers, though the abbess

was still "the lady of Zurich." This council was made up of the representatives of certain knightly and rich mercantile families (the "patricians"), who excluded the craftsmen from all share in the government, though it was to these last that the town was largely indebted for its rising wealth and importance.

In October 1291 the town made an alliance with Uri and Schwyz, and in 1292 failed in a desperate attempt to seize the Hapsburg town of Winterthur. After that Zurich began to display strong Austrian leanings, which characterize much of its later history. In 1815 the men of Zurich fought against the Swiss Confederates at Morgarten. Thc year 1836 marks the admission of the craftsmen to a share in the town government, which was brought about by Rudolph Brun, a patrician. Under the new constitution (the main

features of which lasted till 1798) the council was made up of

thirteen members from the " constafel " (including the old patricians and the wealthiest burghers) and the thirteen masters of the craft guilds, each of the twenty-six holding office for six months. The office of burgomaster was created and given to Brun for life. Out of this change arose a quarrel with one of the branches of the Hapsburg family, in consequence of which Brun was induced to throw in the lot of Zurich with the Swiss Confederation (1st May 1351). The double position of Zurich as a free imperial city and as a member of the Everlasting League was soon found to be embar- rassing to both parties (see SWITZERLAND, vol. xxii. p. 784 sq.). Meanwhile the town had been extending its rule far beyond its

walls,—a process which began in the 18th century, went on apace in the 14th, and attained its height in the 15th century (1268-1467). This thirst for territorial aggrandizement brought about the first civil war in the Confederation (the "Old Zurich War," 1436-50), in which, at the fight of St Jacob on the Sihl (1443), under the walls of Zurich, the men of Zurich were completely beaten and their burgomaster Stiissi slain. The purchase of the town of Winterthur from the Hapsburgs (1467) marks the culmination of the territorial power of the city. It was to the men of Zurich and their leader Haus Waldmann that the victory of Morat (1476) was due in the Burgundian War ; and Zurich took a leading part in the Italian campaign of 1512-15, the burgomaster Schmid naming the new duke of Milan (1512). No doubt her trade connexions with Italy led her to pursue a southern policy, traces of which are seen as early as 1331 in an attack on the Val Leventina and in 1478, when Zurich

meu were in the van at the fight of Giornico, won by a handful of

Confederates over 12,000 Milancse troops.

In 1400 the town received from the emperor the Reichsvogtei, which carried with it complete immunity from the empire and the right of criminal jurisdiction. As early as 1893 the chief power had practically fallen into the hands of the council of 200 (really 212), composed of the former council and a number of other citizens originally elected by it; and in 1498 this change was formally recog- nized. This transfer of all power to the guilds had been one of the aims of the burgomaster Hans Waldmann (1483-89), who wished to make Zurich a great commercial centre. He also introduced many financial and moral reforms, and subordinated the interests of the country districts to those of the'town. He practically ruled the Confederation, and under him Zurich became the real capital of the League. But such great changes excited opposition, and he was overthrown and executed. His main ideas were embodied, however, in the constitution of 1498, by which the patricians be- came the first of the guilds, and which remained in force till 1798 ; some special rights were also given to the subjects in country dis- tricts. It was, however, the prominent part taken by Zurich in adopting and propagating the principles of the Reformation which finally secured for it the lead of

the Confederation ; for a detailed account of its policy and the events in which it shared during this period, see SWITZERLAND (vol. xxii. p. 790 sq.) and ZWINGLt.

In the 17th and 18th centuries a distinct tendency becomes ob- servable in the city government to limit power to the actual holders. Thus the country districts were consulted for the last time in 1620 and 1640; and a similar breach of the charters of 1489 and 1531 occasioned disturbances in 1777. The council of 200 came to be chosen by a small committee of the members of the guilds actually sitting in the council, and early in the 18th century a determined effort was made to crush by means of heavy duties the flourishing silk trade in Winterthur. In 1655 an attempt was made by Bern and Zurich to set up a central administration in the Confederation, which failed through the jealousy of the other cantons. The first symptoms of active discontent appeared later among the dwellers by the lake, who founded in 1794 a club at Stafa and claimed the restoration of the liberties of 1489 and 1531, a movement which was put down by force of armsin1795. The old system of govern- ment perished in Zurich, as elsewhere in Switzerland, in 1798, and under the Helvetic constitution the country districts obtained political liberty. But under the cantonal constitution of 1815 the town had 130 representatives in the great council, while the country districts had only 88.

that the town finally lost the last relics of the privileges which it had so long enjoyed as compared with the country districts. In 1833 Zurich tried hard to secure a revision of the Federal constitu- tion and a strong central Government. The town was the Federal capital for 1839-40, and consequently the victory of the Conserva- tive party there caused a great stir throughout Switzerland. But, when in 1845 the Radicals regained power at Zurich, which was again the Federal capital for 1845-46, that city took the lead in opposing the Sonderbund cantons. In 1869 the cantonal constitu- tion was again thoroughly revised in a very democratic sense ; and, with the exception of a few changes made later, it is the existing constitution. There is an executive of seven members and a legis- lature of 211 (one member to every 1500 inhabitants), each holding office

for three years and elected at the same time directly by the vote of the people. The referendum exists in both forms, com- pulsory and optional : all laws and all money grants of a total sun over 250,000 francs or an annual sum of 20,000 must be submitted to a popular vote, the people meeting for that purpose at least twice in each year, while the executive may submit to a popular vote any other matter, though it fall within its powers as defined bylaw. One-third of the members of the legislature or 5000 legally qualified voters can force the Government to submit to the peopic any matter whatsoever (initiative). The constitution provides for the imposition of a graduated and progressive income tax. In 1885 the penalty of death was abolished in the canton. Zurich has sheltered many political refugees of late years, especially Poles and Russians ; but its hospitality has been abused by the Socialists, who have given considerable trouble. The Swiss National Agricul- tural and Industria] Exhibition was held at Zurich in 1883.

For the present state of the town, see Europdische Wanderbilder (Nos. 126- 129), Zurich, 1887. For the local and architectural history the principal work is S. Vogelin, Das alte Ziirich (2d ed., 1878), and for general history, J. C. Bluntschli, Staats- und Rechts-Geschichte der Siadt und Landschaft Ziirich (2d ed., 1856); G. v. Wyss, Geschichte der Abtei Ztirich, 1851-58 (in vol. viii. of Mittheil. d. antiquar. Gesellsch. in Z.); Id., Die Reichsvogtei Ziirich, 1870 (in vol. xvii. of Zetischr. f. Schweiz. Recht). Many of the recent works on Swiss history, e.g., those of Dandliker, Oechsli, Orelli, Strickler, are by Zurich men and pay special attention to Zurich matters. GW: AS BSC:

ZUTPHEN, a fortified town of Holland, in the province of Guelderland, 20 miles by rail south from Deventer, stands on the right bank of the Yssel, at its junction with the Berkel. Its most important public building is the church of St Walburga, dating from the 12th century, which contains several interesting monuments of the counts of Zutphen, and good examples of old metal-work and sculp- ture. The place has an active trade, especially in grain and in the timber floated down from the Black Forest by the Rhine and the Yssel; the industries include tanning, weaving, and oil and paper manufactures. The population in 1887 was 16,357. Some 24 miles to the north of the town is the agricultural colony

of Nederlandsch-Mettray, founded by a private benefactor for the education of poor and friendless boys in 1851, and since that date largely extended,

Zutphen at one time belonged to the Hanseatic League and had an extensive foreign trade. It has been more than once besieged, and it was before Zutphen that Sir Philip Sidney received his mortal wound (22d September 1586).

ZWEIBRUCKEN. See Dreux Ponts.

ZWICKAU, one of the busiest towns in the industrial district of the kingdom of Saxony to which it gives its name, is situated in a pleasant valley on the left bank of the Zwickauer Mulde, 41 miles south of Leipsic. The river is here crossed by four bridges, two of which are of iron, The town contains six churches, including the fine Late Gothic church of St Mary (1453-1536, restored 1884), with a tower 278 feet high, and the Gothic church of St Catherine (14th to 15th century), of which Thomas Miinzer was pastor in 1520-22. Among the secular buildings are the town-house of 1581, the Gothic "'Gewandhaus" (now a theatre) of 1522-24, the Government buildings of 1838, the law-courts, the hospital, and the barracks. The rail- way station, which with its dependencies covers 81 acres, is said to be one of the largest in Germany. The chateau of Osterstein (1581-91) is now a penitentiary. The manu- factures of Zwickau are both extensive and varied: they include machinery, chemicals, porcelain, paper, glass, dye- stuffs, tinware, stockings, and curtains. There are also steam saw-mills, brickfields, iron-foundries, and breweries,

Though no longer so important as when it lay on the chief trade route from Saxony to Bohemia and the Danube, Zwickau still carries on considerable commerce in grain, linen, and coal. The mainstay of the industrial prosperity of the town is the adjacent coalfield, which in 1885 em- ployed 10,000 hands and yielded coal to the value of £854,900. The mines are mentioned as early as 1348; but they have been actively worked only for the last 65 years, during which time the population of the town

has increased more than sixfold. In 1885 the population was 39,245; in 1834 it was 6701.

Zwickau is of Slavonic origin, and is mentioned in 1118 as a trading place. From 1290 till 1348 it was a free imperial city, but about the latter date it was forced to accept the protection of the margrave of Meissen. The Anabaptist movement of 1525 be- gan at Zwickau under the inspiration of the " Zwickau prophets." Robert Schumann (1810-1856), the musical composer, was born here. The name is sometimes fancifully derived from the Latin cygnea, from a tradition that placed a "swan lake" here which had the property of renewing the youth of those who bathed in it.

ZWINGLI, Huupretcw (1484-1531), Swiss Reformer, was born on lst January 1484 at Wildhaus, at the head of the Toggenburg valley, in the canton of St Gall, Switzer- land. His father was a well-to-do peasant proprietor, amman of the township ; his mother was Margaret Meili, whose brother was abbot of the cloister of Fischingen in Thurgau. The people of Wildhaus were in Zwingli's time a self-ruled village community. They had also bought from the abbots of St Gall the privilege of electing their own pastor; and the first parish priest chosen by the votes of the parishioners was Bartholomew Zwingli, the uncle of the Reformer, who latterly became dean of Wesen. Zwingli thus came of a free peasant stock, and he carried the marks of his origin all his life. When eight years old he was sent to school at Wesen, where he lived with his uncle, the dean. Two years later he was sent to Basel ; and after a three years' sojourn there he became a pupil in the high school of Bern, where his master was Heinrich Wolflin, an accomplished classical scholar, from whom Zwingli acquired that love of classical literature which never left him. From Bern he went to Vienna (in 1500), and after two years' study there he returned to Basel. At Basel the celebrated Thomas Wyttenbach was his master and friend, and taught him those Evangelical truths which he afterwards so signally defended.

It is impossible to avoid contrasting the joyous youth of Zwingli with the sad childhood of Luther. Zwingli was full of love of family, of township, of country, and of Christ. He had none of those dark religious

experiences which drove Luther to the convent, and which made him miserable there. He had never to struggle alone in despair of soul, one step at a time, towards the gospel of God's free grace. Wyttenbach was very unlike those nominalist divines from whom Luther learnt medieval theology. He foresaw many things which a later generation discovered. Zwingli has assured us that Wyttenbach taught him that the death of Christ, and not priests, masses, and pilgrim- ages, was a sufficient ransom for the sins of the world ; that he pointed out the errors of the schoolmen and of Romish theology ; and that he asserted that Holy Scrip- ture, and not ecclesiastical tradition, was the sole rule of faith. Itcost Zwingli nothing to break with the medizval church. He had been taught independence from child- hood, and shown how to think for himself while a student at Basel.

When twenty-two years of age Zwingli was ordained by the bishop of Constance. He preached his first sermon at Rapperswyl, and said his first mass among his own people at Wildhaus. He was appointed (1506) to the parish of Glarus, where he had leisure for study and began to read extensively and carefully in preparation for future work.

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At Glarus too he gathered the boys of the district about him (AXgidius Tschudi, the historian of Switzerland, among them) to teach them the classics ; and he set himself by a study of the masterpieces of ancient and medizeval rhetoric to learn the art of oratory. He tells us that at this time he foresaw that a man who is called to be a preacher must know many things, two things above all others—God, and how to speak. Meanwhile he tested every doctrine in theology by the Word of God and took his stand firmly upon what it taught him.

The Swiss troops of Zwingli's day were supposed to be the best in Europe, and neighbouring states were glad to have their assistance in war. The Swiss were accustomed to hire out their soldiers for large sums of money to those states who paid best. It was~their custom also to send the parish priest of the district from which the troops came as chaplain to the

regiment. Zwingli went twice, once in 1512 and again in 1515, with the men of Glarus. He saw the demoralizing tendency of such mercenary war- fare and ever afterwards denounced the immoral traftic. In 1521 he persuaded the authorities of the canton of Zurich to renounce it altogether.

In 1516 Zwingli was transferred to Einsiedeln. It was then, and is still, resorted to by thousands of pilgrims yearly, who come to visit the famous image of the Virgin and Child which has been preserved there for at least a thousand years. Zwingli denounced the superstition of pilgrimages. His sermons made a great sensation and attracted attention in Rome. The papal curia had no wish to quarrel with the Swiss, who furnished them with troops, and sought to silence the Reformer by offers of promotion, which he refused. Soon afterwards he was elected, after some opposition, to be preacher in the cathedral at Zurich, and accepted the office (1518), having first obtained a pledge that his liberty to preach the truth should not be interfered with. He began the fight almost on his arrival. Bernhardin Samson, a pardon-seller like Tetzel, had been selling indulgences in the Forest Cantons and proposed to come to Zurich, Zwingli prevailed on the council to send the friar out of the country. In the beginning of 1519 he began a series of discourses on the New Testament Scriptures,—on St Matthew's Gospel, on the Acts of the Apostles, and on the Pauline Epistles. The sermons, preached '"'in simple Swiss language," had a great effect. The Reformation in Zurich was begun. The council of the canton was on Zwingli's side and protected their preacher. He began to preach against fasting and other Roman practices ; some of his followers put his precepts in practice and ate fleshin Lent. The bishop of Constance accused them before the council of Zurich. Zwingli was heard in their defence, and the accusation was abandoned. The victory on the subject of fasting was followed by an attack on the doctrine of the celibacy of the clergy. Pope Adrian VI. interfered, and asked the Zurichers to abandon Zwingli. The Reformer persuaded the council to allow a public disputation, which was held in 1523. Zwingli pro- duced sixty-seven theses,! containing a summary of his doctrinal views, and argued in their favour with such power that the council upheld the Reformer and separated the canton from the bishopric of Constance. The Refor- mation, thus legally established, went forward

rapidly. The Latin language was discontinued in the service; the incomes of chapters, convents, and monasteries were applied for education; the celibacy of the clergy was abolished ; monks and nuns were freed from their vows; mass and image worship were declared to be idolatrous; and the Eucharist in both kinds was celebrated by a solemn com- munion of all the Reformed congregations on Maundy Thursday 1525.

T Cf. Schaff's Creeds of the Evangelical Protestant Churches, p. 197.

ZWINGLI

The progress of the Reformation in Zurich attracted the attention of all Switzerland, and the Confederation became divided into two parties. The Reformers found numerous supporters in the larger towns of Basel, Bern, and Schaff- hausen, and in the country districts of Glarus, Appenzell, andthe Grisons. The five Forest Cantons—Lucerne, Zug, Schwyz, Uri, and Unterwalden—remained solidly opposed toallreforms. This anti-Reformation party was also strong in the patrician oligarchies which drew papal pensions, and enriched themselves by the nefarious blood traffic de- nounced by Zwingli. The Zurichers felt it necessary to form a defensive league to prevent their Reformation from being crushed by force. They were especially anxious to gain Bern, and Zwingli challenged the Roman Catholics to a public disputation in that city. No less than 350 ecclesi- astics came to Bern from the various cantons to hear the pleadings, which began on 2d January 1528 and lasted nineteen days. Zwingli and his companions undertook to defend against all comers the following ten propositions :—

(1) That the Holy Christian Church, of which Christ is the only Head, is born of the Word of God, abides therein, and does not listen to the voice of a stranger ; (2) that this church imposes no laws on the conscience of people without the sanction of the Word of God, and that the laws of the church are binding only in so far as they agree with the Word ; (3) that Christ alone is our righteousness and our salvation, and that to trust to any other merit or satisfaction is to deny Him ; (4) that it cannot be proved from the Holy Scripture that the body and blood of Christ are corporeally present in the bread and in the wine of the Lord's Supper ; (5) that the mass, in which Christ is offered to God the Father for the sins of

the living and of the dead, is contrary to Scripture and a gross affront to the sacrifice and death of the Saviour ; (6) that we should not pray to dead mediators and inter- cessors, but to Jesus Christ alone; (7) that there is no trace of purgatory in Scripture ; (8) that to set up pictures and to adore them is also contrary to Scripture, and that images and pictures ought to be destroyed where there is danger of giving them adora- tion ; (9) that marriage is lawful to all, to the' clergy as well as to the laity; (10) that shameful living is more disgraceful among the clergy than among the laity.

These they defended to such purpose that the Bernese joined heartily in the Reformation, and the enthusiasm of the people was fired by two burning sermons preached by Zwingli from the minster pulpit to overflowing audiences. The two parties henceforward faced each other in Switzer- land. The country was in those days a confederacy of republics, and yet was far from being a democracy. Most of the cantons were ruled by aristocratic oligarchies who had pensions from foreign Governments, and Zwingli's appeal had always been from an oligarchy of pope, bishops, and abbots to the congregation with the Bible in hand. He founded his religious Reformation on the congregation, and this of itself suggested that the state was nothing but the people. It so happened that those cantons which remained firmly attached to Roman Catholicism were the least powerful, and yet from historical position and the long custom of the Confederacy had the largest legal in- fluence in the country. The Forest Cantons had been the earliest to free themselves. Isolated towns and districts after successful revolt had claimed the protection of these little republics, and the Forest Cantons governed by ineans of prefects a large number of places beyond their boundaries. This gave them votes in the diet or federal council far beyond what they were entitled to by their population and actual resources. These cantons felt that, if the Reformation and the political ideas it suggested spread, their supremacy would be overthrown and their rule confined within their own territories. Nor had they in their upland valleys seen the worst abuses of the medi- zval church. They dreaded the Reformation. They per- secuted inquirers after truth, and imprisoned, beheaded, and burnt the followers of Zwingli when they caught them within their borders. Zwingli, alone among Protestant leaders, saw that the religious and the political questions |

could not be decided separately, but were for practical statesmanship one and the same problem. His policy was to reorganize the Swiss constitution on the principles of representative democracy, to put an end to the unnatural supremacy of the Forest Caritons by abolishing the prefects and their jurisdiction, and by giving the larger cantons the influence in the diet which was due to their resources and population, and to do this at once, and if necessary by war. His counsels were overruled. Bern was anxious to treat the religious question separately, and to negotiate for religious toleration, leaving the political future to take care of itself. The course of history has fully justified Zwingli. The views of the peace party triumphed, and a religious truce was negotiated under the name of the first peace of Cappel, with guarantees on paper that there was to be toleration in religious matters. But no real securities were given. The provisions of the treaty were never carried out in the Roman Catholic cantons, where authori- ties were secretly preparing for war. Zwingli in vain pro- claimed the danger and urged offensive measures. The Protestant cantons remained heedless to the danger. At length the storm burst. The Forest Cantons advanced (1531) secretly and rapidly on Zurich, with the intention of overcoming the Protestant cantons one by one. The Zurichers met their foes-at Cappel, were outnumbered, and were defeated. Zwingli, who had accompanied the troops as field chaplain, and had stood among the fighting men to encourage them, had received two wounds on the thigh when a blow on the head knocked him senseless. After the retreat of the Zurichers, when the victors examined the field, Zwingli was found to be still living. He was not recognized, and was asked if he wished a priest ; when he refused, a captain standing near gave him a death- stroke on the neck. Next day his body was recognized. "Then there was a wonderful running to the spot the whole morning, for every man wished to see Zwingli." He had in death the same eager, courageous expression which his hearers were accustomed to see on his face when he preached. A great boulder, roughly squared, standing a little way off the road, marks the placé where Zwingli fell. It is inscribed with the words, " 'They may kill the body but not the soul': so spoke on this spot Ulrich Zwingli, who for truth and the freedom of the Christian Church

‘died a hero’s death, Oct. 11, 1531.”

Zwingli’s theological views are expressed succinctly in the sixty- seven theses published at Zurich in 1523, and at greater length in the First Helvetic Confession, compiled in 1536 by a number of his disciples.1 They contain the elements of Reformed as distinguished from Lutheran doctrine. As opposed to Luther, Zwingli insisted more firmly on the supreme authority of Scripture, and broke more thoroughly and radieally with the medieval church. Luther was content with changes in one or two fundamental doctrines ; Zwingli aimed at a reformation of government and discipline as well as of theology. Zwingli never faltered in his trust in the people, and was earnest to show that no class of men ought to be called spiritual simply because they were selected to perform certain functions. He thoroughly believed also that it was the duty of all in authority to rule in Christ’s name and to obey His laws. He was led from these ideas to think that there should be no government in the church separate from the civil government which ruled the commonwealth. All rules and regulations about the public worship, doctrines, and discipline of the church were made in Zwingli’s time, and with his consent, by the council of Zurich, which was the supreme civil authority in the state. This was the ground of his quarrel with the Swiss Anabaptists, for the main idea in the minds of these greatly maligned men was the modern thought of a free chureh in a free state. Like all the Reformers, he was strictly Augustinian in theology, but he dwelt chiefly on the positive side of predestination—the election to salva- tion—and he insisted upon the salvation of infants and of the pious heathen. His most distinctive doctrine is perhaps his theory of the sacrament, which involved him and his followers in a long and, on Luther’s part, an acrimonious dispute with the German Protest- ants. His main idea was that the sacrament of the Lord’s Supper

1 Schati, Creeds of the Evangelical Protestant Churches, p. 211. XXIV. — 105

was not the repetition of the sacrifice of Christ, but the faithful remembrance that that sacrifice had been made once for all; and his

decper idea of faith, which included in the act of faith a real union and communion of the faithful soul with Christ, really pre- served what was also most valuable in the distinctively Lutheran doctrine. His peculiar theological opinions were set aside in Switzerland for the somewhat profounder views of Calvin. The publication of the Zurich Consensus (Consensus Tigurinus) in 1549 marks the adhercuce of the Swiss to Calvinist theology. ;

Zwingli's most important writings are— Von Erkiesen und Fryheit der Spysen (April 1522); De Canone Missx Epichiresis (September 1523) ; Commentarius de Vera et Falsa Religione (1525); Vom Tous, vom Wiedertouf, und vom Kindertouf (1525) ; Lin klare Unterrich- tung vom Nachtmal Christi (1526) ; De Providentia Det (1530) ; and Christiane Fidei Expositio (1531).

For his theology, compare Seegwart, Ulrich Zwingli, der Character sciner Theo- logie, 1855 ; especially Hundeshagen, Beitrdge zur Kirchenver fassungsgeschichte u. Kirchenpolitik, 1864; Usteri, Ulrich Zwingli, ein Martin Luther ebenbiirtiger Zeuge des evangelischen Glaubens, 1883; and A. Baur, Zwingli's Theologie, ihr Werden wna ihr System, 1885.

For Zwingli's life, compare Oswald Myconius, De Huldrichi Zwinglit Fortissimi Herois ac 7 heologi Doctissimi Vita, et Obitu, 1532; Bullinger, Reformationsge- schichte, 1838 ; Morikofer, Ulrich Zwingli, 1867 ; and Stahelin, Huldreich Zwingli und sein Reformationswerk, 1884. Stihelin is also the author of the remarkably good article on Zwingli in Herzog-Plitt's Real-Encykl., vol. xvii. (T. M. L.)

ZWOLLE, a fortified town of Holland, capital of the province of Overyssel, 55 miles by rail to the north-east of Utrecht, stands on the Zwarte Water, a right-hand tributary of the Yssel, a little above its junction with that river. On the side of the town next the railway station is the Sassen-poort, an old Gothic gateway of brick ; but the town has few other historical monuments of interest. The large Gothic church of St Michael in the market place, begun in 1406, contains a fine organ and a richly carved pulpit.

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The town has a considerable trade by water, and among its more important industries are shipbuilding, cotton manufacture, dyeing and bleaching, tanning, rope-making, and saltmaking. The population in 1887 was 25,005.

Zwolle was first fortificd in 1223 by the bishop of Utrecht. It afterwards became a free imperial city and a meinber of the Hanseatic League, and first joined the United Provinces in 1580. Three miles from the town on a gentle eminence stands the monas- tery of the Agnetenberg, where Thomas a Kempis lived for the greater part of his life. Terburg the painter was a native of Zwolle.

ZYMOTIC DISEASES ((éuy, ferment), a term in medicine applied by some authorities to the class of acute infectious maladies. As originally employed by Dr Farr of the British registrar-general's department, the term in- cluded the diseases which were "epidemic, endemic, and contagious," and owed their origin to the presence of some morbific principle in the system acting in a manner ana- logous to, although not identical with, the process of fermentation. A very large number of diseases were accordingly included under this designation. The term, however, has come to be restricted in medical nomen- clature to the chief fevers and contagious diseases (e.g., typhus and typhoid fevers, smallpox, scarlet fever, measles, erysipelas, cholera, hooping-cough, diphtheria, é&c.). Al- though the name is held by not a few authorities to be objectionable on account of the theory it suggests, it is still made use of in the registrar-general's classification of diseases,

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